Planning Your Installation

Contents

1 The AptiVolt Microgrid

Autonnic manufactures a wide range of Low Voltage DC Management Modules under the AptiVolt trademark. These can be simply connected together to create complete and comprehensive battery charging systems.

The key component in AptiVolt's charging method is the use of a **microgrid** and AptiVolt's particular implementation is called the **AptiRail**. For all modules designed for charging, the AptiRail provides a common power access bus and the essential feature is that:

- each power source has its own Source Manager and
- each battery has its own Battery Regulator.

(For extra value and convenience, some Source Managers can be shared between two sources.) It is the whole assembly of Managers and Regulators and the AptiRail which makes up the complete battery charging installation.
A unique property of AptiVolt's solution is that AptiRail not only provides a connection for the transfer of power but that it communicates by means of its precise voltage how much power is available. The benefit is that Sources and Regulators can be assigned a Priority Level so that some sources will be used in preference to others and some batteries will be charged up before others.

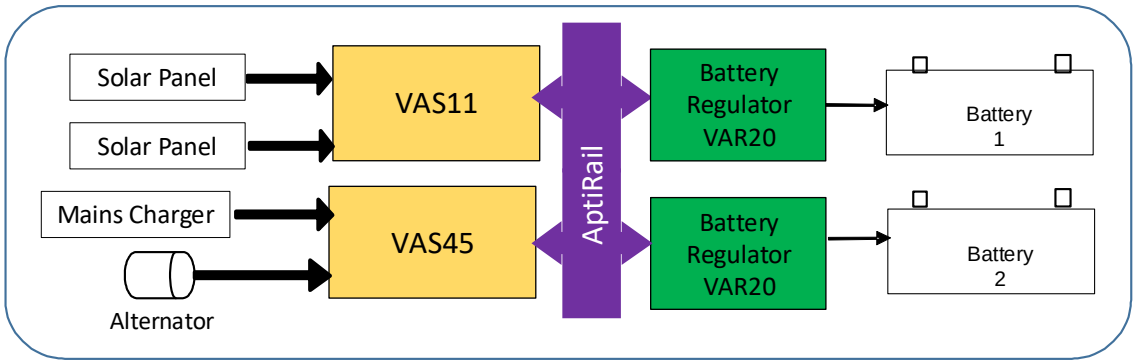

Fig 1

2 Strategic Considerations

The essential planning strategy is to identify all useable sources of charging power and then to identify all batteries together with an overview of where each is placed in the overall physical space.
Start with a plan of where all the parts are because only then will you be able to have a strategy for where to place each Module. For example, we show a typical mono-hull sailing boat in Fig 2.

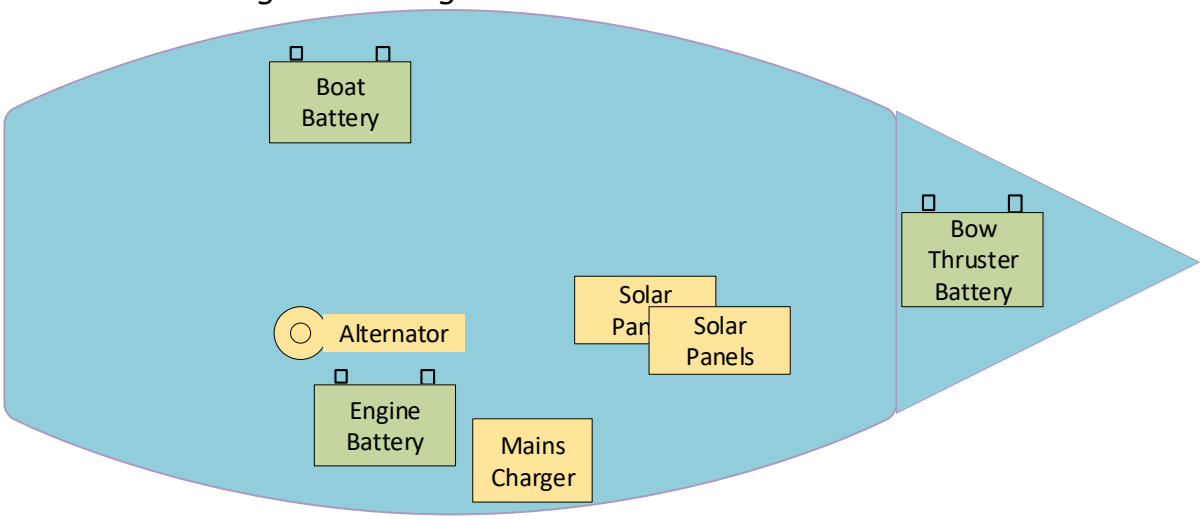

Fig 2

In this boat the owner has 4 sources of power: a couple of solar panels, an engine alternator and a mains battery charger. There are also 3 batteries: Engine, boat and bow-thruster.
Looking at the data-sheet for the AptiVolt modules suggests that to meet all the needs a collection of 5 modules can be used:
1 x VAS11 for the two solar panels – it will handle up to 340W in total and conveniently it has two inputs each of 170W maximum.
1 x VAS45 which also has two inputs. One can be used for the alternator and the other for the mains charger output which is already on the boat.
3 x VAR20 modules – one for each battery. These cannot be shared. Sometimes a battery is made of two or three connected in parallel but that is still only a single thing for charging purposes.

