BR1/10 BCU
BR1/10 Bank Controller Unit
Installation and Maintenance

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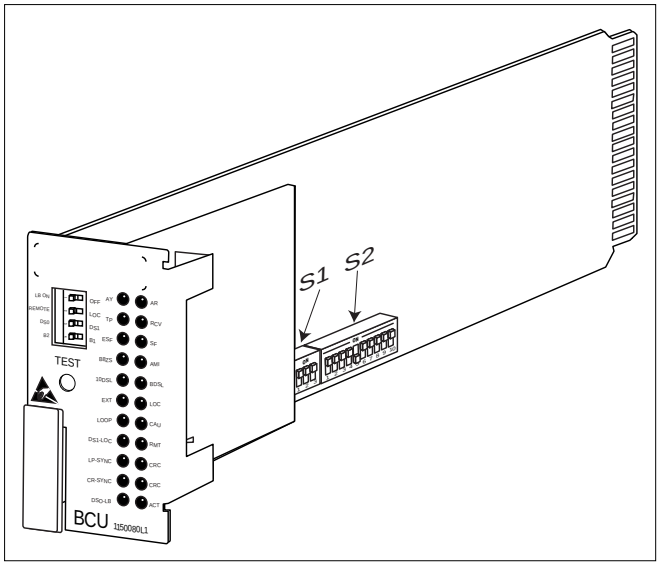

Figure 1. BR1/10 BCU

1. GENERAL

This practice provides installation and maintenance procedures for the ADTRAN BR1/10 Bank Controller Unit (BCU). **Figure 1** is an illustration of the BR1/10 BCU.

Revision History

Revision F of this document shows the correct Table 2.

Features

The BR1/10 BCU, part number 1150080L1, includes the following features and functions:

- Controls, monitors, and displays the status of all common equipment and channel units.
- Monitors alarm conditions.
- Controls H-LIU and responds to various HDSL Loopbacks.

General Description

The BR1/10 BCU is a common module plug-in unit used specifically in the ADTRAN BR1/10. The BCU provides all control functions for the BR1/10 common equipment and the individual U-BR1TE channel units.

The BR1/10 ISDN Channel Bank is designed to provide a maximum concentration of the 2B+D Basic Rate ISDN in a compact and modular configuration. The BR1/10 can operate in the industry standard TR-NWT-000397, 3-DS0 mode and is compatible with any compliant ISDN channel unit such as the ADTRAN D4 U-BR1TE II, or the ADTRAN SLC-5 U-BR1TE. The BR1/10 Channel Bank will operate with other channel bank systems that are WECO D4 compatible, and with SLC-96 Modes 1 and 3. When deployed in the ADTRAN proprietary channel 4:1 TDM, up to ten 2B+D BRI circuits can be delivered providing maximum use of the T1 carrier facilities.

Option selections for the BCU are made using the three-position and ten-position (S1, S2) DIP switches on the printed circuit mother board. The option selection provides for manual choice of T1 related configurations for the BR1/10 ISDN Channel Bank.

A four-position DIP switch and a TEST pushbutton on the faceplate are used with the BR1/10 Line Interface Unit (LIU) or H-LIU in the selection and performance of DSX/DS1 and DS0 level testing. Faceplate LEDs provide status indications of the BR1/10 DSX/DS1

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carrier facilities, selected U-BR1TE channel units, and applicable options selected on the BCU.

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 Customer Service (see *Warranty and Customer Service*).

The BCU plugs directly into the common card area on a BR1/10 chassis in the BCU slot. To install, hold the unit by the faceplate while supporting the bottom side. Align the card to the guide grooves and insert into the shelf until the edge connector seats firmly into the backplane. Lock the unit in place by pressing in on the lock lever.

Faceplate Features

The four-position DIP switch and TEST pushbutton on the faceplate are used with the LIU or H-LIU to select and conduct DS0 level testing. See **Table 1**, **Figure 2**, and the section on Testing, for additional information.

The BCU faceplate LEDs provide operational status and individual DSL status for selected U-BR1TE channel units. See **Table 2** for BCU LED indication.

