



**PM-1500 / LS-1500  
Fiber Optic  
Power Meter and Light Source  
Operating Instructions**

**Quality Fiber Optic Test Equipment**

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1/2016

# Contents

Introduction.....	1
Specifications.....	2
Unpacking, Inspection and Power Consideration.....	3
Power Meter Front Panel.....	4, 5
Power Meter Display.....	6
Power Meter Operation.....	7
Store / Recall.....	8
Light Source Front Panel.....	9
Light Source Display.....	10
Light Source Operation.....	11
Single Cord Test.....	12
Dual Cord Test.....	14
Repair Information.....	16
Warranty Information.....	16

# Introduction

The PM-1500 Series Fiber Optic Power Meter and Laser Light Source are convenient hand held instruments that when paired together make automatic loss measurements at up to three wavelengths simultaneously. The Power Meter incorporates an InGaAs detector for maximum sensitivity and stability.

The power meter paired with the light source also functions as a fiber identifier that permits detection of the modulated source at three frequencies, 270 Hz, 1000 Hz, 2000 Hz. Each instrument is equipped with interchangeable adaptors to accommodate FC, ST or SC connectors.

The PM-1500 Series is powered by a high capacity lithium polymer rechargeable battery that has a charge life that exceeds 15 hours of operation at full charge. The units may also be powered by a universal wall mount supply that operates from 95-260 VAC, 50-60 Hz. The wall mount supply is equipped with mains for North America, Continental Europe, Great Britain and Australia.

The Power Meter stores up to 2000 triple wavelength loss measurements that may be download to a host computer via a USB port and use of the CertSoft Software suite. A rugged hard plastic storage/ carrying case and a protective rubber boot make this instrument an excellent choice for outside plant use.

<b>Power Meter Specifications</b>	
Power Meter Detector Type	InGaAs
Calibrated Wavelengths	850, 1300, 1310, 1490, 1550, 1625 nm
Units of Measurement	dBm, dB,
Resolution	0.01dB
Power Measurement Range	+5 dBm to - 77 dBm (CATV +25dBm to -57dBm)
Power Measurement Uncertainty	± 0.18 dB under reference conditions, ± 0.25 dB from 0 to -65 dBm, ± 0.35 dB from 0 to +5 dBm and from -65 to -77 dBm
Autotest Measurement Rate	Four seconds per wavelength
Autotest Range	0 to - 36 dB
Storage Locations	2000
Battery/Operating Time	Rechargeable Li Polymer/Approximately twenty hours following a full charge
Power Supply / Charger	Universal, US, UK, Continental Europe, and Australian Plugs Included
Power Requirements	95-260 VAC, 50-60 Hz, 3 VA Max
Operating Temperature Range	0 to 5 C
Storage Temperature Range	Equipment -10 to 60C, Battery 0 to 40C
Dimensions (with rubber boot )	5.9" L x 3.9" W x 1.37" H (150mm L x 100mm W x 35mm H)
Weight	10.9 oz. (0.306Kg)
Accessories Provided	FC, ST, SC adaptors, rubber boot, battery, power supply/charger, manual, USB Cable, PC application. Software
Suggested Calibration Interval	3 yrs,
<b>Light Source Specifications</b>	
Laser Output Power	≥-1.00 dBm
Output Stability	± .05 dB / 24 hrs @ constant temp., ± .02 dB/C temperature coefficient
Laser Wavelengths Provided	850nm, 1300nm, 1310 nm, 1490, 1550nm (±20 nm)
Spectral Width	< 3nm typ.
Modulation Modes	CW, 270 Hz, 1000 Hz, 2000 Hz
Autotest Measurement Rate	Four seconds per wavelength
Laser Safety Classification.	Class I safety per FDA/CDRH and IEC-825-1 regulation
Battery	Rechargeable Li Polymer
Operating Time	Approximately fifteen hours following a full charge
Power Supply / Charger	Universal, US, UK, Continental Europe, and Australian Plugs Included
Power Requirements	95-260 VAC, 50-60 Hz, 3 VA Max
Operating Temperature Range	0 to 40 C
Storage Temperature Range	Equipment -10 to 60C, Battery 0 to 40C
Dimensions (with rubber boot )	5.9" L x 3.9" W x 1.37" H (150mm L x 100mm W x 35mm H)
Weight	(0.52 Kg)
Accessories Provided	FC, ST, SC adaptors, rubber boot, battery, power supply/Charger, manual

Specifications are subject to change without notice

## 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 Considerations

The PM-1500 Series Power Meters and Light Sources are equipped with a 9 V lithium polymer rechargeable battery. It will power the unit for approximately 20 hours following a full charge. For bench top operation, a wall mount power supply/charger is provided. This supply may be operated from 95 - 260 VAC , 50-60 Hz. Four interchangeable mains plugs are supplied. (North America, continental Europe, and Australia)

If the supplied battery is discharged in the field and no mains power is available, a 9 V alkaline or other primary battery may be used temporarily.

