

# X-Cite® Optical Power Measurement System User Guide

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*X-Cite® XR2100 Optical Power Meter*  
*X-Cite® XP750 Objective Plane Power Sensor*

# **X-Cite® Optical Power Measurement System User Guide**

035-00390R Rev. 5

Made in Canada

Excelitas Canada Inc. 2022

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**Excelitas Canada Inc.**  
**2260 Argentia Road**  
**Mississauga ON L5N 6H7 CANADA**

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## Table of Contents:

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Safety</b>	<b>2</b>
2.1	Glossary of Symbols	2
2.2	Safety Precautions	3
<b>3</b>	<b>Getting Started</b>	<b>5</b>
3.1	System Components	5
3.2	XP750 Objective Plane Power Sensor	6
3.3	XR2100 Optical Power Meter	7
<b>4</b>	<b>Installation and Basic Operation</b>	<b>10</b>
4.1	XR2100 Optical Power Meter with Light Guide Input	10
4.2	XP750 With Upright Microscopes	11
4.3	XP750 With Inverted Microscopes	12
<b>5</b>	<b>Measuring in Absolute Mode</b>	<b>13</b>
<b>6</b>	<b>Measuring in Relative Mode</b>	<b>13</b>
<b>7</b>	<b>Storing Data</b>	<b>13</b>
7.1	Power Readings	13
7.2	Favorite Wavelengths	14
<b>8</b>	<b>External Control</b>	<b>15</b>
8.1	Driver & GUI (Graphical User Interface) Installation	15
8.2	Graphical User Interface (GUI)	16
8.3	Status, Control and Operational Tabs	17
8.4	Optical Data	17
8.5	Status Data	18
8.6	Calibration Data	19
8.7	Data Log	20
8.8	Power Snapshot	21
8.9	Stability Data	24
8.10	X-Cite® <i>exacte</i> Control Panel Buttons	25
<b>9</b>	<b>Calibration</b>	<b>27</b>
9.1	X-Cite® XP750 Calibration	27
9.2	X-Cite® XR2100 Calibration	27
9.3	X-Cite® <i>exacte</i> Calibration using the XR2100 & Light Guide	27
9.4	Calibrating X-Cite® <i>exacte</i> with the XP750	28
<b>10</b>	<b>Troubleshooting</b>	<b>29</b>
XR2100	Optical Power Meter Error Codes	29
<b>11</b>	<b>Care and Maintenance</b>	<b>30</b>
11.1	General	30
11.2	Cleaning	30
11.3	Lithium Batteries	31
<b>12</b>	<b>Technical Specifications</b>	<b>32</b>
12.1	XR2100 Optical Power Meter	32

12.2	XP750 Objective Plane Power Sensor .....	32
12.3	Electrical Specifications (XR2100).....	33
12.4	Electrical (XP750) .....	33
12.5	General .....	33
12.6	Environmental Specifications (XR2100 & XP750) .....	34
<b>13</b>	<b>Regulatory Compliance.....</b>	<b>35</b>
<b>14</b>	<b>Warranty.....</b>	<b>38</b>
14.1	Returning Equipment to Excelitas Technologies .....	39
<b>15</b>	<b>Contact Information .....</b>	<b>40</b>
15.1	General .....	40
	Technical Support and Service .....	40
15.2	Accessories and Replacement Parts.....	40

**Table of Figures:**

Figure 1:	XP750 Top View.....	6
Figure 2:	XP750 Bottom View .....	6
Figure 3:	XR2100 Keypad .....	7
Figure 4	XR2100 Optical Power Meter Connections.....	9
Figure 5	Graphical User Interface.....	16
Figure 6	XR2100/XP750 Status, Control and Operational Tabs .....	17
Figure 7	X-Cite® <i>exacte</i> Status, Control and Operational Buttons.....	25
Figure 8	X-Cite® <i>exacte</i> Control Panel Buttons Descriptions .....	26
Figure 9	Battery Cavity .....	31
Figure 10	Plastic Case with XP750 & XR2100 .....	39

# 1 Introduction

This Optical Power Measurement System is a measurement tool used to determine the illumination power at the specimen plane on a microscope, for the purposes of recording and recreating experiment conditions, testing and troubleshooting microscope systems.

The X-Cite® Optical Power Measurement System, X-Cite® XR2100 Optical Power Meter Kit and the X-Cite® XP750 Objective Plane Power Sensor are high quality products manufactured in accordance with ISO 9001, CE marked and certified to UL and CSA standards.

Excelitas Technologies Corp. is a global technology leader focused on delivering innovative, customized solutions to meet the lighting, detection and other high-performance technology needs of customers. X-Cite®, formerly of Lumen Dynamics (which was acquired by Excelitas Technologies Corp. in November 2013) offers the Life Science and Analytical Instrumentation market a broad range of innovative lamp and LED fluorescence illumination and measurement solutions.

We recommend that you read this manual to discover all its features, and how to use them.

Thank you for choosing X-Cite®!

## 2 Safety

### 2.1 Glossary of Symbols



**CAUTION - Risk of danger: consult accompanying documents**



**WARNING -Eye damage may result from directly viewing ultraviolet light – protective eye shielding and clothing must be used at all times.**



**Input/Output Signals**



**Input Signal**



**Battery**



**D.C. Current**



**Caution, Hot Surface**

## 2.2 Safety Precautions



### Caution

Never look into the light emitting end of the light guide. The light could severely damage the cornea and retina of the eye if the light is observed directly. UV protective eye shielding must be used at all times as well as clothing to protect exposed skin.



### Warning

Always make sure the light guide is properly inserted into the XR2100 and/or the microscope prior to working with the system. This will minimize the risk of exposure to the UV light.



### Caution!

To prevent damage/ degradation of the attached XP750 Sensor Cable, always allow adequate clearance to prevent kinking or excessive bending.



### Warning

Should this X-Cite® Optical Power Measurement System be used in a manner not specified by Excelitas Technologies, the protection provided by the equipment may be impaired.



### Warning

The XR2100 is supplied with two lithium batteries. Lithium batteries present a potential fire, explosion or severe burn hazard. **DO NOT** attempt to re-charge, disassemble, incinerate, short circuit or expose battery to temperatures above 100° C or expose contents to water.



### WARNING!

Used batteries are not to be discarded. Return to the nearest authorized Excelitas Technologies service center for disposal/ recycling.



Lithium batteries must have terminals taped with non-conductive material prior to returning for disposal/re-cycling to prevent short-circuiting. External packaging material must provide adequate protection to contents.



The lithium battery supplied in XR2100 DOES NOT contain: mercury, lead, manganese or cadmium. Substitution of any other type of battery is not recommended and may void warranty.



### Caution, hot surface

In instances where high power light sources are measured for extended periods of time, the light guide adaptors supplied with the XR2100 may become hot! Always use caution when handling these adaptors.

**Caution**

The detection window operational life can be significantly shortened if it is handled incorrectly. Do not touch the window surface. Skin oils and scratches can cause the window to fail prematurely.

**Caution**

Any electronic equipment connected to the X-Cite® Optical Power Measurement System must be comply with the requirements of EN/IEC 60950-1/62368-1

**Cleaning:**

Clean the exterior of the XR2100 with a slightly dampened cloth and simple water/detergent solution only. Refer to [section 11](#) for detailed cleaning instructions for the XP750.



## 3 Getting Started

### 3.1 System Components

Carefully unpack your system and accessories. Ensure that all components ordered are present. Store the packing material for future use. The XP750 can be stored in its original packaging, or in the plastic case with the XR2100, there is a special foam cut-out for this purpose. (refer to [Figure 10](#) in [section 14.1](#)).

#### **X-Cite® XR2100 Power Meter:**

Qty. 1 - XR2100 Optical Power Meter

Qty. 2 - Lithium Batteries (installed)

Qty. 1 - USB Cable

Qty. 1 - Stereo Connection Cable, 2.0m

Qty. 1 - 3mm Light Guide Adaptor

Qty. 1 – User Guide

(User Guide, Software and Driver downloads:

<https://www.excelitas.com/product/x-cite-optical-power-measurement-system>)

Qty. 1 - Plastic Storage Box

Qty. 1 - Calibration Certificate

Qty. 1 - Safety Precautions Booklet

X-Cite® Control Panel Software

Minimum Computer Specifications:

- Windows XP SP2 or later, Windows Vista, Windows 7, Windows 8.
- One available USB 1.1 or 2.0 port

#### **X-Cite® XP750 Objective Plane Power Sensor (if ordered):**

Qty. 1 - Objective Plane Power Sensor XP750 with attached DIN multi-pin Connector.

