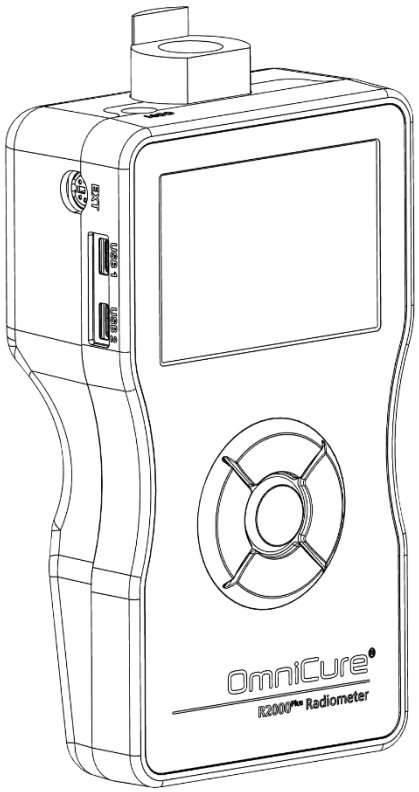
OmniCure®

R2000Plus UV/Visible Radiometer



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1 Introduction

Congratulations on your purchase of the R2000Plus, the next generation in the R2000 radiometer product family. This radiometer includes revolutionary technology that elevates the performance and accuracy of handheld radiometers to new heights, and offers the same high level of innovation, quality, and reliability that customers have come to expect from Excelitas. The R2000Plus Radiometer provides unique features when combined with the OmniCure® 2000 series UV Visible Spot Curing Systems.

The R2000Plus is the replacement for the R2000. New features and other product changes are outlined in this document for reference.

At the heart of both the R2000 and R2000Plus Radiometers are two proprietary systems. The first is a non-imaging optical interface that virtually eliminates measurement variation caused by radiance and intensity variations in the light source. The second is a flat response optical detector system that responds to energy at all wavelengths between 250 and 1000 nm. The result is a handheld, robust, and versatile radiometer with accuracy unmatched in the industry.

2 Product Overview / Description

2.1 R2000 EQUIVALENCY

This product is a replacement for the R2000 Radiometer, an accessory used primarily with OmniCure S2000 series spot curing systems, to measure, calibrate, and set the irradiance and/ or power level of the broad-spectrum curing system coupled via a light guide.

The non-imaging optical interface and flat response optical detector systems are at the heart of the measurement technology used in the R2000, and this design has remained unchanged in the R2000Plus to ensure measurement method equivalency.

2.2 PRODUCT ENHANCEMENTS

The R2000Plus includes product enhancements relative to the R2000 while at the same time maintaining backward compatibility.

Improvements include a new display with backlight, updated communication ports, new user rechargeable battery, enhanced ergonomic design, and an easy-to-use graphical interface.

2.3 PC CONTROL SOFTWARE

PC control software compatible with R2000 units is also compatible with the R2000Plus.

2.4 OPERATING SYSTEM REQUIREMENTS

Minimum Computer Specifications for R2000 Control Panel Software v2.0:

- 300+ MHz processor (Pentium or equivalent)
- Microsoft Windows® 7, 8, 10, or 11
- 32 Mb RAM
- 10 Mb for Software Installation
- 20 Mb of Data Storage
- SVGA video 800x600 resolution
- One available RS-232 Port
- R2000^{Plus} adds USB 2.0 connectivity
- All commands are backward compatible with the R2000

2.5 PROGRAMMER'S REFERENCE MANUAL

For a detailed description of the communication protocol between the radiometer and a PC, refer to the *R2000^{Plus} Programmers Reference Manual*, Doc: 035-00247.

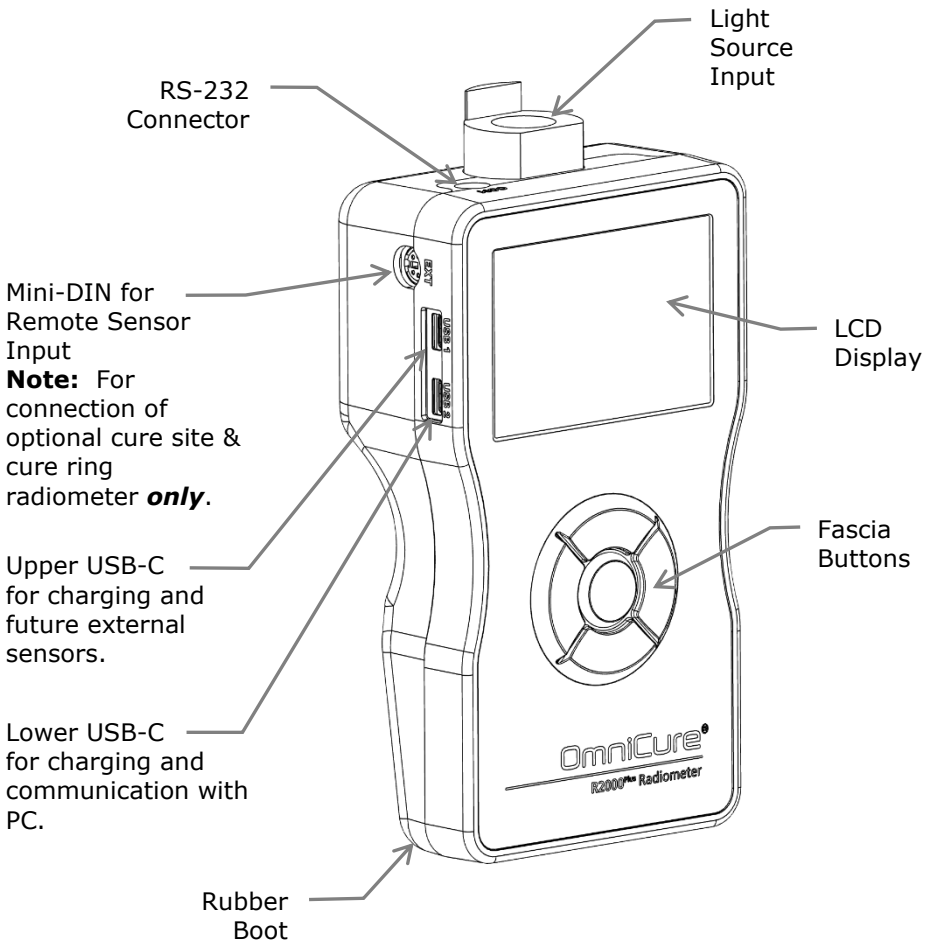
3 R2000Plus Features and Benefits

With a refreshed industrial design, expanded firmware feature set, and enhanced user experience, the R2000Plus offers a rich feature set with many benefits (detailed in the table below).

	Feature	Benefit
Performance and Accuracy	Accurate broadband measurements (250-1000 nm)	Versatile measurement capability suitable for many different light sources
	Optical interface collects light over a large area	Eliminates beam intensity and radiance dependence
	Calibration traceable to NIST	Quality assurance
	Auto-ranging	Maintains precision over full range
Versatility	Compatible with S2000 and S2000 Elite Series	Full backward compatibility for S Series models
	Measure power or irradiance	Flexibility for many applications
	Relative Mode	References measurements to a pre-set value
	Absolute Mode	References measurements to NIST traceable calibration
	Supports multi-leg light guides and optical accessories	Suits wide range of applications needs
	Compatible with external sensors such as OmniCure Cure Site and Cure Ring (connected via 6-pin Mini-DIN connector)	Optimal cure area measurement accuracy
	Fits standard light guides: 2 mm, 3 mm, 5 mm, 8 mm, and custom diameter	Automatically senses light guide diameters & accommodates industry standard light delivery systems
Efficiency	Powered by an internal rechargeable battery (USB connection to PC or compatible USB regulatory certified AC/DC charging block / Power Adapter)	Convenience/ industry standard charging interface
	Programmable auto off function	Provides extended rechargeable battery performance and effortless usability

	Feature	Benefit
	12-month calibration frequency (recommended)	Lower cost of operation
Ease-of-Use	Powerful user interface	Quick and efficient navigation
	One-button press to start S series calibration	Easy calibration and setup of multiple systems with a single radiometer
	Scrollable data log list	Saves current readings for future retrieval by PC software
	USB and RS-232 connection to PC	Supports PC software control/ features
Safety and Compliance	Designed to meet IEC, Canadian and US Standards, and CE marking requirements	Ready for use worldwide

4 Familiarizing yourself with the R2000Plus Radiometer



Rear support stand not shown.

