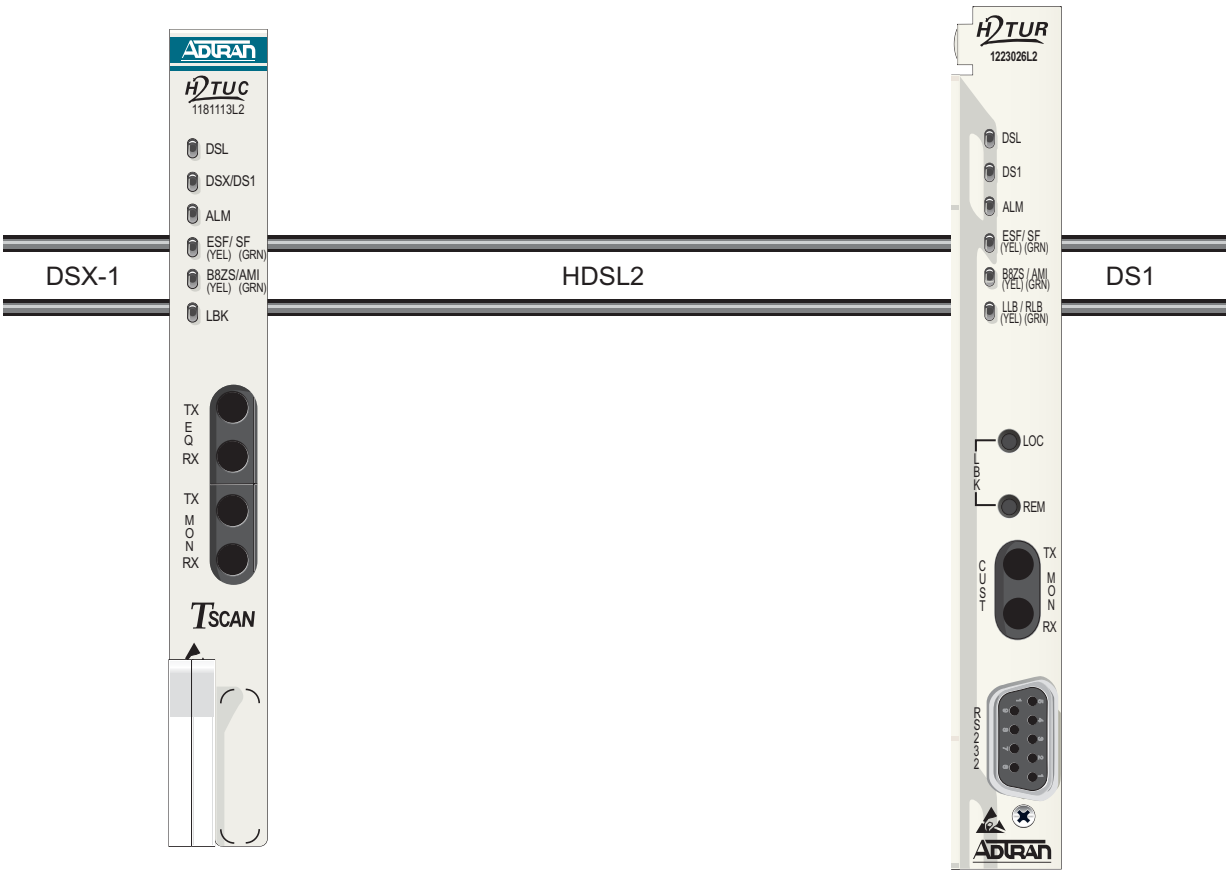

HDSL2 for General Distribution Installation and Maintenance Practice

Document Number: 61223HDSL2L2-5B
June 2005

Part Number	Description	CLEI
1181113L2	Total Access 3000 H2TU-C	T1L71YLA_ _
1223001L2	220/E220 HDSL2 H2TU-C	T1L722MA_ _
1223003L2	DDM+ HDSL2 H2TU-C	T1L734NA_ _
1223004L2	3192 HDSL2 H2TU-C	T1L746PA_ _
1223004L12	3192M HDSL2 H2TU-C	T1L9DEFA_ _
1223024L2	T200 HDSL2 H2TU-R, Local/Span/60 mA Power	T1L8EJEC_ _
1223026L2	T200 HDSL2 H2TU-R, Span Powered	T1L8KMJC_ _

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To the Holder of the Manual

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Revision History

Revision	Date	Description of Changes
A	November 2004	Initial release
B	June 2005	Add new product: 1223004L12, 3192M H2TU-C; Edits to front panel graphics to add TScan; power descriptions; compatibility statements; appearance

Conventions

The following typographical conventions are used in this document:

This font indicates a cross-reference link. First-time references to tables and figures are shown in **this font**.

This font indicates screen menus, fields, and parameters.

THIS FONT indicates keyboard keys (ENTER, ESC, ALT). Keys that are to be pressed simultaneously are shown with a plus sign (ALT+X indicates that the ALT key and X key should be pressed at the same time).

This font indicates references to other documentation and is also used for emphasis.

`This font` indicates on-screen messages and prompts.

`This font` indicates text to be typed exactly as shown.

This font indicates silkscreen labels or other system label items.

This font is used for strong emphasis.

NOTE

Notes inform the user of additional but essential information or features.

CAUTION

Cautions inform the user of potential damage, malfunction, or disruption to equipment, software, or environment.

WARNING

Warnings inform the user of potential bodily pain, injury, or death.

Training

ADTRAN offers training courses on our products. These courses include overviews on product features and functions while covering applications of ADTRAN's product lines. ADTRAN provides a variety of training options, including customized training and courses taught at our facilities or at customer sites. For more information about training, please contact us.

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Training Fax: 256-963-6700

Training Email: training@adtran.com

Contents

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HDSL2 for General Distribution

PRODUCT DESCRIPTION

The HDSL2 modules referenced in this document are used to deploy a T1 circuit using 2-wire metallic facilities.

HDSL2 provides extended range to DS1/T1 transport while providing spectral compatibility with ADSL and other transport technologies. The ADTRAN HDSL2 Transceiver Unit for Central Office (H2TU-C) works in conjunction with the ADTRAN HDSL2 Transceiver Remote Unit (H2TU-R) to provide a DS1 service up to 12,000 feet on the local loop.

The H2TU-C receives DSX-1 signals, converts them and provides HDSL2 signals to the local loop. The H2TU-R receives the HDSL2 signals from the H2TU-C and provides DS1 signals to the customer.

Features available on these products are described in detail in "Appendix B, HDSL2 Features".

Table 1 lists the ADTRAN HDSL2 Central Office modules approved for general distribution.

Table 1. HDSL2 Central Office Modules

HDSL2 Module	Part Number	CLEI Code
Total Access 3000 HDSL2 Transceiver Unit for Central Office (H2TU-C)	1181113L2	T1L7HYLA_ _
220 HDSL2 Transceiver Unit for Central Office (H2TU-C)	1223001L2	T1L7J2MA_ _
DDM+ HDSL2 Transceiver Unit for Central Office (H2TU-C)	1223003L2	T1L7K4NA_ _
3192 HDSL2 Transceiver Unit for Central Office (H2TU-C)	1223004L2	T1L7L7PA_ _
3192M HDSL2 Transceiver Unit for Central Office (H2TU-C)	1223004L12	T1L9DEFA_ _

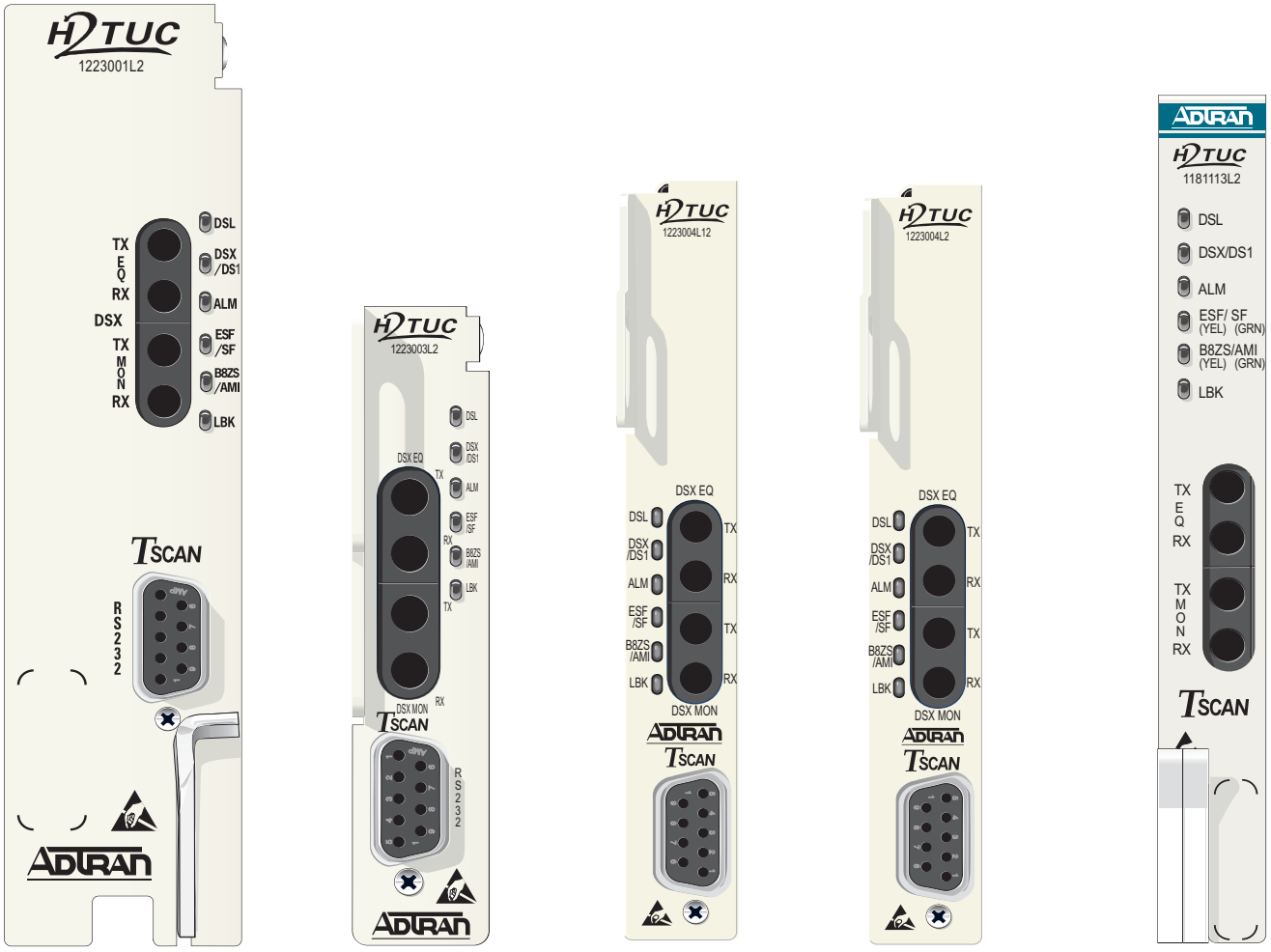
Table 2 lists the ADTRAN HDSL2 remote modules approved for general distribution.

Table 2. HDSL2 Remote Modules

HDSL2 Module	Part Number	CLEI Code
T200 HDSL2 Transceiver Remote Unit (H2TU-R), Locally Powered	1223024L2	T1L8FJFC_ _
T200 HDSL2 Transceiver Remote Unit (H2TU-R), Span Powered	1223026L2	T1L8MOKC_ _

Illustrations

Figure 1 illustrates the front panels of the ADTRAN H2TU-C modules approved for general distribution.



220 H2TU-C
P/N 1223001L2

DDM+ H2TU-C
P/N 1223003L2

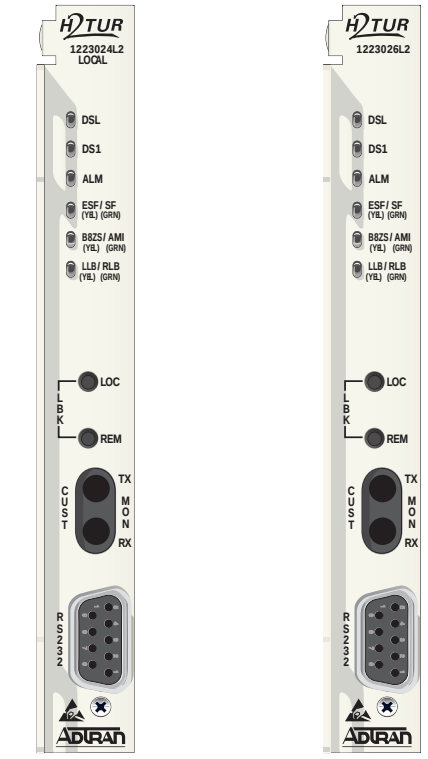
3192M H2TU-C
P/N 1223004L12

3192 H2TU-C
P/N 1223004L2

Total Access 3000
H2TU-C
P/N 1181113L2

Figure 1. ADTRAN HDSL2 Central Office Units for General Distribution

Figure 2 illustrates the front panels of the ADTRAN H2TU-R modules approved for general distribution.



T200 H2TU-R, LOCAL POWERED P/N 1223024L2

T200 H2TU-R, SPAN POWERED P/N 1223026L2

Figure 2. ADTRAN HDSL2 Remote Units for General Distribution

The H2TU-R is a T200 mechanics card which will fit Type 200 or Type 400 mechanics enclosures, as listed in **Table 3**. This table also provides reference information on the ADTRAN enclosures.

Table 3. H2TU-R Enclosure Compatibility

Part Number	Description[1]	Document Number
1242007Lx	HR12 Metal Enclosure Remote Shelf	61242007LX-5x
1242008L1	HR4 Remote Housing	61242008L1-5
1242034L2	T400 Single Mount (removable RJ-48 jacks)	61242034L2-5
1242034L3	T400 Single-Mount High Voltage Enclosure	61242034L3-5
1245034L1[2]	T200 Dual-Mount Installation/Maintenance	61245034L1-5

1. In all applications the H2TU-C must be installed in NEBS compliant and UL listed enclosures to insure full compliance with this unit.
2 The T200 Dual-Mount housing (P/N 1245034L1) is required when using the T200 H2TU-C for HDSL Loop Support System (HLSS™) protection circuits.

Compliance

ADTRAN HDSL2 modules are NRTL listed to the applicable UL standards. The HDSL2 modules are to be installed in a restricted access location and in a type “B” or “E” enclosure only.

These devices comply with Part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by ADTRAN could void the user’s authority to operate this equipment.

H2TU-C Compliance

Table 4 shows the compliance codes for the H2TU-C modules.

Table 4. Compliance Codes, H2TU-C

Code	Input	Output
Power Code (PC)	F	C
Telecommunication Code (TC)	–	X
Installation Code (IC)	A	–

The H2TU-C modules provide span powering voltage (negative only with respect to ground, –190 VDC nominal, GFI protection <5 mA) and meets requirements of Bellcore GR-1089-CORE (Class A2) and ANSI T1.418-2002.

H2TU-R Compliance

Table 5 shows the compliance codes for the H2TU-R modules.

Table 5. Compliance Codes, H2TU-R

Code	Input	Output
Power Code (PC)	C	C
Telecommunication Code (TC)	X	X
Installation Code (IC)	A	–

The H2TU-R modules must only be installed in shelves or mountings that utilize pin 27 of the edge connector as a frame ground.

INSTALLATION GUIDELINES

After unpacking an HDSL2 module, inspect it for damage. If damage has occurred, file a claim with the carrier, then contact ADTRAN Customer Service. For more information, refer to "Appendix D, Warranty".

If possible, keep the original shipping container for returning the module for repair or for verification of shipping damage.

CAUTION

Electronic modules can be damaged by Electro-Static Discharge (ESD). When handling modules, wear an antistatic discharge wrist strap to prevent damage to electronic components. Place modules in antistatic packing material when transporting or storing. When working on modules, always place them on an approved antistatic mat that is electrically grounded.

ADTRAN HDSL2 modules plug directly into the enclosure. Installation wiring is not required.

WARNING

Up to –200 VDC may be present on telecommunications wiring. The DSX-1 interface is intended for connection to intra-building wiring only. Ensure chassis ground is properly connected.

NOTE

These products are intended for installation in **restricted access locations** only.

Powering Options

H2TU-C

An H2TU-C module is capable of span powering an H2TU-R module by applying current to the local loop. Current from 10 to 150 mA is coupled onto an HDSL2 span to power the H2TU-R module when required. **Figure 3** shows the HDSL2 span powering diagram.

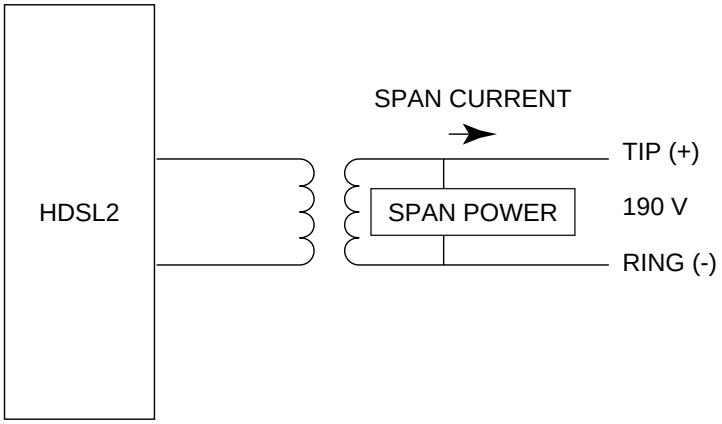


Figure 3. HDSL2 Span Powering Diagram

H2TU-R Span Power

The H2TU-R P/N 1223026L2 receives span power from the H2TU-C.

H2TU-R Local Power

In some circumstances a locally powered remote unit is required. The H2TU-R P/N 1223024L2 can meet those needs.

Module Installation

Follow the step-by-step procedures below to put the HDSL2 modules in service.

Total Access 3000 and 220/E220 H2TU-C Installation

To install the Total Access 3000 H2TU-C (P/N 1181113L2) or 220 H2TU-C module (P/N 1223001L2), perform the following steps:

1. Pull the ejector latch, located on the bottom of the module front panel, out from the closed position.
2. Hold the unit by the front panel while supporting the bottom edge of the module with the ejector latch opened to engage the enclosure edge.
3. Align the unit edges to fit in the lower and upper guide grooves for the module slot.

4. Slide the unit into the module slot. Simultaneous thumb pressure at the top and bottom of the unit will ensure that the module is firmly seated against the backplane of the chassis.
5. Secure the module in place by pushing in on the ejector latch.

All Other Modules

To install any of the HDSL2 modules, with the exception of those explained above, perform the following steps:

1. Hold the unit by the front panel while supporting the bottom edge of the module and engage the enclosure edge.
2. Align the unit edges to fit in the lower and upper guide grooves for the enclosure slot.
3. Slide the unit into the access module slot. Simultaneous thumb pressure at the top and at the bottom of the unit will ensure that the module is firmly seated against the backplane of the enclosure.

NOTE

For the locally powered H2TU-R (P/N 1223024L2), a local power supply (P/N 1353.DSK48V04) is available from ADTRAN.

Initialization

When a module is first installed, it performs a series of self-tests. Once the power up self-test is complete, the status LEDs will reflect the true state of the hardware. For more information, refer to "H2TU-C Front Panel Operation" on page 16 for LED indications.

CONNECTIONS

An H2TU-C module occupies one card slot in the respective Office Repeater Bay for which it is named. Power and alarm signals are provided to the module through the backplane of the shelf. DSX-1 and HDSL2 loop signals are connected to the wire-wrap pins or mass termination (amphenol) shelf connectors corresponding to the slot the module occupies.

Figure 4, **Figure 5**, and **Figure 6** specify the edge connection wiring required for proper operation.

