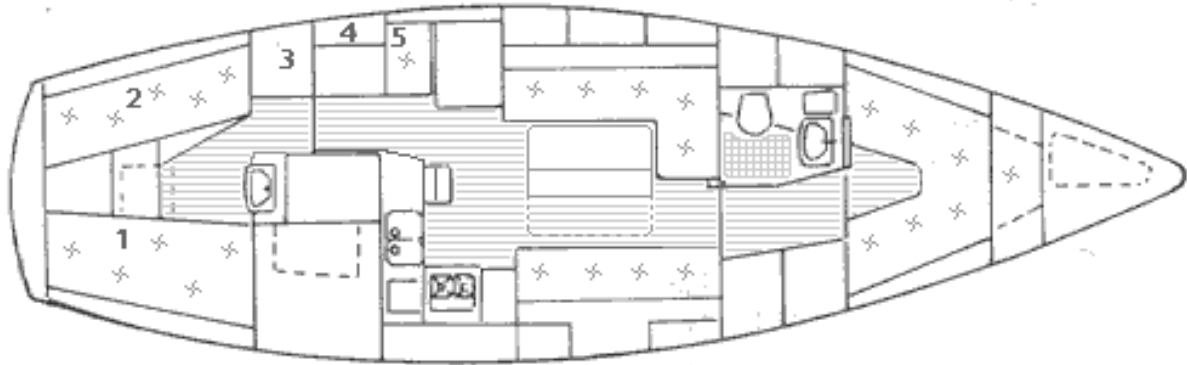


Description of the Electrical System

General

The diagram has a top - down structure. On top the two battery banks are shown, which are located under the two sleeping bunks in the aft cabin (1 and 2 in the lay out figure).



Hallberg Rassey 38 lay out

The service battery is a very powerful bank of six 100 Ah 12V gel batteries, connected in parallel. The starter battery is a single 100Ah 12V gel type battery. The service battery bank has his negative side connected to the system via a 500A shunt, so all currents, charging and discharging can be monitored by a battery monitor. This monitor shows these currents, both battery voltages and, what is very important: the remaining capacity in the service battery bank.

Both battery banks can be fully isolated from the system by the two main switches MS1 and MS2. These switches can be switched off when it is necessary to have a "dead ship" e.g. when someone is working on the system's wiring, when batteries has to be renewed and taken off the ship or when a battery gets broken but has to stay in his place. This battery should then be isolated by switching off the main switch. Be aware to first switch off the faulty battery and to fully take off the switch handle from this switch before closing the emergency switch. The function of the faulty battery is taken over by the other bank via the emergency switch ES. Normally this ES stays open, leaving the two battery banks fully independent. This means that the service bank can be used without affecting the capacity of the starter battery.

When the two main switches are switched on, 12V is connected to the two main power rails. The primary 12V service rail, the 12V starter rail and the rail taking all the common connections are thick copper strips with strong stainless connector bolts, placed at the side of the starter battery box. The three switches, MS1, MS2 and ES are placed down left in the port side closet (number 3 in the lay out figure), next to the aft cabin. The one next to the aisle is the switch for the starter circuit (MS1), the middle one is switching the service circuit (MS2) and the one far down in the corner is the emergency switch (ES).



Batteries and instruments under port side bunk

- 1 = starter battery
- 2 = service battery bank
- 3 = common rail
- 4 = main 12V service rail
- 5 = main 12V starter rail
- 6 = MS1
- 7 = MS2
- 8 = ES
- 9 = Sterling charger starter battery shunt
- 10 = battery monitor shunt
- 11 = fuses shore power charger
- 12 = main fuse service battery
- 13 = fuse Sterling charger
- 14 = solar regulator
- 15 = fuse wind generator

Starter battery circuit

The main function of the starter battery is to store and deliver the energy needed to start the diesel engine. The starter motor is engaged by closing the starting relay. This circuit is drawn just under the starter battery. The starting relay is triggered by turning the starter key on the engine instrument panel. This panel is also powered by the starter battery, via a 50A fuse, and is shown at the downside of the circuit diagram.

When you look down the 12V starter rail you will find three other systems connected to it. All three are battery charging systems.