4.1 INCLUDED ACCESSORIES

- 3 mm (Red), 5 mm (Blue) and 8 mm (Green) Light Guide Adapters
- Six foot long, 3.5 mm phono jack to 3.5 mm phono jack Phono-style cable (RS-232)
- A quantity of two, six-foot-long USB-C to USB-C cables
- One USB-C-to-A adapter
- Carrying case

4.2 LIGHT GUIDE ADAPTER

R2000Plus light guide adapters interface OmniCure standard-size light guides to the radiometer optical input port to accurately deliver light into the R2000Plus (**Note**: Custom adapters are available as SR products).

Each light guide adapter is color-coded to indicate the light guide output diameter it is compatible with. The R2000Plus Radiometer automatically detects the light guide output diameter based on the adapter color. The thumbscrew on the light guide adapter is used to secure the light guide adapter to the light guide.

It is recommended to use only adapters supplied with the R2000Plus Radiometer and other adapters available for order. In some cases, older adapters may not be correctly recognized by R2000Plus Radiometers.

4.3 REMOTE INPUT CONNECTOR

A 6-Pin Mini-DIN connector is used to connect the R2000Plus Radiometer to external cure site and cure ring radiometers.

4.4 RS-232 CONNECTOR

A 'stereo-phono' style connector is used to connect the R2000Plus Radiometer to a PC or compatible OmniCure UV Curing Systems.

4.5 USB CONNECTIONS

Used for communication with Windows PC COM Port and charging the internal lithium-ion rechargeable battery.

4.6 LCD DISPLAY

Large backlit LCD display makes information easy to read at a glance.

4.7 FRONT CONTROLS

Five-button fascia control switch used to navigate the menus and toggle selections. The center Select/Power button is used to turn on the R2000Plus Radiometer. The unit automatically turns on when it is charging via USB.

Refer to the "Using the R2000Plus Radiometer" section for detailed usage.

4.8 PROTECTIVE COVER

The rubber protective cover is a protective, flexible cover that allows the radiometer to stand securely on a flat surface and absorbs impact and reduces the risk of damage if the instrument is dropped. The cover is removable and can be taken off when not required.

5 Using the R2000Plus Radiometer

5.1 TURNING ON THE R2000PLUS RADIOMETER

To turn the R2000Plus Radiometer on when it is not connected to a PC/power source, press and release the center power button.

If the R2000Plus Radiometer is already on and being charged via USB, the unit will stay on as long as it is connected to a power source.

When the unit is not on and is being charged, a battery icon is displayed on the screen. Press the center power button to turn on the device.

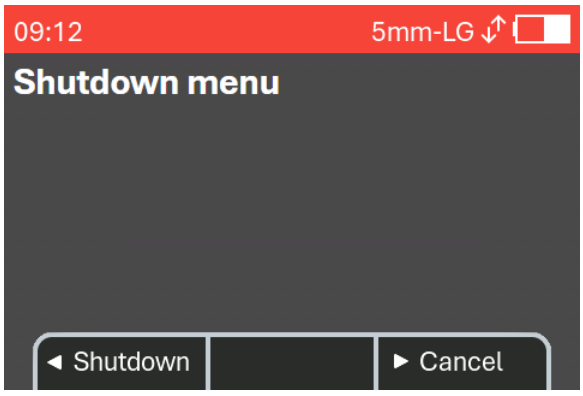
5.2 MENU SELECTION

5.2.1 Fascia buttons

- Use Up/Down ▲or▼ to navigate UI menus and change settings.
- Press Left/Right ◄ or ►to navigate UI menus.
- Press Select/Power to confirm selection or toggle selection

5.2.2 Fascia button control

- Select/Power: Short button hold-down to turn on
- Long button hold-down to access shutdown sub-menu to turn the unit off
    - Navigation to the left confirms shutdown and shuts down the R2000^{Plus}
    - Navigation to right cancels out of the menu



- Extended button hold-down to recover from an unexpected system lock-up
- Left/Right: Navigate UI menus
- Up/Down: Navigate UI menus, change settings

5.3 GRAPHICAL USER INTERFACE MENUS

This section details the indented structure of the available menus.

5.3.1 Measure screen

Default screen on startup.

When reading is valid, press center button to save it to data log.

5.3.2 Settings screen

Enter by pressing left arrow from Measure screen.

(Header) Measurement

Internal sensor unit (Irradiance / Power)

- Use left or right arrow to change setting.

Relative mode (Off / On)

- Use left or right arrow to change setting.

Sensor select (Internal / EXT CH1 / EXT CH2)

- Use left or right arrow to change setting. When an external sensor is not detected, "(Disconnected)" is displayed.

Irradiance set point (Current set point)

- Enter to change set point.
  - Edit value. (0.5 W/cm^2 to 60.0 W/cm^2)
  - Set to current irradiance. (Enabled when current reading is within range)
  - Return to main settings screen.
  - Live reading. (Read only)

Custom light guide size (Current size)

- Enter to edit value. (0.1 to 25.5 mm)

(Header) Configuration

Brightness (5% to 100%)

- Use left or right arrow to change setting.

Auto power off (Never / 1 min – 10 min / 15 min – 60 min)

- Use left or right arrow to change setting.

Date and time (Current date and time)

- Enter to change date and time.

Supervisor mode (Locked / Unlocked)

- Enabling an item protects the setting from being changed.
  - Relative/Absolute (Disable/Enable)
  - Power/Irradiance (Disable/Enable)
  - External sensor (Disable/Enable)
  - Store readings (Disable/Enable)
  - Irradiance setpoint (Disable/Enable)
  - Custom light guide size (Disable/Enable)
  - Date and time (Disable/Enable)
  - Exit to main settings screen

System info

- Model number
- Copyright
- Serial number
- Hardware revision
- Firmware version
- Calibration recommended by

Exit

- Return to Measure Screen

5.3.3 Data log screen

Enter by pressing right arrow from Measure screen (when S-Series is not connected) or Calibration screen.

Navigate to newer/older readings with left or right arrow.

Press center button to return to measure screen.

5.3.4 Calibration screen

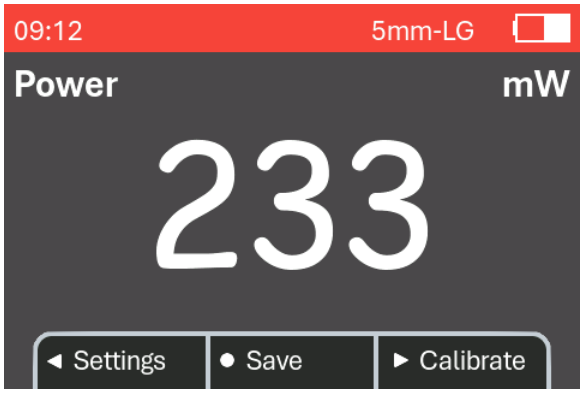
Enter by pressing right arrow from Measure screen (when S-Series is connected).

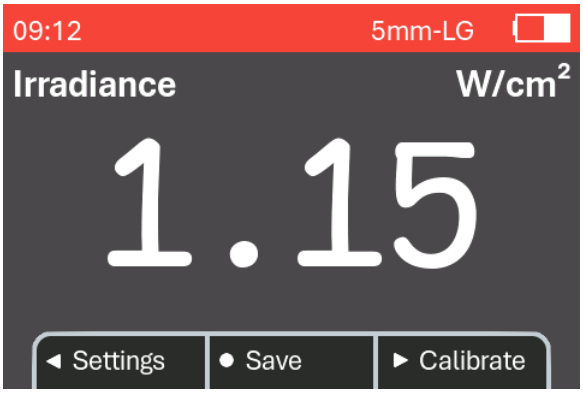
Press enter key to start calibration of the S-Series light source.

6 Graphical User Interface Overview

6.1 POWER ON

After powering on the R2000^{Plus} with the unit connected to the sensor configured in the settings menu, a live measurement is displayed.





The text highlighted below indicates the size of the inserted light guide.

6.2 BATTERY INDICATORS

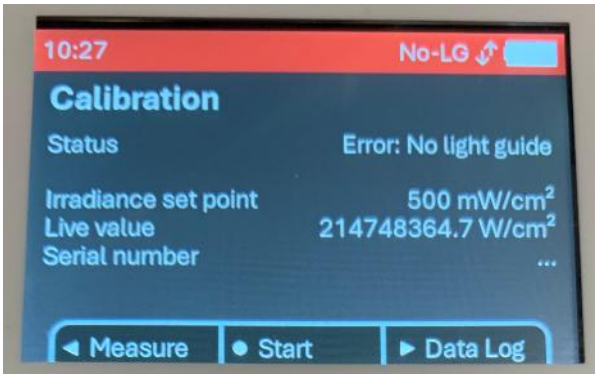
The battery icon indicates the charge level of the rechargeable battery.

The lightning bolt on the battery icon indicates that the USB cable is connected to a power source and the battery is charging.

