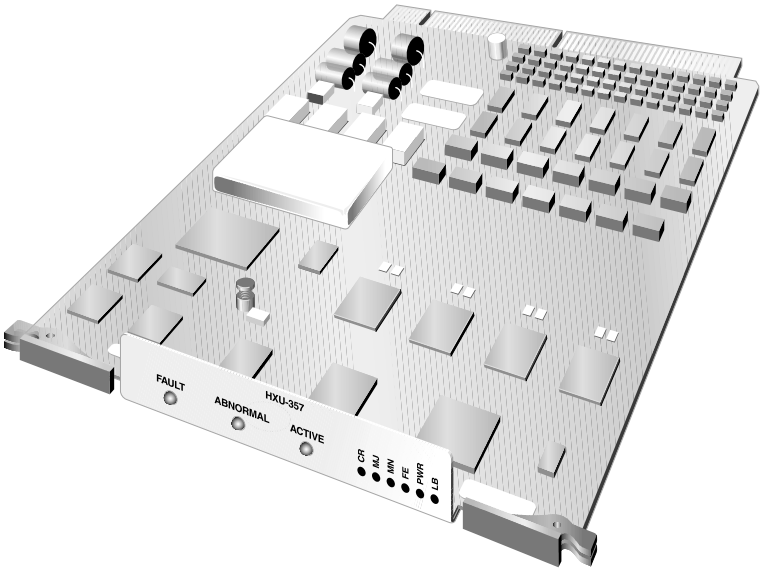
HiGain

USER MANUAL



HXU-357 List 1 HiGain Multiplexer Unit
Product Catalog: 150-2206-01
CLEI: T3D1JP0EAA

ADC

Revision History of This Manual

Revision	Release Date	Revisions Made
01	February 9, 1999	Initial Release
02	March 8, 2002	ADC rebranding

USING THIS MANUAL

The following conventions are used in this manual:

- `Monospace type` indicates screen text, including text you type at a screen prompt.
- 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.
- Two types of messages, identified by icons, appear in text.

Notes contain information about special circumstances.

Cautions indicate the possibility of equipment damage, potential loss of customer data or service, or the possibility of personal injury.

For a list of abbreviations used in this document, refer to "Appendix D - Glossary" on page 63.

RELATED DOCUMENTATION

Document Number	Title
400-100-100-xx	TL1 Command Set Reference
800-357-100-xx	HMS-357 List 1 HiGain Wideband 3190
150-357-100-xx	HFA-357 List 1 HiGain Fan Assembly
150-319-107-xx	HMU-319 List 7 and 7A HiGain Management Unit

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 DSL Systems, Inc. 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 DSL Systems, Inc. as described in "Appendix C - Product Support" on page 60. If you must store the equipment for a prolonged period, store the equipment in its original container.

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OVERVIEW

The HiGain® Multiplexer Unit HXU-357 List 1 is the newest generation of broadband multiplexers. It offers a low-cost multiplexing solution that features low-power consumption and a data transfer rate of 45 mbps. The HXU-357 is designed for HiGain Wideband 3190s that provide a complete T1 delivery system using a standard open architecture system in a 23-inch rack space. These HiGain systems multiplex DS1 channels into a single, industry-standard DS3 data channel. The HXU-357 is capable of transmitting and receiving up to 28 DS1 signals over a DS3 interface. It also displays standard office alarms (Figure 1).

When used in a protection configuration comprised of two multiplexers (one active and the other as a standby), each card monitors the integrity of the user data and automatically switches out a faulty unit.

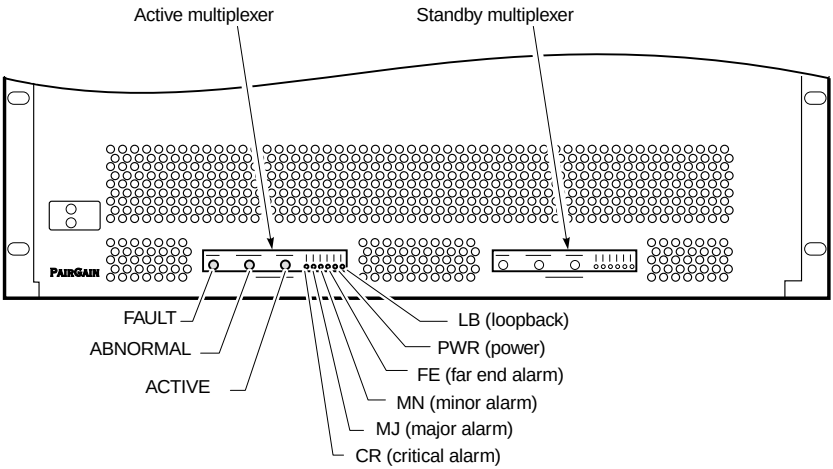


Figure 1. *HXU-357 Multiplexers Installed in Wideband 3190*

FEATURES

- complete software provisioning
- advanced management using Terminal Access Option (TAO) or Transaction Language 1 (TL1) software (through an HMU-319 List 7 or List 7A)
- software-selectable DS3 local and network loopback
- DS1 line code and loopback options
- downloadable software
- automatic and manual protection switching
- password protection
- internal diagnostics testing
- office alarms (Major, Minor, Far-End, Critical)
- front panel status indicators

APPLICATION

The HXU-357 allows you to combine 28 lines into one high-speed DS3 interface, thus providing a substantial cost savings over 28 individual HDSL lines.

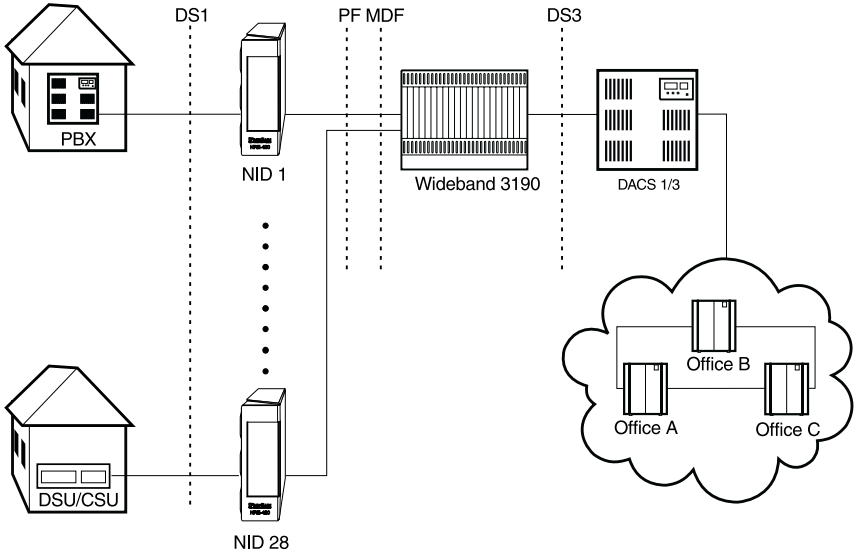


Figure 2. *HiGain Wideband 3190 Application*

DESCRIPTION

This section provides a general functional overview and describes the key components of the HXU-357 multiplexer.

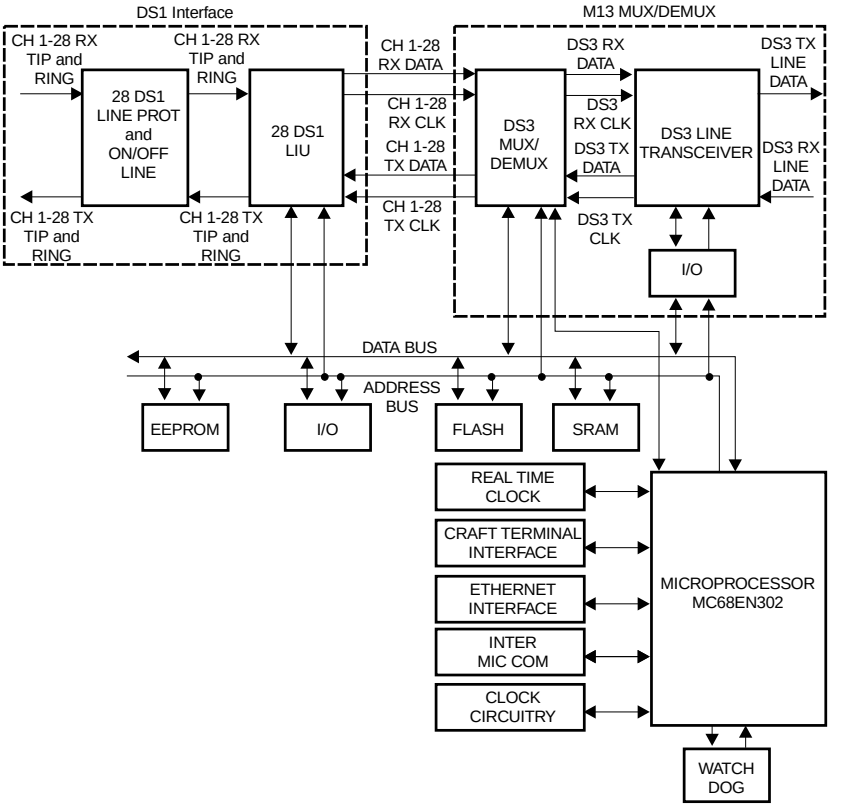


Figure 3. *HXU-357 Multiplexer Block Diagram*

Functional Overview

Transmit Signal Flow

In the transmit direction, the HXU-357 takes the 28 incoming bipolar, asynchronous, Tl low-speed signals, and adds line conditioning. It then multiplexes the signals with DS3 overhead data and stuffing bits to produce an industry-standard DS3 data stream.

The DS3 data and timing signals are converted into a signal for coaxial interface to external equipment. In a 1:1 protection configuration, the microprocessor on each card monitors the integrity of the transmit data signal from the active (primary) and standby card and communicates with the other to determine the online card.

Receive Signal Flow

In the receive direction, the HXU-357 converts the incoming DS3 signal into clock and data signals for interface to the demultiplexer circuitry. In a 1:1 protection configuration, the microprocessor on each card monitors the integrity of the receive data signal and communicates with the other to determine the online card.

The demultiplexer circuitry receives the DS3 data and timing signals and demultiplexes them into the 28 DS1 signals. All stuffing bits added for bit synchronization at the transmitting end of the system are deleted from the data stream prior to line signal encoding.

Protection Switching

In a 1:1 protected configuration, the primary card is defined as the active or online card. The secondary card is the standby. The microprocessors on each card communicate with each other to determine active and standby status.

When a card fails, either because the external watch dog timer timed-out or because the software detected a failure of the hardware, a priority switch is initiated. If the failure is on the primary card, a priority switch to the secondary card occurs. Priority switching occurs from the secondary card to the primary card and, if necessary, back again until the fault is corrected or more than three switches occur in a 10-minute period.

LED Indicators

The HXU-357 provides several LED indicators for monitoring power and alarm status. Figure 4 identifies the location of these indicators. Table 1 describes the various indicators.

