MX2810

M13 Multiplexer
User Manual

Manual P/N 61185001L1-1C
CD P/N 32536153@A

4185001L1	MX2810 Chassis with two PSUs and two DS3 Controllers
4185001L2	MX2810 Chassis with two PSUs and one DS3 Controller
4185001L3	MX2810 Chassis with one PSU and two DS3 Controllers
4185001L4	MX2810 Chassis with one PSU and one DS3 Controller
1200287L1	Amp to Punch-Down Cable 25 ft.
1200287L5	Amp to Punch-Down Cable 50 ft.
1200287L7	Amp to Punch-Down Cable 100 ft.
1200291L1	Breakout Panel
1200291L5	BNC Patch Panel

61185001L1-1C
April 2003

Trademark Information

OpenView is a trademark of Hewlett-Packard Company.
Spectrum is a registered trademark of Cabletron.

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

FCC regulations require that the following information be provided in this manual:

1. This equipment complies with Part 68 of FCC rules. On the bottom of the equipment housing is a label showing the FCC registration number and ringer equivalence number (REN). If requested, provide this information to the telephone company.
2. If this equipment causes harm to the telephone network, the telephone company may temporarily discontinue service. If possible, advance notification is given; otherwise, notification is given as soon as possible. The telephone company will advise the customer of the right to file a complaint with the FCC.
3. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of this equipment. Advance notification and the opportunity to maintain uninterrupted service are given.
4. If experiencing difficulty with this equipment, please contact ADTRAN for repair and warranty information. The telephone company may require this equipment to be disconnected from the network until the problem is corrected or it is certain the equipment is not malfunctioning.
5. This unit contains no user-serviceable parts.
6. An FCC compliant telephone cord with a modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using an FCC compatible modular jack, which is Part 68 compliant.
7. The following information may be required when applying to the local telephone company for a dial-up line for the V.34 modem:

Service Type	REN	FIC	USOC
Loop Start	1.6B/0.8A	02LS2	RJ-11C

8. The REN is useful in determining the quantity of devices you may connect to your telephone line and still have all of those devices ring when your number is called. In most areas, the sum of the RENs of all devices should not exceed five. To be certain of the number of devices you may connect to your line as determined by the REN, call your telephone company to determine the maximum REN for your calling area.
9. This equipment may not be used on coin service provided by the telephone company. Connection to party lines is subject to state tariffs. Contact your state public utility commission or corporation commission for information.

Federal Communications Commission
Radio Frequency Interference Statement

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

Shielded cables must be used with this unit to ensure compliance with Class A FCC limits.

WARNING

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Canadian Emissions Requirements

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of the Department of Communications.

Cet appareil nuerique respecte les limites de bruits radioelectriques applicables aux appareils numeriques de Class A prescrites dans la norme sur le materiel brouilleur: "Appareils Numeriques," NMB-003 edictee par le ministre des Communications.

Canadian Equipment Limitations

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

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable 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 limitations may not prevent degradation of service in some situations.

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

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

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

The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the Load Numbers of all devices does not exceed 100.

Warranty and Customer Service

ADTRAN will replace or repair this product within the warranty period if it does not meet its published specifications or fails while in service. Warranty information can be found at www.adtran.com/warranty.

U.S. and Canada customers can also receive a copy of the warranty via ADTRAN's toll-free faxback server at 877-457-5007.

- Request document 414 for the *U.S. and Canada Carrier Networks Equipment Warranty*.
- Request document 901 for the *U.S. and Canada Enterprise Networks Equipment Warranty*.

Refer to the following subsections for sales, support, CAPS requests, or further information.

ADTRAN Sales

Pricing/Availability:
800-827-0807

ADTRAN Technical Support

Pre-Sales Applications/Post-Sales Technical Assistance:
800-726-8663

Standard hours: Monday - Friday, 7 a.m. - 7 p.m. CST
Emergency hours: 7 days/week, 24 hours/day

ADTRAN Repair/CAPS

Return for Repair/Upgrade:
(256) 963-8722

Repair and Return Address

Contact Customer and Product Service (CAPS) prior to returning equipment to ADTRAN.

ADTRAN, Inc.
CAPS Department
901 Explorer Boulevard
Huntsville, Alabama 35806-2807

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Chapter 1 Introduction

PRODUCT OVERVIEW

The MX2810 is an M13 multiplexer that consolidates T1 and E1 signals into a T3 circuit. This unit provides a cost-effective, versatile tool for combining independent T1s, E1s, or a combination of the two over the same T3 circuit.

The MX2810 houses two hot-swappable controller cards which provide 1:1 redundancy for the T1 and T3 signals, as well as the T3 connections.

Embedded SNMP (simple network management protocol) and TELNET are available through the 10BaseT Ethernet port. Using the Management Information Base II (MIB II), RFC 1407 standards, and an ADTRAN enterprise MIB, the MX2810 can be configured, monitored, and diagnosed with standard SNMP network management programs such as Hewlett Packard's HP OpenView™ and Cabletron's Spectrum™. In addition, the SysLog Host Daemon allows remote monitoring, collecting, and logging of MX2810 events in realtime. This information can be useful during installation setups and/or troubleshooting.

Complete configuration, loopbacks, and performance monitoring are available through SNMP, TELNET, or a VT100 terminal interface. This connection can be made via Ethernet, a local EIA-232 link. The MX2810 is designed for installation in a 19-inch or 23-inch rack.

The major features of the MX2810 are as follows:

- Built-in 1:1 redundancy
- Hot-swappable controller cards
- Independent, dual-load sharing, redundant power supplies
- Embedded SNMP and TELNET management through 10BaseT Ethernet
- Detailed performance monitoring for local and remote units
- Simplified configuration through the VT100 terminal menu structure
- Capable of backhauling multiple service types (T1/E1)
- DC power
- External BITS clock option for future STS-1 interface
- M13 and C-bit signaling support
- NEBS Level 3 compliant
- Standard 10-year warranty

Controller Card 1:1 Redundancy

The MX2810 supports two hot-swappable controller cards which provide 1:1 redundancy for the T1 and T3 signals. With two cards installed, the MX2810 can recover from circuit failure. See *Circuit Redundancy* on page 7-1 for more information.

T3 OVERVIEW

A T3 provides the same bandwidth as 28 T1s. Typically, leasing a T3 line costs the same as eight to ten T1s. Using the MX2810, a single T3 can provide internet connectivity and voice (local and long distance) to individual sites across up to 28 individual DSX-1s. T3 is also extremely cost effective for backhauling local and long distance voice.

SNMP

The MX2810's embedded SNMP feature allows the unit to be accessed and controlled by a network manager through the

10BaseT local area network (LAN) port. The MX2810 supports the MIB-II standard, RFC 1213, and the ADTRAN Enterprise Specific MIB.

MIB files are available from ADTRAN in the support section of the ADTRAN Web page at ***www.adtran.com****.*

The term SNMP broadly refers to the message protocols used to exchange information between the network management system (NMS) and the managed devices, as well as to the structure of device management databases. SNMP has three basic components: the network manager, the agent, and the MIB.

Network Manager

The network manager is a set of control programs that collect, control, and present data pertinent to the operation of the network devices. These programs reside on a network management station.

Agent

The agent is a control program that resides in every network device. This program responds to queries and commands from the network manager, returns requested information or invokes configuration changes initiated by the manager, and sends unsolicited traps to the manager.

MIB

An MIB is an industry standard presentation of all status and configuration parameters supported by a network device.

TELNET

TELNET provides a password-protected, remote login facility to the MX2810 that allows a remote user to control the MX2810 through the terminal menus. Only one TELNET menu session may be active at a time.

TL1

Transaction Language 1 (TL1) is an ASCII based language that supports both command-response and autonomous (NE) message generation. Commonly, TL1 is used over a X.25 packet network but is completely independent of any physical layer protocols. For the MX2810, TL1 is implemented as a TELNET session running over Ethernet or an X.25 packet network. Currently, up to eight TL1 TELNET connections can be active at a time.

AVAILABLE OPTIONS

The following optional equipment is available for use with the MX2810. Contact your local distributor or the ADTRAN sales department for more information (see end of manual for phone number).

Breakout Panel (P/N 1200291L1)

The optional breakout panel connects to the MX2810 and provides 28 RJ connectors for the individual T1s/E1s. Shipment includes two six-foot, 64-pin to 64-pin Amp cables which allow direct cabling to the MX2810 (see *Connecting the Breakout Panel* on page 2-5 for more information).

Battery Backup (P/N 4175043L2)

The battery backup system provides power backup in the event of power loss. This system includes the battery, an AC battery charger, and an alarm cable.

E1 Patch Panel (P/N 1200291L5)

The optional E1 patch panel (see **Figure 1-1**) connects to the MX2810 and provides 28 pairs of BNC connectors for E1 deployment (21 used for E1 deployment). Shipment includes two six-foot, 64-pin to 64-pin amphenol cables which allow direct cabling to the MX2810.

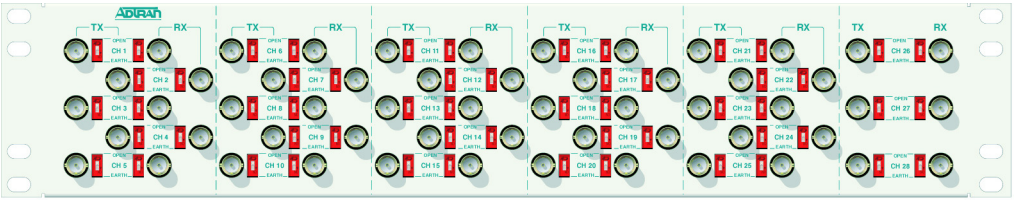


Figure 1-1. E1 Patch Panel

Chapter 2 Installation and Operation

UNPACK, INSPECT, POWER UP

Receiving Inspection

Carefully inspect the MX2810 for any damage that might have occurred in shipment. If damage is suspected, file a claim with the carrier and contact ADTRAN Technical Support (see *Warranty and Customer Service* on page -vi of this manual for phone numbers). Keep the original shipping container to use for future shipment or verification of damage during shipment.

ADTRAN Shipments Include

The following items are included in ADTRAN shipments of the MX2810.

- MX2810 unit
- DC power supply (two power supplies come with the Redundant versions)
- Controller card (two cards come with the Redundant versions)
- Mounting ears and screws for 19-inch or 23-inch rack installation
- User manual or CD containing the User Manual

The ADTRAN MX2810 MIB is available in the support section of the ADTRAN Web page at ***www.adtran.com****.*

Power Up

The MX2810 is powered using a -48V DC power source. The rear panel of the unit has screw down lugs for both A and B power feeds. The screw down terminal strip is located at the lower right side of the unit, as looking from behind. Figure 2-1 and Table 2-1 on page 2-3 illustrate the DC power connector and give definitions for the connector symbols.

It is recommended that a 3 amp fuse be used in the fuse and alarm panel that feeds the MX2810.

For more detailed information on power connections, refer to Chapter 8, *Power Loss Recovery*.

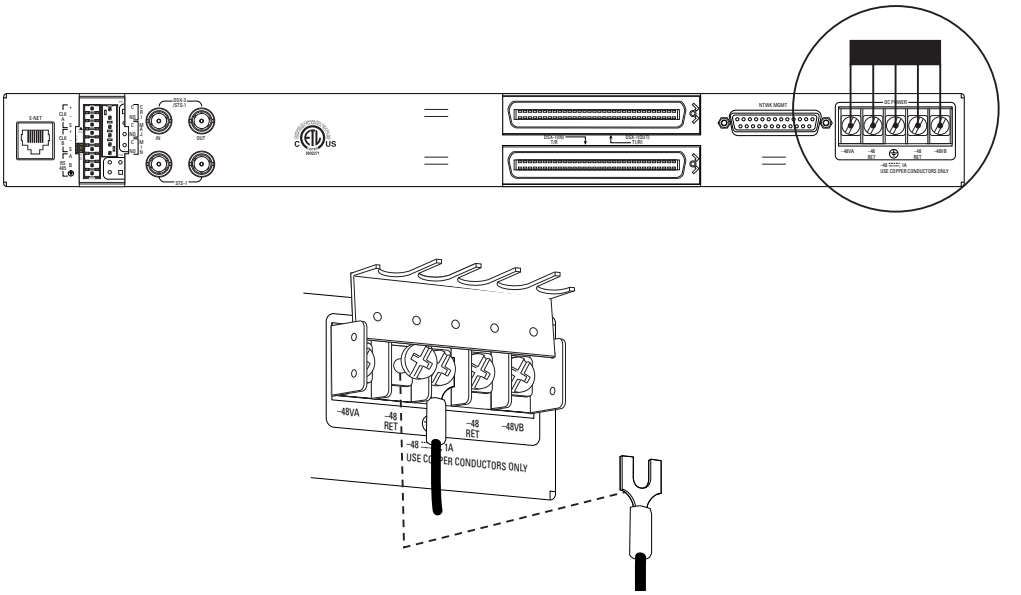


Figure 2-1. DC Power Connector

Table 2-1. DC Connector Symbol Definitions

Symbol	Definition
-48VA	Negative side of DC power source (A)
-48VB	Negative side of DC power source (B)
-48 RET	Positive side of DC power source (usually ground)
⏚	Frame Ground

If only one power feed is available, lugs for A and B power feed must be jumpered together.

Power Requirements

Table 2-2 provides the power requirements and heat dissipation properties of the MX2810 chassis.

Table 2-2. Power Requirements

Voltage	Amperage	Power
Nominal (-48V)	520 mA	24.96 W
Peak (at -48V)	590 mA	28.32 W
Peak (at -42.6V)	760 mA	32.38 W

The following UL requirements must be met during installation of the MX2810 DC version:

1. Disconnect all power sources prior to servicing (unit may use multiple power sources).
2. Input: Minimum -48 VDC, 0.8 A
3. Connect to a reliably grounded -48 VDC source which is electrically isolated from the AC source.
4. The branch circuit overcurrent protection must be a fuse or circuit breaker rated minimum 48 VDC, maximum 20 A.
5. A readily accessible disconnect device that is suitably approved and rated must be incorporated in the field wiring.
6. The chassis should be connected to an earth ground using the ground stud located between the AC and DC power sources on the rear panel.
7. The unit shall be installed in accordance with the requirements of NEC NFPA 70.
8. The unit shall be installed in accordance with Articles 400 and 364.8 of the National Electrical Code NFPA 70 when installed outside of a Restricted Access Location (i.e. Central Office, behind a locked door, service personnel area only).
9. Care should be taken to not upset the stability of the equipment rack after installation is complete.

Use copper conductors only for DC Power and Ground Connection.

RACKMOUNT INSTALLATION

The MX2810 can be mounted into a standard 19-inch or 23-inch equipment rack. Follow these steps to mount your unit into a rack:

1. Install the mounting flanges on each side of the MX2810 at one of the three available positions.

Be sure to install the flanges with the screws provided.

2. After the flanges have been installed, position the MX2810 at the correct location within the rack and secure the mounting flanges to the mounting rails of the rack.
3. Make all network, DSX terminations, and power connections to the rear of the unit. See *Power Up* on page 2-2 for more information on making the DC power connection.
4. Connect a VT100 terminal device to the **CRAFT** port on the front panel of the unit.

Two MX2810s may be stacked with no spacing between units. ADTRAN recommends 1U (1.75") of separation above and below the two stacked units. This spacing allows the unit to dissipate heat. The design of the MX2810 uses the chassis to distribute heat generated by the unit's internal cards. This design allows the unit to operate without a cooling fan, which increases the overall reliability of the unit.

Connecting the Breakout Panel

The optional breakout panel (P/N 1200291L1) connects to the MX2810 via the **IN** and **OUT** Champ connectors located on the back of the unit, and provides 28 RJ connectors for the individual T1s/E1s. Shipment includes two six-foot, 64-pin to 64-pin Amp cables which allow direct cabling to the MX2810. Connect the breakout panel's **IN** Champ connector to the MX2810's **IN** Champ connector and the breakout panel's **OUT** Champ connector to the MX2810's **OUT** Champ connector (see Figure 2-2)

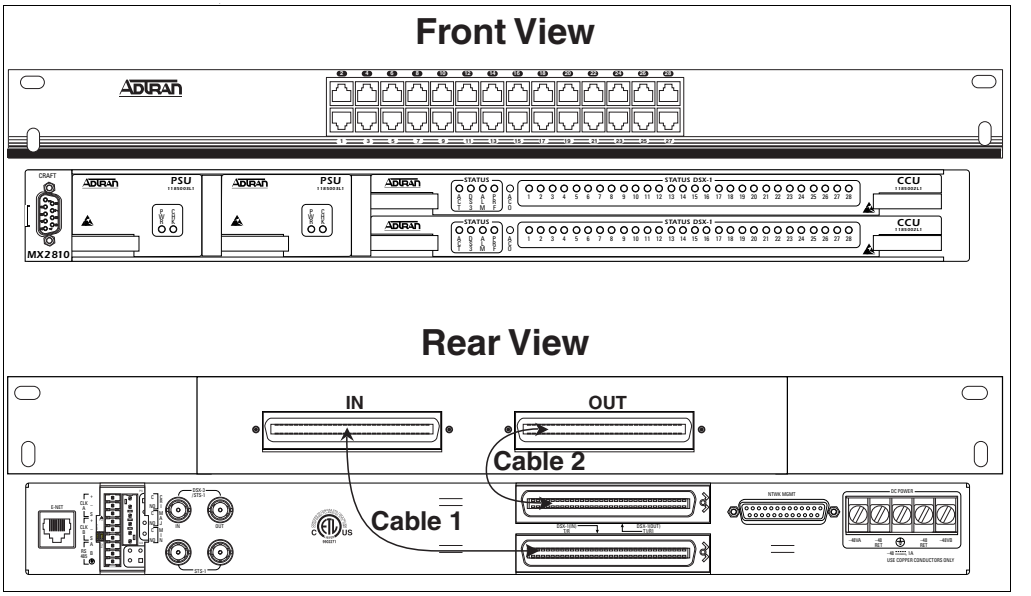


Figure 2-2. The Breakout Panel

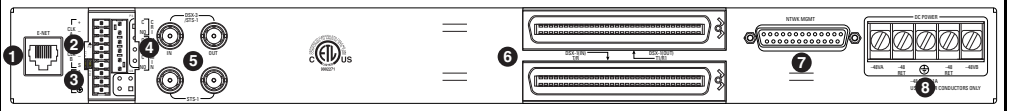
Connecting the E1 Patch Panel

The optional E1 patch panel (P/N 1200291L5) connects to the MX2810 via the **TX** and **RX** Champ connectors located on the back of the unit, and provides 28 pairs of BNC connectors for the individual T1/E1s. Shipment includes two six-foot, 64-pin to 64-pin amphenol cables which allow direct cabling to the MX2810. Connect the E1 patch panel's **TX** Champ connector to the MX2810's **IN** Champ connector and the E1 patch panel's **RX** Champ connector to the MX2810's **OUT** Champ connector.

REAR PANEL

The MX2810 rear panel is equipped with an Ethernet port, wire-wrap pins for external clock A/B, wire-wrap pins for RS-485, wire-wrap pins for alarms (critical, major, and minor), two sets of BNC connectors, two 60-pin female amphenol connectors, DB-25 Network Management port, and a terminal strip for DC power feed (A and B). Figure 2-3 illustrates the rear panel and identifies its

equipment. Descriptions for these items follow the figure. Pin assignments are given in *Pinouts* on page B-1.



#	Item	Function
1	E-NET	10BaseT ethernet connection
2	External Clock	Wire-wrap pins for external connection of clock
3	RS-485	Wire-wrap pins for external connection of RS-485
4	Critical/Major/Minor Alarm Relays	Wire-wrap pins for external connection to alarm relays: C (Common) and NO (Normally Open).
5	DSX-3/STS-1	BNC connectors for DSX-3/STS-1
6	DSX-1	64-pin female amphenol connectors for T1/E1s
7	Network Management	DB-25 connector for network management
8	DC Power	Connection for A and B power feeds

Figure 2-3. MX2810 Rear View

E-NET Port

The **E-NET** port is an 8-pin modular connector that provides a 10BaseT ethernet LAN interface. This **LAN** interface is used for SNMP and TELNET control.

NOTE *Connect the E-NET port to intra-building wiring only.*

NOTE *VT100 menus can be accessed by initiating a telnet connection to the product's IP address on Port Number 23 (the standard port number for telnet connections) or on Port Number 2002.*
TL1 can be accessed by initiating a connection on Port Number 3116.

Critical, Major, and Minor Alarm Connectors

Connectors for critical, major, and minor alarms are located on the rear panel of the MX2810. Both **C** (common) and **NO** (normally open) contacts are provided. The alarm connectors are wire-wrap headers.

The alarm functions can be enabled or disabled through the **ALARM RELAYS** section of the **CONFIGURATION** menu (see the section *Alarm Relays* on page 3-13).

DSX-3 Interfaces

The DSX-3 network interfaces are full-duplex circuits provided by two BNC coaxial cable connections. The receive data from the network is connected to the RX (**IN**) connectors, while the transmit data from the MX2810 is connected to the TX (**OUT**) connectors.

DSX-3 interfaces must be connected using coaxial cables that have the shields grounded at both ends.

DSX-1/E1 Interfaces

The DSX-1/E1 interfaces are 64-pin Amp connectors. These interfaces provide Tx and Rx connections between the unit and equipment such as wire-wrap patch panels, punch-down panels, or breakout panels.

Connect the DSX-1/E1 interfaces to intra-building wiring only.

Power Connection

The DC power connections are described earlier in this chapter on page 2-2.

FRONT PANEL

The MX2810 front panel is shown in Figure 2-4. Descriptions of each part of the front panel follow.

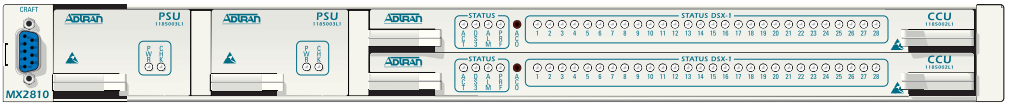


Figure 2-4. MX2810 Front Panel

ACO Buttons

The **ACO** (alarm cut off) buttons allow you to turn off an active audible alarm. The buttons are recessed, so you must use a pen or other pointed instrument to press them. Once you have used an **ACO** button to deactivate an alarm, it remains disabled until the condition has cleared.

Alarms can also be turned off remotely by using a selection found in the **STATUS** menu. See the section *Acknowledge Alarms (ACO)* on page 4-8 for more information.

LED Descriptions

The MX2810 has LED status indicators for the power supplies, the DS3 state, the controller cards, and the individual T1s/E1s. These LEDs are identified as follows:

Power Supply A/B

The **PWR** LED is active when the unit is on and receiving full power. The **CHK** LED is active when the power supply is failing or is providing low power and needs to be checked.

Status LEDs

The **STATUS** LEDs apply to the two controller cards. The LEDs provided are **ACT** (active), **DS3**, **ALM** (alarm), and **PRF** (performance). Different conditions are indicated by the state of the LED (it remains solid, blinks, or alternates colors). The condition descriptions vary depending on whether the LED represents the

active controller card or the controller card on standby. The following tables provide LED definitions for the active cards (see Table 2-3) and T1/E1 cards (see Table 2-4).

Table 2-3. LED Conditions for Active Cards

	LED State	Card Condition
ACT	green solid	Normal (All OK)
	green/amber alternating	Normal + Console Open
	red solid	Self Test Failed
	amber solid	Software Update in Progress
	red/amber alternating	Self Test Failed + Console Open
	red blinking	Card Failure
DS3	green solid	Normal (All OK)
	red blinking	LOS
	red solid	AIS, LOF, RAI, Idle Alarms
	amber solid	In Test (Local)
	amber blinking	In Test (Remote)
	red/amber alternating	In Test + Alarms
ALM	green solid	Normal (No Alarm)
	red blinking	Critical Alarm
	red solid	Major Alarm
	amber blinking	Minor Alarm
	amber solid	Alarm Suppressed (**ACO** button was pushed)

Table 2-3. LED Conditions for Active Cards (Continued)

	LED State	Card Condition
PRF	green solid	Normal (All OK)
	red flash (once per event)	Single/Burst CV
	red blinking	Continuous Code Violations
	red solid	XCV Threshold Exceeded (see *XCV Threshold* on page 3-4)

Table 2-4. LED Conditions for Standby Cards

	LED State	Card Condition
ACT	green blinking	Normal (All OK)
	amber solid	Software Update in Progress
	red blinking	Self Test Failed
DS3	off	Normal (All OK)
	red blinking	DS3 Failure
ALM	off	Normal (No Alarm)
PRF	off	Normal (All OK)

T1/E1 Status LEDs

These LEDs apply to each individual T1 or E1. Different conditions are indicated by the state of the LED (its color and whether it flashes, alternates color, or is on solid). The condition descriptions vary depending on whether the LEDs represent T1s or E1s of the active controller card or the controller card on standby. Table 2-5 provides LED definitions for the active and standby cards.

Table 2-5. T1/E1 LED Conditions

	LED State	T1/E1 Condition
Active Card	green solid	Normal (All OK)
	off	Disabled
	red blinking	LOS
	red flash (once per event)	Single/Burst CV
	red solid	XCV Threshold Exceeded or AIS (see *XCV Threshold* on page 3-4)
	amber solid	In Test (Local)
	amber blinking	In Test (Remote)
	red/amber alternating	In Test + Alarm
Standby Card	off	Normal (All OK) *or* N/A (in the case of E1 configuration)
	red blinking	T1/E1 Failure

Craft Port

The **CRAFT** port provides connection to a VT100 EIA-232 compatible interface.

Establishing Terminal Connection

Only one menu session, through either Telnet or craft port, may be active at a time. When an attempt to activate a second menu session is made, the user will be asked if they want to disconnect the other menu session. If "Yes" is chosen, the user (who must have "Admin" privileges) will be required to enter a valid username and password. The new menu session will be active at this time. The disconnected user will be notified and provided with the username of the new user.

To connect the MX2810 to a VT100 terminal, follow this procedure:

1. Configure the VT100 terminal for 9600, 19200, 38400, or 57600 baud, 8-bit characters, no parity, and one stop bit (*xxxx*, 8N1).
2. Connect the DTE port of a terminal to the DB-9 jack labeled **CRAFT** on the MX2810 front panel.
3. Initialize the terminal session.
4. Press **Enter** repeatedly until the password prompt appears.
5. Enter the username and password. The factory default username is "**username**". The factory default password is "**password**". The **MAIN** menu appears. See Figure 2-5.

6. Make selections by entering the number corresponding to the chosen parameter. Press **ESC** on the keyboard to return to the previous screen. End a terminal session by selecting **LOGOUT** from the **MAIN** menu or by pressing **Ctrl-C** at any time.

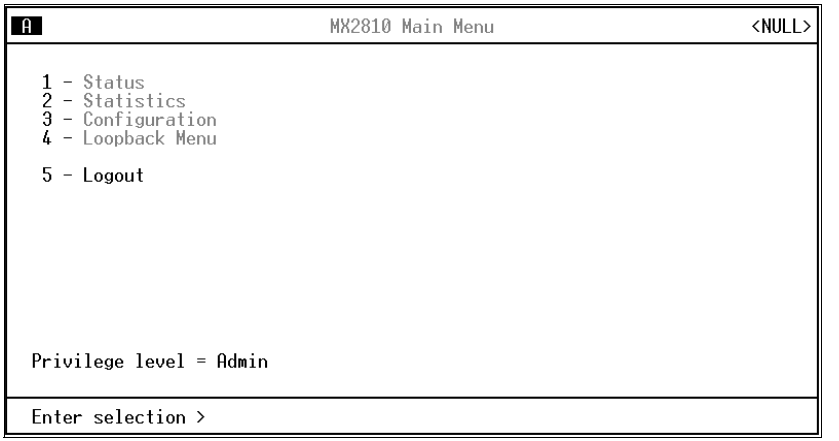


Figure 2-5. Terminal Main Menu

The letter displayed in the upper left-hand corner of the terminal menu indicates which controller card is active (A or B).

Navigating Within the Menus

Navigate within the MX2810 terminal menus using the following procedures:

If you want to...	Press...
select an item	the number corresponding to your choice, and then press the **Enter** key
scroll left and right within the same screen	the left and right arrow keys. Additional screens are available when **<** or **>** is displayed in the top portion of the menu
return to the previous menu	the **ESC** key
end the terminal session	**Ctrl-C**
refresh the display	**Ctrl-R**

The MX2810 **MAIN** menu consists of the following sections:

Status

Provides information on the current state of the DS3, power supplies, system, DS2s, and T1/E1 lines. See the chapter *Status* on page 4-1 for more detailed information.

Statistics

Provides detailed statistical information (both current and historical) for the DS3, DS2s, T1/E1 lines, and Protection Switch Statistics. See the chapter *Statistics* on page 5-1 for more detailed information.

Configuration

Sets DS3 network, T1/E1, system management parameters, and Utilities. See the chapter *Configuration* on page 3-1 for more detailed information.

Loopbacks

Performs loopback tests over the DS3, DS2s, or T1/E1 lines. See the chapter *Loopbacks* on page 6-1 for more detailed information.

