TTS 3, EZ-TESTER
T-Carrier Test Set

Reference Manual

Warranty Registration

Thank you for purchasing the TTS 3, EZ-TESTER. To activate the warranty and to insure that you receive updated information on your EZ-Tester, we must have a record of warranty registration. Please fill out the WARRANTY REGISTRATION CARD in the back of this manual and mail it to us *as soon as possible*. Also, there are two CHANGE OF ADDRESS cards for your use, as required.

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SECTION 1
Introduction to the TTS 3, EZ-TESTER

1.1 OVERVIEW

The TTS 3, EZ-TESTER is a lightweight, hand-held, T1 test set that performs in-service and out-of-service transmission, bit error performance, and DSO channel tests on full and fractional T1 systems. It can be powered from a 115/230 VAC source or from an internal rechargeable battery for convenient portable use.

The EZ-TESTER is menu driven and operated from a simple front-panel keyboard and a large screen that displays test setup menus and selections, control functions, and test results. It can also be operated from a personal computer (PC) either locally or remotely using a dial-up modem and a telephone line.

A data memory facility in the EZ-TESTER captures and stores important test results and programmable alarm/status events for transfer to an external printer. A test setup memory file stores 3 factory-programmed test setups and up to 8 user-programmable test setups. This important feature eliminates human errors and saves time when setting up frequently used tests.

A special **OnCall®** feature allows quick and convenient "in-the-field" installation of the latest factory software changes and enhancements via a dial-up modem and telephone line (see SECTION 4 for instructions).

The EZ-TESTER is shipped with the basic accessories listed in Table 1-1.

Table 1-1. TTS 3, EZ-TESTER Basic Accessories

QTY	ACCESSORY
1	Padded Carrying Case w/Removable Carrying Strap P/N 140058
1	TTS 3 Removable Carrying Strap
1	AC Power Adapter P/N 400020
2	5-ft Bantam-to-Bantam Patch Cable P/N 600041
2	Bantam-to-310 Adapter Plug P/N 600042
1	5-ft RS-232 "Y" Ribbon Cable P/N 600031
1	6-ft 15-Pin to 4x4 Patch Cord P/N 600057 (included only with Option 04)
1	Terminal Cable P/N 600064 (included only with Option 10)
1	Earphone P/N 130006
1	Removable Plastic Stand (tilt bail)
1	Technical Manual P/N 610056

1.2 OPTIONAL FEATURES AND ACCESSORIES

The options and accessories, listed in Table 1-2, are available to expand the use of your EZ-TESTER. You may have purchased one or more options when you initially ordered your EZ-TESTER. To determine which options are installed, turn the power on and press **[F3] GRAPHIC** when the MAIN MENU screen appears. Then press **[F3] OPTIONS**. A list of the options installed will be displayed on the screen.

If you wish to order an option or an accessory, please call the factory or your local Electrodata representative.

SECTION 1. Introduction (Continued)

Table 1-2. TTS 3, EZ-TESTER Options & Accessories

NUMBER	DESCRIPTION
	OPTIONS
01	Fractional T1 (FT1) Circuit Testing
02	On-Screen Pulse Shape Analysis
03	ESF/SLC 96 Datalink Monitoring & Control
04	T1 Line Performance Monitor Data Retrieval
05	Addressable Repeater & Maintenance Switch Control
06	Dial/Supervision
07	Computer Enhanced Remote Testing (using Windows)
08	MF Dial/Capture (requires Option 06)
09	Primary Rate ISDN
10	Terminal Emulation
11	DDS Channel Testing
12	GR-303 Test Access
13	SS7 Capture/Analysis
	ACCESSORIES (NOTE: Patch cords are 6 feet long)
630046	Vehicle Cigarette Lighter Battery Charger
630047	LP 1 Thermal Printer
630049	LP 1 Thermal Paper (5 rolls)
630048	RE 1 Repeater Extender
630053	LIU Interface Connector Model 735
600048	Bantam to 310 Patch Cord
600049	Bantam to Alligator Clips Patch Cord
600051	15-Pin D to 15-Pin D NI Patch Cord
600052	15-Pin D to RJ48 Patch Cord
600053	Station Protector Block to Dual Bantam Patch Cord
600058	Bantam to Wire Wrap Patch Cord
600059	Dual Bantam to RJ48 Patch Cord
210076	TAC Test Apparatus Connector
600047	15-Pin to RJ11C Patch Cord

1.3 ADDITIONAL INFORMATION/TECHNICAL ASSISTANCE

If you need additional information about your EZ-TESTER, or if you need technical assistance, please call the factory during working hours (Eastern Time Zone) or send us a FAX or e-mail at any time.

We also offer special on-site training programs covering basic T1 technology and the functions and applications of the TTS 3, EZ-TESTER.

Phone:	**216-663-3333**
Toll Free:	**800-441-6336**
FAX:	**216-663-0507**
e-mail:	**support@electrodata.com**
Internet:	**http://www.electrodata.com**

Please remember to fill out and return the **WARRANTY REGISTRATION CARD** in the back of this manual. This will put you on our mailing list to receive technical information about new features and software updates for the EZ-TESTER.

1.4 SPECIFICATIONS

Technical specifications for the TTS 3, EZ-TESTER are listed in **Appendix A** to this manual.

SECTION 2
Description of the TTS 3, EZ-TESTER

2.1 PHYSICAL DESCRIPTION

The TTS 3, EZ-TESTER is a compact, hand-held test set weighing less than 3 pounds. It is mounted in a sturdy weather-resistant metal case.

All push button controls, switches, indicator lamps, and T1 input/output jacks are mounted on the front panel, along with a backlit display screen. The AC power, RS-232 interface, and earphone connectors are mounted on the top of the unit.

The EZ-TESTER display screen provides a large viewing area 2-5/8 inches square (24 lines x 32 characters). The following major functions can be displayed on the screen, as selected by the operator:

- MAIN MENU and sub-menu setup and operating functions
- Menu choices for function keys (F1-F4)
- Graphic display of currently selected TTS 3 operating mode
- Time and date
- Signaling bit status--all 24 channels simultaneously
- Graphic display of input signal pulse shape and standard pulse masks
- Current test results and related setups (7-page display)

Example of Test Results Screen Page 1

```
                                          PAGE 1
                    RESULTS - SUMMARY
                    NO ERRORS

RECV LEVEL:                  -1.9 dBdsx
RECV FREQUENCY:              1,544,002 HZ
SIMPLEX CURRENT:             60 mA

                 CURRENT TEST SETUPS

CODING:    AMI         FRAMING: D3/D4
FORMAT:    64 X 1         CHAN: 23
PATTERN:   QRSS
CAPTURE:   ON

PAGE-UP      PAGE-DN       CLR-HST      more

   [F1]         [F2]         [F3]        [F4]
```

The connectors, controls, and indicator lamps mounted on the top and front panel of the EZ-TESTER are described in Table 2-1.

SECTION 2.1   Physical Description (Continued)

Table 2-1.   TTS-3 Connectors, Controls & Indicators

NAME	PURPOSE / DESCRIPTION
CONNECTORS	
AUXILIARY PORT	25-pin RS-232 serial interface connector. Used to interface printer, PC or modem to EZ-TESTER (see Table 2-2 for pin assignments)
6.5 VDC	Input jack for AC Power Adapter
EAR	Earphone jack. Used to listen to DSO channels (internal speaker is disconnected when earphone is connected)
RX	Bantam jack. Connects DS1 INPUT signal from T1 circuit under test to EZ-TESTER
TX	Bantam jack. Connects DS1 OUTPUT signal from EZ-TESTER to T1 circuit
REF	Bantam jack. Connects external DS1 reference signal to EZ-TESTER for timing measurements (frame/clock slips & wander)
NETWORK INTERFACE (NI)	DB-15 network interface connector. Used to terminate a public network T1 access line at a customer's premises. IN/OUT circuits of connector parallel the EZ-TESTER RX-TX in/out jacks. Also used to access signaling bits and selected VF channels (EXT. VF setup mode). (See Table 2-3 for pin assignments).
CONTROLS	
INPUT TERMINATION TERM	3-position slide switch to set EZ-TESTER T1 RX interface mode Terminates EZ-TESTER input circuit in 100 ohms (standard impedance of T1 line)
MON	Sets EZ-TESTER input circuit to interface a resistor-isolated DSX-1 MON jack (100-ohm input termination with 20 dB signal amplifier to offset resistive loss)
BRDG	Sets EZ-TESTER input circuit to high-impedance bridging mode (1000 ohms)
VOL +/-	Sets internal speaker volume (channel access mode)
TALK	Push-to-talk key (channel access mode)
PWR	Power on/off switch
F1 thru F4	Menu function soft keys
EDIT	Press to edit a changeable menu selection displayed on screen (using arrow keys)
MENU	Press to display MAIN MENU
ENTER	Press to enter a selected menu choice or editing change
RESTART	Press to start a test run (RUNNING STATUS lamp will light)
BIT/BPV ERROR	Injects a single BPV or BIT error into EZ-TESTER DS1 output signal (associated lamp flashes); or injects errors continually at a selected rate (associated lamp remains lit)
(Table continued on next page)	

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SECTION 2.1 Physical Description (Continued)

Table 2-1. TTS 3 Connectors, Controls & Indicators (Continued)

NAME	PURPOSE / DESCRIPTION
	LED INDICATOR LAMPS
ALARMS	**YELLOW & RED LAMPS/MONITOR INPUT SIGNAL ALARM CONDITIONS**
YELLOW ALARMS	(Yellow) Lights when T1 D4 or ESF YELLOW ALARM signal is detected (signal indicates that far-end T1 terminal device has lost its incoming signal)
EXCESS ZEROS	(Red) Flashes when more than 15 consecutive zeros are detected with AMI line coding; or more than 8 consecutive zeros are detected with B8ZS line coding
ALL ONES	(Red) Lights when more than 2048 consecutive ones are detected. Indicates presence of either a framed or unframed ALL ONES Alarm Indication Signal (AIS) sent downstream by an intermediate T1 circuit device (e.g. repeater). AIS is used to maintain transmission continuity when service has been interrupted upstream.
STATUS	**GREEN LAMPS/MONITOR INPUT SIGNAL STATUS**
SIGNAL PRESENT	Lights when T1/DS1 signal is present at EZ-TESTER input
FRAME SYNC	Lights when EZ-TESTER synchronizes with framing format of incoming DS1 signal
PATTERN SYNC	Lights when EZ-TESTER synchronizes with incoming DS1 test pattern (out-of-service test mode)
B8ZS	Lights when B8ZS code is detected at the EZ-TESTER DS1 input
RUNNING	Lights when [RESTART] key is pressed to indicate that a test run is in progress
ERROR INSERTION	**RED LAMPS/INDICATE WHEN ERRORS ARE INSERTED IN OUTPUT SIGNAL**
BIT ERROR	Flashes when [BIT ERROR] key is pressed to inject a single bit (or logic) error into EZ-TESTER DS1 output signal during test run. Remains lit when [BIT ERROR] key is pressed to inject bit errors at a selected rate during test run.
BPV ERROR	Same as BIT ERROR insertion

Table 2-2. Auxiliary Port Pin Assignments (RS-232)

PIN	EIA DESIGNATION	DESCRIPTION	PIN	EIA DESIGNATION	DESCRIPTION
1	AA	Frame Ground	6	CC	Data Set Ready
2	BA	Transmit Data	7	AB	Signal Ground
3	BB	Receive Data	8	CF	Receive Carrier Detect
4	CA	Request to Send	20	CD	Data Terminal Ready
5	CB	Clear to Send			

SECTION 2. Description of TTS 3 (Continued)

Table 2-3. Network Interface Connector Pin Assignments

PIN	DESCRIPTION	PIN	DESCRIPTION
1	Transmit Tip (T)	8	Signaling bit C
2	Ground	9	Transmit Ring (R)
3	Receive Tip (T1)	10	Not used
4	Ground	11	Receive Ring (R1)
5, 13	Balanced analog out	12	Unbalanced analog in
6	Internal use	14	Signaling bit A
7	Signaling bit D	15	Signaling bit B

2.2 FUNCTIONAL DESCRIPTION

The menu-driven TTS-3 EZ-TESTER performs standard DS1 transmission, bit error performance and DSO channel tests on T1 spans, SLC 96 systems, channel banks, multiplexers, and digital switches. It is also equipped with auxiliary features such as setup memory files, remote control, and external printing to complement the test and measurement functions.

MAIN MENU

Setups and test functions of the EZ-TESTER are selected from a **MAIN MENU** which can be accessed at any time by pressing the [MENU] key. Test functions are chosen from the MAIN MENU using the arrow keys (to scroll the cursor), the function keys (F1 thru F4), and the [EDIT] and [ENTER] keys, as appropriate. Up to 8 frequently-used test setups can be labeled and stored in memory and recalled on command quickly and easily.

The MAIN MENU choices (see Table 2-4) are displayed on a multi-page screen with a vertical sliding-bar indicator on the left side. As the operator scrolls down the menu (moving the cursor), the bar slides downward to indicate progression through the MAIN MENU choices. When the EZ-TESTER is turned on, it goes through a short self-test and then defaults to the first page of the MAIN MENU screen. At the bottom of this screen are four function key selections, as follows:

[F1] DARKER   Press and hold to darken screen contrast.

[F2] LIGHTER   Press and hold to lighten screen contrast.

[F3] GRAPHIC   Press to display a graphic illustration of current EZ-TESTER operating mode, a list of test setups, and the time and date.

NOTE: When **[F3] GRAPHIC** function key is pressed, it changes to **[F3] OPTIONS** (and vice versa)

[F3] OPTIONS   Press to display a list of the **optional** functions installed in your EZ-TESTER (see Table 1-2 for a list of all available options).

SECTION 2. Description of TTS 3 (Continued)

Table 2-4. List of EZ-TESTER MAIN MENU Choices

1. TEST SETUP	14. PM TEST ACCESS (Opt. 04)
2. AUTO CONFIGURATION	15. PULSE SHAPE ANALYSIS (Opt .02)
3. STORE/RECALL SETUPS	16. CAPTURE EVENTS
4. VF CHANNEL ACCESS	17. ESF/SLC DATALINK (Opt. 03)
5. DIAL/SUPERVISION (Opts. 06/08)	18. VIEW CHANNEL DATA
6. PRIMARY RATE ISDN (TE EMULATE)	19. TERMINAL EMULATION (Opt. 10)
7. PRIMARY RATE ISDN (MONITOR)	20. CSU/NIU EMULATION
8. DDS CHANNEL TESTING (Opt. 11)	21. CONFIGURATION SETUP
9. 24 CHANNEL SIGNALING	22. PRINT
10. GR-303 TEST ACCESS (Opt. 12)	23. AUXILIARY PORT
11. SS7 CAPTURE/ANALYSIS (Opt. 13)	24. FULL SELF-TEST
12. DELAY MEASUREMENT	25. OnCall UPDATE
13. LOOPBACK/SPAN CONTROL*	

* add Opt. 05 to control T1 spans equipped with addressable devices

The **MAIN MENU** choices are described in Table 2-5 in the order that they appear on the EZ-TESTER screen.

Table 2-5. EZ-TESTER MAIN MENU

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
TEST SETUP	**Test Setup Menu Choices**
OPERATING MODE	**OPERATING FORMAT/T1 INTERFACE CONFIGURATION**
[F1] MON-IS	In-service monitoring
[F2] TEST-IS	Channel drop & insert testing/T1 in-service
[F3] TEST-OS	Out-of-service testing
CODING FORMAT	**LINE CODING FORMAT**
[F1] AMI	Alternate Mark Inversion
[F2] B8ZS	Bipolar with 8 zero substitution
FRAMING FORMAT	**DS1 SIGNAL FRAMING FORMAT**
[F1] D3/D4	Superframe (twelve 24-channel frames)
[F2] SLC-96	Modified D4 framing with datalink (SLC-96 systems only)
[F3] ESF	Extended Superframe (twenty-four 24-channel frames)
[F4] more	Press to display additional function key selections
[F1] UNFRAMD	Unframed format (no channelization)
[F2] D1D	Early T1/DS1 framing format (single 24-channel frame)
[F3] D2	Early T1/DS1 framing format (single 24-channel frame)
[F4] more	Press to display previous function key selections
TRANS CLK SOURCE	**TTS 3 DS1 OUTPUT CLOCK SOURCE**
[F1] INTERNL	Internal TTS 3 clock (out-of-service test mode only)
[F2] RECOVRD	Clock recovered from incoming DS1 signal
	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
TEST SETUP **(Continued)**	**Test Setup Menu Choices**

<u>CHANNEL FORMAT</u>
[F1] FULL T1
[F2] 56 x 1
[F3] 64 x 1
[F4] FT1 (Opt.01)
   [F1] 56 x N
     [F1] SELECT
     [F2] DELETE
     [F3] CLR ALL
     [F4] AUTO
   [F2] 64 x N
     [Same as 56 x N)
	<u>DSO CHANNEL FORMAT/FT1 TIME SLOT FORMAT & PROGRAMMING</u>
	No Channelization
	Restricted 7-bit DS0 data channel format
	Standard 8-bit DS0 voice or clear data channel format
	Channel blocking for FT1 circuit testing (with screen display)
	   <u>Program/Display FT1 circuit using 56-kbs data channels</u>
	     Select (unblock) channel (at cursor position)
	     Delete (block) channel (at cursor position)
	     Clear current program - all channels blocked
	     Autoconfigure to FT1 input signal, display blocked and unblocked channels
	   <u>Program FT1 circuit using 64-kbs voice or clear data channels</u>
	     (Same as 56 x N above)

<u>CHANNEL NUMBER</u> [F1] NEXT [F2] PREVIUS	<u>SELECT DSO CHANNEL NUMBER</u> (requires 64 x 1 or 56 x 1 channel format) Select next **higher** channel number Select previous **lower** channel number

<u>TEST PATTERN</u>
[F1] QRSS
[F2] ALL 1'S
[F3] 1:7
[F4] 3 IN 24
    or
[F4] ALL 0'S
	<u>EZ-TESTER DS1 OUTPUT TEST PATTERN (Out-of-Service Test Mode)</u>
	Pseudorandom 20-bit pattern with 15 zero suppression
	All ones
	Eight bit pattern with only bit 2 set to a 1
	If **CODING FORMAT** is set to AMI: 24 bit pattern with only bits 2, 18 and 22 set to a
	    1.
	If **CODING FORMAT** is set to B8ZS: All zeros

"PRESS [EDIT] FOR SELECTIONS"	List of industry-standard test patterns stored in TTS 3 are displayed on screen/ use up-down/left-right arrow keys to move cursor to selection. **NOTE**: See Table 2-7, page 37 for a list of available test patterns
USER PATTERNS USER	**STORE/RECALL UP TO 8 USER TEST PATTERNS (up to 2048 bits each)** Move cursor to USER and press [ENTER] to recall or store a programmable setup (USER TEST PATTERN SCREEN appears)

Recall a Stored Pattern
(see below to view/edit pattern)
   [F1] VIEW
     [F1] FIRST
     [F2] LAST
     [F3] HEX/BINARY
     [F4] EDIT
       [F1] SET=1/+
       [F2] SET=0/-
       [F3] INSERT
       [F4] DELETE
   [F2] ERASE
   [F4] PRINT
	Move cursor to desired pattern label (file# 1-8) and press [ENTER] to select
	
	<u>View & edit selected user pattern (binary, hex & ASCII formats)</u>
	   Moves cursor to first BYTE in pattern (#1)
	   Moves cursor to last BYTE in pattern (up to 256)
	   Toggle to select HEX or BINARY format (for editing)
	   <u>Press to setup EDIT function (cursor moves to first binary/hex position in BYTE#1)</u>
	     Set bit to 1/or scroll "+" to increase hex digit (at cursor)
	     Set bit to 0/or scroll "-" to decrease hex digit (at cursor)
	     Insert character at cursor position
	     Delete character at cursor position
	Erase user pattern (at cursor)
	Print stored pattern (at cursor)

	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
TEST SETUP (Continued)	**Test Setup Menu Choices**
Label, Program & Store a Pattern [F1] LABEL	Move cursor to empty user file number (1-8) Use up/down & left/right arrows to create label for user pattern (up to 16 characters)
[F1] INSERT [F2] DELETE	Insert new character at cursor position Delete character at cursor position
"PRESS [ENTER] TO CONTINUE" [F1] FIRST [F2] LAST [F3] HEX/BINARY F4] EDIT	USER TEST PATTERN programming screen appears Moves cursor to first BYTE in pattern (byte #1) Moves cursor to last BYTE in pattern (maximum 256 bytes) Toggle to program pattern in hexadecimal or binary code Press to setup EDIT function (cursor moves to first binary/hex position in BYTE#1)
[F1] SET=1/+ [F2] SET=0/- [F3] INSERT [F4] DELETE [F2] FOX	Set bit to 1/or scroll to increase hex digit (at cursor) Set bit to 0/or scroll to decrease hex digit (at cursor) Insert new character at cursor position Delete character at cursor position 448-bit user-defined FOX pattern (same labeling & programming procedure as above)
TEST LENGTH [F1] TIMED "PRESS [EDIT]" [F2] CONT	SET LENGTH OF TEST RUN Timed test run (automatic timeout/use arrow keys to set time from 1 second to 100 hours/00:00:00=hours:minutes:seconds) Use left/right keys to move cursor & up/down keys to set time Continuous test run (i.e. no scheduled timeout)
AUTO CONFIGURATION	**Autoconfiguration & Display of Line Coding, Frame Format & Test Pattern of Incoming DS1 Signal**
(Press [ENTER] to start)	EZ-TESTER auto configures to line coding, framing format and test pattern (if applicable) of incoming DS1 signal. Configuration is displayed on screen as each parameter is detected. Note: Auto Configuration will not determine or change line coding if the detected test pattern one's density is such that a B8ZS line code would not be present in the incoming T1 signal. Note: D3/D4 (T1DM) will be displayed for FRAMING FORMAT if the T1DM framing format "10111xx0" is present in channel 24. Note: CDI DS1 IDLE will be displayed for TEST PATTERN if the Customer Disconnect Indicator (CDI) signal is present.
	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
AUTO CONFIGURATION (Continued)	**Autoconfiguration & Display of Line Coding, Frame Format & Test Pattern of Incoming DS1 Signal**
	Note: If auto configuration is unable to identify the incoming pattern, **UNKNOWN** will be displayed and **TEST PATTERN** will default to **2E23-1**.
[F1] RESTART [F4] RESTORE	Press to restart auto configuration process Will abandon new settings and restore Test Set to settings prior to entering Auto Configuration
STORE/RECALL SETUPS	**Store & Recall up to 8 User-Defined Test Setups, Configuration Setups & Capture Events. Recall 3 Factory-Defined Setups**
STORE/RECALL USER SETUPS	One of 2 setup screens is displayed
SCREEN #1	CURSOR *NOT ON* AN EXISTING USER SETUP
[F1] FACTORY or [F1] USER [F2] LABEL	Change display to RECALL FACTORY SETUPS--move cursor to select factory setup Return to STORE/RECALL USER SETUPS screen. Move cursor up/down to select file number (1-8) Display STORE CURRENT SETUP screen. Store and make a **label** (up to 16 characters) for the user-defined setup currently programmed
[F1] INSERT [F2] DELETE	Insert character at cursor position Delete character at cursor position (except #1)
	Use up/down arrows to select each character (A-Z or 0-9). Use left/right arrows to set cursor to another character position
	CURSOR *ON* AN EXISTING USER SETUP
SCREEN #2 [F1] FACTORY or [F1] USER [F2] UPDATE	Same as Screen #1 above) Use cursor to select USER setup file Change existing user setup in selected file to current TTS 3 programmed setups (select file # with cursor)
[F1] YES [F2] NO [F3] ERASE [F4] PRINT	Update (change) selected file to current setup Do not update file to current setup--return to previous screen Erase user setup file (at cursor position) Print user setup file (at cursor position) using external printer
	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
VF CHANNEL ACCESS	**Setup VF Channel Functions/Display Channel Data**
CHANNEL NUMBER	SELECT VF CHANNEL NUMBER
[F1] NEXT [F2] PREVIUS	Advance to next higher channel number Return to previous lower channel number
- SEND -	Select VF Send Functions
CHANNEL DATA	INSERT TEST TONE OR PATTERN INTO SELECTED CHANNEL
[F1] TRNSPNT	Received channel signals are retransmitted (allows scrolling through channels without disturbing live traffic in TEST-IS operating mode)
[F2] DIG-MW	1000 Hz test tone at a level of 0 dBm
[F3] FIXED	Press [EDIT] key to set 8-bit DS0 pattern to any combination of 1s & 0s
[F1] SET=1	Set data bit at cursor position to 1
[F2] SET=0	Set data bit at cursor position to 0
[F4] more	Press to display additional function key selections
[F1] EXT.VF	Activate EXTERNAL VF function (use front panel DB-15 connector to interface external VF test set to selected channel)
[F2] IDLE	Send 01111111 data bits in channel
[F3] ALL 1'S	Send 11111111 data bits in channel
[F4] more	Press to display previous function key selections
SET SIGNALING	SET OUTGOING SIGNALING BITS IN SELECTED CHANNEL (AB or ABC&D)
"PRESS [EDIT] KEY TO SET"	Set cursor on AB bit position (or ABCD if ESF) and press [F1] or [F2] to set
[F1] SET=1 [F1] SET=0	Set signaling bit at cursor to 1 Set signaling bit at cursor to 0
- RECEIVE DATA/SIGNALING -	Display Data/Signaling Bits & VF Freq/Level Measurements 0 1 2 3 4 5 6 7 A B or A B C D (ESF) [] [] [] [] [] [] [] [] [] [] [] [] [] [] NOTE: Shaded box = 1 Clear box = 0 FREQ: 0000Hz LEVEL: --.-dBm
	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
DIAL/SUPERVISION (Option 06)	**Perform Dialing & Supervisory Functions on Digital Trunks**
Move cursor to selection/Press [EDIT] DIAL/SUPERVISION SETUP	NOTE: EZ-TESTER CHANNEL FORMAT must be set to **64x1** or **56x1** NOTE: Current **TRUNK TYPE** and **DIAL METHOD** setups appear at top of screen. Move cursor to these setups and press [EDIT] key to display DIAL/SUPERVISION SETUP screen.
CHANNEL DATA 　[F1] TRNSPNT 　[F2] DIG-MW 　[F3] FIXED 　　[F1] SET=1 　　[F2] SET=0 　[F4] more 　[F1] EXT. VF 　[F2] IDLE 　[F3] ALL 1'S 　[F4] more TRUNK TYPE 　[F1] E&M 　[F2] G-START 　[F3] L-START	INSERT TEST TONE OR PATTERN INTO SELECTED CHANNEL 　Received channel signals are retransmitted (allows scrolling channels without disturbing traffic in **TEST-IS** setup mode) 　1000 Hz/0 dBm test tone 　Press [EDIT] key to set 8-bit fixed pattern to any combination of ones & zeros 　　Set data bit at cursor position to 1 　　Set data bit at cursor position to 0 　Press to display additional function key selections 　Activate EXTERNAL VF function 　Send bit pattern 01111111 in channel 　Send bit pattern 11111111 in channel 　Press to display previous function key selections SELECT TYPE OF TRUNK SIGNALING (See Appendix E for Summary) 　E&M (on/off-hook signaling used in inter-switch trunks) 　Ground start (on/off-hook signaling used in FX or SLC trunks) 　Loop start (on/off-hook signaling between telephone and switch)
EMULATE* 　[F1] FXS 　[F2] FXO 　[F3] SLC-STA 　[F4] SLC-OFF 　　*Trunk type must be set to 　　G-START or L-START	EMULATE SUPERVISORY FUNCTION OF GROUND & LOOP START TRUNKS 　Foreign Exchange station equipment (signal towards FXO) 　Foreign Exchange office equipment (signal towards FXS) 　SLC station equipment (signal towards CO switch) 　SLC office equipment (signal towards SLC remote terminal)
DIAL METHOD 　[F1] PULSE 　[F2] DTFM 　[F3] MF (requires Option 08)	SELECT TYPE OF DIALING 　Dial pulse signaling 　Dual-Tone Multi-Frequency signaling (See Appendix F for Frequencies) 　Multi-Frequency tone signaling (See Appendix F for Frequencies) (press [ENTER] to return to DIAL SUPERVISION screen)
CHANNEL NUMBER: 　[F1] NEXT 　[F2] PREVIUS	SELECT CHANNEL NUMBER (1-24) 　Advance to next higher channel number 　Return to previous lower channel number
OPERATION 　[F1] DIAL/STOP	SELECT DIAL/SUPERVISION OPERATIONS Dials digits from the dial sequence displayed on screen/Stop dialing process
	(Table continued on next page)

SECTION 2.2 Functional Description (Continued)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
DIAL/SUPERVISION (Continued)	**Perform Dialing & Supervisory Functions on Digital Trunks**
[F2] RING	Send ringing signals towards channel bank to ring loop
[F1] STOP	Stop sending ringing signals
[F3] ME WINK	Send off-hook signal and measure delay to wink and the wink duration (in milliseconds)
[F1] ABORT/RESTART	Stop operation/Restart operation
[F4] more	Press to display more function-key selections
[F1] DI-ECHO	Send 2100 Hz tone for 3 seconds to disable echo cancelers
[F2] V.54 LU	Send CCITT V.54 loopback code to loop DSU/CSU
[F3] V.54 LD	Send CCITT V.54 loopback code to loop down DSU/CSU
[F4] more	Press to display more function-key selections
[F1] WINK AN	When off-hook signal is received from far end, EZ-TESTER answers with wink back signal (on-hook to off-hook and back to on-hook) and is ready to receive dial sequence
[F2] WINK OR	EZ-TESTER sends off-hook signal to far end and waits for wink back/When wink back is detected, SEND DIAL SEQUENCE number displayed on screen is dialed automatically
[F1] STOP	Manually stop automatic WINK AN or WINK OR operation
[F4] more	Press to display more function-key selections
[F1] ON-HOOK	Send ON-HOOK signal
[F2] OF-HOOK	Send OFF-HOOK signal
[F3] WINK	Send wink (momentary OFF-HOOK signal)
[F4] more	Press to return to initial function-key selections
RECV DIAL SEQUENCE	**DISPLAY DIALED DIGITS RECEIVED FROM FAR-END SWITCH** (up to 32 alphanumeric characters)
[F1] PAUSE/CAPTURE	Stop capturing received dialed digits/Restart capturing received dialed digits
[F2] CLEAR	Clear dialed digits currently displayed on screen
SEND DIAL SEQUENCE	**SEND DIAL SEQUENCE DISPLAYED** **ENTER NUMBER MANUALLY OR STORE/RECALL NUMBER IN USER FILE**
(Press [EDIT] key to enter number manually)	Use right/left arrow key to move cursor to next character position/Use up/down arrow key to select character: 0-9/ABCD/*/#/P (Pause)
[F1] INSERT	Insert new character at cursor position
[F2] DELETE	Delete character at cursor position
[F1] USER	USER DIAL SEQUENCES screen appears. Select user-stored telephone number or label & store a new number
[F1] LABEL	Add label (up to 16 characters) to USER file (1-8) at cursor position
(if cursor **not on label**)	(label is for DIAL SEQUENCE currently displayed)
[F1] INSERT	Insert new character at cursor position
[F2] DELETE	Delete character at cursor position (if cursor on file number with existing label)
(or if cursor **on a label**)	
F1] UPDATE	Update USER DIAL SEQUENCE with current Send Dial Sequence
F2] ERASE	Erase label and number stored in USER file
	NOTE: SEND and RECEIVE channel signaling status (AB or ABCD, if ESF) is displayed at bottom of screen
	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
PRIMARY RATE ISDN **(Option 09)**	**Place and Receive ISDN Primary Rate Voice and Data Calls to Verify Service Functionality**
TE EMULATE	
PRIMARY RATE ISDN SETUP 1 PRESS <ENTER> TO CONTINUE [F1] SETUP 2	Press <ENTER> key to go to setup screen 2 Go to setup screen 2
Q931 STANDARD [F1] AT&T [F2] NTI [F3] ISDN-2 D-CHANNEL NUMBER [F1] NEXT [F2] PREVIUS	SELECT CALL CONTROL STANDARD AT&T 5ESS per 235-900-342 Northern Telecom DMS-100 per NIS A211-1 National ISDN-2 (NI-2) SELECT LOCATION OF D-CHANNEL (1-24) Advance to next higher channel number Return to previous lower channel number
INTERFACE ID [F1] NEXT [F2] PREVIUS	SELECT INTERFACE ASSOCIATED WITH ABOVE D-CHANNEL (1-31) Advance to next higher number Return to previous lower number
BEARER CAPABILITY [F1] VOICE [F2] DATA [F3] 3.1 KHz	SELECT BEARER CAPABILITY FOR OUTGOING CALLS Voice calls Data calls Audio

BEARER RATE
[F1] 56 X 1
[F2] 64 X 1
[F3] H11
[F4] more (Opt. 01)
   [F1] 64 X N
      [F1] SELECT
      [F2] DELETE
      [F3] CLR ALL
   [F2] H0
      [F1] 1-6
      [F2] 7-12
      [F3] 13-18
      [F4] 19-24
	SELECT BEARER RATE FOR OUTGOING DATA CALLS (data calls only)
	Rate adapted 56 kbps data
	64 kbs unrestricted data
	1,536 kbps unrestricted data
	
	Multirate (64 kbps base rate) unrestricted data
	Select (unblock) channel (at cursor position)
	Delete (block) channel (at cursor position)
	Clear current channel selections
	384 kbps unrestricted data
	Select H0 channel group 1 through 6
	Select H0 channel group 7 through 12
	Select H0 channel group 13 through 18
	Select H0 channel group 19 through 24

BEARER CHAN. NUMBER [F1] NEXT [F2] PREVIUS	BEARER CHANNEL NUMBER FOR OUTGOING CALLS (1-24) (only available for voice & 56 x 1 and 64 x 1 data only) Advance to next higher channel number Return to previous lower channel number
INTERFACE ID [F1] NEXT [F2] PREVIUS	SELECT INTERFACE ASSOCIATED WITH ABOVE B-CHANNEL (1-31) Advance to next higher number Return to previous lower number
	(Table continued on next page)

SECTION 2.2 Functional Description (Continued)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
PRIMARY RATE ISDN (TE EMULATE) (Continued)	**Place and Receive ISDN Primary Rate Voice and Data Calls to Verify Service Functionality**

<u>CALLED PARTY NUMBER</u>
 	
(Press \<EDIT\> key to enter
number manually)
[F1] INSERT
[F2] DELETE
 	
<u>PRIMARY RATE ISDN SETUP 1</u>
 	
PRESS \<ENTER\> TO CONTINUE
[F1] SETUP 1
 	
<u>NETWORK TYPE</u>
[F1] NONE
[F2] NTNAL
[F3] USER
 	
<u>NETWORK ID PLAN</u>
[F1] UNKNOWN
[F2] CIC
[F3] DATA
 	
<u>NETWORK IDENTIFICATION</u>
(Press \<EDIT\> key to enter)
 	
<u>FACILITY CODING</u>
[F1] NONE
[F2] FEATURE
[F3] SERVICE
 	
<u>FACILITY CODE</u>
[F1] NEXT
[F2] PREVIUS
 	
<u>CALLING PARTY NUMBER</u>
[F1] NONE
(Press \<EDIT\> key to enter)
 	
[F1] INSERT
[F2] DELETE
 	
PRIMARY RATE ISDN
(MAIN SCREEN)
	<u>NUMBER OF CALLED PARTY</u>
	<u>ENTER NUMBER MANUALLY OR STORE/RECALL NUMBER IN USER AREA</u>
	Use right/left arrow keys to move cursor to next or previous character position and then use up/down arrow keys to select character: 0 - 9
	    Insert new character at cursor position
	    Delete character at cursor position
	
	Press \<ENTER\> key to go to main screen
	    Go to setup screen 1
	
	<u>SELECT NETWORK SPECIFIC INFORMATION FOR OUTGOING CALLS</u>
	    No network identification will be included
	    Network type identification will be set to National Network Identification
	    Network type identification will be set to User Specified
	
	<u>SELECT NETWORK IDENTIFICATION PLAN FOR OUTGOING CALLS</u>
	    Unknown plan
	    Carrier Identification Code
	    Data Network Identification Code
	
	<u>ENTER NETWORK IDENTIFICATION (3 Digits)</u>
	Use left/right arrow keys to move cursor left or right and up/down arrow keys to select numbers
	
	    NOTE: CIC code for AT&T 288
	           CIC code for MCI: 222
	           CIC code for SPRINT: 333
	
	<u>SELECT FACILITY CODING OPTION FOR OUTGOING CALLS</u>
	    No facility code will be included
	    Requested facility is a feature.
	    Requested facility is a service.
	
