Carmanah 708 LED Lantern Instructions

The Carmanah 708 lantern is a self-contained, omni-directional LED lantern for use on lighted buoys and structures with a range of 3-6 nautical miles. 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 708 lantern is 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 17)
Website: http://www.carmanah.com/

The lantern is self-contained; the four solar panels, battery, flasher, daylight control and lantern assembly are housed as a single unit.

Every lantern has an inherent color (red, green, white or yellow), but the flash rhythms and intensity are programmable. The color of the lantern is identified by the color of the lantern's identification plate under the top of the lens.

Lanterns contain a revision number (**A** or **B**) on the label. Lanterns delivered before Nov 2010 are revision **A**, after Nov 2010 are revision **B**. The performance of **Rev A** and **Rev B** lanterns are dfferent and are noted in this instruction.

Carmanah 708 LED Lantern

SECTION 1
PERFORMANCE DATA

Intensity

The red, green, white and yellow-colored Carmanah 708 lanterns have different intensities (both revisions). Further, the user can select either a "HIGH", "MEDIUM" or "LOW" light intensity output. The tables below show the effective intensity values for the 708 and compares those values to the Carmanah 701-5, 702-5 and 704-5 and to corresponding values for legacy 155mm lanterns. Lanterns ordered or delivered after Nov 2010 are "**Rev B**" and have higher intensities and lower power consumption. Use the "**Rev B**" tables for all new purchases.

Effective Intensity Tables for Carmanah 708
Rev B is the Latest
(and Carmanah 701-5, 702-5 & 704-5, and 155mm Lanterns)

RED (Rev A)

Q, FL 2.5 & FL (2+1)6		FL 4 & FL (2) 5		FL 6	
Lantern	**Eff Int**	**Lantern**	**Eff Int**	**Lantern**	**Eff Int**
704-5 (Low)	18	155 w/ 0.55	20	704-5 (Low)	23
701-5 & 702-5*	20**	704-5 (Low)	20	155 w/ 0.55	25
708 (Low)	**20**	**708 (Low)**	**22**	701-5 & 702-5*	25
155 w/ 0.55	22	701-5 & 702-5*	22	**708 (Low)**	**25**
155 w/ 0.77	25	155 w/ 0.77	30	155 w/ 0.77	35
155 w/ 1.15	35	155 w/ 1.15	40	155 w/ 1.15	50
704 (High)	42	704-5 (High)	47	704-5 (High)	53
708 (Medium)	**48**	**708 (Medium)**	**53**	**708 (Medium)**	**60**
155 w/ 2.03	55	155 w/ 2.03	75	155 w/ 2.03	95
708 (High)	**98**	**708 (High)**	**109**	**708 (High)**	**122**

* Intensity values for Carmanah 701-5 and 702-5 lanterns reflect increased intensities for these lanterns starting with lanterns manufactured in 2007.
** 17 cd for Quick Flash

RED (Rev B)

Q, FL 2.5 & FL (2+1)6		FL 4 & FL (2) 5		FL 6	
Lantern	**Eff Int**	**Lantern**	**Eff Int**	**Lantern**	**Eff Int**
708 (Low)	**17**	**708 (Low)**	**19**	**708 (Low)**	**21**
701-5 & 702-5*	20**	704-5 (Low)	20	704-5 (Low)	23
704-5 (Low)	18	155 w/ 0.55	20	155 w/ 0.55	25
155 w/ 0.55	22	701-5 & 702-5*	22	701-5 & 702-5*	25
155 w/ 0.77	25	155 w/ 0.77	30	155 w/ 0.77	35
155 w/ 1.15	35	155 w/ 1.15	40	155 w/ 1.15	50
708 (Medium)	**40**	**708 (Medium)**	**45**	**708 (Medium)**	**50**
704 (High)	42	704-5 (High)	47	704-5 (High)	53
155 w/ 2.03	55	155 w/ 2.03	75	155 w/ 2.03	95
708 (High)	**99**	**708 (High)**	**110**	**708 (High)**	**124**

* Intensity values for Carmanah 701-5 and 702-5 lanterns reflect increased intensities for these lanterns starting with lanterns manufactured in 2007.
** 17 cd for Quick Flash

