

User manual for

Maja

a 30 foot Fisher motor sailer



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Introduction

Maja is a Fisher 30 motor sailer from 1978. It has registration number RAD122 and the MMSI number is 257564850. It has hull number 158, molded into the side of the boat and visible inside the anchor rope locker at the back (Figure 1).

This description will give an overview of how to operate the boat and fix simple problems. This description only gives an overview of how the instruments work, for details see the manuals. They are placed all together in a blue large folder in the cupboard in the dog house, except manuals for chart plotter, VHF and autopilot which are placed on shelf for the instruments next to the VHF. The log book is also placed here. It must be used for every trip.



Figure 1 Hull number

Start and stop

Procedure to start motor

- Turn on battery 1 (see Figure 2).
- Turn gas handle 45 degrees forward while pushing in the center button (to avoid that the gear is engaged).
- Turn the ignition key to start, the alarms should now sound since the motor is not running.
- Turn the ignition key to heating, leave for 5- 10 sec, then turn to start.

- Connect all batteries (all switches to 'all') so all batteries will be charged, NEVER run motor without batteries.
- Turn gas handle back to neutral (right up).
- Engage the motor forwards or backwards.
- Run for a few minutes with about 1300 rpm to warm up motor (until motor temperature reaches blue area).
- Use normal operating speed if desired, about 1500 rpm for 5 knots. Around 2000 rpm is also fine, seep around 6 knots. Some propeller vibrations (cavitations is felt above 2000 rpm).

It is possible to start with battery 1, 2, 3 and 5 but not 4 since it is the bow thruster battery in the front, so it has a long cable.



Figure 2 Switches for batteries. Battery 1-2 on top switch, 3-4 on middle switch and 5 on bottom switch. Between the two top switches is seen the main 200A automatic fuse which work on all the batteries.

Procedure to stop motor

- Put motor in neutral, let it idle for a minute.
- Stop motor by turning key all the way to the left.

- Turn key back to the middle.

Start of electric systems

- Turn VHF on with knob on volume control on VHF.
- Turn wind vane, AIS and GPS for VHF on with contact marked 'Instr' (lower left, see Figure 3).
- If dark, turn on navigation light with 'Nav', will turn on red, green and white light in the back. If under motor, also turn on masthead light (right switch), located halfway up the main mast and lighting forwards.
-



Figure 3 Left part of instrument panel. Left round switch is for heating. ComNav is the auto pilot. Above the log is seen the dimmer for the compass light. The windlass is for the front winch. The mechanical log to the right does not work, the drive cable is missing.

While running

- Have a look at the instrument panel periodically to check that all measures (oil pressure (around 3-4), motor temperature (80-90) and voltage (13-14) are within acceptable ranges, see Figure 4).
- Check that cooling water comes out of the exhaust pipe (back, left side).
- Check that cooling water comes out of the cooling water air vent (small outlet at the back on right hand side).



Figure 4 Motor instrument panel. When key is turned, before motor runs, only the battery light will be on. It turns off when the motor is running.

VHF

The VHF (Figure 5) normally operates on channel 16, the distress and call channel. The call sign of the radio is LL 9795 and the MMSI number is 257564850. For call to a coast radio, a working channel must be used, see map in log book for call channels of coastal stations.

- Select channel, either by turning channel wheel or using arrows on then microphone.
- Transmit to coast radio by pressing button on microphone. E.g. “Rogaland radio, this is Maja, Lima Lima 9795 on channel 25”.
- Wait for response from coastal radio.

Since the VHF has a built in GPS and AIS receivers, it can show SOG and COG and location of other ships with AIS, independently of the plotter. To cycle through the two main displays, press AIS button.

The AIS display shows a small map (no contours) with North up. The arrow in the middle shows which way the boat is moving. The two rings show the distance to the boat, often at 5 and 10 miles (easy to change with the soft keys (keys with a ‘-’). Other boats with AIS will be shown with a small dot with a direction arrow to show in which direction they move. A list of the boats with names, CPA etc can be displayed with the soft keys (see manual), but it is easier on the plotter.

It is also possible to call using SelCall, a digital service. The simplest way is to use the AIS display, see VHF manual.

When the distress button is pressed, the name and number of Maja as well as the position is set on an emergency channel to other boats with SelCall as well as the coast radio. If the coast radio has received the signal, it will call back. To receive a SelCall, press the big round button when the signal sounds.

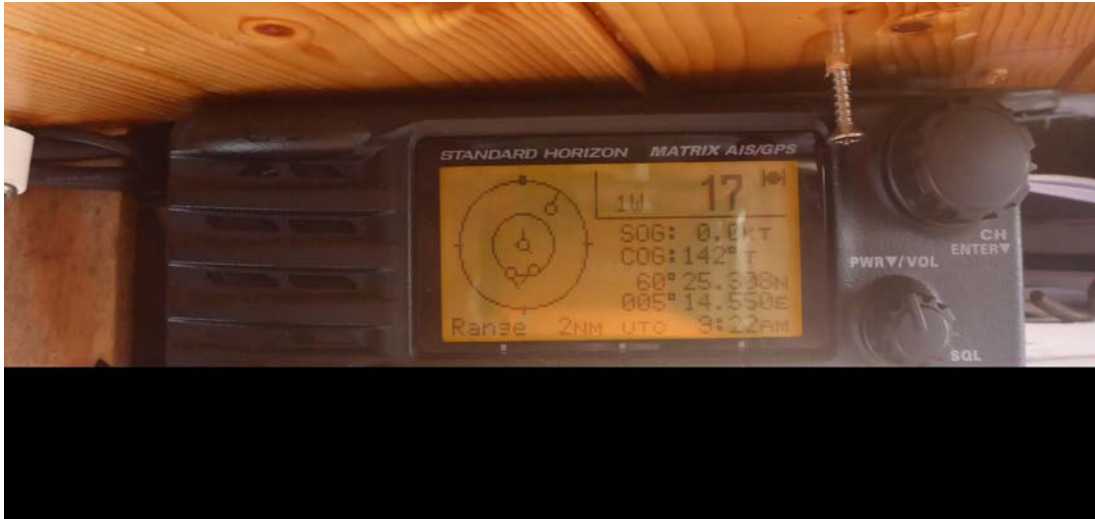


Figure 5 VHF. Note the red button under the lid for distress call. The screen is showing the AIS screen as well as navigational information.

There is also a handheld VHF. It is in the cradle near the window on the left hand side. Normally it is stored in the cupboard in the dog house. Breaker VHF2 must be turned on for it to charge (green light).

Emergency

- Use VHF, see above.
- Flares are located below on large shelf in left side of dog house (round red box).
- Life raft is located behind the mast.
- In case of broken windows, wooden covers can be put on, see Figure 49. The doghouse can be closed to the cockpit with sliding boards, located next to the stairs, behind the stairs and under the right hand side bunk in the saloon. The doghouse can also be closed off from the saloon with sliding boards found at the same places.

IsatPhone PRO: Number 00870 776 40 73 69, sim number: 898 709 910 416 140 969

Heating

Motor running

When the more is running, heating by hot air can be used starting the air blower on instrument panel (Figure 3). It is marked with heater and has 3 speeds. The air is blowing out for

defrosting windows in dog house, at the floor of the dog house, under saloon table and in the toilet.

Oven

The oven is located next to the sink. It is a diesel burner and gets its oil from the spare tank in the dog house (rear left corner).

Start

- Turn on the main diesel line, valve just behind the oven on the oil regulator.
- Remove lid from oven.
- Pour in a 'drink' ethanol (found in lowest cupboard next to oven).
- Turn on heater with rotary switch on oven oil regulator, regulator at lowest level (just after start).
- Light with a match and replace lid. In unfavorable wind conditions, the fire goes out quickly, try again. It can be seen if the fire is on looking through the small hole in the cover.
- If it starts burning ok, the heating can increase after a few minutes.
- Do not use the maximum setting, the oven might be red hot.

Stop

- Turn off on the rotary regulator and the main oil valve.

The oven can often not be used under sail since the sail might press air down the chimney and the smoke comes out in the cabin. This can also happen without sail in special wind conditions. An oven can produce deadly CO if not enough oxygen is available and there is therefore a CO detector on the roof above the oven. The main oil valve has a fuse that will melt and block the arrival of oil if the temperature is very high. The amount of oil available for burning can be checked with the small window in the oil tank. The tank is automatically filled when the motor is running.

Water

The cold water tank is located under the bunk in front. It is filled by a filler cap on the deck in the front. Follow the level while filling on the level tube located near the front cabin. Do not fill with pressure since water then might overflow through the air tube into the front bunk. The tank holds approximately 100 l. The water is filtered and the filter is located below the sole of the front cabin. The filter is of type Pentek 5". The filter can be removed. If the filter gets blocked, the pumps will start to mostly pump air.

The hot water tank is located in the motor room, left side. It holds approximately 20 l. It is heated by the motor and keeps warm for about 24 hours.

