# VEGA INDUSTRIES VLB-36
# SELF-CONTAINED LED LANTERN

The VLB-36 is a self contained Light Emitting Diode (LED) lantern suitable for use on both buoys and structures. It is used where it is economical to replace legacy signal and power hardware with a single lantern and a self contained power system (i.e., solar panels, battery and light are a single unit). The Coast Guard purchased and distributed 120 VLB-36 LED red and green lanterns from Vega Industries, Inc., of New Zealand for field test and evaluation. Additional lanterns were purchased at the unit level and a follow-on contract provides a means to purchase lanterns for aid modernization.


Small Medium Large/Extra Large

The lantern is completely self-contained and has three solar panels, LED optic head and a lead-acid non-spill rechargeable battery. It is available in white, yellow, red and green. The cap above the lantern indicates the signal color.

## Versions

The USCG purchased two versions of the VLB-36 LED lantern. Lanterns purchased before 1 Sep 2008 and below serial number 36-0962 have 4 effective intensity settings; low, medium, high and very high. These lanterns use a "tap switch" to program the flash rhythm and effective intensity. These lanterns are designated ***Early*** lanterns in this publication. *Early* lanterns slated for fixed structures have two solar panels; buoys have three solar panels. *Early* lanterns with two solar panels can not be used on buoys. Lanterns with a tap switch can not be programmed with an infrared (IR) remote control. Early lanterns were available in three power system sizes; small, medium and large.

Lanterns purchased after 1 Sep 2008 with serial number 36-0962 and higher have discreet effective intensity settings, greater range and are programmed via an IR remote control. These lanterns are designated ***Late*** lanterns in this publication. *Late* lanterns are only available with three solar panels and are suitable for use on both buoys and structures. *Late* lanterns do not have a "tap" switch and must be programmed with an IR remote control. *Late* VLB-36 lanterns have the LED version on the label (421, 422, etc). Late lanterns are available in four power system sizes; small, medium, large and extra large.

**LED Version** – The capabilities of LEDs are changing very rapidly. Vega periodically uses new LEDs in a specific lantern (or group of lanterns). This impacts the lantern's effective intensity values, current draw and solar sizing. In order to identify the LEDs used in a lantern, Vega uses a 3-digit number to identify the "LED version." Generally, the highest LED version for a specific color is the version available at the time the lantern is ordered. Specify the version or consult with Vega when ordering. Lanterns will be labeled with the LED version, the LED version can be retrieved from the lantern using the IR programmer, and solar sizing spreadsheets will contain all LED version information to determine the effective intensity and power requirements of *early* lanterns.

## Effective Intensity

***Early*** lanterns have four effective intensity settings; low, medium, high and very high. The default setting is medium. Range is 4 nautical miles for all rhythms in either low or medium effective intensity setting and 5 nautical miles in either high or very high effective intensity setting.

***Late*** lanterns have 10 effective intensity settings. Both *early* and *late* lanterns use the Schmidt-Clausen correction feature which maintains constant effective intensity regardless of flash rhythm.

***Early*** VLB-36 lanterns have the following effective intensity selections (all colors and rhythms):

Low-27 Candelas (cd) Medium-40 cd High-60 cd Very High-77 cd

*Late* VLB-36 lanterns have the following effective intensity selections (all colors and rhythms, except as noted):

| | | | | |
|---|---|---|---|---|
| 21 cd | 54 cd | 83 cd | 150 cd | 240 cd* |
| 29 cd | 66 cd | 109cd | 161 cd* | 290 cd* |
| 39 cd | 77cd | 131 cd | 205 cd* | |

*The maximum effective intensity for red/green lanterns is 240 cd; white is 240 or 290 cd (depending on LED version) and yellow is 150 cd. Consult with the "Vega VLB-36 Sizing Program" on our website: http://www.uscg.mil/hq/cg4/cg432/publications.asp to determine if the color/rhythm/effective intensity setting is allowable.

When replacing a 155mm or 250mm lantern with a LED lantern, it is generally a good idea to target a LED lantern effective intensity that is at least equal to that of the lantern it replaces. For comparison, the effective intensities of 155 mm and 250mm lanterns are shown on the next page:

*Effective Intensity (cont'd)*

**155mm White Lantern Effective Intensities in Candelas**

| Flash Rhythm | 0.55a Lamp | 0.77a Lamp | 1.15a Lamp | 2.03a Lamp |
|---|---|---|---|---|
| FL(2)6 | 95 | 150 | 210 | 390 |
| FL6(.6) | 85 | 130 | 180 | 330 |
| FL4(.4), Mo(A) | 70 | 110 | 150 | 260 |
| FL2.5(.3), Q | 60 | 90 | 120 | 190 |
| FL(2+1)6, FL(2)5 | 60 | 90 | 120 | 190 |

**155mm Red(Green) Lantern Effective Intensities in Candelas**

| Flash Rhythm | 0.55a Lamp | 0.77a Lamp | 1.15a Lamp | 2.03a Lamp |
|---|---|---|---|---|
| FL(2)6 | 30(35) | 40(55) | 60(75) | 110(140) |
| FL6(.6) | 25(30) | 35(45) | 50(65) | 95(120) |
| FL4(.4) | 20(25) | 30(40) | 40(55) | 75(90) |
| FL2.5(.3), Q | 20(20) | 25(35) | 35(40) | 55(70) |
| FL(2+1)6, FL(2)5 | 20(20) | 25(35) | 35(40) | 55(70) |

**250mmWhite Lantern Effective Intensities in Candelas**

| Flash Rhythm | 0.55a Lamp | 0.77a Lamp | 1.15a Lamp |
|---|---|---|---|
| FL(2)6 | 150 | 220 | 320 |
| FL6(.6) | 130 | 190 | 280 |
| FL4(.4) | 110 | 160 | 220 |
| FL2.5(.3), Q | 90 | 130 | 180 |
| FL(2+1)6, FL(2)5 | 90 | 130 | 180 |

**250mm Red/Green Lantern Effective Intensities in Candelas**

| Flash Rhythm | 0.55a Lamp | 0.77a Lamp | 1.15a Lamp | 2.03a Lamp | 3.05a Lamp |
|---|---|---|---|---|---|
| FL(2)6 | 45 | 70 | 100 | 190 | 250 |
| FL6(.6) | 40 | 60 | 85 | 160 | 200 |
| FL4(.4) | 35 | 50 | 70 | 120 | 140 |
| FL2.5(.3), Q | 30 | 40 | 55 | 95 | ---- |
| FL(2+1)6, FL(2)5 | 30 | 40 | 55 | 95 | ---- |

For combinations not listed here, consult with COMDTINST M16510.2A Visual Signal Design Manual or contact COMDT (CG-432A).

## Purchase

CGHQ established a 5 year requirements contract with Vega Industries. The *late* VLB-36 lantern is purchased through Ms. Jing Liu at the SILC in Alameda, CA. Provide a copy of the funded procurement request to her with the "**CIMS bound box**" checked, routed to inbox **7513C** and she will draft a delivery order with Vega. You must contact Mr. Jon Grasson at COMDT (CG-432A) upon receipt of the lanterns so payment can be authorized. Current pricing for Vega lanterns is available from your training team chief or COMDT (CG-432A) http://www.uscg.mil/hq/cg4/cg432/organization.asp.

*Purchase (cont'd)*

Lanterns must be purchased using the following format (it would be helpful to the contract specialist if the **Item No.** listed in the contract is included with your order):

**VLB-36-(Color)07-(Size)-(BY)**

| | | |
|---|---|---|
| Where: | Color = | W, R, G, Y for White, Red, Green and Yellow, respectively. |
| | Size = | SM, MD, LG, XL for small, medium, large and extra large powerpacks, respectively. |
| | BY = | Lantern with 3 solar panels used on buoys and structures. |

Example: VLB-36-W07-SM-BY White, 3 solar panels, small power pack.

## Solar Sizing

"*Early*" lanterns were available as two types (floating aids with three solar panels and fixed aids with two solar panels) and three sizes; small, medium and large. The progressively larger housings have more solar panel surface area, a larger battery and are capable of generating and storing more power. "*Late*" lanterns are only available with three solar panels and can be used on both fixed aids (structures) and floating aids (buoys). The *late* lanterns add the extra large power system which yields more efficient solar panels for greater power production.

Contact COMDT (CG-432A) for assistance when sizing *early* lanterns used on structures or buoys. These programs were pulled from our website, but are available from us.

When sizing *late* lanterns use the solar sizing program "Vega VLB-36 Sizing Program" on our website: http://www.uscg.mil/hq/cg4/cg432/publications.asp to determine which size power system is required for the selected color/effective intensity/rhythm selection. Use the smallest power system allowable by the program. Note that some combinations will not have a solution which will require a stand-alone LED lantern and a legacy solar panel and battery. This normally occurs in northern latitudes and/or rhythms with high duty cycles (Q, Mo(A), Iso rhythms). **Do not assume that the same size lantern will be used in the same waterway; you must perform a solar sizing for each color/rhythm/effective intensity combination.**

## Programming/Battery Charging

The lanterns must be programmed to the proper flash rhythm and effective intensity setting, and tested in the shop before deployment.

