

OP815 Insertion Loss Test Set



Instruction Manual

OP815 Insertion Loss Test Set

Contacting OptoTest Corporation

Telephone: (805) 987 1700 (8 a.m. to 5 p.m. PST)

Web site: www.optotest.com

E-mail: engineering@optotest.com

Mail: OptoTest Corp.
4750 Calle Quetzal
Camarillo, CA 93012

Notice of Proprietary Rights

The design concepts and engineering details embodied in this manual, which are the property of OptoTest Corporation, are to be maintained in strict confidence. No element or detail of this manual is to be spuriously used or disclosed without the express written permission of OptoTest Corporation. All rights are reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from OptoTest Corporation.

**COPYRIGHT © 2004 by OptoTest Corp
ALL RIGHTS RESERVED. FIRST EDITION 2004
PRINTED IN THE UNITED STATES OF AMERICA**

MnOP815-RevA2

Table of Contents

OP815	1
Insertion Loss Test Set	1
Instruction Manual	1
Table of Contents	3
Overview	4
Initial Preparation	5
Unpacking and Inspection	5
Damaged In Shipment	5
Standard Contents	5
Specifications	6
OP815-85/13, OP815-850, OP815-1300, OP815-85/13	6
OP815-650, OP815-850, OP815-650/850	7
Definition of Specifications	8
Dynamic Range	8
Linearity	8
Calibration Wavelength	8
Calibration Traceability	8
Spectral Responsivity	8
Absolute Accuracy	9
Number of readings/sec	9
Channel Performance	9
Warm-up Time	9
Recommended Recalibration Period	10
Fiber Compatibility	10
Environmental	10
Frontpanel Operation	11
Display	13
OPM Mode – Power meter mode	13
Wavelength	13
Absolute Power	13
Relative Power	13
Internal Temperature	13
USB Control of the OP815	14
Command Summary	14
Warranty Information	15

Overview

The OP815 offers an economical approach for insertion loss measurements for either singlemode cables or multimode cables. For the multimode testing the OP815 is equipped with an 850nm LED, a 1300nm LED or a switched 850nm/1300nm dual LED source. The source for the singlemode configuration consists of a dual wavelength laser with 1310nm and 1550nm wavelengths. For all those models the power meter is equipped with a fiber terminated InGaAs detector.

For Specific applications such as plastic optical fiber (POF) the OP815 can be equipped with various LED sources (480/630/650/850nm) with internal launch fibers of various sizes 50 μ m to 900 μ m). For those lower wavelength sources the power meter is equipped with a 3mm Si (silicon) detector.

Dual wavelength instruments: With dual wavelength instruments, that have a single combined optical port, the sources are either internally switched (multimode) or optically combined (Singlemode). With those instruments only one optical source is active at a time. For dual wavelength instruments with individual sources both sources are active all the time, unless the power is manually reduced to zero.

Initial Preparation

Unpacking and Inspection

The unit was carefully inspected, mechanically, electrically and optically before shipment. When received, the shipping carton should contain the items listed in *Standard Contents*. Account for and inspect each item. In the event of a damaged instrument, write or call OptoTest Corp, California. Please retain the shipping container in case re-shipment is required for any reason.

Damaged In Shipment

All instruments are shipped F.O.B. Newbury Park when ordered from OptoTest. If you receive a damaged instrument you should:

1. Report the damage to your shipper immediately.
2. Inform OptoTest Corporation.
3. Save all shipping cartons.

Failure to follow this procedure may affect your claim for compensation.

