

# User Manual



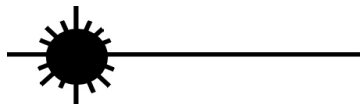
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**Canoga Perkins**  
**2262 T1/E1**  
**Fiber Optic Modem**

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**2262 T1/E1 Fiber Optic Modem**



## Caution!

This product may contain a laser diode emitter operating at a wavelength of 1300nm - 1600nm. Use of optical instruments (for example: collimating optics) with this product may increase eye hazard. Use of controls or adjustments or performing procedures other than those specified herein may result in hazardous radiation exposure.

Under normal conditions, the radiation levels emitted by this product are under the Class 1 limits in 21 CFR Chapter 1, Subchapter J.

### ATTENTION!

Cet équipement peut avoir une diode laser émettant à des longueurs d'onde allant de 1300nm à 1600nm. L'utilisation d'instruments optiques (par exemple : un collimateur optique) avec cet équipement peut s'avérer dangereuse pour les yeux. Procéder à des contrôles, des ajustements ou toute procédure autre que celles décrites ci-après peut provoquer une exposition dangereuse à des radiations.

Sous des conditions normales, le niveau des radiations émises par cet équipement est en dessous des limites prescrites dans CFR21, chapitre 1, sous chapitre J.



## Notice!

**This device contains static sensitive components. It should be handled only with proper Electrostatic Discharge (ESD) grounding procedures.**

## NOTE!

**Cet équipement contient des composants sensibles aux décharges électro-statiques. Il doit absolument être manipulé en respectant les règles de mise à la terre afin de prévenir de telles décharges.**

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# 1. Description

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## 1.1 2262 Modem

The 2262 T1/E1 Fiber Optic Modem features standard data speeds of 1.544Mbps (T1) or 2.048Mbps (E1).

Available as a stand alone or rack-mount unit, the 2262 has local and remote loopback capability for system diagnostic test. A set of alarm relay connectors (Normally Closed and Normally Open) is provided to indicate optical link and power status. Input power can be 115 or 230VAC (+/-10%), or an optional -48VDC.

Connectors can be either:

- T1 DA-15/RJ-48C *or* Terminal Block/RJ-48C
- E1 Terminal Block *and* BNC

The 2262 has extended distance options. Transmission distances to 40km or more are realistic when using single mode optics. The 2262 is typically offered for multimode fiber optic applications at 850nm, but also has the option of 1310nm single mode.

The 2262 is transparent to the incoming bipolar signal and is fully compatible with allowed speed variations. It allows the passing of bipolar violations for B8ZS coding for T1 or w for E1.

## 1.2 Applications

Applications for the 2262 are numerous and varied. For example, it can be used for earth station down links, fiber front ends for T1/E1 multiplexers, PBX interconnects or linking CAD/CAM displays to controllers (see Figures 1-1 and 1-2).

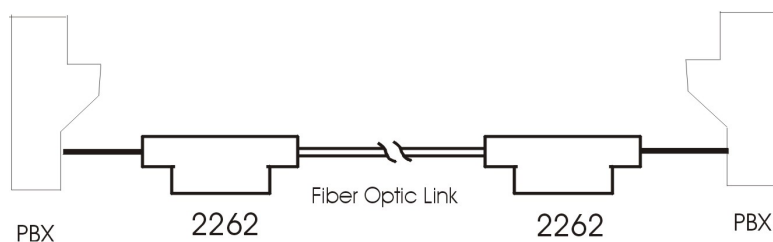


Figure 1-1.  
Typical 2262 Modem  
Application with PBX  
Interconnections

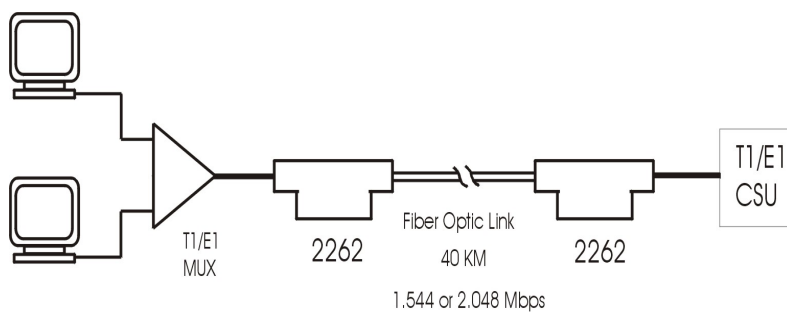


Figure 1-2.  
Typical 2262 Modem  
Application with  
T1/E1 and CSU  
Interconnections

