T200 H2TU-R
2-Wire HDSL (HDSL2) Remote Unit
Installation and Maintenance

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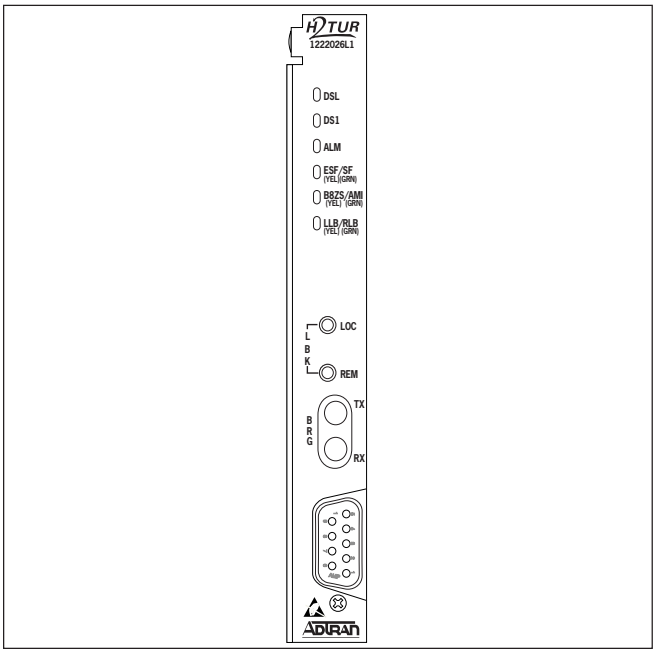


Figure 1. ADTRAN T200 H2TU-R

1. GENERAL

The ADTRAN 2-Wire T200 HDSL2 Transceiver Unit for the Remote end (H2TU-R), ADTRAN P/N 1222026L1, is a network terminating unit used to deploy an HDSL2 T1 circuit using 2-wire metallic facilities. The H2TU-R is a T200 mechanics card which will fit T200 or T400 mechanics enclosures. The H2TU-R can be housed in the ADTRAN standalone metal enclosure (P/N 1242034L3) or the T200 Dual-Mount Enclosure (P/N 1245034L1). Refer to the appropriate ADTRAN practice for more information. The T200 H2TU-R card can also plug into the ADTRAN HR12 HDSL remote shelf (P/N 1242007LX), or the ADTRAN HR4 HDSL remote shelf (P/N 1242008L1). In all applications the H2TU-R must be installed in NEBS compliant and UL listed enclosures to insure full compliance with this unit.

Revision History

This is the initial release of this document. Future revisions to this document will be explained in this subsection.

Description

This version of the H2TU-R works with multiple list versions of the HDSL2 transceiver unit for the central office (H2TU-C) as listed below.

Unit Number	Description
1221001LX	220/E220 H2TU-C
1221003LX	DDM+ H2TU-C
1221004LX	3192 H2TU-C
1221006L1	T200 H2TU-C
1181111L1	Total Access 3000 H2TU-C
1222001LX	2nd Generation 220/E220 H2TU-C
1222003LX	2nd Gen DDM+ H2TU-C
1222004LX	2nd Generation 3192 H2TU-C
1181112L1	2nd Generation Total Access 3000 H2TU-C

The H2TU-R can be deployed in circuits using one H2TU-C and one H2TU-R.

The H2TU-R terminates local loop HDSL2 signals originating from the Central Office (CO) unit and transforms the HDSL2 signal into traditional DS1 signals to be delivered to the customer.

The H2TU-R (P/N 1222026L1) can be used with any H2TU-C to provide a fully span-powered extended-range HDSL2 circuit. Span power is provided from the H2TU-C. Span powering meets all requirements of Class A2 voltages as specified by Bellcore GR-1089-CORE.

The H2TU-R can also be locally powered from a -48 Vdc (nominal) service. In this application, the H2TU-C's span power should be disabled.

CAUTION

Upon removal of a local power source (-48 Vdc) from a multi-mount housing where the H2TU-R is installed, there may be a temporary loss of power which would be service affecting. The H2TU-R should be either installed for a design supporting span power or local power, but not both.

2. INSTALLATION

CAUTION!
SUBJECT TO ELECTROSTATIC DAMAGE OR DECREASE IN RELIABILITY.
HANDLING PRECAUTIONS REQUIRED.

After unpacking the unit, inspect it for damage. If damage is discovered, file a claim with the carrier, then contact ADTRAN. See *Warranty and Customer Service*.

The settings on the H2TU-C are encoded and transmitted to the H2TU-R once the circuit has achieved synchronization. There are no switch settings on the H2TU-R.

Remote Provisioning

This H2TU-R can be used to provision the entire HDSL2 circuit via the craft interface.

Compliance Codes

CAUTION

Voltages up to -200 Vdc may be present on the telecommunications wiring.

CAUTION

The DSX-1 connections should be connected to intra-building wiring only.

Table 1 shows the Compliance Codes for the H2TU-R. The H2TU-R complies with the requirements covered under UL 60590 third edition and is intended to be installed in an enclosure with an Installation Code (IC) of "B" or "E."

NOTE

This product is intended for installation in **Restricted Access Locations** only.

Table 1. Compliance Codes

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

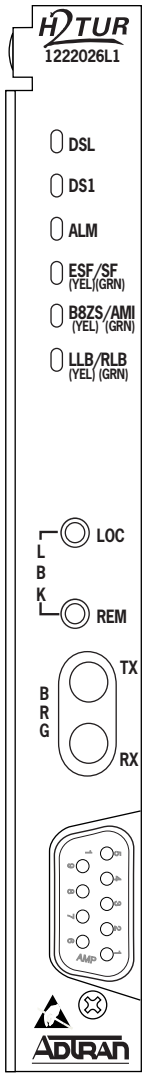
Faceplate Indicators

There are six faceplate mounted status indicators, described in **Table 2**.

Faceplate Pushbuttons

Two loopback (LBK) pushbuttons are accessible from the faceplate. The REM loopback button controls a customer loopback at the H2TU-C. The LOC loopback button controls a bidirectional loopback at the H2TU-R. See **Table 3** for details.

