ADTRAN

Type 400 T1 CSU

TYPE 400 T1 CHANNEL SERVICE UNIT

User's Manual

Type 400 T1 CSU Stand-Alone 1210015L1
Type 400 T1 CSU Circuit Pack 1210018L1

61210.015L1-1C

FCC regulations require that the following information be provided to the customer in this manual:

1. This equipment complies with Part 68 of the FCC rules. The required label is inside the rear access door affixed to the lower side of the chassis.

2. If your telephone equipment (TI CSU) causes harm to the telephone network, the Telephone Company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice isn't practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC.

3. Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of your equipment. If they do, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.

4. If you experience trouble with this equipment (TI CSU), please contact ADTRAN at (205) 971-7800 for repair/warranty information. The telephone company may ask you to disconnect this equipment from the network until the problem has been corrected, or until you are sure the equipment is not malfunctioning.

5. This unit contains no user serviceable parts.

6. The following information is required when applying to your local telephone company for leased line facilities. The user may select any one of the three via TI CSU option switches.

Service Type	Digital Facility Interface Code	Service Order Code	Network Jacks
1.544 Mbps Digital Interface SF	04DU9-B	6.0F	RJ48C
1.544 Mbps Digital Interface ESF	04DU9-C	6.0F	RJ48C
1.544 Mbps Digital Interface ESF with B8ZS	04DU9-S	6.0F	RJ48C

FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE STATEMENT:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio interference. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

SHIELDED CABLES MUST BE USED WITH THIS UNIT TO ENSURE COMPLIANCE WITH CLASS A FCC LIMITS.

WARNING
Change or modification to this unit not expressly approved by the party responsible for compliance could void user authority to operate the equipment.

WARRANTY AND CUSTOMER SERVICE

ADTRAN will replace or repair this product within five (5) years from the date of shipment, if the product does not meet its published specifications or if it fails while in service. For detailed warranty, repair, and return information, refer to ADTRAN's Equipment Warranty and Repair and Return Policy Procedure.

Return Material Authorization (RMA) is required prior to returning equipment to ADTRAN.

For service, RMA requests, or further information, contact one of the following numbers.

ADTRAN Customer Service:
> **RMA .... (205) 971-8722**
> **Technical Support .... (800) 726-8663**
> **Sales .... (800) 827-0807**

Repair and Return Address:
> **ADTRAN, Inc.**
> **Customer Service Department**
> **901 Explorer Boulevard**
> **Huntsville, Alabama 35806-2807**

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FIGURES

TABLES

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1.   GENERAL

1.1   Unit Overview

The ADTRAN Type 400 T1 CSU provides the T1 interface between customer premise equipment (channel banks, T1 multiplexers, PBXs, etc.) and the carrier network as shown in **Figure 1** . The unit complies with Part 68 of FCC Rules, and with applicable sections of AT&T 62411, ANSI T1.102 and ANSI T1.403. The unit provides functions such as surge protection, signal regeneration, alarms and loopbacks necessary for circuit operation, and fault isolation (see the functional block diagram in **Figure 2**). The unit is transparent to ESF and SF framing formats, as well as AMI and B8ZS line coding. The unit is available as a Circuit Pack (1210.018L1) or as a Stand-Alone model (1210.015L). The Stand-Alone consists of a metal housing with signal and power terminations (an external power supply is available if needed), and the Type 400 T1 CSU Circuit Pack. The Stand-Alone housing has four holes on the bottom which allow the unit to be wall mounted, using the template and screws provided. The Circuit Pack can be removed from the housing by removing the plastic front panel and sliding the unit out of the housing, allowing access to the option switches. The Circuit Pack, which can be purchased without the housing, may also be used in a general purpose Type 400 NCTE rack, or in a Type 400 T1 CSU slot of a channel bank such as the ADTRAN ACT I.

1.2   Power Options

The Circuit Pack may receive power from the 48 V supply of the Type 400 NCTE rack (local power), or from the carrier on-line (line power). The line power from the Telco is 60 mA of constant current and is provided over transmit and receive pairs. The Stand-Alone may also receive local or line power. The local power is supplied by the customer's 48 V supply with an available power cable or by a 48 V wall mount power supply purchased with the unit.

For use with private networks only, an option to source sealing current (preventing corrosion of the circuit) is available. For most applications sealing current will not be sourced.

| CPE | 4-Wire Circuit up to 655 Feet | Provides Alarms, Loopbacks, Signal Regeneration, Surge Protection, and LBO | Network (Local Exchange Carrier, Inter Exchange Carrier, or Private Facilities) | Provides Alarms, Loopbacks, Signal Regeneration, Surge Protection, and LBO | CPE |

Channel Bank, Multiplexer, PBX, etc...

