ADCP-61-504
Issue 6
February 2000

Homeworx™ HFC Access Platform DS1 Host Digital Terminal Installation Manual

1066359 Rev A

Alexander and Walter Soto, Ex. 2011
A. Soto and W. Soto v. Infinera, IPR2023-00834

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REVISION HISTORY

EDITION/ISSUE	DATE	REASON FOR CHANGE
1st Edition, Issue 1	09/1994	Initial release.
2nd Edition, Issue 1	04/1996	B-released reflecting the B-released DS1 HDT.
2nd Edition, Issue 2	05/1997	Incorporate design changes.
2nd Edition, Issue 3	01/1998	Incorporate text and design changes.
2nd Edition, Issue 4	05/1998	Revised reference to DS1 connectors.
Issue 6	02/2000	Updated manual for System Software Releases 2.1 and 3.0.

LIST OF CHANGES

The technical changes incorporated into this issue since the 2nd Edition, Issue 4 release are listed below.

SECTION	IDENTIFIER	DESCRIPTION OF CHANGE
Preface	Certification	Added UL Approval statement and deleted FCC Compliance statement.
Preface	Related Pubs	Updated to list only current publications.
All	DSX-1	Changed DS1 references to DSX-1 references where applicable.
All	Micro Manager	Deleted all references and procedures related to the Micro Manager.
All	X.25	Deleted all references and procedures related to the X.25 interface.
All	Fans	Updated all HDT chassis drawings to show fans.
2	Table 2-2	Added DNIU information.
2	Table 2-2	Added DSX-1 input/output signal level information.
2	Table 2-2	Added CXMU input/output signal level information.
3	Sub-Section 2.	Added DNIU information.
3	Sub-Section 5.	Added CXMU03 information.
4	TOPs format	Eliminated use of TOPs format and reformatted manual using standard headings.
4	Sub-section 3.	Added baffle installation procedure.
4	Sub-section5.	Added procedure for connecting the fan alarm pins to a local alarm system.
4	Sub-section8.	Updated procedure on to cover securing both sides of DS1 cable connectors.
4	Sub-section 9.	Updated procedure for connecting coax cables to the CXMU
4	-	Deleted procedure for connecting the HDT local craft port to a PC.
4.	-	Deleted procedure for connecting the HDT to an X.25 interface.
4	-	Deleted procedure for connecting the HDT to a metallic loop testing (MLT) interface.
5	-	Extracted plug-in unit installation procedures from Section 4 and inserted into Section 5.
6	-	Extracted installation troubleshooting procedures from Section 4 and inserted into Section 6.
7	-	General Information section changed from Section 5 to Section 7.

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TABLE OF CONTENTS

Content	Page

FRONT MATTER

TRADEMARK INFORMATION ii
DISCLAIMER OF LIABILITY ii
REVISION HISTORY iii
LIST OF CHANGES iii
ABOUT THIS MANUAL ix
RELATED PUBLICATIONS ix
ADMONISHMENTS x
GENERAL SAFETY PRECAUTIONS x
CERTIFICATION xi
LIST OF ACRONYMS AND ABBREVIATIONS xi

SECTION 1
INTRODUCTION

1 GENERAL 1-1
2 SYSTEM OVERVIEW 1-1

SECTION 2
HDT DESCRIPTION

1 INTRODUCTION 2-1
2 DESCRIPTION 2-1
2.1 HDT Mounting Shelf ñ Front View 2-1
2.2 HDT Mounting Shelf ñ Rear View 2-2
2.3 HDT Architecture 2-4
2.4 HDT Plug-In Units 2-5
2.5 HDT Mounting Shelf Cabling 2-6
3 SPECIFICATIONS 2-10

SECTION 3
PLUG-IN UNIT DESCRIPTION

1 GENERAL 3-1
2 DIGITAL SIGNAL 1 UNIT (DS1U) AND DIGITAL NETWORK INTERFACE UNIT (DNIU) 3-1
2.1 DS1U/DN1U Protection Switching 3-3
3 PROTECTION SWITCH AND TEST UNIT (PSTU) 3-3
4 CLOCK/TIME SLOT INTERCHANGE UNIT (CTSU) 3-4
5 COAX MASTER UNIT (CXMU) 3-5
6 SHELF CONTROL UNIT (SCNU) 3-6
7 POWER SUPPLY UNIT (PWRU) 3-8
7.1 Load Sharing 3-9

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TABLE OF CONTENTS

Content	Page

SECTION 4
MOUNTING SHELF INSTALLATION

1 GENERAL 4-1
1.1 Use An ESD Wrist Strap For all Installation Procedures 4-2
1.2 Tools and Materials Required 4-2
2 UNPACK MOUNTING SHELF 4-3
3 INSTALL MOUNTING SHELF AND BAFFLE 4-3
3.1 Install Mounting Shelf 4-3
3.2 Install Baffle 4-5
4 CONNECT CHASSIS AND LOGIC GROUND 4-6
4.1 Chassis Ground 4-6
4.2 Logic Ground 4-8
5 CONNECT LOCAL ALARMS 4-8
5.1 Shelf Alarm Connections 4-8
5.2 Fan Alarm Connections 4-11
6 CONNECT EXTERNAL TIMING 4-11
7 CONNECT COMMUNICATIONS LAN 4-13
8 CONNECT DS1 LINES 4-15
9 INSTALL COAXIAL FEEDER CABLES 4-17
10 CONNECT POWER SOURCES 4-20
11 INSTALL HDT FRONT COVER 4-22

SECTION 5
PLUG-IN UNIT INITIAL INSTALLATION

1 GENERAL 5-1
1.1 Use an ESD Wrist Strap for all Installation Procedures 5-1
1.2 Tools Required 5-2
2 UNPACK PLUG-IN UNITS 5-2
3 REMOVE AND STORE HDT FRONT COVER 5-2
3.1 Remove Cover 5-2
3.2 Cover Storage 5-3
4 INSTALL PLUG-IN UNITS 5-5
4.1 Install Power Unit A (PWRU A) 5-5
4.2 Install Clock Time Slot Unit (CTSU) 5-6
4.3 Install Coax Master Unit (CXMU) 5-8
4.4 Install Digital Signal 1 Unit (DS1U) and/or Digital Network Interface Unit (DNIU) 5-10
4.5 Install Protection Switch and Test Unit (PSTU) 5-12
4.6 Install Power Unit B (PWRU B) 5-13
4.7 Install Shelf Control Unit (SCNU) 5-15
5 INSTALL HDT FRONT COVER 5-17

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A. Soto and W. Soto v. Infinera, IPR2023-00834

TABLE OF CONTENTS

Content		Page
SECTION 6 INSTALLATION TROUBLESHOOTING		
1	GENERAL	6-1
2	TROUBLESHOOT BLOWN FUSES	6-2
3	TROUBLESHOOT –48 VDC OUT OF RANGE	6-4
4	VERIFY PLUG-IN UNIT OPERATION	6-6
SECTION 7 GENERAL INFORMATION		
1	WARRANTY/SOFTWARE	7-1
2	SOFTWARE SERVICE AGREEMENT	7-1
3	REPAIR/EXCHANGE POLICY	7-1
4	REPAIR CHARGES	7-2
5	REPLACEMENT/SPARE PRODUCTS	7-2
6	RETURNED MATERIAL	7-2
7	CUSTOMER INFORMATION AND ASSISTANCE	7-3

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ABOUT THIS MANUAL

This manual provides a description of the the DS1 Host Digital Terminal (HDT) including the mounting shelf and all plug-in units plus detailed installation, initial service activation, and test procedures. The purpose of this manual is to provide technicians and installation teams with specific procedures for completing their assigned tasks. Refer to the Related Publications section below for a listing of additional publications.

This document is a hardware installation document and is not intended to provide detailed information on provisioning the HDT for service. Provisioning information is covered in related Homeworx HFC access platform documents.

RELATED PUBLICATIONS

Listed below are related manuals and their publication numbers. Copies of these publications can be ordered by contacting the ADC Technical Assistance Center at 1-800-366-3891, extension 2300 (in U.S.A. or Canada) or 612-946-2300 (outside U.S.A. and Canada).

Title/Description	ADCP Number
System Turn-Up	
TR-303 Release 3.0 System Turn-Up and Test Manual Provides procedures for turning-up and testing the TR-303 Release 3.0 telephony segment of the HFC system.	**61-665**
Loop/CPE Installation	
Home Integrated Services Unit Installation Manual Describes the Home Integrated Services Unit (HISU) and provides procedures for installation and testing.	**61-594**
ISU-12 Integrated Services Unit Installation Manual Describes the ISU-12 Integrated Services Unit and provides procedures for installation and testing.	**61-593**
Indoor ISU-32 Integrated Services Unit Installation Manual Describes the Indoor ISU-32 Integrated Services Unit and provides procedures for installation and testing.	**61-632**
Outdoor ISU-32 Integrated Services Unit Installation Manual Describes the Outdoor ISU-32 Integrated Services Unit and provides procedures for installation and testing.	**61-676**

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Title/Description	ADCP Number

Element Manager Systems

CraftWorx TR-303 Release 3.0 Quick Start Installation Guide **61-687**

Provides instructions for installing the TR-303 Release 3.0 CraftWorx system.

CraftWorx TR-303 Release 3.0 Multi HDT User Manual **61-688**

Provides instructions for using the TR-303 Release 3.0 CraftWorx system.

ADMONISHMENTS

Important safety admonishments are used throughout this manual to warn of possible hazards to persons or equipment. An admonishment identifies a possible hazard and then explains what may happen if the hazard is not avoided. The admonishments — in the form of Dangers, Warnings, and Cautions — must be followed at all times. These warnings are flagged by use of the triangular alert icon (seen below), and are listed in descending order of severity of injury or damage and likelihood of occurrence.

⚠ **Danger**: *Danger is used to indicate the presence of a hazard that **will** cause severe personal injury, death, or substantial property damage if the hazard is not avoided.*

⚠ **Warning**: *Warning is used to indicate the presence of a hazard that **can** cause severe personal injury, death, or substantial property damage if the hazard is not avoided.*

⚠ **Caution**: *Caution is used to indicate the presence of a hazard that **will** or **can** cause minor personal injury or property damage if the hazard is not avoided.*

GENERAL SAFETY PRECAUTIONS

⚠ **Warning**: *To prevent electrical shock, never install telephone equipment in a wet location or during a lightning storm. When installing or modifying telephone lines, disconnect lines at the network interface before working with uninsulated lines or terminals.*

⚠ **Warning**: *To avoid electric shock or severe burns, be careful when working near power supplies. The HDT uses –48 Vdc office power.*

⚠ **Caution:** *Plug-in units can be damaged by static electrical discharge. Electrostatic Discharge (ESD) protection must always be used when handling a plug-in unit. A wrist band can be connected to the ESD grounding jack located behind the front panel in the upper left corner of the HDT shelf. Ensure that all plug-in units removed from the equipment or not installed, are properly stored in anti-static packing material. When working with plug-in units, always place them on an approved and electrically grounded anti-static mat.*

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CERTIFICATION

UL Tested

The DS1 Host Digital Terminal complies with UL 1950: Standard for Safety of Information and Technology Equipment, Including Electrical Business Equipment.

LIST OF ACRONYMS AND ABBREVIATIONS

The acronyms and abbreviations used in this manual are detailed in the following list:

AC	Alternating Current
ACO	Alarm Cut off
AWG	American Wire Gauge
BITS	Building Integrated Timing Supply
CASD	Cable Access Systems Division
CC	Composite Clock
CO	Central Office
COAX	Coaxial
COM	Common
CTS	Clear To Send
CTSU	Clock/Time Slot Interchange Unit
CXMU	Coax Master Unit
DC	Direct Current
DCD	Data Carrier Detect
DCE	Data Communication Equipment
DNIU	Digital Network Interface Unit
DS0	Digital Signal Zero
DS1	Digital Signal One
DS1U	Digital Signal One Unit
DSR	Data Set Ready
DSX	Digital Signal Cross-connect
DSX-1	Digital Signal Level One at the DSX bay
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
ESD	Electrostatic Discharge
ESF	Extended Super Frame
FCC	Federal Communications Commission
G, GND	Ground

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LIST OF ACRONYMS AND ABBREVIATIONS, continued

HDT	Host Digital Terminal
HFC	Hybrid Fiber Coax
HISU	Home Integrated Services Unit
IST	Integrated Services Transport
ISU	Integrated Services Unit
LAN	Local Area Network
LDS	Local Digital Switch
LED	Light Emitting Diode
LPBK	Loopback
MHz	Mega Hertz
MLT	Metallic Loop Testing
MISU	Multi Integrated Services Unit
ODN	Optical Distribution Node
OSP	Outside Plant
OUT	Output
PRI	Primary
PSTU	Protection Switch Test Unit
PWRU	Power Unit
R	Ring
RET, RTN	Return
RF	Radio Frequency
RX	Receiver, receive
RXD	Receiver Data
SCNU	Shelf Controller Unit
SEC	Secondary
SG	Signal Ground
SMB	Sub-Miniature “B”
T	Tip
TX	Transmitter, transmit
TXD	Transmit Data
V	Volts
VDC	Volts Direct Current
XMT	Transmit

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INTRODUCTION

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SECTION 1: INTRODUCTION

Content	Page
1 GENERAL	1-1
2 SYSTEM OVERVIEW	1-1

1 GENERAL

This manual provides instructions for installing the DS1 Host Digital Terminal (HDT). The HDT is used in the ADC Homeworx Hybrid Fiber/Coax (HFC) access platform system. The HDT interfaces with the telephony switched services network, the HFC network, and the Element Manager (EM) system communications LAN.

The HDT provides a central point of control for each Homeworx system and is installed in the Central Office (CO), the Head End, or in a hub. All traffic and control messages to and from the equipment in the local loop pass through the HDT. Information in this manual is divided into sections as listed below:

- **Section 1 - Introduction:** Provides a brief overview of the HDT and the Homeworx HFC access platform.
- **Section 2 - HDT Description:** Describes the HDT mounting shelf, the various electrical interfaces, and provide the HDT specifications.
- **Section 3 - Plug-In Unit Description:** Describes the HDT the plug-in units.
- **Section 4 - Mounting Shelf Installation:** Provides procedures for installing the HDT mounting shelf.
- **Section 5 - Plug-In Unit Initial Installation:** Provides procedures for the initial installation of the plug-in units.
- **Section 6 - Installation Troubleshooting:** Provides procedures for troubleshooting installation problems.
- **Section 7 - General Information:** Provides information about warranty, repair, and support services.

2 SYSTEM OVERVIEW

The Homeworx HFC access platform is an integrated broadband transport system that can deliver video, telephony, data, and other services over a network of fiber optic and coaxial cables. The HFC system utilizes fiber optic and radio frequency (RF) transmission technologies for transporting the various services from their points of origin to the end subscriber. Designed as an end-to-end solution, the HFC system architecture accommodates all existing video and telephony services but at the same time remains flexible in order to accommodate future services and expansion.

Each HFC access platform consists of many components, all of which are designed to function seamlessly together in an integrated system. The exact mix of components and equipment in a given system is dependent on the basic architecture of the system and the services it must provide. A diagram of a typical Homeworx HFC network that provides video, data, and telephony services is shown in Figure 1-1.

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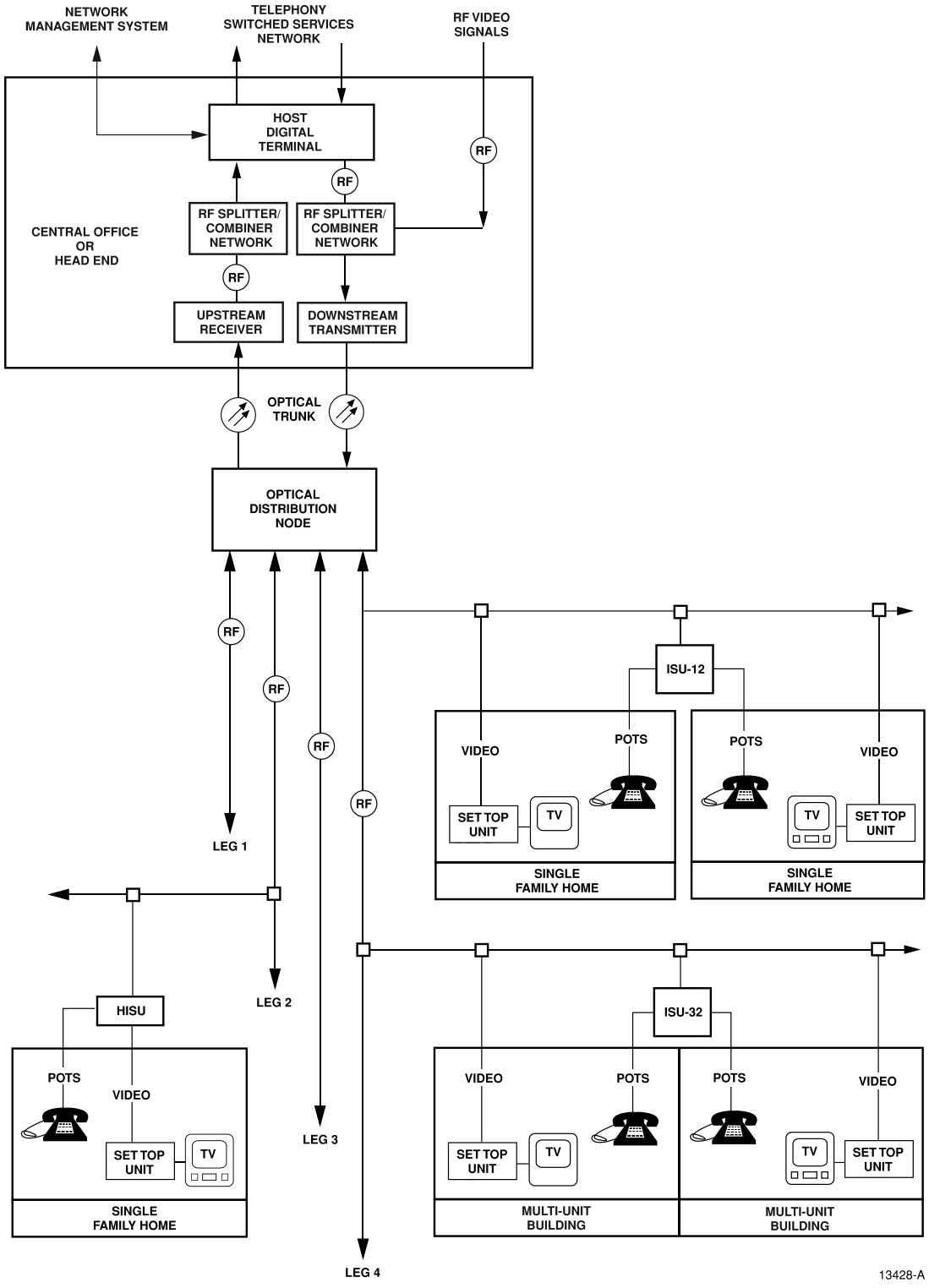


Figure 1-1. Typical HFC System

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HDT DESCRIPTION

SECTION 2: HDT DESCRIPTION

Content	Page
1 INTRODUCTION	2-1
2 DESCRIPTION	2-1
2.1 HDT Mounting Shelf – Front View	2-1
2.2 HDT Mounting Shelf – Rear View	2-2
2.3 HDT Architecture	2-4
2.4 HDT Plug-In Units	2-5
2.5 HDT Mounting Shelf Cabling and Wiring Connections	2-6
3 SPECIFICATIONS	2-10

1 INTRODUCTION

This section describes the DS1 Host Digital Terminal (HDT). The HDT is the point of interface between the HFC network, the public switched telephony network, and the EM system. The HDT may be located at a Central Office (CO) with the local digital switch (LDS) or located at a hub or head end and linked to the LDS via a digital carrier system.

The HDT transmits and receives up to 28 DS1 telephony signals. In the downstream direction, the DS1 signals are received from the LDS by the HDT. The DS1 signals are separated into DS0s and then converted into RF signals. The RF signals are passed to an optical transmitter for transmission over the HFC network. In the upstream direction, optical signals are received from the HFC network by an optical receiver. The optical signals are converted into RF signals by the optical receiver and passed to the HDT. The RF signals are then converted back into separate DS0s and recombined into DS1 signals for transmission to the LDS.

In addition to signal conversion functions, the HDT also provides control, communication, and monitoring functions for the Homeworx system. All control communications between the EM system and the HDT are passed through a Local Area Network (LAN) interface.

2 DESCRIPTION

The HDT consists of a cover, mounting shelf, and various electronic plug-in units. The electronic plug-in units provide the functions required for HDT operation including powering, signal termination, protection switching and testing, clock/time slot interchange, signal processing and transport, and system control and management. It is also recommended that a separate baffle be installed below each HDT mounting shelf that is not mounted directly above another HDT. The baffle prevents possible obstruction of air flow into the HDT.

2.1 HDT Mounting Shelf – Front View

Figure 2-1 shows the HDT with the front cover installed. Behind the cover is the HDT mounting shelf. The mounting shelf consists of a cover, a metal chassis, and a backplane. The mounting shelf holds the various plug-in units when they are inserted into the shelf. The backplane provides an electrical interface with the installed plug-in units. Each plug-in unit is keyed so it will only fit in its assigned slot.

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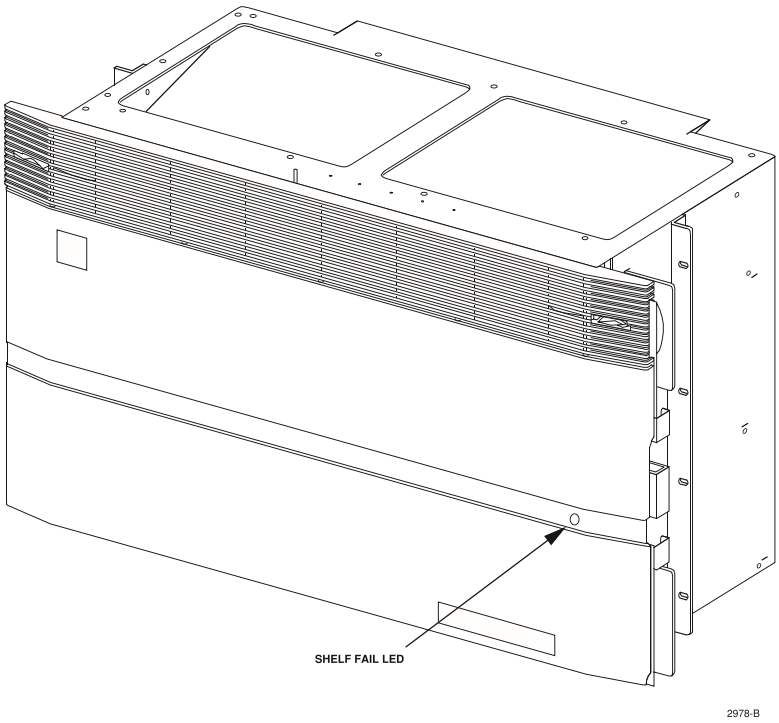


Figure 2-1. HDT Mounting Shelf - Front View

Mounting brackets are provided on the left and right side of the HDT mounting shelf which allows the HDT to be installed in a 23-inch rack. The mounting brackets are positioned so the HDT front panel extends five inches (12.7 cm) in front of the rack. A Shelf Fail indicator is located between the two Power Supply Unit (PRWU) positions. The Shelf Fail indicator is visible through the front panel and when lighted, indicates a failure has occurred in the shelf or in another part of the Homeworx system. Each plug-in unit also includes various LED indicators. The LED indicators are maintenance or status related and are not visible with the front cover installed.

2.2 HDT Mounting Shelf – Rear View

HDTs built prior to Release 3.0 relied on convection air flow for cooling. HDTs built after Release 3.0 incorporated a fan assembly for improved cooling. Figures 2-2 provides a rear view of an HDT mounting shelf without the fan assembly. Figure 2-3 provides a rear view of an HDT with the fan assembly. Replacement fans are available (HDT-AC-FAN) if required.

Located on the rear panel of both types of HDTs are two wire wrap pin blocks, one power terminal strip, and two 64-pin AMP CHAMP connectors. The two wire wrap pin blocks provide a point for connecting alarms and the various communication interfaces. The power terminal strip provides a point for connecting the power supply wiring. The HDT operates on –48 VDC and provides connections for two power sources (A and B). Two 64-pin AMP CHAMP connectors provide a point for connecting the DS1 cables. HDTs with the fan assembly also have a fan assembly terminal block which provides a point for connecting power and alarm wires to the fan assembly.

