Total Access 1500 Dual Line Interface Unit (LIU) Installation and Maintenance Practice

CONTENTS

FIGURES

TABLES

1. GENERAL

This practice is an installation and maintenance guide for the ADTRAN® Total Access 1500® Dual Line Interface Unit (LIU) Common Module. Figure 1 shows the Dual LIU (P/N 1180009L1) front panel.

Revision History

This is the fourth issue of this practice. This issue reflects updates to the Total Access 1500 System Software Release 3.0, Dual LIU software T07D, and incorporates the addition of new features including:

- Changed CLK OOS Alarm in Alarms menu to Disable as factory default
- Incorporation of automatic mapping for 2B+D ISDN when in Dual T1 mode
- Removed signaling bits from 4-wire TO

A full list of features is detailed in *Total Access 1500 System Release 3.0 Release Notes* available at www.adtran.com.

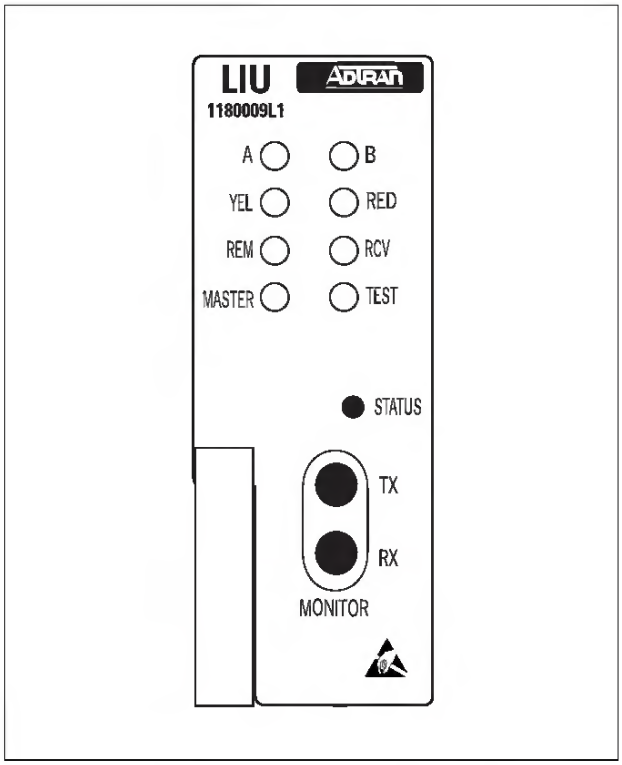

Figure 1. Dual LIU Front Panel

NOTE

This release of the LIU software is designed to operate with System Controller Unit (SCU) software release V08 or later to support these feature enhancements.

Description

The Dual LIU is a common module for the Total Access 1500 chassis (P/N 1180001L1) or the Total Access 1500 19-inch chassis (P/N 1180019L1).

The Dual LIU connects the chassis to a T1 line at the DSX-1 or DS1 level. All data formatting and line encoding as well as backplane timing and control are performed by the Dual LIU.

Features

The basic features of the Dual LIU include the following:

- Terminates up to 2 T1 lines providing DSX-1 or DS1 interface to the network
- Supports up to 48 DS0s
- SF or ESF data framing formats
- AMI or B8ZS line code formats
- Local and remote loopbacks
- Front panel bantam jacks for monitoring T1s
- Local, loop, or external timing modes
- Supports ANSI T1.403 in-band payload and line loopback

Compliance

Table 1 shows the compliance codes for the Dual LIU. The Dual LIU is NRTL listed to the applicable UL Listing.

The Total Access 1500 chassis frame ground terminal must be connected to an earth ground to ensure that the front panel of the Dual LIU is properly grounded via the backplane connector.

Table 1. Compliance Codes

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

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

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

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

2. INSTALLATION

After unpacking the Dual LIU, 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 Dual LIU for repair or for verification of shipping damage.

Shipping Contents

The contents include the following items:

- Dual LIU
- Dual LIU 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 Dual LIU plugs directly into the Total Access 1500 channel bank. No installation wiring is required.

