



DH-2000 Deuterium-Halogen Light Source

Installation and Operation Manual



For Products:
DH-2000-BAL, DH-2000-BAL-TTL-24V,
DH-2000-FHS-DUV-TTL, DH-2000-S-DUV-TTL

Document: 355-00000-000-01
Version 1.0



WARNING

Protective Eye Wear Must Be Worn
When Using This Instrument -
Intense Ultraviolet Radiation Present
See Important Safety Notices inside.

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About This Manual

Document Purpose and Intended Audience

This document provides you with installation information to get your DH-2000 light source up and running.

What's New in this Document

This version of the *Deuterium-Halogen Light Source Installation and Operation Manual* describes the re-engineered DH-2000 family of light sources. To verify that you have a re-engineered unit, look for the phrase “Assembled in USA” on the product label.

Document Summary

Chapter	Description
Chapter 1: Setup	Contains a list of package contents and unpacking instructions. Also contains instructions for connecting the fiber optic cable.
Chapter 2: DH-2000 Specifications	Contains operating environment specifications, as well as other physical details of the product, a parts list, and pinout information for the D-SUB-15 connector.
Chapter 3: Operating Instructions	Provides instructions for operating the DH-2000 lamp and the TTL shutter.
Chapter 4: Troubleshooting	Contains a table of troubleshooting information.
Appendix A: Maintenance	Provides instructions for returning the unit to Ocean Optics for bulb replacement.

Product-Related Documentation

You can access documentation for Ocean Optics products by visiting our website at <http://www.oceanoptics.com>. Select *Technical Operating Instructions*, and then choose the appropriate document from the available drop-down lists.

Ocean Optics offers a Glossary of spectroscopy terms to help you further understand your state-of-the-art products and how they function, located at:

<http://oceanoptics.com/glossary/>.

- Detailed instructions for OceanView Spectrometer Operating Software are located at: <http://oceanoptics.com/wp-content/uploads/OceanViewIO.pdf>.

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.

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.
3. Only allow qualified personnel to operate this unit.
4. Do not use the unit if it is damaged in any way. Contact your dealer for repair or replacement information.
5. Always screw in the fiber optic cables before starting the instrument.



WARNING

Protective eyewear **must** be worn when using this equipment. Intense ultraviolet radiation is present.

Never look directly into the light beam, as this can cause eye damage.

Warranty

Light Source products are covered by Ocean Optics Exclusive Three Year Warranty. For details, please visit the following webpage:

<https://oceanoptics.com/wp-content/uploads/Warranty-Sheet.pdf>

There are no warranties for the bulbs/modules.

This instrument should not be used for any Clinical or Diagnostic purposes. Data generated in these areas is not warranted in any way by Ocean Optics, Inc.

Certifications and Compliance

ISO CERTIFICATION

Ocean Optics, the industry leader in miniature photonics, has been certified for ISO 9001:2008 applicable to the design and manufacture of electro-optical equipment since 2009.



WEEE COMPLIANCE

The WEEE symbol on the product indicates that the product must not be disposed of with normal household waste. Instead, such marked waste equipment must be disposed of by arranging to return to a designated collection point for the recycling of waste electrical and electronic equipment. Separating and recycling this waste equipment at the time of disposal will help to conserve natural resources and ensure that the equipment is recycled in a manner that protects human health and the environment.



This device has been tested and complies with the following standards:

EN 61326-1:2013

EN 61000-4-2:2009 / IEC 61000-4-2:2008

EN 61000-4-3:2006 / IEC 61000-4-3:2006

EN 61000-4-5:2006 / IEC 61000-4-5:2005

EN 61000-4-11:2004 / IEC 61000-4-11:2004

EN 55011: 2009/A1:2010 Group 1 Class A

ANSI C63.4:2003

FCC COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class A 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 a commercial environment. 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. Operation of this equipment in a residential area is likely to cause harmful interference in which the user will be required to correct the interference at his own expense.



Chapter 1

Setup

Overview

The following sections provide instructions on unpacking and setting up your DH-2000 Light Source.

Before using the DH-2000 for the first time, check for transport damage. Be sure to adhere to all warnings on the unit and in this manual.



DH-2000 Deuterium-Halogen Light Source

Unpacking the DH-2000

► *Procedure*

1. Unpack your lamp assembly carefully. Although the 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 [Operating Environment](#)).

Contents

Your DH-2000 package should contain the following:

- ❑ DH-2000 High-Power Light Source
- ❑ Power cord
- ❑ UV safety goggles
- ❑ One IC-DB15-2 interface cable for shutter operation
- ❑ Quick Start Document

Connecting the Fiber Optic Cable

Connect the fiber optic cable to the unit prior to turning on the deuterium or halogen lamps.

