OmniCure® S2000

USER'S GUIDE

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EXCELITAS TECHNOLOGIES®

SERIES 2000 User's Guide

S2000 Control Panel Software

Minimum Computer Specifications:
300+ MHz processor (Pentium or equivalent)
Windows 98, 2000 or XP
64 Mb RAM
10 Mb for Software Installation
20 Mb for Data Storage
SVGA video 800 x 600 resolution
One available RS-232 Port

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1 Introduction

The OmniCure® SERIES 2000 represents a new standard in UV Curing. It gives you the power, control and reliability never before available in such a cost effective UV curing system. The SERIES 2000 joins the Excelitas Technologies family of light systems offering the same high level of innovation, quality and reliability that our customers have come to expect. Since 1982, Excelitas Canada Inc. (formerly Lumen Dynamics Group Inc. & EXFO Life Sciences & Industrial Division) has combined next generation optical engineering, state-of-the-art electronics and fibre-optics to produce sophisticated technologies that employ light. Today Excelitas Canada Inc. is a leading developer of light based systems for sectors ranging from manufacturing to bio-medicine and we are unmatched in our commitment to quality and service.

The heart of the OmniCure® SERIES 2000 is a proprietary 200-watt mercury short arc lamp with an amazing 2000-hour guaranteed lifetime. This extended lifetime is made possible by the proprietary technology incorporated into the design of the system. The lamp is mounted in an elliptical reflector with a proprietary coating to provide excellent spectral and power output.

Control for the OmniCure® SERIES 2000 is provided by a new rotary shutter / iris mechanism. The iris is adjustable in 1% increments to provide very precise amounts of light to your application. In order to set your OmniCure SERIES 2000 system at specific irradiance levels (W/cm2), we suggest adding the OmniCure model R2000 handheld Radiometer to your OmniCure SERIES 2000 system. Other standard features incorporated in the SERIES 2000 include: the pre-aligned Intelli-Lamp® system, band pass filter, exposure timer, an accumulative lamp hour meter, “lock out” protection, mode indicators, Closed-Loop Feedback and a light guide status indicator. Additionally, units are available configured for either standard or surface curing applications.

We suggest that you read this manual to discover all features of the OmniCure® SERIES 2000, and how to use them.

2 Getting Started

2.1 Box Contents:

1. The S2000 UV/Visible Spot Curing Unit
2. The 200W lamp module
3. UV Safety Glasses
4. Foot Pedal Switch
5. Lamp Housing Access Tool (fastened beneath the system housing)
6. Grounded POWER Cord
7. RS-232 Cable (9 Pin)
8. CD with User Guide and Interface Software

If your packaged unit is missing any of the above components, call Excelitas Canada Inc. at (905-821-2600) or
1-800-668-8752.

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

2.2 Front Panel

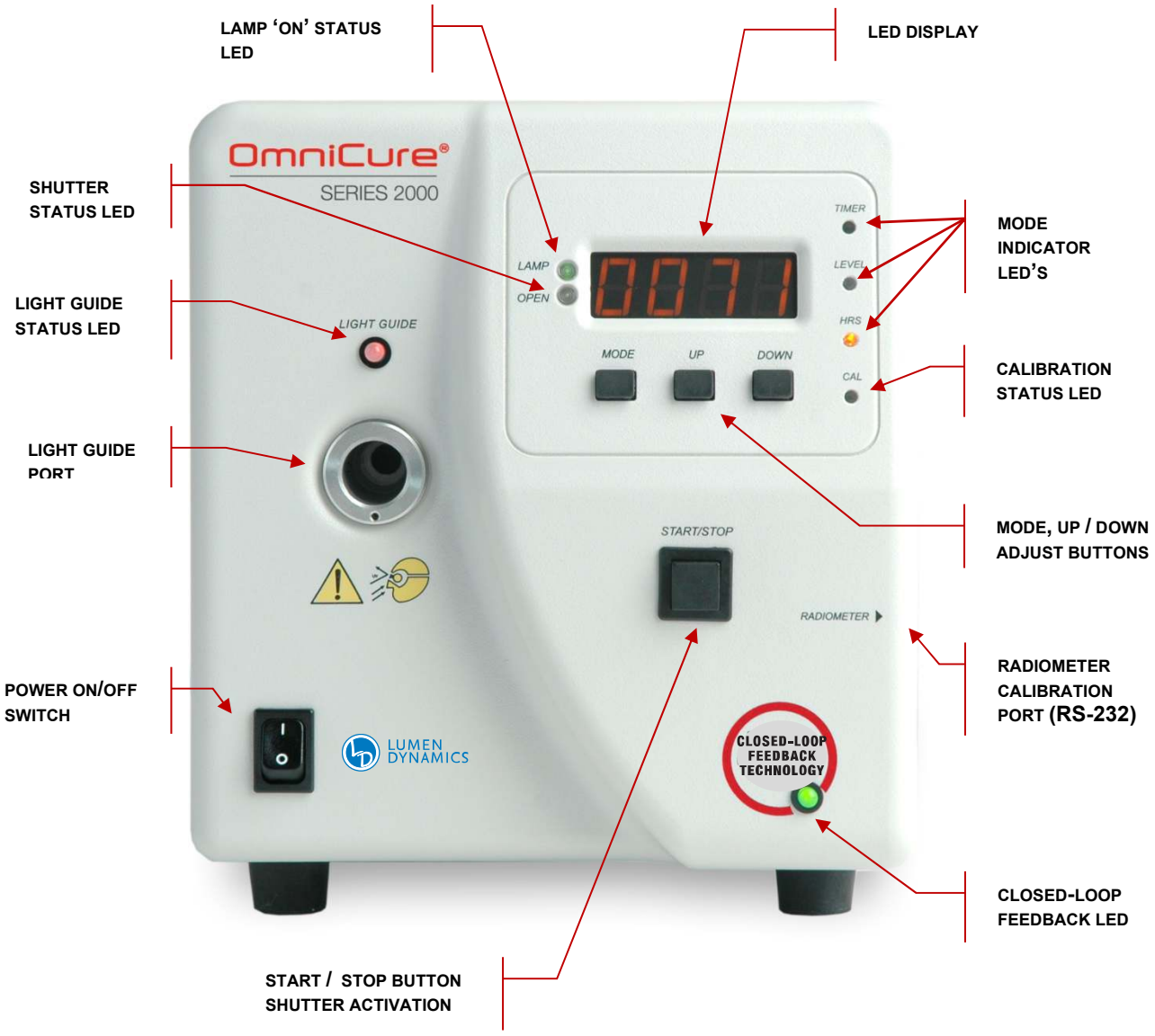


Figure 1 Front Panel

Rear Panel

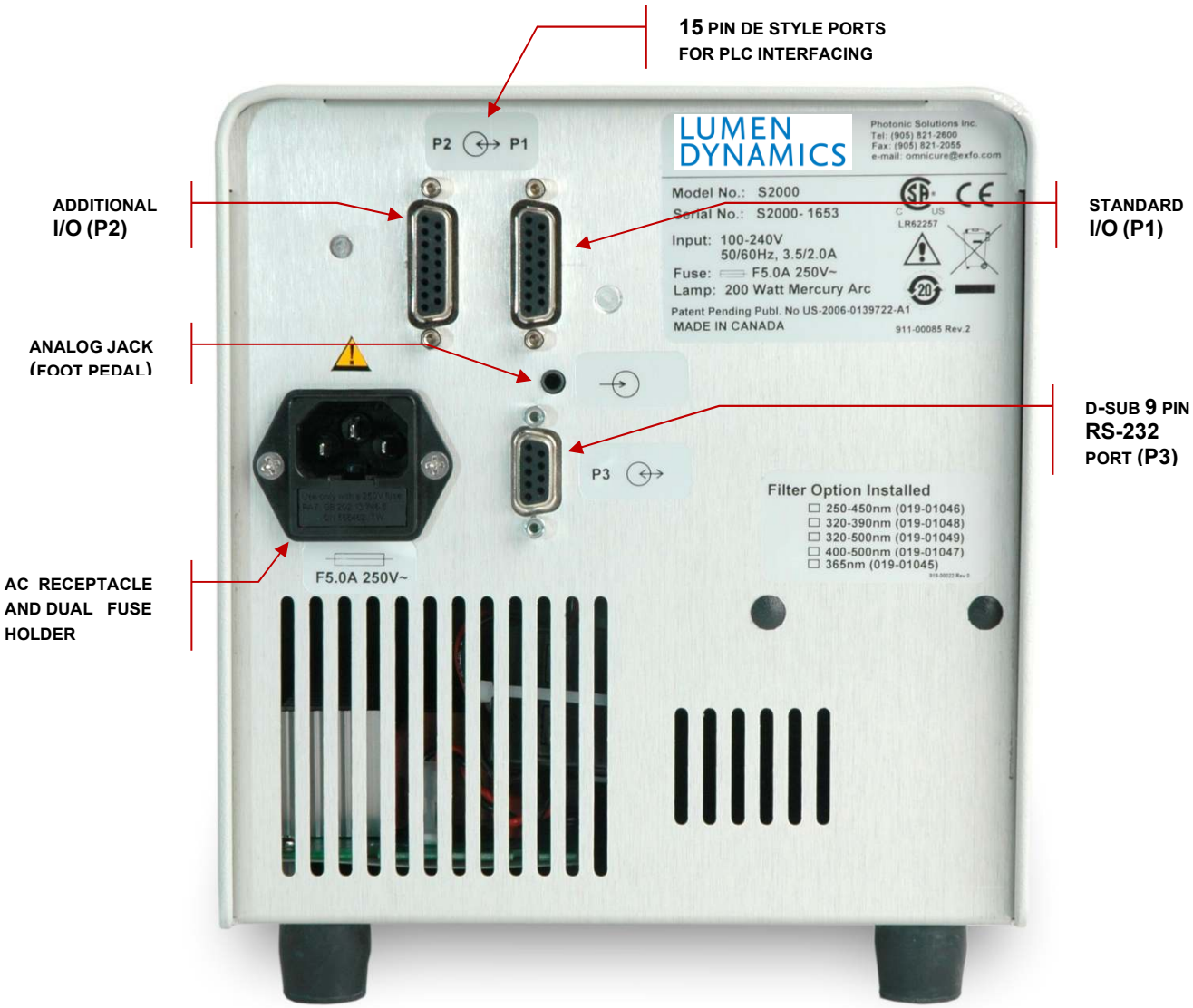


Figure 2 Rear Panel

3 Safety Precautions

Glossary

Caution risk of danger – consult accompanying documents

Caution 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

The S2000 is equipped with two safety sensors to protect the user from accidental UV exposure. In addition, please observe the following precautions during use. This Series of cautions, warnings and dangers relate to the operation and maintenance of the S2000. They are also presented throughout this User's Guide where necessary.

Warning
Eye damage may result from directly viewing the light produced by the lamp used in this product. Always use the UV protective eyewear supplied with the unit and always turn the lamp off before removing lamp housing cover.

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. 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 S2000 prior to turning on POWER to the unit. This will minimize the risk of exposure to the UV light.

Warning
To reduce the risk of fire or shock, always replace the fuses with the same type and rating. Always detach the POWER supply cord prior to attempting to replace fuses!

Warning
Disconnecting of the main supply source is only possible by unplugging the POWER cord.

Danger
This unit contains HIGH VOLTAGE components. It is recommended that ONLY QUALIFIED TECHNICAL PERSONNEL perform any testing or repairs.

Monitoring the unit during manual operation
The Level of UV energy supplied by the S2000 is sufficient to ignite flammable substances. During manual operation, the unit must be attended at all times by a qualified operator. The unit must not be left unattended while turned on. If an operator leaves the work area of the unit, the POWER switch must be turned off.

Monitoring the unit during automated operation
The Level of UV energy supplied by the S2000 is sufficient to ignite flammable substances. Therefore, when the unit is operated unattended in an automated environment, an alarm function must be provided by the user to indicate a malfunction in the associated equipment used.

Warning
Hg – LAMP CONTAINS MERCURY, Manage in Accord with Disposal Laws, see: www.lamprecycle.org or 1-800-668-8752

Danger: Exposure to Mercury represents a health hazard to humans.
When unpacking or installing the lamp, always wear protective clothing and a face mask. Operate lamp only in the S2000 lamp housing. This prevents direct viewing of the arc and in the case of lamp bursting, contains the lamp particles. In the rare instance in which a lamp bursting occurs, and the mercury content is released, the following safety precautions are recommended: all personnel should be immediately evacuated from the area to prevent inhalation of the mercury vapour. The area should be well ventilated for a minimum of 30 minutes. Prior to clean up ensure an approved mercury respirator mask and non-porous gloves such as latex or rubber are used. After the lamp housing elements have cooled, the mercury residue should be collected with the use of a special absorbing agent available from laboratory equipment suppliers.

Listed below are examples of internet web sites for obtaining Mercury Spill Kits:

- https://www.amazon.com/mercury-spill-kit/s?k=mercury+spill+kit
- https://www.uline.ca/BL_272/Mercury-Spill-Kit

Warning
Should this S2000 unit be used in a manner not specified by Excelitas Technologies, the protection provided by the equipment may be impaired.

Warning
The method in which lamps are disposed of must comply with local rules & regulations for disposal of hazardous materials. Lamps may be returned to Excelitas Technologies, providing they are returned in its original packaging. Excelitas Technologies will dispose of them in the appropriate manner.

Caution
The lamp module's operational life can be significantly shortened if it is handled incorrectly. Do not touch the bulb's glass envelope or the inside surface of the reflector. Skin oils can cause the lamp module to fail prematurely.

Caution
Prior to opening the unit and handling the lamp module, allow the lamp module to cool down completely (approximately 20 min).

Caution
Any electronic equipment connected to the S2000 must be IEC 60950-1 certified.

Cleaning
Clean exterior of the unit with a water dampened cloth and simple detergent only.

4 Installing the Lamp Module

The S2000 curing system is available configured in 2 different versions, one version is for standard curing and one version is for surface curing. The appropriate type of lamp must be installed depending on which configuration your S2000 is set.

Note: Refer to Section 3 – Safety Precautions before proceeding

4.1.1 Be sure the AC POWER cord is disconnected from the unit.

4.1.2 Remove the screw from the lamp housing side panel using the tool provided and remove the panel from the unit cover.