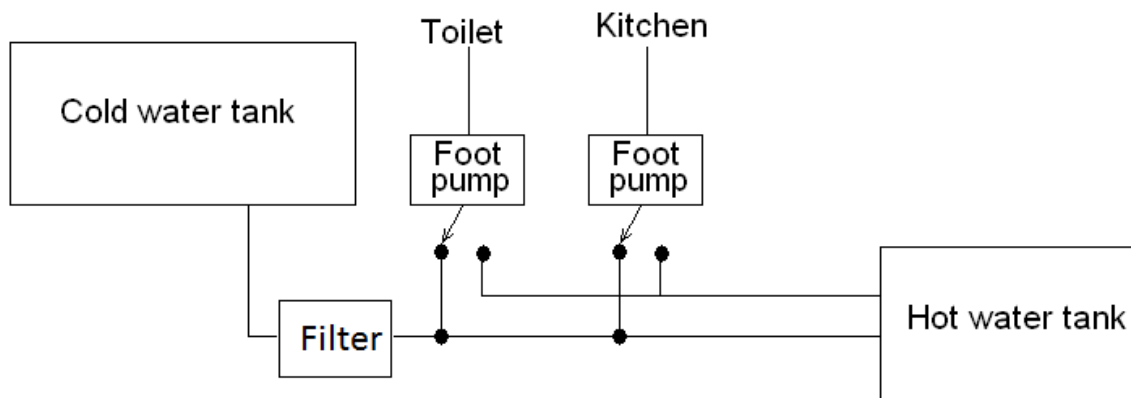


Figure 6 Fresh water system. The valve shown for toilet and kitchen can either be in warm or cold position and no mixing can be done.

The valve for hot and cold water in the kitchen is located above the oven, see Figure 7.



Figure 7 Location of valve for hot and cold water. The handle is in the warm position.

Gas

The most likely, cause of explosion on board is a leaking gas system. The gas is heavier than air and will sink to the bottom of the boat so it can also kill you. So be careful. The gas bottles are located in the gas locker just outside the doghouse, on the left. It is drained to the outside of the boat so if a bottle starts leaking the gas should drain outside the boat. If gas leaks into the main cabin, a gas detector will give an alarm. The detector is located under the stairs, is always on (green light) if the electricity is turn on, **SO DO NOT TURN OFF ELECTRICITY WHEN SLEEPING.** The gas system can be checked for leakage:

- Open gas bottle valve.
- Push the button on leak detector up, if any gas is leaking out of the system, bubbles will be seen (see Figure 9).
- Test leak detector by turning on the gas stove, bubbles should be seen.

There is room for 4 bottles (standard Canpingaz 2.75kg, R902) but only one is connected. Alternatively, 4 2kg Norwegian type bottles or 2 5kg bottles. Each has their own regulator. The 5kg gas bottles wedged in place with pieces of wood to avoid they are moving. The small bottles are in buckets so not getting in too much contact with the water coming in through the drain hole when moving in the waves. The schematics of the gas system is shown in Figure 8.

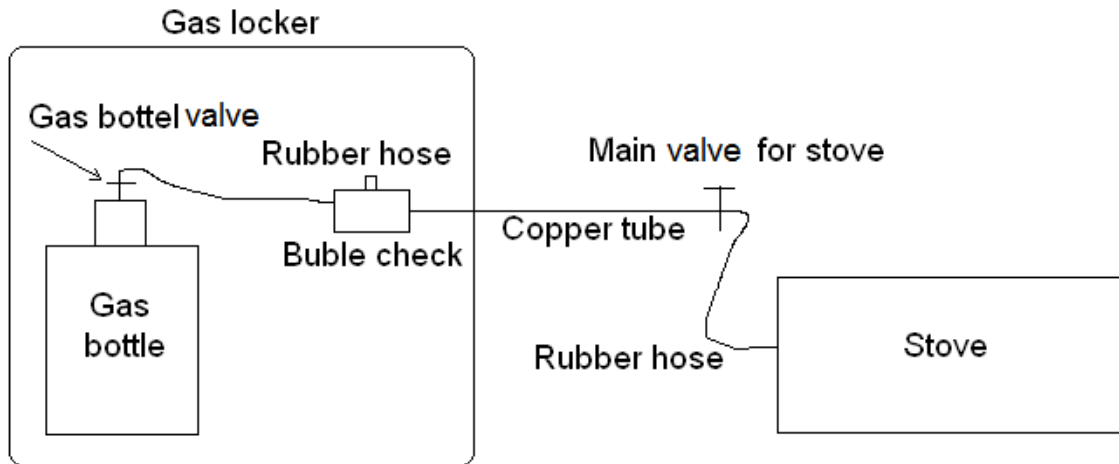


Figure 8 Schematics of the gas system



Figure 9 Gas room. In upper left hand corner is seen the leak detector. To the left is a 5kg bottle and to the right a 2kg bottle.

Operation

- Turn on gas in gas locker, valve on top of gas bottle.
- Close gas locker.
- Turn on gas in the locker under the bunk (see Figure 10)
- Turn gas handle for a burner, hold it in and light it with the red push button.
- Hold switch for a couple of seconds, if the gas blows out, the gas supply should be switch off to that burner.
- When not using the stove, turn off valve near stove.
- When sleeping or leaving the boat, turn of main valve in gas locker.



Figure 10 Gas switch just before the stove. The rubber tube goes to the stove. The figure shows the switch off position.

Steering and hydraulic system

The steering is hydraulic. It consists of a steering pump connected to the steering wheel and hydraulic hoses from the steering wheel to the steering cylinder, which actually turns the rudder. The steering pump has valves to that the wheel remains in a fixed position and thereby locks the position of the rudder. The autopilot pump is connected in parallel to the manual steering pump. Between the auto pilot pump and the steering pump, there is a rubber hose for airing the system and allowing return of hydraulic fluid.



Figure 11 Steering pump, seen from opening in saloon. The middle hose is for overflow from the auto pilot pump.

Tiller steering: Due to blocking valve in the auto pilot pump and the steering pump, the tiller cannot normally be moved. In order to move the tiller, the bypass valve under the seat in the cockpit (see Figure 12) must be opened. The fluid then passes through this valve when the tiller is moved. Neither the auto pilot nor the wheel steering can now be used since the hydraulic fluid would then pass through the bypass valve.



Figure 12 The handle of the bypass valve to change from tiller steering (rudder) to wheel steering (normal).

Maintenance: Once the system has been properly aired (see manufactures description) there should be no maintenance needed. It is possible that a bit of fluid must be added in case of a small leakage or because there is still some air in the system which has escaped. To check the fluid level, see the level in the reservoir (see Figure 13 and Figure 34). It should be about half full, if not add hydraulic fluid (found with oil in motor room).



Figure 13 Left: Steering wheel and hose to the hydraulic oil reservoir. Right: Reservoir for hydraulic oil, brown bottle with white cap.

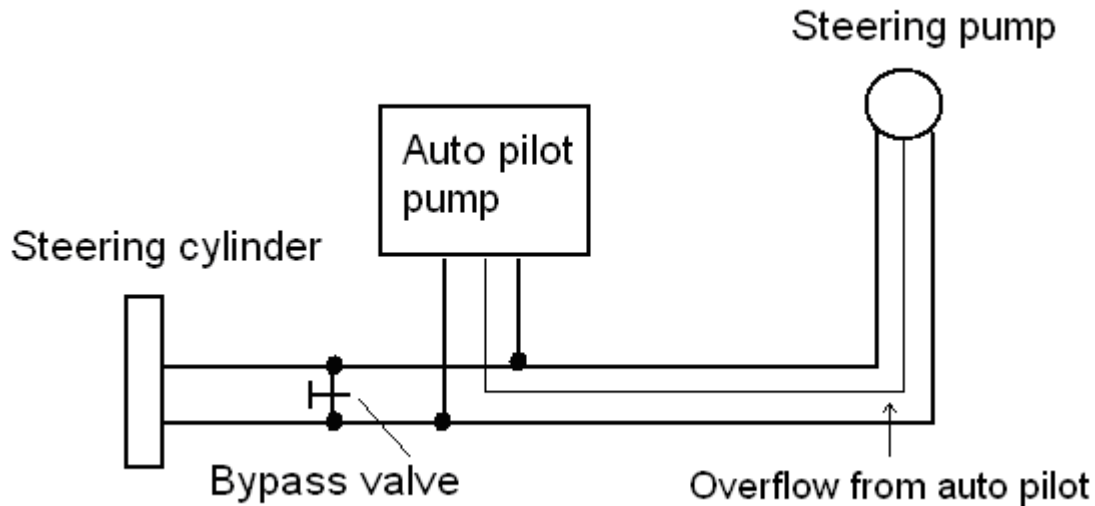


Figure 14 Schematics of hydraulic system.

Auto pilot

The auto pilot can either steer the boat at a given course or it can steer to a waypoint defined by the chart plotter. The control unit is located to the left on the instrument panel, see Figure 15.



Figure 15 Autopilot control unit.

To operate

- Steer boat in wanted direction: Press 'Pilot' and the boat will continue in same direction.
- Change course by 1 degree left or right by pressing red and green button, respectively
- Change course by a larger amount: Hold down green or red key until direction is correct, then press Pilot.
- Turn off by pressing 'Off'.

To steer to a waypoint, select a waypoint on the plotter and press NAV on auto pilot. See manual for more detail. If the hydraulic motor is working frequently, reduce the pilot sensitivity by holding down top middle button and pres top red button. To increase sensitivity, use the green button.

The control unit can be released from its holder and moved a few meters since it has a loose cable below. So it is possible to sit in the cockpit to control the auto pilot.

Diesel system

The diesel system seen in Figure 16. The system has a main tank of ca 150 l and a spare tank of about 18 l. Both tanks are made of wood covered by epoxy. The main tank is located between the doghouse and the cockpit in the motor room and the spare tank in the doghouse, left-back corner (Figure 17). The filler cap for the main tank is located on the right hand side of the boat on the step between the cockpit and the side. The filler cap for the spare tank is located on the left hand side of the cockpit. Only the main tank is filled up since the spare tank is filled up by the overflow from the motor.