*Programming/Battery Charging (cont'd)*

*Early* and *late* lanterns use two different methods for programming. *Early* lanterns are programmed by tapping a "tap" switch located under the lantern head accessed by removing the solar panel housing from the base. *Late* lanterns are programmed through the lens using a Vega IR programmer or TV remote control.

## Programming/Battery Charging– *Early* Lantern

Unscrew the three Allen bolts securing the V-band to the base using a 3/16" T-Handle Allen wrench. Back-out the bolts just to the point that a few threads remain inside the cylindrical nut in the clamp. If the bolt is removed, be sure not to lose the cylindrical nut in the clamp as it will fall out. Remove the V-band and set aside. Pull the top of the lantern off the base (it may stick) and lay it on its side taking care no to pull on the internal wires.

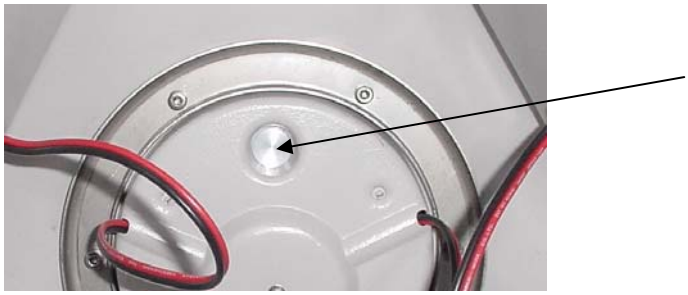
Determine the state of charge of the battery by measuring the open circuit voltage (no leads connected to the battery). Batteries shall be above 12.8 volts (80% state of charge) prior to deployment (up to two months). Below is the table detailing the state of charge for a range of corresponding battery voltages.

| Battery Voltage | State of Charge |
|---|---|
| >12.80 volts | 80-100% |
| 12.5-12.8 | 60-80% |
| 12.2-12.5 | 40-60% |
| 11.9-12.2 | 20-40% |
| <11.9 | 0-20% |

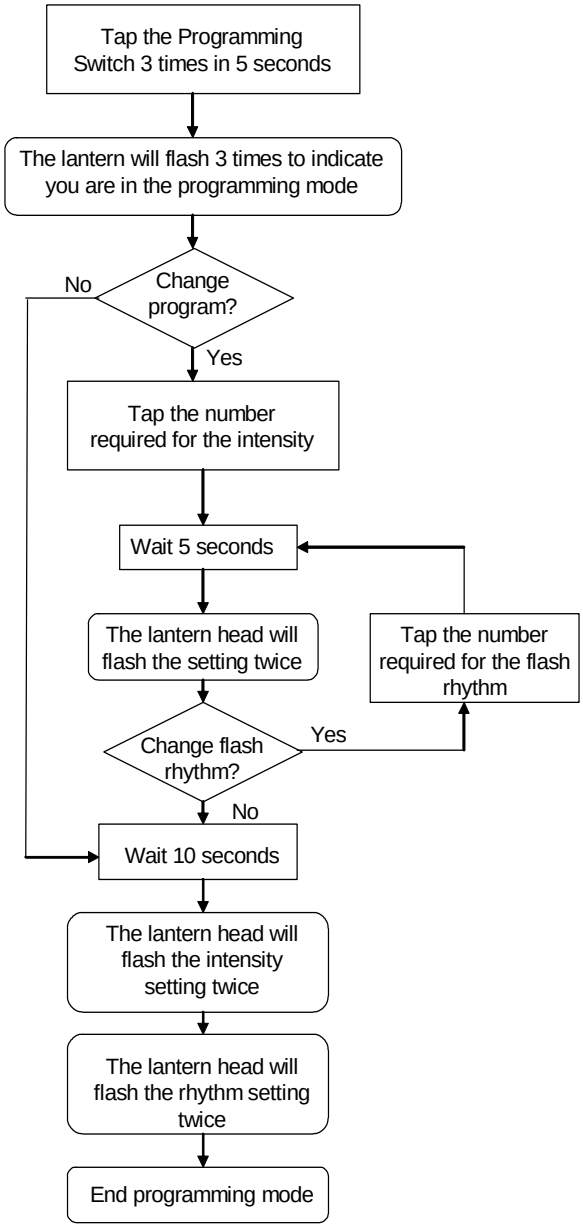
If the battery is below 12.8 volts, charge the battery using a Schumacher Ship'n Shore Speed Charge, Model SSC-1000A http://store.schumachermart.com/ssc-1000a.html or equivalent with provisions for Gelled and Absorbed Glass Mat (AGM) battery technology and adjustable charge rate down to 2 amperes. With the lantern leads disconnected, connect the charger to the battery, plug it in and select the battery type (AGM for Power Sonic or Gelled for Haze) and charge rate (2 amps for the small and medium lantern, and 6 amps for the large and extra large lanterns). You can change the display mode to show the state of charge. After the display shows 100% state of charge, **unplug the charger first, and then remove the clamps** to prevent sparks near the battery.

For the small and medium lanterns, push the lugs completely onto the terminals.
For the large and extra large lanterns, connect the lugs to the terminals using the supplied nut and bolt using two 7/16" wrenches. **Connect the red wire to the positive terminal and the black to the negative terminal of the battery.** Lead acid batteries are a source of almost unlimited current. **Use care to prevent shorting terminals with metal tools.** The lantern should turn on if the lantern head is partially covered or operated in a dimly lit room to simulate nighttime. The lantern is programmed using a finger tap switch located on the bottom of the LED head. The switch is recessed and may seem difficult to access, but does not require excessive force to initiate a program sequence.

*Programming/Battery Charging– Early Lantern (cont'd)*




**Programming using the TAP Switch**




| Intensity | Taps/Flashes |
|---|---|
| Low | 1 |
| Medium | 2 |
| High | 3 |
| Very High | 4 |

| Rhythm | Taps/Flashes |
|---|---|
| FL2.5 (0.3) | 1 |
| FL4 (0.4) | 2 |
| FL6 (0.6) | 3 |
| FL (2+1) 6 | 4 |
| FL (2) 6 | 6 |
| Q | 7 |
| Fix | 8 |

<u>Notes on programming:</u>
To check an existing program, tap 3 times and wait 10 seconds. The lantern will display the effective intensity setting, then the flash rhythm.
If you make an error, wait 10 seconds and reenter programming mode (tap 3 times) and try again (from the beginning).

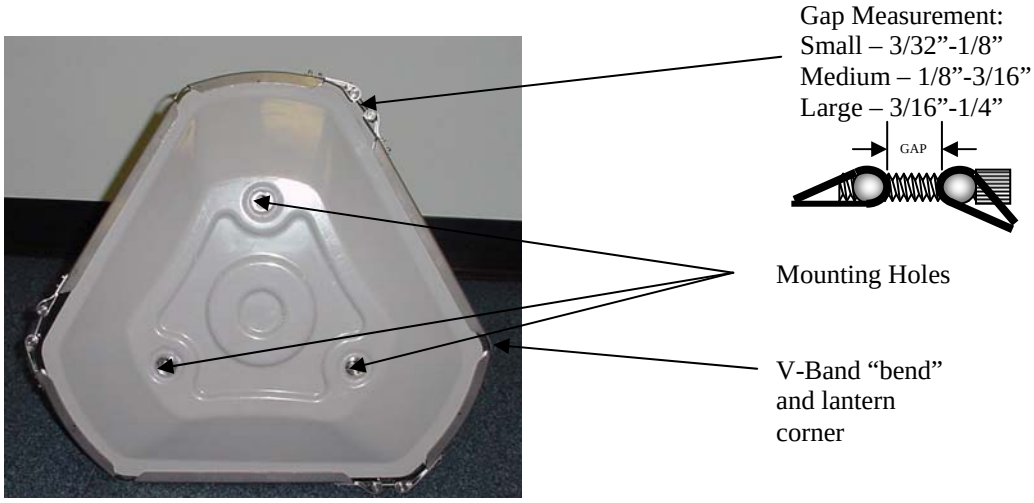
Programming/Battery Charging– Early Lantern (cont'd)

Note: If the lantern is stored for an extended period of time (more than 2-weeks) before deployment the leads to the battery should be disconnected. The lantern will retain the last flash rhythm programmed into the lantern

Before reassembly, inspect the O-ring to be sure that it is aligned along the perimeter of base. Also be sure that the Velcro battery strap is tight. Tuck any excess strap through the hold down to prevent it from getting pinched between the top and base.


Carefully tuck the wires inside the lantern to prevent them from getting pinched and lower the top on the base. Orientation is not important (unless the lantern is already installed on a fixed aid as there are only two solar panels and they must face southeast/southwest.)

Lower the V-band over the lantern and align the 'bends" in the band over the corners on the lantern, as shown below:




***Gently*** tap the V-band onto the base on all six sides using a rubber mallet or no-bounce hammer. Tighten the Allen bolts using a 3/16" T-handle Allen wrench evenly until the gap between the three clamps are as specified.

