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Model 8800/8200 Photonics Test System

User's Manual

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Certificate No.: FM 27207

Newport Corporation, Irvine, California, has been certified compliant with ISO 9002 by the British Standards Institution.

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EU DECLARATION OF CONFORMITY

We declare that the accompanying product, identified with the CE mark, complies with requirements of the Electromagnetic Compatibility Directive, 89/336/EEC and Low Voltage Directive 73/23/EEC.

Model Number: **8800/8200**

Year CE mark affixed: **2000**

Type of Equipment:

Electrical equipment for measurement, control and laboratory use

Standards Applied:

Compliance was demonstrated to the following standards to the extent applicable:

BS EN61326: 1998 "Electrical equipment for measurement, control and laboratory use – EMC requirements"

This equipment meets the CISPR 11 Class A radiated and conducted emission limits.

BS En 61000-3-3, Voltage fluctuations and flicker

BS EN 61010-1 "Safety requirements for electrical equipment for measurement, control and laboratory use"

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CHAPTER 1

1 General Information

1.1 Introduction

This chapter describes the features, options, accessories, and specifications of the Model 8800 and Model 8200 Photonics Test Systems.

In most cases, references to the "8800" or "Model 8800" will be applicable to both the 8-channel Model 8800 Photonics Test System and the 2-channel Model 8200 Photonics Test System. Sections that deal with a specific model will be indicated as such.



Figure 1 – Model 8800 and 8200 Photonics Test Systems

1.2 Model 8800 / 8200 Mainframe

The Model 8800 Photonics Test System is a result of Newport's continuing commitment to provide photonics test equipment at affordable prices. The module bays are designed to accept a wide variety of modules that allow the user to construct many different test systems.

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The Model 8800 and Model 8200 are modular instrumentation platforms that allow the end-user to configure an application specific photonics test system. These instruments feature eight plug-in bays for the Model 8800 and two plug-in bays for the Model 8200 that accommodate a variety of interchangeable plug-in modules, including stabilized light sources, optical power and wavelength meters, optical attenuator, and optical switches. Multiple systems can be interconnected to increase channel density and many other modules are currently in development, resulting in an ever-growing module portfolio. Advanced designs guarantee that the Model 8800 will accommodate future modules, making this controller the most complete instrument for fiber optics test and measurement.

The 8800 platform primarily targets the testing and qualification of optical fibers and fiber optic components in an R&D, QA/QC, or manufacturing environment. The instrument's versatility, enabled by the multitude of available modules, also makes it extremely useful in fiber optic sensor, medical, and bio-photonics applications.

The instrument mainframe contains the power supply, central processor, and communication functions. Foldout legs are included and rack mount kits are optional, allowing either bench top or instrumentation rack configurations.

Both mainframes feature an auto-detect mechanism, recognizing the modules inserted upon power up. A backlit LCD display is used to display either module-specific status information or test specific data. Modules can be individually addressed by selecting one of eight keys located around the display, or by pressing a short-cut key located on each module.

The Photonics Test System's Control Software enables the user to link various modules, thereby defining a specific test configuration. The software also allows connectivity to external instruments, further extending the platform's utility.

The Model 8800/8200 can be controlled via its internal soft-key addressable menu structure or remotely by a PC via RS-232, GPIB/IEEE-488.2, or Universal Serial Bus (USB) connection.

1.3 GPIB/IEEE-488.2, RS-232, and USB Interface

GPIB/IEEE-488.2, RS-232, and USB interfaces allow the user to remotely control and collect data. All control and measurement functions are accessible via the remote interface.

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1.3.1 Product Features

- Eight module bays in Model 8800 (two module bays in Model 8200)
- GPIB/IEEE 488.2, RS-232, and USB Interface
- Modular platform for flexible, user defined test setup
- Numerous modules available to cater to all photonics needs
- Several systems can be interconnected for increased channel density
- Bench top or rack mounted configurations

1.3.2 Available Mainframe Test Modules

- Stabilized Light Sources
- Optical Power Meters
- Wavelength Meter
- Optical Switches
- Optical Attenuator
- Broadband Light Source

1.3.3 Available Options and Accessories

- 8800-Rack Mount Kit
- 8200-Rack Mount Kit

1.4 Safety Terms and Symbols

1.4.1 Terms

The following safety terms are used in this manual:

- The **WARNING** heading in this manual explains dangers that could result in personal injury or death.

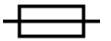
- The **CAUTION** heading in this manual explains hazards that could damage the instrument.

- The **NOTES** heading provides information to the user that may be beneficial when using this instrument.

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1.4.2 Symbols

The following symbols are used in this manual and on the instrument:

-  Refer to the documentation for proper operating instructions.
-  Protective earth ground connection.
-  Fuse symbol with voltage and amperage information.
-  Caution, risk of electrical shock.
-  This product is "CE" certified.
-  ON/OFF
-  Caution, laser radiation emitted.

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1.5 General Warnings and Cautions

The following general warnings and cautions are applicable to this instrument:

CAUTION

Do **NOT** plug-in or unplug a module with the AC power ON.

CAUTION

There are no serviceable parts inside the Model 8800. Work performed by persons not authorized by Newport Corporation may void the warranty. For instructions on obtaining warranty repair or service please refer to Chapter 10 of this manual.

CAUTION

Although ESD protection is designed into the 8800, operation in a static-free work area is required. The light source modules contain laser diodes.

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

WARNING

This instrument is intended for use by qualified personnel who recognize shock hazards or laser hazards and are familiar with safety precautions required to avoid possible injury. Read the instruction manual thoroughly before using, to become familiar with the instrument's operations and capabilities.

WARNING

The American National Safety Institute (ANSI) states that a shock hazard exists when probes or sensors are exposed to voltage levels greater then 42 VDC or 42V peak AC. Do not exceed 42V between any portion of the Model 8800 (or any attached detector or probe) and earth ground or a shock hazard will result.

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WARNING

The Model 8800 can weigh approximately **40 lbs. (18 kg)** with modules installed. To avoid injuries, use proper moving equipment whenever possible and use extreme care when moving or installing the mainframe.

WARNING

Any use of the Model 8800 not specified by Newport Corporation, or failure to comply with precautions or specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of this equipment. Violation of safety standards and misuse of equipment may cause damage or injury.

WARNING

Do not use a damaged AC power cord. Failure to comply with this warning may result in electrical shock or damage to the equipment.

WARNING

Disconnect AC power before cleaning.

WARNING

Disconnect AC power before checking or replacing fuses.

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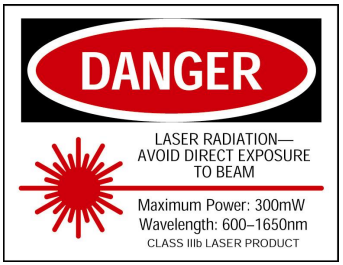


Figure 2 – Laser Radiation Specifications Danger Label

Laser Danger Label – This label indicates that this laser product is class IIIb in compliance with FDA 21 CFR 1040.10.

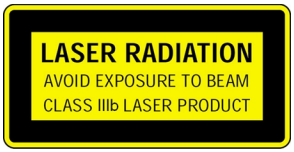


Figure 3 – Class IIIb Laser Product Warning Label

Laser Radiation Warning Label – This label indicates that this laser product is class IIIb in compliance with EN 60825-1.



Figure 4 – Warning Label, Hazard Symbol

Warning Label, Hazard Symbol (EN 60825-1) – Avoid exposure: Laser radiation emitted from this aperture.

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1.6 Model 8800 / 8200 Mainframe Specifications

Model 8800/8200 Mainframe Specifications

Type	LCD graphics display, 240 (W) x 128 (H) pixels
Back Lighting	Green LED
Controls	Brightness and Contrast (contrast optimizes viewing angle)
Channel Active	Green LASER ACTIVE LED indicates that at least one Laser Diode output is on and the LCD graphics shows details of active channels.
Mainframe Output Connectors: Chassis Ground GPIB Connector RS-232 Connector USB Connector Group Sync In/Out Key Control Input Power	 4 mm Banana Jack 24-pin IEEE-488 One 9-pin male D-sub USB BNC One 9-pin female D-sub IEC 320 C14 input
Power Requirements	***8800:*** 100/120/220/240 VAC, 5.00 Amp Max. (user selectable), 50/60 Hz ***8200:*** 100/120/220/240 VAC, 2.50 Amp Max. (user selectable), 50/60 Hz
Size (H x W x D)	***8800:*** 13.3 cm x 43.8 cm x 41.4 cm (5.23 in. x 17.26 in. x 16.28 in.) ***8200:*** 13.3 cm x 22.5 cm x 41.4 cm (5.23 in. x 8.86 in. x 16.28 in.)
Mainframe Weight *(with no modules installed)*	***8800:*** 14.3 kg (31.5 lbs.) ***8200:*** 7.3 kg (16.0 lbs.)
Operating Temperature/Humidity	5°C to 40°C, < 70% relative humidity non-condensing
Storage Temperature/Humidity	-20°C to 60°C, < 90% relative humidity non-condensing
Operating Altitude	< 2000 meters (6562 feet)
Installation Category	II
Pollution Degree	2
Laser Safety Features	Laser, Key Control, Output Delay (meets CDRH US21 CFR 1040.10)
Instrument Use	The Model 8800/8200 is intended for indoor use only.

Table 1 – Model 8800/8200 Mainframe Specifications

NOTE

In accordance with ongoing efforts to continuously improve our products, Newport Corporation reserves the right to modify product specifications without notice and without liability for such changes.

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C H A P T E R 2

2 Model 8800/8200 PC-Based Control Software

2.1 Newport Photonics Test Studio Control Software

2.1.1 Introduction

The Model 8800 software package, Photonics Test Studio, is a Windows 98 or NT 4.0 application that allows the user to control all aspects of the Model 8800 from any PC equipped with GPIB, Universal Serial Bus (USB), or RS-232 serial ports. The software is designed to simplify the operation of the Model 8800 by using a familiar Windows-style user interface and to allow the integration of multiple 8800s in a single application.

Test Studio operates by treating each module in an 8800 as a separate window or "ActiveX" control, which allows the user to interact with only the modules needed. Module windows can be easily resized to maximize available screen space. In addition, the user can create different workspaces, where a selection of module windows can be opened and arranged as a custom work area. This can be useful when working setups for different test applications. These workspaces can be saved and later recalled, allowing each setup to have a separate work area.

Graphs, tables, and charts are used for different modules, as needed, to display current and historical data. For example, the power meter module can be configured to display power levels over several hours or as configured by the user. This data can be saved as an ASCII file to import into other applications such as Microsoft Excel or it can be printed as a graph. Continuous data logging is also available for storing information over long periods of time.

Additional functions may also be added, extending the application beyond simple instrument control.

Please see the Photonics Test Studio Users Manual for installation and operation of the control software.

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2.1.2 Software Product Features

- Provides interrelation of instruments and devices
- Provides real-time monitoring of controls through Test Studio or standalone module control Applets
- Provides customizable toolbars and menus
- Provides a selection of modules that can be opened and arranged in a custom work area
- Provides a familiar Windows-style user interface

2.1.3 Test Studio Control Software

A PC equipped to run the Photonics Test Studio software must have the following minimum requirements:

- IBM-compatible
- Pentium II processor
- Microsoft® Windows 98 or Windows NT®
- 32 MB of RAM
- 20 MB of available hard drive space
- A GPIB, RS-232, or USB communication interface with cable
- CD-ROM drive

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CHAPTER 3

3 System Operation

3.1 Introduction

This chapter describes how to operate the Model 8800 mainframe. Module-specific details can be found in the module's manual.

3.2 Instrument Installation and Setup

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

WARNING

The Model 8800 can weigh approximately **40 lbs. (18 kg)** with modules installed. To avoid injuries, use proper moving equipment whenever possible and use extreme care when moving or installing the mainframe.

CAUTION

Although ESD protection is designed into the 8800, operation in a static-free work area is required. The light source modules contain laser diodes.

Use extreme care when moving and installing the Model 8800/8200 mainframe. Before moving the unit, disconnect any communications cables and power cords. When lifting the unit, ensure that the entire unit is well supported on the bottom and the sides. When moving the instrument using a cart, dolly, or any other piece of moving equipment, secure it carefully to prevent the instrument from falling off the equipment.

Due to the weight of the instrument with modules installed, try to use two people to lift the unit when fully loaded to help distribute the weight. If no additional help is available, it may be necessary to remove some or all of the modules in order to safely move the instrument.

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3.2.1 Installing and Removing Modules

The following sections provide instructions for the installation and removal of testing modules for the Model 8800/8200 Photonics Test System.

3.2.1.1 Installing Modules

The Model 8800 and 8200 mainframes can accept any eight test modules (two modules for the 8200) in any order.

To install a test module follow these steps:

1. Turn the mainframe power OFF by pressing the power button located in the lower left corner on the front of the mainframe, under the LCD display screen.

CAUTION
Do **NOT** plug-in or unplug a module with the AC power ON.

2. Starting with position 1, align the module with an empty module bay in the mainframe and slide the module into the mainframe.

   Verify that the module inserts straight into the empty bay. The last 1/4-inch will require a small increase in force as the module engages a 96-pin connector at the back of the module bay.

NOTE
Do not use excessive force when installing test modules!

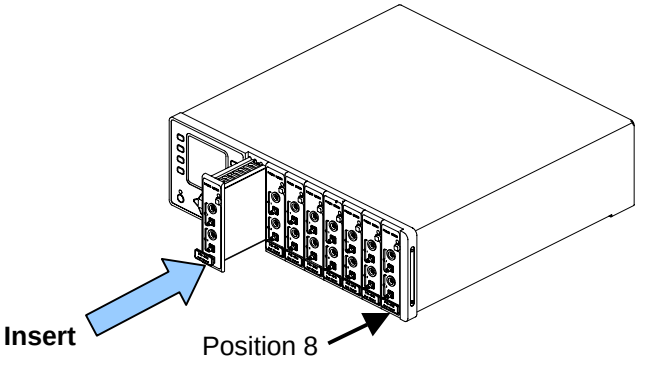


Figure 5 – Inserting a Test Module

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3. Once the module is completely inserted into the mainframe, depress the lock at the bottom of the module (push down on the rectangular tab), and slide the lock downward until the lock remains depressed.

   Refer to **Figure 6** and **Figure 7** for an example of the unlocked and locked positions for the lock tab.

CAUTION
Do **NOT** plug-in or unplug a module with the AC power ON.

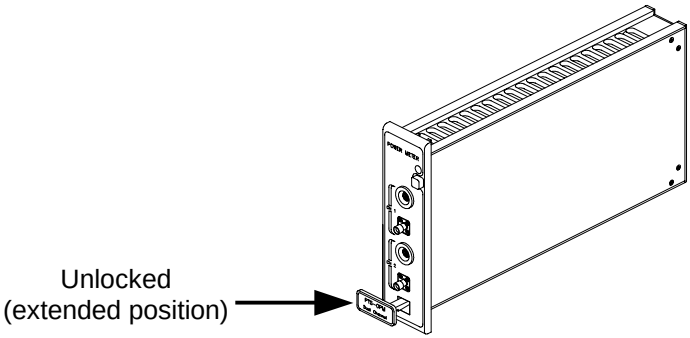


Figure 6 – Unlocked Test Module

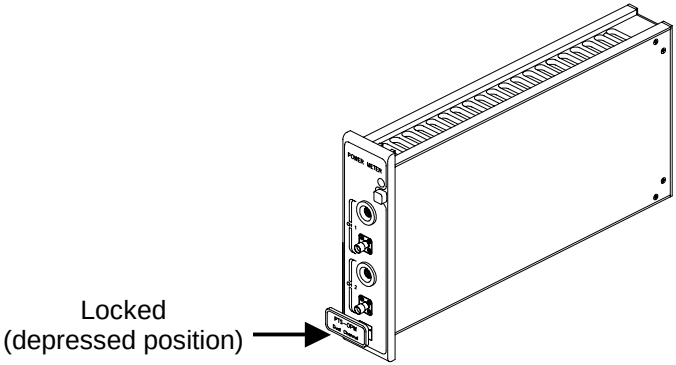


Figure 7 – Locked Test Module

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4. When properly installed, the module will be flush with the front panel and other modules (see **Figure 8**).

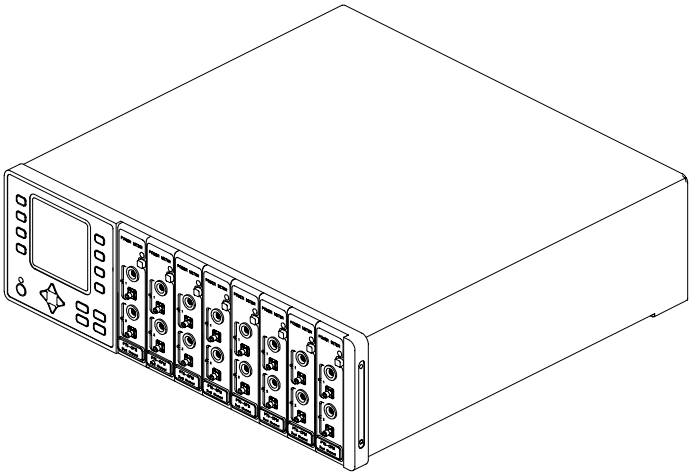


Figure 8 – Inserted Modules

CAUTION
Do **NOT** plug-in or unplug a module with the AC power ON.

3.2.1.2 Removing Modules

The Model 8800 and 8200 mainframes can accept any eight test modules (two modules for the 8200) in any order.

To remove a test module follow these steps:

1. Turn the mainframe power OFF.

CAUTION
Do **NOT** plug-in or unplug a module with the AC power ON.

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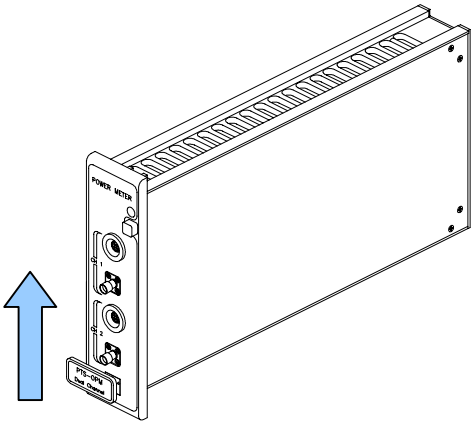


Figure 9 – Unlocking a Test Module

2. Slide the lock mechanism up. The lock will extend to its unlocked position (see **Figure 6**).

3. Using the lock mechanism, pull the module out of the mainframe.

CAUTION

Do **NOT** plug-in or unplug a module with the AC power ON.

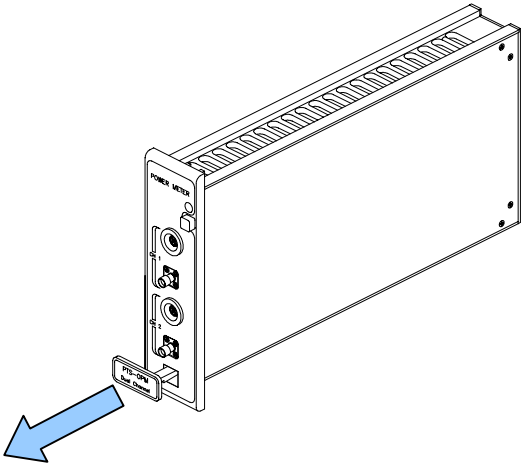


Figure 10 – Removing a Test Module

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4. Pull the extended lock until the module disengages from the mainframe and slides completely out of the mainframe.

CAUTION
Do **NOT** plug-in or unplug a module with the AC power ON.

3.2.2 AC Power Considerations

WARNING
ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

WARNING
To avoid electrical shock hazard, connect the instrument to properly earth-grounded, 3-prong receptacles only. Failure to observe this precaution can result in severe injury or death.

CAUTION
Do not exceed 250 VAC on the line input.

Do not operate with a line voltage that is not within ±10% of the line setting. Too low of an input voltage may cause excessive ripple on the DC supplies. Too high of an input voltage will cause excessive heating.

The 8800 can be configured to operate at a nominal line voltage of 100, 120, 220, or 240 VAC. Normally, line voltage is configured at the factory based on the particular needs of the customer and need not be changed before operating the instrument. However, the operator should verify that the voltage setting is correct on the power input module. See **Figure 11** and **Section 3.2.3** for instructions on how to change the voltage setting if necessary. The 8800 is shipped set for 120 VAC and a caution sticker is placed on the input power connector.

Verify that the correct fuses are installed before connecting to an AC power source.

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The main supply voltage should not fluctuate more than 10 percent of the nominal supply voltage.

See **Figure 57** and **Section 10.2** on changing fuses if necessary.

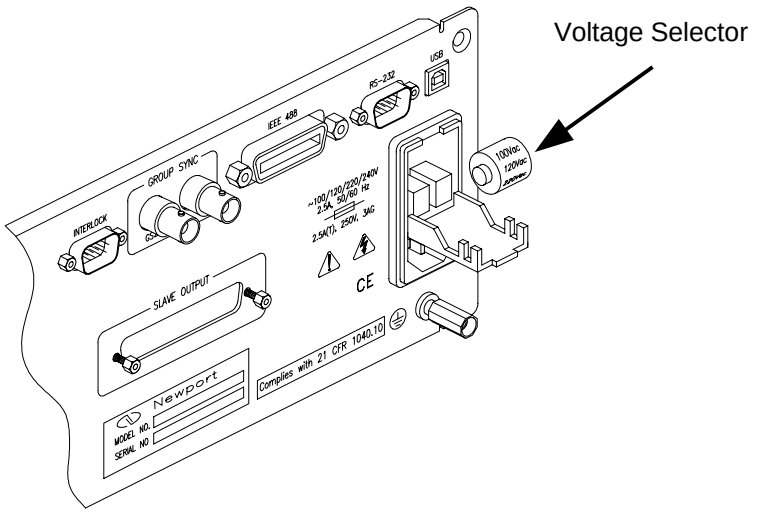


Figure 11 – Voltage Selector

3.2.3 Changing Voltage Settings

The Model 8800 can operate on several different supply voltages. Before powering up the unit, check the facility voltage supply, and select the appropriate voltage according to the procedure below.

Use the following procedure to change the Model 8800 voltage setting:

1. Referring to **Section 10.2 – Fuse Replacement**, open the power entry module cover.

2. Referring to **Figure 11**, remove the voltage selector drum.

3. Rotate the voltage selector until the appropriate voltage will be viewed through the voltage window.

4. Reinsert the voltage selector.

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5. If necessary, change the fuses according to the procedure found in **Section 10.2 – Fuse Replacement**.

6. Close the power entry module cover.

7. Verify that the correct voltage is displayed through the voltage window.

3.2.4 Tilt-Foot Adjustment

WARNING

The Model 8800 can weigh approximately **40 lbs. (18 kg)** with modules installed. To avoid injuries, use proper moving equipment whenever possible and use extreme care when moving or installing the mainframe.

The 8800 has front legs that extend to make it easier to view the LED displays when placed on a flat surface, such as a bench top or table.

Use the following procedure to extend the tilt-feet:

1. Place the 8800 on a flat stable surface.

2. Lift the front end of the 8800, and rotate the legs downward until they lock into position. Ensure that the instrument is stable when placed on the work surface.

3.2.5 Rack Mounting

The 8800 may be rack mounted by using a Model 8800 Rack Mount Kit. Please refer to the information included with the Model 8800/8200 Rack Mount Kit for detailed mounting instructions.

WARNING

The Model 8800 can weigh approximately **40 lbs. (18 kg)** with modules installed. To avoid injuries, use proper moving equipment whenever possible and use extreme care when moving or installing the mainframe.

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3.2.6 Ventilation Requirements

The rear panel area requires two (2) to four (4) inches of clearance for adequate air circulation. Ensure that the fan area in the back of the unit is unobstructed to allow for proper airflow through the unit.

3.3 Power-Up Sequence

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

With the 8800 Mainframe connected to an AC power source and the correct voltage selected, turn the mainframe ON by pushing the **Power** button on the left side of the front of the mainframe below the LCD display screen. This will supply power to the instrument and start the power-up sequence. During the power-up sequence, the following takes place:

An initialization screen is shown for 15 to 20 seconds and then each power meter module requires an additional 15 seconds during initialization. The firmware version is displayed in the lower left corner of the screen. During this time a self-test is performed to ensure that the 8800 hardware and firmware are communicating.

If the 8800 cannot successfully complete this test, an error message will be displayed on the LCD display on the front of the mainframe.

After the 8800 goes through its power-up sequence and initialization, it configures itself to the state it was in when the power was last turned off and displays the Master Menu. The Master Menu displays each module installed in the Model 8800 Test System.

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3.4 Front Panel Familiarization

The front panel functions are described below (see **Figure 12**).

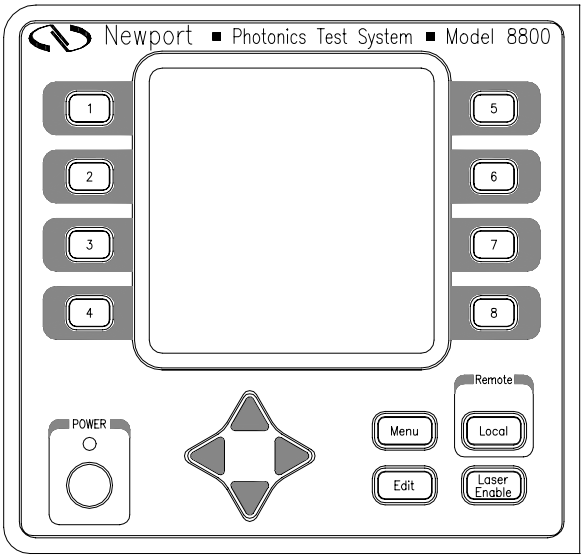


Figure 12 – Model 8800/8200 Front Panel

3.4.1 Front Panel Keys

The following keys are located on the front panel of the Model 8800/8200 main chassis.

1. **Power On/Off Button** – The Power button toggles the Model 8800 ON and OFF:

   - To turn the unit **ON**, depress the Power button until it clicks and stays in the depressed position. An amber light is displayed just above the power button when the Model 8800 is ON.
   - To turn the unit **OFF**, press the Power button again until it clicks and returns to its original position.

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2. **Laser Enable Button** – Accesses the Light Source Enable Password screen and/or enables/disables ALL laser outputs from light source module(s) installed in the Model 8800/8200 chassis.

NOTE

In order for the light source module to work, a key must be inserted into the key (INTERLOCK) connector on the rear panel of the Model 8800/8200 AND the Light Source Enable Password must be entered. The light source will not operate without the key in place AND the Light Source Enable Password entered.



Avoid exposure: Class IIIb laser radiation emitted. Always replace laser safety covers on light source output connector AND deactivate the light source when not in use!

- **Enabling Light Source** – If the amber "Ready" LED on the light source module is not already illuminated, pressing the Laser Enable button will display the Light Source Enable screen that allows the user to enter the proper password to enable the light source. Once the password is entered, pressing the Laser Enable button again enables ALL of the installed light source modules. Refer to **Section 3.11** for the enable code and additional light source enabling information.

- **Disabling Light Source** – If the amber "Ready" LED on the light source module is illuminated, pressing the Laser Enable button disables ALL installed light source modules. The password must then be reentered to activate the light source again.

3. **Soft Keys (1 to 8)** – These eight light color keys located immediately to the left and right of the LCD display are labeled 1 through 8. The function of each of these eight keys varies, depending on which menu is displayed. See **Section 3.7.5.2** for a complete description of these keys.

4. **Menu Key** – Returns to the master display screen or the main from any screen in the system. When at the Main Menu or the Master Display screen, the Menu Key toggles between the Main Menu and the Master Display screen.

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5. **Arrow Keys** – The blue up/down (▲▼) and left/right (◀▶) arrow keys are provided on the front of the mainframe just below the display. Use the up and down arrow keys to move from one data field to another. The left and right arrow keys enable the user to change data in the editable data fields.

NOTE
A data field is defined as a highlighted "button" on the display and is editable depending on what value it represents.

6. **Local** – The 8800 is placed in Remote mode either through GPIB, RS-232, or USB interface. When the unit is in Remote mode, pressing the Local soft key takes the 8800 out of software control (external application), and returns the unit to a local instrument state of control allowing the user to operate and edit the 8800 directly via the front panel. A green light is displayed just above the **Local** key when the 8800 is in Remote mode.

7. **Edit** – The functionality of the Edit button is to be determined by Newport Corporation.

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3.5 Module Description (Light Source Module Example)

The various Model 8800 modules have different features and functions available on the module case and front panel. Each module is self-contained and can be plugged into any open slot in the mainframe. Where necessary, each module is clearly labeled with important safety information. As an example, the features and labels for a Stabilized Light Source Module side and front panel are described in the section below.