***NOTE: NEVER attempt to use the charger with any battery other than the one supplied with the unit or severe damage to the instrument may result!***

# Power Meter Front Panel



**Power, ON/OFF-** This control alternately energizes and de-energizes the unit. Auto-Shutdown mode, in which the unit turns itself off following fifteen minutes without a key press, is the default mode. This mode conserves the battery should the user forget to turn the unit off. Holding this key down for at least four seconds at turn-on will de-activate Auto Shutdown.

**Power Meter Wavelength Selector-** This control selects the calibration factor for the wavelength being measured by the power meter. The progression is as follows: 850 nm → 1300 nm → 1310 nm → 1490 nm → 1550 nm → 1625 nm → 850 nm, etc. The wavelength is displayed in the upper right hand corner of the display.



**Store Reference Level-** This control saves the currently measured power level for the wavelength in use. When in the dB mode, all subsequent readings will be made relative to this power level. A storage location is maintained for each of the six calibrated wavelengths.

**dBm, dB mode Selector-** This control alternately switches between comparing the currently measured power to 1.00 milliwatts (dBm mode) or to the stored reference power level. (dB mode) When changing to the dB mode, if no reference level has been previously stored, an error tone will sound and the message "rEF ?" will be displayed for a few seconds. The reference values are volatile, that is, they are not saved when the unit is powered down.

If you are in dB mode and attempt to select a wavelength that has no stored reference an error message will appear and the wavelength change will not be accepted until a reference level has been stored for the new wavelength. Return to the dBm mode and store a reference level for the new wavelength.

# Power Meter Front Panel

Continued



**Store Rdg** - This control saves the current measurement value(s) to non-volatile memory for later downloading. This may be a dBm measurement or a dB loss measurement. When the button is activated the memory location is flashed on temporarily. The memory locations will begin at address 000 and auto increment as each new value is stored. Locations may be skipped if so desired by invoking the Recall mode and advancing the memory pointer. The next storage location will increment from this point. Upon filling memory location 1999 no more data may be stored and the screen will indicate "FULL" even though some locations may have been skipped. The memory must then be cleared before new data can be stored.

Note: If ERR1 is displayed during a store operation, the power meter has detected that the optical signal is still settling to its final value. Wait until the signal has stabilized before attempting to save.

