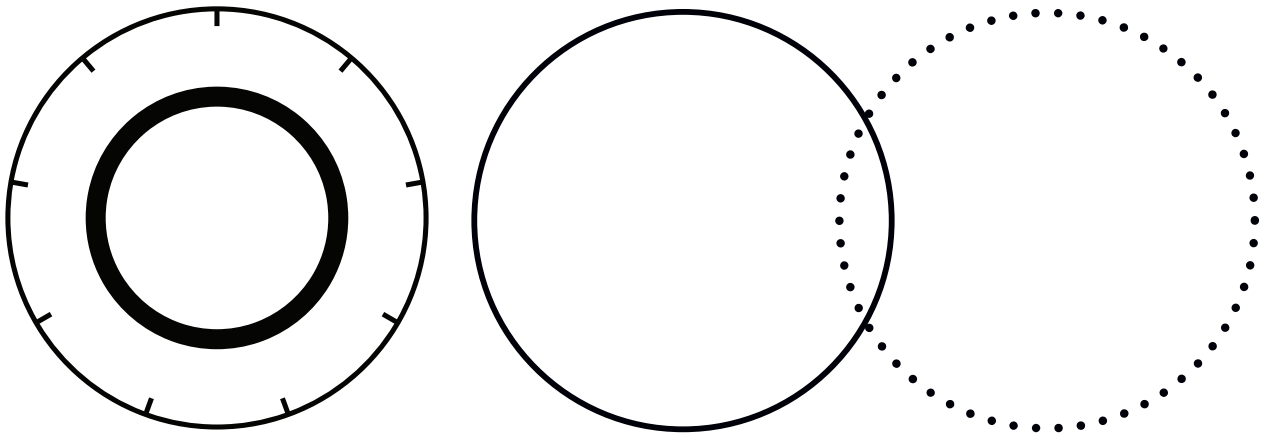


# FieldMaxII-T0™

User Manual





**User Manual  
FieldMaxII-TO  
Laser Power Meter**



27650 SW 95th Ave.  
Wilsonville, OR 97070

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

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# 1 Introduction

## 1.1 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.

### 1.1.1 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.

### 1.1.2

### 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.

---

## 1.2

### **Preface**

This manual contains user information for the FieldMaxII-TO™ laser power meter.

## 1.3

### **Safety and Compliance**

Read and obey all safety and compliance information provided in the next chapter before equipment is set up and operated.

## 1.4

### **Publication Updates**

To view information that may have been added or changed since this publication went to print, connect to [www.Coherent.com/resources](http://www.Coherent.com/resources).



## 2 Safety and Compliance

Carefully review the following safety information to avoid personal injury and to prevent damage to this meter or any sensor connected to it. Except for replaceable batteries—discussed under 'AC Adapter' (p. 12)—there are no user-serviceable parts in the FieldMaxII-TO meter. For service information, refer to '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.' (p. 37).



---

**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.**

---

## **2.1 Compliance**

This section describes compliance with various government requirements for safety, environmental regulations, and control law.

For additional information about Coherent Compliance, please visit:

<https://www.coherent.com/company/environmental>

### **2.1.1 CE Marking**

The European Community requirements for product safety are specified in the Low-Voltage Directive (LVD) (published in 2014/35/EU).

This Directive requires that lasers comply with the standard EN 61010-1/IEC 61010-1 “Safety Requirements For Electrical Equipment For Measurement, Control and Laboratory Use” and EN 60825-1/IEC 60825-1 “Safety of Laser Products”. Compliance with the European requirements is certified by CE Marking.

### **2.1.2 Electromagnetic Compatibility**

The primary issue for electromagnetic compatibility is to design covers, shielding, grounding, routing of electrical cable assemblies, and control elements with the proper safety features for a complete system.

The European requirements for Electromagnetic Compliance (EMC) are specified in the EMC Directive (published in 2014/30/EU).

**Class A:**

Conformance (EMC) concerning emission and immunity is achieved through compliance with the harmonized standard EN 61326-1\_Ed2:2013 (IEC 61326-1\_Ed2:2012 for Electrical Requirement for Measurement, Control and Laboratory for Class A.

**Class B:**

Conformance to the EMC requirements is achieved through compliance with the harmonized standards EN55011:2009 for emission and EN61000-6-2:2006 for immunity.

### 2.1.3 Environmental Compliance

This section describes compliance with various environmental regulatory directives to identify hazardous substances.

### 2.1.4 RoHS Compliance


The European Union RoHS Directive EN 50581:2012 restricts the use of certain hazardous substances in electrical and electronic equipment.

Coherent product(s) conform to all applicable requirements of the EU-RoHS Directive (2011/65/EU) and Amendment Directive (EU) 2015/863. Compliance Declarations are available upon request.

#### 2.1.4.1 China RoHS Compliance

The China RoHS (Restriction of Hazardous Substances) Regulation SJ/T 11364-2014 restricts the use of certain hazardous substances in electrical and electronic equipment. The China RoHS Regulation applies to the production, sale, and import of products into the Peoples Republic of China.

Any hazardous substances in Coherent products (if applicable) are listed on the product label, as shown in the example shown in Figure 2-1:

产品中有害物质的名称及含量							
部件名称 Part Name	有害物质 Hazardous Substances						
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)	
印刷电路板组装 Printed Circuit Board Assembly	X	O	O	O	O	O	
电源 Power Supply	X	O	O	O	O	O	
电源线 Power Cord	X	O	O	O	O	O	

本表格依据 SJ/T 11364 的规定编制  
 O: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。  
 X: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

Figure 2-1. China RoHS Label

The China RoHS Regulation also requires that the date of manufacture be identified. This information is provided on the *Certificate of Calibration* shipped with each product.

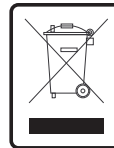
### **2.1.5 Waste Electrical and Electronic Equipment (WEEE, 2002)**

Coherent product(s) conform to all applicable requirements of the EU Waste Electrical and Electronic Equipment (WEEE)- Directive (2012/19/EU). WEEE management also covers EU Directive 2006/66/EC-EU Battery Directive and Directive 94/62/EC on Packaging and Packaging Waste. Do not dispose of these products or packaging as unsorted municipal waste.

Coherent joins approved compliance organizations to meet its collection and recycling obligations. For further information, please contact:

Email: [info@rene-europe.com](mailto:info@rene-europe.com)  
Phone: +49 (0) 8266-869806  
Website: [www.rene-europe.com](http://www.rene-europe.com)

This directive is represented by a crossed-out garbage container label, shown in Figure 2-2.



