



**1510 T1/FT1
CSU/DSU
Model 1510
2/4 Port with Drop & Insert
User's Manual**



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FCC Requirements, Part 15

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

FCC Requirements, Part 68

This equipment complies with Part 68 of the FCC rules. On the bottom cover of this equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN) is not used for this digital equipment. If requested, this information must be provided to the Telephone Company. 1510 T1/FT1 CSU/DSU registration number and REN is as follows:

FCC 68 Registration Number: 2PUTAI-75463-DE-N
REN: 0.0B

FACILITY INTERFACE CODE FOR DIGITAL SERVICES

CODE	DESCRIPTION
04DU9-BN	1.544 Mbps Superframe Format (SF) without line power.
04DU9-DN	1.544 Mbps SF and B8ZS without line power.
04DU9-1KN	1.544 Mbps ANSI ESF without line power.
04DU9-1SN	1.544 Mbps ANSI ESF and B8ZS without line power.

SERVICE ORDER CODES FOR DIGITAL SERVICES

CODE	DESCRIPTION
6.0N	Does not provide billing and encoded analog protection. Uses either an integrated or external CSU. Affidavit to telco is required.

The 1510 T1/FT1 CSU/DSU connects to the network using a RJ48 connector.

For single and two-line equipment that connects to the telephone network via a plug and jack, the plug and jack must comply with FCC Part 68 rules. This equipment does not have connection to the POTS telephone network.

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. If advance notice isn't practical, the Telephone Company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the Telephone Company will provide advance notice in order for you to make the necessary modifications in order to maintain uninterrupted service.

Normally, this equipment will be used in conjunction with FCC registered equipment that limits the Encoded Analog Content and provides the required Billing Protection. If the connected equipment is not of this type, an affidavit must be supplied to the telephone company where the network connection is to be made. The affidavit is to be notarized, and is to be filed at least ten days before the initial connection.

If trouble is experienced with this equipment, please contact Raymar-Telenetics Customer Support for repair and warranty information. If the trouble is causing harm to the telephone network, the Telephone Company may request you remove the equipment from the network until the problem is resolved. All repairs should be handled by authorized Raymar-Telenetics Personnel. Service can be facilitated through our office at:

Raymar Information Technology, Inc.

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This equipment cannot be used on telephone company-provided coin service. Connection to Party Line Service is subject to state tariffs.

Safety Requirements

CAUTION:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch un-insulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

Refer to the installation chapter in this manual for a safe and proper installation procedure. All wiring external to this equipment should follow the current provision of the National Electrical Code.

For performance and safety reasons, only use the following with this equipment:

- Either a UL (Underwriters Laboratories) or a CSA (Canadian Standard Association) certified of -48 VDC 450 ma power supply.
- 250V 0.8 A fuse.

National Electrical Code Requirements

The 1510 T1/FT1 CSU/DSU, including this equipment, is ETL certified and is in compliance with UL 1459. The ETL control number for 1510 T1/FT1 CSU/DSU is 75425.

Standard Lists

The 1510 T1/FT1 CSU/DSU is designed to meet the following standards:

- ♦ AT&T TR 54016 Requirements for interfacing digital terminal equipment to services employing the extended Superframe format.
- AT&T TR 54019 International ACCUNET® digital services description and network interface specifications
- AT&T TR 54019A Addendum to TR54019
- AT&T TR 62411 ACCUNET®T1.5 service description and interface specification

Interface Specification

- ANSI T1.403-1989 Carrier to customer installation - DS1 metallic interface

DOC CS-03 Requirements

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

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

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

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

Caution:

- User should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.
- The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the Load Number of all the devices does not exceed 100.

CSA 22.2 Requirements

The 1510 t1/FT1 CSU/DSU including this equipment, is ETL certified, and is in compliance with CSA std 22.2 No. 225. The ETL control number for 1510 T1/FT1 CSU/DSU is 75425.

1.0 Product Description

1.1 Description

The 1510 T1/FT1 CSU/DSU is a family of intelligent Fractional T1 Channel Service Unit and Data Service Unit (CSU/DSU) products as shown in Table 1.1. This product family provides DSX-1 and DS-1 network interface, DS0 channel multiplexing, D&I (Drop and Insert) functionality, and direct connections to voice, data, and video DTE (Data Terminal Equipment), as well as T1 channel bank and PBX (Private Branch Exchanges). These products can also be used as Superframe (SF)-to-Extended Superframe (ESF) and Alternate Mark Inversion (AMI)-to-Bipolar 8 Zero Substitution (B8ZS) conversion equipment.

Table 1-1. 1510 T1/FT1 CSU/DSU Product Family

Model	NI (Network Interface)	Physical	DTE Ports
1510-2X	DSX-1	YES	2
1510-4X	DSX-1	YES	4

The 1510 T1/FT1 CSU/DSU can be configured via a front panel interface, local terminal (RS232) control, or through the use of a Simplified Network Management Protocol (SNMP) management system.

1.2 Applications

The 1510 T1/FT1 CSU/DSU application example is illustrated in Figure 1.1. Via DACS (Digital Access Cross-Connect System), 1510 T1/FT1 CSU/DSU interfaces various applications such as LAN (Local Area Network) to WAN (Wide Area Network) communications, host to workstation communications, video conferencing, and integrated voice and data communication of PBX (Private Branch Exchanges). This allows users to integrate different applications into a single communication link and utilize only partial of available bandwidth. Furthermore, this allows user to expand bandwidth, on demand, up to 24 DS0 channels, without worry about additional physical link because it is already available. Voice applications may include equipment such as PBX, Channel Banks, and Multiplexers. Data and video applications may include equipment such as video conferencing, bridge, routers, gateway, workstation, host computer, and various high-speed data terminal equipment. Figure 1.2 to Figure 1.4 illustrate some of these applications.

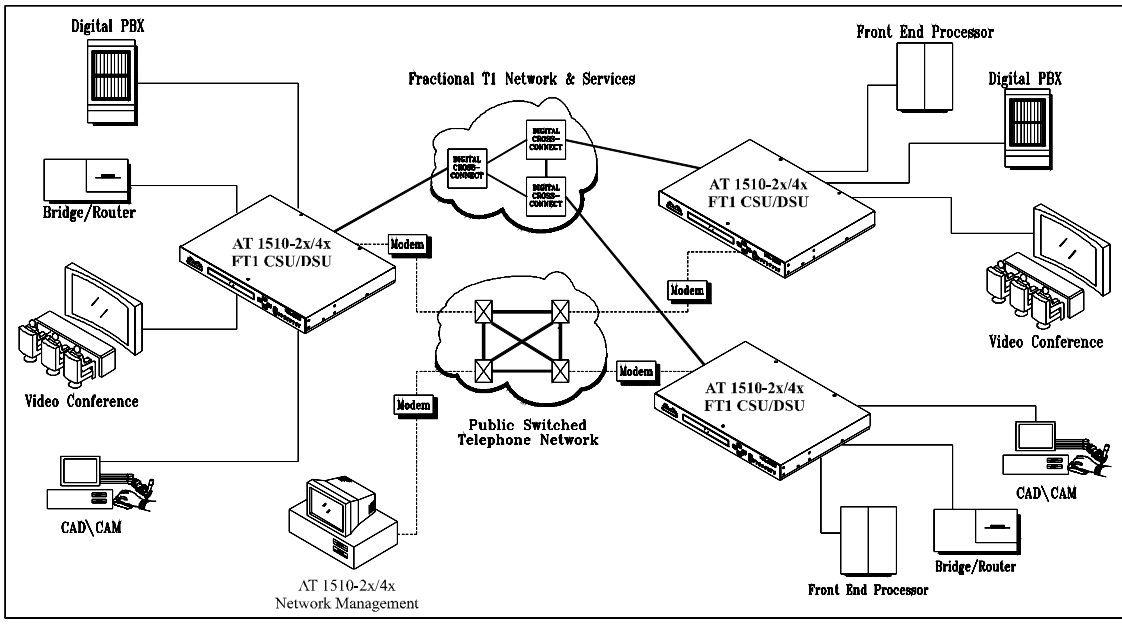


Figure 1-1. Application Illustration - 1

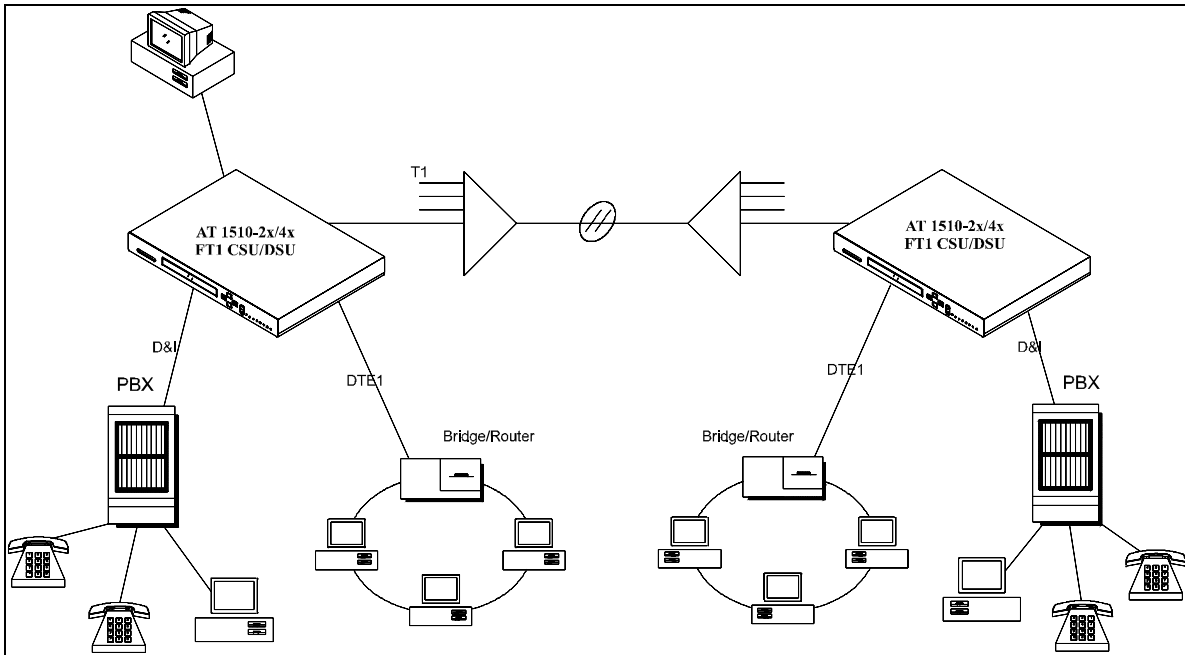


Figure 1-2. Application Illustration - 2

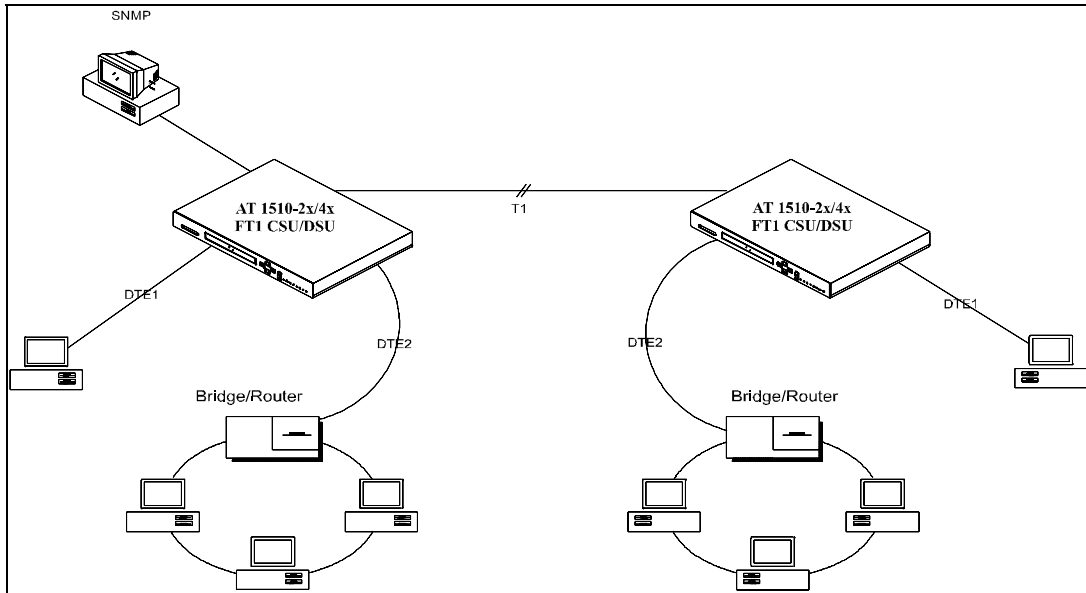


Figure 1-3. Application Illustration -3

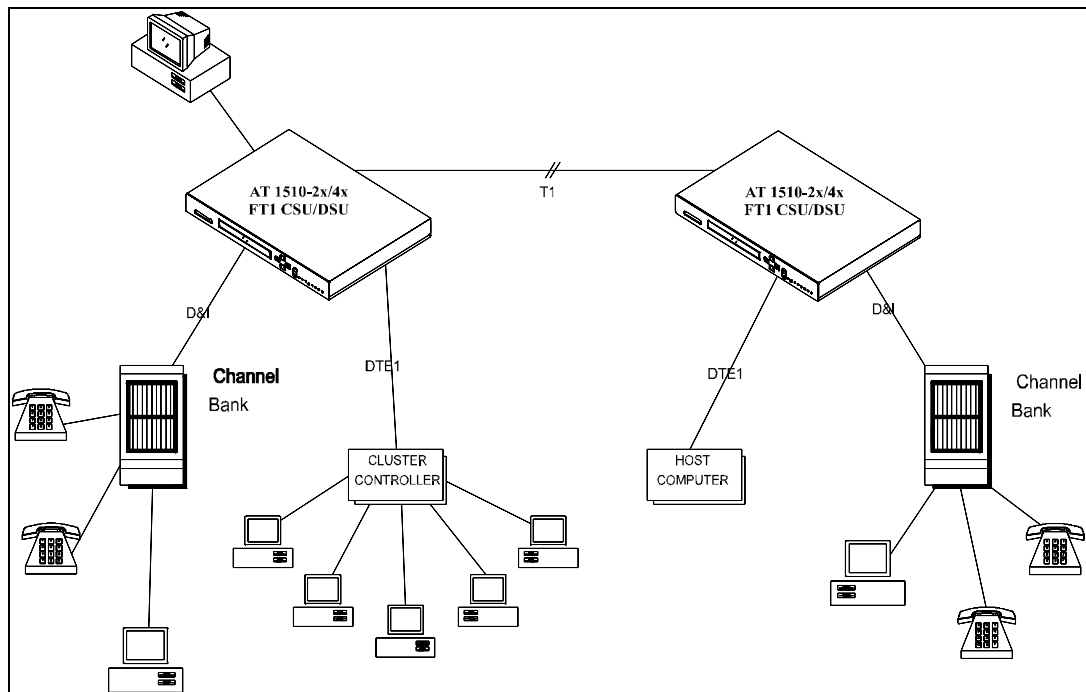


Figure 1-4. Application Illustration -4

2.0 Installation

CAUTION:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch un-insulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

2.1 Unpacking

This product is shipped in a complete package which contains a 1510 T1/FT1 CSU/DSU and accessories such as user's manual and DB25 to V.35 or RS449 conversion cable.

Check the shipping material against Table 2.1 Shipping Material List. Inspect the unit for any signs of damage. Report any damages to the carrier and contact American Technology's customer representative. Retain all packaging material in case you need to move or ship the unit in the future. 1510 T1/FT1 CSU/DSU parts number list is in Table 2.2.

Table 2-1. Shipping Material List

Description	Item
1510 T1/FT1 CSU/DSU	1
User's Manual	1
AC Power Cord	For AC powered unit only

Table 2-2. 1510 T1/FT1 CSU/DSU Parts Number List

Component	Description
1510 T1/FT1 CSU/DSU	2-Port w/SNMP and D&I
1510 T1/FT1 CSU/DSU	4-Port w/SNMP and D&I
1510 T1/FT1 CSU/DSU User's Manual	User's Manual
DTE3/DTE4 card	Optional 2 DTE ports
V.35 Conversion Cable	DB25M/v.35 M34F
RS449 Conversion Cable	DB25M/RS449 DB37F
DTE Loopback Plug	DB25M/pigtail
RS232C Conversion Cable	DB9F/DB25M
1510 T1/FT1 CSU/DSU to D&I	DB15M/DB15F
1510 T1/FT1 CSU/DSU Jumper Box	DB15F/Jumper Box
T1 Loopback Plug	DB15M/pigtail
1510 T1/FT1 CSU/DSU to network conversion cable	DB15F/RJ48C
SNMP Firmware	Embedded SNMP Agent
SNMP MIB Diskette	SNMP MIB File
AC Power Cord Standard IEC	Power Cord

2.2 Site Selection

The following are guidelines for site selection. These guidelines must be followed to ensure a proper installation.

- The installation site should have a 115V AC power receptacle.
- The following are the maximum suggested cable lengths:
 1. V.35 200 ft.
 2. RS449 200 ft.
 3. RS232 200 ft.
 4. EIA530 200 ft.
 5. X.21 200 ft.

NOTE: If a longer cable length is required and has a grounded shield, it can be connected. However, the achievable speed may be less than the maximum speed with a shorter cable. For more information, please contact American Technology's service representative.

- The installation site should provide proper room for adequate ventilation and cable routing. Reserve at least 5 inches at the rear of the unit for cables and air flow.
- The site should provide a stable environment. The operating area should be clean and free from extremes of temperature, humidity, shock, and vibration.
- Relative humidity should stay between 0 and 95%. Do not operate the unit at an altitude greater than 3000 meters (10,000 feet).

2.3 Mechanical and Electrical Installation

2.3.1 Mechanical Installation

The 1510 T1/FT1 CSU/DSU can be installed as a desk top unit or mounted in a 19 inch or a 23 inch rack. The 1510 T1/FT1 CSU/DSU desk-top unit is stackable. 1510 T1/FT1 CSU/DSU has accessories to install in a 19 inch or 23 inch rack as shown in Figure 2.1.

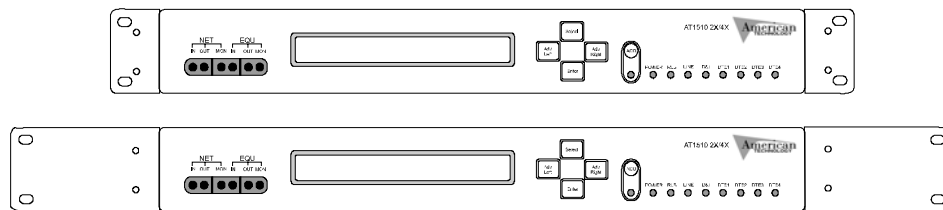


Figure 2-1. 1510 T1/FT1 CSU/DSU Rack Mount View

2.3.2 Electrical Installation

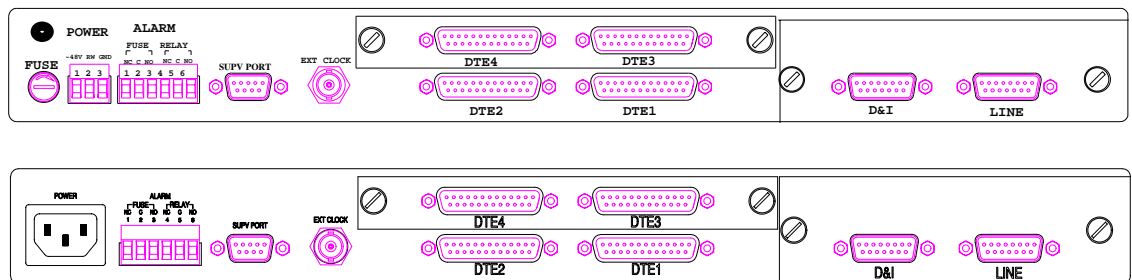


Figure 2-2. 1510 T1/FT1 CSU/DSU Backplane

Figure 2.2 shows the backplane of the 1510 T1/FT1 CSU/DSU. The right portion is a plug-in board containing a D&I connector and T1 connector labeled D&I and LINE, respectively. The T1 Line connector is a male miniature DB15-pin connector. The D&I connector is a female miniature DB15-pin connector. Connector pin definition of the T1-line connector and the D&I connector are shown in Table 2.3 and Table 2.4, respectively.