**Clearing Memory: Be sure to download any desired data before clearing the memory.**

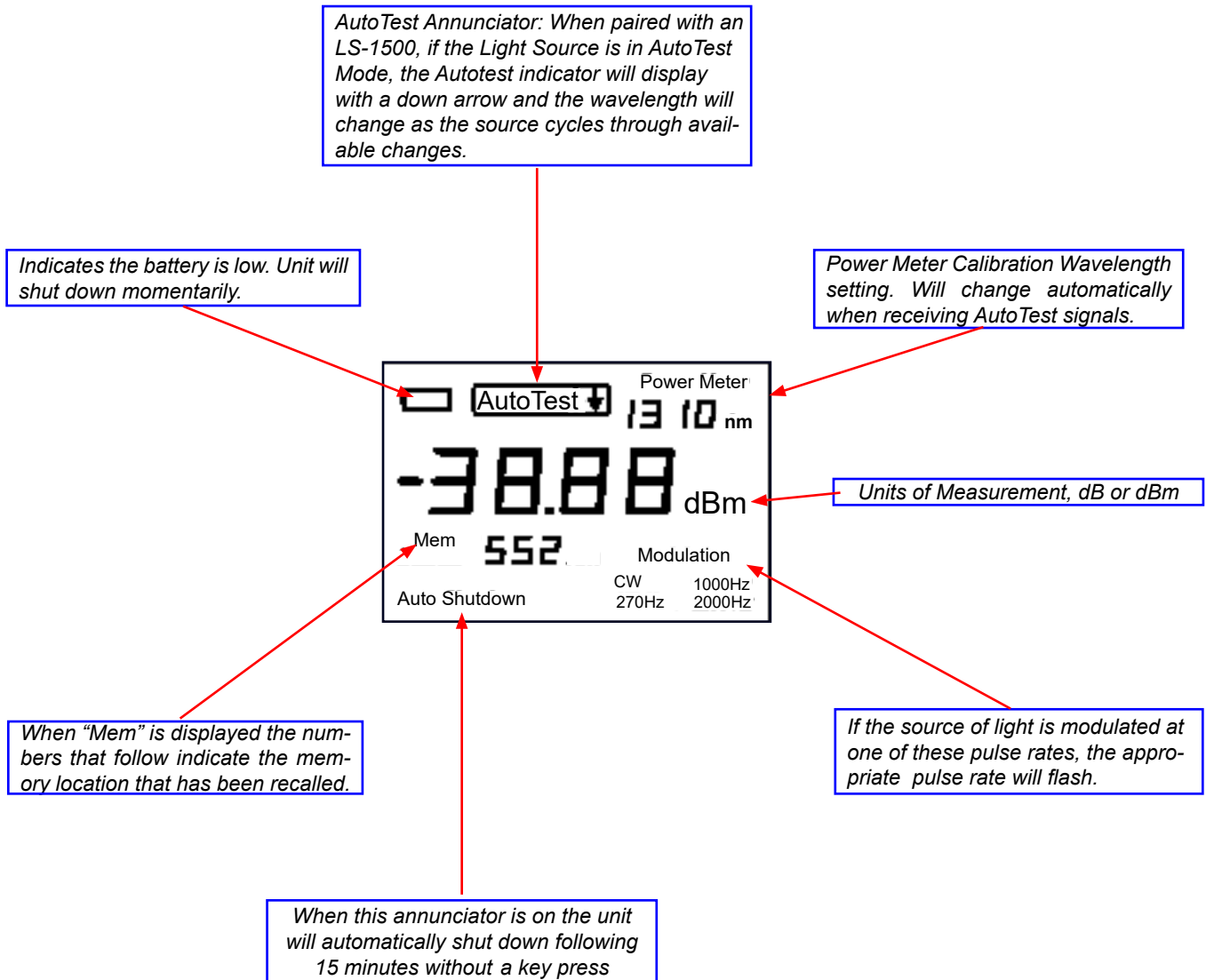
Clearing memory is accomplished by holding down the Store Rdg. and Recall Rdg. buttons simultaneously for at least four seconds. Note that the unit must be in the measurement mode and not in Recall mode. The display will indicate "CLR" while the memory is being erased. The memory address display will indicate progress of the operation.



**Recall Rdg** - When pressed, the unit enters Recall Mode which displays a memory location and the value(s) stored in it. **If the memory location is empty, four horizontal lines will appear in the main display as well as the power meter wavelength display.** In this mode the user may access any memory location by using the up and down controls. Holding one of these buttons down will cause it to accelerate through the memory locations so that any of the 2000 locations can be accessed quickly. When a location contains an AutoTest measurement all three loss measurements will be shown in a repeating sequence. An Auto Test measurement will be indicated by the presence of the Auto Test annunciator on the display without the up or down arrows. **To exit the Recall mode simply press Recall Rdg button again.**

**To erase only one memory location:** Recall the memory location. Simultaneously press the **Store Rdg** and the **Recall Rdg** buttons for at least one second. When the buttons are released the selected location will have been erased.

# Power Meter Display





# Power Meter Operation

## Optical Power Readings

Connect the fiber carrying the optical power to be measured to the PM-1500 detector utilizing the adaptor that mates with the fiber connector style in use. Energize the unit. Select the wavelength calibration factor that matches the wavelength of the light being measured by pressing the  $\lambda$  key repeatedly until the desired wavelength setting appears on the display. The power reading will now indicate the optical power in units of dBm. If the power level is greater than +5 dBm or less than -77 dBm (+25 dBm to -57 dBm for CATV Versions) the display will indicate an out-of-range condition by a series of dashes across the main display.

## *Relative Power Readings*

To make a relative power measurement you must first save the reference power level by pressing the store ref button. Then press the dB/dBm button. The units of the display will now change to dB. Subsequent readings will now be displayed in terms of dB relative to the stored reference value. A reference memory location is provided for each calibrated wavelength. If the wavelength is changed in dB mode, an error message will occur if no reference is stored in the next wavelength. These stored reference values will be lost once the unit is turned off. The unit will indicate an error if the dB/dBm button is pressed to change to dB if no reference is stored.

## *Auto Test*

To use the auto test feature, connect your fiber under test to the power meter and the measurements will cycle through the available wavelengths of the light source. These measurements will be relative to zero dBm (1mw). Allow the unit to cycle through the available wavelengths before the Store Rdg is pressed. All tested wavelengths will be stored to one location. AutoTest loss measurement will be displayed as follows: The AutoTest annunciator will be displayed without the down arrow. The stored loss values and the wavelength at which they were measured will be displayed sequentially for a period of 5 seconds each so that they may be copied down if so desired.

## Store/Recall

To store a measurement press store rdg button. The mem: annunciator will flash on briefly and indicate the memory location to which it is being saved.

