



Blue LED Pulsed Light Source LS-450

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Important Safety Notices

1. Do not remove or modify any installed safety device on this equipment. Doing so will void your warranty and create an unsafe operating environment.
2. Dangerous voltages are present in this device. There are NO user serviceable parts inside.
3. Only allow qualified personnel to service this unit.
4. Do not use the unit if it is damaged in any way. Contact your dealer for repair or replacement information.

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About This Manual

Document Purpose and Intended Audience

This document provides you with an installation section to get your system up and running.

Document Summary

Chapter	Description
Chapter 1: Introduction	Contains product information for the LS-450 and information on unpacking.
Chapter 2: LS-450 Standalone Version Set-up and Operation	Contains instructions for setting up and operating the LS-450.
Chapter 3: R-LS-450 Rack-mount Set-up and Operation	Contains instructions for setting up and operating the R-LS-450.
Chapter 4: USB-LS-450 Blue LED Pulsed Light Source	Contains instructions for setting up the USB-LS-450.
Chapter 5: Specifications	Provides product specifications.
Appendix A: Maintenance	Contains instructions for changing the bulb and troubleshooting information.

Product-Related Documentation

You can access documentation for Ocean Optics products by visiting our website at <http://www.oceanoptics.com>. Select *Technical* → *Operating Instructions*, then choose the appropriate document from the available drop-down lists. Or, use the **Search by Model Number** field at the bottom of the web page.

You can also access operating instructions for Ocean Optics products on the *Software and Technical Resources* CD included with the system.

Engineering-level documentation is located on our website at *Technical* → *Engineering Docs*.

Upgrades

Occasionally, you may find that you need Ocean Optics to make a change or an upgrade to your system. To facilitate these changes, you must first contact Customer Support and obtain a Return Merchandise Authorization (RMA) number. Please contact Ocean Optics for specific instructions when returning a product.

Chapter 1

Introduction

Product Overview

The LS-450 Series Blue LED Pulsed Light Sources are compact, low-cost light-emitting diodes that produce pulsed or continuous spectral output at 470 nm – the blue region – for high-sensitivity emission fluorescence measurements.

The LS-450 light source can be combined with other sampling optics for a variety of fluorescence applications.

The LS-450 series consists of the following light sources:

- LS-450 (stand-alone version)
- R-LS-450 (rack-mount version)
- R-LS-450-2 (rack-mount version with 2 LEDs)
- USB-LS-450 (connects directly to USB spectrometers, documented separately)



LS-450 (Standalone version)

Features

- Excitation Source. Produces either pulsed or continuous output at 470 nm for high-sensitivity fluorescence applications
- Software Operation. Lamps can be turned on/off and used in pulsed or continuous mode through manual or software operation
- Synchronization with Detector Scan Rate. Configure lamp pulse rates via jumper blocks on the lamp or on the spectrometer

Unpacking the LS-450

► Procedure

1. Unpack your lamp assembly carefully. Although the blue LED lamp is rigidly mounted, dropping this instrument can cause permanent damage.
2. Inspect the outside of the instrument and make sure that there is no damage. Do not use the instrument if damage is present. Contact your dealer for repair or replacement information, if necessary.
3. Use this instrument in a clean laboratory environment (see [Error! Reference source not found.](#)).

LS-450 Standalone Version Set-up and Operation

Overview

The LS-450 Standalone version connects to the spectrometer via an interface cable. An SMA 905 connector enables coupling to fiber optics. For an S2000 Spectrometer, you can configure the light source to operate through a jumper block on the source or on the circuit board of the spectrometer.

Package Contents

Your LS-450 Stand-alone version package should contain the following:

- ❑ LS-450 Blue LED Pulsed Light Source
- ❑ DB-15 accessory cable
- ❑ Power supply

Connecting the LS-450 Standalone Version

► *Procedure*

To set up your LS-450 stand-alone version,

1. Plug the wall transformer into a standard 110V outlet.
2. Connect the power cord to the power input on the LS-450.
3. Connect an optical fiber to the SMA 905 connector to the LS-450.
4. Connect the other end of the optical fiber to the SMA 905 connector on your spectrometer or sampling device.

