Use of Electric pumps, batteries and solar charging on Victorys. Guidance for owners

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Background and status of this document:

Following 2 incidents in the 2017 racing season, resulting in minor fires and smoke damage to boats on moorings, the Class directors issue this guidance to Owners to assist them in ensuring a safe installation of electric bilge pumps and associated battery charging equipment.

This guidance is based on generally available information and practical experience within the Class. The Directors take no responsibility for any omissions or for incidents or damage involving the use of electrical equipment on Victorys. It remains the Owners responsibility to ensure a safe and compliant installation, and if they have any doubt the Owner should consult with a qualified Marine Electrical Engineer. Examples and specifications given below are based ONLY on current 'Good Practice' as seen in the class.

Class Rules that apply:

5.10.14 Battery Operated Bilge Pump *may be fitted to boats and used whilst racing. Batteries used shall be of Fully Sealed type and may be placed anywhere in the boat. A photovoltaic panel may be used to supplement the power drain of the battery.*
The Class recommends that:-

- *Pumps should have a minimum pumping capacity of 1925 litres per hour, be fully automatic, and securely fixed to the hull of the boat.*
- *Batteries are not placed below the floorboards due to the risk of short circuit in the event that they become immersed*

Batteries are not part of the 'sailing weight, rule 6.6.5 c refers

Note: the installation of an electric pump does not remove the need for a manual bilge pump to be fitted if specified as an item of mandatory equipment (rule 6.1 refers)

Appropriate usage of electric pumps

The class rule to allow battery operated bilge pumps was intended to allow use whist racing. Two sinkings which occurred due to boats racing in rough conditions, shipping significant water upwind and then broaching out of control downwind prior to the crew being able to remove the water led to the rule being added. The class **recommends** that any Victory of any construction considers fitting an automatically operated electric bilge pump for use while racing.

Any electrical installation in an open boat such as the Victory should be considered as likely to fail at some point. The class recommends that owners **DO NOT** rely on electric bilge pumps to keep their boats afloat when unattended on moorings, be they swinging or marina berths. If your Victory cannot remain unattended for a reasonable length of time (circa 7 days) without reaching the point of sinking if not pumped, then you should take steps to fix the leaks. Reliance on an electric pump is not recommended. At least one class insurer is considering excluding cover for unattended sinking due to electric pump failure.

Minimum Specifications/Recommended types of pumping equipment (Examples of current types in Appendix A)

Pumps:

1500 litres /hour capacity is the current **recommended** minimum capacity. Victorys can ship significant water when racing and smaller 500 and 750 l/hr pumps are likely to fail more frequently in constant use.

Float/Automatic switches:

Mechanical float switches are prone to failure due to the significant movement of boat and water in rough conditions. Solid state electronic float switches are **recommended.**

Integrated pump and automatic switches (typically 'Rule' pumps at time of writing) would appear to be more prone to failure then separate switches and pumps. Separation also allows replacement of one part rather then all. The class **recommends** installation of a separate Pump and switch.

Minimum Specifications/Recommended Batteries (Examples of current types in Appendix A)

Class rules **require** batteries to be Fully Sealed.

The class **recommends** use of a minimum 18 – 20 amp hour 12v battery for running electric bilge pumps whilst racing. This provides a balance of capacity verses battery size and weight. Batteries typically intended for Jet Ski installations are in this category.

Batteries to support 24/7 pumping on moorings should be sized specifically based on the power draw of the pump and the frequency or capacity of any charging arrangements. They will inevitably need to be of a larger capacity then if used only when racing.

Minimum Specifications/Recommendations for Solar charging:

Solar charging removes the need to transport batteries to and from the boat and may allow a more robust battery installation by removing the need for repeated connection/disconnection. The solar charging capacity required needs calculation based on battery and panel capacity and assumptions on usage and charging time. An **example** is given below from a current Victory installation (where the bilge pump is NOT left on while the boat is moored). **Net is that a 5w solar panel** should be sufficient to maintain a battery for use during weekly Victory racing, **but owners should validate the assumptions for their own boat.**

Power drain;

9 hours turned on per week (three races) on @ say 25% pump on time = 2.25 hours running

2.25 hours at 4.8 amps current draw for specified pump = 10.8 amp hours per week

Charging:

12v at 5 watts panel capacity = 0.42 amps

Assume 8 hours per day charging. Assume 50% panel capacity achieved across the time...

