

Table of Contents

Important Safety Information Section 1	3
1.1 Important Safety Information.	5
1.2 Safety Precautions.	7
1.3 Shipping/Storage Precautions.	9
General Information Section 2	11
2.1 Lumen 200 /Pro Specification.	13
2.2 Lumen 200.	13
2.3 Lumen 200Pro.	13
2.4 Liquid Light Guide Information.	14
Unpacking The System Section 3	15
3.1 Identifying your system.	17
Installation Section 4	21
4.1 Installing the Bulb	23
4.2 Connecting to the Microscope	27
Getting Started Section 5	29
5.1 Starting Up the Lumen	31
5.2 Shutting down the Lumen	31
5.3 When to Change the bulb	32
5.4 Changing Filters in the Filter Wheel (Pro only)	32
5.5 Routine Maintenance.	34
Advanced Operation Section 6	35
6.1 Connecting your Lumen 200Pro to a OptiScan or ProScan System	37
6.2 RS232 Command Set	38
6.3 Error Codes	44
Troubleshooting Section 7	45
7.1 Alarms and Warnings	47
7.2 Troubleshooting	48
Replacement Parts Section 8	51
Returns and Repairs Section 9	55

Important Safety Information *Section 1*

I.1 Important Safety Information.

- Use only as specified by the operating instructions or the intrinsic protection may be impaired.
- Keep this manual in a safe place as it contains important safety information and operating instructions.
- Before using the system, please follow and adhere to all warnings, safety and operating instructions located either on the product or in this User's Manual.
- **Do not** expose the product to water or moisture.
- **Do not** expose the product to extreme hot or cold temperatures.
- **Do not** expose the product to open flames.
- **Do not** allow objects to fall on or liquids to spill on the product.
- Connect the AC power cord only to designated power sources as marked on the product.
- Make sure the electrical cord is located so that it will not be subject to damage.



- Always disconnect power from product before connecting the components together.



- Use only the power supply cord set provided with the system for this unit, should this not be correct for your geographical area, contact your supplier.

- Do not in any way attempt to tamper with the product, doing so will void the warranty, and may damage the system. This product does not contain consumer serviceable components, all repairs or services should be performed by Authorised Service Centres, contact your local dealer for details.



- Ensure that the ventilations slots in the controller case are free from blockages.



- **WARNING:** - Hg-LAMP CONTAINS MERCURY, Manage in Accord with Disposal Laws.



- **WARNING:** The method in which the lamps are disposed of must comply with the local rules & regulations for disposal of

hazardous materials. Lamps may be return to Prior Scientific providing they are return in their original packaging.

- Before replacing a fuse, DISCONNECT THE EQUIPMENT FROM THE MAINS SUPPLY.
- Ensure that the mains switch / IEC socket/ mains plug is easily accessible to allow the unit to be switched off.

Warnings:



- Eye damage may result from directly viewing the light produced by the lamp used in this product.



- Always make sure the light guide is properly inserted into the collimator which is firmly attached to the microscope using the adaptor provided and into the Lumen 200/Pro, before turning on the power to the unit.

Caution:



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



- Never place the end of an emitting light guide near skin as this may result in burning and damage to the skin.



- Never place the end of an emitting light guide near a flammable substrate as sufficient power is emitted from the light guide to ignite flammable substances.

I.2 Safety Precautions.

The Lumen 200 has protection features built in to avoid unintentional exposure to UV radiation. In addition to this protection, please observe the following safety instructions.

Definitions of Labels:



Warning read instructions to determine possible hazard.

Caution: Read these operating instructions fully before use and pay particular attention to sections containing this symbol.

Use only as specified by the operating instructions or the intrinsic protection may be impaired.



Warning surface may be Hot



Warning UV Output



Danger Electrical Shock hazard.

Monitoring of the unit manual operation:



- The level of energy supplied is sufficient to ignite flammable substances. During operation the unit must be attended at all times by a qualified operator. The unit must not be left unattended while left on. If an operator leaves the work area of the unit, the lamp power must be switched off.

I.3 Shipping/Storage Precautions.

- NEVER SHIP THE UNIT WITH THE BULB INSTALLED.
- Always use the original packaging for shipping and storing purposes.

Unpacking and Inspection

- Carefully unpack the unit and retain packaging to return equipment for servicing.
- If the equipment appears damaged in any way, return it to sales outlet in it's original packaging. No responsibility for damage arising from the use of non-approved packaging will be accepted.
- Ensure all items and accessories specified are present. If not contact your local sales outlet.

Lumen 200 Standard Contents:

Lumen 200, Lumen 200/Pro Manual, Liquid Light Guide, Adaptor for specific microscope, Lumen 200 Bulb, Power Cord, Hex key.

Lumen 200Pro Standard Contents:

Lumen 200Pro, Lumen 200/Pro Manual, Liquid Light Guide, Adaptor for specific microscope, Lumen 200 Bulb, Power Cord, Two Filter Wheel Cables, Shutter cable, Filter Wheel tool, Hex key.

General Information *Section 2*

General Information

2.1 Lumen 200 /Pro Specification.

Power:

Universal integral Power Supply: Input 110-240V, 50/60Hz

Use within ambient temperature range: 18-28 °C.

Required clearance: 100mm minimum.

2.2 Lumen 200.

The Lumen 200 version of the Lumen series is a stand-alone standard unit and is furnished with a manual 6 position shutter, (0,10,25,50,75,and 100%). The Lumen contains a 200 Watt Metal halide bulb which is temperature controlled. The bulb is self-aligning and is coupled via special optics to the Liquid Light guide, which transfers the light to the Microscope. For each major make of microscope an adaptor is available to connect the liquid light guide to the microscope.

2.3 Lumen 200Pro.

The Lumen 200Pro version of the Lumen series contains a 6 position filter wheel and an advanced shutter (0-100% in 1% increments). The filter wheel and shutter require an external controller, it is recommended that this is the Prior ProScan or PCI card, the OptiScan II will control these accessories.

2.4 Liquid Light Guide Information.

Liquid light guides have a limited lifetime, independently of whether they are stored or in use. However, lifetime may vary depending on climatic conditions. Cold and humid environments will extend lifetime, hot and/or dry environments will shorten it. Though the outstanding UV performance will not markedly degrade during usage, we recommend that the light guide is replaced in advance of the expected lifetime of expiration. Final degradation is generally caused by the formation of bubbles in the liquid, and optical output may then drop very rapidly.

Approximate lifetime: 4 years

Suggested replacement time: 3 years

Figures based on 23°C and 60% humidity.