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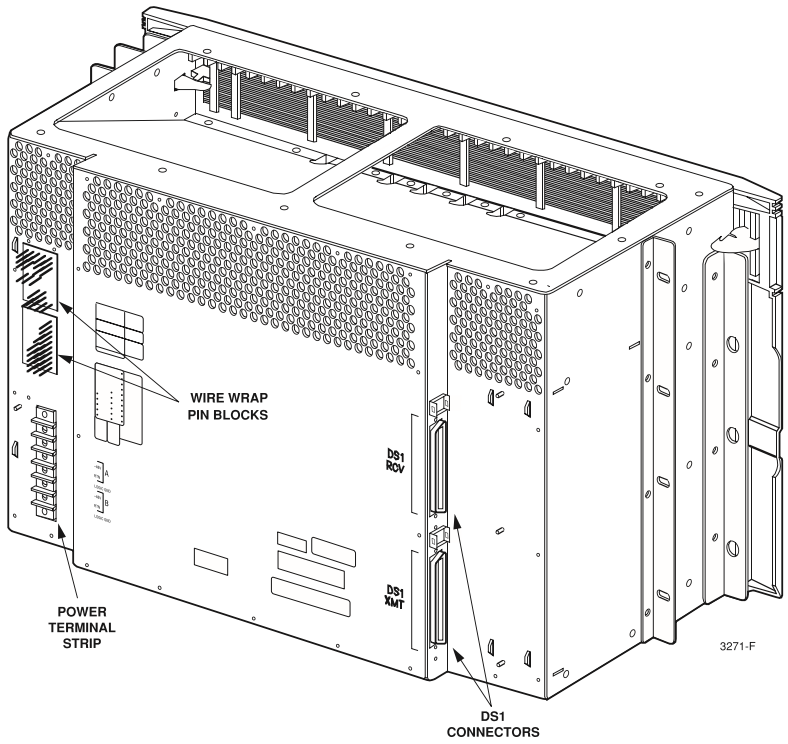


Figure 2-2. HDT Mounting Shelf Without Fans - Rear View

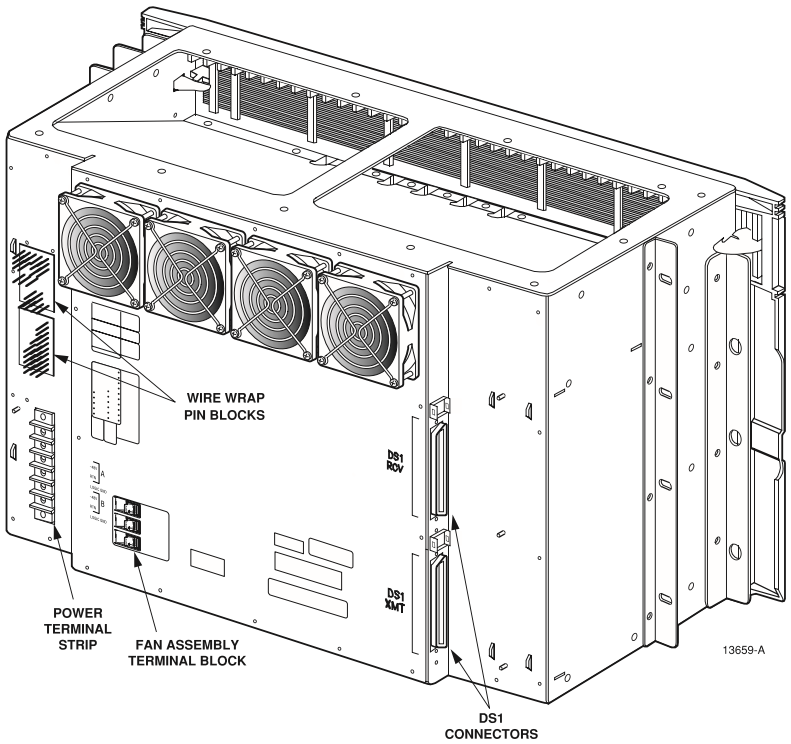


Figure 2-3. HDT Mounting Shelf With Fans - Rear View

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2.3 HDT Architecture

Figure 2-4 provides a block diagram that shows each of the plug-in units and their relationship to each other. Each DS1U/DNIU can support up to 4 DS1 lines and up to 7 DS1U/DNIUs can be mounted in the HDT. When 7 DS1U/DNIUs are installed, the HDT can support up to 28 DS1 lines. Each CXMU terminates a transmit coaxial cable (for downstream transmitting) and a receive coaxial cable (for upstream receiving). When 3 pairs of CXMUs (active and standby) are installed, the HDT can support up to 3 separate HFC network connections.

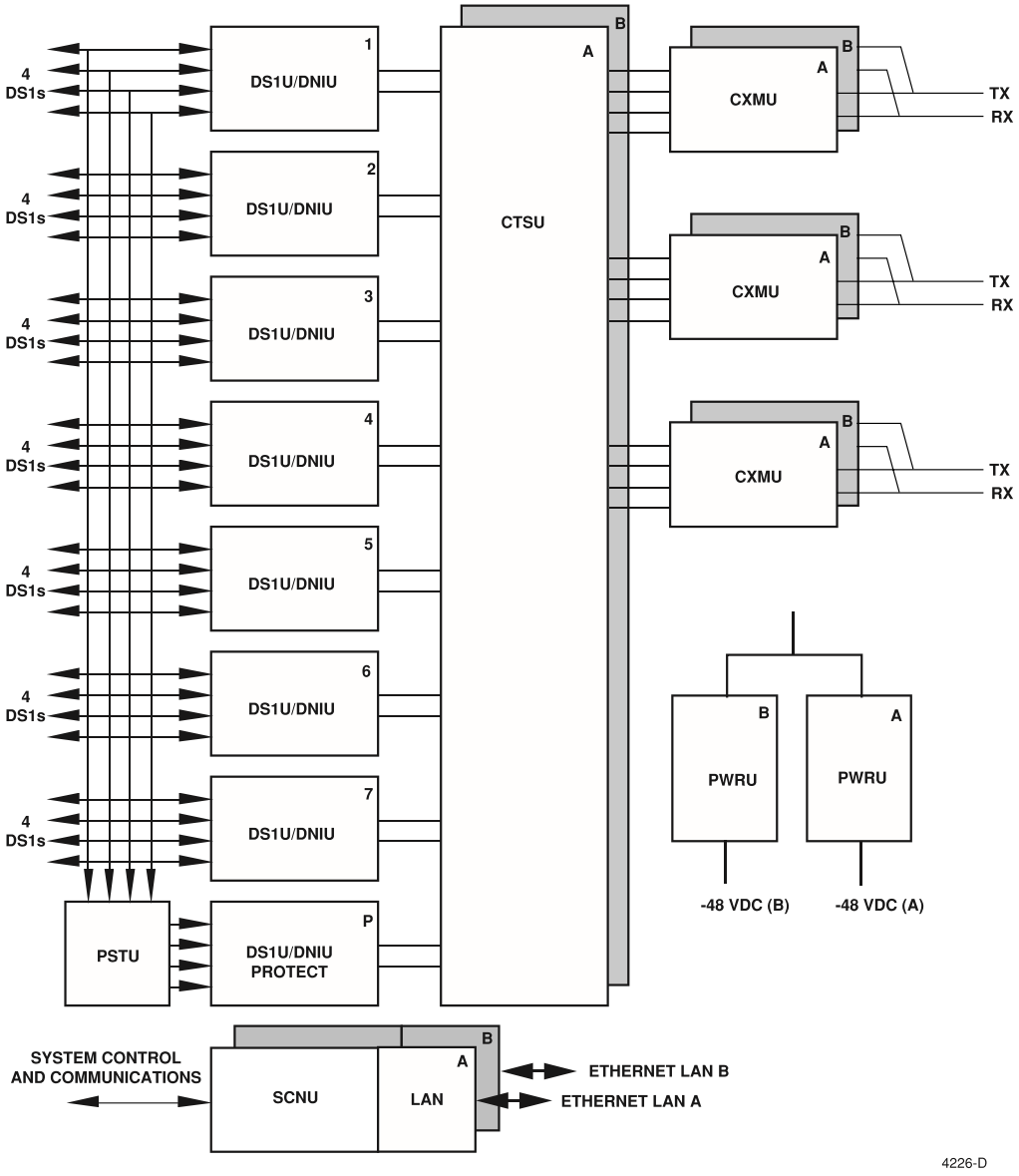


Figure 2-4. HDT Block Diagram

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Figure 2-5 shows the various network and communication interfaces provided by the HDT. A DSX-1 interface is provided for the DS1 lines. A coaxial cable interface is provided for the HFC network RF cable connections. A 10BaseT Ethernet LAN interface is provided for communications with the Element Manager systems. A local alarm interface is provided for transmitting alarms (both visual and audible) to a local alarm system. Local LED indicators provide a means for visually checking the system operating status.

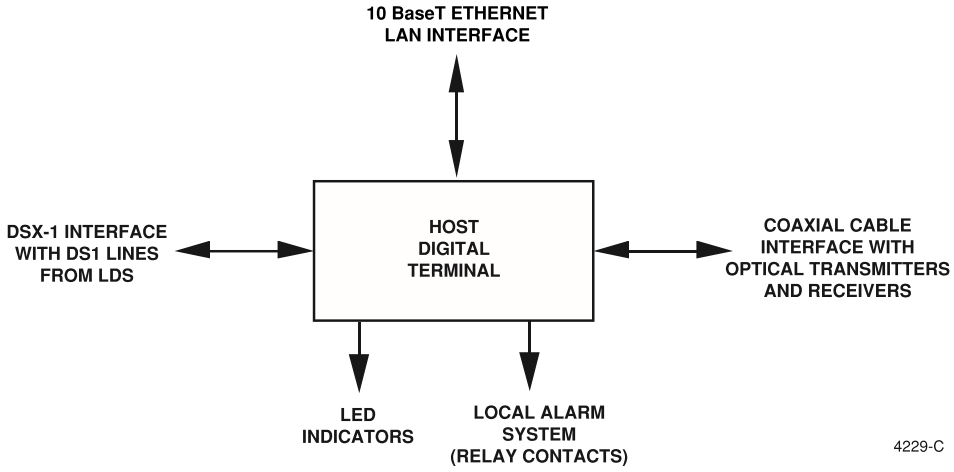


Figure 2-5. HDT Network and Communication Interfaces

2.4 HDT Plug-In Units

The location of the HDT plug-in units is shown in Figure 2-6. Each plug-in unit provides specific functions which are described in Section 3 of this manual. Each plug-in unit has one or more indicators that display the operating status of the unit. These indicators are not visible with the HDT front panel installed. If an abnormal operation condition is detected in any unit, the Shelf Fail indicator (visible through the HDT front panel) lights. Removal of the front panel allows viewing of the unit indicators so the failed units can be quickly identified. The Shelf Controller Unit (SCNU) also provides some switches which are described in Section 3.

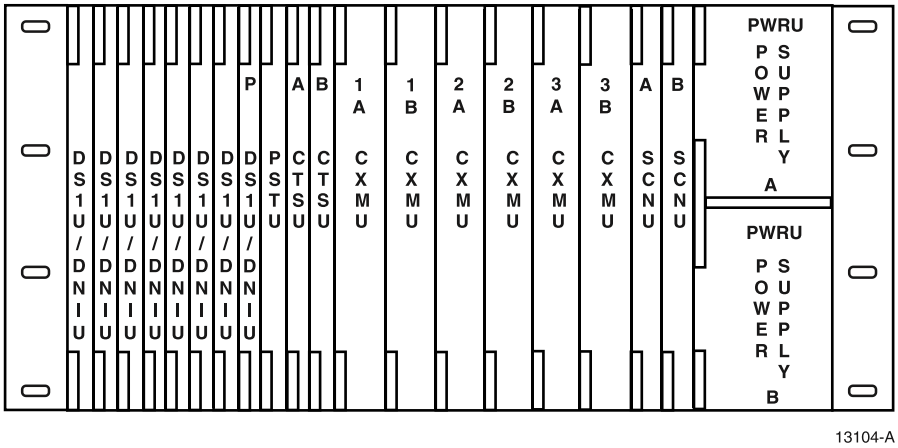


Figure 2-6. Location of HDT Plug-In Units

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2.5 HDT Mounting Shelf Cabling and Wiring Connections

The HDT mounting shelf provides the following cabling and wiring connections:

- Power and ground wiring
- LAN wiring
- Local alarm wiring
- Fan alarm wiring
- BITS clock wiring
- DSX-1 interface cables
- Coaxial transmit/receive cables

2.5.1 Power and Ground Wiring

The HDT operates from a –48 VDC power source. Power cable connections are made at the **POWER** terminal block shown in Figure 2-7. Two power sources may be connected for redundant powering. The upper segment of the terminal block is labeled with an **A** (Source A) and the lower segment is labeled with a **B** (Source B). The **–48 V** and **RTN** (return) connections to the terminal block must be made with no smaller than 18 AWG wire and each of the two circuits must be protected by a 7.5 ampere fuse.

The –48 VDC power wires must be connected to a fuse panel. The power distribution and circuit protection requirements for the HDT must be provided by a fuse panel that will accommodate 7.5 amp fuses and #18 AWG wire.

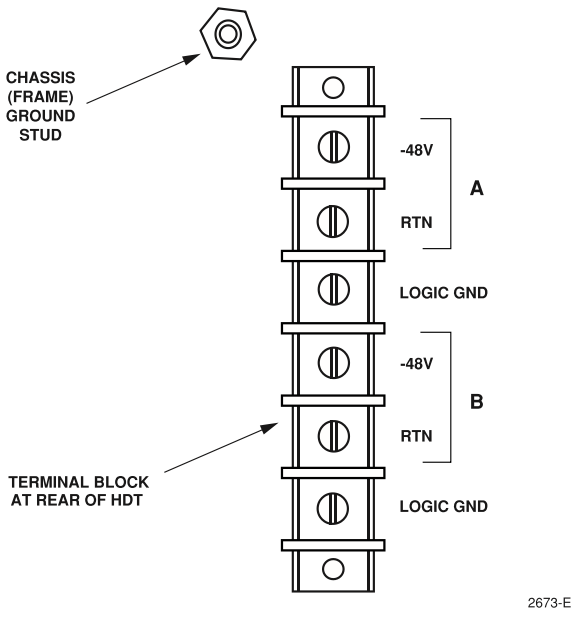


Figure 2-7. –48 Vdc Power Wiring and Ground Connections

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Several points on the HDT must be connected to a grounding point. A stud located adjacent to the power terminal block (see Figure 2-7) is provided for connecting the HDT chassis to a grounding point. A pair of terminals are also provided on the power terminal block for connecting the HDT logic ground to a grounding point.

2.5.2 LAN Wiring

Communications between the HDT and the Element Manager systems are over an Ethernet 10BaseT Local Area Network (LAN). Wire wrap pins for connecting the LAN wiring are provided on the lower wire wrap terminal block as shown in Figure 2-8.

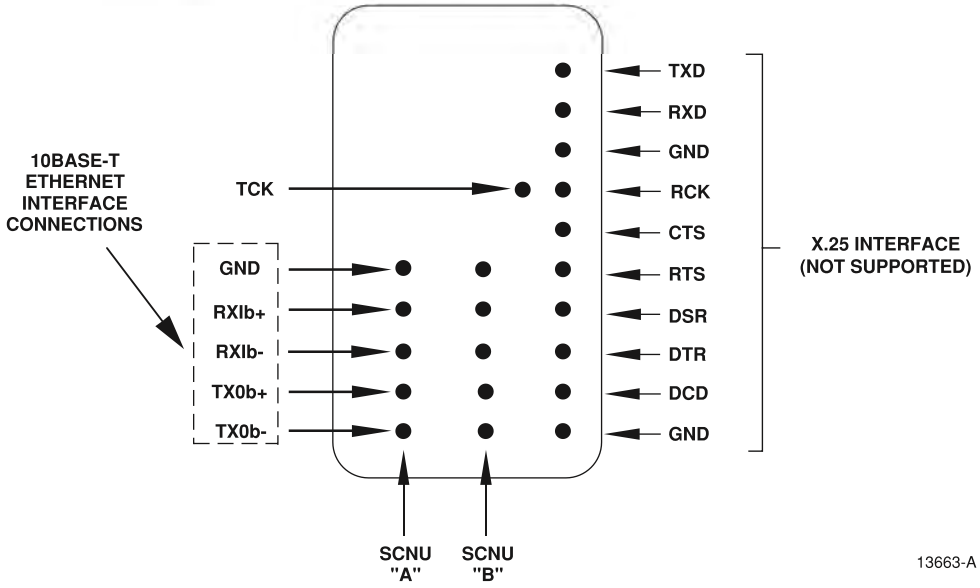


Figure 2-8. Lower Wire-Wrap Pin Terminal Block.

2.5.3 Local Alarm System Wiring

Wire-wrap pins for connecting local alarm system wiring are provided on the upper wire-wrap pin terminal block as shown in Figure 2-9. Separate dry contacts are provided for the **CRITICAL**, **MAJOR,** and **MINOR** (**VISUAL** and **AUDIBLE**) alarms from the shelf. The SCNU has a normally closed contact that actuates a **MAJOR VISUAL** alarm if shelf power is lost. Sending of alarms is software controlled except in the event SCNU power is lost.

A **NEW ALARM** signal is generated by the SCNU which closes a separate dry contact. The signal shares the alarm contact common. This signal is pulsed by the SCNU software to indicate to the local alarm system that a new alarm is being sent to the panel. This signal makes it possible to "bus" the **CRITICAL**, **MAJOR**, and **MINOR** alarms without blocking new alarms from other HDT shelves. This pulse clears the ACO on the local alarm system. The new alarm connection can only be used with alarm systems that accommodate the new alarm connections.

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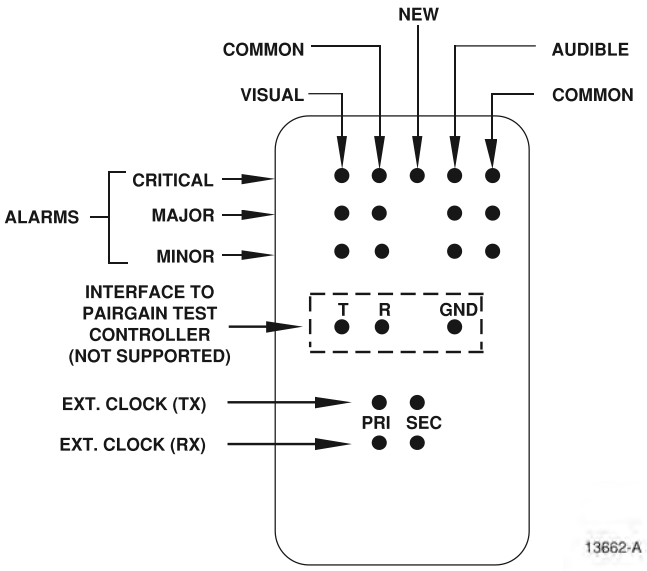


Figure 2-9. Upper Wire-Wrap Pin Terminal Block

2.5.4 Fan Alarm Wiring

The HDT fan assembly provides cooling air-flow for the various plug-in units installed in the mounting shelf. If any of the four fans fails while in service, an alarm signal in the form of a contact closure is generated by the fan assembly. Wire wrap pins for connecting the local alarm system are provided on the lower wire-wrap pin terminal block (Figure 2-8).

2.5.5 BITS Clock Wiring

The HDT may be provisioned to use either line timing or an external timing source. Wire wrap pins for connecting the primary and secondary Building Integrated Timing Supply (BITS) clock wiring are provided on the upper wire wrap terminal block (see Figure 2-9). The BITS clock may be either SF or ESF format. The HDT does not support the use of a Composite Clock (CC) for a BITS clock.

2.5.6 DSX-1 Interface Cables

Two 64-pin **male** AMP CHAMP connectors are mounted on the rear side of the HDT for connection of the DS1 lines as shown in Figure 2-10. The upper connector provides receive (input) terminations and the lower connector provides transmit (output) terminations. A standard DSX-1 signal interface is provided. The DS1 output from the HDT provides the standard DSX-1 signal level up to a distance of 655 feet (200 meters).

The DS1 connections can be made in either of two ways. Two stub cables (ordered separately) can be connected to the DS1 RCV and DS1 XMT connectors on the HDT. The other end of each stub cable can then be terminated at a cross-connect panel. **Female** AMP CHAMP connectors can also be attached to customer-supplied cables for connection to the HDT. The termination, pair numbers, and color codes are shown in Table 2-1.

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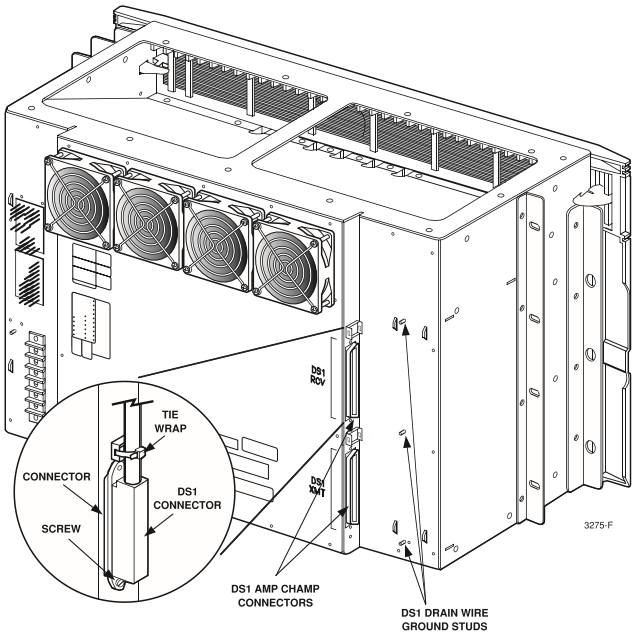


Figure 2-10. DSX-1 Interface Connections

2.5.7 Coaxial Transmit/Receive Cables

The coaxial transmit and receive 735A feeder cables connect directly to the Coax Master Units (CXMUs) at the front of the HDT as shown in Figure 2-11. The end of the cable that connects to the CXMU is equipped with an SMB connector. The other end of the cable is equipped with an F-type or BNC connector. Each pair of transmit/receive cables is routed from the front of the HDT to a splitter/combiner panel. Cables are available in 1, 2, and 3 meter lengths.

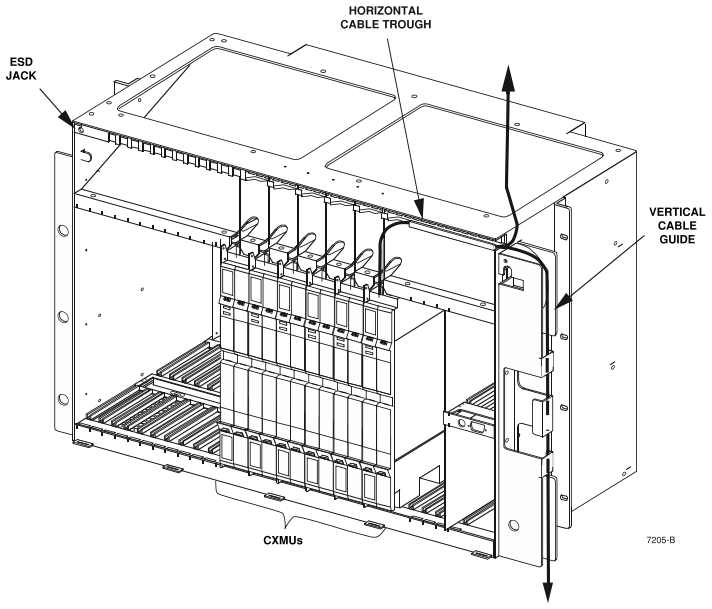


Figure 2-11. Coaxial Cable Connections

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Table 2-1. DS1 Receive/Transmit Connector and Stub Cable Pin-Outs

PAIR	SIGNAL	WIRE COLOR	RING TIP	PAIR	SIGNAL	WIRE COLOR	RING TIP
1	DS1U1A	Blue/White White/Blue	1 33	16	DS1U4D	Blue/Yellow Yellow/Blue	16 48
2	DS1U1B	Orange/White White/Orange	2 34	17	DS1U5A	Orange/Yellow Yellow/Orange	17 49
3	DS1U1C	Green/White White/Green	3 35	18	DS1U5B	Green/Yellow Yellow/Green	18 50
4	DS1U1D	Brown/White White/Brown	4 36	19	DS1U5C	Brown/Yellow Yellow/Brown	19 51
5	DS1U2A	Slate/White White/Slate	5 37	20	DS1U5D	Slate/Yellow Yellow/Slate	20 52
6	DS1U2B	Blue/Red Red/Blue	6 38	21	DS1U6A	Blue/Violet Violet/Blue	21 53
7	DS1U2C	Orange/Red Red/Orange	7 39	22	DS1U6B	Orange/Violet Violet/Orange	22 54
8	DS1U2D	Green/Red Red/Green	8 40	23	DS1U6C	Green/Violet Violet/Green	23 55
9	DS1U3A	Brown/Red Red/Brown	9 41	24	DS1U6D	Brown/Violet Violet/Brown	24 56
10	DS1U3B	Slate/Red Red/Slate	10 42	25	DS1U7A	Slate/Violet Violet/Slate	25 57
11	DS1U3C	Blue/Black Black/Blue	11 43	26*	DS1U7B	Blue/White White/Blue	26 58
12	DS1U3D	Orange/Black Black/Orange	12 44	27*	DS1U7C	Orange/White White/Orange	27 59
13	DS1U4A	Green/Black Black/Green	13 45	28*	DS1U7D	Green/White White/Green	28 60
14	DS1U4B	Brown/Black Black/Brown	14 46		Chassis Ground	Drain Wire	64
15	DS1U4C	Slate/Black Black/Slate	15 47				

* Pairs are inner core with orange spiral threaded binder. All other pairs are outer connectors.

3 SPECIFICATIONS

Specifications for the HDT are provided in Table 2-2.

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Table 2-2. HDT Specifications

CHARACTERISTIC	SPECIFICATION	REMARKS
–48 VDC Power Consumption (Watts)		
Fans	11.5 W	
DNIU	7.2 W active/6.9 W standby	7 active, 1 standby per shelf
PSTU	2 W	1 per shelf
CTSU	5 W active/3.9 W standby	1 active, 1 standby per shelf
CXMU	12.1 W active/9.2 W standby	3 active, 3 standby per shelf
SCNU	9.6 W active/6.9 W standby	1 active, 1 standby per shelf
PWRU	10.6 W (load shared)	2 active per shelf
Total	181.3 W	Fully loaded
Dimensions and Weight		
Height	13.95 in (35.4 cm)	
Width	21.40 in (54.36 cm)	
Depth	12.0 in (30.48 cm)	
Weight	57 lbs (25.85 kg)	Maximum configuration
Mounting		
Rack size	23-inch	EIA/WECO
Extension from rack	5 inches (12.6 cm)	
Coaxial Interface		
Cable length (maximum)	100 ft (30.5 m)	
Cable connector type	SMB	At the CXMU
RF input (receive level)	–24 to –28 dBmV	–26 dBmV nominal
RF output (transmit level)	55 to 59 dBmV	57 dBmV nominal (240 DS0s)
CXMU02 transmit frequency	574 to 744 MHz	Lower band edge to upper band edge, 6 MHz per CXMU
CXMU03 transmit frequency	620 to 774 MHz	Lower band edge to upper band edge, 6 MHz per CXMU
CXMU02 receive frequency	18 to 42 MHz	Lower band edge to upper band edge, 6 MHz per CXMU
CXMU03 receive frequency	12 to 70 MHz	Lower band edge to upper band edge, 6 MHz per CXMU
Temperature		
Operating (Normal)	0° C to +35° C	+32° F to +95° F
Operating (Short Term)	0° C to +50° C	+32° F to +120° F
Storage	–40° C to +70° C	–40° F to +158° F
Heat dissipation (maximum)	140 BTU/hr	
Humidity		
Operating	20% to 80%	
Storage	5% to 95%	
Flammability		
Rating	UL 94 V-1 or better	
DSX-1 Interface		
Capacity	28 DS1 lines per HDT	
Frequency	1.544 Mb/s	Per TR-TSY-000499
Cable length	Up to 655 feet (200 m)	
DSX-1 input signal level	+ or – 2.4 to 3.6 Volts	+ or – 3.0 Volts nominal
DSX-1 output signal level	+ or – 2.4 to 3.6 Volts	+ or – 3.0 Volts nominal

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PLUG-IN UNIT DESCRIPTION

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SECTION 3: PLUG-IN UNIT DESCRIPTION

Content Page

1 GENERAL 3-1
2 DIGITAL SIGNAL 1 UNIT (DS1U) AND DIGITAL NETWORK INTERFACE UNIT (DNIU) 3-1
2.1 DS1U/DN1U Protection Switching 3-3
3 PROTECTION SWITCH AND TEST UNIT (PSTU) 3-3
4 CLOCK/TIME SLOT INTERCHANGE UNIT (CTSU) 3-4
5 COAX MASTER UNIT (CXMU) 3-5
6 SHELF CONTROL UNIT (SCNU) 3-6
7 POWER SUPPLY UNIT (PWRU) 3-8
7.1 Load Sharing 3-9

1 GENERAL

This section describes the various electronic plug-in units used with the HDT mounting shelf. The electronic plug-in units provide the functions required for HDT operation including powering, signal termination, protection switching and testing, clock/time slot interchange, signal processing and transport, and system control and management. Each plug-in unit consists of a printed circuit card, rear connector, front panel, LED indicators, and switches (SCNU only). The LED indicators display the unit operating status. Except for the Protection Switch and Test Unit (PSTU), all plug-in units are protected with a standby unit that will become active if the working unit fails.

