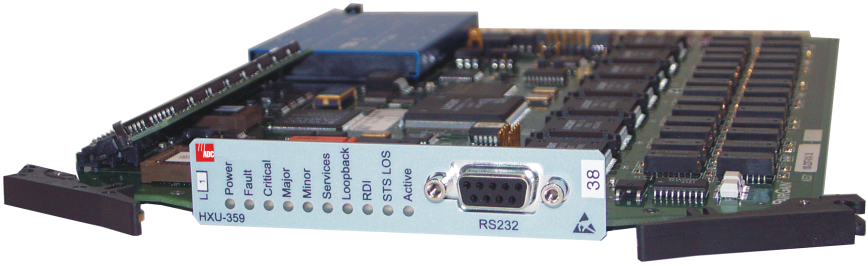
USER MANUAL



HXU-359 Multiplexer
Product Catalog: HXU-359L2V11
CLEI: VAPHFJ0D

Revision History of This Practice

Revision	Release Date	Revisions Made
01	12/20/01	Initial release

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December 20, 2001

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USING THIS TECHNICAL PRACTICE

The following conventions are used in this manual:

- `Monospace type` indicates screen text.
- Keys you press are indicated by small icons such as ENTER. Key combinations to be pressed simultaneously are indicated with a plus sign as follows: CTRL + ESC.
- Three types of messages, identified by icons, appear in text.

Notes contain information about special circumstances.

Cautions indicate the possibility of equipment damage or the possibility of personal injury.

The Electrostatic Discharge (ESD) susceptibility symbol indicates that a device or assembly is susceptible to damage from electrostatic discharge.

INSPECTING SHIPMENT

Upon receipt of the equipment:

- Unpack each container and inspect the contents for signs of damage. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company and to ADC. Order replacement equipment, if necessary.
- Check the packing list to ensure complete and accurate shipment of each listed item. If the shipment is short or irregular, contact ADC as described in the Warranty located inside the back cover. If you must store the equipment for a prolonged period, store the equipment in its original container.

SAFETY INFORMATION AND NOTICES

Electrical Rating and Insulation

The card power input is rated –40 to –57.5 Vdc, 0.37 to 0.27 A. The power supply feeds must be either -48 Vdc SELV sources or -48 Vdc sources that are both electrically isolated from the AC sector and reliably connected to earth. This card is a Class III device; no safety insulation is provided between various parts of the circuit.

On-board Overcurrent Protector

The card is provided with a fuse in the main –48 Vdc path. The time delay type fuse (F1) is rated 2 A, 125 V, and is CSA-certified and UL-recognized.

Thermal Insulation

The card safety evaluation is based on a maximun ambiant temperature of 85°C, with natural convection cooling. Some parts may be hot and not suitable for body contact.

Telemetry I/O

The telemetry I/O must be connected to either a SELV source or an ELV source that is electrically isolated from the AC sector and reliably connected to earth.

The electrical rating of the telemetry output is 57.5 Vdc, 30 Vac, 250 mA for the dry contact type, and 57.5 Vdc, 100 mA for the open collector type.

Metallic Telecommunication Interconnections

The card's metallic telecommunication interface is not intended to be electrically connected directly to the public telecommunication network and, therefore, it is tested to the TNV requirements.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES

Information in this document is Company Private to ADC DSL Systems, Inc., and shall not be used, copied, reproduced or disclosed in whole or in part without the written consent of ADC, which can only be granted by the Product Manager responsible for this product.

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OVERVIEW

The HiGain® Multiplexer Unit, HXU-359, is the SONET multiplexing component of the Wideband 3190 system. It can also be installed in the ADC ThinMux™ chassis, a compact 1RU high enclosure. The HXU-359 multiplexes 28 DS1 lines into a single Synchronous Transport Signal (STS-1) interface at a signal rate of 51.84 Mbps.

The typical Wideband 3190 or ThinMux application incorporates two HXU-359s: one card functioning as the active multiplexer, the other as a standby. This redundancy provides Automatic Protection Switching (APS). In the event of a failure, the active HXU-359 relinquishes control to the standby HXU-359 within 50 ms.

FEATURES

- Complete software provisioning
- Advanced management using Terminal Access Option (TAO) or Transaction Language 1 (TL1) software
- Virtual Tributary (VT) allocation of 28 DS1 line interfaces
- Flexible Time Slot Assignment (TSA) capability
- Software-selectable STS-1 and DS1 loopbacks
- In-service software upgrades
- Automatic and manual protection switching
- Performance monitoring and alarm logs
- Programmable DS1 line buildout
- Support for mixed T1 and E1 line interfaces
- Primary and secondary timing sources with multiple synchronization options (dual BITS, DS1 interfaces, STS-1 interface, or internal clock)
- Optional Optical Carrier Level 3 (OC-3) interface
- Internal diagnostics testing
- Office dry-contact alarms (Major, Minor, Critical) under the control of the HMU

- Front-panel status indicators
- Front-panel RS-232 craft port for direct connection to a maintenance terminal

COMPATIBILITY

The HXU-359 is compatible with Wideband 3190 management shelves and the ThinMux standalone chassis.

Do not mix different models of HiGain multiplexers within the same chassis. If you wish to replace an existing HiGain multiplexer with a different model, contact Customer Service.

FRONT PANEL

Figure 1 shows the front panel of the HXU-359. The HXU-359 continuously monitors the services, the Network Element (NE), the network and the signals it transports. The LEDs on the HXU front panel indicate current states. Any alarm triggers an audible alarm relay.

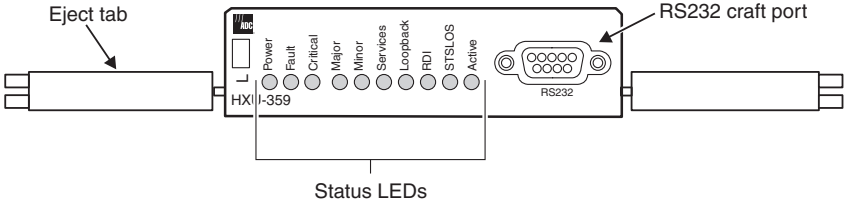

Figure 1. *HXU-359 Front Panel*

Table 1. *Front-Panel Description*

Front-Panel Feature	Function
Status LEDs	
Power (green)	Power on.
Fault (yellow)	HXU-359 controller is not operating properly. It is normal, however, for the LED to flash during powerup.
Critical (red)	Critical alarm.
Major (red)	Major alarm.
Minor (yellow)	Minor alarm.
Services (red)	Indicates a critical or major alarm in at least one of the DS1 services.
Loopback (green)	A DS1 or STS-1 loopback operation is active.
RDI (red)	A Remote Defect Indication alarm indicates that an alarm has been received from the remote SONET system.
STS LOS (red)	Loss of Signal at STS-1 level.
Active (green)	Active indication in a protected system.

Continued

Table 1. *Front-Panel Description (Cont.)*

Front-Panel Feature	Function
Craft port	RS-232 connector for serial communications with a maintenance terminal.
Card ejector tabs	Use to insert or remove the card from the card slot.

WIDEBAND 3190 SYSTEMS

WIDEBAND 3190 APPLICATION

The HXU-359 allows you to combine 28 DS1 lines into one high-speed STS-1 interface, thus providing a substantial cost savings over 28 individual DS1 lines. Figure 2 shows an application for the Wideband 3190. Figure 7 on page 11 demonstrates the use of ThinMux for efficient service aggregation.

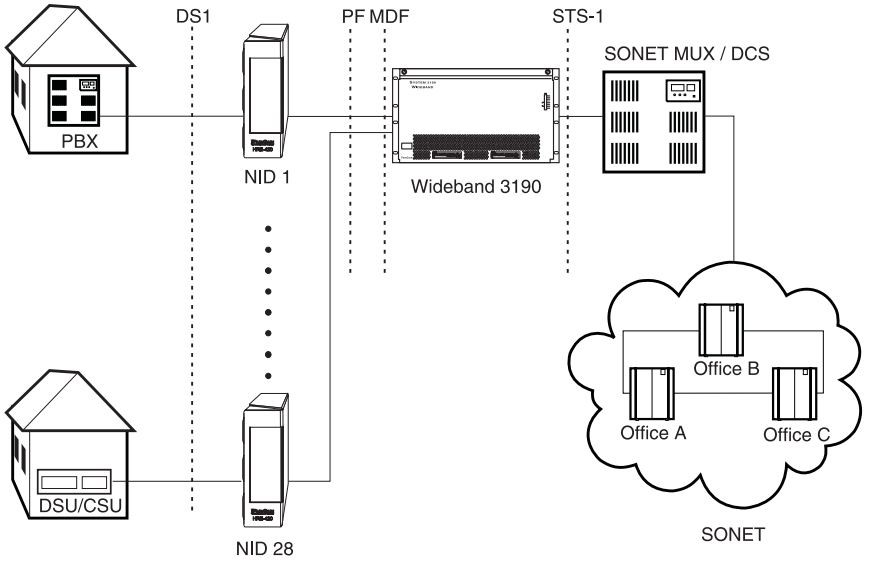

Figure 2. *Wideband 3190 Application*

INSTALLATION IN WIDEBAND 3190

Before installing the HXU-359, visually check its packaging to ensure that it has sustained no shipping damage. Immediately report any damage to the shipping agent.

The HXU-359 multiplexer card can be damaged by electrostatic discharge (ESD).

- **Always wear an antistatic wrist strap connected to equipment ground when handling the card. (The Wideband 3190 provides an ESD strap input above the HMU slot.)**
- **When working with the HXU-359, place it on an electrically grounded antistatic mat.**
- **Properly store in antistatic packing material any HXU-359 that is removed from the Wideband 3190 chassis.**

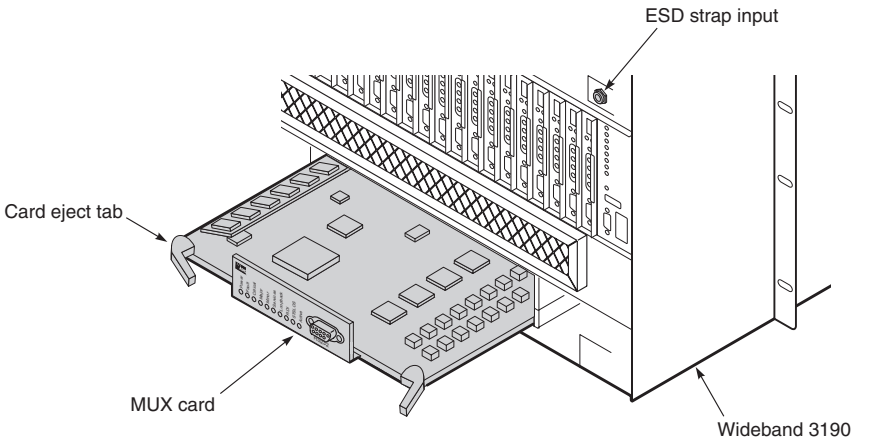

Figure 3. *Installing an HXU-359 in a Wideband 3190 Chassis*

Do not mix different models of HiGain multiplexers within the same chassis. If you wish to replace an existing HiGain multiplexer with a different model, contact Customer Service.

1 Unscrew the two hold-down lugs on each side of the chassis front cover. The cover folds down.

2 Connect your ESD wrist strap to the ESD strap input on the chassis (above the HMU slot on the Wideband 3190 chassis).

3 Verify that all switches on the SW2 switch block (located on the circuit board, behind the front panel) are in the OFF position. For more information about SW2, refer to "Appendix B - HXU-359 DIP Switch Configuration" on page 57.

4 Align the edges of the card with the slot guides in the multiplexer tray.

5 Grasping the card eject tabs, gently push the card into the bay (Figure 3 on page 6).

6 Firmly press in on the tabs until the card snaps into place. The LEDs flash momentarily. The Power LED and Active LED on the active multiplexer remain illuminated.

7 Protection switching requires the installation of a second (standby) multiplexer. Repeat the preceding installation steps 3 through 6. The LEDs on the standby multiplexer should be off, except for the Power LED.

When installed in a working system that already has an HXU-359, the second HXU-359 is automatically configured for that system by the active HXU-359 in the shelf.

ACCESSING THE HXU MANAGEMENT SCREENS (WIDEBAND 3190)

The HiGain Management Unit interface presents the user with an interactive, text-based, menu-driven interface that configures, monitors, and controls a Wideband 3190 and all its components. By connecting a local or remote maintenance terminal to the HMU-319 List 7A or List 9, you can access the craft port user interface for system provisioning and performance monitoring, including the HXU. (Switches 3 and 5 on SW2 must be set to the OFF position to activate the HMU craft port and OSTS protocol.)

Figure 4 shows the general structure of the HMU TAO management interface. It provides access to the HXU-359 management screens.