General usage temperature range:

Min +5°C/41°F

Max: +30°C /+86°F

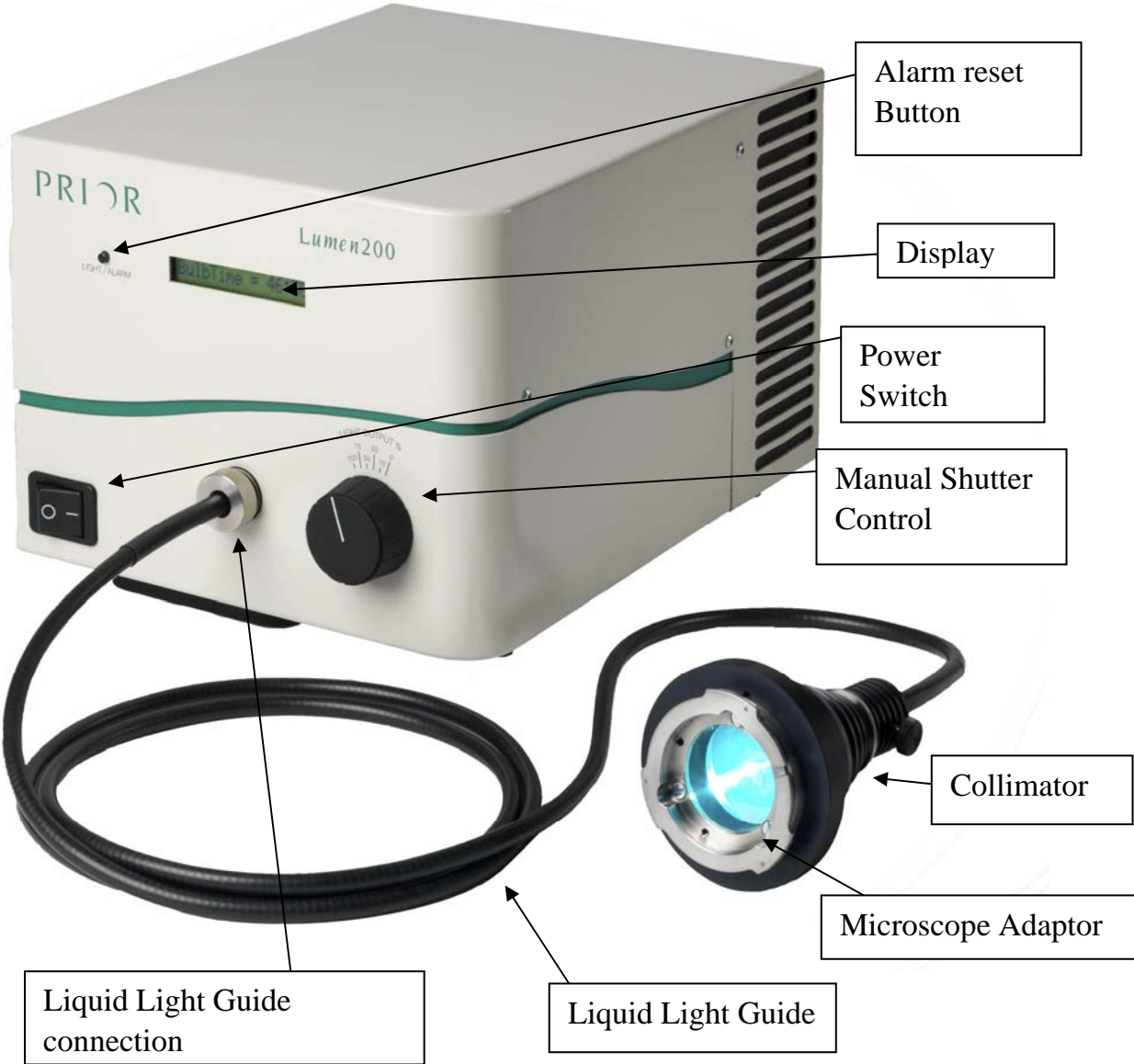
Should the temperature limits be exceeded the likely damage is the formation of bubbles inside the liquid. These may be reabsorbed if the light guide is stored at room temperature for several days.