Table 2. Faceplate Indicators



Indicator	Description
DSL	Indicates HDSL2 signal quality on the Loop is in one of the following five states: *Off* — No synchronization of H2TU-C and H2TU-R. *Red* — Poor signal quality on Loop (≥ 10^{-7} BER). *Yellow* — Marginal signal quality on Loop (≤ 2 dB margin above 10^{-7} BER). *Green* — Good signal quality on Loop (> 2 dB margin above 10^{-7} BER). *Blinking* — Detected error at H2TU-C or H2TU-R (the color of this LED, when flashing, will match the color representing the loop's signal quality.)
DS1	This LED indicates three possible DS1 Signal conditions: *Off* — Customer-side DS1 signal is absent or is of a format that does not match the HDSL2 circuit provisioning. *Blinking Green* — Detected error on the DS1 interface. *Solid Green* — Customer-side DS1 signal is present and synchronized.
ALM	This LED indicates three possible alarm conditions: *Off* — No alarm condition detected. *Red* — Detected local alarm condition (H2TU-R). *Yellow* — Detected remote alarm condition (H2TU-C).
ESF/SF	This LED indicates three possible framing modes: *Yellow* — Indicates DS1 is provisioned for ESF framing mode. *Green* — Indicates DS1 is provisioned for SF framing mode. *Off* — Indicates DS1 is provisioned for Unframed operation.
B8ZS/AMI	This LED indicates two possible line codes: *Yellow* — Indicates DS1 is provisioned for B8ZS coding. *Green* — Indicates DS1 is provisioned for AMI coding.
LLB/RLB	This LED indicates three possible loopback conditions: *Off* — Unit is not in loopback or armed state. *Solid Yellow* — Active local bidirectional loopback from the H2TU-R toward the customer and the network. *Green* — Active remote loopback from the H2TU-C toward the customer. *Blinking Yellow* — Unit is armed but not in active loopback condition.

Table 3. Faceplate 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 customer loopback. • If the H2TU-C is in loopback, pressing this button will deactivate the customer 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 bidirectional loopback. • If the H2TU-R is in loopback, pressing this button will deactivate a bidirectional loopback.

Faceplate DS1 Bridging Jack

The H2TU-R provides DS1 bridging bantam jacks. These jacks provide a test point for DS1 traffic to and from the customer. For more details, refer to subsection 4 of this practice.

3. CONNECTIONS

All connections of the H2TU-R are made through card edge connectors. **Table 4** gives the card edge pin assignments for the H2TU-R circuit pack.

Table 4. Card Edge Pin Assignments

Pin	Designation	Description
1	CH GND	Chassis ground
5	DS1-T1	DS1 receive out tip (to customer interface)
7	H1-T	HDSL2 Loop tip (facility)
11	CH GND	Chassis ground
12	GND	Ground for protection switching
13	H1-R	HDSL2 Loop ring (facility)
15	DS1-R1	DS1 receive out ring (to customer interface)
17	-48VR	-48 Vdc Return
20	VCC	+5 Vdc for protection switching
27	CH GND	Chassis ground
35	-48V	-48 Vdc
40	PROT-1	Control line for protection switching
49	DS1-R	DS1 transmit in ring (from customer interface)
55	DS1-T	DS1 transmit in tip (from customer interface)

When the circuit pack is installed in any of the H2TU-R enclosures, all connections are made through the enclosure backplanes. See the following ADTRAN documents for more information:

- 61242007LX-5, HR12 Installation/Maintenance
- 61242008L1-5, HR4 Installation/Maintenance
- 61242034L2-5, T400 Single Mount Installation/ Maintenance (removable RJ-48 jacks)
- 61242034L3-5, T400 Single-Mount High Voltage Installation/Maintenance
- 61245034L1-5, T200 Dual-Mount Installation/ Maintenance

ADTRAN's T200 Dual-Mount housing (P/N 1245034L1) is required when using the T200 H2TU-R for HDSL Loop Support System (H-LSS™) protection circuits.

NOTE

Ensure chassis ground is properly connected for either standalone or shelf mounted applications.

4. HDSL2 SYSTEM TESTING

The T200 H2TU-R provides diagnostic, loopback, and signal monitoring capabilities.

The six Faceplate LEDs provide diagnostics for HDSL2 loops, DS1 signals, alarms, provisioning, and loopbacks. See *Faceplate Indicators* subsection on previous page of this practice for details.

The H2TU-R provides local and remote loopback capabilities via the loopback pushbutton on the faceplate. The customer loopback and the network loopback, for the bilateral loopback case, are logic loopbacks within the HDSL2 transceiver. All other network loopbacks at the H2TU-R are a metallic loopback at the DS1 interface. See **Figure 3**.

The DS1 BRG jacks provide access for DS1 signal monitoring.

DS1 Bridging Jacks

The jack labeled "BRG" provides a test access point for monitoring the transmit and receive signals at the DS1 interface point.

The bridging jack can be used in two different ways. First, the bridging jack of the H2TU-R unit provides a nonintrusive tap onto a signal line and permits the connection of the test equipment to monitor the characteristics of the signal with a DS1 test set optioned for BRIDGING mode. Second, if the DS1 test set is optioned for TERMINATE mode and the customer DS1 is disconnected, then the bridging jack of the H2TU-R unit provides an intrusive tap and could be used to transmit and receive signals between the H2TU-R and the network. **Figure 2** is an illustration of specific jack detail.

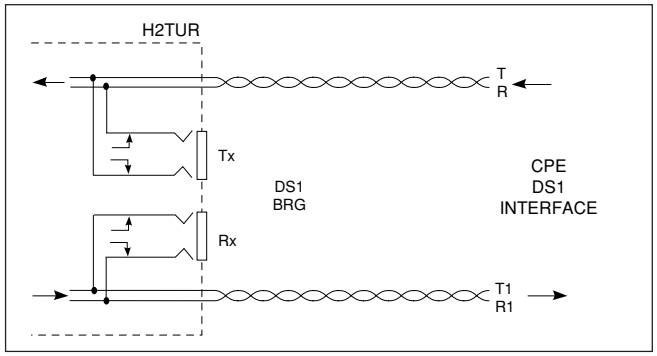


Figure 2. H2TU-R Bridge Diagram

NOTE

For the BRG jacks, the Tx and Rx indications relate to the direction of the DS1 signal to/from the H2TU-R, respectively.

H2TU-R Network Loopbacks

The H2TU-R responds to multiple loopback activation processes. First, loopback activation may be accomplished using the control port of the H2TU-C or H2TU-R.

Second, the H2TU-R will respond to the industry defacto HDSL loopback codes as designated in the ANSI document T1E1.4/92. A synopsis of the method described by ANSI is presented in Appendix A of this practice.

Third, the H2TU-R responds to T1 Network Interface Unit (NIU) loopback codes as described in Bellcore TR-TSY-000312 if the H2TU-R is optioned for NIU loopback enabled. The NIU loopback codes are as follows:

In-band Codes
Loop Up 11000
Loop Down 11100

ESF Codes
Loop Up 0001 0010 1111 1111
Loop Down 0010 0100 1111 1111

This unit contains smartloop technology. That is, it constantly monitors the DSX-1 for a framing pattern. The unit will initiate the proper loopback regardless of how the loopback control sequence is sent (framed or unframed).

Receiving the in-band codes for more than five seconds or the ESF codes four consecutive times will cause the appropriate loopback action.

The H2TU-R will respond to the loop up codes by activating the NIU loopback from either the disarmed or armed state. The loop down codes will return the H2TU-R to a disarmed state from the armed or loop up state.