## 2. Installation

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### 2.1 Unpacking the Unit

Each 2262 modem is factory tested and shipped in protective cartons. After unpacking the unit and accessories, retain the shipping carton and protective packing for reuse in the event a need arises for returning it to the factory.

To assure proper operation of the modem, please inspect it and its shipping carton carefully for damage. If damage is sustained to the unit, file a liability claim immediately with the freight carrier. Canoga Perkins is not liable for damage caused during shipment.

### 2.2 General Installation

#### 2.2.1 Manufacturing Settings

The 2262 has the following settings from the factory:

- Switchable AC Power Setting: 230VAC
- Input DC Power Option: -48VDC
- Impedance Option (E1 only): 75 $\Omega$  (Up position for Rack Mount Card)
- Loopback Switch: OFF

#### 2.2.2 Fiber Cable

The proposed fiber optic cable must provide adequate bandwidth and optical loss characteristics for the intended modem link. The 2262 is compatible with 8-10/125 single mode and 62.5/125 multimode cables.

The connectors are clearly marked, either transmit (Tx) or receive (Rx), on the back panel of stand alone units and on the rear of the 2201 Rack Chassis.

For multimode applications, the 2262 is available with ST\* connectors. For single mode applications, the 2262 is available with FC or ST\* connectors.

**Warning:**            **Do not over tighten FC/PC fiber connections - damage may occur. Hand tighten only!**

*\*ST is a Trademark of AT&T.*



### 2.2.3 Loss Budget

The maximum possible distances with the standard versions is dependent on the overall optic loss over the fiber optic link. This is called the "loss budget." The loss budget is determined by comparing the launch power at the modem with receiver sensitivity at the other end of the link. The differential is the loss budget. Refer to Table 2-A for 2262 loss budgets.

Cable	850nm LED Standard	1310nm Laser
62.5/125	15	N/A
8-10/125	N/A	20

Table 2-A.  
2262 Loss Budgets

**NOTE:** To measure the optical power, data must be present at the data input leads.

## 2.3 Stand Alone Installation

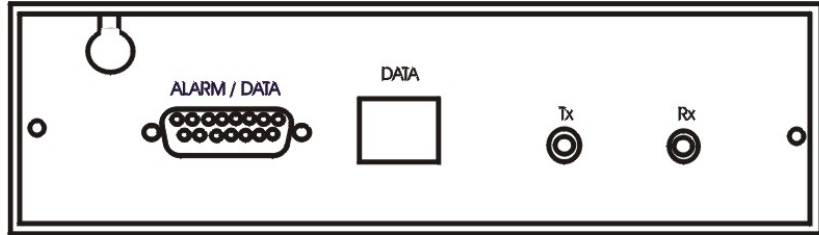
Installing the stand alone version of the 2262 modem is straightforward. It should be located convenient to the operator, but the electrical and optical cables should be isolated from foot traffic to prevent possible damage to the fiber optics. See Figure 2-1 for available rear panel configurations.

The main components of the 2262 are the following:

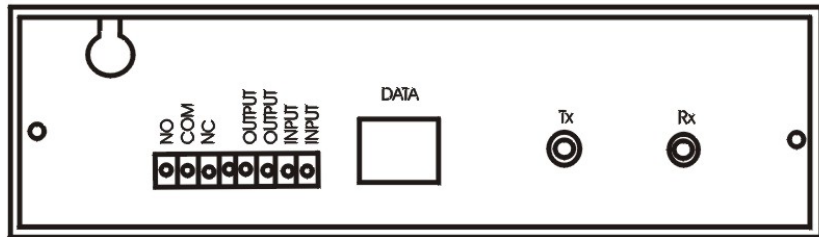
- AC/DC Power
- Interface Connectors
- Alarm Relay Connectors
- E1 Impedance Switch
- Loopback Switch (front panel)

Figure 2-1 shows the rear panel configurations available for T1 applications.