**Figure 2-2. WEEE Label**

### **2.1.6 Battery Directive**

The batteries used in this product are in compliance with the EU Directive 2006/66/EC (“EU Battery Directive”). For a list of batteries used with the product, refer to Table A-1, ‘Batteries Contained in this Product,’ (p. 41).

## **2.2 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.

## **2.3 Declaration of Conformity**

Declaration of Conformity certificates are available upon request.



# 3 Description

Thank you for purchasing the FieldMaxII-TO™—a versatile, easy-to-use digital power meter designed for field service and production applications.



**Figure 3-1. FieldMax II TO**

## 3.1 Features

Below is a list of specific features included in the FieldMaxII-TO meter:

- 73 x 58 mm backlit LCD display
- Fast and effective laser tuning mode
- Works with thermopile and optical sensors
- Intuitive soft key-driven user interface
- USB 1.1 interface
- Portable AC/DC operation
- Compact, rugged enclosure with stand

The versatile FieldMaxII-TO measures:

- Power: W, W/cm<sup>2</sup>
- Full statistics: max, min, and mean

## 3.2 Front Panel

The front panel—Figure 3-2, below—includes a liquid crystal display (LCD) and buttons that are used to enter parameters, select modes, and change ranges.

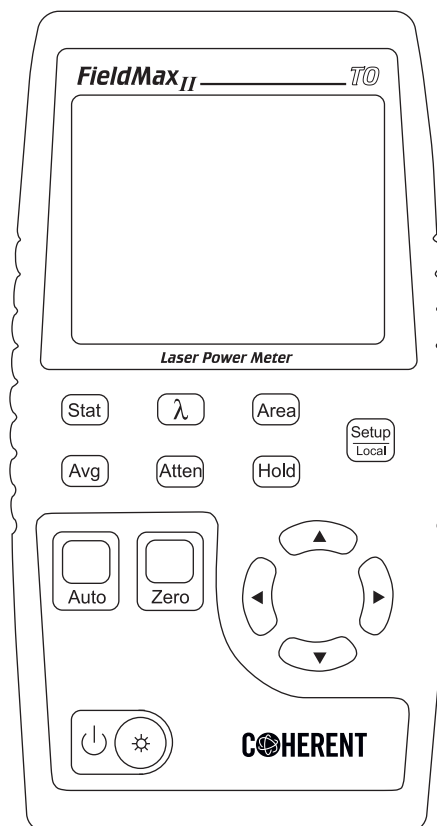



Figure 3-2. Front Panel

## 3.2.1

**Buttons**

The following buttons are on the front panel of the FieldMaxII-TO:

- Setup/Local—starts or ends a parameter edit cycle. This button is also used to cancel the front panel lockout when Remote Control is active.
- Stat—statistics processing parameter
- Wave ( $\lambda$ )—wavelength compensation parameter
- Area—area correction parameter
- Avg—display smoothing parameter
- Atten—attenuation correction parameter
- Hold—LCD freeze mode
- Auto—Auto Ranging mode
- Zero—start batch. When Statistics mode is not active, this button can also be used to zero a thermopile or optical sensor.
- —Power Switch/Backlight Toggle button
- Up Arrow ( $\blacktriangle$ )—field adjust or range select
- Down Arrow ( $\blacktriangledown$ )—field adjust or range select
- Left Arrow ( $\blacktriangleleft$ )—field select
- Right Arrow ( $\blacktriangleright$ )—field select

For detailed information about each of these buttons, refer to 'Operation' (p. 17).

### 3.2.2 Display

The LCD display provides visual measurement information. Figure 3-3 shows all the possible segments that may appear on the display.

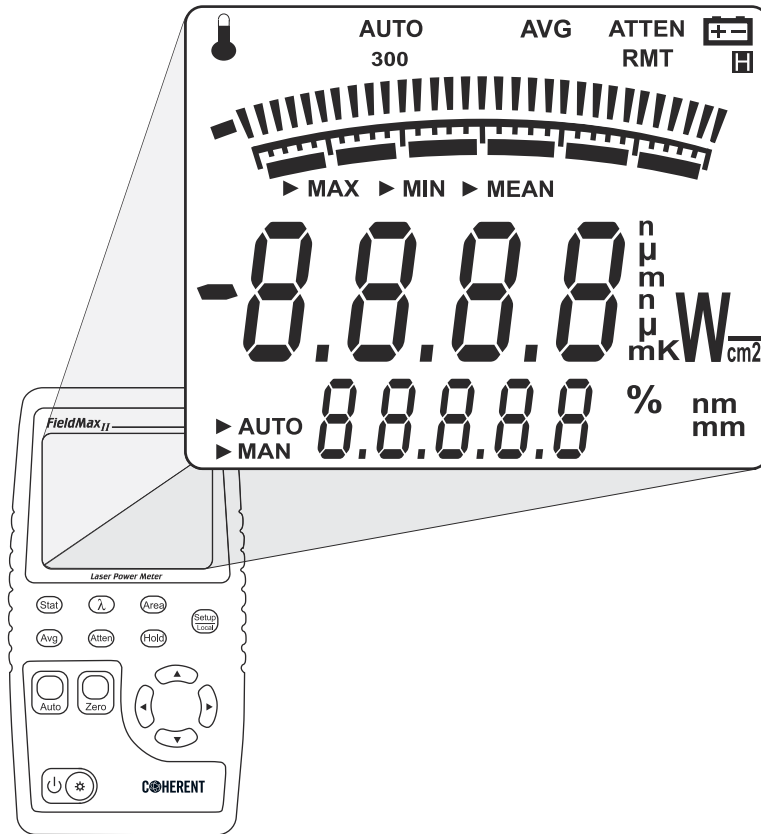


Figure 3-3. LCD Display

---

**NOTICE**

The type of sensor being used and the individually-selected settings determine what type of information will actually appear on the display

---

Information that appears on the display is divided into the groups described in the following list. Figure 3-3 shows the general location of each group).

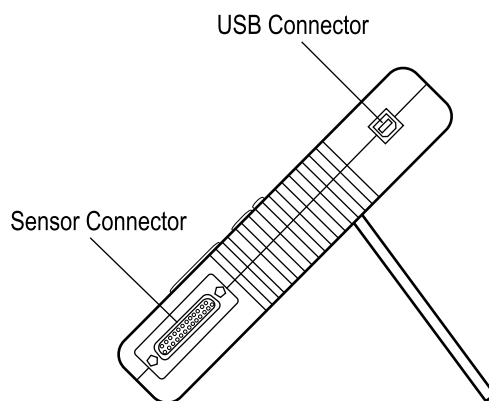
- Annunciators: Temperature, AUTO, Range Hint, AVG, ATTEN, RMT, and Battery
- Digital tuning feature

- Tuning meter scale
- Statistical parameters: MAX, MIN, and MEAN
- Numeric measurement value—large numeric characters
- Measurement units and engineering prefixes
- Statistical Sampling mode: AUTO and MAN
- Numeric data entry, batch count, and parameter settings
- Data entry units and current parameter units

For detailed information about these settings, refer to 'Button Functions' (p. 27).