Figure 3 Lamp Housing Panel

4.1.3 Carefully remove the lamp module from its container, holding only the ceramic component and lamp rim.

Caution!
The lamp module's operational life can be significantly shortened if handled incorrectly. Be sure only to handle the ceramic surfaces and the lamp rim. Do not touch the bulb's glass envelope or the inside surface of the reflector. Skin oils can cause the lamp module to fail prematurely.

4.1.4 As illustrated below position the lamp facing towards the front of the unit with the POWER leads facing towards you. The lamp should be aligned so that the leading edge of the reflector (lamp rim) fits into the mounting groove on the lamp holder assembly.

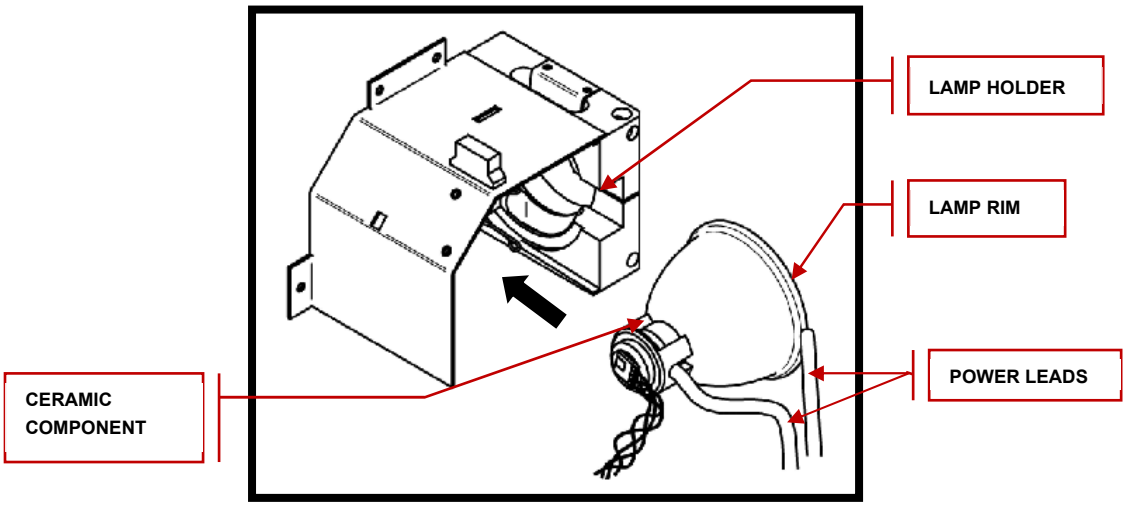


Figure 4 Lamp Direction

4.1.5 Make sure the middle of the lamp is in position to fit into the spring clamp. Slide the lamp until it snaps into the spring clamp. The leading edge of the reflector (lamp rim) should fit snugly into the lamp holder recess.

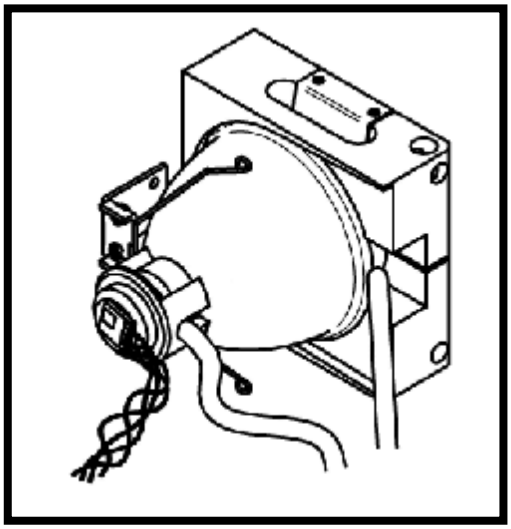
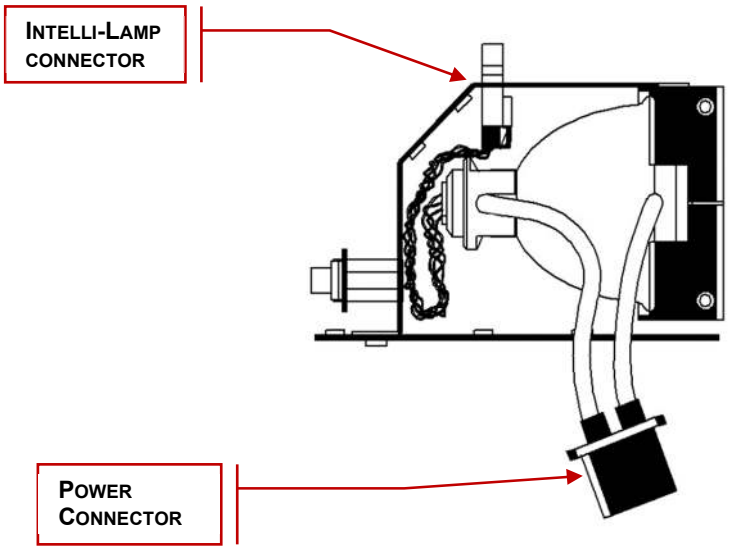


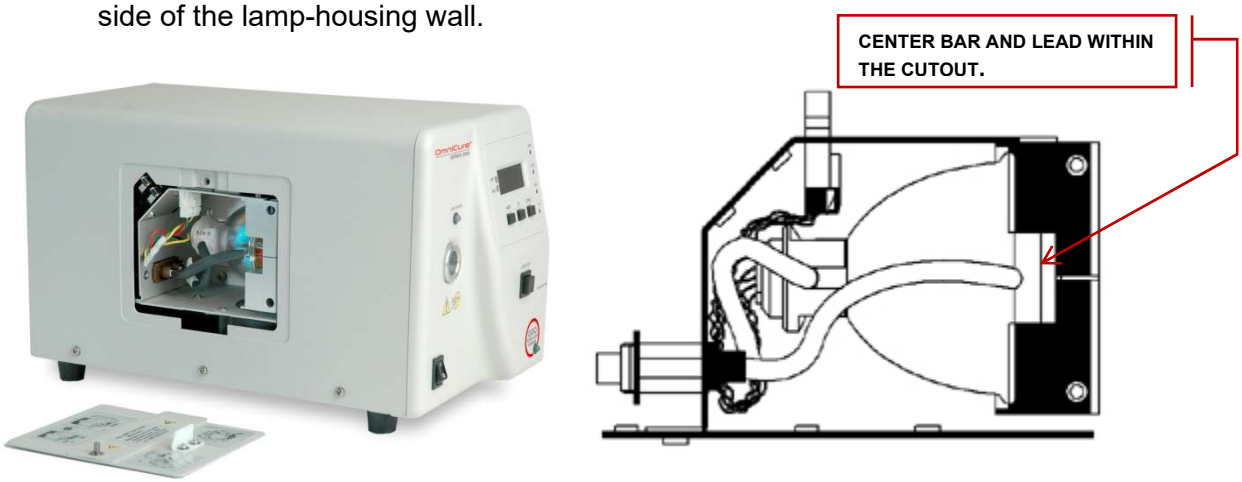
Figure 5 Lamp Connection

4.1.6 Locate the 4-pin Intelli-Lamp sensor connector at the rear of the lamp module and connect it to its mate located on the top of the lamp-housing wall.

> ***Tip**: the Intelli-lamp connector will only attach in the correct orientation. If you are having difficulty attaching the connector, try rotating it by 180º.*
> ***Note:** if the Intelli- lamp connector is not installed correctly, the lamp will not strike and the "bulb" message will display when POWER is turned on to the unit.*



4.1.7 Locate power connector with two leads and connect it to its mate located on the side of the lamp-housing wall.



4.1.8 Ensure the lamp anode cooling fin (bar) and lamp power lead, at the front of the lamp, are centered within the lamp holder cut out. Rotate the lamp as required.

4.1.9 Replace the lamp housing side panel and tighten the fastening screw.

> ***Note 1****: if the lamp housing panel is not secured completely the lamp will not strike and the "**bulb**" message will display when power is turned on to the unit.*
>
> ***Note 2****: if the wrong type of lamp has been installed in your unit the message "**E1**" will appear on the LED display. Refer to section 20 for troubleshooting information.*

5 Inserting and Removing the Light Guide

> ***Note:*** *3mm single leg liquid light guides are not compatible with the S2000!*

5.1.1 Ensure that the protective end caps are removed from both the input and output ends of the light guide prior to installation.

5.1.2 Insert the light guide into the light guide port located on the front panel of the unit. Push the light guide in until it seats with a second positive "click".

> ***Tip:*** *When the light guide is fully inserted, the LED above the light guide port will illuminate green when POWER is on to the unit. If the light guide is not fully inserted the LED will illuminate red.*
>
> ***Note:*** *the shutter will not open if the light guide is not fully inserted.*

5.1.3 During installation or removal, grasp the light guide on the strain-relief nearest the input end of the light guide.

> ***Note:*** *Never grip the light guide during installation or removal in a place other than the strain relief portion of the light guide.*

5.1.4 To remove the light guide, firmly grip the strain relief near the light guide retainer and pull out firmly.

5.1.5 Refer to section 19.5 for Light Guide Cleaning Instructions.

> ***Note:*** *The S2000 is designed for use with* Excelitas Technologies *Light Guides.* Excelitas Technologies *can not guarantee the performance of the S2000 if using light guides other than those supplied by* Excelitas Technologies.

6 Powering Up and Powering Down

Lamp Warm-UP:

The ARC lamp has 3 distinct phases of operation;

1. Ignition.
2. **Warm-up.** Excelitas Technologies **recommends 20 minutes of proper warm-up and to ensure a stable optical output.**
3. Stable Operation.

It is recommended that phase 1 and 2 are not interrupted. This can result in shortened lamp life. **The lamp must be allowed to warm-up uninterrupted.**

6.1.1 Ensure that the lamp and light guide have been properly installed and that the lamp housing panel is securely fastened.

6.1.2 Plug the S2000 unit into a properly grounded AC outlet.

6.1.3 Turn on the mains POWER switch "I ", located on the front panel and check the fan for airflow.

6.1.4 As soon as the LED display turns on it will display the version of software currently programmed in the S2000 (i.e. R – X). Once the software version level has been indicated, the display will reset after several seconds to the next display mode.

6.1.5 The lamp will automatically turn on within 45 seconds and the lamp indicator will illuminate and flash. The front panel display will flash during the warm up period for approximately 4 minutes. The display will stop flashing when the warm up period has completed.**,** Excelitas Technologies **recommends 20 minutes to ensure a stable optical output**.

Warning: *If the lamp is turned off, and an attempt is made to turn it back on before it has fully cooled, the "cool" message will appear on the display. The lamp will automatically re-strike when the lamp has cooled.*

6.1.6 To power down the unit, set the mains power located on the front panel to "0".

6.1.7 10 exposures must be run to save any new exposure settings (intensity & timer) into memory for it to remember next time the system is powered-up.

7 Output Intensity Modes/Calibration Process

7.1.1 Calibration of the exposure timer is not required.

7.1.2 The S2000 system uses a quarts crystal to generate it's system clock signal. It provides a stable and precise clock signal to the S2000 control system and sub-systems, including the timing module of the light intensity control shutter.

7.1.3 The accuracy of the S2000 exposure time is therefore determined by the oscillating frequency stability of it's quartz crystal. Quartz crystals are well known to oscillate at a constant frequency throughout their lifetime.

7.1.4 The S2000 design allows Excelitas Technologies to Guarantee the Exposure Timer Tolerance for the lifetime of the product. The exposure does not need calibration.

S2000 Exposure Timer Tolerance:
+/- 250ms or +/- 1% of the exposure time setting, whichever is greater.

7.1.5 The S2000 system can operate in two different output intensity modes: Absolute or Relative.

7.1.6 Absolute mode: refers to the condition when the S2000 has been calibrated. The display will show an absolute value of irradiance in W/cm2 and the front panel "CAL" LED is ON.

7.1.7 Relative mode: refers to the condition when S2000 has not been calibrated. The display will show the percentage of iris opening and the front panel "CAL" LED is OFF.

7.1.8 Section 8 describes adjusting the light output in both relative and absolute modes in greater details.

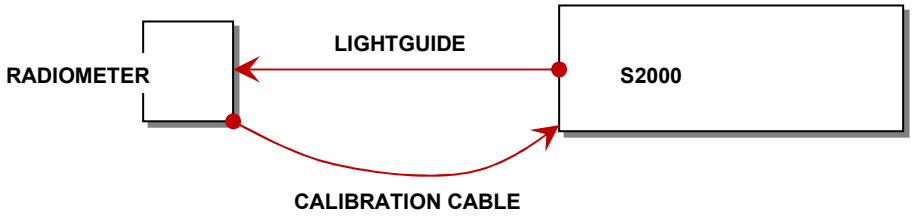
7.1.9 The S2000 can be calibrated and correspondingly set to a specified irradiance (set point) by the R2000 Radiometer. The R2000 Radiometer connects to the S2000 via the front side panel RS-232 radiometer port.

7.1.10 While the CAL button on the radiometer is pressed, the display will indicate the current set point and the SET icon will be flashing. If the CAL button on the radiometer is pressed for less than 5 seconds the current radiometer set-point will be sent to the S2000.

7.1.11 Holding this button for 5 seconds will store the current optical input into the radiometer's set point (this feature can be enabled or disabled via PC). The SET Icon will cease flashing and be continuously on until the button is released.

7.1.12 When the CAL button is pressed for less than 5 seconds, and then released, the radiometer will send the set point to the S2000 thus setting the S2000 in the absolute mode. Additionally, the current light guide diameter value selected by the radiometer will be transferred to the S2000. This light guide diameter will be used by the S2000 to calculate the proper output irradiance in W/cm2.

7.1.13 For detailed operating instructions regarding calibration of the S2000, refer to the R2000 user's guide.



8 Adjusting the Light Output

Your S2000 system includes an iris adjustment to control the intensity level of the light output from the unit. The intensity level adjustment is only possible when the front panel LEVEL LED mode indicator is illuminated.

The S2000 system offers 2 different operating modes: *Relative or Absolute*.

Relative Mode: offers an un-calibrated intensity level output which is displayed as a percentage of iris opening on the LED display.

Absolute Mode: offers a calibrated intensity level output from the unit which is displayed in irradiance (W/cm2) on the LED display. This mode is only accessible only when the S2000 has been calibrated with an R2000 Radiometer (front panel Calibration LED is ON).