## Programming/Battery Charging– *Late* Lantern

*Late* lanterns are programmed using the Vega IR remote control or any TV remote control. There is no need to open the lantern prior to installation unless the battery needs to be recharged (see page 5). All programming, battery state of charge determination and settings can be made external to the lantern.

## Programming - Overview

The lantern must be programmed to the proper flash rhythm and effective intensity before deployment.

The lantern is programmed using the Vega Infrared (IR) Remote Control or any Carmanah or RCA TV 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 6 2. If the remote uses a 4-digit code, then use code 1 0 6 2. **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 (use the first one for the Carmanah remote):

| | | |
|---|---|---|
| Press and hold | **CODE SEARCH** | until red light on remote turns on |
| Press | **TV** | red light on remote will blink once |
| Enter | **0 6 2** | red light will blink once after each entry |
| | **or** | |
| Press and hold | **TV** | keep holding TV button! |
| Enter | **1 0 6 2** | **while still holding TV button** |
| Release TV button | | |

(Note: the codes for Carmanah and RCA remotes need to be verified. Use the Vega remote until positive confirmation is received.)

You are now ready to program the Vega VLB-36 lantern.

Gather the information needed to program the lantern; effective intensity and flash rhythm code. The effective intensity is the actual effective intensity value chosen in the Vega VLB-36 spreadsheet. You can check the existing entries; see Programming – Reading a Program Setting detailed later in this instruction.

**Standard CG Flash Rhythms**

| Rhythm | Code | Rhythm | Code |
|---|---|---|---|
| FL2.5 (0.3) | **310** | Q | **601** |
| FL4 (0.4) | **321** | Mo(A) | **801** |
| FL6 (0.6) | **337** | Iso 2 | **100** |
| FL (2+1) 6 | **472** | Iso 6 | **104** |
| FL (2) 5 | **406** | Oc 4 | **205** |
| FL (2) 6 | **416** | | |

*Programming/Battery Charging– Late Lantern (cont'd)*

Intensity codes are four digit numbers* corresponding to the effective intensity of the lantern:

**Intensity Codes***

| Effective Intensity | Code | Effective Intensity | Code | Effective Intensity | Code |
|---|---|---|---|---|---|
| 21 candelas | **0021** | 77 candelas | **0077** | 161 candelas | **0161**** |
| 29 | **0029** | 83 | **0083** | 205 | **0205**** |
| 39 | **0039** | 109 | **0109** | 240 | **0240**** |
| 54 | **0054** | 131 | **0131** | 290 | **0290**** |
| 66 | **0066** | 150 | **0150** | | |

*Note: Lanterns purchased prior to December 2009 and lower than serial number 36i-1892 use a 3-digit intensity code. Omit the first zero from the above list.
**Not available for all rhythms and colors. Use the Vega VLB-36 Sizing Program to determine the maximum allowable intensity.

## Programming Notes:

- Lantern must be programmed with power applied (battery connected) in daytime conditions outside or in a lighted room (lantern commanded off by the daylight control).
- Programming entries must not lag by more than 10 seconds or the lantern will exit the programming mode. Write down the programming codes for each session to avoid delays.
- The Infrared Receiver (IR) is located in the lens. Aim the remote control 6-12" from the lantern centered at the lens.
- Enter the programming mode by pressing and holding the "red standby", "power" or "program" key on the remote for 5 seconds (up to 60 seconds if in the storage mode). The lantern will display 4 quick flashes (0.1 sec on, 0.1 sec off) indicating that it is in the programming mode.
- Each successful numeric keypad entry will result in 1 flash for each key pressed.
- Wait for the lantern to flash before entering the next digit (don't rush programming).
- When the programming code is recognized, the lantern will display the 3 or 4 digit code as a series of quick flashes with a gap of 0.5 seconds between each "number" of the code. A zero (0) is displayed as a 2 second flash.
- If the programming code is not recognized, the lantern will display 3 quick flashes and the lantern will return to the programming mode (re-enter entire program code again).
- When exiting programming mode, the lantern will display 2 quick flashes, followed by a short pause and another 2 quick flashes, then display the flash rhythm for 16-20 seconds (note: the lantern will not display the flash rhythm when programming the storage mode).
- After programming, write the flash rhythm and intensity setting on the lantern with an indelible ink marker to aid identification while in storage.

## Programming

The lantern is shipped in the "Storage Mode" which essentially turns the light off in both day and night conditions. The operation mode should be changed from "**storage mode**" to "**normal mode**" and then programmed to the desired flash rhythm and effective intensity. The lantern can be programmed and placed back into the storage mode if the lantern will not be deployed within two weeks of being programmed. The lantern will retain the last programming sequence (flash rhythm and effective intensity) while in the storage mode.

*Programming/Battery Charging– Late Lantern (cont'd)*

The programming sequences are grouped together so that all codes are entered at one time. It is suggested and acceptable to perform the programming operation in three separate sessions (detailed **Operation Mode**, **Flash Rhythm & Effective Intensity**).

**Operation Mode.** The lantern is shipped in the **Storage Mode** which prevents the light from inadvertently turning on when in a darkened space (storage room, shipping box, etc.) It must be placed in the **Normal Mode** prior to deployment. The programming sequence for the normal mode is:

| | | Code |
|---|---|---|
| Operation | Programming | 1 |
| Feature | Operation Mode | 5 |
| Value | Normal Mode | 000 (Storage mode is code 009) |

The programming sequence for this example is **1 5 0 0 0**.

In a lighted room or outside, aim the remote at the lens and:

| | |
|---|---|
| 1. Press and hold the standby/program/power button for up to 60 seconds*. | The lantern will give 4 quick flashes to indicate that it has entered the programming mode. |
| 2. Enter the programming sequence for the flash rhythm **15000** (wait for confirmation flash after each digit) | The lantern will flash once each time a key on the programmer is pressed. When the sequence is entered and accepted, the lantern will display the value 000 as a series of flashes as: a 2 second flash followed by a 0.5 sec gap, 2 second flash followed by a 0.5 gap and finally a 2 second flash. (If programming the storage mode the last sequence is 9 quick flashes) |
| 3. Leave the programmer idle for 10 seconds to exit the programming mode. | The light will give 2 quick flashes followed by a short pause, then another 2 quick flashes. After that it will flash on the last programmed rhythm for 16-20 sec. |

*While in the storage mode, the receiver in the lantern only checks for programming instructions once every 60 seconds. You must hold the standby/program/power button until the lantern acknowledges with 4 quick flashes. Also, the lantern will only display 4 quick flashes and not the last programmed rhythm after it is put in the storage mode.

**Important Note: unsuccessful programming sessions will be followed by 3 quick flashes followed by the lantern returning to the programming mode (step 2). Try the code again, or wait at least 10 seconds to exit the programming mode and reenter the above sequence (step 1).**

*Programming/Battery Charging– Late Lantern (cont'd)*

**Flash Rhythm.** Now that the lantern is in the Normal Mode, you can program the flash rhythm. Gather the data for each operation. For example, the following VLB-36 has a flash rhythm of FL6(.6) and an effective intensity setting of 77 candelas. The code for FL6(.6) is **337**. The programming **operation** is code **1**. The flash rhythm **feature** is code **0**.

Assemble the codes, as shown below for your flash rhythm programming sequence:

| | | Code |
|---|---|---|
| Operation | Programming | 1 |
| Feature | Flash Rhythm | 0 |
| Value | FL6(.6) | 337 |

The programming sequence for this example is **1 0 3 3 7**.

In a lighted room or outside, aim the remote at the lens and:

| | |
|---|---|
| 1. Press and hold the standby/program/power button for 5 seconds. | The lantern will give 4 quick flashes to indicate that it has entered the programming mode. |
| 2. Enter the programming sequence for the flash rhythm 10337 (wait for confirmation flash after each digit) | The lantern will flash once each time a key on the programmer is pressed. When the sequence is entered and accepted, the lantern will display the value 337 as a series of flashes as: 3 quick flashes followed by a 0.5 sec gap, 3 quick flashes followed by a 0.5 gap and finally 7 quick flashes. |
| 3. Leave the programmer idle for 10 seconds to exit the programming mode. | The light will give 2 quick flashes followed by a short pause, then another 2 quick flashes. After that it will flash on the programmed rhythm for 16-20 seconds. |

**Important Note: unsuccessful programming sessions will be followed by 3 quick flashes followed by the lantern returning to the programming mode (step 2). Try the code again, or wait at least 10 seconds to exit the programming mode and reenter the above sequence (step 1).**

*Programming/Battery Charging– Late Lantern (cont'd)*

**Effective Intensity.** Next, assemble the codes, as shown below for your intensity setting programming sequence:

| | | Code |
|---|---|---|
| Operation | Programming | 1 |
| Feature | Nighttime Intensity | 1 |
| Value | Intensity, 77 candelas | 0077* |

The programming sequence for this example is **1 1 0 0 7 7**.

