BLACK BOX
NETWORK SERVICES

T1 CSU-B

T1 CSU-B

133	266	399	533	655	MAX. FT.

EQUIP. LBO

NETWORK LBO

0	7.5	15	22.5	dB

☐ POWER

☐ NETWORK LOS

☐ EQUIPMENT LOS   TEST JACKS

☐ LOOPBACK   NET MON ○

ON   EQ MON ○

MANUAL LB   EQ IN ○

OFF   EQ OUT ○

                         NET IN ○

                         NET OUT ○

NET   CPE   POWER

FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE STATEMENT

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

"This digital apparatus does not exceed the Class A limits for Radio noise emission from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications."

"Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada."

TRADEMARKS

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CONTENTS

1.0 Specifications

Network Interface — 4-wire (T, R, T1 and R1)

Data Rate — 1.544 Mbps ± 50 bps

Connectors — (3) 8-pin modular (RJ-48C)

Indicators — (4) LEDs: Power, Network Loss, Equipment Loss, Loopback

Signal Format — Bipolar with B8Zs transparency

Temperature — Operating 32° to 122° F (0° to 50°C)
Storage -4° to 158° F (-20° to 70°C)

Relative Humidity — Up to 95% (non-condensing)

Power — span: 60 to 140 mA at 30 volts,
local: 20-50 mA at 48 volts

Size — 1.35"H x 6.25" W x 3.75"D (3.4 x 15.9 x 9.5 cm)

Weight — 10 oz.   (283.5 g)

2.0 Introduction

The T1 CSU-B provides a T1 interface between equipment such as channel banks, T1 multiplexors, PBXs, etc., and the network as illustrated in Figure 2-1. The unit complies with Part 68 of FCC Rules as noted in Section 6, and with applicable sections of AT&T 62411, ANSI T1.102, and ANSI T1.403.

The T1 CSU-B provides functions such as surge protection, signal regeneration, alarms, and loopbacks necessary for circuit operation and fault isolation, as illustrated in Figure 2-2. The unit is transparent to ESF or SF framing formats and AMI or B8ZS line coding.
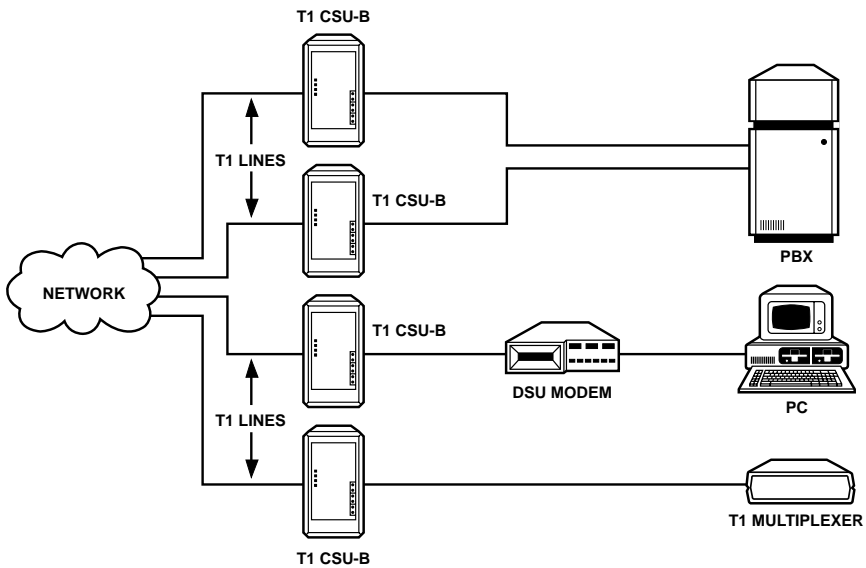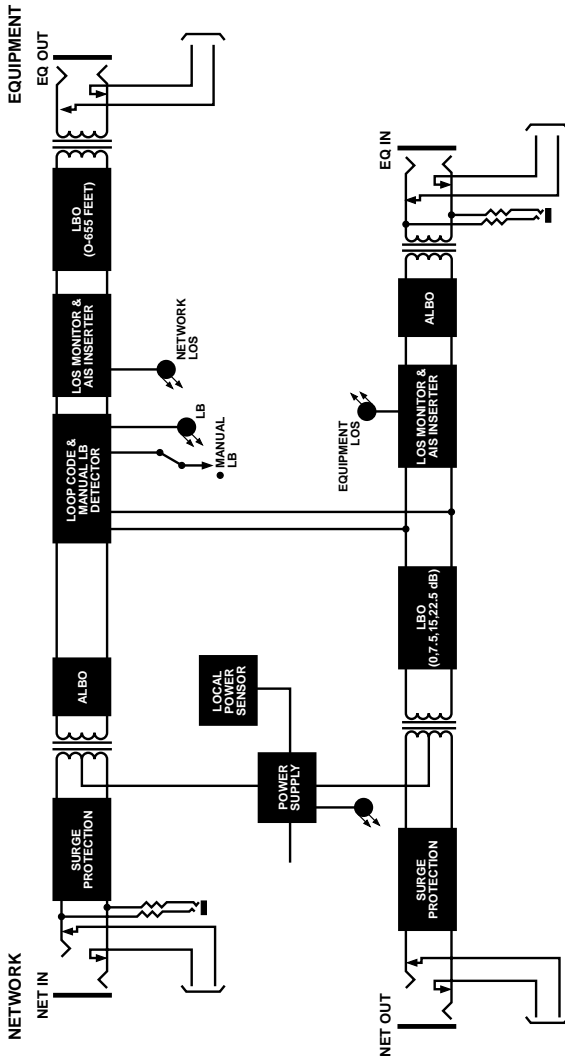

