



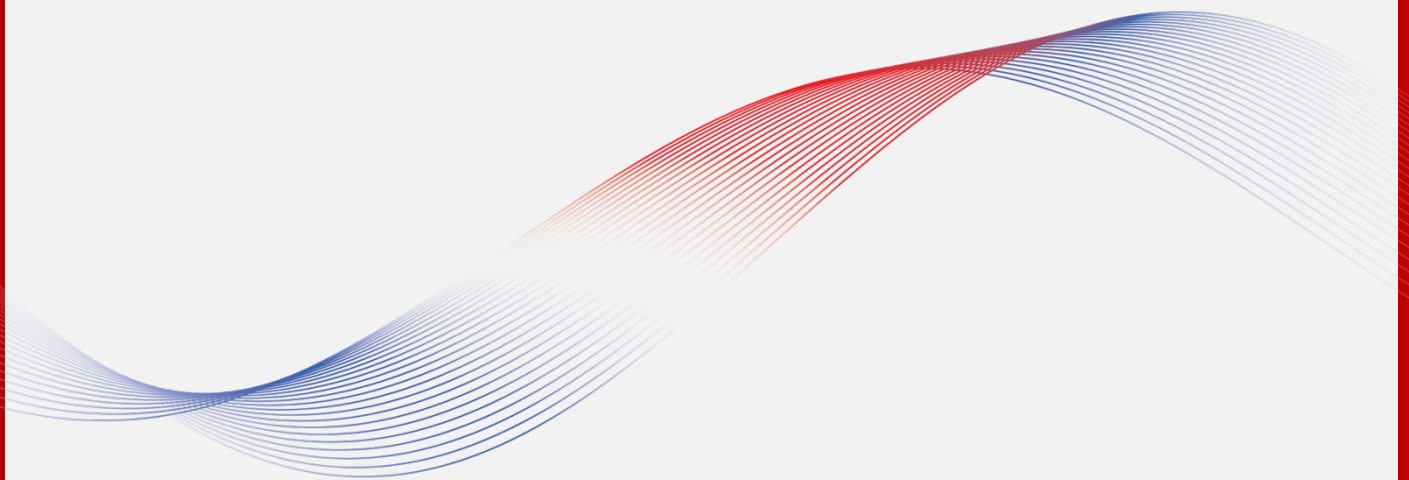
**santec**

**OPM-150**

**Multichannel Optical Power  
Meter**

**Instruction Manual**

OPM-150-M-E-Ver 1.0



All information contained herein is believed to be accurate and is subject to change without notice. No responsibility is assumed for its use. © Santec Inc., 2020. All rights reserved.

## TABLE OF CONTENTS

LIST OF FIGURES AND TABLES.....	iv
<b>COMPLIANCE .....</b>	<b>1</b>
CE Compliance .....	1
<b>GENERAL INFORMATION.....</b>	<b>2</b>
OPM-150 Optical Power Meter Overview.....	2
Applications.....	3
Key Features.....	3
Test & Measurement Standards.....	3
<b>INITIAL PREPARATON.....</b>	<b>4</b>
Initial Preparation .....	4
Unpacking and Inspection .....	4
Damaged In Shipment .....	4
Standard Contents .....	4
Operational Requirements .....	4
<b>POWERING ON INSTRUMENT.....</b>	<b>5</b>
<b>DEFINITION OF SPECIFICATIONS.....</b>	<b>6</b>
<b>OPERATION.....</b>	<b>8</b>
How to Navigate the User Interface.....	8
<b>SPECIFICATIONS .....</b>	<b>14</b>

***LIST OF FIGURES AND TABLES***

Figure 1: OPM-150 Multichannel High-Speed Optical Power Meter .....	2
Figure 2: C13 Power cord .....	5
Table 2: Environmental requirements .....	4
Table 13: OPM-150 optical and electrical specifications sheet .....	14

# 1

---

## COMPLIANCE

### ***CE Compliance***

Electronic test equipment is subject to the EMC Directive in the European Union. The EN61326 standard prescribes both emission and immunity requirements for laboratory, measurement, and control equipment. This unit has undergone extensive testing according to the European Union Directive and Standards.

