Total Access SHDSL T1/E1 Line Terminating Unit
Installation and Maintenance Practice

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1. GENERAL

This document is an installation and maintenance practice for the ADTRAN Total Access® SHDSL T1/E1 Line Terminating Unit (LTU). **Figure 1** illustrates the SHDSL T1/E1 LTU front panel, P/N 1182210L1.

Revision History

This is the initial issue of this practice. Future changes to this documentation will be explained in this subsection.

2. DESCRIPTION

The SHDSL T1/E1 LTU was designed for use in the Total Access 3000 chassis. The Total Access SHDSL T1/E1 LTU provides an interface between the SHDSL network and the Central Office data network. The SHDSL T1/E1 LTU receives a G.703 signal from the network and transmits an SHDSL signal to the customer. The G.703 and SHDSL signals are transmitted/received via the Total Access 3000 chassis backplane connectors. The SHDSL T1/E1 LTU supports loop rates from 192 kbps to 2.048 Mbps.

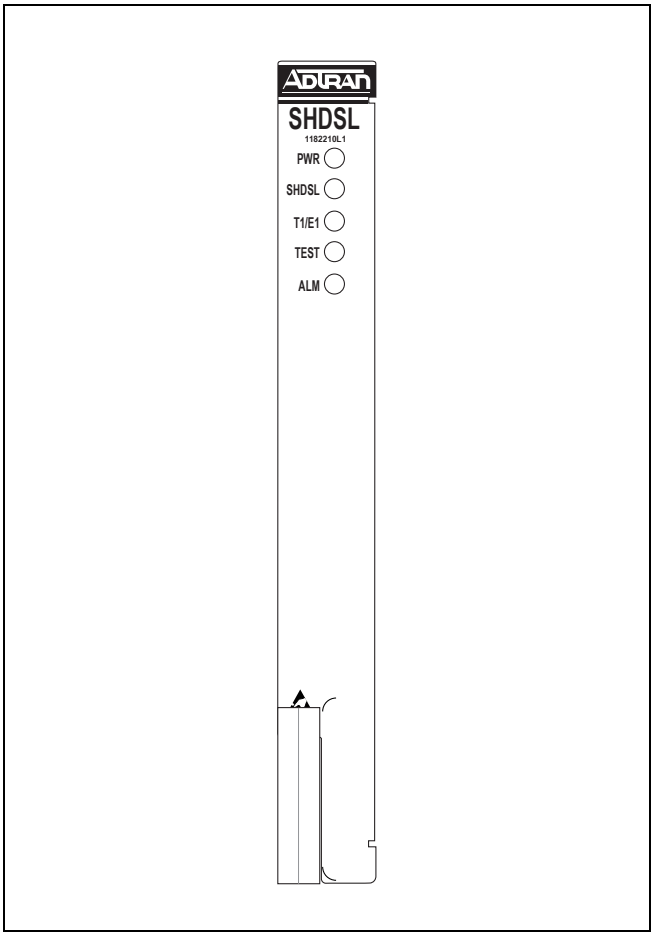

Figure 1. SHDSL T1/E1 LTU Front Panel

The module is 100 percent compliant with the ITU recommendation (G.991.2) for SHDSL transmission, ensuring spectral compatibility and interoperability.

Features

The basic features of the SHDSL T1/E1 LTU, P/N 1182210L1, include the following:

- Responds to an Embedded Operations Channel (EOC) inventory response message
- Provides both transmit and receive clocking
- Provides a user selectable service state option
- Operates in T1 mode with a data rate of 200 kbps to 1.544 Mbps and E1 mode with a data rate of 192 kbps to 2.048 Mbps
- Non-volatile memory configuration

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- Factory default restoration via VT100 menu screens or SNMP commands
- Firmware upgrade using YModem or TFTP connection
- Receives remote NTU's firmware upgrades via YModem or TFTP connection
- Automatically updates the Circuit ID
- Automatically updates the date and time registers
- Password protected

See **Figure 2** for a typical configuration setup.