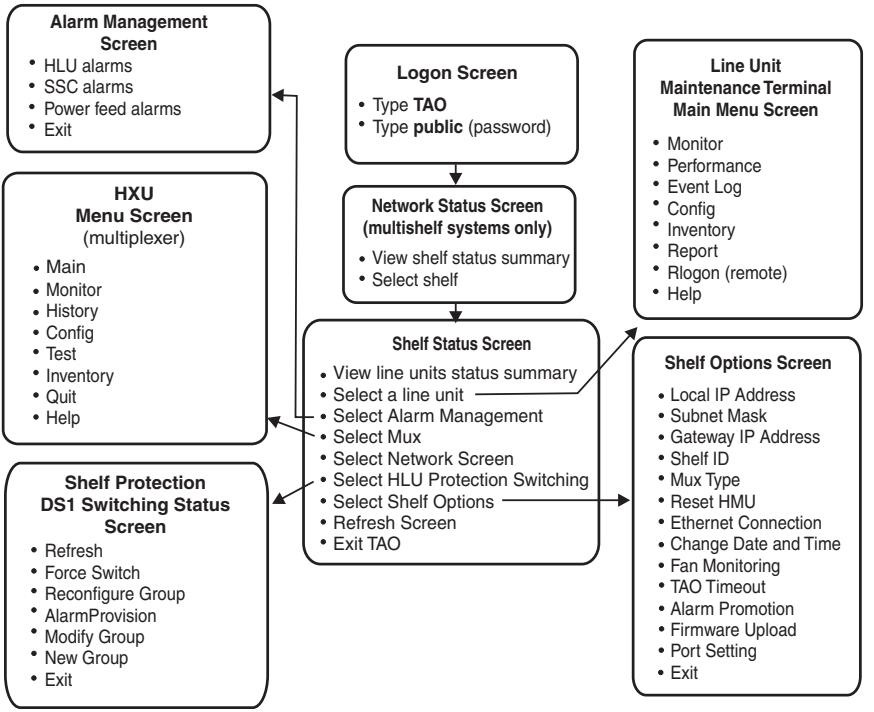

Figure 4. *Management Interface*

For more information about the HMU, refer to the user manual for the HMU-319 List 7A or List 9 and to the Wideband 3190 Installation Manual.

To log on to the management interface:

1. Connect a maintenance terminal to the HMU craft port. (Refer to the user manual for the HMU-319 for complete information). Upon connecting to the HMU-319, the TL1 prompt (<) appears.
2. Type TAO, then press **ENTER** to invoke TAO. The following password prompt appears.

   ```
   Please enter password for Terminal Access Option:

   Password:
   ```

3. Type `public` (default), then press **ENTER**.
4. Type `TAO` at the prompt, then press **ENTER**. This opens the Terminal Access Option (TAO) interface.

The logon screen can also be accessed by a TELNET session or through connection to the OS port. See the HMU user manual for more information.

5. From the Network Status screen (for multishelf configurations), type the number of the desired shelf ID (1 through 32), then press **ENTER**.
6. From the Shelf Status screen (Figure 5 on page 10), select the **Shelf Options**, then select **Mux Type** and the type of multiplexer (**HXU-359**).

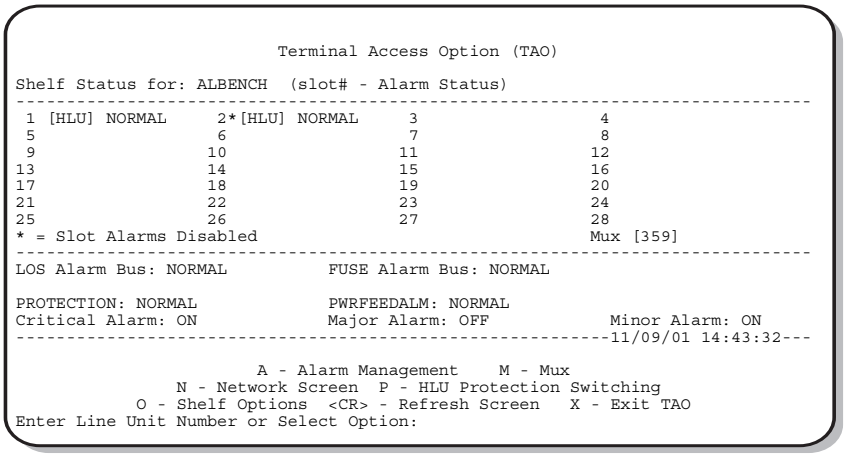

Figure 5. *Shelf Status Screen*

7 From the Shelf Status screen, select **M** to log onto the HXU-359 menu screen (Figure 6). To configure the HXU, go to "Configuration (Wideband 3190 and ThinMux)" on page 16.

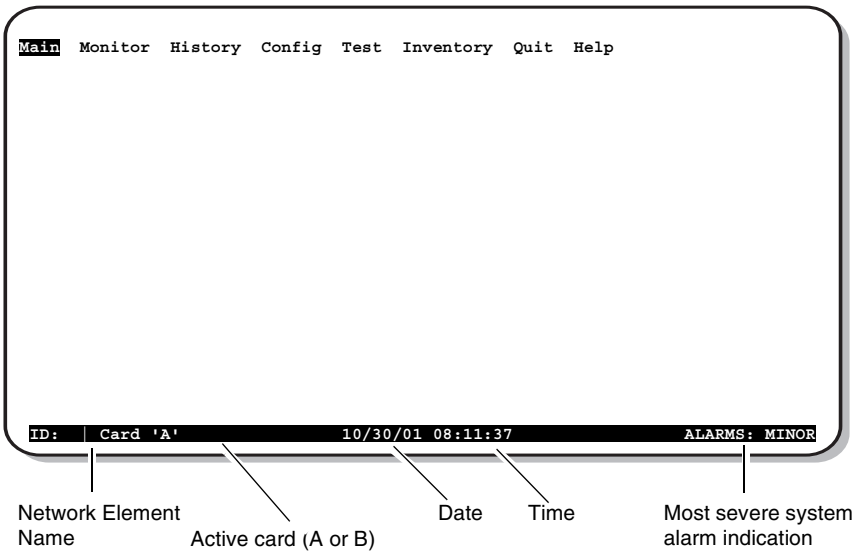

Figure 6. *HXU-359 Main Menu*

THINMUX CHASSIS

THINMUX APPLICATION

ADC's ThinMux product family offers the most efficient, cost-effective solution for aggregating low-speed T1/E1 services into larger network interfaces. The minimal space requirements for a ThinMux solution results in greater service density and lower service provisioning costs. The flexibility to replace low-speed interfaces with higher speed interfaces extends the life of existing infrastructure.

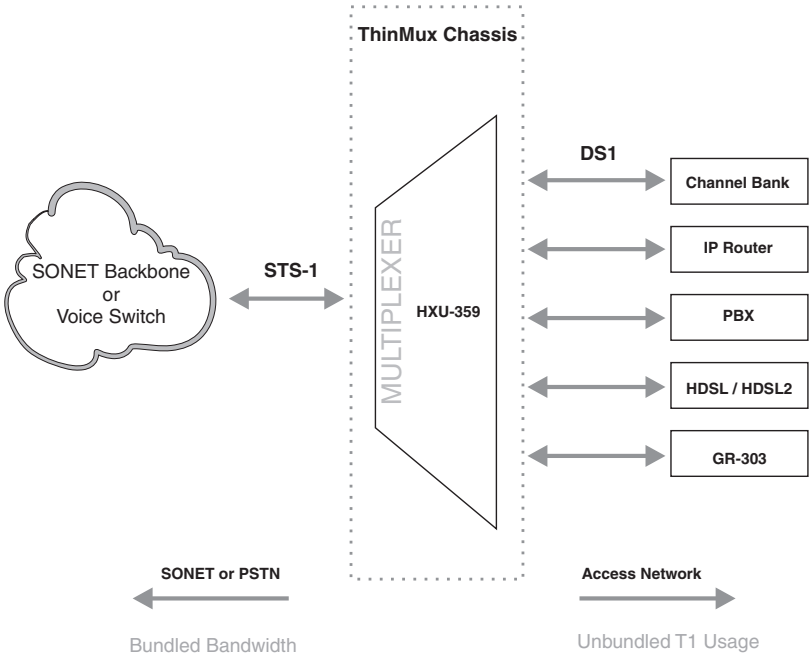

Figure 7. *ThinMux Application*

INSTALLATION IN THINMUX CHASSIS

Before installing the HXU-359, visually check its packaging to ensure that it has sustained no shipping damage. Immediately report any damage to the shipping agent.

The HXU-359 multiplexer card can be damaged by electrostatic discharge (ESD).

- **Always wear an antistatic wrist strap connected to equipment ground when handling the card. (The ThinMux chassis provides ESD strap inputs.)**
- **When working with the HXU-359, place it on an electrically grounded antistatic mat.**
- **Properly store in antistatic packing material any HXU-359 that is removed from the ThinMux chassis.**

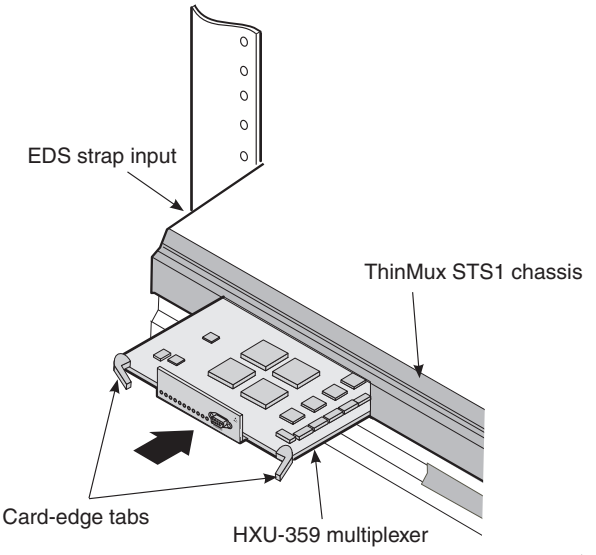

Figure 8. *Installing an HXU-359 in a ThinMux Chassis*

Do not mix different models of HiGain multiplexers within the same chassis. If you wish to replace an existing HiGain multiplexer with a different model, contact Customer Service.

HXU-359 multiplexer cards can be installed in a standalone ThinMux chassis.

1. Unscrew the two hold-down lugs on each side of the chassis front cover. The cover folds down.
2. Connect your ESD wrist strap to the ESD strap input on the chassis (on the back of the ThinMux chassis or on the left ESD bracket).
3. Set switch 3 on the SW2 switch block located on the circuit board, behind the front panel to the ON position. All other switches should be in the OFF position For more information about SW2, refer to "Appendix B - HXU-359 DIP Switch Configuration" on page 57.

When HXUs are installed in the ThinMux chassis and only switch 3 on the HXUs is configured in the ON position, the craft port on the backplane of the ThinMux chassis is enabled for dual access to the HXU management screens. For access to HXU front-panel craft ports, set switches 3 and 5 to the ON position.

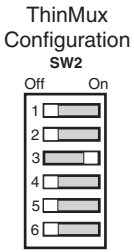

Figure 9. *SW2 Switch Block - Default Setting*

4. Align the edges of the card with the slot guides in the multiplexer tray.
5. Grasping the card eject tabs, gently push the card into the bay.

6 Firmly press in on the tabs until the card snaps into place. The LEDs flash momentarily. The Power LED and Active LED on the active multiplexer remain illuminated. The LEDs on the inactive (standby) multiplexer should be off, except for the Power LED.

When installed in a chassis that already has an HXU-359, the second HXU-359 is automatically configured for that system by the active HXU-359 in the shelf.

ACCESSING THE HXU MANAGEMENT SCREENS (THINMUX)

The HXU-359 Main Menu (Figure 10) can be accessed from the craft port on the back of the ThinMux chassis.

1 Configure the HXU-359 for a standalone ThinMux Chassis (see "Installation in ThinMux Chassis" on page 12).

2 Connect a maintenance terminal (PC running a terminal emulation program) to the craft port on the back of the ThinMux chassis using a standard 9-pin DB-9 terminal cable.

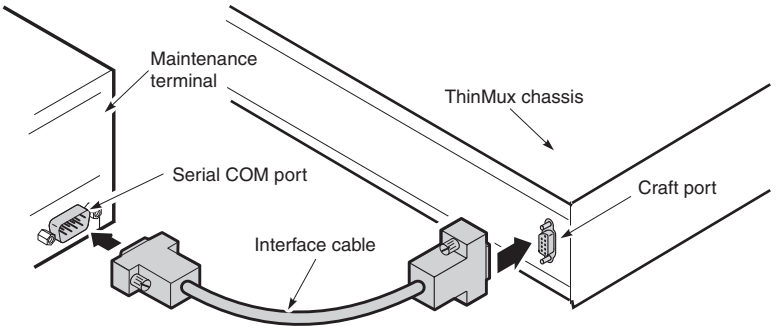

Figure 10. *Connecting a Maintenance Terminal to the Chassis Craft Port*

3 Configure the maintenance terminal as follows:

- 9600 baud
- No parity
- 8 data bits
- 1 stop bit

4 When the ADC banner appears on the screen along with a prompt to enter a password, type `public` (default password), then press **ENTER**. The HXU-359 main menu appears (Figure 11 on page 16).