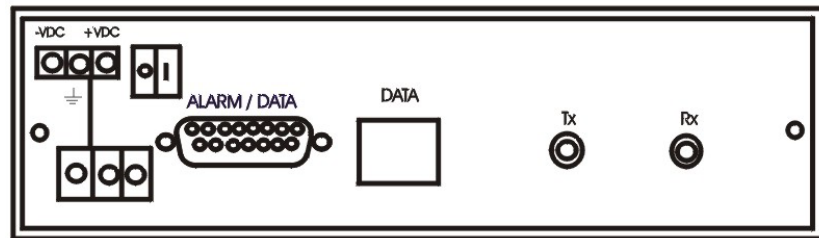
Figure 2-2 shows the rear panel configurations available for E1 applications.



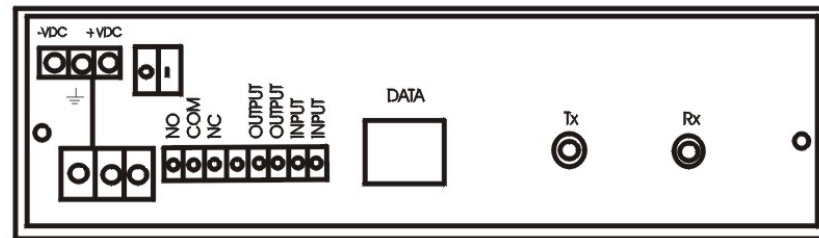
T1, DA-15/RJ-48C, AC



T1, TERM STRIP/RJ-48C, AC



T1, DA-15/RJ-48C, VDC



T1, TERM STRIP/RJ-48C, VDC

Figure 2-1.  
Rear Panel T1  
Configurations

\* NOTE: INPUT AND OUTPUT CONNECTORS AND IMPEDANCE SWITCH ARE NOT INSTALLED IN T1 MODEMS.

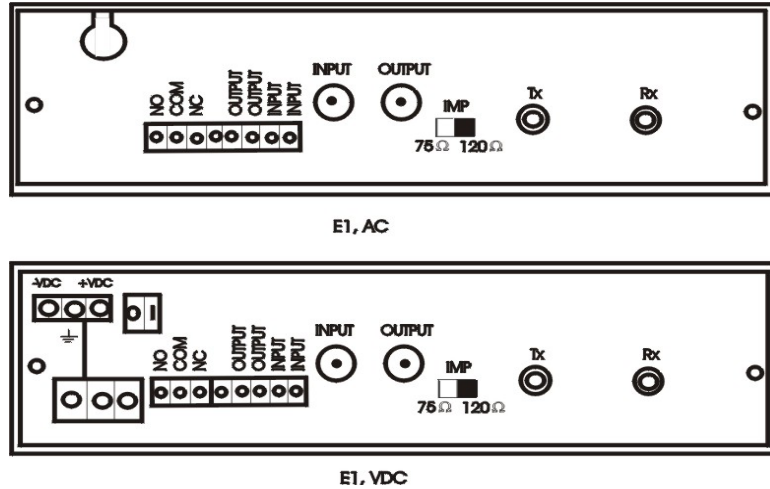
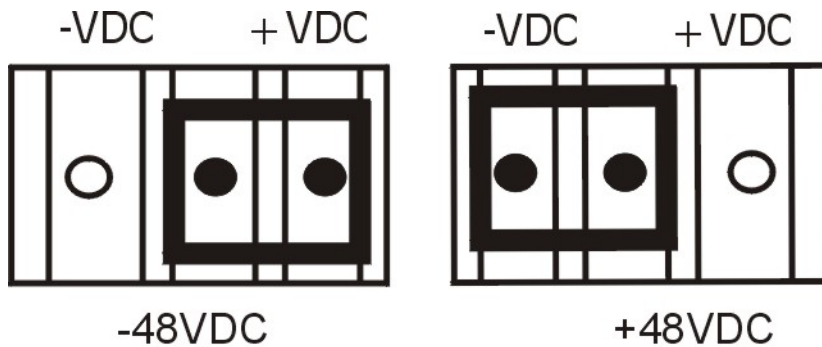


Figure 2-2.  
Rear Panel E1  
Configurations

### 2.3.1 AC/DC Power

The stand alone AC power supply, which is attached to the unit, is a wall-type transformer. It should be plugged into a standard AC wall outlet that offers a ground line. No power ON switch is provided, as the modem powers up upon plug in.