GREEN (Rev A)

Q, FL 2.5 & FL (2+1)6		FL 4 & FL (2) 5		FL 6	
Lantern	**Eff Int**	**Lantern**	**Eff Int**	**Lantern**	**Eff Int**
708(Low)	**16**	**708(Low)**	**18**	**708(Low)**	**20**
155 w/ 0.55	20	704-5 (Low)	23	704-5 (Low)	26
704-5 (Low)	21	155 w/ 0.55	25	155 w/ 0.55	30
701-5 & 702-5*	28**	701-5 & 702-5*	31	701-5 & 702-5*	35
155 w/ 0.77	35	155 w/ 0.77	40	155 w/ 0.77	45
708(Medium)	**36**	**708(Medium)**	**40**	**708(Medium)**	**45**
155 w/ 1.15	40	704-5 (High)	50	704-5 (High)	56
704-5 (High)	45	155 w/ 1.15	55	155 w/ 1.15	65
155 w/ 2.03	70	155 w/ 2.03	90	**708 (High)**	**105**
708 (High)	**84**	**708 (High)**	**93**	155 w/ 2.03	120

* Intensity values for Carmanah 701-5 and 702-5 lanterns reflect increased intensities for these lanterns starting with lanterns manufactured in 2007.

** 23 cd for Quick Flash

GREEN (Rev B)

Q, FL 2.5 & FL (2+1)6		FL 4 & FL (2) 5		FL 6	
Lantern	**Eff Int**	**Lantern**	**Eff Int**	**Lantern**	**Eff Int**
708(Low)	**18**	**708(Low)**	**20**	**708(Low)**	**23**
155 w/ 0.55	20	704-5 (Low)	23	704-5 (Low)	26
704-5 (Low)	21	155 w/ 0.55	25	155 w/ 0.55	30
701-5 & 702-5*	28**	701-5 & 702-5*	31	701-5 & 702-5*	35
155 w/ 0.77	35	155 w/ 0.77	40	155 w/ 0.77	45
155 w/ 1.15	40	**708(Medium)**	**45**	**708(Medium)**	**51**
708(Medium)	**41**	704-5 (High)	50	704-5 (High)	56
704-5 (High)	45	155 w/ 1.15	55	155 w/ 1.15	65
155 w/ 2.03	70	155 w/ 2.03	90	155 w/ 2.03	120
708 (High)	**125**	**708 (High)**	**139**	**708 (High)**	**156**

* Intensity values for Carmanah 701-5 and 702-5 lanterns reflect increased intensities for these lanterns starting with lanterns manufactured in 2007.

** 23 cd for Quick Flash

WHITE (Rev A)

Q, FL 2.5 & FL (2+1)6		Mo(A), FL 4 & FL (2) 5		FL 6	
Lantern	**Eff Int**	**Lantern**	**Eff Int**	**Lantern**	**Eff Int**
704-5 (Low)	17	704-5 (Low)	19	704-5 (Low)	21
701-5 & 702-5	21*	701-5 & 702-5	23**	701-5 & 702-5	26
708 (Low)	**22**	**708 (Low)**	**25**	**708 (Low)**	**28**
704-5 (High)	41	704-5 (High)	45	704-5 (High)	51
708 (Medium)	**48**	**708 (Medium)**	**53**	**708 (Medium)**	**60**
155 w/ 0.55	60	155 w/ 0.55	70	155 w/ 0.55	85
155 w/ 0.77	90	**708 (High)**	**105**	**708 (High)**	**119**
708 (High)	**95**	155 w/ 0.77	110	155 w/ 0.77	130
155 w/ 1.15	120	155 w/ 1.15	150	155 w/ 1.15	180
155 w/ 2.03	190	155 w/ 2.03	260	155 w/ 2.03	330

* 18 cd for Quick Flash

** 19 cd for Mo(A)

WHITE (Rev B)