Unpacking The System

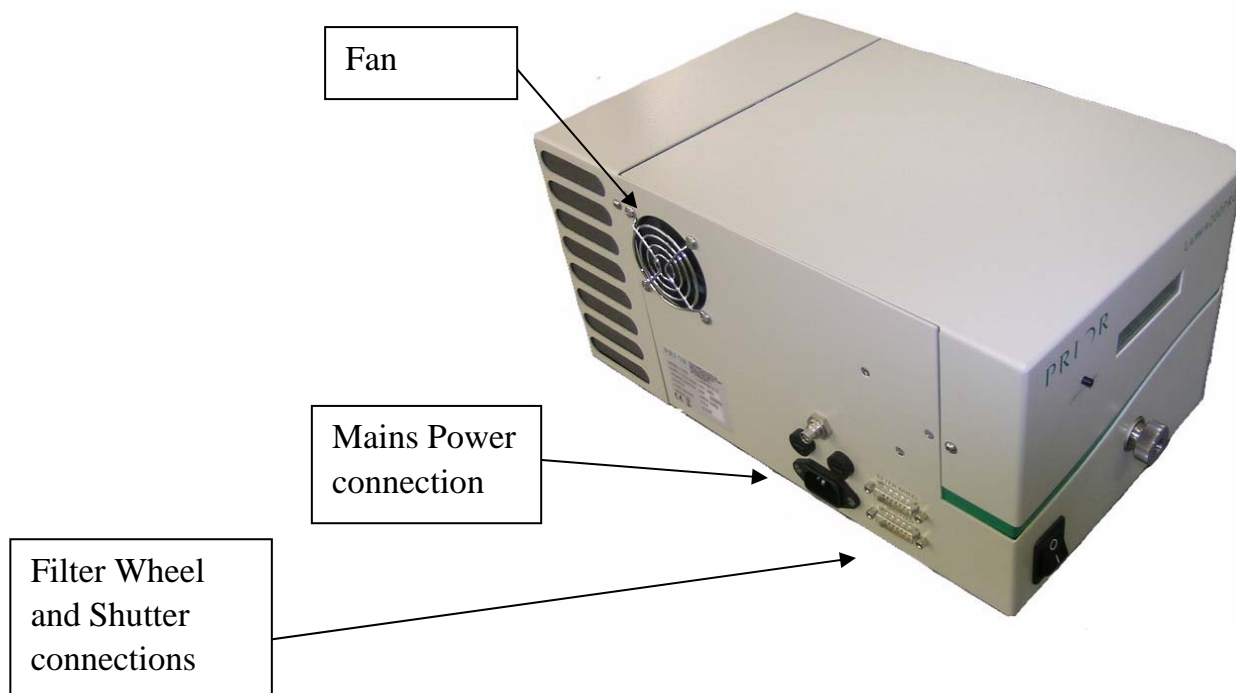
Section 3

3.1 Identifying your system.

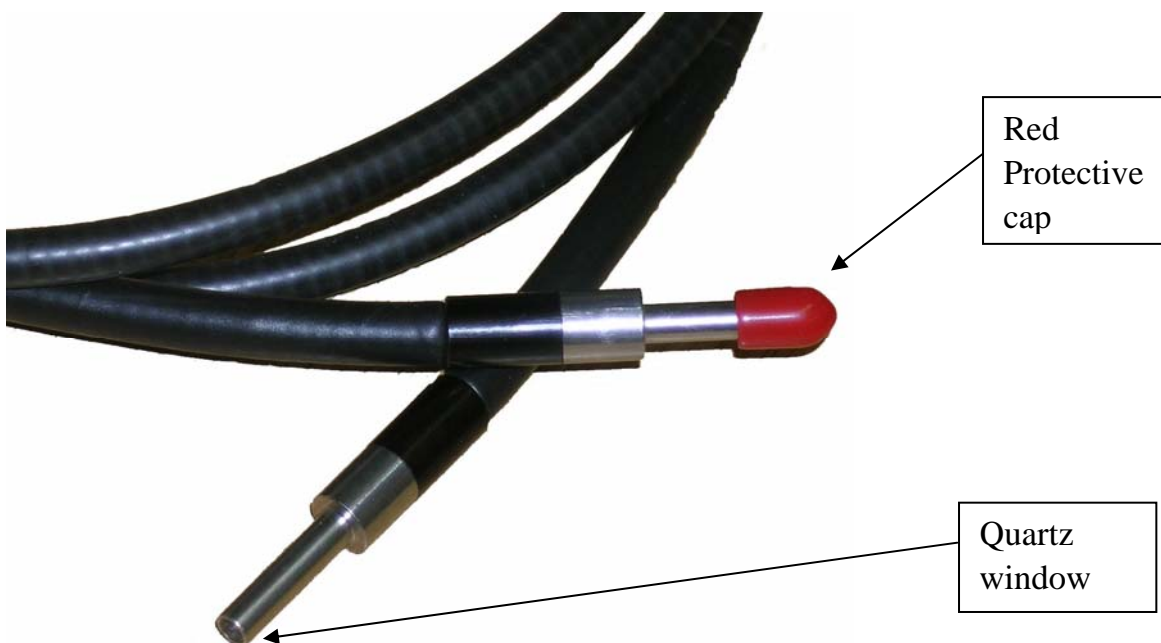
The Lumen200:



The Lumen 200Pro:



Liquid Light Guide:



Adaptor for microscope and collimator.



4.1 Installing the Bulb

Required equipment:

Lumen 200, Hex Key, Prior LM200B1 Bulb

Warning:

- Only use Prior LM200B1 bulbs, failure to do so may cause damage to the unit.
- **Do not touch the inside of the reflector of the bulb.**
- The bulb is delicate, handle with care.

Instructions:

1. Disconnect the Lumen from the mains supply, (*If the lumen has been previously switched on, wait for 30 mins to allow bulb to cool*).
2. Find a flat surface and place the lumen upside down on the surface.
3. Unscrew the four Hex screws and remove the panel, as indicated in Figure 4.1a below.

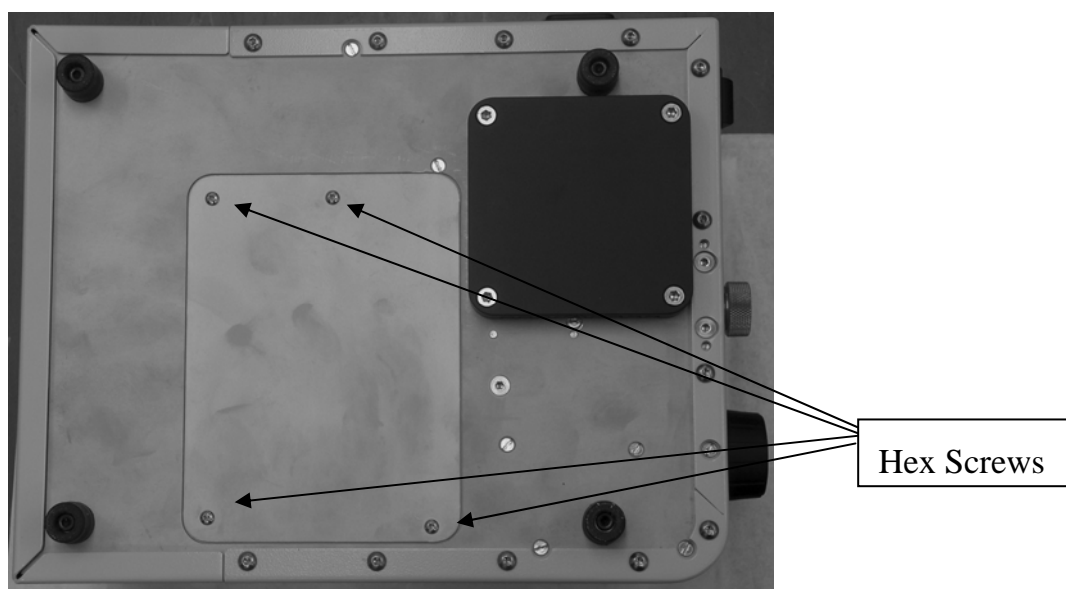


Figure 4.1a Bulb housing.

4. Remove bulb from Carton (See Figure 4.1b below):
 - a. Open top of Carton
 - b. Remove V-shaped Cardboard Holder

- c. Push Cardboard Flaps back
- d. Lift bulb out of carton.

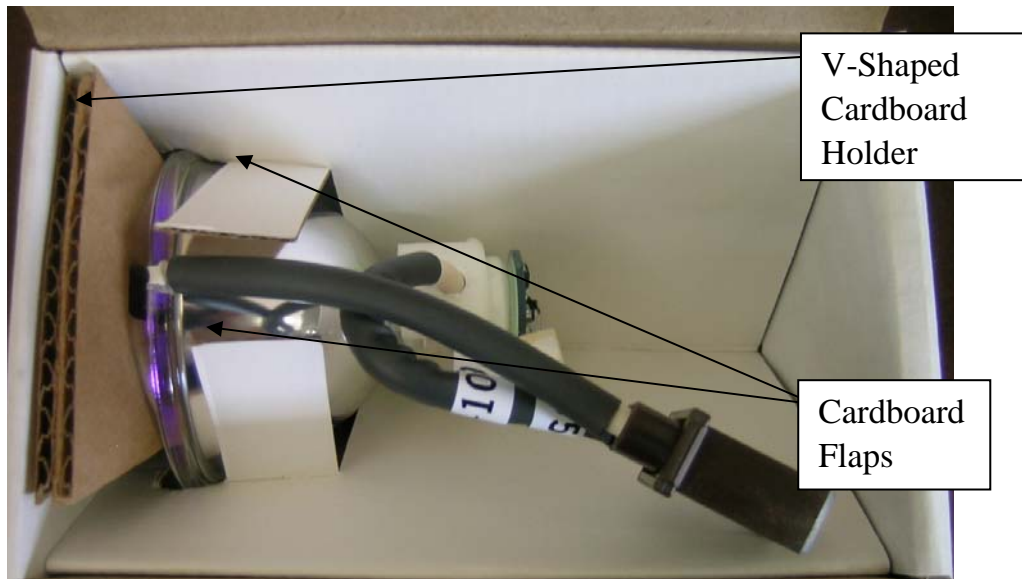


Figure 4.1b: Bulb storage and transportation carton.