Refer to *Appendix A* for more details on loopbacks and loopback arming sequences.

Customer Loopbacks

In addition to the loopbacks in the direction of the network, the H2TU-R may also be looped back in the direction of the customer using the terminal control port of either the H2TU-C, the H2TU-R or the LOC LBK button on the Faceplate of the H2TU-R. The H2TU-C can be looped using the REM LBK button on the Faceplate of the H2TU-R. The H2TU-C and H2TU-R Customer Side Loopbacks are illustrated in **Figure 3**.

NOTE

Network and customer loopbacks are governed by the loopback time out option.

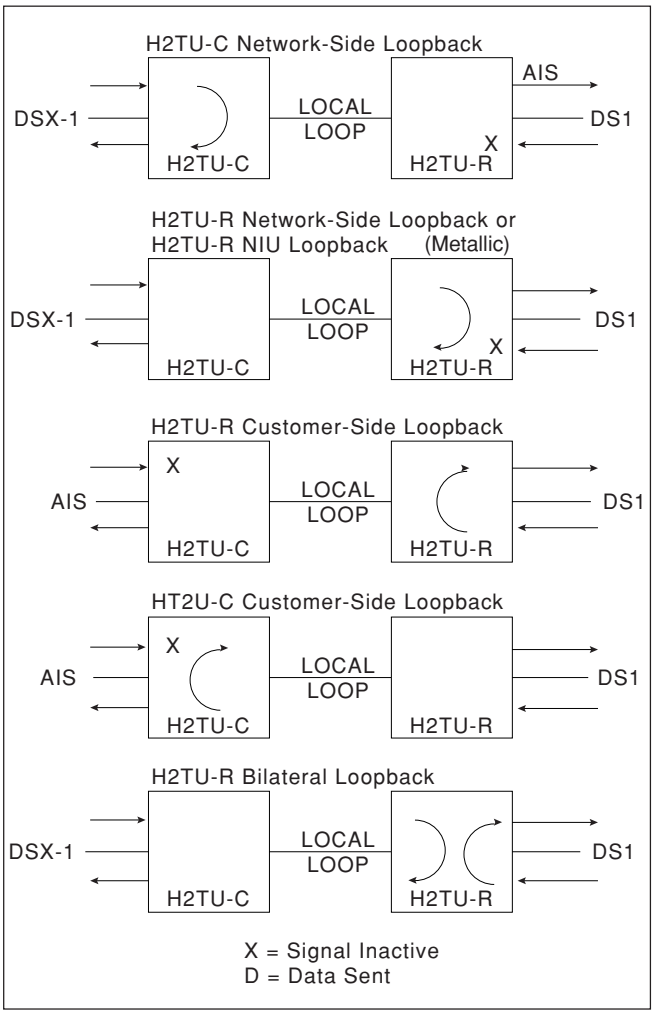


Figure 3. HDSL2 Loopbacks

5. CONTROL PORT OPERATION

The H2TU-R provides a faceplate mounted DB-9 connector that supplies an RS-232 interface for connection to a controlling terminal. The pinout of the DB-9 is illustrated in **Figure 4**.

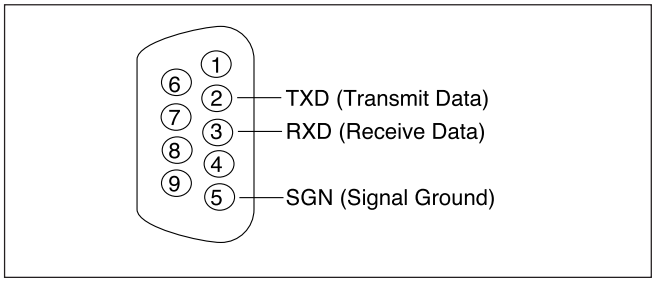


Figure 4. RS-232 (DB-9) Pin Assignments

The terminal interface operates at data rates from 1.2 kbps to 19.2 kbps. The asynchronous data format is fixed at 8 data bits, no parity, and 1 stop bit. The supported terminal type is dumb terminal, VT100 or compatible. The line wrap feature of emulation programs should also be disabled.

NOTE

If you are 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 timeouts.

Operation

For abbreviations used in the screen diagrams, see **Table 5**. The Performance Data Definitions Screens also offer a listing of screen definitions by selecting "1" from the Performance History screen menu.

The screens illustrated in **Figure 5** through **Figure 20** apply to an HDSL2 circuit deployed with ADTRAN's HDSL2 technology. The circuit includes an H2TU-C and an H2TU-R. Other configurations are possible (e.g., other vendor's equipment) and their displays will vary slightly from those shown in this section.

A terminal session is initiated by entering multiple space bar characters, which are used by the H2TU-C to determine the speed of the terminal. Once the speed has been determined, an HDSL2 Main Menu is presented, as illustrated in **Figure 5**.

Table 5. Screen Abbreviations

Abbreviation	Definition
NET	Network (DSX-1)
CUST	Customer (DS1)
ATTEN	Pulse Attenuation
LOS	Loss of Signal
SF	Superframe format
ESF	Extended Superframe format
B8ZS	Bipolar with 8 Zero Substitution
AMI	Alternate Mark Inversion
LBO	Line Build Out
BPV	Bipolar Violation
NIU	T1 Network Interface Unit
S/N	Serial Number
15M	Fifteen-Minute period
60M	Sixty-Minute period
24H	Twenty-Four-Hour period

The Main Menu provides access to detailed performance and configuration information. Selecting the corresponding number or letter can access the following screens:

1. HDSL2 Unit Information
2. Provisioning
3. Span Status
4. Loopbacks and Test
5. Performance History
6. Circuit ID, Time/Date
7. Terminal Modes
8. Alarm History
9. Event History
10. Virtual Terminal Control

The HDSL2 Unit Information Screen, illustrated in **Figure 6**, provides detailed product information on each component in the HDSL2 circuit. This screen also displays contact information for ADTRAN Technical Support, Internet site and address.

```
CIRCUIT ID:                                                  01/01/00 00:03:05

                              Adtran HDSL2 Main Menu


                                1.  HDSL2 Unit Information
                                2.  Provisioning
                                3.  Span Status
                                4.  Loopbacks and Test
                                5.  Performance History
                                6.  Circuit ID, Time/Date
                                7.  Terminal Modes
                                8.  Alarm History
                                9.  Event History
                               10.  Virtual Terminal Control









                               Selection:
```

Figure 5. HDSL2 Main Menu

```
CIRCUIT ID:                                                  01/01/00 00:03:23
                      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
             List: 1                            List: 1
              S/N: DA26D3779                     S/N: 123456789
             CLEI: T1L123X4AA                   CLEI: T1L3RVTAAA
             Manf: 08/31/2000                   Manf: 01/01/2000
```

Figure 6. HDSL2 Unit Information Screen

The Provisioning Screen, illustrated in **Figure 7**, displays the current provisioning settings for the HDSL2 circuit. To change a particular option setting, select the appropriate number and a new menu will appear with a list of the available settings.