Figure 2-1. Typical T1 CSU-B Application.

Figure 2-2. T1 CSU-B Block Diagram.

2.1 Power Options

The T1 CSU-B may receive power either from the carrier on the line or from a local power supply. Line power from the telco transmit and receive pairs is a constant 60 to 140 mA of current. Local power can be supplied with your own 48V supply and the supplied power cable, or by an optional wallmount power supply (PS429) shown in Figure 2-3.
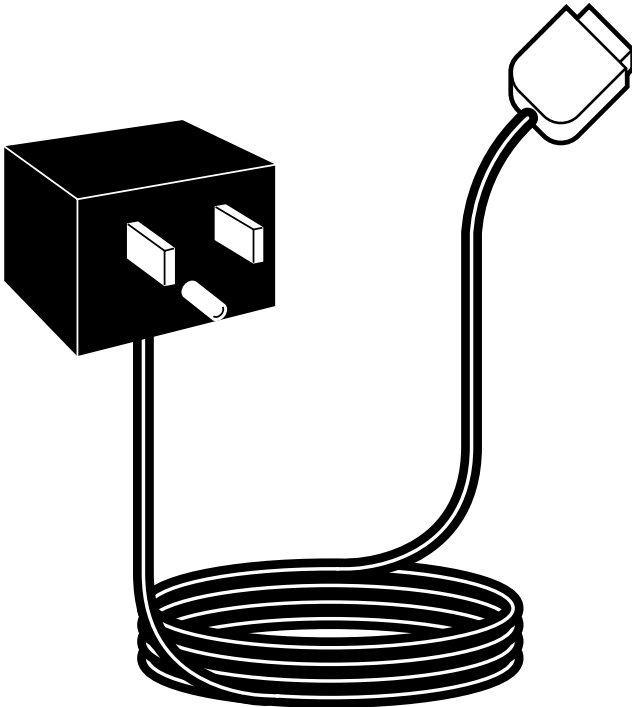
Figure 2-3. Power Supply (PS429).