In a lighted room or outside, aim the remote at the lens and:

| | |
|---|---|
| 1. Press and hold the standby/program/program button for 5 seconds. | The lantern will give 4 quick flashes to indicate that it has entered the programming mode. |
| 2. Enter the programming sequence for the flash rhythm 110077 (wait for confirmation flash after each digit) | The lantern will flash once each time a key on the programmer is pressed. When the sequence is entered and accepted, the lantern will display the value 0077 as a series of flashes as: 2 sec flash followed by a 0.5 sec gap, 2 sec flash followed by a 0.5 sec gap, then 7 quick flashes followed by a 0.5 sec gap and finally 7 quick flashes. |
| 3. Leave the programmer idle for 10 seconds to exit the programming mode. | The light will give 2 quick flashes followed by a short pause, then another 2 quick flashes. After that it will flash on the programmed rhythm at the selected intensity for 16-20 seconds. |

**Important Note: unsuccessful programming sessions will be followed by 3 quick flashes followed by the lantern returning to the programming mode (step 2). Try the code again, or wait at least 10 seconds to exit the programming mode and reenter the above sequence (step 1).**

*Note: Lanterns purchased prior to December 2009 and lower than serial number 36i-1892 use a 3-digit intensity code. Omit the first zero from the intensity. The example above would read 11077 and if the sequence is accepted the lantern will display the value 077 as a series of flashes: 2 sec flash followed by a 0.5 sec gap, then 7 quick flashes followed by a 0.5 sec gap and finally 7 quick flashes.

*Programming/Battery Charging– Late Lantern (cont'd)*

**Programming – Reading a Program Setting**

The IR remote control can be used to identify existing program settings such as: flash rhythm, effective intensity, and battery voltage without reprogramming the lantern.

Program settings can be checked with the lantern in either the Normal Mode or the Storage Mode.

If the lantern is in the Normal Mode aim the programmer at the lens, press and hold the standby/program/power button for 5 seconds. The lantern will respond with 4 quick flashes. After the lantern responds, proceed as indicated below.

If the lantern is in the Storage Mode aim the programmer at the lens, press and hold the standby/program/power button until the lantern responds with 4 quick flashes. This may take up to 60 seconds. After the lantern responds, proceed as indicated below.

**To check flash rhythm**:

| | | Code |
|---|---|---|
| Operation | Read Settings | 9 |
| Feature | Flash Rhythm | 0 |

The programming sequence to check the flash rhythm is **9 0**.

**To check intensity setting**:

| | | Code |
|---|---|---|
| Operation | Read Settings | 9 |
| Feature | Intensity Setting | 1 |

The programming sequence to check the intensity is **9 1**.

**To check LED version** (see page 2 for info):

| | | Code |
|---|---|---|
| Operation | System Check | 3 |
| Feature | LED Version | 5 (example: will display **4 2 1** as a series of flashes) |

The programming sequence to check the LED version is **3 5**.

**To check battery voltage**:

| | | Code |
|---|---|---|
| Operation | System Checks 3 | |
| Feature | Battery Voltage* | 1 (example: will display 12.5 volts as a series of flashes; 12.5 is displayed as **1 2 5**)) |

The programming sequence to check the battery voltage is **3 1**.

*Battery voltage should be measured with the solar panels covered with a jacket or blanket. Misleading battery voltages will be present if light (sunlight, ambient and office lighting) falls on the solar panels during this measurement.

Examples are on the next few pages.

*Programming/Battery Charging– Late Lantern (cont'd)*

**For example**, to check if a lantern is programmed as a FL4(.4), look up the code on page 8 (code 321). In a lighted room or outside, aim the remote at the lens and:

| | |
|---|---|
| 1. Press and hold the standby/program/power button for 5 seconds (up to 60 sec if the lantern is in storage mode). | The lantern will give 4 quick flashes to indicate that it has entered the programming mode. |
| 2. Enter the programming sequence to determine the flash rhythm: **90** (wait for confirmation flash after each digit). | The lantern will flash once each time a key on the programmer is pressed. When the sequence is entered and accepted, the lantern will display the value 321 as a series of flashes as: 3 quick flashes followed by a 0.5 sec gap, 2 quick flashes followed by a 0.5 gap, 1 quick flash. |
| 3. Leave the programmer idle for 10 seconds. | The lantern will display 2 quick flashes, a pause followed by 2 quick flashes, display the FL4(.4) rhythm for 16-20 seconds, then turn off (if daytime) or return to storage mode. |

**For example:** To check if a lantern is programmed with an effective intensity of 77 candelas, look up the code on page 9 (code 0077). In a lighted room or outside, aim the remote at the lens and:

| | |
|---|---|
| 1. Press and hold the standby/program/power button for 5 seconds (up to 60 sec if the lantern is in storage mode). | The lantern will give 4 quick flashes to indicate that it has entered the programming mode. |
| 2. Enter the programming sequence to determine the intensity: **91** (wait for confirmation flash after each digit). | The lantern will flash once each time a key on the programmer is pressed. When the sequence is entered and accepted, the lantern will display the value **0077** as a series of flashes as: 2 sec flash followed by a 0.5 sec gap, 2 sec flash followed by a 0.5 sec gap, 7 quick flashes followed by a 0.5 gap, 7 quick flashes. |
| 3. Leave the programmer idle for 10 seconds. | The lantern will display 2 quick flashes, a pause followed by 2 quick flashes, display the programmed rhythm for 16-20 seconds, then turn off (if daytime) or return to storage mode. |

*Programming/Battery Charging– Late Lantern (cont'd)*

**For example**, to check if a lantern's battery voltage without opening it up, in a lighted room or outside aim the remote at the lens and:

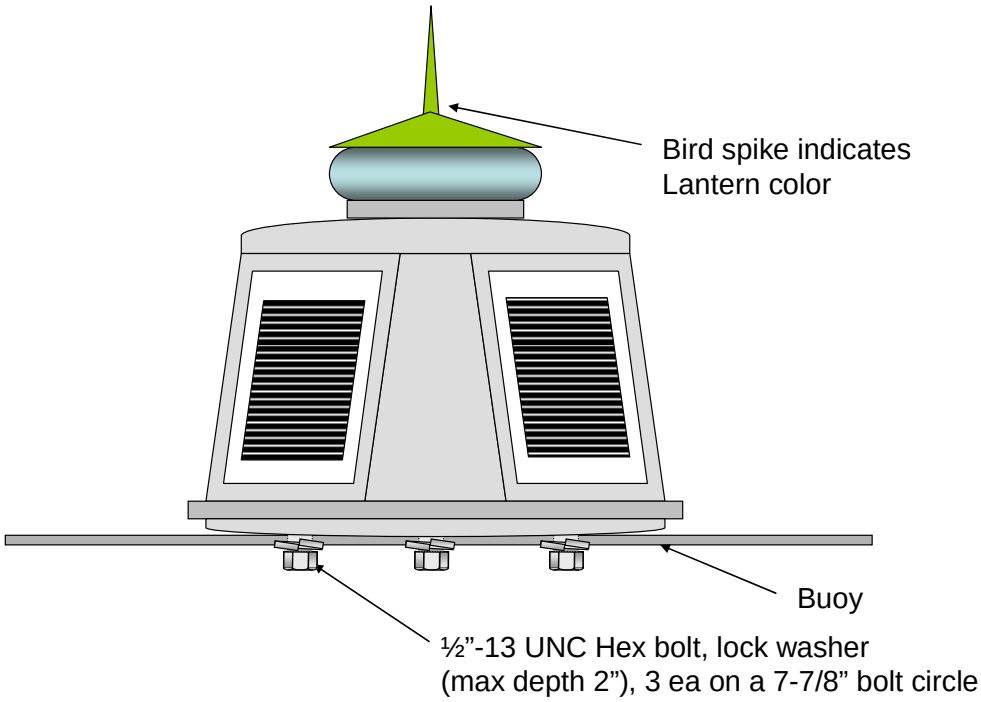
| | |
|---|---|
| 1. Press and hold the standby/program/power button for 5 seconds (up to 60 sec if the lantern is in storage mode). | The lantern will give 4 quick flashes to indicate that it has entered the programming mode. |
| 2. Enter the programming sequence to determine the flash rhythm: **31** (wait for confirmation flash after each digit). | The lantern will flash once each time a key on the programmer is pressed. When the sequence is entered and accepted, the lantern will display the battery voltage; for example if it is 12.8 volts: 128 as a series of flashes as: 1 quick flash followed by a 0.5 sec gap, 2 quick flashes followed by a 0.5 gap, 8 quick flashes. |
| 3. Leave the programmer idle for 10 seconds. | The lantern will display 2 quick flashes, a pause followed by 2 quick flashes, display the programmed rhythm for 16-20 seconds, then turn off (if daytime) or return to storage mode. |

## Bench Test (Early & Late Lanterns)

Bench test each beacon at the selected effective intensity and flash rhythm for 24 hours in a darkened room (the daylight control is located behind the lens and may be covered to simulate darkness.)

At the conclusion of the 24 hour test, if the lantern will not be installed for a period exceeding 2-weeks, program it to the "storage mode" (*late* lanterns) or disconnect the battery (*early* lanterns), otherwise store the lantern outside or in a lighted room at the ANT or onboard the cutter.

