# DropLite
# P/N 710-060-601
# User Manual

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## 1. Introduction

Congratulations on the purchase of your new DropLite. DropLites are underwater lights designed to be dropped off the side of a boat or lowered into a tube or pipe. DropLites use standard screw base quartz halogen lamps which are available up to 1000 watts. An exclusive spring loaded socket prevents vibration-loosening lamp failures. The DropLite's built-in underwater electrical connector allows the light to be removed from the power cable. Relamping is easily done without the use of a tool by unscrewing the connector/socket assembly from the light body.

A lightweight, plastic tube protects the fixture from shock and impact. This protective housing is made from tough, non-corrodible polycarbonate. The tube housing permits unrestricted, omni-directional lighting.

Applications for the DropLite include attracting fish, pipe inspection, and general underwater illumination.

This product has been subjected to extensive testing and development and is widely recognized as a high quality underwater light of superior design.

Features that contribute to the versatility of the DropLite include the following:

1) The socket/connector assembly unscrews from the light body without the use of any tools, exposing the lamp for easy replacement. Removal of the light from its mount is usually not required during the relamping process. Also, the glass-metal seal is not disturbed during relamping, which increases reliability and eliminates the need for frequent pressure testing.

2) Many lamps of different voltages and wattages are available. The socket is designed to position the lamp filament in the optimal location for highly efficient performance.

3) The spring loaded lamp socket provides positive gripping of the lamp to prevent vibration related contact failures as well as to provide superior lamp alignment.

4) Two different connector types are available; XSG and BH3M types. The standard depth rating of the DropLite is 1,000 meters.

5) Standard construction is of rugged 6061-T6 aluminum.

## 2. DropLite Pre- and Post-Deployment Checklist

**Warning:** After each deployment, carefully check to make sure the light has not flooded. It is possible for the light to partially flood and then reseal itself while underwater. Upon surfacing, the light can become internally pressurized, which may be potentially dangerous. Additionally, if the power remains on when the light has partially flooded, it is possible for electrolytic generation of an explosive mixture of hydrogen and oxygen gases. **If a light appears flooded upon removal from the water, it should be treated as potentially dangerous. Point the light away from persons and valuable equipment and verify whether or not it is internally pressurized. Make sure that the power is disconnected as soon as a flooded condition is suspected.**

Each DropLite is shipped ready for immediate use. To ensure that the light will perform reliably, please observe the following maintenance guidelines:

1) Try to rinse the light with fresh water after use in salt water.

2) It is normal for a scale buildup to occur on the plastic tube. This can be cleaned off with vinegar. Use a non-abrasive cloth to minimize future buildup.

3) Always check to make sure that the the rear bulkhead connector assembly is secure before deployment.

4) Check for condensation inside the glass envelope, especially after changing lamps. If any condensation is evident, unscrew the connector/socket assembly from the body and remove the lamp. Place the connector/socket assembly and lamp inside a warm oven (at least 100 C or 212 deg F) for at least 30 minutes to bake out any moisture that may present. If possible, purge with dry nitrogen while reassembling the light.

5) After each deployment, examine the power cable and rear connector for damage.

<u>Lamp Changing Procedure</u>

To change the lamp, first remove the plastic tube from the body by unscrewing the plastic set screws. The cable can then be disconnected by unscrewing the plastic locking sleeves and pulling the connector halves apart. Then simply unscrew the socket/connector assembly from the light body and remove the old lamp by twisting counter-clockwise. When installing the new lamp, be sure not to get any fingerprints on the surface of the lamp. Use a piece of tissue or other clean paper to hold the lamp while installing it. Fingerprints can be cleaned from the surface of the lamp with isoproply (rubbing) alcohol.

## 3. Electrical Requirements

It is very important to use an appropriate power supply for each particular DropLite; factors to consider are: voltage requirements (including voltage drop over long cable lengths), current draw of the lamp, cold filament power surge, and lamp life at various voltages.