> ***Note:*** *Removing the light guide from the front panel optical port while in Absolute Mode will cancel the unit's calibration, and the unit will automatically return back to the Relative Mode (CAL LED will turn OFF).*

8.1 Adjusting the Light Output in the Relative Mode ("CAL" LED is OFF)

8.1.1 Set your OmniCure S2000 to Level Mode by pressing the Mode button until the "LEVEL" LED on the front panel is illuminated. The "CAL" LED indicator will be OFF. The display will show CLF and the Closed-Loop Feedback LED will be illuminated. The only exception is when the unit is set to 100%, for maximum output power. In this case; the Closed-Loop Feedback option is not activated (Closed-Loop Feedback LED will be OFF) and the LED display will indicate 100 (% of iris opening).

> ***Note:*** *The Closed-Loop Feedback LED will be OFF if the exposure alarm is activated or the iris is at 100%.*

Note: Closed Loop Feedback shut-off @exposure time of .3 sec and lower.

> ***Warning:***
>
> ***UV light will be emitted from 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.***

> ***Note:*** *The shutter will not open if the light guide is not inserted properly.*

8.1.2 Press the **start /stop** button to open the shutter. The open LED indicator will illuminate. The display will show three (3) digits (XXX). The three digit number shown will indicate the percentage of maximum iris opening.

> ***Note**: While in Level Mode, pressing the **start/stop** button will manually open the shutter until the **start/stop** button is pressed again to close the shutter. The timer function will not be activated.*

8.1.3 Pressing the up button will increase the light output and pressing the down button will decrease the light output. For fine adjustments the displayed iris opening will increase or decrease by 1% increments for each time the up or down button is pressed.

> ***Note:** The shutter must be in the open position to make adjustments to the iris position.*

8.1.4 For coarse adjustments of 10% increments, press and hold the up or down button to rapidly increase or decrease the light output.

8.1.5 Press the start /stop button to close the shutter. The open LED indicator will turn off.

8.1.6 For any setting at 99% or less, the S2000 will record the optical output intensity using internal sensors for the Closed-Loop Feedback circuit. Each subsequent exposure will automatically generate the same optical output intensity, even as the lamp ages. As a result of lamp aging, subsequent exposures may display a higher iris open percentage value; however, the output intensity will be consistent with the original setting (+/-5% or 200mW/cm2, whichever is greater).

> **Note:** Closed Loop Feedback shut-off @exposure time of .3 sec and lower.

8.2 Adjusting the Light Output in the Absolute Mode

> ***Note 1**: The S2000 must be calibrated using the R2000 Radiometer. In absolute mode the front panel CAL and Closed-Loop Feedback LEDs will be illuminated.*
>
> ***Note 2**: Removing the light guide at any time from the front panel light guide port will require re-calibration of the S2000.*

8.2.1 Set your S2000 to Level Mode by pressing the Mode button until the LEVEL LED on the front display is illuminated. The LED display shows an absolute value of Irradiance in W/cm2. This value is referred to as a SET POINT.

Warning

UV light will be emitted from the 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 clothing to protect exposed skin.

Note: *The shutter will not open if the light guide is not inserted properly.*

8.2.2 Press the start /stop button to open the shutter. The open indicator will illuminate. The display will show the actual irradiance output (as opposed to the Set Point).

8.2.3 Press the up button to increase the light output intensity or press the down button to decrease the light output intensity. For precise adjustments press the button and release it within 1-4 sec.

8.2.4 For coarse adjustments, press and hold the up or down button for greater than 5 seconds to rapidly increase or decrease the light output.

8.2.5 Press the start /stop button to close the shutter. The open indicator will turn off.

8.2.6 To check the percent of iris opening while in the level mode; press and hold the Mode button. The LED display will indicate “XXX” percentage of iris opening.

Note: *While in Level Mode, pressing the start/stop button will manually open the shutter until the start/stop button is pressed again to close the shutter. The timer function will not be activated.*

Note: *While in Absolute Mode, and while the shutter is closed, the displayed irradiance value is the user defined Set Point. Whenever the shutter is opened the S2000 will immediately attempt to adjust the optical output to within +/-2% of the Set Point. The actual output irradiance will be displayed at this point and will vary slightly (to within +/-5% or 200mW/cm2, whichever is greater) from exposure to exposure.*

Note:
OmniCure® S2000 Minimum Adjustable Irradiance Level**:** 0.5W/cm²

9 Locking and Unlocking the UP/DOWN Adjustment Button

9.1.1 Your S2000 system allows you to disable the up/down buttons. When the system is locked, no modifications to the set time or the optical output power can be made. This can help to ensure process control when multiple operators are using the same equipment.

Note: This feature is available only when the unit is set to “Timer” or “Level” modes. Since the mode button is designed to make the mode jump to the next level i.e. Timer if you are in Hours Mode & Level if you are in Timer Mode, you should pre-set the mode to the previous level to lock the system in next level.

9.1.2 To Lock the up/down buttons:

A. Push and hold the mode button
B. While pressing the mode button, and within 2 seconds press the following sequence of buttons:

DOWN - UP – UP – UP

C. After 2 seconds the message “LOC” will appear for 2 seconds. While the system is locked, only the mode button and the start/stop button will function. If the up or down button is pressed, the “LOC” message will appear for 2 seconds.

9.1.3 To Unlock the up/down buttons:

A. Push and hold the mode button
B. While pressing the mode button, and within 2 seconds press the following sequence of buttons:

DOWN - UP – UP – UP

C. After 2 seconds the message “ULOC” will appear for 2 seconds. When the system is unlocked, all of the front panel buttons will perform their respective functions.

Note: *The front panel can also be locked via the PLC I/O’s (P1-pins 14 & 4) or via connection of the PC side software.*

10 Timed Exposures

Your S2000 system includes a timer to automatically close the shutter after a user selected amount of time. Adjustments to the exposure time can only be made when the S2000 unit is in Timer Mode.

10.1 Adjusting the Exposure Time

10.1.1 Set the system to Timer Mode by pressing the Mode button until the front panel "Timer" LED is illuminated. The LED display will indicate four digits with the "." (decimal) located to the left of the furthest right digit. The number shown will indicate the exposure time in seconds and tenth of seconds (XXX.X).

10.1.2 Press the up button to increase the exposure time by 1/10 sec, or press the down button to decrease the exposure time by 1/10 sec.

10.1.3 For coarse adjustments, press and hold the up or down button to rapidly increase or decrease the exposure time.

10.2 Running a Timed Exposure

10.2.1 While in Timer or Lamp Hours mode, press the start /stop button. The shutter will open and the exposure time will begin to count down. When the exposure time has elapsed to zero, the shutter will close.

10.2.2 Running a timed exposure is only possible when the unit is set in either TIMER or LAMP HOURS mode.

10.2.3 To view the remaining exposure time during a timing cycle, the unit must be set in TIMER MODE (Front panel TIMER LED is illuminated). The LED display will indicate the remaining time as the unit counts down.

Note: *The open LED indicator will illuminate when the shutter is open. The shutter will not open if the light guide is not inserted properly.*

Note: *To stop a timed exposure from running, press the start /stop button. The shutter will close and the exposure time will reset after approximately 2 seconds. The open LED will not be illuminated.*

11 Interfacing with the SERIES 2000

11.1 Connection Options

11.1.1 The S2000 is designed to be fully automated both quickly and easily via PLC control or computer control using the RS-232 port. All of the advanced features ensuring process control and curing repeatability can be accessed through built in standard optically isolated I/O signals. In addition to a foot pedal jack, there are two PLC compatible I/O connectors that are 15 pin DE style (P1 & P2), the RS-232 port is a D-Sub 9-position socket (P3). One RS-232 9 pin cable has been provided with the unit to expedite implementation.

11.1.2 Additionally, a stereo phono connector is available for a simple RS-232 radiometer connection on the side of the front panel.

11.1.3 The PLC I/O's, foot pedal and RS-232 port are optically isolated from the control S2000 control electronics. This has been done in order to maximize the S2000's immunity to noise and minimize its noise output. Even the analog inputs and outputs (intensity monitor output and intensity control input) are optically isolated from the control circuitry.

11.2 Input/ Output Signals and Descriptions

11.2.1 Output Signals

- an output signal is said to be active when the output is ON
- a signal is said to be ON when the transistor side of it's respective optocoupler is conducting current
- the description of current conduction is dependant upon its' end configuration, selectable by the user
- an output can be configured as active high in which case the transistor is sourcing current, or active low in which case the transistor is sinking current

Note: *Refer to the following page for examples of output signal circuit configurations.*

The "digital" outputs have the following characteristics:

>polarized type, output device:	optocoupler, NPN transmitter
>logic Level:	uncommitted emitter and collector can be used as active high or active low
>maximum voltage withstand:	30VDC capability (Vce):
>maximum carry current:	8 mA

Note: *a signal is said to be active when the transistor side output of the optocoupler is on/conducting and inactive when the transistor side of the optocoupler is off.*

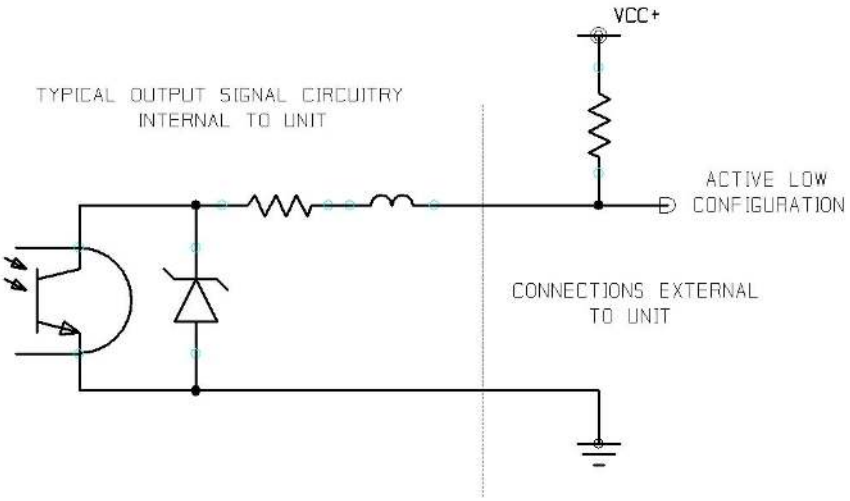


Figure 6 Active Low Signal Circuit Configuration:

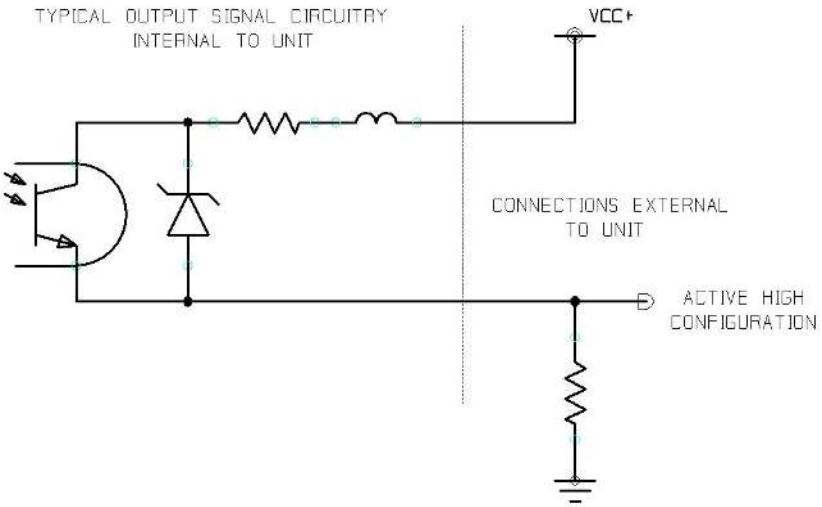


Figure 7 Active High Signal Circuit Configuration:

11.2.2 Input Signals

The "digital" inputs have the following characteristics:

>polarized type, input device	optocoupler, photo-diode, cathode side
>logic Level	active low, zero voltage input
>max open circuit output voltage:	6 VDC
>max current sinking requirement:	5mA
>logic low time for momentary	150mS, minimum

The diagram below is a sample connection method which may be utilized for the S2000 rear panel I/O connections:

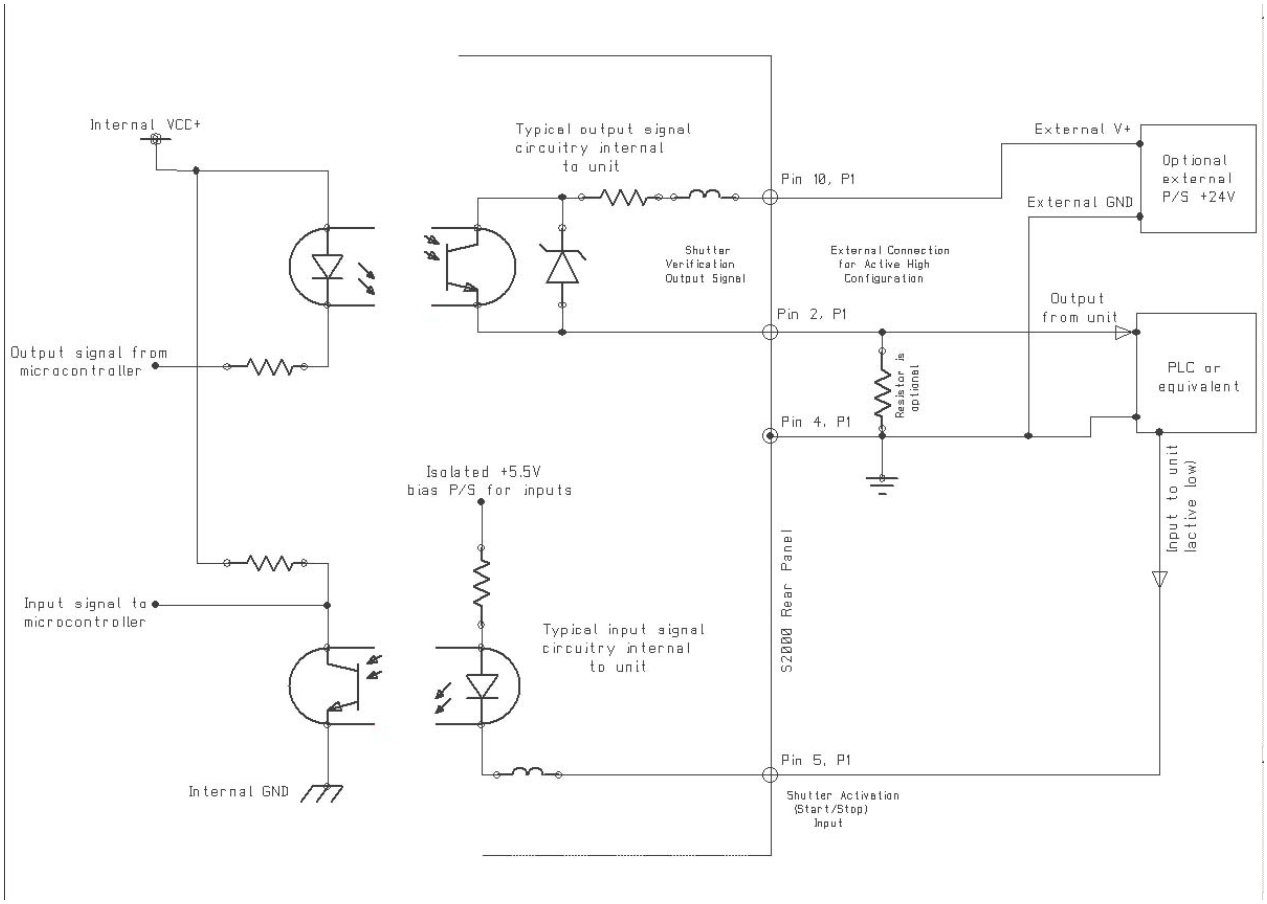


Figure 8 Rear Panel Sample Connection

11.2.3 Analog Signals

The analog I/O signals have the following characteristics:

Intensity Monitor Output
>output voltage: 1-5VDC
>maximum output current: 1mA
Intensity Control Input
>input voltage: 1-5VDC
>maximum input current: 500 µA

Four I/O signal connectors are located on the rear panel of the S2000 and one connector located is located on the right side of the front panel. Refer to the following pages for signal descriptions and locations.