Connecting for Pulsed Mode Operation

Follow the instructions below for your specific spectrometer to configure Pulsed mode on the LS-450.

S2000 Spectrometer

► **Procedure**

1. Open the S2000 spectrometer housing and remove the spectrometer from the housing. Do not tamper with the optical bench.

Note

If you have more than one channel in your system, you may have to disconnect the channels from one another. The master spectrometer is always on the bottom of a multiple channel system.

2. Locate Jumper Block 3 (labeled JP3) on the green circuit board. This jumper block consists of 10 pins labeled by rows (/16, /14, /12, /10, and 2).
3. Attach the jumper to the appropriate pins to configure the number of pulses per second for your A/D converter. The table below illustrates the possible number of pulses per second for each A/D converter:

S2000 JP3 Pin Row	ADC2000-PCI Frequency (Hz)	ADC1000 Frequency (Hz)
/16	30.4	15.2
/14	120	60.8
/12	488	244.0
/10	1952	976.0
2	Controlled by flash delay in software	

5. Ensure that there are a constant number of flashes for every integration time by adjusting the integration time in your spectrometer operating software to a value shown in the table below.

S2000 JP3 Pin Row	ADC2000-PCI Frequency Acceptable Integration Times	ADC1000 Frequency Acceptable Integration Times
/16	32	64
/14	8	16
/12	2	4
/10	2	4
2	Integration time must be a multiple of flash delay	

USB2000/USB2000+/USB4000/HR2000 Spectrometer

The USB2000 and HR2000 Spectrometers have a 10-pin connector. The USB2000+/USB4000/HR2000 have a 20-pin connector. For these spectrometers, you need to use the USB-ADP-PX2 serial adapter.

► Procedure

1. Connect the USB-ADP-PX2 serial adapter to the spectrometer's accessory connector. For USB2000+/USB4000/HR2000 Spectrometers with the 20-pin connector, skip the first column of pins (A1 and A2) when plugging in the adapter.
2. Tighten the jackscrew to hold the adapter in place.
3. Connect the DB15 cable that came with the LS-450 to the USB-ADP-PX2, then to your LS-450.

Connecting to Ocean Optics Spectrometers with a 30-pin Connector

Our other spectrometers such as the NIRQuest, Maya, QE65000 and HR4000 use a 30-pin accessory connector.

► Procedure

Follow the steps below to connect the LS-450 to a spectrometer with a 30-pin accessory connector:

1. Connect the HR4000-CBL-BB ribbon cable to the spectrometer's 30-pin accessory connector.
2. Connect DB15 cable assembly to the spectrometer's ribbon cable and the other end to the LS-450's 15-pin connector.

Connecting the LS-450 Using the Breakout Box

The Breakout Box offers another option for connecting the LS-450 to our spectrometers with the 30-pin connector. The Breakout Box is a passive module that separates the signals from the 30-pin port of the spectrometer into an array of standard connectors and headers. You'll want to use the Breakout Box if you need multiple interfaces to your spectrometer. See the [Breakout Box Installation and Operation Instructions](#) for information on using the Breakout Box.

Note

If you are connecting the Breakout Box to the USB4000 Spectrometer, you must first attach the USB-ADP-BB adapter to the spectrometer.

Operating the LS-450 Standalone Version

The LS-450 can be used in Continuous or Pulsed mode.

Continuous Mode Operation

► Procedure

To operate the LS-450 in Continuous mode, follow the steps below:

1. Set the switch on the back of the LS-450 to **contin**. This means that the light coming out of the LS-450 is continuous.
2. Set the switch on the back of the LS-450 to **off** to turn the lamp off.

Pulsed Mode Operation

► Procedure

To operate the LS-450 in Pulsed mode, follow the steps below:

1. Set the desired integration time with your spectrometer operating software.
2. Select the Strobe/Lamp Enable with your spectrometer operating software. The spectrometer will pulse the lamp at 1 msec intervals, ensuring a consistent pulse rate regardless of the configured integration time.