Logout

The **LOGOUT** selection ends the terminal session and logs out of the system. Password entry is required before a new session can begin. The unit will also log out of a terminal session automatically if the session remains inactive for a certain period of time. For more information, see the section *Terminal Time Out* on page 3-25.

Chapter 3 Configuration

To configure the MX2810, use a 10BaseT ethernet connection or a VT100 terminal. Figure 3-1 shows the main configuration terminal menu, and Figure 3-2 on page 3-2 shows the **CONFIGURATION** menu tree.

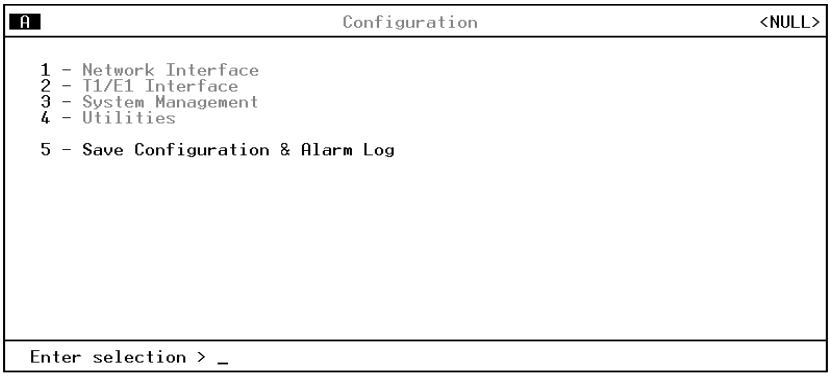


Figure 3-1. Configuration Main Menu

Detailed descriptions of the menu selections are given in the following sections which are divided by the five submenus: **NETWORK INTERFACE** (page 3-3), **T1/E1 INTERFACE** (page 3-6), **SYSTEM MANAGEMENT** (page 3-12), **UTILITIES** (page 3-29), and **SAVE CONFIGURATION** (page 3-35).

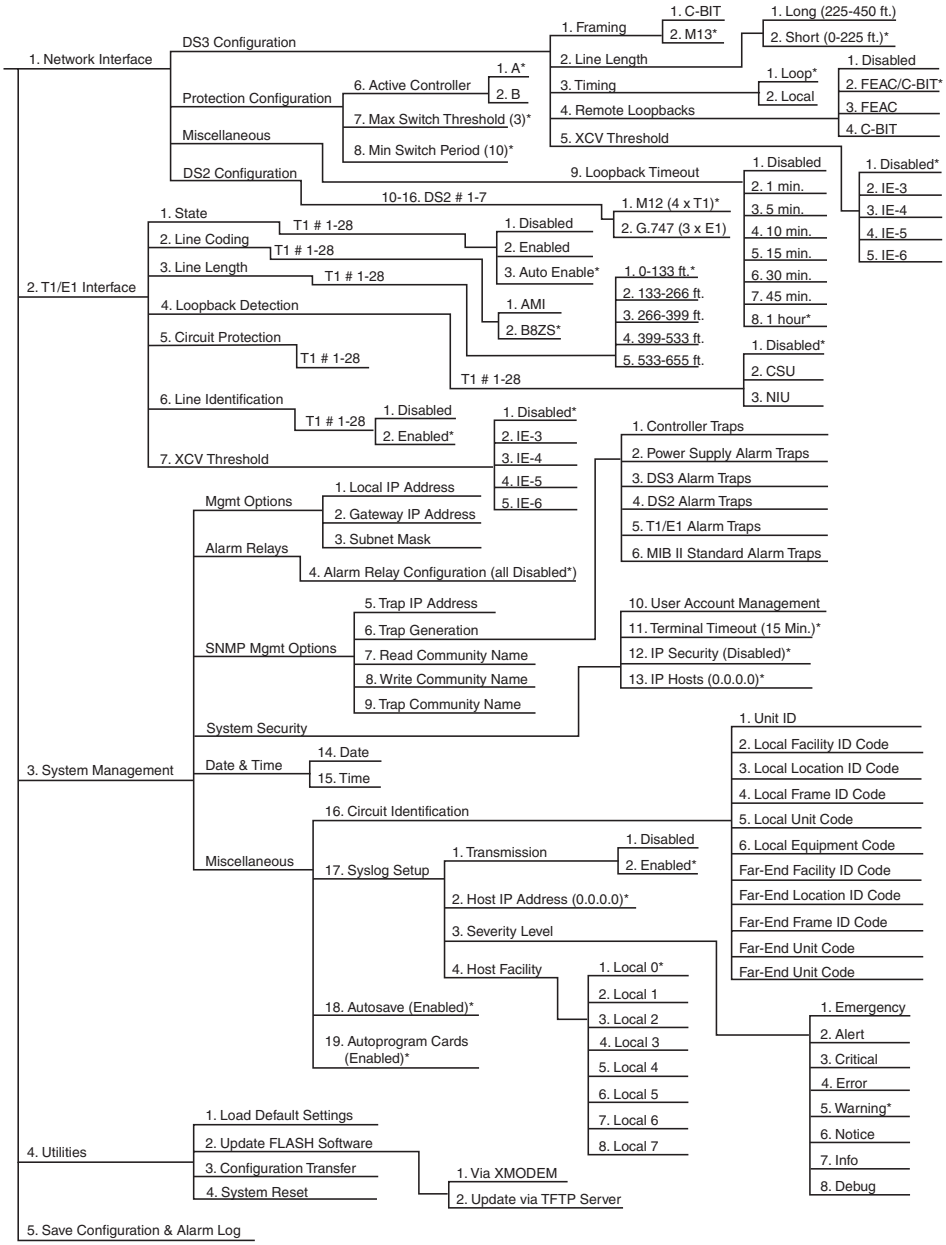


Figure 3-2. Configuration Menu Tree

NETWORK INTERFACE

Select **NETWORK INTERFACE** to access the network configuration parameters (see Figure 3-3). Configure the MX2810 network settings to match the DS3 signal received from the service provider.

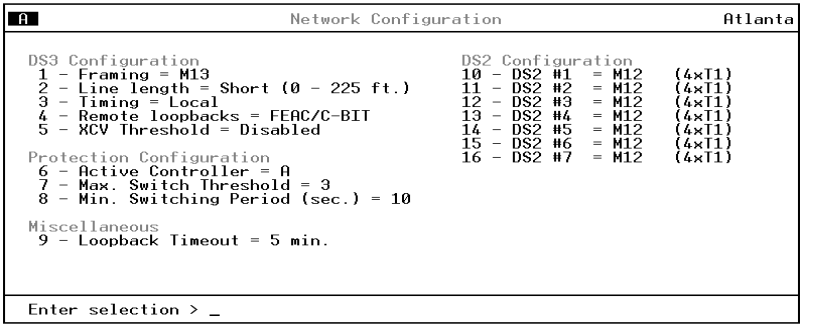


Figure 3-3. Network Configuration Menu

DS3 Configuration

Use the **DS3 CONFIGURATION** selections to configure the DS3 network settings to match your application. Descriptions of these settings follow:

Framing

Set the framing format to match the format of the receive signal at the network interface. The MX2810 supports **C-BIT** and **M13** framing formats.

Line Length

Set the line length to reflect the physical length of the DS3 network line. Set to **LONG** if the cabling distance exceeds 225 feet; set to **SHORT** if the distance is less than 225 feet.

Timing

In most cases, configure the MX2810 for **LOOP** timing to derive timing from the network. However, set to **LOCAL** if the MX2810 is the master timing source for the circuit.

Remote Loopbacks

Select **FEAC/C-BIT** to allow the MX2810 to respond to remote loopback requests received over either the DS3 Far End Alarm and Control (FEAC) channel and/or DS2-level C bits. This mode is valid in both C-BIT or M13 framing formats. Select **FEAC** to allow the MX2810 to respond only to remote loopback requests received over the DS3 FEAC channel. This mode is only valid when using C-BIT framing. In this mode, DS2 C bit loopbacks will be ignored. Select **C-BIT** to allow the MX2810 to respond only to remote loopback requests received over DS2 C bits. This mode is available when operating in either C-BIT or M13 framing. In this mode, FEAC loopbacks received when operating in C-BIT framing will be ignored. Select **DISABLED** to ignore all out-of-band loopback requests (FEAC and DS2 C-BIT). When **DISABLED** is selected, the MX2810 will still respond to individual T1 inband CSU/NIU loopbacks if so configured in the T1/E1 Loopback Detection menu.

XCV Threshold

The **XCV** (excessive code violations) **THRESHOLD** sets a limit on CVs accepted by the unit before it switches controller cards. If set to **DISABLED**, code violations will not cause the unit to switch controller cards. The threshold limits are described in the following chart:

Setting	The unit switches controller cards if...
$1E^{-3}$	more than one out of every 1,000 bits received on the DS3 contains a code violation.
$1E^{-4}$	more than one out of every 10,000 bits received on the DS3 contains a code violation.
$1E^{-5}$	more than one out of every 100,000 bits received on the DS3 contains a code violation.
$1E^{-6}$	more than one out of every 1,000,000 bits received on the DS3 contains a code violation.

Protection Configuration

The MX2810 houses two controller cards for 1:1 protection against hardware failure. The selections in this menu allow you to customize the unit's protection setup:

Active Controller
This field displays **A** or **B**, indicating the active controller card. This setting can be used to force the controller cards to switch. For example, if controller card **A** is active and you select **B**, a switch-over occurs immediately.

Max. Switch Threshold
The value entered in this field determines the number of times per hour the unit is allowed to switch between controller cards. If, in an hour, the cards switch more than the **MAX SWITCH THRESHOLD**, the unit issues a trap (see page 3-16) and stops switching cards for the next 24 hours. The default setting is **3** times an hour. This count may be cleared by clearing **PROTECTION SWITCH** alarm counts (see page 5-12).

Min. Switching Period
After the unit switches controller cards, the number of seconds entered in this field must pass before another card switch will be allowed. The default setting is **10** seconds.

Miscellaneous

Loopback Timeout
Sets the loopback timeout to **DISABLED**, **1 MIN.**, **5 MIN.**, **10 MIN.**, **15 MIN.**, **30 MIN.**, **45 MIN**. or **1 HR**.

DS2 Configuration

The MX2810 can individually frame each of the seven DS2 streams in M12 (four T1s) or G.747 (three E1s) format. When set to **M12 (4xT1)**, the four T1s for the selected group are framed per ANSI T1.107. When set to **G.747 (3xE1)**, the first three T1/E1 ports of the selected group are framed per CCITT G.747 into the DS3 stream.

The fourth T1/E1 port of the selected group is not available in this mode. Any combination of **M12 (4xT1)** and **G.747 (3xE1)** is allowed.

T1/E1 INTERFACE

The **T1/E1 INTERFACE** menu (shown in Figure 3-4 on page 3-6) allows you to activate/deactivate individual T1s and E1s and to set their line coding, length, loopback detection, circuit protection, and line ID string. The T1/E1 code violation threshold is also configured through this menu. Configuration selections are described in the sections following Figure 3-4.

A DS2 can be divided into either three E1s or four T1s. Therefore, when dealing with an E1 configuration, some of the fields in the **T1/E1 INTERFACE** *menus do not apply (and therefore display* **N/A***).*

```
A                    Configure T1/E1 Interface

  1 - T1/E1 State
  2 - T1/E1 Line Coding
  3 - T1/E1 Line Length
  4 - T1/E1 Loopback Detection
  5 - T1/E1 Circuit Protection
  6 - T1/E1 Line Identification

  7 - XCV Threshold = Disabled

Enter selection >
```

Figure 3-4. T1/E1 Interface Menu

T1/E1 State

Set T1/E1 lines to **DISABLED, ENABLED, OR AUTO ENABLE.** In Auto Enable, the unit automatically detects when a T1/E1 is connected and enables that T1/E1 line. (See Figure 3-5).

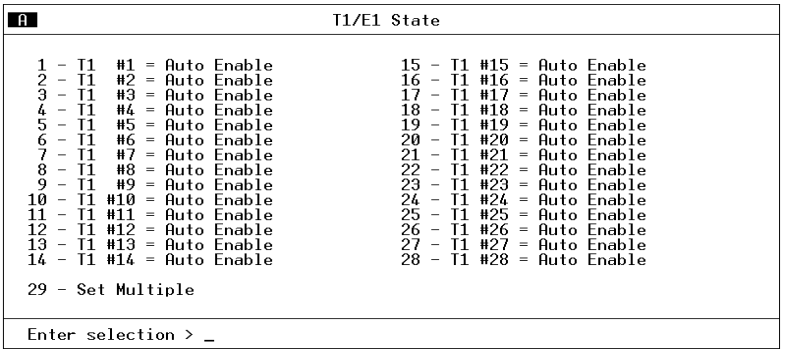


Figure 3-5. T1/E1 State Menu

Set Multiple

Use **SET MULTIPLE** (see Figure 3-6 on page 3-7) to enable or disable a contiguous group or all of the T1/E1s at one time. To enable or disable all T1/E1s, set **FIRST** to **1** and **LAST** to **28**. Enter **APPLY SETTINGS** before leaving the menu. To enable or disable only some of the T1/E1s, set **FIRST** and **LAST** to correspond to the lines you want to enable or disable. Enter **APPLY SETTINGS**. You can now either leave the menu or continue to enter new **FIRST** and **LAST** numbers for other lines. Remember to apply the settings following each change.

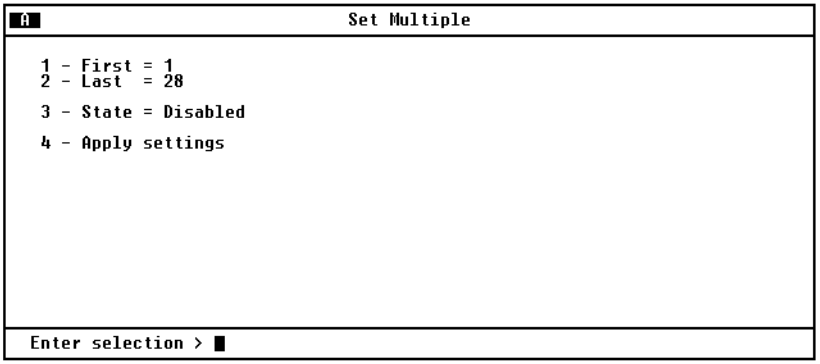


Figure 3-6. Set Multiple Menu

T1/E1 Line Coding

Set the line code for each individual T1/E1 interface to match the connected device (see Figure 3-7). The choices available for T1 are **AMI** and **B8ZS**. The choices available for E1 are **AMI** and **HDB3**. Select **SET MULTIPLE** to set a contiguous group or all of the T1s (or E1s) to the same value at the same time. See *Set Multiple* on page 3-7 for a description of the **SET MULTIPLE** option, entering the line code for each line.

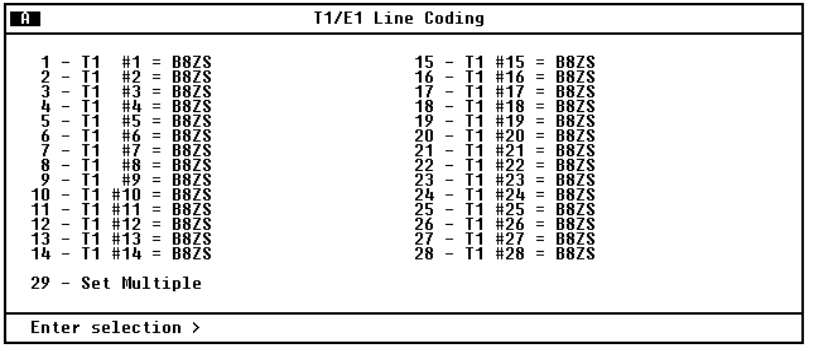


Figure 3-7. T1/E1 Line Coding Menu

T1/E1 Line Length

Set the line length for each T1 interface according to the distance from the MX2810 to your connecting DSX termination (see Figure 3-8). The E1 **LINE LENGTH** is not selectable and remains at **0-6 dB** loss. Select **SET MULTIPLE** to configure the line length for a contiguous group or all of the T1s to the same length at the same time. See *Set Multiple* on page 3-7 for a description of the **SET MULTIPLE** option, entering the line length for each line.

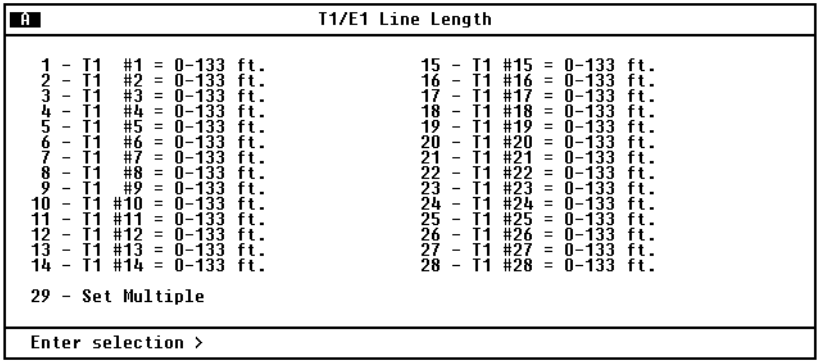


Figure 3-8. T1/E1 Line Length Menu

T1/E1 Loopback Detection

Choose which T1/E1 lines will respond to CSU or NIU loopback requests coming from the network (see Figure 3-9 on page 3-9). Set to **CSU** or **NIU** if you want the T1/E1 to respond to that type of request. Set to **DISABLE** if you want the T1/E1 to ignore the request. Select **SET MULTIPLE** to set a contiguous group or all of the T1/E1s to the same value at the same time. See *Set Multiple* on page 3-7 for a description of the **SET MULTIPLE** option, entering either **DISABLED**, **CSU**, or **NIU**. Not available in E1 mode.

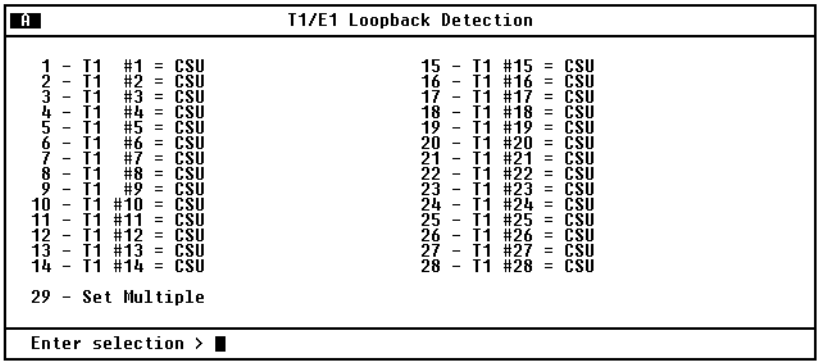


Figure 3-9. Loopback Detection Menu

T1/E1 Circuit Protection

T1/E1 Circuit Protection determines which circuit will be allowed to initiate a protection switch if a failure in the circuitry for that channel is detected (see Figure 3-10 on page 3-10). If a T1/E1 is set to **DISABLED**, then the failure of the circuitry of that one channel will not cause a protection switch. If set to **ENABLED**, then the failure of a channel *could* cause a protection switch to occur (depending on the **PROTECTION THRESHOLD** setting in this menu).

The **PROTECTION THRESHOLD** setting determines how many of the **ENABLED** lines must fail before a card switch occurs. If you want the failure of a single protected (enabled) line to cause a card switch, set the **PROTECTION THRESHOLD** to **1**. Choices include **1** through **28**.

Select **SET MULTIPLE** to set a contiguous group or all of the T1/E1s to the same value at the same time. See *Set Multiple* on page 3-7 for a description of the **SET MULTIPLE** selection, entering **ENABLED** or **DISABLED**.

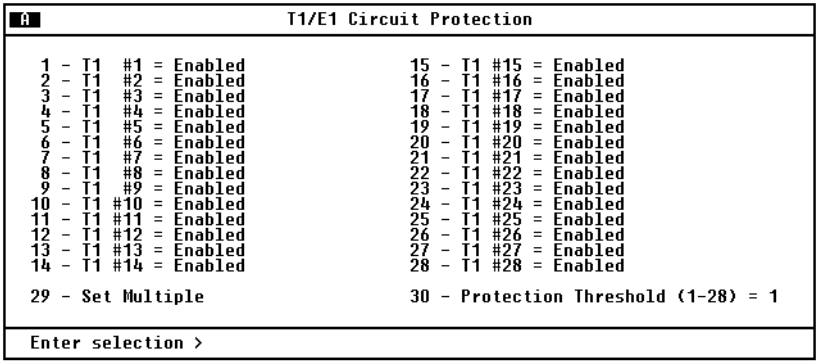


Figure 3-10. Circuit Protection Menu

T1/E1 Line Identification

Enter user-configurable text strings to name the individual T1/E1 lines (see Figure 3-11). This field will accept up to 18 alpha-numeric characters, including spaces and special characters (such as an underbar).

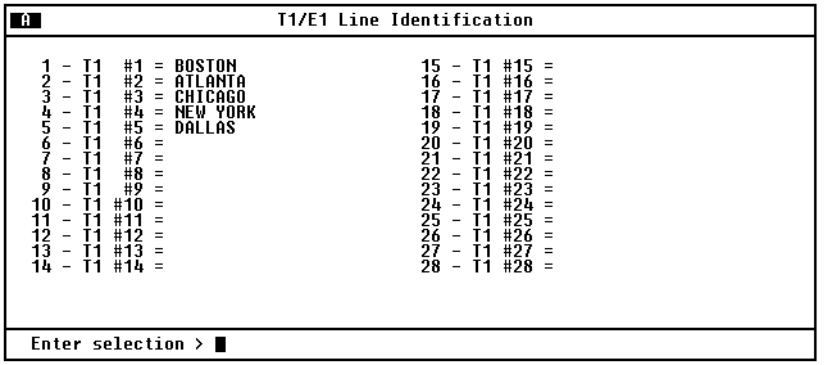


Figure 3-11. Line Identification Menu

XCV Threshold

Set a limit on code violations (CVs) accepted by the unit over an individual T1/E1 line before it switches controller cards. If set to **DISABLED**, code violations will not cause the unit to switch controller cards. The threshold limits are described in the following chart:

Setting	The unit switches controller cards if...
$1E^{-3}$	more than one out of every 1,000 bits received on a T1/E1 line contains a code violation.
$1E^{-4}$	more than one out of every 10,000 bits received on a T1/E1 line contains a code violation.
$1E^{-5}$	more than one out of every 100,000 bits received on a T1/E1 line contains a code violation.
$1E^{-6}$	more than one out of every 1,000,000 bits received on a T1/E1 line contains a code violation.

SYSTEM MANAGEMENT

Configure the MX2810 for management through SNMP, TELNET, or a VT100 interface (see Figure 3-12). Embedded SNMP and TELNET are available via a 10BaseT ethernet interface. This menu also includes options used to customize your unit's alarm and trap generation, security setup, and equipment identification.

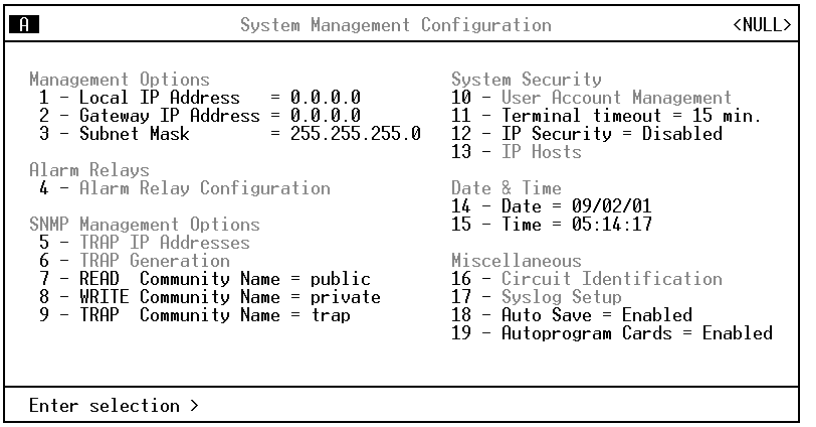


Figure 3-12. System Management Configuration Menu

WARNING

Configuration changes to **LOCAL IP ADDRESS**, **GATEWAY IP ADDRESS**, **SUBNET MASK**, *and* **IP HOSTS** *will not be implemented unless all TELNET sessions are closed. Changes made while TELNET sessions are active will invoke a warning message on the console*

Management Options

Local IP Address

Enter the MX2810 IP address. This IP address applies to the LAN. This address is available from your network administrator.

Gateway IP Address

Enter the gateway IP address of the MX2810. This address is necessary only if the MX2810 and the network manager are connected through a gateway node. If an IP packet is to be sent to a different network, the unit sends it to the gateway.

Subnet Mask

Enter the subnet mask of the MX2810. This address is available from your network administrator.

Alarm Relays

Alarm Relay Configuration

Enables audible and visible alarms for specific error conditions (see Figure 3-13). The following charts describe the alarm conditions found in this menu. Conditions marked in the charts with an asterisk (*) sound the critical alarm when enabled. All other conditions sound the non-critical alarm.

```
A                    Alarm Relay Configuration                    Atlanta

DS3 Alarms                          System Alarms
 1 - RAI = Enabled                   9 - Controller A Fail  = Enabled
 2 - LOS = Enabled                  10 - Controller B Fail  = Enabled
 3 - LOF = Enabled                  11 - Protection Switch  = Enabled
 4 - IDLE = Enabled                 12 - Controller Removed = Enabled
 5 - FEAC = Enabled
                                    Power Supply Alarms
DS2 Alarms                         13 - Malfunction           = Enabled
 6 - RAI = Enabled                 14 - Power Low             = Enabled
 7 - LOF = Enabled                 15 - Power Fail            = Enabled
                                   16 - Temperature High      = Enabled
T1/E1 Alarms                       17 - Temperature Critical  = Enabled
 8 - LOS = Enabled                 18 - Input Fail            = Enabled
                                   19 - Power Card Removed    = Enabled

Enter selection >
```

Figure 3-13. Alarm Relay Configuration Menu

DS3 Alarms

Alarm	Description
RAI (Major)	The unit is receiving an RAI (yellow) alarm from the network. This alarm is a signal sent back toward the source of a failed transmit circuit. The X-bits (X1 and X2) are set to zero.
LOS (Critical)	The unit has lost the network Rx signal.
LOF (Critical)	The unit detects a framing loss from the network.
IDLE (Minor)	The unit detects an idle sequence from the network.
FEAC (Minor)	The unit is currently receiving a FEAC alarm over the DS3 data link.

DS2 Alarms

Alarm	Description
RAI (Major)	The unit is receiving an RAI (yellow) alarm from the network across a DS2. This alarm is a signal sent back toward the source of a failed transmit circuit. The X-bit is set to zero.
LOF (Major)	The unit detects a framing loss from the network across a DS2.

System Alarms

Alarm	Description
Controller Card A/B Fail (Minor)	Controller Card A/B has failed. *Note: This is a critical alarm when Inactive Card is not installed or is not working.*
Protection Switch (Minor)	The unit detects a Controller Card protection switch.
Controller Card Removed (Minor)	The unit detects that a Controller Card has been removed.

T1/E1 Alarms

T1/E1 alarms are cleared when the T1/E1 is disabled or set to **AUTO ENABLE** *after receiving an alarm.*

Alarm	Description
LOS (Major)	The unit has lost the receive signal on a T1/E1.

Power Supply Alarms

Alarm	Description
Malfunction (Minor)	Power supply card is no longer working. The unit has switched to the backup power supply or battery backup.
Power Low (Minor)	Power supply's output level is abnormally low.
Power Fail (Minor)	Power supply card does not detect power input.
Temperature High (Minor)	Power supply card temperature is above normal.
Temperature Critical (Minor)	Power supply card temperature is so high that it may suffer damage.
Input Fail (Minor)	A power feed input (A or B) has failed.
Power Card Removed (Minor)	The unit detects that a Power Supply Card has been removed.

If only using one power feed input, jumper the power feed to the unused set of power feed terminals to prevent an Input Fail alarm.

SNMP Management Options

Trap IP Addresses

Enter up to five IP addresses of SNMP managers to which the MX2810 sends traps.

Trap Generation

Use this menu (see Figure 3-14) to designate which error conditions will cause the unit to send trap messages.

