



User Manual
FieldMate™
Laser Power Meter



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FieldMate
Laser Power Meter



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Wilsonville, OR 97070

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In the US:

Should you experience difficulties with your product, or need technical information, please visit our website: www.Coherent.com. You can obtain additional support by either telephoning our Technical Support Hotline at 1.800.343.4912, or e-mailing our Support Team at support.instruments@Coherent.com. Telephone coverage is available Monday through Friday (except U.S. holidays).

If you call outside our office hours, your call will be taken by our answering system and will be returned when the office reopens.

If there are technical difficulties with your product that cannot be resolved by support mechanisms outlined above, please e-mail or telephone Coherent Technical Support with a description of the problem and the corrective steps attempted. When communicating with our Technical Support Department via the web or telephone, the Support Engineer responding to your request will require the model and serial number of the product.

Outside the US:

If you are located outside the U.S., visit our website for technical assistance, or telephone our local Service Representative. Representative phone numbers and addresses can be found on the Coherent website: www.Coherent.com.

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TABLE OF CONTENTS

Preface	v
Export Control Laws Compliance	v
Publication Updates	v
Signal Words and Symbols in this Manual.....	vi
Signal Words.....	vi
Symbols	vii
Section One: Safety	1-1
Waste Electrical and Electronic Equipment (WEEE, 2002).....	1-2
Declaration of Conformity.....	1-2
Section Two: Description	2-1
Meter Stand.....	2-1
Front Panel.....	2-2
LCD	2-2
Analog Meter	2-3
Buttons	2-4
Side Panel	2-4
Sensor Connector.....	2-5
Analog Out Connector	2-5
Power Connector.....	2-5
Battery Replacement.....	2-5
Battery Directive.....	2-5
Section Three: Operation	3-1
Controls.....	3-1
Button Functions.....	3-1
Power	3-1
Meter Zero Adjustment.....	3-1
Zero	3-1
Wave	3-2
Auto	3-3
Up and Down Arrows	3-3
Display Functions	3-3
Measurement Display	3-3
Annunciators	3-4
Power-Up Display.....	3-5
Fault Codes	3-5
Wavelength Edit	3-6
Wavelength Edit Limits	3-6

Section Four: Special Topics	4-1
Analog Output.....	4-1
Negative Power Display	4-1
Instrument Fault Response.....	4-1
Numeric Display Stationary Pattern	4-2
Section Five: Calibration and Warranty	5-1
Calibration	5-1
Coherent Calibration Facilities and Capabilities	5-1
Limited Warranty.....	5-2
Extended Warranty	5-2
Warranty Limitations.....	5-3
Obtaining Service	5-3
Product Shipping Instructions.....	5-4
Appendix A: Specifications	A-1

LIST OF FIGURES

1-1. Waste Electrical and Electronic Equipment Label	1-2
2-1. Meter Stand.....	2-1
2-2. Front Panel	2-2
2-3. LCD	2-2
2-4. Analog Meter	2-3
2-5. Button Locations.....	2-4
2-6. Side Panel	2-4
2-7. Battery Replacement.....	2-6
4-1. Numeric Display Stationary Pattern	4-2

LIST OF TABLES

2-1. Batteries Contained in this Product	2-5
3-1. Fault Codes	3-5
5-1. Coherent Service Centers.....	5-4
A-1. Specifications.....	A-1

Preface

This manual contains user information for the FieldMate™ laser power meter.

Export Control Laws Compliance

It is the policy of Coherent to comply strictly with U.S. export control laws.

Export and re-export of lasers manufactured by Coherent are subject to U.S. Export Administration Regulations, which are administered by the Commerce Department. In addition, shipments of certain components are regulated by the State Department under the International Traffic in Arms Regulations.

The applicable restrictions vary depending on the specific product involved and its destination. In some cases, U.S. law requires that U.S. Government approval be obtained prior to resale, export or re-export of certain articles. When there is uncertainty about the obligations imposed by U.S. law, clarification must be obtained from Coherent or an appropriate U.S. Government agency.

Products manufactured in the European Union, Singapore, Malaysia, Thailand: These commodities, technology, or software are subject to local export regulations and local laws. Diversion contrary to local law is prohibited. The use, sale, re-export, or re-transfer directly or indirectly in any prohibited activities are strictly prohibited.

Publication Updates

To view information that may have been added or changed since this publication went to print, connect to www.Coherent.com.

Signal Words and Symbols in this Manual

This documentation may contain sections in which particular hazards are defined or special attention is drawn to particular conditions. These sections are indicated with signal words in accordance with ANSI Z-535.6 and safety symbols (pictorial hazard alerts) in accordance with ANSI Z-535.3 and ISO 7010.

Signal Words

Four signal words are used in this documentation: **DANGER**, **WARNING**, **CAUTION** and **NOTICE**.

The signal words **DANGER**, **WARNING** and **CAUTION** designate the degree or level of hazard when there is the risk of injury:

DANGER!

Indicates a hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

WARNING!

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION!