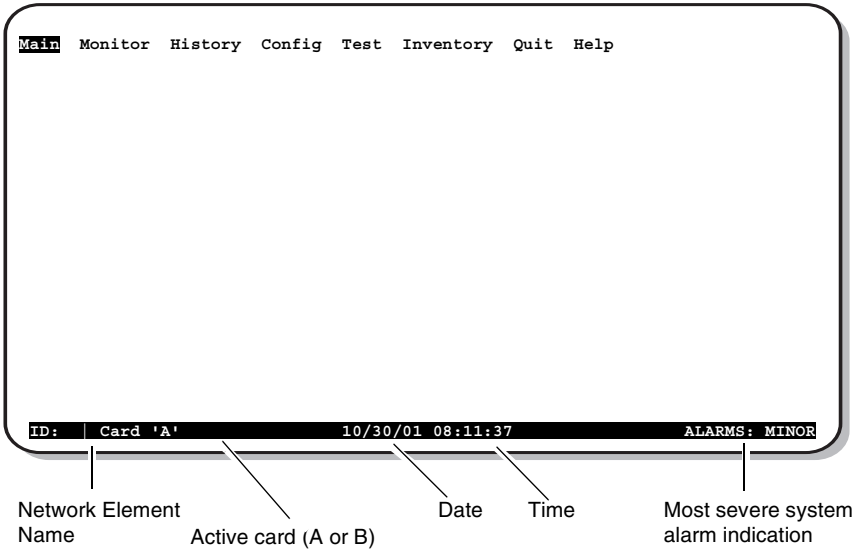

Figure 11. *HXU-359 Management Screen*

CONFIGURATION (WIDEBAND 3190 AND THINMUX)

The HXU-359 logon menu provides the following menu options:

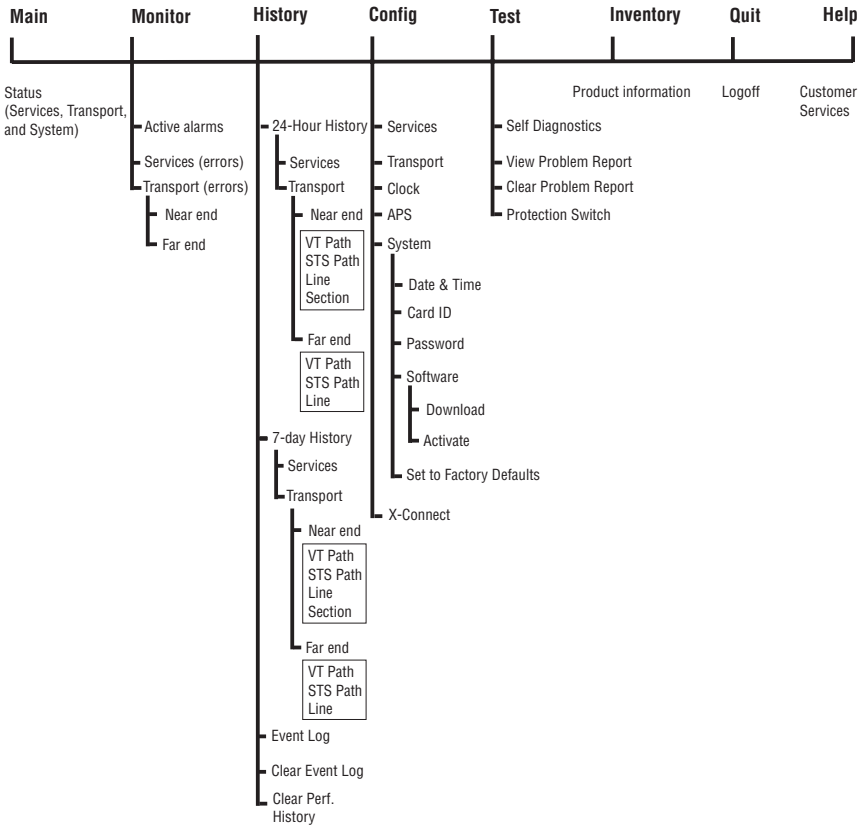

Figure 12. *HXU-359 Menu Tree*

The HXU-359 menus can be navigated by using the following navigational keys:

Table 2. *Navigational Keys*

Use this key	to perform this function
←↑→↓	Move to a menu selection
TAB	Move through the fields of a selection
SPACEBAR	Scroll through options
ENTER	Enter a menu or execute a choice
ESC	Return to previous level or selection
N	Next page
P	Previous page
T	Top of page
B	Bottom of page

Table 3. *HXU-359 Menu Options*

Menu Name	Select This Menu to:
Main	View DS1 services status. The screen also displays transport status, common alarms and card status.
Monitor	View active alarms, service errors (continuous count), and transport errors (continuous count).
History	View 24-hour and 7-day performance monitoring histories at the the STS-1 port (transport) and the DS1 interfaces (services). Also provides an Event Log and the ability to clear the Event Log and Performance History.
Config	Configure the DS1 ports and set up Virtual Tributary Group (VTG) and Virtual Tributary Slot (VTS) connections, configure the STS-1 port, set the clock synchronization, configure automatic protection switch, change the date and time, change the card ID number, change the password, initiate a software download, initiate a DS1 or STS-1 loopback, restore the factory default settings, or set the cross-connect map.
Test	Run self diagnostics, view or clear the problem report, and perform a protection switch.
Inventory	View HXU product information.
Quit	Exit the HXU-359 interface.
Help	View customer service information.

Minimal configuration tasks for the HXU-359 include:

- Setting the date and time (see below)
- Entering the card ID (page 19)
- Setting the system clock synchronization (page 20)
- Setting up a cross-connect map (page 22)
- Configuring the DS1 ports (page 26)
- Configuring the STS-1 interface (page 28)

SETTING DATE AND TIME

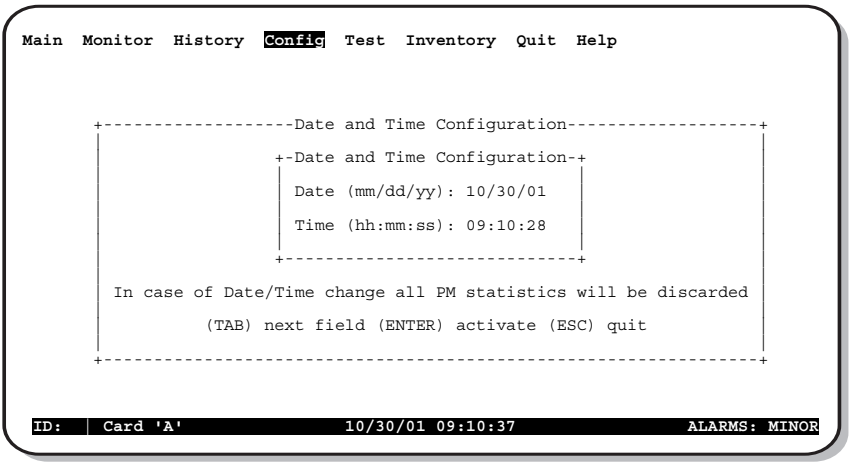

Figure 13. *Config Menu: Date and Time*

1 Select the **Config** menu and choose **System**.

2 Choose **Date & Time**.

3 Type the current information in the Date & Time Configuration screen, and then press ENTER. Performance monitoring statistics are cleared when a new time is entered.

ENTERING CARD IDENTIFICATION

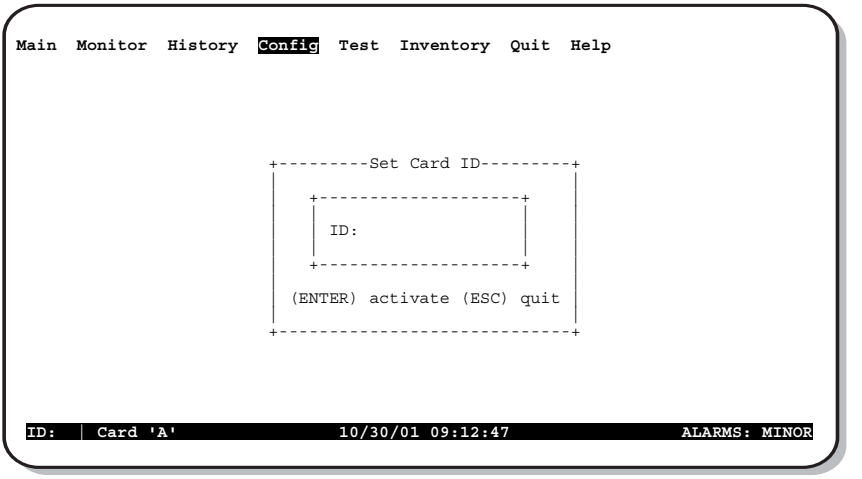

Figure 14. *Config Menu: Card ID*

1 Select the **Config** menu and choose **System**.

2 Choose **Card ID**.

3 Type a name for the card (network element name), and then press ENTER. The name entered is attached to both cards in a protected system. Card A is the multiplexer in slot A; Card B is the multiplexer in slot B.

SETTING THE SYSTEM CLOCK SYNCHRONIZATION

Synchronous network elements must derive their timing from a reference source. Each HXU-359 can be synchronized with the following timing sources:

- the internal clock, which is set at 51.84 MHz ±20 ppm
- the received SONET STS-1 signal
- any external DS1 input
- either of two BITS inputs

The HXU uses the primary source during normal operation and, if a problem is detected in the primary signal, the system automatically switches to the secondary source. If a problem is detected in the secondary source, the signal switches to the internal clock. A failure in the clock reference generates a major alarm.

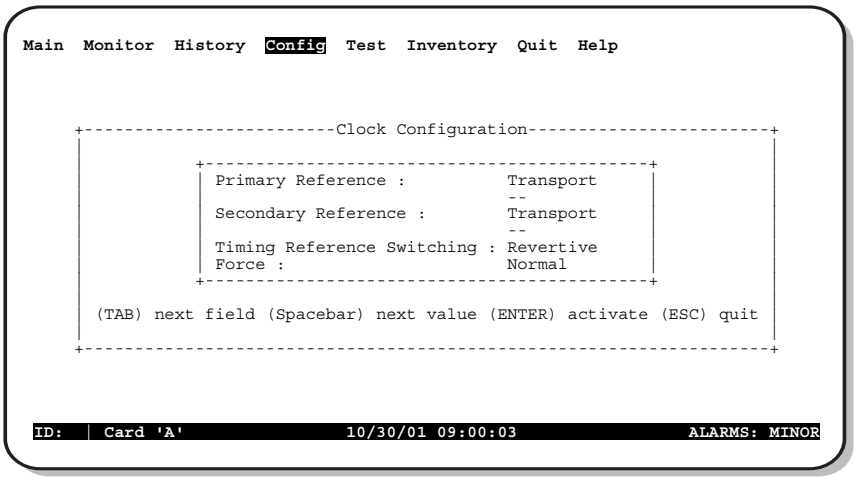

Figure 15. *Clock Configuration*

Select the **Config** menu, choose **Clock**, and then perform the following tasks:

1 Using the spacebar to cycle through the configuration options, set the **Primary Reference.** This selection determines the primary source for clock synchronization. See Table 4 on page 22.

A service or transport must be configured as In Service (IS) prior to being selected as the synchronization source.

2 Set the **Secondary Reference** for synchronization. See Table 4.

3 Set the **Timing Reference Switching** (revertive or non revertive). Setting the timing reference to **revertive** causes the clock to revert to the primary clock when it is valid.

4 To manually force the clock synchronization mode, set **Force** to the desired mode. The default setting is **normal**. See Table 4 for other configuration options.

Table 4. *Clock Configuration Options*

Clock Field	Option Descriptions
Primary Reference	BITS A (DS1 speed) BITS B (DS1 speed) Internal Transport (STS-1) Service #n (1 through 28)
Secondary Reference	BITS A (DS1 speed) BITS B (DS1 speed) Internal Transport (STS-1) Service #n (1 through 28)
Timing Reference Switching	Revertive (reverts to primary clock when valid) Nonrevertive
Force	BITS A (DS1 speed - default setting) BITS B (DS1 speed) Normal — normal operation Primary — use primary reference Secondary — use secondary reference Internal — use internal clock Holdover — use internal clock (last valid setting)

SETTING UP A CROSS-CONNECT MAP

The HXU-359 is comprised of 7 four-input muxes which are connected to the DS1 channels. Four DS1 channels feed into each VT group mux. The outputs of the seven multiplexers are multiplexed into a single STS-1 stream.

The HXU-359 supports two cross-connect mapping schemes, transparent and interleaved, that allow you to automatically configure 28 DS1 lines. The default configuration is interleaved mapping. Figure 16 on page 24 and Figure 17 on page 25 show the two different mapping schemes.

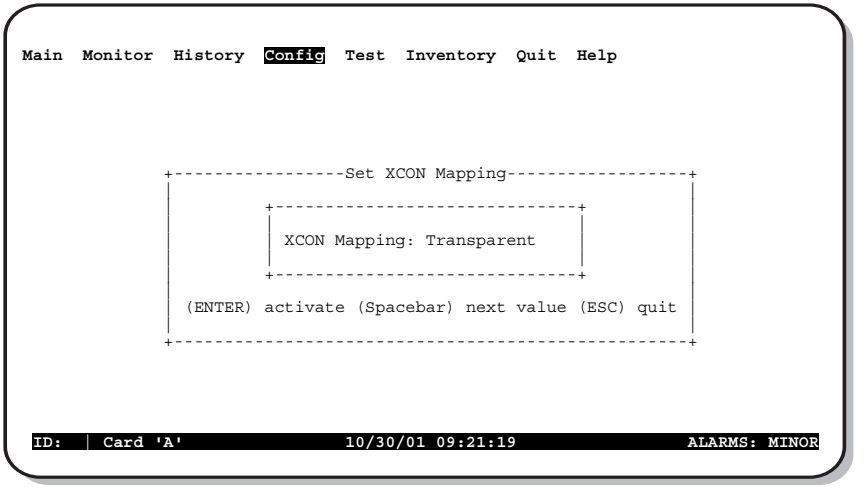

Figure 16. *Config Menu: X-Connect*

To determine the current mapping mode, view the Services **submenu under** Config **and note the VT and VG mapping relationships. Figure 16 on page 24 and Figure 17 on page 25 are graphical representations of transparent and interleaved mapping.**

To change the cross-connect map:

1 All DS1 interfaces must be in OOS-A mode. If they are not, then:

- **a** Select the **Config>Services** menu.
- **b** Select a DS1 service port, then press ENTER. The configuration bar at the bottom of the screen should show your selection.
- **c** Press the TAB key to select the Mode field.
- **d** Press the SPACEBAR to select OOS-A.
- **e** Press ENTER.

2 Select the **Config>X-Connect** menu and press the SPACEBAR to change the mapping mode, then ENTER to activate your selection.

