

BR1/10 Total Reach DDS-DP Total Reach DDS Dataport w/DS0 Loopback Installation and Maintenance

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1. GENERAL

Purpose

This practice provides installation and maintenance procedures for the ADTRAN BR1/10 Total Reach® DDS-DP Total Reach All-Rate DDS Dataport.

Figure 1 is a stylized rendering of the ADTRAN Total Reach DDS-DP.

Features

The BR1/10 Total Reach DDS-DP, part number 1150106L2, features include the following:

- 2-wire deployment
- Repeaterless operation
- Bridged tap tolerant
- Span power for remote TROCU-R termination

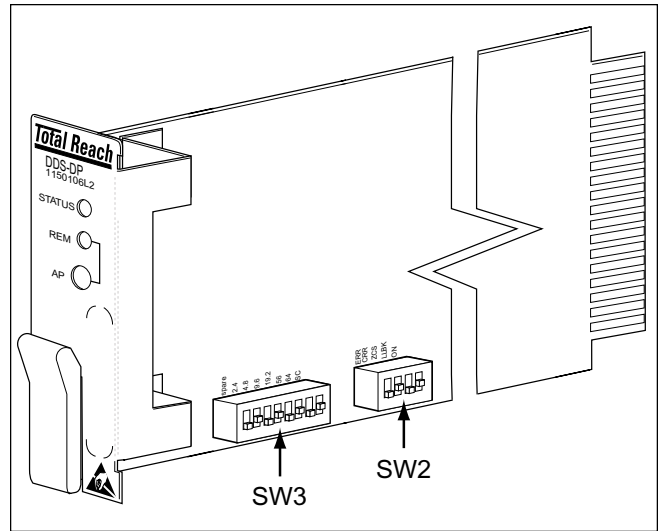


Figure 1. BR1/10 Total Reach DDS-DP

unit

- Utilization in BR1/10 channel bank in 8 or 10 DSL mode
- NEAR logic level Bantam test access in both directions
- Loop Quality Monitor option
- Embedded Digital System 6 capabilities for remote provisioning, configuration, and performance monitoring
- UL 1950 compliant

Document Revision History

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

Description

The BR1/10 Total Reach DDS-DP is a functional replacement for the D4 OCU DP, delivering data at rates up to 64 kbps using a single copper pair. Used in combination with the TROCU-R termination unit, the DDS-DP can accommodate extended loop lengths thus eliminating the need for DDS repeaters.

Two faceplate LEDs provide operating and provisioning status. A faceplate pushbutton selects provisioning methods and two board-mounted DIP

switches select options and data rates. All are explained in detail later in this Practice.

The Total Reach DDS-DP span powers the remote TROCU-R located at the customer premise. The TROCU-R converts the 2-wire signal to the traditional 4-wire Alternate Mark Inversion (AMI) signal for delivery to the customer.

The Total Reach DDS-DP occupies a single channel slot in the BR1/10 channel bank. It provides the interface between a DS0 time slot of the T-carrier data stream and the 2-wire metallic loop extending to the customer premise. The DDS-DP can interoperate over the carrier system with either another DDS-DP, or OCU DP, or with a DS0 DP, 1/0 DCS, or switch.

The unit can be located in an end office, hub office, intermediate office, or Digital Loop Carrier. A typical arrangement is shown in **Figure 2**.

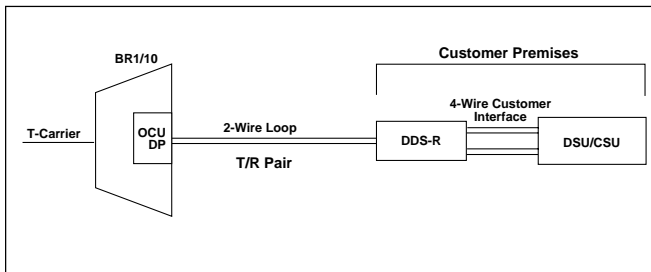


Figure 2. Total Reach DDS Circuit Diagram

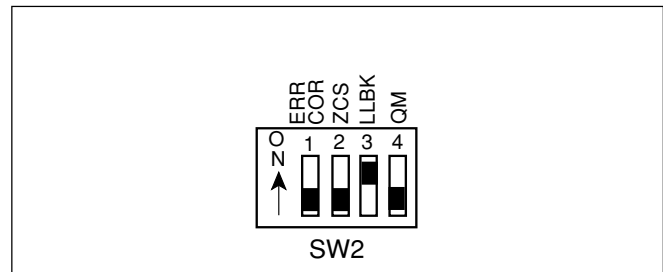


Figure 3. Option Switch

NOTE

The Total Reach DDS-DP must be used with an appropriate TROCU-R unit.

