



## LVA01 LVA™ Low Voltage Monitor with Alert & Relay

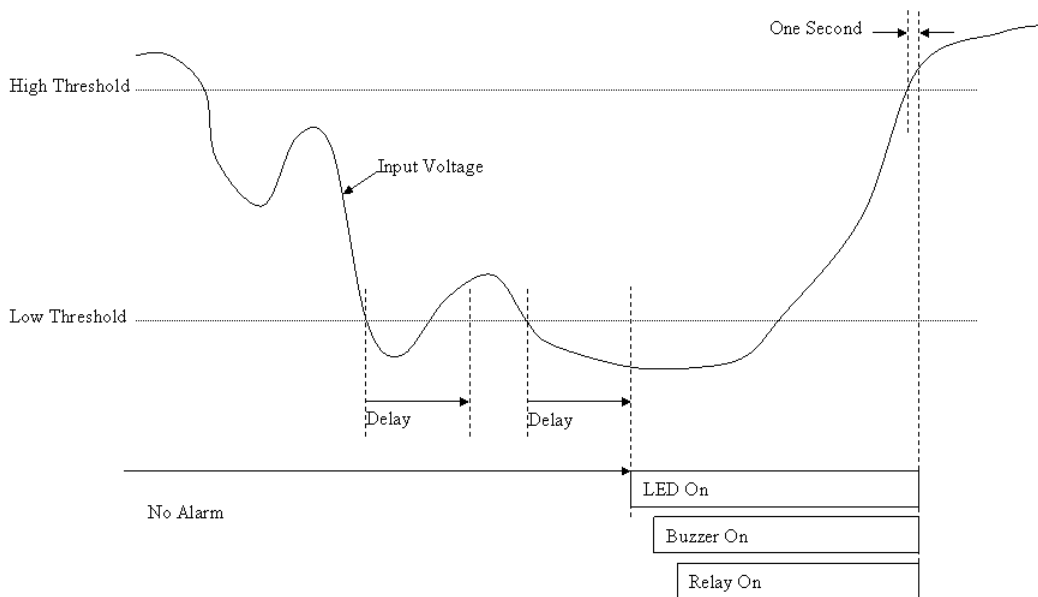
**OVERVIEW:**

The Low Voltage Alarm and Relay provides a smart programmable alert of low battery voltage. After low voltage is maintained for a programmable delay time period, the Alarm will show a visual alert. Fifteen seconds later, an audible alert is sounded. After another 15 seconds, a high current relay is triggered, providing for the turn off or turn on of high power devices up to 30 amps. The Alarm may also be muted or disabled. The Alarm's Low and High Voltage Thresholds as well as Delay Times have default values, but can be set by the user from 11.0 volts to 13.0 volts for low voltage and 13.5 to 16.0 volts for high voltage, and from 15 seconds to 5 minutes, in logical steps. A single 100,000 hour life illuminating LED push button provides a Visual Alarm, Special Function Control, and User Programming Interface.

In addition to low voltage monitoring, the Sailor's Solution's Low Voltage Alarm and Relay monitors excess voltage. If the battery voltage is excessively high, an over-voltage alarm will immediately sound and the LED push button will flash.

The Alarm includes an on-board 85dB buzzer that may be enabled or disabled via a pull-tab jumper. The Alarm board will also drive a separate user-provided buzzer, bell, or light drawing up to 5 amps at 12 volts. Other existing alarm systems on your boat may be connected in series with the Low Voltage Alarm thus sharing your existing buzzer or bell.