Qty. 1 - Calibration Certificate

If your packaged system is missing any components, call Excelitas Technologies at (905) 821-2600 or TOLL FREE 1-800-668-8752.

Any additional optional items purchased to customize the unit will also be present.

### 3.2 XP750 Objective Plane Power Sensor

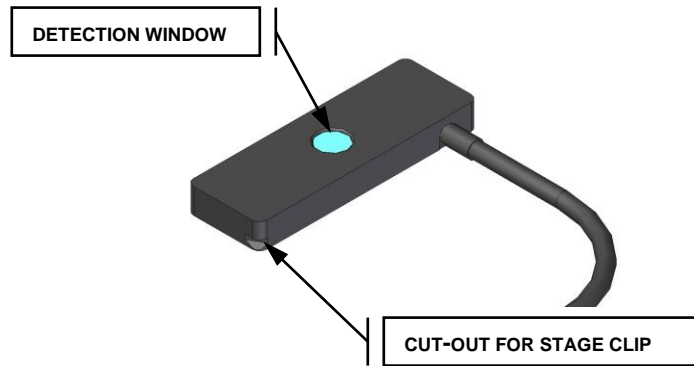


Figure 1: XP750 Top View

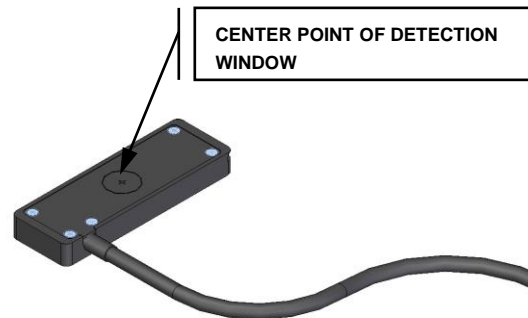


Figure 2: XP750 Bottom View

### 3.3 XR2100 Optical Power Meter

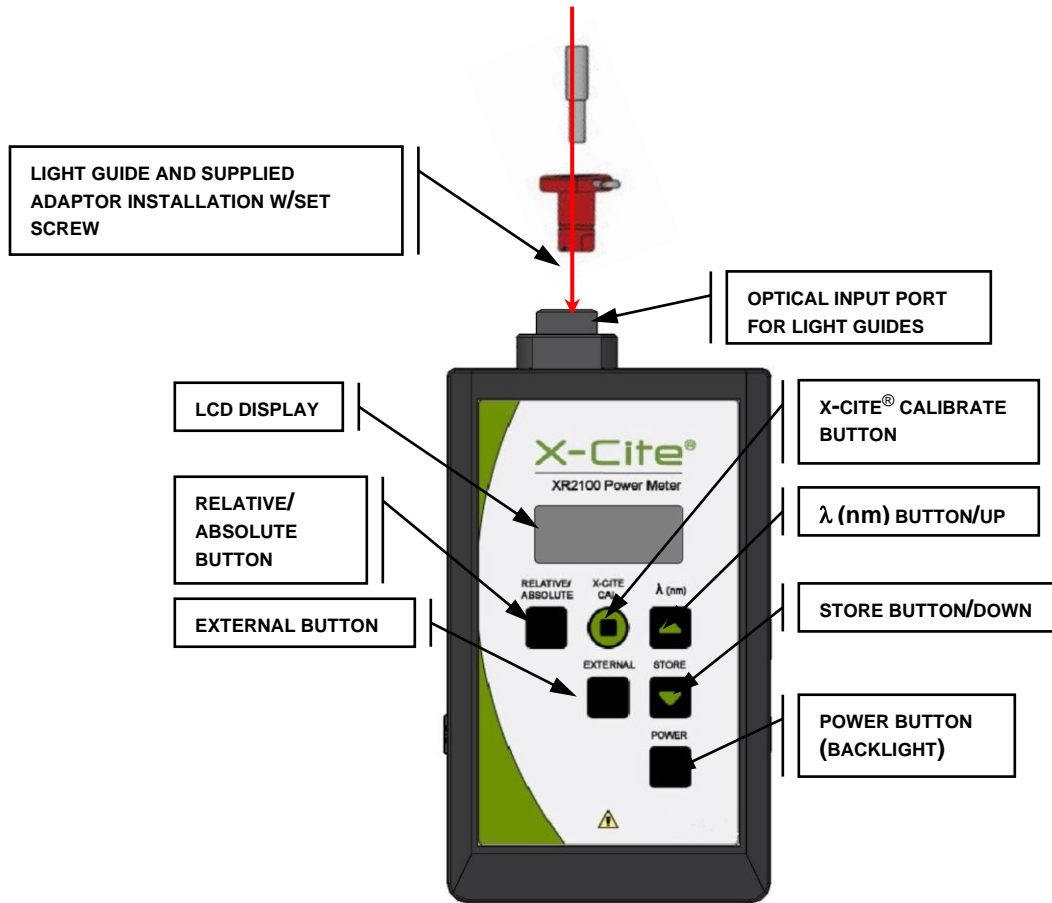


Figure 3: XR2100 Keypad

### Optical Input Port



- Accepts standard 3mm size light guides (using the supplied 3mm adapter) facilitating accurate light delivery into the XR2100.

### X-Cite® CAL Button

- Initiates calibration sequence for compatible X-Cite® illumination systems. Refer to [section 9](#).
- Set or clear favorite wavelengths. Refer to [section 7.2](#).

### $\lambda$ (nm)/UP (▲) Button

- Wavelength selection.
- View current wavelength setting.
- Re-setting wavelength setting.
- In wavelength select mode, scrolls through the wavelength setting by 1nm increments.
- Clear favorite wavelength setting.
- Refer to [section 7.2](#).

### Store/Down (▼) Button

- Store power readings obtained via the light guide or the XP750. refer to [section 7](#).
- In wavelength select mode, scrolls through the wavelength setting by 1nm decrements. Refer to [section 7.2](#).

### Power Button and Backlight

- Press once to turn the XR2100 on.
- A second time to turn on the LCD backlight. Press again to turn off the back light.
- Press and hold this button for 4 seconds to turn off the unit.

### LCD Display

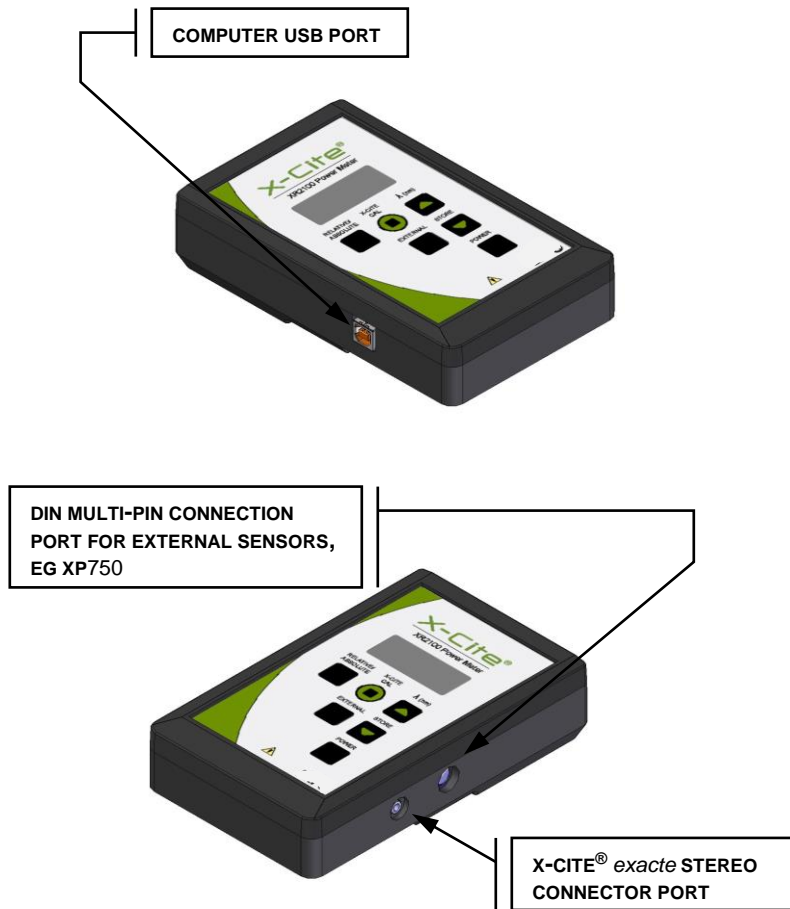
- The display is a 3.1 digit, 7 segment LCD display
- Use the power button to turn backlight on/off (see above).