The 48VDC power version can be configured as +48VDC or -48VDC by connecting the earth ground (center connector) to either -V or +V, respectively (see Figure 2-3). A power ON switch is provided.



\*FACTORY SETTING

Figure 2-3.  
DC Power  
Connectors

### 2.3.2 Interface Connectors

Three different interface connectors, located on the rear panel (see Figure 2-4), are available for the 2262.

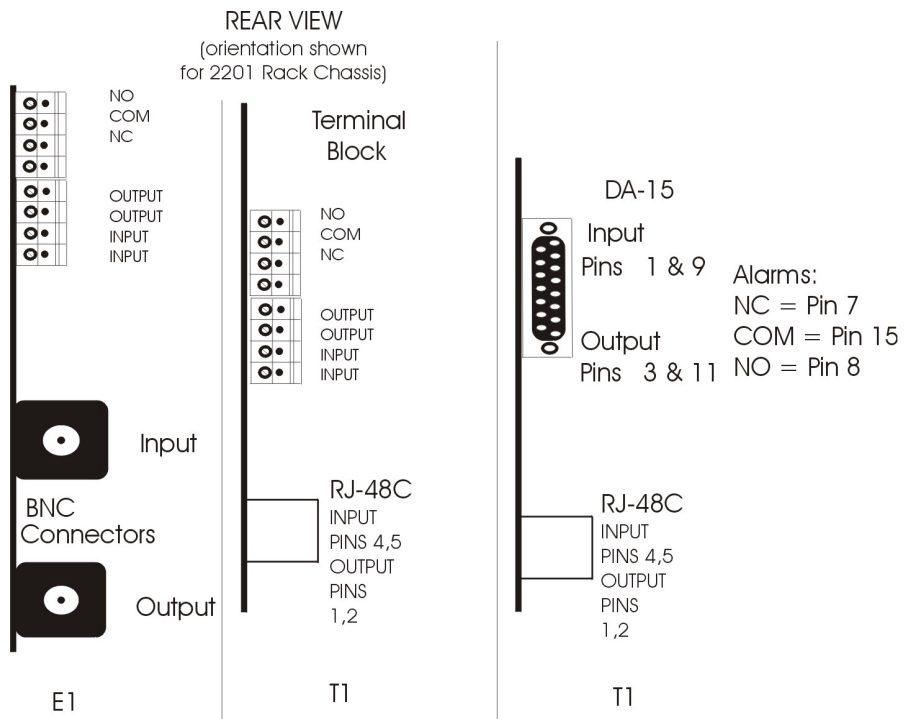
For T1:

- DA-15/RJ-48C or
- Terminal Block/RJ-48C

For E1:

- BNC and Terminal Block

Figure 2-4.  
2262 Interface  
Connectors



### 2.3.3 Alarm Relay Connectors

The Alarm Relay Connection shares the DA-15 or terminal block. See Figure 2-4 for details.

### 2.3.4 E1 Impedance Switch

An impedance switch is provided to select either  $75\Omega$  (BNC connectors) or  $120\Omega$  (terminal block) for E1 models only. On stand alone models, this switch is located on the rear panel.

On rack-chassis models, the switch is located at the rear printed circuit board edge, above the optic transmitter connector. The Up setting is for  $75\Omega$ ; the Down setting is for  $120\Omega$ .

### 2.3.5 Loopback Switch

The Loopback switch (located on the front panel) is to be set in the Off position for normal operations.