CAUTION

The devices described in this document are subject to ESD damage. Follow all static control measures when working with this equipment.

2. PROVISIONING

Provisioning of the Total Reach DDS-DP takes place prior to inserting the card into the channel bank. Options and data rates are selected with two DIP switches located on the circuit board (SW2 and SW3). See **Table 1** and **Figure 3** for option selections.

Table 1. Option Descriptions

Switch	Function	Position	Description
SW2-1 ERR COR	Error Correction	ON OFF	Automatic enabling of the appropriate technique to ensure data integrity across the T-carrier system. ERR COR disabled.
SW2-2 ZCS	Zero Code Suppression	ON OFF	Ensures pulse density in the T carrier data stream. ZCS is automatically disabled for 64 kbps Clear Channel circuits. ZCS disabled.
SW2-3 LLBK	Latching Loopback	ON OFF	Automatically responds to DS0, OCU, and CSU latching loopback sequences. Must be ON to test 64 kbps Clear Channel circuits. LLBK disabled.
SW2-4 QM	Quality Monitor	ON OFF	Monitors incoming 2-wire and 4-wire customer interface for errors. If excess errors detected, the Total Reach DDS-DP blocks customer data transmission and sends Abnormal Station Code to network. Customer data transmission automatically restored when trouble condition clears. QM disabled

NOTE

Error Correction at rates of 56 and 64 kbps require two DS-0 time slots for data and error-correcting parity bytes.

Rate Selection

RATE is selected with SW3 by positioning the switch for the desired data rate towards the inscribed value. If more than one switch is On the unit defaults to 56 kbps. See **Figure 4** for rate selections.

NOTE

If 64 (kbps) is selected, the secondary channel (SC) switch must not be selected.

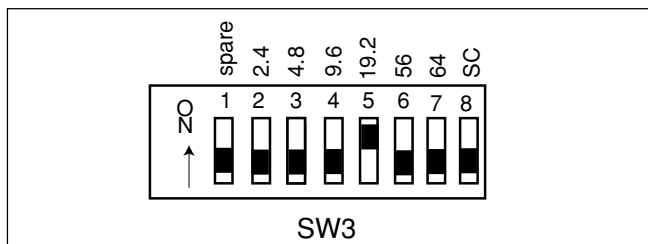


Figure 4. Rate Selection

Alternate Provisioning

After installation an alternate provisioning method (or testing) is available via the BR1/10 LIU and a portable test unit (TP 108/109). The Alternate Provisioning (AP) pushbutton on the Total Reach DDS-DP faceplate selects which provisioning is in effect; DIP switches or remote provisioning. When the pushbutton is pressed the (green) REMote LED adjacent to the pushbutton provides the following status:

- Off - Remote provisioning not in effect, DIP switch provisioning active
- Flashing - Remote provisioning in progress
- On steady - Remote provisioning in effect, overrides DIP switch provisioning

Remote provisioning is normally a temporary provisioning or test process. The overrides stay in effect as long as the REM LED remains On. When temporary provisioning or testing is completed, pressing the AP pushbutton again will deactivate the temporary overrides, the REM LED goes Out, and DIP switch provisioning goes back into effect.

However, those options set remotely remain in memory and the AP pushbutton can toggle between the two option sets. Additional information on remote provisioning and diagnostics is provided in Section 5.

3. INSTALLATION



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

WARNING

Risk of electric shock. Voltages up to 140 Vdc may be present on telecommunication circuits.

This Practice assumes that the BR1/10 has the power, LIU, and BCU modules installed and power is on the backplane.

The ADTRAN Total Reach DDS-DP inserts into the BR1/10 channel bank. No special wiring is required. The 2-wire customer loop uses the tip and ring pair on pins 2 and 20 of the BR1/10 backplane in slots 1 through 10. Signal ground is via pins 14 and 32, chassis ground is via pins 1 and 19.