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

The signal word “**NOTICE**” is used when there is the risk of property damage:

NOTICE!

Indicates information considered important, but not hazard-related.

Messages relating to hazards that could result in both personal injury and property damage are considered safety messages and not property damage messages.

Symbols

The signal words **DANGER**, **WARNING**, and **CAUTION** are always emphasized with a safety symbol that indicates a special hazard, regardless of the hazard level:



This symbol is intended to alert the operator to the presence of important operating and maintenance instructions.



This symbol is intended to alert the operator to the danger of exposure to hazardous visible and invisible laser radiation.



This symbol is intended to alert the operator to the presence of dangerous voltages within the product enclosure that may be of sufficient magnitude to constitute a risk of electric shock.



This symbol is intended to alert the operator to the danger of Electro-Static Discharge (ESD) susceptibility.



This symbol is intended to alert the operator to the danger of crushing injury.



This symbol is intended to alert the operator to the danger of a lifting hazard.

SECTION ONE: SAFETY

Carefully review the following safety information to avoid personal injury and to prevent damage to this instrument or any sensor connected to it. There are no user-serviceable parts in the FieldMate laser power meter. For service information, refer to “Obtaining Service” (p. 5-3).



WARNING!

Use only the power cord specified for the meter. The grounding conductor of the cord must be connected to earth ground.



WARNING!

Do not operate the meter if its panels are removed or any of the interior circuitry is exposed.



WARNING!

Do not operate the meter in wet or damp conditions, or in an explosive atmosphere.



NOTICE!

Operate the meter only within the specified voltage range.



NOTICE!

Do not apply a voltage outside the specified range of the input connections.



NOTICE!

Do not operate the meter if there are suspected failures. Refer damaged units to qualified Coherent service personnel.

Waste Electrical and Electronic Equipment (WEEE, 2002)

The European Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) is represented by a crossed-out garbage container label (see Figure 1, below). The purpose of this directive is to minimize the disposal of WEEE as unsorted municipal waste and to facilitate its separate collection.

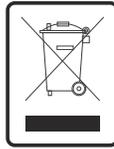


Figure 1-1. Waste Electrical and Electronic Equipment Label

Declaration of Conformity

Declaration of Conformity certificates are available upon request.

SECTION TWO: DESCRIPTION

Thank you for purchasing the Coherent FieldMate™ laser power meter—a versatile, easy-to-use meter designed for field service, laser system production, and QA testing.

Specific features of FieldMate include:

- Intuitive soft key user interface.
- Works with thermopile and optical sensors.
- Fast analog tuning.

Meter Stand

Figure 2-1 shows the attached meter stand in the open (operational) position.

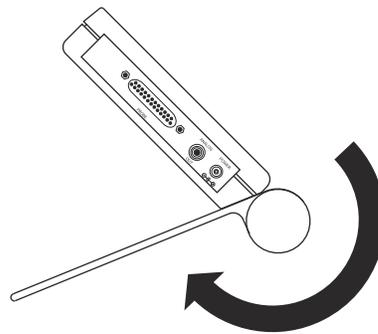


Figure 2-1. Meter Stand



Front Panel

The front panel is organized as shown in Figure 2-2. The sensor, analog out, and power connectors—all located on the side panel—are shown in Figure 2-6 (p. 2-4).

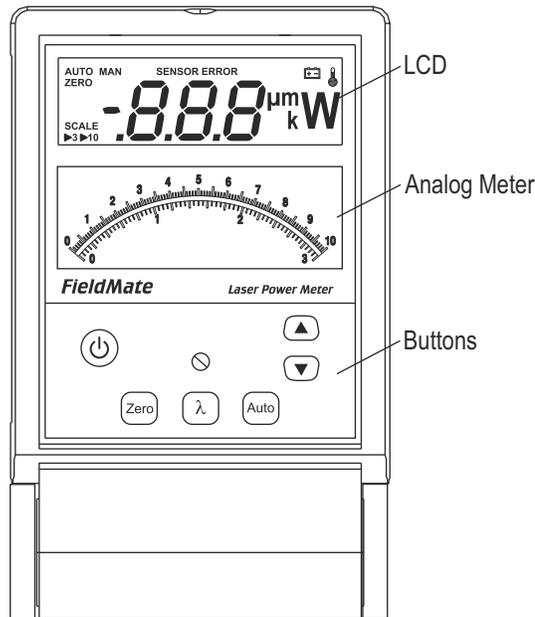


Figure 2-2. Front Panel

LCD

The LCD—along with the analog meter—provides measurement information. Figure 2-3 shows all available annunciators and segments that may appear on the LCD.

