WIDEBAND 3190 INSTALLATION AND VERIFICATION GUIDE

HMS-358 List 5 (Split Power)
Product: HMS-358-L5
CLEI Code: VAMXKG0F

HMS-358 List 6 (Redundant Power)
Product: HMS-358-L6
CLEI Code: VAMXKH0F

Revision History of This Document

Copies of this document, LTPH-SM-1052-04, can be downloaded from the ADC web site at www.adc.com. To order a hard copy, please see your sales representative.

Issue	Release Date	Revisions Made
1	May 8, 2001	Initial release.
2	August 8, 2001	Updated Connecting to the Network Interface and Environmental Specifications.
3	November 30, 2001	Added new Appendix B, “HMU Configuration for X.25 and Ethernet Connections”.
4	July 14, 2002	Updated line card shelf count specifications.

CONVENTIONS USED

The following conventions are used in this document:

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

Notes contain information about special circumstances.

Cautions indicate the possibility of personal injury or equipment damage.

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

ABOUT THIS GUIDE

This guide details a typical step-by-step Wideband 3190 system installation and provides for a final system verification. For detailed information about specific system components, refer to the documentation for that component.

An abbreviated version of the installation and verification procedure for each configuration is located at the end of this guide (see "Project Member Signatures" on page 87). You can pull out the checklist from this guide, verify the installation, sign where appropriate, and file the list in a safe place.

RELATED DOCUMENTATION

Catalog Number	Title
LTPH-UM-1044-xx	HXU-358-V104 Multiplexer User Manual
LTPH-UM-1127-xx	HXU-359 List 2 (Version 1.1) Multiplexer User Manual
LTPH-UM-1089-xx	HXU-360 List 1 Multiplexer User Manual
150-357-100-xx	HFA-357 List 1 Fan Assembly Unit Quick Installation Guide
100-319-200-xx	HTC-319 List 1 Test Card Quick Installation Guide
350-319-200-xx	HCC-319 List 1 Cut-through Card Quick Installation Guide
350-319-201-xx	HCC-319 List 2 Cut-through Card Quick Installation Guide
LTPH-UM-1086-xx	HMU-319 List 7A and List 9 (Version 3.07) Management Unit User Manual
LTPH-UM-1142-xx	HMU-319 User Manual (Version 3.1) Management Unit User Manual
LTPH-TP-1026-xx	HLU-319 List 5x Line Unit Technical Practice
LTPH-TP-1172-xx	H2TU-C-319 List 2x Line Unit Technical Practice
LTPH-UM-1031-xx	H4TU-C-319 List 1 Line Unit User Manual
350-409-100-02	HDU-409 Doubler Unit Quick Installation Guide
350-407-102-02	HDU-407 Doubler Unit Quick Installation Guide
350-404-102-02	HDU-404 List 2 Doubler Unit Quick Installation Guide
LTPH-UM-1120-xx	H4D-409 List 1 Doubler Unit Quick Installation Guide
LTPH-TP-1024-xx	HRU-402 List 4 Remote Unit Technical Practice
LTPH-QI-1150-xx	H2TU-R-402 List 5x Remote Unit Quick Installation Guide
LTPH-QI-1033-xx	H4TU-R-402 Remote Unit Quick Installation Guide

For information about line units, doublers, and remote units, refer to the appropriate documentation for the product model number. Copies of documents can be downloaded from the ADC web site at www.adc.com. To order a hard copy, please see your sales representative.

SAFETY WARNINGS AND NOTICES

The DC power supply feeds of the enclosure must be connected to either (1) -48 Vdc Safety Extra Low Voltage (SELV) sources or (2) -48 Vdc sources that are electrically isolated from the AC sector and reliably connected to earth. The source's fault current capacity shall be lower than 30A, or an appropriate overcurrent protection, rated 30A, must be provided on each -48 Vdc conductor. The overcurrent protection can also be used as a cut-off switch if another disconnect device is not installed.

This equipment may be provided with a module that incorporates laser source(s). Refer to the module's documentation for detailed safety information.

The telemetry In/Out (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 metallic telecommunication interface should not leave the building premises unless connected to telecommunication devices providing primary and secondary protection.

AVIS ET AVERTISSEMENTS DE SÉCURITÉ

Les alimentations CC du boîtier doivent être branchées soit (1) à des sources 48 Vcc TBTS ou (2) à des sources qui sont isolées électriquement du secteur ca et qui sont reliées à la terre de façon fiable. Le courant de faute des sources doit être inférieur à 30 A ou des protections appropriées contre les sur-courants, spécifiée 30 A doivent êtres installées sur chaque conducteur -48 Vcc. La protection sur-courant doit aussi servir d'interrupteur si un interrupteur n'est pas installé.

Cet équipement peut être fournit avec des modules qui peuvent contenir des sources LASER. Se référer à la documentation du module pour plus d'information.

Les E/S de télémétrie doivent être branchées soit (1) à une source TBTS ou (2) à une source qui est isolée électriquement du secteur ca et qui est reliée à la terre de façon fiable.

Les interfaces métalliques de télécommunication ne doivent pas quitter le bâtiment à moins d'êtres reliés aux dispositifs de télécommunication assurant la protection primaire et secondaire.

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INTRODUCTION

DOCUMENT SCOPE

This guide provides basic step-by-step instructions for installing several different shelf configurations and establishing a working Wideband 3190 system. Once you have completed the basic installation and verified that your system is functioning properly, you can refer to the user manuals for the individual components. The user manuals provide comprehensive configuration and technical information that will help you further define system parameters to meet your particular system requirements.

To use this guide:

- Follow the steps provided in the order of their presentation, beginning with the section entitled "Before You Begin" on page 4.
- Tabbed sections are provided for chassis cabling and multiplexer installations. Based upon your choice of multiplexer and chassis configuration, select the sections that apply to your system installation.
- Place a check mark after each installation task you complete and then sign your name in the places indicated after each section you complete.

This is a basic installation guide that is designed to aid you in successful installation of the Wideband 3190 system. For more information about the individual components used in this installation procedure, refer to their respective user manuals.

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Verify that all equipment to be used in the Wideband 3190 system has met the necessary NEBS and UL requirements. The use of unapproved equipment in the HMS-358 may violate NEBS (GR-1089-CORE, GR-63-CORE) and UL/CSA 1950 standards.

The HMS-358 List 5 and List 6 have been tested and approved for use with all HiGain line units, HMU-319 List 7 management units, and HiGain multiplexers.

SYSTEM OVERVIEW

The Wideband 3190 (HMS-358 List 5 and List 6) combines an industry-standard multiplexer function with a High-bit-rate Digital Subscriber Line (HDSL, HDSL2, or HDSL4) distribution system, providing the lowest-cost T1 delivery system available. The HMS-358 terminates 28 ports and multiplexes them to either 28 discrete DSX-1 interfaces or into a single, high-speed network interface with full metallic and electrical test access on all low speed ports. By selecting the multiplexer card, a variety of high-speed network interfaces, such as DS3 and STS-1, can be accommodated. The use of the same multiplexer and DSL units found in ADC standalone products assures a versatile and cost-effective solution to your system requirements. The open architecture of the HMS-358 supports backward compatibility by accepting any industry-compliant 3192 line card. (ADC recommends that third-party line cards be certified for compliance with a Wideband 3190.)

Figure 1 shows a functional diagram of a Wideband 3190 system. Figure 2 on page 3 shows a typical application.

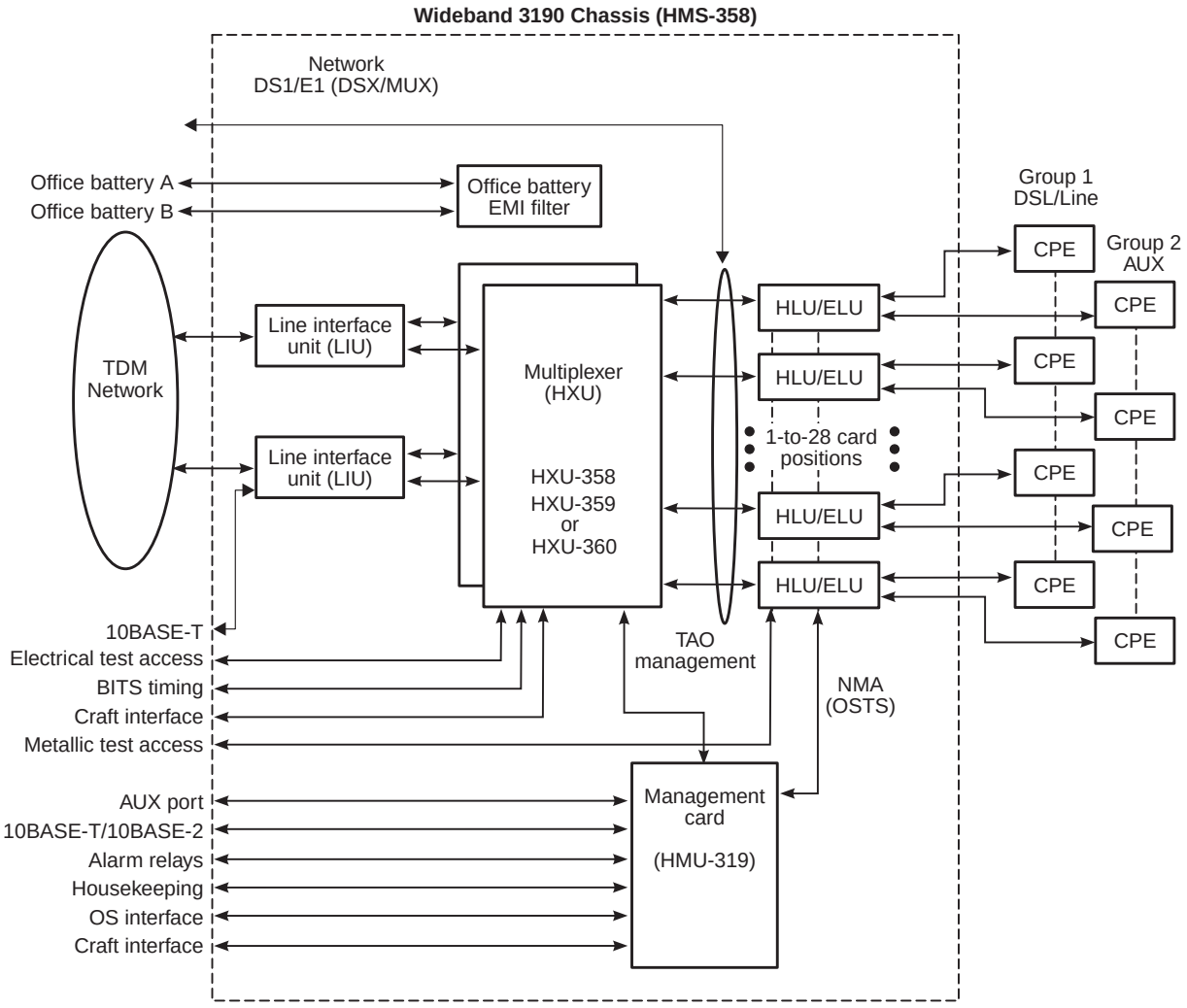
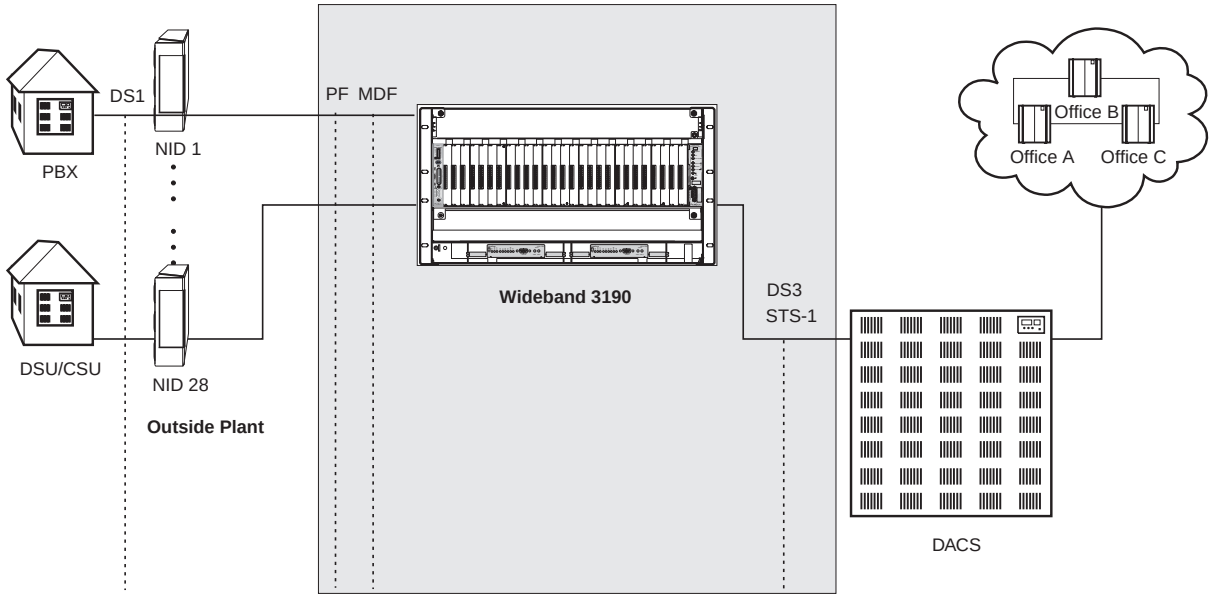


Figure 1. *Wideband 3190*

For management, both Terminal Access Option (TAO) and Transaction Language 1 (TL1) systems are supported on X.25, 10BASE-T, 10BASE-2, and RS-232 interfaces. The HMS-358 also features standard alarm relay contacts and accepts a redundant A/B office battery source.

The Wideband 3190 system (with a full complement of remote equipment) can be configured with up to six chassis (up to 672 lines) in a 7-foot rack and meets NEBS requirements for CO equipment.

The HMS-358 supports 1+N protection switching at the customer interface and provides facility and equipment protection.



DACS — Digital Access Cross-connect System
DS3 — Digital Signal 3
DSU/CSU — Digital Service Unit/Channel Service Unit
MDF — Main Distribution Frame
NID — Network Interface Device
PBX — Private Branch Exchange
PF — Protection Frame
STS-1 — Synchronous Transport Signal 1

Figure 2. *Outside Plant Service Model*

Implementation of DS1 protection switching in the HMS-358 requires two HXU-358 multiplexers (software version 1.04 or higher) and an HMU-319 List 7A or List 7C management unit (software version 3.06 or higher). The designated protection line must be comprised of an HLU-316 List 6 or an H2TU-C-319 List 6 line unit and an HRU-402 List 6 or an H2TU-R-402 List 6 remote unit. The remote enclosure must be an HRE-206 List 1 equipped with a PSC-606 List 1 protection switching controller. For information about implementing protection switching, refer to the documentation for the PSC-606 List 1, document number LTPH-TP-1006-xx.

BEFORE YOU BEGIN

Prior to installing the Wideband 3190, it is important to prepare for the installation by:

- Reviewing installation plans through establishing a Method of Procedure (MOP)
- Unpacking and inspecting the system components
- Gathering the tools for the installation

REVIEWING INSTALLATION PLANS

Installation personnel, engineers, and Central Office (CO) supervisors, involved in the installation of the HMS-358, should participate in the preparation of an MOP for approval by CO management.

ESTABLISHING A METHOD OF PROCEDURE

Following is a list of tasks and considerations that need to be addressed and mutually agreed upon before proceeding with installation:

- Assignment of personnel
- Installation tools and methods
- Protection requirements for personnel, equipment, and tools
- Evaluation of potential hazards that may affect service
- Scheduled time for installation
- Space requirements (see “Power Requirements” on page 72)
- Power requirements (see “Power Requirements” on page 72)
- Identification of procedures and tests required before connecting to working equipment
- Identification of work steps and any necessary notifications to CO personnel or engineers before work begins
- Assignment of individual system IDs for up to 32 managed systems (see “Setting the Shelf Identifier (Option D)” on page 30)
- Assignment of IP addresses for each installed system (see “Setting the Local IP Address (Option A)” on page 31)

UNPACKING AND INSPECTING THE SYSTEM COMPONENTS

Table 1 lists the components shipped with the HMS-358 kit. Unpack and inspect for the contents of the kit for any damage that may have occurred during shipping. After inspecting each unit, sign for each item received. Table 17 on page 82 provides a list of required and optional components that may not be included in the HMS-358 kit, but are either necessary or recommended for the Wideband 3190 system. A notes section (see Table 2) has been provided to document any components not listed below.

Table 1. *Packing List*

Check ✓	Item	Part Number	Installer Initial
❒	HMS-358 List 5 (split power) or HMS-358 List 6 (redundant power)	1156286 or 1156287	
❒	One (1) LIU Module A line interface unit (for DS3 or STS-1)	150-2232-01	
❒	Two (2) mounting brackets	202-1684-01A	
❒	One (1) male, BNC 50Ω terminator	651-1115-01	
❒	One (1) BNC T-adapter connector (J-P-J)	655-1022-01	
❒	Eight (8) 6-32 x $^{3}/_{16}$ screws	670-1006-03	
❒	Two (2) 8-32 x $^{1}/_{4}$ screws	670-1009-04	
❒	Ten (10) 12-24 x $^{1}/_{2}$ screws	670-1017-08	
❒	Twelve (12) 4.5-inch x .10-inch cable ties	674-1055-01	
❒	One (1) label holder	203-1038-01	
❒	One (1) circuit ID label	950-1093-01	
❒	One (1) installation and verification guide	1238335	
❒	Six (6) 4-40 x $1^{3}/_{8}$ PH. screws	670-1001-22	
❒	One (1) ground cable	120-1036-01	

Table 2. *System Installation Notes*

Notes

Be sure to have an IP address ready; it is necessary during installation if the system is connected to Ethernet.

MOUNTING THE CHASSIS

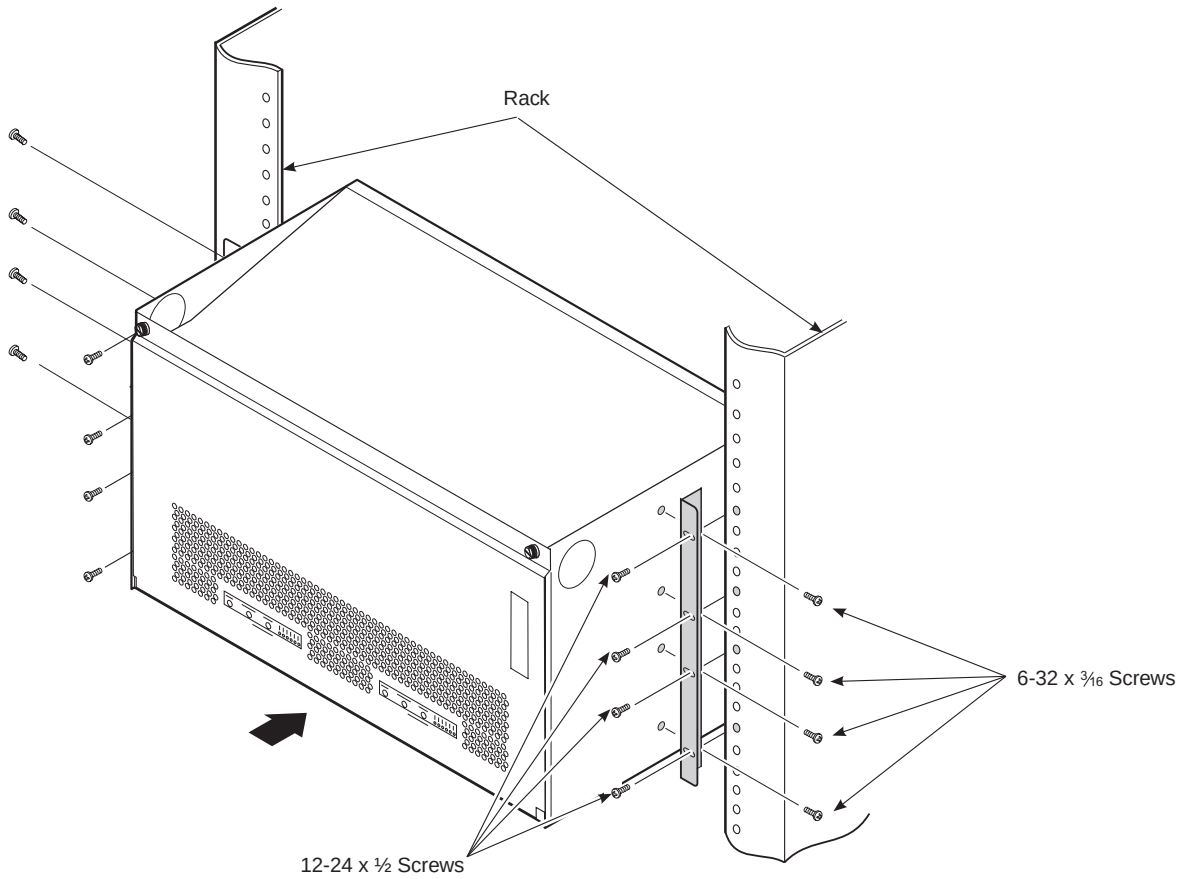


Figure 3. *Mounting the Wideband 3190 in a CO Rack*

Verify that the battery feed is disconnected.

For single shelf installation only: to fulfill NEBS requirements, establish a 4-inch space above and below the chassis. For more information on thermal characteristics, see "Power Requirements" on page 72.

Step	Procedure	Installer Check ✓
1	Install a mounting bracket on each side of the HMS-358 chassis using the four (6-32 x $^{3}/_{16}$) screws provided for each bracket. Mounting brackets and screws are contained in the installation kit. Apply the amount of torque specified by local codes.	❒
2	Align the chassis mounting bracket holes with the rack's vertical mounting holes. The rack's mounting holes should be spaced $^{1}/_{2}$ inch or 1-$^{1}/_{4}$ inches apart to properly align with the mounting bracket holes.	❒
3	Mount the chassis in the rack. Install four each 12-24 x $^{1}/_{2}$ screws in each bracket and secure the chassis to the rack. Apply the amount of torque specified by local codes.	❒

Installer Signature ✍	**Date**

CABLING THE CHASSIS

The HMS-358 allows for several network interface configurations:

- DS3 (see "Installing Interface Cables—DS3 or STS-1 to DSL" on page 12)
- STS-1 (see "Installing Interface Cables—DS3 or STS-1 to DSL" on page 12)
- DSX-1 (see "Installing Interface Cables—DSX-1 to DSL (Port 2)" on page 14)

Depending on which of these shelf configurations you ordered, locate the proper cable installation procedures as detailed in "Selecting the Proper Installation Procedures" on page 32.

DRAIN WIRE AND CABLE TIE INSTALLATION

To satisfy Network Equipment-Building System (NEBS) requirements, it is necessary to connect a drain wire from a female amphenol cable connector to a male amphenol backplane connector. Cable ties are included in each kit to secure the cables to the backplane. The following procedure should be repeated for each amphenol connector.

The grounding of shielded cables should always conform to local codes. To avoid ground loops, confirm that all shielded cables are grounded at only one end.

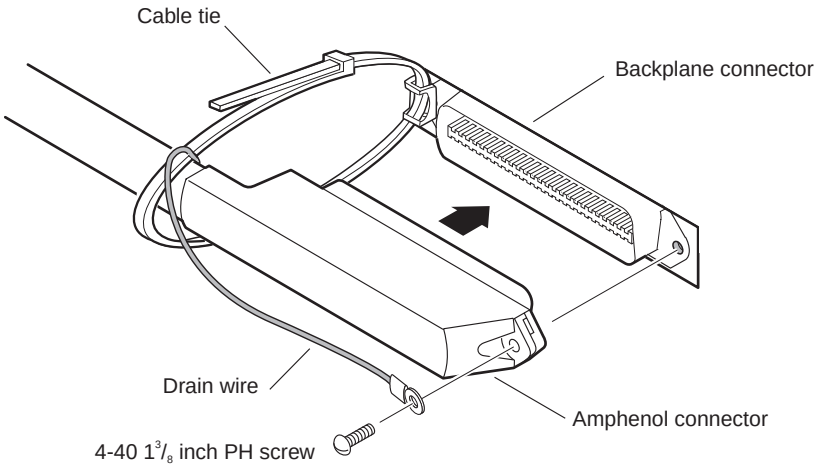


Figure 4. *Installing the Drain Wire and Cable Tie for all Amphenol Connectors*

Step	Procedure
1	Place the 4-40 x $1^{3}/_{8}$-inch screw through the drain wire, the screw hole on the female amphenol cable connector, and the screw hole on the male amphenol backplane connector. (See Figure 4.) Tighten the screw until the connector is securely attached.
2	Lace a cable tie through the tie base on the male backplane connector, thread the tip of the tie through the eye of the tie, and then pull the tip until the cable tie is completely snug.

CABLE CONNECTOR PINOUTS

Figure 5 shows a standard 16/16 or 25/7 connector cable (available in 50-foot or 200-foot lengths). See Table 3 and Table 4 on page 10) for pinout descriptions of these two cable connectors.

