

Carmanah 701, 701-5, 702 and 702-5 LED Lantern Instructions

The Carmanah 701, 701-5, 702 and 702-5 lanterns are nominal 3 to 4-nautical mile, self-powered, omni-directional LED lanterns for use on lighted aids to navigation. This document provides performance data (Section 1), selection criteria (Section 2), set-up, installation and maintenance instructions (Section 3), and ordering information (Section 4).

Overview

The Carmanah 701/702-series lanterns are manufactured by:

Carmanah Technologies Inc.,
Building 4, 203 Harbour Road,
Victoria, British Columbia, Canada V9A 3S2,
Phone: 1-877-722-8877

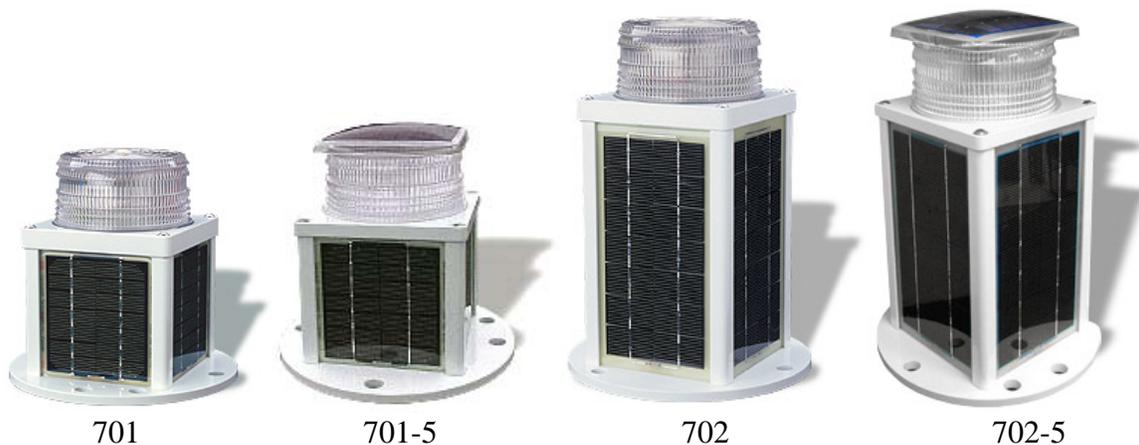
(see ordering instructions on page 19)

Website: <http://www.carmanah.com/>

The lanterns are self-contained; the solar panels, battery, flasher, daylight control and lantern assembly are housed as a single unit. They are available in four models*: the 701, 702 and 702-5 (the 704-5 and 708 lanterns are discussed in separate instructions). All four models produce the same intensity; the difference is the size of the solar panels and internal battery. The 701 has the least capable power system; the 702-5 has the most capable power system.

Every lantern has an inherent color (red, green, white or yellow), but the flash rhythms are programmable.

Carmanah 701-702 Series LED Lanterns



*Carmanah discontinued the 701 and 702 lanterns on 30 Sep 2008. The 701-5 lantern replaces the 701 and the 701-5 or 702-5 replaces the 702 (see tables on pages 4-6). 701 and 702 lanterns can remain in service until they no longer provide an acceptable signal to the mariner.

SECTION 1 - PERFORMANCE DATA

Intensity

The intensity of the red, green and white Carmanah 701/702-series lanterns have changed over previously published values. The old published values (lower intensity) are printed to the right of the new values. Red lanterns purchased after July 2007 produce the higher values. White and Green lanterns purchased after January 2007 produce the higher values. If you are uncertain when a lantern was purchased, send an email to Andrea Bradley (page 22) with the serial number of the lantern and she can provide the date. To aid identification, all lanterns purchased after January 2008 have a “MOD2” sticker affixed to its base and produce the higher listed intensities.

The following table shows effective intensities of Carmanah lanterns for the standard flash characteristics. For comparison, the table also shows the corresponding effective intensities of 155mm lanterns, with 0.55 amp lamps, in red, green, white and yellow.

EFFECTIVE INTENSITIES OF CARMANAH 701, 701-5, 702 and 702-5 LED Lanterns

(and 155mm lantern with 0.55 amp lamps – all values in candela – New /Old intensity values)

<u>Lamps</u>	<u>Carmanah</u>				<u>155mm w/0.55a</u>			
	<u>red</u>	<u>green</u>	<u>white</u>	<u>yellow</u>	<u>red</u>	<u>green</u>	<u>white</u>	<u>yellow</u>
FL 2.5 (0.3)	20 /15	28 /15	21 /15	11	20	20	60	45
FL 4	22 /17	31 /17	23 /17	12	20	25	70	55
FL 6	25 /19	35 /19	26 /19	14	25	30	85	65
FL (2) 5	22 /17	31 /17	23 /17	12	20	25	70	55
FL (2+1) 6	20 /15	28 /15	21 /15	11	20	20	60	45
Mo(A)	--	--	19 /14		--	--	70	55
Q	17 /13	23 /13	18 /13	9	20	20	60	45

Vertical Divergence (degrees)

	Red	Green
50% beam width	±2.8	±3.5
15% beam width	±8.9	±9.5

Nominal Range (nautical miles; nm)

The nominal range of the 701, 701-5, 702 and 702-5 lanterns is either 3 or 4 nautical miles. To find the correct nominal range, use the effective intensity in conjunction with the following table.

<u>Effective Intensity</u>	<u>Nominal Range</u>
10-23 cd	3 nm
24-53cd	4 nm

The appropriate value for Nominal Range should be published in the Light List. **Caution:** as stated in the AtoN Technical Manual, “The nominal range of a light plays no part in the selection process.” Never select a lantern for an aid based on the lantern’s nominal range.

SECTION 2 - 701, 701-5, 702 and 702-5 LANTERN SELECTION

Overview

The 701/702-series Carmanah lanterns are authorized for use on the modified 5th class foam buoy. This buoy/lantern combination is a replacement for the old lighted discrepancy buoy. The lanterns can also be used on any standard Coast Guard lighted buoy or minor aid where the effective intensity satisfies the operational requirement. The lanterns shall not be installed on any buoy or structure without prior approval of the district aids to navigation office. Lanterns may be used as hot packs on aids that are discrepant. A notice to mariners should be issued if the range is lower than the equipment it temporarily replaced. Lanterns shall be recharged immediately after retrieval to prevent damage to the lead-acid battery.