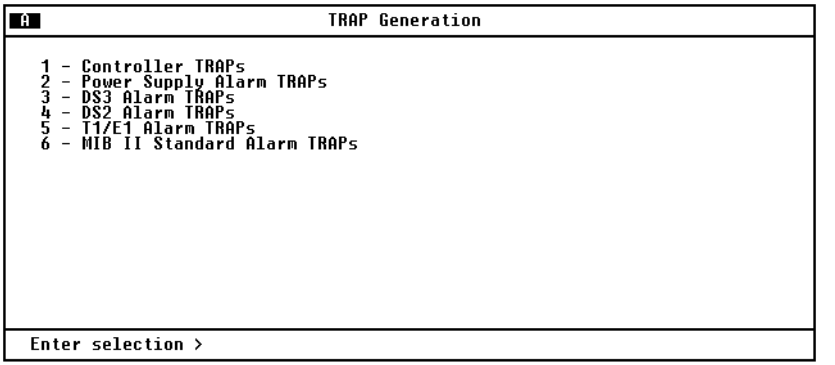


Figure 3-14. Trap Generation Menu

Controller Traps

Trap	If enabled, the unit issues a trap when...
Protection Switch	the controller cards switch
Card Removed	a controller card has been removed
Card Failure	a controller card has failed
Communication Fail	the controller cards can no longer communicate with each other
Max Switches	the **MAX SWITCH THRESHOLD** is reached. See page 3-5

Power Supply Alarm Traps

Trap	If enabled, the unit issues a trap when...
Card Removed	the power supply card has been removed
Malfunction	the power supply card is no longer working and the unit has switched to the backup power supply or battery backup
Card Failure	the power supply card has failed
Power Low	the power supply's output level is abnormally low
Temperature High	the power supply card is getting too hot
Temperature Critical	the power supply card temperature is so high that it may suffer damage
Input Fail	a power feed input (A or B) has failed

DS3 Alarm Traps (Near-End Active and Standby Cards)

Trap	If enabled, the unit issues a trap when...
LOS	the controller card has lost the network Rx signal
OOF	the controller card detects a framing loss from the network
AIS	the controller card is receiving an AIS (blue) alarm condition from the network. AIS alarms occur when consecutive 1010s are received in the information bits. This indicates that there is a transmission fault located either at or upstream from the transmitting terminal
RAI	the controller card is receiving an RAI (yellow) alarm from the network. This alarm is a signal sent back toward the source of a failed transmit circuit. The X-bits (X1 and X2) are set to zero
IDLE	the controller card detects an idle sequence from the network.
TX LOS	the controller card's transmitter has failed
XCV	The controller card is receiving excessive code violations, exceeding the threshold set by the user (see *XCV Threshold* on page 3-11)
In/Out Test	the DS3 is going in and out of test (applies to the Active controller card only)

DS3 Alarm Traps (Far-End Active Cards)

Trap	If enabled, the unit issues a trap when...
LOS	the remote unit's active controller card has lost the network Rx signal
OOF	the remote unit's active controller card detects a framing loss from the network
AIS	the remote unit's active controller card is receiving an AIS (blue) alarm condition from the network
IDLE	the remote unit's active controller card detects an idle sequence from the network.
DS3 Eqpt Fail SA	the remote unit's active controller card is receiving a service-affecting equipment failure message from the network
DS3 Eqpt Fail NSA	the remote unit's active controller card is receiving a non-service-affecting equipment failure message from the network
Comn Eqpt Fail NSA	the remote unit's active controller card is receiving a common equipment failure message from the network

DS2 Alarm Traps

Trap	If enabled, the unit issues a trap when...
OOF	the DS2 detects a framing loss from the network
AIS	the DS2 is receiving an AIS (blue) alarm condition from the network. AIS alarms occur when the unit is receiving unframed all ones
RAI	the DS2 is receiving an RAI (yellow) alarm from the network. This alarm is a signal sent back toward the source of a failed transmit circuit. The X-bit is set to zero

T1/E1 Alarm Traps

Trap	If enabled, the unit issues a trap when...
Local T1/E1 Alarms	
LOS	the unit has lost the Rx signal on a T1/E1
CAIS (carrier side AIS)	the T1 is receiving all ones from the DS3 side of the network
LAIS (loop side AIS)	the T1 is receiving all ones from the DSX-1 interface
XCV	the unit is receiving excessive code violations across a T1/E1, exceeding the configured threshold (see *XCV Threshold* on page 3-4)
T1/E1 Failure	a T1/E1 has failed
In/Out Test	a T1/E1 is going in or out of test
Far-End Alarms (only available in C-Bit Parity mode)	
Multiple DS1 LOS	the far-end equipment has lost multiple T1/E1 lines
Single DS1 LOS	the far-end equipment has lost a single T1/E1
DS1 Eqpt Fail SA	a service-affecting equipment failure is being reported by the far-end
DS1 Eqpt Fail NSA	a non-service-affecting equipment failure is being reported by the far-end

MIB II Standard Alarm Traps

Trap	If enabled, the unit issues a trap when...
Cold Start	the unit is first powered up
Link Up	the DS3 is up with no alarms
Link Down	the DS3 is in alarm
Authentication Failure	an attempt has been made by an unauthorized user to access the unit

Read Community Name

Enter the authentication strings used for SNMP management. Match the MX2810 to the SNMP manager for read privileges.

Write Community Name

Enter the authentication strings used for SNMP management. Match the MX2810 to the SNMP manager for write privileges.

Trap Community Name

Enter the identification string used for trap management. This string accompanies all traps transmitted by the MX2810.

System Security

User Account Management

Enter up to 15 user accounts. Each user account is assigned a username, password, and privilege level. Usernames and passwords are not case sensitive but must be 12 characters or less. Each user account is assigned a privilege level to provide the option of limiting a user's access to the MX2810. The four privilege levels are listed below:

Guest

A read-only privilege level. A user with this privilege level can view almost all menu items on the console interface menus and can perform a limited number of TL1 commands, none of which can alter the product's configuration.

Interface

A write-access privilege level in which a user may configure items related to the network interface and T1/E1 interface, but may not initiate loopbacks and view and/or alter several system-level items such as LAN configurables, etc.

Test

A write-access privilege level in which a user may configure the network interface and T1/E1 interface and may initiate loopbacks, but may not view and/or alter several system-level items such as LAN configurables, etc.

Admin
The user may view and/or alter all menu items. Only a user with an Admin user account may alter the User Account Management information.

User accounts provide access to the MX2810 for console interface sessions and TL1 sessions..

The **LOAD DEFAULT SETTINGS** *menu item that is located on the Configuration/Utilities menu will reset the User Account Management table back to the factory default account* **username/password/admin**.

Table 3-1. Console Menu User Privileges

Console Menu Item:	Privilege level(s) under which a user may alter (and in some cases, view) this item:			
	Guest	Interface	Test	Admin
Status menu				
Acknowledge alarms		X	X	X
Statistics menus				
Clear statistics (for all Statistics menus)		X	X	X
Reset alarm log		X	X	X
Configuration – Network Interface menu				
DS3 framing mode		X	X	X
DS3 line length		X	X	X
DS3 timing		X	X	X
DS3 loopback detection		X	X	X
DS3 XCV threshold		X	X	X
Active controller		X	X	X
DS3 max switch threshold		X	X	X
DS3 min switching period		X	X	X

"X" denotes a privilege level that allows execution of the associated menu item

Table 3-1. Console Menu User Privileges (Continued)

Console Menu Item:	Privilege level(s) under which a user may alter (and in some cases, view) this item:			
	Guest	Interface	Test	Admin
Loopback timeout		X	X	X
DS2 #1-7 mode (T1 or E1)		X	X	X
Configuration – T1/E1 Interface menu				
T1/E1 state		X	X	X
T1/E1 line coding		X	X	X
T1/E1 line length		X	X	X
T1/E1 loopback detection		X	X	X
T1/E1 circuit protection		X	X	X
T1/E1 protection threshold		X	X	X
T1/E1 line identification		X	X	X
T1/E1 XCV threshold		X	X	X
Configuration – System Management menu				
Local IP address				X
Gateway IP address				X
Subnet mask				X
Alarm Relay Configuration menu				X
SNMP Trap IP addresses menu				X
SNMP Trap Generation menu				X
SNMP Read Community name				X
SNMP Write Community name				X
SNMP Trap Community name				X
User Account Management menu				X

"X" denotes a privilege level that allows execution of the associated menu item

Table 3-1. Console Menu User Privileges (Continued)

Console Menu Item:	Privilege level(s) under which a user may alter (and in some cases, view) this item:			
	Guest	Interface	Test	Admin
Terminal timeout				X
IP security				X
IP hosts				X
Date				X
Time				X
Circuit Identification menu				X
Syslog Setup menu				X
Auto-save		X	X	X
Autoprogram cards				X
Configuration – Utilities menu				
Load default settings				X
Update flash software				X
Configuration transfer				X
System reset				X
Loopback menu				
T1/E1 loopbacks			X	X
DS2 loopbacks			X	X
DS3 loopbacks			X	X
Reset all tests			X	X
Clear BERR			X	X
Save Configuration & Alarm Log	X	X	X	X
Logout	X	X	X	X

"X" denotes a privilege level that allows execution of the associated menu item

Terminal Time Out

Set the amount of time the terminal or TELNET session remains inactive before automatically closing the session, requiring the user to log in again. The options include **DISABLED**, **1 MIN.**, **5 MIN.**, **15 MIN.**, **60 MIN.**, or **1 DAY**.

IP Security

Enable or disable the **IP SECURITY** option. If **ENABLED**, the unit accepts management commands and TELNET sessions from the IP addresses entered into the **IP HOSTS** fields.

IP Hosts

Enter up to 16 IP addresses of management stations from which the unit should accept management commands. These addresses are only applicable if **IP SECURITY** is **ENABLED** (see previous paragraph).

Date & Time

Enter date and time information. Enter the month, date, and year separated by forward slashes (02/23/00). Enter the time in military time separated by colons (13:15:25).

Miscellaneous

Circuit Identification

These fields allow you to store information that identifies the unit (see Figure 3-15 on page 3-26). Information provided for the far-end is read-only. Local information is read/write from this menu.

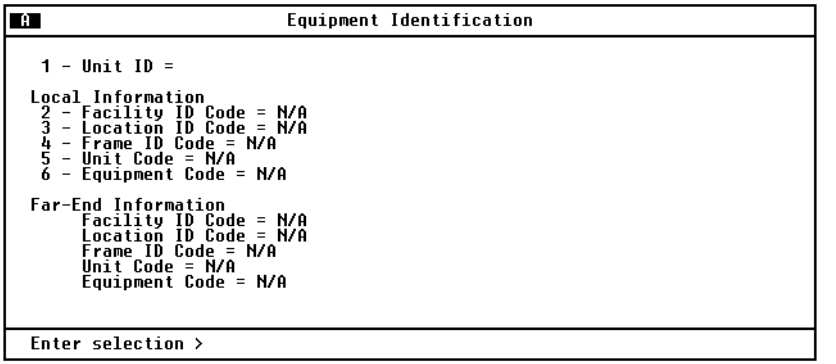


Figure 3-15. Equipment Identification Menu

Unit ID

Provides a user-configurable text string for the name of the MX2810. This name can help you distinguish between different installations. You can enter up to 32 alpha-numeric characters in this field, including spaces and special characters (such as an underbar). This information is locally stored and displayed in the upper right-hand corner of the MX2810 terminal screens.

Facility ID/Location ID/Frame ID/Unit and Equipment Codes

These fields provide user-configurable text strings to identify the MX2810 over the network. The **LOCATION ID CODE**, **FRAME ID CODE**, and **EQUIPMENT CODE** fields support up to ten alpha-numeric characters each. The **FACILITY ID CODE** supports 38 characters and the **UNIT CODE** supports 6 characters. This information is transmitted over the DS3 on the equipment ID channel.

Syslog Setup

Selections include **TRANSMISSION**, **HOST IP ADDRESS**, **SEVERITY LEVEL**, and **HOST FACILITY**.

Transmission

Enables or disables the transmission of log events to the external Syslog server. You must first define the host IP address.

Host IP Address

Specifies the IP address of the external server that is running the Syslog host daemon.

Severity Level

Specifies the lowest level of severity that causes messages to be logged to the Syslog server. The levels are listed in Table 3-2, in order of decreasing severity. Any message at or above a selected severity level will be logged if a transmission is enabled.

Table 3-2. Syslog Severity Levels

Level	Description
Emergency	The system is unusable.
Alert	An action must be taken immediately.
Critical	Shows critical conditions.
Error	Shows error conditions.
Warning	Shows warning conditions.
Notice	Shows normal, but significant, conditions.
Info	Shows informational messages.
Debug	Shows a debug-level message.

Host Facility

Specifies the facility destination of log events. Facilities are located on the host and are managed by the Syslog host daemon running on either a UNIX machine or a PC. Options include Local 0-7.

Auto Save

Enable this function to save the configuration every five minutes and when you logout. Disable if you do not want to save the configuration. The configuration may be saved manually from the **CONFIGURATION** Main Menu.

Autoprogram Cards

Enable this function to allow the controller cards to automatically update software and ensure that both controller cards are running the same version of code. When the software of both controller cards are not the same, the card running the older software will automatically be updated with the newer version. If the option is disabled, the controller cards will continue to run existing software.

UTILITIES

The **UTILITIES** menu (see Figure 3-16) allows you to view MX2810 system information for both controller cards (including self-test results), revert to default configuration settings, flash-load a new version of software, transfer configuration information to and from a TFTP server, and reset the system. Possible results for the self-test are listed in the chart following Figure 3-16.

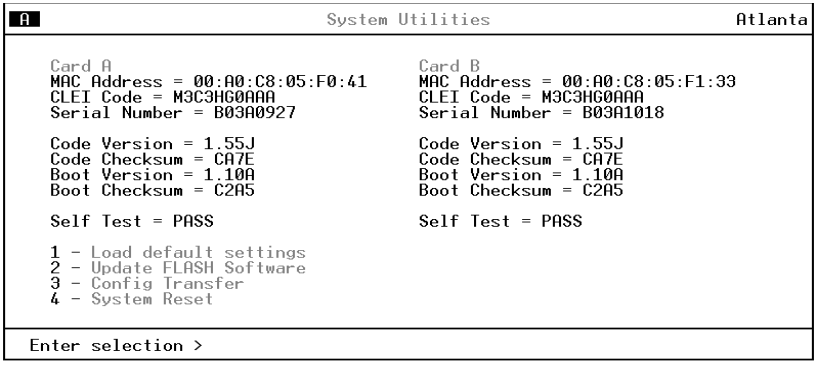


Figure 3-16. System Utilities Menu

Table 3-3. Self-Test Results

If the self test results are...	Then...
PASS	the self-test was successful and the unit is ready to use.
BAD RAM DATA BAD RAM ADDRESS BAD CODE CHECKSUM BAD BOOT SECTOR IOX PROGRAM FAILURE AFE PROGRAM FAILURE ETHERNET FAILURE DS3 FAILURE DSX FAILURE	contact ADTRAN Technical Support. See the inside back cover of this manual for more information.

If the self test results are...	Then...
CONFIGURATION CORRUPT	select **SAVE CONFIGURATION** from the main **CONFIGURATION** menu. If condition persists, contact ADTRAN Technical Support.

Loading Default Settings

> **WARNING** *Loading the default settings will disable all DSX ports. The* **USER ACCOUNT MANAGEMENT** *table is also reset to default.*

Select **LOAD DEFAULT SETTINGS** from the **UTILITIES** menu. Once the settings have been successfully retrieved, **Command Accepted** will appear at the bottom of the screen.

> **NOTE** *The IP Address, Default Gateway, and subnet mask will not be reset when default settings are loaded.*

Updating Software

Select **UPDATE FLASH SOFTWARE** from the **UTILITIES** menu to update software using either XMODEM protocol or Trivial File Transfer Protocol (TFTP).

> **NOTE** *Before beginning update of FLASH software, disable the* **AUTO SAVE** *feature of the MX2810. From the* **CONFIGURATION** *menu, choose* **SYSTEM MANAGEMENT**, *then select* **OPTION 18** *until* **AUTO SAVE** *is set to* **DISABLE**.

Update Via XMODEM

Updating the FLASH Software via XMODEM requires that a VT100 terminal menu session be active through the unit's craft port. To update the software via XMODEM, follow the steps below:

1. From the MX2810 Main Menu, select **CONFIGURATION**, select **UTILITIES**, select **UPDATE FLASH SOFTWARE**, select **UPDATE VIA XMODEM**.
2. Once it has been determined where the new binary file is located, select **START** to begin the transfer.
3. Once Start has been selected, start the XMODEM transfer from the terminal menu program that is being used by selecting or typing the file path for the location of the new binary file. See appropriate documentation for your terminal emulator to begin XMODEM transfer.
4. After selecting the binary file, the XMODEM transfer will begin. If you wish to cancel a transfer in progress, press **Ctrl-x** three times. The **ACT LED** on the active card is solid amber for the duration of XMODEM transfer. The **ACT LED** on the stand-by card is blinking green.
5. If updating a unit with redundant controller cards, the active controller will begin uploading the new code to the stand-by controller after the XMODEM transfer has completed and the unit has successfully loaded and programmed the new software into its **FLASH** memory. If the unit does not have redundant controller cards, go to step 7.
6. While the stand-by card is having code uploaded, the **ACT LED** on the stand-by card will be solid amber. After the code has finished uploading to the stand-by card, the card will reset itself and begin running the new code.

WARNING

*The stand-by card must remain in place until the upload process is complete and the **ACT LED** is no longer solid amber and returns to blinking green. Removing the stand-by card during the uploading process will corrupt the software.*

7. The system must be manually reset after downloading new software for the active controller card to begin running the new code. From the **UTILITIES** menu, select **SYSTEM RESET**, and then

select either **IMMEDIATE RESET** to immediately reset the system or **SCHEDULE RESET TIME** to set a time for the system to reset. Once the system has been reset, the new software will be running.

*This function is available only when updating the software through the **CRAFT** port.*

Update via TFTP Server

Updating the FLASH Software via TFTP Server requires that the IP address and file name of file to be downloaded is known. To update the software via TFTP, follow the steps below:

1. Select **UPDATE VIA TFTP SERVER** from the **UTILITIES** menu. A new menu displays allowing you to enter the IP address and file name of the file you want to download to the unit. Once this information in entered, select **START/STOP TRANSFER**.
2. After selecting the binary file, the TFTP transfer will begin. If you wish to cancel a transfer in progress, press **Ctrl-x** three times. The **ACT LED** on the active card is solid amber for the duration of TFTP transfer. The **ACT LED** on the stand-by card is blinking green.
3. If updating a unit with redundant controller cards, the active controller will begin uploading the new code to the stand-by controller after the XMODEM transfer has completed and the unit has successfully loaded and programmed the new software into its FLASH memory. If the unit does not have redundant controller cards, go to step 5.
4. While the stand-by card is having code uploaded, the **ACT LED** on the stand-by card will be solid amber. After the code has finished uploading to the stand-by card, the card will reset itself and begin running the new code.

WARNING

The stand-by card must remain in place until the upload process is complete and the **ACT LED** *is no longer solid amber. Removing the stand-by card during the uploading process will corrupt the software.*

5. The system must be manually reset after downloading new software for the active controller card to begin running the new code. From the **Utilities** menu, select **SYSTEM RESET**, and then select either **IMMEDIATE RESET** to immediately reset the system or **SCHEDULE RESET TIME** to set a time for the system to reset. Once the system has been reset, the new software will be running.

.

Configuration Transfer

Select **CONFIG TRANSFER** from the **UTILITIES** menu to transfer files to and from a TFTP server. The **CONFIG TRANSFER** option also lets you save the MX2810 configuration as a backup file, so you can use the same configuration with multiple MX2810 units. Only one configuration transfer session (upload or download) can be active at a time.

NOTE

Before using **CONFIG TRANSFER**, *the MX2810 should have a valid IP address, subnet mask, and default gateway (if required), and should be connected to an Ethernet network.*

Saving to a TFTP Server

To save current configuration information to a TFTP server, follow the steps listed below.

1. Set the **SERVER IP ADDRESS** field to the IP address of the machine running the TFTP server program.

   If you are using the ADTRAN TFTP server, the IP address displays in the **SERVER IP ADDRESS** field. For other TFTP servers, please refer to the appropriate documentation.

2. Change the TFTP Server Filename to a unique filename. This will be the name of the configuration file saved to the remote server.

Some TFTP servers constrain the format of the filename depending on the operating system of the server. For example, a TFTP server running on a PC under Windows 3.1 may only permit 8.3 format filenames (8 characters, period, and three extension characters).

3. Select **SAVE CONFIG REMOTELY**.

Retrieving from a TFTP Server

To retrieve current configuration information from a TFTP server, follow the steps listed below.

1. Set the **SERVER IP ADDRESS** field to the IP address of the machine running the TFTP server program.

   If you are using the ADTRAN TFTP server, the IP address displays in the **SERVER IP ADDRESS** field. For other TFTP servers, please refer to the appropriate documentation.

2. Change the TFTP **SERVER FILE NAME** to a unique filename. Include the complete path. This will be the name of the configuration file retrieved from the remote server.

WARNING *Configuration changes will not be implemented until all Telnet sessions are closed. Loading a new configuration may disrupt data traffic.*

3. Select **LOAD AND USE CONFIG**.

Resetting the System

The system must be manually reset after downloading new software. When the unit has successfully loaded and programmed the new software into its FLASH memory, it will begin uploading the code to the stand-by controller. This will be indicated on the menu and the **ACT LED** on the stand-by card will display solid yellow.

WARNING *The stand-by card must remain in place until the process is complete and the **ACT LED** is no longer solid yellow. Removing the stand-by card during the uploading process will corrupt the software.*

Once the upload is complete, the stand-by card will self-reset and begin running the new code. However, the active card does not reset automatically. The unit must be reset through the **IMMEDIATE RESET** or **SCHEDULE RESET TIME** functions.

SAVE CONFIGURATION AND ALARM LOG

Commits the current configuration and alarm log to nonvolatile memory. If this option is not selected after making changes to the configuration, the unit reverts to its previous configuration when powered down.

Chapter 4 Status

View MX2810 status information by selecting **1-STATUS** from the **MAIN** menu (see Figure 4-1). The information for the DS3, DS2s, T1/E1 lines, power supplies, and controller cards is provided.

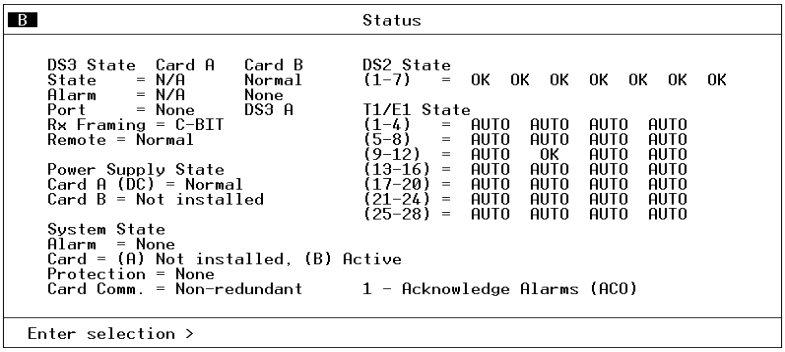


Figure 4-1. Status Menu

DS3 STATE

Displays the current state of the DS3. The following sections describe the DS3 status fields in detail.

Rx Framing

Shows the network framing type (C-bit or M13).

State

Displays the current condition of the network. Possible conditions are listed in the following chart:

Condition	Description
Normal	The MX2810 is ready to pass data.
Alarm	The unit is currently receiving an alarm indication. Alarm types are discussed in the following section, *Alarm*.
In Test	The unit is currently in test mode. See *Loopbacks* on page 6-1 for information on the test type.

Alarm

This field displays the current alarm condition of the MX2810. Possible conditions are given in the following chart:

Condition	Description
Normal	No alarms are currently being received.
RAI (remote alarm indication)	The unit is receiving an RAI (yellow) alarm from the network. This alarm is a signal sent back toward the source of a failed transmit circuit. The X-bits (X1 and X2) are set to zero.
LOS (loss of signal)	The unit has lost the Rx signal.
AIS (alarm indication signal)	The unit is receiving an AIS (blue) alarm condition from the network. AIS alarms occur when consecutive 1010s are received in the information bits. This indicates that there is a transmission fault located either at or upstream from the transmitting terminal.
LOF (loss of framing)	The unit detects a framing loss from the network.

Condition	Description
Excessive CV	The unit is receiving excessive code violations from the network, exceeding the threshold set by the user (see *XCV Threshold* on page 3-4).
TLOS (Tx loss of signal)	The transmitter has failed.
Idle	The unit detects an idle sequence from the network.

Remote

This field indicates the current state of the remote MX2810. Possible conditions are given in the following chart:

Condition	Description
Normal	The far-end MX2810 is not reporting any conditions.
RAI (remote alarm indication)	The far-end unit is receiving an RAI (yellow) alarm from the network. This alarm is a signal sent back toward the source of a failed transmit circuit. The X-bits (X1 and X2) are set to zero.
LOS (loss of signal)	The far-end unit has lost the Rx signal.
AIS (alarm indication signal)	The far-end unit is receiving an AIS (blue) alarm condition from the network. AIS alarms occur when consecutive 1010s are received in the information bits. This indicates that there is a transmission fault located either at or upstream from the transmitting terminal.
LOF (loss of framing)	The far-end unit detects a framing loss from the network.
Idle	The far-end unit detects an idle sequence from the network.

Condition	Description
DS3 Eqpt Fail (SA)	The far-end unit or network is reporting a service-affecting DS3 equipment failure.
DS3 Eqpt Fail (NSA)	The far-end unit or network is reporting a non-service-affecting DS3 equipment failure.
Common Eqpt Fail (NSA)	The far-end unit or network is reporting a non-service-affecting common equipment failure.
Multiple DS1 LOS	The far-end unit is experiencing a loss of signal on multiple DS1s.
Single DS1 LOS	The far-end unit is experiencing a loss of signal on a single DS1.
DS1 Eqpt Fail (SA)	The far-end unit is experiencing a service-affecting DS1 equipment failure.
DS1 Eqpt Fail (NSA)	The far-end unit is experiencing a non-service-affecting DS1 equipment failure.
Unknown	The unit is unable to discern the status of the far-end unit. (Normal for M13 framing.)

POWER SUPPLY STATE

This field indicates which types of power supplies are installed (AC or DC) in Card A and Card B and gives their current state:

Condition	Description
Normal	The power supply is fully operational.
Error	The controller card cannot communicate with the power supply.
Power Low	The power supply's output level is abnormally low.
Power Fail	The power supply's input power is lost.
Temp High	The power supply card temperature is abnormally high.
Temp Critical	The power supply card temperature is so high that it will soon shut off completely.

SYSTEM STATE

These fields display information regarding the two controller cards. The following sections describe the system state fields in detail.

Alarm

This field displays what type (if any) of system alarm is currently recognized by the unit. The condition is displayed until it clears up, with the exception of the **SWITCHED** condition (which is cleared manually) and the **EXCESSIVE SWITCHES** (which is cleared when **PROTECTION SWITCH** alarms counts are cleared, see page 5-12) .

To clear the **SWITCHED** condition, select **ACKNOWLEDGE ALARMS (ACO)** or push the **ACO** button on the front panel. See the sections *ACO Buttons* on page 2-9 and *Acknowledge Alarms (ACO)* on page 4-8 for more information. Possible alarm types are listed in the following chart:

Condition	Description
Supply Failure	A power supply card has failed.
Card Failure	A controller card is not passing data.
Excessive Switches	The **MAX SWITCHING THRESHOLD** has been exceeded. See *Max. Switch Threshold* on page 3-5.
Switched	A card switch has occurred.

Card A/Card B

These fields display the current state of the two controller cards. Possible states for the controller cards are listed in the following chart:

Condition	Description
Not Installed	No controller card is installed in this slot.
Stand By	The controller card is ready to pass data, but is currently acting as a backup card.
Active	The controller card is acting as the primary card.
Failure	The controller card has failed and needs to be replaced.

Protection

This field lists the type of protection mode currently active. Possible states are listed in the following chart:

Condition	Description
Circuit	Unit is in Circuit Protection Mode and everything is healthy.
None	One controller card is installed, *or* the unit is in Circuit Protection Mode and the secondary card has failed.

For more information on the different types of Protection Modes, see the chapter Circuit Redundancy on page 7-1.

Card Comm

This field displays the current state of the communication link between the two controller cards. **OK** indicates that the cards are communicating; **FAILURE** indicates that the cards are not able to communicate with each other. If there is only one card installed, **NON-REDUNDANT** is displayed.

DS2 STATE

This field displays the current state of each of the seven DS2s. Possible states are listed in the following chart:

Condition	Description
OK	The DS2 is not receiving alarms.
LOF	The unit detects framing loss across the DS2.
RAI	The unit is receiving an RAI (yellow) alarm across the DS2. This alarm is a signal sent back toward the source of a failed transmit circuit. The X-bit is set to zero.
AIS	The unit is receiving an AIS (blue) alarm condition from the network across the DS2. AIS alarms occur when the unit receives unframed all ones.

T1/E1 STATE

The field displays the current state of the individual T1s or E1s. Possible states are listed in the following chart:

Condition	Description
OK	The T1/E1 is ready to pass data.
LOS	The unit has lost the Rx signal on the T1/E1.
XCV	The unit is receiving excessive code violations across the T1/E1, exceeding the configured threshold (see *XCV Threshold* on page 3-4).

Condition	Description
TST	The T1/E1 is currently in test mode.
HOT	The T1/E1 transceiver temperature is too high.
LAIS (loop side AIS)	The T1 is receiving all ones from the DSX-1 interface.
CAIS (carrier side AIS)	The T1 is receiving all ones from the DS3 side of the network.

A DS2 can be divided into either three E1s or four T1s. Therefore, when dealing with an E1 configuration, some of the fields in the **T1/E1 STATE** *menus do not apply (and display nothing).*

ACKNOWLEDGE ALARMS (ACO)

This selection allows you to remotely turn off an active alarm. It is the software equivalent of the **ACO** button (described in the section *ACO Buttons* on page 2-9).

