

User's Guide

Fiber Optic Power Head OMH-6709B



 **ILX Lightwave**
Photonic Test & Measurement Instrumentation

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SAFETY AND WARRANTY INFORMATION

The Safety and Warranty Information section provides details about cautionary symbols used in the manual, safety markings used on the instrument, and information about the Warranty including Customer Service contact information.

Safety Information and the Manual

Throughout this manual, you will see the words *Caution* and *Warning* indicating potentially dangerous or hazardous situations which, if not avoided, could result in death, serious or minor injury, or damage to the product. Specifically:

CAUTION

Caution indicates a potentially hazardous situation which can result in minor or moderate injury or damage to the product or equipment.

WARNING

Warning indicates a potentially dangerous situation which can result in serious injury or death.

WARNING

Visible and/or invisible laser radiation. Avoid direct exposure to the beam.

General Safety Considerations

If any of the following conditions exist, or are even suspected, do not use the instrument until safe operation can be verified by trained service personnel:

- Visible damage
- Severe transport stress
- Prolonged storage under adverse conditions
- Failure to perform intended measurements or functions

If necessary, return the instrument to ILX Lightwave, or authorized local ILX Lightwave distributor, for service or repair to ensure that safety features are maintained (see the contact information on page xii).

All instruments returned to ILX Lightwave are required to have a Return Authorization Number assigned by an official representative of ILX Lightwave Corporation. See Returning an Instrument on page x for more information.








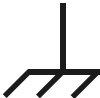


SAFETY SYMBOLS

This section describes the safety symbols and classifications. Technical specifications including electrical ratings and weight are included within the manual. See the Table of Contents to locate the specifications and other product information. The following classifications are standard across all ILX Lightwave products:

- Indoor use only
- Ordinary Protection: This product is NOT protected against the harmful ingress of moisture.
- Class I Equipment (grounded type)
- Mains supply voltage fluctuations are not to exceed $\pm 10\%$ of the nominal supply voltage.
- Pollution Degree II
- Installation (overvoltage) Category II for transient overvoltages
- Maximum Relative Humidity: $< 80\%$ RH, non-condensing
- Operating temperature range of $0\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$
- Storage and transportation temperature of $-40\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$
- Maximum altitude: 3000 m (9843 ft.)
- This equipment is suitable for continuous operation.

Safety Marking Symbols

This section provides a description of the safety marking symbols that appear on the instrument. These symbols provide information about potentially dangerous situations which can result in death, injury, or damage to the instrument and other components.

	<p>Caution, refer to manual</p>		<p>Earth ground Terminal</p>		<p>Alternating current</p>		<p>Visible and/or invisible laser radiation</p>
	<p>Caution, risk of electric shock</p>		<p>Protective Conductor Terminal</p>		<p>Caution, hot surface</p>		<p>Frame or chassis Terminal</p>
 <p>or (I)</p>	<p>On: In position of a bistable push control. The slash (I) only denotes that mains are on.</p>	 <p>or (O)</p>	<p>Off: Out position of a bistable push control. The circle (O) only denotes that mains are off.</p>				

WARRANTY

ILX LIGHTWAVE CORPORATION warrants this instrument to be free from defects in material and workmanship for a period of one year from date of shipment. During the warranty period, ILX will repair or replace the unit, at our option, without charge.

Limitations

This warranty does not apply to fuses, lamps, defects caused by abuse, modifications, or to use of the product for which it was not intended.

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for any particular purpose. ILX Lightwave Corporation shall not be liable for any incidental, special, or consequential damages.

If a problem occurs, please contact ILX Lightwave Corporation with the instrument's serial number, and thoroughly describe the nature of the problem.

Returning an Instrument

If an instrument is to be shipped to ILX Lightwave for repair or service, be sure to:

- 1 Obtain a Return Authorization number (RA) from ILX Customer Service.
- 2 Attach a tag to the instrument identifying the owner and indicating the required service or repair. Include the instrument serial number from the rear panel of the instrument.
- 3 Attach the anti-static protective caps that were shipped with the instrument and place the instrument in a protective anti-static bag.
- 4 Place the instrument in the original packing container with at least 3 inches (7.5 cm) of compressible packaging material. **Shipping damage is not covered by this warranty.**
- 5 Secure the packing box with fiber reinforced strapping tape or metal bands.
- 6 Send the instrument, transportation pre-paid, to ILX Lightwave. Clearly write the return authorization number on the outside of the box and on the shipping paperwork. ILX Lightwave recommends you insure the shipment.

If the original shipping container is not available, place your instrument in a container with at least 3 inches (7.5 cm) of compressible packaging material on all sides.

