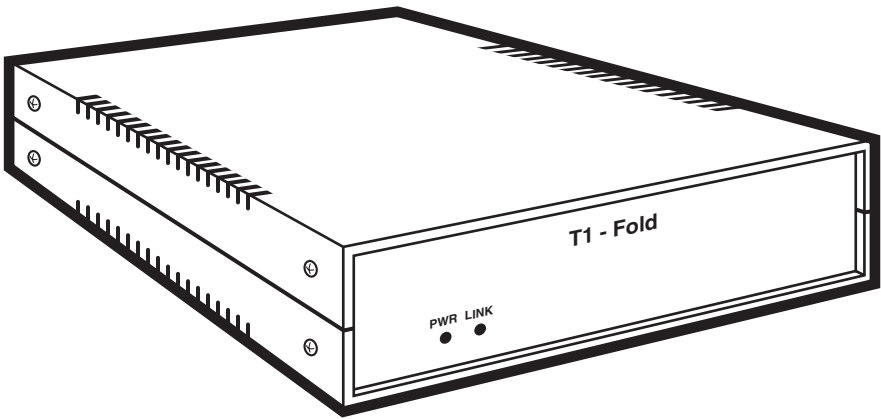




T1 Fold (2KM)



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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 necessary to correct the interference.

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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 Industry Canada.

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1. Specifications

Compliance — FCC Class A, Subpart J of Part 15; CSA; UL®

Speed — 1.544 Mbps for T1

Interface — Jumper-selectable between T1 100Ω twisted pair, balanced, on DB15 connector

Connectors — (1) DB15 female, (2) ST®

Optic Launch Power (nominal) — -10 dBm into 100μ fiber: -14 dBm into 62.5 μ fiber

Receiver Sensitivity (nominal) — -28 dBm

Range (nominal) — 100 μ core fiber—3 km; 62.5 μ core fiber—2 km

Operating Wavelength — 820 nm

Fiber Type — Multimode

Indicators — (2) LEDs: (1) Power, red and (1) Link, green

MTBF — Approx. 100,000 hours

MTTR — 20 minutes

Operating Temperature — 32 to 122°F (0 to 50°C)

Storage Temperature — -4 to 158°F (-20 to 70°C)

Humidity — 15 to 90% noncondensing

Power — 115 VAC ±10%, 60 Hz, 5 watts (max.); PS154: 120 VAC/60 Hz, 20 watts, 17 VAC/ct. 0.7 A; PS154E: 230 VAC/50 Hz, 20 watts, 17 VAC/ct. 0.75 A

Size — 2.5"H x 8"W x 12"D (6.4 x 20.3 x 30.5 cm)

Weight — 5.5 lb. (2.5 kg)

2. Introduction

2.1 Overview

The T1 Fold (2KM) is a fiberoptic modem for transmission of T1 data (1.544 Mbps) over multi-mode fiberoptic media. It is transparent to T1 framing, and can transmit data using any framing pattern protocol with AMI or B8ZS coded signals.

The T1 Fold converts the T1 electrical signal into an optical signal via an infrared LED (light-emitting diode) transmitter. At the opposite end of the fiber, the optical signal is converted back into an electrical signal and amplified into the required level. Automatic Gain Control (AGC) circuits are used to accommodate various distances. The T1 Fold uses a Phase Locked Loop (PLL) circuit to recover data and clock from the signal. The T1 Fold provides jumper-selectable electrical interface options:

- Balanced.
- 100-ohm terminations. The 100- Ω termination is normally used for T1 twisted-pair cable.

A 15-pin (T1) connector is provided on the rear panel. Internal jumpers enable the input/output ports to be floating (balanced) according to the application.

Diagnostic and alarm features include an LED status indicator, all-ones signaling (AIS) alarm generation, and dry-contact closure upon link failure.

The T1 Fold is designed to operate with several different sizes of fiberoptic cable, and provides you with the following features:

- Immunity to electrical interference such as EMI, RFI, spikes, and differential ground loops.
- Protection from sparking and lightning.
- A secure link in hazardous or hostile environments.

The standard version is supplied with an 820-nm multi-mode fiberoptic interface.

The electrical interface meets requirements of AT&T® PUB 62411 and CCITT G.703 for T1 interfaces. The unit comes in a compact standalone case that can be placed on a desk top or shelf.

