MX2800

M13 Multiplexer
User Manual

4200290L1	AC Non-Redundant Version with Modem
4200290L2	AC Redundant Version with Modem
4200290L3	DC Non-Redundant Version with Modem
4200290L4	DC Redundant Version with Modem
4200290L5	AC Non-Redundant Version
4200290L6	AC Redundant Version
4200290L7	DC Non-Redundant Version
4200290L8	DC Redundant Version
1200291L1	Breakout Panel
4175043L1	Battery Backup
1200657L1	Battery Backup Adapter Cable
1200287L1	Amp to Punch-Down Cable

61200290L1-1C
April 2000

Trademark Information

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

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Huntsville, AL 35814-4000
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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.

Important Safety Instructions
Save These Instructions

When using your telephone equipment, please follow these basic safety precautions to reduce the risk of fire, electrical shock, or personal injury:

1. Do not use this product near water, such as near a bathtub, wash bowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool.
2. Avoid using a telephone (other than a cordless-type) during an electrical storm. There is a remote risk of shock from lightning.
3. Do not use the telephone to report a gas leak in the vicinity of the leak.
4. Use only the power cord, power supply, and / or batteries indicated in the manual. Do not dispose of batteries in a fire. They may explode. Check with local codes for special disposal instructions.

Warranty and Customer Service

ADTRAN will replace or repair this product within ten years from the date of shipment if it does not meet its published specifications or fails while in service. For detailed warranty, repair, and return information refer to the ADTRAN Equipment Warranty and Repair and Return Policy Procedure.

Return Material Authorization (RMA) is required prior to returning equipment to ADTRAN.

For service, RMA requests, or further information, contact one of the numbers listed at the end of this manual.

LIMITED PRODUCT WARRANTY

ADTRAN warrants that for ten (10) years from the date of shipment to Customer, all products manufactured by ADTRAN will be free from defects in materials and workmanship. ADTRAN also warrants that products will conform to the applicable specifications and drawings for such products, as contained in the Product Manual or in ADTRAN's internal specifications and drawings for such products (which may or may not be reflected in the Product Manual). This warranty only applies if Customer gives ADTRAN written notice of defects during the warranty period. Upon such notice, ADTRAN will, at its option, either repair or replace the defective item. If ADTRAN is unable, in a reasonable time, to repair or replace any equipment to a condition as warranted, Customer is entitled to a full refund of the purchase price upon return of the equipment to ADTRAN. This warranty applies only to the original purchaser and is not transferable without ADTRAN's express written permission. This warranty becomes null and void if Customer modifies or alters the equipment in any way, other than as specifically authorized by ADTRAN.

EXCEPT FOR THE LIMITED WARRANTY DESCRIBED ABOVE, THE FOREGOING CONSTITUTES THE SOLE AND EXCLUSIVE REMEDY OF THE CUSTOMER AND THE EXCLUSIVE LIABILITY OF ADTRAN AND IS IN LIEU OF ANY AND ALL OTHER WARRANTIES (EXPRESSED OR IMPLIED). ADTRAN SPECIFICALLY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING (WITHOUT LIMITATION), ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME STATES DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO THIS EXCLUSION MAY NOT APPLY TO CUSTOMER.

In no event will ADTRAN or its suppliers be liable to Customer for any incidental, special, punitive, exemplary or consequential damages experienced by either Customer or a third party (including, but not limited to, loss of data or information, loss of profits, or loss of use). ADTRAN is not liable for damages for any cause whatsoever (whether based in contract, tort, or otherwise) in excess of the amount paid for the item. Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to Customer.

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Chapter 1 Introduction

PRODUCT OVERVIEW

The MX2800 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 MX2800 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 modem port using SLIP / PPP or through the 10BaseT ethernet port. Using the Management Information Base II (MIB II), RFC 1407 standards, and an ADTRAN enterprise MIB, the MX2800 can be configured, monitored, and diagnosed with standard SNMP network management programs such as Hewlett Packard's HP OpenView™ and Cabletron's Spectrum™.

Complete configuration, diagnostics, and performance monitoring are available through SNMP, Telnet, or a VT 100 terminal interface. This connection can be made via ethernet, a local EIA-232 link, or through the built-in V.34 modem (see the note at the end of this section on page 1-2). The modem can dial-out a "cry for help" for units located in unmanned facilities. The MX2800 is designed for either desktop use or for installation in a 19- or 23-inch rack.

The major features of the MX2800 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 or SLIP / PPP dialup
- Detailed performance monitoring for local and remote units
- Simplified configuration through the VT 100 terminal menu structure
- Integrated V.34 modem for dial-up and dial-out access (see the following note)
- Capable of backhauling multiple service types (T1 / E1)
- AC or DC power
- External DS3 clock option
- M13 and C-bit signaling support
- NEBS Level 3 compliant
- Standard 10-year warranty

Information regarding the built-in modem applies to the following list of part numbers: 4200290L1, L2, L3, and L4.

Controller Card 1:1 Redundancy

The MX2800 supports two hot-swappable controller cards which provide 1:1 redundancy for the T1 and T3 signals as well as the T3 connections. With two cards installed, the MX2800 can recover from circuit or network failure, depending on the configuration. See *Circuit and Network 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 MX2800, 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 MX2800'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 MX2800 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
A 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 MX2800 that allows a remote user to control the MX2800 through the terminal menus. Only one Telnet session may be active at a time.

AVAILABLE OPTIONS

The following options are available for use with the MX2800. Contact your local distributor or the ADTRAN sales department for more information (see end of manual for phone number).

Breakout Panel

The optional breakout panel (part number 1200291L1) connects to the MX2800 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 MX2800 (see *Connecting the Breakout Panel* on page 2-5 for more information).

Battery Backup

The battery backup system (P / N 4175043L1) provides power backup in the event of power loss. This system includes the battery, an AC battery charger, and an alarm cable. For an example of a battery backup configuration, see the section *Battery Backup Mode* on page 8-5.

Chapter 2 Installation and Operation

UNPACK, INSPECT, POWER UP

Receiving Inspection

Carefully inspect the MX2800 for any damage that might have occurred in shipment. If damage is suspected, file a claim immediately with the carrier and contact ADTRAN Technical Support (see the end 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 MX2800.

- MX2800 unit
- DC or AC power supply (two power supplies come with the Redundant Versions)
- Controller card (two cards come with the Redundant Versions)
- 8-pin to 6-pin modular cable (modem version only)
- 8-pin to 8-pin modular cable
- 8-pin modular to DB-9 female connector
- Two 4-position terminal lug connectors
- 3-position terminal lug connector
- Six-foot AC power cord (AC Versions only)

- Mounting ears and screws for 19- or 23-inch rack installation
- User manual or CD containing the User Manual

NOTE

The ADTRAN MX2800 MIB is available in the support section of the ADTRAN Web page at ***www.adtran.com****.*

Power Up

The AC version of the MX2800 is provided with a six-foot power cord, terminated by a three-prong plug which connects to a grounded 120 VAC power receptacle.

NOTE

Power to the AC version of the MX2800 must be provided from a grounded 120 VAC, 60 Hz receptacle.

The DC version of the MX2800 is provided with two four-position modular terminal lug connectors. These connectors make it easier to perform initial wiring and to connect and disconnect DC power when replacing rackmount units.

To establish DC power, use 12 to 26 AWG wire to connect the modular connector as follows:

1. Connect the wire lugs on the modular connector which correspond to the positive (**RET**) and negative (**-**) terminals on the rear panel to a -48V DC, 1A source.
2. Connect the wire lug on the modular connector which corresponds to the **PWR FAIL** terminal on the rear panel to a battery backup source.
3. Connect the remaining wire lug to the frame ground.

Once the modular connector is wired, push it firmly into one of the rear panel **POWER** connectors. Figure 2-1 and Table 2-1 on page 2-3 illustrate the DC power connector and give definitions for the four connector symbols.

NOTE

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.

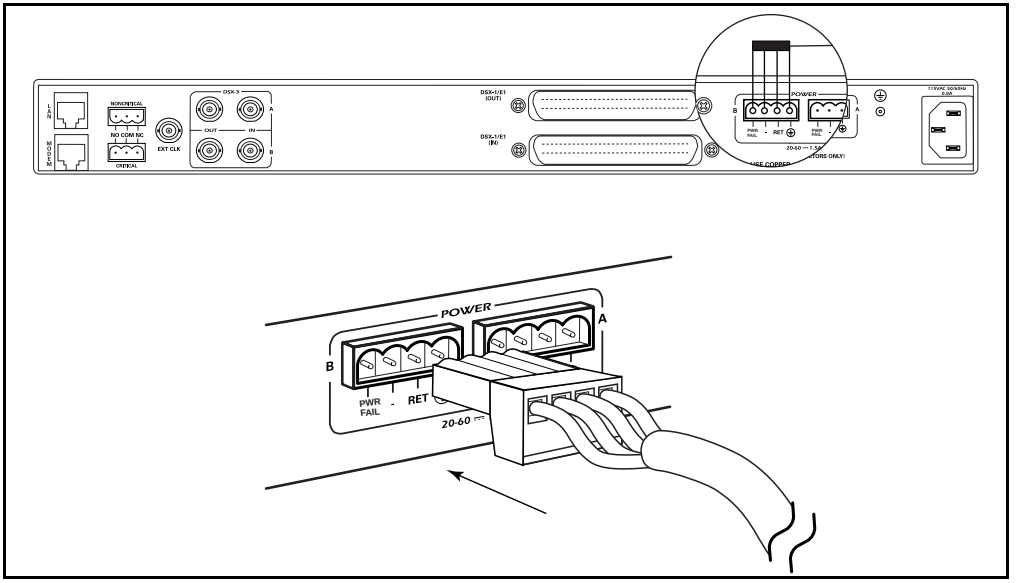


Figure 2-1. DC Power Connector

Table 2-1. DC Connector Symbol Definitions

Symbol	Definition
PWR FAIL	Battery backup connection. If AC fails, a trap is sent to alert user.
-	Negative side of DC power source (usually -48V)
RET	Positive side of DC power source (usually ground)
⏚	Frame Ground

The following UL requirements must be met during installation of the MX2800 DC version:

1. The unit must be connected to a reliably grounded -48 VDC source which is electrically isolated from the AC source.
2. The branch circuit overcurrent protection should be a fuse or circuit breaker rated -48 V, 15 A.
3. The unit should be installed in accordance with the requirements of NEC NFPA 70.
4. A readily-accessible disconnect device that is suitably approved and rated should be incorporated in the fixed wiring.

Use copper conductors only.

RACKMOUNT INSTALLATION

The MX2800 can be mounted into a standard 19- or 23-inch equipment rack. (See *Establishing Terminal Connection* on page 2-10 for information on terminal configuration.) Follow these steps to mount your unit into a rack:

1. Prepare the MX2800 mounting ears by scraping the paint away from the mounting ears' portion that makes contact with the rack and the portion where the screw mounts into the side of the MX2800.

To ensure proper grounding in 23-inch rack configurations, prepare the MX2800's mounting ears for installation by scraping away the paint.Scraping away the paint exposes the bare metal, allowing the MX2800 to make proper contact with the rack.

2. Install the mounting flanges on each side of the MX2800 at one of the three available positions.

CAUTION

Be sure to install the flanges with the screws provided.

3. After the flanges have been installed, position the MX2800 at the correct location within the rack and secure the mounting flanges to the mounting rails of the rack.
4. Make all network, DTE, 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.
5. Using the 8-position modular to DB-9 female connector and the 8-position modular to 8-position modular cable, connect a VT 100 terminal device to the **CRAFT** port on the front panel of the unit.

NOTE

Two MX2800s 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 MX2800 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 MX2800 via the **IN** and **OUT** Champ connectors 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 MX2800. Connect the breakout panel's **IN** Champ connector to the MX2800's **IN** Champ connector and the breakout panel's **OUT** Champ connector to the MX2800's **OUT** Champ connector (see Figure 2-2).