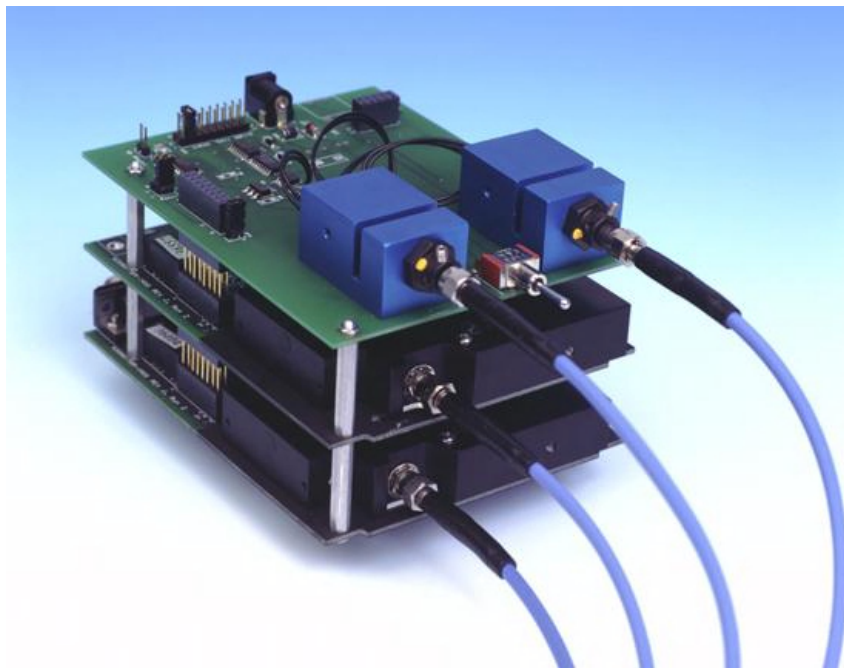
R-LS-450 Rack-mount Set-up and Operation

Overview

The R-LS-450 Blue LED Pulsed Light Source is the rack-mounted version of the LS-450. You can configure the R-LS-450 to operate in continuous wave mode via manual operation as well as through the software. You can also configure the R-LS-450 to operate in pulsed mode manually and through the software.

Ocean Optics ships the R-LS-450 with following jumper configuration:

- Jumper over pins in JP1
- Jumper over manual pins in JP3
- Jumper over 2¹⁰ pins in JP2 (fastest pulse rate available)



Connecting the R-LS-450 Rack-mount Version with an S2000 Spectrometer

You can configure the lamp using a switch and three jumper blocks on the circuit board of the R-LS-450 and, if applicable, one jumper block on the S2000 Spectrometer. The following section details the variety of configurations available with the R-LS-450. You need to determine the best mode of operation for your setup and configure your system appropriately.

Note

If you are using a USB-based spectrometer, instructions specifically for the S2000 spectrometer will not apply.

S1 Switch

The S1 switch is a three-position switch on the R-LS-450. The switch can be moved into the following positions:

- Continuous wave operation
- Off
- Pulsed operation

Jumper Block 1 (JP1)

JP1 consists of only one set of pins. If you configure other jumper blocks correctly, a jumper over JP1 allows you to turn the R-LS-450 on and off via the Strobe Enable/Disable function in your spectrometer operating software. This feature is only available with a “J” or later version of the S2000 spectrometer (USB-based spectrometers have a fixed pulse rate of 1 ms).

Note

To find out if you have a J-series or later S2000, look at the third character in your S2000 serial number.

Jumper Block 2 (JP2)

JP2 consists of nine sets of pins. You can configure the number of pulses per seconds by changing which pins are jumpered in JP2. However, pulses per second are also dependent on the master frequency of the A/D converter you are using.

The following table contains information on the function of each set of pins in JP2.

- Jumpering the CW pins makes the R-LS-450 operate continuously. This means that there is no pulsing of the light source. Other jumper blocks must be configured correctly for this setting to work properly.
- Jumpering sets 2^{16} , 2^{15} , 2^{14} , 2^{13} , 2^{12} , 2^{11} , and 2^{10} controls the pulse rate per second of the R-LS-450, depending on the A/D converter you are using to interface to the spectrometer (see the table below for pulse rates).
- Jumpering the CS pins controls the pulse rate via the spectrometer's Continuous Strobe Setting in OOIBase32 software (see the *Using JP3 on the S2000* section that follows for more information).