The Dual LIU should be installed in the Total Access 1500 channel bank in the slot labeled **LIU-A** or **LIU-B**. Refer to *Provisioning* on page 4 prior to card insertion.

CAUTION

This release of the LIU software is designed to operate with SCU software release V08 or later to support feature enhancements. SCU software can be found at www.adtran.com under the Service/Support page.

To install the Dual LIU, perform the following steps:

1. If present, remove the LIU Blank (P/N 1180010L1) from the appropriate LIU common module slot of the Total Access 1500 chassis.

2. Hold the Dual LIU by the front panel while supporting the bottom edge.
3. Align the Dual LIU card edges to the guide grooved for the slot designated **LIU-A**.
4. Insert the Dual LIU until the edge connector seats firmly into the backplane.
5. Push the ejector in place to ensure the Dual LIU is fully seated.

NOTE

An additional **LIU-B** slot is also provided for optional redundancy. For dual operation, only Dual LIUs of the same software revision should be installed.

When the Dual LIU first powers up it performs the power up self-tests, which check the DRAM and checksum. Once the power up self-test is complete, the status LEDs will reflect the true state of the hardware.

Front Panel LEDs

The front panel LEDs provide status and alarm information. See Table 2 for LED descriptions.

Front Panel Pushbutton

A pushbutton switch labeled **STATUS** is accessible from the front panel to aid in test and troubleshooting. The **MONITOR TX** and **RX** bantam jacks are provided for T1 access.

NOTE

TX = Transmit (Out) and **RX** = Receive (In)

Table 2. Front Panel LEDs

Label	Condition	Description
A	Red	ON = T1-A in Red Alarm
	Yellow	ON = T1-A in Yellow Alarm
	Green	ON = T1-A Active
	Flashing	FLASHING = T1-A in Test
	Off	OFF = In Monitor Mode
B	Red	ON = T1-B in Red Alarm
	Yellow	ON = T1-B in Yellow Alarm
	Green	ON = T1-B Active
	Flashing	FLASHING = T1-B in Test
	Off	OFF = In Monitor Mode
RED	Red	ON = Monitored T1 in Red Alarm
YEL	Yellow	ON = Monitored T1 in Yellow Alarm
RCV	Red	ON = Monitored T1 bipolar or logic error detected
REM	Green	ON = Remotely Provisioned (Craft or Network)
	Off	OFF = Locally Provisioned (DIP Switches)
TEST	Yellow	ON = Test Mode Active
MASTER	Green	ON = Online Unit
	Flashing	FLASHING = Provisioning in progress. Failover not possible.
STATUS	Switch	Momentary activation cycles through the T1s for monitoring purposes. Activating the switch for two or more seconds will cause provisioning to toggle between local and remote.

3. PROVISIONING

All options on the Dual LIU are provisionable either manually, using internal DIP switches, or electronically using the SCU **ADMIN** port.

Manual Provisioning

The DIP switches SW1 and SW2 provide the Total Access 1500 with the necessary option settings for DSX/DS1 modes of operation. Figure 2 shows the orientation of the DIP switches. Table 3 on page 5 shows the available DIP switch settings.

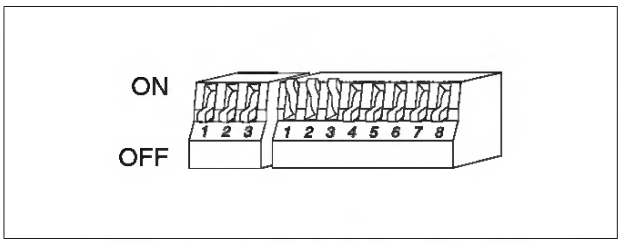

Figure 2. DIP Switches

NOTE

DIP switch settings can be used for the initial turn up of the system, and will automatically assign time slots to physical slots, depending on the setting selected. If any setting is changed via the VT100 interface, the **REM** LED on the front panel will light indicating that the settings have changed.