Chapter 5 Statistics

VIEWING STATISTICAL INFORMATION

Select **2-STATISTICS** from the **MAIN** menu to access **STATISTICS** menus (see Figure 5-1). Alarm information and performance parameters are available for both the near and far ends of the network. Information is also given for the individual DS2s and T1/E1 lines.

Statistical information is given in screens based on the following time periods: the current 15-minute interval, a 24-hour history (divided into 96 15-minute intervals), and the totals for the previous 24 hours. Also, a cumulative alarm count is given. This count continues indefinitely until reset by the user.

Figure 5-1. Main Local Statistics Menu Screen

DS3 Statistics

This menu provides submenus for alarm history and performance parameters (see Figure 5-2).

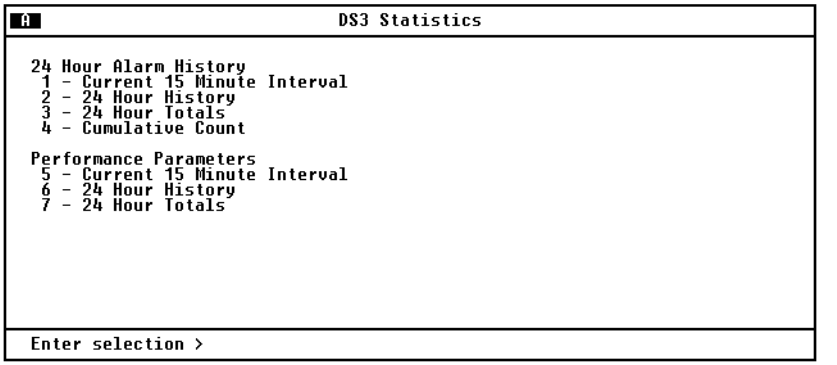


Figure 5-2. DS3 Statistics Menu

24 Hour Alarm History

The MX2810 keeps track of alarms for both the near and far ends of the network. View alarm history information in one of the three time period selections, or view a cumulative alarm count. Information in these fields is for the given time period (if any) since the last reset. The cumulative alarm count continues indefinitely until **CLEAR ALL DS3 ALARM COUNTS** is selected. See Figure 5-3 and Figure 5-4 on page 5-4 for examples of alarm screens.

The following alarm counts are provided in this menu:

Condition	Description
LOS	Number of times the unit has lost the receive signal.
LOF	Number of times the unit has detected a loss of framing from the network.
AIS	Number of times the unit has received an AIS (blue) alarm condition from the network. AIS alarms occur when consecutive 1010s are received in the information bits. This indicates that there is a transmission fault located either at or upstream from the transmitting terminal.
RAI	Number of times the unit has received an RAI (yellow) alarm from the network. This alarm is a signal sent back toward the source of a failed transmit circuit. The X-bits (X1 and X2) are set to zero.
IDLE	Number of times the unit has detected an idle sequence from the network.

The count given reflects the number of times the alarm or state has occurred (rather than the number of seconds the alarm was active).

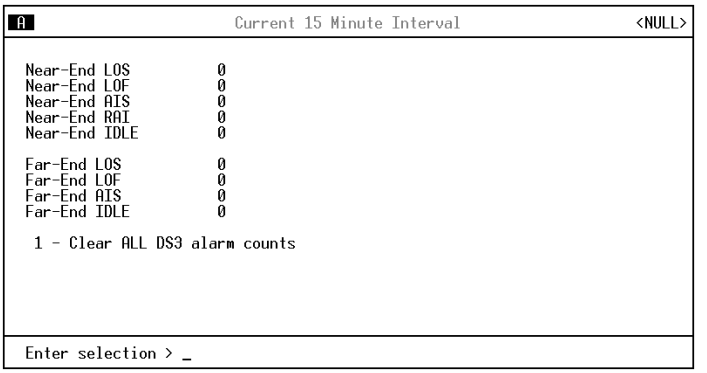


Figure 5-3. DS3 Current Alarm Count Screen

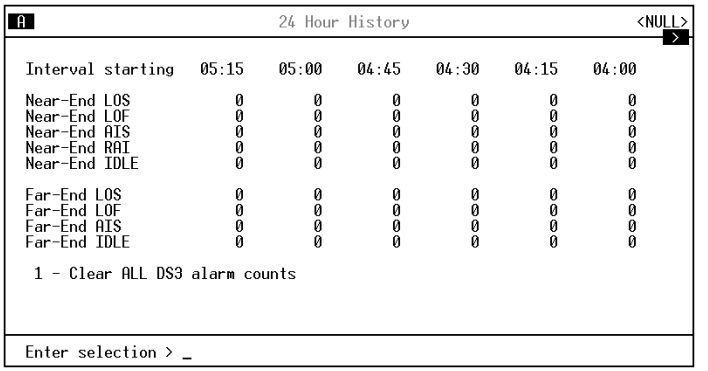


Figure 5-4. DS3 24-Hour Alarm History Screen

*When a **>** or **<** symbol appears in an upper corner of the screen, you can use the arrow keys on your keyboard to scroll right or left to view additional information. See the upper right-hand corner of Figure 5-4.*

Performance Parameters

View performance parameter information for the network in one of the three time period selections. Information in these fields is for the given time period since the last reset. When viewing the

24-hour history statistics screen, use the left and right arrow keys to scroll through all 96 15-minute intervals. See Figure 5-5, Figure 5-6, and Figure 5-7 on page 5-6 for examples of the performance parameter screens.

Descriptions of the fields in each screen follows.

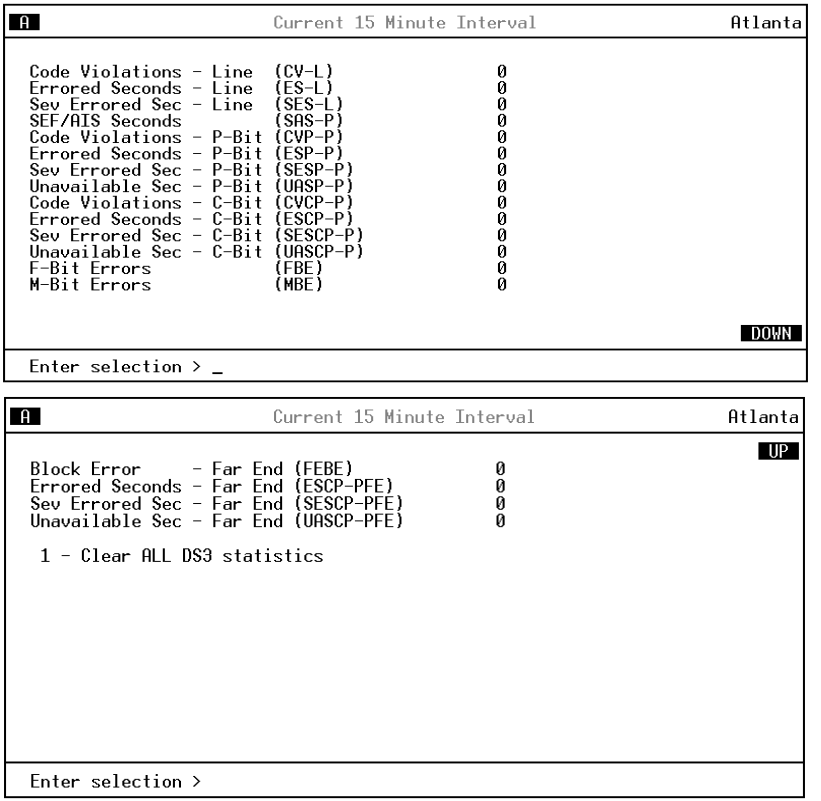


Figure 5-5. DS3 Performance Parameters (Current 15 Minutes)

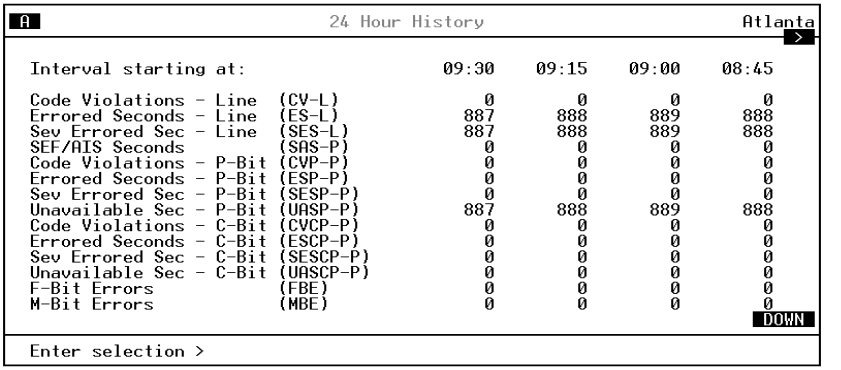


Figure 5-6. DS3 Performance Parameters (24 Hour History)

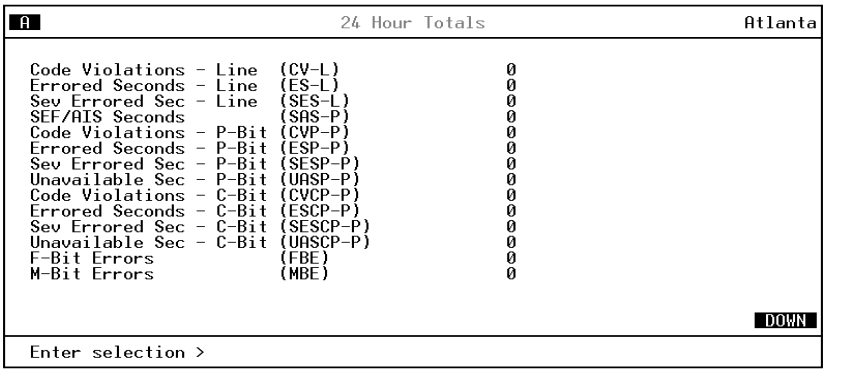


Figure 5-7. DS3 Performance Parameters (Totals)

Interval starting at:

Time that the 15-minute interval began. This field is only displayed in the 24-hour history screen, which gives information for the previous 24 hours divided into 15-minute intervals (shown in Figure 5-6 on page 5-6).

Coding Violations - Line (CV-L)

Number of BPVs (bipolar violations) and EXZs (excessive zeros) that have occurred.

Errored Seconds-Line (ES-L)
Number of seconds in which one or more CVs or one or more LOS (loss of signal) defects occurred.

Severely Errored Seconds-Line (SES-L)
Number of seconds with 44 or more LCVs or one or more LOS (loss of signal) defects occurred.

SEF/AIS Seconds (SAS-P)
Number of seconds with one or more out-of-frame defects or a detected incoming AIS.

Coding Violations - P-Bit (CVP-P)
Number of coding violation (CV) error events that have occurred.

Errored Seconds - P-Bit (ESP-P)
Number of seconds with one or more PCVs (P-bit coding violations), one or more out-of-frame defects, or a detected incoming AIS. This count is not incremented when UASs (unavailable seconds) are counted.

Severely Errored Seconds - P-Bit (SESP-P)
Number of seconds with 44 or more PCVs, one or more out-of-frame defects, or a detected incoming AIS. This count is not incremented when UASs are counted.

Unavailable Seconds - P-Bit (UASP-P)
Time in seconds for which the DS3 path is unavailable. The DS3 path becomes unavailable at the onset of 10 contiguous SESP-Ps.

Code Violations - C-Bit (CVCP-P)
In C-bit parity mode, this is a count of coding violations reported via the C-bits or the number of C-bit parity errors that have occurred.

Errored Seconds - C-Bit (ESCP-P)
Number of seconds with one or more CCVs, one or more out-of-frame defects, or a detected incoming AIS. This count is not incremented when UASs are counted.

Severely Errored Seconds - C-Bit (SESCP-P)
Number of seconds with 44 or more CCVs, one or more out-of-frame defects, or a detected incoming AIS. This count is not incremented when UASs are counted.

Unavailable Seconds - C-Bit (UASCP-P)
Time in seconds for which the DS3 path is unavailable. The DS3 path becomes unavailable at the onset of 10 contiguous SESCP-Ps.

F-Bit Errors (FBE)
Number of times an F-bit framing error has occurred.

M-Bit Errors (MBE)
Number of times an M-bit framing error has occurred.

Block Error - Far End (FEBE)
Number of times the far-end unit has received a C-parity or framing error.

Errored Seconds - Far End (ESCP-PFE)
Time in seconds containing one or more Far End Block Errors (FEBE)

Severely Errored Seconds - Far End (SESCP - PFE)
Number of seconds with 44 or more Far End Block Errors (FEBEs).

Unavailable Seconds - Far End (UASCP - PFE)
Time in seconds for which the DS3 path is unavailable. The DS3 path becomes unavailable at the onset of 10 contiguous SESCP-PFEs.

Clear All Local DS3 Statistics/Refresh All Remote Statistics
Clears or refreshes all current information. These selections affect all statistical information (not just the displayed screen). When viewing the 24-hour history screen, press the down arrow key to access this selection.

DS2 Statistics

24 Hour Alarm History

The MX2810 keeps track of RAI, OOF, and AIS alarms for each of the seven DS2s. View alarm history information in one of the three time period selections, or view a cumulative alarm count. Information in these fields is for the given time period (if any) since the last reset. The cumulative alarm count continues indefinitely until **CLEAR ALL DS2 ALARM COUNTS** is selected. When viewing the 24-hour history menus, use the up and down arrow keys to view all three alarm counts (RAI, OOF, and AIS). See Figure 5-8 and Figure 5-9.

```
A                    Current 15 Minute Interval

DS2              RAI                 OOF                 AIS

#1               0                   1                   0
#2               0                   1                   0
#3               0                   1                   0
#4               0                   1                   0
#5               0                   1                   0
#6               0                   1                   0
#7               0                   1                   0



1 - Clear ALL DS2 alarm counts

Enter selection >
```

Figure 5-8. DS2 Statistics (Current 15 Minutes)

```
A                    24 Hour RAI Alarm History                    >

DS2        N/A       N/A       N/A       N/A       N/A       N/A       N/A

#1           0         0         0         0         0         0         0
#2           0         0         0         0         0         0         0
#3           0         0         0         0         0         0         0
#4           0         0         0         0         0         0         0
#5           0         0         0         0         0         0         0
#6           0         0         0         0         0         0         0
#7           0         0         0         0         0         0         0



 1 - Clear ALL DS2 alarm counts                                  DOWN

Enter selection >
```

Figure 5-9. DS2 RAI 24-Hour Alarm History

Performance Parameters

The performance parameters screen displays a count of parity bit errors and frame bit errors for the seven DS2s. View this information in any of the three time period selections. Information in these fields is for the given time period since the last reset. When viewing the 24-hour history statistics screen, use the left and right arrow keys to scroll through all 96 15-minute intervals; use the up and down arrow keys to scroll between the **PBERR** (parity bit error) and **FBERR** (frame bit error) menus. See Figure 5-10 and Figure 5-11.

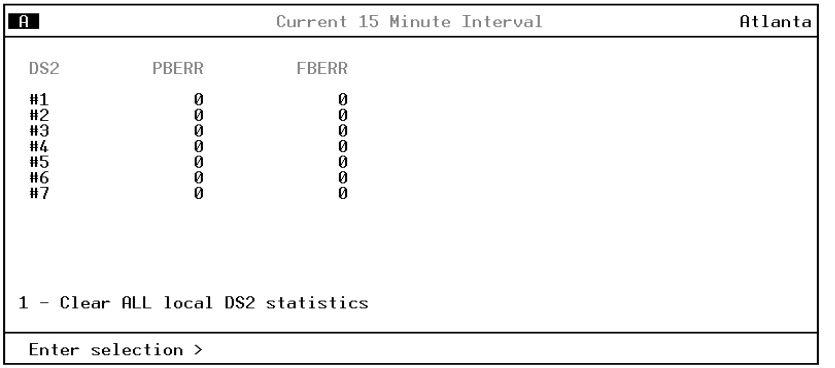


Figure 5-10. DS2 Performance Parameters (Current 15 Minutes)

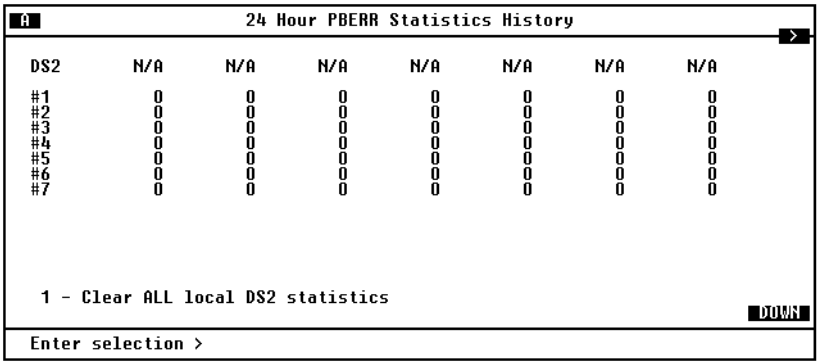


Figure 5-11. DS2 PBERR 24-Hour Alarm History

T1/E1 Statistics

The MX2810 keeps track of **LOSS OF SIGNAL ALARMS**, **LINE CODING VIOLATIONS**, **AIS LOOP ALARMS**, **AIS CARRIER ALARMS, ERRORED SECONDS,** and **SEVERELY ERRORED SECONDS** for each of the T1s and E1s (see Figure 5-12). View this information in one of the three time period selections, or view a cumulative alarm count. Information in these fields is for the given time period (if any) since the last reset. The cumulative alarm count continues indefinitely until **CLEAR ALL T1/E1 ALARM COUNTS**, located in each field, is selected.

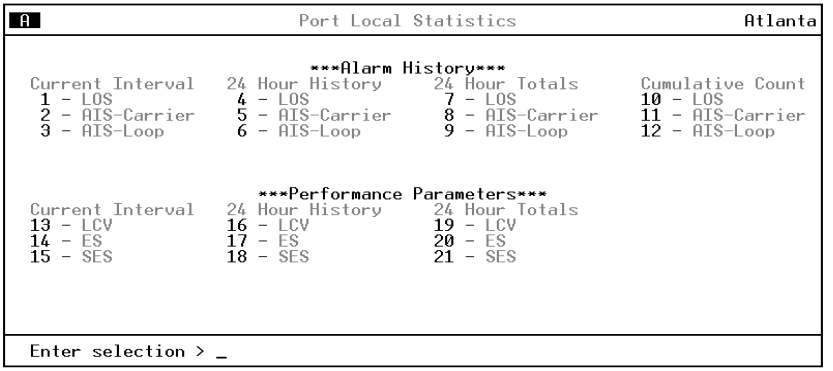


Figure 5-12. T1/E1 Statistics Menu

PROTECTION SWITCH STATISTICS

This menu provides statistics regarding protection switches. The number of protection switches that occur within the particular time period will be listed. (See *Figure 5-13*.)

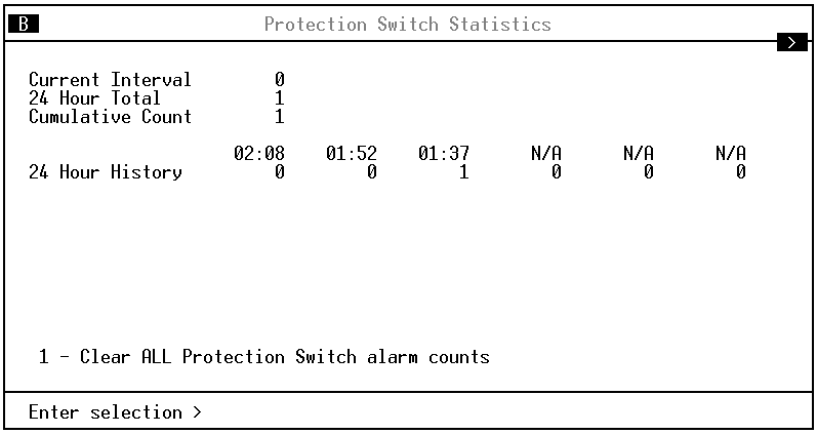


Figure 5-13. Protection Switch Statistics Menu

Performance Parameters

View performance parameter information for the network in one of the three time period selections. Information in these fields is for the given time period since the last reset. When viewing the 24-hour history statistics screen, use the left and right arrow keys to scroll through all 96 15-minute intervals. Clearing protection switch alarm counts will clear the **EXCESSIVE SWITCH STATE** if active.

Alarm Log

This menu provides a list of the last 200 alarms that have occurred on the MX2810. When the alarm log becomes full, new alarms replace the oldest alarms in a first-in, first-out sequence.

The alarm log is periodically stored in non-volatile memory. Once every minute, if an alarm has been recorded or if the alarm log has been reset since the last time it was saved, then the alarm log and

system configuration are saved to non-volatile memory. Both the alarm log and system configuration may be saved manually when the user executes the **SAVE CONFIGURATION & ALARM LOG** menu function in the **CONFIGURATION** menu. Each time the system powers up, the alarm log is retrieved from non-volatile memory.

A **RESET ALARM LOG** function is accessible from the alarm log menu. This option clears the alarm log (See Figure 5-14.)

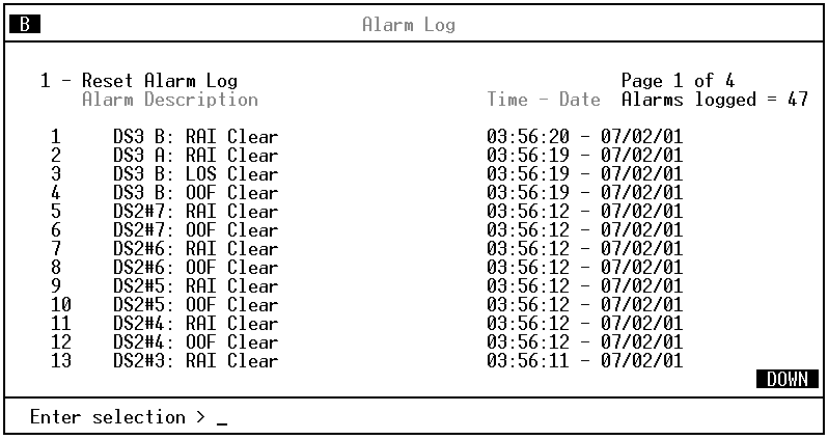


Figure 5-14. Alarm Log

Chapter 6 Loopbacks

The **LOOPBACK** menu allows you to initiate loopback tests from the MX2810. Figure 6-1 shows the main **LOOPBACK** menu. From this menu, select **T1/E1**, **DS3**, or **DS2 LOOPBACKS**. Once this selection is made, a second menu appears displaying the types of tests available.

Descriptions and testing diagrams of the loopback tests are provided in the following portions of this chapter:


```
B                          Loopback Menu

T1/E1 Loopbacks          T1/E1 Loopbacks       DS3/DS2 Loopbacks
 1 - Data Mode           15 - Data Mode        29 - DS3 = Data Mode
 2 - Data Mode           16 - Data Mode
 3 - Data Mode           17 - Data Mode        30 - DS2 #1 = Data Mode
 4 - Data Mode           18 - Data Mode        31 - DS2 #2 = Data Mode
 5 - Data Mode           19 - Data Mode        32 - DS2 #3 = Data Mode
 6 - Data Mode           20 - Data Mode        33 - DS2 #4 = Data Mode
 7 - Data Mode           21 - Data Mode        34 - DS2 #5 = Data Mode
 8 - Data Mode           22 - Data Mode        35 - DS2 #6 = Data Mode
 9 - Data Mode           23 - Data Mode        36 - DS2 #7 = Data Mode
10 - Data Mode           24 - Data Mode
11 - Data Mode           25 - Data Mode        37 - Reset ALL tests
12 - Data Mode           26 - Data Mode
13 - Data Mode           27 - Data Mode
14 - Data Mode           28 - Data Mode

Enter selection >
```

Figure 6-1. Loopback Main Menu

T1/E1 LOOPBACKS

After you select the number that corresponds with the line you want to test, the menu in Figure 6-2 appears. The sections following the figure provide descriptions and illustrations of the testing options. Select **1-DATA MODE** to end a test in progress.

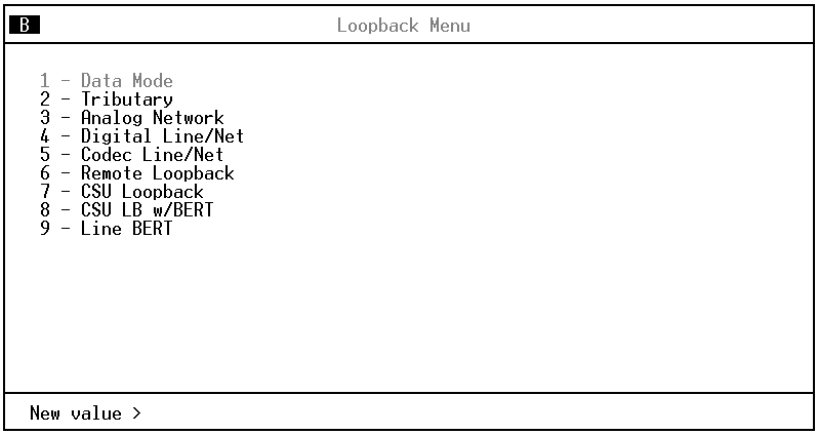


Figure 6-2. T1/E1 Loopback Menu

Tributary

A **TRIBUTARY** loopback loops the selected T1/E1 back to the network (DS3). The T1/E1 is de-multiplexed through the M23 and M12/G.747 de-multiplexers, looped back, and multiplexed back up through the M12/G.747 and M23 multiplexers. During this loopback, all network receive data is passed to the DSX-1/E1 transmitters, but all data received by the DSX-1/E1 loop side is ignored and substituted with the network data. See Figure 6-3 on page 6-3 for an illustration of this test.

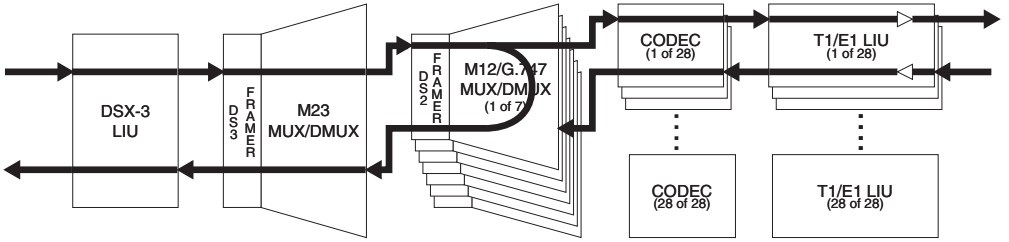


Figure 6-3. Tributary Loopback Test

Analog Network

An **ANALOG NETWORK** loopback test loops the selected T1/E1 back to the network (DS3). The T1/E1 is completely de-multiplexed, looped back at the T1/E1 line interface unit (LIU), through the LIU drivers and receivers, and multiplexed back onto the DS3 network stream. See Figure 6-4 for an illustration of this test.

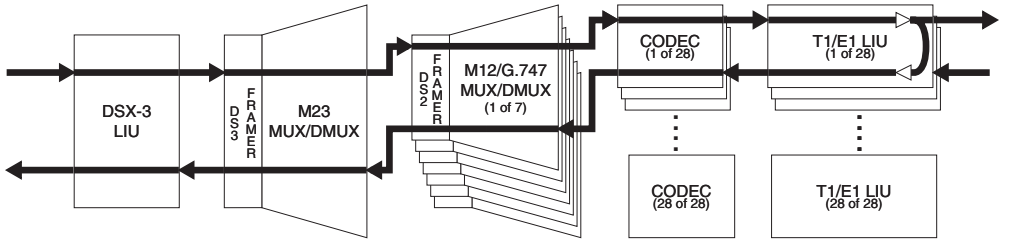


Figure 6-4. Analog Network Loopback

Digital Line/Net

A **DIGITAL LINE/NET** loopback performs a loopback of the selected T1/E1 in both the network and local loop directions. Both loopbacks occur at the T1/E1 LIU. The network side loopback occurs at the edge of the LIU while the T1/E1 loop side loopback occurs deep into the LIU through the receiver, receive equalizer, transmit jitter attenuator, and finally, through the T1/E1 transmit drivers. See Figure 6-5 on page 6-4 for an illustration of this test.

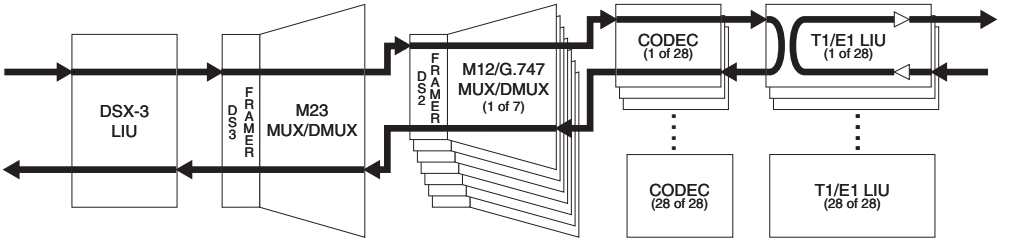


Figure 6-5. Digital Line/Network Loopback

Codec Line/Net

A **CODEC LINE/NET** loopback performs a loopback of the selected T1/E1 in both the network and local loop directions. Both loopbacks occur at the T1/E1 codec. Both the network and the local loop side of the loopback are executed at the edge of the codec, completely testing the M13 mux and the T1/E1 LIU. See Figure 6-6 for an illustration of this test.