ADTRAN T1-CSU

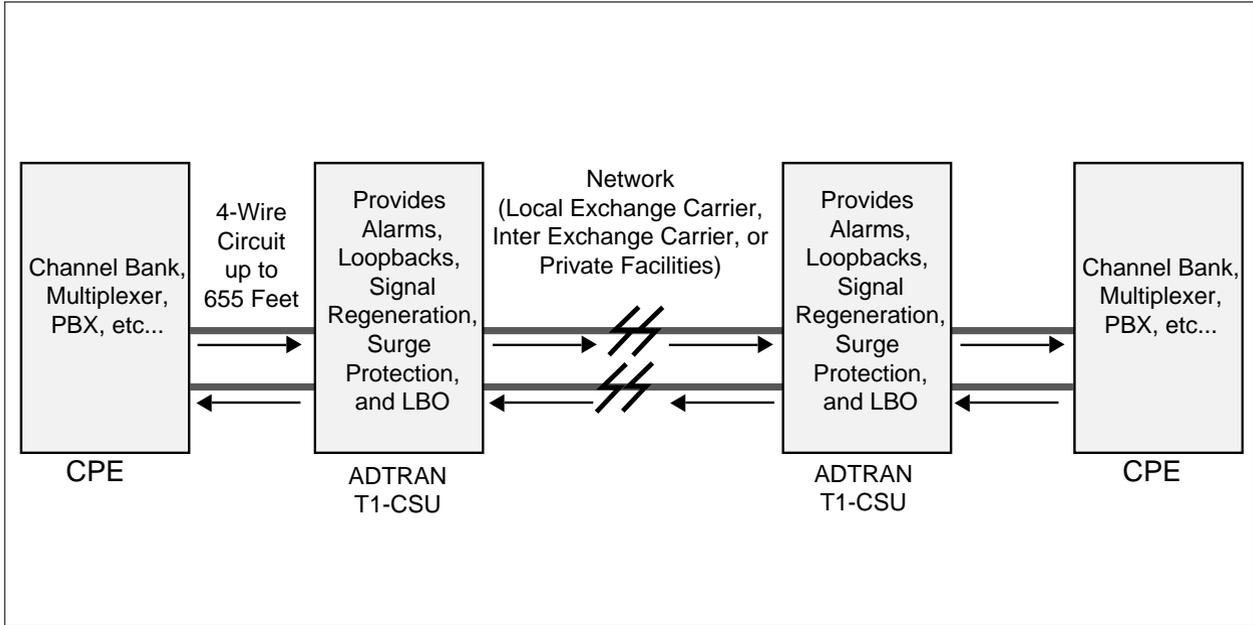ADTRAN T1-CSU

Channel Bank, Multiplexer, PBX, etc...
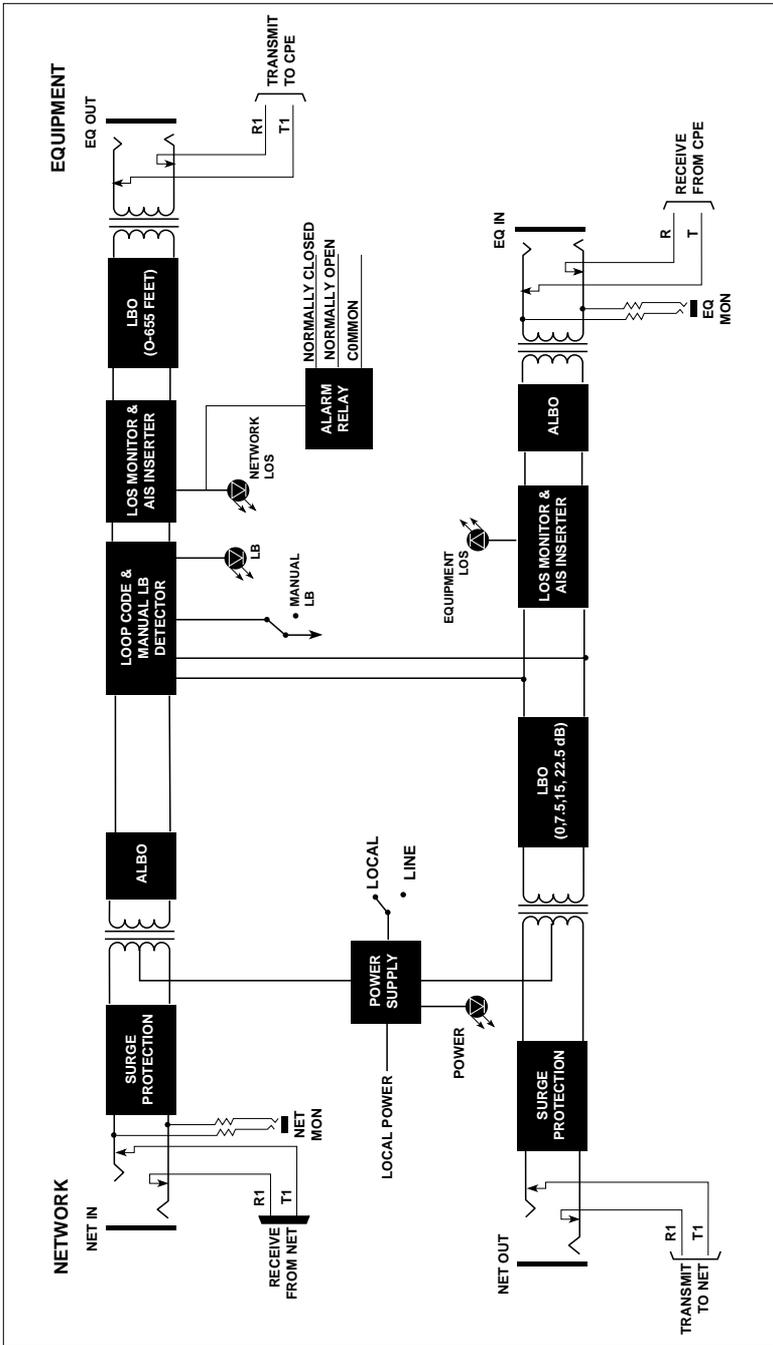
Figure 1. T1 CSU Application

Figure 2. Type 400 T1 CSU Block Diagram

1.3 Alarms

Both models provide alarms which facilitate troubleshooting of the communication channel. Three visual alarms are provided on the faceplate of the circuit pack. The first is the **POWER** LED which indicates whether the unit is receiving power. If the unit detects a loss of signal (LOS) from the network, it will be indicated by **NET LOS**. This condition drives a double pole relay alarm which can be tested using two of three pins on the terminal block in the Stand-Alone. Pin 7 is the common connection, pin 6 normally opened, and pin 5 normally closed. On the card edge connector of the Circuit Pack, pin 25 is the common connection, pin 29 normally opened, and pin 31 normally closed. If the unit detects a loss of signal from the Customer Premise Equipment (CPE), the **EQ LOS** LED alerts the user.

1.4 Loopback

Two forms of loopback are supported by the CSU, in which the unit takes the signal received from the network and transmits it back toward the network. An unframed all 1s signal is transmitted toward the CPE, and the signal received from the CPE is ignored. The first form, Manual Loopback, is activated by depressing the **MAN LB** switch on the front plate of the Circuit Pack. The unit will stay in MAN LB until the switch is pressed again (switch is in the out position). The second form of loopback is Network Loopback, activated by sending the unit the 1-in-5 pattern (1000010000...) from the network side for 5 seconds. This form of loopback can be deactivated by sending the 1-in-3 pattern (100100100...) for 5 seconds. Patterns may be unframed or framed (SF or ESF framing). Regardless of which form of loopback is used, the **LB** LED on the front plate of the Circuit Pack indicates the unit is in loopback.

1.5 Line Build Out (LBO)

Switch SW1 on the Circuit Pack selects LBO for the CSU. Separate LBOs set transmit levels on network and CPE sides of the CSU (see **Tables A** and **B**). On the network side, the amount of attenuation is specified in dB, and is selected for 0, 7.5, 15 or 22.5 dB of attenuation, as specified by the carrier. On the CPE side of the CSU, the amount of attenuation is determined by setting the maximum amount of cable between the CSU and CPE, available at 133, 266, 399, 533 and 655 feet.

Receivers on both sides of the CSU contain Automatic Line Build Out circuitry compensating for cable signal loss.