To store to a particular location, enter the recall mode as described below and move to the desired location using the up and down arrows. Press the recall rdg. button again and the unit will now revert back to the active measurement mode. The next time store rdg is pressed, the measurement will be stored to the location selected.

If the desired position is occupied, the position can be emptied while in the recall mode by simultaneously pressing the store rdg and the recall rdg buttons for at least one second. When the buttons are released the selected location will have been erased.

To recall a memory location press the recall rdg button and the unit will enter the recall mode. The memory location will be displayed and if a value is stored in that memory location the test information will display. If the memory location is empty, four horizontal lines will appear in the main display as well as the power meter wavelength display. In this mode the user may access any memory location by using the up and down controls. Holding one of these buttons down will cause it to accelerate through the memory locations so that any of the 2000 locations can be accessed quickly.

An AutoTest loss measurement will be displayed as follows: The AutoTest annunciator will be displayed without the down arrow. The stored loss values and the wavelength at which they were measured will be displayed sequentially for a period of 5 seconds each so that they may be copied down if so desired.

To exit the mem: mode, simply press the recall rdg. button again. The unit will now revert back to the active measurement mode.

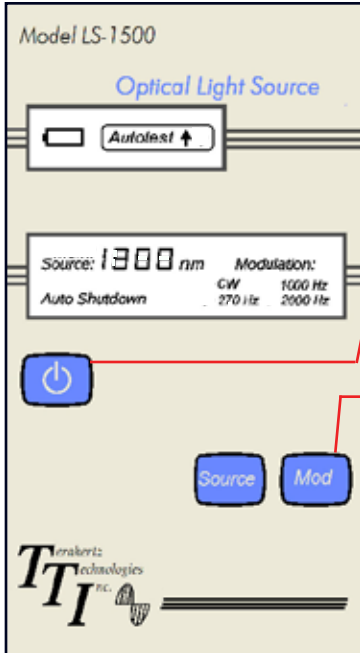
To erase one memory location: recall the memory location. Simultaneously press the store rdg and the recall rdg buttons for at least one second. When the buttons are released the selected location will have been erased.

## Clearing Memory

***Be sure to download any desired data before clearing the memory.***

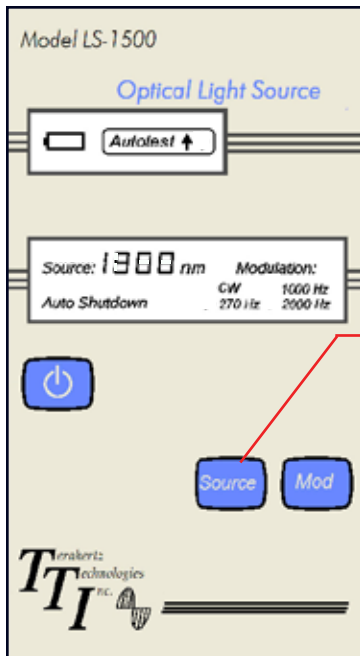
Clearing memory is accomplished in **Measurement Mode Not Recall Mode**, by holding down the store rdg. and recall rdg. buttons simultaneously for at least four seconds. The display will indicate "CLr" while the memory is being erased. The memory address display will indicate progress of the operation.

# Light Source Front Panel



**Power, ON/OFF-** This control alternately energizes and de-energizes the unit. Auto-Shutdown mode, in which the unit turns itself off following fifteen minutes without a key press, is the default mode. This mode conserves the battery should the user forget to turn the unit off. Holding this key down for at least four seconds at turn-on will de-activate Auto Shutdown.