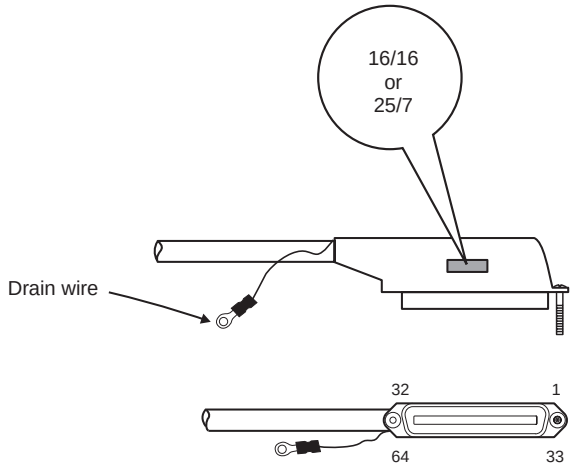


Figure 5. *50-foot (16/16 or 25/7) or 200-foot (16/16 or 25/7) Cable Connectors*

Table 3. *Cable Connector Pinout and Color Code (16/16 Cable)*

	Ring Pins			Tip Pins		
	Color Code	Connector Pin Number	Slot	Connector Pin Number	Slot	Color Code
BINDER #1 (BLUE)	Blue/White	1	1	33	1	White/Blue
	Orange/White	2	2	34	2	White/Orange
	Green/White	3	3	35	3	White/Green
	Brown/White	4	4	36	4	White/Brown
	Slate/White	5	5	37	5	White/Slate
	Blue/Red	6	6	38	6	Red/Blue
	Orange/Red	7	7	39	7	Red/Orange
	Green/Red	8	8	40	8	Red/Green
	Brown/Red	9	9	41	9	Red/Brown
	Slate/Red	10	10	42	10	Red/Slate
	Blue/Black	11	11	43	11	Black/Blue
	Orange/Black	12	12	44	12	Black/Orange
	Green/Black	13	13	45	13	Black/Green
	Brown/Black	14	14	46	14	Black/Brown
	Slate/Black	15	15	47	15	Black/Slate
	Blue/Yellow	16	16	48	16	Yellow/Blue
BINDER #2 (ORANGE)	Blue/White	17	17	49	17	White/Blue
	Orange/White	18	18	50	18	White/Orange
	Green/White	19	19	51	19	White/Green
	Brown/White	20	20	52	20	White/Brown
	Slate/White	21	21	53	21	White/Slate
	Blue/Red	22	22	54	22	Red/Blue
	Orange/Red	23	23	55	23	Red/Orange
	Green/Red	24	24	56	24	Red/Green
	Brown/Red	25	25	57	25	Red/Brown
	Slate/Red	26	26	58	26	Red/Slate
	Blue/Black	27	27	59	27	Black/Blue
	Orange/Black	28	28	60	28	Black/Orange
	Green/Black	29	29	61	29	Black/Green
	Brown/Black	30	30	62	30	Black/Brown
	Slate/Black	31	31	63	31	Black/Slate
	Blue/Yellow	32	32	64	32	Yellow/Blue

Table 4. *Cable Connector Pinout and Color Code (25/7 Cable)*

	Ring Pins			Tip Pins		
	Color Code	Connector Pin Number	Slot	Connector Pin Number	Slot	Color Code
BINDER #1 (BLUE)	Blue/White	1	1	33	1	White/Blue
	Orange/White	2	2	34	2	White/Orange
	Green/White	3	3	35	3	White/Green
	Brown/White	4	4	36	4	White/Brown
	Slate/White	5	5	37	5	White/Slate
	Blue/Red	6	6	38	6	Red/Blue
	Orange/Red	7	7	39	7	Red/Orange
	Green/Red	8	8	40	8	Red/Green
	Brown/Red	9	9	41	9	Red/Brown
	Slate/Red	10	10	42	10	Red/Slate
	Blue/Black	11	11	43	11	Black/Blue
	Orange/Black	12	12	44	12	Black/Orange
	Green/Black	13	13	45	13	Black/Green
	Brown/Black	14	14	46	14	Black/Brown
	Slate/Black	15	15	47	15	Black/Slate
	Blue/Yellow	16	16	48	16	Yellow/Blue
	Orange/Yellow	17	17	49	17	Yellow/Orange
	Green/Yellow	18	18	50	18	Yellow/Green
	Brown/Yellow	19	19	51	19	Yellow/Brown
	Slate/Yellow	20	20	52	20	Yellow/Slate
	Blue/Violet	21	21	53	21	Violet/Blue
	Orange/Violet	22	22	54	22	Violet/Orange
	Green/Violet	23	23	55	23	Violet/Green
	Brown/Violet	24	24	56	24	Violet/Brown
	Slate/Violet	25	25	57	25	Violet/Slate
BINDER #2 (ORANGE)	Blue/White	26	26	58	26	White/Blue
	Orange/White	27	27	59	27	White/Orange
	Green/White	28	28	60	28	White/Green
	Brown/White	29	29	61	29	White/Brown
	Slate/White	30	30	62	30	White/Slate
	Blue/Red	31	31	63	31	Red/Blue
	Orange/Red	32	32	64	32	Red/Orange

SELECTING THE PROPER INSTALLATION PROCEDURES

This guide identifies the cable installation procedures for each shelf configuration with a tabbed section title (Figure 6).

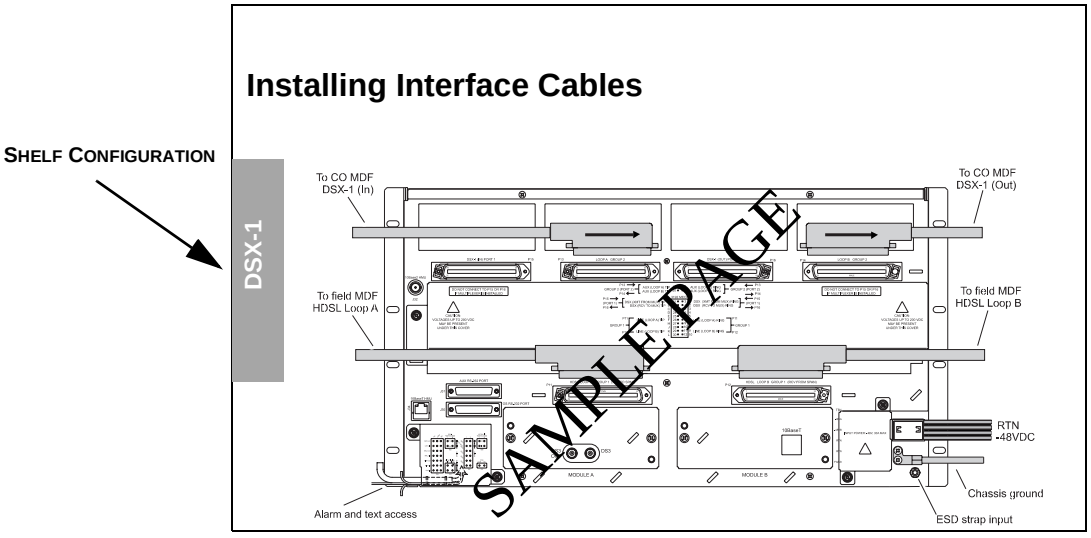


Figure 6. *Selecting the Proper Tabbed Section for Your Shelf Configuration*

Select the tabbed section that applies to your configuration and only follow those procedures:

- DS3 or STS-1 to DSL configuration (see "Installing Interface Cables—DS3 or STS-1 to DSL" on page 12)
- DSX-1 to DSL (Port 1), no multiplexer configuration (see "Installing Interface Cables—DSX-1 to DSL (Port 1)" on page 13)
- DSX-1 to DSL (Port 2), multiplexed network configuration (see "Installing Interface Cables—DSX-1 to DSL (Port 2)" on page 14)

INSTALLING INTERFACE CABLES—DS3 OR STS-1 TO DSL

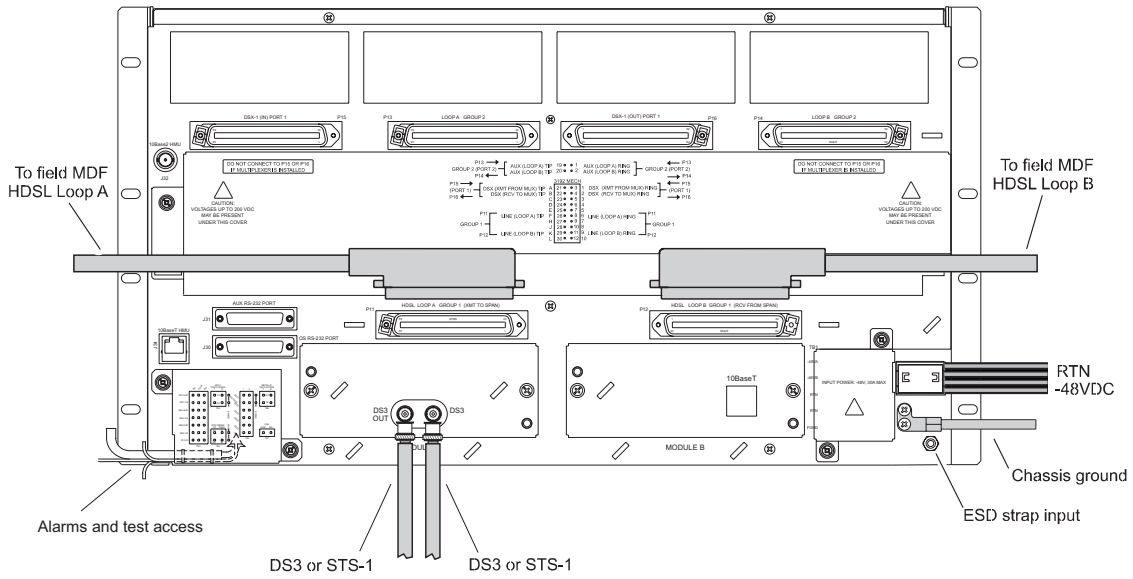


Figure 7. *Installing Cables for a DS3 or STS-1 Configured Shelf (Backplane View)*

Step	Procedure	Installer Check ✓
	Whenever installing or removing units from the HMS-358 chassis, be sure to wear an antistatic wrist strap and connect it to the ESD strap input.	
1	Connect the 32-pair shielded amphenol female connector to **P11**, HDSL LOOP A and route to the field MDF. See "Drain Wire and Cable Tie Installation" on page 8 for proper installation of all amphenol connectors.	❒
2	Connect the 32-pair shielded amphenol female connector to **P12**, HDSL LOOP B and route to the field MDF.	❒
3	Connect a DS3 coaxial cable to Module A DS3 IN connector.	❒
4	Connect a DS3 coaxial cable to Module A DS3 OUT connector.	❒
5	Proceed to "Wiring the Common Access Panel" on page 15.	❒

Installer Signature ✍	Date

INSTALLING INTERFACE CABLES—DSX-1 TO DSL (PORT 1)

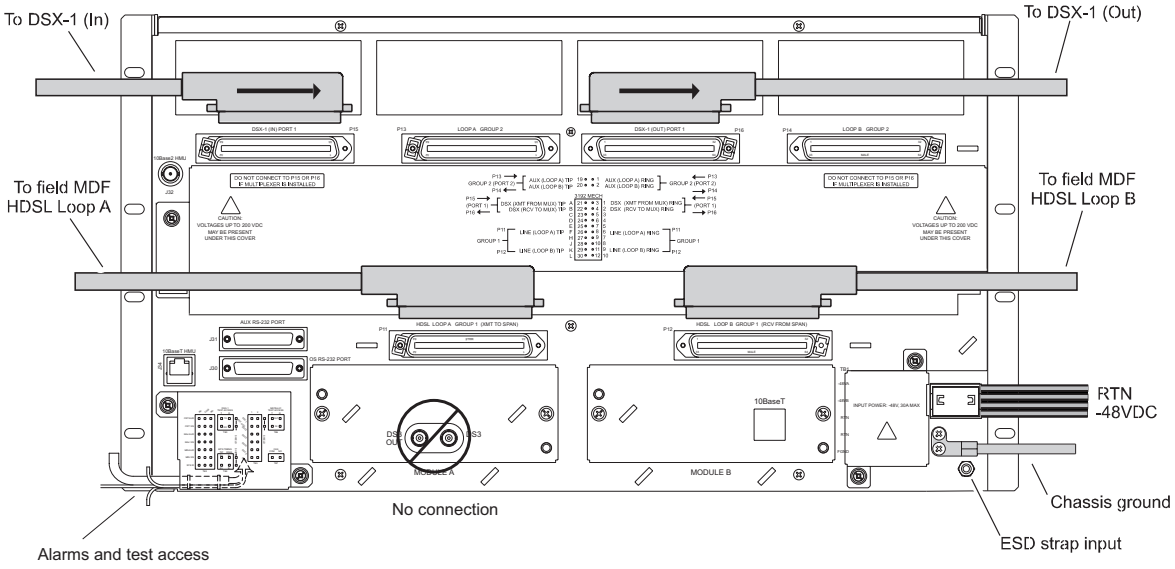


Figure 8. *Installing Cables for a DSX-1 Configured Shelf (Backplane View)*

Standard 3192 Port 1 Connection: This configuration uses the Port 1 DSX-1 connection from any 3192-compliant line card. Do not use a multiplexer in this configuration. If a multiplexer is required, refer to "Installing Interface Cables—DSX-1 to DSL (Port 2)" on page 14.

Step	Procedure	Installer Check ✓
	Whenever installing or removing units from the HMS-358 chassis, be sure to wear an antistatic wrist strap and connect it to the ESD strap input.	
1	Connect the 32-pair shielded amphenol female connector to **P11**, HDSL LOOP A and route to the field MDF. See "Drain Wire and Cable Tie Installation" on page 8 for proper installation of all amphenol connectors.	❒
2	Connect the 32-pair shielded amphenol female connector to **P12**, HDSL LOOP B and route to the field MDF.	❒
3	Connect the 32-pair shielded amphenol female connector to **P15**, DSX-1 (IN) LINE CARD and route to the DSX-1.	❒
4	Connect the 32-pair shielded amphenol female connector to **P16**, DSX-1 (OUT) LINE CARD and route to the DSX-1.	❒
5	Proceed to "Wiring the Common Access Panel" on page 15.	❒

Installer Signature ✍	Date

INSTALLING INTERFACE CABLES—DSX-1 TO DSL (PORT 2)

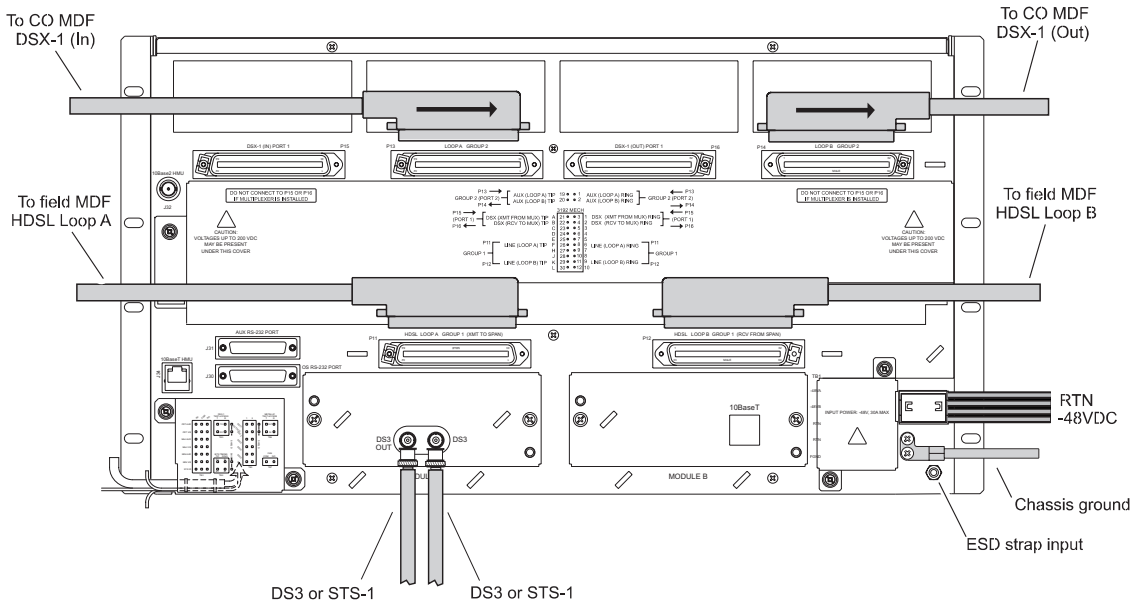


Figure 9. *Installing Cables for a DSX-1 Configured Shelf (Backplane View)*

Port 2 Connection with Optional Multiplexer: This configuration requires the installation of an H2TU-C List 2E line card to access P13 (IN) and P14 (OUT) Port 2 DSX-1 functions. A multiplexer can be installed in this configuration. (The Transmit and Receive DSX-1s for H2TU-C List 2E line cards are set to Port 1 by default. To configure for Port 2, refer to the H2TU-C List 2E user manual.)

Port 2 can also be accessed by wirewrapping the connections. See "Appendix C - Optional Wire-Wrapping Port Connections" on page 80 for instructions.

Step	Procedure	Installer Check ✓
	Whenever installing or removing units from the HMS-358 chassis, be sure to wear an antistatic wrist strap and connect it to the ESD strap input.	
1	Connect the 32-pair shielded amphenol female connector to **P11**, HDSL LOOP A and route to the field MDF. See "Drain Wire and Cable Tie Installation" on page 8 for proper installation of all amphenol connectors.	❒
2	Connect the 32-pair shielded amphenol female connector to **P12**, HDSL LOOP B and route to the field MDF.	❒
3	Connect the 32-pair shielded amphenol female connector to **P13**, DSX-1 (IN) LINE CARD and route to the DSX-1.	❒
4	Connect the 32-pair shielded amphenol female connector to **P14**, DSX-1 (OUT) LINE CARD and route to the DSX-1.	❒
5	Proceed to "Wiring the Common Access Panel" on page 15.	❒

Installer Signature	Date

WIRING THE COMMON ACCESS PANEL

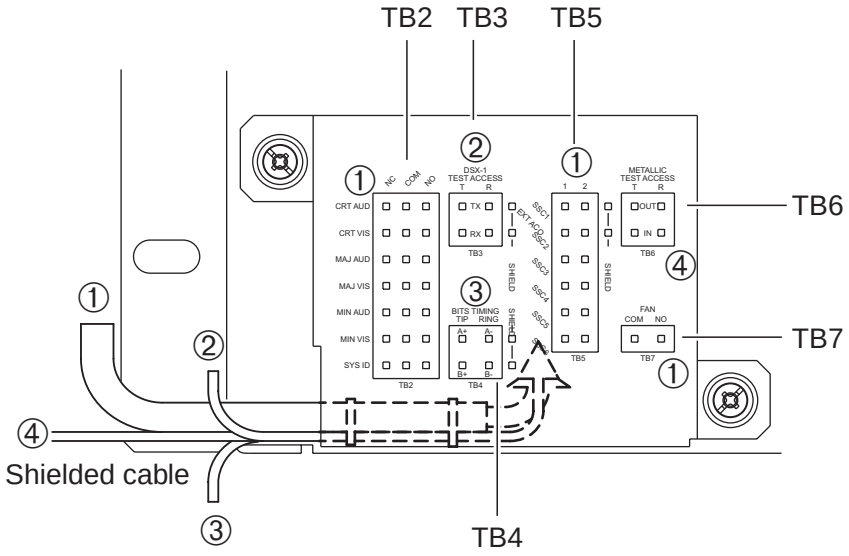


Figure 10. *Common Access Panel*

Step	Procedure	Installer Check ✓
	Whenever installing or removing units from the HMS-358 chassis, be sure to wear an antistatic wrist strap and connect it to the ESD strap input.	
1	Loosen the hold-down lugs on the Common Access Panel (see Figure 10) and lift off the cover. (For enlarged view of wire-wrap posts, see Figure 41 on page 70.)	❒
2	Connect shielded alarm relay wires from the CO alarm center to the wire wrap posts at **Alarm Management (TB2)**. Follow the CO site instructions for connecting alarm relays.	❒
3	Connect shielded transmit (TX) tip and ring and receive (RX) tip and ring at the DSX-1 **Test Access (TB3)** block and the corresponding chassis shield posts to the external test head.	❒
4	If you are installing an HXU-359 multiplexer in the HMS-358, connect the shielded **Bits Timing (TB4)** block Bits A, Bits B, and the corresponding chassis shield posts to the SONET clock synchronization source.	❒
5	If you have a requirement for an external alarm, such as an open door alarm, use the **User Configurable Alarm Inputs (TB5)** block to wire the SSC1 EXT ACO (Special Signaling Channel 1 External Alarm Cutoff), the SSC2 (Special Signaling Channel 2), and the chassis shield to the third-party alarm.	❒
6	Wire COM pin and the NO pin of the **Fan (TB7)** block in series with an external rack fan. There is a dry contact closure between pins 1 and 2 when the internal air temperature of the HMS-358 reaches 80°F.	❒
7	Replace the cover and tighten the screws.	❒
8	Proceed to "Installing the Power Cables" on page 16.	❒

Installer Signature ✍	Date

INSTALLING THE POWER CABLES

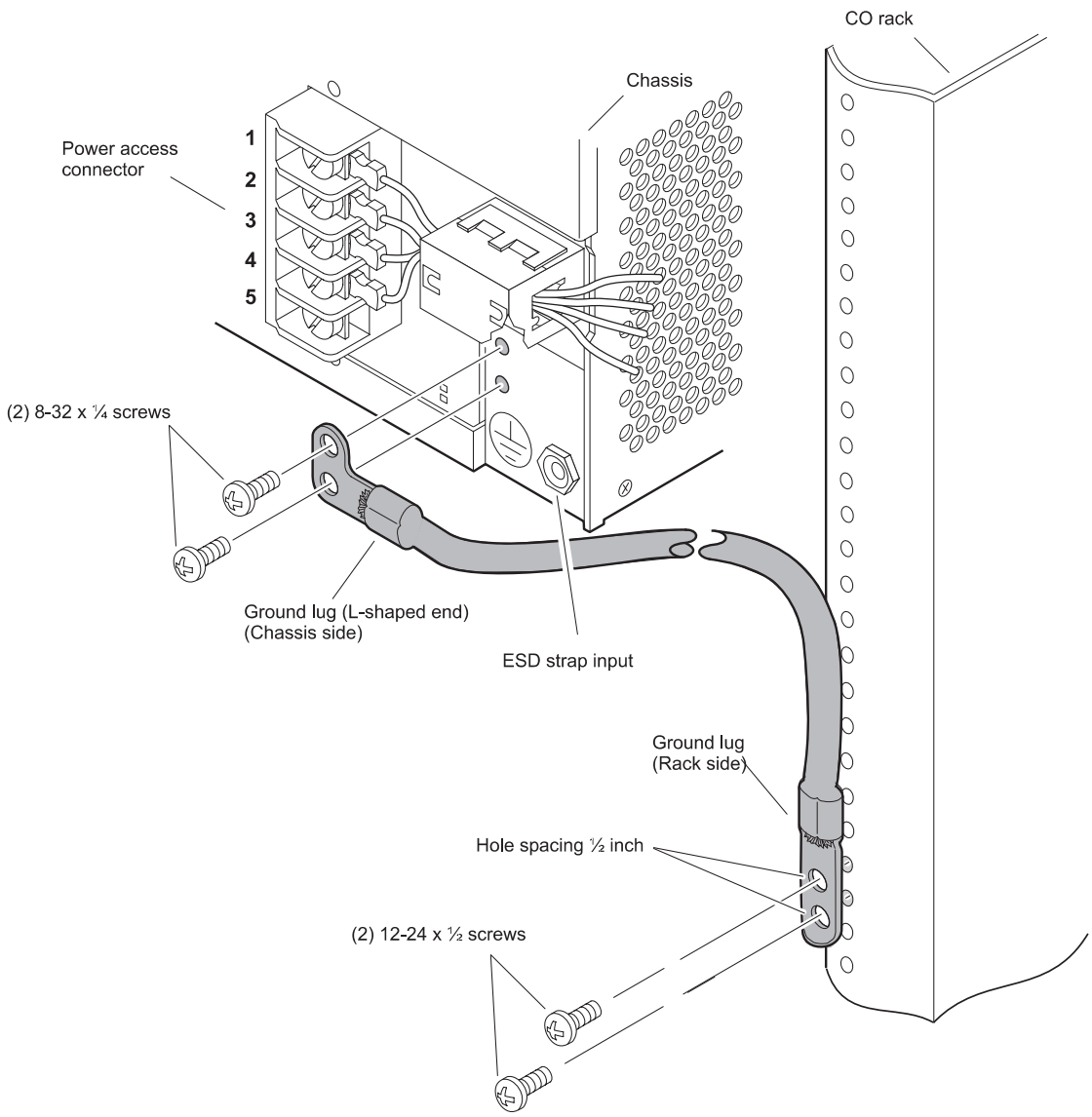


Figure 11. *Grounding the Chassis (Right-Hand Side, Rear View)*

Step	Procedure	Installer Check ✓
	Whenever installing or removing units from the HMS-358 chassis, be sure to wear an antistatic wrist strap and connect it to the ESD strap input.	
1	Verify that fuses are removed from fuse panel.	❒
2	Remove the panel on the lower right-hand corner of the backplane by removing the two screws that secure it (use a No. 1 Phillips).	❒

Continued

Step	Procedure (Continued)	Installer Check ✓
	For legacy (painted) racks, remove the paint from the contact area to ensure good frame ground.	
3	Attach the L-shaped end of the ground lug (see Figure 11 on page 16) using two 8-32 x $^{3}/_{16}$ screws to the rear of the chassis.	❒
4	Attach the other end of the ground lug (see Figure 11 on page 16) using two 12-24 x $^{1}/_{2}$ screws to the CO rack using locally approved methods (6 AWG or larger cables require double screw connectors).	❒
5	Reduce EMI by prying open the ferrite clamp (see Figure 12) with a slot screwdriver and routing the battery feed wires through the clamp before connecting them to the Power Access.	❒

Continued

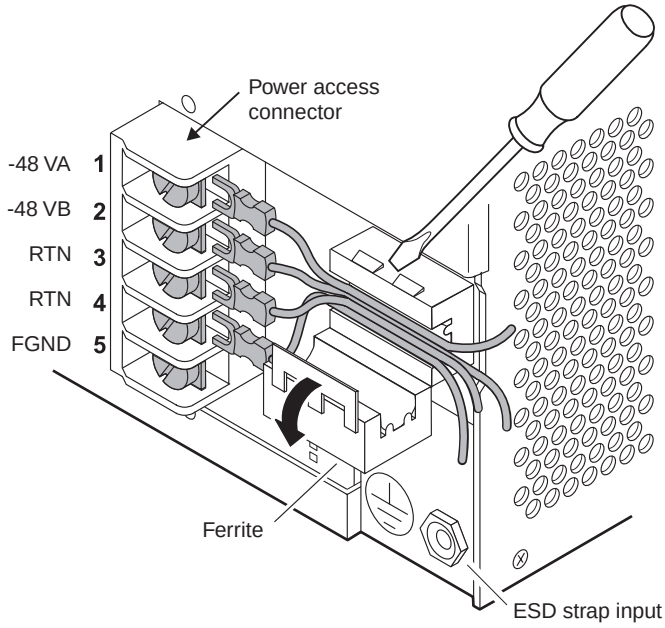


Figure 12. *Opening the Ferrite and Routing the Battery Feed Wires (Right-Hand Side, Rear View)*

-48 VA Return and -48 VB Return are tied together on the backplane and are referenced as RTN on the Power Access connector.