District Considerations - Intensity

The intensities of red and green Carmanah 701/702-series lanterns closely match the intensities of 155mm lanterns with 0.55 amp lamps. If a red or green aid has a 155mm lantern with 0.55 amp lamps, and if the existing effective intensity meets the operational need, then the aid is a potential candidate for a Carmanah 701/702-series lantern. The effective intensities of the white and yellow 701/702-series lanterns are considerably lower than the intensities of a white or yellow 155mm with 0.55 amp lamps. A white or yellow Carmanah 701/702 should not be installed until the District has carefully evaluated the aid and determined that a lower intensity and reduction in service to the mariner are acceptable.

To determine the intensity requirements for any aid, Districts use the standard procedures for selecting an AtoN light signal as prescribed in the AtoN Technical Manual (Chapter 6, Section 6.B, page 6-1) and the Visual Signal Design Manual (Chapter 3). These references describe how operational range, luminous range, light color, light characteristic, background lighting, and meteorological visibility are used to calculate intensity needs. Higher intensities can be obtained by using the Carmanah 704-5 or 708 LED lanterns.

Selecting a Specific Carmanah Model

If, and only if the District has determined that a Carmanah will provide an intensity that meets the operational needs for a specific aid, **then** the next step is to choose a Carmanah model that has a power system matched to the aid location and flash characteristic. The table that begins on the following page should be used to select a Carmanah model. The table uses the same 92 solar radiation reference sites as the existing USCG solar sizing table. Note that the green lanterns are sized differently than the red, white or amber (yellow). Note also that some location/flash-characteristic combinations have an “N/A” (particularly in Districts 13 and 17). “N/A” means that no Carmanah model can be used because the power system cannot power the aid with the available solar radiation. A Carmanah solar sizing spreadsheet is available on the Ocean Engineering website: <http://www.uscg.mil/hq/cg4/cg432/> under Pubs/Software and may be used to size seasonal aids and aids using Iso6 and Occ4 rhythms.

Carmanah Solar Sizing Table

Color:	Green	Red White Yellow	Green	Red White Yellow	Green	Red White	Green	Red White Yellow
Characteristic:	FL 4 FL 6	FL 4 FL 6	FL 2.5 (0.3s)	FL 2.5 (0.3s)	FL(2+1)6	FL(2+1)6 FL (2) 5	Q	Q Mo (A)
Portland, ME	701	701	701	701-5	701	702	702	702-5
Boston, MA	701	701	701	701-5	701	702	702	702-5
Providence, RI	701	701	701	701-5	701	702	701-5	702-5
Bridgeport, CT	701	701	701	701-5	701	702	702	702-5
New York, NY	701	701	701	701-5	701	702	702	702-5
Albany, NY	701	701	701	701-5	701	702	702	N/A
Burlington, VT	701	701	701	702	701	702	702	N/A
Newark, NJ	701	701	701	701-5	701	702	701-5	702-5
Atlantic City, NJ	701	701	701	701	701	701-5	701-5	702
Wilmington, DE	701	701	701	701	701	701-5	701-5	702
Philadelphia, PA	701	701	701	701	701	701-5	701-5	702
Baltimore, MD	701	701	701	701	701	701-5	701-5	702
Sterling, VA	701	701	701	701	701	701-5	701-5	702
Norfolk, VA	701	701	701	701	701	701-5	701-5	702
Cape Hatteras, NC	701	701	701	701	701	701	701	702
Wilmington, NC	701	701	701	701	701	701	701	702
Charleston, SC	701	701	701	701	701	701	701	702
Savannah, GA	701	701	701	701	701	701	701	702
Jacksonville, FL	701	701	701	701	701	701	701	702
Daytona Beach, FL	701	701	701	701	701	701	701	701-5
West Palm Beach, FL	701	701	701	701	701	701	701	701-5
Miami, FL	701	701	701	701	701	701	701	701-5
San Juan, PR	701	701	701	701	701	701	701	701-5
Key West, FL	701	701	701	701	701	701	701	701-5
Tampa, FL	701	701	701	701	701	701	701	701-5
Tallahassee, FL	701	701	701	701	701	701	701	702
Mobile, AL	701	701	701	701	701	701	701	702
New Orleans, LA	701	701	701	701	701	701	701	702
Port Arthur, TX	701	701	701	701	701	701	701	702
Houston, TX	701	701	701	701	701	701	701	702
Corpus Christi, TX	701	701	701	701	701	701	701	702
Brownsville, TX	701	701	701	701	701	701	701	702
Little Rock, AR	701	701	701	701	701	701-5	701	702
Fort Smith, AR	701	701	701	701	701	701	701	702

- Notes:
1. Numbers in table refer to Carmanah Model number.
 2. "N/A" means that no Carmanah can provide the desired characteristic.
 3. If a 701 lantern is specified, a 701-5, 702 or 702-5 may be used. If a 701-5 lantern is specified, a 702 or 702-5 may be used. If a 702 lantern is specified, a 702-5 may be used.
 4. If a desired characteristic is not listed contact Ocean Engineering (CG-432A).