Standard Contents

1. Model OP815 Insertion Loss
2. Power Cord (U.S. Shipments only)
3. USB A-B cable
4. Certificate of Calibration and if requested the Metrology Report
5. Instruction Manual(s)
6. CD with applicable software and documentation

Specifications

OP815-85/13, OP815-850, OP815-1300, OP815-85/13

	Specifications	
Models	OP815-SM-13/15 OP815-SM-1310 OP815-SM-1550	OP815-MM-85/13 OP815-MM-850 OP815-MM-1300
Power Meter Operation		
Measurement Range	+3 to -80dBm	
Measurement Linearity⁽¹⁾	+/- 0.05dB (+0dBm to -65dBm)	
Wavelength Dependency	see <i>Spectral Responsivity</i>	
Calibration Wavelength⁽²⁾	850nm, 980nm, 1300nm, 1310nm, 1480nm, 1550nm, 1625nm, 1650nm	
Calibration Traceability	U.S. N.I.S.T.	
Absolute Accuracy	±0.25 dB at calibration conditions for all NIST traceable wavelengths	
Stability⁽³⁾	< ±0.02 dB (3dBm to -65dBm)	
Resolution	0.001 dB	
Recommended Calibration Period	12 months	
Settling Time (auto-range from dark to max. power.)	0.2 seconds (0dBm to -80dBm)	
Number of readings/sec. (in remote mode)	≥ 10 readings per second	
Measurement Performance	Internal sampling interval approx. 35msec	
Measurement Modes	dBm, dB	
Optical Connector Interface	fixed bulkhead interface, FC/PC, SC/PC, ST/PC (others available)	
	PC polish angle polish	PC polish only
Fiber Compatibility	9/125 (SMF-28)	50/125 or 62.5/125 GI multimode
Source Operation		
Source Wavelength⁽⁴⁾	1310nm, 1550nm or both	850nm, 1300nm , or both
FWHM	Less than 20nm for both	Less than 80nm for 850nm LED Less than 180nm for 1300nm LED
Source Type	FP Laser	LED
Output Power	typical -3dBm	typical -10dBm
Source Switching Time (if not individual port)	0.1sec	0.2sec
Referencing Cycle	<5 sec	

⁽¹⁾ Measured at wavelength of 1480nm

⁽²⁾ NIST traceable calibration at -10dBm, continuous wave

⁽³⁾ Within specified ambient environmental temperature of 20°C to 25°C, stable within +/- 2°C

⁽⁴⁾ All actual center wavelengths are +/-30nm of the nominal value.

OP815 Insertion Loss Test Set

OP815-650, OP815-850, OP815-650/850

	Specifications
Models	OP815-650/850 OP815-630, OP815-650, OP815-850
Power Meter Operation	
Measurement Range	+3 to -65dBm
Measurement Linearity	+/- 0.05dB (+0dBm to - 55dBm)
Wavelength Dependency	<i>see Spectral Responsivity</i>
Calibration Wavelength⁽¹⁾	480nm, 650nm, 850nm, 980nm, 1080nm
Calibration Traceability	U.S. N.I.S.T.
Absolute Accuracy	±0.25 dB at calibration conditions for all NIST traceable wavelengths
Stability⁽²⁾	< ±0.02 dB (3dBm to -65dBm)
Resolution	0.001 dB
Recommended Calibration Period	12 months
Settling Time (auto-range from dark to max. power.)	0.2 seconds (0dBm to -80dBm)
Number of readings/sec. (in remote mode)	≥ 10 readings per second
Measurement Performance	Internal sampling interval approx. 35msec
Measurement Modes	dBm, dB
Optical Connector Interface	fixed bulkhead interface, FC/PC, SC/PC, ST/PC (others available) PC polish
Fiber Compatibility	Customer specific (50µm to 900µm)
Source Operation	
Source Wavelength	630nm, 650nm, 850nm (combinations, 2 per unit)
Source Type	LED
Output Power	typical -10dBm (depending on the source and fiber size)
Referencing Cycle	<5 sec

OP815 Insertion Loss Test Set

Mainframe	
Power Supply	90VAC ... 264VAC 47Hz to 63Hz 0.7Amps(115VAC) 0.4Amps(230VAC) Fuse: T1A, 250V
Warm-up time	5-15 minutes
Environmental: Operating temp. Storage temp: Humidity	0°C to +50°C -15°C to +70°C 0 - 95% RH (non-condensing)
Dimensions	19" Rack Standard (16.8 x 3.8 x 10 in.)
Shipping dimensions	14" x 12" x 21"
Weight	6lbs
Shipping weight	12lbs