# 2

## GENERAL INFORMATION

### OPM-150 Optical Power Meter Overview

Santec’s OPM-150 Multichannel Optical Power Meter is a cost-effective solution for manufacturers or anyone requiring high channel counts and measurements. Available with up to 24 individual optical power meters, the OPM-150 builds on the established reputation of Santec’s OP710 Multichannel Optical Power Meter, offering enhancements including built-in USB and Ethernet communication, and simultaneous power measurements on all channels.

The OPM-150 is capable of faster than 20ms sampling time over the USB interface. Simultaneous optical power measurement capability enables users to instantly spot a port failure, making the OPM-150 an ideal instrument for demanding production and lab applications. The high-speed on-demand USB measurements allow for fast feedback to enable active optical alignment for fiber coupling and silicon photonics applications enabling automation of many manual alignment processes.

The OPM-150 is backward compatible with all software developed for the OP710, making it a drop-in upgrade to existing test systems, and can be easily integrated with custom test applications. Ethernet connectivity makes the OPM-150 accessible over a network for hassle-free integration into high volume production environments.



**Figure 1: OPM-150 Multichannel High-Speed Optical Power Meter**

Available detector options:

<b>IN1</b>	1mm InGaAs detector with 5/8" Adapter
<b>IN3</b>	3mm InGaAs detector with 5/8" Adapter
<b>IN5</b>	5mm InGaAs detector with 5/8" Adapter
<b>IN10</b>	10mm InGaAs detector with 5/8" Adapter
<b>HP</b>	2mm High Power InGaAs detector with 5/8" Adapter
<b>SI3</b>	3mm Silicon detector with 5/8" Adapter
<b>R</b>	Electrical port for Remote Head Detector
<b>S</b>	Digital port for Integrating Sphere

***Applications***

- Optical alignment
- Silicon photonics
- Optical signal monitoring
- Transceiver testing
- Lab and R&D
- Free space optics

***Key Features***

- Mix and match different detector types (Si or InGaAs) and sizes (1, 3, 5 or 10 mm)
- Simultaneous readings from up to 24 detectors
- < 30 ms sampling time
- Color touch screen display
- USB or Ethernet

***Test & Measurement Standards***

- Calibrated in accordance with IEC 61315.
- IL conforms to IEC 61300-3-4 and IEC 61280-4-1
- Multimode IL launch conditions meet the IEC 61280-4-1 Encircled Flux standard
- RL conforms to IEC 61300-3-6

# 3

---

## INITIAL PREPARATON

### *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 Santec 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 Santec 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 Santec. If you receive a damaged instrument, you should:

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

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

#### *Standard Contents*

1. Model OPM-150 Multichannel High-Speed Power Meter
2. Power Cord (U.S. Shipments only)
3. 18V AC/DC power supply

#### *Operational Requirements*

For the unit to meet the warranted specifications, the operating environment must meet the conditions outlined in Table 1.

**Table 1: Environmental requirements**

Parameter	Specification
Max Detector Count	1
Operating Temperature	5 to 40°C
Humidity (Non-condensing)	Maximum 95% RH from 5 to 40 °C



# 4

## POWERING ON INSTRUMENT

Prior to powering on the unit, verify that the appropriate power supply and power cord is connected. A power cord with a C13 male connector is needed to mate to this to the AC to DC desktop power supply. The power supply is attached to a P6 5.5mm/2.5mm DC plug and connects to the DC barrel power jack on the back of the unit.

The other end of the C13 power cord should have a grounded 3 prong connector that is appropriate for the outlets used in the region of operation. For more information, please contact Santec Corporation.



Figure 2: 18V AC/DC Power Supply

**Note:** For customers within the United States an appropriate power cord is supplied.

To power the unit on, push the power button until it locks. To power off the unit, push the power button again to release the button.



