Windward Passage Operating Manual

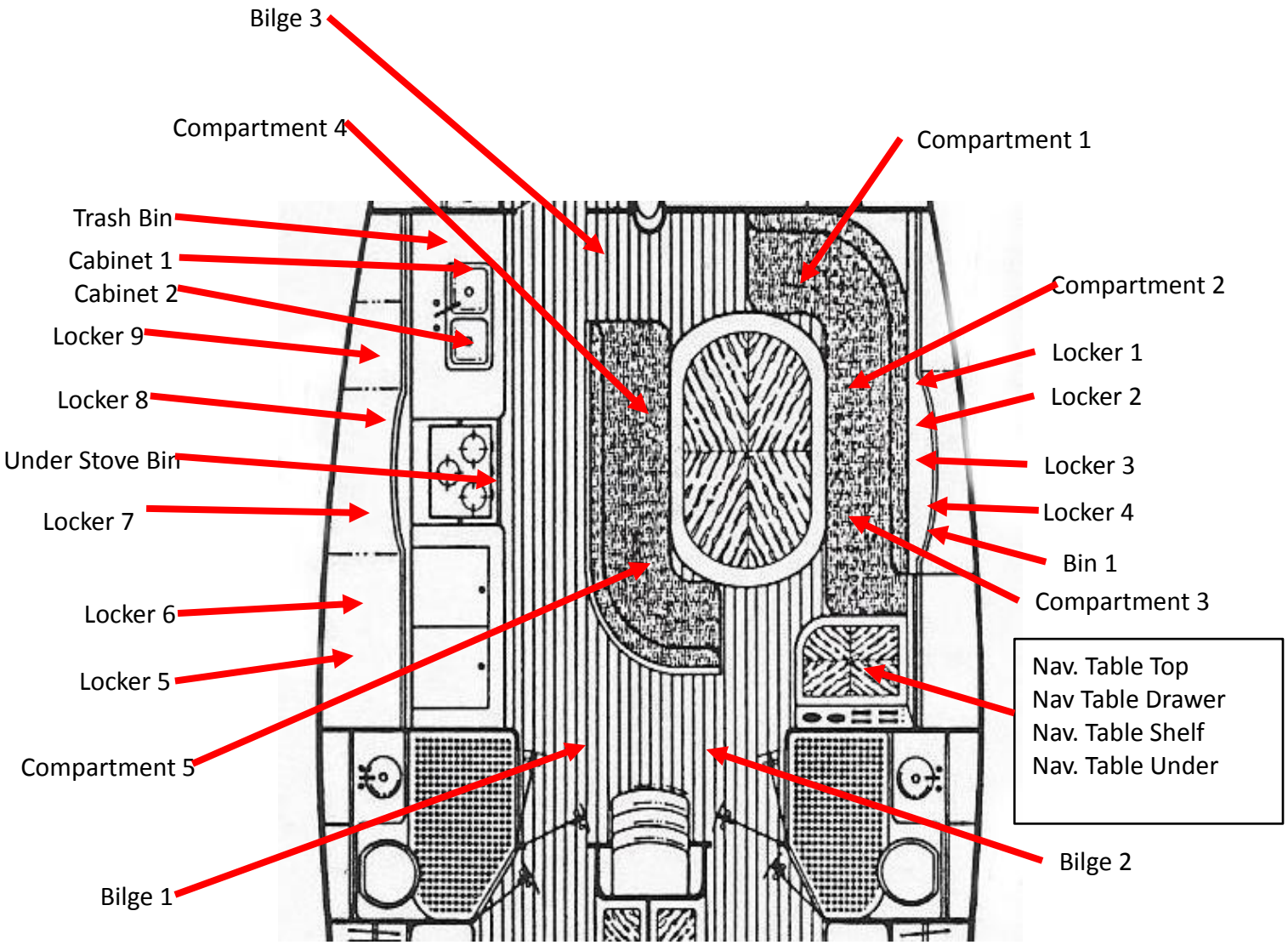
Contents

I. Stowage Compartment Layout and Contents

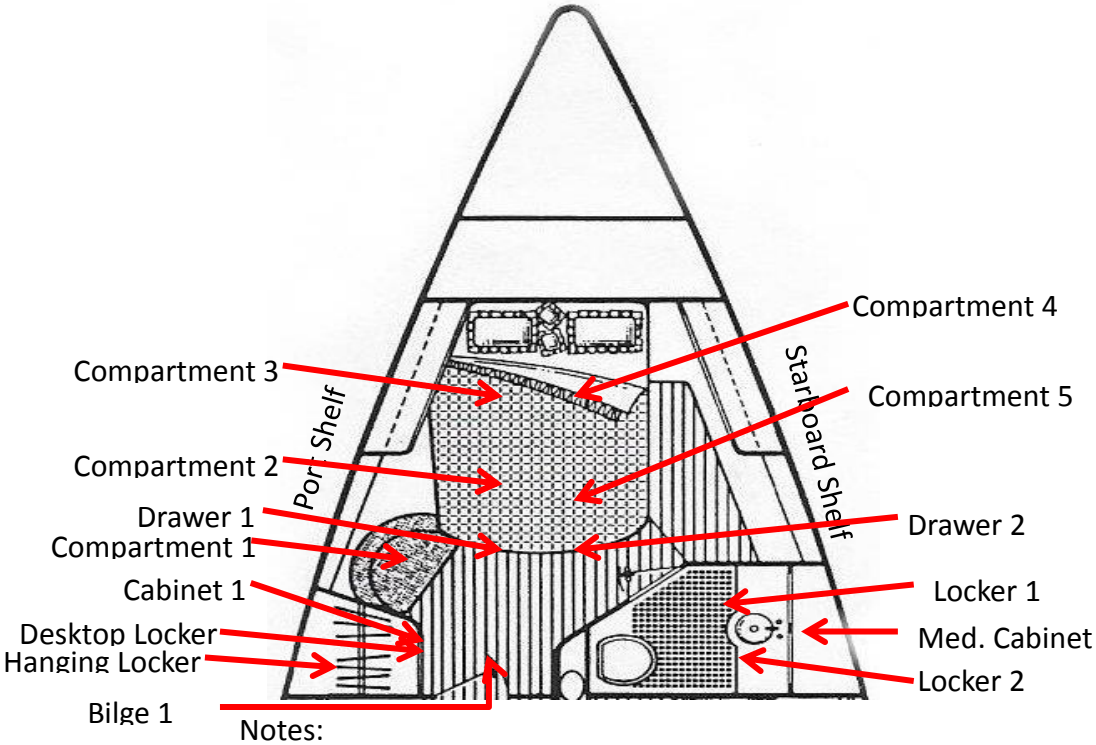
A. Stowage Documentation

A complete listing of all of the items except provisions stowed on Windward Passage may be found in the Ship's Operation Binder and as an Excel spreadsheet on the ship's computer. The printed version is sorted three ways: by item, by category and by location. A listing of the provisions and their location is developed for each passage and is maintained in the Ship's Operation Binder.