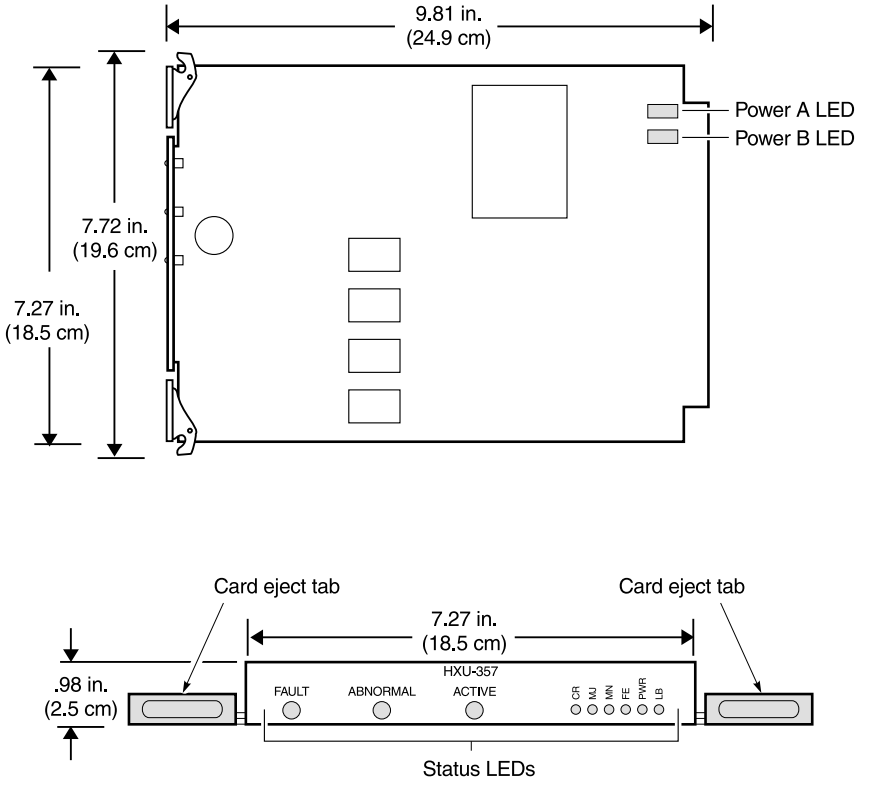


Figure 4. *LED Indicators*

Table 1. *HXU-357 LED Indicators*

Indicator	Type	Illuminates when …
FAULT (red)	Fault	a critical (CR), major (MJ) or minor (MN) alarm condition exists.
ABNORMAL (yellow)	Abnormal	an external status condition exists.
ACTIVE (green)	Active	the multiplexer is online.
CR (red)	Critical	a service-affecting fault exists or more than four DS1 inputs are removed or faulty.
MJ (red)	Major	a service-affecting fault exists or up to four DS1 inputs are removed or faulty.
MN (yellow)	Minor	a potential service-affecting fault exists.
FE (yellow)	Far-End	any remote alarm exists and also illuminates when an alarm or loopback occurs at the far end.
PWR (green)	Power	power (A and B) is applied to the multiplexer card and the card is operating normally.
PWR A (green)	Power Supply A	-48 Vdc is being supplied to leg A of the power supply circuit. Located near the card connector.
PWR B (green)	Power Supply B	-48 Vdc is being supplied to leg B of the power supply circuit. Located near the card connector.
LB (yellow)	Loopback	a local DS1 or DS3 loopback is active.

For a more complete description of Critical, Major, Minor, Far-End and Abnormal alarms, see Table 10 on page 40.

Alarm Drivers

The microprocessor drives the alarm relays for the multiplexer unit. The relay outputs are wire-ORed from both cards on the back left side of the Wideband System 3190 chassis and are read by the HMU, which in turn combines this information to generate Critical, Major, Minor, and Far-End alarm outputs.

Interfaces

Address/Data Bus

A bidirectional data bus controls the transfer of data to and from the microprocessor in response to the state of the read/write control line.

The alarm inputs to the HXU-357 multiplexer card enter at the data bus. When an alarm signal is received, the corresponding alarm LED on the front panel of the HXU-357 illuminates. The HXU-357 sends independent alarm signals to activate critical (CR), major (MJ), minor (MN), and far-end (FE) alarm relays on the HMU-319 List 7 or List 7A management unit.

HiGain Management Unit Interface

The multiplexer card interfaces with the HMU over a serial RS-232 interface. The HMU provisions the system parameters (for example, setting the BER threshold), performs maintenance tasks, and monitors system status.

DS1 Interface

The DS1 signals enter the HXU as balanced, half-width bipolar waveforms where they are converted to DS1 NRZ data and clock signals by the T1 Line Interface Unit (LIU). (See Figure 3 on page 4.) The LIU also provides BPV detection and loopback functions.

Signals transmitted by the HXU are converted back to bipolar DSX-1 before they are presented to the 28 Tip and Ring interfaces on the card.

The Line Protection block provides high-voltage protection and a line protection switch.

Microprocessor

The microprocessor reads and writes data to the bidirectional data bus using a system clock of 40 MHz divided down to 20 MHz.

The microprocessor performs arithmetic and logic operations as directed and monitors various alarm point functions throughout the multiplexer. These tasks include:

- illuminating appropriate fault and status indicators on the circuit card.
- using lockout software to isolate a fault condition to a specific card, thereby suppressing down-line faults due to sympathetic alarm conditions.
- performing automatic switching from the defective multiplexer card to the standby card.
- calculating DS3 BER for the online and offline cards.
- calculating the bipolar violation (BPV) errored-seconds performance for each DS1 low-speed input and DS3 channel inputs.
- providing remote alarm reporting, external to the multiplexer, using relay contact closures to indicate major, minor, critical, abnormal and far-end alarm conditions.

Microprocessor System Software

The microprocessor system software supports the following operational, administrative, maintenance and provisioning features:

- performance management: retrieves and schedules all performance management parameters, thresholds and histories.
- configuration management: enters, edits, deletes, and retrieves provisionable parameters.
- fault management: clears and views current alarms, views 100-event alarm history log.
- system administration: logs in, initializes, edits password, and manages user names.

- controls: operates and releases controls, including loopback and switching.
- Simple Management Network Protocol (SNMP): supports both standard and proprietary Management Information Bases (MIBs); supports SNMP version I and MIB II.

You can download the HXU-357 software over the Ethernet connection or locally by a maintenance terminal connected to the craft port of an HMU-319 List 7 or List 7A. This operation is under software control. See "Upgrading the Multiplexer Software" on page 46.

Multiplexer / Demultiplexer Circuitry

The HXU-357 accepts up to 28 DS1 (data and clock) signals and multiplexes them into an electrical DS3 clock and data signal. It also demultiplexes the electrical DS3 clock and data signal into 28 DS1 (data and clock) signals. The transceiver converts the NRZ signals to a bipolar drive for the coax cable.

The HXU-357 firmware controls multiplexer operation. The firmware allows the local multiplexer to perform tests as well as initiate loopbacks on the far-end multiplexer.

Memory

Resident software programming is permanently stored in three types of memory: EEPROM, Flash RAM, and SRAM. Each can be upgraded from 1 MB to 2 MB.

In addition to the three memories mentioned above, there are four 16-bit registers (two read registers and two write-parallel registers).

Clock Circuit

The microprocessor derives its clock source from a crystal oscillator operating at 40 MHz divided down to 20 MHz. This provides the timing references at the clock input for the HXU-357.

Watchdog Timer

If the watchdog timer does not receive a strobe pulse within 200 ms, a time-out condition occurs, resulting in a hardware reset. The watchdog timer also provides two other vital functions:

- power-up hardware reset during power-up conditions
- voltage monitoring that indicates when the +5 Vdc falls out of tolerance (+/-0.5 Vdc).

Real Time Clock

The Real Time Clock (RTC) is supported through the Serial Communication Port (SCP) on the microprocessor. The SCP consists of independent transmit and receive section and a common clock generator. A serial alarm RTC provides a full Binary Coded Decimal (BCD) clock calendar.

DC-to-DC Converter

The HXU-357 accepts two inputs of -48 Vdc from the A and B battery supplies. Both the supply and return lines have isolated fault paths. The converter supplies the primary +5 Vdc for the HXU-357.

INSTALLATION

This section provides basic installation procedures.

UNPACKING

Before installing the HXU-357, visually check its packaging to ensure that it has sustained no shipping damage. Immediately report any damage to the shipping agent.

SAFETY PRECAUTIONS

The HXU-357 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 and on the chassis backplane.)**
- **When working with the HXU-357, place it on an electrically grounded antistatic mat.**
- **Properly store in antistatic packing material any HXU-357 that is removed from the Wideband 3190.**

INSTALLING THE HXU-357

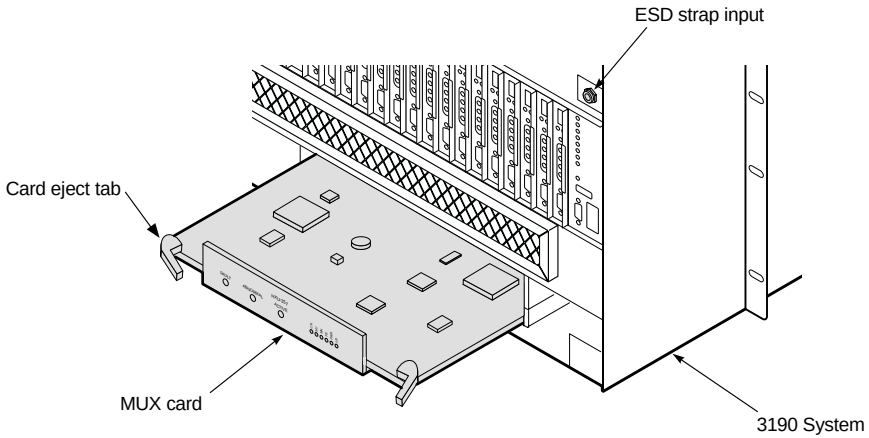


Figure 5. *Installing an HXU-357 Multiplexer Card*

These instructions assume you are replacing a standby multiplexer in a Wideband 3190 that is completely assembled and operational.

If this is a first-time installation of an HXU-357 multiplexer (not a replacement installation), consult the Wideband 3190 Installation Guide for step-by-step instructions for installation and provisioning. A first-time installation of an HXU-357 needs to be undertaken in the context of a complete Wideband 3190 installation.

HXU-357 multiplexer cards are installed from the front of the Wideband 3190 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 above the HMU slot.

3 Remove the standby multiplexer you are replacing by opening the card eject tabs and pulling the card out of the tray.

4 Align the edges of the replacement card with the guide rails 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 when the multiplexer card is installed. The power LED and activity LED on the active multiplexer remain illuminated. The LEDs on the inactive (standby) multiplexer should be off.

Once installed in a working system, the replacement HXU-357 is automatically configured for that system by the active HXU-357 in the shelf.

PROVISIONING

This section provides general information about configuring and managing the HXU-357 through the HMU-319 List 7 or List 7A, which use Terminal Access Option (TAO) management software.