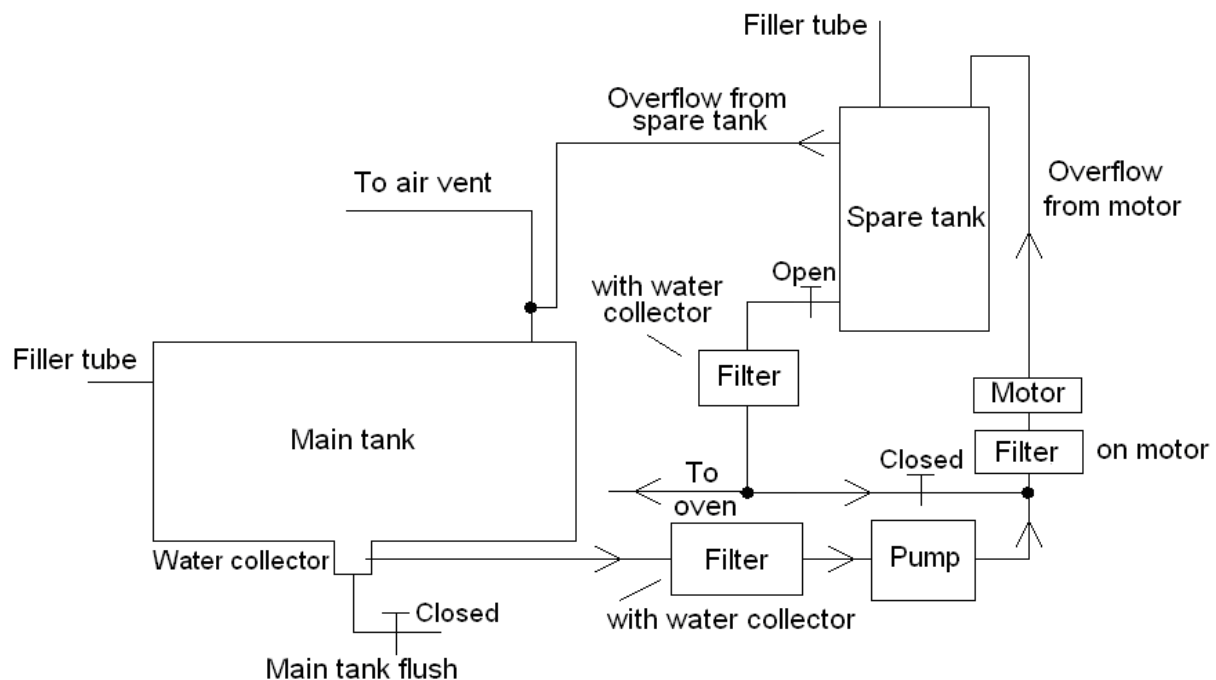


Figure 16 Schematics of diesel system. Valves are indicted by T's. Their normal positions are indicated.

The diesel flows from the main tank to first filter (located in motor room, see Figure 22), then to the electrical diesel pump (also has a filter inside) from where it goes to the fine filter before entering the motor. The overflow goes back to the spare tank which overflows to the main tank. Both tanks are aired through a tube ending up on the right hand side if the boat, just outside the cockpit.

The diesel in the spare tank is used directly for the oven. In case, the diesel pump stops or the main tank runs dry, the spare tank can also be used for the motor by opening the closed valve in the motor room (just behind the stairs, see Figure 17).



Figure 17 Left: Valve for diverting oil from the spare tank to the motor. The valve is shown in closed position (normal operation). Right: Spare diesel tank in cockpit. Notice the glass window showing the diesel level, normally it should be almost full.

Pumps

The boat has 5 pumps:

- Manual pump in the cockpit (water empties over the back right).
- Manual pump in the doghouse under the bench (water empties on deck just outside dog house, right hand side). A plug outside must be removed since in heavy weather, the water will enter here.
- Two electric pumps in the motor room (pump 1 back, pump 2 front). Water empties at the back, left hand side. The electric pumps are started with buttons on the instrument panel. **REMEMBER TO STOP WHEN FINISHED USING IT.** The electric pumps also have an internal float switch and will start automatically if the water level rises. This will happen also if the electricity is turned off since they are connected directly to a battery through a fuse (see Figure 36).
- Small electric pump with automatic switch. This pump is placed higher than the other pumps, under the floor in the locker under the cockpit. It will only be activated if the water is quite high. It also has a manual switch placed in the aft outside locker.

Pump 1 is connected to battery 2, pump 2 to battery 3 and pump 3 to battery 4. So that leaves battery 1 and 5 without power drain.

Motor

Oil

The motor uses synthetic oil, it can also use normal oil. The oil level is checked with the dip stick on the motor right hand side (remove right hand floor cover). The level should be near the top level. Spare oil is in the box near the motor. The oil is put in on top of the valve cover (Figure 18), remove middle floor cover to get access. Oil consumption should be less than 0.1 l in 100 hours so normally no oil is added between oil changes.



Figure 18 Top of motor: To the top is seen shiny lid for cooling liquid and to the lower right the black lid for the oil.

Cooling liquid

The cooling liquid level is checked by opening the cooling cover, on the left hand side of the top of the motor, see Figure 18. The level should be about 3 cm below the top, if higher the liquid is just thrown out. It will go to the box of the left side of the motor through the hose connected. Spare liquid is in the box to the right of the motor. Use long life liquid, usually red.

Gear box oil

The level of the gear box oil is checked with the dip stick on the left hand side of the gear box, see Figure 19. The level should be near the top mark. The gear box uses Dextron automatic transmission fluid (NOT MOTOR OIL) found in box to the right of the motor. The oil can be put in through the dipstick hole, else unscrew the large plug on the top middle of gear box. Be careful to push the dipstick all the way down so it is well seated since otherwise the oil might leak out. Normally the gear box should not use oil.



Figure 19 Gear box with dip stick (red left) and filler cap (big screw in the middle).

The previous gearbox has had trouble with oil leakage so a box is placed under it. It then it becomes apparent if there is a leakage and it also avoids getting oil in the bottom.

Cooling system

A sketch of the cooling system is shown in Figure 20. The sea water enters the cooling system in the bottom in the left side of the motor room, where also the shut off valve is located, see Figure 22.

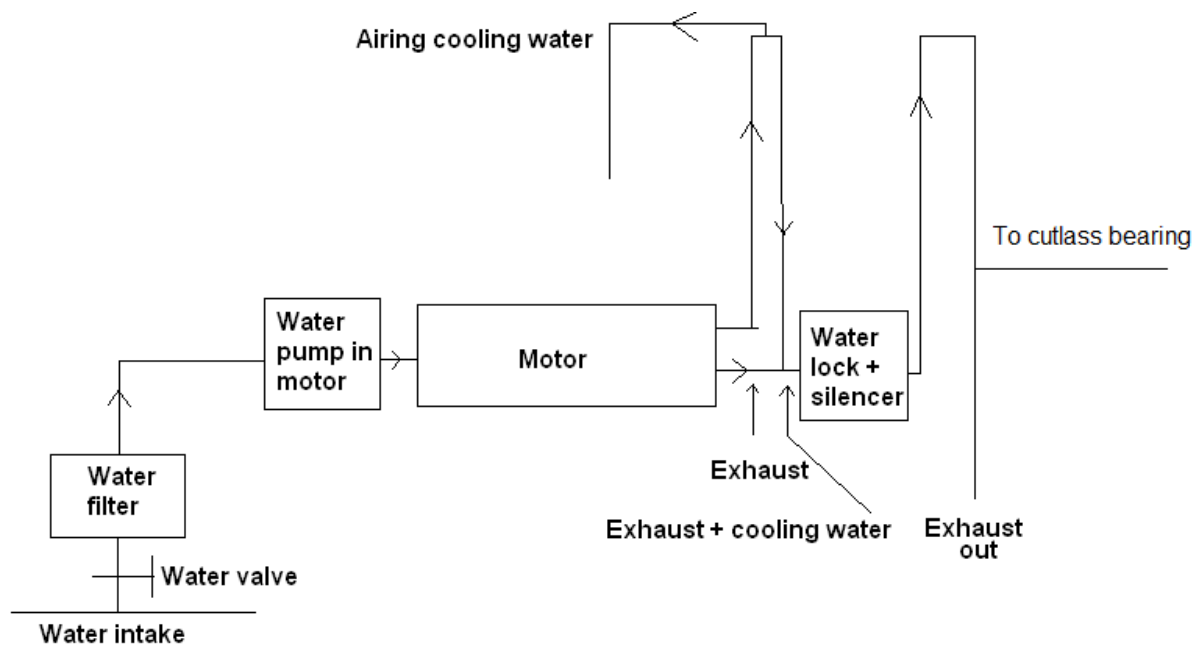


Figure 20 The motor cooling system. The arrows show the normal flow direction.

The water then enters the water filter (Figure 22) located above the sea level. It then goes to the water pump in the front of the motor (Figure 23), cools the motor and comes out as hot

water at the back of the motor. From there it enters a long loop putting it above the sea level before it enters the exhaust tube near the motor. At its highest point there is a small hose connected (Figure 20 and Figure 54) that will take away some of the water which comes out of the boat at the right hand side in the back (see Figure 55). The purpose of the hose is to make sure the cooling water hose is emptied when the motor stops so no water can be sucked back into the motor. In addition, water is pumped out in the stern tube to lubricate the cutlass bearing, see Figure 21.



Figure 21 The location of the hose (brown fitted into a black one) to the stern tube for pumping water to the cutlass bearing. The photo is taken from the storage room under the cockpit.