B. Main Salon Storage Layout

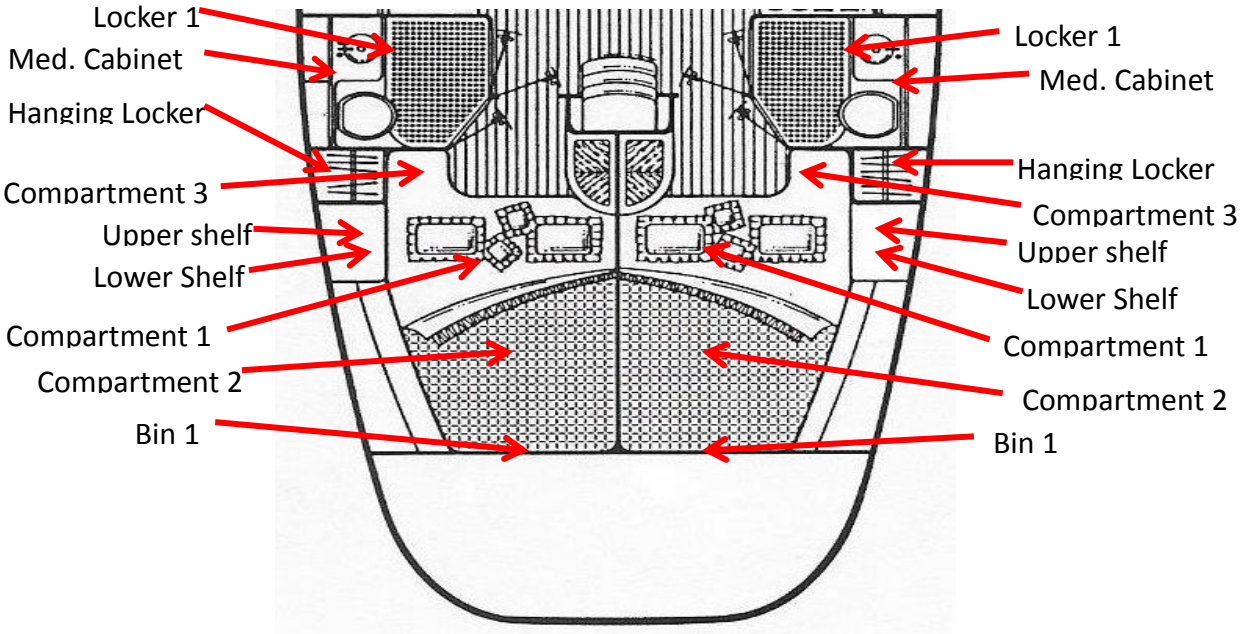


C. Forward and Aft Cabin Stowage Layout

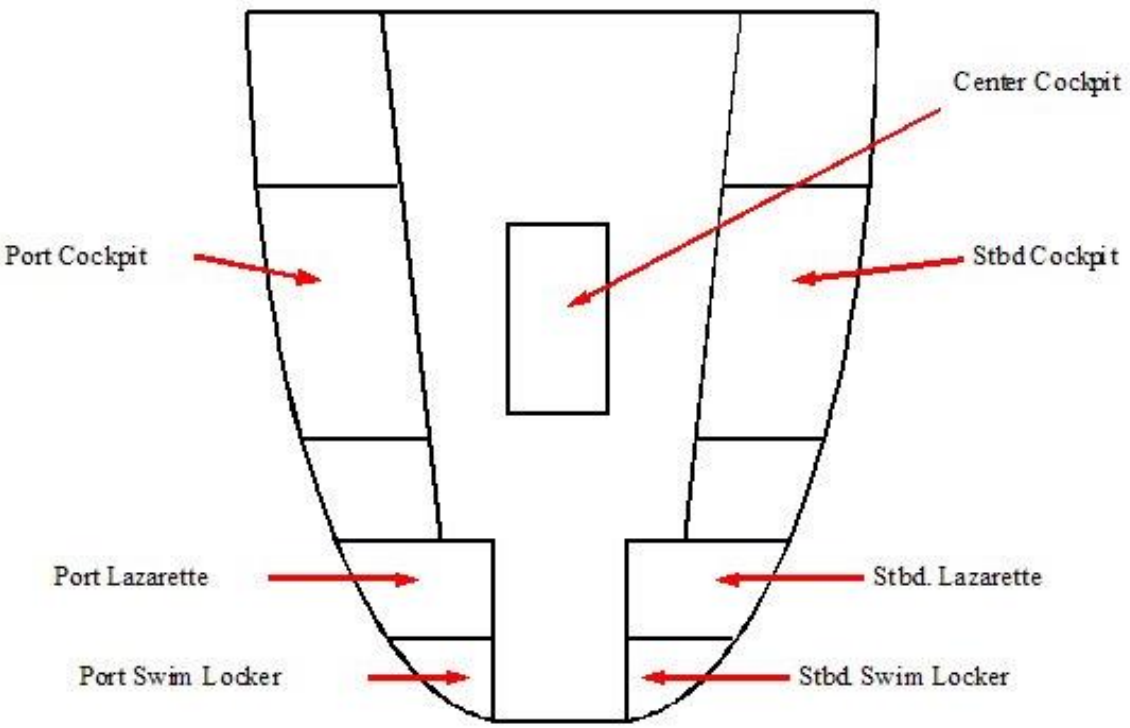


Notes:

1. Compartments are under seats or beds
2. Lockers are horizontal hinged doors
3. Bins are vertical snap-in doors
4. Bilge are storage space below the floorboards
5. Cabinets are large vertical units



D. Cockpit Stowage Layout



II. Safety Information

A. Personal

1. Life Preservers

There are 5 life preservers on board in a bag marked "Life Preservers" that is stored in the main salon. Additional preservers are in the hanging lockers in each cabin.

2. Harnesses, Tethers and Jack Lines

There are six harnesses and tethers on board. They have integral life preservers that are inflated with CO2 cartridges that are manually operated (they may also be inflated by mouth). Four are stored in Compartment 1 in the Forward Cabin and are assigned to crew when sailing offshore. Two are stored in the hanging locker in the forward cabin. While sailing offshore or at night jack lines will be fitted from the bow to the stern on each side of the boat. The jack lines are run inside the shrouds so that one can go from the cockpit to the bow of the boat along the centerline of the boat without having to unsnap your tether. These jack lines are stored in Compartment 2 in the forward cabin when not in use.

Harnesses must be worn and attached to a jack line or other appropriate attachment point under the following conditions:

- When sailing offshore and you need to leave the cockpit to go anywhere on deck
- When sailing at night and you are outside of the salon area
- When the conditions are such that the captain or the person on watch deems it necessary for crew outside the salon area to utilize harnesses

3. Emergency Signaling Devices

a) Flares

Located in a flare container that is in the starboard cockpit locker. There are at least 6 hand held flares and a flare gun with at least six shells. A battery powered signaling device is stored in the starboard cockpit locker with the flares. Additional flares and flare gun are in the abandon ship bag when sailing offshore.

b) Distress Flag

Located in the flare container that is on the starboard cockpit locker.

c) Signal Horn

One is in the cockpit at the helm station and one is stored underneath the Nav. Table Desk.

d) Fog Signals

The VHF intercom/hailer system has an automated fog signal system that will automatically sound the correct fog signal when underway under power, underway under sail or anchored. Instructions are in the VHF manual and section III-G-3 of this manual. There is a fog bell mounted above the navigation station.

e) EPIRB

Mounted above the navigation station – must be manually activated.

f) VHF Radio

Is set up to send an automatic position report and distress signal. See the section on operation of this radio on page 29 for detailed instructions. A brief set of instructions is mounted on the bulkhead next to the radio.

g) Hailer/ Intercom

The VHF Radio (page 29) has a hailer function that will broadcast from a speaker mounted on the mast just below the radar pod. There is also an intercom function that allows communications between the navigation station and the helm station.

4. Life Raft

The life raft is mounted on the deck and may be inflated manually or will inflate automatically if immersed in water to a depth of 10 feet. **Make sure that the raft painter is tied to the boat before throwing it overboard.** Then yank on the painter to inflate the raft. The life raft has emergency provisions for 6 people. Do not deploy the raft and enter it unless you are certain that the ship is sinking. Many boats have been found abandoned and still floating while their crew were lost in their life raft or were rescued after a very uncomfortable and dangerous ride. There is a yellow abandon ship bag in the forward cabin that contains extra provisions and survival gear. If it appears that it may be necessary to abandon the ship for the life raft move this bag to the cockpit so it can be placed into the raft at the time that you abandon ship. If there is time, load additional water and provisions into the life raft. The abandon ship bag contains a hand held VHF radio and a portable GPS. If it is necessary to enter the life raft you should take the EPIRB (mounted above the Navigation station) into the raft with you.

5. Man Overboard Sling

A Life Sling is located on the port lifeline with its tether tied to the toe rail. To retrieve a person overboard with this device you return to the vicinity where the person is in the water then throw the life preserver that is in the Life Sling bag overboard to trail behind the boat. Then steer the boat at slow speed in a circle around the person in the water. The person should then be able to grab the tether and pull the life preserver to themselves. As soon as the person has grabbed the tether STOP THE BOAT and slowly pull the person to the stern rail to retrieve them. The swim ladder should be deployed to aid in retrieving the person.

6. Man Overboard Pole

When sailing offshore a man overboard pole is located at the stern pulpit starboard side. It is connected with polyethylene line to the horseshoe buoy and to a strobe light that activates when in the upright position. If a person should fall overboard lift the pole to clear the stern pulpit and throw it with the horseshoe buoy and the strobe light overboard as soon as possible. The pole has a flag that helps the person in the water to find the buoy and helps the people on the boat to locate the person. The strobe light will provide location assistance in bad visibility and at night.

B. Disaster Control

1. Fire Control

There are six fire extinguishers on the boat:

- In the forward cabin on the forward bulkhead
- In the port aft cabin on the wall by the head
- In the starboard aft cabin on the wall by the head
- In the main cabin on the side of the navigation table
- In the main salon on the port side above the refrigerator
- In the starboard cockpit locker

Make sure you are familiar with their location prior to setting sail.

To operate:

- If the extinguisher is mounted on a wall, flip the latch on the holder to release the extinguisher
- Hold the extinguisher upright and aim at the base of the fire
- Pull pin and squeeze lever at top of the extinguisher while aiming at the base of the fire

If you suspect an electrical fire, switch off the four main battery switches in the aft port cabin below the bunk. Then use the fire extinguisher on the fire.

If there is a fire in the engine compartment, a plastic cover over a hole in the companionway steps is designed to let you fight the fire without opening the engine compartment. Remove the plastic cover and inject the contents of the fire extinguisher into the engine compartment through the hole. This minimizes the amount of air available to the fire and contains the fire extinguisher contents to the area where the fire is located.

2. Flooding Control

There is a 500 GPH automatic bilge pump and a 2000 GPH automatic bilge pump in Bilge 3 compartment in the Main Cabin. The smaller pump is in the bilge sump and will activate when there is about 2 inches of water in the sump. This pump may cycle occasionally as small amounts of water finds its way into the boat. However, Windward Passage rarely has water in the bilge so if the larger pump actuates it is a sign that a major leak may have developed. Both of these pumps activate automatically and are connected directly to the batteries with in line fuses located in compartment 4 in the main salon. The pumps can be turned on manually using circuit breakers on the upper circuit breaker panel that are labeled “Sump Pump” (for the smaller pump) and Bilge Pump (for the larger pump).