Optioning

DIP switches S-1 and S-2 provide the BR1/10 ISDN

Table 1. BCU Faceplate Test Switch

Position	Description
LB ON LB OFF	Initiates DS1 loopbacks. Terminates DS1 loopbacks.
LOCAL REMOTE ESF SF	Initiates internal local loopback in the T1 data stream. Initiates a remote loopback to the far unit. Initiates line loopback at the local BR1/10 bank.
DS0 DS1	Reserved for future use.
B1 B2	Selects B1 channel for BRI testing. Selects B2 channel for BRI testing.

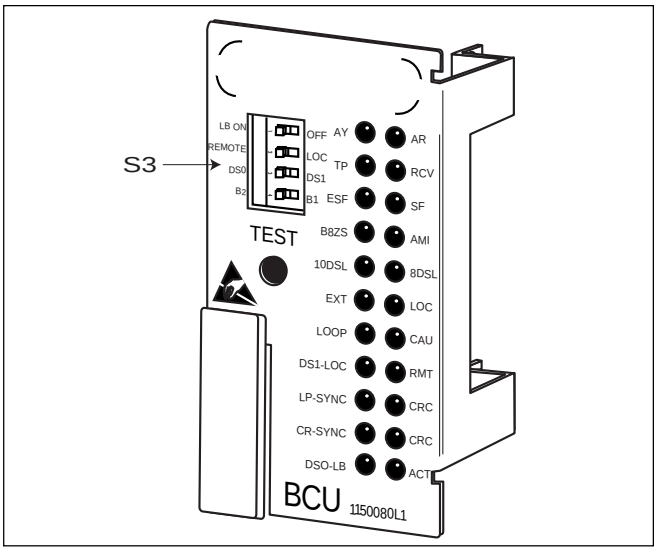

Figure 2. BCU Faceplate Features

Channel Bank with the necessary option settings for DSX/DS1 modes of operation. The BCU must be withdrawn from the channel bank to change switch positions. Option settings for the individual U-BR1TE channel units are provided on each individual unit. Refer to Installation and Maintenance Practice, part number 61150.077L1-5, for additional information. **Table 3** shows the option settings for S-1 and S-2.

NOTE

The DS1 Attenuation settings (S1-1, 2, 3) are only applicable when using the Line Interface Unit, List 2, part number 1150079L2.

SUBSCRIBER LOOP CARRIER OPERATION

Digroup A of a SLC-96 supports SLC framing format but does not support SF or ESF formats. DIP switch S2-2 selects Framing Format but does not have a SLC framing option. However, the BR1/10 will support SLC framing using an “autoframe” feature.

The following arrangement supports autoframe and the SLC framing format:

- The BR1/10 is connected to digroup A of a SLC bank.
- Terminal Mode DIP switch, S2-7, 8, 9, set to SLC Mode 1 or 3.
- Framing Format DIP switch, S2-2, set to SF.

The “autoframe” feature then determines if SLC framing is needed and will automatically switch from SF to SLC. Any change to the above arrangement will