2.2 Alarms

The T1 CSU-B has three LED alarms on the front of the unit, as illustrated in Figure 4. The **POWER** LED shows that the unit is receiving power. The **NETWORK LOS** LED indicates Loss of Signal (LOS) from the network. The **EQUIPMENT LOS** LED is illuminated when an LOS from the attached equipment is detected.
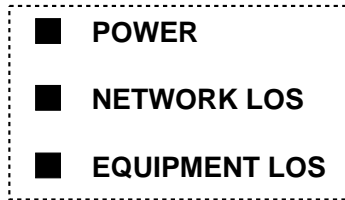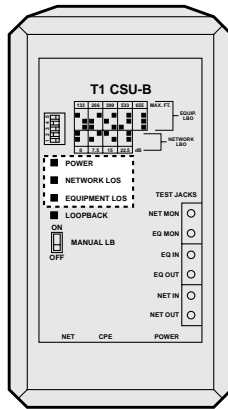

Figure 2-4. T1 CSU-B Front Panel LEDs.

2.3 Loopback

The T1 CSU-B supports two types of loopback, whereby the unit loops the signal received from the network back to the network, and transmits an unframed **all ones** pattern to the attached equipment. The signal received from the equipment is ignored. The **LOOPBACK** LED will be lit when either form of Loopback is in progress.

The first type of Loopback, Manual Loopback, is initiated by switching on the **MANUAL LB** switch on the front of the unit, and will continue until **MANUAL LB** is switched off. The second type of Loopback, Network Loopback, is activated by sending the unit a 1-in-5 pattern (1000010000) from the network side for five seconds, and can be cleared by sending the 1-in-3 pattern (100100100) for five seconds. The patterns may be unframed or framed (SF or ESF framing).
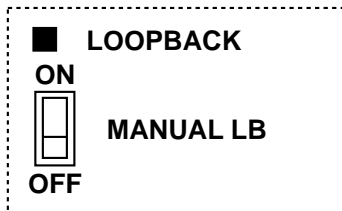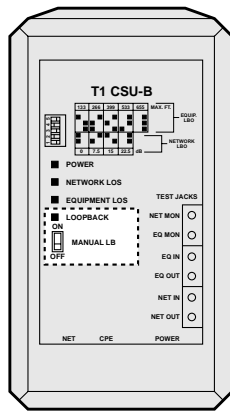
Figure 2-5. T1 CSU-B Loopback Switch and LED.

2.4 Line Build Out

The five-position switch on the front of the T1 CSU-B selects Line Build Out (LBO). Separate LBOs set the transmit levels for the Network and Equipment sides of the T1 CSU-B. The receivers on both sides of the T1 CSU-B contain Automatic Line Build Out (ALBO) circuitry to compensate for LOS.

On the Network side, the amount of attenuation in decibels (dB) specified by the carrier can be selected as shown in Table 3-1. On the equipment side, the amount of attenuation is determined by the maximum length of cable between the T1 CSU-B and the attached equipment, as shown in Table 3-2.
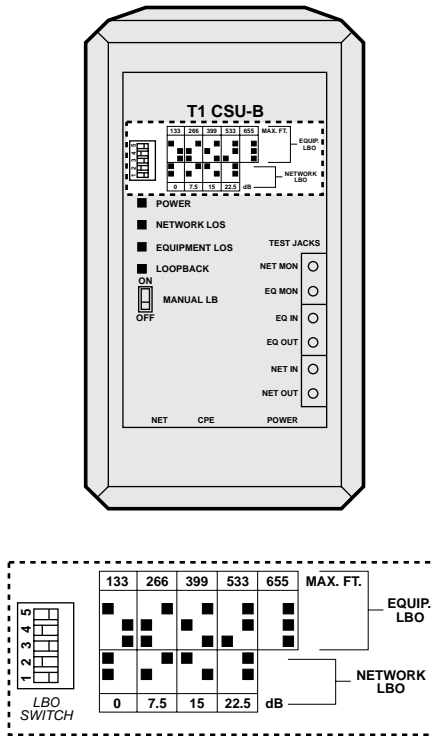
Figure 2-6. Line Build Out Switch.