6.3 CONNECTING TO AN S-SERIES LIGHT SOURCE

Connect a light guide with corresponding light guide adapter into the optical input port of the R2000^{Plus} Radiometer. Turn the light source ON. Always turn light source OFF before removing light delivery from the R2000^{Plus} Radiometer. Refer to warnings and safety precautions section for additional information.

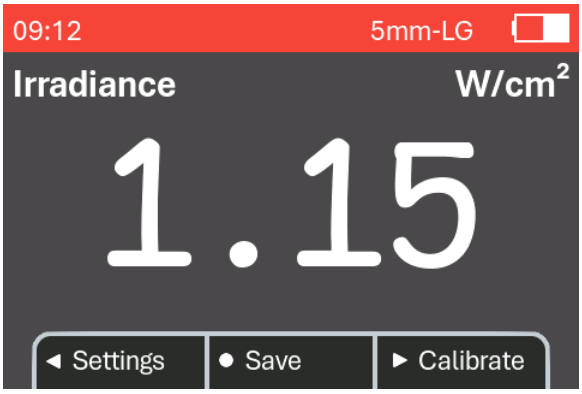
The screen below indicates that communication with an S-Series unit has been established (arrows icon), but no light guide is detected.



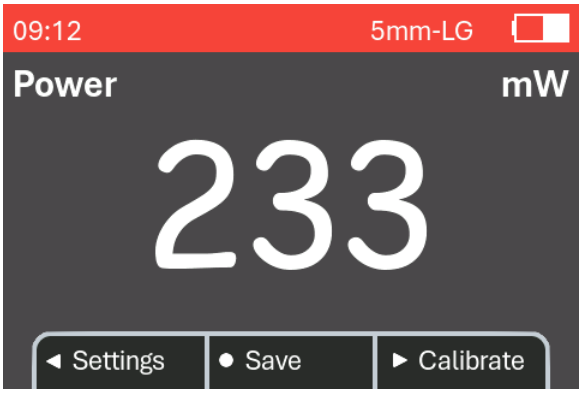
The Up/Down arrows indicate that communication is established with either a PC or light source via a valid RS-232 or USB connection.

6.4 MEASURING IRRADIANCE OR POWER

Irradiance measurements are displayed in either mW/cm^2 or W/cm^2.



Power measurements are displayed in either mW or W.



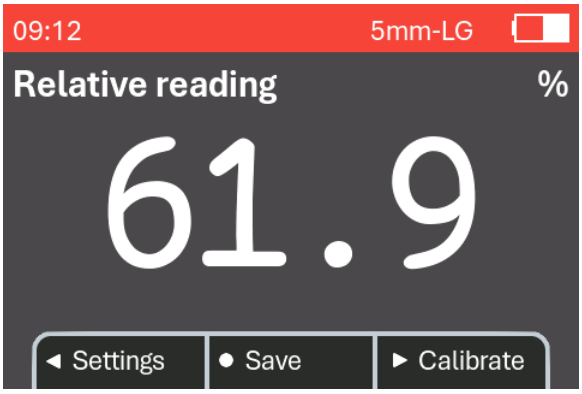
The R2000^{Plus} Radiometer automatically detects the size of the light guide that is inserted, calculates the irradiance or power, and displays the measurement. Use the measurement unit menu to toggle to the desired unit of measure.

6.5 MEASURING IN ABSOLUTE MODE

In Absolute mode, depending on the measurement unit selected, the R2000^{Plus} Radiometer displays the reading in units of either power or irradiance.

6.6 MEASURING IN RELATIVE MODE

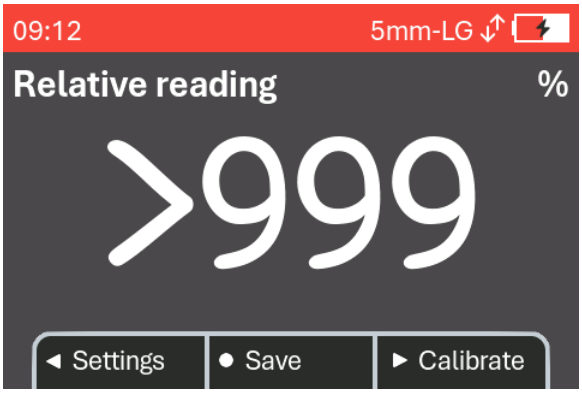
Relative mode displays measurements as a percentage of reference value. The reference value is set upon entering Relative mode.



Adjust the optical source to the desired reference level and then enable Relative mode in the settings menu. The R2000^{Plus} Radiometer will switch to Relative mode. All subsequent measurements will be displayed as a percentage of the reference. For example, inserting a light guide from a different source will provide a measurement that is relative to the initial reading.

A reading of "100%" indicates that the current measurement is the same value as the reference. A reading of "50%" indicates that the current measurement is half of the initial reference measurement. A reading of "200%" indicates that the current measurement is double of the initial reference.

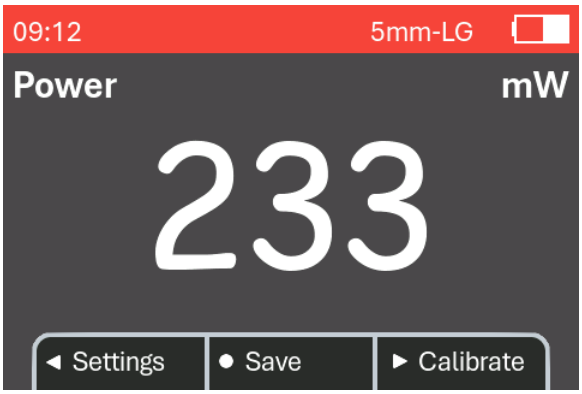
The calculated percentage is not displayed if it is over “999%”.

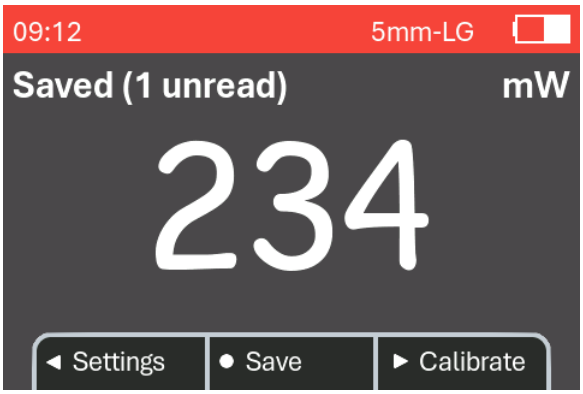


6.7 STORING DATA

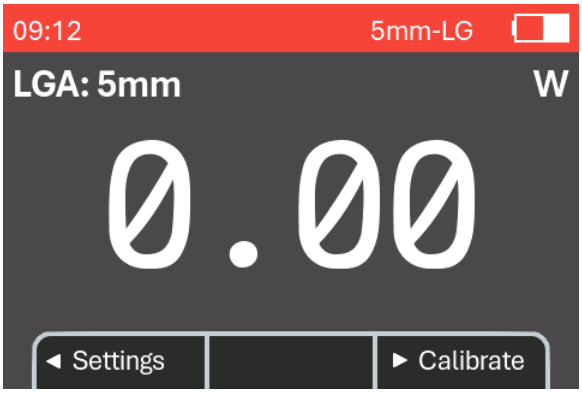
The R2000Plus Radiometer can store measurements based on what is being detected at the time the save function is activated.

When the measured reading is within the valid range, the “Save” function becomes available. Press the Select button on the front of the R2000Plus to save a reading.





When a reading is invalid (under range), the save function is disabled.



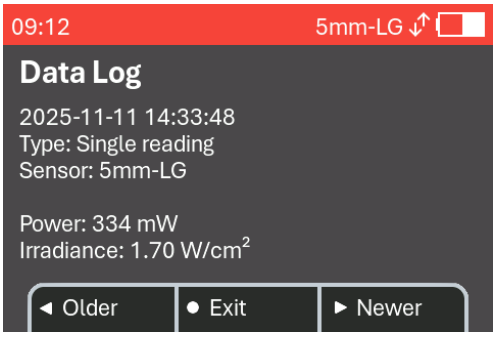
The STORE feature is generally used when the R2000Plus Radiometer is connected to a PC via the RS-232 connection. When connected, the stored readings are downloaded into a Data Log as seen on the R2000Plus Control Panel (via the GUI software provided). The stored readings can only be viewed by downloading them to a PC. The stored readings can also be accessed in the Data Log screen.

6.8 SETTINGS

Press Left ◄ from Measure screen to enter the settings screen.