NOTE: Because of high electrical noise in most installation sites, cables for line and D&I connections should have separate shields for the transmit and receive pairs. The shields should be properly grounded.

Table 2-3. DB9 (Male) 15 Pin Connector

Pin Number	Signal	Signal Direction
1	Transmit Tip	To DS1 Network
2	Transmit Ground	
3	Receive Tip	From DS1 Network
4	Receive Ground	
5	Unassigned	
6	Unassigned	
7	Unassigned	
8	Unassigned	
9	Transmit Ring	To DS1 Network
10	Unassigned	
11	Receive Ring	From DS1 Network
12	Unassigned	
13	Unassigned	
14	Unassigned	
15	Unassigned	

Table 2-4. DB (Female) 15 Pin Connector

Pin Number	Signal	Signal Direction
1	Transmit Tip	From D&I Equipment
2	Transmit Ground	
3	Receive Tip	To D&I Equipment
4	Receive Ground	
5	Unassigned	
6	Unassigned	
7	Unassigned	
8	Unassigned	
9	Transmit Ring	From D&I Equipment
10	Unassigned	
11	Receive Ring	To D&I Equipment
12	Unassigned	
13	Unassigned	
14	Unassigned	
15	Unassigned	

The middle portion of the backplane contains the built-in **DTE1** and **DTE2** ports. Above it is a plug-in board containing optional **DTE3** and **DTE4** ports. Each port is configured as a DCE device with female DB25 connection. One DB25 to v.35 or DB25 to RS-449 conversion cable is required for proper connection. These conversion cables are illustrated in Appendix A. The user must specify a proper conversion cable when placing an order. The DB25 connector pin definition is in Table 2.5.

Table 2-5. DTE Port Connector

Pin Number	Signal	Signal Direction
1	Cable Shield	
2	Transmit Data	From DTE
3	Receive Data to DTE	To DTE
4	RTS (Request to Send)	From DTE
5	CTS (Clear to Send)	To DTE
6	DSR (Data Set Ready)	To DTE
7	Signal Ground	
8	Data Carrier Detect	To DTE
9	Receive Clock Return	
10	Data Carrier Detect Return	
11	External Clock Return	
12	Transmit Clock Return	
13	Clear to Send Return	
14	Transmit Data Return	
15	Transmit Clock	To DTE
16	Receive Data Return	
17	Receive Clock	To DTE
18	Local Loopback	From DTE
19	Request to Send Return	
20	Unassigned	
21	Unassigned	
22	Data Set Ready Return	
23	Unassigned	
24	External Clock	From DTE
25	Test Mode	To DTE

The BNC (EXT CLOCK) connector is for external clock input. The external clock signal should be TTL level with ± 32 ppm accuracy and 40 to 60 % duty cycle. Please refer to Section 3.1.2 for details.

The supervisory port (SUPV PORT) is configured as a DTE device with a male DB9 connector. It complies with RS-232 standards. It can either be connected via a null modem cable to a local terminal or via modem to a remote terminal. Connector pin specifications are defined in Table 2.6.

Table 2-6. DB9 Supervisory Port

Pin Number	Signal	Data Direction
1	Data Carrier Detect	From Modem
2	Receive Data	From Modem
3	Transmit Data	To Modem
4	Unassigned	
5	Signal Ground	
6	Unassigned	
7	Unassigned	
8	Unassigned	
9	Unassigned	

The 6 pin connector is for external alarm, such as buzzer or flashing lights. Pin definitions are in Table 2.7.

Table 2-7. Alarm Relay Connector

Pin Number	Signal
1	Alarm Fuse Normally Close
2	Alarm Fuse Common
3	Alarm Fuse Normally Open
4	Alarm Relay Normally Close
5	Alarm Relay Common
6	Alarm Relay Normally Open

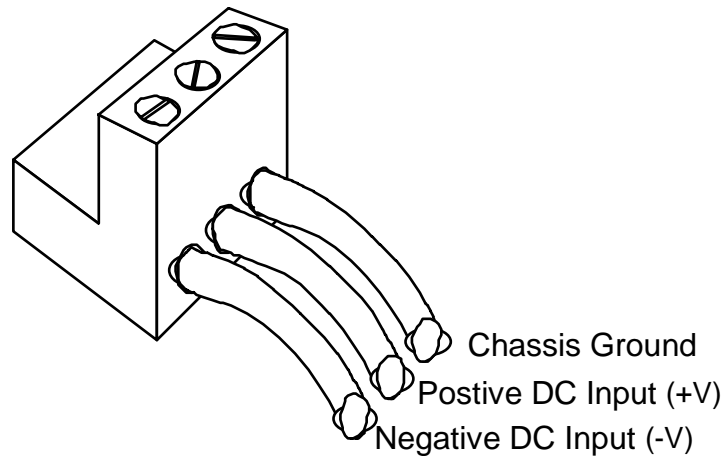


Figure 2-3. Wiring to the Power Supply Terminal Block

The 3 pin power connector is for DC power input. Pin definitions are in Table 2.8.

Table 2-8. Power Connector

Pin Number	Signal
1	Negative DC Input (-v)
2	Positive DC Input (+v)
3	Chassis Ground

DC power can be either 24 to 48 volts. Observe polarity when installing.

NOTE: The fuse housing is equipped with a 250V, 0.8 AMP UL approved fuse. Use Only with Class 2 power source, -48VDC 300 ma or -24 VDC 600 ma. A UL approved external AC to DC power module must be used.

2.4 Configuration

2.4.1 Hardware Configuration

All configurations are software programmable. No DIP switches are available. Users should not need to open the case for modifications.

2.4.2 Software Configuration

The three sets of software configurations are as follows:

- ◆ factory default configuration,
- ◆ user stored configuration, and
- ◆ working configuration.

The factory default configuration is not changeable. The equipment is shipped with all three configuration set to the factory default configuration. The user may change the current working configuration at any time. Also, the user may save the current working configuration to non-volatile memory as the user stored configuration. The user may retrieve the user stored configuration at any time to reset the current working configuration. Please refer to Chapter 5 and Chapter 6 for detail instructions. The system will store the current working configuration. When the system is turned off and then turned back on again, the previous working configuration is retrieved as the current working configuration.

To restore the factory default configuration, press the ESC key during power up and then press the ENTER key while the LCD is displaying "SELF TEST". If the operation is successful, the LCD will display "LOAD DEFAULT CONFIGURATION".

Table 2-9. Default Software Configuration

Supervisory Port	Default
Baud Rate	9600
Data Bit	8
Stop Bit	1
Parity Bit	NONE
XON-XOFF	OFF
Interface	TERMINAL
SNMP	OFF
T1 Line	Default
Frame Format Mode	D4
Line Code Mode	AMI
Line Build Out	0 db
Line Equalizer	0-133 feet
Yellow Alarm	ON
Inband Signaling	ON
TABS Address	CSU
Idle Code	FF
Drop and Insert Port	Default
Frame Format Mode	D4
Line Code Mode	AMI
Equalizer	0-133 feet
DTE Port	Default
Rate	64kxn
Clock	NORMAL
Data	NORMAL
Interface	RS449
RTS	ACTIVE
TTM	OFF
Active Map	Default
MAP1	All idle
MAP2	All idle
Switch MAP1:	(00:00 – 12:00)
MAP2:	(12:00 – 00:00)

Master Clock	Default
Primary Master Clock	Line Clock
2nd Clock	Line Clock
External Clock Rate	1.544 Mbps
Alarm Threshold	Default
Alarm Enable	Disable
Alarm Relay	Disable
Alarm Dial-out	Disable
BPV, Line and D&I	10E- 5
ES, Line	1
UAS, Line	1
CS, Line	1
ES, D&I	1
UAS, D&I	1
Dial Out	Default
Primary Dial String	ATDT
Start Time	08:00
Stop Time	07:59
Secondary Dial String	ATDT
Start Time	08:00
Stop Time	07:59
Inactivity Time-out	0 Minutes
Misc.	Default
Password	15102x/4x
Device Name	1510-01
Menu Lock	Disable

3.0 Operation

This chapter describes the 1510 T1/FT1 CSU/DSU configuration options and operational functions. Users should refer to Chapter 5: Front Panel Operation and Chapter 6: Terminal Operation for detailed operational procedures.

3.1 Quick Start for 1510 T1/FT1 CSU/DSU

After installation, the user may want to become familiar with the equipment immediately. The following abbreviated instructions will give the user a quick start.

3.1.1 Power On

The unit has no ON/OFF switch. Turn power on by attaching a power cable at the rear of the unit. On the LCD, the unit will first display “SELF TEST” followed by the main menu.

3.1.2 Return to Default Setting

The unit is shipped with factory default setting.

To restore factory settings in the future, immediately after power on, and during the display of “SELF TEST” on the LCD, press the SELECT key followed by pressing ENTER. The unit will confirm with “LOAD DEFAULT CONFIGURATION”.

3.1.3 Using the Front Panel

To use the front panel to configure the unit, use the four keys to the right of the LCD. The menu is tree structured, with the main menu at the root of the tree. The SELECT key brings the user towards the root. The ENTER key is used (a) to descend to branches of the menu, or (b) to confirm a selection.

The ADV LEFT and ADV RIGHT arrow keys are used to move the selection left or right.

3.1.3.1 Review of Default Settings

All the default settings can be reviewed or changed. This is done by selecting the menu item. Either a sub-menu is shown or the selected setting is indicated with an asterisk.

3.1.3.2 Line

To review or change LINE settings, use the ADV LEFT and ADV RIGHT keys to move the cursor to LINE. Then press ENTER. The default LINE parameters are shown. The actual settings are shown for each parameter, which can be selected by ADV keys.

To change the settings, use the ENTER key to select the parameter, use ADV LEFT and ADV RIGHT keys to select the new setting, and then press ENTER again. If SELECT is pressed before ENTER, the setting will not be changed.

3.1.3.3 DTEI

To review or change DTE settings, use the ADV LEFT and ADV RIGHT keys to move the cursor to DTE1. Then press ENTER. The default DTE1 parameters are shown. The actual settings are shown for each parameter, which can be selected by the ADV LEFT and ADV RIGHT keys.

To change the settings, use the ENTER key to select the parameter, use ADV LEFT and ADV RIGHT keys to select the new setting, and then press ENTER again. If SELECT is pressed before ENTER, the setting will not be changed.

3.1.3.4 Map Setup

To review or change MAP settings, use the ADV LEFT and ADV RIGHT keys to move the cursor to DS0-MAP. Then press ENTER. The current active map is indicated.

To review or change MAP1 settings, use ADV LEFT and ADV RIGHT keys to move the cursor to MAP1. Then press ENTER. The current active map is indicated.

To change the settings, use the ENTER key to select MAP1, use ADV LEFT and ADV RIGHT keys to select the DS0 channel number for new assignment, and then press ENTER again. Then select IDLE, DTE-1, DTE-2, etc, for the new channel assignment. Press ENTER. If SELECT is pressed before ENTER, the setting will not be changed.

3.1.4 Using Terminal

To use the RS232 interface to configure the unit, connect a VT100 terminal to the RS232 connector using a “null modem” cable. The VT100 terminal can be a PC running VT100 emulation software. The unit is configured as a DTE device. Thus a null modem cable is needed for direct connection to a VT100.

Upon connection, press ENTER and SELECT alternately to bring the main menu into view.

Press O (Log On) to see the full menu.

Press S (System Setup) to review or change the configuration.

3.1.4.1 Review of Default Settings

The entire configuration is shown when S is pressed. To change any setting, use the arrow keys to move to the target setting. Then press the TAB key repeatedly to cycle to the desired setting for any selected parameter.

3.1.4.2 Line

Use arrow keys to move cursor to the target LINE parameter. Then use TAB key to change the parameter setting.

When satisfied, press ESC. Confirm with Y (yes).

3.1.4.3 DTEI

Use arrow keys to move cursor to the target DTE1 parameter. Then use TAB key to change the parameter setting.

When satisfied, press ESC. Confirm with Y (yes).

3.1.4.4 Map Setup

Use arrow keys to move the cursor to the target MAP parameter. Then use TAB key to change the parameter setting.

When satisfied, press ESC. Confirm with Y (yes).

3.2 System Operation

3.2.1 Date

This product is equipped with an RTC (Real Time Clock). Users can change the current date and time as necessary. The RTC is activated by the manufacturer before shipping. This is to save RTC battery life. The RTC battery has a 10 year power off life cycle. For detailed instruction, please refer to Section 5.10 or Section 6.17.

3.2.2 Master Clock

This product has a system clock PLL (Phase Lock Loop) which may be phase locked to the T1 line clock, Drop and Insert clock, one of the DTE clocks, internal clock, or external clock. T1 line clock, Drop and Insert clock, and internal clock are all 1.544 Mbps. DTE clock is either 56kxn, or 64kxn bps (N is 1 to 24) as DTE rate configuration. Furthermore, the external clock rate can be 56kxn or 64kxn bps (N is from 1 to 24), 1.544 Mbps, or 6.176 Mbps. For detailed operation please refer to Section 5.5 or Section 6.16. The default master and 2nd clock source are T1 line clock. The default external clock frequency is 1.544 Mbps.

When the master clock source is lost, the system will automatically switch to the 2nd clock source. This is to provide an alternative clock source when the primary clock source is lost. The current active clock source is shown by the LCD "MCLK" command and terminal "s" and "c" commands. If a second clock source is not available, the user SHOULD set the second clock source the same as the master clock source, or MAY set it to internal. If a 2nd clock is selected and this clock is lost as well, 1510 T1/FT1 CSU/DSU will free run at some indeterminate clock rate. When the 2nd clock source returns, 1510 T1/FT1 CSU/DSU will again sync to the 2nd clock source when it returns.

When the master clock source returns, the CSU/DSU may or may not return to the master clock source, depending of the master clock source. If the master clock source is LINE or D&I, the CSU/DSU returns to the master clock source one minute after the master clock is recovered. If the master clock source is any other source, the CSU/DSU does not return to the master clock, but instead remains with the 2nd clock source, or free-runs at its internal clock rate if the 2nd clock source is not present. In order to switch back to the master clock source, the clock must be reselected as the master clock source via the front panel MCLK command or the terminal [s] command.

3.2.3 Serial Communication Port

The serial port allows the user to either use a local VT-100 terminal via direct connection or use a remote VT-100 terminal via modem for system configuration, diagnostics, polling status reports, etc. The serial port must be set to a proper operational mode. If necessary, the user must use the Front Panel to setup the serial port to use either a local or a remote terminal. The serial port baud rate, data bit length, stop bit length, parity bit length, XON-XOFF flow control, and interface type set is shown in Table 3.1. For detailed instructions, please refer to Section 5.9 or Section 6.16.

Table 3-1. Serial Port Default Setting

Item	Options	Default
Baud Rate	38400, 19200, 9600, 2400, 1200 bps	9600
Data Bit	8, 7 bit per byte	8
Stop Bit	2, 1 bit	1
Parity Bit	NONE, EVEN, ODD	NONE
XON-XOFF	ON, OFF	OFF
Interface	TERMINAL, MODEM	TERMINAL

3.2.4 Menu Lock

The LCD front panel and terminal are used to read alarms, system configurations, and system status. The front panel also can be used to change the system configuration and clear the alarm queue, etc. By enabling the menu-lock, only read operations are allowed. Modification to the current status is not allowed. Users may not change the system configuration or clear performance data. For instructions on the menu-lock, please refer to Section 5.11 or Section 6.14.

- Password and menu-lock options are disabled by default.
- The default terminal access password is "15102x/4x".

3.2.5 Logon, Logoff and Password

Logoff Prevents system configuration changes at the terminal, while logon allows system configuration changes. The password feature is used to augment lock control against unauthorized terminal users. With password enabled, logon requires entering the correct password. If password is disabled, no password is required to logon. For further details, refer to Sections 6 and 7.

3.2.6 Configuration

User can save the current configurations to non-volatile memory. This allows the user to retrieve the last stored configuration. For detailed operation please refer to Section 5.6 or Section 6.15.

3.3 DS0 Channel Map

DS0 channel multiplexing is done by the DS0-MAP command. 24 DS0 channels can be assigned to any one of the DTE and Drop and Insert ports. Two maps are available to store different DS0 channel assignment: MAP1 and MAP2. A SWITCH command is available to automatically switch between MAP1 and MAP2 at a scheduled time. This mode is only available in ESF frame format. The 1510 T1/FT1 CSU/DSU will send the active DS0 maps to the remote side when the SWITCH command is set and when the switch time expires. If the remote side doesn't respond, local 1510 T1/FT1 CSU/DSU alerts the user via a fail message. All unused channels are idle. An idle code is transmitted on those unused idle channels. For detailed information, please refer to Section 5.1 or Section 6.16.

- The default active map is MAP1.
- The default DS0 channel assignment of both MAP1 and MAP2 are idle channel.
- The default switch time is MAP1 (00:00 to 12:00) and MAP2 (12:00 to 00:00).

NOTE: For DS1 network interface with B8ZS coding on all DTE ports with 56KxN bps, all 24 channels are available for DS0 multiplexing configuration.

NOTE: For DS1 network interface with AMI coding and DTE ports with 64KxN bps, only alternate odd or even DS0 channels should be used. This is required to guarantee one's density requirement.

3.4 DS1 Network Line Configuration

A detailed option list of T1 line configuration is in Table 3.2 The following paragraphs will describe each item.

3.4.1 Frame Format Mode

This equipment can be used in T1/D4 and ESF frame format DS1 network interface. In ESF frame format mode, the user can choose either AT&T or ANSI facility data link protocol. To set this option, please refer to Section 5.2.1 or Section 6.16. ESF&T1.403 chooses ANSI ESF data link protocol. A one second performance report will be automatically sent to the network every second. Also, ANSI and AT&T data link message are acceptable in ANSI ESF frame format mode. However, AT&T ESF frame format mode only accepts AT&T ESF data link protocol.

3.4.2 Line Code Mode

This equipment can be used in AMI (Alternate Mark Inversion) and B8ZS (Bipolar 8 Zero Substitution) line code format. For detailed operation please refer to Section 5.2.2 or Section 6.16.

3.4.3 Line Build Out

The T1 line long haul transmit LBO can be programmed to either 0 db, -7.5 db, or -15 db relative to DSX-1. For detailed instructions please refer to Section 5.2.3 or Section 6.16.