Definition of Specifications

Dynamic Range

The dynamic range spans from the maximal power level the instrument can measure without major saturation of the detector to the minimal power level where the thermal noise of the detector becomes greater than the current produced by the incident light. For accurate power measurements it is NOT recommended to measure power levels at either end of the dynamic range. (see Linearity)

Linearity

Photodetectors are, by nature, very linear over a wide range of optical input powers, but the power meter electronics can affect the overall system linearity. The power meter linearity is characterized and specified to know the measurement accuracy and linearity over the full dynamic range. For accurate insertion loss measurements only power levels that fall within the range with the best linearity ($\pm 0.05\text{dB}$) should be measured.

Calibration Wavelength

The calibration wavelengths are the *nominal* wavelengths of the instruments calibration points. The exact wavelength of each particular calibration is stated in the *certificate of calibration*.

Calibration Traceability

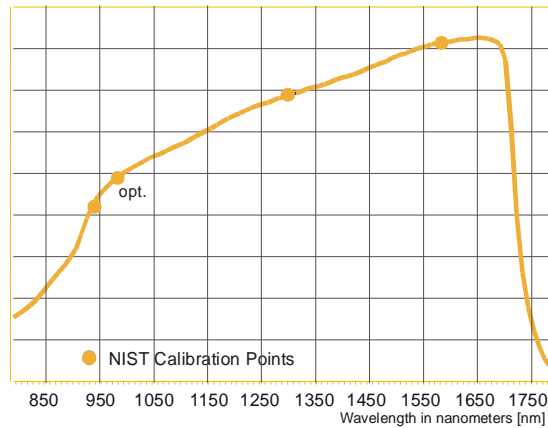
The detector's absolute calibration data is directly traceable to N.I.S.T. at the specified calibration wavelength and the specified power level, usually -10dBm .

Spectral Responsivity

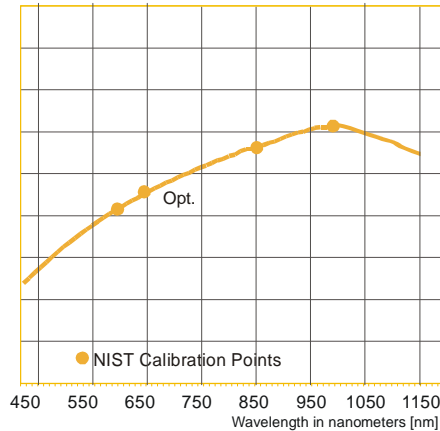
Depending on the detector type, InGaAs (Indium Gallium Arsenide) or Silicon, the spectral responsivity is the efficiency of the detector to convert optical power into electrical current changes with wavelength.

OP815 Insertion Loss Test Set

Responsivity of InGaAs Detectors



Responsivity of Silicon Detectors



Absolute Accuracy

The absolute accuracy specification includes the total measurement uncertainties involved in the calibration process including the transfer of the absolute power standard from N.I.S.T.

Number of readings/sec

Although the USB interface can handle a data rate of up to 12 Mbit/sec the instrument responds to requests for measurement data not faster than this parameter.

Channel Performance

The power meter circuit converts and digitizes the optical power level with the given sampling interval. Changes in light levels such as modulation will be averaged within that sampling interval.

Warm-up Time

The optical power meters, in general, do not need any warm-up time unless the instrument has to acclimate to a changing environment. In order to calibrate the instrument or to perform stable measurement the instrument should be acclimated for 15 minutes for each 5°C of temperature differential. For example if the instrument was stored at 18°C and brought into an environment of 28°C the instrument should be allowed to warm-up for 30 minutes.

OP815 Insertion Loss Test Set

Recommended Recalibration Period

This is the recommended time period for re-calibration in order to maintain accuracy specifications. The recommendation is made based on statistics on detector aging; however it is up to the metrology policies and procedures within each company to define the calibration cycles on optical power meters.