0.21amp * 8 hours * 7 days = 11.76 amp hours per week.

Result- battery maintains full charge

Note that this installation uses an 18 amp/hr battery and hence the battery maintains a significant percentage of at all times

It is useful to compare this to potential maximum usage, which would typically occur during Cowes Week, as follows:

In Cowes week …

7 days @ 4 hours per day @25% pump time = 33.6 Amp hours

Same charging as above.. net 11.76 -33.6 = 21.84 amp hours…

So in theory the battery will be depleted by greater then 50% by the end of Cowes Week if fully charged at the start. In practice the battery normally covers the week if its in good condition. The figures assumed are likely conservative/worst case

Solar panels to support batteries running 24/7 pumping on moorings should be sized specifically based on the power draw of the pump and size of battery, together with assumptions on actual panel capacity achieved. They will inevitably need to be of a higher wattage capacity then if used to support a 'racing only' battery

Installation Recommendations – Solar Charging Side

The charging side of the system comprises:

Solar panel: A robust type that can withstand accidentally being trodden on is recommended. Solar panels may be best placed on the aft deck behind the rudder post where there is less chance of damage.

Solar Regulator/controller: This is ESSENTIAL. A solar regulator is a small box consisting of solid state circuitry that is placed between the solar panel and the battery. Its function is to regulate the amount of charge coming from the panel that flows into the battery in order to avoid the batteries being overcharged, which could result in a fire risk. It should be placed as far away from bilge water as possible.

An inline fuse: On the positive feed wire to the battery. To ensure any failure/short on the charging side does not short out the battery – again a significant fire risk.

Where possible controllers, and other components /connections are best placed in aft lockers. In GRP boats care is needed not to compromise aft tank integrity with holes for wiring, and installation in a waterproof housing under the side seats may be an option

Installation Recommendations – Pump Side

The pump side of the system comprises:

Switch: A typical marine battery master switch on the positive feed line to the pump, to disconnect power to the pump and float switch. The recommendation is that this is securely mounted to bulkhead or battery box

An electric bilge pump: Mounted at the lowest practical point of the bilge, under floorboards to protect from damage

A float switch: Mounted in close proximity to the pump.

Float switch and pump should be placed carefully with their relative heights such that the float switch will turn off before the water has fallen below the level that the pump can lift. Otherwise the pump will remain running and may fail.

An inline fuse: On the positive feed wire to the pump, and placed as close to the battery as possible (ie as far away from water as possible)

Pump through hull outlet: It is recommended that this is positioned above the level of the thwart, to prevent this contributing to the sinking of the boat if it becomes very low in the water. If the outlet is lower a non-return valve should be fitted in the pipework between pump and outlet. If the through hull outlet is shared with another bilge pump of any type an additional non-return valve should be fitted to ensure no return of water to the bilge via the other pump.

Appropriate pipework: Of reinforced plastic hose secured with jubilee clips.

Installation Recommendations – Battery

Batteries: should be placed such that they will not be submerged under normal racing conditions. This typically requires installation in aft locker or similar position. Consideration should be given to enclosing the battery in a plastic battery box. A smaller battery of the 18-20 amp hour type, in a standard battery box, leaves enough space for other electronic components (eg regulator, switch , fuses etc) to be included in the battery box as a self contained unit.

Example equipment list in use in one installation in the class.

Panel:

https://www.marlec.co.uk/product/spectralite/?v=79cba1185463

Regulator:

https://www.qwsolutions.co.uk/solara-sr60ul--phocos-cm04-21-1212-p.asp

Battery:

https://www.tayna.co.uk/mobility-batteries/lucas/lslc18-12/

Pump:
https://www.force4.co.uk/rule-1500-submersible-bilge-pump-21galls-min.html

Float Switch:
https://www.asap-supplies.com/johnson-ultima-electronic-bilge-switch-508324

Appendix A: Typical wiring diagram example

To be added in later version.