Electronic Provisioning

The craft ports on the Total Access 1500 SCU are used to change default options and obtain access module status through menu screens. To access the menu screens, connect a VT100 terminal or computer running a terminal emulation program to the SCU front panel **ADMIN** port using a standard male RS-232, DB-9 cable. **ADMIN** port settings are as follows:

- 9600 baud
- No parity
- 8 data bits
- 1 stop bit
- No flow control

Windows HyperTerminal

Windows HyperTerminal can be used as a VT100 terminal emulation program. 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 a function of the SCU and is factory disabled. If password authentication is enabled, then the SCU will display the Logon screen. A valid User Name and Password are required to access menus.

NOTE

The factory default User Name is "user", and the default Password is "password". The User Name and Password are not case sensitive.

Menu Navigation

To traverse through the menus, select the desired entry and press Enter. To work backward in the menu press the Esc key.

The menu tree in Figure 3 on page 6 illustrates the path to every provisioning, performance, and test access point in the Total Access 1500 Dual LIU menu.

Menus

The following subsections describe the Dual LIU menu screens.

Main Menu

The LIU main menu provides access to the Dual LIU for various functions such as viewing configuration, provisioning, viewing the current status of the module, setup of alarms, testing, and performance monitoring.

Configuration Screen

The LIU Configuration screen is a read-only display. It provides configuration data pertaining to the Dual LIU and cannot be changed. Information such as unit name, CLEI code, part number, product revision, and software revision are displayed. Items such as Software Revision will reflect new software revisions as upgrades are performed.

Table 3. Dual LIU Switch Settings

Switch	Function	Description				
SW1	DSX-1 Line Build Out and DS1 Attenuation	Selects the Line Build Out in feet; Attenuation in Decibels (dB)				
		Distance	**SW1-1**	**SW1-2**	**SW1-3**	
		0-133 (Feet)/0 dB*	OFF	OFF	OFF	
		133-266	OFF	OFF	ON	
		266-399	OFF	ON	OFF	
		399-533	OFF	ON	ON	
		533-655	ON	OFF	OFF	
		–7.5 dB	ON	OFF	ON	
		–15 dB	ON	ON	OFF	
		–22.5 dB	ON	ON	ON	
SW2-1 OFF ON	Line Code Format AMI B8ZS*	Enables Bipolar Eight Zero Substitution (B8ZS), which allows for Clear Channel operation for the T1 carrier system, or Alternate Mark Inversion (AMI). This option must be configured identically with all other T1 network equipment on this circuit.				
SW2-2 OFF ON	Framing Format SF ESF*	Enables either Extended Superframe Format (ESF) or Superframe Format (SF). This option must be configured identically with all other T1 network equipment on this circuit.				
SW2-3 SW2-4	Timing Mode	Determines a clock source for the Total Access 1500 channel bank.				
		Function			**SW2-3**	**SW2-4**
		Local clock – provided by local LIU			OFF	OFF
		Loop A clock – uses recovered clock from T1 bit stream*			OFF	ON
		External clock input			ON	OFF
SW2-5 SW2-6 SW2-7	Terminal Mode	Select the appropriate Terminal Type and counting mode for the Total Access 1500 system.				
		Terminal Mode	**Counting**	**SW2-5**	**SW2-6**	**SW2-7**
		D4*	D4	OFF	OFF	OFF
		D4	D1D	OFF	OFF	ON
		Dual D4	D4	OFF	ON	OFF

* Denotes factory default settings

Note: SW1-1 through SW2-4 set up both T1s identically.