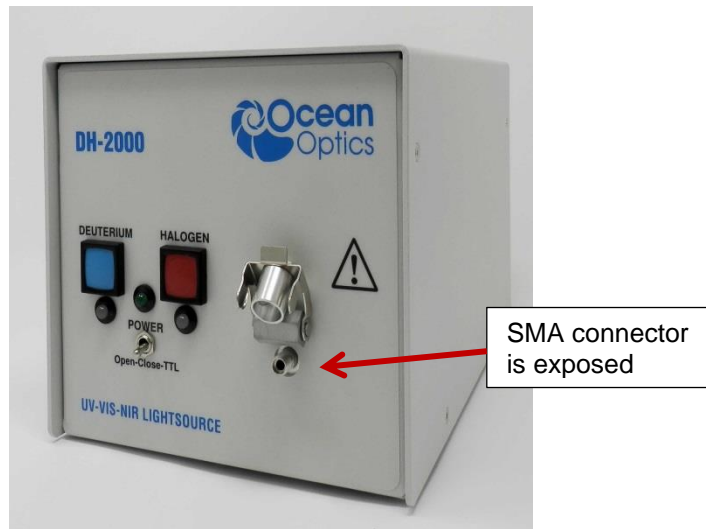
► Procedure

To connect the fiber optic cable to the DH-2000:

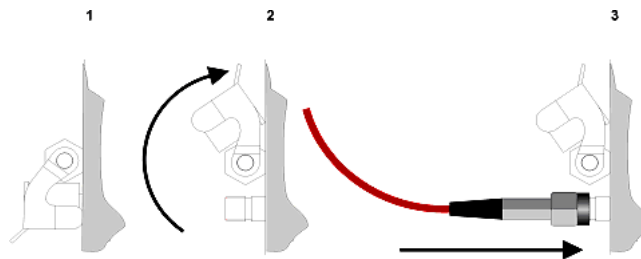
1. Locate the cap on the front of the DH-2000.



2. Lift the cap on the front of the DH-2000 to expose the SMA connector.



3. Connect the fiber optic cable to the SMA connector.



Chapter 2

DH-2000 Specifications

This section provides information on the operating environment, physical controls, and dimensions of the DH-2000. It also provides pinout information for the connector.

Operating Environment

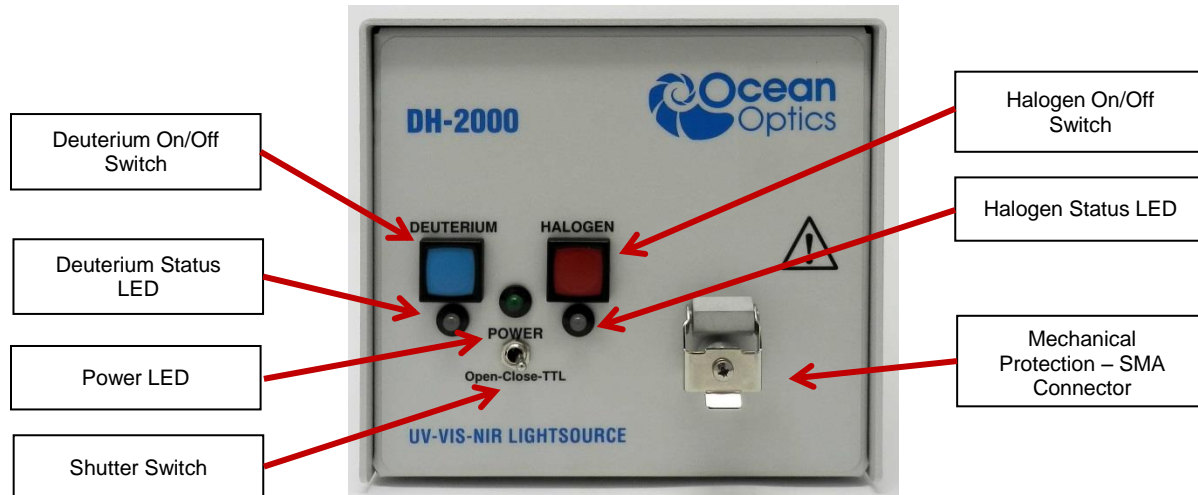
The following table provides information on optimizing the operating environment of your DH-2000.

Moisture	5-95% without condensation at 40°C
Ventilation	Unit should be situated so that its location or position does not interfere with proper ventilation.
Temperature	5°C – 35°C. Unit should be situated away from any device that emits excessive heat.
Object and Liquid Entry	Unit should be positioned so that objects do not fall on top of the unit. Additionally, ensure that no liquids are spilled into the enclosure through openings.