Q, FL 2.5 & FL (2+1)6		Mo(A), FL 4 & FL (2) 5		FL 6	
Lantern	**Eff Int**	**Lantern**	**Eff Int**	**Lantern**	**Eff Int**
704-5 (Low)	17	704-5 (Low)	19	704-5 (Low)	21
708 (Low)	**18**	**708 (Low)**	**20**	**708 (Low)**	**23**
701-5 & 702-5	21*	701-5 & 702-5	23**	701-5 & 702-5	26
704-5 (High)	41	704-5 (High)	45	704-5 (High)	51
708 (Medium)	**43**	**708 (Medium)**	**47**	**708 (Medium)**	**53**
155 w/ 0.55	60	155 w/ 0.55	70	155 w/ 0.55	85
155 w/ 0.77	90	155 w/ 0.77	110	155 w/ 0.77	130
155 w/ 1.15	120	155 w/ 1.15	150	155 w/ 1.15	180
708 (High)	**161**	**708 (High)**	**179**	**708 (High)**	**201**
155 w/ 2.03	190	155 w/ 2.03	260	155 w/ 2.03	330

* 18 cd for Quick Flash
** 19 cd for Mo(A)

YELLOW

Only consider the 708 for yellow if the 701-5, 702-5 or 704-5 do not meet the solar sizing requirements for the aid. Performance data for the yellow 708 is available in the sizing program available on the Ocean Engineering website at: http://www.uscg.mil/hq/cg4/cg432/ under Pubs/Software.

Notes for Intensity Tables:

1. **(Low)** means low intensity setting. **(Medium)** means medium intensity setting. **(High)** means high intensity setting.
2. Note that the less expensive 701-5, 702-5 and 704-5 is close to the performance of the 708 for all but the high intensity setting. The only advantage to using the 708 at a lower intensity setting is if the other lanterns will not operate at the desired location due to lack of power production or not enough autonomy. For lower intensity applications, determine if the 701-5, 702-5 and 704-5 will work at the desired location before considering using the 708.

Vertical Divergence

The 708 has a vertical divergence (to 50% of maximum intensity) of ±3.5°. This is a similar to the vertical divergence of the Carmanah 701 and 702 (±3°), slightly better than the 155mm lantern (±2.5°), but not as great as the 704-5 (±5°). A larger vertical divergence is a desirable feature for a lantern on an active buoy.

SECTION 2
SELECTION

Overview

The Carmanah 708 is an authorized replacement for a 155mm or 250mm lantern on either a buoy or a fixed aid if it provides an acceptable effective intensity and if its solar system is sufficiently capable.

District Considerations - Intensity

The 708 lantern provides a wide range of intensities, however the capabilites of this lantern in the lower intensity settings are duplicated with the 701-5, 702-5 and 704-5. Because of cost considerations, use of the 708 is limited to aid locations requiring effective intensities available in the "high" setting or at locations where the power system sizing of the 701-5, 702-5 and 704-5 is not adequate.

To determine the intensity requirements for any aid, Districts shall 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.

A less desirable, but quicker method is to replace a 155mm or 250mm with a Carmanah 708 if the 708 provides an effective intensity that is equal to, or greater than the effective intensity of the lantern that it will replace.

After the effective intensity is determined, use the following table to find Nominal Range.

Nominal Range Table

Effective Intensity	Nominal Range
1 – 2	1
3 – 9	2
10 - 23	3
24 - 53	4
54 - 107	5
108 - 203	6

Under no circumstances should any lantern replace another lantern simply because it has the same nominal range. Nominal range should never factor into lantern selection.

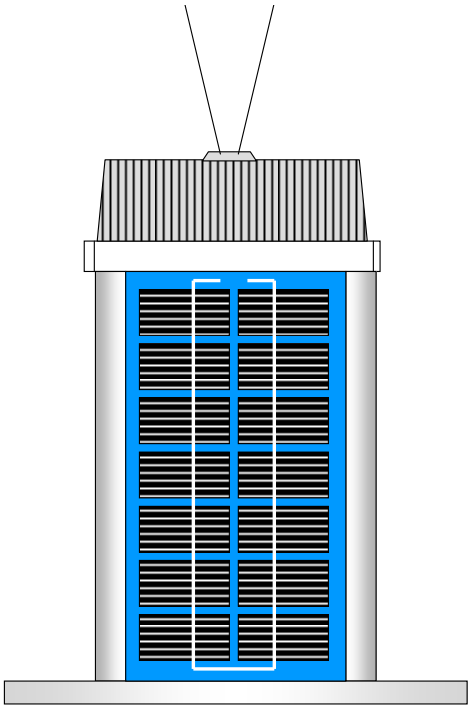
Solar Sizing - "GO" vs "NO GO"