5. Turn the bulb so that the cables and connector hang down into the bulb chamber. Plug the brown connector on the bulb into power socket in bulb housing, ensure it is pushed firmly into position.
 - a. This will orientate the bulb with the (Hg) label facing upwards.

6. Locate the bottom of the bulb (as indicated in figure 4.1d below) into the groove in the bottom (lamp house clamp Figure 4.1c) of the lamp housing.

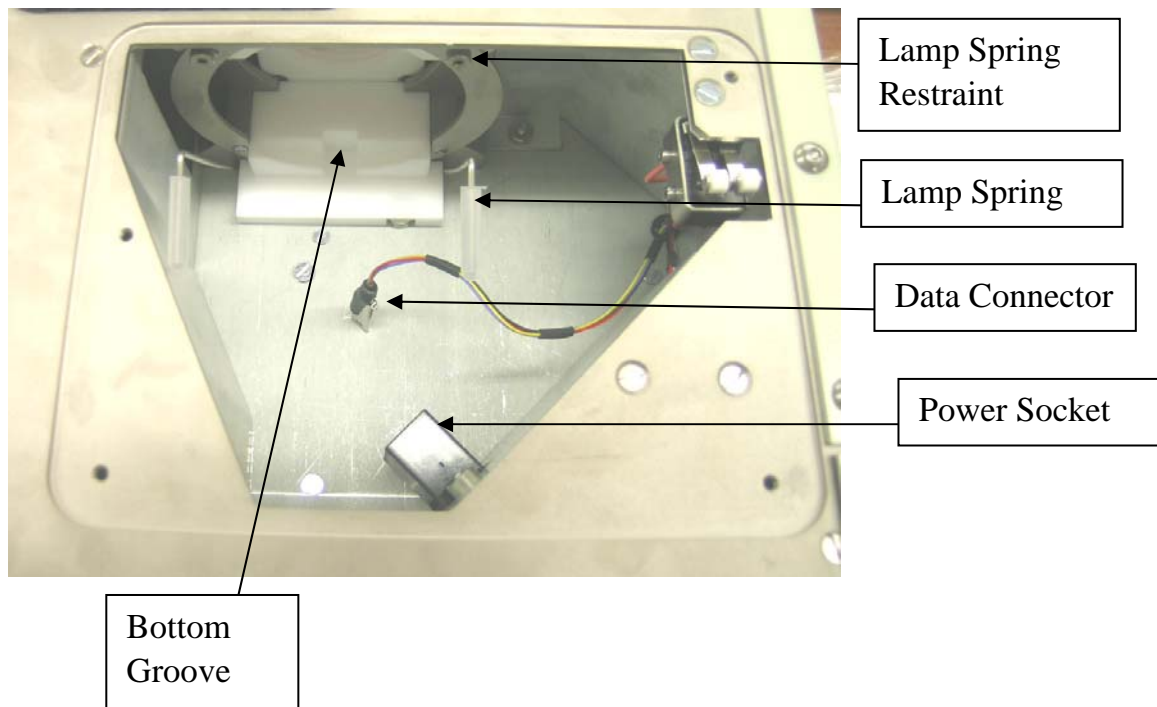


Figure 4.1c: Bulb Housing.

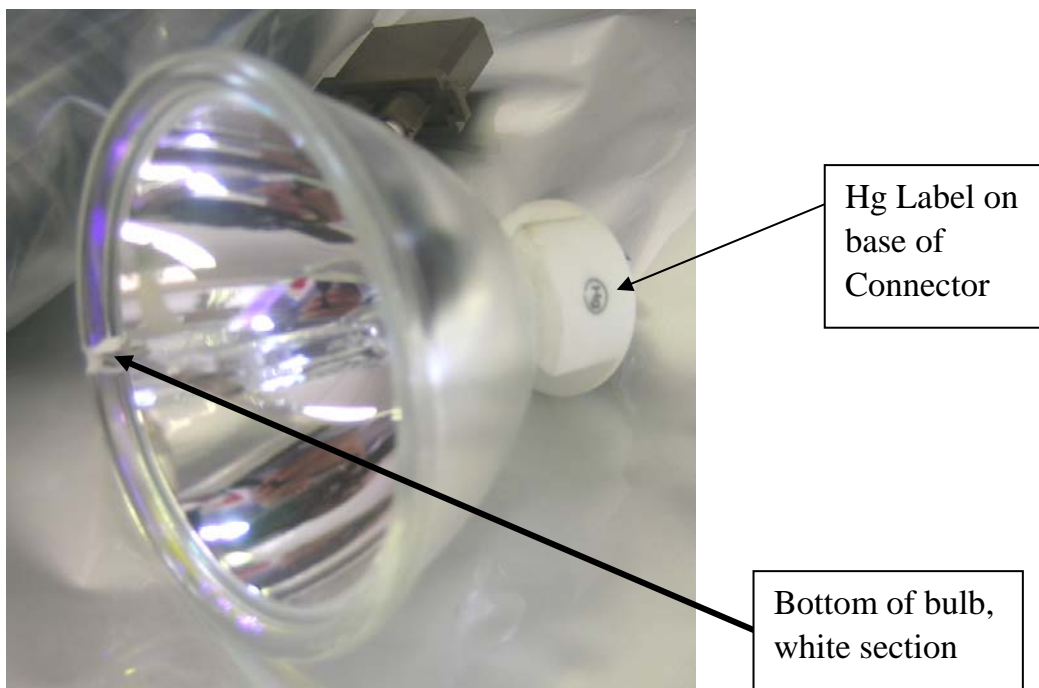


Figure 4.1d: Lumen Bulb.

- Lift the spring towards the bulb, as you do so the bulb will be pushed into the correct position, click the springs all the way into the Lamp Spring Restraints. (see Figure 4.1e).

