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LS-1 Series Tungsten Halogen Light Sources

The LS-1 Series of tungsten halogen light sources are versatile, white-light lamps optimized for use in the VIS-Shortwave NIR range (360-2000 nm). These light sources offer high color temperature, very efficient output, and long bulb life.

The standard **LS-1** model comes with a 900-hour, 3100 K bulb. The **LS-1-LL** model features a 10,000-hour, 2800 K bulb that provides extra long life. All LS-1 light sources come with a 12 VDC power supply and a power cord. A set of Teflon diffusing discs and a BG-34 color-correcting filter are included with these models.

The **R-LS-1** and **R-LS-1-LL** Tungsten Halogen Light Sources are the rack-mounted versions of the LS-1 models explained above. Both of these lamp models ship with a set of Teflon diffusing discs and a BG-34 color-correcting filter.

Each of the LS-1 models above is described in detail in the following sections.



*LS-1 Tungsten Halogen Light Source (top)
connected to a FVA-UV Fiber Optic Variable
Attenuator (bottom)*

LS-1 Tungsten Halogen Light Source

Standard LS-1 light sources come with a 900-hour 3100 K bulb. However, the LS-1-LL (long life) is identical to the LS-1 with the exception of its 10,000-hour 2800 K bulb.

Parts Included

The LS-1 light source ships with the following items:

- LS-1 Tungsten Halogen Light Source
- Allen wrench
- Three Teflon diffusion discs
- One BG-34 blue filter
- 12 VDC power supply (a European power supply is also available)

The Teflon® diffusion discs are installed inside the light source. They are used to create a diffuse light source that is optimal for coupling into fibers, as well as for attenuating the source when spectrometer saturation is an issue. From smallest to largest, the three Teflon discs attenuate the light by approximately 50%, 75%, and 99% respectively.

The BG-34 blue filter is a 12.7 mm filter that you can install in the light source to enhance the signal in the blue region relative to the red and NIR regions.

See the *Using the LS-1* section that follows for more information.

LS-1 Series Tungsten Halogen Light Sources

Using the LS-1



Warning

Do NOT insert plastic or flammable materials into the 3 mm filter slot on the top of the LS-1. These materials could melt or ignite due to the extreme heat generated by the light source.

The light source becomes extremely hot during operation and does not feature a cooling fan. Handle with extreme care during operation.

Connecting the LS-1

Follow the instructions below to connect your LS-1 light source:

1. Plug the 12 VDC power supply into a standard wall outlet.
2. Plug the 12 V output end of the power supply into the back of the LS-1.
3. Connect a fiber to the SMA 905 connector on the LS-1.
4. Switch the lamp on using the silver On/Off switch on the rear of the LS-1 and allow the lamp to warm up for approximately 30 minutes.

The LS-1 is now ready to be connected to your sampling system.

Installing the Blue Filter or Teflon Discs in the LS-1

The BG-34 filter and Teflon disc can be permanently installed into the LS-1 to further optimize your experiment. The BG-34 filter amplifies the blue region in relation to the other regions in the spectrum, while the Teflon discs diffuse the light emitted from the LS-1. A BG-34 transmission graph can be found at the end of this manual.

Follow the instructions below to install the BG-34 blue filter or Teflon discs into the LS-1:

Note: This procedure involves opening the LS-1 light source. Before opening, ensure that the lamp has been off long enough to allow the unit to cool and disconnect the power supply from the LS-1.

1. Remove the two black hex bolts (located on either side of the silver On/Off switch) using a 3/32 Allen wrench (not included). Keep these bolts nearby.
2. Turn the LS-1 over and use the 0.050" Allen wrench included with the LS-1 to loosen the small silver screw located directly in the middle of the front portion of the lamp, directly between the heat fins of the LS-1.
3. Separate the two halves of the LS-1 by gently pulling them apart. Ensure that you the wires of the LS-1 are not caught and that the unit separates easily.
4. Insert the BG-34 filter or Teflon disk you wish to install into the 1/2" counter bore on the inside of the front half of the LS-1 (where the silver lamp tube resides when the lamp is assembled). Ensure that the disk lays flush against the bottom of the 1/2" counter bore.

When inserting the T-shaped Teflon plug, insert the narrow end first.

5. Replace the silver lamp tube, ensuring that it is fully inserted into the 1/2" counter bore. Verify that the black wire that connects to the bulb is still connected.
6. Hold the silver lamp tube in place and re-insert the small silver screw that you loosened in Step 2. This fastens the silver lamp tube in place.
7. Re-attach the two sides of the LS-1, ensuring that the lamp is fully connected.