If the District has determined that a Carmanah 708 will provide an intensity that meets the operational needs for a specific aid, **then** the next step is to see if the 708's solar system is capable of maintaining an acceptable battery state-of-charge (for the desired location, flash characteristic, and intensity setting). Because the 708 comes with one-sized solar system, solar sizing ultimately comes down to "GO" or "NO GO."

The Carmanah 708 can be sized using a solar sizing spreadsheet available on our website at: http://www.uscg.mil/hq/cg4/cg432/ under Pubs/Software. The sizing program for the 708 is combined with the 701-5, 702-5 and 704-5 so that you can see the capabilities of the lantern systems and determine which one meets the operational requirements at the least cost.

If a desired characteristic is not listed, or for assistance, contact Ocean Engineering (CG-432).

SECTION 3
STORAGE, SET-UP, INSTALLATION AND MAINTENANCE



Receipt and Handling

The lantern is charged prior to shipment. It will arrive fully charged and programmed OFF (i.e., it will not flash in a darkened room). 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 that is shipped with the lantern. The standard warranty is free replacement within a year of purchase and pro-rated up to 3 years.

Storage and Recharge Intervals

The lantern batteries are very susceptible to self-discharge, especially if left unused in a hot place for a long period of time. To avoid this unnecessary loss of charge and battery damage, store the lantern at less than 70° F if at all possible. Depending on storage temperature, the lanterns (batteries) must be recharged as follows:

Storage Temperature [°F]	**Recharge Interval** [months]
< 70°	12
70° – 90°	6
90° - 105°	3
> 105°	1

For example, if a 708 lantern is stored at 100° F, it will have to be charged every 3 months in order to preserve the battery.

The lantern should always be stored at a 100% state-of-charge to avoid damaging the battery. Check the battery's state-of-charge using the procedure described in the "Determining Battery State-of-Charge" section. If the battery state-of-charge is not 100%, then recharge (per instructions in the "recharging" section) prior to storage.

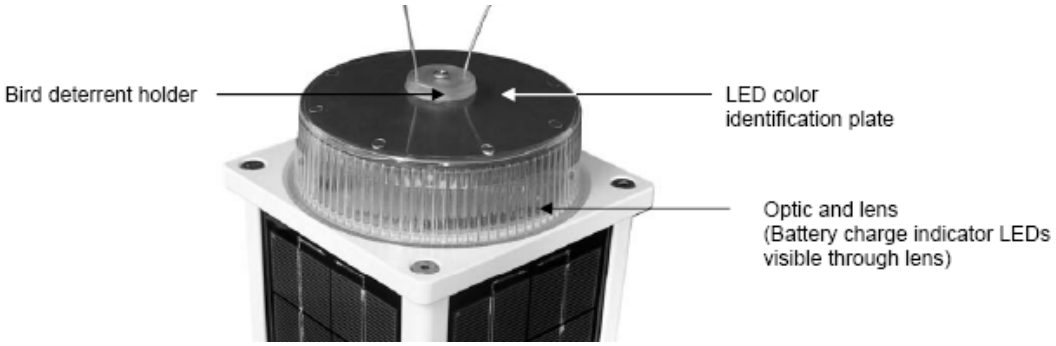
The lantern should always be turned OFF prior to storage. See the "Programming" section for details.

Determining Battery State-of-Charge (SoC)

There are two methods to determine the Battery State-of-Charge (SoC): indicator lights inside the lens and using the remote control. The remote control shall be used to determine the SoC prior to deployment. The indicator lights do not provide adequate information regarding the health of the battery, unless it is at a very low state of charge. Three indicator lights inside the lens of the 708 flash once every 5 seconds for approximately 0.5 seconds indicating the health of the battery:

Green flashing LED - 10% to 100% battery state-of-charge.
Yellow flashing LED - 2% to 10% battery state-of-charge; main optic will flash once a minute.
Red flashing LED - 0% to 2% battery state-of-charge; main optic off to preserve battery.