Table A. Network Transmit LBO

SW1-1	SW1-2	SW1-3	Attenuation (dB)
Off	On	On	0
Off	On	Off	7.5
Off	Off	On	15
Off	Off	Off	22.5
On	N/A	N/A	Automatic

Table B. Customer Transmit LBO

SW1-4	SW1-5	SW1-6	Cable Length (feet)
Off	Off	On	0-133
On	On	Off	134-266
Off	On	Off	267-399
On	Off	Off	400-533
Off	Off	Off	534-655

1.6   Automatically Setting Transmit LBO

An additional option allows transmit LBO towards the network to be set automatically by the CSU based on the level of the signal received from the network. By setting SW1-1 for AUTO, SW1-2 and SW1-3 are ignored and the transmit line build out is set automatically. Setting SW1-1 to MANUAL allows SW1-2 and SW1-3 to control the transmit line build out.

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2. INSTALLATION

2.1   Setting the Option Switches

Remove the plastic front panel of the Stand-Alone housing and slide the Circuit Pack out of the front of the unit. See **Figure 3** for the location of switches SW1, SW3 and SW4. Switch SW1 selects the LBO (see descriptions of SW1-1 through SW1-5 in **Tables A** and **B**).   Switch SW3 selects the powering option. If line power is supplied by the carrier, place the switch in the LINE position, and in LOCAL position if not. Switch SW4 selects whether sealing current is sourced or not. For all applications other than a private network, this switch should be placed in the SINK position. Only if the CSU is to be used in a private network, and sealing current is desired, should SW4 be in the SOURCE position.
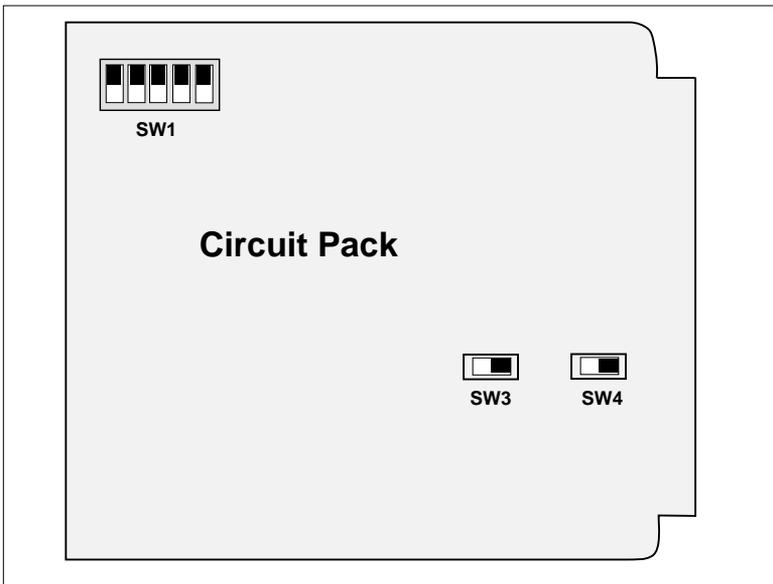

Figure 3. Switch Locations

2.2   Installing the Circuit Pack

Figure 4 illustrates the edge connector pinout of the Circuit Pack. If the Circuit Pack is to be used in an Type 400 NCTE rack or a channel bank, these pin assignments should be consistent with the rack or bank being used.

After the switches have been optioned correctly, insert the Circuit Pack into the rack or bank by firmly pushing the Circuit Pack into the appropriate slot. It should slide in smoothly and snap into place.
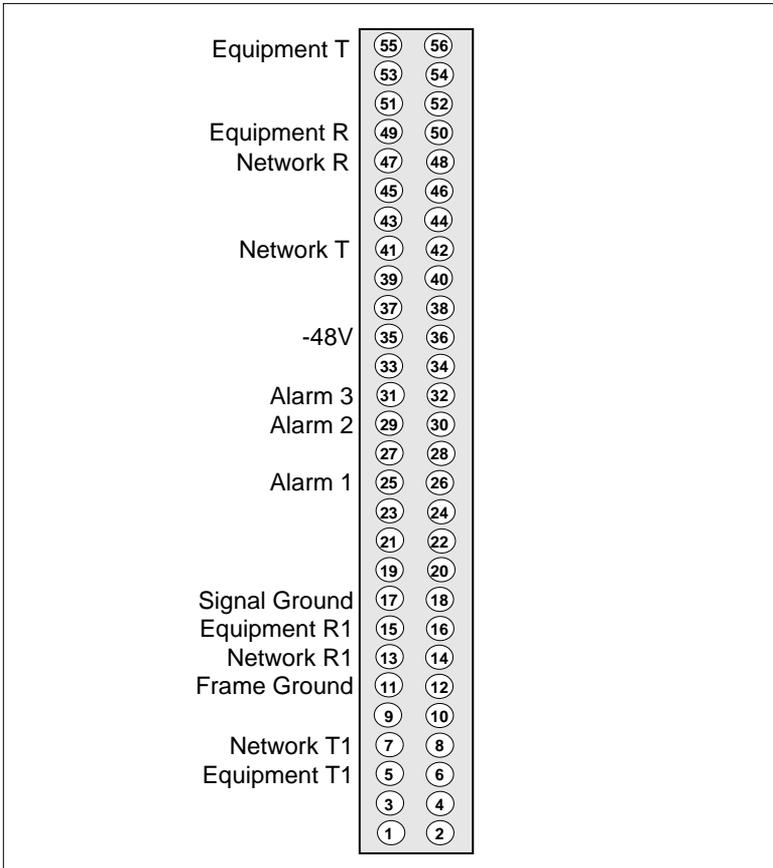
Equipment T	55 56
	53 54
	51 52
Equipment R	49 50
Network R	47 48
	45 46
	43 44
Network T	41 42
	39 40
	37 38
-48V	35 36
	33 34
Alarm 3	31 32
Alarm 2	29 30
	27 28
Alarm 1	25 26
	23 24
	21 22
	19 20
Signal Ground	17 18
Equipment R1	15 16
Network R1	13 14
Frame Ground	11 12
	9 10
Network T1	7 8
Equipment T1	5 6
	3 4
	1 2