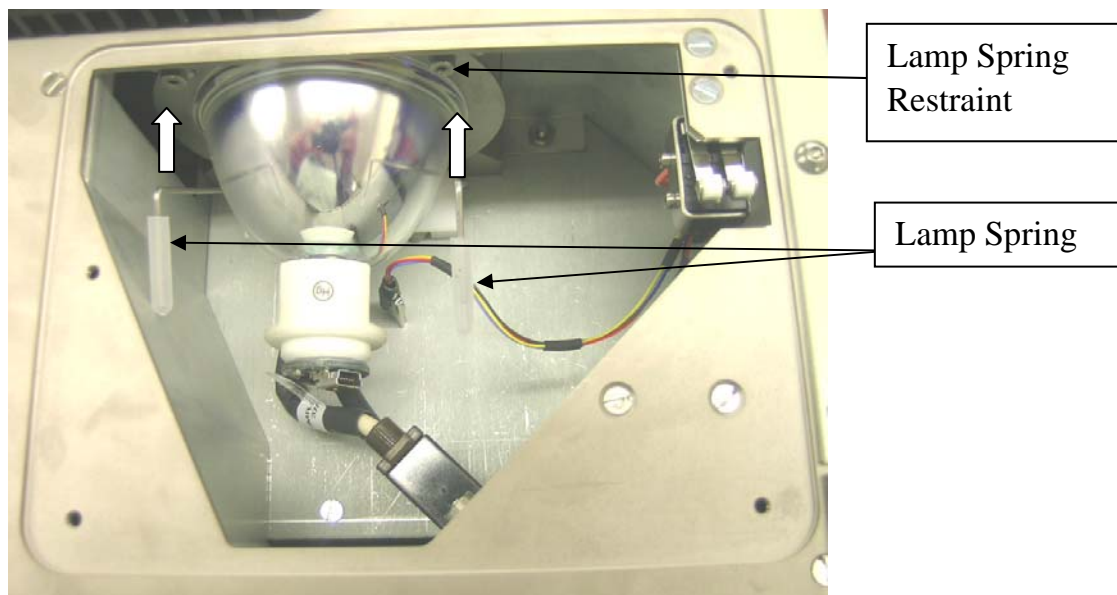


Figure 4.1e: Top section of the bulb clamp being pulled up with two fingers.

- The bulb is now firmly held vertically in place.
- Plug Data connector into base of bulb.
- Replace the bulb housing cover and replace the four hex screws.

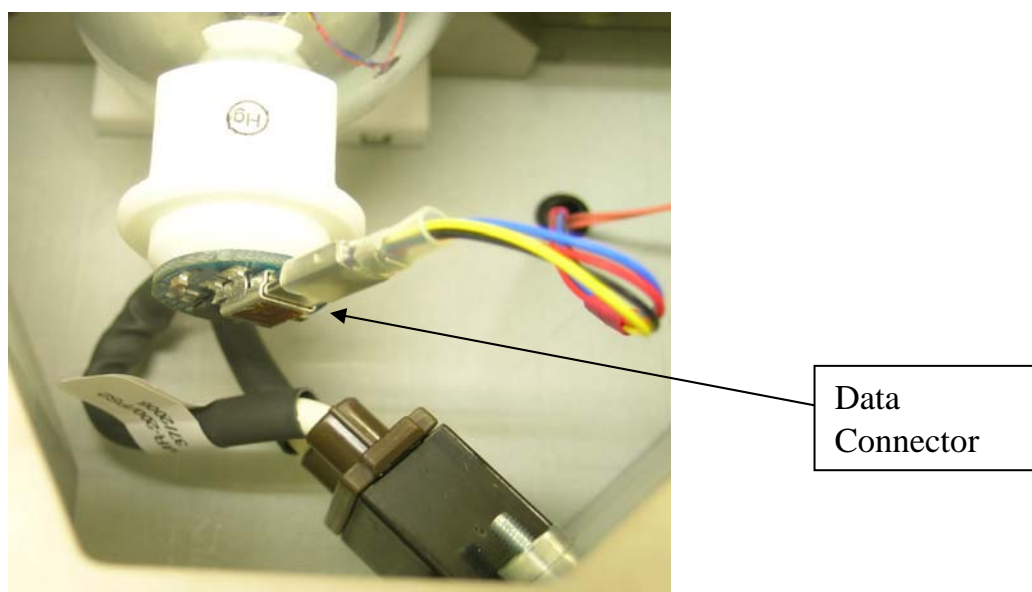


Figure 4.1f: Data connections on Bulb.

4.2 Connecting to the Microscope

Once the bulb is installed (see section 4.1), the Lumen is ready to be connected to the microscope.

1. Place the Lumen in a safe location and ensure none of the fan outputs are obstructed.
2. Unpack the Liquid Light guide from the foil packaging and remove both plastic caps from the light guide. Note: It is important to remove the caps before connecting to the light guide to avoid damage on power up.
3. Unscrew the connector on the front of the Lumen, and insert the Light guide.
 - a. Ensure the light guide is fully inserted into the Lumen, the light guide should be inserted by 58mm.
4. Tighten the connector unit resistance is felt, the light guide is now firmly held in the Lumen connector.
5. Locate the collimating lens supplied to attach the light guide onto the microscope, loosen the screw on the back of the collimating lens. Firmly push the light guide into the hole ensuring it has reached its end stop and tighten the screw.
 - a. The Lumen is supplied with a collimating lens specifically designed to fit your microscope, the supplied collimating lens will only fit the specified make of microscope.

5.1 Starting Up the Lumen

Warning:

- Do not power up the lumen without the light guide attached to both the Lumen and Microscope.

- Only power up the Lumen when it is installed on a level surface.

1. Ensure the light guide is attached to both the Lumen and Microscope.
2. Connect the power cable to the Lumen.
3. Switch the Lumen power switch on.
4. Allow 1-5 minutes for light to reach 70% of output.
5. Allow 30 minutes for the Lumen to reach operational temperature.
6. Warning: Do not power down the unit within 30 mins of power up. This may reduce the effective lifetime of the bulb.

5.2 Shutting down the Lumen

The following warnings apply as damage to the bulb may result if instructions not followed.

Warning: Do not shut the unit down within 30 minutes of powering up the unit.

Warning: After shutting down the unit allow 30 minutes before re-powering up or changing the bulb. Failure to do so is likely to result in damage to the bulb.

5.3 When to Change the bulb

The Lumen Bulb is installed with a timer chip which counts the hours that specific bulb has been activated. Once the bulb reaches the recommended lifetime of 2000hours, an alarm sound on the lumen.

It is recommended that the bulb is changed at this point.