6.9 DATA LOGGING

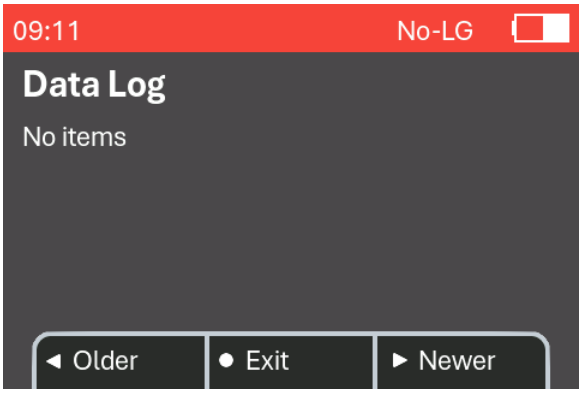
Saved readings can be reviewed on the R2000^{Plus} using the Data Log screen. Press the right button from the Measure or Calibration screen to enter the Data Log screen. Press the Select button on the front of the R2000^{Plus} to return to the Measure screen.



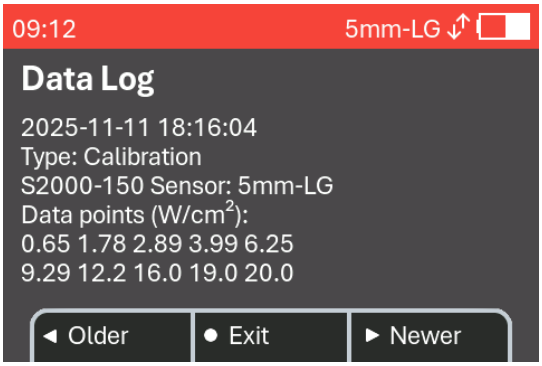
Use left or right arrow button to navigate through data log entries. Hold down an arrow button to scroll through entries quickly.

The following information is also available for saved readings when the radiometer is used with an S2000 or S2000 Elite unit.

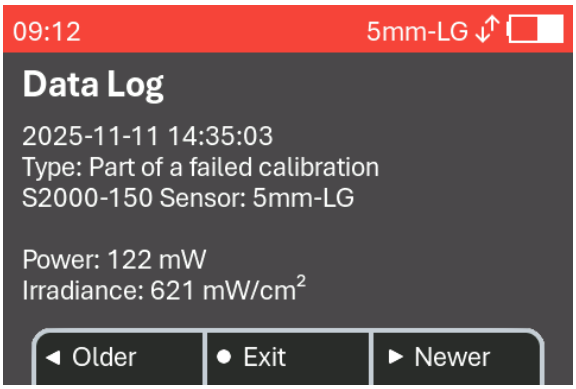
If there are no saved readings, the message below is displayed.



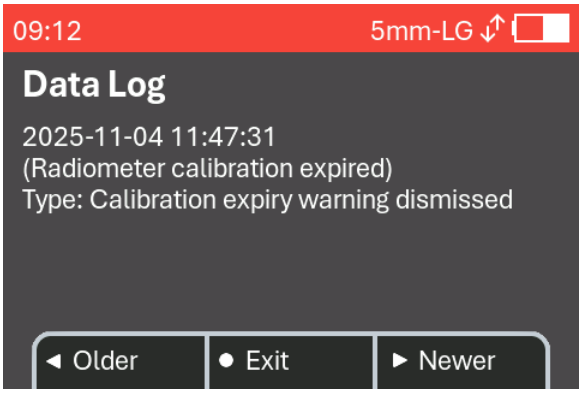
All 10 calibration points acquired during a calibration cycle are displayed.



For failed calibrations, readings are shown individually.

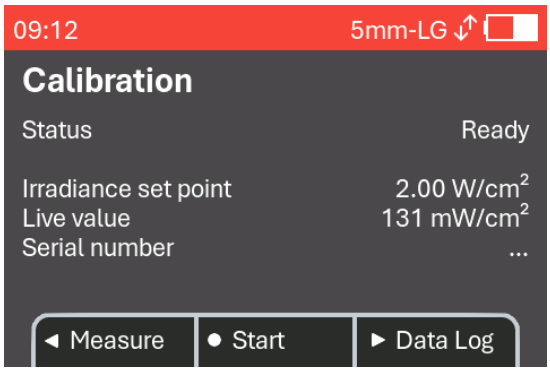


If the expired calibration warning is dismissed during startup, a data log entry is generated.

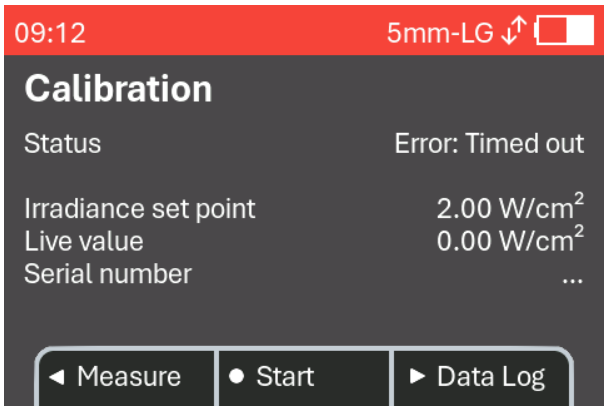


6.10 CALIBRATING S-SERIES LIGHT SOURCES.

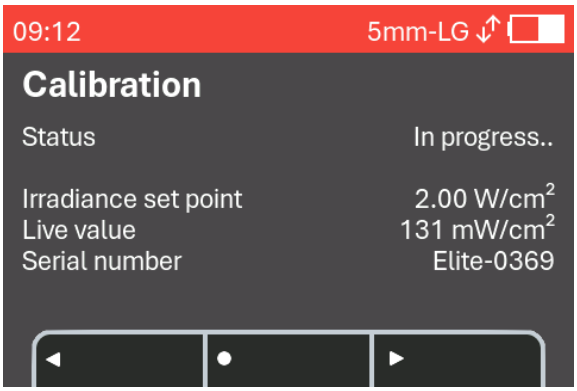
With the phono-style cable connected, press the **Right** arrow button on the front of the R2000^{Plus} to navigate from the Measure screen to the Calibration screen.



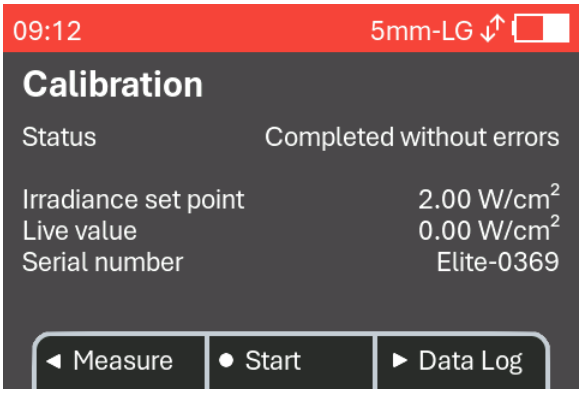
The **Status bar** may indicate that communication is established with the **S-Series** unit, while the on-screen message displays "**Error: Timed Out**" This occurs when the R2000^{Plus} does not receive feedback from the S-Series unit during the calibration cycle.



To begin the calibration process, press the Center button on the front of the R2000^{Plus}. The Status line will change to "In Progress", and all buttons will remain locked until calibration is complete.



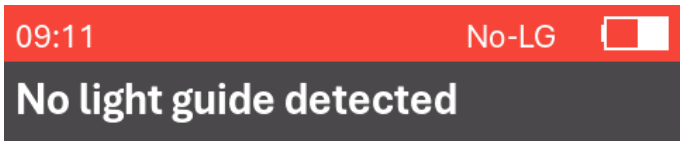
If the calibration is completed successfully, the status line displays “Completed without errors”.



6.11 COMMON CALIBRATION ERRORS

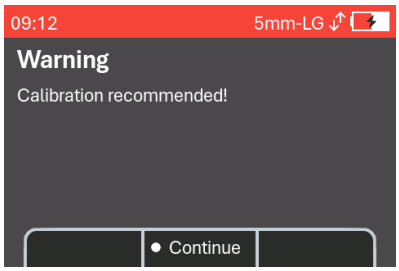
“No Communication” or “Timed Out” – Ensure the phono jack cable is fully inserted at both ends. Verify that the light source is turned on. If the issue persists, replace the phono jack cable.

“No Light Guide” – Verify that the light guide and adapter are fully inserted. Clean the light guide adapter if necessary. If no light guide is detected, it will be indicated on the screen.



6.12 INTERNAL SENSOR CALIBRATION

When the internal radiometric sensor requires calibration, the following message appears immediately after the unit is powered on.



If the message “CAL” appears on the display immediately after powering on the R2000^{Plus} Radiometer, it indicates that the unit requires calibration. The message will remain on the screen for approximately 5 seconds.

It is recommended that the R2000^{Plus} Radiometer be calibrated every 12 months to ensure valid measurements. The calibration is traceable to NIST, and a calibration certificate is included at each calibration cycle.

WARNING!

Calibration must be performed exclusively by an authorized, certified Excelitas service center. Using third-party calibration providers carries a significant risk of inaccurate or improper calibration.