Connections

The SHDSL T1/E1 LTU inserts into any access module slot (1 through 28) of a Total Access 3000 chassis. Power and alarm signals are provided to the module through the backplane of the chassis.

The G.703 and SHDSL signals are transmitted/received via the 64-pin backplane amphenol connectors. The G.703 signal is transmitted to the network side via "Pair 8," and the G.703 signal is received from the network side via connector "Pair 7." The SHDSL signal is transmitted to and from the customer side via connector "Pair 2."

Compliance

Table 1 shows the compliance codes for the SHDSL T1/E1 LTU. The SHDSL T1/E1 LTU is NRTL listed to the applicable UL standards. The SHDSL T1/E1 LTU is to be installed in a restricted access location and in a Type "B" or "E" enclosure only.

This device complies 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.

Table 1. Compliance Codes

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

3. INSTALLATION

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

After unpacking the SHDSL T1/E1 LTU, inspect it for damage. If damage has occurred, file a claim with the carrier, then contact ADTRAN Customer Service. Refer to the *Warranty and Customer Service* section for further information. If possible, keep the original shipping container for returning the SHDSL T1/E1 LTU for repair or for verification of shipping damage.

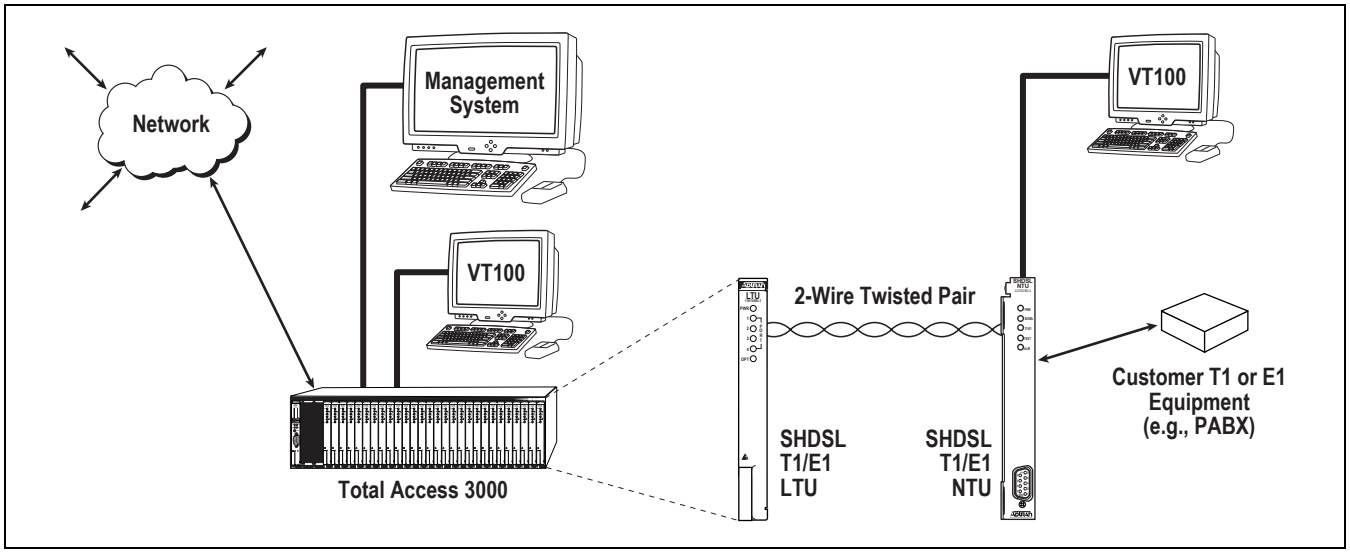

Figure 2. Typical System Application

Shipping Contents

The contents include the following items:

- SHDSL T1/E1 LTU
- SHDSL T1/E1 LTU Installation and Maintenance Practice

CAUTION

Electronic modules can be damaged by 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.

