Model D4 TRI-C DP
Total Reach® ISDN Central Office Unit
Installation and Maintenance

CONTENTS

FIGURES

TABLES

1. GENERAL

This practice provides installation and maintenance information for the ADTRAN D4 TRI-C DP, P/N 1102182L1. **Figure 1** is an illustration of the TRI-C DP.

Revision History

Issue 3 of this document updates the CLEI Code.

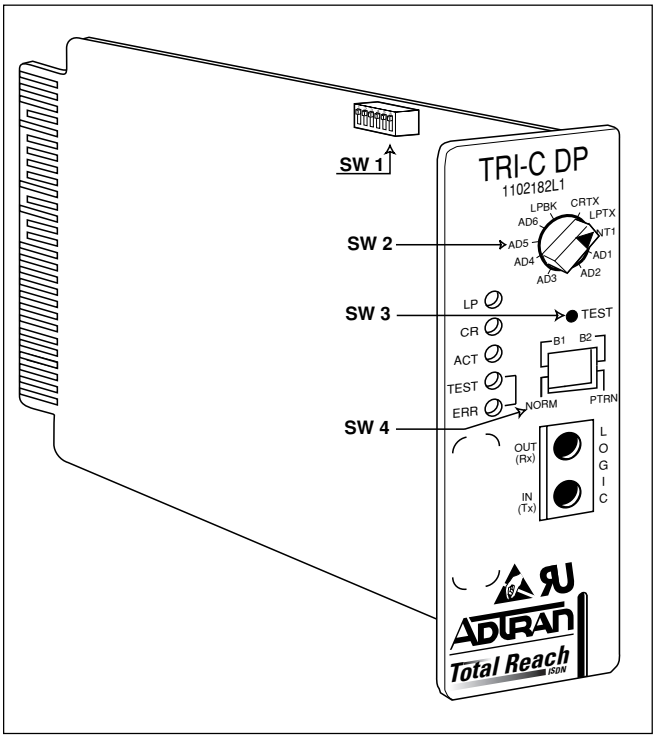

Figure 1. D4 TRI-C DP

Features

- Total Reach interface provides 30.5 kft nominal range on mixed wire gauge.
- Provides span powering for the Total Reach ISDN Remote unit, compliant with GR-1089-CORE Class A2 powering requirements.
- Lightning and power cross protection in compliance with GR-1089-CORE.
- ISDN 2B1Q interface which meets all Layer 1 requirements as specified in ANSI T1.601-1991.
- All Layer 1 maintenance functions.
- Transportation of ISDN Basic Rate 2B+D information over T1 facilities in the 3-DS0 format specified in TR-NWT-000397.
- Performance monitoring of the Layer 1 facility as specified in TR-NWT-000397 and TR-TSY-000829.

- Distinctive metallic DC test signature to identify line unit LT mode of operation as specified in TR-NWT-000397.
- Eight hours of performance history, as specified by TR-NWT-000829.
- Eight ISDN BRA National Standard *eoc* messages responded to, including B1, B2, 2B+D loopbacks.
- B1 and B2 loopback addressability at the front panel for the NT1 and up to six devices in the Network-to-Customer direction.
- Responds to OCU and CSU latching loopback in 2B, B1, and B2 modes of operation.
- Internal test pattern allows for testing of individual B channels without requiring external test equipment.
- Addressing and error status with front panel LED indicators. Test functions chosen by a front panel 10-position rotary switch.
- DS0 logic level transmit and receive data access through front panel bantam jacks.
- A built-in Cyclic Redundancy Check (*crc*) clock error detector allows for local performance monitoring at the front panel without test equipment.
- Meets NEBS Level 3 Requirements.

General Description

The D4 TRI-C DP line card plugs into a single channel slot of an AT&T D4/SLC®-96 channel bank. It provides the interface between the T1 carrier facility and the Digital Subscriber Line (DSL) towards the customer premises. Clear channel capability (B8ZS) is not required of the T1 facility if zero byte substitution (ZBS) is enabled. The TRI-C DP plugs into a single channel slot of the D4 bank, but can require up to three time slots when transporting 2B+D information. Block error rate performance over the T1 facility is monitored by the unit and the information is available to the network. The TRI-C DP is intended to be deployed in a Logical Unit Line Termination (LULT) configuration, typically referred to as Adjacent-to-Customer.

The D4 TRI-C DP works in conjunction with an ADTRAN 2nd Generation Total Reach ISDN Remote unit as listed in **Figure 2**. The TRI system allows for the transparent transport of Basic Rate ISDN (BRI) service to the customer premises at distances up to 30.5 kft over a single twisted pair of mixed gauge wire.