**OFF**



**ON**

When powered on, the instrument will display a splash screen showing the Santec logo. Once the splash screen has finished, the unit will load the mode which has been selected as the Startup Mode in the Settings screen. To change mode screens, press the home [top left yellow] button and the unit will transition to the Mode Select screen. The startup mode can be set by the user under the Settings Menu from the front panel. **(Note: Do not attempt to initial USB or ethernet communication to the instrument. It has not been properly powered up until the splash screen has completed.)**

# 5

---

## 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 instrument's 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.

### **Absolute Accuracy**

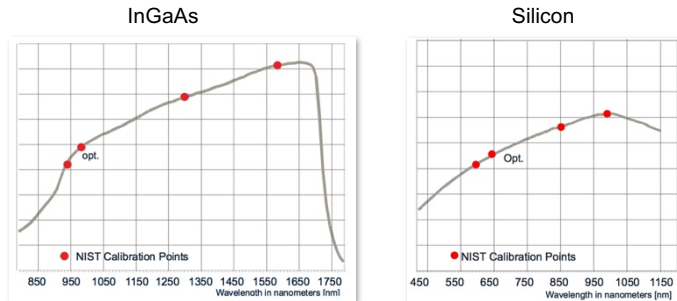
The absolute accuracy specification includes the total measurement uncertainties involved in the calibration process including the transfer of the absolute power standard from N.I.S.T. Contact Santec for the detailed chain of uncertainties.

### **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.

### 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 and it varies with wavelength.



### Instrument Warm up Time

Optical power meters, in general, do not need any warm-up time unless the instrument must acclimate to a changing environment. To calibrate the instrument or to perform stable measurements, 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.

### Recommended Recalibration Period

This is the recommended time period for re-calibration in order to maintain accurate 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 areal 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.

### Instrument, Environmental

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

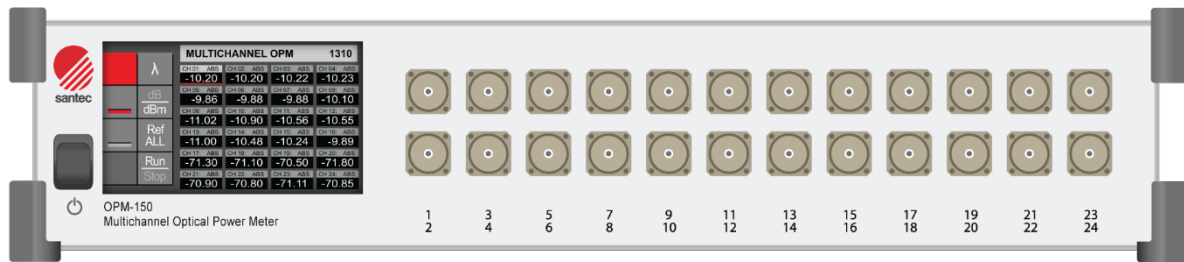
**Storage Temperature:** This is the temperature range at which the instrument can be stored with the power off without any damage or any loss of specification to the instrument. It is required that the instrument be brought back to within the operating temperature range before it is turned on.

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

# 6

## OPERATION

### How to Navigate the User Interface



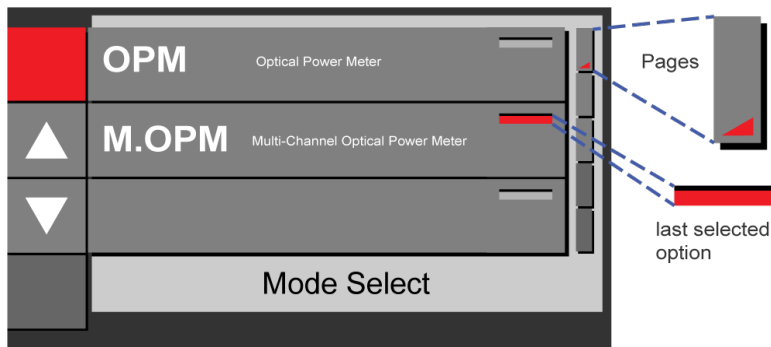
#### Mode Select Screen

On the Mode Select screen, press the select operation modes for the unit, such as OPM, M.OPM, Settings, and Status. The up and down arrows on the left side of the screen will navigate the pages of mode screens. Pressing the home button on the Mode Select screen will put the unit back into the mode that it was in most recently.