3.4.4 Equalizer

The T1 line transmit equalizer can be programmed in 0 to 133 feet, 266 to 399 feet, 399 to 533 feet, or 533 to 655 feet. The transmit signal at the distant end with 100 ohm termination meets the ANSI and AT&T signal template requirements. To set this option, please refer to Section 5.3.3 or Section 6.16.

3.4.5 Yellow Alarm

1510 T1/FT1 CSU/DSU transmits a yellow alarm when LOS (Loss of Signal) is detected, AIS (alarm Indication Signal) is detected, or OOF (Out of Frame) is detected for 2.5 ± 0.5 seconds. User can disable this feature via the disable yellow alarm command. For detailed information, please refer to Section 5.2.4 or Section 6.16.

3.4.6 Inband Signaling

In T1/D4 framing format and ESF (both AT&T and ANSI data link protocol), inband loopback code recognition is used to activate remote loopback operation. For detailed operation please refer to Section 5.2.5 or Section 6.16.

3.4.7 Address

In T1/ESF framing format, TABS operation requires the address of either the CSU (Channel Service Unit) or the TE (Terminal Equipment) for identification. For detailed instructions, please refer to Section 5.2.6 or Section 6.16.

3.4.8 Idle Code

Any DS0 channel which is not assigned to a DTE port or a D&I port is an idle channel. An idle code is transmitted on idle DS0 channels. Users may program the idle channel to any bit pattern from 00₁₆ to FF₁₆. For detailed instructions, please refer to Section 5.2.7 or Section 6.16.

NOTE: Due to one's density requirement, it is advised that idle code to be set as FF₁₆. Or, user must program idle code to contain at least two bits of '1'. The factory default idle code is FF₁₆.

Table 3-2. T1 Line Default Settings

Item	Options	Default
Frame Format Mode	D4, ESF , ESF&T1.403	D4
Line Code Mode	AMI, B8ZS	AMI
Line Build Out	0, -7.5, -15 db	0 db
Line Equalizer	0-133, 133-266, 266-399, 399-533, 533-655 feet	0-133 feet
Yellow Alarm	ON, OFF	ON
Inband Signaling	ON, OFF	ON
Address	CSU, TE	CSU
Idle Code	00 ~ FF	FF

3.5 Drop and Insert Configuration

A detailed option list of T1 Drop and Insert configuration is in Table 3.3 The following paragraphs will describe each item.

3.5.1 Frame Format Mode

The Drop and Insert interface can be used in T1/D4 and ESF frame format. To set this option, please refer to Section 5.3.1 or Section 6.16.

3.5.2 Line Code Mode

The Drop and Insert interface can be used in AMI (Alternate Mark Inversion) and B8ZS (Bipolar 8 Zero Substitution) line code format. For detailed instructions, please refer to Section 5.3.2 or Section 6.16.

3.5.3 Equalizer

The Drop and Insert interface transmit equalizer can be programmed in 0 to 133 feet, 133 to 266 feet, 266 to 399 feet, 399 to 533 feet, or 533 to 655 feet. The transmit signal at the distant end with 100 ohm termination meets the ANSI and AT&T signal template requirement. To set this option, please refer to Section 5.3.3 or Section 6.16.

Table 3-3. Drop and Insert Default Setting

Item	Options	Default
Frame Format Mode	D4, ESF	D4
Line Code Mode	AMI, B8ZS	AMI
Equalizer	0-133, 133-266, 266-399, 399-533, 533-655 feet	0-133 feet

3.6 DTE Configuration

This product is equipped with 2 DTE ports. Two additional DTE ports are optional. Users may add the additional DTE ports by powering down the CSU/DSU first. The system will automatically recognize their existence upon power up. However, all DTE ports must be individually configured for proper operation. A detailed list of DTE configuration options is in Table 3.4. The following paragraphs will describe each item.

3.6.1 Rate

The DTE port can operate at 56kxn or 64kxn bps, (N is 1 to 24). Use the rate command to select 56K or 64K. Use the DS0 MAP command to select the number of DS0 channels that the DTE ports are going to occupy. For detailed instructions, please refer to Section 5.4.1 or Section 6.16 for the rate command and Section 5.1 or Section 6.16 for DS0 MAP command.

3.6.2 Clock Polarity

The clock polarity of the DTE port is either normal or inverted. It is used to drive transmit data and to sample receive data. For detailed instructions, please refer to Section 5.4.2 or Section 6.16.

3.6.3 Data Polarity

The data polarity of the DTE port is either normal or inverted. This is used as positive logic or negative logic. For detailed instructions, please refer to Section 5.4.3 or Section 6.16.

3.6.4 Interface

The DTE port interface type can be either RS-449 or V.35. A conversion cable for each DTE port is available. The user must specify the proper interface type when ordering. Conversion cables are illustrated in Appendix A. To set this option, please refer to Section 5.4.4 or Section 6.16.

3.6.5 RTS

The DTE facility can use an RTS (Request To Send) signal to control transmission. When the RTS is "ACTIVE", and in the OFF state, all ones are sent to the T1 line side on the DTE port associated to the DS0 channels. When the RTS is "PERMANENT", the RTS signal is ignored and forced ON permanently. To set this option, please refer to Section 5.4.5 or Section 6.16.

3.6.6 Terminal Timing Mode

In a normal operating mode, the CSU/DSU uses the transmit clock to sample received data transmitted from the DTE facility. In Terminal Timing Mode (TTM), the CSU/DSU uses the receive clock to sample received data. This avoids data reception problems due to phase delay caused by long cables. If the DTE cable is too long, the DTE's transmit data may not be in-phase with the transmit clock by the time they reach the CSU/DSU. By using this feature, the receive clock data is in-phase at the CSU/DSU data port.

Table 3-4. DTE Port Default Setting

Item	Options	Default
Rate	56K, 64Kxn (n=1 ~ 24)	64Kxn
Clock	NORMAL, INVERTED	NORMAL
Data	NORMAL, INVERTED	NORMAL
Interface	RS449, V.35	V.35
RTS	ACTIVE, PERMANENT	ACTIVE
TTM	ON, OFF	OFF

3.7 Alarms and Reports

3.7.1 Alarms

The 1510 T1/FT1 CSU/DSU has twenty types of alarms, as listed in Table 3.5 and an alarm queue which record and time stamp the last 40 alarms. The 1510 T1/FT1 CSU/DSU also has alarm history and alarm status registers which are used to track the alarm count. Each alarm can be individually enabled or disabled. When disabled, no action is taken. When enabled, the alarm counter increments by one each time a specific type of alarm occurs. When an alarm occurs, or the counter threshold is exceeded, an alarm is triggered.

When an alarm is triggered, a dial-out or alarm relay is activated. If activated, these features are enabled. If they are not, no action is taken and only the specific alarm counter increases. Dial-out dials out through a modem to a remote terminal. An alarm relay is connected to an external buzzer or flashing signal via the alarm relay connector, as listed in Table 2.7. Please refer to Section 6.7 and Section 6.13 for detailed instructions. When the threshold level is implemented, it is based on the 15 minutes alarm count register. All alarms are disabled by default. The dial-out and alarm relay are also defaulted to disabled.

NOTE: Disabling an alarm automatically inhibits DIAL OUT and RELAY, even if DIAL OUT and RELAY are enabled.

Hayes compatible AT dialing commands are recommended for both primary and secondary dial-out strings. The 1510 T1/FT1 CSU/DSU will send the following AT commands to initialize the modem when the modem interface type is selected. Users may add specific commands in the dialing string to suit their environment.

1. Auto answer, S0=1.
2. Ignore DTR signal, &D0.
3. Track carrier, &C1.
4. Echo off, E0.
5. Display result codes in verbose form, V1
6. Return result code, Q0.
7. Wait time for carrier 30 sec, S7=30.
8. Save, &W0 &Y0.

Inactivity time-out can be programmed via the "s" command as in Section 6.16. After an alarm message is sent, the 1510 T1/FT1 CSU/DSU waits for a specific number of inactivity time-out second and then disconnect the modem. If a new alarm is sent during that period, the time-out counter is reset. Inactivity time-out of 0 seconds will immediately disconnect the modem after an alarm message is sent.

Individual fault counts are updated every second. Bipolar Violation (BPV) counts are updated every second, but the BPV alarm is based on an average Bit Error Rate (BER) that is calculated over a 15-minute interval. Therefore, BPV alarm status is updated every 15 minutes after the average BER is calculated. If the average BPV rate exceeds the preset threshold — i.e., From 10^{-9} up to 10^{-5} , an alarm can be declared (assuming BPV alarm is enabled). ES and UAS employ threshold-triggered alarms, but these alarms are declared as soon as the recorded count exceeds the preset threshold. The 15-minute integration interval does not apply to ES and UAS alarms. Alarm register stated are reset every 15 minutes, but preserved in the Alarm History display.

Table 3-5. Alarm Type Table

ALARM TYPE	ALARM DESCRIPTION	THRESHOLD
"MAST-CLK LOSS"	Master Clock Loss	No
"YEL,LINE"	T1 Line Yellow Alarm	No
"AIS,LINE"	T1 Line Alarm Indication Signal	No
"LOS,LINE"	T1 Line Loss of Signal	No
"LOF,LINE"	T1 Line Loss of Frame	No
"BPV,LINE"	T1 Line Bipolar Violation 10E- (5, 6, 7, 8, 9)	Yes (default 5)
"ES,LINE"	T1 Line Error Second (0 to 900)	Yes (default 1)
"UAS,LINE"	T1 Line Unavailable Second (0 to 900)	Yes (default 1)
"CSS,LINE"	T1 Line Control Slip Second (0 to 900)	Yes (default 1)
"DTE1 ALARM"	DTE1 RTS loss or clock loss in TTM	No
"DTE2 ALARM"	DTE2 RTS loss or clock loss in TTM	No
"DTE3 ALARM"	DTE3 RTS loss or clock loss in TTM	No
"DTE4 ALARM"	DTE4 RTS loss or clock loss in TTM	No
"YEL,D&I"	D&I Port Yellow Alarm	No
"AIS,D&I"	D&I Port Alarm Indication Signal	No
"LOS,D&I"	D&I Port Loss of Signal	No
"LOF,D&I"	D&I Port Loss of Frame	No
"BPV,D&I"	D&I Port Bipolar Violation 10E- (5, 6, 7, 8, 9)	Yes (default 5)
"ES,D&I"	D&I Port Error Second (0 to 900)	Yes (default 1)
"UAS,D&I"	D&I Port Unavailable Second (0 to 900)	Yes (default 1)

Table 3.6 Shows subsequent actions when a T1 port detects LOF (LED=red), AIS (LED=flashing amber) or Yellow (YEL) alarm (LED=amber).

Table 3-6. Alarm Conditions and Subsequent Actions

DS1 Alarm Condition	Line Port Output	D&I Port Output	DTE Port(s) Output
LOS, LOF, or AIS at Network port	Yellow +	AIS	All "1s"
Yellow at Network port	—	Yellow	—
LOS, LOF, or AIS at D&I port	*	Yellow	—
Yellow at D&I port	Yellow when all 24 DS0 Channels are mapped to D&I Port, and both ports are Configured for D4 framing	—	—
* All "1s" on channels that are mapped to the D&I port; through data from DTE port on channels Mapped to the DTE port; idle code on idle channels (channels that are not mapped). — Not affected. Normal operation. + If Yellow alarm option is enabled.			

3.7.2 Reports

1510 T1/FT1 CSU/DSU has four sets of performance registers: line, user, D&I, and far-end. The line performance register tracks the line receiver performance status. The user performance register tracks the line receiver as well, but users may clear it any time. The D&I performance register tracks D&I port receiver status. The far-end performance register tracks the far-end 1510 T1/FT1 CSU/DSU receiver status. The performance parameters are listed in Table 3.6. The user performance register and the D&I performance register have two additional parameters. One is the BPV register, to count bipolar violation in both D4 and ESF modes. The other is the ESF register, to track framing error and CRC errors in ESF frame format mode only.

Each performance parameter has 96 sets of register to record 24 hours of history in 15-minute intervals.

Table 3.7 lists the types of reports available, performance parameters provided by each report, and the reset command(s) for each report.

Table 3-7. Performance Report Options

Report Type [Menu Command]	Category	Report							
		ES	UAS	BES	SES	CSS	LOFC	BPV	ESF
Front Panel Reports	USER [Network]	Y	Y	Y	Y	Y	Y	Y	—
	D&I [Equipment]	Y	Y	Y	Y	Y	Y	Y	—
1-Hour Terminal Reports Menu Option [1]	USER [Network]	Y	Y	Y	Y	Y	Y	—	—
	LINE [Network]	N/c	N/c	N/c	N/c	N/c	N/c	—	—
	D&I [Equipment]	Y	Y	Y	Y	Y	Y	—	—
	FAR-END	N/c	N/c	N/c	N/c	N/c	N/c	—	—
24-Hour Terminal Reports Menu Option [2]	USER [Network]	Y	Y	Y	Y	Y	Y	Y	Y
	LINE [Network]	N/c	N/c	N/c	N/c	N/c	N/c	N/c	N/c
	D&I [Equipment]	Y	Y	Y	Y	Y	Y	Y	Y
	FAR-END	N/c	N/c	N/c	N/c	N/c	N/c	—	—
CRC Error Count Terminal Reports Menu Option [e]	USER [Network]	—	—	—	—	—	—	—	Y X
	LINE [Network]	—	—	—	—	—	—	—	N/c
	D&I [Equipment]	—	—	—	—	—	—	—	Y X
	FAR-END	—	—	—	—	—	—	—	N/c

Y = Report available and can be cleared by front panel “RESET” or admin terminal command “Y”.
 X = Report available and can be cleared by front panel “RESET” or admin terminal command “X”.
 N/c = No Clear. Report available, but counts cannot be cleared by the user.
 — = Report not available.

Table 3-8. Performance Parameter List

Performance Parameter	Description	Definition (T1/D4)	Definition (ESF)
ES	Error Second	BPV \geq 1, OOF \geq 1, or CS \geq 1.	CRC6 ERROR \geq 1, OOF \geq 1, or CS \geq 1.
BES	Bursty Error Second	1 < BPV < 1544	1 < CRC 6 < 320
SES	Severe Error Second	BPV \geq 1544, or OOF \geq 1	CRC6 \geq 320, or OOF \geq 1
CSS	Controlled Slip Second	Frame slip \geq 1	Frame slip \geq 1
OOF	Out of Frame	2 frame bit error in 6 consecutive frame bits	2 frame bit error in 6 consecutive frame bits
LOFC	Loss Of Frame Count	OOF for 2.5 \pm 0.5 sec	OOF for 2.5 \pm 0.5 sec
UAS	Unavailable Second	\geq 10 consecutive SES	\geq 10 consecutive SES
BPV	Bipolar Violation	Bipolar Error Count	Bipolar Error Count
ESF	CRC6 Error, or Out Of Frame	(not used, always 0)	CRC6 error or OOF

3.7.3 Requesting Performance Reports

In both T1/D4 and ESF frame format modes, the performance report can be accessed directly from a local terminal or from a remote terminal via modem. Please refer to Section 6.2 for detailed instructions.

In ESF mode, the performance report can also be accessed via a data link. Users must choose either AT&T or ANSI T1.403 data link operation in the DS1 network line interface configuration as described in Section 3.3. AT&T TR 54016 should be referred to regarding how the performance report request message and response message are structured. ANSI T1.403 should be referred to regarding how the one second performance report message is structured.

1510 T1/FT1 CSU/DSU supports both AT&T TR 54016 and ANSI T1.403 performance report messages. To set this option, please refer to Section 5.2.1 or Section 6.16.

3.8 LED Operations

The front panel has 9 LEDs for operation and error indications. The four DTE LEDs are for the DTE1, DTE2, DTE3, and DTE4 ports. The D&I LED is for the T1 Drop and Insert port. The LINE LED is for the DS1 network line port. The RLB LED is for Remote Loopback indication. The POWER LED is for system power indication. The ACO LED is for Alarm Cut-Off indication. Each LED can have three colors: green, amber, and red. There are three LED display states: Off, steady on, or flashing. The following table shows the meanings of the various LED colors and display states.

Table 3-9. Front-Panel LED Table

LED	Color	Indication
POWER	Green	Powered on and operational
	Red	Self-Test failure
LINE	Off	No T1 line card exist
	Flashing Green	A line-side loopback is active
	Green	T1 line frame sync
	Amber	Receive yellow alarm from T1 line
	Flashing Amber	Receive AIS from T1 line
D&I	Red	Loss of Frame Sync (LOFS) or Loss of Signal (LOS)
	Off	D&I port is not assigned any DS0 channel
	Flashing Green	A D&I loopback is active
	Green	D&I frame sync
	Amber	Receive yellow alarm from D&I port
DTE1,2,3,4	Flashing Amber	Receive AIS from D&I port
	Red	Loss of Frame Sync (LOFS) or Loss of Signal (LOS)
	Off	DTE port is not assigned any DS0 channel
	Flashing Green	DTE side loopback is active
	Green	RTS is asserted from DTE port
RLB	Red	DTE port RTS loss or loss clock in TTM
	Off	Remote loopback is inactive
ACO	Flashing Green	Remote loopback is active
	Off	Alarm Relay inactive
	Red	Alarm Relay active

3.9 Bantam Jack (Model 102 & 202 Only)

Figure 3.1 shows the block diagram of the bantam jack. It is used to monitor and isolate faults on the D&I port to detect and isolate D&I facility malfunction.

Table 3-10. Bantam Jacks:

1	NET-IN	Insert signal toward T1 network
2	NET-OUT	Receive signal from T1 network
3	EQU-IN	Insert signal toward D&I equipment
4	EQU-OUT	Receive signal from D&I equipment
5	NET-MON	Monitor T1 network signal
6	EQU-MON	Monitor D&I equipment signal

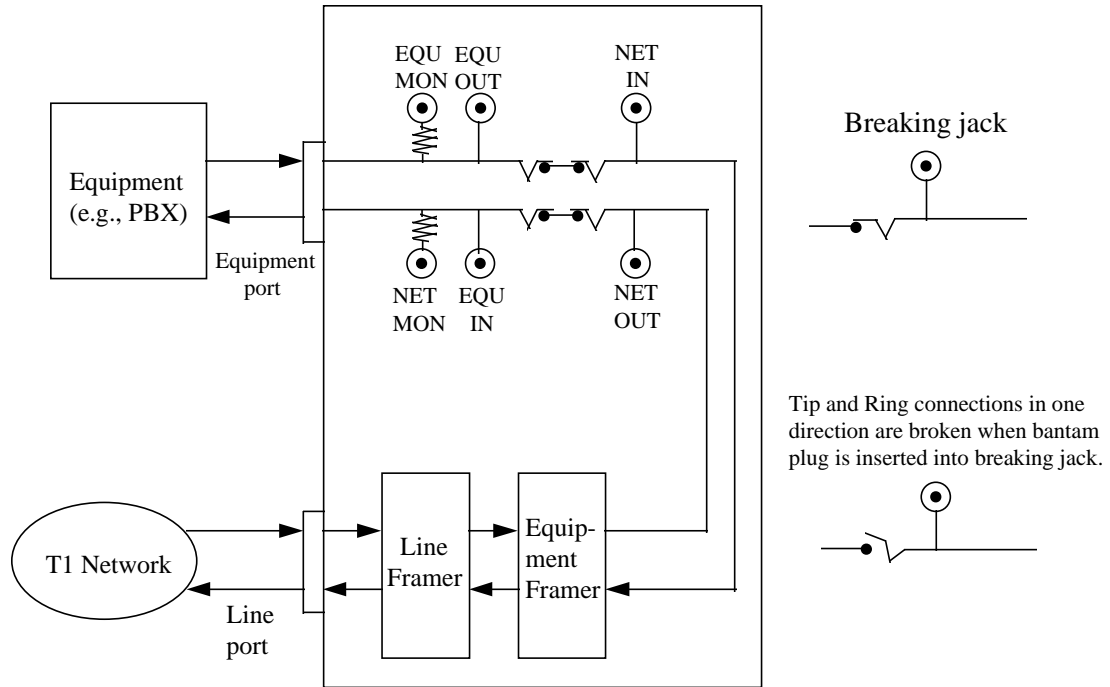


Figure 3-1. Bantam Jack Block Diagram

3.10 Error Messages

The 1510 T1/FT1 CSU/DSU provides various error messages on the LCD display to indicate abnormal conditions as listed in Table 3.8.