Note: If you cannot fully reconnect the LS-1 due to the installed filter, you may need to gently move the black capacitor in the rear half of the LS-1 out of the way until the halves properly connect.

(Continued)

LS-1 Series Tungsten Halogen Light Sources

8. Re-insert the two hex bolts and tighten.
9. Connect the LS-1 as described in the *Connecting the LS-1* section.

You have now properly installed the BG-34 or Teflon disc into the LS-1.

Using the Filter Slot on the LS-1

The 3 mm slot between the lamp and the fiber coupler can be used to hold filters or light blocks. You can place a filter in the filter slot, but you must heed the following warnings:

- Filters must be 3 mm thick or less
- Filters should not be plastic, as they may melt from the heat generated by the lamp
- Filters should not be flammable materials, as they may ignite due to the lamp heat
- Filters cannot be clamped in place, as there is no filter locking mechanism built into the lamp

Maintaining the LS-1

Replacing the Bulb in the LS-1

Follow the steps below to replace the bulb in the LS-1:

1. Obtain the appropriate replacement bulb. The LS-1-B is a 900-hour bulb, and the LS-1-LL-B is a 10,000-hour bulb.
2. Turn off the LS-1 and remove the power input from the rear of the lamp. Allow the lamp to cool.
3. Use the included Allen wrench to loosen the setscrew on the bottom of the lamp. You do not need to remove the setscrew.

This screw holds the bulb in place inside the LS-1.

4. Remove the two black hex bolts (located on either side of the silver On/Off switch) using a 3/32" Allen wrench (not included). Keep these bolts nearby.
5. Separate the two halves of the LS-1 by gently pulling them apart. Ensure that you the wires of the LS-1 are not caught and that the unit separates easily.
6. Carefully remove the silver bulb from the housing in the front of the LS-1.
7. Detach the black wire from the silver bulb and dispose of the old bulb.
8. Plug the new bulb into the socket on the black wire.
9. Slide the silver bulb into the bulb housing on the front of the LS-1. Ensure that it is fully inserted.
10. Tighten the setscrew gently on the bottom of the LS-1.
11. Re-attach the two sides of the LS-1, ensuring that the lamp is fully connected.

Note: If you cannot fully reconnect the LS-1 due to the installed filter, you may need to gently move the black capacitor in the rear half of the LS-1 out of the way until the halves properly connect.

12. Re-insert the two hex bolts and tighten.

You have now replaced the bulb in the LS-1.

LS-1 Series Tungsten Halogen Light Sources

R-LS-1 Rack-mount Tungsten Halogen Light Source

The R-LS-1 Rack-mount Tungsten Halogen Light Source is a white-light source optimized for the VIS-NIR (360-2000 nm) range. It offers high color temperature, highly efficient output and long life in a compact, economical package.

Standard R-LS-1 light sources come with a 900-hour 3100 K bulb. However, the LS-1-LL (long life) is identical to the LS-1 with the exception of its 10,000-hour 2800 K bulb.

The R-LS-1 is the rack-mount version of the LS-1. It is identical in performance to the LS-1.

Parts Included

The R-LS-1 light source ships with the following items:

- R-LS-1 Rack-mount Tungsten Halogen Light Source
- Allen wrench
- Three Teflon diffusion discs
- One BG-34 blue filter
- 12 VDC power supply (a European power supply is also available)

The Teflon® diffusion discs are installed inside the light source. They are used to create a diffuse light source that is optimal for coupling into fibers, as well as for attenuating the source when spectrometer saturation is an issue. From smallest to largest, the three Teflon discs attenuate the light by approximately 50%, 75%, and 99% respectively.

The BG-34 blue filter is a 12.7 mm filter that you can install in the light source to enhance the signal in the blue region relative to the red and NIR regions.

See the *Using the R-LS-1* section that follows for more information.

Using the R-LS-1



Warning

Do NOT insert plastic or flammable materials into the 3 mm filter slot on the top of the LS-1. These materials could melt or ignite due to the extreme heat generated by the light source.

The light source becomes extremely hot during operation. Handle with extreme care.