Repairs are made and the instrument returned transportation pre-paid. Repairs are warranted for the remainder of the original warranty or for 90 days, whichever is greater.

Claims for Shipping Damage

When you receive the instrument, inspect it immediately for any damage or shortages on the packing list. If the instrument is damaged, file a claim with the carrier. The factory will supply you with a quotation for estimated costs of repair. You must negotiate and settle with the carrier for the amount of damage.

Comments, Suggestions, and Problems

To ensure that you get the most out of your ILX Lightwave product, we ask that you direct any product operation or service related questions or comments to ILX Lightwave Customer Support. You may contact us in whatever way is most convenient:

Phone (800) 459-9459 or (406) 586-1244

Fax (406) 586-9405

On the web at: ilx.custhelp.com

Or mail to:

ILX Lightwave Corporation
P. O. Box 6310
Bozeman, Montana, U.S.A 59771
www.ilxlightwave.com

When you contact us, please have the following information:

Model Number: _____

Serial Number: _____

End-user Name: _____

Company: _____

Phone: _____

Fax: _____

Description of what is connected to the ILX Lightwave instrument:

Description of the problem:

If ILX Lightwave determines that a return to the factory is necessary, you are issued a Return Authorization (RA) number. Please mark this number on the outside of the shipping box.

You or your shipping service are responsible for any shipping damage when returning the instrument to ILX Lightwave; ILX recommends you insure the

shipment. If the original shipping container is not available, place your instrument in a container with at least 3 inches (7.5 cm) of compressible packaging material on all sides.

We look forward to serving you even better in the future!

WARRANTY

INTRODUCTION AND SPECIFICATIONS

This manual contains operation and maintenance information for the OMH-6709B Fiber Optic Power Head. The OMH-6709B must be used in conjunction with the OMM-6810B Optical Multimeter. To get started immediately, read Appendix B of the OMM-6810B Instruction Manual first.

Safety Considerations



WARNING

Care must be exercised when handling fiber optic cables. Direct viewing of the (sometimes invisible) output can produce retinal or corneal damage. Absorption of the laser light by the eye causes localized heating and denaturing of tissue proteins. The ANSI publication Z-136.1, "The Safe Use of Lasers", lists Maximum Permissible Exposure (MPE) levels for direct, or intrabeam viewing of laser beams. From the MPE levels, a "hazard zone" may be computed for a particular laser and exposure time. For more information concerning laser and laser diode safety, contact the Center for Devices and Radiological Health or ILX Lightwave.



WARNING

If any of the following symptoms exist, or are even suspected, remove the OMH-6709B from service. Do not use the OMH-6709B until safe operation can be verified by trained service personnel.

- Visible damage
- Severe transport stress
- Prolonged storage under adverse conditions
- Failure to perform intended measurements or functions

If necessary, return the instrument to ILX Lightwave for service and repair to ensure that safety features are maintained.

Product Overview

The OMH-6709B Fiber Optic Power Head, when coupled to the OMM-6810B Optical Multimeter, provides the capability to measure fiber optic power from +3 to -90 dBm. The uniform, cooled InGaAs detector used in the OMM-6709B is calibrated to a NIST-traceable standard in 10 nm increments, ensuring highly accurate measurements.

Quick setup, a two meter cable and sturdy design makes the OMH-6709B Fiber Optic Head easy to integrate into an experiment. The multimeter can be integrated with other equipment via the optional GPIB/IEEE-488.2 interface.

Available Options and Accessories

The OMH-6709B must be coupled to the OMM-6810B Optical Multimeter. Other options and accessories available with the LWM-6500B and the OMM-6810B include:

Description	Model Number
Silicon Power Probe (400 nm - 1100 nm)	OMH-6700 ¹
Silicon Power Head (400 nm - 1100 nm)	OMH-6701B ¹
InGaAs Power Head (1000 nm - 1600 nm)	OMH-6706B ¹
Self Calibrating Silicon Power Head (500 nm - 1000 nm)	OMH-6710B ²
Silicon Power/WaveHead (500 nm - 1000 nm)	OMH-6720B ²
InGaAs Power/WaveHead (1000 nm - 1600 nm)	OMH-6725B ²
Silicon WaveHead (500 nm - 1000 nm)	OMH-6730B
InGaAs WaveHead (1000 nm - 1600 nm)	OMH-6735B

Description	Model Number
Dual Rack Mount Kit (allows installation of two 6810Bs into a standard 19" rack)	123
Single Rack Mount Kit (allows installation of one 6810B into a standard 19" rack)	125
Measurement Head Mounting Kit	650
FC Fiber-Optic Adapter for Power Probes	670
FC Fiber-Optic Adapter for Measurement Heads	671
GPIB/IEEE-488.2 Interface	1268

1 These power measurement heads will work only with the OMM-6810B.

2 These measurement heads will measure both wavelength and power when used with the OMM-6810B but will measure wavelength only when used with the LWM-6500B.