Refer to the Wideband 3190 Installation manual and the technical practice for the HMU-319 List 7 or List 7A for complete information about:

- connecting a maintenance terminal
- accessing the management interface
- logon and logoff
- navigating the various TAO screen menus and options
- changing passwords

Also refer to your Central Office (CO) system plans for provisioning details.

ACCESSING THE MANAGEMENT INTERFACE

The HiGain Management Unit interface presents the user with an interactive, text-based, menu-driven interface that configures, monitors, and controls a HiGain Wideband 3190 and all the components that it comprises. By connecting a local or remote maintenance terminal to the HMU-319 List 7 or List 7A, you gain access to the craft port user interface which displays menus and prompts to guide you through a provisioning process.

Figure 6 on page 16 shows the general structure of the TAO software. It provides access to the HLU maintenance terminal screens and to the Root Menu (the HXU-357 software interface).

If you would like more information about the TAO software, refer to the technical practice for the HMU-319 List 7 or List 7A, or to the Provisioning Reference section of the Wideband 3190 Installation Manual.

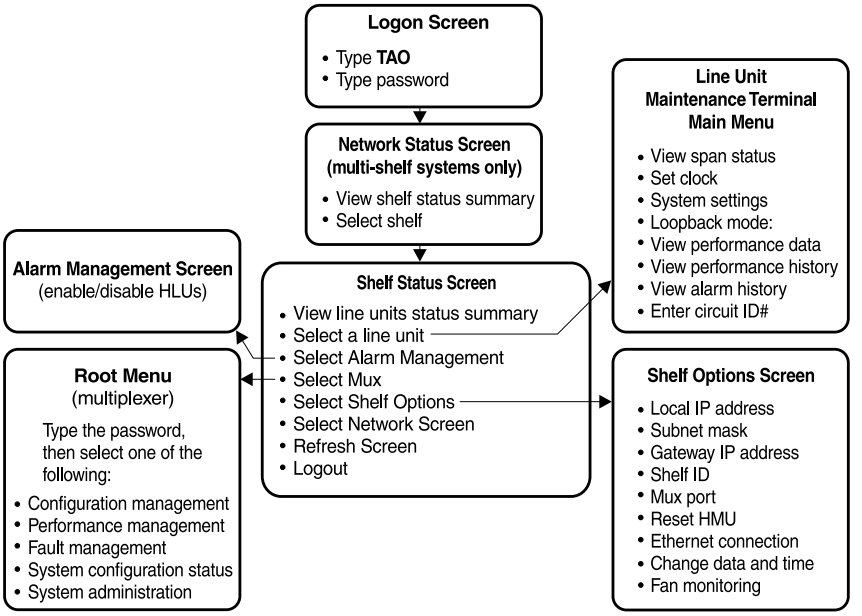


Figure 6. *Management Interface*

ACCESSING THE HXU-357 ROOT MENU

Like the HMU-319 and the line units in a Wideband 3190, the multiplexer unit has its own set of configuration screens. If you are merely replacing a standby multiplexer, no configuration should be needed.

- Figure 7 shows the introductory Root Menu screen for the multiplexer unit. This is accessed through the HMU-319 List 7 or List 7A TAO program.
- Table 2 on page 18 lists navigational keyboard commands for the Root Menu.
- Figure 8 on page 19 is a graphical representation of the basic menus and submenus available under the Root Menu.
- Table 3 on page 20 through Table 7 provide detailed information about all the configuration selections available under the Root Menu.

The Root Menu is accessible from the TAO Shelf Status screen.

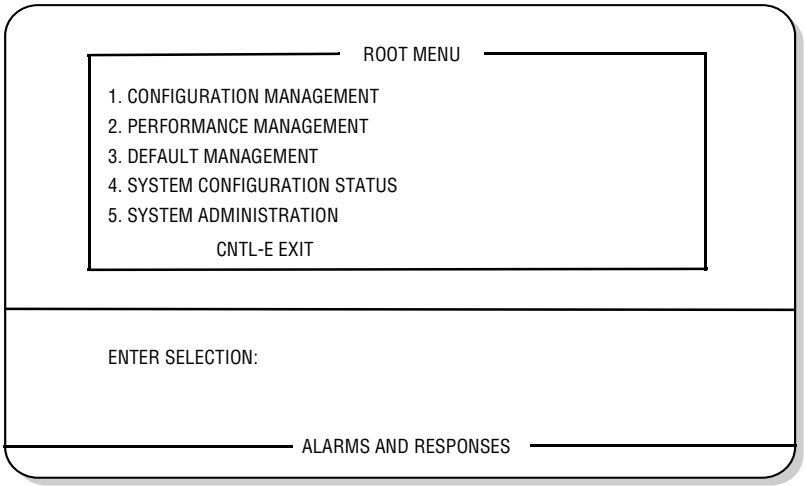


Figure 7. *Root Menu*

To view HXU-357 related screens in their proper format, the maintenance terminal needs to be fully VT100-compliant.

To log onto the multiplexer interface (Root Menu):

1. Log onto the maintenance terminal connected to the HMU craft port.
2. Type **TAO** at the prompt (<), and then press **ENTER** to invoke TAO.
3. Type the password, and then press **ENTER**. The default password is `public`.
4. From the Network Status screen, type the number of the desired shelf ID (1 through 32), and then press **ENTER**.
5. From the Shelf Status screen, type **M** to log onto the HXU-357.
6. At the (ID:) prompt, enter the password to access the Root Menu. The default password is `public`.

7 Select one of the Root Menu submenus:

- Configuration Management **1** (to configure DS1 and DS3 interfaces, select loopback modes, place in service and equip, and enable protection switching)
- Performance Management **2** (to view performance statistics)
- Fault Management **3** (to view alarm history and current alarm status)
- System Configuration Status **4** (to view DS1 and DS3 status, system status, IP addresses, and card inventory)
- System Administration **5** (to change password, system settings and IP addresses and to download multiplexer software)

Table 2 lists various keyboard commands which can be used to navigate the Root menu.

Table 2. *Keyboard Commands*

Keyboard Command	Description
CTRL + D	Scroll the status buffer down a page
CTRL + E	Exit (return to "ID:" prompt)
CTRL + P	Return to previous menu
CTRL + R	Return to Root / Main Logon menu
CTRL + U	Scroll the status buffer up a page

In Tables 3 through 7, default options are marked with an asterisk (*). Selection of configuration and management options must be based upon the particular requirements of your system as defined by the CO.

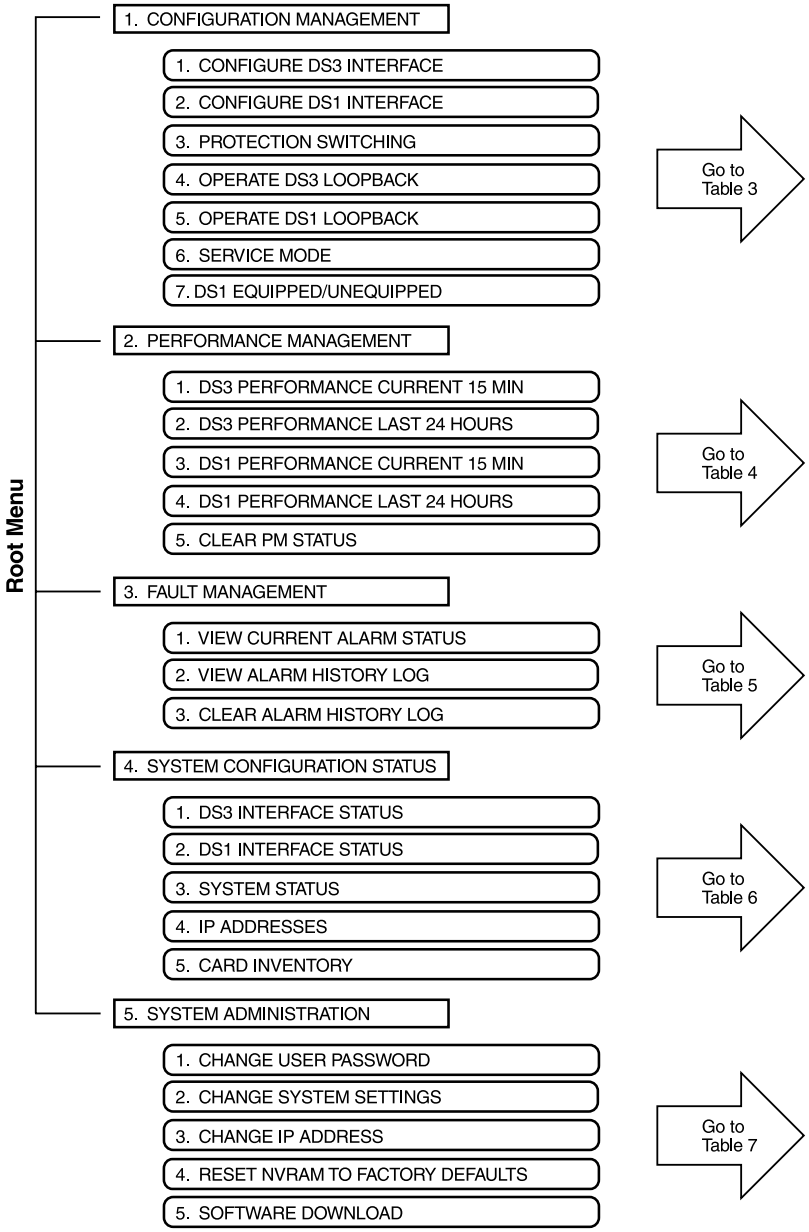


Figure 8. *Root Menu for Multiplexer Configuration*

Table 3. *Configuration Management*

Type 1, 1 to select…	CONFIGURE DS3 INTERFACE
(See "Configuring the HXU DS3 Interface" on page 33.)	1 Configure DS3 mode = 1 C-Bit parity mode 2 M13 mode* 2 Configure DS3 line buildout 1 Set buildout to 0-50 ft.* 2 Set buildout to 50-450 ft. 3 Configure DS3 transmit timing 1 Set transmit timing to local* 2 Set transmit timing to loop 4 Configure DS3 BER threshold 1 Set threshold to $1x10^{-6}$ 2 Set threshold to $1x10^{-7}$ 3 Set threshold to$1x10^{-8}$ 4 Set threshold to $1x10^{-9}$*

* Default selection

Table 3. *Configuration Management (Continued)*

Type 1, 2 to select…	CONFIGURE DS1 INTERFACE
(See "Configuring the HXU DS1 Interface" on page 34.)	0 All channels 1 thru 28 individual channel
These settings affect the HXU-to-HLU interface within the chassis. If a standard HLU is used, always set the DS1 interface to the default selections.	1 Set DS1 line code CH# Line code 1 Set to (A)MI 2 Set to (B)8ZS* 2 Set DS1 line buildout CH# Line Bldout 1 Set to 0-133 ft.* 2 Set to 133-266 ft. 3 Set to 266-399 ft. 4 Set to 399-533 ft. 5 Set to 533-665 ft.
	1 2 12345678901234567890123456 78 A.....A 1 2 12345678901234567890123456 78 1111. 1
Type 1, 3 to select…	PROTECTION SWITCHING
An excessive number protection switches causes an alarm that can only be cleared by this menu selection.	1 Protection mode 1 Allow protected mode 2 Switch traffic 1 Online card = Switch traffic card 3 Clear TMS 1 Clear TMS
Type 1, 4 to select…	OPERATE DS3 LOOPBACK
(See "Troubleshooting" on page 52.)	1 Initiate facility loopback 2 Initiate terminal loopback 3 Initiate remote facility loopback 4 Release loopback*

