

## OWNER'S MANUAL

SWAN 65

This manual is intended to give some general maintenance hints and as a guide to the proper use of the equipment.

### Sections

1. HULL
2. DECK
3. INTERIOR
4. PROPULSION
5. PLUMBING
6. ELECTRICAL
7. INSTRUMENTS
8. RIG
9. HAULING + STORAGE
- ~~10. SPARES~~
- ~~11. TOOLS~~
12. DRAWINGS AND MANUALS IN POCKET AT END OF MANUAL

Note: The manual has been written to cover the whole series of SWAN 65's. Individual boats may differ in detail from one another and all variations cannot be covered. No attempt is made to cover owner supplied items.

May 1976

## 1. HULL

### GLASSFIBRE MAINTENANCE

Glassfibre is not completely maintenance-free. The surface collects dirt and slowly loses its gloss. Regular cleaning and waxing is needed to keep the surface in top condition.

#### Cleaning

Soap and water or a detergent will remove most of the dirt. There are also a number of special glassfibre cleaners available. Gasoline or kerosene will remove oil and tar. If they fail, rubbing compound can be tried. Harsh abrasive and chemical cleaners are not recommended. Wet and dry sandpaper, 600 grit, is the strongest remedy, and must be followed by polishing with rubbing compound to restore the gloss. Be careful not to sand through the gelcoat surface.

#### Waxing

Wax your boat at least once every year. Wax seals and protects the surface, minimizing the collection of dirt. Use special boat wax, or a silicone-free automotive type.

#### Scratches

Shallow scratches are rather harmless, but if they are deep and expose the glassfibres, the laminate will absorb water by capillary action. This will impair the strength of the laminate, so instant action is needed.

#### Patching

Gelcoat for patching is delivered with the boat. The bigger can contains gelcoat for hull, the smaller is for the boot top. The bottle contains catalyst. Gelcoat can be stored about one year, or appreciably longer if kept in a cool place. The amount of catalyst to be added is 1.8%, which will give a working time of about 25 minutes at an ambient temperature of 20°C (68°F). Before work can start, the damaged area must be completely dry. Remove dirt and loose gelcoat, and de-wax around the edges with wax solvent. The use of acetone, chloroform, carbon tetrachloride, or methylenechloride is not recommended as they have a detrimental effect on the laminate if applied too liberally. Rub up the surface by sanding and put masking tape around the edges to limit the patch. Add catalyst to a suitable amount of gelcoat and spread the mixture over the damaged area, filling up a little overthickness, as the material shrinks when curing. To get a smooth surface, the repair work can be covered with cellophane and squeegeed down.

After about twice the working time mentioned above has elapsed, the patch is cured and can be wet sanded smooth with 600-grit paper, followed by rubbing compound and wax.

If your boat has been exposed to the sun a lengthy time, the patch will at first differ in colour, but will fade in after a couple of months.

#### Antifoulings

There are basically two types of antifouling - soft, which can be scrubbed away, and hard, which tends to build up until starting to peel off. The hard type is recommended for boats spending more than a few hours ashore before being launched, or which occasionally are out of the water. Antifoulings with a

stronger effect are needed in warm waters. Remember that anti-fouling contains toxic chemicals which can harm eyes and lungs. Never dry grind old antifouling. Wear appropriate goggles and a respirator even when wet scrubbing or sanding. Never use paint removers on glassfibre surfaces. Nautor boats have uncoloured gelcoat below the water line to provide a better grip for the antifouling.

### Keel

Often, on hauling, it will be noticed that along the joint between the hull and the lead keel there is a crack in the paint. This is caused by different thermal expansion and contraction in the materials and should cause no problems. If the crack gets too large, it can be filled with micro balloons and faired.

### Steering gear

#### Assembly drawing

Steering cables should be hand tight. The adjusting screws are located on each side of the quadrant. Check the cables regularly for wear. If there are any broken strands, change cables at the earliest opportunity.

The steering gear has nylon bearings needing no lubricant. Remember that the emergency tiller, stowed in the lazarette, must always be easily available. Practice its installation, which can save very vital time should it ever be required.

Mark and center king spoke, then center quadrant with adjusting nuts. Always lock securely when centered with correct tension. It is advisable to carry spare cables and best to have a complete assembly including chain marked at center with cables attached.

### Flotation reference marks

At bow and stern there are reference marks twelve inches above datum water line. With the aid of these the exact flotation can be determined. Note: Normal flotation is heavy of the DWL - this is provided as a reference only.

## OPTIONALS

### Autopilot

The drive unit is located under the cockpit floor, and is connected to the wheel by sprocket and chain. The remote compass is located under the port berth in owner's cabin, and the same precautions should be taken as for the steering compass, see section 7. The drive unit has fuses inside the cover, see Manufacturer's Handbook for instructions.

## 2. DECK

Deck arrangement Ketch  
Deck arrangement Sloop  
Single laminate areas

### Glassfibre deck

Maintenance directions for the glassfibre decks are the same as those given in the hull section (Section 1).

### Winches

Winches should be rinsed with fresh water periodically and after rough passages. Grease bearings and gears lightly with a marine lubricant grease at least twice a year and before and after long passages.

## OPTIONALS

### Teak deck

The teak decking is imbedded in Formflex mastic when layed. The teak is screwed to the fibreglass deck and the screw-holes are then plugged. All seams are payed with the same Formflex mastic. Prior to delivery all decks are treated with Pinotex Preservative. To maintain the appearance of the deck, regular cleaning and treatment with this preservative is recommended.

