

HP-LED
Nuclear Lighting
System

OPERATION AND MAINTENANCE MANUAL



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WARRANTY

ROS, Inc. (hereinafter called "**ROS**") warrants its products as stated below subject to the conditions specified.

ROS warrants its products, when operated under normal conditions, to be free from defects in material or workmanship for a period of one year from the date of purchase provided that inspection by **ROS** discloses that such defects developed under normal and proper use. **ROS** products repaired or replaced pursuant to this warranty shall be warranted for the unexpired portion of the warranty applying to the original product. The liability of **ROS** under this warranty shall exist subject to the following conditions:

- (a) Purchaser properly notifies ROS of such defects and the defective product is returned to ROS, transportation charges paid by Purchaser.
- (b) ROS shall be released from all obligations under its warranty in the event repairs or modifications are made by persons not authorized by ROS.
- (c) Representations and warranties made by any person, including distributors and representatives of ROS, which are inconsistent or conflict with the terms of this warranty, shall not be binding upon ROS unless reduced to writing and approved by an officer of ROS. ROS shall in no event be liable for other direct, special, incidental, consequential, indirect or penal damages.
- (d) The laws of the State of California shall govern this warranty.

In the event the defect is determined to be within the terms of this warranty then **ROS** agrees to repair and/or replace (at **ROS**' discretion) the product or defective portion at no charge to the Purchaser. This warranty does not apply to expendable items or to normal wear-and-tear, and is conditional upon performance of normal preventative maintenance procedures.

Our commitment to quality and customer service directs us to constantly strive to improve our products. The materials and specifications presented in our manuals and data sheets are correct and accurate to the best of our knowledge, and are presented in good faith. However, the information is not guaranteed and is subject to change without notice.

LIMITATIONS OF REMEDIES

Purchaser assumes all risk and liability for results obtained in any installation, operation, or use of the product. Purchaser's sole remedy for any breach of warranty by vendor shall be limited to the "express remedies" set forth above. Otherwise, in no event shall vendor, its agents, or employees be liable to the original purchaser or any third party for any consequential or incidental damages or expenses of any nature arising directly out of or in connection with the use of vendor projects, even if vendor has been advised of the possibility of such damages or expenses. In any event, unless otherwise contrary to state law, vendor liability under this limited warranty shall not exceed the purchase price of the product.

CUSTOMER ASSISTANCE

ROS, Inc. uses a worldwide network of stocking distributors and representatives who are familiar with our products and are able to provide assistance during installation and/or operation of these products.

If you have any questions or problems with this product that are not covered by this manual or instruction, please contact our agent in your area, or contact us directly by phone or FAX or e-mail.

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CHANGE RECORD

<u>REV</u>	<u>DESCRIPTION</u>	<u>DATE</u>
X1	See EC-01331	12SEP12
A	SEE EC-01350	24OCT12
B	SEE EC-01520	27MAR13
C	SEE EC-01622	14JUN13

1 WARNINGS



WARNING: Assembly, disassembly, connecting cables, or disconnection of cables, must only occur when the HP-LED Light is disconnected from the power source.

- Please be cautious anytime you are dealing with HP-LED Lighting system. The light is extremely bright and looking directly at the array while it is on could pose a health risk such as blindness. Protective eyewear is required. ROS recommends Honeywell Uvex Stealth® OTG goggles with Shade 5.0.
- When handling the HP-LED Lighting System, or any of its components, please be aware that the light is relatively heavy. Dropping the HP-LED, or any of its components, could result in personal injury or damage to the system.
- Be careful when handling the light, power supply, and cables due to exposed male pins on the connectors. The pins can be damaged if they are bumped excessively. Any damage may result in difficulty when connecting cables or possible flooding for those connections that are underwater.
- When handling the cables, do not pull or tug on the cables more than necessary. Connector or cable damage through cutting of the jacket may result.
- If operating the power supply in air, be aware that the housing can reach temperatures of 45°C hotter than the surrounding air. It may be too hot to comfortably touch the power supply with your bare hand.