	<u>SELECT FACILITY CODE VALUE (1-31) (See Appendix G for Options)</u>
	    Select next higher value
	    Select previous lower value
	
	<u>ENTER CALLING PARTY NUMBER TO BE INCLUDED IN OUTGOING CALLS</u>
	    No calling party number will be included in outgoing calls
	    Use left/right arrow keys to move cursor left or right and up/down arrow keys to select digits: 0 - 9
	    Insert new digit at cursor position
	    Delete digit at cursor position
	
	This is the screen from which ISDN calls are placed and received

	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
PRIMARY RATE ISDN (Continued)	**Place and Receive ISDN Primary Rate Voice and Data Calls to Verify Service Functionality**
LAYER 2:	NOT READY EZ-TESTER cannot establish layer 2 datalink READY EZ-TESTER has established layer 2 datalink. Calls can now be placed and received

CALL STATE: IDLE
    [F1] SETUP
    [F2] CALL
	Call control is in idle state
	    Return to Setup screen 1
	    Place outgoing call as setup in ISDN setup screens 1 and 2

CALL STATE: INCOMING CALL
    [F1] ACCEPT
    [F2] REJECT
    [F3] VIEW
	Call has been received but not accepted or rejected
	    Accept incoming call
	    Reject incoming call
	    Display selected channels of incoming 64 x N data calls

CALL STATE: CALL IN PROCESS
    [F1] CLEAR
	Call has been placed towards network
	    Clear outgoing call before it is accepted or rejected

CALL STATE: CONNECTED	Incoming or outgoing has been accepted and connection established
- BERT TEST RUNNING-	If connected call is a data call the lower half of screen will display BERT information
PATTERN: NNNN	Current test pattern selected: 2047, 2E15-1, QRSS, ALL 0'S, 1:7, 2 IN 8, 55OCTET, ALL 1'S

BPV ERRORS:
BIT ERRORS:
FRM ERRORS:
CRC ERRORS:
ELAPSED TIME:
    [F1] CLEAR CALL
    [F2] CHANGE PATTERN
    [F3] CLEAR RESULTS
    [F4] INSERT ERROR
	Bipolar violation count
	Test pattern (logic) error count
	Framing pattern error count
	ESF Cyclic Redundancy Check error count (only present if ESF selected)
	00:00:00 (hours:minutes:seconds) elapsed time since start of test
	    Clear this call and return to call idle state
	    Change to next pattern in sequence
	    Clear current results and restart test
	    Insert a single logic error into outgoing test pattern

- VF CHANNEL ACCESS -	If connected call is a voice call, the lower half of the screen will display VF information Current data being sent in selected B channel: IDLE, DIG-MW, EXT-VF
CHANNEL DATA : NNNN	Frequency of tone being received in selected B-channel

FREQUENCY: 0000 Hz
LEVEL: -00.0 dBm
    [F1] CLEAR CALL
    [F2] CHANNEL DATA: IDLE
    [F3] CHANNEL DATA: DIG-MW
    [F4] CHANNEL DATA: EXT-VF
	Level of tone being received in selected B-channel
	    Clear this call and return to call idle state
	    Send bit pattern 01111111 in B-channel
	    Send 1000 Hz/0 dBM test tone
	    Activate EXTERNAL VF function (use front panel DB-15 connector to connect
	      external VF test set to selected B-channel)

	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
PRIMARY RATE ISDN **(Continued)**	**Place and Receive ISDN Primary Rate Voice and Data Calls to Verify Service Functionality**
	NOTE: When the connected call is a voice call, the front panel push-to-talk button (TALK) is active and the volume control (VOL) may be used with either the earphone or the internal speaker.
CAUSE VALUE:	Numeric and plain language description of cause value sent from network
PRIMARY RATE ISDN **MONITOR**	**Capture, View and Print Data Contained in ISDN D-Channel**

PRIMARY RATE ISDN MONITOR
 	
Q931 STANDARD
    [F1] AT&T
    [F2] NTI
    [F3] ISDN-2
 	
D-CHANNEL NUMBER
    [F1] NEXT
    [F2] PREVIUS
 	
CAPTURE MEMORY
 	
    [F1] CAPTURE
 	
FRAME COUNT
 	
FRAME ERRORS
 	
ELAPSED TIME
 	
    [F1] STOP
    [F2] VIEW
    [F3] PRINT CONDNSD
    [F4] PRINT EXPANDD
 	
VIEW CAPTURED DATA - CONDENSED
 	
    [F3] EXPAND
    [F4] RETURN
 	
VIEW CAPTURED DATA - EXPANDED
    [F1] NEXT
    [F2] PREVIOUS
    [F3] CONDNSD
    [F4] RETURN
	SELECT CALL CONTROL STANDARD
	    AT&T 5ESS per 235-900-342
	    Northern Telecom DMS-100 per NIS A211-1
	    National ISDN-2 (NI-2)
	
	SELECT LOCATION OF D-CHANNEL (1-24)
	    Advance to next higher number
	    Return to previous lower channel number
	
	INITIATE DATA CAPTURE
	Use down arrow key to move cursor to CAPTURE MEMORY line.
	    Initiates data capture. F1 changes to STOP
	
	Current frame count
	
	Current frame error count
	
	Elapsed time from start of capture - hours;minutes;seconds (Clock starts when [F1] CAPTURE is pressed)
	    Terminate data capture routine. F1 changes to CAPTURE
	    View captured data on VIEW CAPTURED DATA - CONDENSED screen
	    Print VIEW CAPTURED DATA - CONDENSED screen
	    Print VIEW CAPTURED DATA - EXPANDED screen
	
	VIEW CAPTURED EVENT TITLE AND TIME.
	Select event for expanded view by highlighting desired event and pressing [F3] EXPAND
	    Change screen to VIEW CAPTURED DATA - EXPANDED
	    Change screen to PRIMARY RATE ISDN MONITOR screen
	
	VIEW DETAILS OF EVENT SELECTED ON CONDENSED SCREEN
	    Advance screen to display additional event data
	    Return to previous expanded screen
	    Change display to VIEW CAPTURED DATA - CONDENSED screen
	    Change display to PRIMARY RATE ISDN MONITOR screen

	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
DDS CHANNEL TESTING (Option 11)	**Test DDS circuits and components**

CHANNEL NUMBER
[F1] NEXT
[F2] PREVIOUS
	SELECT CHANNEL NUMBER (1-24)
	    Advance to next higher channel number
	    Return to previous lower channel number

DSO-A CHANNEL RATE [F1] 2400 [F2] 4800 [F3] 9600 [F4] more [F1] 19.2K [F2] 38.4K [F3] 56K [F4] more [F1] 64K [F4] more	SELECT DSO-A CHANNEL FORMAT Bytes are repeated 20 times to attain 2,400 bps rate Bytes are repeated 10 times to attain 4,800 bps rate Bytes are repeated 5 times to attain 9,600 bps rate Press to display more function-key selections Bytes are framed into a five byte frame to attain 19,200 bps rate Bytes are framed into a five byte frame to attain 38,400 bps rate Seven bits of each byte are used to attain a 56,000 bps rate Press to display more function-key selections All eight bits of each byte are used to attain a full 64,000 bps rate Press to return to initial function-key selections
TEST PATTERN "PRESS [EDIT] FOR SELECTIONS"	TEST PATTERN TO BE SENT AND RECEIVED List of industry standard test patterns for DDS testing including 63, 127, 511 Pseudorandom patterns and DDS-1 through DDS-6 stress patterns. Use up-down/left-right arrow keys to move cursor to selection. See "USER PATTERNS" under TEST SETUP for description of storing and recalling user test patterns.

- STATUS -
 	
[F1] LOOP ENABLE
	Current Loopback Status and presence of any received control codes.
	
	    Select DDS Loopback sequence to be sent:
	        CHANNEL LATCHING
	        DSU LATCHING
	        OCU LATCHING
	        DSO DATAPORT
	        NIE LATCHING
	        USER LATCHING
	        CHANNEL ALTERNATING
	        DSU ALTERNATING
	        OCU ALTERNATING
	        USER ALTERNATING
	
	Note: Alternating sequences are not available when DSO-A CHANNEL RATE is set to 64 KBPS.

	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
DDS CHANNEL TESTING (Continued)	**Test DDS circuits and components**

[F2] LOOP DISABLE
[F3] CONTROL CODES
	Send TEST IN PROGRESS control code to disable loopback
	Select DDS Loopback sequence to be sent:
	    REPEATER RELEASE CODE (Alternating ALL 1's and CSU code)
	    IDLE
	    ABNORMAL STATION
	    MUX-OUT-OF-SYNC
	    UNASSIGNED MUX CHANNEL
	    TEST CODE
	    TEST ALERT
	    MJU ALERT
	    LOOPBACK ENABLE
	    FAR-END VOICE
	    TRANSITION IN PROGRESS
	    BLOCK CODE
	    RELEASE CODE
	    MAP0 CODE
	    MAP1 CODE
	    USER CODE

[F1] CANCEL [F4] START BERT	Cancels sending of selected control code sequence. Starts bit error rate test using selected TEST PATTERN.
- BERT RESULTS -	**Current Bit Error Results**

BPV ERRORS:
BIT ERRORS:
FRM ERRORS:
CRC ERRORS:
ELAPSED TIME:
    [F2] CLEAR RESULTS
    [F3] INSERT ERROR
    [F4] STOP BERT
	Bipolar violation count
	Test pattern (logic) error count
	Framing pattern error count
	ESF Cyclic Redundancy Check error count (only present if ESF selected)
	00:00:00 (hours:minutes:seconds) elapsed time since start of test
	    Clear current results and restart test
	    Insert a single logic error into outgoing test pattern
	    Stop Bert testing and return to Status display

24 CHANNEL SIGNALING	**Display Signaling Bits in all 24 Channels Simultaneously**
[F1] HOLDSCR	Current AB or ABCD (if ESF) signaling bit status for all 24 channels is displayed on screen Freeze status (1 or 0) of instantaneous signaling bits currently flashing on screen (for operator review)
	(Table continued on next page)

SECTION 2.2 Functional Description (Continued)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
GR-303 TEST ACCESS (Option 12)	**Timestamp and Display TMC and EOC Channel Data**
TMC/CSC CHANNEL	TIME MANAGEMENT CHANNEL / COMMON SIGNALING CHANNEL DATA CAPTURING
TMC/CSC MONITORING	CAPTURE AND DISPLAY LAYERS, CRV FILTERING, AND CAUSE CODE FILTERING
LAYER FILTER [F1] ALL [F2] 3 ONLY	Select data to be displayed by protocol layer Display data from layer 2 and layer 3 Display data from layer 3 only
CRV FILTER [F1] ALL [F2] SPECIFIC	Select data to be displayed by Call Reference Value (CRV) Display all CRV data Display data for one specific CRV
CAUSE CODE FILTER [F1] ALL [F2] ABNORMAL	Select data to be displayed by Cause Code Display data for all cause codes Display data for abnormal cause codes only
- CAPTURE MEMORY - [F1] CAPTURE/STOP	Initiate data capture and display results Commence capture / Stop capture
FRAME COUNT: FRAME ERRORS: ELAPSED TIME:	Number of counted frames increments during capture operation Number of detected errors increments during capture operation Elapsed time counter increments during capture operation
"CAPTURING FRAMES" "NO CAPTURED FRAMES"	Message appears during capture operation Message appears before capture operation is initiated
[F2] VIEW [F3} EXPAND [F4] RETURN [F3] STATS [F4] RETURN [F4] more	Change display to the VIEW CAPTURED DATA - CONDENSED screen Change display to the VIEW CAPTURED DATA - EXPANDED screen Returns display to the TMC/CSC MONITORING menu Change display to the TMC/CSC CAPTURED STATISTICS screen Returns display to the TMC/CSC MONITORING menu Enables PRINT CONDNSD and PRINT EXPANDD function
EOC CHANNEL	EMBEDDED OPERATIONS CHANNEL DATA CAPTURING
EOC MONITORING	MONITOR THE MANAGEMENT COMMUNICATIONS BETWEEN THE SWITCH AND REMOTE TERMINAL
LAYER FILTER [F1] ALL [F2] 3 ONLY	Select data to be displayed by protocol layer Display data from layer 2 and layer 3 Display data from layer 3 only
CAPTURE MEMORY [F1] CAPTURE/STOP	Initiate data capture and display results Commence/Stop capture
FRAME COUNT: FRAME ERRORS: ELAPSED TIME:	Number of counted frames increments during capture operation Number of detected errors increments during capture operation Elapsed time counter increments during capture operation
"CAPTURING FRAMES" "NO CAPTURED FRAMES"	Message appears during capture operation Message appears before capture operation is initiated
	(Table continued on next page)

SECTION 2.2 Functional Description (Continued)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
GR-303 TEST ACCESS (Continued)	**Timestamp and Display TMC and EOC Channel Data**
<u>CRAFT INTERFACE ACCESS</u>	CRAFT INTERFACE ACCESS USING THE RS-232 AUXILIARY JACK (This screen is only available if Option 10 is installed)
Auxiliary port settings screen is displayed when Craft Interface Access is selected "(INITIALIZING)"	After selecting CRAFT INTERFACE ACCESS, momentary screen appears displaying port settings : current interface (DTE/DCE), bit rate, bits per character, parity (EVEN/ODD), number of stop bits
[F1] CURSOR LEFT [F2] CURSOR RIGHT [F3] BACKSPACE [F4] SELECT	Moves the cursor left through alphabet and numbers Moves the cursor right through alphabet and numbers Sends backspace character Sends character displayed in cursor position
<u>PERFORMANCE REPORT MSGS</u>	**PERFORMANCE REPORT MESSAGE CAPTURING** (This screen is only available if Option 3 is installed)
<u>T1.403 ESF DATALINK</u>	**Monitor & emulate ANSI T1.403 network performance reporting over ESF datalink (this screen appears when ESF FRAMING is selected)**
- SEND -	Setup T1.403 SEND functions to emulate coded messages transmitted in ESF datalink (**NOTE: EZ-TESTER must be set to TEST-OS or TEST-IS** operating mode to use SEND functions) selected source of T1.403 Performance Report Messages (PRMs) sent in datalink.
<u>MODE:</u>	
[F1] LIVE	PRM's are transmitted once each second using variable performance data recovered from the RECEIVED DS1 signal while test run is in progress.
[F2] FIXED (Scroll cursor down to select CRC EVENT, ASBs, and UNSCHD MSG)	Fixed PRMs are transmitted once each second as selected from the CRC EVENT and ASBs setup menus below
<u>CRC EVENT:</u>	Select range of CRC error events to be encoded into PRM 1) None 5) 11 to 100 errors 2) One Error 6) 101 to 319 errors 3) 2 to 5 errors 7) 320 or more errors 4) 6 to 10 errors
[F1] NONE [F2] LOWER [F3] HIGHER	No CRC error events to be encoded Scroll to select lower CRC error event range Scroll to select higher CRC error event range
<u>ASB's:</u>	Select Application Specific Bits to be encoded into PRM plb=CSU payload loopback activated sl=Controlled slip lv=Line code violation or BPV se=Severely errored second (320 or more fe=Frame synchronization error CRC errors or out-of-frame condition/2 of 4 consecutive framing bits in error)
"PRESS <EDIT> KEY TO SET"	Move cursor to select ASBs to be transmitted in datalink
[F1] SET	Set ASB at cursor (when SET, ASB message is transmitted in UPPERCASE letters)
[F2] RESET	Reset ASB at cursor (when RESET, ASB message is transmitted in lowercase letters (this is a history message indicating that ASB was SET but is now clear)
	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
GR-303 TEST ACCESS (Continued)	**Timestamp and Display TMC and EOC Channel Data**
[F3] UNSCHED	Simulate unscheduled PRIORITY or COMMAND RESPONSE codeword messages to be transmitted in datalink
<u>UNSCHED MSG</u>	Select unscheduled preprogrammed codeword message from function key menu (F1-F4) or press [EDIT] to manually program a codeword message)
[F1] YEL-ALM [F2] PLPK-UP [F3] PLPK-DN [F4] more	Yellow alarm CSU payload loopback switch activated CSU payload loopback switch deactivated (circuit restored) Press to display additional function-key selections
[F1] LLPK-UP [F2] LLPK-DN [F4] more	CSU line loopback switch activated CSU line loopback switch deactivated (circuit restored) Press to display additional function-key selections
[F1] NLPK-UP [F2] NLPK-DN [F4] more	NIU (or smart jack) loopback switch activated NIU (or smart jack) loopback switch deactivated (circuit restored) Press to return to initial function-key selections
"PRESS <EDIT> KEY TO SET" [F1] SET 1 [F2] SET 0	Manually program an unscheduled codeword message (use left/right arrow keys to move cursor to bit position) Set bit at cursor to 1 Set bit at cursor to 0
- RECEIVE -	**Display standard decoded ESF datalink T1.403 PRM's, Error Counts, and Elapsed Time**
CRC EVENT ASB STATUS UNSCHED MSGS ERRORED SEC SVRLY ERRD SEC MESSAGE ERRORS ELAPSED TIME	CRC error messages Application Specific Bits encoded into PRM's Unscheduled 6-bit messages (any current message appears at left/previous message received appears at right in parentheses) Number of test seconds with a frame bit error or CRC error Number of test seconds with 2 of 4 consecutive frame bits in error, or more than 320 CRC errors Number of PRM's received in error Elapsed time clock - hours:minutes:seconds (clock starts initially when ESF/SLC DATALINK function is selected from MAIN MENU)
[F1] CLEAR	Clear currently displayed PRM's, error counts and reset elapsed time clock to 00:00:00.
<u>HYBRID SIGNALING</u>	**DISPLAY REAL TIME 24 CHANNEL SIGNALING BITS**
<u>HYBRID SIGNALING SETUP</u> <u>CIRCUIT TYPE</u> [F1] IDT → RDT [F2] RDT → IDT [F3] DNE → RDT [F4] RDT → DNE	**Select circuit type and signal direction** Integrated Digital Terminal to Remote Digital Terminal Remote Digital Terminal to Integrated Digital Terminal Digital Network Element to Remote Digital Terminal Remote Digital Terminal to Digital network Element
	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
GR-303 TEST ACCESS (Continued)	**Timestamp and Display TMC and EOC Channel Data**

SERVICE
 	
"PRESS [EDIT] FOR SELECTIONS"
 	
"PRESS [ENTER] TO CONTINUE"
(24 Channel Signaling screen appears)
 	
24 CHANNEL SIGNALING
    [F1] HLDSCRN
 	
    [F2] SETUP
    [F3] DECODED
 	
DECODED ABCD CODES
    [F1] HLDSCRN
    [F2] SETUP
    [F3] RAW
    [F4] LEGEND
	SELECT.....
	
	    LOOP START
	    GROUND START
	    LOOP REVERSE BATTERY
	    COIN CF/DTF
	    MULTI-PARTY
	
	DISPLAY RAW SIGNALING BITS
	Freeze status (1 or 0) of instantaneous signaling bits currently flashing on screen (for operator review)
	Return to the HYBRID SIGNALING SETUP menu
	Display the DECODED ABCD CODES screen
	
	DISPLAY DECODED SIGNALING CODES
	Freeze screen to display instantaneous decoded ABCD bits
	Return to the HYBRID SIGNALING SETUP menu
	Display the 24 CHANNEL SIGNALING screen
	Display the momentary HYBRID SIGNALING LEGEND screen
	    LC LOOP CLOSURE
	    LO LOOP OPEN
	    LCF LOOP CURRENT FEED
	    RLCF REV. LOOP CURRENT FEED
	    LCFO LOOP CURRENT FEED OPEN

SS7 CAPTURE/ANALYSIS (Option 13)	**Capture and Analyze SS7 Link Channel MSU Messages; Monitor Number of FISU, LSSU, MSU, SUs and Inverted FIBs and BIBs**

- CONFIGURATION OPTIONS -
 	
SIGNALING TIME SLOT
    [F1] NEXT
    [F2] PREVIOUS
 	
SIGNALING BIT RATE
    [F1] 56KBPS
    [F2] 64KBPS
 	
- SS7 OPERATION -
 	
MSU CAPTURE
 	
MSU CAPTURE FILTER SETUP
    SERV INFO FIELD
        [F1] ALL
        [F2] SCCP
        [F3] ISUP
        [F4] more
	CONFIGURE TEST SET TO LINK CHANNEL NUMBER AND BIT RATE
	
	Select T1 channel serving as SS7 link
	    Increments channel number by 1
	    Decrements channel number by 1
	
	Select bit rate of SS7 link
	    Sets test set for 56KBps operation
	    Sets test set for 64KBps operation
	
	SELECT CAPTURE OR ANALYSIS OPERATION
	
	Select the MSU capture and analysis function
	
	Filter MSU messages for capture by the following criteria:
	Filters messages by contents of the Service Information octet to the following:
	    Select all MSU messages
	    Select only Signaling Connection Control Part (SCCP) MSUs
	    Select only ISDN User Part (ISUP)MSUs
	    Enable more softkey selections

	(Table continued on next page)

SECTION 2.2 Functional Description (Continued)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
SS7 CAPTURE ANALYSIS **(Continued)**	**Capture and Analyze SS7 Link Channel MSU Messages; Monitor Number of FISU, LSSU, MSU, SUs and Inverted FIBs and BIBs**
[F1] SNT [F2] SNM	Select only Signaling Network Test (SNT) MSUs Select only Signaling Network (Management) MSUs
DEST POINT CODE [F1] ALL [F2] SPECIFIC	Filter messages by specific destination point code Select all messages Select only messages with a user designated destination point code
ORIG POINT CODE [F1] ALL [F2] SPECIFIC	Filter messages by originating point code Select all messages Select only messages with a user designated originating point code
CIRCUIT ID CODE [F1] ALL [F2] SPECIFIC	Filter messages by circuit identification code Select all messages Select only messages with a user designated circuit identification code
CALLED ADDRESS [F1] ALL [F2] SPECIFIC	Filter messages by called address Select all messages Select only messages with user designated called address
CALLING ADDRESS [F1] ALL [F2] SPECIFIC	Filters messages by calling address Select all messages Select only messages with user designated calling address
"PRESS <ENTER> TO CONTINUE"	
<u>- MSU CAPTURE FILTER SUMMARY -</u>	<u>Top half of screen displays selected filters</u>
- MSU CAPTURE MEMORY - [F1] CAPTURE [F3] FILTER	<u>Bottom half of screen displays summary of capture operation</u> Initiate capture operation. F1 key toggles to STOP. Return display to the MSU CAPTURE FILTER SETUP screen
PROCESSED: CAPTURED: ELAPSED TIME:	Indicates number of MSUs detected on link Indicates number of MSUs captured in accordance with selected filters Displays elapsed time since capture operation was started
"CAPTURING MSU'S"	Message is displayed while capture operation is in progress
"NO CAPTURED MSU'S"	Message is displayed if no messages meet the filter criteria by the end of the capture operation
SU / MSU ANALYSIS	<u>SELECT THE SU MSU ANALYSIS OPERATION</u>
SU ANALYSIS	<u>Count number of FISU LSSU MSU messages and inverted FIBs and BIBs</u>
FISU **LSSU**	Fill-In Signal Unit count Link Status Signal Unit count
	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
SS7 CAPTURE ANALYSIS **(Continued)**	**Capture and Analyze SS7 Link Channel MSU Messages; Monitor Number of FISU, LSSU, MSU, SUs and Inverted FIBs and BIBs**
MSU TOTAL SU	Message Signal Unit count Total Signaling Unit count
- RETRANSMISSIONS -	Lower half of screen displays number of requests for message retransmission
FIB INV BIB INV [F1] PAUSE/RESUME [F2] RESTART [F3] MSU [F4] LEGEND	Inverted Forward Indicator Bit count Inverted Backward Indicator Bit count Halt or resume display of counted messages. Test set continues counting while screen is halted. Clear counters and restart counting operation Change display to MSU ANALYSIS screen Change display to show legend of acronyms used on SU ANALYSIS screen
<u>MSU ANALYSIS</u>	<u>Count number of SNM, SNTR, SNTS, SCCP, TUP, ISUP, OTHER messages and TOTAL MSUs.</u>
SNM SNTR SNTS SCCP TUP ISUP OTHER TOTAL MSU [F1] PAUSE / RESUME [F2] RESTART [F3] MSU [F4] LEGEND	Signal Network Management message count Signaling Network Test Regular message count Signaling Network Test Special message count Signaling Connection Control Part message count Telephone User Part message count ISDN User Part message count Other unspecified message count Total count of MSUs Halt or resume display of counted messages. Test set continues counting while screen is halted. Clear counters and restart counting operation Change display to SU ANALYSIS screen Change display to show legend of acronyms used on MSU ANALYSIS screen
DELAY MEASUREMENT	**Distance to Loopback / Round trip Delay Measurement**
"LOOPBACK NOT PRESENT" [F1] RESTART momentarily followed by ABORT (if loop-back is present) - ROUND TRIP DELAY - UNIT INTERVALS: 0 MICROSECONDS: 0.0	Measurement starts automatically when DELAY MEASUREMENT function is selected. Message is displayed to indicate that no loopback is detected Restart or abort measurement <u>PROPAGATION DELAY OF 1.544 MHZ DS1 SIGNAL</u> Delay measurement in Unit Intervals (1 UI=1 DS0 time slot or 648 nanoseconds) Delay measurement in microseconds
	(Table continued on next page)

SECTION 2.2   Functional Description (Continued)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

DELAY MEASUREMENT (Continued)	Distance to Loopback / Round trip Delay Measurement
- ONE WAY DISTANCE - KiloFEET: 0.0 MILES: 0.0 KILOMETERS: 0.0 "ASSUMING 500 ft per UI"	<u>DISTANCE FROM TEST ACCESS POINT TO EXISTING T1 LINE LOOPBACK</u> Distance in kilofeet (1 kilofoot=1000 feet) Distance in miles Distance in Kilometers Assumption used to simplify measurement (actual propagation rates vary according to the type & size or gauge of transmission cables and delays in transmission equipment such as multiplexers)
LOOPBACK/SPAN CONTROL	**T1 Span Control/Addressable Repeater & Maintenance Switch Control (Option 05)**
Move cursor to selection using up/down arrow keys	**NOTE:** Control of addressable (intelligent) repeaters and maintenance switches requires Option 05. The special functions and binary codes used in addressable devices are not standardized and may be customized by the manufacturer for a specific telephone company's use.
<u>OPERATING REGION</u> "PRESS [EDIT] FOR SELECTIONS"	<u>SELECT REGIONAL TELEPHONE OPERATING COMPANY</u> SW BELL (Southwestern Bell) NYNEX BELL ATL (Bell Atlantic) AMERITECH PACTEL (Pacific Telesis) SNET (Southern New England Telephone) US WEST
<u>REPEATER VENDOR</u> "PRESS [EDIT] FOR SELECTIONS"	<u>SELECT ADDRESSABLE REPEATER MANUFACTURER</u> TELTREND WESTELL WESCOM
<u>MAINT. SWCH VENDOR</u> "PRESS [EDIT] FOR SELECTIONS"	<u>SELECT MAINTENANCE SWITCH MANUFACTURER</u> TELTREND WESTELL
<u>TESTING POINT</u> [F1] DSX-1 [F2] CSU	<u>SELECT TEST ACCESS POINT OF T1 SPAN UNDER TEST</u> DSX-1 Access Point Channel Service Unit (at customer premises)
<u>DEVICE TYPE</u> [F1] CSU/NIU	<u>SELECT TYPE OF SPAN DEVICE/SETUP OPERATION</u> CSU/ NIU CONTROL screen appears (cursor defaults to CSU/OPERATION)
	(Table continued on next page)