* Default selection

Table 3. *Configuration Management (Continued)*

Type 1, 5 to select…	OPERATE DS1 LOOPBACK
(See "Troubleshooting" on page 52.)	0 All channels 1 thru 2 8 individual channel CH# 1 2 Loopback 12345678901234567890123456 78 Status F..... 1 Enable (F)acility loopback 2 Enable (T)erminal loopback 3 Enable (R)emote terminal loopback 4 Release loopback*
Type 1, 6 to select…	SERVICE MODE
(See "Placing the HXU DS3 Interface in Service" on page 36.)	1 DS3 service mode 1 Set to IN-SERVICE* 2 Set to OUT-OF-SERVICE 2 DS1 service mode 0 All channels 1 thru 2 8 individual channel Channel = CH# 1 2 Service 12345678901234567890123456 78 Mode I I I I . . . . 1 Set to (I)N-SERVICE 2 Set to (O)UT-OF-SERVICE*

* Default selection

Table 3. *Configuration Management (Continued)*

Type 1, 7 to select…	DS1 EQUIP / UNEQUIP
(See "Placing the HXU DS1 Interface in Service" on page 35.)	Select DS1 channel 0 All channels 1 thru 28 individual channel Channel = CH# 1 2 EQPT 12345678901234567890123456 78 State U U U U . . . . 1 Set state to (E)QUIPPED 2 Set state to (U)NEQUIPPED*

* Default selection

Table 4. *Performance Management*

Type 2, 1 to select…	DS3 PERFORMANCE CURRENT 15 MINUTES
See "Viewing Performance at the HXU" on page 45.	Line code violations (CV) = Line errored seconds (LES) = P-bit code violations (PCV) = P-bit errored seconds (PES) = P-bit severely errored seconds (PSES) = C-bit code violations (CCV) = C-bit errored seconds (CES) C-bit severely errored seconds (CSES) = Severely errored framing seconds (SEFS) = Unavailable seconds (UAS) =

Table 4. *Performance Management (Continued)*

Type 2, 2 to select…	DS3 PERFORMANCE LAST 24 HOURS Line code violations (CV) = Line errored seconds (LES) = P-bit code violations (PCV) = P-bit errored seconds (PES) = P-bit severely errored seconds (PSES) = C-bit code violations (CCV) = C-bit errored seconds (CES) C-bit severely errored seconds (CSES) = Severely errored framing seconds (SEFS) = Unavailable seconds (UAS) Total switches =
Type 2, 3 to select… This only monitors the HXU-to-HLU interface. For more information, access the HLU Maintenance Terminal screens.	DS1 PERFORMANCE CURRENT 15 MINUTES Channel 1 2 3 4 5 6 7 ..... Errors = 0 0 0 0 0 0 0..... Error seconds 0 0 0 0 0 0 0 .....
Type 2, 4 to select… This only monitors the HXU-to-HLU interface.	DS1 PERFORMANCE LAST 24 HOURS Channel 1 2 3 4 5 6 7 ..... Errors = 0 0 0 0 0 0 0..... Error seconds 0 0 0 0 0 0 0 .....
Type 2, 5 to select…	CLEAR PM STATS
This only monitors the HXU-to-HLU interface.	1 Clear all PM DS3 and DS1 status

Table 5. *Fault Management*

Type 3, 1 to select…	VIEW CURRENT ALARM STATUS (See Table 10 on page 40 for a listing of HXU-357 alarms reported by the multiplexer.)
Type 3, 2…	VIEW ALARM HISTORY LOG
Type 3, 3…	1 CLEAR ALARM HISTORY LOG

Table 6. *System Configuration Status*

Type 4, 1 to select…	DS3 INTERFACE STATUS
(See "Viewing System Configuration Status" on page 44.)	Operating mode = (C-bit / P-bit parity) Line code = B8ZS Line buildout = (0-50 ft. / 50 to 450 ft.) Transmit timing = (local / loop) BER threshold = (BER alarm setting) BER value = (current BER setting) Loopback = (none, facility, terminal, remote facility) Service mode = (IN-SERVICE / OUT-OF-SERVICE)
Type 4, 2 to select…	DS1 INTERFACE STATUS Select channel (1-28 channel number) Channel = channel number Line code = AMI / B8ZS Line buildout = length in feet Loopback = (none, facility, terminal, remote facility) Service mode = (IN-SERVICE / OUT-OF-SERVICE)
Type 4, 3 to select…	SYSTEM STATUS Protective mode = protected / unprotected On-line card = (A/B) Date = (MM/DD/YYYY) Time = (HH:MM:SS) System name = System 3190 System location = unknown location Contact person = default name
Type 4, 4…	IP ADDRESSES
These addresses must match those defined under the HMU. See "Appendix B - Network Addresses" on page 56.	Local IP address = 0.0.0.0 Subnet mask = 255.255.255.0 Gateway IP address = 0.0.0.0 Trap IP address #1 = 0.0.0.0 (enter IP address of HMU) Trap IP address #2 = 0.0.0.0 Trap IP address #3 = 0.0.0.0 Trap IP address #4 = 0.0.0.0 Local C-bit IP address = 0.0.0.0 (not used) Remote C-bit IP address = 0.0.0.0 (not used) C-bit subnet mask = 0.0.0.0 (not used)

Table 6. *System Configuration Status (Continued)*

Type 4, 5 to select…	CARD INVENTORY
Card Inventory lists multiplexer hardware revision numbers, serial number, manufacture date, CLEI code, software revision and release date, and the multiplexer hardware address.	M13 CCA420 = (#######) M13 CCA = (#######) M13 CCB = (#######) M13 CCP = (#######) M13 Serial # = (#######) Manufacture date = (MM/DD/YYYY) CLEI = (####) M13 software rev. = (#######) SW release date = (MM/DD/YYYY) MAC address = (####)

Table 7. *System Administration*

Type 5, 1 to select…	CHANGE USER PASSWORD
(The default password is `public`.)	User password = The new password should consist of 30 alphanumeric characters or less. Enter new password:
Type 5, 2 to select…	CHANGE SYSTEM SETTINGS
(See "Setting up System Administration" on page 32. System settings must match those selected for the HMU-319 List 7 or List 7A installed in the Wideband 3190.)	1 Date = (MM/DD/YYYY) Enter date: 2 Time = (HH:MM:SS) Enter time: 3 System name = Enter name: 4 System location = Enter location: 5 Contact person = Enter person:

Table 7. *System Administration (Continued)*

Type 5, 3 to select…	CHANGE IP ADDRESS
(See "Setting up System Administration" on page 32 and "Appendix B - Network Addresses" on page 56.	1 Local Ethernet IP address = 0.0.0.0 Enter address: 2 Subnet mask = 255.255.255.0 Enter mask: 3 Gateway IP address = 0.0.0.0 Enter address: 4 Trap IP address #1 = 0.0.0.0 (set to HMU local IP address) Enter address: 5 Trap IP address #2 = 0.0.0.0 Enter address: 6 Trap IP address #3 = 0.0.0.0 Enter address: 7 Trap IP address #4 = 0.0.0.0 Enter address: 8 Local C-bit IP address = 0.0.0.0 (not used) Enter address: 9 Remote C-bit IP address = 0.0.0.0 (not used Enter address: 10 C-bit subnet mask = 0.0.0.0 (not used Enter mask:
Type 5, 4 to select…	RESET NVRAM TO FACTORY DEFAULT
(For a list of factory defaults, see Table 11 on page 50.)	1 Reset NVRAM Please read the caution in "Restoring Factory Defaults" on page 49 before resetting NVRAM.

Table 7. *System Administration (Continued)*

Type 5, 5 to select…	SOFTWARE DOWNLOAD
(See "Upgrading the Multiplexer Software" on page 46.)	Filename = 0.0.0.0 Server IP address = 0.0.0.0 1 Set filename Set the download filename (maximum of 30 characters) 2 Set server IP address Set IP address (XXX.XXX.XXX.XXX) 3 Download controls 1 Start download 4 Start new program Warning system will reset 1 Start downloaded program

MINIMAL CONFIGURATION REQUIREMENTS

Replacement of a standby HXU-357 does not ordinarily require configuration changes. The online multiplexer automatically configures the standby multiplexer.

Following is a checklist of minimal configuration tasks for HXU-357 operation. This list is intended only as a guideline and should be subordinate to any system installation plan.

1 Set up the multiplexer channel. (See "Setting up the Communications Channel to the HXU-357" on page 31.)

2 Configure system settings by selecting System Administration from the Root Menu. For more information, refer to "Setting up System Administration" on page 32.

Type 5, 2 Change System Settings. Provide the necessary information for the following selections. These settings should match the settings for the HMU.

1 Date =

2 Time =

3 System name =

4 System location =

5 Contact person =

3 Set up network addressing under System Administration. These settings should match the settings for the HMU. For more information, refer to "Setting up System Administration" on page 32.

Type 5, 3 Change IP Address. Supply the necessary address information.

1 Local Ethernet IP Address =

2 Subnet mask =

3 Gateway IP address =

4 Trap IP address #1 =

5 Trap IP address #2 =

6 Trap IP address #3 =

7 Trap IP address #4 =

4 Configure the HXU DS3 interface under Configuration Management. For more information, see "Configuring the HXU DS3 Interface" on page 33.

Type 1, 1 Configure DS3 Interface.

1 Configure DS3 mode

2 Configure DS3 line buildout

5 Configure the HXU DS1 interface under Configuration Management. These settings much match the HLU configuration. For more information, see "Configuring the HXU DS1 Interface" on page 34.

Type 1, 2 Configure DS1 Interface

Select a channel or all channels

1 Set the line code

2 Set the line buildout

6 Equip the DS1 channel under Configuration Management. For more information, see "Placing the HXU DS1 Interface in Service" on page 35.

Type 1, 7 DS1 Equip / Unequip

1 Equip channel(s)

7 Place the DS3 and DS1 channels in service under Configuration Management. For more information, see "Placing the HXU DS1 Interface in Service" on page 35 and "Placing the HXU DS3 Interface in Service" on page 36.

1 DS3 service mode

1 Set to IN-SERVICE

2 DS1 service mode

Select a channel or all channels

1 Set to IN-SERVICE

The following procedures assume some familiarity with the TAO management software. These procedures are provided for a quick reference. Please refer to the Wideband 3190 Installation Guide for complete system configuration information.