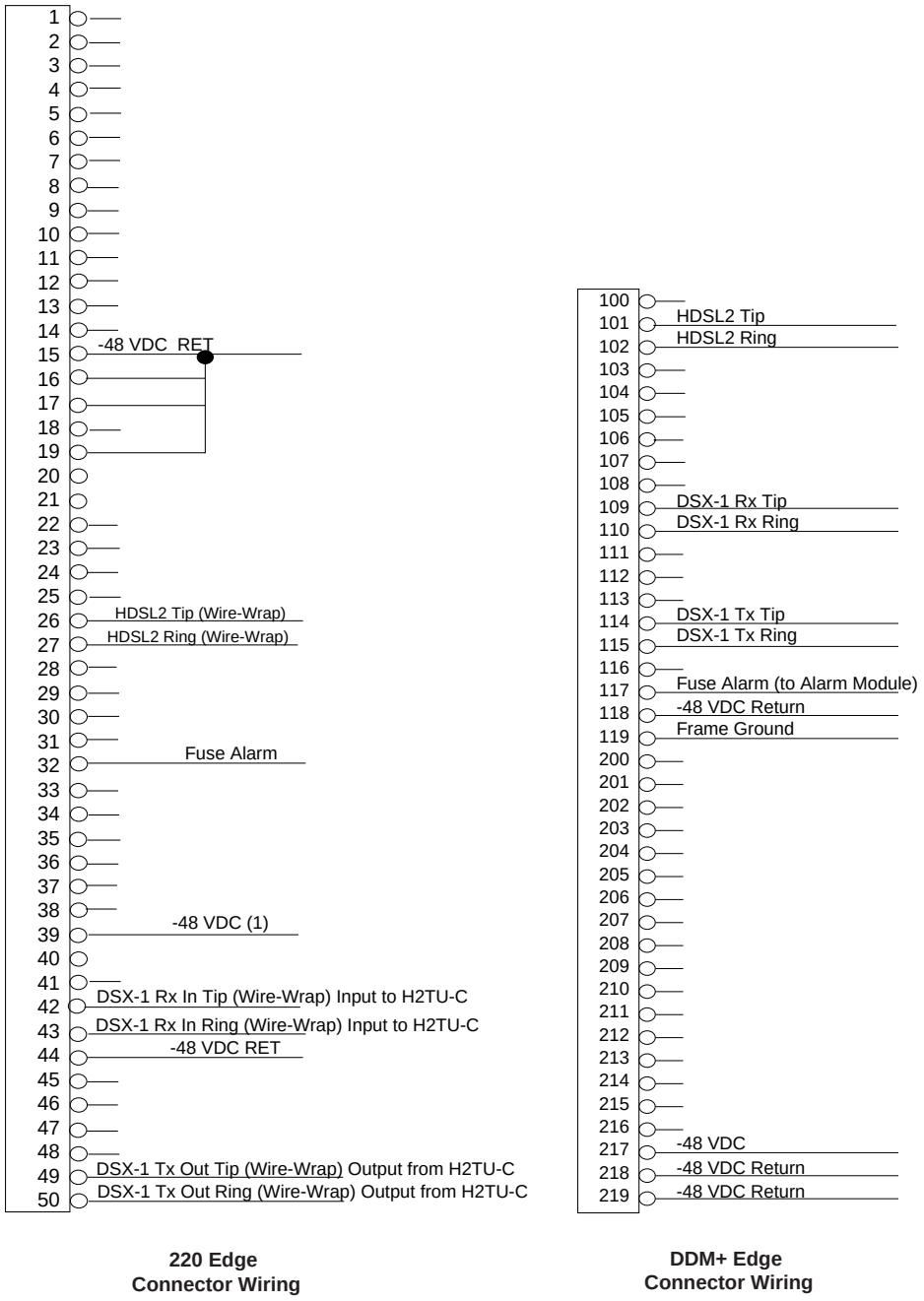
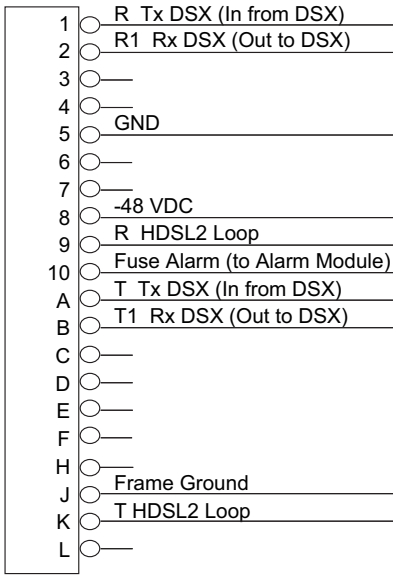
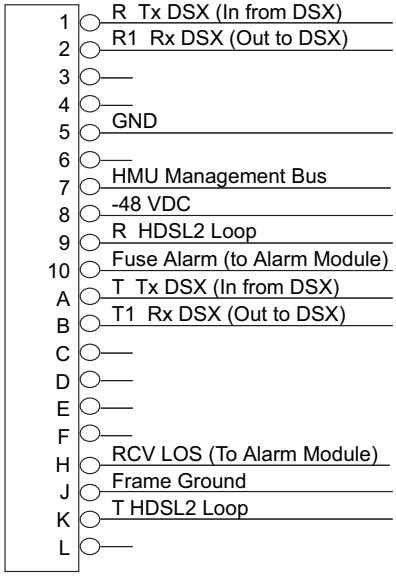


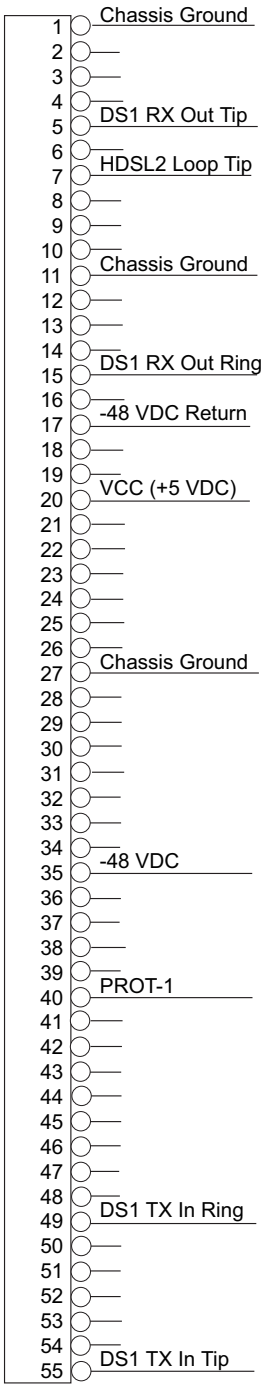
Figure 4. HDSL2 Edge Connector Wiring



3192 Edge Connector Wiring



3192M Edge Connector Wiring

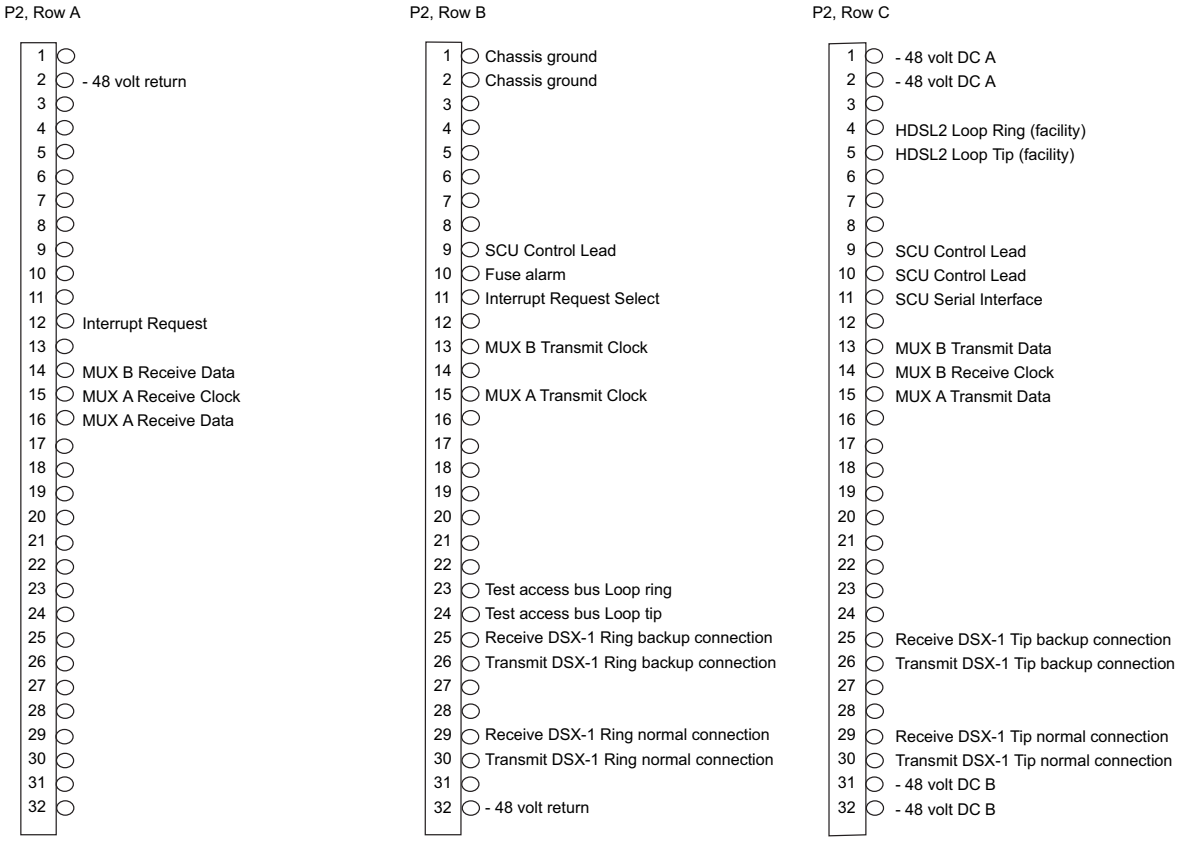


T200 H2TU-R Edge Connector Wiring

Figure 5. HDSL2 Edge Connector Wiring, continued

Total Access 3000 H2TU-C Edge Connector

The Total Access 3000 shelf delivers DSX-1 from the network to the H2TU-C via connectors on the backplane labeled **Pair 7** and **Pair 8**. The HDSL2 signal is provided toward the customer via the backplane connector labeled **Pair 2**. Pins 1 and 33 of the connectors Pair 7 and Pair 8 are the DSX connections for the H2TU-C in slot 1. Pins 2 and 34 of these connectors are associated with slot 2. Pins 3 and 35 are associated with slot 3, and so forth, up to pins 28 and 60 for slot 28.



Total Access 3000
H2TU-C Edge Connector Wiring

Figure 6. HDSL2 Edge Connector Wiring, continued

PROVISIONING

HDSL2 Configuration is performed via software control. For more information, refer to "Control Port Operation" on page 17. The provisioning settings can be viewed and manipulated through access to the firmware via the front panel RS-232 port. **Table 6** lists the available provisioning options and their factory default settings.

Table 6. Provisioning Options

Provisioning Option	Option Settings	Default Settings
1. DSX-1 Line Build Out [1]	0-133 feet, 133-266 feet, 266-399 feet, 399-533 feet, 533-655 feet, EXTERNAL	0 to 133 feet
2. DSX-1/DS1 Line Code	B8ZS, AMI	B8ZS
3. DSX-1/DS1 Framing	SF, ESF, Unframed, Auto	ESF
4. Force Frame Conversion	Disabled, Enabled	Disabled
5. Smartjack Loopback	Disabled, Enabled	Enabled
6. Loopback Time Out	None, 120 Min	120 Minutes
7. Latching Loopback Mode[2]	T1 (Disabled), FT1 (Enabled)	T1 (Disabled)
8. DS1 Tx Level	0 dB, –7.5 dB, –15 dB	0 dB
9. Span Power	Enabled, Disabled	Enabled
10. Customer Loss Indicator[3]	AIS, Loopback, AIS/CI	AIS/CI
11. Performance Reporting Messages	None, SPRM, NPRM, AUTO (both)	AUTO
12. Loop Attenuation Alarm Threshold	0 (Disabled), 1-99 dB	30 dB
13. SNR Margin Alarm Threshold	0 (Disabled), 1-15 dB	04 dB
14. Remote Provisioning	Disabled, Enabled	Enabled
15. Shelf Alarm [4]	Disabled, Enabled	Enabled

2. External is used only for Kentrox shelves. Unit transmits 12-volt p-p to DSX panel.
3. Latching Loopback Mode
   - T1 - When optioned for T1 mode, the unit does not respond to DDS Latching Loopback codes.
   - FT1 (Fractional T1) - DDS Latching Loopback operation is supported. The H2TU-C units which are in the HDSL circuit are treated as Identical Tandem Data ports and the HTU-R is treated as a different Tandem Data port.

   Note: When operating in FT1 mode and during periods of T1 loss of signal, LOS, or T1 AIS from the customer CI, the HDSL system will send in the network direction from the HTU-C a Fractional DS1 idle signal consisting of a repeating 7E (HEX) byte payload within a framed/unframed T1 signal. In addition, when optioned for FT1 mode, the setting for Customer Loss Response is ignored.
4. Customer Loss Indicator
   - AIS - Send AIS to network upon T1 loss of signal or T1 AIS from customer.
   - LPBK - HTU-R initiates a network loopback upon T1 loss of signal or T1 AIS from customer.
   - AIS/CI - HTU-R sends customer disconnect indication upon loss of signal, loss of synchronization, or receipt of T1 AIS from customer.

   Note: The CI is generated by transmitting the framing received from the network while overwriting the payload with a repeating pattern. For applications where the DS1 is Extended Superframe, the data link is overwritten with a Yellow Alarm that is interrupted once every second by a 100 milli-second code burst of 7E (HEX).
5. Shelf Alarm is on the DDM+, 3192M, and 3192 Units only.

Provisioning Options, Total Access 3000 H2TU-C

The Total Access 3000 H2TU-C is provisioned through the SCU on the Total Access 3000 chassis. In addition to the options shown in Table 6 on page 11, the options shown in **Table 7** apply.

Table 7. Total Access 3000 Additional Provisioning Options

Provisioning Option	Option Settings	Default Settings
15. Service State[1]	In Service; Out-of-Service Unassigned; Out-of-Service Maintenance	Out-of-Service Maintenance
16. Network Source[2]	DSX, MUX A, MUX B, Auto MUX	DSX
17. External Alarms	Enabled, Disabled	Disabled
18. Auto In Service	Disabled, Enabled	Enabled
19. Auto IS Startup Period	1 hour, 4 hours, 8 hours, 24 hours	4 hours
20. Auto IS Off Period	1 hour, 4 hours, 8 hours, 24 hours	8 hours

1. The Service State defaults to Out-of-Service Maintenance. This setting allows active connections to the DSX or MUX interface; however, no alarms will be generated. Out-of-Service Unassigned allows the loops to train up but will not connect to the DSX or MUX interface. The In Service setting allows full functioning connections to DSX or MUX interfaces.
2. For Network Source settings, the following options apply:
   - DSX-1: The module will utilize the DSX-1 interface. The Muxes will not be used, even if present.
   - Mux A: The module will use Mux A as its data source. The module will not switch to Mux B in the case of a Mux A failure. The EQ jacks can be used as a temporary test point in conjunction with the EQ jack setting on the loopback/test screen.
   - Mux B: The module will use Mux B as its data source. The module will not switch to Mux A in the case of a Mux B failure. The EQ jacks can be used as a temporary test point in conjunction with the EQ jack setting on the loopback/test screen.
   - Auto Mux: The module will default to Mux A as its data source. In the event of a Mux A failure, the module will perform a protection switch to Mux B if it is present and in service. The EQ jacks can be used as a temporary test point in conjunction with the EQ jack setting on the loopback/test screen.

HDSL2 SYSTEM TESTING

The ADTRAN HDSL2 system provides the ability to monitor the status and performance of the DSX-1 signals, DS1 signals, and HDSL2 loop signals. Detailed performance monitoring is provided by the front panel-mounted RS-232 control port (or via the SCU RS-232 port for the Total Access 3000). These features are valuable in troubleshooting and isolating any system level problems that may occur at installation or during operation of the HDSL2 system. Additional testing features are described below.

H2TU-C Bantam Jacks

The front panel of an H2TU-C module contains both metallic splitting (**EQ**) and monitor (**MON**) bantam jacks.

The **EQ** jacks provide an *intrusive* access point, interrupting signal access to the local loop. This will enable the user to transmit a test signal toward an H2TU-R module and to receive a test signal from an H2TU-R module.

The **MON** jacks, when connected to a bit-error rate test set that is configured for monitor (bridging) mode, provide a *nonintrusive* test access point for observing the transmit or receive signal. In this configuration, synchronization, test patterns, and other functions can be observed.

Alternatively, the **MON** jacks can also be used for intrusive testing toward the network. To utilize this configuration, perform the following steps:

1. Disconnect the H2TU-C DSX-1 interface by opening both the metallic splitting **TX** and **RX EQ** jacks with either a bantam open plug or a bantam test cord that is not terminated.
2. Configure a test set for Terminate mode.
3. Connect the test set to the **MON** jacks. (Test access toward the network equipment is achieved).
4. Connect the output (TRANS) of the test set to the **MON RX** jack, and the input (REC) of the test set to the **MON TX** jack.

> **NOTE**
>
> For additional Bantam Jack testing from the Total Access 3000 H2TU-C (P/N 1181113L2), refer to "Appendix C, Front Panel DSX and MUX Mode Test Access".

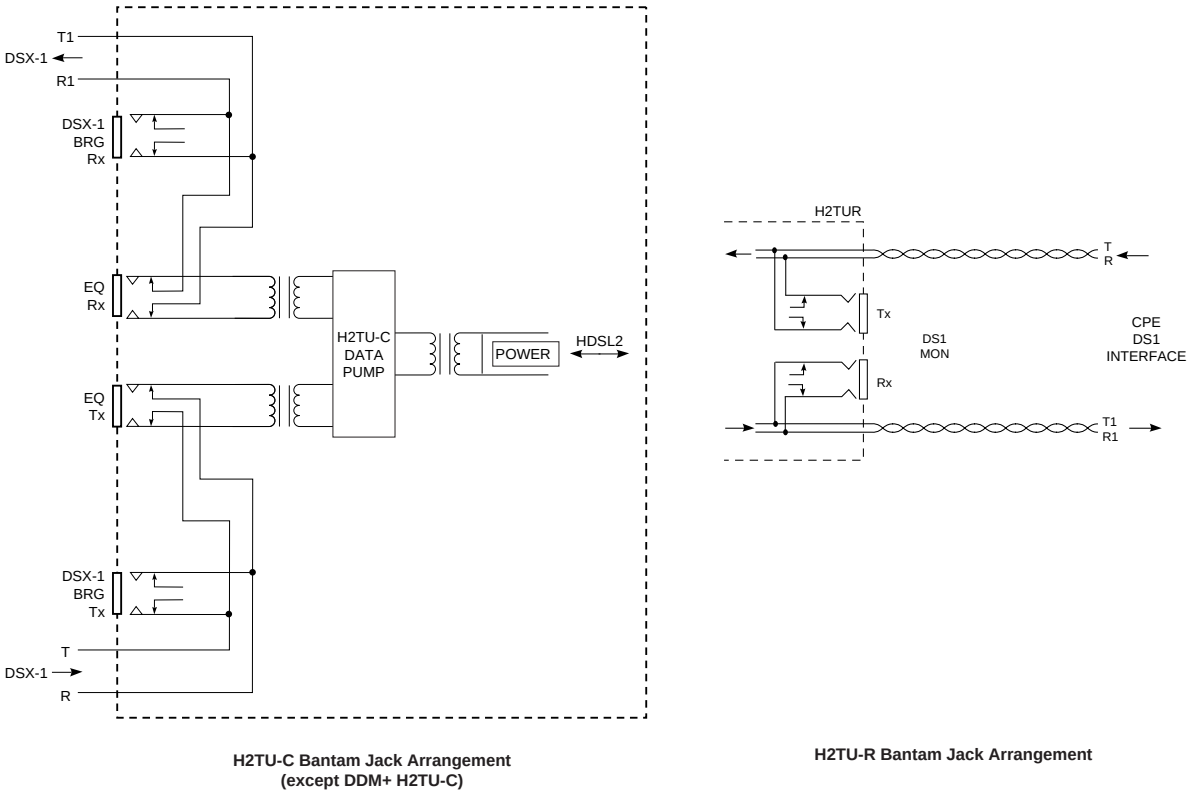
H2TU-R Bantam Jacks

The DS1 monitoring from the H2TU-R is accomplished using the **MON** bantam jacks.

The jacks labeled **MON** provide a test access point for monitoring the transmit and receive signals at the DS1 interface point. The bridging jacks can be used in two different ways:

1. The bridging jack of an H2TU-R module provides a *nonintrusive* tap onto a signal line and permits the connection of test equipment to monitor the characteristics of the signal with the DS1 test set optioned for Bridging mode.
2. If the DS1 test set is optioned for Terminate mode and the customer DS1 is disconnected, then the bridging jack of an H2TU-R module provides an *intrusive* tap and could be used to transmit and receive signals between an H2TU-R module and the network.

Figure 7 illustrates the complete bantam jack arrangement and details for specific jacks.



H2TU-C Bantam Jack Arrangement (except DDM+ H2TU-C)

H2TU-R Bantam Jack Arrangement

Figure 7. Bantam Jack Arrangements

Loopbacks

The ADTRAN HDSL2 modules respond to three different loopback activation processes. These processes may be utilized to provide a loopback that affects either an H2TU-C or an H2TU-R module (locally or remotely).

1. Loopbacks may be activated using the craft interface. The Loopback Options screen that provides for the H2TU-C and H2TU-R loopbacks is described in "Control Port Operation" on page 17.
2. The modules respond to the industry standard for HDSL loopbacks. A detailed description of these loopback sequences is given in "Appendix A, HDSL2 Loopbacks".
3. HDSL2 modules respond to loopbacks depending on the module type as follows:
   - H2TU-C modules respond to loopbacks initiated using the software functions described in 1 and 2 above.
   - H2TU-R modules respond to loopbacks initiated using front panel pushbuttons. See **Table 8**.

ADTRAN HDSL2 modules contain smartloop technology which constantly monitors the DSX-1 for a framing pattern. ADTRAN HDSL2 modules will initiate the proper loopback regardless of how the loopback control sequence is sent (framed or unframed).

The loopback condition imposed in both cases is a logic level loopback at the point within an H2TU-C module where the DSX-1 signal passes into the HDSL2 modulators. **Figure 8** depicts all of the loopback locations possible with ADTRAN HDSL2 equipment.

In addition to network-side loopbacks, an H2TU-C module provides customer-side loopbacks initiated by using either the terminal control port or in-band loop codes. For more information, refer to "Appendix A, HDSL2 Loopbacks". In this mode, an AIS signal (all ones) is supplied to the network.

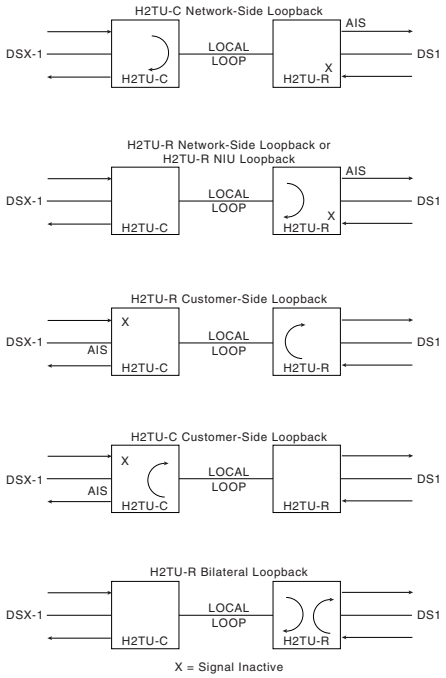


Figure 8. HDSL2 Loopbacks

H2TU-R Front Panel Pushbuttons

Two loopback (**LBK**) pushbuttons are accessible from the front panel of the H2TU-R. The **REM** loopback button controls a customer loopback at the H2TU-C. The **LOC** loopback button controls a bidirectional loopback at the H2TU-R. **Table 8** details the loopback pushbutton operation.