The Span Status Screen, illustrated in **Figure 8**, provides quick access to status information for each HDSL2 receiver in the circuit. The Legend selection provides a description of the messages that are used on the Span Status Screens.

```
CIRCUIT ID:                                              01/01/00 00:03:51
                  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       =  Auto
                4.  NIU Loopback            =  Enabled
                5.  NEW ENGLAND 1:6 LPBK    =  Disabled
                6.  Loopback Timeout        =  120 Min
                7.  Latching Loopback Mode  =  T1 (Disabled)
                8.  DS1 TX Level            =  -7.5 db
                9.  Customer Loss Indicator =  AIS / CI
               10.  PRM Setting             =  none
               11.  Loop Atten Alarm Thres  =  40db
               12.  SNR Margin Alarm Thres  =  04db




                        SELECTION:
```

Figure 7. Provisioning Screen

```
CIRCUIT ID:                                              01/01/00 00:04:23
                  Press ESC to return to previous menu

                          Span Status Screen
                               ATTEN
                         ______ <-29dB->  ______
                       |H2TUC |           |H2TUR |
                <------|      |           |      |------>
                       |      |           |      |
                NET    |      |<--------->|      |   CUST
                       |      |09dB   10dB|      |
                ------>|      |  MARGIN   |      |<------
                DSX-1  |______|           |______|    DS1









                        1.  Legend
                        2.  Detailed Status


                        Selection:
```

Figure 8. Span Status Screen

The Detailed Status selection from the Span Status Menu, illustrated in **Figure 9**, displays the HDSL2 and T1 status for each receiver point. From this screen, all registers can be zeroed (which requires confirmation), and min/max can be reset.

Figure 10 illustrates the Loopback and Test Commands Screen, which provides the user with the ability to evoke or terminate all available HDSL2 loopbacks. It also provides a self-test option to perform a self-diagnostic of the H2TU-C and H2TU-R. Each HSDL2 circuit component can be looped toward the network or customer from this screen.

```
CIRCUIT ID:                                                  01/01/00 00:04:53
                  Press ESC to return to previous menu

                         Detailed HDSL2 and T1 Status

                             HDSL2 RECEIVER DATA
                               H2TU-C    H2TU-R

                              --------  --------
          MARGIN(CUR/MIN/MAX): 08/00/10  11/00/12
               ATTEN(CUR/MAX):  29/93     29/29
                     ES 15MIN:   010       000
                    SES 15MIN:   000       000
                    UAS 15MIN:   041       814

                           T1 RECEIVER DATA
                        DSX-1                DS1
                       ------               -------
            FRAMING:    AUTO                 AUTO
          LINE CODE:    B8ZS                 B8ZS
          ES-P/ES-L:   000/001              000/008        1. Zero Registers
        SES-P/SES-L:   000/001              000/008        2. Restart Min/Max
        UAS-P/UAS-L:   000/000              822/000
             ALARMS:    NONE                 NONE             Selection:
```

Figure 9. Detailed Status Screen

```
CIRCUIT ID:                                                  01/01/00 00:05:12
                  Press ESC to return to previous menu

                          Loopback and Test Commands

                          ______              ______
                         |H2TUC |            |H2TUR |
                  <------|      |            |      |------>
                         |      |            |      |
                  NET    |      |<---------->|      |   CUST
                         |      |            |      |
                  ------>|      |            |      |<------
                  DSX-1  |______|            |______|    DS1

                          1.  Run Self Tests
                          2.  H2TU-C Loopup Network
                          3.  H2TU-C Loopup Customer
                          4.  H2TU-R Loopup Network
                          5.  H2TU-R Loopup Customer




                                Selection:
```

Figure 10. Loopback and Test Commands Screen

The Performance History Screens, illustrated in **Figure 11, Figure 12**, and **Figure 13** display the historical HDSL2 and T1 performance data in several different registers. At each 15-minute interval, the performance information is transferred to the 15-minute performance data register. This unit stores performance data in 15-minute increments for the last 24-hour period. Additionally, some units store up to 48 hours worth of 60-minute interval data.

At each 24-hour interval, the performance data is transferred into the 24-hour performance data registers. This unit stores up to 31 days of 24-hour interval data.

The user is prompted to select a module and interface to view the corresponding performance data. Line (L) and Path (P) related data can be viewed.