Figure 22 Bottom left of motor room. Top left shows the diesel filter and water separator, bottom left the water lock and silencer, top right the water filter, in the middle right the inlet water valve (red handle) and to the right the hot water tank. The small hose in the middle leaving to the right is a tube containing the cable for the log.

The exhaust hose also goes above sea level before it is emptied outside on right hand side of the boat at the back. Since this hose is large, it will empty out and no water will be left in the hose after its highest point. The water in the hose before the highest point will run back and accumulate in the combined water lock and silencer and thus not enter the motor. If water enters the motor it will run into the cylinders and the motor might be damaged. It is therefore important to make sure that water comes out of the airing hose when the motor runs since this indicates that it is not blocked.



Figure 23 Water pump. To the left is shown the pump and to the right the location of the trap door under the bunk in the saloon.

Toilet

To flush the toilet, put handle on top of pump to in left position (Figure 24) and pump out. To empty completely, put handle to the right and pump out all water. Leave handle in right hand position and twist and lock the pump handle. The pump needs greasing from time to time. The piston can be removed by twisting the handle anti clockwise. Cooking oil can then be put into the pump cylinder. Or it can be put in the bowel. Cooking oil in the cupboard above.



Figure 24 Left: Toilet and pump. Right: Two way valve for pumping out in either tank or sea. The sea water inlet is below the toilet.

The sea toilet can be emptied to the holding tank or to the sea directly, see Figure 24 and Figure 26).

Empty to sea: Put valve to sea (Figure 24). The valve trough the hull must be open, see Figure 25.

Empty to holding tank: Put valve to holding tank (Figure 24).

Valve 2 (red, Figure 26) is only open when the holding tank is emptied.



Figure 25 Valve from toilet to the sea. It is shown in the open position. To close, turn 90 degrees.

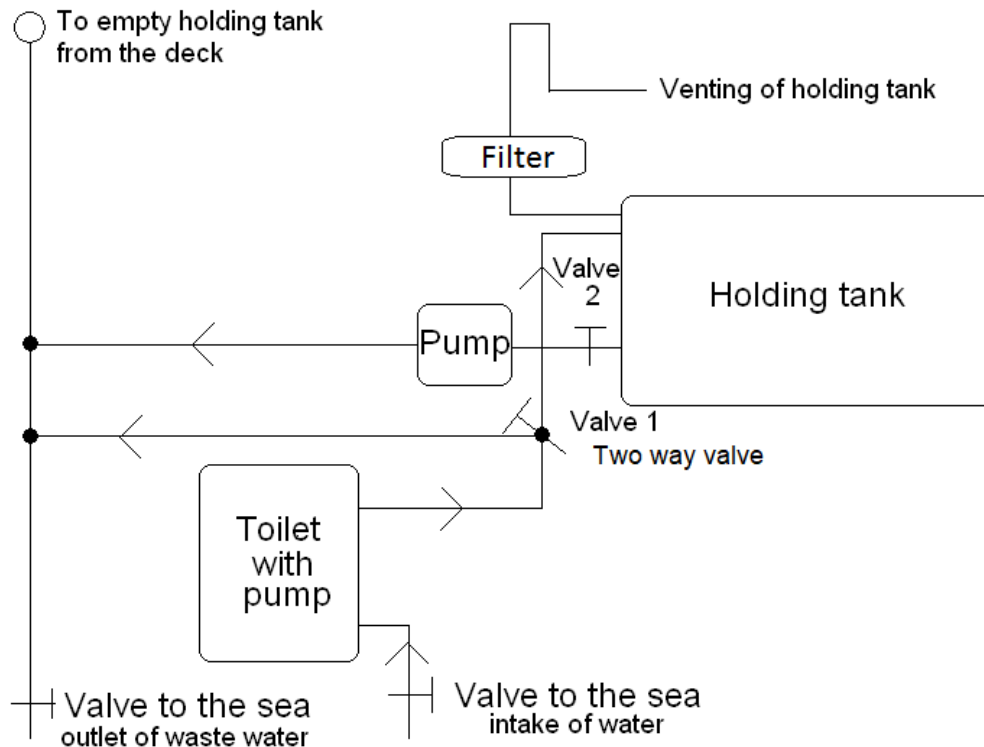


Figure 26 Schematics of toilet and holding tank system.

The holding tank holds about 80 l. The level of the tank can be monitored with the gauge in the toilet room, just above the sink. The gauge is not linear since the tank has a funny shape, see numbers marked on the wall. Make sure it is not overfilled since it can then crack when trying to pump more into it. There is also a level meter using a blood pressure meter, see calibration inside on the cupboard door. Both measuring systems tend to be clogged and must be cleaned from time to time. For the gauge, it must be removed and cleaned and for the blood pressure tester air must be blown down in the tank through the hose connected to the meter. If that does not work, a piece of wire is stuck down the tube in the holding tank.

The venting of the holding tank goes through a carbon filter to avoid stink. Different kinds of filters can be used as long as they fit physically. The filter is located in the cupboard above the wash basin. Since the filter will be ruined if water gets into it, the hose has a long goose neck up behind the cupboard. Without it, water could easily get into it when the boat heels. It is important that the air vent is not blocked. It can block at the outlet from the tank. Usually this can be cleaned by remove the hose coming out of the tank and cleaning with a piece of steel wire. If really bad, it must be cleaned from the inside of the tank, there is a small cover on top of the tank just over the tank vent.

The carbon filter used now is made by airforcefilters.com. It has been bought in the US on eBay.

Empty holding tank:

To the sea: Open valve 2 (red handle) and valve to the sea and pump out with the white pump.

Empty holding tank through the deck fitting:

- Open valve 2, close valve to sea
- Connect suction device to hose fitting on deck and out. Make sure not too fast since the tank must suck air so not to implode.
- Alternatively the shit can be pumped out manually.

Fresh water: There is hot and cold water, it cannot be mixed. Use the valve below toilet to switch from one to the other.

There also a valve for the outlet water from the sink to the sea below the toilet.

Electrical power generation system

The boat gets power from the generator in the motor and solar panels and a total of 5 batteries can be charged, see Figure 27.

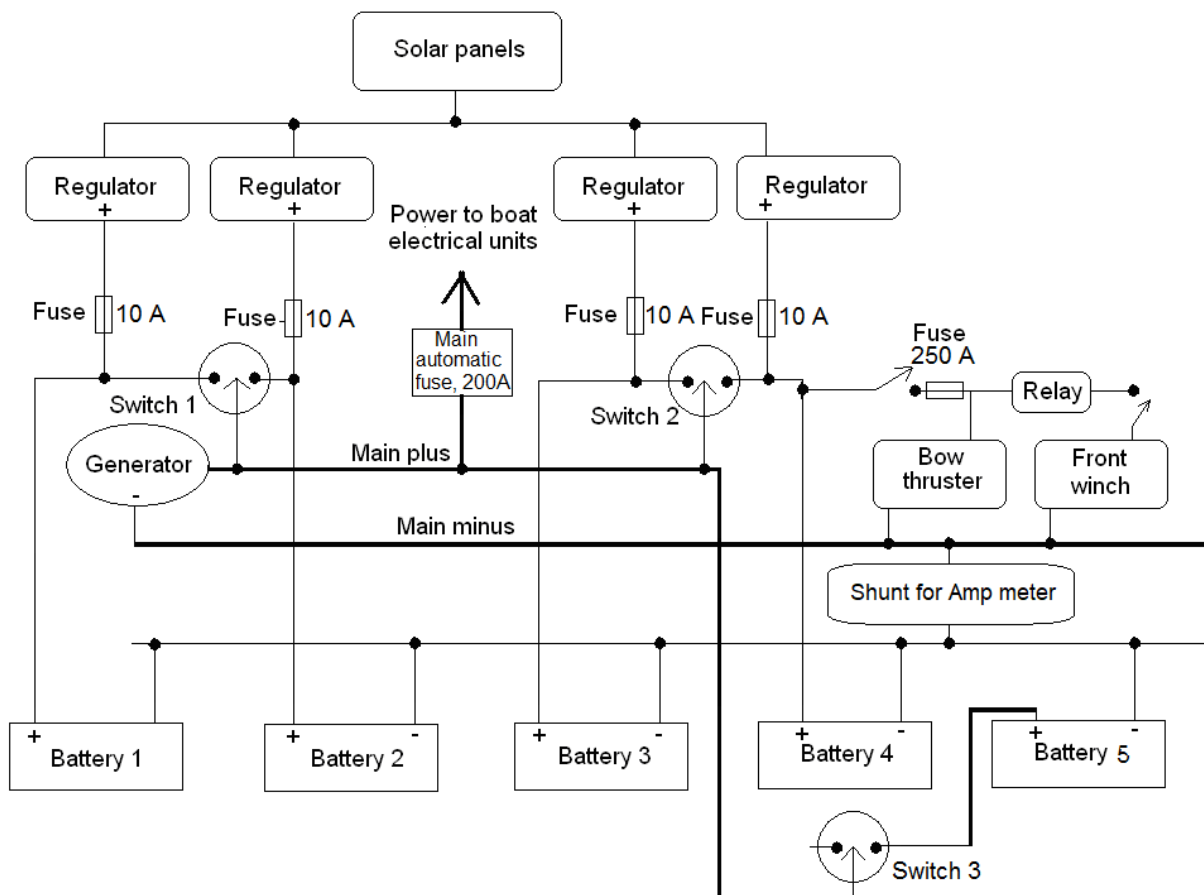


Figure 27 Schematics of power system. Dots mean electrical connection. Solar panels consist of 16 panels connected together in parallel so they act as one. For simplicity, the negative connection of solar panels and regulators are not shown. Fuses and diodes are not shown either. An amp-meter shows the total current from all the solar panels.