Connecting the R-LS-1

Follow the instructions below to connect your R-LS-1 light source:

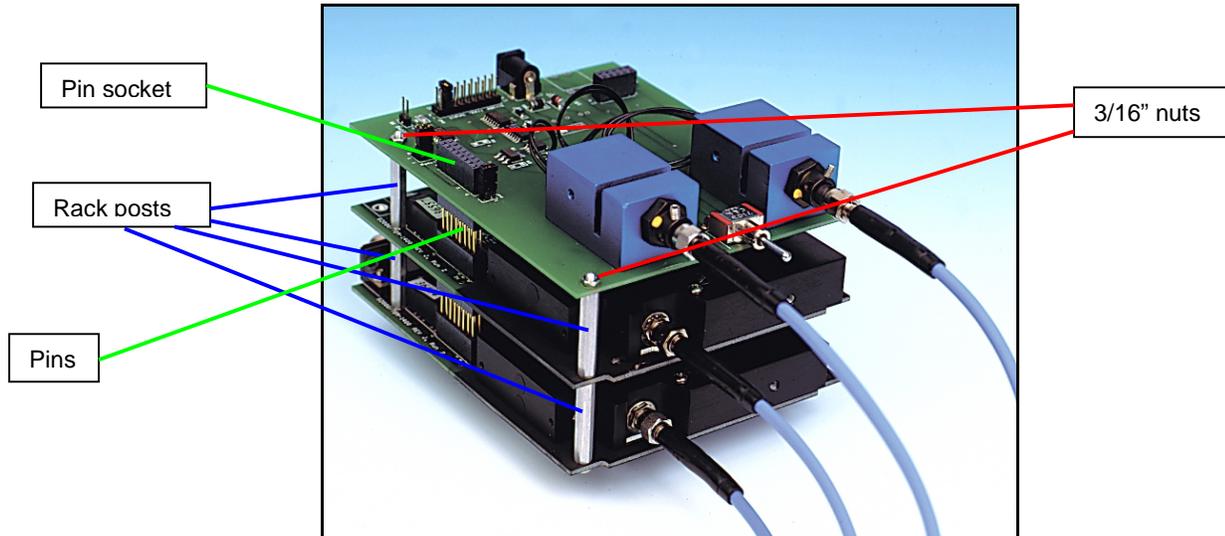
1. Identify the R-LS-1 in the equipment rack.
2. Connect the 12 VDC power supply to a wall outlet.
3. Connect the barrel connector on the power supply to the rear of the R-LS-1.
4. Connect a fiber to the SMA 905 connector on the R-LS-1.
5. Switch the lamp on using the silver On/Off switch on the R-LS-1 and allow the lamp to warm up for approximately 30 minutes.

The R-LS-1 is now ready for operation in your sampling system.

LS-1 Series Tungsten Halogen Light Sources

Removing the R-LS-1 from a Rack

If you received your rack-mounted spectrometer system pre-assembled from Ocean Optics, the R-LS-1 should be installed as the top item in the rack, with nothing above the blue anodized bulb housing. The R-LS-1 generates a large amount of heat, and it should always be installed in this location to minimized thermal effects on the spectrometers in the rack.



Sample Ocean Optics rack-mount system illustrating rack post assembly. In this illustration, the R-LS-450 is shown instead of the R-LS-1.

If you disassemble the rack for any reason, you should always install or re-install the R-LS-1 in the top position in the rack.

Follow the steps below to remove the R-LS-1 from a rack system:

1. Use a 3/16 nut driver or a small adjustable wrench to remove the four rack post nuts from the top component of the rack system (see diagram above). Keep the four rack post nuts in a safe place.
2. Lift the component off the rack and set aside.

Note: If the R-LS-1 is the top component in the rack, there is no need to continue further. Otherwise, continue to Step 3.

3. Unscrew the four rack posts to free the next component. Keep the four rack posts in a safe place.
4. Remove the component from the rack by gently pulling the component straight up until the two sets of pins bottom of the component are freed from the pin sockets on the lower component.

Repeat Steps 3-4 until the R-LS-1 has been removed. When you are done working on the R-LS-1, reverse the steps to re-assemble the rack, taking particular care to fully insert the pins into the pin sockets and tighten the rack posts.

LS-1 Series Tungsten Halogen Light Sources

Installing the Blue Filter or Teflon Discs in the R-LS-1

The BG-34 filter and Teflon disc can be permanently installed into the LS-1 to further optimize your experiment. The BG-34 filter amplifies the blue region in relation to the other regions in the spectrum, while the Teflon discs diffuse the light emitted from the R-LS-1. A BG-34 transmission graph can be found at the end of this manual.

Before installing blue filter discs, Teflon discs, or light bulbs in the R-LS-1, you must first remove the R-LS-1 from the rack it is installed in.

See the *Removing the R-LS-1 from a Rack* section before continuing.

