400 WATT HID
6000 Meter Lighthead

User's Guide

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1.0 Introduction:

Congratulations on your purchase of the DeepSea Power & Light 400 Watt HID Lighthead. The Lighthead contains the 400 watt lamp.

1.1 Limited Warranty:

DeepSea Power & Light, Inc. (DeepSea) warrants all of its products, unless otherwise noted, to be free from defects in workmanship and materials for a period of one year from the date of original purchase.

DeepSea is not responsible for warranty service should the product fail to be properly maintained or fail to function properly as a result of misuse, abuse, improper installation, neglect, improper shipping, damage caused by disasters such as fire, flood, and lightning, or unauthorized repair or modifications.

Should your DeepSea product prove defective during the warranty period, promptly notify DeepSea, and return product, freight prepaid. DeepSea will at its option repair or replace the product or defective portion without charge for parts or labor, or at DeepSea's option, refund purchase price. DeepSea will pay for return ground transportation on warranty repairs.

Products repaired or replaced under this warranty shall be warranted for the unexpired portion of the warranty applying to the original product(s).

No warranty or affirmation of fact, express or implied, other than as set forth in the limited warranty statement above is made or authorized by DeepSea. DeepSea disclaims any liability for product defect claims that are due to product misuse, improper product selection, or misapplication. Any liability for consequential and incidental damages is expressly disclaimed. DeepSea's liability in all events is limited to, and shall not exceed, the purchase price paid.

This Warranty does not apply to the lamp - On average these lamps will function properly for 1000 hours but may not and as actual hours of operation are impossible to verify our policy is that we will not replace lamps under warranty.

2.0 Specifications:

MECHANICAL

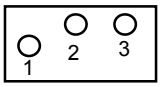
Material:	
Lighthead Body:	Titanium 6AL-4V
Dome Retaining Cowl:	Black Acetal (Delrin)
Glass Dome:	Borosilicate
Length:	27.43 cm (10.8 in.)
Diameter:	13.46 cm (5.3 in.)
Air Weight:	3.67 kg (8.1 lbs.)
Water Weight (approx.):	1.8 kg (4.0 lbs.)

ENVIRONMENTAL

Depth Rating:	6,000 meters (19,680 ft.)
Design Safety Factor:	1.5 times depth rating
Temperature:	-5 to +40 deg. C

ELECTRICAL

Input Connector Pin-out:



LPBH3MP
1 = Hot
2 = Neutral
3 = Ground to shell

Input Voltage:	From ballast
Input Power:	400 watts
Lamp Average Life Time:	1000 hours

3.0 Installation and Operation

CONNECT LIGHTHEAD TO A PROPER BALLAST.

WARNING: Whenever AC power is used in the vicinity of water, we **strongly** recommend that a Ground Fault Interrupt (GFI) or other protective device is utilized to minimize the chance of electric shock due to a short circuit.

First connect the Ballast to Lighthead. Second connect the ballast to the power source thru a proper on/off switch and circuit protector (fuse/circuit breaker).

The light and ballast are ready to test. At turn on there is a delay of approximately 1 minute before the lamp will start. After the lamp starts it goes thru a warm up of 4-6 minutes. This is for a Cold lamp start. For a Hot lamp Restart the Restart time will be 6-20 minutes.

Warning: The lighthead must be submerged in water when running or it will overheat and cause damage to the seals and possible the dome.

Warning: HID lights emit a significant amount of UV radiation that can cause sunburn and damage to eyes. While in the lighthead the Borosilicate dome filters out the UV. Do not run the lamp with the dome removed.

To turn off the light remove power to the Ballast.

4.0 Arc Lamp Module Components

The arc lamp tube is a pinched-off quartz tube which contains a drop of mercury, a small amount of sodium scandium (a solid salt), and is filled with a rare gas. Two main electrodes are located at opposite ends of the tube, with an additional starter electrode and ballast resistor at one end. The arc lamp tube is mounted within a lamp module assembly which consists of a borosilicate (Pyrex) envelope which is O-ring sealed into a brass and titanium lamp module base (no brass is exposed to seawater). A "hydrogen getter" disk in the lamp module removes hydrogen gas from inside the module; at high temperatures, hydrogen diffuses through the quartz arc tube wall and "poisons" the arc tube. Hermetic feedthrus provide lamp power connection terminals.

4.1 Arc Lamp Operating Environment

The arc lamp requires a controlled operating environment to perform to the fullest potential. The presence of oxygen, hydrogen, or hydrocarbons will all detrimentally affect the performance of the arc lamp. Oxygen outside of the arc tube but inside the lamp module will corrode the molybdenum foil seals which penetrate the arc tube; this oxidation phenomenon is accelerated by heat. Hydrogen in the arc tube reacts with the iodides, forming hydrogen iodide, which inhibits the arc from striking by increasing the required starting voltage; this phenomenon is known as hydrogen poisoning. Since the quartz arc tube is permeable to hydrogen gas, the hydrogen getter must be used to remove as much hydrogen as possible from the environment directly outside the tube. It is particularly important to make sure there is no water (or water vapor) in the lamp module since the intense heat and UV energy can split water into hydrogen and oxygen. It is virtually impossible to remove all water molecules from the hygroscopic components of the arc tube, and as a result, hydrogen is continuously released during operation of the lamp. The hydrogen getter is required to prevent hydrogen poisoning from this source. The presence of hydrocarbons outside the arc tube is apparent when the outside of the tube turns black; the light output is obviously affected. The arc tube will also gradually darken as a result of normal operation. Tungsten plates out from the electrodes onto the inside of the arc tube. A significantly blackened arc lamp should be replaced.