The batteries are connected to the boat power system using the main switches Switch 1, 2 and 3, see Figure 2. Each can switch on one of the two connected batteries or both ('all') and 1-4 batteries can thus be used at the same time.

When the motor is running, all batteries connected through the main switches can be charged. The charging current and voltage can be monitored on the V-A display, see Figure 34. Battery 4, which is located in the front of the boat, is used to operate the bow thruster. It has its own additional switch and fuse, see Figure 28.

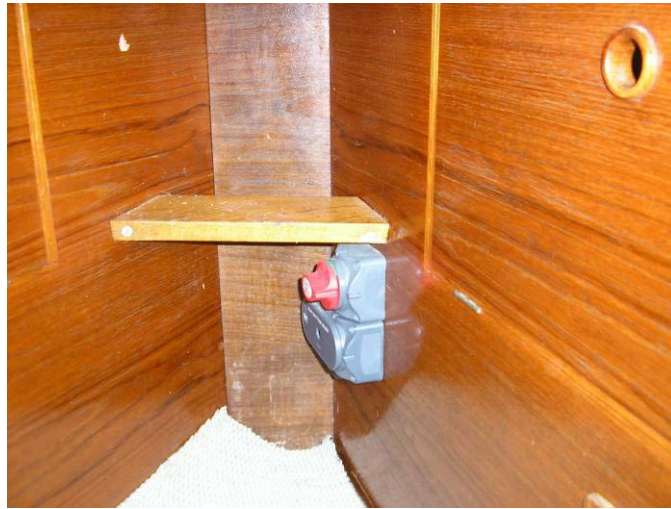


Figure 28 Switch and fuse box for bow thruster.

The battery locations are as follows

- Battery 1: Under the bunk in the saloon, left hand side, AGM, 100Ahr.
- Battery 2: Under the bunk in the saloon, right hand side, GEL, 80Ah.
- Battery 3: In dog house in open locker to the left, Lithium, 100Ah.
- Battery 4: In front cabin, under the cupboard right hand side, AGM, 100 Ah.
- Battery 5: In dog house in open locker to the left, on top of battery 3, Lithium, 50 Ah.

All batteries have a capacity of about 80-110 Ah, depending on how fast they are discharged. They are 2 AGM batteries, one gel battery, two lithium batteries and all therefore cannot spill liquid and never needs water.

Battery 5 is intend for being used with the electric outboard motor and is therefore easy to remove. It can only be charged by solar panels if it is in parallel with one of the other batteries, but it can be charged by the motor on its own.

Solar panels

The batteries are also charged through the solar panels, see Figure 29.



Figure 29 Solar panels on dog house roof. The long panels can be walked on, while the square panels will break if walked on.



Figure 30 Right: Solar panels in the front. Note switch for front winch. Left: Solar panels on the side.

The 16 solar panels are all connected in parallel (total 330 W) are connected to the 4 solar panel regulators (Figure 32) which each charge one battery independently. This will happen whether the main switches are on or not. The charging circuits are protected with fuses. A fuse box is located behind the main switches (Figure 36). Solar panel charging can be monitored on the solar panel display panels, see Figure 32.

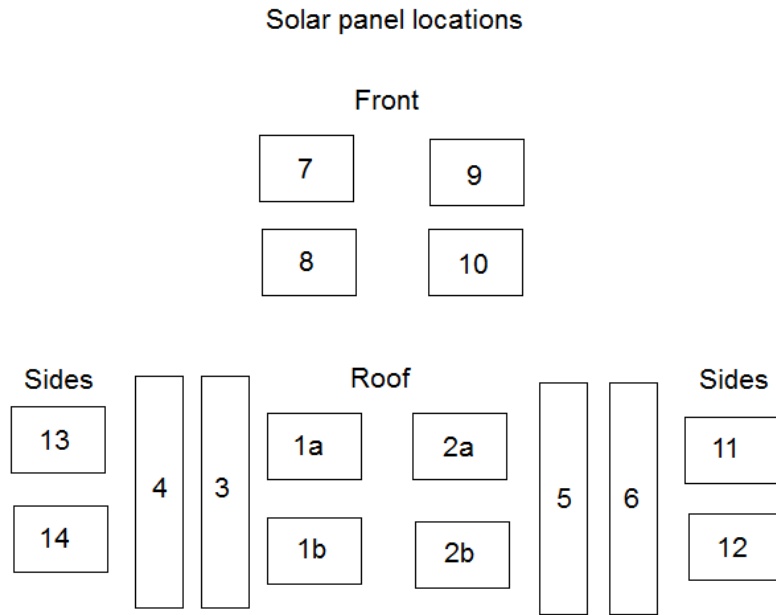


Figure 31 Location of solar panels and the panel numbers.

Panel power

- 10 W: 1 and 2
- 20 W: 4, 6, 7-10
- 25 W: 3 and 5
- 30 W: 11-14

Total 330 W

Although the total is 330 W, the output will never be that much since the sun will never shine on all panels at the same time and at a right angle. The maximum input current is about 8-10 A, typical 6 A.



Figure 32 Solar panels regulators. To the left is seen the amp-meter measuring the total charge current from all solar panels and the fuses protecting the panels. The switch is used to turn of the amp-meter. The next figure shows the interconnection.

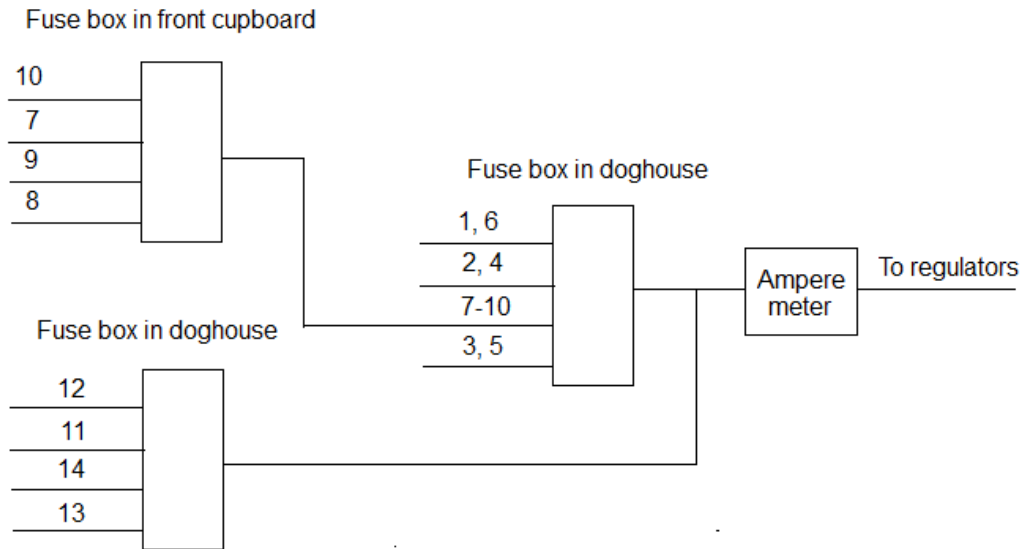


Figure 33 Interconnection of solar panels. Panel 12 and (1,6) in fuse box is towards the window. The amp-meter is shown as if in positive connection but it is actually in the negative connection.

The fuse boxes have the purpose of protecting the interconnection in case of a broken panel. It is then easy to disconnect the panel(s). It is also easy to test a panel by just taking out the fuse and measuring directly on the panel. Fuses are 5 A. Panels should have a diode in series so current do not flow back when there is no or little light. Panels 11-14 have diodes installed where the wire comes out of the wall. Panes 1 and 2 probably have diodes built in. For the rest it is unknown.

Charging and discharging batteries

Normally the batteries will be fully charge after some days of sunshine or after many hours of using the motor. The charge of the batteries can be checked with the voltmeter (see Figure 34):

- Turn on one battery at a time, make sure nothing is using electricity (only the gas detector will be using electricity, ca 0.1 A).
- Read voltage.
- Alternatively use solar cell displays (use set button, see Figure 32), then voltage can be read without connecting any of the batteries.

A fully charged AGM or Gel battery has a voltage of 12.7-12.9 V depending on the temperature. A fully charged lithium battery has a voltage of about 13.2. It is unhealthy to discharge the AGM and Gel battery to less than 12.0 V (unloaded). A discharged battery has an unloaded voltage of about 11.8V. When the motor is not running, use battery 2 or 3 and disconnect battery 1, 4 and 5. If no more power in battery 2 use battery 4 or 5. Only battery 1 and 2 can be used for starting but if all batteries are weak, al can be put in parallel for starting.

Battery 3 can be fully discharged and will give 100 Ah.. Check how many A are used (x) and calculate how many hours it can run as 100/x. E.g. the fridge will run for ca 100 hr since it uses 1.3 A on average.

Wind generator

The generator is installed near the top of the mizzen mast. It rarely gives out more than 1 A so it is connected directly to battery 1 without a regulator. The generator produce three phase AC so there is a bridge rectifier between the generator and the battery. The diodes are near the dog house roof just where the cable comes into the dog house.

In general the output is shorted with the switch since it produces so little and it also has some vibrations. The voltage and current can be monitored with the display near the switch

Monitoring voltage and current

The volt and ampere meter is shown in Figure 34.



Figure 34 Left: Voltage and current monitoring. Right Below the motor instrument panel there is a brown bottle for topping up hydraulic oil. See also Figure 13.

The voltage is measured just after the main switches and the current is measured using a shunt just after the main automatic circuit breaker. The voltage for each battery can also be monitored on the solar panel regulators, also when the main switches are off.