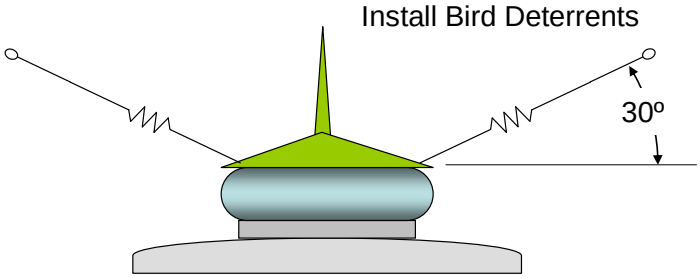
## Installation – Buoy



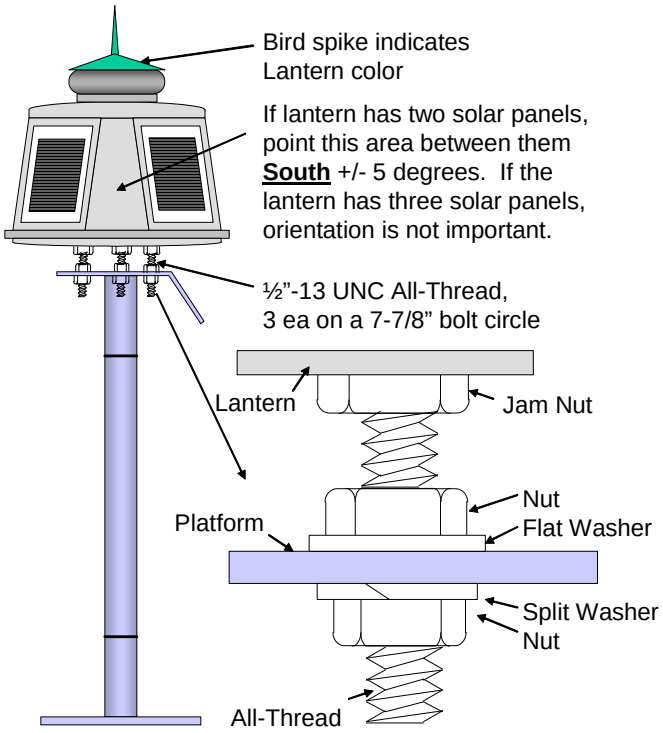

The lantern has provisions for a conventional 3-hole mount on a 7-7/8" bolt circle; however the lantern is fastened by blind holes in the base. Use three 316 stainless-steel 2" x ½" -13 coarse thread bolts with split lock washers as shown above. If the top-plate is warped, insert three stainless steel or nylon flat washers between the lantern and buoy to prevent distortion of the base. **Hint**: insert a stud (bolt with head cut off) in one or two of the base holes to position the lantern on the buoy. Remove the stud(s) and insert a bolt after the other bolts are installed. Slotting the head of the stud with a hacksaw or pneumatic cutoff wheel will allow you to use a screwdriver to remove it from the lantern.

Cover the lantern with a jacket and note if it turns on and flashes at the correct rhythm.

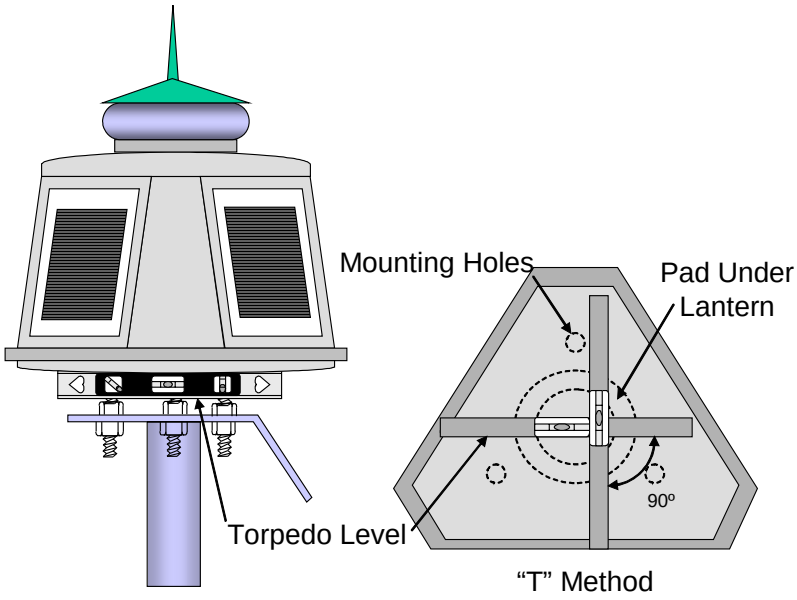
Install the three bird deterrents by attaching the supplied springs into the holes on top of the lantern with the supplied fasteners (*early* versions had no threads and are just pushed in at a 30 degree angle).



## Installation - Structures




Insert three 6" lengths of stainless steel ½"-13 UNC All-Thread in the base of the lantern as far as they will go (about 2"). Thread three ½" stainless steel nuts and tighten against the base of the lantern. These act as jam nuts and prevent the All-Thread from loosening in the lantern. Thread three stainless steel ½" nuts about half-way up the All-Thread. Place three stainless steel flat washers on the platform, then install the lantern on the platform.



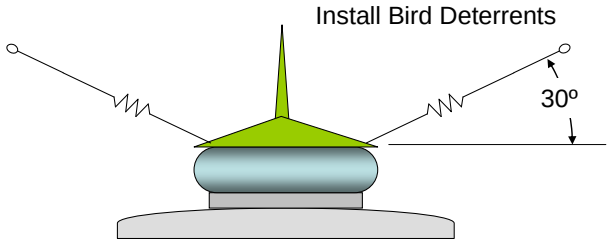
*Installation – Structures (cont'd)*

Place a torpedo level on the bottom of the lantern (there is a circular pad in the center) in-line with two of the mounting holes. Using the "T" method taught at the NATON School, level the lantern using one or both of the nuts on top of the platform corresponding to those two mounting holes. Turn the level 90 degrees and level the lantern in that direction by turning the one nut on top of the platform opposite the other two nuts. The lantern should be level in both directions.

Install a stainless steel split lock washer and nut on the bottom of the All-Thread and secure the lantern to the platform. If the nothing moved, the lantern should still be level; check with the torpedo level and adjust, if necessary.

Cover the lantern with a jacket and note if it turns on and flashes at the correct rhythm.

Install the three bird deterrents by attaching the supplied springs into the holes on top of the lantern with the supplied fasteners (*early* versions had no threads and are just pushed in at a 30 degree angle).




## Servicing

Servicing should be performed in accordance with the standard cycle established for the aid. The recommended cycle for the lantern is every 2 or 3 years. The lantern should be replaced when it can no longer provide adequate service to the mariner (based on durability of housing, lens and solar panels) with battery replacement at 6 year intervals.

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

Cover the lantern with a jacket and note if it turns on and flashes at the correct rhythm. Note any dark areas around the lens indicating non-working LEDs. If present, replace the lantern.

## Troubleshooting

If the lantern is reported discrepant, inspect it for obvious signs of damage; broken lens cover, broken solar panels or evidence of water behind the lens. Replace the lantern.

If solar panels are just covered in bird guano, clean with soap and water. Add additional bird deterrents. Check the battery voltage using the IR remote (see pages 13 & 15). Be sure that the solar panels are covered with a jacket or blanket. If the battery voltage is below 12.2 volts, remove the lantern from service and recharge at CG Base, otherwise allow the lantern to remain on station and recharge using the solar panels.

If the daylight control fails (lantern will not turn off in daylight), replace the lantern.

*Back at CG Base or on the Cutter:*

Open the lantern and measure the battery voltage. If below 12.8 volts, charge the battery as discussed in the Programming/Battery Charge section (page 5).

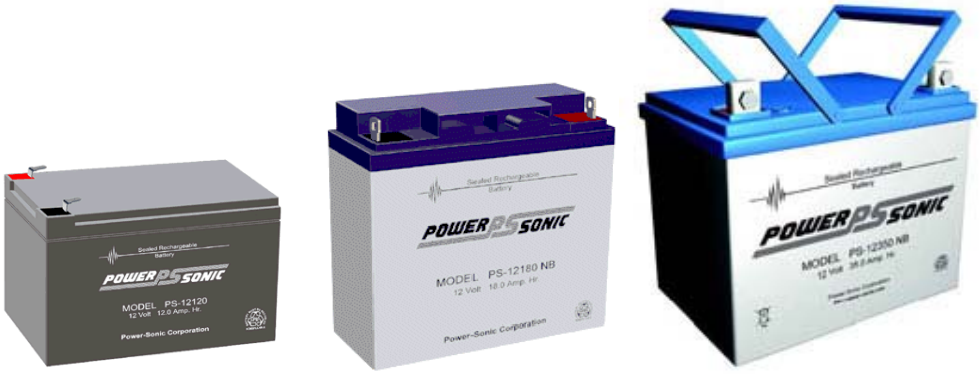
If the battery voltage is acceptable, disconnect one battery lead, wait 10 seconds to reset the processor, and then reconnect. Test the lantern by placing a cover over the lens and note if it flashes on-rhythm.