CAUTION

The BR/10 BCU must be Rev. V or later to support DDS-DP units. If the BCU is not Rev. V or later, please contact ADTRAN Technical Support at: 1-800-726-8663, for a BCU upgrade.

NOTE

The Total Reach DDS-DP works in close relationship with the channel bank's LIU and BCU cards. The I&M Practice Sections for those cards: 61150079L2-5 & 61150080L1-5, should be on hand for reference purposes.

Compliance

This product is intended for installation in a Type “B” or “E” enclosure in a Restricted Access Location only.

Table 2 lists UL 1950 Compliance Codes. Maximan Output is 140 Vdc @ 0.040 A.

Table 2. Compliance Codes

Code	Input	Output
PC	C	C
TC	–	X
IC	A	–

Span Power

Span power is accomplished using -130 Vdc measured from Tip to Ring. Voltage measured from Ring to GND should indicate 0 V. Voltage measured from Tip to GND should indicate -130 Vdc or less depending on voltmeter impedance.

Synchronization

After inserting in the channel bank, the Total Reach DDS-DP automatically synchronizes with upstream and downstream components.

Synchronization normally occurs within 30 seconds but could take up to 90 seconds. If synchronization fails, repeat the process with a Total Reach DDS-DP known to be functioning properly. If Total Reach DDS-DP failure is suspected refer to the Technical Support Subsection.

Synchronization LED Status

Synchronization status is obtained from two LED sources:

- DDS DP Status LED
- BCU Status LEDs

Total Reach DDS-DP Status LED

When inserted into a channel bank that has power applied to the backplane and has the common cards installed, the unit synchronizes with the far end DDS-R. The STATUS LED on the Total Reach DDS-DP faceplate provides the following information:

- Off - No power
- Red - Not synchronized with the TROCU-R
- Green - Synchronized with the TROCU-R
- Red/Green Flashing - A 3-second flashing indicating selection by LIU Channel Selection switch

BCU Status LEDs

The BR1/10 channel bank selection and status is obtained by using the LIU and BCU common units. See **Figure 5**.

Additional status is displayed by the bottom six BCU LEDs when the subject unit is selected with the LIU's DSL Channel Selection switch. When first selected by the rotary switch, that unit's Status LED will flash