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

3.5.1 Module Side Panel Description (Light Source Module Example)

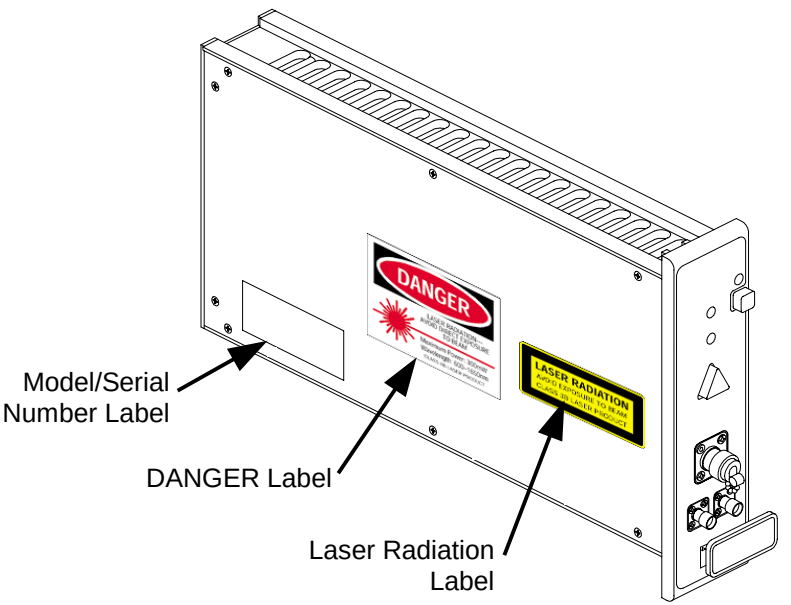


Figure 13 – Stabilized Light Source Module Hazard Labels on Left Side

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1. **DANGER Label (red, white, and black)** – Alerts user to the danger and specifications of this laser product. This label indicates that this laser product is class IIIb in compliance with FDA 21 CFR 1040.10.



Figure 14 – Laser Radiation Specifications Danger Label

2. **LASER RADIATION Warning Label (yellow and black)** – Alerts the user to the possibility of being exposed to a class IIIb laser beam. This label indicates that this laser product is class IIIb in compliance with EN 60825-1.



Figure 15 – Class IIIb Laser Product Warning Label

3. **Serial Number Label** – Displays the Newport Corporation model number and unique serial number information for the module.



Figure 16 – Newport Model/Serial Number Label

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3.5.2 Module Front Panel Description (Light Source Module Example)

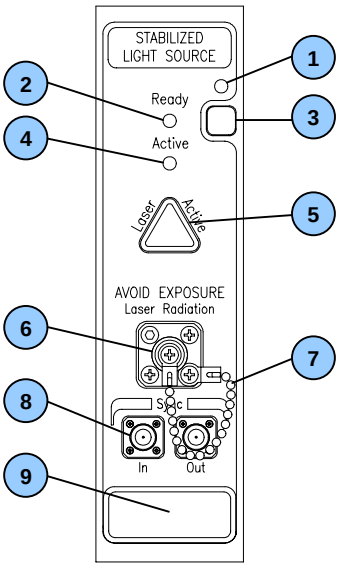


Figure 17 – Stabilized Light Source Module Front Panel

1. **Active Module LED (green)** – The Active Module LED indicates that the module is powered up and ready for use.

2. **Ready LED (amber)** – The Ready LED indicates that the Light Source Enable Password has been entered properly and that the light source is powered up and ready for use.

   Refer to **Section 3.11 Light Source Enable Password Screen** for additional information about the Light Source Enable Password.

NOTE

In order for the light source module to work, a key must be inserted into the key (INTERLOCK) connector on the rear panel of the Model 8800/8200 AND the Light Source Enable Password must be entered. The light source will not operate without the key in place AND the Light Source Enable Password entered.

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3. **Module Select Button (gray)** – The gray module select button activates the module and changes the display screen to the control menu for that module. This button performs the same function as selecting the module(s) from the Main Module Menu

4. **Active LED (green)** – The Active LED indicates that the laser light source is active (ON).



Avoid exposure: Class IIIb laser radiation emitted. Always replace laser safety covers on light source output connector AND deactivate the light source when not in use!

5.  **Laser Active Button** – Use the Laser Active button to enable and activate the laser light source for the module.

NOTE

In order for the light source module to work, a key must be inserted into the key (INTERLOCK) connector on the rear panel of the Model 8800/8200 AND the Light Source Enable Password must be entered. The light source will not operate without the key in place AND the Light Source Enable Password entered.



Avoid exposure: Class IIIb laser radiation emitted. Always replace laser safety covers on light source output connector AND deactivate the light source modules when not in use!

6. **Light Source Output Connector** – Output connector for the light source module fitted with removable laser safety cover. Note that there are different types of connectors that are available for each module.

7. **Laser Safety Cover with Chain** – Manually fastened light source output connector cover used to terminate the laser beam at the output connector. The chain connected to the cover prevents the cover from getting misplaced when not fastened to the connector.



Always replace laser safety covers on light source output connector AND deactivate the light source modules when not in use!

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The cover must be fastened properly per the following instructions when no instruments are connected to the output connector:

- Rotate the cover *clockwise* to tighten and *secure* the output connector cover.

- Rotate the cover *counterclockwise* to loosen and *remove* the output connector cover.

8. **Input, Output, and Fiber Optic Connectors** – Connectors for the various inputs and outputs for the module. Note that there are different types of connectors that are available for each module.

9. **Module Insertion and Removal Handle** – The module insertion and removal handle is used to help install, lock, and remove the module from the mainframe.

3.6 Fiber Optic Connector Types

The Model 8800 modules accept a variety of different fiber optic connector types. When the modules are ordered, part of the module's model number that is specified contains the code for the connector type and fiber end finish. It is important that the proper connector type is specified to ensure that all components are compatible. Usual connector types available for the various Model 8800 modules include FC, SC, and ST. See **Section 10.3.3** Fiber Optic Connector Cleaning and End Preparation for additional connector information.

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

NOTE

Clean connectors in good condition are essential to optimum fiber optic performance and accurate measurements. Before making any fiber optic connections, refer to **Section 10.3.3.2** Cleaning Fiber Optic Connector for details.

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3.7 General Operation

3.7.1 Display Elements

The Model 8800 uses a graphical display to depict information about the current state of the system. The display can be broken up into four basic elements: static fields, non-editable data fields, editable data fields, and soft key labels (see **Figure 18**).

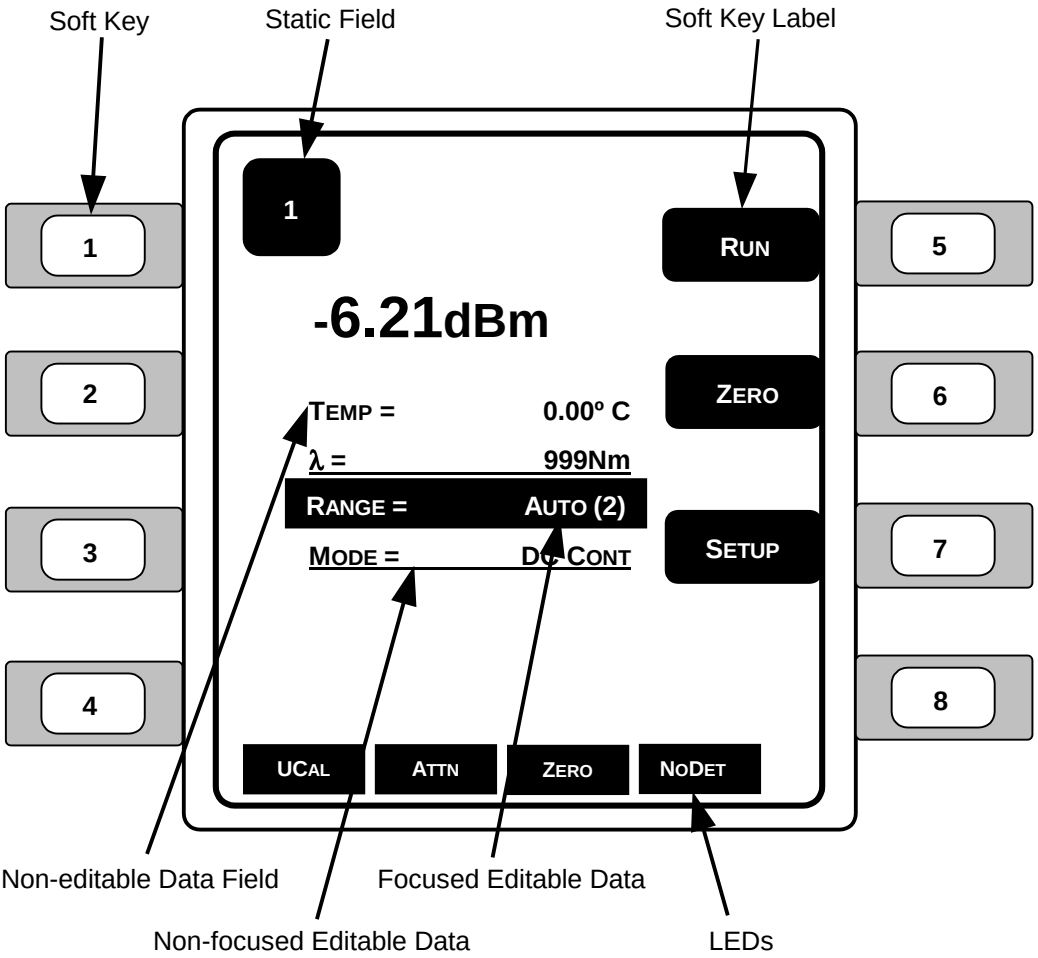


Figure 18 – Various Data Fields Found on the Master Display

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3.7.2 Navigating Data Fields

Blue up/down and left/right arrow keys are provided on the front of the mainframe just below the display screen:

- The up and down arrow keys (▲▼) are used to move up and down from one data field to another. The currently selected editable data field is shown as highlighted or in "focus".
- The left and right arrow keys (◀▶) allow the user to change data in the currently selected editable data field.

3.7.3 Static Fields

Static fields are elements on the display that are fixed in time and do not change from moment to moment. These can include help text, screen titles, and error messages.

3.7.4 Non-Editable Data Fields

Non-editable data fields are used mainly to display sensor feedback information. These fields can have a prefix or suffix label, such as "**mW**", "**dBm**", or "**mA**" and are periodically updated by the system.

3.7.5 Editable Data Fields

Editable data fields are used for module and system settings such as current set point, temperature set point, display contrast, etc. An editable field has three distinct display states: focused, non-focused, and read-only.

The focused state indicates that the field has the input "focus." When the field has the focus, it is shown in reverse color (white text on a black background if the display is not inverted). Use the right and left blue arrow keys to make adjustments to the field. Only one field at a time can have focus. Move between fields by using the up and down blue arrow keys.

When the user starts to make changes to the data field using the left/right arrow keys, the field enters the focused and editing state.

The non-focused state indicates that the field is editable, but does not currently have the focus. These fields are drawn with a solid underline. Using the up and down arrows, focus can be moved to these fields.

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When the editable data field is in the read-only state, it looks and acts exactly like a non-editable data field. Like the non-editable data field, the editable data field cannot have focus, and the up or down arrow keys will skip over the field. This state is used primarily to lock out specific data elements from being changed at the front panel when the Model 8800 is in remote mode. Any IEEE-488, RS-232, or USB communication will place the unit in remote mode, and editable fields that are protected during remote operations change to the read only state.

3.7.5.1 Changing Data Fields

A data field can only be changed from the front panel when the field has the focus. Some fields are numeric-based, such as the current set point or temperature limits. Other fields are multiple-choice fields, such as Yes/No fields. Both types can be edited with using the left and right arrow keys.

3.7.5.2 Soft Key Labels

Soft key labels are labels for the buttons located immediately to the right and left of the LCD display screen and are labeled 1 through 8. Each label either indicates the action that is performed when the corresponding physically numbered key is pressed (such as changing screens) or the label indicates the state of a data element in the system. Like the editable data fields, certain soft keys are programmed to enter a read-only mode when the unit enters remote mode. Read-only soft keys are displayed as an outline rather than a solid block.

3.7.6 LEDs

The "Light Emitting Diodes" (LEDs) or enunciators display status and error conditions. An LED will only be displayed if and when that condition is met. For instance, if the "NoDET" LED is illuminated, the system is indicating that no wavelength detector unit is installed or that the detector is not functioning properly.

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3.8 Menu Structure

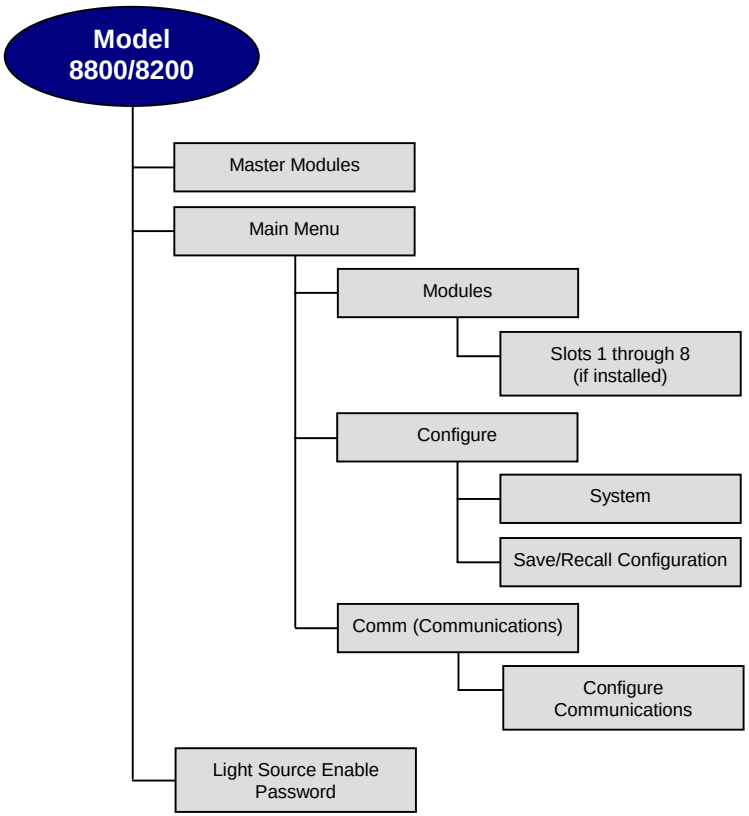


Figure 19 – Model 8800/8200 Menu Structure

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3.9 Master Modules Screen

An example of the Master screen is shown in **Figure 20**. The Master screen is the highest-level display and indicates the general status of the modules installed in the system. Certain parameters on each module may also be changed on the Master screen using the blue arrow buttons.

Pressing one of the eight soft keys immediately to the left and right of the display or pressing the gray button on the module changes the screen to the selected module's settings. Once in the module view, the user may view and edit the module's setup information and parameters.

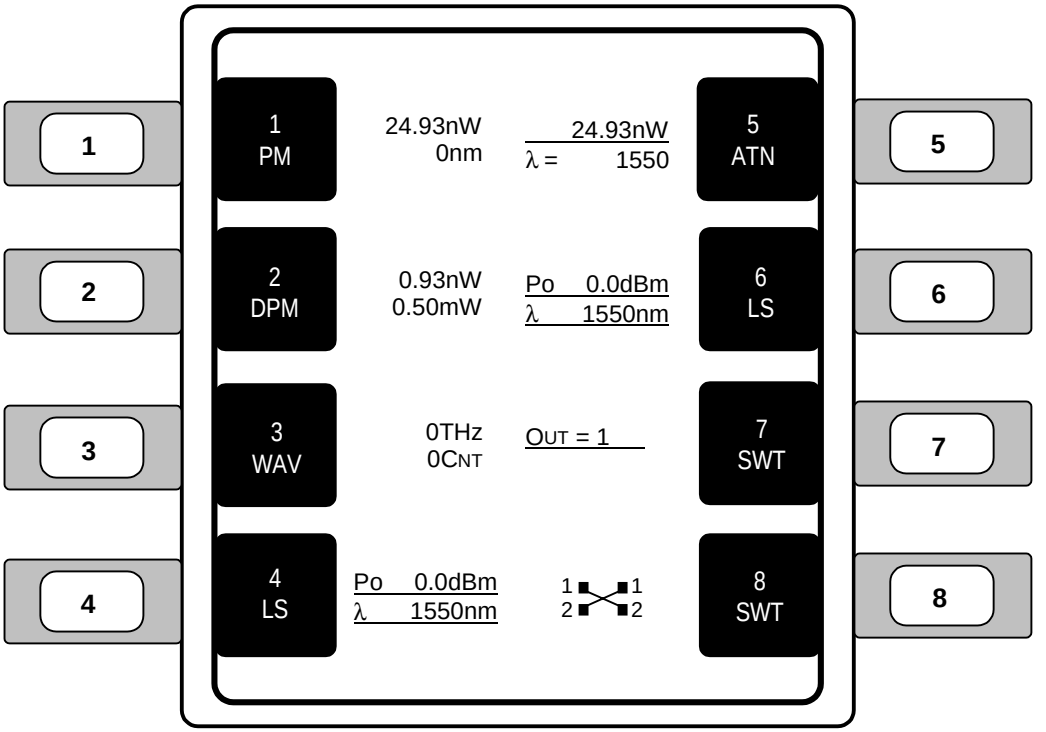


Figure 20 – Master Modules Screen

The order in which the modules are inserted into the Model 8800 mainframe determines how the buttons on the Master Screen are arranged. For example, if a light source module is inserted into the number six bay of the mainframe, as in **Figure 20**, a light source label will appear as a number 6 soft key. Access to the light source will be through the number 6 soft key or by pressing the gray module selection button on the Light Source module itself.

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3.10 Main Menu Screen

The Main Menu Screen is shown in **Figure 21**. The Main Menu is the second highest menu and is displayed (toggled) using the Menu key on the Model 8800 front panel.

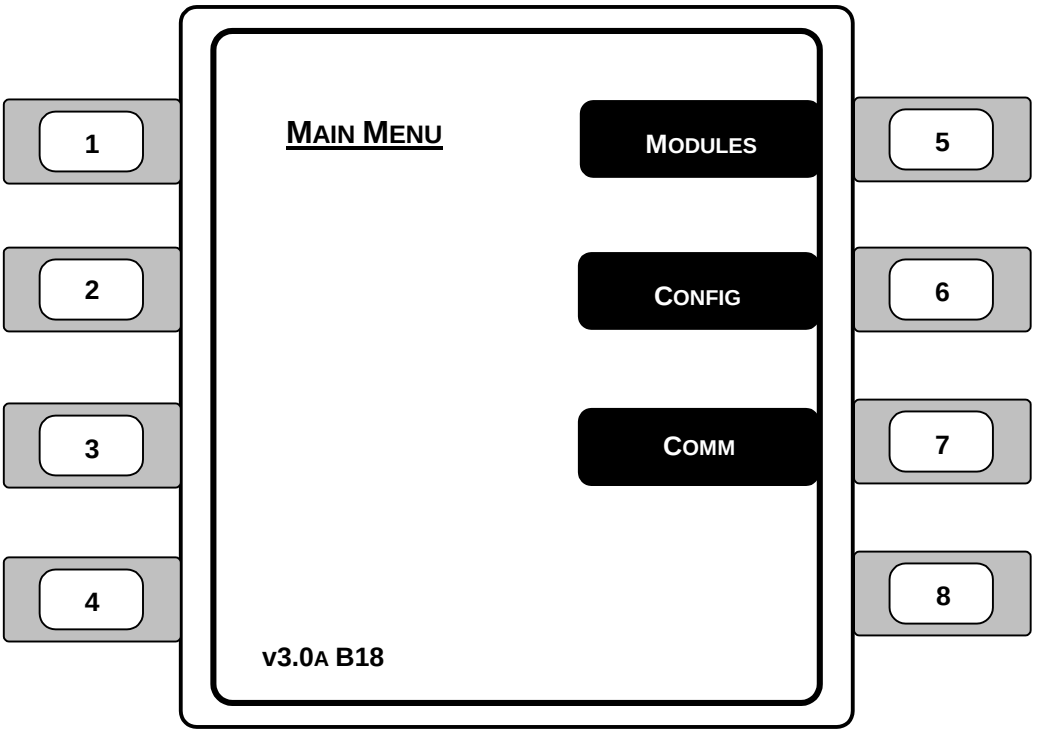


Figure 21 – Main Menu Screen

1. **MODULES** – Pressing the adjacent soft key allows the user to access setup and control functions of each module. See **Figure 22** for details.

2. **CONFIG** – Pressing the adjacent soft key allows the user to access the Configure menu for the instrument. System and Save/Recall are available in the Configure menu. See **Figure 24** and **Figure 25** for details.

3. **COMM** – Pressing the adjacent soft key allows the user to access the GPIB, RS-232, and USB communication parameters. See **Figure 26** for details.

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3.10.1 Main Menu / Module Screen

Displays the modules that are installed in the Model 8800 Photonics Test System.

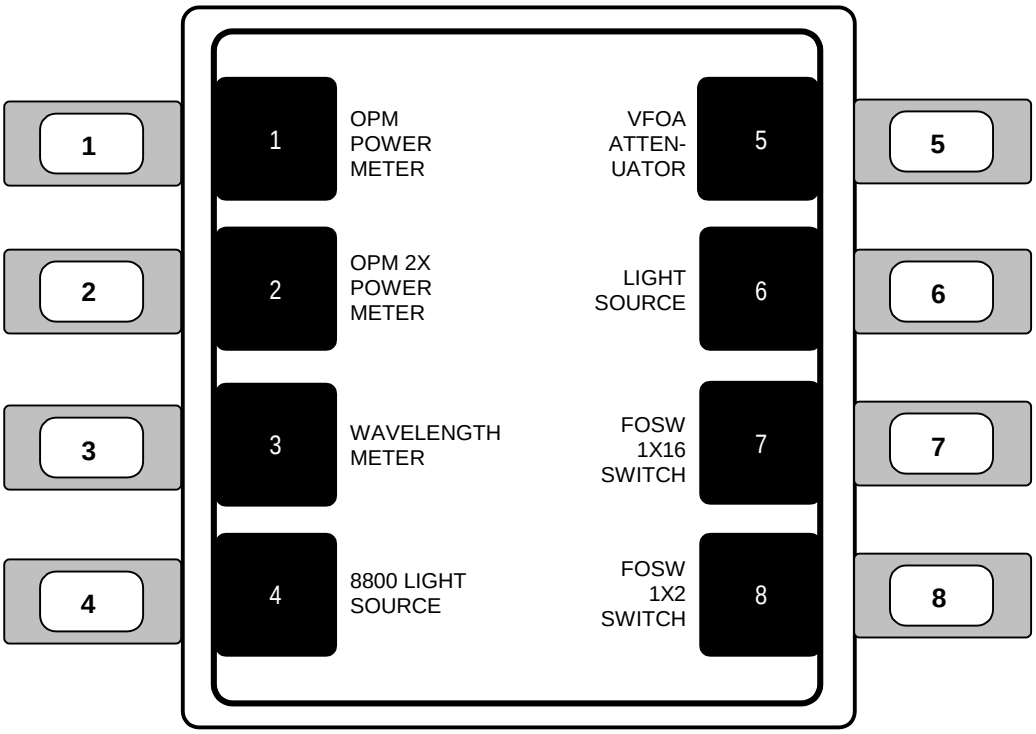


Figure 22 – Module Screen

See **Section 3.9 Master (Modules) Screen** for additional information regarding the modules screen.

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3.10.2 Main Menu / Configure Screen

The Configure Menu Screen is shown in **Figure 23**. The Configure menu provides access to the System Configuration Screen and Configuration Save/Recall Screen.

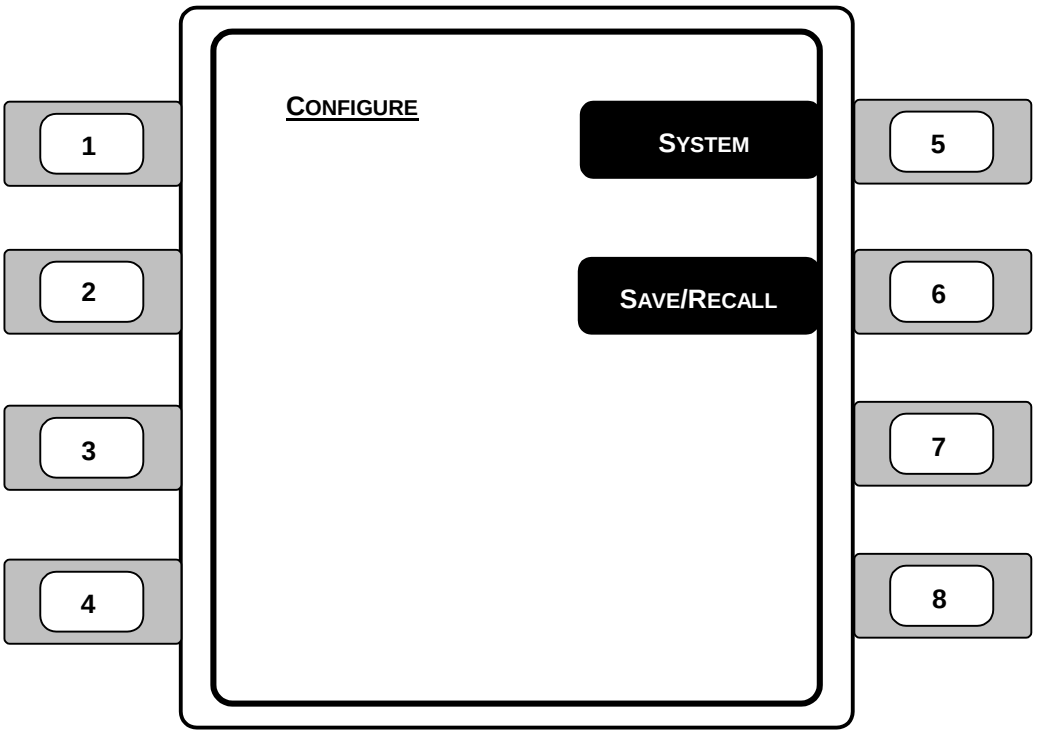


Figure 23 – Configure Menu Screen

1. **SYSTEM –** Displays the System configuration screen that allows the user to setup the instrument display and behavioral settings.

2. **SAVE/RECALL** – Allows the user to save and recall configuration settings for the instrument.

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3.10.3 Main Menu / Configure / System Screen

The Configure System Screen is shown in **Figure 24**. The Configure System Screen controls basic operation of the Model 8800. Press the Menu key on the front panel to return to the Master display screen.

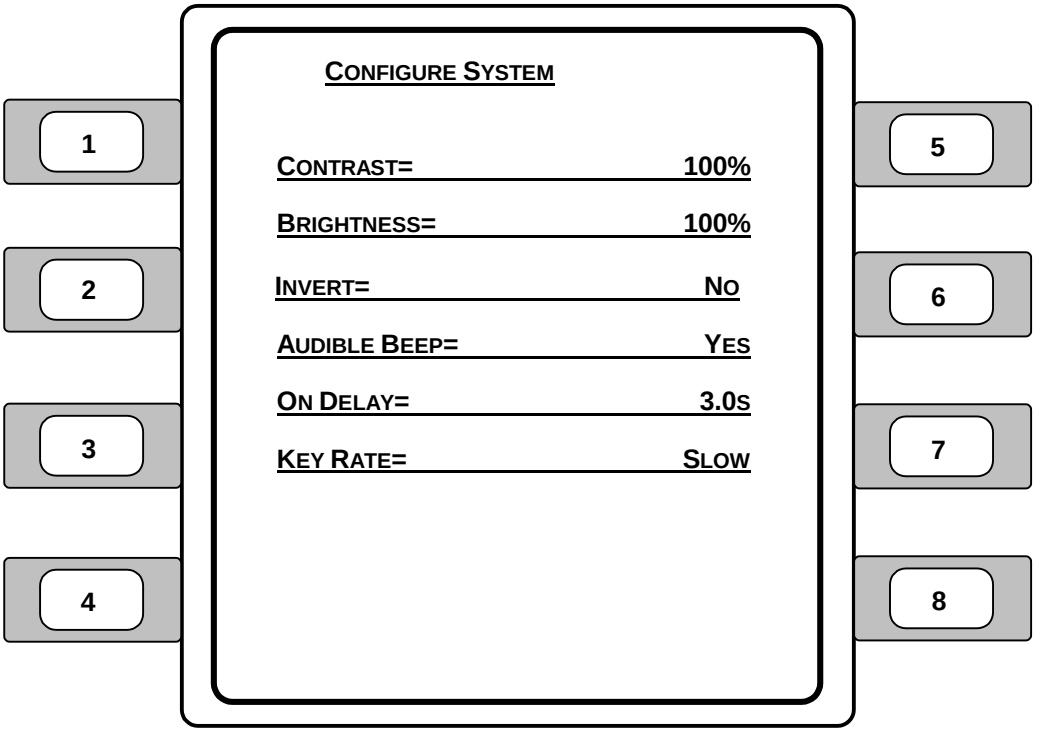


Figure 24 – Configure System Screen

1. **CONTRAST –** Optimizes the viewing angle (100% = maximum viewing angle).

