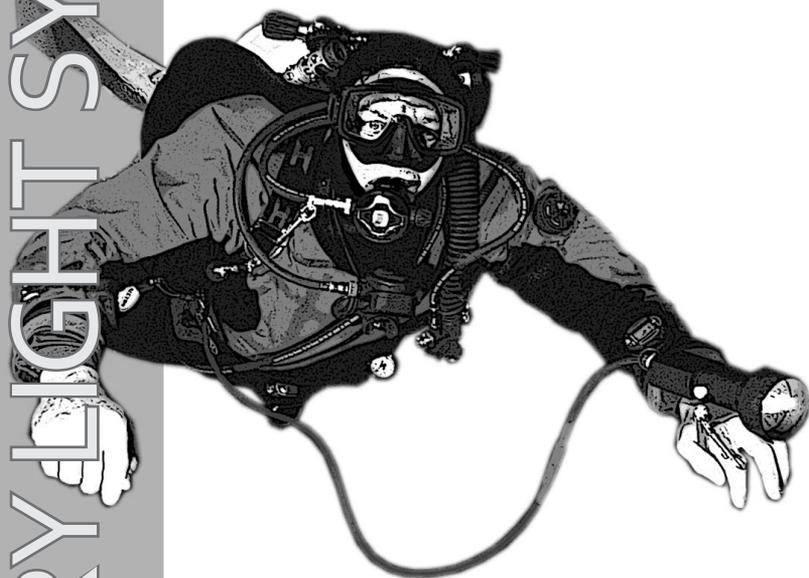


PRIMARY LIGHT SYSTEMS



HALCYON
DIVE SYSTEMS



Explorer/Eos/Apollo
Lighting Systems Manual

Halcyon HID & LED Primary Light Owner's Manual

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Warnings, Cautions and Notes

Pay special attention to information provided in warnings, cautions, and notes accompanied by these icons:



A **WARNING** indicates a procedure or situation that, if not avoided, could result in serious injury or death to the user.



A **CAUTION** indicates any situation or technique that could cause damage to the product, and could subsequently result in injury to the user.



WARNING: This manual provides essential instructions for the proper operation, inspection, and care of your new Halcyon lighting product. Because Halcyon's lighting systems utilize patented technology, it is very important to take the time to read these instructions in order to understand and fully enjoy the features that are unique to your specific model.

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Halcyon Explorer, Eos & Apollo Lighting Systems

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Congratulations on your purchase of a Halcyon primary light. At Halcyon we appreciate the faith your choice places in our products. Like the rest of the Halcyon line, the Explorer, Eos and Apollo lights were created out of a very real need for a lighting instrument capable of withstanding the rigorous demands of exploration diving. Formed by some of the world's leading explorers, Halcyon is dedicated to establishing a link between active underwater explorers and the manufacture of precision diving equipment. Who better than leading explorers to design and test your life support equipment? We've spent more than a decade of careful refinement and real world testing in developing your Halcyon light, and we are proud to count you among our select group of demanding customers. It is an instrument that we would not hesitate to take from the storeroom shelf directly to the water for an exploration dive.

Every Halcyon primary light is individually inspected and pressure tested to 300 feet/91 meters.

Halcyon's three primary light lines meet the needs of every level diver and every imaginable dive environment. The Explorer HID line utilizes a reliable and brilliant 21-watt HID light head with NiMH battery technology and tougher-than-steel Delrin to produce an exploration grade system that is the benchmark for underwater lighting instruments. The Eos LED line incorporates a powerful LED light head with all the unique features of our Explorer canister and battery pack to create a system that is as much at home at the back of a cave as on a Caribbean reef. Halcyon's Apollo line of video systems provides high-power HMI and HID illumination in combination with our indestructible Delrin canisters to complete your video, film or photographic package.

Explorer, Eos and Apollo light canisters are designed to be mounted on a diver's waist belt, while the hands-free Goodman-style light head allows you maximum dexterity during the dive. Manufactured from a single solid piece of black Delrin, the tough Goodman-style head of our HID Explorer line allows for hands-free operation while sitting cleanly on top of the diver's

hand. The nearly indestructible Aluminum Eos LED light head is coated with a robust Mil-Spec hardcoat. Both light heads use a fully adjustable handle that is hard-coated aluminum, can be sized for cold water dry gloves, and can be ordered with an optional reserve mini-knife attached.

Lighting Systems Features

Halcyon Canister Features

- Industry-first sealed, watertight, Delrin lid design isolates battery compartment from cord/light head
- Proprietary switch design with captured, silicon switch boot and ergonomic Delrin switch protector
- Machined from solid Delrin, our canisters are sized to ease stowing of the long hose
- Proprietary canister water trap and raised battery tray help protect the battery pack
- Solid battery to lid connection with corrosion resistant, solid-core, gold-plated plugs
- O-ring sealed electrical connections
- Secure battery tray with Stainless Steel rods for additional protection
- Strain-relief fittings on all Explorer cords
- Nickel-plated brass sealing glands
- Larger diameter, hands-free Goodman handle; easy to use with dry gloves
- Stainless Steel locking latches
- Dual-voltage 110 or 220v, 4-amp charger with built-in cooling fan
- NiMH batteries
- Lifetime canister warranty
- Depth rated to 300-ft / 90-m
- One-piece canister maintains maximum reliability

Explorer 21-watt HID Light head

- The Halcyon 21-watt HID shares all the quality features common to our range of Explorer canisters with a uniquely designed HID light head.
- Locking bulb design eliminates the risk of dislodged bulbs and sporadic ignition problems.
- High-temperature polymer (PEEK) nearly eliminates risk of socket damage common within the competition.
- New, brighter bulb with a shorter stem and protection sleeve reduce risk of breakage.
- Includes the time-tested Goodman handle and Halcyon reflector.