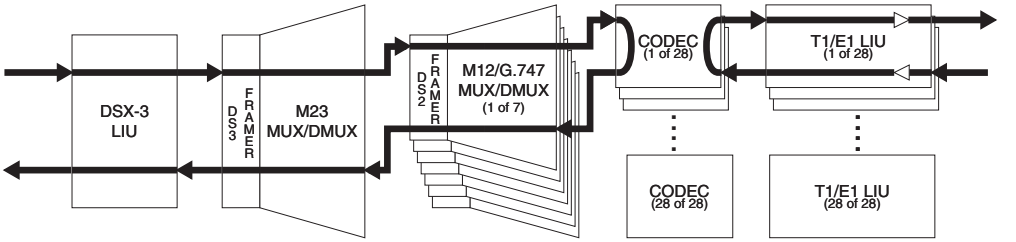


Figure 6-6. Codec Loopback

Remote Loopback

A **REMOTE LOOPBACK** performs a loopback of the selected T1/E1 on the far-end M13 multiplexer. If an MX2810 is located at the far end, an **ANALOG NETWORK LOOPBACK** is executed when a **REMOTE LOOPBACK** is engaged. This loopback is only available when the DS3 is configured for C-bit parity framing since it requires the availability of the far-end alarm and control (FEAC) channel. See ANSI T1.107.

CSU Loopback

A **CSU LOOPBACK** enables the MX2810 to generate a CSU loop up pattern (001001…) toward the T1 CSU attached to the selected T1 line for six seconds. After six seconds have elapsed, the pattern will cease and incoming network traffic will be passed through to the CSU device. If the CSU device responded to the CSU loop up pattern, it will return all data back toward the network. A loop down pattern (0000100001….) will be generated toward the CSU for six seconds when **DATA MODE** is selected.

When in **CSU LOOPBACK**, *only the* **DATA MODE** *for the T1 under test may be selected. Selecting any other option will result in an error message being displayed.*

CSU Loopback w/BERT

A **CSU LOOPBACK W/BERT** enables the MX2810 to test the local T1 loop to the CSU using the standard 511 pseudorandom bit sequence. When **CSU LOOPBACK W/BERT** is selected, the MX2810 will initiate a CSU loopback toward the CSU attached to the selected T1 line similar to the **CSU LOOPBACK** test above. Six seconds after starting the CSU loop up pattern, the MX2810 will cease sending the CSU loop up pattern and begin sending an unframed 511 pattern toward the CSU. If the CSU device responded to the CSU loop up pattern, the MX2810 will check the incoming pattern for errors. Additional menu items will appear to show the state of pattern synchronization, error count, and a clear error count option (see Figure 6-7 on page 6-6). Selecting **DATA MODE** will cease the transmission of the 511 pattern and start transmission of a loop down pattern as previously described.

When in **CSU LOOPBACK W/BERT**, *only the* **DATA MODE** *for the T1 under test may be selected. Selecting any other option will result in an error message being displayed.*

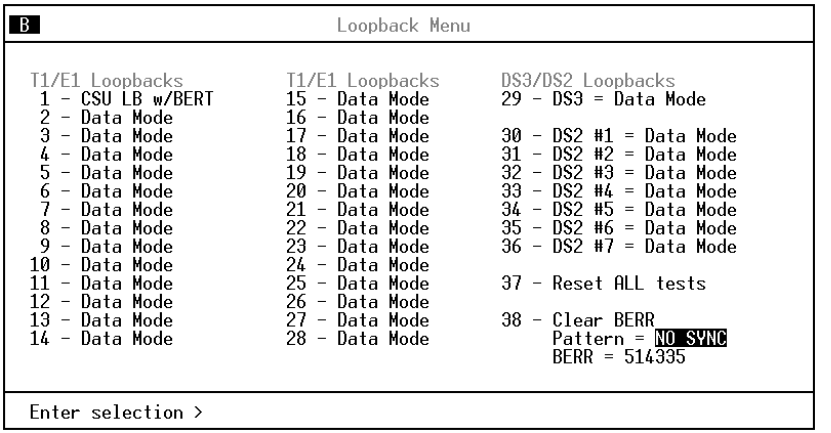


Figure 6-7. Loopback Menu with BERT Selected

Line BERT

A **LINE BERT** enables the MX2810 to perform a "head-to-head" **BERT** test toward the T1 line/loop. Selecting **LINE BERT** will replace all incoming network traffic for the selected T1 with an *unframed* 511 pattern toward the T1 line/loopU. When **LINE BERT** is selected, additional menu items will appear to show the state of pattern synchronization, cumulative error count, and a clear error count option. Selecting **DATA MODE** will cease 511 pattern generation and substitution of the incoming data stream.

When in **LINE BERT** *mode, only the* **DATA MODE** *option for the T1 under test may be selected. Selecting any other option will result in an error message being displayed.*

Only one T1 port may engage a **CSU LOOPBACK**, **CSU LOOPBACK W/ BERT**, *or a* **LINE BERT**. *If a* **CSU LOOPBACK**, **CSU LOOPBACK W/ BERT**, *or a* **LINE BERT** *is already active at the time a new* **CSU LOOPBACK**, **CSU LOOPBACK W/BERT**, *or* **LINE BERT** *is selected, the former test will be terminated and the latter test will be engaged.*

DS3 LOOPBACKS

After you select **DS3 LOOPBACK**, the menu in Figure 6-8 appears. The sections following the figure provide descriptions and illustrations of the testing options. Select **1=DATA MODE** to end a test in progress.

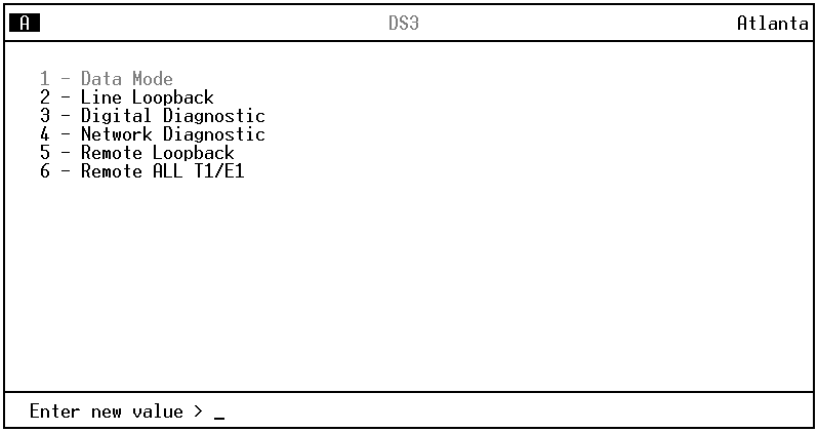


Figure 6-8. DS3 Loopback Menu

Line Loopback

LINE LOOPBACK performs a loop of the DS3 back to the network. This loopback occurs just prior to the DS3 framer and B3ZS decoder, but it makes full use of the DS3 LIU in both receive and transmit directions; therefore, any coding violations received by the DS3 will be inserted back into the network without modification. See Figure 6-9 on page 6-8 for an illustration of this test.

If a **LINE LOOPBACK** *is active when the MX2810 is operating in the* **LOCAL** *timing mode, the timing source for the DS3 is effectively removed from the circuit. Therefore, it is up to the test equipment or network to provide DS3 timing into the circuit for the duration of the test.*

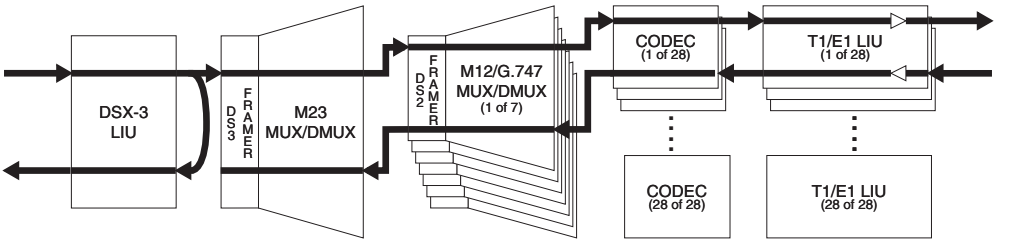


Figure 6-9. Line Loopback Test

Digital Loopback

A **DIGITAL LOOPBACK** loops the entire DS3 back to the local loop side. The end effect of this test is a loopback of all T1/E1s after being fully multiplexed and de-multiplexed to and from a DS3. The incoming DS3 data is ignored and the outgoing DS3 stream is substituted in its place just prior to exiting the DS3 framer. This test is illustrated in Figure 6-10.

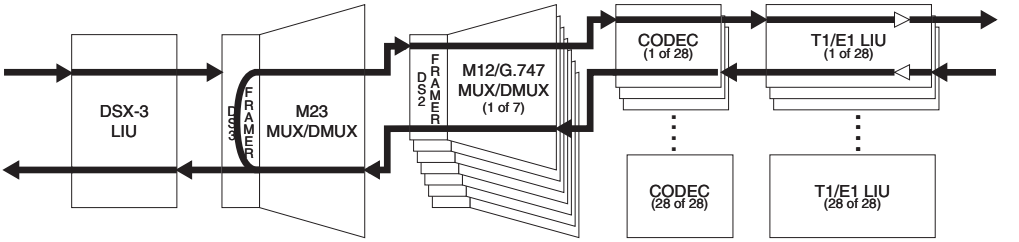


Figure 6-10. Digital Loopback

Network Loopback

A **NETWORK LOOPBACK** test loops the entire DS3 back to the local loop side. The end effect of this test is a loopback of all T1/E1s after being fully multiplexed and de-multiplexed to and from a DS3, and passed through both directions of the DS3 LIU. During this test, the incoming DS3 is disconnected from the DS3 receiver and the outgoing DS3 signal is substituted in its place. See Figure 6-11 on page 6-9 for an illustration of this test.

The **DS3 LINE LENGTH** *should be set to* **SHORT** *before performing this loopback.*

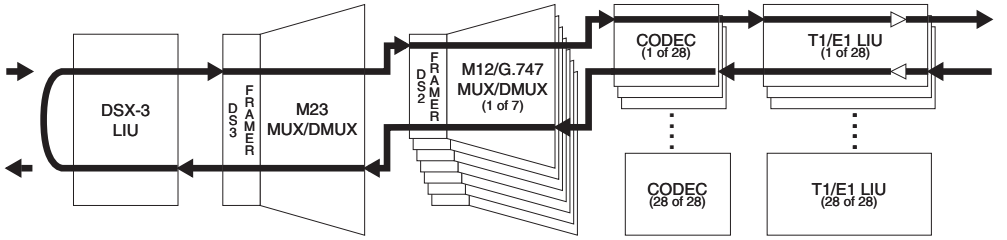


Figure 6-11. Network Loopback Test

Remote Loopback

A **REMOTE LOOPBACK** performs a loopback on the far-end M13 multiplexer. The form of this loopback code sent to the far-end will depend on the framing mode being used. When in C-Bit parity mode, the MX2810 will send loopback commands over the FEAC channel. When operating in M13 framing mode, the MX2810 will send C-Bit loopbacks at the DS2 level.

Remote all T1/E1

A **REMOTE ALL T1/E1** loopback performs a loopback of all T1/E1 channels on the far-end M13 multiplexer. If an MX2810 is located at the far end, an **ANALOG LOOPBACK** is executed on all active channels simultaneously. This loopback is only available when the DS3 is configured for C-bit parity framing since it requires the availability of the FEAC channel (see ANSI T1.107).

DS2 LOOPBACKS

After you select the number that corresponds with the DS2 you want to test, the menu in Figure 6-12 appears. The section following the figure provides a description and an illustration of the DS2 **NETWORK** loopback testing option. Select the appropriate DS2 **1-DATA MODE** to end a test in progress.

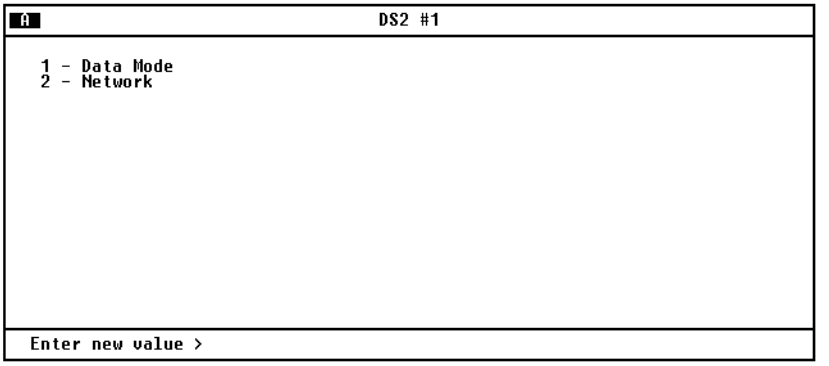


Figure 6-12. DS2 Loopback Menu

DS2 Network

A **DS2 NETWORK** loopback test loops the selected DS2 back to the network (DS3) prior to being passed through the M12/G.747 demultiplexer. All T1/E1s attached to that DS2 will receive data normally, but all data inserted into the T1/E1s attached to the selected DS2 will be ignored and replaced by the incoming DS2 network data. This test is illustrated in Figure 6-13.

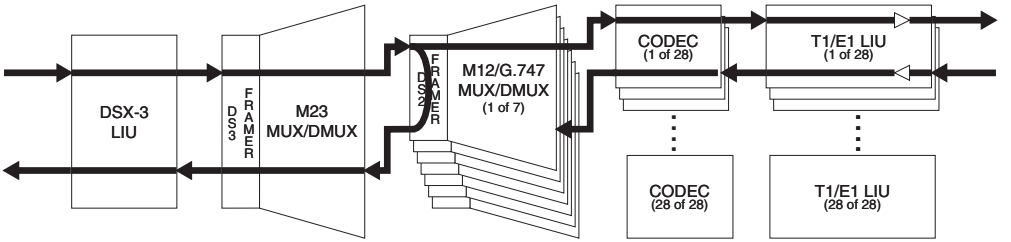


Figure 6-13. DS2 Network Loopback Test

Chapter 7 Circuit Redundancy

The MX2810 provides backup measures of protection for circuit failure. The following sections describe the possible modes of operation:

- *Non-Redundant Mode*, which offers no backup protection, is described on page 7-2.
- *Circuit Failure Recovery Mode*, which offers backup protection in the event of controller card failure, is described on page 7-3.

The descriptions given include illustrations and suggested configuration settings. Please note that the settings may need modification based on your network configuration.

NON-REDUNDANT MODE

In Non-Redundant Mode, the MX2810 houses only one controller card. There is no failure protection. In the event of a failure, an alarm is initiated and the front panel LEDs reflect the condition. See Figure 7-1 for an illustration.

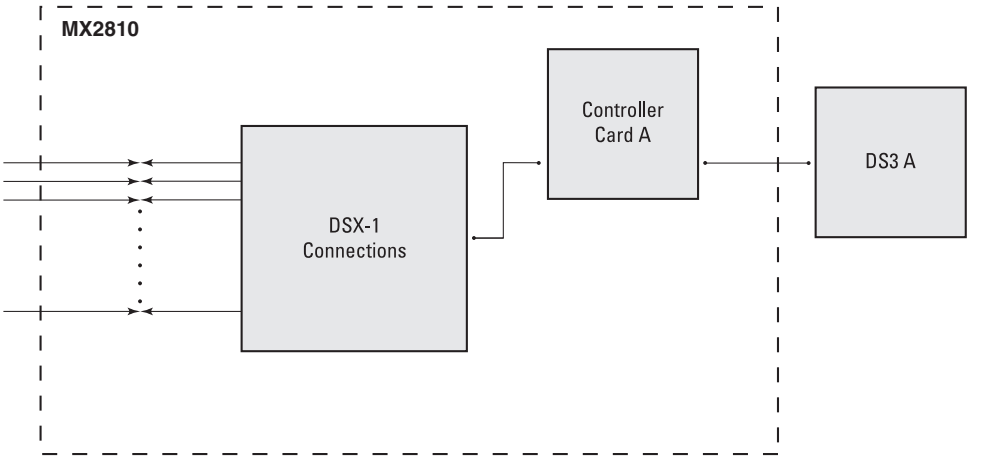


Figure 7-1. Non-Redundant Mode

CIRCUIT FAILURE RECOVERY MODE

In Circuit Failure Recovery Mode, two controller cards are installed (see Figure 7-2). In this mode, the MX2810 can continue operating in the event of a controller card failure. When both cards are healthy, the primary card actively processes data while the secondary card stands by ready to take over if the first fails. The secondary card continuously monitors the line and remains framed to the incoming signal.

See Table 7-1 on page 7-4 for a list of this mode's configuration requirements.

During a card switch, service interruption is experienced on both the DS3 and the DSX1 connections. However, since the secondary controller card remains framed to the incoming signal at all times, it is a minimal interruption.

Figure 7-2. Circuit Failure Recovery Mode

Table 7-1. Configuration Requirements for Circuit Recovery

Selection Path	Recommended Setting
Config > Network Interface > XCV Threshold	1E-3 (see the following note)
Config > Network Interface > Max. Switch Threshold	3
Config > Network Interface > Min. Switching Period	10 seconds
Config > T1/E1 Interface > T1/E1 Circuit Protection	Enable all or select the T1/E1s that redundant switching should occur on.
Config > T1/E1 Interface > XCV Threshold	1E-3 (see the following note)

The XCV Threshold settings are based on the error rates considered acceptable on the DS3 or DS1 before switching.

Chapter 8 Power Loss Recovery

The MX2810 provides backup measures of protection for both power supply and power source failure. The following sections describe the possible modes of operation:

- *Non-Redundant Power Mode*, which offers no backup protection, is described on page 8-2.
- *Power Supply Recovery Mode*, which offers backup protection in the event of power supply card failure, is described on page 8-3.
- *Power Supply and Source Recovery Mode*, which offers a backup system for both card and source failure, is described on page 8-4.
- *Battery Backup Mode*, which offers battery backup in the event of a power outage, is described on page 8-5.

NON-REDUNDANT POWER MODE

In Non-Redundant Power Mode, the MX2810 houses only one power supply card and only one power source is available. There is no power failure protection. If a power supply card fails, then the unit is down until the card is repaired or replaced. See Figure 8-1 for an illustration.

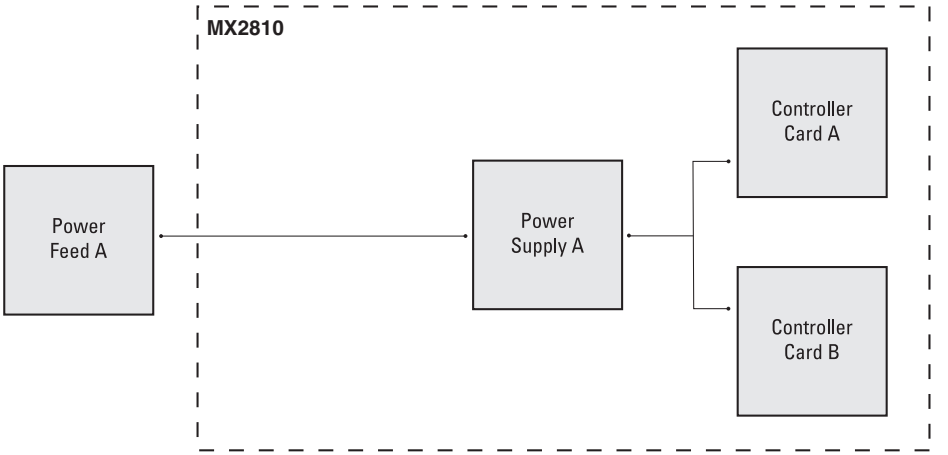


Figure 8-1. Non-Redundant Power Mode

Power supplies are hot-swappable.

POWER SUPPLY RECOVERY MODE

In Power Supply Recovery Mode, two power supply cards are installed and connected to a single power source (see Figure 8-2). In this mode, the MX2810 can continue operation in the event of a power supply failure, without interrupting service. The power supplies are load sharing, so either power supply can provide power for the entire unit.

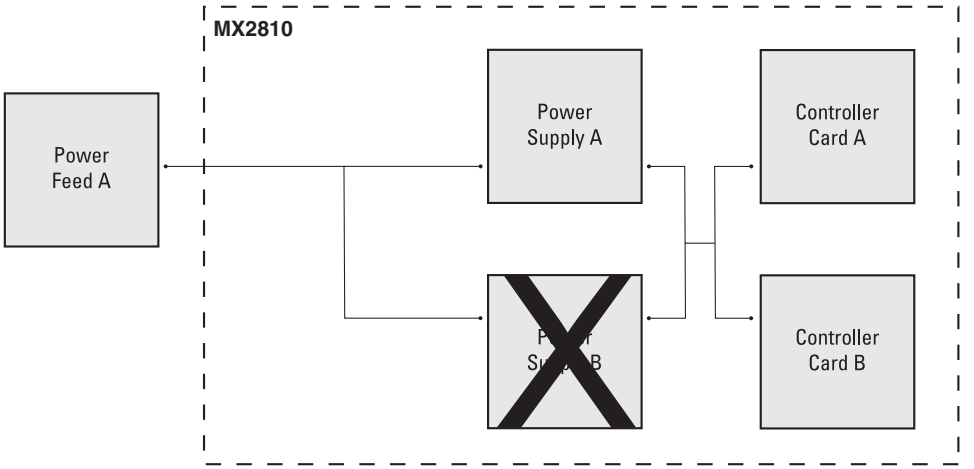


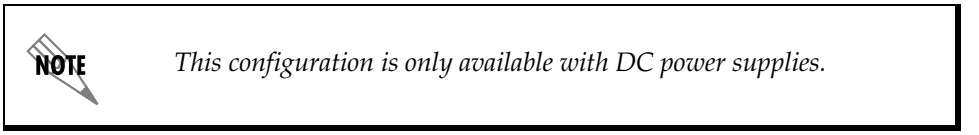
Figure 8-2. Power Supply Failure Recovery Mode

For this configuration, screw terminals for A and B power feed must be jumpered together.

POWER SUPPLY AND SOURCE RECOVERY MODE

In this mode, two power supply cards are installed and are connected to two individual power sources. The MX2810 handles any combination of power source or power supply failure.

Much like the backup design for the controller cards, the MX2810 is able to internally re-route the power source if a power supply card and the *opposite* power source fail. For example, in the illustration given in Figure 8-3, failed **POWER SOURCE A** is connected to healthy **CARD A** and healthy **POWER SOURCE B** is connected to failed **CARD B**. In a case like this, the MX2810 automatically connects **POWER SOURCE B** to **CARD A.**



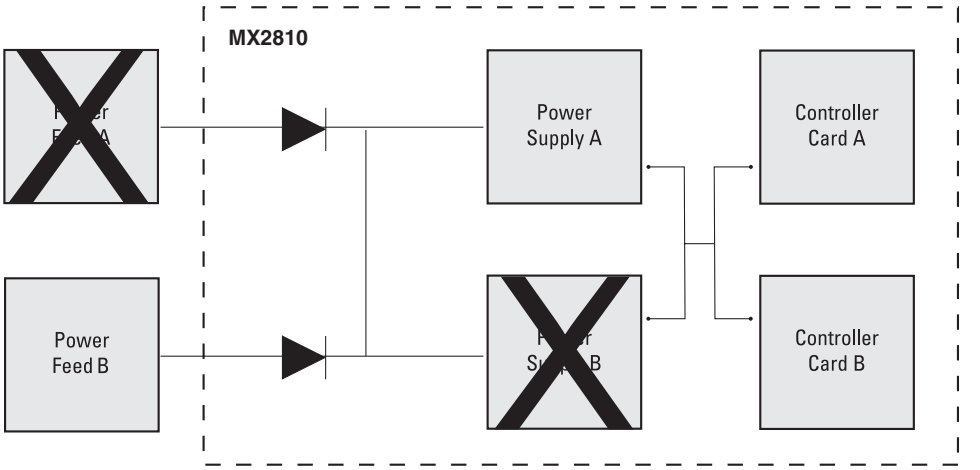


Figure 8-3. Power Supply and Source Failure Recovery Mode

BATTERY BACKUP MODE

With the installation of the ADTRAN Power Supply/Battery Charger (PS/BC) and backup battery pack, the MX2810 is able to continue operation without service interruption in the event of a power outage. This PS/BC (P/N 4175043L10) provides -48 VDC to the MX2810. It receives 115 VAC through a standard plug and wall socket.

The PS/BC maintains the battery at peak charge (-48 V) at all times. If AC power is lost, the unit automatically transfers power to the battery without interrupting service. When AC power returns, the unit switches back to AC power and recharges the battery. For installation instructions, refer to the guide provided with the PS/BC. See Figure 8-4 for an illustration of this setup.

NOTE

The MX2810 can operate on a fully-charged battery for four hours without recharging.

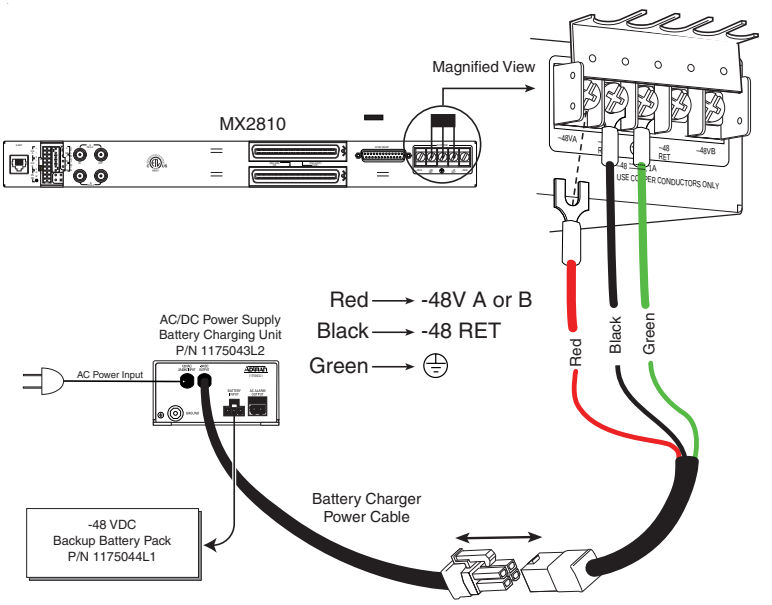


Figure 8-4. Battery Backup System

Chapter 9 Transaction Language 1 (TL1)

INTRODUCTION

Transaction Language 1 (TL1) is a BELLCORE standard used in the input and output messages that pass between Operations Systems (OS) and Network Elements (NE) in telecommunication networks. It was developed to standardize equipment surveillance and memory administration, and to test with a common format.

This release of TL1 primarily supports the interactive and autonomous retrieval of system events as part of a valid TL1 session.

OVERVIEW

TL1 is an ASCII based language that supports both command-response and autonomous (NE) message generation. Commonly, TL1 is used over a X.25 packet network but is completely independent of any physical layer protocols. For the MX2810, TL1 is implemented as a TELNET session running over Ethernet or over an X.25 packet network.

The MX2810 supports an RS-232 compatible serial interface to be used in conjunction with the X.25 network. The unit includes PAD functions onboard so an external PAD is not required for operation with the X.25 network (an external PAD may be necessary when the unit is being used with a test network with a PC.) Physical access uses a 25-pin female DB-25 connector (Network Management) on the rear of the MX2810. The X.25 connector pin assignments are detailed in Table 1. This port operates as a DTE and is configured for the following settings:

- 1-way in or 2-way operation
- Up to four SVCs
- Up to 64 Kbps (synchronous)
- Packet size: 128 Bytes
- Packet window: 2
- n2 retry limit: 3
- T1 ACK timer: 20 seconds
- T3 time out: 3 seconds
- k window size: 2

Table 9-1. X.25 Connector Pin Assignments

Pin Number	Function
1	Frame Ground
2	Transmit Data (TD) from DTE
3	Receive Data (RD) into DTE
4	Request to Send (RTS)
5	Clear to Send (CTS)
6	Data Set Ready
7	Signal Ground (SG)
8	Data Carrier Detect (DCD)
15	Transmit Clock (TC)
17	Receive Clock (RC)
20	Data Terminal Ready (DTR)
22	Ring Indicator (RI)
24	External Clock (EXC)

In order to initiate a TL1 session successfully, the unit must be properly configured for an Ethernet (LAN) or X.25 connection. A valid IP address, gateway address, and a valid subnet mask are required. User authentication is also required. An account must be setup before initiating a TL1 session.

An account may be setup via the VT100 menus (Configuration/ System Management/System Security/User Account Management.) An account includes a username, password, and privileges. The privileges include ADMIN, GUEST, INTERFACE, TEST, and DISABLED (see Table 9-2). ADMIN privileges allow the user to use all supported commands. TEST privileges allow the user to use all supported commands with the exception of modifying the user account information, configuring alarm relays, and setting the MX2810 date and time. INTERFACE privileges allow the user to use all supported commands with the exception of modifying the user account information, setting the MX2810 date and time, configuring alarm relays, and operating loopbacks. GUEST privileges only allow the user to activate the TL1 session, cancel a TL1 session, and retrieve specific system information.