Electrical units and fuses

The main power generating system was shown in Figure 27. From the main 12 V through the main battery switches (Figure 2), power to all devices pass through the fuse boxes. The fuse boxes are located behind the instrument panel and accessed through a cover in the saloon. Spare fuses are found in the lower drawer. In addition there are fuses on the motor (see Figure 19) for the motor.

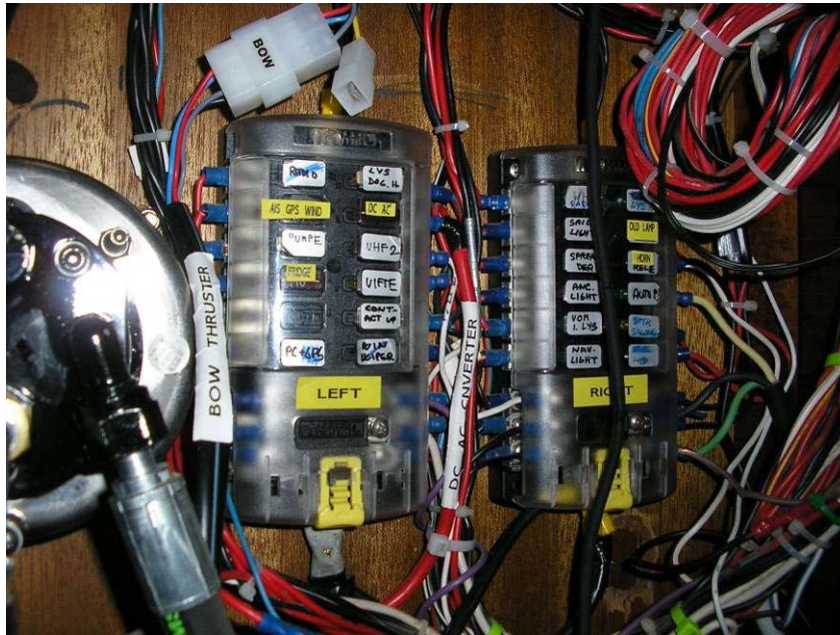


Figure 35 The fuse boxes.

The only units which are not connected through the fuse boxes are the automatic bilge pumps which are connected directly to a battery with its own fuses (Figure 36). It is the same pumps which can be started manually from the instrument panel.



Figure 36 Left: The back of the two main battery switches. Right: Fuse holder for the automatic bilge pumps and fuses for the solar panels (between regulator and battery).

Converter to 220 V

It is located on instrument shelf, see Figure 37. The unit makes a pure sine wave. It has a continuous power of 2000 W but it should not be used with more than 1500W. Connect 4 batteries if a high load is used. It has its own automatic fuse to the left of the unit.



Figure 37 DC to 220 V converter. The automatic 150A fuse is seen to the left.

Wind speed and direction

Located on instrument shelf. (Figure 38). It is turned on with the “Instr” switch on instrument panel and then with the on switch on the instrument. It connects wireless to the mast top where the sensor has a small solar panel. Fuse in fuse box.



Figure 38 Instrument panel on top. Blue 'mouse' to the left is GPS for the PC. Next follows the Log. In the middle is seen the AIS. To the right of the AIS is seen the wind instrument and to the far right right is the GPS for the VHF (black) and for the AIS (white).

Depth sounder (fishfinder)

It is located just under the instrument panel, see Figure 37. It is turned on with its own on/off switch. The swinger is located in the bunk in main saloon.

AIS

Located on instrument shelf (Figure 38). It is turned on with the “Instr” switch on instrument panel. Fuse in fuse box. The AIS will automatically start to send out position and speed and must be turned on to get the position of other ships on chart plotter. Pressing the button on the unit will stop the transmission of Maja’s position. Note, there is also an AIS receiver in the VHF.

Chart plotter

To turn on, use switch on instrument panel call 'PC', then turn on chart plotter on the instrument itself. To show position of other boats, the AIS must be turned on, see above. The chart plotter can be used in connection with the autopilot by setting a waypoint in the chart plotter, see manuals. The interconnection is seen in Figure 39. The chart plotter has the GPS located under the dashboard, next to the PC room.

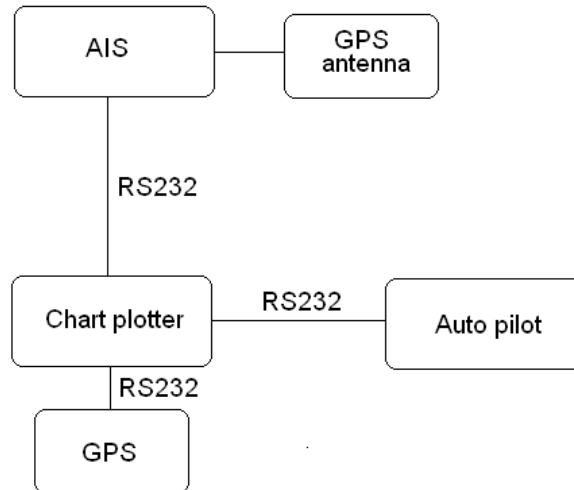


Figure 39 Interconnection of AIS, chart plotter and auto pilot. The signals are sent on a RS232 cable using the NMEA standard.

The units are connected together with a junction box under the chart plotter, see Figure 40.

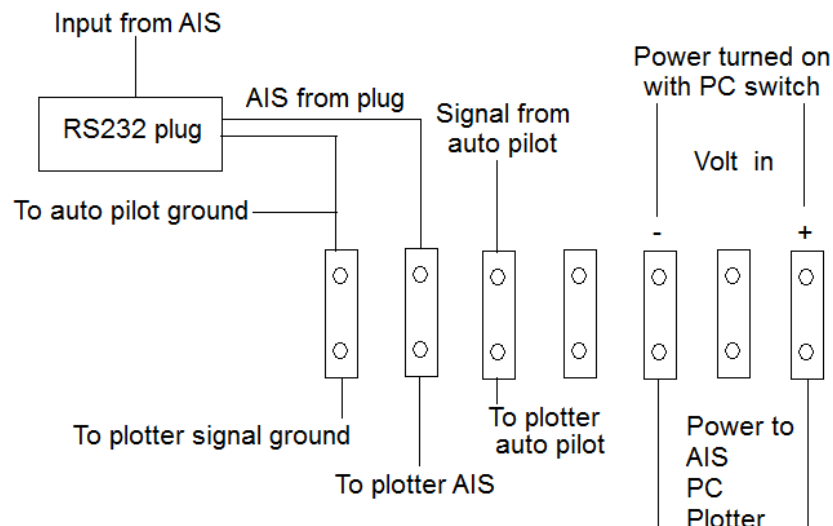


Figure 40 Connection box in PC box under chart plotter.

The RS232 plug can be connected to the PC and it is possible to access the AIS directly with a program on the PC. This can be used for setup and getting the list of ships nearby.

Radar

The radar is located on top of the dog house. It is turned on with the switch 'Radar'. The radar is using the chart plotter for display and it can use the whole screen or half the screen if the map is also shown. Since the radar is placed low it will only be useful for a few miles. It is normally set to be used until a distance of 3 miles.

PC

The PC runs on 12 V, however when the motor is running, the voltage is higher than 12 V and the PC must be operated with the PC-power regulator located in PC-room below chart plotter. If the motor is stopped, it can also be used with just a cable to the 12 plug. The cable is found in the box with cables under the bunk in the front room.

The PC has a spare navigation program called CmapEcs. Before starting the program connect the GPS USB cable (in PC room) through the USB slot on the PC. The GPS used is placed on the instrument shelf to the left and is only used if connected to the PC and it gets its power from the PC. The PC navigation system can therefore be operated without power from the boat.

Radio

Located on instrument shelf (Figure 37). It is turned on by pushing blue button on radio. Fuse in fuse box. It can receive FM, AM and DAB, play CD and MMS.

Lights

All lights use LED so there are no spare. Also navigation lights are LED.

Fridge

The fridge is turned on with a switch inside the fridge. The main power must be on. The temperature inside the fridge is shown on the wall to the right of the stairs when you go down.

Navtex

The Navtex gives weather forecasts. It might have to be set up for the local area, see manual. The Navtex is in the dog house, see *Figure 46* and its antenna is in the front cabin. It is turned on and off with the small switch.

Electrical winch at the back

The winch is connected to the battery bank through an automatic fuse on the instrument panel (see *Figure 41*). To throw out the anchor, leave the plastic rim over the winch wheel and the rope slides off. Do not leave rope in rode (the roller), tie it directly to the boat. To take up the anchor, remove plastic rim and engage the rope. The winch must first be turned on by pressing the black button (WINCH) and the green light comes on. Up and down motion can be activated with the up and down button. When taking up the rope, it will sometimes slip a

bit. Then push down the lever on top of the rope. There is also a contact next to the winch which can be used for the up motion.



Figure 41 Location of winch controls.

Electrical winch in the front

This winch is connected to battery 4 in the front of the boat, the same battery as for the bow thruster. It has its own automatic breaker (Figure 42) and is connected to the battery through a solenoid switch placed at the end of the left bunk (Figure 43) which must be put in position on for the winch to be used. The winch can be operated with a switch on the instrument panel (Figure 3) or a switch in the front of the boat. When taking up the anchor, the anchor chain will often pile up in the anchor room and block the anchor winch. Use the handle from the pump in the doghouse to periodically redistribute the anchor chain in the anchor room using the hawser hole.



Figure 42 The automatic breaker for the front winch.