## 2.4 Rack Mount Installation

The 2201 Rack Chassis is designed to accommodate up to ten 2262 modems; see Figure 2-5. The 2201 will fit into a standard 19-inch equipment rack. Tabs are provided on each side of the unit and are predrilled for standard spacing. For further details, refer to the 2201 Rack Chassis User Manual.

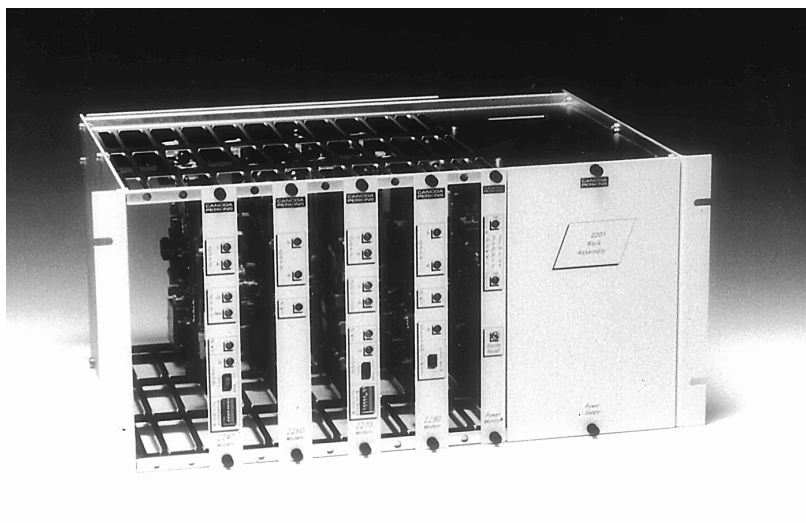


Figure 2-5.  
2201 Rack Chassis

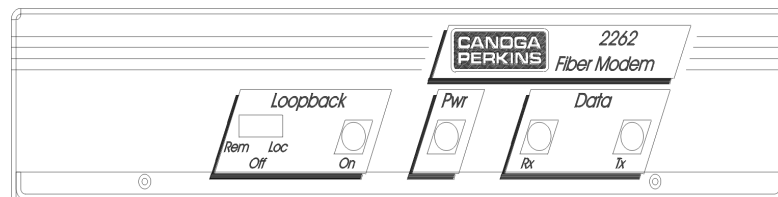
## 3. Operation

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During normal operation, the 2262 receives input data at the metallic interface and modulates it into an optic signal. It also detects the optic input signals, demodulates them back into the original T1 or E1 data stream, and retransmits output data at the metallic interface.

The 2262 lights the Tx LED (see Figure 3-1) when data pulses are detected from the Input leads, and lights the Rx LED when data pulses are transmitted at the Output leads. When the 2262 fails to receive optic signals, the alarm relay will be deenergized and the relay contact status will be changed.

Figure 3-1.  
2262 Front Panel



### 3.1 Local Loopback Operation

When the 2262 Loopback Switch is set to Loc, the Loopback LED will light and the 2262 will operate in the local loopback mode. During this operation, the data received from the Input leads will be looped directly back into the Output leads. The Tx and Rx LEDs will be lit as data pulses are presented on those leads. The received optical data will be demodulated then remodulated. It will then be transmitted back out as transmit optical data. The relay contact status will stay normal as long as optical pulses are presented at the optical Rx port.

### 3.2 Remote Loopback Operation

When the 2262 Loopback Switch is set to Rem, the Loopback LED will light and the 2262 will then operate in the remote loopback mode. During this operation, the transmitted optical signals at the optical Tx port will be further encoded to carry a remote loopback protocol.

The 2262 at the remote side will detect the remote loopback protocol and set itself into a local loopback mode. The remote unit will also light its loopback LED (blinking). The loopback switch at the remote side must remain in the Off position; otherwise, the loopback operation at both local and remote sides will be terminated.

Figure 3-2, 2262 Block Diagram, shows the various operation modes and signal flows.