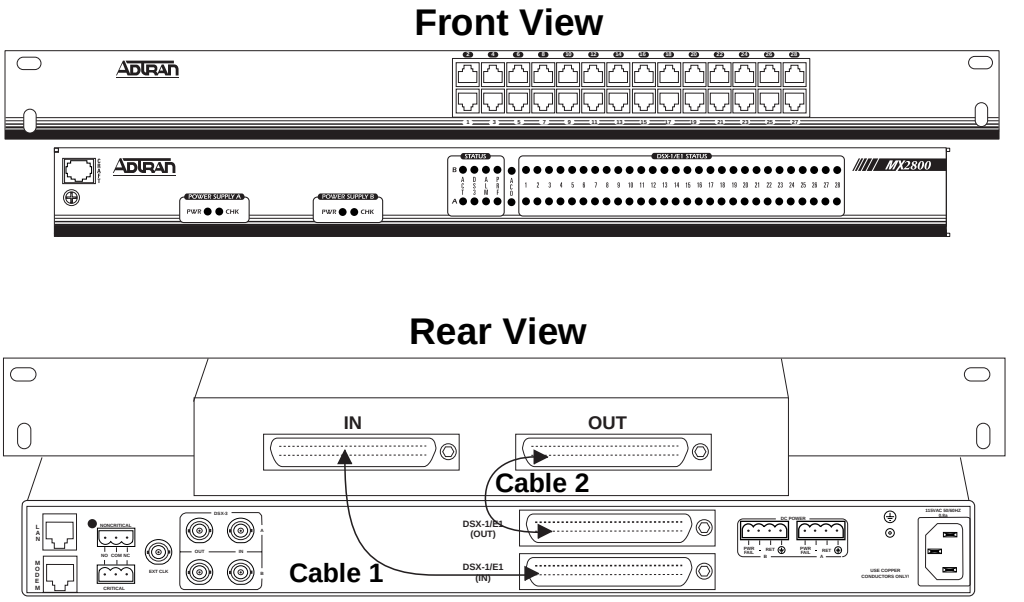
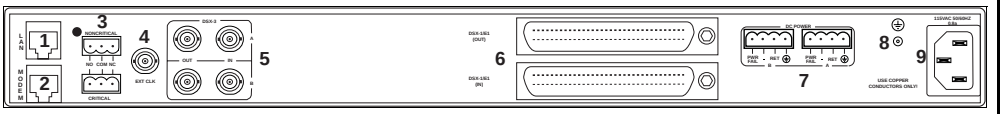


Figure 2-2. The Breakout Panel

> **CAUTION**
>
> *To properly ground the breakout panel, expose the contact points' bare metal prior to installation. Do this by scraping the paint from the portion of the panel's mounting ears that makes contact to the rack.*

REAR PANEL

The MX2800 rear panel is equipped with a LAN port, a modem port, two alarm output terminal blocks, an external clock interface, two sets of DS3 in / out jacks, two Amphenol (Amp) connectors, and DC / AC power connections. 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 A-1.



#	Item	Function
1	LAN	10BaseT LAN connection *Note: The LED to the right of this connector illuminates when the unit is connected to an active ethernet segment.*
2	Modem	Telephone line connection for internal V.34 modem (see note on page 2-8)
3	Noncritical/Critical	Connections for external audible/visible alarms
4	Ext Clk	Connection for a 44.736 MHz, 20 ppm, 1 Vpp sinusoid to externally time the DS3 interfaces
5	DSX-3	T3 service connections for controller cards A and B
6	DSX-1/E1	64-pin Amp connectors for T1/E1s
7	Power	DC power connection
8	⏚	Ground stud
9	115 VAC 50/60Hz	AC power connection

Figure 2-3. MX2800 Rear View

LAN Port

The **LAN** 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 LAN port to intra-building wiring only.*

Modem Port

The **MODEM** port is an 8-pin modular jack that provides a telephone line (POTS) connection for the internal V.34 modem.

The MX2800 can be configured as a dial-in host and also as a dial-out-on-Trap device (meaning that the unit dials out to a specified host to report error conditions). Configure the modem parameters in the **DIALUP OPTIONS** menu under the **SYSTEM MANAGEMENT** portion of the **CONFIGURATION** menu (**CONFIGURATION** -> **SYSTEM MANAGEMENT** -> **DIALUP OPTIONS**). See *Dialup Options* on page 3-13.

Information regarding the built-in modem applies to the following list of numbers: 4200290L1, L2, L3, and L4.

Noncritical and Critical Alarm Connectors

The alarm connectors connect to the three contacts of a Form C type relay on the main board of the MX2800. This relay is activated any time the MX2800 detects an alarm condition on the T3 network interface. Both **NC** (normally closed) and **NO** (normally open) contacts are provided.

Connect alarms first to one of the three-position modular terminal lug connectors (provided). These connectors make it easier to perform initial wiring and to connect and disconnect alarms when replacing rackmount units. Once a modular connector is wired, push it firmly into the rear panel **NONCRITICAL** or **CRITICAL** connector.

The alarm functions can be enabled or disabled through the **ALARM RELAYS** section of the **CONFIGURATION** menu (see the section *Alarm Relays* on page 3-16).

DSX-3 Interfaces

The DSX-3 network interfaces are full-duplex circuits provided by four BNC coaxial cable connections (two for each controller card).

The receive data from the network is connected to the RX (**IN**) connectors, while the transmit data from the MX2800 is connected to the TX (**OUT**) connectors.

> NOTE *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.

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

Power Connection

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

FRONT PANEL

The MX2800 faceplate is shown in Figure 2-4. Descriptions of each part of the front panel follow.

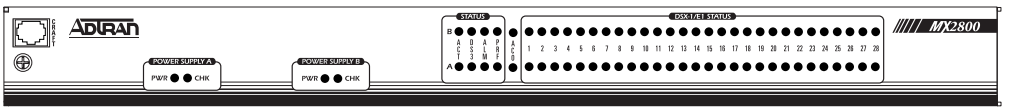


Figure 2-4. MX2800 Front Panel

Craft Port

The **Craft** port, an 8-pin modular jack, provides connection to a VT 100 EIA-232 compatible interface (using the supplied 8-pin modular to DB-9 female connector and the 8-pin to 8-pin modular cable).

Establishing Terminal Connection

To connect the MX2800 to a VT 100 terminal, follow this procedure:

1. Configure the VT 100 terminal for 9600, 19200, 38400, or 57600 baud, 8-bit characters, no parity, and one stop bit (*xxxx*, 8N1).
2. Using the ADTRAN-provided terminal interface cable adapter, connect the DTE port of a terminal to the 8-pin modular jack labeled **CRAFT** on the MX2800 front panel.
3. Initialize the terminal session.
4. Press **Enter** repeatedly until the password prompt appears.
5. Enter the password. The factory default password is **adtran** (all lower-case). The **MAIN** menu appears. See Figure 2-5 on page 2-11.
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.

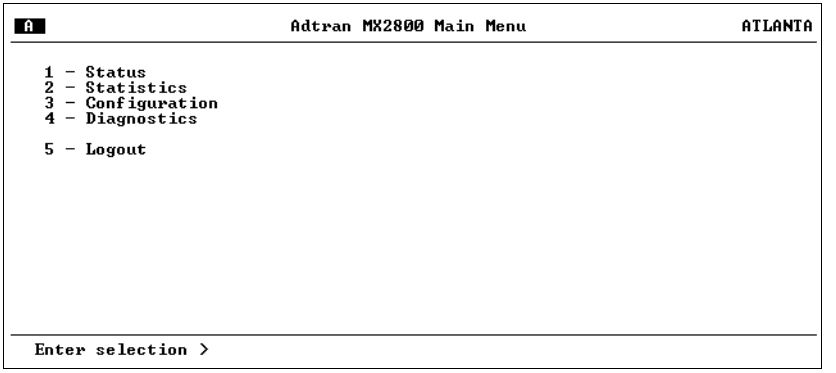


Figure 2-5. Terminal Main Menu

NOTE

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 MX2800 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 MX2800 **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, and T1/E1 lines. See the chapter *Statistics* on page 5-1 for more detailed information.

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

Diagnostics
Performs loopback tests over the DS3, DS2s, or T1/E1 lines. See the chapter *Diagnostics* 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 Timeout* on page 3-24.

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 MX2800 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 (its color and whether it blinks, alternates color, or is on solid). 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 (Table 2-2) and standby (Table 2-3) cards.

Table 2-2. 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

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

	LED State	Card Condition
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	Non-Critical Alarm
	amber blinking	Critical Alarm Suppressed (**ACO** button was pushed)
	amber solid	Non-Critical Alarm Suppressed (**ACO** button was pushed)
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 2-3. 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 T-1 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 2-4 provides LED definitions for the active and standby cards.

Table 2-4. 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/green alternating	XCV Threshold Exceeded (see *XCV Threshold* on page 3-12)
	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

Chapter 3 Configuration

To configure the MX2800, use a 10BaseT ethernet connection, a SLIP / PPP modem port, or a VT 100 terminal. Figure 3-1 shows the main configuration terminal menu, and Figure 3-2 shows the **CONFIGURATION** menu tree.

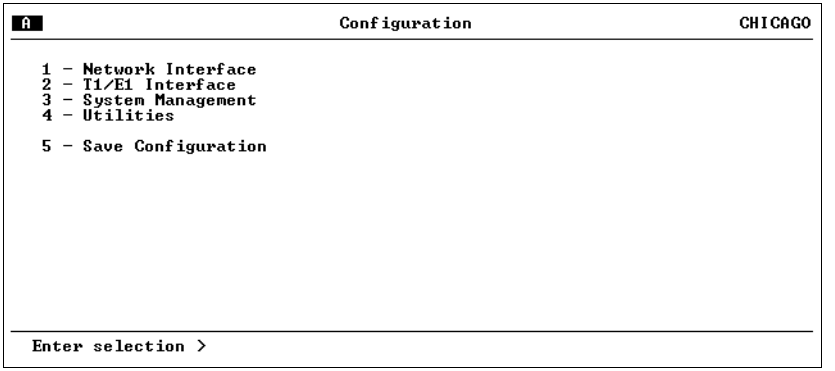


Figure 3-1. Configuration Main Menu

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 3-28), and **SAVE CONFIGURATION** (page 3-30).

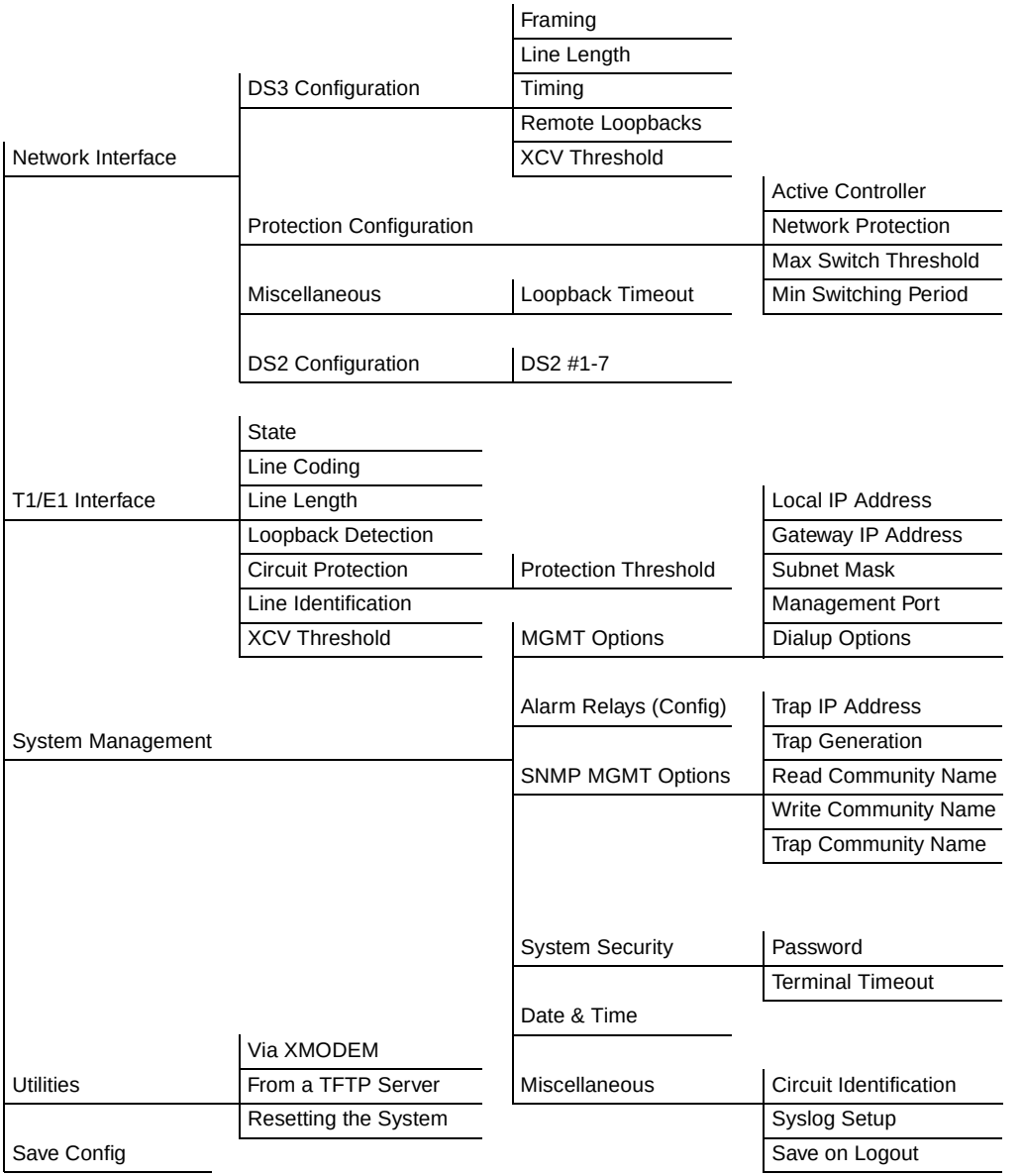


Figure 3-2. Configuration Menu Tree

NETWORK INTERFACE

Select **NETWORK INTERFACE** to access the network configuration parameters (see Figure 3-3). Configure the MX2800 network settings to match the DS3 signal received from the service provider.