## 3.3 Right Side Panel

The right side panel contains the USB and Sensor connectors—refer to Figure 3-4.



**Figure 3-4. Right Side Panel**

### 3.3.1 USB Connector

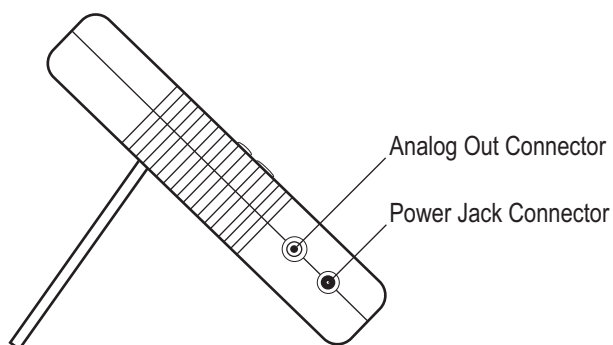
Attachment of the supplied cable to this standard USB connector allows communication between FieldMaxII-TO and a computer with a USB interface.

### 3.3.2 Sensor Connector

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

## 3.4 Left Side Panel

The left side panel contains the Analog Out and Power Jack connectors. Refer to Figure 3-5.



**Figure 3-5. Left Side Panel**

### 3.4.1 Analog Out Connector

When power is set to ON, the Analog Out connector outputs a voltage proportional to the current laser measurement. The output voltage is zero (0) volts when the measured power is zero (0) or less. The output voltage is the full-scale output voltage when the measured power is full-scale or over-ranged. The full-scale output voltage (1V, 2V, or 5V) is selected via the host interface. Factory default full-scale output voltage is 2V.

### 3.4.2 Power Jack Connector

The supplied power cord is connected to this jack.

## 3.5 AC Adapter

Use of an AC adapter prolongs battery life. FieldMaxII-TO automatically senses when an adapter is used.



## *Description*

When batteries rather than an adapter, are used, the battery annunciator flashes if the battery charge is low.

While in battery operation, if a sensor is not connected to the meter, power is automatically set to OFF after ten minutes.



# 4 Quick Setup and Getting Started

This section presents a 'mini-tutorial' that explains how to connect a sensor to a FieldMaxII-TO meter and begin to take measurements within minutes. For in-depth information about product functions for the procedure introduced in this section, refer to 'Operation' (p. 17).

In this section:

- 'Install Software and Drivers' (p. 15)
- 'Measure Power With a Thermopile or Optical Sensor' (p. 16)



---

**WARNING!**

Follow all laser safety procedures. The laser must be blocked or switched OFF before beginning the procedure described in this section.

---



---

**WARNING!**

Power to the FieldMaxII-TO instrument must be OFF before beginning the procedure described in this section.

---

## 4.1

### Install Software and Drivers

#### 4.1.1

##### Install Software

For complete software installation instructions, refer to the *FieldMax II Software Installation and Quick Start Guide* (PN 1176436), available on the Coherent website.

If that document is unavailable, go to [www.coherent.com/resources](http://www.coherent.com/resources) and download the Fieldmax II Setup software.

## 4.1.2 USB Driver Installation

When first connecting the meter to a PC with the USB cable, users are prompted through an installation process. USB drivers are automatically installed onto the computer.

Insert the supplied USB drive when prompted.

---

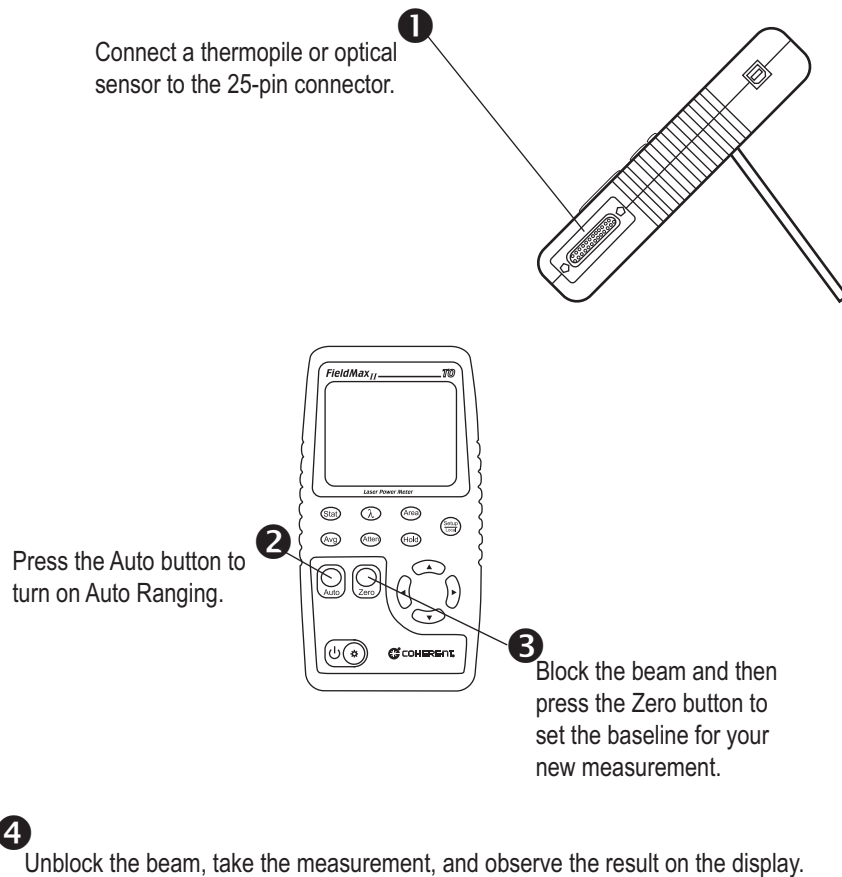
### **NOTICE**

**Do not exceed the power density limits of the sensor.**

---

## 4.2 Measure Power With a Thermopile or Optical Sensor

The following figure describes how to take a power measurement using a thermopile or optical sensor.