If the grey, weathered look is preferred, allow the deck to weather and then clean, as necessary, with soap and water. Do not use bleaching solutions as they will destroy the mastic.

Note: Do not use bronze wool in cleaning teak as it will react with the aluminium toe rails.

### Anchor windlass

A trip circuit switch is located under the navigator's seat, forward edge. On the after face of the windlass there are two buttons, one for continuous operation and one for inching. Near the stemhead fitting, there is a foot switch for inching. On the starboard side of the windlass there is a clutch lever for the chain gipsy. Clutch lever forward = chain gipsy free, clutch lever up = chain gipsy connected. A lever for working the windlass manually is stowed inside the anchor locker. The oil level inside the windlass can be checked in the little sight glass on the forward face. The oil level must always be visible.

Note: The windlass consumes much battery power, and should be used judiciously.

### 3. INTERIOR

Cabin arrangement plan Ketch  
Cabin arrangement plan Sloop

#### General

Take care of the interior, keep the boat well ventilated at all times.

All teak surfaces are varnished with several coats of Sadolux varnish. If any damage should occur, sand smooth with light sandpaper and apply Sadolux varnish or equivalent. Sadolux varnish is available from Nautor.

#### Floorboards

All floorboards are treated with Pinotex preservative, which can be obtained from Nautor. If the floorboard should stick, plane the edges with a  $10^{\circ}$  under bevel to restore easy fit.

#### Overhead covering

The overhead covering may be removed if necessary. First remove the teak strips which are held in place with an adhesive backing. This will expose the screws holding up the panels, which can be taken out to release the covering.

#### Head doors

Should a door inadvertently become locked with no-one inside, it can be unlocked by pushing an ice pick or similar device through the hole in the center of the knob.

When the head is unoccupied, the doors should be left open to facilitate ventilation.

#### Leeboards, canvas

To install leeboards, the edge under the mattress should be stretched as tightly as possible between the eyes provided. When needed, tie one end of the upper edge through the eye at the foot of the bunk, then tie in the head end, again as tightly as possible, after entering the bunk.

When not in use, the canvas should be stowed flat under the mattress.

#### 4. PROPULSION MACHINERY

Engine installation  
 Spin on oil filter  
 Fuel system  
 Sounding table fuel, sloop  
 Sounding table fuel, ketch

The engine handbook contains detailed instructions for running and servicing as well as a technical description of the engine. The owner is advised to read this book carefully.

##### Engine controls:

###### At main switchboard:

- Audible alarm and warning light for low oil pressure/  
high temperature
- Engine hour meter (in navigator's seat)

###### In cockpit:

- ON/OFF switch for engine controls
- Audible alarm for low oil pressure/high coolant temperature
- Tachometer
- Oil pressure gauge
- Coolant temperature gauge
- Charging control lamps for starting and service batteries.
- Warning light for low oil pressure
- Warning light for high engine temperature
- Starting button
- Stopping button
- For Volvo engine: Glow plug button
- Engine control lever with combined throttle and gear shift  
(For starting up, the gear shift is disengaged by pulling out the neutral throttle knob which allows changing engine speed without engaging propeller).

##### Check before starting:

- Fuel tank level
- Cooling water intake seacock open (Positioned in engine room port side)
- Engine lubricating oil level
- Reduction gear oil level
- No water in fuel line water separator (Positioned to starboard forward in engine space)
- Fuel shut off valves open (Positioned at each tank)
- Fuel valve chest open (Positioned at forward end of engine space)
- Fuel return valve open (Positioned in engine room starboard side)
- Cooling water strainer not choked up (to be cleaned every 50 hours of running or when the engine temperature shows a tendency to rise). Located in engine space aft end.-Check for air pockets after rough weather sailing and bleed.
- Shaft lock not engaged.

### Starting

- Turn on main switch. Pull out the neutral throttle knob with lever in neutral, then advance throttle to starting position i.e. half open.
- Turn on cockpit switch marked engine controls. Charging control and oil pressure lamps will light up and audible alarms sound.
- For Volvo engine: Push glow plug for about 45 seconds.
- Push start button, (not more than 10...15 secs continuously) with throttle half open. During cold weather set the speed control to full throttle to enrich the mixture for starting.

### Running

- After engine has started, set revolutions to idling (about 750 rpm)
- Check that the oil pressure warning light switches off
- Check that charging control lamps switch off
- Return control lever into neutral, push in the "neutral throttle knob". Now throttle and gear shift are coupled together.

CAUTION - Engine should not be run, either for power or charging batteries, at excessive heel angles. When running at angles of more than 20°, temperature and oil pressure should be watched carefully. Do not run engine continuously at full throttle. Full throttle operation should be for emergency use only. For normal use back off throttle slightly, 200 r/min below maximum attainable engine speed.

### Stopping

Slow engine to idling speed and shift into neutral. Push stop button until engine is stopped. Turn off engine control switch.

### Lubricating Oil Filters for Perkins engine

Spin-on element canisters are being used. For the proper functioning of the filter, it is very important that the following elements are incorporated:

- a bypass valve with a setting peculiar to the engine
- a standpipe to prevent drain back through the engine bearings.
- a rubber flap valve to prevent drain back through the lubricating oil pump.

### Note:

As there are filters on the market without these features, it must be kept in mind that only genuine replacement canisters of the correct type be used, otherwise engine damage could result.

### Priming the filter

Before fitting the new filter, it is recommended that it be primed with oil. Clean lubricating oil should be poured slowly into the centre threaded orifice - the stack pipe of the filter - allowing time for the oil to fill the bowl through the filter element. When offering the canister up to the filter head, only a small quantity of oil in the stack pipe will be spilled before the canister is screwed home onto its seal.