The Mode Select screen functions as a home screen for the unit. Operators can use the Mode Select screen as a point of reference for the user interface or if they need to change Operation Modes.

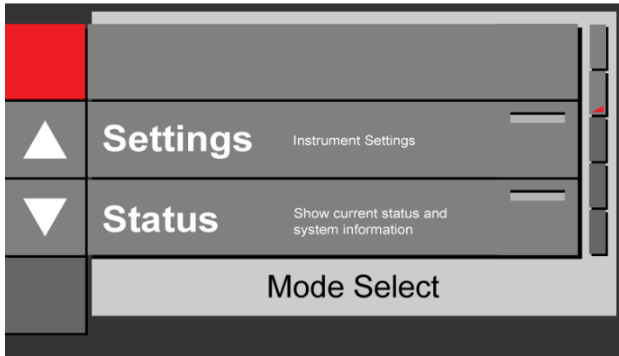
The unit's Mode Select screen deploys several modes. Each page has three selections to choose from and the page number is indicated on the bottom of the screen by the placement of the wedge as seen in the figure below.

Below is a brief description of the operation modes on each page of the Mode Select Screen:



#### Mode Select Screen Page 1

OPM	Displays the optical power incident on the selected detector.
M.OPM	Multi-Channel Optical Power Meter


**Mode Select Screen Page 2**

Settings	Allows certain settings—such as pass/fail criteria and measurement adjustment factors—to be changed and saved on the unit.
Status	Shows current settings and system information.

**Operation Mode Screens**

When the unit is in one of its operation screens, the buttons will operate largely the same. Buttons on the second column will select options such as wavelength and channel switching. The first column page buttons under the home button will select the pages of these procedures and options. Pressing the home button in an operation screen will bring the unit back to the Mode Select Screen and pressing it while in a procedure screen, such as for wavelength and channel switching, will take the unit back to the root screen for that operation mode.

**OPM Mode**

This mode controls the optical power meter of the selected channel. OPM mode supports all the functions of a state-of-the-art optical power meter such as multiple wavelength calibrations, absolute mode (dBm), and relative mode (dB).

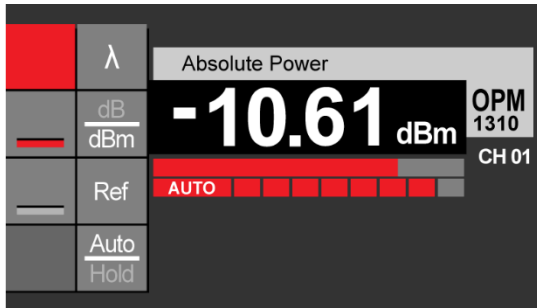
This is a preferred mode for performing measurements using an external optical source.

The indicators below the power reading visually depict the measured power in terms of the current gain stage of the detector and whether the unit is measuring on the high or low end of that gain stage.

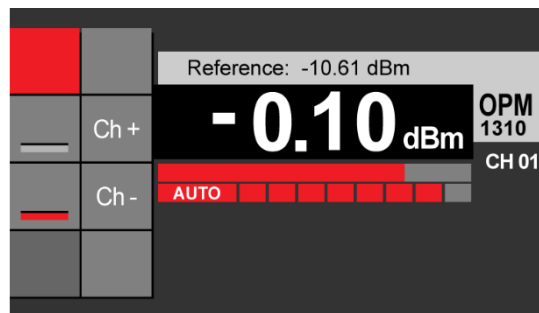
The unit, by default, operates in “Auto Range” mode meaning that it will find the gain stage in which it will be able to measure the optical power most accurately.

However, the unit has an option to operate in “Range Hold” mode wherein it will remain in the same gain stage regardless of the power incident on the detector.

Note: In “Range Hold” one should not be operating at the high or low end of the range. This will increase the error of the measurement.