2 DIGITAL SIGNAL 1 UNIT (DS1U) AND DIGITAL NETWORK INTERFACE UNIT (DNIU)

The DS1U/DNIU, shown in Figure 3-1, provides the DSX-1 network termination functions required for interfacing with the DS1 facilities. The DS1U/DNIU may be configured to terminate the Extended Super Frame (ESF) framing formats. The DS1 HDT can be equipped with up to seven active DS1U/DNIUs and one DS1U/DNIU protection unit. Each DS1U/DNIU terminates four DS1 lines.

The DNIU was introduced as a replacement for the DS1U and both are currently in use. The DNIU can be installed in the same shelf with DS1Us or it can totally populate an HDT. The DNIU provides the same features provided by the DS1U plus it supports a feature called *range transparency*. When one or more DS1Us are installed in the HDT, a plant delay setting (in µsec) must be entered in order for the system to compensate for the round-trip plant delay. A measurement or calculation of the overall round-trip plant delay must be completed before the correct plant delay setting can be selected. When only DNIU units are installed in the HDT, the *range transparent* setting may be selected instead of a specific plant delay setting.

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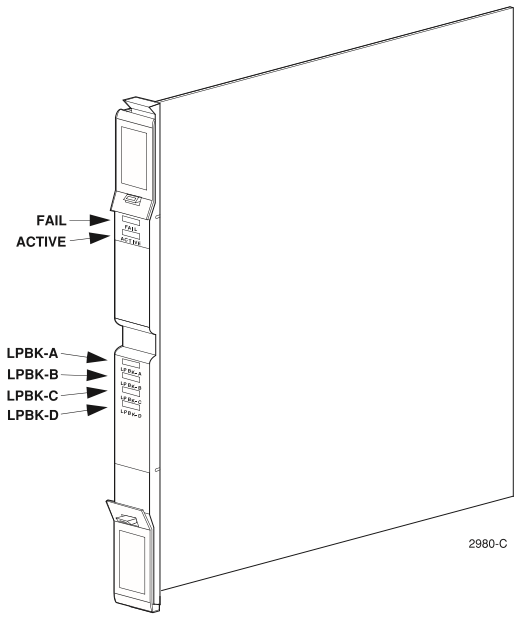


Figure 3-1. Digital Signal 1 Unit/Digital Network Interface Unit (DS1U/DNIU)

The DNIU also supports a feature related to Forward Error Correction (FEC) not supported by the DS1U. When only DNIUs are installed in the HDT, FEC may be enabled on an IST basis. When DNIUs and DS1Us are installed in the same HDT, FEC may only be enable for all ISTs.

Six LEDs provided on the front of the DS1U/DNIU. Refer to Table 3-1 for a description of the DS1U/DNIU LED indicators.

Table 3-1. DS1U/DNIU LED Indicators

INDICATOR	COLOR	DESCRIPTION
FAIL	Red	Unit is initializing (following reset) or unit has failed.
	Off	No fail condition detected.
ACTIVE	Green	Unit is active.
	Off	Unit is initializing (following reset), unit has failed (FAIL LED red), or unit is inactive (protection configuration).
LPBK-A	Green	Unit is initializing (following reset) or loopback is active on circuit A.
	Off	Loopback is inactive on circuit A.
LPBK-B	Green	Unit is initializing (following reset) or loopback is active on circuit B.
	Off	Loopback is inactive on circuit B.
LPBK-C	Green	Unit is initializing (following reset) or loopback is active on circuit C.
	Off	Loopback is inactive on circuit C.
LPBK-D	Green	Unit is initializing (following reset) or loopback is active on circuit D.
	Off	Loopback is inactive on circuit D.

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2.1 DS1U/DNIU Protection Switching

Up to seven active DS1U/DNIUs can be protected with the placement of a standby DS1U/DNIU in the eighth (P) DS1U/DNIU slot. For protection switching to occur, the protection switching and test unit (PSTU) must also be installed. The protection switching process is initiated when the SCNU detects and isolates a failure on an active DS1U/DNIU. The SCNU provisions the standby DS1U/DNIU to match the data base of the failed DS1U/DNIU and forces the failed DS1U/DNIU into equipment loopback. The PSTU then switches the four DS1 lines of the failed DS1U/DNIU to the standby unit and operation through the standby DS1U/DNIU begins.

Note: When DS1Us and DNIUs are installed in the same HDT, a DNIU **must** be installed in the 8th (P) slot. A DS1U may be used as a protection unit only if no DNIUs are installed in slots 1 through 7.

Protection switching of the DS1U/DNIU is revertive. Replacement of a failed unit restores it to an active mode and the protection DS1U/DNIU to a standby mode.

3 PROTECTION SWITCH AND TEST UNIT (PSTU)

The PSTU, shown in Figure 3-2, supports the DS1 protection switching functions. If a DS1U/DNIU failure occurs, the SCNU detects the failure and signals the protection DS1U/DNIU which directs the PSTU to switch the four DS1 lines of the failed DS1U/DNIU to the protection unit. The PSTU is not protected since its loss would not be service affecting in a normally functioning system. Two LEDs provided on the front of the PSTU. Refer to Table 3-2 for a description of the PSTU LED indicators.

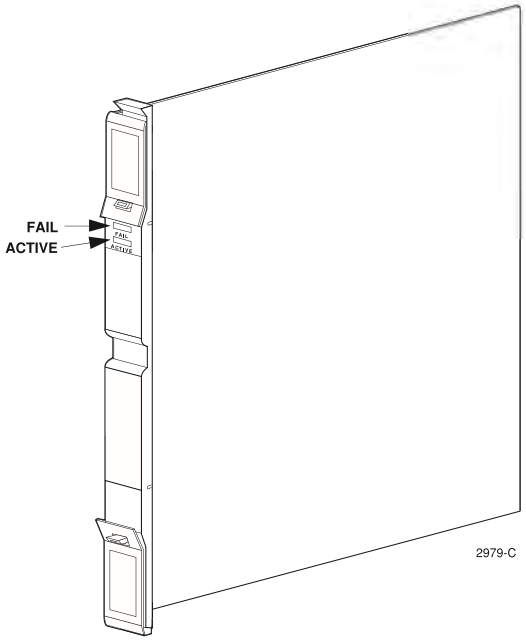


Figure 3-2. Protection Switch and Test Unit (PSTU)

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Table 3-2. PSTU LED Indicators

INDICATOR	COLOR	DESCRIPTION
FAIL	Red	Unit has failed.
	Off	No fail condition detected.
ACTIVE	Green	Unit is active (DS1U/DNIU protection switch).
	Off	Unit is inactive (normal unless a protection switch has occurred).

4 CLOCK/TIME SLOT INTERCHANGE UNIT (CTSU)

The CTSU, shown in Figure 3-3, provides clocking and time slot interchange functions for the HDT. Two CTSUs can be installed in the HDT mounting shelf. One unit is the active (working) unit and the other unit (standby) provides protection. If the active CTSU fails, the protection (standby) CTSU is automatically switched into service. The red **FAIL** LED lights on the CXMU that failed. This switch is non-revertive. When the failed unit is replaced, a switch back to the replaced unit will not occur automatically.

There are two LEDs provided on the front of the CTSU. Refer to Table 3-3 for a description of the CTSU LED indicators.

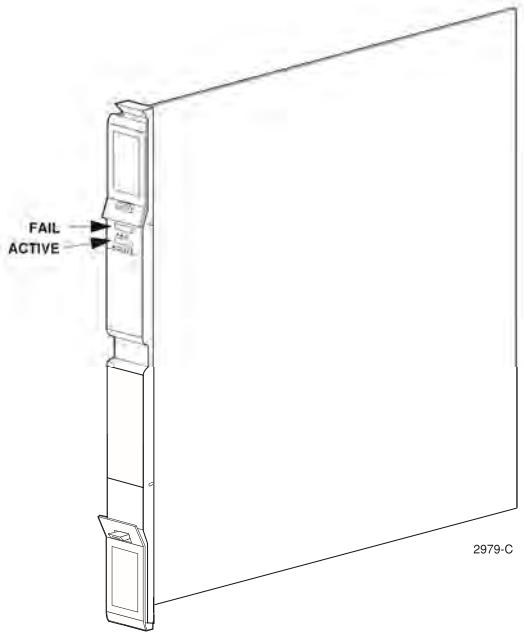


Figure 3-3. Clock/Time Slot Interchange Unit (CTSU)

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Table 3-3. CTSU LED Indicators

INDICATOR	COLOR	DESCRIPTION
FAIL	Red	Unit is initializing (following reset) or unit has failed.
	Off	No fail condition detected.
ACTIVE	Green	Unit is active.
	Off	Unit is initializing (following reset), unit has failed (FAIL LED red), or unit is inactive (protection configuration).

5 COAX MASTER UNIT (CXMU)

The CXMU, shown in Figure 3-4, uses QAM-32 constellations and Orthogonal Frequency Division Multiplexing (OFDM) techniques to modulate and demodulate the payload and signaling information associated with up to 240 DS0s in a 6 MHz tune-able RF band. The CXMU also provides management functions associated with the transport. These include provisioning, alarming, bandwidth management, and performance monitoring.

Three pairs of CXMU units can be installed in the HDT mounting shelf. Within each CXMU pair, one unit is the active (working) unit and the other unit (standby) provides protection. If the active CXMU fails, the protection (standby) CXMU is automatically switched into service. The red **FAIL** LED lights on the CXMU that failed. This switch is non-revertive. When the failed unit is replaced, a switch back to the replaced unit will not occur automatically.

Two versions of the CXMU, the CXMU02 and the CXMU03 are available. The CXMU03 was introduced as a replacement for the CXMU02 and both types of CXMUs are currently in use. Refer to Table 3-3 for a description of the differences between the two types of CXMUs and the compatibility requirements.

Table 3-3. CXMU Features and Compatibility Requirements

CXMU CATALOG NUMBER	SYSTEM SOFTWARE REQUIREMENTS	DOWNSTREAM FREQUENCY RANGE	SUPPORTS FORWARD ERROR CORRECTION
HDT-CXMU02	Release 1.1 or later	577 to 741 MHz	No
	Can only be used as a replacement for the HDT-CXMU**03** if the downstream frequency is set within the 623 to 741 MHz range and FEC is **not** enabled. If both conditions are not met, the CXMU will not initialize when installed.		
HDT-CXMU03	Release 3.0 or later	623 to 771 MHz	Yes
	Can only be used as a replacement for the HDT-CXMU**02** if the downstream frequency is set within the 623 to 741 MHz range and the HDT is running on Release 3.0 or later system software. If both conditions are not met, the CXMU will not initialize when installed.		

There are two LEDs provided on the front of the CXMU. Refer to Table 3-4 for a description of the CXMU LED indicators. SMB connectors for the coaxial cables are located at the top of the CXMU. See the **Specifications** section in **Section 2** for the CXMU input/output signal levels.

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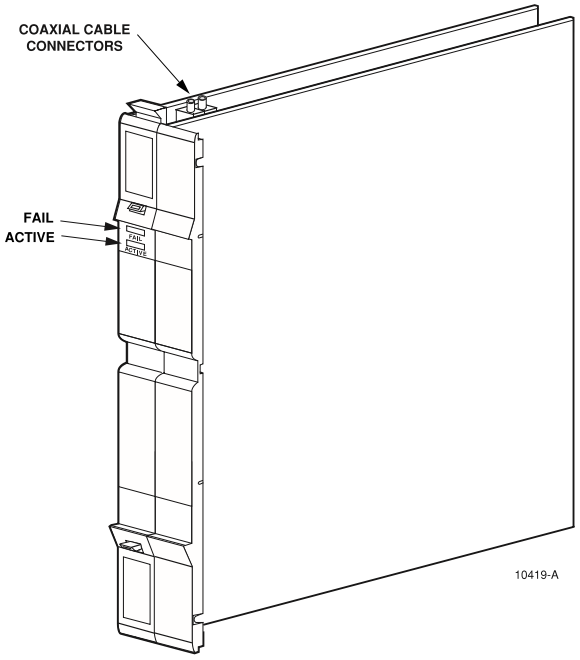


Figure 3-4. Coax Master Unit (CXMU) Plug-In Unit

Table 3-4. CXMU LED Indicators

INDICATOR	COLOR	DESCRIPTION
FAIL	Red	Unit is initializing (following reset) or unit has failed.
	Off	No fail condition detected.
ACTIVE	Green	Unit is active.
	Off	Unit is initializing (following reset), unit has failed (FAIL LED red), or unit is inactive (protection configuration).

6 SHELF CONTROL UNIT (SCNU)

The SCNU, shown in Figure 3-5, provides control and monitor functions for the HDT and the associated ISUs. It also processes all communications between the element manager systems and the HDT. Two SCNUs can be installed in the HDT mounting shelf. One unit is the active (working) unit and the other unit (standby) provides protection. If the active SCNU fails, the protection (standby) SCNU is automatically switched into service. The red **FAIL** LED lights on the SCNU that failed. This switch is non-revertive. When the failed unit is replaced, a switch back to the replaced unit will not occur automatically.

New SCNUs have a generic software image stored in the internal memory. The generic image provides basic recognition and communication functions. During the turn-up and test process, the system software is downloaded to the active SCNU using the CraftWorx system. The system software files replace the generic image. When the protection SCNU is installed, the system software is copied from the active SCNU to the protection SCNU.

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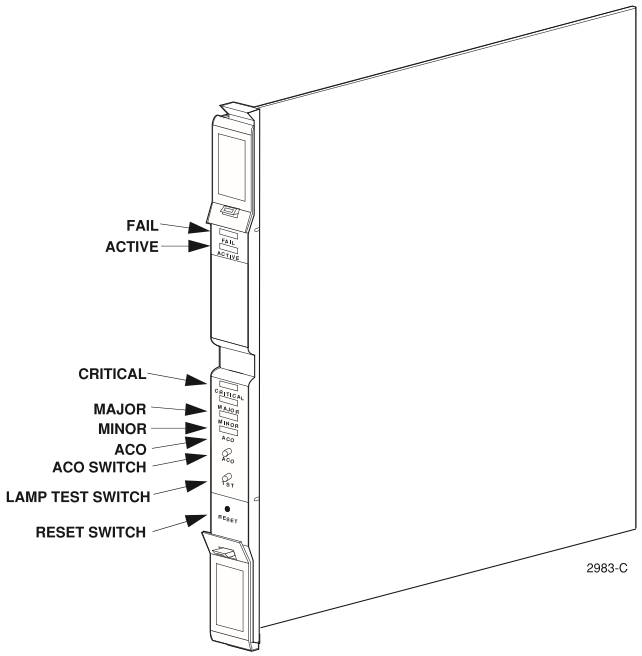


Figure 3-5. Shelf Control Unit (SCNU)

Two versions of the SCNU, the SCNU20 and SCNU30, are available. The SCNU20 is loaded with the Release 2.1 generic image. The SCNU30 is loaded with the Release 3.0 generic image. Either version of the SCNU may be used with the TR-303 Release 3.0 version of the Homeworx system. A label that identifies the SCNU type is attached to the front panel of the SCNU.

There are six LEDs, an **ACO** switch, lamp **TEST** switch and **RESET** switch provided on the front of the SCNU. Refer to Table 3-7 for a description of the SCNU switches and LED indicators.

Table 3-7. SCNU LED Indicators Switches

INDICATOR	COLOR	DESCRIPTION
FAIL	Red	Unit is initializing (following reset) or unit has failed.
	Off	No fail condition detected.
ACTIVE	Green	Unit is active.
	Off	Unit is inactive (protection configuration).
CRITICAL	Red	A severe service-affecting condition exists that has caused the equivalent of 128 or more lines to be out-of-service.
	Off	No alarm detected.
MAJOR	Red	A service-affecting condition exists that has caused the equivalent of 24 or more lines to be out-of-service.
	Off	No alarm detected.

continued

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Table 3-7. SCNU LED Indicators Switches, continued

INDICATOR	COLOR	DESCRIPTION
MINOR	Yellow	A non-service-affecting condition exists or a condition that effects less than 24 lines exists.
	Off	No alarm detected.
ACO	Green	Alarm cut-off activated.
	Off	Alarm cut-off inactive.
SWITCH	**FUNCTION**	
ACO	Disables audible alarms when pressed.	
TEST	Lights all LEDs on all HDT plug-in units, and the FAIL indicator at the front of the HDT shelf.	
RESET	This recessed switch performs a microprocessor reset (non-service-affecting) when pressed. The tip of a mechanical pencil may be used to activate the reset function.	

7 POWER SUPPLY UNIT (PWRU)

The PWRU, shown in Figure 3-6, is a switcher-type power supply that converts the –48 VDC office power into the voltages needed by the various HDT plug-in units. These voltages are distributed to the plug-in units through the HDT mounting shelf backplane. Two PWRU units (A and B) are typically installed to share the load and to provide protection in case one unit should fail.

The HDT mounting shelf accommodates two power supplies: the A (upper) and B (lower). One power supply unit can supply enough power to operate a fully equipped HDT mounting shelf. However, two units are recommended for protection purposes and to maximize long-term reliability. If the shelf is equipped with two PWRUs, they share the load equally.

Two LEDs provided on the PWRU front panel. Refer to Table 3-7 for a description of the PWRU LED indicators.

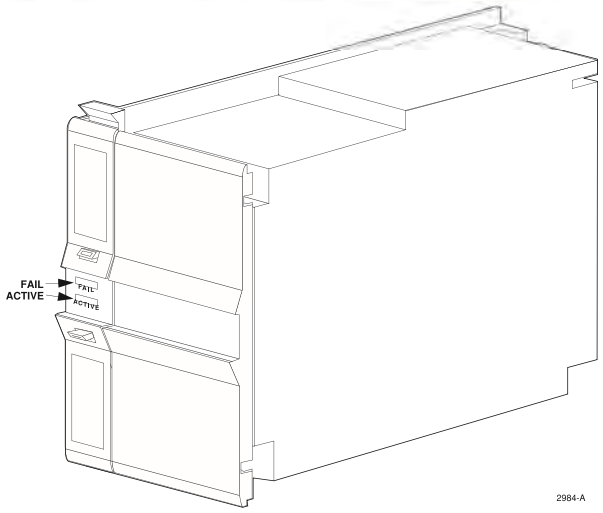


Figure 3-6. Power Supply Unit (PWRU) Plug-In Unit

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Table 3-6. PWRU LED Indicators

INDICATOR	COLOR	DESCRIPTION
FAIL	Red	Unit has failed or has insufficient load to initiate load sharing.
	Off	No fail condition detected.
ACTIVE	Green	Unit is active and functioning normally.
	Off	Unit has failed, load is insufficient to initiate load sharing, or fuse is open. At least a DS1U/DNIU, CTSU, and CXMU must be installed in the mounting shelf to initiate load sharing.

7.1 Load Sharing

Load sharing is initiated whenever two PWRUs are installed in the HDT mounting shelf. However, under low load conditions, the PWRUs may be unable to share the load properly. An insufficient load may cause the red **FAIL** LED on one of the PWRUs to be on. This indicates the load share function is not initiated and does not mean the PWRU has failed.

To initiate proper load sharing by the PWRUs, one each of the following units must be installed in the mounting shelf before a second PWRU (B unit) is installed: a DS1U, CTSU, and CXMU. This will ensure that sufficient load is present to properly initiate the PWRU load sharing feature. Adding the specified plug-in units to a mounting shelf with an insufficient load will also turn off the **FAIL** LED and initiate load sharing.

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MOUNTING SHELF INSTALLATION

SECTION 4: MOUNTING SHELF INSTALLATION

Content		Page
1	GENERAL	4-1
1.1	Use An ESD Wrist Strap For all Installation Procedures	4-2
1.2	Tools and Materials Required	4-2
2	UNPACK MOUNTING SHELF	4-3
3	INSTALL MOUNTING SHELF AND BAFFLE	4-3
3.1	Install Mounting Shelf	4-3
3.2	Install Baffle	4-5
4	CONNECT CHASSIS AND LOGIC GROUND	4-6
4.1	Chassis Ground	4-6
4.2	Logic Ground	4-8
5	CONNECT LOCAL ALARMS	4-8
5.1	Shelf Alarm Connections	4-8
5.2	Fan Alarm Connections	4-11
6	CONNECT EXTERNAL TIMING	4-11
7	CONNECT COMMUNICATIONS LAN	4-13
8	CONNECT DS1 LINES	4-15
9	INSTALL COAXIAL FEEDER CABLES	4-17
10	CONNECT POWER SOURCES	4-20
11	INSTALL HDT FRONT COVER	4-22

1 GENERAL

This section provides instructions for installing the HDT mounting shelf in an equipment rack and for connecting the cables and wiring. The HDT typically resides in a CO, Head End, or a hub. The HDT interfaces with the public switched telephony network, HFC network, EM system communications LAN, local alarm system, office battery power sources, and local timing source.

All cables (except for the coaxial interface cables) connect to the mounting shelf from the rear side. The coaxial transmit/receive cables connect at the front of the mounting shelf and are routed into the shelf from the right side. Wire-wrap pins are provided for connecting the EM system communications LAN, local alarm system, and local timing source wiring. Screw-down type terminals are provided for connecting the power source wires. Two 64-pin **male** AMP CHAMP connectors are provided for connecting the DS1 lines. The HDT mounting shelf can terminate up to 28 DS1 lines and provides a standard DSX-1 interface.

The DS1 HDT mounting shelf installs in a 23-inch EIA or WECO equipment rack and requires 14 inches (35.5 cm) of rack space. Up to five mounting shelves can be installed in a 7 foot (213.3 cm) rack. Each mounting shelf extends 5 inches from the front of the rack when installed. It is recommended that a baffle be installed below the lowest mounting shelf to insure that adequate airflow is provided for cooling.

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1.1 Use An ESD Wrist Strap For all Installation Procedures

Before handling any HDT components, slip on an Electro-Static Discharge (ESD) wrist strap and connect the ground wire to the ESD jack on the front side of the HDT. Wear the ESD wrist strap while completing each section of the mounting shelf installation procedure.

⚠ **Warning**: *Electronic components can be damaged by static electrical discharge. To prevent ESD damage, always wear an ESD wrist strap when working on the HDT or when handling electronic components.*

1.2 Tools and Materials Required

The following tools are required to complete the procedures in this section:

- ESD wrist strap
- Box cutter
- Medium size flat bladed screwdriver with a minimum shaft length of 6 inches
- #2 Phillips screwdriver
- Wire cutters
- Wire stripper
- Pliers
- Terminal crimper
- Wire wrap tool (0.045 square pins)
- SMB coax connector tool (catalog # HDT-ACC-CRT)
- DC Voltmeter

The following materials are required to complete the procedures in this section:

- Cable ties
- 26 AWG (0.40 mm) insulated solid copper wire (alarms)
- 26 AWG (0.40 mm) insulated and shielded solid copper wire (external timing)
- 18 AWG (1.00 mm) insulated solid copper wire (red and black for power connections)
- 18 AWG (1.00 mm) insulated stranded copper wire (grounding)
- 4-wire unshielded twisted pair cable (Ethernet LAN)
- Insulated ring and fork terminals for 18 AWG wire
- Twelve #12-24 × 1/2 inch binder head machine screws
- Two 7.5 amp fuses (Fuse panel must accommodate 7.5 amp fuses and #18 AWG wire)
- Two DS1 cables (shielded) with 64-pin AMP CHAMP female connectors
- Coaxial 735A feeder cables with SMB/F-type connectors or SMB/BNC connectors

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2 UNPACK MOUNTING SHELF

This procedure provides instructions for opening the shipping boxes, verifying that all parts have been received, and verifying that no shipping damage has occurred. Use the following procedure to unpack the mounting shelf:

1. Open the shipping carton and carefully unpack the HDT from the protective packing material.
2. Check each component for broken or missing parts. If there are any damages, fill out a red HDT Equipment Repair Tag and attach to the part. Then contact ADC Telecommunications (see General Information Section at the end of this manual) for an RMA (Return Material Authorization) and to reorder any components that require replacement.

3 INSTALL MOUNTING SHELF AND BAFFLE

This procedure provides instructions for installing the HDT mounting shelf in an unequal flange 23-inch equipment rack. The HDT mounting shelf requires both front and rear access during installation. Only front access is required for normal operations. It is also recommended that a separate baffle be installed **below** each HDT mounting shelf that is not mounted directly above another HDT. Use the following procedure to install the mounting shelf in the equipment rack:

3.1 Install Mounting Shelf

1. Place the HDT mounting shelf in its assigned location in the rack. Up to five HDTs may be mounted in a 7 foot (2133 mm) rack as shown in Figure 4-1. If more than one HDT will be installed, mount the first shelf in the lowest mounting space first.

2. Align the mounting bracket holes on each side of the shelf with the threaded holes in the rack.

Note: The HDT mounting shelf extends five inches (127 mm) in front of the rack when mounted.

3. Use eight #12-24 × 1/2 inch binding head machine screws to secure the shelf mounting brackets to the rack. Insert the screwdriver through the specially provided holes in the left cover bracket and the right vertical cable guide as shown in Figure 4-2.