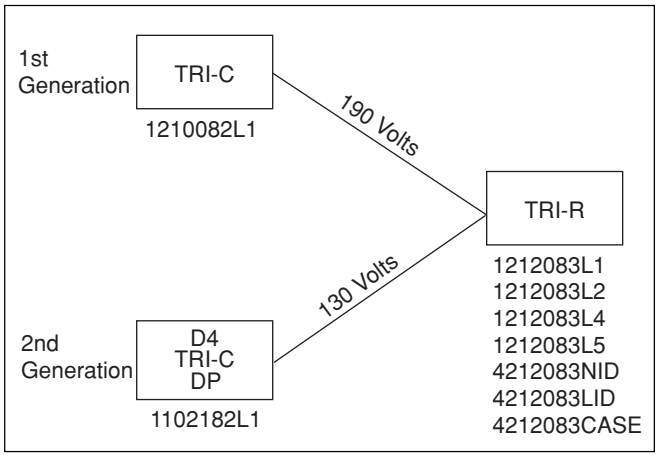

Figure 2. 1st Generation to 2nd Generation Compatibility

The TRI-C DP can be deployed in either a Central Office or Remote Terminal location that terminates a T1 carrier facility from an ISDN serving Central Office or Tandem Office configuration (see **Figure 3**).

The TRI-C DP converts the 2B+D data and Layer 1 embedded operations channel (*eoc*) information from the T1 data stream to the TRI-interface for transport to the TRI-R. The TRI-C DP provides -130 VDC normal tip-to-ring on the DSL for span powering of the TRI-R. The TRI-R terminates the DSL and restores the 2B+D data and Layer 1 *eoc* information to an ANSI T1.601 compatible U-interface for delivery to the customer's NT1/TA.

The TRI-C DP makes use of ADTRAN's Simple Coded Pulse Amplitude Modulation (SC PAM) line coding technology to extend the service range of ISDN without the use of current mid-span U-Repeater technology. SC PAM is a full-duplex, multilevel encoding scheme that uses bandwidth reduction and improved adaptive equalization to transparently extend the ISDN DSL well beyond the current serving range of ISDN.

The Total Reach ISDN system extends the DSL service range up to 52 dB when measured at 20 kHz. This is based on -44.2 dBm of 2B1Q Near End Crosstalk (NEXT) as defined in ANSI T1.601 (typically referred to as 0 dB margin). Refer to *Deployment Guidelines* subsection for additional information.

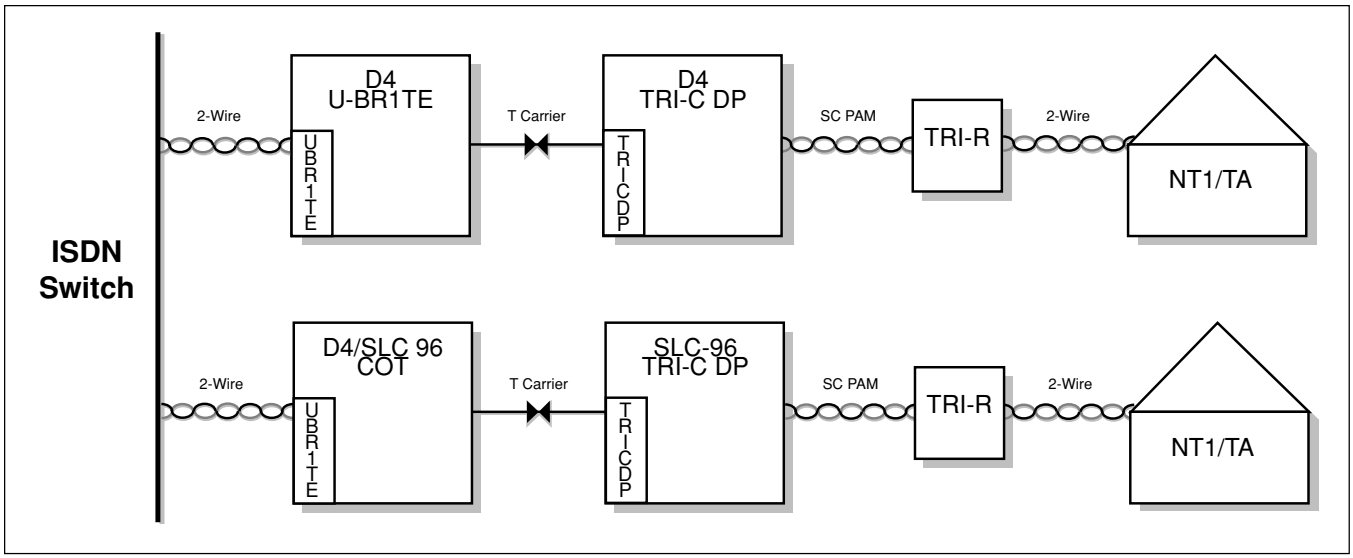

Figure 3. Position Settings at Network Locations

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. Refer to *Warranty and Customer Service* Section.

Compliance

This product is intended to be installed in products providing a Type "B" or "E" enclosure and in a restricted access location only. See **Table 1** for compliance codes.