OPM Screen (Page 1)



OPM Screen (Page 2)

### OPM Screen Page 1 & 2

	Selected page.
	Changes the selected wavelength for the power meter. Typically, for power meters with InGaAs this is 850nm, 980nm, 1300nm, 1310nm, 1490nm, 1550nm, and 1625nm; and for Silicon Power Meters the wavelengths are 650nm, 850nm, and 980nm
	Switches the display between absolute (dBm) and relative (dB) measurement modes. The active mode will be in white.
	Performs a measurement of the current optical power and stores it. The unit will then measure the optical power relative to the reference power. A loss in power will be displayed as a negative value.
	Prevents the unit from changing gain stages on its detector. This option is good if the user is measuring within a limited range of optical power as the accuracy will suffer if the power is not within the optimal limits for that gain stage.
	Other pages (Page 3 is blank).
 	Toggle channels ( <b>Page 2</b> )
	Returns to the Home Screen.

## Multichannel OPM Mode

This mode is capable of measuring output power simultaneously up to 24 individual optical power meters. Each of the functions of a state-of-the-art optical power meter such as multiple wavelength calibrations, absolute mode (dBm), and relative mode (dB) are applied to all channels simultaneously.

		MULTICHANNEL OPM 1310			
	$\lambda$	CH 01: ABS -10.20	CH 02: ABS -10.20	CH 03: ABS -10.22	CH 04: ABS -10.23
	$\frac{dB}{dBm}$	CH 05: ABS -9.86	CH 06: ABS -9.88	CH 07: ABS -9.88	CH 08: ABS -10.10
	Ref ALL	CH 09: ABS -11.02	CH 10: ABS -10.90	CH 11: ABS -10.56	CH 12: ABS -10.55
	$\frac{Run}{Stop}$	CH 13: ABS -71.30	CH 18: ABS -71.10	CH 19: ABS -70.50	CH 20: ABS -71.80
		CH 21: ABS -70.90	CH 22: ABS -70.80	CH 23: ABS -71.11	CH 24: ABS -70.85

		MULTICHANNEL OPM 1310			
	Ref	CH 01: ABS -10.20	CH 02: ABS -10.20	CH 03: ABS -10.22	CH 04: ABS -10.23
	Ch +	CH 05: ABS -9.86	CH 06: ABS -9.88	CH 07: ABS -9.88	CH 08: ABS -10.10
	Ch -	CH 09: ABS -11.02	CH 10: ABS -10.90	CH 11: ABS -10.56	CH 12: ABS -10.55
	Auto Hold	CH 13: ABS -71.30	CH 18: ABS -71.10	CH 19: ABS -70.50	CH 20: ABS -71.80
		CH 21: ABS -70.90	CH 22: ABS -70.80	CH 23: ABS -71.11	CH 24: ABS -70.85

Multichannel OPM screen (page 1)

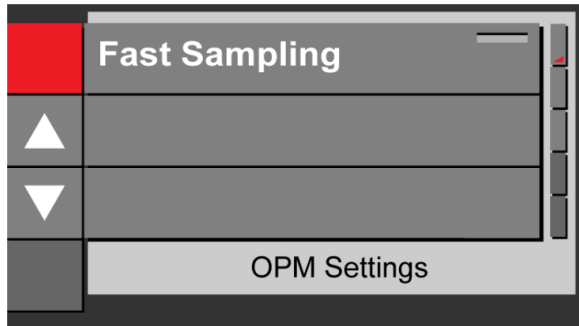
## OPM Screen Page 1 & 2

	Selected page.
	Changes the selected wavelength for the power meter for all channels. Typically, for power meters with InGaAs this is 850nm, 980nm, 1300nm, 1310nm, 1490nm, 1550nm, and 1625nm; and for Silicon Power Meters the wavelengths are 650nm, 850nm, and 980nm
	Switches the display between absolute (dBm) and relative (dB) measurement modes for all channels. The active mode will be in white.
	Performs a measurement of the current optical power and stores it. The unit will then measure the optical power relative to the reference power. A loss in power will be displayed as a negative value. <b>On Page 2, this button references the currently selected channel in the lighter frame.</b>
	Run or stop the continuous measurement of all channels.
	<b>On Page 2,</b> this prevents the unit from changing gain stages on its detector. This option is good if the user is measuring within a limited range of optical power as the accuracy will suffer if the power is not within the optimal limits for that gain stage for all channels.
	Other pages
	Toggle channels ( <b>Page 2</b> ). <i>Note: the selected channel can also be changed by pressing one of the channel displays.</i>
	Returns to the Home Screen.