2 DESCRIPTION

The HP-LED Nuclear Lighting System is a revolutionary underwater LED luminaire utilizing the most advanced LEDs on the market. The quality and intensity of the light from the HP-LED makes it the highest performing light for today's nuclear industry. With the ability to handle 100 to 240 VAC, the HP-LED Lighting System draws 510 Watts of power and generates an astounding 30,000 lumens of light.

The HP-LED Lighting System consists of two main assemblies: a HP-LED Power Supply and the HP-LED Light Head. The two assemblies are pole mounted for user convenience and are electrically connected with a DC cable and an AC cable.

3 PRODUCT SPECIFICATIONS

Mechanical Light Head	
Housing Material	Electro-polished Stainless Steel
Window Material	Optical Grade Polycarbonate
Mounting	Mounts in yoke - tilts in 12 degree increments
Weight in Air	29.7 lbs (13.5 kg)
Size	12.0 in (304.8mm) X 12 in (304.8mm) x 6 in (152.4mm) with connector
Connector	PBH-5-MP
Mechanical Power Supply	
Housing Material	Electro-polished Stainless Steel
Mounting	Two quick release pins to mounting pole
Weight in Air	24.9 lbs (11.3 kg)
Size	8.1 in (206mm) x 13.4 in (340mm) x 3.1 in (79mm) excluding connectors
Connectors	PBH-3-MP AC inlet PBH-5-FS DC outlet
Environmental	
Depth Rating	35 meters (IPX8)
Test Pressure	50 psi
Min/Max Operating Temperature	-10°C to 50°C <ul style="list-style-type: none"> • The HP-LED Light Head must be immersed in water to operate. • The HP-LED Power Supply can be air or water cooled.
Storage Temperature (in air)	-25°C to 80°C
Power Supply Thermal Protection	Thermal cutoff when power supply reaches 100°C / resets at 80°C
Optical/Electrical	
Color Temperature	6300 K (typical)
Light Output	30,000 lumens
Beam Pattern (half-intensity angle)	70° Vertical X 104° Horizontal
End of Life Light Output	70% Rated Intensity at 30,000 Hrs
Power Draw	100-240 VAC, 50-60Hz, 7.0A, 510W (typ)

Table 1, Specifications

4 INSTALLATION

Your new LED luminaire is intended for years of service free use. The luminaire is not intended to be serviced or troubleshot in the field. Please contact your sales representative should any issues arise with your new luminaire.

To install the luminaire in the yoke, insert the two quick release pins through the posts in the rear of the light to lock the light to the pivoting mounts on the yoke as shown in Figure 1.



Figure 1, HP-LED Light Head, Rear View

To adjust the tilt of the light in the yoke, remove the quick release pins on either the side of the yoke which is inserted into the pivoting mounts, tilt the light to the desired tilt angle and then reinsert the quick release pin to lock in the tilt angle.



CAUTION: Use careful handling procedures to prevent localized damage to the equipment because corrosion can occur more rapidly in these areas.



Figure 2, HP-LED Light Head, Front View

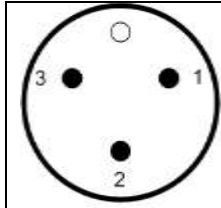
Connect the cable assembly from the HP-LED Light Head to the HP-LED Power Supply assembly.



Figure 3, HP-LED Power Supply

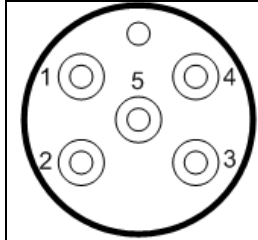
Connect the cable assembly from the power supply with the extension cable to AC power outlet.

Note: Figure 2 and 3 are for illustrative purposes only.