Carmanah Solar Sizing Table

Color:	Green	Red White Yellow	Green	Red White Yellow	Green	Red White	Green	Red White Yellow
Characteristic:	FL 4 FL 6	FL 4 FL 6	FL 2.5 (0.3s)	FL 2.5 (0.3s)	FL(2+1)6	FL(2+1)6 FL (2) 5	Q	Q Mo (A)
Oklahoma City, OK	701	701	701	701	701	701	701	702
Memphis, TN	701	701	701	701	701	701-5	701-5	702
Huntsville, AL	701	701	701	701	701	701-5	701-5	702
Chattanooga, TN	701	701	701	701	701	701-5	701-5	702
St Louis, MO	701	701	701	701	701	701-5	701-5	702
Kansas City, MO	701	701	701	701	701	701-5	701-5	702
Moline, IL	701	701	701	701-5	701	702	702	702-5
Minneapolis, MN	701	701	701	701-5	701	702	702	N/A
Evansville, IN	701	701	701	701	701	701-5	701-5	702
Indianapolis, IN	701	701	701	701-5	701	702	702	702-5
Louisville, KY	701	701	701	701-5	701	702	701-5	702-5
Cincinnati, OH	701	701	701	701-5	701	702	702	702-5
Pittsburgh, PA	701	701-5	701	702	701	702	702	N/A
Massena, NY	701	701-5	701	702	701	702	702	N/A
Rochester, NY	701	701-5	701	702	701-5	702	702	N/A
Buffalo, NY	701	701-5	701	702	701-5	702	702	N/A
Erie, PA	701	701-5	701	702	701-5	702	702	N/A
Cleveland, OH	701	701-5	701	702	701-5	702	702	N/A
Toledo, OH	701	701-5	701	701-5	701	702	702	N/A
Detroit, MI	701	701-5	701	702	701-5	702	702	N/A
Alpena, MI	701	701-5	701	702	701-5	702	702	N/A
Traverse City, MI	701	701-5	701	702	701-5	702	702	N/A
Muskegon, MI	701	701-5	701	702	701-5	702	702	N/A
Chicago, IL	701	701-5	701	701-5	701	702	702	N/A
Milwaukee, WI	701	701-5	701	701-5	701	702	702	N/A
Green Bay, WI	701	701	701	701-5	701	702	702	N/A
Sault Ste Marie, MI	701	701-5	701	702	701-5	702	702	N/A
Houghton, MI	701	702	702	702	702	702-5	702-5	N/A
Duluth, MN	701	701-5	701	701-5	701	702	702	N/A
Internat'l Falls, MN	701	701-5	701	702	701-5	702	702	N/A
Salt Lake City, UT	701	701	701	701-5	701	702	702	702-5
Reno, NV	701	701	701	701	701	701-5	701	702
Las Vegas, NV	701	701	701	701	701	701	701	701-5
San Diego, CA	701	701	701	701	701	701	701	701-5

- Notes:
1. Numbers in table refer to Carmanah Model number.
 2. "N/A" means that no Carmanah can provide the desired characteristic.
 3. If a 701 lantern is specified, a 701-5, 702 or 702-5 may be used. If a 701-5 lantern is specified, a 702 or 702-5 may be used. If a 702 lantern is specified, a 702-5 may be used.
 4. If a desired characteristic is not listed contact Ocean Engineering (CG-432A).

Carmanah Solar Sizing Table

Color:	Green	Red White Yellow	Green	Red White Yellow	Green	Red White	Green	Red White Yellow
Characteristic:	FL 4 FL 6	FL 4 FL 6	FL 2.5 (0.3s)	FL 2.5 (0.3s)	FL(2+1)6	FL(2+1)6 FL (2) 5	Q	Q Mo (A)
Long Beach, CA	701	701	701	701	701	701	701	702
Los Angeles, CA	701	701	701	701	701	701	701	702
Santa Maria, CA	701	701	701	701	701	701	701	701-5
San Francisco, CA	701	701	701	701	701	701-5	701-5	702
Arcata, CA	701	701	701	701-5	701	702	702	702-5
North Bend, OR	701	701-5	701	702	701	702	702	N/A
Astoria, OR	701	702	701-5	702	702	N/A	702-5	N/A
Portland, OR	701	702	701-5	702	702	N/A	N/A	N/A
Pendleton, OR	701	701-5	701	702	701-5	702	702	N/A
Quillayute, WA	701	702	701-5	702	702	N/A	N/A	N/A
Seattle, WA	701	702	701-5	702	702	N/A	N/A	N/A
Annette, AK	702	N/A	702	N/A	N/A	N/A	N/A	N/A
Yakutat, AK	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Anchorage, AK	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kodiak, AK	702	N/A	702	N/A	N/A	N/A	N/A	N/A
Cold Bay, AK	702	N/A	702	N/A	N/A	N/A	N/A	N/A
King Salmon, AK	702	N/A	702-5	N/A	N/A	N/A	N/A	N/A
Bethel, AK	702-5	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nome, AK	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hilo, HI	701	701	701	701	701	701	701	701-5
Kahului, HI	701	701	701	701	701	701	701	701-5
Honolulu, HI	701	701	701	701	701	701	701	701-5
Lihue, HI	701	701	701	701	701	701	701	701-5
Guam	701	701	701	701	701	701	701	701-5

- Notes:
1. Numbers in table refer to Carmanah Model number.
 2. "N/A" means that no Carmanah can provide the desired characteristic.
 3. If a 701 lantern is specified, a 701-5, 702 or 702-5 may be used. If a 701-5 lantern is specified, a 702 or 702-5 may be used. If a 702 lantern is specified, a 702-5 may be used.
 4. If a desired characteristic is not listed contact Ocean Engineering (CG-432A).

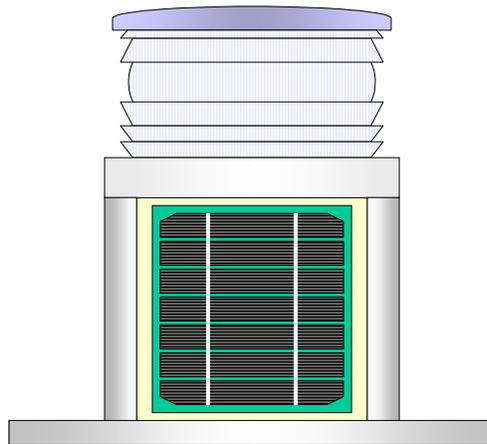
Hot Packs

If the lantern/color/characteristic is not listed in the Carmanah Solar Sizing Table (above), then use of the lantern is limited to the autonomy of the battery, in days, as stated below:

Carmanah 701, 701-5, 702, 702-5 Lantern Hot Pack Limitation in Days

Rhythm	701 G	701 RWY	702 G	702 RWY
FL2.5(.3)	26 days	15	62	25
FL4(.4), FL6(.6)	31	18	49	30
Q, Mo(A)	12	7	20	12

SECTION 3 - SET-UP, INSTALLATION AND MAINTENANCE



Receipt and Handling

The lanterns are charged prior to shipment. It will arrive fully charged and programmed OFF, (i.e., it will not flash in a darkened room) and ALC* feature disabled. If not needed right away it should be checked for damage, then stored in its box in a cool location. Take a few minutes to fill out and mail the warranty card shipped with the lantern.