### Alarm Triggers



**Settings:**

**Programmable Settings:**

	Default	Programmable Range
Low Threshold Voltage:	11.6 volts	11.0 to 12.8 volts, in 0.1 volt steps
High Threshold Voltage:	12.3 volts	11.1 to 13.0 volts, in 0.1 volt steps
Over-Voltage:	15.0 volts	13.5 to 16.0, in 0.5 volt steps
Delay Time:	90 seconds	15, 30, 45, 60, 90 seconds and 2, 3 and 5 minutes

(Delay Time is the time low voltage must be maintained prior to audible alarm)  
 (There is no delay time for the Over-Voltage alarm)

**Non-programmable Settings:**

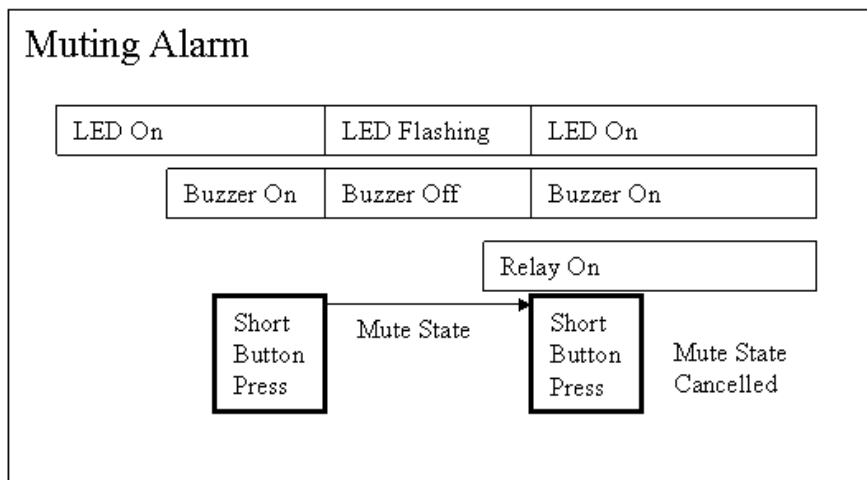
Visual Alarm to Audible Alarm Delay: 15 seconds  
 Audible Alarm to Relay Activation Delay: 15 seconds  
 Minimum difference between Low and High Threshold Voltages: 0.2 volts

**Special Functions:**

**Initial Power-up:** When powered is provided to the unit, it will load your prior settings (or factory defaults if you have not programmed other settings), acknowledge its proper operation by a rapid set of ten flashes of the Visual Alarm, display the software revision code via a series of long and short flashes (eg. V1.2 = one long and two short flashes), and complete initialization by displaying a second set of ten rapid flashes.

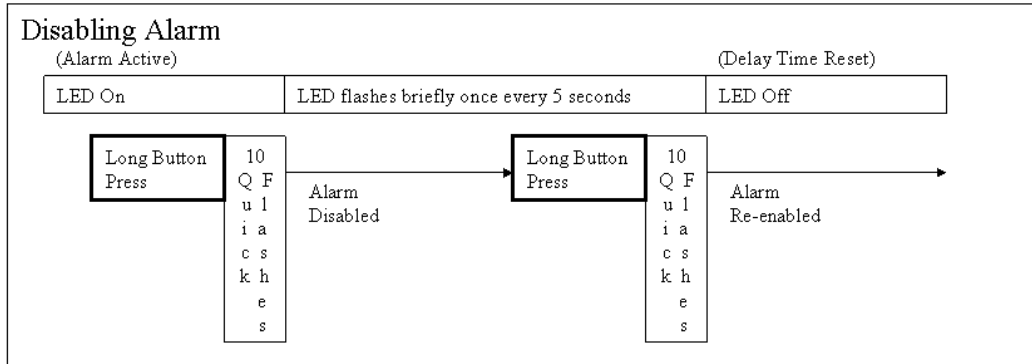
**Mute:** When the Visual Alarm is active, a short button press will enable the Mute function. The Visual Alarm will change from steady to flashing. The relay will still activate 30 seconds after the Visual Alarm. After 5 minutes, if the low voltage condition is maintained, the Mute will reset, the Audible Alarm sound, and the Visual Alarm will return to steady illumination.

**Un-mute:** A muted Audible Alarm, indicated by a flashing Visual Alarm, may be un-muted by a short button press. The Visual Alarm will return to steady illumination.