Table 3-11. Error Message Table

ERROR CODE	ERROR DESCRIPTION
ERROR01	A loopback is in effect
ERROR02	ESF or ESF&T1.403 mode is required
ERROR03	D&I isn't mapping to any DS0
ERROR04	Dten can't be in TTM if MCLK=dten
ERROR05	Dten is in TTM or MCLK=dten
ERROR06	Can't change active map of SWITCH
ERROR07	No DS0 channel is assigned
ERROR08	Modem error
ERROR09	A diagnostic test is in progress
ERROR10	DTE local loopback is in progress
ERROR11	SNMP_SLIP mode is in progress

3.11 Embedded SNMP Agent

The embedded SNMP agent for the 1510 T1/FT1 CSU/DSU offers standard RFC 1213 MIB II and RFC 1406 DS1 MIB as well as American Technology's enterprise MIB. The network manager may use any SNMP compatible network management system, such as SunConnect's SunNetManager and Hewlett-Packard's HP Openview, to monitor and control the 1510 T1/FT1 CSU/DSU. This enables users to integrate WAN equipment management with LAN SNMP network management systems. The embedded SNMP agent also includes Telnet implementation to allow the user to access the 1510 T1/FT1 CSU/DSU terminal interface from any workstation in the network.

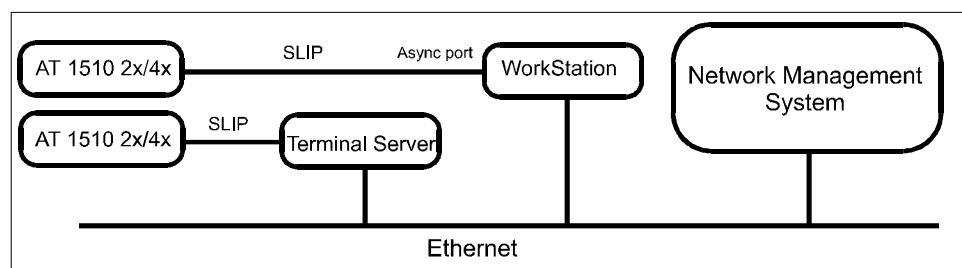


Figure 3-2. SNMP Implementation

The 1510 T1/FT1 CSU/DSU uses the supervisory port to provide the embedded SNMP agent functionality. Typically, a workstation can be configured to run SLIP protocol on its async port. If there are not many 1510 T1/FT1 CSU/DSU that need SLIP interfacing, no dedicated terminal servers are needed.

Before SNMP is enabled, make sure the IP address for the 1510 T1/FT1 CSU/DSU is configured correctly and the communication parameters match the Terminal server port. To set the IP address, please refer to Section 5.8.7 or Section 6.16.

To enable the SNMP agent, refer to section 5.8.6.

Once the SNMP agent is activated, users can verify that the 1510 T1/FT1 CSU/DSU is operating properly by using the “ping” command to check for a response from the 1510 T1/FT1 CSU/DSU , e.g.:

```

$ ping 192.1.100.45
192.1.100.45 is alive
  
```

Please refer to the respective SNMP manager operation instruction to incorporate the 1510 T1/FT1 CSU/DSU enterprise MIB into the user’s system.

Telnet capability comes with the embedded SNMP agent. Once the SNMP agent is running, users can use a Telnet program that is simulating a VT100 to access the 1510 T1/FT1 CSU/DSU command screen. The most popular Telnet utility in the public domain is provided by NCSA. It can maintain several Telnet connections simultaneously. Running the COMM port at its maximum speed is recommended to reduce jittery output on the terminal. The 1510 T1/FT1 CSU/DSU can run reliably at 38.4K bps with the SNMP option.

4.0 Maintenance

4.1 Self-Test

At system power up, a complete self-test routine is run to check all I/O ports, read/write memory, and data paths to validate system integrity. During the system self test, a "SELF TEST" message is shown on the upper line of the LCD display. The software release version and date code is shown on the lower line of the LCD display. If an error is found, a "FAIL" is shown in the upper right corner of the LCD display and a dedicated error message is shown on the lower line. Users may press "SELECT", ADV Left, ADV Right, and "ENTER" keys in this order to read a specific error code. If no error is found, the LCD display will show "PASS" in the upper right corner of the LCD display followed by a Main Menu as shown in Figure 5.2. Various system diagnostic methodologies are found in the following paragraphs.

4.2 Diagnostics

A 20-bit register QRSS (Quasi-Random Signal Sequence) is used in the 1510 T1/FT1 CSU/DSU. Please refer to Appendix B for details of the 20-bit QRSS. The QRSS test pattern is used to test local 1510 T1/FT1 CSU/DSU system integrity utilizing the local loopback test. It can also be used to measure the T1 line quality. The diagnostics scenario is as follows:

1. First, send a remote loopback command to cause the remote facility to loopback DS0 channels.
2. Then, activate the local QRSS diagnostics operation, use the Test command to enable QRSS and choose test DS0 channels in a bundle of DTE1, DTE2, DTE3, DTE4, all 24 channels (FULL) or optionally only idle channels. The FULL QRSS diagnostic uses a framed pattern. This is useful for testing full T1 loopbacks at the far-end.
3. When the QRSS pattern sync is found, a bit error counter tracks total bit errors. It is advised to send QRSS for more than a 15 minute interval to evaluate the quality of loop conditions and facility reliability.

In both front panel and terminal operation, the user may utilize the ADV Right key to inject single error, ADV Left key to reset the error counter, and the 'SELECT' key to terminate QRSS testing. The user may also read performance reports to understand the type of error which occurred.

4.3 Near End Loopback

The near end loopbacks, such as local loopback, line loopback, payload loopback, DTE port loopback, and D&I port loopback, are activated by the local 1510 T1/FT1 CSU/DSU. The loopbacks are at the near end facility. The following paragraphs describes each loopback in detail.

NOTE: Deactivate the near-end loopbacks from the front panel or the terminal, depending on where it was activated.

4.3.1 Local Loopback

Local loopback is illustrated in Figure 4.1. The outgoing signal is looped back through the T1 PCM transceiver. All 24 DS0 channels are looped back to the receiver path. This loopback test is activated by the Test command. This loopback test can be used with the QRSS diagnostic test pattern to validate the local 1510 T1/FT1 CSU/DSU's integrity. An AIS (Alarm Indication Signal) is sent to the network during local loopback testing. The local loopback test can be activated from the front panel and terminal as described in Section 5.7 and Section 6.12.

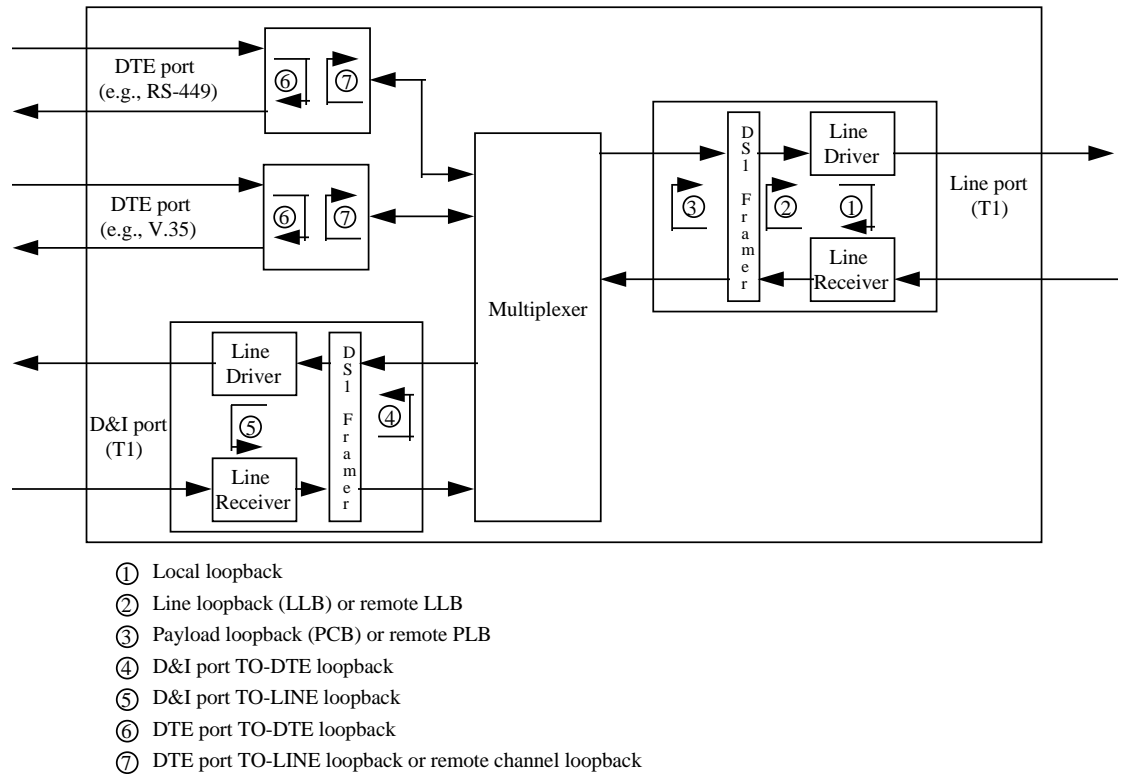


Figure 4-1. Loopback Block Diagram

4.3.2 Line Loopback

Line loopback is illustrated in Figure 4.1. The incoming T1 line signal is looped back to the outgoing T1 signal before the T1 transceiver framer. This loopback is used to isolate the local equipment from a troubled T1 transmission line. The line

loopback test can be activated from the front panel and terminal as described in Section 5 and Section 6. AIS is sent to the D&I port during this test.

NOTE: Since line loopback does not pass through DS1 framers, the looped back pattern may be framed or unframed. This is the only loopback that can pass an unframed pattern.

4.3.3 Payload Loopback

Payload loopback is illustrated in Figure 4.1. The incoming signal is looped back to the outgoing T1 signal after the T1 transceiver framer. This loopback is used to isolate the DTE ports and D&I port from the troubled T1 transmission line. The payload loopback test can be activated from the front panel and terminal as described in Section 5.7 and Section 6.12. AIS is sent to the D&I port during this test.

4.3.4 D&I Port Loopback

There are two types of D&I loopback: TO-DTE and TO-LINE. These loopback tests are used to isolate the D&I port from other ports on the 1510 T1/FT1 CSU/DSU. In TO-DTE loopback, an incoming framed T1 signal received at the D&I port is looped back to the D&I port. The Line and DTE port operations are not affected during this test.

In TO-LINE loopback, an incoming framed T1 signal received at the Line port is looped back to the Line port. Either unframed AIS or a transmit data stream can be sent from the D&I port output during this test. DTE port operations are unaffected, meaning DS0 channels mapped to any DTE port are still dropped to the associated DTE port.

NOTE: D&I loopbacks work only if one or more DS0 channels are mapped to the D&I port.

4.3.5 DTE Port Loopbacks

There are two types of DTE loopbacks: TO-DTE and TO-LINE. These loopback tests are used to isolate DTE equipment connected to the DTE port from other ports of the 1510 T1/FT1 CSU/DSU. In TO-DTE loopback, an incoming data signal received at the DTE port is looped back to the same DTE port. The D&I port operation is not affected during this test. All ones are sent to the Line port on the DTE-associated DS0 channels.

In TO-LINE loopback, an incoming framed T1 signal received at the Line port is looped back to the Line port. The D&I and other DTE port operations are not affected during this test.

NOTE: DTE loopbacks work only when one or more DS0 channels are mapped to the DTE port.

4.4 Far End Loopbacks

Far-end loopbacks - remote line loopback, remote payload loopback, and remote channel loopback - can be activated by the local 1510 T1/FT1 CSU/DSU to cause a remote facility to perform the loopbacks. Inband codes, AT&T and ANSI FDL protocols, and proprietary codes are utilized to send remote loopback commands to the far-end facility. Inband codewords are supported by D4, ESF, or ESF&T1.403 framing format. When using ANSI FDL messages, the Line port must be in ESF&T1.403 framing format. All remote loopbacks can be activated from the front panel or the terminal, as described in Sections 6 and 7.

If the remote facility responds to a remote loopback activate command, a “LOOPED” message appears in the lower left corner of the display. If the remote facility responds to a remote loopback deactivate command, a “NOLOOP” message appears. If the remote activation/deactivation fails, an error message appears.

It is best to use remote loopbacks in conjunction with QRSS diagnostic testing to measure the T1 network line integrity. The procedure is as follows:

1. Send a remote loopback command to cause the remote facility to perform a loopback.
2. Activate the QRSS diagnostics test.

NOTE: Deactivate the far-end loopbacks from the front panel or the terminal, depending on where it was activated.

Following are descriptions for each type of far-end loopback.

4.4.1 Remote Line Loopback

Remote line loopback is illustrated in Figure 4.1. The remote line loopback is initiated by the remote equipment via the signal or ESF data link message with AT&T or ANSI protocol. Table 4.1 shows the inband remote line loopback code. Table 4.3 shows the ANSI T1.403 ESF data link remote line loopback code. Remote line loopback test can be activated from the front panel and terminal as described in Section 5.7 and Section 6.12.

Table 4-1. In-band Control Codewords

Remote LLB	Codeword
Activate	10000, receive 5+/-0.5 second
Deactivate	100, receive 5+/-0.5 second

4.4.2 Remote Payload Loopback

Remote payload loopback is illustrated in Figure 4.1. The remote payload loopback is initiated by the remote equipment via the ESF data link message with AT&T or ANSI protocol. Table 4.2 shows the AT&T ESF T1.403 ESF data link remote payload loopback codes. The remote payload loopback test can be activated from the front panel and terminal as described in Section 5.7 and Section 6.12.

Table 4-2. AT&T ESF Data-Link Codeword

Remote PLB	Codeword
Activate	ESF-DL SX.25 Request Message #1
Deactivate	ESF-DL SX.25 Request Message #2

Table 4-3. ANSI T1.403 Bit-Oriented ESF Data-Link Codeword

Remote PLB	Codeword
Activate	0 000111 011111111 repeat at least 10 times
Deactivate	0 011100 011111111 repeat at least 10 times
Remote PLB	Codeword
Activate	0 001010 011111111 repeat at least 10 times
Deactivate	0 011001 011111111 repeat at least 10 times

4.4.3 Remote Channel Loopback

Remote channel loopback is illustrated in Figure 4.1. The remote channel loopback is initiated by the local equipment via the following methods:

1. In-band remote channel loopback code.

In-band activate and deactivate codes are used to enable and disable the DTE to a TO-LINE loopback. This loopback provides a unique way to isolate problems of a specific data path from the T1 network line towards the remote DTE.

Activate code, 11110111 rotate left in 10 Hz for 5 ± 0.5 sec.

Deactivate code, 11011011 rotate left in 10 Hz for 5 ± 0.5 sec.

2. ESF and ESF&T1.403 facility data link remote channel loopback codes.

A proprietary protocol in the ESF facility data link is used to enable and disable the remote DTE port to perform a TO-LINE loopback. This loopback provides a unique way to isolate problems of a specific data path from the T1 network line towards the remote DTE port.

The remote channel loopback command uses the ESF data link message. The ESF data link messages to activate a request and the associated response are in Table 4.4 and Table 4.5 and the data link messages to deactivate a request and the associated response are listed in Table 4.6 and Table 4.7.

Table 4-4. Remote Channel Loopback Activate Request Message

Octet No.	Label	Contents
1	Command #	0 to 255
2	Originate Unit Add	(A or Z) or (B or Y)
3	Target Unit Add	(A or Z) or (B or Y)
4	Request #	249
5~28	DS0~DS23	0: no action. 1: DTE1 activate loopback 2: DTE2 activate loopback 3: DTE3 activate loopback 4: DTE4 activate loopback 5: D&I activate loopback

Table 4-5. Remote Channel Loopback Activate Response Message

Octet No.	Label	Contents
1	Command #	0 to 255
2	Status	0000U000
3	Originate Unit Add	(A or Z) or (B or Y)
4	Target Unit Add	(A or Z) or (B or Y)
5	Current Status	FU0000L0

NOTE:

- f=1, if U or L=1.
- U=1, if an unavailable signal state exists,
- L=1, if the PLB is activated.
- 0(reserved)

Table 4-6. Remote Channel Loopback Deactivate Request Message

Octet No.	Label	Contents
1	Command #	0 to 255
2	Originate Unit Add	(A or Z) or (B or Y)
3	Target Unit Add	(A or Z) or (B or Y)
4	Request #	249
5~28	DS0~DS23	0: no action. 1: DTE1 activate loopback 2: DTE2 activate loopback 3: DTE3 activate loopback 4: DTE4 activate loopback 5: D&I activate loopback

Table 4-7. Remote Channel Loopback Deactivate Response Message

Octet No.	Label	Contents
1	Command #	0 to 255
2	Status	0000U000
3	Originate Unit Add	(A or Z) or (B or Y)
4	Target Unit Add	(A or Z) or (B or Y)
5	Current Status	FU0000L0

NOTE:

- f=1, if U or l=1.
- U=1, if an unavailable signal state exists,
- L=1, if the PLB is activated.
- 0(reserved)

4.4.4 V.54 Loopback

1510 T1/FT1 CSU/DSU also supports V.54 loopback protocol. Refer to ANSI T1.403-1995 Annex B.

4.5 Test Pattern

Four test patterns are available to determine faults such as deficient clock recovery, faulty ALBO level recovery, inadequate jitter margin, presence of bridge taps, and mis-optioned network interfaces. These four patterns are framed patterns with proper D4 or ESF frame patterns as described in the following paragraphs.

4.5.1 3-in-24 Pattern

This framed 3-in-24 pattern is aligned with the frame bit so as not to transmit a false yellow alarm. It tests the consecutive zeros requirement and is useful to test AMI circuits.

Framed 3-in-24 pattern sequence is as follows,

F 01000100 00000000 00000100 01000 (Left to Right)

F indicates frame bit.

4.5.2 1-in-8 Pattern

This framed 1-in-8 pattern tests the ability of a circuit to support a pattern having the minimum ones density. It is useful to reveal a timing recovery problem. The bit set to one must be set to bit 2 to avoid false yellow alarm.

Framed 1-in-8 pattern sequence is as follows,

F 01000000 01000000 0100 (Left to Right)

F indicates frame bit.