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Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
LOOPBACK/SPAN CONTROL (Continued)	**T1 Span Control/Addressable Repeater & Maintenance Switch Control (Option 05)**
<u>CSU/NIU OPERATION</u>	Send selected LOOP UP/DOWN codes (as displayed in LOOP CODE/<u>ESF</u> <u>LOOP CODE sub-menu functions)/Operate Q-TEST function</u>
[F1] LOOP-UP/then [F1] ABORT	Send selected loop-up code (OPERATION COMPLETE message flashes on screen when switching occurs)/Abort operation
[F2] LOOP-DN/then [F1] ABORT	Send selected loop-down code (OPERATION COMPLETE message flashed on screen when switching occurs)/Abort operation in progress
[F3] L-TEST	<u>Execute LONG TEST to verify bit error performance of T1 Line</u> (Long Test enter test time screen appears)
TEST TIME/PATTERN: NN [F1] HIGHER [F2] LOWER [F3] 5-MIN [F4] 15-MIN	Length of time each test pattern is to be tested in minutes. Increase test time per pattern Decrease test time per pattern Set test time per pattern to 5 minutes Set test time per pattern to 15 minutes
"PRESS <ENTER> TO CONTINUE" (Long test results screen appears)	LONG TEST TIME REMAINING: --:-- ALL 0'S : ("N/A" if TTS 3 not set to **B8ZS** line coding format) ALL 1'S : "TESTING" then "PASSED" (if no errors) or "FAILED" 1:7 : 3 in 24 : (Same messages appear for each pattern QRSS : as Long Test progresses) T1-DALY :
"PRESS <ENTER> TO CONTINUE" [F1] ABORT or [F1] REPEAT	Returns to CSU/NIU Control Screen. Stop test (while test is in progress) Repeats test
[F4] Q-TEST (quick test results screen appears)	<u>Execute QUICK TEST to verify bit error performance of T1 line</u> QUICK TEST 5 SECONDS PER PATTERN (Results are the same as the Long Test Results shown above)
<u>LOOP CODE</u> [F1] CSU	<u>Select type of loop code/Program user codes</u> Channel Service Unit (CSU) codes In-band: loop-up 10000 /loop-down 100 Datalink: loop-up 111000/loop-down 001110
[F2] NIU	Network Interface Unit (NIU) codes In-band: loop-up 11000/loop-down 11100 Datalink: loop-up 100100/loop-down 010010
(Table continued on next page)	

SECTION 2.2 Functional Description (Continued)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
LOOPBACK/SPAN CONTROL (Continued)	**T1 Span Control/Addressable Repeater & Maintenance Switch Control (Option 05)**
[F3] NET-NIU	New England Telephone (NET) NIU codes In-band: loop-up 10000/loop-down 11100 Datalink: loop-up 100100/loop-down 010010
[F4] USER 　[F1] VIEW 　[F2] ERASE or 　[F1] LABEL 　(if cursor on unused file) 　[F1] INSERT 　[F2] DELETE	Program & label up to 8 user loop codes (up to 32 bits each) 　Display user codes at cursor position (for viewing/editing) 　Erase user code at cursor position 　Set cursor to an unused file (#1-8) and press [F1] to label new user code (up to 16 alphanumeric characters). Use up/down arrow keys to select each character in label; and right/left arrow keys to move cursor to next or previous character position 　Insert new character at cursor position 　Delete character at cursor position (up to 1st character)
"PRESS [ENTER] TO CONTINUE"	CSU/NIU USER LOOP CODE editing screen displayed (with LABEL) 　(move cursor to the loop code that you wish to edit)
- LOOP-UP - IN-BAND: DATALINK:	In-band loop-up code Out-of-band loop-up code to be sent in ESF datalink
- LOOP-DOWN - IN-BAND: DATALINK:	In-band loop-down code Out-of-band loop-down code to be sent in ESF datalink
[F1] EDIT 　　[F1] SET=1 　　[F2] SET=0 　　[F3] INSERT 　　[F4] DELETE	Program or edit loop code at cursor position 　Set bit at cursor position to 1 　Set bit at cursor position to 0 　Insert new bit at cursor position 　Delete bit at cursor position (up to 1st bit)
ESF LOOP CODE	Select ESF loop code format for DEVICE TYPE
[F1] IN-BAND 　[F2] DATALNK	CSU/NIU loop codes sent in the in-band time slots CSU/NIU loop codes sent in the out-of-band ESF datalink
[F2] REPEATR	REPEATER CONTROL screen appears
	(Table continued on next page)

SECTION 2.2 Functional Description (Continued)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION	PURPOSE / DESCRIPTION
LOOPBACK/SPAN CONTROL (Continued)	**T1 Span Control/Addressable Repeater & Maintenance Switch Control (Option 05)**

"REPEATER CONTROL" Press [EDIT] and then set cursor to select control function from **REPEATER OPERATION** menu **NOTES** Vendors' CONTROL and ADDRESS codes are preprogrammed into the TTS 3 and are transmitted automatically when selected REPEATER operation is executed. Response messages are decoded automatically in the TTS 3 and displayed on screen in plain text. Refer to repeater vendor's documentation for descriptions of loopback/maintenance operations and related control codes.	**REPEATER OPERATION MENUS**

REPEATER OPERATION MENUS

WESTELL	TELTREND	WESCOM
ARM IN-BAND	ARM IN-BAND	LOOP-UP
ARM ESF DATALINK	ARM ESF DATALINK	REPEATER ADDRESS
SEQUENTIAL LOOP-UP	LOOP-UP LINE RPTR	A-M(except I)
LOOP-UP LINE RPTR	RPTR ADDRESS 01-20	1, 2, 0
RPTR ADDRESS 01-20	LOOP-UP OFF. RPTR #1	AA-AM(except AI)
CHANGE RPTR ADDRESS	LOOP-UP OFF. RPTR #2	LOOP-DOWN
RPTR ADDRESS 01-20	LOOP-UP OFF. RPTR #3	TEST FPR PWR LOOP
LOOP-UP OFF. RPTR #1	QUERY LOOPBACK	
LOOP-UP OFF. RPTR #2	DISABLE LPBK TIMEOUT	
QUERY LOOPBACK	LOOP ILR IN PWR LOOP	
DISABLE LPBK TIMEOUT	POWER CUT THROUGH	
AIS DISABLE	ENABLE DUAL LPBK	
LOOP ILR IN PWR LOOP	POWER DWN OFF. RPTR	
POWER DOWN	LOOP-DOWN REPEATER	
LOOP-DOWN	CLEAR IOR FT1 MODE	
	DISARM	
	6-BIT ARM IN-BAND	

[F1] EXECUTE	Transmit the repeater control/address code selected from repeater OPERATION menu (watch screen for response messages)
* [F2] NEXT	Advance to next repeater address*
* [F3] PREVIUS	Return to previous repeater address*
[F3] L-TEST	Execute LONG TEST (see description on page 27)
[F4] Q-TEST	Execute QUICK TEST (see description on page 27)

*NOTE: These functions are added to REPEATER CONTROL screen when an ADDRESS code must be selected and sent with the control code

- STATUS -   **Display message indicating if T1 span is ARMED or in LOOPBACK**

SPAN IDLE	Span has not been armed
SPAN ARMED	Span has been armed by sending arm command
NO LOOPBACK	No loopback present in span
LOOPBACK PRESENT	Loopback present in span

(Table continued on next page)

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Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION	
LOOPBACK/SPAN CONTROL (Continued)	**T1 Span Control/Addressable Repeater & Maintenance Switch Control** (Option 05)	
DEVICE TYPE (Cont'd)	MAINTENANCE SWITCH CONTROL screen appears	
[F3] SWITCH	**SWITCH OPERATION MENUS**	
Press **[EDIT]** and then set cursor to select control function from **SWITCH OPERATION** menu	**WESTELL** LOOP-UP SWITCH LINE NIU SLOT POSITION (01-28) RAMP LINE NIU SLOT POSITION (01-28) RESET SWITCH RESET RAMP LOOP-DOWN	**TELTREND** LOOP-UP & ARM SWITCH LINE NIU SLOT POSITION (01-16) RESTORE LINE QUERY LOOPBACK DISABLE LOOPBACK TIMEOUT LOOP-DOWN & DISARM
NOTES Vendors' CONTROL and NIU SLOT POSITION codes are preprogrammed into the TTS 3 and are transmitted automatically when switch operation is executed		
Response messages are decoded automatically in the TTS 3 and displayed in plain text	**NOTE:** Refer to maintenance switch vendors' product documentation or practices for descriptions of operations and control/NIU slot position codes	
[F1] EXECUTE	Transmit the switch control/NIU slot position code selected from SWITCH OPERATION menu (watch screen for response messages)	
*[F2] NEXT *[F3] PREVIUS [F3] L-TEST [F4] Q-TEST	*Advance to next NIU slot position *Return to previous NIU slot position Execute LONG TEST (see description on page 20, 21) Execute QUICK TEST (see description on page 20, 21)	
	*NOTE: These functions are added to MAINTENANCE SWITCH CONTROL screen when an NIU slot position must be selected	
- STATUS -	**Display messages indicating line loopback, switching or RAMP status (watch screen for momentary STATUS messages relating to line switching and Westell RAMP functions)**	
"NO LOOPBACK"	Display message indicating that NO line loopback is present	
"LOOPBACK PRESENT"	Display message indicating that a line loopback is present	
	(Table continued on next page)	

SECTION 2.2 Functional Description (Continued)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
PM TEST ACCESS **(Option 04)**	**Retrieve Statistics Stored in Westell 3114-XX T1 NIU/Performance Monitor or Teltrend Performance Monitoring Digital Network Interface (PMDNI)**
	NOTE: Refer to WESTELL documentation or practices for descriptions of Model 3114-XX T1 NIU/Performance Monitor data retrieval functions and operations
	NOTE: Refer to TELTREND documentation or practices for descriptions of Model PMDNI DS1 Performance Monitoring Digital Network Interface data retrieval functions and operations
"NO RETRIEVED PM DATA AVAILABLE"	Message displayed when no PM information is currently stored in EZ-TESTER memory

PM OPERATION:
   [F4] RETURN
	Display of currently selected EZ-TESTER PM OPERATION
	   Return to MAIN MENU

"PRESS [EDIT] FOR SELECTIONS"	Press to select PM OPERATION/Move cursor to selection and press [ENTER] to start
NONE	**No PM data will be retrieved.** Return to PM TEST ACCESS screen

RETRIEVE PM STATISTICS
 	
   [F1] ABORT
   [F1] VIEW (after retrieval)
   [F2] PRINT
   [F4] RETURN
	Execute RETRIEVE PM STATISTICS operation (NIU loop up, data retrieval and loop down operations are automatic)
	   Stop the PM retrieval operation
	   View retrieved performance data on screen
	   Pass retrieved performance data to external printer
	   Return to MAIN MENU

SET PM CLOCK
   "ARE YOU SURE
   YOU WANT TO DO THIS?"
 	
   [F1] YES
 	
   [F2] NO
	Set clock in NIU/PM to agree with EZ-TESTER clock
	
	   Execute SET PM CLOCK operation (loop up, set clock, loop down operations occur automatically)
	   Abort SET PM CLOCK function

CLEAR PM STATISTICS
   "ARE YOU SURE YOU WANT
   TO DO THIS?"
 	
   [F1] YES
 	
   [F2] NO
	Clear statistics currently stored in NIU/PM monitor
	
	   Execute CLEAR PM STATISTICS operation (loop up, clear PM, loop down operations occur automatically)
	   Abort CLEAR PM STATISTICS function

	(Table continued on next page)

SECTION 2.2   Functional Description (Continued)

Table 2-5.   EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
PULSE SHAPE ANALYSIS (Option 02)	**On-Screen Graph of DS1 Pulse Shape & Mask with Measurement & Print Function**

[F1] STATS	Graph of incoming DS1 signal pulse shape appears on screen with time and date of capture (message "PASS" or FAIL" also appears if pulse mask is displayed)
	
	PULSE SHAPE STATISTICS screen appears
	    DATE: 00/00/00 (month/day/year captured)
	    TIME: 00:00:00 (hour: minute: second captured)
	
	    WIDTH: (in nanoseconds)
	    RISE TIME: (in nanoseconds)
	    FALL TIME: (in nanoseconds)
	    UNDERSHOOT: (% of undershoot)
	    OVERSHOOT: (% of overshoot)
	    MASK: (selected reference mask or none)
	    T1 LEVEL: (level of DS1 signal in dBdsx or volts p-p)

[F1] GRAPH	Return to graph display (previous screen)
[F2] CAPTURE	Capture and store the current incoming pulse shape, with time & date of capture and associated pulse measurements (stats)
[F3] PRINT	Print out captured pulse shape using external printer (this print command is duplicated in the **MAIN MENU PRINT** function)
[F4] MASK	Select reference mask (shape of incoming pulse compared against standard mask)

[F1] NO MASK
   [F2] CB-119
 	
   [F3] T1.403
 	
   [F4] more
	Pulse shape not compared to a standard mask
	Pulse shape compared to standard mask described in AT&T Compatibility Bulletin 119 for cross-connects (with PASS or FAIL message)
	Pulse shape compared to standard mask described in ANSI specification T1.403 for the Network Interface (with PASS/FAIL message)
	Return to initial function key selections

CAPTURE EVENTS	**Capture & Store in Memory Selected Alarm & Signal Status Events & CCITT G.821 Performance Events that Occur During a Test Run**
<u>CAPTURE EVENTS</u>	Capture selected test events during a test run (each captured event is numbered in order of occurrence and date/time stamped)

CAPTURE OPERATION
 	
   [F1] OFF
   [F2] ON
     [F1] DISABLE
	Select type of TEST EVENTS to be captured during a test run
	  (Capture from 100 to 1500 events depending on type)
	  Turn **OFF** capture operation
	  Turn **ON** capture operation (use cursor to select test events to be captured)
	   Do not capture event

	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
CAPTURE EVENTS (Continued)	**Capture & Store in Memory Selected Alarm & Signal Status Events & CCITT G.821 Performance Events that Occur During a Test Run**
[F2] ENABLE	Capture & date/time stamp event as it occurs during test run
STATUS CHANGE: ALARM CHANGE: PERFORMANCE CHANGE:	Change in front panel **STATUS** indicator Change in front panel **ALARM** indicator Change in the current CCITT Recommendation G.821 Performance Category is detected. **NOTE:** CCITT Recommendation G.821 defines T1 circuit performance categories as **AVAILABLE** or **UNAVAILABLE** times according to existing error rate conditions
ERRORED SECONDS: SEVERLY ERRD SEC: FRAME SLIP: SCHEDULED SUMMARY	Number of test seconds with 1 or more bit, BPV, frame or CRC errors Number of test seconds with bit, BPV, frame or CRC error rate >10E-3) Number of times that the test signal slips + or - 193 bits compared to DS1 reference clock signal (clock signal must be patched to EZ-TESTER REF jack) Schedule test summaries to be captured at selected intervals during a TEST RUN
"PRESS [EDIT] KEY TO SET" [F1] DISABLE [F2] TIMED	Use cursor and up/down arrow keys to schedule intervals in hours:minutes:seconds (00:00:00) from start of test run. Disable the function (no periodic summaries Activate function after setting schedule (scheduled interval displayed on screen
CAPTURE MEMORY	**Display number of events in memory/clear or print EVENT memory file**
EVENTS CAPTURED = (0 to 9999) [F1] CLEAR [F2] PRINT	Number of events captured (stored) in memory Clear capture memory of all stored events Print captured test events, scheduled test summaries, and final test summary currently stored in memory (this print command is duplicated in the **MAIN MENU PRINT** function)
ESF/SLC DATALINK (Option 03)	**T1 Span ESF & SLC-96 Datalink Monitoring and Control**
"FRAMING FORMAT MUST BE EITHER ESF OR SLC-96"	These 2 messages appear on screen initially if EZ-TESTER is NOT set to ESF or SLC-96 framing format
"MAKE SELECTION NOW OR PRESS [MENU] KEY TO CONTINUE" [F1] ESF [F2] SLC-96	 Select ESF framing format Select SLC-96 framing format
	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION	PURPOSE / DESCRIPTION
ESF/SLC DATALINK (Continued)	**T1 Span Datalink Monitoring & Control**
T1.403 ESF DATALINK	Monitor & emulate ANSI T1.403 network performance reporting over ESF datalink (this screen appears when ESF FRAMING is selected)
- SEND - MODE:	Setup T1.403 SEND functions to emulate coded messages transmitted in ESF datalink (NOTE: EZ-TESTER must be set to **TEST-OS** or **TEST-IS** operating mode to use SEND functions) select source of T1.403 Performance Report Messages (PRM's) sent in ESF datalink
[F1] LIVE	PRM's are transmitted once each second using variable performance data recovered from the RECEIVED DS1 signal while test run is in progress
[F2] FIXED (Scroll cursor down to select CRC EVENT, ASB'S & UNSCHD MSG)	Fixed PRM's are transmitted once each second as selected from the CRC EVENT and ASB'S setup menus below
CRC EVENT	Select range of CRC error events to be encoded into PRM 1) None 5) 11 to 100 errors 2) One Error 6) 101 to 319 errors 3) 2 to 5 errors 7) 320 or more errors 4) 6 to 10 errors
[F1] NONE [F2] LOWER [F3] HIGHER	No CRC error events to be encoded Scroll to select lower CRC error event range Scroll to select higher CRC error event range
ASB'S	Select Application Specific Bits to be encoded into PRM plb=CSU payload loopback activated sl=Controlled slip lv=Line code violation or BPV se=Severely errored second (320 or more fe=Frame synchronization error CRC errors or out-of-frame condition/2 of 4 consecutive framing bits in error)
"PRESS [EDIT] KEY TO SET"	Move cursor to select ASB's to be transmitted in Datalink
[F1] SET [F2] RESET	Set ASB at cursor (when SET, ASB message is transmitted in UPPERCASE letters) Reset ASB at cursor (when RESET, ASB message is transmitted in lowercase letters (this is a history message indicating that ASB was SET but is now clear)
[F3] UNSCHED UNSCHD MSG	Simulate unscheduled PRIORITY or COMMAND RESPONSE codeword messages to be transmitted in datalink Select unscheduled preprogrammed codeword message from function key menu (F1-F4) or press [EDIT] to manually program a codeword message)
[F1] YEL-ALM [F2] PLPK-UP [F3] PLPK-DN [F4] more	Yellow alarm CSU payload loopback switch activated CSU payload loopback switch deactivated (circuit restored) Press to display additional function-key selections
	(Table continued on next page)

SECTION 2.2 Functional Description (Continued)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
ESF/SLC DATALINK (Continued)	**T1 Span Datalink Monitoring & Control**
T1.403 ESF DATALINK MODE (cont'd)	SEND function (continued)
MODE (continued)	
[F1] LLPK-UP [F2] LLPK-DN [F4] more	CSU line loopback switch activated CSU line loopback switch deactivated (circuit restored) Press to display additional function-key selections
[F1] NLPK-UP [F2] NLPK-DN [F4] more	NIU (or smart jack) loopback switch activated NIU (or smart jack) loopback switch deactivated (circuit restored) Press to return to initial function-key selections
"PRESS [EDIT] KEY TO SET" [F1] SET=1 [F2] SET=0	Manually program an unscheduled codeword message (use left/right arrow keys to move cursor to bit position) Set bit at cursor to 1 Set bit at cursor to 0
- RECEIVE -	**Display standard decoded ESF datalink T1.403 PRM's, Error Counts, and Elapsed Time**
CRC EVENT ASB STATUS UNSCHED MSGS ERRORED SEC SVRLY ERRD SEC MESSAGE ERRORS ELAPSED TIME	CRC error messages Application Specific Bits encoded into PRM's Unscheduled 6-bit messages (any current message appears at left/previous message received appears at right in parentheses) Number of test seconds with a frame bit error or CRC error Number of test seconds with 2 of 4 consecutive frame bits in error, or more than 320 CRC errors Number of PRM's received in error Elapsed time clock - hours:minutes:seconds (clock starts initially when ESF/SLC DATALINK function is selected from MAIN MENU)
[F1] CLEAR	Clear currently displayed PRM's, error counts and reset elapsed time clock to 00:00:00.
SLC-96 DATALINK	**Monitor & simulate SLC-96 datalink alarm & maintenance messages (this screen appears when SLC-96 FRAMING is selected**
- SEND -	Encode and SEND standard alarm and maintenance messages in SLC-96 datalink (**NOTE**: EZ-TESTER must be setup and patched to the *A SHELF* T1 line in the *TEST-OS* or *TEST-IS* operating mode to use datalink SEND functions) **NOTE:** Move cursor to SEND menu selection (displayed on screen) and then press [EDIT] key to select a specific send function
ALARMS: SHELF ALARMS:	Select up to 3 types of SLC-96 system alarm messages (MAJOR, MINOR, and POWER/MISCELLANEOUS) Select specific SLC-96 shelf alarms (**ABC & D** shelves)
	(Table continued on next page)

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SECTION 2.2   Functional Description (Continued)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
ESF/SLC DATALINK **(Continued)**	**T1 Span Datalink Monitoring & Control**

FAR-END LOOP:
 	
[F1] SET
 	
[F2] RESET
 	
MAINTENANCE
IDLE
ON-HOOK/SEIZE
PROCEED
TEST ALARM
PROTECTION
IDLE
LINE A RX
LINE B TX
LINE C TX
LINE D TX
LINE B TX/RX
LINE C TX/RX
LINE D TX/RX
 	
- RECEIVE -
 	
ALARMS
SHELF ALARMS
 	
FAR-END LOOP
MAINTENANCE
PROTECTION
 	
CONCENTRATOR
 	
[F1] CLEAR
	Send far-end loopback commands to selected SLC-96 T1 lines
	   (**ABCD**, and the protection line P)
	    Press to send the alarm message or loop command at cursor (when SET,
	      selection changes to uppercase letters)
	    Press to reset (remove) the alarm message or loop command at cursor
	      (selection changes back to lower case letters)
	Select 1 of 4 SLC-96 maintenance messages
	   Idle condition (no maintenance messages in datalink)
	   NOTE: Scroll cursor down to menu choice; then press [ENTER] to
	            transmit the selected maintenance message in the datalink
	
	Send command to switch a selected line to the protection line
	   Protection line idle (no fault conditions on lines ABC or D)
	
	   NOTE: Scroll cursor down to menu choice; then press [ENTER] to
	            transmit datalink message to switch the selected TX and/or
	            RX line to the protection line
	
	Display standard decoded messages currently in SLC-96 datalink
	
	NOTE: Decoded system ALARM & SHELF ALARM messages (defined in SEND
	         unction above), displayed in **UPPERCASE** letters, indicate **current** alarm
	         status. Decoded alarm messages displayed in **lowercase** letters indicate
	         previous alarm conditions that are now cleared
	Decoded messages indicating that T1 line (ABCD or P) is in far-end loopback mode.
	Decoded maintenance messages (defined in SEND function above)
	Decoded message indicating that a T1 line (ABC or D) has been switched to protection
	   line
	Decoded concentrator messages (SLC-96 system operating in MODE II/96 channels
	   using 2 T1 lines with concentrator)
	Clears previous alarm messages (currently displayed in lowercase letters)

VIEW CHANNEL DATA	**View 256 Channel Data Bytes**

VIEW DATA ON CHANNEL: XX*
 	
[F1] NEXT
[F2] PREVIUS
 	
*selected channel 01 - 24
	Select channel for viewing binary, hexadecimal and ASCII coded data (channel
	format must be set to 56x1 or 64x1)
	Select next higher channel number
	Select previous lower channel number
	
	BYTE BINARY HEX ASCII
	  1 10011001 99 (99) ( ) (examples of channel data coding
	  2 01101110 6E (76) n (v) displayed on screen/1st 3 bytes)
	  3 10100101 A5 (A5) ( )
	
	256 (up to 256 bytes can be viewed/16 bytes each screen display)

	(Table continued on next page)

SECTION 2.2 Functional Description (Continued)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
VIEW CHANNEL DATA (continued)	**View 256 Channel Data Bytes**
[F3] PAUSE	Freezes instantaneous binary digits, hex and ASCII codes flashing on current screen (for viewing and printing)
[F1] PAGE UP	Scroll to previous screen (after scrolling beyond first page)
[F2] PAGE DN	Scroll to next screen
[F3] RESUME	Resume dynamic display of channel data
[F4] PRINT	Pass channel data to external printer (all 256 bytes)
TERMINAL EMULATION	**RS-232 ASCII TERMINAL EMULATION**
[F1] CURSOR LEFT	Moves the cursor left through alphabet and numbers
[F2] CURSOR RIGHT	Moves the cursor right through alphabet and numbers
[F3] BACKSPC	Sends backspace character
[F4] SELECT	Sends character displayed in cursor position
	NOTE: Use arrow keys to position the viewing area on the larger virtual screen. Use the <RESTART> key to send an ESC character.
CSU/NIU EMULATION	**Emulate CSU/NIU Remote Loopback Switch Function & Display Error Performance**
Move cursor to setup functions using up/down arrow keys	NOTE: EZ-TESTER CHANNEL FORMAT must be turned OFF (use FULL T1)
EMULATION:	**Select T1 line loopback device**
[F1] NIU	Network Interface Unit
[F2] CSU	Channel Service Unit
[F3] NET-NIU	New England Telephone - Network Interface Unit
ESF LOOP CODE:	**Select ESF loop code format**
[F1] IN-BAND	Loop codes transmitted in band
	NIU loop codes: up 11000/down 11100
	CSU loop codes: up 10000/down 100
	NET-NIU loop codes: up 100000/down 11100
[F2] DATALINK	Loop codes transmitted in ESF datalink (out-of-band)
	NIU loop codes: up 100100/down 010010
	CSU loop codes: up 111000/down 001110
	NET-NIU loop codes: up 100100/down 010010
- RECEIVE -	**Set receive functions/display error performance & elapsed time**
BPV ERRORS:	Bipolar violation count
BIT ERRORS:	Test pattern (logic) error count
FRM ERRORS:	DS1 framing pattern error count
CRC ERRORS:	ESF Cyclic Redundancy Check error count (if TTS 3 set to ESF framing format)
ELAPSED TIME:	00:00:00 (hours:minutes:seconds)
[F1] CLEAR	Zero the error counters and elapsed time clock
[F2] LOOP	Press to **activate** loop function (when loop **closes**, error counting & elapsed-time clock restart and [F2] resets to UN-LOOP)
or [F2] UN-LOOP	Press to **deactivate** loop function (when loop **opens**, error counting stops, elapsed-time clock restarts and [F2] resets to LOOP)
	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
CONFIGURATION SETUP	**Setup EZ-TESTER Test Configuration**
AUTO SHUT OFF: [F1] DISABLE [F2] ENABLE	**Shut off EZ-TESTER power automatically after 15 minutes of no activity** Disable automatic power shut-off function Activate automatic power shut-off function
DISPLAY BACKLIGHT: [F1] ON [F2] OFF [F3] AUTO	**Control display screen backlight** Turn ON backlight Turn OFF backlight Turn ON backlight with automatic turn off after 60 seconds of no activity (backlight turns back on when any key is pressed)
AUDIBLE ALARM: [F1] DISABLE [F2] ENABLE	**Audible alarm sounds each time a selected alarm, status, or performance event occurs during a test run (see CAPTURE EVENTS)** Turn OFF function Turn ON function
LEVEL DISPLAY: [F1] p-p V [F2] dBdsx	**Set unit of measurement for DS1 signal level display** Peak-to-peak voltage (average peak voltage of 1's pulses) Voltage measurement relative to standard DSX level of 3 volts base-to-peak (i.e. 0 dBdsx = 3 volts base-to-peak)
FILL DATA: [F1] ALL 1's [F2] IDLE	**Set DS0 channel data bit format (except test channel)** Channel data bits set to 11111111 Channel data bits set to 01111111
SET SIGNALING: " PRESS [EDIT] KEY TO SET" [F1] SET=1 [F2] SET=0	**Set output A&B or ABC&D (if ESF) signaling bit status** (signaling bits are set by moving cursor to each bit, in turn, using right or left arrow key and then selecting F1 or F2) Set signaling bit at cursor position to 1 Set signaling bit at cursor position to 0
BIT ERROR INSERT: [F1] NONE [F2] SINGLE [F3] AUTO	**Insert bit (logic) errors into EZ-TESTER DS1 output signal** No bit errors inserted Single bit error inserted each time [BIT ERROR] key is pressed (BIT ERROR lamp flashes each time key is pressed) Bit errors inserted at a selected rate when [BIT ERROR] key is pressed (BIT ERROR lamp remains lit). Select error rate from 2E-5 to 5E-3 using up/down arrow keys
BPV ERROR INSERT: (Same as BIT ERROR INSERT)	**Insert BPV errors into EZ-TESTER DS1 output signal** (same as BIT ERROR insertion, except select [F3] AUTO BPV error rate from 5E-9 to 5E-3)
CURRENT DATE: "PRESS [EDIT] KEY TO SET" CURRENT TIME: "PRESS [EDIT] KEY TO SET"	**Set EZ-TESTER calendar to current date** Press left/right arrow to set cursor on month, day or year. Scroll up/down arrow to set current MONTH:DAY:YEAR **Set EZ-TESTER clock to current time** Press left/right arrow to set cursor on hour, minutes, seconds. Scroll up/down arrow to set current HOUR:MINUTES:SECONDS
	(Table continued on next page)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
PRINT	**Select & Initiate Printing Functions**
PRINT MENU (move cursor to selection)	NOTE: Setup AUXILIARY PORT and connect printer to TTS 3
LAST RESULTS CAPTURED EVENTS	Results from last test run Test events and results summaries currently stored in the **Main Menu** CAPTURE EVENTS memory file (this print command is duplicated in the CAPTURE EVENTS function)
CURRENT SETUPS	List of current TTS 3 **TEST, CONFIGURATION, & CAPTURED EVENTS Main Menu setups**
USER SETUPS USER TEST PATTERNS CAPTURED CHANNEL DATA RETRIEVED PM DATA CAPTURED PULSE SHAPE	List of user-defined TTS 3 setups currently stored in memory List of user-defined test patterns currently stored in memory Channel data captured in memory (256 bytes) Performance Monitor statistics captured in memory Pulse shape of DS1 signal captured in memory
"PRESS [ENTER] TO PRINT"	
AUXILIARY PORT	**Setup RS-232 Serial Interface Port to Match External Device**
INTERFACE TYPE [F1] DTE [F2] DCE	**Setup connector pin assignments** Data Terminal Equipment (e.g. printer or PC) Data Communications Equipment (e.g. modem)
BIT RATE (BPS) [F1] 1200 [F2] 2400 [F3] 9600	**Transmission speed** 1200 bits per second 2400 bits per second 9600 bits per second
BITS/CHARACTER [F1] 7 [F2] 8	**Length of each ASCII character** 7 bits per character 8 bits per character
PARITY	**Error-detecting scheme used in asynchronous transmission/a bit is added to each character so that total number of binary "ones" are "odd" or "even"**
[F1] NONE [F2] EVEN [F3] ODD	No parity Total number of 1's in each character are EVEN Total number of 1's in each character are ODD
STOP BITS	**Additional bits used in asynchronous transmission to indicate that transmission of a character is complete**
[F1] 1 [F2] 2	1 stop bit 2 stop bits
PRINTER WIDTH [F1] 80 [F2] 40	**Column width of external printer in use** 80-column printer 40-column printer
	(Table continued on next page)

SECTION 2.2 Functional Description (Continued)

Table 2-5. EZ-TESTER MAIN MENU (Continued)

MAIN MENU SUBMENU / FUNCTION KEYS	PURPOSE / DESCRIPTION
FULL SELF-TEST	**Comprehensive Self Test of Important EZ-TESTER Functions**
IMPORTANT Carefully follow the setup procedures and instructions as they appear on screen	PRESS [ENTER] key to start test and watch screen carefully for instructions. You will be asked yes/no questions and given commands to perform during tests of the following functions: PROGRAM MEMORY: TESTING/PASSED OR FAILED DATA MEMORY: DISPLAY: INDICATORS: (see **NOTE** below) SPEAKER: KEYBOARD: LOOPBACK: NOTE: The message "**TESTING**" appears next to the function currently under test. When each test is completed, the message "**PASSED**" or "**FAILED**" appears on screen to indicate the results.
ONCALL® UPDATE	**Update EZ-TESTER Software via Dial-Up Modem/Phone Line**

IMPORTANT
Carefully read and follow the instructions displayed on screen. Move cursor to set bit rate and call prefix
 	
BIT RATE:
  [F1] 1200
  [F2] 2400
  [F3] 9600
 	
CALL PREFIX:
  [F1] 1-216
  [F2] 9-1-216
  [F3] 1
  [F4] more
  [F1] 9-1
  [F2] LOCAL
  [F3] 9-LOCAL
  [F4] more
 	
"On-Call UPDATE
- IN PROGRESS -"
 	
  [F1] ABORT or
  [F1] RETRY
	Select transmission rate to agree with modem setup
	  1200 bits per second
	  2400 bits per second
	  9600 bits per second
	
	Select the call prefix that matches your regular local or long-distance telephone dialing requirements
	
	NOTE: The telephone number is located at Electrodata's main facility in Bedford Heights, Ohio (Cleveland metropolitan area). The prefix and the number are out pulsed automatically when you press [ENTER].
	