11.2.4 PLC Signal Descriptions

The rear panel has an I/O signal connector labelled “P1”; it is a 15 pin DE style connector. It has the following pin-outs:

PIN NO	SIGNAL NAME
1	lamp ON output-emitter (-)
2	shutter verification output emitter (-)
3	exposure fault output-emitter (-)
4	common/return for inputs
5	shutter activation (start/stop) input
6	shutter interlock input
7	intensity adjust increase input
8	intensity adjust decrease input
9	lamp ON output-collector (+)
10	shutter verification output-collector (+)
11	exposure fault output-collector (+)
12	lamp power on/ off input
13	shutter signal select mode input
14	front panel lock input
15	intensity lock/ unlock input

Table 1 “P1” Pin-Out

Additionally, the rear panel Optional I/O signal connector labelled “P2”; it is a 15 pin DE style connector. It has the following pin-out:

PIN NO	SIGNAL NAME
1	alarm clear input
2	shutter alarm out (-)
3	shutter alarm out (+)
4	bulb alarm out (-)
5	bulb alarm out (+)
6	intensity control input
7	intensity monitor output (+)
8	cool out (-)
9	cool out (+)
10	sync out (-)
11	sync out (+)
12	mode button input
13	not used
14	common/return for intensity I/O
15	common for inputs (GND)

Table 2 “P2” Pin-Out

11.2.5 I/O signal connector (P1): signal descriptions

Pins 1 (-) and 9 (+): Lamp on output

This signal advises the user of the lamp status. When the lamp is ON the signal is active. When the lamp is OFF, the signal is inactive.

Pins 2 (-) and 10 (+): Shutter verification output

The shutter verification output signal remains inactive during successful shutter activations. The signal is active only when if a shutter activation failure is detected. This signal is also dependant on the state of the "Shutter verification mode" input signal.

Pin 3 (-) and 11 (+): Exposure fault output

This signal is inactive during successful exposures and active only when the intensity deviates by more than +/- 10% from the current intensity setting.

Pin 4: Common/return for inputs

The isolated common/return signal is the reference point for all digital inputs.

Pin 5: Shutter activation (start/stop) input

This is a contact closure type signal with dual feature input. The shutter activation input triggers the shutter. The functionality of this signal duplicates the front panel start/stop button. When the PLC Shutter signal mode in GUI system administration is selected to Pulsed Mode(default), a momentary closed contact activates the internal timer. When the PLC Shutter signal mode is selected to Level Mode, continuous closed contact provides external timing as the iris remains open for the duration of the contact closure.

Pin 6: Shutter interlock input

The shutter interlock input is a closed contact type signal. Activating this signal by closing the contact will prevent the shutter from opening. Leaving this signal open will result in normal unit operation.

Pin 7: Intensity increase input

The intensity increase input is a contact closure type signal that allows the user to remotely increase the output intensity of the unit. A closed contact signal will increase the intensity by 1 increment once the intensity lock/ unlock mode contact is closed.

Pin 8: Intensity decrease input

The intensity adjust down input is a contact closure type signal that allows the user to remotely decrease the output intensity of the unit. A closed signal will reduce the unit's output intensity by 1 increment once the intensity lock/ unlock mode contact is closed.

Pin 12: Lamp off/on input

This contact closure type signal toggles power to the lamp. If the lamp is OFF, a momentary closed contact will turn the lamp on. Conversely, if the lamp is ON, a momentary closed contact on this input will turn the lamp off.

Pin 13: Shutter verification mode input

Providing a contact closure changes the mode of the shutter verification output signal found on pins 2 and 10 to a shutter position indicator. When this feature is in use, pins 2 and 10 will be active when the shutter is open and inactive when the
shutter is closed.

Pin 14: Front Panel lock/ unlock input

This contact closure type signal locks/ unlocks the front panel controls.

Pin 15: Intensity lock/ unlock input

The intensity lock/ unlock input is a contact closure type signal. This signal must be activated to allow use of the intensity increase or intensity decrease signals as described above.

11.2.6 I/O signal connector (P2): signal descriptions

Pin 1: Alarm clear input

This signal allows the user to clear the alarm state of the unit. Accompanied with an alarm signal would be an audible alarm. In addition to clearing the output alarm signal this input signal would allow the user to shut down the audible alarm.
When an activation signal is received, the alarm state of the S2000 will be cleared.

Pins 2 (-) & 3 (+): Shutter alarm output

This signal provides an indication of a shutter failure. The output signal is ON when an alarm condition is present. The optocoupler is OFF at all other times.

Pins 4 (-) and 5 (+): Bulb alarm out

This signal provides an indication of a lamp failure. The output signal, accessible through pins 4 and 5, is ON when an alarm condition is present. The optocoupler is OFF at all other times.

Pin 6: Intensity control input (external feedback)

This option is optically isolated. This analog input pin has been provided to allow the S2000 to regulate its output intensity at the cure site or somewhere external to the unit. The DC input voltage should range between 1VDC and 5VDC depending on the sampled intensity. The relationship between the output intensity and the input voltage should match that of the intensity monitor output, as follows:
Input Voltage = 1 + (Required Output POWER * 0.36) W (1W=1.360V, 0W = 1VDC)

Pin 7: Intensity monitor output (+)

This option is optically isolated. An intensity monitor assembly located within the optical tube continually monitors the intensity of the lamp module at the light guide entrance. The DC voltage provided ranges between 1VDC and 5VDC depending on the sampled intensity. The relationship between the intensity and the output voltage is as follows:

Output Voltage = 1 + (POWER * 0.36) W (1W = 1.360V, 0W = 1VDC)

Pins 8 (-) & 9 (+): Cool output

This signal is enabled when the “Cool” message is displayed on the LED display. (Lamp is too hot to strike). Once the lamp re-strikes, the signal disables.

Pins 10 (-) & 11 (+): Sync output

This signal is enabled only during a timed exposure cycle. Once the cycle is completed and the shutter closes, the signal becomes disabled.

Pin 12: Mode Input

Provides remote operation of the front panel “Mode” button via a contact closure input. Allows remote selection of timer, level or lamp hour modes. Mode selection can be verified by front panel LED’s.

Pin 14: Common for intensity I/O

The common/return signal is the reference point for all analog inputs.

Pin 15: Common/ return for inputs (GND)

This pin is used as a return for the inputs. Tying any of the inputs to this pin will activate that input function.

11.2.7 RS-232 9 Pin Connector (P3): Signal Descriptions

The rear panel 9 pin RS-232, female connector is labelled “P3”. This is a RS-232 interface which utilizes a standard 9 pin serial cable that is supplied with the unit. Plugging the cable into any free serial port of a PC, allows data to be transferred to and from a PC to perform a variety of functions. All functions are initiated by a program that executes on the PC. See Section 16 for further details.

PIN NO	SIGNAL NAME
1	N/C
2	RS232 transmit
3	RS232 receive
4	DTR (Data Terminal Ready)
5	RS232 GND
6	N/C
7	N/C
8	N/C
9	N/C

Table 3 “P3” Pin-Out

11.3 Radiometer RS-232 Phono Connector: Signal Descriptions

11.3.1 The side front panel RS-232 stereo phono connector is labelled “Radiometer”. This connector is used to connect S2000 to the R2000 Radiometer for calibration and setup purposes. It is a RS-232 connector dedicated to communication with the R2000 Radiometer.

PIN NO	SIGNAL NAME
1 (Shield)	GND
2 (Ring)	Tx
3 (Tip)	Rx

Table 4 RS-232 Phono-Connector Pin-Out

11.4 Audio Style Foot Pedal Connector: Signal Descriptions

11.4.1 The rear panel foot pedal connector, a 3 mm audio style jack, has the following pin-out:

Connection Point	SIGNAL NAME
Outer Rim	Positive input, active low
Center Pin	Common ground (GND)

Table 5 Foot Pedal Pin-Out

11.4.2 This is a simple 2-wire, audio style jack that can be connected to a foot pedal (supplied with each unit) or any other electro-mechanical triggering device. This is an exposure trigger input used to start an exposure. The shutter activation input and front panel START/STOP button will also trigger the shutter.

12 Viewing the Accumulated Lamp Hours

12.1.1 Your S2000 system automatically accumulates the number of hours that the lamp is on and shows this information on the LED display. The lamp hours are shown when the unit is in Lamp Hour mode.

12.1.2 Set your S2000 to Lamp Hour Mode by pressing the Mode button until the “L HRS” LED on the front panel is illuminated. The LED display will indicate four digits with a flashing “.” (decimal) located to the right of the furthest right digit. This shows the accumulated number of hours the lamp has been on. (XXXX.)

> ***Note**: Pressing the start/stop button while in Lamp Hour mode will open the shutter for the set Exposure Time.*

13 Messages / Indicators

The S2000 display and LED indicators provide information to the user to aid in unit operation and to advise when certain conditions exist. The following is a collective listing of messages and their meanings.

1. **"XXXX."**
   A flashing decimal point to the right of the four numbers on the display advises the user that the unit is in Lamp Hour Mode. See Section 12, Viewing the Accumulated Lamp Hours.

2. **"XXX.X"**
   A decimal point to the left of the furthest right digit of the four digits on the display indicates the unit is in Timer Mode. The number shown will indicate the exposure time in seconds and tenth of seconds. See Section 10, Timed Exposures.

3. **“XX.XX”**
   The unit displays Irradiance in W/cm2 if it has been calibrated and set to Absolute Intensity Mode. Decimal point is solid.

4. **“CLF”**
   The unit has not been calibrated and has been set to Relative Intensity Mode. Shutter is closed. Closed-loop feedback is available.

5. **"XXX"**
   Three digits on the display indicate that unit is in Intensity Mode and shutter is open. The three digit number shown will indicate the percent iris opening. See Section 8, Adjusting the Light Output.

6. **"bulb"**
   The "bulb" message advises the user that the bulb has failed to ignite or extinguished after striking.
   If the bulb message appears immediately after power up and is accompanied by an audible beeping, this indicates that the lamp has not been installed correctly. See Section 4, Installing the Lamp Module.
   If the bulb message appears after about 45 seconds and is accompanied by an audible beeping, this indicates that the lamp has failed to strike. It may be a result of the lamp reaching end of life, that the lamp housing panel is not secured properly in place or that the lamp power connector is not plugged in. Press the start/stop button to clear the audible alarm. Turn power off to the unit and disconnect power cord. Check that the lamp housing panel is secured properly in place and verify that all lamp connections as correct as per section 4. Wait a few minutes and turn power on to the unit. If it still does not strike, re-check all electrical connections to the lamp.

7. **" old / bulb"**
   The “old” and then “bulb” message appear in alternating sequence for about 10 seconds when POWER is first turned on to the unit if the accumulated lamp hours have reached 2000 hours. When this message occurs, it is recommended that the lamp be replaced soon.

8. **" end / bulb"**
   The “end” and then “bulb” message appear in alternating sequence when POWER is first turned on to the unit if the accumulated lamp hours have reached 4000 hours. This indicates that the lamp has reached the end of safe life. If the lamp hours reach 4000 hours, safety measures will prevent the lamp from striking or extinguish the lamp if it is running. The lamp must be replaced at this point.

9. **"cool"**
   The "cool" message advises the user that the lamp must cool down before re-ignition. It appears on the display when POWER is turned on to the unit and the lamp is too hot to strike. Striking the lamp when it is too hot will significantly reduce lamp life. The lamp will automatically strike once it has reached optimum temperature.

10. **"LOC"**
    The LOC message appears for about 2 seconds when the up/down adjustments are initially locked. It also appears if the up or down button is pressed while they are locked, advising the user that these functions are locked out. See Section 9 – Locking and Unlocking the up/down Adjustment Buttons.

11. **"ULOC"**
    The ULOC message appears for about 2 seconds after unlocking the up/down adjustment buttons to advise the user they have been unlocked. See Section 9 – Locking and Unlocking the up/down Adjustment Buttons.

12. **"SFI"**
    The “SFI” message appears if there is a shutter failure. The lamp will shut down when a shutter error occurs. POWER down the unit, wait a few minutes and turn POWER on to the unit. If the unit displays a shutter failure again, contact your local Excelitas Technologies Service Centre to have your unit serviced.

13. **“CAL”**
    The “CAL” message appears if the unit is being calibrated.

14. **“E1”**
    The “E1” message appears when the wrong type of lamp has been installed into the unit. Turn off power as per section 6 and verify that the lamp part number is correct for the applicable lamp type (standard or surface curing). Restart the system as per section 6. If error re-occurs the unit should be serviced.

15. **E3**
    The “E3” message appears on the display when the lamp temperature monitoring has turned off the lamp due to excessive heat. Turn off power as per section 6 and verify the cooling exhaust vent is not blocked. Restart the system as per section 6. If error re-occurs the unit should be serviced.

