

LS-1-CAL Calibrated Light Source

The **LS-1-CAL CALIBRATED LIGHT SOURCE** for the VIS-Shortwave NIR (300-1050 nm) is a tungsten halogen light source that provides you with known absolute intensity values at several wavelengths, expressed in $\mu\text{W}/\text{cm}^2/\text{nm}$. Since the spectral intensity of the LS-1-CAL can be traced to an intensity standard provided by the National Institute of Standards and Technology (NIST), it is specifically designed for calibrating the absolute spectral response of your system.

Parts Included

- ◆ LS-1-CAL Calibrated Light Source
- ◆ Switching AC adapter for stabilizing power
- ◆ Power cord for supplying power to the power supply
- ◆ Two Lamp Calibration Reports; one for using the LS-1-CAL with a bare fiber and one for using the LS-1-CAL with a CC-3 cosine-corrected irradiance probe
- ◆ A disk that holds files for both lamp calibration reports
- ◆ Allen wrench for adjusting the inner barrel of the SMA connector

Caution!

- ☠ The LS-1-CAL becomes **HOT** during operation. DO NOT insert flammable materials into the filter slot. The materials could melt or ignite. Handle with care.
- ☞ The LS-1-CAL is not designed as an illumination source for absorbance, transmission or reflection measurements. The LS-1 Tungsten Halogen Light Source should be used for those applications.

Setting Up

The LS-1-CAL is designed to calibrate the absolute spectral response of your system. Before beginning, make sure you have your LS-1-CAL, your spectrometer, an SMA-terminated optical fiber or CC-3 cosine-corrected irradiance probe, and OOIIrrad Ocean Optics Irradiance Software. (If you have a spectrometer setup that is highly sensitive, you may not be able to use the LS-1-CAL as a calibration source.)

Using the LS-1-CAL for Calibration

1. Use an Allen wrench to loosen the set screw on the LS-1-CAL's SMA connector.
2. If you are using a bare fiber with the lamp, withdraw the inner barrel from the SMA connector. Screw this connector barrel onto the end of your fiber. The connection should be tight. Insert the barrel/fiber all the way into the LS-1-CAL's SMA connector. If you are using a fiber and cosine corrector with the lamp, remove the inner barrel from the SMA connector. Screw the CC-3 cosine corrector onto the end of the fiber. The connection should be tight. Insert the CC-3/fiber all the way into the LS-1-CAL's SMA connector, taking the place of the SMA's inner barrel.
3. Use an Allen wrench to tighten the set screw on the SMA connector of the LS-1-CAL. Take the other end of the fiber and screw it all the way into the SMA connector of the spectrometer.
4. Plug the switching AC adapter (the black rectangle-shaped box) into the back of the LS-1-CAL. The adapter stabilizes the power coming into the lamp to insure constant spectral intensity.
5. Plug the power cord into a standard outlet. Plug the other end of the power cord into the back of the switching AC adapter.

6. Find the on/off switch on the back of the lamp and turn the lamp on.
7. Let the lamp warm up for at least 15 minutes before using.
8. Insert the disk that came with your lamp into your computer. The disk contains two ASCII files. These files have the same information as the Lamp Calibration Reports that came with your LS-1-CAL. One file has the calibration numbers for calibrating the spectral response of your system with the lamp and a *bare fiber*; its name contains the lamp's serial number, followed by **FIB.LMP**. The second file has the calibration numbers when calibrating the spectral response of your system with the lamp and a *CC-3 cosine-corrector and fiber*; its name contains the lamp's serial number, followed by **CC3.LMP**.
9. Copy these two files into your OOIrrad Irradiance Software directory.
10. Start OOIrrad Irradiance Software. Make sure you are in **Scope Mode**.
11. Under the **Lamp** menu options, choose **Select Lamp**. A window opens in which you must choose the Lamp Calibration Report file that reflects your optical setup.
12. Under the **Spectrometer** menu options, choose **Configure Fibers**. Enter the fiber diameter values for each channel in your setup. If using a bare fiber, enter the fiber's diameter here. If using a fiber with a CC-3 cosine corrector, enter 3,900. Whatever optical setup you wish to use for your application, you must also use for calibrating the spectral response of your system. For example, if you are going to use a 200- μm fiber with a CC-3 cosine corrector for your application, you must use the same 200- μm fiber and CC-3 for calibrating the spectral response of your system.
13. To the right of the displayed spectrum, enter the data acquisition parameters for your setup. The values for Scans to Average and Smoothing Size must be the same for your reference, dark and irradiance scans. You may use a different integration period for your reference scan, but you must use the same integration period for your dark and irradiance scans.
14. Under **Spectrometer** menu options, choose **Calibrate** and then select the channel you are calibrating.
15. A dialog box opens with the message **Verify lamp was ON for at least 15 minutes for a REFERENCE scan**. Make sure nothing is blocking the light path going to your spectrometer. Your setup (spectrometer, fiber, and sampling optics) for taking a reference should be identical to your setup for measuring your sample. Taking a reference spectrum is requisite before the software can calculate absolute irradiance measurements. Click **OK**.
16. Another dialog box opens with the message **Block light path to spectrometer for a DARK scan**. If possible, do not turn off the light source. Instead, completely block the light path going to your spectrometer by inserting an opaque object into the lamp's filter slot. Taking a dark spectrum is requisite before the software can calculate absolute irradiance measurements. Click **OK**. The spectral response of your system is calibrated.
17. If you selected **Display calibration info when calculating** in the **Configure Spectrometer** dialog box, you will now see the results of the calibration procedure. The top left graph represents the linear 15th order polynomial regression. The top right graph represents the dark scan. The bottom graph is the calibration curve representing the spectral response of the process.
18. The calibration procedure is saved in a file named **CH0.CAL** for calibrating the master spectrometer channel, **CH1.CAL** for calibrating the first slave spectrometer channel, and so on.

Specifications

Spectral range (calibrated):	300-1050 nm
Dimensions:	9.0 cm x 5.0 cm x 3.2 cm (LWH); 3.5" x 2.0" x 1.25" (LWH)
Power input:	12 VDC/800 mA (regulated)
Power output:	6.5 watts
Bulb life:	900 hours (recalibrate after ~50 hours of use)
Bulb color temperature:	3100K
Output to bulb:	5 volts/1.3 amps
Output regulation:	0.2% voltage
Time to stabilized output:	~15 minutes
Connector:	SMA 905