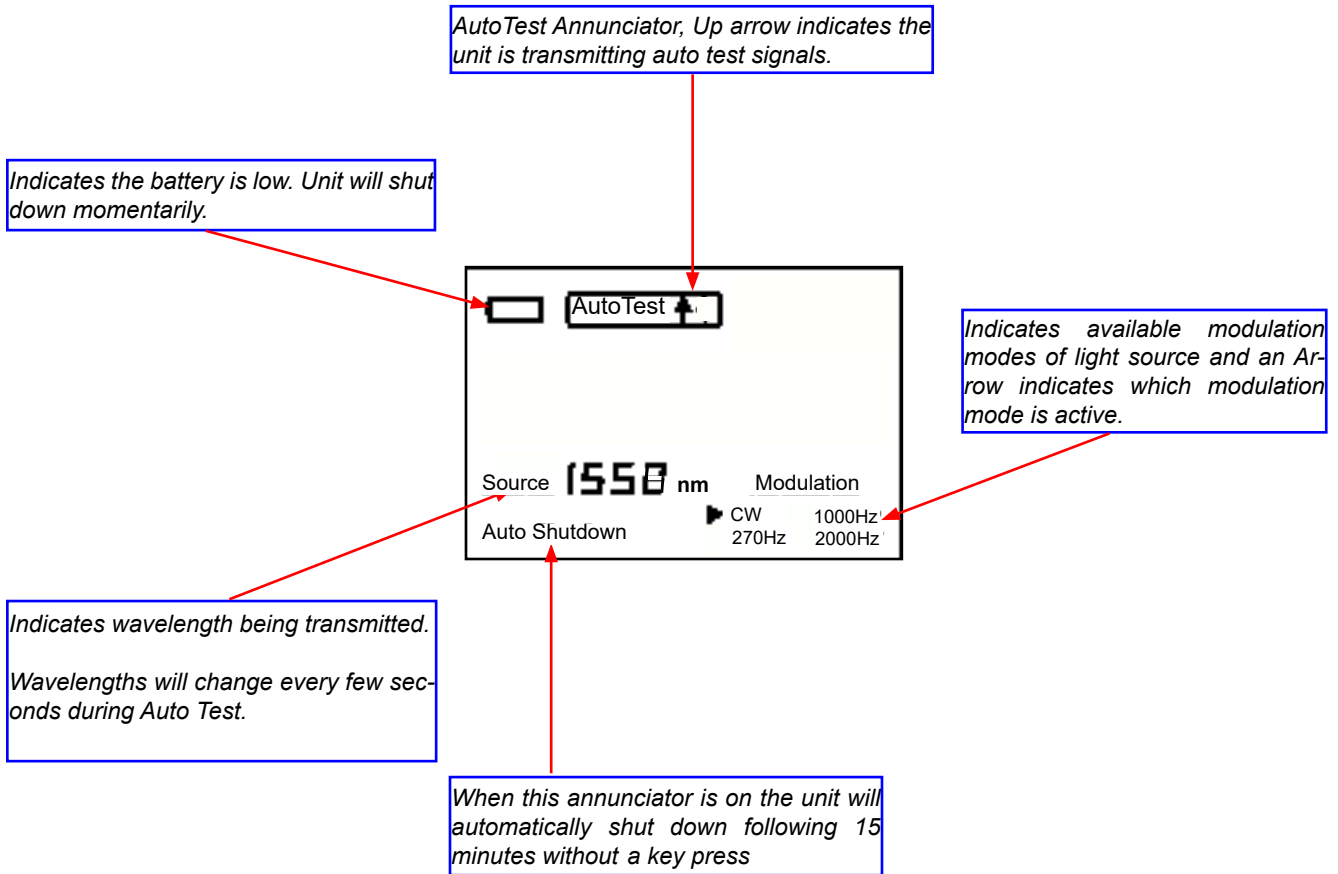
**Modulation Selector-** This control selects the modulation of the laser source. This feature permits using the instruments to identify one particular fiber in a cable. The sequence is as follows: Continuous Wave (CW) → 270 Hz, → 1000 Hz → 2000 Hz → CW. The modulation is a 50 % duty cycle square wave. An arrow points to the modulation mode selected. When the power meter detects light modulated at one of these frequencies the associated annunciator will flash.



**Source Selector -** This control selects the laser wavelength to be used. The lasers are initially turned off when the instrument powers up. Pressing the Source button activates the laser and changes wavelength in the following sequence: 1310 nm → 1490 nm → 1550 nm, → Auto Test (in which the lasers are activated in a sequence of 5 seconds each), → OFF.

When transmitting in Auto Test, the Annunciator will appear at the top of the display with an up-pointing arrow. The source wavelength display will automatically change in accordance with the laser in use. When changing source wavelength in *non*-Autotest mode, the transmitting unit will briefly modulate the signal to cause the receiving power meter to change its wavelength setting to match the transmitted signal. The receiving Autotest arrow will turn on for a short time.

# Light Source Display



## Light Source Operation

The laser source is equipped with interchangeable adaptors that accommodate connection to FC, ST, and SC style fiber optic connectors. To change adaptors, remove the two Philips head screws that retain the adaptor, remove the old adaptor, replace it with the desired adaptor, and replace the two screws.

The lasers are initially in the off state when the unit is powered up. Pressing the source button activates the laser and changes wavelength in the following sequence: first available wavelength, next wavelength..... → Auto Test (in which the lasers are activated in a sequence of 5 seconds each), → OFF.

When transmitting in Auto Test, the Annunciator will appear at the top of the display with an up-pointing arrow. The source wavelength display will automatically change in accordance with the laser in use.