4.5.3 2-in-8 Pattern

This framed 2-in-8 pattern, in conjunction with the 1-in-8 Pattern, is useful when performing tests to reveal the presence of equivalent mis-options for B8ZS. Use of 2-in-8 pattern will confirm the circuit's ability to support error free transmission when B8ZS substitution does not occur. A framed 1-in-8 will contain 8 consecutive zeros around a zero frame bit causing a B8ZS substitution.

Framed 2-in-8 pattern sequence is as follows,

F 01000010 01000010 01 (Left to Right)

F indicates frame bit.

4.5.4 1:1 Pattern

This framed 1:1 pattern tests AMI circuits. It will cause a false yellow alarm in D4 frame format mode.

Framed 1:1 pattern sequence is as follows,

F 10101010 10101010 10 (Left to Right)

F indicates frame bit.

4.6 Verifying 1510 T1/FT1 CSU/DSU Operations

The purpose of this section is NOT to help the user determine where a possible fault in the network may lie. For this, the user needs to know the exact architecture of the network. Then standard network trouble shooting procedures should be followed, which involve sectionalizing the network and performing loop back tests on segments of the network.

The purpose here is to help the user determine whether the 1510 T1/FT1 CSU/DSU equipment is at fault after tests have pointed a suspicious finger. The procedures outlined here depend upon test equipment and other equipment the user may have on hand.

The organization of these procedures starts from the simple to the complex. The procedure ends when a definitive conclusion is made that the 1510 T1/FT1 CSU/DSU equipment is at fault. To verify that the 1510 T1/FT1 CSU/DSU equipment is not at fault, specialized equipment such as a BERT (bit error rate test) set is required.

4.6.1 Quick Test

See if the LCD display on the 1510 T1/FT1 CSU/DSU shows normal text. If not, the 1510 T1/FT1 CSU/DSU has failed.

Remove all line and DTE connections to the 1510 T1/FT1 CSU/DSU. Remove power. After a few seconds, re-apply power. Observe the power-up self-test sequence. If this fails, then the 1510 CSU/DSU has failed.

See if the LEDs show any abnormal displays. If yes, use the LED indications to guide the user to test other parts of the network, such as the T1 line, the D&I line, or the DTE equipment.

Especially during initial installation, excessive errors may be due to (a) incorrect configuration of either the 1510 T1/FT1 CSU/DSU or of the equipment at the other end of the line, or (b) due to faulty line installation, which results in excessive noise, cross talk, or an impedance mismatch. Especially in electrically noisy environments, such as central offices, use of shielded cables is mandatory.

4.6.2 Substitution

If a spare 1510 T1/FT1 CSU/DSU is available, then replace the working one with the spare. The user must carefully configure the spare exactly as the working one. If the substitution clears the problem, then the original working unit is suspect. Note that this is not a total diagnosis, as other reasons may cause the same symptoms. A good practice is to reconfigure the original unit and swap once more.

If both units behave the same, then the problem is probably elsewhere.

4.6.3 Using Loopback Plugs

Without a spare, a loopback plug is handy for diagnosis. Note that internal loopback facilities of the 1510 T1/FT1 CSU/DSU does not include the interface circuitry. Thus a set of plugs, one for each of the interfaces, line, D&I, and DTE are needed for complete tests. These plugs are wired such that signals from the 1510 T1/FT1 CSU/DSU are looped back by hard wire back to the receive pins of the same plug.

Replace the line connector with a loopback plug. Observe if the line is in sync. If not then 1510 T1/FT1 CSU/DSU has failed. Then perform a QRSS test towards the line. If this fails, then 1510 T1/FT1 CSU/DSU has failed.

Similarly, replace the D&I connector with a loopback plug. Observe if the line is in sync. If not then the 1510 T1/FT1 CSU/DSU has failed. However, a QRSS test must be initiated from the far end 1510 T1/FT1 CSU/DSU or equivalent terminal.

For the DTE ports, a loopback plug must be used in concert with a far end 1510 T1/FT1 CSU/DSU. If such a terminal is available, then a QRSS test will determine if that DTE port is operational. Note that if a far end terminal is available, the first test should be a local line loopback to see if the line is good.

If the local DTE has diagnostic capabilities, then a loopback plug towards the DTE would help determine if the line to the DTE is good. This can further help isolate the problem. If tests with loopback plugs all pass, then the problem is probably elsewhere.

4.6.4 Using A Bert Test Set

If a BERT (bit error rate test) set is available, such as the Firebird 9000, then a comprehensive suite of tests are available to examine the functionality of the 1510 T1/FT1 CSU/DSU.

With a BERT, each of the ports of the 1510 T1/FT1 CSU/DSU can be tested individually. The user must configure the BERT in the exact way the 1510 T1/FT1 CSU/DSU is configured. This is easily done by comparing each of the options one by one. After checking that the configuration matches, if any one of the ports fails, then the 1510 T1/FT1 CSU/DSU has failed.

5.0 Front Panel Operation

The front panel operation utilizes a 2-line x 40-character LCD display and four keys labeled SELECT, ENTER, ADV Left, and ADV Right, as shown in Figure 5.1. The ENTER key enables a selection, while the ADV left and ADV right keys move the cursor to the left and right. The SELECT key returns toward the main menu. The first menu displayed after power up is shown in Figure 5.2.

NOTE: The ENTER key must be used to confirm a change. Where YES is shown at the lower right corner, it must be selected to enable a change.

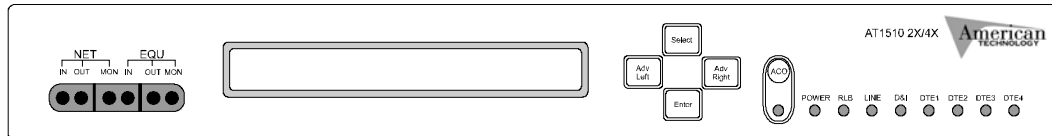


Figure 5-1. 1510 T1/FT1 CSU/DSU Front Panel

The main menu consists of up to fifteen different functions as described in the following paragraphs. To select one of the fifteen functions, use ADV left and ADV right keys to move the cursor to a desired function and then press the ENTER key. See Appendix C for the menu tree layout.

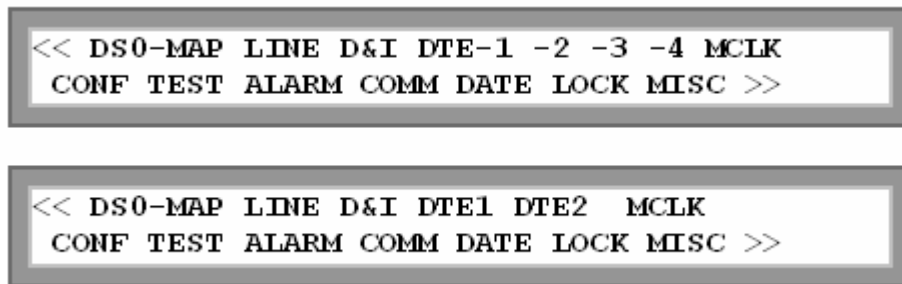


Figure 5-2. LCD Main Menus

One of the two menu presentations are shown after power up dependent upon whether two or four ports are installed in the unit.

5.1 DS0-Map Menus

The DS0-Map menus are used to configure the DS0 channel assignments for the DTE ports and the D&I port. It is also used to program MAP1 and MAP2 schedules as well as to enable the SWITCH function. The DS0 channel assignment can be sent to the remote end by using the SEND command.

5.1.1 Active Menu

The Active menu shows the current active MAP, either MAP1, or MAP2, or SWITCH by placing an asterisk (*) beside the appropriate function. To change the MAP simply move the cursor to a desired MAP or SWITCH and press ENTER. When SWITCH is selected, the current active map is shown inside the brackets.

```

DS0-MAP>ACTIVE  MAP1  MAP2  SWITCH  SEND
                MAP1  MAP2  *SWITCH<MAP1>
  
```

This switch menu uses a proprietary ESF data link message, and is only available in ESF and ESF&T1.403 frame format modes. In other modes the error message ERROR 2 will be displayed. If the far end facility acknowledges this command, the LCD will display an "ACK". Otherwise, a "FAIL" message is shown on the LCD display.

5.1.2 MAP1 Menu

```

DS0-MAP>ACTIVE  MAP1  MAP2  SWITCH  SEND
                MAP1  >[iiiiiiiiiiiiiiiiiiii]
  
```

The MAP1 menu shows the current assignment for ports for each DS0 channel. To change the assignment, press the ENTER key to jump to a lower menu layer as follows.

```

MAP> [iiiiiii111ii22ii333i44ddd] CH : 01
      *IDLE DTE-1 -2 -3 -4 D&I 12 : 768K
  
```

In the MAP1 menu, “i” indicates idle, “1”, “2”, “3”, and “4” indicate corresponding DTE port numbers, and “d” indicates the D&I port. As in the above example, CH:01 in the top right corner shows the current cursor

designated channel number is 01. In the lower right corner, 12: 768K indicates there are 12 idle channels using a total of 768 Kbps of the total 1536 Kbps bandwidth. To change a specific DS0 channel port assignment, move the cursor to a specific DS0 channel. Press ENTER, the cursor will move to the lower line of the display. The selected port is highlighted by a '*'. To change the port assignment, move the cursor to the desired port and press ENTER. The cursor will return to the upper line and the LCD will show the channel number and bandwidth associated with the designated port.

NOTE: MAP2 Menu operations are similar.

5.1.3 Switch Menu

```
DS0-MAP>ACTIVE  MAP1  MAP2  SWITCH  SEND
SWITCH>MAP1 23:00-12:00  MAP2 12:00-23:00
```

The Switch menu shows the current MAP1 and MAP2 schedule as in the above display. In this case, MAP1 is scheduled to START from 23:00 and END at 12:00 and MAP2 is scheduled to START at 12:00 and END at 23:00. To change the MAP1 and MAP2 schedule, press the ENTER key to go to a lower layer of the menu as follows.

```
SWITCH>MAP1 23:00-12:00  MAP2 12:00-23:00
(H)U D (M)U D-(H)U D (M)U D YES
```

In the above display “U” indicates up, “D” indicates down, “(H)” indicates hour and “(M)” indicates minute. To change the START time of MAP1, move the cursor to the left (H) and (M) then select U to increase or D to decrease the START time. To change the END time of MAP1, move the cursor to the right (H) and (M) and do the same. Notice that the MAP2 START and END times are changed in relation to the END and START time of MAP1. This operation must be concluded by pressing ENTER with the cursor positioned to YES.

5.1.4 Send Menu

Selecting the send menu and pressing ENTER will send the current working DS0 map information to the far end. It will overwrite the current far end working DS0 map. The send menu uses a proprietary ESF data link message, and is only available in ESF and ESF&T1.403 frame format modes. Otherwise, the error message ERR02 is displayed. If the far end facility acknowledges this command,

an "ACK" is shown on the LCD display. Otherwise, a "FAIL" message is shown on the LCD display.

```
DS0-MAP>ACTIVE  MAP1  MAP2  SWITCH  SEND
"Send active ds0-map to far-end"
```

5.2 Line Menus

Line menus are used to configure T1 line operation modes including frame format, line code, Line Build Out (LBO), yellow alarm transmission with the occurrence of LOF and LOS, inband loopback code recognition, FDL address code, and transmission idle code.

5.2.1 Frame Format Menu

The following display shows D4 frame format is selected and highlighted by an '*'. To change the frame type, move the cursor to the desired selection and press ENTER. ESF&T1.403 indicates ESF frame format is chosen and the facility data link message follows the ANSI T1.403 standard. ESF indicates ESF frame format is selected and the facility data link follows AT&T PUB 54016 standard.

```
LINE>FRAME CODE LBO YEL INBAND ADDR IDLE
D4 *ESF ESF&T1.403
```

5.2.2 Code Format Menu

The Code format menu shows the current coding scheme, either AMI or B8ZS, by an '*'. To select the coding scheme, move the cursor to the desired selection and press ENTER.

```
LINE>FRAME CODE LBO YEL INBAND ADDR IDLE
*AMI B8ZS
```

5.2.3 Line Build Out (LBO) Menu

The Line Build Out (LBO) menu shows the current transmission LBO as 0, -7.5, or -15 db as indicated by an asterisk '*' adjacent to the selected entry. To change the LBO, move the cursor to the proper selection and press ENTER.

```

LINE>FRAME CODE LBO YEL INBAND ADDR IDLE
*0.0 -7.5 -15

```

5.2.4 Yellow Menu

The Yellow menu shows the current yellow alarm transmission state when the 1510 T1/FT1 CSU/DSU experiences a loss of signal or frame sync. The current selection is highlighted by an '*'. To set the alarm to automatically be transmitted when loss of signal or loss of frame sync are detected, move the cursor to ON and press ENTER. To disable yellow alarm, move the cursor to OFF and press ENTER.

```

LINE>FRAME CODE LBO YEL INBAND ADDR IDLE
*ON OFF

```

5.2.5 Inband Menu

The Inband menu shows the remote inband loopback diagnostics code recognition. The current selection is highlighted by an '*'. To enable this, move the cursor to ON and press ENTER. To disable, move the cursor to OFF and press ENTER.

```

LINE>FRAME CODE LBO YEL INBAND ADDR IDLE
*ON OFF

```

5.2.6 Address Menu

The Address menu shows that the current 1510 T1/FT1 CSU/DSU address used by the Facility Data Link is CSU or TE, when ESF frame format mode is selected. The current selection is highlighted by an '*'. To change, move the cursor to the desired selection and press ENTER.

```

LINE>FRAME CODE LBO YEL INBAND ADDR IDLE
*CSU TE

```

5.2.7 Idle Menu

The Idle menu shows the transmission idle code when the DS0 channel is in idle mode. To change the idle code, press ENTER to go to the lower line. Then move the cursor to ROLL-UP or ROLL-DN. Press ENTER to select a desired idle code which is shown in the lower left corner of the display. This operation must be concluded by entering YES to enable the changes.

Due to ones density requirements, it is advised that the idle code be set to FF₁₆. Also, users must program the idle code to contain at least two bits of '1'. The factory default idle code is FF₁₆.

```
LINE>FRAME CODE LBO YEL INBAND ADDR IDLE
      =FF ROLL-UP ROLL-DN YES
```

5.3 D&I Menus

D&I menus are used to configure Drop and Insert port operation modes, such as frame format, line code, and transmission equalizer.

5.3.1 Frame Format Menu

The Frame format menu shows the current frame format by placing an asterisk (*) by the selected option. To change the frame format, move the cursor to the desired selection and press ENTER.

```
D&I>FRAME CODE EQU
      D4 ESF
```

5.3.2 Line Code Menu

The Line code menu shows the current coding scheme by placing an asterisk (*) by the selected option (either AMI or B8ZS). To select the coding scheme, move the cursor to the desired selection and press ENTER.

```
D&I>FRAME CODE EQU
      *AMI B8ZS
```

5.3.3 Equalizer Menu

The Equalizer menu shows the current transmission equalizer by placing an asterisk (*) by the selected option. Five distance ranges are provided: 0 to 655 feet as shown in the lower line of the display. The illustration below shows that the current selection is 0 to 133 feet. To change the equalizer, move the cursor to the desired selection and press ENTER.

```
D&I>FRAME CODE EQU
*0-133 133-266 266-399 399-533 533-655
```

5.4 DTEn Menus

DTEn menus are used to configure DTE1, DET2, DTE3, and DTE4 port operation modes, such as data rate, clock mode, data mode, interface type, RTS mode, and TTM (Terminal Timing Mode).

5.4.1 Rate Menu

The Rate menu shows the current DTE data rate is either 64kxn or 56kxn bps by placing an asterisk (*) by the selected option. To change the DTE data rate, move the cursor to the desired selection and press ENTER.

```
DTEn>RATE CLK DATA INTERF RTS TTM
*64KxN 56KxN
```

5.4.2 Clock Menu

The Clock menu shows the current DTE clock polarity status (either normal or inverted) by placing an asterisk (*) by the appropriate selection. To change the DTE clock polarity, move the cursor to the desired selection and press ENTER.

```
DTEn>RATE CLK DATA INTERF RTS TTM
*NORMAL INVERTEN
```

5.4.3 Data Menu

The Data menu shows the current DTE data polarity (either normal or inverted) by placing an asterisk (*) by the appropriate selection. To change the DTE data polarity, move the cursor to the desired selection and press ENTER.

```

DTEn>RATE CLK DATA INTERF RTS TTM
*NORMAL INVERTED
  
```

5.4.4 Interface Menu

The Interface menu shows the current DTE interface type (either RS449 or V.35) by placing an asterisk (*) by the appropriate selection. To change the DTE interface type, move the cursor to the desired selection and press ENTER.

```

DTEn>RATE CLK DATA INTERF RTS TTM
*RS449 V.35
  
```

5.4.5 RTS Menu

The RTS menu shows the current DTE RTS operation mode (either active or permanent) by placing an asterisk (*) by the appropriate selection. To change the DTE RTS operation mode, move the cursor to the desired selection and press ENTER.

```

DTEn>RATE CLK DATA INTERF RTS TTM
*ACTIVE PERMANENT
  
```

5.4.6 TTM Menu

TTM menu shows the current DTE terminal timing mode (either OFF or ON) by placing an asterisk (*) by the appropriate selection. To change the DTE terminal timing mode, move the cursor to the desired selection and press ENTER.

```

DTEn>RATE CLK DATA INTERF RTS TTM
*OFF ON
  
```

5.5 Master Clock Menus

Master clock menus are used to configure the master clock source and external clock source and clock rate.

5.5.1 Master-Clock Menu

NOTE: 2nd-CLK Menu operation is similar.

The Master clock menu shows the clock source options are line, internal, D&I, external, or one of the DTE ports by placing an asterisk (*) by the appropriate selection. To change the selection, move the cursor to the desired selection and press ENTER. The upper right corner shows the current active clock as m-CLK or 2-CLK.

```
MCLK> MAST-CLK 2nd-CLK EXTERN-FRQ <2-CLK>
*LINE INTN D&I EXTN DTE -1 -2 -3 -4
```

5.5.2 External-Clock Menu

The External-clock menu shows the current external clock rate in the lower left corner of the display. Possible rates are 56KxN or 64KxN bps (N is 1 to 24). To change the external clock rate, move cursor to ROLL-UP or ROLL-DN and press ENTER to roll the clock up down one step at a time. This operation must be concluded by entering YES to enable the changes.

```
MCLK> MAST-CLK 2nd-CLK EXTERN-FRQ <2-CLK>
=1.544MBPs ROLL-UP ROLL-DN YES
```

5.6 Configuration Menus

Configuration menus are used to store and retrieve system configuration information.

5.6.1 Store Menus

The Store menu is used to store the current working configuration to the user stored configuration by pressing the ENTER key.

```
CONF>SSTORE RETRIEVE
      Store current configuration
```

5.6.2 Retrieve Menu

The Retrieve menu is used to retrieve the user stored configuration to the current working configuration by pressing the ENTER key.

```
CONF>STORE RRETRIEVE
      Retrieve last stored configuration
```

NOTE: When the user stored configuration is retrieved, all loopback tests will be terminated and all alarm queues and alarm histories are reset. The current working configuration is overwritten.

5.7 Test Menus

Test menus are used to perform DTE port loopback tests, Drop and Insert port loopback tests, remote DTE port loopback tests, local and remote T1 line loopback tests, QRSS tests, and test pattern selections as in the following paragraphs. If a remote loopback is in progress, the front panel RLB LED will be flashing green.

