



## TIA-4000 Optical/Electrical Converter



## Operating Instructions

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## Introduction

The TIA-4000 Optical to Electrical Converter is a convenient high bandwidth detection system for fiber optic applications. With a typical bandwidth of 30 KHz to 7 GHz, it accurately provides an electrical replica of the optical signal presented to it. It is intended to drive a 50 ohm cable terminated in its characteristic impedance.

The unit is equipped with an InGaAs/InP Avalanche Photodiode that is responsive in the wavelength range of 950 - 1650 nm. The TIA-4000 is provided with an FC/APC fiber optic receptacle. Other fiber optic connectors can be provided on request. The output signal is presented to a type K SMA female connector.

Each unit is powered by an external universal input wall-mount power supply.

**Calibration - This is a qualitative measurement device. No calibration is required or necessary.**

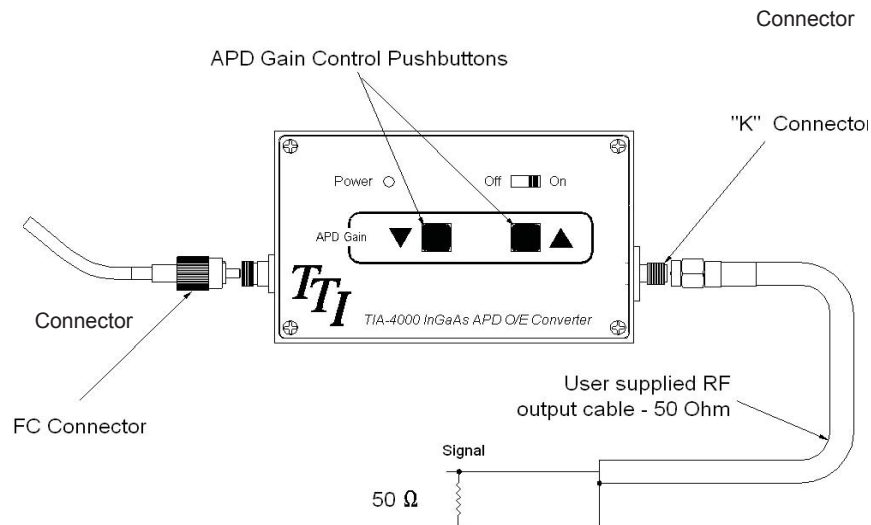
## Unpacking and Inspection

Prior to shipment this instrument was inspected and found to be free of mechanical and electrical defects. Upon acceptance by the carrier he assumes responsibility for its safe arrival. After unpacking, examine the unit for any evidence of shipping damage. Should you receive this instrument in a damaged condition, apparent or concealed, it must be noted on the freight bill or express receipt and signed by the carrier's agent. Failure to do so could result in the carrier refusing to honor the claim. Upon filing a claim TTI should be notified.

## Power Supply

Each unit comes equipped with a 9 V regulated power supply that provides power to the unit. Simply plug the power supply output cable into the receptacle located beneath the FC fiber optic connector. It is recommended that the user never attempt substitution of this unit with any other power supply. Reverse polarity or voltages other than 9 Volts may irreparably damage the unit. The power supply can be used with mains of either 120 or 240 VAC, 50-60 Hz. Several replaceable power plug adaptors are supplied for use in various countries.

# Setup



## Operating Considerations

### Operating Sequence

Turn on sequence:

1. Turn on the TIA-4000
2. Hold ▼ button for 7 seconds to decrease APD voltage
3. Connect optical power
4. Adjust APD voltage to achieve desired gain

Turn off sequence:

1. Remove optical power
2. Decrease APD voltage, hold ▼ button for 7 seconds to decrease APD voltage
3. Turn off TIA-4000

Failure to operate the TIA-4000 as directed will void the warranty

## Operating Considerations (continued)

The TIA-4000 is comprised of a fiber coupled InGaAs APD detector coupled with a variable reverse bias voltage network and fast transimpedance amplifier. The output of the unit brought out to a type K female SMA connector. Light falling on the detector generates a positive-going proportional current. This current, multiplied by the transimpedance produces a voltage that is proportional to the light incident on the detector surface.

Normally the unit is used to drive a coaxial cable, this cable should have a 50 ohm characteristic impedance and be terminated with a 50 ohm load at the oscilloscope or other measuring device to be used.