Voltage Requirements: The power supply must of course be able to supply sufficient voltage to the light, however in many cases (especially with low voltage lights), the output voltage from the power supply must be much higher than the lamp voltage. The reason for this is that a significant amount of power is lost due to the electrical resistance of the power cable. The voltage drop over a length of cable can be calculated by using the formula, **V = IR**, where V is the voltage drop, I is the current draw of the light in amps, and R is the total electrical resistance of the power cable in ohms. The current draw of a particular lamp can be calculated if the wattage and voltage of the lamp are known. The current draw is equal to the lamp wattage divided by the lamp voltage, or, **amps = watts/volts**.

For example, referring to the table of electrical resistances of various wire gauges listed below, we can calculate the voltage required to operate a 24 volt-300 watt light at 24 volts over 250 feet of 16 gauge cable. The current draw of a 24 volt-300 watt lamp operating at 24 volts is 300 watts/24 volts = 12.5 amps. The resistance of 16 gauge wire is approximately 4 ohms/1000 feet. *Since the total path of the circuit is from the power supply to the light and back to the power supply, the total resistance of the cable is twice the length of the cable times the linear resistance*, or for this example, R = (2 x 250 ft) x (4 ohms/1000 ft) = 2.0 ohms. Since V = IR, the voltage drop, V is equal to 12.5 amps x 2.0 ohms = 25 volts. This means that 25 volts is lost due to resistance and so the power supply will need to provide at least 49 volts to power this 24 volt-300 watt light over a 250 foot cable!

| **Wire Gauge** | **Ohms/1000 ft (approx)** |
|---|---|
| 20 | 10 |
| 18 | 6 |
| 16 | 4 |
| 14 | 2.5 |
| 12 | 1.5 |

Current Requirements: The current draw of a particular lamp is determined by dividing the lamp wattage by the lamp voltage. It is worthwhile to note that if high voltage (greater than 110 volts) current is being used to power the light, there is still a voltage drop over the length of cable, but the amperage is often small enough (due to the high voltage) that the voltage drop is less significant. The power supply must still provide the necessary power; a 120 volt-1000 watt generator will only power 1000 watts' worth of lights at 120 volts.

Cold Filament Surge: Upon initial power-up of the lamp, it takes a great amount of energy to heat up a cold lamp filament--up to 10 times the operational current draw for a short period. The power supply must be capable of providing not only the necessary voltage and sustained operational current draw of the lamp, but must also provide this temporary high current. Many

power supplies have built-in safety foldback circuits to protect the power supply (and powered equipment) from accidental short circuits. The cold filament current surge may appear to the power supply as a direct short circuit, and so will trip the foldback circuit. It is often necessary to modify the power supply to desensitize this foldback circuit in order to allow the momentary high current necessary to heat the filament. We suggest that the power supply manufacturer's application recommendations be followed whenever applicable.

Varying Operational Voltages: The various lamps will operate at voltages other than the nominal recommended voltage, affecting lamp life and color temperature. Undervoltage will increase lamp life, while overvoltage will rapidly decrease lamp life.

Connector Options: Two different industry standard underwater connectors can be used with the DropLite: a Subconn-type 3-pin male bulkhead connector, model BH3M and an XSG type. The standard connector pinouts are illustrated below.

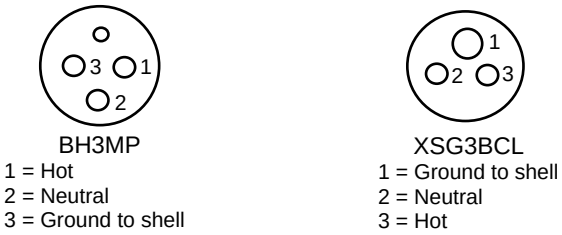



Figure 1: Standard DropLite Connector Pinouts

## 4. Electrical and Thermal Warnings

It is essential that caution is exercised whenever electricity is utilized in or near the water. AC current is certainly more dangerous, but even 12 volts DC can pose an electrocution hazard under certain circumstances. **A Ground Fault Interrupt should be used whenever high voltage lights are being utilized; when divers are in the water this is especially critical! Do not operate AC-powered lights without a GFI!** Additionally, all high voltage lights should be case grounded for safety. If a protective glass dome is broken and the light floods, a short circuit will likely occur. The current will flow to the ground reference; if the body of the light is grounded, then the short circuit will occur between the "hot" lead and the body of the light rather than the water surrounding the light.