You can also individually allocate each DS1 line to any VT within the SONET payload by selecting **Config>Services**. See "Configuring the DS1 Ports" on page 26.

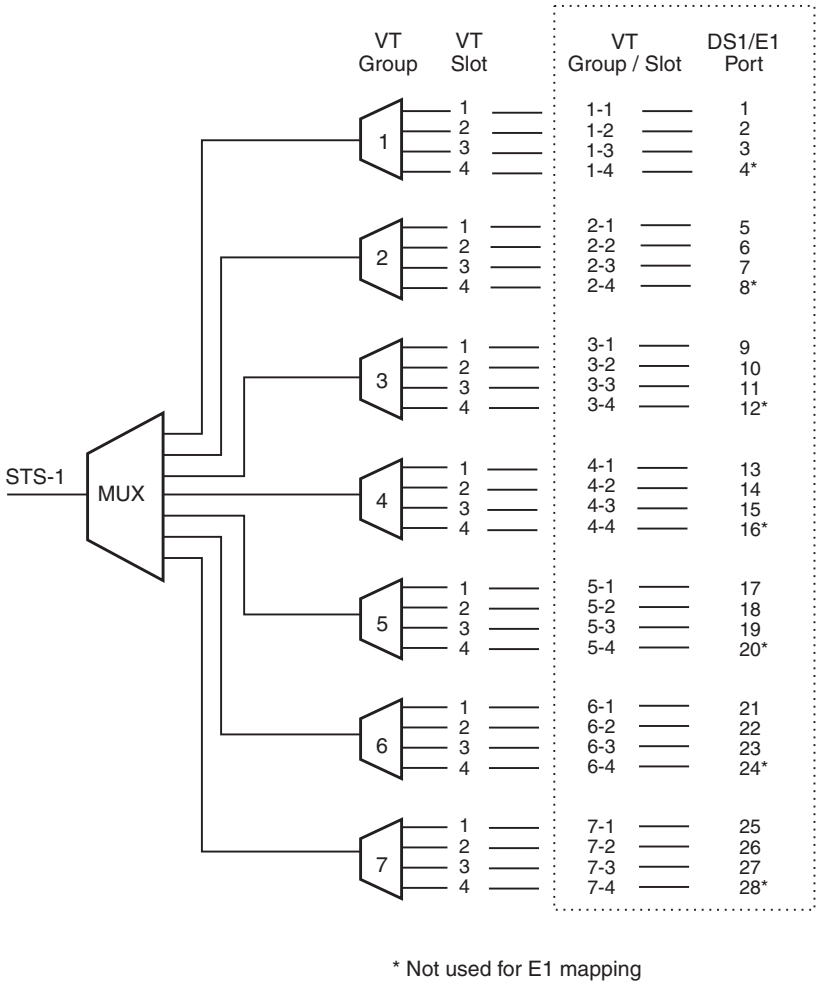

Figure 17. *SONET Transparent Mapping*

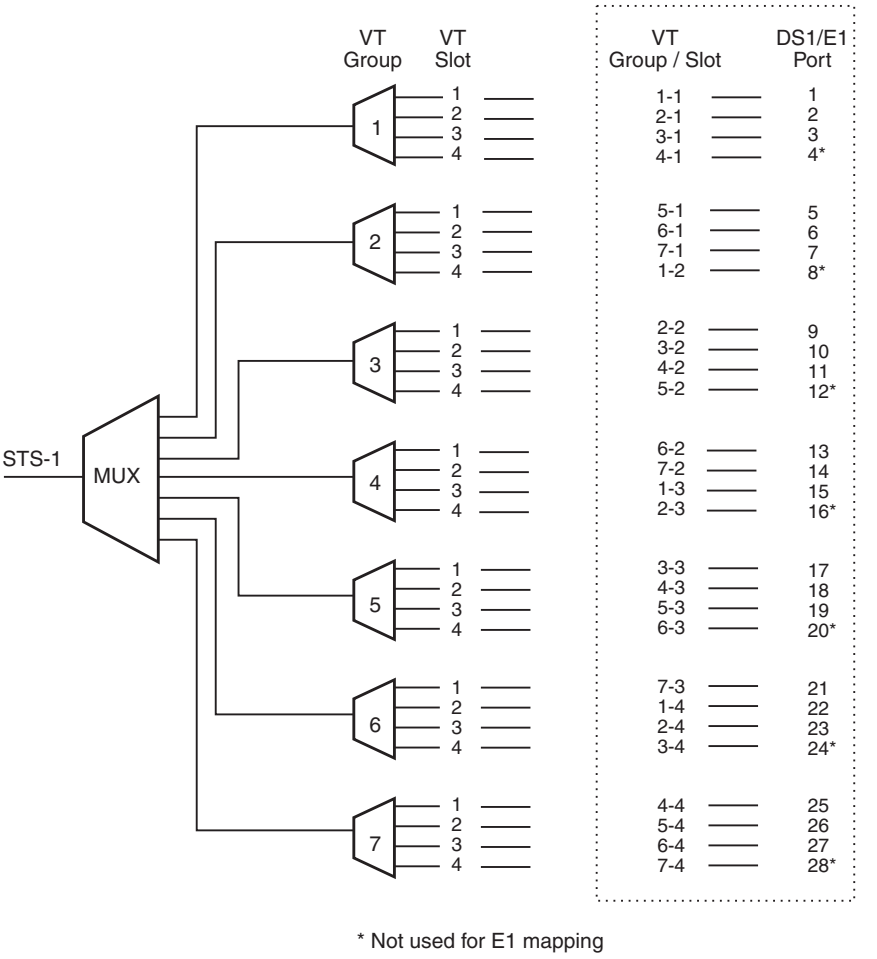

Figure 18. *M13 Interleaved Mapping*

CONFIGURING THE DS1 PORTS

Table 5 on page 27 gives a summary of all the configuration options available on the Services Configuration screen. Table 6 on page 28 describes the DS1 service modes.

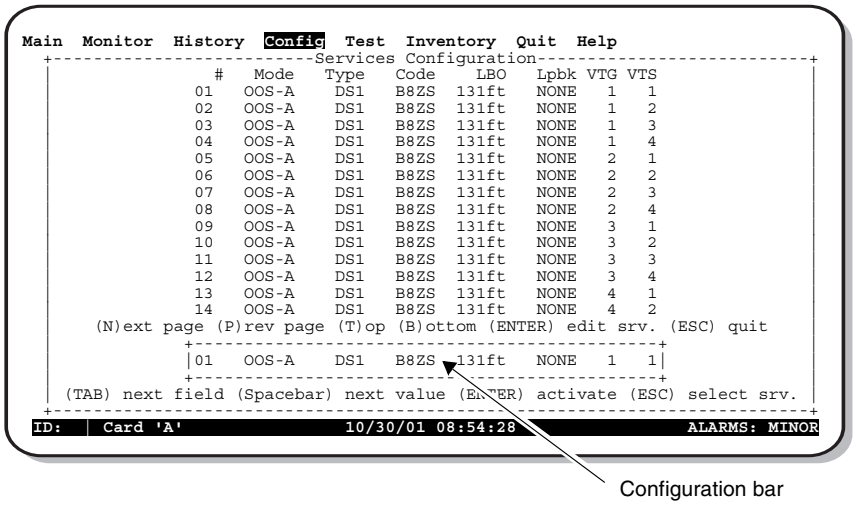

Figure 19. *Config Menu: DS1 Ports*

To make configuration changes to a DS1 port, select the **Config** menu, choose **Services**, and then perform the following tasks:

1 Select a DS1 service port, then press **ENTER**. The configuration bar at the bottom of the screen should show your selection.

2 If the selected DS1 port is configured as IS or OFF (Mode field):

a Press the **TAB** key to select the Mode field.

b Press the **SPACEBAR** to select OOS-A.

Do not configure a service as OOS-M or OOS-A when it is selected as a clock synchronization source.

3 Choose the type of service (DS1). At this time only DS1 service is supported.

4 Choose the type of line code (B8ZS or AMI).

5 Chose the line buildout for the DS1 port (131, 262, 393, 524, or 655 ft.)

6 Select the Virtual Tributary Group (VTG) 1 through 7 and the Virtual Tributary Slot (VTS) 1 through 4. The cross-connection of tributaries allows mapping of any of the DS1 channels to any available time-slot location. Only available combinations are presented for selection. See Figure 16 on page 24 for the default SONET tributary mapping. Figure 17 on page 25 shows an M13 tributary mapping.

7 When finished configuring the port, reset the port to **IS** to place it in service, then press ENTER. If desired, reconfigure another service in the DS1 list.

Table 5. *Services Configuration Options*

Configuration Field	Configuration Options
Mode	Out of Service-Maintenance (OOS-M) Out of Service-Administrative (OOS-A) In Service (IS) OFF
Type	DS1
Code	B8ZS, AMI
Line Buildout (LBO)	131, 262, 393, 524, or 655 ft.
Loopback (Lpbk)	NONE FCLT (facility loopback) TERM (terminal loopback)
Virtual Tributary Group (VTG)	Groups 1 through 7
Virtual Tributary Slot (VTS)	Slots 1 through 4 of a specified group

Table 6 on page 28 shows the effect of the various DS1 modes on the functions of the HXU-359.

Table 6. HXU-359 DS1 Service Modes

Service State	Configuration Allowed	Loopback Allowed	PM Data Reported	Alarms Reported	Passes Data
In Service (IS)	No	No	Yes	Yes	Yes
Out of Service-Administrative (OOS-A)	Yes	Yes	No	No	Yes
Out of Service-Maintenance (OOS-M)	No	Yes	No	No	Yes
OFF	Yes	n/a	No	No	No

CONFIGURING THE STS-1 PORT

Table 7 on page 29 gives a summary of all the configuration options for the transport configuration screen. Table 8 on page 30 describes the primary transport states.

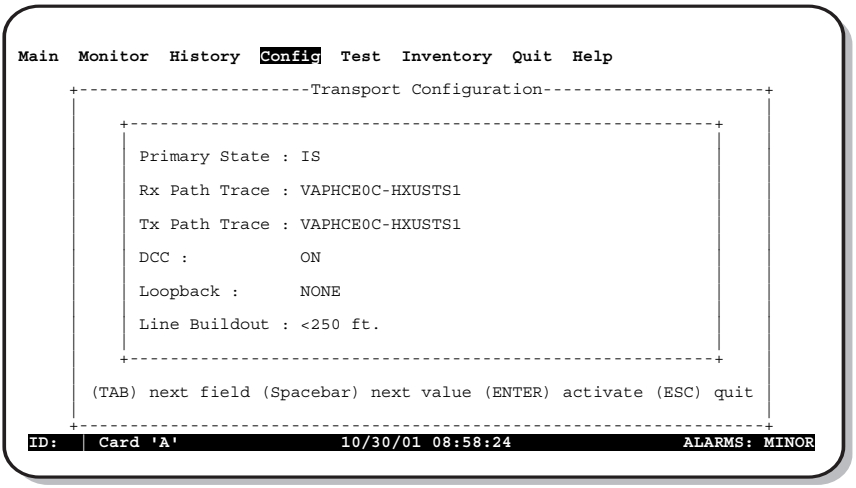

Figure 20. *Config Menu: STS-1 Port*

To configure the STS-1 port, select the **Config** menu, choose **Transport**, and then perform the following tasks.

1 Set Primary State to **OOS-A** using the SPACEBAR, then press ENTER.

Do not configure the transport as OOS-M or OOS-A when it is selected as a clock synchronization source.

2 Type the transmit path trace string (SONET path name).

3 Set the Data Communications Channel (DCC) to **ON**.

4 Set Loopback to **NONE**.

5 Configure the line buildout to less than 250 feet or more than 250 feet (up to 455 feet maximum).

6 When finished configuring the STS-1, set Primary State to **IS** to place it in service, and press ENTER.

Table 7. *Transport Configuration Options*

Configuration Field	Configuration Options
Primary State (See Table 8 on page 30 for a description of the state configurations.)	Out of Service-Maintenance (OOS-M) Out of Service-Administrative (OOS-A) In Service (IS)
Rx Path Trace	Rx path trace string (maximum size = 40)
Tx Path Trace	Tx path trace string (maximum size = 40)
DCC	Data Communications Channel ON or OFF
Loopback	NONE FCLT (facility loopback) TERM (terminal loopback)

Table 8 shows the effect of the various STS-1 primary states on the functions of the HXU-359.

Table 8. *HXU-359 STS-1 Primary States*

Primary State	Configuration Allowed	Loopback Allowed	PM Data Reported	Alarms Reported	Passes Data
In Service (IS)	No	No	Yes	Yes	Yes
Out-of-Service Administrative (OOS-A)	Yes	Yes	No	No	Yes
Out-of Service Maintenance (OOS-M)	No	Yes	No	No	Yes

OTHER CONFIGURATION OPTIONS

There are other useful configuration options that are not essential to the basic configuration procedures. These include:

- Changing the password
- Downloading HXU-359 software updates
- Restoring default configuration settings

Setting Automatic Protection Switching

Currently, the APS configuration screen has a fixed threshold setting and protection mode. Only the Total Switch Count mode can be configured for reset (**Yes** or **No**).