If the battery was discharged for an extended period (below 11.9 volts for two or more weeks), or the battery will not accept a charge from the charger, or the voltage after the battery stabilizes after the charger is removed is not above 12.8 volts, replace the battery.

On the small and medium lanterns, push the lugs completely on the terminals.
On the large and extra large lantern, connect the lugs to the terminals using the supplied nut and bolt using two 7/16” wrenches. **Connect the red wire to the positive terminal and the black to the negative terminal of the battery.** Lead acid batteries are a source of almost unlimited current. **Use care to prevent shorting terminals with metal tools.**

If the lantern fails to operate with a known good battery, contact Commandant (CG-432A) for its disposition.

## Battery replacement




To replace the battery pack, open the lantern as described in the Programming/Battery Charging section. Disconnect the battery leads and unstrap the battery. Lift the battery out, but be sure that the mounting pad or feet remain in the base. This reduces the transmission of vibration and shock to the battery. Replace the battery and be sure to tighten the Velcro strap tightly and engage all of the Velcro material.

The batteries are manufactured by Power-Sonic or Haze and have the following part numbers:

| | Power Sonic | Haze |
|---|---|---|
| Small – (12 volt, 12 AH) | PS-12120 | HZY-SL12-12 Solar Gel |
| Medium – (12 volt, 18AH) | PS-12180F | HZY-SL12-18 Solar Gel |
| Large & Extra Large – (12 volt, 35AH) | PS-12350 | HZY-SL12-33 Solar Gel |

Batteries may be purchased from your local supplier or online from Mouser Electronics (www.mouser.com) for Power-Sonic batteries and http://www.hazebatteryusa.com/ for Haze batteries. At this time, do not use "cross match" other types of batteries as they have not been tested in the lantern and some have the wrong terminals.

## Reporting Requirements

Districts shall enter the following information into IATONIS so that your district and CG Headquarters can monitor these lanterns. In the LANTERN TYPE field, select the LED designation from the drop-down list:

| | |
|---|---|
| LED VegaVLB36-SM Buoy | VEGA SC LED w/ small power system and 3 solar panels |
| LED VegaVLB36-MED Buoy | VEGA SC LED w/ medium power system and 3 solar panels |
| LED VegaVLB36-LRG Buoy | VEGA SC LED w/ large power system and 3 solar panels |
| LED VegaVLB36-SM Fixed* | VEGA SC LED w/ small power system and 2 solar panels |
| LED VegaVLB36-MED Fixed* | VEGA SC LED w/ medium power system and 2 solar panels |
| LED VegaVLB36-LRG Fixed* | VEGA SC LED w/ large power system and 2 solar panels |

*Only *Early* VLB-36 lanterns used on fixed structures have 2 solar panels. Very few were purchased. All *Late* VLB-36 lanterns used on buoys and structures have 3 solar panels and should be entered into IATONIS as one of the first 3 choices.

*Reporting Requirements (cont'd)*

In AID REMARKS field enter the programmed effective intensity in candelas.

In LAMP TYPE field select the designation: LED

Battery tracking numbers are required. Labels can be affixed under the base of the lantern.

## Storage

Self-contained LED lanterns should be stored in a cool, dry place. Lead-acid batteries discharge when they are in storage. Hotter storage locations cause the battery to discharge faster. Batteries must be recharged on a regular basis in order to prevent internal damage to the battery and ensure that sufficient capacity is present to operate the lantern when it is deployed. The VLB-36 can be stored at the following average temperatures before recharge is necessary:

| | |
|---|---|
| 68 degrees F | 10 months |
| 86 degrees F | 5 months |
| 104 degrees F | 3 months |

The battery can be charged by placing the lantern outside in a sunny location for 5 days if the above storage guidelines are followed. The lantern will charge the battery in either the normal or storage mode.

## Battery Disposal

These batteries are lead-acid, similar to the Delco-2000 and Sunlyte 12-5000. Recycle these batteries the same way you are currently disposing of conventional solar batteries. The Material Safety Data Sheet (MSDS) for the batteries is attached.

## Questions/Comments

Questions and comments about this lantern and instructions should be directed to Mr. Jon Grasson at 202-475-5629 email jon.t.grasson@uscg.mil or Mr. Larry Jaeger at 202-475-5624 email larry.e.jaeger@uscg.mil.

HAZE Battery Co.

Material Safety Data Sheet

Data Sheet No: VRLA GEL Issue 3

Date Issued: January 19th, 2010

## 1 Identification of the substance

Product name: Valve Regulated Lead Acid, Gelled Electrolyte Battery

Trade name: Lead acid battery


Manufacturers Name: HAZE Battery Ltd
Manufacturers Address: Xiangshuihe,
Dayawan Economy & Technology Development Zone
Huizhou, Guangdong, China. 516085
E mail: Custserv@hazebattery.com
Tel: (86) 0752-5189988
Fax: (86) 0752-5189966


Responsible persons: QA Representative, Managing Director

## 2 Composition / Ingredient Data

| Hazardous Components Chemical Identity | CAS Number | OSHA PEL | ACGIH TLV | Percent By Weight | EC Number | Average |
|---|---|---|---|---|---|---|
| Lead | 7439-92-1 | 50 µg/$m^3$ | 50 µg/$m^3$ | 45-55% | 231-100-4 | 50% |
| Sulfuric Acid | 7664-93-9 | 100 µg/$m^3$ | 1.00 mg/$m^3$ | 19-24% | 231-639-5 | 21% |
| Lead Oxide | 1309-60-0 | 50 µg/$m^3$ | 500 µg/$m^3$ | 19-23% | 215-174-5 | 21% |

| | Risk Phrases | Safety Phrases |
|---|---|---|
| Sulphuric Acid | R61,62,20/22,33 | S1/2,S26,S30,S45 |
| Lead Oxide | R35 | None |

## 3 Hazards Identification

Odour: Not applicable
Appearance: Article as described above
Weight High Density/ Good lifting technique required

**Hazards refer to internal component, i.e. lead and sulphuric acid**
Contact with eyes: Causes irritation
Contact with skin: May cause dermatitis
Inhalation: May cause irritation
Ingestion: Can cause damage to the kidneys

## 4 First Aid Measures

Contact with skin: Remove contaminated clothing immediately and drench affected skin with plenty of water, then wash with soap and water.

Contact with eyes: If substance has got into eyes, immediately wash out with plenty of water for at least 15 minutes.

**Seek immediate medical attention**.

Ingestion: Do not induce vomiting.

**Seek immediate medical attention**.

Inhalation: Remove patient to fresh air.
Seek medical attention if irritation persists.

## 5 Fire-Fighting Measures

Auto-ignition point (Hydrogen) 580º C at 760 mm Hg
Wear positive-pressure breathing apparatus
In case of fire use foam, carbon dioxide or dry agent (S43)
Flash point Hydrogen 259º C
Flammable Limits in air, Lower 4.1%
% by 3/4 vol. (Hydrogen)

**Fire / explosion**
Hydrogen and oxygen gases are produced in the cells during normal battery operation (hydrogen is flammable and oxygen supports combustion).

## 6 Accidental Release Measures

Immediate Actions: Shut off all ignition sources
Clean Up Actions: Neutralise with soda ash
Place in appropriate container
Ventilate area
Do not empty into drains (S29)

## 7 Handling and Storage

Under normal conditions of battery use, internal components will not present a health hazard

Handling: Keep away from heat and sources of ignition
Wash hands thoroughly after use
Avoid sparks
Avoid contact with metal jewellery and watches etc.
**Do Not Remove Vent Caps**
Do not double stack industrial batteries, it may cause damage.

Storage: Keep in cool and dry & Protect from heat.

Store lead acid batteries with adequate ventilation.
Room ventilation is required for batteries utilised for standby power generation.
**Never re-charge batteries in an unventilated, enclosed space.**

## 8 Exposure Controls / Personal Protection

Personal protection: Wear safety shoes with toe protector.
Where internal components are liberated use rubber or neoprene boots.
Wear goggles/safety glasses giving complete eye protection.
Respiratory protection may be required under exceptional circumstances when excessive air contamination exists.
Wear PVC mitts, gloves or gauntlets.

Exposure Limits: Lead OES / LTEL - ppm 0.15 mg/m3
Lead Dioxide OES / LTEL - pmm 0.15 mg/m3

## 9 Physical and Chemical Properties

| | |
|---|---|
| Odour: | Not applicable. |
| Appearance: | Sealed Valve Regulated lead Acid Battery |
| State under normal temp: | Solid |
| Flash point (Hydrogen): | 259º C |

**Internal components**

| | |
|---|---|
| pH - (Sulphuric acid): | 1.3 . |
| Boiling point: (at 760 mm/Hg) | Battery Electrolyte 110º C, Lead 1755º C |
| Melting point: | Lead 327.4º C |
| Vapour pressure: | 11.7 |
| Vapour density: | Battery Electrolyte 3.4, (air =1) |
| Specific gravity: | Battery Electrolyte 1.3 g/cm3. (water =1) |
| Auto-ignition point: | 580º deg C at 760 mm/Hg. |
| Water solubility: | Battery Electrolyte is 100% soluble in water |

## 10 Stability and Reactivity

VRLA Batteries are considered stable at normal conditions.
Keep away from heat and sources of ignition.
Incompatible with reducing agents. Incompatible with organic agents.
Decomposition products may include hydrogen.
Decomposition products may include sulphur oxides.