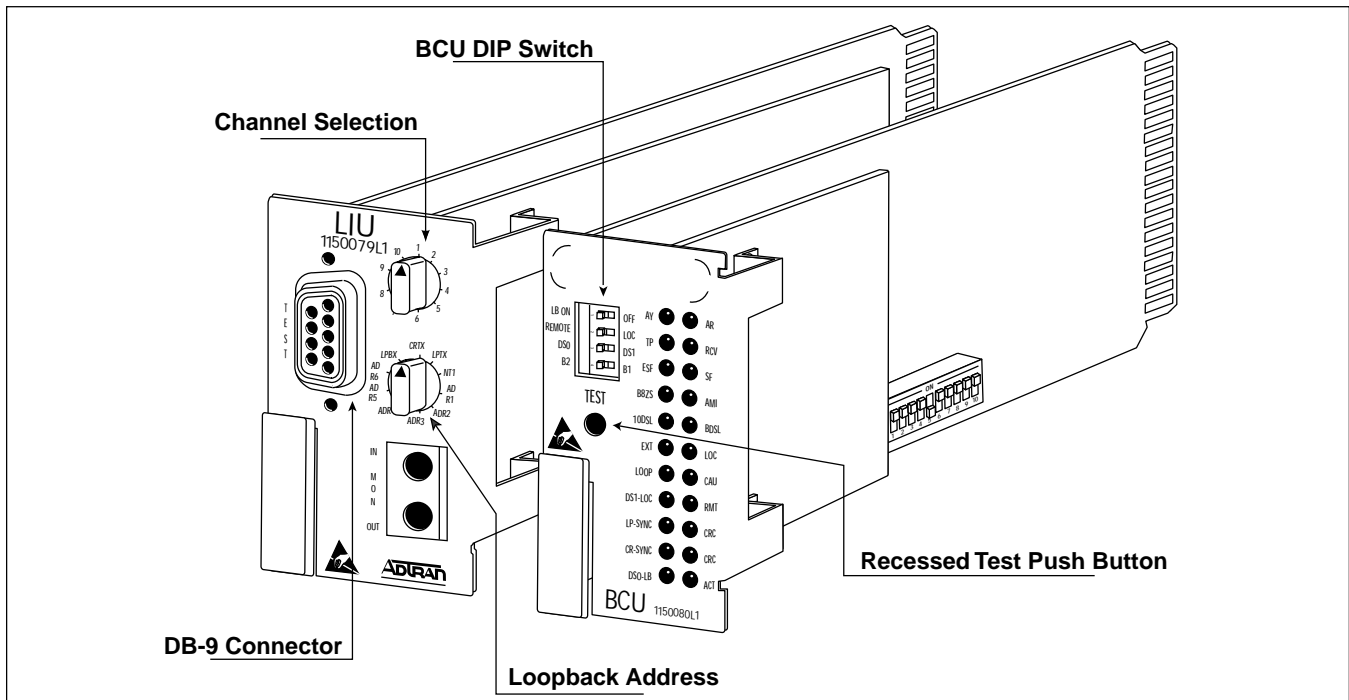


Figure 5. LIU & BCU Common Cards

Red/Green letting the user know that the unit has been selected and is establishing communication with the BCU. After about 3 seconds the LED turns solid Green.

Following selection, the bottom six BCU LEDs, shown here:

LP-SYNC **O** **O** CRC
 CR-SYNC **O** **O** CRC
 DSO-LB **O** **O** ACT

provide status information for the selected unit.

Table 3 describes BCU status LEDs.

4. TESTING

The Total Reach DDS-DP works in conjunction with the BCU and LIU common cards for test processes.

To initiate tests, the LIU DSL rotary switch is set to the desired channel bank access card, then the test switch is placed to the desired test direction; CRTX or LPTX. Test results are monitored with a portable TPI 108/109 (or equivalent) test set.

NOTE

Loop transmit (LPTX) and carrier transmit (CRTX) are the only test settings supported by the BR1/10 Total Reach DDS-DP.

Remote latching loopback is activated using either the automated testing capability of the Service Test

Table 3. BCU LED Indication

LED	Description
LP-SYNC OFF ON	DDS-DP interface synchronization Unit is synchronized Unit not synchronized
CR-SYNC OFF ON	Carrier interface synchronization Unit is synchronized Unit not synchronized
LP-CRC OFF ON	DDS-DP interface CRC errors No CRC errors from loop Receiving CRC errors from loop
CR-CRC OFF ON	Carrier interface CRC errors No CRC errors from carrier Receiving CRC errors from carrier
DSO-LB OFF ON Flash 1/sec	Loopback Status Loopback inactive Initiating loopback Responding to loopback
ACT	Not used with DDS-DP

Center (STC), or the faceplate test connector(s) with a TPI 108/109 test set. When using a portable test set always select NEAR logic.

Additional information on remote provisioning and diagnostics is provided in Section 5.

Testing for the Total Reach DDS-DP is accomplished using the same test procedures for 4-wire OCU DP units. **Table 4** describes cable loss for the Total Reach DDS Nyquist frequency of 13.3 kHz.

Table 4. Cable Type and Temperature Loss Data @ 13.3 kHz

PLASTIC CABLE	dB LOSS/kft	PAPER CABLE	dB LOSS/kft
19 Gauge PIC (0F)	0.5302	19 Gauge PULP (0F)	0.5616
19 Gauge PIC (70F)	0.6083	19 Gauge PULP (70F)	0.6415
19 Gauge PIC (120F)	0.6610	19 Gauge PULP (120F)	0.6955
22 Gauge PIC (0F)	0.912	22 Gauge PULP (0F)	0.9454
22 Gauge PIC (70F)	1.0258	22 Gauge PULP (70F)	1.0606
22 Gauge PIC (120F)	1.1015	22 Gauge PULP (120F)	1.1370
24 Gauge PIC (0F)	1.2571	24 Gauge PULP (0F)	1.2900
24 Gauge PIC (70F)	1.3982	24 Gauge PULP (70F)	1.4324
24 Gauge PIC (120F)	1.4917	24 Gauge PULP (120F)	1.5268
26 Gauge PIC (0F)	1.6751	26 Gauge PULP (0F)	1.6823
26 Gauge PIC (70F)	1.8469	26 Gauge PULP (70F)	1.8568
26 Gauge PIC (120F)	1.9608	26 Gauge PULP (120F)	1.9718

The Total Reach DDS-DP has logic level bantam test access via the LIU faceplate jacks. Tests can be conducted in both directions. Latching DS0, OCU, CSU, and NIE loopbacks are supported. Additionally, alternating OCU and CSU loopbacks are supported.