When calibration is due, contact an Excelitas service center for a return materials authorization number (RMA).

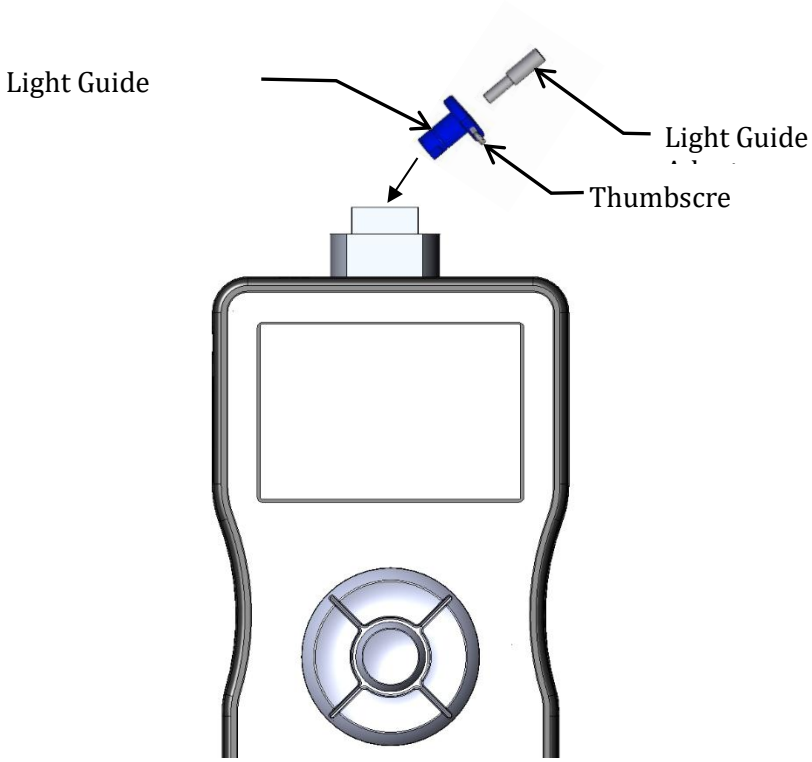
6.13 USING LIGHT GUIDE ADAPTERS

Each R2000^{Plus} Radiometer includes three standard light guide adapters, 3 mm (RED), 5mm (BLUE) and 8mm (GREEN). A 2 mm (GOLD) adapter is available and can be ordered separately. Custom sizes are also available (customer adapters are BLACK).

Insert the light guide adapter into the optical input port to the end of its travel. A click should be heard that indicates positive insertion of the light guide adapter.

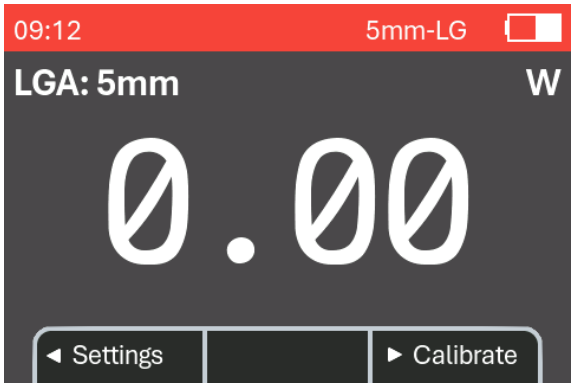
Insert the light guide into the light guide adapter to the end of its travel. Hand-tighten the thumb screw to secure the light guide into place.

Note: The use of a tool to tighten the thumbscrew is not recommended. Over-tightening can cause damage to the light guide.



When the light guide adapter is secured, it can remain attached to the light guide when the light guide is removed.

When a light guide is inserted, the light guide diameter is briefly displayed on the measurement screen. The diameter is also continuously displayed beside the battery icon.



6.14 USING NON-STANDARD SIZE LIGHT GUIDES

To use non-standard size light guides with the R2000^{Plus} Radiometer, a custom light guide adapter is required. Contact Excelitas Technologies for further details.

Note: The diameter of the light guide must be entered in the PC software or settings menu before the light guide is used with its custom adapter.

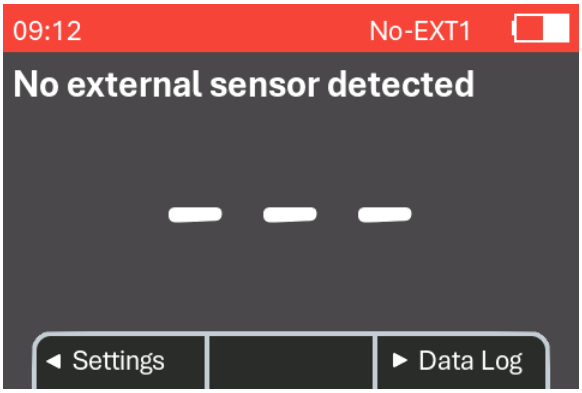
6.15 CONNECTING EXTERNAL RADIOMETER DEVICES

To use the R2000^{Plus} Radiometer with optional Cure Site and Cure Ring Radiometers, connect the external device to the 6-pin Mini-DIN remote input connector of the R2000^{Plus} Radiometer.

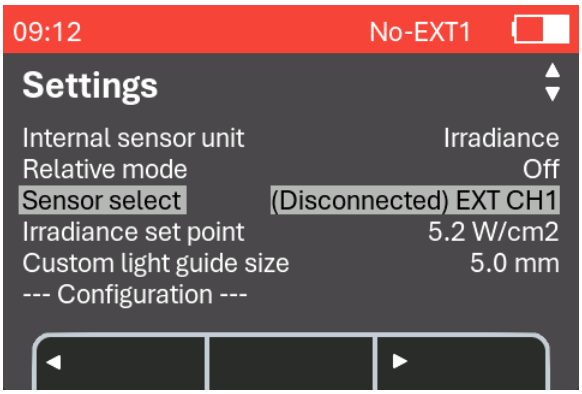
External radiometer devices are available from Excelitas as custom ordered items.

Use the "Sensor select" settings selection when using an external sensor. The top bar will show the EXT icon and a number (starting at 1), which corresponds to the external radiometer sensor being detected.

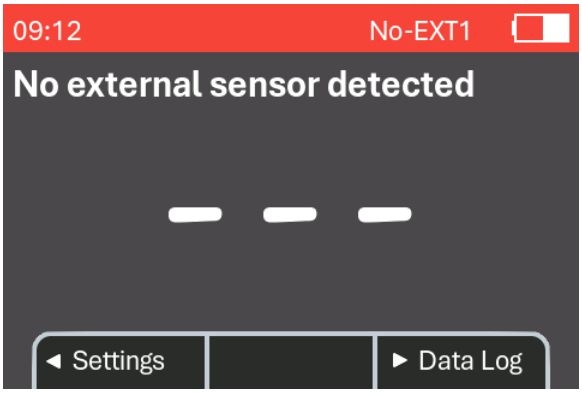
If no external sensors are detected on the selected channel, “No-EXT” is displayed in the top bar, and a warning is displayed on the Measure screen.



If the external sensor is selected but communication cannot be established, “Disconnected” will be displayed.



If external sensor is selected but communication cannot be established, the on-screen message will show “No external sensor detected”.



The measurement mode is dependent on the external device sensor type. For example, the R2000^{Plus} Radiometer will only measure Irradiance when an external radiometer device is able to measure only Irradiance.

The unit of measurement is switched automatically with the type of externally connected sensor.

6.16 INTERFACING WITH AN S-SERIES LIGHT SOURCE

Refer to the *OmniCure Curing System User Guide* for more details.

The R2000Plus Radiometer is equipped with one I/O port for communication with compatible OmniCure curing systems. When connected, the R2000Plus Radiometer can calibrate the OmniCure S2000 series UV Curing System and set the irradiance to a specific level.

To interface via the RS-232, plug the phono-style cable into the RS-232 connector located on the top of the unit and to the Audio Jack connector located on the front panel side of the OmniCure UV Curing System (a 6' long cable is supplied with the R2000Plus Radiometer).

6.17 I/O CONNECTIVITY

The following connections are available on the R2000Plus.

6.17.1 Phono style connector

- For communication with S2000 Elite/ S2000/ PC
- 3.5 mm stereo jack
- Supports serial 232 communication

6.17.2 USB-C OTG Connectors

- For communication with Windows PC COM Port and battery charging.
- There are two connector ports on the R2000Plus. The port closest to the top of the radiometer is for charging only, and the port below that supports both charging and communication with a PC.

6.17.3 Mini-DIN style external sensor connector

- To communicate with external sensors.

6.18 USING THE R2000PLUS RADIOMETER WITH A PC

Refer to the section "Operating system requirements" for minimum requirements to use the R2000Plus Control Panel software.