16. **E4**
    The “E4” message appears on the display when an internal error has occurred. Turn off power and restart as per section 6. If error re-occurs the unit should be serviced.

17. **E5**
    The “E5” message appears on the display when the communication to the intellilamp has failed. Turn off power as per section 6, open the lamp access door and verify all connections are secure. Restart the system as per section 6. If error re-occurs the unit should be serviced.

18. **E6**
    The “E6” message appears on the display when an internal error has occurred. Turn off power as per section 6, disconnect foot pedal, check for control buttons stuck down and restart after 5 minutes. Restart the system as per section 6, if error re-occurs the unit should be serviced.

18. **“EFI”**
    The “EFI” message appears on the display when an exposure failure (alarm condition) occurs.

14 LED Indicators

LED indicators display the status of the following:

- Light Guide
- Lamp
- Shutter
- Calibration
- Display Modes: Timer/ Level (Intensity) / Lamp Hours

The following table describes LED status and descriptions of each status in details.

LED Indicator	Status	Description
Light Guide	On – Green	The light guide is fully inserted
Light Guide	On – Red	The light guide is not fully inserted
Lamp ON	On	The lamp is on
Lamp ON	Off	The lamp is off
“Open” Shutter Status	On	The shutter is open
	Off	The shutter is closed
Timer Mode	On	The unit is in timer mode; LED display indicates exposure time.
LEVEL Mode:	On	The unit is in intensity mode; LED display indicates intensity in mW/cm2 when calibrated OR LED display indicates percentage of iris opening when unit is not calibrated.
L Hrs Mode	On	The unit is in lamp hours mode; LED display indicates accumulated lamps
Cal	On	The S2000 has been successfully calibrated
	Off	The S2000 requires calibration via R2000 radiometer
Closed-Loop Feedback	On	The S2000 Closed-Loop Feedback is operational
	Off	The S2000 Closed-Loop Feedback is not operational

Table 6 LED Status

15 Clearing Audible Alarm

15.1.1 The S2000 provides an audible alarm to alert the user of various error conditions.

15.1.2 To clear the audible alarm:

1. Press the front panel start/stop button

***Note**: Alternately, depressing the foot pedal, or providing a momentary contact closure on the rear panel analog jack, will clear an audible alarm.*

2. The audible alarm can be also cleared remotely:
- From a PC through I/O port when the “CLR” command is sent to the S2000.
- Through the PLC I/O port via P2: pin 1 and pin 15

16 Remote Automated Control Requirements

16.1.1 The S2000 system is designed to provide remote automated control of the UV spot curing system from a PC.

16.1.2 The S2000 PC software requirement specification below is used to describe the communication protocol between the S2000 unit and a PC.

WARNING: *If the user does not observe and adhere to the protocol and command timing specifications, abnormal unit operation will result!*

16.2 Com Port Configuration:

Baud rate:	19200
Data bits:	8
Parity:	None
Stop bits:	1
Flow Control:	None

16.3 Message Format and Protocol:

16.3.1 All commands sent to the S2000 and responses from the S2000 include 3 pieces of data: the command section, a CRC8, and a carriage return ("\r" in C code or chr$(13) in basic code). The CRC8 (one byte value) is entered as a hex string. Please refer to CRC8 routine for details in section 16.7

16.3.2 When the carriage return character (CR) is received, the S2000 will respond with an error message if there is a problem.

For example:

Error Message Response: "Err67\r"

16.3.3 If there are no errors, the S2000 will respond as indicated below. In the example, the XX presents one byte CRC8 value.

Note: *The command "CONN18\r" must be sent out first to establish communication with the connected PC. If a "READY0A\r" is received from the S2000, communications can commence with the unit, otherwise, the command "CONN18\r" should be resent until the response "READYOA\r" is received.*

16.4 Command Descriptions:

1. **Connect S2000**
   Command to S2000; **CONN**
   Response from S2000; **READY**

2. **Disconnect S2000**
   Command to S2000; **DCON**
   Response from S2000; **CLOSE**

3. **Lock the front panel**
   Command to S2000; **LOC**
   Response from S2000; **Received**

4. **Unlock the front panel**
   Command to S2000; **ULOC**
   Response from S2000; **Received**

5. **Clear Alarm**
   Command to S2000; **CLR**
   Response from S2000; **Received**

6. **Get unit status**
   Command to S2000; **GUS**
   Response from S2000; **n** (n represents a integer number)

   Example:
   If “50XX\r” is received, the unit status is as follows: Alarm - Off; Shutter Home – Pass; Lamp – On; Lamp Ready – Yes; Shutter – Close; Front Panel – locked; Calibration – No; Exposure Fault – No.

   Note: *Please refer to Table 7 Unit Status for details.*

7. **Run a timed exposure**
   Command to S2000; **RUN**
   Response from S2000; **Received**

8. **Open Shutter**
   Command to S2000; **OPN**
   Response from S2000; **Received**

9. **Close Shutter**
   Command to S2000; **CLS**
   Response from S2000; **Received**

10. Turn On Lamp

Command to S2000; **TON**
Response from S2000; **Received**

11. Turn Off Lamp

Command to S2000; **TOF**
Response from S2000; **Received**

12. Get Lamp Configuration

Command to S2000; **GLH**
Response from S2000; **n** (n represents a integer number)
Bit 15: Abuse Bit (0=OK, 1=lamp abused)
Bit 14: Lamp Type (0= surface curing, 1=standard)
Bit 13 – Bit 0: Lamp Hours

Example:
If "20XX\r" is responded, the lamp configuration is as follows:
No abuse bit set, surface curing with 20 hours lamp.

13. Get calibrated lamp hours

Command to S2000; **CLH**
Response from S2000; **n** (n represents a integer number in hours)

Example:
If "20XX\r" is responded, the unit was calibrated when the lamp hours was 20.

Note: *Need CAL – the S2000 need to be calibrated before the calibrated lamp hours can be obtained.*

14. Get iris Level

Command to S2000; **GIL**
Response from S2000; **n** (n represents a integer number 1-100)

Example:
If "20XX\r" is responded, the iris Level will be 20%.

15. Clear unit calibration

Command to S2000; **CLC**
Response from S2000; **"Done"**

16. Get exposure time

Command to S2000; **GTM**
Response from S2000; **n** (n represents a integer number in 100's of msecs)

Example:

If "20XX\r" is responded, the exposure time will be 2 seconds.

17. Get software versions from main board

Command to S2000; **VEB**
Response from S2000; **n** (n represents a integer number)

Example:

If "10XX\r" is responded, the software version on the main board will be 1.0.

18. Get software versions from I/O board

Command to S2000; **VIO**
Response from S2000; **n** (n represents a integer number)

Example:

If "10XX\r" is responded, the software version on the I/O board will be 1.0.

19. Get SERIES 2000 serial number

Command to S2000; **GSN**
Response from S2000; **n** (n represents a integer number)

Example:

If "20XX\r" is responded, the S2000 serial number will be 20.

20. Get light guide diameter

Command to S2000; **GLG**
Response from S2000; **n** (n represents a float number)

Example:

If "2.5XX\r" is responded, the light guide diameter will be 2.5mm

Note:

- *If "3.402823466e38XX\r" is responded, no light guide diameter information is available.*
- *If the unit is in LEVEL mode, "Need CAL" will be the response.*
- *If "-3.403823466e38XX\r" is responded, no light guide diameter information is available. The S2000 displays LEVEL instead of irradiance.*

21. Get SERIES 2000 POWER set point

Command to S2000; **GPW**
Response from S2000; **n** (n represents a float number in Watts)

Example:

- If "1.222XX\r" is responded, the S2000 LEVEL set point will be 1.222 W.
- If the unit is in LEVEL mode, "Need CAL" will be the response.

22. Get SERIES 2000 irradiance set point

Command to S2000; **GIR**
Response from S2000; **n** (n represents a float number in Watts per square cm)

Example:

- If "15.66XX\r" is responded, the S2000 irradiance set point will be 15.66 W/cm2.
- If the unit is in LEVEL mode, "Need CAL" will be the response.

23. Get SERIES 2000 actual irradiance reading

Command to S2000; **GIM**
Response from S2000; **n** (n represents a float number in Watts per square cm)
If the unit is in LEVEL mode, “Need CAL” will be the response.

Example:
If “15.66XX\r” is responded, the S2000 irradiance reading will be 15.66 W/cm2.

24. Get SERIES 2000 maximum irradiance output

Command to S2000; **GMP**
Response from S2000; **n** (n represents a float number in Watts per square cm)
If the unit is in LEVEL mode, “Need CAL” will be the response.

Example:
If “35.66XX\r” is responded, the S2000 maximum irradiance output will be 35.66 W/cm2.

25. Set iris Level

Command to Series 2000; **SILn**

***Note**: 0 < n ≤100*
n must be a integer number

Example:
If “SIL20XX\r” is set, the S2000 iris Level will be 20%.

Response from S2000;
Received – if the value n is valid
Invalid – if the value n is out of range
Done CAL – the S2000 has been calibrated, so the value can not be set.
EXP – the S2000 is running a timed exposure, so the value cannot be set.

26. Set exposure time

Command to S2000; **STMn**

Note: *2 ≤ n ≤ 9999*
n must be a integer number

Example:

If “STM10XX\r” is set, the S2000 exposure time will be 1 second

Response from S2000;

Received – if the value n is valid
Invalid – if the value n is out of range
EXP – the S2000 is running a timed exposure, so the value cannot be set.

27. Set LEVEL set point

Command to S2000; **SPWn**

Note*: n ≥ .1 (5mm LG)*
n ≥ .25 (8mm LG) and n is a float number

Example:

If “SPW2.55XX\r” is set, the SERIES 2000 LEVEL set point will be 2.55 W.

Response from S2000;

Received – if the value n is valid
Invalid – if the value n is out of range
Need CAL – the S2000 need to be calibrated before the value can be set.
EXP- the S2000 is running a timed exposure, so the value cannot be set.

28. Set irradiance set point

Command to S2000; **SIRn**

Note: *n > 0, and n is a float number*

Example:

If "SIR15.32XX\r" is set, the S2000 irradiance set point will be 15.32 W/cm2.

Response from S2000;

Received – if the value n is valid
Invalid – if the value n is out of range
Need CAL – the S2000 need to be calibrated before the value can be set.
EXP – the S2000 is running a timed exposure, so the value cannot be set.

29. Get PLC Mode

Command to S2000; **GPM**
Response from S2000; **n**

Note*: If n is '1' then trigger level mode is enabled, if it is '0' then trigger level mode is disabled.*

30. Set PLC Mode

Command to S2000; **SPMn**

Note*: n, if n is 0 then trigger level mode is disabled. If n is 1 then trigger level mode is enabled.*

Response from S2000;

Received – if the command has been accepted.
Invalid – if the value is outside the specified range.

16.5 Command Timing Specification:

16.5.1 The minimum amount of time required for data to be received by the PC is over 20mS except for any commands related to iris movement which is over 200msec. The next command must be sent after the previous command is responded by the unit. Failure to adhere to this requirement will result in dropped responses as well as other undesirable effects.

16.6 Graphic User Interface Control:

16.6.1 When the unit is connected to PC, the unit front panel will be automatically locked out. The unit status will be sampled at twice per second. Refer to section 20 for detailed operating description of the GUI.

16.7 Sample Code:

Example Borland C++ code for command "GLG" – Get light guide diameter

```
void __fastcall TForm1::Cmd33Click(TObject *Sender)
{
   signed char Tries = 4;
   float  LG_diameter;

   unsigned char     *Command;
   String           Textcom= "GLG";
   int            Command_CRC;

   Timer1->Enabled = false;
   Cmd33->Enabled = false;

   Command = Textcom.c_str();
   Command_CRC = CalcCRC8(0, Command, 3); // Calculate CRC8 for the
command "GLG"

  Screen->Cursor = crHourGlass;                    // Show hourglass
cursor
  Application->ProcessMessages();

   while (Tries--)
   {
      ComPort->FlushInBuffer();
      ComPort->FlushOutBuffer();
      ComPort->PutString(Textcom);                  // send the
command "GLG"
      ComPort->PutChar(Asc[Command_CRC>>4]);              // send the
CRC8 in hex string
      ComPort->PutChar(Asc[Command_CRC & (0xF)]);     // send the CRC8
in hex string
      ComPort->PutChar('\r');

     a=0;
     UnitResponse = "";

     TimeOut = false;
     TimeOutTimer = 1;
     while (TimeOutTimer) Application->ProcessMessages();

    if (a == '\r')
    {
          a = 0;
       if (CompareCRC())                           // Check if the data is
received correctly
```

```
      {
            if ( strcmp(RdPtr, "Err") == 0)            {
              MessageDlg("Command is wrong", mtError, TMsgDlgButtons() <<
mbCancel, NULL);
                Screen->Cursor = crDefault;
                     Cmd33->Enabled = true;
                Timer1->Enabled = true;
                     Application->ProcessMessages();
                     return;
           }  else   {
                     LG_diameter = atof(RdPtr);
                     Edit9->Text = FloatToStrF(LG_diameter, ffFixed, 12, 3);

                     Screen->Cursor = crDefault;
                     Cmd33->Enabled = true;
                     Timer1->Enabled = true;
                      Application->ProcessMessages();
             return;
            }
          }
     }
  }

 if (TimeOut)
       MessageDlg("No response from Unit", mtError, TMsgDlgButtons() <<
mbCancel, NULL);

 Screen->Cursor = crDefault;
 Cmd33->Enabled = true;
 Timer1->Enabled = true;
 Application->ProcessMessages();
```

Bit		0	1	2	3	4	5	6	7
		Alarm	Lamp	Shutter	Home	Lamp Ready	Lock	Calibration	Exposure Fault
Status	0	Off	Off	Close	Pass	No	Off	No	No
	1	On	On	Open	Fault	Yes	On	Yes	Yes

Table 7 Unit Status

CRC8 sample code:

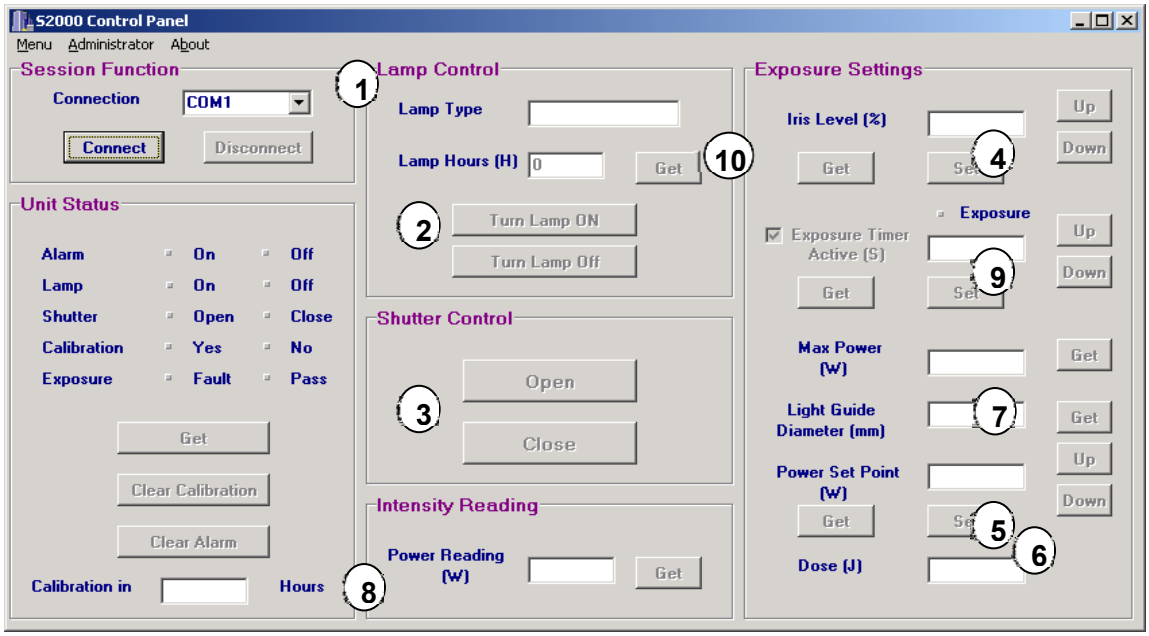
```
unsigned char CalcCRC8(unsigned char  *Data)                    // calc 8 bit CRC
{
  unsigned char LoopCntr;
  unsigned char CRC8;
  unsigned char A;
  unsigned char i;

  CRC8 = 0;                                                     // reset CRC8

  for (i = 0; i < 8; i++){                                      // data loop
       A = *Data++;                                             // get first data byte
      for (LoopCntr = 0; LoopCntr < 8; LoopCntr++, A >>= 1){   // 8 bit loop
       if ((A ^ CRC8) & 0x01){                                  // test bit 0 of (OneWire.Data XOR
CRC8)
            CRC8 ^= 0x18;                                       // toggle bits 3 and 4 of CRC8
            CRC8 >>= 1;                                         // rotate right CRC8, 1 time
            CRC8 |= 0x80;                                       // set bit 7 of CRC8
       }else
            CRC8 >>= 1;                                         // rotate right CRC8, 1 time
    }
  }
  return CRC8;
```

17 S2000 Graphical User Interface

The purpose of the Graphical User Interface (GUI) is to provide quick control of the S2000 UV curing system functions via a remote PC. There is no need to create code or applications.
The main GUI below is the Control Panel which is used to control the S2000 unit:



The Control Panel provides the following features:

1. COM port selection
2. Lamp ON/OFF control
3. Shutter control
4. Relative intensity setting control
5. Absolute intensity setting control in power
6. Absolute intensity setting control in irradiance
7. View light guide diameter
8. View calibration expiration time
9. Exposure time setting
10. Display lamp hours

Display unit status:

- Alarm
- Shutter position
- Lamp status; lamp warming up (yellow)
- Calibration status
- Exposure failure status

17.1 S2000 Software Minimum PC Configuration Requirements

The following are the minimum requirements for a PC to be used with the S2000 Control Panel software:

- 300+ MHz recommended Pentium or equivalent processor
- 64 MB RAM
- 10 MB available storage for software installation
- 20MB additional storage (suggested) for your data files
- SVGA video 800 X 600 resolution, 8-bit color (16-bit color or better recommended)
- Available RS-232 COM port required for one-time setup procedure and for remote unit operation

Operating System Requirements:
Microsoft Windows® 98, NT, 2000, ME or XP

17.2 Installing S2000 PC Control Panel Software

Perform the following to install the S2000 software:

17.2.1 Turn on the PC to be used with the S2000 system

17.2.2 It is recommended that any other Windows programs currently in use be shut down

17.2.3 Insert the S2000 Control Panel software CD in the CD-ROM drive of your PC

17.2.4 Right-click your mouse on the Windows Start button and select Explore

17.2.5 Left-click on Explore and select the appropriate drive containing the Series 2000 installation CD (usually D :)

17.2.6 Double click on SETUP.EXE

17.2.7 Next 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.

17.2.8 Click on “finish” to complete the installation.

17.2.9 To access the control panel software program, click on the Windows Start menu and select: programs/EXFO►/S2000 Control Panel. A screen with a title bar displaying “S2000 Control Panel” at the top will appear on you monitor.

17.3 Session Function - S2000 Connection

17.3.1 Connect the rear panel RS-232 port (P3) on the SERIES 2000 unit to an available COM port on your PC using the 9 pin cable assembly supplied.

17.3.2 Ensure that your S2000 unit is plugged in a functional AC outlet.

17.3.3 Turn on the front panel POWER switch and wait until the warm-up period has been completed (front display has stopped flashing).

17.3.4 Next, on the GUI, in the "Session Function" control block, click your mouse on the "Connection" text box to select the appropriate COM port link. Select "COM 1" or "COM 2", etc.

17.3.5 Next, click on the "Connect" button. If the wrong COM Port number has been selected, then the following error message will appear:

17.3.6 "No response from unit". If this occurs click on "Cancel" and re-select the appropriate COM link.

Note: *Once the appropriate link has been established all of the functional buttons on the graphical user interface will become enabled (high-lighted). Disabled (non-functional) control buttons will be greyed out. The S2000 unit controls will be locked and the unit will be in lamp hour mode.*

17.4 Lamp Control

Lamp Type:

Depending on the type of lamp that is provided with your unit, one of the following messages will be displayed in the "Lamp Type" text box: "Surface Curing" or "Standard Curing"

Lamp Hours:

The amount of elapsed lamp hours is displayed in the test box labelled "Lamp Hours (H)". To update the reading to the current value, right click your mouse on the adjacent GET control button.

Lamp On/ Off:

The lamp in the S2000 is turned on automatically once the front panel POWER switch on the unit is set to the ON position. To remotely turn the lamp off, click on the "Turn Lamp Off" button in the Lamp Control section on the GUI. The following message will be displayed: "Are you sure you want to turn the lamp off?" Click on "Yes" to confirm. The lamp will shut off and the Unit Status indicators will confirm by showing Lamp "Off". To turn the lamp back on, click on the "Turn Lamp On" button.

Note: *During the lamp warm-up cycle, or if the lamp is to hot to strike, both "Lamp On" and "Lamp Off" buttons will be disabled until the warm-up/ cooling cycle has been completed. Once the "Turn Lamp On" button has been selected, the lamp will turn on automatically when the unit has cooled to the appropriate temperature.*

17.5 Exposure Settings

17.5.1 Iris Level (% of Iris Opening): Relative Mode only

17.5.2 Iris Level can be selected by the Up/Down control buttons next to the Iris Level text box only when the unit is in Relative mode (calibration LED OFF). In Absolute Mode when the unit is calibrated, these buttons will be greyed out (non-functional).

17.5.3 Method 1: Click on the “Up/ Down” buttons located right of “Iris Level (%)” to select the desired Level. The percentage of iris opening will change in 1% increments. The set value will be displayed in the iris Level text box.

17.5.4 Method 2: Click in the iris Level text box and enter the numerical value in the box, then click on the SET control button. Once the SET control button is greyed out, the new setting has been entered and saved.

> ***Note:*** *If 0% is selected the shutter will not open and the error message will appear: “Value is outside of allowable range”. The value must be set from 1 to 100.*

17.6 Intensity Level (Irradiance in W/cm2): Absolute Mode only

17.6.1 Intensity Level can be set in irradiance (W/cm2) when the unit is in Absolute mode (calibration LED is ON).

17.6.2 The maximum available output LEVEL in irradiance (W/ cm2) is displayed in the “Max Irradiance” text box. Click on the GET button to update the reading to the current value. This displayed value is the maximum available output intensity from the unit.

17.6.3 Method 1:To set the optical output to a specified irradiance value, click on the “Irradiance Set point” UP and DOWN buttons until the desired value is displayed in the irradiance set point text box. The value will change in increments of 10 mW/cm2.

> ***Note:*** *If the selected value is greater than the maximum available value, an error message will appear. Re-select a value at or below the maximum available output.*

17.6.4 Method 2: Set the output LEVEL in irradiance (W/cm2) by clicking on the irradiance set point text box and typing in the desired value. Once the value has been entered, click on the SET button. Once the set button has greyed out, the value has been entered.

> ***Note:*** *If the selected value is greater than the maximum available value, an error message will appear. Re-select a value at or below the maximum available output.*

17.7 Iris Level (Power in W): Absolute Mode only

17.7.1 Iris Level can be set in power (W) when the unit is in Absolute mode (calibration LED is ON). The iris level can be changed to power mode (W) from irradiance (W/cm2) under Menu.

17.7.2 The maximum available output LEVEL in power (W) is displayed in the “Max Power” text box. Click on the GET button to update the reading to the current value. This displayed value is the maximum available output intensity from the unit.

17.7.3 Method 1:To set the unit output to a specified power value, click on the “Power Set point” UP and DOWN buttons until the desired value is displayed in the power set point text box. The value will change in increments of 1 W.

> ***Note:*** *If the selected value is greater than the maximum available value, an error message will appear. Re-select a value at or below the maximum available output.*

17.7.4 Method 2:Set the output LEVEL in power (W) by clicking on the power set point text box and typing in the desired value. Once the value has been entered, click on the SET button. Once the set button has greyed out, the value has been entered.

> ***Note:*** *If the selected value is greater than the maximum available value, an error message will appear. Re-select a value at or below the maximum available output.*

17.8 Exposure Settings: Exposure Timer

17.8.1 Ensure that the check box next to “Exposure Timer Active (S)” has been selected. Exposure time can be selected by the following 2 different methods:

17.8.2 Method 1: Adjust the exposure time by clicking on the “Up/ Down” buttons located right of the “Exposure Timer”. The exposure time will change in increments of 1 second. If a value outside of acceptable limits is chosen, the error message: “Value is outside allowable range” will appear. Select “Cancel” and select a value within the allowable range of .2 to 999.9 seconds.

> ***Note:*** *If another value is not selected, the S2000 will automatically retain the value that was previously selected prior to the error message being displayed.*

17.8.3 Method 2: Click with your mouse on the "Exposure Timer" text box and type in the desired value. Click on the Set button, once the time has been accepted, the SET button will be greyed out. The allowable exposure time range by this method is 0.2 to 999.9 seconds. If a value outside the range is entered, an error message "Value is outside allowable range" will appear. Select "Cancel" and re-enter an acceptable value.

Note: If another value is not selected, the S2000 will automatically retain the value that was previously selected prior to the error message being displayed.

17.9 Exposure Settings: Disabling Exposure Timer

17.9.1 To disable the exposure timer de-select the checkbox next to "Exposure timer active (S)". This will allow the shutter to remain in the open or closed position as per the shutter control, without any pre-set timing function.

17.10 Intensity Reading

17.10.1 To get the intensity level, open the shutter and under Intensity Reading click on the GET button. The value will correspond to the mode selected; relative power, absolute power (W), or irradiance (W/cm2). When the shutter is closed, the intensity will read 0.

17.11 Shutter Control

17.11.1 To activate the shutter control once the appropriate intensity and exposure settings have been entered, click on the "Open" button in the "Shutter Control" section.

Note: *During a timed exposure cycle, when the shutter is open, a red bullet will appear next to "Exposure" in the Exposure settings section. The Exposure bullet will NOT be high lighted when the "Exposure timer active (S)" control has been disabled. The Unit Status indicator next to Shutter will indicate "Open" during the open duration.*

17.11.2 With the "Exposure timer active (S)" selected, after the exposure cycle has been completed, the shutter will close and the exposure time will automatically reset to the pre-selected value. The Unit Status indicator will display Shutter "Close". To interrupt and close the shutter during an exposure cycle, click on the "Close" button.

17.12 Alarm Function

The following conditions will cause the unit to indicate an alarm condition:

1. Lamp fails to strike (bulb)
2. Lamp access door not correctly installed (bulb)
3. Intelli-lamp sensor/ connection failure (bulb)
4. Shutter position failure (SFI)
5. Exposure failure (EFI)

17.12.1 The alarm condition is indicated by a repeating audible beep from the S2000 unit. The Unit Status indicator on the GUI will display Alarm “On”.

17.12.2 To clear the alarm signal, click on the “Clear Alarm” button. The audible alarm on the unit will cease and the Unit Status indicator will display Alarm “Off”.

17.12.3 To clear the alarm condition press the Start/ Stop button on the front panel. The fault which caused the original alarm condition must be corrected prior to resuming normal operation.