Follow the instructions below to install the BG-34 blue filter or Teflon discs into the R-LS-1:

Note: This procedure involves opening the R-LS-1 light source. Before opening, ensure that the lamp has been off long enough to allow the unit to cool and disconnect the power supply from the R-LS-1.

1. Make a note the location of the four Phillips screws on the bottom of the R-LS-1. You must return these screws to this exact position when reconnecting the R-LS-1.
2. Loosen the four Phillips screws on the bottom of the R-LS-1. These screws hold the blue anodized bulb housing in place on the R-LS-1 card.
3. Slide the R-LS-1 in place on the card until the recessed silver Allen screw is visible under the blue anodized bulb housing on the bottom of the R-LS-1 card.
4. Use the Allen wrench included with the R-LS-1 to loosen the small silver screw. It is not necessary to remove this screw completely.
5. Slide the silver lamp tube out of the blue anodized bulb housing.
6. Insert the BG-34 filter or Teflon disk you wish to install into the ½" counter bore on the inside of the blue anodized bulb housing (where the silver lamp tube resides when the lamp is assembled). Ensure that the disk lays flush against the bottom of the ½" counter bore.
7. Replace the silver lamp tube, ensuring that it fully inserted into the ½" counter bore.
8. Hold the silver lamp tube in place and re-insert the small silver screw that you loosened in Step 4. This fastens the silver lamp tube in place.
9. Tighten the four Phillips screws on the bottom of the R-LS-1 card. Ensure that the black wire is still connected to the rear of the silver lamp tube.
10. Connect the R-LS-1 as described in the *Connecting the R-LS-1* section.

You have now properly installed the BG-34 or Teflon disc into the R-LS-1.

Using the Filter Slot on the R-LS-1

The 3 mm slot between the lamp and the fiber coupler can be used to hold filters or light blocks. You can place a filter in the filter slot, but you must heed the following warnings:

- Filters must be 3 mm thick or less
- Filters should not be plastic, as they may melt from the intense heat generated by the lamp
- Filters should not be flammable materials, as they may ignite due to the intense lamp heat
- Filters cannot be clamped in place, as there is no filter locking mechanism built into the lamp

Maintaining the R-LS-1

Replacing the Bulb in the R-LS-1

Before you replace the bulb in the R-LS-1, you must first remove the R-LS-1 from the rack it is installed in. See the *Removing the R-LS-1 from a Rack* section before continuing.

Follow the steps below to replace the bulb in the R-LS-1:

1. Obtain the appropriate replacement bulb. The LS-1-B is a 900-hour bulb, and the LS-1-LL-B is a 10,000-hour bulb.
2. Turn off the R-LS-1 and remove the power input from the rear of the lamp. Allow the lamp to cool.
3. Make a note the location of the four Phillips screws on the bottom of the R-LS-1. You must return these screws to this exact position when reconnecting the R-LS-1.
4. Loosen the four Phillips screws on the bottom of the R-LS-1. These screws hold the blue anodized bulb housing in place on the R-LS-1 card.
5. Slide the R-LS-1 in place on the card until the recessed silver Allen screw is visible under the blue anodized bulb housing on the bottom of the R-LS-1 card.
6. Use the Allen wrench included with the R-LS-1 to loosen the small silver screw. It is not necessary to remove this screw completely.
7. Slide the silver lamp tube out of the blue anodized bulb housing.
8. Detach the black wire from the silver bulb and dispose of the old bulb.
9. Plug the new bulb into the socket on the black wire.
10. Slide the silver bulb into the bulb housing on the front of the R-LS-1. Ensure that it is fully inserted.
11. Tighten the setscrew on the bottom of the R-LS-1.
12. Tighten the four Phillips screws on the bottom of the R-LS-1

You have now properly replaced the bulb in the R-LS-1.

LS-1 Series Tungsten Halogen Light Sources

R-LS-1 Pin Information

Pinouts for the H1 and H2 Headers of the R-LS-1 are the same as the H1 and H2 headers on the S2000 Spectrometer:

H1 Header Pins (Analog)

| Pin | Description |
|-----|------------------|
| 1 | Analog Channel 0 |
| 2 | Analog Channel 1 |
| 3 | Analog Channel 2 |
| 4 | Analog Channel 3 |
| 5 | Analog Channel 4 |
| 6 | Ground |
| 7 | Reserved |
| 8 | Analog Channel 7 |
| 9 | Analog Channel 6 |
| 10 | Analog Channel 5 |

H2 Header Pins (Digital)

| Pin | Description |
|-----|------------------------|
| D | N/C |
| C | A/D Trigger |
| B | Digital In 3 (D3) |
| A | S1 |
| 1 | Ground |
| 2 | +5 VDC |
| 3 | Phi A/D clock |
| 4 | Phi Read Out Gate |
| 5 | Reserved |
| 6 | Temperature (optional) |
| 7 | Read Enable |
| 8 | S0 |
| 9 | Strobe Single flash |
| 10 | Strobe Multiple Flash |
| 11 | Integration Clock |
| 12 | Master Clock |

These are the same headers contained on an S2000 spectrometer. However, H1 is not used by the R-LS-1. It is only required when the R-LS-1 is rack-mounted between spectrometers.