Figure 4. Circuit Pack Connector Pin Assignments

2.3   Powering the Unit (Stand-Alone Unit Only)

If the unit is line powered, slide the Circuit Pack back into the housing, remove the power cable from the back of the housing and refer to **Section 2.05** . If the unit is to be locally powered from the customer's 48 V supply, connect the power cable as shown in **Figure 5** . Replace the cover and plastic front plate after connecting the power cable. After supplying the unit with power, the **POWER LED** on the front of the Circuit Pack should be on.
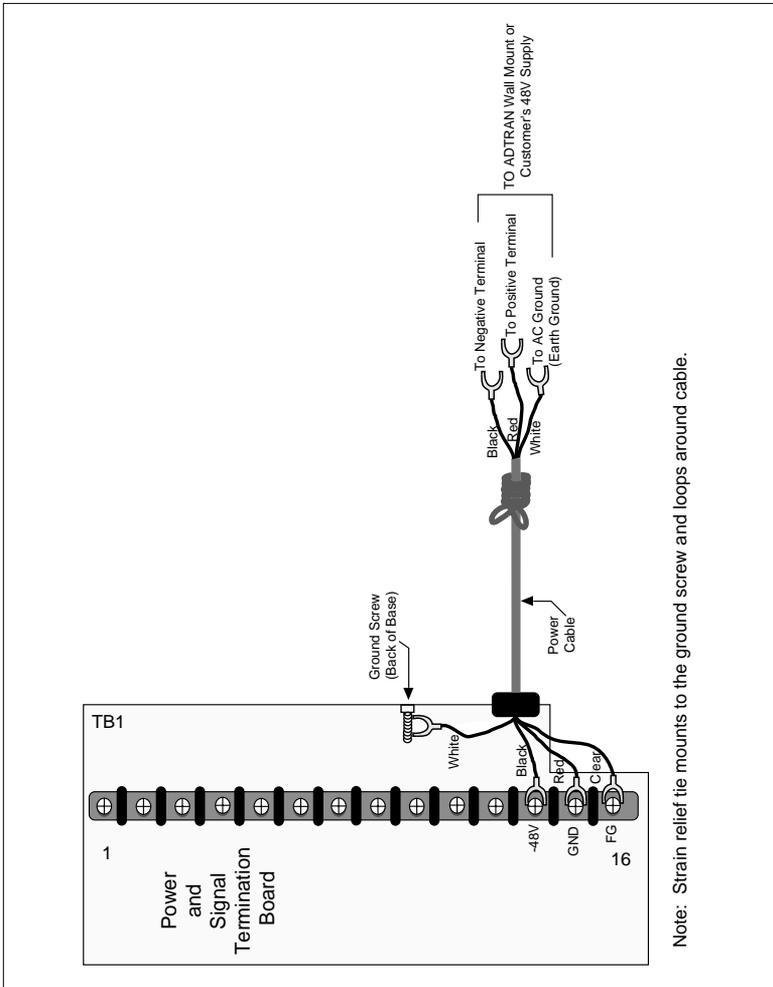

Figure 5. Local Power Termination

2.4   Connecting to the Network and CPE
(Stand-Alone Unit Only)

The rear panel of the Stand-Alone housing has two 8-pin modular connectors. Plug network cables into connector labeled NETWORK, and CPE cables into connector marked CUSTOMER. If the modular connections are not to be used, then pins 10 - 13 on the terminal block inside the housing are used for the network connection, and pins 1 - 4 for CPE connections. These pins should be connected as shown in **Table C**.