DH-2000 Components

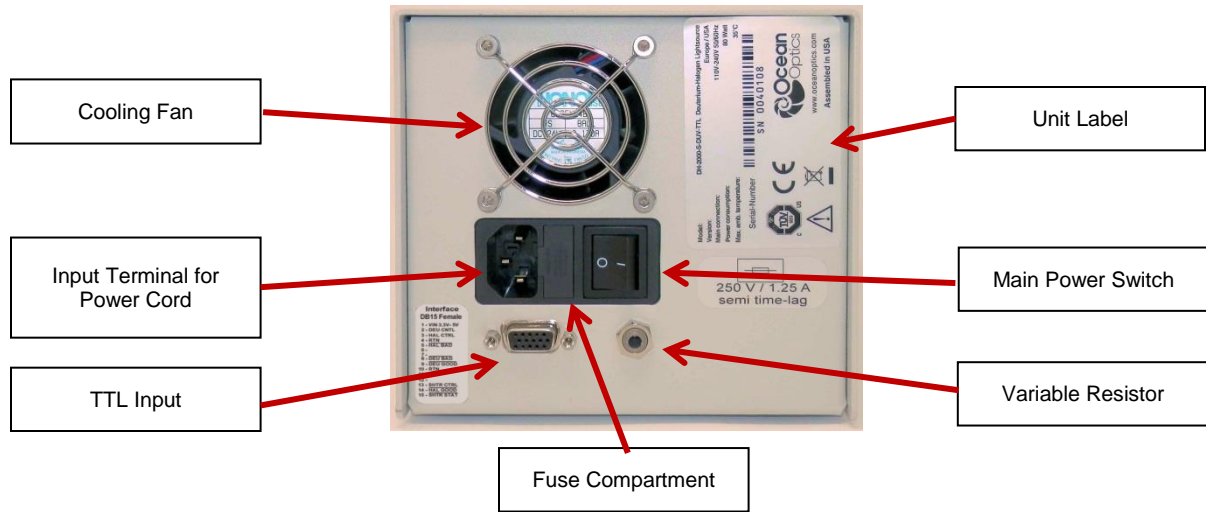
The following sections describe the components located on the front and rear of the DH-2000 unit.

Front Panel

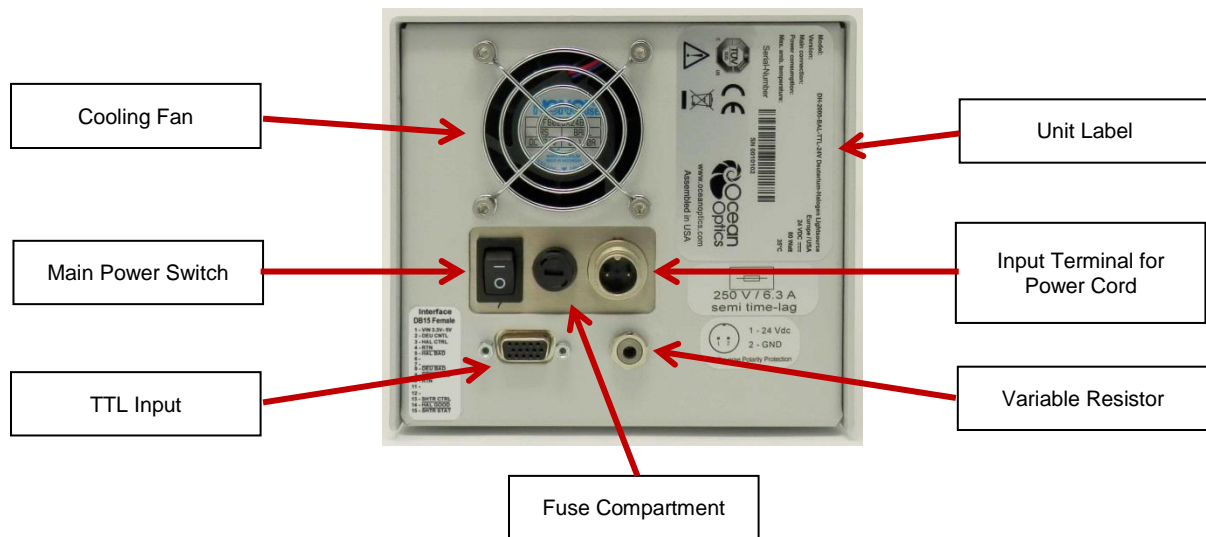


Component	Description
Deuterium On/Off	Press the blue DEUTERIUM button to turn the Deuterium lamp on or off. The bulb requires a warm-up time of 20 seconds before the Deuterium lamp is illuminated. You must allow the bulb to warm up to receive accurate data from the lamp. LED located under button lights green upon successful illumination or red to indicate lamp malfunction.
Power LED	Indicates the power state of the DH-2000.
Mechanical Protection – SMA Connector	Covered to protect users from unintentionally looking directly at the beam of light. Connect the fiber cable to the DH-2000 BEFORE turning the lamp on to avoid unnecessary exposure to UV radiation. Always wear proper eye protection when using the DH-2000 lamp.
Halogen On/Off	Press the red HALOGEN button to turn the Halogen lamp on or off. LED located under button lights green upon successful illumination or red to indicate lamp malfunction.
Shutter Mode Switch	Sets the operational mode of the shutter. Open indicates that the shutter is constantly open; Closed indicates that the shutter is constantly closed; TTL indicates the shutter is operated via the rear panel connector (see Rear Panel).