	When On-Call UPDATE is completed, the telephone line is switched back to ON-HOOK automatically.
	
	Message appears on screen while updating is in progress
	
	Stop the On-Call UPDATE operation in progress
	Restart the operation (after pressing ABORT)
	
	NOTE: When updating is 100% complete, power the EZ-TESTER OFF and then back ON to verify operation

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SECTION 2.2 Functional Description (Continued)

<u>EZ-TESTER OPERATING MODES</u>

The test and measurement functions of the EZ-TESTER are set according to the **OPERATING MODE** selected by the operator. There are 3 operating modes:

1) In-Service Monitoring (**MON-IS**)
2) Out-of-Service Testing (**TEST-OS**)
3) In-Service Channel Drop/Insert Testing (**TEST-IS**)

<u>In-Service Monitoring</u>

In this mode the TTS 3 simulates a span line repeater by regenerating the received signal and transmitting it without modification. Bipolar violations are not removed, DSO channel data cannot be inserted, there is no line code conversion, and BIT and BPV errors cannot be inserted.

The testing capabilities of the EZ-TESTER when set to the In-Service Monitoring mode (**MON-IS**) are listed Table 2-6.

Table 2-6. In-Service Monitoring Functions

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DS1 INPUT SIGNAL ALARM & STATUS MONITORING

<u>ALARMS Indicator Lamps (LEDs)</u>
    Yellow Alarms (D4/ESF)
    Excess Zeros
    All Ones
<u>STATUS Indicator Lamps (LEDs)</u>
    Signal Present
    Frame Sync
    B8ZS (line coding)
    Running (test run in progress)

T1 TRANSMISSION MONITORING & MEASUREMENTS

DS1 Signal Loss (duration in seconds)
Yellow Alarm Condition (duration in seconds)
Excess Zeros (duration in seconds)
DS1 Frequency (Hz)
DS1 Level (dBdsx or volts peak-to-peak)
Timing Measurements (with DS1 input reference signal)
    Frame/Clock Slips (+/- from reference signal)
    Clock Slip Rate (total slips divided by elapsed test time in seconds)
    Peak Wander (+/- from reference signal)
Pulse Shape Analysis (using DSX or NI standard mask)
Display Pulse Shape Waveform (with selected mask)
ESF/SLC 96 Datalink Monitoring

(Table continued on next page)

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SECTION 2.2   Functional Description (Continued)

Table 2-6. In-Service Monitoring Functions (Continued)

DS1 ERROR PERFORMANCE MEASUREMENTS

BPV, Frame & CRC (ESF) Error Counts & Rates
Errored Seconds*
Severely-Errored Seconds*
Error-Free Seconds*
CCITT G.821 Performance Analysis
    Current Performance Status (acceptable, degraded, unacceptable, or unavailable)
    Available Seconds*
    Unavailable Seconds*
    Acceptable Minutes*
    Degraded Minutes*
    Unacceptable Seconds*

  *(Total count & percent of total test time)

DS0 CHANNEL MONITORING

View AB or ABCD signaling in selected channel
View AB or ABCD signaling in all 24 channels simultaneously
Display data bits in selected channel
View 256 data bytes in selected channel (binary, hexadecimal & ASCII codes)
Listen to voice/data transmissions, test tones & noise
    (via internal speaker or earphone)
Measure channel signal level (dBm)
Measure channel signal frequency (Hertz)
Pass input channel VF signals to external VF interface
    (for use with external VF test set, e.g. TIMS)

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SECTION 2.2 Functional Description (Continued)

Out-Of-Service Testing

In this mode, the transmitted data pattern is generated internally by the TTS 3. Out-of-Service testing is used for testing T1 equipment and out-of-service T1 spans. One Test Set can be used to test a span by looping the remote CSU or network interface or two Test Sets can be used for end-to-end testing without loopback. Test patterns can be inserted into one several or all DSO channels.

Table 2-7 lists the testing capabilities of the EZ-TESTER in the out-of-service mode.

Table 2-7. Out-of-Service Test Functions

DS1 INPUT SIGNAL ALARM & STATUS MONITORING

ALARMS Indicator Lamps (LEDs)
    Yellow Alarms (D4/ESF)
    Excess Zeros
    All Ones
STATUS Indicator Lamps (LEDs)
    Signal Present
    Frame Sync
    Pattern Sync
    B8ZS (line coding)
    Running (test run in progress)

T1 LINE SETUP & SPECIAL FEATURES

DS1 Output LBO (for level coordination)
Remote NIU/CSU Loop Up/Loop Down Switching
    (standard & user-defined codes)
Addressable Repeater & Maintenance Switch Control
    (option/specific telcos and vendors)
ESF/SLC 96 Datalink Monitoring & Control (option)
NIU Performance Monitor Statistical Data Retrieval (option-Westell NIU/PM only)
Computer Enhanced Testing (option)
CSU/NIU Emulation (special setup mode - EZ-TESTER emulates CSU or NIU remote loopback
    switching functions/with error performance monitoring)

T1 TRANSMISSION MEASUREMENTS

DS1 Input Frequency (Hz)
DS1 Input Level (dBdsx or volts peak-to-peak)
DC Loop Current (milliamps)
Pulse Shape Analysis using DSX or NI Standard Mask/Display Pulse Shape Waveform with
    Selected Mask (option)
Distance to Loopback (using round trip propagation delay measurement)

(Table continued on next page)

Table 2-7. Out-of-Service Test Functions (Continued)

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DS1 ERROR PERFORMANCE TESTING

Quick Test (each pattern transmitted for 5 seconds)
    ALL 0's (if line coding format set to B8ZS)
    ALL 1's
    1:7 (10000000)
    3 in 24 (3 ones in 24 bits)
    QRSS (QuasiRandom Signal Sequence
    T1-DALY (ANSI 55 octet pattern)

NOTE: PASS (no errors) or FAIL (errors) message appears after each pattern as test progresses

Test Pattern Generation

QRSS	2047	2E15-1
2E20-1	2E23-1	1:7
ALL 0s	ALL 1s	Bridge Tap
2in8	3in24	Multiple Pattern
Alt 1/0	55 Octet	User Defined
T1-DALY	T1-1	T1-2
T1-3	T1-4	T1-5
DDS-1	DDS-2	DDS-3
DDS-4	DDS-5	DDS-6

Bit/BPV Error Injection
    Single errors, or at error rates from 2E-5 to 5E-5 (bit errors) or
    5E-9 to 5E-3 (BPV errors)

DS1 Error Measurements
    BPV, Frame & CRC (ESF) Error Counts & Rates
    Test Pattern Bit (logic) Error Count & Rate
    Errored Seconds*
    Severely-Errored Seconds*
    Error-Free Seconds*
    CCITT G.821 Performance Analysis
       Current Performance Category (acceptable, degraded, unacceptable, or unavailable)
       Available Seconds*
       Unavailable Seconds*
       Acceptable Minutes*
       Degraded Minutes*
       Unacceptable Seconds*

    *(Total count & percent of total test time)

Fractional T1
    Program channel bandwidth (56 x N or 64 x N)
    DS0 channel blocking (contiguous or non-contiguous)
    Automatically display DS0 channel assignment of FT1 circuit under test

OUT-OF-SERVICE CHANNEL TESTING

Refer to Channel Testing in Table 2-8

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SECTION 2.2   Functional Description (Continued)

Channel Testing

The EZ-TESTER DS0 channel testing capabilities are listed in Table 2-8.

Table 2-8. Channel Test Functions

VF CHANNEL TESTING

SEND FUNCTIONS
Digital Milliwatt Test Tone, 1000 Hz at 0 dBm
Supervisory signaling (E&M, ground start & loop start trunks)
Signaling Emulation (OFF/ON hook & ringing), FXO, FXS, SLC 96 office/station
Label, store & recall up to 8 telephone numbers (up to 30 characters each)
Autodialing (DTMF, pulse & MF)
Talk (via push-to-talk microphone)
Wink (momentary off-hook signal)
Disable echo canceler, 2100 Hz tone sent for 3 seconds
Idle pattern, ALL 1's, or user-defined fill data pattern sent in all channels except test
        channel (out-of-service mode)

RECEIVE FUNCTIONS
Measure channel signals & test tones (dBm)
Measure wink delay & wink duration
Capture and display incoming dialed digits
Listen on channel (via internal speaker or earphone)
Display data bits in selected channel
Display AB or ABCD signaling bit status in selected channel
Display AB or ABCD signaling bit status in all channels simultaneously
External VF mode (expand channel measurements using external VF test set (e.g.
TIMS)
Transparent operating mode (allows scanning channels in **Test-In Service** setup mode
        without disrupting live traffic)

DATA CHANNEL TESTING

SEND FUNCTIONS

Standard DDS circuit test patterns
        DDS-1 200 Octet
        DDS-2 200 Octet
        DDS-3 16 Octet
        DDS-4 16 Octet
        DDS-5 256 Octet
        DDS-6 8 Octet
Loopback codes
        CCITT V.54 CSU/DSU 4-second loop up/down codes

RECEIVE FUNCTIONS

Measure channel signal frequency (Hz) and level (dBm)
Listen on channel (via internal speaker or earphone
Display data bits in selected channel
View 256 data bytes in selected channel (displayed in binary, hexadecimal & ASCII codes)

SECTION 2.2 Functional Description (Continued)

RUNNING TESTS

Once the setup and test functions have been selected from the MAIN MENU or recalled from the setup memory file, a **timed** or **continuous** test run can be started by simply pressing the **[RESTART]** key (**RUNNING** lamp on front panel turns ON). This zeros the error measurement counters and displays the first page of the multi-page RESULTS screen. For operator convenience, the CURRENT TEST SETUPS in use are also displayed on each page of the screen.

The first page of the RESULTS screen displays the message **NO ERRORS** in large letters if there are no errors occurring in the DS1 input signal. If errors occur, a short error measurement summary is displayed in place of the NO ERRORS message. The remaining pages of the RESULTS screen provide more detailed error performance measurements.

When an alarm condition is detected by the EZ-TESTER during a test run, the applicable **ALARMS** lamp on the front panel will light. If the alarm condition is cleared during the test run, the lamp will flash on and off to alert the operator that an alarm event occurred but is now cleared. Also, any active **STATUS** lamps will flash on and off to indicate that the status was disrupted during a test run, but is now restored. These can be reset by pressing the CLR HST function key.

The test length for a timed test run can be set from 1 second up to 100 hours. Error measurement counting stops automatically when the time period ends and a test RESULTS SUMMARY is recorded and available for printing. This summary includes the last transmission measurements and the cumulative error counts. It also includes the alarm, status and error events programmed by the operator before the test run. For long test runs, intermediate test summaries can be recorded at selected intervals during the test length (timed or continuous) and stored in the CAPTURE EVENTS memory file.

The selected **test length, elapsed test time**, and **test time remaining** (for timed tests) are displayed on **page 5** of the RESULTS screen. To view the current or end-of-test measurements, error counts and captured events, the operator simply scrolls through the pages of the RESULTS screen; or passes the results to an external printer for a hardcopy record.

The RESULTS screen contains 7 pages, as described in Table 2-9 beginning on the next page.

SECTION 2.2 Functional Description (Continued)

Table 2-9. RESULTS Screen

PAGE NO./DISPLAY	DESCRIPTION
PAGE NO. 1 **SUMMARY**	Displays summary of current DS1 error conditions, T1 transmission measurements & EZ-TESTER setups (RUNNING lamp ON)
NO ERRORS or (when errors occur) BPV ERRORS: BIT ERRORS: FRM ERRORS: CRC ERRORS: FRAME SLIPS:	Message indicates no errors are occurring (measurements are displayed when errors/ slips occur) Bipolar violations Bit errors (out-of-service testing) Framing errors CRC errors (if ESF) Frame slips
RECV LEVEL: RECV FREQUENCY: SIMPLEX CURRENT:	DS1 input signal level (dBdsx or volts peak-to-peak) DS1 input signal frequency (Hertz) DC line current/repeatered lines (out-of-service test mode only)
- CURRENT TEST SETUPS -	**Description of current EZ-TESTER setups**
CODING: FRAMING: FORMAT: CHAN: PATTERN: CAPTURE:	DS1 line coding/framing format Channel format/channel number Selected test pattern CAPTURE EVENTS function ON, OFF or FULL (memory file is full)
Function Key Menu [F1] PAGE-UP [F2] PAGE-DN [F3] CLR HST [F4] more [F1] LOOP-UP [F2] LOOP-DN [F4] more [F1] STOP [F2] PRINT [F4] more	**Function Key Selections** Scroll up to next high page number Scroll down to next lower page number Clear flashing (history) front panel **ALARMS/STATUS** indicators (flashing occurs when an alarm condition occurs or the incoming test signal is disrupted but the circuit is now restored) Press to display additional function key selections Press to send selected CSU/NIU Loop Up code **NOTE:** Press **RESTART** key to restart test after loop up occurs Press to send selected CSU/NIU Loop Down code **NOTE:** These CSU/NIU loop up/down operations are part of the **MAIN MENU** **LOOPBACK/SPAN CONTROL** function Press to display additional function key selections Stop the test run (RUNNING lamp turns off) Print the end-of-test summary (using external printer) Press to return to initial function key selections
PAGE NO. 2 **BPV/BIT ERRORS**	**Display current BPV/BIT error measurements**
BPV ERRORS: BPV ERROR RATE: BPV ERRD SECONDS: BIT ERRORS: BIT ERROR RATE: BIT ERRD SECONDS:	BPV error count BPV error rate (BPV count divided by total bits tested) Number of test seconds with BPV Bit error count (logic errors) Bit error rate (error count divided by total bits tested) Number of test seconds with a bit error
PAGE NO. 3 **FRM/CRC ERRORS**	**Display current FRAME/CRC error measurements**
FRM ERRORS: FRM ERROR RATE: FRM ERRD SECONDS: CRC ERRORS: CRC ERROR RATE: CRC ERRD SECONDS:	Frame error count Frame error rate (error count divided by total frame bits tested) Number of test seconds with Frame error CRC error count (ESF circuits only) CRC error rate (error count divided by total CRC bits tested) Number of test seconds with a CRC error
	(Table continued on next page)

SECTION 2.2 Functional Description (Continued)

Table 2-9. RESULTS Screen (Continued)

PAGE NO./DISPLAY	DESCRIPTION
	NOTE: CURRENT TEST SETUPS & FUNCTION KEY MENU are displayed on each page of the RESULTS screen
PAGE NO. 4 **ALARM/STATUS SECONDS**	Display duration (in seconds) of alarm conditions and loss of signal/synchronization
YELLOW ALARM: EXCESS ZERO'S: ALL ONES: SIGNAL LOSS: FRAME SYNC LOSS: PAT SYNC LOSS:	Yellow alarm signal (D4 or ESF) More that 15 consecutive zeros All ones signal (may be unframed alarm signal) Loss of input signal Loss of frame synchronization Loss of synchronization with incoming test pattern
PAGE NO. 5 **ERRD SECONDS & TIME**	Display number of errored seconds/percent of test time; and test time data
ERRORED SECONDS: SVRLY ERRD SECS: ERROR FREE SECS: TEST LENGTH: ELAPSED TIME: TIME REMAINING:	Number and % of errored test seconds Number and % of seconds with error rate >10E-3 (1 error in 1000 bits) Number and % of test seconds without an error User-programmed test length/hrs:mins:secs:, or continuous Elapsed time from start of test/hrs:mins:secs: Test time remaining (if using **timed** test length)
PAGE NO. 6 **CLOCK/FRAME SLIPS**	Display DS1 timing slip measurements (received test signal compared to a reference signal - connected to REF jack on front panel or to internal clock)
CLOCK SLIPS: SLIP RATE: PEAK (+) WANDER: PEAK (-) WANDER: (+) FRAME SLIPS: (-) FRAME SLIPS:	Clock or bit slips (193 +/- clock slips = 1 frame slip) Total number of clock slips divided by elapsed time in seconds Maximum value of (+) clock slips counted during test run Maximum value of (-) clock slips counted during test run Maximum value of (+) frame slips counted during test run Maximum value of (-) frame slips counted during test run NOTE: (+) sign indicates that test signal frequency is *higher* than the reference signal (-) sign indicates that test signal frequency is *lower* than the reference signal
PAGE NO. 7 **G.821 PERFORMANCE**	CCITT Recommendation G.821 error-rate performance as a function of time
CURRENT G.821: AVAILABLE SECS: UNAVAIL SECS: ACCEPTABLE MINS: DEGRADED MINS: UNACCEPTABLE SECS:	Current G.821 circuit performance condition (AVAILABLE, ACCEPTABLE, DEGRADED, UNACCEPTABLE or UNAVAILABLE) Total test seconds, less unavailable seconds Total number of test seconds in which error rate has exceeded 10E-3 for a least 10 consecutive seconds Cumulative test minutes with error rate less than 10E-6 Cumulative test minutes with error rate less than 10E-3 but greater than 10E-6 Cumulative test seconds with error rate greater than 10E-3 for less than 10 consecutive seconds

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SECTION 2.2   Functional Description (Continued)

<u>PRINTING FUNCTIONS</u>

The EZ-TESTER contains a number of printing functions that allow you to obtain a hardcopy record of current user-defined setups; and various test results that have been captured in memory. Any standard RS-232 serial printer (with 40 or 80 column print widths) should work with the EZ-TESTER.

A small, battery-operated thermal printer is available from Electrodata that can be carried with your EZ-TESTER in a padded carrying case (contact Electrodata or your local representative for information about this handy printer).

To initiate printing, a printer is connected to the EZ-TESTER AUXILIARY PORT and turned on. Next, the **MAIN MENU AUXILIARY PORT** must be setup to match the RS-232 interface setup of your printer. With the EZ-TESTER set to a PRINT function, you simply press the **[ENTER]** key or a function key to start printing. If you need any assistance in getting your particular printer to work with the EZ-TESTER, please call Electrodata during normal work hours (**1-800-441-6336/Eastern Time Zone**).

There is a **MAIN MENU PRINT** function that contains 8 separate print selections. For operator convenience, 5 of these 8 print functions are duplicated in respective **MAIN MENU** test functions. In addition, there is a separate **RESULTS** print command associated with the **RESTART** (test run) function. Printing functions are described in Table 2-10.

Table 2-10. EZ-TESTER Printing Functions

PRINTING FUNCTIONS	DESCRIPTION / PURPOSE
MAIN MENU PRINT FUNCTION	Includes the 5 function key print commands below, plus LAST RESULTS, CURRENT SETUPS, and USER SETUPS (refer to MAIN MENU PRINT function on page 32)
FUNCTION KEY PRINT COMMANDS	Print commands conveniently located in respective MAIN MENU functions
<u>Main Menu Function</u> STORE/RECALL SETUPS PM TEST ACCESS PULSE SHAPE ANALYSIS CAPTURE EVENTS VIEW CHANNEL DATA	Print a list of currently stored user-defined TEST SETUPS, CONFIGURATION SETUPS, & CAPTURE EVENT setups, including file number & associated user-defined label Print historical performance data retrieved from a T1 Network Interface Unit/Performance Monitor (NIU/PM) and stored in the TTS 3 Print DS1 pulse shape displayed on screen and associated measurements (this print command is duplicated in the MAIN MENU PRINT function) Print all test run events currently stored in the CAPTURE MEMORY file, including scheduled and final test summaries (this print command is duplicated in the **MAIN MENU PRINT** function) Print 256 bytes of selected channel data (after pressing [F3] PAUSE to freeze the instantaneous status of incoming channel data bits/1 or 0). Each byte is reported in binary, hex and ASCII code
PRINTING TEST RESULTS	Obtain printout of final results from a test run
Print from **RESULTS - SUMMARY** screen (PRINT [F2] key)	Printout of current or final test results (all 7 pages of RESULTS screen)
Print from **CAPTURE EVENTS Main Menu function** (PRINT [F2] key)	Printout of all **CAPTURED EVENTS, SCHEDULED SUMMARIES, MANUAL SUMMARIES** and **TEST END SUMMARIES** currently stored in memory

SECTION 2.2   Functional Description (Continued)

COMPUTER ENHANCED TESTING (using WINDOWS® software)

This special option (Option 07) allows you to operate the EZ-TESTER from a personal computer equipped with Microsoft Windows. The computer can be connected directly to the EZ-TESTER for local operation; or it can be connected via a dial-up modem and telephone line for remote operation.   The EZ-TESTER is connected to the computer or modem using the AUXILIARY PORT and the ribbon cable supplied with the test set.

The EZ-TESTER Windows software is supplied on a 1.44MB high-density 3-1/2 inch disk for installing the program to the hard disk in your personal computer system. After installation, an **ELECTRODATA EZ-TESTER** program icon is added to the Windows Program Manager. The program follows the operations and graphics familiar to all Windows applications and greatly enhances the use and operation of your EZ-TESTER.

For example, you can dedicate an EZ-TESTER to a DACS test port and connect the AUXILIARY PORT of the tester to a dial-up modem and telephone line. Now, you can have the suspected T1 line switched to the test port and then accessed and tested remotely from a field technician's laptop computer or from a centralized computer work station.

Table 2-11. EZ-TESTER Windows MENU BAR Selections

MENU / COMMAND	DESCRIPTION / PURPOSE
File	
Print...	*List box* appears to select EZ-TESTER PRINT function & start printer (see Table 2-12)
Exit	Exit EZ-TESTER Windows program
Options	
Serial Port...	*List box* appears to select serial port (COM 1 - COM 4) & setup RS-232 interface
Modem...	*Text box* appears for entering the appropriate Hayes standard dial-up modem *AT Commands* and the called number dialing sequence
Activate Terminal at Startup	**Terminal** function is activated initially when EZ-TESTER Windows is started (function is used to communicate with a remote computer system via the selected COM port)
	Dialing commands start automatically when EZ-TESTER Windows is started
Dial at Startup	Any changes in settings are saved after closing the Windows program
Save Setting on Exit	
Communications	Activate **Terminal** function when necessary to communicate with a remote computer
Terminal Active	system via the selected COM port (EZ-TESTER link is disconnected)
	Send *dialing* commands to the dial-up modem
Dial	Send *hangup* commands to the dial-up modem
Hangup	
View	**View Captured Events** window appears with command buttons to select stored test
Capture Memory...	events for on-screen viewing and to erase stored events from memory
	Graphic representation of EZ-TESTER setup
Graphic	
Window	Restore **Test Options & Results** windows to their original positions on the applications
Arrange	screen (after *moving* either of them)
	Exit currently selected Test Option window or Results window
1 (blank)	Select **Test Option** window (title bar is highlighted)
2 Test Options	Select **Results** window (title bar is highlighted)
3 Results	
Help	Identifies the EZ-TESTER Windows software version installed in your computer system;
About WINTTS 3-EZ	and the EZ-TESTER currently connected to the Windows program, including serial number, and the firmware version and options currently installed in the test set

SECTION 2.2 Functional Description (Continued)

COMPUTER ENHANCED TESTING (Continued)

When you start EZ-TESTER Windows on your computer, a graphic representation of the EZ-TESTER front panel (*without* function keys F1-F4) appears on the applications screen, along with a **Test Options** window and a **Results** window. The **EDIT**, **ENTER** and up/down, left/right **arrow** keys on the front panel graphic are *dimmed* or *grayed out* and are not used in the Windows application. The Test Options and the Results windows remain on the EZ-TESTER Windows applications screen. The EZ-TESTER Windows Menu Bar and associated drop-down menus are described in Table 2-11.

Directly below the menu bar is a **STATUS BAR** with indented windows. The far left window contains the message "**TTS 3 Link Down**" when the communications link to the EZ-TESTER is not connected. The message "**connecting....**" appears in this window *momentarily* when the link connection is being made. The number of test events currently stored in the CAPTURE EVENTS memory file of the EZ-TESTER is displayed in the far right window. The messages "**Captured Events Full**" and "**Battery Low**" also appear in status bar windows when applicable.

The EZ-TESTER MAIN MENU function always appears on the screen of the front panel graphic, along with a vertical scroll bar and up/down arrows to move through the menu. When you *click-on* a menu selection, an associated dialog box appears on screen (except for the TEST SETUP function which remains on screen in a window labeled TEST OPTIONS). The EZ-TESTER PRINT, AUXILIARY PORT, and FULL SELF-TEST main menu selections do not apply to the Windows program and are omitted.

All of the test features and functions of the EZ-TESTER can be controlled from the Windows program. The ALARMS and STATUS indicators on the front panel graphic light to indicate the incoming signal conditions displayed on the EZ-TESTER. Also, you can "click on" the <PWR> switch on the front panel graphic to turn the EZ-TESTER on and off in the remote control mode, using a dial-up modem and telephone line (the far-end modem ringing and disconnect signals operate the on/off switch function in the EZ-TESTER).

Table 2-12. EZ-TESTER Windows PRINT Functions

Print Function	Description
TTS 3 Setups	Current TEST, CONFIGURATION & CAPTURE EVENTS setups
Capture Memory	Test data stored in CAPTURE EVENTS memory file
Last Results	Final results of last test run
PM Statistics	Retrieved PM data from Westell NIU/PM
Pulse Shape	Captured pulse shape of incoming DS1 signal
Channel Data	Captured binary, hexadecimal & ASCII coded channel data (256 bytes from selected channel)

In addition, the EZ-TESTER printing functions listed in Table 2-12 can be operated when a printer is connected to your computer system. The print function is accessed by "clicking on" the word "**File**" in the menu bar and then selecting PRINT from the drop-down menu. This opens a dialog box which contains the print function options and commands.

To add the **Computer Enhanced Test** option to your EZ-TESTER, or to learn more about it, contact your Electrodata Sales Representative or contact the factory directly **(1-800-441-6336)**.

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SECTION 3
EZ-Tester Operation

3.1 INITIAL TURN ON & BASIC SETUP PROCEDURES

This section describes the step-by-step procedures for setting up and operating the EZ-Tester. To operate the test set effectively, you need to understand its functions and capabilities, the type of T1 facility that you are going to test, and the type of test or monitoring functions that you intend to perform.

These procedures assume that you have read SECTIONS 1 and 2 of this manual and understand how the EZ-TESTER operates. You should review SECTION 2 of the manual if you are uncertain about the capabilities of a particular EZ-Tester function that you intend to use.

The EZ-Tester can be operated from the internal battery or from a standard AC power outlet using the AC adapter. It will operate from its internal battery for about 4 hours. To conserve the battery, it is a good practice to use AC power whenever it is convenient.

If the battery needs recharging during operation, a "**beep**" will sound and the message "**LOW BAT**" will appear on screen. The test set will continue to operate satisfactorily for at least 15 minutes after the warning beep. It takes about 6 hours to fully recharge the battery (refer to SECTION 4.2 for more battery maintenance information).

Before starting a test with the EZ-Tester you may need to perform certain preliminary checks and setup procedures. If you are **NOT** recalling a setup from the **STORE/RECALL** memory file, you need to perform certain setups manually from the **TEST SETUP, CONFIGURATION SETUP** and **CAPTURE EVENTS** MAIN MENU functions described below.

TEST SETUP MENU - Used to set the operating mode and test signal interface characteristics of the EZ-TESTER, and to select the channel format or initial test pattern to be used during a test.

CONFIGURATION SETUP MENU - Used to setup basic EZ-Tester control and test functions and to set the internal clock and calendar. These parameters are usually set once and seldom used afterwards.

CAPTURE EVENTS MENU - Used to select events including scheduled periodic test summaries that will be placed into the Capture Memory during a test run. Captured events are date/time stamped as they occur and can be printed out after a test run, along with any scheduled periodic test summaries and the final test summary.

IMPORTANT NOTICE
You should *label* and *store* frequently used basic setups in the **STORE/RECALL** memory file of the EZ-Tester. This eliminates the need to reset them manually each time you have to repeat a test. There are three factory-programmed setups stored permanently in memory. Also, you can program and store up to eight additional setups, each with a descriptive label for quick and easy recall.