2.2 System Considerations

The T1 Fold (2KM) provides a simple and reliable means for transmitting full-duplex T1 signals via a fiberoptic media.

A typical application of the T1 Fold is shown in Figure 2-1.

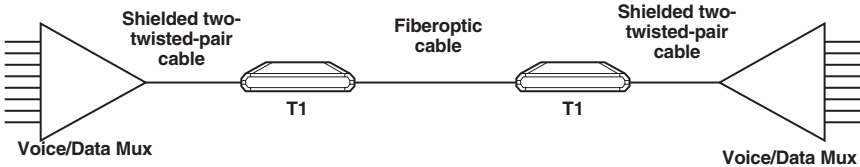


Figure 2-1. Typical T1 Fold (2KM) Application.

2.2.1 DATA TRANSFER

In the application illustrated in Figure 2-1, each T1 Fold (2KM) receives T1 signals, which are equalized to overcome electrical link distortion. The T1 Fold then converts the T1 signals into an optical signal. The optical signal is coupled to the fiberoptic media and transmitted via the optical link to the remote unit.

A high-sensitivity pre-amplifier and an AGC (Automatic Gain Control) circuit enable the remote unit to receive the optical signal. The output of the receiver is applied to the clock-recovery and data-regeneration circuit, which then applies it to the circuit that drives the electrical-interface driving circuit.

2.2.2 INTERFACING

The T1 interface fully complies with requirements of AT&T PUB 62411 and G.703. Two types of line coding can be used: AMI or B8ZS. Select the T1 interface by installing jumpers in appropriate positions, as shown in Fig 3-1 and Table 3-1.

3. Installation

3.1 Unpacking

Before unpacking the unit, inspect the equipment container. Note and report evidence of damage immediately.

Place the container on a clean flat surface, cut all straps, and open or remove top. Carefully remove the T1 Fold (2KM) from the carton and place it on a clean surface.

Inspect the T1 Fold. Contact your supplier immediately if there is any damage.

Your package should contain one T1 Fold (2KM), one power supply (PS154 or PS154E), and this user's manual.

3.2 Site Requirements

The T1 Fold (2KM) is a standalone unit. It should be installed within 5 feet (1.5 m) of a grounded AC outlet capable of furnishing the rated voltage of the unit (115 or 230 VAC, depending on which model you have).

3.3 Setting the Configuration

The T1 Fold (2KM) is configured for operation in various modes by arranging user-alterable jumpers on the printed circuit board. You won't need to reconfigure the jumpers for typical T1 applications—the default settings (T1/100-ohm/Balanced/1.544 Mbps) should work. If you need to make or change the settings, however, follow these steps:

1. Disconnect the power supply from the mains outlet.
2. Open the T1 Fold by removing the four screws on the bottom.
3. Identify the jumpers (see Figure 3-1).
4. Install the jumpers in the desired positions (refer to **Section 3.4**).
5. Replace the T1 Fold's cover and screw in the four side screws.

3.4 Internal Settings Information

Before you install the T1 Fold (2KM), set the internal jumpers according to your application (that is, electrical interface). The jumpers are located on the T1 Fold board, as shown in Figure 3-1. Jumper functions are listed in Table 3-2.

The internal jumpers near RD and DB15 (see Figure 3-1) select 100 Ω for T1 balanced signals, usually applied by the DB15 connector.