The next step is to plan where to place them all. The obvious thing to do would be to put all the modules together and wire the terminals to the sources and batteries – but that might not always be the most suitable. It would look like this:

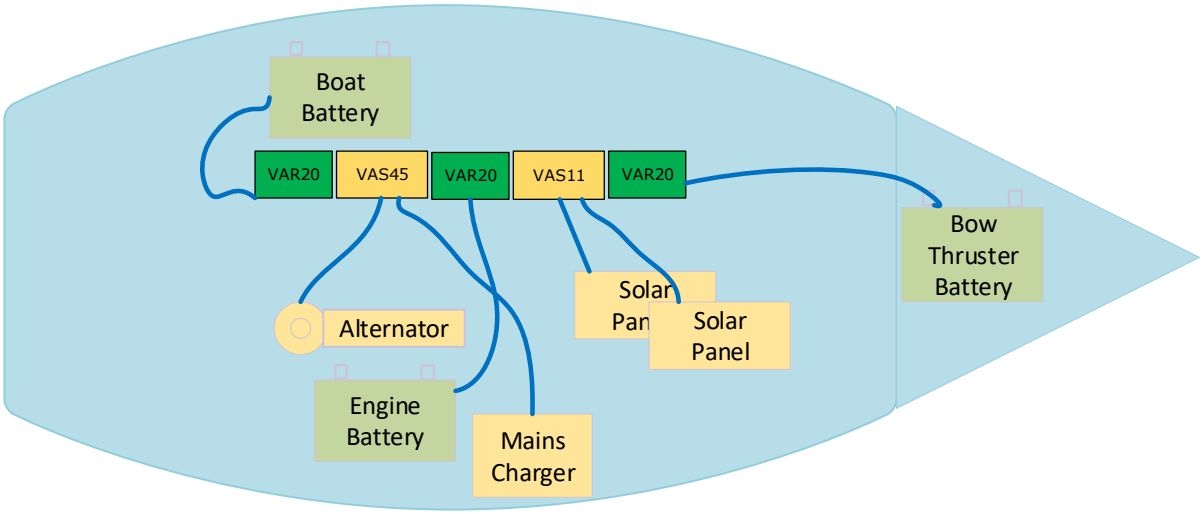

Fig 3

But it could be wired like this:

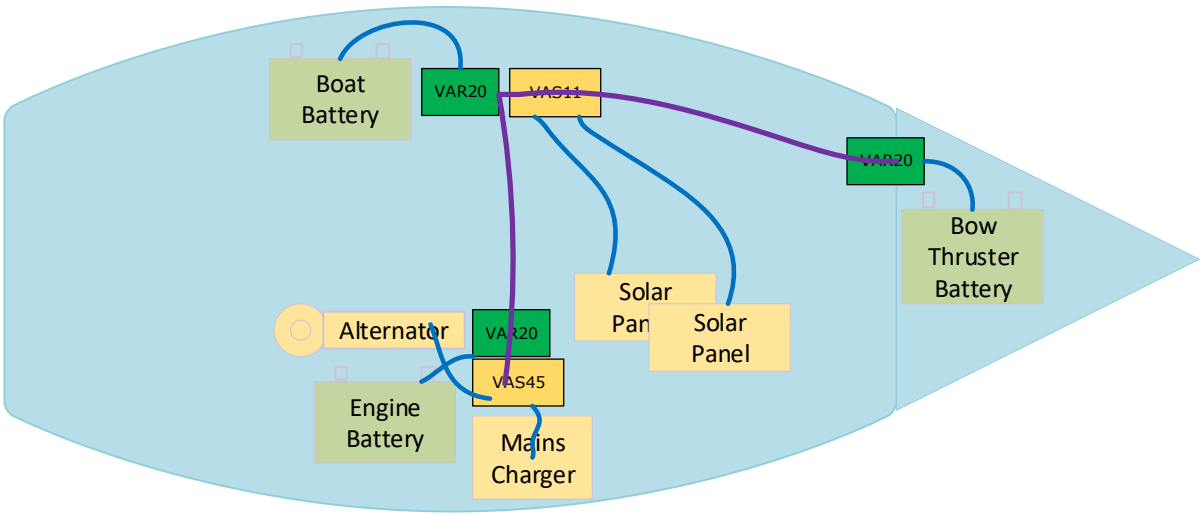

Fig 4

In this example the AptiRail itself is the joining wire between the groups of modules. The arrangement has resulted in a simpler installation with the temperature sensors for each of the Regulators having only a short wire directly to its VAR20s.