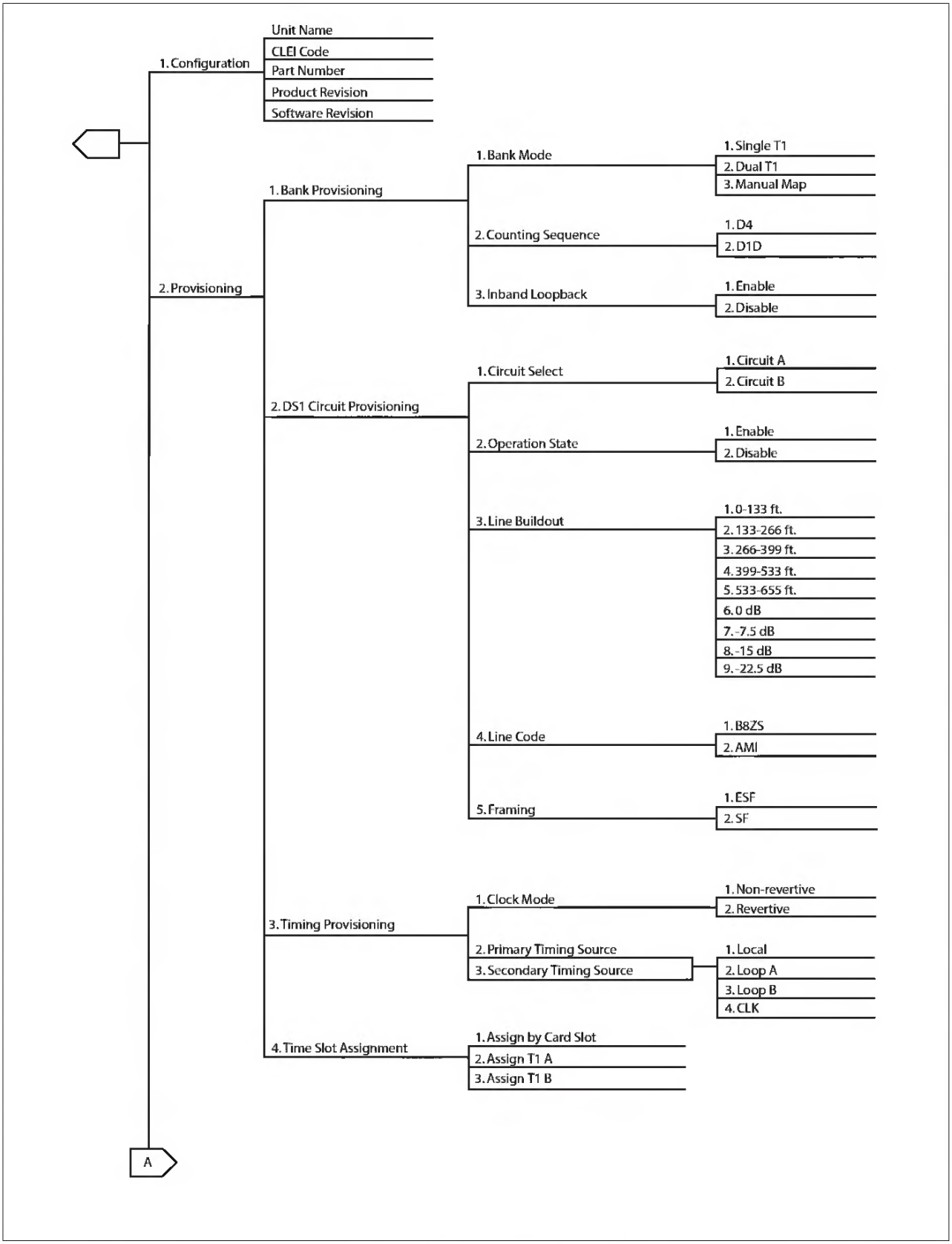

Figure 3. Dual LIU Menu Tree

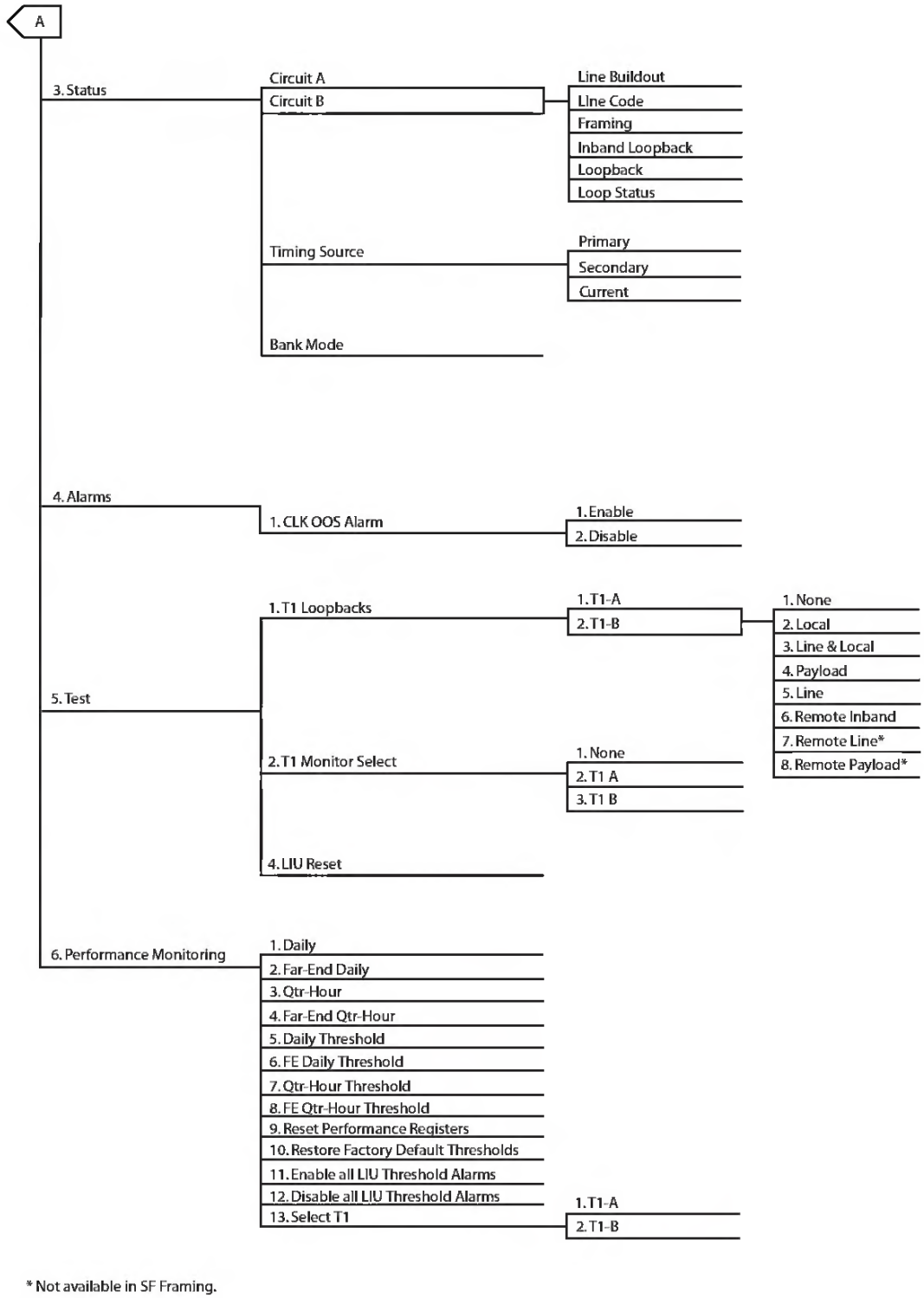

Figure 3. Dual LIU Menu Tree (continued)

Provisioning Menu

The Dual LIU Provisioning menu is a top-level provisioning screen which contains several other provisioning categories that allow users to make provisioning changes to the Dual LIU.

The provisioning categories are listed below with all respective submenus listed under each category.

Bank Provisioning

The Bank Provisioning menu items are used to set general channel bank provisioning settings. Options include the following:

1. **Bank Mode:** This option is used to select the bank mode for the Total Access 1500. Options include the following:
   - Single T1
   - Dual T1
   - Manual Map

NOTE

If Manual Map is selected, time slots must be assigned using the Time Slot Assignment option from the LIU Provisioning menu.

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2. **Counting Sequence:** This option is used to select the counting sequence of the selected T1. The options include the following
   - D4
   - D1D
3. **In-band Loopback:** This option is used to enable or disable ANSI T1.403 in-band loopbacks.