A third bilge pump is located in Compartment 5 in the Main Cabin with the fresh water pumps. This bilge pump serves double duty as a bilge pump and a pump to remove water from the refrigerator. To activate this pump, you must throw the switch labeled "Refrigerator Drain" on the circuit breaker panel and you must throw the three way valve in Compartment 5 so that water is being pulled out of the bilge and not out of the refrigerator. While the pump is running check the hose in the right hand side of the

refrigerator box to ensure that it is not sucking water. If it is, the bilge pump valve is in the wrong position.

A manual bilge pump is located on the starboard side of the swim platform pass-through below the helmsman's seat. The handle for this pump is in the port lazaret with the propane tanks. Insert the handle into the pump below the helmsman's seat and pump.

For an emergency situation involving severe flooding there are buckets in the starboard cockpit locker and the waste cans in the three heads may be used to bucket water.

3. Thru-hull Fittings

Wooden plugs for use if a through-hull fitting were to break are located on the shelf below the navigator table. A hammer for driving the plugs into the hole is in the tool box in Compartment 2 in the Main Salon. The below-water through-hull fittings are in the following locations:

In Lockers 1 and 2 of all heads (three thru-hull fittings below each sink)

At the stuffing box for the propeller shaft (in the engine room)

In Bilge 1 compartment of Forward Cabin (depth sounder and speed meter)

Engine cooling water intake (main salon below the stairs just forward of the engine)

Keel cooler for refrigerator located below the floor boards just aft of the entrance to the forward cabin (there is no valve on this thru-hull).

In the sail locker as feed to the wash down pump

Several additional through-hull fittings are located above the water line but may be below water when the boat is heeled:

Galley sink drain (Cabinet 1 Main Cabin)

Bilge pump outflow (Starboard lazaret) – no valve

Shower pump outflow (Lockers 1 & 2 in each head) no valve

Sink drains in all heads

4. Emergency Tiller

The emergency tiller is located in the port cockpit locker. To fit the emergency tiller you must remove the wheel (stow it below). Use the winch handle to remove the cover for the rudder post access that is located below the helmsman's seat. Insert the emergency tiller so that it fits over the square top of the rudder post and begin steering. If the steering problem is a result of jammed cables it may be necessary to remove the cable from the steering quadrant before you will be able to steer with the emergency tiller. The quadrant can be accessed from the port aft cabin through the access panel in the stern or from the starboard lazaret. It is possible to steer Windward Passage in a straight line course by locking

the steering wheel and adjusting sail trim. If you are using the emergency tiller it is important to adjust sail trim for minimum helm.

Note that the auto pilot can be used to steer the boat if the steering cable breaks since it is connected directly to the steering quadrant. This is much easier than trying to use the emergency tiller but it does use battery power.

5. Storm Jib

The storm jib is a Gale Sail and is stowed in the sail locker (accessed through a hatch on the foredeck) along with the spinnaker sheets that are used for sheeting this sail. This sail should be used when the wind is forecast to be greater than 30 knots. The sail is attached by hanking it on over the rolled up genoa and raising it with the spare genoa halyard. It should be attached at the tack with a painter that allows the tack to be adjusted so that the sail is just high enough to allow waves to pass under it but as low as possible to minimize the heeling moment and the lee helm for the sail. This painter should be led through a snatch block (stowed on the shelf under the navigation table) at the bow and then to one of the bow cleats so that it can be easily adjusted if necessary. Be sure that the genoa sheets are tied off so that they do not go overboard and drag under the boat. After hanking on the Gale Sail run its sheets through the fairleads that normally accommodate the genoa sheets, raise the sail and sheet it like a jib. It may be better to run the sheets inside the shrouds to minimize chafe. If you need to heave too you should run the active jib sheet inside the shroud to minimize the pressure on the shroud and chafe of the sheet or use a snatch block on the sheet with a line to another snatch block at the toe rail and back to a winch or cleat to pull the sheet away from any shroud where it might chafe. Snatch blocks are stored on the shelf under the navigation table.

6. Top Climber and Bosun Chair

The Top Climber is used to climb the mast or the forestay or backstay for working aloft. It is stowed in Compartment 2 in the port aft cabin. The climber uses two rock climber's ascenders that compress the line to which they are attached. Consequently, it is not good to attach them directly to a halyard as they can cause damage to the line's fibers. An 80 ft. long line is provided to be used for the climb. This line is tied to the shackle for the halyard that will be used. Be sure that the line is tied through a closed thimble and do not rely on the quick release shackle if you use the spare genoa halyard or the spinnaker halyard. Use a bunt line hitch or a bowline with a locking hitch to secure the line to the halyard. Using the halyard, pull the line to within about 1 ft. of the top of the mast then secure the line at the bottom by taking it through one of the blocks at the bottom of the mast and then to a cleat on the mast. Once the bottom is secured, the halyard should be tightened using a halyard winch. The tighter the line, the easier it is to use the Top Climber. If the line cannot be made sufficiently tight for easy climbing, the halyard shackle may be against the block at the top of the mast. If so, release the halyard and take up about 6 inches on the line at the bottom then retighten the halyard. Once the tension on the climbing line is satisfactory you should lock the halyard clutch and tie the bitter end off to a cleat.

To use the Top Climber, you sit on the seat with your feet in the bottom loops and raise the lower ascender. Then stand up in the loops and raise the top ascender. Repeat these steps until you have

climbed to the desired height. If a second person is available, you should use a second halyard secured to the Top Climber with the second person belaying you with this halyard as you climb and descend.

To descend you stand in the loops and lower the top ascender about 10 inches. Then sit on the seat, lean back and lower the lower ascender about the same amount. Repeat these steps until you have descended completely. Sometimes the lower ascender is lowered too much and, when you stand to lower the seat you cannot take the pressure off of the upper ascender. When this happens, simply sit back down and raise the lower ascender slightly. After a few cycles you will have a feel for the amount you should lower each ascender for each step.

I attach the tool bag to the bottom of the seat while climbing but when I reach the working height I usually reattach the tool bag to the lifting ring at the top of the climber as I find it easier to reach the tools.

A bosun chair is stored in compartment 1 in the aft port cabin. If used with the main halyard or the spare jib halyard, the electric halyard winch can be used to raise someone in the bosun chair.

III. System Operation

A. Auxiliary Engine

1. Maintenance Checks

a) Cooling Water Level in Engine

Manually check the water level in engine by removing the heat exchanger filler cap located on the top, port side of the engine. DO NOT REMOVE THE CAP IF THE ENGINE IS HOT. This cap is metal and similar to the radiator cap found on any automobile. Water frequently needs topping up in the tropics and neglecting to do so is the most common cause of the engine overheating. The small plastic overflow tank for the radiator should have water in it at the bottom mark when the engine is cold and at the top mark when the engine is at operating temperature. When adding water be sure that you are adding it to the heat exchanger and not into the oil filler location on the top, center of the engine. The cap has a mark to indicate when it is screwed on properly. If the cap is not screwed on properly the radiator is not vented to the overflow tank and a severe overpressure of the radiator can occur if the engine overheats.

b) Engine Oil Level

Access to the dipstick is possible by removing the companionway steps or the engine room panel in the aft starboard cabin. The dipstick is on the starboard side of the engine. To check the level, remove the dipstick, wipe it clean, put it back in and remove it. The oil level on the dipstick should be between MIN. and MAX. Only add oil if the level is at MIN. If you do have to add oil, do so through the oil filler on top of the engine. Be sure to differentiate between the oil and water filler. Do not overfill with oil as this can cause damage to the engine. The engine oil and the oil filter should be changed every 200 engine operating hours. When they are changed the date and engine hours should be recorded in the ship's log and in the maintenance log (an Excel file on the ship's computer).

c) Alternator and Refrigerator Compressor Belt Tension

Make sure the belts have not become loose or the engine may overheat. There should be about 5-10mm (¼ - ½ inch) play in the belts if they are properly tensioned.

d) Transmission Fluid Level

The transmission fluid level is checked using a dip stick that is on top of the transmission. The stick has a hex head and must be removed with a wrench. There is a metal washer between the stick hex head and the transmission. Be careful not to lose it when you remove the stick. There are two lines scribed on the dip stick. The transmission level must be between these two levels. To check the level, remove the dip stick and wipe it clean. Then insert it but do not screw it in. Remove it again and read the level. If transmission fluid is required to bring the level up to the lower mark, be careful not to overfill as this may cause the seals in the transmission to blow out resulting in an expensive repair or replacement of the transmission. The transmission fluid should be changed every 200 engine operating hours. When it is changed the date and engine hours should be recorded in the ship's log and in the maintenance log (an Excel file on the ship's computer).

e) Engine Room

Check for any water, fuel or oil leaks. There should be no oil visible anywhere in the engine room. If there is a leak it must be discovered and fixed. Any oil in this area will be washed into the bilge and pumped overboard which is illegal.

2. Engine Operation

a) General

Windward Passage is equipped with a 50HP Yanmar 4JH2E marine diesel engine. The fuel tank holds approximately 50 gallons of diesel. At an engine speed of 2100 RPM fuel consumption is about 0.75 gallons per hour and speed through the water will be about 5 to 7 knots. This results in a cruising range under power of about 300 to 400 miles. A factory maintenance manual and a factory parts list are stored in the starboard shelf in the forward cabin.

b) Starting the Engine

(i) Put the gear selector in neutral position (throttle lever upright). You should be able to push in the black button on the lever if you are in the neutral position. If the button will not go in, you are not in neutral.