### Relative/Absolute Button

- Each press of this button toggles between relative (percentage) and absolute (watts, milliwatts, microwatts) mode. Refer to [sections 5 & 6](#).

### External Button

- Pressing this button enables the XR2100 to receive input from an external device such as the XP750, when connected through the DIN multi-pin connection port.
- Refer to [sections 4.2 & 4.3](#).



**Figure 4 XR2100 Optical Power Meter Connections**

- ↔ **DIN Multi Pin Connection Port For External Sensors**
  - For input using the Objective Plane Power Sensor, connect cable to this port.
- ↔ **Computer USB Port**
  - For PC communication, connect USB cable from XR2100 to the computer USB port.
- ↔ **X-Cite® exacte Stereo Connection Port**
  - If using or calibrating the X-Cite® exacte, the Stereo Connection Cable is used to connect the XR2100 to the X-Cite® exacte.

## 4 Installation and Basic Operation

The X-Cite® Optical Power Measurement System can be configured for use in 4 ways. Refer to the appropriate section for your specific application:

Section 4.1 - XR2100 Optical Power Meter with Light Guide Input

Section 4.2 - XP750 With Upright Microscopes

Section 4.3 - XP750 With Inverted Microscopes

Section 9.4 - Calibrating X-Cite® *exacte* with the XP750

### 4.1 XR2100 Optical Power Meter with Light Guide Input

- 4.1.1 Install the light guide adaptor corresponding to the size of your light guide into the Optical Input Port of the XR2100. Refer to Figure 3 for location.

**Note:**

A 3mm light guide adaptor is supplied with the XR2100 which is compatible with the 3mm light guide used on most X-Cite units. If another size is required contact the Excelitas Sales Team, (section 15).

- 4.1.2 For viewing convenience the XR2100 can either lay flat or rest on the hinged pull-out stand located in the back for an upright/angular view.
- 4.1.3 Set light source to the desired intensity level. Close shutter.
- 4.1.4 Remove light guide from microscope adapter and insert the light guide end into the light guide adaptor and fasten in place using the supplied thumb screw.
- 4.1.5 Open shutter and turn the XR2100 ON.
- 4.1.6 Use **Relative/Absolute** button to adjust display mode of measurement.
- 4.1.7 To calibrate X-Cite® *exacte* connect the Stereo Connection Cable to XR2100 and X-Cite® *exacte* press '**CAL**'. (refer to X-Cite® *exacte* user guide for more information on calibration).

**Note:**

Once the XR2100 boots-up (approx 6 seconds) the screen will read 'LG' if the light guide is not inserted, if a light guide is inserted a reading will be displayed.

## 4.2 XP750 With Upright Microscopes

- 4.2.1 Plug the XP750 multi-pin connector into the XR2100. Refer to [Figure 4](#) for connecting cable locations.
- 4.2.2 For upright microscopes, place the XP750 onto the stage with the detection window (refer to [Figure 1](#)) facing up, and approximately centered beneath the microscope objective lens.
- 4.2.3 Secure the XP750 in place using the microscope's stage clip and the supplied suction-cup ensuring the XP750 is seated firmly and sits flush on the stage. The suction-cup can be adjusted to fasten anywhere along the XP750 connection cable or removed if not needed to hold device in place. The microscope stage clip should be resting in the "stage clip cut-out" to prevent slipping. Refer to [Figure 1](#).

**Note:**

Leave some cable slack before attaching the suction-cup to allow for x-y stage movement.

- 4.2.4 Turn on the epi-fluorescence light source and open the microscope shutter, ensure that the filter cube in the beam path is directing visible light to the microscope stage.



**!!Warning!!**  
Do not use UV light for this alignment

- 4.2.5 To align the detection window (refer to [Figure 1](#)) with the visible light from the microscope objective, use the microscope stage x-y controls, ensuring the light is centered within the window
- 4.2.6 Press the XR2100 '**POWER**' button, allow approximately 6 seconds for initialization. If the display reads '**LG**' press '**EXTERNAL**' to change input channel to the XP750. '**EXT**' will be displayed at left side of LCD, and the reading may take several seconds to stabilize.

**TIP:**

Press '**POWER**' a second time and the backlight will illuminate. Press a third time to turn off the back light.

- 4.2.7 Engage the appropriate objective, filter cube, intensity and other microscope settings.
- 4.2.8 Press the ' $\lambda(\text{nm})$ ' button to see the current wavelength setting.
- 4.2.9 Select the appropriate wavelength by pressing  $\blacktriangle$  button repeatedly to cycle through wavelengths in 1nm increments, or  $\blacktriangledown$  button to decrement the wavelength in 1nm increments. XR2100 display will show currently selected wavelength while cycling and for 4 seconds after final selection.
- 4.2.10 Hold down wavelength select button  $\blacktriangle$  to rapidly scroll through the wavelengths via PC.
- 4.2.11 Refer to [section 8 GUI](#) to program, store and cycle through your desired/favorite wavelength(s) via the PC.

### 4.3 XP750 With Inverted Microscopes

- 4.3.1 Plug the XP750 multi-pin connector into the XR2100. Refer to [Figure 4](#) for connecting cable locations.
- 4.3.2 For inverted microscopes, place the XP750 onto the stage with the detection window facing down and approximately centered above the microscope objective lens. The + icon (etched inside a circle) should be facing up (refer to [Figure 2](#)) which marks the center of the detection window.
- 4.3.3 Secure the XP750 in place using the microscope's slide holder or the supplied suction-cup ensuring the XP750 is seated firmly and sits flush on the stage. The suction-cup can be adjusted to fasten anywhere along the XP750 connection cable or removed if not needed to hold device in place.
- 4.3.4 Turn on the transmission light source and using the microscope stage x-y controls, center the light on the + icon.
- 4.3.5 Press the XR2100 '**POWER**' button, allow approximately 6 seconds for initialization. If the display reads '**LG**' press '**EXTERNAL**' to change input channel to the XP750. '**Ext**' will be displayed at left side of LCD, and the reading may take several seconds to stabilize.

**TIP:**

Press '**POWER**' a second time and the backlight will illuminate. Press a third time to turn off the back light.

- 4.3.6 Engage the appropriate objective, filter cube, intensity and other settings.
- 4.3.7 Press the ' $\lambda(\text{nm})$ ' button to see the current wavelength setting.



- 4.3.8 Select the appropriate wavelength by pressing ▲ button repeatedly to cycle through wavelengths in 1nm increments, or ▼ button to decrement the wavelength in 1nm increments. XR2100 display will show currently selected wavelength while cycling and for 4 seconds after final selection.
- 4.3.9 Hold down wavelength select or the ‘λ(nm)’/▲ button to rapidly scroll through the wavelengths.
- 4.3.10 Refer to [section 8](#) to program, store and cycle through your desired/favorite wavelength(s).

## 5 Measuring in Absolute Mode

- 5.1.1 The default measurement mode for the XR2100 is Absolute Mode. When in Absolute Mode the XR2100 displays the reading as power in W (watts), mW (milliwatts), or μW (microwatts). Press ‘Relative/Absolute’ button to toggle between Absolute mode and Relative mode.

## 6 Measuring in Relative Mode

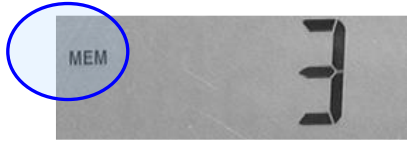
- 6.1.1 Press ‘Relative/Absolute’ button to toggle between Absolute Mode and Relative Mode.
- 6.1.2 The Relative Mode displays measurement as a percentage of a reference value measured in % (percentage).
- 6.1.3 The “reference value” will be taken as the power level being measured when the unit was toggled into Relative Mode.
- 6.1.4 The relative mode is a light measurement comparative tool and can be used with a light guide or the XP750.

## 7 Storing Data

### 7.1 Power Readings

- 7.1.1 To manually store the power readings from the XP750 or the light guide port press the ‘STORE’ button. The reading currently being displayed will be stored along with the time and date.