- Adjustable light beam
- Choice of NiMH battery pack size (4.5, 9, or 13.5 amp)
- Goodman handle with optional Exploration upgrade with mini-knife available

Eos LED Light head

- The Eos Explorer shares all the quality features common to our range of Explorer canisters while enjoying a uniquely designed LED light head.
- Advanced LED array provides powerful output in a small, attractive form; full power output equals 600 Lumen.
- Lux rating at one meter is 10,700 at three meters, 1,450 and at five meters, 530.
- High-quality, aluminum light head with a Type 3, Class 2 Mil-Spec hard coat.
- Aluminum light head optimizes heat dissipation while protecting LED electronics.
- High-quality LEDs are rated for approximately 20,000 hours and protected by a nearly indestructible light head.
- The dual-intensity LED allows an option to double battery run time (see run time chart in Appendix 1). Simply flip the power switch on/off quickly to toggle between intensities.
- The built-in thermal protection circuit prevents the LED array from overheating when out of the water.
- The Eos Goodman handle features an innovative bolt snap attachment point.
- The light head body provides a rear bolt snap attachment option.



Apollo HID and HMI

- Apollo series includes the Halcyon canister features.
- HMI has been fully upgraded with hardcoat aluminum ballast housing, Delrin battery canister, 24v 13.5ah NiMh battery pack and nearly neutral design.
- HMI and HID light heads specifically crafted for video, film and photographic applications.



HID Lighting Systems

High Intensity Discharge lamps produce a brilliant white light while drawing

a fraction of the power of a halogen lamp. HID has quickly become the standard for exploration-grade lighting systems. Halcyon's Explorer and Apollo lights require very little attention beyond the care given to a halogen light. Although it produces 5% of its output when first ignited, the HID light requires a few seconds (usually 15-20) to produce full output. Also, if power to the lamp is lost or turned off (such as with an underwater pluggable cord), the light ballast must be allowed a brief period to reset before being reignited. Halcyon HID lights only require a brief 5 - 10 seconds.

The ballast in an HID lighting system provides the proper starting voltage to strike and maintain the arc, and it regulates the proper current to the lamp once the arc is established. Ballasts are not interchangeable among different types of HID lamps. A ballast design incorporates electronic circuitry to provide specific lamp/ballast operating characteristics.

With adequate care as outlined in this manual, your HID lamp should last approximately 750 hours.

Special Considerations for HID Lighting Systems

The light emitted from the HID arc tube is intense and appropriate safety precautions relating to exposure protection are required. Metal halide bulbs operate at very high temperatures and pressures. The glass lamps should be handled with care giving special attention to the quartz arc tube. The Halcyon HID light is a DC lamp; proper electrical wiring polarity must be observed to prevent damage to the lamp. Only certified Halcyon repair technicians are authorized to work on Halcyon products; non-certified work voids your Halcyon warranty.



CAUTION: *Ultraviolet, visible and infrared radiation is emitted from metal halide lamps. Possible skin or eye irritation can result from exposures exceeding 15 minutes. Do not stare at exposed lamp in operation. During operation, the bulb should be enclosed in a housing to prevent injury. Do not remove bulb from equipment until it has cooled. Never handle the bulb when it is operating. Keep your face away from the light head during ignition and operation.*

Protect the arc tube when handling the lamp. Keep the arc lamp clean. Do not touch the arc tube of the 21 watt HID, the inside surface of the reflector and the connecting wires. Contamination can degrade lamp performance or cause premature failures. If necessary, clean the lamp by wiping with a lint-free towel. Any interaction with the bulb should be conducted very carefully. Bulbs break easily when handled improperly and are not covered by warranty.

While HID bulbs last considerably longer than halogen bulbs, you should be aware of several



21 watt HID Bulb

characteristics that indicate a bulb is approaching the end of its lifespan. Initial symptoms of end-of-life are characterized by low light output and/or intermittent starting. Visual signs include blackening at the ends of the arc tube and electrode tip deterioration. Note that HID bulbs contain metals, including mercury, that are harmful to the environment. Please be responsible in arranging for proper disposal of an HID bulb.

The bulb and ballast are sensitive to external operating temperature. Although HID light technology doesn't generate heat equal to that of a halogen light, it should be treated like any other dive light. The HID lamp should only be operated while in the water, to provide proper cooling for the lamp assembly. While transporting your HID light, please don't leave the light in direct sunlight or in a car's interior on a hot day.

21 watt HID Light Head

Halcyon's workhorse light, the 21 watt HID, allows full adjustability and easy bulb changes in a conventional test tube style design. Light output is similar to a 100 watt halogen light at a fraction of the power consumption. Halcyon 21 watt HID lights include our exclusive ultra-bright reflector. We've designed the parabola of the reflector specifically for diving applications, where a sharp spot is beneficial for signaling. The surface is spun and polished to our specifications and will not chip or flake like metal film vacuum-coated reflectors. Combined with the extended protective cowling on our light head, the Explorer lights throw out an intensely focused beam of bright, white light that you can rely on in the most challenging of situations.

21 watt HID Light Head Operation

The one-piece machined Delrin slug is temperature resistant and completely non-corrosive. The slug assembly consists of a bulb socket, bulb, test tube and cord. The bulb slug contains three O-rings. The two O-rings closest to the bulb actually provide the water-tight seal while the base ring cushions the glass tube.

The focus of your light may be set by loosening the locking screw on the Goodman Light head and moving the bulb slug assembly backward or forward in the light head. To avoid the potential of breaking the bulb covering, be careful not to tighten the screw down on the glass tube. The focus should be set so that the beam forms a tight circle several feet in front of you, allowing for brightest illumination and more convenient signaling to one's dive buddy.

Never leave your light on while at the surface! Without the dissipating effect of the water, the heat generated by the bulb can accumulate in the light head, damaging the assembly's components.