2. **BRIGHTNESS** – Varies the backlighting intensity to optimize the viewing angle (100% = maximum backlighting brightness).

3. **INVERT** – Inverts the screen to be white text on a black background (YES) or black text on a white background (NO).

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4. **AUDIBLE BEEP** – Controls the system's audible beeper. The beeper indicates errors, invalid data entry, and other situations where the Model 8800 needs to alert the user (YES = beep function ON).

5. **ON DELAY** – Controls the delay time from the moment the Laser Diode Driver is turned on by the user to the actual time the output is energized. The delay time is programmable from 0 seconds to 30 seconds. The default setting is 3 seconds.

6. **KEY RATE** – Controls the repeating speed when a key is held down. Settings are **SLOW**, **MEDIUM**, and **FAST**.

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3.10.4 Main Menu / Configure / Save/Recall Screen

The **SAVE** and **RECALL** functions are used to store and retrieve the Model 8800 mainframe setup configurations for future use. For example, a specific test setup may be saved for later use. Then, when the user desires to perform the specific test, that setup can simply be recalled.

Non-volatile memory is used for saving the instrument parameters. When a Save operation is performed, all of the parameters that are currently in effect on the Model 8800 are stored under a user-selected "bin" number. Then, when the user Recalls that bin number, the Model 8800 uses the parameters previously stored in the selected bin number.

NOTE

A special "bin 0" is reserved for the reset state. Recalling bin 0 will reset the mainframe and all modules installed in the mainframe to factory defaults.

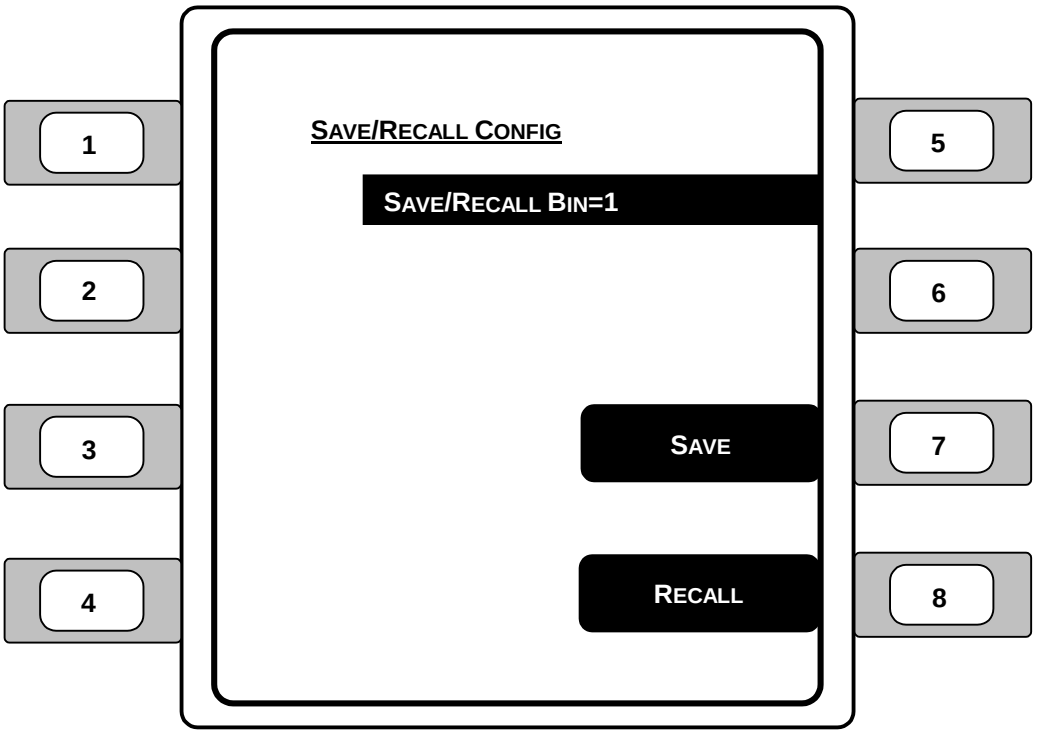


Figure 25 – Configure Save/Recall Screen

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1. **SAVE/RECALL BIN –** Using the left and right blue arrow keys, select a Save/Recall Bin number. Bin numbers 1 and 2 are used to save and recall user configuration parameters. Bin number 0 is used to Recall default instrument parameters only. Custom configuration parameters cannot be saved to bin 0.

2. **SAVE** – Select the adjacent soft key to save the current system configuration parameters to the bin number that is currently displayed (bin number must be either 1 or 2).

3. **RECALL** – Select the adjacent soft key to recall the system configuration parameters saved for the bin number that is currently displayed (bin number must be either 1 or 2).

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3.10.5 Main Menu / Communications Screen

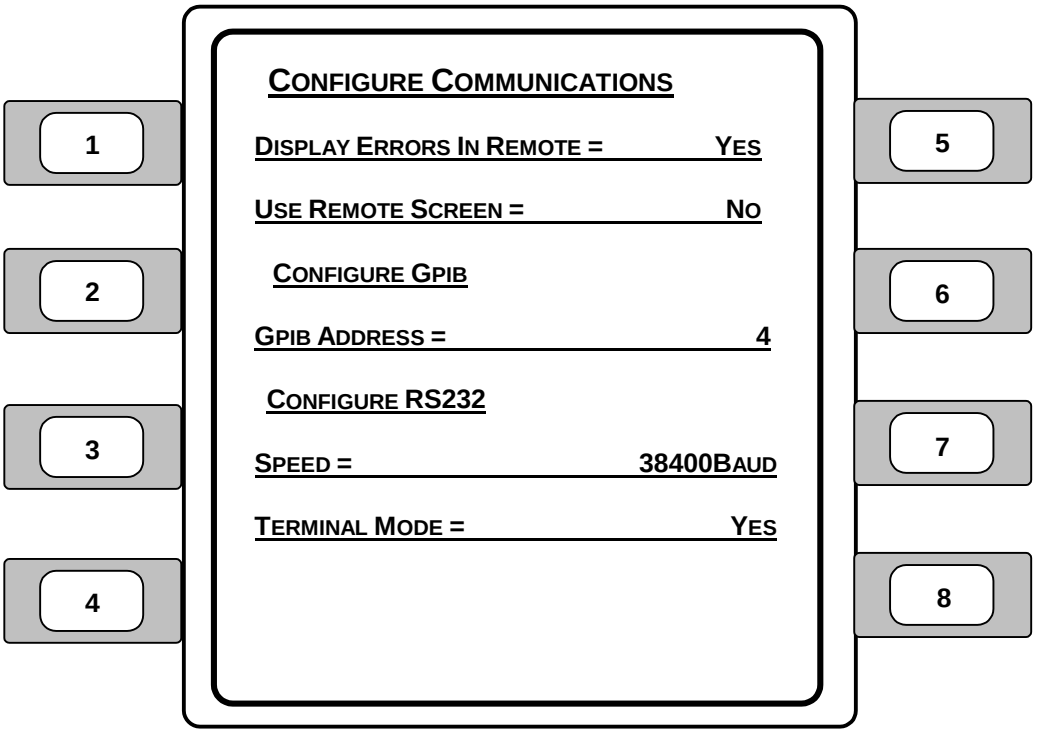


Figure 26 – Configure Communications Screen

1. **DISPLAY ERRORS IN REMOTE –** This function controls the announcement of errors on the Model 8800's screen and is intended to keep the 8800 screen free of error messages while operating in Remote mode. When the user selects **YES**, all errors will be listed on the 8800 screens, even in Remote mode. When the setting is **NO**, no errors will be displayed via Remote mode (but will be displayed in Local mode).

NOTE
This *does not* affect the Error List which is queried via the **GPIB ERR?** query.

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2. **USE REMOTE SCREEN** – This function is intended to help improve throughput on fully loaded 8800 systems by reducing the latency time between the sending of a GPIB command and the actual time the command is processed. When this setting is **YES**, the 8800 will switch to a "remote" screen when entering Remote mode, although the **MENU** key may be used to switch out of this screen. When leaving the Remote mode, the Model 8800 will switch to the Master display, unless the user has left the Remote screen. Selecting **NO** will leave the display on the instrument.

3. **GPIB ADDRESS ("Instrument Address" – Test Studio Software)** – Selects the GPIB address (IEEE-488 device address) assigned to the Model 8800. Valid addresses range from 1 through 31 and must be unique for each device connected within a system.

NOTE
The GPIB address is known as the "Instrument Address" in the Newport Photonics Test Studio software and user's manual.

4. **SPEED** – Sets the baud rate of the RS-232 serial port. Available communication speeds are: 300 (min), 1200, 2400, 4800, 9600, 19200, and 38400 (max) baud.

5. **TERMINAL MODE** – Terminal Mode enhances the interface with the Model 8800 when communicating via the RS-232 in an ANSI/VT100 compatible serial terminal. See the ***Model 8800 Computer Interfacing Manual*** for additional information on **TERMINAL MODE** and **SPEED**.

3.10.5.1 Error Message Control

Error messages may appear on the display when error conditions occur which force the output off or reflect hardware errors in the Model 8800. Chapter 12 contains an explanation of the error messages that may be reported by the 8800. Display of error messages on the Model 8800 screen may be disabled while in Remote mode by setting **DISPLAY ERRORS WHILE REMOTE** to **NO**. Errors will continue to accumulate in the error queue, but will not be displayed on the screen.

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3.11 Light Source Enable Password Screen

The Light Source Enable Password screen appears when the Laser Enable button on the Model 8800 mainframe front panel is pressed and the light source modules are not already enabled. Once the proper password is entered AND the interlock key is in place, the light source can be enabled. The following section describes the functionality of the Light Source Enable Password screen. Refer to **Section 4.2** for the complete procedure on how to enable the light source modules and activate the light source.

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

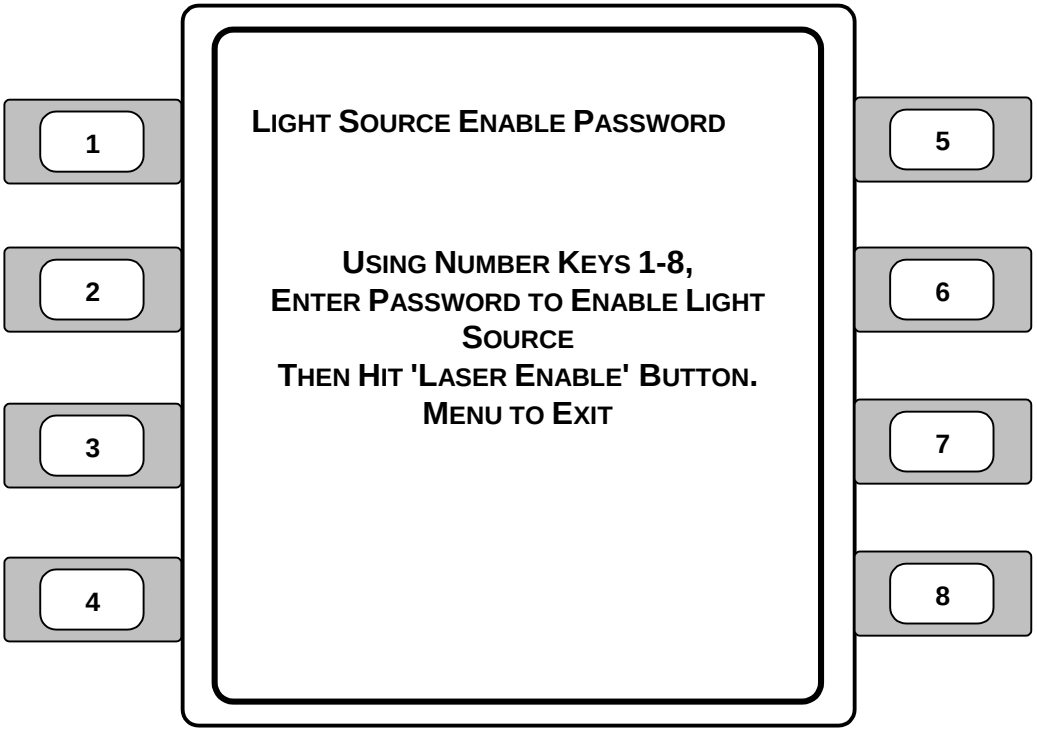


Figure 27 – Light Source Enable Password Screen

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The Light Source Enable Password screen provides instructions for the user how to enter the password. At this screen the user can perform the following functions:

- Using the number soft keys (1-8), enter the password (**2 7 6 3**).
- Using the **Laser Enable** button, clear password entries.
- Press the **Menu** button to cancel and exit the screen without entering a password.

3.12 Rear Panel Familiarization

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

3.12.1 Rear Panel Description – Model 8800

Described below are the functions of each area of the rear panel for the Model 8800, as shown in **Figure 28**.

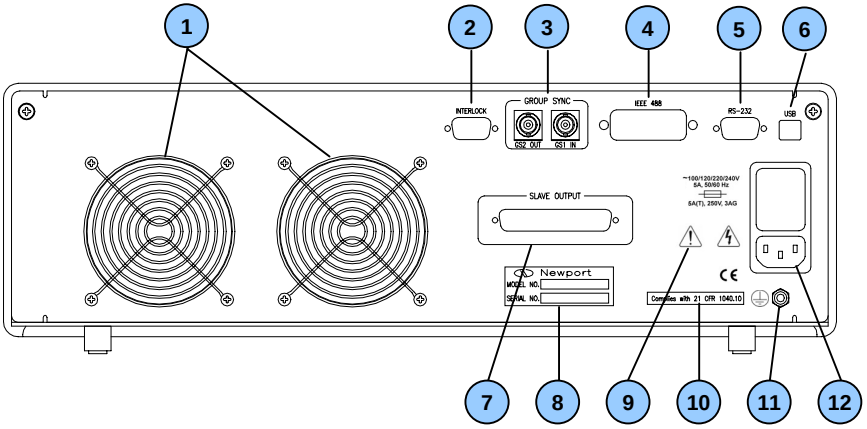


Figure 28 – Rear Panel, Model 8800

1. **Instrument Cooling Fans** – The cooling fans move air through the unit to cool the power supply and other components inside the unit case. Ensure that there is a two to four inch minimum free space behind the rear panel to effectively move air through the unit.

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2. **Interlock (Key Connector)** – The Interlock connector is for the Laser Key that must be in place in order for the laser to operate. Note that the laser will not turn on without a key inserted into the Key Control connector.

NOTE
Pins 1 and 2 must be jumpered to allow the laser to operate. A plug with a jumper on pins 1 and 2 is provided to plug into the Key Connector labeled INTERLOCK.

3. **Group Sync GS1 IN/GS2 OUT** – The group sync Input and Output BNC connectors permit the synchronization of multiple mainframes.

4. **GPIB Connector** – The GPIB connector, located on the back of the mainframe, allows full remote control as described in the ***Model 8800/8200 Computer Interfacing Manual***. The connector accepts a standard IEEE-488 cable for remote control and uses metric lock screws.

5. **RS-232 Connector** – The RS-232 connector is located on the back of the mainframe for remote control via the serial port. See the ***Model 8800/8200 Computer Interfacing Manual*** for a more complete description of the RS-232 interface.

6. **USB** – The USB connector is located on the back of the mainframe for remote control via the USB port. See the ***Model 8800/8200 Computer Interfacing Manual*** for a more complete description of the USB interface.

7. **Slave Output** – Allows multiple Model 8800 instruments to be linked together.

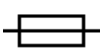
8. **Serial Number Label** – Displays the Newport Corporation model number and unique serial number information for the module.



Figure 29 – Newport Model/Serial Number Label

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9. **Symbols and Information on Rear Panel** – The symbols and their associated meanings provided below are printed on the rear panel of the Model 8800.

   -  Fuse symbol with voltage and amperage information.
   -  Refer to the documentation for proper operating instructions.
   -  Caution, risk of electrical shock.
   -  This product is "CE" certified.
   -  Protective earth ground connection.

10. **Compliance Label ("Complies with 21 CFR 1040.10")** – Indicates that the instrument meets the requirements for standard 21 CFR 1040.10.

11. **Ground Post** – The ground post, designated by the international protective earth ground symbol, provides access to the chassis ground, which is also an earth ground as long as a standard 3-wire line cord is used. See **Section 3.12.4** GND Post for additional information.

12. **AC Input Power Connector** – The input power connector accepts a standard line cord for AC input. See **Section 3.12.3** (Input Power Connector) for additional information.

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3.12.2 Rear Panel Description – Model 8200

Described below are the functions of each feature on the rear panel for the Model 8200, as shown in **Figure 30**.

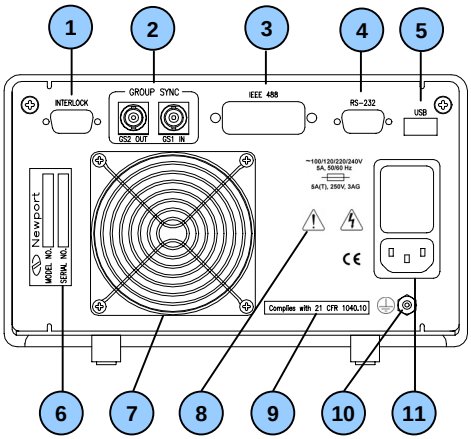


Figure 30 – Rear Panel, Model 8200

1. **Interlock (Key Connector)** – The Interlock connector is for the Laser Key that must be in place in order for the laser to operate. Note that the laser will not turn on without a key inserted into the Key Control connector.

> **NOTE**
> Pins 1 and 2 must be jumpered to allow the laser to operate. A plug with a jumper on pins 1 and 2 is provided to plug into the Key Connector labeled INTERLOCK.

2. **Group Sync GS1 IN/GS2 OUT** – The group sync Input and Output BNC connectors permit the synchronization of multiple mainframes.

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3. **GPIB Connector (IEEE-488)** – The GPIB connector, located on the back of the mainframe, allows full remote control as described in the ***Model 8800/8200 Computer Interfacing Manual***. The connector accepts a standard IEEE-488 cable for remote control and uses metric lock screws.

4. **RS-232 Connector** – The RS-232 connector is located on the back of the mainframe for remote control via the serial port. See the ***Model 8800/8200 Computer Interfacing Manual*** for a more complete description of the RS-232 interface.

5. **USB** – The USB connector is located on the back of the mainframe for remote control via the USB port. See the ***Model 8800/8200 Computer Interfacing Manual*** for a more complete description of the USB interface.

6. **Serial Number Label** – Displays the Newport Corporation model number and unique serial number information for the module.



Figure 31 – Newport Model/Serial Number Label

7. **Instrument Cooling Fans** – The cooling fans move air through the unit to cool the power supply and other components inside the unit case. Ensure that there is a two to four inch minimum free space behind the rear panel to effectively move air through the unit.

8. **Symbols and Information on Rear Panel** – The symbols and their associated meanings provided below are printed on the rear panel of the Model 8200.

-  Fuse symbol with voltage and amperage information.
-  Refer to the documentation for proper operating instructions.

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-  Caution, risk of electrical shock.
-  This product is "CE" certified.
-  Protective earth ground connection.

9. **Compliance Label ("Complies with 21 CFR 1040.10")** – Indicates that the instrument meets the requirements for standard 21 CFR 1040.10.

10. **Ground Post** – The ground post, designated by the international protective earth ground symbol, provides access to the chassis ground, which is also an earth ground as long as a standard 3-wire line cord is used. See **Section 3.12.4** GND Post for additional information.

11. **AC Input Power Connector** – The input power connector accepts a standard line cord for AC input. See **Section 3.12.3** (Input Power Connector) for additional information.

3.12.3 Input Power Connector

The input power connector accepts a standard line cord for AC input and permits the user to select one of four AC input settings: 100V, 120V, 220V, and 240V. Refer to the procedure provided in **Section 3.2.3** (Changing Voltage Settings) for details on setting the input voltage.

NOTE

The voltage selection is set for 120 VAC prior to shipping. A caution sticker is then placed over the input power connector to help ensure that the customer checks for proper voltage.

CAUTION

Do not exceed 250 VAC on the line input.

Do not operate with a line voltage that is not within ±10% of the line setting. Too low of an input voltage may cause excessive ripple on the DC supplies. Too high of an input voltage will cause excessive heating.

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3.12.4 Protective Earth Ground Terminal

The protective earth ground terminal provides access to the chassis ground, which is also an earth ground as long as a standard 3-wire line cord is used. This is a protective conductor terminal used to achieve chassis grounding requirements when the main connectors do not provide an earth ground terminal. Use a minimum of 18-gauge wire to connect to this grounding terminal.

3.13 Warm-Up and Environmental Consideration

Operate the Model 8800 at an ambient temperature in the range of 5 to 40°C. Storage temperatures should be in the range of -20 to 60°C. To achieve the rated accuracy, let the Model 8800 warm up for 1 hour before use.

CAUTION

Operating above 40°C can cause excessive heating and possible component failures.

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C H A P T E R 4

4 Light Source Modules

4.1 Introduction

A large selection of Stabilized Light Source Modules is available for the Model 8800/8200 Photonics Test System platform. These light sources have been designed to address all applications requiring a stable reference source for testing and characterizing fiber optic components, systems, and instruments.

The Stabilized Light Source Modules were also designed to provide the highest level of safety for the user according to many industry standards. Some of the safety features include:

- Password protected, central "Laser Enable" function
- "Laser Active" switch and LED on each module
- Programmable turn-on delay sequence
- Safety caps on outputs to protect the user from accidental exposure
- CDRH and IEC compliant



As with all light emitting devices, eye safety precautions need to be observed when operating Newport's Light Source Modules. Please remember to not look directly into the fiber output connectors of any light source module or a fiber patchcord attached to it, since invisible laser radiation may be emitted. All light source modules are either Class I or Class IIIb laser products, and labeled as such per CDRH and IEC guidelines.

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4.2 Light Source Module Enabling

Use the following procedure to enable the light source module(s) so that the laser(s) can be activated.



Avoid exposure: Class IIIb laser radiation emitted. Always replace laser safety covers on light source output connector AND deactivate the light source when not in use!

NOTE

In order for the light source module to work, a key must be inserted into the key (INTERLOCK) connector on the rear panel of the Model 8800/8200 AND the Light Source Enable Password must be entered. The light source will not operate without the key in place AND the Light Source Enable Password entered.

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

1. Insert the interlock key connector in the INTERLOCK connector on the rear panel of the Model 8800.

2. Press the **Laser Enable** button on the Model 8800 mainframe front panel to display the Light Source Enable Password screen.

3. Using the soft keys (1-8), enter the following fixed 4-digit password:

   2 **7** **6** **3**

   Note that no numbers will appear as the number keys are pressed.

   Press the **Menu** button to cancel out of the Light Source Enable Password screen without entering a password.

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4. Press the **Laser Enable** button to enter the password.

   If the password is valid and accepted, the master Modules screen will be displayed and the amber "Ready" LED will illuminate on all installed light source modules.

   If an invalid password is entered, press the Laser Enable button to clear the entry. You will hear an audible beep. Reenter the proper password.

5. Ensure that the fiber patchcord is properly connected to the light source module output connector and device.

6. Press the **Laser Active** button () on the light source module to activate (turn ON) the laser. The green Active LED will illuminate indicating that the light source is emitting from the module's output connector.

7. Press the **Laser Active** button on the light source module again to deactivate (turn OFF) the laser.

   OR

   Press the **Laser Enable** button to turn ALL active light sources OFF. This will also disable ALL installed light source modules (turn "Ready" LED OFF).

8. Repeat Steps 1 through 6 to enable and activate the light source module(s) again.

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4.3 PTS-WDM / PTS-DFB Laser Light Source Module

4.3.1 Introduction

The PTS-WDM stabilized DFB laser diode modules feature high output power and stable wavelength registration at specific ITU-T wavelengths in the 1550 nm window, utilized in *Dense Wavelength Division Multiplexed* (DWDM) fiber optic telecommunication systems. These laser sources are a necessity for all DWDM-related testing, whether they are used in prototyping and characterization of new fiber optic components and erbium doped fiber amplifiers (EDFAs) in an R&D setting or in verifying their specifications in QA or on the manufacturing floor.

The PTS-DFB stabilized light source module features a high output power, temperature stabilized DFB laser diode, operating in the 1310 nm region. Although this light source emits in the fiber optic telecommunication band, its actual wavelength makes it useful in single channel test applications that require a stable reference light source.

Both the PTS-WDM and the PTS-DFB light source modules include an internal optical isolator and feature the following:

- **Coherence Control** – sinusoidal waveforms are used with adjustable modulation and frequency, to adjust the laser line width
- **Ultra-Stable Temperature Control** – enables short term wavelength stability of ±0.005 nm
- **Configurable Output Power** – the wavelength of the device can be fixed, while modifying the output power by 10 dB
- **Wavelength Tuning** – the output power of the module can be held constant while tuning the wavelength over a range of ±4 nm
- **Modulation Capability** – modulation at standard test tones from 270 Hz to 500 kHz is provided for each module. Synchronization between all modules mounted in the mainframe is provided via a central sync. signal generated by the mainframe or via input of an external synchronization signal.

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4.3.2 Product Features

- DFB Laser Diode sources calibrated to telecom ITU-T DWDM wavelengths
- Tight temperature control for accurate wavelength stabilization and tuning
- Configurable output power
- Coherence control for average line width adjustment
- Internal signal generator allowing modulation up to 500 kHz
- Synchronized modulation of multiple light sources to a master sync signal internal or external signal
- Built-in optical isolator
- Single-mode (SM) and polarization-maintaining (PM) fiber output options and five (5) connector choices

4.3.3 Installation

Light sources can be used with the Model 8800 and 8200 mainframes in any of the eight (8) or two (2) available module slots, respectively.

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

CAUTION

Do **NOT** plug-in or unplug a module with the AC power ON.

NOTE

In order for the light source module to work, a key must be inserted into the key (INTERLOCK) connector on the rear panel of the Model 8800/8200 AND the Light Source Enable Password must be entered. The light source will not operate without the key in place AND the Light Source Enable Password entered.



Avoid exposure: Class IIIb laser radiation emitted. Always replace laser safety covers on light source output connector AND deactivate the light source when not in use!

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4.3.4 ITU-T DWDM Grid

The following grid displays the telecommunications International Telecommunication Union Telecommunication Standardization Sector (ITU-T) channel codes and accompanying center wavelengths for the Dense Wavelength Division Multiplexed (DWDM) systems.

Channel Code	Center Wavelength (λ) [nm]		Channel Code	Center Wavelength (λ) [nm]
18	1563.05		41	1544.53
19	1562.23		42	1543.73
20	1561.42		43	1542.94
21	1560.61		44	1542.14
22	1559.80		45	1541.35
23	1558.98		46	1540.56
24	1558.17		47	1539.77
25	1557.36		48	1538.98
26	1556.56		49	1538.19
27	1555.75		50	1537.40
28	1554.94		51	1536.61
29	1554.13		52	1535.82
30	1553.33		53	1535.04
31	1552.53		54	1534.25
32	1551.72		55	1533.47
33	1550.92		56	1532.68
34	1550.12		57	1531.90
35	1549.32		58	1531.12
36	1548.52		59	1530.33
37	1547.72		60	1529.55
38	1546.92		61	1528.77
39	1546.92		62	1527.99
40	1546.12			

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4.3.5 DFB Laser Light Source Module Screen

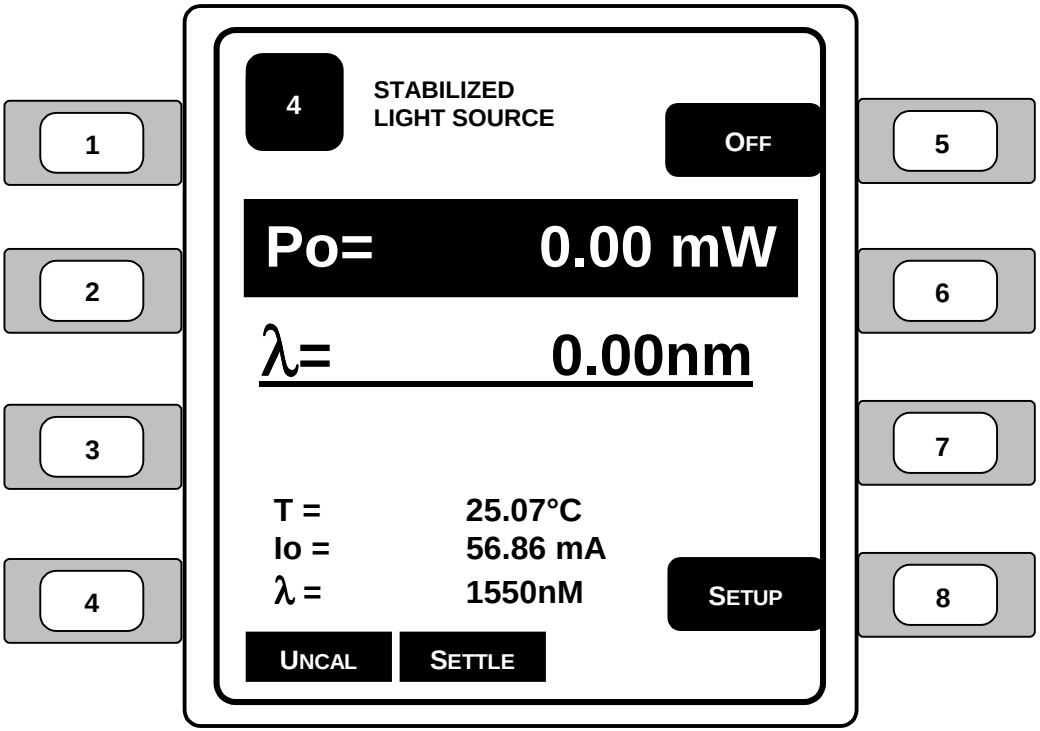


Figure 32 – DFB/WDM Stabilized Light Source Module Screen

1. **Po** (Power) **–** Sets the laser output power in the selected units. Use the left and right arrow keys to edit the power (or current) setting.