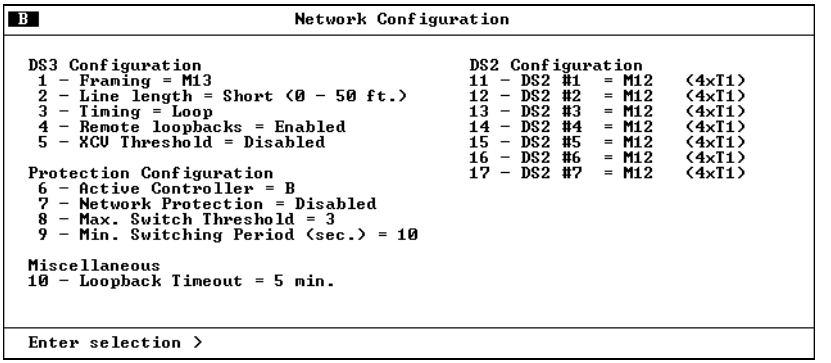


Figure 3-3. Network Configuration Menu

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 MX2800 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 50 feet; set to **SHORT** if the distance is less than 50 feet.

Timing

In most cases, configure the MX2800 for **LOOP** timing to derive timing from the network. However, set to **LOCAL** if the MX2800 is the master timing source for the circuit, or set to **EXTERNAL 44.736 MHZ** if timing is derived from an external device that is connected to the **EXT CLK** port.

Remote Loopbacks

Enabling this option allows the MX2800 to respond to remote loopback requests received over the DS3 Far End Alarm and Control (FEAC) channel when operating in C-bit parity mode. When disabled, all loopback requests are ignored.

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 MX2800 houses two controller cards for 1:1 protection against hardware failure. The two cards can also provide network protection, supporting two T3 circuits simultaneously. 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.

Network Protection

Enable or disable the unit's ability to automatically route information to the backup T3 in the event of a primary T3 failure. With **NETWORK PROTECTION** set to **ENABLED**, all information is automatically routed to the backup T3 in the event that the primary T3 fails. When **NETWORK PROTECTION** is set to **DISABLED**, the stand-by controller will be used to protect against failures of the circuitry on the active controller.

When choosing a setting for **NETWORK PROTECTION**, *there are many cabling and network provisioning issues to consider. Refer to the chapter Circuit and Network Redundancy on page 7-1 for configuration examples of the different modes of protection.*

Max. Switch Threshold

The value entered in this field determines how many times each 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 3-19) and stops switching cards for the next 24 hours. The default setting is **3** times an hour.

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 MX2800 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) 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.

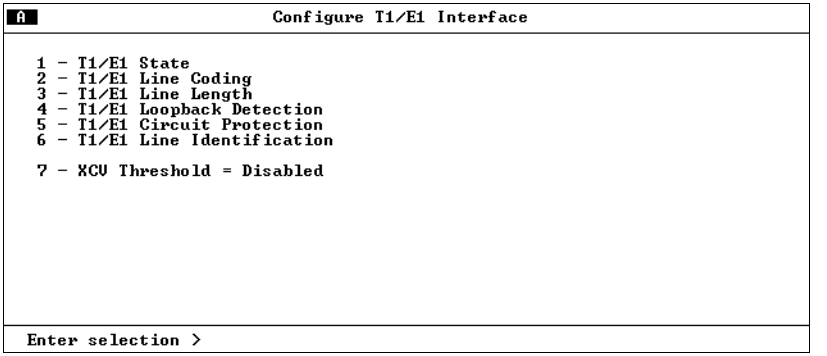


Figure 3-4. T1/E1 Interface Menu

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***).*

T1/E1State

Set unused T1/E1 lines to **DISABLED**. Set used lines to **ENABLED** (see Figure 3-5).

```
B                                  T1/E1 State

  1 - T1  #1 = Enabled                15 - T1 #15 = Enabled
  2 - T1  #2 = Enabled                16 - T1 #16 = Enabled
  3 - T1  #3 = Enabled                17 - T1 #17 = Enabled
  4 - T1  #4 = Enabled                18 - T1 #18 = Enabled
  5 - T1  #5 = Enabled                19 - T1 #19 = Enabled
  6 - T1  #6 = Enabled                20 - T1 #20 = Enabled
  7 - T1  #7 = Enabled                21 - T1 #21 = Enabled
  8 - T1  #8 = Enabled                22 - T1 #22 = Enabled
  9 - T1  #9 = Enabled                23 - T1 #23 = Enabled
 10 - T1 #10 = Enabled                24 - T1 #24 = Enabled
 11 - T1 #11 = Enabled                25 - T1 #25 = Enabled
 12 - T1 #12 = Enabled                26 - T1 #26 = Enabled
 13 - T1 #13 = Enabled                27 - T1 #27 = Enabled
 14 - T1 #14 = Enabled                28 - T1 #28 = Enabled

 29 - Set Multiple

 Enter selection >
```

Figure 3-5. T1/E1 State Menu

Set Multiple

Use **SET MULTIPLE** (see Figure 3-6) to enable or disable any 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 when you finish each setting.

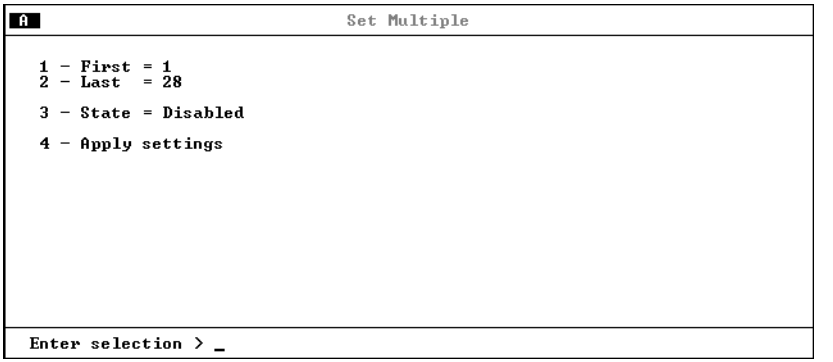


Figure 3-6. Set Multiple Menu

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 any 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** selection, entering the line code for each line.

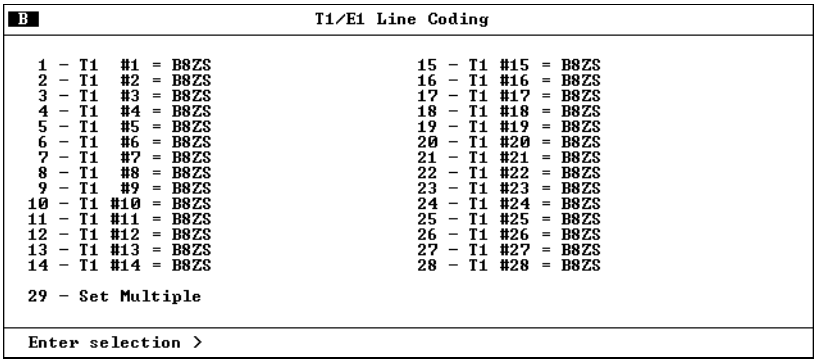


Figure 3-7. T1/E1 Line Coding Menu

T1/E1 Line Length

Set the line length for each T1 interface according to the distance from the MX2800 to your DTE device (see Figure 3-8). Set to **-7.5 dB** if the attached DTE device only supports DS1 levels. The E1 **LINE LENGTH** is not selectable and remains at **0-3000 FT**. Select **SET MULTIPLE** to configure the line length for any 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** selection, entering the line length for each line.

```
B                          T1/E1 Line Length

 1 - T1  #1 = 0-133 ft.          15 - T1 #15 = 0-133 ft.
 2 - T1  #2 = 0-133 ft.          16 - T1 #16 = 0-133 ft.
 3 - T1  #3 = 0-133 ft.          17 - T1 #17 = 0-133 ft.
 4 - T1  #4 = 0-133 ft.          18 - T1 #18 = 0-133 ft.
 5 - T1  #5 = 0-133 ft.          19 - T1 #19 = 0-133 ft.
 6 - T1  #6 = 0-133 ft.          20 - T1 #20 = 0-133 ft.
 7 - T1  #7 = 0-133 ft.          21 - T1 #21 = 0-133 ft.
 8 - T1  #8 = 0-133 ft.          22 - T1 #22 = 0-133 ft.
 9 - T1  #9 = 0-133 ft.          23 - T1 #23 = 0-133 ft.
10 - T1 #10 = 0-133 ft.          24 - T1 #24 = 0-133 ft.
11 - T1 #11 = 0-133 ft.          25 - T1 #25 = 0-133 ft.
12 - T1 #12 = 0-133 ft.          26 - T1 #26 = 0-133 ft.
13 - T1 #13 = 0-133 ft.          27 - T1 #27 = 0-133 ft.
14 - T1 #14 = 0-133 ft.          28 - T1 #28 = 0-133 ft.

29 - Set Multiple

Enter selection > _
```

Figure 3-8. T1/E1 Line Length Menu

T1/E1 Loopback Detection

Choose which T1/E1 lines will respond to CSU loopback requests coming from the network (see Figure 3-9). Set to **ENABLE** if you want the T1/E1 to respond to the request. Set to **DISABLE** if you want the T1/E1 to ignore the request. Select **SET MULTIPLE** to set any 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 either **DISABLED**, **CSU**, or **NIU**.

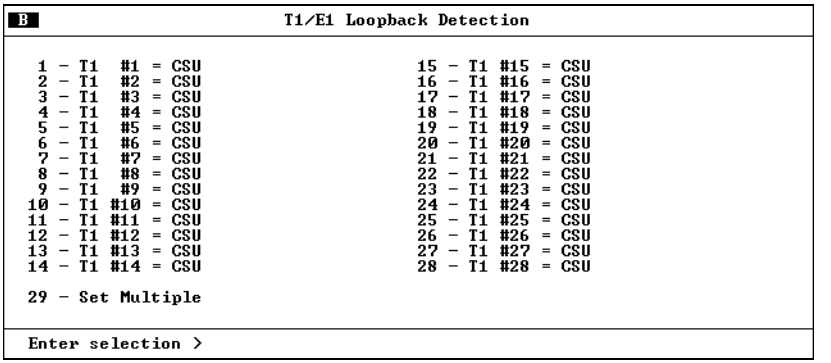


Figure 3-9. Loopback Detection Menu

T1/E1 Circuit Protection

Choose which T1/E1 lines to protect (see Figure 3-10). If a T1/E1 is set to **DISABLED**, then the failure of that one line will not cause the controller cards to switch. If set to **ENABLED**, then the line's failure *could* cause the cards to switch (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 any 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**.

```
B                          T1/E1 Circuit Protection

  1 - T1  #1 = Enabled                 15 - T1 #15 = Enabled
  2 - T1  #2 = Enabled                 16 - T1 #16 = Enabled
  3 - T1  #3 = Enabled                 17 - T1 #17 = Enabled
  4 - T1  #4 = Enabled                 18 - T1 #18 = Enabled
  5 - T1  #5 = Enabled                 19 - T1 #19 = Enabled
  6 - T1  #6 = Enabled                 20 - T1 #20 = Enabled
  7 - T1  #7 = Enabled                 21 - T1 #21 = Enabled
  8 - T1  #8 = Enabled                 22 - T1 #22 = Enabled
  9 - T1  #9 = Enabled                 23 - T1 #23 = Enabled
 10 - T1 #10 = Enabled                 24 - T1 #24 = Enabled
 11 - T1 #11 = Enabled                 25 - T1 #25 = Enabled
 12 - T1 #12 = Enabled                 26 - T1 #26 = Enabled
 13 - T1 #13 = Enabled                 27 - T1 #27 = Enabled
 14 - T1 #14 = Enabled                 28 - T1 #28 = Enabled

 29 - Set Multiple                     30 - Protection Threshold (1-28) = 1

 Enter selection > _
```