**Figure 4-1. Measure Power With a Thermopile or Optical Sensor**

# 5 Operation

This section gives detailed information about control functions and how they are used operate the Fieldmax II:

- 'Tuning Mode' (p. 17)
- 'Annunciators' (p. 20)
- 'Fault Display Indicators' (p. 21)
- 'Invalid and not Available Data Conditions' (p. 22)
- 'Setup Parameters' (p. 23)
- 'Button Functions' (p. 27)
- 'Statistics Mode' (p. 28)
- 'Measurement Display and Range Selection' (p. 29)

## 5.1 Tuning Mode

---

**NOTICE**

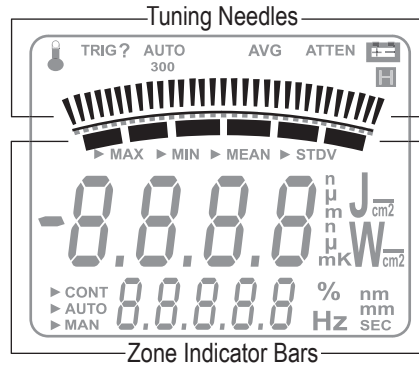
**This mode only works in Manual Ranging mode. For more information about ranging, refer to 'Auto vs. Manual Ranging Mode' (p. 31).**

---

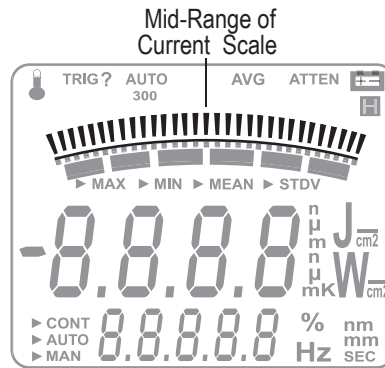
As shown in Figure 5-1, below, tuning is visually displayed on the LCD using tuning needles and zone indicator bars.

### 5.1.1 Tuning Needles

Tuning needles—which divide a given tuning zone into thirty 'increments'—are used to bring laser output to a peak. As the top or bottom of a zone is reached, the tuning needles automatically move to the center of the next zone (see Figure 5-2). Zone indicator bars shows when this happens. Refer to 'Zone Indicator Bars' (p. 18) for more information.



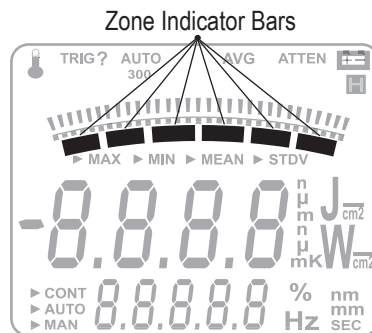
**Figure 5-1. Location of Tuning Needles and Zone Indicator Bars**



**Figure 5-2. Current Scale Mid-Range**

### 5.1.2 Zone Indicator Bars

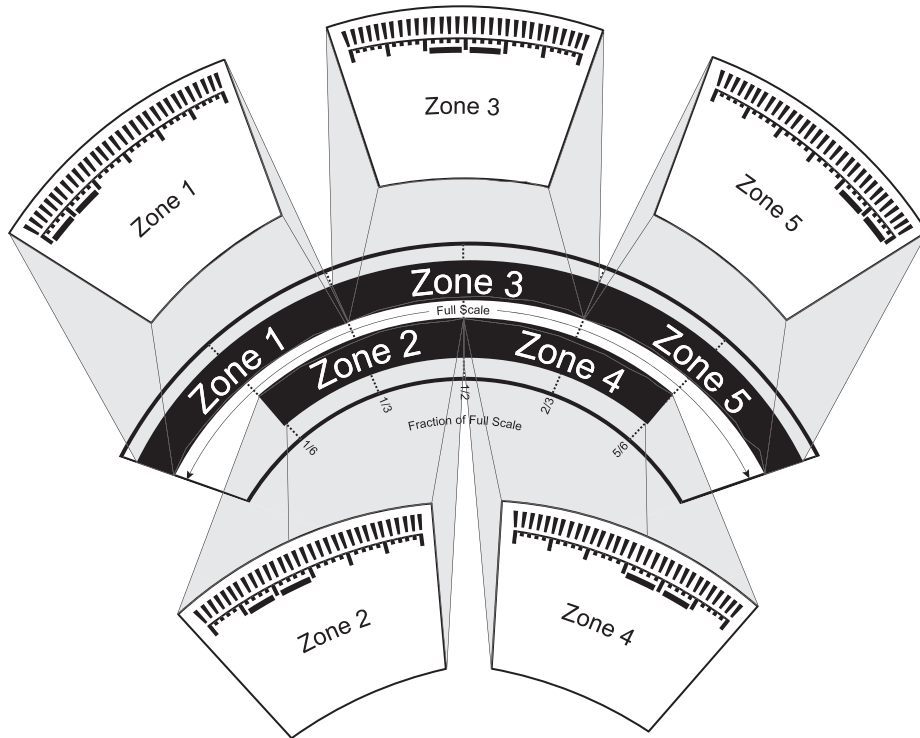
Zone indicator bars are a series of six segments, as shown in Figure 5-3, below:



**Figure 5-3. Zone Indicator Bars**

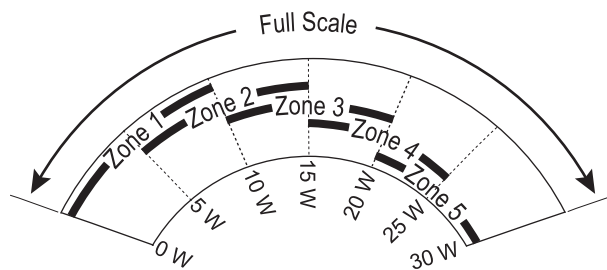
These bars act as visual indicators while the tuning needles automatically move through zones, and also provide a relative indication of where the measurement falls within the active range.

Zone indicator bars always appear in pairs, with each overlapping zone representing 1/3 of full scale. Figure 5-4 shows how the five zone indicator bars correlate to full scale measurement on the tuning meter scale.



**Figure 5-4. Comparison of Zone Indicator Bars to Full Scale Measurement**

Figure 5-5 shows an example of how the zone indicator bars overlap on a 30-watt scale:



**Figure 5-5. Tuning Mode Example - Full Scale**

## 5.2 Annunciators

Annunciators refers to the icon-type symbols that appear on the LCD. Figure 3-2 (p. 8) shows all the annunciators on the FieldMaxII-TO meter. The update rate for all annunciators is 3 times per second.

### 5.2.1 Temperature



*(thermopile sensors only)* The Temperature annunciator flashes whenever the meter detects a sensor over-temperature condition. This annunciator is not visible unless a sensor over-temperature condition exists.

### 5.2.2 AUTO

The AUTO annunciator displays the state of the auto ranging of the meter. Auto Ranging is active when “AUTO” displays. If Auto Ranging is not active, the AUTO annunciator is not visible.