Important Handling Note: the top solar panel on a 701-5 and 702-5 lantern is not designed to support the full weight of the lantern. **Never use the top solar panel to lift the lantern.**

The batteries are very susceptible to self-discharge, especially if left unused in a very warm place for a long period of time. To avoid this unnecessary loss of charge and battery damage, store the lantern at 20°C (68°F) or cooler. If this is not possible, the lanterns (batteries) will have to be recharged at the following charge intervals to preserve the battery:

Storage Temperature [°F]	Recharge Interval for 701-702 Series Lanterns [months]
<70°	12
70°-90°	6
90°-105°	3
>105°	1

For example, if a 701/702-series lantern is stored at 100°F, it will have to be charged every 3 months in order to preserve the battery.

*The Automatic Light Control (ALC) is not used on USCG aids to navigation.

The lantern should always be stored at 100% state of charge to avoid damaging the battery. Check the battery's state of charge using the procedure described below. If the battery state-of-charge is not 100%, then recharge prior to storage.

Determining Battery State of Charge (SOC)

The Battery State-of-Charge (SoC) is determined using the remote as follows:

- Transition the Lantern: per guidance in Programming Section
- Enter the Security Code : **POWER 7 5 3 CHAN^**
- Enter the Battery Status Code: **POWER 8 1 0 CHAN^**

The lantern will respond with 3 flashes (to indicate that it correctly received the instruction), then after a 2-second pause will emit a series of up to 10 flashes. Each flash indicates 10% usable charge (4 flashes indicate 40% state-of-charge; 10 flashes indicate full charge). After a brief pause the lantern will repeat the battery flashes for verification.

Recharging

The battery state-of-charge can be increased by leaving the lantern outside on a sunny day or by using an artificial light source.

Using Sunlight. The easiest way to recharge the lantern is to leave it outside on a sunny day. Use the following table to determine how many *sunny days* are required to return the lantern to 100% state-of-charge. Ensure that the lantern is turned off so that the light does not turn on at night (see Programming Section; the battery will recharge when the lantern is turned off).

Battery SoC	Sunny Days to Return Lantern to 100% SoC
90%	1
80%	2
70%	3
60%	4
50%	5
40%	6
30%	6
20%	7
10%	8

Using Artificial Light. Artificial light is capable of charging the lanterns if sunlight is unavailable or inconvenient. Use a high-intensity light such as a 90 – 150W halogen floodlight.

Set up the spot light so that it is *at least* 24” away from the solar panel to prevent the lantern from being damaged due to overheating. Desk lamps using 60W bulbs can be as close as 2” away from the solar panel. The plastic encasing the top solar panel is prone to heat damage and can crack or bubble if overheated. Arrange the charging light to cast as much illumination as possible on one of the *side* solar panels. Using additional charging lights on the other side solar panels will reduce the charging time.

Use the following table to determine how many days of artificial lighting are required to return the lantern to 100% state-of-charge (based on 24-hour/day charging).

Lantern Model	Light Source	Distance from Solar Panel	Hours to Charge Battery from 10% to 100%
701	500 W halogen spot	2 feet	300
701-5	60 W tungsten in a reflector housing (desk lamp)	2 inches	
702	500 W halogen spot	2 feet	250
702-5	60 W tungsten in a reflector housing (desk lamp)	2 inches	

Applying light to more than one solar panel at the same time can reduce the amount of time to charge 701/702 lanterns, e.g., four lights on four panels would divide charging time by four.

Warning: reduction of the distance will overheat the solar panel; increasing the distance greatly reduces the charging efficiency.

An alternative is to purchase an external charger from Carmanah and the access tool for the tamper resistant Allen screw (see the GSA contract information in Section 4); the 5/32" tamper resistant Allen wrench may be purchased from Carmanah or McMaster Carr Supply Company, 732-329-3200, part number 7390A27). The charger will recharge the battery in a fraction of the time, however specific procedures must be followed or damage to the battery and/or control unit will occur.

1. Place security bit in a hex-driver or drill and remove the top four screws from housing completely. Remove nylon washers from each of the holes in the flange. Discard both.
2. Gently pull up on one corner of the flange. Use caution as the head unit may stick due to the gasket being compressed onto the housing body.
3. Once the head has been separated, disconnect the 3-conductor (black and red) cable first, by depressing the catch on the clip and gently pulling apart. Be sure not to pull on the wires; grasp only the clip.
4. Disconnect the 2-conductor (orange and black) cable in the same manner as described above.
5. Remove the small desiccant pack from inside the light and discard.
6. Remove and retain the foam-packing block.
7. Take the battery pack out of the housing.
8. Attach the proper external charger pigtail to the connector feeding the battery.

9. Measure the voltage at the point where wires from the battery connector are soldered to the battery board. Ensure that the voltmeter probes do not touch each other when making a measurement.
10. Based on the voltage measurement, charge the battery in a well ventilated area for the following amount of time:

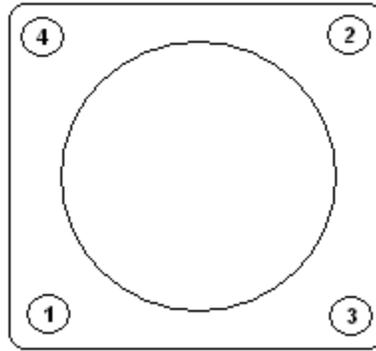
<u>Voltage</u>	<u>701 & 701-5 Lantern (15 AH)</u>	<u>702 & 702-5 Lanterns (24 AH)</u>
4.14 volts or higher	5 hours	7 hours
3.98 volts to 4.13 volts	15 hours	18 hours
3.86 volts or lower	20 hours	27 hours

Do not charge the battery longer than the time specified.

Overcharging can cause hydrogen gas to vent, which can reduce the battery life.