The active area of the TIA-4000 is 30 microns in diameter. It is coupled to a single mode optical fiber. Typical optical return loss is 52 dB and is caused primarily by the FC/APC connector employed.

The applied bias voltage controls the gain of the APD. This voltage in turn, is controlled by means of the two push buttons on the top panel. The rightmost button increases the gain and the leftmost button decreases the gain. There are 64 discrete gain settings that are retained in non-volatile memory when the power is turned off. Thus the gain setting will be retained even though power is disconnected from the unit.

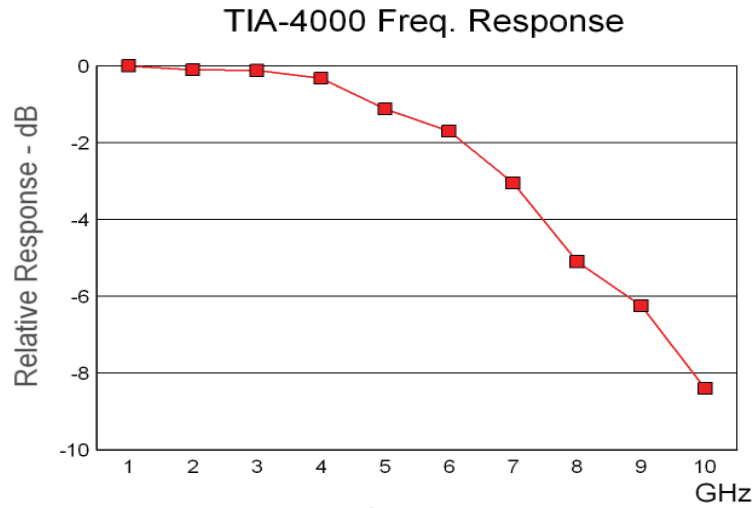
### Operation Notes:

- 1: Do not apply optical power to the detector until AFTER the device is power on and the APD bias is confirmed to be set to the lowest level.
- 2: To avoid damaging the detector, the gain must be set to the lowest setting prior to turning off the TIA-4000.

Pressing a button once causes the unit to advance in the selected direction by one step. Holding the button down causes the unit to advance automatically until a limit is reached.

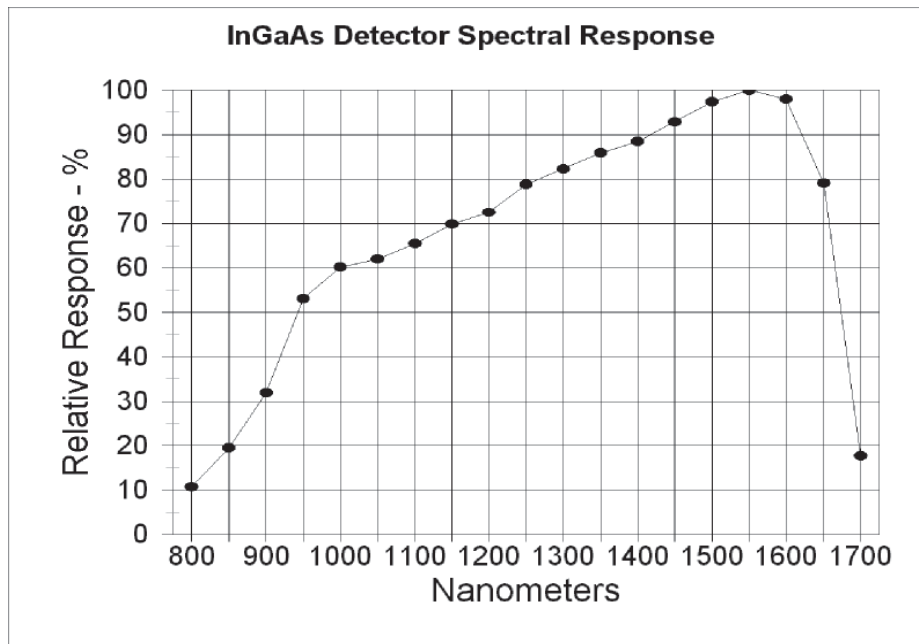
## Typical Frequency Response

The bandwidth of the TIA-4000 is from 30 KHz to typically 7 GHz (-3 dB). Refer to the following Bode plot.