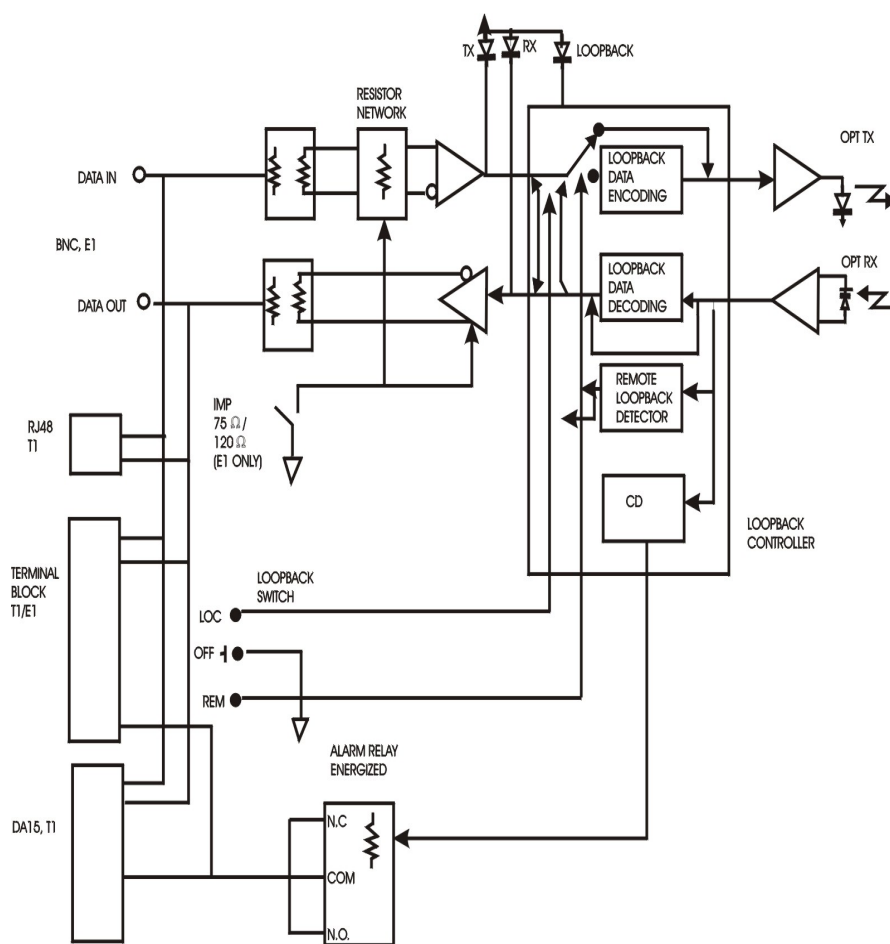


Figure 3-2.  
2262 Block  
Diagram

## 4. Troubleshooting

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### 4.1 Test Accessories

The following test accessories will aid in troubleshooting the operation of the 2262 T1/E1 Fiber Optic Modem.

- Plastic loopback rod (supplied with modem for non-laser applications)
- Standard Data Test Set (not supplied with modem)
- Photometer reading in dBm (not supplied with modem)
- Short length of single mode fiber optic cable (not supplied with modem) terminated with connectors compatible with those on the modem(s)

### 4.2 Diagnostic Procedures

#### 4.2.1 Power Supply Diagnostic Procedure

Symptom	Step	Possible Cause	Remedy
<i>Stand Alone only:</i> Power LED is off.	1	Power source, power supply.	Return to factory for repair.
<i>Rack Mount only:</i> Power LED is off.	1	Power source, power supply.	See 2201 Rack Chassis User Manual for further steps.



### 4.2.2 Link Diagnostic Procedure

Symptom	Step	Possible Cause	Remedy
Tx LED is off	1	Reversed data input and output connection.	Swap T1/E1 data input and output cable connection.
	2	No data input at metallic interface.	See Section 4.2.3, Loopback Diagnostic Procedure, step 1.
Tx LED is off	3	Unit failed.	Return to factory for repair.
Rx LED is off	1	Reversed optic transmit and receive connection.	Swap the optic transmit and receive cable connection.
	2	Local or remote side system or fiber optic link failure.	See Section 4.2.3, Loopback Diagnostic Procedure, steps 2 to 4.
High error rate	1	Bad optical connection.	Clean the optic connector end surface.
	2	Local or remote side system or fiber optic link failure.	See Section 4.2.3, Loopback Diagnostic Procedure, steps 1 to 4.