Make sure that the plugs on the charger do not touch each other if you have the old style of the charger with banana plugs. |

11. Using a paper towel or cloth with a small amount of rubbing alcohol, wipe the top edge of the housing extrusion where it comes into contact with the head gasket. This will help ensure a proper seal.
12. Pull the gasket on the underside of the head out of its channel. Discard gasket.
13. Install the new gasket by pressing it into place. Be sure it is evenly seated in the channel. **DO NOT USE TOOLS. USE YOUR FINGERS ONLY.**
14. Reinstall the foam-packing block and a new desiccant bag (if available).
15. Place the optic head next to the base and connect the orange and black cable first. The light should begin flashing. The light will retain the last flash pattern programmed.
16. Connect the black and red cable.
17. Place the head into position on top of the housing. **ENSURE THAT THE CABLING DOES NOT PROTRUDE OUTSIDE THE HOUSING! IF IT DOES IT WILL BE PINCHED AND CUT BY THE FLANGE WHEN IT IS BEING TIGHTENED.** Tuck it in with your finger or a blunt tool.
18. Place a new nylon washer into each hole recess.
19. Using an anti-seize paste (Permatex or equivalent), lightly coat the threads of the new screws and insert them into the mounting holes as far as you can, using your fingers. This will help avoid the chance of cross threading.
20. Using the security bit, tighten the head down in the following order:



21. Tighten the screws firmly by hand to slightly compress the gasket. Over tightening may damage the threads in the aluminum base.

Programming

The color of the lantern cannot be identified by the appearance of the lens or LEDs when they are off. The color of the lantern is indicated by the color of the ring around the lens.

All programming is accomplished with a TV remote control set to communicate with the lantern. The remote can be purchased from Carmanah or a RCA TV Universal Remote can be purchased locally.

Carmanah Remote. If the lantern does not respond to the remote, or if the remote's batteries have been replaced, then the remote must be **initialized** as follows:

Press and hold	CODE SEARCH	until red light on remote turns on
Press	TV	red light on remote will blink once
Enter	0 0 6	red light will blink once after each entry

RCA Television Universal Remote. There are about 30 different RCA TV Universal Remote Controls. The remote must be **initialized** so that the remote can communicate with the lantern. Different models have different initialization procedures. If the remote purchased uses a 3-digit code use code 0 0 6. If the remote uses a 4-digit code use code 1 0 0 6. **Consult the instructions that come with the remote.** Follow the "Direct Entry Method" for programming a TV as shown in the instructions. Initialization will likely take one of the following two forms:

Press and hold	CODE SEARCH	until red light on remote turns on
Press	TV	red light on remote will blink, then stay on
Enter	0 0 6	red light will turn off after 3-digit code successfully entered

or

Press and hold	TV	keep holding TV button!
Enter	1 0 0 6	while still holding TV button
Release TV button		

Programming Overview.

Programming the lantern always requires a 3-step process:

Step 1. “Transitioning” the lantern. See the “Transitioning the Lantern” section for details.

Step 2. Enter the security code as follows:

Press	POWER	lantern will flash once
Enter	7 5 3	lantern will flash once after each entry
Press	CHAN^	lantern will flash once – then flash 3 times if the security code is successfully entered.

Step 3. Enter the desired programming instructions:

Press	POWER	lantern will flash once
Enter	# # #	where # # # is the appropriate instruction code (see instruction codes below; lantern will flash once after each entry
Press	CHAN^	lantern will flash once – then flash 3 times if the instruction is successfully entered.

- Notes:
1. “**POWER**” means pressing the remote’s ON/OFF button.
 2. More than 1 programming instruction can be entered as long as not more than 1 minute passes between successive entries.
 3. After 1 minute of no entries the lantern exits the programming mode. If more instructions are needed and the lantern has exited the programming mode, then the user must start again at Step 1 (transition the lantern).

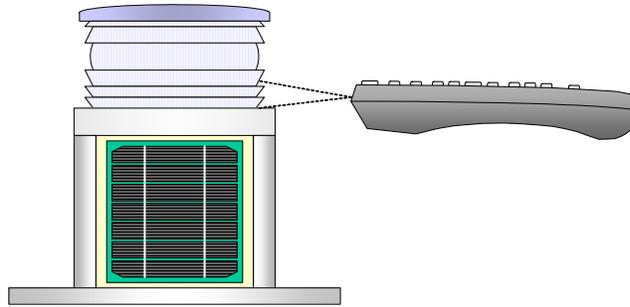
Transitioning the Lantern.

Before the lantern will accept any instructions from the remote the lantern must be “transitioned.” *Transitioned* means either moving the lantern from a dark environment to a bright environment, or visa versa.

If the lantern will be programmed in a bright (daylight) environment:

- Cover the lantern with a coat, blanket, shroud, or any other material that blocks light. Keep it covered for 20 seconds.
- Remove the cover.
- Point the remote at the lens and press the ON/OFF(POWER) button repeatedly. If the lantern responds with a flash, it has transitioned and it is ready for programming.

Note: Proceed to Step 2 (entering the Security Code) within 1 minute of transitioning.



If the lantern will be programmed in a dark (nighttime) environment:

- Expose the lantern to a **high** level of external light. A typical incandescent or fluorescent light may not be bright enough. It may require a 90W or greater halogen floodlight or sunlight. Keep the lantern in the high-light condition for 20 seconds.
- Move the lantern to a dark condition (by either turning off the external light, covering the lantern, or moving the lantern indoors to a dark room).
- Point the remote at the lens and press the ON/OFF(POWER) button repeatedly. If the lantern responds with a flash, it has transitioned and it is ready for programming.

Note: Proceed to Step 2 (entering the Security Code) within 1 minute of transitioning.

Putting It All Together.

Here's the short version of what must be done to program the lantern:

Step 1. Transition the lantern: as described above.