SECTION 3.1   Initial Turn On & Basic Setup Procedures (Continued)

Table 3-1. Initial Turn On & Basic Setup Procedure

STEP	INSTRUCTIONS / COMMENTS
	INITIAL TURN ON
1	If AC power is available, connect the AC Power Adapter to the AC outlet and to the 6.5 VDC connector on the top panel of the EZ-TESTER. CAUTION: Use only the AC Adapter supplied by Electrodata
2	Press **[PWR]** key to turn on EZ-TESTER. The EZ-TESTER will begin a self test and momentarily display its serial number, installed software version and revision level.
3	Press **[F1] HLDSCRN** to freeze the display if you wish to read the information on screen. Press **[F1] RESUME** to release. If the power-on self test fails, refer to SECTION 4 of this manual for assistance. If the self test passes, the EZ-TESTER will display the first page of the **MAIN MENU** and is ready for use.
	TEST SETUP
1	Move cursor on MAIN MENU screen to **TEST SETUP** (cursor defaults to this position after completing the power-on self test) and then press **[ENTER]** (TEST SETUP MENU screen appears).
2	Use cursor, arrow keys, function keys (F1-F4) and [EDIT] key to select setups from the following TEST **SETUP** menu functions (according to your test requirements):
a	**OPERATING MODE** (also set **INPUT TERMINATION & OUTPUT LBO** switches): **MON-IS:** Set INPUT TERMINATION switch to **MON** or **BRDG** **TEST-IS:** Set INPUT TERMINATION switch to **TERM, MON** or **BRDG** depending on circuit patching/Set OUTPUT LBO attenuation to match output signal level requirements of test line **TEST-OS:** Set INPUT TERMINATION switch to **TERM**/Set OUTPUT LBO attenuation to match output signal level requirements of test line
b	**CODING FORMAT:** Select line code-AMI or B8ZS-to match test line (EZ-TESTER will **autoconfigure** to input signal coding format)
c	**FRAMING FORMAT:** Select D format, ESF, SLC-96 or unframed to match test line (EZ-TESTER will **autoconfigure** to input signal framing format)
d	**TRANS CLK SOURCE:** Select source of clock to control transmit signal of EZ-Tester -- TEST-OS mode only/Select **[F1]** INTERNAL clock or **[F2]** to recover clock from incoming signal
e	**CHANNEL FORMAT:** Press **[F1] FULL T1** to turn off CHANNEL ACCESS; or press **[F2]** or **[F3]** to select VF or data channel bandwidth; or press **[F4]** to set fractional T1 channel format - refer to **SPECIAL OPERATING FUNCTIONS** for fractional T1 setup procedures
f	**CHANNEL NUMBER:** Select number of DATA channel under test/NOTE: refer to VF **CHANNEL ACCESS** or optional **DIAL/SUPERVISION** functions if testing VF channels or trunk circuits
g	**TEST PATTERN:** Press **[EDIT]** key and then move cursor to select test pattern for out-of-service testing
h	**TEST LENGTH:** Press **[F1] TIMED** and then press **[EDIT]** to set duration of test run (using cursor and up/down arrow keys); or press **[F2] CONT** for continuous testing with no automatic timeout (test run must be shut off manually)
3	Press **[MENU]** to return to MAIN MENU screen
	(Table continued on next page)

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Table 3-1. Initial Turn On & Basic Setup Procedures (Continued)

STEP	INSTRUCTIONS / COMMENTS
	CAPTURE EVENTS SETUP
1	From MAIN MENU screen, scroll cursor down to **CAPTURE EVENTS** and then press **[ENTER]** (CAPTURE EVENTS screen appears/cursor defaults to CAPTURE EVENTS position).
2	Check to see if there are any captured events (from previous test runs) that are currently stored in memory (press **[F1] CLEAR** to erase these events from memory). To obtain a record of these events before erasing them, connect a printer to the EZ-TESTER and press **[F2] PRINT**.
3	Move cursor to **CAPTURE OPERATION** and turn function **OFF** or **ON** using functions keys **[F1]** and **[F2]**. If function is turned ON, use cursor, arrow keys and function keys to **ENABLE** the test events that you want to capture during a test run; and to **DISABLE** the ones that you don't want to capture (refer to SECTION 2 for descriptions of these test events).
4	Move cursor to **SCHEDULED SUMMARY** and press **[F1]** to **DISABLE** the function; or press **[F2] TIMED** to set the time interval for periodic test summaries to occur during a test run.
5	Press **[EDIT]** key, then use arrow keys to set time interval in hours, minutes, and seconds (00:00:00) from start of test run. Press **[ENTER]** to return to initial screen, then press **[MENU]** to return to MAIN MENU.
	CONFIGURATION SETUP
1	From MAIN MENU screen, scroll cursor down to **CONFIGURATION SETUP** and then press **ENTER]**.
2	Use arrow keys, function keys and [EDIT] key to set the following EZ-TESTER control functions displayed on screen, as appropriate to your particular test requirements:
a	**AUTO SHUT OFF:** Power turns off automatically after 15 minutes of no activity
b	**DISPLAY BACKLIGHT:** ON, OFF or AUTO--off after 60 seconds of no activity/back on when any key is pressed
c	**AUDIBLE ALARM:** Beep sounds each time a selected test event occurs during a test run
d	**LEVEL DISPLAY:** Select DS1 signal level display format (dBdsx or volts p-p)
e	**FILL DATA:** Fill all channels with ALL ONES or IDLE pattern, except test channel
f	**SET SIGNALING:** Set output signaling bits in test channel (AB or ABCD if ESF)
g	**BIT ERROR INSERT:** Insert single bit errors into DS1 output signal; or insert errors at selected fixed rates
h	**BPV ERROR INSERT:** (same as bit error insert)
3	Check **CURRENT DATE & CURRENT TIME** displayed at bottom of screen. If correct, press [MENU] twice to return to top of MAIN MENU. If not correct, proceed to STEPS 4-6 .
4	Using down arrow key, scroll cursor to CURRENT DATE **00:00:00** (month:day:year) and then press **[EDIT]** (cursor defaults to MONTH). Use up/down arrow keys to set current **MONTH** (01-12).
5	Press right arrow key to select **DAY** and use up/down arrow keys to set current day (01-31). Press right arrow key to select **YEAR** and use up/down arrow keys to set current year (00-99).
6	Press **[ENTER]** and then press **[MENU]** to return to MAIN MENU screen.
	(Table continued on next page)

SECTION 3.1 Initial Turn On & Basic Setup Procedures (Continued)

Table 3-1. Initial Turn On & Basic Setup Procedures (Continued)

STEP	INSTRUCTIONS / COMMENTS
	LABELING & STORING CURRENT SETUPS IN MEMORY
1	From MAIN MENU screen, scroll cursor to **STORE/RECALL SETUPS**, then press [ENTER].
2	To label and store the basic setups just completed, move cursor to an unused file number (1-8) and then press **[F2] LABEL** (cursor defaults to first character position displaying the letter A).
	NOTE: Create a descriptive label for the setup (up to 16 numbers and/or letters) and write it down to facilitate entering it in the EZ-TESTER
3	Scroll up/down arrow keys to select first character (letter or number) and then press right arrow key to move cursor to second position.
4	Scroll up/down arrow keys to select second character and then press right arrow key to move cursor to third position. Continue this process until the label is completed. Use **[F1] INSERT** and **[F2] DELETE** keys to make corrections or changes to the label displayed.
5	When label is complete, press [ENTER] to return to the MAIN MENU screen (current basic setup is now labeled and stored in the selected memory file).
	RECALLING A BASIC SETUP STORED IN MEMORY
1	From MAIN MENU screen, scroll cursor to **STORE/RECALL SETUPS** and then press [ENTER]. To recall a **user-programmed** setup, move cursor to the setup label/file number (1-8) and then press [ENTER] (EZ-TESTER autoconfigures to selected setup, returns to MAIN MENU, and is ready to start a test).
2	To recall 1 of 3 **factory-installed** setups, press **[F1] FACTORY**. Move cursor to factory setup that you want to recall (file 1-3) and then press [ENTER] (EZ-TESTER autoconfigures to the factory setup selected, returns to MAIN MENU, and is ready to start a test).
	MANAGING THE BASIC SETUP MEMORY FILE
1	To **delete** a user-programmed setup from a file, move cursor to the setup label/file number (1-8) and then press **[F3] ERASE** (setup is erased from memory).
2	To **change** an existing stored setup to the current EZ-TESTER setup (TEST SETUP, CONFIGURATION SETUP and CAPTURE EVENTS), move cursor to the label/file number (1-8) and then press **[F2] UPDATE**. Press **[F1] YES** to change the stored setup to the current setup and return to MAIN MENU (label remains the same).
	SETTING UP THE AUXILIARY PORT
1	To setup the RS 232 interface characteristics of the AUXILIARY PORT to match the setup of the connecting device, scroll down the MAIN MENU to **AUXILIARY PORT** and press [ENTER].
2	Set the cursor to each parameter displayed on screen, in turn, and then press the appropriate function key ([F1], [F2] or [F3]) to make the selection.
3	When finished, press [MENU] to return to the MAIN MENU screen.

SECTION 3. EZ-TESTER Operation (Continued)

3.2 PERFORMING BASIC TESTS

Basic tests performed by the EZ-TESTER include **in-service monitoring, out-of-service T1 span testing**, and **VF channel testing** (with T1 in or out of service). Remember, before starting a test, follow the **turn on** and **basic setup procedures** described in SECTION 3.1.

In-Service DS1/DS0 Monitoring

In-service monitoring involves patching the input of the EZ-TESTER to one side of a T1 line using a DSX-1 MON jack or any bridging test point. Major test functions that you can perform in this mode are summarized below (refer to Table 2-6, SECTION 2 for a detailed list of monitoring functions).

T1 Transmission
DS1 signal status & alarm monitoring
DS1 signal level & frequency measurements
Timing measurements (slips & wander)

DS1 Error Performance Measurements
Error counts & error rates
Errored seconds
CCITT G.821 error performance (available/unavailable test time)

DS0 Channels
Measure signal level & frequency
View AB or ABCD signaling bit status in selected channel or all 24 channels simultaneously
Listen to channel signals/voice transmissions
Capture and display dialed digits in selected channel
Incoming VF signals in selected channel are passed to external jack

TEST Results
View current and final error performance measurements on screen
Quick print end-of-test summary
Print alarm/status events, scheduled test summaries, and end-of-test summary stored in CAPTURE EVENTS memory (when setup and activated)

Table 3-2. In-Service DS1/DS0 Monitoring Procedures

STEP	INSTRUCTIONS / COMMENTS
1	**SETUP & PATCHING** Press [PWR] key and then perform the basic setup procedures described in Table 3-1 (as appropriate to your test requirements). NOTE: If you enable the **CAPTURE EVENTS** function for this test run, you should **CLEAR** the memory file of any test events captured during previous test runs.
2	Set **INPUT TERMINATION** switch to **MON** (if patching to a DSX-1 monitor jack) or to **BRDG** if patching to a bridging test point.
3	Using a patch cord, connect the side of the T1 line that you wish to test to the RX input jack of EZ-TESTER. The **SIGNAL PRESENT** and **FRAME SYNC STATUS** lamps should light (the **B8ZS STATUS** lamp will light if B8ZS line coding is detected). Check to see that no **ALARMS** lamps are lit.
	(Table continued on next page)

SECTION 3.2 Performing Basic Tests (Continued)

Table 3-2. In-Service DS1/DS0 Monitoring Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
	SETUP & PATCHING (continued)
4	If the **FRAME SYNC** STATUS lamp is not lit, scroll cursor in MAIN MENU to **AUTO CONFIGURATION**, press **[ENTER]**, and watch screen. The coding and framing formats will be displayed as they are detected by the EZ-TESTER, and the **FRAME SYNC** STATUS lamp should light.
5	To make slip or wander measurements, connect another patch cord from the EZ-TESTER REF jack to the **other side** of the T1 line (if circuit is loop timed) or to a **network clock** (if circuit is network timed).
	RUNNING A TEST
1	Press the **[RESTART]** key to start a test run (this zeros all error counters and starts the test length time clock). The **RUNNING** status lamp lights and the first page of the 7-page **RESULTS** screen appears.
	A large **NO ERRORS** message is displayed on screen (if errors are not occurring), with frequency and level* measurements of DS1 signal, and a summary of current test setups (for convenience, this summary is repeated on each page of the RESULTS screen).
	*NOTE: When EZ-TESTER input termination is set to **MON**, the input signal is amplified 20 dB to compensate for the loss in the resistor-isolated DSX MON jack.
2	If errors occur, the NO ERRORS message is replaced by a cumulative error count summary. Scroll **[F1] PAGE-UP** and **[F2] PAGE-DN** to view all of the **current** error measurements on pages 2-7 of the RESULTS screen.
3	During a test run, check the **ALARMS** and **STATUS** lamps to observe if any circuit disruptions have occurred. The affected ALARMS and/or STATUS lamps will flash on and off if the circuit was disrupted but has been restored. Press **[F3] CLR-HST** (clear history) to stop the flashing.
4	Scroll to page 5 of the RESULTS screen if you wish to check the **ELAPSED TIME** of the test run and the **TIME REMAINING** (if test length is not continuous). You can stop the test run **manually** at any time by pressing **[F1] STOP** (scroll **[F4] more** if function is not displayed).
5	At the end of a timed test run, a beep will sound and the **RUNNING** lamp will turn off. Scroll **[F1] PAGE-UP** and **[F2] PAGE-DN** to view the **end-of test** results displayed on pages 1-7 of the RESULTS screen.
6	If a printer is connected to the EZ-TESTER and ready to print, press **[F2] PRINT** to printout a quick end-of-test summary (also refer to **PRINTING THE TEST RESULTS** below).
	PRINTING THE TEST RESULTS
1	Connect a printer to the EZ-TESTER **AUXILIARY PORT** and setup the RS-232 interface to match the printer.
2	To printout the complete final test results stored in the **CAPTURE EVENTS** memory (alarm/status events, scheduled test summaries, and the end-of-test summary), press **[MENU]** and scroll cursor to **PRINT** and then press **[ENTER]** (the **PRINT MENU** appears).
3	Scroll the cursor to **CAPTURED EVENTS,** then press **[ENTER]** (printer should start printing).
	NOTE: This comprehensive end-of-test report can also be obtained from the print command in the **CAPTURE EVENTS** MAIN MENU function.
	(Table continued on next page)

SECTION 3.2   Performing Basic Tests (Continued)

Table 3-2. In-Service DS1/DS0 Monitoring Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
	CHANNEL MONITORING
	NOTE: EZ-TESTER must be set to 56 x 1 or 64 x 1 CHANNEL FORMAT to access channels (see TEST SETUP MENU)
1	From MAIN MENU, scroll cursor to **VF CHANNEL ACCESS** and press [ENTER] (cursor defaults to CHANNEL NUMBER).
2	With cursor on **CHANNEL NUMBER**, scroll [F1] **NEXT** or [F2] **PREVIUS** to select the channel that you want to monitor (01-24).
3	Data bit (or information bit) and signaling bit status in the selected channel is displayed at the bottom of the screen (clear box=0/shaded box=1). To listen on the channel, press and hold +/-[VOL] key to set volume level (use ear phones if environment is noisy).
4	The frequency and level measurements of any tones in the channel are also displayed at the bottom of the screen. For more extensive VF channel measurements, connect a VF test set (e.g TIMS) to the 15-pin D connector on the front panel of the EZ-TESTER (any VF signal in the selected DS0 channel also appears on pins 5 and 13 of this connector).
5	To view the signaling bit status in all 24 channels simultaneously, press [MENU] and scroll down to **24 CHANNEL SIGNALING** and then press [ENTER] (clear box=0, shaded box=1).
6	To return to the channel access screen, press [MENU and scroll up to **VF CHANNEL ACCESS**, then press [ENTER].
7	To capture and display dialed digits in a selected channel, press [MENU] and scroll cursor to **DIAL/SUPERVISION** (if option installed), and press [ENTER]. Move cursor to top of screen and press [EDIT] to display DIAL/SUPERVISION SETUP menu. Move cursor to DIAL METHOD and select type of dialing using function keys, then press [ENTER].
8	Move cursor to **RECV DIAL SEQUENCE** and press [F1] **CAPTURE**. Dialed digits transmitted in channel will be displayed on screen. Press [F1] **PAUSE** to stop capturing digits or [F2] **CLEAR** to erase digits on screen.

Out-of-Service T1/DS1 Testing

Out-of-service T1/DS1 testing provides a means of stress testing T1 spans using a variety of test patterns to verify performance during installation. It is also used to troubleshoot existing T1 spans, to isolate or sectionalize faulty equipment, and to verify circuit performance when repair work is completed.

Out-of-service testing is accomplished in either a point-to-point (or end-to-end) mode; or in a T1 loopback mode. In the point-to-point mode, an EZ-TESTER is patched to each end of the T1 span. In the loopback mode, an EZ-TESTER terminates the send and receive circuits at one end of the T1 span, with the far end of the T1 span looped back.

SECTION 3.2   Performing Basic Tests (Continued)

Out-of-Service T1/DS1 Testing (Continued)

Looping a T1 span is usually accomplished remotely by sending coded signals from the EZ-TESTER to a far-end device containing a loopback switch (e.g. smart jack, network interface unit or CSU). In this manual, the loopback test mode will be used to describe the basic out-of-service test procedures.

The basic T1/DS1 test functions that you can perform in the out-of-service mode are summarized below (refer to Table 2-7, SECTION 2 for a detailed list of out-of-service test functions).

Setup Functions
Line buildout (LBO) attenuation (0, -7.5 or -15 dB) for output signal level coordination
Remote loopback switching (transmit standard and user-programmable loop up/down codes)

T1 Transmission
DS1 signal status & alarm monitoring
DS1 signal level & frequency measurements
DC loop current measurement (repeatered metallic spans)
Distance to loopback measurement (based on propagation delay of DS1 signal)

DS1 Error Performance
Transmit industry-standard and user-defined test patterns with error insertion capability
Multipattern Quick Test function (5 seconds each pattern)
Bit error counts and bit error rate measurements
Errored seconds measurements
CCITT G.821 performance measurements (available/unavailable test times)

Test Run Results
View current and final test results on screen
Quick print end-of-test summary
Print alarm/status events, scheduled test summaries, and end-of-test summary stored in
    CAPTURE EVENTS memory (when setup and activated)

Table 3-3. Out-of-Service T1/DS1 Test Procedure

STEP	INSTRUCTIONS / COMMENTS
1	**SETUP & PATCHING (Loop Testing)** Press [PWR] key and then perform the basic setup procedures described in Table 3-1 (as appropriate to your test requirements). NOTES: Make sure that **CHANNEL FORMAT** in TEST SETUP MENU is set to **FULL T1** (selected by pressing **[F1]** key). Also, if you enable the **CAPTURE EVENTS** function for this test run, you should **CLEAR** the memory file of any test events captured during previous test runs.
2	Set **INPUT TERMINATION** switch to **TERM**; and the **OUTPUT LBO** switch to **0, -7.5** or **-15 dB** (according to the output signal level requirements at the T1 line test access point).
3	Patch **RX** input and **TX** output jacks of EZ-TESTER to **DSX OUT/IN** jacks associated with T1 line under test (T1 line is now out of service and terminated with the EZ-Tester).
	(Table continued on next page)

SECTION 3.2 Performing Basic Tests (Continued)

Table 3-3. Out-of-Service T1/DS1 Test Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
	SETUP & PATCHING (Continued)
4	Press **[MENU]** (if MAIN MENU screen is not displayed) and scroll cursor to **LOOPBACK/SPAN CONTROL**, and then press **[ENTER]** to display **CSU/NIU CONTROL** screen.
5	Scroll cursor to **LOOP CODE** and select type of code from function key menu (**[F1]-[F4]**).
6	If testing an ESF circuit, move cursor to **ESF LOOP CODE** and select **[F1] IN-BAND** (standard loop codes sent in band), or **[F2] DATALINK** (loop codes sent in ESF datalink).
7	Move cursor to **CSU/NIU OPERATION** and press **[ENTER]** or **[F1] LOOP-UP** to send loop-up code to far-end loopback switch. Message **LOOPING UP CSU/NIU** appears on screen.
	When the loopback switch activates and the transmitted test pattern returns to the input of the EZ-TESTER, the message **OPERATION COMPLETE** will appear on screen. The **SIGNAL PRESENT**, **FRAME SYNC** and **PATTERN SYNC** STATUS lamps will light (along with the **B8ZS** lamp if a B8ZS line coded signal is detected).
8	For a quick PASS/FAIL check of line performance, press **[F4] Q-TEST** and watch the screen for results (5 or 6 patterns transmitted in succession for 5 seconds each). Press **[ENTER]** when test is completed.
	RUNNING A TEST
1	Press the **[RESTART]** key to start a test run (this zeros all error counters and starts the test length time clock). The **RUNNING** status lamp lights and the first page of the 7-page **RESULTS** screen appears.
2	A large **NO ERRORS** message appears on screen if errors are NOT occurring. The DS1 frequency, level and dc loop current measurements are displayed on screen along with a summary of current setups (for convenience, this summary is repeated on each page of the RESULTS screen).
	Check this information carefully to verify that the transmission measurements and the EZ-TESTER setups are correct.
3	If errors are occurring, the NO ERRORS message is replaced by a short summary of current error measurements. You can scroll the pages of the RESULTS screen to view all current measurements and to check the test run **LAPSED TIME** and **TIME REMAINING** (if running a timed test).
4	You can stop the test run **manually** at any time by pressing **[F1] STOP** (scroll **[F4] more** if function is not displayed).
5	At the end of a timed test run, a beep will sound and the RUNNING status lamp will turn off. Scroll **[F1] PAGE-UP** and **[F2] PAGE-DN** to view the end-of-test results displayed on pages 1-7 of the RESULTS screen.
6	If a printer is connected to the EZ-TESTER and ready to print, press **[F2] PRINT** for a quick printout of the end-of-test summary (also refer to **PRINTING THE TEST RESULTS** on next page).
	(Table continued on next page)

SECTION 3.2   Performing Basic Tests (Continued)

Table 3-3. Out-of-Service T1/DS1 Test Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
	PRINTING THE TEST RESULTS
1	Connect a printer to the EZ-TESTER AUXILIARY PORT and setup the RS-232 interface to match the printer.
2	To printout a report of the complete final test results stored in the **CAPTURE EVENTS** memory file, press **[MENU]** and scroll cursor to **PRINT**, and then press **[ENTER]** (the **PRINT MENU** appears).
3	Scroll the cursor to **CAPTURED EVENTS** and then press **[ENTER]** (printer should start printing).
	NOTE: This comprehensive end-of-test report can also be obtained from print command in the **CAPTURE EVENTS** MAIN MENU function.

VF Channel Testing

The channel access functions in the EZ-TESTER provide a means of performing VF transmission and signaling tests on T1 lines terminated with a channel bank, SLC-96 terminal, digital switch or PBX. Channel tests can be performed with the T1 line in or out of service.

In the in-service mode, the EZ-TESTER is connected in series with one side of the T1 line using the RX/TX jacks. After the connection is made, the DS1 bit stream passes through the in/out circuits of the EZ-TESTER undisturbed. A single channel can then be taken out-of-service for one-way drop/insert testing **without** disturbing the remaining 23 channels.

In the out-of-service mode, the EZ-TESTER terminates both the transmit and receive sides of a T1 line. This mode allows you to perform full two-way channel transmission and signaling tests during installation of new trunk circuits and to troubleshoot existing channel banks and digital switches.

The EZ-TESTER channel test functions are summarized below (refer to Table 2-8 on page 45 for a complete list of channel test functions).

Basic test Functions
Set outgoing AB or ABCD signaling bits (on/off-hook signaling)
View incoming signaling bits (test channel or all channels
View incoming data (or information) bits in test channel
Send digital milliwatt test tone/Measure frequency & level of test tones
Talk and listen on channel
External access to VF channels (for external VF test set)

SECTION 3.2   Performing Basic Tests (Continued)

<u>VF Channel Testing (Continued)</u>

<u>Dial/Supervision Functions   (requires Option 06 with or without Option 08)</u>
Display incoming & outgoing AB or ABCD signaling bits
Send wink, dialing and ringing signals
Emulate ground start/loop start signaling operations
Measure wink duration and wink delay
Display incoming dialed digits in test channel
Disable echo cancelers

Table 3-4. VF Channel Testing Procedure

STEP	INSTRUCTIONS / COMMENTS
	<u>SETUP & PATCHING (T1 Out-of-Service)</u>

1	Press **[PWR]** key and then perform the basic setup procedures described in Table 3-1 (as appropriate to your test requirements)
	
	        NOTE: For VF channel testing, make sure that **CHANNEL FORMAT** in TEST
	                         SETUP MENU is set to **64 x 1**

2	Set **INPUT TERMINATION** switch to **TERM**; and the **OUTPUT LBO** switch to **0, -7.5** or **-15 dB** (according to the output signal level requirements at the T1 line test access point)
3	Patch **RX** input and **TX** output jacks of EZ-TESTER to T1 line DSX OUT/IN jacks (the T1 line is now out of service and terminated with the EZ-TESTER). <u>BASIC CHANNEL TESTING (Channel Alignment/Talk & Listen)</u> <u>NOTE:</u> Have someone assist you at the far end channel bank with a VF test set and a butt set.
1	From MAIN MENU screen, scroll cursor to **VF CHANNEL ACCESS** and then press **[ENTER]** (VF CHANNEL ACCESS screen appears and cursor defaults to CHANNEL NUMBER).
2	Scroll **[F1] NEXT** or **[F2] PREVIUS** to select test channel.
3	If you need to go **OFF-HOOK** to hold the channel for testing, move cursor to **SET SIGNALING** and then press **[EDIT]**. Set the signaling bits to the appropriate off-hook format using the left/right arrow keys and function keys **[F1]** and **[F2]**.
4	Move cursor to **CHANNEL DATA** and select **[F2] DIG-MW** (press **[F4] more** if this function is not displayed). The tester at the far-end can now measure the frequency and level of the 1000 Hz test tone at the VF output. These measurements will reveal if the frequency has been offset and if channel alignment is correct.
5	To perform the measurements in the opposite direction, have the far-end tester put a test tone in the VF input of the channel under test. The frequency and level of this incoming test tone are displayed at the bottom of the screen.
6	Have the far-end tester connect a butt set to the VF output of the channel under test. You can talk and listen over the channel using the push-to-**TALK** microphone key and the built-in speaker (press and hold the **+ VOL -** keys to set the sound volume).
	(Table continued on next page)

SECTION 3.2 Performing Basic Tests (Continued)

Table 3-4. VF Channel Testing Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
	OPTIONAL DIAL/SUPERVISION OPERATIONS (2-Way Trunk Testing Setup)
1	Press [MENU] key and scroll the cursor to **DIAL/SUPERVISION** and then press [ENTER] (the DIAL/SUPERVISION screen appears and the cursor defaults to **OPERATION**).
2	Move cursor to top of screen and press [EDIT] to display the **DIAL/SUPERVISION SETUP** menu. Move the cursor to each menu item, in turn, and use function keys [F1-F4] to make your selections. For example, to select the following setups: CHANNEL DATA: [F2] IDLE (press [F4] **more** if function not displayed) *TRUNK TYPE: [F3] L-START (loop start) *EMULATE: [F1] FXS (foreign exchange station equipment) DIAL METHOD: [F2] DTMF *In this example, the EZ-TESTER is setup to emulate a loop start FXS channel unit testing towards an FXO channel unit in a switching office.
3	Press [ENTER] to return to the **DIAL/SUPERVISION** screen (current setup is displayed at top of screen). **SIGNALING SUPERVISION, DIAL & TALK TESTING ON TRUNK CIRCUITS** (using current setup example)
1	Move cursor to **CHANNEL NUMBER** and scroll function keys [F1] and [F2] to select the test channel (01-24). CAUTION: If the you are testing on an in-service span, the Channel Data parameter should be set to Transparent **TRNSPNT** before the Channel Number is changed.
2	Move cursor to **SEND DIAL SEQUENCE** and press [EDIT] to enter a telephone number. If you have stored the telephone number previously, press [F1] **USER** and scroll the cursor to the file containing the number, then press [ENTER] (telephone number in file will appear on screen under SEND DIAL SEQUENCE).
3	Move cursor to **OPERATION** and then press [F1] **DIAL** (FX signaling protocol is sent automatically and dial sequence is output when dial tone is received from far end). When called party answers you can talk and listen using the push-to-**TALK** key and the built-in speaker (press and hold the **+ VOL -** keys to set sound volume). NOTE: You can follow the above procedures to select other TRUNK TYPES, to emulate other LOOP/GROUND START trunks; to draw dial tone and output a telephone number (toward a digital switch); or to send RING signals in the channel (towards the station equipment to ring the local loop). These functions allow you to test channel signaling and ringing and to talk and listen on the circuit.
	(Table continued on next page)

SECTION 3.2 Performing Basic Tests (Continued)

Table 3-4. VF Channel Testing Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
	OPTIONAL DIAL/SUPERVISION OPERATIONS (Continued)
	Wink Testing Interoffice Digital Trunks
1	Move cursor to top of DIAL/SUPERVISION screen and press **[EDIT]** key to display setup menu. Use cursor and function keys **[F1]-[F4]** to select the type of trunk and dialing required for the channel under test. Press **[ENTER]** to return to the DIAL/SUPERVISION screen.
2	Move cursor to **CHANNEL NUMBER** and select test channel (01-24) by scrolling function keys **[F1]** and **[F2]**.
3	Move cursor to **OPERATION** and press **[F3] ME-WINK** (scroll **[F4] more** if function is not displayed). EZ-TESTER automatically sends off-hook signal to far end and waits for wink back signal.
	The delay to wink (delay from time of seizure to receipt of wink) and the duration of the wink are displayed on screen in milliseconds.
	Originating Calls on Wink Start Digital Trunks
1	Perform DIAL/SUPERVISION setup required for the test channel (as described previously).
2	From DIAL/SUPERVISION screen, move cursor to **SEND DIAL SEQUENCE** and press **[EDIT]** to enter a telephone number. If you have stored the number previously, press **[F1] USER** and scroll the cursor to the file containing the number, then press **[ENTER]** (telephone number in file will appear on screen under SEND DIAL SEQUENCE).
3	Move cursor to **OPERATION** and press **[F2] WNK-ORG**. EZ-TESTER automatically sends off-hook signal to far-end switch and waits for wink back. When wink back is detected, the SEND DIAL SEQUENCE number displayed on screen is output.
	When calling party answers you can talk and listen on the channel using the push-to-**TALK** key and the internal speaker.
	Answering Wink Supervision on Wink Start Digital Trunks
1	Perform DIAL/SUPERVISION setup required for the test channel (as described previously).
	NOTE: You will need someone at the far end to originate a call on the test channel.
2	From DIAL/SUPERVISION screen, move cursor to **OPERATION** and press **[F1] WNK-ANS**. Have assistant at far end go off hook and dial a number.
3	When off-hook signal is detected by EZ-TESTER it answers with a wink signal (momentary off-hook) and waits for incoming dial sequence. Received dialed number is displayed on screen under **RECV DIAL SEQUENCE**. To verify dialing accuracy, move cursor to **RECV DIAL SEQUENCE**. Have assistant at far end dial a number (number will appear on screen). Repeat this process as often as necessary to verify the accuracy of dialing equipment.
4	Press **[F2] CLEAR** to erase numbers currently on screen.
5	Press **[MENU]** to return to MAIN MENU.

SECTION 3.3   Special Functions

The EZ-TESTER includes the following special functions and options to complement its basic test functions and to expand its capabilities.

Printing (using external printer)
Pulse Shape Analysis (screen display & printout)
Delay to Loopback Measurement
ESF Datalink Monitoring & Control (ANSI T1.403)
Monitoring & Testing Fractional T1 Circuits
Control of T1 Spans Using Addressable Devices
Teletrend and Westell Performance Monitor Data Retrieval
Primary Rate ISDN Testing
DDS Channel Testing
SLC-96 Datalink Monitoring & Control
Viewing Channel Data
Terminal Emulation
CSU/NIU Emulation
Remote Control Operation
GR-303 Test Access
SS7 Capture/Analysis
Computer Enhanced Testing (Using Windows)

Printing

The EZ-TESTER should work with any standard RS-232 serial printer with printing widths of 40 or 80 columns. The following 8 printing functions are available in the EZ-TESTER from the MAIN MENU **PRINT** function.

Table 3-5.   Main Menu Print Functions

PRINT FUNCTION	DESCRIPTION
*LAST RESULTS	Last end-of-test summary (from the RESTART test run function)
*CAPTURED EVENTS	Test run alarm/status events and test summaries stored in the CAPTURE EVENTS memory file
CURRENT SETUPS	Printout of the current setup configuration of the EZ-TESTER (setups selected from the TEST SETUP, CONFIGURATION SETUP, and CAPTURE EVENTS main menu functions)
USER SETUPS	List of the user-defined setups stored in the STORE/RECALL main menu function
USER TEST PATTERNS	List of user-defined test patterns currently stored in the TEST SETUP main menu function
*CAPTURED CHANNEL DATA	Report containing 256 bytes of channel data captured in the VIEW CHANNEL DATA main menu function
*RETRIEVED PM DATA	Report of T1 performance statistics retrieved from a Westell NIU/PM using PM TEST ACCESS main menu option
*CAPTURED PULSE SHAPE	Graph of pulse shape and list of pulse shape measurements captured in PULSE SHAPE ANALYSIS main menu option

*   These print command functions are duplicated in the respective MAIN MENU functions (LAST RESULTS print function is duplicated in the RESTART test run function).

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SECTION 3.3 Special Functions (Continued)

Table 3-6. Printer Setup Procedure

STEP	INSTRUCTIONS / COMMENTS
1	Press **[PWR]** key to turn on EZ-TESTER and scroll cursor down MAIN MENU to **AUXILIARY PORT**, then press **[ENTER]** to display the AUXILIARY PORT MENU (the cursor defaults to **INTERFACE TYPE** at top of screen).
2	Using the cursor and the function keys (**[F1]-[F3]**, select the interface parameters listed in the AUXILIARY PORT menu to match the external printer that you intend to use. **NOTE:** If you are using the Electrodata LP-1 printer, the correct settings are listed on a label affixed to the bottom of the unit.
3	Connect printer to the AUXILIARY PORT using the "Y" ribbon cable supplied with the EZ-TESTER and turn it on (check to see that the printer is equipped with sufficient paper).
4	To test the printer, press the **[MENU]** key and scroll the MAIN MENU cursor to **PRINT**, then press **[ENTER]**.
5	Scroll the cursor to **CURRENT SETUPS** and press **[ENTER]** (a report of the currently selected EZ-TESTER setups should start printing) **NOTE:** If printer fails to start or prints incorrectly, check the setup parameters in the AUXILIARY PORT and in the printer to see that they agree. Contact Electrodata if you cannot get your printer to work with the EZ-TESTER. The printer can now be operated from the main menu **PRINT** function, as described in the test above, or from any print command function key located in the 5 other MAIN MENU functions (identified on the previous page).