The light on the R-LS-1 can be toggled on and off through a TTL signal. This signal is supplied by OOIBase32 software through the PC to Pin 8 on H2. However, in order for software to control the on/off function of the R-LS-1, the JP1 jumper must be closed.

Note: When using a Rev. D S2000 Spectrometer, you must remove the jumper from JP1 on the R-LS-1. In this state, you can only operate the R-LS-1 via the power switch on the light source.

JP2 is a power jumper that allows multiple stacked light sources to use a single power supply by running power to each unit via H2 (alternate Voltage).

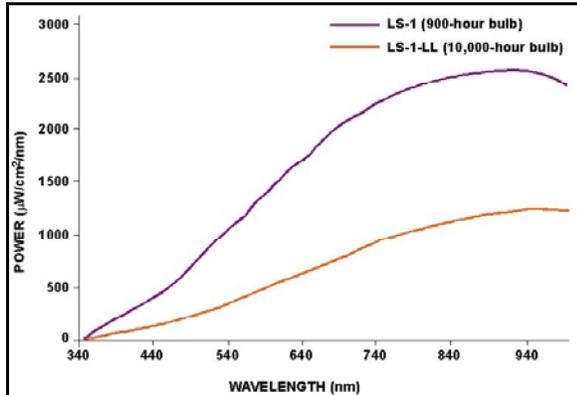
Note: JP1 is the strobe enable jumper (S0). This jumper must be closed to enable software on/off functionality.

LS-1 Series Tungsten Halogen Light Sources

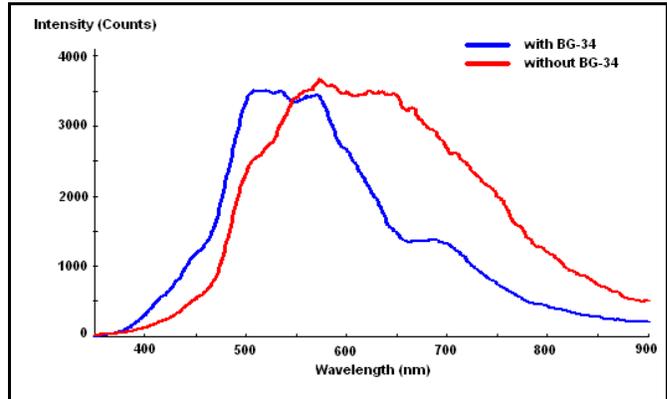
Spectral Output: LS-1 and R-LS-1

The graph on the left represents normalized blackbody curves for tungsten halogen light sources with 2800K and 3100K color temperatures. The observed spectral output of the LS-1 will vary due to bulb type, spectrometer configuration, sampling optics in use, and inherent fluctuations in LS-1 output.

The graph on the right represents the Scope mode signal from the LS-1 with and without the BG-34 filter.



Normalized blackbody curves for 2800K and 3100K color temperatures



Comparison of typical LS-1 Scope mode signal with and without BG-34 filter

Specifications: LS-1 and R-LS-1

| | LS-1 | R-LS-1 |
|----------------------------|---|--------|
| Spectral range: | 360-2000 nm If used with an Ocean Optics spectrometer, the practical spectral range of the light source is limited to the spectral response of the detector. | |
| Dimensions: | 113.5 mm x 50.8 mm x 31.6 mm | |
| Weight | 140 grams | |
| Power input: | 12 VDC / 800 mA 7-20 VDC / 0.5-2 amps | |
| Power output: | 6.5 watts | |
| Bulb life: | 900 hours (standard) 10,000 hours (long life) | |
| Bulb color temperature: | 900-hour bulb – 3100K 10,000-hour bulb – 2800K | |
| Output to bulb: | 5 volts / 1.3 amps | |
| Output regulation: | 0.2% voltage | |
| Time to stabilized output: | ~30 minutes | |
| Bulb output: | 7400 foot-candles (7.4 MSCP) | |
| Connector: | SMA 905 | |



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