Step 2. Enter Security Code: **POWER 7 5 3 CHAN^**

Step 3. Enter programming instructions as appropriate:

POWER 0 4 9 CHAN^	to select FL 2.5 (.3)
POWER 1 7 4 CHAN^	to select FL 4 (.4)
POWER 0 7 3 CHAN^	to select FL 6 (.6)
POWER 1 2 9 CHAN^	to select Quick Flash
POWER 0 2 2 CHAN^	to select FL (2+1) 6
POWER 1 7 5 CHAN^	to select FL (2) 5
POWER 1 7 6 CHAN^	to select Mo(A)
POWER 0 8 1 CHAN^	to select Iso 6
POWER 1 1 8 CHAN^	to select Occ 4
POWER 8 0 0 CHAN^	to turn ALC off (required for all lanterns)
POWER 9 8 0 CHAN^	to lock ALC off *
POWER 0 0 0 CHAN^	to TURN OFF the lantern (for storage)

*Code 980 **required** for 701-5 and 702-5 lanterns with serial numbers shown below and higher:

701-5 red: 18711; 701-5 green: 18715; 701-5 white: 18837; 701-5 yellow: 18709
702-5 red: 18431; 702-5 green: 18721; 702-5 white: 18431; 702-5 yellow: 18431

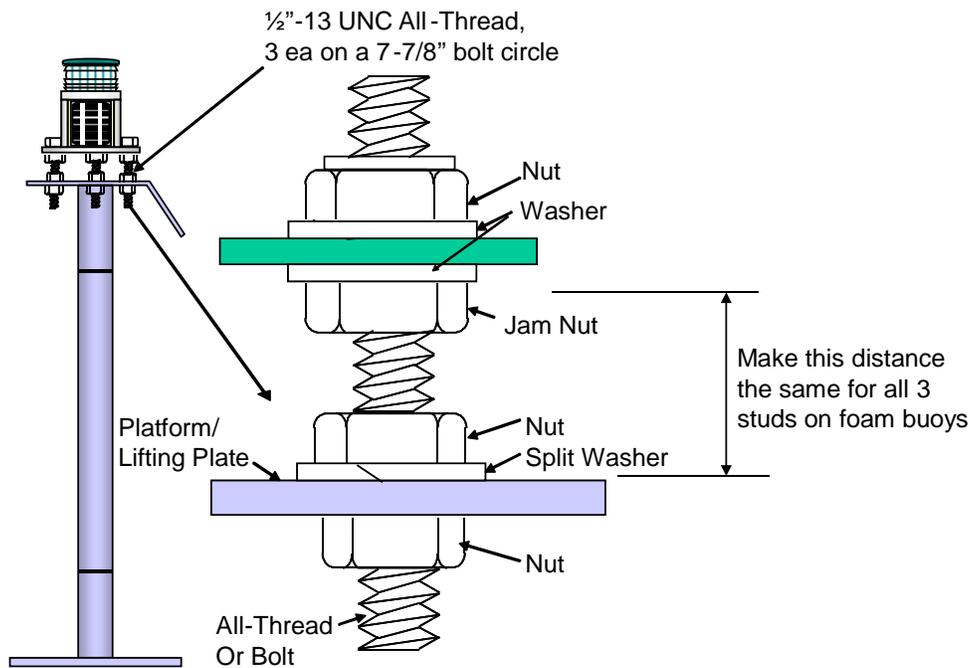
Final Programming Hints and Notes.

1. The 701/702-series lanterns have an *optional* feature called “Automatic Light Control” (ALC). This feature automatically reduces light intensity (several times) as battery voltage drops. The ALC feature should **never** be used on USCG aids. Turn ALC “off” using code 800 as described in the “Putting It All Together” section.
2. Transitioning the lantern is typically the trickiest part. If the lantern is not responding to the remote, it probably hasn’t transitioned. Repeat the transitioning process.
3. The lantern should flash one time in response to a button on the remote being pushed. If the lantern does not respond, or if it responds with 2 flashes, then the signal from the remote was not properly received.
4. After completing a program instruction (and after the one quick flash in response to the CHAN^ button), the lantern should flash 3 times to indicate that it has received and processed the instruction.
5. The lantern will exit the programming mode if it goes 1 minute without receiving any input. Don’t delay. Have a plan. Start from scratch (transition the lantern) if more than a minute passes and the lantern is no longer responding.

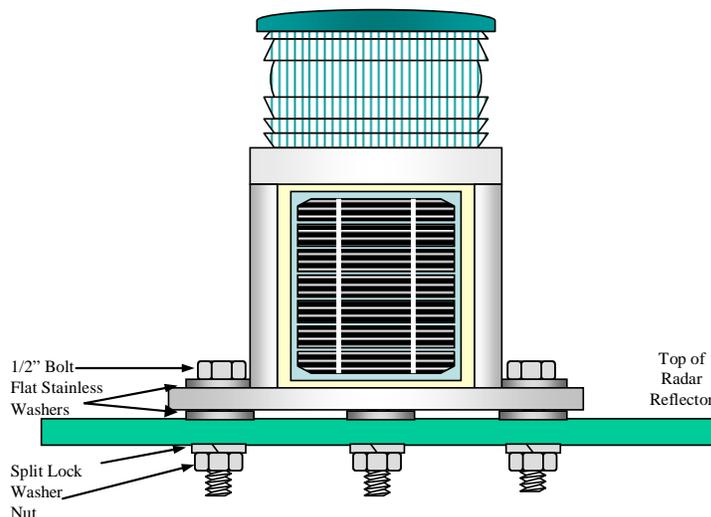
Installation

Mount the lantern **on a fixed aid or foam buoy** as shown on the next page. The lantern should ALWAYS be mounted with 3 bolts (or lengths of all-thread), never 4. The bolts will shadow the solar panels if they extend too far above the lantern’s base. Therefore, after securing the bolts (or all-thread) to the structure’s mounting plate as shown in the figure, install three jam nuts on the bolts so that about 1” of thread is exposed. Place the lantern on top of the jam nuts, then drop on the split washers and position the uppermost nuts at the very upper end of the thread. Do not tighten these uppermost nuts – they are positioned at this time to ensure that the lantern doesn’t fall off. Level the lantern on structures by adjusting the jam nuts (use a torpedo level on the base plate of the lantern - use the “T” method described in the Short Range Aids to Navigation Servicing Guide COMDTINST M16500.19A). On foam buoys the lantern is not “leveled”, but the distance from the lifting eye plate to the jam nuts on all three bolts should be the same. When the lantern is level, tighten the upper-most nuts (40 – 44 ft-lbs).

Installation – Structure/Foam Buoy



Mount the lantern **on a steel/composite (plastic) buoy** as shown below. Foam buoys require an offset lifting eye (if not installed) as shown in drawing 121169 (<http://www.uscg.mil/hq/cg4/cg432/docs/drawings/432B/121169d.pdf>), available from the Gilman Corporation (<http://www.gilmancorp.com/>). The lantern should ALWAYS be mounted with 3 bolts, never 4. Note that stainless steel washers **MUST BE** installed between the lantern base and buoy's mounting plate. **The lantern vents through a hole in the bottom of the lantern's base, so the lantern CAN NOT be mounted flush with the buoy's mounting plate.** Stainless steel washers should also be installed between the heads of the mounting bolts and the top of the lantern's base as shown below. The mounting bolts should be torqued to 40 – 44 ft-lbs.