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). You can enter up to 18 alpha-numeric characters in this field, including spaces and special characters (such as an underbar).

```
A                          T1/E1 Line Identification                  ATLANTA

  1 - E1  #1 = BOSTON                  15 - T1 #15 =
  2 - E1  #2 = ATLANTA 1               16 - T1 #16 =
  3 - E1  #3 = CHICAGO                 17 - T1 #17 =
      ---- #4 N/A ----                 18 - T1 #18 =
  5 - T1  #5 = SAN JOSE                19 - T1 #19 =
  6 - T1  #6 = NEW YORK                20 - T1 #20 =
  7 - T1  #7 = WASHINGTON              21 - T1 #21 =
  8 - T1  #8 = DENVER                  22 - T1 #22 =
  9 - T1  #9 = KANSAS CITY             23 - T1 #23 =
 10 - T1 #10 = NASHVILLE               24 - T1 #24 =
 11 - T1 #11 = HUNTSVILLE              25 - T1 #25 =
 12 - T1 #12 = DALLAS                  26 - T1 #26 =
 13 - T1 #13 = RICHMOND                27 - T1 #27 =
 14 - T1 #14 = ATLANTA 2               28 - T1 #28 =


 Enter new value > BOSTON 2_
```

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 MX2800 for management through SNMP, Telnet, or a VT 100 interface (see Figure 3-12). Embedded SNMP and Telnet are available via a SLIP/PPP modem port or 10BaseT ethernet interface. This menu also includes options used to customize your unit's alarm and trap generation, security setup, and equipment identification.

```
B                    System Management Configuration

Management Options                        System Security
 1 - Local IP Address    = 192.168.1.1    12 - Password = ******
 2 - Gateway IP Address  = 0.0.0.0        13 - Terminal timeout = 1 day
 3 - Subnet Mask         = 255.255.255.0  14 - IP Security = Disabled
 4 - Management Port     = LAN            15 - IP Hosts
 5 - Dialup options
                                          Date & Time
Alarm Relays                              16 - Date = 04/16/00
 6 - Alarm Relay Configuration            17 - Time = 03:48:52

SNMP Management Options                   Miscellaneous
 7 - TRAP IP Addresses                    18 - Circuit Identification
 8 - TRAP Generation                      19 - Syslog Setup
 9 - READ  Community Name = public        20 - Save on Logout = Enabled
10 - WRITE Community Name = private
11 - TRAP  Community Name = trap

Enter selection >
```

Figure 3-12. System Management Configuration Menu

Management Options

Local IP Address

Enter the MX2800 IP address. This IP address applies to the LAN or modem port (when configured for PPP or SLIP). This address is available from the network administrator.

Gateway IP Address

Enter the gateway IP address of the MX2800. This address is necessary only if the MX2800 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 MX2800. This address is available from the network administrator.

Management Port

Assign the management port as either **LAN** or **MODEM**. The **MODEM** setting applies only to units equipped with an internal modem.

Dialup Options

Configure the dialup capabilities of the (see Figure 3-13). These options apply only to units equipped with an internal modem.

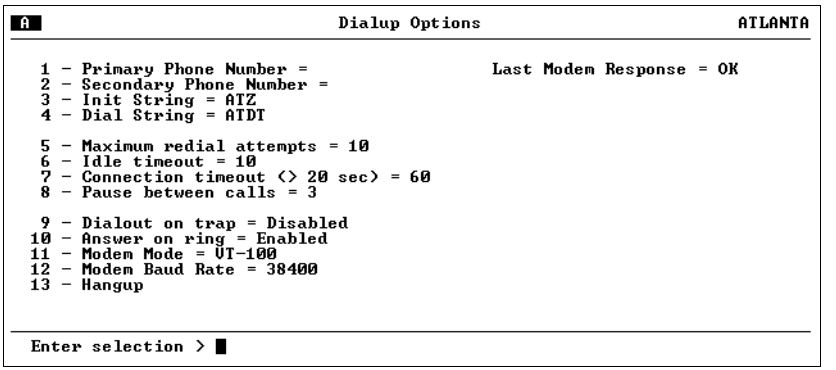


Figure 3-13. Dialup Options Menu

Primary and Secondary Phone Numbers

When the MX2800 dials out to send a trap, it first dials the **PRIMARY PHONE NUMBER**. If the call is unsuccessful, it tries the **SECONDARY PHONE NUMBER**. Attempts between the two numbers continue until a call is established and the trap is reported (or until each number's maximum for redial attempts is reached; see the following section, *Maximum Redial Attempts*).

Initializing String

The AT command entered in this field is used to initialize the modem. Normally, this field should be left at the default setting (ATZ).

Dial String

The AT command entered in this field causes the modem to dial out. Normally, this field should be left at the default setting (ATDT).

Maximum Redial Attempts

The MX2800 attempts to establish a call the number of times entered in this field. If a successful call is not established after the final attempt, the MX2800 discards the trap messages.

Idle Timeout

After establishing a call and sending trap messages, the MX2800 remains online for the amount of seconds entered in this field. If the field is set to 0, the unit hangs up as soon as the trap is sent.

Connection Timeout

The MX2800 waits for a connection the amount of seconds entered in this field. Timing begins as soon as the dial command is issued. This field must be set for greater than 20 seconds.

Pause Between Calls

The MX2800 waits between redial attempts the number of seconds entered in this field.

Dialout On Trap

Enable or disable the MX2800's ability to dial out to report traps. **MODEM MODE** configured for **VT 100** reports error conditions in plain ASCII with the following information:

- The Unit ID value programmed in the **CIRCUIT IDENTIFICATION** portion of the **SYSTEM MANAGEMENT** screen (see *System Management* on page 3-12)
- A trap code indicating the error condition
- The **TRAP COMMUNITY NAME** (see *Trap Community Name* on page 3-24)
- The date and time when the error was logged

When **MODEM MODE** is configured for **PPP** or **SLIP**, the MX2800 logs into the PPP / SLIP host and reports the error conditions to the hosts designated under **TRAP IP ADDRESSES** (see *Trap IP Addresses* on page 3-19).

Answer on Ring

Enable or disable the MX2800's ability to accept incoming calls. If enabled, incoming calls are automatically answered by the MX2800, allowing you to remotely perform management functions.

Modem Mode

Select the **Modem** port function for your application (**VT 100**, **PPP**, or **SLIP**). The **Modem** port, located on the rear panel of the MX2800, provides a telephone line (POTS) for connection to the internal V.34 modem. This setting applies only if the **MANAGEMENT PORT** (see *Management Port* on page 3-13) is set to **MODEM**.

Modem Baud Rate

Set the maximum operating speed of the **Modem** port (1200, 2400, 4800, 9600, 19200, and 38400 bps).

Hangup

Selecting this option forces the MX2800 to end an established call.

Last Modem Response

This status field displays the last modem response to the MX2800. Possible responses include **OK**, **CONNECT**, **BUSY**, **ERROR**, **NO DIALTONE**, and **NO CARRIER**.

Alarm Relays

Alarm Relay Configuration

Enables audible and visible alarms for specific error conditions (see Figure 3-14). 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.

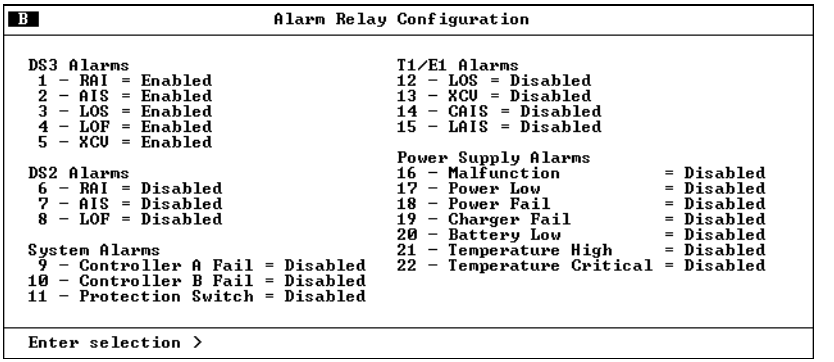


Figure 3-14. Alarm Relay Configuration Menu

DS3 Alarms

Alarm	Description
RAI*	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.
AIS*	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.
LOS*	The unit has lost the network Rx signal.

LOF*	The unit detects a framing loss from the network.
XCV	The controller card is receiving excessive code violations, exceeding the threshold set by the user (see *XCV Threshold* on page 3-4).
*Sounds critical alarm.	

DS2 Alarms

Alarm	Description
RAI	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-bits (X1 and X2) are set to zero.
AIS	The unit is receiving unframed all ones across a DS2.
LOF	The unit detects a framing loss from the network across a DS2.

System Alarms

Alarm	Description
Controller A Fail*	Controller Card A has failed. *Note: This is a critical alarm only when Card B is not installed or is not working.*
Controller B Fail*	Controller Card B has failed. *Note: This is a critical alarm only when Card A is not installed or is not working.*
Protection Switch*	All data has been routed from the primary card to the stand-by card.
*Sounds critical alarm.	

T1/E1 Alarms

Alarm	Description
LOS	The unit has lost the receive signal on a T1/E1.
XCV	The controller card is receiving excessive code violations, exceeding the threshold set by the user (see *XCV Threshold* on page 3-12).
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.

Power Supply Alarms

Alarm	Description
Malfunction	Power supply card is no longer working. The unit has switched to the backup power supply or battery backup.
Power Low	Power supply's output level is abnormally low.
Power Fail	Power supply card's input power is lost.
Charger Fail	Battery backup charger has failed or has lost its AC connection.
Battery Low	Battery backup has reached a critical energy point at which it may be unable to supply the unit with sufficient power to maintain operation.
Temperature High	Power supply card temperature is above normal.
Temperature Critical	Power supply card temperature is so high that it will soon shut off completely.

SNMP Management Options

Trap IP Addresses

Enter up to five IP addresses of SNMP managers to which the MX2800 sends traps.

Trap Generation

Use this menu (see Figure 3-15) to designate which error conditions will cause the unit to send trap messages.

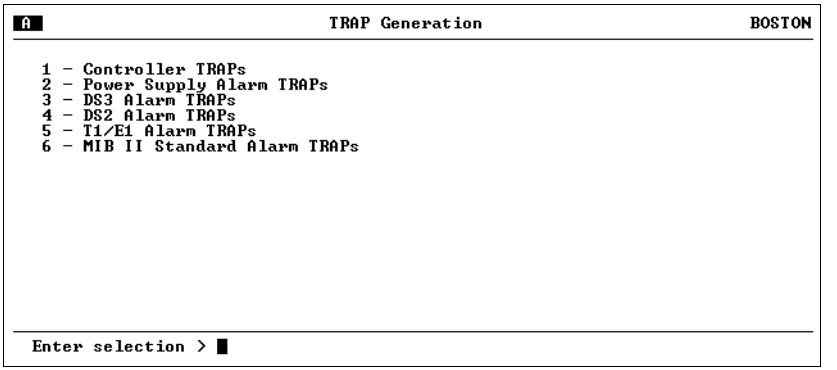


Figure 3-15. Trap Generation Menu

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.
Charger Fail	the battery backup charger has failed or has lost its AC connection.
Battery Low	the battery backup has reached a critical energy point at which it may be unable to supply the unit with sufficient power to maintain operation.
Temperature High	the power supply card is getting too hot.
Temperature Critical	the power supply card temperature is so high that it will soon shut off completely.

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. Service is immediately available for use.
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 3-4).
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.
RAI	the remote unit's active 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 remote unit's active controller card detects an idle sequence from the network. Service is immediately available for use.
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-bits (X1 and X2) are 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 3-12).
T1/E1 Failure	a T1/E1 has failed.
In/Out Test	a T1/E1 is going in and 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 MX2800 to the SNMP manager for read privileges.

Write Community Name

Enter the authentication strings used for SNMP management. Match the MX2800 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 MX2800.

System Security

Password

Set the password required at login (up to 32 characters). The default password is **adtran** (all lower case).

Terminal Timeout

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 section).

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

Equipment Identification

These fields allow you to store information that identifies the unit. Information provided for the far-end is read-only. Local information is read / write from this menu.

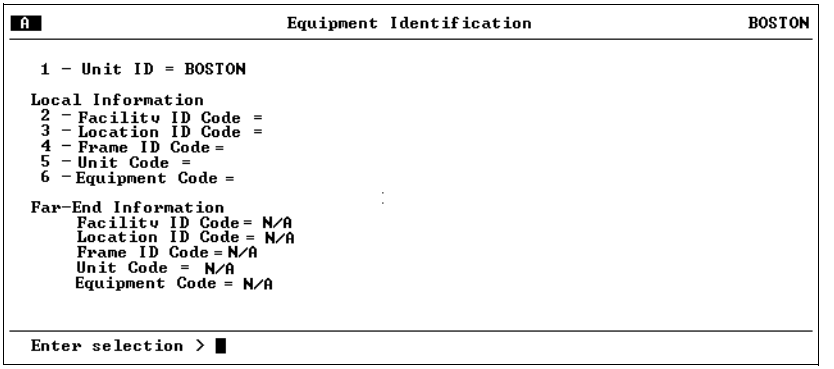


Figure 3-16. Equipment Identification Menu

Unit ID

Provides a user-configurable text string for the name of the MX2800. 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 MX2800 terminal screens (see Figure 3-16).