First the shore power system. This unit is powerful and very intelligent. It is able to charge four battery banks, but only two outputs are used. The first output has the highest priority and is connected to the service battery bank. The idea behind this choice is the fact that, once connected to shore power, the main concern is to get the big service battery fully charged. When this is done, the charger puts the service battery on a floating voltage and starts to charge the starter battery. The two charging wires are fused by a double 60A automatic fuse. This fuse is located next to the battery banks.

The second charging unit is the Sterling Alternator-Battery Charger. This charger is the ultimate instrument for this job, being a fully computer controlled multi-stage split-charge system. The alternator current and starter battery charging current are measured by means of two shunts. The charging current of the service battery bank is computed as the difference of the two measured currents. The charger is protected by a 120A fuse in the common return line. When the engine and the alternator are not running, the unit is not active and does not draw any current from the batteries. The shore power unit and the Sterling charger are placed in the port side closet (3), next to the aft cabin.

The third charging system consists of four solar panels, connected to the battery banks by a regulator. This regulator has a double output for two battery banks. The regulator is fused by a small fuse placed in the unit itself which is situated under the port side bunk (2) in the aft cabin, outside the service battery box.



Instruments in closet (2)

- 1 = shore power charger
- 2 = Sterling 2kW converter
- 3 = Sterling alternator- battery charger and on the left side: the alternator shunt
- 4 = starter battery main switch MS1
- 5 = service battery main switch MS2
- 6 = emergency switch ES

Service battery circuit

The service battery circuit is the main 12V electrical circuit, going fully around the ship, powering all 12V systems. The diagram, drawn above, is restricted by showing only the most powerful loads, leaving the small loads in one box placed at the downside of the diagram. Almost all of this small loads are fused and switched on/off by the panel on the back side of the navigational seat (5).

The line in the diagram representing the primary 12V service rail is zig-zagging down from MS2 to the solar regulator. Going down from MS2 you will see the same charging units connected to this rail as mentioned before. First the shore power charger and the Sterling charger are drawn. In between the lines

drawn from this two chargers you see the automatic bilge pump. This is the only load staying under power when the main load switch MS3 is switched off. When the boat is left in the water for a long period and all loads are switched off by means of MS3, the automatic bilge pump remains active to protect the boat against any leaking water coming in. Normally this is a very small amount of power and the solar cells or the wind generator deliver enough power to compensate for the bilge pump load.

The wind generator is the fourth charging system on board. The power lines from the wind generator are placed under and along the port side bunk in the aft cabin (2). There you will find the 50A fuse also, which protects against a shortcut in the connection with the generator. The wind generator switch is located in the small closet (4) in between the bigger closet (3) and the navigation corner. When this switch is in the off position 2, the wind generator is shorted to stop the generator turning. The output from the wind generator is connected at the "wrong" side (load side) from the 225A fuse. The reason is to save a cable going back to the 225A fuse which is located next to the battery banks under the bunk (2). Beside, this will not harm the wind generator because this type of generator can be shortcuted, as actually is done by the switch in the off position.



Instruments in the small closet (4)

- 1 = control panel Sterling 2kW converter
- 2 = control panel Sterling alternator-battery charger
- 3 = Victron battery monitor
- 4 = on/off switch electrical heater boiler
- 5 = 220V outlet converter
- 6 = on/off switch wind generator
- 7 = automatic fuse anchor winch
- 8 = main switch anchor winch MS AW
- 9 = main switch loads service battery MS3

Down the service 12V line, the main switch MS3 is placed. This switch separates the charging units from the loading devices. This switch is placed in the small closet (4) as is shown in the picture above. The anchor winch has its own main switch, because this winch has to be switched off while sailing and, in that situation, can not unwillingly be activated by some one working the sails on the fore deck. An anchor winch is easily overloaded and a 100A automatic fuse is used to protect the winch. When this fuse switches off, one has to wait a while before switching it on again, giving the switch and the winch some time to cool down.

The small loads are fused as one group by a 150A fuse, placed behind the control panel at the back side from the navigational seat. Behind this panel you will find also the 12V rail connecting the small loads to the service battery. A diagram for the small loads can be found in the general HR38 handbook.

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