Should the bulb assembly become difficult to focus, make certain that the nylon adjustment screw is loose and not binding the assembly's

movement. Dirt may become trapped along the focusing barrel, creating friction between the test tube and light head. To clean the dirt from the bulb assembly, simply loosen the locking screw and push the bulb assembly out toward the cord. Clean the light head and bulb assembly. Be careful not to pull a stuck assembly out by the cord while underwater as the tube may come free from the assembly, flooding the light. The groove on your light head's bulb assembly will prevent the unit from being accidentally pulled out from the light head by an entangled cord.

LED Lighting Systems

The promise of LED technology that can fully replace HID lighting just took a step forward with Halcyon's Eos primary light. The new Eos capably blends numerous desirable features with a focused light output exceeding the 10-watt HID. The Eos also reduces battery consumption with an efficient array of dual-intensity LEDs and a quick flip of the switch more than doubles the battery's run time. A machined aluminum head shields a nearly indestructible LED light array with an expected lifecycle of 20,000 hours.

The Eos LED primary light has a voltage protection circuit to keep the battery voltage from dropping to a level that may be harmful to the battery pack. This circuit is activated at approximately 9.8 volts and will cause the light to alternate between normal intensity and notably reduced light output. This "flicker" exists as a



warning to indicate the light is nearing its capacity. Because the reduced light output decreases the draw on the battery, your light might continue in this fashion for approximately 30 minutes (depending on the battery, light output, temperature etc). The light will shut off completely as it nears 9.4 volts. This cutoff will prevent damage to your battery.

The Eos LED primary light is also fitted with a temperature protection circuit to prevent the diodes in the LED from overheating; this will help ensure maximum LED longevity. The temperature protection circuit will trigger a reduction in light output similar to the low voltage cutoff. In this case, the light reduces output by 50%. It will alternate between normal and 50% output until the heat problem is resolved. Overheating can be most quickly resolved by immersing the light in water. Ideally, the Eos, like all other dive lights, should not be used at the surface for any extended period. It is unlikely that your Eos LED should ever experience an overheating situation while used underwater.

Halcyon has taken great strides to ensure your Eos LED will operate flawlessly without any additional adjustments. The LED module and the unique aluminum light head work as a unit to provide the Eos with optimum heat-synching ability; this together with proper alignment help ensure maximum

light output. Please do not attempt to disassemble the light head. Do not remove the glass lens or tamper with the LED module or electronics. Taking apart your Eos will void the warranty and may damage the internal circuitry of the LED module.

Eos LED Light Head

The Eos features two attachment locations for bolt snaps. One on the light head which is similar to the 21 and 50-watt HID light heads. The second tie-off point is cleverly designed as a Halcyon chevron and is located on the Goodman handle.



Video Light heads

Halcyon's Apollo series are available with dual/single lamp HID and HMI light heads. Dual head Apollo systems are ready for mounting on housing arms with standard hardware. The HMI lamp is truly an underwater motion picture studio lighting instrument, with output exceeding that of a 1,000 watt halogen burning at a solid 5,600K.

Halcyon Bulb Replacement

21 watt HID Bulb Replacement

Should the bulb in your Halcyon 21 watt HID light become damaged, it can be easily replaced by following these simple steps:

1. Remove the Goodman handle and reflector assembly from the light head.
2. Carefully remove the bulb cover (test tube) from the slug assembly. Pull the cover straight off; a twisting action is more likely to break the glass tube. It is advisable to use a protective barrier such as a leather glove or heavy rag to protect your hand from a possible break in the glass lamp cover. Be especially careful with the HID bulb as care needs to be used to prevent breaking the bulb.
3. Visually inspect the bulb (HID) for damage. To remove the bulb from the ballast assembly, unscrew the bulb retaining ring. Be careful not to drop the bulb as the retaining ring is taken off. When the ring is removed grasp the lamp base and remove the bulb from the socket.
4. Open the package containing the new bulb. Grasp the bulb base and insert the bulb into the socket. Replace the bulb retaining ring, finger tight. (See Figures 1-3) Do not overtighten.
5. Wipe the bulb assembly O-rings clean with a cloth. Wipe out any moisture



Figure 1



Figure 2



Figure 3

that might have accumulated in the lamp cover. Do not use any silicone on the bulb slug o-rings.

6. After cleaning the bulb slug O-rings and the lamp cover, gently place the glass cover over the bulb slug and push it into place. Make sure that the bulb cover is seated all the way to the bottom O-ring on the slug assembly. Use a protective barrier such as a leather glove or heavy rag to protect your hand from a possible break in the glass bulb cover

7. Place the Goodman head assembly back onto the light head, focusing the light to a tight beam and locking down the screw.

Explorer, Eos and Apollo Canister and Lid

Take the time to inspect the O-ring on the canister lid before every dive. The O-ring should be free of grit or dirt and should not have any signs of damage. Remove the O-ring from the lid and wipe it down with a clean cloth before every dive. The lid O-ring does not require any lubrication. The O-ring groove on the lid should also be cleaned of any dirt or debris.

Be careful not to damage the sealing surface on the lid or canister. During transport, the lid should always be attached to the canister to prevent accidentally nicking either surface. However, you should store your light for extended periods of time with the lid off or the battery removed from the canister. Over time, and especially after discharge, the rechargeable batteries will off-gas potentially combustible gasses. While off-gassing has not proven itself to be a common problem, you should be aware of the potential risk by not allowing the canister to sit over time with discharged batteries sealed inside.

Light Canister

The light canister must keep the battery dry and protected while you are diving at depth. Halcyon lights use two locking latches to secure the lid to the canister. When opening or closing your light, work both latches simultaneously to avoid stressing any side of the lid unevenly.