Note: To reach the screw heads, the screwdriver must measure at least 6 inches (15.2 cm) from the handle to the tip of the blade.

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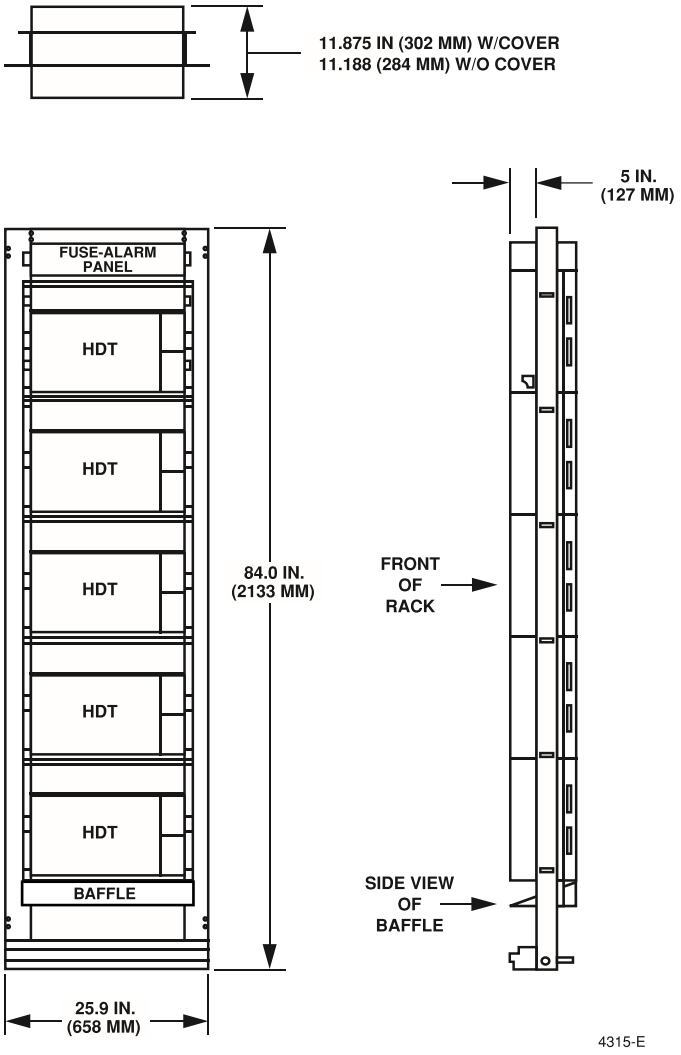


Figure 4-1. Equipment Rack Configuration

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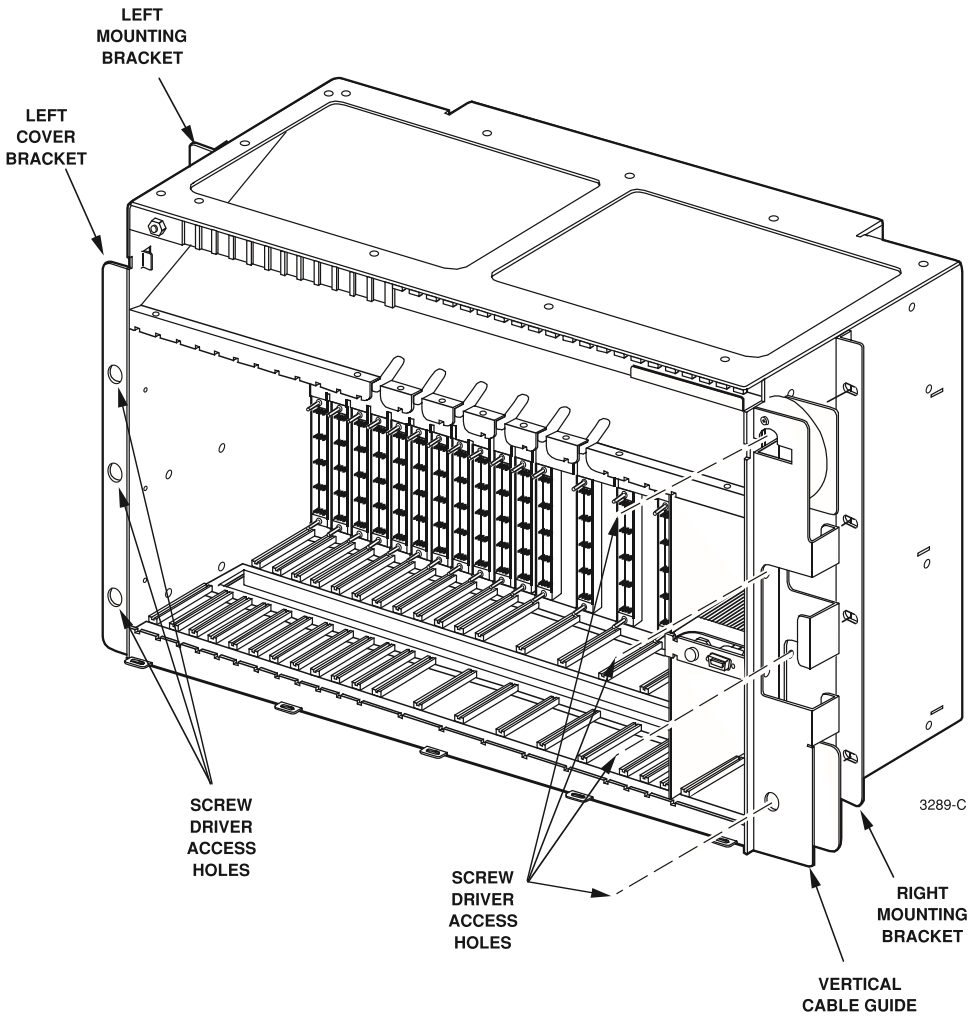


Figure 4-2. HDT Mounting Shelf - Front View

4. Install each additional mounting shelf directly above the previously installed mounting shelf.
5. Install a baffle below each HDT that is not mounted directly above another HDT as described in the next section.

3.2 Install Baffle

It is recommended that a separate baffle (catalog number SPX-BAFF40B1) be installed below each HDT mounting shelf that is not mounted directly above another HDT. The baffle prevents possible obstruction of air flow into the HDT above. The baffle also deflects heated air rising from equipment below. A baffle is not required between consecutively mounted HDTs because an integral baffle is provided in the top section of each HDT. Use the following procedure to install the baffle:

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1. Place the HDT baffle, shown in Figure 4-3, in position for mounting below the HDT mounting shelf. If several HDTs are mounted consecutively in the same rack (see Figure 4-1), position the baffle below the lowest HDT in the rack.
2. Align the mounting holes on each side of the baffle with the threaded holes in the rack.
3. Use four #12-24 × 1/2 inch binding head machine screws to secure the baffle mounting brackets to the rack.

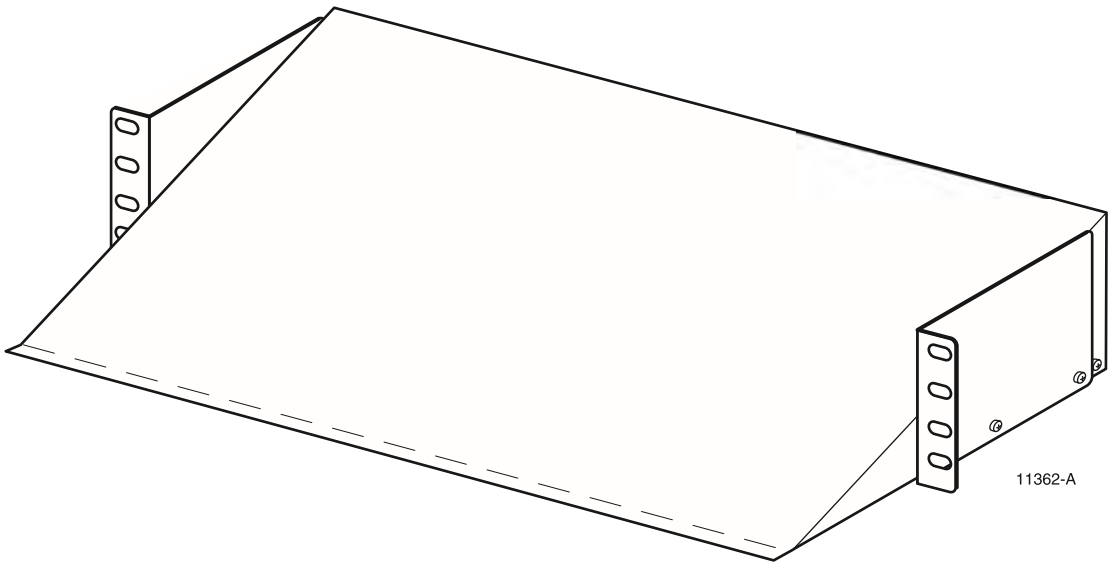


Figure 4-3. HDT Baffle - Front View

4 CONNECT CHASSIS AND LOGIC GROUND

This procedure provides instructions for connecting the chassis (frame) ground wiring and logic ground wiring to the HDT mounting shelf. Securing the mounting shelf to the rack does not usually provide an adequate chassis ground because of the insulating properties of the paint covering the rack. Failure to provide an adequate chassis ground may cause various plug-in units to reset for no apparent reason.

4.1 Chassis Ground

Use the following procedure to connect the chassis ground wire:

1. Obtain a length of #18 AWG (1.00 mm) insulated **stranded** copper wire for use as a chassis grounding wire.
2. Terminate one end of the wire with a ring terminal.
3. Locate the chassis ground stud at the rear of the HDT chassis as shown in Figure 4-4.

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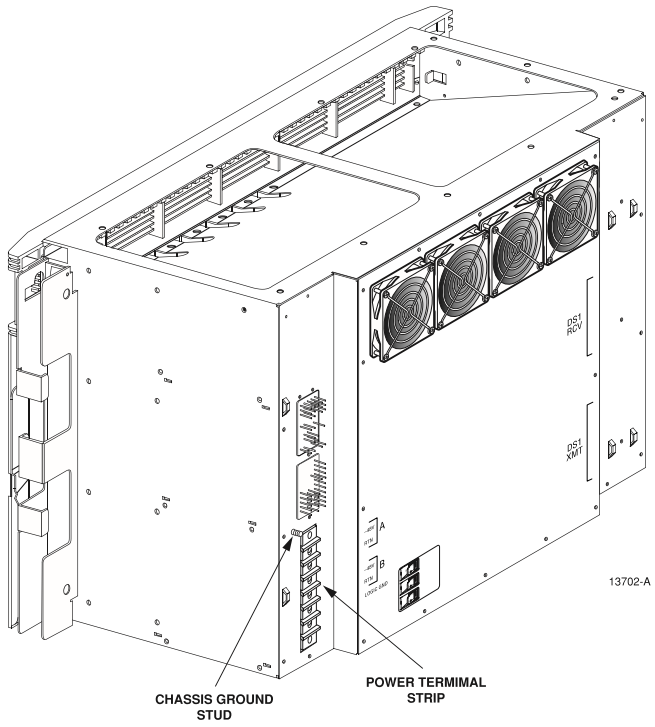


Figure 4-4. Chassis Ground Stud and Power Terminal Strip Location

4. Attach the ring terminal end of the wire to the chassis ground stud located adjacent to the power terminal strip as shown in Figure 4-5.
5. Route the chassis grounding wire to the frame grounding point on the rack.
6. Cut the chassis grounding wire to length and connect it to the frame grounding point on the rack as required by local practice.

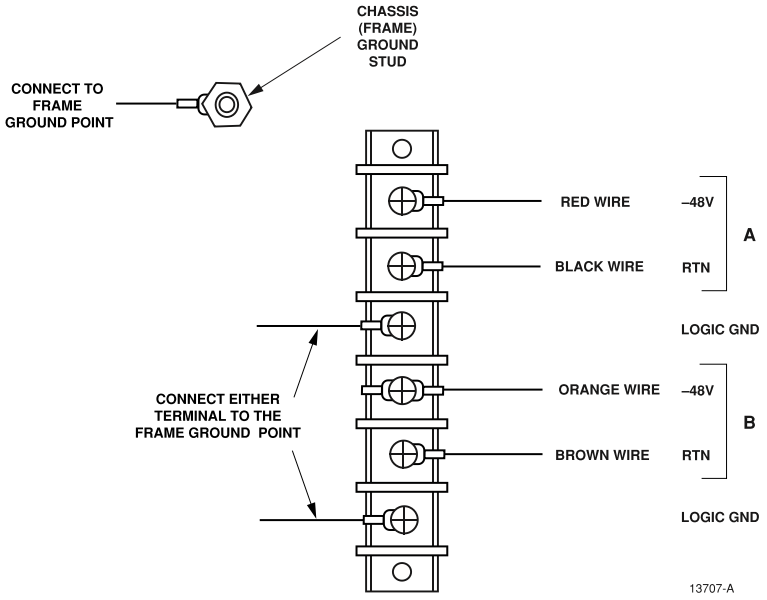


Figure 4-5. Chassis Ground Stud and Logic Ground Terminal Connections

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4.2 Logic Ground

Use the following procedure to connect the logic ground wire:

1. Obtain a length of #18 AWG (1.00 mm) insulated **stranded** copper wire for use as a logic grounding wire.
2. Terminate one end of the wire with a fork terminal.
3. Locate the power terminal at the rear of the HDT chassis (see Figure 4-4).
4. Remove the protective cover from the power terminal strip.
5. Attach the fork terminal end of the wire to either one of the two **LOGIC GND** terminals on the power terminal strip (see Figure 4-5). Note: The two terminals are connected together internally so that only one of the two terminals requires connection to ground.
6. Re-install the protective cover on the power terminal strip.
7. Route the logic ground wire to the frame grounding point on the rack.

Note: Do not use the **RTN** (–48 return) terminals on the terminal block as a grounding point for the logic ground wire. Connecting the logic ground terminals to the –48 return terminals may cause high error rates which could result in erratic operation.

8. Cut the logic ground wire to length and connect it to the frame grounding point on the rack as required by local practice.

5 CONNECT LOCAL ALARMS

This procedure provides instructions for connecting the HDT to a local alarm system. Normally open (dry) contacts are provided for Critical (visual and audible), Major (visual and audible), Minor (visual and audible), and New alarms. One set of connections is provided for alarms generated by a failure within one of the HDT plug-in units. Another set of connections is provided for alarms generated by a fan assembly failure. If a local alarm system is not in use, skip this procedure and proceed to the next section.

5.1 Shelf Alarm Connections

Use the following procedure to connect the wiring for alarms generated by a plug-in unit failure:

1. Obtain several lengths of #26 AWG (0.40 mm) insulated solid copper wire for the shelf alarm connections. Six wires are required for the visual alarm connections (critical/common, major/common, minor/common), six wires are required for the audible alarm connections, and one wire is required for the new alarm connection.
2. Locate the upper wire-wrap pin block at the rear of the HDT chassis as shown in Figure 4-6.

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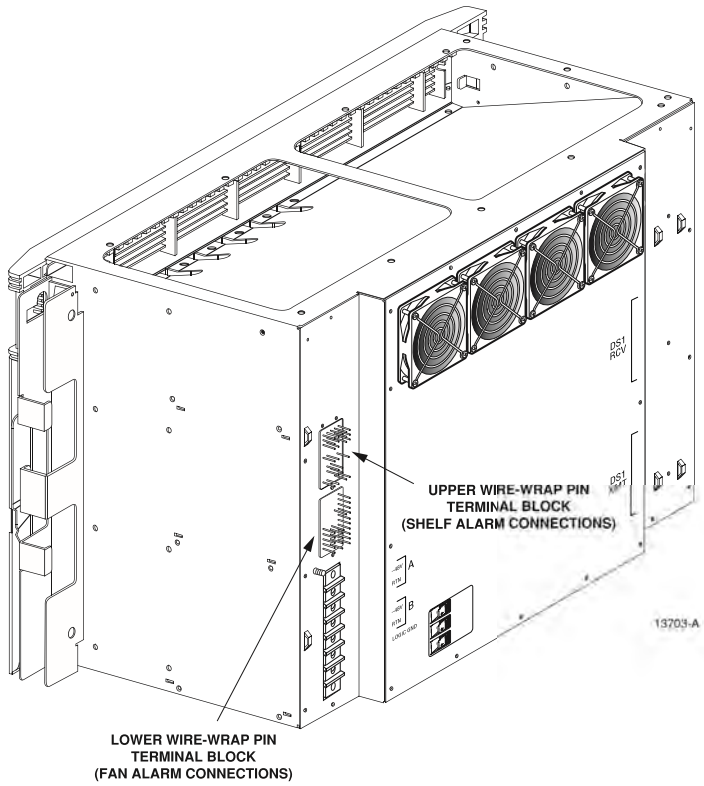


Figure 4-6. Upper and Lower Wire-Wrap Pin Blocks Location

3. Connect the CRITICAL alarm wire pairs (visual/common and audible/common) to the appropriate pins on the upper wire wrap pin block as shown in Figure 4-7.

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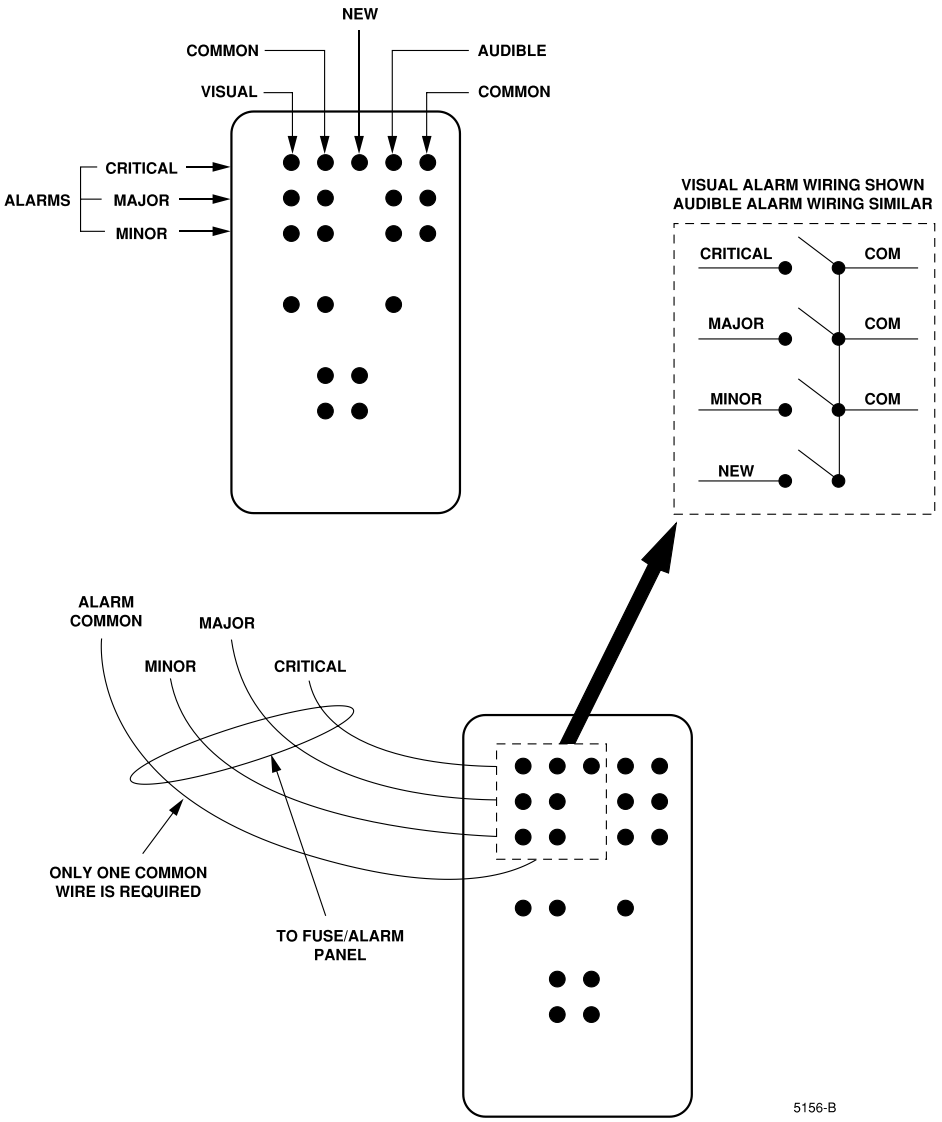


Figure 4-7. Shelf Alarm Connections (Upper Wire-Wrap Pin Block)

4. Connect the MAJOR alarm wire pairs (visual/common and audible/common) to the appropriate pins on the upper wire wrap pin block (see Figure 4-7).
5. Connect the MINOR alarm wire pairs (visual/common and audible/common) to the appropriate pins on the upper wire wrap pin block (see Figure 4-7).
6. If applicable, connect the NEW alarm wire to the NEW pin on the upper wire wrap pin block (see Figure 4-7).

Note: The NEW alarm feature can only be used with alarm systems that incorporate the NEW alarm feature. A separate common wire is not required since the return path is provided by the common connection used for all alarms.

7. Route the alarm wires to the local alarm system as required by local practice.
8. Connect all alarm wires to the appropriate terminals on the local alarm system.

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5.2 Fan Alarm Connections

Use the following procedure to connect the wiring for alarms generated by a fan failure:

1. Obtain two lengths of #26 AWG (0.40 mm) insulated solid copper wire for the fan alarm connections.
2. Locate the lower wire-wrap pin block at the rear of the HDT chassis (see Figure 4-6).
3. Connect the fan alarm wire pair to the appropriate pins on the lower wire wrap pin block as shown in Figure 4-8. A white and blue wire will already be connected to the specified pins.

Note: The fan alarm wires connect to pins (CTS and RTS) that are marked for use with an X.25 interface.

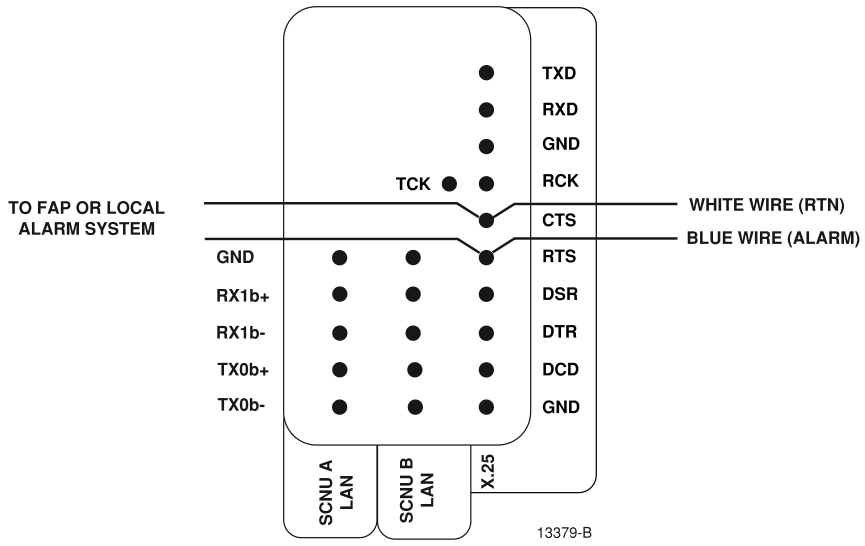


Figure 4-8. Fan Alarm Connections (Lower Wire-Wrap Pin Block)

4. Route the fan alarm wires to the local alarm system as required by local practice.
5. Connect all alarm wires to the appropriate pins on local alarm system.

6 CONNECT EXTERNAL TIMING

This procedure provides instructions for connecting the HDT to a primary and secondary Building Integrated Timing Supply (BITS) clock. The BITS clock may be either SF or ESF format. If external timing is not in use, skip this procedure and proceed to the next section.

Note: The HDT does support use of a Composite Clock (CC) for a BITS clock. The clock must be a DS1 format.

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Use the following procedure to connect the wiring for external timing:

1. Obtain a length of #26 AWG (0.40 mm) two-pair shielded solid copper wire cable for the external timing connections.
2. Locate the upper wire-wrap pin block at the rear of the HDT chassis as shown in Figure 4-9.

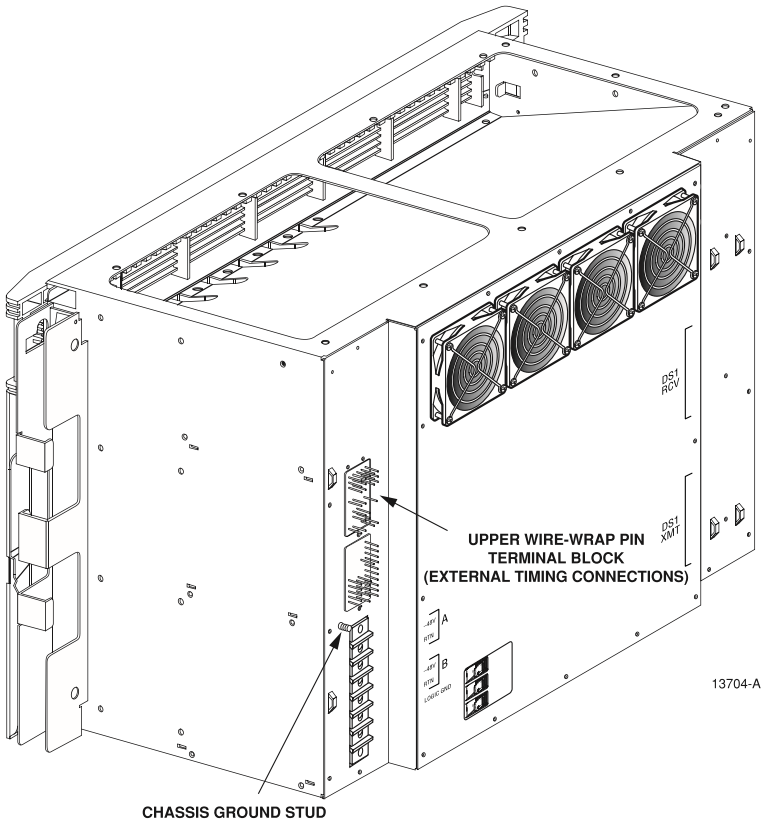


Figure 4-9. Upper Wire-Wrap Pin Block Location

3. Connect the timing cable wire pairs to the appropriate pins on the upper wire-wrap pin block as shown in Figure 4-10.
4. Connect the cable shield drain wire to the chassis ground stud (see Figure 4-9) adjacent to the power terminal strip.