Note: lanterns deployed by the USCG must maintain at least 70% state of charge, so the indicator lights are meaningless, unless you are troubleshooting the light.



A more precise method of determining SoC is to query the lantern using the remote:

- 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%	7
20%	8
10%	9

*Number of days in Spring and Summer; double the number in Fall and Winter.

Using Artificial Light. Artificial light is capable of charging the 708 if sunlight is unavailable or inconvenient. Use a high-intensity light such as a 90 – 150W halogen floodlight.

Set up the charging light so that it is *at least* 24" away from the 708 to prevent the lantern from being damaged due to overheating. 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).

Battery SoC	Days to Return Lantern to 100% SoC (1 floodlight)	Days to Return Lantern to 100% SoC (2 floodlights)	Days to Return Lantern to 100% SoC (3 floodlights)	Days to Return Lantern to 100% SoC (4 floodlights)
90%	1	0.5	0.3	0.2
80%	2	1	1	0.5
70%	3	1	1	1
60%	4	2	1	1
50%	5	2	2	1
40%	6	3	2	1
30%	6	3	2	2
20%	7	4	2	2
10%	8	4	3	2

Programming

Remote Control.

All programming is done using a TV remote control. The preferred source of supply for a remote control is Carmanah. As an alternative, an RCA TV Universal Remote can be used to program the 708 lantern.

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 aids.**
POWER 5 9 8 CHAN^	to select HIGH light intensity
POWER 5 0 1 CHAN^	to select MEDIUM light intensity
POWER 5 0 0 CHAN^	to select LOW light intensity
POWER 0 0 0 CHAN^	to TURN OFF the lantern

Final Programming Hints and Notes.

1. The 708 lantern has 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.

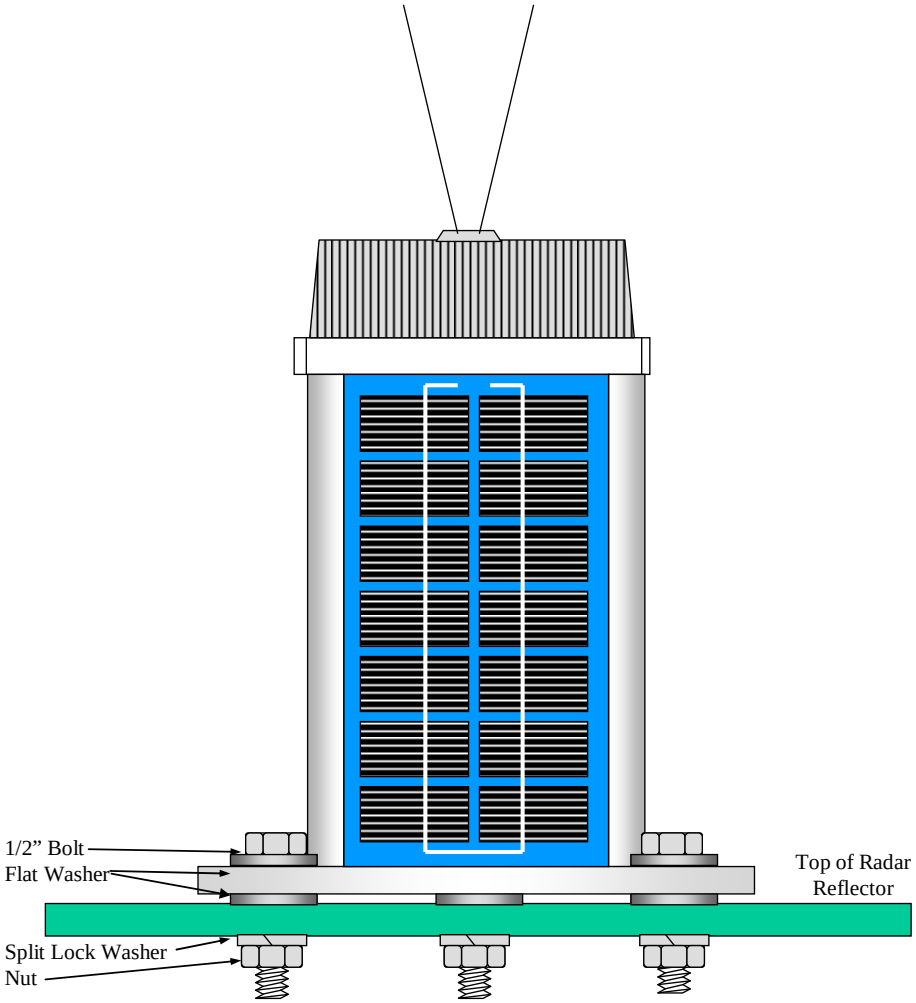
5. The lantern will exit the programming mode if it goes 1 minute without receiving any input. Don't delay. Have a plan. Start from scratch (transition the lantern) if more than a minute passes and the lantern is no longer responding.