JP2 Pins	Function	ADC1000 Frequency (Hz)	ADC2000-PCI Frequency (Hz)
CW	Continuous mode	0	0
2^{16}	Divide by 2^{16}	15.2	30.4
2^{15}	Divide by 2^{15}	30.4	60.8
2^{14}	Divide by 2^{14}	60.8	122.0
2^{13}	Divide by 2^{13}	122.0	244.0
2^{12}	Divide by 2^{12}	244.0	488.0
2^{11}	Divide by 2^{11}	488.0	976.0
2^{10}	Divide by 2^{10}	976.0	1952.0
CS	Continuous Strobe	Software-controlled	Software-controlled

Jumper Block 3 (JP3)

JP3 consists of two sets of pins. The jumper position determines the source of power control (manual or remote) for the R-LS-450. Jumpering the Remote pins allows you to control the R-LS-450 through the software (if other jumper blocks are configured correctly).

R-LS-450 Operation Matrix

Use the following operation matrix to help you determine the correct jumper settings:

S1 Switch	JP1	JP3	LED Status
Off	No jumper	No jumper	Off
CW	No jumper	No jumper	Continuously On

3: R-LS-450 Rack-mount Setup and Operation

S1 Switch	JP1	JP3	LED Status
CW	Jumpered	Jumper remote pins	Continuous wave mode controlled by software (see the Continuous Wave Mode section for more information)
CW	Jumpered	Jumper manual pins	Continuously on
Pulsed	No jumper	No jumper	Pulse rate determined by JP2 on the R-LS-450 board (See the JP2 table above for pulse rates)
Pulsed	Jumpered	Jumper remote pins	Pulse mode controlled by software (See the Pulsed section for more information)
Pulsed	Jumpered	Jumper manual pins	Pulse rate determined by JP2 on the R-LS-450 board (See the JP2 table for pulse rates)

Using Jumper Block 3 (JP3) on the S2000

You can also configure functionality on the R-LS-450 through JP3 on the S2000 circuit board (if you are using the S2000 spectrometer). JP3 on the S2000 spectrometer allows you to control the R-LS-450 through the spectrometer operating software.

Continuous Wave Mode with JP3 on the S2000

You can turn the lamp of the R-LS-450 on and off (using JP3 of the S2000) while the unit is in continuous wave mode using the Strobe Enable function in software ONLY if the following conditions are met:

- The switch is turned to continuous wave mode
- The pins in JP1 on the R-LS-450 are jumpered
- The CW pins in JP2 of the R-LS-450 are jumpered
- The Remote pins in JP3 of the R-LS-450 are jumpered
- The two pins in JP3 of the S2000 spectrometer are jumpered

Pulsed Mode with JP3 on the S2000

You can control the pulses per second of the R-LS-450 (using JP3 of the S2000) ONLY if the following conditions are met:

- The switch is turned to pulsed mode
- The pins in JP1 of the R-LS-450 are jumpered
- The CS pins in JP2 of the R-LS-450 are jumpered
- The Remote pins in JP3 of the R-LS-450 are jumpered
- The pins labeled /16, /14, /12, or /10 (depending on the pulse rate you need) in JP3 of the S2000 spectrometer are jumpered.

The pulses per second are also dependent upon the frequency of your A/D converter. See the table below for options.

S2000 JP3 Pin Row	ADC2000-PCI Frequency (Hz)	ADC1000 Frequency (Hz)
/16	30.4	15.2
/14	120	60.8
/12	488	244.0
/10	1952	976.0
2	Controlled by flash delay in software	

You can control the pulses per second of the R-LS0450 through the Flash Delay function in the software if the following conditions are met:

- The switch is turned to Pulse mode
- The pins in JP1 on the R-LS-450 are jumpered
- The CS pins in JP2 on the R-LS-450 are jumpered
- The Remote pins in JP3 on the R-LS-450 are jumpered
- The pins labeled “2” in JP3 on the S2000 spectrometer are jumpered

Setting the Integration Time with the R-LS-450 and the S2000

When using any of the pulsed modes and the R-LS-450, you must ensure that a constant number of flashes occur for every integration cycle to ensure a continuous and stable signal. Set the integration time in the spectrometer operating software.