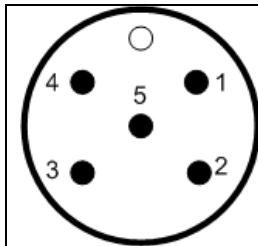
- PBH-3-MP
 - Pin 1 PROTECTIVE GROUND
 - Pin 2 NEUTRAL
 - Pin 3 HOT

Figure 4, Power Supply, AC Power Side



- PBH-5-FS
 - Pin 1 -VDC LIGHT 2
 - Pin 2 +VDC LIGHT 2
 - Pin 3 -VDC LIGHT 1
 - Pin 4 +VDC LIGHT 1
 - Pin 5 PROTECTIVE GROUND

Figure 5, Power Supply, LED Light Head Side



- MCBH-5-MP
 - Pin 1 -VDC LIGHT 2
 - Pin 2 +VDC LIGHT 2
 - Pin 3 -VDC LIGHT 1
 - Pin 4 +VDC LIGHT 1
 - Pin 5 PROTECTIVE GROUND

Figure 6, LED Light Head Connector

5 OPERATION

The HP-LED Lighting System is designed for the ultimate simplicity of operation. Once the HP-LED Lighting System has been assembled it is only necessary to connect it to a suitable AC Power source. There is no ON/OFF switch; the system will be ON whenever power is applied. To turn the system OFF, simply disconnect the HP-LED Lighting System from the AC Power Source.

Please note that is normal for one LED array of the HP-LED Light Head to illuminate before the other LED array. Both arrays should illuminate within 10 seconds of having full power supplied.



CAUTION: It is important to remember that the HP-LED Lighting System is designed to operate underwater. As a minimum, the HP-LED Light Head should be completely submerged for adequate cooling, but may be operated in air for up to 1 minute.

The HP-LED Light Head should not be removed from the water prior to the power being disconnected. Operating the HP-LED Light Head in air may rapidly lead to an over temperature condition. The HP-LED Power Supply assembly may be operated either underwater or in air, but the operating environment should be no higher than 50°C. This restriction applies to operation in either air or in water.

6 MAINTENANCE

The HP-LED Lighting System is intended to be maintenance free. Seals do not require periodic replacement, but silicone lubricant is applied on the external connectors at the factory to make it easier to install the cables. The HP-LED Light Head is purged with dry air to eliminate moisture which prevents problems with corrosion and condensation.

Though the HP LED Lighting System is constructed of highly corrosion resistant materials, corrosion of all components can further be minimized by ensuring a good earth ground on the AC Input. Additionally, we recommend careful handling procedures be used to prevent deep scratches or dents which can expose free iron and create localized corrosion.

In the event the luminaire stops working, please contact ROS customer service. For troubleshooting please see section 7.

Note: The HP-LED Lighting System contains no user serviceable components.

7 TROUBLESHOOTING

This section provides information on trouble shooting the HP-LED Lighting System.

Note: The HP-LED contains no user serviceable components.

The information presented in this section is designed to provide a guide to isolating the source (root) of any problems that may be observed during the operation of the HP-LED. If a failure is noted the only option for repair in the field is to replace the failed item.

Failure modes, causes, and corrective action are listed in Table 2, Trouble Shooting. A flow chart for trouble shooting is presented in **Error! Reference source not found..** The procedures listed in the flow chart are found later in this section: subsection 1 and subsection 7.3.



WARNING: Assembly, disassembly, connection of cables, or disconnection of cables, must only occur when the HP-LED Light is disconnected from the

power source. Debugging procedures with the HP-LED system partially assembled and powered on may only be executed by qualified personnel.



CAUTION: During operation the HP-LED can become hot to the touch. Care must be taken to allow the system to cool down to ambient (room) temperatures prior to handling.



WARNING: Avoid direct eye exposure from clear window. Near UV and blue light can cause eye injury. Luminaire is classified as Risk Group 3 per IEC 62471:2008.

Prior to performing any fault isolation procedure the system should be inspected for any signs of visible damage. These may include denting, discoloration, corrosion, or flooding. All connectors should be inspected to assure that pins are straight and no damage has occurred that could allow misalignment or flooding.