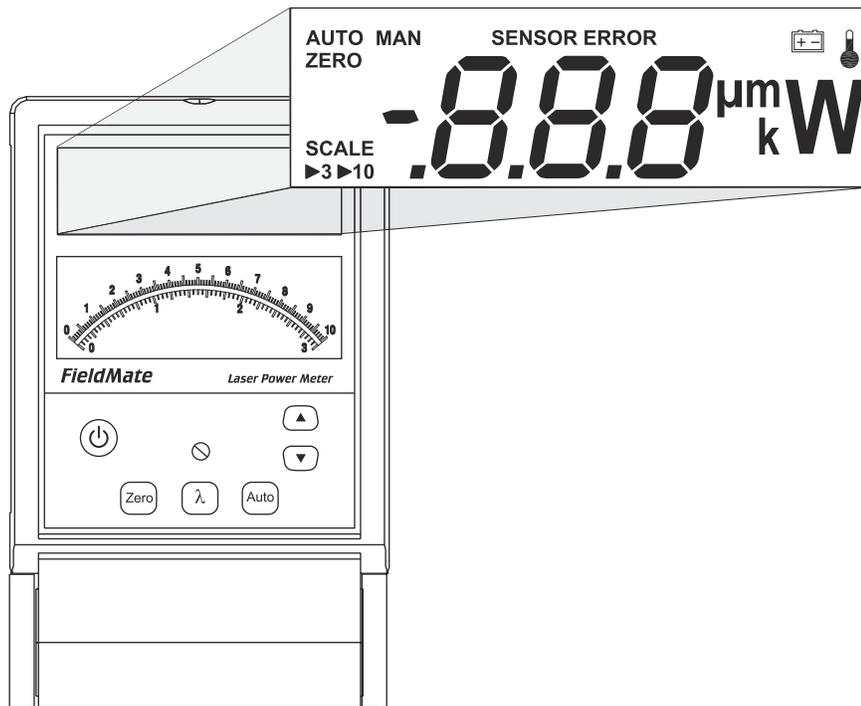


Figure 2-3. LCD

“Annunciators” (p. 3-4) presents detailed information about each of the annunciators. For information about the analog meter, refer to “Analog Meter” (p. 2-3).

Analog Meter

The analog meter (Figure 2-4) is a mechanical meter with two hash-marked scales (0 to 3, and 0 to 10). The currently-selected analog scale (either 3 or 10) is indicated on the lower left side of the LCD. For information on how to select a measurement scale for the analog meter, refer to “Up and Down Arrows” (p. 3-3).

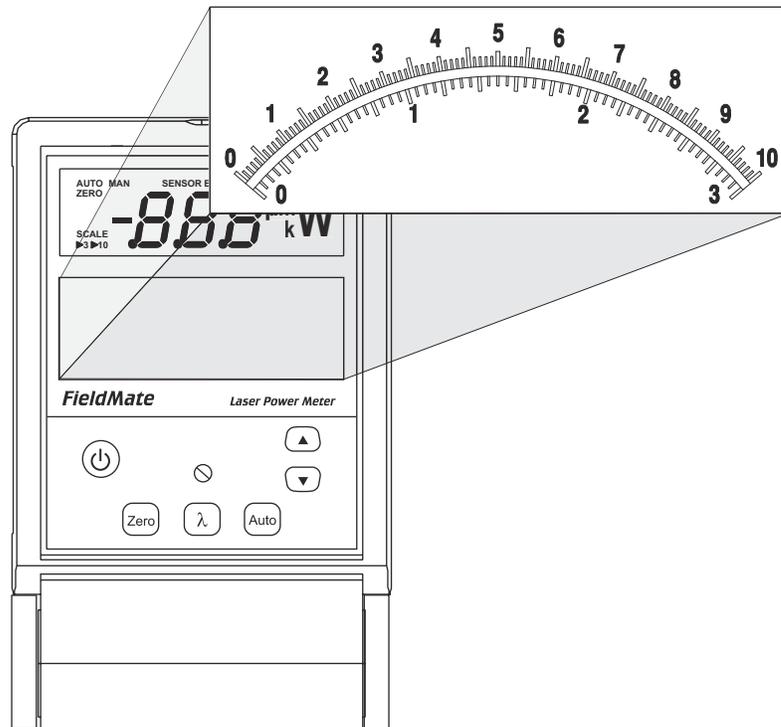


Figure 2-4. Analog Meter

For information about the digital display, refer to “LCD” (p. 2-2).

Buttons

Figure 2-5 shows the button locations on the front panel.