Table 2. BCU LED Indication

Indicator	Color	Description
AY	Amber	**ON** indicates a yellow alarm is being received from the T1 carrier facilities.
AR	Red	**ON** indicates the BR1/10 is in a red alarm condition.
TP	Amber	**ON** indicates trunk processing is active on the channel units.
RCV	Red	**ON** indicates a loss of framing of T1 signal from the network.
ESF	Green	**ON** indicates that Extended Superframe Format is on.
SF	Green	**ON** indicates that the Superframe Format is selected.
B8ZS	Green	**ON** indicates B8ZS (Bipolar Eight Zero Substitution) line coding is selected.
AMI	Green	**ON** indicates Alternate Mark Inversion (AMI) line coding is selected.
10 DSL	Green	**ON** indicates D channel 4:1 TDM mode is selected for 10 BRI circuits.
8 DSL	Green	**ON** indicates TR-397 3-DSO froming across the T1 carier for 8 BRI circuits.
EXT	Green	**ON** indicates external timing input is selected (a suitable BITS or compatible clock must be provided).
LOC	Green	**ON** indicates BR1/10 is using a locally generated clock form the T1 carrier.
LOOP	Green	**ON** indicates BR1/10 is using recovered clock from the T1 carrier.
CAU	Green	**ON** indicates clock is recovered from the DSL position #1 to time the network.
DS1-LOC	Green	**ON** indicates the BR1/10 is in a Local DS1 loopback.
RMT	Green	**Flashes** in response to a remotely-commanded loopback, or has provided a loopback path for the network's T1 data stream (SF mode). **ON** indicates the unit has initiated remote D1 loopback (ESF mode).
LP-SYNC*	Red	**ON** indicates U-interface is out of sync for the selected channel unit.
LP-CRC*	Red	In normal operation: **Flashes** upon receipt of NEBE from the loop of the selected channel unit. In Local Performance Monitoring: **Flashes** when 6-19 *crc* errors are detected from the loop. **Solid** when 20 or more *crc* errors are received from the loop.
CR-SYNC*	Red	**ON** indicates indicates no TR-397 framing across the carrier for the selected channel unit.
CR-CRC*	Red	In normal operation: **Flashes** upon receipt of NEBE from the T1 carrier in the selected channel unit. In Local Performance Monitoring: **Flashes** when 6-19 *crc* errors are detected from the carrier. **Solid** when 20 or more *crc* errors are received from the carrier.
DS0-LB*	Amber	**ON** indicates the selected BR1/10 U-BR1TE is in a 2B+D network commanded loopback. **Flashes** once per second for a B1 loopback and twice per second for a B2 loopback.
ACT*	Green	**ON** indicates Customer's NT1 has successfully exchanged ACT bits with the network for the selected channel unit.
*Status is for the chanel unit selected on the DSL 10-position rotary switch on the BR1/10's LIU.		

Table 3. S1 and S2 Option Selections

Switch	Function	Description
S1-1 S1-2 S1-3	**DSX Line Build Out and DS1 Attenuation**	Selects the Line Build Out in feet, Attenuation in Decibels (dB). **Distance** **S1-1** **S1-2** **S1-3** 0-133 (feet)/0 dB* ON ON ON 133-266 ON ON OFF 266-399 ON OFF ON 399-533 ON OFF OFF 533-655 OFF ON ON -7.5 dB OFF ON OFF -15 dB OFF OFF ON -22.5 dB OFF OFF OFF
S2-1 ON* OFF	**Line Code Format** B8ZS AMI	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.
S2-2 ON* OFF	**Framing Format** ESF SF	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.
S2-3 ON* OFF	**Remote Loopback Location Selection** Payload Line	Determines which T1 remote loopback command is initiated. Only valid in ESF mode. PAYLOAD occurs after framing regeneration at 1.536 mbps in the remote unit. LINE occurs before framing regeneration at 1.544 mbps in the remote unit.
S2-4 S2-5	**Timing Mode**	Determines a clock source for the BR1/10 channel bank. **S2-4** **S2-5** **Function** OFF OFF External BITS input, Pins LX and LY (IN) OFF ON *Local Clock--provided by local LIU ON OFF Loop Clock--uses recovered clock from T1 bit stream ON ON CAU--uses input from channel position 1 to provide channel bank timing
S2-6 ON* OFF	**Bank Mode** 8 DSL 10 DSL	Enables either 8-Digital Subscriber Lines (DSL) using the 3 DS-0, TR-NWT-000397 method, or the ADTRAN proprietary 4:1 TDM mode allowing for 10 DSL. When configured for 8 DSL, the BR1/10 is comparable with the WECO D4, and will operate with any other 3 DS-0 ISDN channel unit. In 10 DSL mode, another ADTRAN BR1/10 must be at the far end.
S2-7 S2-8 S2-9	**Terminal Mode**	Select the appropriate Terminal Type and counting mode for the BR1/10 system. This option is only valid in the 8 DSL Bank Mode (S2-6 ON), and is ignored in the 10 DSL Bank Mode. **Terminal Mode** **Counting** **S2-7** **S2-8** **S2-9** D4 D4* ON ON ON DID ON ON OFF SLC Mode 1 DID ON OFF ON SLC Mode 3 D4 ON OFF OFF DID OFF ON ON
S2-10 ON OFF*	**CSU Loopback** Enable Disable	Enables the CSU Loopback Function. Unit will respond to CSU loopback sent from a remote network device or test equipment.
* Denotes factory default settings.		

disable the autoframe feature. Specifically if S2-2 is set to ESF the autoframe function is disabled.