Servicing

Servicing should be performed in accordance with the standard cycle established for the aid.

Ensure that the lens and solar panels are clean. Wipe with a cloth dampened with mild soap and water, if necessary.

Cover the lantern with a shroud, jacket, box, blanket, etc., to simulate darkness. The lantern should flash on rhythm after a few seconds. It should stop flashing after the cover is removed in the daytime. While covered, observe the LEDs through the lens. Dark sectors indicate that an LED cluster is not operating, necessitating replacement of the optic head.

Uncover the lantern. It should stop flashing.

Troubleshooting

Symptom: Lantern will not respond to the remote.

- The most likely problem is that the lantern has not transitioned. Repeat the transitioning process as described in the “Transitioning the Lantern” section.
- It’s possible that the batteries in the remote are dead, the remote is not functioning, or that the remote is not properly initialized. Change the batteries in the remote and initialize the remote as described in the “Remote Control” section. If that doesn’t work, try another remote.

Symptom: Lantern does not flash the programmed flash characteristic. Instead it flashes one quick flash once a minute.

- The battery state-of-charge is unacceptably low. If the battery becomes further discharged, the main LED array will no longer flash once per minute.
- If the lantern was sized properly and if it was programmed properly (correct flash characteristic and light intensity setting) then it should maintain a high state-of-charge. Confirm proper solar sizing using the table in this data sheet. Confirm proper programming.
- Look for other reasons the system did not maintain a satisfactory state-of-charge. Are the vertical panels covered with guano? Is the lantern shaded? Is the DLC properly turning off the light during daylight?
- How old is the battery? Is it past the recharge interval shown in the “Service Life” section? If the battery is past its recharge interval, purchase a new battery from Carmanah.
- If all items above check out, contact Ocean Engineering.

Symptom: Lantern reported discrepant.

- Determine the battery's state-of-charge as described in the "Determining Battery State-of-Charge" section. If state-of-charge is less than 60% then proceed through the steps in the troubleshooting section immediately above.
- If battery state-of-charge is 60% or greater then reprogram the lantern. Ensure that lantern responds as expected to programming instructions.
- 701/702-series lanterns purchased prior to Oct 2007 have 8 LEDs that are evenly spaced around the optic head. Lanterns purchased after that date use 24 LEDs. When the light flashes, confirm that the light output appears to be uniformly distributed through 360 degrees (check the LEDs by looking slightly down at the lantern from above the lantern's focal plane; DO NOT look into the lantern with your eye in the focal plane).
- If the lantern does not perform as it should, and the problem is not attributable to physical damage, Carmanah will replace the lantern – free of charge – within the first year of purchase. If the lantern is between 1 and 3 years old it is covered by Carmanah's 3-year pro-rated warranty. A warranty card is supplied with each unit. The warranty can also found be online at: <http://www.carmanah.com/content/products/warranty/>. Contact Carmanah Customer Service (info below) before returning a lantern or seeking a warranty claim.

Carmanah Customer Service

Mail: Carmanah Technologies Corp.
Building 4, 203 Harbour Rd.
Victoria, BC Canada V9A 3S2

Phone: 1-877-722-8877

POC Chere Lynn Minshall or Simon Proctor

Fax: 1-250-380-0062

Email: abradley@carmanah.com, sproctor@carmanah.com

Website: www.carmanah.com

Before contacting Carmanah's customer service, please have the serial number of the lantern available, a brief description of the problem, as well as all details of installation and recharging efforts.

Service Life

Batteries. The expected battery life is highly dependent on temperature. The higher the temperature the shorter the expected battery life. Battery recharge intervals range from 4 years in hot climates to 10 years in cold climates. Field units should recharge (replace) batteries at intervals as shown in the Table on the next page. Battery replacement by Coast Guard personnel is the preferred procedure. Battery Replacement Kits can be ordered from Carmanah (see page 19). The kit contains harness, battery hold-down plate, head/base gasket, washers and 15 AH Cyclon cells for the 701 and 701-5 lanterns and 24 AH Cyclon cells for the 702 and 702-5 lanterns. Detailed instructions are included with each kit. If the lantern fails within warranty (up to 3 years after purchase), contact Carmanah 1-877-722-

8877 for a RMA number before shipping it back to them. Lanterns have a 1-year free replacement warranty; pro-rated up to 3 years.

District	Recharge Interval (years)
D1	8
D5 (VA north)	7
D5 (NC)	6
D7 (SC & GA)	5
D7 (FL & PR)	4
D8 (FL, MS, AL & LA)	5
D8 (TX)	4
D8 (rivers - Cairo south)	6
D8 (rivers - Cairo north)	7
D9	8
D11 (southern CA)	6
D11 (northern CA)	7
D13	9
D14	4
D17	10

Lantern. The lantern can be kept in service as long as it provides an acceptable signal.

Battery Tracking

Batteries shall be tracked and Battery Tracking Labels shall be affixed to the base of the lantern (underside is preferred to protect the label). When the battery is replaced, remove the label (if possible) and attach it to the battery to track it through disposal. If the label is destroyed, write the battery tracking number on the battery after it is removed from the lantern. Attach a new label to the lantern when a new battery is installed.

SECTION 4 - ORDERING INSTRUCTIONS

The Carmanah 701/702-series LED lanterns are manufactured and sold by:

Mail: Carmanah Technologies Corp.
Building 4, 203 Harbour Rd.
Victoria, BC Canada V9A 3S2

Phone: 1-877-722-8877 (Toll Free)

POC Chere Lynn Minshall

Fax: 1-250-380-0062

Email: cminshall@carmanah.com

Website: www.carmanah.com

The USCG SILC established a 5 year Blanket Purchase Agreement (BPA) with Carmanah Technologies. Ordering instructions and pricing is available from your District DPW staff or anyone on the CG-432A website: <http://www.uscg.mil/hq/cg4/cg432/organization.asp>. The

buyer specifies the Model Number (M701-5, M702-5) and specifies the color (red, green, white or yellow). All lanterns are now manufactured in Texas (no customs or fees will be charged).