Instructions for Installing the Module

The SHDSL T1/E1 LTU inserts into any access module slot (1 through 28) of a Total Access 3000 chassis. To install the SHDSL T1/E1 LTU, perform the following steps:

1. If present, remove the Access Module Blank (P/N 1181953L1) from the appropriate access module slot of the Total Access 3000 chassis.
2. Hold the unit by the front panel while supporting the bottom side with the ejector latch at the bottom, and the latch opened to engage the chassis edge when it is plugged in.
3. Align the module edges to fit in the lower and upper guide grooves for the designated slot.
4. Slide the module into the access module slot while pressing equally on the top and bottom of the front panel until the module is firmly positioned against the backplane of the chassis.
5. Lock the module in place by pushing in on the locking lever located on the lower left-hand side of the module.

The SHDSL T1/E1 LTU initializes and goes operational upon insertion into an active Total Access 3000 chassis. Initialization is indicated by the front panel LEDs.

LED Indicators

The front panel of the SHDSL T1/E1 LTU has five LED status indicators. **Table 2** lists the LED descriptions.

Table 2. Front Panel LEDs

LED	Indication	Description
PWR	Off Green Yellow	The module is powered off The module is In Service The module is Out of Service or in the process of a firmware upgrade
SHDSL	Off Green Yellow Red	SHDSL loop is Out of Service, Unassigned SHDSL loop is trained with good signal quality SHDSL loop is trained with poor signal quality SHDSL loop is not trained
T1/E1	Off Green	Port is active with alarms Port is active with no alarms
TEST	Off Green Yellow Red	Module is not in loopback or BERT Local loopback is active or BERT is running with no errors BERT is running with bit errors BERT is running with no pattern sync
ALM	Off Yellow Red	No alarm condition detected Alarm condition detected remotely Alarm condition detected locally

4. PROVISIONING

All provisioning will be handled through the SCU communication link, either through the menu access or SNMP. There are no onboard DIP switches or jumpers. The unit will retain provisioning data in a nonvolatile memory device in case of a loss of power to the module.

Total Access 3000 system management and provisioning is facilitated by a series of intuitive menus that are accessible on a computer screen. Connecting either a VT100 terminal or a PC emulating a VT100 terminal to the craft interface on the SCU front panel allows access to the menus and management features of the Total Access 3000.

The front craft access port for the Total Access 3000 system is located on the front panel of the SCU and is a DB-9 connector. Access can also be made to the Total Access 3000 chassis from the backplane through the port labeled **ADMIN** (J31). It is a DB-25 connector, and is located on the upper right corner of the backplane.

NOTE

Connecting to the Total Access 3000 chassis from the front craft port on the SCU requires a straight serial data cable. Connection to the Total Access 3000 chassis via the rear connector on the backplane requires the use of a null modem cable, because that port is configured for a modem and expects to see DCE equipment.

The parameters of the VT100 terminal should be set as follows:

- 9600 Baud
- No parity
- 8 Data bits
- 1 Stop bits
- No Flow Control

Windows HyperTerminal

Windows HyperTerminal can be used as a VT100 terminal emulation program. Open HyperTerminal by selecting Programs/Accessories/HyperTerminal. Refer to the Help section of HyperTerminal for additional information.

NOTE

To ensure proper display background, select VT100 terminal emulation under Settings.

Password and User ID

Password protection is factory enabled. If password protection is enabled, the SCU will display the logon screen, and a valid account name and password are required to access menus. The factory default account names and default passwords (both are case sensitive) are displayed in **Table 3**.

Table 3. Account Names and Passwords

Account Name	Default Password	Access Rights
ADMIN	PASSWORD	Administration Access
READONLY	PASSWORD	Read Access only
READWRITE	PASSWORD	Read and Write Access
TEST	PASSWORD	Read and Test Access

NOTE

The Account Name and Password are to be entered in all capital letters.

Menu Navigation

The following subsection describes the SHDSL T1/E1 LTU menus. Most menu selections are made by typing the corresponding number and then pressing ENTER. If the wrong selection is made, pressing ESC will display the previous screen. The Question Mark (?) can be used at any time to display a list of menu commands.

Main Menu

The Total Access Main menu allows the user to access the module for various functions such as provisioning, status, alarms, and performance monitoring.