To achieve a constant number of flashes per integration cycle, the integration time you select must be a multiple of the times shown in the table below (depending on the A/D converter you are using).

S2000 JP3 Pin Row	ADC2000-PCI Acceptable Integration Times	ADC1000 Acceptable Integration Times
/16	32	64
/14	8	16
/12	2	4
/10	2	4
2	Integration time must be a multiple of flash delay	

Note

USB-based spectrometers automatically flash the lamp once per millisecond. Thus, there are always a constant number of flashes regardless of the integration time configured.

R-LS-450-2 Model

The instructions for controlling the R-LS-450-2 are exactly the same as those for the R-LS-450. The R-LS-450-2 has two LEDs, and the jumper configurations described in this manual will control both bulbs simultaneously. There is no way to control each bulb individually.

Chapter 4

USB-LS-450 Blue LED Pulsed Light Source

This section provides information on the operating environment and physical components of the LS-450.



Functionally similar to the LS-450, the USB-LS-450 attaches directly to the accessory connector of the USB4000-FL or the USB2000-FL Spectrometer. Its small-footprint design combines with the portability of the USB spectrometer to form a complete, self-contained light source and spectrometer combination.

The USB-LS-450 features the following design innovations:

- Simplified LED-Spectrometer Interface – USB-LS-450 connects to the USB2000 Spectrometer, which connects directly to the USB port of any desktop or notebook PC.
- Small Footprint – USB-LS-450 and spectrometer combination is about the size of a deck and a half of playing cards.
- On-board Memory for O₂ Measurements – FOXY Fiber Optic Oxygen Sensor users can conveniently store oxygen and temperature calibration coefficients.
- No External Power Requirements – Spectrometer and USB-LS-450 draw power from the host PC.

Package Contents

Your LS-450 Stand-alone version package should contain the following:

- ❑ USB-LS-450 Blue LED Pulsed Light Source
- ❑ Allen wrench (to adjust collimating lens)

Connecting the USB-LS-450

► *Procedure*

1. Align the male 10-pin accessory input on the USB-LS-450 with the accessory connector on the USB2000-FL Spectrometer.

For the USB4000-FL Spectrometer, connect the USB-ADP-PX2 serial adapter to the spectrometer's accessory connector.

2. Secure the spectrometer and the USB-LS-450 together by firmly interfacing the accessory connectors.
3. Insert the silver thumbscrew through the interface plate of the USB-LS-450 and tighten the thumbscrew to secure the USB-LS-450 and the spectrometer together.

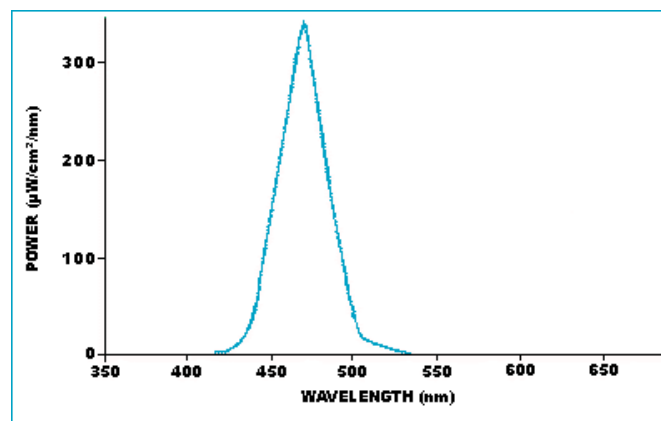
Specifications

LS-450 Series Technical Specifications

Lamp Specifications

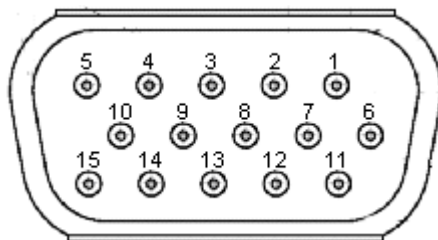
Item	LS-450, R-LS-450, R-LS-450-2 USB-LS-450	USB-LS-450
Physical Dimensions	90 mm x 50 mm x 32 mm (LS-450 only)	89 mm x 102 mm x 38 mm
Power Consumption	25 mA @ 12 VDC	60 mA @ 5 VDC
Power Output (minimum)	50 μ W into 600 μ m fiber	60 μ W into 600 μ m fiber
Stability	<1.0% after 2-minute warm-up	<1.0% after 2-minute warm-up
LED Drive Current	20 mA, 5 mA switchable	20 mA +/-0.15 mA