17.13 Calibration Status

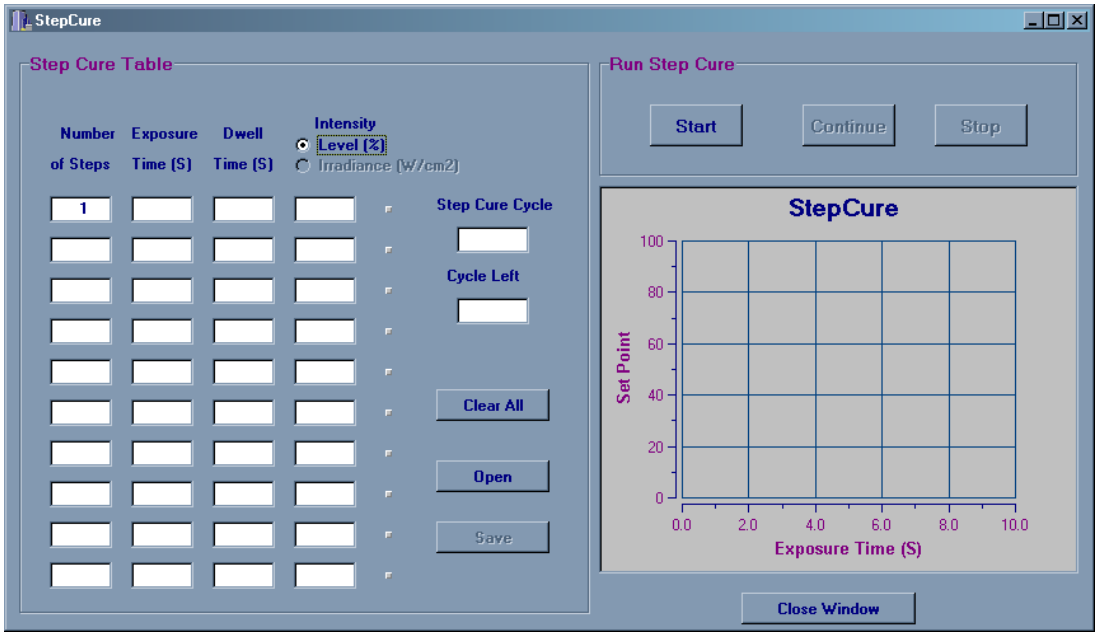
17.13.1 The S2000’s calibration interval is valid for 112 hours of elapsed lamp on time as measured from the time the unit is calibrated with a R2000 Radiometer. The remaining calibration time is displayed in the “Calibration In” text box in hours. To retrieve the current remaining time, click on the GET button beside the Calibration In text box. To turn off the calibration, click on the “Clear Calibration” button. This will clear the text box, and change the unit mode to Relative (un-calibrated) mode. To recalibrate the unit it will be necessary to reconnect the unit to a R2000 Radiometer and repeat the calibration procedure. Refer to section 7 for details pertaining to calibration of the Series 2000.

> ***Note:*** *Performing a calibration using the RS-232 radiometer interface does NOT require disabling the GUI.*

18 StepCure

18.1.1 To open the StepCure screen, go to Menu and click on StepCure.

The following is the StepCure screen:



For each step, the input parameters required are:

18.1.2 **Exposure Time**: The time (seconds) the shutter is open at the specified intensity set point.

18.1.3 **Dwell Time:** The time (seconds) the shutter is closed until the next step begins.

18.1.4 **Intensity Set Point**: The optical output power level. When the GUI is in absolute mode, the intensity shown changes from relative Level (%) to either Irradiance (W/cm2) or Power (W) depending on which mode was selected in the main GUI under Menu. Refer to the Control Panel for the maximum irradiance or power available.

18.1.5 Input the above parameters for each step (maximum of 10 steps) and then enter the number of StepCure cycles. Press Save to save the input parameters and then press Start to start the StepCure. To run a previously saved StepCure, press Open and select the saved file. The StepCure process will be shown in graph. The StepCure can be stopped and continued at any time.

18.1.6 Download: The download button transfers the step cure process into the S2000 unit. When programmed with Step Cure, initiating a timed exposure on the S2000

unit will perform the step cure operation. In Timer or Hours mode, pressing the start/stop button will run the step cure cycle. In Level Mode, pressing the start/stop button will manually open the shutter until the start/stop button is pressed again to close the shutter & the stepcure function will not be activated.

Note: *the download function only downloads one step cure cycle.*

18.2 Clear StepCure:

18.2.1 To clear the step cure from the S2000, hold the up button while pressing the down button twice. Calibration will disable current step cure automatically therefore Step cure has to be updated when unit calibration status changes. Downloaded Step cure is also disabled if step cure is run directly from the GUI.

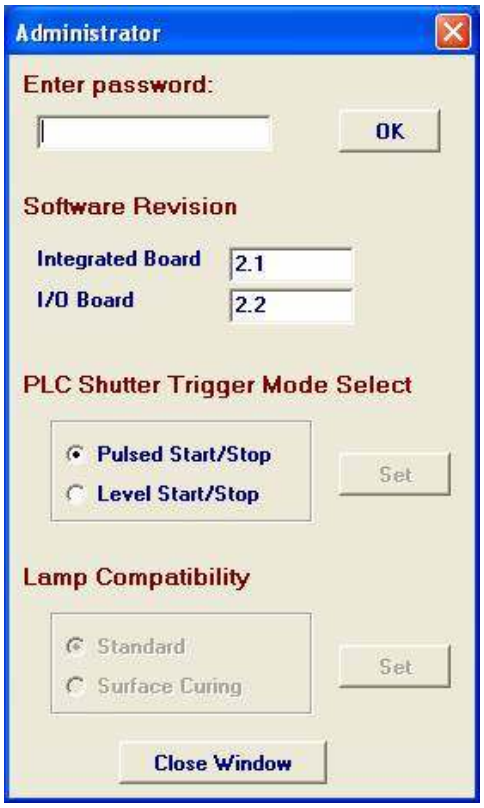
18.2.2 The clear step cure button in GUI will remove the step cure process from the S2000 unit connected. If no step cure process is currently in the S2000 unit, this command will have no effect.

18.2.3 Enable Password: Enter the password of “54321” to enable the modification of the step cure settings. The password does not need to be entered to initiate a step cure from the control panel software.

18.3 PLC Shutter Mode

18.3.1 To change PLC Shutter Signal mode, you need to open the administrator screen, go to the Administrator menu and click on Setup System.

The following is the administrator screen:



The PLC Shutter Signal Mode can be switched between the pulsed start/stop and the level start/stop without password.

18.3.2 The pulsed start/stop opens and closes the shutter when the S2000 shutter contacts are closed. The shutter will automatically close on the next closure of the contacts if it is open, if it is closed it will start the next timed exposure.

18.3.3 The level start/stop mode opens the shutter when the shutter inputs are closed and closes the shutter when the shutter inputs are opened. When PLC Shutter signal mode is in Level Start/Stop the S2000 must be also in level mode for the shutter to open/close with the trigger. The minimum exposure time in Level Mode is 0.5s.

Note: *The shutter will not respond to the PLC inputs if it has been opened by using the front panel start/stop button or if the shutter open command has been issued from the Control Panel.*

19 Routine Care and Maintenance

1. Operate the unit in a well ventilated area with at least six inches clearance at the rear of the unit for proper air flow. Do not place any objects below the unit, between the feet as this will restrict airflow through the bottom of the front face plate.
2. For safe operation, use only a grounded outlet.
3. Avoid physical shocks or jarring to the unit especially while the unit is operating. Such sudden movements reduce the lamp module life.
4. The lamp module must be operated for a minimum of 20 minutes each time it is turned on to prevent damaging the lamp. Increasing the time between turning the lamp module on and off will maximize lamp life.
5. Replace the air filter, found under the front face plate, frequently to ensure unrestricted air flow. It is recommended as a minimum that the air filter be removed and washed with a mild detergent and water every time the lamp module is replaced.

> ***Note:*** *restricted airflow can cause the lamp temperature to increase above optimum temperature, significantly reducing lamp life.*

6. When necessary, clean the light emitting end of the light guide using an optical cleaning solution.
7. Cleaning of unit is not required, however if cleaning is desired, disconnect the AC power cord from the unit and use only a water and simple detergent solution. Ensure that cleaning solution does not come in contact with any optical, moving mechanical or electrical parts.
8. Recommended operation of S2000 is in horizontal position using S2000 beyond 15% of tilt from a horizontal position will wear lamp life.

19.1 Replacing the Lamp Module

19.1.1 The S2000 comes configured for either standard or surface curing applications. Please ensure that the appropriate type lamp has been selected for your curing system/ application. The part number of the lamp module is available on the lamp box.

Excelitas Technologies Part #	Description
012-64000R	Standard Curing Lamp
012-65000R	Surface Curing Lamp

Table 8 Lamp Part Number

Refer to Section 4 for lamp module replacement instructions
Refer to Section 20 for messages regarding troubleshooting and lamp module replacement.

19.2 Replacing the External Fuses

⚠ **19.2.1** The external (mains) fuses are located in the fuse drawer which is located in the AC inlet module on the rear panel.

19.2.2 Turn off the main POWER switch and remove the AC POWER cord from the unit.

19.2.3 Gently pull out the drawer with the aid of a flat-head screwdriver.

19.2.4 Carefully lever one end of the blown fuse up from its retaining clip with a small flat-head screwdriver and lift it out.

⚠ **19.2.5** Replace the damaged fuse(s) only with the same type and rating (F5A, 250V). The rear compartment must contain two active fuses.

19.2.6 Close the fuse drawer.

19.2.7 Reconnect the AC POWER cord.

19.3 Replacing the Air Filter

⚠ **19.3.1** The external air filter is located under the front face plate of the S2000.

19.3.2 Turn off the main POWER switch and remove the AC POWER cord from the unit.

19.3.3 Gently slide and pull out the filter.

19.3.4 Push in the replacement filter so that it sits flat in place

19.4 Replacing The Bandpass Filter

19.4.1 The S2000 includes a bandpass filter to limit the wavelengths of light for your application. There are 5 bandpass filters available, which are selected at the time of purchase

Part #	Description
P019-01045R	Filter 365 nm
P019-01046R	Filter 250-450 nm
P019-01047R	Filter 400-500 nm
P019-01048R	Filter 320-390 nm
P019-01049R	Filter 320-500 nm

Table 9 Replacement Filter Part Numbers

19.4.2 The bandpass filter currently installed on your S2000 system will be identified on a label located on the back panel of the system. To change the bandpass filter, the system must be returned to your local Excelitas Technologies Service Centre. See section 0– Contact Information to find the nearest service centre.

19.5 Light Guide Cleaning

Instructions for cleaning the light emitting end (output) of the light guide

Materials:

- Lens Tissue sheets
- Optical Swabs
- IPA (Isopropyl Alcohol) solution
- Wooden stick (eg; tongue depressor/popsicle stick)

Caution:

Before using Isopropyl Alcohol consult the manufactures MSDS Sheets for proper handling and storage.

Caution:

Never look directly into the light emitting end (output) of the light guide. The light could severely damage the cornea and retina of the eye. Protective eye wear must be used at all times and always turn the system off before removing the lightguide.

Notes:

1. The staining which appears on the light emitting end of the light guide is the result of gaseous burn-off from the UV adhesive.
2. Inspect light guide optical input port of R2000 Radiometer for signs of residual gaseous burn-off powder/dirt, transferred from the light emitting end of the light guide, clean as stated below.
3. Never apply a dirty tissue/swab to the end of the light guide or R2000 optical input port.
4. Never use a razor blade or any other metallic apparatus to scrape off adhesive build up from the quartz lens on the light emitting end of the light guide. This may cause permanent damage (scratches) to the quartz lens.

Procedure:

1. Turn off power to the UV spot curing system and let the light guide cool down for at least 10 minutes.
2. If required, remove light guide output end from the production fixture.
3. Remove the light guide from the light guide port of the UV spot curing system.
4. Place the protective cap onto the light guide input end while cleaning output end.
5. Wipe output end of light guide with non-abrasive lint free lens tissue or optical swab saturated with an IPA cleaning solution until the staining has disappeared.
6. For excessive adhesive build up on the light emitting end lightly scrape the adhesive build up with a wooden stick such as tongue depressor/popsicle stick. Take care not to damage the quartz lens.
7. Re-install the light guide as per the instructions located in the relevant UV spot curing manual/user guide.
8. For cleaning R2000 optical input port; wipe surfaces with non-abrasive lint free lens tissue or optical swab saturated with an IPA cleaning solution until the staining has disappeared. Care is to be taken to avoid puddling/over saturation of input port.

20 Troubleshooting

Display	Decimal Point Status	Alarm	Message	Description
XXXX.	Flashing	Off	L. Hrs Mode	Displays the accumulated hours the lamp has been on
XXX.X	Solid	Off	Timer Mode	Displays the time in seconds the shutter will remain open when the start button is pressed
XX.XX	Solid	Off	LEVEL Mode	Displays Irradiance (W/cm2) if the S2000 has been calibrated. CAL Led is ON.
XXX	None	Off	Iris Opening	Displays the percentage the iris is open while in Intensity Mode.(S2000 is not calibrated)
Flashing	None/Flash	Off	Flashing display	The lamp is warming up. Warm up time is approximately 4 minutes.
bulb	None	On	Bulb Error	Lamp did not strike or extinguished after striking
cool	None	Off	Cool Warning	Lamp is too hot to strike. The lamp will automatically re-strike when it has reached optimum temperature.
old / bulb	None	Off	Alternating Old and then Bulb	The lamp has accumulated over 2000 hours. Lamp may be near end of life.
end / bulb	None	On	Alternating End and then Bulb	The lamp has accumulated over 4000 hours. The lamp will not strike.
SF1	None	On	Shutter Failure	Shutter has failed. Unit should be serviced
CA1	None	Off	Calibration	S2000 unit is doing calibration
		On	Calibration Failure	The calibration has failed
LOC	None	Off	Adjustment Locked	The up/down adjustment buttons have been locked. No changes can be made to the exposure time or iris setting.
ULOC	None	Off	Adjustment Unlocked	The up/down adjustment buttons have been unlocked. Changes can be made to the exposure time and iris setting.
E1	None	Off	Wrong Type of Lamp Installed	Check lamp part# to verify that the appropriate lamp type has been installed.
E3	None	On	Lamp exceeded temperature	The lamp temperature monitoring has turned off the lamp due to excessive heat. Verify the cooling exhaust vent is not blocked.
E4	None	On	Internal error.	An internal error has occurred. If error re-occurs the unit should be serviced
E5	None	On	Failed to communicate with intellilamp	The communication to the intellilamp has failed, open the lamp access door and verify all connections are secure.
EF1	None	On	Exposure Failure	Selected output intensity was not delivered.
CLF	None	Off	Intensity Mode Relative	S2000 is set to relative Intensity Mode. Shutter is closed. (S2000 is not calibrated). Closed-Loop Feedback is available.