Pulse Shape Analysis

Distorted T1 pulses are a source of transmission errors and the shape of the pulses should be analyzed when troubleshooting problems in T1 facilities. T1 pulse shape has been standardized at two interface points on a T1 line; at a DSX-1 interface (AT&T Compatibility Bulletin CB-119/ANSI specification T1.102) and at a customer premises Network Interface (ANSI Specification T1.403).

The two standards each include a pulse shape mask that defines the boundaries of the respective pulse shape specifications (pulse width, rise/fall times, and % overshoot/undershoot). Both of these masks are stored in the EZ-TESTER. During a test, the incoming T1 pulses are superimposed on the selected mask and displayed on screen for easy comparison. Also, pulse shape graphs and measurements can be passed to an external printer for a hardcopy record.

Comparative pulse shape tests can be performed **only** at the specified interface points. For accurate measurements, the T1 line must be taken out of service so that it can be properly terminated in 100 ohms by the EZ-TESTER. Also, it is also important to use a low ones-density test pattern (e.g. 1:7) to eliminate adjacent pulse interference during the measurement.

SECTION 3.3   Special Functions (Continued)

Table 3-7. Pulse Shape Test Procedure

STEP	INSTRUCTIONS / COMMENTS
	NOTE: The EZ-TESTER must be patched to a DSX or NI test point in a termination (out-of-service) mode to perform pulse shape analysis (also, the level of in coming pulses must be at least **-4 dBdsx**).
1	Setup EZ-TESTER for out-of-service testing and patch it to the line as described in Tables 3-1 and 3-3 (select the 1:7 test pattern to avoid adjacent pulse interference)
2	From MAIN MENU screen, scroll cursor to **PULSE SHAPE ANALYSIS** and then press **[ENTER]** (pulse shape of last captured DS1 signal, if any, is displayed on screen with **PASS** or **FAIL** message if reference mask used).
3	To delete the mask, or to select either the T.403 mask (DSX standard) or the CB-119 mask (NI standard), press **[F4] MASK** and then press **[F1]**, **[F2]** or **[F3]** to make the selection. Press **[F4] more** to return to the previous function key menu.
4	Press **[F2] CAPTURE** to capture and display the pulse shape graph of the incoming DS1 signal (with **PASS** or **FAIL** message if MASK is used, and time and date of capture).
5	Press **[F1] STATS** to display the pulse shape measurement statistics, input signal level (dBdsx or volts p-p), and time and date of capture. Press **[F1] GRAPH** to return to pulse shape display and to the previous function key menu.
6	If a printer is connected to the EZ-TESTER, press **[F3] PRINT** to obtain a hardcopy record of the captured pulse shape graph and statistics.
	NOTE: This print command is duplicated in the main menu **PRINT** function

Distance to Loopback Measurement

The distance to loopback (delay) measurement function provides a means of identifying the location of a T1 circuit device (e.g. repeater) that is in a loopback mode and for DS1 signal path delay comparison. This measurement is performed in the out-of-service mode and is based on the propagation delay of the DS1 signal.

Table 3-8.   Distance to Loopback Measurement Procedure

STEP	INSTRUCTIONS / COMMENTS
1	Setup the EZ-TESTER for out-of-service testing and patch it to the T1 line as described in Tables 3-1 and 3-3 (EZ-TESTER **SIGNAL PRESENT**, **FRAME SYNC** and **PATTERN SYNC** lamps should light to indicate that the T1 line is looped downstream).
2	From MAIN MENU screen, scroll cursor to **DELAY MEASUREMENT** and press **[ENTER]**. **ROUND TRIP DELAY** and **ONE-WAY DISTANCE** measurements to the loopback are displayed on screen (refer to engineering/installation records to identify the location of the loopback).

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SECTION 3.3   Special Functions (Continued)

ESF Datalink Monitoring & Control/ANSI T1.403   (part of Option 03)

This optional function allows you to monitor Performance Report Messages (PRM's) transmitted in ESF datalinks (in accordance with ANSI Standard T1.403) and collected and stored in ESF CSU's at the network interface.

Also, you can transmit PRM's and monitor responses to emulate the T1.404 ESF performance message function, with the ESF T1 line taken out of service.

Table 3-9.   ESF T.403 Datalink Monitoring & Test Procedure

STEP	INSTRUCTIONS
	MONITORING ESF DATALINK PERFORMANCE REPORT MESSAGES
1	Setup the EZ-TESTER for in-service monitoring and patch to DSX MON jack of test line, as described in Tables 3-1 and 3-2 (check to see that **SIGNAL PRESENT** and **FRAME SYNC** status lamps are lit).
2	Scroll MAIN MENU cursor to **ESF/SLC DATALINK** and press **[ENTER]** to display **T1.403 DATALINK** screen (press **[F1] ESF** if displayed; or, if necessary, return to TEST SETUP MENU and set framing to ESF).
3	You can now VIEW the datalink PRM's received from the far-end CSU, error performance, and the elapsed time clock displayed at bottom of screen. Press **[F1] CLEAR** to erase current messages displayed on screen and to reset the error counters and elapsed time clock to zero.
	EMULATING THE T1.403 ESF PERFORMANCE REPORT FUNCTION
1	Setup the EZ-TESTER for out-of-service testing and patch to DSX IN/OUT jacks of test line, as described in Tables 3-1 and 3-3 (set **OPERATING MODE** to **TEST-OS** or to **TEST-IS**).
2	Scroll MAIN MENU cursor to **ESF/SLC DATALINK** and press **[ENTER]** to display **T1.403 DATALINK** screen (press **[F1]** if displayed; or, if necessary, return to SETUP MENU and set framing to ESF).
3	Move cursor to -SEND- MODE position and select source of PRM's to be transmitted in datalink using function keys **[F1] LIVE**, **[F2] FIXED** or **[F3] UNSCHED** (refer to page 34 for a description of these functions).
4	If FIXED or UNSCHED MODE is selected, scroll down the -SEND- function menu and use function keys **[F1]-[F4]** and **[EDIT]** key to select the following: CRC EVENT: (CRC error range) ASB'S: (Application Specific Bits) UNSCHD MSG: (Select or program 6-bit unscheduled **priority** or **command response** codeword message)
5	Continue to change the -SEND- messages while viewing the -RECEIVE - messages and error performance at bottom of screen.
6	To reset the error counters and elapsed time clock to zero, move cursor to -RECEIVE- and press **[F1] CLEAR**.

SECTION 3.3 Special Functions (Continued)

Monitoring and Testing Fractional T1 Circuits (requires Option 01)

This option allows you to monitor and test fractional T1 (FT1) circuits using contiguous or noncontiguous 56 x N or 64 x N time slots. The EZ-TESTER will autoconfigure to the time slot assignments in an FT1 circuit, and display the channel assignments on screen.

FT1 circuits can be monitored **in-service** to verify channel assignments and to measure error performance, or taken **out-of-service** for bit error testing.

Table 3-10. Fractional T1 Monitoring & Test Procedure

STEP	INSTRUCTIONS / COMMENTS
	IN-SERVICE MONITORING
1	Setup the EZ-TESTER for in-service monitoring and patch to the circuit under test as described in Tables 3-1 and 3-2 (**SIGNAL PRESENT** and **FRAME SYNC** status lamps should light).
2	Set MAIN MENU cursor to **TEST SETUP** and press [ENTER] to display the **TEST SETUP MENU** screen.
3	Scroll the cursor down to **CHANNEL FORMAT** and press **[F4] FT1**. Next, press **[F1] 56 X N** or **[F2] 64 X N** to select the time slot format of the FT1 circuit to be monitored (**TIME SLOT SELECT** screen appears).
4	To verify the time slot assignments, press **[F3] CLR ALL** to clear the existing screen display, and then press **[F4] AUTO**.
	EZ-TESTER will autoconfigure to time slot assignments of incoming FT1 signal and display them on screen (shaded squares=selected time slots; clear squares=blocked time slots)
5	Press **[RESTART]** key to start a test run to measure the error performance of the FT1 circuit (**RUNNING** status lamp lights).
	When test run is completed, you can view the results on screen or print out the test results (as described previously).
	OUT-OF-SERVICE BIT ERROR TESTING
1	Setup EZ-TESTER for out-of-service loopback testing and patch to the circuit under test as described in Tables 3-1 and 3-3 (after looping the circuit, **SIGNAL PRESENT & FRAME SYNC** lamps should light, **PATTERN SYNC** lamp should be off unless FT1 channel selection is correct).
2	Set cursor to main menu **TEST SETUP** and press [ENTER]. Move cursor down to **CHANNEL FORMAT** and press **[F4] FT1**, then press **[EDIT]** to display **TIME SLOT SELECT** screen (cursor defaults to 01 time slot).
3	Use **[F1] SELECT** (unblock) and **[F2] DELETE** (block) to select the time slots (01-24) to match the authorized channel assignment (unblocked channels) of the FT1 circuit, and then press **[ENTER]**. **PATTERN SYNC** lamp should now light if channel assignment of FT1 circuit is correct.
4	With **PATTERN SYNC** lamp ON, press **[RESTART]** to run an error performance test (view and print test results as previously described).

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SECTION 3.3   Special Functions (Continued)

Control of T1 Spans Using Addressable Devices (Option 05)

This option is installed in the **LOOPBACK/SPAN CONTROL** main menu function of the EZ-TESTER. It is used to operate addressable loopback switches and maintenance devices used in intelligent T1 spans devices.

The addressable repeaters and maintenance devices used in intelligent T1 spans are operated remotely using binary-coded command and response signals. The binary-coded command signals are stored in the EZ-TESTER and activated by simple keystroke commands. Coded response signals are translated automatically and displayed on the EZ-TESTER screen in plain text.

The command and response signals used in addressable devices are not standardized, and manufacturers develop their own system of binary codes. Option 05 supports the major manufacturers of these devices.

For simplicity, Westell addressable devices will be used as examples in describing the step-by-step procedures. All addressable devices operate similarly and you should have no difficulty in applying these test procedures to T1 spans using other types of devices.

Table 3-11.   Intelligent T1 Span Testing Procedure

STEP	INSTRUCTIONS / COMMENTS
	SETUP AND PATCHING
1	Setup the EZ-TESTER for out-of-service testing and patch to DSX-1 IN/OUT jacks on span to be tested, as described in Tables 3-1 and 3-3 (in **TEST SETUP** function, set **CHANNEL FORMAT** to **[F1] FULL T1**).
2	Scroll MAIN MENU cursor to **LOOPBACK/SPAN CONTROL** and press **[ENTER]** to display menu screen.
3	Scroll cursor to **OPERATING REGION** and press **[EDIT]** to display selection menu. Move cursor to select your operating region and press **[ENTER]**.
4	Repeat STEP 3 to select the following: REPEATER VENDOR: WESTELL MAINTENCE SWCH VENDR: WESTELL TESTING POINT: [F1] DSX-1 DEVICE TYPE: [F2] REPEATR
5	With cursor on **DEVICE TYPE: REPEATER**, press **[ENTER]** (REPEATER CONTROL screen appears with **OPERATION; ARM-IN BAND** and line **STATUS** displayed).
6	Press **[F1] EXECUTE** to send the **ARM IN-BAND** code down the span line (this code is the same as the standard NIU loop up code). This function "ARMS" the loopback switches in the office and line repeaters and loops up the NIU at the far end (**SIGNAL PRESENT, FRAME SYNC** and **PATTERN SYNC** status lamps should light after arming occurs).
	(Table continued on next page)

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SECTION 3.3 Special Functions (Continued)

Table 3-11. Intelligent T1 Span Testing Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
	STATUS should indicate **SPAN ARMED** and **LOOPBACK PRESENT**. **NOTE:** The span repeater loopback switches must be ARMED to respond to command and query codes. The switches will stay ARMED for two hours or until a DISARMING code is sent down the span. **LOOPBACK TESTING & FAULT ISOLATION** (using Westell's sequential repeater-loopback feature and the EZ-TESTER Quick Test function)
1	Press **[F4] Q-TEST** to perform a quick test of the span and watch screen for results (If any FAILED conditions occur the span is faulty). Press **[ENTER]** to return to **REPEATER CONTROL** screen.
2	To isolate the faulty span segment, press **[EDIT]** to display the **OPERATION** screen and move cursor to **SEQUENTIAL LOOP-UP**. Press **[ENTER]** to display **REPEATER CONTROL** screen and then press **[F1] EXECUTE**.
3	The first repeater in the span will loopback (e.g Intelligent Office Repeater #1) and **IOR #1** appears in the STATUS display to indicate which repeater segment is now in loopback. Press **[F4] Q-TEST** to quick test the looped repeater segment and watch the screen for results.
4	If this segment passes the quick test, press **[F1] EXECUTE** to loopback the next repeater in line (e.g. Intelligent Line Repeater #1). Office repeater #1 will loop down, and the STATUS message **ILR #1** will appear to identify the next repeater that is now in loopback.
5	Again, press **[F4] Q-TEST** to quick test the second looped segment of the span. Repeat STEPS 4 and 5 until the faulty span segment is located.
6	When the fault locating test is completed, press **[ENTER]** to return to the **REPEATER CONTROL** screen, and then press **[EDIT]** to display the **OPERATION** menu.
7	Move cursor to **DISARM** and press **[ENTER]** to display **REPEATER CONTROL** screen. Press **[F1] EXECUTE** to send the disarming code down the span (same as NIU loop down code). This will disarm the span repeater loopback switches and remove any loopbacks (repeater and NIU). STATUS display should indicate that line is **IDLE** and **NO LOOPBACK** is present. **NOTE:** If preferred, you can loop up repeaters in **ANY** sequence after arming the span. This is done by setting the **OPERATION** menu cursor to one of the LOOP UP LINE or OFFICE REPEATER functions and then entering the repeater address from the REPEATER CONTROL screen (move cursor to REPEATER ADDRESS and use function keys **[F2]** and **[F3]** to select the address number). A repeater will remained looped up for 30 minutes. You can disable this auto timeout function by sending the **DISABLE LOOPBACK TIMEOUT** code to the repeater. This function is selected from the **OPERATION** menu and then executed from the **REPEATER CONTROL** screen.
	(Table continued on next page)

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SECTION 3.3 Special Functions (Continued)

Table 3-11. Intelligent T1 Span Testing Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
	REPEATER QUERY FUNCTIONS
	Repeater Power Query
	NOTE: When an intelligent line repeater (optioned for THRU POWER) detects a simplex power fault (cable cut or ground fault condition) on its drop side, it switches to LOOP POWER mode. This query function allows you to identify remotely which line repeater is in the LOOP POWER mode.
1	Perform the setup and patching procedures described previously.
2	Press [EDIT] to display OPERATION menu and scroll the cursor to LOOP ILR IN POWER LOOP. Press [ENTER] to display REPEATER CONTROL screen and then press [F1] EXECUTE to send
3	power query code down the span. The repeater in POWER LOOP mode will switch to the loopback mode and respond with an acknowledgment code containing its address. The repeater address is displayed on screen.
	Repeater Loopback Query
	NOTE: This function allows you to identify which span repeater is in a loopback mode; or to verify that the line is clear of any repeater loopbacks.
1	Perform the setup and patching procedures described previously.
2	Press [EDIT] to display OPERATION menu and scroll the cursor to QUERY LOOPBACK.
3	Press [ENTER] to display REPEATER CONTROL screen and then press [F1] EXECUTE to send loopback query code down the span. When a repeater in loopback mode detects this query code, it responds with an acknowledgment code containing its address. The repeater address is displayed on screen.
	NOTE: These same general procedures can be followed to perform loopback testing on T1 spans equipped with TELTREND or WESCOM intelligent repeaters. Refer to the respective manufacturer's repeater documentation or practices for descriptions of addressable functions and codes.
	(Table continued on next page)

SECTION 3.3   Special Functions (Continued)

Table 3-11.   Intelligent T1 Span Testing Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
	Remote Line Switching & Loopback testing
	NOTE: Maintenance switches supplied by Westell and TELTREND provide a means of remotely switching a suspected faulty T1 access line to a spare line quickly. This eliminates lengthy service outages on critical T1 circuits. The Westell 3171 T1 Network Interface and Maintenance System is used as an example in describing these step-by-step operating procedures.
1	Setup the EZ-TESTER for out-of-service loopback testing as described previously and patch to the **spare line** DSX-1 IN/OUT jacks.
2	Scroll MAIN MENU cursor to **LOOPBACK/SPAN CONTROL** and press **[ENTER]** to display menu screen. Move cursor to **DEVICE TYPE** and press **[F1] CSU/NIU** to display the **CSU/NIU CONTROL** screen.
3	Press **[F1] LOOP-UP** to send the NIU loop-up code down the spare line to the far-end NIU (**SIGNAL PRESENT, FRAME SYNC**, and **PATTERN SYNC** status lamps will light to indicate that the spare line NIU is in loopback mode).
4	To quick test the spare line, press **[F4] Q-TEST** and watch the screen for test results.
5	If the spare line is clear, press the down arrow to move cursor to **NIU SLOT POSITION** and scroll function key **[F2]** or **[F3]** to select the 2-digit line card position of the suspected span line.
6	Press **[F1] EXECUTE** to send the line card switching command and wait for the acknowledgment message to appear on the screen. When the acknowledgment message appears, **QUICKLY** remove patch cords from EZ-TESTER TX/RX jacks and insert into respective DSX-1 IN/OUT jacks of inter-office T1 line (associated with access line being switched to the spare line). **In 10 seconds the customer's T1 circuit will switch to the spare line.** NOTE: You can now troubleshoot the suspected T1 line as described above for LOOPBACK TESTING & FAULT ISOLATION
7	When the suspected line is fixed, connect the EZ-TESTER to the DSX IN/OUT jacks and scroll the MAIN MENU cursor to **LOOPBACK/SPAN CONTROL**.
8	Press **[ENTER]** to display the menu screen (cursor defaults to **DEVICE** position). Press **[F3] SWITCH** to display the **MAINTENANCE SWITCH CONTROL** screen and then press **[EDIT]** to display the **SWITCH OPERATION** menu.
9	Move cursor to **RESET SWITCH** and press **[ENTER]** to return to the **MAINTENANCE SWITCH CONTROL** screen. Press **[F1] EXECUTE** to loop up and switch the circuit and watch for the acknowledgment message to appear on screen. When acknowledgment message appears, **QUICKLY remove all patch cords**. After 10 seconds, the customer's T1 circuit will switch back to the restored T1 access span and service conditions are to back to normal.

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SECTION 3.3   Special Functions (Continued)

Performance Monitor Data Retrieval (Option 04)

This optional function is used to remotely retrieve T1 span historic performance data, collected and stored in the Westell 3114-XX T1 Network Interface Unit/Performance Monitor (NIU/PM)or Teltrend DS1 Performance Monitoring Digital Network Interface (PMDNI). Refer to Teltrend or Westell documentation for descriptions of the data collected and stored in the NIU. NIU/PM data retrieval is performed in the out-of-service test mode. After looping the span at the far-end NIU/PM, the EZ-TESTER sends coded commands to the PM to perform the following 3 functions:

- Retrieve historic performance data stored in the PM's memory
- Set the PM's clock
- Clear the PM's Memory

Table 3-12. Teltrend and Westell NIU/PM Data Retrieval Procedure

STEP	INSTRUCTIONS / COMMENTS
1	Setup the EZ-TESTER and patch to the T1 span line as described for out-of-service loopback testing in Tables 3-1 and 3-3.
2	Scroll MAIN MENU cursor to PM TEST ACCESS and press [ENTER] to display PM TEST ACCESS screen.
	RETRIEVING PM DATA
1	Press [EDIT] to display PM OPERATION menu screen and scroll cursor to RETRIEVE PM STATISTICS.
2	Press [ENTER] to send NIU loopback code and the PM data retrieval command code. When the NIU loopback switch activates and return signal is detected in the EZ-TESTER, the SIGNAL PRESENT, FRAME SYNC and PATTERN SYNC status lamps will light.
	When the data retrieval operation is completed, the EZ-TESTER automatically transmits the NIU loop down code to restore the T1 span.
3	Press [F1] VIEW to view the performance data on screen; or press F2] PRINT to printout a hardcopy record (if printer is connected to AUXILIARY PORT). (The RETRIEVED PM DATA print command is also in the main menu PRINT function.)
	SETTING THE PM CLOCK (to agree with EZ-TESTER clock)
1	Press [EDIT] to display the PM OPERATION menu and move cursor to SET PM CLOCK. Press [ENTER] and then press [F1] YES to answer the question on screen (loop up, set clock & loop down operations occur automatically).
	CLEARING THE PM's MEMORY FILE
1	Press [EDIT] to display the PM OPERATION menu and move cursor to CLEAR PM STATISTICS. Press [ENTER] and then press [F1] YES to answer the question on screen (loop up, clear PM memory file and loop down operations occur automatically).

SECTION 3.3   Special Functions (Continued)

Primary Rate ISDN Testing (Option 09)

This option is used to test Primary Rate ISDN circuits at the central office or at the customer location. It simulates the customer equipment and allows the placing and receiving of either data or voice calls. It will test 23B+D circuit configurations or 23B+D and 24B circuit configurations with the use of a second test set. The test set will receive a call while placing a call so that a loopback on the same span can be set up. The D-channel location is selectable so that individual trunk groups, with their own D-channels, can also be tested. Table 3-12 describes the TE Emulate operation. Table 3-13 describes the Monitor operation.

Table 3-13.   Primary Rate ISDN (TE Emulate) Test Procedure

STEP	INSTRUCTIONS / COMMENTS
	PRIMARY RATE ISDN SETUP
1	Setup the **CODING FORMAT** (either **AMI** or **B8ZS**) and **FRAMING FORMAT** (either **D3/D4** or **ESF**) in the **TEST SETUP** menu to match the span to be tested.
2	Scroll MAIN MENU cursor to **PRIMARY RATE ISDN** and press [ENTER] to display the **PRIMARY RATE ISDN SETUP 1** screen (press [F1] D3/D4 or [F2] ESF if displayed).
	NOTE: If you have already gone through the two setup screens for ISDN and you do not want to make any changes, you can just press [ENTER] twice at this point to go to the main **PRIMARY RATE ISDN** screen
3	Select the **Q931 STANDARD** to match the controlling switch at the central office.
4	Select the location of the D-channel on the span (this is normally timeslot 24).
5	Select the Interface ID of the Primary Rate interface associated with the selected D-channel (if there is only a single Primary Rate interface or if you are unsure, select 00).
	NOTE: If you are not going to place any outgoing calls, you can skip the remaining parameters and just press [ENTER] twice which will take you to the main **PRIMARY RATE ISDN** screen.
6	Select the type of outgoing call (or **BEARER CAPABILITY**)to be placed, either **VOICE** or **DATA**.
7	If a **DATA** call is being placed, select the appropriate data rate (or **BEARER RATE**).
	NOTE: 64 X N and H0 channels will only be available if the EZ-TESTER has Option 01 Fractional FT1 installed. Also, verify switch capability to make sure that the **BEARER RATE** selected is compatible.
8	If a **VOICE** call or single channel **DATA** call is being placed select the appropriate B-channel.
9	Select the Interface ID of the Primary Rate interface associated with the selected B-channel or channels (if there is only a single Primary Rate interface or if you are unsure, select 00).
10	Enter the number of the party you want to call. Press [EDIT] to enter a number or if you have stored the number previously, press [F1] USER and scroll the cursor to the file containing the number, and then press [ENTER].
11	Press [ENTER] to go the **PRIMARY RATE ISDN SETUP 2** screen.
	(Table continued on next page)

SECTION 3.3 Special Functions (Continued)

Table 3-13. Primary Rate ISDN (TE Emulate) Test Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
	PRIMARY RATE ISDN SETUP (Continued)
12	Select the desired **NETWORK SPECIFIC** information. If none is desired, or unsure, select **NONE**. If **NETWORK SPECIFIC** information is desired, make the appropriate choices for **NETWORK TYPE** and **NETWORK ID PLAN**. To enter the **NETWORK IDENTIFICATION**, press the [EDIT] key and then use the arrow keys to enter the appropriate numbers: 　　NOTE:　CIC code for AT&T:　　288 　　　　　　CIC code for MCI:　　　222 　　　　　　CIC code for SPRINT:　333
13	Select the **FACILITY CODING** if desired. If none is desired or unsure select **NONE**. If **FACILITY CODING** is desired, make the appropriate choice. To enter the **FACILITY CODE**, press the [EDIT] key and then use the arrow keys to enter the appropriate numbers: 　　　NOTE:　Facility codes for the various call controls can be found in Appendix G.
14	If you wish to include a calling party number with your outgoing call press [EDIT] and enter the desired number. If you do not wish to send a calling party number or are unsure select **[F1] NONE**.
15	Press [ENTER] to go to the main **PRIMARY RATE ISDN** screen (This the screen from which calls are placed and received). If you are connected to the span the **SIGNAL PRESENT** and **FRAME SYNC** indicators should be on. If not verify your cable connections. If the EZ-TESTER is able to initialize layer 2 communications, there will be a double beep and the **LAYER 2** status will go from **NOT READY** to **READY**. If not, verify that you have selected the correct D-channel.
	PLACING AN OUTGOING CALL When ready, press **[F2] CALL** to place the call you set up in the SETUP screens.
1	The **CALL STATE** will go from **IDLE** to **CALL IN PROCESS**. The lower half of the screen will display the type, rate and channel identification information of the call being placed. If the call is rejected by the switch, the **CALL STATE** will go to **CALL REJECTED** and the reason for the rejection will be displayed in **CAUSE VALUE**. If the call is accepted, the **CALL STATE** will go to **CONNECTED**.
	RECEIVING AN INCOMING CALL
1	If an incoming call is received, the **CALL STATE** will go to **INCOMING CALL** and a ringing sound will be heard. The lower half of the screen will display the, type, rate and channel identification information of the incoming call. To answer, or accept the call, press **[F1] ACCEPT**. To reject the call, press **[F2] REJECT**. 　　NOTE:　If the incoming call is a multirate 64 X N call, pressing and holding down [F3] 　　　　　　VIEW will display the selected channels. If the call is accepted, the **CALL STATE** will go to **CONNECTED**.
	BERT TESTING OF CONNECTED DATA CALLS If the connected call is a data call and the channel or channels are in the same Primary Rate interface as the D-channel (as indicated by the Interface ID information) the lower half of the screen will display BERT information.
	(Table continued on next page)

SECTION 3.3   Special Functions (Continued)

Table 3-13.   Primary Rate ISDN (TE Emulate) Test Procedures (Continued)

STEP	INSTRUCTIONS / COMMENTS
1	If the call placed is being looped back, the **PATTERN SYNC** indicator should be on for any pattern selected. If the connected call is from another test set, and the **PATTERN SYNC** indicator is not on, press **[F2] CHANGE PATTERN**, to identify the pattern being received. Once the **PATTERN SYNC** indicator is on, press **[F3] CLEAR RESULTS** to clear accumulated results and start a test run. Any errors will be indicated. Pressing **[F4] INSERT ERROR** will insert one error into the outgoing data stream.
2	When testing is complete, press **[F1] CLEAR CALL** to terminate the call. The **CALL STATE** should change to **CALL CLEARED**.
	<u>**VF CHANNEL TESTING OF CONNECTED VOICE CALLS**</u>
	If the connected call is a voice call and the channel is in the same Primary Rate interface as the D-channel (as indicated by the Interface ID information) the lower half of the screen will display VF information.
	At this point, the speaker volume level can be adjusted by pressing either **[VOL+]** or **[VOL -]** and the push-to-talk microphone can be enabled by pressing **[TALK]**. A digital milliwatt can be sent on the selected channel by pressing **[F3] CHANNEL DATA DIG-MW**. If an external VF test set is connected to the DB-15 connector on the front of the EZ-TESTER, external VF input can be enabled by pressing **[F4] CHANNEL DATA EXT-VF**.
	If a tone is being received, the frequency and level of the tone will be displayed.
3	When testing is complete, press **[F1] CLEAR CALL** to terminate the call. The **CALL STATE** should change to **CALL CLEARED**.

Table 3-14.   Primary Rate ISDN (Monitor) Procedure

STEP	INSTRUCTIONS / COMMENTS
	<u>**PRIMARY RATE ISDN SETUP**</u>
1	Setup the **CODING FORMAT** (either **AMI** or **B8ZS**) and **FRAMING FORMAT** (either **D3/D4** or **ESF**) in the TEST SETUP menu to match the span to be monitored.
2	Scroll MAIN MENU cursor to **PRIMARY RATE ISDN (MONITOR)** and press [ENTER] to display the **PRIMARY RATE ISDN MONITOR** screen.
3	Select the **Q931 STANDARD** to match the controlling switch at the central office.
4	Select the location of the D-channel on the span (this is normally timeslot 24).
5	Scroll the cursor to **CAPTURE MEMORY** and press **[F1] CAPTURE**. The **ELAPSED TIME** counter will increment every second and the [F1] key will change to **STOP**. The **FRAME COUNT** will increment with every frame and the **FRAME ERRORS** will increment each time an error occurs.
	(Table continued on next page)

SECTION 3.3 Special Functions (Continued)

Table 3-14. Primary Rate ISDN (Monitor) Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
6	Press [F1] STOP to end the capture operation.
7	Press [F2] VIEW to display the VIEW CAPTURED DATA - CONDENSED screen.
8	To view a specific event shown on the VIEW CAPTURED DATA - CONDENSED display, scroll the cursor to the desired event and press [F3] EXPAND.
9	On the VIEW CAPTURED DATA - EXPANDED display, scroll the cursor up and down to view the entire display.
10	To select another event, press [F3] CONDNSD to return to the VIEW CAPTURED DATA - CONDENSED display.
11	To print the VIEW CAPTURED DATA screens, press [F3] PRINT CONDNSD on the PRIMARY RATE ISDN MONITOR screen for the CONDENSED display and [F4] PRINT EXPANDD to print the EXPANDED screens.

DDS Channel Testing (Option 11)

This option is used to test DDS circuits and components from a T1 access point. Both latching and non-latching loopback codes can be sent to loopback various pieces of equipment. In addition, control codes, such as the repeater release code, can be sent to further sectionalize problems. The EZ-TESTER® will also detect and display the presence of any control codes being received. Full BERT capability is supported using any pattern including 63, 127 and 511 pseudorandom patterns and DDS-1 through DDS-6 stress patterns.