2. **λ** (Wavelength) – Displays the light source wavelength.

3. **T** (Temperature) – Displays the temperature of the internal TEC.

4. **Io** (Current) **–** Displays the current of the laser driver.

5. **λ** (Wavelength) – Displays the wavelength of the laser.

6. **ON/OFF –** Enables and disables the laser. Refer to **Section 4.2** Light Source Module Enabling for additional information regarding activating and deactivating the laser light source modules.

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7. **SETUP –** Changes the screen to the Stabilized WDM Light Source setup screen.

8. **LEDs –** LEDs display the following status and error conditions:
   - **UNCAL** – functionality to be determined by Newport Corp.
   - **SETTLE** – temperature settling

4.3.6 DFB Laser Light Source Module Setup Screen

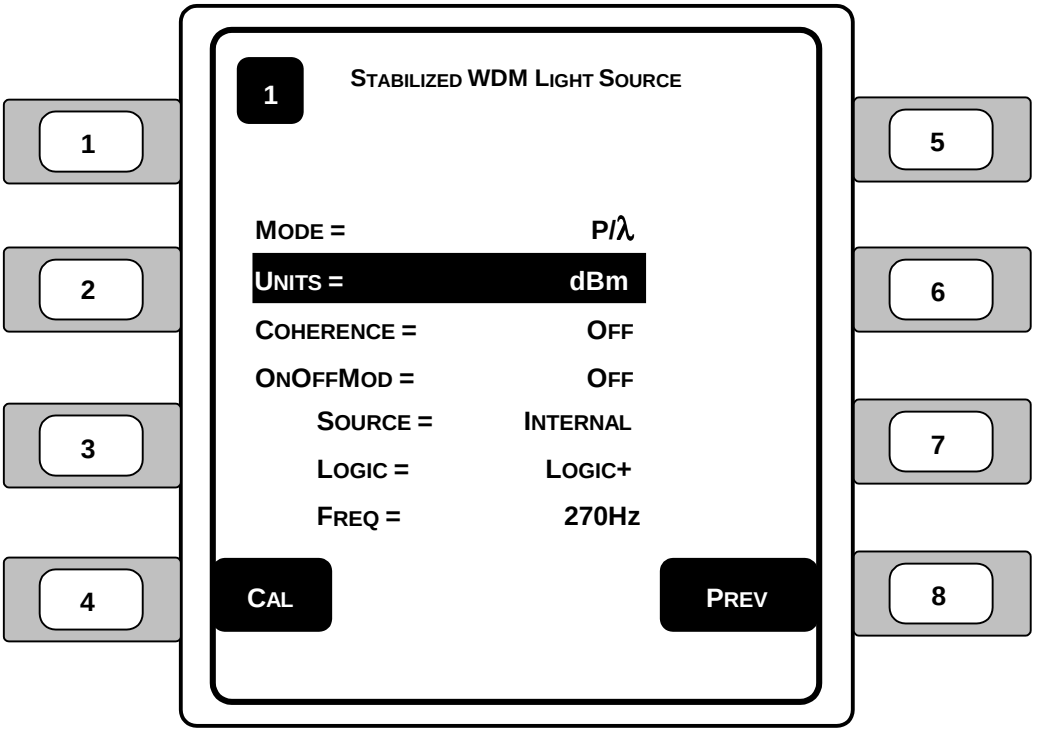


Figure 33 – DFB/WDM Laser Light Source Setup Screen

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1. **MODE –** The light source mode refers to the measurements that allow the user to control the laser current.
   Selections: P/λ, P/T, I/λ, I/T

   - **P/λ** [power/wavelength] (Po) – provides power to hold the wavelength constant.
   - **P/T** [power/temperature] (Po) – power and temperature will remain constant, but the wavelength may vary.
   - **I/λ** [current/wavelength] (Io) – the power will change to hold the current.
   - **I/T** [current/temperature] (Io) – power and temperature are held constant to create a fixed wavelength.

2. **UNITS –** This parameter allows the user to select the light source power units.
   Selections: dBm, mW

3. **COHERENCE** (Coherence Mode) – Turns the coherence mode on/off. With coherence turned on, the light source oscillates in a sine wave at a set frequency and amplitude to simulate the transmission of information through the light energy.
   Selections: On, Off

4. **ONOFF MOD** (On/Off Modulation) – Turns the light source frequency oscillator (pulsing) on/off. The on/off modulation pulses the light source off and on according to the source, logic, and frequency settings.
   Selections: On, Off

5. **SOURCE** – Sets the light source on/off modulation input source:
   Selections: Internal, Sync In, GS1, GS2

   - **INTERNAL** – enables the internal modulation chip to modulate the frequency based on the user defined internal frequency.
   - **SYNC IN** (Internal) – allows the user to set the input synchronization to an external transistor-transistor logic (TTL) level voltage signal source connected to the SMA input connector on the front of the module.
   - **GS1** (Group Sync In) – allows the user to set the input synchronization to an external source connected to the GS1 IN SMA connector on the rear panel of the Model 8800. This allows for simultaneous synchronization across multiple instruments and modules.
   - **GS2** (Group Sync Out) – allows the user to set the input synchronization to the instrument's main processor via an external source connected to the GS2 OUT SMA connector on the rear panel of the Model 8800. The processor will generate a pulse that can be used to synchronize all of the modules.

6. **LOGIC** – Determines the where the light source modulation will begin in the cycle, either on the positive side (on) or on the negative side (off).
   Selections: Logic+, Logic-

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7. **FREQ** – Determines the frequency to be used for the light source module.
   Range: 270Hz, 1kHz, 2kHz

8. **CAL** (calibration) **–** Changes the display to the light source calibration screen.

9. **PREV** (previous) **–** Changes the display to the previous screen.

4.3.7 PTS-WDM Stabilized DFB Laser Light Source Module Specifications

Specifications	PTS-WDM	PTS-DFB
Center Wavelength [nm]	per ITU grid	1310 ± 20
Linewidth [MHz] (typ)	<30 or as per diode manufacturer specifications	
Wavelength Stability [nm] (1) Short Term – 15 minutes Long Term – 8 hours	± 0.005 ± 0.01	
Tuning Range [nm]	± 1	
Maximum Output Power	2 mW (3 dBm) 10 mW (10 dBm)	2 mW (3 dBm) 8 mW (9.2 dBm)
Power Adjustment Range [dB]	10	
Power Stability [dB] (1) Short Term – 15 minutes Long Term – 8 hours	±0.005 ±0.03	
On/Off Modulation Frequency Internal External	270 Hz, 1 kHz, or 2 kHz user determined sync input	
Coherence Modulation	50 kHz, sine wave, 10% depth of modulation, internal source	
Fiber Type	9/125 µm SM or PM	9/125 µm SM
Module Dimensions [H x W x D]	5.23 x 1.39 x 9.09 in. (13.3 x 3.5 x 23.1 cm)	
Module Weight	1.75 lb. (0.8 kg)	
Operating/Storage Temperature [°C]	0 to 40 / -20 to 60	

Table 2 – PTS-WDM Stabilized DFB Laser Light Source Module Specifications

NOTES:
1) After 1 hour of stabilization at 23 ± 3°C ambient

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4.4 High Power PTS-BBS Broadband Light Source Module

4.4.1 Introduction

The PTS-BBS Broadband Light Source Module is a high power amplified spontaneous emission (ASE) broadband source, which emits low coherence randomly polarized light.

The light is generated by an ASE source operating in the 1550 nm regime. The module features 50 nm of usable bandwidth which is flat from 1528 to 1560 nm, with long term spectral stability of less than 0.01 dB over a 24-hour period, resulting in consistent and stable measurements.

The module's adjustable, high-output power corresponds to a high dynamic range, which extends the utility of this module beyond typical broadband sources.

4.4.2 Product Features

- High output power
- Wavelength-flattened
- 50 nm usable bandwidth
- Single stage isolator at output
- Excellent short and long term stability
- Adjustable output power

4.4.3 Installation

Light source modules can be used with the Model 8800 and 8200 mainframes in any slot.

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

CAUTION

Do **NOT** plug-in or unplug a module with the AC power ON.

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NOTE

In order for the light source module to work, a key must be inserted into the key (INTERLOCK) connector on the rear panel of the Model 8800/8200 AND the Light Source Enable Password must be entered. The light source will not operate without the key in place AND the Light Source Enable Password entered.



Avoid exposure: Class IIIb laser radiation emitted. Always replace laser safety covers on light source output connector AND deactivate the light source when not in use!

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4.4.4 PTS-BBS Broadband Light Source Module Screen

The features of the broadband laser light source module screens are described below.

NOTE

This module meets performance criteria C, meaning there is a temporary loss of function requiring operator intervention when this module is exposed to significant static discharge levels (per BS EN61326-1:1997) causing error messages to be displayed such as "Hard Current Limit Error" or "Overcompliance Error".

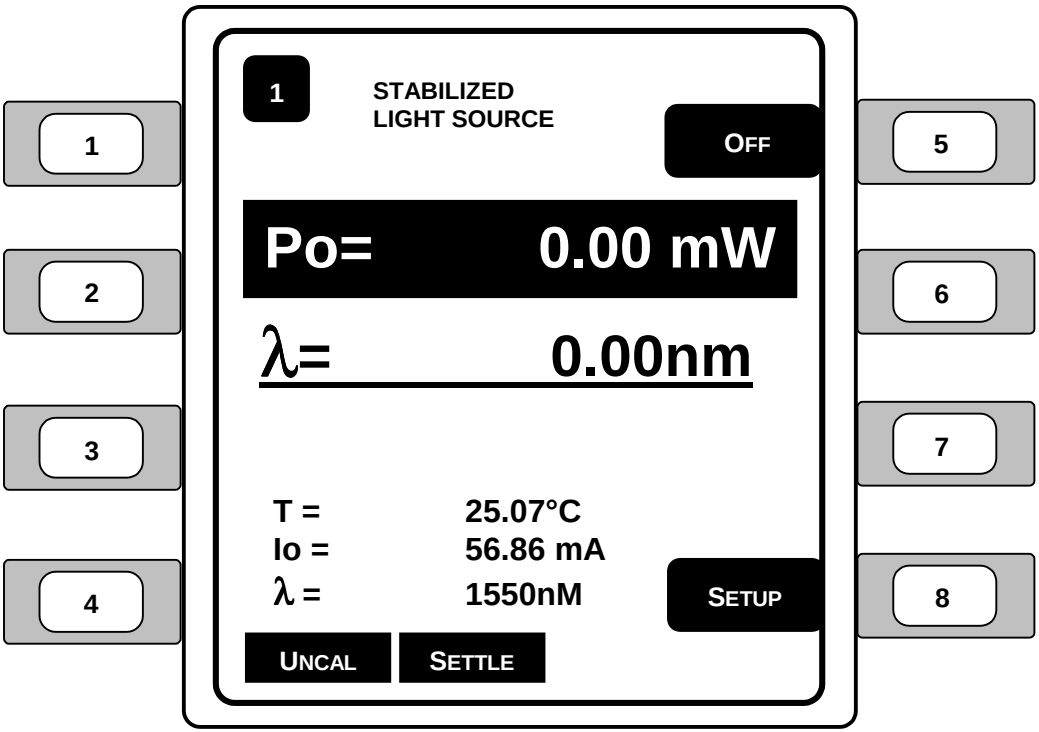


Figure 34 – PTS-BBS Stabilized Light Source Module Screen

1. **Po** (Power) **–** Sets the laser output power in the selected units. Use the left and right arrow keys to edit the power (or current) setting.

2. **λ** (Wavelength) – Displays the light source wavelength.

3. **T** (Temperature) – Displays the temperature of the internal TEC.

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4. **Io** (Current) **–** Displays the current of the laser driver.

5. **λ** (Wavelength) – Displays the wavelength of the laser.

6. **ON/OFF –** Enables and disables the laser. Refer to **Section 4.2** Light Source Module Enabling for additional information regarding activating and deactivating the laser light source modules.

7. **SETUP –** Changes the screen to the Stabilized WDM Light Source setup screen.

8. **LEDs –** LEDs display the following status and error conditions:
   - **UNCAL** – functionality to be determined by Newport Corp.
   - **SETTLE** – temperature settling

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4.4.5 BBS Laser Light Source Module Setup Screen

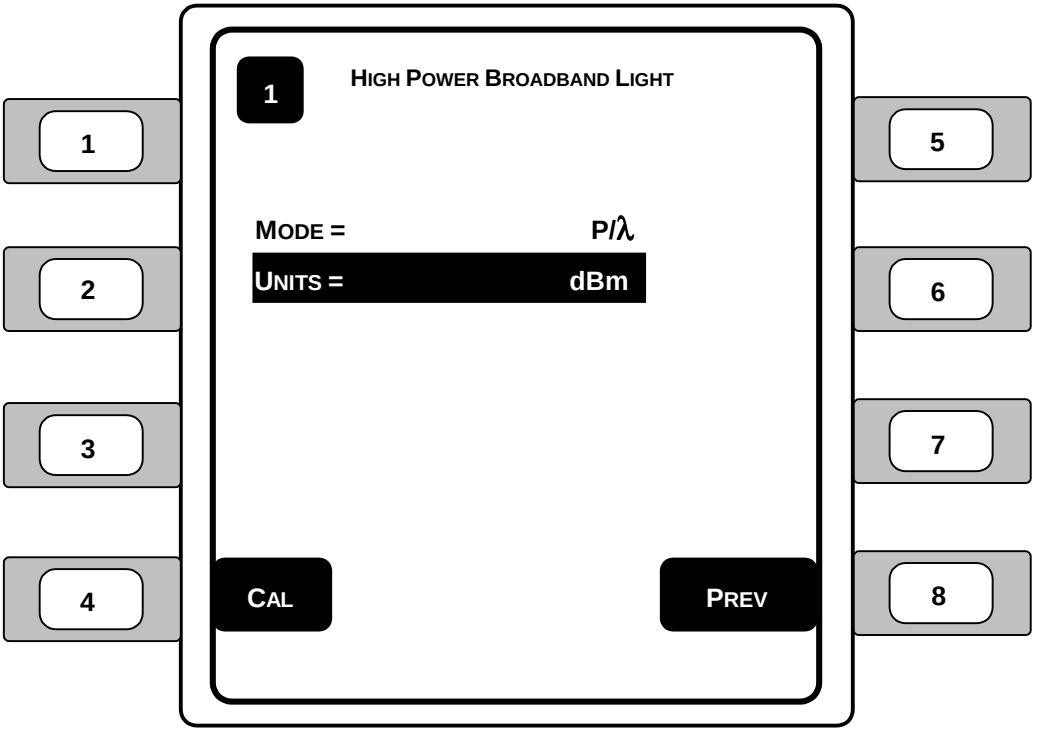


Figure 35 – PTS-BBS Laser Light Source Setup Screen

1. **MODE –** The light source mode refers to the measurements that allow the user to control the laser current.
   Selections: P/λ, P/T, I/λ, I/T

   - **P/λ** [power/wavelength] (Po) – provides power to hold the wavelength constant.
   - **P/T** [power/temperature] (Po) – power and temperature will remain constant, but the wavelength may vary.
   - **I/λ** [current/wavelength] (Io) – the power will change to hold the current.
   - **I/T** [current/temperature] (Io) – power and temperature are held constant to create a fixed wavelength.

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2. **UNITS –** This parameter allows the user to select the light source power units. *Selections: dBm, mW*

3. **CAL** (calibration) **–** Changes the display to the light source calibration screen.

4. **PREV** (previous) **–** Changes the display to the previous screen.

4.4.6 High Power PTS-BBS Broadband Light Source Module Specifications

Specifications	
Nominal Wavelength [nm]	1550
Spectral Width [nm]	<30
Output Power [mW] Typical/Minimum	 30/25
Power Adjustment [dB]	Off to Max
Spectral Density [dBm/nm] (@ 1550 nm)	> -3
Output Stability [dB] (1) Short Term – 15 minutes Long Term – 1 hour	 ±0.04 ±0.2
Output Isolator [dB]	30 (single stage)
Fiber Type	9/125 µm SM
Module Dimensions [H x W x D]	5.23 x 2.79 x 9.09 in. (13.3 x 7.1 x 23.1 cm)
Module Weight	3.5 lb. (1.6 kg)
Operating/Storage Temperature [°C]	0 to 40 / -20 to 60

Table 3 – PTS-BBS Broadband Light Source Module Specifications

NOTE:
1) After 1 hour of stabilization at 23 ± 3°C ambient

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4.5 PTS-FP Series Fabry-Perot Laser Light Source Module

4.5.1 Introduction

These stabilized light source modules feature Fabry-Perot laser diodes. All major wavelengths used in fiber optic telecom, datacom and sensor applications are available -- 635, 650, 670, 785, 850, 1310, 1550 and 1625 nm.

Modules feature programmable temperature control for wavelength tuning , programmable output power and internal modulation of square, triangular and sinusoidal waveforms from 20 Hz to 500 kHz. User settings can be stored for easy recall.

NOTE

Tuning may result in mode hopping, affecting wavelength and power.

4.5.2 Product Features

- Available in telecom, datacom, and sensor wavelengths
- Temperature control provides wavelength tuning capability
- Output power stabilized and adjustable
- Internal signal generator for modulation from 20 Hz to 50 kHz
- Multiple sources can be synchronized to internal or external sync. signal
- Available with various fiber optic output connector styles

4.5.3 Installation

Light sources can be used with the Model 8800 and 8200 mainframes in any slot. However, always ensure that a working module is installed in position 1 at all times when the instrument power is ON.

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

CAUTION

Do **NOT** plug-in or unplug a module with the AC power ON.

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NOTE

In order for the light source module to work, a key must be inserted into the key (INTERLOCK) connector on the rear panel of the Model 8800/8200 AND the Light Source Enable Password must be entered. The light source will not operate without the key in place AND the Light Source Enable Password entered.

Avoid exposure: Class IIIb laser radiation emitted. Always replace laser safety covers on light source output connector AND deactivate the light source when not in use!

4.5.4 PTS-FP Laser Light Source Module Screens

The features of the Fabry-Perot laser light source module screens are described below.

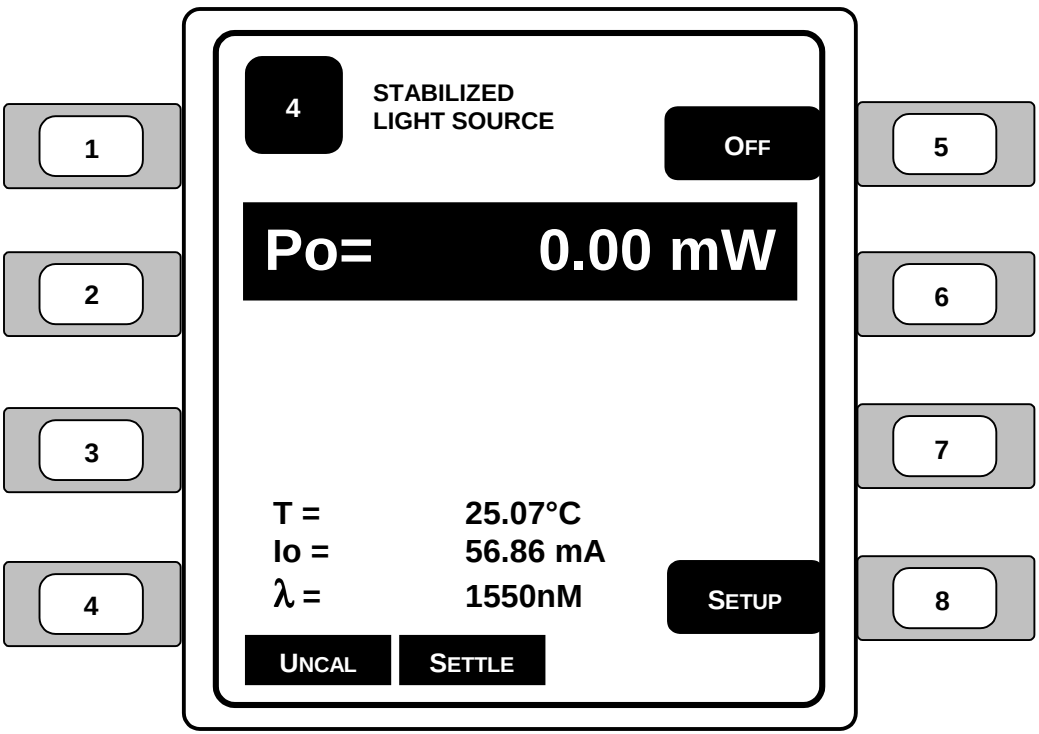


Figure 36 – PTS-FP Stabilized Light Source Module Screen

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1. **Po** (Power) **–** Sets the laser output power in the selected units. Use the left and right arrow keys to edit the power (or current) setting.

2. **T** (Temperature) – Displays the temperature of the internal TEC.

3. **Io** (Current) **–** Displays the current of the laser driver.

4. **λ** (Wavelength) – Displays the wavelength of the laser.

5. **ON/OFF –** Enables and disables the laser. Refer to **Section 4.2** Light Source Module Enabling for additional information regarding activating and deactivating the laser light source modules.

6. **SETUP –** Changes the screen to the Stabilized WDM Light Source setup screen.

7. **LEDs –** LEDs display the following status and error conditions:
   - **UNCAL** – functionality to be determined by Newport Corp.
   - **SETTLE** – temperature settling

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4.5.5 FP Laser Light Source Module Setup Screen

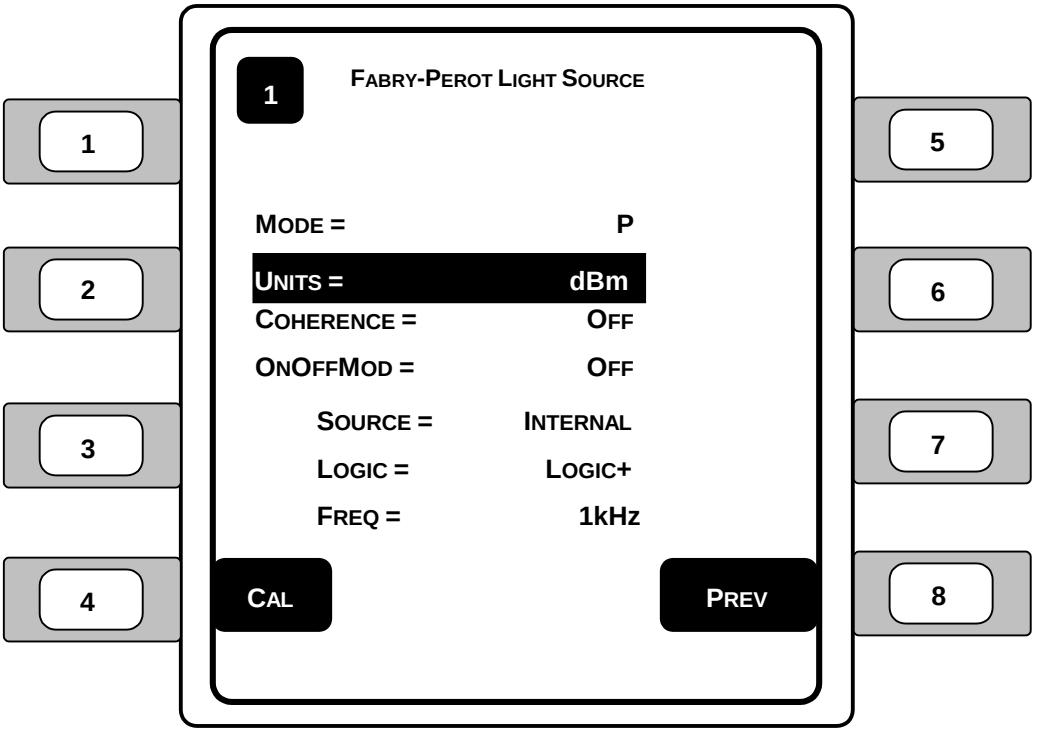


Figure 37 – PTS-FP Laser Light Source Setup Screen

1. **MODE –** The light source mode refers to the measurements that allow the user to control the laser current.
   Selections: P, I

   - **Po** (power) – provides power control of the light source.
   - **Io** (current) – provides current control of the light source.

2. **UNITS –** This parameter allows the user to select the light source power units.
   Selections: dBm, mW

3. **COHERENCE** (Coherence Mode) – Turns the coherence mode on/off. With coherence turned on, the light source oscillates in a sine wave at a set frequency and amplitude to simulate the transmission of information through the light energy.
   Selections: On, Off

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4. **ONOFF MOD** (On/Off Modulation) – Turns the light source frequency oscillator (pulsing) on/off. The on/off modulation pulses the light source off and on according to the source, logic, and frequency settings.
   Selections: On, Off

5. **SOURCE** – Sets the light source on/off modulation input source:
   Selections: Internal, Sync In, GS1, GS2

   - **INTERNAL** – enables the internal modulation chip to modulate the frequency based on the user defined internal frequency.
   - **SYNC IN** (Internal) – allows the user to set the input synchronization to an external transistor-transistor logic (TTL) level voltage signal source connected to the SMA input connector on the front of the module.
   - **GS1** (Group Sync In) – allows the user to set the input synchronization to an external source connected to the GS1 IN SMA connector on the rear panel of the Model 8800. This allows for simultaneous synchronization across multiple instruments and modules.
   - **GS2** (Group Sync Out) – allows the user to set the input synchronization to the instrument's main processor via an external source connected to the GS2 OUT SMA connector on the rear panel of the Model 8800. The processor will generate a pulse that can be used to synchronize all of the modules.

6. **LOGIC** – Determines the where the light source modulation will begin in the cycle, either on the positive side (on) or on the negative side (off).
   Selections: Logic+, Logic-

7. **FREQ** – Determines the modulation frequency to be used for the light source module.
   Range: 270Hz, 1kHz, 2kHz

8. **CAL** (calibration) – Changes the display to the light source calibration screen.

9. **PREV** (previous) – Changes the display to the previous screen.

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4.5.6 Fabry-Perot PTS-FP Series Light Source Module Specifications

Specifications

Order Code	63	65	67	78	85	13	15	16
Center Wavelength [nm]	635±10	650±10	670±10	785±20	850±15	1310 ±20	1550 ±15	1625 ±10
Spectral Width [nm]	<4 or as per diode manufacturer specifications							
Output Power [mW] (1)								
with 9/125 µm Fiber	1	1	1	1	1	1.5	1.5	5
with 4/125 µm Fiber	1	0.5	0.3	-	-	-	-	-
Power Adjustment [dB](typ)	10							
Power Stability [dB] (1)								
Short Term – 15 min.	±0.005							
Long Term – 8 hrs.	±0.05							
On/Off Modulation Frequency								
Internal	270 Hz, 1 kHz, or 2 kHz							
External	user determined sync input							
Coherence Modulation	50 kHz, sine wave, 10% depth of modulation, internal source							
Fiber Type	9/125 µm or 9/125 µm SM							
Module Dimensions [H x W x D]	5.23 x 1.39 x 9.09 in. (13.3 x 3.5 x 23.1 cm)							
Module Weight	3.5 lb. (1.6 kg)							
Operating/Storage Temperature [°C]	0 to 40 / -20 to 60							

Table 4 – PTS-FP Series Light Source Module Specifications

NOTES:
1) After 1 hour of stabilization at 23 ± 3°C ambient

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4.6 PTS-PUMP Stabilized Light Source Module

4.6.1 Introduction

The PTS-PUMP stabilized light source modules incorporate high-power Fabry-Perot laser diodes, emitting at 980 or 1480 nm (refer to the Fiber Amplifier Pump Light Source Module Specifications table in this section for actual power output). These lasers are used in pumping erbium doped fiber gain media, which are key building blocks in long-haul fiber optic telecom networks. 980 nm pump modules are also available with an optional built-in fiber Bragg grating, assuring enhanced wavelength stability and narrow spectral line width.