Table 10 Message References

Note: The Alarm will be "On" if the light guide is not fully inserted and the shutter is supposed to be open

LED Indicator	Status	Description
Light Guide	ON – Green	Light guide is fully inserted
	ON – Red	Light guide is not fully inserted
Lamp	ON	The lamp is ON
	OFF	The lamp is OFF
Open	ON	The shutter is open
	OFF	The shutter is closed
Timer	ON	The unit is in timer mode; LED display indicates exposure time
LEVEL	ON	*The unit is in intensity mode*; LED display indicates intensity in mW/cm2 when unit is calibrated. LED display indicates percentage of iris opening when unit is not calibrated. Timer is not functional in this mode. Shutter is controlled by start/ stop button only. If PLC Shutter Signal Mode in GUI is set to "Level Start/Stop" instead of default "Pulsed Start/Stop", Shutter will remain open only for the time till the start/stop button or foot pedal is pressed.
L.HRS	ON	The unit is in lamp hours mode; LED display indicates accumulated lamps
CAL	ON	Calibration status indicator. The S2000 has been successfully calibrated. Unit is in absolute mode. Calibration will remain in effect for 112 hours of lamp on time
CAL	OFF	The S2000 requires calibration via R2000 Radiometer. Unit is in relative mode
CAL	Flashing	The unit will require calibration, LED will start blinking during the last 16 hours of the calibration interval
Closed Loop Feedback	ON	The S2000 Closed-Loop Feedback is operational
Closed Loop Feedback	OFF	The S2000 Closed-Loop Feedback is not operational. Unit is set to 100% output LEVEL or the unit is experiencing an exposure failure.

Table 11 Front Panel LED Descriptions

Front Panel Buttons	Position	Description
Front POWER ON/OFF Switch	"I / "O"	POWER ON POWER OFF
Start/Stop Button	Depressed	Shutter Activation
MODE	Momentary Depressed	Selects between three Modes: Timer, Level and Lamp Hours
UP	Momentary Depressed	Increases the current value displayed.
DOWN	Momentary Depressed	Decreases the current value displayed.

Table 12 Front Panel Button Descriptions

Service to be completed by qualified repair personnel only!

20.1.1 If the unit fails to POWER up or function properly, use the following checklist to eliminate the most common causes of problems. Check that:

1. The AC POWER cord is securely plugged into a functional AC wall plug.
2. The AC POWER cord is securely plugged into the AC inlet on the rear of the unit.
3. The mains AC POWER switch is in the ON position.

20.1.2 If the LED display lights and the fan starts, but the lamp will not turn on, check for the following:

1. The LED display indicates the "bulb" message and the system begins to beep. This indicates that no lamp is detected. Check if the lamp has been installed correctly. Refer to Section 4 – Installing the Lamp Module.
2. The LED display indicates the "bulb" message after approximately 45 seconds and the system begins to beep. This indicates that the lamp has failed to strike. It may be a result of the lamp reaching end of life, or that the lamp housing panel is not secured properly in place. Press the start/stop button to clear the audible alarm. Turn power off to the unit. Check that the lamp housing panel is secured properly. Wait a few minutes and turn the power on to the unit. If it still does not strike, replace the lamp.
3. The LED display indicates the "cool" message. This indicates the lamp is too hot to strike. The lamp will automatically strike when it has cooled.

20.1.3 If the shutter does not open, check that:

1. The light guide is fully inserted; the LED above the light guide port will be illuminated green. The lamp is warmed-up; the display is not flashing. The shutter interlock input is not active (P1, pins 6 & 4).
2. The LED displays “SF1”, indicating a shutter failure. POWER down the unit, wait a few minutes and turn POWER on to the unit. If the unit displays a shutter failure again, contact your local Excelitas Technologies Service Centre to have your unit serviced.

20.1.4 If the light intensity is too low, check that:

1. The percent iris opening is set high enough. Put the unit into Level Mode and press the up button to increase the iris opening. See Section 8 – Adjusting the Light Output.
2. There are no foreign substances on the emitting end of the light guide.
3. There are no bends, kinks, or other physical damage to the guide. Replace the light guide if there is any physical damage.
4. The lamp has been installed correctly. See section 4 – Installing the Lamp Module.

It may be necessary to replace the lamp or to replace the light guide. Contact your* Excelitas Technologies *sales representative for information on purchasing a new lamp or light guide.

20.1.5 If the LED display does not light:

1. If the fan is functional, POWER down the unit, wait approximately 20 seconds then POWER it up again
2. If the problem persists, contact your local Excelitas Technologies Service Centre.

20.1.6 If one or more fans do not work:

1. If the LED display is functional, POWER down the unit, wait approximately 20 seconds then POWER it up again
2. If the problem persists, contact your local Excelitas Technologies Service Centre.

21 Technical Specifications

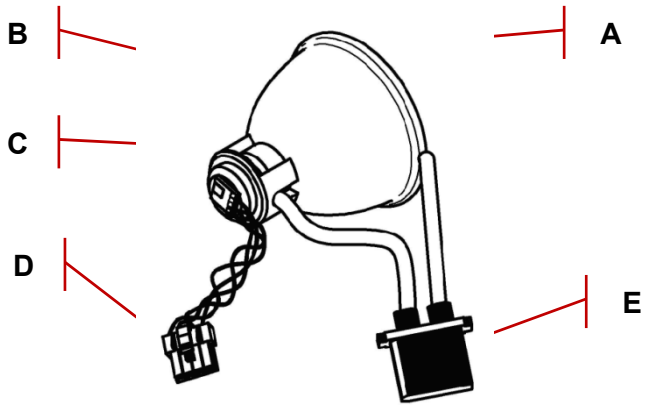
OmniCure ® S2000 Exposure Timer Tolerance:
+/- 250ms or +/- 1% of the exposure time setting, whichever is greater.

OmniCure ® S2000 Output Accuracy (with close-loop feedback activated):
+/-5% or 200mW/cm2, whichever is greater.

OmniCure® S2000 Minimum Adjustable Irradiance Level: 0.5W/cm²

OmniCure® S2000 Closed Loop Feedback shut-off @exposure time of .3 sec and lower.

21.1 Lamp Module



A – Rim of Lamp Reflector **B** – Reflector **C** – Back ceramic Mount
D – Intelli-Lamp Connector **E** – Power Connector

Lamp Module	Excelitas Technologies 200W Mercury DC: Standard or Surface Curing
Focal Point of Spot	52.875 mm
Lamp Module Life	2000 hours
Warm Up	4 minutes (min)
Lamp Voltage (new bulb)	60VDC nominal
Lamp Voltage (range)	36VDC to 95VDC
Lamp Current	3.33A typical, 5.7A maximum

⚠ **Warning**
The method in which lamps are disposed of must comply with local rules & regulations for disposal of hazardous materials. Lamps may be returned to Excelitas Technologies providing they are returned in its original packaging. Excelitas Technologies will dispose of them in the appropriate manner.

Warning
Hg – LAMP CONTAINS MERCURY, Manage in Accord with Disposal Laws, see:
www.lamprecycle.org or 1-800-668-8752

21.2 Light Guide

Light Delivery	Flexible High Power Fibre Light Guides will be available in a variety of lengths with a variety of core diameters.

Note: *3mm single leg liquid light guides are not compatible with the S2000!*

Power	Input
Power Supply:	Power Factor Corrected, Universal Input
Input Voltage:	100 - 240VAC, 50/60Hz
Current:	3.5A max at 120VAC 2.0A max at 240VAC
Input Surge:	50A max. (cold start)
Protection:	Short circuit auto-recovery Overvoltage (up to 135%, +/- 5% of nominal) EMI filtering integrated into the power supply Power supply has integrated thermal cut-off
Fuse Rating:	Dual fuse system: each fuse rated at F5.0A 250V, 5x20mm type located in the AC receptacle

21.3 I/O Ports (including RS-232)

21.3.1 The S2000 has 5 different I/O ports; 4 located on the back of the unit. The 1st port is a simple 2-wire, audio style jack that can be connected to a foot pedal (supplied with each unit) or any other electro-mechanical triggering device. This is an exposure trigger input used to start an exposure. The 2nd port is a RS-232 port (9 pin) to be connected to a PC and is described in more detail in section 19. The 3rd and 4th ports (15 pin DE style) are for PLC interfacing. A 5thport is a RS-232 port located on the side of the front panel which is used to connect to the R2000 Radiometer for calibration of the S2000.

21.4 USB Interface

21.4.1 A USB interface, an optional feature, can be provided through the existing RS-232 port via an external RS-232 to USB converter device. A RS-232 to USB converter device such as part number RS232B by FTDI (Future Technology Devices International Inc.) or equivalent can be used.

21.5 Environmental Conditions

Operating Conditions

Ambient Temperature:	15ºC to 40ºC
Altitude:	2000m max.
Atmospheric Pressure:	700 to 1060 hPa
Relative Humidity:	15% to 95% (non-condensing)
Installation Category:	II
Pollution Degree:	2

Transport and Storage Conditions

Temperature:	-40 to +70ºC
Relative Humidity:	10% to 100%
Atmospheric Pressure:	500 to 1060 hPa

21.6 Noise and the OmniCure SERIES 2000

Using the SERIES 2000 in a Noisy Environment

What is Noise?
"Electrical noise" is a term used to describe unwanted electronic emissions. Noise is actually comprised of RFI (Radio Frequency Interference) EMI (Electro Magnetic Interference) and other similar sources of energy. Electronic equipment may behave in a non-standard manner (exhibit erratic operation) with the presence of high Levels of noise. They will continue to behave erratically as long as the noise is present, unless protected with noise suppressors.

21.6.1 What are Sources of Noise?

Sources of noise are any electronic equipment which utilize or generate a high frequency AC current and voltage. Specifically, equipment such as metal halide arc lamps, mercury short arc lamps, xenon arc lamps, switch mode POWER supplies, pulsed lasers, x-ray equipment, welding equipment and RFI generators are a few classic examples of large noise producing equipment.

21.6.2 Determining the Noise Level in Your Environment

If the S2000, along with other pieces of equipment, operate abnormally, in an intermittent or continuous manner, it is quite possible that large Levels of noise are present. It is recommended that prior to installing the S2000, the user examine any equipment nearby. If any of the equipment falls into the category of equipment listed above it is further advised that the user examine the ratings and description labels on each piece of equipment. Any equipment that does not have a label indicating that it meets Industry Canada, FCC, or IEC- EMC requirements is a possible noise source. If any equipment is deemed a noise source, or even suspected to be a noise source, then additional noise protection should be incorporated during the installation of the S2000.

21.6.3 Shielding

Any wire or cable assembly entering or exiting the S2000 may act like an antenna which will pick up noise and transmit it to the internal electronics. This may cause the S2000 to operate erratically.

There are several ways in which the S2000 can be shielded (protected). Excelitas Technologies recommends the use of shielded cables for all cable assemblies: the AC line cord, the I/O cables and the foot switch. Furthermore, it is advised that clamp-on ferrite shield beads be added to every cable assembly. Suitable ferrite shield beads are: P/N: 0443164251 by Fair-Rite Products Corp. (or) P/N: 28A2025-0A0 by Steward.

Noise suppression products are also available in the form of AC power bars that incorporate surge suppression and noise suppression circuitry. Either type will help in protecting the S2000 from noise. Providing the S2000 with an AC line that is separate from any other noise producing equipment will also be beneficial.

Depending on the noise Level in the environment, any combination or all of the above shielding recommendations may be necessary to protect the S2000 from noise and ensure smooth operation. We can help you to shield the S2000 from electrical noise. Please contact Excelitas Technologies for further assistance.

22 Regulatory Compliance

22.1 Product Safety and Electromagnetic Compatibility

The OmniCure S2000 Series 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 visit http://www.excelitas.com/Pages/Product/OmniCure.aspx

CE Marking

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

22.2 FCC Part 15, Subpart B, Class B-Unintentional Radiators

FCC Class B Digital Device or Peripheral - Information to User

NOTE

This equipment has been tested and found to comply with the limits for a Class B 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 residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna*
- *Increase the separation between the equipment and receiver*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected*
- *Consult the dealer or an experienced radio/TV technician for help*

WARNING

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

22.3 WEEE Directive

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.

22.4 China RoHS

The following table contains substance information for the Omnicure S2000 Series as required by China RoHS regulations.

Part Name	Hazardous Substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr (VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
200W Lamp	X	X	O	O	O	O
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.

22.5 Mechanical Specifications

Dimensions

Height:	8.2"/ 20.6 cm
Depth:	13.3"/ 33.8 cm
Width:	7.1"/ 18.0 cm
Unit Weight:	9.05 lbs/ 4.10 kg

22.6 Miscellaneous

Display:	1 line x 4 digit, LED, blue
Keypad:	3 button, tactile & 1 start/ stop switch

Specifications may vary slightly and are subject to change without notice.

23 Warranty

23.1.1 Excelitas Technologies warrants 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. All repairs are warranted for 90 days.

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

23.1.3 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.

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

23.1.5 Package the equipment in its original shipping case or as appropriate to prevent damage during transport.

23.1.6 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 Service Centre, 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.

23.1.7 This warranty is not transferable.

23.1.8 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.

Warning: *Apart from lamps (for certain equipment), fuses, air filters, or optical filters (for certain equipment) there are no field serviceable parts within the equipment. Opening the equipment main enclosure will void the warranty.*

23.2 Replacement Bulb Warranty

23.2.1 If the S2000 bulb fails to strike during the warranty period of 2000 hours, the bulb will be replaced under warranty. In the event of a claim under this guarantee, the lamp is to be sent postage and carriage paid, including a description of the fault, to the Excelitas Technologies Service Centre. Returned equipment will not be received without a Return Authorization (RA) Number, issued by the appropriate Service Centre. Lamps must be purchased from an authorized Excelitas Technologies Representative or Distributor to be eligible for the warranty replacement. This warranty is non-transferable.

23.2.2 In the case of damage caused by careless handling, neglect, by the use of force or in the case of interventions and repairs not carried out by an Excelitas Technologies Service Centre to the S2000 system, the guarantee ceases to be valid.

23.3 Returning your S2000 to Excelitas Technologies

23.3.1 Please make a note of the problem encountered, the steps followed to isolate the problem and the result of any trouble shooting steps taken.

23.3.2 Telephone the nearest Excelitas Technologies Service Centre to obtain a Return Authorization Number so that repairs may be completed quickly and efficiently. In North America, request for Return Authorization number can be made online from website https://www.excelitas.com/ox_service_request_form

23.3.3 Enclose details of the problem with the unit and return both to the Excelitas Technologies Service Centre. The unit should be returned in its original packaging if possible. Please do not ship the unit with the lamp installed.

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

24 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 Centers, please go to the main web site: https://www.excelitas.com/dealer-search

25 Addendums

25.1.1 All systems shipped after ***January/01/2009*** will have the following modifications.

- Section 11.2.5 The Rear Panel I/O signal connector labelled “P1”; PIN 5 shutter activation.
- Section 20 Front Panel LED Descriptions (level indicator).
- Section 16.4 Command Descriptions; New PLC command features.
- Section 18.1.5 Stepcure functionality.
- Section 18.3 PLC Shutter Signal Mode.