In the non-auto test mode the lasers may be used in the CW (continuous mode) or they may be modulated by a square wave of 270 Hz, 1000 Hz, or 2000 Hz. An arrow next to these values on the screen indicate the modulation mode in use. Note that when measuring average power of the lasers the output will drop by exactly 3.01 dB as the source is off precisely half of the time.

(This is also true of the laser output when in the Auto Test mode however the unit receiving this signal automatically compensates for the loss in average power and this is transparent to the user.)

When switching the source wavelength in the CW mode, the light source automatically communicates to the Power Meter (if it is a TTI 1500 series PM or equipped FTE series unit) its wavelength which then changes its power meter wavelength setting to correspond to the wavelength it is receiving.

The modulation function is useful for fiber identification and for general purpose optical component testing. The unit that receives one of the modulated frequencies will flash the appropriate frequency annunciator, that is, 270 Hz, 1000 Hz, or 2000 Hz..

## Conducting a Single Cord Loss Test



### **Connect a Reference Cable**

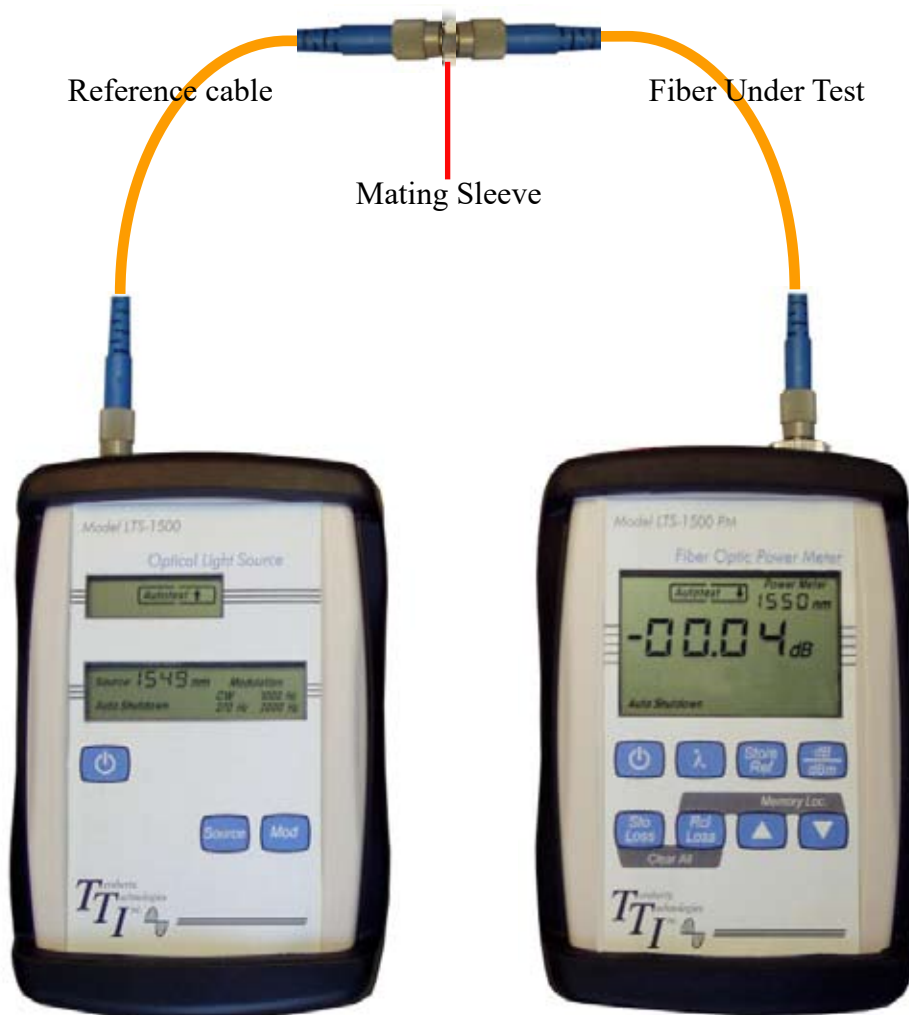
Connect a reference cable from the light source to the power meter. Power on both the light source and the power meter. Set the light source to the desired wavelength. The power meter will set itself to match the light source.

In dBm mode press the Store Ref button and then press the dB/dBm button to change to dB mode (relative power mode). the meter should now read zero or maybe 0.01, it may fluctuate between these a bit. If you need to test at a second wave length, change the source to the second wavelength and the power meter will change with the light source. It will sound a signal to tell you that you need to set a reference. It will god back to dBm mode. press Store Ref again and then dB/dBm to switch to dB mode

Remove the connector from the POWER METER. Do not remove it from the light source or a new Store Ref (Zero) will need to be conducted.