Specifications

The Electro-Optic performance specs for the OMH-6709B when coupled to the OMM-6810B Optical Multimeter are described below.

Input Specifications	Description
Sensor Element	3 mm InGaAs Photodiode
Surface Uniformity	± 2%
Wavelength Range	800 to 1700 nm
Power Range	± 3 to -90 dBm; 2 mW to 1 pW
Display Resolution	0.001 dB
Uncertainty	
At Reference Conditions (1)	± 2.5%
Total (2)	± 5% ± 1.5 pW
Power Linearity	
From 18 to 28 °C	± 0.015 dB ± 1 pW
Over the Operating Temperature Range	± 0.05 dB ± 1.5 pW
Stability	
10 minutes	0.003 dB
24 hours	0.01 dB
Temperature Coefficient	0.005 dB/°C
Peak to Peak Noise (3)	< 1.5 pW
Sampling Rate	
Slow	16 samples @ 60 mS/Sample
Medium	4 samples @ 60 mS/Sample
Fast	1 sample @ 60 mS/Sample
Input Bandwidth	
Slow	1 Hz
Medium	10 Hz
Fast	60 Hz
REFERENCE CONDITIONS (1)	<ul style="list-style-type: none"> • λ from 1000 to 1650 nm • Power level at -20 dBm, CW • 50 μm graded index fiber, NA= 0.2, fully excited • Ambient temperature 23 ± 5 °C • Seiko PC/SPC connector • Spectral width < 10 nm
UNDER THE FOLLOWING CONDITIONS (2)	<ul style="list-style-type: none"> • λ from 1000 to 1600 nm • Fiber \leq 50 μm, NA \leq 0.2; for NA > 0.2, add 1% • Ambient temperature 0 to 55 °C, noncondensing • Seiko PC/SPC connector • Spectral width < 10 nm
(3)	<ul style="list-style-type: none"> • Slow update rate, highest to lowest readings over 60 sec @ 10 pW

Table 1.1 Electro-Optic Specifications

Analog Output representing the power measurement is available at the rear panel of the multimeter. Refer to the OMM-6810B Instruction Manual or to Chapter 2 in this manual for details.

Display Specifications	Description
Left Display (Power Display)	
Units	
Linear Power	pW, nW, μ W, mW, W, Δ P
Log Power	dBm, dB
Range	
Linear Power	0.000 nW to 999.999 W
Log Power	-99.999 to 99.999 dBm/dB
Resolution	
Slow Update Rate	
Linear Power	0.001 pW
Log Power	0.001 dB
Medium and Fast Update Rate	
Linear Power	0.01 pW
Log Power	0.01 dB
Right Display (Wavelength Calibration Display)	
Units	nm, cm^{-1} ,
Range	800 to 1650 nm, 12,500 to 6061 cm^{-1}
Resolution	1 nm, 1 cm^{-1}
Bargraph	Represents the percent of full scale power within the selected gain range
Brightness	5 settings incrementally spaced from dark to bright

Table 1.2 Analog Output Specifications

Specification	Description
Operating Temperature	+ 10 °C to +40 °C
Storage Temperature	-40 °C to + 70 °C
Humidity	< 70 % RH, non-condensing, input power < 100 nW < 85% RH, non-condensing, input power ≥ 100 nW
Overall Dimensions (HxWxD)	51 mm x 64 mm x 102 mm
Weight	0.5 kg
Input	A variety of fiber connectors are available
Connector to Main Unit ³	26-pin High Density sub-D

³ An antistatic cover is included on the connector to the Multimeter. To prevent damage from electrostatic discharge, this cover should remain in place when the Optical Measurement Head is not connected to the Multimeter.

Table 1.3 General Specifications

Our goal is to design and produce the best optical test equipment available anywhere. To achieve this, we need your ideas and comments on ways we can improve our products. We invite you to contact us at any time with your suggestions.

OPERATION AND INSTALLATION

This chapter describes how to install and operate the OMH-6709B Fiber Optic Power Head in conjunction with the OMM-6810B Optical Multimeter. It is divided into sections covering installation, power-up, front panel controls, rear panel, and general operation. A detailed familiarization of the Multimeter's features is presented in Chapter 2 of the OMM-6810B Instruction Manual.