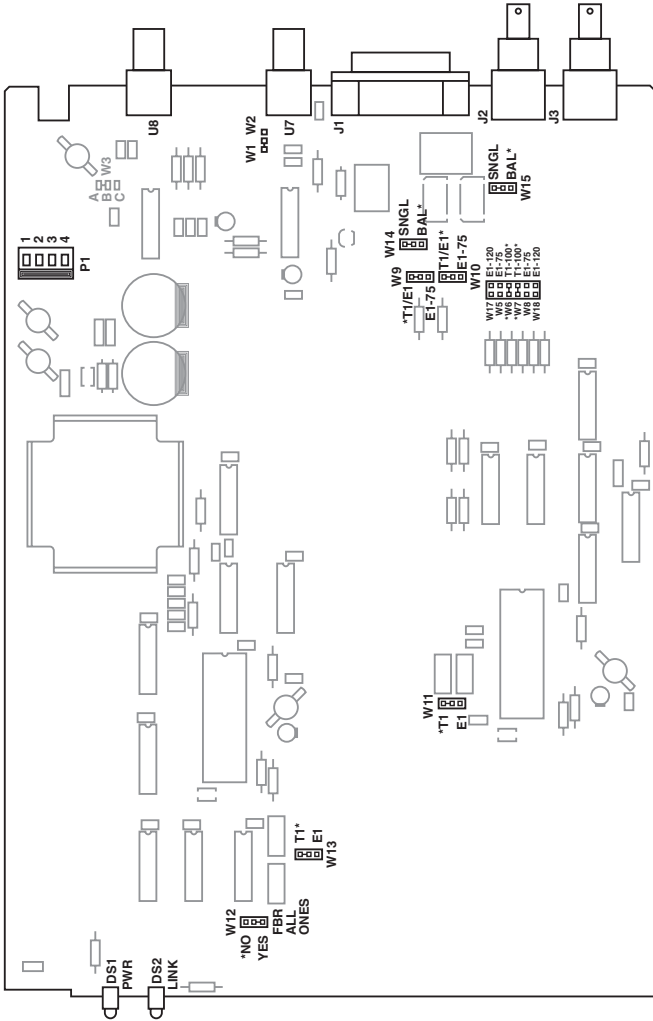


Figure 3-1. Jumper Locations.
 Jumpers marked with an asterisk (*) are factory-default settings.

Jumper W12 can be set to YES or NO. When W12 is set to YES and the received optical signal is lost, the T1 Fold sends an all-ones signal (AIS) at a nominal frequency of +50 ppm. When the W12 fiber all-ones jumper is in the NO position, the AIS signal is sent only to the electrical interface of the local unit (that is, to the attached T1 equipment).

When the fiber all-ones jumper is set to YES, the AIS optical signal is also sent to the remote unit via the transmit optical link.

3.5 Preparation for Operation

After you have set the internal jumpers, the T1 Fold (2KM) is ready for operation.

3.5.1 GROUNDING

For your protection, the T1 Fold (2KM) must always be connected to a properly grounded mains outlet. Operation without a proper ground can make this instrument dangerous.

3.5.2 POWER CONNECTION

Power should be supplied to the T1 Fold through the power attachment arrangement supplied with the unit. This is either a wallmount or in-line transformer power-pack.

3.5.3 FIBEROPTICS CONNECTION

Two fiberoptic connectors are located on the rear panel, marked TX and RX. Remove the protective caps from the connectors and store them in a safe place for later use. Connect the transmit fiber to the connector marked TX and the receive fiber to the connector marked RX.

At the remote unit, the transmit fiber must be connected to RX and the receive fiber to TX.

T1 FOLD (2KM)

3.5.4 T1 CABLE CONNECTION

Connect to the DB15 female connector on the rear panel. Refer to Appendix A for information on the wiring of the DB15 connector. Jumpers W6, 7, 9, 10, 14, 15, 17, and 18 set the electrical characteristics of the 100Ω DB15 interface. See Table 3-1.

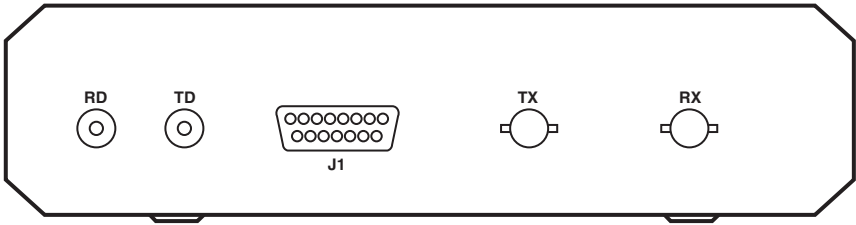


Figure 3-2. T1 Fold (2KM) Rear Panel.