Installation

If District has determined that the Carmanah 708 satisfies effective intensity requirements, and if the lantern's solar sizing is a "GO," then the lantern may be installed on a steel buoy that is designed to mount a light, a 5 X 9 foam buoy, or on a structure.

Program the lantern prior to installation on the buoy or structure. After programming, cover the lantern or move to a dark room to simulate a night environment. Confirm that the lantern flashes the correct flash characteristic. "Time" the light with a stopwatch. Confirm that all LEDs are operating (check the LEDs by looking around the lantern just above the lantern's focal plane; DO NOT look into the lantern with your eye in the focal plane). Another method is to wrap a piece of white printer paper around the lens and view the image of the LEDs on the paper.

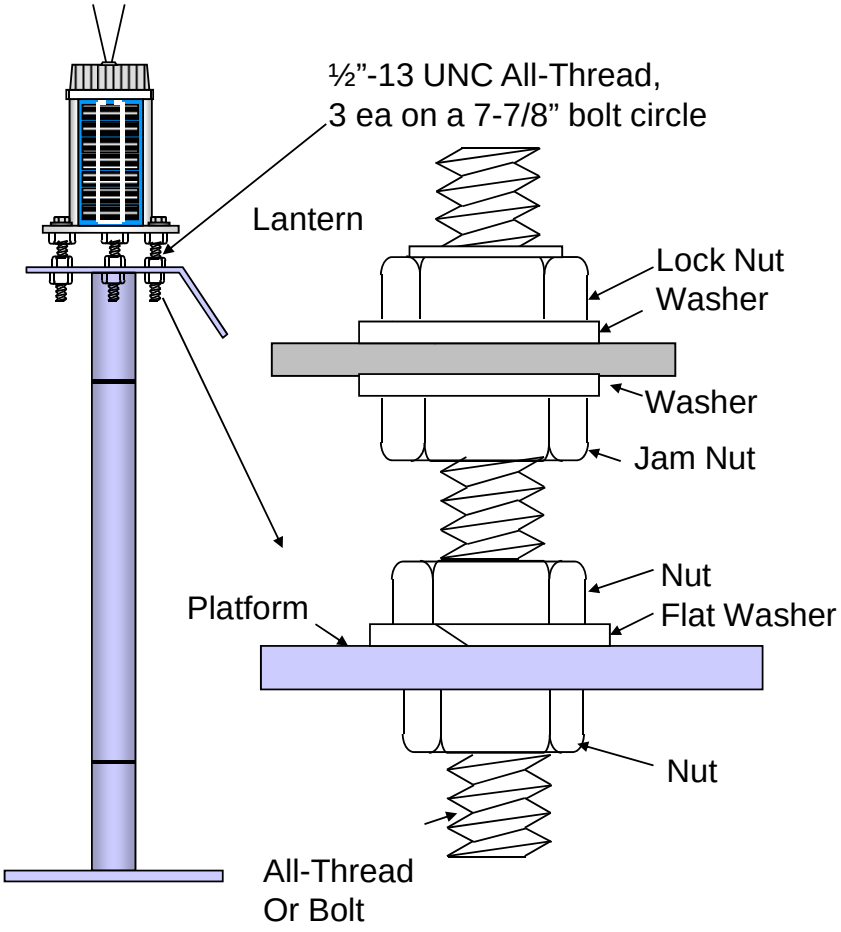
Buoy Mount



Mount the lantern **on a buoy** as shown in the figure above. 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 in the figure. The mounting bolts should be torqued to 40 – 44 ft-lbs.