## Spectral Response

The approximate relative response curves of the detectors employed is as shown below. Note that these are representative curves and do not necessarily correspond to the exact response of the particular detector in use



## TIA-4000 Specifications

Detector Type	InGaAs/InP APD
Bandwidth (-3 dB)	30 KHz to 7 GHz typical
Transimpedance Gain	500 Ohms
Spectral Response	(950-1650) Gain 2 - 7
Maximum Linear Input Power	-10 dBm (100 $\mu$ w)
Maximum Input Power Without Damage	-6 dBm
Sensitivity	-25 dBm @ 10 <sup>-12</sup> BER, 2 <sup>31</sup> -1 PRBS
Output Impedance	Terminate in 50 Ohms
Output Connector	Type K SMA female
Fiber Optic Connector	FC-APC or FC-PC
Input Numerical Aperture	0.11
Optical Return Loss	Typ. 30dB
Wall-mount Supply Power Requirements	120/240 VAC, 50-60Hz
Mains Connectors Supplied	North America, British, Continental Europe, Australian
Dimensions	4.0" L, 2.5" W, 1.2" H, (102 , 63 , 31 mm)
Weight	5 oz., 150 g.
LED Annunciators Provided	Power On
Operating Temperature Range	0 - 40 C
Standard Warranty	Two Years Workmanship, 30 Day Satisfaction Guarantee
Accessories Supplied	Transit Case, Universal Power Supply, Manual on CD

## LIMITED WARRANTY

TERAHERTZ TECHNOLOGIES INC. (“TTI”) WARRANTS THAT TO THE FIRST PURCHASER, FOR A PERIOD OF TWO YEARS FROM THE DATE OF RECEIPT, THAT THIS PRODUCT (“THE PRODUCT”) WILL BE FREE FROM DEFECTS IN MANUFACTURING/WORKMANSHIP. THE FOREGOING WARRANTY IS THE ONLY WARRANTY, EXPRESS OR IMPLIED, GIVEN BY TTI, I.E., THERE IS NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. TTI HEREBY DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY OTHER THAN THE WARRANTY IN THE FIRST SENTENCE TO THE FULLEST EXTENT PERMITTED BY LAW. THE SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY IS REPAIR OR REPLACEMENT AT TTI’S OPTION OF ANY PRODUCT THAT PROVES TO BE DEFECTIVE IN MANUFACTURING/WORKMANSHIP WITHIN TWO YEARS OF RECEIPT OF THE PRODUCT. NOTE: THIS WARRANTY DOES NOT APPLY TO ANY PRODUCT WHICH HAS BEEN SUBJECT TO MISHANDLING, MISUSE, OR SERVICE BY UNAUTHORIZED PERSONNEL OR TO ANY PRODUCT WHICH HAS BEEN DAMAGED, MODIFIED, ALTERED OR TAMPERED WITH. TO THE FULLEST EXTENT OF THE LAW, TTI DISCLAIMS ALL LIABILITY FOR ANY OTHER DIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ALLEGED TO BE CAUSED BY A DEFECTIVE PRODUCT, I.E., TTI WILL NOT BE RESPONSIBLE FOR ANY PERSONAL INJURY, PROPERTY DAMAGE OTHER THAN THE COST OF REPLACING THE PRODUCT OR ANY OTHER MONETARY DAMAGE SUCH AS LOST WAGES OR PROFITS CAUSED BY ANY USE, ATTEMPTED USE OR INABILITY TO USE THE PRODUCT. NOTE: BY USING THE PRODUCT, YOU AGREE THAT REPAIR OR REPLACEMENT AT TTI’S OPTION WILL FULLY SATISFY TTI’S WARRANTY OBLIGATION TO YOU, WHETHER IN CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY OR OTHER APPLICABLE LAW.

### Service / Repair Information

Products manufactured by Terahertz Technologies Inc. are designed and fabricated to provide reliable performance. However, in the event that service is required, both telephone technical assistance and factory repair services are available. Call (855) TTI-TEAM (884-8326) for information.

For IN-WARRANTY REPAIRS, call us to obtain a Returned Material Authorization number, (RMA Number). All products are to be returned to TTI with freight charges pre-paid. Those products sent under warranty will be returned to our customers pre-paid. We cannot be responsible for returned products that do not reference the TTI RMA number.

For OUT-OF-WARRANTY repairs, services are billable for both time and materials.

**Calibration - This is a qualitative measurement device. No calibration is required or necessary.**