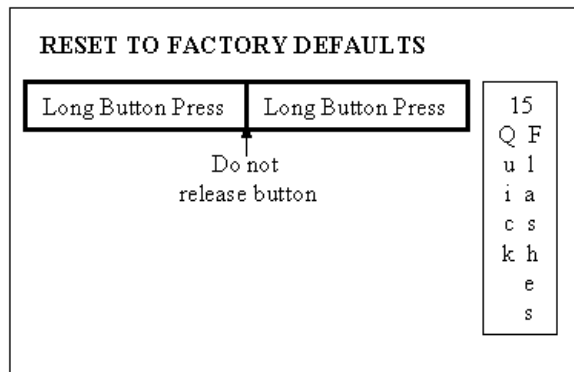


**Disable:** When the Visual Alarm is active, the unit may be disabled by holding the push button down for approximately 3 seconds, until the Visual Alarm flashes rapidly (10 very rapid flashes). The Visual Alarm will flash briefly once every 5 seconds to indicate the Disabled state.

**Re-Enable:** When the unit is disabled, holding the push button down for approximately 3 seconds, until the Visual Alarm flashes rapidly, will re-enable the unit.



**Factory Reset:** Holding the push button down for approximately 7 seconds, until the second set of rapid flashes appears on the Visual Alarm, will initiate a Factory Reset of the unit. This will return all settings to their factory defaults and re-initialize the unit. The Initial Power-up sequence, described above, is displayed.



**Display Settings:** When in Programming Mode (see below), holding the push button down for approximately 3 seconds, until the Visual Alarm flashes rapidly, will cause the unit to display its settings. The settings are flashed out, in a set of long and short flashes, Morse code fashion: Low Threshold followed by High Threshold, and lastly, Delay Time. (Flashes from the programming mode may be briefly displayed first and should be ignored. There is a two second separation between the display of each code.

**Display Codes:** The unit settings are displayed via sets of long and short flashes of the Visual Alarm.

Voltage Codes:

Long Flash = last whole digit of voltage

e.g. one long flash = 11 volts

two long flashes = 12 volts

three long flashes = 13 volts

Short Flash = tenths of volts

Example: 2 long flashes and 3 short flashes = 12.3 volts

1 long flash followed by a two second pause = 11.0 volts

**Time Codes:**

Long Flashes = number of full minutes

Short Flashes = number of 15 seconds intervals

Example: 3 short flashes = 45 seconds (3 x 15 seconds)

Example: 1 long flash and 2 short flashes = 1 minute 30 seconds

After entering the display mode, there will be a brief delay and then the current Low Voltage Threshold setting will be displayed. After a two second delay, the High Voltage Threshold setting will be displayed. After three second delay, the Delay Time setting will be displayed. The unit then returns to normal operation.

**Programming:** When no Visual Alarm is active, the unit may be programmed. Holding the push button for approximately 3 seconds, until the Visual Alarm flashes rapidly, will put the unit in programming mode.

Using the display codes explained above, the Visual Alarm will flash out all potential settings in order from lowest to highest, starting with the Low Voltage Threshold setting of 11.0 volts. After the setting you desire appears, you may select it by pressing the push button briefly (at least ½ second, but less than 2 seconds). Your selection will be acknowledged by a set of 10 rapid flashes of the Visual Alarm. The maximum value for the Low Voltage Threshold is 12.8 volts, but you will most certainly want to select a lower value.

The setting choices for the next setting, High Voltage Threshold, will then be displayed. Similarly, select your choice by pressing the push button briefly. Again, your choice will be acknowledged by a set of rapid flashes of the Visual Alarm. The maximum value for the High Voltage Threshold is 13.0 volts.