4.6.2 Product Features

- F-P pump laser diodes available in 980 nm and 1480 nm wavelengths
- Kink-free output
- Temperature control for wavelength stabilization
- Integrated fiber Bragg grating available for 980 nm module
- Available with various fiber optic output connector styles

4.6.3 Installation

Light sources can be used with the Model 8800 and 8200 mainframes in any slot.

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

CAUTION

Do **NOT** plug-in or unplug a module with the AC power ON.

NOTE

In order for the light source module to work, a key must be inserted into the key (INTERLOCK) connector on the rear panel of the Model 8800/8200 AND the Light Source Enable Password must be entered. The light source will not operate without the key in place AND the Light Source Enable Password entered.

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Avoid exposure: Class IIIb laser radiation emitted. Always replace laser safety covers on light source output connector AND deactivate the light source when not in use!

4.6.4 PTS-PUMP Stabilized Light Source Module Screens

The features of the pump laser light source module screens are described below.

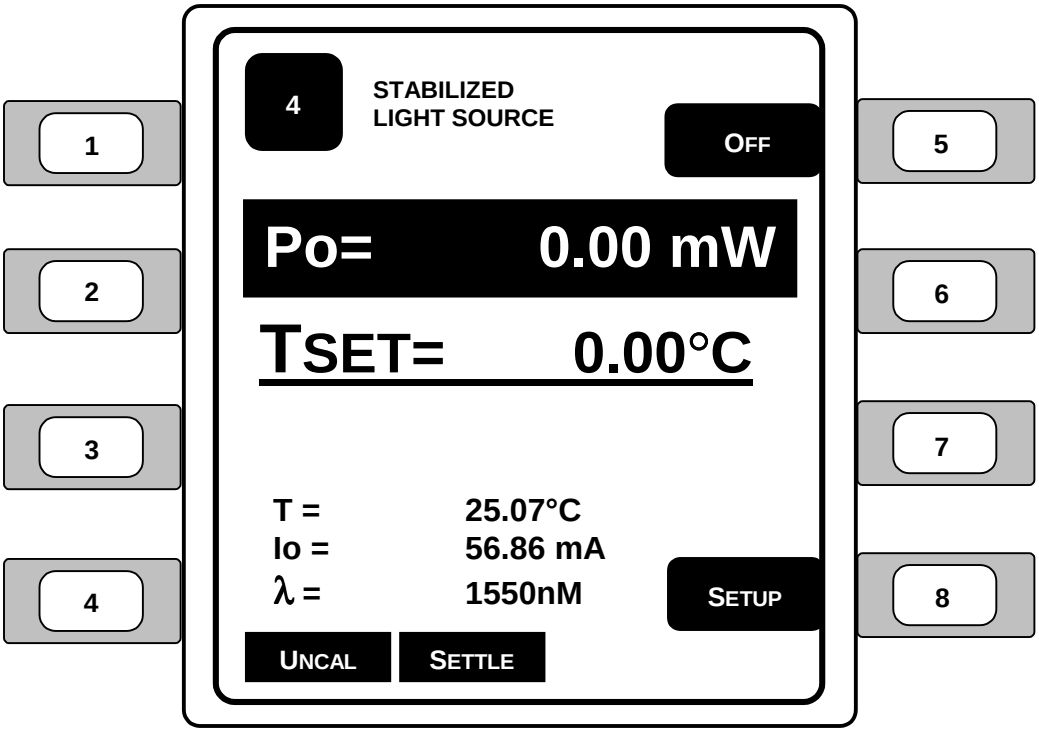


Figure 38 – PTS-PUMP Stabilized Light Source Module Screen

1. **Po** (Power) **–** Sets the laser output power in the selected units. Use the left and right arrow keys to edit the power (or current) setting.

2. **TSET** (Temperature Set Point) – Displays the light source temperature set point.

3. **T** (Temperature) – Displays the temperature of the internal TEC.

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4. **Io** (Current) **–** Displays the current of the laser driver.

5. **λ** (Wavelength) – Displays the wavelength of the laser.

6. **ON/OFF –** Enables and disables the laser. Refer to **Section 4.2** Light Source Module Enabling for additional information regarding activating and deactivating the laser light source modules.

7. **SETUP –** Changes the screen to the Stabilized WDM Light Source setup screen.

8. **LEDs –** LEDs display the following status and error conditions:
   - **UNCAL** – functionality to be determined by Newport Corp.
   - **SETTLE** – temperature settling

4.6.5 PUMP Laser Light Source Module Setup Screen

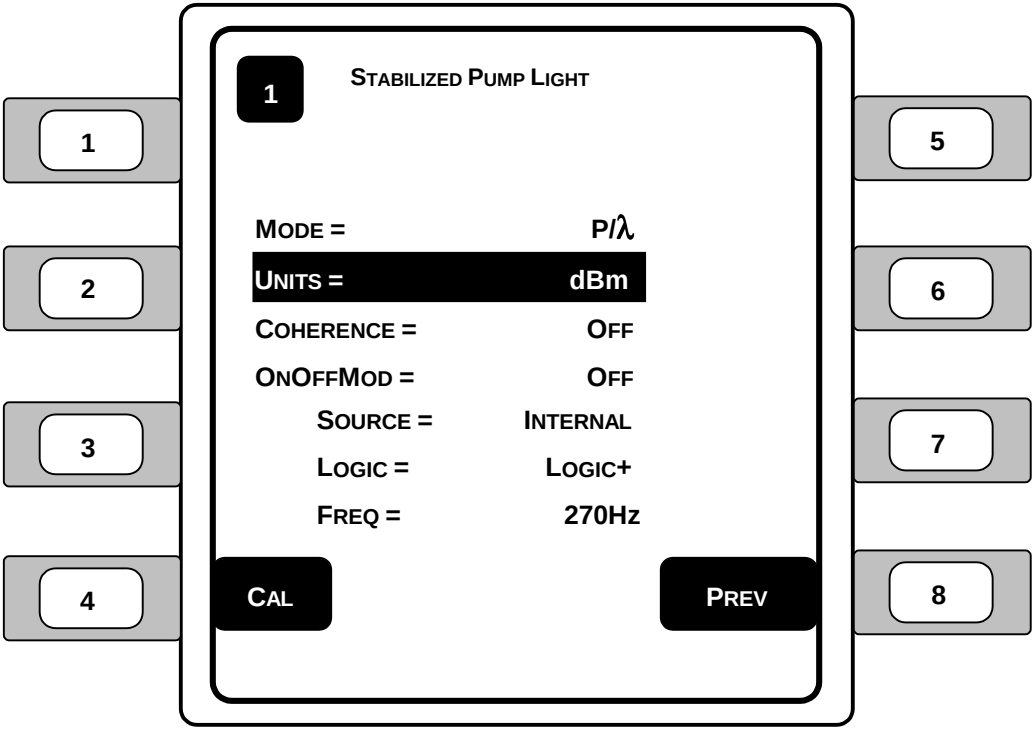


Figure 39 – PTS-PUMP Series Laser Light Source Setup Screen

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1. **MODE –** The light source mode refers to the measurements that allow the user to control the laser current.
   Selections: P/λ, P/T, I/λ, I/T

   - **P/λ** [power/wavelength] (Po) – provides power to hold the wavelength constant.
   - **P/T** [power/temperature] (Po) – power and temperature will remain constant, but the wavelength may vary.
   - **I/λ** [current/wavelength] (Io) – the power will change to hold the current.
   - **I/T** [current/temperature] (Io) – power and temperature are held constant to create a fixed wavelength.

2. **UNITS –** This parameter allows the user to select the light source power units.
   Selections: dBm, mW

3. **COHERENCE** (Coherence Mode) – Turns the coherence mode on/off. With coherence turned on, the light source oscillates in a sine wave at a set frequency and amplitude to simulate the transmission of information through the light energy.
   Selections: On, Off

4. **ONOFF MOD** (On/Off Modulation) – Turns the light source frequency oscillator (pulsing) on/off. The on/off modulation pulses the light source off and on according to the source, logic, and frequency settings.
   Selections: On, Off

5. **SOURCE** – Sets the light source on/off modulation input source:
   Selections: Internal, Sync In, GS1, GS2

   - **INTERNAL** – enables the internal modulation chip to modulate the frequency based on the user defined internal frequency.
   - **SYNC IN** (Internal) – allows the user to set the input synchronization to an external transistor-transistor logic (TTL) level voltage signal source connected to the SMA input connector on the front of the module.
   - **GS1** (Group Sync In) – allows the user to set the input synchronization to an external source connected to the GS1 IN SMA connector on the rear panel of the Model 8800. This allows for simultaneous synchronization across multiple instruments and modules.
   - **GS2** (Group Sync Out) – allows the user to set the input synchronization to the instrument's main processor via an external source connected to the GS2 OUT SMA connector on the rear panel of the Model 8800. The processor will generate a pulse that can be used to synchronize all of the modules.

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6. **LOGIC** – Determines the where the light source modulation will begin in the cycle, either on the positive side (on) or on the negative side (off).
   Selections: Logic+, Logic-

7. **FREQ** – Determines the frequency to be used for the light source module.
   Range: 270Hz, 1kHz, 2kHz

8. **CAL** (calibration) – Changes the display to the light source calibration screen.

9. **PREV** (previous) – Changes the display to the previous screen.

4.6.6 Fiber Amplifier Pump Light Source Module Specifications

Specifications	980 nm Pump LD with Bragg Grating			980 nm Pump LD			1480 nm Pump LD	
Order Code	90	91	92	95	96	97	40	41
Center Wavelength [nm]	980±5			980±5			1480±15	
Spectral Width [nm](typ) with Grating without Grating	1 -			- 5			- 10	
Output Power [mW]	100	130	150	100	130	150	120	140
Power Adjustment [dB](typ)	6			6			6	
Power Stability [dB] (1) Short Term – 15 minutes Long Term – 8 hours	±0.02 ±0.05			±0.02 ±0.05			±0.02 ±0.05	
On/Off Modulation Frequency Internal External	270 Hz, 1 kHz, or 2 kHz user determined sync input							
Coherence Modulation	50 kHz, sine wave, 10% depth of modulation, internal source							
Fiber Type	4.2/125 µm SM			4.2/125 µm SM			9/125 µm SM	
Module Dimensions [H x W x D]	5.23 x 1.39 x 9.09 in. (13.3 x 3.5 x 23.1 cm)							
Module Weight	1.75 lb. (0.8 kg)							
Operating/Storage Temperature [°C]	0 to 40 / -20 to 60							

Table 5 – PTS-PUMP Light Source Module Specifications

NOTE:
1) After 1 hour of stabilization at 23 ± 3°C ambient

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CHAPTER 5

5 PTS-OPM Series Optical Power Meter

5.1 Optical Power Meter Module

5.1.1 Introduction

The PTS-OPM Series Optical Power Meter Modules give the Model 8800 and 8200 Photonics Test System mainframes the utility of a benchtop optical power meter along with the convenience of a modular platform.

Single and dual-channel versions of this module are available, featuring an analog output for monitoring the detector input directly with an oscilloscope or volt meter. The PTS-OPM modules utilize any one of Newport's new 918 Series low-power, semiconductor detectors.

This makes these meters extremely versatile for measuring free-space and fiber optic light sources, with power levels from 1 pW (-90 dBm) up to 2 W (+33 dBm), and wavelengths in the 190 nm to 1800 nm regime. The modules are also backward compatible with Newport's full range of 818 Series detectors, which can be used with an adaptor cable.

The optical power meter modules are individually calibrated using NIST-traceable, precision current sources, and are shipped with a certificate of calibration.

5.1.2 Product Features

- Free-space and fiber optic measurements
- Compatible with all of Newport's low-power, semiconductor detectors, including integrating sphere-based systems
- Wide power range – from 1 pW up to 2 W (-90 to +33 dBm)
- Wide wavelength range – 190 nm to 1800 nm
- Analog output for connection to external instruments

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5.1.3 Installation

Optical power meter modules are for use in the Model 8800 and 8200 mainframes in any slot.

NOTE

When making a connection to the analog output (A/O) connector on the optical power meter module, use a coaxial cable no longer than six (6) feet (2 meters). Using a coaxial cable longer than six feet (two meters) may result in improper readings from the analog output connector on the power meter.

CAUTION

Do **NOT** plug-in or unplug a module with the AC power ON.

5.1.4 Optical Power Meter Screen – Single Channel

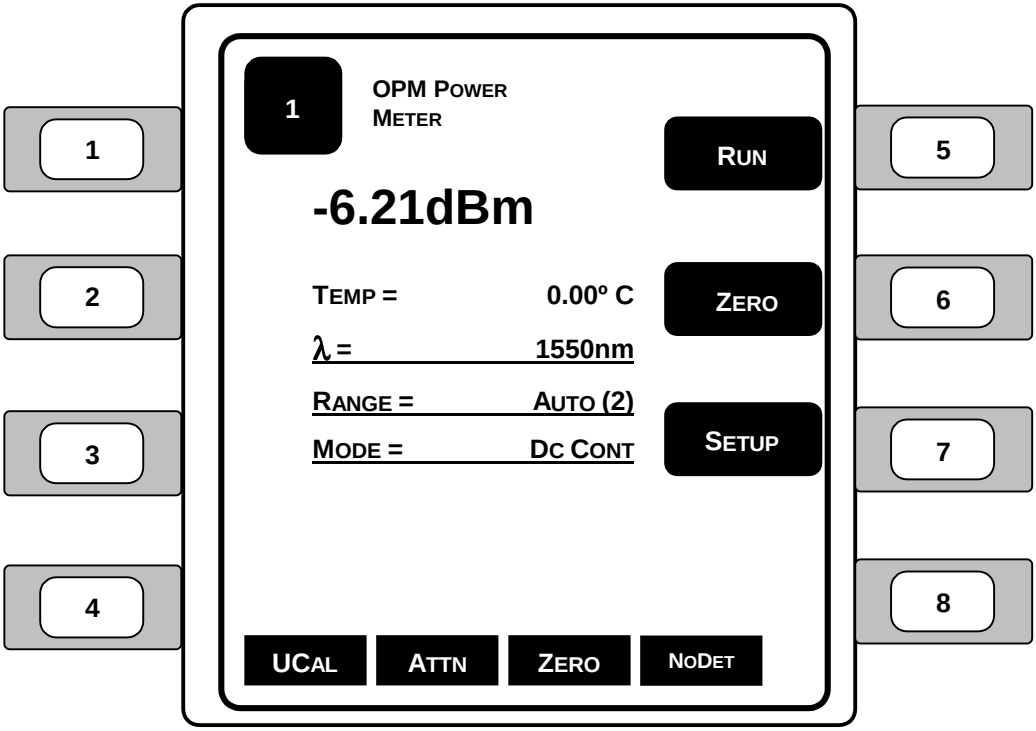


Figure 40 – Single Channel Optical Power Meter

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1. **TEMP** – Displays the calibrated detector head temperature.

2. λ (Wavelength) – Sets the wavelength being measured by the power meter. A detector calibration module contains responsivity data for its assigned detector at discrete wavelengths. By telling the meter which wavelength is being measured, the correct responsivity value is used in calculating the measured power or energy. When a wavelength falls between two calibration points, linear interpolation is used to approximate the true responsivity value.

3. **RANGE** – Displays the currently selected amplifier signal range. Signal ranges step in 1 decade gain increments that are mode dependent as the Range is changed in order to utilize maximum resolution from the meter's analog-to-digital converters.

   Press the left and right arrow keys (◀▶) to increase or decrease the signal range and enable and disable the **AUTO** feature and cause the signal range to change. Manual ranging is useful when working with external analog recording equipment.

   The available signal ranges are detector and mode dependent. Zero (0) through seven (7) can be selected: **0** is the ***minimum*** gain, **7** is the ***maximum*** gain setting. If AUTO is on, then the signal range number will change if the detector signal varies more than a decade in magnitude. Signal range changes can occur without an effect on the displayed measurement value. Available ranges are determined by the capability of the detector.

4. **MODE** – Displays the selection of measurement modes for acquiring data. At power on, the meter checks the detector's calibration module to determine which measurement modes the detector supports. **Table 6** describes the measurement modes available for each family of detector.

Family	Mode	V	A	W	dBm	dB	REL
Low-Power	DC CONT		✓	✓	✓	✓	✓
Low-Power	DC SINGLE		✓	✓	✓	✓	✓

Table 6 – Valid Display Units Available to Detector Families by Mode

Press the left and right arrow keys (◀▶) repeatedly until the desired mode is indicated in the mode enunciator display area. When selecting a new mode, the display units will change to the appropriate default units if they are not compatible with the new measurement mode.

- **DC CONT** – measurement occurs at a programmable sample rate.
- **DC SINGLE –** a measurement is taken every time the meter receives a trigger up to a 1000 Hz rate.

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5. **RUN/STOP** – The RUN/STOP key provides front panel control over data acquisition. When in Single measurement mode, each RUN/STOP key press causes one reading to be taken. In CONT measurement mode, each RUN/STOP key press toggles continuous data acquisition on and off.

6. **ZERO** – This button turns offset subtraction on and off. When turned ON, the ZERO LED lights and the last signal reading is saved as S and subtracted from all subsequent signal readings. This causes subsequent signal calculations (and for the reading display) to use the S-S (S_{zero} minus $S_{current}$) instead of S.

   Offset subtraction allows for the removal of ambient DC signal effects, by zeroing the display before taking a measurement. Pressing the ZERO button a second time, turns OFF the ZERO LED and stops offset subtraction.

7. **SETUP** – Changes the screen to the optical power meter setup menu. See **Figure 41**.

8. **LEDs –** LEDs display status and error conditions:
   - **UCAL** – user calibration information is being used for readings and calculations. The instrument is using the user-defined responsivity instead of the responsivity from the calibration file.
   - **ATTN** – the detector head's attenuator is in place and detected and/or turned on. Refer to the Power Meter Setup screen section for additional information.
   - **ZERO** – a zero value is selected and being used.
   - **NoDET** – a detector has not been found.

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5.1.5 Optical Power Meter Setup Screen – Single Channel

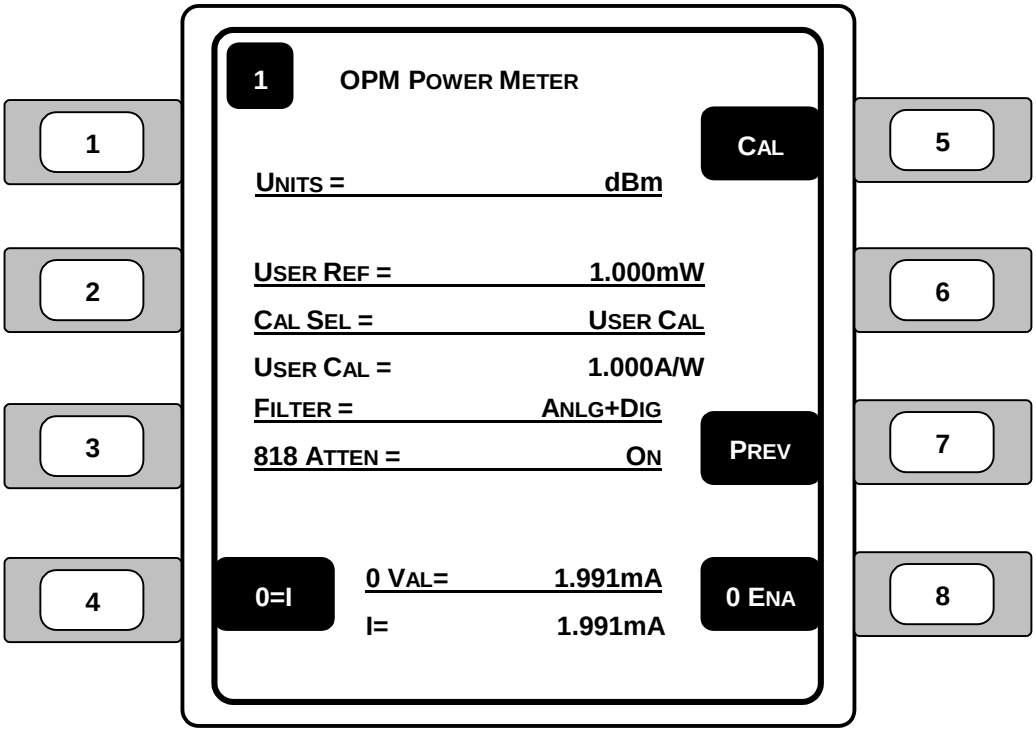


Figure 41 – Single Channel Optical Power Meter Setup

1. **UNITS** (Display Units) – Displays the currently selected units. The set of units available at any given time is determined by the detector type and the measurement mode. Press the left and right arrow keys (◀▶) when the UNITS function is the focus to select the desired units. **Table 6** describes the available units for each detector family as a function of the measurement mode.

2. **USER REF** – Enter the proper reference value when displaying power. The User Ref sets the divisor when displaying power units in Relative (REL) mode.

3. **CAL SEL** – Selects the calibration (responsivity) value to be used for power meter calculations. Detector calibration (Det Cal) uses the calibration information stored in the detector calibration file. User calibration (User Cal) uses the responsivity entered for the User Cal value.

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4. **USER CAL** – Enter the desired power meter responsivity in Amps per Watt (A/W).

5. **FILTER** – Press the left and right arrow keys (◀▶) to cycle input signal filtering between: **NONE**, **ANALOG**, **DIGITAL**, **ANLG+DIG**. This function provides methods of lowering the noise observed in the measurement data and the analog output.

NOTE

There is temporary degradation of signal amplitudes at the analog output which is self-recovering (meeting Performance Criterion B) when this product is exposed to interference stipulated by BS EN61326:1998, the applicable international standard for electromagnetic immunity.

When ANALOG is chosen, a 5Hz low-pass filter lowers the noise floor by attenuating high frequency components. Analog filtering is not available to High Power detectors, Energy detectors or any P-P modes.

When DIGITAL is chosen, measurements pass through a moving 10-sample averaging buffer before being further processed, stored, or communicated to the display or computer interfaces. With digital on, all observable values represent digitally averaged results relative to the original A/D conversions. This averaging is independent of the subsequent processing available through the STATS buffer.

Analog plus Digital (ANLG+DIG) uses the filtering elements from both Analog and Digital filtering presented above. No signal filtering is performed with NONE selected.

6. **818 ATTEN** – Selects whether or not the attenuator for the 818 Series power detector is on the detector.

NOTE

This selection is only displayed if a 918 Series detector is not detected. The attenuator for the 918 Series Detectors is automatically detected if in place, and thus requires no on/off setting.

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7. **0 VAL** – Allows the user to enter the desired zero (offset) value for the power reading.

   If desired, set the zero value equal to the present current reading by selecting the 0=I button. The 0 VAL will be set to the present current reading when the button is pressed.

8. **I** (current) – Displays the present current read by the power meter. Note that the units may vary according to the amount of current measured.

9. **CAL** – Select the CAL button to begin the calibration sequence for the power meter module. The power meter can be calibrated by following the instructions on the display, but should only be completed when necessary.

10. **PREV** – Takes the user back to the previous screen.

11. **0 ENA/0 DIS** – Enables or disables the use of the zero offset function for the power meter. With 0 ENA displayed, the zero offset is enabled. With 0 DIS displayed, the zero offset is disabled and the power readings are raw, uncalculated values. Offset subtraction allows for the removal of ambient DC signal effects, by zeroing the display before taking a measurement.

12. **0=I** – Sets the zero offset value to the present current reading.

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5.1.6 Optical Power Meter Screen – Dual Channel Display

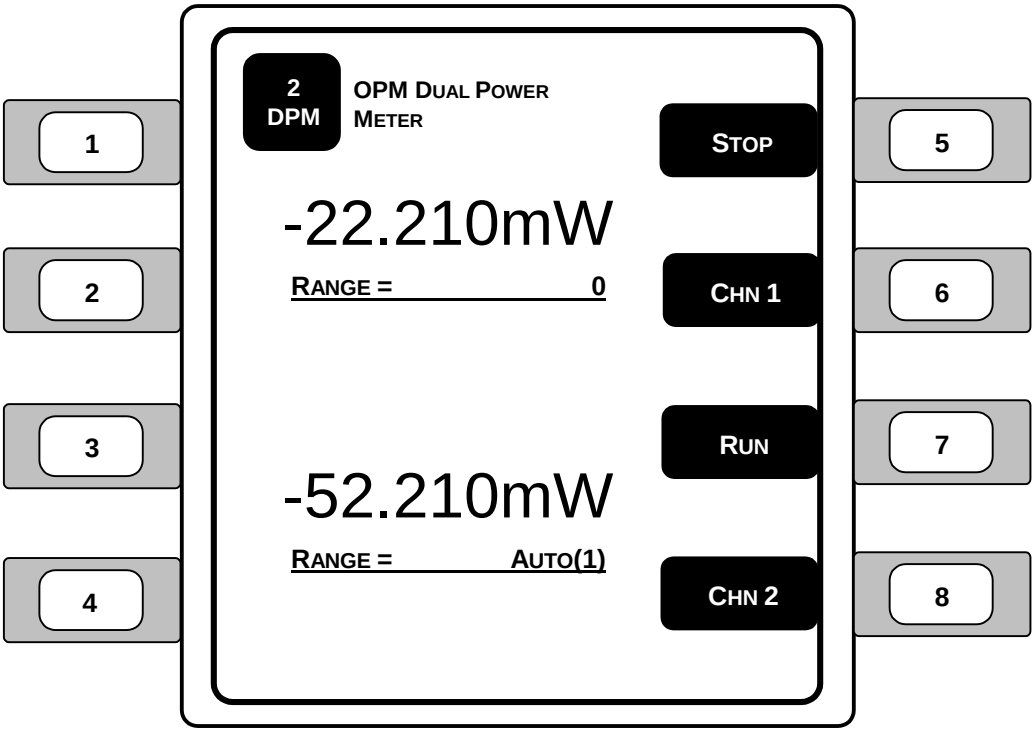


Figure 42 – Dual Channel Optical Power Meter Screen

1. **POWER DISPLAY** (Channel 1) – Displays the present power reading for channel 1.

2. **RANGE** (Channel 1) – Displays the present range selected for channel 1.

3. **POWER DISPLAY** (Channel 2) – Displays the present power reading for channel 2.

4. **RANGE** (Channel 2) – Displays the present range selected for channel 2.

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5. **RUN/STOP** (Channel 1) – The RUN/STOP key provides front panel control over data acquisition. When in Single measurement mode, each RUN/STOP key press causes one reading to be taken on channel 1. In CONT measurement mode, each RUN/STOP key press toggles continuous data acquisition on and off for channel 1.

6. **CHN 1** – Displays the power meter operating information for channel 1.

7. **RUN/STOP** (Channel 2) – The RUN/STOP key provides front panel control over data acquisition. When in Single measurement mode, each RUN/STOP key press causes one reading to be taken on channel 2. In CONT measurement mode, each RUN/STOP key press toggles continuous data acquisition on and off for channel 2.

8. **CHN 2** – Displays the power meter operating information for channel 2.

5.1.7 Selected Optical Power Meter Screen – Dual Channel

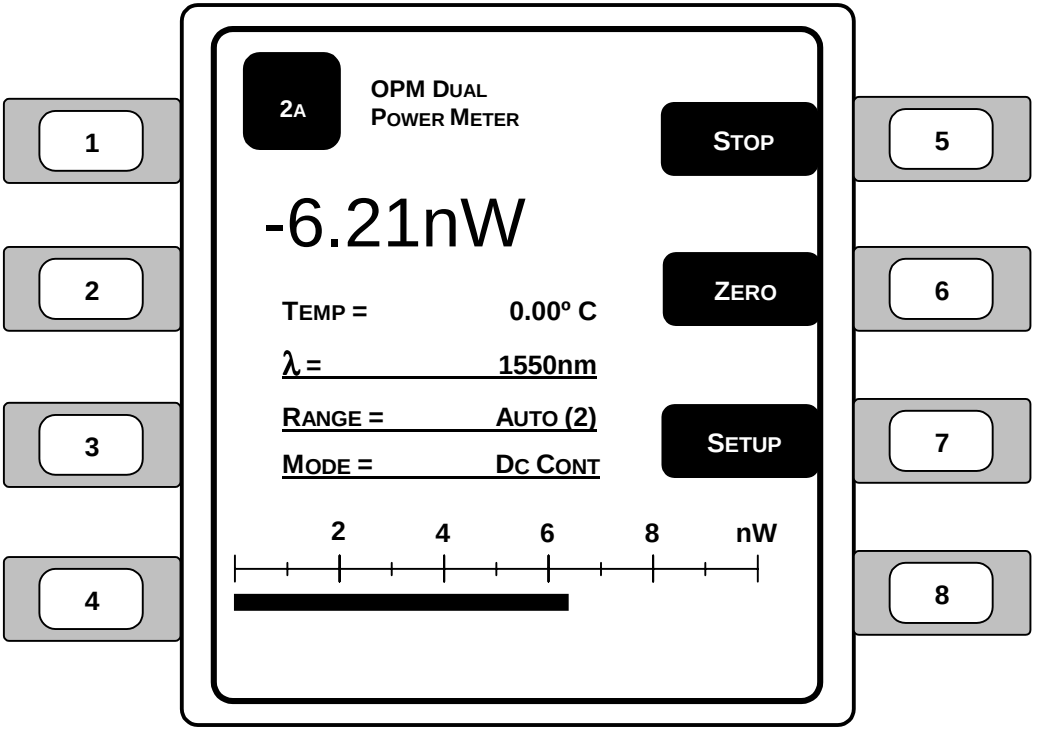


Figure 43 – Selected Dual Channel Optical Power Meter Screen

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1. **TEMP** – Displays the calibrated detector head temperature.