The intention of the above example was to show the flexibility and adaptability of the AptiVolt system and its potential to save wire and the time to install.

But to make a final placement decision, you need to look at tactics.

3 Tactical Considerations

3.1 Decisions about source and battery priorities.

Each device needs to be set to one of the three priority levels, but there are exceptions:

A VAS11 is always at the highest priory. Even if there are several they will all be at the highest level so that sunlight will always charge the batteries whenever it is available.

A VAS45 can be set to any one of the three levels but it is important to remember that this is the same for both inputs – you cannot have different priorities for each of the two inputs.
So while any VAS11 is always at the high priority, a VAS45 can be set to high, medium or low. A VAS45 set to medium will be used as the power source for charging even when power is available via another VAS45 which is set to a low priority. If you insist that the mains charger which is managed by a VAS45 is to have a lower priority to the alternator then you would need to install a separate VAS45 module for it.
In practice the two inputs to a VAS45 are likely to be non-conflicting in that it is most probable that the engine will run when the boat is not on a marina and that the boat will be plugged into shore power only when the engine is not running.
In addition, the internal operation of the VAS45 is such that, if there are two inputs with different voltages, the highest voltage source will be used. The practical implication is that the mains charger will be likely to have a higher voltage as the alternator regulator will limit its output. In any case there is no danger.

3.2 Placing the DIN rails

Every AptiVolt module needs a length of DIN rail to physically mount the device. On boats this should be of stainless steel or aluminium. The VAS11 modules require a length of 70mm and the VAR20 and VAS45 need 140mm. Always allow for another 70mm for an AptiLoop communications module to be added in later; it will make a valued contribution to the information about what is going on with your DC systems.

3.2.1 Thermal considerations

AptiVolt managers are not 100% efficient. Losses in the VAR20 and VAS45 modules amount to about 2% which at 250W can therefore be 5W. While there is no need for a fan, provision must be made for a good flow of air. We caution that:

- Each module *must* be mounted vertically
- Each *must* have a clear air inlet path below it
- Each *must* have a clear air outlet path above it
- Any collection of modules *should have good ventilation* and *not be in a box.*

3.2.2 Visibility of the displays

Every module has in informative display for showing its performance as well as for setting it up at installation time. We advise that each module is powered up, from a 12v source, and set-up using the front panel button and menu. Also, the button on the front panel provides a reset feature which you might need access at any time.

3.3 Wiring type and thickness

We advise that each VAR20 is wired to its battery with 6mm and that this wire is no longer than 3m. 4mm wire is acceptable but it will take longer to charge.
Aptivolt provides a table of wire thickness against distance for wiring the AptiRail. If the modules are together we provide busbars.
It is important to remember that AptiRail is rated at 60A so that if there are 3 sources and 3 battery regulators all operating at peak output any wiring needs to be rated to reduce the voltage drops – see the tables. But that is unlikely in a

charging arrangement – for example the AptiRail extension to a bow-thruster battery's VAR20 will never be required to deliver more than 15A when charging the battery at 20A. But it should be in thick wire so as not to drop volts and alter the system's priority voltage measurements.

3.4 Wiring path

3.4.1 Temperature sensor wiring

Each VAR20 is capable of using a battery temperature probe to modulate its output voltage according to the needs of the selected battery chemistry. Each VAR20 is supplied with the VAS00 sensor which has 3m of wire. If you do not fit it the module will use a value of battery temperature of 22°C for its charging algorithms but there is a disadvantage: the battery is likely to be under-charged in cold weather.
The wire may be extended and for this you do not need thick wire – any wire will do but take care not to connect any part of the wire to anything else. The two wires are not polarised as it uses resistive sensing.

3.4.2 AptiLoop wiring

In any installation we advise that a wire is threaded through the AptiLoop features of each module ready for the time that a Loop Monitor might be installed. It is much easier to do this when putting in the other wiring rather than doing it later especially in a distributed placement such as shown in Fig 4.

4 Ordering

Once you have done the placing plan you can order all the parts.
Note that:

- In some markets kits are excellent value
- Each VAR20 comes with a VAS00 temperature sensor
- Each VAR20, VAS11 and VAS45 comes with 2 AptiRail links but you may need more either long or short
- Remember to order DIN rail
- Remember to order wire to connect to the sources and the batteries.

end