Table 9-2. TL1 Account Privileges

TL1 Command	Guest	Interface	Test	Admin
ACT-USER	x	x	x	x
ALW-MSG-rr	x	x	x	x
CANC-USER	x	x	x	x
DLT-USER-SECU				x
ED-USER-SECU				X
ED-rr (related to loopbacks)			X	X
ED-rr (configuring alarm relays)				X
ED-rr (all remaining)		X	X	X
ENT-USER-SECU				X
INH-MSG-rr	X	X	X	X
OPR-LPBK			X	X
REPT-STAT	X	X	X	X
RLS-LPBK			X	X
RTRV-ALM-rr	X	X	X	X
RTRV-COND-rr	X	X	X	X

"x" denotes item is supported by privilege level

Table 9-2. TL1 Account Privileges (continued)

TL1 Command	Guest	Interface	Test	Admin
RTRV-HDR	X	X	X	X
RTRV-rr	X	X	X	X
RTRV-SYS	X	X	X	X
RTRV-USER-SECU				X
RTRV-VER	X	X	X	X
SET-DAT				X

"x" denotes item is supported by privilege level

To bring up a TL1 TELNET connection (up to eight may be active,) a TELNET client is used to request a connection on (TCP) port 3116. Once the TELNET connection is established, it is necessary to initiate a TL1 session. Establishing a TL1 session involves successful user authentication. Until a TL1 session is established, all commands other than those used to initiate or terminate a session will be denied (autonomous messaging is also disabled.) For information on using the Act-User command to initiate a TL1 session, see the section *TL1 Commands* on page 9-11.

TL1 MESSAGES

As stated earlier, TL1 messages are either part of a command-response exchange or are generated autonomously.

A TL1 command has the general format of:

<verb>:<tid>:<aid>:<ctag>:<general block>:<keyword block>:<state block>;

where:

<verb> is the type of TL1 command such as ED or RTRV. The "verb" may have modifiers as well that are separated by a dash.

<tid> is the Target Identifier. The Target Identifier is the same as the Unit Id that is set in the menus. The Target Identifier may be left empty.

<aid> is the Access Identifier.

<ctag> is the Correlation Tag, a 1 to 6 character alphanumeric identifier that is echoed in the response message for the command.

<general block> is unused in this application and should be empty.

<parameter block> is a block that is used in many of the setup TL1 commands. There may be more than one parameter block. If there is, they will be separated by a comma.

<keyword block> is a block that is used in TL1 Edit and RTRV commands.

<state block> is unused in this application and should be empty.

The field separator character is a colon.

The terminator of a TL1 command is a semicolon (not a carriage return). The terminator may be used after the last non-empty field without supplying the remaining colon separators.

An example TL1 command is:

```
ACT-USER::username:::password;
```

This command initiates a TL1 session. The <verb> is "ACT," its modifier is "USER" separated by a dash. There is no <tid>, but its field separator remains. The <aid> in this example is the login username where the value was "username." The <ctag> is optional and was not used in this example, but the field separator remains. There is no <general block>, but the field separator remains. The <keyword block> in this example is the login password where the value was "password." The semicolon terminates the TL1 command. It is not necessary to maintain the field separator colon for the <state block>, because the <keyword block> was the last field used.

Refer to *TL1 Commands* on page 9-11 for a list of TL1 commands supported by the MX2810.

TL1 Responses

There are three types of TL1 responses:

- Acknowledgment messages
- Output Response messages
- Autonomous messages

Acknowledgment Messages

Acknowledgment messages are brief output messages generated in response to received TL1 commands. The MX2810 currently supports two types of acknowledgment messages: In Progress (IP) and All Right (OK).

In Progress

The IP acknowledgment message is usually generated as an interim response message to indicate that a message has been received and that the command is being executed. IP messages have the following general format:

```
IP <CTAG><CR><LF>
<
```

All Right

The OK acknowledgment message indicates that a command has been received and that the required action was initiated and completed. This message has the following general format:

```
OK <CTAG><CR><LF>
<
```

Output Response Messages

Output Response messages are generated in response to received commands and have the following general format:

```
<cr><lf><lf>
^^^<tid>^<date>^<time><cr><lf>
M^^<ctag>^<code><cr><lf>
^^^<errcode><cr><lf>;
```

Where

<cr> is the Carriage Return,

<lf> is the Line Feed,

the carrot (^) symbol represents a one space character,

<tid> is the shelf's unit ID,

<date> is the date in the form YY-MM-DD,

<time> is the time in the form HH-MM-SS,

<ctag> is the correlation tag from the command line,

<code> is the completion code:

COMPLD indicates normal completion

DENY indicates an error condition

<errcode> is one of the error codes. This line only appears after a DENY condition.

An example of a normal TL1 response is:

```
   Unit 1 01-10-09 16:20:05
M  1 COMPLD
```

In this example, "Unit 1" is the unit ID or <tid> that was set in the menus. "01-10-09 16:20:05" is the date and time stamp. The second line contains the <ctag> and the <code> which was COMPLD. This indicates a normal completion.

An example of a TL1 response that contains an error code is:

```
   Unit 1 01-10-09 16:20:05
M  2 DENY
ICNV
```

In this example, "Unit 1" is the unit ID or <tid> that was set in the menus. "01-10-09 16:20:05" is the date and time stamp. The second line contains the <ctag> and the <code> which was DENY. The third line contains an error code since there was an error condition. The error code may be looked up in the TL1 Error Code table located in this document.

See the section *TL1 Error Codes* on page 9-23 for a discussion of possible MX2810 error codes.

The MX2810 specifically uses “quoted line(s)” in the response message of successfully executed **RTRV-ALM** commands. The quoted line format is as follows:

<AID>:<NTFCNCDE>,<CONDTYPE>,<SRVEFF>,<OCRDAT>,<OCRTM>,<LOCN>…

The **NTFCNCDE** field will contain one of the following values:

- MN - Minor
- MJ - Major
- CR - Critical

Refer to the condition types listed in Table 9-4 on page 9-19 (*MX2810 Alarm Events*) for possible MX2810 **CONDTYPE** codes.

Autonomous Messages

The Autonomous message is sent from the NE to the OS and is not associated with any explicit input message. The MX2810 uses this message to exclusively report alarmed and non-alarmed events. An autonomous message has the following general format:

```
<cr><lf><lf>

^^^<tid>^<date>^<time><cr><lf>
<alarm code>^<atag>^<verb>[^<modifier>[^modifier>]]<cr><lf>
^^^"<aid>:<message parameters>"<cr><lf>;
```

Where

<cr> is the Carriage Return,

<lf> is a Line Feed,

the carrot (^) symbol represents a one space character,

<tid> is the shelf's unit ID,

<date> is the date in the form YY-MM-DD,

<time> is the time in the form HH-MM-SS,

<alarm code> is the alarm code. The alarm code indicates the severity of the autonomous message.

Possible values for the **ALARM CODE** field include:

- *C - Critical Alarm
- ** - Major Alarm
- * - Minor Alarm
- A - Non-alarm
- NULL - (blank)

The <atag> parameter is the Autonomously Generated Correlation Tag (ATAG). It is a decimal number assigned by the NE. It must be sequential and must be included in all autonomous messages. The ATAG allows an OS to determine if it has failed to receive any autonomous outputs by checking for omissions in the sequence of messages received.

The <verb>[^<modifier>[^<modifier>]] entry identifies the nature of the autonomous output and allows for quick identification of the semantics of the information in the text block. It consists of up to three valid TL1 identifiers separated by the space character (^). The first identifier (<verb>) is the autonomous message verb and is a required entry. In most cases, the verb in an autonomous message will be REPT (Report). The autonomous message verb can have up to two optional modifiers. Thus, valid forms are <verb>, <verb>^<modifier> and <verb>^<modifer>^<modifier>. The first identifier following the verb is used to modify the verb. The second modifier is used to specify the object generating the message. Certain modifiers mean that the <aid> parameter (if it exists) is addressing a particular type of entity in the NE.

<message block> is the detailed data related to the specific alarm or report.

An example of an autonomous message alarm is:

```
   Unit 1 01-10-09 16:20:05
*C 1 REPT ALM T3
  "301:CR,LOS,SA,10-09,16-20-05,NEND,,,,"
```

In this example, "Unit 1" is the unit ID or <tid> that was set in the menus. "01-10-09 16:20:05" is the date and time stamp. The "*C" indicates that this is a critical alarm. "1" is the <atag> that is automatically generated. "REPT ALM T3" is the <verb> and its modifiers. The "301:CR,LOS,SA,10-09,16-20-05,NEND,,,," is the message. The message contains the <aid>, then the type of alarm, whether or not it is service affecting, the date in MM-DD format,

the time in HH-MM-SS format, and whether the alarm is NEND of FEND ("Near End" or "Far End").

An example of an autonomous message event is:

```
   Unit 1 01-10-09 16:21:10
A 22 REPT EVT EQPT
  "405:PROTNA,TC,10-09,16-21-10,NEND,,,,"
```

In this example, "Unit 1" is the unit ID or <tid> that was set in the menus. "01-10-09 16:21:10" is the date and time stamp. The "A" indicates this is a non-alarm message. "22" is the <atag> that is automatically generated. "REPT EVT EQPT" is the <verb> and its modifiers. The "405:PROTNA,TC,10-09,16-21-10,NEND,,,," is the message. The message contains the <aid>, then the type of event, tells that it is a transient condition (TC), the date in MM-DD format, the time in HH-MM-SS format, and whether the event is NEND of FEND ("Near End" or "Far End").

The MX2810 specifically uses “quoted line(s)” in **REPT-ALM** and **REPT-EVT** autonomous messages. The **REPT-ALM** message has the following quoted line format:

<AID>:<NTFCNCDE>,<CONDTYPE>,<SRVEFF>,<OCRDAT>,<OCRTM>,<LOCN>…

The **NTFCNCDE** field will contain one of the following values:

- CL - Alarm Cleared
- TC - Transient Condition
- MN - Minor
- MJ - Major
- CR - Critical

The **REPT-EVT** message has the following quoted line format:

<AID>:<CONDTYPE>,<CONDEFF>,<OCRDAT>,<OCRTM>,<LOCN>…

The **CONDEFF** field will contain one of the following values:

- CL - Standing Condition Cleared
- SC - Standing Condition Raised
- TC - Transient Condition

For possible **CONDTYPE** codes for both **REPT-ALM** and **REPT-EVT** quoted lines, refer to the condition types listed in Table 9-4 on page 9-19 and Table 9-5 on page 9-22, respectively.

See the section *TL1 Autonomous Messages* on page 9-17 for a list of autonomous messages currently supported by the MX2810.

TL1 COMMANDS

As stated in *TL1 Messages* on page 9-4, the general format for a TL1 command is:

<VERB>[-<MOD1>[-<MOD2>]]:[<TID>]:[<AID>]:[<CTAG>]:[GB](:<PARAMx>(,<PARAMx>)*)*;

Areas of concentration for TL1 support in the MX2810 include session initiation, session termination, and system event reporting. Table 9-3 lists the commands currently supported by the MX2810.

The Target ID (TID) is the same as the unit's Unit ID (See VT100 menus: Configuration/System Management/Equipment Identification.)

Table 9-3. TL1 Commands

ACT-USER::<username>:::<password>;	
Description	Initiates a TL1 session
TID*	Target ID
AID	Username (must be present in the User Account Management table)
CTAG*	Transaction Number (integer)
PARAM1	Password for associated username
ALW-MSG-{EQPT|rr|ALL};	
Description	Allows the transmission of the requested autonomous alarm(s)

** An asterisk indicates optional command blocks.*

Table 9-3. TL1 Commands (Continued)

MOD2	Specifies what entity type to allow: EQPT ... General Equipment Unit rr ..... Facility or Circuit (i.e. T1, T2, T3) ALL ..... All entity types
TID*	Target ID
CTAG*	Transaction Number (integer)
PARAM1*	Specifies what notification code to allow: MN ..... minor MJ ..... major CR ..... critical ALL.....all notification codes
CANC-USER;	
Description	Terminates a TL1 session
TID*	Target ID
AID*	Username (must be present in the User Account Management table)
CTAG*	Transaction Number (integer)
ED-USER-SECU::<username>:::,<password>,,<privileges>;	
Description	Edits the requested user's account
TID*	Target ID
AID	Username
CTAG*	Transaction Number (integer)
PARAM2	User's new password
PARAM4	User's new privileges: 0..... disabled 1..... guest 2..... interface 4..... test 8..... admin
ENT-USER-SECU::<username>:::<password>,,<privileges>;	
Description	Adds the requested user to the User Account Mangament table

** An asterisk indicates optional command blocks.*

Table 9-3. TL1 Commands (Continued)

TID*	Target ID
AID	Username
CTAG*	Transaction Number (integer)
PARAM1	User's password
PARAM3	User's privileges: 0 ..... disabled 1 ..... guest 2 ..... interface 4 ..... test 8 ..... admin
DLT-USER-SECU::<username>;	
Description	Removes the requested user from the User Account Management table
TID*	Target ID
AID	Username
CTAG*	Transaction Number (integer)
INH-MSG-{EQPT|rr|ALL};	
Description	Inhibits the transmission of the requested autonomous alarm(s)
MOD2	Specifies what entity type to inhibit: EQPT... General Equipment Unit rr ..... Facility or Circuit (i.e. T1, T2, T3) ALL ..... All entity types
TID*	Target ID
CTAG*	Transaction Number (integer)
PARAM1*	Specifies what notification code to inhibit: MN..... minor MJ..... major CR ..... critical ALL.....all notification codes

** An asterisk indicates optional command blocks.*

Table 9-3. TL1 Commands (Continued)

RTRV-HDR;	
Description	Replies with a normal "COMPLD" response
TID*	Target ID
CTAG*	Transaction Number (integer)
RTRV-VER;	
Description	Retrieves the current software revision
TID*	Target ID
CTAG*	Transaction Number (integer)
RTRV-SYS;	
Description	Retrieves the system identifier string
TID*	Target ID
CTAG*	Transaction Number (integer)
RTRV-USER-SECU;	
Description	Retrieves the current list of users from the TL1 users table
TID*	Target ID
CTAG*	Transaction Number (integer)
RTRV-ALM-{EQPT|rr|ALL};	
Description	Retrieves the requested alarm status
MOD2	Specifies what entity type to query: EQPT ... General Equipment Unit rr ..... Facility or Circuit (i.e. T1, T2, T3) ALL ..... All entity types
TID*	Target ID

** An asterisk indicates optional command blocks.*

Table 9-3. TL1 Commands (Continued)

AID*	Identifies the component to which the desired alarm pertains. Identifiers are integers and are dependent on the entity specified in "MOD2" as follows: for EQPT: 401 ....Generic 402 ....Control Card A 403 ....Control Card B 404 ....Power Supply A 405 ....Power Supply B ALL....all EQPT identifiers (default selection) for T1: 101 ....DS1#1 102 ....DS1#2 . 128 ....DS1#28 ALL....all DS1 circuits (default selection) for T2: 201 ....DS2#1 202 ....DS2#2 . 207 ....DS2#7 ALL....all DS2 circuits (default selection) for T3: 301 ....DS3#1 302 ....DS3 (Control Card A) 303 ....DS3 (Control Card B) ALL....all DS3 circuits (default selection) for ALL: x .....specific identifier (e.g. "1", "28",etc.,) ALL....all identifiers (default selection)
CTAG*	Transaction Number (integer)
PARAM1*	Specifies what notification code to query: MN..... minor MJ..... major CR ..... critical

** An asterisk indicates optional command blocks.*

Table 9-3. TL1 Commands (Continued)

RTRV-COND-{EQPT|rr|ALL};	
Description	Retrieves the requested alarms and conditions
MOD2	Specifies what entity type to query: EQPT ... General Equipment Unit rr ..... Facility or Circuit (i.e. T1, VT1, STS1) ALL ..... All entity types
TID*	Target ID
AID*	Identifies the component to which the desired alarm pertains. Identifiers are integers and are dependent on the entity specified in "MOD2" as follows: for EQPT: 401 ... Generic 402 ... Control Card A 403 ... Control Card B 404 ... Power Supply A 405 ... Power Supply B ALL... all EQPT identifiers (default selection) for T1: 101 ... DS1#1 102 ... DS1#2 . 128 ... DS1#28 ALL... all DS1 circuits (default selection) for T2: 201 ... DS2#1 202 ... DS2#2 . 207 ... DS2#7 ALL... all DS2 circuits (default selection) for T3: 301 ... DS3#1 302 ....DS3 (Control Card A) 303 ....DS3 (Control Card B) ALL... all DS3 circuits (default selection) for ALL: x ..... specific identifier (e.g. "1", "28",etc.,) ALL... all identifiers (default selection)

** An asterisk indicates optional command blocks.*

Table 9-3. TL1 Commands (Continued)

CTAG*	Transaction Number (integer)
PARAM1*	Specifies what notification code to query: SC ..... standing condition
SET-DAT:::::<YY-MM-DD>,<HH-MM-SS>;	
Description	Sets the date and time
PARAM1	Date in YY-MM-DD format
PARAM2	Time in HH-MM-SS format

** An asterisk indicates optional command blocks.*

TL1 Autonomous Messages

Autonomous messages provide a mechanism for real time reporting of system events. Although most events reported are alarms, some events are only informational. The **VERB**, **MOD1**, and **MOD2** parameters of the message indicate what type of event has occurred.

*The default setting for autonomous message reporting is **OFF**.*

In order to enable autonomous message reporting, the following steps must be followed:

- Initiate a TL1 session by following the setup procedures and using the ACT-USER command (if this has not been done.)
- Use the ALW-MSG command to enable autonomous messaging. This command is described in Table 9-3 The format for the command is:

  ALW-MSG-{EQPT[rr]ALL};

  Where

  { } means to use one of the following,
  rr is either T1, T2, or T3.

An example of this command that would enable "all" autonomous messages is:

```
ALW-MSG-ALL;
```

The response to this command would be:

```
   Unit 1 01-10-15 10:34:21
M  0 COMPLD
;
```

Where

"Unit 1" is the <tid> defined in the menus,
"01-10-15 10:34:21" is the date and time,
"M 0 COMPLD" is the ctag and completion code.

Similarly, to enable just the T1 autonomous messages the following command could be used:

```
ALW-MSG-T1;
```

In order to disable autonomous message reporting, the following steps must be followed:

- Initiate a TL1 session by following the setup procedures and using the ACT-USER command (if this has not been done.)
- Use the INH-MSG command to disable autonomous messaging. This command is described in Table 2. The format for the command is:

  ```
  INH-MSG-{EQPT[rr]ALL};
  ```

  Where

  { } means to use one of the following,
  rr is either T1, T2, or T3.

An example of this command that would disable "all" autonomous messages is:

```
INH-MSG-ALL;
```

The response to this command would be:

```
   Unit 1 01-10-15 10:34:21
M  0 COMPLD
```

;

Where

"Unit 1" is the <tid> defined in the menus,
"01-10-15 10:34:21" is the date and time,
"M 0 COMPLD" is the ctag and completion code.

Similarly, to disable just the T1 autonomous messages the following command could be used:

INH-MSG-T1;

REPT-ALM indicates an alarm event. Table 9-4 lists possible autonomous messages for alarm events.

Table 9-4. MX2810 Alarm Events

	AID	Notification Code	Condition Type	Service Affecting	Location	Description
REPT ALM T1	101-128	MN	ACTLPBK	SA	NEND	DS1 In-test
	101-128	MJ	LOS	SA	NEND	Loss Of Signal
	101-128	MJ	FACTERM	NSA	NEND	T1 Failure
REPT ALM T2	201-207	MJ	OOF	SA	NEND	T2 Out Of Frame
	201-207	MJ	RAI	SA	FEND	T2 Remote Alarm Indication

Table 9-4. MX2810 Alarm Events (Continued)

	AID	Notification Code	Condition Type	Service Affecting	Location	Description
REPT ALM T3	301	MN	TSA	SA	NEND	DS3 In-test
	301	MN	EXT-DS3	SA	FEND	FEND DS3 Equipment Failure
	301	MN	LOS	SA	FEND	FEND DS3 Loss of Signal
	301	MN	OOF	SA	FEND	FEND DS3 Out Of Frame
	301	MN	AIS	SA	FEND	FEND DS3 Alarm Indication Signal
	301	MN	ISD	SA	FEND	FEND DS3 Idle
	301	MN	EXT-DS3	NSA	FEND	FEND DS3 Equipment Failure
	301	MN	EXT	NSA	FEND	FEND Common Equipment Failure
	301	MN	LOS-M	SA	FEND	FEND Multiple DS1 Loss Of Signal
	301	MN	EXT-DS1	SA	FEND	FEND DS1 Equipment Failure SA
	301	MN	LOS-S	SA	FEND	FEND Single DS1 Loss Of Signal
	301	MN	EXT-DS1	NSA	FEND	FEND DS1 Equipment Failure NSA

Table 9-4. MX2810 Alarm Events (Continued)

	AID	Notification Code	Condition Type	Service Affecting	Location	Description
REPT ALM T3	302 (Ctrl A)	CR	LOS	SA	NEND	DS3 Loss Of Signal
	303 (Ctrl B)					
	302 (Ctrl A)	CR	OOF	SA	NEND	DS3 Out Of Frame
	303 (Ctrl B)					
	302 (Ctrl A)	MJ	RAI	SA	FEND	DS3 Remote Alarm Indication
	303 (Ctrl B)					
	302 (Ctrl A)	MN	ISD	SA	FEND	DS3 Idle
	303 (Ctrl B)					
REPT ALM EQPT	401 (General)	MN	CTNEQPT	NSA	NEND	Controller Communication Failure
	402 (Ctrl A)	MN	CTNEQPT	NSA	NEND	Controller Card Failure
	403 (Ctrl B)					
	402 (Ctrl A)	CR	TRMT	SA	NEND	DS3 Transmit Loss Of Signal
	403 (Ctrl B)					
	404 (PS A)	MN	PWR	NSA	NEND	Power Supply Failure
	405 (PS B)					
	404 (PS A)	MN	MISC	NSA	NEND	Power Supply Communication Failure
	405 (PS B)					
	404 (PS A)	MN	PWR-5	NSA	NEND	Power Supply Low
	405 (PS B)					
	404 (PS A)	MN	HITEMP	NSA	NEND	Power Supply Temp High
	405 (PS B)					
	404 (PS A)	MJ	HITEMP	NSA	NEND	Power Supply Temp Critical
	405 (PS B)					
	404 (PS A)	MN	PWR-48	NSA	NEND	Power Supply Source Failure
	405 (PS B)					

REPT-EVT indicates an informational event. Table 9-5 lists possible autonomous messages for informational events.

Table 9-5. MX2810 Informational Events

	AID	Notification Code	Condition Type	Service Affecting	Location	Description
REPT EVT T1	101-128	EVT	BPV	NSA	NEND	Bipolar Violation
	101-128	EVT	AIS	NSA	FEND	T1 Line AIS (LAIS)
	101-128	EVT	AISUONES	NSA	FEND	T1 Carrier AIS (CAIS)
REPT EVT T2	201-207	EVT	AIS	NSA	FEND	T2 AIS
REPT EVT T3	302 (CTRL A)	EVT	AIS	NSA	FEND	DS3 Alarm Indication Signal
	303 (CTRL B)					
	302 (CTRL A)	EVT	BPV	NSA	NEND	Excessive DS3 Bipolar Violation
	303 (CTRL B)					
REPT EVT EQPT	401 (General)	EVT	WKSWPR	NSA	NEND	Protection Switch
	401 (General)	EVT	ESW	NSA	NEND	Excessive Protection Switch
	402 (CTRL A)	EVT	PROTNA	NSA	NEND	Controller Card Removed
	403 (CTRL B)					
	402 (CTRL A)	EVT	NORMAL	NSA	NEND	Controller Card Inserted
	403 (CTRL B)					
	404 (PS A)	EVT	NORMAL	NSA	NEND	Power Supply Card Inserted
	405 (PS B)					
	404 (PS A)	EVT	PROTNA	NSA	NEND	Power Supply Card Removed
	405 (PS B)					

TL1 ERROR CODES

When the MX2810 denies a received TL1 command, the Output Response message has an associated 4-letter error code indicating the reason for denial. Table 9-6 lists possible error codes.

Table 9-6. TL1 Error Codes

Error Code	Description
ICNV	Input, Command Not Valid
IDRG	Input, Date Range
IIAC	Input, Invalid Access Identifier
IITA	Input, Invalid Target Identifier
IPNV	Input, Parameter Not Valid
PIUI	Privilege, Input User Not Valid
PLNA	Privilege, Login Not Active or Insufficient Privileges
SROF	Status, Requested Operation Failed
SSRE	Status, System Resources Exceeded

TL1 Editing

TL1 editing commands allow the MX2810 to be provisioned through a TL1 session rather than through the menu system that is accessed using a VT100 terminal emulator. User account information must be provisioned through the a console menu session or TL1 session prior to initiating a TL1 session. Once a TL1 session has been initiated using the ACT-USER command described earlier in this chapter, the TL1 editing commands may be used. The standard format for an edit command is as follows:

ED-rr::<aid>:<ctag>:::<keyword>=<value>;

- rr is T1, T2, T3, or EQPT
- <aid> is the Access Identifier
- <ctag> is a 1 to 6 character correlation tag (echoed in response)

- <keyword> is one of the entries from the following data dictionaries
- <value> is one of the enumerated types in the data dictionaries, an integer, or Y/N depending on the TYPE..

<ctag> is an optional parameter. The placemarker (:) must remain in place. The default <ctag> is 0.

TL1 Editing Examples:

ED-T1::106:1:::LBO=133TO266; (this would edit line build out for T1 #6 to be 133 to 266)

ED-T2::205:2:::DS2CFGMODE=T1; (this would configure T2 #5 for T1 mode versus E1)

ED-T3::300:3:::DS3MAXNUMSW=3; (this would set maximum number of switches for controller cards to 3)

ED-EQPT::400:4:::PSTEMPCRITRLY=Y; (this would enable the alarm relay for power supply temperature critical)

To view the value of a parameter, a retrieve (RTRV) command is used. The standard format for the RTRV command is as follows:

RTRV-rr::<aid>:<ctag>:::<keyword>;

- rr is T1, T2, T3, or EQPT
- <aid> is the Access Identifier
- <ctag> is a 1 to 6 character correlation tag (echoed in response)
- <keyword> is one of the entries from the following data dictionaries

<Keyword> is an optional parameter. When left out, all applicable Keywords will be retrieved.

<ctag> is an optional parameter. The placemarker (:) must remain in place. The default <ctag> is 0.

TL1 RTRV examples:

RTRV-T1::100:1; (this would return all common parameters for T1s # 1-28)

RTRV-T1::106:1; (this would return all unique and common parameters for T1 #6)

RTRV-T1::106:1:::LBO; (this would return the value of line build out for T1 #6)

RTRV-T2::205:2:::DS2CFGMODE; (this would return the configuration mode of T2 #5)

RTRV-T3::300:3:::DS3MAXNUMSW; (this would return the setting for the maximum number of switches for controller cards)

RTRV-EQPT::400:5:::PSTEMPCRITRLY; (this would return the status of the alarm relay for power supply temperature critical)

The data dictionaries that follow are to be used while performing TL1 editing or retrieve commands. Each data dictionary contains four columns. The first column "KEYWORD" gives the values to be placed in the <keyword> portion of the edit command. The second column "TYPE" describes the type of <value> that is required to be entered in the edit command. ENUM requires a text and/or number string to be entered as the <value>. Y/N requires a "Y" or "N" representing "yes" or "no" to be entered as the <value>. INT requires that an integer be entered as the <value>. The third column "DOMAIN" describes valid entries that may be entered into the <value> portion of the edit command. The fourth column "DESCRIPTION" explains each of the edit or retrieve commands.