SETTING UP THE COMMUNICATIONS CHANNEL TO THE HXU-357

The AUX port is not available to the user as a craft interface when an HXU-357 is used in the shelf. HMU-319 List 7 uses the AUX port to communicate with the HXU-357. HMU-319 List 7A automatically sets up the AUX port when the IP address is assigned to support IP network communication with the HXU-357.

1 Log onto the maintenance terminal connected to the HMU craft port.

2 Type **TAO** at the prompt (<), and then press **ENTER**.

3 Type the password, and then press **ENTER**. The default password is `public`.

4 From the Network Status screen (for multishelf configurations), type the number of the desired shelf ID (1 through 32), and then press **ENTER**.

5 From the Shelf Status screen, type **O** to select Shelf Options.

6 From the Shelf Options screen, type **E** to configure the Mux port.

7 Do one of the following:

a If there is an HMU-319 List 7 in the shelf, type **2** to select the AUX port as the multiplexer interface.

b If there is an HMU-319 List 7A in the shelf, type **2** and enter the IP address of the multiplexer. Your administrator should supply this address. Also, refer to "Appendix B - Network Addresses" on page 56.

8 Type **X** to exit the screen, then **Y** to confirm, save the setting, and return to the Shelf Status screen.

SETTING UP SYSTEM ADMINISTRATION

1 Log onto the maintenance terminal connected to the HMU craft port.

2 Type **TAO** at the prompt (<), and then press **ENTER**.

3 Type the password, and then press **ENTER**. The default password is `public`.

4 From the Network Status screen (for multishelf configurations), type the number of the desired shelf ID (1 through 32), and then press **ENTER**.

5 From the Shelf Status menu, select **M** to log onto the multiplexer.

6 At the multiplexer logon prompt (ID:), type a valid password to display the Root menu. The default password is `public`.

7 Type **5** to select System Administration from the Root Menu.

8 Type **2** to select Change System Settings for the HXU-357. Select the number of the parameter you wish to change and then type the appropriate data. These settings must match those selected for the HMU in the system chassis.

1 Date

2 Time

3 System name

4 System location

5 Contact person

9 Press **CTRL** + **P** to return to the System Administration menu.

10 Type **3** to select Change IP Address.

11 Type the address and mask information (selections **1** through **1 0**). The IP address assigned to the HXU-357 (under the HMU Shelf Options screen) must also be entered under the System Administration menu. The trap IP address should match the local IP address entered at the Shelf Options screen. The subnet mask should be 255.255.255.0.

12 Press **CTRL** + **R** to return to the Root Menu.

CONFIGURING THE HXU DS3 INTERFACE

Configure the DS3 interface according to network requirements.

The DS3 interface on the 3190 chassis must be configured as Out-of-Service in order to make changes and not report alarms to the network.

1. Log onto the maintenance terminal connected to the HMU craft port.
2. Type **TAO** at the prompt (<), and then press **ENTER**.
3. Type the password, and then press **ENTER**. The default password is `public`.
4. From the Network Status screen (for multishelf configurations), type the number of the desired shelf ID (1 through 32), and then press **ENTER**.
5. From the Shelf Status menu, select **M** to log onto the multiplexer.
6. At the multiplexer logon prompt (ID:), type a valid password to display the Root menu. The default password is `public`.
7. Type **1** to select the Configuration Management from the Root Menu.
8. Type **1** to select Configure DS3 Interface.
9. Configure the DS3 interface according to CO requirements. Type the number of the parameter and then select an appropriate setting. See Table 3 on page 20 for a listing of available settings. Default settings are marked with an asterisk.

   1 Configure DS3 mode

   2 Configure DS3 line buildout

   3 Configure DS3 transmit timing

   4 Configure DS3 BER threshold
10. Press **CTRL** + **R** to return to the Root Menu.

CONFIGURING THE HXU DS1 INTERFACE

After an HLU is placed under HMU management and configured under the HLU Maintenance Terminal screen, access the HXU-357 Configuration Management menu to configure the DS1 interface.

The DS1 interface on the 3190 chassis must be configured as Unequipped and Out-of-Service in order to make changes and not report alarms to the network. Unequipped and Out-of-Service are the default states of the DS1 interface.

1 Log onto the maintenance terminal connected to the HMU craft port.

2 Type **TAO** at the prompt (<), and then press **ENTER**.

3 Type the password, and then press **ENTER**.

4 From the Network Status screen (for multishelf configurations), type the number of the desired shelf ID (1 through 32), and then press **ENTER**.

5 From the Shelf Status menu, select **M** to log onto the multiplexer.

6 At the multiplexer logon prompt (ID:), type a valid password to display the Root menu. The default password is `public`.

7 Type **1** to select the Configuration Management submenu.

8 Type **2** to select Configure DS1 Interface.

9 Type the channel number of the HLU being configured.

10 Type **1** to select Set the DS1 Line Code, and then **2** to select (B)8ZS line code. This is the default setting: it should not require adjustment. The HXU and HLU must be configured identically.

11 Type **CTRL** + **P**.

12 Type **2** to select Line Buildout, and then **1** to select 0-133 ft. The default is 0-133 feet. It should not require adjustment.

13 Type **CTRL** + **R** to return to the Root Menu.

PLACING THE WIDEBAND 3190 IN SERVICE

An Equipped DS1 or DS3 channel can be monitored and report alarms, whether or not it is In-Service. DS1 channels that will not be used should be configured as Unequipped.

The Wideband 3190 interfaces internally to the 28 lines at the common DSX-1 point. Once all lines have been configured, the DS1 interface should be Equipped and In-Service.

The DS3 interface must be configured to match the line equipment used. Once all configuration changes have been made, the DS3 interface must be placed In-Service.

See Table 9 and Table 8 on page 37 for complete information about DS1 and DS3 interface modes.

Placing the HXU DS1 Interface in Service

1. Log onto the maintenance terminal connected to the HMU craft port.
2. Type **TAO** at the prompt (<), and then press **ENTER**.
3. Type the password, and then press **ENTER**. The default password is `public`.
4. From the Network Status screen, type the number of the desired shelf ID (1 through 32), and then press **ENTER**.
5. From the Shelf Status menu, select **M** to log onto the multiplexer.
6. At the multiplexer logon prompt (ID:), type a valid password to display the Root menu. The default password is `public`.
7. Type **1** to select Configuration Management.
8. Type **7** to select DS1 Equip / Unequip.
9. Type the number of an individual channel line or select all channels by typing **0**.
10. Do one of the following:
    a. Set the state to EQUIPPED by typing **1**.

b Set the state to UNEQUIPPED by typing **2** (if the line is not being used).

11 Type **CTRL** + **P** to return to the Configuration Management screen.

12 Type **2** to select Service Mode.

13 Type **2** to select DS1 service mode.

14 Type the number of an individual channel line or select all channels by typing **0**.

15 Do one of the following:

a Type **1** to select (I)N SERVICE.

b Type **2** to select (O)UT OF SERVICE.

Placing the HXU DS3 Interface in Service

1 Log onto the maintenance terminal connected to the HMU craft port.

2 Type **TAO** at the prompt (<), and then press **ENTER**.

3 Type the password, and then press **ENTER**. The default password is `public`.

4 From the Network Status screen, type the number of the desired shelf ID (1 through 32), and then press **ENTER**.

5 From the Shelf Status menu, select **M** to log onto the multiplexer.

6 At the multiplexer logon prompt (ID:), type a valid password to display the Root menu. The default password is `public`.

7 Type **1** to select Configuration Management.

8 Type **6** to select Service Mode.

9 Type **1** to select DS3 service mode.

10 Do one of the following:

a Type **1** to set to IN-SERVICE.

b Type **2** to set to OUT-OF-SERVICE.

HXU-357 Interface State Descriptions

The default configuration for the HXU-357 DS3 interface (Table 8) is Out-of-Service and requires no equipping. To perform DS3 maintenance loopbacks and change DS3 parameters, the DS3 interface must be configured as Out-of-Service.

The HXU-357 DS1 interface (Table 9 on page 38) is configured as Unequipped and Out-of-Service to prevent alarm reporting and to allow changing of DS1 parameters during installation. Once a line is installed, it should be configured as Equipped and In-Service.

Table 8. *DS3 Interface State Descriptions*

Equipped Mode	Service Mode	DS3 State Description
n/a	Out-of-Service (default)	Change any DS3 parameter (DS3 line buildout, DS3 transmit timing, DS3 BER threshold) Perform DS3 maintenance loopbacks Allow protection switching
n/a	In-Service	Allow alarm reporting Allow protection switching

Table 9. *DS1 Interface State Descriptions*

Equipped Mode	Service Mode	DS1 State Description
Equipped	Out-of-Service	STANDBY MODE (no equipment installed at the line location) Change any DS1 parameter (DS1 line code, DS1 line buildout) Perform DS1 maintenance loopbacks (will generate loopback alarm) Alarm reporting enabled AIS pattern enabled Performance monitoring statistics available
Unequipped (default)	Out-of-Service (default)	MAINTENANCE MODE (normal maintenance or line troubleshooting) Change any DS1 parameter (DS1 line code, DS1 line buildout) Perform DS1 maintenance loopbacks (will generate loopback alarm) Alarm reporting disabled No performance monitoring statistics
Equipped	In-Service	OPERATION MODE (normal state during operation) Alarm reporting enabled AIS pattern enabled Performance monitoring statistics available No DS1 parameter (DS1 line code, DS1 line buildout) changes allowed No DS1 loopbacks are allowed, however, inband loopbacks and release loopbacks are permitted.

UNDERSTANDING HXU-357 ALARMS

See Table 10 on page 40 for a description of HXU-357 alarms that are recorded in the Fault Management alarm history logs.

Refer to the technical practice for the HMU-319 and to the Wideband 3190 Installation Guide for more information about other types of alarms in the Wideband 3190.

Viewing Alarm Status

The alarm strings shown in Table 10 on page 40 are reported under the Fault Management submenu. To view alarm status:

1. Type TAO and press ENTER to invoke TAO.
2. Type the password and then press ENTER. The default password is `public`.
3. When the Network Status menu appears, type the number of the shelf and then press ENTER. The Shelf Status menu appears.
4. From the Shelf Status menu, select M to log onto the multiplexer.
5. At the multiplexer logon prompt (ID:), type a valid password to display the Root menu. The default password is `public`.
6. Type 3 to select Fault Management.
7. Do one of the following:
   - **a** Type 1 to view the current alarm status.
   - **b** Type 2 to view the alarm history log.
   - **c** Type 3 to clear the alarm history log.
8. Press CTRL + R to return to the Root menu.