Replacing the filter

1. Unscrew and discard the old canister
2. Clean the filter head and threaded spigot.
3. Using clean engine oil, prime filter and lightly oil top seal of replacement canister.
4. Screw replacement canister onto filter head until seal just touches head and then tighten by hand a further half turn. If the canister is overtightened, then difficulty may be experienced in its removal.
5. Run the engine and check for leaks.

Note:

On the engine is a label stating the type and make of engine and reduction gear oil filled at the yard.

Folding propeller operation

Folding propeller will give good service as long as it is used with reasonable care. The following points should be kept in mind.

1. Avoid shifting to "forward" at more than idle engine speed. Excessively rapid forward engagement can damage the propeller. Be especially careful after going astern and always avoid excessive speeds when going astern.

Note: If propeller fails to open on shifting into forward, shift to reverse and back to forward and it should open.

2. When starting to sail, after running under power, to insure propeller folding correctly, momentary use of reverse before stopping the engine will help. Otherwise the normal spinning of the propeller in "ahead" can keep blades open and shafts spinning after shutting down the engine. Temporary friction to stop shaft rotation should cause a spinning propeller to fold.
3. If after following this procedure the propeller persists in spinning when under sail, this indicates that there is some propeller damage preventing the normal folding of the propeller.

Shaft lock

To permit use of the engine to charge the batteries while racing, there is a shearable shaft lock pin provided. This is inserted to engage the reduction gear coupling in one of two positions 180° apart, which will lock the propeller with the blades in the vertical position. While locked, the engine can be run in neutral. An accidental gear shift will cause no damage other than shearing this pin. An extra pin is provided in case this should occur.

Note: Do not allow the propeller shaft to rotate while sailing, as there is no lubrication in the gearbox with the engine stopped.

Shafting

A flexible shaft log arrangement is used, with the sterntube gland flexibly supported by reinforced rubber hose. The gland can absorb normal engine movement on flexible mountings. It is recommended that shaft alignment be checked annually, preferably with the boat in the water. Taking into account the face run-out on the gearbox and propeller shaft flanges, the total misalignment should not be greater than 0.0635 mm (0.0025 ins).

Vibration in the shaft is generally caused by unbalance either in the propeller after hitting some floating object, or in bad cases also by a bent shaft. Carefully investigate the reason, and rectify at the first opportunity.

#### Shaft bearings

The shaft has two replaceable Cutless Rubber Bearings (TB 2 Ø 1 1/2") one aft of the stuffing box, the other in the shaft strut. These bearings should be checked whenever the boat is hauled. If worn so that there is visible clearance around the shaft, the bearing should be replaced.

#### Fuel system

The fuel tanks are located under the main cabin floor and filled through deck plates each side marked "FUEL". The fuel supply can be checked by putting the sounding rod, stowed in the oilskin locker, through a small hole covered by a screw cap in the inspection plate on the tank. Refer to the table in Plumbing section for conversion.

The fuel system has a shut-off valve at each tank and a double water separator positioned under the floorboards forward in the engine space. The fuel tank vent outlets are in the cockpit coaming aft. The fuel return line has a shut off valve for each side positioned under the floorboards to starboard in the engine space. One side must always be open. It is recommended to use fuel from all tanks simultaneously. The system has one-way valves to prevent cross-flow.

#### Approximate fuel consumption

##### Volvo engine:

At maximum continuous speed 3800 rpm about 16 l (4.3 US gal) per hour.

At 3500 rpm about 13 l (3.5 US gal) per hour.

At 3100 rpm about 9 l (2.4 US gal) per hour

##### Perkins engine:

At maximum continuous speed 2400 rpm about 18 l (4.8 US gal) per hour.

At 2100 rpm about 13 l (3.5 US gal) per hour

At 1800 rpm about 9 l (2.4 US gal) per hour

#### Morse stuffing box

##### CAUTION: TIGHTEN BY HAND ONLY

When the shaft is first operated by the boat engine, tighten packing gland until it almost stops leaking (about one drop per second) but do not stop leak entirely. After the shaft has run for a few hours it is permissible to further take up (by hand only) the packing gland to reduce leakage to a minimum. For maximum service life from the packing and to avoid the possibility of scoring the shaft, always allow the packing to leak just a slight amount. If the stuffing box feels hot when running, it is over-tightened and should be loosened alightly to allow lubrication. Be sure to install the locking cotter pin after adjusting.

#### Cooling water system

The cooling water intake with seacock is located on port side, and water strainer is mounted aft in the engine space. Cooling water discharges through the exhaust system.

Exhaust system

This is of the water-jacketed type, with the engine manifold jacket discharging into the mixing chamber, located in the locker aft of the navigator's seat. From the mixing chamber the mixture of water and exhaust gases is led through a muffler to the discharge opening in the hull topside.

Cathodic protection

There is a zinc anode on the propeller shaft right in front of the shaft strut which should be checked visually whenever the boat is hauled or at least 2 or 3 times/season. If this is more than 50 % eaten away it should be replaced. If the deterioration is rapid, it indicates a leak in the electrical system and the whole system should be checked by a competent marine electrician.

## OPTIONALS

Automatic feathering propeller

The propeller blades can feather to sailing position only with the blades in the forward position, and not in reverse. Therefore, when stopping the engine, gear shift lever must be in forward.

Whenever the boat is out of the water, make sure that the blade mechanism moves freely. Otherwise the water stream will not be able to turn the blades to the desired fore- and aft position during sailing.