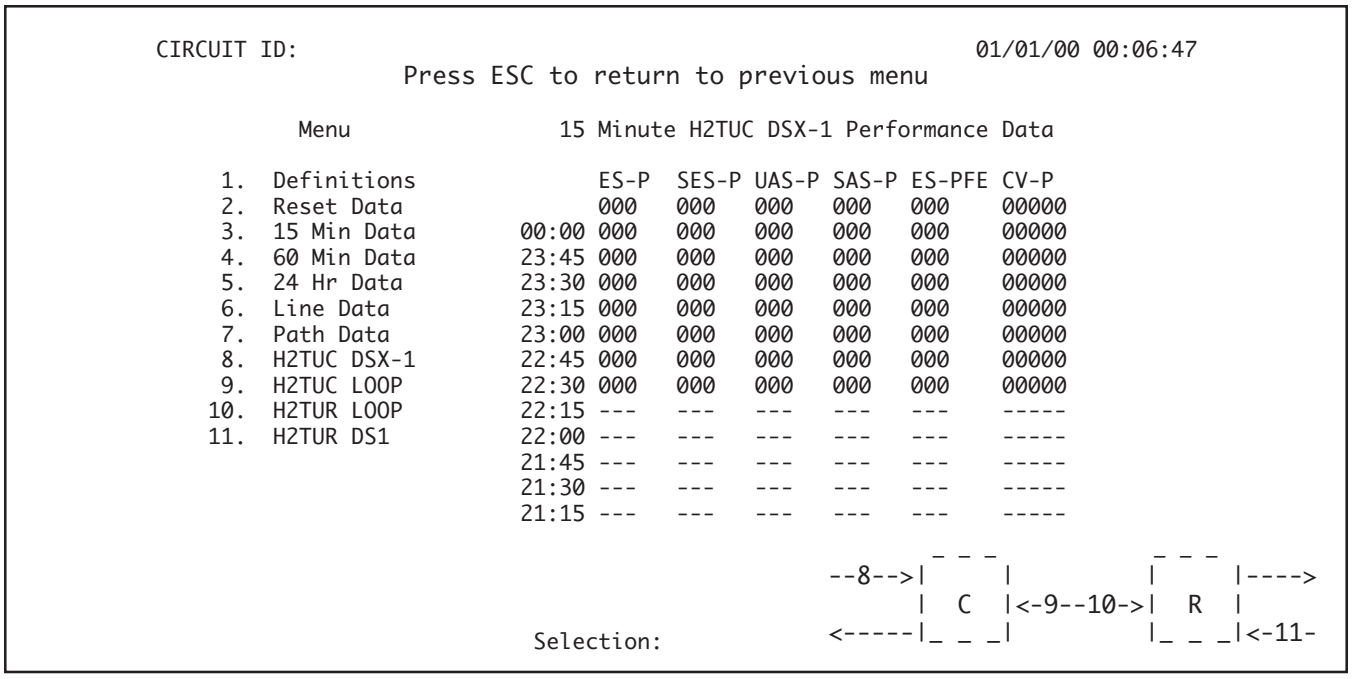


Figure 11. 15-Minute Performance History Path Data Screen

```
CIRCUIT ID:                                                  01/01/00 00:07:07
                  Press ESC to return to previous menu

          Menu                60 Minute H2TUC DSX-1 Performance Data

     1.  Definitions                ES-L  SES-L UAS-L PDVS-L B8ZS-L CV-L
     2.  Reset Data                 0001  0001  0000  0002   0427   00000
     3.  15 Min Data      01/01 00:00 1800  1800  1800  0000   0000   00000
     4.  60 Min Data      12/31 23:00 ----  ----  ----  ----   ----   -----
     5.  24 Hr Data       12/31 22:00 ----  ----  ----  ----   ----   -----
     6.  Line Data        12/31 21:00 ----  ----  ----  ----   ----   -----
     7.  Path Data        12/31 20:00 ----  ----  ----  ----   ----   -----
     8.  H2TUC DSX-1      12/31 19:00 ----  ----  ----  ----   ----   -----
     9.  H2TUC LOOP       12/31 18:00 ----  ----  ----  ----   ----   -----
    10.  H2TUR LOOP       12/31 17:00 ----  ----  ----  ----   ----   -----
    11.  H2TUR DS1        12/31 16:00 ----  ----  ----  ----   ----   -----
                          12/31 15:00 ----  ----  ----  ----   ----   -----
                          12/31 14:00 ----  ----  ----  ----   ----   -----
                          12/31 13:00 ----  ----  ----  ----   ----   -----

                                                  _ _ _           _ _ _
                                              --8-->|     |         |     |---->
                                                    |  C  |<-9--10->|  R  |
                                Selection:          <-----|_ _ _|         |_ _ _|<-11-
```

Figure 12. 60-Minute Performance History Line Data Screen

```
CIRCUIT ID:                                                  01/01/00 00:07:40
                  Press ESC to return to previous menu

          Menu                24 Hour H2TUC DSX-1 Performance Data

     1.  Definitions                ES-L  SES-L UAS-L PDVS-L B8ZS-L CV-L
     2.  Reset Data                 04497 04497 04496 00002  00460  0000000
     3.  15 Min Data         12/31 ----- ----- ----- -----  -----  -------
     4.  60 Min Data         12/30 ----- ----- ----- -----  -----  -------
     5.  24 Hr Data          12/29 ----- ----- ----- -----  -----  -------
     6.  Line Data           12/28 ----- ----- ----- -----  -----  -------
     7.  Path Data           12/27 ----- ----- ----- -----  -----  -------
     8.  H2TUC DSX-1         12/26 ----- ----- ----- -----  -----  -------
     9.  H2TUC LOOP          12/25 ----- ----- ----- -----  -----  -------
    10.  H2TUR LOOP          12/24 ----- ----- ----- -----  -----  -------
    11.  H2TUR DS1           12/23 ----- ----- ----- -----  -----  -------
                             12/22 ----- ----- ----- -----  -----  -------

                                                  _ _ _           _ _ _
                                              --8-->|     |         |     |---->
                                                    |  C  |<-9--10->|  R  |
                                                    <-----|_ _ _|         |_ _ _|<-11-
                                Selection:
```

Figure 13. 24-Hour Performance History Line Data Screen

Abbreviations used in the Performance History Screens are defined in the Data Definitions, see **Figure 14** and **Figure 15**.

```
CIRCUIT ID:                                                  01/01/00 00:05:46
                  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 14. Performance History Data Definitions Screen

```
CIRCUIT ID:                                                  01/01/00 00:06:01
                  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 15. Performance History Data Definitions Screen (Continued)

Figure 16 illustrates the Circuit ID and Time/Date Screen. The Circuit ID can be any alphanumeric string up to 25 characters in length. The time should be entered using military time (for example, enter 3:15 p.m. as “151500”). The date should be entered as MMDDYY (for example, enter January 02, 2000, as “010200”).

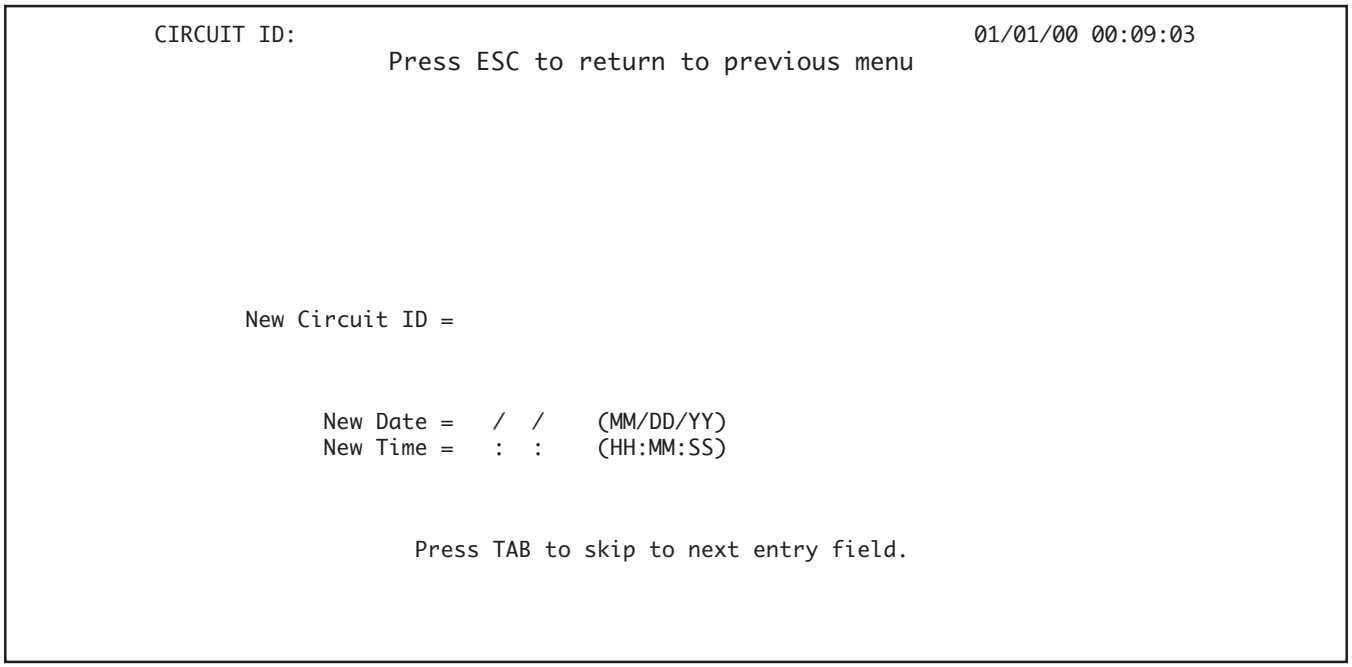


Figure 16. Set Circuit ID, Time/Date Screen

This unit includes two terminal emulation modes. The desired terminal mode can be selected from the Terminal Modes Screen, illustrated in **Figure 17**. Additionally, pressing "CTRL" and "T" while on any screen can toggle the two terminal modes.