Problem	Typical Cause	Corrective Action
No Light from HP-LED Head	Power not supplied	Disconnect the HP-LED system from the mains. Test mains power. Reconnect the HP-LED as appropriate.
	Power Supply malfunction	Replace Power Supply (see Section 7.2)
	Light Head malfunction	Replace Light Head (See Section 7.3)
	Cable malfunction	Replace cables
One array of Light Head does not output light	Partial Power Supply malfunction	Replace Power Supply (see Section 7.2)
	Partial Light Head malfunction	Replace Light Head (see Section 7.3)
Light turns off while powered	Over temperature protection of Light Head or Power Supply	Allow the HP-LED to cool for 30 minutes in air, or 15 minutes in water. The temperature of the HP-LED System should 50°C or less when power is reapplied.
Light blinks on/off within 1 minute	Over temperature switch malfunction	Replace Light Head
	AC Mains low voltage	Test mains power to ensure 100 VAC minimum
Light output dims over time	Aging of array. Check specifications and operation history.	Replace HP-LED System
	Excessive exposure to radiation. Check specifications and operation history.	Replace HP-LED System

Table 2, Trouble Shooting



WARNING: Fault isolation procedures involve the measurement of potentially dangerous voltages at possibly fatal current levels. These procedures should only be executed by personnel that are qualified in such procedures and who are authorized to undertake such procedures.

7.1 Fault Isolation Overview.

In general it can be assumed that, if power is correctly applied to the HP-LED Light System, any faults will be one or more of the following:

- Failed Cables.
- Failed Power Supply.
- Failed Light Head.

The simplest method for isolating the fault is a “golden system” approach. If known good elements of the system are available for use in fault isolation, then a simple substitution approach may be used. First, substitute the known good light head into the suspect system. Then check for restored operation. If this does not identify the problem, then replace the original light head. Second, substitute the known good power supply and test for restored operation. Finally, substitute the cables and test the system if the fault has not been identified.

For those situations where a “golden system” is not available a more analytical approach can be taken. This process is described in the following two sections.

7.2 Fault Isolation Procedure 1

The purpose of this procedure is to isolate the probable root failure for an HP-LED System that is producing no light. It is assumed that the unit has been checked for damage or flooding and that no abnormalities have been detected. Further, it is assumed that power to the unit has been checked and that all cables are in good repair and properly connected. This procedure checks the HP-LED Power Supply.

Equipment required: DVM

If an HP-LED Light is producing no light output the problem could be in either the power supply or the Light Head. In general, a no light output condition will only occur under one of two conditions: the light is operated above the maximum operating temperature (such as with the Light Head be operated in the air), or in the case of a power supply failure. The two light emitting discs in the HP-LED Light head are powered independently. Therefore if both discs are not producing light it is probable that the HP-LED Power Supply has failed.

A basic check of the Power Supply can be performed by measuring the voltage output of the power supply:

- First, disconnect the HP-LED System from power.
- Next, disconnect the cable from the power supply to the Light Head. Disconnect

- at the light head.
- Supply power to the HP-LED Power Supply.
- Measure the voltage between Pin 2 and Pin 1 on the output connector of the power supply.
- Next, Measure the output between Pin 3 and Pin 4.
-

Both readings should be greater than 40V. If the voltages read are lower than 40V it can be assumed that the power supply is bad.

Note: It is indicative, though not definitive, that a voltage above 40V constitutes a working power supply. However, no (or very low) voltage readings on either output positively identifies a failed power supply.

7.3 Fault Isolation Procedure 2

The purpose of this procedure is to isolate the probable root failure for an HP-LED System that is producing no light. It is assumed that the unit has been checked for damage or flooding and that no abnormalities have been detected. Further, it is assumed that power to the unit has been checked and that all cables are in good repair and properly connected. This procedure checks the HP-LED Light Head.

Equipment required: Laboratory power supply capable of producing 2A @ 30V.

- First, disconnect the HP-LED System from power.
- Next, disconnect the cable from the power supply to the Light Head. Disconnect at the light head.
- Set the laboratory power supply to a current limit of 0.5A.
- Set the laboratory power supply to a voltage to 0.0V.