3.0 Installation

3.1 Setting the LBO Switch Positions

Network and customer LBO
switch position settings are defined
in Tables 3-1 and 3-2.

Table 3-1. Network LBO Switch Position Settings.

Position 1	Position 2	Attenuation (dB)
ON	ON	0
ON	OFF	7.5
OFF	ON	15
OFF	OFF	22.5

Table 3-2. LBO Switch Position Settings for Attached Equipment.

Position 3	Position 4	Position 5	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

3.2 Powering the Unit

The T1 CSU-B can be line powered if line power from the carrier is available. If the T1 CSU-B relay detects that local power is present, the unit ignores the line power. If line power is used, the power cable should be disconnected from the unit. The power is received from the transmit and receive pairs of the Network side of the T1 CSU-B.

Local power may be tapped using the power cable supplied and your own 48-volt power supply. A wall mount power supply is available (PS429). See Figure 3-1 for an illustration of cable installation. When power is applied to the unit, the **POWER** LED lights.

TOP

THIS END PLUGS
INTO T1 CSU

RED — TO NEGATIVE TERMINAL

BLACK — TO POSITIVE TERMINAL

GREEN — TO AC GROUND
(EARTH GROUND)

THIS END ATTACHES
TO 48V SUPPLY
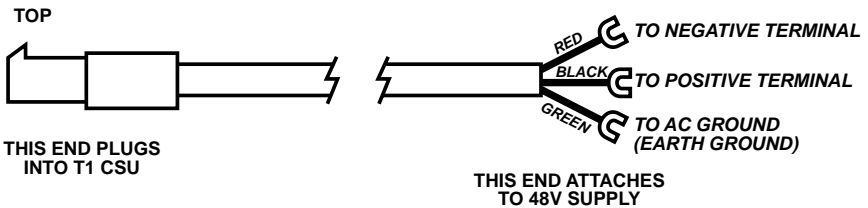
NOTE: WITH THE T1 CSU FACE UP, PLUG THE CABLE IN WITH THE PLUG ORIENTED AS SHOWN.

Figure 3-1. Power Connection.

3.3 Connecting to the Network and Other Equipment

Two RJ-48 modular connectors are located on the bottom of the T1 CSU-B. The connector marked **NET** is for connecting the T1 CSU-B to the network via the Network cable. The connector marked **CPE** is used for connecting the cable from your attached equipment to the T1 CSU-B. Notify your T1 line supplier before you connect the T1 CSU-B to the network. Connect the T1 CSU-B to the network before connecting it to any other equipment. Pin assignments for the RJ-48 connector are listed in Table 3-3.

Table 3-3. RJ-48 Connector Pin Assignments.

Pin	Network	Attached Equipment
1	R1 (Receive from Network)	Transmit to DTE
2	T1	
3	Not Used	Not Used
4	R (Transmit to Network)	Receive from DTE
5	T	
6	Not Used	Not Used
7	Not Used	Not Used
8	Not Used	Not Used

3.4 Test and Monitor Access

The six Bantam jacks located on the side of the T1 CSU-B provide test and monitor access for the network and equipment side of the unit. Figure 3-2 shows each jack's function.

The first two jacks are monitor jacks. These jacks bridge the received signals, so that the circuit can be monitored while in service. **NET MON** monitors the signal received from the network. **EQ MON** monitors the signal received from the attached equipment.