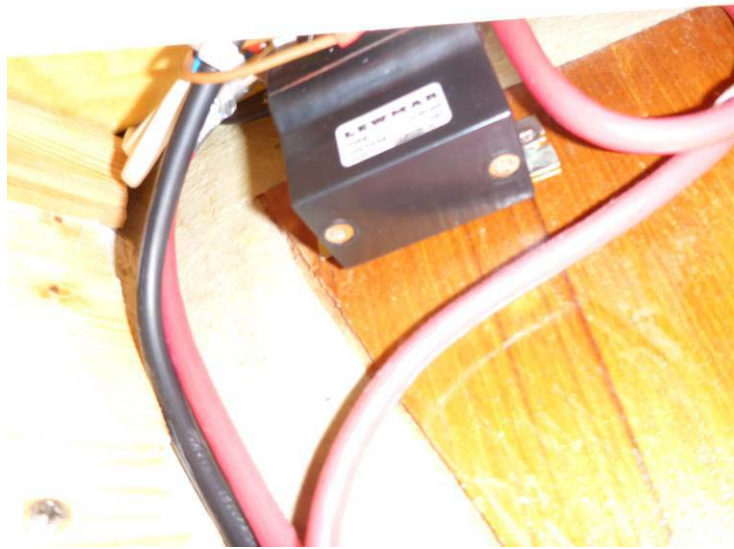


Figure 43 The solenoid switch for the front winch.

Pressure pump in cockpit

A pressure pump pumping sea water is located in a cupboard in the cockpit. It can be used as a fire pump or just for cleaning cockpit and decks. It is connected directly to battery 3 through an automatic fuse located in the cupboard see Figure 44. This is also used for on-off, remember to turn it off when not in use. Thus the pump can be started without any main switches being turned on which might be needed in case of fire. It has a 5m hose and valve.



Figure 44 Pressure pump in cockpit. The switch on the automatic fuse is seen (red). Push it down to give power to the pump. The pump will start and stop when pressure has built up. Opening the valve on the end of the hose, the pump will start. It will only work well after a few seconds since air in the system has to be pumped out.

12 V sockets

On the instrument panel, there is a car and a boat type 12 socket. Must be turned on with the breaker marked socket. In the saloon there is a socket under the shelf on the left hand side and in the top cupboard over the oven.

Hidden wirers

Wires behind the instrument panel can be access by dismantling panels in the saloon. There are three set of panels in the roof towards the back of the saloon that can be screwed out. Under the mast, panels can also be removed to get access to the wires from the mast.

Internet

Internet can be obtained in different ways:

Modem and a sim card: A TP Link modem is located in dog house, see Figure 45. It provides WiFi. A e sim-card must be inserted.

Alpha WiFi extender. Mounted in the mast (round tube). The USB cable must be connected to the PC and the driver software installed on PC. The cable comes out in the corner.

SatPhone: Connect USB cable from sat phone box to PC with driver software. That PC is located in box with printer under bunk in front cabin.



Figure 45 Left: TP Link modem and router. Right: Switch modem and outside light. WyFi is not used.

Tables, benches, chart table etc

The chart table is located below the main doghouse chair and can be installed at the entrance to the main cabin, see figure below.



Figure 46 Chart table. To the right is seen the Navtex.

One of the seat backs can be used as a table in the dog house and the large wash board as a bench, see Figure 47



Figure 47 Table and bench using the seatback from the main cabin and the large wash board.

Heavy weather

In case of lots of spray, the front ventilator (over toilet) should be turned to face backwards. The ventilator in saloon can be closed by turning it from below. The side windows in the saloon leak badly if getting a splash from a wave so they should be covered by plastic splashboards, (left side now blocked permanently with silicone so no longer needed). There are 3 available. There is none for the window in the toilet since water coming in here will just run out or the bottom of the boat. The three splashboards are found in the right cupboard in the cockpit. There are mounted with rubber bands and the screws fit into the holes in the frame of the windows. See Figure 48.



Figure 48 Mounting of splashboard. It cannot be seen since it is transparent.

Splash boards can also be mounted on all the windows in the dog house (except the door window). The boards are found under the bunks in the front, and under bunks in the saloon. They are passed through the holes and locked in place with shackles found in the lower large drawer in saloon. See Figure 49 for an example.



Figure 49 Wash board for the side window.

Lids over all bunks and the motor can be locked in place with clips.

The main entry to the dog house as well as the passage from the dog house to the cabin can be closed off with wash boards, an example is seen in Figure 50.



Figure 50 One of two wash boards which can be used to block off the main cabin. It is located just below the stairs. Also used for a bench, see Figure 47.

Where to find things

Inside

Life west: In dog house, left hand side. Under the bunk to the right in saloon next to the motor.

Wash boards: Under bunks in front cabin, next to stairs to main cabin, under left seat near stairs in main cabin.

Tools, glues etc: Under seat in dog house and in top drawer in saloon.

Spare parts

- | | |
|---------------------------------|---------------------------------------|
| • Screws etc | Bottom drawer |
| • Fuses | ----- |
| • Batteries | ----- |
| • Shackles and mech. parts: | ----- |
| • Spare propeller: | Under the anchor room |
| • Spare pumps: | ----- |
| • Spare starter motor | ----- |
| • Spare generator | ----- |
| • Spare parts for drive axis CV | ----- |
| • Spare auto pilot | Under bunk right in main saloon |
| • Wood: | Under bunks in forward room |
| • Filters: | Under bunk in corner of saloon (back) |
| • Motor parts: | ----- |

- Spares for dinghy: -----
- Elastic cord: -----
- Motor liquids: In motor room
- Sail repair: Tool room over gas bottles
- Spare auto pilot: Under bunk in cabin
- Hoses etc: -----

Anchoring tools: Right hand cupboard in cockpit.

Sail: Dog house left side.

Outside

The main storage outside is under the cockpit sole (Figure 51). The cover is locked and can be open with a handle (retrieved) in the doghouse. Normally the bicycles and the dinghy are stored here.



Figure 51 Right: Lid for storage room under cockpit. Left: Handle in doghouse for opening, the handle is pulled out.

Maintenance

Frequent checks

- Oil level in gear box (make sure plug is pressed all the way down, or else it will leak and the gearbox can run dry).
- Oil level in motor.
- Tighten propeller axel gland (Figure 52) if it leaks more than a few drops. It is tightened up with a special short key (Figure 52) and can be accessed from the cargo bay in the cockpit.
- Grease the axel gland with the grease gun in the motor room, about every 10-20 hours, see Figure 53.
- Tighten rudder grease cup every 100 h (Figure 54).
- Drain some diesel into a jar from the water collector in bottom of the tank (Figure 16) and check for dirt and water. There should only be a couple of drops of water.



Figure 52 Middle: Access to propeller axle pack box from cargo bay. The black surface is the back of the large fuel tank. Left: Propeller axle pack box. Right: Key used to tighten the pack box.



Figure 53 Grease gun used to grease the axis pack box. On the bottom is seen the hose going the pack box.

For every 100 hours or once year

- Change motor oil.
- Change gear oil.
- Change filters.

If the motor runs for extended periods and at low RPM (like 1500), it is enough to do the service every 150 h.

For every year

- Put grease in grease gun if needed.
- Put grease in rudder grease cup if needed.
- Check all nuts on propeller flexible drive.
- Check hydraulic drive steering nut (Figure 54).
- Check level of hydraulic oil for steering (under instrument panel)
- Check rudder axel bolts.
- Check and replace anodes if needed.
- Check all through hull fittings for corrosion.
- Check all hose clamps.
- Drain main diesel tank for water (valve at the bottom).
- Check bow thruster room.
- Check and possibly adjust rig with rig tension tool. Tension should be about 10 % of breaking strength. Tool in top drawer.
- Check propeller for play. Grease each propeller blade. Grease gun with special grease and fitting for propeller in tool room above gas locker. See manual for propeller.

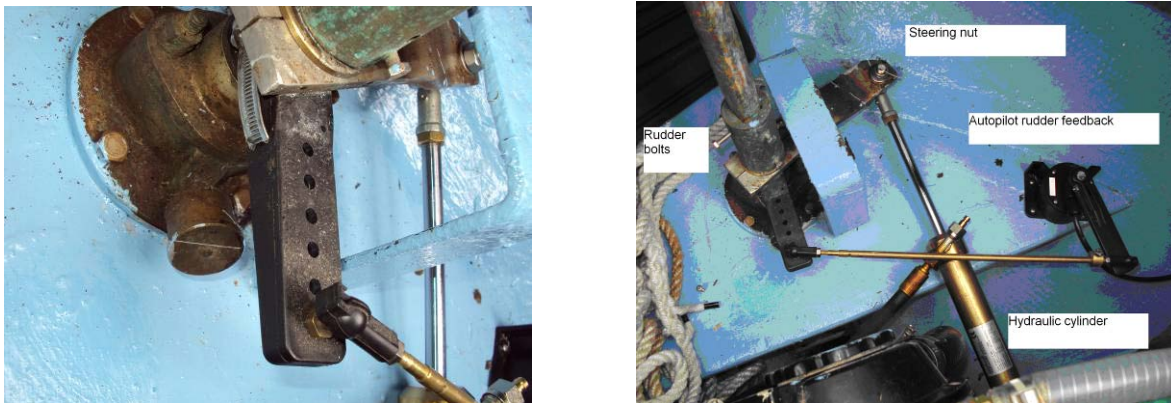


Figure 54 Left: Grease cup for steering. Right: Auto pilot system and rudder fastening.



Figure 55 Steering room. The bottom hose is for the electric bilge pump, the green hose is the exhaust and the transparent hose is the output of the cooling water. Note the small hose venting the cooling water hose. All hoses are here above the water level to make a “swan neck” to prevent water to siphon back in.