Be sure the propeller hub is kept packed with a chemically stable, water resistant grease that meets N.L.G.I. No. 0 specifications. (Flake graphite mixed with No. 30 oil to a heavy cream consistency is recommended).

The grease is injected through a grease hole, closed by a plug, in the propeller hub.

## 5. PLUMBING

Plumbing diagram  
Blake owner's manual  
Cooker manual  
Sounding table water, sloop  
Sounding table water, ketch  
Plumbing details

Blake Sea Cocks

The sea cock is open when the handle is pointing away from the hose, and closed with the handle touching the hose from either side.

Sounding tables

The tank positions and capacities are shown on this table (capacity is related to sounding measurement by the table). There are two marked sounding rods located in the oilskin locker, one for water and one for fuel.

Fresh water system

The water pressure pump is located in the forward part of the main cabin U-sofa. The pressure vessel and gauge are located in the port guest cabin hanging locker. Inside the pressure vessel is an air volume, which should contain air at a pressure of 1  $\text{kp/cm}^2$  with no pressure in the water system. The pressure gauge should display between 1.2 and 2.8  $\text{kg/cm}^2$  with the system working. The pump is controlled by a switch marked WATER PRESS on the main switchboard. With the pressure system off, the foot pumps can be used, but remember to open the watertap before actuating the pedal.

The water heater uses either engine cooling water or optional 220 V current. With shore power, before turning on WATER HEATER, first make sure the heater is filled up with water. This can be checked by opening a hot water tap, letting a little water out. The heater has a thermostat, located on the top. There are normally seven water tanks, located under the floorboards in the galley and guest cabin area. They are all filled through a deck plate marked "WATER" on the port side. When filling the tanks all tank shut off valves must be open. Fill through the deck plate until water flows out through the vent pipes into the galley sink. The valve chest is located in the port guest cabin hanging locker behind a small door at floor level.

The tank shut-off valves are labelled.

Water should only be taken from one tank at a time. This will give you a warning when you are running low on water. When the first tank is empty, close it and open the second tank and so on. When the sixth tank is empty, is a good time to start looking for more water as there will be no further warning before running out.

Note: If the boat has a list with the tanks full, you should use a tank on the low side first to straighten her up. Water supply can be checked at any time using the sounding rod (inserted through hole in inspection plate on top of tank after removing screw cap) and the sounding table.

The wash basins and the galley sinks are connected to the fresh water system.

### Sea water system

The galley sinks have a sea water spout connected to a foot pump. Maintain the markings and use only when underway in clean water.

### Deck wash

The deck wash pump is located under the floorboards at the forward end of the engine space and is controlled by a switch marked DECK WASH on the main switchboard. There is a relief valve allowing the water to circulate in the system if the fore deck valve is closed. Remember to switch off the DECK WASH after use, otherwise the pump will run all the time.

### Bilge and drainage system

There are two hand operated bilge pumps, one in the cockpit, the second in the locker aft of the navigator's seat. The electric bilge pump is located under the chart table. On the main switchboard there is a two-way control switch marked BILGE PUMP. In position AUTO, the pump works only if bilge water actuates the float switch, in position MAN, the pump is working continuously. If the bilge water level rises more than 10 cm above the float switch the warning lamp on main switchboard will light up. The screened bilge pump intakes are located in the bilge sump between the chart table and the ice box, and the discharge in the cockpit scuppers. The galley sinks drain through a seacock under the aft head wash basin. The wash basin and shower in each head drain into a sump tank, which can be emptied either by an electric pump with vacuum switch, located in the locker under the wash basin, or by a hand pump in the head. The knob on the vacuum switch should be pushed down to start the pump, which will stop automatically when the sump tank is empty. The switches on the main switchboard marked SUMP TANK PUMP merely control the circuit and do not start the pumps. Outlet above water line.

Note: Each time the sump tank pump is used, the pumping must go on until the pump sucks air. This will break any water siphon in the outlet loop, and prevent sea water from flowing back and flooding the tank.

### Toilets

Instructions for the maintenance of the toilets are given in the Baby Blake manual.

The intake sea cock for the aft head is located under owner's cabin floorboards, at the forward end STB side, the outlet cock under the wash basin. The forward head intake sea cock is located under starboard guest cabin floorboards, outlet under port head wash basin.

Note: When pumping out the toilet, always go on until the pump sucks air. This will break any water siphon in the outlet loop, and prevent sea water from flowing back and flooding the toilet.

### Gas stove

Use and maintenance of the stove is explained in the Cooker Manual. Two 6 kg gas bottles are located under the helmsman's seat in the cockpit. On the gas supply line near the stove there is a shut off valve which should be kept closed except when cooking. Never leave a lighted stove unattended. It is recommended to check the gas line for tightness every month, and after rough passages. A simple method is to apply soapwater with a brush.

Warning: Never check the gas line with an open flame.

If you can smell gas in the boat, the engine space suction blower

should be used for evacuation. Blowing in fresh air does not remove the heavy gas from the bilge.

### Fridge and deep freeze

#### Wiring diagram

A Canpa condensing unit is installed under the floorboards near the chart table, with the cooling water outlet above water line, with shut-off on the unit, and the inlet sea cock close to the unit. Holding plates are installed in both insulated boxes, with the capacity divided so that the inboard compartment serves as fridge and the outboard as freezer. The condensing unit needs to be run about 3 hours every 24 hours. There is a small control light for each box on the main switchboard, showing that the box is not yet cooled to the temperature set on its thermostat. These lights only light while the compressor is running.

Defrost the boxes regularly for best efficiency.

Under the inboard end of the ice box there is a translucent container for drain water from the fridge and freezer, which should be emptied when necessary.