It is also important not to burn a light in air for more than a few seconds unless that light has been specifically designed for this purpose. Most lights become quite hot under normal operation and rely on the surrouding water to provide cooling. When an underwater light is burned in air, the resulting heat buildup can pose a fire hazard. If the light is operated for testing purposes in air, be sure to let it cool down for a couple of minutes before immersing it in water. It is also a good idea to turn the light off a few seconds prior to removing it from the water. These precautions minimize the thermal shock on the pyrex glass envelope; thermal shock is a rapid change in temperature which can cause the pyrex to crack. If a certain application requires

the light to be operated in a wet/dry environment, DSPL recommends using lamps of 100 watts or less. Extreme caution must be used when handling lights burning in air due to the high operating temperatures.

## 5. DropLite Glass Envelope Replacement (Emergency Field Repair Procedure)

Before any field replacement of a DropLite component is initiated, the work area must be made as clean as possible. The surface used to work on should be dirt and lint free. Once a suitable work space has been established, use the following procedure:

1) To make servicing the DropLite easier, it is desirable to first remove the connector/socket assembly from the body. This can be done by firmly grasping the **body** with one hand and twisting the connector/socket assembly in a counterclockwise direction with the other hand, taking care to grip the body only and not the envelope itself.

2) Once the connector/socket assembly has been removed, stand the DropLite body on end to avoid having the O-rings accumulate any particles from the work surface which may inhibit their sealing function. To remove the existing envelope from the DropLite body:

    a) Place the body on a clean flat surface and hold in place with one hand.

    b) Using a small jewelers-type slotted screwdriver or the point of a small awl, push the flange of the spiral retaining ring out of it's groove toward the envelope and push up.

    c) Once the flange has cleared the top of the body sufficiently, grip the exposed end and **slowly** twist the spiral retaining ring out of the groove, taking care not to twist it out of shape--the ring can be reused if it maintains its original form.

3) Clean out any broken glass and debris from the body before installing the new envelope. A very small piece of debris between the envelope and body can cause the glass envelope to crack when pressurized.

4) Inspect the O-ring located in the body. Check very closely for slices, tears, cracks, or rough spots. It is recommended to replace the O-ring with a new one, however the old O-ring may be reused if it is still in good condition.

5) With a fresh O-ring in place, carefully push the new envelope into position on the front of the body. It may be a tight fit--there is some variation between individual envelopes since they are hand-blown--so be careful not to force it into place.

6) When the envelope is fully seated, replace the metal snap ring, being careful not to chip or scratch the glass. Work the snap ring all the way into its groove with an awl, pushing the ring outward against the wall of the body to make sure it is completely seated and won't come out.

7) Make sure the inside of the envelope is clean before reassembling.

## 6. DropLite Quality Control Procedures

This section is included to provide an understanding of the quality control process that each DropLite is subjected to.

After assembly is completed, each DropLite is electrically tested with the Meg-Ohm tester to verify that the socket wire insulation is intact, and that there are no short circuits between a power lead and the metal light body. Each individual lamp is also tested for short circuit between the power leads and the lamp base. The connector is then checked to verify that it is firmly secured to the light body.

Before installing the lamp, the light is pressure tested in one of the DeepSea pressure test vessels. All DropLites are pressure tested to their rated depth.

The light is then test-burned in a test tank for thirty minutes. After the test burn while soaking, the light is checked for internal condensation. If there is no condensation present, the light is then prepared for shipping.

## 7. Troubleshooting

| Problem | Possible Cause | Recommended Action |
|---|---|---|
| Light doesn't turn on. | Not plugged in. | Secure all connections. |
| | GFI tripped. | Reset GFI. |
| | Lamp burned out. | Change lamp. |
| | Cable defective. | Check continuity from one end to the other. Meg test if possible. |
| | Insufficient voltage. | Make sure battery is fully charged. Verify power supply is adequate (refer to Section III). |
| Light flooded. | Connector loose. | See Section 8. |
| | Damaged O-ring. | Replace as required. |
| | Glass cracked or chipped. | Replace envelope as per Sec. 5. |

## 8. Flooded Light Repair

If the light is leaking, first suspect that there is a damaged O-ring, or that the glass envelope is cracked or has a chipped edge.