The other four 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 the network input and output of the T1 CSU-B. In order to test the attached equipment, a T1 Bit Error Rate Test (BERT) test set can be used to simulate the network. **EQ IN** and **EQ OUT** can be used to simulate the equipment with a BERT test set, allowing the network to be tested. The T1 CSU-B on the other end of the circuit can be looped back in order to test only the network. Most BERT test sets have the ability to send loopback enable and loopback clear codes.
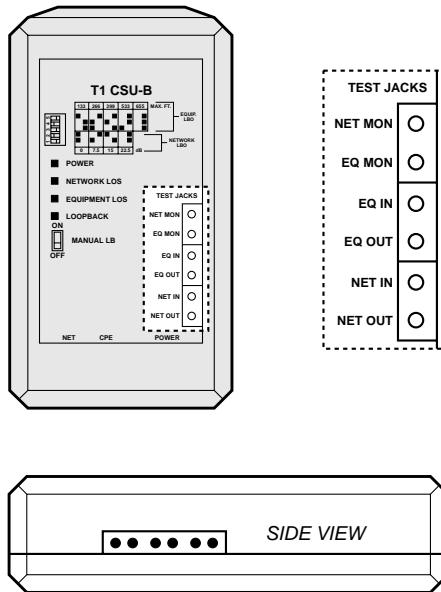

Figure 3-2. T1 CSU-B Bantam Jacks.

3.5 Wall-Mounting

Two strips of VELCRO® are included with the unit for wall mounting. Without separating the VELCRO surfaces, remove the protective paper covering from the adhesive surface on one side of each strip.

On the back of the T1 CSU ACE unit, firmly place one VELCRO strip on the area above the approvals label, and one strip below the approvals label, as shown in Figure 3-3. Remove the protective paper covering from the remaining adhesive surface. Firmly place the T1 CSU-B on the desired mounting surface.
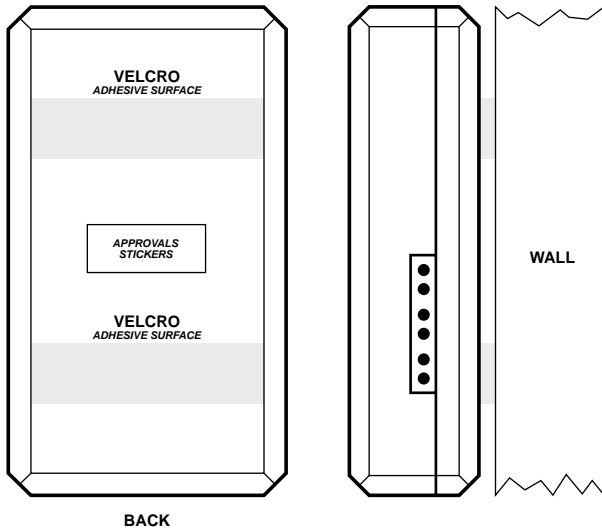
VELCRO
ADHESIVE SURFACE

APPROVALS STICKERS

VELCRO
ADHESIVE SURFACE

WALL

BACK

Figure 3-3. Wall-Mounting the T1 CSU-B.

4.0 Troubleshooting

The following is a list of some basic problems (with some solutions) that may occur with your T1 CSU-B.

1. POWER LED is not illuminated.

If locally powered, verify the power cable installation. If line-powered, verify the cable installation. Notify the T1 line supplier.

2. NETWORK LOS LED is illuminated.

Verify that the cable from the network is in NET modular jack on the bottom or end of the T1 CSU-B. If all connections seem intact, the far-end T1 CSU-B can be looped back (using a BERT test set to send the LB code, or using the **MANUAL LB** at the other end) to isolate the problem to the far end customer premises or the network. If the problem persists after the loopback has been activated, the problem would appear to be within the network or the far end T1 CSU-B. The carrier should be notified. If the problem disappears after loop-up, then the cause must be at the far-end customer premises.

3. EQUIPMENT LOS LED is illuminated.

Verify that the cable from the attached equipment is in the CPE modular jack on the bottom of the CSU ACE. If all connections seem intact, use a BERT test set in the **NET IN** and **NET OUT** jacks to test the attached equipment.

The T1 CSU-B requires no routine maintenance to operate. No repairs should be performed in the field. Repair services can be obtained by returning the unit to your supplier.