Table 10. *HXU-357 Alarms*

Alarm String	Channel	Condition
Critical Alarm	n/a	The HXU reports a critical alarm if it is online and it detects any of the following: • DS3 Receive LOS condition • DS3 Receive Fail condition • DS3 Transmit Fail condition • five or more DS1 input faults • two or more DS2 out-of-frame faults
Major Alarm	n/a	A major alarm is generated if the HXU is online and detects any of the following: • up to four DS1 faults • one DS2 out-of-frame fault
Minor Alarm	n/a	The HXU reports a minor alarm if it detects any of the following: • A/B power supply fault • removal of the standby multiplexer • fault in standby multiplexer • configuration mismatch • software revision mismatch • too many protection switches between the multiplexers • DS1 and DS3 terminal and facility loopbacks • Standby card is offline.
Abnormal	n/a	The HXU reports an Abnormal alarm for the following conditions: • DS3 Receive (LOS, BER, AIS or Idle) • DS1 transmit LOS • Power A or Power B alarm
Far-end Alarm	n/a	Received yellow DS3 far-end alarm codes.
Online Card	n/a	Active card in alarm.
Offline Card	n/a	Standby card in alarm.
MPU Reset	n/a	Hardware reset of the card has occurred.
DS1 Transmit Loss of Signal	1 - 28	DS1 from HLU is not active. Can be generated for each of the 28 DS1 channels.

Table 10. *HXU-357 Alarms (Continued)*

Alarm String	Channel	Condition
DS1 Receive Loss of Signal	1 - 28	DS1 from the DS3 is not active. Can be generated for each of the 28 DS1 channels.
DS1 Transmit Fault	1 - 28	DS1 signal transmitted is in error. Can be generated for each of the 28 DS1 channels.
DS1 Receive Fault	1 - 28	DS1 signal received is in error. Can be generated for each of the 28 DS1 channels.
DS1 Terminal Loopback	1 - 28	DS1 port is looped back to DS3 (loopback of the demultiplexed DS1 data back onto the multiplexed path). Can be generated for each of the 28 DS1 channels.
DS1 Facility Loopback	1 - 28	DS1 port looped back to HLU loopback of the incoming DS1 back to the external output). Can be generated for each of the 28 DS1 channels.
DS2 Receive Out-of-Frame Quad 1	n/a	Ports 1 - 4 internal to HXU (DS2) have lost frame. Check C-bit parity.
DS2 Receive Out-of-Frame Quad 2	n/a	Ports 5 - 8 internal to HXU (DS2) have lost frame. Check C-bit parity.
DS2 Receive Out-of-Frame Quad 3	n/a	Ports 9 - 12 internal to HXU (DS2) have lost frame. Check C-bit parity.
DS2 Receive Out-of-Frame Quad 4	n/a	Ports 13 - 16 internal to HXU (DS2) have lost frame. Check C-bit parity.
DS2 Receive Out-of-Frame Quad 5	n/a	Ports 17 - 20 internal to HXU (DS2) have lost frame. Check C-bit parity.
DS2 Receive Out-of-Frame Quad 6	n/a	Ports 21 - 24 internal to HXU (DS2) have lost frame. Check C-bit parity.
DS2 Receive Out-of-Frame Quad 7	n/a	Ports 25 - 28 internal to HXU (DS2) have lost frame. Check C-bit parity.
Protection Switch	n/a	Momentary alarm generated when a switch to protection has occurred.
DS3 Receive Loss of Signal	n/a	DS3 detects a loss of signal.
DS3 Receive Failure	n/a	DS3 detects a failure.
DS3 Receive BER	n/a	BER of DS3 Receive traffic exceeds the set BER threshold.
DS3 Receive AIS	n/a	AIS pattern (all ones) has been detected in the DS3 Receive traffic.

Table 10. *HXU-357 Alarms (Continued)*

Alarm String	Channel	Condition
DS3 Receive Idle	n/a	IDLE pattern has been detected in the DS3 Receive traffic.
DS3 TX Failure	n/a	DS3 Transmit clock failure.
DS3 TX Terminal Loopback	n/a	The DS3 signal is looped back to the DS1s (loopback of the Transmit data back onto the Receive path).
DS3 TX Facility Loopback	n/a	The DS3 signal is looped back to the DS3 (loopback of the Receive data back onto the Transmit path).
Reserved	n/a	Reserved for future use.
Card A Reporting	n/a	Multiplexer in slot A has an alarm.
Card B Reporting	n/a	Multiplexer in slot B has an alarm.
Power Input A	n/a	Power source A failure.
Power Input B	n/a	Power source B failure.
Adjacent Card Removed	n/a	The standby card has been removed.
Card - Card Comm.	n/a	Multiplexer communication between slot A and slot B.
Configuration Mismatch	n/a	A mismatch between the configuration on the multiplexer cards has been detected.
Excessive Switching	n/a	More than three protection switches within 10 minutes.
Yellow Alarm	n/a	Receiving yellow alarm on DS3.
Far-end DS3 Equipment. (service-affecting)	n/a	FEAC far-end DS3 alarm. (C-Bit mode only)
Far-end DS3 Loss of Signal	n/a	FEAC far-end DS3 loss of signal. (C-Bit mode only)
Far-end DS3 Out of Frame	n/a	FEAC far-end DS3 loss of frame. (C-Bit mode only)
Far-end DS3 Receive AIS	n/a	FEAC far-end DS3 receive AIS (C-Bit mode only)
Far-end DS3 Receive Idle	n/a	FEAC far-end DS3 receive IDLE. (C-Bit mode only)
Far-end DS3 Equipment (Non service-affecting)	n/a	FEAC far-end DS3 equipment failure. (C-Bit mode only)

Table 10. *HXU-357 Alarms (Continued)*

Alarm String	Channel	Condition
Far-end Common Equipment	n/a	FEAC far-end DS3 common equipment. (C-Bit mode only)
Far-end DS1 Multiple Loss of Signal	n/a	FEAC far-end DS3 multiple loss LOS. (C-Bit mode only)
Far-end DS1 Equipment (service-affecting)	n/a	FEAC far-end DS1 equipment failure. (C-Bit mode only)
Far-end DS1 Single Loss of Signal	n/a	FEAC far-end DS1 LOS. (C-Bit mode only)
Far-end DS1 Equipment (non service-affecting)	n/a	FEAC far-end DS1 equipment failure. (C-Bit mode only)
Adjacent Card Failure	n/a	Redundant HXU card failure
Network Configuration	n/a	Momentary alarm generated after a network configuration parameter has been modified.
Software Revision Mismatch	n/a	A fault occurs on the online card.

Alarm Lockout

The HXU-357 masks out sympathetic alarms in the following order:

Demultiplex Direction

- DS3 Receive Loss of Signal alarm (This signal is never masked.)
- DS3 Receive Fail alarm
- BER alarm
- AIS alarm
- Idle alarm
- DS2 Out-of-Frame Quads 1 through 7 (If a DS2 quad is out-of-frame, the four corresponding DS1 Receive channels are masked.)
- DS1 Receive Loss of Signal alarm (channels 1 through 28)
- DS1 Receive Fail alarm (channels 1 through 28)

Multiplex Direction

- DS1 Transmit Loss of Signal alarm (Channels 1 through 28 are never masked.)
- DS1 Transmit Fail alarm (channels 1 through 28)

VIEWING SYSTEM CONFIGURATION STATUS

Before placing the Wideband 3190 in service, verify that all necessary provisioning changes have been made.

The Wideband 3190 provides a common interface with an open architecture. This open architecture allows any industry-compliant 3190 card to access a managed DS3-based shelf, thus affording greater flexibility than many other systems. The flexibility the Wideband 3190 affords is due in part to the separate multiplexing and management functions which must be independently configured.

Before placing the system in service, take a moment to reassess your configuration requirements.

- Check shelf status by accessing the HMU TAO software and viewing the Shelf Status screen.
- Check the HLU Maintenance terminals screens that are accessible through the Shelf Status menu.
- Check the System Configuration Status screens that are accessible when logging onto the multiplexer Root Menu through the Shelf Status Screen.

To access the System Configuration Status:

1 Log onto the maintenance terminal connected to the HMU craft port, if you are not already logged on.

2 Type **TAO** at the prompt (<), and then press **ENTER**.

3 Type the password and then press **ENTER**. The default password is `public`.

4 From the Network Status screen, type the number of the desired shelf (1 through 32), and then press ENTER.

5 From the Shelf Status menu, select M to log onto the multiplexer.

6 At the multiplexer logon prompt (ID:), type a valid password to display the Root menu. The default password is `public`.

7 Type 4 to select System Configuration Status, and select any of the following status screens. Use these screens to verify system configuration selections.

   1 DS3 Interface Status

   2 DS1 Interface Status

   3 System Status

   4 IP Addresses

   5 Card Inventory

8 If necessary, access the Configuration Management screen or System Administration screen to make changes before placing the DS1 and DS3 interfaces in service.

VIEWING PERFORMANCE AT THE HXU

Once the line has been installed and tested, you may wish to view the DS1 and DS3 performance data. The DS1 performance data is only associated with intercage communications between the HXU and the HLU.

To view the DS1 performance of the HDSL line and the corresponding DS1 customer interface, access the HLU Maintenance Terminal screens. The HLU Maintenance Terminal screens provide detailed performance histories.

1 Log on to the maintenance terminal connected to the HMU craft port, if you are not already logged on. Type TAO at the prompt (<).

2 From the Network Status screen, type the number of the desired shelf (1 through 32), and then press ENTER.

3 Access the Root Menu from the Shelf Status Menu by typing M, and then the password.

4 Type 2 to select Performance Management.

5 Select one of the following performance histories or clear the statistics by typing the corresponding number:

- 1 DS3 Performance Current 15 Minutes
- 2 DS3 Performance Last 24 Hours
- 3 DS1 Performance Current 15 Minutes
- 4 DS1 performance Last 24 hours
- 5 Clear PM Stats

6 Type CTRL + R to return to the Root Menu.

UPGRADING THE MULTIPLEXER SOFTWARE

When performing a software download in a protected system, the software must be loaded to both multiplexer modules individually. Upon completion of a download, the system switches to the standby module, at which time a second download must be initiated to complete a full system upgrade.

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

- a serial connection between the maintenance terminal and the HMU
- a 10BASE-T Ethernet connection between the multiplexer and the HMU
- the AUX port is set up to communicate with the multiplexer
- a communications package on the maintenance terminal, such as HyperTerminal or ProComm, using XMODEM

Accessing the System Administration Screen

Upon connecting to the HMU-319, the TL1 prompt (<), appears.

1 Type TAO and press ENTER to invoke TAO. The default password is public.

2 Type the password and then press ENTER. The Network Status menu appears.

If the Shelf Status menu appears instead, this indicates that the HMU is managing a single shelf and the HMU IP address has not been set. Set the HMU IP address before proceeding.

1 Type O to select the Options menu.

2 Type A to configure the local IP address.

3 Enter the address, and then return to the Shelf Status menu.

3 Type the number of the shelf (1 through 32) and then press ENTER. The Shelf Status menu appears.

4 From the Shelf Status menu, select M to log onto the multiplexer.

5 At the multiplexer logon prompt (ID:), type a valid password to display the Root menu. The default password is `public`.

6 Select 5, System Administration.

Verifying the Multiplexer IP Address

1 Select 3, Change IP Address.

2 Verify that Local Ethernet IP address (selection 1) and Subnet Mask (selection 2) are set to the proper values. These addresses should be defined in the Screen Options screen.