When looking for the source of a leak, first check if the rear connector is loose. If the connector is secure, check for a sliced or otherwise damaged O-ring; make sure the O-ring sealing surfaces are clean. If there is no apparently damaged O-ring, remove the glass dome and inspect the edge of the glass. If the edge is chipped, this is probably the source of the leak, and the dome should be replaced.

If a light is flooded and/or damaged, we recommend that the light be returned to DeepSea Power & Light for repair or replacement; DeepSea Power & Light cannot be responsible for any damage incurred during emergency field repairs. Such repairs should be undertaken only as a last resort and by qualified personnel.

## 9. General Notes

Do not burn a DropLite out of water for more than about 30 seconds unless it is specially equipped for wet/dry use.

Do not operate any high voltage electrical equipment without using a Ground Fault Interrupt circuit for safety, especially when divers are in the water!

Do not operate a lamp at higher than recommended voltage. The lamp filament will melt with severe over-voltage, and slight over-voltage drastically reduces lamp life.

Be sure that any fingerprints are cleaned off the lamp with isopropyl alcohol before use.

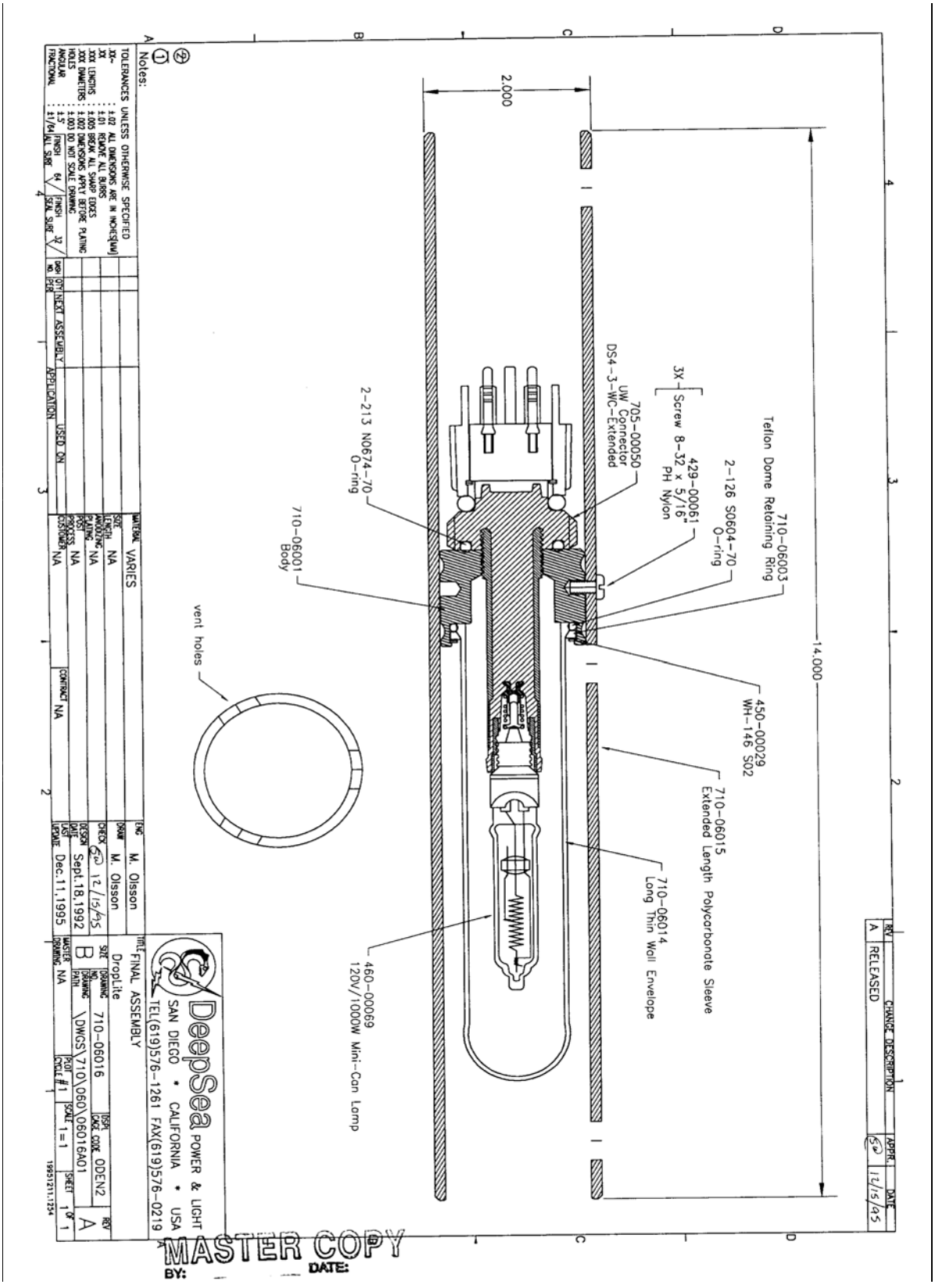
## 10. Specifications

MECHANICAL

| | |
|---|---|
| Material: | Anodized 6061-T6 aluminum |
| Length: | 15.2 cm (6.0 in.) |
| Diameter: | 4.4 cm (1.75 in.) maximum |
| Tube Housing: | 5.1 cm (2.0 in.) outer diameter by 30.5 cm (12.0 in.) overall length |
| Dome Housing: | 17.3 cm (6.8 in.) outer diameter by 16.6 cm (6.5 in.) overall length |
| Weight in Air: | 0.3 kg (0.7 lbs.) |