5.7.1 DTE Menu

```
TEST>DTE D&I RemDTE NearLB RemLB V54 PAT
*DTE>DTE1 DTE2
```

The DTE menu is used to perform DTE loopback test. To control DTE loopback tests, move the cursor to DTE and press ENTER to jump to a lower layer menu as follows.

```
DTE>DTE DTE2
*OFF TO-DTE TO-LINE
```

The current DTE loopback state is highlighted by an ASTERISK (*). To change this option, first press ENTER to move the cursor to the lower line of the display. Then select OFF to end the DTE loopback test; TO-DTE to loop the DTE incoming data back to the DTE; TO-LINE to loop the outgoing data back to the line receiver.

5.7.2 D&I Menu

The D&I menu is used to perform D&I loopback tests. The current loopback test state is shown by an asterisk (*). To change the state, press ENTER to move the cursor to the lower line of the display. Then, select OFF to end the loopback test; TO-DTE to loop the incoming data back to the D&I facility, TO-LINE to loop the outgoing data back to the drop and insert line receiver.

```
TEST>DTE D&I RemDTE NearLB RemLB V54 PAT
*OFF TO-DTE TO-LINE
```

5.7.3 RemDTE Menu

The RemDTE menu is used to control remote DTE channel loopback tests. Press ENTER to jump a lower menu as follows.

```
TEST>DTE D&I RemDTE NearLB RemLB V54 PAT
RemDTE>ACTIVATE DEACTIVATE
```

To activate the remote DTE channel loopback, first move the cursor to ACTIVATE. Then, press ENTER to move the cursor to the lower line of the display and select a desired DTE port for remote loopback operation, such as DTE1, DTE2, DTE3, DTE4, D&I, or all ports. To deactivate the remote DTE loopback, first move the cursor to DEACTIVATE and do the same as above. This RemDTE test uses a proprietary message as shown in Section 4.4.3. If the remote facility responds to this command a "LOOPED" message will be shown in the left lower corner of the LCD display. Otherwise, a "NOLOOP" message will be shown.

```
RemDTE>ACTIVATE DEACTIVATE
*ALL DTE1 DTE2 DTE3 DTE4 D&I
```

5.7.4 NearLB Menu

The NearLB menu is used to control near end T1 line side loopback operations, such as local loopback, payload loopback, and line loopback. The current near end T1 line side loopback state is shown by an asterisk (*). To change this state, first press ENTER to move the cursor to the lower line of the display. Then select OFF to end the loopback test, LOCAL to start a local loopback test, PLB to start a payload loopback test, and LLB to start a line loopback test.

```
TEST>DTE D&I RemDTE NearLB RemLB V54 PAT
*OFF LOCAL PLB LLB
```

5.7.5 RemLB Menu

The RemLB menu is used to activate T1 line remote loopback tests. There are three remote loopback types: Inband, AT&T 54016, and T1.403. Press ENTER to move the cursor to a lower level menu as follows.

```
TEST>DTE D&I RemDTE NearLB RemLB V54 PAT
*RemLB>ACTIVATE DEACTIVATE
```

To activate a remote T1 line loopback, first move the cursor to ACTIVATE. Then, press ENTER to move the cursor to the lower line of the display and select a desired loopback operation. IN-BAND remote line loopback uses inband coding, AT&T-P remote payload loopback uses AT&T FDL coding, ANSI-P remote payload loopback uses ANSI FDL coding, ANSI-L remote line loopback uses ANSI FDL coding. To deactivate a remote T1 Line loopback, first move the cursor to DEACTIVATE and do the same as above.

```
RemLB>ACTIVATE DEACTIVATE
*IN-BAND AT&T-P ANSI-P ANSI-L
```

5.7.6 V54 Menu

The V54 menu is used to control remote V54 channel loopback tests. Press ENTER to move the cursor to a lower menu as follows.

```
TEST>DTE D&I RemDTE NearLB RemLB V54 PAT
RemDTE>ACTIVATE DEACTIVATE
```

To activate a remote V54 loopback, first move the cursor to ACTIVATE. Then, press ENTER to move the cursor to the lower line of the display and select a desired DTE port for remote loopback operation, such as DTE1, DTE2, DTE3, DTE4. To deactivate the remote V54 loopback, first move the cursor to DEACTIVATE and do the same as above. This V54 test uses a V.54 Loopback protocol. See ANSI T1.403-1995 Annex B for details. If the remote facility responds to this command a "LOOPED" message will be shown in the lower left corner of the LCD display. Otherwise, a "NOLOOP" message is shown.

```
V54>ACTIVATE DEACTIVATE
DTE1 DTE2 DTE3 DTE4
```

5.7.7.1 QRSS Menu

The QRSS menu is used to perform QRSS (Quasi Random Signal Sequence) tests. The QRSS test channel is selected from a grouping of designated DTE1, DTE2, DTE3, DTE4, D&I, idle channels, or all 24 DS0 channels. The current selection is high lighted by an asterisk (*). OFF indicates that the QRSS test is off. To change this, press ENTER to move the cursor to the lower line of the display. Then move the cursor to the desired selection and press ENTER. When QRSS is activated, the lower line of the display shows the results of pattern synchronization, targeted DTE channel, and an error count.

```
PATTERN>*QRSS 3-IN24 1-IN-8 2-IN-8 1:1
*OFF FULL DTE1 DTE2 D&I IDLE
```

If the received signal is not a QRSS pattern, "QRSS UNSYNC" is shown in the lower left corner of the LCD display. Otherwise, "QRSS SYNC" is shown and a bit error count is displayed which counts each individual error. The QRSS test port is shown in the LCD display as well. User may use the ADV Right key to inject single bit error and the ADV Left key to reset the error counter, The 'SELECT' key ends the QRSS test.

5.7.7.1 Test Pattern Menu

The test pattern menu is used to transmit on all 24 channels to the T1 line. Four test patterns, inclusive of 3-in-24, 1-in-8, 2-in-8 and 1:1 are available. To select a pattern, move the cursor to the desired pattern and press ENTER, which moves the cursor to the lower line of the display. To activate pattern transmission, move the cursor to SEND and press ENTER. To terminate, press the SELECT key.

```
PATTERN>QRSS 3-IN24 1-IN-8 2-IN-8 1:1
          *OFF SEND
```

5.8 Alarm Menus

Alarm menus are used to view the alarm queue and alarm history, to clear the alarm queue, alarm history, and alarm relay, as well as setup alarm thresholds, etc. The following illustrates alarm menu handling.

```
ALARM>QUEUE HISTORY CLEAR SETUP
QUEUE>1 2 3 4 5 6 7 8 9 10(Last 10 alarm)
```

5.8.1 Queue Menu

The Queue menu shows the alarm queue of the last 10 alarms. To view any one of the ten queue alarms, move the cursor to the queue number. The alarm status is shown on the lower line of the display. In the following example, the lower left corner contains "AIS, D&I". The first part shows the alarm type, AIS (Alarm Indication Signal). The second part shows where the alarm occurred (D&I port). The time and date of the alarm are shown on the same line.

```
ALARM>1 2 3 4 5 6 7 8 9 10(Last 10 alarm)
"AIS,D&I" 18:22:34 03/03/93
```

5.8.2 History Menu

```
ALARM>QUEUE HISTORY CLEAR SETUP
HISTORY>NEXT PREVIOUS
```

The History menu shows alarm history of the various types of alarms as shown in Table 3.5. To view the alarm history, press ENTER to move to the following display. Then move the cursor to NEXT or PREVIOUS and press ENTER to scroll to the next or previous alarm history. In the following example, the first part "MAST-CLK LOSS" indicates a master clock loss. The second part "OK" shows the current status. The last part "0" is the total error count.

```
HISTORY>NEXT PREVIOUS
"MAST-CLK LOSS" OK 0
```

5.8.3 Clear Menu

The Clear menu is used to clear alarm queues and histories. To clear an alarm queue and history press ENTER. Otherwise, press SELECT and exit without taking any action.

```
ALARM>QUEUE HISTORY CLEAR SETUP
ALARMS
```

5.8.4 Setup Menu

```
ALARM>QUEUE HISTORY CLEAR SETUP
SETUP>NEXT PREVIOUS EDIT
```

The Setup menu is used to set up alarm relays and auto dial out functions. To set up these functions, press ENTER to move to the following display. Then, move the cursor to NEXT or PREVIOUS and press ENTER to view each alarm type. To edit the threshold level, alarm relay, and dial out functions, move the cursor to EDIT and press ENTER.

```

SETUP>NEXT PREVIOUS EDIT
"MAST-CLK LOSS" EN RELAY-EN DIAL-EN
  
```

5.8.4.1 Edit Menu

The Edit menu is used to set the threshold level of each alarm type listed in Table 3.5, and enable the alarm relays and auto dial out functions. Some types of alarms do not have a threshold level.

To change the threshold level of ES, UAS, and CSS, move the cursor to the threshold level, as in the following display, and press ENTER. Then, move the cursor to U to increase or D to decrease the corresponding (100), (10), and (1) digits. The threshold level count is updated each time ENTER is pressed. This operation must be concluded by entering YES to enable the changes.

```

EDIT> "UAS,D&I" 001 EN RELAY-EN DIAL-EN
(100)U D (10)U D (1)U D YES
  
```

To change the threshold level of BPV, move the cursor to the threshold column and press ENTER to move to the lower line of the display. The current selection is highlighted by an asterisk (*). To change the selection, move the cursor to the desired selection and press ENTER.

```

EDIT>"BPV,LINE" 10E-5 DI RELAY-DI DIAL-EN
*5 6 7 8 9
  
```

EN or DI enables or disables the alarm error count. RELAY-EN or RELAY-DI enables or disables the alarm relay that is activated when an alarm occurs or an error count exceeds a specific level. DIAL-EN or DIAL-DI enables or disables the dial out function that is activated when an alarm occurs or an error count exceeds a threshold level. To change these parameters, press ENTER to move the cursor to the lower line of the display. Then move the cursor to the desired function and press ENTER.

```

EDIT>"AIS,D&I" EN RELAY-DI DIAL-EN
*DISABLE ENABLE
  
```

Disabling an alarm reporting function automatically disables the relay and modem dial out features, even if these features are individually enabled.

5.9 Communication Menus

Communication menus are used to configure the supervisory port. Configuration options are data rate, data bits, stop bits, parity bit, XON-XOFF control, interface type, and SNMP control as described in the following paragraphs.

The front panel must be used to set up the Supervisory port interface type.

5.9.1 Baud Menu

The baud menu shows the current data rate by placing an asterisk (*) by the selected option. To change the communications data speed, move the cursor to the desired selection and press ENTER. All numbers are in bps (bits per second).

```

COMM>BAUD DATA STOP PAR XON INTERF IP
      *38400 19200 9600 2400 1200
    
```

5.9.2 Data Menu

The Data menu shows the current data bit length by an asterisk (*) next to the selected length. To change the data bit length, move the cursor to the desired selection and press ENTER.

```

COMM>BAUD DATA STOP PAR XON INTERF IP
      *8 7
    
```

5.9.3 Stop Menu

The Stop menu shows the current stop bit value by placing an asterisk (*) by the selected option. To change the stop bit value, move the cursor to the desired selection and press ENTER.

```

COMM>BAUD DATA STOP PAR XON INTERF IP
          *1 2
  
```

5.9.4 Parity Menu

The Parity menu shows the current parity bit option by placing an asterisk (*) by the currently selected value. To change the data parity option, move the cursor to the desired selection and press ENTER.

```

COMM>BAUD DATA STOP PAR XON INTERF IP
          *NONE EVEN CDD
  
```

The user MUST use the front panel to set up the supervisory port configuration properly in order to use the terminal and modem mode.

5.9.5 XON Menu

The XON menu shows the current XON-XOFF flow control status: Either “ON” or “OFF”. An asterisk (*) is placed by the currently selected setting. To change the setting, move the cursor to the desired setting and press ENTER.

```

COMM>BAUD DATA STOP PAR XON INTERF IP
          *OFF ON
  
```

5.9.6 Interface Menu

The Interface menu shows the current supervisory port interface type (either terminal, modem or SNMP-SLIP) by placing an asterisk (*) by the selected setting. To change the setting, move the cursor to the desired selection and press ENTER. In modem mode, a modem initialization routine is run to establish the connection. The initialization routine must be run each time the modem is installed.

```

COMM>BAUD DATA STOP PAR XON INTERF IP
          *TERMINAL MODEM
  
```

The SNMP selection is only available when the optional SNMP feature is purchased. Select the SNMP-SLIP option to enable the 1510 T1/FT1 CSU/DSU embedded SNMP agent operations.

```

COMM>BAUD DATA STOP PAR XON INTERF IP
      *TERMINAL MODEM *SNMP-SLIP
  
```

5.9.7 IP Menu (optional)

The IP menu allows users to modify the device IP address and the IP address used by the SNMP trap message.

```

COMM>BAUD DATA STOP PAR XON INTERF IP
      IP>MY-IP-ADDR TRAP-IP-ADDR
  
```

Each IP address can be modified by moving the cursor to the desired position and selecting a number. After making all changes, select YES to save the changes.

```

IP>MY-IP-ADDR TRAP-IP-ADDR
  
```

```

MY IP Address = 192.009.200.010
  
```

```

MY IP Address = 192.009.200.010 YES
0123456789
  
```

5.10 Date Menu

The Date menu shows the current date and time as in the following display. Use U to increase and D to decrease the corresponding (M) for month, (D) for day, (Y) for year, (H) for hour, (M) for minute, and (S) for second. This operation must be concluded by entering YES to enable the changes.

```

DATE>03/16/93 18:30:23
(M)U D(D)U D(Y)U D(H)U D(M)U D(S)U D YES
  
```

5.11 Lock Menu

The Lock menu is used to control LCD panel operation. Normally, the configuration can be changed from the front panel. Front panel configuration changes can be disabled by selecting LOCK MENU to disable the front panel. With a locked front panel, the user still can interact to obtain the configuration information and line status.

```
LOCK>front panel and password
*DISABLE ENABLE
```

To disable the front panel lock, users must enter a password. Use ADV left or ADV right keys to select a character. There are 66 possible characters to choose from. Password modification can only be done using terminal operation.

```
Enter password: _____
0123456789ABCDEFGHIJKLMNPOQRSTUVWXYZ! "#$
```

Move the cursor to the right of \$ for more characters.

```
Enter password: _____ YES
%&'()*+,-,/:<=>?@[ ]^`{|}
```

5.12 Miscellaneous Menus

5.12.1 Error-Code Menu

The Error-code menu shows error codes and error descriptions as in the following examples. Table 3-8 lists error codes and error messages.

```
MISC>ERROR CODE PERFORMANCE STATUS
ERROR_CODE>1 2 3 4 5 6 7 8 9 10 11
```

```
ERROR_CODE>1 2 3 4 5 6 7 8 9 10 11
ERR01:A loopback is in effect
```

5.12.2 Performance Menu

The Performance menu shows the total performance registers of the user group and resets the registers.

```
MISC>ERROR CODE PERFORMANCE STATUS
PERF>USER RESET
```

User performance registers are shown and updated every second.

```
USER>ES UAS BES SES CS LOFC BPV
      0  1  0  0  0  0  0
```

Select the reset menu to reset the user performance registers. Enter YES to confirm the action.

```
PERF>USER RESET
      Clear Performance Data ? YES
```

5.12.3 Status Menu

The Status menu shows the line status and D&I status if equipped.

```
STATUS>LINE D&I
      Show Line Status
```

The status is shown and updated every second. An asterisk (*) marks the status. The following example shows a detected LOS (Loss of Signal).

```
LINE>LOS LOF RED YEL AIS BPV
      *
```

6.0 Terminal Operations

The 1510 T1/FT1 CSU/DSU provides comprehensive reporting and enhanced configuration capability through the supervisory port. A VT100 type terminal or a modem can be connected to the supervisory port on the back of the 1510 T1/FT1 CSU/DSU. Using single-character commands and arrow keys, the 1510 T1/FT1 CSU/DSU can be configured and monitored. The single-character commands are not case sensitive. On each screen, the available commands and the configurable fields are highlighted. Alarm messages are also sent to the supervisory port and are shown blinking on the top of the screen. When the 1510 T1/FT1 CSU/DSU is powered on, a main menu is shown.

NOTE: On the upper right corner of the screen, a time-of-day display indicates the time the current screen was shown. Users may press any key other than ESC to update the screen.

NOTE: Far-end operation is accessible only in ESF frame format mode.

```

1510 T1/FT1 CSU/DSU V1.5      === Main Menu ===      10:50:45 01/11/94
[DISPLAY]                    [SETUP]
1  -> 1-Hour Perf. Report
2  -> 24-Hour Perf. Report
A  -> Line Availability
C  -> 1510 System Setup
D  -> 1510 Description
E  -> ESF Error Count
H  -> Alarm History
I  -> 1510 Status
Q  -> Alarm Queue           [CLEAR & RESET]
[ACCESS]
F  -> Log Off [SETUP] and
   [CLEAR & RESET] menu
O  -> Log On [SETUP] and
   [CLEAR & RESET] menu

>>Enter Command ?

```

If the terminal screen is illegible, press the "Enter↵" key and "Esc" key alternatively to bring up the main menu. If all efforts fail, make sure the proper cable has been used and the supervisory port parameter settings match the terminal settings. This can be done via the front panel "COMM" command.

The main menu consists of four groups of commands: Display, Access, Setup and Clear & Reset. Initially, only the Display and the Access commands are available. To view Setup and the Clear commands, the user must log on using the "O" command.

```

1510 T1/FT1 CSU/DSU V1.5      === Main Menu ===      10:51:45 01/11/94

[DISPLAY]                    [SETUP]
1  -> 1-Hour Perf. Report    L  -> Loopback Test
2  -> 24-Hour Perf. Report  M  -> Alarm Setup
R  -> Line Availability      P  -> Password Setup
C  -> 1510 System Setup     R  -> Retrieve Last Stored Configuration
D  -> 1510 Description      S  -> System Setup
E  -> ESF Error Count       T  -> Change Date and Time
H  -> Alarm History         V  -> Store Current Configuration
I  -> 1510 Status          W  -> Send Active DSO-MAP to Far-end
Q  -> Alarm Queue          N  -> Synchronize Far-end System Time
[ACCESS]                    [CLEAR & RESET]
F  -> Log Off [SETUP] and   B  -> Reset Alarm Relay
    [CLEAR & RESET] menu    U  -> Clear Alarms
O  -> Log On [SETUP] and   X  -> Clear ESF Error Count
    [CLEAR & RESET] menu    Y  -> Clear Performance Data
Z  -> System Reset

>>Enter Command?

```

6.1 One Hour Performance Report

To show the 1 hour performance reports, enter "1". A prompt asking for the type of report is shown at the bottom of the screen. Four choices are available.

```

>>Select Register Type? *USER LINE D&I FAR-END { <- , -> , ENTER }

```

NOTE: Far-end one hour and twenty-four hour performance reports do not display frame format, line code, and interface type, such as ESF, AMI, and DS-1.