NOTE

Alternating loopbacks do not operate when 64 kbps data rate is selected.

Before initiating a test ensure test jacks are properly seated and that the test set is selected to NEAR logic.

Loopside Test

To test toward the 2-wire Customer Loop:

1. Insert the bantam jacks in the LIU
2. Select the desired channel with the LIU Channel Selection rotary switch
3. Select LPTX with the LIU Loopback Address rotary switch
4. Press the BCU TEST button

Results: The DS0-LB LED on the BCU will go On indicating the LIU now has a test path between the bantam jack and the customer loop for the selected unit. No loopback has been initiated at this point. With the test path established the test set can now be used to initiate a test.

Carrierside Test

To test toward the carrier system (T1):

1. Insert the bantam jacks
2. Select the desired channel unit with the LIU Channel Selection rotary switch
3. Select CRTX with the LIU Loopback Address rotary switch
4. Press the BCU TEST button

Results: The DS0-LB LED on the BCU will go On indicating the LIU now has a test path between the bantam jack and the T1 Time slot for the selected unit. No loopback has been initiated at this point. With the test path established the test set can now be used to initiate a test.

NOTE

If 64 kbps is selected, the unit will only respond to latching loopback sequences. Alternating sequences are not valid at this rate.

Total Reach DDS-DP Bidirectional Loopback Support

The Total Reach DDS-DP will perform a bidirectional loopback when performing a DS0 loopback. If the TROCU-R detects a bidirectional loopback during power-up synchronization, the TROCU-R allows data to pass on the 4-wire interface and the BCU flashes its DS0-LB LED. This allows a standard portable DDS test set, connected to the 4-wire customer interface of the TROCU-R, to generate a test pattern testing the 2-wire loop. Refer to **Figure 6** for an illustration of the bidirectional loopback. If the DS0 loopback is initiated after loop synchronization the TROCU-R will open the 4-wire customer loop.

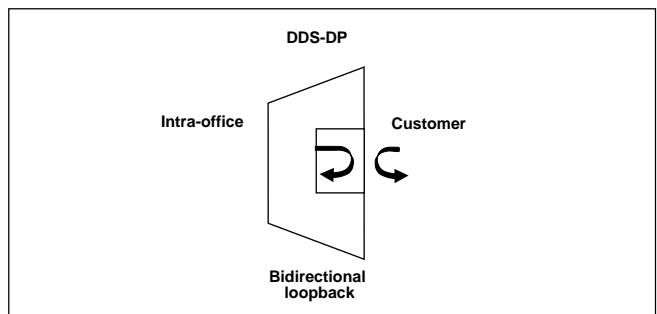


Figure 6. DS0 Bidirectional Loopback

Total Reach DDS Trouble Code

The Total Reach DDS system provides a quick diagnosis in the case of a circuit condition where continuity is broken. The trouble code type received by a tester determines whether the open condition is occurring on the local loop or at the customer premises. In the event of a 2-wire DSL loss of signal, loss of sync, or open condition caused by an open conductor or disconnected 2-wire loop, the TR DDS-DP transmits an alternating MOS (9Ah)/ASC (9Eh) trouble code into the network shown in **Figure 7**. During a similar Out-of-Service

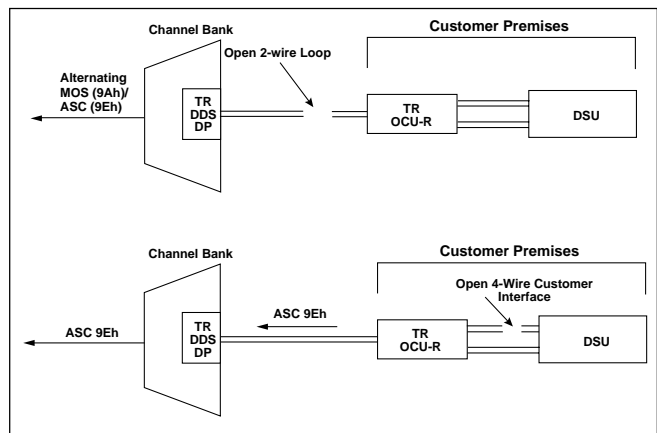


Figure 7. DDS Trouble Codes

condition at the customer premises, the TROCU-R transmits Abnormal Station Code (ASC 9Eh) upstream into the network as shown in Figure 7.