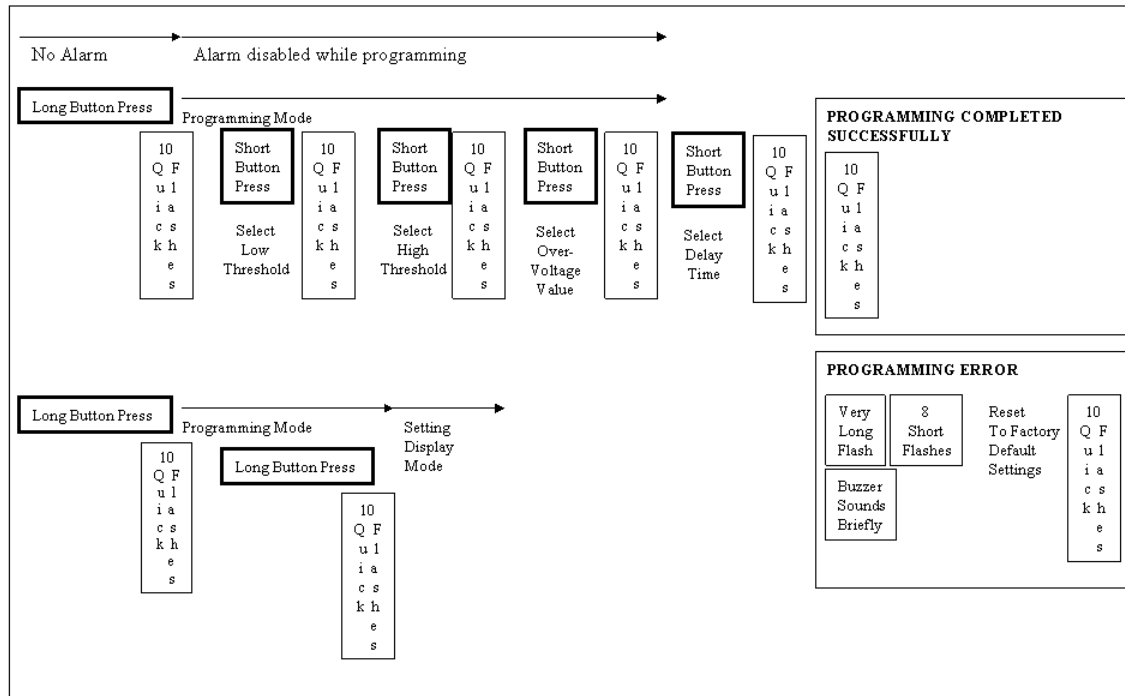
The next setting choices, Over-Voltage Threshold, will then be displayed. These choices are displayed in ½ volt increments, starting at 13.5 volts. Similarly, select your choice by pressing the push button briefly. Again, your choice will be acknowledged by a set of rapid flashes of the Visual Alarm. The maximum value for the Over-Voltage Threshold is 16.0 volts.

After the Over-Voltage Threshold is set, the Delay Time selections will be displayed, starting with a single short flash representing 15 seconds. (Remember, the delay time is the amount of time low voltage must be maintained before the Audible Alarm is activated. When the delay is set to 15 seconds, the Visual Alarm will appear immediately when the Low Voltage Threshold is crossed and the Audible Alarm will occur 15 seconds later.) As with the prior settings, a brief press of the push button will lock in your selection and be acknowledged by a set of rapid flashes of the Visual Alarm. The maximum value for the Delay Time is 5 minutes.

Proper programming is acknowledged by an additional set of ten rapid flashes of the Visual Alarm. The unit then returns to normal operation, using the values you just selected.

Should you fail to select appropriate values or not make three voltage and one delay time selection; the unit will indicate an error by displaying a very long flash of the Visual Alarm, while sounding the buzzer, followed by 5 short flashes. The unit will then reset to factory defaults, indicated by display of the Initial Power-up sequence described above. You may then re-enter the programming mode and try again (or accept the factory defaults).

## Button Presses during Idle State



### INSTALLATION:

#### MOUNTING:

The Sailor's Solution Low Voltage Alarm is typically mounted behind your boat's main breaker or switch panel. Spacers are provided to prevent the back of the alarm board from contacting other surfaces. These are tack glued to the board to make installation easier. Take care not to knock off the spacers while handling the board. The board is mounted with four user-provided #6 or #8 screws. These screws are not provided with the alarm as you will determine the length of the screws based on the nature and thickness of the mounting surface.