CAUTION: Failure to observe the correct polarities will cause damage to the light head and will void the warranty.

- First, connect the laboratory power supply to the light head: the positive lead to Pin 4 and the negative lead to Pin 3.



WARNING: Though the light output will be considerably less than when a functional HP-LED is in operation, the light level will still be quite bright. Care should be taken to not look directly into the light head.

- Slowly increase the voltage on the power supply to 30V.
- If the light head is functional light should be seen coming from one of the two discs in the HP-LED Light Head.
- Set the voltage of the laboratory power supply to 0V.
- Disconnect the laboratory power supply from Pin 3 and Pin 4.

- Connect the laboratory power supply to the light head: the positive lead to Pin 2 and the negative lead to Pin 1.
- Slowly increase the voltage on the power supply to 30V.

The other disc in the HP-LED Light Head should illuminate. The light level from both sides of the Light Head should have been approximately equal when energized.

- Set the voltage of the bench top power supply to 0V.
- Disconnect the laboratory power supply from the light head.

If both LED arrays illuminate with approximately the same level of light output, then it can be assumed that the light head is functional.

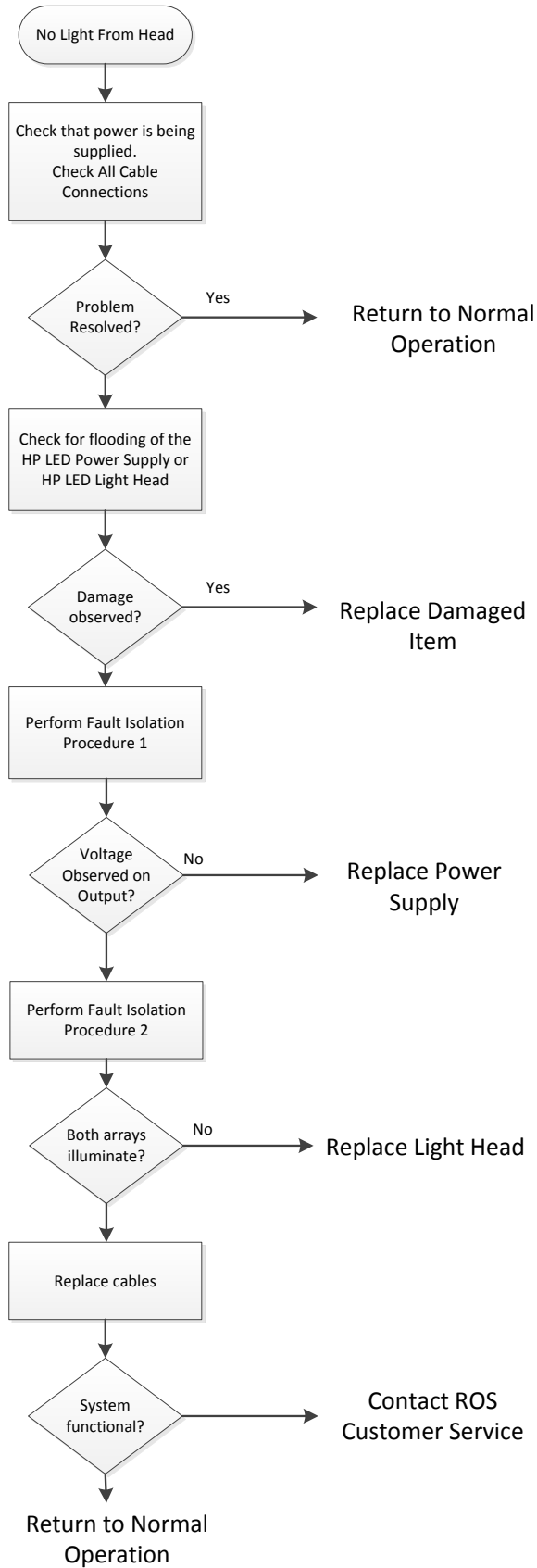


Figure 7, Trouble Shooting Flow Chart