Table 3-1. Internal Jumpers

Jumper No.	Jumper Name	Function	Possible Settings
W11 W13	T1 T1	Sets data rate to T1 (1.544 Mbps).	T1 T1
W15	Balanced	Enables INPUT to be floating.	Balanced (floating)
W14	Balanced	Enables OUTPUT to be floating.	Balanced (floating)
W12	Fiber all-ones	In the event of optical signal loss, sends all-ones optical signaling at ± 50 ppm to the remote unit (in addition to the all-ones signaling sent to the local electrical interface).	YES: AIS signal transmitted both electrically (to local unit) and optically (to the remote unit). NO: AIS signal transmitted electrically (only to the local unit).
W6 W7	T1-100 T1-100	Termination Selection.	100 Ω T1 (DB15) Enable or Disable
W17* W18*	E1-120 E1-120		120 Ω E1 (DB15) Enable or Disable
W5* W8*	E1-75 E1-75		75 Ω E1 (BNC) Enable or Disable
W9*	T1/E1 E1-75		T1/E1 for (DB15) 100 or 120 Ω , E1-75 for (BNC) 75 Ω
W10*	T1/E1 E1-75		

* E1 is not supported in the current T1 Fold (2KM) model.

Table 3-2. Typical Applications

* E1 is not supported in the current T1 Fold (2KM) model.

Typical T1 Unbalanced Application	Typical T1 Balanced Application (Twisted Pair) (Factory Default)	Typical E1 Unbalanced Application (Coax)*	Typical E1 Balanced Application (Twisted Pair)*	Jumper No.
T1	T1	E1	E1	W11
T1	T1	E1	E1	W13
Sngl end (Grounded)	Balanced	Sngl end	Balanced	W15
Sngl end (Grounded)	Balanced	Sngl end	Balanced	W14
No	Yes/No	Yes/No	Yes/No	W12
Installed	Installed	Not installed	Not installed	W6 W7
Not installed	Not installed	Not installed	Installed	W17 W18
Not installed	Not installed	Installed	Not installed	W5 W8
T1/E1	T1/E1	E1-75	T1/E1	W9 W10

4. Operation

4.1 Front-Panel Indicators

The T1 Fold (2KM) has two front-panel indicators for convenient status monitoring:

- **Power**—Lights when power is supplied to the T1 Fold (2KM).
- **Link**—Lights when the optical signal is > -28 dBm.

4.2 General Operation

After installation, the T1 Fold (2KM) normally operates unattended. Operator intervention is required only when the T1 Fold (2KM) is set up for the first time, or when the unit must be adapted to new operational requirements that call for changing the internal jumper settings.

4.3 Operating Instructions

The T1 Fold (2KM) is turned on as soon as you apply power. When power is connected, the POWER LED lights, and remains lit until you remove power.

During normal operation, the Link LED is on.

NOTE

When you turn on the T1 Fold (2KM), the Link LED may be out, indicating that other communication equipment is not yet operating or that the optical signal is below -28 dBm. The LED will light as soon as all link equipment is operating.

The T1 Fold (2KM) is turned off by disconnecting its power. *Always disconnect the power cable from the mains outlet before you disconnect it from the unit.*

5. Troubleshooting

If a problem arises, refer to the table below. Perform the actions listed in the “Corrective Measures” column in the order given until the problem is corrected. If you continue to have problems, call your supplier.

Symptom	Probable Causes	Corrective Measures
POWER LED is off.	No AC power.	Make sure that the AC power is properly connected. Check mains fuses.
	Defective unit.	Replace the unit. Call your supplier.
LINK LED is off.	Incorrect optical signal level received at the receiver input or No signal is present at the electrical interface.	a) Check that the electrical interface is connected. b) Make sure the local and remote units’ jumpers are set to the appropriate setting (Fig. 3-1, Table 3-1). c) Is the fiberoptic cable properly connected to the RX connector? d) Make sure that the remote unit power is on, its attached T1 equipment is sending data, and the TX fiberoptic connector is connected properly. e) Measure the optical levels on both ends (if possible) in order to check the optical link. f) Replace the faulty T1 Fold (2KM).

Appendix A: Functional Interface Specifications

The DB15 female connector has standard T1 interfaces. The pin allocation is described in the table below.

Pin No.	Designation	Function
1	Send Data (TIP)	Transmit Data A wire
9	Send Data (RING)	Transmit Data B wire
3	Receive Path (TIP)	Receive Data A wire
11	Receive Path (RING)	Receive Data B wire

In addition, the following function has been added for monitoring convenience:

6, 13	Signal Loss	Normally Open Dry Contact Pair Closes on Loss of Link or Power
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