Table 8. Front Panel Loopback Pushbuttons

Switch Label	Function
REM	Pressing this button changes the **H2TU-C** loopback state as follows: • If the H2TU-C is not in loopback, pressing this button will activate a bilateral loopback. • If the H2TU-C is in loopback, pressing this button will deactivate the bilateral loopback.
LOC	Pressing this button changes the **H2TU-R** loopback state as follows: • If the H2TU-R is not in loopback, pressing this button will activate a bilateral loopback. • If the H2TU-R is in loopback, pressing this button will deactivate the bilateral loopback.

H2TU-C FRONT PANEL OPERATION

LED indicators mounted on the front panel of the unit provide status of the HDSL2 circuit. Each indicator is described in **Table 9** for the H2TU-C and **Table 10** for the H2TU-R.

Table 9. H2TU-C Front Panel LED Indications

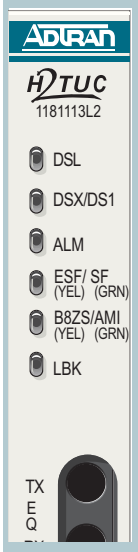
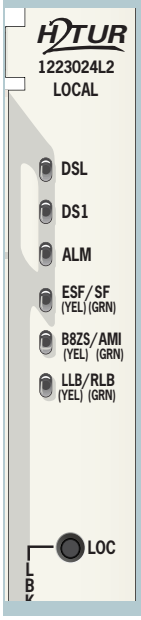
Front Panel	Label	Status	Description
	**DSL**	● Green	DSL sync, no errors currently detected, and signal margin ≥ 2 dB
		● Red	No DSL sync, errors being detected, or signal quality < 2 dB
	DSX/DS1	● Green	DSX-1 signal is present and synchronized and no errors are detected
		● Red	No DSX-1 signal, or signal is present with errors
	ALM	○ Off	No alarm condition detected
		● Red	Loss of DSX-1 signal to the unit
		● Yellow	Loss of DS1 signal to the remote
	ESF/SF	○ Off	Unit is provisioned for unframed data
		● Green	Unit is provisioned for SF data
		● Yellow	Unit is provisioned for ESF data
	B8ZS/AMI	● Green	Unit is provisioned for AMI line code
		● Yellow	Unit is provisioned for B8ZS line code
	LBK	○ Off	Unit is not in loopback
		● Yellow	Unit loopback is active toward network or customer

Table 10. H2TU-R Front Panel LED Indications

Front Panel	Label	Status	Description
	**DSL**	● Green	DSL sync, no errors currently detected, and signal margin > 2 dB
		● Red	No DSL sync, errors being detected, or signal margin ≤ 2 dB
	DS1	● Green	DS1 signal is present and no errors currently being detected
		● Red	No DS1 signal or framing mismatch
	ALM	○ Off	No active alarm present
		● Red	Loss of DS1 signal to the unit
		● Yellow	Loss of DSX signal to the H2TU-C
	ESF/SF	○ Off	Unit is provisioned for UNFRAMED data
		● Green	Unit is provisioned for SF data
		● Yellow	Unit is provisioned for ESF data
	B8ZS/AMI	● Green	Unit is provisioned for AMI line code
		● Yellow	Unit is provisioned for B8ZS line code
	LLB/RLB	○ Off	Unit is NOT in loopback
		● Green	Active remote loopback from the H2TU-C toward the customer
		● Yellow	This unit is in loopback (network and/or customer)

CONTROL PORT OPERATION

The H2TU-C modules provide a DB-9 connector on the front panel that supplies an RS-232 interface for connection to a controlling terminal. The pinout of the DB-9 is illustrated in **Figure 9**.

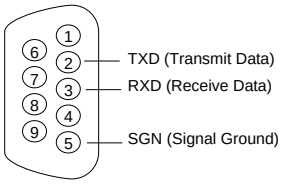


Figure 9. RS-232 (DB-9) Pin Assignments

The Total Access 3000 H2TU-C Control Port access is provided via the DB-9 connector on the Total Access System Controller Unit (SCU), P/N 1181018L1. This section will include Total Access H2TU-C screens separately where they differ from other HDSL2 screens.

The terminal interface operates at data rates from 1.2 kbps to 19.2 kbps. (Total Access 3000 SCU default rate is 9.6 kbps.)

The asynchronous data format is fixed at the following parameters:

8 data bits; no parity; 1 stop bit

Disable the line wrap feature of the emulation program if necessary.

NOTE

If using a personal computer (PC) with terminal emulation capability, be sure to disable any power saving programs. Otherwise, communication between the PC and the HDSL2 unit may be disrupted, resulting in misplaced characters or screen time outs.

Terminal Emulation Modes

An H2TU-C module supports two types of terminal emulation modes:

- Manual Update Mode - This mode is a dumb terminal mode, enabling easy access to print screen and log files commands. This mode also includes a “3 SPACES TO UPDATE” message on the top of the terminal screen (press the spacebar three times to update the screen).
- Real Time Update Mode (default) - This mode is a VT100 terminal mode. This mode enables all screen highlighting and cursor placement. Print screen and log file commands are not available in this mode.

NOTE

The Manual Update Mode is not available on the Total Access 3000 H2TU-C.

Screens

The screens illustrated in Figure 10 through Figure 47 are for an HDSL2 circuit deployed with the ADTRAN HDSL2 technology. The circuit includes an H2TU-C module and an H2TU-R module.

Logon to Main Menu

A terminal session is initiated by entering multiple spacebar characters, which are used by an H2TU-C module to determine the speed of the terminal. Once the speed has been determined, the ADTRAN HDSL2 Main Menu is displayed from which the various Operation, Administrative, Maintenance, and Provisioning (OAM&P) screens may be accessed (**Figure 10**). To display a particular screen from the menu, press the number key associated with the screen title, and press the ENTER key.

NOTE

When the ADC HiGain® Management Unit (HMU) is installed, the 3192M DB-9 is disabled. Terminal screens must be accessed from any one of these HMUs:

HMU-319-L7A
HMU-319-L7AV307
HMU-319-L7A32.

```
Circuit ID:HNTSVLALHDSL2                                  03/01/05 09:29:45

                              Adtran HDSL2 Main Menu


                             1.  HDSL2 Unit Information
                             2.  Provisioning
                             3.  Span Status
                             4.  Loopbacks and Test
                             5.  Performance History
                             6.  Scratch Pad, Ckt ID, Time/Date
                             7.  Terminal Modes
                             8.  Alarm History
                             9.  Event History
                            10.  System PM/Screen Report
                            11.  Clear PM and Alarm Histories
                            12.  Troubleshooting
                            13.  Virtual Terminal Control




                             Selection:
```

Figure 10. ADTRAN HDSL2 Main Menu

Descriptions for the menu items on the HDSL2 Main Menu include the following:

Logon to Main Menu, Total Access 3000 H2TU-C

Accessing the HDSL2 circuit information via the Total Access 3000 SCU control port requires the user to logon by entering a user name and password (**Figure 11**). The default account name is **ADMIN**. The default password is **PASSWORD**.

After successful logon, the Total Access Main Menu (**Figure 12**) will appear. Select Access Modules (option 4) from this menu.

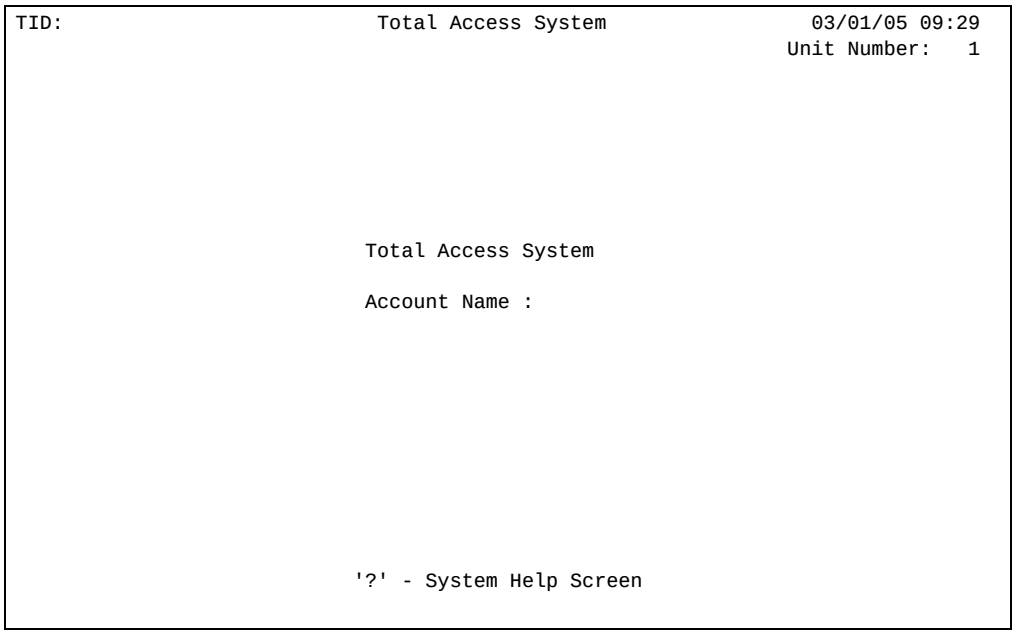


Figure 11. Logon Screen

```
Shelf: 1                        Total Access System                  03/01/05 09:29
Unacknowledged Alarms: None




                                Total Access

                                 1.  System Controller
                                 2.  Common A - [.....]
                                 3.  Common B - [.....]
                                 4.  Access Modules
                                 5.  System Alarms
                                 6.  Network Management
                                 7.  Logoff


                                Selection:




                              '?' - System Help Screen
```

Figure 12. Total Access Main Menu

The Access Module Menus screen (**Figure 13**) will display the access modules occupying the Total Access 3000 shelf. Select the corresponding channel slot number for the desired H2TU-C. To the right of each access module listed, the current alarm state is indicated.

When the module is selected, the ADTRAN HDSL2 Main Menu is displayed, from which the various Operation, Administrative, Maintenance, and Provisioning (OAM&P) screens are accessed (**Figure 14**). To display a particular screen from the menu, press the number key associated with the screen title, and then press the ENTER key.

```
Shelf: 1                        Total Access System                  03/01/05 09:29
Unacknowledged Alarms: None

                                Access Module Menus

             1 - H2TU-C L2... [None]      15 - ............ [None]
             2 - ............ [None]      16 - ............ [None]
             3 - ............ [None]      17 - ............ [None]
             4 - ............ [None]      18 - ............ [None]
             5 - ............ [None]      19 - ............ [None]
             6 - ............ [None]      20 - ............ [None]
             7 - ............ [None]      21 - ............ [None]
             8 - ............ [None]      22 - ............ [None]
             9 - ............ [None]      23 - ............ [None]
            10 - ............ [None]      24 - ............ [None]
            11 - ............ [None]      25 - ............ [None]
            12 - ............ [None]      26 - ............ [None]
            13 - ............ [None]      27 - ............ [None]
            14 - ............ [None]      28 - ............ [None]

                    Enter Channel Slot Number :
```

Figure 13. Access Module Menus Screen

```
Shelf:  1  Slot:  15          Total Access System                 03/01/05 09:29
Unacknowledged Alarms: None
                     Circuit ID:

                              HDSL2 Main Menu

                            1.  HDSL2 Unit Information
                            2.  Provisioning
                            3.  Status
                            4.  Loopbacks and Test
                            5.  Performance Monitoring
                            6.  Scratch Pad, Ckt ID
                            7.  Alarm History
                            8.  Event History
                            9.  System Status/PM Report
                           10.  Clear PM and Alarm Histories
                           11.  Troubleshooting
                           12.  Flash Upgrade




                             Selection:
```

Figure 14. Total Access 3000 H2TU-C Main Menu Screen

HDSL2 Unit Information

The Unit Information screen (**Figure 15**) provides detailed product information on each component in the HDSL2 circuit. ADTRAN Technical Support contact numbers are also available from the Unit Information screen. This screen is shown as an example of an actual HDSL2 screen.

```
Circuit ID:HNTSVLALHDSL2                                    03/01/05 09:29:45
                      Press ESC to return to previous menu

                                  ADTRAN
                             901 Explorer Boulevard
                           Huntsville, Alabama 35806-2807
--------------------- For Information or Technical Support --------------------
      Support Hours ( Normal 7am - 7pm CST, Emergency 7 days x 24 hours )
Phone: 800.726.8663 / 888.873.HDSL  Fax: 256.963.6217  Internet: www.adtran.com
-------------------------------------------------------------------------------

              ADTN H2TU-C                        ADTN H2TU-R
              P/N: 1223001L2                     P/N: 1223026L2
              S/N: FD14E3648                     S/N: 123456789
             CLEI: T1L7J2MAAA                   CLEI: T1L8MOKCAA
             Manf: 08/08/2004                   Manf: 08/01/2004
              Ver: A07                           Ver: A09
```

Figure 15. ADTRAN Information Screen

Provisioning

The Provisioning menu (**Figure 16**) displays current settings. To change a particular option setting (for example, "1" for DSX-1 Line Build Out) select the appropriate number, press ENTER, and the new menu will appear with a list of the available settings. To return to this screen and/or the Main Menu, press ESC. To re-deploy this unit, press D which will restore the factory default settings to those shown in Table 6 on page 11.

```
Circuit ID:HNTSVLALHDSL2                                  03/01/05 09:29:45
                    Press ESC to return to previous menu


                              Provisioning

                1.  DSX-1 Line Buildout     =  0-133 feet
                2.  DSX-1/DS1 Line Code     =  B8ZS
                3.  DSX-1/DS1 Framing       =  ESF
                4.  Forced Frame Conversion =  Disabled
                5.  Smartjack Loopback      =  Enabled
                6.  Loopback Timeout        =  120 Minutes
                7.  Latching Loopback Mode  =  T1 (Disabled)
                8.  DS1 TX Level            =  0 dB
                9.  Span Power              =  Enabled
               10.  Customer Loss Indicator =  AIS / CI
               11.  PRM Setting             =  AUTO
               12.  Loop Atten Alarm Thres  =  30 dB
               13.  SNR Margin Alarm Thres  =  04 dB
               14.  Remote Provisioning     =  Enabled
               15.  Shelf Alarm             =  Enabled
                D.  Restore Factory Defaults

                      Selection:
```

Figure 16. Provisioning Screen

NOTE

DSX-1 Line Build Out is set to 0-133 feet. This option is set to EXTERNAL if using a Kentrox shelf. Otherwise, the LBO option should be set to zero (0).

NOTE

Shelf Alarm option is on the DDM+ and 3192 modules only.

Total Access 3000 H2TU-C Provisioning Menu

Two screens comprise the provisioning menu for the Total Access 3000 H2TU-C. **Figure 17** illustrates the first page of the menu.

Press the N (and ENTER) to move forward to the next screen. **Figure 18** shows the remainder of the Provisioning menu.

To return to the previous screen, press P.

To return to the Main Menu, press ESC.

To re-deploy this unit, press D which restores the factory default settings to those shown in Table 6 and Table 7. The options shown in these tables are available with the H2TU-R (P/N 1223026L2). Some settings may differ when using different H2TU-Rs.

```
Shelf:  1  Slot:  14          Total Access System                03/01/05 09:29
Unacknowledged Alarms: None
                     Circuit ID:

                                Provisioning

                      1.  DSX-1 Line Buildout     =  0-133 Feet
                      2.  DSX-1/DS1 Line Code     =  B8ZS
                      3.  DSX-1/DS1 Framing       =  ESF
                      4.  Forced Frame Conversion =  Disabled
                      5.  Smartjack Loopback      =  Enabled
                      6.  Loopback Timeout        =  120 Min
                      7.  Latching Loopback Mode  =  T1 (Disabled)
                      8.  DS1 TX Level            =  0 dB
                      9.  Span Power              =  Enabled
                     10.  Customer Loss Indicator =  AIS / CI
                     11.  PRM Setting             =  AUTO
                     12.  Loop Atten Alarm Thres  =  30dB
                     13.  SNR Margin Alarm Thres  =  04dB
                     14.  Remote Provisioning     =  Enabled
                     15.  Service State           =  OOS Maintenance
                     16.  Network Source          =  DSX
                      N.  Next Page
                            Selection:
```

Figure 17. Provisioning Menu, Page 1

```
Shelf:  1  Slot:  14          Total Access System                03/01/05 09:29
Unacknowledged Alarms: None
                     Circuit ID:HntsvlALMn0103

                                Provisioning

                     17.  External Alarms         =  Disabled
                     18.  Auto In Service         =  Enabled
                     19.  Auto IS Startup Period  =  4 hours
                     20.  Auto IS Off Period      =  8 hours

                      D.  Restore Factory Defaults
                      P.  Previous Page









                               Selection:
```

Figure 18. Provisioning Menu, Page 2

Span Status

The Span Status Screen (**Figure 19**) provides quick access to status information for each HDSL2 receiver in the circuit.

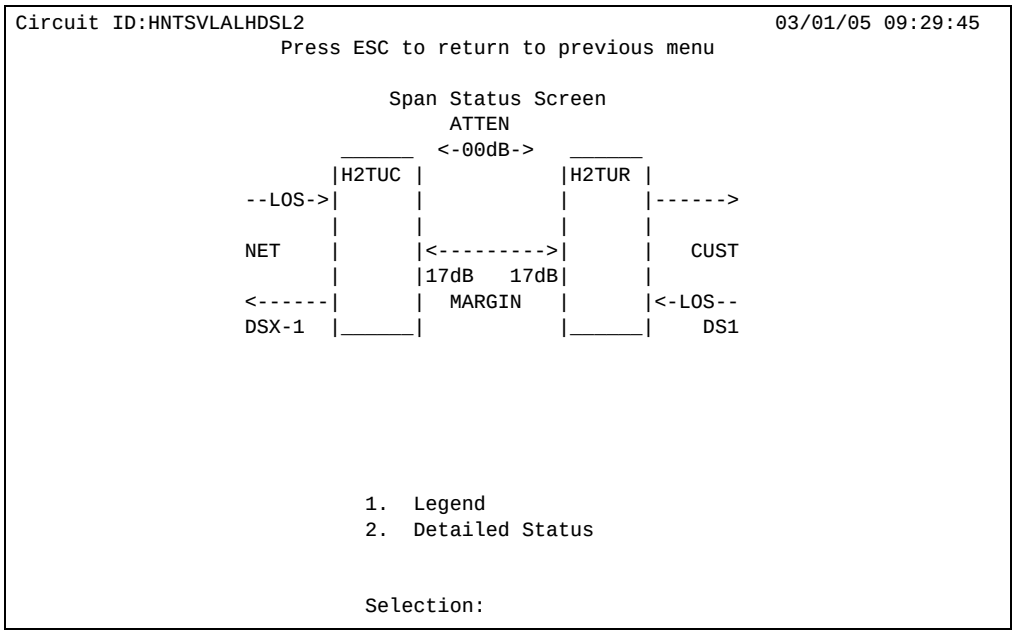


Figure 19. Span Status Screen

The Total Access 3000 Span Status Screen (**Figure 20**) includes an option to access the Auto In Service feature of Total Access 3000.

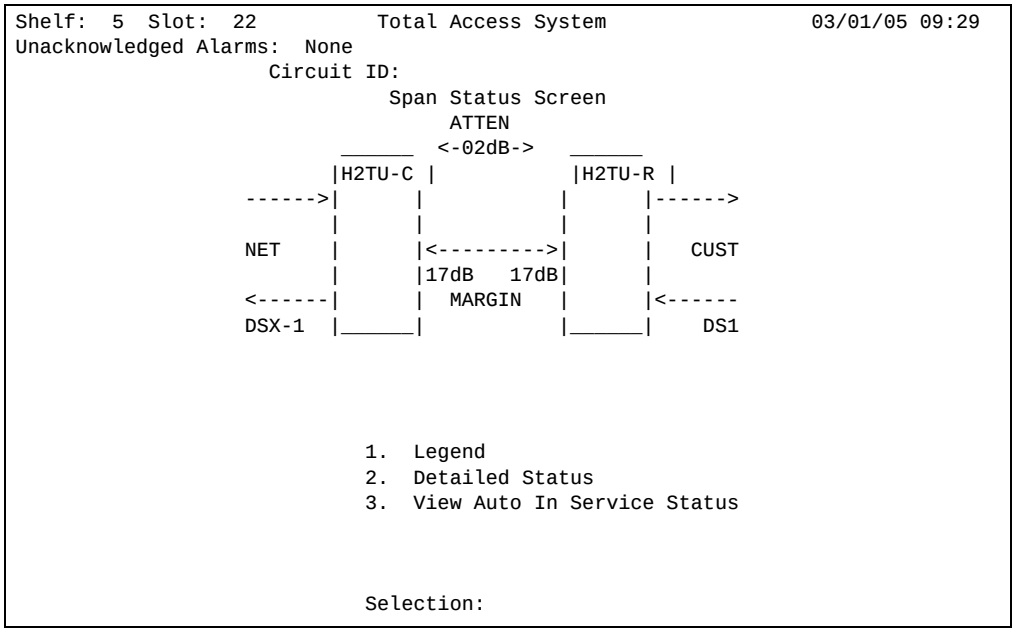


Figure 20. Span Status Screen, Total Access 3000

Status Screen Legend Screen

The Status Screen Legend (**Figure 21**) provides a description of messages used on the Status screens.