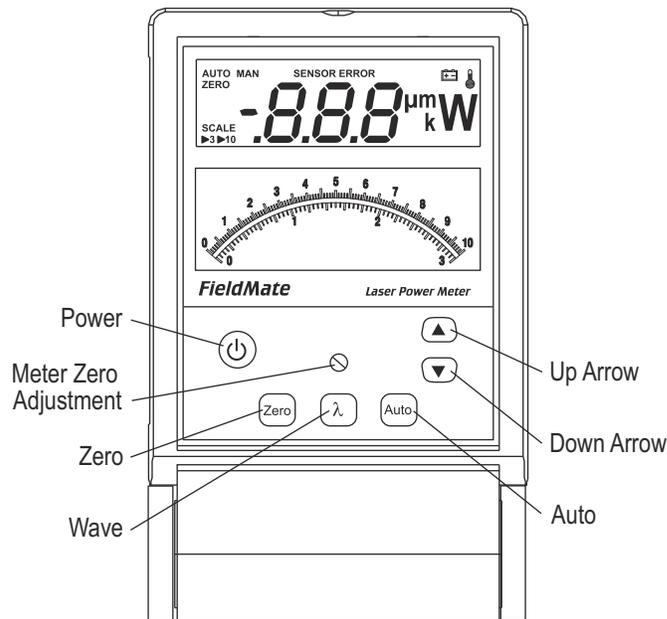


Figure 2-5. Button Locations

- Power (⏻) - toggles power on and off.
- Meter Zero Adjustment - adjusts the analog meter to account for mechanical offset.
- Zero - toggles Zero on/off (when an optical sensor is attached) or zeros the sensor (when a thermopile sensor is attached).
- Wave (λ) - enters or exits Wavelength Edit mode.
- Auto - toggles Auto Ranging and Manual Ranging mode.
- Up (▲) and Down (▼) arrows - adjusts wavelength, selects range, or toggles numeric display.

Side Panel

The side panel, as shown in Figure 2-6, contains the Sensor connector, the Analog Out connector, and the Power connector.

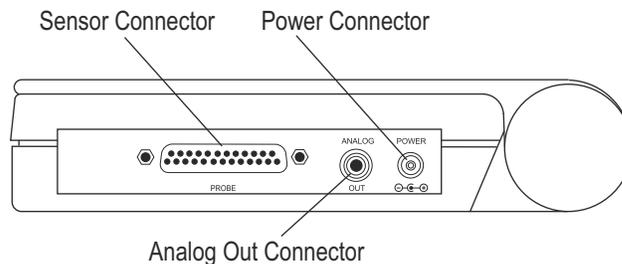


Figure 2-6. Side Panel

Sensor Connector Use this connection to attach a DB-25 SmartProbe connector or adapter.

Analog Out Connector This RCA connector outputs a voltage proportional to the current laser measurement. The voltage is scaled from 0.0V to 2.0V, with 2.0V representing full scale. The voltage is never less than 0.0V and never greater than 2.0V.

Power Connector Connect the power supply (included with the unit) to this barrel connector. Depending on local power requirements, FieldMate ships with a custom AC adapter. If the adapter is lost, contact Coherent for a replacement.

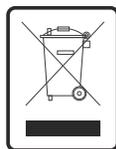
Battery Replacement FieldMate can operate on either one or two 9V alkaline or NiMH batteries (refer to Table 2-1).

Battery Directive The batteries used in this product are in compliance with the EU Directive 2006/66/EC (“EU Battery Directive”).

Table 2-1. Batteries Contained in this Product

Battery Type	Number of Batteries	Hours of Operation
Alkaline	1	46
	2	92
NiMH ^a	1	97
	2	194

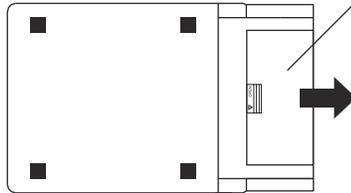
a. NiMH batteries may be used, but the instrument will not recharge them.



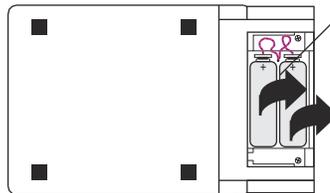
Dispose of batteries according to local regulations. Do not dispose as normal waste. Consult your local waste authorities for guidance.

Figure 2-7 illustrates how to replace the batteries.

With the meter stand in the closed position, lay the meter face down on a flat surface and remove the battery cover. ①



Carefully remove the old batteries from the unit. ②



③ Insert new batteries and replace the battery cover.

Figure 2-7. Battery Replacement

SECTION THREE: OPERATION

In this section:

- Controls (this page)
- Power-up display (p. 3-5)
- Fault codes (p. 3-5)
- Wavelength edit (p. 3-6)

Controls

The front panel display—shown in Figure 2-2 (p. 2-2)—is used to acquire measurement information, obtain feedback during wavelength editing, view various operational modes, and detect error conditions. These capabilities are discussed next.

Button Functions

This section describes the functions of each button and control.

Power



Pressing this button toggles meter power on/off.

Meter Zero Adjustment

This control adjusts the analog meter to account for mechanical offset.

Zero

Pressing the Zero button implements the Zero function and sets the current sensor input as the baseline for future measurements. *It is recommended that you zero the meter after first turning it on and before beginning any new set of power measurements.*

If Auto Range mode is enabled, the meter automatically zeros all available ranges for the attached sensor. In Manual Range mode, each range needs to be zeroed independently. The meter does not retain its zero values when it is turned off and then on again.

When a zero procedure is in process, no other button events are queued or activated until the procedure ends. The zero procedure immediately terminates if the sensor is disconnected or if an error is encountered.

Normally you should press the Zero button while the laser is turned off, or while the laser beam is blocked. If a finite power level is present at the sensor, the instrument will attempt to null it out.