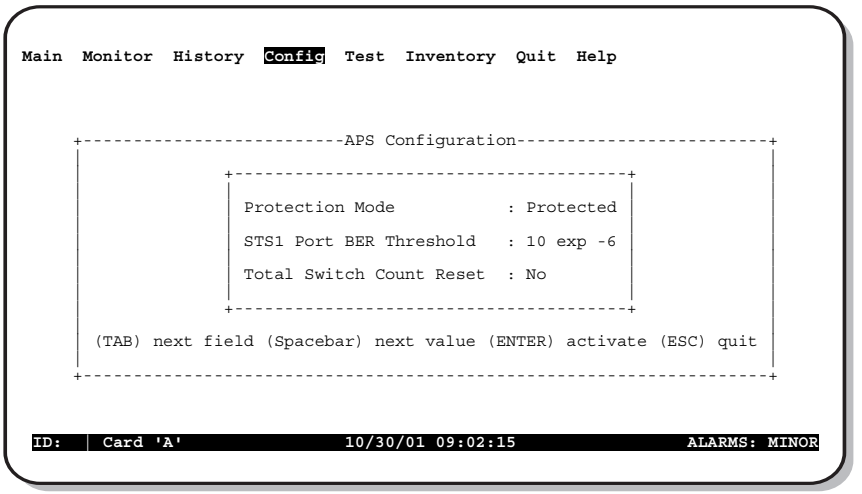

Figure 21. *Config Menu: APS*

Changing the Password

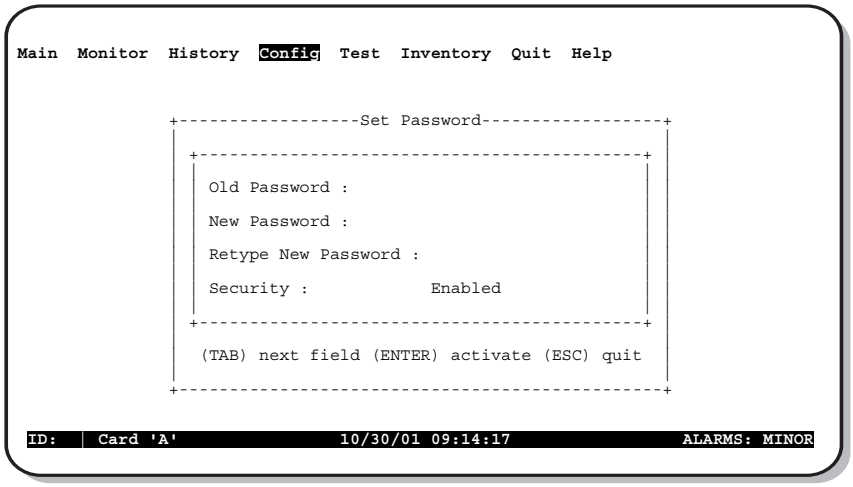

Figure 22. *Config Menu: Password*

1. Select the **Config** menu, choose **System**, then **Password**.
2. Type the old password.
3. Type the new password.
4. Retype the password to confirm it.

To enable password verification when logging in through the craft port, set Security to Enabled**. To log in through the craft port without password verification, set Security to** Disabled**.**

Downloading Software Updates

When performing a software download in a protected system, the software must be loaded to both multiplexer modules individually.

Uploading a new version of multiplexer software assumes the following conditions:

- a serial connection between the maintenance terminal and the HMU or HXU
- a communications package on the maintenance terminal, such as HyperTerminal or ProComm, using XMODEM

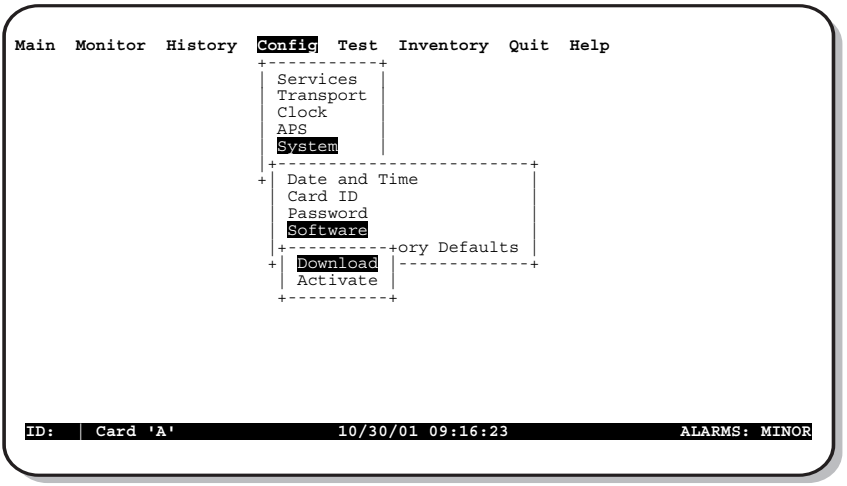

Figure 23. *Config Menu: Software*

1 Select the **Config** menu, choose **System**, **Software**, then **Download**.

2 Copy the firmware to a local directory on your PC.
For example: `C:\MUX Firmware\VO_1_6.bin`

3 Select **Flash Bank 1** or **Flash Bank 2** as the download destination.

4 Select **YES** to proceed. The on-screen response should be:

```
Formatting bank 1 (or 2) containing 2097152
bytes.
```

After approximately 15 seconds, another message appears:

```
Starting XModem Reception, please start
transmission of .bin file. . .
```

5 Using the HyperTerminal transfer utility (make sure the protocol is set to XMODEM), send the binary file.

The download may take some time when using the HMU craft port. When the download is complete, a `download complete` message appears.

6 Select **Activate** from the Software menu.

7 Choose **Flash Bank 1** or **Flash Bank 2**. The Fault LED flashes, indicating that the card is restarting.

Restoring Defaults

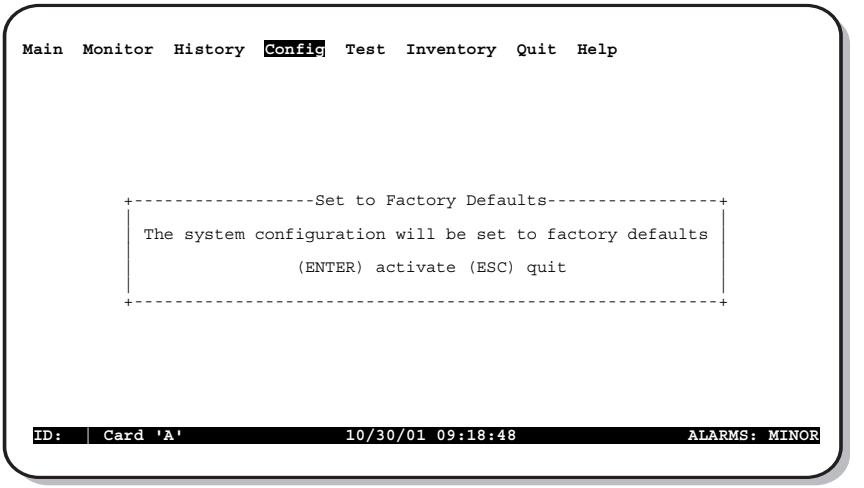

Figure 24. *Config Menu: Restore Defaults*

1 To restore the configuration settings to their original factory settings, select **Config**, **System**, and then **Set to Factory Defaults**.

The following message appears: `The system configuration will be set to factory defaults.`

2 Press **ENTER** to restore the original factory settings or press **ESC** to cancel.

Restoring the factory default settings may affect service.

PERFORMANCE MONITORING

The Main menu provides a status overview of system services. The Monitor and History menus provide essential data for monitoring the performance of the HXU-359.

MAIN MENU

To view services status, press **ENTER** when **Main** is highlighted to view the Services Status screen (Figure 24). The Services Status screen reports status for the DS1 interfaces (Services), the STS-1 interface (Transport), Automatic Protection Switching (APS), and alarms.

```
Main  Monitor  History  Config  Test  Inventory  Quit  Help
+---------------------------------- Main ------------------------------------+
|                SERVICES STATUS                        | TRANSPORT STATUS    |
|  # Type  Mode  Alrm Lpbk |  # Type  Mode  Alrm Lpbk  | # Type   Alrm Lpbk  |
|  1  DS1 OOS-A  NONE NONE | 15  DS1 OOS-A  NONE NONE  | 1 STS-1  NONE NONE  |
|  2  DS1 OOS-A  NONE NONE | 16  DS1 OOS-A  NONE NONE  |                     |
|  3  DS1 OOS-A  NONE NONE | 17  DS1 OOS-A  NONE NONE  | --------------------|
|  4  DS1 OOS-A  NONE NONE | 18  DS1 OOS-A  NONE NONE  | SYSTEM STATUS       |
|  5  DS1 OOS-A  NONE NONE | 19  DS1 OOS-A  NONE NONE  |                     |
|  6  DS1 OOS-A  NONE NONE | 20  DS1 OOS-A  NONE NONE  | NE:     NONE        |
|  7  DS1 OOS-A  NONE NONE | 21  DS1 OOS-A  NONE NONE  | CLK:    NONE        |
|  8  DS1 OOS-A  NONE NONE | 22  DS1 OOS-A  NONE NONE  |                     |
|  9  DS1 OOS-A  NONE NONE | 23  DS1 OOS-A  NONE NONE  |                     |
| 10  DS1 OOS-A  NONE NONE | 24  DS1 OOS-A  NONE NONE  |                     |
| 11  DS1 OOS-A  NONE NONE | 25  DS1 OOS-A  NONE NONE  |                     |
| 12  DS1 OOS-A  NONE NONE | 26  DS1 OOS-A  NONE NONE  |                     |
| 13  DS1 OOS-A  NONE NONE | 27  DS1 OOS-A  NONE NONE  |                     |
| 14  DS1 OOS-A  NONE NONE | 28  DS1 OOS-A  NONE NONE  |                     |
|  [ IS : In Service, OOS-A/M: Out Of Service Admin/Maintenance, OFF : Off ]  |
+------------------------------ CARD STATUS ---------------------------------+
| Prot Mode     : NOT PROTECTED                                               |
| Total Switches: 0                                                           |
+-----------------------------------------------------------------------------+
ID:   Card 'A'              10/30/01 08:13:07                 ALARMS: MINOR
```

Figure 25. *Main Menu: Services Status*

MONITOR MENU

The Monitor menu provides detailed alarm and error information in three subscreens:

- Active alarms
- Services (DS1 error reporting)
- Transport (STS-1 error reporting)

Active Alarms

To view alarms, select **Monitor**, then **Active Alarms**. The View Active Alarms report appears. Refer to Table 9 on page 38 for an explanation of the report fields and possible alarm group descriptions.

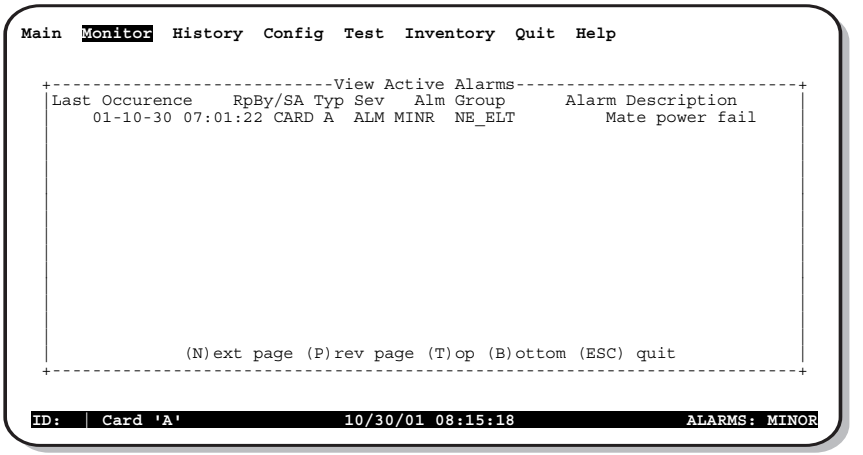

Figure 26. *Monitor Menu: Active Alarms*

To update the active alarms report, reopen the Monitor menu and reselect Active Alarms.

Table 9. *Monitor Menu: View Active Alarms Report*

Alarm Field Description	Field Values
Last Occurrence (date and time alarm occurred)	mm/dd/yy hh:mm:ss (month, day, year, hour, minutes, seconds)
RpBy / SA (alarm reported by, service affecting	CARD A or CARD B reported the alarm. An asterisk identifies a service-affecting alarm.
TYP (alarm type)	ALM = alarm EVT = event TCA = Threshold crossing alert
SEV (alarm severity)	CLR = cleared WARN = warning MINR = minor MAJR = major crossing CRIT = critical
ALM GROUP (alarm group)	NE_ELT = network element PHY_TRM = SONET physical SCT_TRM = SONET section LIN_TRM = SONET line STS_PTH = SONET path PRTN = protection X_CNCT = cross-connect VT_PTH = VT path DS1_LIN = DS1 line E1_LIN = E1 line ETH_LIN = Ethernet line CLK_MNG = clocking management LOG_MNG = logging management PM_RESET = performance monitoring reset PM_SECT = performance monitoring section PM_LINE = performance monitoring line PM_PATH = performance monitoring path PM_VT = performance monitoring VT

DS1 Service Error Statistics

To view real time DS1 service error statistics, select **Monitor**, then **Services**. The screen displays counter values accumulated from the date and time indicated in the "Last Cleared" field. The counter runs continuously until cleared by pressing L. If a field reaches its maximum count, it remains at that maximum value until cleared.