Step	Procedure (Continued)	Installer Check ✓
	All connections to terminal block TB1 Power Access connector must be done to local codes.	
6	Attach a ring connector (or locally approved connector) to terminate the 12 AWG ground wire at frame ground (FGND) on the Power Access connector (if needed).	❒
7	Connect a 12 AWG gauge wire to the -48 V RTN terminal in position 3 (see Figure 12 on page 17) of the Power Access connector. Connect the opposite end of this wire to the battery return of the CO battery supply at the fuse panel. If a connector is required, conform to local code.	❒
8	Connect a 12 AWG gauge wire to the -48 V RTN terminal in position 4 (see Figure 12 on page 17) of the Power Access connector. Connect the opposite end of this wire to the battery return of the CO battery supply at the fuse panel. If a connector is required, conform to local code.	❒
9	Connect a 12 AWG gauge wire to the -48 VA terminal in position 1 (see Figure 12 on page 17) of the Power Access connector (for slots 1-14). Connect the opposite end of this wire to the -48 Vdc CO battery supply at the fuse panel. (Fuse is removed.) If a connector is required, conform to local code.	❒
10	Connect a 12 AWG gauge wire to the -48 VB terminal in position 2 (see Figure 12 on page 17) on the Power Access connector (for slots 15-28). Connect the opposite end of this wire to the -48 Vdc CO battery supply at the fuse panel. (Fuse is removed.)	❒
11	Install a fuse of appropriate value in the fuse panel tray, based on the power recommendations given in "Power Specifications" on page 71 and Table 14 and Table 15 on page 74.	❒
12	Close the ferrite clamp.	❒
13	Connect the fuse panel to the office power supply according to CO guidelines.	❒
14	With a voltmeter, verify voltages on the Power Access connector (see Figure 12 on page 17). There should be -48 Vdc across pins 1, -48 VA and RTNs 3 and 4 and pin 2, -48 VB and RTNs 3 and 4. Returns are tied together.	❒
15	Replace the slide panel that covers the Power Access connector by placing the cover over the screws and aligning the panel holes with the screws. Slide the panel $^1/_4$-inch to the right until it snaps into place, then tighten the screws.	❒
16	Proceed to "Connecting the Network Interface" on page 19.	❒

Installer Signature	Date

CONNECTING THE NETWORK INTERFACE

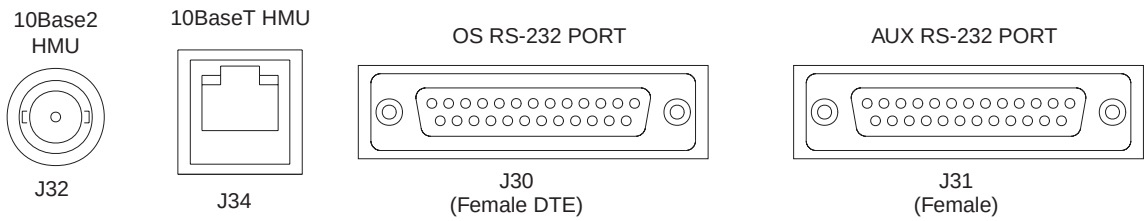


Figure 13. *Network Interface Connections*

For all network connections, shielded cables are required.
For 10BASE-T connections, Category-5 shielded cables are required.

Step	Procedure	Installer Check ✓
	Whenever installing or removing units from the HMS-358 chassis, be sure to wear an antistatic wrist strap and connect it to the ESD strap input.	
1	Determine the network interface for your application	
	10BASE-2 (coaxial - J32)	❒
	10BASE-T (shielded Category 5 - J34)	❒
	OS DB-25 (RS232, X.25 - J30) Female DTE	❒
	AUX DB-25 (RS232 - J31) Female	❒
2	Connect the appropriate network interface cable (10BASE-2, 10BASE-T, or DB-25) from the network to the appropriate network interface connector located on the rear of the shelf (see Figure 13). For connector pinouts, see Table 5 below through Table 8 on page 21.	❒
3	If your network uses a 10BASE-T interface, proceed to "Setting Up a Multishelf 10BASE-T Configuration" on page 22. If your network uses a 10BASE-2 interface, proceed to "Setting up a 10BASE-2 Configuration" on page 23.	❒

Installer Signature ✍	Date

Table 5. *J32 Pinouts for 10BASE-2 Interface*

Pin	Description
Center	LAN
Shield	LAN

Cable must be coaxial.

Table 6. *J34 Pinouts for 10BASE-T Interface*

Pin	Description
1	TD
2	TD
3	RD
4	NC
5	NC
6	RD
7	NC
8	NC

NC = no connection.
Cable must be shielded category 5.

The OS interface (Table 7) supports RS232 craft interface or an X.25 remote interface.

Table 7. *J30 Pinouts for DB-25 (Female Connector) OS Interface (DTE)*

Pin	Description	Pin	Description
1	NC	14	NC
2	NMA TX	15	NMA TCLK
3	NMA RX	16	NC
4	NMA RTS	17	NMA RCLK
5	NMA CTS	18	NC
6	NMA DSR	19	NC
7	NMA RTN	20	NMA DTR
8	NC	21	NC
9	NC	22	NC
10	NC	23	NC
11	NC	24	OS TCLK
12	NC	25	NC
13	NC		

NC = no connection.
Cable must be shielded.

Table 8. *J31 Pinouts for DB-25 (Female Connector) AUX Interface (DTE)*

Pin	Description	Pin	Description
1	NC	14	NC
2	AUX TX	15	NC
3	AUX2 RX	16	NC
4	AUX2 RTS	17	NC
5	AUX2 CTS	18	NC
6	AUX2 DSR	19	NC
7	AUX2 RTN	20	AUX2 DTR
8	NC	21	NC
9	NC	22	NC
10	NC	23	NC
11	NC	24	NC
12	NC	25	NC
13	NC		

NC = no connection.
Cable must be shielded.

The RS-232 DB-25 AUX interface cannot be used when a multiplexer is present in the shelf.

SETTING UP A MULTISHELF 10BASE-T CONFIGURATION

The Wideband 3190 can be connected by an external hub to other shelves in a 10BASE-T network.

Figure 14 shows a multishelf 10BASE-T configuration. Use shielded twisted-pair cables (Category-5) to connect each shelf to the hub.

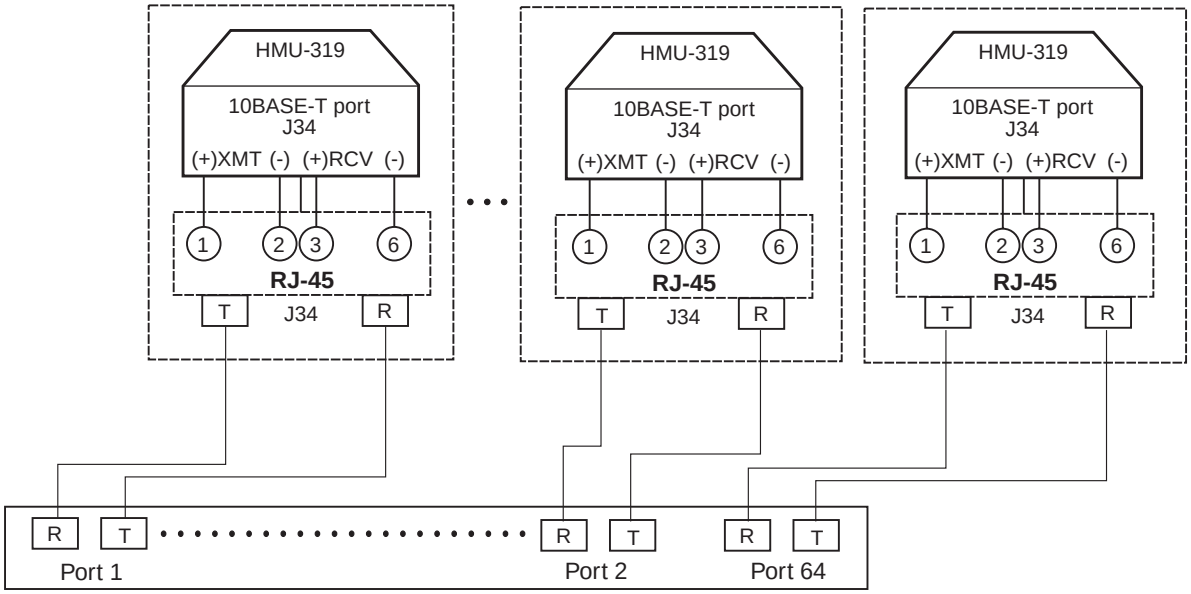


Figure 14. *Multishelf 10BASE-T Configuration*

Step	Procedure	Installer Check ✓
1	Connect each CO shelf to an external hub using shielded twisted-pair cable (Category-5). The maximum length of each twisted pair is 328 ft. (100 m)	❒
2	Proceed to "Installing a Management Unit (HMU)" on page 25.	❒

Installer Signature ✍	Date

SETTING UP A 10BASE-2 CONFIGURATION

The HMS-358 can be connected by an external hub to other shelves in a 10BASE-2 network.

MULTISHELF 10BASE-2 CONFIGURATION

An HMS-358 multishelf 10BASE-2 configuration can be managed locally or by a remote terminal over an X.25 network as shown in Figure 15. For the purposes of installation, this manual only describes local management. For more information on setting up an X.25 connection, refer to the HMU-319 List 5A, List 7A, and List 7C user manuals.

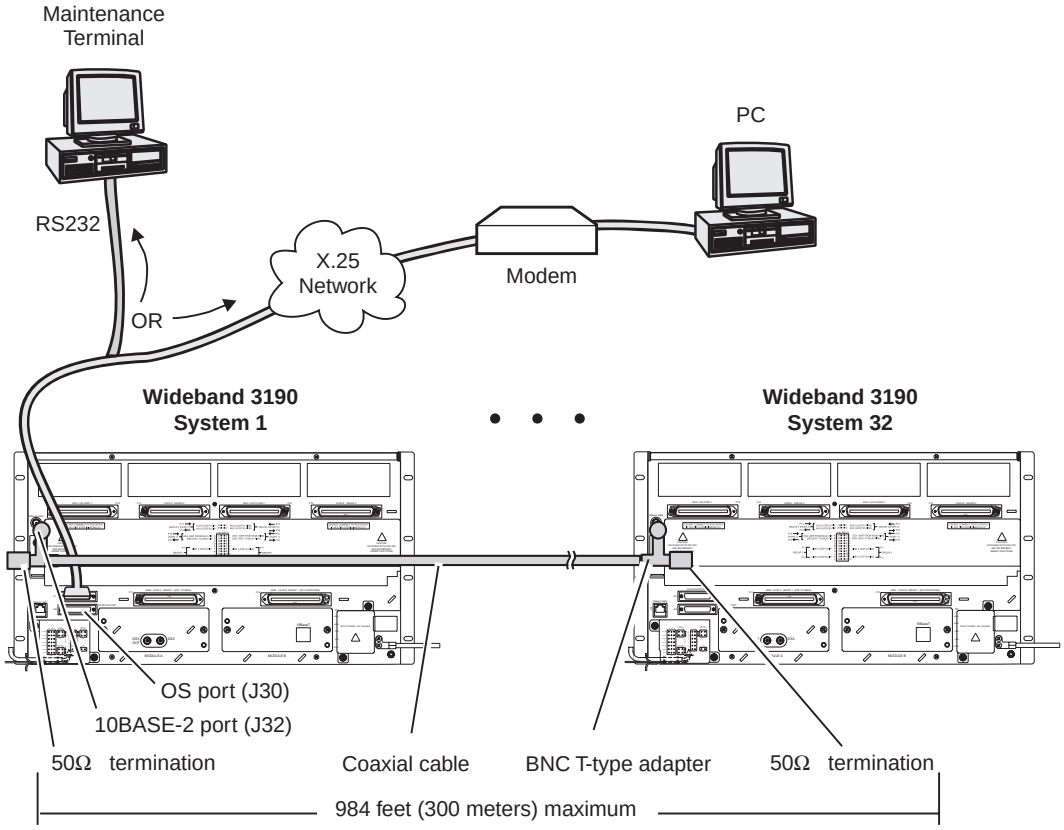


Figure 15. *Multishelf 10BASE-2 Configuration*

- **The bayonet-locking connector (BNC) T-adapter must directly connect to the 10BASE-2 connector.**
- **Do not use coax cable between the BNC T-adapter and J32.**
- **The first and last shelf in a multishelf system require a 50Ω termination.**

Step	Procedure	Installer Check ✓
1	Connect a standard BNC T-adapter to the 10BASE-2 port (J32) on the backplane of each shelf in the series as shown in Figure 15 on page 26.	❒
2	Connect one end of a coaxial cable to the BNC adapter on the back of the first shelf.	❒
3	Connect the other end of the cable to the BNC adapter on the back of the second shelf in the series.	❒
4	Connect each shelf to the next shelf in a series as described in Step 1 through Step 3.	❒
5	Install a standard 50Ω termination on the unused side of the BNC adapter on the first and the last shelves in the series.	❒
6	Proceed to "Installing a Management Unit (HMU)" on page 25.	❒

Installer Signature ✍	Date

MANAGEMENT OVER AN X.25 NETWORK

The HMS-358 can be managed from a remote terminal over an X.25 network. For more information about X.25 networks, refer to the HMU-319 List 5A, List 7A, and List 7C user manuals. Once you have installed and configured the HMU as described in the section "Installing a Management Unit (HMU)" on page 25, you can set up an X.25 interface as described below:

Step	Procedure	Installer Check ✓
1	Connect the remote maintenance terminal to the remote modem. Refer to the HMU user manual for details of connection and configuration.	❒
2	Connect the remote modem to the OS port (J30).	❒
3	Access the HMU and use TL1 commands to configure the OS port for X.25 as described in "Appendix B - HMU Configuration for X.25 and Ethernet Connections" on page 76.	❒
4	Once the OS port is set up for X.25, you can use the HMU X.25 Management screen to customize the X.25 interface.	❒

Installer Signature ✍	Date

INSTALLING A MANAGEMENT UNIT (HMU)

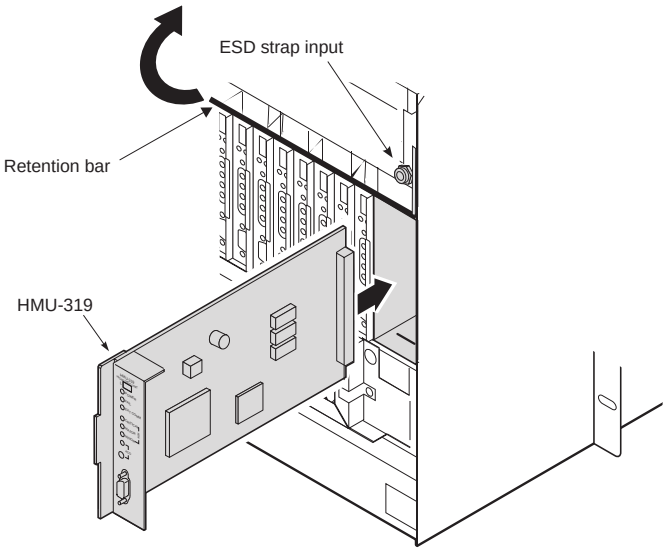


Figure 16. *Installing an HMU*

Step	Procedure	Installer Check ✓
	Whenever installing or removing units from the HMS-358 chassis, be sure to wear an antistatic wrist strap and connect it to the ESD strap input.	
1	Unscrew the two hold-down lugs on each upper corner of the chassis front cover. The cover folds down.	❒
2	Lift the retention bar at the top of the chassis to allow insertion of the module.	❒
3	Hold the HMU-319 vertically with the front of the card toward you. Align the top and bottom edges of the HMU-319 with the guide rails in the HMU slot and slide the HMU-319 into the rightmost slot position on the chassis (labeled HMU). See Figure 16.	❒
4	Press the HMU-319 firmly into the connector at the back of the slot. When the pins on the HMU-319 connect to the pins on the shelf backplane, the HMU-319 powers up, the Power LED lights green, and the Fail LED and Critical LED briefly flash red.	❒
5	Proceed to "Configuring the Management Unit" on page 29.	❒

Installer Signature ✍	Date

CONNECTING A LOCAL MAINTENANCE TERMINAL

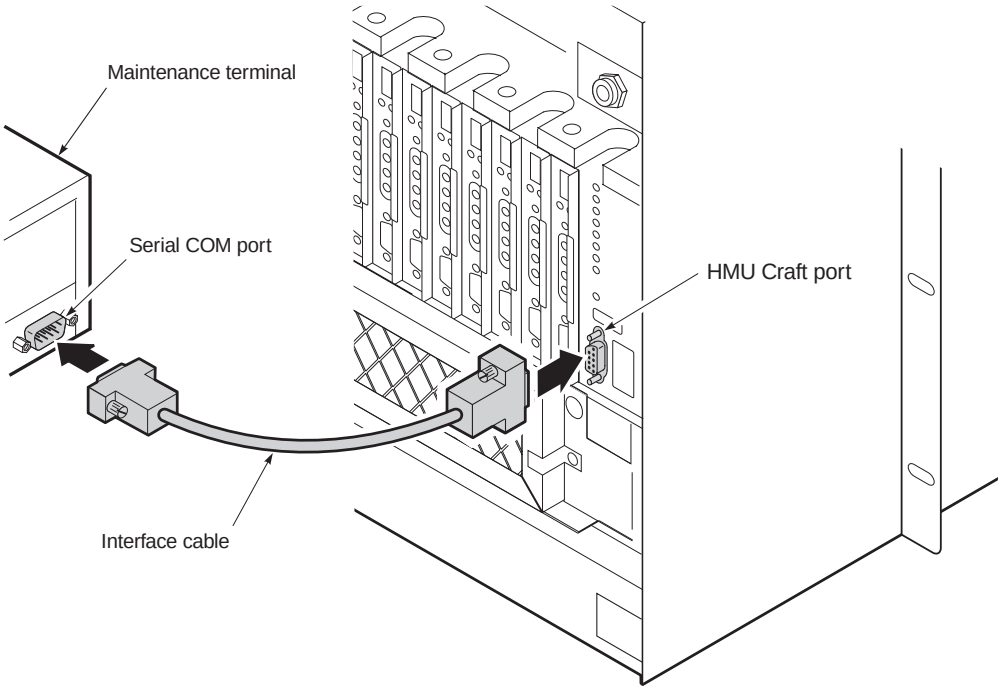


Figure 17. *Connecting a Maintenance Terminal to the HMU Craft Port*

Step	Procedure	Installer Check ✓
	The HMU DCE should be connected to the DTE port of the local maintenance terminal. If the connection to the HMU requires a DTE-to-DTE or DCE-to-DCE interface, see the HMU user manual for information about null modem adapters. The HMU user manual also provides information about remote terminal connections and X.25.	
1	Connect a standard 9-pin, terminal cable to the HMU front panel craft (DB-9) port or connect a 25-pin terminal cable to the OS port (J30) on any of the shelves in the network. If you are connecting the maintenance terminal to the OS port (local RS232 or remote X.25), a null modem adapter is required. The craft port is configured as DCE. The OS port is configured as DTE.	❒
2	Connect the other end of the terminal cable to the serial COM port on the maintenance terminal.	❒
3	Start a VT100 terminal emulation program, such as HyperTerminal or Procomm, on the PC.	❒
4	Configure the maintenance terminal as follows: • 9600 baud • No parity • 8 data bits • 1 stop bit	❒
5	Proceed to "Using the Terminal Access Option" on page 27.	❒

Installer Signature ✍	Date

USING THE TERMINAL ACCESS OPTION

You can use the Terminal Access Option (TAO) interface to access and manage all the components of the HMS-358, including the line units, multiplexers, shelf, and the associated doublers and remote units.

Depending on the version of HMU software you are using, the logon procedure varies. At the time of this writing, all versions of software respond to at least one of the logon procedures described below. Select the logon procedure that applies and follow the instructions.

Procedure 1	**1** At the prompt, type `tao`, then press **ENTER**. **2** At the "enter password" prompt, type `public` (default password) and press **ENTER**.
Procedure 2	**1** At the prompt, type `tao`, then press **ENTER**. **2** After the message, "Please Log off TL1 session and retype TAO," type `logoff`, and then type a semicolon (;). **3** After the "Logged out OK" message, type `tao`, then press **ENTER**. **4** At the password prompt, type `public` (default password) and press **ENTER**.
Procedure 3	**1** At the prompt, type `tao`, then press **ENTER**. **2** After the message, "Please log on to local TL1 with proper privilege and re-type TAO," press **ENTER**. **3** At the "Enter TID [local]" prompt, enter the ID (if necessary) or press **ENTER**. **4** At the "Enter username" prompt, type `superuser` (default username), then press **ENTER**. **5** At the "Enter password" prompt, type `public#1` (default password) and press **ENTER**. **6** At the TL1 prompt (<), type `tao` and press **ENTER**.

- Upon successful logon to a **single-shelf system**, the Shelf Status screen appears (Figure 19 on page 28).
- Upon successful logon to a **multishelf system**, the Network Status Screen appears (Figure 18 on page 28). Select the shelf you wish to view. The Shelf Status screen appears.

If you forget your password, contact ADC Technical Assistance Center (see "Appendix E - Product Support" on page 84). For more information about passwords, refer to the HMU user manual.