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

These fields provide user-configurable text strings to identify the MX2800 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 3-1 on page 3-27, in order of decreasing severity. Any message at or above a selected severity level will be logged if a transmission is enabled.

Table 3-1. 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.

Save on Logout

Enable this function to save the configuration when you log out. Disable if you do not want to save the configuration.

UTILITIES

The **UTILITIES** menu (see Figure 3-17) allows you to view MX2800 system information (including self-test results) for both controller cards, revert to default configuration settings, flash-load a new version of software, and reset the system. Possible results for the self-test are listed in the chart following Figure 3-17.

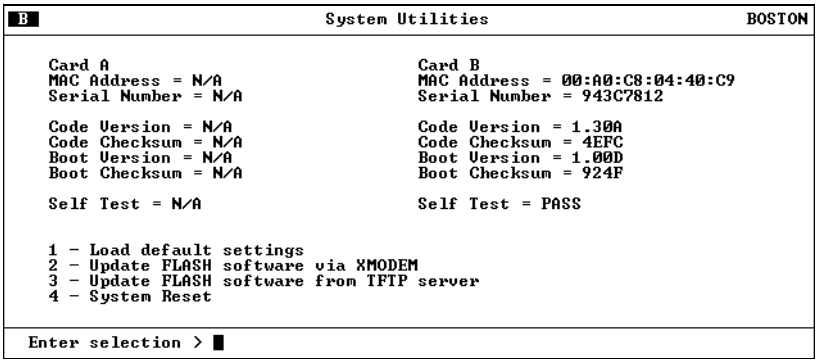


Figure 3-17. System Utilities Menu

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 MODEM FAILURE ETHERNET FAILURE	contact ADTRAN Technical Support. See the inside back cover of this manual for more information.
CONFIGURATION CORRUPT	select **SAVE CONFIGURATION** from the main **CONFIGURATION** menu. If condition persists, contact ADTRAN Technical Support.

Updating Software

Via XMODEM

Select **UPDATE FLASH SOFTWARE VIA XMODEM** from the **UTILITIES** menu. A new menu displays, prompting you to start the transfer. Once you select **START** from this menu, start the XMODEM transfer from your terminal menu program (the XMODEM utility is available under most terminal programs). If you wish to cancel a transfer in progress, press **Ctrl - x** three times.

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

From a TFTP Server

Select **UPDATE FLASH SOFTWARE FROM 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 is entered, select **START/STOP TRANSFER**.

Resetting the System

The system must be manually reset after downloading new software in order for the unit to recognize the change. This helps prevent unintentional service disruption. Select **4-SYSTEM RESET** from the **UTILITIES** menu to reset the unit. From this menu, you can choose to immediately reset the unit, or you can schedule a delayed reset for a time when service will be less affected.

To schedule a delayed reset, select **SCHEDULE RESET TIME**. Enter the number of hours you want to elapse before the reset takes place. Once a value is entered, the **CANCEL SCHEDULED RESET** option appears, along with a reset countdown clock.

SAVE CONFIGURATION

Commits the current configuration changes 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 MX2800 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.

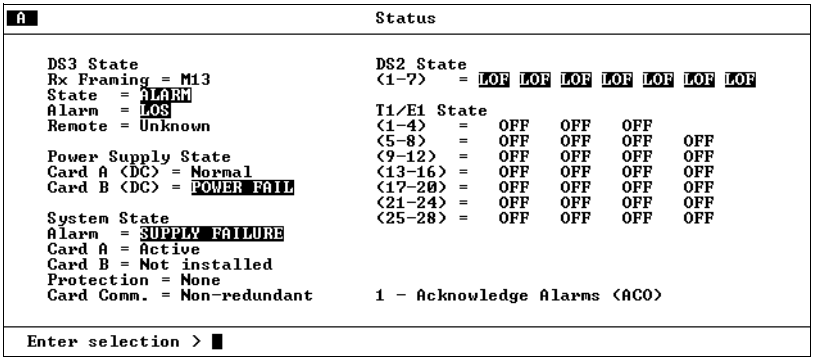


Figure 4-1. Status Menu

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 MX2800 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 *Diagnostics* on page 6-1 for information on the test type.

Alarm

This field displays the current alarm condition of the MX2800. 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.
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).

Condition	Description
TLOS (Tx loss of signal)	The transmitter has failed.
Idle	The unit detects an idle sequence from the network. Service is immediately available for use.

Remote

This field indicates the current state of the remote MX2800. Possible conditions are given in the following table:

Condition	Description
Normal	The far-end MX2800 is ready to pass data.
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. Service is immediately available for use.
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.

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.
Charger Fail	The battery backup charger has failed or has lost its AC connection.
Battery Low	The battery backup has reached a critical energy point at which it may be unable to supply the unit with sufficient power to maintain operation.
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).

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 2-12 and *Acknowledge Alarms (ACO)* on page 4-8 for more information. Possible alarm types are listed in the following table:

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
Network	Both controller cards are installed and everything is healthy. The unit is in full Network Protection Mode.
Circuit	Unit is in Circuit Protection Mode and everything is healthy, *or* unit is in Network Protection Mode and a failure on the network has occurred.
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 and Network 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 table:

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-bits (X1 and X2) are 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 table:

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).
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 therefore 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 2-12).

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).

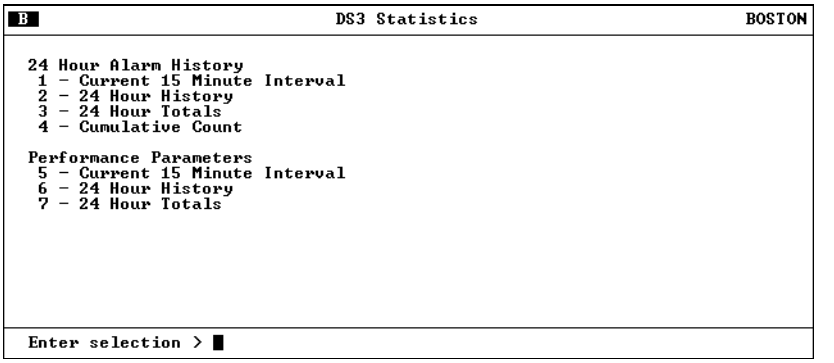


Figure 5-2. DS3 Statistics Menu

24 Hour Alarm History

The MX2800 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 on page 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).

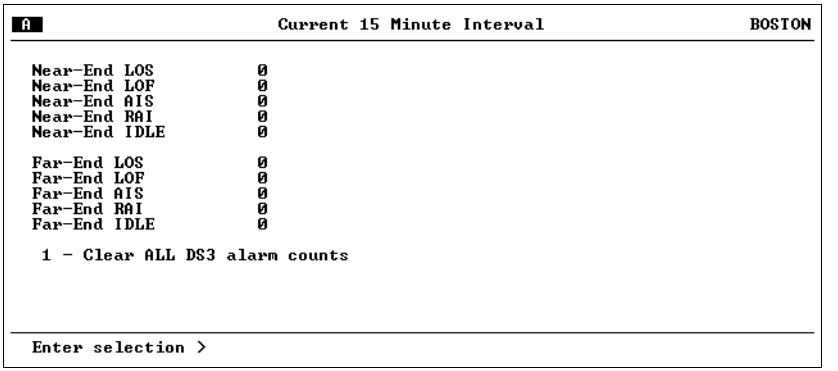


Figure 5-3. DS3 Current Alarm Count Screen

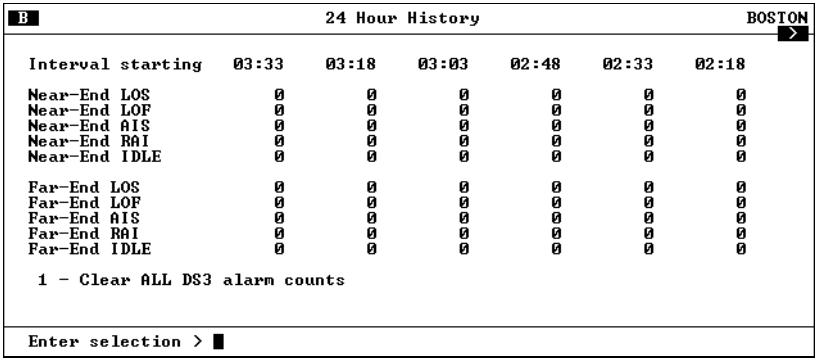


Figure 5-4. DS3 24-Hour Alarm History Screen

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 for examples of the performance parameter screens.

Descriptions of each field of these screens follow:

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).

Unavailable Seconds (UAS)

Time in seconds that the network port is unavailable for data delivery. This means that the T3 link is down or in test, or that the signaling state is down.

Severely Errored Framing Seconds (SEFS)
Number of seconds with one or more out-of-frame defects or a detected incoming AIS.

Line Coding Violations (LCV)
Number of BPVs (bipolar violations) and EXZs (excessive zeros) that have occurred.

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

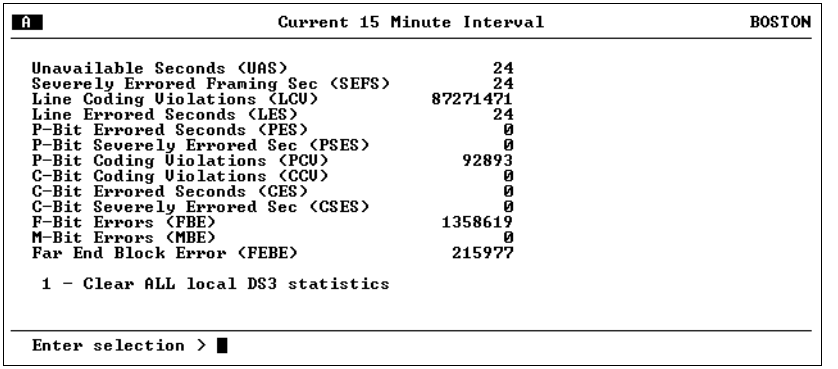


Figure 5-5. DS3 Performance Parameters (Current 15 Minutes)

P-Bit Errored Seconds (PES)
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.

P-Bit Severely Errored Seconds (PSES)
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.

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

C-Bit Coding Violations (CCV)

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.

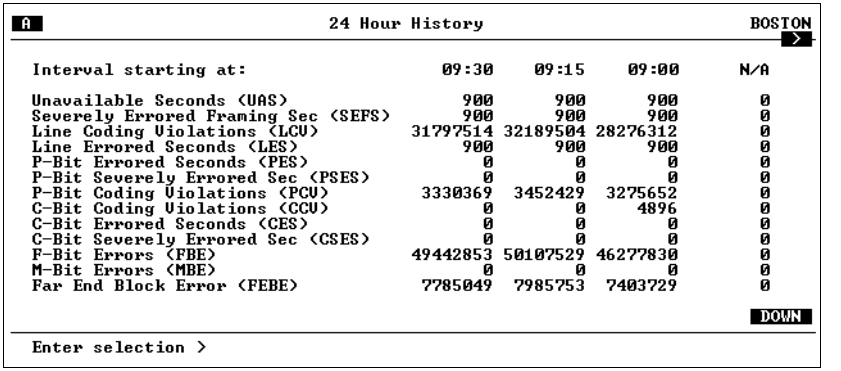


Figure 5-6. DS3 Performance Parameters (24 Hour History)

C-Bit Errored Seconds (CES)

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.

C-Bit Severely Errored Seconds (CSES)

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.

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.

Far End Block Errors (FEBE)

Number of times the far-end unit has received a C-parity or framing error.

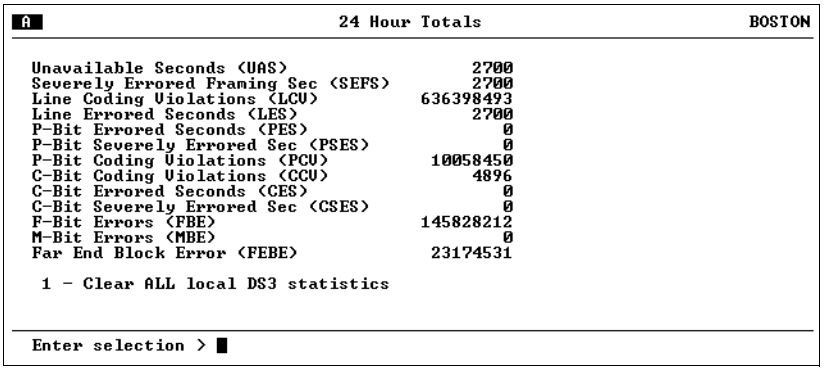


Figure 5-7. DS3 Performance Parameters (Totals)

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 MX2800 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 on page 5-8 and Figure 5-9 on page 5-8.