2. λ (Wavelength) – Selects the wavelength being measured by the currently selected power meter. A detector calibration module contains responsivity data for its assigned detector at discrete wavelengths. By telling the meter which wavelength is being measured, the correct responsivity value is used in calculating the measured power or energy. When a wavelength falls between two calibration points, linear interpolation is used to approximate the true responsivity value.

3. **RANGE** – Displays the currently selected amplifier signal range. Signal ranges step in 1 decade gain increments that are mode dependent as the Range is changed in order to utilize maximum resolution from the meter's analog-to-digital converters.

   Press the left and right arrow keys (◀▶) to increase or decrease the signal range and enable and disable the **AUTO** feature and cause the signal range to change. Manual ranging is useful when working with external analog recording equipment.

   The available signal ranges are detector and mode dependent. Zero (0) through seven (7) can be selected: **0** is the ***minimum*** gain, **7** is the ***maximum*** gain setting. If AUTO is on, then the signal range number will change if the detector signal varies more than a decade in magnitude. Signal range changes can occur without an effect on the displayed measurement value.

4. **MODE** – Displays the selection of measurement modes for acquiring data. At power on, the meter checks the detector's calibration module to determine which measurement modes the detector supports. **Table 7** describes the measurement modes available for each family of detector.

Family	Mode	V	A	W	dBm	dB	REL
Low-Power	DC CONT		✓	✓	✓	✓	✓
Low-Power	DC SINGLE		✓	✓	✓	✓	✓

Table 7 – Valid Display Units Available to Detector Families by Mode

Press the left and right arrow keys (◀▶) repeatedly until the desired mode is indicated in the mode enunciator display area. When selecting a new mode, the display units will change to the appropriate default units if they are not compatible with the new measurement mode.

- **DC CONT** – measurement occurs at a programmable sample rate.
- **DC SINGLE –** a measurement is taken every time the meter receives a trigger up to a 1000 Hz rate.

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5. **RUN/STOP** – The RUN/STOP key provides front panel control over data acquisition. When in Single measurement mode, each RUN/STOP key press causes one reading to be taken. In CONT measurement mode, each RUN/STOP key press toggles continuous data acquisition on and off.

6. **ZERO** – This button turns offset subtraction on and off. When turned ON, the ZERO LED lights and the last signal reading is saved as S and subtracted from all subsequent signal readings. This causes subsequent signal calculations (and for the reading display) to use the S-S (S_{zero} minus $S_{current}$) instead of S.

   Offset subtraction allows for the removal of ambient DC signals effects, by zeroing the display before taking a measurement. Pressing the ZERO button a second time, turns OFF the ZERO LED and stops offset subtraction.

7. **SETUP** – Changes the screen to the power meter setup menu. See **Section 5.1.8**.

8. **LEDs –** LEDs display status and error conditions:
   - **UCAL** – user calibration information is being used for readings and calculations. The instrument is using the user-defined responsivity instead of the responsivity from the calibration file.
   - **ATTN** – the detector head's attenuator is in place and detected and/or turned on. Refer to the Power Meter Setup screen section for additional information.
   - **ZERO** – a zero value is selected and being used.
   - **NoDET** – a detector has not been found.

9. **Power Display Bar Graph** – Actively displays the present power reading using a scaled bar graph. Note that the bar graph is only displayed when Watts (W) or Amps (A) are selected for the Units at the Setup screen.

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5.1.8 Optical Power Meter Setup Screen – Dual Channel

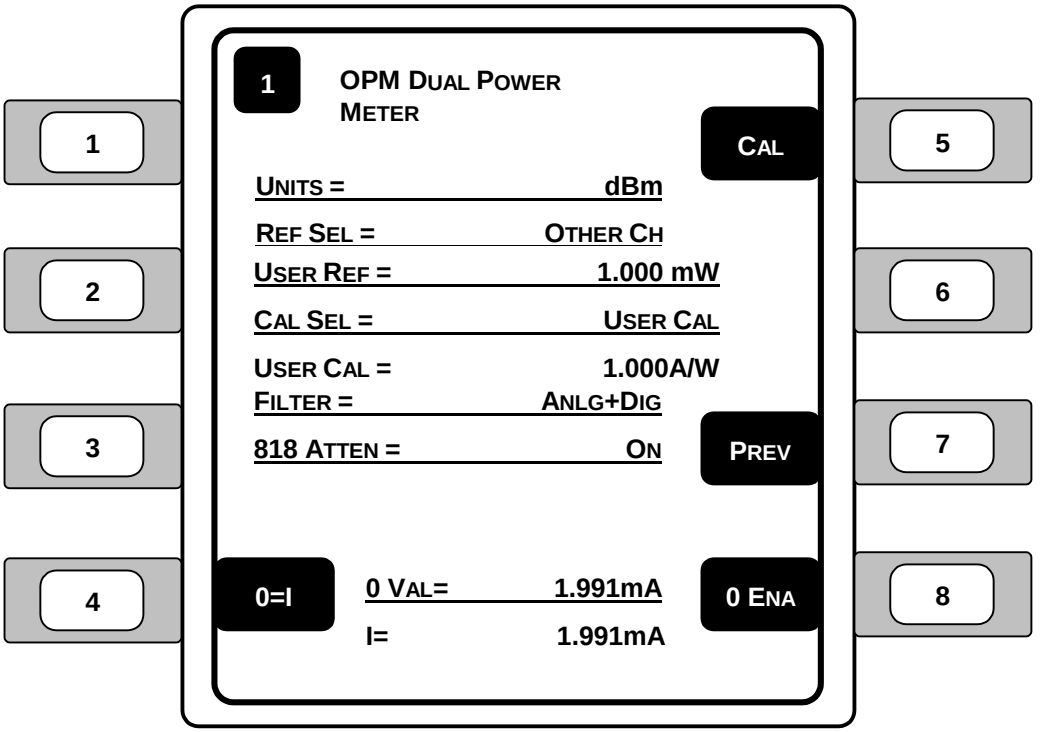


Figure 44 – Dual Channel Optical Power Meter Setup

1. **UNITS** (Display Units) – Displays the currently selected units. The set of units available at any given time is determined by the detector type and the measurement mode. Press the left and right arrow keys (◀▶) when the UNITS function is the focus to select the desired units. **Table 7** describes the available units for each detector family as a function of the measurement mode.

2. **REF SEL** – Selects the designation for the reference value used to display the proper power reading. Press the left and right arrow keys (◀▶) to select the desired source for the reference value. With User Reference (User Ref) selected, the power meter uses the value entered in the User Ref entry line for the power reading display calculation. With Other Channel (OtherCh) selected, the power meter uses the setting selected for the other channel on the dual power meter (either channel 1 or 2).

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3. **USER REF** – Enter the proper reference value when displaying power. The User Ref sets the divisor when displaying power units in Relative (REL) mode.

4. **CAL SEL** – Selects the calibration (responsivity) value to be used for power meter calculations. Detector calibration (Det Cal) uses the calibration information stored in the detector calibration file. User calibration (User Cal) uses the responsivity entered for the User Cal value.

5. **USER CAL** – Enter the desired power meter responsivity in Amps per Watt (A/W).

6. **FILTER** – Press the left and right arrow keys (◀▶) to cycle input signal filtering between: **NONE**, **ANALOG**, **DIGITAL**, **ANLG+DIG**. This function provides methods of lowering the noise observed in the measurement data and the analog output.

NOTE

There is temporary degradation of signal amplitudes at the analog output which is self-recovering (meeting Performance Criterion B) when this product is exposed to interference stipulated by BS EN61326:1998, the applicable international standard for electromagnetic immunity.

When ANALOG is chosen, a 5Hz low pass filter lowers the noise floor by attenuating high frequency components. Analog filtering is not available to High Power detectors, Energy detectors or any P-P modes.

When DIGITAL is chosen, measurements pass through a moving 10-sample averaging buffer before being further processed, stored, or communicated to the display or computer interfaces. With digital on, all observable values represent digitally averaged results relative to the original A/D conversions. This averaging is independent of the subsequent processing available through the STATS buffer.

Analog plus Digital (ANLG+DIG) uses the filtering elements from both Analog and Digital filtering presented above. No signal filtering is performed with NONE selected.

7. **818 ATTEN** – Selects whether or not the attenuator for the 818 Series power detector is on the detector.

NOTE

This selection is only displayed if a 918 Series detector is not detected. The attenuator for the 918 Series Detectors is automatically detected if in place, and thus requires no on/off setting.

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8. **0 VAL** – Allows the user to enter the desired zero (offset) value for the power reading.

   If desired, set the zero value equal to the present current reading by selecting the 0=I button. The 0 VAL will be set to the present current reading when the button is pressed.

9. **I** (current) – Displays the present current read by the power meter. Note that the units may vary according to the amount of current measured.

10. **CAL** – Select the CAL button to begin the calibration sequence for the power meter module. The power meter can be calibrated by following the instructions on the display, but should only be completed when necessary.

11. **PREV** – Takes the user back to the previous screen.

12. **0 ENA/0 DIS** – Enables or disables the use of the zero offset function for the power meter. With 0 ENA displayed, the zero offset is enabled. With 0 DIS displayed, the zero offset is disabled and the power readings are raw, uncalculated values. Offset subtraction allows for the removal of ambient DC signals effects, by zeroing the display before taking a measurement.

13. **0=I** – Sets the zero offset value to the present current reading.

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5.2 Optical Power Meter Specifications

Optical Power Meter Specifications

Model Number	PTS-OPM-1	PTS-OPM-2
Module Type	Single-Channel	Dual-Channel
Signal Ranges	Up to 8 decades (detector dependent)	
Auto-Ranging Time [ms] (typ.)	200	
Max. Detector Input Current [mA]	5	
Analog Output [V] (into 1 MΩ)	0 to 2	
DC Accuracy [%]	< ± 2	
Connectors Detector Input Analog Output	 14-pin circular connector Mini-SMA	
Module Dimensions [H x W x D]	5.23 x 1.39 x 9.09 in. (13.3 x 3.5 x 23.1 cm)	
Module Weight	1.75 lb. (0.8 kg)	
Operating/Storage Temperature [°C]	5 to 40 / -20 to 60	

Table 8 – Optical Power Meter Module Specifications

NOTE

When making a connection to the analog output (A/O) connector on the optical power meter module, use a coaxial cable no longer than six (6) feet (2 meters). Using a coaxial cable longer than six feet (two meters) may result in improper readings from the analog output connector on the power meter.

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CHAPTER 6

6 PTS-FOPM Series Fiber Optic Power Meter

6.1 Fiber Optic Power Meter Module

6.1.1 Introduction

The PTS-FOPM series fiber optic power meters accept a direct fiber input to acquire power measurements in the 400 to 1800 nm wavelength range (refer to the Fiber Optic Power Meter Specifications table in this section for additional information). Both single and dual-channel versions are offered, with five different input connector options available.

Both the single and dual-channel versions of this module featuring an analog output to monitor the detector output directly with an oscilloscope or voltmeter.
Each module is individually calibrated to NIST traceable standards using Newport's in-house calibration facility. Calibration data is taken in 10 nm increments and electronically stored inside the module, resulting in accurate power measurements over the entire wavelength band.

Certificates of calibration as well as the actual calibration curves recorded are shipped with each module. Annual re-calibration is recommended to assure measurement accuracy.

6.1.2 Product Features

- Direct fiber input for fiber optic component measurements
- Single and dual-channel versions offered
- Three modules cover 400-1800 nm wavelength range
- Measurement range from -100 to +3 dBm
- Analog output for connection to external instruments
- Available with variety of fiber connector styles

6.1.3 Installation

Fiber optic power meter modules are for use in the Model 8800 and 8200 mainframes in any slot.

NOTE

When making a connection to the analog output (A/O) connector on the fiber optic power meter module, use a coaxial cable no longer than six (6) feet (2 meters). Using a coaxial cable longer than six feet (two meters) may result in improper readings from the analog output connector on the power meter.

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CAUTION
Do **NOT** plug-in or unplug a module with the AC power ON.

6.1.4 Fiber Optic Power Meter Screen – Single Channel

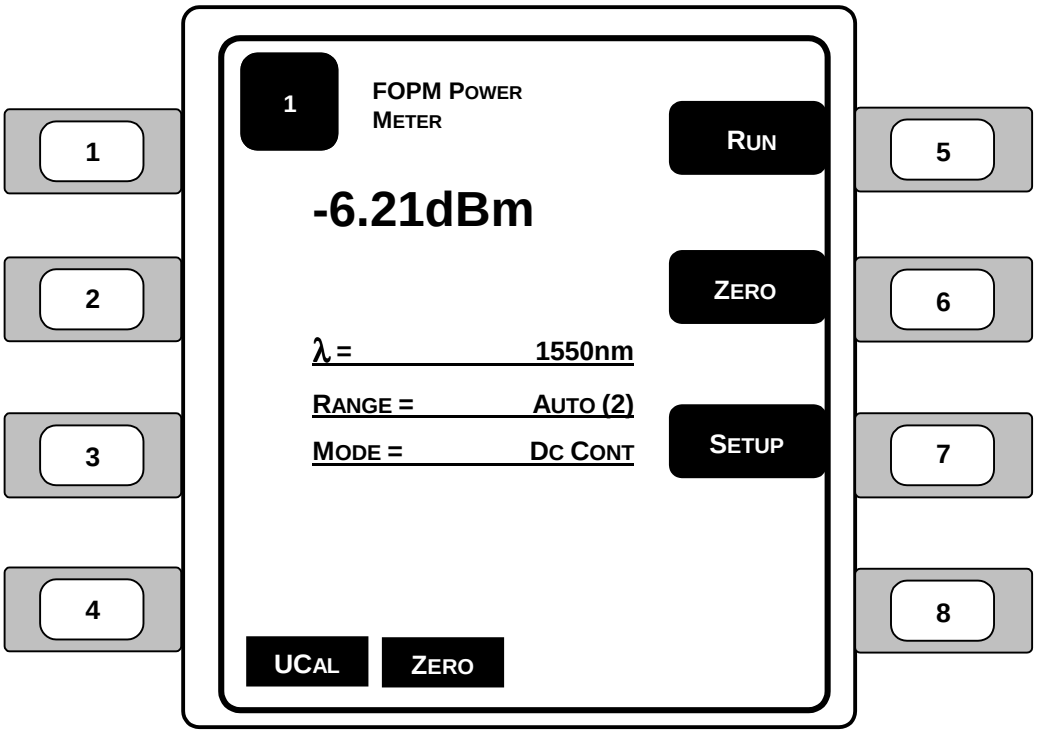


Figure 45 – Single Channel Fiber Optic Power Meter

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1. **λ** (Wavelength) – Selects the wavelength being measured by the power meter. A detector calibration module contains responsivity data for its assigned detector at discrete wavelengths. By telling the meter which wavelength is being measured, the correct responsivity value is used in calculating the measured power or energy. When a wavelength falls between two calibration points, linear interpolation is used to approximate the true responsivity value.

2. **RANGE** – Displays the currently selected amplifier signal range. Signal ranges step in 1 decade gain increments that are mode dependent as the Range is changed in order to utilize maximum resolution from the meter's analog-to-digital converters.

   Press the left and right arrow keys (◀▶) to increase or decrease the signal range and enable and disable the **AUTO** feature and cause the signal range to change. Manual ranging is useful when working with external analog recording equipment.

   The available signal ranges are detector and mode dependent. Zero (0) through seven (7) can be selected: **0** is the ***minimum*** gain, **7** is the ***maximum*** gain setting. If AUTO is on, then the signal range number will change if the detector signal varies more than a decade in magnitude. Signal range changes can occur without an effect on the displayed measurement value.

3. **MODE** – Displays the selection of measurement modes for acquiring data. At power on, the meter checks the detector's calibration module to determine which measurement modes the detector supports. **Table 9** describes the measurement modes available for each family of detector.

Family	Mode	V	A	W	dBm	dB	REL
Low-Power	DC CONT		✓	✓	✓	✓	✓
Low-Power	DC SINGLE		✓	✓	✓	✓	✓

Table 9 – Valid Display Units Available to Detector Families by Mode

   Press the left and right arrow keys (◀▶) repeatedly until the desired mode is indicated in the mode enunciator display area. When selecting a new mode, the display units will change to the appropriate default units if they are not compatible with the new measurement mode.

   - **DC CONT** – measurement occurs at a programmable sample rate.
   - **DC SINGLE –** a measurement is taken every time the meter receives a trigger up to a 1000 Hz rate.

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4. **RUN/STOP** – The RUN/STOP key provides front panel control over data acquisition. When in Single measurement mode, each RUN/STOP key press causes one reading to be taken. In CONT measurement mode, each RUN/STOP key press toggles continuous data acquisition on and off.

5. **ZERO** – This button turns offset subtraction on and off. When turned ON, the ZERO LED lights and the last signal reading is saved as S and subtracted from all subsequent signal readings. This causes subsequent signal calculations (and for the reading display) to use the S-S (S_{zero} minus $S_{current}$) instead of S.

   Offset subtraction allows for the removal of ambient DC signals effects, by zeroing the display before taking a measurement. Pressing the ZERO button a second time, turns OFF the ZERO LED and stops offset subtraction.

6. **SETUP** – Changes the screen to the power meter setup menu. See **Figure 46**.

7. **LEDs –** LEDs display status and error conditions:
   - **UCAL** – user calibration information is being used for readings and calculations. The instrument is using the user-defined responsivity instead of the responsivity from the calibration file.
   - **ZERO** – a zero value is selected and being used.

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6.1.5 Fiber Optic Power Meter Setup Screen – Single Channel

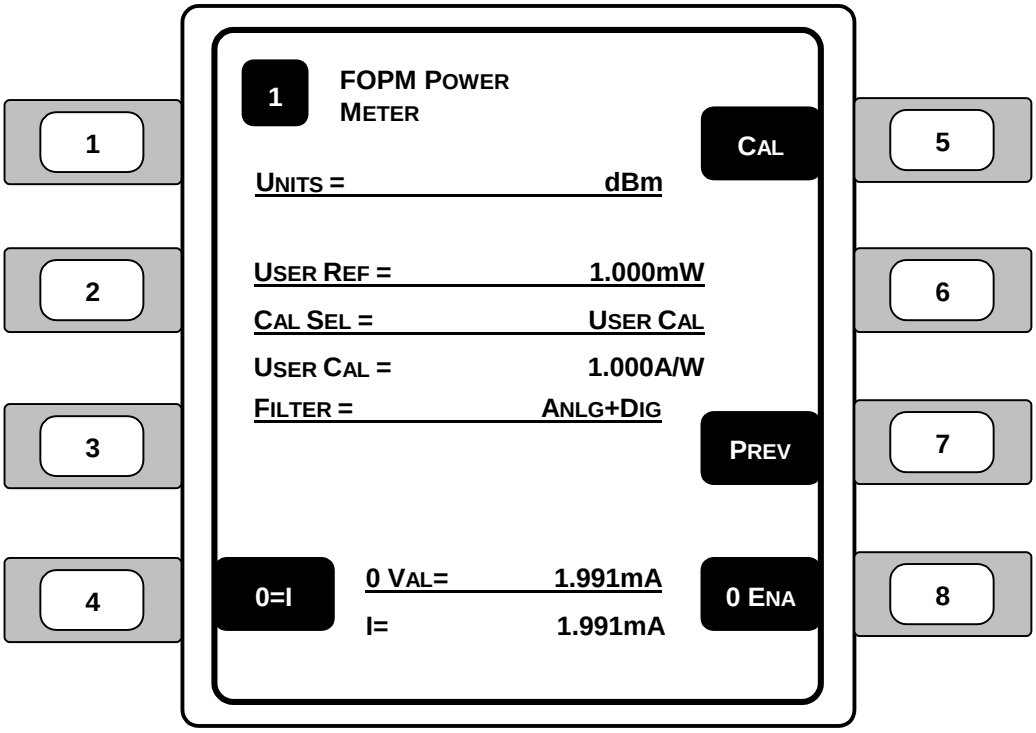


Figure 46 – Single Channel Fiber Optic Power Meter Setup

1. **UNITS** (Display Units) – Displays the currently selected units. The set of units available at any given time is determined by the detector type and the measurement mode. Press the left and right arrow keys (◀▶) when the UNITS function is the focus to select the desired units. **Table 9** describes the available units for each detector family as a function of the measurement mode.

2. **USER REF** – Enter the proper reference value when displaying power. The User Ref sets the divisor when displaying power units in Relative (REL) mode.

3. **CAL SEL** – Selects the calibration (responsivity) value to be used for power meter calculations. Detector calibration (Det Cal) uses the calibration information stored in the detector calibration file. User calibration (User Cal) uses the responsivity entered for the User Cal value.

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4. **USER CAL** – Enter the desired power meter responsivity in Amps per Watt (A/W).

5. **FILTER** – Press the left and right arrow keys (◀▶) to cycle input signal filtering between: **NONE**, **ANALOG**, **DIGITAL**, **ANLG+DIG**. This function provides methods of lowering the noise observed in the measurement data and the analog output.

NOTE

There is temporary degradation of signal amplitudes at the analog output which is self-recovering (meeting Performance Criterion B) when this product is exposed to interference stipulated by BS EN61326:1998, the applicable international standard for electromagnetic immunity.

When ANALOG is chosen, a 5Hz low pass filter lowers the noise floor by attenuating high frequency components. Analog filtering is not available to High Power detectors, Energy detectors or any P-P modes.

When DIGITAL is chosen, measurements pass through a moving 10-sample averaging buffer before being further processed, stored, or communicated to the display or computer interfaces. With digital on, all observable values represent digitally averaged results relative to the original A/D conversions. This averaging is independent of the subsequent processing available through the STATS buffer.

Analog plus Digital (ANLG+DIG) uses the filtering elements from both Analog and Digital filtering presented above. No signal filtering is performed with NONE selected.

6. **0 VAL** – Allows the user to enter the desired zero (offset) value for the power reading.

   If desired, set the zero value equal to the present current reading by selecting the 0=I button. The 0 VAL will be set to the present current reading when the button is pressed.

7. **I** (current) – Displays the present current read by the power meter. Note that the units may vary according to the amount of current measured.

8. **CAL** – Select the CAL button to begin the calibration sequence for the power meter module. The power meter can be calibrated by following the instructions on the display, but should only be completed when necessary.

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9. **PREV** – Takes the user back to the previous screen.

10. **0 ENA/0 DIS** – Enables or disables the use of the zero offset function for the power meter. With 0 ENA displayed, the zero offset is enabled. With 0 DIS displayed, the zero offset is disabled and the power readings are raw, uncalculated values. Offset subtraction allows for the removal of ambient DC signals effects, by zeroing the display before taking a measurement.

11. **0=I** – Sets the zero offset value to the present current reading.

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6.1.6 Fiber Optic Power Meter Screen – Dual Channel Display

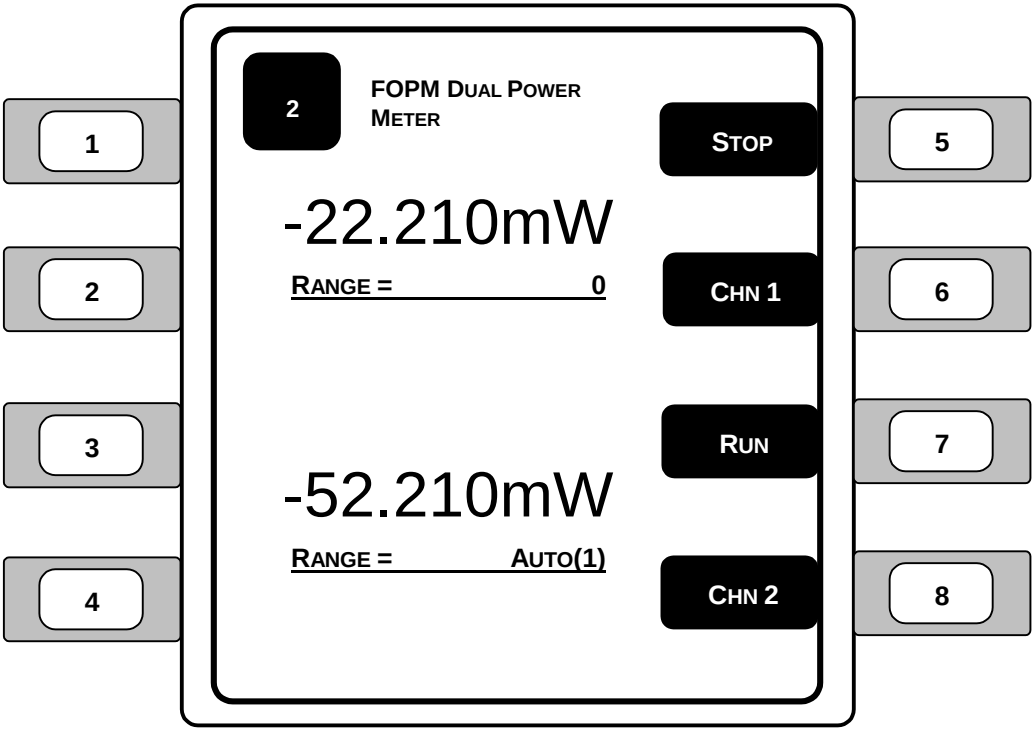


Figure 47 – Dual Channel Fiber Optic Power Meter Screen

1. **POWER DISPLAY** (Channel 1) – Displays the present power reading for channel 1.

2. **RANGE** (Channel 1) – Displays the present range selected for channel 1.

3. **POWER DISPLAY** (Channel 2) – Displays the present power reading for channel 2.

4. **RANGE** (Channel 2) – Displays the present range selected for channel 2.

5. **RUN/STOP** (Channel 1) – The RUN/STOP key provides front panel control over data acquisition. When in Single measurement mode, each RUN/STOP key press causes one reading to be taken on channel 1. In CONT measurement mode, each RUN/STOP key press toggles continuous data acquisition on and off for channel 1.

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6. **CHN 1** – Displays the power meter operating information for channel 1.

7. **RUN/STOP** (Channel 2) – The RUN/STOP key provides front panel control over data acquisition. When in Single measurement mode, each RUN/STOP key press causes one reading to be taken on channel 2. In CONT measurement mode, each RUN/STOP key press toggles continuous data acquisition on and off for channel 2.

8. **CHN 2** – Displays the power meter operating information for channel 2.

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6.1.7 Selected Fiber Optic Power Meter Screen – Dual Channel

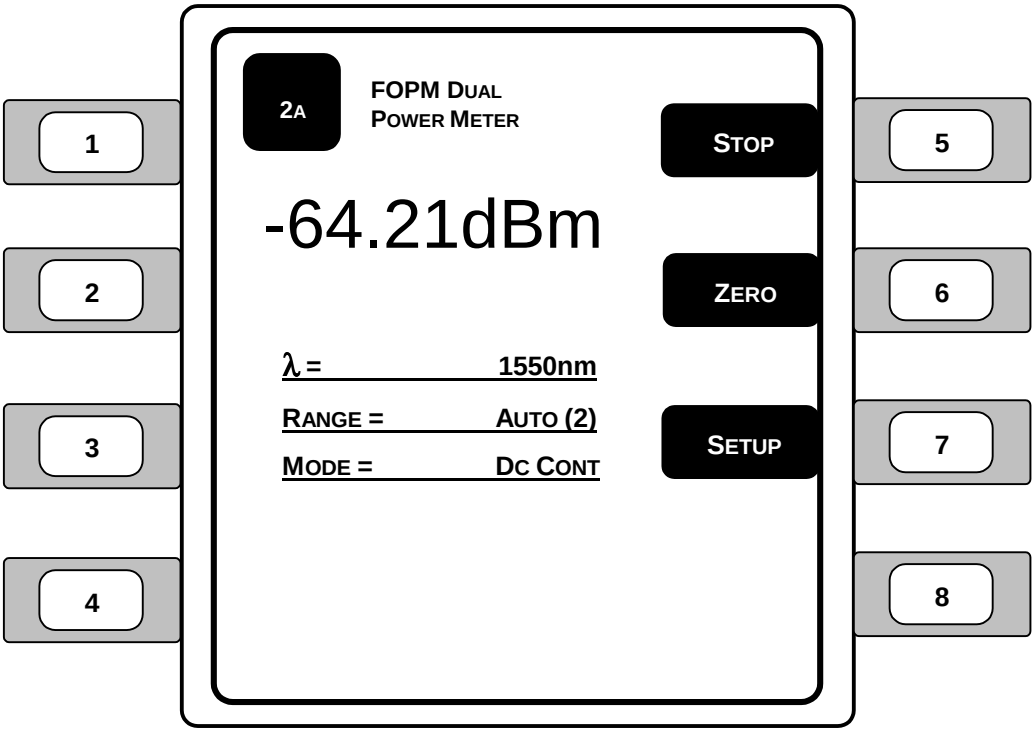


Figure 48 – Selected Dual Channel Fiber Optic Power Meter Screen

1. **λ** (Wavelength) – Selects the wavelength being measured by the currently selected power meter. A detector calibration module contains responsivity data for its assigned detector at discrete wavelengths. By telling the meter which wavelength is being measured, the correct responsivity value is used in calculating the measured power or energy. When a wavelength falls between two calibration points, linear interpolation is used to approximate the true responsivity value.

