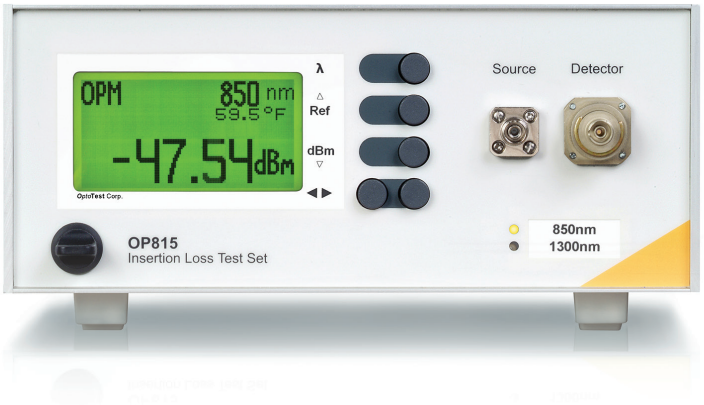
OptoTest

Test Solutions for Fiber Optics



OP815

Insertion Loss Test Set

Instruction Manual

(Also supports the OP850)

www.optotest.com | 1.805.987.1700

Contacting OptoTest Corporation

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MnOP815-RevE

OP815
online resources

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Overview

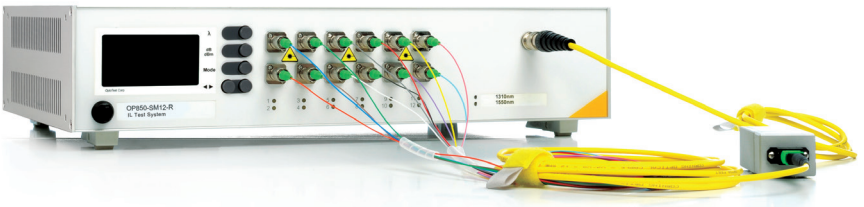
The **OP815** offers an economical approach for insertion loss measurements for either singlemode cables or multimode cables. For the multimode testing the OP815 is equipped with an 850nm LED, a 1300nm LED or a switched 850nm/1300nm dual LED source. The sources for the single mode configuration consists of Fabry-Perot LASERs 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 (50µm to 900µm). For 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 (single mode). With those instruments only one optical source is active at a time.

OP850 (Multichannel IL Test Set)

The **OP850** is similar to the **OP815** in that it is primarily an insertion loss test set with a source and a power meter. The OP850 is a multichannel version of the OP815. Both the OP815 and OP850 have similar modes (OPM, IL, and SRC). These modes function the same, but the only difference is the front panel button behave a little different for the two units.



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.

Note: Be aware that accessories such as detector adapters, remote head detectors, and high performance reference cables will be located inside a small box labeled "Accessories Inside". If this box is not included with the original shipment, contact OptoTest of their nearest distributor.

Please retain the shipping container in case re-shipment is required for any reason.

Damaged In Shipment

All instruments are shipped F.O.B. Camarillo 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/OP850 Insertion Loss Meter
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/USB drive with applicable software and documentation (if ordered)
7. Rack mount kit (optional)

Definition of Specifications

Dynamic Range

The dynamic range, or measurement range, of the optical power meter spans from the maximal power level the instrument can measure, without major saturation to 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). The dynamic range is measured by comparing the absolute measured power against a reference power. When the difference between the two exceeds 1dB either end of the dynamic range has been reached.

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 (+/-0.05dB or better) 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

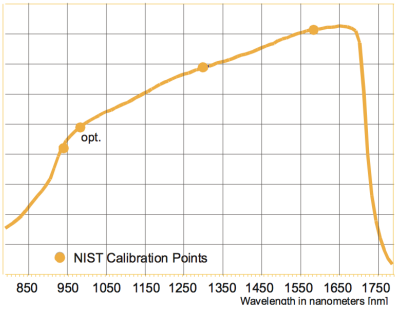
The detector's absolute calibration data is directly traceable to N.I.S.T. at the specified calibration wavelength and the specified power level, typically -10dBm.

Definition of Specifications

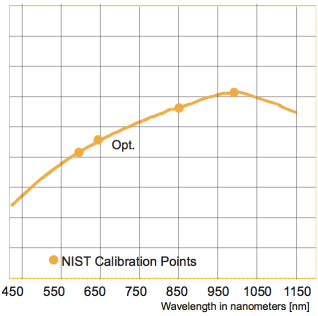
Spectral Responsivity

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

Responsivity of InGaAs Detectors



Responsivity of Silicon Detectors



Note that other detector types are available such as IN5 (5mm InGaAs) IN10 (10mm InGaAs) as well as WSR (wide spectral range) and might exhibit a different spectral responsivity.