The R2000Plus Radiometer supports R2000 Control Panel software that enables the operation and control of the Radiometer from a PC.

6.18.1 Installing the R2000 Control Panel Software

Follow the installation procedure below using the PC unit that will be used with the R2000Plus Radiometer.

1. Download the R2000 software from the Software tab on the R2000Plus product page.
2. Double click on the downloaded file and follow the prompts.
3. Follow the setup instructions as they appear by clicking "next" each time the user prompt appears, until the installation has been completed and "finish" appears. Click on "finish" to complete the installation.

To access the control panel software program, click on the Windows Start menu and select: programs/ EXFO ►/ R2000 Control Panel. A screen with a title bar displaying "R2000 Control Panel" will appear.

Click on Connect at the top of the screen. The R2000 Control Panel will open when there is a successful connection. This should take no more than a few seconds.

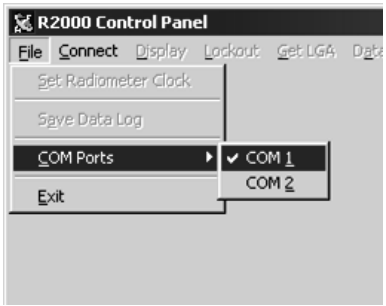
As long as there is a connection between the PC and the Radiometer, data is automatically downloaded to the PC.

A 9-pin serial cable is provided with the R2000^{Plus} Radiometer.

If a problem connecting occurs, a 'No response from radiometer….' Error may be displayed. If this occurs click 'OK' and check the R2000^{Plus} Radiometer. Press the ON keypad button as necessary and try connecting again.

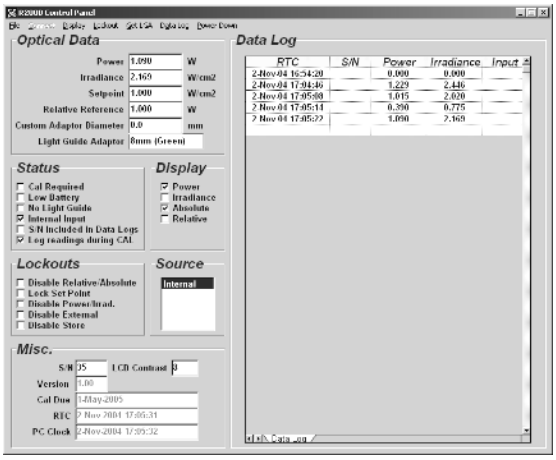
If a problem connecting occurs, the PC may display a 'Failed to open COM port' message. Click 'OK'.

Select from the File pull down menu – COM Ports. Ensure that the applicable COM port is checked and cable is connected to corresponding plug. Try connecting again.



Note: This error may also appear if another program is running that is using the COM port that has been selected.

The following illustrates the R2000 Control Panel:



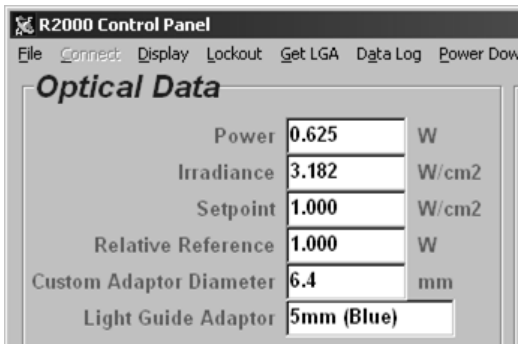
Based on the settings and data being read from the R2000Plus Radiometer, the information will display in the respective areas of the Control Panel. Some data is user-defined such as:

- Set Point
- Relative Reference
- Custom Adapter Diameter
- LCD Contrast

Note: When data is entered into a user-defined field, the background color of the field content changes to yellow. To transfer the number into the R2000Plus Radiometer, press the ENTER key. If successful, the background reverts to the default color.

If the transfer fails, the background color reverts to the default color, but the foreground color becomes red. A dialogue box will appear indicating that the request failed. Click OK to continue.

The Optical Data frame displays a combination of real-time data as it pertains to readings being taken from the R2000Plus Radiometer as well as user-defined fields.



Power – Displays real-time data as it pertains to readings being taken from the R2000Plus Radiometer. Display units are either mW or W.

Irradiance – Displays real-time data as it pertains to readings being taken from the R2000Plus Radiometer. Display units are either mW/cm^2 or W/cm^2.

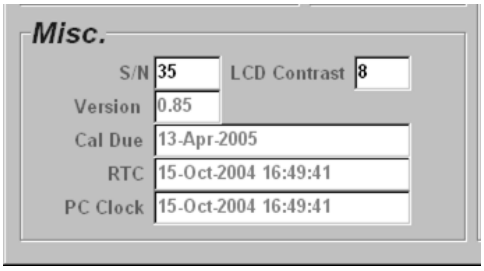
Light Guide Adaptor – Displays the diameter and color of the light guide adapter being detected by the R2000Plus Radiometer.

Setpoint – This is a user-defined parameter. Enter the desired irradiance that will be used to set the compatible OmniCure UV Curing System after the OmniCure CAL button is pressed.

Relative Reference – This is a user-defined parameter. Enter the desired power reference to be used in Relative mode.

Custom Adapter Diameter – This is a user-defined parameter. If using a non-standard light guide with the R2000Plus Radiometer, enter the applicable diameter of the customized light guide adapter. This information must be entered before the light guide is used with the R2000Plus Radiometer.

Light Guide Adaptor – Displays the diameter and color of the light guide adapter being detected from the R2000Plus Radiometer. The **Misc.** frame displays a combination of real-time data as it pertains to readings being taken from the R2000Plus Radiometer as well as user-defined fields.



S/N – Displays serial number of the R2000Plus Radiometer.

LCD Contrast – This is a user-defined parameter that indicates the R2000Plus Radiometer LCD Display contrast level (0 is darkest, 15 is lightest).

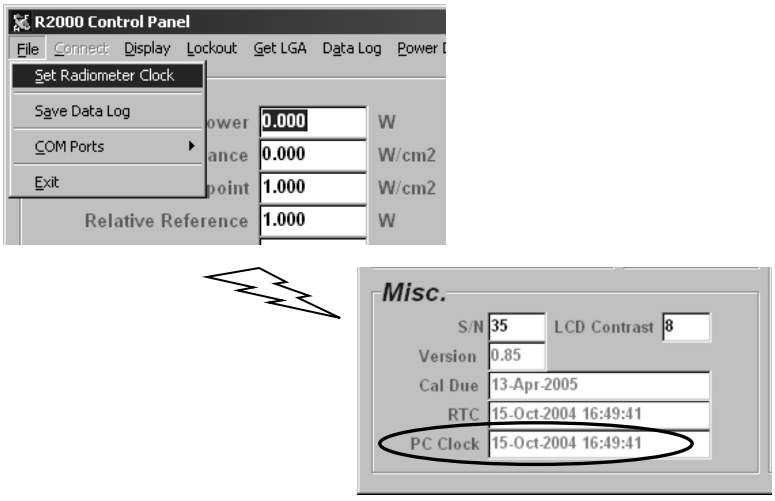
Version – Displays software version of the R2000Plus Radiometer.

Cal Due - Displays recommended date of next R2000Plus calibration.

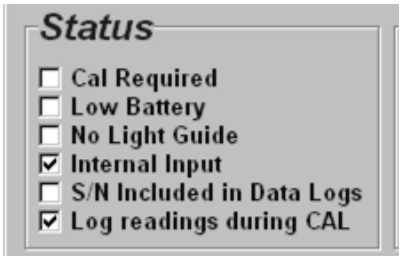
RTC (Real-Time Clock) - Displays date and time based on internal clock of the R2000Plus Radiometer.

PC Clock - Displays date and time according to PC clock.

If the RTC date/time stamp is not the same as the PC clock use the Set R2000Plus Radiometer Clock function under the File menu to synchronize.



Status – The Status frame indicates the applicable status modes of the R2000Plus Radiometer.



Cal Required – When checked, the R2000Plus Radiometer is past its recommended calibration date. This is equivalent to the 'CAL' message that appears on the R2000 Radiometer display.

Low Battery – When checked, the battery is low and should be recharged. This is equivalent to the 'BAT' message that appears on the R2000 Radiometer display.

No Light Guide – When checked, the R2000Plus Radiometer is not detecting a light guide. This is equivalent to the 'LG' message that appears on the R2000 Radiometer display.

Internal Input – This box will be checked when Internal is selected in the Source frame. It indicates that optical input is being received from the optical port on the R2000Plus Radiometer.

S/N Included in Data Logs – When checked, the serial number of the compatible OmniCure UV Curing System will be included in the Data Log. This requires a 3.5mm stereo jack connection between R2000Plus and S2000 series unit. The serial number is automatically acquired from the S2000 series unit during the data storage process. If the unit is not connected, a delay will occur and no serial number will be included.