- 7.1.2 When the '**STORE**' button is pressed the display shows the '**MEM**' icon and a number (starting at 1), that corresponds to the number of stored readings. The number will increment each time '**STORE**' is pressed and the measurement will be stored.



- 7.1.3 Stored readings cannot be recalled on the XR2100. The stored readings can be downloaded and viewed when connected to the X-Cite® Control Panel. Refer to [section 8](#) for X-Cite® Control Panel Operation/data log.
- 7.1.4 After downloading the stored data into the X-Cite® Control Panel, the stored reading numbers will start at 1 again.

**Note:**

Also see [section 8.8](#) GUI Operation/Advanced Power Snapshot to store directly onto the computer.

## 7.2 Favorite Wavelengths

- 7.2.1 **If the same few wavelength settings will be used again and again they can be stored as favorites. Up to 5 favorites can be selected, all favorites must be selected during one wavelength selection session.** The session is over when the LCD screen defaults back to displaying a power reading indicated by a watts unit or a percentage unit. Only the wavelengths saved will be stored as favorites. The selected session will time-out after idling for 4 seconds, so it is important to know your favorites prior to starting the selection session.
- 7.2.2 To manually store your favorite wavelengths into the XR2100, use the ▲ or ▼ button to scroll through and select desired wavelength.
- 7.2.3 Press the '**X-Cite® CAL**' button, the display will start to flash, once flashing press the '**STORE**' button to store this wavelength as a favorite. To select another wavelength repeat steps [7.2.2](#) and [7.2.3](#).

- 7.2.4 When finished selecting all wavelengths, let the XR2100 idle for 4 seconds until flashing stops, indicating the end of the session.
- 7.2.5 To view the stored favorites press ' **$\lambda$ (nm)**' repeatedly to scroll through your favorites.
- 7.2.6 To clear **ALL** favorites press the ' **$\lambda$ (nm)**' button to display a favorite, press the '**X-Cite® CAL**' button, once flashing press the ' **$\lambda$ (nm)**' button to erase the favorites.
- 7.2.7 To be able to modify favorite wavelength settings one at a time refer to [section 8.4](#).

## 8 External Control

### 8.1 Driver & GUI (Graphical User Interface) Installation

Minimum Computer Specifications;

- Windows XP, Windows Vista, Windows 7, Windows 8.
- Two available USB ports (1 port for the XR2100 & 1 port for the X-Cite® *exacte* if using), USB 1.1 or 2.0 format

8.1.1 Driver and Graphical User Interface (GUI) for use with the X-Cite® XR2100 are available on Excelitas website: <https://www.excelitas.com/product/x-cite-optical-power-measurement-system>

1. Unzip files and save to a folder on your computer.
2. Double-click the file **setup.exe** within that folder.
3. Follow set-up wizard instructions.

8.1.2 **Connect a USB cable to the XR2100 and the Computer USB port. Refer to Figure 4** for connecting cable locations.

8.1.3 Connect XP750 to the XR2100. Refer to [Figure 4](#) for connecting cable locations.

8.1.4 If using or calibrating the X-Cite® *exacte*, connect the XR2100 to the X-Cite® *exacte* unit using the supplied Stereo Connection Cable (refer to [Figure 4](#)). Connect the X-Cite® *exacte* to the computer using the USB connection (USB cable is supplied with the X-Cite® *exacte* unit).

## 8.2 Graphical User Interface (GUI)

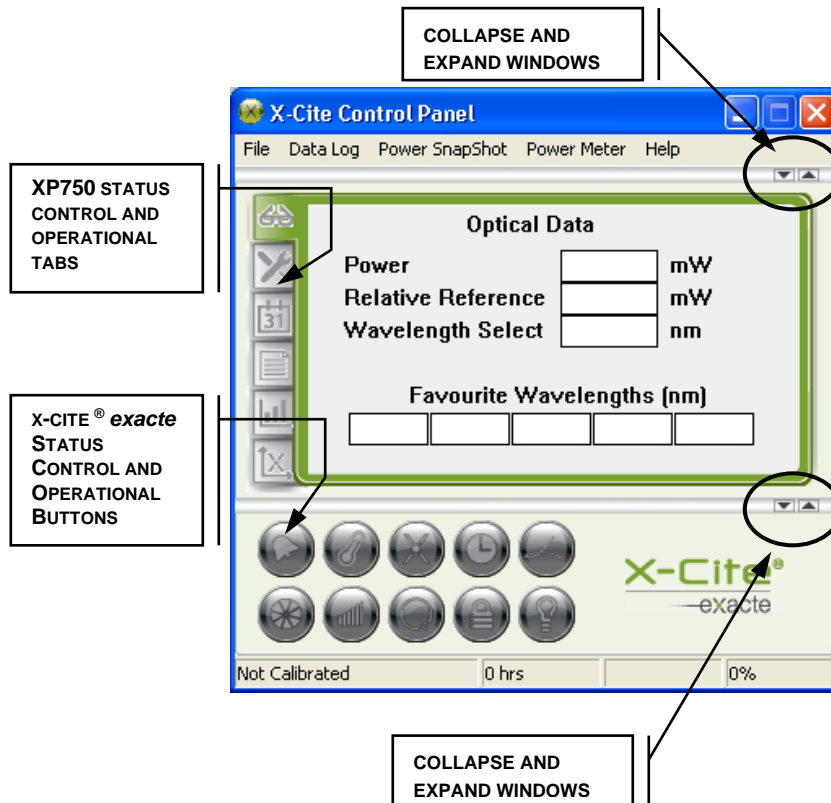


Figure 5 Graphical User Interface

***A Graphical User Interface (GUI) for use with the X-Cite® Optical Power Measurement System, the X-Cite® XR2100 Optical Power Meter and the X-Cite® exacte is available as a software download:***

***<https://www.excelitas.com/product/x-cite-optical-power-measurement-system>***

### 8.3 Status, Control and Operational Tabs

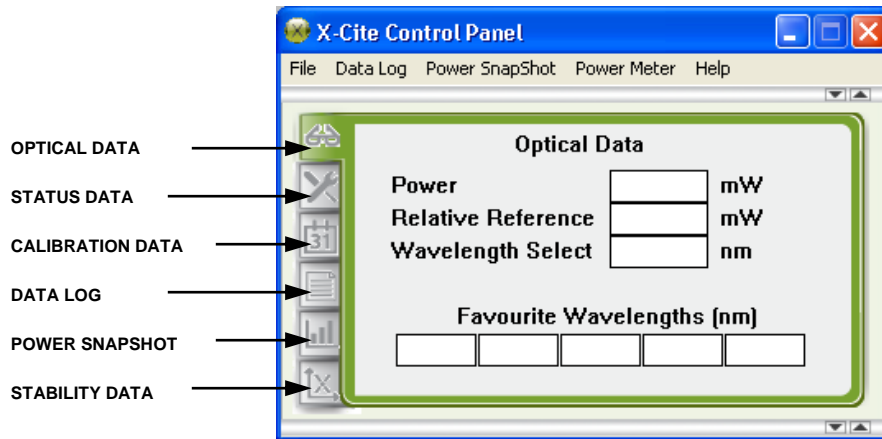
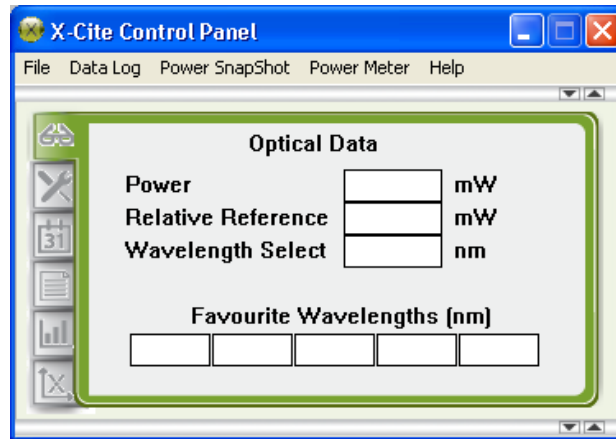


Figure 6 XR2100/XP750 Status, Control and Operational Tabs

### 8.4 Optical Data



#### Power:

- Shows the power displayed on the XR2100 screen.

#### Relative Reference:

- If the XR2100 is operating in Relative Mode this reference is equal to 100%, as defined when the unit entered Relative Mode (refer to [section 6](#) for additional information).