## 11 Toxicological Information

Danger of cumulative effects. (R33)
May cause severe irritation.
May cause gastro-intestinal disturbances.
Can cause damage to the mucous membranes.

## 12 Ecological Information

Ecotoxicology - no information available

## 13 Disposal Considerations

| | |
|---|---|
| Classification: | This material and/or its container must be disposed of as hazardous waste. |
| Disposal considerations: | Do not discharge into drains or the environment, dispose to an authorised waste collection point. |

**14 Transport Information**

We hereby certify that the HAZE Battery co. range of Maintenance Free Rechargeable Sealed Lead Acid batteries conform to the UN2800 classification as " Batteries, Non- Spillable, and electric storage" as a result of passing the Vibration and Pressure Differential Test described in DOT [49 CFR 173.159(d) and IATA/ICAO [Special Provision A67].

Haze Battery Co. having met the related conditions are EXEMPT from hazardous goods regulations for the purpose of transportation by DOT, and IATA/ICAO, and therefore are unrestricted for transportation by any means.

**15 Regulatory information**

Classification and labelling Not classified as hazardous for supply

**16 Other Information**

Under normal conditions of battery use, internal components will not present a health hazard. The information contained in this Safety Data Sheet is provided for battery electrolyte (acid) and lead, for exposure that may occur during battery production or container breakage or under extreme heat conditions such as fire.
Tested as per IMDG Amendment. 34-08, special provision 238 "a" and "b", Comply.

This Safety Data Sheet and the information therein does not constitute the user's own assessment of work place risk as required by other Health & Safety legislation.

# MATERIAL SAFETY DATA SHEET

## PS, PSH, PSG, PG and Power Sport Series
## Valve Regulated (VRLA) Batteries
## Absorbed Electrolyte (AGM)

## Section 1 - Product Identification

| *Manufacturers Name* | *Emergency Telephone Numbers:* |
|---|---|
| **Power-Sonic Corporation,<br>7550 Panasonic Way<br>San Diego, CA 92154** | **CHEMTREC (Domestic): (800) 424-9300<br>CHEMTREC (International): (703) 527-3887** |
| | *Telephone Number for Information*<br>**Power-Sonic Corporation: (619) 661-2020** |
| | *Date Issued:* **January 2, 2007** |

***The information contained within is provided as a service to our customers and is for their information only. The information and recommendations set forth herein are made in good faith and are believed to be accurate at the date compiled. Power-Sonic Corporation makes no warranty expressed or implied.***

## Section 2 - Hazardous Ingredients/Identity Information

| Components | CAS Number | Approx Wt. % | OSHA PEL (µg/m³) | ACGIH TLV (µ/m³) | NIOSH (µ/m³) |
|---|---|---|---|---|---|
| Inorganic Lead/Lead Compounds | 7439-92-1 | 65%-75% | 50 | 150 | 10 |
| Tin | 7440-31-5 | <0.5% | 2000 | 2000 | N/A |
| Calcium | 7440-70-2 | <0.1% | N/A | N/A | N/A |
| Electrolyte: Dilute sulfuric Acid | 7664-93-9 | 14-20% | 1000 | 1000 | 1000 |
| Fiberglass Separator | - | 5% | N/A | N/A | N/A |
| Case Material: Acrylonitrile Butadine Styrene (ABS) | 9003-56-9 | 5-10% | N/A | N/A | N/A |

Inorganic lead and electrolyte (sulfuric acid) are the main components of every Valve Regulated Lead Acid battery supplied by Power-Sonic Corporation. Other ingredients may be present dependent upon the specific battery type. For additional information contact Power-Sonic Corporation Technical Department.

## Section 3 - Physical/Chemical Characteristics

| Components | Density | Melting Points | Solubility (H2O) | Odor | Appearance |
|---|---|---|---|---|---|
| Lead | 11.34 | 621 F° | None | None | Silver-Gray |
| Lead Sulfate | 6.20 | 1950 F° | 40mg/l(60 F°) | None | White Powder |
| Lead Dioxide | 9.40 | 554 F° | None | None | Brown Powder |
| Sulfuric Acid | About 1.30 | 203-240 F° | 100% | Sharp penetrating pungent | Clear Colorless Liquid |
| Fiberglass Separator | N/A | N/A | Slight | None | White Fibrous |
| Case Material: Acrylonitrile Butadine Styrene (ABS) | N/A | N/A | None | None | Solid |

Continued on next page

## Section 4 – Flammability Data

| Components | Flashpoint | Explosive Limit | Comments |
|---|---|---|---|
| Lead and Sulfuric Acid | None | None | None |
| Hydrogen | | LEL = 4.1% | Sealed batteries can emit hydrogen if overcharged (float voltage> 2.40 VPC) |
| Fiberglass Separator | N/A | N/A | Toxic vapors may be released. In case of fire, wear self contained breathing apparatus |
| Acrylonitrile Butadine Styrene (ABS) | None | N/A | Temp over 527°F (300°C) may release combustible gases. In case of fire, wear self contained breathing apparatus |

## Section 5 - Reactivity Data

| **Stability** | Unstable | | Conditions to Avoid |
|---|---|---|---|
| | Stable | X | Prolonged overcharge on high current, ignition sources. Sulfuric acid remains stable at all temperatures |

**Incompatibility (Materials to Avoid)**

**Sulfuric acid**: Contact with combustibles and organic materials may cause fire and explosion. Also reacts violently with strong reducing agents, metals, sulfur trioxide gas, strong oxidizers, and water. Contact with metals may product toxic sulfur dioxide fumes and may release flammable hydrogen gas.
**Lead Compounds**: Avoid contact with strong acids, bases, halides, halogenates, potassium nitrate, permanganate, peroxides, nascent hydrogen, and reducing agents.

**Hazardous Decomposition or Byproducts**

**Sulfuric acid**: Sulfur trioxide, carbon monoxide, sulfuric acid mist, sulfur dioxide, and hydrogen sulfide.
**Lead Compounds**: High temperatures above the melting point are likely to produce toxic metal fume, vapor, or dust; contact with strong acid or base or presence of nascent hydrogen may generate highly toxic arsine gas. Hazardous Polymerization.

**Polymerization:** **Sulfuric acid** will not polymerize

**Decomposition Products:** Sulfuric Dioxide, Trioxide, Hydrogen Sulfide, Hydrogen.

**Conditions to Avoid:** Prohibit smoking, sparks, etc. from battery charging area. Avoid mixing acid with other chemicals.

## Section 6 - Health Hazard Data

**Routes of Entry**

**Sulfuric acid**: Harmful by all routes of entry
**Lead compounds**: Hazardous Exposure can occur only when product is heated, oxidized, or otherwise processed or damaged to create dust, vapor or fume.

**Inhalation**

**Sulfuric Acid**: Breathing sulfuric acid vapors and mists may cause severe respiratory problems.
**Lead Compounds**: Dust or fumes may cause irritation of upper respiratory tract or lungs.
**Fiberglass Separator**: Fiberglass is an irritant to the upper respiratory tract, skin and eyes. For exposure up to 10F°/ use MSA Comfoll with type H filter. Above 10F use Ultra Twin with type H filter. This product is not considered carcinogenic by NTP or OSHA.

**Skin Contact**

**Sulfuric acid**: Severe irritation, burns, cornea damage, and possible blindness.
**Lead Compounds**: May cause eye irritation

Continued on next page

**Ingestion**

**Sulfuric acid**: May cause severe irritation of the mouth, throat, esophagus, and stomach.
**Lead Compounds:** May cause abdominal pain, nausea, vomiting, diarrhea, and severe cramping. Acute ingestion should be treated by a physician.

**Eye Contact**

**Sulfuric acid**: Severe irritation, burns, cornea damage and possible blindness.
**Lead Compounds**: May cause eye irritation.

**Acute Health Hazards**

**Sulfuric acid**: Severe skin irritation, burns, damage to cornea may cause blindness, upper respiratory irritation.
**Lead Compounds**: May cause abdominal pain, nausea, headaches, vomiting, loss of appetite, severe cramping, muscular aches and weakness, and difficulty sleeping. The toxic effects of lead are cumulative and slow to appear. It affects the kidneys, reproductive and central nervous systems. The symptoms of lead overexposure are listed above. Exposure to lead from a battery most often occurs during lead reclamation operations through the breathing or ingestion of lead dust or fumes.

**Chronic Health Hazards**

**Sulfuric acid**: Possible scarring of the cornea, inflammation of the nose, throat and bronchial tubes, possible erosion of tooth enamel.
**Lead Compounds**: May cause anemia, damage to kidneys and nervous system, and damage to reproductive system in both males and females.