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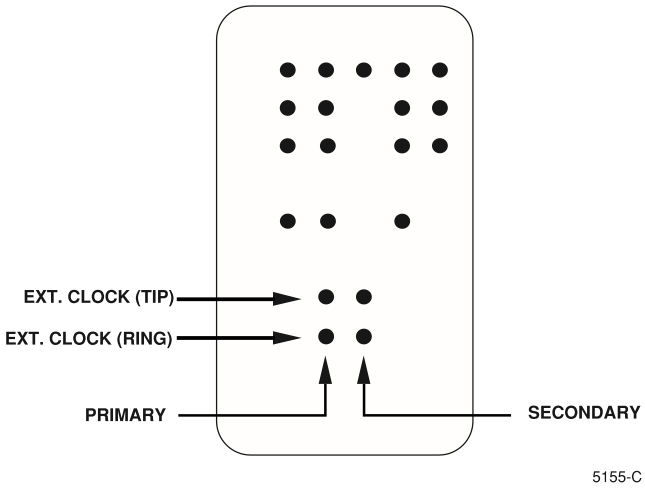


Figure 4-10. External Timing Connections (Upper Wire-Wrap Pin Block)

5. Route the external timing source cable to the BITS clock source as required by local practice.
6. Connect the external timing wires to the primary and secondary BITS clock source as described in the appropriate equipment installation manual.

7 CONNECT COMMUNICATIONS LAN

This procedure provides instructions for connecting the HDT to a 10BaseT Ethernet LAN for communications with the element manager systems and for networking with other equipment. Two separate sets of LAN connections are provided on the HDT, one for SCNU A and the other for SCNU B. Operation over a span of 0 to 328 feet (0 to 100 meters) at data rates of up to 10 Mbps is possible. The HDT LAN interface supports IEEE 802.3 network configurations using the CSMA/CD access method as defined in ISO/IEC 8802-3:1992 with baseband signaling. Use the following procedure to connect the wiring for the communications LAN:

1. Obtain a length of 4-wire unshielded twisted-pair copper cable for the communications LAN connections.
2. Locate the lower wire-wrap pin block at the rear of the HDT chassis as shown in Figure 4-11.
3. Connect the LAN cable wire pairs to the appropriate pins on the lower wire-wrap pin block as shown in Figure 4-12.

Note: One set of Ethernet wire wrap pins is provided for SCNU A and another set of wire wrap pins is provided for SCNU B.

4. Route the LAN cable to the LAN equipment as required by local practice.
5. Connect the LAN cable to the LAN equipment as described in the appropriate equipment installation manual.

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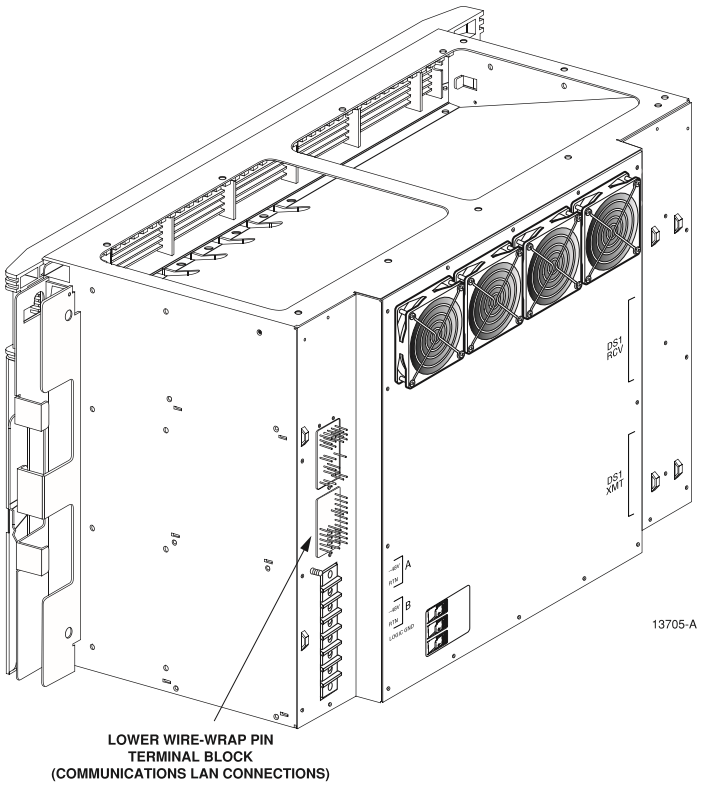


Figure 4-11. Lower Wire-Wrap Pin Block Location

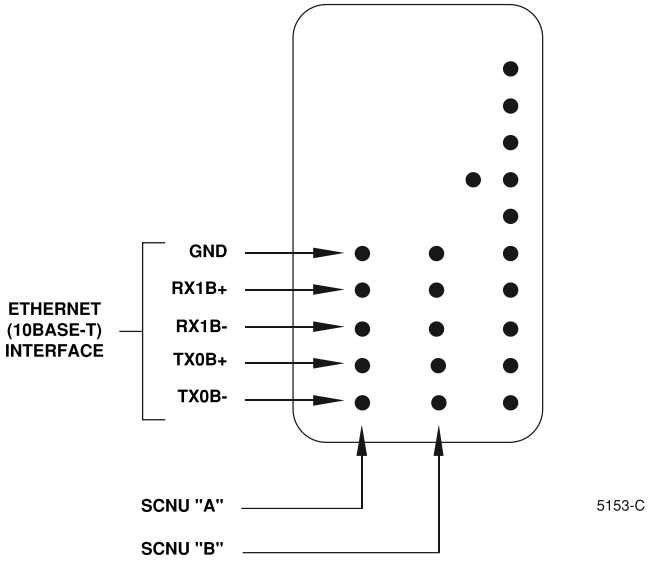


Figure 4-12. LAN Connections (Lower Wire-Wrap Pin Block)

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8 CONNECT DS1 LINES

This procedure provides instructions for connecting the DS1 transmit and receive cables to the HDT mounting shelf. Two 64-pin AMP CHAMP **male** connectors are mounted on the rear side of the HDT for connecting the DS1 cables. The stub ends (non-connectorized) of the DS1 cables are routed to a cross-connect panel for termination. The HDT provides a standard DSX-1 interface and can terminate up to 28 DS1 lines. Use the following procedure to connect the DS1 transmit and receive cables:

1. Obtain the required DS1 transmit and receive cables. Refer to Table 4-1 for the catalog number and corresponding length of the DS1 cables available from ADC.

Note: Use only shielded twisted-pair cable for the DS1 transmit and receive cables.

2. Locate the DS1 RCV and XMT connectors at the rear of the HDT chassis as shown in Figure 4-13.
3. Connect the DS1 **receive** (input) cable to the **DS1 RCV** connector (see Figure 4-13).
4. Using the screw provided, secure the bottom of the RCV cable connector to the chassis connector.
5. Secure the top of the RCV connector to the chassis with a tie wrap.
6. Connect the DS1 **transmit** (output) cable to the **DS1 XMT** connector (see Figure 4-13).
7. Using the screw provided, secure the bottom of the XMT cable connector to the chassis connector.
8. Secure the top of the XMT connector to the chassis with a tie wrap.
9. If each connector has a separate drain wire, attach the drain wire to the nearest DS1 drain wire ground stud (see Figure 4-13). Note: If the cable is provided by ADC, the shield drain wire is connected to ground through the connector.
10. Route the DS1 cables to the DSX cross-connect panel per local office practice.

Note: The cable distance to the DSX cross-connect panel should not exceed 655 feet (200 m).

11. Terminate the stub end of the DS1 transmit and receive cables at the DSX panel per local office practice. Refer to Table 4-2 for the wire color code and connector pin designations.
12. Install cross-connect wires between the HDT DS1 line terminations and the Local Digital Switch (LDS) DS1 line terminations per local office practice.

Table 4-1. DS1 Cable Lengths

CATALOG #	LENGTH
HDT-IO-CBL25	25 Ft. (7.62 m)
HDT-IO-CBL50	50 Ft. (15.24 m)
HDT-IO-CBL100	100 Ft. (30.49 m)
HDT-IO-CBL200	200 Ft. (61 m)
HDT-IO-CBL400	400 Ft. (122 m)

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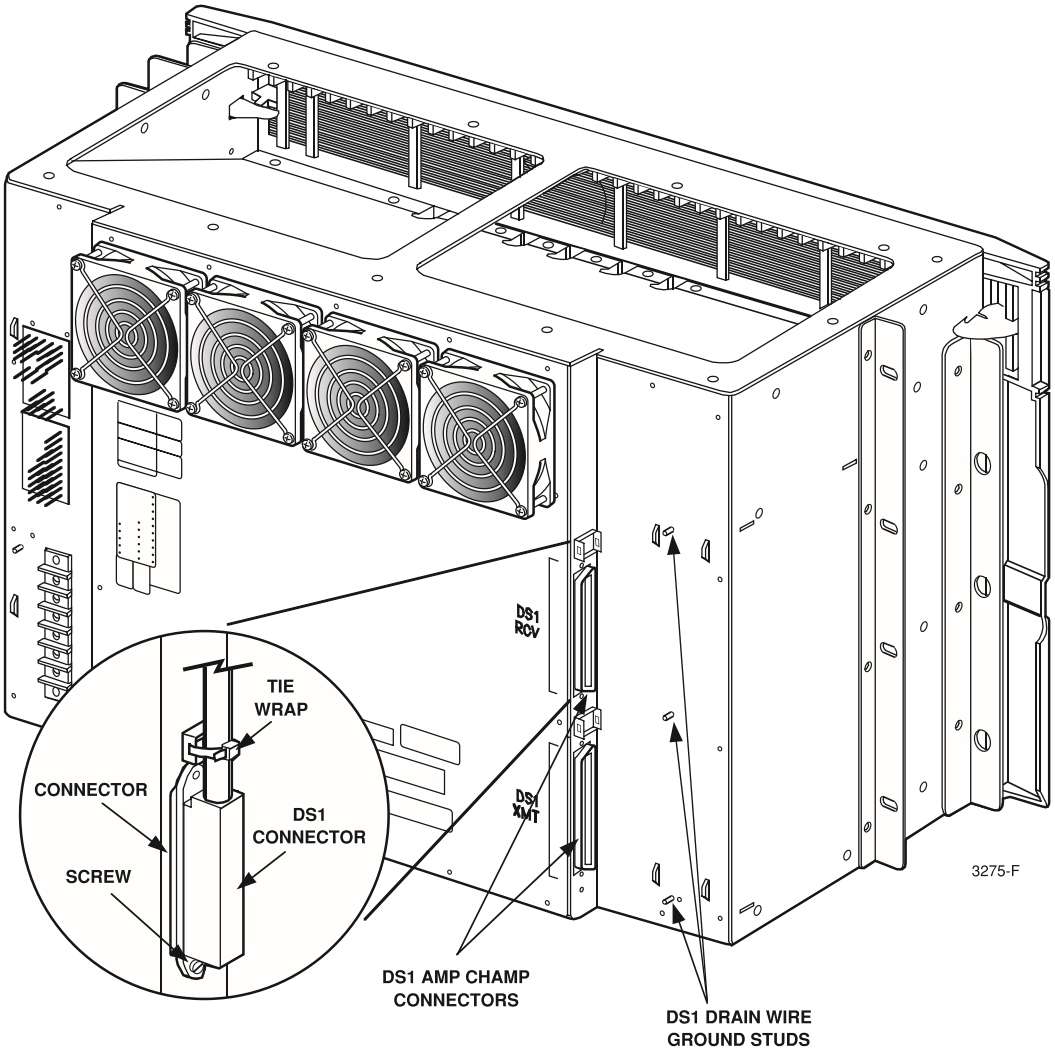


Figure 4-13. DS1 Transmit and Receive Connectors Location

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Table 4-2. DS1 Receive/Transmit Connector Pin Designations

PAIR	SIGNAL	WIRE COLOR	RING TIP	PAIR	SIGNAL	WIRE COLOR	RING TIP
1	DS1U1A	Blue/White White/Blue	1 33	16	DS1U4D	Blue/Yellow Yellow/Blue	16 48
2	DS1U1B	Orange/White White/Orange	2 34	17	DS1U5A	Orange/Yellow Yellow/Orange	17 49
3	DS1U1C	Green/White White/Green	3 35	18	DS1U5B	Green/Yellow Yellow/Green	18 50
4	DS1U1D	Brown/White White/Brown	4 36	19	DS1U5C	Brown/Yellow Yellow/Brown	19 51
5	DS1U2A	Slate/White White/Slate	5 37	20	DS1U5D	Slate/Yellow Yellow/Slate	20 52
6	DS1U2B	Blue/Red Red/Blue	6 38	21	DS1U6A	Blue/Violet Violet/Blue	21 53
7	DS1U2C	Orange/Red Red/Orange	7 39	22	DS1U6B	Orange/Violet Violet/Orange	22 54
8	DS1U2D	Green/Red Red/Green	8 40	23	DS1U6C	Green/Violet Violet/Green	23 55
9	DS1U3A	Brown/Red Red/Brown	9 41	24	DS1U6D	Brown/Violet Violet/Brown	24 56
10	DS1U3B	Slate/Red Red/Slate	10 42	25	DS1U7A	Slate/Violet Violet/Slate	25 57
11	DS1U3C	Blue/Black Black/Blue	11 43	26*	DS1U7B	Blue/White White/Blue	26 58
12	DS1U3D	Orange/Black Black/Orange	12 44	27*	DS1U7C	Orange/White White/Orange	27 59
13	DS1U4A	Green/Black Black/Green	13 45	28*	DS1U7D	Green/White White/Green	28 60
14	DS1U4B	Brown/Black Black/Brown	14 46		Chassis Ground	Drain Wire	64
15	DS1U4C	Slate/Black Black/Slate	15 47				

* Pairs are inner core with orange spiral thread binder. All other pairs are outer conductors. Pins 61, 62, and 63 are not used.

9 INSTALL COAXIAL FEEDER CABLES

This procedure provides instructions for installing the transmit and receive 735A coaxial feeder cables in the HDT mounting shelf. The coaxial feeder cables connect the transmit/receive connectors on each CXMU to a splitter/combiner panel mounted near the rear side of the HDT. Installation of the feeder cables requires partial installation of a CXMU plug-in unit to establish the proper length and routing of each cable. The cables are not connected to the CXMUs until the CXMUs are installed in the HDT mounting shelf.

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⚠ **Caution:** *Plug-in units can be damaged by static electrical discharge. Before handling plug-in units, Electrostatic Discharge (ESD) protection must always be used. Store all plug-in units that are not installed in the mounting shelf in anti-static packing material. Always place plug-in units on an approved, electrically grounded anti-static mat.*

Use the following procedure to install the coaxial feeder cables:

1. Obtain the required transmit and receive 735A coaxial feeder cables.

Note: Pre-terminated cables in lengths of 1, 2, and 3 meters are available from ADC. One end of the cable is terminated with an SMB connector and the other end is terminated with either an F-type or BNC connector. Two cables are required for each CXMU and up to six CXMUs may be installed in the HDT mounting shelf.

2. Slip on an ESD wrist strap and connect the ground wire to the ESD jack in the upper left corner of the HDT mounting shelf.
3. Partially insert each CXMU into the HDT mounting shelf as shown in Figure 4-14.

Note: Partial insertion of the CXMUs is necessary in order to determine the proper length and routing of the 735A feeder cables.

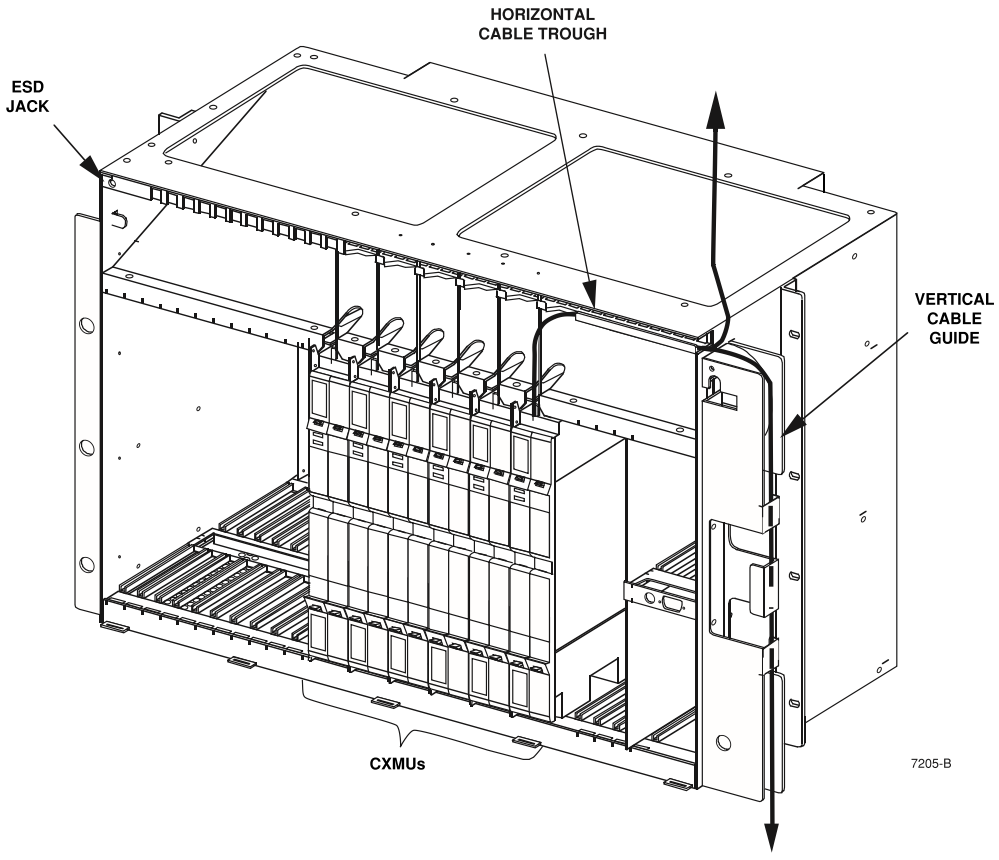


Figure 4-14. CXMU and Coaxial 735A Feeder Cable Installation

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4. Route the individual 735A feeder cables into the trough at the top of the HDT mounting shelf and then over the respective radius limiter. The end of the cable with the SMB connector connects to the TX or RX coaxial cable connector on the corresponding CXMU as shown in Figure 4-15.

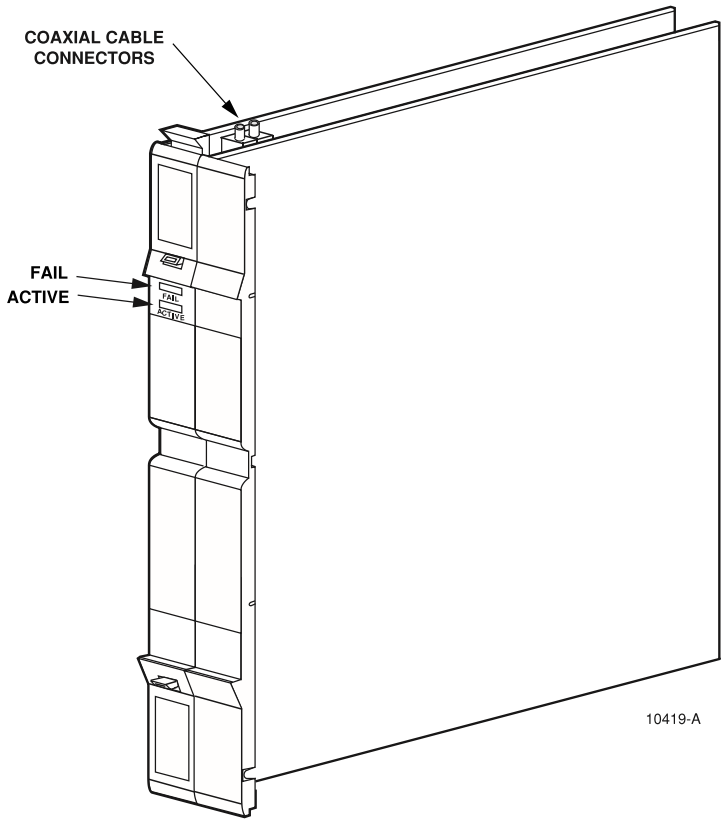


Figure 4-15. CXMU Coaxial Cable Connectors

5. Tag each coaxial feeder cable with its circuit identification.
6. Arrange 735A feeder cables neatly in the trough and vertical cable guide, removing any excess slack.
7. Secure the 735A feeder cables to the side of the rack per local office practice and then route to the splitter/combiner panel.

Note: The splitter/combiner panel provides an interface for connecting the CXMUs to the optical transmitters/receivers.

8. Connect the feeder cables to the splitter/combiner panel as described in the appropriate equipment installation manual.
9. Remove the CXMUs from the HDT and return them to their protective packing material.

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10 CONNECT POWER SOURCES

This procedure provides instructions for connecting the -48 VDC office battery power supply wiring to the HDT mounting shelf. Two office battery sources (A and B) provide redundant power for the mounting shelf. Always follow local wiring practices when installing power wiring.

⚠ **Warning:** *Before making any connections to the mounting shelf, verify that the power is off (fuses removed at the fuse and alarm bay) and all plug-in units are removed. Plug-in units should not be installed nor fuses inserted until after the mounting shelf wiring is completed.*

1. Obtain two pairs of #18 AWG (1.00 mm) red and black insulated **solid** copper wire for use as the power source wires.
2. Terminate one end of each wire with a fork terminal.
3. Locate the power terminal strip at the rear of the HDT chassis as shown in Figure 4-16.

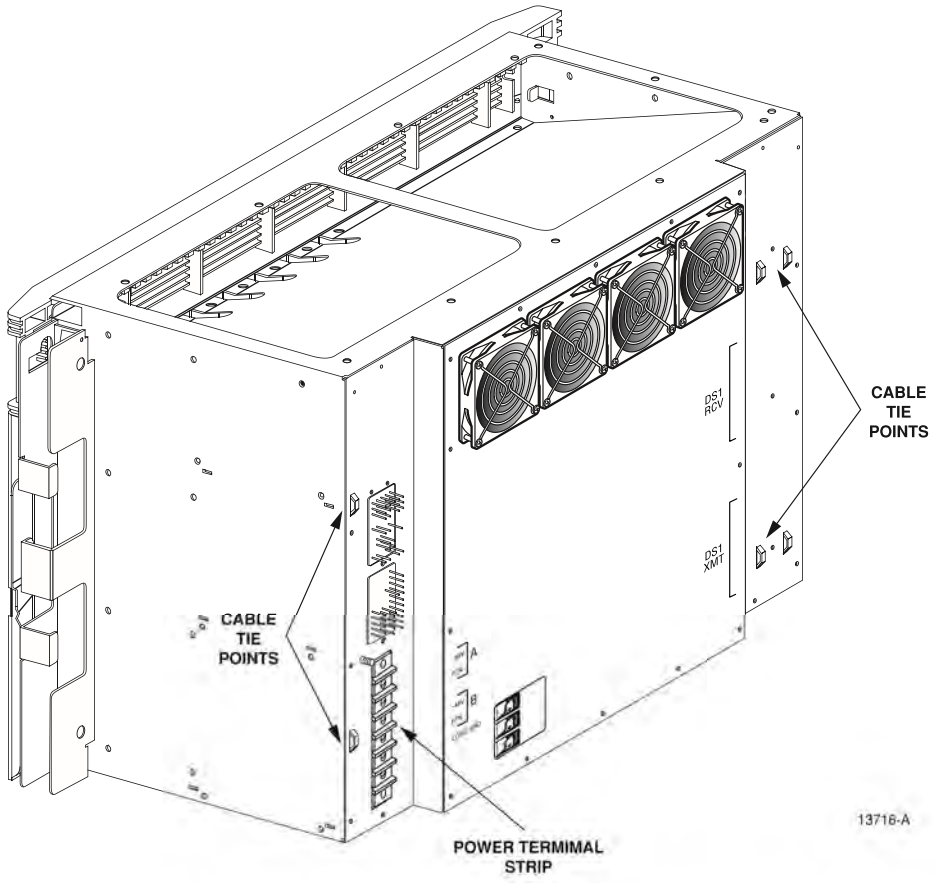


Figure 4-16. Power Terminal Strip and Cable Tie Down Location

4. Remove the protective cover from the power terminal strip.
5. Connect one pair of **red and black** power wires to the **–48V A** and **RTN A** terminals on the HDT power terminal strip as shown in Figure 4-17 and as specified in Table 4-3.

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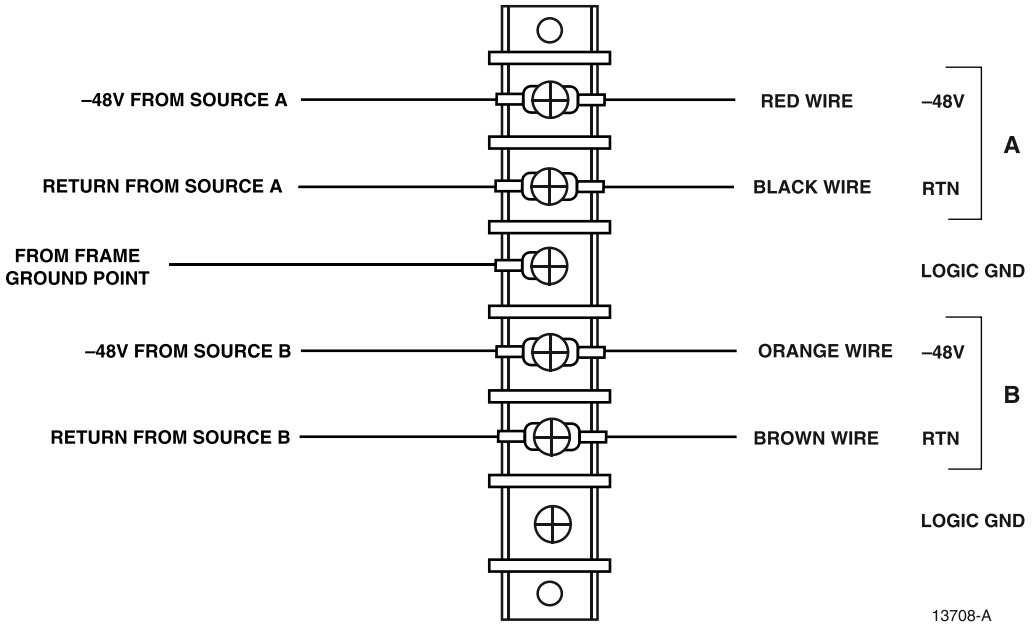


Figure 4-17. Power Terminal Strip

Table 4-3. Power Terminal Strip Connections

SOURCE	CONNECT TO
–48 Vdc office battery "A"	–48 V on "A" terminal block
–48 Vdc office battery "B"	–48 V on "B" terminal block
Office battery return "A"	RTN on "A" terminal block
Office battery return "B"	RTN on "B" terminal block
Office frame ground	LOGIC GND on "A" terminal block
Office frame ground	LOGIC GND on "B" terminal block

6. Route the source A power wires to the fuse panel per local office practice.
7. Verify that fuses **are not** installed in the fuse panel.
8. Connect the power wires to the appropriate **Source A** power terminals as specified in the documentation provided with the fuse panel.
9. Connect remaining pair of **red and black** power wires to the **–48V B** and **RTN B** terminals on the HDT power terminal strip (see Figure 4-17 and Table 4-3).
10. Route the source B power wires to the fuse panel per local office practice.
11. Verify that fuses **are not** installed in the fuse panel.
12. Connect the power wires to the appropriate **Source B** power terminals as specified in the documentation provided with the fuse panel.