The menu tree in **Figure 3** illustrates the path to every provisioning, performance, and test access point in the SHDSL T1/E1 menu system.

Table 4 lists the complete set of configurable options with settings and factory default values.

NOTE

When the LTU is in T1 mode, all related E1 options will be non-applicable. A non-applicable option setting is still changeable, but will not take affect until the option become applicable.

5. OPERATION

Test Capabilities

The Total Access SHDSL T1/E1 LTU has the following test capabilities:

- Self diagnostics
- Local loopbacks
- EOC initiated remote loopbacks
- Internal bit error rate tester (BERT)

Self Diagnostics

The Total Access SHDSL T1/E1 LTU performs self diagnostic tests of its Read Only Memory (ROM), Random Access Memory (RAM), LEDs, and non-volatile configuration setting upon power-up.

Local and Remote Loopbacks

For troubleshooting purposes, the SHDSL T1/E1 LTU provides three types of loopback tests.

1. Dual sided
2. Network
3. Customer

BERT

The SHDSL T1/E1 LTU provides an internal bit error rate tester (BERT) for the injection and observation of random bit sequence to and from the SHDSL.

Customer Port

The SHDSL T1/E1 LTU operates in either E1 mode or T1 mode.

E1 Mode

In E1 mode the port features are as follows:

- Carries information at the rate of 2.048 Mbps
- Uses CCS framed format with or without CRC-4
- Operates in either Alternate Mark Inversion (AMI) or High-Density Bipolar 3 (HDB3) line code
- Provides programmable timeslot idle pattern
- Supports ISDN-PRA V3 service
- Displays additional status information via a local VT100 management screen

See **Table 5** for E1 port statistics definitions.

T1 Mode

In T1 mode the port features are as follows:

- Carries information at the rate of 1.544 Mbps
- Uses Superframe Format (SF) or Extended Superframe Format (ESF)
- Operates in either Alternate Mark Inversion (AMI) or Bipolar w/8-Zero Substitution (B8ZS) line code
- Provides programmable timeslot idle pattern
- Monitors the Facility Data Link (FDL)
- Displays additional status information via a local VT100 management screen

See **Table 6** for T1 port statistics definitions.

NOTE

In T1 mode both the SHDSL T1/E1 LTU and the SHDSL NTU must be operational.