Installer Signature **Date**

Contact the Technical Assistance Center (TAC) for information on using the Transaction Language 1 (TL1) command line interface for the following command sets:

- **HXU-358 List 1 (M13) TL1 Command Set**
- **HXU-359 List 1 (STS-1) TL1 Command Set**

Proceed to "Configuring the Management Unit" on page 29.

```
                          Terminal Access Option (TAO)

Network Status(Shelf # / Status / ID) Host ID: NEWCARD
--------------------------------------------------------------------------------
 1-Shelf name (1)                     17-
 2-Shelf name (2)                     18-
 3-Shelf name (3)                     19-
 4-                                   20-
 5-                                   21-
 6-                                   22-
 7-                                   23-
 8-                                   24-
 9-                                   25-
10-                                   26-
11-                                   27-
12-                                   28-
13-                                   29-
14-                                   30-
15-                                   31-
16-                                   32-
------------------------------------------------------------10/01/01 15:33:27---
                      X - Exit TAO   <CR> - Refresh Screen
Enter shelf number or select option:
```

Figure 18. *Multishelf Configuration Sample*

```
                          Terminal Access Option (TAO)

Shelf Status for: NEWCARD  (slot# - Alarm Status)
--------------------------------------------------------------------------------
 1 [HLU] NORMAL     2                  3 [HLU] NORMAL     4 [HLU] NORMAL
 5 [ELU] NORMAL     6 [ELU] NORMAL     7 [ELU] NORMAL     8 [UNK] NORMAL
 9 [HLU] NORMAL    10 [HLU] NORMAL    11 [UNK] UNKNOWN   12 [HLU] NORMAL
13 [HLU] NORMAL    14 [HLU] NORMAL    15 [HLU] NORMAL    16 [UNK] UNKNOWN
17 [HLU] NORMAL    18                 19 [HLU] NORMAL    20 [HLU] NORMAL
21 [HLU] NORMAL    22                 23 [HLU] NORMAL    24*[HLU] NORMAL
25 [HLU] NORMAL    26 [HLU] NORMAL    27 [HLU] NORMAL    28 [HLU] NORMAL
* = Slot Alarms Disabled                                 Mux [358] NORMAL
--------------------------------------------------------------------------------
LOS Alarm Bus: NORMAL          FUSE Alarm Bus: NORMAL

PROTECTION: NORMAL             PWRFEEDALM: NORMAL
Critical Alarm: OFF            Major Alarm: ON             Minor Alarm: OFF
------------------------------------------------------------10/01/01 15:34:26---

                       A - Alarm Management    M - Mux
                N - Network Screen  P - HLU Protection Switching
            O - Shelf Options  <CR> - Refresh Screen   X - Exit TAO
Enter Line Unit Number or Select Option:
```

Figure 19. *Single-Shelf Configuration Sample*

CONFIGURING THE MANAGEMENT UNIT

Be sure to have an IP address ready. It is required during HMU configuration. For more information on IP addressing, refer to "Network Communications" on page 68.

Once the HMU has been installed in the shelf, you need to complete the following basic configuration steps:

- Setting the HMU date and time stamp for all alarms and reporting (page 30)
- Setting up a Shelf Identifier (SID) for each shelf for on-screen displays (page 30)
- Setting the Local IP address (page 31)

If you forget your password, contact ADC Technical Assistance Center (see "Appendix E - Product Support" on page 84). For more information about passwords, refer to the HMU user manual.

Step	Procedure	Installer Check ✓
	 **The following procedure assumes proper TAO login. For proper login procedure, please refer to "Using the Terminal Access Option" on page 27.**	
1	From the Network Status screen (for multishelf configurations only), enter the number of the desired shelf (1 through 32), and then press ENTER.	❒
	 **The user-assigned chassis name must be used for proper shelf identification. A descriptive naming plan must be developed and implemented.**	
2	From the Shelf Status screen, press O to select Shelf Options.	❒
3	Proceed to "Setting the HMU Date and Time (Option H)" on page 30.	❒

Installer Signature ✍	Date

TAO times out after a period of inactivity. Enter TAO **to return to the TAO screen.**

Setting the HMU Date and Time (Option H)

Setting the HMU date and time globally configures these parameters for all HLU-319s in the system. The HMU-319 List 7A also globally updates the time and date settings for the HXUs in the chassis.

Step	Procedure	Installer Check ✓
1	Press H and then press ENTER to select Change HMU Date and Time.	❒
2	At the prompt, enter the current date using MM/DD/YY format, and then press ENTER.	❒
3	At the prompt, enter the current time using HH:MM 24-hour format, and then press ENTER.	❒
4	Press X to exit the screen and return to the Shelf Status menu.	❒
5	Proceed to "Setting the Shelf Identifier (Option D)" on page 30.	❒

Installer Signature ✍	Date

Setting the Shelf Identifier (Option D)

Step	Procedure	Installer Check ✓
1	From the Shelf Options menu, press D and then press ENTER to select Shelf ID.	❒
2	At the prompt, enter a text string of 32 alphanumeric characters or less to identify the shelf, and then press ENTER. The Shelf Identifier may be set to any value, but must be unique for each shelf in the network.	❒
3	Press X to exit the screen.	❒
4	Press Y to confirm, save the setting, and return to the Shelf Status menu.	❒
5	Proceed to "Setting the Local IP Address (Option A)" on page 31.	❒

Installer Signature ✍	Date

Setting the Local IP Address (Option A)

Step	Procedure	Installer Check ✓
1	From the Shelf Options menu, press A, then press ENTER to select Local IP Address for the HMU.	❒
2	At the prompt, enter the local IP address using the XXX.XXX.XXX.YYY format, where XXX and YYY are decimal numbers from 0 through 255. Do not select your own address. Your administrator should notify you of the unique address that has been assigned to the network. For additional help on IP addressing, see "Network Communications" on page 68.	❒
3	Press ENTER.	❒
4	Press X to exit the screen.	❒
5	Press Y to confirm, save the setting, and reset the HMU. The program returns to the Network Status menu (if in a multishelf configuration) or Shelf Status menu (if in a single shelf).	❒

Installer Signature ✍ **Date**

Setting the Ethernet Connection (Option G)

Step	Procedure	Installer Check ✓
1	From the Shelf Options menu, press G and then press ENTER to select Change Ethernet Connection.	❒
2	Press 1 and then press ENTER to select 10BASE-T.	❒
	For a single system installation that does not require a hubbed network connection, verify that the special 10BASE-T cable that comes with the module is connected from the module to the 10BASE-T (J34) connection on the back of the shelf. **If a hub is used, the 10BASE-T module can be routed directly to the hub using a Category-5 shielded connection.**	
3	Press X to exit the screen.	❒
4	Press Y to confirm, save the setting, and reset the HMU. The program returns to the Network Status menu (if in a multishelf configuration) or Shelf Status menu (if in a single shelf).	❒
5	Proceed to "Installing Multiplexers" on page 32.	❒

Installer Signature ✍ **Date**

INSTALLING MULTIPLEXERS

The HMS-358 can be configured with the following multiplexer cards:

- HXU-358 or HXU-360—DS3 (T1/E1) (see "Installing the HXU-358 or HXU-360 Multiplexer Card" on page 33)
- HXU-359—STS-1 (see "Installing the HXU-359 Multiplexer Card" on page 42)

Depending on which of these multiplexers you are configuring, locate the proper installation procedures as detailed in "Selecting the Proper Installation Procedures" below.

Before installing a multiplexer, verify that there are no cables plugged into P15 and P16 (Port 1) at the rear of the chassis. If there are cables connected to P15 and P16 and they are not in use, remove them. If the cables are in use, take them out of service and then remove them.

Leaving cables attached to P15 and P16 (Port 1) double terminates the DSX-1 interface and causes it to malfunction.

SELECTING THE PROPER INSTALLATION PROCEDURES

This guide divides the installation procedure of each multiplexer into tabbed sections (see Figure 20). Follow the procedures listed only within this tabbed section of the guide.

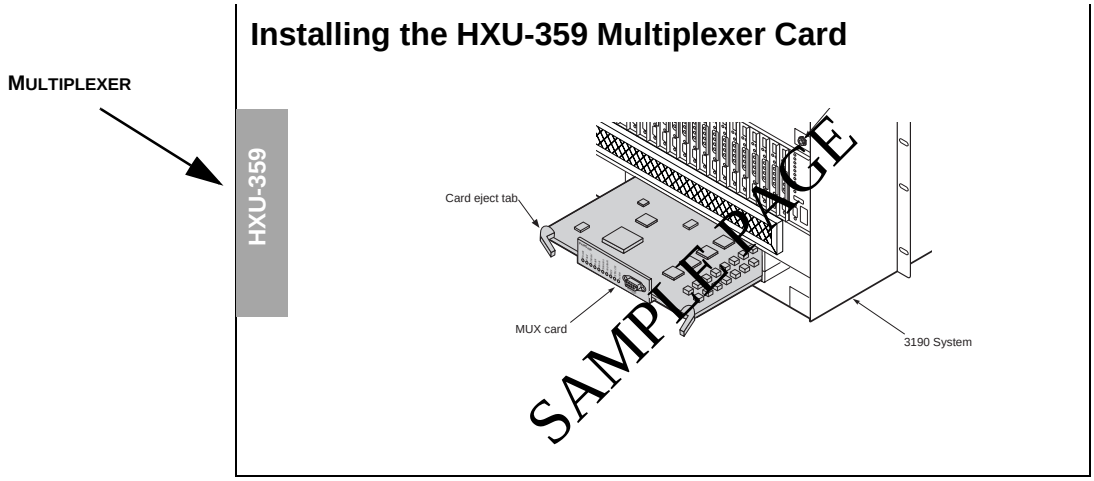


Figure 20. *Selecting the Proper Tabbed Section for Your Multiplexer*

INSTALLING THE HXU-358 OR HXU-360 MULTIPLEXER CARD

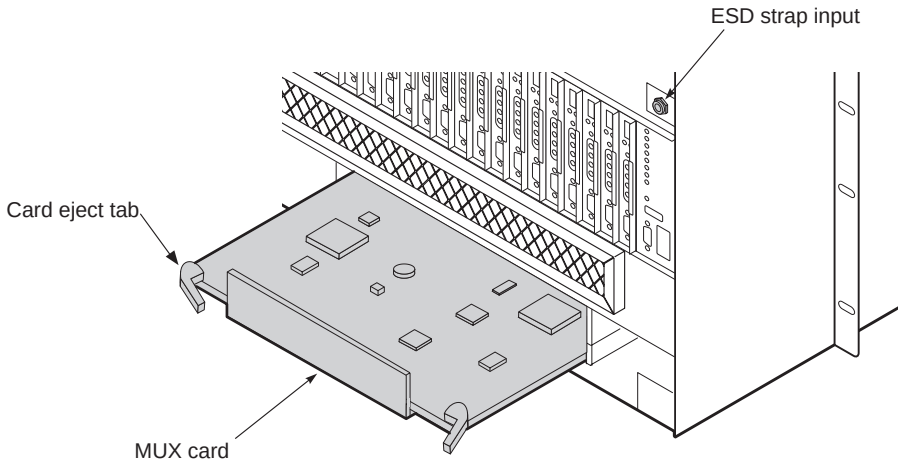


Figure 21. *Installing an HXU-358 or HXU-360*

Step	Procedure	Installer Check ✓
	Whenever installing or removing units from the HMS-358 chassis, be sure to wear an antistatic wrist strap and connect it to the ESD strap input.	
1	If you have not already done so, unscrew the two hold-down lugs on each side of the chassis front cover. The cover folds down.	❒
2	Plug your ESD strap into the ESD input on the front of the chassis.	❒
3	Align the edges of the HXU-358 or HXU-360 multiplexer card with the slot guides in the multiplexer tray.	❒
4	Grasping the card eject tabs, gently push the card into the bay.	❒
5	Firmly press in on the tabs until the card snaps into place.	❒
6	Repeat Step 3 through Step 5 for the other HXU-358 or HXU-360 multiplexer.	❒
7	Proceed to "Setting Up Basic System Parameters Through the Config Menu" on page 34.	❒

Installer Signature ✍	Date

Setting Up Basic System Parameters Through the Config Menu

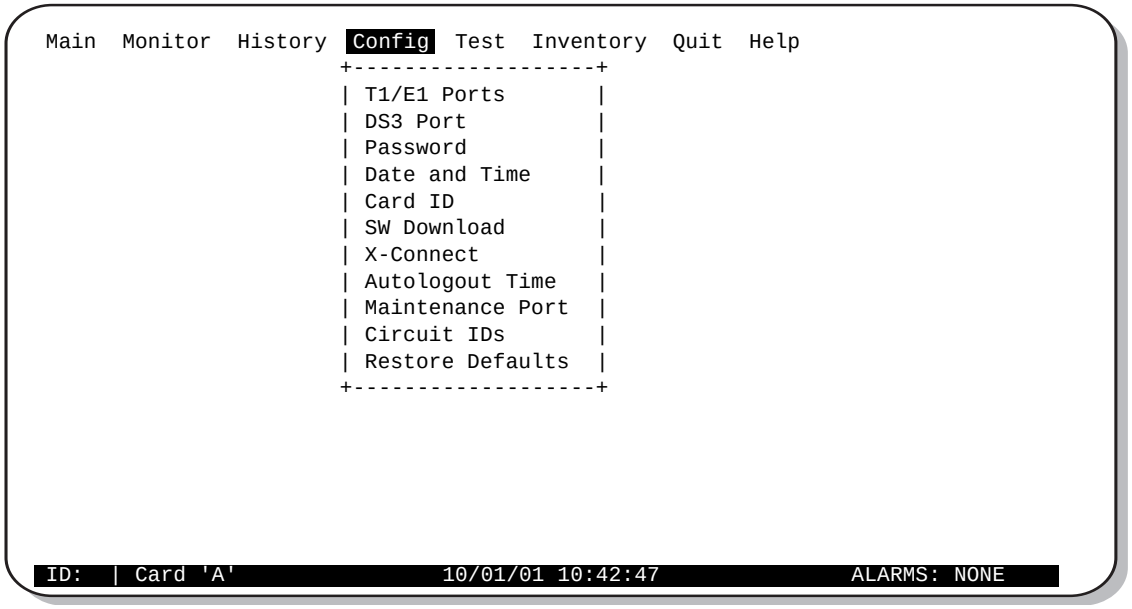


Figure 22. *Config Menu for the HXU-358*

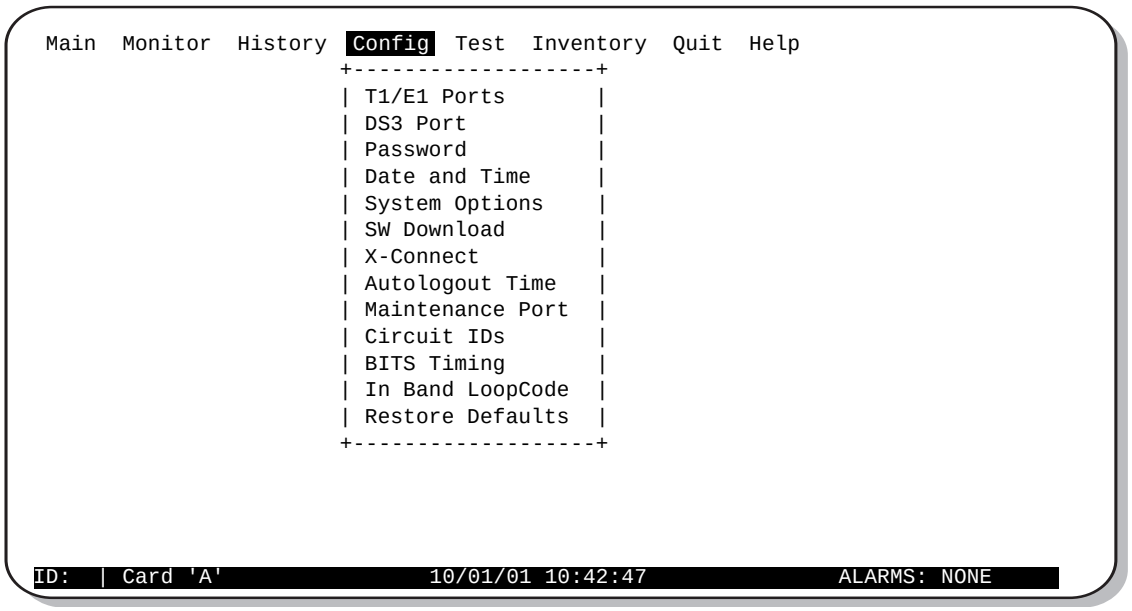


Figure 23. *Config Menu for the HXU-360*

Step	Procedure	Installer Check ✓
	The following procedure assumes proper TAO login. For proper login procedure, please refer to "Using the Terminal Access Option" on page 27.	
	Use ←, ↑, →, ↓ to navigate through multiplexer menu options and settings.	
1	From the Network Status screen, type the number of the desired shelf ID (1 through 32), and then press ENTER.	❒
2	From the Shelf Status screen, press O to select Shelf Options.	❒
3	From the Shelf Options screen, press E to configure the Mux Type.	❒
4	Press 2 for HXU-358 or HXU-360.	❒
5	Press X to exit the screen and return to the root menu of the Shelf Status screen.	❒
6	From the Shelf Options screen, select M.	❒
7	Select the **Config** menu and then press ENTER.	❒
8	Proceed to "Entering the Card ID (System Name) Through the Config Menu" on page 36.	❒

Installer Signature ✍	Date

Entering the Card ID (System Name) Through the Config Menu

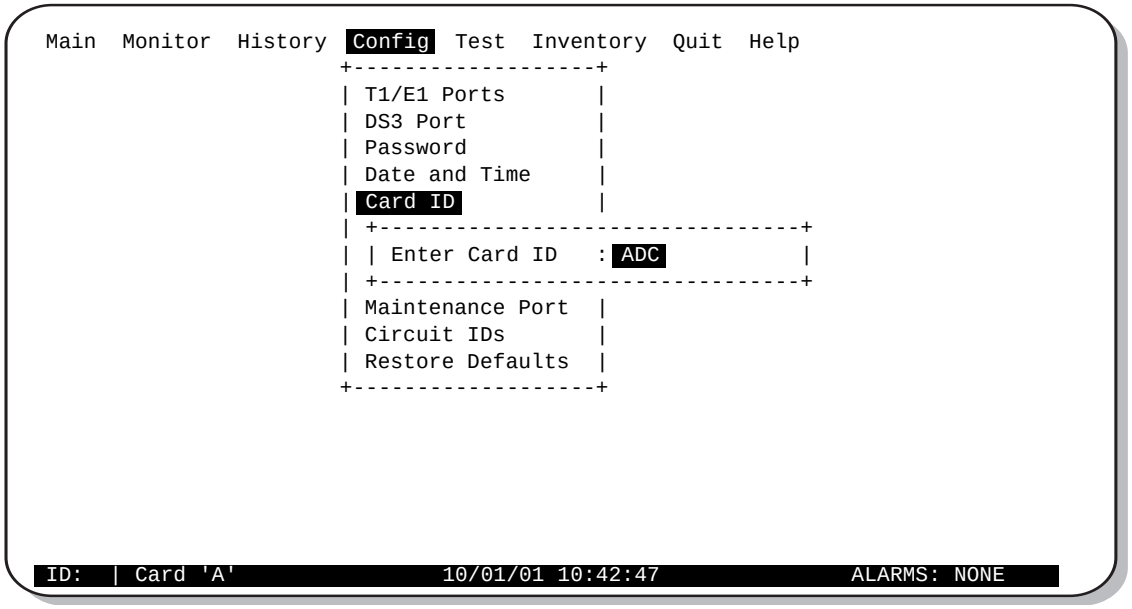


Figure 24. *Setting the Card ID Through the HXU-358*

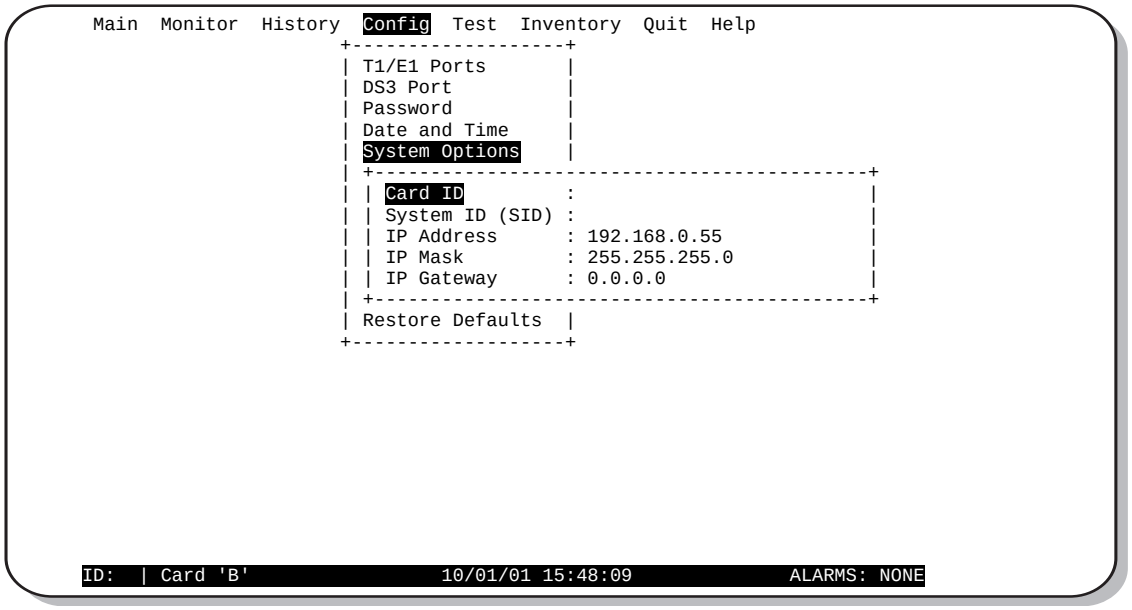


Figure 25. *Setting the Card ID Through the HXU-360*

Step	Procedure	Installer Check ✓
	Use ←, ↑, →, ↓ to navigate through multiplexer menu options and settings.	
1	To select the Card ID for the HXU-358: • From the **Config** menu, select **Card ID** and then press ENTER. • For more information on navigating through the menu system, refer to the procedures detailed in "Setting Up Basic System Parameters Through the Config Menu" on page 34. To select the Card ID for the HXU-360: • From the **Config** menu, select **System Options** and then press ENTER.	❒
2	Type the system name after **Enter Card ID** (for the HXU-358) or **Card ID** (for the HXU-360) and then press ENTER. **System ID (SID) must match the Wideband 3190 HMU System ID. See "Setting the Shelf Identifier (Option D)" on page 30 for instructions on setting the HMU SID.** **Disregard IP Address, IP Mask, and IP Gateway. These settings do not apply to the Wideband 3190 chassis.**	❒
3	Return to the **Config** menu by pressing ESC.	❒
4	Proceed to "Configuring DS1 Services Through the Config Menu" on page 38.	❒

Installer Signature ✍	Date

Configuring DS1 Services Through the Config Menu

```
 Main  Monitor  History  Config  Test  Inventory  Quit  Help
                        +------------------+
                        | T1/E1 Ports      |
+-------------------------------------------------------------------------------+
|  Port   Srvc Mode   LBO  Code  T1/E1  | Port   Srvc Mode  LBO  Code  T1/E1   |
|    1     IN-SRVC    133  B8ZS   T1    |  15   OUT-OF-SRVC 133  B8ZS   T1     |
|    2     IN-SRVC    133  B8ZS   T1    |  16   OUT-OF-SRVC 133  B8ZS   T1     |
|    3     IN-SRVC    133  B8ZS   T1    |  17   OUT-OF-SRVC 133  B8ZS   T1     |
|    4     IN-SRVC    133  B8ZS   T1    |  18   OUT-OF-SRVC 133  B8ZS   T1     |
|    5   MAINTENANCE  133  B8ZS   T1    |  19   OUT-OF-SRVC 133  B8ZS   T1     |
|    6   MAINTENANCE  133  B8ZS   T1    |  20   OUT-OF-SRVC 133  B8ZS   T1     |
|    7   MAINTENANCE  133  B8ZS   T1    |  21   OUT-OF-SRVC 133  B8ZS   T1     |
|    8   MAINTENANCE  133  B8ZS   T1    |  22   OUT-OF-SRVC 133  B8ZS   T1     |
|    9    MEM-ADMIN   266  B8ZS   T1    |  23   OUT-OF-SRVC 133  B8ZS   T1     |
|   10    MEM-ADMIN   399  B8ZS   T1    |  24   OUT-OF-SRVC 133  B8ZS   T1     |
|   11    MEM-ADMIN   533  B8ZS   T1    |  25   OUT-OF-SRVC 133  B8ZS   T1     |
|   12    MEM-ADMIN   655  B8ZS   T1    |  26   OUT-OF-SRVC 133  B8ZS   T1     |
|   13   OUT-OF-SRVC  133  B8ZS   T1    |  27   OUT-OF-SRVC 133  B8ZS   T1     |
|   14   OUT-OF-SRVC  133  B8ZS   T1    |  28   OUT-OF-SRVC 133  B8ZS   T1     |
+-------------------------------------------------------------------------------+

    Use <Spacebar> to cycle through option settings and <Enter> to activate

ID:  | Card 'A'              10/01/01 10:42:47              ALARMS: NONE
```

Figure 26. *Setting the T1/E1 Ports through the HXU-358 or HXU-360*

Step	Procedure	Installer Check ✓
	Use ←, ↑, →, ↓ to navigate through multiplexer menu options and settings.	
1	From the **Config** menu, select **T1/E1 Ports** and then press **ENTER**. For more information on navigating through the menu system, refer to the procedures detailed in "Setting Up Basic System Parameters Through the Config Menu" on page 34.	❒
2	To configure any of the 28 ports, select the port and change its **Srvc Mode** to MEM-ADMIN by pressing the **SPACEBAR**, and then press **ENTER**.	❒
3	Configure the following options: • Type of service **T1** or **E1** (T1 default) • Line code for T1 (**Code**) – AMI – B8ZS (default) • Line code for E1 (**Code**) – HDB3 • Line buildout (**LBO**) options for the channel (133 [default], 266, 399, 533, or 655 feet). Pertains to T1 only, not applicable for E1.	❒