The canister is configured for attaching to the diver's waist belt. The unique three-fold webbing attachment on your Halcyon Light is held in place by two stainless steel bands. The three-piece fold holds the light with more stability than conventional methods, and prevents the light from accidentally releasing from the diver's hip. The steel bands can be raised or lowered on the canister to balance the light on your hip; the canister should rest parallel to your body when mounted on your harness.

Delrin Canisters

Halcyon canisters are milled out of a solid rod of Delrin. The one-piece design ensures a structural integrity not found in any other available dive light. Delrin shares the same characteristics of industrial metals such as aluminum and stainless steel. Some comparable properties include stiffness, dimensional stability, impact resistance, and structural strength. Material operational temperatures range from 180° F (82° C) to -100° F (-73° C). The one-piece Delrin canister is virtually indestructible under normal usage. Although the canister itself can withstand depths of over 3,000 feet/909 meters, the maximum recommended working depth of the Halcyon Explorer line is 300 feet/90 meters. All Halcyon lights feature high quality nickel plated brass fittings and stainless steel locking latches.

Halcyon lights use a lid-integrated set of plugs to connect to the battery pack. Simply line up the plugs with the gold-edged receptacles on the top of the battery pack and push down until the lid rests on top of the battery pack's delrin cap. The lid can be rotated 180-degrees and plugged into the "dummy holes" on the battery cap so the light can be transported without a "hot" connection. To charge the Explorer, Eos or Apollo battery, firmly secure the charger's plug into the gold-edged receptacles on the top of the battery pack. Always charge your battery with the pack removed from the canister— the charger plug will not fit on the battery pack when it is still in the canister.

Halcyon Power Systems

Halcyon carefully selects from among the finest batteries available, to provide enhanced performance and reliability for our lighting systems. Our Explorer and Apollo NiMH battery packs provide extended burn times with the advantage of dramatically reduced size over that of a sealed lead acid. High quality batteries typically result in the maintenance of longer burn times over the life of the battery. Burn times for Halcyon's lights are listed in Appendix A.

Battery Care and Maintenance

Rechargeable batteries can release small amounts of combustible gas that can become dangerous in a sealed environment. The release of gas is more prominent while the batteries are being over-charged or deeply discharged.

Lights that have been discharged and then left sitting in a sealed canister over time should be opened prior to actuating the switch. While the risk of gas ignition is limited, the risk should be treated with respect.



Warning: To reduce the risk of gas accumulation, open the canister and allow the gas to vent before use. Venting the canister is especially important if you have left the light closed over time or for transport after a deep discharge. Always charge your battery with the pack removed from the canister.

Charging the Battery

All of Halcyon's lights utilize the highest quality NiMH batteries, providing years of consistent use. However, even the best batteries are only as good as the manner in which they are maintained. Batteries should always be charged as soon as possible after use and not left to sit for long periods in a discharged state. While NiMH batteries do not experience the reduced discharge effect known as "memory," they can be damaged if left at low voltage levels. The charger provided with your light will charge the batteries up to capacity and then turn off automatically provide a maintenance charge.

Batteries tend to slowly discharge if left over time, especially if exposed to extremes of heat or cold. Your Halcyon charger is designed to top the battery pack back to a full charge when left connected to the battery during storage. Halcyon recommends that you always store your battery pack connected to your battery charger if you plan to use your light within a few week's time. If the battery is going to be left unused for several weeks or months, you should charge it up, disconnect the battery and charger, and top off the battery prior to the next use. If the battery is to be stored without use for a long period, top it off with a recovery charge every six months.

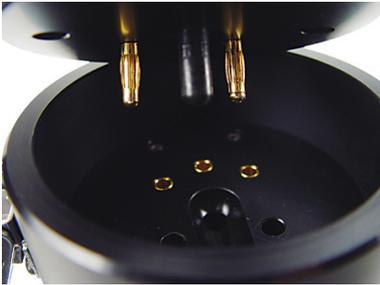
Charging your Explorer, Eos or Apollo battery pack (NiMH Batteries)

Proper charging of your Explorer battery pack is essential to ensure a long NiMH battery life. If the charger is not properly designed and matched to the battery's voltage, chemistry and configuration, the result can be poor performance of the battery due to insufficient charge, shortened battery life due to overheating of the battery, and the chance of fire or explosion of the battery from over-charging. Charger selection is so important to the life of your Explorer battery pack that the use of any charger other than the Halcyon NiMH charger will void your Halcyon warranty. The Halcyon Explorer charger has been specially designed to charge the Explorer 4.5, 9 and 13.5 battery packs and should not be used with any other make or type of battery. The Explorer charger cannot be used with Halcyon's previous models that use lead acid battery packs.

The charge proceeds in two stages:

- *Bulk Charge.* Current is supplied to the battery pack at a rate programmed by Halcyon into the charger specifically for Explorer and Apollo packs.
- *Topping Charge.* Current is supplied at a fraction of the bulk charge rate.

If the charger is plugged in to a power source but no battery is connected, the red light will indicate that the charger is searching for a battery to charge. Once a battery is connected, the yellow light will indicate that the charger has entered the Bulk Charge state. Once the battery pack is completely charged, the green light will indicate that the system has entered its Topping Charge state. In some cases heat or power fluctuations may trick the charger causing it to switch off prematurely. You may check the charge of your pack by disconnecting the battery and waiting for 3-5 seconds, reconnect the battery and see if the yellow light appears. For a fully discharged battery, the complete charging process should take approximately 1 hour for an Explorer/Eos 4.5 pack, 2 hours for an Explorer/



Engage the lid plugs with the battery cap's gold receptacles to provide power to the light (top). To charge the battery pack, push the charger's steel connectors completely into the battery pack's gold receptacles until the charger assembly rests on the lid (right).

Eos/Apollo 9 pack, and 3 hours for an Explorer/Eos/Apollo 13.5 pack.