Table 1. Compliance Codes

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

Physical Requirements

The TRI-C DP plugs into a single D4/SLC-96 channel slot. The connector pin assignments are illustrated in **Figure 4**. When provisioned for basic rate service (2B+D), the TRI-C DP occupies three time slots. In a D4 or SLC-96 Mode III channel bank, it occupies the time slot associated with the physical channel slot that it occupies plus the next two time slots to the right. The physical channel slots, whose time slots are used in this manner, must remain unoccupied.

In a SLC-96 Mode I with D1D counting channel bank, the time slots are allocated as shown in **Figure 5** with two time slots per physical channel slot.

The unit uses two time slots in one physical slot plus a time slot from an adjacent slot when configured for 2B+D operation. When selected for Slot 1, 4, 7, or 10 operation, the unit occupies the two time slots associated with the physical slot in which it resides plus the upper time slot of the next adjacent physical slot.

When selected for Slot 2, 5, 8, or 11 operation, the unit occupies the lower time slot of the occupied physical slot plus the adjacent two time slots of the next physical slot to the right. When using the Slot 2, 5, 8, 11 option, the physical slot to the right must be left vacant. A unit selected for one or two time slots, B1+D, B2+D, B1, B2, 2B, and D occupies only the two time slots associated with the physical slot used. In this configuration, option the unit for Slot 1, 4, 7, or 10. See **Figure 6** and **Table 2** for additional channel slot deployment restrictions for each bank type.