Continued

Step	Procedure (Continued)	Installer Check ✓
	In the HMS-358 system, these settings must match the HLU settings (not the default settings). **If an HCC-319 List 1 and List 2 cut-through card is used, these settings should match those of the external line connected to the port.**	
4	Repeat Steps 1 and 3 for each service you are configuring.	❒
5	Proceed to "Configuring the DS3 Transport Through the Config Menu" on page 40.	❒

Installer Signature ✍	Date

Configuring the DS3 Transport Through the Config Menu

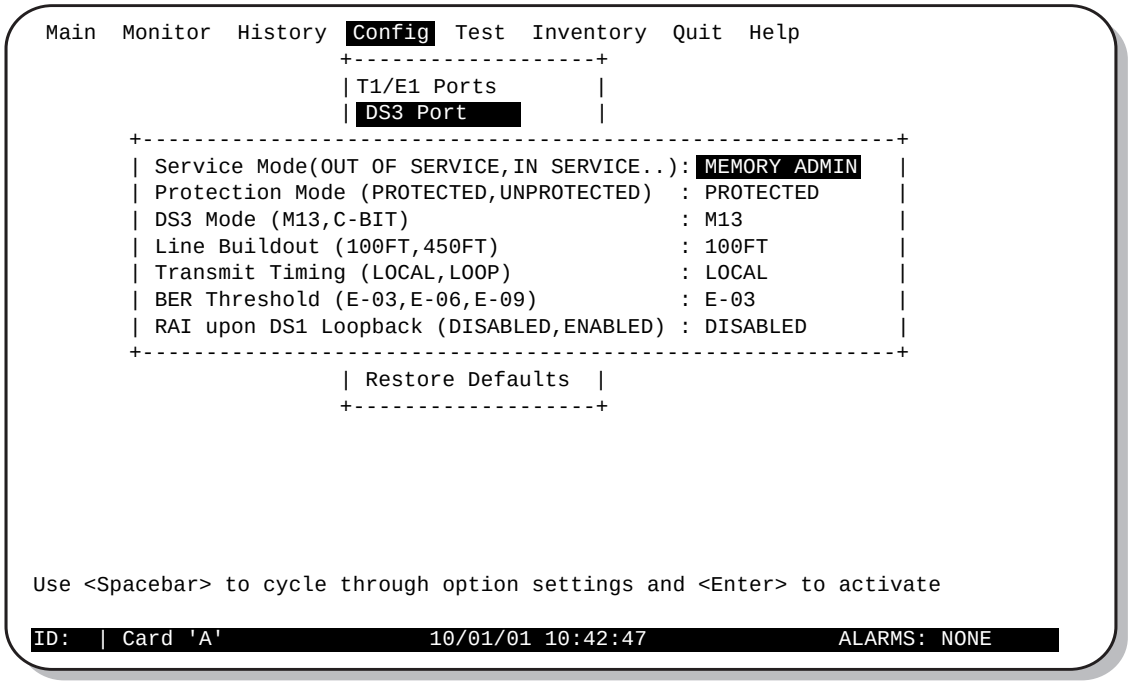


Figure 27. *Setting the DS3 Port Through the HXU-358 or HXU-360*

Step	Procedure	Installer Check ✓
1	From the **Config** menu, select **DS3 Port** and then press ENTER. For more information on navigating through the menu system, refer to the procedures detailed in "Setting Up Basic System Parameters Through the Config Menu" on page 34.	❒
2	Select **Service Mode**, press the SPACEBAR to select MEM-ADMIN, then press ENTER. No configuration changes can be made unless the Service Mode is configured as MEM-ADMIN.	❒
3	If this is a dual multiplexer application, **Protection Mode** is automatically set to PROTECTED.	❒
4	In most applications, **Operating Mode** should be set to M13.	❒
5	Set **Line Buildout** to 100FT (default) or 450FT. **In most applications Transmit Timing should be set to LOCAL.**	❒
6	Set the **BER Threshold** to E-03 (default), E-06, or E-09. (This sets the Bit Error Rate [BER] point at which an alarm is declared and protection switching occurs.)	❒
7	Set the **RAI upon DS1 Loopback** to DISABLED (default) or ENABLED. (RAI = Remote Alarm Indication)	❒
8	When you are finished configuring the DS3 Port, select **Service Mode** and change it to IN SERVICE.	❒
9	Exit the Shelf Options screen.	❒

Continued

Step	Procedure (Continued)	Installer Check ✓
10	Exit the Network Status screen by pressing ESC, then ENTER.	❒
11	If you plan to install a fan assembly, proceed to "Installing a Fan Assembly (Optional)" on page 51; otherwise, proceed to "Installing a Line Unit (HLU)" on page 53.	❒

Installer Signature ✍	Date

INSTALLING THE HXU-359 MULTIPLEXER CARD

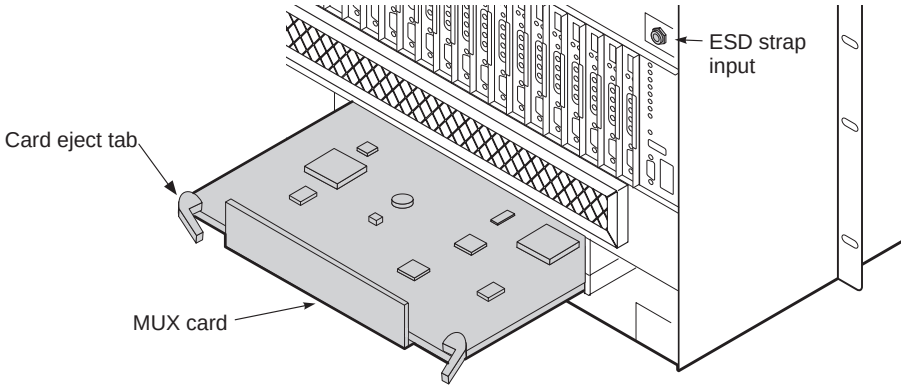
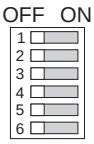


Figure 28. *Installing an HXU-359*

Step	Procedure	Installer Check ✓
	Whenever installing or removing units from the HMS-359 chassis, be sure to wear an antistatic wrist strap and connect it to the ESD strap input.	
1	Unscrew the two hold-down lugs on each side of the chassis front cover. The cover folds down.	❒
2	Plug your ESD strap into the ESD input on the front of the chassis.	❒
3	For an HMU-managed Wideband 3190, verify that switches 3 and 5 on the SW2 switch block located on the circuit board are set to the OFF position (default). Switch 3 (OFF) activates the (Open Span Termination System (OSTS) protocol for the backplane. Switch 5 (OFF) activates the HMU craft port for management. All other positions should be off. (ON position is towards the front panel. OFF position is towards the card-edge connector.) 	❒
	The HXU-359 default dip switch settings are set for Wideband 3190 operation and should not be modified.	
4	Align the edges of the HXU-359 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.	❒
7	Repeat Step 3 through Step 6 for the other HXU-359.	❒
8	Proceed to "Setting Up Basic System Parameters Through the Config Menu" on page 43.	❒

Installer Signature ✍ **Date**

Setting Up Basic System Parameters Through the Config Menu

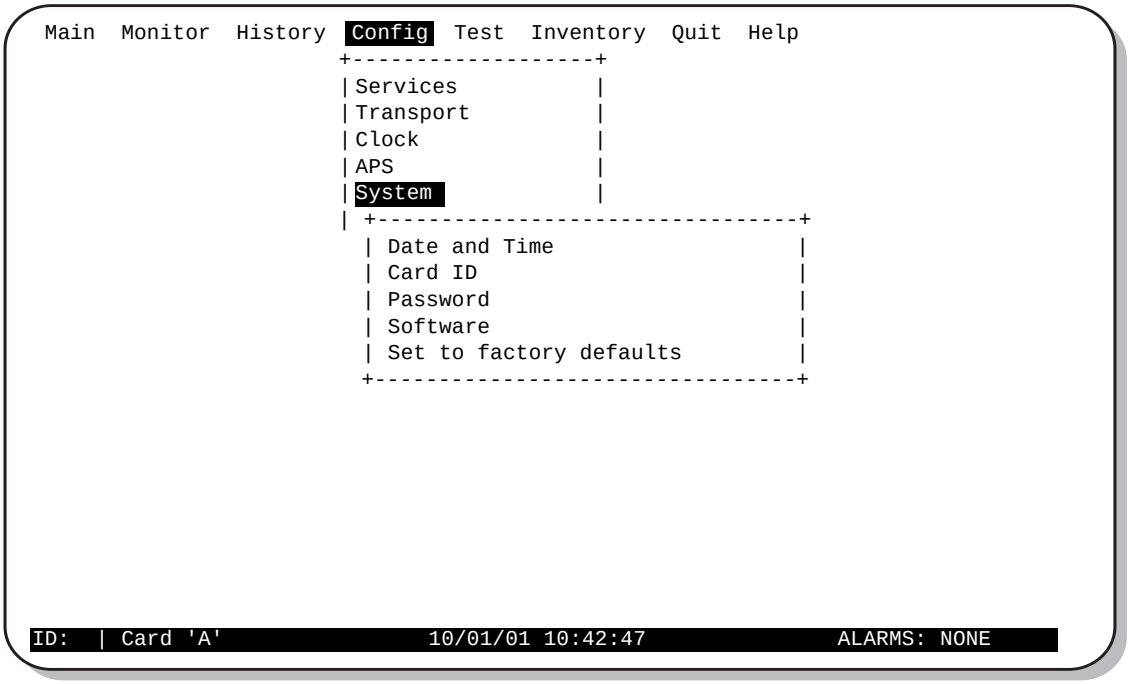


Figure 29. *Setting the Date and Time Through the HXU-359*

Step	Procedure	Installer Check ✓
	The following procedure assumes proper TAO login. For proper login procedure, please refer to "Using the Terminal Access Option" on page 27.	
1	From the Network Status screen, type the number of the desired shelf ID (1 through 32), and then press ENTER.	❒
2	From the Shelf Status screen, press O to select Shelf Options.	❒
3	From the Shelf Options screen, press E to configure the Mux Type.	❒
4	Press 3 for HXU-359.	❒
5	Press X to exit the screen, then press Y to confirm and save the setting and return to the root menu of the Shelf Status screen.	❒
6	From the Shelf Status screen, select M.	❒
7	Select the **Config** menu, choose **System**, and then press ENTER.	❒
8	Proceed to "Entering the Card ID (System Name) Through the Config Menu" on page 36.	❒

Installer Signature	Date

Entering the Card ID (System Name) Through the Config Menu

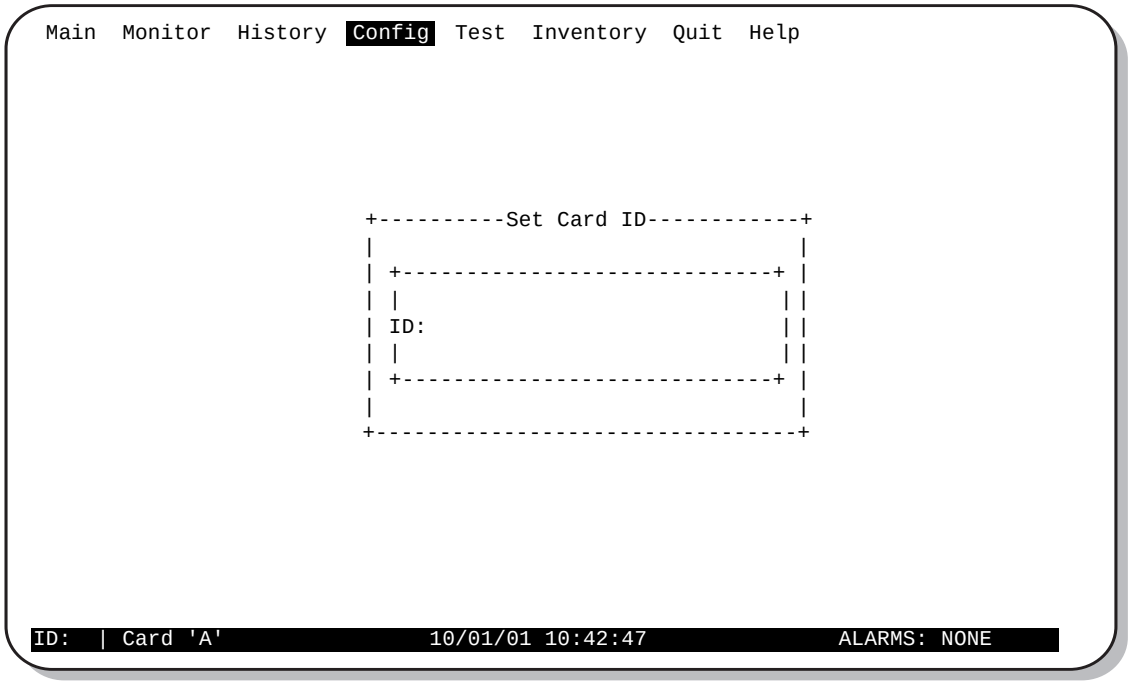


Figure 30. *Setting the Card ID Through the HXU-359*

Step	Procedure	Installer Check ✓
1	From the **System** submenu, choose **Card ID**, and then press **ENTER**. **Card ID is used to identify multiplexer to STS-1 network connection.**	❒
2	Type a name for the card (network element name), and then press **ENTER**. The name typed 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.	❒
3	Exit the **Config** menu by pressing **ESC**.	❒
4	Proceed to "Setting the System Clock Synchronization Through the Config Menu" on page 45.	❒

Installer Signature ✍	Date

Setting the System Clock Synchronization Through the Config Menu

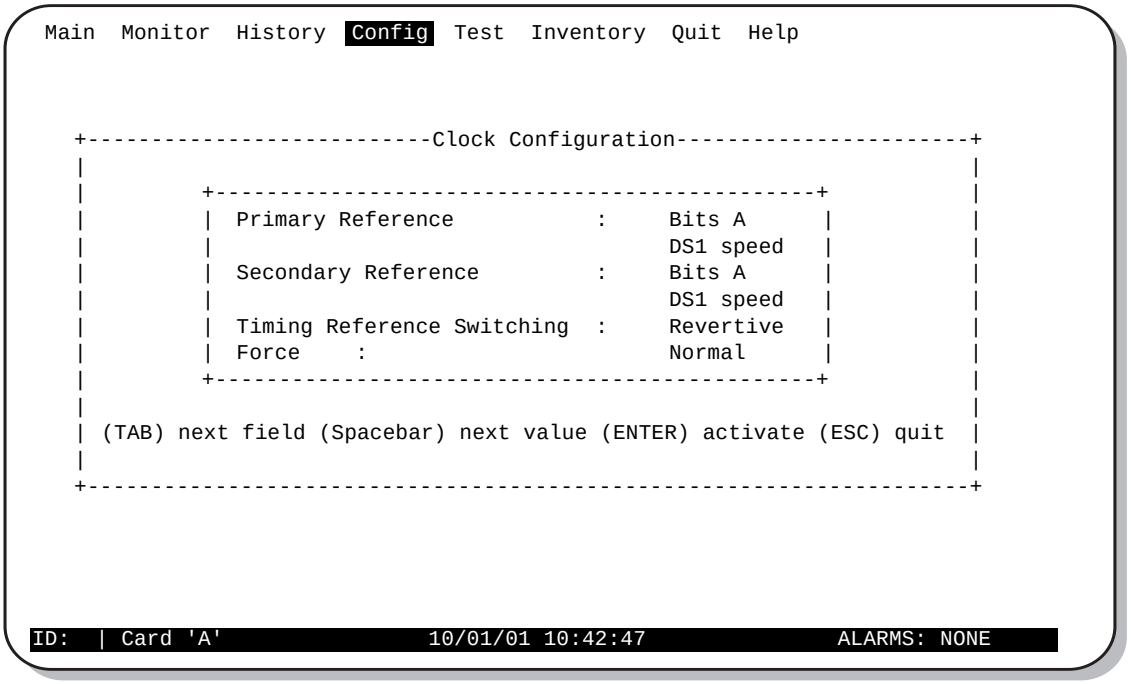


Figure 31. *Setting the Clock Configuration Through the HXU-359*

Step	Procedure	Installer Check ✓
1	From the **Config** submenu, choose **Clock**, and then press ENTER. For more information on navigating through the menu system, refer to the procedures detailed in "Setting Up Basic System Parameters Through the Config Menu" on page 43.	❒
2	Press the SPACEBAR to select the next value, and press TAB to select next field. Configure the following options: • Bits A DS1 speed (default) or E1 speed • Bits B DS1 speed (default) or E1 speed • Internal • Transport • Service #1 ~ 28	❒

Continued

Step	Procedure (Continued)	Installer Check ✓
3	Set the **Secondary Reference** and press TAB to select speed for synchronization. Configure the following options: • Bits A DS1 speed (default) or E1 speed • Bits B DS1 speed (default) or E1 speed • Internal • Transport • Service #1 ~ 28	❒
4	Set the **Timing Reference Switching.** Setting the timing reference to **Revertive** causes the clock to revert to the primary clock when it is valid. Configure the following options: • Revertive (default) • Non-revertive	❒
5	To manually force the clock synchronization mode, set **Force** to the desired mode. Configure the following options: • Normal (default) • Primary • Secondary • Internal • Hold-over	❒
6	Return to the **Config** menu by pressing ESC.	❒
7	Proceed to "Configuring DS1 Services Through the Config Menu" on page 47.	❒

Installer Signature ✍	Date

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

Configuring DS1 Services Through the Config Menu

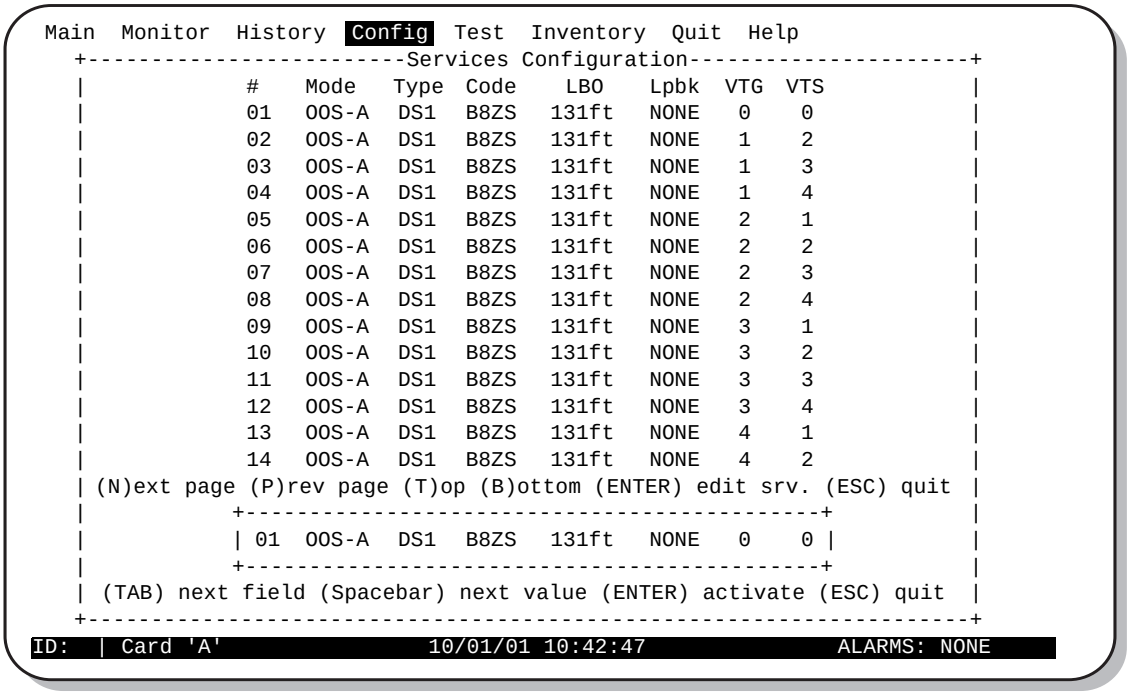


Figure 32. *Setting Up DS1 Services Through the HXU-359*

Step	Procedure	Installer Check ✓
1	From the **Config** submenu, choose **Services**, and then press **ENTER**. For more information on navigating through the menu system, refer to the procedures detailed in "Setting Up Basic System Parameters Through the Config Menu" on page 43.	❒
2	Select a DS1 service port, then press **ENTER**. The configuration bar at the bottom of the screen should show your selection.	❒
3	If the selected DS1 port is configured as **IS**, **OFF**, or **OSS-M** (Mode field): • Press the **TAB** key to select the Mode field. • Press the **SPACEBAR** to select OOS-A (default). Press **ENTER**.	❒
4	Choose the type of service (DS1). **Units do not support E1 type service.**	❒
5	Choose the type of line code [B8ZS (default) or AMI].	❒
6	Choose the line buildout for the DS1 port [131 (default), 262, 393, 524, or 655 ft.].	❒

Continued

Step	Procedure (Continued)	Installer Check ✓
	Line load, line type, and line buildout must match the HCU card in use. These settings should be set to the default values. **If an HCC-319 List 1 and List 2 cut-through card is used, these settings should match those of the external line connected to the port.**	
7	Select the **Virtual Tributary Group (VTG) 1 through 7** and the **Virtual Tributary Slot (VTS) 1 through 4**. Only available combinations are presented for selection.	❒
8	When finished configuring the port, reset the port to **IS** to place the line unit in service, then press ENTER.	❒
9	Return to the **Config** menu by pressing ESC.	❒
10	Proceed to "Configuring the STS-1 Transport Through the Config Menu" on page 49.	❒

Installer Signature ✍	Date

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

Configuring the STS-1 Transport Through the Config Menu

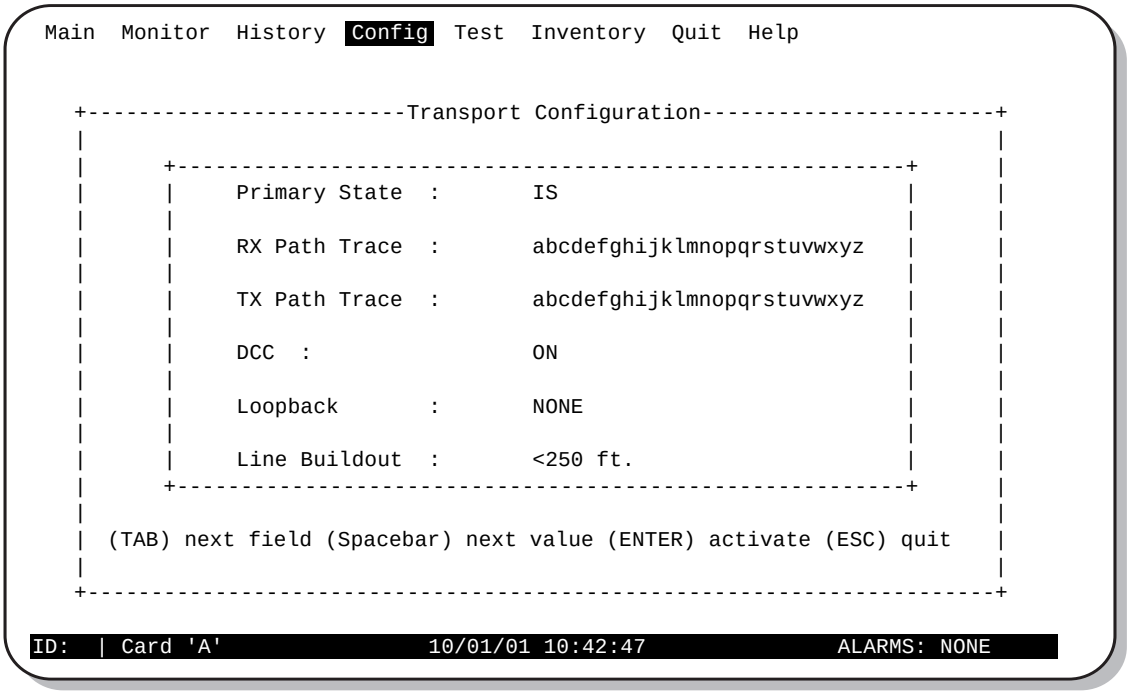


Figure 33. *Setting Up the STS-1 Transport Through the HXU-359*

Step	Procedure	Installer Check ✓
1	From the **Config** submenu, choose **Transport**, and then press ENTER. For more information on navigating through the menu system, refer to the procedures detailed in "Setting Up Basic System Parameters Through the Config Menu" on page 43.	❒
2	Set Primary State to **OOS-A** using the SPACEBAR, and then press ENTER. **Do not configure the transport as OOS-M or OOS-A when it is selected as a clock synchronization source.**	❒
3	Select **Transport** and then press ENTER.	❒
4	Type the Tx Path Trace transmit path trace string. The string cannot be longer than 40 characters.	❒
5	Set the Data Communications Channel (DCC) to **ON**.	❒
6	Set Loopback to **NONE** and then press ENTER.	❒
7	Set Line Buildout option to either >250 ft. or <250 ft. and then press ENTER.	❒
8	Set Primary State to **IS** and press ENTER.	❒

Continued

Step	Procedure (Continued)	Installer Check ✓
9	Exit the Transport Configuration screen by pressing ESC.	❒
10	If you plan to install a fan assembly, proceed to "Installing a Fan Assembly (Optional)" on page 51; otherwise, proceed to "Installing a Line Unit (HLU)" on page 53.	❒

Installer Signature ✍	Date

INSTALLING A FAN ASSEMBLY (OPTIONAL)

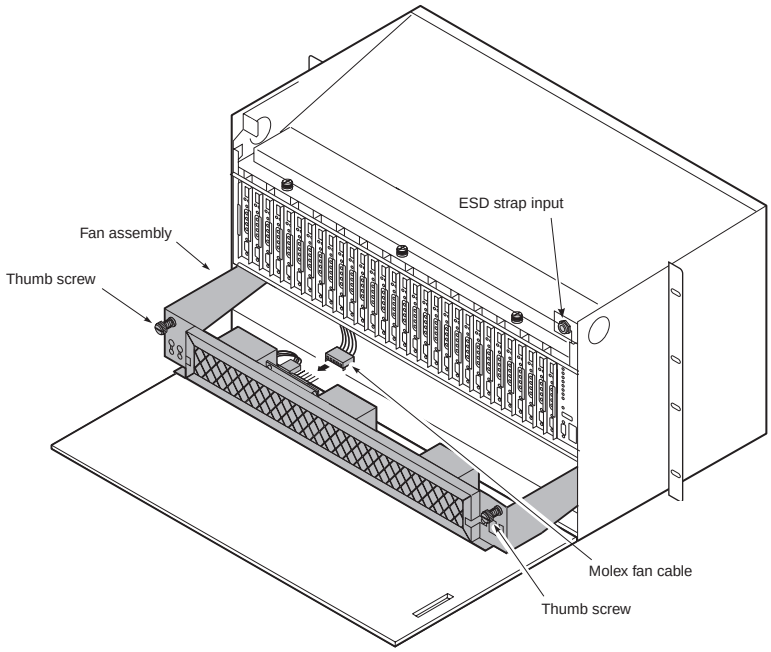


Figure 34. *Installing the Fan Assembly (Cover Down)*

The HFA-357 fan assembly is installed from the front of the chassis, above the multiplexer tray.