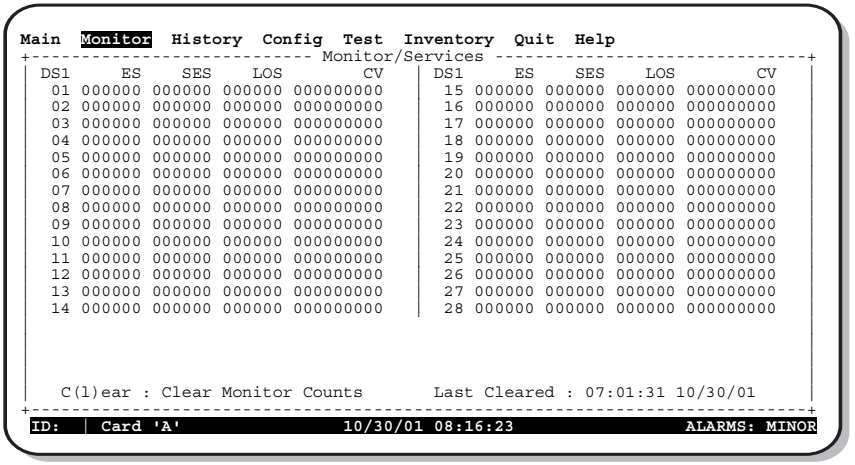

Figure 27. *Monitor Menu: DS1 Services*

Table 10 on page 40 describes the ES, SES, LOS, and CV errors reports for DS1 services.

Table 10. *DS1 Error Definitions*

Error Type	Description
ES-L	Errored Seconds-Line—a count of seconds during which one or more of the following has occurred: BPVs, EXZs, and LOSs. For a B8ZS-coded signal, BPVs that are part of the zero substitution code are excluded.
SES-L	Severely Errored Seconds-Line—a count of the seconds during which 1544 or more BPVs or EXZs, or one or more LOS defects have occurred. This number is chosen in accordance with ITU-T guidelines and corresponds to an approximate BER of 10^{-3}. For a B8ZS-coded signal, BPVs that are part of the zero substitution code are excluded.
LOSS-L	Loss of Signal Seconds-Line—a count of 1-second intervals containing one or more LOS defects.
CV-L	Code Violation-Line—a count of Bipolar Violations (BPVs) and Excessive Zeroes (EXZs) occurring over the accumulation period. An EXZ increments the CV-L by one, regardless of the length of the zero string. For a B8ZS-coded signal, BPVs that are part of the zero substitution code are excluded from the count.

Transport Error Statistics

To view the performance statistics for the STS-1 interface, select **Monitor**, then **Transport**. You can choose to view performance monitoring from the near end or the far end. Figure 27 shows performance monitoring from the near end of the STS-1. Table 11 on page 43 through Table 14 on page 44 describe the kinds of performance monitor errors reported.

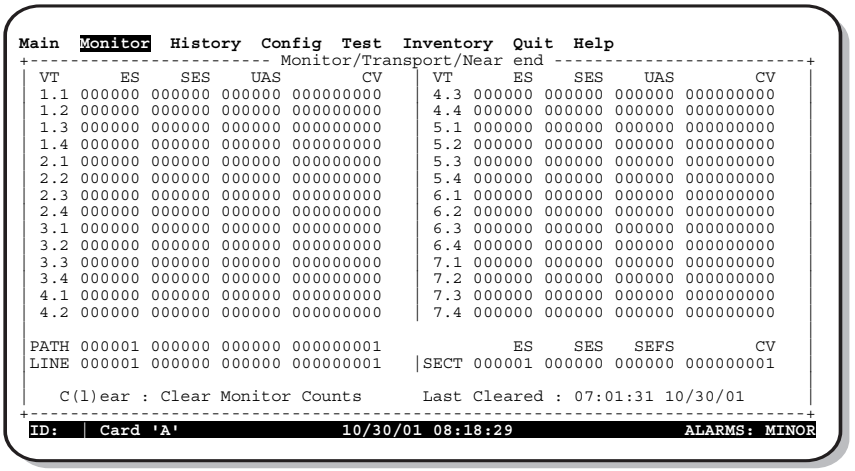

Figure 28. *Monitor Menu: Near-End Transport*

To clear Monitor statistics, press L.

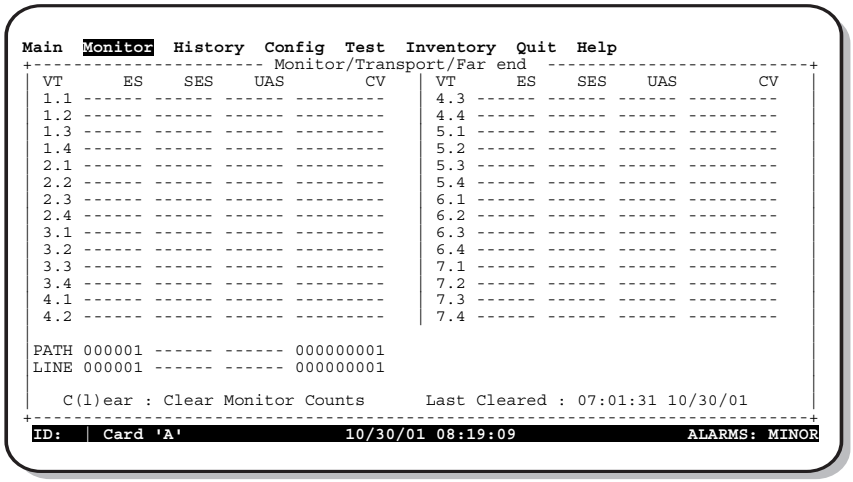

Figure 29. *Monitor Menu: Far-End Transport*

The HXU-359 reports the following kinds of STS-1 performance monitoring information:

- Section layer (near end)
- Line layer
- Path layer
- Virtual Tributary layer

Refer to Table 11 on page 43 through Table 14 for STS-1 error definitions.

Table 11. *STS-1 Error Definitions—Section Layer PM*

Error Type	Description
ES-S	Section Errored Seconds—a count of the seconds during which at least one section layer BIP error was detected or an SEF or LOS defect was present.
SES-S	Section Severely Errored Seconds—a count of the seconds during which 52 or more section layer BIP errors were detected or an SEF or LOS defect was present.
SEFS-S	Section Severely Errored Framing Seconds—a count of the seconds during which an SEF defect was present.
CV-S	Section Code Violations—the count of BIP errors detected at the section layer. Up to eight section BIP errors can be detected per STS-1 frame, with each error incrementing the CV-S current second register.

Table 12. *STS-1 Error Definitions—Line Layer PM*

Error Type	Description
ES-L	Errored Seconds—a count of the seconds during which at least one line layer Bit-interleaved Parity (BIP) was detected or an AIS defect (or a lower-layer, traffic-related, near-end defect) was present.
SES-L	Severely Errored Seconds—a count of the seconds during which 51 or more line layer BIP errors were detected or an AIS defect (or lower-layer, traffic-related, near-end defect) was present.
UAS-L	Unavailable Seconds—a count of the seconds during which the line was considered unavailable.
CV-L	Code Violation—the count of BIP errors detected at the line layer (for example, using B2 bytes in the incoming SONET signal). Up to 8 BIP errors can be detected per STS-1 frame, with each error incrementing the CV line current second register.

Table 13. *STS-1 Error Definitions—Path Layer PM*

Error Type	Description
ES-P	Errored Seconds—a count of the seconds during which at least one STS path layer BIP error was detected or an AIS-P defect was present.
SES-P	Severely Errored Seconds—a count of the seconds during which 2400 or more STS-1 path layer BIP errors were detected or an AIS-P defect was present.
UAS-P	Unavailable Seconds—a count of the seconds during which the STS-1 path was considered unavailable.
CV-P	Code Violation—the count of BIP errors detected at the STS path layer (for example, using B3 bytes in the incoming SONET signal). Up to 8 BIP errors can be detected per STS-1 frame, with each error incrementing the CV line current second register.

Table 14. *STS-1 Error Definitions—VT Path Layer PM*

Error Type	Description
ES-V	Errored Seconds—a count of the seconds during which at least one VT path layer BIP error was detected or an AIS-V defect was present.
SES-V	Severely Errored Seconds—a count of the seconds during which 600 or more VT path layer BIP errors were detected or an AIS-V defect was present.
UAS-V	Unavailable Seconds—a count of the seconds during which the VT path was considered unavailable.
CV-V	Code Violation—the count of BIP errors detected at the VT path layer (for example, using bits 1 and 2 of the V5 byte in the incoming SONET signal). Up to 2 BIP errors can be detected per VT superframe, with each error incrementing the CV-V current second register.

HISTORY MENU

The History menu provides the following submenu selections:

- 24-Hour History — provides 24-hour performance history screens for the STS-1 interface (**Transport Near End** and **Transport Far End**) and the DS1 interfaces (**Services**). There are four types of error statistics screens for the Transport Near End: VT path, STS path, line, and section. There are three types of screens for the Transport Far End: VT Path, STS path, and line.
- 7-Day History— provides 7-day performance history screens for the STS-1 interface (**Transport Near End** and **Transport Far End**) and the DS1 interfaces (**Services**). There are four types of error statistics screens for the Transport Near End: VT path, STS path, line, and section. There are three types of screens for the Transport Far End: VT Path, STS path, and line.
- Event Log — provides a running event log of all alarms and events with time, date, and description.
- Clear Event Log — use this selection to clear the Event Log.
- Clear Perf. History — use this selection to clear Performance History screens.

Viewing History Screens

To view a Services history:

1 From the History menu, select **24-Hour History** or **7-Day History**.

2 Select **Services**.

3 Type the DS1 port number. The 24-hour (or 7-day) history screen for the service appears. Figure 30 on page 47 is an example of a 7-day history screen for a DS1 port.

To view a Transport history at the near end:

1 Select **Transport** from the History menu. The 24-hour (or 7-day) history screen for the transport appears.

2 Select **Transport Near End** and one of the following:

- **a** Select **VT Path** and type the VT (group/slot) number to see near-end VT path errors. For a graphical explanation of VT numbers, see Figure 16 on page 24.
- **b** Select **STS Path** to see near-end STS path errors.
- **c** Select **Line** to see near-end line errors.
- **d** Select **Section** to see near-end section errors.

Figure 29 on page 47 shows a 24-hour performance history screen for the near-end transport interface (STS path). Similar screens (24-hour and 7-day) are available for the far-end transport.

To view a Transport history at the far end:

1 Select **Transport** from the History menu.

2 Select **Transport Far End** and one of the following:.

- **a** Select **VT Path** and type the VT (group/slot) number to see far-end VT path errors. For a graphical explanation of VT numbers, see Figure 16 on page 24.
- **b** Select **STS Path** to see far-end STS path errors.
- **c** Select **Line** to see far-end line errors.

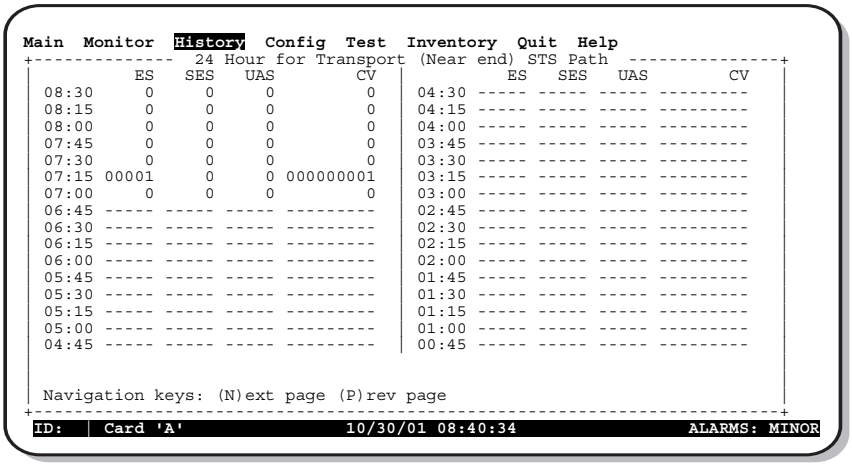

Figure 30. *History Menu: 24-Hour Transport - Near End, STS Path*

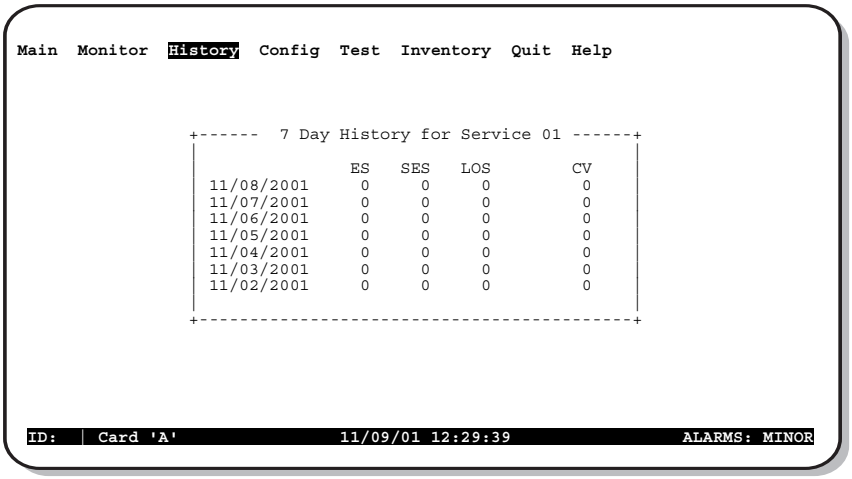

Figure 31. *History Menu: 7-Day History for Service*

Valid "no error" entries are indicated by a zero.

Invalid data (incomplete time period or change of date or time) is indicated by a dashed line.

Performance history data can be erased by selecting Clear Perf. History **under the** History **menu.**

Viewing the Event Log

Figure 31 shows an event log. To view, select **History**, then **Event Log**. This running event log reports the occurrence of alarms, events, or threshold crossings. An asterisk identifies service-affecting alarms. See Table 15 on page 49 for a description of the various types of events that can be reported.