#### Wavelength Select:

- Shows wavelength currently selected on the XR2100 for use by XP750.
- To change wavelength, type in new value between 320nm and 750nm.

### Favorite Wavelength:

- If already entered into the XR2100, the favorite wavelengths will self-populate.
- Type in favorite wavelengths in each box, (will reflect in the power meter display).
- To clear individual favorites enter '0' into each box, or clear all favorite wavelengths from the 'Power Meter' pull-down menu.
- Wavelength range: 320nm to 750nm.

## 8.5 Status Data



- This window will self-populate once the XR2100 is connected.

Note: **S/N** = the XR2100 serial number

### Items That Can Be Changed By Operator:

#### LCD Contrast:

Can be set between 1-15 (boldest LCD contrast to dimmest). Constantly operating on the highest LCD contrast will shorten battery life.

#### Log during CAL:

Saves values to data log during a calibration.

#### Disable Rel Abs:

Locks the "Relative/Absolute" button on the XR2100. XR2100 stays in current display mode.

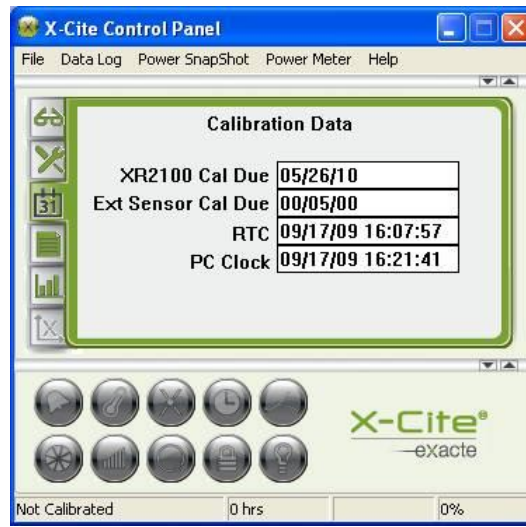
Disable Store:

Locks the “Store” button on the XR2100. You will not be able to store data to the XR2100 internal memory. Locking the store button does not affect ability to use the down arrow ▼ during wavelength selection.

S/N Included in Data:

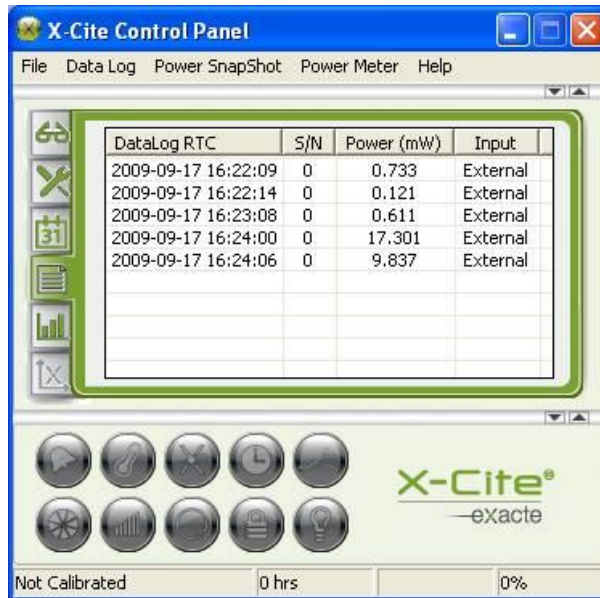
If checked will record S/N of X-Cite® *exacte* when using “store”. S/N will be displayed in the Data Log if the XR2100 & X-Cite® *exacte* are connected with the Stereo Connection Cable.

## 8.6 Calibration Data



- This window will self-populate once the XR2100 is connected.
- In case of the ‘CLO’ error, the XR2100 RTC can be reset using the RTC to PC Clock menu item under the ‘Power Meter’ pull-down menu.
- **RTC** = Real Time Clock.

## 8.7 Data Log



- Allows access to data collected with XR2100 '**STORE**' function.
- Data can be saved into CSV format, readable by MS Excel®.
- Does not allow saving of microscope settings.

### Heading Definitions:

Data Log RTC:

The DataLog RTC (Real Time Clock) column will populate with times and dates of the power readings from the XR2100.

S/N:

The S/N (Serial Number) column will populate with the serial number of the X-Cite® *exacte* unit if connected when the reading was stored.

Power (mW):

The Power column will populate with the power readings from the XR2100.

Input:

The Input column will populate with the input source, "**Internal**" if the reading was taken from the XR2100, "**External**" will be displayed if the reading was taken using the XP750.



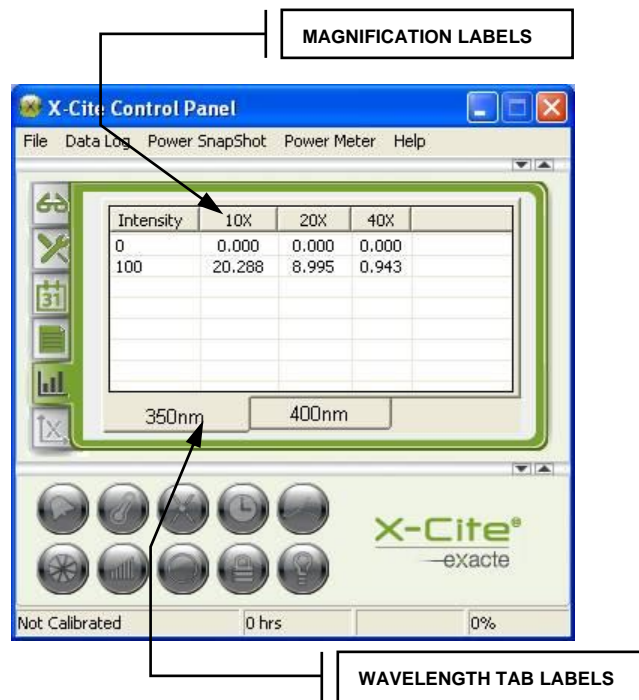
### To Download Data;

1. Enter and store power readings in the XR2100 (refer to [section 4.2.9](#) for upright microscopes and [section 4.3.8](#) for inverted microscopes).
2. Attach USB cable to the XR2100 and the computer (refer to [Figure 4](#) ).
3. Select '**Data Log**' pull down menu and click on "Download XR2100 '**STORE**' Data Log."
4. Click on pull-down menu '**Data Log**' select "**Clear XR2100 Store Data Log**" to clear all fields from XR2100.

### To Export Logged Data to MS Excel® Compatible Format;

1. Click on the 'File' pull-down menu.
2. From the drop down menu, choose "**Save Data Log As...**"
3. Give the file a name, click '**SAVE**' - data will be saved in Comma Separated Values (.csv) format, which can be opened in MS Excel®.

## 8.8 Power Snapshot



Power Snapshot can be used to fully characterize illuminating power of any light source under multiple objective/filter/intensity conditions. A complete snapshot table can be downloaded for a permanent record of experiment parameters.

### **Data Table Set up:**

1. Wavelength tab labels: Click on pull-down menu '**Power Snapshot**' select '**Axis setup/Modify Wavelengths**' to modify labels. Type list of wavelengths, one per line. Up to nine (9) selections are permitted. Wavelengths must be in the range 320-750nm.
2. Magnification labels: Click on pull-down menu '**Power Snapshot**' select '**Axis setup /Modify Magnifications**' to modify objective magnification labels. Type list of magnifications, one per line. Up to eight (8) selections are permitted. Magnifications must be numerical only, up to three (3) characters long.
3. Intensity Levels: There are two ways to define the intensity levels for which data will be collected, manually entering each level into the table itself, or using the auto-fill feature.
  - Manual\* - Click on a cell in the "Intensity" column. Type in intensity level. Repeat for additional intensity levels being used.
  - Auto-fill - Click on pull-down menu "**Power Snapshot**" select '**Axis setup /Intensity Increments**' to define an intensity increment in %. Increment must be between 1 and 100. Levels will appear in the table during data capture. 0% level will always appear in the first line.

**\*Note:**

**If using a version of X-Cite® Control Panel lower than v1.1, manually typing intensity level in the data table is not available. Auto-fill must be used. To determine software version, go to Help/About. For the latest Control Panel version, visit <https://www.excelitas.com/product/x-cite-optical-power-measurement-system> or contact Excelitas Technologies (refer to [section 15](#)).**

- With the X-Cite® *exacte*, you can auto capture power readings from External Detector, using a defined wavelength, objective and % intensity increments.
- Allows downloading to CSV format which can be read by MS Excel® to become a permanent record for the experiment files.