### 5.2.3 Range Hint

The Range Hint annunciator—towards the top of the LCD, just above the tuning needles—displays ‘3,’ ‘30,’ or ‘300’. These numbers represent the full-scale range currently selected by the user. Range Hint is discussed in more detail under ‘Measurement Display and Range Selection’ (p. 29).

### 5.2.4 AVG

When AVG (display smoothing) is active, display values are averaged by time. “AVG” displays when averaging is active. Nothing displays in this position if averaging is not active.

### 5.2.5 ATTEN

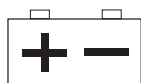
The ATTEN annunciator indicates if attenuation correction is applied to the measurement value. ‘ATTEN’ displays whenever attenuation is active.



## 5.2.6 RMT

The RMT annunciator indicates that the FieldMaxII meter is currently in Remote Control mode. Remote Control is discussed under 'Setup/Local' (p. 23).

## 5.2.7 Battery



The Battery annunciator flashes whenever the batteries need to be replaced.

---

**The Battery annunciator only appears when the meter is running on battery power, not the AC adapter.**

---

## 5.2.8 Hold



The Hold annunciator toggles between freezing the power reading and associated indicators on the LCD, and displaying live measurements.

## 5.3 Fault Display Indicators

FieldMaxII-TO is capable of detecting internal and user-induced faults. When a fault is detected, the letters 'Er', followed by a numeric fault code, appear on the display—refer to Table 5-1, below. A fault can be dismissed by pressing any button, or by correcting the cause of the fault.

**Table 5-1. Fault Codes**

Error condition	Fault code
Unrecognized sensor	1
Sensor communication failure	2
Sensor error	3
Sensor error	4

**Table 5-1. Fault Codes (Continued)**

Error condition	Fault code
Sensor/firmware version mismatch (sensor format version exceeds capability of the instrument firmware—firmware upgrade needed)	5
Sample rate fault	6
Hardware fault (detectable hardware error)	20
Bad zero <sup>a</sup>	40
Data overflow (result of an arithmetic operation that is greater than can be held in the allocated storage)	41
Wrong type of sensor is attached to the instrument	42

a. For more information about the bad zero fault code, refer to 'Zero Button' (p. 27).

As an example, 'Er 4' appears on the display if there is a sensor error. The fault can be dismissed by removing the sensor from the meter, or by pressing any button.

Attaching an unrecognized sensor to the meter creates a special fault condition. This condition is characterized by displaying a sensor fault (1 through 5).

## 5.4 Invalid and not Available Data Conditions

The update rate for invalid or not available data conditions is three times per second.

### 5.4.1 Invalid Data

Invalid data is obtained whenever the meter over-ranges. When invalid data is sensed, the letters "OL" (overload) appear on the display. If 'OL' appears while in Auto mode, no further action needs to be taken. If 'OL' appears while in Manual mode, start a new batch by pressing the Zero button. All data used to generate a batch result must be valid.

## 5.4.2 Not Available Data

Measurement data may be unavailable at certain times during meter operation. When data is not available, a series of dashes appears in the measurement area of the display. The following condition will generate unavailable data:

- Statistics mode is entered and batch data has not been compiled.

## 5.5 Setup Parameters

This section explains how to select and set user-definable parameters.

### 5.5.1 Setup/Local

The Setup/Local button serves several purposes:

1. If an edit cycle is not in progress, pressing the Setup/Local button initiates an edit cycle. If the next button pressed represents an edit parameter (STAT, WAVE, AREA, ATTEN, or AVG button), Edit mode is entered and the parameter for the applicable button may be edited using the edit buttons. Additional presses of the Setup/Local button—without first pressing an edit parameter button—are ignored.
2. If a parameter has not been selected, pressing the Setup/Local button cancels an edit cycle.
3. If Edit mode is active and a parameter has been selected, pressing the Setup/Local button commits the adjusted edit parameter to the instrument.
4. Setup/Local is used to cancel the front panel lockout when Remote Control is active.

---

#### **NOTICE**

**Remote Control is active when the instrument is connected to a host computer via a USB connection and is communicating with a host application program. While the instrument is in Remote Control mode, all front panel buttons—except Power/Backlight and Setup/Local—are disabled. Pressing the Setup/Local button while in Remote Control mode cancels Remote Control and returns the instrument to Local (all instrument functions available) mode.**

---

The Setup/Local button is also used to edit user-defined parameters. Pressing this button initiates a parameter edit cycle.

A *parameter edit cycle* consists of:

- Pressing the Setup/Local button to begin the cycle.
- Pressing the parameter button (Stat, Wave ( $\lambda$ ), Area, Avg, Atten, or Hold) that needs to be edited. If an edit cycle has been initiated, successive presses of the same edit parameter button will be ignored.
- Using the arrow buttons to select the appropriate field and adjust the data value.

Pressing the Setup/Local button a second time to end the cycle and commit the new data value.

- 

## 5.5.2 Stat Button

A press of the Stat button will:

- Enter Statistics mode—if Statistics mode is not active and the button is pressed for less than two seconds.
- Exit Statistics mode.
- Enter Edit mode and select the statistics parameters to be edited (Batch Size and Restart mode) after edit cycle initiation (if Setup/Local is pressed beforehand). Batch size is 1 to 99,999 seconds.
- View the statistics parameters if the button is pressed for two seconds or more.

## 5.5.3 Wave Button

$\lambda$  Users can configure FieldMaxII-TO to automatically account for any difference between the laser wavelength and the calibration wavelength. In the case of optical sensors, this compensation is necessary because the sensor contains calibration data from a number of different wavelengths. Thermopile and optical sensors include wavelength compensation information that is used in this mode.

After pressing Setup/Local, the Wave button is used to enter Edit mode and set the wavelength. If an edit cycle has not been initiated, pressing the Wave button will display the wavelength value. The available wavelength range is 1.00 to 99,999 nm. The actual range is sensor-dependent.

---

**NOTICE**

**If Wavelength compensation information is not programmed into the sensor, users will not be able to change the wavelength data value.**

---

## 5.5.4

### Area Button

This mode allows the measurement of laser power in terms of average power density.

---

**NOTICE**

**Area calculation returns an average power density reading for both Flat and Gaussian profiles.**

---

The parameter is entered as a diameter and assumes a circular beam or aperture. The range for Area mode is 0.01 to 999.99 mm.

Pressing the Area button will:

- Toggle the state of Area Correction mode, if the button is pressed for less than one second. Refer to “Area Correction and Zeroing,” below, for more information about Area Correction mode.
- Enter Edit mode and select the beam diameter, if Setup/Local is pressed beforehand.
- View the beam diameter, if the button is pressed for one second or more.