This alarm can be silenced using the button situated to the left of the display panel on the front of the lumen. Once a bulb has reach 2000hours the alarm will sound on power up of the Lumen until the bulb is changed.

5.4 Changing Filters in the Filter Wheel (Pro only)

The Filter Wheel can hold up to 6, 25mm filters, these are held in position using the standard Prior mechanism.

Changing a Filter:

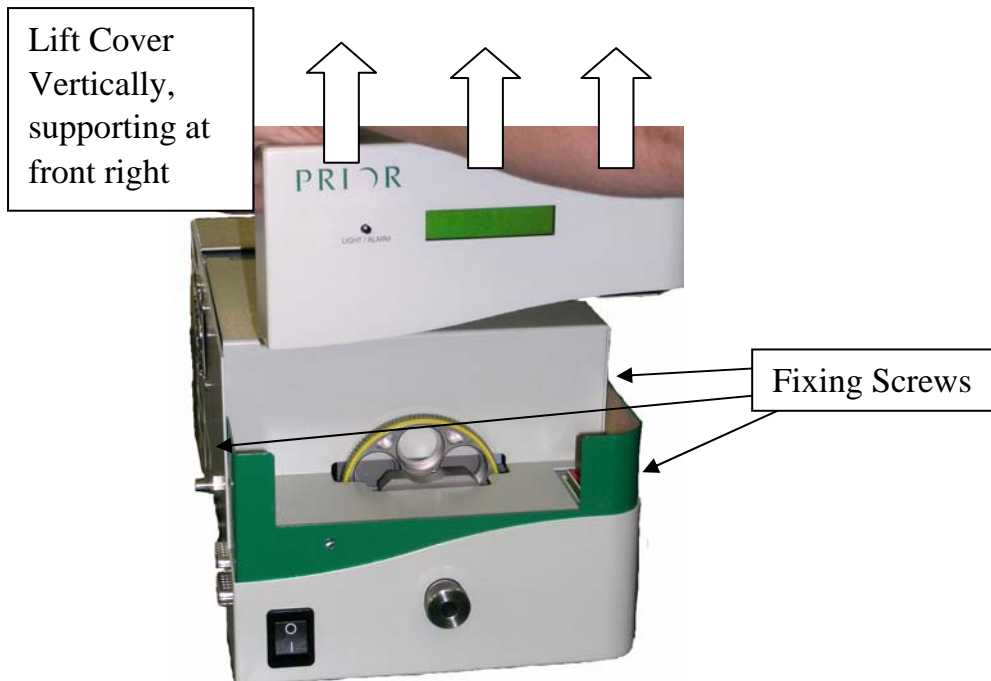
Equipment required: Lumen 200Pro, Filter, Prior Filter block tool, Hex key.

Instructions:

1. Disconnect the Lumen from mains Power.
2. Disconnect from controller.
3. Ensure the unit has been allowed to cool for 30mins.
4. Place the unit on a flat surface with empty space in front of the unit.
5. Unscrew the hex screws as indicated in Figure 5.5a.
6. Lift the top of the unit, applying particular pressure to the front right corner to disconnect the internal connector. See Figure 5.5a.
7. Turn the filter wheel until the desired filter position is in the filter change position indicated in Figure 5.5b. The filter number is displayed on the bottom right of the filter hole.
8. Using the Prior Filter block tool unscrew the filter ring.
 - a. Use the two lugs in the Filter block tool to locate in the two holes of the filter ring.

9. Remove the old filter, replace the new filter taking care not to place finger prints on the filter.
10. Using the Prior Filter block tool screw the filter ring to hold the filter.
 - a. Do not over tighten the filter ring, some filters will expand as they are heated by the light.
 - b. Tighten until tight then unscrew by a small amount, increase this for filters prone to heat expansion e.g., glass.
11. Repeat for all required filters.
12. Replace top of unit, ensuring the internal connector is aligned.
13. Replace hex screws.
14. Reconnect controller
 - a. Test filter wheel
15. Reconnect Lumen mains power.

Figure 5.5a: Fixing screws for Lumen 200 Pro.



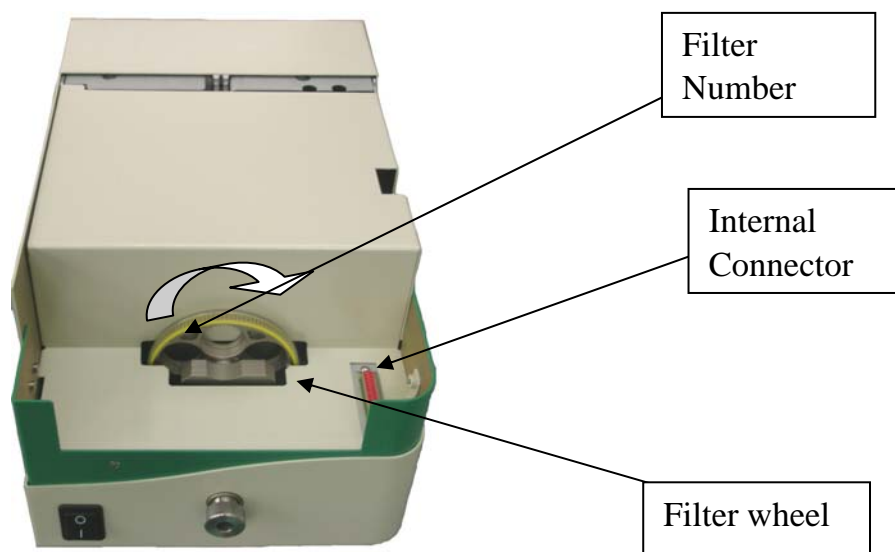


Figure 5.5b: Lumen 200 Pro with cover removed.

5.5 Routine Maintenance.

The internal dust filters require cleaning every 12 months of use.

1. Remove the three screws holding the rear cover on.
2. Lift the rear cover off.
3. Remove filters.
4. Wash in warm soapy water.
5. Rinse filters in water and allow to dry.
6. Replace filters.
7. Replace rear cover ensuring the isolator switches are beneath the cover.
8. Replace screws.