Table 3-15. DDS Channel Test Procedure

STEP	INSTRUCTIONS / COMMENTS
	SETUP AND PATCHING
1	Press [PWR] key and then perform the basic setup procedures described in Table 3-1 (as appropriate to your test requirements).
2	Set INPUT TERMINATION switch to TERM; and the OUTPUT LBO switch to 0, -7.5 or -15 dB (according to the output signal level requirements at the T1 line test access point).
	(Table continued on next page)

SECTION 3.3   Special Functions (Continued)

Table 3-15.   DDS Channel Test Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
	SETUP AND PATCHING (Continued)
3	Patch RX input and TX output jacks of EZ-TESTER to DSX OUT/IN jacks associated with T1 line under test (T1 line is now out of service and terminated with the EZ-Tester).
4	Setup the **CODING FORMAT** (either **AMI** or **B8ZS**) and **FRAMING FORMAT** in the **TEST SETUP** menu to match the span to be tested.
5	Scroll MAIN MENU cursor to **DDS CHANNEL TESTING** and press **[ENTER]** to display the **DDS CHANNEL TESTING** screen.
6	Move the cursor to **CHANNEL NUMBER** and use the **[F1] NEXT** and **[F2] PREVIUS** keys to select the channel to be tested.
7	Move the cursor down to **DSO-A CHANNEL RATE** and select the channel rate of the DSO-A channel to be tested.
8	Move the cursor to **TEST PATTERN** and press the **<EDIT>** key to display the available test patterns. Use the arrow keys to select the desired pattern and press **<ENTER>**.
9	To place the channel in loopback, press **[F1] LOOP ENABLE**, to display the available loopback codes. Move the cursor to either CHANNEL LATCHING or CHANNEL ALTERNATING and press **<ENTER>**.
	The display will return to the **DDS CHANNEL TESTING** screen and display the status of the loopback enable operation. If the loopback is successful, you will hear a double beep and the message **LOOPBACK ENABLE COMPLETE** will be briefly displayed. The **SIGNAL PRESENT, FRAME SYNC** and **PATTERN SYNC** indicators should all be on.
	Under - **STATUS** -, **LOOPBACK** will display the last loopback enabled or attempted and **RCV CTRL CODE** will display the presence of any control codes in the receive data stream.
	DDS BERT TESTING
1	Press **[F4] START BERT** to start a bit error test. The bottom half of the screen will be replaced the BERT RESULTS. All the counts should remain at zero.
2	To verify that you are in loopback, you can press **[F3] INSERT ERROR**, to insert a single bit error. Pressing **[F2] CLEAR RESULTS** will return all the counts to zero.
3	When you are done testing, press **[F4] STOP BERT** to again display - **STATUS** -.
4	To clear the loopback on the first repeater or device on the channel and move to the next device, press **[F3] CONTROL CODES** and move the cursor to **REPATER RELEASE CODE**. Pressing the **<ENTER>** key will return the display to the **DDS CHANNEL TESTING** screen with the message **SENDING CONTROL CODE** being displayed.
5	After approximately one second, press **[F1] CANCEL** to stop sending the selected control code.
6	If another device is in loopback, the **SIGNAL PRESENT, FRAME SYNC** and **PATTERN SYNC** indicators should all be on again.
7	Repeat steps 1 and 2 under **BERT TESTING** to test this portion of the channel.
	(Table continued on next page)

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SECTION 3.3   Special Functions (Continued)

Table 3-15.   DDS Channel Test Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
8	This same procedure can be repeated as necessary to test each device on the channel. When all testing is complete, press **[F2] LOOP DISABLE**, to remove the channel loopback and return the channel to normal operation. By using the other loopback codes other devices on the channel such as the OCU, DS0-DP and CSU can be placed in loopback and tested. **NOTE:** When the **DS0-A CHANNEL RATE** is set to **64 KBPS**, the alternating loopback codes are not available.

SLC-96® Datalink Monitoring & Control (part of Option 03)

SLC-96 subscriber loop carrier systems use the D4 framing format in Digroups B, C and D (shelves B, C and D). In Digroup A (or A shelf) the D4 framing format is modified to provide a special datalink that is used for maintenance and control of the SLC-96 system. This modified framing format is also used in the SLC-96 protection line (when installed).

This optional EZ-TESTER function allows you to access and monitor SLC-96 datalink messages in the in-service monitoring mode; and to emulate the datalink maintenance and alarm messages in the out-of-service test mode.

Table 3-16.   SLC-96 Datalink Monitoring & Test Procedure

STEP	INSTRUCTIONS / COMMENTS
1	**MONITORING THE SLC-96 DATALINK** Setup the EZ-TESTER for in-service monitoring and patch to SLC-96 Digroup A DSX MON jack, as described in Tables 3-1 and 3-2 (remember to set the framing format to SLC-96). Check to see that the EZ-TESTER **SIGNAL PRESENT** and **FRAME SYNC** lamps are lit.
2	Scroll MAIN MENU cursor to **ESF/SLC DATALINK** and press **[ENTER]** to display **SLC-96 DATALINK** screen (press **[F2] SLC-96** if displayed; or, if necessary, return to TEST SETUP MENU and set framing to SLC-96. You can now view the current datalink alarm and maintenance messages displayed in the -RECEIVE- section of the screen. **ALARMS** (system major, minor & power/misc. alarms) **SHELF ALARMS** (individual ABC & D shelf alarms) **FAR-END LOOP** (message indicates if any shelf is in loopback) **MAINTENANCE** (standard decoded maintenance messages) **PROTECTION** (message indicates if ABC or D shelf has been switched to the protection shelf)
	(Table continued on next page)

SECTION 3.3 Special Functions (Continued)

Table 3-16. SLC-96 Datalink Monitoring & Test Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
	EMULATING THE SLC DATALINK FUNCTIONS
	NOTE: This test function involves sending standard datalink messages to the far-end SLC-96 terminal and verifying the return datalink messages on the EZ-TESTER screen.
1	Setup the EZ-TESTER for out-of-service testing and patch to DSX-1 IN/OUT jacks of Digroup A (shelf A), as described in Tables 3-1 and 3-2 (remember to set the framing format to SLC-96).
2	Scroll MAIN MENU cursor to **ESF/SLC DATALINK** and press **[ENTER]** to display **SLC DATALINK** screen (press **[F2] SLC-96** if displayed; or, if necessary, return to TEST SETUP.
3	Using the up arrow, move cursor to **-SEND- ALARMS** position at top of screen and then press **[EDIT]** to activate the major, minor and power/misc. alarm messages (cursor defaults to **maj**).
4	Press **[F1] SET** to activate the major alarm message (**maj** will switch from lowercase letters to uppercase **MAJ**). Verify that the **RECEIVE ALARMS** message displays **MAJ** to indicate the alarm condition.
5	Repeat this process to send other alarm and maintenance messages from the **SEND** function menu while observing the **RECEIVE** messages on screen (if necessary, refer to page 29 for a description of the alarm and maintenance messages while performing this test function).
	NOTE: When you reset a SEND message to lowercase letters, the RECEIVE message should also reset to lowercase. A **RECEIVE** lowercase message indicates that an alarm or maintenance message was present but is now reset (e.g. prior alarm condition now cleared).
6	To clear any lowercase RECEIVE messages from the screen, move cursor to **RECEIVE** and press **[F1] CLEAR**.

View Channel Data

This special function displays 256 bytes (8-bit digital samples) of the signal in a selected channel. The channel data is displayed in binary, hex and ASCII code formats. This function is useful in analyzing signal performance in DS0 data channels.

To analyze the transmission performance of a data channel, you need to take it out of service and insert a known binary, hex or ASCII coded test pattern into the channel.

Table 3-17. View Channel Data Setup Procedure

STEP	INSTRUCTIONS / COMMENTS
1	Take the test channel out of service and insert a known binary, hex or ASCII coded pattern into the channel with a test pattern generator (use end-to-end or loopback test setup mode).
2	Setup the EZ-TESTER and patch it to the T1 line in an in-service monitoring mode (as described in Tables 3-1 and 3-2). During setup, make sure that you select the correct channel format (64x1 or 56x1) and channel number (01-24).
	(Table continued on next page)

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SECTION 3.3   Special Functions (Continued)

Table 3-17. View Channel Data Setup Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
3	From MAIN MENU screen, scroll cursor to **VIEW CHANNEL DATA** and press **[ENTER]** to display the first page of the VIEW DATA ON CHANNEL: (00-24) screen. There are 16 pages of this screen, each containing 16 bytes of channel data displayed in binary, hex and ASCII formats.
4	Scroll **[F1] NEXT** and **[F2] PREVIUS** to view the live channel data flashing on each page of the screen.
5	Press **[F3] PAUSE** to freeze the instantaneous data flashing on screen, and then scroll **[F2] PAGE-DN** to analyze the static channel data displayed on each page of the screen.
6	If an external printer is connected to the EZ-TESTER, press **[F4] PRINT** to obtain a hardcopy record of the static channel data.

Terminal Emulation (Option 10)

This option allows the EZ-TESTER to be connected to the RS-232 port on HDSL equipment provided by ADTRAN, Inc. or PairGain Technologies, Inc. and the Digital Network Interface (DNI) equipment provided by Teltrend. Once connected, the EZ-Tester provides access to the performance monitoring, provisioning and system maintenance capabilities of the HDSL equipment and performance information in the DNI. The EZ-TESTER emulates a terminal for displaying data and entering control commands. The option is fully supported by the OnCall® feature, which allows installation and upgrades via a simple modem connection.

Table 3-18. Terminal Emulation Test Procedure

STEP	INSTRUCTIONS / COMMENTS
1	**TERMINAL EMULATION SETUP** Scroll MAIN MENU cursor to **TERMINAL EMULATION** and press **[ENTER]** to display the **TERMINAL EMULATION** screen.
2	Connect the **RS-232 cable**(PN: 600064) between the **HDSL unit or NIU** and the EZ-TESTER **AUXILIARY PORT**.
3	The EZ-TESTER will initialize and display the **Maintenance Terminal Menu**.
4	Use the **arrow keys** to position your viewing area on the larger VT100 display area.
5	Use the **[F1]** and **[F2]** keys to choose the character for the menu item you wish to view. Press **[F4]** to select the displayed character. Use the <RESTART> key to send an ESC character
*	You may also use the **[F1]**, **[F2]** and **[F4]** keys to enter character strings when necessary, such as for date or threshold settings. Use **[F3]** for backspacing should you make an error. To transmit an ESC character, press the **[RESTART]** key. To enter a C/R, press the **[ENTER]** key. To insert an "arrow" sequence, press **[EDIT]** and then the desired arrow key. When you have selected all of the characters for the string, press **[ENTER]** to continue. **NOTE:** With this option, the **EZ-TESTER** serves as a display terminal. Refer to vendor documentation for instructions involving system particulars.

SECTION 3.3   Special Functions (Continued)

CSU/NIU Emulation

In this setup mode, the EZ-TESTER terminates a HiCap T1 access line at a customer premises and emulates the loopback switching functions of a network interface device (NIU or smart jack) or a CSU.

In addition, error performance measurements are displayed on screen with an associated elapsed-time clock (clock resets to zero when EZ-TESTER loopback switch is activated).

Table 3-19. CSU/NIU Emulation Procedure

STEP	INSTRUCTIONS / COMMENTS
1	Setup the EZ-TESTER and patch it to the line (in place of an NIU or CSU) as described for out-of-service testing in Tables 3-1 and 3-3. (Use the EZ-TESTER DB-15 network interface connector instead of the RX/TX jacks, if appropriate.)
2	Scroll MAIN MENU cursor to **CSU/NIU EMULATION** and press **[ENTER]**. CSU/NIU EMULATION screen appears with graphic display of loopback mode (looped or unlooped).
3	Move cursor to EMULATION and press **[F1] NIU** or **[F2] CSU** to select the T1 line terminating device that you want to emulate. EZ-TESTER will now respond to standard loopback codes sent from far end office.
4	Move cursor to - RECEIVE - and observe the graphic display (loop should be open and [F2] function key menu should read **LOOP**).
	When a *loop-up* code is sent from far end, the message **LOOP-UP DETECTED** appears on screen until EZ-TESTER loopback switch activates. When loopback switch **activates**:

	- Message disappears
	      - Graph changes to display the line **loop up** condition
	      - **[F2]** menu changes to **UN-LOOP**
	      - Error counter & elapsed time clock reset to zero
	      - Elapsed time clock resets to zero

	When a *loop-down* code is detected, the message **LP-DWN DETECTED** appears on screen. When loopback switch **deactivates**:

	- Message disappears
	      - Graph changes to display the line **loop down** condition
	      - **[F2]** menu changes back to **LOOP**.
	      - Error counter & elapsed time clock reset to zero

5	Press **[F1] CLEAR** at any time to reset error counter and elapsed time clock to zero.
6	To operate the EZ-TESTER loopback switch **manually**, press **[F2] LOOP** to *activate* the loopback switch; or **[F2] UN-LOOP** to *deactivate* the loopback switch.
7	**IMPORTANT: At end of test, press [F2] UN-LOOP to deactivate the internal loopback switch before turning off the EZ-TESTER.**

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SECTION 3.3   Special Functions (Continued)

GR-303 Test Access (Option 12)

This option provides functions for testing loop access systems as described in Bellcore's GR-303-CORE, "IDLC Generic Requirements, Objectives, and Interface." With this option, the EZ-TESTER is able to capture and display timestamped Time-Slot Management Channel (TMC) and Embedded Operations Channel (EOC) data. The setup menu allows the user to select all retrievable protocol layer 2 and 3 data, or to filter a narrower range of specific data based upon layer, Call Reference Value (CRV), and abnormal cause codes. The Hybrid Signaling Channel is supported by displays of raw and decoded signaling (ABCD) bits. If the test set configuration includes Option 03 (ESF/SLC 96 Monitor and Control), the test set can display performance messages. If Option 10 (Terminal Emulation) is installed, craft interface access is also provided.

Table 3-20. GR-303 Test Access Procedure

STEP	INSTRUCTIONS / COMMENTS
	GR-303 Test Access Setup
1	Scroll MAIN MENU cursor to **GR-303 TEST ACCESS** and press **[ENTER]** to display the GR-303 TEST ACCESS test menu. The test set automatically configures for ESF framing and B8ZS line code.
2	Set the **INPUT TERMINATION** switch to **MON**.
3	Patch the RX input jack of the EZ-TESTER to the monitor jack of the T1 line.
	Monitor the TMC/CSC Channel
1	On the GR-303 TEST ACCESS menu, scroll the cursor to **TMC/CSC CHANNEL** and press **[ENTER]**.
2	Select the protocol layers to be monitored by pressing **[F1] ALL** for layers 2 and 3, or **[F2] 3 ONLY** for layer 3. If **ALL** is selected, no further filtering selections are available and the cursor moves to **CAPTURE MEMORY**. If **3 ONLY** is selected, the cursor moves to **CRV FILTER**.
3	If the cursor moves to **CRV FILTER**, press **[F1] ALL** to filter reports for all customer calls or **[F2] SPECIFIC** to filter reports for a specific customer. If **SPECIFIC** is selected, scroll the cursor back to **CRV FILTER** and press the **[EDIT]** key and arrow keys to designate a specific CRV. When the CRV selection is complete, press **[ENTER]**.
4	Press **[F1] CAPTURE** to initiate the data capture. The **[F1]** key changes to **STOP**. During capture, or after the capture is stopped, the TMC/CSC MONITORING menu displays the **FRAME COUNT**, **FRAME ERRORS**, and **ELAPSED TIME** of the capture.
5	Press **[F1] STOP** to end the capture. The test set can now display the captured messages.
	If messages related only to abnormal events are to be displayed, move the cursor back to **CAUSE CODE FILTER** and press **[F1] ABNORMAL**.
	If messages related only to abnormal events are to be displayed, move the cursor back to **CAUSE CODE FILTER** and press **[F1] ABNORMAL**.
	Press **[F2] VIEW** to display the VIEW CAPTURED DATA - CONDENSED screen, **[F3] STATS** to display the TMC/CSC CAPTURED STATISTICS screen, or **[F4] more** to enable printing the condensed or expanded screens.
	(Table continued on next page)

SECTION 3.3 Special Functions (Continued)

Table 3-20. GR-303 Test Access Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
	On the VIEW CAPTURED DATA - CONDENSED screen, individual events related to specific customer calls can be selected using the arrow keys and **[F3] EXPAND** . Press **[F3] EXPAND** to view the VIEW CAPTURED DATA - EXPANDED screen. On the VIEW CAPTURED DATA - EXPANDED screen, [F1] NEXT scrolls the screen to show more information, **[F3] CONDNSD** returns the display to the VIEW CAPTURED DATA - CONDENSED screen, and **[F4] RETURN** changes the display to the TMC/CSC MONITORING screen. **Monitor the EOC Channel** On the GR-303 TEST ACCESS menu, move the cursor to **EOC CHANNEL** and press **[ENTER]**. Select the protocol layers to be monitored by pressing **[F1] ALL** for layers 2 and 3, or **[F2] 3 ONLY** for layer 3. Press **[F1] CAPTURE** to initiate the data capture. The **[F1]** key changes to **STOP**. During capture, or after the capture is stopped, the TMC/CSC MONITORING menu displays the **FRAME COUNT**, **FRAME ERRORS**, and **ELAPSED TIME** of the capture. Press **[F1] STOP** to end the capture. The test set can now display the captured messages. Press **[F2] VIEW** to display the VIEW CAPTURED DATA - CONDENSED screen, **[F3] STATS** to display the EOC CAPTURED STATISTICS screen, or **[F4] more** to enable printing using **[F1] PRINT CONDENSD** or **[F2] PRINT EXPANDD**. On the VIEW CAPTURED DATA - CONDENSED screen, individual events related to specific customer calls can be selected using the arrow keys and **[F3] EXPAND** . Press **[F3] EXPAND** to view the VIEW CAPTURED DATA - EXPANDED screen. On the VIEW CAPTURED DATA - EXPANDED screen, [F1] NEXT scrolls the screen to show more information, **[F3] CONDNSD** returns the display to the VIEW CAPTURED DATA - CONDENSED screen, and **[F4] RETURN** changes the display to the EOC MONITORING screen. **CRAFT INTERFACE ACCESS** If Option 10 (Terminal Emulation) is installed, CRAFT INTERFACE ACCESS can be selected on the GR-303 TEST ACCESS menu. Connect the test set **AUXILIARY PORT** to the device to be controlled using an RS-232 test cable. On the GR-303 TEST ACCESS menu, move the cursor to **CRAFT INTERFACE ACCESS** and press **[ENTER]**. An interface configuration screen appears briefly as the test set automatically sets the bit rate, word length, and the parity and stop bits. Use the **[F1]** and **[F2]** keys to scroll through the character string at the bottom left corner to select the necessary letters, numbers, or symbols required for each command. To select a character, align it between the brackets on the screen with the arrows, and then press **[F4] SELECT**. When each command is completed, press **[ENTER]**.
	(Table continued on next page)

SECTION 3.3   Special Functions (Continued)

Table 3-20. GR-303 Test Access Procedure (Continued)

STEP	INSTRUCTIONS / COMMENTS
	Monitor the Hybrid Signaling Channel
1	On the GR-303 TEST ACCESS menu, scroll the cursor to **HYBRID SIGNALING** and press **[ENTER]**.
2	On the HYBRID SIGNALING SETUP screen, press **[F1] IDT → RDT**, **[F2] RDT → IDT**, **[F3] DNE → RDT**, or **[F4] RDT → DNE** to select the configuration of the line being monitored..
3	Move the cursor to **SERVICE** and press **[EDIT]** to select the type of service for the line, then press **[ENTER]** to return to the HYBRID SIGNALING SETUP screen.
4	On the HYBRID SIGNALING SETUP screen, press **[ENTER]** to view the ABCD signaling bits on the 24 CHANNEL SIGNALING screen.
5	On the 24 CHANNEL SIGNALING screen, use the **[F1] HLDSCRN** key to freeze the display. Use **[F2] SETUP** to return to the HYBRID SIGNALING SETUP screen,, and the **[F3] DECODED/RAW** key to toggle between the raw data view or the decoded data view.

SS7 Capture/Analysis (Option 13)

This option is used for analyzing common channel signaling as described in Bellcore's GR-246-Core, "Bell Communications Research Specification of Signalling System Number 7." Signaling System Number 7 (SS7) uses signaling links for transfer of messages between exchanges or other nodes in the telecommunications network served by the system. The EZ-TESTER's SS7 testing feature enables a technician to capture and analyze messages present on an SS7 56K or 64K signaling channel and to monitor the performance of the link in real time to help isolate typical problems.

During SS7 capture/analysis, two specific operations can be performed. The first operation, MSU CAPTURE, enables the test set to capture and time stamp Message Signaling Units (MSU) that appear on the SS7 link to which the test set is attached. Captured messages, selected for viewing using pre- and post-capture filtering, can be displayed by message type on a summary screen, or in detail on an "expanded" screen that shows the contents of all available message fields. The second operation, SU/SMU ANALYSIS, provides running totals on two separate screens of Signaling Unit (SU) messages and MSUs appearing on the SS7 link as the test set monitors the line.   During the monitoring period, which begins as soon as SU/MSU ANALYSIS is selected, the test set counts the messages as they are detected and continuously increments a series of counters showing the results as totals, subtotals, and percentage of message types. The SU ANALYSIS screen also displays the number of message re-transmissions by counting inverted Forward Indicator Bits (FIB INV) and Backward Indicator Bits (BIB INV). Legends are provided for both the SU and MSU analysis screens. The procedure for performing SS7 CAPTURE/ANALYSIS is shown in Table 3-21. Table 3-22 explains the signal acronyms that appear on the VIEW CAPTURED DATA - CONDENSED screen.

SECTION 3.3   Special Functions (Continued)

Table 3-21. SS7 Capture/Analysis

STEP	INSTRUCTIONS / COMMENTS
	SS7 Capture/Analysis Setup
1	On the MAIN MENU, scroll the cursor to **SS7 CAPTURE/ANALYSIS** and press **[ENTER]** to display the SS7 CAPTURE/ANALYSIS screen.
2	Set the INPUT TERMINATION switch to **MONITOR**.
3	Connect the RX input of the EZ-TESTER to the monitor jack at the T1 access point.
4	On the **SS7 CAPTURE/ANALYSIS** screen, move the cursor to **SIGNALING TIME SLOT** and use **[F1] NEXT** or **[F2] PREVIOUS** to select the SS7 link channel.
5	Move the cursor to **SIGNALING BIT RATE** and use **[F1] 56KBPS** or **[F2] 64KBPS** to select the link channel data rate.
	MESSAGE SIGNALING UNIT (MSU) CAPTURE
	This operation enables the test set to filter and select for viewing MSU messages that appear on the SS7 link channel. The value of MSU capture/analysis lies in the user's ability to examine key data fields in the MSUs and identify codes such as the Service Indicators (SI) or Destination Point Codes (DPC) that are incorrect for the circuit being monitored. The EZ-TESTER captures the messages. Recognition of incorrect codes is dependent upon knowledge of the normal operating conditions, intended function, and proper routing of SS7 link data.
1	On the **SS7 CAPTURE/ANALYSIS** screen, move the cursor to **MSU CAPTURE** and press **[ENTER]** to display the **MSU CAPTURE FILTER SETUP** screen.
2	Move the cursor to **SERV INFO FIELD** to select the type of message by user part: **[F1] ALL, [F2] SCCP** (Signaling Connection Control Part_), **[F3] ISUP** (ISDN User Part). Press **[F4] more** to enable **[F1] SNT** (Signal Network Test), and **[F2] SNM** (Signal Network Management).
3	Move the cursor to **DEST POINT CODE** to select the type of message by destination: **[F1] ALL, [F2] SPECIFIC**. If SPECIFIC is selected, press **[EDIT]** and then enter the destination point code using the arrow keys. Press **[ENTER]** to continue.
4	Move the cursor to **ORIG POINT CODE** to select the type of message by originating point: **[F1] ALL, [F2] SPECIFIC**. If SPECIFIC is selected, press **[EDIT]** and then enter the originating point code using the arrow keys. Press **[ENTER]** to continue.
5	**CIRCUIT ID CODE** is only enabled if the SERV INFO FIELD is set to ISUP. If CIRCUIT ID CODE is enabled, move the cursor there and select the message type by pressing **[F1] ALL** or **[F2] SPECIFIC**. If SPECIFIC is selected, press **[EDIT]** and enter the circuit ID code using the arrow keys. Press **[ENTER]** to continue.
6	**CALLED ADDRESS** is only enabled if the SERV INFO FIELD is set to SCCP or ISUP. If CALLED ADDRESS is enabled, move the cursor there and select the message type by pressing **[F1] ALL** or **[F2] SPECIFIC**. If SPECIFIC is selected, press **[EDIT]** and enter the called address using the arrow keys. Press **[ENTER]** to continue.
7	**CALLING ADDRESS** is only enabled if the SERV INFO FIELD is set to SCCP or ISUP. If CALLING ADDRESS is enabled, move the cursor there and select the message type by pressing **[F1] ALL** or **[F2] SPECIFIC**. If SPECIFIC is selected, press **[EDIT]** and enter the calling address using the arrow keys. Press **[ENTER]** to display the **MSU CAPTURE FILTER SUMMARY** screen.
8	On the **MSU CAPTURE FILTER SUMMARY** screen, confirm the filtering setup is correct. To change a filter selection, press **[F3] FILTER** to go back to the **MSU CAPTURE FILTER SETUP** screen and make any necessary changes. Press **[ENTER]** to continue.
	(Table continued on next page)

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SECTION 3.3 Special Functions (Continued)

Table 3-21. SS7 Capture/Analysis (Continued)

STEP	INSTRUCTIONS / COMMENTS
9	Press [F1] CAPTURE to initiate the message capture. The [F1] key changes to STOP. During capture, or after the capture is stopped, the screen displays the number of messages PROCESSED for filtering; the number of messages CAPTURED because they met the filtering criteria; and the ELAPSED TIME of the operation.
10	To stop the capture operation, press [F1] STOP or wait for the capture buffer to fill.
11	Press [F2] VIEW to change the display to the VIEW CAPTURED DATA - CONDENSED screen. This screen displays the messages in chronological order as they were captured, showing the time and message type.
12	For message details, move the cursor to the desired message and press [F3] EXPAND to change the display to the VIEW CAPTURED DATA - EXPANDED screen. Use the arrow keys to scroll the screen up and down to view all the details of the selected message. Table 3-22 lists the message types and priorities for ISUP and SCCP messages. The message to be expanded can be changed on the VIEW CAPTURED DATA - CONDENSED screen by moving the cursor and pressing [ENTER] or from the VIEW CAPTURED DATA - EXPANDED screen by pressing [F1] NEXT or [F2] PREVIOUS. Post-capture filtering can be accomplished by pressing [F3] FILTER to return to the MSU CAPTURE FILTER SETUP screen and changing the filtering criteria. Then press [ENTER] to return to the MSU FILTER SUMMARY screen, and press [F2] VIEW to display the messages. __PRINTING CAPTURED MESSAGES__ After a capture operation is complete, the VIEW CAPTURED DATA - CONDENSED and VIEW CAPTURED DATA - EXPANDED screens can be printed to any standard 80 column printer with an RS-232 serial port.
1	Connect the RS-232 Auxiliary Port on the test set to the RS-232 serial port on the printer using the "Y" ribbon cable provided with the test set.
2	Go to the MAIN MENU and move the cursor to AUXILIARY PORT and press [ENTER].
3	On the AUXILIARY PORT MENU set the listed items to match the requirements of your printer, then return to the SS7 CATURE/ANALYSIS menus.
4	Press [ENTER] several times until the MSU CAPTURE FILTER SUMMARY screen appears.
5	On the MSU CAPTURE FILTER SUMMARY screen, press [F4] more, then press [F1] PRINT CONDENSD or [F2] PRINT EXPANDED. The printer will print the full contents of the test set capture buffer.
	(Table continued on next page)

SECTION 3.3   Special Functions (Continued)

Table 3-21. SS7 Capture/Analysis (Continued)

STEP	INSTRUCTIONS / COMMENTS
	SIGNALING UNIT/ MESSAGE SIGNALING UNIT (SU/MSU) ANALYSIS The value of this type of analysis lies in recognizing the normal volume of various message types appearing on the link. Large numbers of Fill-In Signal Unit (FISU) messages, for instance, implies a low link efficiency since fill-in messages generally appear when the link is idle. Inverted Forward Indicator Bits (FIB) and Backward Indicator Bits (BIB) indicate requests for re-transmission of messages, therefore, increasing numbers may indicate degraded line quality and a need for corrective maintenance. **SU ANALYSIS** The SU (Signal Unit) ANALYSIS function provides a running tally of all three types of SU messages appearing on the link: Fill-In Signal Units (FISU), Link Status Signal Units (LSSU), and Message Signal Units (MSU). The bottom of the screen shows a running tally of MSU re-transmissions by counting the inverted FIBs (FIB INV) and Inverted BIBs (BIB INV).
1	Starting on the **SS7 CAPTURE/ANALYSIS** screen, move the cursor to **SU/MSU ANALYSIS** and press **[ENTER]**. The display changes to the **SU ANALYSIS** screen and message counting begins automatically.
2	The total number of Signaling Units detected are shown in real time on the FISU, LISU, MSU, TOTAL SU, FIB INV, and BIB INV counters.
3	On the **SU ANALYSIS** display, press **[F1] PAUSE** to freeze the display. F1 toggles from **PAUSE** to **RESUME**. When **[F1] RESUME** is pressed, the counters on the display continue to increment with no messages having been lost during the pause.
	MSU ANALYSIS The MSU ANALYSIS function provides a running tally of specific types of MSUs detected on the SS7 link channel: Signal Network Management (SNM), Signal Network Test Regular (SNTR), Signal Network test Special (SNTS), Signal Connection Control Part (SCCP), Telephone User Part (TUP), ISDN User Part (ISUP), and other undesignated messages.
1	Starting on the **SU ANALYSIS** display, press **[F3] MSU**. The display changes to the **MSU ANALYSIS** display.
2	The total number of MSUs are shown in real time on the SNM, SNTR, SNTS, SCCP, TUP, ISUP, OTHER, and TOTAL MSU counters.
3	On the **MSU ANALYSIS** display, press **[F1] PAUSE** to freeze the display. F1 toggles from PAUSE to RESUME. When **[F1] RESUME** is pressed, the counters on the display continue to increment with no messages having been lost during the pause.
4	Press **[F2] RESTART** to reset the counters and begin counting from zero.
5	Press **[F4] LEGEND** to view the **MSU ANALYSIS - LEGEND** display.

SECTION 3.3   Special Functions (Continued)

Table 3-22 - ISUP and SCCP Message Types and Priorities

ISUP MESSAGES			SCCP MESSAGES		
	Message Type	**Priority**		**Message Type**	**Priority**
ACM	Address Complete	1	AK	Data Acknowledgment	0-1
ANM	Answer	2	CC	Connection Confirm	1
BLA	Blocking Acknowledge	0	CR	Connection Request	0-1
BLO	Blocking	0	CREF	Connection Refused	1
CCR	Continuity Check Request	1	DT1	Data Form 1	0-1
CFN	Confusion	0	DT2	Data Form 2	0-1
CGB	Circuit Group Block	0	EA	Expedited Data Acknowledgment	1
CGBA	Circuit Group Block Acknowledge	0	ED	Expedited Data	1
CGU	Circuit Group Unblock	0	ERR	Error	1
CGUA	Circuit Group Unblock Acknowledge	0	IT	Inactivity Test	1
CIQR	Circuit Group Query Response	0	LUDT	Long Unit Data	0-2
CIQU	Circuit Group Query	0	LUDTS	Long Unit Data Service	0-2
COT	Continuity	1	RLC	Release Complete	2
CPG	Call Progress	1	RLSD	Released	2
CRA	Circuit Reservation Acknowledge	0	RSC	Reset Confirmation	1
CRES	Circuit Reservation	0	RSR	Reset Request	1
CVAR	Circuit Validation Response	0	UDT	Unit Data	0-2
CVT	Circuit Validation Test	0	UDTS	Unit Data Service	0-2
EXIT	Exit	1	UNKNOWN	Unknown	
FOT	Forward Transfer	1	XUDT	Extended Unit Data	0-2
GRA	Group Reset Acknowledge	0	XUDTS	Extended Unit Data Service	0-2
GRS	Circuit Group Reset	0			
IAM	Initial Address	0			
INF	Information	1			
INR	Information Request	1			
LBAC	Loopback Acknowledge	1			
PAM	Pass Along	0-2			
REL	Release	1			
RES	Resume	1			
RLC	Release Complete	2			
RSC	Reset Circuit	0			
SUS	Suspend	1			
UBA	Unblocking Acknowledge	0			
UBL	Unblocking	0			
UCID	Unequip Circuit Identification	1			

SECTION 3.3   Special Functions (Continued)

Remote Control Operation

The TTS 3-EZ EZ-TESTER can be controlled from an external terminal or computer using the auxiliary port. The terminal or computer can be connected directly to the EZ-TESTER for local operation; or connected to a leased line or dial-up modem for remote control operation. In either case, you can control the test set the same as if you were pressing its operating keys directly. The EZ-TESTER supports most asynchronous 80 column video terminals or computers, operating in character-mode using 7 or 8 level ASCII code, with or without parity.

The external terminal, computer or modem is connected to the EZ-TESTER **AUXILIARY PORT** using the ribbon cable provided. Before plugging the cable into the test set, the interface characteristics of the AUXILIARY PORT must be setup to match those of the selected control device (refer to **SETTING UP THE AUXILIARY PORT**, page 48).