**Carcinogenicity**

**Sulfuric acid**: The National Toxicological Program (NTP) and The International Agency for Research on Cancer (IARC) have classified strong inorganic acid mist containing sulfuric acid as a Category 1 carcinogen, a substance that is carcinogenic to humans. The ACGIH has classified strong inorganic acid mist containing sulfuric acid as an A2 carcinogen (suspected human carcinogen). These classifications do not apply to liquid forms of sulfuric acid or sulfuric acid solutions contained within a battery. Inorganic acid mist (sulfuric acid mist) is not generated under normal use of this product. Misuse of the product, such as overcharging, may result in the generation of sulfuric acid mist.
**Lead Compounds**: Human studies are inconclusive regarding lead exposure and an increased cancer risk. The EPA and the International Agency for Research on Cancer (IARC) have categorized lead and inorganic lead compounds as a B2 classification (probable/possible human carcinogen) based on sufficient animal evidence and inadequate human evidence.

**Medical Conditions Generally Aggravated by Exposure**

Inorganic lead and its compounds can aggravate chronic forms of kidney, liver, and neurological diseases. Contact of battery electrolyte (acid) with the skin may aggravate skin diseases such as eczema and contact dermatitis. Overexposure to sulfuric acid mist may case lung damage and aggravate pulmonary conditions.

**Emergency and First Aid Procedures**

*Inhalation*
**Sulfuric acid**: Remove to fresh air immediately. If breathing is difficult, give oxygen
**Lead Compounds**: Remove from exposure, gargle, wash nose and lips, consult physician

*Ingestion*
**Sulfuric acid**: Do not induce vomiting, consult a physician immediately.
**Lead Compounds**: Consult a physician immediately

*Eyes*
**Sulfuric acid**: Flush immediately with water for 15 minutes, consult a physician.
**Lead Compounds**: Flush immediately with water for 15 minutes, consult a physician

*Skin*
**Sulfuric acid**: Flush with large amounts of water for at least 15 minutes, remove any contaminated clothing. If irritation develops seek medical attention.
**Lead Compounds**: Wash with soap and water.

Continued on next page

## Section 7 - Precautions for Safe Handling and Use

**Steps to be Taken in Case Material is Released or Spilled**

There is no release of material unless the case is damaged or battery is misused/overcharged. If release occurs stop flow of material, contain/absorb all spills with dry sand, earth, or vermiculite. Do not use combustible materials. Neutralize spilled material with soda ash, sodium bicarbonate, lime, etc. Wear acid-resistant clothing, boots, gloves, and face shield. Dispose of as hazardous waste. Do not discharge acid to sewer

**Waste Disposal Method**

Spent Batteries - send to secondary lead smelter for recycling. Follow applicable federal, state and local regulations Neutralize as in preceding step. Collect neutralized material in sealed container and handle as hazardous waste as applicable. A copy of this MSDS must be supplied to any scrap dealer or secondary lead smelter with the battery.

**Precautions to be Taken in Handling and Storing**

Store batteries in a cool, dry, well ventilated area that are separated from incompatible materials and any activities which may generate flames, sparks, or heat. Keep all metallic articles that could contact the negative and positive terminals on a battery and create a short circuit condition.

**Electrical Safety**

Due to the battery's low internal resistance and high power density, high levels of short circuit current can be developed across the battery terminals. Do not rest tools or cables on the battery. Use insulated tools only. Follow all installation instructions and diagrams when installing or maintaining battery systems.

**Fiberglass Separator**

Fiberglass is an irritant to the upper respiratory tract, skin and eyes. For exposure up to 10F°/ use MSA Comfoll with type H filter. Above 10F use Ultra Twin with type H filter. This product is not considered carcinogenic by NTP or OSHA.

## Section 8 - Control Measures

**Respiratory Protection**

None required under normal conditions. If battery is overcharged and concentrations of sulfuric acid are known to exceed PEL use NIOSH or MSH approved respiratory protection.

**Engineering Controls**

Store and handle batteries in a well ventilated area. If mechanical ventilation is used, components must be acid resistant

| **Protective Gloves** | **Eye Protection** |
|---|---|
| None needed under normal conditions. If battery case is damaged use rubber or plastic elbow length gauntlets | None needed under normal conditions. If handling damaged or broken batteries use chemical splash goggles or face shield |

**Other Protective Clothing or Equipment**

None needed under normal conditions. In case of damaged or broken battery use an acid resistant apron. Under severe exposure or emergency conditions wear acid resistant clothing.

**Work Hygienic Practices**

Handle batteries carefully to avoid damaging the case. Do not allow metallic articles to contact the battery terminals during handling. Avoid contact with the internal components of the battery.

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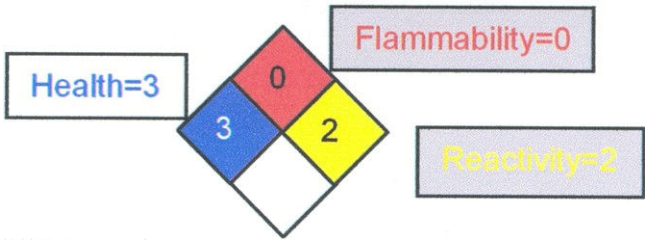
# Section 9 Regulatory Information

**NFPA Hazard Rating for Sulfuric Acid**




**Transportation Batteries. Non-Restricted Status**

## North America Surface and Air Shipments

Our nonspillable lead acid batteries are listed in the U.S. Department of Transportation's (DOT) hazardous materials regulations but are ***excepted*** from these regulations since they meet all of the following requirements found at 49 CFR 173.159(d) – NMFC # 60680 Class 65.

- When offered for transport, the batteries are protected against short circuits and securely packaged as required by 49 CFR 173.159(d) (1);
- The batteries and outer packaging are marked with the words NONSPILLABLE BATTERY as required by 49 CFR 173.159(d) (2); and
- The batteries comply with the vibration and pressure differential tests found in 49 CFR 173.159(d) (3) and "crack test" found at 49 CFR 173.159(d) (4).

## International

Our non-spillable lead acid batteries also are ***excepted*** from the international hazardous materials (also known as "dangerous goods") regulations since they comply with the following requirements:

- The vibration and pressure differential tests found in Packing Instruction 806 and Special Provision A67 of the **International Air Transport Association (IATA) Dangerous Goods Regulations**;

The vibration and pressure differential tests found in Packing Instruction 806 and Special Provision A67 of the International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air; and

- The vibration, pressure differential, and "crack" tests found in Special Provision 238.1 and 238.2 of the **International Maritime Dangerous Goods (IMDG) Code**.

**Regulatory Information**

**RCRA**: Spent lead acid batteries are not regulated as hazardous waste by the EPA when recycled, however state and international regulations may very.

**CERCLA (superfund) and EPCRA:**

(a) Reportable Quantity (RQ) for spilled 100% sulfuric acid under CERCLA (superfund) and EPCRA (Emergency Planning Community Right to Know Act is 1,000lbs. State and local reportable quantities for spilled sulfuric acid may vary.
(b) Sulfuric acid is a listed "Extremely Hazardous Substance" under EPCRA with a Threshold Planning Quantity (TPQ) of 1,000lbs.
(c) EPCRA Section 302 Notification is required if 1,000lbs. or more of sulfuric acid is present at one site. The quantity of sulfuric acid will vary by battery type. Contact Power-Sonic Corporation for additional information.
(d) EPCRA Section 312 Tier 2 reporting is required for batteries for batteries if sulfuric acid is present in quantities of 500lbs. or more and/or lead is present in quantities of 10,00lbs. or more.
(e) Supplier Notification: This product contains toxic chemicals which may be reportable under EPCRA Section 313 Toxic Chemical Release Inventory (Form R) requirements. If you are a manufacturing facility under SIC codes 20 through 39 the following information is provided to enable you to complete the required reports:

Continued on next page

**Regulatory Information continued:**

(f)

| Toxic Chemical | CAS Number | Approximate % by weight |
|---|---|---|
| Lead | 7439-92-1 | 60 |
| Sulfuric Acid | 7664-93-9 10- | 30 |
| Arsenic | 7440-38-2 | 0.2 |

If you distribute this product to other manufacturers in SIC odes 20 through 39, this information must be provided with the first shipment in a calendar year. The Section 313 supplier notification requirement does not apply to batteries which are "consumer products". Not present in all battery types. Contact Power-Sonic Corporation for further information.

**TSCA**

Ingredients in Power-Sonic Corporation's batteries are listed in the TSCA Registry as follows:

| Components | CAS Number | TSCA Status |
|---|---|---|
| Electrolyte Sulfuric Acid (H2SO4) | 7664-93-9 | Listed |
| Inorganic Lead Compound: Lead (Pb) | 7439-92-1 | Listed |
| Lead Oxide (PbO) | 1317-36-8 | Listed |
| Lead Sulfate (PbSO4) | 7446-14-2 | Listed |
| Arsenic (As) | 7440-38-2 | Listed |
| Calcium (Ca) | 7440-70-2 | Listed |
| Tin (Sn) | 7440-31-5 | Listed |

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