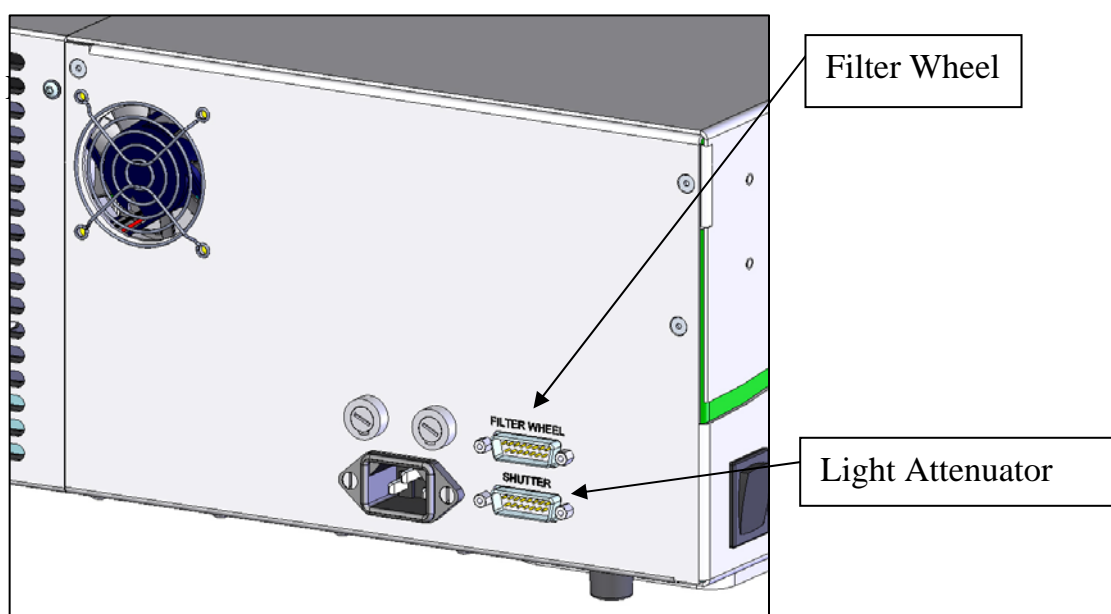
Advanced Operation

6.1 Connecting your Lumen 200Pro to a OptiScan or ProScan System

The Lumen 200Pro requires two filter wheel connections to a ProScan II or OptiScan II system.

Connecting your system:

1. Switch off the ProScan II or OptiScan II controller.
2. Connect both Filter Wheel and Shutter ports on the Lumen to the Filter 1 and Filter 2 ports on the ProScan or OptiScan II system using the cables provided.
 - a. It is not important which Filter connections are used on the Controller, but this should be noted for use with the command set described below.
 - b. Tighten the screws to fix the cables in position.
3. Switch on the Controller, your Lumen 200Pro is now ready to accept commands.
 - a. It is not necessary to switch the Lumen 200Pro power on to control the Shutter and Filter Wheel, these are powered by the attached controller.



6.2 RS232 Command Set

A description of how to connect to the ProScan or OptiScan systems is supplied in the OptiScan II and ProScan II manual. The following is the RS232 commands applicable to the Lumen 200Pro.

General Commands for identifying the Lumen 200Pro.

Identify which Filter Wheel port the Shutter and Filter Wheel are connected to using the “?” command described below.

Command	Arguments	Response (All end with <cr>)	Description
\$	a	decimal number	<p>Reports status as a decimal number and gives motion status of the Filter Wheel or Shutter of the Lumen Attached to the controller. After binary conversion convention is as follows:-</p> <p>F2 F1 A Z Y X D05 D04 D03 D02 D01 D00</p> <p>Parameters “\$,a” where a is the axis or resource</p> <p> F - Filter wheels F1 - Filter wheel 1 F2 - Filter wheel 2</p> <p>When the optional parameter is used the binary word is just for the axis requested. F is for filters (both Filter Wheel and Shutter) and would return 0 to 3 depending on if they are in use.</p>

?	None	Text string	<p>Reports information about the peripherals currently connected to the controller. The information end is always a line saying END This allows for the addition of extra fields of information without effecting application software. Users should always read lines in until the END is seen.</p> <p>A typical response is shown below</p> <pre> OPTISCAN INFORMATION DRIVE CHIPS 11111 JOYSTICK ACTIVE STAGE = NONE FOCUS = NONE FILTER_1 = LLG_SHUTTER FILTER_2 = LLG_FILTER SHUTTERS = 000 END </pre>
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The filter wheel installed in the Lumen Pro accepts the following commands.

Command	Arguments	Response (All end with <cr>)	Description
7	w, f	if f = F the current filter else R If no wheel is fitted E,17 will be returned.	If f is a number move filter wheel w to filter position f. if f is a 'N' move filter wheel w to next filter. If f is a 'P' move filter wheel w to previous filter. If f is a 'F' report current filter on filter wheel w. if f is a 'H' performs a home routine. If f is 'A' wheel will auto home on controller startup If f is 'D' wheel will NOT auto home on startup (default)
FILTER	w	Text string	Prints information about filter wheel w. The information end is always a line saying END This allows for the addition of extra fields of information without effecting application software. Users should always read lines in until the END is seen to keep in order to maintain compatibility. Example FILTER_1 = LLG_FILTER TYPE = 3 PULSES PER REV = 262500 FILTERS PER WHEEL = 6 OFFSET = 223500 HOME AT STARTUP = FALSE END
FPW	w	n	Reports the number n of filters on wheel 'w'.
SAF	w	a	Report the current filter wheel w acceleration setting.
SAF	w, a	0	Sets the current filter wheel w, acceleration to a. Range is 4 to 100
SMF	w	m	Report the current filter wheel w maximum speed setting m
SMF	w, m	0	Sets the current filter wheel w maximum speed to m. Range is 1 to 100

Lumen 200Pro Standard Shutter Commands.

The Lumen 200Pro Shutter accepts the standard commands for a Filter Wheel, Position 1-10 provide a standard range of light output from 0-100%.

Command	Arguments	Response (All end with <cr>)	Description
7	w, f	if f = F the current filter else R If no wheel is fitted E,17 will be returned.	If f is a number move filter wheel w to filter position f. if f is a 'N' move filter wheel w to next filter. If f is a 'P' move filter wheel w to previous filter. If f is a 'F' report current filter on filter wheel w. if f is a 'H' performs a home routine. If f is 'A' wheel will auto home on controller startup If f is 'D' wheel will NOT auto home on startup (default)
FILTER	w	Text string	Prints information about filter wheel w. The information end is always a line saying END This allows for the addition of extra fields of information without effecting application software. Users should always read lines in until the END is seen to keep in order to maintain compatibility. Example FILTER_1 = LLG_SHUTTER TYPE = 3 PULSES PER REV = 262500 FILTERS PER WHEEL = 10 OFFSET = 223500 HOME AT STARTUP = FALSE END
FPW	w	n	Reports the number n of filters on wheel 'w'.
SAF	w	a	Report the current filter wheel w acceleration setting.
SAF	w, a	0	Sets the current filter wheel w, acceleration to a. Range is 4 to 100
SMF	w	m	Report the current filter wheel w maximum speed setting m

SMF	w, m	0	Sets the current filter wheel w maximum speed to m. Range is 1 to 100
Command	Arguments	Response (All end with <cr>)	Description

The following are a list of commands specific to the Lumen 200Pro.