DS1 Circuit Provisioning

The DS1 Circuit Provisioning menu items are used to provision the DS1 circuit. Options include the following:

1. **Circuit Select:** This option is used to select the circuit to be provisioned. The options include the following:
   - Circuit A
   - Circuit B
2. **Operation State:** This option is used to enable or disable the operation state of circuits A and B.
3. **Line Buildout:** This option is used to select the line length or the attenuation loss of the selected T1. Option include the following:
   - 0-133 feet
   - 133-266 feet
   - 266-399 feet
   - 399-533 feet
   - 533 - 655 feet
   - 0 dB
   - –7.5 dB
   - –15 dB
   - –22.5 dB
4. **Line Code:** This option is used to select the line coding type. Options include the following:
   - B8ZS: This option is used to enable Bipolar Eight Zero Substitution (B8ZS), which allows for Clear Channel operation for the T1 carrier system. This option must be configured identically with all other T1 network equipment on this circuit.
   - AMI: This option is used to enable Alternate Mark Inversion (AMI). This option must be configured identically with all other T1 network equipment on this circuit.
5. **Framing:** This option is used to select the framing format for the selected T1. This setting must be configured identically with all other T1 network equipment on this circuit. Options include the following:
   - ESF: This option is used to enable Extended Superframe Format.
   - SF: This option is used to enable Superframe Format.

Timing Provisioning

The Timing Provisioning menu items are used to establish the clock mode and primary and secondary timing source. Options include the following:

1. **Clock Mode:** Options include Non-revertive or Revertive clock mode. This decision should be based on whether a primary and secondary timing source are available. In the event that the primary timing source is lost, the Dual LIU will automatically switch to the secondary timing source.

- Revertive: This option allows the unit to revert to the primary timing source if and when it becomes available.
- Non-revertive: This option allows the unit to remain on the secondary timing source. If Non-revertive is chosen and the secondary timing source becomes active due to a primary timing source failure and the secondary source fails, the unit will switch to the primary timing source if it has become available.

2. **Primary Timing Source:** This option is used to select the primary timing source for the T1s. Options include the following:
   - Local
   - Loop A
   - Loop B
   - CLK
3. **Secondary Timing Source:** This option is used to select the secondary timing source for the T1s. Options include the following:
   - Local
   - Loop A
   - Loop B
   - CLK

   This timing source will become the current timing source if the primary timing source is lost. If both timing sources are lost, the timing reverts to local. As timing sources are regained, the current timing source reverts to the primary or secondary timing source as they become available.

Time Slot Assignment

Used to assign time slots when the bank is in manual map mode. This option allows time slots to be assigned by T1-A, T1-B, or by the card slot.

Status Screen

The Dual LIU Status screen is used to quickly view the status of the loops, the provisioned settings for each T1, the bank mode, M.T.A. status, the settings for primary and secondary timing, and the status of the timing source.

Alarms Menu

The Dual LIU Alarms menu is used to enable or disable the external clock alarms. These alarms should be enabled when a timing source is connected to the external clock pins.

Test Menu

The Dual LIU Test menu is used to perform loopbacks, select which T1 is monitored by the front panel monitor jacks, or reset the Dual LIU.

Performance Monitoring Menu

The Dual LIU collects and stores the Performance Monitoring (PM) information statistics for each of the T1s. This PM information is stored in non-volatile memory and is accessible through the Performance Monitoring menu. A brief description of the various options follows:

1. **Daily:** This option is used to display daily counts of multiple performance monitoring statistics.
2. **Far-End Daily:** This option is used to display daily counts of multiple performance monitoring statistics associated with the far-end.
3. **Qtr-Hour:** This option is used to display counts of performance monitoring statistics in seven 15-minute intervals.
4. **Far-End Qtr-Hour:** This option is used to display counts of performance monitoring statistics in seven 15-minute intervals associated with the far-end.
5. **Daily Threshold:** This option is used to set threshold points for daily counts and enable or disable an alarm that would occur when this threshold is exceeded.
6. **FE Daily Threshold:** This option is used to set threshold points for far-end daily counts and enable or disable an alarm that would occur when this threshold is exceeded.
7. **Qtr-Hour Threshold:** This option is used to set threshold points for 15-minute counts and enable or disable an alarm that would occur when this threshold is exceeded.
8. **FE Qtr-Hour Threshold:** This option is used to set far-end threshold points for 15-minute counts and enable or disable an alarm that would occur when this threshold is exceeded.
9. **Reset Performance Registers:** This option is used to reset all performance registers.
10. **Restore Factory Default Thresholds:** This option is used to reset thresholds back to factory defaults.
11. **Enable all LIU Threshold Alarms:** This option is used to enable all Dual LIU threshold alarms.
12. **Disable all LIU Threshold Alarms:** This option is used to disable all Dual LIU threshold alarms.