#### PUSHBUTTON INSTALLATION:

We suggest that the illuminating LED pushbutton be mounted in a logical open location on your breaker/switch panel, perhaps near bilge alarms or the like. Drill a 5/8" hole to accommodate the pushbutton. Lacking a 5/8" drill bit, drill a 1/2" hole and ream it up to 5/8" with a rattle file or a Dremel-type tool.

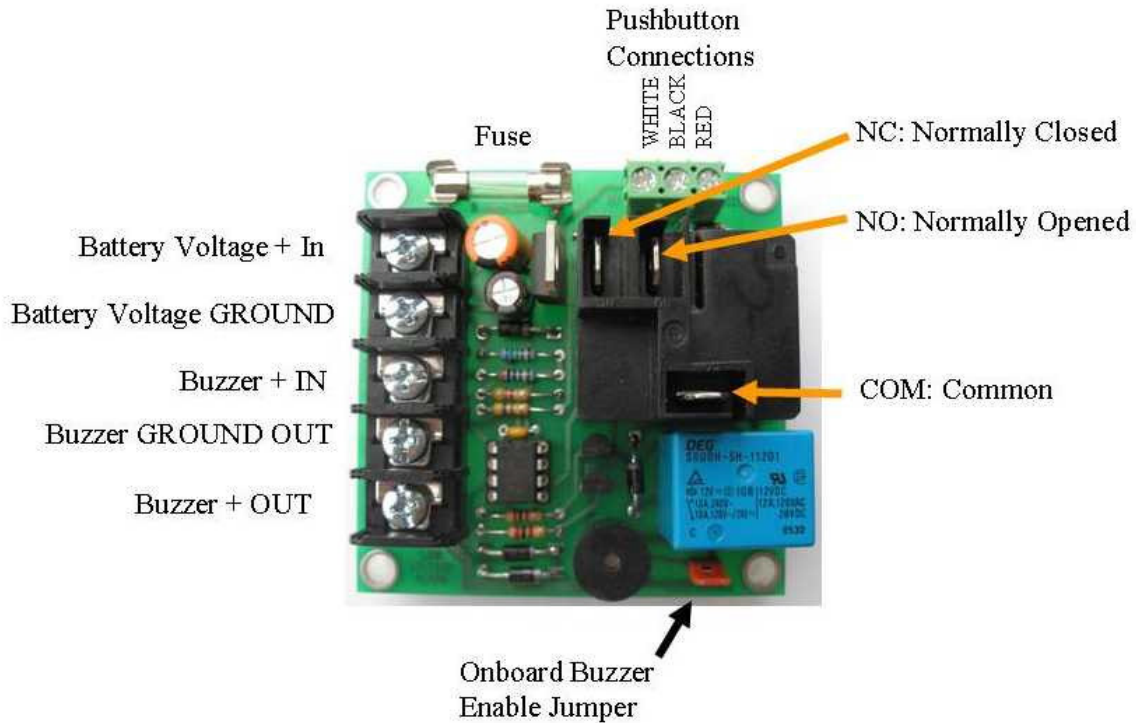
Disconnect the pushbutton leads from the alarm board with a small straight blade or Philips screwdriver. Just loosen, do not remove these screws. The color assignments for the wires are noted on the board as "RED", "BLK" and "WH". Avoid cutting the lead wire if possible, but if you must, re-tin the ends of the wires to insure a corrosion-free connection. Note that the cable's shield is connected to the black wire. The retaining nut is removed from the switch by turning it counterclockwise. The wire is led through the hole you prepared and the switch positioned in the hole. The nut slid up the wire, from behind the mounting panel and tightened firmly by hand. DO NOT USE PLIER OR OTHER TOOLS as you may easily break the nut or pushbutton.