Use the cursor keys to select a desired type of report and press the "Enter↵" key to view the report as follows.

```

=== 1-Hour Performance Report ===                               10:52:45 01/11/94
USER D4 AMI DS-1
-- Valid Seconds in Current 15-Min Interval : 103 seconds
      (ES)   (UAS)   (BES)   (SES)   (CSS)   (LOFC)
Current 15-Min Interval :      0      0      0      0      0      0
1st Nearest 15-Min Interval :      0      0      0      0      0      0
2nd Nearest 15-Min Interval :      0      0      0      0      0      0
3rd Nearest 15-Min Interval :      0      0      0      0      0      0
4th Nearest 15-Min Interval :      0      0      0      0      0      0
-- Valid 15-Min Intervals in Current 24-Hour Interval : 96
      (ES)   (UAS)   (BES)   (SES)   (CSS)   (LOFC)
Current 24-Hour Interval :      0      0      0      0      0      0

<< Press ESC key to return to Main Menu >>

```

The Second line of the screen shows the type of performance register set, frame format type, line code type, and line type of the current report.

6.2 Twenty-Four Hour Performance Report

To show the 24 hour performance report, enter "2". A prompt asking for the type of report and performance data is shown at the bottom of the screen.

```

>>Select Register Type? *USER LINE D&I FRM-END ( <- , -> , ENTER )
>>Select Perf Para.? *ES UAS BES SES CS LOFC ( <- , -> , ENTER )

```

Use the cursor keys to select a desired type of report and press the "Enter,␣" key to view the report as follows.

```

=== 24-Hour Performance Report ===                               10:53:45 01/11/94
USER ES D4 AMI DS-1
-- Valid Seconds in Current 15-Min Interval : 105 seconds
      (ES)   (UAS)   (BES)   (SES)   (CSS)   (LOFC)
Current 15-Min Interval :      0      0      0      0      0      0
-- Valid 15-Min Intervals in Current 24-Hour Interval : 96
      (ES)   (UAS)   (BES)   (SES)   (CSS)   (LOFC)
Current 24-Hour Interval :      0      0      0      0      0      0
-- USER, ES, Last 96 15-Min Interval :
01-08 >      0      0      0      0      0      0
09-16 >      0      0      0      0      0      0
17-24 >      0      0      0      0      0      0
25-32 >      0      0      0      0      0      0
33-40 >      0      0      0      0      0      0
41-48 >      0      0      0      0      0      0
49-56 >      0      0      0      0      0      0
57-64 >      0      0      0      0      0      0
65-72 >      0      0      0      0      0      0
73-80 >      0      0      0      0      0      0
81-88 >      0      0      0      0      0      0
89-96 >      0      0      0      0      0      0

<< Press ESC key to return to Main Menu >>

```

The Second line of the screen shows the type of the performance register set, performance register, frame format type, line code type and line type of the current report.

6.3 Line Availability Report

To show the line availability report, enter "A". The information, based on the user performance register set, includes the valid seconds, available seconds, unavailable seconds and the line availability.

```

=== Line Availability during Last 24-Hour ===                               10:54:45 01/11/94
Valid seconds : 86400 seconds
Available Seconds : 86400 seconds
Unavailable Seconds : 0 seconds
Line Availability : 100.0 %

<< Press ESC key to return to Main Menu >>

```

6.4 System Setup Report

To show the system configuration report, enter "C". A prompt asking for the type of report will appear at the bottom of the screen.

```

>>Select Type? *LOCAL STORED FAR-END ( <- , -> , ENTER )

```

Use the cursor keys to select a desired type of report and press the "Enter.␣" key to view the report as follows.

6.6 ESF Error Count Report

To show the ESF error report, enter "E". A prompt asking for the type of report will appear at the bottom of the screen.

```
>>Select Register Type? *USER LINE D&I FAR-END ( <- , -> , ENTER )
```

Use the cursor keys to select a desired type of report and press "Enter.␣" key to view the report as follows.

```

=== ESF Error Count ===                                10:57:07 01/11/94
USER
Start Time : 15:30:58 04/25/93
ESF Errors : 10

<< Press ESC key to return to Main Menu >>

```

For the user and D&I performance register set, the ESF error count is the number of ESF error since the reset of the ESF error count command [x] or the Clear Performance Data Command [y] was executed.

6.7 Alarm History Report

To show the alarm history report, enter "H". A prompt asking for the type of alarm history report will appear at the bottom of the screen.

```
>>Select Type? *LOCAL FAR-END ( <- , -> , ENTER )
```

Use the cursor keys to select a desired type of report and press the "Enter.␣" key to view the report as follows.

```

=== Alarm History Report ===
LOCAL Start Time = 10:50:51 10/27/93
(ALARM-TYPE) (THRESHOLD) (CUR-STA) (COUNT) (ALARM) (RELAY) (DIALOUT)
MAST-CLK LOSS OK 0 ENABLE ENABLE ENABLE
YEL,LINE OK 0 ENABLE ENABLE ENABLE
AIS,LINE OK 0 ENABLE ENABLE ENABLE
LOS,LINE OK 0 ENABLE ENABLE ENABLE
LOF,LINE OK 0 ENABLE ENABLE ENABLE
BPV,LINE 10E-5 OK 0 ENABLE ENABLE ENABLE
RS,LINE 1 OK 0 ENABLE ENABLE ENABLE
UAS,LINE 1 OK 0 ENABLE ENABLE ENABLE
CS,LINE 1 OK 0 ENABLE ENABLE ENABLE
DTE1 ALARM OK 0 ENABLE ENABLE ENABLE
DTE2 ALARM OK 0 ENABLE ENABLE ENABLE
DTE3 ALARM OK 0 ENABLE ENABLE ENABLE
DTE4 ALARM OK 0 ENABLE ENABLE ENABLE
YEL,D&I OK 0 ENABLE ENABLE ENABLE
AIS,D&I OK 0 ENABLE ENABLE ENABLE
LOS,D&I OK 0 ENABLE ENABLE ENABLE
LOF,D&I OK 0 ENABLE ENABLE ENABLE
BPV,D&I 10E-5 OK 0 ENABLE ENABLE ENABLE
RS,D&I 1 OK 0 ENABLE ENABLE ENABLE
UAS,D&I 1 OK 0 ENABLE ENABLE ENABLE

<< Press ESC key to return to Main Menu >>

```

6.8 System Status Report

To show the 1510 T1/FT1 CSU/DSU status report, enter "I". A prompt asking for the type of system status report will appear at the bottom of the screen.

```

>>Select Type? *LOCAL FAR-END ( <- , -> , ENTER )

```

Use the cursor keys to select a desired type of report and press the "Enter.␣" key to view the report as follows.

```

=== 1510 Status Display ===                                10:58:46 01/11/94
LOCAL
-- LINE --
  LOS      : No
  LOF      : No
  RCV AIS  : No
  RCV YEL  : No
  XMT AIS  : No
  XMT YEL  : YES
  BPV ERROR COUNT : 1536
  ES ERROR COUNT : 2376
-- dten --
  DTE1 RTS LOSS : No
  DTE2 RTS LOSS : No
  DTE3 RTS LOSS : No
  DTE4 RTS LOSS : No
  DTE1 CLOCK LOSS : No
  DTE2 CLOCK LOSS : No
  DTE3 CLOCK LOSS : No
  DTE4 CLOCK LOSS : No
-- D&I --
  LOS      : No
  LOF      : No
  RCV AIS  : No
  RCV YEL  : No
  XMT AIS  : NO
  XMT YEL  : NO
  BPV ERROR COUNT : 0
  ES ERROR COUNT : 0
-- TEST --
  PATTERN TRANSMITTED : OFF
  QRSS CHANNEL        : OFF
  NEAR-END LOOPBACK   : OFF
  DTE1 LOOPBACK       : TO-DTE
  DTE2 LOOPBACK       : OFF
  DTE3 LOOPBACK       : TO-LINE
  DTE4 LOOPBACK       : OFF
  D&I LOOPBACK        : TO-LINE

<< Press ESC key to return to Main Menu >>

```

In the example, the DTE1 port is looping back the DTE port signal to the DTE, DTE3 and the D&I port is looping back the incoming PCM signal to the line. The yellow alarm is being sent out to the line.

6.9 Alarm Queue Report

To show the alarm queue report, enter "Q".

```

=== Alarm Queue ===                                       10:59:12 01/11/94
1st nearest alarm -- "LOS,D&I      " 08:13:22 04/29/93
2nd nearest alarm -- "AIS,LINE     " 11:37:31 04/28/93
----- Page 1 -----

<< Press ESC key to return to Main Menu >>

```

The latest 40 alarm entries are shown on the terminal, in two pages of 20 entries each. If there are more than 20 entries, press any key other than "ESC" to view the second page. To return to the main menu, press the "ESC" key.

6.10 Logoff

After completing the system setup or clearing the history data, users should log off to prevent accidentally changing the system configuration. Enter "F" to logoff.

6.11 Logon

To show a full menu, users must logon by pressing "O". If the password option is turned on, a prompt asking for a password will be shown.

```
==>> Enter Password ?
```

If a valid password is entered, the full menu is shown, otherwise the user is asked to enter the correct password again.

```
>>Invalid Input of Password ! Try Again ? [y/n]
```

6.12 Loopback Test Menu

To enter the loopback test menu, enter "L". To initiate a loop back test, select the desired options and press the enter "Enter.␣" key. The loop back tests can be performed simultaneously on the T1 line, DTE ports and D&I port. At the bottom of the screen, information about the loop back test is shown.

```
=== Loopback Test Menu ===  ARROW KEYS: CURSOR MOVE, ENTER: SELECT  11:02:12 01/11/94
- NEAR-END LOOPBACK : *OFF LOCAL PLB LLB
- DTE1 LOOPBACK      : *OFF TO-DTE TO-LINE
- DTE2 LOOPBACK      : *OFF TO-DTE TO-LINE
- DTE3 LOOPBACK      : *OFF TO-DTE TO-LINE
- DTE4 LOOPBACK      : *OFF TO-DTE TO-LINE
- D&I LOOPBACK       : *OFF TO-DTE TO-LINE
- SEND LOOPBACK ACTIVATE CODE TO FAR-END :
  *IN-BAND RT&t-P ANSI-P ANSI-L
- SEND LOOPBACK DEACTIVATE CODE TO FAR-END :
  *IN-BAND RT&t-P ANSI-P ANSI-L
- SEND CHANNEL LOOPBACK ACTIVE CODE TO FAR-END :
  *ALL DTE1 DTE2 DTE3 DTE4 D&I
- SEND V54 LOOPBACK ACTIVATE CODE TO FAR-END :
  *DTE1 DTE2 DTE3 DTE4
- SEND V54 LOOPBACK DEACTIVATE CODE TO FAR-END :
  *DTE1 DTE2 DTE3 DTE4
- SEND QRSS :
  *OFF FULL DTE1 DTE2 DTE3 DTE4 D&I IDLE
- SEND TEST PATTERN :
  OFF 3-IN-24 1-IN-8 2-IN-8 1:1

<< Press ESC key to return to Main Menu >>
```

To initiate the QRSS test, choose the test port(s) and press ENTER. When QRSS pattern synchronization is acquired, a bit error counter, an errored second counter, and an elapsed second counter are displayed on the terminal. Press the right arrow key to inject an error, the left arrow key to reset the counters, or the ESC key to terminate the QRSS test. In order for the QRSS BERT to work, a far-end loopback (compatible with the type of QRSS pattern selected), or other means of returning the transmitted pattern back to the Line port receiver, must be active. (This restriction does not apply to the other test pattern diagnostics.)

```
Status : QRSS SYNC , CHANNEL=FULL, BIT ERR= 65535
          ERROR SECONDS= 20 , ELAPSED SECONDS= 139027
```

To transmit a test pattern continuously, choose one of the 4 patterns and press the "Enter" key to start the test. Enter "ESC" key to stop the test.

```
Status : "Transmitting 3-in-24 test pattern"
```

6.13 Alarm Setup Menu

To enter the alarm setup menu, enter "M". A prompt asking for the type of alarm setup menu will appear at the bottom of the screen.

```
>>Select Type? *LOCAL FAR-END ( <- , -> , ENTER )
```

For each type of alarm, three setups are available. "ALM" is used to enable or disable the alarm register counter. "DIAL" and "RELAY" activates or deactivates the alarm reporting functions. When an alarm exceeds its threshold, DIAL is used to dial out from the supervisory port and RELAY is used to engage the alarm relay.

```
=== Local Alarm Setup ===                               11:48:48 01/11/94
ARROW KEYS : CURSOR MOVE , TAB : ROLL-UP , ROLL-DOWN

(TYPE)      (THRESHOLD) (ALM) (RELAY) (DIAL)  (TYPE) (THRESHOLD) (ALM) (RELAY) (DIAL)
MAST-CLK LOSS      DIS  DIS  DIS  DTE2 ALARM      EN  EN  DIS
YEL,LINE           EN  EN  EN  DTE3 ALARM      EN  EN  EN
AIS,LINE           EN  EN  EN  DTE4 ALARM      EN  EN  EN
LOS,LINE           EN  EN  EN  YEL,D&I         EN  EN  EN
LOF,LINE           EN  EN  EN  AIS,D&I         EN  EN  EN
BPV,LINE           10E-5 EN  EN  EN  LOS,D&I         EN  EN  EN
ES,LINE            1    EN  EN  EN  LOF,D&I         EN  EN  EN
UAS,LINE           1    EN  EN  EN  BPV,D&I         10E-5 EN  EN  EN
CS,LINE            1    EN  EN  EN  ES,D&I          1    EN  EN  EN
DTEL ALARM         EN  EN  EN  UAS,D&I         1    EN  EN  EN

<< Press ESC key to return to Main Menu >>
```

NOTE: Disabling an alarm automatically inhibits DIAL OUT and RELAY, even if DIAL OUT and RELAY are enabled.

6.14 Password Setup Menu

To change the password setup, enter "P". A prompt asking for action is shown.

```
=== Password Setup ==                               10:42:58 01/11/94
Password ? *DISABLE ENABLE CHANGE ( <- , -> , ENTER )
```

To enable the password, select "ENABLE". The previously entered password is used. The password itself is not case sensitive. If you want to select your own password, select "CHANGE". A prompt asking for the original password and a new password are shown.

```
Enter CURRENT Password:
Enter NEW Password:
Re-Enter NEW Password:
```

6.15 Retrieve Last Stored Configuration

If configuration changes cause unexpected problems, enter "R" to restore the user stored configuration. The system will prompt the following message. Enter "y" to retrieve, and "n" to quit.

```
=>> Retrieve Last Stored Configuration (y/n)?
```

6.16 System Setup Menu

Enter "S" to show and configure the 1510 T1/FT1 CSU/DSU. A prompt asking for the type of system setup menu appears at the bottom of the screen.

```
>>Select Type? *LOCAL FAR-END ( <- , -> , ENTER )
```

The cursor keys are used to select the field to be changed. As the cursor moves from field to field, the second line on the screen shows available inputs for the field. After making all the changes, press the "Esc" key and answer yes to make the changes.

NOTE: Certain settings cannot be modified in the FAR-END System Setup menu (e.g., D&I frame format can be changed, but Line frame format cannot be changed).

```

=== Local System Setup ===                               10:45:26 01/11/94
ARROWKEYS: CURSOR MOVE, TAB: ROLL-UP

DSO-MAP: ACTIVE MAP = MAP1                               CH:02
MAP1=[idd11112222233444444444iii]   MAP2=[idddddd11111111111111111111iii]
SWITCH TIME = MAP1 00:00-12:00 MAP2 12:00-00:00
LINE:FRAME=D4      CODE=AMI  LEO=0.0  YEL=ON  INBAND=ON  ADDR=CSU  IDLE=FF
D&I :FRAME=D4      CODE=AMI  EQU=0-133  <MAP1> 2: 128K  <MAP2> 8: 512K
(RATE) <MAP1>    <MAP2>    (CLOCK) (DATA) (INTERFACE) (RTS) (TTM)
DTE1: 64K      4: 256K 12: 768K  NORMAL  NORMAL  RS449  ACTIVE  OFF
DTE2: 64K      6: 384K 0: OK    NORMAL  NORMAL  RS449  ACTIVE  OFF
DTE3: 56K      2: 112K 0: OK    NORMAL  NORMAL  RS449  ACTIVE  OFF
DTE4: 64K      6: 384K 0: OK    NORMAL  NORMAL  RS449  ACTIVE  OFF
MAST-CLOCK: INTERN 2nd-CLOCK:LINE EXT-FREQ: 1.544Mbps CURRENT=MAST-CLOCK
RS-232 PORT: BAUD=9600 DATA=8 STOP=1 PAR=NONE XON-XOFF=OFF INTERF=TERMINAL
DIAL-OUT SETUP:
PRIMARY DIALSTRING: RTDT (32 char)
START TIME 08:00 STOP TIME 07:59
SECONDARY DIALSTRING: RTDT (32 char)
START TIME 08:00 STOP TIME 07:59
INACTIVITY TIMEOUT: 000 MINUTES
DEVICE NAME: 1510-01 (20 char)
MY IP ADDRESS :192.009.200.010 COMMUNITY NAME: public (12 char)
TRAP IP ADDRESS:255.255.255.255

<< Press ESC key to return to Main Menu >>

```

6.17 Change Date and Time

Enter "T" to change the system date and time. The date and time are shown with the cursor on the hour field. Use the arrow keys to select the field to be changed and enter the correct information.

```

22:17:02 05/05/93 { <- , -> : CURSOR MOVE , 0-99 : INPUT }

```

Press the "ESC" key after making the necessary changes and confirm the changes with "y". Input is checked for validity. Invalid information is discarded and the original values are shown.

```

>>Save DATE & TIME Setup (y or n) ?

```

6.18 Store Current Configuration

Enter "v" to save the working configuration to the user stored configuration so that it can be retrieved using the "r" command. The system will prompt the following message. Enter "y" to store, and "n" to quit.

```

=>> Store Current Configuration (y/n)?

```

6.19 Send Active DS0 Map to Far-end

Enter the "W" command to send the current active DS0 map information to the far-end 1510 T1/FT1 CSU/DSU. Since the notification procedure is implemented in a proprietary format, only the 1510-2X/1510-4X CSU/DSU product family will interpret the message correctly. The 1510 T1/FT1 CSU/DSU has to be in ESF frame format mode to send the active DS0 map to the far-end. An "ACK" or "FAIL" is shown depending on the far-end's acceptance or rejection of the DS0 map.

```
=>> Send Active DS0-MAP to Far-end ... ACK
```

6.20 Synchronize Far-end System Time

Enter the "N" command to synchronize the far-end 1510 T1/FT1 CSU/DSU system time's minutes and seconds. Due to time zone differences, hours are not updated by this command. Since the notification procedure is implemented in proprietary format, only the 1510-2X/1510-4X CSU/DSU product family will interpret the message correctly. An "ACK" is shown if the far-end acknowledges this command; otherwise, a "FAIL" is shown.

```
=>> Synchronize Far-end System Time .ACK
```

6.21 Reset Alarm Relay

Enters the "B" command to reset the ACO LED and the alarm relay.

6.22 Clear Alarms

Enter "U" to clear alarm history and queues.

6.23 Clear ESF Error Count

Enter "X" to reset the user and D&I ESF error counters. The ESF error count start time is reset. See Table 3.7 for what reports will be cleared.

6.24 Clear Performance Data

Enter "Y" to reset the user and D&I performance registers. This command does not affect the contents of the performance register set. This command includes the functions of "X". See Table 3.7 for what reports will be cleared.