The fans begin operating as soon as the cable is connected. Avoid contact with the fan blades and do not allow any foreign matter to obstruct the operation of the fan blades.

Do not install fans without connecting the cable. A fan assembly that is not operational will block airflow and cause overheating.

Step	Procedure	Installer Check ✓
	Whenever installing or removing units from the HMS-358 chassis, be sure to wear an antistatic wrist strap and connect it to the ESD strap input above the HMU slot on the inside of the chassis.	
1	Unscrew the two hold-down lugs on each side of the chassis front cover. The cover folds down.	❒
2	Plug your ESD wrist strap into the ESD input above the HMU slot.	❒
3	Locate the keyed Molex fan cable (connected to the inside of the chassis) and attach it to the circuit board on the fan assembly. The fans begin operating as soon as the cable is connected.	❒
4	Slide the fan assembly into the opening above the multiplexer tray.	❒
5	Secure the fan assembly in place with the hold-down lugs (one at each corner of the assembly).	❒
6	Proceed to "Placing the Fan Under HMU Management" on page 52.	❒

Installer Signature	Date

Placing the Fan Under HMU Management

Step	Procedure	Installer Check ✓
	The following procedure assumes proper TAO login. For proper login procedure, please refer to "Using the Terminal Access Option" on page 27.	
1	From the Network Status screen (for multishelf configurations), type the number of the desired shelf (1 through 32), and then press ENTER.	❒
2	From the Shelf Status screen, press O to select Shelf Options.	❒
3	From the Shelf Options screen, press K to select Fan Monitoring.	❒
4	Press 2 to turn on fan monitoring.	❒
5	Press X to exit the screen, then press Y to confirm and save the setting.	❒
6	Verify that the fans are running properly and that no alarms are indicated on the Shelf Status screen. Fan alarms and failures are now monitored by the HMU.	❒
7	Proceed to "Installing a Line Unit (HLU)" on page 53.	❒

The fan assembly filter should be changed when dirty—normally every six to nine months.

1. **To remove the filter, slightly loosen the bracket screws that secure the two filter brackets.**
2. **Move the brackets aside and slide out the filter.**
3. **Insert the new filter, adjust the brackets and tighten the bracket screws.**

Installer Signature	Date

INSTALLING A LINE UNIT (HLU)

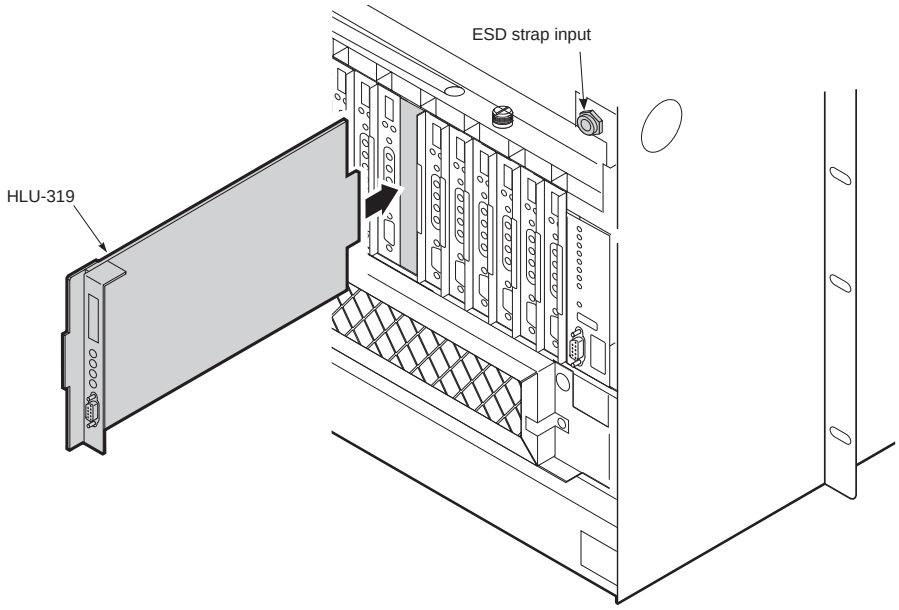


Figure 35. *Installing a Line Unit into the Wideband 3190 Chassis*

Step	Procedure	Installer Check ✓
	Whenever installing or removing units from the HMS-358 chassis, be sure to wear an antistatic wrist strap and connect it to the ESD strap input.	
1	Open the chassis front cover by unscrewing the two hold-down lugs on the upper corners. The cover folds down.	❒
2	Be sure to plug your ESD wrist strap into the ESD above the HMU slot.	❒
3	Lift the retention bar at the top of the chassis to allow insertion of the module.	❒
4	Slide the line unit into the card guides for the desired slot, then push the unit in until it touches the backplane card-edge connector and the retaining latch on the front panel opens (Figure 35).	❒
5	Place your thumbs on the line unit front panel and push the line unit into the card-edge connector until it is entirely within the card guides and the retaining latch closes. This indicates that the card is properly seated.	❒
	Do not enable alarms at this point in the procedure. You will not fully configure the HLU until the line units are placed into service. This procedure is detailed in "Placing the Line in Service" on page 57.	
6	If you plan to install remote units, proceed to "Installing a Remote Unit (HRU)" on page 55, otherwise; proceed to "Setting Up Circuit IDs" on page 56.	❒
7	Pull down the retention bar to secure all the modules in the shelf (Figure 36 on page 54).	❒

Installer Signature	Date

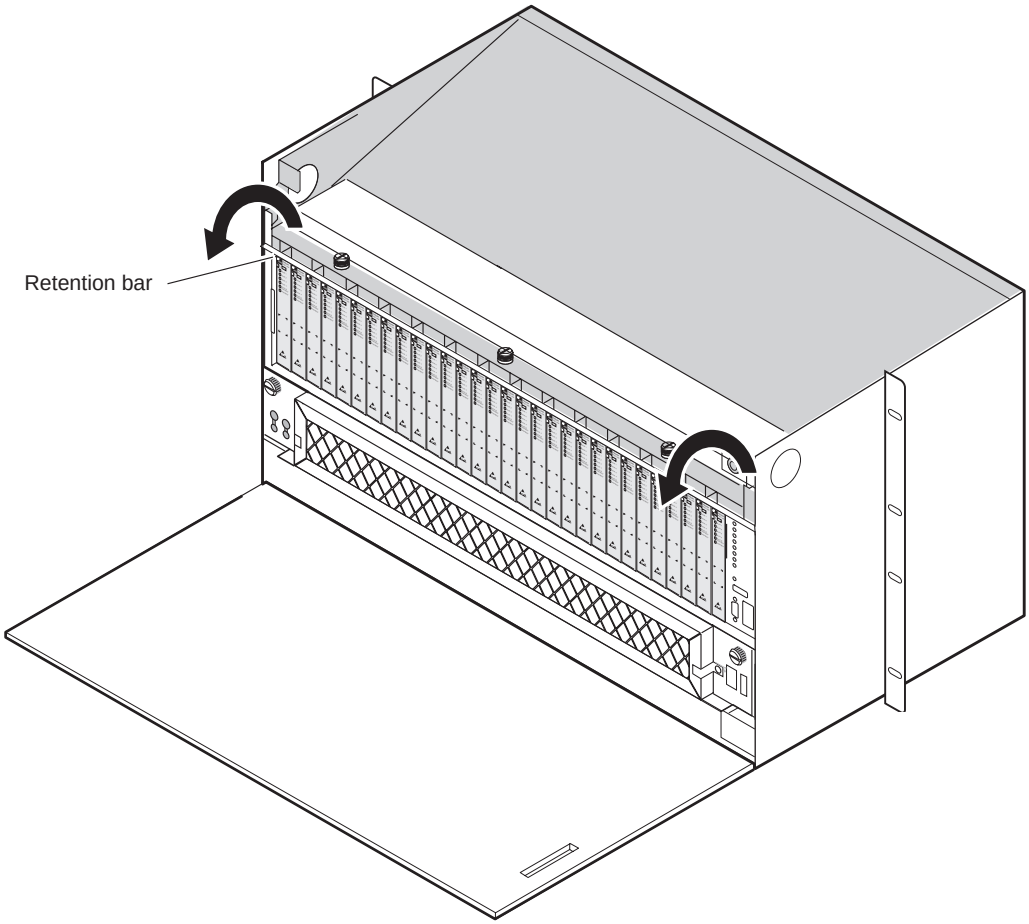
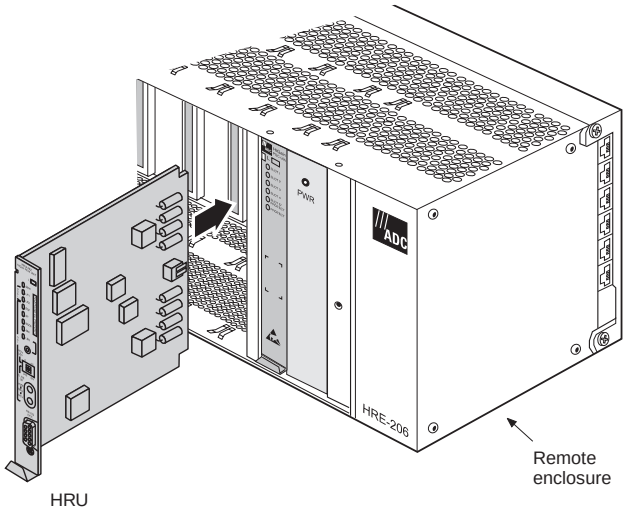


Figure 36. *Securing the Modules with the Retention Bar*

INSTALLING A REMOTE UNIT (HRU)



Standard 400/200 Interface

56	□ ■	55	DS1TIP	XMT
54	□ □	53		
52	□ □	51		
50	□ ■	49	DS1RING	
48	□ ■	47	HDSL2RING1	
46	□ □	45		
44	□ □	43		
42	□ ■	41	HDSL2TIP1	
40	□ □	39		
38	□ □	37		
36	□ ■	35	(–)	48V Local Power
34	□ □	33		
32	□ □	31		
30	□ □	29		
28	□ □	27		
26	□ □	25		
24	□ □	23		
22	□ □	21		
20	□ □	19		
18	□ ■	17	Circuit Ground	(+)
15	□ ■	15	DS1 RING1	RCV
14	□ ■	13	HDSL1 RING	
12	□ □	11		
10	□ □	9		
8	□ ■	7	HDSL1 TIP	
6	□ ■	5	DS1 TIP1	
4	□ □	3		
2	□ ■	1	Chassis Ground*	

* Chassis Ground may be tied to Earth Ground per local practice.
Note: Active pins are highlighted in black.

Figure 37. *Installing an HRU in a Remote Enclosure*

Step	Procedure	Installer Check ✓
	Whenever installing or removing units from a remote enclosure, be sure to wear an antistatic wrist strap and connect it to the ESD strap input.	
1	Open the remote enclosure cover.	❒
2	Plug your ESD wrist strap into the ESD above the HMU slot.	❒
3	Set the user options for status LEDs. Refer to the HRU user manual for details. User options usually include setting the: • DS1 receive level • TLOS • Sealing current • Local or line power selection	❒
	Refer to the HRU pinout in Figure 37 if remote chassis is not pre-wired.	

Continued

Step	Procedure (Continued)	Installer Check ✓
4	Slide the remote unit into the card guides for the desired slot, then push the unit into the enclosure until it is seated in the card-edge connector. The unit should snap into place, indicating that the unit is properly seated. The HRU should power up within 30 seconds.	❒
5	Proceed to "Setting Up Circuit IDs" on this page.	❒

Installer Signature ✍	Date

The craft port on an HRU can be accessed for configuration whether or not it is managed by an HMU. Refer to "Configuring the Management Unit" on page 29 and the HRU user manual for more information about provisioning the HRU.

SETTING UP CIRCUIT IDS

Step	Procedure	Installer Check ✓
	The following procedure assumes proper TAO login. For proper login procedure, please refer to "Using the Terminal Access Option" on page 27.	
1	From the Shelf Status screen, type the number of the line unit, and then press ENTER.	❒
2	From the Maintenance Terminal Main menu, select H from the Main menu to display the line unit System Inventory screen.	❒
3	Press the corresponding letter of the unit of which you want to change the circuit ID.	❒
4	Type a text string of 32 alphanumeric characters or less to identify the unit and then press ENTER.	❒
5	Press E to exit the System Inventory screen, and then choose C to confirm. If more than 24 characters are typed, a warning beep is emitted and only the first 24 characters are accepted.	❒
6	If you would like to perform a loopback test of the line at this time, follow the instructions provided in the HRU user manual. Loopback testing allows verification of the integrity of the HDSL channel to the HLU as well as the DS1 channel to the customer and the HLU DSX-1 interface. A loopback testing diagram is found on the inside front panel on the chassis as well as in "Installing a Test Card (HTC) (Optional)" on page 62.	❒
7	Repeat Step 1 through Step 6 for each line that you plan to activate.	❒
8	Press ESC to exit the Network Status screen.	❒
9	Proceed to "Placing the Line in Service" on page 57.	❒

Installer Signature ✍	Date

PLACING THE LINE IN SERVICE

After the line installation is complete, the line must be placed in service by:

- enabling the alarms on the HLU
- placing the DS1 interface in service at the HXU

Placing the HLU Under HMU Management

Step	Procedure	Installer Check ✓
	The following procedure assumes proper TAO login. For proper login procedure, please refer to "Using the Terminal Access Option" on page 27.	
1	From the Network Status screen, type the number of the desired shelf (1 through 32) and then press ENTER.	❒
2	From the Shelf Status screen, press A to select Alarm Management.	❒
3	Type the slot number of the line unit you want to enable.	❒
4	Press an appropriate Y or N response for the alarm setting you are changing.	❒
5	Proceed to "Placing the Line Unit in Service at the HXU" on page 58.	❒

Installer Signature ✍	Date

If an HLU card is hot-swapped while under HMU management, no setup is required. All configuration settings are automatically downloaded from the HMU.

If the HMU is managing the line unit, only the HMU maintenance terminal (ASCII terminal or PC running a terminal emulation program) can configure the line unit.

Removal of the HMU from the chassis enables the front panel craft port on the HLU.

When an HMU is replaced, the new HMU rebuilds its configuration database from the active line units.

Placing the Line Unit in Service at the HXU

The Wideband 3190 interfaces internally to the 28 lines at the common DSX-1 point. Once a line has been configured on the HLU, the DS1 interface at the HXU should be placed In-Service. Some alarm reporting will be lost if the line is not placed In-Service.

The procedure to place a line unit in service varies by the type of multiplexer installed:

- If you have an HXU-358 or HXU-360—DS3 (T1/E1), see "Placing the Line Unit in Service Using an HXU-358 or HXU-360 Multiplexer" on page 58.
- If you have an HXU-359—STS-1, see "Placing the Line Unit in Service Using an HXU-359 Multiplexer" on page 60.

Placing the Line Unit in Service Using an HXU-358 or HXU-360 Multiplexer

Step	Procedure	Installer Check ✓
	The following procedure assumes proper TAO login. For proper login procedure, please refer to "Using the Terminal Access Option" on page 27.	
1	From the Shelf Options screen, select **M**.	❒
2	Select the **Config** menu and then press **ENTER**.	❒
3	Select the **T1/E1 Ports** menu and then press **ENTER**.	❒
4	Select the Port #, use the **SPACEBAR** to select IN-SRVC, and then press **ENTER**.	❒
5	Press **ESC** to return the Shelf Status menu.	❒
6	Proceed to "Enabling Alarms for Systems Using an HXU-358 or HXU-360 Multiplexer" on page 59.	❒

Installer Signature ✍	Date

Once a line is placed In Service under the HXU Configuration Management menu, its provisioning cannot be changed. To reprovision a line, place it in maintenance mode (Unequipped and Out-of-Service). This does not affect changing DS1 parameters under the HLU Maintenance Terminal menu.

Enabling Alarms for Systems Using an HXU-358 or HXU-360 Multiplexer

Step	Procedure	Installer Check ✓
1	From the Shelf Options screen, press A to select Alarm Management. The following prompt appears: `Which Line Unit do you want to change the alarm settings on (1-28). (E)nable All, (D)isable All`	❒

2	Type the slot number of the line unit you want to enable. When you type a slot number (*x*), one of the following prompts appears.
	`Do you want to ENABLE alarm settings for Line Unit x (Y/N)`
	`Do you want to DISABLE alarm settings for Line Unit x (Y/N)`
		❒

3	Press an appropriate Y or N response for the alarm setting you are changing.	❒
4	If you plan to install a test card, proceed to "Installing a Test Card (HTC) (Optional)" on page 62. If you plan to install a cut-through card, proceed to "Installing a Cut-Through Card (HCC) (Optional)" on page 63. The Wideband 3190 should now be operational. If you experience any difficulties at this time, refer to "Installing a Test Card (HTC) (Optional)" on page 62.	❒

Installer Signature ✍	Date

Placing the Line Unit in Service Using an HXU-359 Multiplexer

Step	Procedure	Installer Check ✓
	The following procedure assumes proper TAO login. For proper login procedure, please refer to "Using the Terminal Access Option" on page 27.	
1	From the Shelf Options screen, select **M**.	❒
2	Select the **Config** menu and then press **ENTER**.	❒
3	Select the line unit, use the **SPACEBAR** to select IN-SRVC, and then press **ENTER**. Confirm that the settings for Type, Code, LBO, LBK, VTG, and VTS are appropriate.	❒
4	Proceed to "Enabling Alarms for Systems Using an HXU-359 Multiplexer" on page 60.	❒

Installer Signature ✍ **Date**

Enabling Alarms for Systems Using an HXU-359 Multiplexer

Step	Procedure	Installer Check ✓
1	From the Shelf Options screen, press **A** to select Alarm Management. The following prompt appears: `Which Line Unit do you want to change the alarm settings on (1-28). (E)nable All, (D)isable All`	❒

2	Type the slot number of the line unit you want to enable. When you type a slot number (*x*), one of the following prompts appears.
	`Do you want to ENABLE alarm settings for Line Unit x (Y/N)`
	`Do you want to DISABLE alarm settings for Line Unit x (Y/N)`
		❒

3	Press an appropriate **Y** or **N** response for the alarm setting you are changing.	❒
4	If you plan to install a test card, proceed to "Installing a Test Card (HTC) (Optional)" on page 62. If you plan to install a cut-through card, proceed to "Installing a Cut-Through Card (HCC) (Optional)" on page 63. The Wideband 3190 should now be operational. If you experience any difficulties at this time, refer to "Troubleshooting and System Testing" on page 61.	❒

Installer Signature ✍ **Date**

TROUBLESHOOTING AND SYSTEM TESTING

Figure 38 shows system loopbacks and test access points. You can do additional system tests through test cards (see "Installing a Test Card (HTC) (Optional)" on page 62). You can route multiplexer output to provide local access to any DS1 or E1 channel on the DS3 transport at an electrical DSX-1 or E1 cross-connect point using cut-through cards (see "Managing Alarms" on page 65).

Removal and replacement of line units should not be your first approach to troubleshooting. You will lose important performance management information which may help you resolve a line problem. Before making a call to Product Support, read the Performance Management history and conduct voltmeter tests for leakage to determine if the source of trouble is a marginal line or a facility problem.

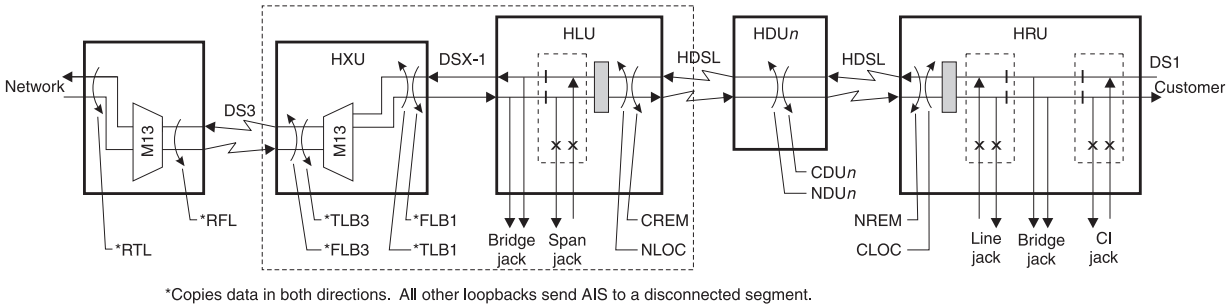


Figure 38. *System Loopbacks and Test Access*

Table 9. *System Loopback Definitions*

Test Point	Loopback Definition
TLB3 (a) (b)	Terminal loopback to the customer at the DS3 line. Activate from the HXU-358 or HXU-360 Test menu.
FLB3 (a) (b)	Facility loopback to the network at the DS3 line. Activate from the HXU-358 or HXU-360 Test menu.
TLB1 (a) (b)	Terminal Loopback to the network at the DSX-1 line. Activate from the HXU-358 or HXU-360 Test menu.
FLB1 (a) (b)	Facility loopback to the customer at the DSX-1 line.
RFL (a) (b)	Remote facility loopback from the far-end DS3 line. Activate from the HXU-358 or HXU-360 Test menu.
RTL (a) (b)	Remote terminal loopback from the far-end DSX-1 line. Activate from the HXU-358 or HXU-360 Test 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 DS3 and T1/E1 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.

INSTALLING A TEST CARD (HTC) (OPTIONAL)

The HTC-319 List 1 test card provides you with an easy method of testing CO and field Tip and Ring pairs.