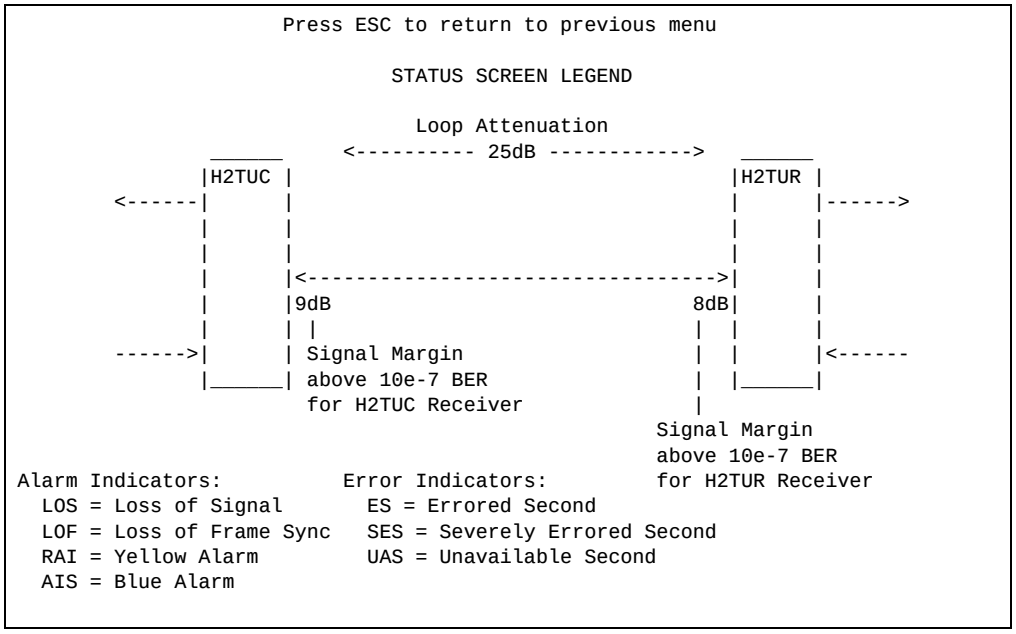


Figure 21. Status Screen Legend

Detailed Status Screen

The Detailed Status selection from the Span Status Screen menu (**Figure 22**) displays the T1 and HDSL2 status for each receiver point.

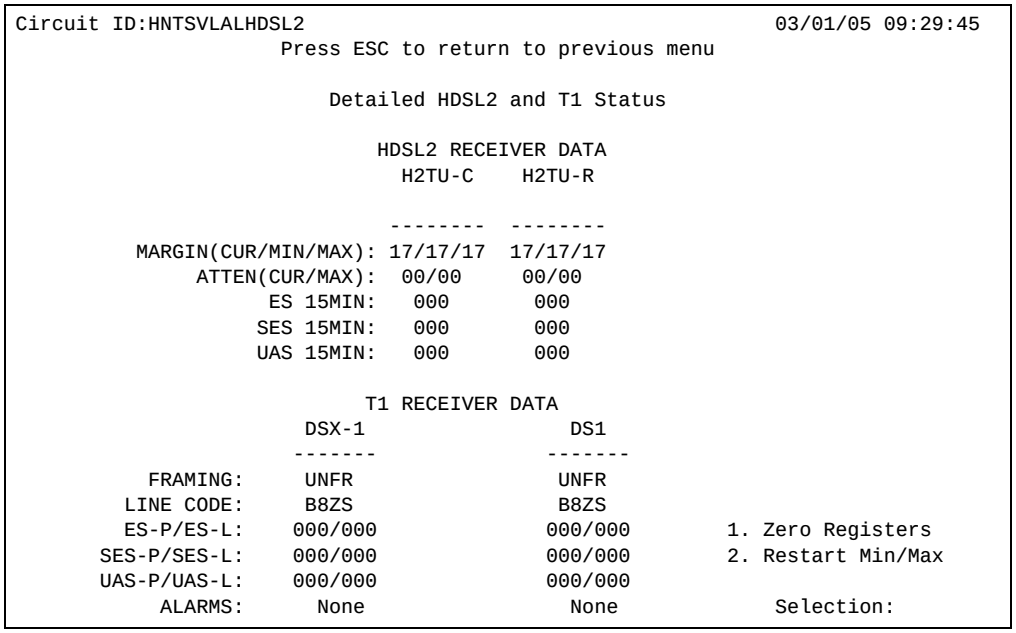


Figure 22. Detailed Status Screen

Total Access 3000 H2TU-C Auto In Service Status Screen

The Auto In Service Status Screen (**Figure 23**) provides the status of the Auto In Service feature.

The T1 alarm indications will display if the External Alarms option is enabled on the Provisioning menu (Figure 17).

The Auto In Service Status screen also indicates the startup or exit period remaining as either 1, 4, 8, or 24 hours. This is the time during which the unit monitors both loop synchronization (Loop Sync) and T1 alarms (if enabled) and will only go into (or out of) service if the circuit remains synchronized and without T1 alarms during the entire measured period. These times are also set from the Provisioning menu. System responses displayed in the status fields on this screen are shown in **Table 11** below.

A single menu option is provided to view the Alarm History Screen. This screen is also available by selecting the HDSL2 Main Menu option.

```
Shelf:  1  Slot:  15          Total Access System                 03/01/05 09:29
Unacknowledged Alarms: None
                     Circuit ID:
                         Auto In Service Status Screen

      Current Auto In Service State = Out-of-Service Maintenance
      Auto In Service Status        = Currently in Startup Period
      Auto In Service Criteria      = DSL Loop Sync (T1 alarms ignored)

            NOTE: The external alarms provisioning option determines
                  whether T1 alarms are an auto in service criterion.
                  Enabling external alarms sets T1 alarms as a criterion.

                             Criteria       Status
                           ---------------   ------
                           DSL Loop Sync      LOS


                           ---Startup Period Timer---
                            4 hrs  0 mins
--------------------------------------------------------------------------------
                             1.  View Alarm History

                             Selection:
```

Figure 23. Auto In Service Screen

Table 11. Auto In Service Status Indications

Status Field Name	System Indications
Current Auto In Service State (line 1)	In-Service Out-of-Service Maintenance
Auto In Service Status (line 2)	Currently in startup period Currently in exiting period OK, Startup Period COMPLETED OK, Startup INCOMPLETE (forced in-service)
Auto In Service Criteria (line 3)	DSL Loop Sync (T1 alarms ignored) DSL Loop Sync and absence of T1 alarms
Criteria (current status)	DSL Loop Sync = OK or LOS (LOS shown in Figure 23) T1 Alarm Status = Alarm or OK

Loopbacks and Test

The Loopback and Test Commands screen (**Figure 24**) provides the user with the ability to initiate or terminate all available HDSL2 loopbacks. Each HDSL2 circuit component can be looped toward the network or customer from this screen. Unit self tests can also be initiated from this screen. A “Loop Down ALL Units” command will be available in lieu of the “Run Self Tests” option when any loopback is active.

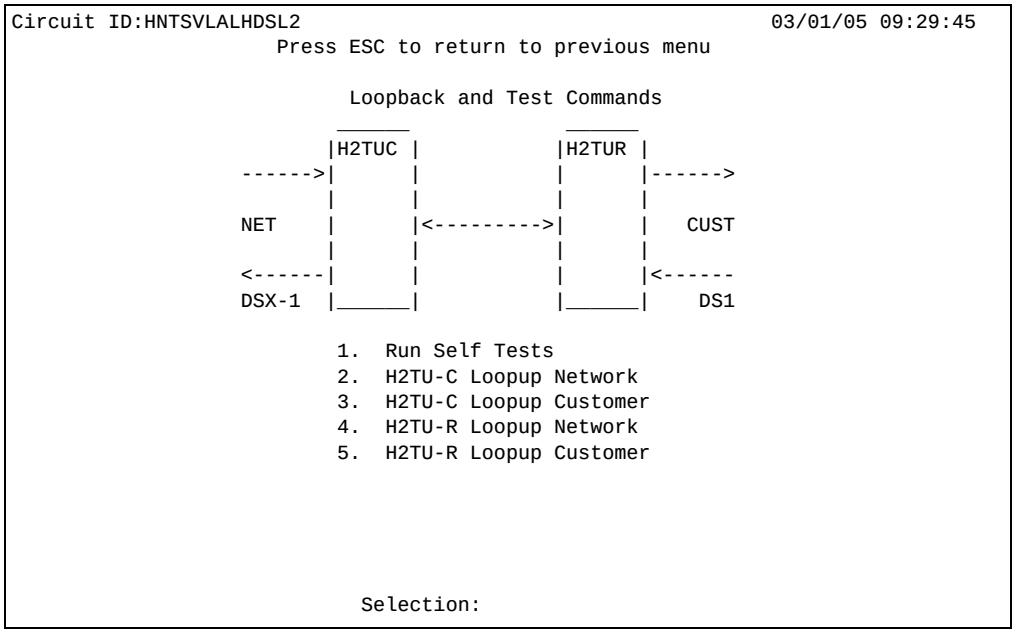


Figure 24. Loopback and Test Commands Screen

Total Access 3000 H2TU-C Loopback and Test Screen

The Total Access 3000 H2TU-C (**Figure 25**) has the following additional features:

- Equipment Jack - Select Network or Customer for testing purposes. Refer to “Appendix C, Front Panel DSX and MUX Mode Test Access” for details.
- BERT Test Functions

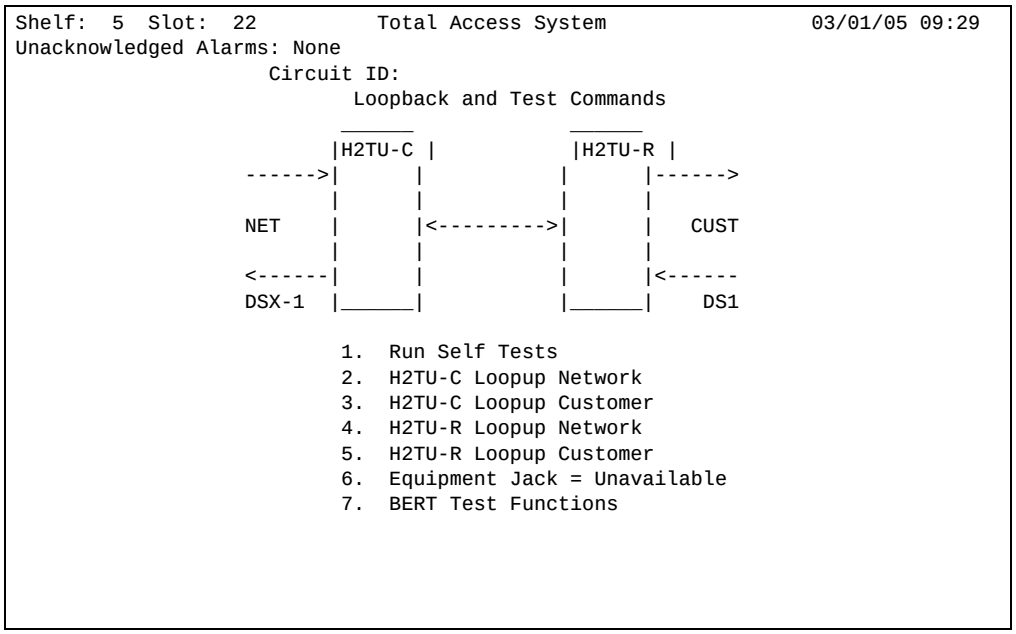


Figure 25. Total Access 3000 H2TU-C Loopback and Test Commands Screen

BERT Test Functions

The Bit Error Rate Testing (BERT) Test Screen (**Figure 26**) is accessed by selecting the associated number on the Loopback and Test menu. A five-selection menu is at the bottom of the screen. Option 1, (Re)start Pattern is used to start (or restart) a test, and option 2, Stop Test is used to manually stop the test.

NOTE

The BERT only runs unframed patterns. When the BERT is running, option 5 changes to Inject Bit Errors.

```
Shelf:  1  Slot:  18          Total Access System                 03/01/05 09:29
Unacknowledged Alarms: None
                     Circuit ID:
                                BERT Test Screen

                                  Test Results
              ------------------------------------------------
                  Test Direction:              Customer
                  Unframed Pattern Generation: OFF
                  Pattern:                     QRSS Pattern
                  Line Coding:                 B8ZS
                  Bit Errors:                  0000000
                  Bit Error Rate:              0.0E-08
                  Pattern Sync:                N/A
                  Pattern Sync Losses:         000
                  Test Length (HH:MM:SS):      02:00:00
                  Time Elapsed (HH:MM:SS):     00:55:12
              ------------------------------------------------
                              1.  (Re)start Pattern
                              2.  Stop Test
                              3.  Select Data Pattern
                              4.  Enter Test Timeout
                              5.  Toggle Test Direction
                           Selection:
```

Figure 26. BERT Test Screen

NOTE

When the BERT is started, the H2TU-R will automatically be put in loopback and the default test length of 2 hours will be initiated.

Selecting option 3, Select Data Pattern from the BERT Test Screen allows the appropriate data test pattern for the desired results to be selected. **Figure 27** shows this screen with the menu of test patterns.

```
Shelf:  1  Slot:  18          Total Access System                  03/01/05 09:29
Unacknowledged Alarms: None
                     Circuit ID:
                           CUSTOMER Pattern Screen

                             Current Pattern = QRSS Pattern
                             ------------------------------------

                             1. 63 Pattern
                             2. 511 Pattern
                             3. 2047 Pattern
                             4. REV. 2047 Pattern
                             5. 2^15 Pattern
                             6. 2^20 Pattern
                             7. QRSS Pattern
                             8. 2^23 Pattern




                          Selection:
```

Figure 27. Select Data Pattern

Option 4, Enter Test Timeout from the BERT Test Screen displays the Timeout Screen (**Figure 28**). The time out can run for a specific duration by entering the hours and/or minutes, or can run indefinitely by entering 00:00, as indicated by the note on the screen. With no test running the Toggle Test Direction option from the BERT Test Screen allows the toggling of the test signal in the opposite direction (from customer to network and vice versa).

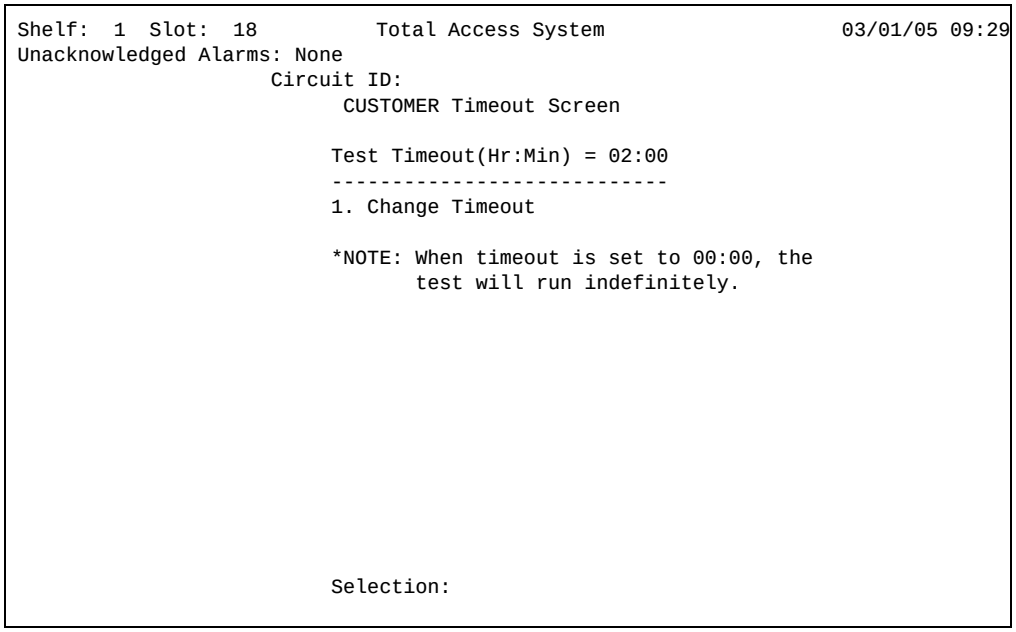


Figure 28. BERT Test Functions - Enter Test Timeout Option

When option 1, (Re)start Pattern is selected to start the test, option 5 changes to Inject Bit Errors. This option is used to display the screen shown in **Figure 29**. This allows the insertion of errors from this test origination point to validate the test results.

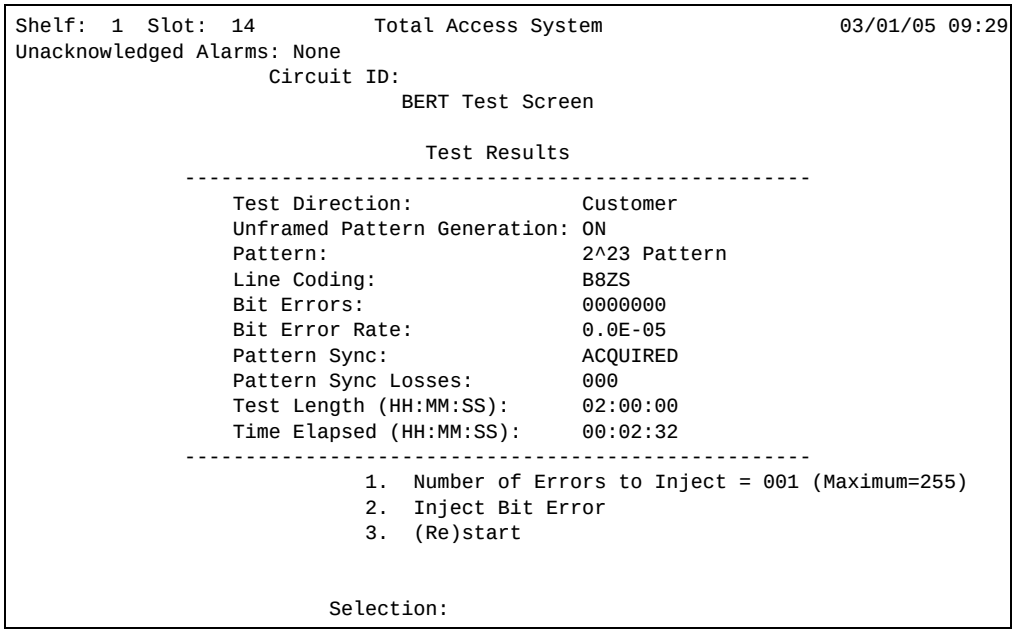


Figure 29. BERT Inject Errors Screen

Performance History

The Performance History screens (**Figure 30**) display the historical HDSL2 and T1 performance data in several different registers. At each 15-minute interval, the performance information is transferred to the previous 15-minute performance data register. This unit stores performance data in 15-minute increments for the last 24-hour period.

Additionally, some modules store up to 48 hours worth of 60-minute interval data. At each 24-hour interval, the performance data is transferred into the previous 24-hour performance data registers. The module used in this example stores up to 31 days of 24-hour interval data.

Select a module and interface to view the corresponding performance data. Line (L) and Path (P) can be viewed.

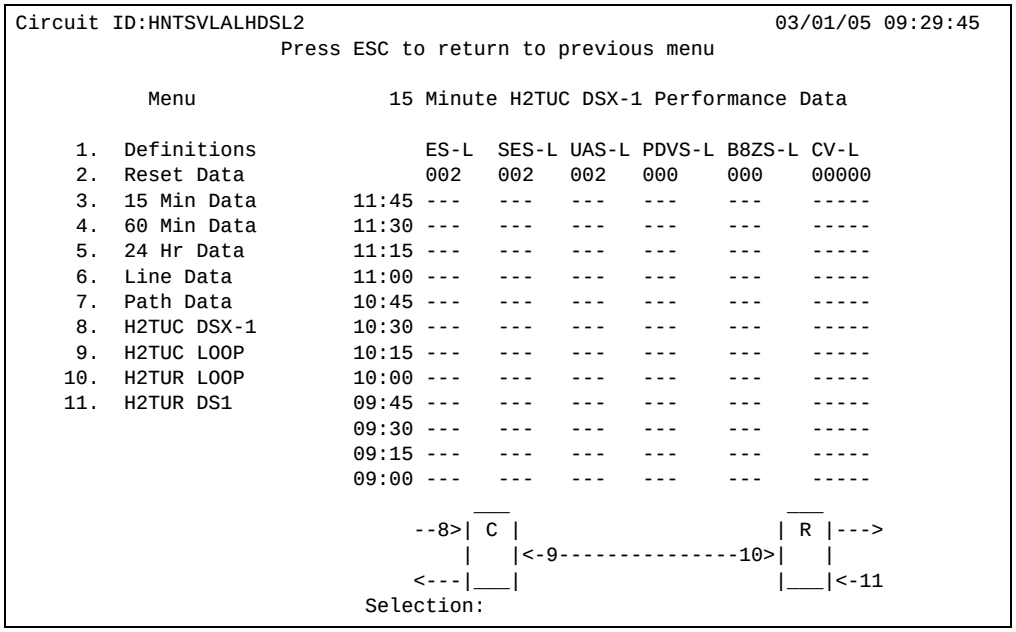


Figure 30. Performance History, 15-Minute Line Data

Abbreviations used in the Performance Data screens are defined in the Data Definitions screens (**Figure 31** and **Figure 32**).

```
Circuit ID:HNTSVLALHDSL2                                    03/01/05 09:29:45
                     Press ESC to return to previous menu

                          Performance Data Definitions

H2TUC, H2TUR, and H2R LOOP Related:     HDSL2 Framing
  ES-L    Errored Seconds                 CRC>=1 or LOSW>=1
  SES-L   Severely Errored Seconds        CRC>=50 or LOSW>=1
  UAS-L   Unavailable Seconds             >10 cont. SES-Ls

DS1 and DSX-1 Line Related:             Superframe and Extended Superframe
  ES-L    Errored Seconds                 (BPV+EXZ)>=1 or LOS>= 1
  SES-L   Severely Errored Seconds        (BPV+EXZ)>=1544 or LOS>=1
  UAS-L   Unavailable Seconds             >10 cont. SES-Ls
  PDVS-L  Pulse Density Violation Secs    EXZ>=1; >7 zeros if B8ZS, >15 if AMI
  B8ZS-L  B8ZS Seconds                    B8ZS coded signal received
  CV-L    Code Violation Count            (BPV+EXZ) count

NOTE: Reverse video indicates invalid data due to a terminal restart (or power
      cycle), a data register reset, or a system date or time change.


    N.  Next
    P.  Previous            Selection:
```

Figure 31. Performance Data Definitions, Loop

```
Circuit ID:HNTSVLALHDSL2                                    03/01/05 09:29:45
                     Press ESC to return to previous menu

                          Performance Data Definitions

DS1 and DSX-1 Path Related:           Superframe           Extended Superframe
  ES-P    Errored Seconds               FE>=1 or             CRC>=1 or
                                         SEF>=1 or AIS>=1     SEF>=1 or AIS>=1
  SES-P   Severely Errored Seconds      FE>=8 or             CRC>=320 or
                                         SEF>=1 or AIS>=1     SEF>=1 or AIS>=1
  UAS-P   Unavailable Seconds           >10 cont. SES-Ps     >10 cont. SES-Ps
  SAS-P   SEF/AIS Seconds               SEF>=1 or AIS>=1     SEF>=1 or AIS>=1
  ES-PFE  Far End Errored Seconds       n/a                  PRM bits G1-G6,SE,
                                                              or SL=1, or RAI
  CV-P    Code Violation Count          FE count             CRC error count

NOTE: Under a UAS-P condition, ES-P and SES-P counts are inhibited.
      Under a SES-L or SES-P condition, the respective CV-L or CV-P count is
      inhibited.




    P.  Previous            Selection:
```

Figure 32. Performance Data Definitions, Path

Scratch Pad, Circuit ID, Time/Date Screen

The Scratch Pad, Circuit ID, Time/Date screen (**Figure 33**) provides a logging medium for circuit information. The format for the items on this screen are as follows:

- The scratch pad is for circuit-specific notes and can hold 50 alphanumeric characters in any combination.
- The circuit ID can be any alphanumeric string up to 25 characters in length.
- The time should be entered using military time format (for example, enter 3:15 p.m. as “151500”).
- The date should be entered in the MMDDYY format (for example, enter January 02, 2003, as “010203”).