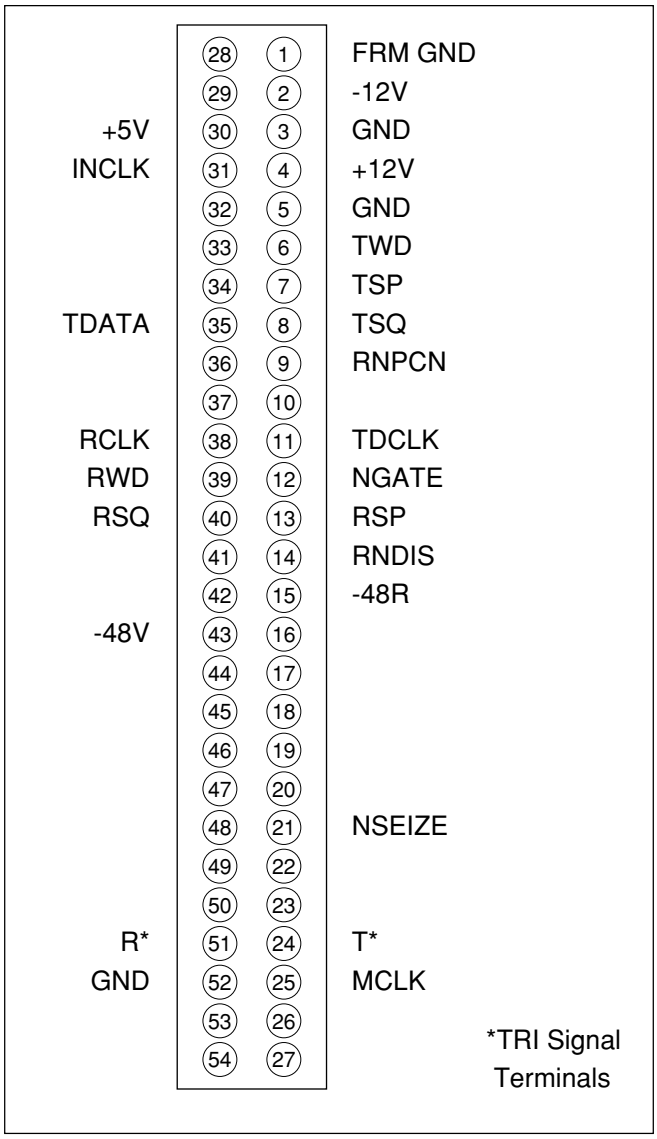

Figure 4. Connector Pin Assignments

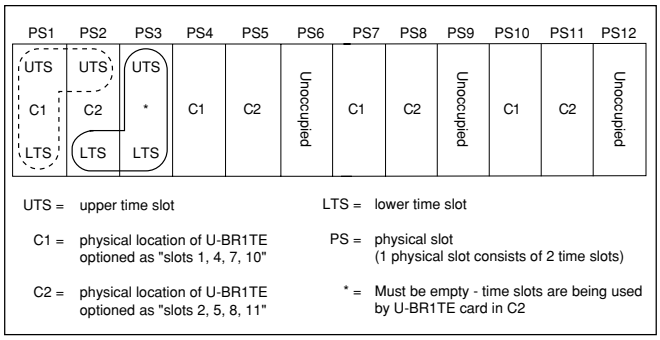

Figure 5. Time Slot Assignments for 2B+D Service in SLC Mode w/D1D Counting

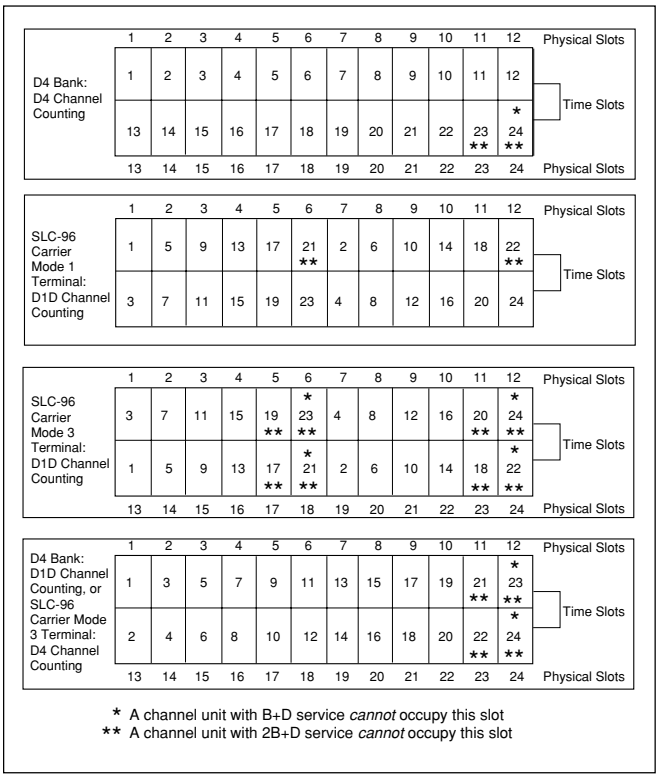

Figure 6. Physical Slots that CANNOT Contain TRI–C DP Cards

Table 2. Physical Slots that CANNOT Contain TRI–C DP Cards

Service Setting	D	B1+D or B2+D (*)	2B+D (**)
D4 Bank /w D4 Counting	---	24	23, 24
SLC-96 Mode I w/ D1D Counting	---	---	6, 12
SLC-96 Mode III w/ D1D Counting	---	6, 12, 18, 24	5, 6, 11, 12, 17, 18, 23, 24
D4 Bank w/ D1D Counting or SLC-96 Mode III w/ D4 Counting	---	12, 24	11, 12, 23, 24
* When provisioned for this service, slots listed in this column cannot be occupied. ** When provisioned for this service, slots in this column cannot be occupied.			

Deployment Guidelines

The Total Reach ISDN system provides range extension on single twisted-pair, nonloaded loops that exceed the typical ISDN deployment range. The general guidelines require the loop have an insertion loss of 52 dB at 20 kHz, or less than 61 dB at 40 kHz, with 135 ohms driving and terminating impedances (see **Table 3**). **Table 4** provides recommended guidelines for the Total Reach ISDN interface. Adherence to these guidelines will allow general deployment of Total Reach ISDN without further qualification. If any of the stated guidelines are exceeded, additional circuit testing will be required to ensure loop loss and noise levels are not exceeded.

CAUTION

ADTRAN does not recommend that the Low Power TRI-C DP be installed on existing circuits terminated with P/N 1210083L1, 1210083L2, 4210083NID, or 4210083LID. No damage will result from inadvertent deployment of the Low Voltage -130 VDC TRI-C DP with a -190 VDC TRI-R.

NOTE

All load coils must be removed from the circuit pairs being deployed. Loading coils, which are used to enhance voice quality on analog circuits, are designed to pass frequencies in the lower bandwidth range. Technologies operating in higher bandwidth ranges such as DDS, HDSL, or in this case ISDN, will not operate properly if all loading coils are not removed from the pair.

Specific loop loss constant values and DC loop resistance for various wire gauges are provided in **Table 5**. Loop loss constants (in dB/kft) are provided for 20 and 40 kHz and can be used to determine the Estimated Measured Loss (EML) for any local loop. Examples of maximum loop lengths are provided for each wire gauge, and are based on 70°F PIC cable, with -44.2 dBm ANSI NEXT. These constants were derived using the method for determining insertion loss with 135 ohms driving and termination impedances from *Bell Lab Transmission System for Communications, 1982*. The total length of multigauge cable must yield a loop loss less than or equal to 52 dB @ 20 kHz or 61 dB @ 40 kHz.

Table 3. 20 kHz vs 40 kHz Loop Loss Conversion

20 kHz (dB)	40 kHz w/majority 22 AWG (dB)	40 kHz w/majority 24 AWG (dB)
1	1	1
5	6	6
10	12	12
15	18	18
20	23	24
25	29	30
30	35	36
31	36	38
32	37	39
33	39	40
34	40	41
35	41	42
36	42	44
37	43	45
38	44	46
39	46	47
40	47	48
41	48	50
42	49	51
43	50	52
44	51	53
45	53	55
46	54	56
47	55	57
48	56	58
49	57	59
50	58	61
51	60	62
52	61	63

Table 4. TRI-Interface Deployment Guidelines

Description	Value
Maximum Loop Loss @ -44.2 dBm ANSI NEXT	52 dB @ 20 kHz or 61 dB @ 40 kHz
Maximum DC resistance	2000 W
Maximum single bridged taps	2 kft
Maximum total bridged taps	6 kft
Maximum number bridged taps	3