Fiber Compatibility

The amount of aerial coverage of the detector, the portion of the light emitted from the fiber being measured, depends on the mechanical features of the optical interface, the active area of the detector and the numerical aperture (NA) of the fiber. A fiber with a large NA, for example 100/140 multimode fiber, might not under fill a small area detector hence the absolute power reading will be less than actual.

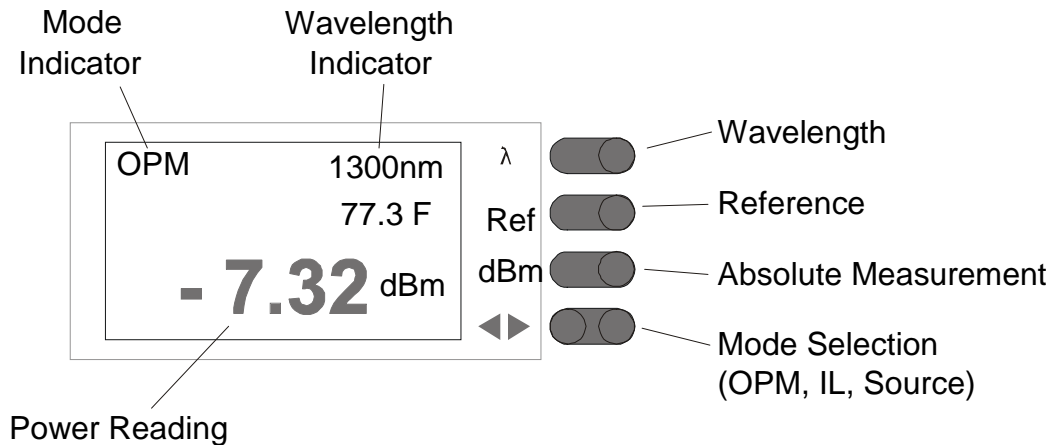
Environmental

Operating Temperature: This is the temperature range in which the instrument will conform to the specifications after the specified warm up time.

Storage Temperature: This is the temperature range at which the instrument can be stored with the power off, without any damage or any loss of specification to the instrument. It is required that the instrument be brought back to within the operating temperature range before it is turned on.

Humidity: The relative non-condensing humidity levels allowed in the operating temperature range.

Frontpanel Operation



Wavelength

The wavelength button toggles through the available calibration wavelength and source selection depending on the mode of the instrument.

OPM Mode: The measurement wavelengths for the OP815 are 850nm, 1300nm, 1310nm, 1480nm, and 1550nm for InGaAs detectors and 489nm, 650nm, 850nm, 980nm, and 1080nm, unless otherwise noted.

IL Mode: The wavelength button toggles the source wavelength concurrently with the power meter calibration wavelength. For OP815 with a single wavelength source there is no wavelength to be selected, for dual wavelength implementations the wavelength selection switches between the two sources.

Source Mode: The wavelength button toggles the source wavelength.

Reference [Ref]

For OPM

The **Ref** button switches the power meter into relative measurement mode. At the same time it stores the current absolute power reading at the current wavelength as the reference. The reference power is displayed above the relative power reading (see illustration of Display). If the instrument is already in relative measurement mode pressing the **Ref** button stores the

OP815 Insertion Loss Test Set

current power level as the new reference. For each wavelength a reference reading can be stored.

For Ref mode:

Pressing the **Ref** button in *Ref mode* executes a reference sequence. For single wavelength devices, or dual wavelength instruments with individual ports this involves taking the reference at the selected wavelength. For dual wavelength instruments this involves taking the reference for the first wavelength, then repeats the same for the second wavelength. The referencing cycle can take up to 5 seconds.



Absolute Measurement [dBm]

The **dBm** button switches the power meter into absolute measurement mode.



Mode Selection

The mode selection switches between the following modes:

OPM Optical Power Meter

The OP815 operates as a standard optical power meter measuring absolute or relative power. In this mode the **dBm** button switches the instrument into absolute mode. The **Ref** button switches the instrument to relative mode (also dB mode on other instruments). (Note: A reference is taken for the selected wavelength only.)