(ii) Make sure that the fuel cut off cable on the port side of the pedestal is in the down position

(iii) Turn the key to the on position. The engine low oil pressure alarm will activate and stay on until the engine starts and the oil pressure builds to the proper level. If the alarm continues after the engine has been running for a few seconds, **shut the engine down immediately**. There is a problem that can destroy the engine.

(iv) Turn the key to the start position to start the engine and hold in this position until the engine starts, provided it does so within 5 seconds. Do not run the starter continuously for over 5 seconds at a time. If the engine fails to start check that the fuel cut off cable is pushed all the

way down. If the engine fails to start on the first three tries do not continue to try to start the engine, **STOP** and check for fuel feeding problems. If a diesel engine is turned over by the starter but does not start it is almost always a result of a fuel blockage, being out of fuel or having air in the fuel feed line.

(v) When the engine starts, check that engine cooling water is coming out of the exhaust. The exhaust is located on the starboard side of the stern. It is normal for the exhaust to surge but there should be visible water coming out in spurts.

(vi) If you want to run the engine to charge the belt driven refrigerator compressor or use the anchor windlass you must increase the engine speed to about 1500 rpm. To do this without having the propeller engaged you hold in the black button on the gear shift lever in while in neutral and pull the lever back until the desired engine speed is attained. The button should stay in when you release it and the propeller should not be turning (or it may be turning slowly due to slippage in the transmission).

c) Stopping the Engine

Do not turn off the key switch on the engine panel while the engine is running as doing so will likely ruin the diodes in the alternator. To stop the engine, pull the fuel shut off cable located on the port side of the pedestal. This turns off the supply of diesel fuel and the engine will stop in a second or two. When the engine stops, the low oil pressure alarm will sound. Turn the toggle key to the off position and the alarm will go off. Then push the fuel shut off cable to the down position.

NOTE: There is an emergency shut-off fuel valve in the aft port cabin at the forward end of the bunk. This is only to be used in the event the engine will not shut down using the cockpit cut-off lever. If you shut the engine down this way, you will need to bleed the air from the fuel line before it will start again. This is a difficult and messy task!

d) Engaging the Transmission

Any time the black button on the throttle shift lever is pushed in, the transmission is not engaged. This button works like the clutch on a manual shift car. To engage the transmission, one must bring the throttle to the neutral position and the button will pop out. To go forward push the throttle forward, to go in reverse pull the throttle back.

e) Engine Speed

The proper speed range for cruising is 1800 to 2500 rpm. Never run the engine at full throttle (3600 rpm). The best fuel efficiency is attained at engine speeds of 1800 to 2100 rpm. Always reverse slowly and never use more than 2000 rpm in reverse. When in open water it is better for the engine to be run at 2100 to 2300 rpm though this will use slightly more fuel. Diesel engines are not designed to be run for long periods of time at low rpm. While you are sailing with the engine off, leave the engine in reverse. This will lock the propeller giving much quieter sailing. In addition, if the transmission is left in neutral while sailing the propeller will spin and cause unnecessary wear on the cutlass bearing.

f) Fuel Supply

The main fuel tank holds approximately 50 gallons of diesel. On off shore passages an additional 20 gallons of diesel are carried in four 5-gallon plastic jerry cans stored in the starboard cockpit locker. A ball siphon is in the locker with the jerry cans. To use it to siphon one inserts the ball check valve into the jerry can and place the other end of the hose into the diesel fill fitting on the starboard fantail. Then you simply shake the valve up and down four or five times. The fuel that you are siphoning enters the tube on the down stroke and is prevented from leaving on the up stroke by the ball check. After a few shakes the fluid fills the tubing until the siphon starts then you stop shaking the tubing and watch the fluid flow. The pictures below show the ball siphon and how it is used to transfer fuel.

3. Potential Problems

a) Transmission Cable Failure

The indications are that you can control engine speed but the transmission will not shift from forward to neutral or to reverse. Check the shift lever on the transmission in the engine room to see if it is moving when the throttle is moved through the neutral position. This lever is located on the starboard side of the transmission and is accessed through the engine access bin in the aft starboard cabin. If the lever on the transmission does not move when the throttle moves through neutral you should disconnect the cable at the lever and, with the engine at slow idle, try to shift from forward through neutral to reverse by moving the lever itself. If you are able to shift using the lever at the transmission you can use this technique until in port where repairs to the cable mechanism can be made.

b) Throttle Cable Failure

The indications are that you will be able to shift from forward through neutral to reverse but will not be able to change the engine speed. The engine will run at idle rpm, about 800 rpm. Check the fuel valve on the engine to see if it moves when the throttle is moved. If not, disconnect the throttle cable and manually activate the fuel valve at the engine. The throttle cable will have to be replaced.

B. Autopilot

1. Basic Operation

The Autopilot circuit breaker must be on for the autopilot to operate. The autopilot has the ability to steer a constant compass course or, if the chart plotter instruments are on to steer a constant angle on the wind. To engage the auto pilot in compass mode, maintain the compass heading that you wish Auto to steer and then press the Auto button. To go back to hand steering press the Standby button. While auto is controlling you cannot manually steer the boat with the wheel but you can adjust the course in 1 degree or 10 degree increments by pushing the +/- 1 or the +/- 10 buttons. The + buttons turn the boat to starboard and the – buttons turn the boat to port.

If the chart plotter and wind instruments are active the autopilot will steer a constant angle to the wind. Steer on a constant course with the wind angle that you wish for a few minutes. Then push both the Auto and the Standby button at the same time. The display will show the angle on the wind relative to the bow of the boat that it will maintain. The +/- 1 and +/- 10 buttons will increase or decrease the angle on the wind. To go back to hand steering press the Standby button.

2. Controls

The primary controls are the Auto, Standby, +/- 1 and +/- 10 buttons discussed above. In addition, the display button if held down for about 5 seconds (the display will show: Lamp and a number that represents the intensity between 1 and 3) will light the instrument for night sailing. The light intensity can be adjusted by pressing the display button repeatedly when Lamp is displayed. To use the auto pilot to follow a route refer to the manual in the ships file. However, I prefer that we not track routes but use the autopilot to steer a compass course or an angle on the wind as I consider this safer operation. The position of the rudder is displayed as an arc of dots that appear below the heading numbers as the rudder is turned away from the centerline.

3. Cautions

The autopilot does not have any knowledge of obstacles or ships in the path that it has been told to steer. The helmsperson is responsible for ensuring that the course is safe before engaging the autopilot and that it remains safe while underway. If the autopilot should fail it may be necessary to turn off the autopilot circuit breaker in order to disengage it.

C. Anchoring

1. Anchor and Windlass

The main anchor is stowed on the bow roller and will be either a 45 lb. CQR or a 40 lb. Bruce with 200 ft. of chain. It is secured on the bow and should be tied to the pulpit or the toe rail when under way to prevent it from deploying while sailing. The chain runs over the starboard gypsy on the windlass and into the anchor locker below. When deploying the anchor, you can use the windlass motor (the boat engine must be running and at a speed of about 1200 rpm or the circuit breaker will blow) using the control switch or you can manually deploy by loosening the brake mechanism (three-prong fitting on the starboard side of the gypsy). It is important to control the speed when deploying. If the speed is too fast the chain can jump off of the gypsy. When this

happens, the weight of the chain will pull the remaining chain out of the locker at a high speed doing damage to the deck and to any human limbs that get in the way. **DO NOT TRY TO STOP THE RUNAWAY CHAIN FROM DEPLOYING**. The deck is easier to repair than a lost limb! If using the brake on the gypsy to deploy, use the handle to loosen or tighten the brake. This keeps your hand away from the chain and the gypsy. When the desired amount of chain has been deployed, apply a snubber line to the anchor chain and tie it off to the starboard bow cleat.

To retrieve the anchor using the windlass the engine must be running and the engine speed must be above 1200 rpm. You normally will have the clutch (center button on throttle lever) engaged to keep the engine at this speed without the propeller turning. Use the windlass control to raise the anchor in short burst to avoid overheating of the windlass motor. If the wind or current is strong use the engine to move the boat forward slowly while retrieving the chain. If excessive strain is put on the windlass an electrical circuit breaker will activate and turn off the power to the windlass. This circuit breaker is located in the port cabin on the port side of the bunk about one foot off the floor. If it trips, it must be manually reset before the windlass will work again. While retrieving the anchor be careful that the chain does not pile up in the locker as this can cause the chain to pop off of the gypsy and run out uncontrollably. Check the pile of chain occasionally to ensure that it is spreading out into the locker and not building vertically and near the top of the locker. Do not try to free a fouled anchor with the windlass, you will either trip the circuit breaker or burn out the motor.

A second remote switch is installed at the helm station for raising and lowering the anchor if there is no one to do so at the bow. The control is stored in the center table-locker and must be plugged into the receptacle on the port side of the helm station next to the VHF microphone. Care must be used to not put too much strain on the anchor windlass when retrieving the anchor using this aft switch since it is difficult to monitor the strain from that location.