Table 5. Cable Loss Constants (PIC 70ºF)

Cable Gauge/ mm	Maximum Loop Length*	Loss @ 20 kHz per kft	Loss @ 40 kHz per kft	Ohms per kft
26/0.40	24 kft	2.159 dB	2.721 dB	83
24/0.51	33 kft	1.586 dB	1.921 dB	52
22/0.61	46 kft	1.134 dB	1.325 dB	32
19/0.91	80 kft	0.655 dB	0.770 dB	16
Bridged Tap	6 kft	1.32 dB	2.09 dB	N/A
*Based on -44.2 dBm ANSI NEXT				

For EML, multiply each section's loop length in kilofeet by the appropriate cable loss constant in Table 5 to determine the insertion loss of each section. To determine the insertion loss for each bridged tap in the feeder, multiply the length of the bridged tap by 1.32 dB (2.09 for 40 kHz). The maximum loss of each bridged tap is 4.2 dB, (4.7 dB for 40 kHz) regardless of length. Assume 250 feet for central office wiring. For total insertion loss for the loop, add each section's insertion loss, the loss due to bridged taps, and loss of central office wiring.

Some loop deployment programs provide automatic loop insertion loss predictions based on 40 kHz for ISDN 2B1Q. Table 3 provides a conversion estimate in dB between insertion loss at 40 kHz for 2B1Q ISDN and the recommended 20 kHz for Total Reach ISDN. To use, determine the dB loss at 40 kHz using current methods and the largest component cable size (24 or 22 AWG). If the 22 and 24 AWG components are approximately the same, use the values associated with 22 AWG.

This table should only be used to provide a rough estimate of the insertion loss at 20 kHz. A more accurate estimate can be obtained by determining the exact cable makeup of a loop and using the cable loss constants in Table 5.

D4 Bank Requirements

CAUTION

The TRI-C DP is designed for installation in D4/SLC 96 channel banks conditioned for Dataport applications. Do not install in ED-3C650-30 channel banks (CLEI D4CB590A) built prior to 12/81 with J98726A, B, or C backplanes.

The COT D4 bank must be configured with an OIU-2 selected for external timing. The COT bank must be provided with an external composite clock synchronized with the network. The TRI-C DP obtains power from the +5 and -48 VDC supply rails of a model 325A PCU.

SLC-96 Bank Requirements

The COT SLC-96 bank must be configured with a special service unit (SSU) selected for external timing. The COT SLC-96 bank must be provided with an external composite clock synchronized with the network.

Interface Requirements

The TRI-C DP unit includes two interfaces. The loop-side interface is an ISDN U-interface which is used to deliver basic rate service. The carrier-side interface is a D4/SLC-96 channel bank interface which is used to insert data into the 1.544 Mbps T1 stream. Only the polarity-insensitive T and R leads are used in the cross-connection.

Option Switch Settings

Figure 7 displays the location and labeling for SW1.
Table 6 describes the option settings for SW1.

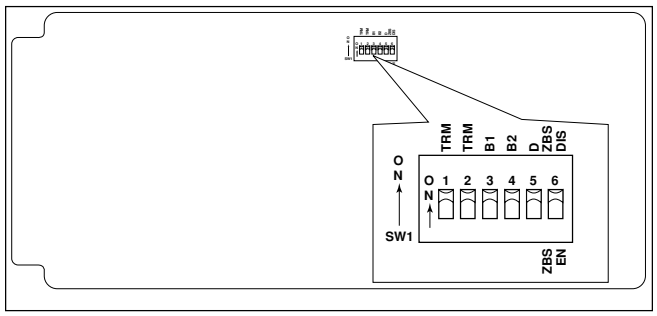

Figure 7. SW1 Labeling

Table 6. SW1 Option Settings

Switch	Label	Function	Description			
SW1-1 SW1-2	TRM TRM	Bank Type Selection	Selects the bank type for the TRI-C DP.			
			Bank	**Count/Slot**	**SW1-1**	**SW1-2**
			D4	D4 Counting D1D Counting	ON ON	OFF ON
			SLC I	CU in slots CU in slots	ON OFF	ON OFF
			SLC III	D4 Counting D1D Counting	ON OFF	ON ON
SW1-3 SW1-4 SW1-5	B1 B2 D	Service Level Selection	Selects the service level. The TRI-C DP may be optioned to deliver full ISDN (2B+D) or any other level of service.			
			Service Option	**SW1-3 B1**	**SW1-4 B2**	**SW1-5 D**
			2B+D 2B B1+D B2+D B1 B2 D	ON ON ON OFF ON OFF OFF	ON ON OFF ON OFF ON OFF	ON OFF ON ON OFF OFF ON
SW1-6	 ZBS DIS ZBS EN	Zero Byte Substitution ON-Disables ZBS OFF-Enables ZBS	The ZBS option must be set the same for the COT and RT. SW1-6 should be set toward "ZBS EN" for AMI-provisioned carriers. The switch setting is optional for B8ZS-provisioned carriers. Consult local provisioning guidelines.			