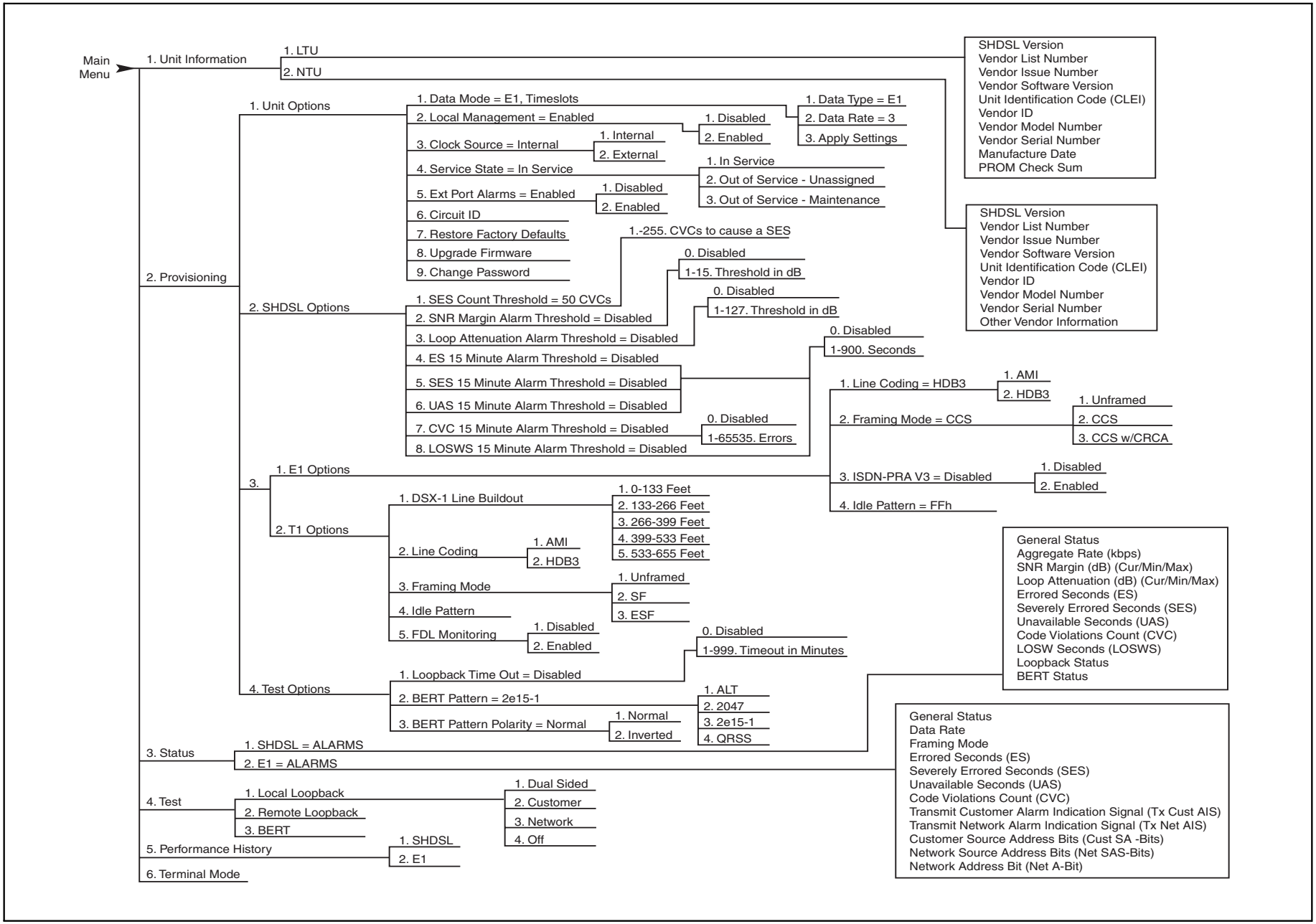

Figure 3. SHDSL T1/E1 LTU Menu Tree

Table 4. Configuration Options List

Category	Option	Setting	Default
Unit Options	Data Mode	For Data Type = T1, Data Rate can be from 3 to 24 timeslots (i.e. 200 kbps to 1.544 Mbps) For Data Type = E1, Data Rate can be from 3 to 32 timeslots (i.e., 192 kbps to 2.048 Mbps)	Data Type = 1 Data Rate = 24
	Local Management	1 = Disabled 2 = Enabled	Enabled
	Clock Source	1 = Internal 2 = External	Internal
	Service State	1 = In Service 2 = Out of Service - Unassigned 3 = Out of Service - Maintenance	Out of Service - Maintenance
	External Port Alarms	1 = Disabled 2 = Enabled	Disabled
	Restore Factory Defaults		
	Firmware Upgrade		
	Change Password		
SHDSL Options	SES CVC Threshold	0 to 255 CVC's	50
	SNR Margin Alarm Threshold	0 = Disabled 1 to 15db = Alarm Threshold	Disabled
	Loop Attenuation Alarm Threshold	0 = Disabled 1 to 127db = Alarm Threshold	Disabled
	ES 15 Minute Alarm Threshold	0 = Disabled 1 to 900 Seconds = Alarm Threshold	Disabled
	SES 15 Minute Alarm Threshold	0 = Disabled 1 to 900 Seconds = Alarm Threshold	Disabled
	UAS 15 Minute Alarm Threshold	0 = Disabled 1 to 900 Seconds = Alarm Threshold	Disabled
	CVC 15 Minute Alarm Threshold	0 = Disabled 1 to 65535 Errors = Alarm threshold	Disabled
	LOSWS 15 Minute Alarm Threshold	0 = Disabled 1 to 900 Seconds = Alarm Threshold	Disabled
T1 Options (T1 Mode Only)	Line Coding	1 = AMI 2 = B8ZS	B8ZS
	Framing Mode	1 = Unframed 2 = SF 3 = ESF	ESF
	Idle Pattern	00h to FFh	7Fh
	FDL Monitoring (ESF Mode Only)	1 = Disabled 2 = Enabled	Disabled