### **Acquiring Power Snapshot Data – Standard Method**



**WARNING:**

Once data has been entered into the table, modifying the objective or wavelength column/axis labels will clear the entire Power Snapshot. Please ensure all labels are correct before beginning, and **SAVE** the data before attempting to change labels. Labels can be adjusted when data is exported to spreadsheet format if necessary.

1. Place XP750 on microscope stage (refer to [section 4](#)).
2. Connect XP750 to XR2100 and turn on (refer to [section 4](#)).
3. Adjust microscope settings as desired.
4. Locate the data cell corresponding to those parameters.
5. When the power reading stabilizes on the XR2100 display, double click the appropriate cell in the data table. The power reading will automatically be entered into the table. (Note: if using the auto-fill option for intensity levels, row 1 will be 0%).
6. Change microscope settings and repeat steps 4 and 5 until Power Snapshot is complete.
7. If a value is put into the wrong cell, it can be overwritten by double-clicking again.
8. To clear data from entire table, click on pull-down menu "Power Snapshot" select 'Clear Captures'.

### Acquiring Power Snapshot Data – Auto-Capture Method

#### Note:

The Auto-Capture feature functions only if an X-Cite® *exacte* is turned on and connected to the computer via USB.



#### WARNING:

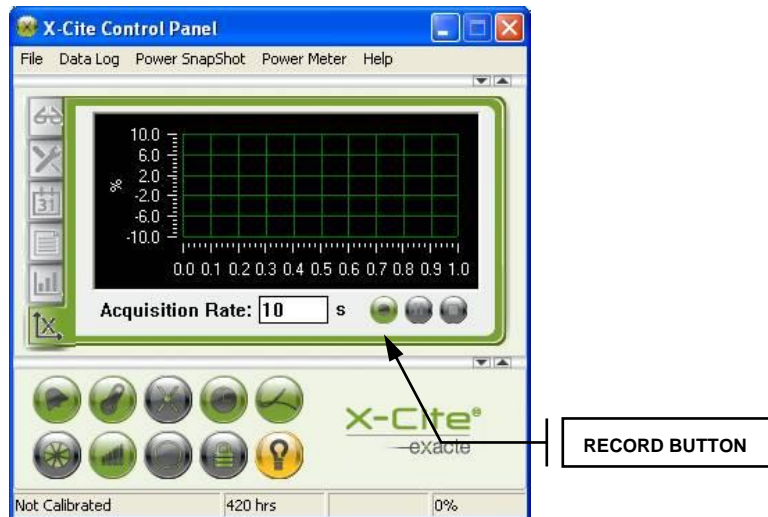
Once data has been entered into the table, modifying the objective or wavelength column/axis labels will clear the entire Power Snapshot. Please ensure all labels are correct before beginning, and **SAVE** the data before attempting to change labels. Labels can be adjusted when data is exported to spreadsheet format if necessary.

1. Set up data table with appropriate wavelength, magnification and "auto-fill" intensity increments (see "**Data Table Set-up**"). Only these predefined options will be available for selection in Auto-Capture mode.
2. To start Auto-Capture with X-Cite® *exacte*: Click on pull-down menu "Power Snapshot" select X-Cite® *exacte* auto capture.
3. Select the current magnification and wavelength settings on the microscope, and click OK to initiate the capture.
4. Change settings on microscope and repeat step 3 until your Power Snapshot is complete.
5. To clear data from entire table, click on pull-down menu "Power Snapshot" select 'Clear Captures'.

#### Exporting Logged Data;

1. Click on the 'File' pull-down menu.
2. From the drop down menu, choose "Save Power Snapshot As..."
3. Give the file a name, click **SAVE** - data will be saved in Comma Separated Values (.csv) format, which can be opened in MS Excel®.

## 8.9 Stability Data



-----For use with X-Cite® exacte Unit only-----

- Collect, display and record intensity stability data from X-Cite® exacte during CLF operation.
- Automatically log events such as alarm conditions, calibration expiry, and CLF turning off.
- User-defined events or information relating to the X-Cite® exacte set-point, or experimental conditions can also be logged in the data file Logging Events.
- Allows download to MS Excel® file.

### To collect/display stability data;

1. Engage CLF on X-Cite® exacte (refer to X-Cite® user guide, Excelitas Technologies document # 035-00283 for full instructions).
2. Click '**RECORD**' button.
3. Click '**STOP**' or '**PAUSE**' button as required.

### To log an event;

1. Double left-click on the plot area.
2. Type in the event or information, up to 100 characters.
3. Click **OK**. The information will be logged in the data file for the time point when the dialogue box first opened (even if it takes several time points to type in the information).

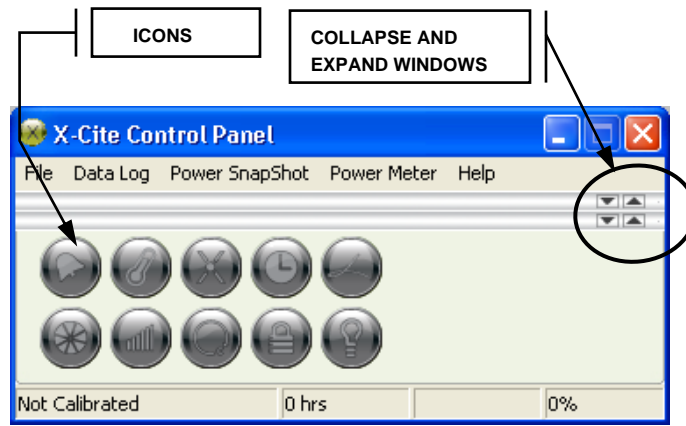
### To export logged data;

1. Click on the '**File**' pull-down menu.
2. From the drop down menu, choose "**Save Stability Graph Data As...**"
3. Give the file a name, click '**SAVE**' - data will be saved in Comma Separated Values (.csv) format, which can be opened in MS Excel®.

## 8.10 X-Cite® *exacte* Control Panel Buttons

**Note:**











When icons are **ALL** grey, the X-Cite® *exacte* is either disconnected or not communicating properly with the computer.



**Note:**

XP750 Control Panel is collapsed in this view.

Figure 7 X-Cite® *exacte* Status, Control and Operational Buttons

	Alarm	Indicates an alarm state Click to silence audible alarm Red = Alarm on
	Temperature	Indicates lamp temperature status Yellow = Lamp running hot Red = Lamp off, excessive heat
	Calibration	Indicates calibration status Green = Calibrated Grey = not Calibrated
	Lamp Hours	Indicates hours logged on lamp green < 2500 hours, yellow = > 2500 hours, make sure there is a spare lamp on hand red = > 4000 hours, lamp is off due to age.
	Light Guide	Indicates light guide position Green = Light guide present Red = Light guide not present
	Shutter	Click to open/close shutter [note: lock front panel to use, see note #2 below]
	Intensity	Left mouse click = increase by 1% increment. Right mouse click = decrease by 1% increment. Left double click mouse = dialog box enabling data input of desired intensity or power.
	Closed-Loop Feedback	Engage/disengage CLF mode Grey = OFF Green = ON, if clicked ON intensity will freeze, click again to turn off.
	Lock/unlock	Lock/unlock the front panel controls on the unit Green = front panel of exacte locked Grey = front panel of exacte unlocked, Shutter will not activate from the control panel if the front panel is not locked.
	Lamp	Click to turn lamp on/off, color indicates status Green = ON, click to turn lamp on Grey = OFF, click to turn lamp off Yellow = Warming Up, lamp is on and is warming up.

**Figure 8 X-Cite® exacte Control Panel Buttons Descriptions**

## 9 Calibration

### 9.1 X-Cite® XP750 Calibration

- 9.1.1 The XP750 is calibrated at Excelitas Tehnologies prior to shipping and is ready for use. An Excelitas Tehnologies generated calibration certificate is provided.
- 9.1.2 It is recommended the XP750 be returned to Excelitas Technologies annually for re-calibration. Refer to [section 14.1](#) for shipping instructions.