Front Panel Features

The TRI-C DP front panel features a 2-position DIP switch (SW4), a recessed pushbutton (SW3), a rotary switch (SW2), a bantam jack, and status LEDs. The B1/B2 DIP switch selects the desired bearer channel, B1 or B2, to be tested during local tests using the TRI-C DP front panel. The NORM/PTRN DIP switch is set to PTRN for test purposes. The 10-position rotary switch is used to determine the specific test that will be performed, including downstream loopbacks (see **Table 7**). LED indicators display the current status of the unit, as listed in **Table 8**.

3. TESTING

The TRI-C DP responds to *eoc* loopbacks, including B1, B2, and 2B+D, when configured for D channel operation. This allows an upstream network element, such as an ISDN switch, to sectionalize a network fault. When used in non-D channel modes of operation (B1, B2, or 2B), the TRI-C DP will respond to an in-band OCU or CSU latching loopback sequence for each B-channel. When remote testing is not available, or during isolation of trouble or equipment malfunction, the TRI-C DP front panel provides local test capabilities. Using the internal 2047 pseudorandom test pattern generator or the bantam jacks allows craft personnel to test in both the downstream and upstream directions, including loopback for 6 addressable ISDN devices and the customer's NT1.

Table 7. Rotay Switch Option

Display	Interpretation
AD1	Address #1, address of this unit
AD2	Address #2, the next unit downstream
AD3	Address #3, the second unit downstream
AD4	Address #4, the third unit downstream
AD5	Address #5, the fourth unit downstream
AD6	Address #6, the fifth unit downstream
LPBK	Loopback, forces this unit to loopback either B1/B2 from the front panel. Loopbacks occur in both the customer and network directions.
CRTX	Carrier transmit, in the carrier direction
LPTX	Loop transmit, in the loop direction
NT1	NT1, address of the NT1

The front panel bantam jacks accommodate standard DS0 Logic Testers such as the TPI 108/109 RT II or FIREBERD 4000/6000 which perform both the upstream and downstream testing. In addition, nonintrusive local performance monitoring is available through the front panel LEDs. Front panel initiated loopbacks are nonintrusive to unused channels. Loopback on a single B channel will not interrupt the other channels. A network issued 2B+D loopback will affect customer service.

Loopback Tests (ADR1 - ADR6, NT1)

Loopbacks in the Network-to-Customer direction can be initiated from either the ISDN switch or the front panel. Either the internal 2047 test pattern or a DS0 digital test set provide the 64 kbps test pattern to be tested in B1 or B2. When initiating loopbacks from the TRI-C DP front panel, the downstream direction is automatically selected based on the card position in the network.

To initiate a loopback using the internal 2047 test pattern, perform the following:

1. Select the desired loopback address using the 10-position rotary switch. Refer to Table 7.
2. Select the desired bearer channel using the B1/B2 DIP switch.
3. Select PTRN on the NORM/PTRN DIP switch.
4. Depress the recessed TEST pushbutton to initiate the test. The TEST LED will illuminate GREEN when the loopback is established to the selected address and the ERR LED should go out following synchronization to the test pattern. If the selected address does not respond, the TEST LED will remain out and the ERR LED will illuminate.
5. To momentarily insert one bit error (for less than two seconds), depress the TEST pushbutton. The ERR LED should flash upon receipt of the injected error.
6. Tests to additional network addresses are performed by changing the selector knob to the desired address. It is not necessary to exit the test mode to select a new address.
7. To deactivate the loopback, depress the TEST pushbutton for two seconds, until the GREEN TEST LED is extinguished, or select NORM on the NORM/PTRN DIP switch.

Table 8. LED Indicators

Indicator	Status	Description
Loop Status (LP)	Off	Indicates TRI loop synchronization has been established and no Near End Block Errors (NEBE) are being received from the loop interface.
	Red	Illuminated when TRI-interface is out of sync or has a loss of signal.
	Yellow	Flashes upon receipt of a NEBE. During Local Performance Monitoring (see TESTING) will flash when BER > 10^{-6} is detected and illuminate solid when a BER > 10^{-5} is detected.
Carrier Status (CR)	Off	Indicates carrier synchronization (framing per TR-TSY-000397) has been established and no Near End Block Errors (NEBE) are being received from the carrier interface.
	Red	Illuminated when no framing pattern is received.
	Yellow	Flashes upon receipt of a NEBE. During Local Performance Monitoring (see TESTING) will flash when a BER > 10^{-6} is detected and illuminate solid when a BER > 10^{-5} is detected.
Activation (ACT)	Green	lluminated when Layer 1 is established from the ISDN switch to the customer ISDN terminal equipment.
Test (TST)	Yellow	Solid when a front panel test has been successfully initiated or when responding to a 2B+D loopback request. Flashes once every two seconds when responding to a B1 loopback request or when forced into a B1 loopback from the front panel. Flashes once per second when responding to a B2 loopback request or when forced into a B2 loopback from the front panel.
	Green	Solid when in Local Performance Monitoring or when the local test pattern gen/det is invoked.
Error (ERR)	Red	Flashes when errors are seen by local test pattern detector.