### 5.5.4.1

#### Area Correction and Zeroing

---

**NOTICE**

**It is important to zero the sensor before using Area Correction, as explained in the following procedure.**

---

1. Enter Area Correction by pressing the Area button for less than one second.
2. Set Auto Ranging by pressing the Auto button.
3. Block the sensor beam.
4. Allow the sensor to enter a steady (cool-down) state. If using a thermopile sensor, this steady state can be determined by watching the display numbers on the LCD. At first the numbers will decrease quickly but, as the sensor cools, the numbers decrease more slowly—the slower the decrease, the cooler the sensor, and the cooler the sensor, the more accurate the area correction reading will be. Optical sensors do not require a cool-down period.
5. Press the Zero button.

The sensor is now zeroed. For more information about zeroing, refer to 'Zero the Sensor' (p. 31).

### 5.5.5 Avg Button

Average mode enables display smoothing, which suppresses variations in the display reading that can make it difficult to read.

---

#### **Display values are averaged by time.**

---

The FieldMaxII-TO uses a boxcar averaging method, with a boxcar length of 32 samples.

Pressing the Avg button toggles the state of Average mode.

### 5.5.6 Atten Button

Attenuation mode allows true measurements with use of an attenuator that has a known attenuation factor. When Attenuation Correction mode is enabled, the measured value is adjusted to indicate the measurement at the attenuator and not the sensor. The range for this mode is 0.01 to 999.99.

Here's an example of how to determine the attenuation correction factor that needs to be set in the FieldMaxII-TO meter: If a 1 W laser beam is focused through an attenuator that has an attenuation factor of 50%, then, to get a true laser measurement value, the correction factor in the FieldMaxII-TO instrument needs to be set to 2. In other words, since only half the power of the beam is transmitted through the attenuator, the measured result must be doubled to obtain a true laser measurement.

The Atten button is used to initiate several activities:

- Toggle the state of Attenuation Correction mode, if the button is pressed for less than one second.
- Enter Edit mode and select the attenuation factor, if Setup/Local is pressed beforehand.
- View the attenuation factor, if the button is pressed for one second or more.

### 5.5.7 Hold

Pressing the Hold button toggles between freezing the power reading and associated indicators on the LCD, and displaying live measurements.

## 5.6 Button Functions

### 5.6.1 Auto

Pressing the Auto button instructs the FieldMaxII-TO to select the best measurement range for the incoming signal.

### 5.6.2 Zero Button

Pressing the Zero button causes the analog circuitry to zero its internal settings by running a zero cycle. If Auto Ranging is not active, the meter will zero the currently-selected range. If Auto Ranging is active, the meter will zero all available ranges for the attached sensor. When a zero procedure is in process, no other button events are queued or activated until the procedure ends. The zero procedure is immediately terminated if the sensor is disconnected or if an error is encountered.

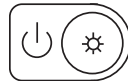
Normally, the Zero button is pressed with the laser blocked from the connected sensor. If a finite power level is present at the sensor, the instrument will attempt to null it out. A *bad zero* fault code appears if a given power input is too large to null on the sensitive ranges.

If the bad zero fault code appears:

- Press any soft button to dismiss the error
- Select a new range
- Press the Zero button

The secondary function of the Zero button is to manually start a batch while in Statistics mode.

### 5.6.3 Power Switch and Backlight Toggle Button



The combination Power Switch and Backlight Toggle button serves a dual purpose. It sets power on/off to the meter, and toggles the backlight.

- When the meter is off, the power-on state is activated by pressing the button for one second.
- A press of the button for one second while in the power-on state sets the meter to OFF.
- When the meter is in the power-on state, the backlight state is toggled by pressing the button for less than one second.
- The backlight is always off when power is first applied to the meter.

### 5.6.4 Up and Down Arrows



These buttons serve a dual purpose. When Edit mode is active, the buttons are used to adjust the currently-selected edit field. When Edit mode is not active, the buttons are used to select the measurement range and automatically cancel Auto Range mode, if Auto Range mode is active.

### 5.6.5 Left and Right Arrows



This button pair has a dual purpose. When the Edit mode is active, the buttons allow users to select the edit field of the currently-selected edit parameter. When the Edit mode is not active and Statistics mode is active, the buttons are used to select the statistical parameter of interest (MAX, MIN, or MEAN). These buttons are nonfunctional when Edit mode and Statistics mode are not active.

## 5.7 Statistics Mode

FieldMaxII-TO can be configured to display statistical data instead of instantaneous measurements. Statistical data is generated over time.



Selecting Auto mode restarts the batch count used to take a reading. If the instrument is not in Auto mode, the batch count must be manually restarted by pressing the Zero button.

---

**NOTICE**

**Pressing and holding the Stat button displays the current instrument mode: Auto or Manual.**

---

For more information on selecting parameters while in Statistics mode, refer to 'Left and Right Arrows' (p. 28).

The tuning needles and zone indicator bars are not present in Statistics mode.

### 5.7.1

#### Invalid Data

A statistical batch requires valid data for every data point in the batch. If a batch collection of data is in process and invalid data is measured, the batch is considered contaminated and the batch immediately ends with no batch result computed. If the Restart mode is Auto, a new batch is immediately restarted. The error that caused the contaminated batch is displayed

## 5.8

### Measurement Display and Range Selection

The display update rate for numeric measurement is three times per second.

Measurement range is selected in decade steps. Range selection—shown in Table 5-2 (p. 30)—is dependent on the sensor type and characteristics, as well as user-determined measurement settings.

FieldMaxII-TO uses the “3’s” *Rule*—a display formatting rule in which the display value is not allowed to exceed 3, 30, or 300, depending on where the decimal point falls, with the decimal point located in a fixed position, as determined by the current range. Typically if a reading exceeds the “3’s” limit, the instrument is over-ranged or, in the case of Auto Ranging, the instrument will automatically range up.

*Over-ranging* refers to a meter setup condition in which the sensor output signal is greater than the maximum allowable level for the selected range. An “OL” (overload) appearing on the display signifies an over-range condition. Over-ranging generates invalid data.

**NOTICE**

When area correction is enabled in Watts mode, a '/cm<sup>2</sup>' will be appended to the units.s

Table 5-2 indicates the display format for different full-scale range settings.