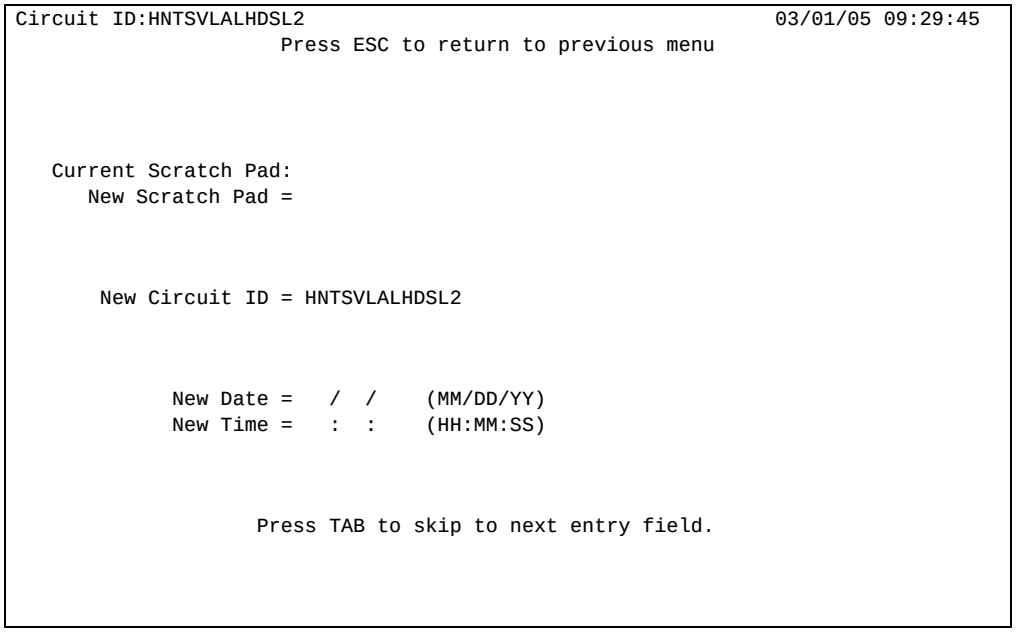


Figure 33. Scratch Pad, Circuit ID, and Date/Time Screen

Terminal Modes

The module used in this example includes two terminal emulation modes.

- Manual Update Mode - This mode is used to manually update the screens. This mode supports efficient print screen and log file utilities for storage of key provisioning parameters, alarm or performance history and current system status. The message “3 SPACES TO UPDATE” appears at the top of each screen. By pressing the spacebar three times, the screen will be refreshed and will reflect the most current circuit conditions and provisioning options.
- Real-Time Update Mode (VT100) - This mode provides real-time updating of HDSL2 circuit conditions and provisioning options as changes occur. The default mode is Real-Time Update.

The desired terminal mode can be selected from the Terminal Modes Menu, illustrated in **Figure 34**. Additionally, pressing CTRL+T while on any screen can toggle the two terminal modes.

```
Circuit ID:HNTSVLALHDSL2                                    03/01/05 09:29:45
                      Press ESC to return to previous menu
                            TERMINAL MODES MENU

    MANUAL UPDATE MODE:

    * You can print or log screens
    * No text is highlighted
    * "3 SPACES TO UPDATE" appears at the top of each screen,
       reminding you to press the spacebar 3 times to update the screen
    * There is a delay between screen changes & updates
    * After 30 min. of no interaction, a new baud rate search is begun
    * Ignores input until screen is finished printing.

    REAL-TIME UPDATE MODE:

    * Faster of the two modes
    * You cannot print screens to a log file
    * Highlighting is enabled
    * Recommended for daily operation


              Press CTRL+T to toggle update modes on any screen.
```

Figure 34. Terminal Mode Screen

NOTE

The Manual Update Mode is not available on the Total Access 3000 H2TU-C.

Alarm History

The Alarm History screens are divided into three separate screens:

- “T1 Alarm History” on page 35
- “HDSL2 Span History” on page 36
- “HDSL2 Facility Alarm History” on page 37

T1 Alarm History

The T1 Alarm History screen (**Figure 35**) displays the following information:

- DSX-1/DS1 Red Alarm
- DSX-1/DS1 Yellow Alarm
- DSX-1/DS1 Blue Alarm

```
Circuit ID:HNTSVLALHDSL2                                    03/01/05 09:29:45
                     Press ESC to return to previous menu

                              T1 Alarm History
LOCATION   ALARM       FIRST               LAST                CURRENT   COUNT
-------------------------------------------------------------------------------
H2TU-C     RED(LOS/LOF) 01/01/00  00:00:04   01/01/00  00:00:04   Alarm      002
 (DSX-1)   YELLOW(RAI)                                           OK         000
           BLUE(AIS)                                             OK         000

H2TU-R     RED(LOS/LOF) 01/01/00  00:14:05   01/01/00  00:14:05   Alarm      001
 (DS1)     YELLOW(RAI)                                           OK         000
           BLUE(AIS)                                             OK         000









-------------------------------------------------------------------------------
 1. T1 Alarm       2. HDSL2 Span    3. Facility Alarm  C. Clear T1 Alarm
                            Selection:
```

Figure 35. T1 Alarm History Screen

HDSL2 Span History

The HDSL2 Span History screen (**Figure 36**) displays the following information:

- Loss of Sync for each HDSL2 receiver
- Margin Threshold Alarm for each HDSL2 receiver
- Attenuation Threshold Alarm for each HDSL2 receiver

```
Circuit ID:HNTSVLALHDSL2                                        03/01/05 09:29:45
                     Press ESC to return to previous menu

                              HDSL2 Span History
LOCATION   ALARM       FIRST                LAST                 CURRENT   COUNT
-------------------------------------------------------------------------------
SPAN 1     LOOP HLOS                                             OK         000


H2TU-C          MRGN                                             OK         000
H2TU-R          MRGN                                             OK         000




H2TU-C          ATTN                                             OK         000
H2TU-R          ATTN                                             OK         000




-------------------------------------------------------------------------------
 1. T1 Alarm       2. HDSL2 Span    3. Facility Alarm  C. Clear HDSL2 Span
                            Selection:
```

Figure 36. HDSL2 Span History Screen

HDSL2 Facility Alarm History

The HDSL2 Facility Alarm History screen (**Figure 37**) displays the following information:

- DC Open
- Over-current (short)
- Ground fault
- Power cycle

```
Circuit ID:HNTSVLALHDSL2                                    03/01/05 09:29:45
                     Press ESC to return to previous menu

                              Facility Alarm History
LOCATION   ALARM       FIRST                LAST                 CURRENT   COUNT
-------------------------------------------------------------------------------
FACILITY DC OPEN       01/01/00  00:00:03   01/01/00  00:13:06   OK          002
FACILITY SHORT                                                   OK          000
FACILITY GROUND FAULT                                            OK          000

H2TU-C   POWER CYCLE   01/01/00  00:00:02   01/01/00  00:00:02   OK          002









-------------------------------------------------------------------------------
 1. T1 Alarm       2. HDSL2 Span    3. Facility Alarm  C. Clear Facility Alarm
                           Selection:
```

Figure 37. HDSL2 Facility Alarm History Screen

Event History

The Event History screen (**Figure 38**) provides a log history of HDSL2 circuit events. The following is a list (but not all-inclusive) of possible events:

- Circuit ID Change
- DS1 Transmit Level Option Change
- DSX/DS1 Alarm Type Active/Inactive
- DSX-1 Line Build Out Option Change
- Element Network/Customer Loop up/Loop down
- Event Log Reset
- External Alarm Blocking Change
- Framing Option Change
- H2TU-C/H2TU-R Powered Up
- HDSL/T1 PM Registers Reset
- Line Code Option Change
- Loopback Time Out Option Change
- Network Source Setting Change
- NIU Loopback Option Change
- Span Power Option Change
- Time/Date Changed From/To
- Loop Segment XX In/out of Sync
- Splice Detector Reset
- Bad Splice Detected

```
Circuit ID:HNTSVLALHDSL2                                    03/01/05 09:29:45
                    Press ESC to return to previous menu

 Num   Description of Event                      Date     Time      Source
 ------------------------------------------------------------------------

   1.  H2TU-C Powered Up                         01/01/00 00:00:01  H2TU-C
   2.  H2TU-R Powered Up                         01/01/00 00:03:08  H2TU-R
   3.  H2TU-C Powered Up                         01/01/00 00:00:01  H2TU-C
   4.  H2TU-R Powered Up                         01/01/00 00:14:03  H2TU-R
   5.  Default Options Restored                  01/01/00 00:16:23  H2TU-C
   6.  Date changed to                           06/09/04 02:18:07  H2TU-C
   7.  Time changed to                           06/09/04 11:28:00  H2TU-C
   8.  T1 PM Registers Reset                     06/09/04 11:54:37  H2TU-C
   9.  T1 PM Registers Reset                     06/09/04 11:57:09  H2TU-C



        Page Number:   1/  1   Number of Events:   9
 ------------------------------------------------------------------------
      'P' - Previous Page  'H' - Home      'R' - Reset Events
      'N' - Next Page      'E' - End

                            Selection:
```

Figure 38. Event History Screen

System PM/Screen Report

The System PM/Screen Report option (**Figure 39**) offers four types of reports on performance monitoring. Selecting a report type will display all the reports for that category on the screen at once, which is more efficient than accessing each menu individually.

```
                              6.  Scratch Pad, Ckt ID, Time/Date
                              7.  Terminal Modes
                              8.  Alarm History
                              9.  Event History
                             10.  System PM/Screen Report
                             11.  Clear PM and Alarm Histories
                             12.  Troubleshooting
                             13.  Virtual Terminal Control




                              Selection: 10


       Enable data logging now.
Select Report Type or Press Escape to cancel:
  1)  Full System/History Report
  2)  Current Status Report
  3)  System Configuration Report
  4)  Alarm/Event History
```

Figure 39. System PM/Screen Report Option

Clear PM and Alarm Histories

The Clear PM and Alarm Histories option from the HDSL2 Main Menu initializes data from performance monitoring and alarm histories. Selecting this option from the Main Menu displays the prompt shown in **Figure 40**.

```
Circuit ID:HNTSVLALHDSL2                                  03/01/05 09:29:45

                              Adtran HDSL2 Main Menu


                              1.  HDSL2 Unit Information
                              2.  Provisioning
                              3.  Span Status
                              4.  Loopbacks and Test
                              5.  Performance History
                              6.  Scratch Pad, Ckt ID, Time/Date
                              7.  Terminal Modes
                              8.  Alarm History
                              9.  Event History
                             10.  System PM/Screen Report
                             11.  Clear PM and Alarm Histories
                             12.  Troubleshooting
                             13.  Virtual Terminal Control

                  This will clear the PM, Alarm, Span Status, and
                 Troubleshooting Histories for all circuit elements.
                             Are you sure (Y/N)?

                              Selection: 11
```

Figure 40. Clear PM and Alarm Histories

Troubleshooting

The Troubleshooting screens include the new feature “Splice Detection.” This and other new features are described in more detail in “Appendix B, HDSL2 Features”.

The Troubleshooting screen (**Figure 41**) provides troubleshooting menu items at the bottom of the screen plus ADTRAN contact information. Select from the following menu options:

- “Troubleshooting Guidance” on page 41
- “General Information” on page 42
- “Chronic Circuit Guidance” on page 43

```
Circuit ID:HNTSVLALHDSL2                                    03/01/05 09:29:45
                      Press ESC to return to previous menu
                                Troubleshooting

For HELP based on detected problems, select Troubleshooting Guidance from the
list below. If further assistance is needed, contact ADTRAN Tech Support.









Hours: Normal 7am - 7pm CST                    1. Troubleshooting Guidance
       Emergency 7 days x 24 hours             2. General Information
Phone: 800.726.8663 / 888.873.HDSL             3. Chronic Circuit Guidance
  Fax: 256.963.6217

                             Selection:
```

Figure 41. Troubleshooting Screen

Troubleshooting Guidance

Selecting the option number associated with the Troubleshooting Guidance selection on the Troubleshooting screen causes an H2TU-C module to read the operational status of the circuit and return troubleshooting guidance to the probable cause of the trouble, as shown in **Figure 42**.

```
Circuit ID:HNTSVLALHDSL2                                    03/01/05 09:29:45
                      Press ESC to return to previous menu
             DSX-1 Loss of Signal(LOS) / Loss of Frame(LOF) (Red Alarm)

- Patch test set REC jack into H2TUC BRG TRANS jack to verify integrity of
signal to the H2TUC from the network (verify test set in Bridge mode).

- If signal to H2TUC is missing, insert test set at DSX panel IN Jack connecting
toward H2TUC (to verify wiring between DSX and H2TUC shelf). Check H2TUC to
verify DSX-1 LOS alarm is cleared. This verifies TX(out) and RX(in) pairs are
not swapped.

- If signal from DSX OK, verify cross-connect wiring at DSX panel is turned over
(OUT to IN) and (IN to OUT).

-If DSX wiring OK, connect test set REC to the DSX MON, network side equipment,
to verify signal from network (verify test set to MON). If no signal,
troubleshoot office problems.
```

Figure 42. Troubleshooting Guidance

NOTE

The display on the Troubleshooting screens represent a single circuit problem, based upon a hierarchy within the software. Other problems may exist.

General Information

The General Information screen (**Figure 43**), from the main Troubleshooting screen, provides a summary of the deployment guidelines necessary to provision this HDSL2 circuit.

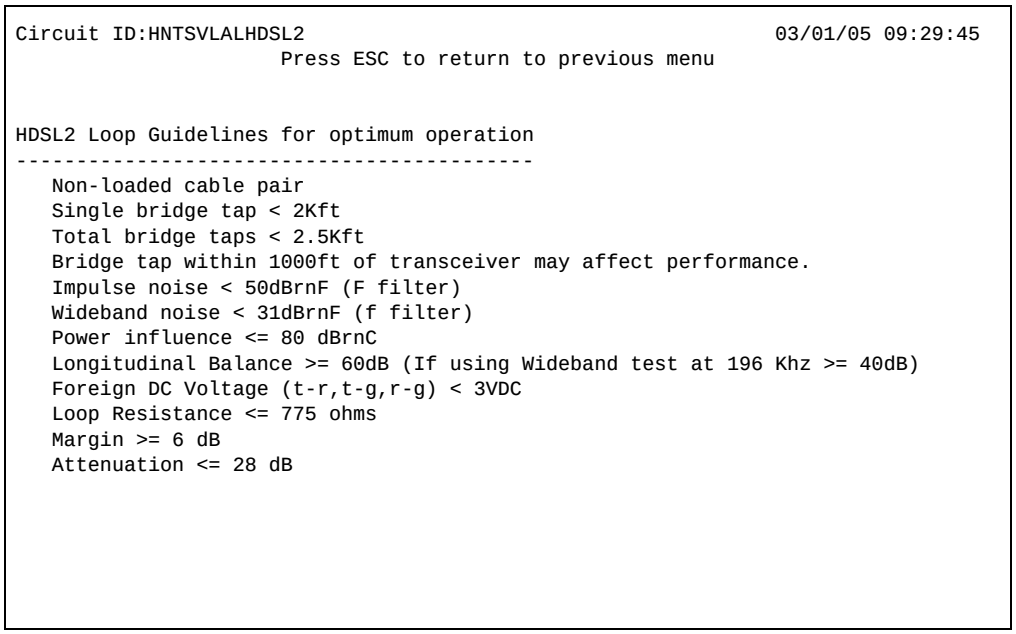


Figure 43. General Information Screen

Chronic Circuit Guidance

Selecting the Chronic Circuit Guidance option displays the Chronic Circuit Problems screen (**Figure 44**). General information about circuits with bad splices is provided as well as a menu to the Bad Splice Detection feature.

Splices that are varying in impedance will cause the HDSL data pump to see a reduced and/or fluctuating signal quality (margin). The HDSL data pump will attempt to track these changes, but when the changes become too severe, errors or loss of synchronization result. This is reflected by the symptoms described on this screen. If a circuit meets the criteria listed on the screen then the possibility of an impedance-varying splice should be considered.

```
Circuit ID:HNTSVLALHDSL2                                    03/01/05 09:29:45
                      Press ESC to return to previous menu
                             Chronic Circuit Problems

  Field experience has shown that many chronic circuit failures are due to
  bad splices. These type circuits generally have the following symptoms:

  - Wire pairs pass all electrical tests and meet deployment guidelines.
  - Large margin fluctuations will occur on the suspect pair. This can be seen
    on the Detailed Status Screen. (Min & Max margins differ by > 6 dB)
  - Pairs experience errored seconds (ES,SES,UAS) and/or loss of sync (LOS).
  - The bad splice will most severely impair the unit closest to the splice.

     This HDSL unit has the ability to test for bad splices. This detection
     should be used as a last resort after all other loop testing has been
     done. The detection is an approximation which can point the technician
     to the general area of the suspect splice.(+/- 275 ft). For best
     results, re-splice all splices close to the indicated trouble.



     1. View Splice Results
     2. View Histogram Screen
     3. Reset Splice Detector
```

Figure 44. Chronic Circuit Problems Screen

Descriptions of the menu items on this screen are provided as follows:

- “View Splice Results” on page 43
- “Splice Histogram” on page 44
- “Reset Splice Detector” on page 45

View Splice Results

The View Splice Results screen (**Figure 45**) reports one of three things for each transceiver in the Splice Detection Results column:

- NTF - No Trouble is Found on the circuit.
- LOS - Loss of Synchronization exists on the circuit (remote unit has not been detected).
- Number - A number is shown if an anomaly has been detected a number of times that exceeds the detection count threshold of eight. The number shown in this column represents the distance, in feet, from the transceiver (Reference Point) to that anomaly.

In this example, a detection has occurred approximately 250 feet from an H2TU-C module.

The (B) Back command will allow the technician to scroll back through the last 14 days Splice Detection Results.

```
Circuit ID:HNTSVLALHDSL2                                    03/01/05 09:29:45
                     Press ESC to return to previous menu

* Note: Chronic Circuit Results are only valid after all other circuit    *
* qualification tests have been performed and failed to show a trouble !! *

Splice Detector Version 1 Result Definitions:
---------------------------------------------
NTF    - No Trouble Found yet.
LOS    - Unit not in sync.
Number - Distance from Reference point (in ft.) of suspect splice.

 Reference    Splice Detection    Version              Result Shown
   Point          Results         Number                 for date
 ---------    ----------------    -------                MM/DD/YY
   H2TUC           0250             01                   --------
   H2TUR           NTF              01                   03/01/05

                                                        (B)Back
```

Figure 45. View Splice Results Screen

Splice Histogram

The Splice Histogram Screen (**Figure 46**) displays the counters that the splice detector uses to make its result decision. For HDSL2, it displays six columns. The first and fourth columns, labeled Splice (feet), represent the distance away from the respective transceiver that the anomaly detector is evaluating. Columns 2 and 5 display the counters incremented by an H2TU-C module when it detects an anomaly. Columns 3 and 6 display the counters incremented by an H2TU-R module when it detects an anomaly.

In this example, the distances shown are corresponding to an H2TU-C module since that is the transceiver that has detected the anomaly. The count of 09 in the 250 feet row under the H2TU-C column indicates that an anomaly has been seen nine times at this distance from an H2TU-C module. Since nine is larger than the count detection threshold of eight, this result is reported to the Splice Result screen. Since the H2TU-R column shows 00 for all counts in columns 3 and 6, there is no reason to change (C) the view of the distance column to show the distances an H2TU-R module is evaluating.