Rear Panel



DH-2000-FHS-DUV, DH-2000-S-DUV-TTL, DH-2000-BAL



DH-2000-BAL-TTL-24V

Component	Description
Main Power Switch	Turn on to supply power to the unit. The Power LED lights when this switch is in the ON position.
Fuse Compartment	Contains the fuse to protect the unit against overload: 2.0 Amp, 250 V slow blow. Littlefuse part # 0218002
Input Terminal for Power Cord	Plug power cord into this terminal. Note: Only connect the power cable to the lamp when the Main Power Switch is in the OFF position. THE INSTRUMENT MUST BE CONNECTED TO A GROUNDED (EARTHED) OUTLET
TTL Input	D-SUB 15-pin connector for automatic shutter control and remote lamp enable
Variable Resistor	Use a screwdriver to adjust the intensity of the halogen lamp to optimize the intensity between deuterium and halogen light in UV-VIS applications.
Unit Label	<ul style="list-style-type: none"> - Model DH-2000-xxxxx Deuterium-Halogen Lightsource - Version Europe / USA - Main connection 115 / 240V 47-63Hz - Power consumption 50 Watt - Max. Ambient Temperature 35°C - Serial-No. xxxxxx
Cooling Fan	Cools the interior of the DH-2000. Do not obstruct.

Unit Specifications

Specifications	Deuterium Lamp Criteria	Tungsten-Halogen Lamp Criteria
Wavelength Range	210–2500 nm 190–2500 nm (DUV models)	
Stability	0.01 % / h@ 254 nm	0.01 % / h@ 700 nm
Drift	0.01 % / h@ 254 nm	0.01 % / h@ 700 nm
Warm-Up Time	20 minutes*	25 minutes*
Lamp Lifetime (typical)	2000 hours	
Radiation Characteristics	(13°)	Focused
Possible Filter Dimensions (FHS model only)	Diameter or square 20-25mm Thickness 4-6mm	
Performance Guaranteed Temperature	5°C – 35°C	
Humidity	5 - 95% without condensation at 40°	
Internal Power Consumption	26 W	20 W
Total Power Max. Power Consumption	100 Watt/190 Watt (Heating D-Lamp for 20 seconds)	
Power Requirements:	110-240V 50/60 Hz (24VDC for DH-2000-BAL-TTL-24V)	
Remote Lamp Enable and Shutter Enable Requirements	I = 2.6 mA at 2.5V I = 8.1mA at 5V	
Weight	Approximately 6 kg	
Size	150 x 135 x 319 mm	

*Warm-up time @23 °C ambient, free airflow, no vibrations

Output Power	Deuterium Bulb Only	Tungsten-Halogen Bulb Only
DH-2000-FHS	217 μ W	295 μ W
DH-2000-DUV	585 μ W	990 μ W
DH-2000-BAL	194 μ W	615 μ W

* Typical output power coupled into a 600 μ m UV/VIS fiber and measured with an optical power meter integrated from 200 – 1100 nm

Modification of device specifications and designs to improve performance may occur without notice.

Parts List

Description	Part Number
Balanced Deuterium Tungsten-Halogen Source, 210-2500nm	DH-2000-BAL
Balanced Deuterium Tungsten-Halogen Source, 24Vdc, 210-2500nm	DH-2000-BAL-TTL-24V
Deep UV Deuterium Tungsten-Halogen Source, 190-2500 nm	DH-2000-S-DUV-TTL
Deep UV Deuterium Tungsten-Halogen Source with integrated filter holder, 190-2500nm	DH-2000-FHS-DUV-TTL
Fuse	Littlefuse 0218002.HXP
Deuterium Bulb	DH-2000-BD
Tungsten-Halogen Bulb	DH-2000-BH
Deep UV Deuterium Bulb	DH-2000-DUV-B

Pinout Information

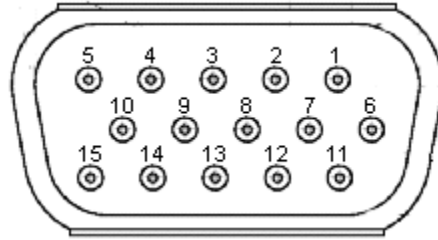
The following table contains pinout information for the DH-2000 Light Sources:

Pin	Description
1	Must be pulled up by use to 2.6V to 5 Volts
2	Deuterium Lamp – Turns the Deuterium Lamp on/off when 2.6V to 5V is applied to the pin (Rising Edge ON, Rising Edge OFF). *
3	Halogen Lamp - Turns the Halogen Lamp on/off when 2.6V to 5V is applied to the pin (Rising Edge ON, Rising Edge OFF). *
4	Light Source Ground
5	HAL_BAD: In the event the Halogen lamp is bad, this will be active low, otherwise it will be hi. This equates to the Red Halogen LED on the front. Note this LED usually flashes briefly at power up
6	NA
7	NA
8	D_BAD: In the event the Deuterium lamp is bad, this will be active low, otherwise it will be hi. This equates to the Red Deuterium LED on the front
9	D_GOOD: This is active low when the Deuterium is on. It will toggle at 1 Hz during warm up, just like the Green Deuterium LED on the front
10	Shutter Ground
11	NA
12	NA
13	Lamp Enable Signal (Rising Edge ON, Rising Edge OFF, 2.6V to 5V). *
14	HAL_GOOD: This is active low when the Halogen is on. Just like the Green Halogen LED on the front.
15	SHTR_STAT: Should be active HI if the shutter is OPEN

*This pull up is only required to use the OUTPUT signals on pins 5, 8, 9, 14, and 15. The input control signals on pins 2, 3, and 13 do not require this pull up.

A label on the rear of the unit also provides pin information.

Pinout Diagram



Operating Instructions

Operating the Lamp

The following sections provide instructions on operating the deuterium and halogen lamps in the DH-2000 Light Source. The DH-2000 unit must be in a horizontal position for it to work.

Starting Main Power

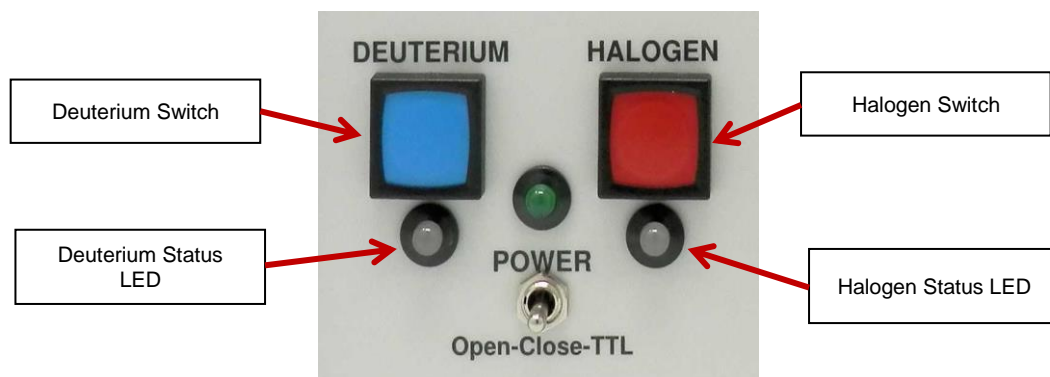
To apply main power to the unit,

1. Ensure that the Main Power Switch is OFF. Then, connect the power cord to the Terminal Input on the rear panel of the unit.
2. Turn the Main Power Switch ON. The Power LED lights, indicating that the unit is receiving power. The Status LED blinks momentarily after the main power is switched on. The deuterium and halogen bulbs remain off after power-on; they must be turned on separately.

Manual Operation of Lamp

Starting the Lamp

Press the DEUTERIUM or HALOGEN On/Off switch down to ignite the desired lamp. The LED blinks green until the lamp illuminates (approximately 20 seconds for the deuterium lamp, 1-2 seconds for the halogen lamp.)



After successful illumination, the two-color LED beneath the lamp's On/Off switch lights up green to indicate that the lamp is on. Should the lamp fail to light, the two-color LED lights up red. This indicates a malfunction of the lamp. Press the On/Off switch again to reset the lamp. See [Troubleshooting](#) for more information.



Protective eyewear must be worn when using this equipment - Intense ultraviolet radiation present.

Never look directly into the light beam, as this can cause eye damage.

Turning the Lamp Off

Turn the Deuterium or Halogen lamp off by tapping the appropriate ON/OFF switch. Wait 60 seconds before powering off the unit.

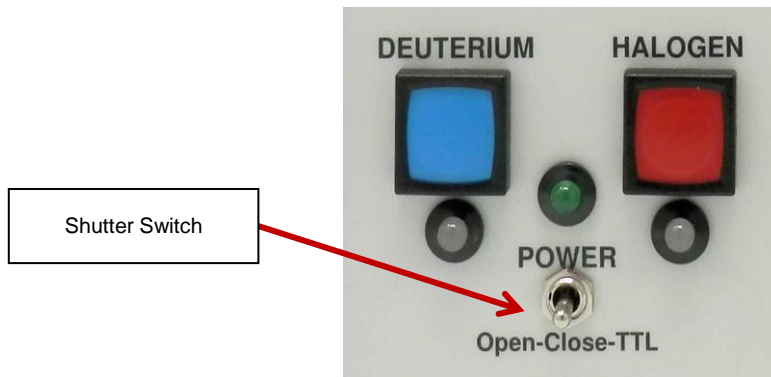
Warming Up the Lamp

After starting the lamp, it must be followed by a warm-up period. The Deuterium lamp requires 10–15 minutes, while the Tungsten-Halogen lamp requires 5–10 minutes of operation to reach a state of thermal equilibrium. During this warm-up period, the intensity of the output power can vary substantially.