Note: The condensing unit is powered from the service batteries, and these have to be charged regularly. See section 6, Electrical. The thermostat setting knobs on the outside of each box regulate the coldness (higher number = colder). A maximum setting does not cool down a newly loaded box any more quickly. Instead it is recommended to use the maximum setting a few hours before loading anything in the freezer.

The system is provided with an overload protection, which may trip if the condensing unit has to work continuously for an extended period, i.e. if an empty freezer is completely filled up. The protection switch is a little red button located under the navigator's seat, at the forward inboard corner.

### Ventilation

The cabins have natural ventilation.

Fresh air is provided through Dorade vents. They should be trimmed to face the wind except in heavy weather when they should be turned 180° from the wind.

There is an exhaust blower for the engine space, discharging through the main mast.

The control switch on the main switchboard has two positions, AUTO, which means that the blower runs whenever the temperature in the engine space exceeds 45°C (thermostat control), and CONT, denoting it is running continuously.

### Hatch covers

Hatch covers should be used in heavy weather and can be used in rain or light spray when without covers it would be impossible to have any hatches open.

## OPTIONALS

### Holding tank system

The sewage from the toilets can be pumped either overboard, or into the holding tanks, one for each head. The holding tanks can be emptied either by suction from shore or by hand pumps through deck connections. On the main switchboard there is a warning light labelled HOLDING TANK FULL. A blinking light means a nearly full tank, a steady light denotes that the tank is completely filled.

Webasto cabin heaterWiring diagram

The manufacturer's operating instructions are appended. The heater is installed under deck in the lazarette. On the main switchboard there is a three-position switch for OFF, HEAT, and VENT, and a small control light nearby, showing when the heater has ignited and is operating properly. The heater can be run on fan only for ventilation merely by switching to "VENT"-position at the switch.

The heater uses fuel from the engine fuel tanks, and has a separate shut-off cock with water separator, located under the floorboards forward in the engine space. The fuel pump is under the floorboards near the navigator's seat. Before starting the heater, check the service battery voltage. This must be at least 24V, otherwise charge the battery first. The heater is started by turning the thermostat to the desired temperature and then switching to HEAT position. This energizes the glow plug, and can be verified by a negative reading on the service A-meter. After a while, the control light on the switchboard should light up, indicating that the heater has ignited. If the control light does not light up within a reasonable time you should check if the glow time limiter has switched off the heater. The glow time limiter is a time switch with a red push button, located in the navigator's seat. After about 5 minutes the red button can be pushed in and begin the automatic starting sequence again.

Note: It is recommended not to start and stop the heater repeatedly, either by using the thermostat or the HEAT-switch, as this will interrupt the normal airing procedure, and cause smoking.

Do not turn off the master and main switches immediately after turning off the heater. The heater has an automatic cooling down sequence, which needs power for about 5 minutes. The very high temperature in the combustion chamber will, if not vented out, damage the blower bearings. The fuses for the heater are located in the navigator's seat.

Approximate fuel consumption

The heater uses about 1 l (0.26 US gal) per hour when operating continuously.

## 6. ELECTRICAL

Service wiring diagram

Engine wiring diagram

There are two independent electrical systems - the service circuit for lighting, instruments, pumps, etc. and the engine circuit for starting and charging.

### Main switch

This cuts out all electricity in the boat and should be turned off when the boat is left unattended, or when making repairs on the electrical system. The main switch is located under the navigator's seat and has a black knob on top which has to be turned.

Warning! Never turn the main switch off with the engine or Webasto air heater running as this will destroy the alternator and air heater!

### Master switch

This cuts out the service circuit, and is located on the switchboard on the far right.

### Dials on main switchboard

To the left is the engine battery Ammeter, indicating the amount of charging. In the middle there is a voltmeter for checking service or starting battery voltage by turning the switch marked BAT.TEST into the appropriate position. To the right is the service battery Ammeter.

### Service switches

These are of the trip circuit type, which will switch off automatically if overloaded. If, when a switch is pushed upward (ON-position) it immediately drops back down, (OFF-position), this means that there is a fault causing excessive current. The fault must be found and remedied before the switch can be used normally.

Warning! Never try to force a switch to stay in the ON-position.

### Fuses

On the switchboard there are a number of fuses for such electric equipment that have own built-in switches. To check if a fuse has blown, unscrew the cap and examine the fuse wire. If in doubt, change to a new fuse. The fuses for the service main, the engine alternators, starting circuit, bilgepump, engine room blowers, and engine controls are found in the navigator's seat.

### Battery charging

Batteries should be checked regularly. If voltage in either battery set is below 23 volts, they should be charged. Two to four hours charging per day is recommended, depending on usage. A 35 Amp alternator on the main engine charges the starting battery and a 70 Amp alternator charges the service batteries. At engine revolutions over 17 rps (1100 rpm), both Ammeters should display positive charging, recommend charging rpm is 23 rps (1400 rpm).

Note: The alternator switches each side of the Volt-meter must be in ON-position for charging. Only if interference from the alternators must be eliminated, for instance when using a SSB-receiver, the switches are turned off. The charging current reaches its maximum immediately after starting, and is about 60 A for a discharged service battery, and about 20 A for a discharged starting battery. The charging current gradually decreases as the batteries become charged, and approaches zero when they are fully loaded. If both Ammeters do not display any charging after starting, the vee-belt drive for the alternators must be checked for correct tension. The tension should be checked after the first 5 hours of engine running, and after that every 50 hours.

#### Battery maintenance

For the service system there are normally six 12V 95Ah batteries coupled in series to deliver 24 V, located in GRP boxes under the owner's cabin floorboards.