If the EZ-TESTER is being connected to a modem, select the following "AT" command sequence:

E0, Q1, V0, S0=1 and &W0.

Communications with the EZ-TESTER is established by pressing the ESCAPE key on the terminal or computer. The prompt ">" should appear on the left side of the terminal or computer screen. If this prompt does not appear after pressing the ESCAPE key, make sure that the AUXILIARY PORT interface parameters are setup correctly.

Once communication has been established, you can enter display, control or setup commands. All commands are ASCII strings which can be terminated by pressing the [RETURN] key. Entry errors can be corrected by pressing the RUBOUT or BACKSPACE key and retyping the character or characters in error. If the test set does not recognize a command, it will echo the command string back followed by a question mark. A command string, or operation, can be aborted by pressing the ESCAPE key.

Display commands are used to display EZ-TESTER status and alarm conditions, setup menus, current test results, test events stored in the CAPTURE EVENTS memory file, and the currently installed software version and revision level. The available display commands are described in Table 3-23.

Control commands are used to clear the CAPTURE EVENTS memory file, start and stop test runs, insert bit or BPV errors and store current results in the CAPTURE EVENTS memory file. The available control commands are described in Table 3-24.

Setup commands are used to display and change the EZ-TESTER setup parameters in the **TEST SETUP, CAPTURE EVENTS** and **CONFIGURATION SETUP** main menu functions. The available setup commands are described in Tables 3-25 through 3-27.

NOTE

- To display the **current setup**, enter the setup command and then press <RETURN>.
- To display the **available setup options**, enter the setup command, then enter a space followed by a question mark, and then press <RETURN>.
- To **change a setup**, enter the setup command, then a space followed by the new setup command, then press <RETURN>.

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Table 3-23. Auxiliary Port Display Commands

COMMAND	DESCRIPTION
ALRM	Display alarm indicators
BTRE	Display current bridge tap or multipattern results
CAEV	Display all capture events
CCNT	Display number of stored capture events
CAPE	Display capture events setup menu
CFEV	Display first captured event
CNEV	Display next captured event
CPEV	Display previous captured event
LRSL	Display last results
CNFG	Display configuration setup menu
PCCD	Display Captured Channel Data
PMSS	Display stored PM statistics
RSLT	Display current results
STAT	Display status indicators
TOPT	Display test options setup menu
TPSU	Display test, configuration and capture memory options
VERS	Display software version and revision

Table 3-24. Auxiliary Port Control Commands

COMMAND	DESCRIPTION
BITI	Insert bit errors
BPVI	Insert BPV errors
CLHI	Clear history indicators
CCLR	Clear capture memory
RSTR	Start test run
SMRY	Capture current results
STOP	Stop test run
AUCO	Perform auto configuration
DELY	Perform delay measurement
LPUP	Perform loop-up
LPDN	Perform loop-down
QTST	Perform Quick Test
PMPS	Retrieve PM statistics
PMSC	Set PM clock
PMIR	Retrieve PM Performance Index Ratio (PIR)
PMCS	Clear PM statistics

TERMINAL EMULATION (Continued)

Responses . . . . Standard character responses are provided

Equipment Supported . . . . Adtran, Inc.
        HDSL Central Office and Customer Premises Unit
        Models: HTU-R, T400HTU-R, HFAC
    PairGain Technologies, Inc.
        HDSL Central Office and Customer Premises Unit
        Models: HLU-231, 319,388, 611, 612, D41; HRU-412,
        512; HLIU-960; HDU-451
    Teltrend, Inc.
        PMDNI Digital Network Interface

DDS CHANNEL TESTING (Option 11)

DSO-A Channel Rates . . . . 2.4, 4.8, 9.6, 19.2, 38.4, 56 and 64 Kbps

Loopbacks (Latching and Alternating) . . . . Channel, DSU, OCU, DSO-DP, NIE and eight-bit user defined

Control Codes (Generate and Detect) . . . . Repeater Release, Idle, Abnormal Station, Mux-Out-of-Sync, Unassigned Mux Channel, Test Code, Test Alert, MJU Alert, Loopback Enable, Far-End Voice, Transition in Progress, Block Code, Release Code, MAP0 Code, MAP1 Code, and eight-bit user defined

BERT Patterns . . . . 63, 127, 511, 2047, $2E^{15}$-1, 2E20-1, QRSS, All 0's, 1:7, 2 in 8, 3 in 24, ALT 1/0, All 1's, T1-1, T1-2, T1-3, T1-4, T1-5, 55 Octet, T1-Daly, DDS-1, DDS-2, DDS-3, DDS-4, DDS-5, DDS-6, and user defined pattern up to 2048 bits long.

BERT Results . . . . BPV, BIT, Frame and CRC errors and elapsed time

PRINTING

Print Functions . . . . Last Results, Captured Events, Current Setups, User Setups User Test Patterns, Captured Channel Data, Retrieved PM Data, Captured Pulse Shape

    Captured Events
        Types of Events (input signal conditions) . . . Signal STATUS/ALARM changes
                Changes in current CCITT G.821
                Performance Category
                Errored Second
                Severely-Errored Second
                Frame Slip
        Number of Events . . . . 100 to 1500 (depending on type)
        Event Triggers . . . . Automatic, selectable & manual

    Printer Interface. . . . . See AUXILIARY PORT

Technical Specifications (Continued)

AUXILIARY PORT

Function   RS 232 Interface/Remote Control or Printer
Connector . . . . 25-pin D Shell Female
Type of Interface . . . . DTE or DCE
Transmission Speeds . . . . 1200, 2400 & 9600 bps
Bits per Character . . . . 7 or 8
Parity . . . . Odd, Even or None
Stop bits . . . . 1 or 2
Printer Widths . . . . 40 or 80 Columns

PHYSICAL SPECIFICATIONS

Size . . . . 10.2"L x 3.8"W x 3"H
Weight . . . . 3 lbs. (1.35 kilograms)
Display Screen . . . . Backlit LCD, 24 lines x 32 characters
Operating Temperature . . . . -20 to +60 degrees C
Storage Temperature . . . . -30 to +90 degrees C
Humidify . . . . 10% to 90% noncondensing

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APPENDIX B

Factory-Installed Setups (STORE/RECALL Function)

SETUP TEST	FILE # 1 OUT-OF-SERVICE QRSS	FILE # 2 BRIDGE TAP TEST	FILE # 3 MULTIPLE PATTERN
TEST SETUPS			
Operating Mode	TEST-OS	TEST-OS	TEST-OS
Coding Format	AMI	AMI	AMI
Framing Format	ESF	ESF	ESF
Trans Clk Source	INTERNAL	INTERNAL	INTERNAL
Channel Format	FULL T1	FULL T1	FULL T1
Channel Number	N/A	N/A	N/A
Test Pattern	QRSS	BRIDGE	MLTPLE
Test Length	00:15:00	00:10:30	00:15:00
CONFIGURATION SETUPS			
Auto Shut Off	ENABLE	ENABLE	ENABLE
Display Backlight	AUTO	AUTO	AUTO
Audible Alarm	ENABLE	ENABLE	ENABLE
Level Display	P-P V	ENABLE	ENABLE
Fill Data	IDLE	IDLE	IDLE
Set Signaling	ABCD=0000	ABCD=0000	ABCD=0000
Bit Error Insert	SINGLE	SINGLE	SINGLE
BPV Error Insert	SINGLE	SINGLE	SINGLE
CAPTURE EVENTS			
Capture Operation	OFF	OFF	OFF
Status Change	N/A	N/A	N/A
Alarm Change	N/A	N/A	N/A
Performance Chng	N/A	N/A	N/A
Errored Second	N/A	N/A	N/A
Severly Errd Sec	N/A	N/A	N/A
Frame Slip	N/A	N/A	N/A
Scheduled Summary	N/A	N/A	N/A

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APPENDIX C

SAMPLE PRINTOUTS

LAST RESULTS

```
START OF TEST 12/15/94  09:06:51
CODING FORMAT:     AMI
FRAMING FORMAT:    ESF
CHANNEL FORMAT:    FULL T1
CHANNEL NUMBER:    N/A
TEST PATTERN:      QRSS
```

```
RESULTS SUMMARY 12/15/94  09:07:27
RECV LEVEL:        6.30 VOLTS P-P    RECV LEVEL:        +.4 dBdsx
RECV FREQUENCY:    1,544,337 HZ      SIMPLEX CURRENT:   UNDER 10 mA.
BPV ERRORS:        9                 BIT ERRORS:        5
BPV ERROR RATE:    1.63E-07          BIT ERROR RATE:    9.14E-08
BPV ERRD SECONDS:  3                 BIT ERRD SECONDS:  3
FRM ERRORS:        0                 CRC ERRORS:        5
FRM ERROR RATE:    0.00E-05          CRC ERROR RATE:    4.21E-04
FRM ERRD SECONDS:  0                 CRC ERRD SECONDS:  3
SIGNAL LOSS:       0      SEC        YELLOW ALARM:      0      SEC
FRAME SYNC LOSS:   0      SEC        EXCESS ZERO'S:     0      SEC
PAT SYNC LOSS:     0      SEC        ALL ONE'S:         0      SEC
ERRORED SECONDS:   6      17.1%      TEST LENGTH:       00:15:00
SVRLY ERRD SECS:   0      0.0%       ELAPSED TIME:      00:00:35
ERROR FREE SECS:   29     82.8%      TIME REMAINING:    00:14:25
CLOCK SLIPS:       +1                SLIP RATE:         +2.85E-02
PEAK (+) WANDER:   1                 (+) FRAME SLIPS:   0
PEAK (-) WANDER:   0                 (-) FRAME SLIPS:   0
CURRENT G.821:     AVAILABLE         ACCEPTABLE MINS:   0      0.0%
AVAILABLE SECS:    35     100.0%     DEGRADED MINS:     0      0.0%
UNAVAILABLE SECS:  0      0.0%       UNACCEPTBLE SECS:  0      0.0%
```

CAPTURED EVENTS

```
EVENT: 0042   12/15/94  09:33:02   START OF TEST
CODING FORMAT:     AMI
FRAMING FORMAT:    ESF
CHANNEL FORMAT:    64 X N=06
CHANNEL NUMBER:    N/A
TEST PATTERN:      QRSS
```

```
EVENT: 0043   12/15/94  09:33:03   PERFORMANCE CHNG AVAILABLE
EVENT: 0044   12/15/94  09:34:02   PERFORMANCE CHNG ACCEPTABLE
EVENT: 0045   12/15/94  09:36:13   SVRLY ERRD SEC
EVENT: 0046   12/15/94  09:36:13   STATUS CHANGE SIGNAL LOSS DETECTED
EVENT: 0047   12/15/94  09:36:13   STATUS CHANGE FRAME SYNC LOSS DETECTED
EVENT: 0048   12/15/94  09:36:13   STATUS CHANGE PAT SYNC LOSS DETECTED
EVENT: 0049   12/15/94  09:36:13   ALARM CHANGE EXCESS ZERO'S DETECTED
EVENT: 0050   12/15/94  09:36:13   PERFORMANCE CHNG UNAVAILABLE
EVENT: 0051   12/15/94  09:36:14   SVRLY ERRD SEC
EVENT: 0052   12/15/94  09:36:14   ALARM CHANGE EXCESS ZERO'S CLEARED
EVENT: 0053   12/15/94  09:36:15   SVRLY ERRD SEC
EVENT: 0054   12/15/94  09:36:16   SVRLY ERRD SEC
EVENT: 0055   12/15/94  09:36:17   STATUS CHANGE SIGNAL LOSS CLEARED
EVENT: 0056   12/15/94  09:36:17   STATUS CHANGE FRAME SYNC LOSS CLEARED
EVENT: 0057   12/15/94  09:36:17   STATUS CHANGE PAT SYNC LOSS CLEARED
EVENT: 0058   12/15/94  09:36:17   PERFORMANCE CHNG AVAILABLE
EVENT: 0059   12/15/94  09:37:06   PERFORMANCE CHNG ACCEPTABLE
EVENT: 0060   12/15/94  09:39:08   MANUAL STOP
```

SAMPLE PRINTOUTS (Continued)

CURRENT SETUPS

```
             -- TEST SETUPS --

OPERATING MODE:       TEST-OS
CODING FORMAT:        AMI
FRAMING FORMAT:       ESF
TRANS CLK SOURCE:     INTERNAL
CHANNEL FORMAT:       FULL T1
CHANNEL NUMBER:       N/A
TEST PATTERN:         QRSS
TEST LENGTH:          00:15:00

          -- CONFIGURATION SETUPS --

AUTO SHUT OFF:        ENABLE
DISPLAY BACKLIGHT:    AUTO
AUDIBLE ALARM:        ENABLE
LEVEL DISPLAY:        P-P V
FILL DATA:            IDLE
SET SIGNALING:        ABCD=0000
BIT ERROR INSERT:     SINGLE
BPV ERROR INSERT:     SINGLE

            -- CAPTURE EVENTS --

CAPTURE OPERATION:    ON
STATUS CHANGE:        ENABLE
ALARM CHANGE:         ENABLE
PERFORMANCE CHNG:     ENABLE
ERRORED SECOND:       DISABLE
SEVERLY ERRD SEC:     ENABLE
FRAME SLIP:           ENABLE
SCHEDULED SUMMARY:    DISABLE
```

USER SETUPS

```
USER SETUP 1: UNFRAMED BRIDGE

             -- TEST SETUPS --

OPERATING MODE:       TEST-OS
CODING FORMAT:        AMI
FRAMING FORMAT:       UNFRAMD
TRANS CLK SOURCE:     N/A
CHANNEL FORMAT:       N/A
CHANNEL NUMBER:       N/A
TEST PATTERN:         BRIDGE
TEST LENGTH:          00:10:30

          -- CONFIGURATION SETUPS --

AUTO SHUT OFF:        ENABLE
DISPLAY BACKLIGHT:    AUTO
AUDIBLE ALARM:        ENABLE
LEVEL DISPLAY:        P-P V
FILL DATA:            IDLE
SET SIGNALING:        AB=00
BIT ERROR INSERT:     SINGLE

                .

                .
```

C-2

SAMPLE PRINTOUTS (Continued)

USER TEST PATTERNS

```
            USER TEST PATTERN #5
       USER LABEL: FOX
       LENGTH IN BITS: 448

       BYTE   BINARY      HEX      ASCII

        1     00101010   2A (54)   * (T)
        2     00010010   12 (48)     (H)
        3     10100010   A2 (45)     (E)
        4     00000100   04 (20)   ( )
        5     10001010   8A (51)     (Q)
        6     10101010   AA (55)     (U)
                    .
                    .
                    .
       52     00011100   1C (38)     (8)
       53     10011100   9C (39)     (9)
       54     00001100   0C (30)     (0)
       55     10110000   B0 (0D)   ( )
       56     01010000   50 (0A)   P ( )
```

CAPTURED CHANNEL DATA

```
          CAPTURED CHANNEL DATA
          12/15/94  10:40:28
             CHANNEL: 05

       BYTE   BINARY      HEX      ASCII

        1     00000100   04 (20)   ( )
        2     00110010   32 (4C)   2 (L)
        3     10000010   82 (41)     (A)
        4     01011010   5A (5A)   Z (Z)
        5     10011010   9A (59)     (Y)
        6     00000100   04 (20)   ( )
        7     00100010   22 (44)   " (D)
        8     11110010   F2 (4F)     (O)
        9     11100010   E2 (47)     (G)
       10     00000100   04 (20)   ( )
       11     10001100   8C (31)     (1)
       12     01001100   4C (32)   L (2)
                    .
                    .
                    .
      241     11101100   EC (37)     (7)
      242     00011100   1C (38)     (8)
      243     10011100   9C (39)     (9)
      244     00001100   0C (30)     (0)
      245     10110000   B0 (0D)   ( )
      246     01010000   50 (0A)   P ( )
      247     00101010   2A (54)   * (T)
      248     00010010   12 (48)     (H)
      249     10100010   A2 (45)     (E)
      250     00000100   04 (20)   ( )
      251     10001010   8A (51)     (Q)
      252     10101010   AA (55)     (U)
      253     10010010   92 (49)     (I)
      254     11000010   C2 (43)   @
      255     11010010   D2 (4B)     (K)
      256     00000100   04 (20)   ( )
```

SAMPLE PRINTOUTS (Continued)

RETRIEVED PM DATA

```
              NIU/PM STATISTICS
        RETRIEVED: 12/15/94  12:24:00
        NIU HEADER: 12/15/94  12:24:00


     - PERFORMANCE INDEX RATIO (PIR) -


                        A TO Z   Z TO A
        ERROR FREE SECS:  100%     98%
        STATUS BITS SET:   >9%     >9%

     STATUS REGISTER KEY:
     1 = LOOPED BACK        5 = POWER LOSS
     2 = DATA INCOMPLETE    6 = AIS
     3 = LOSS OF SIGNAL     7 = YELLOW ALARM
     4 = UNUSED             8 = OUT OF FRAME

     ONLY NON-ZERO STATISTICS ARE PRINTED.


     PERIOD 01 OF 33
     CURRENT HOUR: 12/15/94   12:00

             A TO Z     Z TO A
     CVL:    0          16
     ESL:    0          16
     CVP:    0          3
     ESP:    0          3
     MSEC:   900        900
     STAT:   12         12


     PERIOD 02 OF 33
     CURRENT DAY: 12/15/94

             A TO Z     Z TO A
     CVL:    0          19
     ESL:    0          20
     SESL:   0          1
     CVP:    0          4
     ESP:    0          5
     SESP:   0          1
     PDVS:   0          1
     B8ZS:   0          1
     MSEC:   1,013      1,013
     STAT:   12         12
```
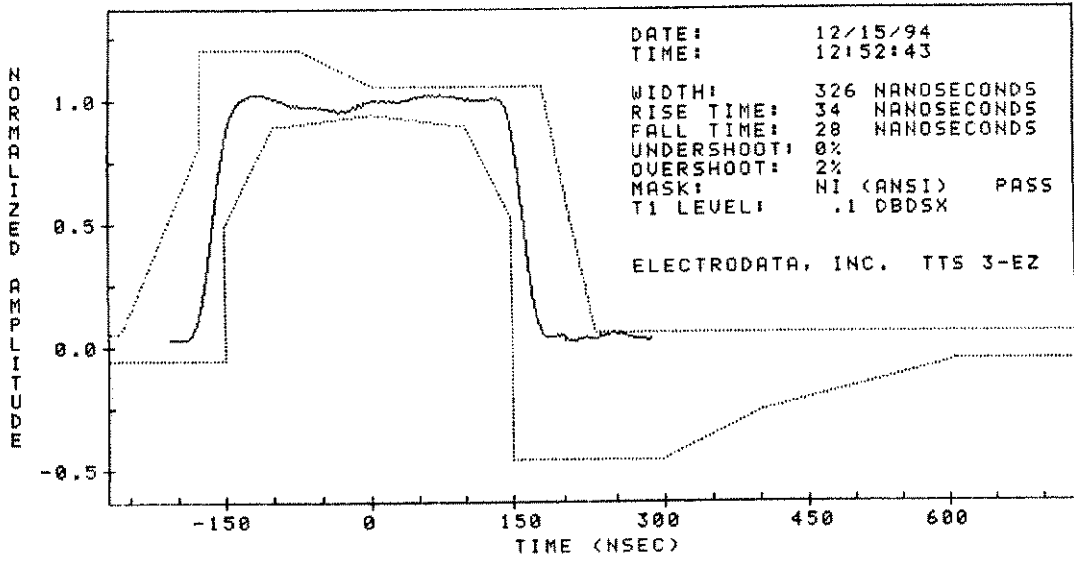
SAMPLE PRINTOUTS (Continued)

CAPTURED PULSE SHAPE

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APPENDIX D

Fixed Test Patterns

BRIDGE

Automatically generated sequence of test patterns used to detect bridge taps on analog lines that are being converted to digital service. Bridge taps will selectively attenuate the higher frequencies associated with T1 transmission causing bit and bipolar violations to occur for specific patterns. During a Bridge Tap test, which takes less than 11 minutes to perform, each pattern is transmitted and monitored for errors. Each pattern is transmitted for 30 seconds and monitored for only 23 seconds. Results are kept on each of the individual patterns and on the entire test sequence.

ALL 1'S	F1111 ...
1:1	F0101 ...
1:3	F0100 ...
1:5	F0100 00 ...
1:6	F0100 000 ...
1:7	F0100 0000 ...
2:8	F1100 0000 00 ...
2:9	F1100 0000 000 ...
2:10	F1100 0000 0000 ...
2:11	F1100 0000 0000 0 ...
2:12	F1100 0000 0000 00 ...
2:13	F1100 0000 0000 000 ...
2:14	F1100 0000 0000 0000 ...
3 IN 18	F1101 0000 0000 0000 00 ...
3 IN 19	F1100 1000 0000 0000 000 ...
3 IN 20	F1100 0100 0000 0000 0000 ...
3 IN 21	F0100 0100 0000 0000 0000 1 ...
3 IN 22	F0100 0100 0000 0000 0000 10 ...
3 IN 23	F0100 0100 0000 0000 0000 100 ...
3 IN 24	F0100 0100 0000 0000 0000 0100 ...
QRSS	2E20-1 with 15 zero suppression

MLTIPLE

Automatically generated sequence of test patterns used by technicians to perform acceptance testing on a new T1 span or trouble shooting on an existing span. During a Multiple Pattern test, which takes 15 minutes to perform, each test pattern is transmitted and monitored for errors. Each pattern is transmitted for three minutes or 180 seconds and monitored for only 175 seconds. Results are kept on each of the individual patterns and on entire test sequence.

ALL 1'S	F1111 ...
1:7	F0100 000 ...
2 IN 8	F0100 0100 ...
3 IN 24	F0100 0100 0000 0000 0000 0100 ...
QRSS	2E20-1 with 15 zero suppression

ALL 0'S   F0000 ...

1:7   F0100 0000 ...

Fixed Test Patterns (Continued)

2 IN 8   F0100 0100 ...

3 IN 24   F0100 0100 0000 0000 0000 0100 ...

ALT 1/0   F1010 ...

ALL 1'S   F1111 ...

T1-1   (MIN/MAX) A 72 octet pattern that generates rapid transitions from low ones density octets to high ones density octets. It is commonly used to test repeater pre-amplification, equalization, and automatic line build out (ALBO) circuitry.

80H	80H	80H	80H	01H	00H	01H	01H	01H	03H
80H	01H	80H	01H	01H	80H	01H	22H	00H	20H
22H	00H	20H	AAH	AAH	AAH	AAH	AAH	55H	55H
55H	55H	AAH	AAH	AAH	AAH	55H	AAH	AAH	55H
55H	55H	80H	80H	FFH	FFH	FFH	FFH	FFH	FFH
FFH	FEH	FFH	FFH	24H	49H	92H	88H	88H	88H
10H	42H	08H	21H	84H	20H	08H	82H	40H	20H
10H	80H								

T1-2   **(TRIP TEST)** - A 96 octet pattern that generates a long series of high ones density octets followed by quick changes from average ones density to low density octets. It is commonly used to detect faulty M12 cards in DS3 equipment.

FFH	FFH	FFH	FFH	FFH	FFH	FFH	FFH	FFH	FFH
FFH	FFH	FFH	FFH	FFH	FFH	FFH	FFH	FFH	FFH
FFH	FFH	FFH	FFH	FFH	FFH	FFH	FFH	FFH	FFH
FFH	FFH	FFH	FFH	FFH	FFH	FFH	FFH	FFH	FFH
FFH	FFH	FFH	FFH	FFH	FFH	FFH	FFH	AAH	AAH
AAH	AAH	80H	01H	80H	01H	80H	01H	80H	01H
80H	01H	80H	01H	80H	01H	80H	01H	80H	01H
80H	01H	AAH	AAH	AAH	AAH	80H	01H	80H	01H
80H	01H	80H	01H	80H	01H	80H	01H	80H	01H
80H	01H	80H	01H	80H	01H				

T1-3   **(54 OCTET)** - A 54 octet pattern that consists of rapid transitions from low ones density octets to high ones density octets. It is commonly used to test repeater pre-amplification, equalization, and automatic line build out (ALBO) circuitry.

01H	01H	01H	01H	01H	01H	00H	01H	01H	01H
01H	01H	01H	03H	01H	01H	01H	01H	07H	01H
01H	01H	01H	55H	55H	55H	55H	AAH	AAH	AAH
AAH	01H	01H	01H	01H	01H	01H	FFH	FFH	FFH
FFH	FFH	FFH	80H	01H	80H	01H	80H	01H	80H
01H	80H	01H	80H						

Fixed Test Patterns (Continued)

T1-4

(120 OCTET) - A 120 octet pattern that consists of rapid changes from high ones density to minimum ones density. It is commonly used to stress the equalization circuits between T1 multiplexers.

```
FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH
FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH
FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH
FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH
FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH
FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH
FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH   FFH
FFH   FFH   AAH   AAH   AAH   AAH   10H   10H   10H   10H
10H   10H   10H   10H   10H   10H   10H   10H   10H   10H
10H   10H   10H   10H   10H   10H   AAH   AAH   AAH   AAH
10H   10H   10H   10H   10H   10H   10H   10H   10H   10H
10H   10H   10H   10H   10H   10H   10H   10H   10H   10H
```

T1-5

A 53 octet pattern that generates rapid transitions from high ones density octets to low ones density octets. It is commonly used to test repeater pre-amplification, equalization, and automatic line build out (ALBO) circuitry.

```
80H   01H   80H   01H   80H   01H   80H   01H   80H   01H
80H   01H   80H   01H   80H   01H   80H   01H   80H   01H
80H   01H   80H   01H   80H   01H   80H   01H   80H   01H
01H   AFH   AAH   AFH   01H   01H   01H   01H   FFH   FFH
FFH   FFH   01H   01H   01H   01H   FFH   FFH   FFH   FFH
FFH   FFH   CBH
```

55OCTET

(T1-6) - A 55 octet pattern that generates rapid transitions from high ones density octets to low ones density octets. It is commonly used to stress repeater automatic line build out (ALBO) and timing recovery circuits. When framed, this pattern will generate excess zero's.

```
01H   01H   01H   01H   01H   01H   00H   01H   01H   01H
01H   01H   01H   03H   01H   01H   01H   01H   07H   01H
01H   01H   01H   55H   55H   55H   55H   AAH   AAH   AAH
AAH   01H   01H   01H   01H   01H   01H   FFH   FFH   FFH
FFH   FFH   FFH   80H   01H   80H   01H   80H   01H   80H
01H   80H   01H   80H   01H
```

T1-DALY

A 55 octet pattern identical to T1-6 except the seventh octet is changed from 00H to 80H. This pattern is specified by ANSI and meets ones density and excess zero's criteria.

```
01H   01H   01H   01H   01H   01H   80H   01H   01H   01H
01H   01H   01H   03H   01H   01H   01H   01H   07H   01H
01H   01H   01H   55H   55H   55H   55H   AAH   AAH   AAH
AAH   01H   01H   01H   01H   01H   01H   FFH   FFH   FFH
FFH   FFH   FFH   80H   01H   80H   01H   80H   01H   80H
01H   80H   01H   80H   01H
```

Fixed Test Patterns (continued)

DDS-1   A 200 octet pattern that consists of 100 octets of FFH followed by 100 octets of 00H. It is commonly used to stress DDS circuit signal recovery capability.

DDS-2   A 200 octet pattern that consists of 100 octets of 7EH followed by 100 octets of 00H. This pattern simulates bit oriented protocol flags for DDS testing.

DDS-3   A 16 octet pattern that provides a continuous stream of medium ones density 4CH octets. It is commonly used to simulate a typical DDS signal.

DDS-4   A 16 octet pattern that provides a continuous steam of low density 40H octets. It is commonly used to stress DDS clock recovery circuits.

DDS-5   A 256 octet pattern that is a compilation of patterns DDS-1 through DDS-4 as follows: 54 FFH, 54 00H, 54 7EH, 54 00H, 16 4C, 16 40H, 7 FEH and 1 FFH. It is commonly used to provide a quick test of DDS circuit operation.

DDS-6   An 8 octet pattern that consists of seven octets of FEH followed by one octet of FFH. It is commonly used to simulate a DDS signal transition from IDLE mode to DATA mode.

APPENDIX E

Trunk Type Summary

OPERATION	STANDARD (E&M)			
ON-HOOK	A=0	B=0	C=0	D=0
OFF-HOOK	A=1	B=1	C=1	D=1

OPERATION	GROUND START - FXS			
ON-HOOK	A=0	B=1	C=0	D=1
OFF-HOOK	A=1	B=1	C=1	D=1

OPERATION	GROUND START - FXO			
ON-HOOK	A=1	B=1	C=1	D=1
OFF-HOOK	A=0	B=1	C=0	D=1
RING	A=0	B=0	C=0	D=0

OPERATION	GROUND START - SLC STATION	
ON-HOOK	A=0	B=0
OFF-HOOK	A=1	B=0

OPERATION	GROUND START - SLC OFFICE	
ON-HOOK	A=0	B=0
OFF-HOOK	A=0	B=0/1
RING	A=1	B=0/1

OPERATION	LOOP START - FXS			
ON-HOOK	A=0	B=1	C=0	D=1
OFF-HOOK	A=1	B=1	C=1	D=1

OPERATION	LOOP START - FXO			
IDLE	A=0	B=1	C=0	D=1
RING	A=0	B=0	C=0	D=0

OPERATION	LOOP START - SLC STATION	
ON-HOOK	A=0	B=0
OFF-HOOK	A=1	B=0

OPERATION	LOOP START - SLC OFFICE	
IDLE	A=1	B=1
RING	A=1	B=0/1

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APPENDIX F

Dial Tone Frequencies

DIGIT	FREQUENCIES	
	LOW	HIGH
1	697Hz	1209Hz
2	697Hz	1336Hz
3	697Hz	1477Hz
4	770Hz	1209Hz
5	770Hz	1336Hz
6	770Hz	1477Hz
7	852Hz	1209Hz
8	852Hz	1336Hz
9	852Hz	1477Hz
0	941Hz	1336Hz
A	697Hz	1633Hz
B	770Hz	1633Hz
C	852Hz	1633Hz
D	941Hz	1633Hz
#	941Hz	1477Hz
*	941Hz	1209Hz

DTMF Frequencies

DIGIT	FUNCTION	FREQUENCIES	
		LOW	HIGH
1		700Hz	900Hz
2		700Hz	1100Hz
3		900Hz	1100Hz
4		700Hz	1300Hz
5		900Hz	1300Hz
6		1100Hz	1300Hz
7		700Hz	1500Hz
8		900Hz	1500Hz
9		1100Hz	1500Hz
0		1300Hz	1500Hz
A	ST3P	700Hz	1700Hz
B	STP	900Hz	1700Hz
C	ST2P	1300Hz	1700Hz
D		--	--
#	ST	1500Hz	1700Hz
*	KP	1100Hz	1700Hz

MF Frequencies

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APPENDIX G

ISDN Facility Option Codes

AT&T Custom Facility Options	
Feature	**Code**
Operator Telephone Co.	5
Operator Common Carrier	6
Service	**Code**
Access for Virtual Private network	1
MEGACOM 800 service	2
MEGACOM service	3
IN WATS	4
WATS Maximal subscriber band	5
ACCUNET	6
International Long Distance Service	7
International 800	8
Electronic Tandem Network	11
Private Virtual Network	13
DIAL-IT NOVA	16

AT&T National ISDN-2 Facility Options	
Service	**Code**
WATS Band	1
National ISDN Banded OUTWATS	18
Foreign Exchange	19
Tie Trunk Selection	20
National ISDN INWATS	17
National ISDN Unbanded OUTWATS	18

ISDN Facility Option Codes (continued)

Northern Telecom Facility Options	
Service	**Code**
Private	1
In WATS	2
Out WATS	3
Foreign Exchange	4
Tie Trunk	5

National ISDN-2 (Except AT&T) Options	
Service	**Code**
In WATS	17
Out WATS	18
Foreign Exchange	19
Tie Trunk	20