If applications require extreme intensity stability, the Deuterium and/or Halogen lamps should be warmed up for an additional 15 minutes. Once warmed up for this amount of time, the lamp will reach specified drift values.

Manual Operation of the Shutter

The shutter on your DH-2000 device may be operated either manually or remotely by utilizing the shutter switch on the front of the unit.



Manually set the operating mode of the DH-2000 with the Shutter Switch as follows:

- OPEN - Shutter open
- CLOSE - Shutter closed
- TTL – Remote operation of shutter

Remote Operation of the LAMP and Shutter

For remote operation, plug the D-SUB 15-pin connector into the appropriate socket on your spectrometer.

USE ONLY THE CABLE PROVIDED OR A CUSTOM CABLE DESIGNED TO INTERFACE WITH THE PINOUTS AS DESCRIBED IN THE PINOUT INFORMATION SECTION. DO NOT USE A VGA VIDEO CABLE.

- Set the front panel shutter switch to the TTL position
- Pin 2 of the connector is the Deuterium LAMP ON/OFF control.
- Pin 3 of the connector is the Halogen LAMP ON/OFF control.
- Pin 13 of the connector is the shutter control. (HIGH=OPEN, LOW=CLOSE)

Refer to [Pinout Information](#) for information on operation of the Lamp and shutter.

Operating the Filter Slit (DH-2000-FHS-DUV-TTL only)

► Procedure

1. Rotate the light beam protection cap to open the filter slit.



2. Insert your filter with a maximum size of 1" round or square into the filter slit.
3. Rotate the light beam protection cap to completely close the filter slit, ensuring that no light is being emitted



4. After removing the filter, rotate the protection cap to its closed position.

Halogen Lamp Output Adjustment

The user has an option to adjust the halogen lamp output to optimize the intensity between deuterium and halogen light in UV/VIS applications.

On the rear of the unit, there is a variable resistor that can be adjusted with a small screwdriver.

	Voltage	Optical Power
Halogen adjustment	Approx. 5V - 12 V	10% - 100%

Troubleshooting

Deuterium Lamp

If the power supply or Deuterium lamp does not seem to functioning properly, check the following:

Issue	Probable Cause	Resolution
Power switches on, but no LEDs light.	Line power not present	Check line voltage
	Fuse defective	Check fuse
Deuterium lamp does not light. The two-color LED under the Deuterium On/Off switch lights up red, indicating an error.	Deuterium lamp too hot	Allow the Deuterium lamp to cool down (20 minutes). Press On/Off switch again to reset the Deuterium Tungsten-Halogen lamp, then press again to restart.
	Deuterium lamp life exhausted	Replace Deuterium lamp
	Deuterium lamp's internal connection plug is not closed correctly.	Open unit (see Maintenance) and close connector plug.
Deuterium lamp turns off during operation.	Deuterium lamp too hot	Turn off the unit. Allow the unit to cool down for at least 20 minutes. Once the unit has cooled down, turn the Deuterium lamp back on.

Halogen Lamp

If the Halogen lamp does not seem to functioning properly, check the following:

Issue	Probable Cause	Resolution
Halogen lamp does not work after pressing On/Off switch	Deuterium lamp is warming up	Wait until the Deuterium lamp has lit and try again
	Halogen lamp is defective	Replace the Halogen lamp
LED does not light after switching on the Halogen lamp	Internal power supply is defective	Disconnect the unit from the main power source and contact your dealer for repair or replacement

Appendix A

Maintenance

Overview

Bulb Replacement

You can manually change the Deuterium and Halogen bulbs in the DH-2000. To order replacement bulbs for the DH-2000, order the following item number(s):

Deuterium Spare Bulb (210 – 400 nm): DH-2000-BD

Deuterium Spare Bulb Deep UV (190 – 400 nm): DH-2000-DUV-B

Halogen Spare Bulb (300 – 1500 nm): DH-2000-BH

WARNING

Before replacing the bulb in the DH-2000, disconnect the lamp from your power source and allow the unit to cool for at least twenty minutes.

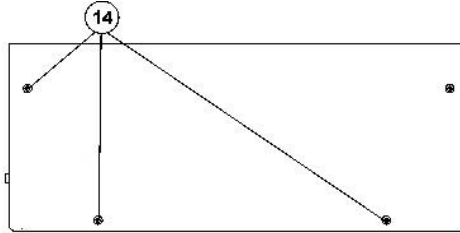
Do not touch the lamp glass directly, as contact with bare fingers will reduce the lifetime of the bulb.

Both the deuterium and tungsten-halogen bulbs have a typical life of 2000 hours. A good practice recommendation is to change both bulbs at the same time.