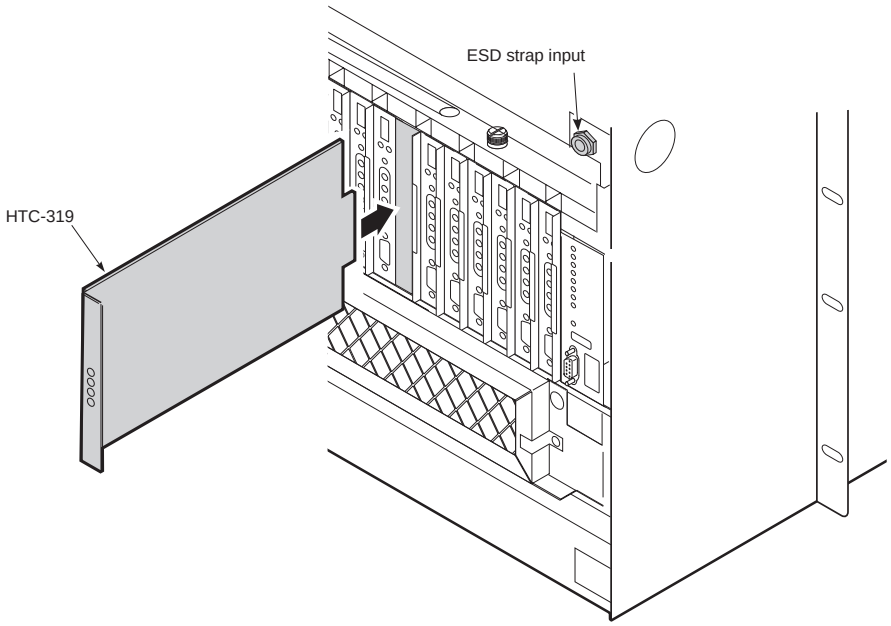


Figure 39. *Installing a Test Card into the HMS-358*

Step	Procedure	Installer Check ✓
	Whenever installing or removing units from the HMS-358 chassis, be sure to wear an antistatic wrist strap and connect it to the ESD strap input.	
1	Open the chassis front cover by unscrewing the two hold-down lugs on the upper corners. The cover folds down.	❒
2	Be sure to plug your ESD wrist strap into the ESD above the HMU slot.	❒
3	Lift the retention bar at the top of the chassis to allow insertion of the module.	❒
4	Plug the HTC-319 into the shelf slot whose circuit you want to test.	❒
5	Set the four-position slide switch (S1) on the HTC-319 to the type of test you want to perform (LOOP BACK, LOOP THRU, SHORT, or OPEN).	❒
6	Monitor the circuit at the corresponding test points on the card. The number of each test point corresponds to the edge connector pin of the circuit under test.	❒
7	When testing is complete, remove the test card, pull down the retention bar, close the front cover, and then screw in the two hold-down lugs.	❒
8	If you plan to test a line unit, proceed to "Line Unit Testing" on page 64. The Wideband 3190 should now be operational. If you experience any difficulties at this time, refer to "Installing a Test Card (HTC) (Optional)" on page 62.	❒

Installer Signature ✍	Date

INSTALLING A CUT-THROUGH CARD (HCC) (OPTIONAL)

The HCC-319 List 1 cut-through card allows you to route the output of multiplexers to HDSL lines. The List 2 card can be configured to route the DSX-1 from the multiplexer to the Port 2 connections.

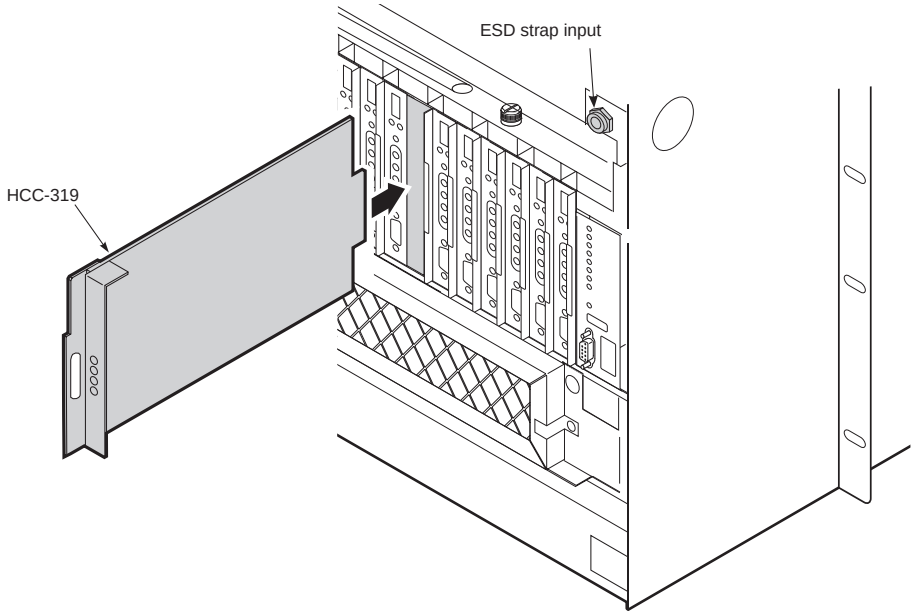


Figure 40. *Installing a Cut-Through Card into the HMS-358*

Step	Procedure	Installer Check ✓
	Whenever installing or removing units from the HMS-358 chassis, be sure to wear an antistatic wrist strap and connect it to the ESD strap input.	
1	If you have not already done so, open the chassis front cover by unscrewing the two hold-down lugs on the upper corners. The cover folds down.	❒
2	Be sure to plug your ESD wrist strap into the ESD above the HMU slot.	❒
3	Lift the retention bar at the top of the chassis to allow insertion of the module.	❒
4	Plug the HCC-319 into the shelf slot whose circuit you want to access.	❒
5	Connect standard T1/E1 test equipment to access jack on the front panel to monitor the line.	❒
6	If you plan to test a line unit, proceed to "Line Unit Testing" on page 64. The Wideband 3190 should now be operational. If you experience any difficulties at this time, refer to "Installing a Test Card (HTC) (Optional)" on page 62.	❒

Installer Signature ✍	Date

LINE UNIT TESTING

Once the line unit is installed, verify that it is operating properly. To do this, monitor the following:

- Status LED
- Messages reported by the front-panel display.

Verification Without a Downstream Device

If there is no downstream device installed:

Step	Procedure
1	Verify that the line unit powers up. The front-panel display illuminates and reports status messages.
2	Verify that the line unit attempts to communicate with downstream devices (status LED flashes red). Even if a downstream device is not present, the following events should occur: • The front-panel display reports various four-character status messages. • The line unit again attempts communication until a downstream device is detected.

Verification With a Downstream Device

If a downstream device has been installed:

Step	Procedure
1	Verify that the line unit powers up. (The front-panel display illuminates and reports various status messages.)
2	Verify that the line unit attempts to communicate with downstream devices (status LED flashes red): • If downstream devices are successfully identified and the loop(s) synchronizes, the line unit status LED lights a steady green. The line unit reports normal margin messages on the front-panel display. • If downstream devices are not successfully identified, the line unit reports status messages. The line unit attempts communication again and reports four-character status messages until a downstream device is detected.
3	Verify that a valid DS1 signal has been applied to the line unit and the remote unit. • If no DS1 signal is being applied to either the line unit or the remote unit inputs, then the appropriate DS1 alarms (LLOS or RLOS) display on the front panel and the status LED flashes red. • If a valid DS1 signal is being supplied to the line unit and remote unit, then DS1 alarm indications should be absent and the status LED lights a steady green.
4	If you need more information on managing line units, see the user manual for the respective unit. If you need more information on managing alarms, see "Managing Alarms" on page 65.

MANAGING ALARMS

The Wideband 3190 system reports alarms from the shelf, the line units, the fan assembly and the multiplexer unit.

The HMS-358 displays an alarm summary on the HMU at all times. Any alarm that exists in the system is represented by a critical, major or minor alarm LED on the HMU front panel. The alarm LEDs on each HLU in the system provide additional fault isolation. In general, the HLU or HXU with an active red alarm LED is the unit directly associated with a fault.

The M13 function is provided by two multiplexer cards wired in parallel. Both monitor the DS3 and DS1 interfaces and check for proper bit rate and line coding. If an error exists on these interfaces, both HXU cards issue an alarm. A missing HLU or HRU creates a faulty DS1 signal and causes the active and standby HXU to issue a line alarm. Unused ports on the multiplexer must be configured as Unequipped and Out-of-Service to prevent them from reporting alarms to the system.

For complete information on managing alarms, consult the quick installation guide and user manual for each multiplexer in your system.

HMU ALARMS

The HMU-319 reports Critical, Major, and Minor alarms.

- CR: A critical alarm is generated if:
  - power to the shelf or one of the A/B feeds has been lost, causing the Visible and Audible Critical Alarms to be asserted.
  - shelf temperature exceeds 170°F / 77°C, causing the Visible and Audible Critical Alarms to be asserted.
  - the multiplexer reports a Critical alarm.
- MJ: A major alarm is generated if:
  - any line card issues a fuse alarm.
  - shelf temperature exceeds 113°F / 45°C.
  - the multiplexer reports a Major alarm.
- MN: A minor alarm is generated if:
  - there is loss of sync on an HDSL loop.
  - the multiplexer is enabled, but not present.
  - there is loss of T1 signal at either the line unit or remote unit.
  - the HDSL loop margin falls below the selected margin threshold.
  - the multiplexer reports a Minor alarm.

When any critical, major or minor alarm occurs, the following events result:

- The HMU activates the appropriate audio and visual alarm relay circuits. These alarm relay circuits activate an external audio or visual alarm, if connected as discussed.
- The appropriate alarm LEDs light on the HMU front panel.
- The management interface displays the alarm status on the Shelf Status screen (after the screen is updated).

To silence the alarm, do one of the following:

- Press the ACO pushbutton on the front panel of the HMU.
- Press the external ACO pushbutton (if installed).

The following events occur:

- The front panel ACO LED lights and remains lit until the original alarm is cleared or until another alarm occurs.
- The audio alarm relay circuits are disabled, causing any connected audio alarms to turn off.

HXU ALARMS

The HXU reports Critical, Major, Minor and Far End alarms to the HMU.

- CRITICAL: The HXU reports a critical alarm if it detects:
  - a critical service-affecting fault.
  - more than four faulty DS1 inputs or DS2 failure.
- MAJOR: A major alarm is generated if the HXU detects:
  - up to four faulty DSX-1 lines.
  - one or more faulty DS1 inputs.
  - a major service-affecting fault.
- MINOR: The HXU reports a minor alarm if it detects:
  - a potential service-affecting fault condition.
  - a DS3 Far-End alarm.
  - a low-speed loopback.
  - a DS3 loopback.
- ABNORMAL: The HXU reports an Abnormal alarm if it detects:
  - DS3 Receive condition (AIS or Idle).
  - Power A or Power B alarm.
- FAR END: The HXU reports a Far End alarm if the far end of the DS3 has an alarm.

LINE UNIT ALARMS

The Shelf Status menu reports the alarm status for each line unit. This includes both physical alarms (LOS ALARM BUS and FUSE ALARM BUS) as well as alarm messages shown in Table 10.

The LOS ALARM BUS field on the Shelf Status menu indicates when any unmanaged line unit (or any other non-manageable card installed in the shelf) is reporting a minor alarm on pin H of the line unit edge connector. Refer to the shelf and line unit user manuals for information on using pin H.

The FUSE ALARM BUS field on the Shelf Status menu indicates when any line unit (or any other card installed in the shelf) is reporting a fuse alarm on pin 10 of the line unit edge connector. Refer to the shelf and line unit user manuals for information on pin 10.

The line unit H1ES, H2ES, and DS1 Errored Seconds Threshold alarms are not supported by the Shelf Status menu. If any of these conditions exist on a line unit, the line unit status indicates NORMAL. For this reason, use of the line unit Errored Seconds Threshold alarm option is not recommended. Refer to the line unit documentation for instructions on setting the Errored Seconds Threshold option.

Table 10. *Line Unit Alarm Messages*

Alarm Message	Definition	Description
LOSW	Loss Of Sync Word	Loss of signal on an HDSL span.
RLOS	Remote Loss Of Signal	Loss of DS1 signal at the remote unit.
LLOS	Local Loss Of Signal	Loss of DSX-1 signal at the line unit.
MAL1, MAL2	Margin Alarm 1, Margin Alarm 2	Loop margin has dropped below the user-set, minimum threshold level.
NORMAL		No alarm condition exists.
UNKNOWN		Line unit failed to respond to status requests.

Enable the ALM (alarm) option of an unmanaged line unit to allow the unit to trigger an alarm on pin H of the shelf connector (the LOS Alarm Bus). A managed HLU initiates an HMU alarm message over the digital management bus between the HLU and HMU. An unmanaged HLU or a T1 repeater triggers the HMU alarm by driving the LOS Alarm Bus to ground. Refer to the line unit's documentation for instructions on enabling the ALM option.

NETWORK COMMUNICATIONS

NETWORK PROTOCOL

ADC uses the standard Transmission Control Protocol/Internet Protocol (TCP/IP) on an Ethernet interface to send internal management information between chassis. The HMS-358 can support up to 32 chassis using a low-cost 10BASE-T twisted pair or 10BASE-2 coaxial cable Local Area Network (LAN). If only TAO software is used and there is no need to download multiplexer software, then either type of cable can be used. Systems that use TL1 or require download functions must use 10BASE-T. Additionally, larger systems using 10BASE-T require less troubleshooting than larger systems using other LAN protocols.

ADC recommends placing the HMS-358 on its own 10BASE-T LAN. Any connection to a larger network should be done through a router with the appropriate firewall protection. Selecting the IP address, subnet mask, TCP/IP server address and trap addresses are 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 after a device is plugged into a particular network. Each IP address is associated with a particular hardware device. For example, the HMU-319 in each HMS-358 shelf is programmed with a unique IP address that identifies each shelf. 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 11.)

Table 11. *Network Addressing*

Subnet Mask	Class C
11111111 11111111 11111111 00000000	
255.255.255.0	
IP Address	Class C
← *netid* → ← *hostid* →	
110nnnnn nnnnnnnn nnnnnnnn hhhhhhhh	
200.200.200.1	

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, indicate 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 12 shows a Class C network address. Class C is recommended for most HMS-358 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, an HMS-358 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 12 provides some suggestions for addressing your system if it is on its own LAN. It shows a logical relationship between the HMU in chassis #1 and the HMU in chassis #32.

Table 12. *Sample Class C IP Address Plan for the HMS-358*

Suggested HMU 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 00100000 200.200.200.32 HMU 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 cannot 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.

APPENDIX A - SYSTEM SPECIFICATIONS

INTERFACE SPECIFICATIONS

Figure 41 identifies the contacts for the common access panel. Table 13 lists the relay specifications. See "Wiring the Common Access Panel" on page 15 for wiring instructions.

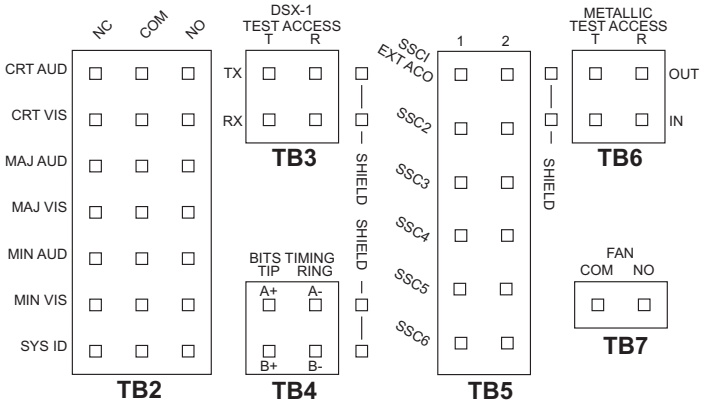


Figure 41. *Common Access Panel (Specification)*

All relay contacts are rated at 48 Vdc at 1A.

Table 13. *Relay Specifications*

Parameter	
Rated Load	0.5A at 125 Vac
Maximum switching capacity	62.5 VA, 33W
Contact type	bifurcated for high sensitivity

ENVIRONMENTAL SPECIFICATIONS

The HMS-358 is designed to meet NEBS CO requirements.

System Operating Temperatures

Minimum/Maximum Ranges	32°F to 122°F (0°C to +50°C)	-40°F to 149°F (-40°C to +65°C)
Line Units	All	All
Mux Units	HXU-357 List 1 HXU-359 List 1	All others
HMUs	HMU-319 List 7A	HMU-319 List 9

Operational Altitude 197 ft. (60m) below sea level to 13,000 ft. (3962m) above sea level

Relative Humidity

Operational	5% to 85% non-condensing
Short-term	5% to 90%
Non-operating	5% to 95%

Electromagnetic Compatibility FCC Part 15, Class A, Subpart J; Bell TR EOP 000063, Section 4.10

PHYSICAL SPECIFICATIONS

Dimensions 12-$^{1}/_{8}$" H x 21-$^{3}/_{8}$" W x 11-$^{3}/_{4}$" D (30.8 x 54.3 x 30.5 cm)

Weight (unloaded) 37 lbs. (16.78 kg)

Chassis per 7-foot Rack 4

DS1 Capacity 28 lines

Power Feeds -48 Vdc, A and B

POWER SPECIFICATIONS

CO Supply -48 Vdc nominal (-41.5 Vdc to -56.5 Vdc)

Line Power to HDSL/HDSL2/HDSL4 Remote Unit -180 Vdc or ±122 Vdc

POWER REQUIREMENTS

Each system must be individually fused to support redundant power feeds. The HMS-358 List 5 provides a split-power backplane to limit the current requirements of each battery feed line to less than 20A for any configuration. The HMS-358 List 6 provides a diode-ORed feed that requires system configurations that are limited to 20A per feed. For this reason, each battery feed line must be individually fused. However, fuse requirements may be as low as 5A per fuse, depending upon the system configuration.

The power requirement for the shelf is characterized by three different measurements:

- **Current draw** is the actual current drawn from the -48 Vdc Office Battery by the system. This is useful in setting the requirements for shelf fusing. It is the total power consumption divided by the lowest office battery voltage anticipated (-42.5 Vdc).
- **Power consumption** is the total power used by the system and including the power fed to the remote locations.
- **Power dissipation** is that part of the total power that is consumed by the CO end of the system. It represents the CO heating and is useful in calculating the power density (watts per square foot) for CO equipment.

The requirements in GR-63-CORE for a typical six-lineup floor plan (Figure 42) of 12-inch deep frames (305 mm) places the natural convection heat dissipation at 1450 W/m^2 (134.7 W/ft^2). This is increased to 1950 W/m^2 if forced-air fans are used.

Each 23-inch (584m) rack occupies 0.654m^2 (7.03 Ft^2) of floor space. This allows 948W per rack without the optional fan assembly and 1275W with the fan assembly.

For a maximum load, each rack should contain no more than four HMS-358s. Higher rack densities can be obtained by installing the optional fan assembly in each system, by limiting the number of line doublers in each system, or by changing the floor lineup of the racks.

The Wideband 3190 has been designed to provide adequate convection cooling for an environment of 0°C to 50°C (32°F to 122°F) with up to 230W of internal heat dissipation.

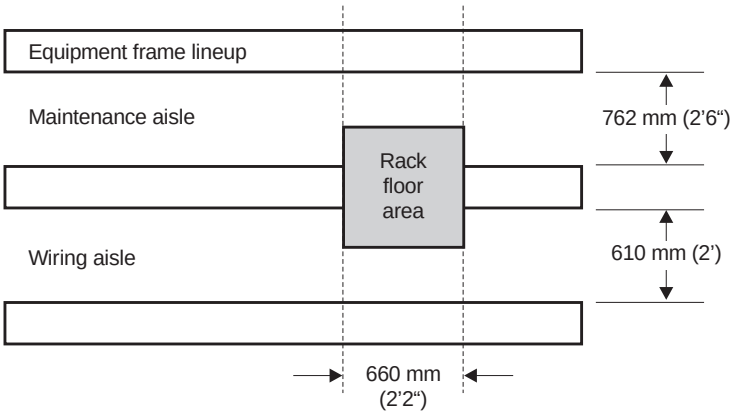


Figure 42. *Typical Six-Lineup Floor Plan*

A/B POWER SOURCES

Each chassis requires one A battery feed and one B battery feed rated at a maximum of 30A total for fully loaded chassis assemblies capable of driving a full complement of doublers and remote units.

The A/B power feeds provide total backup power for the HXU, HMU, and HFA cards. The HMU, HXU, and optional HFA have diode-ORed power feeds.

For the HMS-358 List 5 chassis, the line units are powered as a split feed with half of the line units on each battery feed. A loss of one battery feed forces 14 lines out of service. This reduces the maximum current required per battery feed for systems with the maximum number of doublers.

For the HMS-358 List 6 chassis, the line units are powered from the backplane through diode-ORed power feeds. A loss of one power feed will not affect service.

FUSES

System fuses are located in an external fuse tray typically mounted at the top of the CO rack. The HMU reports all fuse alarms within the HMS-358. Each chassis within the rack must be equipped with A and B fuses for proper power protection. Depending upon the system configuration, fuse ratings can vary from 5A to 20A. See Table 14 and Table 15 on page 74 for information about fuse selection and the maximum number of line units that can be operated in the shelf at a particular fuse size. Fuse sizes other than the ones shown may be estimated from the application environment and interpolated from the table entries.

For a limited power application, ADC offers an A/B fuse panel that provides A/B power redundancy. This fuse panel allows the lower 15A fuse requirement of the HMS-358 List 1 chassis to be used and still provide redundant power.

ADC does not recommend configurations in excess of 30A total per shelf.

For fuse selection, refer to Figure 43 on page 75 and Figure 44 on page 80. These figures are based upon the following assumptions:

- Each chassis has a maximum of 28 lines installed for driving remote units.
- The maximum number of doublers per chassis is 84.

Table 14 shows the chassis fuse requirements in amps based on the number of doublers per chassis with split power feed and Table 15 shows the chassis fuse requirements in amps based on the number of doublers per chassis with redundant power feed.

Table 14. *HMS-358 List 5 Split Power Shelf* [(a)]

Fuse Rating at 150% Overcurrent	5				10			
	No Multiplexers		2 Multiplexers		No Multiplexers		2 Multiplexers	
	No Doublers	Max. Doublers	No Doublers	Max. Doublers	No Doublers	Max. Doublers	No Doublers	Max. Doublers
HLU-319 List 5x	14	8	14	8	14	14	14	14
H2TU-C-319-List 2, 3, 4x	14	—	14	—	14	—	14	—
H4TU-C-319-List 1x	14	6	14	6	14	13	14	12

(a) Each half of an HMS-358 List 5 split power shelf (double number of cards per half to obtain total shelf capacity).

Table 15. *HMS-358 List 6 Redundant Power Shelf*

Fuse Rating at 150% Overcurrent	10				20			
	No Multiplexers		2 Multiplexers		No Multiplexers		2 Multiplexers	
	No Doublers	Max. Doublers	No Doublers	Max. Doublers	No Doublers	Max. Doublers	No Doublers	Max. Doublers
HLU-319 List 5x	28	17	28	16	28	28	28	28
H2TU-C-319-List 2, 3, 4x	28	—	28	—	28	—	28	—
H4TU-C-319-List 1x	28	13	28	12	28	27	28	25

Figure 43 on page 75 shows bay heat dissipation based on four chassis. Although the power requirements of the system can vary greatly depending on the line makeup, in practice the line makeup seldom requires more than 30% of the lines to have doublers. With this type of provisioning, power limitations due to CO heating are seldom a factor.

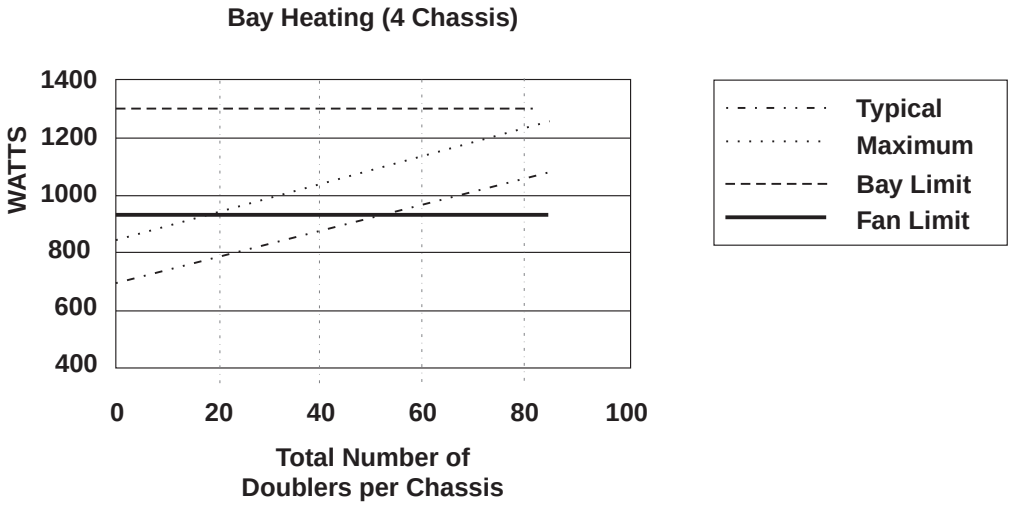


Figure 43. *Bay Heating Based on Doublers per Chassis*

Each HDSL2 line must be counted as one doubler when using Figure 43 to calculate heat dissipation.

FANS

For a 0°C to 50°C (32°F to 122°F) operating environment, a fan assembly is required for any of these situations:

- One system with ≥ 230W power dissipation
- Four systems with ≥ 948W power dissipation
- Extended temperature operation (65°C or 149°F)

No shelf configuration should exceed a total power dissipation ≥ 1275W.

APPENDIX B - HMU CONFIGURATION FOR X.25 AND ETHERNET CONNECTIONS

OPERATING MODES

The HMU may be connected to an X.25 network through the OS port (J30 on the rear of the Wideband 3190), if properly configured. Regardless of the connection type (X.25, IP, or Serial), the HMU must be configured for one of two operating modes, Interactive or Network Management Administration (NMA). Depending on the mode selected, TAO (often referred to as the Craft screen interface) and TL1 communications are supported.

Interactive Mode

The Interactive Mode is intended for human interface and supports both TAO and TL1 communication. The HMU echoes input from the user in a conventional command line interface. If the user enters a partial TL1 command, the HMU prompts the user for additional input to formulate a complete TL1 command.