The Manual Update Mode allows the user to manually update the provisioning option 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. "3 SPACES TO UPDATE" appears at the top of each screen. By pressing the space bar 3 times, the screen will be refreshed and will reflect the most current circuit conditions and provisioning options.

The second terminal emulation mode is the Real Time Update Mode (VT100). This mode provides real time updating of HDSL2 circuit conditions and provisioning options as changes occur. The Real Time update mode is the default mode.

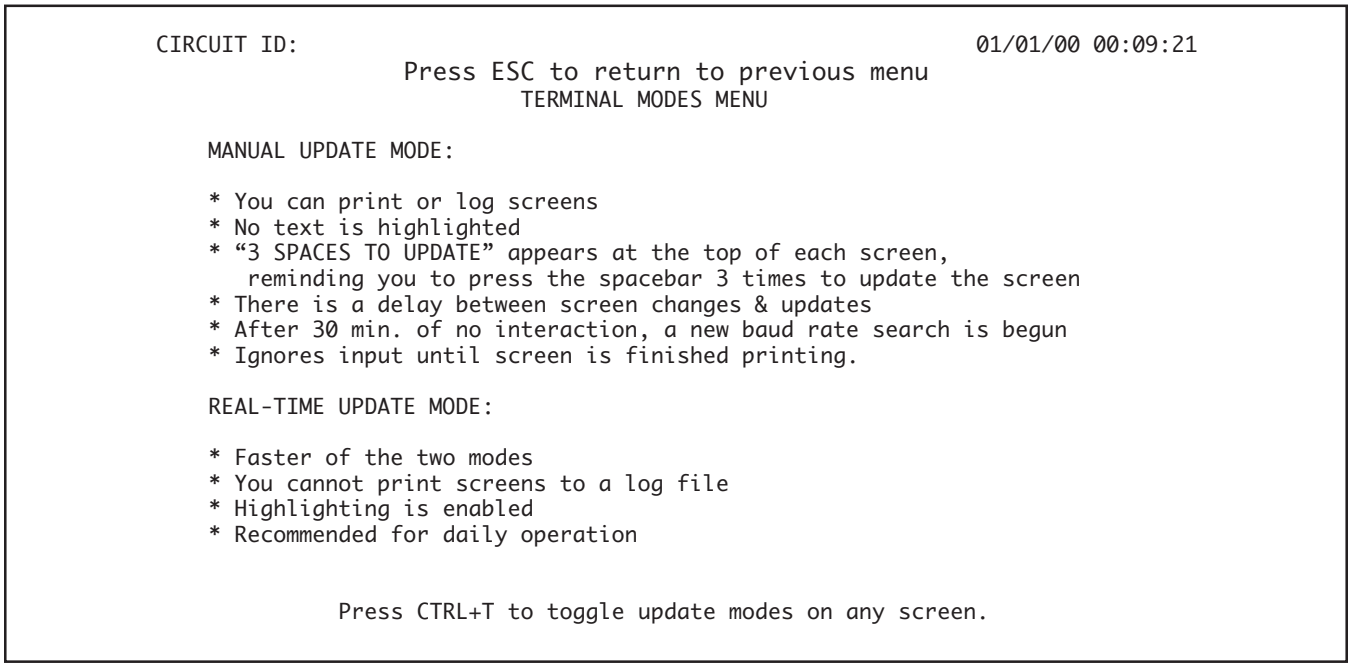


Figure 17. Terminal Modes Menu Screen

The Alarm History Screen, illustrated in **Figure 18**, provides the user with a detailed alarm history and events log for the HDSL2, T1 spans, and the system alarm history. These screens include a time, date, first/last occurrence and count for each type of HDSL2, T1 alarm, and system alarm history.

The Event History Screen, illustrated in **Figure 19**, provides a log history of HDSL2 circuit events.

```
CIRCUIT ID:                                                  01/01/00 00:09:39
               Press ESC to return to previous menu

                              T1 Alarm History
LOCATION   ALARM       FIRST                LAST                 CURRENT   COUNT
-------------------------------------------------------------------------------
H2TU-C     RED(LOS/LOF) 10/12/00  17:00:22   10/12/00  17:00:22   OK         001
 (DSX-1)   YELLOW(RAI)                                            OK         000
           BLUE(AIS)                                              OK         000

H2TU-R     RED(LOS/LOF)                                           OK         000
 (DS1)     YELLOW(RAI)                                            OK         000
           BLUE(AIS)    01/01/00  00:00:04   10/12/00  18:15:03   OK         026









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

Figure 18. Alarm History Screen

```
CIRCUIT ID:                                                  01/01/00 00:10:24
               Press ESC to return to previous menu

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

   1.  H2TU-R Powered Up                             01/01/00 00:00:01  H2TU-R
   2.  H2TU-C Powered Up                             10/12/00 17:00:22  H2TU-C
   3.  H2TU-R Powered Up                             10/12/00 18:15:01  H2TU-R
   4.  H2TU-C Powered Up                             01/01/00 00:00:43  H2TU-C









        Page Number:   1/  1   Number of Events:   4
 ------------------------------------------------------------
      'P' - Previous Page  'H' - Home      'R' - Reset Events
      'N' - Next Page      'E' - End