The meter can only zero a finite level of offset. If zeroing on a selected range is unsuccessful, the meter will display “E40,” indicating “Fault Code 40—Bad Zero.” For more information about fault codes, refer to “Fault Codes” (p. 3-5).

If zeroing is unsuccessful—which means that the power input is too large to null—re-zero in a more stable environment or select a different range.

For information about the ZERO annunciator, refer to “ZERO” (p. 3-4).

Wave

 Pressing the Wave button toggles between two modes: Edit Wavelength and Measure. When in Edit Wavelength mode, pressing the Up and Down arrow buttons allows selection of the operational wavelength.

- Available wavelengths are set according to the wavelength correction table in the sensor EEPROM. If there is no wavelength correction table in the sensor EEPROM, the wavelength of operation automatically becomes the calibration wavelength and may not be adjusted.
- The decimal point of the wavelength is fixed.
- The longer an Up or Down arrow is pressed, the faster the measurement changes.

Pressing the Wave button while in the Edit Wavelength mode selects the adjusted wavelength and changes the mode from Edit to Measure.

Whenever instrument power is turned off, FieldMate stores the last wavelength used. The next time the instrument is powered up, that same wavelength will be in effect. However, if another sensor is attached to FieldMate while power is off, and the new sensor is out of wavelength range, FieldMate uses the default calibration wavelength the next time power is restored.

(Optical sensors only) Changing the wavelength while in Zero mode, automatically turns off Zero mode.

Auto

Pressing the Auto button toggles between Auto Ranging and Manual Ranging mode. Auto Ranging mode instructs the FieldMate meter to select the best measurement range for the incoming signal. Manual Ranging mode requires the user to select the range.

Up and Down Arrows

- The Up and Down arrow buttons serve a dual purpose, depending on which mode (Edit Wavelength or Measure) is currently in use.
- *Edit Wavelength mode:* When in this mode, the Up and Down arrow buttons allow adjustment of the wavelength of operation.
 - *Measure mode:* In this mode, the buttons allow selection of the measurement range (either 3 or 10), automatically cancel Auto Ranging (if Auto is active) and, once Auto Ranging has been cancelled, adjust the measurement range.

Display Functions**Measurement Display**

The display update rate for the display is three times per second.

Measurement range selection is dependent on the sensor type and characteristics, as well as the wavelength of operation. If a display value is greater than the maximum allowable level for the selected range, over-ranging takes place. An “OL” (overload) appearing on the display signifies an over-range condition. If over-ranging occurs while in Manual Ranging mode, press the Up arrow until measurement data displays on the LCD.

With Auto Ranging, unless it is at the top range, the instrument automatically ranges up, rather than go into an over-range condition. If the measurement is above the maximum range allowed by the sensor, an over-range condition will occur, even while in Auto Ranging mode.

Annunciators

The update rate for all annunciators is three times per second. Figure 2-3 (p. 2-2) shows all available annunciators that may appear on the LCD.

AUTO and MAN

The AUTO and MAN annunciators indicate the instrument is either in Auto Ranging or Manual Ranging mode.

ZERO

The ZERO annunciator indicates that the instrument is in Zero mode. This annunciator does not appear when either of the following conditions exist:

- An invalid sensor is attached to the instrument.
- The instrument is in a Non-Zero mode.

Thermopile sensors have a relative zero and, therefore, the ZERO annunciator is not used with these types of sensors. For information on the Zero button, refer to “Zero” (p. 3-1).

Optical sensors, on the other hand, use semiconductor diodes that have an absolute zero reference. When an *optical* sensor is attached to the instrument, pressing the Zero button causes the meter to toggle between the Zero and the Non-Zero modes.

Scale

The Scale annunciator indicates which scale is to be used for the analog meter (0 to 3, or 0 to 10).

SENSOR ERROR

If an invalid or unrecognized sensor is attached to the instrument, the SENSOR ERROR annunciator and a series of three dashes will display on the LCD. If this occurs, contact Customer Service for support—refer to Table 5-1 (p. 5-4) for contact information.

Battery Low

A flashing Battery Low annunciator indicates the battery voltage is low. From the time the annunciator first starts flashing, there are approximately 12 hours (with alkaline batteries) or seven hours (with NiMH batteries) of measurement time left. There is no change in measurement accuracy—for either type battery—during the time the Battery Low annunciator is flashing.

Over-Temperature

(*Thermopile sensors only*) The Over-Temperature annunciator flashes when FieldMate detects a sensor over-temperature condition.



NOTICE!

If an Over-Temperature annunciator appears, IMMEDIATELY turn off the laser to avoid damaging the sensor by overheating.

If the sensor does not seem to function correctly, contact Customer Service for support—refer to Table 5-1 (p. 5-4) for contact information.

Power-Up Display

Pressing the Power button—refer to Figure 2-5 (p. 2-4)—powers up the instrument. The firmware version is displayed until system initialization is complete.