To initiate a loopback using a DS0 digital test set, perform the following:

1. Insert the TX and RX bantam plug of the DS0 digital test set into the TRI-C DP respective front panel bantam jacks. Connect the clock input of the DS0 digital test set to the channel bank's clock source (the D4 OIU, or the SLC-96 SSU). Configure the test set for Near Logic and 64 kbps.
2. Select the desired loopback address using the 10-position rotary switch. Refer to Table 7.
3. Select the desired bearer channel using the B1/B2 DIP switch.
4. Depress the recessed TEST pushbutton to initiate the test. The TEST LED will illuminate YELLOW when the loopback is established to the selected address. If the selected address does not respond, the TEST LED will remain OFF. Observe the DS0 digital test set for bit errors.
5. Tests to additional network addresses may be performed by changing the selector knob to the desired address. It is not necessary to exit the test mode to select a new address.
6. To deactivate the loopback, depress the TEST pushbutton or remove the transmit bantam plug. Upon deactivation of the test, the TEST LED will go out.

Point-to-Point Test (CRTX, LPTX)

A point-to-point (straightaway) test can be performed to either the TRI-interface (LPTX) or the T-1 carrier interface (CRTX). In both cases, either the internal 2047 test pattern generator or a DS0 digital test set is used to verify the performance of the selected bearer channel.

To initiate a point-to-point test using the internal 2047 test pattern, perform the following:

1. Select the desired test direction, LPTX or CRTX, using the 10-position rotary switch. Refer to Table 7.
2. Select the desired bearer channel using the B1/B2 DIP switch.
3. Select PTRN on the NORM/PTRN DIP switch.
4. Depress the recessed TEST pushbutton to initiate the test. The TEST LED will illuminate GREEN and the ERR LED should go out following synchronization to the test pattern from the far end.
5. If the far end unit is a U-BR1TE III or IV using the internal 2047 test pattern, perform steps 1 through 4, choosing the same front panel switch setting. If the far end is a test set, ensure it is configured for a 2047 test pattern.
6. To momentarily insert one bit error (for less than two seconds), depress the TEST pushbutton. Bit errors will be seen at the far end test unit.
7. To deactivate the loopback, depress the TEST pushbutton for two seconds, until the GREEN TEST LED is extinguished, or select NORM on the NORM/PTRN DIP switch. Upon deactivation of the test, the TEST LED will go out.

To initiate a point-to-point test using a DS0 digital test set, perform the following:

1. Insert the TX and RX bantam plug of the DS0 digital test set into the TRI-C DP respective front panel bantam jacks. Connect the clock input of the DS0 digital test set to the channel banks clock source (D4's OIU, or the SLC-96 SSU). Configure the test set for Near Logic and 64 kbps.
2. Select the desired test direction, LPTX or CRTX, using the 10-position rotary switch. Refer to Table 7.
3. Select the desired bearer channel using the B1/B2 DIP switch.
4. Depress the recessed TEST pushbutton to initiate the test. The TEST LED will illuminate YELLOW.
5. If the far end unit is a U-BR1TE III or IV using a DS0 digital test set, perform steps 1 through 4, choosing the same front panel switch setting. Ensure that both test sets are configured for the same test pattern (511, 2047). If the far end unit is a U-BR1TE III or IV using the internal 2047 test pattern, perform steps 1 through 4 of the previous section.
6. Observe the DS0 digital test set for bit errors.
7. To deactivate the loopback, depress the TEST pushbutton, or remove the transmit bantam plug. Upon deactivation of the test, the TEST LED will go out.

Local Loopback (LPBK)

A bilateral loopback can be initiated from the TRI-C DP front panel for either bearer channel. A local test pattern source is not required for this test. To initiate a local loopback, perform the following:

1. Select the desired bearer channel using the B1/B2 DIP switch.
2. Select LPBK using the 10-position rotary switch. Refer to Table 7.
3. Depress the recessed TEST pushbutton to initiate the test. The TEST LED will illuminate YELLOW.
4. To deactivate the loopback, depress the TEST pushbutton. Upon deactivation of the test, the TEST LED will go out.

Local Performance Monitoring

Performance Monitoring of the local T1 carrier system and 2-wire TRI-interface of the ISDN data can be performed from the front panel without interruption of service to the customer. For this test, bearer channel selection is not applicable and a test pattern source is not required. To initiate a local performance monitoring, perform the following:

1. Ensure the NORM/PTRN DIP switch is in the NORM position, and that a bantam plug is NOT installed in the front panel TX bantam jack.
2. Select ADR1 using the 10-position rotary switch.

3. Depress the recessed TEST pushbutton to initiate the test. The TEST LED will illuminate GREEN.
4. The total number of Near End Block Errors (NEBE) received are simultaneously displayed as *crc* errors with the LP and CR CRC status LEDs. (See Table 8).
5. To exit Local Performance monitoring, depress the TEST button for two seconds or longer. Upon deactivation of the test, the TEST LED will go out.