Route and secure the pushbutton lead appropriately and then reconnect to the appropriate terminals of the Alarm Board.

A laminated label is provided to label the pushbutton once it is installed. Carefully peel the backing from the label, taking care not to crease the label or touch the adhesive surface.

**WIRING:**

All wiring should be installed in accordance with normal marine standards. Wire should be sized appropriately for current demand and length. Proper crimp terminals should be used to terminal all wires (not necessary for pushbutton leads). Please refer to the photo below for a brief description of each of the connections on the Low Voltage Alarm and Relay board.



**MINIMUM REQUIRED CONNECTIONS:**

The alarm board will function with just the three Pushbutton leads, Battery Voltage + In, and Battery Voltage GROUND connected. ALWAYS CONNECT THE BATTERY VOLTAGE GROUND CONNECTION FIRST.

**Battery Voltage GROUND** should be connected to a reliable source of ground, preferably a DC ground bus bar.

**Battery Voltage + In** should be connected to nearby +12V bus bar.

**NOTE ABOUT FUSE:** The fuse on the alarm board protects the circuitry on the board. It does not protect against excess load created by your buzzer or bell. You should consider fusing this load separately, but not to exceed 5 amps. A spare 5 amp fuse is provided. Do not use fuses larger than 5 amps.

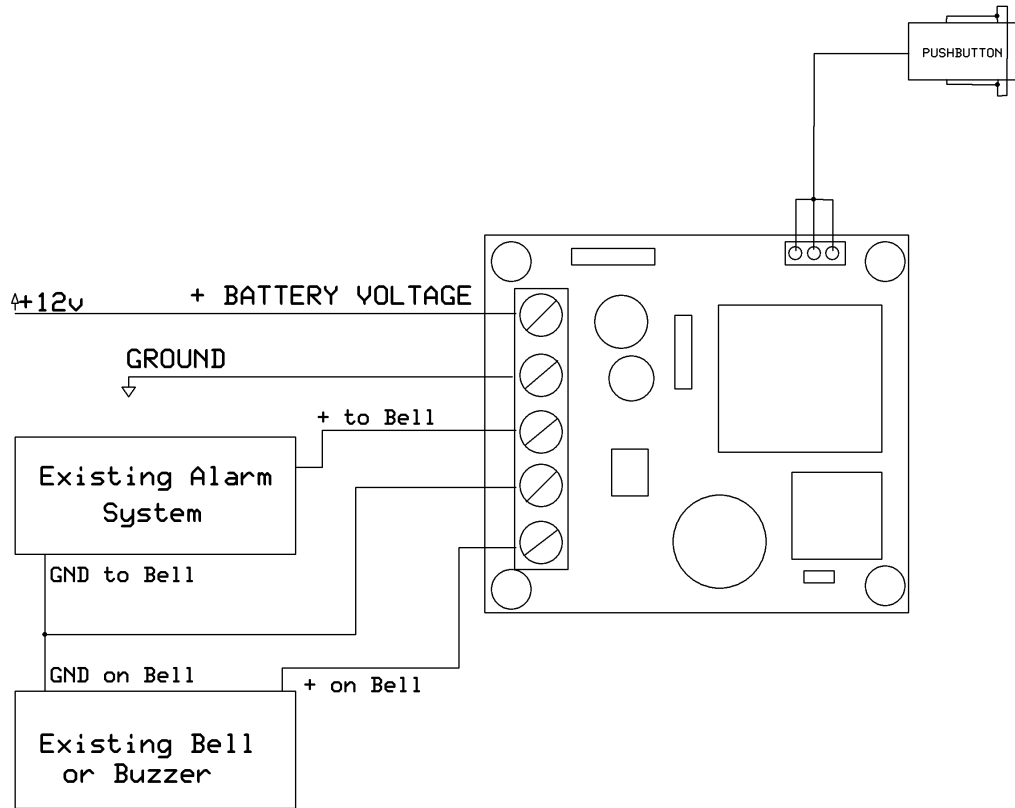
**OPTIONAL CONNECTIONS:**

An external, off-board buzzer or bell may be connected to the **Buzzer + OUT** and **BUZZER GROUND OUT** terminals. You are advised to fuse the external buzzer or bell appropriately.