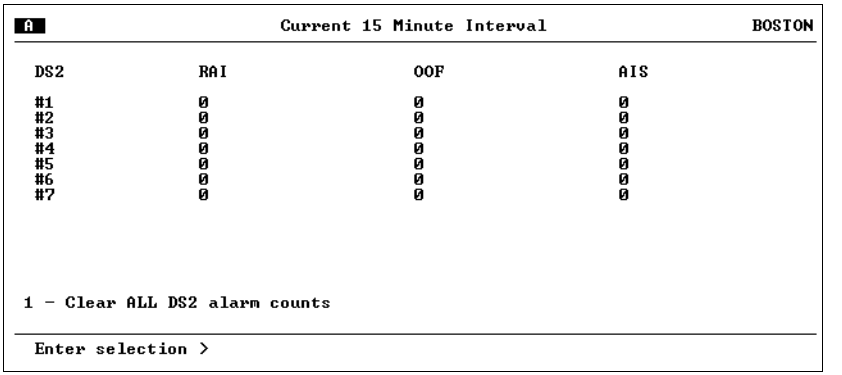


Figure 5-8. DS2 Statistics (Current 15 Minutes)

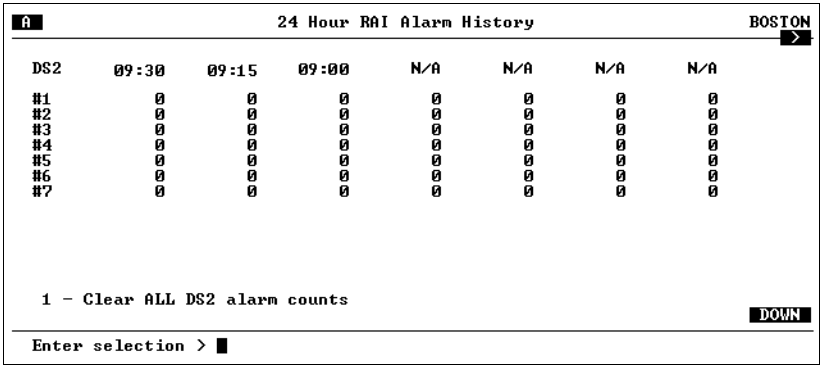


Figure 5-9. DS2 RAI 24-Hour Alarm History

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** and **FBERR** menus. See Figure 5-10 on page 5-9 and Figure 5-11 on page 5-9.

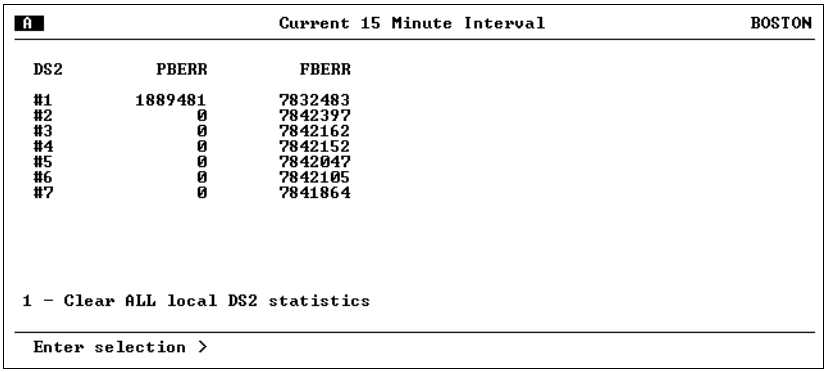


Figure 5-10. DS2 Performance Parameters (Current 15 Minutes)

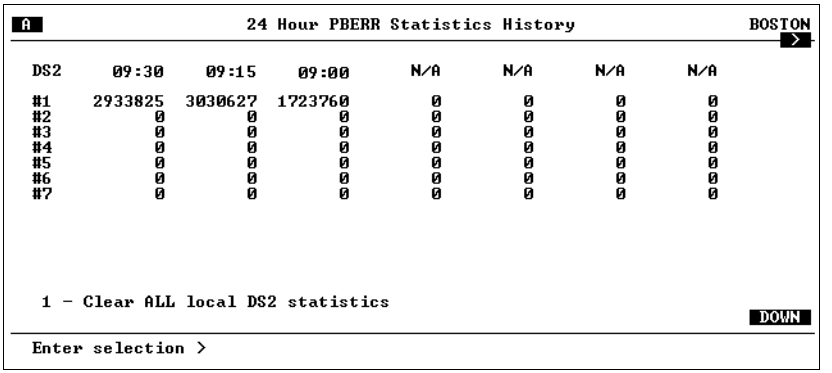


Figure 5-11. DS2 PBERR 24-Hour Alarm History

T1/E1 Statistics

The MX2800 keeps track of **LOSS OF SIGNAL ALARMS**, **BIPOLAR VIOLATION COUNTS**, **AIS LOOP ALARMS**, and **AIS CARRIER ALARMS** 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.

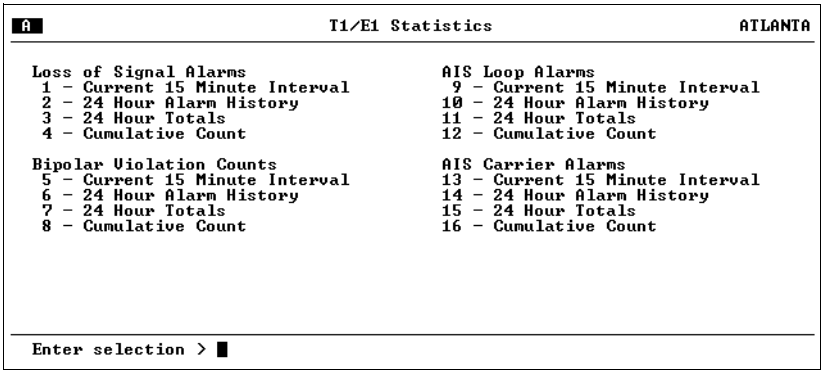


Figure 5-12. T1/E1 Statistics Menu

The cumulative alarm count continues indefinitely until **CLEAR ALL T1/E1 ALARM COUNTS**, located in each field, is selected.

Chapter 6 Diagnostics

The **DIAGNOSTICS** menu allows you to initiate loopback tests from the MX2800. Figure 6-1 shows the main **DIAGNOSTICS** 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:

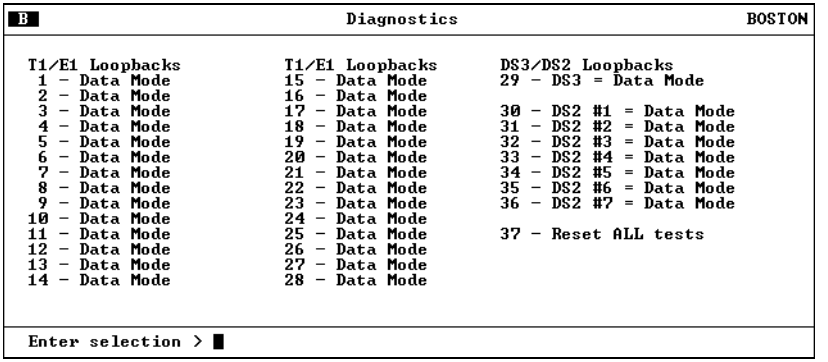


Figure 6-1. Diagnostics Main Menu

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.

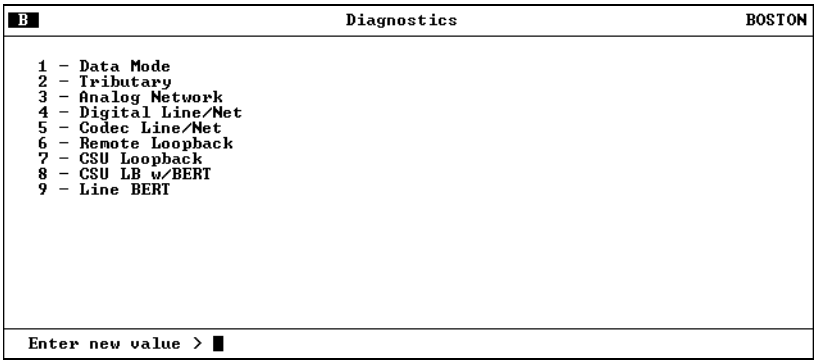


Figure 6-2. T1/E1 Diagnostics Menu

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.

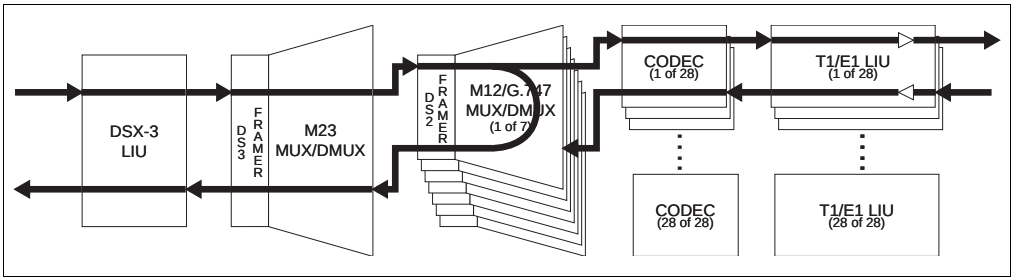


Figure 6-3. Tributary Loopback Test

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.

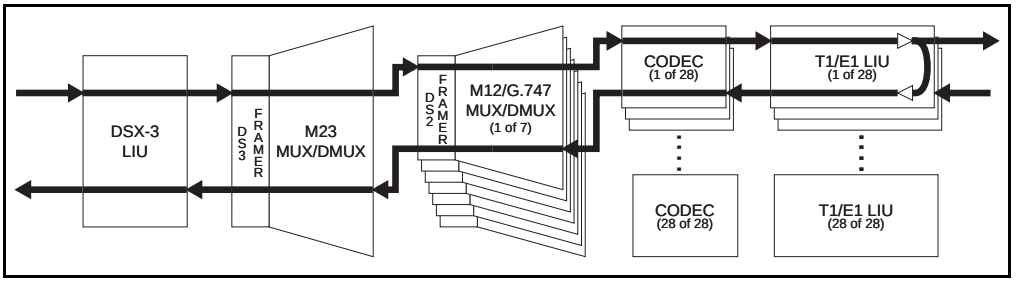


Figure 6-4. Analog Network Loopback

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.

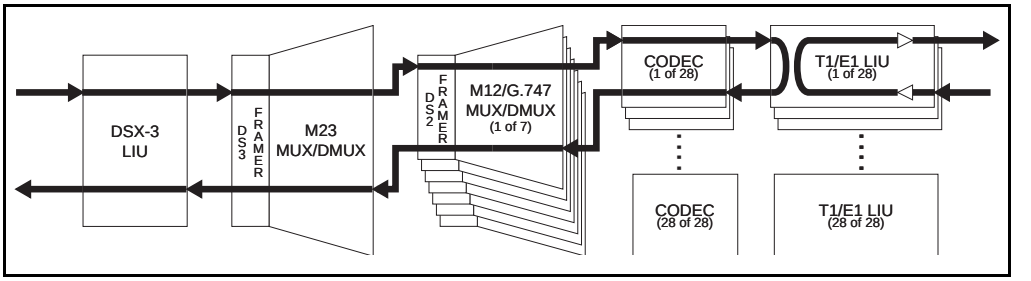


Figure 6-5. Digital Line/Network Loopback

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.