For the engine starting system there are two 12 V 95 Ah batteries, coupled in series.

Check the state of charging at least once every month with a hydrometer. The specific gravity of the acid should be 1,28 for a fully loaded battery. This applies to an ambient temperature of 27°C. For other temperatures, a correction should be applied as follows:

70°C + 0,032, 60°C + 0,024, 50°C + 0,016, 43°C + 0,012,  
38°C + 0,008, 32°C + 0,004, 27°C 0, 20°C - 0,004  
15°C - 0,008, 10°C - 0,012, 5°C - 0,016, 0°C - 0,020,  
-7°C - 0,024, -12°C - 0,028

Interpolate between table values if necessary. By adding or subtracting the correction, the specific gravity is normalized to a 27°C temperature. The battery state can then be evaluated with the aid of the following table:

Sp. gr.	State of charge
1,28	100 %
1,25	75 %
1,22	50 %
1,19	25 %
1,13	empty

The acid level for a fully loaded battery should be 3 ... 8 mm over the plates. If too low, add distilled water.

Note: Never add water to a discharged battery, because the process of charging may cause an overflow, which will weaken the acid concentration. This results in an appreciably shorter battery life. Never use open fire nearby when the batteries are checked. Never move acid from one cell to another. Before the cell caps are screwed down, check that the air holes are open. Check and grease the battery cable connections with vaseline monthly.

Check that the ventilation pipes from the battery box are properly connected.

Important! If the batteries are removed, make sure that the main switch is turned off, and that the cables are properly marked before they are disconnected.

Note. Electrical parts and salt water do not get along well, so make sure that all vulnerable electrical parts are sprayed often with preservatives.

#### Navigation lights

Navigation lights are constantly exposed to the weather and must be cared for. At the beginning of the season take the bulbs out, clean the contacts and spray with a cleaner-preservative (such as WD-40 or CRC 6-66). This treatment should be repeated periodically (especially after rough weather or hard rain) and again at lay-up time.

#### OPTIONALS

##### Shore power

##### Wiring diagrams

This is an independent electrical circuit, including a separate switchboard with polarity alarm, Volt- and Ammeter and main switch, outlets, and 15 m connection cable with plug-in on the boat.

Important! Make sure that the shore voltage matches with the boat installation, 110 and 220 V must not be mixed up. To plug in the cable to the boat, push hard and simultaneously turn clockwise until a stop is felt. Then tighten the screw ring. If the polarity alarm - a buzzer behind the switchboard - starts ringing when the land end of the cable is connected, an electrician must be called to sort things out. If both 110 and 220 V are available, it is preferable to use 220 V as this will double the power available from the outlets. After the shore cable has been connected the SHORE switch is turned on. Check that the voltage displayed on the panel is between 200 and 245 V before switching on anything else. Before disconnecting the cable, turn off the SHORE switch. When the switch marked BATTERY CHARGER is turned on, the Ammeter should display positive charging. An empty service battery will at first draw about 60 A charging current, the value will decrease as the battery gets charged, and at last approaches zero.

The battery charger can be left on for an indefinite period, as it has automatic regulation of current and voltage.

The shore power fuses are located in the locker aft of the navigator's seat.

Shore power can be used for the following:

- 220 V outlets
- Battery charger
- Water heater
- Electric stove

##### Battery charger

This is located under the main companionway ladder, and must not be covered up as ventilation is needed for cooling.

Water heater

Before switching on the WATER HEATER, proceed as described in the Plumbing section, under fresh water system. The heater consumes 1700 W.

Dieselgenerator

6 KVA, wiring diagram

The generator provides 220 V 50 HZ AC, and serves the same functions as shore power, see above.

Starting:

The 6 KVA unit is started with a key, which should first be turned into the HEATER position for between 30 and 50 seconds, then to STARTER, and back to ON. The alternator has its own starting battery 12 V 95 Ah, located with the engine starting batteries.

Running:

After the alternator has started, check that the lamp ALTERNATOR RUN is lighted. This means that current is being made properly, and the switches for the 220 V consumers can then be turned on.

If the red lamp 12 V CHARGE FAULT lights up, this indicates that the alternator starting battery is not getting any charge. This will not interfere with the running of the alternator, but must nevertheless be investigated for obvious reasons.

The warning light OIL PRESS, WATER TEMP indicates a serious fault, and the alternator must be stopped immediately, if the automatic cut-out has not done it already. If the alternator is run when sailing, the heeling angle must be less than 15 degrees, otherwise the lubricating oil pump cannot work properly, and will cause occasional stopping. Turn off all 220 V switches before attempting to restart.

Overload protection:

If the current exceeds 24 Amp for the 6 KVA unit, the overload protection will disconnect the main circuit from the alternator output, and the warning ALTERNATOR OVERLOAD will light up. If this happens, switch off all the 220 V consumers and switch on the overload protection again. The overload protection is located in the locker aft of the navigator's seat. After that, switch on the 220 V consumers again one by one and notice which one takes too much load. The protection is slow and will not trip for an overload of very short duration.

Stopping:

Turn off all the 220 V consumers, and turn the alternator key to OFF.

## 7. INSTRUMENTS

### Danforth Compass Instructions

All navigating instruments except the compass and clock are optional. Therefore, only a few general hints are given, and the owner is advised to consult the manufacturers' detailed instructions, which are worthwhile reading carefully and in a devotional spirit with proper reverence.