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. Contact OptoTest for the detailed chain of uncertainties.

Optical Power Meter, Channel Performance

For multichannel instruments, 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.

Instrument, Warm up Time

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 measurements, the instrument should be acclimated for 15 minutes for each 5ºC of temperature differential. For example if the instrument was stored at 18ºC and brought into an environment of 28ºC the instrument should be allowed to warm up for 30 minutes.

Definition of Specifications

Recommended Recalibration Period

This is the recommended time period for re-calibration in order to maintain accuracy specifications. The recommendation is made based upon 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.

Optical Power Meter, Fiber Compatibility

The amount of aerial coverage of the detector, or 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.

Return Loss Range

The lower end of the return loss (low return loss = high reflection) defines the level where the instrument is saturated by large reflections. The higher end of the return loss (high return loss = very weak reflections) is given by capability of the instrument to amplify and resolve reflection out of the noise floor.

Return Loss Accuracy

The Return Loss Accuracy is measured using an optical variable attenuator connected to a >98% reflector. The insertion loss of the attenuator is initially quantified against a reference optical power meter. The actual attenuation is then used to calculate the generated reflection, where the resulting reflection = 2x (variable attenuation + insertion loss of attenuator) + reflector coefficient. Accuracy of return loss measurements can also be affected by the reference cable and any excessive losses at the front panel interface.

Definition of Specifications

Reference Cable

The reference cable is the cable with which the DUTs will be measured against. Typically reference cables are required to be of a defined quality with a specified connector/endface polish.

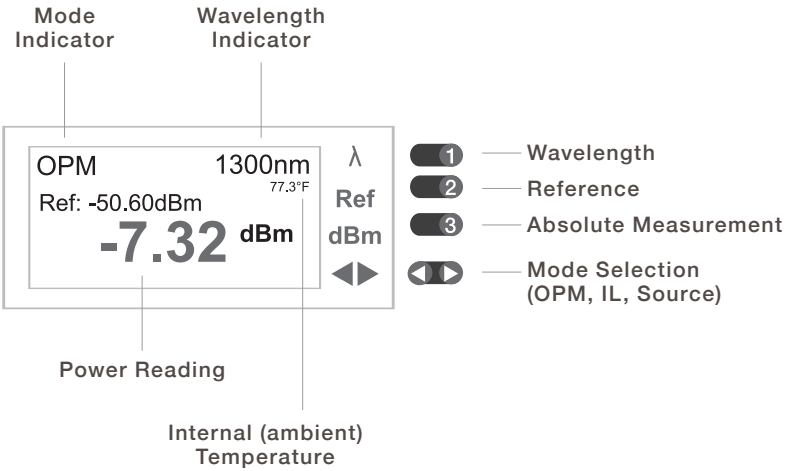
Instrument, Environmental

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.

Front Panel Operation – OP815



1 *Wavelength*

The **wavelength button** 1 toggles through the available calibration wavelengths 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 650nm, 850nm, and 980nm for silicon detectors, 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.

2 *Reference*

For OPM Mode: The **Ref button** 2 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 current power level as the new reference. For each wavelength a reference reading can be stored.

Front Panel Operation – OP815

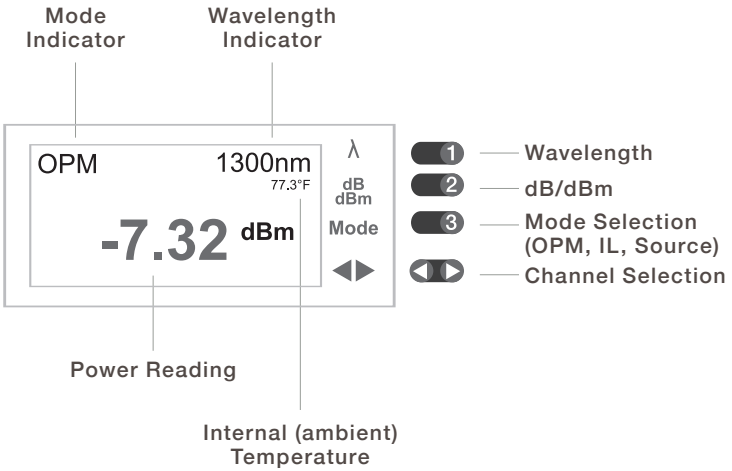
IL Mode: Pressing the Ref button in IL mode executes a reference cycle. For single wavelength devices, or dual wavelength instruments with individual ports this involves taking the reference at the selected wavelength. For dual wavelength instruments this involves taking the reference for the first wavelength,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

3 *Absolute Measurement [dBm]*
The dBm button switches the power meter into absolute measurement mode.