Installation

The OMH-6709B must be connected to the OMM-6810B. Make sure the power to the Multimeter is turned off then connect the cable from the 6709B to the **INPUT** connector on the rear panel of the multimeter.



WARNING

Do not attach or remove the Power Head while power is applied to the Multimeter. Please turn the power switch off when changing heads.

To avoid electrical shock hazard, connect the multimeter to a properly earth grounded, three prong receptacle only. Failure to observe this precaution can result in severe injury or death.

Power-Up

Connect the multimeter to an AC power source. Press the **POWER** switch to supply power to the device and start the power-up sequence.

The power-up sequence takes about six seconds. Initially, all LEDs and enunciators are illuminated and the seven-segment displays denote "8". Then, all LEDs and the displays are turned off while the microprocessor executes a device self-test. Should the self test fail, the error message E-720 is displayed. The multimeter then loads personality and calibration data from the measurement head. The left display indicates -6709- and the firmware version is shown on the

right display. If an error occurs while loading data, message E-711 is displayed. If an incompatible head is connected, E-715 is displayed. If a measurement head is not connected both displays show "-----" until a head is attached. Appendix A in the OMM-6810B Instruction Manual describes the error messages.

At power up the multimeter is configured to the same state that was present when the power was last turned off.

Front Panel Controls

The OMM-6810B/OMH-6709B is intuitively operated from the front panel keypad, indicator LEDs and dual displays. A drawing of the front panel is shown in Figure 2.1. Front panel functions which are not available with the OMH-6709B are outlined in Section 2.4.1.

Refer to the OMM-6810B Instruction Manual for descriptions of each front panel switch function.

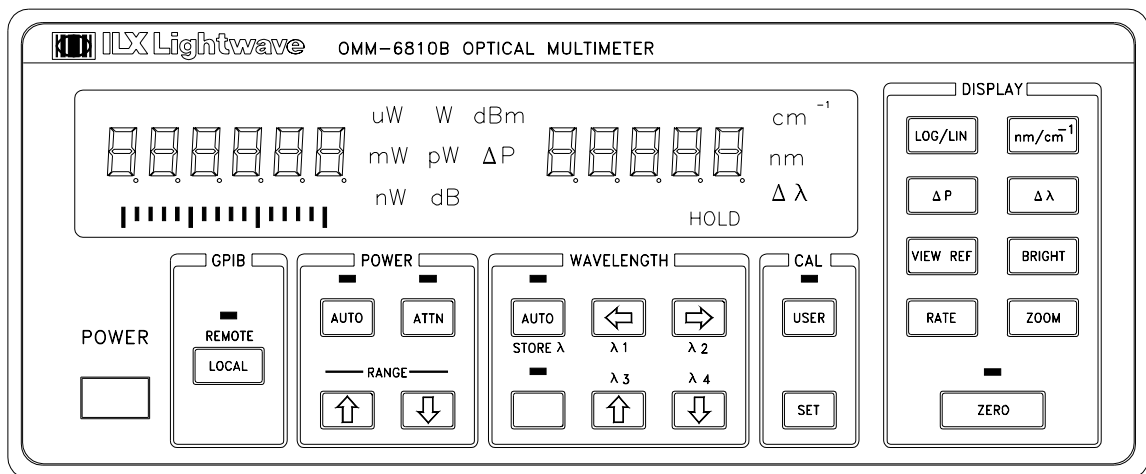
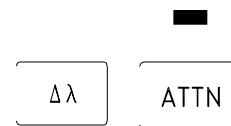


Figure 2.1 OMM-6810B Front Panel

Unused Functions

The Multimeter functions that are not utilized (disabled) when the OMH-6709B is attached are shown to the right. If a disabled button is pushed, the 6810B will display the error code E-715.



The Multimeter function WAVELENGTH AUTO, shown at the right, will not work to measure wavelength. However, this button may still be used to store preselected wavelengths.



All other switch functions perform as described in the OMM-6810B Instruction Manual.

Error Display

Execution errors are indicated on the right display. Errors are shown as "E-xxx" where xxx is a three digit number representing the unique error. Errors are displayed for three seconds or until the error causing condition is remedied, whichever is longer. See Appendix A in the OMM-6810B Instruction Manual for a detailed list of error messages.

Rear Panel Connections

The OMH-6709B interfaces with the rear panel of the multimeter as described in the following paragraphs.

Input Connector

The OMH-6709B interfaces the Multimeter via the 26-pin high density "D" connector located on the lower left side of the rear panel. Do not attach or remove the head while power is applied to the Optical Multimeter. Please turn the power switch off when changing optical measurement heads.