Non regular maintenance

Changing the thrust bearing at the propeller axis

This bearing normally last a few thousand hours. It must be changed with the boat out of the water. Procedure for changing:

- Remove the CV joint , this gives access to the screws holding the thrust bearing to the propeller axis.
- Unscrew the 6 screws
- Use 3 of the screws to release the clamping on the propeller axis. This is done by screwing them into the 3 holes next to the holes where the 6 screws were removed. Screw all the way in and now the propeller axis is free.
- Move the propeller axis back (from the outside) so the thrust bearing assembly is free of the axis.
- Unscrew the thrust bearing assembly from the boat, 2 screws with rubber dampers.
- Move some of the hoses to one side, must be disconnected.
- Tip out the assembly.
- Press out the center part from the bearing.
- Put in a new bearing.
- Press back the center part.
- Put the assembly in the boat again with the 2 screws.
- Put the axis back into the assembly.
- Fasten it with the 6 screws.
- Mount the rest.

When the thrust bearing assembly is out, there is access to the pack box which can be opened and more packing material put in if needed.

What can go wrong ?

Motor stops

Out of fuel:

Check fuel gauge below instrument panel. If empty, change to spare tank located in back left hand corner of dog house:

- Open valve in motor room just behind the stairs (see Figure 17)
- Stop diesel pump with contact ‘Diesel pump’ seen just above the stairs (see Figure 56). In order to turn off pump with the electrical switch, the strap must be cut away. The strap is there to make sure the electrical diesel pump is not stopped by mistake.
- The diesel level can now be monitored in spare tank through the window in the tank.



Figure 56 Emergency starting. Contact "On" will give electricity to motor independent of instrument panel. "Start" will turn the starter. "Diesel pump" will disconnect power form diesel pump when instrument panel is used. This contact has a lock which must be cut off in order to turn the switch off. CURRENTLY NOT CONNECTED.

The spare tank has sufficient fuel for about 4-5 hours and the motor can run without using the diesel pump (should run without).

Clogged diesel filter:

- If it is the filter near the main tank, it should be possible to change over to the spare tank, see above.
- Alternatively change the filter if there is no urgency to continue.
- If it is the fine filter on the motor, it must be changed, for location of spare parts, see page 38.
- There is also a filter in the diesel pump, but that is unlikely to be clogged.

Diesel pump defective:

- Follow procedure about to switch to spare tank.

No current to diesel pump:

- Follow procedure above to use spare tank.

Motor will not turn over with the starter after it has stopped, or the motor stops

The most likely cause is a bad contact in the multi function connector between the motor and the instrument panel so there is no electricity to starter and diesel pump.

- If no urgency, lift up the motor instrument panel and locate the connector (see Figure 57). There is a similar connector in the motor room.
- Disconnect and connect a couple of times and try again.
- If urgent:
 - Use the spare switch to start diesel pump (see Figure 56).
 - Start motor with spare starter button.

Both of these switches bypass the instrument panel and can also be used if the ignition key to the instrument panel is lost.

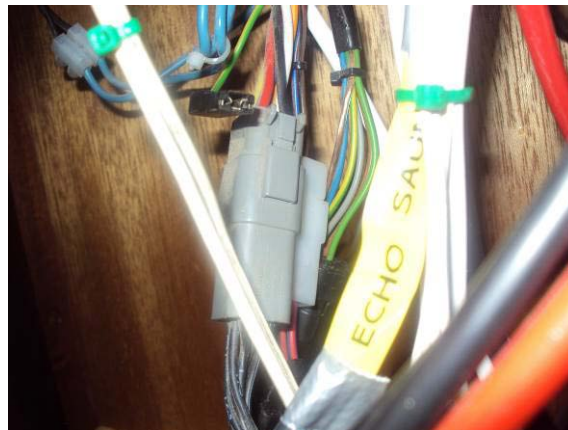


Figure 57 Motor multi connector: The grey connector in the middle of the picture.

Alarms

When the motor is running there should not be any alarm. The alarms are indicated with a light on the instrument panel (Figure 58).

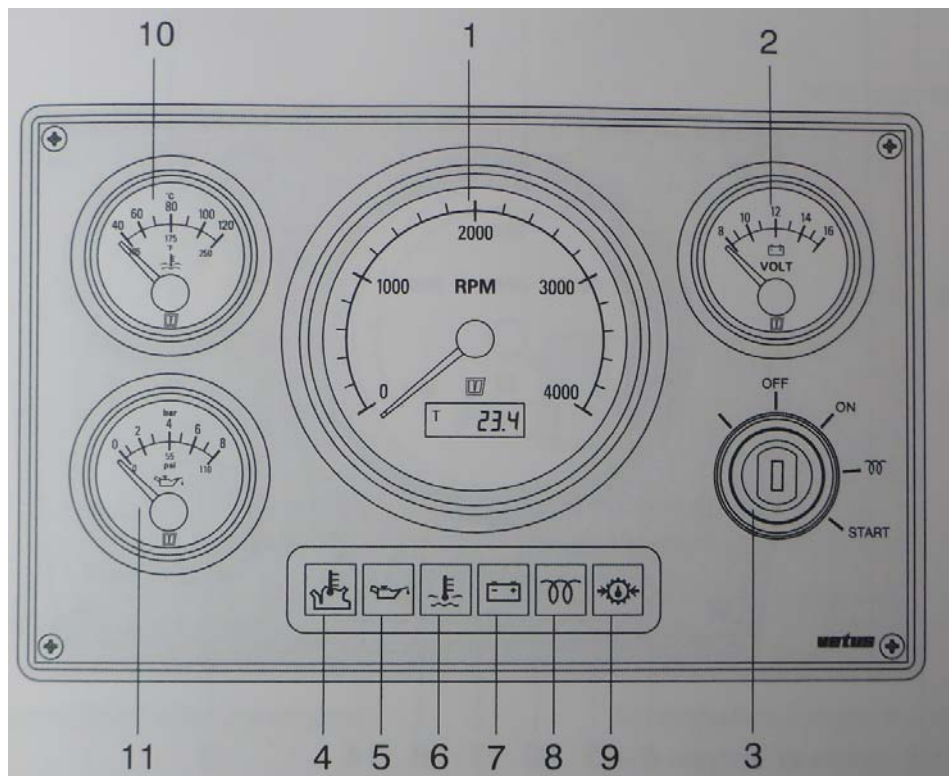


Figure 58 Instrument panel.

If an alarm sounds, the motor should be stopped immediately unless in a critical situation. The alarm can be one of the following (see figure above):

- 4: Water temperature in exhaust. This alarm will sound if the cooling water does not reach the exhaust and the exhaust hose will melt very quickly. This means that no cooling water is getting in, the cause can be:
 - Water pump defective (bad impeller (rubber wheel inside pump)). Change impeller (see under spare parts to find it). The water pump is located in the front of the motor. To access it, open bunk below left in saloon, open small door to motor room (see Figure 23).
 - One of the water hoses are leaking, check hoses.
 - Water filter clogged. Clean filter. The filter is located in the motor room, left hand side see Figure 22.
 - Water valve in bottom of boat is accidentally closed (see Figure 22).
 - Water inlet clogged under the boat.
 - Close water inlet valve in the bottom.
 - Dismantle the hose and check for obstructions.
- 5: Low oil pressure, check the oil pressure meter while the motor is still running. If ok, continue and the fault is the on-of oil pressure switch for the alarm. The oil pressure meter has an independent sensor.
- 6: Water temperature inside motor. Check the motor temperature meter. If ok continue. The fault is then probably in the water temperature alarm switch.
- 7: No charging from the generator. Check the charging current with the voltmeter, (see Figure 34). The boat can continue for many hours without the generator. If the spare tank is used and the diesel pump turned off, the motor does not use any power at all. Check the current consumption, and calculate how many hours are left (see electrical sections on p 27).
- 8: Preheating.
- 9: Not used.

Water in the bottom

Apart for a new hole, water can enter several places.

- Check all through-hull fittings: 3 in toilet, 2 below sink and one in motor room. If boat is heeled, water can enter through toilet and kitchen sink: Close valves. Wooden pegs to plug holes are available in tool room, small compartment on the left.
- Propeller gland can be leaking, see p 39.
- Exhaust outlet can be leaking and water could enter, although it is above the sea level.
- One of the hoses for the motor room is leaking, either in the motor room or while going to the back of the boat.
- The large rubber hose connecting the stern tube to the pack box might be bad, see Figure 52.
- Where the stern tube screws into to the end of the boat, there has been a leak (see under wooden board in cargo room). This has been fixed with a large rubber hose fitted around it the stern tube. It might leak again.
- There is a leak in the gas room. Since water comes into the gas room with a bit of waves, it can leak down in the bottom if the room is not tight.
- No plug in manual pump out hole. With some waves, water can get in that way.

Electrical problem

- Smells burnt: Disconnect main power.

- No power: Check main switches.
- No power for some instrument. Check fuses.

Steering wheel turns but boat does not change direction

- Bypass valve (see Figure 12) in cockpit has been opened, close valve.
- Lack of hydraulic fluid, possibly caused by a leak in the system.
 - Check for leaks.
 - Repair if possible.
 - Add fluid (see Figure 13).
- Obstructions near the steering system in the back of the boat, see Figure 54.
 - Open and inspect, remove objects blocking the movement.

If hydraulic system fails, the boat can be steered by the tiller.

Tiller is blocked

- The bypass valve is closed, open bypass valve (see Figure 12).
- Obstructions below, check (Figure 54)