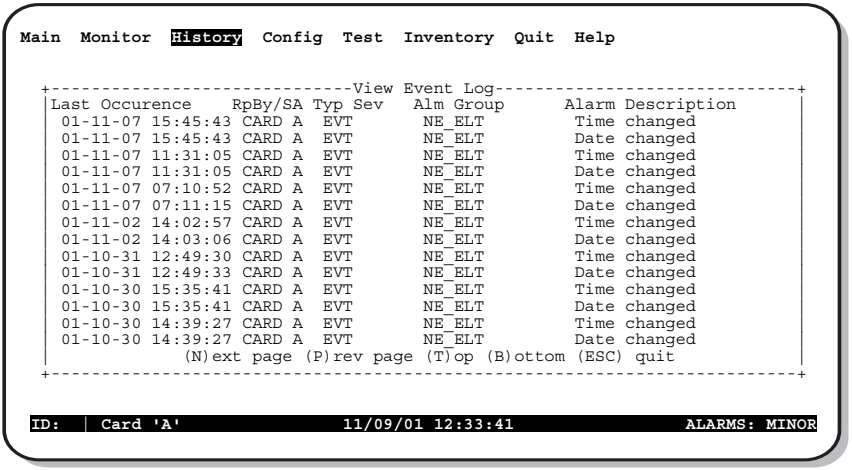

Figure 32. *History Menu: Event Log*

The Event Log data can be erased by selecting Clear Event Log **under the** History **menu.**

Table 15. *History Menu: Event Log Report*

Event Field Description	Field Values
Last Occurrence (date and time log occurred)	mm/dd/yy hh:mm:ss (month, day, year, hour, minutes, seconds)
RpBy / SA (log reported by, service affecting	CARD A or CARD B reported the log. An asterisk identifies a service-affecting log.
TYP (log type)	ALM = alarm EVT = event TCA = Threshold crossing alert
SEV (log severity)	CLR = cleared WARN = warning MINR = minor MAJR = major crossing CRIT = critical
ALM GROUP (log group)	NE_ELT = network element PHY_TRM = SONET physical SCT_TRM = SONET section LIN_TRM = SONET line STS_PTH = SONET path PRTN = protection X_CNCT = cross-connect VT_PTH = VT path DS1_LIN = DS1 line E1_LIN = E1 line ETH_LIN = Ethernet line CLK_MNG = clocking management LOG_MNG = logging management PM_RESET = performance monitoring reset PM_SECT = performance monitoring section PM_LINE = performance monitoring line PM_PATH = performance monitoring path PM_VT = performance monitoring VT

TESTING

The Test menu (Figure 32) offers the following troubleshooting selections:

- Self Diagnostics
- View Problem Report
- Clear Problem Report
- Protection Switch

SELF DIAGNOSTICS

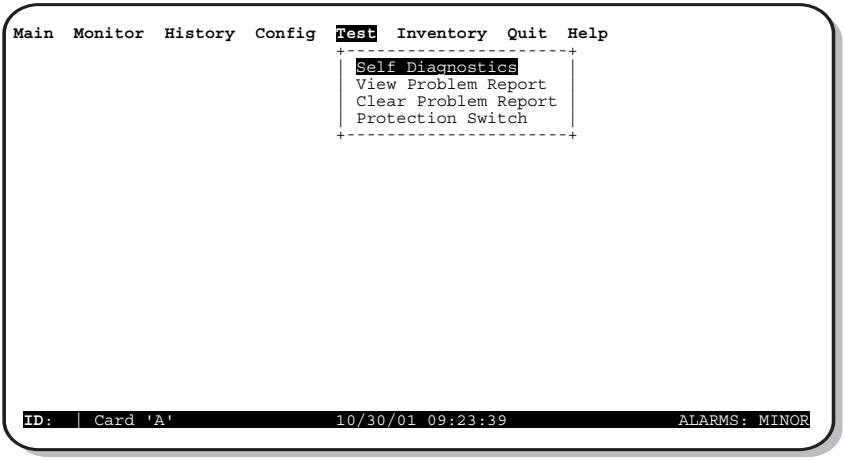

Figure 33. *Test Menu: Self Diagnostics*

1 To run self diagnostics, select the Test menu, then **Self Diagnostics**. Use the SPACEBAR to cycle through the test options:

- All
- Verifying integrity of Flash Bank 1
- Verifying integrity of Flash Bank 2

- Verifying integrity of database

2 Press **ENTER** to select the test option.

3 To view the problem report screen, select **View Problem Report** from the Test menu.

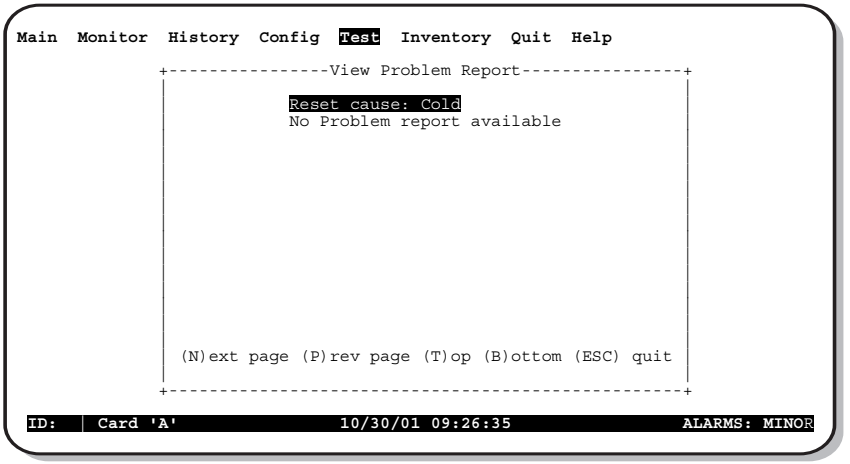

Figure 34. *Problem Report*

4 To clear the problem report screen, select **Clear Problem Report** from the Test menu. Press **ENTER** to clear the report or **ESC** to quit the screen.

PROTECTION SWITCH

In a dual multiplexer (protected) system, it is possible to switch all traffic to the standby multiplexer, if necessary. **Protection Switch** is an option under the Test menu. To execute a switch to the standby multiplexer, press **ENTER** when prompted. The status bar at the bottom of every screen indicates which multiplexer (A or B) is currently active.

LOOPBACKS

Loopbacks can be used to verify that signals are being properly transmitted and received by sending a SONET or DS1 signal back to its origin. Refer to Figure 34 on page 53 and Table 16 on page 54 for a description of system loopbacks. The choices for loopback configurations are:

- NONE - no loopback
- TERM - terminal loopback
- FCLT - facility loopback

Do not configure a service or transport as OOS-M or OOS-A when it is selected as a clock synchronization source.

DS1 Loopbacks

To set a loopback for a DS1 interface:

1 Choose **Config**, then **Services**. Press ENTER.

2 Use the arrow keys to select the DS1 service and press ENTER.

3 Using the spacebar, set the port to OOS-M.

4 Press the TAB key to select the **Lpbk** field in the configuration bar at the bottom of the screen.

5 Press SPACEBAR to view the loopback options (NONE, TERM or FCLT), then press ENTER to activate a loopback.

To deactivate the TERM or FCLT loopback for the DS1 service port:

6 Reselect the DS1 service port (steps 1 and 2 above).

7 Press SPACEBAR to place it in service (IS).

8 Press the TAB key to select the **Lpbk** field and set the loopback option to NONE. Press ENTER.

STS-1 Loopbacks

To set a loopback for the STS-1 interface:

1 Choose **Config**, then **Transport**.

2 Set **Primary State** to OOS-M by pressing SPACEBAR, then press ENTER and use the TAB key to select the **Loopback**.

3 Press SPACEBAR to view the loopback options (NONE, TERM or FCLT), then press ENTER to activate a loopback.

To deactivate the TERM or FCLT loopback for the transport:

4 Set **Primary State** to IS.

5 Press the TAB key to select the **Loopback** and press SPACEBAR to select NONE. Press ENTER.

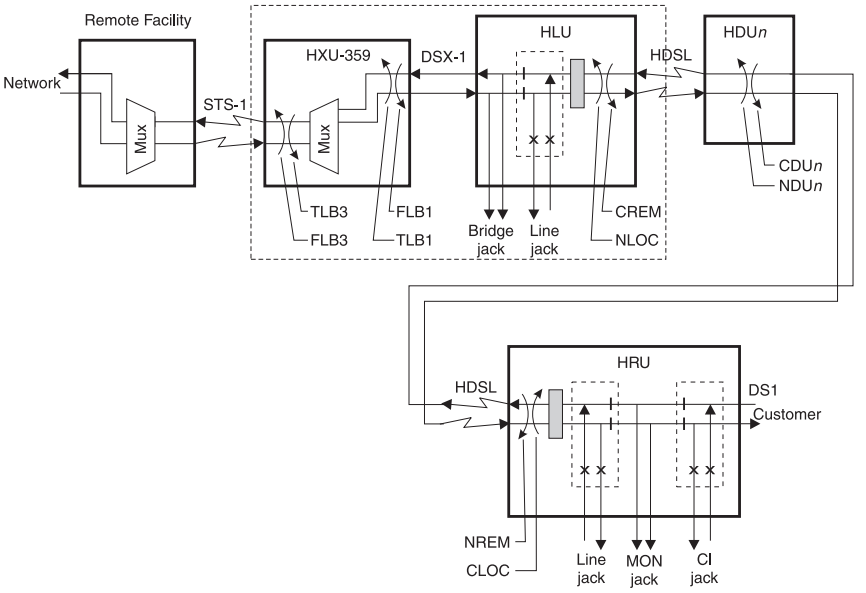

Figure 35. *System Loopbacks*

Table 16. *System Loopback Definitions*

Test Point	Loopback Definition
TLB3 (a) (b)	Terminal loopback to the customer at the STS-1 line. Activate from the **Config >Transport** menu.
FLB3 (a) (b)	Facility loopback to the network at the STS-1 line. Activate from the **Config>Transport** menu.
TLB1 (a) (b)	Terminal Loopback to the network at the DSX-1 line. Activate from the **Config>Service** menu.
FLB1 (a) (b)	Facility loopback to the customer at the DSX-1 line. Activate from the **Config>Service** menu.
CREM	Customer remote loopback is activated by selecting the line unit on the Shelf Status Screen and then the **Loopback Mode** selection from the HLU Maintenance Terminal Main Menu.
NLOC	Network local loopback is activated by selecting the line unit on the Shelf Status screen and then the **Loopback Mode** selection from the HLU Maintenance Terminal Main Menu.
CDU*n* (c)	Customer doubler *n* loopback is activated by selecting the line unit on the Shelf Status screen and then the **Loopback Mode** selection from the HLU Maintenance Terminal Main Menu.
NDU*n* (c)	Network doubler *n* loopback is activated by selecting the line unit on the Shelf Status screen and then the **Loopback Mode** selection from the HLU Maintenance Terminal Main Menu.
CLOC	Customer local loopback is activated by selecting the line of the Shelf Status screen and then the **Loopback Mode** selection from the HLU Maintenance Terminal Main Menu.
NREM	Network remote loopback is activated by selecting the line on the Shelf Status Screen and then the **Loopback Mode** selection from the HLU Maintenance Terminal Main Menu.

(a) To perform this loopback command, the STS-1 and DS1 ports can be in any mode other than IN-SRVC.
(b) Copies data in both directions. All other loopbacks send AIS to a disconnected segment.
(c) The number of the doubler.

APPENDIX A - SPECIFICATIONS

STS-1 Interface (Multiplexer)

Cable	
Line rate	51.840 megabits/s ± 20 ppm
Line code	B3ZS
Line impedance	75Ω ±5%
STS-1 span buildout	0 to 450 ft. (0 to 137.2m)

DS1 Internal Interface to Backplane

Number of lines	28 DS1s
Line rate	1.544 megabits/s ± 32 ppm output, ± 130 ppm input
Line code	AMI or B8ZS selectable (per DS1 channel)
Line impedance	100Ω ±5%, balanced
Pulse amplitude	3.0V ±0.6V
Jitter generation	<0.3 UI rms (1 UI = 648 ns)
DS1 span	1 to 655 ft. (.3 to 199.6m)
Cable	ABAM or equivalent

Environmental Requirements

Operating temperature	-13°F to 149°F (-25°C to +65°C)
Storage temperature	-13°F to 158°F (-25°C to +70°C)
Humidity	5% to 95% non-condensing
Operating altitude	0 ft. to 13,000 ft. (0 to 4000m)

Power Requirements

Input voltage	-40 Vdc to -57.5 Vdc
Power dissipation	15W maximum operating, 10W standby

Physical Dimensions

Length	9.81 in. (24.9 cm)
Width	7.72 in. (19.6 cm)
Height	.75 in. (1.9 cm)
Weight	.88 lb. (0.4 kg)

Protection Switching

Operation	Automatic or manual
Switching time	≤ 50 ms
APS activated upon receiving	BER at the STS-1 level, LOS, LOF, AIS-L, manual operation

APPENDIX B - HXU-359 DIP SWITCH CONFIGURATION

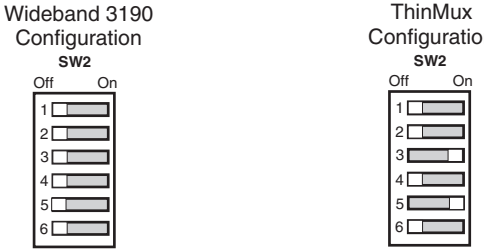

Figure 36. *Default Configurations for HXU-359 SW2*

Table 17. *HXU-359 SW2 Switch Block Settings*

SW2 Switch Block			
	Switch 1	**Switch 2**	Firmware selection (factory use only):
Switches 1 - 2	ON	ON	• Boot PROM: specify software to activate
	ON	OFF	• FLASH 1 only
	OFF	ON	• FLASH 2 only
	OFF	OFF	• Active bank per user
	OFF	**ON**	
Switch 3	OSTS	VT100	Select communications protocol for backplane
Switch 4	Menu	Command line	User interface mode
Switch 5	Chassis backplane connector	HXU front panel	Active serial port
Switch 6			Not used

APPENDIX C - FUNCTIONAL DESCRIPTION

Figure 36 shows a simplified block diagram of the HiGain Multiplexer Unit.