2. Anchor Wash System

An anchor wash-down pump is located in the sail locker at the bow of the boat. The wash-down hose is stored in the anchor chain locker. The circuit breaker that turns the pump on is in the circuit breaker panel at the navigation station. The inlet water to the pump is obtained from a through hull located in the sail locker. Before using the system ensure that the valve for the through hull fitting is in the open position and the circuit breaker is on. The pump has a pressure activated switch that turns it on and off. There is a valve where the hose connects. This valve must be open to use the wash down system. The valve is a ball valve and only turns ¼ turn between open and closed. Take the hose from the anchor chain locker and press the nozzle. The pump should come on and water should start to flow. Let it flow for a few minutes to get the air out of the system. When the nozzle is released the pump should stop after a few seconds. When finished washing down the anchor and chain, replace the hose in the anchor locker and turn the circuit breaker off. The valve at the through hull fitting can be left open except on ocean passages. It is important to always turn off the circuit breaker since the pump will come on and pump water from outside the boat to inside the boat if a leak should develop between the hose and the nozzle or if the nozzle should be pressed to the open position by other items stowed in the sail locker. If the valve at the through hull fitting is closed no water can come into the pump but if a leak downstream

of the pump should occur the pump motor will come on and, if let run dry for a long time, the motor will burn out.

D. Dinghy and Outboard Engine

1. Dinghy Storage

The dinghy is a six-person inflatable with an 8 hp Yamaha outboard engine. For offshore passages where it will not be used for several days it should be deflated and stowed tied securely on deck behind the life raft. If stowed in the sail locker it should be below the storm jib and the storm trysail so that they can be accessed without having to remove the dinghy. For coastal cruising where the dinghy will be used on a frequent basis it can be stowed upside down on the deck, forward of the mast pulpit. It should be securely lashed down using the dinghy painter. For day sailing in smooth water it may be towed. Never leave the engine on the dinghy or the oars, seat or other equipment in the dinghy while it is being towed.

A lifting bridle is in the dinghy supplies bag in the starboard cockpit locker. Use the spare jib halyard to lift the dinghy out of the water for storage on deck. There are two eye bolts in the transom to which the lifting bridle can be attached. The third leg of the lifting bridle attaches to the fitting on the bow of the dinghy. Attach the shackle on the spare jib halyard to the ring on the lifting bridle and use the electric winch to raise the dinghy. A crew member should push the halyard away from the boat while lifting the dinghy to keep it from catching on the hull. When the dinghy is clear of the lifelines guide it forward and let it down to the deck. Flip the dinghy upside down to stow it on deck so that it does not fill with water. Tie it securely to the toe rails on either side.

2. Inflation

The dinghy has two side compartments, a forward compartment, a floor compartment and a keel compartment. All five compartments must be fully inflated. The easiest way to inflate if AC current is available is to use the boat vacuum cleaner with the hose on the discharge side. If AC current is not available or if you just need to top off the pressure in the compartments, there is a hand pump in the starboard cockpit locker. The pressure in the compartments should never exceed 2.8 psi except for the floor compartment where the pressure should be 8.7 psi. A pressure gauge is stowed with the pump and hose. Each chamber has a valve that allows air to flow into the chamber during pumping but prevents it from flowing out. The vacuum cleaner exhaust will only inflate the chambers to approximately 2 psi so they will have to be topped up to specified pressure with the hand pump.

3. Deflation

To deflate the dinghy chambers, you must carefully unscrew the valve and remove it. If AC current is available, the boat vacuum cleaner can be attached to each compartment and all of the air can be sucked out by the vacuum. This is the preferred way of deflating if you are going to stow the dinghy in the deflated condition as it makes the most compact package. If you cannot use the vacuum cleaner, the hand pump has a deflation mode that can be used.

4. Operation

Any time that you take the dinghy away from the boat it should have at least one life preserver for each person in the dinghy and the oars and anchor should be on board. If using the dinghy at night use the bow and stern lights stored with the dinghy supplies. The bow light has a suction cup to hold it on the bow but a safety line should be used to tie the light to the dinghy in case the suction cup should let go (this happens frequently).

The pump for inflating the dinghy and the oars are stowed in the starboard cockpit locker. The anchor and a plastic bailer are stowed in the starboard swim platform locker.

A cable is attached to the transom for locking the dinghy to the boat when at anchor or to a dinghy dock when going ashore. Be sure to take one of the boat's locks and keys with you. Check to ensure that the key opens the lock before locking the dinghy to any fixture. When the locks have not been used for a while they will sometimes accumulate salt or rust that prevents them from being opened and it is good to learn this when the dinghy is not locked to the fixture.

The gas must be mixed with two stroke engine oil in a ratio of 100 to 1. A container of fuel-oil mixture is in the starboard transom locker. The engine fuel tank is in the port transom locker. Before leaving Windward Passage in the dinghy be sure you have the gas tank in the dinghy and that it has gas in it. The engine carburetor has residual gas in it that will run the engine for several minutes – just long enough to get several boat lengths away from Windward Passage before the engine quits!

5. Engine Operation

The dinghy engine is an 8 horsepower Yamaha 2 stroke gasoline engine. The fuel for this engine must be a 100:1 mixture of gasoline and 2-stroke engine oil. A 4 gallon can of this mixture is stored in the port swim platform locker along with a 2 gallon tank that attaches to the engine. When replenishing the supply of gasoline into the storage can be sure to add the 2 stroke engine oil immediately at the ratio of 1.25 oz. of oil to each gal. of gasoline so there will never be gasoline in the can that is not the proper 100:1 mixture. A few ounces of Mystery Oil (stored in the starboard cockpit locker) can be added to the gas mixture to provide additional lubrication.

To start the engine, attach the fuel hose from the gas tank to the engine. Be sure that it is firmly in place and does not leak. Attach the plastic kill switch clip on to the red pull out kill switch. Set the choke on by pulling the choke knob out. Make sure that the shift lever is in neutral (the engine will not start in gear) and adjust the throttle control on the tiller to the start position. Pull the start cord smartly. When the engine starts push the choke button in.

To stop the engine put it into neutral, reduce the throttle to idle and either push in the red button on the kill switch or pull the kill switch key off. If the engine is to be removed from the dinghy and not used for more than two days, you should let the engine run with the gas feed line disconnected until the engine stops. This will take several minutes and assures that the gas in the carburetor is used and will not gel and plug the carburetor jets when the engine is not used for an extended period.

6. Engine Storage

The engine should never be left on the dinghy when towing the dinghy. To remove it from the dinghy, use the engine lifter crane located on the pole for the wind generator. Snap the lifter shackle on to the harness that is on the engine. Then loosen the clamps holding the engine on to the dinghy transom. Pull the lifting crane line to raise the engine to the height of the storage rack on the stern rail and swing the engine over the rack. Lower the engine on to the rack and tighten up the clamps. The lifter shackle can be left attached to the engine harness. In areas where there is a possibility of theft the engine should be locked to the stern rail with the cable on the stern pulpit and one of the ship's locks.

E. Housekeeping

1. Fresh Water System

The fresh water system consists of three separate water tanks. One (80 gal.) is located under the forward berth; the other two (60 gal. each) are under the floorboards in the main salon. The three inputs for these tanks is on deck and labeled "Water". One is at the bow and the other two are amidships on each side. When filling be careful for there is a "Waste" fitting next to the starboard water filling and you will fill the holding tank if you put water into the wrong fitting! There is a manifold in compartment 5 of the main salon that allows you to select from which tank you are drawing water. Only one tank should be selected at any time. To switch from one tank to another you simply close the valve for the tank currently in use and open the valve for the new tank. If the tank that had been used was allowed to run dry you may have to prime the pump by turning on the galley sink faucet and letting the water run until all the air has come out of the system. If offshore or in a location where water is difficult to obtain you should catch the water that comes out during the priming process and use it for cooking or washing dishes so it is not wasted.

There are two electric pumps for the fresh water system with one in use and the other a spare. There is a switch in compartment 5 that selects which pump is being used. Both pumps have a pressure switch that shuts the pump off when the pressure in the system reaches a preset level. If the pump is on for a long period (more than 3 minutes) and no faucets are open it usually means that the water tank in use is empty or that somehow air has gotten into the system. You should switch to a new tank and bleed the air out of the system. The pump should then go off. There are no gauges in the water tanks. It is important to note in the log and make sure the captain is aware when a tank has run dry, especially if we are sailing offshore.

There is a foot pump at the galley sink that will pump water from the selected water tank. This is the only way to obtain water from the tanks if the house batteries have gone dead.

There is a very fine filter in the cold water line to the galley sink. This filter will remove microbes and bacteria as well as iron and other salts. It makes the water safe to drink and removes bad taste.

There is a small hot water heater that uses the engine cooling water to heat the water in the system. This heater also has an electrical heater that can be used when we are in a marina with electrical power connected. This water can get very hot (180F) if the engine runs for an hour or more. Be careful when taking a shower as this temperature will scald you.

2. Propane System and Stove

Two 10-pound propane tanks are located in the port side lazaret. The lazaret compartment is vented overboard so that no propane vapors can get into the bilge from this locker. The tanks are connected through a dual two stage regulator. This is an automatic regulator which would switch from one tank to the other if both tanks were open and the active tank was to run empty. However, I keep the non-active tank valve closed. If the active tank runs empty you must close its valve and open the valve on the spare tank to make it the active tank. It should be noted in the log when the tanks are switched because one of them is empty.

An electrically operated solenoid valve is in the gas line leaving the pressure regulator. No propane should flow to the stove if this solenoid valve has not been opened. To open the solenoid valve one must throw the switch labeled "Stove" on the electrical panel at the Navigation station. This switch should be in the off position when the stove is not being used.