**Table 5-2. Full Scale Range Settings**

Full Scale Measurement	Display Format
3 nW	X.YYY nW
30 nW	XX.YY nW
300 nW	XXX.Y nW
3 μW	X.YYY μW
30 μW	XX.YY μW
300 μW	XXX.Y μW
3 mW	X.YYY mW
30 mW	XX.YY mW
300 mW	XXX.Y mW
3 W	X.YYY W
30 W	XX.YY W
300 W	XXX.Y W
3 kW	X.YYY kW
300 kW	XX.YY kW

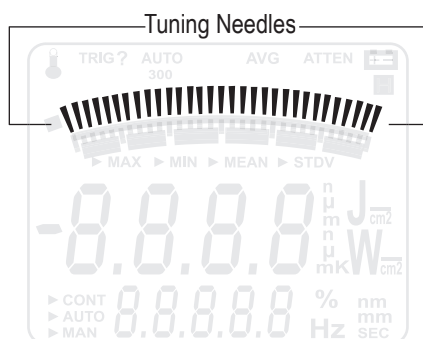
The Range Hint annunciator displays the full-scale range value with the engineering prefix and units omitted. For example, when the range is 30 kW, the Range Hint annunciator displays '30'. Note that it also displays '30' when the selected range is 30 W, 30 mW, 30 μW, or 30 nW. For more information about the Range Hint annunciator, refer to 'Range Hint' (p. 20).

### 5.8.1 Manual Ranging Mode

Manual ranging requires the user to select the range. Refer to 'Up and Down Arrows' (p. 28) for more information about manual ranging.

### 5.8.2 Auto vs. Manual Ranging Mode

Auto Ranging (Auto) enables FieldMaxII-TO to automatically select the range (gain). While in Auto Ranging mode, the tuning needles represent a zero-to-full scale movement (as compared to Tuning mode, where the zones overlap). Refer to Figure 5-6, below.



**Figure 5-6. Auto Ranging**

---

#### **NOTICE**

Manual ranging requires the range to be selected by the user. Refer to 'Up and Down Arrows' (p. 28) for more information.

---

### 5.8.3 Zero the Sensor

Thermopile and optical sensors require periodic zeroing. Zeroing happens when a meter attempts to null out any signal coming from the sensor and establish a zero-power baseline. If Auto Ranging is active, the sensor is zeroed for every available range. If Auto Ranging is not active, the sensor is zeroed at the current range only. Under typical operating conditions, the zero procedure takes about one second for each range.

When starting the zeroing procedure, the large numerals on the LCD are replaced by an animated set of dashes. Unless there is an error, the normal measurement mode resumes once the zeroing procedure ends.

#### **5.8.4 Negative Power Display**

A negative power reading indicates the sensor needs to be zeroed. Two areas of the display are affected by a negative power reading: the digital tuning feature and the numeric measurement display.

The digital tuning feature always displays the absolute value of measured power. If the power is negative, the minus sign segment is set to ON. The inertia of a mechanical meter will be mimicked for negative, as well as positive, power readings.

# 6 Host Interface

## 6.1 Overview

The host interface is intended for use with a National Instruments LabVIEW virtual instrument (VI) that accesses an ActiveX DLL called FieldMax2Lib.dll. The DLL handles communication and data transmission between the FieldMaxII and host applications written in LabVIEW.

A Getting Started introduction and LabVIEW examples are available at <https://www.coherent.com/resources>



# 7 Calibration and Warranty

## 7.1 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 measurement systems serviced and re-calibrated.

A large percentage of Coherent calibrations are performed within five business days, and expedited service is available, to minimize customer downtime.

### 7.1.1 Scope of Calibration

Calibration of a Coherent power and energy laser measurement product includes:

- Calibration to original uncertainty levels
- Minor repairs (see more information, below)
- Extended 12 month warranty, on eligible products
- Fast calibration turnaround time.

Minor repairs includes fixing manufacturer's defects, hardware updates, firmware, software updates, damaged connectors, and other small repairs. Detector element replacement due to laser damage and damage caused by negligent use is not covered – for customer caused damage, an additional repair service charge is applied.

This level of service results in an overall lower cost of ownership, with many owners realizing a lifetime warranty for their products.

### 7.1.2 Re-certify Once Per Year

To maintain this high level of performance, and to ensure compliance with your quality and ISO certification, it is important to have measurement systems serviced and re-certified once per year.

Extended use of laser power and energy meters and sensors, as well as environmental factors, can have an adverse effect on accuracy and also result in wear and/or damage to parts critical to optimum performance.

### **7.1.3 Coherent Calibration Facilities and Capabilities: ISO 17025 Accredited**

Coherent calibration facilities contain the widest possible range of light sources from 193 nm to 10,600 nm, with powers ranging nanowatts to kilowatts.

Coherent Wilsonville, Oregon, and its satellite sites, are fully accredited to ISO/IEC 17025:2017 by ANAB - The ANSI National Accreditation Board. ANAB is a signatory of the International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC) multilateral recognition arrangements. ANAB has signed the MRAs of the InterAmerican Accreditation Cooperation (IAAC) and the Asia Pacific Accreditation Cooperation (APAC). Accreditation to ISO/IEC 17025 is the formal recognition that a calibration laboratory is technically competent to carry out specific calibrations.

A detailed discussion of the Scope of Accreditation and the Technical Requirements of ISO 17025 Accreditation can be found on the Coherent ISO 17025:2017 Accreditation web page.

In addition, Coherent team delivers the industry's best service, with a knowledgeable and responsive staff, and rapid turnaround.

## **7.2 Limited Warranty**

Coherent, Corp. (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, Corp. 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.

## **7.3 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.



# 8 Extended Warranty Program

Coherent, Corp. (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.

To qualify for this Warranty, a Customer must return the Product to the Company for recalibration and recertification.

- The Company will re-certify 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 re-certified 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.

For information about calibration and recertification services, refer to ‘Calibration’ (p. 35).



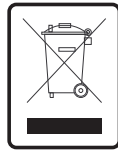
# Appendix A: Maintenance

## A.1 Battery Replacement

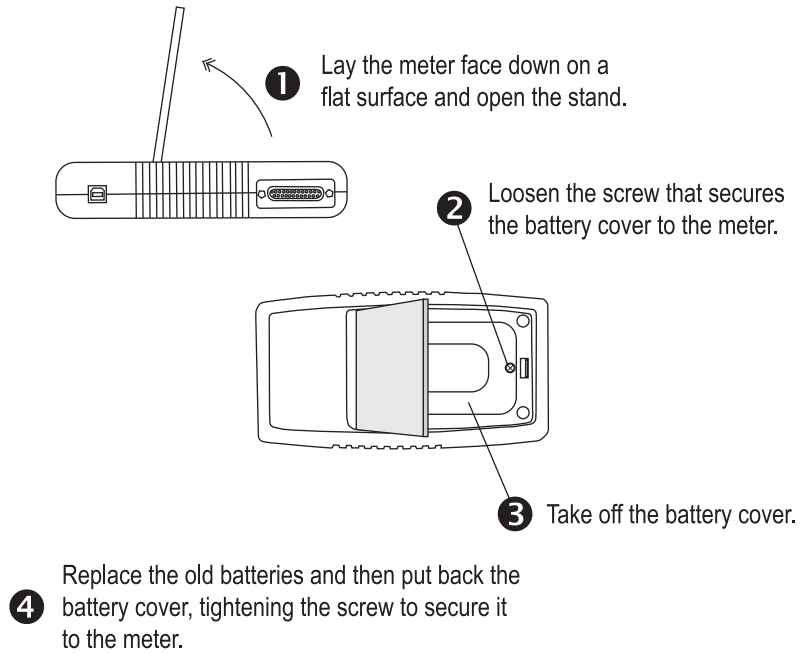
FieldMaxII-TO uses a rechargeable battery pack (standard), six 1.5V alkaline batteries, or a 90-to-260 VAC, 50/60 Hz AC adapter—refer to “AC Adapter” (p. 12) for more information. Figure A-1 (p. 42) illustrates how to replace the optional alkaline batteries.