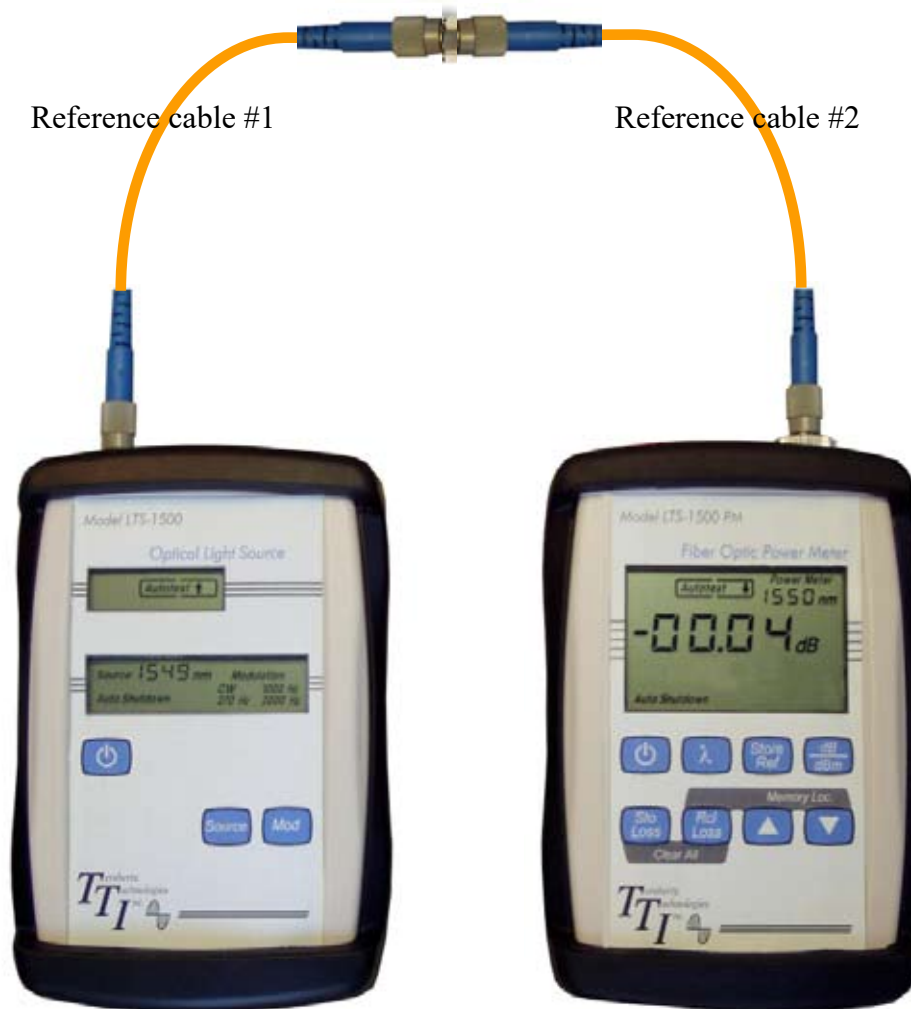
(If the power meter is powered down a new ref also needs to be conducted.)

Connect a cable to be tested in line as shown to conduct a loss test of the fiber under test



**This test (Single Cord) gives loss of the Connector at the mating sleeve along with the loss of the fiber itself, but the loss of the connector at the power meter is still unknown and is not included in the loss test.**

## Conducting a Dual Cord Loss Test



### **Connect Reference Cables**

Connect two reference cables as shown from the light source to the power meter. Power on both the light source and the power meter. Set the light source to the desired wavelength. The power meter will set itself to match the light source.

Storing the reference is the same as the single cord test.