2. **RANGE** – Displays the currently selected amplifier signal range. Signal ranges step in 1 decade gain increments that are mode dependent as the Range is changed in order to utilize maximum resolution from the meter's analog-to-digital converters.

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Press the left and right arrow keys (◀▶) to increase or decrease the signal range and enable and disable the **AUTO** feature and cause the signal range to change. Manual ranging is useful when working with external analog recording equipment.

The available signal ranges are detector and mode dependent. Zero (0) through seven (7) can be selected: **0** is the ***minimum*** gain, **7** is the ***maximum*** gain setting. If AUTO is on, then the signal range number will change if the detector signal varies more than a decade in magnitude. Signal range changes can occur without an effect on the displayed measurement value.

3. **MODE** – Displays the selection of measurement modes for acquiring data. At power on, the meter checks the detector's calibration module to determine which measurement modes the detector supports. **Table 10** describes the measurement modes available for each family of detector.

Family	Mode	V	A	W	dBm	dB	REL
Low-Power	DC CONT		✓	✓	✓	✓	✓
Low-Power	DC SINGLE		✓	✓	✓	✓	✓

Table 10 – Valid Display Units Available to Detector Families by Mode

Press the left and right arrow keys (◀▶) repeatedly until the desired mode is indicated in the mode enunciator display area. When selecting a new mode, the display units will change to the appropriate default units if they are not compatible with the new measurement mode.

- **DC CONT** – measurement occurs at a programmable sample rate.
- **DC SINGLE –** a measurement is taken every time the meter receives a trigger up to a 1000 Hz rate.

4. **RUN/STOP** – The RUN/STOP key provides front panel control over data acquisition. When in Single measurement mode, each RUN/STOP key press causes one reading to be taken. In CONT measurement mode, each RUN/STOP key press toggles continuous data acquisition on and off.

5. **ZERO** – This button turns offset subtraction on and off. When turned ON, the ZERO LED lights and the last signal reading is saved as S and subtracted from all subsequent signal readings. This causes subsequent signal calculations (and for the reading display) to use the S-S (S_{zero} minus $S_{current}$) instead of S.

Offset subtraction allows for the removal of ambient DC signals effects, by zeroing the display before taking a measurement. Pressing the ZERO button a second time, turns OFF the ZERO LED and stops offset subtraction.

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6. **SETUP** – Changes the screen to the power meter setup menu. See **Section 6.1.8**.

7. **LEDs –** LEDs display status and error conditions:
   - **UCAL** – user calibration information is being used for readings and calculations. The instrument is using the user-defined responsivity instead of the responsivity from the calibration file.
   - **ZERO** – a zero value is selected and being used.

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6.1.8 Fiber Optic Power Meter Setup Screen – Dual Channel

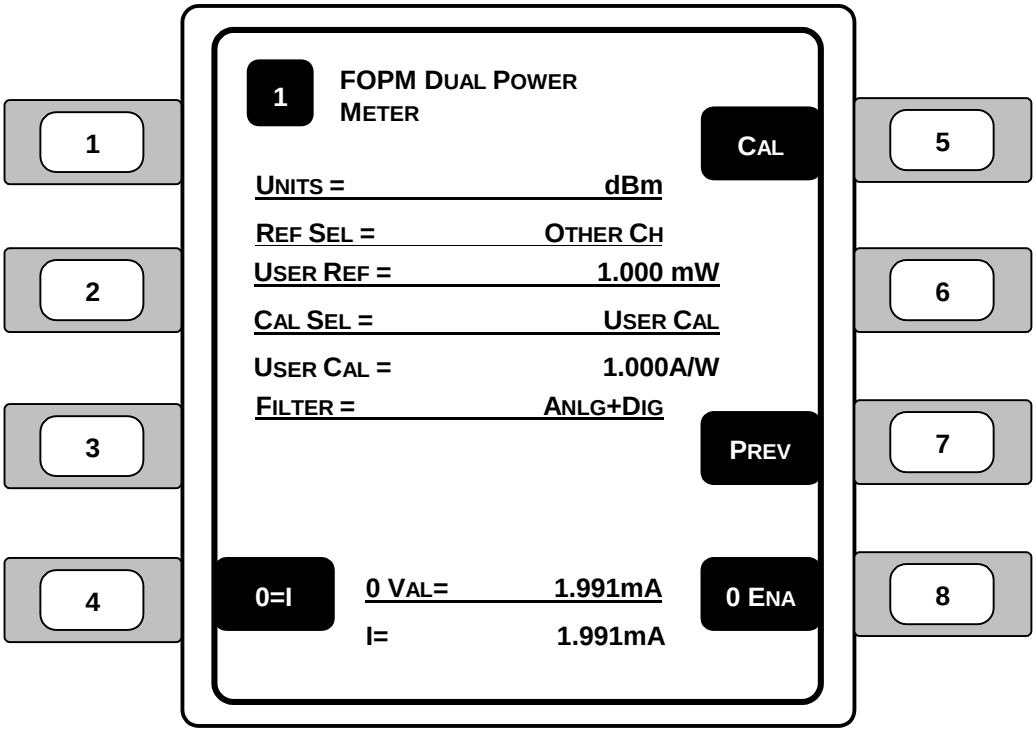


Figure 49 – Dual Channel Fiber Optic Power Meter Setup

1. **UNITS** (Display Units) – Displays the currently selected units. The set of units available at any given time is determined by the detector type and the measurement mode. Press the left and right arrow keys (◀▶) when the UNITS function is the focus to select the desired units. **Table 10** describes the available units for each detector family as a function of the measurement mode.

2. **REF SEL** – Selects the designation for the reference value used to display the proper power reading. Press the left and right arrow keys (◀▶) to select the desired source for the reference value. With User Reference (User Ref) selected, the power meter uses the value entered in the User Ref entry line for the power reading display calculation. With Other Channel (OtherCh) selected, the power meter uses the setting selected for the other channel on the dual power meter (either channel 1 or 2).

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3. **USER REF** – Enter the proper reference value when displaying power. The User Ref sets the divisor when displaying power units in Relative (REL) mode.

4. **CAL SEL** – Selects the calibration (responsivity) value to be used for power meter calculations. Detector calibration (Det Cal) uses the calibration information stored in the detector calibration file. User calibration (User Cal) uses the responsivity entered for the User Cal value.

5. **USER CAL** – Enter the desired power meter responsivity in Amps per Watt (A/W).

6. **FILTER** – Press the left and right arrow keys (◀▶) to cycle input signal filtering between: **NONE**, **ANALOG**, **DIGITAL**, **ANLG+DIG**. This function provides methods of lowering the noise observed in the measurement data and the analog output.

NOTE

There is temporary degradation of signal amplitudes at the analog output which is self-recovering (meeting Performance Criterion B) when this product is exposed to interference stipulated by BS EN61326:1998, the applicable international standard for electromagnetic immunity.

When ANALOG is chosen, a 5Hz low pass filter lowers the noise floor by attenuating high frequency components. Analog filtering is not available to High Power detectors, Energy detectors or any P-P modes.

When DIGITAL is chosen, measurements pass through a moving 10-sample averaging buffer before being further processed, stored, or communicated to the display or computer interfaces. With digital on, all observable values represent digitally averaged results relative to the original A/D conversions. This averaging is independent of the subsequent processing available through the STATS buffer.

Analog plus Digital (ANLG+DIG) uses the filtering elements from both Analog and Digital filtering presented above. No signal filtering is performed with NONE selected.

7. **0 VAL** – Allows the user to enter the desired zero (offset) value for the power reading.

   If desired, set the zero value equal to the present current reading by selecting the 0=I button. The 0 VAL will be set to the present current reading when the button is pressed.

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8. **I** (current) – Displays the present current read by the power meter. Note that the units may vary according to the amount of current measured.

9. **CAL** – Select the CAL button to begin the calibration sequence for the power meter module. The power meter can be calibrated by following the instructions on the display, but should only be completed when necessary.

10. **PREV** – Takes the user back to the previous screen.

11. **0 ENA/0 DIS** – Enables or disables the use of the zero offset function for the power meter. With 0 ENA displayed, the zero offset is enabled. With 0 DIS displayed, the zero offset is disabled and the power readings are raw, uncalculated values. Offset subtraction allows for the removal of ambient DC signals effects, by zeroing the display before taking a measurement.

12. **0=I** – Sets the zero offset value to the present current reading.

6.2 Fiber Optic Power Meter Specifications

Fiber Optic Power Meter Specifications

Detector Type	Si	Ge	InGaAs
Active Diameter [µm]	300	300	300
Wavelength Range [nm]	400-1100	780-1800	800-1650
Power Range [dBm]	-100 to +3	-80 to +3	-100 to +3
Accuracy [%]	±2	±3	±3
Linearity [%]	±0.5	±0.5	±0.5
NEP @ 5 Hz and 1 A/W	20 fW/Hz	1 pW/Hz	10 fW/Hz
Module Dimensions [H x W x D]	5.23 x 1.39 x 9.09 in. (13.3 x 3.5 x 23.1 cm)		
Module Weight	1.75 lb. (0.8 kg)	1.75 lb. (0.8 kg)	1.75 lb. (0.8 kg)
Operating/Storage Temperature [°C]	5 to 40 / -20 to 60	5 to 40 / -20 to 60	5 to 40 / -20 to 60

Table 11 – Fiber Optic Power Meter Module Specifications

NOTE

When making a connection to the analog output (A/O) connector on the fiber optic power meter module, use a coaxial cable no longer than six (6) feet (2 meters). Using a coaxial cable longer than six feet (two meters) may result in improper readings from the analog output connector on the power meter.

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CHAPTER 7

7 Fiber Optic Wavelength Meter Module

7.1 Wavelength Meter Module

7.1.1 Introduction

The PTS-FOWM Series optical wavelength meter modules are highly accurate wavelength meters, based on an internal scanning Michelson interferometer. The wavelength module accepts direct fiber input and provides a relative optical power reading. With absolute accuracy to ±15 ppm, these modules are ideal for testing a variety of DWDM parameters, as well as long-term stability testing of laser diodes.

Two versions are available: 400-1100 nm for visible and 800-1650 nm for near IR light measurements. Both provide a relative optical power reading.

The wavelength meter module accepts a direct fiber input, making it easy to use in fiber optic applications. Free-space laser beams can also be measured, with the help of an optional free-space to fiber coupling adapter.

The module is factory calibrated to a HeNe transition line, providing the reference setting for wavelength measurements. Recalibration of the module can be performed in the field by injecting a fiber-coupled HeNe laser light source into the module input.

7.1.2 Product Features

- Accurate wavelength measurements to ±15 ppm
- Direct fiber input or free-space light input via fiber adapter
- Two versions cover 400-1650 nm wavelength range
- Calibration in the field to ensure measurement accuracy
- Available with FC/PC and FC/APC fiber connector styles

7.1.3 Installation

Optical wavelength meter modules are for use in the Model 8800 and 8200 mainframe in any slot.

CAUTION

Do **NOT** plug-in or unplug a module with the AC power ON.

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7.1.4 Wavelength Meter Module Screen

The Wavelength Meter Module screen is shown in **Figure 50**.

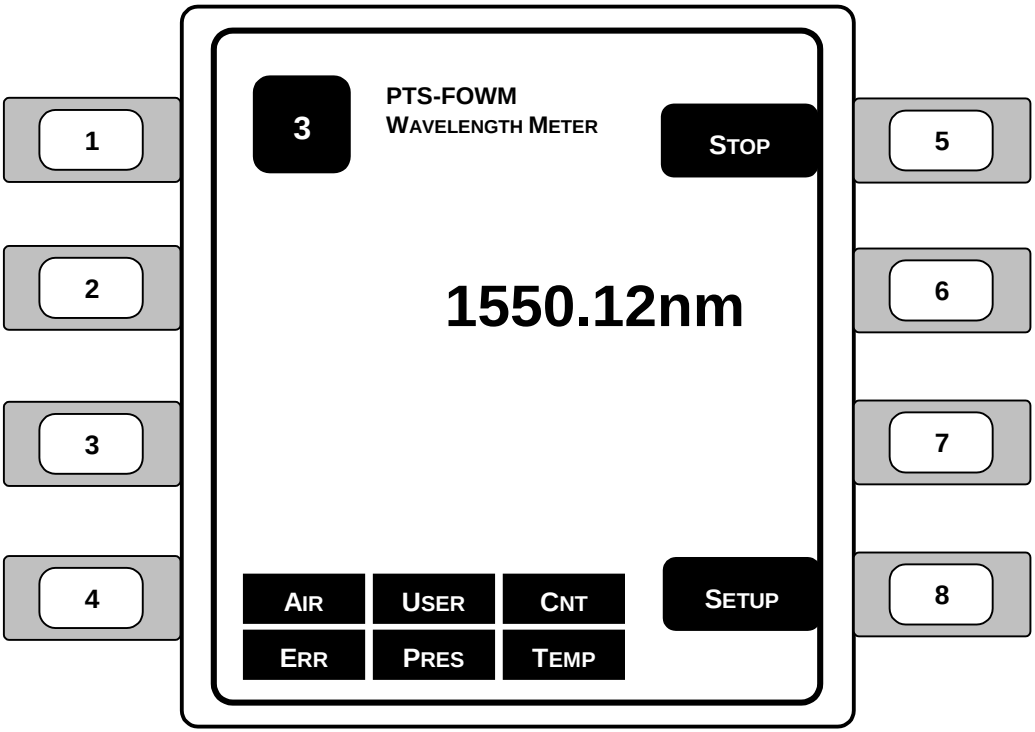


Figure 50 – Wavelength Meter Screen

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1. **WAVELENGTH DISPLAY** – Displays the present wavelength measurement.

2. **STOP/RUN** – This button toggles between Stop and Run. When STOP is displayed and the adjacent soft key (key 5) is pressed, the system starts updating the wavelength and power readings. When RUN is displayed and the adjacent soft key (key 5) is pressed, the system stops.

3. **SETUP** – See **Figure 51** (Wavelength Meter Setup Screen) for additional information.

4. **LEDs –** LEDs display status and error conditions:
   - **ERR** – error summary = INV+SVC+LAM+O/F.
   - **USER** – functionality to be determined by Newport Corp.
   - **PRES** – computed pressure is outside of range (500-900 mmHg).
   - **CNT** – counter error, noisy source of electro-mechanical failure.
   - **TEMP** – computed temperature outside of range (0-70°C).

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7.1.5 Wavelength Meter Module Setup Screen

The wavelength meter setup is shown in **Figure 51**. The wavelength meter control allows you to choose a filter, power units, and a conversion factor.

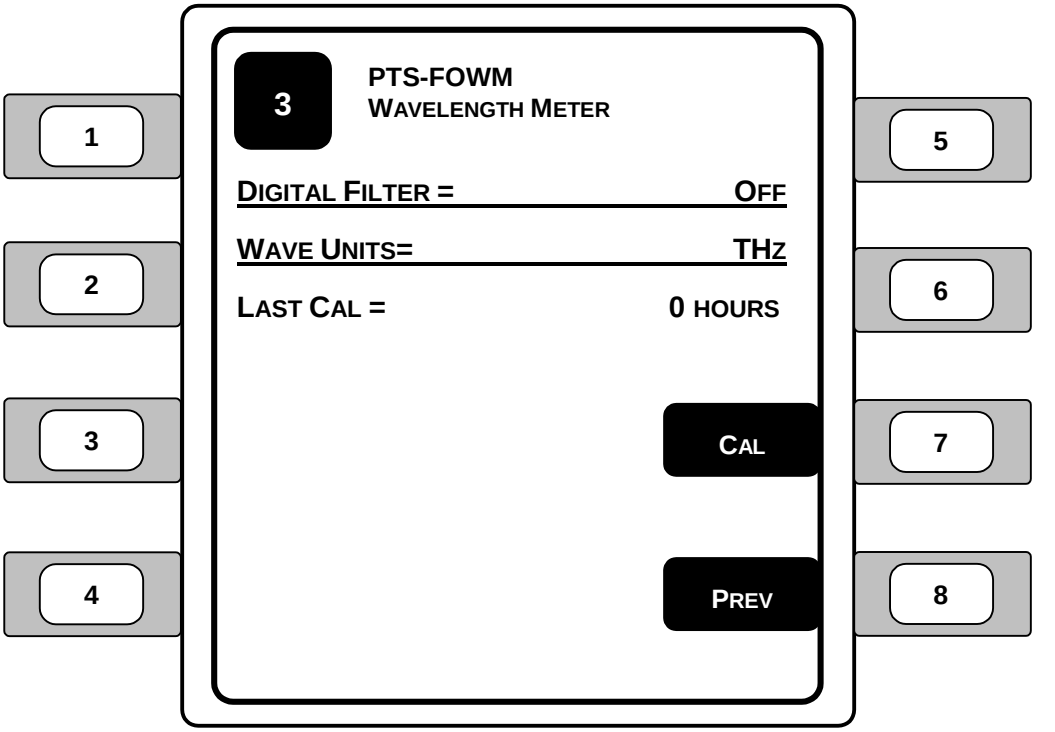


Figure 51 – Wavelength Meter Setup Screen

1. **DIGITAL FILTER** – Enables and disables the digital filter. If the digital filter is enabled, measurements pass through a moving average buffer before being processed further. Settings can range from 2 to 10 and OFF.

2. **WAVE UNITS** – Selects the units for the wavelength measurement. Using the left or right arrow keys (◀▶), select the desired wavelength units from nm VAC (in vacuum), nm AIR (in air), and THz.

3. **LAST CAL** – Displays the duration in hours since the module was last calibrated.

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4. **CAL** – Displays the Wavelength Meter Calibration screen to initiate calibration.

5. **PREV** – Changes the screen to the previous screen.

7.1.6 Wavelength Meter Module Calibration Screens

The Wavelength Meter Module Calibration function provides a simple step-by-step procedure that permits the user to calibrate the wavelength meter module using a HeNe light source. Once a light source is connected to the wavelength meter module, pressing the Next button will continue the calibration process. The wavelength meter will be calibrated and a confirmation message will appear after the calibration sequence is finished. If a calibration error statement is displayed, check all connections, check the light source, and try the calibration sequence again.

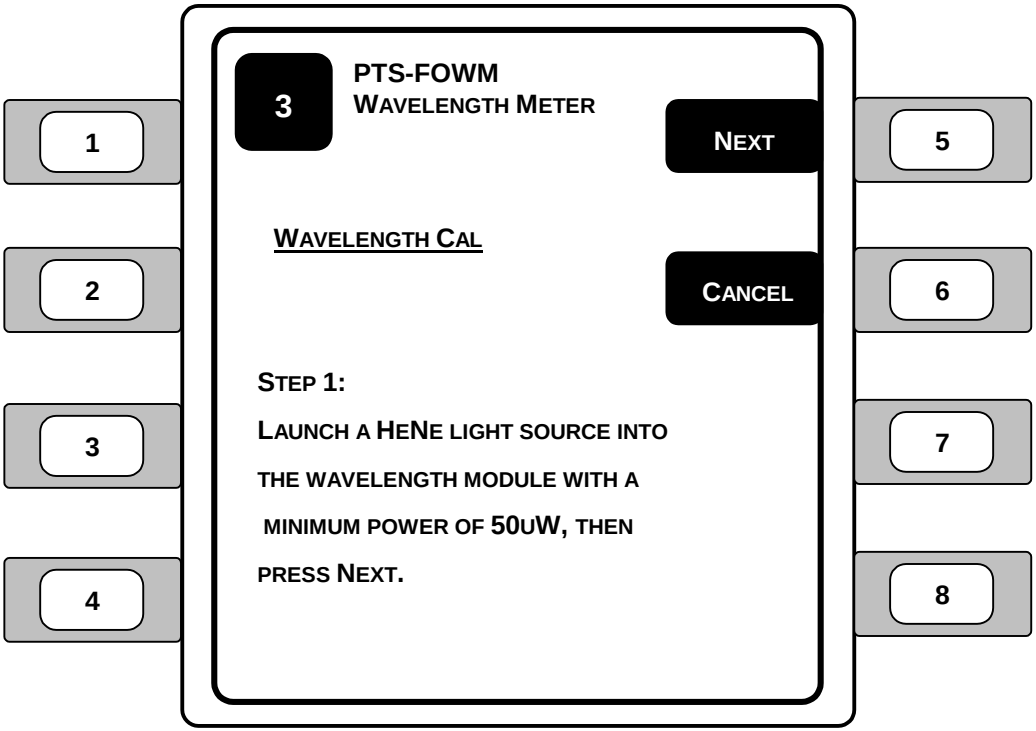


Figure 52 – Wavelength Meter Calibration Screen – Step 1

1. **NEXT –** Pressing the Next button starts the calibration sequence for the wavelength meter.

2. **CANCEL –** Returns the user to the main Wavelength Meter Screen.

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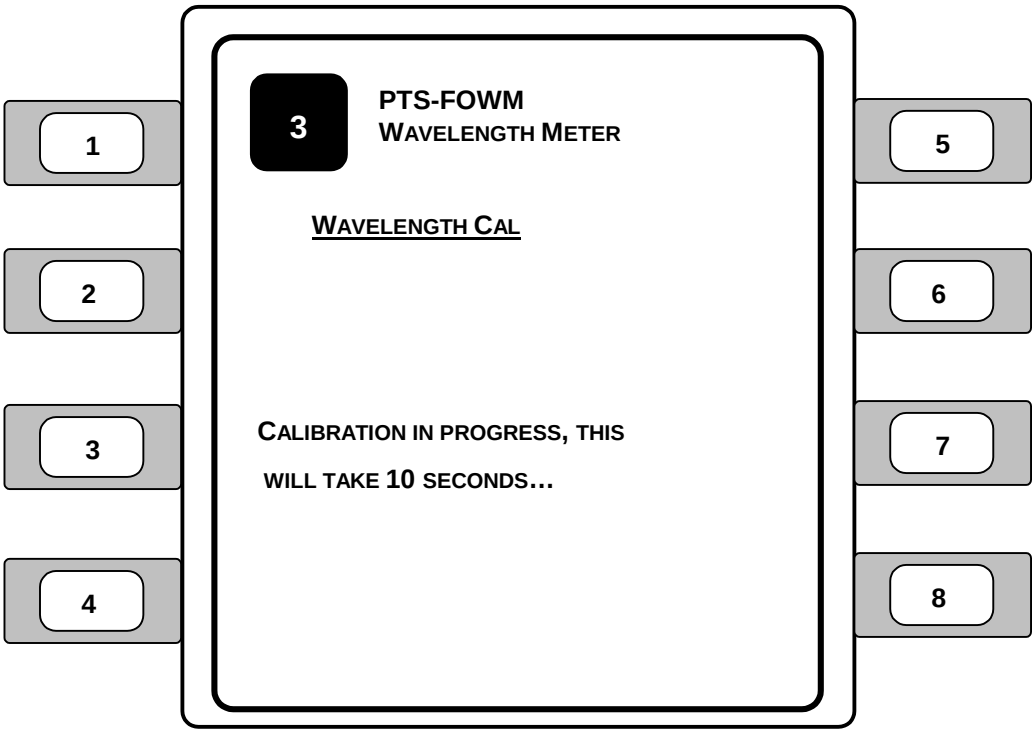


Figure 53 – Wavelength Meter Calibration Screen – Step 2

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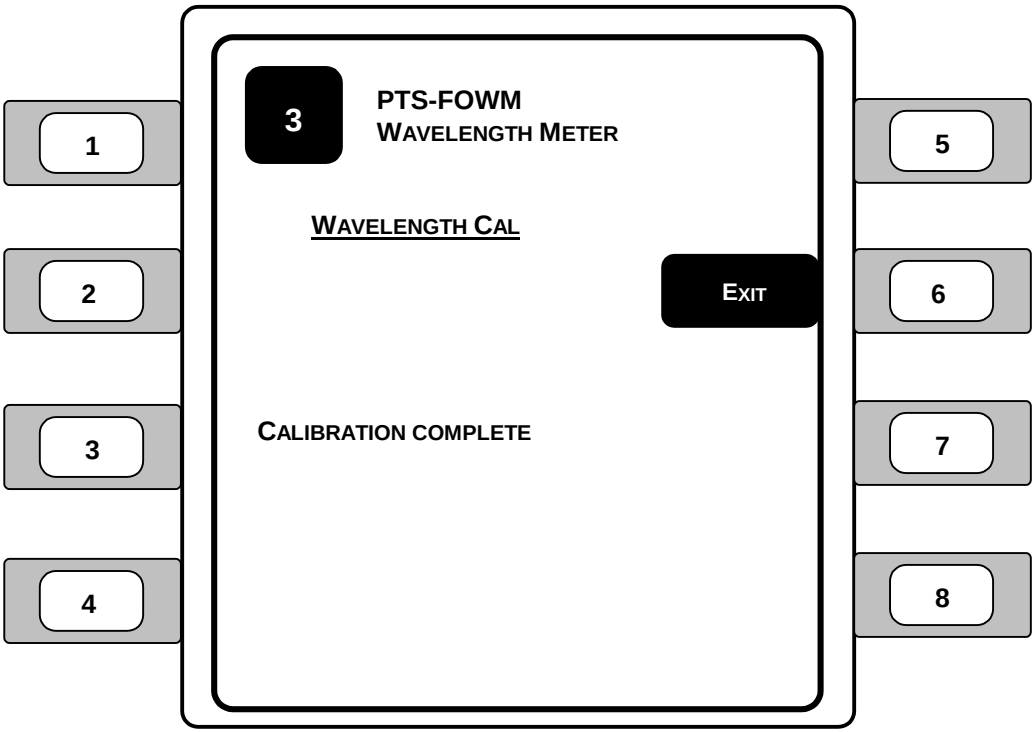


Figure 54 – Wavelength Meter Calibration Screen – Step 3

1. **EXIT** – Once the calibration with the laser is complete, press the Exit button to return to the Wavelength Meter Setup screen.

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7.2 Fiber Optic Wavelength Meter Module Specifications

Wavelength Meter Specifications		
Wavelength Range(1) [nm]	400-1100	800-1650
Absolute Accuracy [ppm]	±15	±15
Wavelength Resolution [ppm]	15	15
Display Resolution(2) [nm]	0.001	0.001
Measurement Update Rate [Hz]	2	2
Detector Type	Si	InGaAs
Power Input Range	10 µW-10 mW	10 µW-10 mW
Connector (input)	FC/PC or FC/APC	
Module Dimensions [H x W x D]	5.23 x 1.39 x 9.09 in. (13.3 x 3.5 x 23.1 cm)	
Module Weight	1.85 lb. (0.8 kg)	
Operating/Storage Temperature [°C]	5 to 40 / -20 to 60	

Table 12 – Wavelength Meter Module Specifications

NOTES:
1) ± 0.0225 nm at 1500 nm, ± 0.0195 nm at 1300 nm, ± 0.015 nm at 1000 nm, ± 0.009 nm at 600 nm
2) Resolution 0.01 nm for wavelengths greater than 1000 nm. If the input signal is of low quality, only four (4) significant digits will be displayed.

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C H A P T E R 8

8 Variable Fiber Optic Attenuator Module

8.1 Variable Fiber Optic Attenuator Module

8.1.1 Introduction

The PTS-VFOA variable fiber optic attenuator module enables automated adjustment of optical power.

The module can be used for a variety of fiber optic test and measurement applications, such as automated bit-error-testing of fiber optic transmission links, dynamic range measurements of detectors and receivers, and characterization of fiber optic amplifiers.

The VFOA module features a wide attenuation range from 1.5(1) to 70 dB, incremental attenuation adjustments of 0.01 dB, low insertion loss and high repeatability. To assure precise and repeatable measurements, the module is factory calibrated for operation at 1310 or 1550 nm wavelengths, with calibration curves stored in the module's non-volatile memory.

The module is offered with various fiber optic connector options.

8.1.2 Product Features

- Wide attenuation range of 1.5(1) to 70 dB
- High resolution and repeatability
- Factory calibrated at 1310 or 1550 nm
- Direct fiber input for automated fiber optic component measurements
- Available with variety of fiber connector styles

NOTE

1) Low end of the range may vary between 0.7 and 1.5 dB.

8.1.3 Installation

Attenuator modules are for use in the Model 8800 and 8200 mainframes in any slot.

CAUTION

Do **NOT** plug-in or unplug a module with the AC power ON.