Fault Codes

When FieldMate detects a fault, the letter “E” appears on the LCD, followed by the appropriate numeric fault code. For example, if the attached sensor has a bad checksum, the display will read “E 4”. Pressing any button—except the Power button—dismisses the displayed fault code. Table 3-1 describes the fault codes and corrective action. For a description of the different classes of faults, refer to “Instrument Fault Response” (p. 4-1).

Table 3-1. Fault Codes

Fault Code	Fault Description	Action Required
1	Unrecognized sensor (unknown head code)	Return sensor for repair
2	Sensor communication failure	Return sensor for repair
3	Sensor NVRAM corrupt (invalid data contained in the sensor)	Return sensor for repair
4	Sensor checksum error	Return sensor for repair
5	Sensor/firmware version mismatch (sensor format version exceeds capability of the instrument’s firmware)	Return instrument for firmware upgrade
20	Hardware fault (detectable hardware error)	Return instrument to Coherent for repair
40	Bad zero	Reduce laser power or change instrument range
42	Wrong sensor type	Attach valid sensor to the instrument

Wavelength Edit

The wavelength appears on the LCD whenever the instrument is in Edit Wavelength mode. The Up and Down arrow buttons—refer to Figure 2-5 (p. 2-4)—allow the user to increase or decrease the wavelength.

Pressing the Wave (λ) button when in Measure mode toggles to the Edit Wavelength mode and initiates an edit cycle. Pressing the Wave button a second time returns the instrument to Measure mode and ends the edit cycle. Ending the edit cycle automatically commits the current wavelength of operation to use. Pressing the Up and Down arrow buttons during the edit cycle adjusts the wavelength. During an edit cycle, all other button functions—except the Power button—are disabled.

Wavelength Edit Limits

The wavelength limits are determined by the wavelength calibration values stored in the sensor EEPROM. If the currently selected wavelength does not fall within the stored calibration values, the wavelength is automatically set to the calibration wavelength.

Wavelength selection is persistent, meaning calibration values are stores between power cycles.

SECTION FOUR: SPECIAL TOPICS

In this section:

- Analog output (this page)
- Negative power display (this page)
- Instrument fault response (this page)
- Numeric display stationary pattern (p. 4-2)

Analog Output

The Analog Output connector outputs a voltage proportional to the current laser measurement. Full scale is indicated by 2.0V at the analog output. Zero power is represented by 0.0V at the analog output. Over-ranged measurements are indicated by a 2.0V output. Negative power is indicated by 0.0V. Speedup is always applied to the analog output when a thermopile sensor is attached.

Negative Power Display

Negative power—an indication that the sensor needs to be zeroed—is displayed on the LCD.

Instrument Fault Response

This section describes the internal response of the instrument when a fault is detected.

There are three classes of faults:

1. Sensor
2. Internal
3. Operational

Sensor faults are caused by various problems with sensor identification or data stored in the sensor EEPROM. A sensor fault effectively results in an invalid sensor state. FieldMate does not permit measurement when a faulty sensor is attached.

Internal faults result from some detectable failure of hardware or software. If the fault is firmware related, power cycling—that is, either using the Power button or removing and reinstalling the batteries—may remedy the problem. If the meter is not functioning,

and you have replaced the batteries and cycled the power, then the instrument may have a hardware-related fault. Contact Customer Service for support—refer to Table 5-1 (p. 5-4) for contact information.

Operational faults occur due to operator error. When an operational fault is dismissed, operation continues as if the fault had never happened.

Refer to “Fault Codes” (p. 3-5) for a list of fault conditions and what action to take to correct them.

Numeric Display Stationary Pattern

Some users prefer to turn off the digital numerals while tuning lasers in a production setting. Fieldmate has an operating mode that temporarily replaces the numeric display with a stationary pattern (shown in Figure 4-1). Pressing the Up and Down arrow buttons simultaneously for longer than one second activates this stationary pattern. To switch back to viewing the numbers, both arrow buttons must again be simultaneously pressed for longer than one second. The numeric display toggle function is not available when the Wavelength Edit cycle is in progress. While the stationary pattern is visible, the range change function associated with the Up and Down arrow buttons is disabled and the annunciators behave as explained under “Annunciators” (p. 3-4).

This display mode is persistent, meaning it will return to this mode after cycling power.

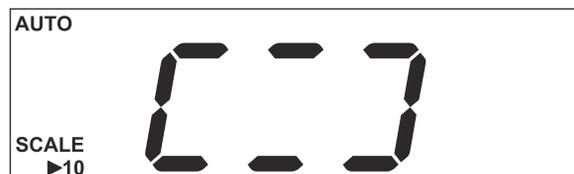


Figure 4-1. Numeric Display Stationary Pattern

SECTION FIVE: CALIBRATION AND WARRANTY

In this section:

- Calibration (this page)
- Coherent calibration facilities and capabilities (this page)
- Limited warranty (p. 5-2)
- Extended warranty (p. 5-2)
- Warranty limitations (p. 5-3)
- Obtaining service (p. 5-3)
- Product shipping instructions (p. 5-4)

Calibration

Coherent laser power and energy meters are precision instruments, capable of delivering very accurate measurements, as well as providing many years of useful service. To maintain this high level of performance, it is important to have your measurement system serviced and recalibrated once a year.