                              Selection:
```

Figure 19. Event History Screen

The Virual Terminal Control Screen, illustrated in **Figure 20**, allows the user to log into the H2TU-C from the H2TU-R.

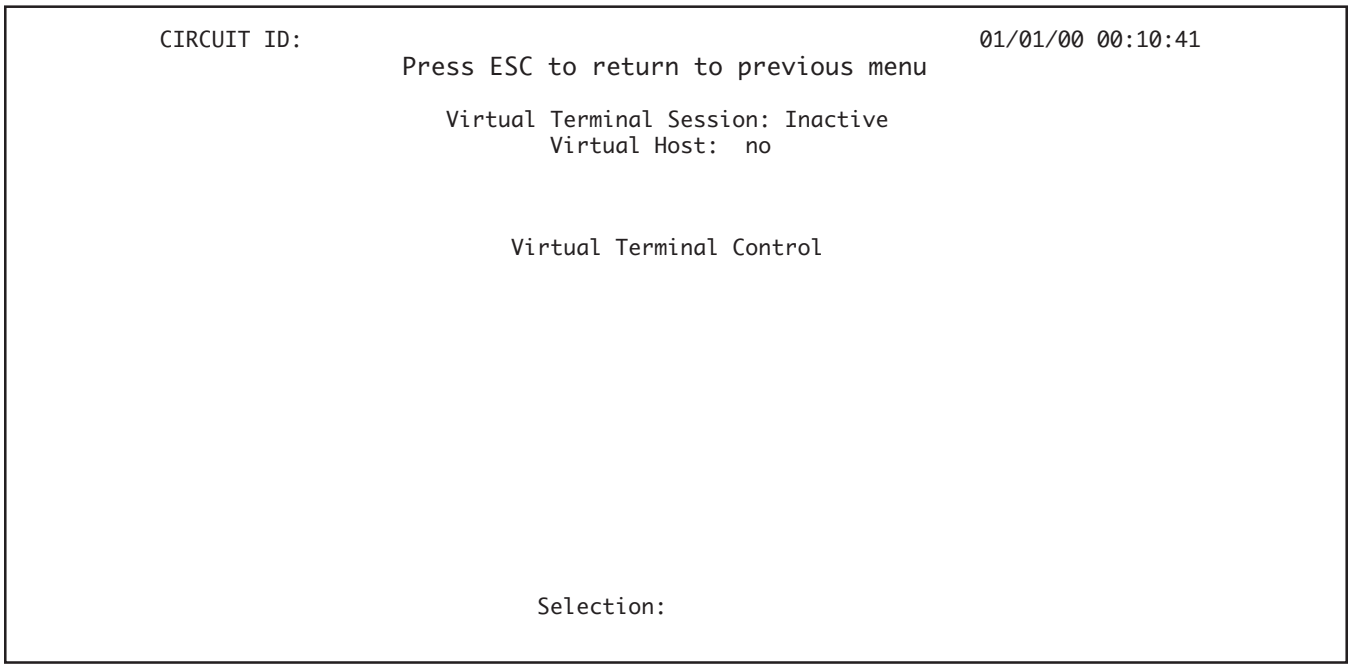


Figure 20. Virtual Terminal Control Screen

6. 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.

1. All loops are non-loaded only.
2. For loops with 26-AWG cable, the maximum loop length including bridged tap lengths is 9 kft.
3. For loops with 24-AWG cable, the maximum loop length including bridged tap lengths is 12 kft.
4. Any single bridged tap is limited to 2 kft.
5. Total bridged tap length is limited to 2.5 kft.
6. The total length of multi-gauge cable containing 26-AWG cable must not exceed

$12 - \{(3*L_{26})/(9-L_{BTAP})\}$ (in kft)

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

L_{BTAP} = Total length of all bridged taps (in kft)

For more information regarding deployment guidelines and applications, reference ADTRAN's *Supplemental Deployment Information for HDSL/HDSL2*, P/N 61221HDSLL1-10

This deployment criteria is summarized in the chart shown in **Figure 21**. Loop loss per kft for other wire is summarized in **Table 6**.

Recommended maximum local loop loss information for PIC cable at 70° F, 135 Ω, resistive termination is provided in **Table 7**.

An approximation for the maximum amount of wideband noise on an HDSL2 local loop as measured by a 50 kb filter is ≤ 31 dBrn.

An approximation for the maximum level of impulse noise as measured using a 50 kb filter on an HDSL2 loop is ≤ 50 dBrn.

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.

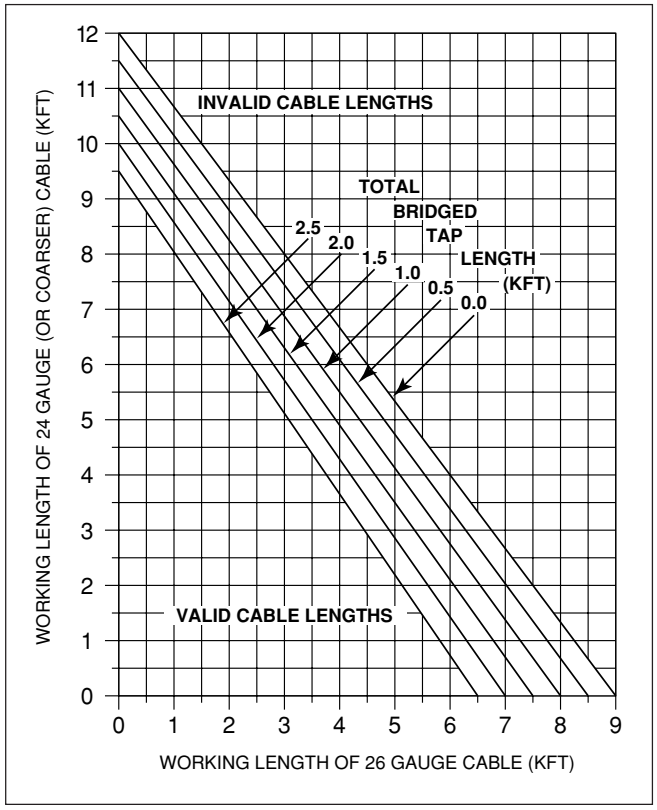


Figure 21. Deployment Guidelines

Table 6. HDSL2 Loss Values
(200 kHz cable loss in dB/kft at 135 Ω)

Cable Gauge	Cable Type	Temperature 68°	90°	120°
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	2.45	2.629
19	PIC	1.551	1.587	1.634
19	Pulp	1.817	1.856	1.909

Table 7. Loop Insertion Loss Data

Frequency (Hz)	Maximum Loss (dB)
3,000	12.00
10,000	15.00
50,000	25.50
100,000	30.00
150,000	32.75
200,000	35.25
250,000	37.50
325,000	42.00

7. TROUBLESHOOTING PROCEDURES

Table 8 is a troubleshooting guide for the T200 H2TU-R.

8. MAINTENANCE

The ADTRAN H2TU-R requires no routine maintenance. In case of equipment malfunction, use the faceplate Bantam jack connector to help locate 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 the ADTRAN. Refer to *Warranty and Customer Service* section of this Practice.

9. PRODUCT SPECIFICATIONS

Table 9 lists the H2TU-R specifications.

10. WARRANTY AND CUSTOMER SERVICE

ADTRAN will replace or repair this product within 10 years from the date of shipment if it does not meet its published specifications or fails while in service. Refer to *ADTRAN U.S. and Canada Carrier Networks Equipment Warranty,* document 60000087-10.

Contact Customer and Product Service (CAPS) prior to returning equipment to ADTRAN.

For service, CAPS requests, or further information, contact one of the following numbers:

ADTRAN Sales

Pricing and Availability
(800) 827-0807

ADTRAN Technical Support

Pre-sales Applications/Post-sales Technical Assistance (800) 726-8663

Standard hours: Monday-Friday, 7 am-7 pm CST
Emergency hours: 7 days/week, 24 hours/day

ADTRAN Repair/CAPS

Return for repair/upgrade
(256) 963-8722

Repair and Return Address

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

Table 8. Troubleshooting Guide

Condition	Solution
All Faceplate indicators are *Off*.	1. Make sure the H2TU-R is properly seating in the housing. 2. Verify that the H2TU-C is delivering sufficient simplex voltage to the loop, if line powered, or that a nominal -48 Vdc is being supplied, if local powered. 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.). 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 the unit.

Table 9. ADTRAN T200 Low Voltage H2TU-R Specifications

Loop Interface

Modulation Type	16-TC PAM
Mode	Full Duplex, Partially Overlapped, Echo Canceling
Number of Pairs	One
Bit Rate	1.552 mbps
Baud Rate	517.333 k baud
Service Range	Defined by Carrier Service Area Guidelines
Loop Loss	35 dB maximum @ 196 kHz
Bridged Taps	Single Taps < 2 kFt, Total Taps < 2.5 kFt
Performance	Compliant with T1.418-2000 (HDSL2 Standard)
H2TU-C Tx Pwr (Data) Level	16.8 ± 0.5 dBm (0 to 450 kHz)
H2TU-C Tx Pwr (Activation) Level	16.6 + 0.5 dBm (0 to 450 kHz)
Input Impedance	135 Ω
Maximum Loop Resistance	900 Ω per span
Return Loss	12 dB (50 kHz to 200 kHz)

Customer Interface

DS1 (T1.403-compatible)	(ITU-T I.431 compliant)
DS1 Signal Output Level	0, -7.5 or -15 dB
DS1 Input Signal Level	0 to -22.5 dB
DS1 Line Coding	AMI, B8ZS
DS1 Framing Format	SF, ESF, Unframed, Auto, FFFC (Forced Frame Format Conversion)

Power

Span-powered by H2TU-C or local-powered by a nominal -48 Vdc source.