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13. Insert **7.5 Amp** fuses for the A and B power sources at the fuse panel.
14. Did the fuses blow?

    If **NO**, proceed to step 15.

    If **YES**, check the wiring for correct polarity and shorts to ground. Refer to Section 6 Installation Troubleshooting for the recommended troubleshooting procedures.
15. Using a voltmeter set to read at least 100 VDC, check the voltage level across the **–48 A** and **RTN** terminals and the **–48 B** and **RTN** terminals at the HDT power terminal strip.

⚠ **Warning**: *High voltage can cause severe personal injury or death. Be careful not to touch the power terminals or to cause a short between terminals when checking for power at the HDT power terminal strip.*

16. Are the voltage readings in step 15 between –42 and –56 VDC?

    If **YES**, proceed to step 17.

    If **NO**, check the wiring, battery voltage, and the integrity of all connections. Refer to Section 6 for the recommended troubleshooting procedures.
17. Remove the fuses for the A and B power sources at the fuse panel.
18. Replace the protective cover at the power terminal strip.
19. Use cable wraps to dress and secure all wiring at the rear side of the HDT. Cable tie downs are provided on both the left and right side of the HDT chassis (see Figure 4-16).

11 INSTALL HDT FRONT COVER

This procedure provides instructions for installing the HDT mounting shelf front cover. Use the following procedure to install the HDT front cover.

1. Open both the left side and right side front cover latches as shown in Figure 4-18.
2. Hold the cover vertically with the front facing outward and then tilt the top edge forward approximately 40°.
3. Position the tabs on the lower edge of the cover in the slots in the tab brackets at the lower edge of the HDT shelf (see Figure 4-18).
4. While pushing downward, slide the cover from side-to-side until the tabs on the bottom edge of the cover fully engage the slots in the tab brackets at the bottom edge of the HDT shelf.
5. Pivot the cover to its vertical position against the HDT shelf.
6. Hold the cover against the HDT shelf and then close both the left and right side latches.
7. Check both sides of the cover to verify that they are secure. If not, release the latches and repeat steps 4 – 6.

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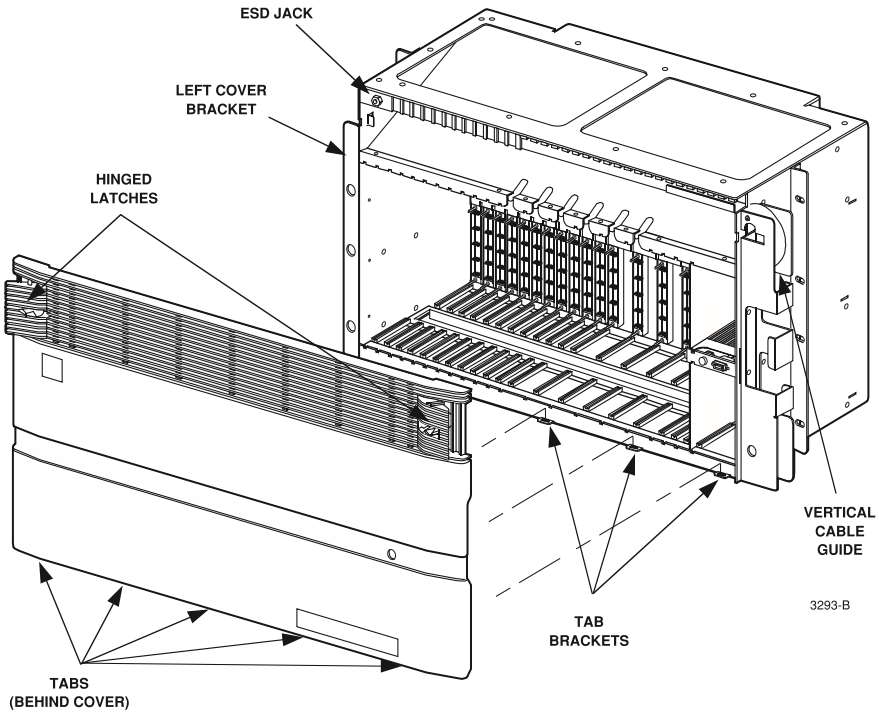


Figure. 4-18. HDT Front Cover Installation

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PLUG-IN UNIT
INITIAL INSTALLATION

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SECTION 5: PLUG-IN UNIT INITIAL INSTALLATION

Content	Page
1 GENERAL	5-1
1.1 Use an ESD Wrist Strap for all Installation Procedures	5-1
1.2 Tools Required	5-2
2 UNPACK PLUG-IN UNITS	5-2
3 REMOVE AND STORE HDT FRONT COVER	5-2
3.1 Remove Cover	5-2
3.2 Cover Storage	5-3
4 INSTALL PLUG-IN UNITS	5-5
4.1 Install Power Unit A (PWRU A)	5-5
4.2 Install Clock Time Slot Unit (CTSU)	5-6
4.3 Install Coax Master Unit (CXMU)	5-8
4.4 Install Digital Signal 1 Unit (DS1U) and/or Digital Network Interface Unit (DNIU)	5-10
4.5 Install Protection Switch and Test Unit (PSTU)	5-12
4.6 Install Power Unit B (PWRU B)	5-13
4.7 Install Shelf Control Unit (SCNU)	5-15
5 INSTALL HDT FRONT COVER	5-17

1 GENERAL

This section provides procedures for the **initial** installation of the electronic plug-in units (circuit packs) into the HDT mounting shelf. If the HDT is active and providing service, follow the Installation Instructions provided separately with each plug-in unit when replacing or installing a plug-in unit. This procedure is for new equipment installations only.

System software download is required before the HDT can become operational and placed in service. Following completion of this procedure, the HDT will be ready for system software download. Refer to the TR-303 System Turn-Up and Test Manual (ADCP-61-665) for the system software download procedures.

1.1 Use an ESD Wrist Strap for all Installation Procedures

Before handling any HDT components, slip on an Electro-Static Discharge (ESD) wrist strap and connect the ground wire to the ESD jack on the front side of the HDT. Wear the ESD wrist strap while completing each section of the plug-in unit installation procedure.

⚠ **Warning**: *Electronic components can be damaged by static electrical discharge. To prevent ESD damage, always wear an ESD wrist strap when working on the HDT or when handling electronic components.*

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1.2 Tools Required

The following tools are required to complete the procedures in this section:

- ESD wrist strap
- Box cutter
- SMB coax connector tool (catalog # HDT-ACC-CRT)

2 UNPACK PLUG-IN UNITS

This procedure provides instructions for opening the shipping boxes, verifying that all parts have been received, and verifying that no shipping damage has occurred. Use the following procedure to unpack the plug-in units:

1. Open the shipping carton and carefully unpack each plug-in unit from the protective packing material but **do not remove unit from ESD packaging**.
2. Check each component for broken or missing parts. If there are any damages, fill out a red HDT Equipment Repair Tag and attach to the part. Then contact ADC Telecommunications (see General Information Section at the end of this manual) for an RMA (Return Material Authorization) and to reorder any components that require replacement.
3. After inspection, return each plug-in unit to its protective packing material to prevent any damage from occurring prior to installation.

3 REMOVE AND STORE HDT FRONT COVER

3.1 Remove Cover

Use the following procedure to remove the HDT front cover:

1. Release the latch on the **right** side of the HDT cover, shown in Figure 5-1, by pulling outward on the edge of the latch. The latch is hinged at the left and swings outward.

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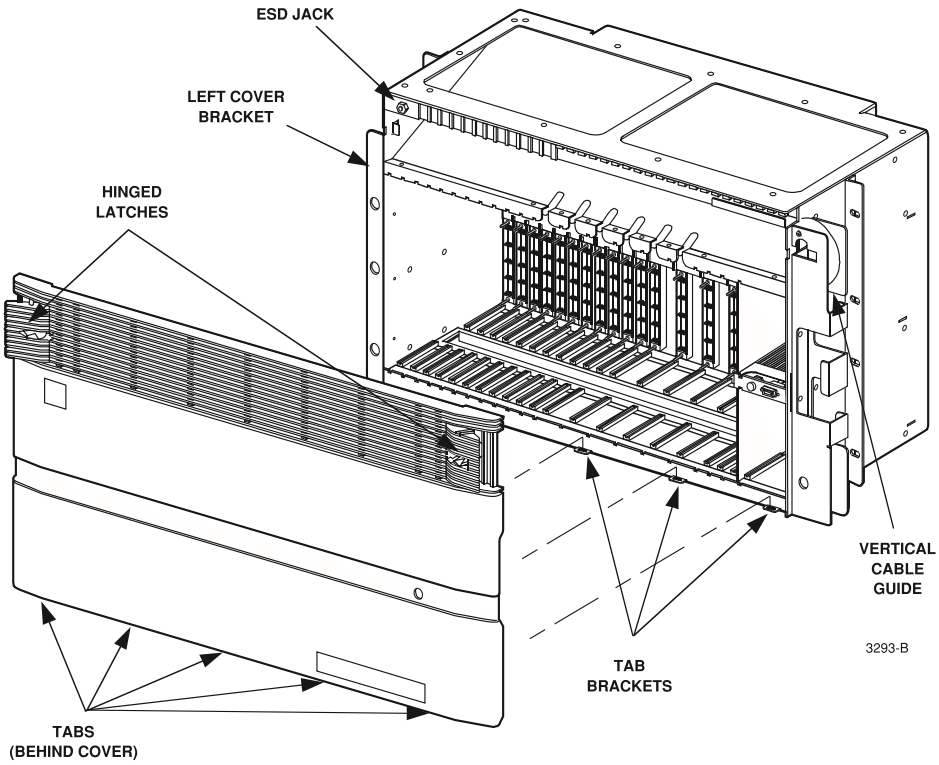


Figure 5-1. HDT Front Cover Removal

2. With the right hand, hold the HDT cover against the HDT shelf.
3. With the left hand, release the **left** side latch by pulling outward on the edge of the latch.
4. Pivot the top edge of the cover forward approximately 40° and then lift it free of the HDT mounting shelf.
5. Place the cover where it will be protected from damage. If the facility/site includes more than one HDT, the cover can be installed temporarily over the front cover of another HDT. Refer to the next section for the HDT front cover storage procedures.

3.2 Cover Storage

Use the following procedure to store the HDT front cover:

1. Place the front cover face up on a flat surface such as a table-top.
2. Release both the left and right side latches, shown in Figure 5-2, by pulling outward on the outer edge of the latch while at the same time pushing inward with the thumb on the inner hinge end of the latch.

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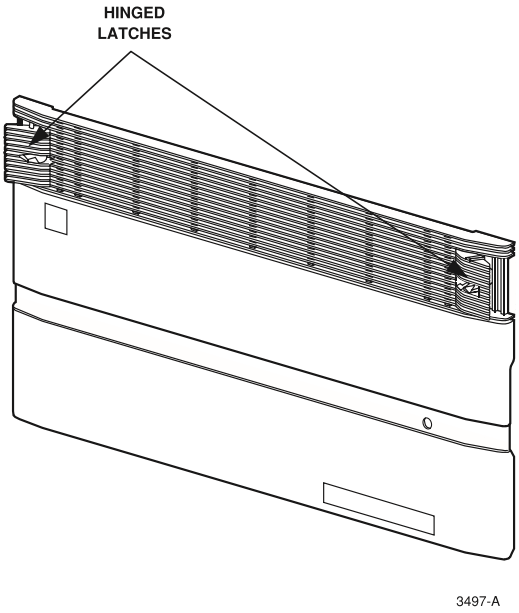


Figure 5-2. HDT Front Cover Latches

3. Position the cover directly over the cover of a nearby HDT mounting shelf as shown in Figure 5-3.
4. With the left hand, hold the cover against the HDT mounting shelf and then close the right side latch.
5. With the right hand, hold the cover against the HDT mounting shelf and then close the left side latch.
6. Check both sides of the cover to ensure they are secure. If not, release the latch(es) and repeat step 3, 4, and 5.

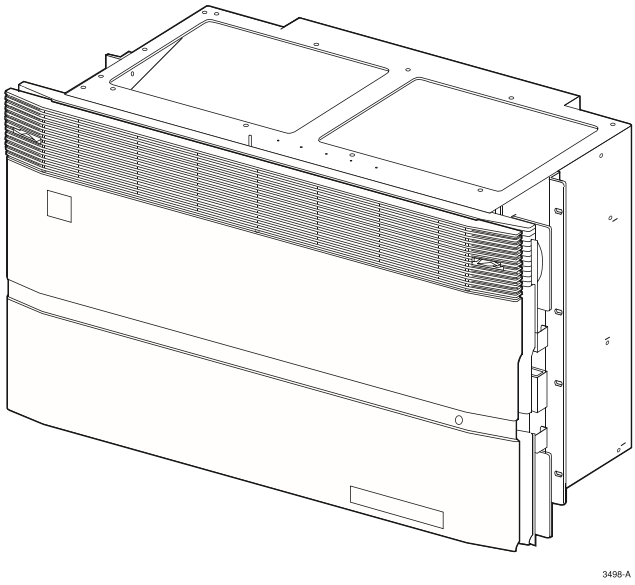


Figure 5-3. HDT Front Cover in Stored Position

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4 INSTALL PLUG-IN UNITS

This section provides procedures for installing the plug-in units in the HDT mounting shelf. Because of the load sharing characteristics of the power supplies, both PWRUs cannot be installed at the same time if a sufficient load is not present. The installation sequence is therefore designed to provide enough of a load so that load sharing will function normally when the second PWRU is installed.

Prior to installing the plug-in units, install 7.5 amp fuses at the fuse panel to connect –48 VDC power (both the A and B power supply sources) to the HDT mounting shelf..

4.1 Install Power Unit A (PWRU A)

The PWRU converts the –48 VDC power source to the voltages required by various plug-in units. Two PWRUs are installed for protected operation although one unit is sufficient for shelf operation. When two PWRUs are installed, both units share the load

Note:. Do not attempt to install the PWRU B unit at this time.

Use the following procedure to install the PWRU A unit:

1. Slip on an ESD wrist strap and connect the ground wire to the ESD jack in the upper left corner of the HDT mounting shelf.
2. Remove the PWRU from its protective packing material.
3. Release the lock tabs on the PWRU to free the upper and lower injector/ejectors as shown in Figure 5-4.

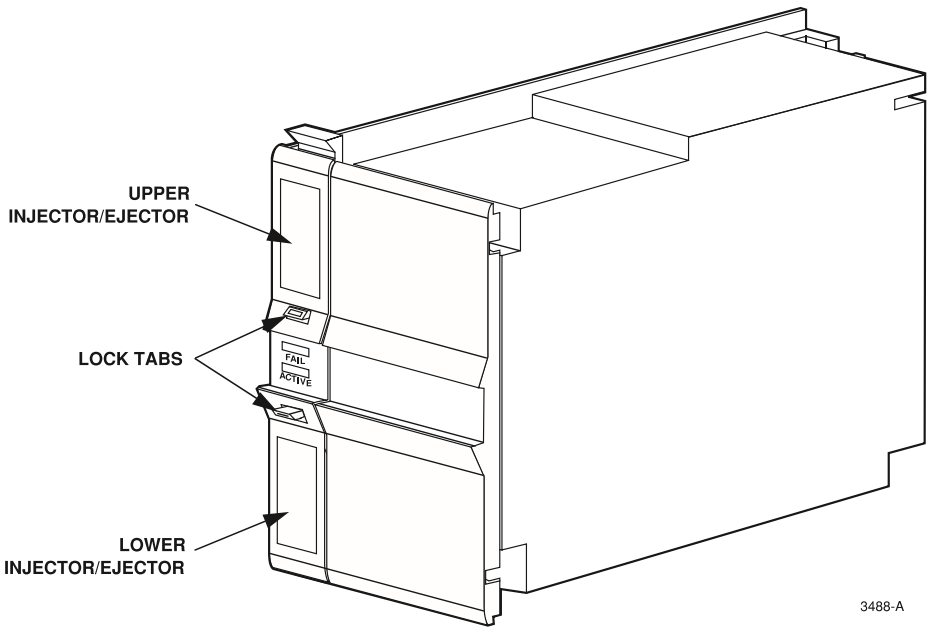


Figure 5-4. Power Unit (PWRU)

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4. Pivot the injectors/ejectors outward so they point away from the PWRU.
5. Insert the PWRU into the upper power supply (PWRU A) location in the HDT mounting shelf as shown in Figure 5-5.

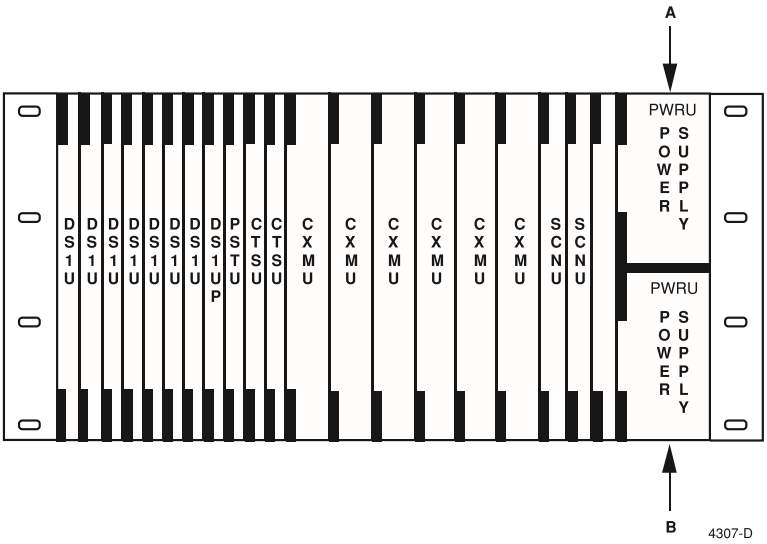


Figure 5-5. PWRU Mounting Slot Locations

6. Verify that the red **FAIL** LED flashes momentarily when the PWRU first engages the connector on the HDT mounting shelf backplane.
7. Continue inserting the PWRU into the shelf while pivoting the injectors/ejectors toward the face plate. Continue pressing the injectors/ejectors until they touch the face plate and are locked by the lock tabs.
8. After the tabs are locked, press firmly against the upper and lower injector/electors to insure that the connectors on the unit are fully seated with the connectors on the mounting shelf backplane.
9. Verify that after a few seconds, the green **ACTIVE** LED lights indicating that the PWRU is operating properly. Refer to Section 6 if the LED indicator does not respond as specified.

4.2 Install Clock Time Slot Unit (CTSU)

The CTSU provides the clocking functions required for normal system operation. A working unit and a standby unit (A and B) are required for protected operation although one unit is sufficient for shelf operation. Use the following procedure to install the CTSU A and B units:

1. Slip on an ESD wrist strap and connect the ground wire to the ESD jack in the upper left corner of the HDT mounting shelf.
2. Remove the CTSU from its protective packing material.
3. Release the lock tabs on the CTSU to free the upper and lower injector/ejectors as shown in Figure 5-6.

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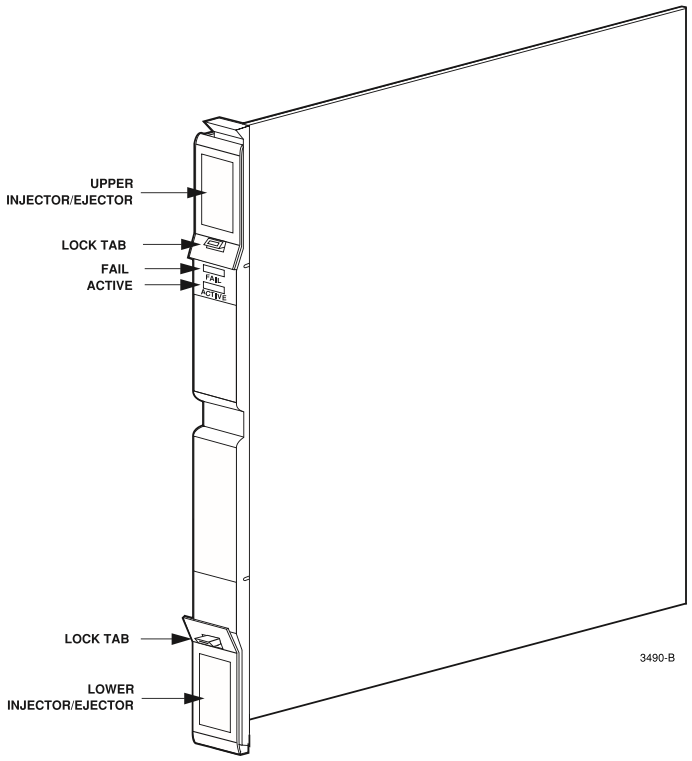


Figure 5-6. Clock/Time Slot Interchange Unit (CTSU)

4. Pivot the injector/ejectors outward so they point away from the CTSU.
5. Insert the CTSU into either slot A or B in the HDT mounting shelf as shown in Figure 5-7.

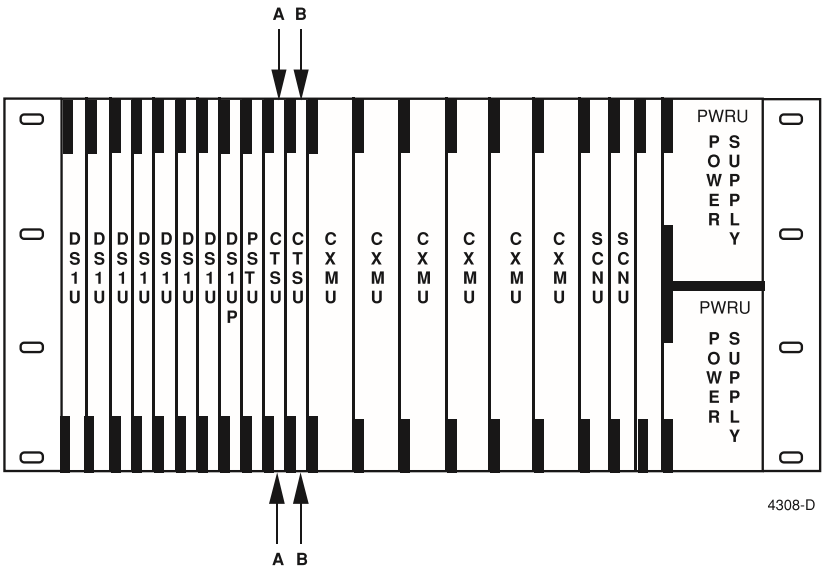


Figure 5-7. CTSU Mounting Slot Locations

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6. Verify that the red **FAIL** LED goes on when the CTSU first engages the connector on the HDT mounting shelf back plane.
7. Continue inserting the CTSU into the shelf while pivoting the injectors/ejectors toward the face plate. Continue pressing the injectors/ejectors until they touch the face plate and are locked by the lock tabs.
8. After the tabs are locked, press firmly against the upper and lower injector/electors to insure that the connectors on the unit are fully seated with the connectors on the mounting shelf backplane.
9. Verify that the red **FAIL** led remains on when the CTSU is fully inserted into the chassis. Refer to Section 6 if the LED indicator does not respond as specified.
10. Repeat steps 2 through 9 if a standby CTSU is being installed.

4.3 Install Coax Master Unit (CXMU)

The CXMU provides RF modem and transport management functions. A working unit and a standby unit (A and B) are required for protected operation although one unit is sufficient for shelf operation. The HDT has mounting slots for six CXMUs. Use the following procedure to install the CTSU A and B units:

1. Slip on an ESD wrist strap and connect the ground wire to the ESD jack in the upper left corner of the HDT mounting shelf.
2. Remove the CXMU from its protective packing material.
3. Release the lock tabs on the CXMU injector/ejectors as shown in Figure 5-8.

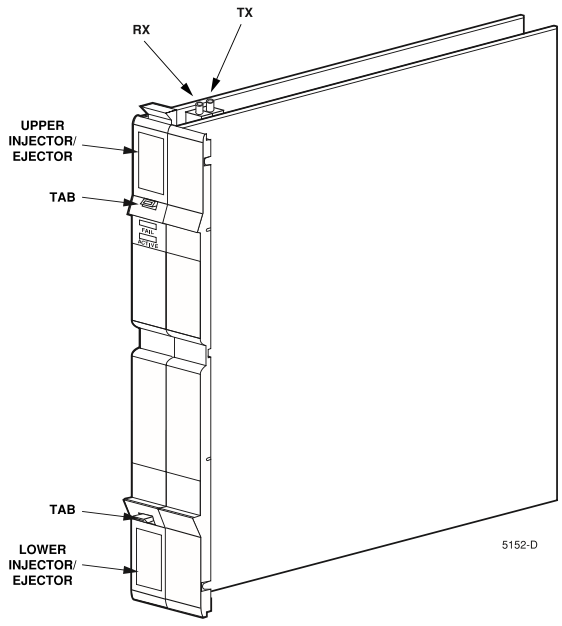


Figure 5-8. Coax Master Unit (CXMU)

4. Pivot the injector/ejectors outward so they point away from the CXMU.

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5. Insert the CXMU into the slot designated 1A in the HDT mounting shelf, as shown in Figure 5-9, until the two coaxial connectors at the top edge of the CXMU are about three inches (7.6 cm) from the front of the shelf. Do not attempt to seat the CXMU at this time.

Note: It is assumed that all three active CXMUs will be installed into mounting slots 1A, 2A, and 3A, respectively. If only one CXMU is being supported, use slot 1A for the active unit and slot 1B for the standby unit. Normally, the work order will specify the mounting slots. However, it is recommended that CXMUs be installed beginning with slot 1A. If installed without protection, either the A or B slot may be used for each of the three CXMU pairs.