Warning: Your Halcyon NiMH charger has a switch next to the power cord that allows the unit to be used with either 110-115 volt or 220-230 volt outlets. Make sure that you have the switch set correctly for your conditions. Failure to set the charger for the proper voltage can damage the charger's electronics.



Recommended Storage Conditions

Store your Halcyon NiMH battery pack disconnected from the light to eliminate loaded storage effects, which in NiMH batteries can lead to increased self-discharge.

Any Nickel-Metal Hydride cell will off-gas hydrogen when subjected to excessive overcharge or overdischarge. Do not store your Explorer light for extended periods of time with the battery pack in place and the lid closed. Always open the lid of your light to vent any ambient gasses after storage and before you operate your light.



Battery Longevity

Your battery should provide you with years of trouble free performance. The anticipated life of a battery is measured in the number of charge and discharge cycles it can tolerate. The life of a battery will depend on many factors, including the storage temperature, the discharge of the battery, and the charging efficiency.

Please see the recommendations below to establish other ways of increasing battery life.

1. Use only Halcyon replacement NiMH battery packs with your Halcyon light. It is very important with NiMH systems that the charger be matched with the battery.
2. Do not allow the batteries to discharge deeply (below about 9 volts).
3. Do not allow the batteries to sit in a discharged state.
4. Do not expose the batteries to extreme temperatures below -15°C (5°F) or above 50°C (122°F). Batteries must be removed from canister for charging.

To be sure that your battery is adequately charged reference the following considerations:

1. Plug in the charger and verify that it is receiving power. Verify that the red power light is on when you connect the charger to the battery pack on SLA packs and the Yellow light is on for NiMH battery packs.
2. Allow the batteries to charge until the green "Charge Complete" light activates on NiMH battery chargers. You may verify the charge by using a voltmeter to gauge the battery voltage. However, this reading is only reliable if the battery is under a load, such as when the light is activated. To ensure that your charger is operating properly, place the light head in a pot of water and connect the batteries to the lid, leaving the battery pack out of the canister. Do not let the light burn for more than a minute out of the water. While the light is discharging the batteries, use a voltmeter to gauge the voltage drop. If the pack is not properly charged, the volt-

age should drop rapidly (within one minute). A properly charged pack will slowly drop voltage from a high of around 14 to roughly 13 volts, and should hold 13 volts for about an hour.

5. The charger will enter a "maintenance stage" when a full charge is reached, so it is possible to leave the battery connected to the charger for extended periods of time. If the battery is going to be left unused for several weeks, charge the battery, disconnect the battery and charger for the length of storage, and then top off the battery with a new charge prior to the next use. If the battery is to be stored without use for a long period it should be topped off with a recovery charge every six months.

Burn Testing

You should burn test your battery pack at least yearly in order to establish the actual burn time of your light. Frequent divers, or those who often rely on longer burn times, may choose to test their light more frequently. In order to conduct an effective test you will need the following equipment:

- *Battery pack*
- *Discharge method: either the light head itself or a discharge array*
- *Volt meter*
- *Timer, preferably with an alarm*
- *Reservoir of water*
- *Paper to record time and voltage*

The following steps will allow you to accurately determine your battery's burn time:

1. Make certain that the battery has been fully charged. For the best charge, burn the battery for ten minutes and then bring it back to a full charge.
2. Place the light head into the water. Make sure that there is enough water to prevent overheating. A one gallon basin or bucket is sufficient.
3. With the battery out of the canister, connect the light head to the battery.
4. Actuate the switch and measure the voltage. For NiMH battery packs, back the lid away from the battery enough to allow you to insert the volt meter probes to make contact with the metal posts. Do not allow the probes to touch each other while in contact with the battery terminals.
5. Record the time and voltage every ten minutes until the pack reaches 10 volts. It is recommended that the timer have an alarm to alert you when an interval has ended. The alarm will prevent you from forgetting about the battery and discharging it completely. A complete discharge is practically certain to damage the battery's cells.
6. Stay near the pack to monitor the voltage decay as the 10 volt limit is approached. As the pack nears 10 volts, the voltage will drop more rapidly. Record the time when the battery reaches 10 volts. This time is the amount of time that your light battery can provide a useful light beam.

7. Record the burn time and date on the battery. Don't forget to update this information with each subsequent test of your battery.
8. Charge the battery immediately. Never discharge your battery below about 9 volts as it can damage the cells to experience deep discharge for any prolonged period. Any time the battery is discharged it should be charged as soon as possible. A quick recharge is especially important when the battery is deeply discharged.

Transporting Your Light

Your Halcyon light should be left unplugged during transport. You want to eliminate the possibility of activating the light while the unit is out of the water. The Explorer lid design has a travel plug configuration for connectors. Be sure to reconnect the battery prior to getting into the water and to disconnect the battery prior to travel.

Troubleshooting Your Halcyon HID Light

If you are experiencing problems with your HID light before the end of its expected lifespan, take a second to inspect the bulb and ballast assembly:

Bulbs

- *Inspect the bulb to make sure it is seated in the socket.*
- *Inspect for broken arc tube or outer lamp jacket.*
- *Check connection where glass meets the base.*
- *Make a visual inspection of the bulb for broken or loose components in the lamp envelope.*
- *Inspect for arc tube end blackening.*
- *Inspect for deposits inside the outer glass envelope.*

Ballast points-of-failure

- *Attempt ignition a second time after properly resetting the ballast by disconnecting, waiting 15 seconds, and then reconnecting the connectors attached to the lid.*
- *Are you using Halcyon replacement lamps? Your ballast will not work with incorrect wattage lamps.*
- *Avoid possible overheating due to ambient temperature.*
- *Inspect ballast housing for mechanical damage.*

Troubleshooting your Halcyon LED Light

Why is my LED flickering?