Command	Arguments	Response (All end with <cr>)	Description																						
LIGHT		a	Reports a the output of light from the shutter in %. The command automatically locates LGG_SHUTTER. Error 20 reported if no shutter detected.																						
LIGHT	n	0	Sets the output from the shutter to n, where n can be set between 1-100%. The command automatically locates LGG_SHUTTER. If n is "h" the shutter will perform a home routine.																						
LIGHT	P,n	0	Sets the filter wheel position P to n % light output. i.e., LIGHT,4,45 Sets position 4 to 45% light output. Use 7,n,4 to move filter to position 4, where n is the Filter Wheel port which the shutter is attached. STANDARD 10 Position Shutter settings are: <table border="0"> <thead> <tr> <th>Position</th> <th>% Light output</th> </tr> </thead> <tbody> <tr><td>1</td><td>0</td></tr> <tr><td>2</td><td>11</td></tr> <tr><td>3</td><td>22</td></tr> <tr><td>4</td><td>33</td></tr> <tr><td>5</td><td>44</td></tr> <tr><td>6</td><td>55</td></tr> <tr><td>7</td><td>66</td></tr> <tr><td>8</td><td>77</td></tr> <tr><td>9</td><td>88</td></tr> <tr><td>10</td><td>100</td></tr> </tbody> </table>	Position	% Light output	1	0	2	11	3	22	4	33	5	44	6	55	7	66	8	77	9	88	10	100
Position	% Light output																								
1	0																								
2	11																								
3	22																								
4	33																								
5	44																								
6	55																								
7	66																								
8	77																								
9	88																								
10	100																								
LIGHT	P, ?	n	Reports n, the %output of position p.																						

6.3 Error Codes

If a command is not valid a response of “E,n” is returned the n specifying an error type as listed below.

Machine or human readable messages are chosen using the **ERROR** Command.

ERROR CODE	ERROR DESCRIPTION
1	NO STAGE
2	NOT IDLE
3	NO DRIVE
4	STRING PARSE
5	COMMAND NOT FOUND
6	INVALID SHUTTER
7	NO FOCUS
8	VALUE OUT OF RANGE
9	INVALID WHEEL
10	ARG1 OUT OF RANGE
11	ARG2 OUT OF RANGE
12	ARG3 OUT OF RANGE
13	ARG4 OUT OF RANGE
14	ARG5 OUT OF RANGE
15	ARG6 OUT OF RANGE
16	INCORRECT STATE
17	WHEEL NOT FITTED
18	QUEUE FULL
19	COMPATIBILITY MODE SET
20	SHUTTER NOT FITTED
21	INVALID CHECKSUM
60	ENCODER ERROR
61	ENCODER RUN OFF

Troubleshooting

7.1 Alarms and Warnings

The Lumen may display several warnings the following table explains the actions recommended on hearing an alarm.

Message	Alarm reason	Quiet Alarm	Actions
Bulb Fault 1	Software not recognising hr count from bulb	No	Switch off unit. Check bulb for damage and check connections.
Bulb Fault 2	Bulb failure	Yes, Hold button for 5-10s. Reset to clear alarm	Switch off unit Check bulb for damage and check connections.
Over Temp Fault	Bulb over temperature	Yes, Hold button for 5-10s Reset to clear alarm	Check vents at rear of unit are not blocked or covered.
CHANGE BULB	Bulb reach 2000hr lifetime limit	Yes, Hold button for 5-10s	Change bulb.

7.2 Troubleshooting

Problem:

On initial start up, no light output from Lumen200.

Suggested Solutions:

- Confirm unit is plugged in and there are no error codes on front display.
- Confirm that the light output knob is not rotated to the 0% position (L200).
- Check shutter position (L200PRO only) position to confirm if it is in the fully closed position. This can be done by sending the “LIGHT” command in HyperTerminal. See ProScan, OptiScan or PriorPCI manual for instructions on using “HyperTerminal”.
- Send “HOME” command to filter wheel (L200PRO only) to insure it is not obstructing the optical path. Confirm that filter position in the light path does not contain a blanking plate.

Problem:

On initial start up, illumination is not bright.

Suggested Solutions:

- The unit requires 5 mins to warm up and 15-30mins to reach full brightness.
- Check that Liquid Light Guide is installed correctly, see section 4 for installation instructions.
- Check that bulb is installed correctly. See section 4 for installation instructions. (Note, you must wait 30 minutes after shutting off the illuminator before opening the access panel.)

Problem:

Just changed bulb and light is significantly less than normal.

Suggested Solutions:

- Check that bulb is installed correctly. See section 4 for installation instructions. (Note, you must wait 30 minutes after shutting off the illuminator before opening the access panel.)

Problem:

Just changed bulb and alarm sounds continuously.

Suggested Solution:

- Check for error messages on display.
- Turn off L200 and confirm that the Data Connector is installed completely into the PCB located at the base of the bulb. See section 4.1.

Problem:

Alarm sounds every time Lumen is turned on.

Suggested Solution:

- Check display on front of Lumen for error message. Check to see if the bulb has exceeded the recommended lifetime.
- Check the display on the front of the Lumen for error message. Check to see if fan vents are covered or blocked.

Problem:

Either Filter Wheel or Light Attenuator will not operate.

Suggested Solution:

- Confirm that the D-connectors on the side of the Lumen are connected securely into the filter wheel ports of a Prior ProScan, PCI or OptiScan controller.
- Check your Controller for error messages.

Replacement Parts

Description	Part Number
Prior Bulb	LM200BI
Fuse	W3377
Liquid Light Guide	LMLGM2M
Filter Wheel Cable	H300
Filter Changing Tool	H1165
Olympus Adaptor	LM10OL
Zeiss Adaptor	LM10ZS
Nikon Adaptor	LM10NI
Leica Adaptor	LM10LC

Returns and Repairs

Should you experience problems with your Lumen System and want to send it back for service, warranty or otherwise, a Return Material Authorisation (RMA) number must be obtained from the appropriate Prior Scientific office before returning any equipment. For North and South America contact Prior Scientific Inc. and for the rest of the world call Prior Scientific Instruments Limited on the telephone numbers shown below.

Prior Scientific Instruments Limited
Unit 4,
Wilbraham Road,
Fulbourn,
Cambridge,
England,
CB1 5ET
Telephone 01223 881711
FAX 01223 881710
email: uksales@prior.com

Prior Scientific Inc.
80 Reservoir Park Drive,
Rockland,
MA 02370-1062
USA
Telephone 781 878 8442
FAX 781 878 8736
email: info@prior.com

Part No. W3402 Issue B