#### Compass

Keep portable radios and cameras with exposure meters away from the compass, because they are strongly magnetic. Maintain exact alignment of compass so that when sighting across it the fore and aft lubber lines line up exactly with the center line of the boat. The correctors are removed from the compass, and are stowed in the chart table drawer.

#### Quartz Clock

The clock is powered straight from the service batteries, and has its own fuse, located behind the switchboard. The clock light is on the same circuit as the other instrument lights. For adjusting the second-hand, gently push in and turn the knob in the centre of the dial, for adjusting the minute-hand, push harder.

### OPTIONALS

#### Log

The transducer housings are located under the floorboards at stn 3.2. When not in use, the transducers should be retracted to avoid damage by floating objects. Do not force a Brookes & Gatehouse transducer down into working position. There is an alignment slot and if the transducer will not go down easily it should be turned until it does.

Note: Calibration instructions are given in the service manuals.

#### Echo sounder

The transducer housings are located under the floorboards at stn 2.7. Normally there is no maintenance except for the winter overhaul.

#### Navigation instruments

The power to all instruments, repeaters and their lighting runs through their fuses on the main switchboard. The lighting, if fitted, is always on but consumes only 40 m A for each repeater.

Important! On Brookes & Gatehouse instruments there is a desiccator plug which should be checked once every month. Normal colour is blue; if it has turned red, proceed as per manufacturer's instructions.

If there is moisture condensing inside the repeaters, also see the instructions.

For the connection of instruments mast wiring, see Section 8, stepping the mast.

Radio telephone, direction finders etc.

The aerial and earth connections should be checked a couple of times every season for possible corrosion and looseness. Faults on these points may cause a severe reduction in performance. Especially troublesome are all plugs and connections to isolated stays. Corroded surfaces should be thoroughly cleaned, and then sprayed with a contact-cleaner. Let the cleaner work for at least half an hour, wipe off the surfaces carefully, and apply a new layer of cleaner before assembling.

## 8. RIG

Sail plan ketch  
Sail plan sloop  
Mast wedging drawing  
Slab reefing drawing

Spars

The spars are anodized aluminium extrusions. They should be washed and waxed as necessary to preserve their appearance. If the spars get scratched, clean the scratches and cover them with metal laquer or wax.

Recommended sail setting

On the sail plan there are indicated sail settings for various wind strengths.

For best performance the boat should not be allowed to heel more than about 25 degrees.

Stepping the mast

The weight of the main mast, including rigging, is about 800 kilogrammes, mizzen about 300 kilogrammes. When inserting the mast heel through the deck opening, be careful not to damage the cables emerging from the mast. Be sure to clear the electrical cables under the foot of the mast as it goes into the step. Connection points for the cables will be found on starboard side adjacent to the mast step.

Do not set up the rigging tight before wedging is done.

Wedging of partners

It is very important for the mast to be held securely at the partners, allowing for a slight athwartships movement under load. This is achieved with the system shown using rubber wedges. The rubber should be "tan pure gum floating stock rubber" of 35 ... 45 shore hardness. Rubber thickness should be 1,25 times the space between mast and collar.

The first wedge is easy to slip into position, but for the second a very strong tackle is needed. The end result should be that the wedges are under considerable pressure. A hose clamp is used to hold bottom edge of the wedges against the mast.

After wedging is done the rubber boot provided is tightened around the mast and the collar to stop leakage. Make sure it is properly installed with large hose clamps to hold it in place and silicone around the top to seal it. The rubber is quite quickly destroyed by sunlight, so it must be covered by the canvas boot provided as well. Make sure this goes all the way around and covers the rubber completely.

Designer's note: Rod versus wire rigging

1 x 19 stainless steel wire is the most dependable rigging available, however, rods have two advantages - they stretch less under load, and have less tendency to foul a spinnaker that has wrapped around. The first point means that there is less to take up in a backstay before the headstay is tight. Note that you cannot set up a rod any harder than a wire, because for the same diameter their strength is about equivalent. For headstays rod should only be installed if standard hanks are to be used, not under a foil system. For shrouds, the only place where rods should be considered is for the top shrouds. Rods are more vulnerable and difficult to handle and install.

Maximum backstay tension

Never apply more tension on the backstay than 25 % of its breaking strength. With a hydraulic backstay tensioner this is easy to control.

Wire diameter	Breaking strength	25 % breaking strength
8 mm	11500 lbs 5200 kgs	2900 lbs 1300 kgs
9 mm	15000 lbs 6800 kgs	3800 lbs 1700 kgs
10 mm	17600 lbs 8000 kgs	4400 lbs 2000 kgs
12 mm	26000 lbs 11800 kgs	6500 lbs 3000 kgs

Downwind the backstay should be kept rather slack, as well as in harbour.

With a divided backstay, only half the tension should be applied to each part.

Mast rake

With the backstay slack the mast should stand vertically. With maximum tension applied (see preceding paragraph) the top of the mast should rake aft as given on the sail plan. If rake is not correct, headstay length must be adjusted.

Mast curvature

Normally the mast heel should be positioned so that the lower portion of the mast stands vertical or perpendicular to the designed plane of flotation. Then with the rake mentioned above there should be a gentle curve or hollow in the after side of the mast. This curvature should be controlled with the mast heel position rather than by adjustment of the forestay or midstay, moving the heel aft to increase, or forward to decrease, the curvature (assuming that the headstay is adjusted as desired for balance and performance).

Note: The mast heel is not designed to be moved while underway. If it must be moved it should be done in harbour with the rigging slackened off and no load on the rig.

Spreaders

The spreaders should bisect the angle between the upper and lower parts of their shrouds.