### 9.2 X-Cite® XR2100 Calibration

- 9.2.1 The XR2100 is calibrated at Excelitas Technologies prior to shipping and is ready for use. An Excelitas Technologies generated calibration certificate is provided.
- 9.2.2 It is recommended the XR2100 be returned to Excelitas Technologies annually for re-calibration. Refer to [section 14.1](#) for shipping instructions.
- 9.2.3 If the XR2100 is only used with the XP750, and the light guide input is **NOT** going to be used, only the XP750 component requires calibration. However, the XR2100 will still indicate a **CAL** message on start-up as a reminder when the calibration on the light guide input sensor expires.

### 9.3 X-Cite® *exacte* Calibration using the XR2100 & Light Guide

- 9.3.1 Set up the XR2100 to obtain a power reading through the light guide input port. Refer to [section 4.1](#).
- 9.3.2 Attach the Stereo Connection Cable to the port on the right side of the XR2100 (under flap in rubber boot), and the port on the right side of the X-Cite® *exacte*.
- 9.3.3 Press and release the X-Cite® *exacte* CAL button on the XR2100.
- 9.3.4 The X-Cite® *exacte* will display CAL, and the XR2100 will display a moving dash ( - ) while the calibration sequence is running.
- 9.3.5 When the calibration is complete, the CAL LED on the X-Cite® *exacte* will light up, and the X-Cite® *exacte* will display intensity settings in the format XX.XX (in watts).
- 9.3.6 For versions 2.0 and up: X.XXX or XXX.X for milliwatts and uXXX for microwatts.
- 9.3.7 Note: the shutter will be in the closed position when the calibration routine is complete.

## 9.4 Calibrating X-Cite® *exacte* with the XP750

- 9.4.1 Leave the X-Cite® *exacte* light guide connected to your microscope as you would during normal operation. Keep the X-Cite® *exacte* positioned as you would during normal operation.
- 9.4.2 Place the XP750 onto your microscope as described in [section 4](#), and connect it to an XR2100.
- 9.4.3 Connect the XR2100 to the X-Cite® *exacte* using the supplied Stereo Connection Cable. Refer to [section 4](#).
- 9.4.4 **IMPORTANT:** The XP750 will calibrate X-Cite® *exacte* using data from only one wavelength setting. It is important to select the wavelength most applicable to your application prior to calibrating the X-Cite® *exacte* using the system. The ideal wavelength setting is dependant on your application and typically corresponds to the excitation maxima (peak) of the fluorophore. Please refer to [section 4.2.9](#) or [section 4.3.8](#) for setting the wavelength being measured by the system.
- 9.4.5 Press the X-Cite® **CAL** button on the XR2100 to perform an XP750 calibration.

**Note:**

X-Cite® *exacte* internal software version 2.0 or higher is required to accurately display the lower power measurements from XP750 calibration. Software version is displayed during X-Cite® *exacte* start-up sequence. Contact Excelitas if a software upgrade is required.



## 10 Troubleshooting

*This section will guide you through some basic troubleshooting steps. Any required service is to be completed by qualified repair personnel only!*

### XR2100 Optical Power Meter Error Codes

If the XR2100 monitoring systems identify a problem, an error code will be generated. Definitions and recommended actions are in the following table.

Code	Error Description	Recommended Action
<b>Adc</b>	Internal problems during power up.	Contact tech support, unit likely requires service.
<b>BAT</b>	Low battery	Replace batteries, refer to <a href="#">section 11</a>
<b>CAL</b>	XR2100 Calibration is more than 12 months old. Recalibration required to ensure accuracy.	Contact tech support, return for calibration
<b>Err</b>	Function was not completed	Attempt desired function again. If error persists contact tech support
<b>SET/Err</b>	SET function not completed	Attempt desired function again. If error persists contact tech support.
<b>EXT/Err</b>	Unable to communicate with external detector	Check cable connection
<b>LG</b>	Light guide not detected	Fully insert light guide or ignore if using external detector such as XP750 and press 'External' button to switch input to XP750
<b>LOC</b>	Keypad function is locked out. Unavailable in current operating mode.	View "Status Data" using GUI, "uncheck" disable boxes if necessary.
<b>CLO</b>	Problem with the Real Time Clock (RTC) Typically occurs when batteries are changed and clock/data setting gets cleared from memory.	Reset RTC (Use X-Cite® Control Panel/Calibration Data to synchronize the XR2100 to the PC clock).

## 11 Care and Maintenance

### 11.1 General

- 11.1.1 XP750 can be stored in its original packaging, or in the plastic case with the XR2100 – there is a special cut-out in the foam insert for this purpose. (see [Figure 10](#))
- 11.1.2 Do not touch the detection window with fingers, microscope immersion oil, or any abrasive object.

### 11.2 Cleaning

- 11.2.1 Cleaning of the XP750 is not generally required. However, if any visible contamination or finger prints appear in the optical window, the contaminants may cause inaccurate measurement. If required, gently clean the detector window and the aluminum housing with reagent grade alcohol and soft cotton swab, a minimum amount alcohol is preferred to avoid alcohol contamination in the detector.



**Warning:**  
Seals are not 100% water tight. Use of excessive liquid will flood and damage the electronics.

- 11.2.2 Large measurement errors may result from be generated through scratches, digs and other coating damage on the detector optical window surface. Refrain from touching the optical surface with any foreign object which could scratch the optical window.

## 11.3 Lithium Batteries

11.3.1 The lithium batteries (qty.2) in the XR2100 are expected to last for 1 year under normal operating conditions. Do not remove the batteries from the XR2100 until the low battery code '**BAT**' appears on the LCD screen.

11.3.2 When replacing the batteries ensure that both batteries are replaced at the same time, this will reset the RTC.

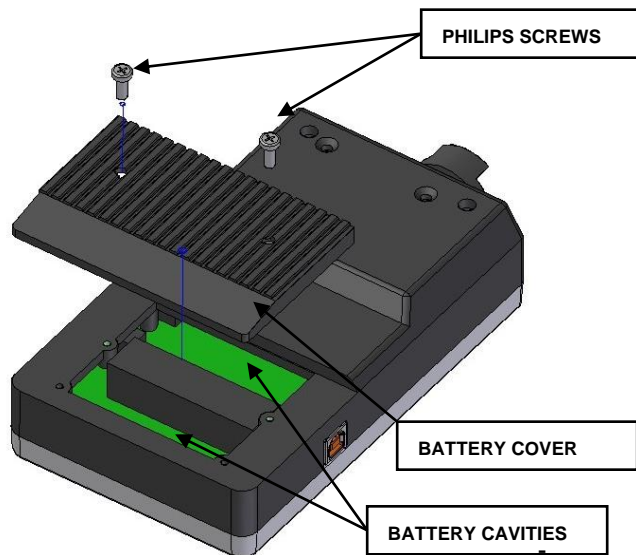
**Note:**

Removing/replacing batteries resets the RTC clock. To set the RTC to the correct time refer to section [8.6](#).

11.3.3 Use the batteries supplied by Excelitas Technologies, do not substitute with another brand. The batteries in the XR2100 are not standard AA batteries. The voltage of the standard AA batteries will not supply enough power to operate the XR2100.

11.3.4 To replace the Excelitas Technologies supplied lithium batteries:

- Remove the protective rubber boot.
- Refer to [Figure 9](#).
- Remove qty.2 Philips screws.
- Open battery cover.
- Remove and discard old batteries (refer to [section 13](#)).
- Insert new batteries (refer to the + / - placement decal inside the battery cavity).



**Figure 9 Battery Cavity**

## 12 Technical Specifications

### 12.1 XR2100 Optical Power Meter

Wavelength Range: 340-675 nm

Power Range: 50mW –10W\*

Uncertainty\*\*:  $\pm 5\%$  typical

#### \*Power Range vs Calibrated Range:

The photo sensor at the light guide input portion of the XR2100 is calibrated with an X-Cite® exacte lamp at power levels from approximately 200mW to 4W. Note that the sensor's dynamic range extends beyond these limits. Higher values can be measured and displayed, but fall into the extrapolated region of the calibration curve.

#### \*\*XR2100 Uncertainty:

The XR2100 uncertainty is claimed to be  $\pm 5\%$ . This means there is a 95% probability the reported power measurement from the light guide input falls within  $\pm 5\%$  of the NRC (National Research Council of Canada) reference standard.