Maximum Heat Dissipation	3.0 W (Local Power Mode)
Maximum Heat Dissipation	3.0 W (Span Power Mode)

Clock Sources

Clock Sources	Internal, HDSL2 Loop Derived
Internal Clock Accuracy	± 25 ppm, (exceeds Stratum 4). Meets T1.101 timing requirements.

Tests

Diagnostics	Loopback (H2TU-R), initiated with HDSL2 in-band codes, initiated with T1 NIU in-band codes, initiated with H2TU-C command, initiated manually, H2TU-R control port. Self-Test.

Physical

Dimensions	5.5 in. High, 0.7 in. Wide, 6.0 in. Deep
Weight	< 1 pound

Environment

Temperature	Operating (Standard): -40°C to +70°C; Storage: -40°C to +85°C
Relative Humidity	Up to 95% noncondensing

Compliance

UL Listed
Bellcore NEBS Level 3 (SR-3580)
FCC 47CFR Part 15, Class A

Part Number

H2TU-R T200 Circuit Pack	1222026L1

Appendix A
HDSL2 Loopbacks

HDSL2 MAINTENANCE MODES

This Appendix describes operation of the HDSL2 system with regard to detection of in-band 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 H2TU-C loopback is similar to an Intelligent Office Repeater loopback and the H2TU-R loopbacks are similar to an inline 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 H2R units which are in the HDSL2 circuit are treated as Identical Tandem Dataports 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 in-band codes are shown left-most bit transmitted first, and the ESF data link codes with right-most bit transmitted first.

Table A-1. HDSL2 Loopback Control Codes

Type	Source [A-1]	Code [A-2, A-3]	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)	6in7 (1111110)	Loopback data from customer toward customer in H2TU-C.
	(C)	5in7 (1111100)	Loopback data from customer toward customer in H2TU-R.
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.
	(C)	FF48 (ESF-DL) (1111 1111 0100 1000)	Loopback data from customer toward customer at H2TU-R.
	(N)	1in6 (100000)	Loopback data from network toward network 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.

[A-1] The Source column indicates which side of the interface the control codes are sent from. For example, an (N) indicates a network sourced code while a (C) indicates a customer sourced code.

[A-2] All codes are inband unless labeled ESF-DL

[A-3] 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 and Response
Arm	11000 (also known as a 2-in-5 pattern) The H2TU-R will loop up toward the network. No AIS or errors will be sent as a result of this loopback. The H2TU-C will Arm.
Disarm	11100 (also known as a 3-in-5 pattern) The H2TU-C is removed from the armed state. If any of the units are in loopback when the 11100 pattern is received, they will loop down. The LBK LEDs will turn *off* on all units.
H2TU-C Network Loop Up	D3D3 (1101 0011 1101 0011) If the units have been armed and no units are in loopback[A-4], the H2TU-C will loop up toward the network, 2 seconds of AIS (all 1s) will be sent, 5 seconds of data will pass, and then 231 bit errors will be injected into the DSX-1 signal. As long as the pattern continues to be sent, 231 errors will be injected every 20 seconds. When the pattern is removed, the unit will remain in loopback. If the pattern is reinstated, the injection of 231 bit errors will resume at 20-second intervals.
Loop down	9393 (1001 0011 1001 0011) Any H2TU-C unit currently in loopback toward the network will loop down and will retain the armed state.
Query Loopback	D5D5 (1101 0101 1101 0101) If the units are armed and the H2TU-C or H2TU-R is in network loopback, errors are injected into the DSX-1 signal upon detection of the query loopback pattern. As long as the pattern continues to be sent, errors are injected again every 20 seconds. The number of errors injected each time depends on which unit is in loopback. 231 errors are injected if the H2TU-C is in network loopback and 20 at a time if the H2TU-R is in network loopback.
Loopback Time Out Override	D5D6 (1101 0101 1101 0110) If the units are armed and this pattern is sent, the loopback time out will be disabled. The time out option will be updated on the Provisioning menu of the H2TU-R (viewable through the RS-232 port) to “None.” As long as the units remain armed, the time out will remain disabled. When the units are disarmed, the loopback time out will return to the value it had before the D5D6 code was sent.
Span Power Disable	6767 (0110 0111 0110 0111) If the units are armed and this pattern is sent, the H2TU-C will deactivate its span power supply, turning off the H2TU-R. As long as the pattern continues to be sent, the span power supply will remain disabled. When the pattern is no longer being sent, the H2TU-C will reactivate its span power supply, turning the remote unit(s) on. All units will retrain and return to the disarmed and unlooped state.

[A-4] If NIU is enabled, then the H2TU-R can be in network loopback when the H2TU-C loop-up codes are sent.