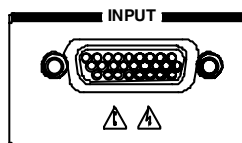


Figure 2.2 Rear Panel Input

Analog Output

Analog output representing the power measurement is located in the upper left corner of the 6810B rear panel. The **POWER ANALOG OUT** is a non-calibrated value between 0 and 10 volts representing the measured power as a percent of full scale power within the selected gain range. For example, if the full scale power

for gain range three is $10 \mu\text{W}$ and the displayed power is $5.000 \mu\text{W}$, then 5.0 volts is present on the **POWER ANALOG OUT** connector.

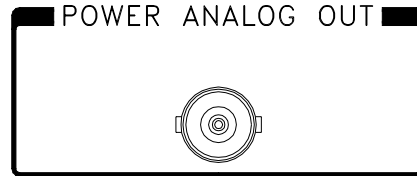


Figure 2.3 Power Analog Out

General Operating Procedures

The following sections present some guidelines for operating the OMM-6810B/OMH-6709B. Remote control is discussed in Chapter 4.

Warm-up and Environmental Considerations

The Multimeter and Measurement Head should operate at an ambient temperature between 10 and 40 °C and a relative humidity less than 85%. Storage temperatures should be between -40 and $+70$ °C. To achieve rated stability, let both devices warm up for at least one hour.

Fiber Optic Cable Considerations

The OMH-6709B is designed to provide a simple operating format. Be certain the fiber ferrule is clean and free from debris before inserting into the connector. All fiber should be at least stable if not secured to the bench for best accuracy.

ILX uses an apertured fiber connector to minimize unwanted multiple reflections at the detector. In addition, the detector rests at an angle with respect to the fiber axis to minimize backreflections.

Fiber Optic Connectors

Several connectors are available for the 6709B. Compatible connector types include FC, SC, ST, Diamond HMS-10, NEC D4, Radiall VFO-DF, Radiall-EC, DIN 47256/4108, Biconic and bare fiber to FC. ILX also offers a special fitting to accommodate Hewlett® Packard 81000 series connectors.

Setting the Wavelength

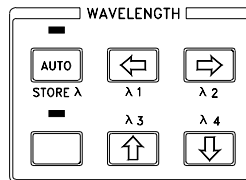


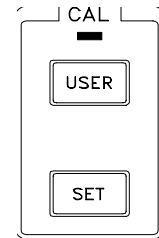
Figure 2.4 Wavelength Setting

It is important to program the 6810B with the wavelength of the laser being measured so the correct calibration factors are used to compute power. The wavelength may be entered via the front panel or GPIB. The 6810B will always be in the Manual Wavelength Mode when using the 6709B. Use the following procedure to set the wavelength via the front panel.

- Use the **LEFT** and **RIGHT** arrow buttons to select which digit on the WAVELENGTH display that will be controlled by the WAVELENGTH **UP** and **DOWN** arrow buttons. The selected digit will flash.
- Use the WAVELENGTH **UP** and **DOWN** arrow buttons to increment or decrement the selected digit. If no buttons are pressed in three seconds, the displayed wavelength will be locked in and the digit will stop flashing.
- Commonly used wavelengths may be stored or retrieved by using the WAVELENGTH BLUE SHIFT, **STORE λ**, **λ 1**, **λ 2**, **λ 3**, and **λ 4** buttons as described in Chapter 2 of the OMM-6810B manual.

Zeroing

The **DISPLAY ZERO** function is used to remove the effects that ambient light has on the power measurement. It is important to zero the multimeter with the 6709B attached before taking measurements. This is especially true for low input power applications or in cases of high ambient light intensity. When measuring lower power levels, avoid letting background radiation illuminate the detector.



Pressing the **DISPLAY ZERO** button when the LED above the **DISPLAY ZERO** button is not lit starts the zeroing process. While zeroing the "0" digit *walks* across both displays and the LED above the **DISPLAY ZERO** button flashes. Pressing the **DISPLAY ZERO** button when the LED above the **DISPLAY ZERO** button is lighted disables the effects of the zero. The procedure for zeroing the instrument is described below.

- The fiber should be secure to the adapter and the source should be turned off.
- If the LED above the **DISPLAY ZERO** button is lighted, press the **DISPLAY ZERO** button once to disable the existing compensation factors.

- Press the **DISPLAY ZERO** button. While zeroing, the "0" digit *walks* across both displays and the zero indicator above the button flashes. When zeroing is complete the zero indicator above the **DISPLAY ZERO** button is lighted. The process takes about 10 seconds.
- Turn the source on. Accurate power measurements are displayed.
Note: If the ambient environmental conditions change (e.g. the room lights are turned on or off) the instrument must be re-zeroed to maintain its accuracy.
- Pressing the **DISPLAY ZERO** button again disables the compensating factors and the LED above the **DISPLAY ZERO** button is turned off.