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8.1.4 Attenuator Module Screen

The Variable Fiber Optic Attenuator Screen is shown in **Figure 55**.

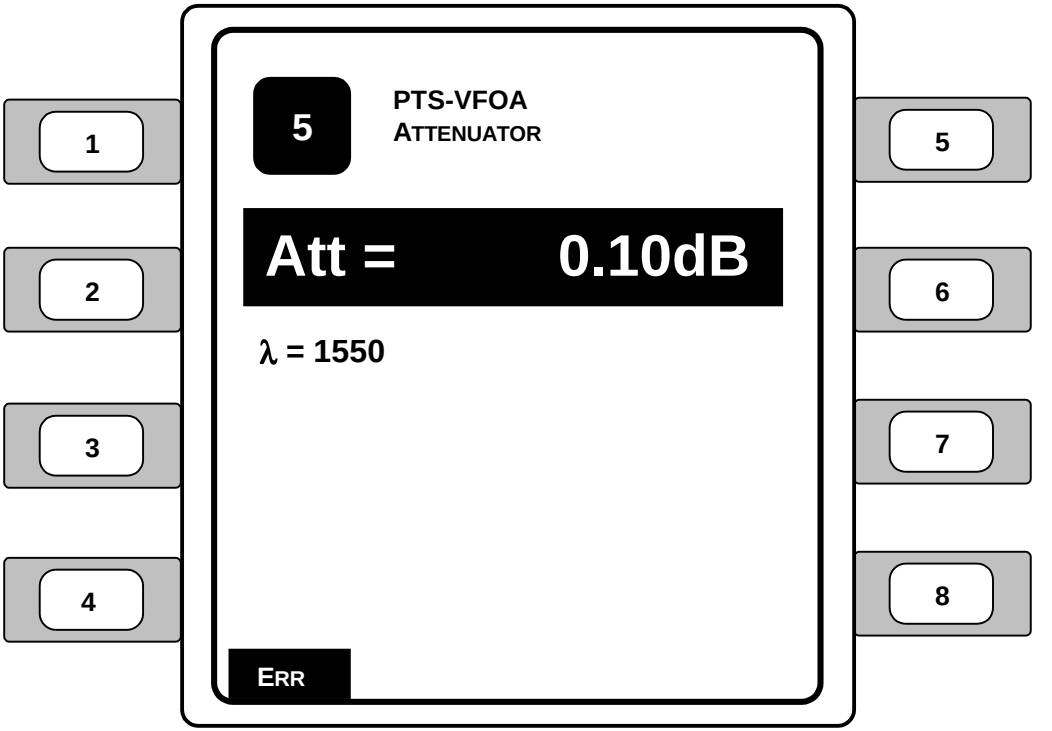


Figure 55 – Attenuator Module Screen

The up and down arrow keys (▲▼) allow the user to choose the attenuation.

The left and right arrow keys (◀▶) allow the user to change the attenuation parameter. A range from 0.10 (see NOTE) to 70.00dB for the attenuation setting may be chosen on the instrument.

NOTE

The actual low-end of the attenuator range will vary from module to module. Typical low-end selections for the attenuator modules can range from 0.7 to 1.5 dB.

LEDs – LEDs display status and error conditions:

- **ERR** – general error reported from attenuator

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8.2 Attenuator Module Specifications

Attenuator Specifications	
Attenuation Range [dB]	1.5[(1)]-70
Resolution [dB]	0.2
Repeatability[(2)] [dB]	0.2
Absolute Accuracy[(2)] [dB]	±0.25
Insertion Loss[(2)] [dB]	1.5
Polarization Dependent Loss (PDL) [(2)] [dB]	0.3
Back Reflection[(2)] [dB]	-50
Tuning Speed [ms]	50-1400
Fiber Type	9/125 µm SM
Module Dimensions [H x W x D]	5.23 x 1.39 x 9.09 in. (13.3 x 3.5 x 23.1 cm)
Module Weight	1.75 lb. (0.8 kg)
Operating/Storage Temperature [°C]	5 to 40 / -20 to 60

Table 13 – Attenuator Module Specifications

NOTES:
1) Low end of the range may vary between 0.7 and 1.5 dB
2) Without connectors

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C H A P T E R 9

9 Fiber Optic Switch Modules

9.1 Switch Modules

9.1.1 Introduction

The PTS-FOSW fiber optic switch modules feature fast switching times, high repeatability and low polarization dependent loss (PDL). These switches are optically passive which make them bi-directional and transparent to bit rates or data formats.

The PTS-FOSW modules are ideal for testing multiple passive fiber optic devices or multi-port devices with a single light source and a single optical meter. Components or instruments can also be selectively bypassed. Remote switch control with a PC enables automated test sequences, used in long term burn-in and environmental testing. For additional information, please see the Photonics Test Studio User's Manual.

The switch modules are offered in a wide variety of standard port configurations -- 1x2, 2x2, 1x4, 1x8, and 1x16 -- allowing the user to choose the appropriate module for the specific task at hand. Various fiber optic connector options are available.

In operation, the switch connects optical channels by redirecting optical signal into the selected fiber. The controllable fiber optic switching modules are designed as an on/off switch or to connect a single channel to one of two channels. This is achieved with a high precision mechanism deploying reflecting optics and activated via control leads. Both single-mode and multimode versions of the switch are available.

The use of collimating lenses minimizes the insertion loss and improves the repeatability and stability of the switch parameters. The switch used is optically passive and is therefore transparent to signaling rates or formats and supports bi-directional operation.

9.1.2 Product Features

- Fast switching times with high repeatability
- Ideal for testing of multi-port fiber optic components
- Wide variety available - 1x2, 2x2, 1x4, 1x8, or 1x16
- Select switches with SM or MM fibers
- Variety of fiber connector styles available

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9.1.3 Installation

Fiber optic switch modules are for use in the Model 8800 and 8200 mainframes in any slot.

CAUTION
Do **NOT** plug-in or unplug a module with the AC power ON.

9.1.4 Fiber Optic Switch Screen

The Fiber Optic Switch screen is shown in **Figure 56**.

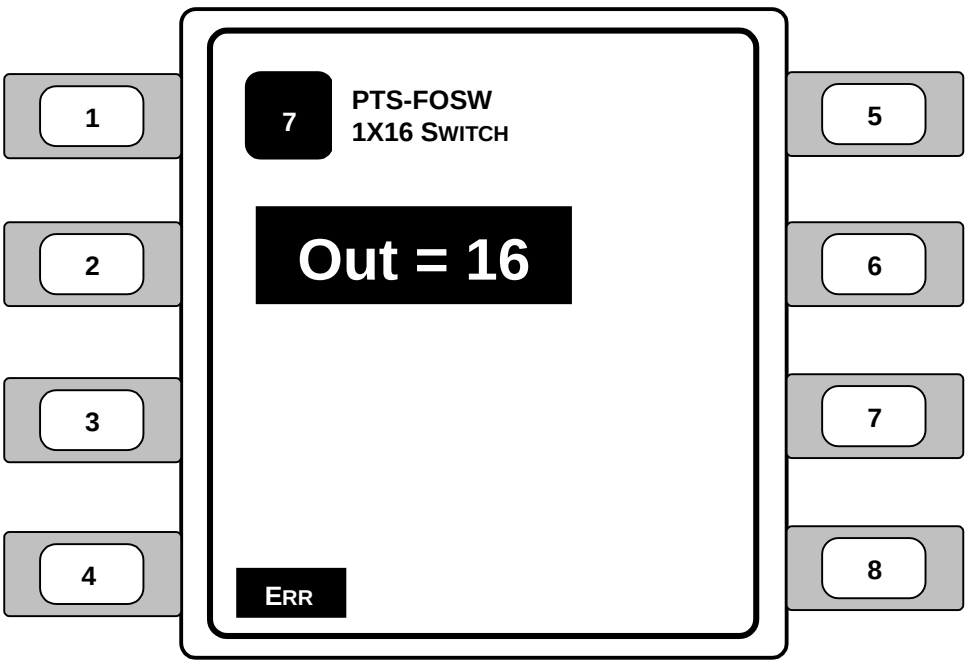


Figure 56 – 1 X 2 and 1 X 16 Fiber Optic Switch Screens

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1. **Out** (Output) – Use the left and right arrow keys (◀▶) to select the desired output switch number.

2. **LEDs** – LEDs display status and error conditions:
   - **ERR** – general error reported from attenuator

9.2 Fiber Optic Switch Module Specifications

Switch Module Specifications

Switch Type	1x2 / 2x2[1]		1xN (N = 4, 8, 16)[2]	
	Typical	Maximum	Typical	Maximum
Wavelength Range [nm]	1270-1630 (SM or MM) or 750-940 (MM only)			
Insertion Loss (SM) [dB]	0.6	1.2	0.4	0.7
Return Loss [dB]	60	> 55	60	> 55
Pol. Dependent Loss (PDL) [dB]	0.06	0.10	0.02	0.05
Repeatability [dB] [3]				
Sequential	±0.03	±0.05	±0.005	±0.02
Random	-	-	±0.01	±0.05
Isolation/Crosstalk [dB]	-65	-60	-90	-80
Switching Time [ms]				
One Ch./Additional Channels	5/-	8/-	75/15	-
Input Power [mW]	-	300	-	300
Fiber Input/Output Type	9/125 µm SM or 62.5 µm MM			
Module Dimensions [H x W x D] [4]	5.23 x 1.39 x 9.09 in. (13.3 x 3.5 x 23.1 cm)			
Module Weight	1.75 lb. (0.8 kg)			
Operating/Storage Temperature [°C]	5 to 40 / -20 to 60			

Table 14 – Switch Module Specifications

NOTES:
1) Only IS type available
2) APC connector not available with multi-mode 1 x N modules
3) Optimum value after
4) Dimensions for single width modules only (1x2, 2x2, 1x4, and 1x8 switch modules). 1x16 switch modules are double width modules

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CHAPTER 10

10 Maintenance

10.1 Introduction

Module specific calibration can be found in the module's manual. No calibration is required on the mainframe. Do not attempt to remove the cover of the instrument!

10.2 Fuse Replacement

The fuses are accessible on the back panel of the Model 8800/8200. Before replacing a fuse, turn power off and disconnect the line cord. Using only the fuses indicated below, replace the necessary fuse(s).

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

WARNING

Disconnect AC power before checking or replacing fuses.

Model	Line Voltage	Fuse Replacement
Model 8800	100/120 VAC	5.00 Amp, 3AG, T, 250V
Model 8800	220/240 VAC	5.00 Amp, 3AG, T, 250V
Model 8200	100/120 VAC	2.50 Amp, 3AG, T, 250V
Model 8200	220/240 VAC	2.50 Amp, 3AG, T, 250V

Table 15 – Replacement Fuse Information

Use the following procedure to access and change the Model 8800 and/or Model 8200 fuses:

1. Turn the instrument OFF by pushing the ON/OFF button on the front instrument panel.

2. Disconnect the AC power cord from the rear of the instrument.

3. Using a small screwdriver, insert and press down into the notch at the top of the power entry module cover to pry the door open.

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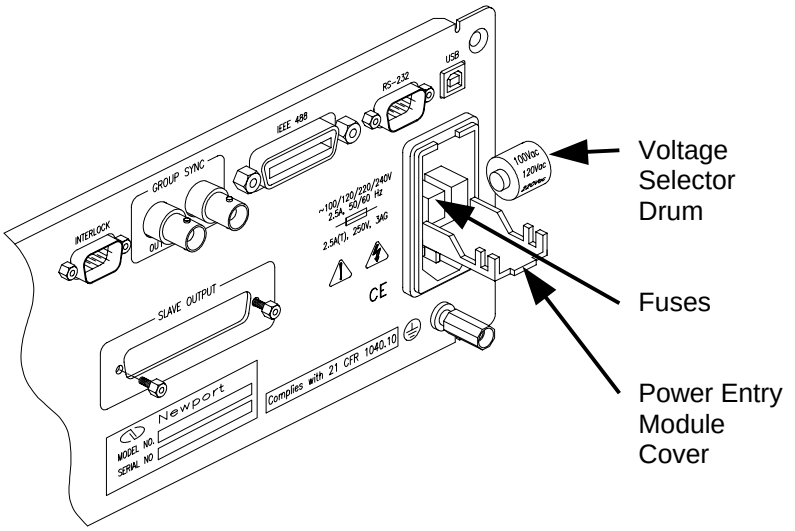


Figure 57 – Open Power Entry Module Cover

4. Using a small screwdriver, carefully pry out and remove the voltage selector drum.

5. Using a pair of needle nose pliers (if necessary), remove the fuse(s) by pulling the light gray fuse holder straight out of the back of the instrument.

6. Remove the fuse from the holder and check the condition of the fuse.

   The fuse element should be continuous and unbroken (refer to **Figure 58** for an example). If the element has a break or the condition is questionable, replace the fuse.

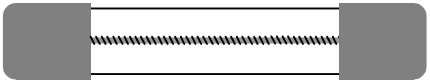


Figure 58 – Continuous Unbroken Fuse Example

7. Verify that the fuse that will be placed in the instrument is appropriate for the amperage selected on the instrument.

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8. Place the new or acceptable fuse in the fuse holder.

9. Slide the fuse holder in the fuse socket so that the arrow on the fuse holder faces out (is visible) and points in the same direction as the arrows on the power entry module cover.

10. Replace the voltage selector drum, ensuring that the proper voltage is will be displayed through the power entry module cover.

11. Close the power entry module cover until the lid clicks and locks.

12. Connect the power AC power cord to the instrument.

13. Turn the instrument ON by pushing the ON/OFF button on the front instrument panel to ensure that the instrument works properly.

10.3 General Cleaning

The Model 8800/8200 is designed for easy and reliable usage. Regular cleaning of the instrument and connectors will help to maintain the appearance and trouble-free operation of the Model 8800/8200.

10.3.1 Cleaning Instrument Surfaces

Use a mild soap solution on a damp but not wet lint-free cloth to wipe off dirty surfaces on the outside of the instrument.

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

WARNING

Disconnect AC power before cleaning.

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10.3.2 Cleaning Instrument Cooling Fans

Ensure that the fan(s) on the rear panel of the instrument are clean and free of lint and dust accumulations. If necessary, clean the fan cover(s) using a long, soft bristle brush and/or vacuum system.

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

WARNING

Disconnect AC power before cleaning.

10.3.3 Fiber Optic Connector Cleaning and Endface Preparation

A variety of different connectors can be used with the Model 8800 and some of its components. Four connector types are shown and described below. The FC/APC connectors are differentiated from the FC/PC connectors with a green cap and a small milled out dimple above the key slot of the FC/PC connector. The FC/APC connectors can be identified by the milled dimple when the green caps are not in place. Note that not all of the connector types provided below are used with the Model 8800.

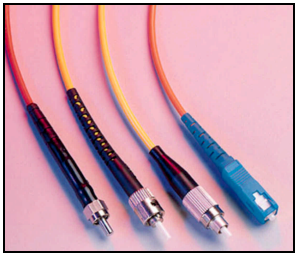


Figure 59 – Fiber Optic Connectors

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SMA – Due to its stainless steel structure and low-precision, threaded fiber locking mechanism, this connector is used mainly in applications requiring the coupling of high-power laser beams into large-core, multimode fibers. The typical insertion loss of an SMA connector is greater than 1 dB. These connectors are not typically used with the Model 8800.

ST – The ST connector is used extensively both in the field and indoor fiber optic LAN applications. Its high-precision, ceramic ferrule allows its use with both multimode and single-mode fibers. The bayonet style, keyed coupling mechanism, featuring push and turn locking of the connector, prevents over tightening and damaging of the fiber end. The insertion loss of the ST connector is less than 0.5 dB, with typical values of 0.3 dB being routinely achieved. These connectors are not normally used directly on most modules on the Model 8800.

FC – The FC is mainly used in fiber optic instruments and SM fiber optic components and in high-speed fiber optic communication links. This high-precision, ceramic ferrule connector is equipped with an anti-rotation key, reducing fiber end face damage and rotational alignment sensitivity of the fiber. The key is also used for repeatable alignment of fibers in the optimal, minimal-loss position. Multimode versions of this connector are also available. The typical insertion loss of the FC connector is around 0.3 dB.

SC – The more recently introduced SC connector is becoming increasingly popular in single-mode fiber optic telecom and analog CATV, field deployed links. The high-precision, ceramic ferrule construction is optimal for aligning single-mode optical fibers. The connectors' outer, square profile combined with its push-pull coupling mechanism, allow for greater connector packaging density in instruments and patch panels. The keyed outer body prevents rotational sensitivity and fiber end face damage. Multimode versions of this connector are also available. The typical insertion loss of the SC connector is around 0.3 dB.

10.3.3.1 Connector Endface Preparation

Once the optical fiber is terminated with a particular connector, the connector end face preparation will determine what the connector return loss, also known as back reflection, will be. The back reflection is the ratio between the light propagating through the connector in the forward direction and the light reflected back into the light source by the connector surface. Minimizing back reflection is of great importance in high-speed and analog fiber optic links, utilizing narrow line width sources such as DFB lasers, which are prone to mode hopping and fluctuations in their output if light is reflected back into them.

Flat Polish – A flat polish of the connector surface will result in a back reflection of about -16 dB (4%).

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PC Polish – The Physical Contact (PC) polish results in a slightly curved connector surface, forcing the fiber ends of mating connector pairs into physical contact with each other. This eliminates the fiber-to-air interface, thereby resulting in back reflections of -30 to -40 dB. The /PC polish is the most popular connector end face preparation, used in most applications.

SPC Polish – In the Super PC (SPC) polish, an extended polishing cycle enhances the surface quality of the connector, resulting in back reflections of -40 to -55 dB. This polish is used in high-speed, digital fiber optic transmission systems.

APC Polish – The Angled PC (APC) polish, adds an 8-degree angle to the connector end face. While the fiber cores are still in contact with each other, light will be reflected at an angle, missing the other fiber's core area. Back reflections of <-60 dB can routinely be accomplished with this polish.

Fiber Cleaving – Cleaving is the fastest way to achieve a mirror-flat fiber end and takes only seconds. The basic principle involves placing the fiber under tension, scribing with a diamond or carbide blade perpendicular to the axis, then pulling the fiber apart to produce a clean break.

10.3.3.2 Cleaning Fiber Optic Connectors

WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

WARNING

Disconnect AC power before cleaning.

Proper care of fiber optic connectors is important to maintain the performance and accuracy that are expected from the optical fiber itself. Fiber optic connectors should be inspected and cleaned regularly according to the procedure below, especially before making any connections. If the connector is still not clean after the initial cleaning, clean the connector again, until the connector is sufficiently clean and performance is suitable.

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Use the following procedure to inspect and clean the fiber optic connectors on the cable ends:

1. Pressing the Power button on the front panel of the mainframe, turn the Model 8800 instrument OFF.

2. Disconnect the fiber optic connector from the front panel of the instrument.

3. Apply pure isopropyl alcohol to a clean lint-free cotton swab or lens paper.

NOTE
If cotton swabs are used, ensure that no cotton fibers are left on any surfaces after cleaning.

4. Wipe around the ferrule and the outside of the connector, avoiding the fiber tip.

5. Apply pure isopropyl alcohol to a new clean lint-free cotton swab or lens paper.

6. Carefully swipe across the fiber optic tip.

NOTE
Do not scrub the fiber optic tip with the first cleaning. Particles on the tip may gouge the surface if the tip is scrubbed.

7. Using a new clean cotton swab or lens paper with pure isopropyl alcohol, clean the fiber optic tip.

8. Using a clean dry cotton swab or lens paper, immediately dry the wet fiber optic tip.

9. Using clean, dry compressed air, blow across the end face of the fiber optic tip at a distance of approximately 6 to 8 inches away.

NOTE
Nitrogen gas or compressed air may also be used, however, care must be taken to not shake, tilt, or invert the container since this may release particulates from the container.

10. As soon as the fiber tip is dry, attach the connector to the front panel of the instrument or cover the end of the connector for future use.

    If the insertion loss performance is poorer than expected, repeat the steps above to clean the connector again.

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11 Calibration and Factory Service

11.1 Introduction

This section contains information regarding calibration and obtaining factory service for the Model 8800. The user should not attempt any maintenance or service of this instrument and/or accessories beyond the procedures given in Chapter 10 and Chapter 11. Any problems that cannot be resolved using the guidelines listed in Chapter 10 and Chapter 11, should be referred to Newport Corporation factory service personnel. Contact Newport Corporation or your nearest Newport representative for assistance.

11.2 Calibration

Calibration procedures for the Model 8800/8200 are to be determined by Newport Corporation. The user with the appropriate equipment may calibrate the Wavelength Meter Module according to the procedure in **Section 11.2.1** (Wavelength Meter Calibration). However, if the user has any questions regarding Wavelength Meter Module Calibration or other items, contact Newport Corporation or your nearest Newport representative for assistance.

11.2.1 Wavelength Meter Calibration

The Fiber Optic Wavelength Meter Module requires periodic calibration to ensure that the wavelength readings are accurate. The module is calibrated using a portable Helium Neon (HeNe) Gas Laser connected to the wavelength input connector on the front of the module.

The portable Helium Neon Gas Laser and the necessary accessories can be purchased from Newport Corporation.

Newport Model Number	Description
U-1507	HeNe Laser for Module Calibration
U-FAS	HeNe Fiber Adapter
F-WM-FA	Free-Space Input Adapter
F-SSD-C-1FC	SM Fiber Patchcord 1m (for adapters)

Table 16 – Wavelength Meter Calibration Accessories

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WARNING

ALWAYS adhere to the precautions and procedures provided in ANSI Z136.1 "American National Standard for Safe Use of Lasers" when using any laser device. Serious injury may result if the guidelines of the standard are not followed.

WARNING

Use caution when working with the portable laser. Read and understand the laser's User Manual before using the laser.

Use the following procedure to calibrate the wavelength meter module:

1. Referring to the laser's User Manual, assemble the portable Helium Neon Gas Laser with the following accessories:

   - HeNe Laser for Module Calibration (U-1507)
   - HeNe Fiber Adapter (U-FAS)
   - Free-Space Input Adapter (F-WM-FA)
   - SM Fiber Patchcord 1 meter (F-SSD-C-1FC) with a flat polish on the end face that will connect to the module

2. Note the written wavelength calibration number on the laser case for later reference (the value should be approximately 632.999 nm).

3. Turn the Model 8800 instrument power ON.

4. Carefully connect the laser fiber optic cable to the Input connector on the Wavelength Meter Module.

5. Display the Wavelength Meter Module screen on the Model 8800:

   Press the gray button on the Wavelength Meter Module.

   OR

   Press the adjacent soft key to the left or right of the module on the main menu screen.

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6. Select the Setup soft key (soft key #8) to access the Wavelength Meter Module Setup screen. See **Figure 50** for details.

7. Select the Cal soft key (soft key #7) to access the Wavelength Meter Module Calibration screen. See **Figure 51** for details.

8. Select the Next soft key (soft key #5) to proceed with the wavelength meter calibration. See **Figure 52** and **Figure 53** for details.

NOTE

The wavelength meter will calibrate itself according to the HeNe laser. When the calibration is complete, "Calibration Complete" will be displayed on the screen.

9. Select the Exit soft key (soft key #6) to exit the Wavelength Meter Module Calibration screen.

10. Verify that the displayed wavelength is very close to the value noted on the laser case in the earlier step.

    If the values do not match, calibrate the module again by repeating steps 6-10 above.

    If the values match, proceed to use the instrument.

11.3 Obtaining Service

To obtain information concerning factory service, contact Newport Corporation at 800-222-6440 (within the U.S.) or your Newport representative. Please have the following information available:

1. Instrument model number (on front panel)

2. Instrument serial number (on rear panel)

3. Description of the problem

If the instrument is to be returned to Newport Corporation, you will be given a Return Materials Authorization (RMA) number, which you should reference in your shipping documents as well as clearly marked on the outside of the shipping container.

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Please fill out the service form, located on the following page, and have the information ready when contacting Newport Corporation. Return the completed service form with the instrument.

Additional service information may be obtained from the Newport Corporation website:

http://www.newport.com

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Service Form

Newport	*Telephone (in the United States):* **800-222-6440**	*FAX:* **949-253-1680**
	Telephone: **949-863-3144**	*Internet:* **www.newport.com**

Name _____ RMA Number _____

Company _____ (NOTE: Please obtain Return Materials

Address _____ Authorization (RMA) number prior to return of item.)

Country _____ Date _____

P.O. Number _____ Phone Number _____

Item(s) Being Returned:

Model Number _____ Serial Number _____

Description _____

Reason for return of goods (please list any specific problems) _____

_____

_____

_____

List all control settings and describe problem _____

_____

_____

_____

(Attach additional sheets as necessary)

System Diagram:

Show a block diagram of your measurement system including all instruments connected (whether power is turned on or not). Describe signal source. If source is laser, describe output mode, peak power, pulse width, and repetition rate.

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Where is measurement being performed?
(factory, controlled laboratory, out-of-doors, etc.)_____

What input power line voltage is used?_____ Variation?_____

Input Power Frequency?_____ Ambient Temperature?_____

Any Additional Information: (i.e. If any special modifications were made by the user, please describe below.)

_____

_____

_____

_____

12 Error Messages

12.1 Introduction

Error messages may appear on the display when error conditions occur in the respective functions of the Model 8800.

In remote operation, the current error list can be read by issuing the "ERR?" query. When this is done, a string will be returned containing all of the error messages that are currently in the error message queue.

12.2 Error Code Ranges

The errors codes are numerically divided into areas of operation as shown in **Table 17** below.

Error Code Range	Area of Operation
E-001 to E-099	Internal Program Errors
E-100 to E-199	Parser Errors
E-200 to E-299	Execution Control Errors
E-300 to E-399	GPIB/RS-232 Errors
E-400 to E-499	Control Errors
E-500 to E-599	Control Errors
E-900 to E-999	Safety Equipment
E-1000 to E-1099	Fiber Optic Switch Errors
E-1100 to E-1199	Light Source Errors
E-9000 to E-9999	Miscellaneous Errors
E-10000 to E-10099	Internal Program Errors

Table 17 – Area of Operation Error Code Ranges

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12.3 Error Codes

Table 18 – Error Codes contains all of the error messages that may be generated by the Model 8800. Some of these messages may not be applicable. Some refer to GPIB activities only, for example.

Table 18 – Error Codes

Error Code	Explanation
E-001	Out of memory
E-002	Floating point error. Element in error set to default value.
E-104	<NON-DECIMAL NUMERIC PROGRAM DATA> type not defined
E-106	<DECIMAL PROGRAM DATA> digit expected
E-107	<DECIMAL PROGRAM DATA> digit not expected
E-115	<PLACEHOLDER PROGRAM DATA> identifier not valid
E-116	Parser syntax error, character was not expected
E-126	Too few or too many program data elements
E-201	<PROGRAM DATA> value out of range
E-214	<PROGRAM DATA> length exceeds maximum
E-217	Attempted to recall a bin from a unsaved position
E-218	Link table full
E-301	A <RESPONSE MESSAGE> was ready, but controller failed to read it. (Query error)
E-302	6000 is talking, but controller didn't read entire message.
E-303	Input buffer overflow
E-304	Output buffer overflow
E-305	Parser buffer overflow
E-306	Parser IEEE received
E-600	Not a wavelength module. Attempt to select a non-wavelength module for wavelength operation.
E-700	Not a power meter module. Attempt to select a non-power meter module for power meter operation.
E-701	Detector calibration reading or writing operation failed.
E-702	PM:CALACTUAL value out of range.
E-703	Power meter set to defaults due to firmware update.
E-800	Not an attenuator module. Attempt to select a non-attenuator module for attenuator operation.
E-900	Calculation Error shutdown output
E-901	System over temperature shutdown all outputs
E-902	Front laser enable panel key lock in off position, shutdown all laser outputs
E-903	Loading of a saved bin shutdown module output
E-904	Module communications/hardware error.

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Error Code	Explanation
E-905	Recoverable EEPROM error, module values set to factory defaults.
E-906	System over-temperature, all outputs shutdown.
E-907	System interlock open, all outputs shutdown.
E-908	ADC ready line failed.
E-910	Power supply failed, supply shutdown.
E-911	Excessive internal power dissipation, output shutdown.
E-912	Inadequate power supplied.
E-913	Device over-temperature, output shutdown.
E-914	Fixture interlock/key switch open, all fixture outputs shutdown.
E-915	Auxiliary temperature exceeds limit, output shutdown.
E-916	Module init bit reset.
E-1000	Not an optical switch module. Attempt to select a non-optical switch module for switching operation.
E-1001	Optical switch hardware busy timeout.
E-1002	Optical switch hardware error.
E-1100	Not a light source module. Attempt to select a non-light source module for light source operation.
E-1101	No light source code selected (entered).
E-1102	Light source calibration reading or writing failed.
E-9999	Last user error
E-10000	No parameter
E-10001	Parameter blank
E-10002	Delay in effect
E-10003	Exceeded command depth

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