### 12.2 XP750 Objective Plane Power Sensor

Wavelength Range: 320-750 nm

Power Range: 5 $\mu$ W –500mW

with the following wavelength dependencies:

$\lambda$ (nm)	Lower Limit	Upper Limit
320-349	10 $\mu$ W	500 mW
350-700	5 $\mu$ W	500 mW
701-750	5 $\mu$ W	400 mW

XP750 Detector Uncertainty\* (total):  $\pm 6\%$ , typical

#### XP750 Detector Uncertainty:

The XP750 uncertainty is claimed to be  $\pm 6.0\%$ . This means there is a 95% probability the reported power measurement from the detector falls within  $\pm 6.0\%$  of the NRC (National Research Council of Canada) reference detector standard.

### 12.3 Electrical Specifications (XR2100)

 Battery Type: 3.6 volt Lithium, non-rechargeable 2.2 Ah

#### I/O Ports:

1. X-Cite® *exacte* Stereo Connection Port use only with X-Cite® *exacte*.
2. USB Port: 1.1 or 2.0 Compatible.

#### Virtual RS-232 Communication Com Port Configuration:

- i. Baud rate: 19200
- ii. Data bits: 8
- iii. Parity: None
- iv. Stop bits: 1

3. External Detector Port: DIN Connector, only use with Excelitas Technologies external detector such as XP750.

### 12.4 Electrical (XP750)

DIN Multi-Pinned Connection Cable: use only connect to XR2100.

### 12.5 General

#### XR2100

Dimensions: Without rubber boot - 7.5 x 4.4 x 2 inches (19cm x 11.5cm x 5cm) (L x W x H).

Weight: 1lb (450g) Without rubber boot.

#### XP750

Dimensions: Without protective cover – 3 x 1 x 0.35 inches (75mm x 25mm x 9mm).

Weight: 2.9oz (82g) without protective cover.

## **12.6 Environmental Specifications (XR2100 & XP750)**

### Operating Environment Conditions

Installation Category II

Pollution Degree 2

Ambient Temperature: 10 to 40 degrees Celsius

Relative Humidity: 15% to 80% (non-condensing)

Atmospheric Pressure: 700 to 1060 hPa

Altitude: 2000 meters (maximum)

### Transport and Storage Conditions

Temperature: -10 to 60 degrees Celsius

Relative Humidity: 10% to 100% (non-condensing)

Atmospheric Pressure: 500 to 1060 hPa

## 13 Regulatory Compliance

### Product Safety and Electromagnetic Compatibility

The X-Cite XR2100 / XP750 have been tested and found to comply with product safety and electromagnetic compatibility requirements. For a complete list of tests and for certification details, please contact your X-Cite representative or visit <https://www.excelitas.com/product/x-cite-optical-power-measurement-system>

### CE Marking

Council Directive 2014/35/EU  
Council Directive 2014/30/EU  
Council Directive 2012/19/EU  
Council Directive 2011/65/EU  
as amended by (EU) 2015/863

Low Voltage Directive  
EMC Directive  
WEEE Directive  
RoHS



Council Directive 2006/66/EEC

Battery Directive

This is a class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

### FCC Class A Digital Device or Peripheral - Information to User

#### **NOTE**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

#### **WARNING**

Changes or modifications not expressly approved by Excelitas could void the user's authority to operate the equipment.



**WEEE Directive (2012/19/EU)**

The symbol above indicates that this product should not be disposed of along with municipal waste, that the product should be collected separately, and that a separate collection system exists for all products that contain this symbol within member states of the European Union.

- The equipment that you bought has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.
- In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will reuse or recycle most of the materials of your end life equipment in a sound way.
- The crossed-out wheeled bin symbol indicated above invites you to use those systems.
- If you need more information on the collection, reuse and recycling systems, please contact your local or regional waste administration.



**Battery Directive (2006/66/EEC)**

Ensure that the battery supplied in this device is disposed in the manner as indicated above.

**China RoHS: XR2100/XP750**



The symbol above indicates that this product is in compliance with China RoHS requirements.

Part Name	Hazardous Substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr (VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Printed circuit board assemblies	X	O	O	O	O	O

This table is compiled according to SJ/T 11364.

O : Indicates that the content of the hazardous substance in all homogeneous materials of the part is below the limit requirement of GB/T 26572.



X : Indicates that the content of the hazardous substance in at least one of the homogeneous materials of the part exceeds the limit requirement specified by GB/T 26572.

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板组件	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。

#### Australia - RCM



The symbol above indicates that this product is in compliance with the Electromagnetic Compatibility and Labelling requirements of the Australian Communications and Media Authority (ACMA).

## 14 Warranty

Excelitas Technologies warrants, to the original purchaser for a period of one (1) full year, calculated from the date of purchase, that the equipment sold is free from defects in material and workmanship.

In the event of a claim under this warranty, the equipment is to be sent postage and carriage paid, including a description of the fault, to the Excelitas Technologies Service Center. Returned equipment will not be received without a Return Authorization (RA) Number, issued by the appropriate Service Center. Alternatively you can fill out a request for Return Authorization (RA#) on our website at:

[https://www.excelitas.com/ox\\_service\\_request\\_form](https://www.excelitas.com/ox_service_request_form)

Any claims for units received with defects in material or workmanship must be reported to an authorized Excelitas Technologies Service Center within 30 days from the original date of receipt. Excelitas Technologies will repair or replace these reported defects free of charge for a period of up to 2 years from the original date of receipt. The equipment must be sent postage and carriage paid.

In order for us to serve you better, include a written description of the fault and the name and telephone number of a contact person who may be contacted for additional service related questions.

Package the XR2100 and/or the XP750 its original shipping case or as appropriate to prevent damage during transport.

In the case of damage caused by wear and tear, careless handling, neglect, by the use of force or in the case of interventions and repairs not carried out by an Excelitas Technologies Authorized Service Center, the warranty ceases to be valid. This warranty may not form the basis for any claims for damages, in particular not for compensation of consequential damages.

### **Warning**

There are no user serviceable parts within the XR2100 or the XP750. Opening the main XR2100 enclosure will void the warranty.

## 14.1 Returning Equipment to Excelitas Technologies

1. Original packaging should be kept for future use. Please use this packaging when sending equipment to Excelitas Technologies for servicing or calibration to protect the sensitive optical and electronic components. It is safe to ship the XP750 in the plastic carrying case with the XR2100 provided it is placed in its foam cut-out, (refer to [Figure 10](#) ) If shipping only the XP750, use its original shipping carton with foam inserts.
2. Please make a note of the problem encountered, the steps followed to isolate the problem and the result of any trouble shooting steps taken.
3. Contact the nearest Excelitas Technologies Service Center to obtain a Return Authorization Number. For your convenience, RA numbers can also be requested on-line at: [https://www.excelitas.com/ox\\_service\\_request\\_form](https://www.excelitas.com/ox_service_request_form)
4. Follow shipping instructions provided by the service technician. The unit should be returned in its original packaging if possible.



Figure 10 Plastic Case with XP750 & XR2100

## 15 Contact Information

### 15.1 General

#### Excelitas Canada Inc

Tel: (905) 821-2600 1-800-668-8752 (*USA and Canada*)

Fax: (905) 821-2055

1-800-668-8752 (*USA and Canada*)

[x-cite@excelitas.com](mailto:x-cite@excelitas.com)

<http://www.excelitas.com/Pages/Product/X-Cite.aspx>

### Technical Support and Service

For Technical Support and Service specific to Excelitas UV & Microscopy products:

(905) 821-2600, option 3

1-800-668-8752, option 3 (*USA and Canada*)

[techsupport@excelitas.com](mailto:techsupport@excelitas.com)

[https://www.excelitas.com/ox\\_service\\_request\\_form](https://www.excelitas.com/ox_service_request_form)

### 15.2 Accessories and Replacement Parts

Replacement components can be purchased directly from Excelitas Technologies. For ordering and pricing information contact the Inside Sales Department at:

(905) 821-2600

1-800-668-8752 (*USA and Canada*)

[x-cite@excelitas.com](mailto:x-cite@excelitas.com)

<http://www.excelitas.com/Pages/Contact/Contact-Us.aspx>

Part Number	Description
010-00242R	XR2100 Optical Power Meter
010-00241R	XP750 Objective Plane Power Sensor
018-00434R	Cable Assy. USB "A" to USB "B"
018-00435R	Cable, 3mm stereo male to 3mm stereo male, 2.0m
019-00111R	3mm Light Guide Adaptor (red)
055-00007R	3.6V Lithium Battery, Non-rechargeable
019-00113R	User Guide