User Calibration

It is possible to calibrate the OMM-6810B/OMH-6709B using a laser source of known wavelength and power. Pressing the **CAL USER** button toggles the instrument in and out of the User Cal Mode. When the LED above the **CAL USER** button is lighted, the unit employs the user defined calibration which has been stored in the Optical Measurement Head. Pressing the **CAL USER** button when the **CAL USER** LED is lighted causes the instrument to revert to factory calibration and the LED to go out. Pressing the **CAL SET** button while the LED above the **CAL USER** button is lighted initiates a user calibration procedure.

Refer to Chapter 6 of this manual to enter a new user calibration.

Installing Different Fiber Optic Connectors

All connectors used on the 6709B are simple threaded "caps". To change the connector simply unscrew it from the detector housing and replace it with the desired connector cap. Excessive force should not be used when tightening the connector caps to the detector mount. When the 6709B is not in use the detector cover should be in place to protect the detector.

COMMAND REFERENCE



Introduction

This chapter is a guide to the usage of the device-dependent GPIB commands for the OMM-6810B Optical Multimeter when the OMH-6709B Fiber Optic Power Head is attached. This chapter is of primary interest to users who wish to utilize the GPIB option. A complete reference describing the syntax and usage of each device-dependent command is provided in Chapter 4 of the OMM-6810B Instruction Manual.

Common Commands

The GPIB Common Commands which are defined by the ANSI/IEEE-488.2-1987 standard are described in Chapter 3 of the 6810B Instruction Manual. These commands do not necessarily reflect front panel operations and are not unique to the measurement head connected to the multimeter. In other words, the common commands listed in the 6810B Instruction Manual are all valid when using the OMH-6709B.

Device-Dependent Commands

Chapter 4 of the OMM-6810B Instruction Manual contains the complete set of device-dependent GPIB commands. Table 4.1 on the next page outlines the subset of commands which are valid when the OMH-6709B Fiber Optic Power Head is attached to the multimeter. Table 4.2 lists the commands which are not usable with the 6709B. The command path *tree* structure is illustrated in Figure 4.1.

Note: The usage and syntax of each device dependent command is best described in Chapter 4 of the OMM-6810B Optical Multimeter Instruction Manual.

Error Messages

Error messages may appear on the right display. In remote operation, the current error list can be read by issuing the **ERR?** query. When this is done, a string is returned containing the previously unread error messages (up to ten). When the error queue is active, bit #7 of the Status Byte is also set to one.

Appendix A of the OMM-6810B Instruction Manual contains an explanation of the error messages which may be reported by the 6810B on the display or via remote operation.

Programming Examples

Two examples of programming the 6810B via GPIB are shown in the 6810B Instruction Manual, Chapter 4.

Command Name	# Parameters Expected	Description
BRlight	1	Sets the brightness of the front panel
BRlight?	None	Returns the level of the display brightness
CAL: POWERSET	2	Sets the user calibration power
CAL: RECall	None	Resets the user calibration
CAL:USER	None	Starts the user calibration
COND?	None	Returns the condition status register
ENAB:COND	1	Sets the enable register for conditions
ENAB:COND?	None	Returns the condition enable register
ENAB:EVENT	1	Sets the enable register for events
ENAB:EVENT?	None	Returns the event enable register
ERRors?	None	Returns errors generated since last ERR?
EVEnt?	None	Returns the event status register
HEAD:IDN?	None	Returns the head identification string
HOLD?	None	Returns the hold status
POWer?	None	Returns the power measurement
POWer:AUTO	1	Sets the power autoranging mode on or off
POWer:AUTO?	None	Returns the status of power autoranging
POWer:MODE	2	Sets the power display units
POWer:MODE?	None	Returns the power display units
POWer:OFFSET	1	Sets the power offset multiplier
POWer:OFFSET?	None	Returns the power offset multiplier

POWer:REFerence	2	Sets the reference for AP measurements
POWer:REFerence?	None	Returns the power reference level
PREselect:CHAN	1	Selects on of four preselected wavelengths
PREselect:CHAN?	None	Returns the preselected wavelength channel being used
PREselect:SAVE	2	Sets one of the four preselected wavelengths
RANge	1	Sets the gain range (manual)
RANge?	None	Returns the gain range (auto/manual)
RANge:AUTO	1	Sets the autoranging mode on or off
RANge:AUTO?	None	Returns the status of the autoranging
RATE	1	Sets the measurement rate
RATE?	None	Returns the measurement rate string
SECURE	1	Used by service personnel to access PUB
TERM	1	Sets the program message terminator
TERM?	1	Returns the program message terminator
TIME?	None	Returns elapsed time since power up
TIMER?	None	Returns elapsed time since last TIMER?
WAVE	2	Sets the wavelength
WAVE?	None	Returns the set wavelength
WAVE:MODE	1	Sets the wavelength display units
WAVE:MODE?	None	Returns the wavelength display units
ZERO	None	Starts the zeroing function
ZERO?	None	Returns the status of the zeroing