The following data dictionary (Table 9-7) contains entries that are used to edit or retrieve options for the DS3 portion of the MX2810. When performing TL1 edit commands from this table, the value of rr should be "T3" and the <aid> value should be one of the following:

300 - All DS3 Circuits
301 - DS3 #1
302 - DS3 Control Card A
303 - DS3 Control Card B

Table 9-7. TL1 Editing Data Dictionary for DS3

Keyword	Type	Domain	Description
ACTIVECONTROLLER	ENUM	One of the following: • A • B	Selects which controller card is active.
CARDSWRLY	Y/N	Y or [N]	Identifies status of System Protection Switch alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
DIAGDS3	ENUM	One of the following: • DATAMODE • LINELPBK • DIGLPBK • METLPBK • REMLPBK • ALLT1	Enables the selected DS3 Loopback.
DS3AISRLY	Y/N	Y or [N]	Identifies status of DS3 AIS alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
DS3CVTHRS	ENUM	One of the following: • Disable • 1E3 • 1E4 • 1E5 • 1E6	Indicates a limit on the number of code violations accepted by the unit over the DS3 before the unit switches controller cards. • 1E3 - 1 out of every 1,000 bits contains a CV • 1E4 - 1 out of every 10,000 bits contains a CV • 1E5 - 1 out of every 100,000 bits contains a CV • 1E6 - 1 out of every 1,000,000 bits contains a CV
DS3LOFRLY	Y/N	Y or [N]	Identifies status of DS3 LOF alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
DS3LOSRLY	Y/N	Y or [N]	Identifies status of DS3 LOS alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm

Table 9-7. TL1 Editing Data Dictionary for DS3 (Continued)

Keyword	Type	Domain	Description
DS3MAXNUMSW	INT	0, 1, 2, ..., N	Maximum number of times per hour the unit is allowed to switch between controller cards. If number is exceeded the unit will issue a trap.
DS3MINSWPERIOD	INT	0, 1, 2, ..., N	Number of seconds that must pass after a protection switch before another protection switch will be allowed.
DS3PROT	Y/N	Y or [N]	Identifies status of DS3 protection switching. • Yes (Y) - enables DS3 protection switching • No (N) - disables DS3 protection switching
DS3RAIRLY	Y/N	Y or [N]	Identifies status of DS3 RAI alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
DS3TLOSRLY	Y/N	Y or [N]	Identifies status of DS3 TLOS alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
DS3XCVRLY	Y/N	Y or [N]	Identifies status of DS3 XCV alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
FMT	ENUM	One of the following: • CBIT • M13	Sets framing format to match the format of the receive signal at the network interface.
LINELEN	ENUM	One of the following: • LONG • SHORT	Identifies Network DS3 line length. • LONG - exceeds 50 feet. • SHORT - less than 50 feet.
RMTLPBK	ENUM	One of the following: • DISABLE • EITHER • FEAC • CBIT	Indicates whether the unit will respond to remote loopbacks over FEAC, CBIT, EITHER, or if remote loopbacks are disabled.
SYSCARDRLY	Y/N	Y or [N]	Identifies status of System Controller Card alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm

Table 9-7. TL1 Editing Data Dictionary for DS3 (Continued)

Keyword	Type	Domain	Description
TMG	ENUM	One of the following: • LPD • INT	Identifies timing supply for the DS3. LPD - loop timed. • LPD - loop timed • INT - internal timing source

The following data dictionary (Table 9-8) contains entries that are used to edit or retrieve options for the DS2 portion of the MX2810. When performing TL1 edit commands from this table, the value of rr should be "T2" and the <aid> value should be one of the following:

201 - DS2#1
202 - DS2#2
.
.
207 - DS2#7

Table 9-8. TL1 Editing Data Dictionary for DS2

Keyword	Type	Domain	Description
DIAGDS2TESTSTATE	ENUM	One of the following: • DATAMODE • NETWORK	Identifies DS2 Diagnostic Loopback. NETWORK selects the available loopback. DATAMODE ends a test in progress.
DS2AISRLY	Y/N	Y or [N]	Identifies status of DS2 AIS alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
DS2CFGMODE	ENUM	One of the following: • T1 • E1	Identifies DS2 Configuration. • T1sets DS2 configuration to M12 (4xT1). • E1 sets DS2 configuration to G.747 (3xE1).
DS2LOSRLY	Y/N	Y or [N]	Identifies status of DS2 LOS alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
DS2RAIRLY	Y/N	Y or [N	Identifies status of DS2 RAI alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm

The following data dictionary (Table 9-9) contains entries that are used to edit or retrieve options for the DSX portion of the MX2810. When performing TL1 edit commands from this table, the value of rr should be "T1" and the <aid> value should be one of the following:

101 - DS1#1
102 - DS1#2
.
.
128 - DS1#28

Table 9-9. TL1 Editing Data Dictionary for DS1

Keyword	Type	Domain	Description
DIAGDSXTESTSTATE	ENUM	One of the following: • DATAMODE • TRIBUTARY • ANALOGNET • DIGNET • CODEC • REMLPBK • CSULPBK • CSUBERT • LINEBERT	Identifies DSX Diagnostic Loopbacks. Choose an available loopback. DATAMODE ends a test in progress.
DSXCAISRLY	Y/N	Y or [N]	Identifies status of DSX CAIS alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
DSXCFGLINESWPROT	ENUM	One of the following: • DISABLE • ENABLE • UNAVAIL	
DSXCFGSTATE	ENUM	One of the following: • DISABLE • ENABLE • UNAVAIL • AUTO	Identifies state of T1/E1 as Disabled, Enabled, Unavailable, or Auto Enable.
DSXCVTHRS	ENUM	One of the following: • Disable • 1E3 • 1E4 • 1E5 • 1E6	Indicates a limit on the number of code violations accepted by the unit over a single T1/E1 before the unit switches controller cards. • 1E3 - 1 out of every 1,000 bits on a single T1/E1 contains a CV • 1E4 - 1 out of every 10,000 bits on a single T1/E1 contains a CV • 1E5 - 1 out of every 100,000 bits on a single T1/E1 contains a CV • 1E6 - 1 out of every 1,000,000 bits on a single T1/E1 contains a CV
DSXLAISRLY	Y/N	Y or [N]	Identifies status of DSX LAIS alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm

Table 9-9. TL1 Editing Data Dictionary for DS1 (Continued)

Keyword	Type	Domain	Description
DSXLBKDETECTION	ENUM	One of the following: • DISABLE • CSU • NIU • UNAVAIL	Identifies for each T1/E1 interface whether the T1/E1 will respond to loopback requests.
DSXLOSRLY	Y/N	Y or [N]	Identifies status of DSX LOS alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
DSXPROTTHRS	INT	1-28	Number of Enabled lines that must fail before a protection switch occurs
DSXXCVRLY	Y/N	Y or [N]	Identifies status of DSX XCV alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
LBO	ENUM	One of the following: • 0TO133 • 133TO266 • 266TO399 • 399TO533 • 533TO655 • MINUS7R5 • E10TO3000 • UNAVAIL	Identifies the line length for each T1 interface according to the distance from the MX2810 to the DTE device. • 0TO133, 133TO266, 266TO399, 399TO533, 533TO655 - distance in feet • MINUS7R5 - -7.5dB length • E10TO3000 - setting for E1 • UNAVAIL - unavailable
LINECDE	ENUM	One of the following: • AMI • B8ZS • E1AMI • E1HDB3 • UNAVAIL	Identifies line code for T1/E1s to match connected devices.

The following data dictionary (Table 9-10) contains entries that are used to edit or retrieve options for the equipment portion of the MX2810. When performing TL1 edit commands from this table, the value of rr should be "EQPT" and the <aid> value should be one of the following:

400 - All EQPT identifiers
401 - Generic
402 - Control Card A
403 - Control Card B
404 - Power Supply A
405 - Power Supply B

Table 9-10. TL1 Editing Data Dictionary for EQPT

Keyword	Type	Domain	Description
DIAGBERTCLEARCOUNT	Y/N	Y or [N]	Clears BERT Count.
DIAGBERTCOUNT	INT	0, 1, 2, ..., N	Error Count.
DIAGBERTSYNC	ENUM	One of the following: • NOSYNC • SYNC	Identifies state of Pattern Synchronization.
DIAGLPBKTIMEOUT	ENUM	One of the following: • DISABLE • 1-MIN • 5-MINL • 10-MIN • 15-MIN • 30-MIN • 45-MIN • 1-HR	Identifies the amount of time before a Diagnostic Loopback will timeout.
DIAGRESET	Y/N	Y or [N]	Resets Diagnostic Loopbacks.
PSBATTERYLOWRLY	Y/N	Y or [N]	Identifies status of Power Supply Battery Low alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
PSCHARGERFAILRLY	Y/N	Y or [N]	Identifies status of Power Supply Charger Fail alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
PSMALFNCRLY	Y/N	Y or [N]	Identifies status of Power Supply Malfunction alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm

Table 9-10. TL1 Editing Data Dictionary for EQPT (Continued)

Keyword	Type	Domain	Description
PSPOWERFAILRLY	Y/N	Y or [N]	Identifies status of Power Supply Power Fail alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
PSPOWERLOWRLY	Y/N	Y or [N]	Identifies status of Power Supply Power Low alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
PSTEMPCRITRLY	Y/N	Y or [N]	Identifies status of Power Supply Temperature Critical alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
PSTEMPHIGHRLY	Y/N	Y or [N]	Identifies status of Power Supply Temperature High alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
CARDSWRLY	Y/N	Y or [N]	Identifies status of Contoller Card Protection Switch relay. • Yes (Y) - enables alarm • No (N) - disables alarm
CARDREMRLY	Y/N	Y or [N]	Identifies status of Contoller Card Removal relay. • Yes (Y) - enables alarm • No (N) - disables alarm
PSCARDREMRLY	Y/N	Y or [N]	Identifies status of Power Supply Card Removal relay. • Yes (Y) - enables alarm • No (N) - disables alarm
PSINPUTFAILRLY	Y/N	Y or [N]	Identifies status of -48V Input Fail relay. • Yes (Y) - enables alarm • No (N) - disables alarm
SYSCARDARLY	Y/N	Y or [N]	Identifies status of System Controller Card A alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm
SYSCARDBRLY	Y/N	Y or [N]	Identifies status of System Controller Card B alarm relay. • Yes (Y) - enables alarm • No (N) - disables alarm

TL1 Loopback Commands:

The OPR-LPBK and RLS-LPBK commands are provided as an alternative to ED commands as a way to perform loopbacks through TL1. The general format for these commands is as follows:

OPR-LPBK-{T1 | T2 | T3}:<tid>:<aid>:<ctag>:<locn>,,,<lpbktype>;

RLS-LPBK-{T1 | T2 | T3}:<tid>:<aid>:<ctag>:<locn>,,,<lpbktype>;

The following table will describe each of the DS3 loopbacks that can be initiated or released with these commands.

Table 9-11. DS3 TL1 Loopback Commands

Verb	MOD2	<aid>	<locn>	<lpbktype>	Description
OPR	T3	3xy	NEND	LINE	Initiates the DS3 Line Loopback
RLS	T3	3xy	NEND	LINE	Releases the DS3 Line Loopback
OPR	T3	3xy	NEND	DIGLPBK	Initiates the DS3 Digital Loopback
RLS	T3	3xy	NEND	DIGLPBK	Releases the DS3 Digital Loopback
OPR	T3	3xy	NEND	TERMINAL	Initiates the DS3 Network Loopback
RLS	T3	3xy	NEND	TERMINAL	Releases the DS3 Network Loopback
OPR	T3	3xy	FEND	LINE	Initiates the DS3 Remote Loopback
RLS	T3	3xy	FEND	LINE	Releases the DS3 Remote LoopbacK
OPR	T3	3xy	FEND	ALLT1	Initiates the DS3 All T1/E1 Loopback
RLS	T3	3xy	FEND	ALLT1	Releases the DS3 All T1/E1 Loopback
RLS	T3	3xy			Releases any active DS3 Loopback

For the above DS3 related commands, xy may be 00 through 03.

The following table will describe each of the DS2 loopbacks that can be initiated or released with these commands.

Table 9-12. DS2 TL1 Loopback Commands

Verb	MOD2	<aid>	<locn>	<lpbktype>	Description
OPR	T2	2xy	NEND	NETWORK	Initiates the DS2 Network Loopback
RLS	T2	2xy	NEND	NETWORK	Releases the DS2 Network Loopback
RLS	T2	2xy			Releases any active DS2 Loopback

For the above DS2 related commands, xy may be 01 through 07 (corresponding to the desired DS2 channel.)

The following table will describe each of the DS1 loopbacks that can be initiated or released with these commands.

Table 9-13. DS1 TL1 Loopback Commands

Verb	MOD2	<aid>	<locn>	<lpbktype>	Description
OPR	T1	1xy	NEND	NETWORK	Initiates the DS1 Tributary Loopback
RLS	T1	1xy	NEND	NETWORK	Releases the DS1 Tributary Loopback
OPR	T1	1xy	NEND	TERMINAL	Initiates the DS1 Analog Loopback
RLS	T1	1xy	NEND	TERMINAL	Releases the DS1 Analog Loopback
OPR	T1	1xy	NEND	DIGNET	Initiates the DS1 Digital Line/Net Loopback
RLS	T1	1xy	NEND	DIGNET	Releases the DS1 Digital Line/Net Loopback
OPR	T1	1xy	NEND	CODEC	Initiates the DS1 Codec Line/Net Loopback
RLS	T1	1xy	NEND	CODEC	Releases the DS1 Codec Line/Net Loopback
OPR	T1	1xy	FEND	DS1FEAC	Initiates the DS1 Remote Loopback
RLS	T1	1xy	FEND	DS1FEAC	Releases the DS1 Remote Loopback
OPR	T1	1xy	FEND	CSULPBK	Initiates the DS1 CSU Loopback
RLS	T1	1xy	FEND	CSULPBK	Releases the DS1 CSU Loopback
OPR	T1	1xy	FEND	CSUBERT	Initiates the DS1 CSU Loopback w/BERT
RLS	T1	1xy	FEND	CSUBERT	Releases the DS1 CSU Loopback w/BERT
RLS					Releases any active DS1 Loopback

For the above DS1 related commands, xy may be 01 through 28 (corresponding to the desired DS1 channel).

Appendix A Acceptance Test Procedure

OVERVIEW

This document describes the procedures to be used in performing acceptance testing of ADTRAN's Total Access MX2810 M13 Multiplexer. It is assumed that the MX2810 has already been installed, powered-up, equipped and cabled to the DSX-1 and DSX-3 or connecting equipment (e.g., DCS) according to the specifications described in the MX2810 Chassis Practice and local operating company procedures.

This Acceptance Test Procedure (ATP) document assumes testing will be done via bit error rate tests (BERT) between the DSX-3 or associated connecting equipment and the DSX-1 or associated connecting equipment using appropriate DS3/DS1 test equipment. An alternate method of testing involves the use of an ADTRAN Test Access Module (TAM), also called a Streaker Card (P/N 1185005L1). The TAM provides the ability to test DS3 and DS1 cabling integrity following chassis installation and power-up (no MX2810 Common Control Unit cards are required). Additional TAM information can be obtained from ADTRAN. That method of testing is well documented in the TAM I&M Practice and will not be addressed in this document.

The MX2810 is an M13 multiplexer used to consolidate 28 DS1s onto a DS3. The unit can be equipped in various ways. The first step will be to take inventory of the equipment installed. This will determine what tests can be performed. In general, this document will address the following areas:

- Equipment, System and Alarm Configuration
- Bit Error Rate Testing

- Alarm Verification
- Redundancy/Protection Switching Tests
- Configuring the MX2810 for Remote Access
- Restoring the System to Default Configuration
- Final System Configuration
- Completing the Acceptance Test Procedures Checklist

EQUIPMENT VERIFICATION

The installed configuration determines the level of redundancy the unit supports. There may be one or two Power Supply Units (PSU) and Controller Card Units (CCU) present. A single Power Supply and Controller are required for operation without redundancy. Equipping the shelf with two of each provides full redundancy. The Power Supply Units are the smaller modules on the left side. The Controller Card Units are the larger modules toward the center and right of the shelf. Visually note which cards are installed in the chassis under test.

SYSTEM CONFIGURATION

Before the required tests can be performed, a minimal amount of configuration must be performed on the MX2810. It is necessary to gain access to the Provisioning menus through the Craft Port, then set the desired parameters for the DS1 ports, the DS3 port and the alarm attributes. The following paragraphs step through the process.

Accessing the Craft Port

The MX2810 has a female DB-9 port labeled "craft" on the left side of the front panel. This port should be connected to the COM port on a computer or dumb terminal using a standard DB9 male to DB9 female straight-wired RS232 cable. Make these connections and start up a terminal emulation program if using a computer (e.g., HyperTerminal, Procomm, Crosstalk, etc.), set to VT100 emulation, and a character format of 9600, N, 8, 1. Press the <ENTER> key several times. A username prompt should appear. The default username and password is **username**. The default password is **password**. The input characters for username and password are not case sensitive. After the logon and password are

accepted, the **MX2810 Main Menu** should appear. This is the screen from which all other management and control functions are accessed.

Provisioning the DS3 Port

In order for the MX2810 to correctly pass traffic through the system, the DS3 and DS1 ports need to be properly configured. The provisioning of the DS3 port will be done in this section, and the provisioning of the DS1 ports will be covered in the following. *Note that the <**Enter**> key is used to select a function and the <**Esc**> key is used to back up a level in the menu system.*

1. From the **Main Menu**, select **Configuration (3)**, and then select **Network Interface (1)**. The **Network Configuration** screen should appear. Set each of the options on this screen as referenced below. **To change an option, simply enter the corresponding number, hit <Enter> and follow the prompts.**

   ### DS3 Configuration

   - Framing = C-Bit (default = M13)
   - Line Length = Use 0-225 ft. (default) or 225-450 ft., depending on the distance to the DS3 Cross connect panel or connecting equipment.
   - Timing = Local (default = Loop)

   NOTE: The timing must be set to Local to ensure DS3 frame synchronization and error free testing during bit error tests, especially when performing tests to a DS3 loopback. Normal operation will generally require that this attribute be set back to Loop (system default) after all acceptance tests are completed. One exception to the rule would be if connecting two MX2810s together on a back-to-back basis (DS3s facing one another). In that situation, one MX2810 would need to be set to Local and the other to Loop.

   - Remote Loopbacks = FEAC/C-Bit (default)
   - XCV Threshold = Disabled (default)

   ### Protection Configuration

   - Active Controller = A (default)
   - Max Switch Threshold = 3 (default)
   - Min. Switching Period (sec.) = 10 (default)

Miscellaneous

- Loopback Time Out = 1 hr. (default)

DS2 Configuration (no changes are required to DS2 Configuration)

- DS2 #1 = M12(4xT1)
- DS2 #2 = M12(4xT1)
- DS2 #3 = M12(4xT1)
- DS2 #4 = M12(4xT1)
- DS2 #5 = M12(4xT1)
- DS2 #6 = M12(4xT1)
- DS2 #7 = M12(4xT1)

2. Press the <**Esc**> key to get back to the **main Configuration Menu**.

Provisioning the DS1 Ports

1. From the **main Configuration** menu, select **T1/E1 Interface (2).** The **Configure T1/E1 Interface** menu should be visible. Since there are 28 DS1 ports to configure and all of them need to be set identically during acceptance testing, the "**Set Multiple**" provisioning feature of the MX2810 will be used during this step. Note, however, that in most instances no changes will be required since the specified settings are the system defaults.
2. To use the **Set Multiple** feature, simply select the attribute from the **Configure T1/E1 Interface** screen. From the **Set Multiple** screen, confirm that **First = 1** and **Last = 28**. If not, make the necessary corrections. Select **State (3)** to toggle the State as necessary until the correct setting is displayed and select **Apply settings (4)** to set all 28 DS1s to that mode. Press <**Esc**> **twice** to return to the **Configure T1/E1 Interface** menu.
3. Select **T1/E1 State (1)**. If all channels are set to **Auto Enable (default)** press **<Esc>** to get back to the **Configure T1/E1 Interface** menu and proceed to the next step. If not, perform the Set Multiple routine referenced above.
4. Select **T1/E1 Line Coding (2)**. If all channels are set to **B8ZS (default)** press **<Esc>** to get back to the **Configure T1/E1 Interface**

menu and proceed to the next step. If not, perform the Set Multiple routine accordingly.

5. Select **T1/E1 Line length (3)**. If all channels are set correctly (0-133, 133-266, 266-399, 399-533 or 533-655 feet) as appropriate for the installation, proceed to the next step. If not, perform the Set Multiple routine accordingly.
6. None of the other settings are important to the acceptance testing process. As such, they will not be addressed.
7. Press the <**Esc**> key to get back to the **main Configuration Menu**.

Alarm Relay Configuration

Although there are numerous alarm configuration options available on the MX2810, our interest here is only to have the ability to generate one CRITICAL, one MAJOR, and one MINOR alarm. This will confirm that the alarm contacts are wired/operating correctly and transmitting the appropriate alarm conditions to the Office alarm panel, DANTEL system, etc. The steps to follow will be required during subsequent alarm testing/ verification.

1. From the **main Configuration menu**, select **System Management (3)**. From this menu, select **Alarm Relay Configuration (4)** to get to the **Alarm Relay Configuration** screen.
2. As necessary, toggle the *DS3* **LOS (2)** state to **Enabled**. This will force generation of a **CRITICAL** alarm when the DS3 port sees a Loss of Signal condition.
3. As necessary, toggle the *T1/E1* **LOS (8)** state to **Enabled**. This will force generation of a **MAJOR** alarm when a DS1 port sees a Loss of Signal condition.
4. As necessary, toggle the *DS3* **FEAC (5)** state to **Enabled**. This will force generation of a **MINOR** alarm when a DS1 port sees a Loss of Signal condition and the DS3 is hard looped back as will be the case during the Alarm Testing process.

OVERALL SYSTEM AND CABLING TEST

Now that the system has been properly provisioned for acceptance testing, we can proceed with the actual acceptance testing of the system. The first key test is to verify that the MX2810 will pass traffic between the DS1 and DS3 ports. Three different methods of testing are presented. **One** of the three should be selected based on test equipment availability and network configuration. All of the tests are performed at the DSX-1 and DSX-3 cross-connect bays or connecting equipment so that both the MX2810 circuitry and the office cabling are tested.

DS1 to DS3 "Head to Head" Test (ordinarily a two-person operation)

This is the preferred means of testing system and cabling integrity. It tests one DS1 channel at a time using a DS1 test set at the DSX-1 cross-connect panel or connecting equipment and a DS3 test set at the DSX-3 or connecting equipment location.

Equipment Required:
- 1 DS1 Test Set capable of running a BERT
- 1 DS3 Test Set capable of accessing and running a BERT on a single DS1

1. At the DSX-3 cross-connect panel or connecting equipment, properly connect the DS3 test set to the DS3 coming from the MX2810 *(confirming transmit and receive integrity is integral to the process)*.
2. Configure the DS3 test set for **C-Bit Framing**, the appropriate **LBO** and set to drop out **DS1 #1**. Configure the DS1 BERT to run in **ESF/ B8ZS** mode using **QRSS** or other preferred test pattern. Confirm that the MX2810 sees a good DS3 signal **(DS3 STATUS LED is solid Green on the Active Controller)** and that the DS3 Test Set is in frame synchronization with the MX2810.
3. At the DSX-1 cross-connect bay or connecting equipment, connect the DS1 test set to the first DS1 channel of the MX2810. Configure the test set for the same framing, line code and BERT pattern as the DS3 test set. Confirm a good, error free BERT for a minimal period, e.g., 15 seconds).
4. Repeat for DS1 channels 2-28 by moving the DS1 test cables and reconfiguring the DS3 test set to drop out the appropriate DS1 channel under test.

5. The MX2810 will be in an alarm condition because of the previously tested and now un-terminated DS1 ports, but this should not prohibit a successful BERT between the DS1 and DS3 test sets on the channel under test.
6. Leave this test set-up in place, as it will be used during the redundancy testing portion of this document. **Proceed to Alarm Verification.**

DS1 Daisy-chain to DS3 (Hard) Loopback

(can only be used if DS1s are terminated at the DSX1)

This test can be performed single-handedly. It loads all 28 ports of the MX2810 with traffic at the same time, but it does **not** confirm DS3 cabling integrity (transmit Vs receive).

Equipment Required:
- 1 DS1 Test Set for running a BERT
- 28 DS1 Bantam test cords
- 1 DS3 test cord

1. At the DSX-3 cross-connect panel or connecting equipment, loop the DS3 from the MX2810 back on itself. Confirm that the MX2810 sees a good DS3 signal (DS3 STATUS LED is solid Green on the Active Controller) and that the DS3 Test Set is in frame synchronization with the MX2810.
2. At the DSX-1 cross-connect panel, insert the TRANSMIT of the DS1 test set into the INPUT of the first DS1 channel of the MX2810.
3. At the DSX-1, install a Bantam test cord from the OUTPUT of the first DS1 channel to the INPUT of the second, then connect a second Bantam test cord from the OUTPUT of the second DS1 channel to the INPUT of the third DS1 channel. Repeat this procedure for all 28 DS1 channels.
4. Connect the OUTPUT of the 28th DS1 channel to the RECEIVE of the DS1 test set.
5. Set the test set options for ESF/B8ZS and run a standard BERT using QRSS or other preferred test pattern(s).
6. All alarms should clear on the MX2810 and the BERT should run error free for a minimal period, e.g., 15 seconds. Troubleshoot as necessary.

7. Leave this test set-up in place, as it will be used during the redundancy testing portion of this document. **Proceed to Alarm Verification.**

DS1 to DS3 (Hard) Loopback

This test requires minimal test equipment, tests one DS1 at a time and can be performed single-handedly. *It does not verify DS3 cabling integrity (transmit Vs receive) to the DSX3 or connecting equipment.*

Equipment Required:
- 1 DS1 Test Set capable of running a BERT test
- 1 DS3 Test Cord

1. At the DSX-3 cross-connect panel or connecting equipment, loop the DS3 from the MX2810 back on itself. Confirm that the MX2810 sees a good DS3 signal (DS3 STATUS LED is solid Green on the Active Controller) and that the DS3 Test Set is in frame synchronization with the MX2810.
2. At the DSX-1 cross-connect bay or connecting equipment, insert the TRANSMIT of the DS1 test set to the DS1 INPUT of the first channel of the MX2810. Connect the RECEIVE of the test set to the OUTPUT of the first DS1 channel of the MX2810.
3. Configure the DS1 test set for ESF/B8ZS and the desired BERT pattern, e.g., QRSS.
4. All alarms should clear on the MX2810 and the BERT should run error free for a minimal period, e.g., 15 seconds. Troubleshoot as necessary.
5. Repeat the above procedure for DS1 channels 2-28. The MX2810 will be in an alarm condition because of the un-terminated DS1 ports, but this should not prohibit a successful BERT.
6. Leave this test set-up in place, as it will be used during the redundancy testing portion of this document. **Proceed to Alarm Verification.**

ALARM VERIFICATION

The MX2810 has three sets of alarm relay contacts available for connection to external alarm systems. They are located on the back panel and are designated as CRITICAL, MAJOR and MINOR. Normally "Open" and "Common" contacts are available for each of the relay outputs.

In the section above, a test scenario was designed to activate each of the relays. The **CRI** (Critical) alarm is activated when the DS3 port experiences a Loss of Signal (LOS) event. The **MAJ** (Major) alarm is activated when one of the 28 DS1 ports experiences a Loss of Signal. The **MIN** (Minor) alarm is activated when one of the 28 DS1 ports experiences a Loss of Signal event and the DS3 is hard looped back on itself, therefore appearing as a **FEAC** (Far End Alarm and Control) alarm. FEAC alarms only occur when the system is provisioned for C-Bit framing, hence the reason for performing acceptance testing in that mode.

Alarm testing procedures are documented below. Testing of autonomous alarm reporting, e.g., to NMA, will first require that the system be configured for remote access. Those procedures are covered in the section entitled "**Configuring the System for Remote Access**".

CRITICAL Alarm Relay Test

This test will actuate the **CRITICAL** alarm relay contacts.

1. Ensure that the DS3 is not in alarm. The easiest way to do this is to place a hard loopback of the DS3 toward the MX2810 using a test cord at the DSX-3 cross-connect panel or connecting equipment.
2. With the loopback in place, all alarms should clear on the Controller Module DS3 port (DS3 STATUS LED is solid Green on the Active Controller).
3. Remove the loopback from the DS3 and insure that no other DS3 signal is entering the MX2810 through the DSX-3 Cross-connect bay or connecting equipment, e.g., DCS.
4. The MX2810 should go into CRITICAL alarm, thus closing the relay contacts and sending the alarm to the alarm monitoring equipment.
5. Verify that the alarm is being properly reported (CRITICAL Alarm).

MAJOR and MINOR Alarm Relay Test

This test will actuate the **MAJOR** and **MINOR** alarm relay contacts.

1. Ensure that the DS3 is not in alarm (DS3 STATUS LED is solid Green on the Active Controller). The easiest way to do this is to once again re-install a hard loopback of the DS3 toward the MX2810.
2. Ensure that the 28 DS1s are out of alarm. The easiest way to accomplish this is as follows:
   - At the DSX-1 cross-connect, insert the TRANSMIT of the DS1 test set into the INPUT of the first DS1 channel of the MX2810. Install a Bantam test cord from the OUTPUT of the first DS1 channel to the INPUT of the second DS1 channel. Then connect a second Bantam test cord from the OUTPUT of the second DS1 channel to the INPUT of the third DS1.
   - Repeat this procedure for all 28 DS1 channels. Connect the OUTPUT of the 28th DS1 channel to the RECEIVE of the DS1 test set. Configure the test set for ESF/B8ZS and run a standard BERT test using QRSS or other preferred test pattern(s).
3. At this point, nothing should be in alarm (DS1 STATUS LEDs are all solid Green on the Active Controller). Remove any one of the Bantam cords from the DSX bay. This will cause a DS1 LOS alarm, which will result in the actuation of the MAJOR alarm relay. Also, since the DS3 is hard looped back on itself, i.e., the DS3 is not in alarm, a FEAC alarm will occur to signify an alarm at the DS1 level reported by the far end (C-Bit framing enables this feature), resulting in the actuation of the MINOR alarm relay.
4. Verify that the MAJOR and MINOR alarms are being properly reported to the Office alarm monitoring equipment.