**WIRING IN SERIES WITH OTHER ALARMS:**

An existing engine or other alarm bell or buzzer may be used with the Low Voltage Alarm and Relay board allowing either your existing alarm or the low voltage alarm to sound your existing bell or buzzer.

The positive and ground leads running from your existing alarm system to your existing bell or buzzer would be intercepted by the low voltage alarm as illustrated below. When using an off-board buzzer or bell, you may wish to deactivate the on-board buzzer by removing the red pull-tab jumper. The jumper may be stored by placing it over just one of the two pins it normally connects to.



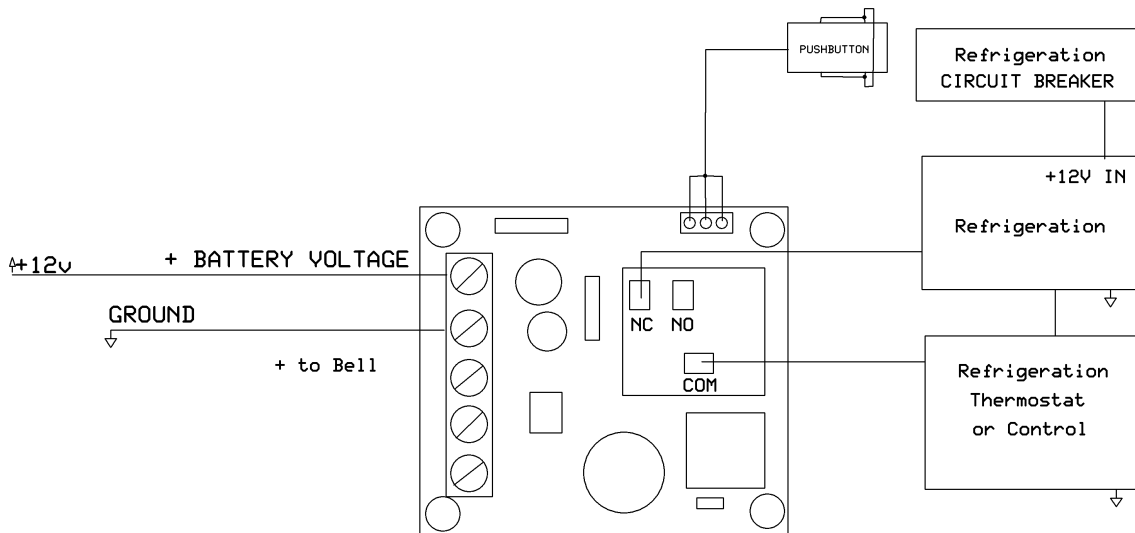
**HIGH CURRENT RELAY:**

The high current relay can disconnect loads such as 12V refrigeration to protect against further battery discharge or connect circuits such as a remote generator controller to recharge the boat's batteries. (Unattended engine or generator operation is not advised).

The high current relay is activated 30 seconds after the visual alert of a low voltage condition (15 seconds after the audible alert).

**DISCONNECTING LOADS AFTER LOW VOLTAGE ALARM:** Once activated, the Normally Closed and Common contacts are disconnected. A load up to 30 amps may be turned off using these connections. The illustration below shows how a refrigeration system might be disconnected.

Always use the lowest current method possible. In other words, do not attempt to disconnect the main power wire between the circuit breaker and the refrigeration system, rather, disconnect the lower current thermostatic control wire. This will allow you to run smaller gauge wires and prevent any unnecessary current loss.



**CONNECTING LOADS AFTER LOW VOLTAGE ALARM:** Once activated, the Normally Open and Common contacts are connected. A load up to 30 amps may be turned on using these connections. Below is an example of such a circuit. Your own creativity is the only limit!