This means they should be angled abt 4 degrees above horizontal. Make sure that the spreader tips are securely supported on the shrouds. If the tips can slip down, this could cause the loss of the rig. It is recommended that spreader tips be covered with a soft material, or taped, to prevent chafing genoas.

Shroud tension

All shrouds should first be set up so they are just tight but under no tension. The sail track must be straight. Both top shrouds should then be tightened up three full turns (with rod rig 1 1/2 to two turns). For adjusting the lower and intermediate shrouds, the boat should be heeled 25 degrees with No. 2 genoa and full aminsail, and the backstay set to maximum tension. Adjust the shrouds so that the mast at the gooseneck, spreaders and top shrouds attachment point is in a straight line athwartships.

A good starting point for double lowers is to have the forward ones one turn tighter than just tight, and the after ones one turn less. The intermediate shrouds should have one turn less than just tight.

### Halyards

Halyard eyes are made with a nico-press so that maximum hoisting can be achieved. With nico-presses it is important not to over-hoist, as the halyard will then fatigue at the edge of the sleeve and break very quickly. Make sure that all halyards are marked so that the nico-press sleeves are not hoisted high enough to touch the sheaves.

### Broken halyard

Inside the mast, there is a messenger line fastened to a little oval plate near the gooseneck. This messenger runs over the unoccupied sheave at the masthead, coming down the aft side of the mast. By fishing the messenger out through the halyard exit, a new mainsail halyard can easily be pulled through. For replacing a genoa halyard at sea it is necessary to go to the mast head, peeling off the tape on the messenger on the way up. Then using a hook fashioned from a wire coat hanger, fish the messenger out over the forward sheave and pull it through, letting the end down on the forward side of the mast. The hauling part must then be fished out from inside the mast through the normal genoa halyard exit, after which the replacement halyard can be pulled through. Great care is necessary when fishing out the hauling part to avoid crossing the messenger with any of the other halyards. When replacement can wait until the boat is moored in smooth water, then a lead weight on a light messenger should be fed in over the sheave at the mast head, while the boat is heeled over to the side that the replacement halyard sheave is on and all other halyards held out of the way by working through the halyard exit holes with the wire hooks. Then the weight can slide down the low side of the mast and be fished out through the correct exit hole. When done in smooth water with the correct heel the messenger should be clear, but check that it runs freely before hauling the replacement halyard through. This same method can be used to replace the main halyard messenger when it has been used.

Note: After replacement of any halyard, when possible it should be rerun over the original sheave (which should be first checked to ascertain what caused the breakage) and the messenger replaced in its original position to avoid later cross-ups.

### Spinnaker aft guy

An aft guy taken straight to the footblock will bend the lifeline stanchions. The aft guy should therefore be led through a block attached to the toerail about station 6,5. For hard downwind running also the spinnaker sheet should be led through a block in the same area. This will make the spinnaker easier to control and minimize rhythmic rolling.

### Slab reefing (optional)

The correct way to rig the reefing lines is: From the sheave at the boom outward end, the line is taken up through the cringle in the sail and down through the adjustable eye under the boom. Make a figure eight knot at the end as a stopper. The eye should be positioned a little aft of the cringle when the sail is reefed, which means it should be aft of a perpendicular down from the cringle to the boom, as a starting point. Over the gooseneck sheave the line is taken through a snatch block at the mast collar to a deck winch.

It is recommended that reefing be practiced in the harbour so that the optional positions and methods can be found.

When reefing always hook in the tack cringle and tighten the halyard before taking up the last bit on the clew to avoid pulling the luff of the sail away from the mast.

Note: Do not use eyes in aluminium mast collar for slab reefing. Deck eyes are provided for this. Collar eyes are only for dead ending lazy halyards and not strong enough for reefing.

#### Lock off cams

The lock off cams in the boom for slab reefing are provided with short handles for a reason. If there is too much load on them to allow easy release, do not force or kick them as this will probably bend or break the handles. Lead the line to the nearest free winch and momentarily take the load on it, allowing the cam to release easily.

#### Snatch blocks

The snatch blocks provided should be the proper sizes. Use the correct ones in the correct places and they will give no trouble. Make sure that the sheaves turn freely. Clean blocks periodically and spray with WD-40 or equivalent.

#### OPTIONALS

#### Hydraulic backstay tensioner

Never apply more tension to the backstay than the maximum given above. If the tensioner can be preset to a load limit, it is recommended that this be done, so preventing accidental overload to the rig. If refilling is necessary, use a non-detergent mineral oil SAE 5 or 10.

## 9. HAULING & STORAGE

### Docking plan

#### Hauling

If slings are used, they should preferably have a frame spreading the slings/so they come down to the deck edge vertically. Otherwise they must be long enough to avoid excessive pressure at deck edge. The slings must be securely fastened so they cannot slip, and be carefully positioned not to damage propeller shafting or any protruding fittings. Be sure that the slings are clean on the inside surface to avoid scratching the hull under the heavy loading.

#### Storing on a cradle

The greatest part of the weight must be taken by the keel, with well padded supporting struts at bulkheads or stringers. There must be a stopper aft of the keel toe, preventing the boat from slipping backwards.

#### Winter storage

- Remove the cushions and curtains, and preferably all loose gear.
- Clean the boat throughout, and leave the floorboards and doors open for airing.
- For cleaning the bilge, a drain plug is provided at the deepest point.
- If freezing temperatures are expected, empty all tanks, piping, and pumps containing water.
- Fuel tanks should preferably be empty.
- Take out the batteries and have them charged regularly.
- The winter is the best time for curing any faults. Carry a notebook onboard and record jobs needed while fresh in your mind.