Table 4. Configuration Options List (Continued)

Category	Option	Setting	Default
E1 Options (E1 Mode Only)	Line Coding	1 = AMI 2 = HDB3	HDB3
	Framing Mode	1 = Unframed 2 = CCS 3 = CCS w/CRC-4	CCS
	Idle Pattern	00h to FFh	FFh
	ISDN - PRA V3 (CCS or CCS w/CRC-4 Mode Only)	1 = Disabled 2 = Enabled	Disabled
Test options	Loopback Timeout	0 = Disabled 1 to 999 Minutes = Timeout	Disabled
	BERT Pattern	1 = ALT 2 + 2047 3 = 2e15 – 1 4 = QRSS	2e15 – 1
	BERT Pattern Polarity	1 = Normal 2 = Inverted	Normal

Table 5. E1 Port Statistics Definitions

Statistic	Framing Mode	Definition
Errored Seconds (ES)	Unframed	LOS condition or BPV's > 0
	CCS	LOS or LOF condition, or if BPV's > or FE's > 0
	CCS w/CRC-4	LOS, LOF, or LOMFA condition, or if FE's > 0 or CRC-4 errors > 0
Severely Errored Seconds (SVS)	Unframed	LOS condition
	CCS	LOS or LOF condition or if FE's > 4
	CCS w/CRC-4	LOS, LOF, or LOMFA condition, or if FE's > 4 or CRC-4 errors ≥ 300
Unavailable Seconds (UAV)	N/A	If 10 continuous SES's, then UAS If 10 continuous seconds with no SES's, then no UAS
Code Violations Count (CVC)	Unframed	If BPV's > 0
	CCS	If BPV's > 0, or FE's > 0
	CCS w/CRC-4	If FE's > 0 or CRC-4 errors > 0

Table 6. T1 Port Statistics Definitions

Statistic	Framing Mode	Definition
Errored Seconds (ES)	Unframed	LOS condition or BPV's > 0
	SF	LOS or LOF condition, or if BPV's > 0 or FE's > 0
	ESF	LOS or LOF condition, or if BPV's > 0 or FE's > 0
Severely Errored Seconds (SVS)	Unframed	LOS condition or BPV's > 1544
	SF	LOS or LOF condition, or if BPV's > 1544 or if FE's > 8
	ESF	LOS or LOF condition, or if BPV's > 1544 or if FE's > 8
Unavailable Seconds (UAV)	N/A	If 10 continuous SES's, then UAS If 10 continuous seconds with no SES's, then no UAS
Code Violations Count (CVC)	Unframed	If BPV's > 0
	SF	If BPV's > 0 or FE's > 0
	ESF	If BPV's > 0 or FE's > 0

6. MAINTENANCE

The SHDSL T1/E1 LTU requires no routine maintenance for normal operation.

ADTRAN does not recommend that repairs be attempted in the field. Repair services may be obtained by returning the defective unit to ADTRAN. Refer to the *Warranty and Customer Service* section for further information.

7. SPECIFICATIONS

Specifications for the Total Access 3000 SHDSL T1/E1 LTU are detailed in **Table 7**.

8. 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.

Table 7. SHDSL T1/E1 LTU Specifications

Environmental	
Operating Temperature:	–5°C to 55°C
Storage Temperature:	–40°C to 85°C
Relative Humidity:	90 percent maximum @ 50°C, noncondensing
Maximum Current Draw:	0.15 A maximum @ –48 VDC
Maximum Heat Dissipation:	3.5 watts
Physical	
Dimensions:	6 in. H x .625 in. W x 10 in. D
Weight:	< 1 lb.
Part Number	
SHDSL T1/E1 LTU Module:	1182210L1