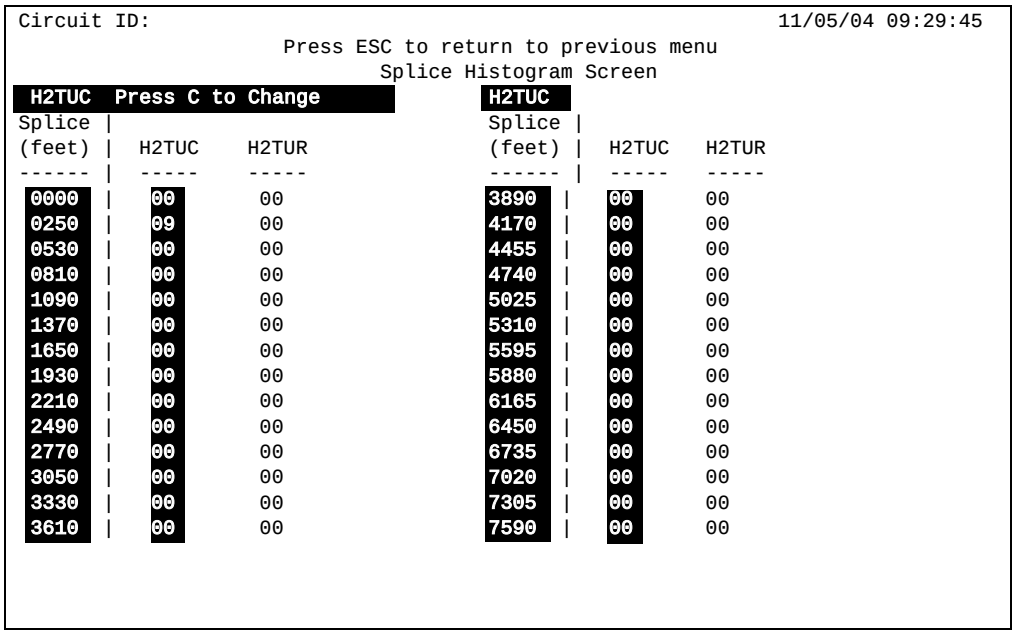


Figure 46. Histogram Screen

Reset Splice Detector

Choosing Reset Splice Detector will prompt to make sure a reset is desired. If Y (yes) is chosen the splice detector will re-initialize and start running again.

Virtual Terminal Control

The Virtual Terminal Control screen (**Figure 47**) is available on all modules except the Total Access 3000 H2TU-C. It allows control of remote unit provisioning from an H2TU-C module. Select the Log into H2TU-R option from this screen, and press ENTER to begin a user-initiated session with the remote unit. When the remote session is completed, press CTRL+X to terminate the session.

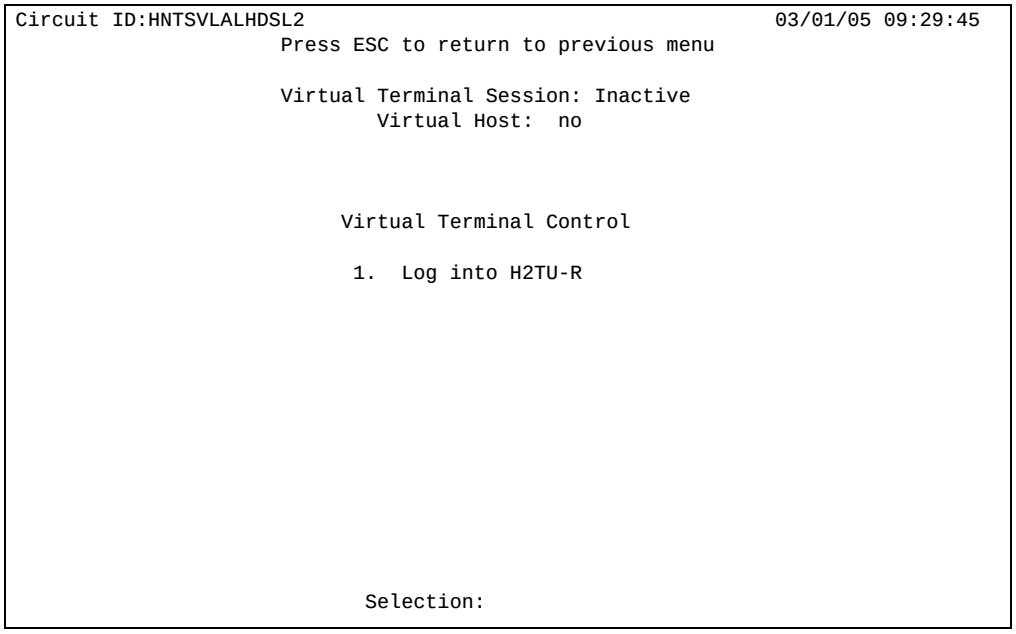


Figure 47. Virtual Terminal Control Screen

Total Access 3000 H2TU-C Flash Upgrade

Ability to download new firmware for the unit is available via the Total Access H2TU-C Flash Image screen (**Figure 48**). This feature allows the download and installation of a firmware upgrade. Any existing provisioning setting will be retained, while new provisioning items will assume the factory default settings. Prior to installing, the H2TU-C will confirm that the firmware is correct. When initiated, setup instructions will be displayed on the craft access terminal.

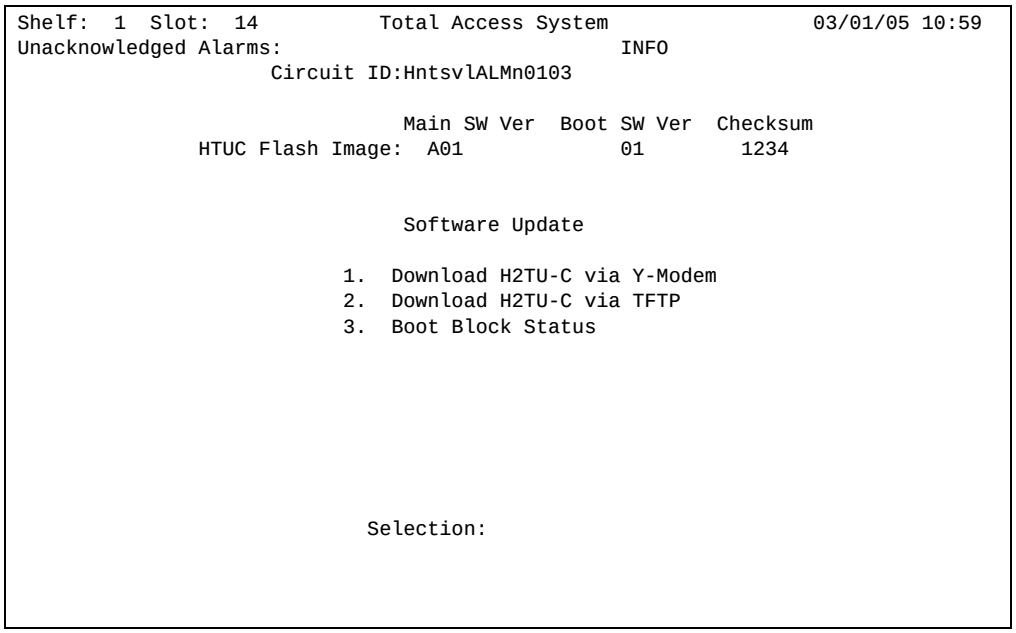


Figure 48. Total Access 3000 H2TU-C Flash Image Screen

The Download H2TU-C via Y-Modem menu (**Figure 49**) allows the user to initiate a Y-Modem file transfer from the computer connected to the SCU craft access port to the H2TU-C. This file is transferred to the SCU and downloaded to the H2TU-C at the SCU craft port baud rate; therefore, a higher-speed connection to the SCU is recommended (typically 115200 baud) to reduce file download times. At 115200 baud, a typical flash download to the H2TU-C will take less than 3 minutes.

NOTE

The file downloaded to the H2TU-C via the SCU should be of the ".bin" file type only and will be provided for feature enhancements and additions.

```
Shelf:  1  Slot:  14          Total Access System                03/01/05 10:59
Unacknowledged Alarms:                              INFO
                     Circuit ID:HntsvlALMn0103



                            Download H2TU-C via Y-Modem

      This utility programs the H2TUC.  The VT100 terminal emulation
      program used must support Y-Modem file transfers and have access to
      the software binary file (*.bin).



                                1.  Start Transfer
                                2.  Abort









                               Selection:
```

Figure 49. Download H2TU-C via Y-Modem Menu

Figure 50 illustrates a Flash upgrade session in progress.

```
Shelf:  1  Slot:  14          Total Access System                03/01/05 10:59
Unacknowledged Alarms:          MAJOR             INFO
                     Circuit ID:




      ...Requesting SCU maintenance channel for Flash Upgrade process


Setup Instructions:

[Note: Your terminal program may differ slightly]
1. Select “Send File” from Transfer options.
2. Set “Transfer Protocol” to the following:
   Xmodem(CRC) or Ymodem
3. Select appropriate binary file (*.BIN) to upload.
4. Upload File.

[Note:  The screen will start displaying C's - this is normal.]
=CCCC
```

Figure 50. Flash Upgrade, Y-Modem in Progress

The Download H2TUC via TFTP menu (**Figure 51**) is utilized to perform a TFTP file transfer from a remotely located computer/server to the H2TU-C. During TFTP transfers, the SCU continues to act as an intermediary to receive the file data from the remote computer and then send it to the H2TU-C unit. Before initiating a TFTP transfer from the menu screen, first enter the TFTP remote filename that is listed on H2TU-C TFTP menu (option 1). The IP address of the remotely located computer must also be set from the network management menu on the SCU (note: this is an SCU menu option and not an H2TU-C menu option).

In addition, the Ethernet interface of the SCU must also be provisioned properly for TFTP transfers. The Ethernet interface settings allow the SCU to communicate properly over the Ethernet network in which it is installed. Without setting these items up properly, neither Telnet sessions nor remote TFTP file transfers will be available.

Refer to the appropriate SCU Installation and Maintenance Practice for details on Ethernet settings.

Once the H2TU-C and SCU have been provisioned properly for the TFTP file transfer, select option 2 from the H2TU-C TFTP file transfer menu screen to initiate the TFTP file transfer from the remotely located computer to the H2TU-C. TFTP file transfers are typically faster than Y-Modem transfers. Once the SCU receives the file from the remote computer, the file is sent from the SCU to the H2TU-C to be downloaded (typically less than 2 minutes).

TFTP transfers can also be initiated remotely using SNMP – totally eliminating the need to be at the Total Access 3000 shelf to update the H2TU-C.

```
Shelf:  1  Slot:  14          Total Access System                 03/01/05 10:59
Unacknowledged Alarms:                                INFO
                     Circuit ID:HntsvlALMn0103



                              Download H2TUC via TFTP

     This utility programs the H2TUC.  You must set the SCU to the IP
     address of the TFTP server that has the firmware binary file (*.bin).



                  1.  Remote Filename = 1181113L2_a01.bin
                  2.  Start Transfer
                  3.  Abort









                             Selection:
```

Figure 51. Download H2TU-C via TFTP

Boot Block

The Boot Block Status screen (**Figure 52**) provides the status of the Boot Block sector, which in rare cases can become locked. If locked, the bootcode cannot be upgraded by future firmware upgrades. The bootcode is seldom changed with new download code.

The bootcode is the small piece of code that allows firmware upgrades on the H4TU-C unit. If the bootcode becomes corrupted, the H4TU-C will require factory service to restore it to a functional state.

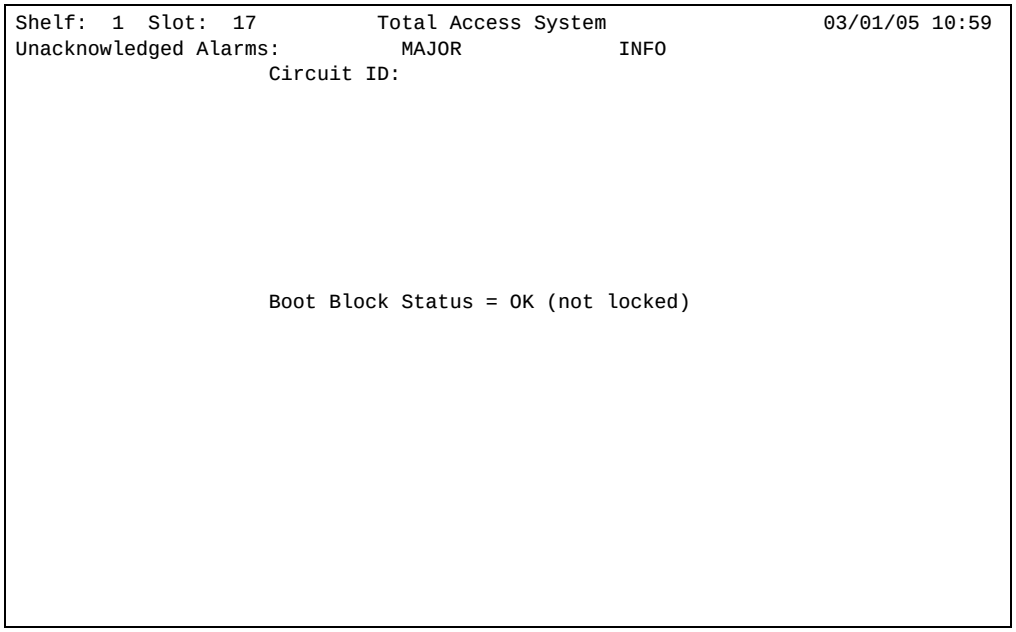


Figure 52. Boot Block Status Screen

HDSL2 DEPLOYMENT GUIDELINES

The ADTRAN HDSL2 system is designed to provide DS1 based services over loops designed to comply with carrier service area (CSA) guidelines. CSA deployment guidelines are given below:

- All loops are nonloaded only.
- For loops with 26-AWG cable, the maximum loop length including bridged tap lengths is 9 kilofeet.
- For loops with 24-AWG cable, the maximum loop length including bridged tap lengths is 12 kilofeet.
- Any single bridged tap is limited to 2 kilofeet.
- Total bridged tap length is limited to 2.5 kilofeet.
- The total length of multigauge cable containing 26-AWG cable must not exceed the results obtained in the following formula:

  $12–[(3*L_{26}) / (9–L_{BTAP})]$ (in kilofeet)

  where L_{26} = Total length of 26-AWG cable excluding bridged taps (in kilofeet)

  and where L_{BTAP} = Total length of all bridged taps (in kilofeet)

These deployment criteria are summarized in the chart shown in **Figure 53**.

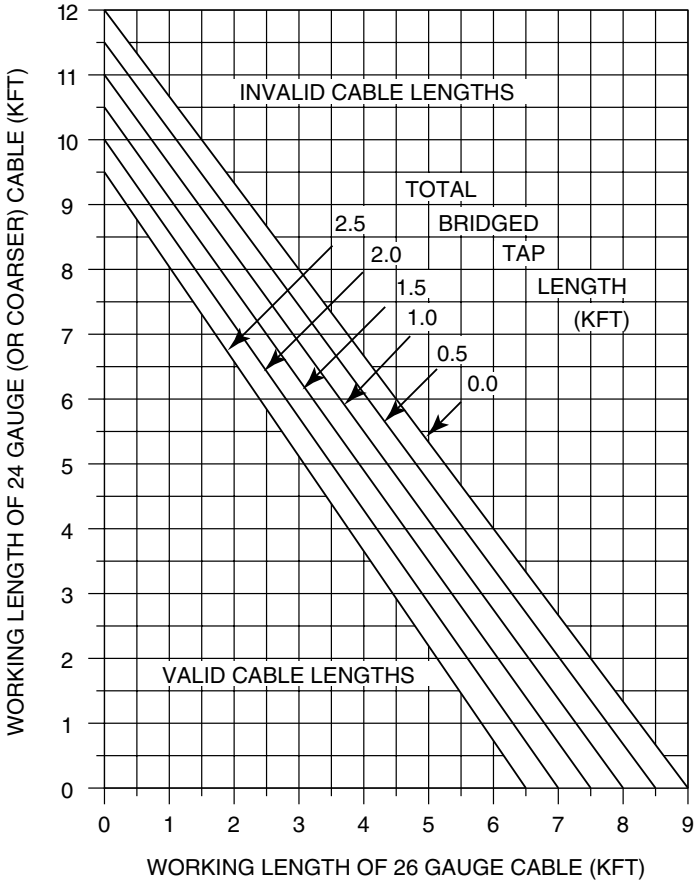


Figure 53. HDSL2 Deployment Guidelines

Loop loss per kilofoot for standard wire gauges is summarized in **Table 12**.

Table 12. HDSL2 Loss Values

Cable Gauge	Cable Type	Temperature 68°F	90°F	120°F
26	PIC	3.902	4.051	4.253
26	Pulp	4.030	4.179	4.381
24	PIC	2.863	2.957	3.083
24	Pulp	3.159	3.257	3.391
22	PIC	2.198	2.255	2.333
22	Pulp	2.483	2.545	2.629
19	PIC	1.551	1.587	1.634
19	Pulp	1.817	1.856	1.909

An approximation for the maximum amount of wideband noise as measured using an F filter on an HDSL2 loop having 35 dB loss is < –47 dBrnF.

An approximation for the maximum level of impulse noise as measured using an F filter on an HDSL2 loop having 35 dB loss is ≤ –38 dBrnF.

For additional information on these and other deployment issues, refer to *Supplemental Deployment Information for HDSL, HDSL2, and HDSL4 (HDSLx),* document number 61221HDSLL1-10.

NOTE

These approximations are to be used as guidelines only and may vary slightly on different loops. Adhering to the guidelines should produce performance in excess of 10^{-7} BER.

MAINTENANCE

The HDSL2 products detailed in this document do not require routine maintenance. In case of equipment malfunction, use the front panel bantam jack connectors to isolate the source of the problem.

ADTRAN does not recommend that repairs be performed in the field. Repair services may be obtained by returning the defective unit to ADTRAN. For more information, refer to “Appendix D, Warranty”.

TROUBLESHOOTING

Table 13 provides a H2TU-C troubleshooting guide to assist in problem resolution.

Table 13. H2TU-C Troubleshooting Guidelines

Condition	Solution
All front panel indicators are *off*.	1. Verify that –48 VDC power is properly connected to the shelf. 2. Inspect the fuse and verify that it is not blown. 3. Insert the H2TU-C into a slot known to be in good working condition, and check the LED indicators. 4. If steps 1 and 2 pass, but step 3 fails, replace the H2TU-C.
DSL LED is solid Red.	Loop has poor signal quality or loss of sync. Basic troubleshooting procedures should identify a problem with the cable pair.
DSX/DS1 LED is solid Red.	Errors are being taken on the DSX-1, DS1 or HDSL2 loop. The craft interface will identify the source. BERT tests toward the appropriate loopbacks should also reveal the source of the problem.
ALM LED is solid Red.	Loss of DSX-1 signal to the unit.
ALM LED is Yellow.	If customer equipment is not installed, initiate an H2TU-R to Network Loopback and perform a BERT test. If this test fails, or the craft interface indicates a loss of sync, then there is a potential problem with the cable pair that should be identified through basic troubleshooting procedures.

Table 14 provides an H2TU-R troubleshooting guide to assist in problem resolution.

Table 14. H2TU-R Troubleshooting Guidelines

Condition	Solution
All front panel indicators are *off*.	1. Make sure the H2TU-R is properly seated in the housing. 2. Check powering voltage: • For Span Powered unit (1223026L2) verify that the H2TU-C is delivering sufficient simplex voltage to the loop. • For Local Powered unit (1223024L2) verify that –48 VDC is properly connected. 3. If steps 1 and 2 pass, replace the H2TU-R.
Power is present and adequate, but loop sync is not available (**DSL** LED is *off*).	1. Verify that the loop conforms with CSA guidelines (not too long, etc.). For more information, refer to "HDSL2 Deployment Guidelines". 2. Verify that loop loss at 196 kHz is not greater than 35 dB. 3. Verify that noise on the HDSL2 loop is within acceptable limits. 4. If steps 1 through 3 pass and loop sync is still not available, replace unit.

SPECIFICATIONS

Table 15 lists the product specifications for each H2TU-C included in this practice.

Table 15. H2TU-C Product Specifications

Specification	Description
Loop Interface	
Modulation Type:	16-TC PAM
Mode:	Full Duplex, Partially Overlapped, Echo Canceling
Number of Pairs:	1
Bit Rate:	1.552 Mbps
Baud Rate:	517.333 kbaud
Service Range:	Defined by Carrier Service Area Guidelines
Loop Loss:	35 dB maximum @ 196 kHz
Bridged Taps:	Single Taps < 2 kilofeet, Total Taps < 2.5 kilofeet
Performance:	Compliant with T1.418-2002 (HDSL2 Standard)
H2TU-C Tx Pwr (Data) Level:	16.6 ± 0.5 dBm (0 to 450 kHz)
H2TU-C Tx Pwr (Activation) Level:	16.3 ± 0.5 dBm (0 to 450 kHz)
Input Impedance:	135 ohms
Maximum Loop Resistance:	775 ohms per span
Return Loss:	12 dB (50 kHz to 200 kHz)
Network Interface	
DSX-1 Line Build Out:	0-133 feet (default) 133-266 feet 266-399 feet 399-533 feet 533-655 feet
DS1 Line Coding:	AMI, B8ZS (default)
DS1 Framing Format:	Auto, Unframed (default)
Power Tested with the ADTRAN H2TU-R (1223026L2)	
Total Power:	–48 VDC @ 160 mA with an H2TU-R module
H2TU-C Power Dissipation:	4.0 watts with an H2TU-R module
Span Power:	–190 VDC (Internally Generated); Class A2 compliant; current limited at 150 mA
Fusing:	1.00 amp (on-board; not field-replaceable)
Clock	
Clock Sources:	DSX-1 Derived (with HDSL2 frame bit stuffing)
Internal Clock Accuracy:	± 25 ppm (exceeds Stratum 4); meets T1.101 timing requirements

Table 15. H2TU-C Product Specifications (Continued)

Specification	Description
Tests	
Diagnostics:	Self-Test Local Loopback (H2TU-C) Remote Loopback (H2TU-R)
Physical	
Dimensions: Total Access 3000 H2TU-C	5.35 in. high × 0.69 in. wide × 10.2 in. deep
220 H2TU-C:	6.00 in. high × 1.40 in. wide × 10.00 in. deep
DDM+ H2TU-C:	4.00 in. high × 0.69 in. wide × 10.13 in. deep
3192 H2TU-C:	4.75 in. high × 0.69 in. wide × 10.13 in. deep
Weight:	Less than 1 pound
Environment	
Temperature, Operating:	–40°C to +70°C;
Temperature, Storage:	–40°C to +85°C
Relative Humidity:	Up to 95% noncondensing
Compliance	
NRTL Listed to the applicable UL standards Bellcore NEBS Level 3 (SR-3580) FCC 47CFR Part 15, Class A	
Part Number	
Total Access 3000 H2TU-C:	1181113L2
220 H2TU-C:	1223001L2
DDM+ H2TU-C:	1223003L2
3192 H2TU-C:	1223004L2
3192M H2TU-C:	1223004L12

Table 16 lists the product specifications for each H2TU-R included in this practice.