Absolute Spectral Output for LS-450 Blue LED Bulbs



Pinout Information

The following graphic and table illustrate the pinout information for the LS-450 light source:



15-pin connector on LS-450

Pin Number	Description
2	Continuous Strobe
10	Ground

This information applies only to the LS-450 model.

USB-LS-450 Specifications

Item	Specification
Power Output	Minimum of 60 W into a 600 μ m optical fiber
LED Drive Current	20 mA +/- 0.15 mA
Maximum Modulation Frequency	1 kHz
0.5% Stability Time	Less than 1 minute
Temperature-dependent Drift	+0.1%/°C

Temperature Measurement Specifications

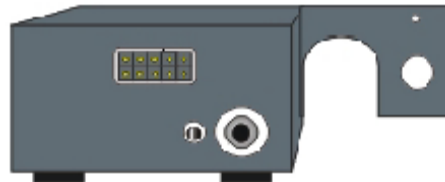
Item	Specification
Precision	Better than 0.1 °C
Accuracy	Better than 0.5 °C
Maximum Data Rate	15 samples per second

Power Specifications

Item	Specification
Input Voltage Range	3.0 to 8.0 volts
Quiescent Range	~20 mA
Current with Lamp On	~20 mA

USB-LS-450 Pin and Interface Information

The USB-LS-450 features a 10-pin accessory input (for the spectrometer) and a 4-pin accessory connector (for the USB-LS-450-TP).



Front view of the USB-LS-450 with 10-pin accessory input

10-pin Accessory Input

The 10-pin accessory Input on the USB-LS-450 provides unaltered connections to the 10-pin accessory connector on the USB2000-FL Spectrometer. Use this connector to configure external triggering options on the spectrometer when the USB-LS-450 is connected to it. Consult the External Triggering Options document at <http://www.oceanoptics.com/technical/engineeringdocs.asp> for more information on specific pin information for triggering.

10	9	8	7	6
5	4	3	2	1

Pinout diagram of the 10-pin connector on the USB2000-FL

Note

If you have the 4/20mA (USB-LS450-4/20) output option, the 4-20mA signal transmits on pin 8 of the 10-pin accessory input. The ground transmits on pin 6.

5: Specifications

4-pin USB-LS-450-TP Connector

The 4-pin USB-LS-450-TP connector is located on the side of the USB-LS-450. It is a round connector approximately 1 cm in diameter. The USB-LS-450-TP Temperature Probe plugs directly into this connector.



Side view of the USB-LS-450 with 4-pin USB-LS-450-TP connector

Consult the Fiber Optic Sensors Manual for more information on the USB-LS-450-TP.

Maintenance

Bulb Replacement for LS-450 Series Light Sources

The LS-450 and R-LS-450 light sources come with a standard LED that emits blue light at approximately 450-470 nm (see Absolute Spectral Output graphic above). However, the LS-450 and R-LS-450 can accommodate LEDs of different wavelengths, which are sold as accessories to the units.

Note

This section is not applicable to the USB-LS-450.

The LED is mounted in a silver reflector barrel, which allows easy insertion into and removal from the optical housing of the LS-450 and R-LS-450. The reflector barrel also optimizes any stray LED light, resulting in increased signal strength. Thus, you should never remove the LED from the reflector barrel.

To change the LED on the LS-450 and R-LS-450, you will need the following tools:

- 3/32 Allen wrench (LS-450 only)
- 1/20 Allen wrench

Changing a Bulb in the LS-450

► Procedure

To change the bulb in the LS-450, follow the steps below:

1. Ensure that the unit is off and that power is disconnected from the LS-450.
2. Use the 1/20 Allen wrench to loosen the small setscrew located on the bottom of the unit (between the set of “fins” that protrude from the sides of the unit). If you remove the screw fully, place it in a safe place until you replace it later in this procedure.