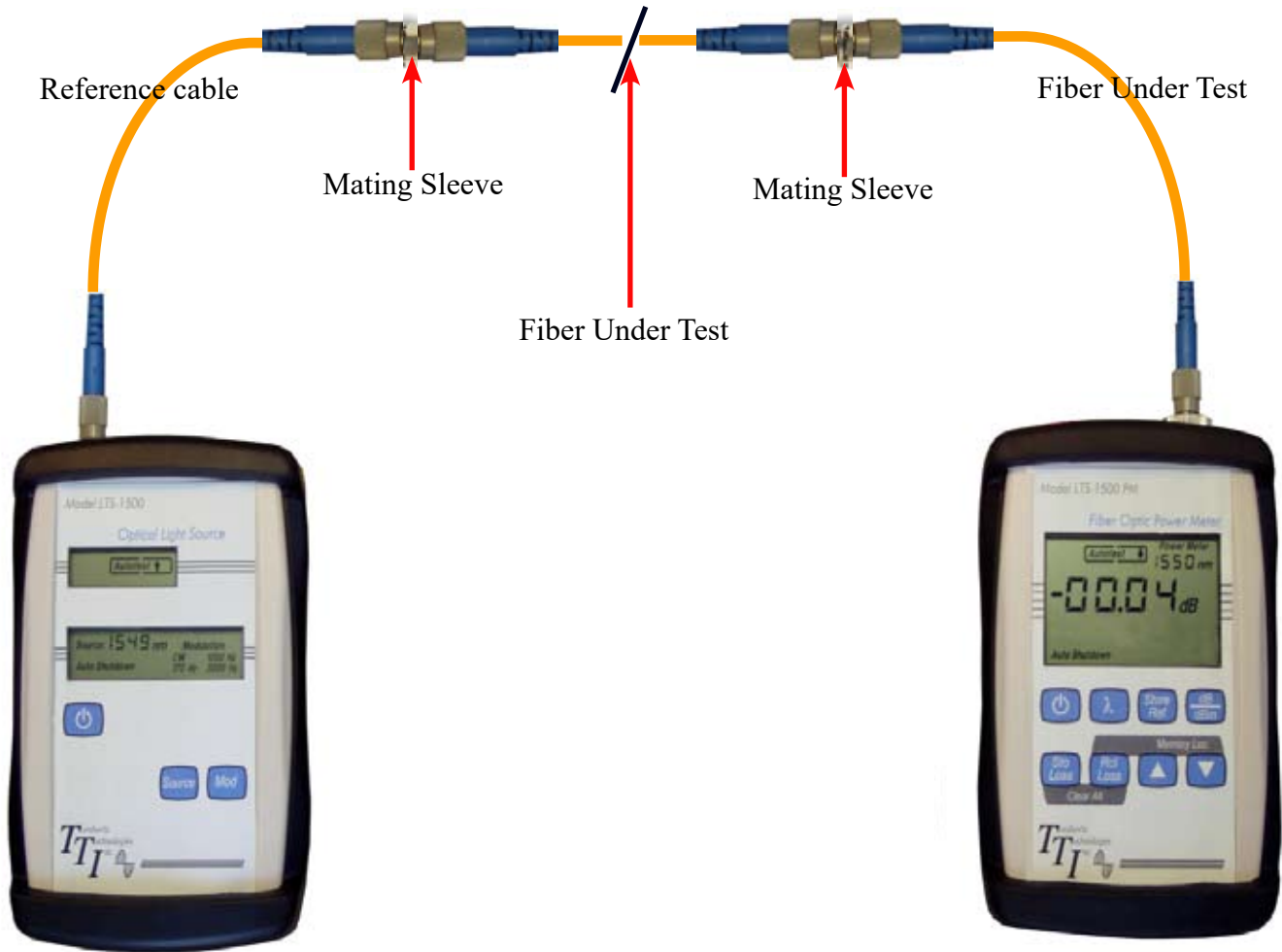
In dBm mode press the Store Ref button and then press the dB/dBm button to change to dB mode (relative power mode). the meter should now read zero or maybe 0.01, it may fluctuate between these a bit. If you need to test at a second wave length, change the source to the second wavelength and the power meter will change with the light source. It will sound a signal to tell you that you need to set a reference. It will god back to dBm mode. press Store Ref again and then dB/dBm to switch to dB mode



Disconnect the two reference cables at the mating sleeve. Do not remove the connector from the power meter or light source or a new Store Ref (Zero) will need to be conducted.

(If the power meter is powered down a new ref also needs to be conducted.)

Connect a cable to be tested in line as shown to conduct a full cord loss test of the fiber under test



**This test (Dual Cord) gives total loss of the cable with both connectors included in that loss.**

# Repair Information

## Service Information

Products manufactured by Terahertz Technologies Inc.(TTI) are designed and fabricated to provide reliable performance. However, in the event that service is required, both technical assistance and factory repair services are available using the contact information below.

All products being returned to TTI must be accompanied by a Return Materials 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. OUT-OF-WARRANTY repairs, services are billable for both time and materials return shipment is the responsibility of the customer.

We cannot be responsible for returned products that do not reference the TTI RMA number.

Please use this contact information to obtain technical information or an RMA number

Toll Free Phone:	(888) TTI-TEAM (876-8377)
International Phone:	(315) 736-3642
Website RMA Request:	<a href="http://teratec.us/rma.asp">http://teratec.us/rma.asp</a>
Website Technical Assistance:	<a href="http://teratec.us/support.asp">http://teratec.us/support.asp</a>

## 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 MATERIALS AND MANUFACTURING. 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 MATERIALS OR MANUFACTURING 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.

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