| Weight in Water: | 0.1 kg (0.1 lbs.) |
| Depth Rating: | 1,000 meters (3,250 feet) |

ELECTRICAL

| | |
|---|---|
| Operating Voltages: | 12, 24, 120, or 240 volts |
| Available Wattages: | 100, 150, 250, 500, or 1,000 watts |
| Connectors: | BH3M type, XSG-3BCL type |


Teflon Dome Retaining Ring 710-06003
2-126 S0604-70 O-ring
3X Screw 8-32 x 5/16" PH Nylon 429-00061
UW Connector DS4-3-WC-Extended 705-00050
2-213 N0674-70 O-ring
710-06001 Body
vent holes
450-00029 WH-146 S02
710-06015 Extended Length Polycarbonate Sleeve
710-06014 Long Thin Wall Envelope
460-00069 120V/1000W Mini-Can Lamp
2.000
14.000
Notes:
TOLERANCES UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES[MM]
REMOVE ALL BURRS
BREAK ALL SHARP EDGES
DIMENSIONS APPLY BEFORE PLATING
DO NOT SCALE DRAWING
FINISH ALL SURF
MATERIAL VARIES
NEXT ASSEMBLY
USED ON
CONTRACT NA
DRAWN M. Olsson
CHECK M. Olsson
DESIGN Sept.18.1992
LAST UPDATE Dec.11.1995
DeepSea POWER & LIGHT
SAN DIEGO • CALIFORNIA • USA
TEL(619)576-1261 FAX(619)576-0219
TITLE FINAL ASSEMBLY
DropLite
SIZE B DRAWING 710-06016
REV A
RELEASED 12/15/95
MASTER COPY
BY:
DATE:

## 11. Re-Ordering Information

All DropLites include choices of connector and lamp. To order a DropLite, please use the following code, substituting values listed below for the following variables: *base model-c-v/w*, where base model = base model, *c* = connector and *v/w* = volts/wattage of the lamp.

| Base Model | Connector | Reflector | Volts/Wattage | Comments |
|---|---|---|---|---|
| DL2-1060 | B = BH3M<br>X = XSG-3BCL | N/A | Max. wattage is 1000W. See lamp matrix. | 1000m rating |

* Includes $35 lamp. Add price differential for higher priced lamps.