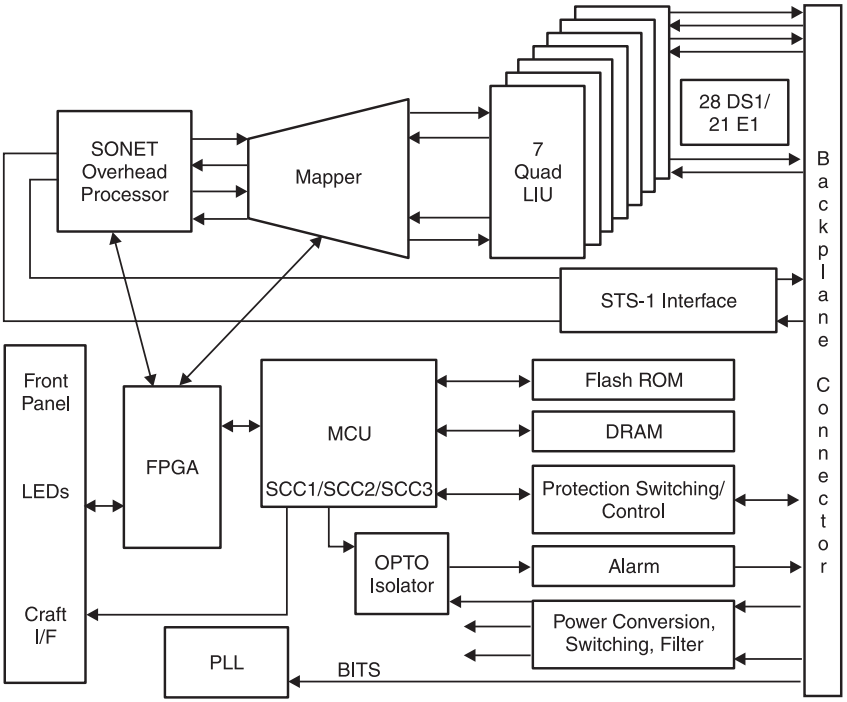

Figure 37. *Simplified Block Diagram*

In a normal system configuration, two HXU-359s are connected to the HMS-358 backplane. Both multiplexers receive data continuously from the DS1 tributaries and the HMU interface.

The HiGain Multiplexer Unit multiplexes 28 DS1 tributaries into a single STS-1 channel. All DS1 tributaries are full-duplex, four-wire, transform-isolated signals utilizing bipolar signal levels. All DS1 interfaces operate at 1.544 MHz.

APPENDIX D - PRODUCT SUPPORT

ADC Customer Service provides expert pre-sales and post-sales support and training for all its products.

TECHNICAL SUPPORT

Technical support is available 24 hours a day, 7 days a week by contacting the ADC Technical Assistance Center (TAC) at one of the following numbers:

- Telephone: 800.638.0031
  714.730.3222
  The 800 line is toll-free in the USA and Canada.
- Fax: 714.730.2400
- Email: wsd_support@adc.com
- Online: www.adc.com/knowledge_base_frames

RETURNS

To return equipment to ADC:

1 Locate the purchase order number under which the equipment was purchased. You will need to provide this number to ADC Customer Service to obtain a return authorization.

2 Call ADC Customer Service to ask for a Return Material Authorization (RMA) number and instructions before returning products. Use the telephone number, fax number, or email address listed below:

- Telephone: 800.366.3891 ext. 73748 or 952.917.3748

  The 800 line is toll-free in the USA and Canada.
- Fax: 952.917.3237
- Email Address: repair&return@adc.com

3 Be prepared to provide the following information:

- Company name, address, telephone number, and the name of a person Customer Service can contact regarding this equipment.
- A description of the equipment as well as the number of units that you are returning. Be sure to include the model and part number of each unit.
- The shipping address to which Customer Service should return the repaired equipment.
- The reason for the return.

APPENDIX E - GLOSSARY AND ABBREVIATIONS

AIS	Alarm Indication Signal — An all ones signal generated to replace the normal traffic signal when it contains a defect condition. Used to prevent consequential downstream failures being declared or alarms being raised.
ALM	Alarm
AMI	Alternate Mark Inversion
APS	Automatic Protection Switching — Installing a redundant HXU provides a standby in the event the active HXU fails.
B8ZS	Bipolar with 8-zero Substitution
BER	Bit Error Rate — The number of coding violations detected in a unit of time, usually 1 second. BER = errored bits received ÷ total bits sent.
BIP	Bit-interleaved Parity — A parity check that groups all the bits in a block into units (such as a byte), then performs a parity check for each bit position in a group.
BLER	Block Error Rate — Blocks in which one or more bits are in error. BLER = errored blocks received ÷ error blocks sent.
BPV	Bipolar Violation
CI	Customer Interface
CO	Central Office
CPE	Customer Premises Equipment
CRC	Cyclic Redundancy Check — A technique for using overhead bits to detect transmission errors.
CSA	Carrier Serving Area
CV	Code Violation — A transmission error detected by the difference between the transmitted and the locally calculated bit-interleaved parity.
DCC	Data Communications Channel — Bytes in the SONET overhead that are used to provide a communication channel between SONET network elements.
DCE	Data Communications Equipment

DCS	Distributed Communications System
DDS	Digital Data Service
DS1	Digital Signal Level 1
DSU/CSU	Digital Service Unit / Channel Service Unit — Converts digital data frames
DSX-1	Digital System Cross-connect frame
ES	Errored Seconds
ESF	Extended Superframe
EXZ	Excessive Zeroes
FCLT	Facility Loopback
GND	Ground
HDB3	High Density Binary 3 — An E1 line code.
HDSL	High-bit-rate Digital Subscriber Line
HXU	HiGain Multiplexer Unit
LBO	Line Buildout — Software-configured LBO allows selection of correct cable length for a particular location.
LINE	One or more SONET sections, including network elements at each end, capable of accessing, generating, and processing Line Overhead.
LOF	Loss of Frame — An LOF occurs when the OOF state exists for a specified time in milliseconds.
LOP	Loss of Pointer — An LOP occurs when a specified number (8, 9, or 10) of consecutive invalid pointers or consecutive new data flags are received.
LOS	Loss of Signal — An LOS is generated when the synchronous signal level drops below the threshold at which a BER of 1 in 103 is predicted. It can occur due to a cut cable, excessive attenuation of the signal, or equipment fault.
LSS	Loss of Sequence Synchronization
MDF	Main Distribution Frame
Multiplexer (MUX)	A device for combining several channels to be carried by one line or fiber.
NDU	Network Doubler Unit

NE	Network Element — Any device that is part of a SONET transmission path and serves one or more of the section, line, and path-terminating functions.
NI	Network Interface
NID	Network Interface Device
NMA	Network Management and Administration
NRZ	Non-Return to Zero — An E1 line code.
NVRAM	Non-Volatile Random Access Memory
OC-3	Optical Carrier Level 3 — The optical equivalent of an STS-1 signal.
OOF	Out of Frame — An OOF occurs when four or five consecutive SONET frames are received with errored framing patterns. The OOF state clears when two consecutive SONET frames are received with valid framing patterns.
OOS-A	Out Of Service — Administration
OOS-M	Out of Service — Maintenance
Overhead	Extra bits in a digital stream used to carry information besides traffic signals.
Path	A logical connection between a point where an STS or VT is multiplexed to the point where it is demultiplexed.
Path Trace	A user-defined value that is passed through the SONET network as a test pattern to validate path integrity.
PBX	Private Branch Exchange - Private local voice switching
PM	Performance Monitoring
RCV	Receive
RDI	Remote Defect Indication — A signal returned to the transmitting terminating equipment upon detecting a LOS, LOF or AIS defect.
REI	Remote Error Indication — An indication returned to a transmitting node (source) that an errored block has been detected at the receiving node (sink). Also know as a Far-end Block Error.

RFI	Remote Failure Indication — A failure is a defect that persists beyond the maximum time allocated to the transmission system protection mechanisms. The RFI is sent to the far end and will initiate a protection switch if this function has been enabled.
Section	The span between two SONET network elements capable of accessing, generating, and processing only SONET section overhead. This is the lowest layer of the SONET protocol stack with overhead.
SEF	Severely Errored Frame
SES	Severely Errored Seconds
SONET	Synchronous Optical Network — A standard for optical transport that defines optical carrier levels and their electrically equivalent synchronous transport signals (STSs). Provides significant configuration flexibility and bandwidth availability over older telecommunications systems. SONET defines a technology for carrying many signals of different capacities through a synchronous, flexible, optical hierarchy. This is accomplished by means of a byte-interleaved multiplexing scheme.
SPE	Synchronous Payload Envelope — The SONET frame format used to transport payload and STS path overhead. A SONET structure that carries the payload (service) in a SONET frame or virtual tributary. The STS SPE may begin anywhere in the frame's payload envelope. The VT SPE may begin anywhere in a floating mode VT, but it begins at a fixed location in a locked-mode VT.
SPLB	Special Loopback.
STS-1	Synchronous Transport Signal, Level 1 — The basic SONET building block signal transmitted at 51.84 Mb/s data rate.
STS-N	Synchronous Transport Signal, Level N — The signal obtained by multiplexing integer multiples (N) of STS-1 signals together.
TAO	Terminal Access Option.
TL1	Transaction Language 1.
Transport	The STS-1 interface.
TSA	Time Slot Assignment
UAS	Unavailable Seconds
UL	Underwriters Laboratories

VT	Virtual Tributary — A signal designed for transport and switching of sub-STS-1 payloads.
VTG	VT Group — A 9 row by 12 column structure (108 bytes) that carries one or more VTs of the same size. An STS-1 payload can accommodate seven VT groups.
VTP	VT Path — See Path.
VT Slot	There are four VT slots in each of the seven VT groups. Future product enhancements will allow the VT slots to be configured to carry either 1.544 Mb/s (VT1.5) or 2.048 Mb/s (VT2) traffic.
Wideband	Services requiring 1.5 to 50 Mb/s transport capacity.
XMT	Transmit
Yellow Signal	A Remote Alarm Indication (REI) and VT Path Remote Failure Indication.

INDEX

I

L

M

P

R

S

T

V

W

X

CERTIFICATION AND WARRANTY

FCC CLASS A COMPLIANCE

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

LIMITED WARRANTY

ADC DSL Systems, Incorporated (“ADC”) warrants that, for a period of sixty (60) months from the date of shipment, the hardware portion of its products will be free of material defects and faulty workmanship under normal use. ADC's obligation, under this warranty, is limited to replacing or repairing, at ADC's option, any such hardware product which is returned during the 12-month warranty period per ADC's instructions and which product is confirmed by ADC not to comply with the foregoing warranty.

ADC warrants that, for a period of 90 days from the date of purchase, the software furnished with its products will operate substantially in accordance with the ADC published specifications and documentation for such software. ADC’s entire liability for software that does not comply with the foregoing warranty and is reported to ADC during the 90-day warranty period is, at ADC’s option, either (a) return of the price paid or (b) repair or replace of the software. ADC also warrants that, for a period of thirty (30) days from the date of purchase, the media on which software is stored will be free from material defects under normal use. ADC will replace defective media at no charge if it is returned to ADC during the 30-day warranty period along with proof of the date of shipment.

The transportation charges for shipment of returned products to ADC will be prepaid by the Buyer. ADC will pay transportation charges for shipment of replacement products to Buyer, unless no trouble is found (NTF), in which case the Buyer will pay transportation charges.

ADC may use reconditioned parts for such repair or replacement. This warranty ***does not*** apply to any product which has been repaired, worked upon, or altered by persons not authorized by ADC or in ADC's sole judgment has subjected to misuse, accident, fire or other casualty, or operation beyond its design range.

Repaired products have a 90-day warranty, or until the end of the original warranty period—whichever period is greater.

ADC DISCLAIMS ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO ITS PRODUCTS AND ANY ACCOMPANYING WRITTEN MATERIALS. FURTHER, ADC DOES NOT

WARRANT THAT SOFTWARE WILL BE FREE FROM BUGS OR THAT ITS USE WILL BE UNINTERRUPTED OR REGARDING THE USE, OR THE RESULTS OF THE USE, OF THE SOFTWARE IN TERMS OF CORRECTNESS, ACCURACY, RELIABILITY OR OTHERWISE.

MODIFICATIONS

Any changes or modifications made to this device that are not expressly approved by ADC DSL Systems, Inc. voids the user's warranty.

All wiring external to the products should follow the provisions of the current edition of the National Electrical Code.

STANDARDS COMPLIANCE

The HiGain Multiplexer Unit has been tested and verified to comply with the applicable sections of the following standards:

- GR 63-CORE - Network Equipment-Building System (NEBS) Requirements
- GR 1089-CORE - Electromagnetic Compatibility and Electrical Safety
- Binational standard, UL-1950/CSA-C22.2 No. 950-95: Safety of Information Technology Equipment

For technical assistance, refer to “Appendix D - Product Support” on page 59.

ADC DSL Systems, Inc.
14402 Franklin Avenue
Tustin, CA 92780-7013
Tel: 714.832.9922
Fax: 714.832.9924

Technical Assistance
Tel: 800.638.0031
Tel: 714.730.3222
Fax: 714.730.2400

DOCUMENT: LTPH-UM-1127-01, ISSUE 1

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