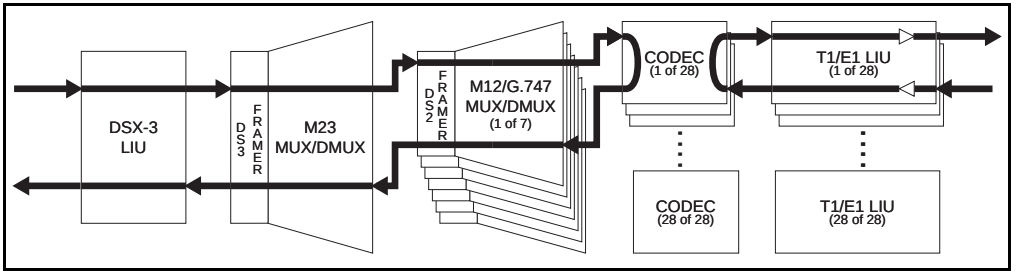


Figure 6-6. Codec Loopback

Remote Loopback

A **REMOTE LOOPBACK** performs a loopback of the selected T1/E1 on the far-end M13 multiplexer. If an MX2800 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 MX2800 to generate a CSU loop-up pattern (001001…) towards 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 towards the network. A loop-down pattern (0000100001….) will be generated towards 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 MX2800 to test the local T1 loop to the CSU using the standard 511 pseudo-random bit sequence. When **CSU LOOPBACK W/BERT** is selected, the MX2800 will initiate a CSU loopback towards 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 MX2800 will cease sending the CSU loop-up pattern and begin sending an unframed 511 pattern towards the CSU. If the CSU device responded to the CSU loop-up pattern, the MX2800 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). 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.*

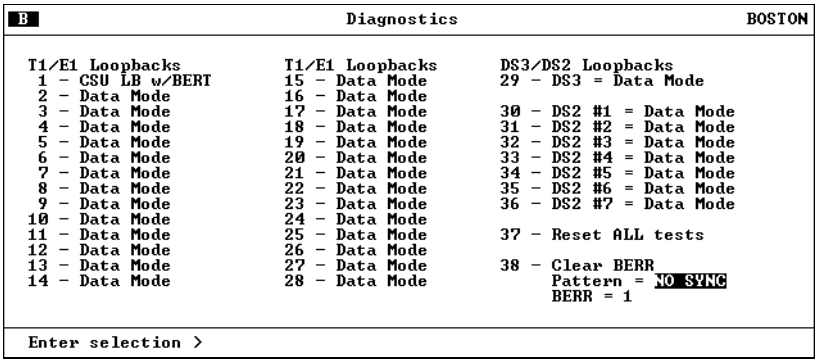


Figure 6-7. Diagnostics Menu with BERT Selected

Line BERT

A Line **BERT** enables the MX2800 to perform a "head-to-head" **BERT** test towards the CSU. Selecting Line **BERT** will replace all incoming network traffic for the selected T1 with an *unframed* 511 pattern towards the CSU. 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.

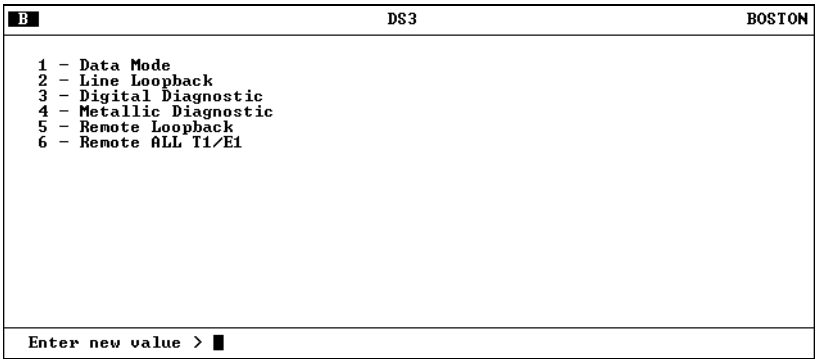


Figure 6-8. DS3 Diagnostics Menu

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 MX2800 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.*

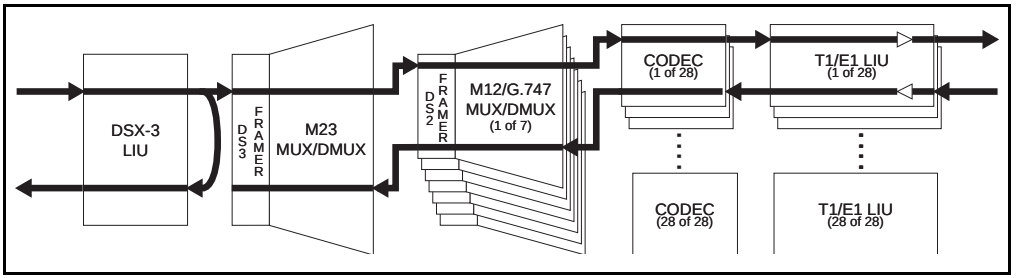


Figure 6-9. Line Loopback Test

Digital Diagnostics

A **DIGITAL DIAGNOSTIC** 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.

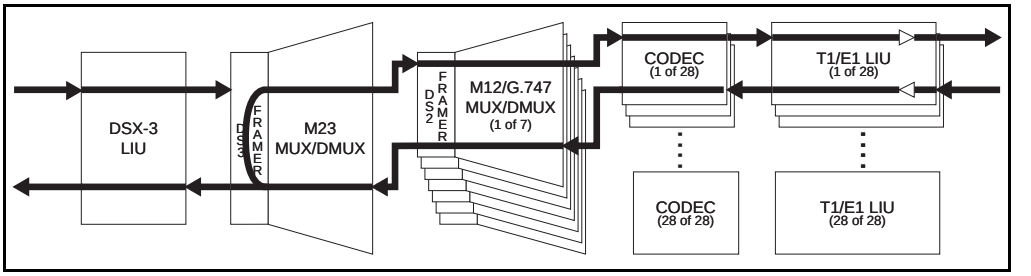


Figure 6-10. Digital Diagnostics Loopback

Metallic Diagnostics

A **METALLIC DIAGNOSTIC** 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.

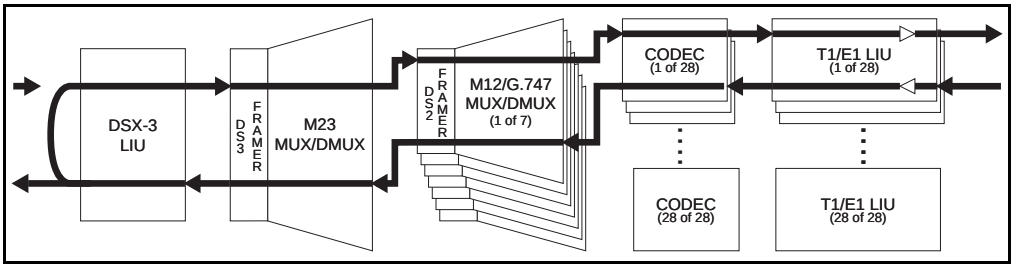


Figure 6-11. Metallic Diagnostics Loopback Test

Remote Loopback

A **REMOTE LOOPBACK** performs a loopback on the far-end M13 multiplexer. If an MX2800 is located at the far end, a **LINE 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 FEAC channel (see ANSI T1.107).

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 MX2800 is located at the far end, an **ANALOG DIAGNOSTIC** 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 **1=DS2 #X DATA MODE** to end a test in progress.

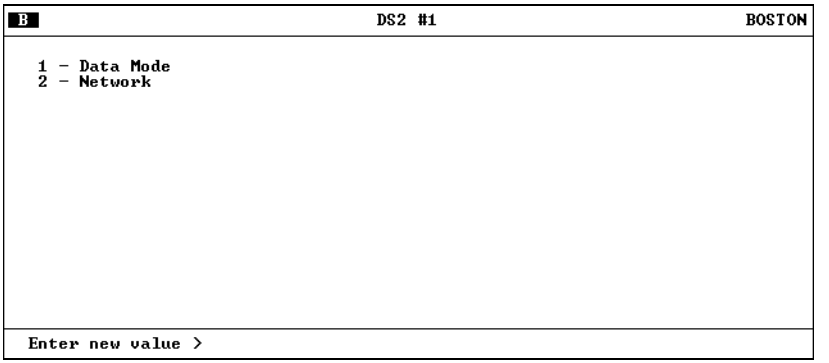


Figure 6-12. DS2 Diagnostics Menu

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.

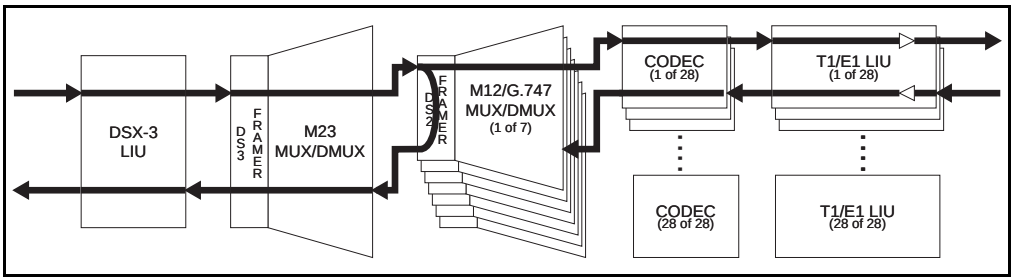


Figure 6-13. DS2 Network Loopback Test

Chapter 7 Circuit and Network Redundancy

The MX2800 provides backup measures of protection for both circuit and network failure. The following sections describe the three 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.
- *Circuit and Network Failure Recovery Mode*, which offers a complete backup system for both card and network failure, is described on page 7-5.

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 MX2800 houses only one controller card and only one network connection is available. 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.

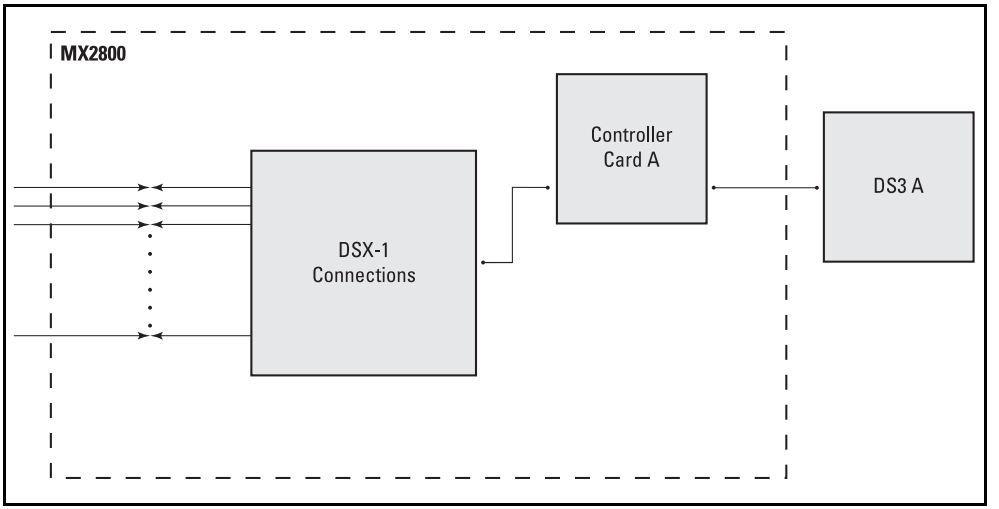


Figure 7-1. Non-Redundant Mode

*In this mode, the DS3 must be connected to the **IN** and **OUT** jacks for **DS3 A**.*

CIRCUIT FAILURE RECOVERY MODE

In Circuit Failure Recovery Mode, two controller cards are installed and a single DS3 line is coming in (see Figure 7-2). In this mode, the MX2800 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.

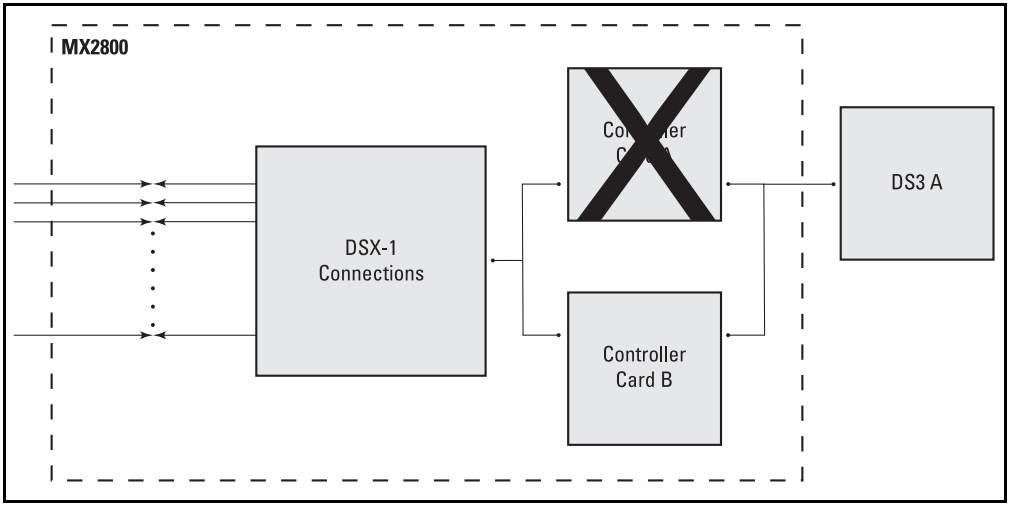


Figure 7-2. Circuit Failure Recovery Mode

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 > Network Protection	Disabled
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.

CIRCUIT AND NETWORK FAILURE RECOVERY MODE

In this mode, two controller cards are installed and connected to two individual DS3 lines. This is, of course, the most complete mode of redundancy. In this mode, the primary controller card is connected to the primary DS3 line and the secondary controller card is connected to the secondary DS3 line. The primary card and line actively transmit data, while the other card and line stand by ready to take over if the first fails. For example if Card A fails, then control switches to Card B and DS3 B.