Table 3.1 Device-Dependent Commands valid with the OMH-6709B

Command Name	# Parameters Expected	Description
ATTen	1	Enables/disables the attenuation function
ATTen?	None	Returns the status of the attenuator
CAL:WAVESET	1	Sets the user calibration wavelength
WAVE:AUTO	1	Sets the auto wavelength feature on or off
WAVE:AUTO?	None	Returns the status of auto wavelength
WAVE:OFFSET	2	Sets the wavelength offset
WAVE:OFFSET?	None	Returns the wavelength offset
WAVE:REFerence	2	Sets the reference for AP measurements
WAVE:REFerence?	None	Returns the wavelength reference point

Table 3.2 Device-Dependent Commands which are not usable with the OMH-6709B

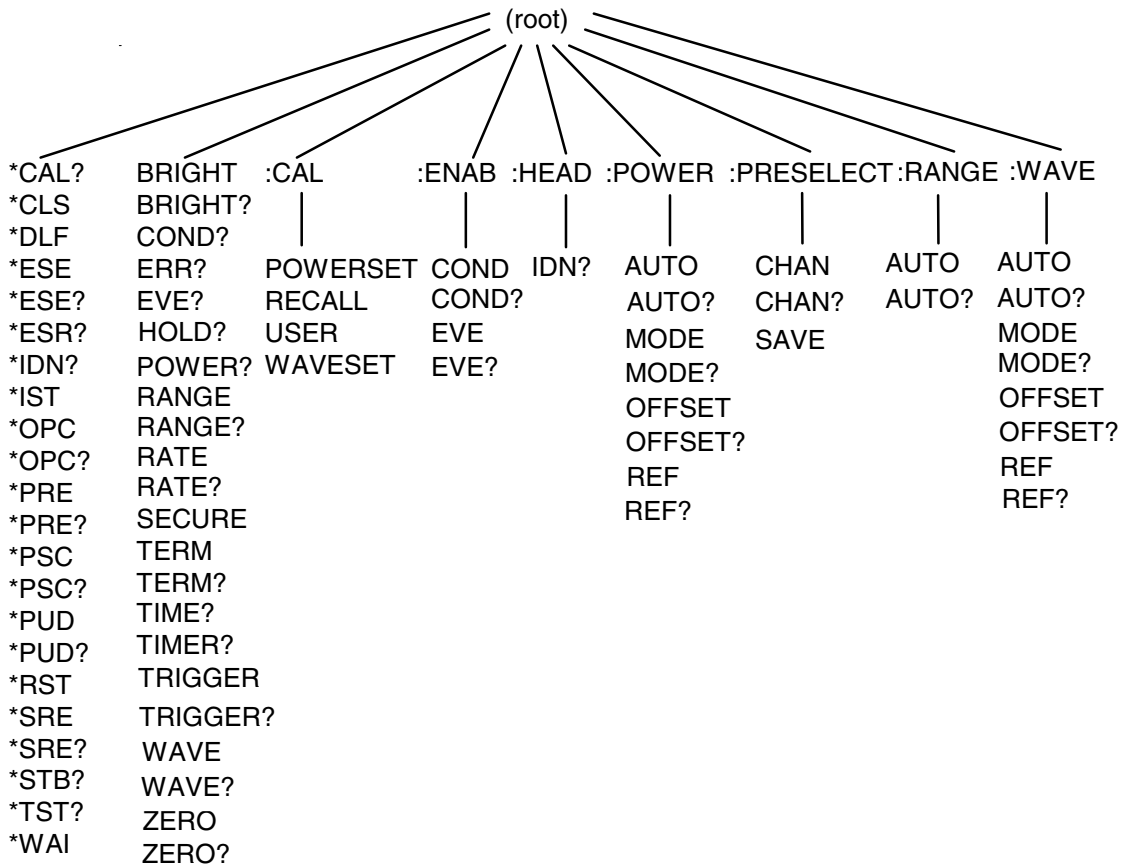
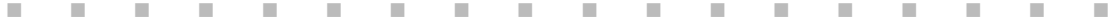


Figure 3.1 Command Path Structure

CALIBRATION**Introduction**

This chapter describes how to calibrate the OMH-6709B Fiber Optic Power Head.