**DropLite Lamps (Mini-Can screw base)**

| Model Number | Part Number | Description |
|---|---|---|
| MC-LV-LA* | 714-001-001 | Mini-Can low voltage lamp adapter |

*Required for use with low voltage lamps.

| Model Number | Part Number | Volts** | Watts | Hours | Color Temp | Lumens |
|---|---|---|---|---|---|---|
| BP-12/50* | 460-00019 | 12 | 50 | 2000 | 3000K | 950 |
| BP-12/100* | 460-00027 | 12 | 100 | 1000 | 3100K | 2,200 |
| BP-24/100* | 460-00032 | 24 | 100 | 2000 | 3000K | 1,800 |
| BP-24/150* | 460-00035 | 24 | 150 | 70 | 3400K | 5,000 |
| BP-24/250* | 460-00038 | 24 | 250 | | | |
| BP-24/300* | 460-00041 | 24 | 300 | | | |
| MC-120/100 | 460-00053 | 120 | 100 | 1500 | 2700K | 1,600 |
| MC-120/150 | 460-00055 | 120 | 150 | 1500 | 2850K | 2,400 |
| MC-120/250 | 460-00059 | 120 | 250 | 2000 | 2900K | 4,750 |
| MC-120/325 | 460-00061 | 120 | 325 | | | |
| MC-120/500 | 460-00064 | 120 | 500 | 2000 | 2950K | 9,930 |
| MC-120/750 | 460-00066 | 120 | 750 | | | |
| MC-120/1000 | 460-00069 | 120 | 1000 | 300 | 3200K | 26,000 |
| MC-220/150 | 460-00079 | 220 | 150 | 1300 | 2800K | 2,100 |
| MC-220/250 | 460-00080 | 220/230 | 250 | 2000 | 2900K | 4,500 |
| MC-240/250 | 460-00082 | 240 | 250 | 2000 | 2900K | 4,200 |
| MC-240/500 | 460-00084 | 240 | 500 | 2000 | 2950K | 9,500 |

* These bi-pin lamps replace the old style mini-can low voltage lamps but require the low voltage lamp adapter.
** 220/230V, 230V, and 240V lamps are used to meet a nominal 240V requirement

**DropLite Spare Parts**

| | |
|---|---|
| DL2-ENV | DropLite2 long borosillicate glass envelope |
| DS4-WC | BH3M connector/socket assembly with locking sleeve |
| DL2-PT | DropLite2 14" polycarbonate protective tube |
| WH-146-S16 | Snap ring for envelope |

## 12. Terms and Conditions of Sale

No terms or conditions, other than those stated herein, whether contained in customer's purchase order or shipping forms or elsewhere, and no agreement or understanding, oral or written, in any way purporting to modify or negate these terms and conditions shall be binding on DeepSea Power & Light, Inc.

**Acceptance of Orders**

A. Acceptance of binding purchase orders are subject to final written approval by DeepSea Power & Light, Inc.
B. DeepSea Power & Light, Inc. will accept orders and bill in accordance with list prices and terms, even though incorrect list prices, discounts and terms may appear on the Purchase Order.

**Terms**

Upon approved credit the following terms will apply:

A. Standard terms are net cash 30 days from date of invoice, unless otherwise specified. Invoices bear the date of shipment and are mailed from San Diego, CA within one business day of the shipment.
B. Any portion of the Invoice amount which has not been paid within 30 days of the invoice date will accrue a monthly service charge equal to the maximum rate permitted under Section 1, Article XV of the California Constitution as amended by Proposition 2 effective November 7, 1979 (i.e., Federal Reserve discount rate plus five (5) percent per annum) commencing 31 days after the invoice date. In the event of any litigation arising out of this contract or any efforts by seller to enforce any of the terms of this contract, or to receive payment of any sum under this contract, the prevailing party shall be entitled to recover its reasonable attorney's fees and costs. This contract shall be interpreted in accordance with the laws of the State of California and venue for any dispute arising out of this contract shall be San Diego County, California.