Table 16. H2TU-R Product Specifications

Specification	Description
Loop Interface	
Modulation Type:	16-TC PAM
Mode:	Full Duplex, Partially Overlapped, Echo Canceling
Number of Pairs:	1
Bit Rate:	1.552 Mbps
Baud Rate:	517.333 kbaud
Service Range:	Defined by Carrier Service Area Guidelines
Loop Loss:	Refer to the "HDSL2 Deployment Guidelines" section.
Bridged Taps:	Single Taps < 2 kilofeet, Total Taps < 2.5 kilofeet
Performance:	Compliant with T1.418-2002 (HDSL2 Standard)
H2TU-C Tx Pwr (Data) Level:	16.8 ± 0.5 dBm (0 to 450 kHz)
H2TU-C Tx Pwr (Activation) Level:	16.3 ± 0.5 dBm (0 to 450 kHz)
Input Impedance:	135 ohms
Maximum Loop Resistance:	775 ohms per span
Return Loss:	12 dB (50 kHz to 200 kHz)
Network Interface	
DS1 Output Level:	0 dB, –7.5 dB, –15 dB
DS1 Signal Input Level:	0 to –22.5 dB
DS1 Line Coding:	AMI, B8ZS (default)
DS1 Framing Format:	SF, ESF (default), Auto, Unframed
Power Tested with the ADTRAN H2TU-C (1223001L2)	
1223024L2 Local Power:	–24 to –48 VDC
1223026L2 Span Power:	Powered by an H2TU-C module at –190 VDC; Class A2 compliant; current limited at 150 mA
H2TU-R Maximum Heat Dissipation:	3.0 watts
Fusing:	1.00 amp (on-board; not field-replaceable)
Clock	
Clock Sources:	HDSL2 loop derived
Internal Clock Accuracy:	± 25 ppm (exceeds Stratum 4); meets T1.101 timing requirements

Table 16. H2TU-R Product Specifications (Continued)

Specification	Description
Tests	
Diagnostics:	Self Test Loopback (H2TU-R) initiated with T1 NIU in-band codes Loopback (H2TU-R) initiated with H2TU-C command Loopback (H2TU-R) initiated manually Loopback (H2TU-R) initiated from H2TU-R control port
Physical	
Dimensions: T200 H2TU-R:	Height: 5.50 inches Width: 0.69 inch Depth: 6.00 inches
Weight:	Less than 1 pound
Environment	
Temperature, Operating:	–40°C to +70°C;
Temperature, Storage:	–40°C to +85°C
Relative Humidity:	Up to 95% noncondensing
Compliance	
NRTL Listed to the applicable UL standards Bellcore NEBS Level 3 (SR-3580) FCC 47CFR Part 15, Class A	
Part Number	
1223024L2:	T200 H2TU-R, Local Powered
1223026L2:	T200 H2TU-R, Span Powered

Appendix A
HDSL2 Loopbacks

HDSL2 LOOPBACK AND CONTROL CODES

This appendix describes the operation of the HDSL2 system in detection of inband and ESF facility data link loopback codes.

Upon deactivation of a loopback, the HDSL2 system will synchronize automatically.

Loopback Process Description

In general, the loopback process for the HDSL2 system elements is modeled on the corresponding DS1 system process. Specifically, the H2TUC loopback is similar to an Intelligent Office Repeater loopback and the H2TU-R loopbacks are similar to an in-line T1 Repeater loopback.

In-band control code sequences are transmitted over the DS1 link by either the *unframed* or *overwrite* method. The HDSL2 elements respond to either method.

The unframed method produces periodic control sequences and the normal DS1 framing bit is omitted.

The overwrite method produces periodic control sequences. However, once per frame, the framing bit overwrites one of the bits in the control sequence.

The unit can detect the loopback activation or deactivation code sequence *only* if an error rate of $1E^{-03}$ or better is present.

DDS Latching Loopback Operation

If the unit is optioned for FT1 mode, then DDS Latching Loopback operation is supported as described in Bellcore TA-TSY-000077, Issue 3, Section 5.1.3. The H2TU-C in the HDSL2 circuit is treated as an Identical Tandem Dataport, and the H2TU-R is treated as a Different Tandem Dataport. The H2TU-R will establish a network loopback upon detection of standard DDS NI-NEI/RPTR loopback sequence.

Loopback Control Codes

A summary of control sequences is given in **Table A-1** and **Table A-2**.

NOTE

In all control code sequences presented, the inband codes are shown leftmost bit transmitted first, and the ESF data link codes with rightmost bit transmitted first.

Table A-1. HDSL2 Loopback Control Codes

Type	Source *	Code	Name
Abbreviated	(N)	3in7 (1110000)	Loopback data from network toward network in the H2TU-R
	(N)	4in7 (1111000)	Loopback data from network toward network in the H2TU-C
	(C)	5in7 (1111100)	Loopback data from customer toward customer in the H2TU-R
	(C)	6in7 (1111110)	Loopback data from customer toward customer in the H2TU-C
Wescom	(N)	FF1E (1111 1111 0001 1110)	Loopback data from network toward network at H2TU-C
	(C)	3F1E (0011 1111 0001 1110)	Loopback data from customer toward customer at H2TU-C
	(N)	FF02 (1111 1111 0000 0010)	Loopback data from network toward network at H2TU-R
	(C)	3F02 (0011 1111 0000 0010)	Loopback data from customer toward customer at H2TU-R
	(N)	FF48 (ESF-DL) (1111 1111 0100 1000)	Loopback data from network toward network at H2TU-R
	(N/C)	1in3 (100)	Loop down everything
	(N/C)	FF24 (ESF-DL) (1111 1111 0010 0100)	Loop down everything

* The Source column indicates from which side of the interface the control codes are sent. For example, an (N) indicates a network sourced code while a (C) indicates a customer sourced code.

Note: All codes are in-band unless labeled ESF-DL.

Note: All codes listed above must be sent for a minimum of 5 seconds in order for them to be detected and acted upon.

Table A-2. In-Band Addressable Loopback Codes

(All codes listed below must be sent for a minimum of 5 seconds in order for them to be detected and acted upon.)

Function	Code	Source	Code and Response
Arm	11000 (2-in-5 pattern)	(N)	If the pattern is sent from the network, the units arm, and the H2TU-R loops back if Smartjack Loopback is enabled.
Disarm	11100 (3-in-5 pattern)	(N/C)	The H2TU-C is removed from the armed state. Any units in loopback when the 11100 pattern is received loop down. The **LBK** LEDs *extinguish* on all units.
H2TU-C Network Loopback	D3D3 (1101 0011 1101 0011)	(N)	If the units have been armed and no units are in loopback, the H2TU-C loops back toward the network, 2 seconds of AIS (all ones) are sent, 5 seconds of data pass, and then 231 bit errors are injected into the DSX-1 signal. As long as the pattern continues to be sent, 231 errors are injected every 20 seconds. When the pattern is removed, the unit remains in loopback. If the pattern is reinstated, the injection of 231 bit errors resumes at 20-second intervals. If Smartjack Loopback is enabled, then the H2TU-R can be in network loopback when the H2TU-C loop-up codes are sent.
HRE Network Loopback	C741 (1100 0111 0100 0001)	(N)	If an HRE is present, the units have been armed, the HRE loops back towards the network, 2 seconds of AIS (all 1s) are sent, 5 seconds of data pass, and then 10 bit errors will be injected into the DSX-1 signal. As long as the pattern continues to be sent, 10 bit errors are injected every 20 seconds. When the pattern is removed, the unit remains in loopback. If the pattern is reinstated, the injection of 10 bit errors resumes at 20-second intervals.
H2TU-R Loopback	C742 (1100 0111 0100 0010)	(N)	When set from the network, an HTU-R network loopback is activated and a 20-bit error confirmation is sent every 10 seconds.
Loop Down	9393 (1001 0011 1001 0011)	(N)	When sent from the network, all units currently in loopback loop down. Armed units do not disarm. In order to behave like a smartjack, the H2TU-R does loop down from a network loopback in response to the 9393 pattern, if Smartjack Loopback is enabled.

Table A-2. In-Band Addressable Loopback Codes (Continued)

(All codes listed below must be sent for a minimum of 5 seconds in order for them to be detected and acted upon.)

Function	Code	Source	Code and Response
Loopback Query	D5D5 (1101 0101 1101 0101)	(N)	If unit is in loopback towards pattern, errors are periodically injected toward pattern as long as pattern is present. H2TU-C 231 Errors every 20 seconds HRE 10 Errors every 20 seconds. H2TU-R 20 Errors every 10 seconds.
Loopback Time Out Override	D5D6 (1101 0101 1101 0110)	(N)	If the units are armed and this pattern is sent, the loopback time out is disabled. The time out option is updated on the Provisioning menu of the H2TU-R to “None” (viewable through the RS-232 port). As long as the units remain armed, the time out remains disabled. When the units are disarmed, the loopback time out returns to the value it had before the D5D6 code was sent. As long as the pattern continues to be sent, errors are injected again every 20 seconds as follows: H2TU-C 231 errors H2TU-R 20 errors
Span Power Disable	6767 (0110 0111 0110 0111)	(N)	If the units are armed and this pattern is sent, the H2TU-C deactivates the span power supply, turning off the H2TU-R. As long as the pattern continues to be sent, the span power supply remains disabled. When the pattern is no longer being sent, the H2TU-C reactivates the span power supply, turning the remote unit(s) on. All units retrain and return to the disarmed and unlooped state.

Appendix B
HDSL2 Features

HDSL NEW ENHANCED FEATURE OVERVIEW

The new HDSL2 and HDSL4 products contain new features to enhance their performance and help the customer reduce down time. The following features are described in this appendix:

TScan

This unit is equipped to support the TScan™ feature, which provides data retrieval and diagnostic capabilities for remote management of DS1 circuits. TScan allows provisioning, performance, and event history information to be retrieved by the test center via the Facility Data Link (FDL). In addition, TScan can be used to determine the nature and location of faults on DS1 trouble circuits. TScan is accessible only through the remote test center.

TScan is a patent-pending, single-ended, diagnostic routine residing on a host server at the central test facility that issues commands and retrieves data via FDL from the H2TU-C.

TScan performs the following functions (see **Figure B-1**):

- Detection and location of an open on one or both conductors
- Detection and location of a short between Tip and Ring
- Detection and location of a ground fault from either or both conductors
- Detection of foreign voltage
- H2TU-C Self Diagnostics
- Remote detection of the presence or absence of a ground connection in the remote mount

Use TScan to integrate these capabilities across multiple computing platforms with existing operating systems.

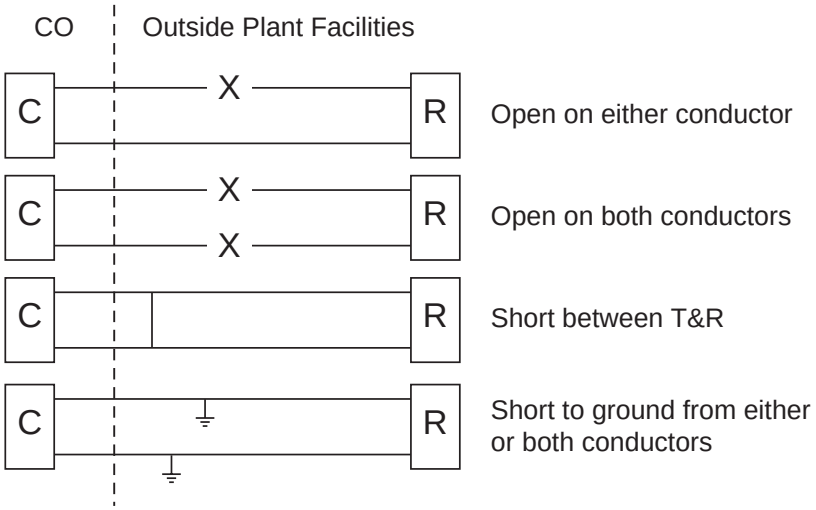


Figure B-1. TScan Diagnostic Capabilities

NOTE

For implementation of **TScan** please contact an ADTRAN sales representative.

Splice Detection Feature

Runtime TScan 2.0™ splice detection feature is an ADTRAN proprietary non-intrusive algorithm for detection of anomalies (bad splices) in the copper pair.

Data transmission transceivers (especially echo-cancelled technologies) are subject to performance degradations and errors in the presence of bad splices. A splice may be benign for a period of time, allowing a circuit to behave appropriately for portions of the day. However, over time the splice will oxidize and incur small, rapid changes in impedance. This inconsistency in behavior makes the problem difficult to locate. Additionally, an impedance change that is large enough to cause the transceiver trouble may still be small enough to be undetected by test equipment utilized on the copper pairs. Therefore a non-intrusive method of identifying these bad splices has been developed to aid the customer in troubleshooting their distribution plant.

NOTE

The Splice Detection Feature is included with this product as an aid to troubleshooting. Due to inconsistency in environmental conditions and their effect on telecommunications plant, ADTRAN cannot guarantee the accuracy of the measurements. Comparison to existing engineering drawings should provide exact locations of suspect splices indicated by ADTRAN algorithms.

The support mechanisms for this feature can logically be divided into the following six segments:

- Splice Detection Algorithm
- Screen Support
- EOC Support
- FDL Support
- EEPROM Support
- Event Support

These support mechanisms are described in the following subsections.

Splice Detection Algorithm

The splice detection algorithm is designed to detect bad splices in training mode and data mode. The training mode detection is important if the splice is bad enough to prevent synchronization. In data mode, the detector will run periodically after synchronization is achieved. The HDSL2/HDSL4 transceiver monitors the loop for impedance changes that are of a magnitude to cause the received signal of the transceiver to be degraded. When a significant impedance change is detected by the transceiver, the approximate distance from that transceiver to the anomaly is recorded on the Splice Histogram screen by incrementing the appropriate counter. When enough counts are accumulated at a particular distance, this distance will be reported on the Splice Results screen.

Screen Support

The craft terminal port allows access to the splice detection menus via the Troubleshooting selection on the main menu. The Chronic Circuit Guidance selection takes the customer to the main splice detection screen which describes the symptoms of a circuit with bad splices.

This menu provides three choices:

1. View Splice Results - This option will displays a screen that provides the results of the splice detection tests. These results are calculated for each receiver point on the circuit. If multiple bad splices are detected for a receiver, the worst is reported.
2. View Histogram Screen - Choosing this option will take the customer to the Histogram Screen which displays the raw counters for each element at all receiver points.
3. Reset Splice Detector - Choosing this option will allow the customer to reset the splice detector. This choice requires a confirmation. The reset of the detector is done locally and the command is sent across the EOC so that all units will also reset their detectors.

EOC Support

To get full coverage of the loop, all elements in the circuit run a local detector and then transmit the results (local histogram counts and corresponding distance buffers) of that detection across the EOC to the terminating units (CO and RT). The terminating units then use these counts to present a result to the customer.

FDL Support

All the information available on the troubleshooting screens is also available via the FDL, allowing the detection to be monitored via network management utilities.

EEPROM Support

The results of the splice detector are stored to the Electronically Erasable Programmable Read-Only Memory (EEPROM) on a daily basis at the same time the 24-hour PM registers are stored to EEPROM. A total of 14 days splice detection history is retained. This history is read from the EEPROM upon power up.

Event Support

An event log entry “Splice Detector Reset” is made any time the splice detector is reset. Also an event log entry “Bad Splice Detected” is made on the first detection occurrence seen since the last splice detection reset. This entry serves to alert the technician that a trouble has been detected without filling up the event log.

Splice Detection Screens

Chronic Circuit Screen

The Chronic Circuit screen (**Figure B-2**) displays general information about circuits with bad splices.

```
Circuit ID:  Chronic Circuit                                  01/09/05 11:34:00
                     Press ESC to return to previous menu
                            Chronic Circuit Problems

  Field experience has shown that many chronic circuit failures are due to
  bad splices. These type circuits generally have the following symptoms:

  - Wire pairs pass all electrical tests and meet deployment guidelines.
  - Large margin fluctuations will occur on the suspect pair. This can be seen
    on the Detailed Status Screen. (Min & Max margins differ by > 6 dB)
  - Pairs experience errored seconds (ES,SES,UAS) and/or loss of sync (LOS).
  - The bad splice will most severely impair the unit closest to the splice.

     This HDSL unit has the ability to test for bad splices. This detection
     should be used as a last resort after all other loop testing has been
     done. The detection is an approximation which can point the technician
     to the general area of the suspect splice.(+/- 275 ft). For best
     results, re-splice all splices close to the indicated trouble.



     1. View Splice Results
     2. View Histogram Screen
     3. Reset Splice Detector
```

Figure B-2. Chronic Circuit Screen

NOTE

Since this detector employs a very sensitive measurement, it is imperative that all obvious troubles be cleared prior to relying on the splice detection information for troubleshooting the circuit. This is reflected by the following screen statement: “Wire pairs pass all electrical tests and meet deployment guidelines.”

Splices that are varying in impedance will cause the HDSL data pump to see a reduced and/or fluctuating signal quality (margin). The HDSL data pump will attempt to track these changes, but when the changes become too severe, errors or loss of synchronization result. This is reflected by the symptoms described on this screen.

If a circuit meets these criteria, the possibility of an impedance-varying splice should be considered.

Three choices are provided on the Chronic Circuit screen:

1. View Splice Results
2. View Histogram Screen
3. Reset Splice Detector

Choosing option 3 will prompt to make sure a reset is desired. If Y (yes) is chosen the splice detector will re-initialize and start running again.

View Splice Results Screen

Selecting the View Splice Results option from the menu displays this screen (**Figure B-3**). Results will be reported in the Splice Detection Results column for each transceiver:

- NTF - Reported if the unit is active and no problems have been detected or the number of anomalies detected have not yet reached the detection count threshold, which facilitates the reporting of the result to this screen. (Eight is the present threshold.)
- LOS - Reported if the remote unit has not been detected.
- Number - Reported if an anomaly has been detected a number of times that exceeds the detection count threshold of eight. The number shown in this column represents the number of feet from the transceiver (Reference Point) to that anomaly. This number will also reflect the highest anomaly count seen, as it is possible to have more than one bad splice per circuit. This screen will report the worst (most frequently detected) anomaly.

In this example, a detection has occurred approximately 250 feet from an H2TU-C module. The (B) Back command will allow the technician to scroll back through the last 14 days Splice Detection Results.

```
Circuit ID:HNTSVLALHDSL2                                    01/09/05 12:16:05
                      Press ESC to return to previous menu

* Note: Chronic Circuit Results are only valid after all other circuit    *
* qualification tests have been performed and failed to show a trouble !! *

Splice Detector Version 1 Result Definitions:
---------------------------------------------
NTF    - No Trouble Found yet.
LOS    - Unit not in sync.
Number - Distance from Reference point (in ft.) of suspect splice.

 Reference    Splice Detection    Version              Result Shown
   Point          Results         Number                 for date
 ---------    ----------------    -------                MM/DD/YY
   H2TUC           0250             01                   --------
   H2TUR           NTF              01                   01/09/05

                                                        (B)Back
```

Figure B-3. Splice Results Screen

View Splice Histogram Screen

The View Splice Histogram Screen (**Figure B-4**) displays the counters that the splice detector uses to make its result decision. For HDSL2, it displays six columns. The first and fourth columns labeled Splice (feet) represent the distance from the respective transceiver that the anomaly detector is evaluating. Columns 2 and 5 display the counters incremented by an H2TU-C module when its detects an anomaly. Columns 3 and 6 display the counters incremented by an H2TU-R module when its detects an anomaly.

H2TU-C and H2TU-R modules exchange this information so that the counters of each transceiver are visible locally at each end of the circuit. Since the distances that each transceiver is evaluating may or may not be exactly the same, the Splice (feet) column reflects the distance calculation from the displayed transceiver. To show the distances measured from the other transceiver, press the C (Change) key. The counters on this screen are always valid for all transceivers shown; however, the distance associated with that counter should be verified by using the C (Change) key to get the most accurate distance.

In the example below, the distances shown are corresponding to an H2TU-C module since that is the transceiver that has detected the anomaly. The count of 09 in the 250 feet row under the H2TU-C column indicates that an anomaly has been seen nine times at this distance from an H2TU-C module. Since nine exceeds the count detection threshold of eight, this result is reported to the Splice Result Screen. Since the H2TU-R shows 00 for all counts in columns 3 and 6, there is no reason to Change (C) the view of the distance column to show the distances an H2TU-R module is evaluating.