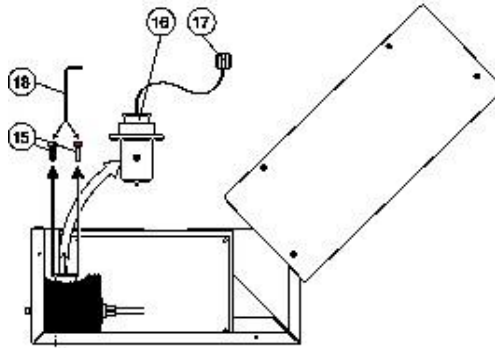
Replacing the Deuterium Bulb for All Models Except DH-2000-BAL

► Procedure

1. Open the six slotted screws (14) and open the casing cover.



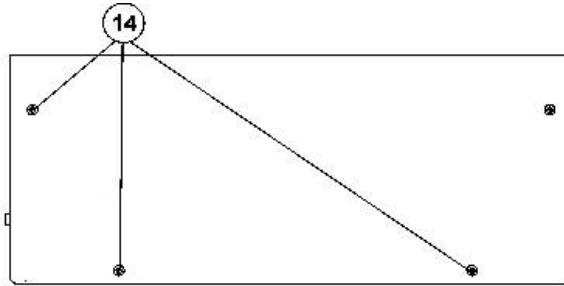
2. Open the screws (15) with the tool (18) that is delivered with the spare bulb (16).
3. Disconnect the old bulb and connect the new Deuterium Tungsten-Halogen lamp only with the originally supplied connection plugs (17).



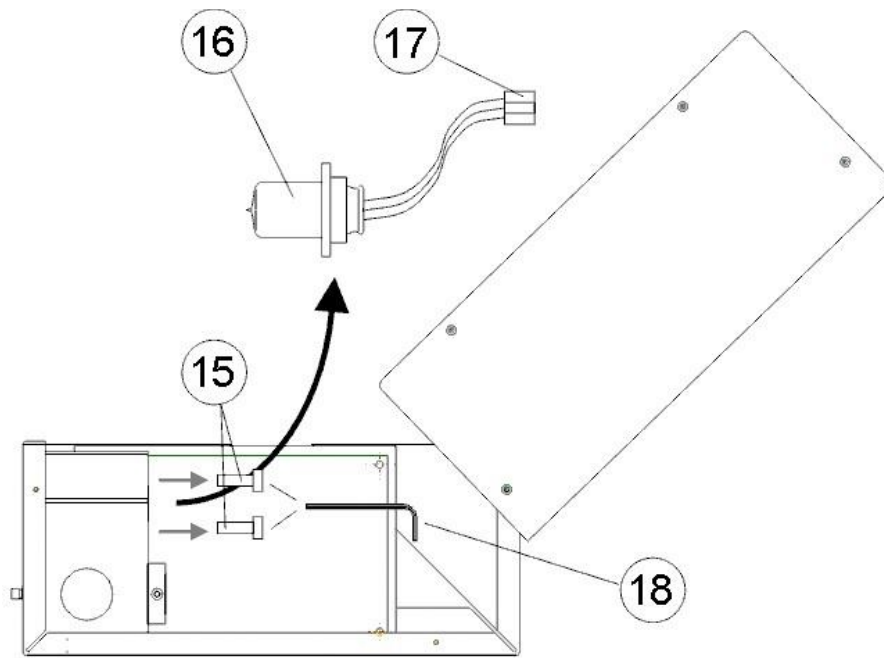
Replacing the Deuterium Bulb for DH-2000-BAL Model

► Procedure

1. Open the six slotted screws (14) and open the casing cover and rotate or remove the cover to expose the bulb housing



2. Open the screws (15) with the tool (18) that is delivered with the spare bulb (16).
3. Disconnect the old bulb and connect the new Deuterium lamp only with the originally supplied connection plugs (17).

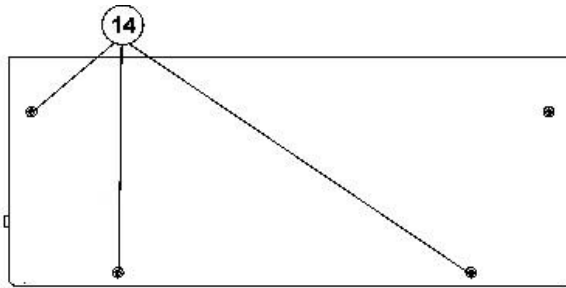


4. Reassemble the lamp housing by reversing Steps 1-3.

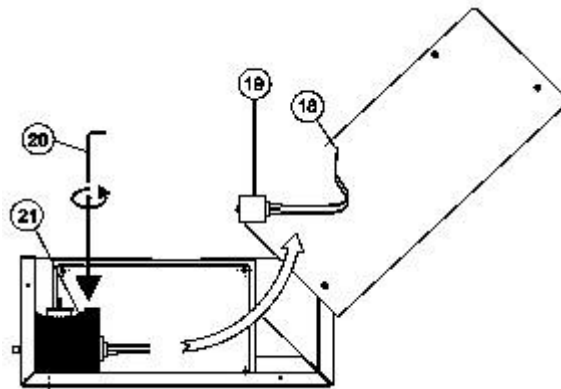
Replacing the Halogen Bulb for All Models Except DH-2000-BAL