If the flickering begins underwater, it is possible that your battery needs to be charged and the voltage protection circuit has been engaged. Charge

your battery as soon as possible. If you have been using your light on the surface, it is possible it has over heated and engaged the temperature protection circuit. Allow your light to cool before attempting to turn it on again.

Halcyon Primary Light General Troubleshooting

What to do if your light does not work

1. Verify that the battery is properly connected, that all wire connections are secure, and that the battery is not completely drained. Use a volt meter to verify that the battery has at least some voltage. The battery should read at least 12.5 volts. If you believe that your power pack has failed, test the questionable light head with a different battery.

For HID Lighting:

2. Verify that the HID bulb is not damaged. If the bulb needs to be changed, please refer to the manual section on changing the bulb. Remember to be careful removing the lamp cover and to avoid touching the bulb with your bare hands.
3. Verify that the HID bulb is seated properly in the socket. Occasionally the HID bulb connection can be compromised if the light head is sufficiently bumped or jarred during transport. To check the HID bulb seating, the lamp cover must be removed. For a comprehensive discussion of this process please see the manual section on changing a bulb. In general, be sure that the HID bulb is not touched directly and that you are careful removing the lamp cover.
4. If you suspect the switch may be the problem, please contact Tech Services for assistance.

What to do with an HID light that works sporadically

If your HID light flickers or only works sporadically, it is very likely to be the result of a poor connection. It is possible that this weak connection is at the bulb and socket, or that wires leading to the battery are frayed. Please consult the troubleshooting section entitled "What to do if your light does not work" for more detail on correcting these problems.

A sporadic HID light is more likely the result of a poor connection in the cord. Test for a poor connection or a kink in the cord by working the cord back and forth, starting by the light head and working back toward the canister, to see if the sporadic problem can be initiated. A kink in the cord is likely to eventually break the wire connections within the cord.

If your HID or LED light is equipped with underwater pluggable connectors (E/O connectors), it is possible that this connection has become compromised. Over time, the female connection may widen out and not clamp securely over the male connector. A rather inelegant but effective method to rectify this problem is to gently tap the female connection with a hammer, carefully tightening the female receptacle.

It is also possible that the switch has become damaged, perhaps with corrosion, resulting in sporadic operation. If you detect corrosion in the switch mechanism, the light should be returned to Halcyon and the switch replaced.

What to do if your HID or LED light turns itself on

A light that begins burning with the switch in the off position must have the switch replaced. This problem occasionally occurs in lights that have been previously flooded. A light that turns itself on should be disconnected immediately to prevent any damage from overheating.

Lights should always be disconnected while transported.

What to do if your burn time is less than expected

Check the condition of the battery pack to confirm that the reduced burn time isn't the result of an error induced during charging. You can check a battery pack's condition with the following steps:

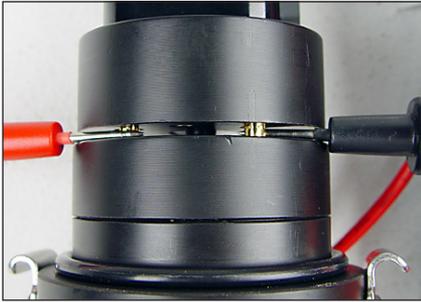
1. Verify that the charger is plugged into a properly functioning outlet. Be sure that this outlet is not controlled by a wall switch that may be shut off inadvertently. Do not use an inverter to power your charger.
2. Verify that the power light (if available on your charger) is activated when the charger is plugged into an active outlet.
3. Verify that the light indicating "charged" is activated at the end of your charging cycle.
4. Verify that the charger is functioning by attempting to charge the battery a second time. Unplug your battery pack from the charger and wait at least 7 seconds before reconnecting so that the charger can reset itself.
5. The battery must be charged completely and then placed under a load with a volt meter, typically as part of a burn test. If the battery voltage drops rapidly below approximately 12 volts, the battery is not charged. The voltage should drop slowly to approximately 12 volts and then continue to drop slowly. Please refer to the manual section on burn testing your battery prior to enacting these suggestions. If you are attempting to verify the voltage drop, submerge the light head in water before activating.
6. Gauge the actual burn time with a battery test. Please consult the earlier section in the manual for instructions on conducting a burn time test. If the battery is charging properly but the test indicates a lower than ex-

pected discharge time, it is likely the symptom of an aging or inadequately maintained battery. Please review the section on battery longevity for tips on maximizing battery life.

What to do if your Halcyon primary light is leaking

This guide will provide instructions for identifying and repairing some possible leaks in your Halcyon light. If your light continues to leak after troubleshooting, contact Halcyon for instructions on returning your light for repair. If any doubt exists about potential damage, please contact Halcyon for consultation about possible repairs.

If the light has leaked into the lamp cover (test tube), the moisture will



To test the NiMH battery pack, your volt meter must have long enough probes to reach the middle of the connector assembly.

Keep a close eye on the volt meter as the discharging battery approaches 10 volts. You can damage your battery pack if the voltage drops below 9 volts, and the rate of discharge will increase rapidly below 10 volts.

typically corrode the socket and continue to produce condensation. Any light or light head that has leaked should be opened up and allowed to dry completely. Please consult the manual section on replacing a bulb for more information on removing the lamp cover. Be careful not to twist the lamp cover while removing it and do not touch the bulb with bare hands.

Possible sites of water intrusion:

1. Typically, water leaks into the light as the result of dirty or damaged O-rings. Check the O-rings in the area of the leak, either the canister or the lamp cover. Replace the O-ring if it appears damaged. If it is dirty, clean the O-ring and the O-ring groove with a clean cloth.
2. Canister O-rings should be cleaned prior to every dive by removing the O-ring and cleaning the seating surface and O-ring thoroughly. Do not use lubrication on the O-ring; the lubricant will attract sand and dirt, increasing the risk of leaking.
3. Bulb slug O-rings are highly unlikely to leak unless either the lamp cover (test tube) or O-rings have been changed from the original factory installed set. Slight variations in the size of an O-ring can prevent the lamp

cover from sealing properly. Gently torque the lamp cover while it sits on the bulb slug assembly; watch to see if either of the two sealing O-rings break contact with the test tube.