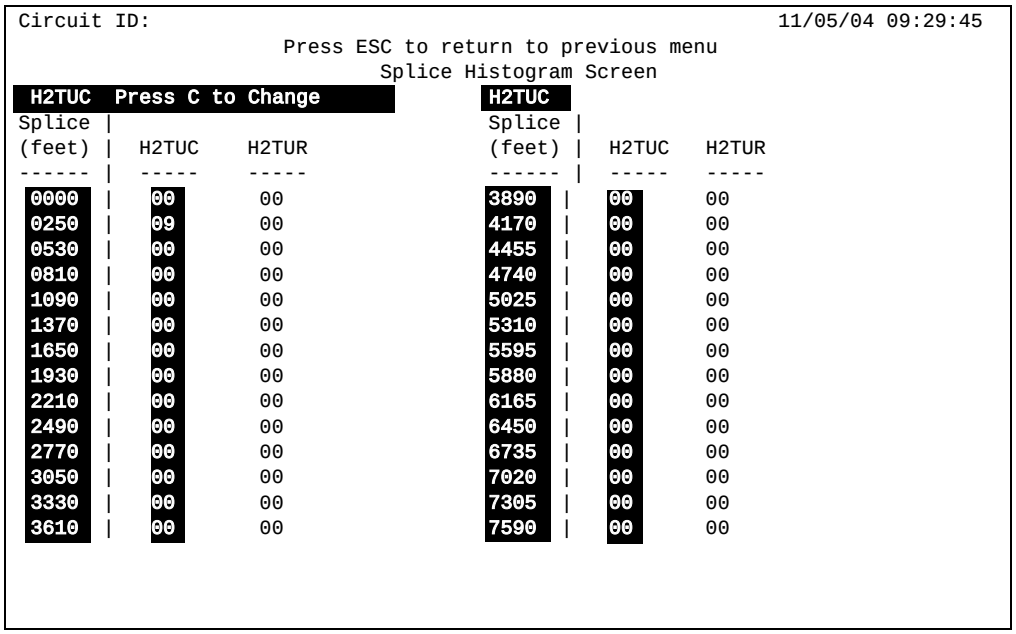


Figure B-4. Splice Histogram Screen

Compatibility

The H2TU-C and H2TU-R both run local detectors; therefore, a splice-detection capable H2TU-C will be able to detect bad splices up to slightly more than half the circuit length. Likewise, a splice detection capable H2TU-R will be able to detect bad splices up to slightly more than half the circuit from the remote end. With older (non-splice detection units) the splice-detection capable units will not receive Embedded Operations Channel (EOC) messages from the older units so visibility from the other end is lost. Splice detection support is not available for two-wire repeaters.

Using the Bad Splice Detector

A brief synopsis of steps that might be utilized on a trouble analysis are as follows:

1. Check the HDSL units for margin fluctuation by checking the Min & Max margins on the Detailed Span Status screen (differ by > 6 dB) corresponding to the time of the trouble.
2. Check for recorded errors (ES, SES, UAS) and/or loss of sync (LOS) in Performance History data that also correspond to the time of the reported trouble.
3. Check that the copper pairs pass specifications using appropriate test equipment.

   If copper pairs pass all tests, re-install the HDSL units. After they achieve synchronization, clear the PM and Alarm histories from the main menu.
4. Go to the Chronic Circuit menu and reset the splice detector. (It is recommended that the splice detector be reset after a circuit is installed to avoid inaccurate results due to old splice-detect data left in the non-volatile memory).
5. Leave the circuit operating for a few hours or days (depending on severity of problem) and then re-check.
6. Go to Splice Detector Results Screen and see if any indicated trouble is reported.
7. If a problem splice has been detected, re-splicing the closest splices to the indicated trouble (±275 feet for HDSL-2 and ±550 feet for HDSL-4) is recommended.

NOTE

In general, the shorter the distance, the more accurate the measurement.

8. If no trouble is reported on the Splice Detection Results Screen, go to the Histogram screen and check for anomalies that have been detected. The anomaly can exist but may not have reached the threshold level to report it to the Splice Detection Results Screen. Any non-zero counter numbers on this screen may correspond to a deteriorating splice point that should be investigated.

NOTE

If a cable pair acceptance test verified the cable pairs at turn up, and the Splice Detector was reset at that time, then the trouble-shooting procedure would include step 1 and step 2, then proceed immediately with step 7 on the first trouble call.

Event History Screen

The Event History screen (**Figure B-5**) shows the messages reported in the event log due to the splice detector. Any reset of the detector is shown as well as the first detect seen since the last reset.

```
Circuit ID:  Chronic Circuit                                  01/09/05 13:31:36
                     Press ESC to return to previous menu

 Num   Description of Event                        Date     Time      Source
-------------------------------------------------------------------------------
   1.  H2TU-C Event Log Reset                      01/09/05 13:34:36  H2TU-C
   2.  H2TU-C Powered Up                           01/09/05 13:30:01  H2TU-C
   3.  H2TU-R Powered Up                           01/09/05 13:30:15  NO ID
   4.  Splice Detector Reset                       01/09/05 13:30:29  H2TU-R
   5.  Bad Splice Detected                         01/09/05 17:30:33  NO ID









       Page Number:   1/  1   Number of Events:   5
 ------------------------------------------------------------------------
     'P' - Previous Page  'H' - Home      'R' - Reset Events
     'N' - Next Page      'E' - End

                           Selection:
```

Figure B-5. Event History Screen

Fault (GFI, Short) Bridging

The Fault Bridging feature minimizes circuit downtime by sustaining the circuit during the impairment until good signal returns, thereby preventing a retrain. Downtime can occur when an intermittent impairment (GFI, short, micro-interruption, bad splice, noise burst, etc.) briefly affects the HDSL loop.

Fault bridging addresses two general types of problems:

- Brief power fault incidents (lightning)
- Brief signal distortions

In the older generation HDSL2 and HDSL4 transceivers, a brief short or GFI would cause a hardware control to quickly shut down the span power supply for safety reasons. The software would then detect the power fault and would hold the span supply off for 3 seconds. The HDSL units would then reinitialize and retrain in approximately 25 to 30 seconds.

In the new enhanced units a combination of hardware and software enhancements allows the units to sustain communication during brief interruptions in the span supply or brief distortions of the HDSL signal. The hardware will still react to shut down the span supply for the duration of a power fault to comply with safety requirements; however, the software will wait much longer (150 msec of fault) before holding the span supply off. This will allow the span power to return immediately if the power fault disappears. The hardware contains extra capacitance to help maintain the power supply voltages during this brief interruption of span

power. When the software detects the power fault, the data pump goes into a fault bridging mode to protect the data pump filters and to maintain service until the anomaly clears.

The software also implements the same fault bridging mode if the HDSL received signal is distorted out on the loop during a non-power fault event (analog signal micro-interruption) to keep the data pump stable until the anomaly clears.

Fast Retrain Feature

Fast Retrain is an ADTRAN proprietary feature whose intent is to minimize downtime when an intermittent non power-related impairment (bad splice, noise burst, etc.) affects the HDSL loop and cannot be bridged.

HDSL-2 and HDSL-4 transceivers normally train in approximately 25 to 30 seconds. For an initial circuit turn-up, this is not a big issue. However, once service has been established on the circuit, any large down-time will interrupt communications on the circuit. A loss of synchronization on the HDSL loop can cause excessive down times due not only to the 30 second HDSL retrain time, but also further delays due to the higher level protocols in the network going through re-synchronization. On the older generation HDSL2 and HDSL4 units, a 1-second loss of HDSL frame synchronization would cause the data pumps to retrain. This retrain would take approximately 25 seconds during which AIS would be sent to the terminating equipment. The reception of AIS by the terminating equipment then might trigger higher level protocol re-synchronizations.

In an effort to minimize this down time, the Fast Retrain feature has been implemented. If an impairment (bad splice, for example) causes the HDSL data pump to lose frame synchronization for 500 msec or longer, instead of retraining, a fast retrain will be attempted. This abbreviated train can achieve data mode in 5 to 7 seconds. A successful fast retrain should be evident by watching the Span Status screen and by reduced unavailable seconds (UAS) in the PM data for each LOS alarm recorded.

NOTE

Fast-Retrain capable units must be installed on both ends of the HDSL2 circuit for this feature to function properly. Also, if there is a failure of a fast retrain attempt, for any reason, then the traditional (25-30 second) retrain will be initiated.

Appendix C
Front Panel DSX and MUX Mode Test Access

GENERAL

Figure C-1 through Figure C-3 are DSX-1 fed modes of operation, and Figure C-4 through Figure C-7 are MUX fed modes of operation. From the Provisioning menu ("Provisioning" on page 22), the Network Source option is used to choose either MUX fed or DSX fed. When performing intrusive MUX mode testing, the equipment jack on the front panel can be configured to access the signal going to the Network or the Customer. The Equipment Jack option, on the Loopback and Test Commands screen ("Loopbacks and Test" on page 27) is used to configure the equipment jack for the network or customer. Every time the HTU-C is power-cycled, it will default to the Customer direction.

DSX MODE TEST ACCESS

DSX Mode connects to the DSX (network) connector on the backplane of the chassis, where a Multiplexer (MUX) is not utilized in the Total Access 3000 shelf.

DSX MON, Tx to Customer

The Rx of the BERT receives data from the **TX MON** jack (**Figure C-1**). This data has a monitor jack impedance of 432 ohms and comes from the Backplane Network T1 DSX (the data that would go toward the customer). The **BERT TX** is not used. **This test is non-intrusive**.

> **NOTE**
>
> The H2TU-C must be provisioned for the Out-of-Service Maintenance service state when intrusive bantam jack testing is being performed.

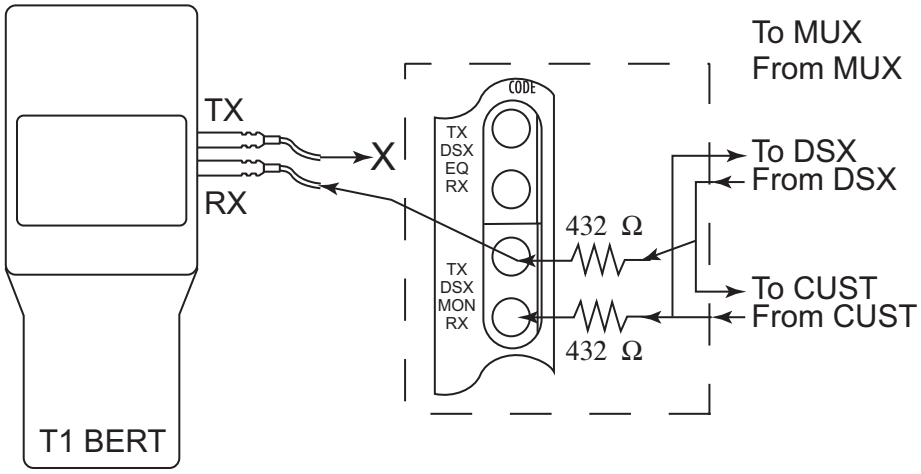


Figure C-1. DSX MON, Tx to Customer

DSX MON, Rx from Customer

The Rx of the BERT receives data from the **RX MON** jack (**Figure C-2**). This data has a monitor jack impedance of 432 ohms and comes from the customer originated data. The **BERT TX** is not used. **This test is non-intrusive**.

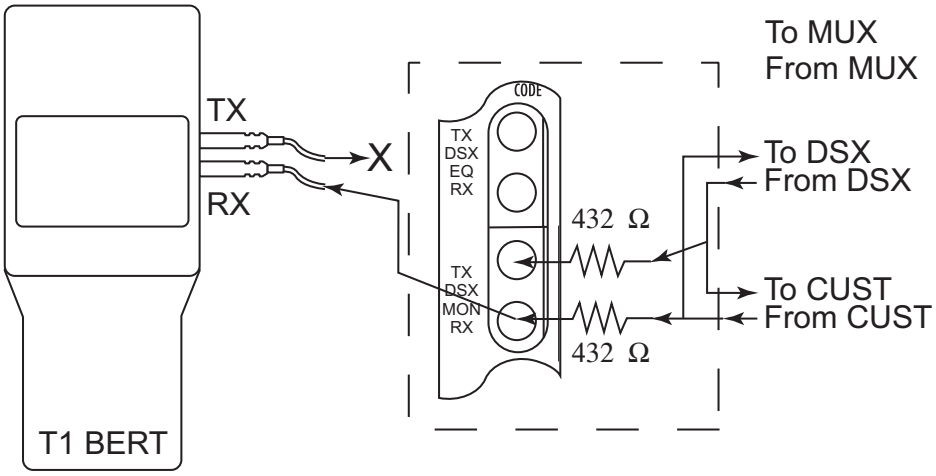


Figure C-2. DSX MON, Rx from Customer

DSX EQ, Tx to Customer, Rx from Customer

The Tx of the BERT goes to the **TX EQ** jack, and the Rx of the BERT goes to the **RX EQ** jack (**Figure C-3**). The **TX EQ** data from the BERT is sent to the customer. The **RX EQ** data to the BERT is data from the customer. The **MON** jack **TX** and **RX** are 432 ohm replicas of the **EQ TX** and **RX** direct connections. **This test is intrusive**, as it connects the **EQ** jacks directly to and from the customer data.

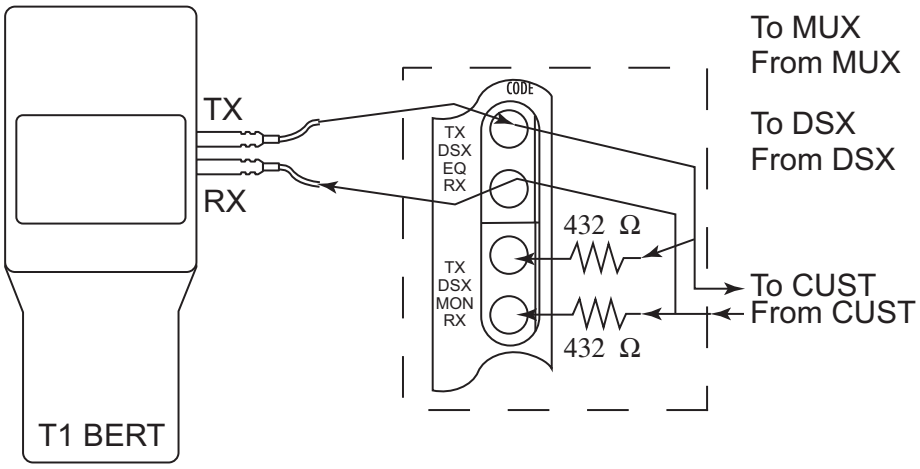


Figure C-3. DSX EQ, Tx to Customer, Rx from Customer

MUX MODE TEST ACCESS

MUX Mode tests through a MUX on the Total Access 3000 shelf.

MUX MON, Tx to Customer

The Rx of the BERT receives data from the **TX MON EQ** jack (**Figure C-4**). This data is a copy of the data that the H2TU-C will transmit to the customer. The Tx of the BERT is not used. **This test is non-intrusive.**

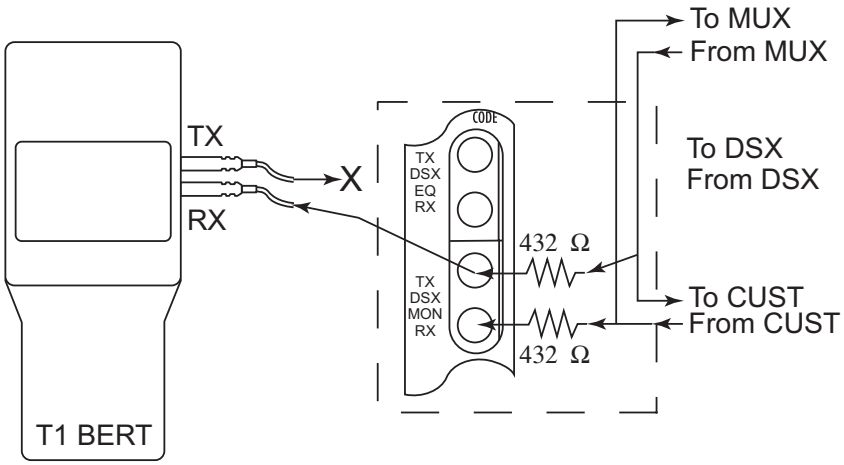


Figure C-4. MUX MON, Tx to Customer

MUX MON, Rx from Customer

The Rx of the BERT receives data from the **RX MON** jack (**Figure C-5**). This data is 432 ohm copy of the data that the H2TU-C will receive from the customer and route to the Total Access shelf's MUX (network). The Tx of the BERT is not used. **This test is non-intrusive**.

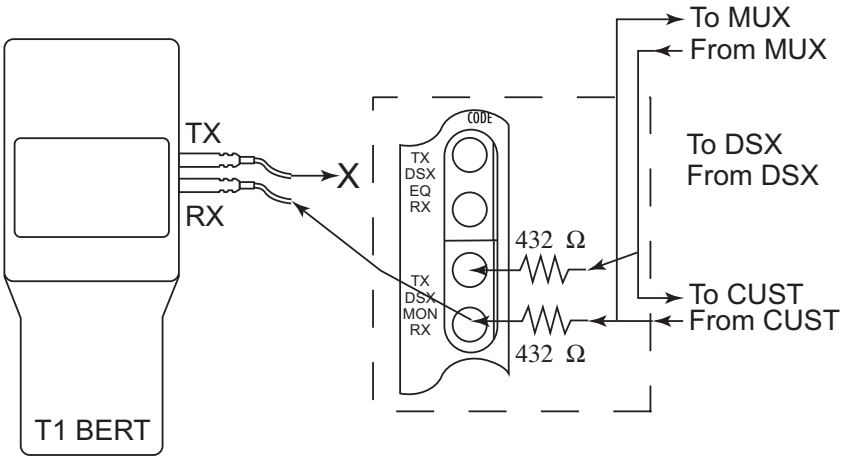


Figure C-5. MUX MON, Rx from Customer

MUX EQ, Tx to Network, Rx from the Network

The Tx of the BERT is connected to the **EQ TX** jack, and the Rx of the BERT is connected to the **RX EQ** jack (**Figure C-6**). The Tx of the BERT is then substituted for the data that the H2TU-C sends to the Total Access Shelf's MUX (network). The Rx of the BERT receives data directly from the MUX (network). The **MON TX** and **RX** jacks are 432 ohm impedance copies of the **EQ** jack **TX** and **RX**. **This test is intrusive**. Via the Test screen, ensure that the equipment jack is in the To Network mode. In the To Network mode, AIS (unframed all 1's) is sent in the customer direction.

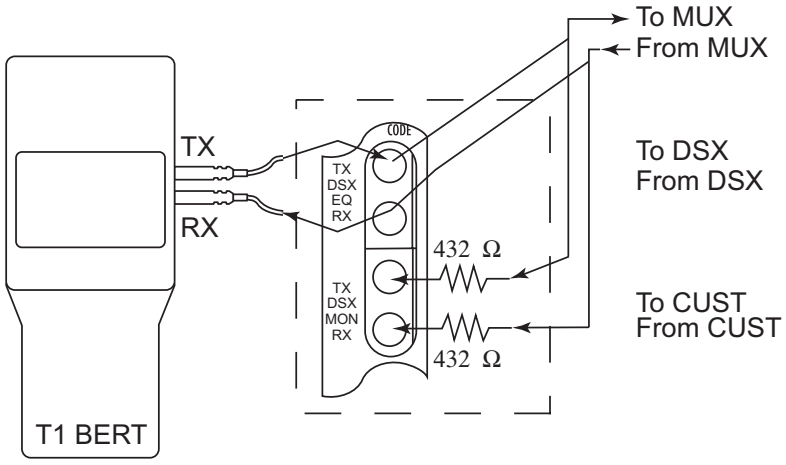


Figure C-6. MUX EQ, Tx to Network, Rx from Network

MUX EQ, Tx to Customer, Rx from Customer

The Tx of the BERT is connected to the **EQ TX** jack, and the Rx of the BERT is connected to the **RX EQ** jack (**Figure C-7**). The Tx of the BERT is then substituted for the data that the H2TU-C sends to the customer. The Rx of the BERT receives data directly from the customer. The **MON TX** and **RX** jacks are 432 ohm impedance copies of the **EQ** jack **TX** and **RX**. **This test is intrusive**. Via the Test screen, ensure that the equipment jack is in the To Customer mode. In the To Customer mode, AIS (unframed all 1's) is sent in the network direction.

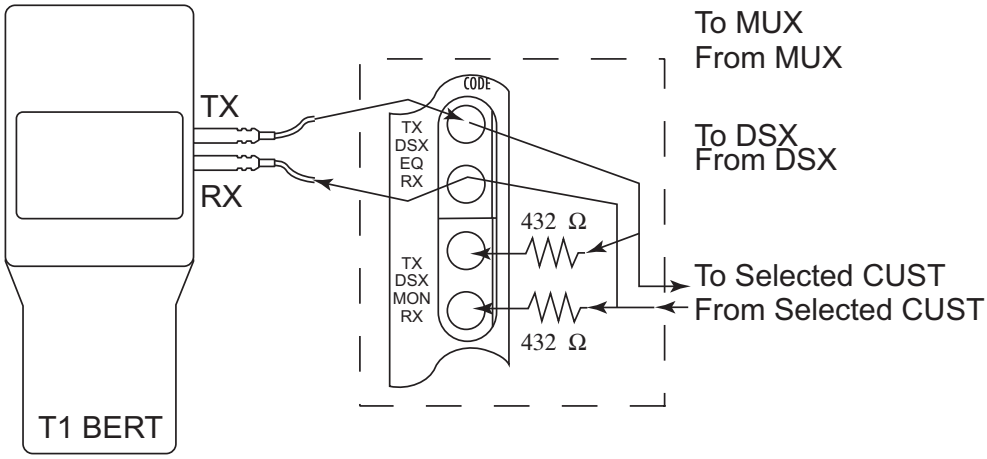


Figure C-7. MUX EQ, Tx to Customer, Rx from Customer

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Appendix D
Warranty

WARRANTY AND CUSTOMER SERVICE

ADTRAN will replace or repair this product within the warranty period if it does not meet its published specifications or fails while in service. Warranty information can be found at www.adtran.com/warranty.

Refer to the following subsections for sales, support, Customer and Product Service (CAPS) requests, or further information.

ADTRAN Sales

Pricing/Availability:

800-827-0807

ADTRAN Technical Support

Pre-Sales Applications/Post-Sales Technical Assistance:

800-726-8663

Standard hours: Monday - Friday, 7 a.m. - 7 p.m. CST
Emergency hours: 7 days/week, 24 hours/day

ADTRAN Repair/CAPS

Return for Repair/Upgrade:

(256) 963-8722

Repair and Return Address

Contact CAPS prior to returning equipment to ADTRAN.

ADTRAN, Inc.
CAPS Department
901 Explorer Boulevard
Huntsville, Alabama 35806-2807

Carrier Networks Division
901 Explorer Blvd.
Huntsville, AL 35806