The remaining digroups (B, C, and D) will continue to support D4 framing, SF and ESF.

Connections

All inputs and outputs to the BCU are made through the backplane. No additional backplane wiring is necessary for design operation.

Operation with Other Channel Bank Systems

The BR1/10 ISDN Channel Bank can be configured to operate with WECO D4 compatible channel banks, SLC Mode 1, and SLC Mode 3 compatible digital loop carrier systems, such as the AT&T SLC-96. To operate with one of these other carrier systems the BR1/10 must be configured for 8 DSL. The ISDN channel cards for the other channel bank system must be TR-NWT-000397, 3-DS0 compatible. **Table 4** shows the BR1/10 physical 2B+D slot assignments for compatible channel bank systems.

3. TESTING

The BR1/10 BCU along with either the LIU or the H-LIU, depending on channel bank arrangement, allows testing of both the DSX/DS1 and U-BR1TE channel unit interfaces. In addition, the BCU initiates DS1 remotely commanded loopbacks when configured for Extended Superframe (ESF) operation. See **Figure 3** for an illustration of the LIUs and BCU.

DS1 testing has two loopback modes: local loopback and remote loopback. DS1 loopbacks include:

- Responding to remote payload or line loopback commands from a remote T1 network device or test equipment (ESF only).
- Initiating either a payload or line loopback command to a remote T1 multiplexer (ESF only).
- Providing a loopback for the local T1 data stream.
- Providing a local loopback to the T1 network (SF only).
- Responding to a remote CSU loopback (when enabled) from a remote T1 network device or test equipment.

NOTE

Test functions of the LIU and H-LIU are the same. In the following procedures only the LIU is referred to but it will represent both units.

Test Access and Selection

The BCU provides selection of a local initiated test for each individual U-BR1TE channel unit. While ISDN is designed to be tested from the ISDN switch, it may be necessary to perform local testing. Each U-BR1TE channel unit will respond to embedded operation channel (*eoc*) loopbacks, including B1, B2 and 2B+D, when configured for D channel operation.

These commands may be initiated from an upstream device, including the ISDN switch, another U-BR1TE channel unit, or ISDN test equipment developed for this purpose. When remote testing is not available or during troubleshooting or equipment malfunction, the BR1/10 LIU and BCU allow technicians local test access for standard DS0 test sets.