13. **Select T1:** This option is used to select the T1 for which performance monitoring statistics will be displayed.

For each statistic, the following specific data is stored:

- Near End – Line: Code Violations (BVP), Errored Seconds (ES), and Severely Errored Seconds (SES)
- Near End – Path: Code Violation (BVP), Errored Seconds (ES), Severely Errored Seconds (SES), Bursty Errored Seconds (BES), Severely Errored Framing Seconds (SEFS), Controlled Slip Seconds (CSS), and Unavailable Seconds (US)
- Far End – Path: Code Violation (BVP), Errored Seconds (ES), Severely Errored Seconds (SES), Bursty Errored Seconds (BES), Severely Errored Framing Seconds (SEFS), Controlled Slip Seconds (CSS), and Unavailable Seconds (US)

The threshold for each statistic can be independently enabled, disabled, or have a specific value entered. When enabled, and crossing of the threshold value will result in a threshold entry into the Total Access 1500 Alarm Log. All thresholds are defaulted to disabled.

4. ALARMS

The Dual LIU supports an external clock input out-of-service alarm and can be enabled or disabled. When the alarms are enabled, an alarm condition will be created when the external timing source is lost.

5. TESTS

The Test menu controls testing for the Dual LIU. The Test menu allows the user to select either T1 A or B for testing, perform local and remote loopbacks, select which T1 to monitor, and reset the Dual LIU. The loopbacks are described below.

Loopback Tests

The Dual LIU supports loopback tests to aid circuit turnup and maintenance efforts. These tests are initiated from the Total Access Site Manager or the Total Access 1500 local **ADMIN** port on the SCU.

Local Loopback

T1 data is looped back toward the customer. The transmit data is looped back after it has passed through the framer and Dual LIU circuitry.

Line and Local Loopback

The Dual LIU supports a bi-directional loopback via menu access only. The loopback in the network direction will be of a line loopback type.

Payload Loopback

For a Payload Loopback, the T1 data is looped back toward the network. The framing pattern, CRC6 calculation, and FDL bits are not looped back.

Line Loopback

For a Line Loopback, the T1 data is looped back toward the network with framing and line coding unchanged.

Remote In-band Loopback

A Remote In-band Loopback initiates the transmission of an in-band line loopback code toward the far end as specified in ANSI T1.403.

Remote Line Loopback

A Remote Line loopback initiates the transmission of a Facility Data Link (FDL) line loop up toward the ar end as specified ANSI T1.403. This loopback is only available when the Total Access 1500 is provisioned for Extended Superframe (ESF).

Remote Payload Loopback

A Remote Payload Loopback initiates the transmission of a FDL Payload loop up code toward the far end as specified in ANSI T1.403. This loopback is only available when the Total Access 1500 is provisioned for Extended Superframe (ESF).

6. MAINTENANCE

The Dual LIU requires no routine maintenance for normal operation.

ADTRAN does not recommend that repairs be attempted in the field. Repair services can 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 Dual LIU are detailed in Table 4.

Table 4. Dual LIU Specifications

Specification	Description
Environmental	
Operating Temperature:	–40°C to +65°C
Storage Temperature:	–40°C to +85°C
Relative Humidity:	95 percent maximum @ 50°C, noncondensing
Maximum Current Draw @ –48 VDC:	Online: 0.042 amps Offline: 0.025 amps
Maximum Heat Dissipation:	Online: 2.02 watts Offline: 1.21 watts
Physical	
Dimensions:	Height: 3.125 inches Width: 1.14 inches Depth: 10.1 inches
Weight:	0.9 pounds
Part Number	
Total Access 1500 Dual LIU:	1180009L1

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.

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.

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901 Explorer Boulevard
Huntsville, Alabama 35806-2807