If the O-rings break contact with the cover, the lamp cover or O-rings must be replaced. There are occasionally slight variations in the size of lamp covers (test tubes). Halcyon manages this problem by using components that fall within exact specifications. Be cautious about purchasing nonstandard lamp covers from other manufacturers or suppliers.

4. Verify that there are no prominent nicks in either the lid or the top lip of the canister.

Troubleshooting E/O Underwater Pluggable Connectors

Wetmates E/O cords are an available option that adds flexibility and modularity to any Halcyon lighting system and are a standard feature of Apollo video lights.

E/O cords offer great advantages in flexibility; however, they require some minor attention to ensure reliable service. Over time the rubberized connectors may loosen and weaken the connection. The problem is easily solved by placing the connector on a hard surface and firmly tapping it with a rubber mallet. This action will tighten the connector and prevent a sloppy connection. Another problem that might occur is a slight oxidation on the connector tip after several dives in salt water. A light sanding with extra fine sand paper will remove any oxidation and ensure a good connection.

When used with a halogen bulb, an improper E/O connection will cause the light to flicker. With an HID lamp, an improper connection will interrupt current, resulting in a loss of light. The effect is the same as if you had turned the light off with the switch: the ballast must reset itself and the bulb cool before restriking. If your light should go off because of a loose E/O connection, re-seat the connection, turn the switch to the off position, and wait ten to twenty seconds before restriking the lamp.

Disconnecting the E/O cords by pulling at an angle instead of straight out can also damage the connectors. Bent connectors cannot be reliably repaired.

Use of E/O cords in salt water requires extra consideration for maintenance. Make sure to rinse and dry E/O connectors after each salt water dive, as the connections will corrode and degrade performance over time. Most professional photographers and explorers recommend scheduled maintenance replacement after every two years if the connectors are constantly exposed to salt water.

Explorer/Eos/Apollo NiMH Frequently Asked Questions

What are the number of charge/discharge cycles I can expect from NiMH batteries?

Under normal conditions you can expect anywhere from 800 - 1000 charge/discharge cycles from your NiMH batteries. Cycle life is dependent upon usage conditions. Severe over-discharge of your NiMH can shorten the lifespan of your pack. Over-discharge is difficult with the 21, 50 and 200 watt HID lights; these lights have a regulated ballast that will terminate light output as the voltage reaches the lower part of the operational spectrum. Using a 10 watt HID (which operates with an unregulated ballast), you should shut down your light when the light begins to dim, but before you run the pack to complete discharge (a minimum of 10 volts).

Do Halcyon NiMH batteries lose any capacity during their useful life?

All battery types lose some capacity over their life, but it is normally very gradual. Our NiMH batteries are designed to have a much longer cycle life and lower rate loss than older generation NiMH or lead acid batteries. You can expect battery capacity to decrease 10 to 15% after 300 - 400 cycles.

My battery pack fell off the bench and hit the deck of the dive boat. Now that battery does not want to take a charge. Is it possible that by dropping it I damaged it somehow?

Yes, by dropping this battery you have probably caused some internal damage. All batteries can be degraded by impact damage. If you do drop your battery pack, we recommend replacement. Even if no damage is apparent, the battery could later develop a short or a leak while in the equipment and then cause even more damage, not to mention the possible inconvenience of a light failure during a dive.

Do I have to use the Halcyon charger with my Explorer, Eos or Apollo battery pack?

The Halcyon Explorer charger has been designed to ensure adequate return of charge while minimizing overcharge. Effective control of overcharge exposure, time and charge rate are all the most important factors in prolonging the life of your NiMH battery pack. Use of any charger other than the Halcyon Explorer/Eos/Apollo charger can damage your battery pack and will void your warranty. Failure to use the proper Halcyon charger may also result in overcharge and possible explosion.

What do I check if the lights won't come on when the charger is plugged in?

If the charger lights do not turn on when the unit is plugged in, first check to make sure that the cord to the power supply is firmly seated in the back of the charger. Next, remove and inspect the fuse that is on the front of the charger. Replace this 10A/250V fuse if it appears to be broken. Finally, if the charger still does not turn on, return it to Halcyon or an authorized dealer so that the internal surge protection fuse can be inspected for damage.

My light was accidentally turned on while in transit and the battery has been fully discharged. Have I damaged my NiMH battery?

Maintaining a load on a NiMH battery past the point of full discharge may eventually cause irreversible changes in the cell chemistry and promote life-limiting phenomena such as creep leakage. If you have over-discharged your NiMH battery pack, recondition the battery by taking it through at least three complete discharge/charge cycles.

Can I disassemble my Explorer/Eos/Apollo battery pack or dry lid?

If you remove the protective Delrin caps, the plastic shrink-wrapping from your NiMH battery pack, or disassemble the Halcyon dry lid, you will void your Halcyon warranty. There are no user-serviceable parts within the pack; if you think that your battery pack or lid might be damaged, please return the light to your Halcyon dealer for inspection. The bolts that secure the dry lid are sealed; breaking the seal will void your light's warranty.



Warning: Your Halcyon Explorer battery pack and dry lid are built to exacting standards. There are no user serviceable parts in either component; removing the pack's end cap or disassembling the lid can damage the system's wiring and result in a catastrophic failure.

Do I need to take any special precautions in shipping and handling my Explorer battery?