5. REMOTE PROVISIONING AND DIAGNOSTICS

Control Protocol

Remote access to provisioning and status information is accomplished using ADTRAN Digital System 6 Message protocol, defined in Control and Diagnostic Procedures Practice, Section 6032991-6. Digital System 6 is supported by the TPI 108/109 and 105 portable test sets and is supported by Hekimian React remote test system. The DDS network elements comply with ANSI T1.107-1995, "Digital Hierarchy Format Specifications Annex G" which allows remote provisioning, querying, and performance monitoring via inband control of network elements.

NOTE

The REACT 2001 GUI software release in September 1998 supports ANSIT1.107-1995.

Remote access is accomplished using a defined set of inband DS0 byte sequences similar to the latching loopback sequence. Commands issued through the test system are recognized by the individual channel unit, which responds with the appropriate byte sequences. These inband commands may be used to verify options via dialogs with REACT 2001 and TPI 108/109 test sets. Unit CLEI, serial number, provisioning, and performance information can be retrieved remotely using the Digital System 6 protocol.

Provisioning and Status

All configuration options can be remotely viewed or provisioned. The front panel Remote (REM) LED Flashes during control link establishment and remains On after the channel unit has been remotely provisioned.

If the channel unit has been remotely provisioned, the operator can alternate between remote configuration and manual switch settings by pressing the front panel momentary Alternate Provisioning (AP) pushbutton. If the channel unit is removed from the system, the unit retains previous provisioning information in nonvolatile RAM.

The REM indicator remains ON when the channel unit is operating based on Remote Provisioning, and is OFF when operating on manual switches. If the channel unit has never been remotely provisioned, the AP switch has no effect and the REM indicator remains OFF.

6. DEPLOYMENT GUIDELINES

The Total Reach DDS-DP and TROCU-R use technology intended to eliminate the need for repeaters and concerns over impairments caused by typical noise and bridged taps. Listed below are the loop design guidelines for DDS:

- All loops must be nonloaded.
- Actual Measured Loss (AML) should not exceed 50 dB at 13.3 kHz (135 Ω termination), the Nyquist frequency of Total Reach DDS.

NOTE

The 50 dB AML limit includes 6 dB of signal margin to account for potential near-end cross talk (NEXT) from other digital services that may be provisioned in the same binder group.

- Loop length should not exceed 50 kft.
- Bridged tap length should not exceed 12 kft.
- Background noise level should not exceed 34 dBrn.
- Impulse noise should not exceed -40 dBm (+50 dBrn).

NOTE

Measure noise with 50 kbit weighting characteristic approximating a filter with a passband of 40 Hz to 30 kHz. Background noise level or impulse noise level is referenced from 56/64 kbps data rate in TR62310.

Table 5 provides different loss measurements for varying wire gauge and transmission distance versus reference frequencies.

Table 5. Total reach DDS Insertion Loss Measurements

Total Reach DDS 13.3 kHz compared to 28 kHz for Traditional DDS Service		
Line Configuration	Expected Loss @ 13.3 kHz	Expected Loss @ 28 kHz
27 kft 26 AWG	50.12 dB	65.35 dB
36.25 kft 24 AWG	50.00 dB	62.50 dB
50 kft 22 AWG	50.24 dB	59.33 dB

7. MAINTENANCE

The Total Reach DDS-DP does not require programmed maintenance for design operation.

8. WARRANTY AND CUSTOMER SERVICE

ADTRAN will replace or repair this product within ten years from the date of shipment if it does not meet its published specifications or fails while in service (see: *ADTRAN Carrier Networks Equipment Warranty, Repair, and Return Policy and Procedure*, document 60000087-10A).

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/Availability
(800) 827-0807

ADTRAN Technical Support

Presales Applications/Postsales 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

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