Setting the Download Filename

1 Press CTRL + P to return to System Administration, and then select 5, Software Download.

2 Select 1 and enter the name of the download file provided to you. This is the name assigned to the software file on the personal computer that is connected to the local HMU craft port. Up to 30 characters are allowed for a file name. It must be a DOS name with an extension of .HEX, .HX or .X.

Setting the Server IP Address

1 Press CTRL + P to return to System Administration, and then select 5, Software Download.

2 Select 2 and type the IP address of the XMODEM terminal that is connected to the HMU in the shelf.

Beginning the Software Download

1 Press CTRL + P to return to System Administration, and then select 5, Software Download.

2 Select 3, Start Download, to go to the Software Download screen and then select 1 to begin the download.

At this time, the HMU displays the prompt, `Begin Transferring Mux File`, along with sync characters.

3 Begin the XMODEM download. You have 2 minutes to initiate the download. After a successful download, the `Download Done` message appears. Download time is dependent upon your interface speed.

Burning in the Flash RAM

The loaded program now resides in RAM and must be burned into Flash RAM in order to run it.

1 Press CTRL + P to return to System Administration, and then select 5, Software Download.

2 Select 4, Start New Program, and then select 1 to start the downloaded program. This causes an HXU reset and a protection switch to the standby HXU. The standby HXU now becomes the active HXU.

3 Repeat the entire download procedure for the other HXU.

RESTORING FACTORY DEFAULTS

Although HXU-357 factory defaults can be restored using the following procedure, ADC does not recommend it for systems that are fully configured and operational. This procedure will disrupt IP-based functions and may result in the loss of customer service.

Table 11 on page 50 shows the HXU-357 default software settings. For maintenance purposes, the HXU-357 can be restored to its factory default settings:

1 Log onto the maintenance terminal connected to the HMU craft port.

2 Type TAO at the prompt (<), and then press ENTER. The default password is `public`.

3 Type the password, and then press ENTER.

4 From the Network Status screen (for multishelf configurations), type the number of the desired shelf ID (1 through 32), and then press ENTER.

5 From the Shelf Status menu, select M to log onto the multiplexer.

6 At the multiplexer logon prompt (ID:), type a valid password to display the Root menu. The default password is `public`.

7 Type 5 for System Administration.

8 Type 4 to reset the nonvolatile RAM.

9 Type 1 to reset to the factory defaults.

10 Press CTRL + R to return to the Root Menu.

Table 11. *HXU-357 Default Software Settings*

NAME/ITEM	DESCRIPTION	DEFAULT
DS3 Operating Mode	Normal operating mode is M13	M13 parity mode
DS3 Line Buildout	Selectable DS3 cable length	0-100 feet
DS3 Transmit Timing	Selectable local (internal clock) or looped timing (external data)	Local (internal)
DS3 Service Mode	In-Service: normal operation Out-of-Service: configuration, maintenance to perform loopbacks	Out-of-Service
DS3 Facility Loopback	DS3 loopback toward the span	Disabled
DS3 Terminal Loopback	DS3 loopback toward the equipment	Disabled
DS3 Remote Facility Loopback	DS3 loopback toward the span	Disabled
DS1 Line Coding	Selectable to AMI or B8ZS	BSZS
DS1 Line Buildout	Selectable cable length to DSX cross-connect	0-133 ft.
DS1 Service Mode	In-Service: normal operation Out-of-Service: configuration, maintenance to perform loopbacks	Out-of-Service
DS1 Equipped or Unequipped State	Equipped: reports alarms Unequipped: no alarm reporting	Unequipped
DS1 Facility Loopback	Loopback toward the equipment	Disabled
DS1 Terminal Loopback	DS1 loopback toward the span	Disabled
DS1 Remote Terminal Loopback	DS1 loopback toward the span	Disabled
Password	Up to 30 alpha-numeric characters long	`public` (not case-sensitive)

Table 11. *HXU-357 Default Software Settings (Continued)*

NAME/ITEM	DESCRIPTION	DEFAULT
Date	Month/day/year, 20 days from fully charged condition (fully charged battery backup, 4 hours)	
Time	Hours:Minutes:Seconds; 20 days from fully charged condition (fully charged battery backup, 4 hours).	
BER (Bit Error Rate)	Selectable; four rates (10^{-6} 10^{-7} 10^{-8} 10^{-9}).	10^{-9}
IP Addresses	Local, subnet, gateway, and trap addresses	000.000.000.000
Protection Mode	System dynamically determines protection mode. One card installed (unprotected), two cards installed (protected).	System-dependent
Online Card	Upon initial powerup, the first card powered up determines the online card. If both cards are powered at the same time, then the A card is the active card.	System-dependent

TROUBLESHOOTING

Figure 9 shows system loopbacks and test access points. Table 12 provides a legend for the various test points. By installing a HiGain Test Card, you can easily access the various test points.

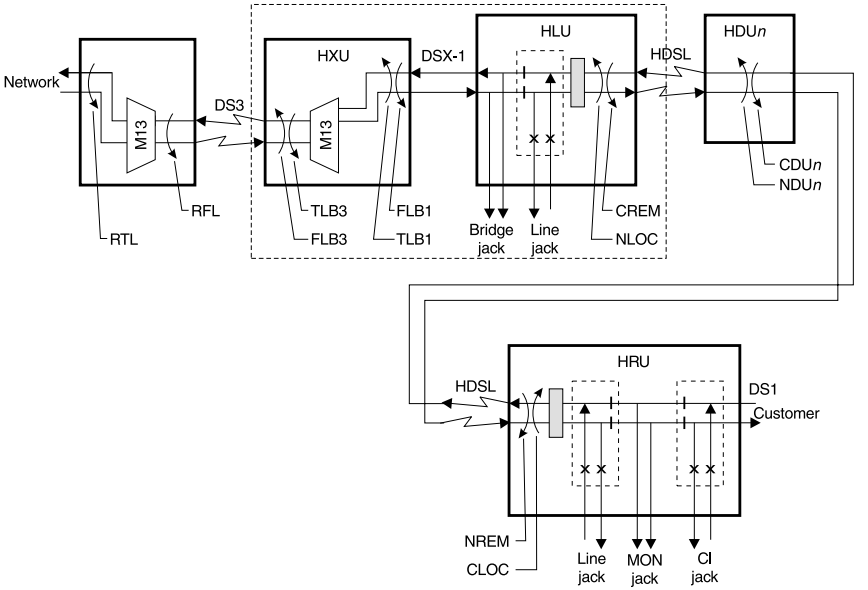


Figure 9. *System Loopbacks and Test Access*

Table 12. *System Loopback Definitions*

Test Point	Loopback Definition
TLB3 [a] [b]	Terminal loopback to the customer at the DS3 line. Activated through the multiplexer unit (**M** option from the Shelf Status screen followed by the option sequence **1**, **4**, **2**). See Table 3 on page 20.
FLB3 [a] [b]	Facility loopback to the network at the DS3 line. Activated through the multiplexer unit (**M** option from the Shelf Status screen followed by the option sequence **1**, **4**, **1**). See Table 3 on page 20.

Table 12. *System Loopback Definitions (Continued)*

Test Point	Loopback Definition
TLB1 [a] [b]	Terminal Loopback to the network at the DSX-1 line. Activated through the multiplexer unit (M option from the Shelf Status screen followed by the option sequence 1, 5, 2). See Table 3 on page 20.
FLB1 [a] [b]	Facility loopback to the customer at the DSX-1 line. Activated through the multiplexer unit (M option from the Shelf Status screen followed by the option sequence 1, 5, 1). See Table 3 on page 20.
RFL [a] [b]	Remote facility loopback from the far-end DS3 line. Activated through the multiplexer unit (M option from the Shelf Status screen followed by the option sequence 1, 4, 3). See Table 3 on page 20.
RTL [a] [b]	Remote terminal loopback from the far-end DSX-1 line. Activated through the multiplexer unit (M option from the Shelf Status screen followed by the option sequence 1, 5, 3). See Table 3 on page 20.
CREM	Customer remote loopback is activated by selecting the line unit on the Shelf Status Screen and then the D selection (Loopback Mode) 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 D selection (Loopback Mode) 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 D selection (Loopback Mode) 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 D selection (Loopback Mode) 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 D selection (Loopback Mode) 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 D selection (Loopback Mode) from the HLU Maintenance Terminal Main Menu.

(a) To perform this loopback command, the DS3 and DS1 ports must be Out-of-Service.
(b) Copies data in both directions. All other loopbacks send AIS to a disconnected segment.
(c) The number of the doubler.

All affected lines must be Out-of-Service and Unequipped during loopback testing to prevent unwanted protection switching from occurring. See “Placing the HXU DS1 Interface in Service” on page 35 and “Placing the HXU DS3 Interface in Service” on page 36.

APPENDIX A - HXU-357 SPECIFICATIONS

DS3 Interface (Multiplexer)

Cable	728A RG-6/U
Number of duplex lines	1 per chassis
Line rate	44.736 megabits/s ±20 ppm
Line code	B8ZS
Line impedance	75Ω ±5Ω, unbalanced
Pulse amplitude	0.36V to 0.85V (meets TR-TSY-000499 requirements)
Jitter generation	≤ 0.3 UI rms
DS3 span buildout	0 to 450 ft. (0 to 137.2m)

DS1 Internal Interface to Backplane

Number of lines	28
Line rate	1.544 megabits/s ±130 ppm
Line code	AMI/B8ZS selectable (per 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

Power Requirements

Voltage	-41.5 to -56.3 Vdc
Power consumption	26W typical

Physical Dimensions

Length	9.81 in. (24.9 cm)
Width	7.72 in. (19.6 cm)
Height	.98 in. (2.5 cm)

APPENDIX B - NETWORK ADDRESSES

ADC uses the standard Transmission Control Protocol / Internet Protocol (TCP/IP) on an Ethernet interface to send internal management information between chassis. The Wideband 3190 can support up to 32 chassis using a low-cost 10BASE-T twisted pair or 10BASE-2 coax cable Local Area Network (LAN). If only TAO software is used and there is no need to download multiplexer software, then 10BASE-T is not required and either type of cable can be used between shelves. Systems that use TL1 or require download functions must use 10BASE-T. 10Base-T also makes troubleshooting larger systems much easier.

ADC recommends that the Wideband 3190 be placed on its own LAN. Any connection to a larger network should be done through a router with the appropriate firewall protection. On a private LAN, selection of the IP address, subnet mask, TCP/IP server address and trap addresses is basically arbitrary, but some understanding of these functions is still required to make an informed choice.