Items not on contract, but available from Carmanah:

53097	Bird Spike for 701 & 702 lanterns	\$16.00 extra
35896	Clamp-on Bird Spike/older 701, 702, all 704-5	\$15.00
30797	External Battery Charger	\$89.00
Kit-015	Head/Battery Replacement Gasket Kit	\$10.00
30567	Tamper Resistant Tool	\$6.00

All prices are in U.S. dollars.

NOTE: Carmanah discontinued the 701 and 702 lanterns after 30 Sep 2008. Replacement batteries are available, however the optic head will be replaced by a 701-5/702-5 version.



INFORMATION ONLY - Please read Section X

SECTION I - Product and Manufacturer Identity

Product Identity:	Revision Date: June 1999
<p>Sealed Lead Battery Cyclon[®], Genesis[®], SBS, Hawker XT[™] Used on Aviation/Military Applications</p>	
<p>Product Contained in Metal Case for Environmental Requirements</p>	
Manufacturer's Name and Address: Hawker Energy Products Inc. 617 North Ridgeway Drive Warrensburg, MO 64093-9301	Emergency Telephone Number: (660) 429-2165 Customer Service Telephone Number: 800-964-2837

SECTION II - Ingredients

Hazardous Components	CAS #	OSHA PEL-TWA	% (By weight)
Lead	7439-92-1	50µg/m ³	45 - 60 %
Lead Dioxide	1309-60-0	50µg/m ³	15 - 25 %
Sulfuric Acid Electrolyte	7664-93-9	1.0 mg/m ³	15 - 20 %
Non-Hazardous Materials	N/A	N/A	5 - 10 %

SECTION III - Physical/Chemical Characteristics

Boiling Point - N/A	Specific Gravity (H ₂ O=1) - NA
Vapor Pressure (mm Hg.) - N/A	Melting Point - N/A
Solubility in Water - N/A	Appearance & Color - N/A

SECTION IV - Fire & Explosion Hazard Data

Flash Point (Method Used): N/A	Flammable Limits: N/A	LEL: N/A	UEL: N/A
Extinguishing Media: Multipurpose Dry chemical, CO ₂ or water spray.			
Special Fire Fighting Procedures: Cool Battery exterior to prevent rupture. Acid mists and vapors in a fire are toxic and corrosive.			
Unusual Fire and Explosion Hazards: Hydrogen gas may be produced and may explode if ignited. Remove all sources of ignition.			

SECTION V- Reactivity Data

Conditions to Avoid: Avoid shorting. Avoid over-charging. Use only approved charging methods. Do not charge in gas tight containers.
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SECTION VI - Health Hazard Data

Routes of Entry: N/A	Health Hazards (Acute & Chronic): N/A
Emergency & First Aid Procedures:	Battery contains acid electrolyte which is absorbed in the separator material. If battery case is punctured, completely flush any released material from skin or eyes with water.

SECTION VII - Precautions for Safe Handling & Use

Steps to be taken in case material is released or spilled:	Avoid contact with acid materials. Use soda ash or lime to neutralize. Flush with water.
Waste Disposal Method:	Dispose of in accordance with Federal, State, & Local Regulations. Do not incinerate. Batteries should be shipped to a reclamation facility for recovery of the metal and plastic components as the proper method of waste management. Contact distributor for appropriate product return procedures.

SECTION VIII - Control Measures - Not Applicable

SECTION IX - Transportation

Hawker Energy Products Inc. batteries are starved electrolyte batteries which means the electrolyte is absorbed in the separator material. The batteries are also sealed. As of September 30, 1995, Hawker Energy Products Inc. batteries were classified as "nonspillable batteries", and as such are not subject to the full requirements of 49 CFR § 173.159. The previous exempt classification, "Dry Batteries, Not Restricted" was discontinued effective September 30, 1995. "Nonspillable" batteries are excepted from the regulation's comprehensive packaging requirements if the following conditions are satisfied: (1) The battery is protected against short circuits and is securely packaged. (2) For batteries manufactured after September 30, 1995, the battery and outer packaging must be plainly and durably marked "NONSPILLABLE" or "NONSPILLABLE BATTERY" and (3) The battery is capable of withstanding vibration and pressure differential tests specified in 49 CFR § 173.159(d).

Hawker Energy Products Inc. batteries have been tested by WYLE Scientific Services & Systems Laboratories Group and determined to be in compliance with the vibration and pressure differential tests contained in 49 CFR § 173.159(d), and therefore as of September 30, 1995, excepted from the DOT requirements set forth in 49 CFR § 173.159, other than paragraph (d).

Battery shipments from Hawker Energy Products Inc. Warrensburg location, will be properly labeled in accordance with applicable DOT regulations.

Packaging changes performed at other locations may require additional labeling, since in addition to the battery itself containing the required marking, the outer packaging of the battery must also contain the required marking: "NONSPILLABLE" OR "NONSPILLABLE BATTERY". Because the batteries are classified as "Nonspillable" and meet the three conditions above, [from § 173.159(d)] they do not have an assigned UN number nor do they require additional DOT hazard labeling.

The regulation change effective September, 1995, was to clarify and distinguish to shippers and transporters, all batteries that have been tested and determined to be in compliance with the DOT Hazardous Material Regulations, the International Civil Aeronautics Organization (ICAO), and the International Air Transport Association (IATA) Packing Instruction 806 and Special Provision A67, and therefore excepted from all other requirements of the regulations and classified as a "nonspillable battery".

SECTION X - Additional Information

The Hawker sealed lead acid battery is determined to be an "article" according to the OSHA Hazard Communication Standard and is thereby excluded from any requirements of the standard. The Material Safety Data Sheet is therefore supplied for informational purposes only.

The information and recommendations contained herein have been compiled from sources believed to be reliable and represent current opinion on the subject. No warranty, guarantee, or representation is made by Hawker Energy Products Inc., as to the absolute correctness or sufficiency of any representation contained herein and Hawker Energy Products Inc. assumes no responsibility in connection therewith, nor can it be assumed that all acceptable safety measures are contained herein, or that additional measures may not be required under particular or exceptional conditions or circumstances.

N/A or Not Applicable - Not applicable for finished product used in normal conditions.