Table C. TB1 Network and CPE Connections

Pin	Function
1	CPE T1 - transmit to CPE (tip)
2	CPE R1 - transmit to CPE (ring)
3	CPE T - receive from CPE (tip)
4	CPE R - receive from CPE (ring)
10	NETWORK T1 - receive from NETWORK (tip)
11	NETWORK R1 - receive from NETWORK (ring)
12	NETWORK T - transmit to NETWORK (tip)
13	NETWORK R - transmit to NETWORK (ring)

Before connecting the CSU to the carrier network, notify the carrier. With no signal present from the CPE, connect the CSU to the network demarcation.

2.5   Test and Monitor Access

Six front panel Bantam jacks provide test and monitor access for both the network and equipment side of the CSU. Signals received from the network are monitored by the **NET MON** jack, while the signal received from the CPE is monitored by the **EQ MON** jack. These monitor jacks are resistively isolated from the received signals, so the circuit can be monitored while in service. The other four Bantam jacks are break and test jacks used for out-of-service testing. These jacks bypass the connections of the modular jacks. **NET IN** and **NET OUT** are used to simulate network input and output of the CSU. A T1 BERT (bit error rate test set) can be used to simulate network, allowing the CPE testing. Likewise, **EQ IN** and **EQ OUT** are used to simulate the CPE with a T1 BERT set, allowing the network testing. The CSU on the other end of the circuit could be looped up to test only the network. On either end (the ability to send loop up and loop down codes is available with most BERT sets).

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3. TROUBLESHOOTING

Table D contains a list of symptoms and remedies for problems possibly encountered during installation of the ADTRAN Type 400 T1 CSU. If the symptom persists, contact ADTRAN Customer Service Technical Support at **(800) 726-8663**.

Table D. Type 400 T1 CSU Troubleshooting Guide

Symptom	Remedy
POWER LED not *On*.	If locally powered, ensure that SW3 is in the LOCAL position. Verify that the power cable is installed per **Figure 5**.
NET LOS LED is *On*.	For the Stand-Alone, verify the cable from network demarcation is in NETWORK modular jack on the rear of the housing, or tied to the TB1 per **Table C**. If all connections appear correct, the far end CSU can be looped (using a BERT tester to send the loop up code or the manual loopback at the other end) to isolate the problem to the either the far end premises or the network. If the problem persists after the loopback has been activated, the problem is within the network (or the far end CSU) and the carrier should be notified. If the problem disappears after loop up, then the cause is at the far end customer premises.
EQ LOS LED is *On*.	For the Stand-Alone, verify the cable from CPE is in CUSTOMER modular jack on the back of the housing, or tied to TB1 per **Table C**. If all connections appear correct, a BERT set can be used in the NET IN and NET OUT bantam jacks to further test the CPE.

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4. MAINTENANCE

The ADTRAN T1 CSU requires no routine maintenance to operate. Repairs should not be performed in the field. Repair services can be obtained by returning the unit to the ADTRAN Repair Department after obtaining a Return Material Authorization (RMA).

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5. **SPECIFICATIONS**

Table E lists the ADTRAN Type 400 T1 CSU specifications.

Table E. Specifications

Network and Customer Interface	
Line:	4-Wire (T, R, T1 and R1)
Data Rate:	1.544 Mbps +/- 50 kbps
Signal Format:	Bipolar with B8ZS transparency
Output Amplitude:	6 Volts, peak-to-peak nominal
Connector Type:	8-position modular (RJ48C)
Faceplate Indicators	
POWER	Receiving line or local power
NET LOS	Loss of Signal from network
EQ LOS	Loss of Signal from CPE
LB	Network or manual loopback
Mechanical (Circuit Pack)	
Size:	1.40" Wide, 6" Diameter, 5.59" High
Weight:	
Mounting:	Type 400 equipment shelves or Stand-Alone housing
Power	
Span Power:	60 mA at 30 V (if line powered)
Local Power:	20 - 50 mA at 48 V
Environmental	
Temperature:	Operating 0 to 50° C Storage -20 to 70° C
Relative Humidity:	Up to 95% (non-condensing)

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