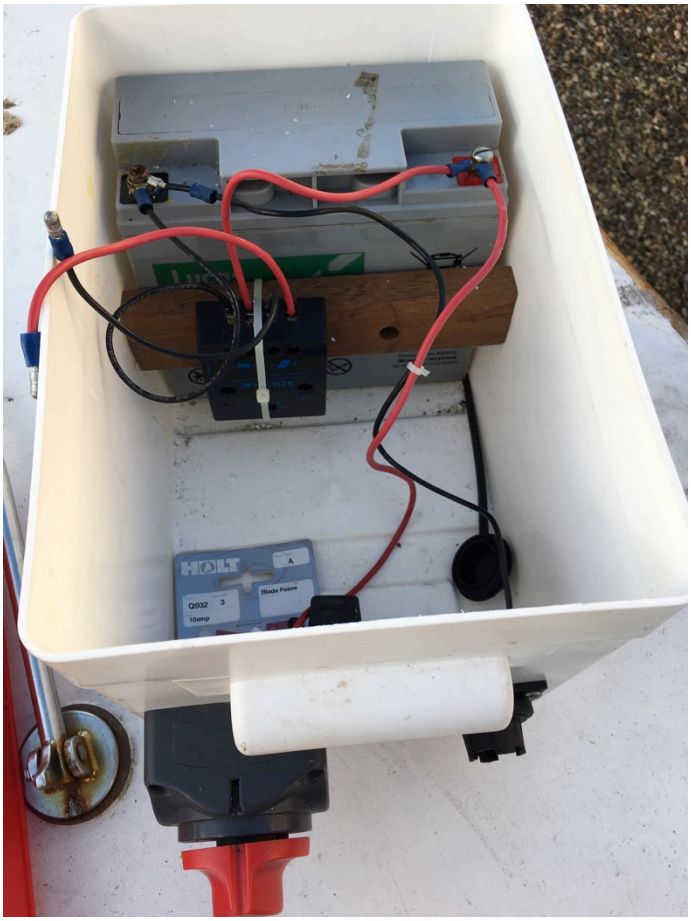
Appendix B: Photos of a current installation contained in a battery box.

Bilge Pump and separate solid state 'float' switch.

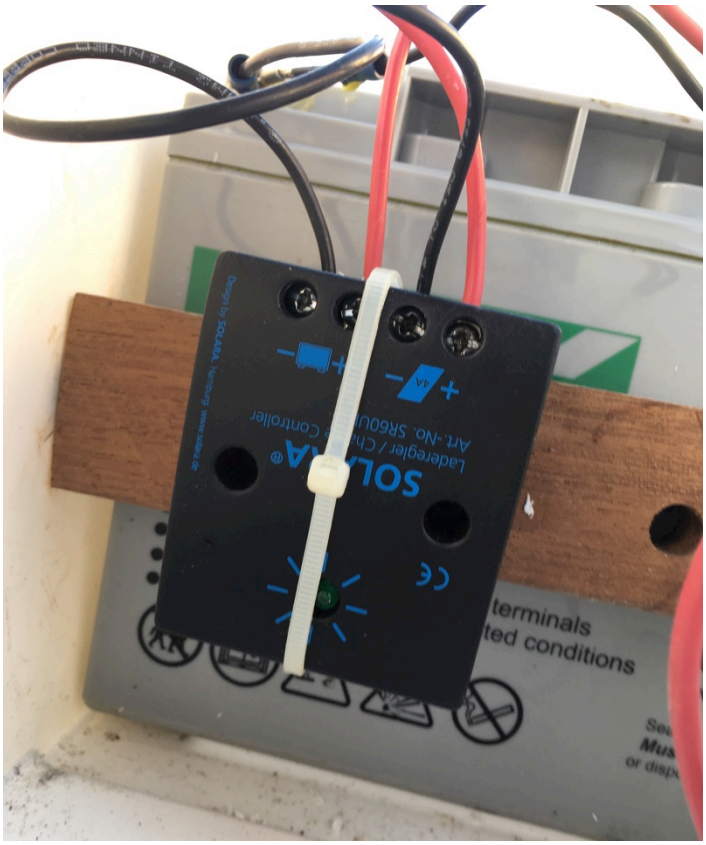
Bilge pump and separate solid state 'float' switch showing inline non return valve

Self contained Battery Box solution as installed in aft locker

External view



Battery box internal - battery and regulator



Typical voltage regulator

Solar panel installation

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