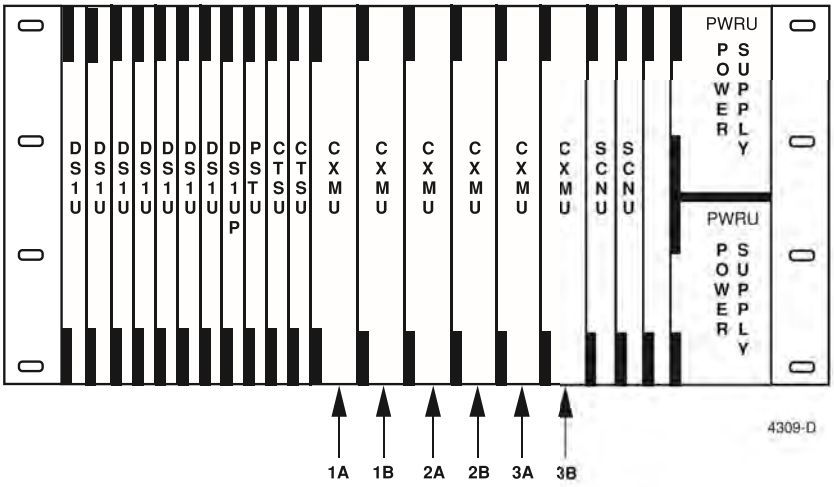


Figure 5-9. CXMU Mounting Slot Locations

6. Connect the upstream (receive) coaxial cable to the **RX** connector on the CXMU.
7. Connect the downstream (transmit) coaxial cable to the **TX** connector on the CXMU.

Note: If it is necessary to remove the coaxial cables from the CXMU during installation, use the special connector removal tool (HDT-ACC-CRT) shown in Figure 5-10.

8. Adjust the coaxial cables in the shelf to remove excess slack.

Caution: *Allow sufficient cable length to permit routing without severe bends. Cables may be permanently damaged if bent or curved to a radius of less than 1.5 inches (3.81 cm).*

9. Slide the CXMU slowly into the shelf while guiding and dressing the coaxial cables in the horizontal trough in the HDT mounting shelf. Provide sufficient slack to allow removal of the CXMU without placing stress on the coaxial cables.
10. Verify that the red **FAIL** LED flashes momentarily when the CXMU first engages the connector on the HDT mounting shelf back plane.

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To remove the SMB Coax Connectors:

1. Slip the tool under the SMB Coax Connector.
2. Pull upward carefully until the SMB Connector is removed from the CXMU.

Caution: *Damage may occur if the coax cables are removed without the use of the SMB removal tool.*

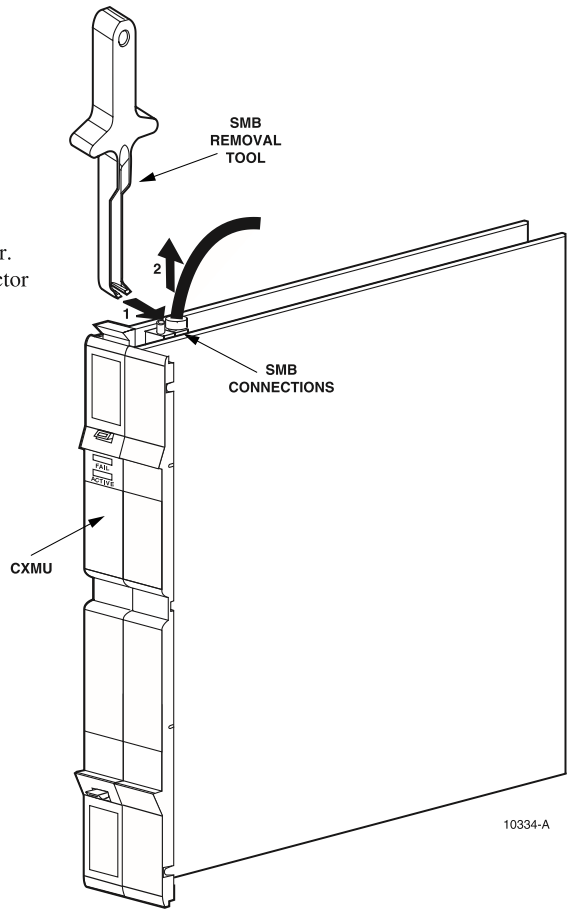


Figure 5-10. Removing Cables From the CXMU

11. Continue inserting the CXMU into the shelf while pivoting the injectors/ejectors toward the face plate. Continue pressing the injectors/ejectors until they touch the face plate and are locked by the lock tabs.
12. After the tabs are locked, press firmly against the upper and lower injector/electors to insure that the connectors on the unit are fully seated with the connectors on the mounting shelf backplane.
13. Verify that the red **FAIL** LED remains on when the CXMU is fully inserted into the chassis. Refer to Section 6 if the LED indicator does not respond as specified.
14. Repeat steps 2 –13 until all CXMUs are installed.

4.4 Install Digital Signal 1 Unit (DS1U) and/or Digital Network Interface Unit (DNIU)

The DS1Us or DNIUs provide termination functions for the DS1 lines. The DS1Us or DNIUs are installed in the HDT mounting shelf from left to right (DS1 slot 1 through DS1 slot 7). The # 8 DS1 slot (P) in the HDT mounting shelf accepts an eighth DS1U/DNIU which serves as a protection unit. If **any** DNIUs are installed in slots 1 through 7 and protection is required, a DNIU **must** be installed in the # 8 protection slot. However, if **only** DS1Us are installed in slots 1 through 7 and protection is required, a DS1U may be used as a protection unit.

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Use the following procedure to install the DS1Us/DNIUs:

1. Slip on an ESD wrist strap and connect the ground wire to the ESD jack in the upper left corner of the HDT mounting shelf.
2. Remove the DS1U/DNIU from its protective packing material.
3. Release the lock tabs on the DS1U/DNIU to free the upper and lower injector/ejectors as shown in Figure 5-11.

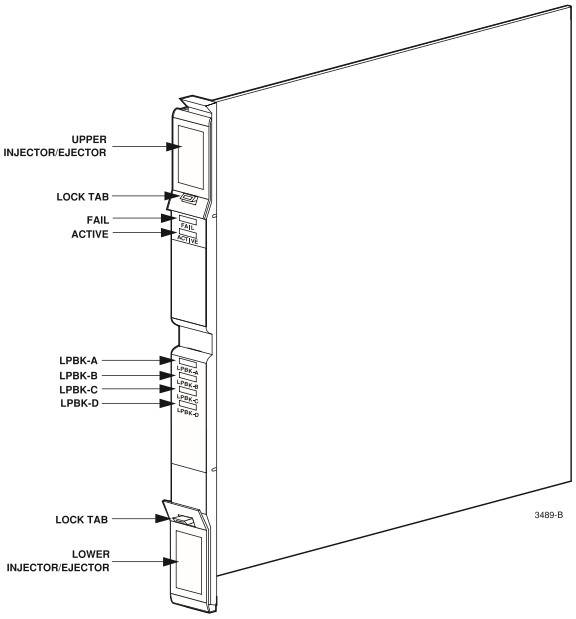


Figure 5-11. DS1U or DNIU unit

4. Pivot the injector/ejectors outward so they point away from the DS1U/DNIU.
5. Insert the DS1U/DNIU into the appropriate mounting slot in the HDT mounting shelf as shown in Figure 5-12.

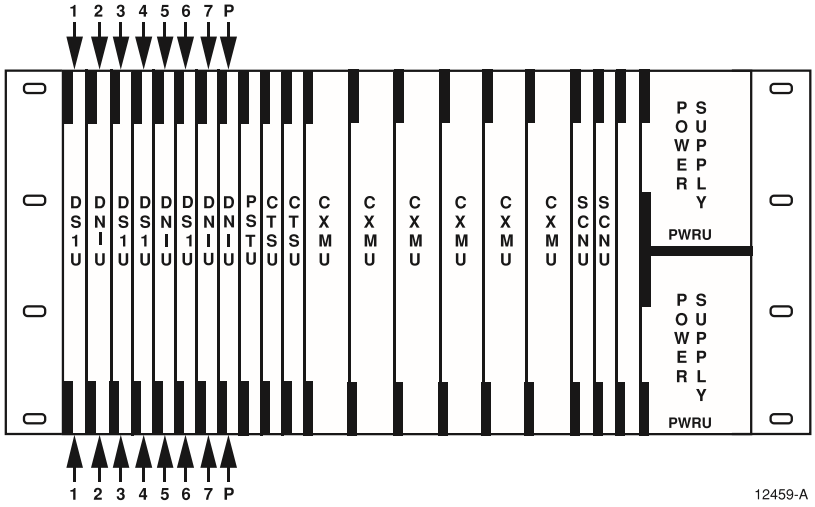


Figure 5-12. DS1U/DNIU Mounting Slot Locations

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6. Verify that the red **FAIL** LED goes on when the DS1U/DNIU first engages the connector on the HDT mounting shelf back plane.
7. Continue inserting the DS1U/DNIU into the shelf while pivoting the injectors/ejectors toward the face plate. Continue pressing the injectors/ejectors until they touch the face plate and are locked by the lock tabs.
8. After the tabs are locked, press firmly against the upper and lower injector/electors to insure that the connectors on the unit are fully seated with the connectors on the mounting shelf backplane.
9. Verify that all four **LPBK** LEDs and the red **FAIL** LED remain on when the DS1U/DNIU is fully inserted into the mounting shelf. Refer to Section 6 if the LEDs do not respond as specified.
10. Repeat steps 2 through 9 until all DS1U/DNIUs are installed.

4.5 Install Protection Switch and Test Unit (PSTU)

The PSTU supports the DS1U/DNIU protection switching functions. Use the following procedure to install the PSTU:

1. Slip on an ESD wrist strap and connect the ground wire to the ESD jack in the upper left corner of the HDT mounting shelf.
2. Remove the PSTU from its protective packing material.
3. Release the lock tabs on the PSTU to free the upper and lower injectors/ejectors as shown in Figure 5-13.

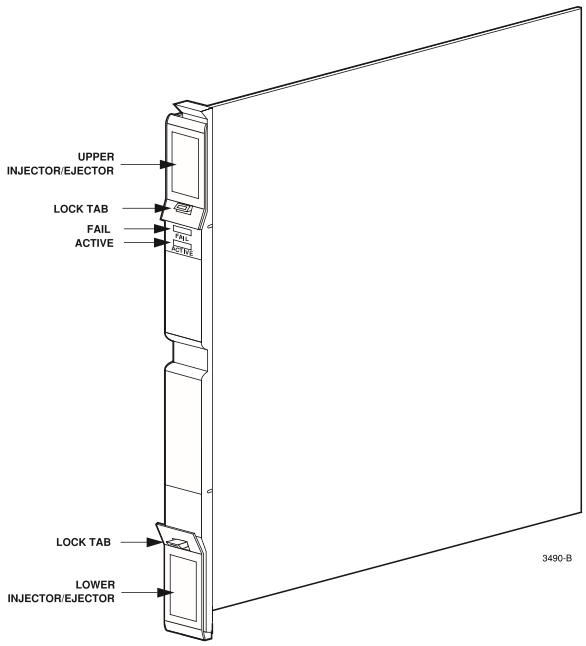


Figure 5-13. Protection Switch and Test Unit (PSTU)

4. Pivot the injector/ejectors outward so they point away from the PSTU .

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5. Insert the PSTU into the PSTU location in the HDT mounting shelf as shown in Figure 5-14.

6. Verify that the red **FAIL** LED stays **off** when the PSTU first engages the connector on the HDT mounting shelf back plane.

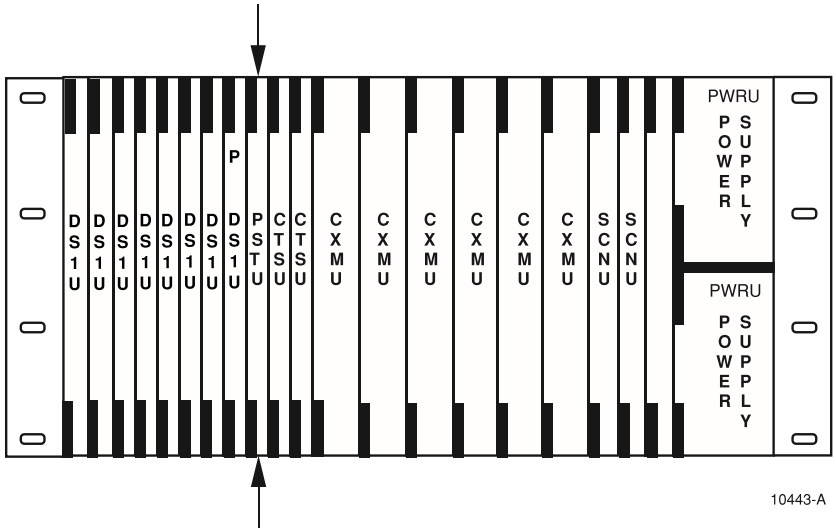


Figure 5-14. PSTU Position in HDT Mounting Shelf

7. Continue inserting the PSTU into the shelf while pivoting the injectors/ejectors toward the face plate. Continue pressing the injector/ejector until they touch the face plate and are locked by the lock tabs.

8. After the tabs are locked, press firmly against the upper and lower injector/electors to insure that the connectors on the unit are fully seated with the connectors on the mounting shelf backplane.

9. Verify that the red **FAIL** LED stays **off** when the PSTU is fully inserted into the mounting shelf. Refer to Section 6 if the LED does not respond as specified.

4.6 Install Power Unit B (PWRU B)

The PWRU converts the –48 VDC power source to the voltages required by various plug-in units. Two PWRUs are installed for protected operation although one unit is sufficient for shelf operation. When two PWRUs are installed, both units share the load.

Load sharing is initiated whenever two PWRUs are installed in the HDT mounting shelf. However, under low load conditions, the PWRUs may be unable to share the load properly. An insufficient load may cause the read **FAIL** LED on one of the PWRUs to be on. This indicates the load share function is not initiated and does not mean the PWRU has failed.

To initiate proper load sharing by the PWRUs, one each of the following units must be installed in the mounting shelf before a second PWRU (B unit) is installed: a DS1U/DNIU, CTSU, and CXMU. This will ensure that sufficient load is present to properly initiate the PWRU load sharing feature. Adding the specified plug-in units to a mounting shelf with an insufficient load will also turn off the **FAIL** LED and initiate load sharing.

Use the following procedure to install the PWRU B unit:

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1. Slip on an ESD wrist strap and connect the ground wire to the ESD jack in the upper left corner of the HDT mounting shelf.
2. Remove the PWRU from its protective packing material.
3. Release the lock tabs on the PWRU to free the upper and lower injectors/ejectors as shown in Figure 5-15.

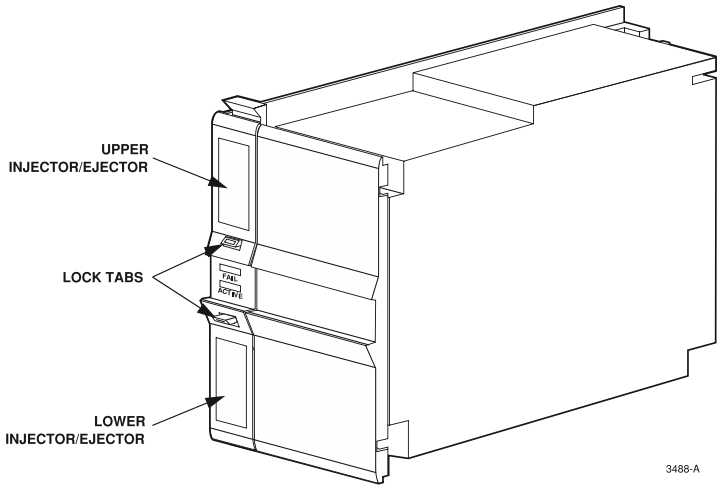


Figure 5-15. Power Unit (PWRU)

4. Pivot the injectors/ejectors outward so they point away from the PWRU.
5. Insert the PWRU into the lower power supply (PWRU B) location in the HDT mounting shelf as shown in Figure 5-16.

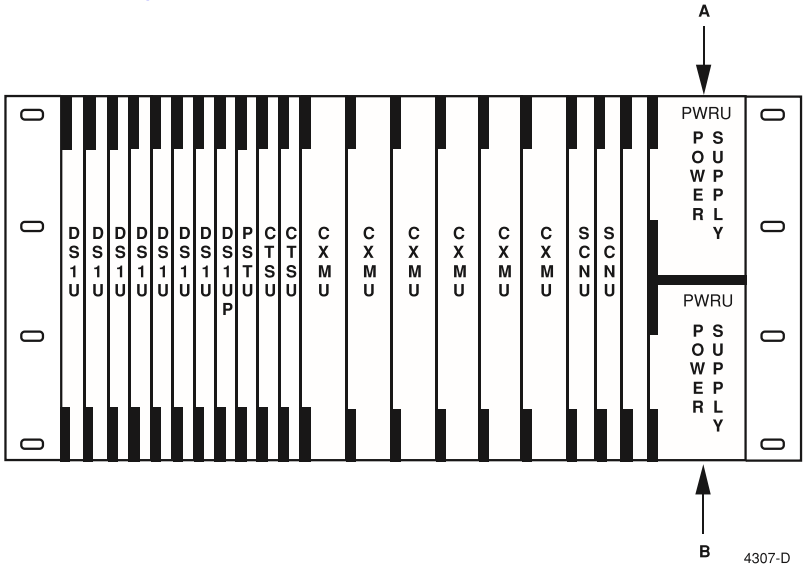


Figure 5-16. PWRU Mounting Slot Locations

6. Verify that the red **FAIL** LED goes on when the PWRU first engages the connector on the backplane in the HDT mounting shelf.

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7. Continue inserting the PWRU into the shelf while pivoting the injectors/ejectors toward the face plate. Continue pressing the injector/ejectors until they touch the face plate and are locked by the lock tabs.
8. After the tabs are locked, press firmly against the upper and lower injector/electors to insure that the connectors on the unit are fully seated with the connectors on the mounting shelf backplane.
9. Verify that the green **ACTIVE** LED on PWRU-B goes on and the red **FAIL** LED goes out as the unit begins to share the load with PWRU A. Refer to Section 6 if the LEDs do not respond as specified.

4.7 Install Shelf Control Unit (SCNU)

The SCNU provides control, communication, and monitoring functions for the HDT. A working unit and a standby unit (A and B) are required for protected operation although one unit is sufficient for shelf operation. The SCNU is not loaded with the full system software images when shipped from the factory. The system software images must be downloaded to the SCNU before the HDT can become operational. The system software and the software download procedures are provided separately with the system software release package. Use the following procedure to install the SCNU:

1. Slip on an ESD wrist strap and connect the ground wire to the ESD jack in the upper left corner of the HDT shelf.
2. Remove the SCNU from its protective packing material.
3. Release the lock tabs on the SCNU to free the upper and lower injectors/ejectors as shown in Figure 5-17.

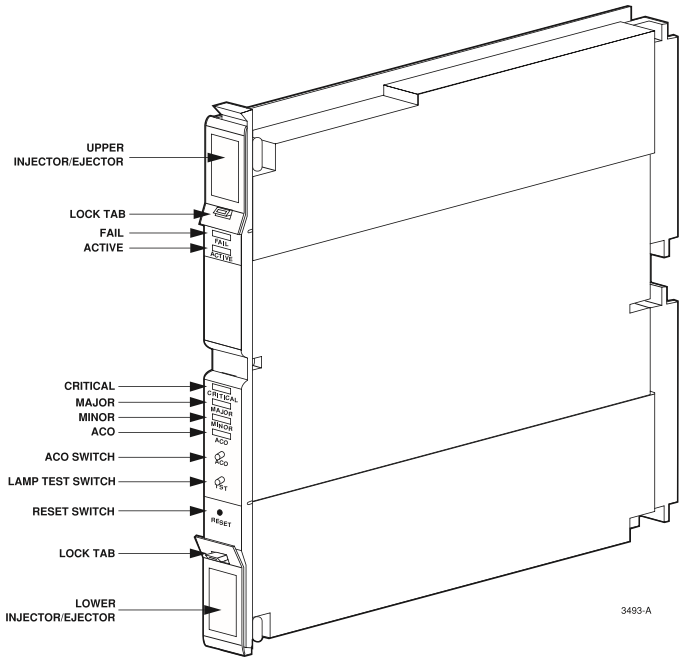


Figure 5-17. Shelf Control Unit (SCNU)

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4. Pivot the injector/ejectors outward so they point away from the SCNU.
5. Insert the SCNU into the appropriate slot in the HDT mounting shelf as shown in Figure 5-18.

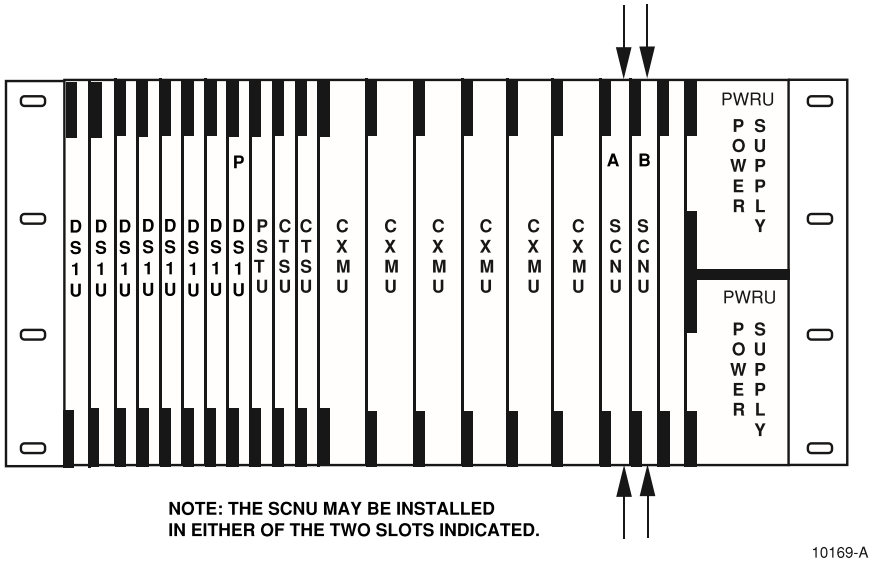


Figure 5-18. SCNU Mounting Slot Locations

6. Continue inserting the SCNU into the shelf while pivoting the injectors/ejectors toward the face plate. Continue pressing the injector/ejector until they touch the face plate and are locked by the lock tabs.
7. After the tabs are locked, press firmly against the upper and lower injector/electors to insure that the connectors on the unit are fully seated with the connectors on the mounting shelf backplane.
8. Verify that the LED indicators respond as described in Table 5-1. Refer to Section 6 if the LED does not respond as specified.
9. Repeat steps 2 through 8 if a standby SCNU is being installed.

Table 5-1. SCNU LED Indicator Operation Following Power-up

UNIT	DESCRIPTION OF INDICATOR OPERATION
SCNU With Generic Image	The red **FAIL** LED lights and remains lit during bootup of the SCNU generic image software. After 1-2 minutes, the red **FAIL** LED goes out. The **ACTIVE** LED stays **off** on both the A and B units indicating neither unit is active. **Note**: The SCNU is shipped with a generic SCNU image stored in its internal memory. The generic image provides basic recognition and communication functions. When the system software is downloaded to the SCNU, the generic image is replaced with the downloaded SCNU image.

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5 INSTALL HDT FRONT COVER

This procedure provides instructions for installing the HDT mounting shelf front cover. Use the following procedure to install the HDT front cover.

1. Open both the left side and right side front cover latches as shown in Figure 5-19.
2. Hold the cover vertically with the front facing outward and then tilt the top edge forward approximately 40°.
3. Position the tabs on the lower edge of the cover in the slots in the tab brackets at the lower edge of the HDT shelf (see Figure 5-19).
4. While pushing downward, slide the cover from side-to-side until the tabs on the bottom edge of the cover fully engage the slots in the tab brackets at the bottom edge of the HDT shelf.
5. Pivot the cover to its vertical position against the HDT shelf.
6. Hold the cover against the HDT shelf and then close both the left and right side latches.
7. Check both sides of the cover to verify that they are secure. If not, release the latches and repeat steps 4 – 6.
8. Remove both fuses at the fuse panel to disconnect –48 VDC office battery power (both the A and B power supply) from the HDT mounting shelf.

Note: The fuses will be re-installed during turn-up and test.

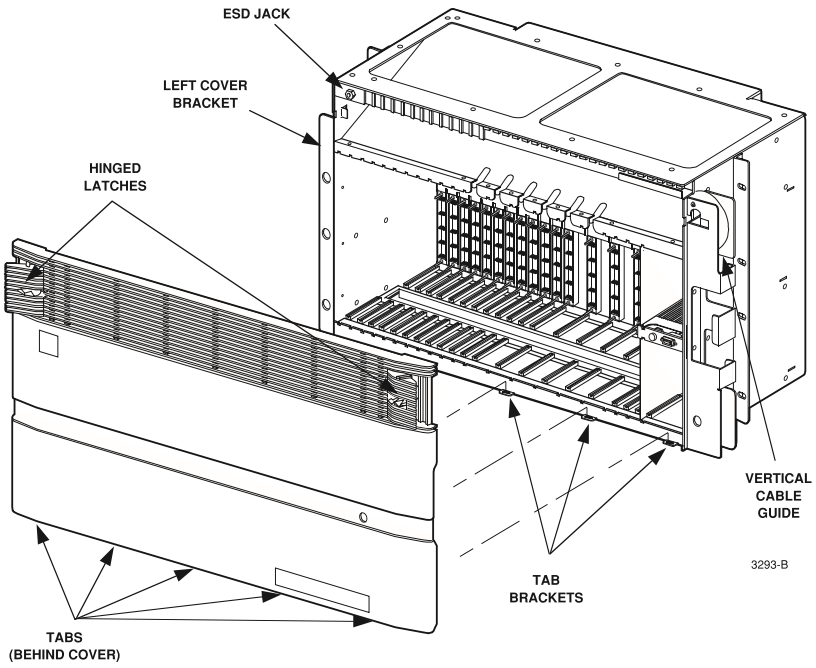


Figure. 5-19. HDT Front Cover Installation

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INSTALLATION TROUBLESHOOTING

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SECTION 6: INSTALLATION TROUBLESHOOTING

Content		Page
1	GENERAL	6-1
2	TROUBLESHOOT BLOWN FUSES	6-1
3	TROUBLESHOOT –48 VDC OUT OF RANGE	6-4
4	VERIFY PLUG-IN UNIT OPERATION	6-6

1 GENERAL

This section provides procedures for isolating and correcting problems that may occur during installation of the HDT. Installation problems are generally related to incorrect installation of the power wiring or incorrect installation of the plug-in units.