The stove is gimbaled port and starboard but not fore and aft. Two fiddles are provided to hold pots when cooking so that they do not fall off the stove if we encounter severe waves.

To light the stove make sure that the valve on the active tank is open and the "Stove" switch on the electrical panel is in the on position. Push the knob for the burner that you are lighting and turn it counter-clockwise. Press the igniter button on the front of the stove and you will hear a clicking noise and the burner should light. Hold the knob in for at least 15 seconds. There is a thermocouple at each burner that senses the presence of a flame. It takes several seconds for this sensor to activate. If the burner goes out when you release the knob you will have to hold the knob in again and press the igniter button to light the burner again. The burners are designed so that the knob is turned to its maximum counter-clockwise position for the lowest flame setting.

The oven is lit in the same manner as the burners. The oven door should be open when lighting the oven. To open the oven door, you must push the lock button on the right hand side and hold it in while lifting the handle and pull the door open. In the bake position the oven knob is calibrated for temperature control. To light the broiler the oven knob is turned clockwise from the off position and pushed in. The oven door should remain open about one inch (there is a stop to hold it in this position) at all times when the broiler is being used. If the oven door is closed when the broiler is on a severe fire hazard is created.

3. Refrigeration Systems

a) General

There are two independent refrigeration systems on the boat. The original system is a Sea Frost Freezer Plate system with the system compressor operating off the auxiliary engine. A second system, the

Evaporator System, has a compressor that operates off of the ship's batteries. When the engine is running it may be wise to run the Freezer Plate System since it uses very little engine power and will reduce the amount of battery power used by the Evaporator System.

b) Sea Frost Freezer Plate System

The refrigerator compressor runs off the engine much like the compressor for the air conditioner in your car. However, for the refrigerator to be cooled, in addition to having the engine running at a speed of at least 1200 rpm and not more than 2100 rpm, the switch located on the front of the refrigerator labeled "compressor" must be on and the timer knob must be rotated clockwise. A red light will indicate that the compressor is cooling the refrigerator. As the compressor runs it cools a liquid salt in the cooling plate until it is frozen at about 10º F. This frozen salt has the same effect as a block of ice. As it absorbs heat from the refrigerator compartment the salt melts until it has turned back into a liquid again. Then the engine must be run and the compressor activated to freeze the salt again.

c) Evaporator System

The evaporator system compressor is run off of the 12 volt electrical system. The compressor is located under the galley behind the trash container. There is a circuit breaker that turns the compressor on. The Freon exiting the compressor flows to a cooler that is attached to the external hull via a thru hull fitting located in the bilge just aft of the bulkhead leading to the forward cabin. This system operates similar to a standard household refrigerator. An evaporator plate is in the freezer compartment. The operation of the compressor can be controlled by a thermostat that senses the temperature in the compartment and turns the compressor on when the temperature rises above a set point. The set point is established on the controller located just in front of the galley sink. The set point should be maintained at 25ºF. A digital readout shows the actual measured temperature in this compartment. However, I prefer to run the compressor on manual setting at either 10 or 20% as shown by the green lights on the compressor panel board.

This system uses about 4 amps of electricity. This presents a substantial drain on the house battery system. If the system is operating it is imperative that a source of electricity be provided to the batteries either through the wind generator, the tow behind generator, the engine alternator or the battery charger plugged into a 120 volt AC source. If a source of electricity is not provided, the house batteries will be completely drained in less than 48 hours.

d) Refrigerator Compartment

A fan in the barrier wall between the freezer compartment and the refrigerator compartment pulls cold air from the freezer compartment into the refrigerator compartment. This fan is controlled by a thermostat that should be set to maintain the temperature in the refrigerator between 35º and 45ºF. This fan is turned on with a circuit breaker labeled Refrigerator Fan and will operate with either the Cold Plate or the Evaporator system operating.

It is important to not open the refrigerator any more than absolutely necessary in order to minimize the amount of time we need to run the engine to keep the refrigerator cool with the freezer plate or the amount of electricity consumed with the evaporator plate.

A drain is in the bottom of the refrigeration compartment that is piped to a pump in compartment 5 in the main salon. This pump is also used as a spare bilge pump via a three way valve. The valve should be left in the position to draw water from the refrigerator so that when the refrigerator drain circuit breaker (Frig Drain) is on the pump pulls water from the refrigerator and not from the bilge. You should be able to hear air being sucked out of the refrigerator if the valve is in the correct position.

4. Electra-Scan Unit and Heads

The Electra-Scan unit is located in compartment 1 of the aft starboard cabin. It serves only the head that opens into the main salon. Operation of the head is the same as for a normal marine head except that after flushing one pushes the black button on the wall in back of the head. This starts the Electra-Scan operation. In order for the unit to function properly it is necessary that the salt content of the flushing water be near to that of sea water. If sailing in water with a lower salt content (like the Chesapeake Bay) it is necessary to mix some strong salt solution with the flushing water. A 2-gallon tank is located in Locker 1 in the starboard head to furnish this salt solution to the head. A pinch valve in the clear tubing from the tank to the head controls the amount of salt solution that flows to the head upon flushing. Several gallons of concentrated salt solution are stored in the starboard cockpit locker. Salt crystals are in a plastic container and the mixture is 4 cups of salt crystals to one gallon of water. It takes several days for the salt to dissolve. It is important to ensure that the salt tank always has solution when flushing the head.

If a blinking red light comes on at the Electra-Scan switch it means that there is a problem with the treatment the button should be pushed to stop the operation. Check the error code on the display in the medicine cabinet in the head. If the error says “Low Voltage” the batteries will need to be recharged before the unit will operate. If the error code says “Low amps” or “<14 amps” it means the salt level in the treatment unit is too low. Check the salt tank to ensure that it has solution. You may then need to add salt solution directly to the head and flush on dry bowl to regain the proper salt level in the treatment unit. You will need to reset the unit using the reset button on the display unit in the medicine cabinet in the head.

F. Electrical

1. Electrical Panel

Before anything electrical works on the yacht, it first has to be switched on at the panel located on the starboard side of the main cabin above the navigator table. While many devices, such as cabin lights, switch on first at the electrical panel and then have their own switches, others such as navigation lights, are only switched on at the panel and must be kept switched off when not in use. There is a meter to display the voltage charge in each of the batteries. Battery 1 is the house battery. The switch only reads battery charge voltage properly with everything switched off and should never be allowed to drop below 11.8 volts. With the lights and other things on the reading should not go below 11 volts. Battery 2 is the engine battery and its voltage should never drop below 12.3 volts. If voltage drops below these levels the engine should be started to recharge the batteries or the AC power should be plugged in if at a dock. The Battery Charger circuit breaker should be on at all times as the batteries are not charged by the engine alternator or the AC power if this switch is off.

You can monitor the voltage for the house or engine battery using the selector switch on the breaker panel and reading the voltage for the selected battery. The DC ammeter measures the amount of amps that are going out of the house battery and flowing to the devices fed through the main breaker on the circuit breaker panel. It does not measure the amps that are consumed by devices that are not fed through the breaker panel (e.g. the Electrascan unit, the electric winch, and the anchor windlass

2. Shore Power

The yacht can be plugged into 110 volt shore power. The power cable and connecting plug is in the starboard cockpit locker. The battery charger that operates off of the shore power is located in Compartment 1 in the aft starboard cabin. It can operate on either 50 cycle or 60 cycle power.

The charger is also an inverter that can supply limited AC current to the boat outlets when not connected to shore power. This feature must be used sparingly as it takes 10 amps of battery power to furnish 1 amp of AC power and the house batteries can be completely depleted very quickly if the inverter is used for even modest loads without the engine running. With the engine running the AC load should not exceed 15 amps for more than 10 minutes or the inverter will overheat and shut down.

The AC power breakers are located in the top right corner of the electrical panel on the starboard side of the main cockpit above the navigator table. These breakers are for the shore power source, battery charger, starboard outlets, port outlets and water heater. Select the systems you want to operate and turn the switch to the "on" position. When the shore power is not in use please turn all AC breakers except the battery charger breaker to the "off" position. The battery charger breaker must be in the "on" position for the batteries to be charged by the engine alternator.

3. Battery Charger/Inverter

The Magnum 2000 battery charger/inverter is located in Compartment 1 in the starboard aft cabin. It is controlled by a Magnum Controller located in the instrument panel to the left of the MFD. When not being used, the inverter should be turned off at the Magnum Controller as it consumes about 0.5 amps in stand-by mode. The battery charger circuit breaker should be left on at all times as the Magnum Controller controls the charging of the batteries both when shore power is being used and when the batteries are being charged through the engine alternator. The inverter should not be operated with high loads when the engine is running. The inverter shares electronic components with the battery charger and the unit will overheat if both the charger circuit and the inverter circuits are being used simultaneously.

The Magnum Controller manages all aspects of the battery system. Instructions for its operation are in the Windward Passage equipment files. All operations are automatic and the unit should not have to be adjusted in any way. You can select which battery is being displayed and can then display battery voltage, amperage to (+) or from (-) the battery, total cumulative amp-hours from full charge (-) as well as several other informational items. Normally the display is left reading the house battery charging/discharging rate.

The batteries should not be discharged below 50% of their maximum capacity. For the house battery bank the capacity is 360 amp-hours. One should check the status of this bank several times a day and should recharge the batteries when the amp-hour reading approaches -180 amp-hours. When the batteries are fully charged the amp-hour reading will be zero or slightly positive.