IL Insertion Loss Mode

In IL mode optical power switches its wavelength to the wavelength of the selected source. In this mode the **dBm** button doesn't have a function. The **Ref** button takes the reference measurement. (Note: For dual wavelength modules the reference will be taken for both wavelengths.) The absolute reference power is reflected in the Reference Indicator. After taking a reference the instrument continuously measures the insertion loss.

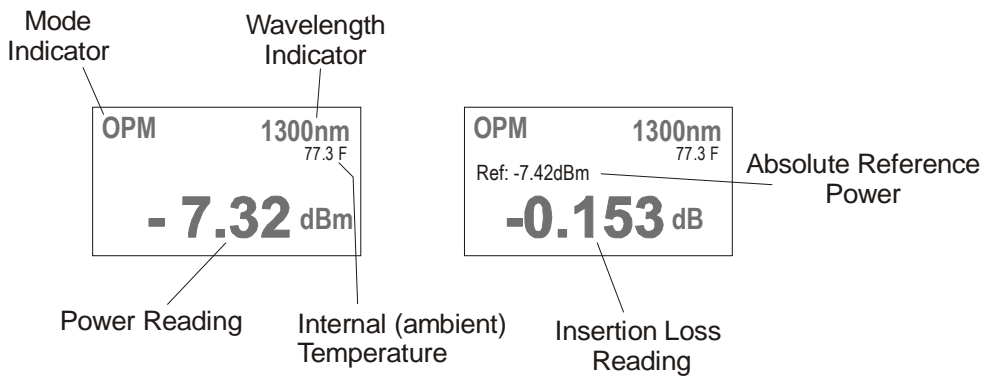
Src Source Mode

In source mode the output power of the selected wavelength can be adjusted using the [**Ref**] button to increase power and [**dBm**] button to reduce power.

Display

Depending on the selected mode the display shows different measurement parameters and results.

OPM Mode – Power meter mode



Wavelength

This label displays the currently selected calibration wavelength of the source wavelength used to measure optical power. Typically the wavelengths are as follows:

OPM Mode	850nm, 980nm, 1300nm, 1310m, 1480nm, 1550nm
IL Mode	Multimode: 850nm, 1300nm, Singlemode: 1310nm, 1550nm

Absolute Power

The absolute power is displayed in dBm.

Relative Power

The relative power is displayed in dB. It is the difference between the reference power at the corresponding wavelength and the measured absolute power.

Internal Temperature

The internal ambient temperature is displayed in either °F (Fahrenheit) or °C (Celsius). The user can alternate between Fahrenheit or Celsius temperature scales by the implementation of a USB command.

USB Control of the OP815

The OP815 can be controlled via the USB bus. The following commands are available via the OP815.DLL to communicate with the instrument through a program.

Command Summary

NOTE: For a detailed and complete description of the OP815.DLL function calls please consult the OP815.DLL Description on the Applications and Driver CD or visit the support section of www.optotest.com.

InitDLL	Initializes the OP815.DLL
GetDLLStatus	Returns the status of the last library call.
GetUSBDeviceCount	Returns the number of OptoTest devices connected to the USB bus.
GetTemperature	Returns the ambient temperature in either Celsius or Fahrenheit
ReadPower	Returns the power reading of the current direction.
SetWavelength	Sets the calibration wavelength.
Backlight	Lights or dims the backlight of the instrument.

Warranty Information

OptoTest Corp. warrants this product to be free from defects in material and workmanship for a period of one year from date of shipment. During the warranty period we will, at our option, either repair or replace any product that proves to be defective. To exercise this warranty contact OptoTest Corp. Headquarters. You will be given prompt assistance and return instructions. Repairs will be made and the instrument returned, transportation prepaid. Repaired products are warranted for the balance of the original warranty period, or at least 90 days.

NOTE: Do not send instruments for any reason without contacting OptoTest headquarters first.