**WARNING**

The OMH-6709B Fiber Optic Power Head has been sealed to protect internal components from damage and to maintain the factory calibration. Do not attempt to disassemble the Head.

Calibration Overview

It is possible to calibrate the OMH-6709B using a source of known power and wavelength. Calibrate the 6709B whenever performance verification indicates that calibration is necessary.

The power calibration consists of one point which changes future power measurements by the percentage calculated during the calibration.

Recommended Equipment

It is recommended that gas-line sources or spectral lamps with the proper line isolation filters be used for calibration. An extremely stable laser diode may be used if it is lasing in a single mode and the wavelength is first measured with a calibrated optical spectrum analyzer.

Warm-up

The OMM-6810B/OMH-6709B should be allowed to warm up for at least 1 hour before calibration.

Manual Operation User Calibration

Front Panel execution of the User Calibration is described in the procedure below:

- Program the wavelength of the calibrator laser source into the OMM-6810B using the procedure described in Section 2.6.3.
- Identify ambient conditions and zero the instrument as described in Section 2.6.5.
- Turn on the source.
- Start the calibration by pressing the CAL **USER** button to place the unit in User Calibration Mode. The LED above the CAL **USER** button will light. Press the CAL **SET** button to initiate the User Calibration Procedure, the right display indicates "**CAL-P**".
- The measured power is shown on the left display. Adjust the displayed power to match the laser's known power using the POWER **UP** and **DOWN** arrow buttons. If large adjustments are necessary, hold down the **UP** or **DOWN** button to accelerate the change.
- Press the CAL **SET** button to complete the calibration. The unit returns to real time power measurements.

Remote (GPIB) Operation User Calibration

Remote controlled User Calibration is described in the following procedure. It may help to be familiar with the manual calibration in Section 6.3 before attempting it remotely.

- Identify ambient conditions. Turn off the source.
- Start the calibration by clearing the status registers, then programming the wavelength of the calibrator laser source into the OMM-6810B. Execute the following GPIB commands:

```
*CLS
```

```
RANGE:AUTO ON
```

```
WAVE xxx.x NM
```

where xxx.x is the wavelength of the calibrator laser source.

- Zero the instrument by issuing the following GPIB command:
ZERO
- Wait for the zero to finish. The controlling software can monitor the status of zeroing by sending the following query in a loop. Exit the loop when the response is '1'.

```
ZERO?
```

- Turn on the source. Start the calibration by sending the following commands.

```
CAL:USER ON
```

```
CAL:USER START
```

- The right display shows "**CAL-P**" and the left display indicates the measured power. Enter the known power using the following command.

`CAL:POWERSET xxx.xxx sss`

where, **xxx.xxx** is the known power and **sss** is the suffix units (See **CAL:POWERSET** command in Chapter 4 of the OMM-6810B Instruction Manual).

- The calibration is complete and the unit is performing real time power measurements.

Resetting the Factory Calibration

The User Calibration is preset at the factory. The factory preset calibration can be restored by pressing the CAL **USER** button when the CAL **USER** indicator is on (or by issuing the **CAL:USER OFF** command via GPIB).

TROUBLESHOOTING



Introduction

This chapter is intended to be used as a guide when the OMM-6810B and OMH-6709B do not perform as expected. It is not a service manual, rather a guide to alleviate basic problems which may arise during operation. A more complete guide, including a GPIB troubleshooting guide, is provided in Chapter 7 of the OMM-6810B Instruction Manual.

Troubleshooting Guide

If you have difficulty using the 6709B, refer to the symptoms listed here. Common causes and corrective actions are listed here. If problems persist, contact your ILX Lightwave representative at (406) 586-1244.

Symptom	Causes and Corrective Actions
Measurement seems unstable	<ul style="list-style-type: none"> • Check for tight fiber connections and that the fiber cable is secure or undisturbed. Ensure other “noisy” electronic devices are not located near the head. • In cases of low input power and high background light, try working in a dark environment and be sure to zero the instrument. • Make sure the end of the fiber is clean and free from debris.
Display shows "-----"	<ul style="list-style-type: none"> • The 6709B is not connected to the Multimeter
Display shows "-OL-"	<ul style="list-style-type: none"> • This condition occurs when the laser’s input power exceeds the maximum allowed for the selected gain range. If in manual mode, press the DOWN switch to select the next lower gain range.
Measurements are known accurate at a known power standard	<ul style="list-style-type: none"> • Be certain the zeroing procedure has been performed correctly. • It may be necessary to perform the User Calibration.