Coherent Calibration Facilities and Capabilities

As the largest laser manufacturer in the world, Coherent has been able to build state-of-the-art calibration facilities containing the widest possible range of laser types and technologies. This enables us to perform instrument and sensor calibration under virtually any combination of wavelength, power, and operating characteristics. Sensors are calibrated against NIST-traceable working standard sensors which are, in turn, calibrated against NIST-calibrated golden standard sensors. These working and golden standards are maintained with the utmost care, recalibrated annually, and verified even more regularly. We maintain multiple NIST-calibrated standards at many laser wavelengths to support the growing calibration needs of our customers. Optical calibration is a core competency at Coherent and we strive to continually improve our methods, precision, and repeatability. Additionally, most of the calibrations are performed with highly automated systems, thus reducing the possibility of human error to nearly zero. Strict quality inspections during many stages of calibration and testing assure a precise and accurate instrument that is NIST traceable and CE marked. The benefit to our customers is that instruments calibrated by Coherent will consis-

tently perform as expected under their actual use conditions. We are a registered ISO 9001:2000 company, our products are NIST traceable, and our calibration labs are fully ANSI Z540 compliant.

In addition to the technological advantage, we also strive to deliver the best service in the industry, with a knowledgeable and responsive staff, and rapid turnaround.

Limited Warranty

Coherent, Inc. (the “Company”) warrants its laser power and energy meters and sensors products (“Products”) to the original purchaser (the “Customer”) that the product is free from defects in materials and workmanship and complies with all specifications, active at the time of purchase, for a period of twelve (12) months.

Coherent, Inc. will, at its option, repair or replace any product or component found to be defective during the warranty period. This warranty applies only to the original purchaser and is not transferable.

Extended Warranty

Coherent, Inc. (the “Company”) offers original purchasers (the “Customer”) purchasing laser power and energy meters and sensors products (“Products”) an extended twelve (12) month warranty program, which includes all parts and labor. In order to qualify for this warranty, a Customer must return the Product to the Company for recalibration and recertification. The Company will recertify the Product, provide software upgrades, and perform any needed repairs, and recalibrate the Product, for a fixed service fee (as established by the Company from time to time and in effect at the time of service). If the product cannot be recertified due to damage beyond repair, parts obsolescence, or other reasons, the Customer may be informed that an Extended Warranty program is not available for the Product.

If the Product fails and is returned to the Company within one year following the date of recalibration and recertification service, the Company will, at its option, repair or replace the Product or any component found to be defective. If the Product must be replaced and the Product is no longer available for sale, Coherent reserves the right to replace with an equivalent or better Product. This warranty applies only to the original purchaser and is not transferable.

Warranty Limitations

The foregoing warranties shall not apply, and Coherent reserves the right to refuse warranty service, should malfunction or failure result from:

- Damage caused by improper installation, handling, or use.
- Laser damage (including sensor elements damaged beyond repair).
- Failure to follow recommended maintenance procedures.
- Unauthorized product modification or repair.
- Operation outside the environmental specifications of the product.

Coherent assumes no liability for Customer-supplied material returned with Products for warranty service or recalibration.

THIS WARRANTY IS EXCLUSIVE IN LIEU OF ALL OTHER WARRANTIES WHETHER WRITTEN, ORAL, OR IMPLIED. COHERENT SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL THE COMPANY BE LIABLE FOR ANY INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH ITS PRODUCTS.

Obtaining Service

In order to obtain service under this warranty, Customer must notify the Company of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. The Company shall, in its sole discretion, determine whether to perform warranty service at the Customer's facility, at the Company's facility or at an authorized repair station.

If Customer is directed by the Company to ship the product to the Company or a repair station, Customer shall package the product (to protect from damage during shipping) and ship it to the address specified by the Company, shipping prepaid. The customer shall pay the cost of shipping the Product back to the Customer in conjunction with recalibration and recertification; the Company shall pay the cost of shipping the Product back to the Customer in conjunction with product failures within the first twelve months of time of sale or during an extended twelve month warranty period.

A Returned Material Authorization number (RMA) assigned by the Company must be included on the outside of all shipping packages and containers. Items returned without an RMA number are subject to return to the sender.

For the latest Customer Service information, refer to our website: www.Coherent.com.

Detailed instructions on how to prepare a product for shipping are shown under “Product Shipping Instructions,” below.