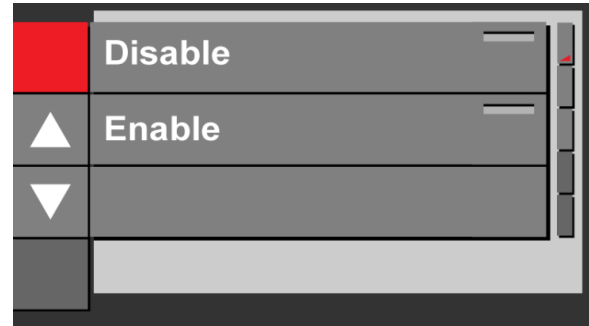
## Settings

The Settings Mode is designed to allow the user to configure certain parameters for the unit including sampling rate, startup mode and temperature.

### *Fast Sampling (OPM)*



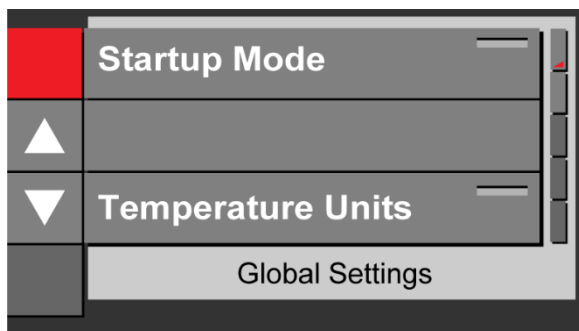
Settings screen (page 1)



Disable or enable fast sampling option

The standard sampling rate is **20 samples per second** via USB when fast sampling is **disabled**. The sampling rate is increased to allow up to **60 samples per second** via the USB when this option is **enabled**. Note: when fast sampling is enabled, this can increase the amount of noise in the power measurements.

### *Global Settings (Startup Mode and Temperature)*



Settings screen with startup Mode and temperature options (page 2)

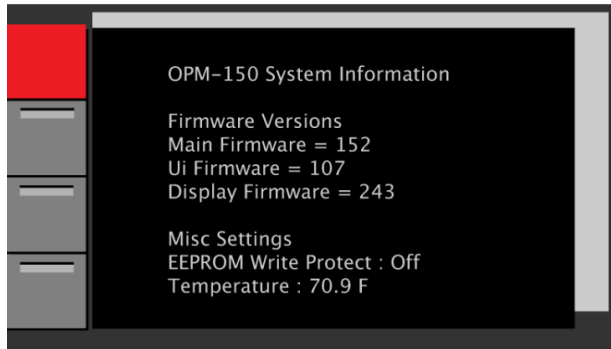
**Startup Mode** is a global setting which allows the operator to specify which Operation Mode to load each time the unit is powered on.

**Temperature Units** setting allows the operator to specify whether they would prefer the unit to display the ambient temperature in Celsius or Fahrenheit.