Log readings during CAL – When checked, indicates that each calibration point during a calibration of a compatible OmniCure UV Curing system will be logged into the Data Log.

Source

The Source frame lists the optical inputs being detected by the R2000Plus Radiometer. Internal indicates detection from the optical input port on the R2000Plus Radiometer. Other sources such as Ext. #1 and Ext. #2 are sources being detected from external radiometer devices that are connected.

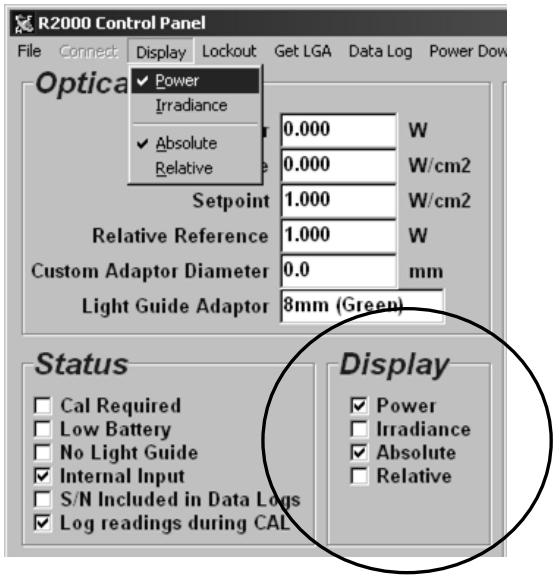
Menu Functions

To operate and control the R2000Plus Radiometer from the PC, select desired menu functions located across the top of the R2000Plus Control Panel.

Display

Select the Display menu and then select the desired mode of Power, Irradiance, Absolute or Relative.

Selected options are indicated as checked boxes in the Display frame.

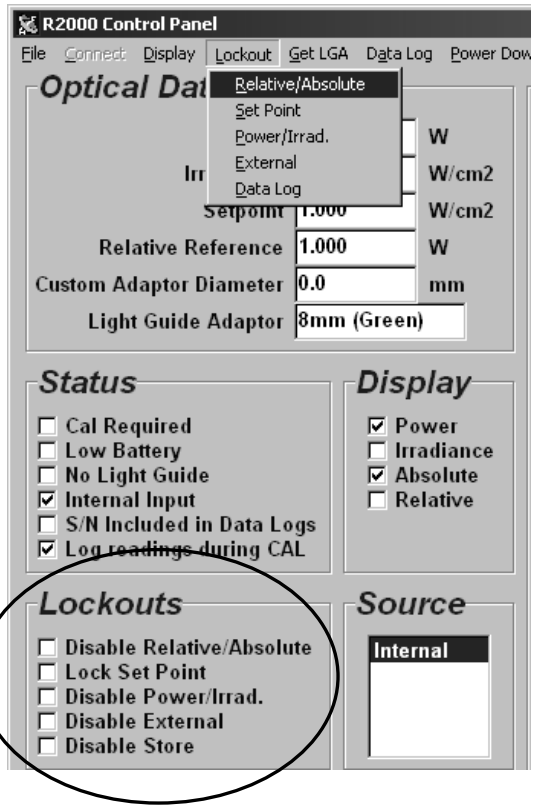


Lockout

Select Lockout menu option to disable certain features or functionality from the front keypad of the R2000^{Plus} Radiometer.

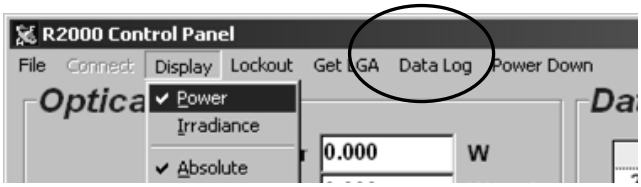
Select from the available list in the pull-down menu. The selections that are checked are indicated in the Lockout frame.

If a box is checked, this means that this function will not operate from the front keypad of the R2000^{Plus} Radiometer.



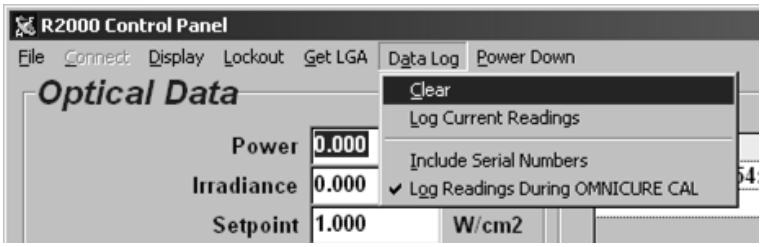
Get LGA

In the event that the size of the light guide adapter must be re-detected remotely, it can be obtained from the Get LGA menu option at the top of the screen. Selecting this will re-detect the color of the light guide adapter and hence the size of the light guide installed in the R2000Plus Radiometer.



Data Log

Select the Data Log menu option and select the desired option from the pull down list.



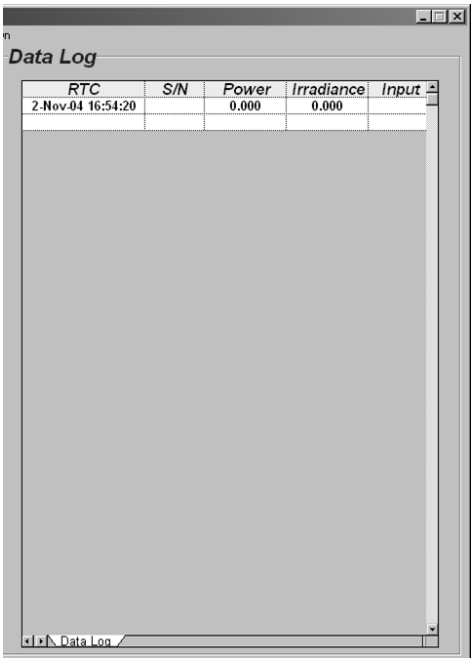
Select Clear to clear any existing data that may be resident in the data log.

Select Log Current Readings to STORE current readings from the R2000Plus Radiometer. The applicable data will be displayed in the Data Log frame.

Select Include Serial Numbers to obtain the serial number of the compatible OmniCure UV Curing System when the STORE button is pressed.

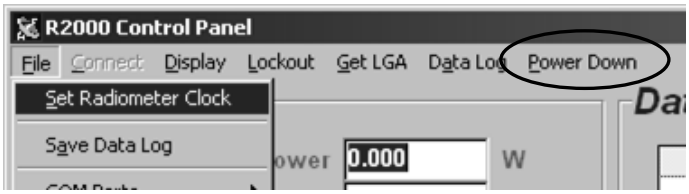
Select Log Readings During OMNICURE CAL to log each calibration point into the Data Log during a calibration cycle with a compatible OmniCure UV Curing System.

The following is a sample screen shot of the Data Log.



Power Down

Select this menu option to power down the R2000^{Plus} Radiometer.



6.19 COMMUNICATION PROTOCOL API

A communication protocol (API) is available for controlling communication between the radiometer and a PC. The API is documented in the *R2000 & R2000^{Plus} Radiometer Programmer's Reference Manual* (Part No. 035-00247R).

7 Symbols and Safety Precautions

CAUTION – RISK OF DANGER

Consult accompanying documents

CAUTION!

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

Battery

D.C. Current

Caution, hot surface

WARNING!

Should the R2000Plus Radiometer be used in a manner not specified by Excelitas, the protection provided by the equipment may be impaired.

WARNING!

The R2000Plus is equipped with an internal lithium-ion rechargeable battery. The battery may be charged via the USB-C connection to a PC.

The battery may also be charged using a customer-supplied AC/DC USB power adapter that is certified to CSA, UL, IEC, EN 62368-1, or equivalent standards and rated as a Limited Power Source (LPS), including other applicable country-specific regulatory certifications.

Must be charged by a 15W PD charger to 100% battery level when charging this product for the first time, or when recharging it after a storage period of 60 days or longer.

The battery is not user-replaceable. Replacement must be performed only by Excelitas authorized service personnel.

WARNING!

The lithium ion battery supplied in the R2000Plus Radiometer **DOES NOT** contain any of the following: mercury, lead, manganese or cadmium. Replacement of the battery voids the warranty. Battery is not customer replaceable and is replaceable only by Excelitas authorized service.

Caution, hot surface

In instances where high power light sources are measured for extended periods of time, the light guide adaptors supplied with the R2000Plus may become hot!

Always use caution when handling these adapters!

8 Technical Specifications/Display Limits

8.1 OPTICAL

Note: Specifications are subject to change without notice.