5.0 Lamp Replacement

5.1 General Information

It is important when opening the lighthead for servicing to take all reasonable steps to ensure that the work is carried out in a clean dry stable environment. It is useful to have a selection of clean plastic bags readily at hand for storage of parts.

Tools required to service the Lighthead:

- 3/16" spanner wrench
- 1/4" spanner wrench
- 3/8" spanner wrench
- 1/4" Medium slotted screw driver
- Eye protection

5.2 Lamp Life and Indications for Replacement

As the HID lamp ages, starting will become more difficult and "dropping out" may occur (lamp "drop out" is when the lamp only gets part way through its warm up cycle and unexpectedly goes out). Light output will slowly decrease over lamp life and a shift in color temperature may occur. Older lamps will become more difficult to restrike.

The lamp should be replaced if:

1. Physical damage is apparent.
    a. Cracking, blistering or whitening of the outer bulb.
    b. Cracks in the inner bulb.
2. Air has leaked into the outer quartz envelope. This will cause a yellow film like coating on the inside of the outer envelop, a result of oxidation of Molybdenum at high temperature in the presence of oxygen.
3. The lamp fails to ignite and the ballast/lighthead combination is known to function properly. Test ballast with another lighthead to verify ballast is working then replace lamp and test lighthead if lights properly then lamp was bad.

5.3 Opening the Lighthead

1. Remove the lighthead from the vehicle and take to the work area.
2. Place a protective cap on the end connector.
3. Using a 1/4" pin diameter spanner wrench, place the spanner pin in one of the 1/4" holes in the lighthead body (where the lighthead head and lighthead body join). See drawing 721-00317.
4. Place a 3/16" pin diameter spanner wrench in one of the 3/16" holes in the lighthead head.
5. Leveraging the spanner handles, unscrew, counter clockwise, the lighthead head from the body. The threads are standard right-hand threads. **DO NOT DISTURB THE DOME RETAINING COWL**. Take care to ensue that the spanner wenches are well seated in their respective holes. Wrench slippage will result in damage to the finish. If necessary, use a soft mallet to tap the spanner wrenches in order to free the parts.
6. After loosening the lighthead body and head, the pieces may be easily unscrewed by hand. It takes approximately 3 1/2 rotations to fully separate the pieces.
7. Carefully remove the lighthead body and attached lamp from the lighthead head. The lamp fits very close to the reflector and care must be taken to not damage the lamp or reflector during disassembly.
8. Place the lighthead head in a clean zip lock bag and set aside.

5.4 Relamping Procedure

Warning
When handling the HID lamp, wrap the lamp in several layers of clean dry paper towel to protect against injury in the event that the lamp shatters or breaks.

5.4.1. Remove the lamp

The lamp fits tightly in the socket and there is some risk of breakage during removal. The lamp is a screw base design like a standard household light. Remove the lamp by unscrewing it.

NOTE: ONLY unscrew the lamp module by the base. DO NOT unscrew the lamp module by the envelopes.

Unscrew the used lamp module from the light body. Check the brass contact rings inside the light body for corrosion. Clean with a pencil eraser if necessary.

5.4.2. Lamp handling Notes

HID lamps must be absolutely clean prior to use. Fingerprints or other contaminants on the quartz envelop will damage the lamp when it becomes hot. Substances such as sodium and potassium diffuse into the hot quartz and cause divitrification of the glass. In turn, the glass may become opaque and brittle and may blister or crack.

Hydrocarbon contaminants will leave black carbon deposits causing a hot spot resulting in loss of light output and overheating. Once the lamp is operated with contaminants on the glass, the lamp is permanently damaged. **DO NOT** touch the lamp envelope during handling. Prior to use, thoroughly clean the glass envelope with lab grade alcohol, another high purity organic solvent,

or the cleaning device supplied with the replacement lamp.

5.4.3 Installing the lamp

1. Install new O-rings before installing the new lamp, this reduces the likelihood of contaminating the lamp's outer glass envelope (bulb) with O-ring grease.
2. Remove the lamp from its box.
3. Visually inspect the lamp inside the sealed plastic bag before opening. Do not break the paper seal on the plastic bag if the lamp is broken or damaged.
4. Wrap the bulb with a clean, dry paper towel. Holding the lamp by the paper towel carefully screw the lamp into the light body.
5. Clean the lamp with a clean towel well damped with lab grade alcohol.

5.5 Closing the Lighthead

1. Verify that the O-rings have been installed.
2. Place the head assembly, dome side down, on the work surface, this orientation helps prevent the 2-039 O-ring from falling out of its groove during reassembly and reduces the risk of lamp breakage.
3. Carefully align the lighthead body such that the lamp passes cleanly through the hole in the parabolic reflector in the head assembly.
4. If possible, dry nitrogen purge the inside of the lighthead for one minute before engaging the threads of the two assemblies. Ensure that the nitrogen nozzle does not introduce any contamination onto the O-rings and sealing surfaces or cause the 2-039 face seal O-ring to pop out of its groove in the head section. A low nozzle pressure is recommended.
5. Screw the pieces together. Verify that the bore seal Teflon back up ring is on the low pressure side (towards threads) of the 2-142 O-ring and that it stays in its groove and does not catch as it enters the bore during assembly.
6. Ensure that the 2-039 O-ring is in place and does not get "pinched" as the head section bottoms against the body section.
7. It is VERY important that the body and head sections bottom metal-to-metal against each other. The rotation of one part against the other will end abruptly when these parts meet. Torque to approximately 20 ft Lb. If the body and head sections are not fully assembled, the threads may jam when at high pressure resulting in damage to the lighthead which may become difficult or impossible to open.
8. Reinstall lighthead on vehicle.

6.0 Lighthead Drawing

See following page