### 4.2.3 Loopback Diagnostic Procedure

Symptom	Step	Possible Cause	Remedy
Set loopback switch to local mode and error is not corrected.	1	Local data source failed.	Correct the local data source.
Disable loopback function and use plastic loopback rod (for multimode) or short length of optic cable (for single mode) to loop the local optic interface when error is not corrected.	2	Unit failed.	Return to factory for repair.
Set loopback switch to remote mode and error is not corrected.	3	Bad optic link.	Repair the bad fiber optic cables.
All above steps are unable to correct errors.	4	Remote system failed.	Correct the remote system.

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## 5. Technical Specifications

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### 5.1 Physical and Environmental

Dimensions:

Stand Alone	12.2" L x 8.4" W x 1.75" H
Rack Mount Card	12.0" L x 7.8" W x 1.06" H

Weight:

Stand Alone	3.6lbs
Rack Mount Card	0.9 lbs

Operating Environment:

Temperature	0 to 55°C
Humidity	0 to 95% (non-condensing)
Storage	-10 to 65°C

Power:

115VAC±10%, 50-60Hz  
 115VAC±10% / 240VAC +10/-15%, 50-60Hz  
 48VDC  
 36-72VDC

LEDs:

Tx	Transmit (green)
Rx	Receive (green)
Pwr	Power (green)
Loopback	Loopback On (red)

Switches:

Loopback (front)	Three-position: Rem, Off, Loc
Impedance (E1 only) (rear)	75Ω / 120Ω

## 5.2 Optical

Transmitter: LED (850nm) ST multimode  
Laser (1310nm) ST or FC single mode

Loss Budget:  
LED 15dBm  
Laser 20dBm

Power Rates:  
LED Launch power: -14dBm  
Sensitivity: -29dBm  
Overdrive: none  
  
Laser Launch power: -6dBm  
Sensitivity: -26dBm  
Overdrive: none

**NOTE:** To measure the optical power, data must be present at the data input leads.

## 5.3 T1/E1 Interface

Connectors:  
T1 DA-15 (female)/RJ-48C or terminal block/RJ-48C, with alarm  
E1 BNC (two female) and terminal block (with alarm)

Impedance:  
T1 100ohm  
E1 Switchable 75ohm / 120ohm

Input Selectivity:  
T1 -6dB  
E1 -6dB

Output Signal Level:  
T1 6V p-p ±1.4V  
E1 75Ω 4.74V p-p ±10%  
120Ω 6V p-p ±10%

Line Codes: Transparent to AMI, B8ZS and HDB3 (passes bipolar violations)

Data Rates: 1.544Mbps (T1), 2.048Mbps (E1)

## 5.4 Agency Certification

- FCC, Part 15 class A (stand alone version)
- Safety Standards (stand alone and rack mount versions):
  - UL 1950
  - CSA950
- Austel TS 016-1990 (2.048MHz, stand alone version)
  - TS 001
  - AS-3548

## 5.5 Connector Pinout

Signal	DA-15 Pin	Terminal Strip Pin	RJ-48C
INPUT	1	8 IN	4
INPUT	9	7 IN	5
OUTPUT	3	6 OUT	1
OUTPUT	11	5 OUT	2
ALARM NC	7	3	
ALARM COM	15	2	
ALARM NO	8	1	

## 6. 2262 Glossary

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BNC	Bayonet Connector
CAD/CAM	Computer-Aided Design/Computer-Aided Manufacturing
Collimation	The process by which a divergent or convergent beam of radiation is converted into a beam with the minimum divergence possible for that system (ideally, a parallel bundle of rays).
CSU	Channel Service Unit
dB	<b>Decibel.</b> A standard unit used to express gain or loss of optical power.
E1	Transmission at 2.048Mbps.
FC	Fiber Optic Connector (developed by NTT)
LED	<b>Light Emitting Diode.</b> A semiconductor device which emits incoherent light formed at the -N junction, either from the junction stripe edge or its surface.
Multimode Fiber	An optical fiber with a core diameter of 25 to 200 microns. The core is much larger than single mode fiber and allows several beams of light to be passed through it.
nm	nanometer ( $10^{-9}$ meters)
PBX	Private Branch Exchange

Single Mode Fiber

A fiber waveguide that supports the propagation of only one wavelength. Usually a low-loss optical waveguide with a very small core (2 to 9 microns). It requires a laser source for the input signals because of the very small entrance aperture (acceptance cone). The small core radius approaches the wavelength of the source; consequently, only a single wavelength is propagated.