2 TROUBLESHOOT BLOWN FUSES

Two power sources supply–48 VDC to the HDT mounting shelf. This procedure provides instructions for determining the reason for blown power source fuses. The fuses are located in the FAP or in a fuse panel located at the top of the HDT rack.

1. The following tools and supplies required to perform this procedure:
   - Multimeter capable of measuring –40 to –60 Vdc
   - 1/2" flat bladed screwdriver
   - Electrical tape
   - Fuses - 7.5 Amp, GMT
2. Follow the trouble analysis procedure flow chart in Figure 6-1 to determine the reason for blown fuses.

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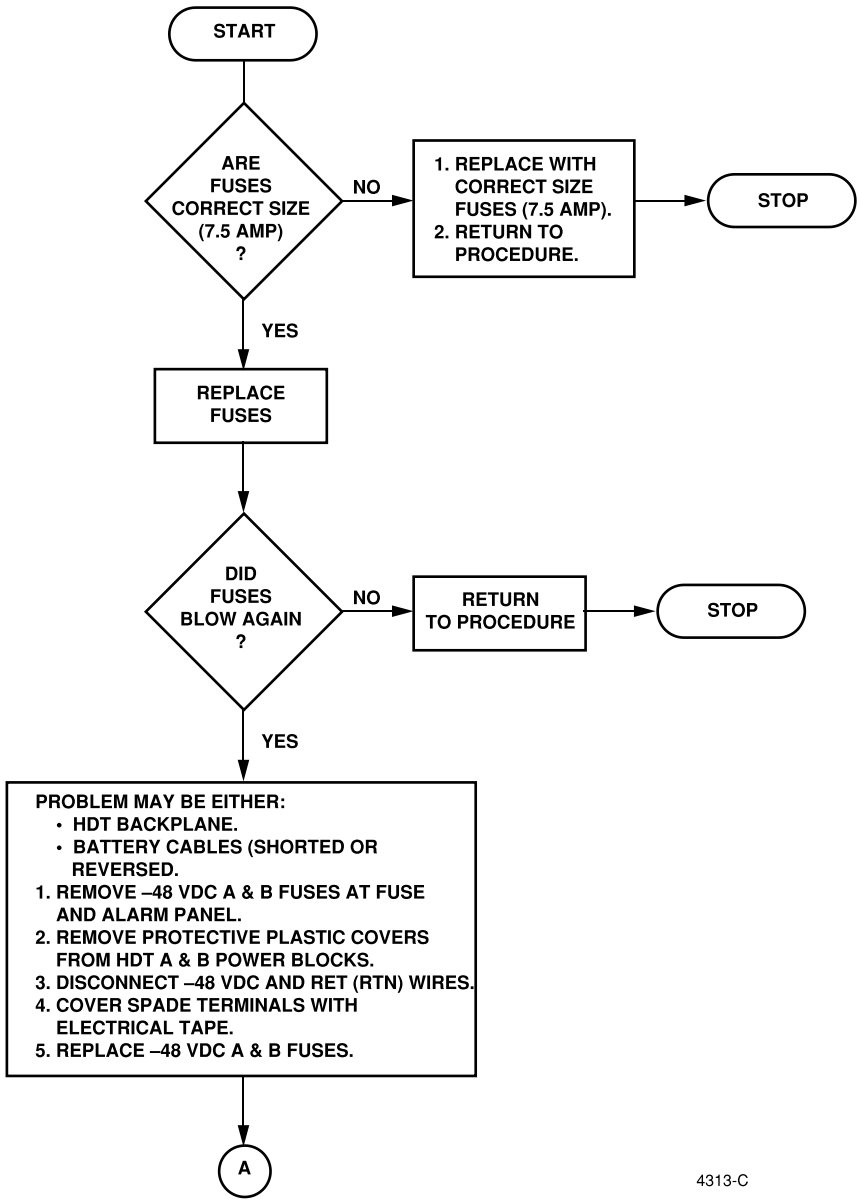


Figure 6-1. Troubleshoot Blown Fuses (continued)

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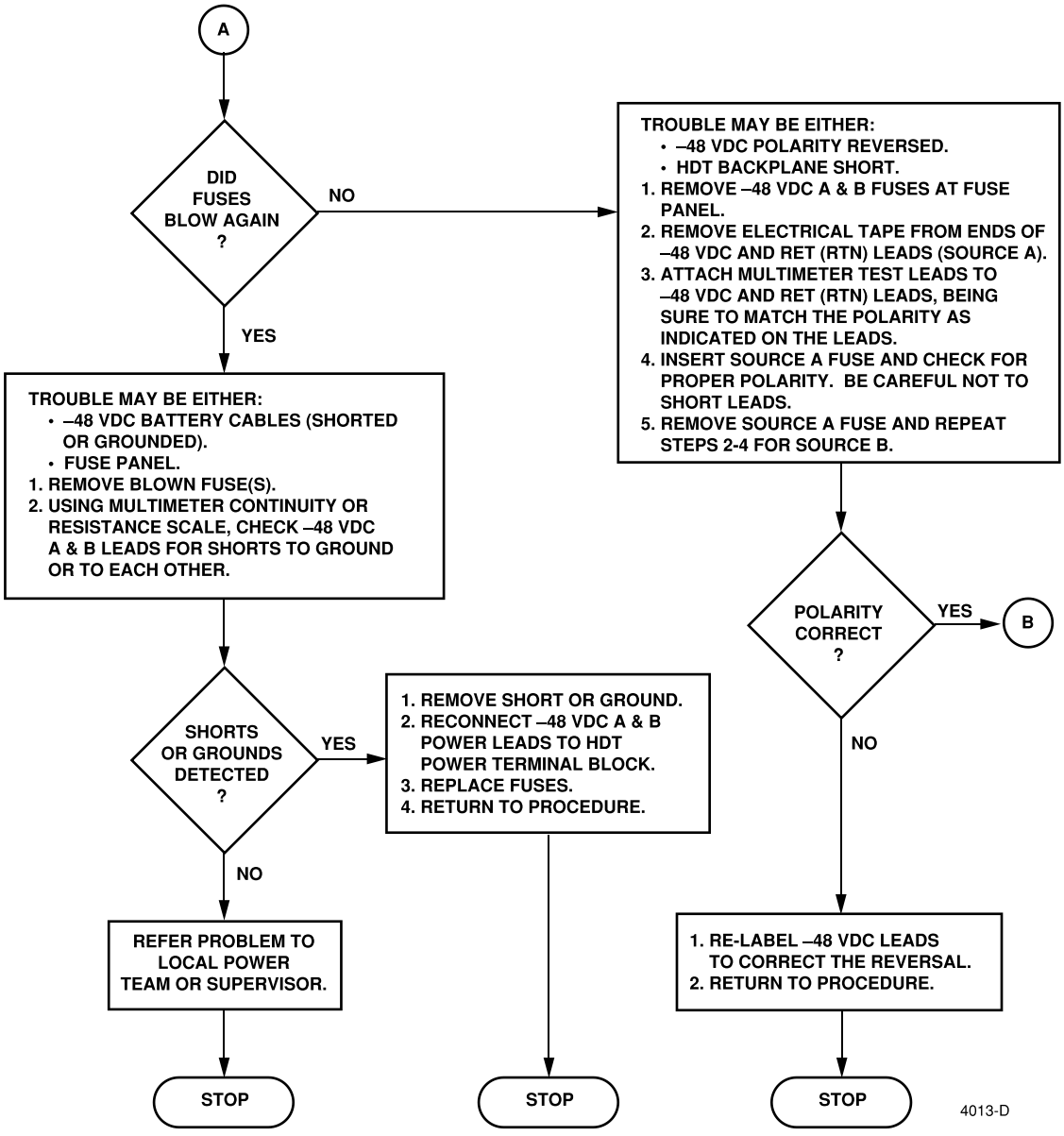


Figure 6-1. Troubleshoot Blown Fuses (continued)

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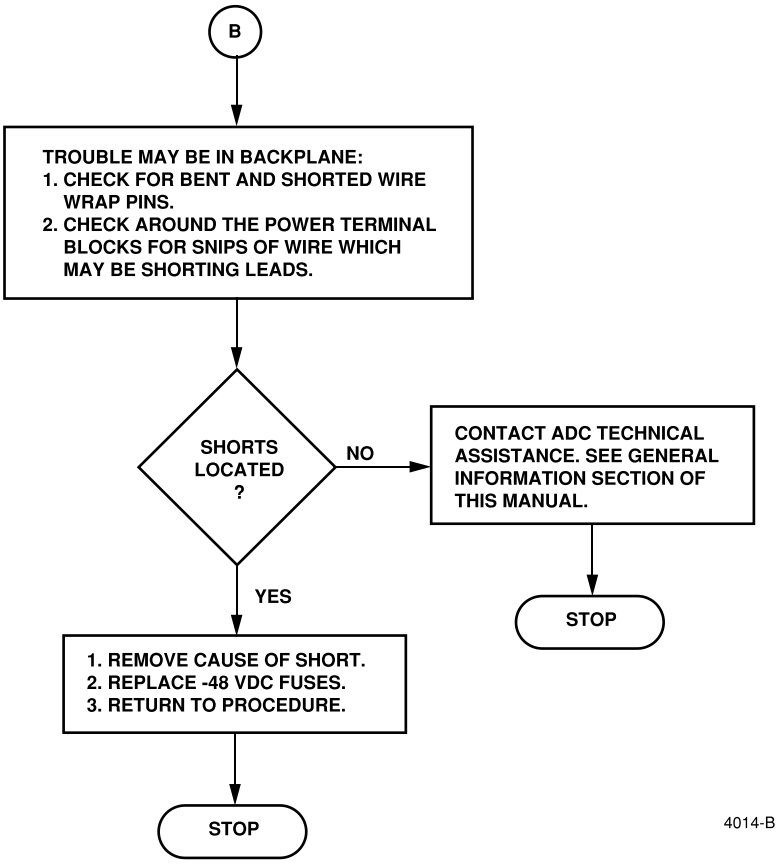


Figure 6-1. Troubleshoot Blown Fuses

3 TROUBLESHOOT –48 VDC OUT OF RANGE

This procedure provides instructions for determining out-of-range voltage readings measured at the HDT power terminal blocks.

1. The following tools and materials are required to perform this procedure:
   - Multimeter capable of reading –40 to –60 Vdc
   - 1/2" Flat blade screwdriver
   - Electrical tape
   - Fuses - 7.5 Amp, GMT
2. Follow the trouble analysis procedure flow chart in Figure 6-2 to determine the reason for out-of-range voltage.

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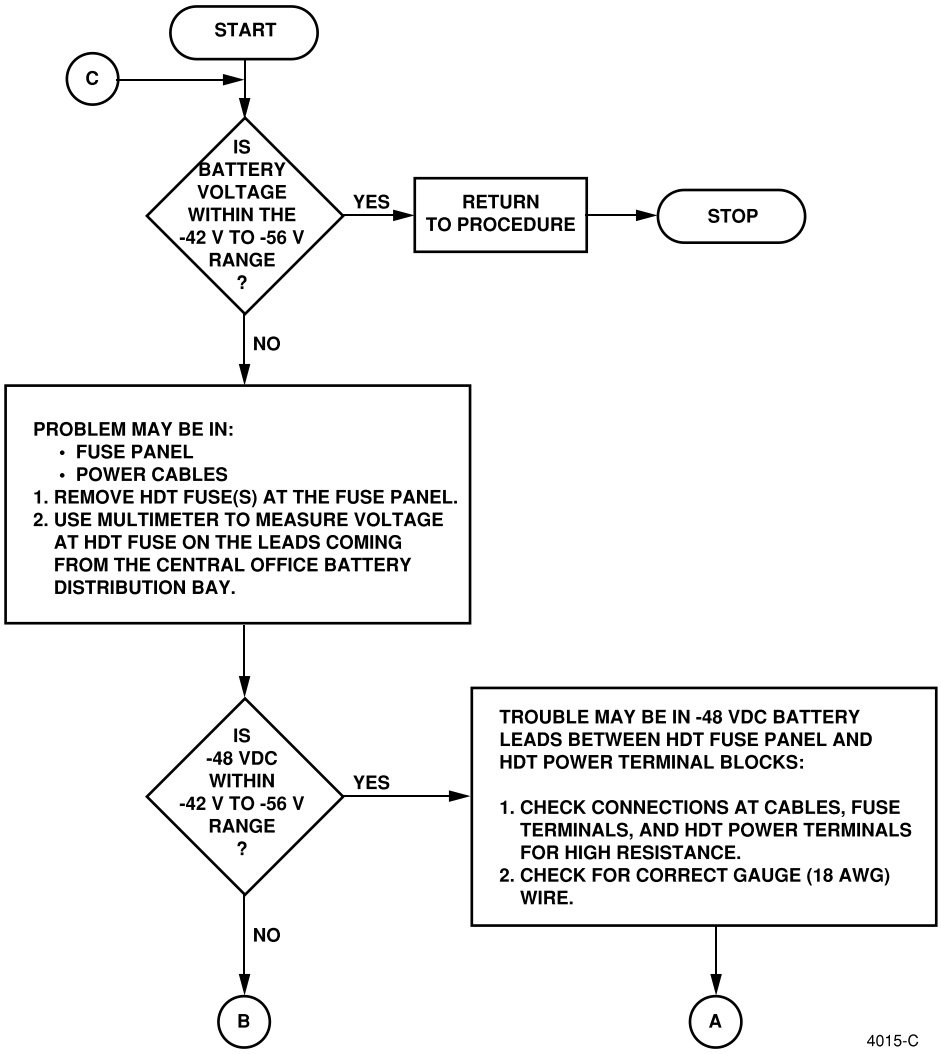


Figure 6-2. Troubleshoot Out-Of-Range Voltage (continued)

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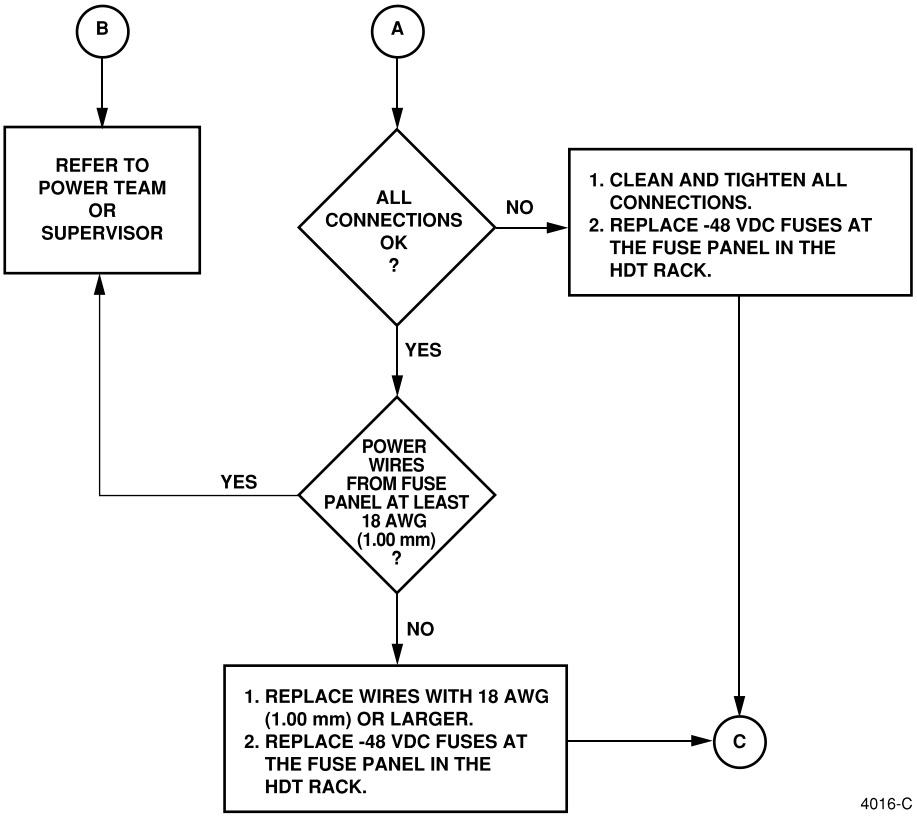


Figure 6-2. Troubleshoot Out-Of-Range Voltage

4 VERIFY PLUG-IN UNIT LED OPERATION

This procedure provides instructions for determining the cause of an incorrect LED indication on a plug-in unit following its initial installation in the HDT mounting shelf. It should be noted that **initially**, the plug-in unit LED indicators respond somewhat differently in systems that have not received a full download of the system software. After a full software download is received and the system has booted up, the LED indicators will respond as described in Section 3 of this manual (Plug-In Unit Description).

1. Slip on an ESD wrist strap and connect the ground wire to the ESD jack in the upper left corner of the HDT mounting shelf.
2. Locate the plug-in unit with the incorrect LED response.
3. Release the lock tabs to free the upper and lower injectors/ejectors as shown in Figure 6-3.

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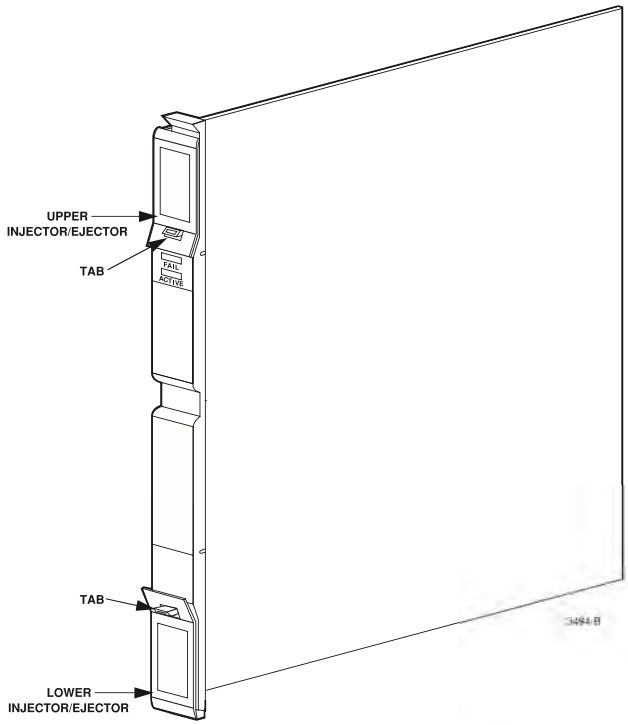


Figure 6-3. Typical Plug-In Unit

4. Pivot the injectors/ejectors outward to separate the unit connector from the backplane connector.
5. Slide the unit outward until it is free of the HDT mounting shelf.

Note: For CXMU removal, partially withdraw the unit from the mounting shelf and then disconnect the TX and RX coaxial cables using the special tool shown in Figure 6-4. Label cables if not labeled. Withdraw the CXMU from the shelf after cables are removed.

6. Remove the plug-in unit with the incorrect LED response from the HDT mounting shelf.
7. Does the plug-in unit show evidence of physical damage?

   If YES - obtain and install a replacement plug-in unit and proceed with step 8.

   If NO - continue with step 8.
8. Insert the plug-in unit into the HDT mounting shelf.
9. Continue inserting the unit into the shelf while pivoting the injectors/ejectors toward the face plate. Continue pressing the injectors/ejectors until they touch the face plate and are locked by the lock tabs
10. After the tabs are locked, press firmly against the upper and lower injector/electors to insure that the connectors on the unit are fully seated with the connectors on the mounting shelf backplane.
11. Do the LEDs respond as described in the plug-in unit installation procedures?

    If YES - go to step 14. The problem was an improperly inserted plug-in unit.

    If NO - go to step 12.

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12. Wait several minutes and then re-check LED operation. It may take up to 15 minutes for the plug-in unit LEDs to respond as described.

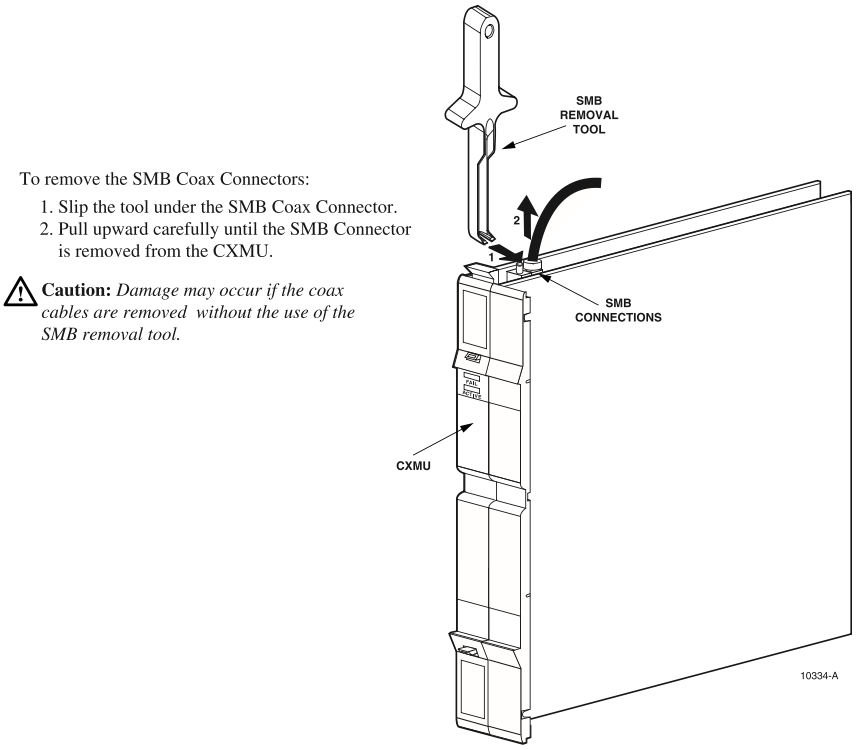


Figure 6-4. Removing Cables From The CXMU

13. Do the LEDs respond as described in the plug-in unit installation procedures?

    If YES - go to step 14. Problem was extended initialization period.

    If NO - obtain and install a replacement plug-in unit.

14. Is problem corrected?

    If YES - stop! You have completed this procedure.

    If NO - call ADC for technical assistance.

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GENERAL INFORMATION

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SECTION 7: GENERAL INFORMATION

Content Page

1 WARRANTY/SOFTWARE 7-1
2 SOFTWARE SERVICE AGREEMENT 7-1
3 REPAIR/EXCHANGE POLICY 7-1
4 REPAIR CHARGES 7-2
5 REPLACEMENT/SPARE PRODUCTS 7-2
6 RETURNED MATERIAL 7-2
7 CUSTOMER INFORMATION AND ASSISTANCE 7-3

1 WARRANTY/SOFTWARE

The Product and Software warranty policy and warranty period for all ADC products is published in ADC's Warranty/Software Handbook. Contact the Cable Access Systems Division (CASD) Technical Assistance Center at 1-800-366-3891, extension 2300 (in U.S.A. or Canada) or 952-946-2300 (outside U.S.A. and Canada) for warranty or software information or for a copy of the Warranty/Software Handbook.

2 SOFTWARE SERVICE AGREEMENT

ADC software service agreements for some ADC Products are available at a nominal fee. Contact the CASD Technical Assistance Center at 1-800-366-3891, extension 2300 (in U.S.A. or Canada) or 952-946-2300 (outside U.S.A. and Canada) for software service agreement information.

3 REPAIR/EXCHANGE POLICY

All repairs of ADC Products must be done by ADC or an authorized representative. Any attempt to repair or modify ADC Products without authorization from ADC voids the warranty.

If a malfunction cannot be resolved by the normal troubleshooting procedures, call Field Service Engineering at 1-800-366-3891, extension 2300 (in U.S.A. or Canada) or 952-946-2300 (outside U.S.A. and Canada). A telephone consultation can sometimes resolve a problem without the need to repair or replace the ADC Product.

If, during a telephone consultation, ADC determines the ADC Product needs repair, ADC will authorize the return of the affected Product for repair and provide a Return Material Authorization number and complete shipping instructions. If time is critical, ADC can arrange to ship the replacement Product immediately. In all cases, the defective Product must be carefully packed and returned to ADC.

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4 REPAIR CHARGES

If the defect and the necessary repairs are covered by the warranty, and the applicable warranty period has not expired, the Buyer's only payment obligation is to pay the shipping cost to return the defective Product. ADC will repair or replace the Product at no charge and pay the return shipping charges.

Otherwise, ADC will charge a percentage of the current Customer Product price for the repair or NTF (No Trouble Found). If an advance replacement is requested, the full price of a new unit will be charged initially. Upon receipt of the defective Product, ADC will credit Buyer with 20 percent of full price charged for any Product to be Out-of-Warranty. Products must be returned within (30) days to be eligible for any advance replacement credit. If repairs necessitate a visit by an ADC representative, ADC will charge the current price of a field visit plus round trip transportation charges from Minneapolis to the Buyer's site.

5 REPLACEMENT/SPARE PRODUCTS

Replacement parts, including, but not limited to, button caps and lenses, lamps, fuses, and patch cords, are available from ADC on a special order basis. Contact Field Service Engineering at 1-800-366-3891, extension 2300 (in U.S.A. or Canada) or 952-946-2300 (outside U.S.A. and Canada) for additional information.

Spare Products and accessories can be purchased from ADC. Contact Sales Administration at 1-800-366-3891, extension 2300 (in U.S.A. or Canada) or 952-946-2300 (outside U.S.A. and Canada) for a price quote and to place your order.

6 RETURNED MATERIAL

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All returned Products must have a Return Material Authorization (RMA) number clearly marked on the outside of the package. The Return Material Authorization number is valid for 90 days from authorization.

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7 CUSTOMER INFORMATION AND ASSISTANCE

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CASD Technical Assistance **Extension 2300** **E-Mail: aps_tech_center@adc.com**	• Technical Information • System/Network Configuration • Product Specification and Application • Training (Product-Specific) • Installation and Operation Assistance • System Turn-Up and Test • Troubleshooting and Repair
Product Return **Extension 2300** **E-Mail: repair&return@adc.com**	• ADC Return Authorization number and instructions must be obtained before returning products.

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