The starting battery is charged as an echo charge when the alternator is running (or when plugged into shore power). It should not be allowed to go below – 20 amp-hours.

4. Battery System

There are two house batteries and one engine starter battery. The starter battery is isolated from the house batteries so that it can never be run down by excessive use of electrical devices. It is important that the batteries not be drained below about 50% of their capacity. Every time lights, water, fans and other appliances are used they are drawing power from the batteries. It is important to conserve electricity as much as possible. Do not leave lights, fans, etc. on when they are not needed. To keep the batteries charged it is necessary to run the engine at least two hours per day, more if there is high electricity usage.

There are three main battery switches and one main windlass switch in the aft port cabin. They should be left on (handles pointing up and down) at all times unless there is an emergency such as an electrical fire. **NEVER TOUCH THESE SWITCHES WHEN THE ENGINE IS RUNNING** as turning them to the OFF position will destroy several diodes in the alternator and you will not be able to charge the batteries until they are repaired.

5. Wind Generator

A MK4+ wind generator is located on the stern port transom. To activate the generator remove the strap that is restraining the propeller from turning. The unit should turn into the wind and the blades should begin turning once the wind speed at the unit exceeds about 4 knots. The unit begins to generate electricity at a wind speed of about 5 knots. At wind speeds greater than 20 knots the unit will generate too high a voltage for the batteries to absorb and a governor on the unit will slow its spinning. This governor is effective up to wind speeds of about 35 knots. At speeds greater than 35 knots there is danger that the unit will fly apart and it must be stopped when the wind speed exceeds 35 knots.

The generator propeller turns at a tip speed exceeding 200 mph in winds of 15 knots and can inflict serious damage to any body part getting in its path. Great care must be taken when operating near the blade to ensure that you not be struck by the spinning blade. To stop the unit carefully use the line that is attached to the back of the unit and turn the unit until the back of the unit is facing into the wind. Hold the tail of the unit into the wind until the propeller has come to a stop. When it stops, quickly grab the blade and attach the strap to restrain the blade from rotating. If the unit is kept with the tail pointing into the wind, the propeller will eventually begin to turn in the reverse direction if the restraining strap is not secured around the blade.

Output from the unit goes to a dual voltage controller that is located on the bulkhead in the aft port cabin. A green light indicates that the unit is generating electricity. A red light on the controller will indicate that the diverter is active. It is better to stop the generator than to let it operate for long periods in the divert mode.

6. Tow Behind Generator

The tow behind generator can only be used when sailing on the open ocean and away from other boats. The line for the propeller is 75 ft. long and it will snag anything that you maneuver close to when making a turn. It runs as deep as 25 feet below the surface (depending on boat speed) so operating it in shallow water will be like throwing out an anchor off the stern.

The tow-behind generator consists of a generator that is mounted below the helmsperson seat, a towing line (either 75 ft. or 100 ft. long) and a towed propeller. When the propeller and line are deployed and the boat is moving through the water the propeller will spin and the generator will begin to generate electricity to charge the batteries. At 5 knots of boat speed the generator will produce about 4 amps of electricity and at 7 knots it produces about 12 amps. At 8.5 knots it will produce nearly 20 amps of electricity. Like the wind generator, the amperage from the tow behind generator is fed through a diode and fuse and into a dual input voltage regulator. When the batteries are fully charged, the regulator sends the amperage being generated to the heating element in the hot water heater.

The generator, line and propeller are stored in the port cockpit locker. To deploy the system the generator is mounted in the plastic holder and secured with a set screw (normally stowed at the navigation table). It should also be tied to the stern rail to ensure that it is not lost overboard. The line and propeller are stored attached to the generator and the propeller is fed through the opening in the helmsperson seat. The line is then deployed overboard forming a large loop. Be sure there are no knots in the line then deploy the propeller by throwing it overboard outside of the loop. Once the line is fully extended the propeller will begin to turn the generator and electricity will be produced.

To retrieve the line and propeller use the red funnel that is stowed in the port cockpit locker. The funnel is tied around the line using the permanently attached cords. Be sure that the large end of the funnel is aft. Throw the funnel overboard and it will work its way down the line until it encounters the propeller. Once there, the propeller will stop turning and the line can be retrieved without severe kinks developing in it. If you try to retrieve the line without the funnel the line will kink every time the propeller makes one revolution as you pull it in and you will have a difficult time removing the kinks. An alternative retrieval method is to bring the boat to a stop and then retrieve the propeller.

7. Running Lights

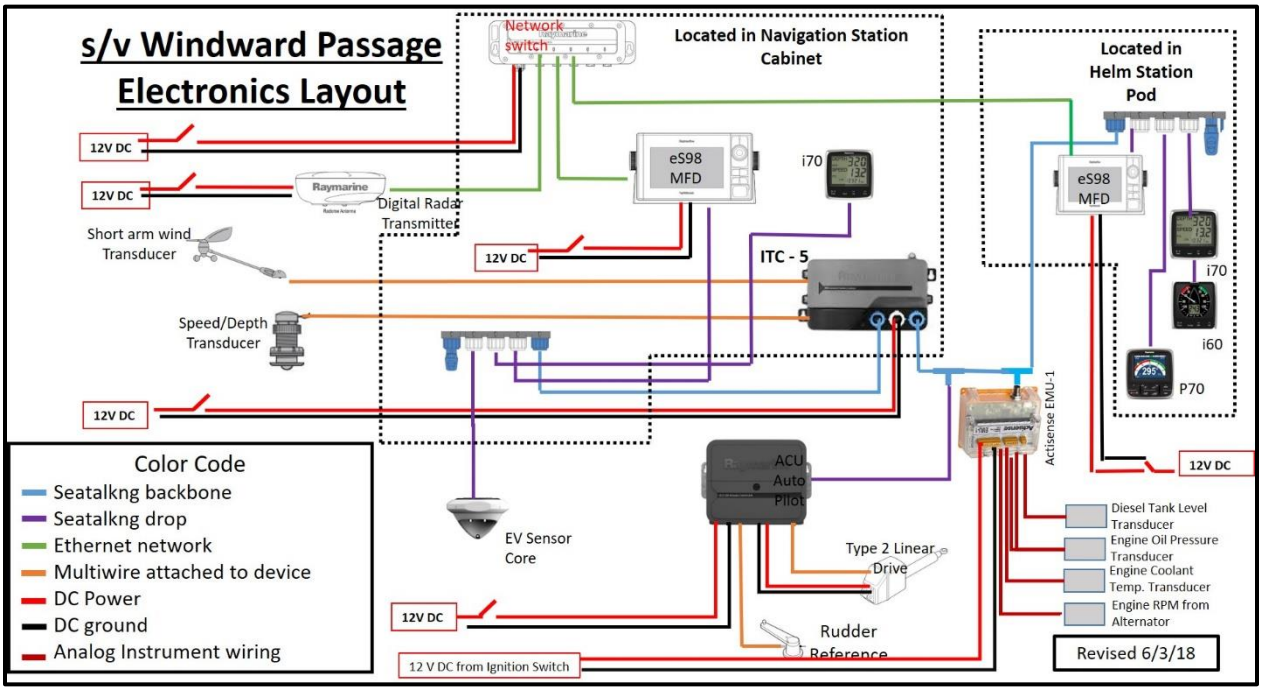
Two sets of running lights are provided. At the top of the mast is an LED tricolor/anchor light/strobe combination. This light is controlled by two circuit breakers at the main panel labeled “Anchor Light” and “Tricolor Light”. If both of these breakers are on the masthead light becomes a strobe light. It is not legal to operate the tricolor light if the engine is being used to propel the boat.

A second set of running lights is located at deck level and is controlled by the circuit breaker labeled “Navigation Lights”. These running lights may be used while sailing and must be used when the engine is propelling the vessel in limited visibility. It is not legal to operate the boat with both the tricolor and the navigation lights turned on.

The steaming light on the front of the mast is controlled by the circuit breaker labeled “Steaming Light”. This light must be on any time the engine is running and the propeller is engaged.

G. Electronics

1. General



Following a lightning strike in August 2017 the entire instrument system was replace and upgraded to NMEA2000 standards using Raymarine electronics and their Seatalkng network system. An Actisense EMU-1 unit was installed to convert the analog signals from the engine oil pressure transducer, the engine coolant transducer, the engine rpm sender and the diesel fuel tank level sender to NMEA2000. There are two multifunction displays that can display a wide selection of data, charts and radar information. Instructions for the operation of this system are given in the Lighthouse Operating Instructions manual located with the ship manuals on the starboard shelf in the forward cabin.

2. Cockpit Instrument Panel

Instrument Panel: The gauges that are fitted on the engine instrument panel are: fuel gauge, hour counter, engine tachometer, oil pressure alarm and engine temperature alarm. Oil pressure should be approximately 25-40 PSI and can be read on the MFDs. The engine cooling water temperature should be 180 degrees Fahrenheit and can be read on the MFDs or on many of the other instruments. The analog fuel gauge is disconnected and the fuel level is now read on the MFD as a % of the 50 gallon

tank capacity. It is advisable to not let this level go below 10% to ensure that any sludge in the bottom of the tank is not sucked into the fuel filters.

The engine is fitted with an alarm which will go off if either:

The oil pressure drops right down or

The water temperature rises to 200 degrees Fahrenheit.