Table 5-1. Coherent Service Centers

Location	Phone	Fax	E-Mail
USA	1.800.343.4912	503.454.5777	info_service@Coherent.com
Europe	+49-6071-968-0	+49-6071-968-499	info_service@Coherent.com
International	503.454.5700	503.454.5777	info_service@Coherent.com

Product Shipping Instructions

To prepare the product for shipping to Coherent:

1. Contact Coherent Customer Service—refer to Table 5-1, above—for a Return Material Authorization number.
2. Attach a tag to the product that includes the name and address of the owner, the person to contact, the serial number, and the RMA number you received from Coherent Customer Service.
3. Wrap the product with polyethylene sheeting or equivalent material.
4. If the original packing material and carton are not available, obtain a corrugated cardboard shipping carton with inside dimensions that are at least 6 in. (15 cm) taller, wider, and deeper than the product. The shipping carton must be constructed of cardboard with a minimum of 375 lb. (170 kg) test strength. Cushion the instrument in the shipping carton with packing material or urethane foam on all sides between the carton and the product. Allow 3 in. (7.5 cm) on all sides, top, and bottom.
5. Seal the shipping carton with shipping tape or an industrial stapler.
6. Ship the product to:
Coherent, Inc.
27650 SW 95th Ave.
Wilsonville, OR 97070
Attn: RMA # (add the RMA number you received from Coherent Customer Service)

APPENDIX A: SPECIFICATIONS

Table A-1 lists specifications for the FieldMate.

Table A-1. Specifications (Sheet 1 of 3)

Parameter	Description
General	
External Power Supply (included)	90 to 260 VAC, 50/60 Hz
Instrument Power Input	9V Alkaline or NiMH (x 2) 12 VDC (center positive plug)
Sensor Input Connector	DB-25
Update Rate	
Primary Digits	≥ 3 times/sec.
Analog Meter	≥ 20 times/sec.
Analog Output	≥ 20 times/sec.
Icons	≥ 3 times/sec.
Performance	
Input	1.8V max. (thermopile) 25 mA max. (optical)
Measurement Range (full scale) Display Power	29.9 mW to 29.9 kW (thermopile) 2.99 nW to 99.9 mW (optical)
Measurement Resolution Power	$\pm 0.1\%$ of full scale (thermopile and optical). All ranges in 10s scale. $\pm 0.3\%$ of full scale (thermopile and optical). All ranges in 3s scale.
Accuracy	
Digital Display	$\pm 1.0\%$ of reading ± 2 LSD (Least Significant Digit) ^a
System	Display unit + sensor accuracy
Analog Meter	$\pm 3.0\%$
Analog Out	$\pm 1.0\%$
Analog Meter	
Meter Response	Tau = 80 ms (2 Hz)
Meter Scale	0 to 3, 60 divisions, and 0 to 10, 100 divisions.
Analog Output	
Full Scale Voltage	2.0 VDC full scale on the current range
Noise	< 1 mV P-P
Resolution	$< 0.1\%$
Update Rate	20 times a second

Table A-1. Specifications (Sheet 2 of 3)

Parameter	Description
Standard Uncertainty Digital Display	± 0.8%
Environmental	
Temperature Operating Storage	5 to 40°C (41 to 104°F) -20 to 70°C (-4 to 158°F)
Relative Humidity (non-condensing) Operating Storage	0 to 90% 0 to 95%
Altitude Operating Storage	-100 to 2,000 m -100 to 4,000 m
Shock and Vibration	Complies with MIL-PRF-28800F Class 3 (or Class 2 drip proof)
EMC EN55011 EN55011 EN61000-4-2 EN61000-4-3 EN61000-4-4 EN61000-4-5 EN61000-4-6 EN61000-4-11 EN61000-3-3	Meets the intent of Directive 89/336/EEC, using applicable parts of EN61326 Class A Radiated Emissions Class A Conducted Emissions Electrostatic Discharge - Performance Criteria B (Unit may respond to an ESD event but will return to normal operation without user intervention.) Radiated Immunity - Performance Criteria A Electrical Fast Transient Immunity - Performance Criteria A Electrical Slow Transient Immunity (Performance Criteria A Conducted RF Immunity - Performance Criteria A Power Line Dropout - Performance Criteria A Powerline Fluctuation & Flicker Emission
Miscellaneous	
Regulations Met	CE

Table A-1. Specifications (Sheet 3 of 3)

Parameter	Description
Safety	
	Complies with EU Directive 92/59/EEC Designed and tested to EN61010-1-2001 Pollution Degree2 Installation Category II Equipment Class I (single insulation/Earthed metal case) Protection against water ingress IP4X (general indoor conditions) Input circuitry and connections (creepage and clearances) Designed to interface at Installation or Measurement Category I
Efficacy	
	Meets or exceeds IEC 61040-1990 Class 1 ^b
Physical Characteristics	
Size (h x w x d)	19.3 x 11.7 x 4.6 cm (7.6 x 4.6 x 1.8 in.)
Weight (including battery)	0.8 kg (1.75 lb.)
Display (viewing area) (h x w)	26.2 x 88.9 mm (1.0 x 3.5 in.) fixed-segment LCD

- a. When using a PM2 model thermopile sensor in the 9.99 mW range, the accuracy is $\pm 1.0\%$ and ± 5 LSD with no averaging. While in the 2.99 mW range, the accuracy with this sensor is $\pm 1.0\%$ and ± 10 LSD.
- b. Meter meets or exceeds IEC 61040-1990 Class 1. Meter and sensor system meet or exceed IEC 61040-1990 Class 5.