Bird Deterrent. The bird deterrent is packaged separately from the lantern. To install, unscrew the plastic bird deterrent holder from the top of the lantern. Insert the tines into the holder from underneath. Reinstall the holder on top of the lantern and tighten until snug. Do not overtighten.

Fixed-Aid Mount



Mount the lantern **on a fixed aid** as shown in the figure above. 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 and washers on the bolts so that about 1" of thread is exposed. Place the lantern on top of the jam nuts, then drop on the washers and position the uppermost locknuts 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 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). When the lantern is level, tighten the upper-most nuts (40 – 44 ft-lbs).

Bird Deterrent. The bird deterrent is packaged separately from the lantern. To install, unscrew the plastic bird deterrent holder from the top of the lantern. Insert the tines into the holder from underneath. Reinstall the holder on top of the lantern and tighten until snug. Do not overtighten.

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.

Check the battery state-of-charge using the remote control and Battery Status Code 810 as described in the "Determining Battery State-of-Charge" section. Battery state-of-charge must be at least 60%. A green battery state-of-charge indicator light is not enough to ensure that the battery is healthy.

Cover the lantern with a shroud, jacket, box, blanket, etc., to simulate darkness. The lantern should flash on rhythm after a few seconds. While covered, confirm that all LEDs are operating (check the LEDs by looking around the lantern just above the lantern's focal plane; DO NOT look into the lantern with your eye in the focal plane).

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 if flashes one quick flash once a minute.

- The battery state-of-charge is unacceptably low. The battery SoC indicator inside the lens will flash yellow every 5 seconds. If the battery becomes further discharged, the main LED array will no longer flash once per minute and the battery SoC indicator will flash red.
- 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, replace the battery.
- 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.
- When light flashes, confirm that all LEDs are operating (check the LEDs by looking around the lantern just 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 Cherelynn 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 708 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.

A Battery Replacement Kit can be ordered from Carmanah (part number 61087; $230 as of April 2009). The kit contains a 50 AH Cyclon battery pack, harness, battery hold-down plate, head/base gasket and washers. 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 708 LED lantern is 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 Cherelynn Minshall
Fax: 1-250-380-0062
Email: cminshall@carmanah.com
Website: www.carmanah.com

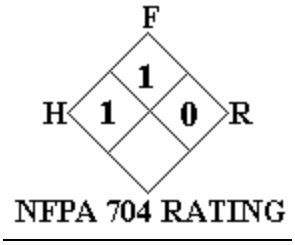
The USCG SILC established a 5 year Blanket Purchase Agreement (BPA) with Carmanah Technologies. Ordering instructions and pricing is available from your District DPW staff or anyone on the CG-432A website: http://www.uscg.mil/hq/cg4/cg432/organization.asp. The buyer specifies the Model Number (M708) 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:

30797	External Battery Charger	$89.00
Kit-015	Head/Battery Replacement Gasket Kit	$10.00
30567	Tamper Resistant Tool	$6.00
61087	Battery Replacement (704-5, 708)	$230.00

All prices are in U.S. dollars.



INFORMATION ONLY - Please read Section X

SECTION I - Product and Manufacturer Identity

Product Identity:

Sealed Lead Battery
Cyclon®, Genesis®, SBS, Hawker XT™
Used on Aviation/Military Applications

Revision Date: June 1999

Product Contained in Metal Case for Environmental Requirements

Manufacturer's Name and Address:
Hawker Energy Products Inc.
617 North Ridgeview 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
Vapor Pressure (mm Hg.) - N/A
Solubility in Water - N/A
Specific Gravity (H_2O=1) - NA
Melting Point - 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.

SECTION VI - Health Hazard Data

Routes of Entry: N/A
Emergency & First Aid Procedures:

Health Hazards (Acute & Chronic): N/A
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.