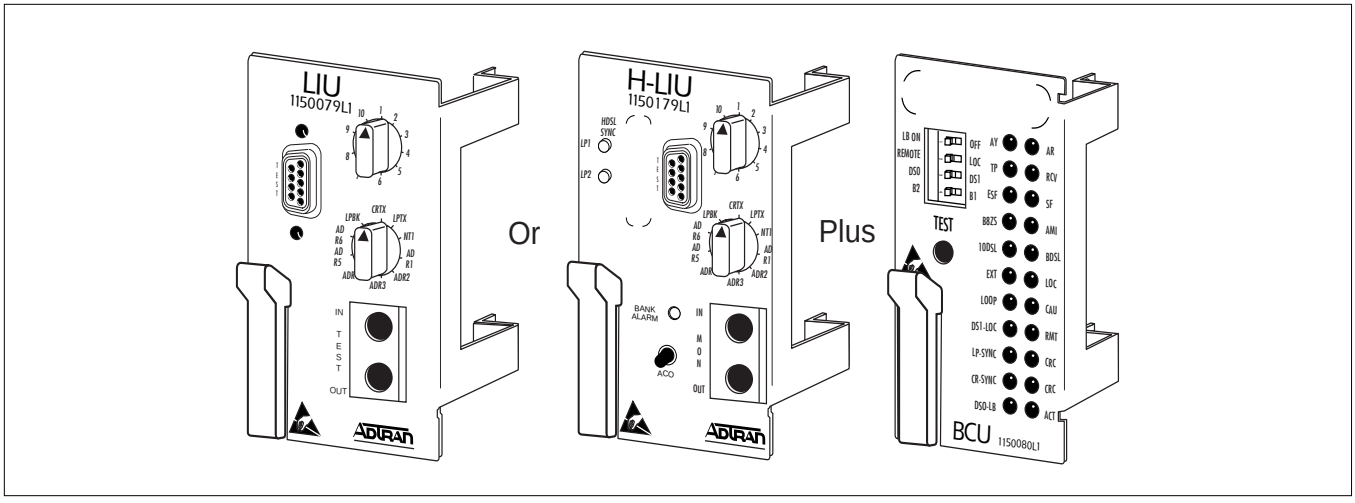

Figure 3. BR1/10 BCU and LIUs

Table 4. 2B+D Slot Assignments for Compatible Channel Bank Systems

BR1/10, D4, D4 Counting	Physical Slot	1	2	3	4	5	6	7	8
WECO D4, D4 Counting	Physical Slot	1	4	7	10	13	16	19	22
SLC-5, INA-RT, D4 Counting									
	Physical Slot	1	2	4	5	7	8	10	11
	A Di-Group	1/2	3/4	7/8	9/10	13/14	15/16	19/20	21/22
	B Di-Group	25/26	27/28	31/32	33/34	37/38	39/40	43/44	45/46
	C Di-Group	49/50	51/52	55/56	57/58	61/62	63/64	67/68	69/70
	D Di-Group	73/74	75/76	79/80	81/82	85/86	87/88	91/92	93/94

BR1/10, D4, DID Counting	Physical Slot	1	2	3	4	5	6	7	8
WECO D4, DID Counting	Physical Slot	1	4	7	10	13	16	19	22
SLC-5, INA-RT, DID Counting									
	Physical Slot	1	2	4	5	7	8	10	11
	A Di-Group	1/2	3/4	7/8	9/10	13/14	15/16	19/20	21/22
	B Di-Group	25/26	27/28	31/32	33/34	37/38	39/40	43/44	45/46
	C Di-Group	49/50	51/52	55/56	57/58	61/62	63/64	67/68	69/70
	D Di-Group	73/74	75/76	79/80	81/82	85/86	87/88	91/92	93/94

BR1/10 SLC Mode 1, DID Counting	Physical Slot	1	2	3	4	5	6	7	8
SLC-96, Mode 1, DID Counting									
	Physical Slot	1	2	4	5	7	8	10	11
	A Di-Group	1/2	3/4	7/8	9/10	13/14	15/16	19/20	21/22
	B Di-Group	25/26	27/28	31/32	33/34	37/38	39/40	43/44	45/46
	C Di-Group	49/50	51/52	55/56	57/58	61/62	63/64	67/68	69/70
	D Di-Group	73/74	75/76	79/80	81/82	85/86	87/88	91/92	93/94

BR1/10 SLC Mode 3, D4 Counting	Physical Slot	1	2	3	4	5	6	7	8
SLC-96, Mode 3, D4 Counting									
	Physical Slot	1	4	7	10	13	16	19	22
	A/B Di-Group	25/26	31/32	37/38	43/44	1/2	7/8	13/14	19/20
	C/D Di-Group	73/74	79/80	85/86	91/92	49/50	55/56	61/62	67/68

BR1/10 SLC Mode 3, DID Counting	Physical Slot	1	2	3	4	5	6	7	8
SLC-96, Mode 3, DID Counting									
	Physical Slot	1	4	7	10	13	16	19	22
	A/B Di-Group	25/26	31/32	37/38	43/44	1/2	7/8	13/14	19/20
	C/D Di-Group	73/74	79/80	85/86	91/92	49/50	55/56	61/62	67/68

When configured for DS0 on the BR1/10 BCU, the LIU bantam jacks accommodate standard DS0 logic testing such as the TPI-108/109 RT II or the FIREBERD 4000/6000.

When configured for DS0 test access, selection for B1 or B2 is also made on the BCU faceplate DIP switch. The TEST pushbutton will initiate the test selected on the LIU test selection switches. During normal operation the DS0/DS1 DIP switch should be kept in the DS0 position to prevent inadvertent interruption of service for the BR1/10 channel bank.