**Title and Risk of Loss**

A. Unless otherwise specified in accepted purchase order, all products are shipped F.O.B. DeepSea Power & Light, Inc. plant, San Diego, CA and title to the property passes to the buyer at the time of shipment. Buyer assumes all risk of damage to or loss or destruction of said property and no loss, injury or destruction of said property shall release buyer from the obligation to pay for this shipment.
B. Unless otherwise specified in accepted purchase order, DeepSea Power & Light, Inc. shall have the option of partial or complete shipment of orders, and shall have the right to select the date of shipment, type of carrier, and routing of shipment on behalf of Customer. DeepSea Power & Light, Inc. will make best efforts to meet quoted shipment dates, but does not guarantee to ship products within the time quoted. DeepSea Power & Light, Inc. shall not be held responsible for any failure to make delivery of all or any part of product or nonperformance of services attributable to governmental action, strike or other labor dispute, riots, storm, flood, epidemic, fire damage to or destruction in whole or in part of products, lack of or inability to obtain raw materials, labor fuel, or supplies, or any act of God or other cause, contingency or circumstances within or without the United States not subject to DeepSea Power & Light, Inc.'s control which prevents or hinders manufacture or delivery of product or performance of services.

**Termination**

Purchase Orders accepted by DeepSea Power & Light, Inc. are not cancellable by Buyer unless all details are agreed upon in writing by DeepSea Power & Light, Inc. and Buyer, including Buyer's agreement to assume termination charges required by DeepSea Power & Light, Inc.

**Returns**

A. No product will be accepted for return, repair or replacement without first obtaining a Return Merchandise Authorization (RMA) number.

The following information will be required:

1. Date of Shipment
2. Invoice Number and Sales Order Number
3. Customer Purchase Order Number
4. Any relevant technical data for failure description and circumstances.

B. New, unused, undamaged, fully operational, standard stock parts may be returned for credit, only with prior written authorization, and will be subject to a $30.00 or 15% minimum handling charge, whichever is greater. Items must have shipped from DeepSea Power & Light, Inc. no more than 30 days prior to requesting an RMA. Return freight charges shall be paid for by Customer. Non-standard or used parts are not returnable.
C. Any return, repair or replacement shall be subject to DeepSea Power & Light, Inc. Quality Assurance acceptability.
D. Buyer assumes all risk of damage or loss or destruction of the property which is accepted for return, repair, or replacement as provided above. It is expressly agreed that all risks of loss are borne by Buyer from and after the

time of shipment from Seller to Buyer.

**Notice**

The technical drawings and data published in our manual, bulletins or literature is not guaranteed. It is considered sufficient technical data to allow proper identification of equipment type, size and use for ordering purposes. All drawings and measurements are approximate and not to scale. Performance and function for which the product is intended will depend upon lighting conditions, visibility, cable size and termination. Technical data is subject to change without notice. Detailed engineering information is available upon request. DeepSea Power & Light, Inc. assumes no responsibility for proper selection or installation of its products.

**Fair Labor Practices**

We hereby certify that products and services are produced in compliance with all applicable requirements of Sections 6, 7 and 12 of the Fair Labor Standards Act of 1938 as amended, and of regulations and orders of the United States Department of Labor issued under Section 14 thereof. DeepSea Power & Light, Inc. complies with Executive Order 11256 prohibiting discrimination in employment because of race, creed, sex, color, or national origin.

**Limited Warranty**

Seller warrants that the goods (except internal electronic components) sold under this contract will be free from defect in material and workmanship for a period of one year from the date of shipment from the factory, if they have been properly used. Internal electronic components are warranted for 90 days from the date of shipment from the factory, if they have been properly used. This warranty will be limited to the repair or replacement of parts and the necessary labor and services required to repair the goods. IT IS EXPRESSLY AGREED THAT THIS WARRANTY WILL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND IN LIEU OF THE WARRANTY OF MERCHANTABILITY. This warranty is the exclusive and only warranty to pass with the goods under this contract. No agent, employee, or representative of the Seller has any authority to bind Seller to any information, representation, or warranty concerning the goods sold under this contract, and unless an affirmation, representation, or warranty made by an agent, employee, or representative is specifically included within this contract, it will not be enforceable by Buyer. If notice of defect is given to DeepSea Power & Light, Inc. within such 90 day or one year warranty period, the sole obligation of DeepSea Power & Light, Inc. shall be to furnish new or repaired parts free of charge in exchange for parts which have been proved defective and does not include any other costs such as the cost of removal of the defective part, installation, labor, or consequential damages of any kind, the exclusive remedy being to require DeepSea Power & Light, Inc. to furnish such new parts. Under no circumstances shall the Buyer be entitled to recover any incidental damages as that term is defined in Commercial Code §2715.