Leased Mode Testing (B1, B2, and 2B)

For leased mode applications, the D channel is typically disabled on the TRI-C DP. Without the D channel, standard ISDN loopbacks by way of the *eoc* are not available across the T1 carrier system. For this situation the TRI-C DP responds to independent network-issued OCU and CSU latching loopback sequences for B1 and B2, when configured as Adjacent-to-Customer. B1 channel will be the DS0 associated with the time slot of the physical slot the TRI-C DP is installed, and B2 channel will be the adjacent time slot. Upon receipt of an OCU latching loopback sequence the TRI-C DP initiates a bilateral loopback for the B channel under test. Upon receipt of a CSU latching loopback sequence, and provided the U-Interface is terminated by a NT1/TA, the TRI-C DP will issue an *eoc* NT1 loopback for the appropriate B channel. In both the OCU and CSU loopback tests, the other B channel is not affected. The TRI-C DP will simultaneously support testing of both B channels. The OCU and CSU latching loopbacks are enabled by the following:

1. Minimum of 35 transition in progress (TIP) bytes (X0111010).
2. Minimum of 35 LSC bytes: OCU (X1010101), CSU (X0110001).
3. Minimum of 100 loopback enable (LBE) bytes (X1010110).
4. Minimum of 32 far-end voice (FEV) bytes (X1011010).

X Denotes *Don't Care* bit - either a 1 or a 0.

Upon receipt of an OCU latching loopback, the TRI-C DP will provide a bilateral loopback on the bearer channel that received the loopback sequence. The other bearer channel is not affected during this loopback.

Upon receipt of a CSU latching loopback sequence in either B1 or B2 channels, and the TRI-interface is in sync, the TRI-C DP will issue an *eoc* loopback request to the NT1 for the appropriate channel. If the TRI-interface is not in sync, the TRI-C DP sends abnormal station (X0011110) in both B1 and B2 channels.

Disabling OCU or CSU latching loopback sequence:

1. Minimum of 35 TIP bytes.

For a TRI-C DP in a CSU latching loopback, receipt of the 35 TIPs will release the test in progress. Following the release code to a TRI-C DP in a CSU test, the TRI-C DP will issue a return-to-normal *eoc* message to the NT1/TA.

The valid front panel tests in leased modes are ADR1, CRTX, LPTX, and LPBK for all circuit positions. NT1, ADR1-ADR6 loopback tests are valid for the Adjacent-to-Customer circuit position only. ADR2 would be used to test the Total Reach ISDN Remote (TRI-R) unit.

Local Performance Monitoring is available only for the TRI-interface, when configured for a leased mode of operation. See subsections: *Loopback Tests*, *Point-to-Point Test*, and *Local Loopback* for applicable test descriptions.

4. SPECIFICATIONS

The specifications for the D4 TRI-C DP are listed in **Table 9**.

5. MAINTENANCE

The ADTRAN TRI-C DP does not require maintenance for normal operation.

ADTRAN recommends that repairs on the unit not be performed in the field. Repair services are obtained by returning damaged units to ADTRAN, refer to *Warranty and Customer Service* Section.

6. WARRANTY AND CUSTOMER SERVICE

ADTRAN will replace or repair this product within ten (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/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

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

Table 9. Specifications

Total Reach ISDN Interface	
Line Operating Mode Signal Format Transmit Power Tx/Rx Impedance Receiver Sensitivity	2-wire Full duplex SC-PAM (Simple Coded Pulse Amplitude Modulation) 13 dBm -14 dBm 135 ohm nominal 46 dB @ 20 kHz w/ 6 dB of 2B1Q NEXT Margin 52 dB @ 20 kHz w/ 0 dB of 2B1Q NEXT Margin
DS1 Facility Interface	
Fully compatible with WECO D4 channel bank Equipment	
Network Compatibility	
Interface	ISDN and other digital service, according to TR-NWT-000397
Mechanical	
Size Weight Mounting	4.4 in. High, 10 in. Deep, 1.4 in. Wide 7.0 oz Mounts in WECO D4 or SLC-96 Channel Banks
Power	
Input Power (-48 VDC to -72 VDC) Output Power (135 VDC Span-Power) 325 Power Unit max output. D4 325 PU output per channel unit. D4 325 PU output for 16 channel units (full load). -48 VDC Supply current draw per channel unit. -48 VDC Supply current draw for 16 channel units. -48 VDC Supply max current limit.	5.6 W nominal for Total Reach loop of 28 kft w/26 AWG @ 25ºC 3.2 W nominal for Total Reach loop of 28 kft w/26 AWG @ 25ºC 60.0 W 0.080 W < 1.28 W 116 mA < 1.86 A 3.0 A
Environmental	
Temperature Relative Humidity	Operating: -40ºC to 70ºC (-40ºF to 158ºF) Storage: -40ºC to 85ºC (-40ºF to 185ºF) Up to 95%, noncondensing