DS1 Testing

CAUTION

DS1 tests are intrusive and will disrupt service for the entire BR1/10 channel bank.

LOCAL LOOPBACK (SF AND ESF)

A local loopback bridges the T1 line across the receive pair to the transmit pair isolating the bank from the T1 line. This allows for internal bank testing, individual card testing, and also provides a baseline for T1 line testing.

To initiate local loopback select LB ON and LOC on the BCU TEST switch. All outgoing transmitted data is looped back to the receiver at the local BR1/10. Unframed All Ones (A1S) are transmitted to the T1 network causing the DS1-LOC LED on the BCU to turn On.

To terminate the test set LB to OFF. The DS1-LOC LED will turn Off.

NOTE

When local loopback is invoked and the BCU is configured for loop timing the BR1/10 defaults to local timing.

REMOTE LOOPBACK (ESF MODE)

Remote loopback in ESF mode provides for a locally initiated remote loopback to further test the T1 line. This limits the need for additional personnel for troubleshooting.

The BR1/10 can initiate two types of remote loopback: payload and line. A payload loopback results in only the payload data being looped; framing is regenerated by the remote T1 multiplexer. A line loopback results in a full loopback in that framing is not regenerated by the remote T1 multiplexer but instead is echoed back to the local BR1/10. BCU DIP switch S2-3 selects between Payload or Line loopback.

To initiate remote loopback select LB ON and REMOTE on the BCU TEST switch. This sends a Loopback Activate command to the remote T1 channel bank.

In response the remote BR1/10 LIU will Flash its RMT LED and retransmits (echoes) the received data back to the local BR1/10. Upon receiving the echoed signal the local RMT LED will turn On indicating successful completion of the remote loopback.

To terminate the test set LB to OFF. A loopback deactivation command is sent to and then echoed by the remote channel bank which will exit the remote commanded test. When no longer detecting the echoed loopback deactivate command, the local channel bank returns to normal operation as indicated by the RMT LED turning Off.

REMOTE LOOPBACK (SF MODE)

To initiate remote loopback select LB ON and REMOTE on the BCU TEST switch. This provides a return path to the remote channel bank. In response the RMT LED will Flash. When the remote station transmits T1 test data the local BCU retransmits the received signal back to the remote unit. At the remote station this configuration appears similar to Remote Loopback is ESF mode. To terminate the test set LB to OFF.

DS0 Testing

When DS0 is selected local test access is provided to each of the BR1/10 U-BR1TE channel units in both the downstream and upstream directions. The BR1/10 LIU provides bantam jacks for DS0 logic access, 8 kHz and 64 kHz clock references, desired channel unit selection (1-10), and desired test.

When the 10-position rotary switch is used to select a channel unit the STATUS LED on the selected unit will Flash red/green for 3 seconds in acknowledgment then return to its current status.

LOOPBACK TEST (ADR1-ADR6, & NT1)

Loopbacks in the network-to-customer direction can be initiated from either the ISDN switch or the LIU. The downstream direction is automatically selected based on the card position in the network. To initiate a loopback, perform the following steps:

1. Insert the TX and RX plugs of the DS0 digital test set into the bantam jacks on the LIU. Connect the clock input to the DS0 digital test set DB-9 connector on the LIU. Configure the test set for Near Logic and 64 kbps.
2. Select the desired U-BR1TE channel unit using the DSL switch on the LIU.
3. Select the desired loopback address on the LIU (ADR1-ADR6, or NT1).
4. Select the desired bearer channel using B1/B2 DIP switch on the BCU.
5. Press the BCU TEST pushbutton to initiate the loopback test. The DS0 LB status LED will turn On when the loopback is established to the selected address. If the selected address does not respond, the DS0 LB LED will remain Off. Observe the DS0 digital set for bit errors.
6. To terminate the loopback, press the TEST pushbutton or remove the transmit bantam plug. Upon deactivation of the test, the DS0 LB LED will turn Off.

Loopback tests to additional network addresses can be performed by changing to another address with the Loopback Address switch (step 3). It is not necessary to exit the test mode to select a new address.