- Wavelength Range: 250-1000 nm
- Power Measurement Range: 10 mW to 12.00W
- If the reading is below 10 mW, the display shows "0.00".
- If the reading is above 12.00W, the display shows the actual measured value, even though it exceeds the specified range.
- Irradiance Range: 5 mW/cm^2 to 60.00 W/cm^2
  - If the reading is below 5 mW/cm^2, the display shows "0.00."
  - If the reading is above 60.00 W/cm^2, the display shows the actual measured value, even though it exceeds the specified range.
- The dynamic range is equivalent to the R2000.
- Resolution and Auto-ranging. The unit displays 3 significant figures (See examples below):
  - 0.00-9.99 mW (increment 0.01 mW)
  - 10.0 mW-99.9 mW (increment 0.1 mW)
  - 100 mW-999 mW (increment 1 mW)
  - 1.00W-9.99W (increment 0.01W)
  - 10.0W-99.9W (increment 0.1W)
- Display Auto-range (Power and Irradiance):
  - For each reading the range that displays the most significant figures will be used.
- Power Measurement Accuracy:
  - +/- 5% (Maximum) when measuring a S2000 Elite standard lamp with 320-500 nm optical filter

8.2 ELECTRICAL

Battery Type: 3.6 volt, 3 Ah, Lithium Ion

- I/O Ports:

  RS-232 Pin 1: (Shield) – GND
  Pin 2: (Ring) – Tx
  Pin 3: (Tip) – Rx

  } Connect only to equipment that is compliant to IEC 62368-1 or equivalent.

- Remote Input Port:
  - Labeled EXT Port
  - A 6-Pin Mini-DIN connector, use only with optional Cure Site & Cure Ring radiometers
- USB connection Type C, (quantity 2)

8.3 MECHANICAL

Dimensions (does not include light guide port):

- Maximum: 7¾ " (H) x 4½ " (W) X 2½ " (H)

- Weight: 600 g

8.4 RS-232 COM PORT CONFIGURATION SETTINGS

Communication ports settings :

- Baud rate: 19200
- Data bits: 8
- Parity: None
- Stop bits: 1

8.5 ENVIRONMENTAL CONDITIONS

Operating Environment Conditions

- Installation Category II
- Pollution Degree 2
- Ambient Temperature:-15 to 35 degrees Celsius
- Relative Humidity: 15% to 95% (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

9 Regulatory Compliance

9.1 SAFETY AND ELECTROMAGNETIC COMPATIBILITY

The R2000Plus Radiometer has 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 OmniCure representative or contact us at https://www.excelitas.com/omnicure-x-cite-inquiries

Council Directive 2014/35/EU	Low Voltage Directive	CE
Council Directive 2014/30/EU	EMC Directive	
Council Directive 2012/19/EU as amended by (EU) 2024/884	WEEE Directive	
Council Directive 2011/65/EU as amended by (EU) 2015/863	RoHS Directive	
Council Regulation (EU) 2023/1542	Batteries Regulation	

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.

9.2 FCC CLASS A DIGITAL DEVICE OR PERIPHERAL

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 their own expense.

WARNING

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

9.3 CHINA ROHS

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)	Dibutyl phthalate (DBP)	Di isobutyl phthalate (DIBP)	Butyl benzyl phthalate (BBP)	Bis(2-Ethylhexyl) phthalate (DEHP)
Printed circuit board assemblies	X	O	O	O	O	O	O	O	O	O

This table is prepared in accordance with the provisions of SJ/T 11364-2024.

O: Indicates that the content of the hazardous substance in all homogeneous materials of the component does not exceed the national standard requirements for the restricted use of hazardous substances in electrical and electronic products.

X: Indicates that the content of the hazardous substance in at least one homogeneous material of the component exceeds the national standard requirements for the restricted use of hazardous substances in electrical and electronic products.

For components not listed above, it means that the content of their hazardous substances does not exceed the national standard requirements for the restricted use of hazardous substances in electrical and electronic products.

(Enterprises can further explain the technical reasons for marking "X" in the above table here according to actual conditions.)

部件名称	有害物质									
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBBs)	多溴二苯醚 (PBDEs)	邻苯二甲酸二正丁酯 (DBP)	邻苯二甲酸二异丁酯 (DIBP)	邻苯二甲酸丁苄酯 (BBP)	邻苯二甲酸二(2-乙基)己酯 (DEHP)
印刷电路板组件	X	O	O	O	O	O	O	O	O	O

本表格依据SJ/T 11364-2024的规定编制。

注1：O: 表示该有害物质在该部件所有均质材料中的含量均不超出电器电子产品有害物质限制使用国家标准要求。

X: 表示该有害物质至少在该部件的某一均质材料中含量超出电器电子产品有害物质限制使用国家标准要求。

注2：以上未列出的部件，表明其有害物质含量均不超出电器电子产品有害物质限制使用国家标准要求。

（企业可在此处，根据实际情况对上表中打“X”的技术原因进行进一步说明。）

9.4 WEEE DIRECTIVE

1. 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.
2. 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.
3. 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.

4. The crossed-out wheeled bin symbol indicated above invites you to use those systems.
5. If you need more information on the collection, reuse and recycling systems, please contact your local or regional waste administration.

10 Accessories

We offer a full line of replacement parts, supplies, and accessories for the R2000^{Plus} Radiometer. For more information consult the OmniCure product catalogue or contact your local sales representative.

In the event a standard accessory is not available to meet your applications needs, contact us for more information about our custom products services (SR program) at omnicure@excelitas.com

10.1 3.6V 3AH RECHARGEABLE LITHIUM ION BATTERY

Refer to section *Returning your* R2000^{Plus} *to Excelitas for Service* for battery replacement.

10.2 LIGHT GUIDE ADAPTERS

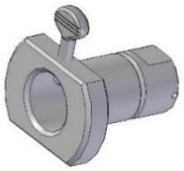
(Thumbscrew supplied)

2 mm - Gold (available), Reorder No. 019-01043

3 mm – Red (supplied), Reorder No. 019-01050

5 mm – Blue (supplied, Reorder No. 019-01051

8 mm – Green (supplied), Reorder No. 019-01042

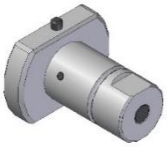


10.3 OPTIONAL ADAPTERS

Optical accessories provide solutions to a wide range of application needs. Optical accessories include the Proximity Measurement Adapter and the optional Lamp Output Adapter.

These adapters expand the range of measurement geometries that can be accommodated.

5mm Proximity Adapter, Re-order No. 019-01041



Lamp Output Adapter – Optional, Re-order No. 019-01033

11 Warranty

Excelitas Canada warrants the original purchaser for one (1) full year, calculated from the date of purchase that the equipment sold is free from defects in material and workmanship. All repairs are warranted for 90 days.

In the event of a claim under this warranty, the equipment is to be sent postage and carriage paid to the Excelitas Service Centre. Returned equipment will not be received without a Return Authorization (RA) Number, issued by the appropriate Service Centre.

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.

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

Package the equipment in 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 Authorized Service Center, the warranty ceases to be valid. This warranty may not form the basis for any damage claims, particularly not for compensation of consequential damages.

This warranty is not transferable.

No warranty is extended to perishable items (if purchased separately or included in systems). These may include, but are not limited to, fuses, air filters, optical filters, cables, light guides, and light guide adapters.

⚠ There are no user serviceable parts within the R2000^{Plus} Radiometer. Opening the R2000^{Plus} Radiometer enclosure voids the warranty.

12 Returning your R2000^{Plus} to Excelitas for Service

Please note the problem encountered, the steps followed to isolate the problem and the result of any troubleshooting steps taken.

Contact the nearest Excelitas Canada Service Centre to obtain a Return Authorization (RA) Number to complete repairs quickly and efficiently. In North America, request for a RA (Return Authorization) number from the website: https://www.excelitas.com/ox_service_request_form

Enclose details of the problem with the unit and return both to the Excelitas Canada Service Centre. The unit should be returned in its original packaging if possible. Do not ship the radiometer with the external sensor connected.

Include a phone number and contact person who may be reached for any additional service-related questions.

13 Contact Information

Excelitas Canada Inc.
2260 Argentia Road
Mississauga, Ontario
L5N 6H7 CANADA

Tel.: +1 905 821-2600

Toll: +1 800 668-8752 (USA and Canada)

Fax: +1 905 821-2055

https://www.excelitas.com/omnicure-x-cite-inquiries

Technical Assistance:

techsupport@excelitas.com

https://www.excelitas.com/ox_service_request_form

For a complete listing of Authorized OmniCure Distributors and Service Centres, please go to

https://www.excelitas.com/dealer-search

14 Acronyms, Abbreviations, and Definitions

PC: Personal Computer

GUI: Graphical User Interface

15 Firmware upgrade

The R2000^{Plus} firmware is user-upgradeable and can be downloaded from the **Excelitas** website.