NMA Mode

NMA Mode is used for communication with the Telcordia NMA Operational Support System and supports TL1 communication only. (TAO is not supported.) NMA Mode does not echo any input and does not automatically complete partial TL1 commands. The HMU expects a complete TL1 command that is terminated by a semicolon (';'). The Ethernet Port (J34 on the rear of the Wideband 3190) may also be used for NMA mode as an alternative to the X.25 OS port. Refer to "Ethernet Port Configuration Procedure" on page 79 for further details.

X.25 PORT CONFIGURATION PROCEDURE

Initial configuration of the OS port for X.25 operation requires that the user log on to the HMU through a different physical port (Serial or Ethernet). Once the user is logged on to the HMU through one of these ports, configuration of the OS port for X.25 operation is accomplished through the HMU Craft screens or by using TL1 commands.

Configuring the OS port through the HMU Craft screens is easier than using TL1 commands.

X.25 Port Configuration Using Craft Screens

The OS port is configured for X.25 operation through the HMU Shelf Options screen, Port Setting (option P). Only Interactive Mode supports TAO.

1. Connect to the HMU through either the Serial or Ethernet port. If connected to the Serial port, use a PC running HyperTerminal; if connected to the Ethernet port, use a Telnet session.
2. Type `TAO`, then press **ENTER**. If prompted for a password, type `public`, then press **ENTER**. The Network Status screen displays
3. Type the number of the shelf to be configured for X.25. The Shelf Status screen displays
4. Press **O** to access the Shelf Options screen.

5 From the Shelf Options screen, press P, then press 2 to select the OS port. The port settings display

6 Confirm that Baud Rate is set at 9600. If the baud rate is not set at 9600, press A, then press 1 to select 9600 baud.

7 Confirm that Character Size is set at 8. If the character size is not set at 8, press B, then press 2 to select 8 bits.

8 Confirm that Parity Bits is set at None. If the parity bits is not set at None, press C, then press 1 to select None.

9 Confirm that Stop Bits is set to 1. If the stop bits is not set to 1, press D, then press 1 to select 1.

10 Confirm that User Type is set to X.25 (Interactive Mode) or X.25NMA (NMA Mode). To change the user type, press E, then press 4 (Interactive Mode) or 5 (NMA Mode).

11 Press X to exit and return to the Shelf Options screen.

12 From the Shelf Options screen, press X to exit and return to the Shelf Status screen. A message appears prompting the user to reset the HMU if changes have been made to any of the shelf options. For changes to take effect, press Y to reset the system. The OS port is now configured for X.25.

For all X.25 connections to the HMU through the OS port, the HMU behaves in either Interactive Mode or NMA Mode, depending on the User Type setting (see Step 10 above).

X.25 Configuration Using TL1 Commands

The following steps describe how to configure the OS port for X.25 using TL1 commands.

1 Connect to the HMU through either the Serial or Ethernet port. If connected to the Serial port, use a PC running HyperTerminal; if connected to the Ethernet port, use a Telnet session.

2 Log on to the HMU with the following ACT-USER command:

ACT-USER :: SUPERUSER ::: PUBLIC#1;

3 Configure the OS port for X.25 in Interactive Mode or NMA Mode using the following applicable ED-PORT commands:

For Interactive Mode:

ED-PORT::PORT-2::::USERTYPE=X.25:MA;

For NMA Mode:

ED-PORT::PORT-2::::USERTYPE=X.25NMA:MA;

The HMU responds with the following four lines of text:

Line 1: contains the Target Identifier followed by the Date and Time
Line 2: M 0 COMPLD
Line 3: /* NOTE: Changes will not take effect until HMU has been cycled.*/
Line 4: ;

4 For the new configuration to take effect, reset the HMU using the following TL1 command:

INIT-SYS::HMU:::0;

The HMU responds with the following message:

“INIT-SYS: System will be reset now, please wait . . .”

X.25 Parameter Configuration

The X.25 implementation of the HMU uses a fixed packet size of 128 bytes and cannot be changed. The HMU does not support X.25 packet size negotiations.

By default, the HMU supports two Permanent Virtual Circuits (PVCs) and eighteen Switched Virtual Circuits (SVCs). The HMU can be configured to support a specific number of PVCs and SVCs, but these parameters cannot be configured using TL1 commands. In order to configure the number of PVCs and SVCs, the user must run TAO.

The following steps describe how to configure the number of PVCs and SVCs.

1 Connect to the HMU through a port configured for Interactive Mode. If connected to the Serial port, use a PC running HyperTerminal; if connected to the Ethernet port, use a Telnet session.

2 Type TAO, then press **ENTER**. If prompted for a password, type `public`, then press **ENTER**. The Network Status screen displays.

3 Type the number of the shelf to be configured. The Shelf Status screen displays

4 From the Shelf Status screen, press **L** to select X.25 Management.

5 From the X.25 Management screen, press **B** to select CUP Parameters. The CUP Parameters screen displays with the following default settings (see Table 16 below for a description of the line indicators):

```
(A) B-Channel One 2-way Minimum LCI: 1
(B) B-Channel One 2-way Maximum LCI: 20
(C) Maximum Number of PVC Supported: 2
(D) PVC0 - Logical Channel Identifier: 1
(E) PVC1 - Logical Channel Identifier: 2
```

Table 16. *CUP Parameters Line Descriptions*

Line Indicators	Description
(A)	Information on logical channels and circuits.
(B)	Information on logical channels and circuits. Indicates that the HMU is currently configured to support up to 20 virtual circuits.
(C)	Information on PVC. Indicates that the HMU is currently configured for 2 PVCs.
(D)	Information on PVC. Indicates that the first PVC is assigned Logical Channel 1
(E)	Information on PVC. Indicates that the second PVC is assigned Logical Channel 2.

If no PVC connections are requested from the network, all twenty virtual circuits are available for SVC. The SVCs are assigned Logical Channel 1 through 20.

If PVC connections are established, the number of SVCs supported by the HMU is either eighteen or nineteen, depending on whether one or two PVCs were established.

6 To modify any of the parameters, select the line indicator (**A** through **E**), and enter the appropriate value.

7 Press **X** to return to the X.25 Management screen, then press **ESC** to return to the Shelf Status screen. If changes have been made, a message appears prompting the user to save the changes and reset the HMU. To save the changes and reset the HMU, press **Y**.

Additional X.25 Parameter Configuration

In addition to PVC and SVC, the following additional X.25 parameters may be modified. The default settings are indicated in parentheses.

Setting	Default
Max frame size	(142)
Layer 2 Restart Timer	(180)
Layer 2 Window Size	(7)
Acknowledge Timer	(5)
Number of Max Retransmit Attempts	(10)

These parameters display on the X.25 Management screen, Line Parameters (option A) selected. Accessing these parameters is similar to accessing PVC and SVC (see "X.25 Parameter Configuration" on page 78).

If these parameters are not properly configured or do not match the equipment settings on the other end of the X.25 connection, the performance of the HMU will be adversely affected.

Only knowledgeable personnel should attempt to configure these parameters.

Ethernet Port Configuration Procedure

The Ethernet port (J34 for 10BASE-T and J32 for 10BASE-2 on the rear of the Wideband 3190) may be used in either Interactive Mode or NMA Mode. Unlike the X.25 port, the operating mode of the Ethernet port is not configured by the user, but is determined by the TCP port opened by the client application.

The following table shows the TCP port number and the operating mode.

TCP Port Number	Operating Mode
TCP Port 23	Interactive Mode
TCP Port 42462	NMA Mode

The HMU cannot operate both 10BASE-T and 10BASE-2 simultaneously. The user must use the Craft screens through the HMU serial port to select the appropriate physical interface. (Refer to the *HMU-319 User Manual*, document LTPH-UM-1086-xx, for a detailed Ethernet configuration procedure.)

APPENDIX C - OPTIONAL WIRE-WRAPPING PORT CONNECTIONS

Figure 44 provides a guideline for wire-wrapping the HMS-358 List 5 and List 6 chassis to support wire-wrapped DSX-1 applications. The wire-wrapping option shown in Figure 44 is for use with four-wire 3192 line units in Central Office (CO) systems.

Group 1 (Port 1) connections typically provide a four-wire connection to the field and can be made through P11 (TX) and P12 (RX) or through wire-wrap connections under the field access cover (Figure 44). Group 2 (Port 2) connections can be accessed through four wire-wrap posts under the field access cover.

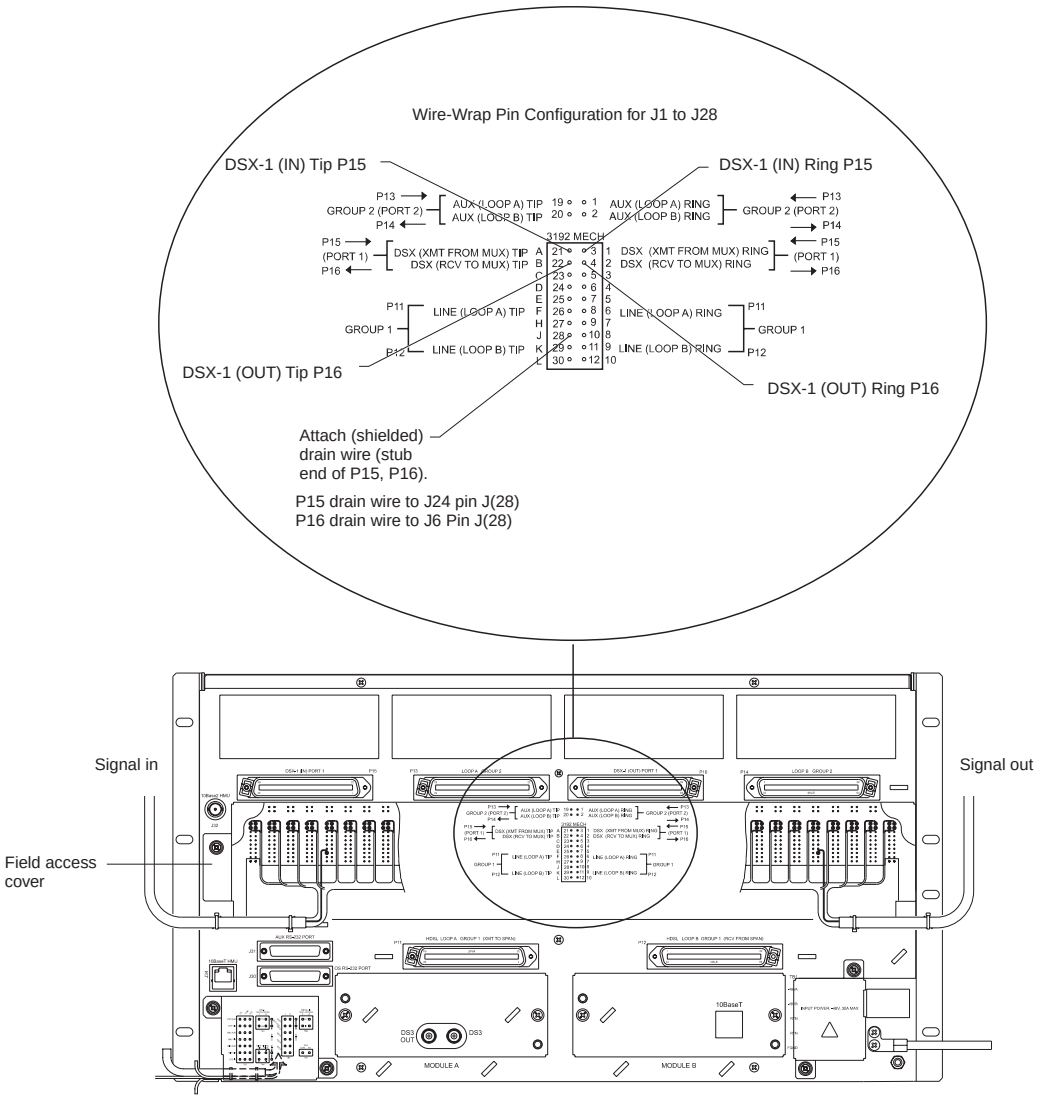


Figure 44. *Wire-Wrapping the HMS-358 List 5 and List 6 Chassis*

- **If P15 and P16 cables are connected, no multiplexer can be installed.**
- **If a multiplexer is installed, P15 and P16 cables cannot be connected.**

Step	Procedure	Installer Check ✓
	Wear an antistatic wrist strap and connect it to the ESD strap input.	
1	To remove the field access cover (Figure 44 on page 80), loosen the 4-40 PH screw, slide the cover to the right, and lift it away from the chassis.	❒
2	Perform the required wire-wrapping procedures determined by CO management. Figure 45 shows how the cable will be routed under the cover and to the field access area.	❒
3	Replace the field access cover by aligning the cover with the notch and sliding it into place.	❒
4	Secure the field access cover with the 4-40 PH screw.	❒

Installer Signature ✍	Date

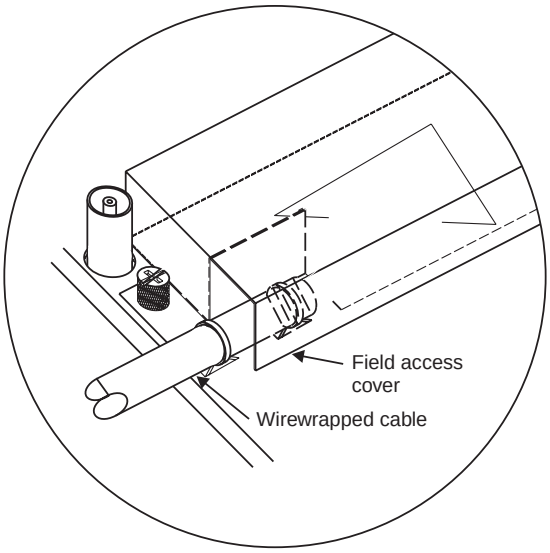


Figure 45. *Routing Cables Under the Field Access Cover*

APPENDIX D - TECHNICAL REFERENCE

SYSTEM COMPONENTS AND COMPATIBILITY

The HMS-358 is an open platform based on the standard 3192 line card and compatible components (see Table 17). However, due to FCC and NEBS testing guidelines, compliance is not guaranteed with all vendors when tested as a system. ADC has verified that all its standard line units are in compliance (see Table 18 on page 83) with these guidelines when tested as a system in the HMS-358 shelf. It is the customer's responsibility to verify that other vendor's equipment meets system-level compliance when installed in the HMS-358 chassis.

Table 17. *System Components*

Check ✓	Item	Catalog Number	Installer Initial ✍
Management Unit (one required)			
❒	Management card, 0 to 50°C	HMU-319L7AV307, HMU-319L7AV31	
❒	Management card, -40°C to 50°C	HMU-319L9V307, HMU-319L9V31	
Multiplexer (two of the same type required for line protection)			
❒	STS-1 multiplexer	HXU-359L2V11	
❒	DS3 multiplexer	HXU-358-V104	
❒	DS3 multiplexer	HXU-360 L1	
Line Units			
❒	HDSL line units for 3190 mechanics	HLU-319 List 1, List 2x, List 5x	
❒	HDSL2 line units for 3190 mechanics	H2TU-C-319 List 2, List 3, List 4x	
❒	HDSL4 line unit for 3190 mechanics	H4TU-C-319 List 1	
❒	HDSL E1 line unit for 3190 mechanics	ELU-319 List 5x	
Doubler Units			
❒	HDSL doubler unit for 239 T1 repeater mechanics	HDU-409	
❒	HDSL doubler unit for DDS/ISDN single-slot	HDU-407	
❒	HDSL doubler unit for 400 mechanics, low power	HDU-404	
❒	HDSL4 doubler unit for 239 T1 repeater mechanics	H4D-409	
Remote Unit			
❒	HDSL remote unit for 200 mechanics	HRU-402	
❒	HDSL2 remote unit for 200 mechanics	H2TU-R-402	
❒	HDSL4 remote unit for 200 mechanics	H4TU-R-402	
Central Office Equipment			
❒	Wideband 3190 fan assembly	HFA-357-L1	
❒	Wideband 3190 air filter	HFA-357-FIL	
Cables			
❒	Cable stub (50 foot)	HCA-532-L1	
❒	Cable stub (200 foot)	HCA-532-L2	
Test/Support Cards			
❒	Cut-through card (for local DSX-1 drops)	HCC-319-L1	
❒	Cut-through card (for Port 2 support)	HCC-319-L2	
❒	Test card	HTC-319-L1	

COMPLIANCE STANDARDS

Table 18. *Compliance Standards*

Standard	Description
GR-499-CORE Issue 1, December 1995	Transport System Generic Requirements (TSGR): Common Requirements
GR-63-CORE Issue 1, October 1995	New Equipment-Building System (NEBS) Generic Equipment Requirements
GR-1089-CORE Issue 1, July 1994 Rev 1, December 1996	Electromagnetic Compatibility and electrical Safety Generic Criteria for Network Telecommunication Equipment
SR-3580, Level 3 NEBS	Bellcore's highest level of compliance for CO environment
TR-NWT TA-TSY-000199 Issue 4, November 1988	Specifications of Memory Administration Messages at the Operations System/Network Element Interface, Bellcore (TL1)
GR-454 TR-TSY-000454 Issue 1, July 1988	Supplier Documentation for Network Elements
FR-NWT-000482 TR-TSY-000482	OTGR, Operations Applications Messages Directory (TL1)
TR-TSY-000825 Issue 2, February 1988.	OTGR, User System Interface - User System Language, Bellcore (Craft interface and is compatible with TL1)
TR-TSY-000827 Issue 1, November 1988	OTGR, Generic Operations Interface: Non-OSI Communications Architecture, Bellcore (TPM1 is the minimum OSI stack with TP over X.25 and is used to carry TL1)
GR-833 TR-TSY-000833 Issue 2, February, 1988	OTGR, Operations Applications Messages - Network Maintenance: Network Element and Transport Surveillance Messages, Bellcore. (TL1)
GR-78 TR-NWT-000078 Issue 3, December 1991	Generic Physical Design Requirements for Telecommunication Products and Equipment
TR-TSY-000191 Issue 1, May 1986	Alarm Indication Signal Requirements and Objectives
PUB 49001 July 1982	Requirements for Compatibility or Telecommunication Equipment with Bell Systems Surveillance and Control Systems
PUB 49002 July 1982	General Remote Surveillance Philosophy and Criteria for Interoffice Transmission Equipment
ANSI T1.102-1987	Digital Hierarchy-Electrical Interfaces
ANSI T1.404-1989	Carrier to Customer Installation - DS3 Metallic Interface
ANSI T1.107-1988 ANSI T1.107a-1990	American National Standard for Telecommunication- Digital Hierarchy- Formats Specifications (DS3 format)

APPENDIX E - 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.

Sales Assistance 800.366.3891 extension 73000 (USA and Canada) 952.917.3000 Fax: 952.917.3237	• Quotation Proposals • Ordering and Delivery • General Product Information
Systems Integration 800.366.3891, extension 73000 (USA and Canada) 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 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 or 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 telephone numbers with an 800 prefix are toll-free in the USA and Canada.

APPENDIX F - ABBREVIATIONS

A

ACO: Alarm Cutoff

AIS: Alarm Indication Signal

ALM: Alarm

AMI: Alternate Mark Inversion

ASCII: American Standard Code for Information Interchange

B

B8ZS: Binary 8 Zero Substitution

BER: Bit Error Rate

C

CDU: Customer Doubler

CLOC: Customer Local Loopback

CO: Central Office

CR: Critical Alarm

CREM: Customer Remote Loopback

D

DACS: Digital Access Cross-connect System

DCE: Data Communication Equipment

DS3: Digital Signal 3

DSU/CSU: Digital Service Unit/Channel Service Unit

DSX-1: Digital Signal Cross-connect Level 1

DTE: Data Terminal Equipment

E

EMI: ElectroMagnetic Interference

ESD: Electrostatic Discharge

F

FGND: Frame Ground

FLB: Facility Loopback

H

HDSL: High-bit-rate Digital Subscriber Line

HFA: HiGain Fan Assembly

HLU: HiGain Line Unit

HMU: HiGain Management Unit

HRU: HiGain Remote Unit

I

IP: Internet Protocol

IS: In-Service

L

LED: Light Emitting Diode

LLOS: Local Loss of Signal

M

MAL1: Margin Alarm 1

MAL2: Margin Alarm 2

MDF: Main Distribution Frame

MJ: Major Alarm

MN: Minor Alarm

MOP: Method of Procedure

N

NDU: Network Loopback

NEBS: Network Equipment-Building System

NID: Network Interface Device

NLOC: Network Local Loopback

NREM: Network Remote Loopback

O

OOS: Out of Service

OSTS: Open Span Termination System

P

PBX: Private Branch Exchange

PVC: Permanent Virtual Circuit

R

RAI: Remote Alarm Indication

RFL: Remote Facility Loopback

RLOS: Remote Loss of Signal

RTL: Remote Terminal Loopback

S

S1: Slide Switch

SELV: Safety Extra Low Voltage

SID: Shelf Identifier

SSC2: Special Signaling Channel 2

STS-1: Synchronous Transport Signal 1

SVC: Switched Virtual Circuit

T

TAO: Terminal Access Option

TL1: Transaction Language 1

TLB: Terminal Loopback

TLOS: Transmit Loss of Signal

V

VTG: Virtual Tributary Group

VTS: Virtual Tributary Slot

X

X.25: Communications network standard

PROJECT MEMBER SIGNATURES

Complete the following table by printing the title and name of each project member followed by their signature. This list may then be removed and stored for future reference.

Table 17. *Signatures*

Title	Name	Signature

INSTALLATION VERIFICATION BY SECTION

Reviewed Installation Plans

(see "Reviewing Installation Plans" on page 4)

Check ✓ if not applicable ❒

Shift Supervisor Signature ✍ Date

Established Method of Procedure

(see "Establishing a Method of Procedure" on page 4)

Check ✓ if not applicable ❒

Shift Supervisor Signature ✍ Date

Unpacked and Inspected System Components

(see "Unpacking and Inspecting the System Components" on page 5)

Check ✓ if not applicable ❒

Shift Supervisor Signature ✍ Date

Verified Presence of Proper Tools and Supplies

(see "Before You Begin" on page 4)

Check ✓ if not applicable ❒

Shift Supervisor Signature ✍ Date

Reviewed Safety Precautions

(see "Safety Warnings and Notices" on page v)

Check ✓ if not applicable ❒

Shift Supervisor Signature ✍ Date

Mounted Chassis

(see "Mounting the Chassis" on page 6)

Check ✓ if not applicable ❒

Shift Supervisor Signature ✍ Date

Installed LIU Module B

(see "Cabling the Chassis" on page 8)

Check ✓ if not applicable ❒

Shift Supervisor Signature ✍ Date

Cabled Chassis

(see "Cabling the Chassis" on page 8) Check ✓ if not applicable ❒

Shift Supervisor Signature ✍	Date

Wired Common Access Panel

(see "Wiring the Common Access Panel" on page 15) Check ✓ if not applicable ❒

Shift Supervisor Signature ✍	Date

Connected Ground Cable

(see "Wiring the Common Access Panel" on page 15) Check ✓ if not applicable ❒

Shift Supervisor Signature ✍	Date

Connected Power Cables

(see "Installing the Power Cables" on page 16) Check ✓ if not applicable ❒

Shift Supervisor Signature ✍	Date

Connected to Network Interface

(see "Connecting the Network Interface" on page 19) Check ✓ if not applicable ❒

Shift Supervisor Signature ✍	Date

Installed Management Unit

(see "Installing Multiplexers" on page 32) Check ✓ if not applicable ❒

Shift Supervisor Signature ✍	Date

Installed Multiplexer(s)

(see "Installing Multiplexers" on page 32) Check ✓ if not applicable ❒

Shift Supervisor Signature ✍	Date

Installed Fan Assembly

(see "Installing a Fan Assembly (Optional)" on page 51) Check ✓ if not applicable ❒

Shift Supervisor Signature ✍	Date

Installed Line Card(s)

(see "Installing a Line Unit (HLU)" on page 53) **Check ✓ if not applicable** ❒

Shift Supervisor Signature ✍	Date

Installed Remote Unit(s)

(see "Installing a Remote Unit (HRU)" on page 55) **Check ✓ if not applicable** ❒

Shift Supervisor Signature ✍	Date

Set Up Circuit ID(s)

(see "Setting Up Circuit IDs" on page 56) **Check ✓ if not applicable** ❒

Shift Supervisor Signature ✍	Date

Placed Line(s) In Service

(see "Placing the Line Unit in Service at the HXU" on page 58) **Check ✓ if not applicable** ❒

Shift Supervisor Signature ✍	Date

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CERTIFICATION AND WARRANTY

FCC 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 60-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 been 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

This equipment has been tested and verified to comply with the applicable sections of the following standards:

- GR 63-CORE - Network Equipment-Building System Requirements: Physical Protection
- GR 1089-CORE - Electromagnetic Compatibility and Electrical Safety

For technical assistance, refer to “Appendix E - Product Support” on page 84.

ADC DSL Systems, Inc.

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