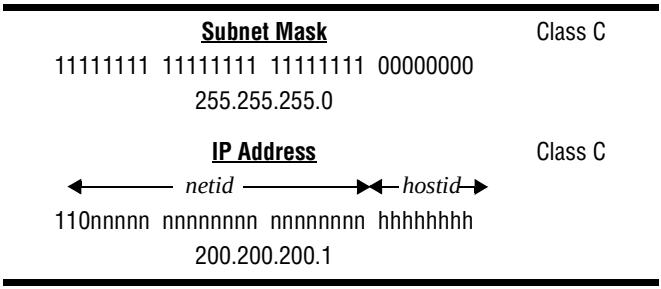
Hardware Addresses and IP Addresses

To communicate, physical networks rely on 48-bit hardware addresses known as Media Access Control (MAC) addresses. Every network interface adapter has a unique hardware address assigned by the manufacturer and coded into the circuitry. On a local network, each piece of equipment picks up data which is addressed to it. In order for one device to send data to another, it must know the hardware address of the destination device. This works fine for small networks, where devices can easily broadcast their names and addresses on the network and make it easy to find them, but it does not work well for large networks or for communication between devices on different networks.

To solve this problem, a higher level of address, called an IP address, is used to identify each device in the internet. IP addresses, unlike hardware addresses, are not burned into the electronics, but are configured in software when a device is set up and plugged into a particular network. Each IP address is associated with a particular hardware device. For example, a Product Name shelf has two components that have IP addresses—the HXU-357 and the HMU-319. Both HXUs share the same IP address using an automatic protection scheme. The IP address is a 32-bit digital address arranged as four 8-bit words, each from 0 to 255, separated by a period.

The IP address consists of two parts: the network ID (netid) and the host ID (hostid). The subnet mask determines which bits form the netid and hostid addresses. (See Table 13.)

Table 13. *Network Addressing*



Subnet Mask

A subnet is a physically separate part of a network, usually representative of all the devices at one geographic location or on the same LAN. The subnet mask is a quantity which is logically ANDed with an IP address to enable a device to determine which IP addresses are located on the local network and which addresses must go to the gateway for forwarding. An IP address of 200.200.200.1 and a subnet mask of 255.255.255.0, for example, indicates that only IP addresses which start with 200.200.200 can be found on the local physical network, and that all other addresses must go through the gateway. (255 is the decimal representation of 8 bits of all ones.)

The subnet mask is also a 32-bit word, but it is generally a string of ones followed by a string of zeroes. Each subnet bit that has a one value identifies a corresponding bit of the IP address that is part of the *netid*. The zero bits identify the *hostid*. The *netid* is further divided into five classes from A to E. Table 13 shows a Class C network address. Class C is recommended for most Product Name applications. All Class C addresses are identified by the first three bits (110). The *hostid* should not be assigned all ones or all zeroes.

Using the foregoing restrictions and conventions, a Product Name can be assigned any IP address that meets your needs, provided that it is on its own LAN and separated from any external network by a router. If this is not the case, then consult your system administrator. Table 14 provides some suggestions for addressing your system if it is on its own LAN. It shows a logical relationship between the HMU and HXU units within each chassis.

Table 14. *Sample Class C IP Address Plan for the HMS-357*

Suggested HMU Addressing for 1 to 32 Chassis	Suggested HXU Addressing for 1 to 32 Chassis
11001000 11001000 11001000 00000001 200.200.200.1 HMU chassis #1 255.255.255.0 Subnet mask	11001000 11001000 11001000 01100101 200.200.200.101 HXU chassis #1 255.255.255.0 Subnet mask
11001000 11001000 11001000 00100000 200.200.200.32 HMU chassis #32 255.255.255.0 Subnet mask	11001000 11001000 11001000 10000100 200.200.200.132 HXU chassis #32 255.255.255.0 Subnet mask

Routers or Gateways

At the place where two or more physical networks interconnect is a device called a gateway or router that handles linking of networks and routing of data packets between the networks that are attached to the gateway. If a device can not find the hardware address associated with a particular IP address on its own local network, it sends the packet on to the gateway. When the packet arrives at the gateway, the gateway transfers the packet to the network of the destination device. The process by which the gateway or router links IP addresses to hardware addresses is called Address Resolution Protocol (ARP). Each forwarding of the packet from one device to another is called a hop. If the device that is to receive the data is not directly connected to any of the physical networks which are connected to the gateway used by the sending device, it may take several hops for the packet to reach its destination. The destination may even be a port on another gateway connected to different physical networks.

Trap IP Address

Trap IP address are used to report network alarms to network management. For the Wideband 3190, the trap IP addresses of the HXU-357 cards must be identical to the IP address assigned to the HMU-319 card in the same chassis.

Duplicate addresses can cause troublesome network problems, so never guess at an IP number or subnet masks when setting up a device. Always consult with your administrator to obtain proper values.

APPENDIX C - PRODUCT SUPPORT

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

Technical support is available 24 hours a day, 7 days a week by contacting the ADC Technical Assistance Center (TAC).

Sales Assistance 800.366.3891 ext. 73000 (USA and Canada) or 952.917.3000 Fax: 952.917.3237	• Quotation Proposals • Ordering and Delivery • General Product Information
Systems Integration 800.366.3891, ext. 73000 (USA and Canada) or 952.917.3000	• Complete Solutions (from concept to installation) • Network Design and Integration Testing • System Turn-Up and Testing • Network Monitoring (upstream or downstream) • Power Monitoring and Remote Surveillance • Service/Maintenance Agreements • Systems Operation
ADC Technical Assistance Center 800.638.0031 (USA and Canada) or 714.730.3222 Fax: 714.730.2400 Email: wsd_support@adc.com	• Technical Information • System/Network Configuration • Product Specification and Application • Training (product-specific) • Installation and Operation Assistance • Troubleshooting and Repair/Field Assistance
Online Technical Support	• www.adc.com/Knowledge_Base/index.jsp
Online Technical Publications	• www.adc.com/library1/
Product Return Department 800.366.3891 ext. 73748 952.917.3748 Fax: 952.917.3237 Email: repair&return@adc.com	• ADC Return Material Authorization (RMA) number and instructions must be obtained before returning products.
All 800 lines are toll-free in the USA and Canada.	

BAR CODE LABEL AND CONFIGURATION NUMBER

Figure 10 shows the location of the CLEI/ECI bar code label and the configuration number on the HXU-357 List 1. Table 15 on page 62 gives a brief description of what each label contains.

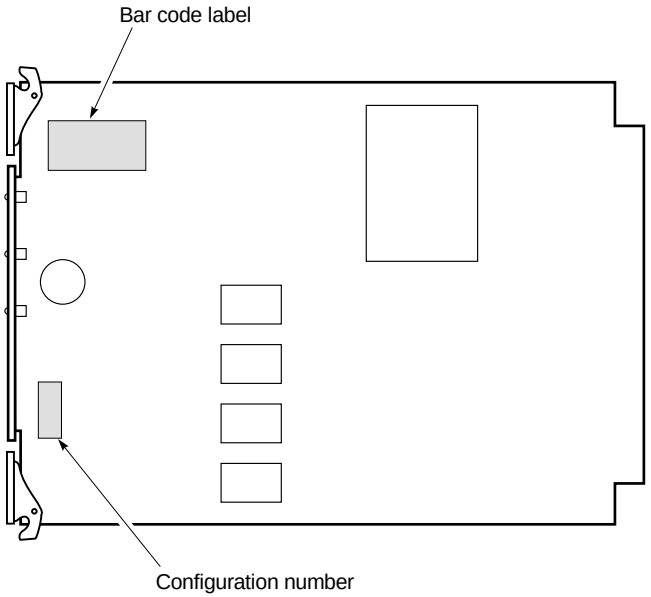


Figure 10. *Location of Bar Code Label and Configuration Number*

Table 15. *Bar Code and Configuration Number*

Name	Description
CLEI/ECI Bar Code Label	Contains human-readable Common Language Equipment Identified (CLEI) code number and Equipment Catalog Item (ECI) bar code number.
Configuration Number	Contains either a five or six-digit warranty configuration number or a standalone two or three-digit configuration number as follows: Digit 1 = Last digit of shipment year Digits 2 and 3 = Shipment month Digits 4, 5, and 6 = Configuration number

APPENDIX D - GLOSSARY

ACO	Alarm Cut Off
AIS	Alarm Indicator Signal
ALM	Alarm
AMI	Alternate Mark Inversion
B8ZS	Bipolar with 8-zero Substitution
BCD	Binary Coded Decimal
BER	Bit Error Rate
BPV	Bipolar Violation
BPVT	BPV Transparency
CDU	Customer Doubler Loopback Unit
CI	Customer Interface
CO	Central Office
CLOC	Customer Local Loopback
CPE	Customer Premises Equipment
CRC	Cyclic Redundancy Check
CREM	Customer Remote Loopback
CSA	Carrier Servicing Area
CSU	Channel Service Unit
DCE	Data Communications Equipment
DDS	Digital Data Service
DL	Data Link
DS1	Digital Signal Level 1
DS3	Digital Signal Level 3
DSR	Data Set Ready
DSX-1	Digital System Cross-connect frame
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
ES	Errored Seconds
ESF	Extended Superframe
FEAC	Far-End Alarm Code
GND	Ground
HCDS	High Capacity Digital Service
HDSL	High-bit-rate Digital Subscriber Line
HDU	HiGain Doubler Unit
HFA	HiGain Fan Assembly
HLU	HiGain Line Unit
HMU	HiGain Management Unit
HRU	HiGain Remote Unit
HTC	HiGain Test Card
HXU	HiGain Multiplexer Unit
IP	Internet Protocol
LOS	Loss of Signal
LOSW	Loss of Sync Word
M13	Multiplexer from DS1 to DS3
MDF	Main Distribution Frame
MIB	Management Information Base
NDU	Network Doubler Unit
NEBS	Network Equipment Building System

NI	Network Interface
NID	Network Interface Device
NLOC	Network Local Loopback
NMA	Network Management and Administration
NREM	Network Remote Loopback
NVRAM	Non Volatile Random Access Memory
OAM&P	Operation, Administration, Maintenance & Provisioning
PCS	Personal Communications System
POTS	Plain Old Telephone Service
RCV	Receive
RTC	Real Time Clock
SAIS	SmartJack AIS
SCP	Serial Communication Port
SF	SuperFrame
SID	Shelf Identifier
SNMP	Simple Network Management Protocol
SNR	Signal to Noise Ratio
SPLB	Special Loopback
STS	Span Termination System
TAO	Terminal Access Option
TFTP	Trivial File Transfer Protocol
TL1	Transaction Language 1
TMS	Time Multiplexed Switch
UAS	Unavailable Seconds
UL	Underwriters Laboratories
XMT	Transmit
ZBTSI	Zero Byte Timeslot Interchange

CERTIFICATION AND WARRANTY

FCC COMPLIANCE

This unit complies with the limits for Class A digital devices 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, can 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.

Refer to the installation section of this manual for guidance on: Cabling, correct connections, grounding.

UL LISTING

The HXU-357 List 1 is listed with the Underwriter Laboratory.

Use caution when installing or modifying telephone lines. Dangerous voltages may be present. Do not install telephone wiring during a lightning storm. Always disconnect telephone lines and power connections from wall outlets before servicing or disassembling this equipment.

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

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 PairGain Technologies, Inc. may void the user's warranty.

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

For technical assistance, refer to “Appendix C - Product Support” on page 60.

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DOCUMENT: 150-357-200-02, ISSUE 2
1221502