6.25 System Reset

Enter "Z" to reset the system without powering down the unit. When this command is issued, the system will restart from a basic initialization routine and perform all power-up diagnostic procedures. The system will prompt the following message and the user must enter a valid password to execute this command.

```
==>> Enter Password ?
```

Appendix A: Line Cables DTE & RS-232 Conversion Cable

The DTE conversion cable, part number 010-0086-3008, is a DB25M to DB37F RS-449 conversion cable as shown in Table a.1. Part number 010-0086-2001 is a DB25M to M34F v.35 conversion cable as shown in Table a.2. These cables can be ordered in special lengths. The following lengths are available: 1 foot and 6 feet.

RS-232 conversion cable part number 010-0086-3010 is a DB9F to DB25M is shown in Table a.3.

The 1510 T1/FT1 CSU/DSU to network conversion cable, part number 010-0086-3014, is a DB15F to RJ48C conversion cable as shown in Table a.4. The 1510 T1/FT1 CSU/DSU to D&I DTE conversion cable, parts number 010-0086-3011, is a DB15M to DB15F conversion cable as shown in Table a.5. These also can be ordered in special lengths. The DB15F to Jumper Box conversion cable, part number 010-0086-3012 is 1 meter long and shown in Table a.6.

Table a.1 DB25M (Male) Connector to DB37F RS449 (Female) Connector Conversion Cable (DCE-DTE Shielded Cable)

DB25 Connector Pin Number	Signal	DB37F Connector Pin Number
1	Cable Shield	1
2	Transmit Data	4
3	Receive Data to DTE	6
4	RTS (Request to Send)	7
5	CTS (Clear to Send)	9
6	DSR (Data Set Ready)	11
7	Signal Ground	19
8	Data Carrier Detect	13
9	Receive Clock Return	26
10	Data Carrier Detect Return	31
11	External Clock Return	35
12	Transmit Clock Return	23
13	Clear to Send Return	27
14	Transmit Data Return	22
15	Transmit Clock	5
16	Receive Data Return	24
17	Receive Clock	8
18	Local Loopback	10
19	Request to Send Return	25
20	Unassigned	12
21	Unassigned	14
22	Data Set Ready Return	29
23	Unassigned	30
24	External Clock	17
25	Test Mode	18

**Table a.2 DB25M (Male) Connector to M34F v.35 (Female)
Connector Conversion Cable
(DCE-DTE Shielded Cable)**

DB25 Connector Pin Number	Signal	M34F Connector Pin Number
1	Cable Shield	A
2	Transmit Data	P
3	Receive Data to DTE	R
4	RTS (Request to Send)	C
5	CTS (Clear to Send)	D
6	DSR (Data Set Ready)	E
7	Signal Ground	B
8	Data Carrier Detect	F
9	Receive Clock Return	X
10	Data Carrier Detect Return	Unassigned
11	External Clock Return	W
12	Transmit Clock Return	AA
13	Clear to Send Return	Unassigned
14	Transmit Data Return	S
15	Transmit Clock	Y
16	Receive Data Return	T
17	Receive Clock	V
18	Local Loopback	Unassigned
19	Request to Send Return	Unassigned
20	Data Terminal Ready	H
21	Unassigned	Unassigned
22	Data Set Ready Return	Unassigned
23	Unassigned	Unassigned
24	External Clock	U
25	Test Mode	Unassigned

**Table a.3 DB9F (Female) to DB25M (Male)
Conversion Cable (RS232 Cable)**

DB25 Connector Pin Number	Signal	DB9F Connector Pin Number
1	Cable Shield	Unassigned
2	Transmit Data	3
3	Receive Data to DTE	2
4	RTS (Request to Send)	❖
5	CTS (Clear to Send)	❖
6	DSR (Data Set Ready)	★
7	Signal Ground	5
8	Data Carrier Detect	1
9	Receive Clock Return	Unassigned
10	Data Carrier Detect Return	Unassigned
11	External Clock Return	Unassigned
12	Transmit Clock Return	Unassigned
13	Clear to Send Return	Unassigned
14	Transmit Data Return	Unassigned
15	Transmit Clock	Unassigned
16	Receive Data Return	Unassigned
17	Receive Clock	Unassigned
18	Local Loopback	Unassigned
19	Request to Send Return	Unassigned
20	Data Terminal Ready	★
21	Unassigned	Unassigned
22	Data Set Ready Return	Unassigned
23	Unassigned	Unassigned
24	External Clock	Unassigned
25	Test Mode	Unassigned

- ❖ Pin 4 (RTS) and Pin 5 (CTS) of DB25 are connected;
- ★ Pin 6 (DSR) and Pin 20 (DTR) of DB25 are connected.

Table a.4 DB15F (Female) to RJ48C Jack Conversion Cable

DB15F Pin Number	Signal	RJ48C Pin Number
1	Transmit Tip	5
2	Transmit Ground	
3	Receive Tip	1
4	Receive Ground	
5	Unassigned	
6	Unassigned	
7	Unassigned	
8	Unassigned	
9	Transmit Ring	4
10	Unassigned	
11	Receive Ring	2
12	Unassigned	
13	Unassigned	
14	Unassigned	
15	Unassigned	

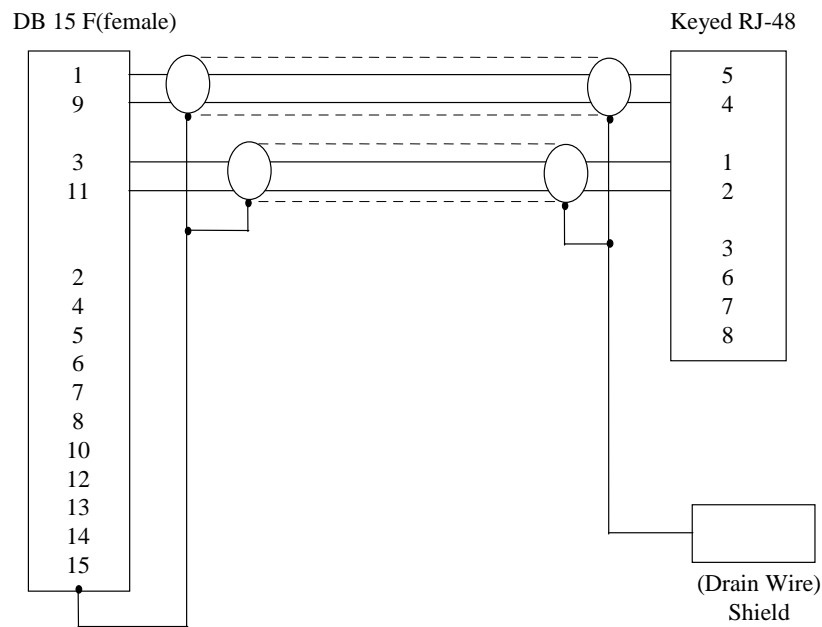


Figure a.4 DB15F-RJ48 Cable

Table a.5 DB15M (Male) to DB15F (Female) Conversion Cable

DB15M Pin Number	Signal	DB15F Pin Number
1	Transmit Tip	1
2	Transmit Ground	2
3	Receive Tip	3
4	Receive Ground	4
5	Unassigned	
6	Unassigned	
7	Unassigned	
8	Unassigned	
9	Transmit Ring	9
10	Unassigned	
11	Receive Ring	11
12	Unassigned	
13	Unassigned	
14	Unassigned	
15	Unassigned	

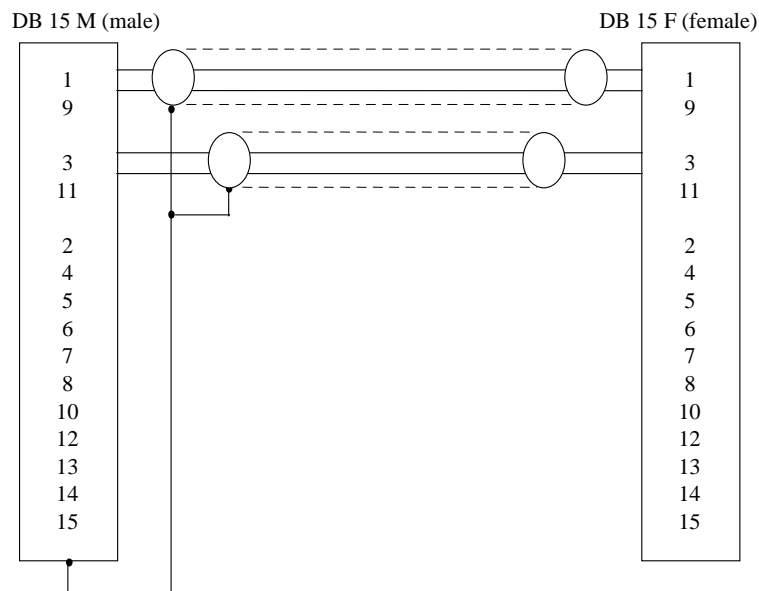


Figure a.5 DB15M-DB15F Cable

Table a.6 DB15F (Female) to Jumper Box Conversion Cable

DB15F Pin Number	Signal	Jumper Box Pin Number
1	Transmit Tip	TTIP
2	Transmit Ground	TGND
3	Receive Tip	RTIP
4	Receive Ground	RGND
5	Unassigned	Unassigned
6	Unassigned	Unassigned
7	Unassigned	Unassigned
8	Unassigned	Unassigned
9	Transmit Ring	TRING
10	Unassigned	Unassigned
11	Receive Ring	RRING
12	Unassigned	Unassigned
13	Unassigned	Unassigned
14	Unassigned	Unassigned
15	Unassigned	Unassigned

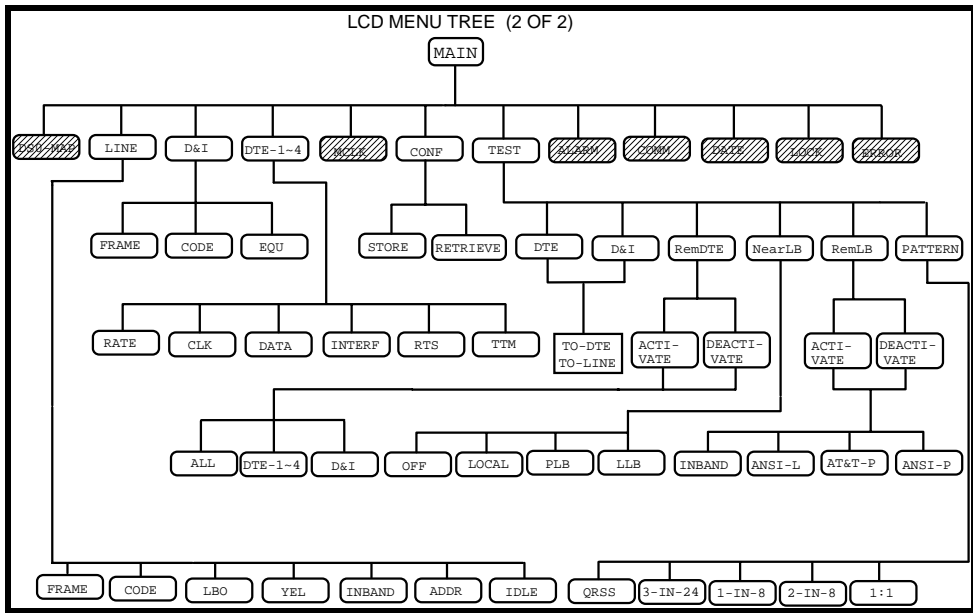
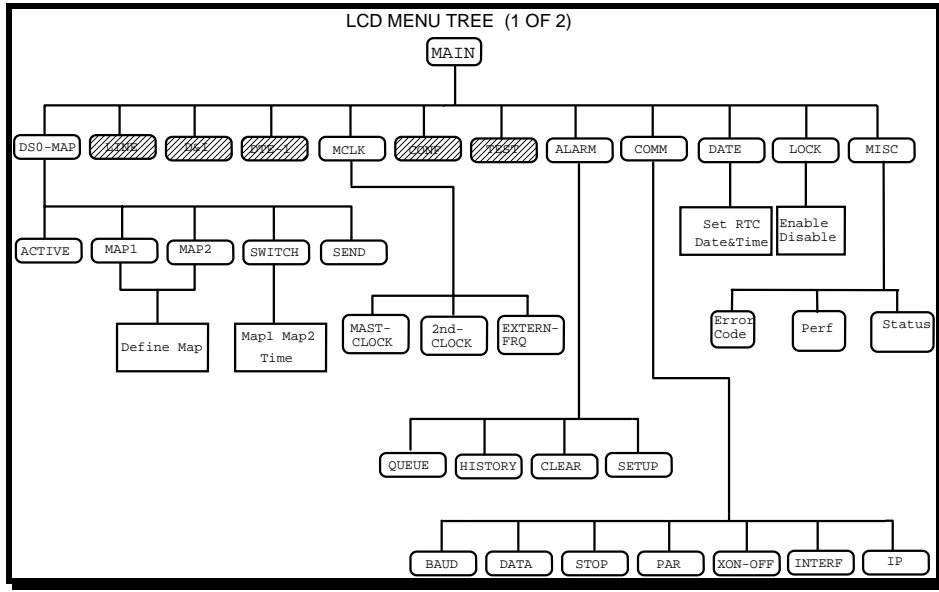
Appendix B: QRSS (Quasi-Random Signal Sequence)

QRSS Quasi-Random Signal Sequence, as defined in ANSI T1.403 - 1989, consists of a PRBS with 20-stage shift register modified to limit the maximum number of sequential zeros transmitted to 14. The QRSS generates every combination of 20-bit words, repeats every 1,048,575 bits and contains high density sequences, low density sequences, sequences that change from low density to high density, and vice versa. When framed, the QRSS meets the pulse density criteria that allows no more than 15 zeros in a sequence.

The pattern is generated in a twenty-stage register whose 17th and 20th stage outputs are added in a module-two addition stage, and the result fed back to the input of the first stage. An output bit is forced to be a ONE when the next 14 bits are all ZERO.

This test pattern can be used in conjunction with a local loopback to test local 1510 T1/FT1 CSU/DSU integrity. It can also be used in conjunction with a remote loopback to test remote 1510 T1/FT1 CSU/DSU and DS1 network line quality.

Appendix C: Front Panel Menu



Appendix D: Glossary of Abbreviations

A		N	
AIS	Alarm Indication Signal	NI	Network Interface
ANI	Alternate Mark Inversion		
ANSI	American National Standards Institute	O	
		OOF	Out of Frame
B		P	
B8ZS	Bipolar 8 Zero Substitution	PBX	Private Branch Exchanges
		PLB	Payload Loopback
C		PLL	Phase Lock Loop
CSU	Channel Service Unit		
CTS	Clear to Send	Q	
		QRSS	Quasi-Random Signal Sequence
D		R	
D&I	Drop and Insert	RTC	Real Time Clock
DACS	Digital Access Cross-Connect System	RTS	Request to Send
DSR	Data Set Ready		
DSU	Data Service Unit	S	
DTE	Data Terminal Equipment	SNMP	Simplified Network Management Protocol
DTR	Data Terminal Ready		
		T	
E		TE	Terminal Equipment
ESF	Extended Super Frame	TTM	Terminal Timing Mode
		W	
L		WAN	Wide Area Network
LAN	Local Area Network		
LBO	Line Build Out		
LLB	Line Loopback		
LOFS	Loss of Frame Sync		
LOS	Loss of Signal		

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One Year Limited Hardware Warranty

Raymar Information Technology, Inc., dba Raymar-Telenetics, warrants their products against defects in hardware, material and workmanship under normal use for one (1) year from the date of purchase. Raymar will, at no charge, either repair the product (with new or reconditioned parts), or replace it (with a new or reconditioned product). Repaired replacement products are warranted for either 90 days or the remainder of the original warranty period, whichever is longer. This warranty extends to the original end-user only.

What This Warranty Does Not Cover

This warranty does not cover: (a) software; (b) installation or service of the product; (c) conditions resulting from consumer damage such as improper maintenance or misuse, abuse, accident or alteration; (d) all plastic surfaces (including display screens) and all other exposed parts that are scratched or damaged due to normal use; (e) operation of our products with equipment not supplied by Raymar (f) products which have had the serial number removed or made illegible; or (g) products rented to others. This warranty applies only to hardware products manufactured by or for Raymar Information Technology, Inc. and identified by the Raymar-Telenetics trademark, trade name or product identification logo affixed to them. Refer to the Service and Support section of the User's Guide for service after the warranty expires. No warranty is made as to coverage availability or grade of service provided by the carrier.

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This warranty sets forth Raymar's entire hardware responsibilities regarding this product. Repair, replacement or refund of the purchase price is at Raymar's discretion. THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER EXPRESS WARRANTIES, IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND ARE LIMITED TO THE DURATION OF THIS LIMITED WARRANTY. IN NO EVENT SHALL RAYMAR BE LIABLE FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE PRODUCT, FOR ANY LOSS OF USE, LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS, LOST PROFITS OR SAVINGS, OR OTHER INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THIS RAYMAR PRODUCT, TO THE FULL EXTENT SUCH MAY BE DISCLAIMED BY LAW. WITHOUT LIMITING THE FOREGOING, RAYMAR SHALL HAVE NO LIABILITY FOR ANY DATA STORED IN OR USED WITH THE PRODUCT, INCLUDING THE RECOVERY COSTS OF SUCH DATA OR PROGRAMS.

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How To Use Raymar's Limited Warranty Service

To take advantage of this warranty, you must do the following:

- If you are having trouble with your product, contact Raymar service using the appropriate number from the Service and Support section of the User's Guide. If it is determined that your product requires service, you will be issued a Return Materials Authorization (RMA) form.
- Pack the defective product securely for shipping. Include only the units pre-approved by service on your RMA form.
- This warranty is void if the product is damaged in transit, you must insure your shipment.
- Ship the defective product, proof of date of purchase, and the RMA form to the address specified.
- Display your RMA number prominently on the outside of the shipping box. Customer is responsible for freight in, door to door. Raymar is responsible for return shipping costs.
- To ensure prompt service, please write on the RMA form a brief description of the problem you are experiencing with the product.

Raymar Information Technology, Inc.
7325 Roseville Road
Sacramento, CA 95842
Service Hotline (800) 747-1522

<http://support.telenetics.com> or e-mail to techsupport@raymarinc.com

Raymar Information Technology, Inc. Return Merchandise Authorization (RMA) Procedure

Before returning any Raymar-Telenetics product, an RMA number must be obtained.

The most convenient way to obtain an RMA number for a product purchased from Raymar-Telenetics is to call **1-800-747-1522 (+1-916-783-1951)**. When doing so, please have the following information ready:

- Company name
- Full billing address, as well as the address for the location where the product should be returned once repaired or replaced
- Telephone & Fax numbers
- Email address
- Product model number and serial number

For each item being returned, please include the product model number, the serial number, a description of the problem being encountered, and the cause of the problem (if known).

Please note that prior to authorizing a return, a product support specialist may call to verify that the product is properly installed or may ask you to perform tests to insure that the product has actually failed.

The product must be properly packed and returned to:

**Raymar-Telenetics
7325 Roseville Road
Sacramento, CA 95842**

The RMA number must be legibly displayed on the shipping carton. Raymar-Telenetics will not be responsible for any product returned without an RMA number.

If the product is out of warranty, estimates for repair rates and any applicable shipping costs will be communicated by a customer service representative. Currently, Raymar-Telenetics accepts purchase orders or credit cards as payment methods.

Repairs currently require 5 – 10 business days and are returned via UPS Ground.