**Table A-1. Batteries Contained in this Product**

Description	Type
7.2V rechargeable battery pack	NiMH
(optional) 1.5V AA	Alkaline



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



**Figure A-1. Optional Alkaline Battery Replacement**

# Appendix A: Service & Support

This section provides information about technical support, service and shipping instructions.

## A.1 Technical Support

Coherent provides telephone and web-based technical assistance as a service to its customers and assumes no liability for any injury or damage that can occur at the same time with such services.

Operation of any Coherent laser with any of its interlocks (or safety features) defeated is always at the operator's own risk. Under no circumstances do these support services affect the terms of any Warranty agreement between Coherent and the buyer.

Be prepared to provide the following information to the Product Support Engineer responding to the request:

- The unit model or part number
- Serial number
- A description of the problem
- Any corrective steps that have been attempted

### A.1.1 Support in the USA and North America

Should any difficulties with the unit be experienced or for product or technical information, contact Coherent as follows:

- By email: [LSMsupport@coherent.com](mailto:LSMsupport@coherent.com)
- Website: [www.Coherent.com](http://www.Coherent.com)

For further assistance, please contact Coherent Technical Support:

- By phone: 1-(800)-343-4912 or 1-(503)-454-5700 outside the U.S.

Telephone coverage is available Monday through Friday (except U.S. holidays and company shutdowns). Inquiries received outside of normal office hours will be captured by our automatic answering system and calls will be quickly returned the next business day.

## **A.1.2 International Support**

If located outside the U.S., visit [www.Coherent.com](http://www.Coherent.com) for technical assistance, or contact a local Service Representative directly:

- Germany: +49-6071-968-0
- Japan: +813-5635-8680

On the Coherent website, contact information (telephone numbers and addresses) for Service Representatives worldwide is provided.

## **A.2 Obtain Service**

To obtain product 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) as instructed in "Product Shipping Instructions" next.
- Ship it to the address specified by the Company, with shipping prepaid. back to Coherent in conjunction with recalibration and recertification.
- Coherent shall pay the cost of shipping the Product back to the Customer in conjunction with product failures within the first twelve (12) months of time of sale or during an extended 12-month warranty period.



## A.3 Product Shipment Instructions

A Returned Material Authorization number (RMA) assigned by the Company must be provided on the outside of all shipping packages and containers. Items returned without an RMA number are subject to return to the sender. Detailed instructions to prepare a product for shipping are provided in the next section.

To prepare a product for shipping to Coherent:

1. Contact Customer Service 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 that was received from Coherent Customer Service. Pack this tag inside the box.
3. Wrap the product with polyethylene sheeting or equivalent material.
4. Using the original shipping and packaging materials, pack the product.
5. Seal the shipping carton with shipping tape or an industrial stapler.
6. Add the RMA number that was received from Coherent Customer Service to the shipping label on the outside of the box. Ship the product to one of the following addresses:

### **USA**

Coherent Laser Measurement and Control Service Center  
Attn: (your RMA number)  
27650 SW 95th Avenue  
Wilsonville, OR 97070

### **Europe**

Coherent Shared Services B.V.  
Dieselstr. 5 b  
D-64807 Dieburg  
Germany

### **Asia**

Coherent, Inc. Japan  
Atsugi Technical Center  
Toda 1042-4  
Atsugi, Kanagawa Prefecture  
243-0023, Japan



# Appendix B: Specifications

Table B-1, below, shows the specifications for the FieldMaxII-TO.

**Table B-1. Specifications**

Parameter	Description
Electrical/Mechanical	
Analog Output	1, 2, or 5V full-scale (user-adjustable) 100 ohm source impedance
Battery Operating Time* (approx) Thermopile * Without a backlight	<i>Rechargeable</i> <i>Alkaline</i> 16 hr.              48 hr.
Calibration Accuracy	± 1%
Digital Output	USB 1.1
Digital Tuning Needle	100 mS (tau) 20 Hz (update rate)
Power Requirements	<i>AC operation:</i> 90-to-260 VAC, 50/60 Hz <i>DC power input:</i> 12 VDC, 1.25A, center-positive <i>Battery operation:</i> rechargeable battery pack (standard) or six optional 1.5V AA alkaline batteries (battery specifications are listed earlier in this table under “Battery Operating Time”)
Linearity	± 1%
Measurement Resolution	± 0.1% of full scale
Environmental	
Altitude	4,500 m (operating) < 12,000 m (storage)
Relative Humidity	< 90% (5 to 40° C) (operating) < 95% (0 to 70° C) (storage)
Temperature	5 to 40° C (operating) -20 to 70° C (storage)

**Table B-1. Specifications (Continued)**

<b>Parameter</b>	<b>Description</b>
Ranges	
Area Parameter (entered as a diameter)	0.01 to 999.99 mm
Attenuation (Attenuation parameter)	0.01 to 999.99
Batch Size (Statistics parameter)	1 to 99,999 seconds
Measurement Range (full scale, sensor-dependent)	3 nW to 300 kW (thermopile sensors) 3 nW to 300 kW (optical sensors)
Window Size (Avg parameter)	1 to 60 seconds
Physical Characteristics	
Dimensions (h x w x d) (approx)	8 in. (20 cm) 4 in. (10 cm) 1.5 in. (4 cm)
Display	58 x 73 mm fixed-segment LCD with backlight
Weight (approx, including batteries)	1.1 lb. (0.5 kg)
Miscellaneous	
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产品中有害物质的名称及含量							
部件名称 Part Name	有害物质 Hazardous Substances						 
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)	
印刷电路板组装 Printed Circuit Board Assembly	X	O	O	O	O	O	
电源 Power Supply	X	O	O	O	O	O	
电源线 Power Cord	X	O	O	O	O	O	

本表格依据 SJ/T 11364 的规定编制  
 O: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。  
 X: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

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