If a new U-BR1TE channel unit is selected testing is terminated. However, pressing the TEST pushbutton will initiate the previous test arrangement on the new U-BR1TE at the address selected. To start from the beginning (ADR 1) return to Step 2.

POINT-TO-POINT TEST, (CRTX, LPTX)

A point-to-point (straightaway) test can be performed to either the U-interface (LPTX) or the T1 carrier interface (CRTX). This test requires personnel at the local and remote channel banks.

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

1. Insert the TX and RX bantam plugs of the DS0 digital test set into the jacks on the LIU. Connect the clock input to the DS0 digital test set DB-9 connector on the LIU. Configure the test set for Near Logic and 64 kbps.
2. Select the desired U-BR1TE channel unit using the DSL switch on the LIU.
3. Select the desired test direction: LPTX or CRTX on the LIU.
4. Select the desired bearer channel using B1/B2 DIP switch on the BCU.
5. Press the TEST pushbutton on the BCU to initiate the test.
6. If the remote unit is a BR1/10 U-BR1TE repeat Steps 1 through 4 on that unit choosing the same faceplate switch settings. Ensure both test sets are configured for the same test pattern (511, 2047).
7. Observe the DS0 digital test set for bit errors.
8. To deactivate the loopback, press the TEST pushbutton or remove the transmit bantam plug. Upon deactivation of the test, the DS0-LB LED will turn Off.

LOCAL LOOPBACK (LPBK)

A bilateral loopback can be initiated for any of the BR1/10 U-BR1TE channel units for either bearer channel. A test pattern source is not required for this test. To initiate a local loopback, perform the following:

1. Select the desired U-BR1TE channel unit using the DSL rotary switch on the LIU.
2. Select LPBK with the rotary switch on the LIU.
3. Select the desired bearer channel using the B1/B2 DIP switch on the BCU.
4. Depress the TEST pushbutton on the BCU to initiate the loopback test. The DS0-LB LED will Flash once a second for B1 or twice in succession for B2.
5. To deactivate the loopback, press the TEST pushbutton. Upon deactivation of the test, the DS0-LB LED will turn Off.

Local Performance Monitoring

Performance monitoring of the local T1 carrier system and the 2-wire U-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 required. To initiate local performance monitoring, perform the following:

1. Ensure a bantam plug is NOT installed in the faceplate TX bantam jack on the LIU.
2. Select the desired U-BR1TE channel unit using the DSL rotary switch on the LIU. The selected U-BR1TE channel card STATUS LED will flash red/green for 3 seconds when selected.
3. Select ADR1 on the LIU.

4. Depress the TEST pushbutton to initiate the test. The DS0-LB LED will turn On.
5. The total number of *crc* errors is simultaneously displayed by the LP and CR CRC status LEDs. The LEDs will Flash for more than 6 or fewer than 19 *crc*s and will turn On solid for more than 20 errors.
6. To exit Local Performance monitoring, press the TEST pushbutton. Upon deactivation of the test, the DS0-LB LED will turn Off.

4. SPECIFICATIONS

Table 5 outlines the BR1/10 BCU specifications.

Table 5. BR1/10 BCU Specifications

Environmental	
Operating Temperature:	-40°C to +70° C (-40°F to 158°F)
Storage Temperature:	-40°C to +85°C (-40°F to 185°F)
Relative Humidity:	95% max., non-condensing
Physical	
Deminsion:	9.8" Long, 4.2" High, 1.3" Wide
Weight:	3.2 ounces

5. MAINTENANCE

The BR1/10 BCU does not require a routine maintenance program for design operation.

ADTRAN does not recommend that repairs be performed in the field. Repair services are obtained by returning the defective unit to ADTRAN Customer Service.

6. 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 Telco Network 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 and availability
(800) 827-0807

ADTRAN Technical Support

Presales Applications / Post-sale Technical Assistance
(800) 726-8663

Standard support hours:
Monday-Friday, 7 a.m. - 7 p.m. CST

Emergency support: 7 days/week, 24 hours/day

ADTRAN Repair/CAPS

Return for repair / upgrade
(256) 963-8722

Repair and Return Address:

ADTRAN, Inc.
Customer and Product Support (CAPS)
901 Explorer Boulevard
Huntsville, Alabama 35806-2807