Shipping and handling of NiMH batteries is straightforward. The following suggestions ensure maximum performance, reliability and safety in working with the cells:

- *Provide proper packaging, considering the weight of the battery pack, to avoid transit damage.*
- *Do not store cells or batteries under load or in a shorted condition.*
- *Avoid excessive handling of charged cells and batteries outside the Explorer canister.*

HALCYON HMI VIDEO LIGHT INSTRUCTIONS

Follow Halcyon's general lighting information for care, charging and maintenance of the HMI video lighting system.

SETUP: Assemble the HMI by placing the ballast housing on top of the battery canister while aligning the banana plugs with the battery terminals. Ensure that the battery canister O-ring is in place before locking the latches. Plug the cord into the lid and screw down the locking retainers. Plug the other end of the cord into the light head and screw down the locking retainers.

CHARGING: Set the voltage selector switch on the back of the charger to the appropriate voltage. Plug the charger in to a wall socket and turn the charger on. Plug the charging plug into the battery. A fully discharged battery will take approximately 3 hours to charge. A fully charged battery will provide 1 hour of burn time on a single 200-watt. Use of HMI in extremely cold conditions will impact the run time.



Please note that the Halcyon HMI video light is a 24-volt system. Always use the supplied 24-volt charger to charge the battery.

Use of an inverter is not recommended.

TROUBLESHOOTING the HMI

Light will not strike

- *Ensure that the battery is connected*
- *Ensure that the cord is securely connected at both ends*
- *Ensure that the bulb is properly seated*

Light performs intermittently

- *Ensure that the cord is securely connected at both ends*
- *Ensure that the bulb is properly seated*
- *Ensure that the battery is fully charged*

The light does not burn for the specified time

- *Ensure that the battery is fully charged*
- *Ensure that the cord is securely connected at both ends*
- *Ensure that the bulb is properly seated*

Appendix 1: Burn Times for Explorer, Eos, Apollo Lights

Light System	Specifications	12watt LED		21 watt HID
4.5 amp Battery Pack	2.6" (6.6cm) OD / 11.63"(29.5cm) L Weight: 4 lb (1.8kg) Buoyancy: -1.75 lb (-.8 kg)	Full Power: 5 hour run time	Half Power: 10 hour run time	2 hour
9 amp Battery Pack	2.95" (7.5cm) OD / 11.63" (29.5cm) L Weight: 5.76-lb. (2.6 kg) Buoyancy: -2.8-lb. (-1.3 kg)	Full Power: 10 hour run time	Half Power: 20 hour run time	4 hour
13.5 amp Battery Pack	3.68" (9.3cm) OD / 11.63" (29.5cm) L Weight: 7.75-lb. (3.5 kg) Buoyancy: -3.2 lb (-1.5 kg)	Full Power: 14 hour run time	Half Power: 28 hour run time	6 hours

Light System	Specifications	Dual 21 watt HID	Single 50 watt HID	Dual 50 watt HID	Single 200 watt HMI
Apollo 13.5	3.68" (9.3cm) OD/ 11.63" (29.5cm) L Weight: 7.75 lb (3.5 kg) Buoyancy: -3.25lb (1.5 kg)	180 min	100 min	65 min	
Apollo HMI	6" (15.25cm) OD/ 25" (63.5cm) L Weight: 27.5-lb. (12.5kg) Buoyancy: -2.2-lb. (1kg)				60 min

Appendix 2: Halcyon Warranty Information

All warranty requests must be accompanied by proof of original purchase from an Authorized Halcyon Dealer. Be sure to save your sales receipt, and present it whenever returning your light for warranty service.

Should your Halcyon lighting system prove to be defective for any reason (other than those listed in the limitations section below) it will be repaired or replaced (at Halcyon's discretion) free of charge excluding shipping and handling charges. All correspondence concerning this warranty must be accompanied by a copy of the original sales receipt. Repair or replacement is Halcyon's only responsibility and your only remedy under this warranty.

Halcyon warrants, to the original purchaser only, that the Halcyon Primary or Video Lighting System will be free of defects in materials and/or craftsmanship under normal diving use for one year from the date of purchase, provided proper care is performed on all materials as described within this manual, with the following exclusions:

A lifetime warranty to the original owner, applies to Halcyon Delrin and UHMW canisters. A 90-day warranty, from the date of purchase, applies to the original owner of the NiMH or Lead Acid battery, under normal diving use, provided proper care is performed on all materials as described within this manual.

ALL WARRANTIES, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED IN DURATION TO A PERIOD ENDING ONE YEAR FROM THE DATE OF PURCHASE.

Some states in the U.S. and certain foreign countries do not allow limitations on the duration of implied warranties, so this may not apply to you. This warranty gives you specific legal rights. You may have rights which vary from state to state and country to country.

HALCYON MANUFACTURING DISCLAIMS AND EXCLUDES ANY LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. SOME STATES IN THE U.S. AND CERTAIN FOREIGN COUNTRIES DO NOT ALLOW EXCLUSIONS OR LIMITATIONS OF LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THIS MAY NOT APPLY TO YOU.

The following restrictions apply to this warranty:

1. This warranty extends to the charger and all light parts, with the exception of the bulb.
2. This warranty does not extend to leaks, flooding, corrosion or any such damage to any part of the light, unless due to a material or craftsmanship defect.
3. This warranty does not extend to damages caused by improper use, improper maintenance, neglect, unauthorized repairs, modifications, accidents, fire, or casualty.

This warranty does not extend to products whose serial number has been altered or intentionally defaced.

4. Cosmetic damage, such as scratches, fraying, and nicks are not covered by this warranty.
5. This warranty does not extend to equipment used for rental, commercial, governmental or military purposes.
6. This warranty covers products purchased in the United States. For warranties that may apply elsewhere, please contact your local representative.
7. Failure to meet any of the above requirements will render the warranty null and void.

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