VERIFICATION OF SYSTEM REDUNDANCY

This section will address the redundancy features of the MX2810. The MX2810 supports redundancy of both the Power Supply and Controller Modules. The equipment configuration (non-redundant Vs redundant and type of power redundancy) will be useful in determining what can and cannot be tested. The following sections describe the tests for various configurations.

Power Supply Redundancy

When installed, the MX2810 can be wired to have either one or two -48VDC power feeds (A and B). In addition, the MX2810 chassis can be equipped with either one or two Power Supply Modules. Test scenarios for the two most common configurations follow. Testing of the other configurations is nothing more than a subset of what follows.

Single Power Supply Module / Dual Power Feeds

When the MX2810 is equipped with only a single Power Supply Module, there is no protection against a failure of the module itself. However, the single Power Supply is capable of utilizing the A and B power feeds to protect against a failure in one of the power sources feeding the shelf. To verify that the MX2810 is properly utilizing the A and B power feeds, the following procedure is suggested:

1. With the MX2810 installed and operating normally, go to the fuse panel at the top of the bay and remove the fuse corresponding to the A power feed for the MX2810 shelf. This should have no effect on the operation of the shelf or customer service, as the MX2810 is now operating on the B power feed.
2. Reinsert the fuse for the A power feed.
3. Now remove the B power feed fuse for the MX2810 shelf. Once again, there should be no effect on the operation of the shelf, as the MX2810 is now operating on the B power feed.
4. Reinsert the fuse for the B power feed.

Dual Power Supply Modules / Dual Power Feeds

When the MX2810 is equipped with two Power Supply Modules and also wired to support dual power feeds, the shelf is protected against a failure of either of the Power Supply cards, as well as a failure of one of the power sources feeding the shelf. Use the following procedure to confirm the operation of this fully redundant configuration:

1. With the MX2810 installed and operating normally, remove the A Power Supply card (the one on the left). This should have no effect on the operation of the shelf, as the MX2810 is now operating on the B Power Supply.

2. Go to the fuse panel at the top of the bay and remove the fuse corresponding to the A power feed. This should have no effect on the operation of the shelf, as the B Power Supply is now running on the B power feed.
3. Reinsert the fuse for the A power feed.
4. Remove the fuse corresponding to the B power feed to the shelf. Again, this should have no effect on the operation of the shelf, as the B Power Supply is now operating on the A power feed.
5. Reinsert the fuse for the B power feed.
6. Reinsert the A Power Supply into the MX2810 chassis.
7. Remove the B Power Supply card (the one on the right). This should have no effect on the operation of the shelf, as the MX2810 is now operating on the A Power Supply.
8. Go to the fuse panel at the top of the bay and remove the fuse corresponding to the A power feed. This should have no effect on the operation of the shelf, as the A Power Supply is now running on the B power feed.
9. Reinsert the fuse for the A power feed.
10. Remove the fuse corresponding to the B power feed to the shelf. Again, this should have no effect on the operation of the shelf, as the A Power Supply is now operating on the A power feed.
11. Reinsert the fuse for the B power feed.
12. Reinsert the B Power Supply into the MX2810 chassis.
13. Confirm both Power Supplies and Power Feeds are functioning as normal. Faceplate LEDs will identify problems with the Power Supplies, but the inputs can only be tested via VOM.

Controller Card Redundancy

The MX2810 can be equipped with either one or two Controller Modules. The Controller contains all of the MX2810's critical circuitry including the DS3 interface, DS1 interfaces, management and communications hardware/firmware, etc. If the MX2810 is equipped with only one Controller, there is no protection against failure. If a failure does occur to

the Controller, an alarm is initiated and the front panel LEDs reflect the condition (ACT LED is either solid or blinking Red).

If the MX2810 is equipped with two Controller Modules, all traffic is protected and can be switched over to the Standby Controller in the event of a card failure. The following procedures will demonstrate the functionality of a Controller switchover.

1. Using the BERT set-up that should still be in place from previous testing, insure that the system is still passing traffic error-free.
2. Log into the MX2810 (if necessary) via the Craft Port to get to the Main Menu screen. From there, select **Configuration (3)**, followed by **Network Interface (1)** and **Active Controller (6)**.
3. This will show which Controller (A or B) is currently Active. If the A Controller is Active, select Controller B as the Active Controller. This will force a switch to the B Controller, which is acting as a hot-standby. If the B Controller is the Active Controller, force a switch to the A Controller.
4. Traffic will be interrupted momentarily during the switch, but will quickly return to error free performance again on the new Controller.
5. Although either Controller can be the Active Controller, for consistency, the A Controller should be left as the Active one.

NOTE: You must repeat the log-in sequence in Step 2 after each protection switch.

CONFIGURING THE MX2810 FOR REMOTE ACCESS

The MX2810 supports either Ethernet (10BT) or X.25 communication for remote management. In the event the MX2810 is to be Remotely Accessible, the process below can be used to configure the system for remote access and confirm proper operation.

Assuming remote access will occur via Ethernet 10BT Telnet session, confirm the 10BT cable is connected to the appropriate HUB/PORT at one end and to the MX2810 Ethernet port at the other. Perform the following from the front panel Craft Port following a successful log in:

1. From the Main Menu, select Configuration (3), followed by System Management (3).

2. From the System Management Configuration screen, select Local IP Address (1). Enter the correct IP Address, e.g., 10.13.254.27, as provided by appropriate engineering personnel.
3. Also from the System Management Configuration screen, enter the correct Gateway and Subnet Mask addresses.

Once the IP Address info has been entered into the system, the final step in the process involves assigning a Target ID (TID) to the system. Once again, this information should be furnished by the appropriate engineering personnel. An example of a TID is HSTNTXCA01012308S1, where the first 8 characters are the Office CLLI, followed by an 8-character relay rack location and a 2-character shelf id. The entire TID is limited to no more than 20-characters.

The following procedures describe the process of inventorying the TID.

1. From the Main Menu, select Configuration (3), followed by System Management (3).
2. From the System Management Configuration screen, select Circuit Identification (16).
3. From the Equipment Identification screen, select Unit ID (1).
4. Enter the TID exactly as documented.

Assuming the proper Data Communications Network routing translations have been performed by DCN administration personnel, attempt remote access via Telnet Session to the shelf from a secure terminal or server (DCN personnel should be able to do this). Work with DCN personnel as necessary to troubleshoot problems.

Once the Ethernet connectivity is established to the shelf, NMA personnel may also be contacted to confirm NMA accessibility for autonomous alarming and/or remote provisioning/maintenance.

With Ethernet connectivity, remote personnel will also have access to the user-friendly craft interface screens. Those screens, the same ones available via the local craft port, will provide access to all OAM&P (Operations, Administration, Maintenance and Provisioning) functions.

For those situations where X.25 is the transport medium for providing remote access to the shelf, the Controllers have a built-in PAD and require

no settings on the MX2810. The RS232 Data Communication Interface on the shelf backplane will be used for that type of connectivity.

NOTE: MX2810 chassis' equipped with X.25 as opposed to Ethernet connectivity will be limited to TL1 provisioning and maintenance, i.e., craft-interface accessibility does not exist.

Once the system has been configured for remote access and tested satisfactorily in that regard, autonomous alarm reporting to NMA can then be tested. NMA personnel will need to access the shelf, perform the required login sequence and enable autonomous alarm reporting. Once that activity has been performed successfully, alarms should be seen by the NMA system. This process should be verified during acceptance testing unless local policy dictates otherwise.

RESTORATION OF DEFAULT SETTINGS

After all Acceptance Tests have been successfully completed, the MX2810 may be restored to its default settings by following the procedures below.

1. Log into the MX2810 (if necessary) via the Craft Port. From the Main Menu, select **Configuration (3)**, followed by **Utilities (4)** and **Load Default Settings (1)**.
2. Once the settings have been retrieved and loaded into the system, **Command Accepted** will appear at the bottom of the screen. The Standby Controller will always maintain an exact copy of the Active Controller's attributes. Confirm all settings are as expected via the Craft Port.
3. Normalize all loopbacks as appropriate and restore all cabling and DSX panels to normal.

Office and Autonomous alarms may be generated as a result of performing step 3 above. DS3 alarms can be cleared by looping the DS3 back toward the MX2810 **and** setting the MX2810 Timing to **LOCAL** via the Craft Port by selecting **Configuration (3), Network Interface (1) and Timing (3)** from the Main Menu, or by ensuring continuity to and proper provisioning of the MX2810 and connecting equipment.

At the DS1 level, the MX2810 has 3 Service States. They operate as follows:

- **Disabled** – No signal continuity exists through the MX2810 and no alarms are detected or transmitted.
- **Enabled** – Signal continuity and alarming are always enabled.
- **Auto Enable (default)** – Signal continuity and alarming exist only after a DS1 signal is detected at the DS1 input to the MX2810. *Once a signal is detected, the only way to disable alarming is to momentarily toggle the DS1 channel to the Disable state as follows:*

From the Main Menu, select **Configuration (3), T1/E1 Interface (2)** and **T1 State (1)**. From the **T1/E1 State** screen, enter the DS1# in question, and then select **Disabled (1)** to disable signal continuity and alarm transmission. Repeat the process of selecting the DS1 from the **T1/E1 State** screen, but this time select **Auto Enable (3)** to once again provision the slot/channel for service. No alarms will be transmitted until a DS1 signal has been detected and removed or an unframed signal is detected.

FINAL SYSTEM CONFIGURATION (TRAFFIC READINESS)

After the previous tests are successfully completed and the default settings are restored, the MX2810 can be considered ready for customer traffic. Specific provisioning of the DS3, DS1 and other options is determined by circuit orders and local practices.

MX2810 ATP CHECKLIST/SIGN-OFF

Use the table below to identify the MX2810 configuration, identify tests performed, etc.

Acceptance Test Procedure Steps	Completed
Verification of Installed Configuration (identify the installed configuration)	
Dual Power Supplies / Dual Power Feeds	
Dual Power Supplies / Single Power Feed	
Single Power Supply / Dual Power Feeds	
Single Power Supply / Single Power Feed	
Dual Controllers	
Single Controller	
Configuring the MX2810 for Test	
Accessing the Craft Port	
Provisioning the DS3 Port	
Provisioning the DS1 Ports	
Alarm Relay Configuration	
Overall System and Cabling Test	
Test Access Module / Streaker Test	
DS1 to DS3 “Head to Head” Test	
DS1 Daisy-chain to DS3 (hard) Loopback	
DS1 to DS3 (hard) Loopback	
Alarm Verification	
Critical Alarm Relay Test	
Major Alarm Relay Test	
Minor Alarm Relay Test	
Power Supply Redundancy Test	
Redundancy tests (Power Supply and Power Feed as appropriate)	
Controller Card Redundancy Test	
Protection switching test	
Configuring the MX2810 for Remote Access	
Remote accessibility	
Autonomous alarm reporting	
Restoration of Default Settings	
Additional Tests (document additional tests/checks performed below)	
1. Autonomous alarm reporting (e.g., NMA)	
2.	
3.	
Final System Configuration (Traffic Readiness)	

NAME:	**DATE:**
LOCATION:	**RELAY RACK:**

Appendix B Pinouts

The following tables give the pin assignments for the connectors located on the MX2810. For more information on these connectors, see the chapter *Installation and Operation* on page 2-1.

Table B-1. Craft Port Pin Assignments

RJ Pin#	DB-9	Function	Direction
1	5	GND	
2	7	RTS	I
3	3	TD	I
4	6	DSR	O
5	2	RD	O
6	8	CTS*	O
7	4	DTR	I
8	1	DCD	O
-	9	not used	-

** Used for hardware flow control.*

Table B-2. LAN Port Pin Assignments

Pin	Name	Description
1	TD+	The positive signal for the TD differential pair. This signal contains the serial output data stream transmitted onto the network.
2	TD-	The negative signal for the TD differential pair (pins 1 and 2).
3	RD+	The positive signal for the RD differential pair. This signal contains the serial input data stream received from the network.
4, 5	N/A	not used
6	RD-	The negative signal for the RD differential pair (pins 3 and 6).
7, 8	N/A	not used

Table B-3. Amp Pin Assignments

Pin	Function		Pin
1	RING 1	TIP 1	33
2	RING 2	TIP 2	34
3	RING 3	TIP 3	35
4	RING 4	TIP 4	36
5	RING 5	TIP 5	37
6	RING 6	TIP 6	38
7	RING 7	TIP 7	39
8	RING 8	TIP 8	40
9	RING 9	TIP 9	41
10	RING 10	TIP 10	42
11	RING 11	TIP 11	43
12	RING 12	TIP 12	44
13	RING 13	TIP 13	45
14	RING 14	TIP 14	46
15	RING 15	TIP 15	47
16	RING 16	TIP 16	48
17	RING 17	TIP 17	49
18	RING 18	TIP 18	50
19	RING 19	TIP 19	51
20	RING 20	TIP 20	52
21	RING 21	TIP 21	53
22	RING 22	TIP 22	54
23	RING 23	TIP 23	55
24	RING 24	TIP 24	56
25	RING 25	TIP 25	57
26	RING 26	TIP 26	58
27	RING 27	TIP 27	59
28	RING 28	TIP 28	60
29			61
30			62
31			63
32	FGND	FGND	64

Table B-3 applies to both the **IN** *and* **OUT DSX1/E1** *Amp connectors.*

Appendix C Specifications Summary

SPECIFICATIONS AND FEATURES

This section describes the standard specifications and features incorporated in the MX2810.

DSX-3 Network Interface

Channelized DS3
Line length: short (less than 225 ft.) and long (greater than 225 ft.)
Framing format: M13 and C-bit parity
Line rate: 44.736 Mbps
Line interface: dual 75-ohm BNC coax female connectors

DSX-1 Interface(s)

Line length: 0-655 feet
Line rate: 1.544 Mbps
Line code: AMI or B8ZS
Line interface(s): two 64-pin Amp connectors

Clocking

Network: receive from DS3 network
Local: internally generated
External: recieve from T1/E1 port or BITS clock from wire-wrap pins on back of chassis

Loopbacks

DS3 Network

ANSI T1.107 compatible loopbacks

Line loopbacks

DS2 Interfaces

DS2 network loopbacks

DSX-1 Interfaces

Local and network loopbacks

Management

VT100 Terminal Interface

DB-9, EIA-232 compatible

SNMP/TELNET

Integrated 10BaseT ethernet
MIB II (RFC 1213), RFC 1215 and RFC 1407 compliant.
ADTRAN Enterprise MIB for extended monitoring and control/ configuration

Alarms

External alarm contacts for critical, major, and minor alarms.
Normally Open (NO) and Common (C) pinout
Front panel alarm cutoff switch

Agency Approvals

FCC Part 15, Class A, Part 68
Industry Canada CS03
UL and CUL
NEBs level 3

Environment

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

Power

DC version: -48 VDC, 30W

Physical

Dimensions: 7.86“D x 17.0“W x 1.7“H
Weight: 5.5 lbs. (redundant); 4.5 lbs. (non-redundant)

Appendix D Acronyms/Abbreviations

ACO ..... alarm cut off
ACT ..... active
AIS..... alarm indication signal
ALM ..... alarm
AMI ..... alternate mark inversion
Amp..... amphenol
ANSI ..... American National Standards Institute
async ..... asynchronous
BERT ..... bit error rate test
bps ..... bits per second
BPV ..... bipolar violation
CA..... communications equipment available
CAIS..... carrier side alarm indication signal
CCITT ..... Consultive Committee for International Telephony and Telegraphy
CCV..... C-bit coding violation
CD ..... carrier detect
CES..... C-bit errored seconds
CO ..... central office
CPE..... customer premise equipment
CRC ..... cyclic redundancy check
CS ..... clear to send

CSES..... C-bit severely errored seconds
CSU ..... channel service unit
CTS..... clear to send
CV..... coding violation
dB..... decibel
DBU..... dial backup
DCD ..... data carrier detect
DCE ..... data communications equipment
DDS..... digital data service
DLCI..... data link connection identifier
DS1 ..... digital signal level one
DS3 ..... digital signal level three
DSR ..... data set ready
DSU..... data service unit
DSX-1 ..... digital signal cross connect, level 1
DTE ..... data terminal equipment
DTR..... data terminal ready
ES..... errored seconds
Eq..... equipment
Eqpt..... equipment
EXZ..... excessive zeros
FBE..... F-bit errors
FCC..... Federal Communications Commission
FDL..... facility datalink
FEAC ..... far-end alarm and control
FEBE..... far end block error
HSSI..... high-speed serial interface
IP..... internet protocol
KA..... keep alive

LAIS ..... loop side alarm indication signal
LAN ..... local area network
LCV ..... line coding violation
LED ..... light emitting diode
LES ..... line errored seconds
LIU ..... line interface unit
LL ..... local loopback
LOF ..... loss of framing
LOS ..... loss of signal
MBE ..... M-bit errors
Mbps ..... megabits per second
MIB ..... management information base
ms ..... millisecond
NC ..... normally closed
NI ..... network interface
NMS ..... network management system
NO ..... normally open
NRZ ..... non-return to zero
NSA ..... non service affecting
OCU ..... office channel unit
OOF ..... out of frame
OOS ..... out of service
PCV ..... P-bit coding violation
PES ..... P-bit errored seconds
POP ..... point of presence
PPP ..... point-to-point protocol
PRF ..... performance
PSES ..... P-bit severely errored seconds
PSTN ..... public switched telephone network

PVC ..... permanent virtual circuit
RD..... receive data
RDL ..... remote digital loopback
RL..... remote loopback
RMA..... return material authorization
RS..... request to send
RTS ..... request to send
Rx..... receive
SA ..... service affecting
SEFS ..... severely errored framing seconds
SES..... severely errored seconds
SLIP..... serial line internet protocol
SNMP..... simple network management protocol
SONET..... synchronous optical network
SR..... data set ready
SW56 ..... switched 56
sync..... synchronous
TA ..... terminal equipment available
TD..... transmit data
TDM..... time division multiplexing
TM ..... test mode
TR ..... data terminal ready
Tx..... transmit
UAS ..... unavailable seconds
WAN..... wide area network
XCV ..... excessive coding violations

Appendix E Glossary

10BaseT
Ethernet connector which implements the IEEE standard on 24-gauge, unshielded twisted-pair wiring.

AMI
Alternate mark inversion. A bipolar line-coding format in T1 transmission systems whereby successive ones are alternately inverted.

ANSI
American National Standards Institute. A non-profit organization that coordinates voluntary standards activities in the United States.

asynchronous
A method of data transmission which allows characters to be sent at irregular intervals by preceding each character with a start bit, followed by a stop bit.

bandwidth
The bandwidth determines the rate at which information can be sent through a channel (the greater the bandwidth, the more information that can be sent in a given amount of time).

baud rate
A measure of transmission speed over an analog phone line. Baud rate measures the shortest signaling elements per second in the analog signal that a modem sends over an analog phone line. Does not necessarily equal the bit rate.

BERT
Bit error rate test. A test that uses any of a number of stress patterns to test T3, T1, FT1, and DDS circuits.

bipolar
A signal containing both positive and negative amplitude components.

bipolar violation
See *BPV*.

bit
A binary digit representing a signal, wave, or state as either a one or a zero. A bit is the smallest unit of information a computer can process.

bit error
The receipt of an encoded bit that differs from what was sent by the transmitter.

bit rate
The speed at which bits are transmitted, usually expressed in bits per second (bps).

bps
Bits per second. The number of bits passing a specific point per second. Examples of common rates are kbps (one thousand bits per second) and Mbps (one million bits per second). T3 operates at 44.736 Mbps.

BPV
Bipolar violation. A violation in the alternate mark inversion (AMI) line code for which consecutive 1s are represented by pulses of opposite polarity. BPVs that are not intentional (B8ZS) are counted as errors. Could also be the presence of two consecutive 1 bits of the same polarity on the T-carrier line.

bridge
A data communications device that connects two or more networks and forwards packets between them.

byte
Generally, an 8-bit quantity of information. This term is used mainly in referring to parallel data transfer, semiconductor capacity, and data storage.

carrier
The provider of the telecommunication services to the customer site. Carriers can be local telephone companies, regional telephone companies, or any interexchange carrier such as AT&T, Sprint, or MCI.

C-bit

An overhead bit in the DS3 string not used for framing, parity, or alarm indication.

CCITT

Consultive Committee for International Telephony and Telegraphy. A standards organization that devises and proposes recommendations for international communications. See also *ANSI.*

CD

Carrier detect. A signal generated by a modem or DSU/CSU indicating the presence of a carrier signal on a communications link.

channel

A transmission path between two or more termination points; also called a circuit, facility, line, link, or path.

channel bank

Equipment in a telephone central office or customer premises that performs multiplexing of lower speed digital channels into a higher speed composite channel. The channel bank also detects and transmits signaling information for each channel, thereby transmitting framing information so that time slots allocated to each channel can be identified by the receiver.

channel service unit

See *CSU*.

clocking

An oscillator-generated signal that provides a timing reference for a transmission link. A clock provides signals used in a transmission system to control the timing of certain functions. The clock has two functions: (1) to generate periodic signals for synchronization, and (2) to provide a time base.

CPE

Customer premises equipment. All telecommunications terminal equipment located on the customer premises, including telephone sets, private branch exchanges (PBXs), data terminals, and customer-owned, coin-operated telephones.

craft port

The electrical interface between the MX2810 and the control terminal. The control terminal is used to communicate commands to the unit.

CSU

Channel service unit. A device used to connect a digital phone line coming in from the phone company to either a multiplexer, channel bank, or directly to another device producing a digital signal; for example, a digital PBX, a PC, or data communications device. A CSU performs certain line-conditioning and equalization functions, and responds to loopback commands sent from the central office. A CSU also regenerates digital signals. It monitors them for problems and provides a way of testing the digital circuit.

CTS

Clear to send. A signal on the DTE interface indicating that the DCE is clear to send data.

data communications equipment

See *DCE*.

data service unit

See *DSU*.

dB

Decibel. A unit of measure of signal strength; usually the relation between a transmitted signal and a standard signal source.

DCE

Data communications equipment. Device that provides all the functions required for connection to telephone company lines and for converting signals between telephone lines and DTE. Also see *DTE*.

DDS

Digital data service. A private line digital service for transmitting data end-to-end at speeds of 2.4, 4.8, 9.6, and 56 kbps (and in some cases 19.2, 38.4, or 64 kbps). The systems can use central hub offices for obtaining test access, bridging legs of multi-point circuits, and cross connecting equipment. DDS is offered on an inter-LATA (local access and transport area) basis by AT&T and on an intra-LATA basis by the Bell operating companies.

delay

The amount of time by which a signal is delayed. A round-trip transmission delay measurement helps detect possible causes of protocol timeouts.

DLCI

Datalink communications identifier. A unique number assigned to a PVC endpoint in a frame relay network. Identifies a particular PVC endpoint within a user's access channel in a frame relay network and has local significance only to that channel.

DS1

Digital signal level one. Twenty-four DS0 channels make up one DS1 (total bandwidth is 1.544 Mbps).

DS3

Digital signal level three. Equivalent of 28 DS1s and 672 DS0s (total bandwidth is 44.736 Mbps).

DSU

Data service unit. A device designed to transmit and receive digital data on digital transmission facilities.

DTE

Data terminal equipment. The end-user terminal or computer that plugs into the termination point (DCE) of a communications circuit. The main difference between the DCE and the DTE is that pins two and three are reversed.

E1

Transmission rates of 2.048 Mbps are available on T1 communication lines. See also *T1*.

end device

The ultimate source or destination of data flowing through a network (sometimes referred to as DTE).

end user

Subscriber who uses (rather than provides) telecommunications services.

ES

Errored seconds. A second with one or more coding violations (CVs).

ethernet
Transmission protocol for packet-switching LANs.

facilities
The equipment used by carriers to provide communication services.

far end
The distant end to that being considered. Not the end where testing is being carried out.

FCC
Federal Communications Commission. The U.S. federal agency responsible for regulating interstate and international communications by radio, TV, wire, satellite, and cable.

FDL
Facility datalink. FDL bits provide overhead communication between the terminal equipment in ESF framing.

gateway
A device which enables information to be exchanged between two dissimilar systems or networks.

host computer
The primary or controlling computer in a multiple computer operation.

idle code
In a T3 circuit, an idle code consists of a sequence of 1100 over the entire payload bandwidth.

in-band
Signaling (dialing, loopbacks, management, configuration, etc.) over the same channel used for data.

IP
Internet protocol. A protocol which provides for transmitting blocks of data between hosts identified by fixed-length addresses.

LAN

Local area network. A privately owned network that offers high-speed communications channels to connect information processing equipment in a limited geographic area.

local loopback (LL)

A type of test used to verify the operation of the local terminal equipment, the CSU, and the connection between the two. The signal from the DTE is looped back by the CSU and is sent back to the DTE.

loopback

The technique for testing the processing circuitry of a communications device. May be initiated locally or remotely via a telecommunications circuit. Device being tested will echo back received test data. The results are compared with the original data.

LOS

Loss of signal. Defined as a line state in which no pulses are received for 175 bit positions.

M13

DS1/DS3 multiplexer that combines up to 28 DS1 channels into one DS3 channel. Uses two-stage, bit synchronous TDM.

Mbps

Megabits per second (one million bits per second).

MIB

Management information base. A database of network management information used by SNMP.

modem

Acronym for modulator/demodulator. Equipment that converts digital signals to and from analog signals. Used to send digital signals over analog phone lines.

monitor

To watch or listen to a signal non-intrusively.

multi-point circuit

A single communications circuit that has more than two terminations.

NC

Normally closed. Relay switch contacts that remain closed when inactive.

near end

The unit on-site.

NI

Network interface. The demarcation point between the CPE and the PSTN.

NO

Normally open. Relay switch contacts that remain open when inactive.

NRZ

Non return to zero. A mode in which the digital level is low for a 0 bit and high for a 1 bit, and does not return to zero between successive 1 bits.

out-of-band

Signaling that is separated from the channel carrying information (voice, data, video, etc.). Typically the separation is accomplished by a filter. The signaling includes dialing and other supervisory signals.

point-to-point

Type of communications link that connects a single device to another single device, such as a remote terminal to a host computer.

POP

Point of presence. Physical place within a LATA (local access and transport area) where a long distance carrier or a cellular provider interfaces with the network of the local exchange carrier (LEC). A POP is usually a building serving as the point of termination which houses switches and transmission equipment.

protocol

A set of rules controlling the orderly exchange of information between stations in data communications networks or systems.

PSTN

Public switched telephone network. Usually refers to the world wide voice telephone network available for public use.

red alarm

Unframed all ones signal (keep alive signal). A red alarm is declared on detection of LOS or OOF not caused by an alarm indication signal (AIS) that persists for more than two seconds.

remote configuration

A feature designed into ADTRAN products that allows remote units to be configured from a local unit or a VT 100 compatible terminal.

router

A device that supports communications between networks. Routers are similar to bridges, with the exception that routers provide more functionality (such as finding the best route between networks and providing network management capabilities).

service

The provision of telecommunications to customers by a common carrier, administration, or private operating agency using voice, data, and/or video technologies.

service provider

A company that delivers or sells a telecom service.

SES

Severely errored seconds. A second in which more than 320 code violations (CVs) occurred or an OOF condition occurred.

signaling

Communication between switches to set up and terminate calls.

SNMP

Simple network management protocol. A control and reporting scheme widely used to manage devices from different vendors. SNMP operates on top of the Internet protocol.

SONET

Synchronous optical network. A standard format for transporting a wide range of digital telecommunications services over optical fiber. SONET is characterized by standard line rates, optical interfaces, and signal formats.

SR

Data set ready. A signal on the DTE interface that indicates if a connection exists and if the devices are ready to start handshaking control signals so communications can begin.

synchronous

Communications in which the timing is achieved by sharing a single clock. Each end of the transmission synchronizes itself with the use of clocks and information sent along with the transmitted data.

T1

Transmission rates of 1.544 Mbps are available on T1 communication lines. Also referred to as digital signal level 1 (DS-1). See also *E1.*

T3

Transmission rates of 44.736 Mbps are available on T3 communication lines. Also referred to as digital signal level 3 (DS-3).

TDM

Time division multiplexing. A technique for transmitting two or more signals at the same time over a single communication medium. This is accomplished by allocating channels to the bandwidth for specific increments of time.

Telnet

The standard TCP/IP remote login protocol specified in RFC-854.

transceiver

A combination of transmitter and receiver providing both output and input interfaces within a single device.

transmission

The signaling of data over telecommunications channels.

V.35

A standard for trunk interface between a network access device and a packet network that defines signaling for data rates greater than 19.2 kbps.

VT 100

A non-intelligent terminal or terminal emulation mode used for asynchronous communications. Used to configure the MX2810.

WAN

Wide area network. A communications network serving geographically separate areas. A WAN typically extends a LAN outside the building to link to other LANs over telephone lines.

yellow alarm

A T3 yellow alarm is an indication sent back toward the source of a failed transmit circuit in a DS3 two-way transmission path. The X-bits (X1 and X2) are set to zero.

Numerics

A

B

C

D

E

F

G

H

I

L

M

N

O

P

R

S

T

U

V

W

X