ST

Straight-Through Fiber Optic Connector (developed by AT&T)

T1

Transmission at 1.544Mbps.



## Appendix A

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### Limited Warranty

#### A.1 Products

Canoga Perkins warrants that, at the time of sale, its products will be free from defects in material and workmanship, and if properly installed and used will substantially conform to Canoga Perkins' published specifications. Subject to the conditions and limitations set forth below, Canoga Perkins will, at its opinion, either repair or replace any part of its product(s) that prove defective by use of improper workmanship or materials. This warranty does not cover any damage to products that have been subjected to lightning damage or other Acts of Nature, misuse, neglect, accident, damage, improper installation or maintenance, or alteration or repair by anyone other than Canoga Perkins or its authorized representative. Customer must notify Canoga Perkins promptly in writing of any claim based on warranty. Canoga Perkins is not liable for, and does not cover under warranty, any costs associated with service and/or the installation of its products or for any inspection, packing or labor costs in connection with return of goods. In the event Canoga Perkins breaches its obligation of warranty, customer's sole and exclusive remedy is limited to replacement, repair, or credit of the purchase price, at Canoga Perkins' option.

#### A.2 Duration of Warranty

Three-year Warranty: This product is covered by this warranty for a period of three (3) years from the date of shipment.

#### A.3 Limitations

Canoga Perkins may at its sole discretion modify its Limited Warranty at any time and from time to time.

Other than those expressly stated herein, THERE ARE NO OTHER WARRANTIES OF ANY KIND, EXPRESSED OR IMPLIED, AND SPECIFICALLY EXCLUDED BUT NOT BY WAY OF LIMITATION, ARE THE IMPLIED WARRANTIES FOR FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY. IT IS UNDERSTOOD AND AGREED CANOGA PERKINS' LIABILITY WHETHER IN CONTRACT, IN TORT, UNDER ANY WARRANTY, IN NEGLIGENCE OR OTHERWISE SHALL NOT EXCEED THE AMOUNT OF THE PURCHASE PRICE PAID BY THE PURCHASER AND UNDER NO CIRCUMSTANCES SHALL CANOGA PERKINS BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES. THE PRICE STATED FOR THE EQUIPMENT IS A CONSIDERATION IN LIMITING CANOGA PERKINS' LIABILITY. NO ACTION, REGARDLESS OF FORM, ARISING OUT OF THE TRANSACTIONS OF THIS AGREEMENT MAY BE BROUGHT BY PURCHASER MORE THAN ONE YEAR AFTER THE CAUSE OF THE ACTION HAS ACCRUED. CANOGA PERKINS' MAXIMUM LIABILITY SHALL NOT EXCEED AND CUSTOMER'S REMEDY IS LIMITED TO EITHER (i) REPAIR OR REPLACEMENT OF THE DEFECTIVE PART OF PRODUCT, OR AT CANOGA PERKINS' OPTION (ii) RETURN OF THE PRODUCT AND REFUND OF THE PURCHASE PRICE, AND SUCH REMEDY SHALL BE CUSTOMER'S ENTIRE AND EXCLUSIVE REMEDY.

#### **A.4 Customer Service Department Repair Warranty**

Repairs performed by the Canoga Perkins Customer Service Department will be free from defects in material and workmanship for a period of ninety (90) DAYS from the date the repaired product is shipped, or until the expiration of the original factory warranty, whichever is longer.

Shipping charges to Canoga Perkins will be at customer's expense. Units will be returned to the customer FOB origin. Repaired units will be returned to the customer by standard ground shipment unless otherwise specified, with any additional costs for customer specified expedited delivery at the customer's expense.