An important feature of the MX2800 is its ability to internally re-route the network connection if a controller card and the *opposite* network connection fail. For example, in the illustration given in Figure 7-3, failed **DS3 A** is connected to healthy **CARD A**; and healthy **DS3 B** is connected to failed **CARD B**. In a case like this, the MX2800 is able to automatically re-route **DS3 B** to **CARD A**.

The configuration requirements for this mode are the same as the ones given for Circuit Failure Recovery Mode (see Table 7-1 on page 7-4) *except* for the **NETWORK PROTECTION** setting, which must be set to **ENABLE**.

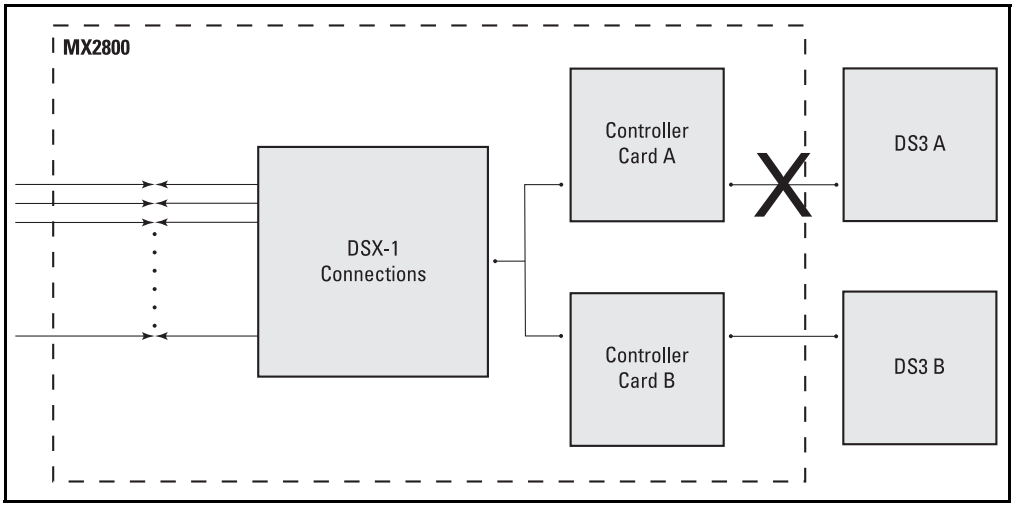


Figure 7-3. Circuit and Network Failure Recovery Mode

Chapter 8 Power Loss Recovery

The MX2800 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 MX2800 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.

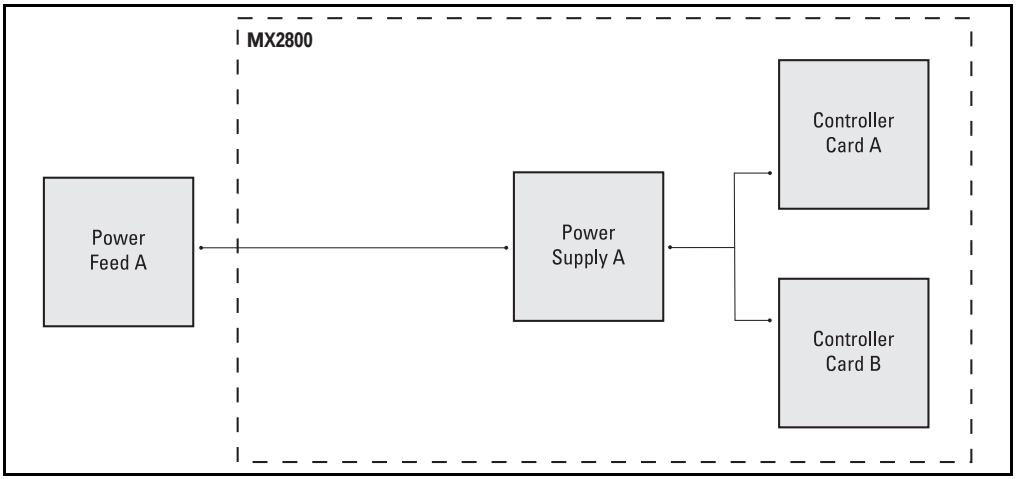


Figure 8-1. Non-Redundant Power Mode

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 MX2800 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.

NOTE

When the unit is configured with dual internal AC power supplies, then this is the only power protection mode available.

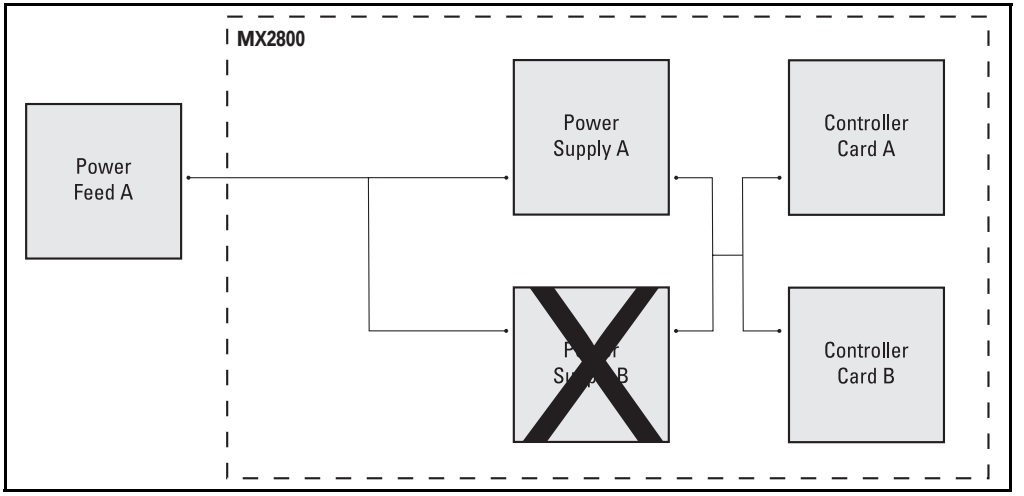


Figure 8-2. Power Supply Failure Recovery Mode

POWER SUPPLY AND SOURCE RECOVERY MODE

In this mode, two power supply cards are installed and are connected to two individual power sources. In this mode, the MX2800 handles any combination of power source or power supply failure.

Much like the backup design for the controller cards, the MX2800 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 MX2800 automatically connects **POWER SOURCE B** to **CARD A.**

This configuration is only available with DC power supplies.

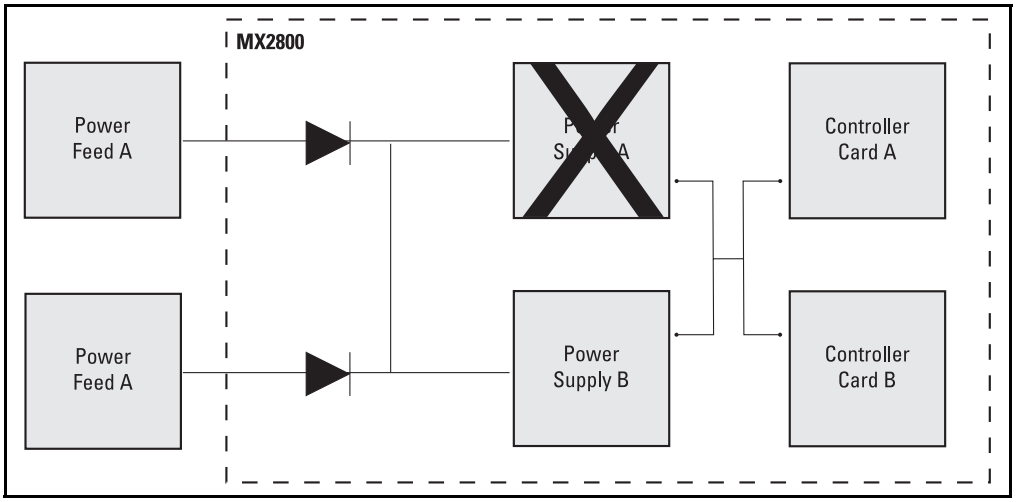


Figure 8-3. Power Supply and Source Failure Recovery Mode

BATTERY BACKUP MODE

With the installation of the ADTRAN Power Supply/Battery Charger (PS/BC) and backup battery pack, the MX2800 is able to continue operation without service interruption in the event of a power outage. This PS/BC (part number 4175043L1) provides -48 VDC to the MX2800. 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 MX2800 can operate on a fully-charged battery for four hours without recharging.

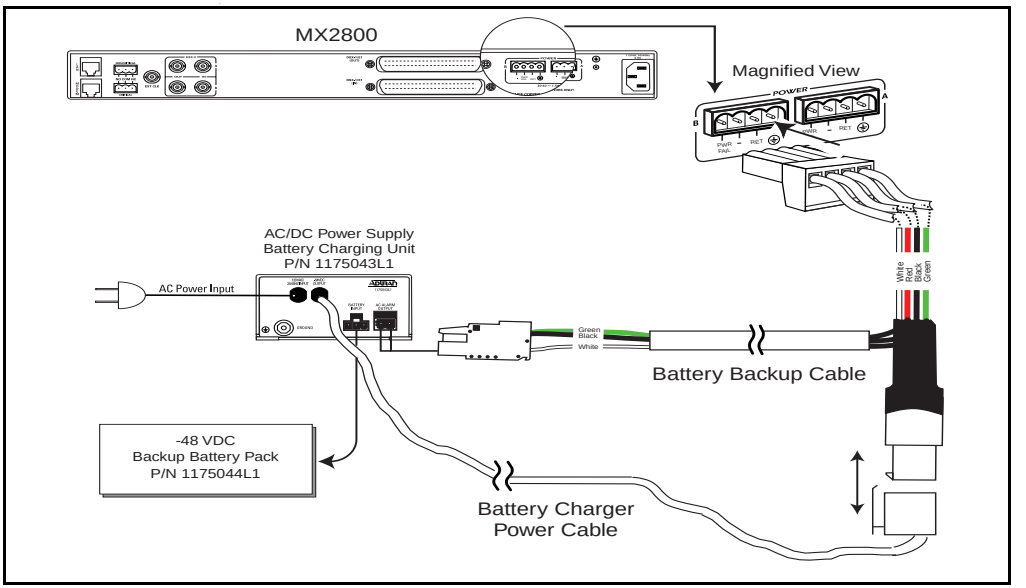


Figure 8-4. Battery Backup System

Appendix A Pinouts

The following tables give the pin assignments for the connectors located on the MX2800. For more information on these connectors, see the chapter *Installation and Operation* on page 2-1.

Table A-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 A-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 A-3. Modem Port Pin Assignments

Pin	Description
1, 2, 3	not used
4	Tip
5	Ring
6, 7, 8	not used

The modem port pin assignments apply to units equipped with an internal modem (4200290L1, L2, L3, and L4).

Table A-4. Amp Pin Assignments

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

*Table A-4 applies to both the **In** and **Out DSX1/E1** Amp connectors.*

Appendix B Specifications Summary

SPECIFICATIONS AND FEATURES

This section describes the standard specifications and features incorporated in the MX2800.

DSX-3 Network Interface

Channelized DS3
Line length: short (less than 50 feet) and long (greater than 50 feet)
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: external BNC input

Diagnostics

DS3 Network
ANSI T1.107 compatible loopbacks
Line loopbacks

DS2 Interfaces
DS2 network loopbacks

DSX-1 Interfaces
Local and network loopbacks

Management

VT 100 Terminal Interface
RJ-48, EIA-232 compatible, female DB-9 adapter provided.

Integrated Modem Interface (4200290L1, L2, L3, and L4)
Dial-up access for VT 100, SNMP, or Telnet
Dial out “cry for help”

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 and noncritical alarms
Normally open and normally closed 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

AC version: 120 VAC, 30 W
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 C 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 D 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 MX2800 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, diagnostics, 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 MX2800.

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.

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Product Support Information

Pre-Sales Inquiries and Applications Support

Please contact your local distributor, ADTRAN Applications Engineering, or ADTRAN Sales:

Applications Engineering	(800) 615-1176
Sales	(800) 827-0807

Post-Sale Support

Please contact your local distributor first. If your local distributor cannot help, please contact ADTRAN Technical Support and have the unit serial number available.

Technical Support	(888) 4ADTRAN

Repair and Return

If ADTRAN Technical Support determines that a repair is needed, Technical Support will coordinate with the Customer and Product Service (CAPS) department to issue a Return Material Authorization (RMA) number. For information regarding equipment currently in house or possible fees associated with repair, contact CAPS directly at the following number:

CAPS Department	(256) 963-8722

Identify the RMA number clearly on the package (below address), and return to the following address:

ADTRAN Customer and Product Service
6767 Old Madison Pike
Progress Center
Building #6 Suite 690
Huntsville, Alabama 35807

RMA # _____