A: Maintenance

3. Use the 3/32 Allen wrench to remove the two screws on the bottom right and left corners of the rear end of the LS-450. This allows the LS-450 to be separated into two pieces. Place these screws in a safe area.
4. Pull the two halves apart gently until they are approximately 1.5” apart. This should expose two thin black wires that are holding the unit together. These wires connect to a small socket on the LED (located in the front half of the unit).
5. Slide the LED barrel out of the front portion of the LS-450. If the unit does not slide out easily, you will need to further loosen the setscrew (see Step 2).
6. Remove the blue filter, seated directly in front of the blue LED. Place the filter to the side. You will only need this filter when using the blue LED.
7. Unplug the blue LED from the connection socket. Remove the socket by gently pulling the insulated black wire back from the rear of the barrel. The socket should unplug easily

Note

If you want to reinsert the default blue LED in the future, identify the original LED orientation with a small amount of liquid paper.

8. Seat the socket of the replacement LED firmly into the rear of the barrel (where the anode and cathode lead pins are located). The orientation of the LED should be marked with a white dot on the side of the barrel (cathode side) OR by differing pin lengths (the short pin is the cathode side of the LED).
9. Place the new LED barrel back into the optical housing of the LS-450 and tighten the setscrew on the bottom (loosened in Step 2) so that the barrel is firmly set in the housing.
10. Reattach the two sides of the LS-450 together and replace the two screws you removed in Step 3. Ensure that the black socket wires do not stray out of the LS-450 enclosure when you reconnect the unit.
11. Plug the unit into the 12 V power supply and turn the unit on. If the new LED does not illuminate when the switch is in the On position, consult the troubleshooting tips at the end of this section.

Changing a Bulb in the R-LS-450

► Procedure

To change the bulb in the R-LS-450, follow the steps below:

1. Ensure that the unit is off and that power is disconnected from the R-LS-450.

2. Use the 1/20 Allen wrench to loosen the small setscrew located on the side of the blue optical housing. If you remove the screw fully, place it in a safe place until you replace it later in this procedure.
3. The LED and barrel are housed within the blue optical housing. This housing also contains the SMA fiber connection. There are two thin black wires connected to a socket, which is in turn plugged in to the rear end of the LED barrel.
4. Slide the LED barrel out of the blue optical housing. The barrel should slide easily. If it does not, you will need to further loosen the setscrew (Step 2) and retry.
5. Remove the blue filter, seated directly in front of the blue LED. Place the filter to the side. You will only need this filter when using the blue LED.
6. Unplug the blue LED from the connection socket. Remove the socket by gently pulling the insulated black wire back from the rear of the barrel. The socket should unplug easily.

Note

If you want to reinsert the default blue LED in the future, identify the original LED orientation with a small amount of liquid paper.

7. Seat the socket of the replacement LED firmly into the rear of the barrel (where the anode and cathode lead pins are located). The orientation of the LED should be marked with a white dot on the side of the barrel (cathode side) OR by differing pin lengths (the short pin is the cathode side of the LED).
8. There is also a diagram of the LED on the circuit board of the R-LS-450, which illustrates the socket orientation relative to the LED. This diagram is located next to where the two black wires connect to the circuit board.
9. Return the LED barrel back into the blue optical housing of the R-LS-450.
10. Push the barrel all the way into the blue optical housing and tighten the setscrew on the side (loosened in Step 2) so that the barrel is firmly set in the housing.
11. Plug the unit into the 12 V power supply and turn the unit on. If the LED illuminates, installation was successful. Return the R-LS-450 to the original rack unit.
12. If the new LED does not illuminate when the switch is in the On position, consult the troubleshooting tips at the end of this section.

Troubleshooting

If the replacement LED does not illuminate when the switch is in the On position, check the following items:

- Is the power supply in use correct? The light sources require a 12 V power supply with a 2.1mm centerpositive jack.
- Is the power supply plugged into an outlet that is enabled and standard for the power supply you are using?
- Is the LED in the correct orientation in respect to the socket (Anode and Cathode)?

If these items are correct and the light source is not emitting light at the proper wavelength (or at all), please contact Ocean Optics Technical Support.

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