The OP850 has a mode button [mode] in place of this button. When pressed this button operates the same as the ◀▶ buttons described below.

◀▶ *Mode Selection*
For the OP815 the mode selection buttons switch between modes.

Front Panel Operation – OP850



1 *Wavelength*

The **wavelength button** 1 toggles through the available calibration wavelengths and source selection depending on the mode of the instrument.

OPM Mode: The measurement wavelengths for the OP850 are 850nm, 1300nm, 1310nm, 1480nm, and 1550nm for InGaAs detectors and 489nm, 650nm, 850nm, 980nm, and 1080nm for silicon detectors, unless otherwise noted.

IL Mode: The **wavelength button** toggles the source wavelength concurrently with the power meter calibration wavelength. For OP850 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.

2 *dB/dBm*

For OPM Mode: The **dB/dBm button** 2 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 **dB/dBm button** stores the current power level as the new reference. For each wavelength a reference reading can be stored.

Front Panel Operation – OP850

IL Mode: Pressing the **dB/dBm button** in IL 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.

Mode Selection

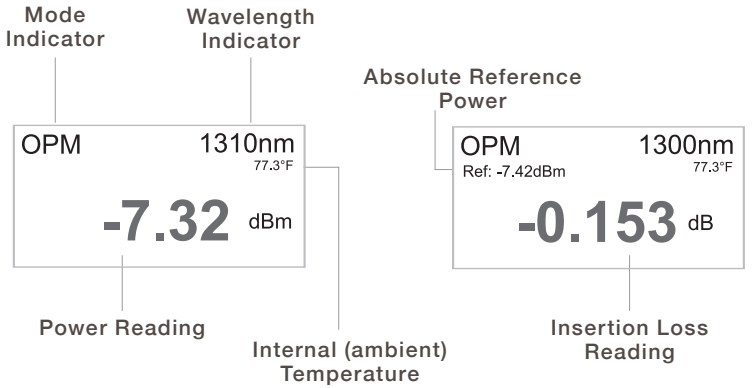
For the OP850, the mode selection buttons switch between modes.

Channel Selection

For the OP850, the channel selection buttons change the active channel.

Display Operation – OP815/OP850

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



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, 1310nm, 1480nm, 1550nm
IL Mode: Multimode 850nm, 1300nm; Single Mode 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 ºF (Fahrenheit) or ºC (Celsius). The user can alternate between Fahrenheit or Celsius temperature scales by the implementation of a USB command.

Smart Remote Head Option

Certain OP815s and OP850s have the option to include a “Smart Remote Head.” The smart remote head (SRH) has the ability to hold its calibration and be used with multiple OptoTest mainframes.

The OP815 and OP850, at power on, will detect the SRH and load it as another OPM in addition to any other OPMs that are also installed on the unit.

Selecting the Integrating Sphere for IL Measurements

If the OP815 or OP850 has a separate power meter, other than the SRH, then, to correctly use the integrating sphere for insertion loss measurements the unit needs to “know” to use the sphere.

For it to load the SRH capability, the SRH must be connected prior to turning on the system. When the system boots up, it will start in **OPM2** mode, which displays the power measured by the SRH. To set the unit to use the SRH for the IL measurements **IL**, **IL2** modes one needs to press and hold the **Ref** button until the **OPM** label in the top left corner displays **Ref**. At that point the unit will use the corresponding power meter for all IL measurements.

To re-select the default power meter, if the SRH is not the default, one needs to navigate to the **OPM** screen and press and hold the **Ref** button until the top left corner of the screen displays **Ref**. The default power will now be used for all IL measurements.

USB Control of the OP815/OP850

The OP815 and OP850 can be controlled via the USB bus. Upon request, OptoTest can supply the appropriate DLLs along with sample programs to facilitate the software creation process. For these DLLs please contact sales@optotest.com.

Warranty Information

OptoTest Corp. warrants this product to be free from defects in material and workmanship for a period of two years 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.

For Application Notes, more detailed Testing Instructions, and the most up-to-date OptoTest News go to ***www.optobuzz.com***

www.optotest.com
1.805.987.1700