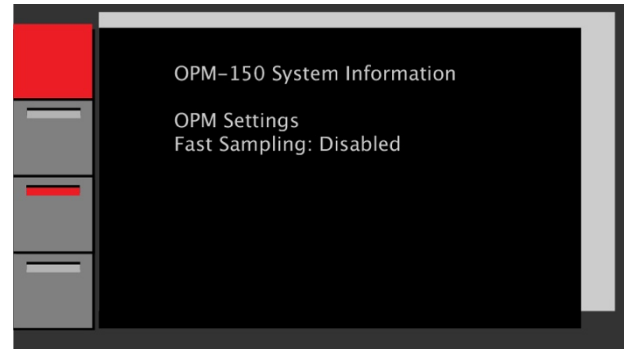


## Status Mode

The Status Mode is a troubleshooting tool which displays the state of the various user configurable settings on the OPM-150. It can also be used to quickly check the unit's settings before beginning to test. The settings, which are displayed on this screen, are as follows:



Status Mode Page 1



Status Mode Page 2



Status Mode Page 3

## Remote Mode

When the unit is connected via USB or ethernet and is communicating with the instrument, the remote mode screen will appear according to the figure below.



Remote mode screen

# 11

## SPECIFICATIONS

**Table 2: OPM-150 optical and electrical specifications sheet**

### OPM-150 Optical / Electrical Specifications

Parameter	Specification						
	1 mm InGaAs	3 mm InGaAs	5 mm InGaAs	10 mm InGaAs	2 mm HP InGaAs	3 mm Silicon	10 mm Silicon
Wavelength Range (nm)	850 to 1650					400 to 1100	
Power Range (dBm)	6 to -72	3 to -72	0 to -65	0 to -55	27 to -40	0 to -65	3 to -50
Total Uncertainty <sup>1</sup>	± 0.25 dB						
Power Resolution (dB)	0,001						
Linearity (dB) <sup>2,3</sup>	± 0.02 (< 10 dB)						
	± 0.05 (> 10 dB)						
Sampling Time	12.5 ms						
Remote Interface	USB or Ethernet						
Display	4.3" touch screen						
Power Supply	Input: 90 - 264 V AC, 47 - 63 Hz						
	Output: 18V DC, 5 A						
Power Consumption (VA)	36 maximum						

**Notes:**
<sup>1</sup> At calibration conditions for all NIST traceable wavelengths

<sup>2</sup> Measured for InGaAs at 1490 nm, between 3 to -65 for 1 mm, 0 to -65 for 3 mm, 0 to -55 for 5 mm, 0 to -45 for 10 mm

<sup>3</sup> Measured for Si at 980 nm, between 0 to -55 for 3 mm

### Mechanical / Environmental Specifications

Parameter	Specification
	OPM-150
Max Detector Count	24
Unit Dimension W x H x D (cm)	42.5 x 8.9 x 20.3
Operating Temperature (°C)	5 to 40
Humidity (Non-condensing)	Maximum 95% RH from 5 to 40 °C



In the event of any trouble with this product, turn the unit off in accordance with the procedures to shut off the power described in this operation manual, disconnect the power source cord, make sure the product name and serial number described on the name plate of the product, and then contact our dealer at your place or directly contact us at Santec Photonics Laboratories. Our telephone number and facsimile number are shown below. However, we are not responsible for any trouble arising from your own repair or modification on this product.

**SANTEC CORPORATION**

5823 Ohkusa-Nenjoyozaka, Komaki, Aichi, 485-0802, JAPAN  
Tel. +81-568-79-1959

**SANTEC U.S.A. CORPORATION**

400 Kelby Street, Suite 1501, Fort Lee NJ 07024 USA  
Tel. +1-201-488-5505 (santec-1)

**SANTEC EUROPE LIMITED**

Magdalen Centre, Robert Robinson Ave., The Oxford Science Park, Oxford OX4 4GA, U.K.  
Tel. +44-1865-784960

**SANTEC (SHANGHAI) CORPORATION, LIMITED**

Shanghai Industrial Investment Building 18C, 18 Cao Xi Road (N), Shanghai 200030, P.R. China  
Tel. +86-21-64279089

**SANTEC CALIFORNIA CORPORATION**

4750 Calle Quetzal, Camarillo, CA, 93012, U.S.A.  
Tel. +1-805-987-1700

**SANTEC CANADA CORPORATION**

160 Michael Cowpland Drive, Ottawa, Canada, K2M 1P6  
Tel. +1-613-599-1000

**[www.santec.com](http://www.santec.com) email:[info@santec.com](mailto:info@santec.com)**