► Procedure

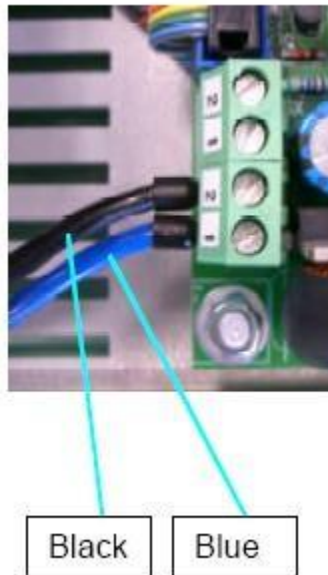
1. Open the six slotted screws (14) and open the casing cover.



2. Remove the screw (21) with the tool (20) provided with the spare bulb (19).
3. Disconnect the old Halogen bulb from the connection plugs (18)
4. Open the screws of the cable-clamp on the lamp-side and remove the defective Halogen lamp module.
5. Insert the new Halogen lamp module and Replace the screw (21).



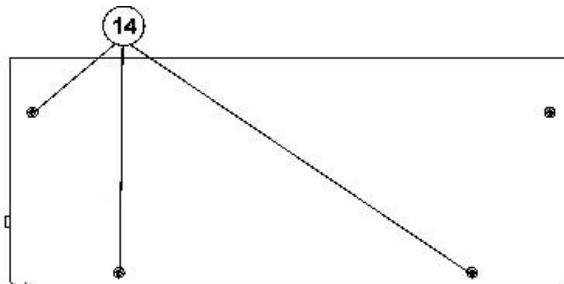
6. Reattach the two cables of the Halogen lamp module to the cable-clamp. To do this, attach the Halogen lamp's blue cable to Port 1 and the black cable to Port 2 of the connector.



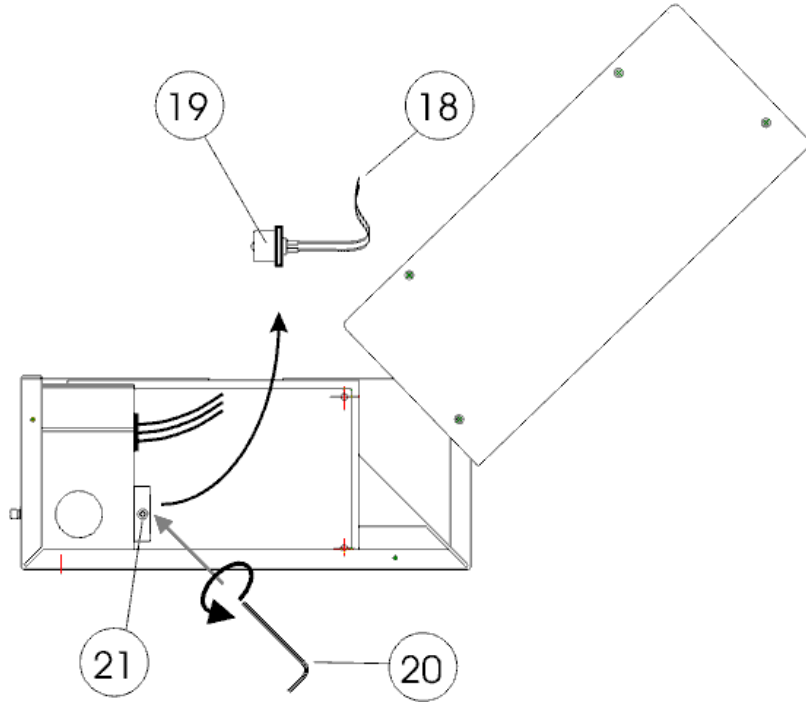
Replacing the Halogen Bulb for DH-2000-BAL Model

► Procedure

1. Open the six slotted screws (14) and open the casing cover.



2. Remove the screw (21) with the tool (20) provided with the spare bulb (19).
3. Disconnect the old Halogen bulb from the connection plugs (18)
4. Open the screws of the cable-clamp on the lamp-side and remove the defective Halogen lamp module.
5. Insert the new Halogen lamp module and Replace the screw (21).
6. Reattach the two cables of the Halogen lamp module to the cable-clamp



7. Reassemble the unit by reversing the disassembly steps.

Warranty Service

To initiate warranty service, navigate to: <https://oceanoptics.com/support/rma/> to obtain a RMA (Return Merchandise Authorization) number.

It is very important that you obtain a RMA number.

Please **DO NOT SHIP** merchandise to Ocean Optics, Inc. without prior authorization.

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