If the alarm goes off check these gauges. If the oil pressure is low, or the water temperature is up to 200 degrees, turn off the engine and check the oil level and the water level and top off if needed. If both appear normal (make sure you are looking at the correct gauges), you may have a fault with the alarm. Proceed under sail to the next harbor where the problem can be diagnosed. If a life-threatening situation exists and it is necessary to use the engine, do so at low rpm (below 1200).

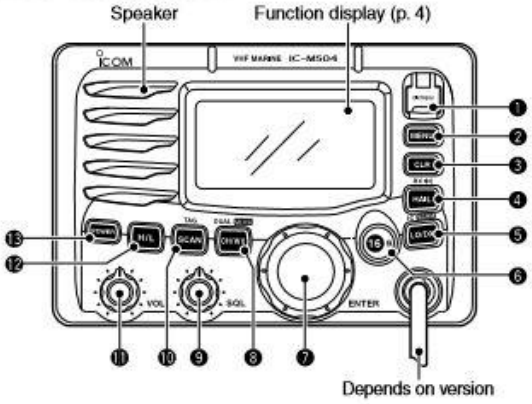
3. VHF Radio

a) Basic Operation

Windward Passage is equipped with an Icom IC-504 VHF Radio mounted at the navigation station with a remote control unit mounted on the port side of the steering pedestal. All of the features of the radio may be operated from the remote station. There is an intercom feature that allows one to communicate from the navigation station to the helm person. Coast guard regulations require that we monitor channel 16 at all times that we are not operating on another channel while under way. The radio is also equipped with an automatic fog horn that will sound selected fog signals. Finally, there is a hailer that puts out sound using a speaker located on the front of the mast just below the radar pod.

The radio is essentially antenna to antenna line-of-sight so it cannot be used to communicate with vessels whose antennas cannot “see” each other. The main station with a description of the function of each item is shown below:

■Front panel



❶ DISTRESS KEY [DISTRESS]
Push for 5 sec. to transmit a Distress call. (p. 23)

❷ DSC MENU KEY [MENU]
Push to toggle the DSC menu appear or disappear. (p. 15)

❸ CLEAR KEY [CLR]
Push to cancel the entered function, exit Set mode. (p. 55)

❹ HAIL/RX SPEAKER KEY [HAIL•RX]
- ➥ Push to turn the hailer mode ON or OFF. (p. 52)
- ➥ Push and hold for 1 sec. to turn the RX Speaker mode ON or OFF. (p. 51)
- ➥ While pushing and holding **[H/L]**, push to turn the auto foghorn function ON. (p. 54)

❺ ATTENUATOR/INTERCOM KEY [LO/DX•IC•SCRM]
- ➥ Push to turn the Attenuator function ON or OFF. (p. 8)
  • "LOC" appears when the Attenuator function is turned ON.
- ➥ Push and hold for 1 sec. to activate an optional Intercom function. (p. 50)
- ➥ Push and hold to call the optional command microphone while in Intercom mode. (p. 50)
- ➥ While pushing and holding **[H/L]**, push to turn the voice scrambler function ON or OFF. (p. 11)

❻ CHANNEL 16/CALL CHANNEL KEY [16•9]
- ➥ Push to select Channel 16. (p. 6)
- ➥ Push and hold for 1 sec. to select Call channel. (p. 6)
  • "CALL" appears when Call channel is selected.
- ➥ Push and hold for 3 sec. to enter Call channel programming condition when Call channel is selected. (p. 9)
- ➥ While pushing and holding **[H/L]**, push to enter the channel comment programming condition. (p. 10)
- ➥ Advance the cursor while in the channel comment programming condition. (p. 10)
- ➥ While turning power ON, push to enter Set mode. (p. 55)

❼ **CHANNEL SELECTOR [DIAL•ENTER]**
- ➥ Rotate to select the operating channels, Set mode settings, etc. (pgs. 6–8, 55)
- ➥ While pushing and holding **[H/L]**, rotate to adjust the brightness of the LCD and key backlight. (p. 10)
- ➥ Push to enter the input channel comment, selected item, etc. (pgs. 10, 55)
- ➥ Rotate to check TAG channels, changes scanning direction or resumes the scan manually during scan. (p. 13)
- ➥ While pushing and holding **[HAIL•RX 🔊]**, rotate to adjust the audio level in RX Speaker mode. (p. 51)
- ➥ Push and hold for 1 sec. to display the GPS information when a GPS receiver is connected. (p. 22)

❽ **CHANNEL/WEATHER CHANNEL KEY [CH/WX•DUAL•U/I/C]**
- ➥ Selects and toggles the regular channel and Weather channel when pushed momentarily. (p. 7)
- ➥ Push and hold for 1 sec. to start Dualwatch or Tri-watch. (p. 14)
- ➥ Push to stop Dualwatch or Tri-watch when either is activated. (p. 14)
- ➥ Move the cursor backward while in the channel comment programming condition. (p. 10)
- ➥ While pushing and holding **[H/L]**, push to select one of three channel groups in sequence. (p. 7)
  - • U.S.A., International and Canadian channels are available.

❾ **SQUELCH CONTROL [SQL]**
Rotate to set the squelch threshold level. (p. 8)

❿ **SCAN/TAG KEY [SCAN•TAG]** (p. 13)
- ➥ Push to start and stop Normal or Priority scan.
- ➥ Push and hold for 1 sec. to set or clear the displayed channel as a TAG (scanned) channel.
- ➥ While pushing and holding **[H/L]**, push for 3 sec. to clear or set all TAG channels in the selected channel group.

⓫ **VOLUME CONTROL [VOL]** (p. 8)
Rotate to adjust the audio level.

⓬ **TRANSMIT POWER KEY [H/L]**
- ➥ Push to toggle the power high or low. (p. 8)
  - • Some channels are set to low power only.
- ➥ While pushing this key, some keys perform secondary functions.

⓭ **POWER KEY [POWER]** (p. 8)
- ➥ Push to turn power ON.
- ➥ Push and hold for 1 sec. to turn power OFF.

The manual for this radio is in the Windward Passage files and should be referred to for set up and operating details. Pushing the button [16-9] momentarily will select channel 16. Holding this button for about 1 second will select channel 9. You can return to the condition that existed before you pushed the [16-9] button by pushing the [CH-WX] button

You can select a weather channel by pushing the [CH-WX] button either once or twice. There are a total of 10 weather channels that can be selected.

Note: Channels 3, 21, 23, 61, 64, 81 and 83 may not lawfully be used by the general public in U.S.A. waters.

To use the radio, select the channel that you wish to use, listen to ensure that someone else is not currently using the channel then push the button on the microphone (PTT button) and talk into the microphone from a distance of about 2-4 inches. When through talking, release the PTT button to listen to the response. You will not be able to hear any response if your PTT button is being depressed.

There are many special features on this radio that will not be described in this operating manual. Use the Icom M504 manual in the ships files to understand these features.

This radio has the ability to send out an automatic distress signal with your current position (latitude and longitude) included in the signal. The GPS that feeds the radar/chart plotter provides the location information. To check that the GPS position is being fed to the unit, push [DSC/ENT-POS] for 1 second. This Distress Call feature should only be used when there is a life threatening situation or the ship is in danger of sinking.

NEVER USE THE DISTRESS CALL WHEN THE SHIP IS NOT IN AN EMERGENCY. A DISTRESS CALL CAN BE USED ONLY WHEN IMMEDIATE HELP IS NEEDED.

To send a distress call:

1. Confirm that a distress call is not being received from another vessel.

2. Lift the cover on the [DISTRESS] button and push and hold the button for 5 seconds.

The distress call is transmitted on channel 70 and is repeated every 4 minutes until an acknowledgment call is received on channel 70. When an acknowledgment is received you reply to the connected station using the microphone. The distress message goes out as "undesignated" for the nature of the distress unless you have previously selected an alternative designation from the menu. Refer to the manual page 21 for information on how to select alternative distress messages.

Intercom Operation:

1. Push [LO/DX-IC-SCR] and hold for 1 second.
2. Push and hold [LO/DX-IC-SCR] again - the transmitter and microphone will emit call beeps.
3. Push and hold the PTT microphone switch and speak at a normal voice level into the microphone.
4. After releasing the PTT button you can hear the response through the speaker.
5. To return to normal operation, push [LO/DX-IC-SCR] momentarily.

b) Intercom Operation

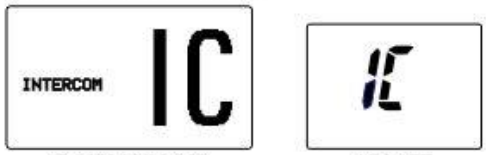
■ Intercom operation

The optional Intercom function allows you to talk to the deck from the cabin. The optional command microphone is required for Intercom operation.

Connect an optional command microphone as described on p. 63.
- Transmitting is impossible during Intercom operation.
- The received signal is muted during Intercom operation.

① Push and hold **[LO/DX•IC•SCRM]** for 1 sec. to enter Intercom mode.
- The optional command microphone power is automatically turned ON, even if the power is OFF.

Push and hold [LO/DX•IC•SCRM] for 1 sec.



IC-M504/HM-162

HM-157

② Push and hold **[LO/DX•IC•SCRM]** for 1 sec. again to call up the optional command microphone side.
- The transceiver and the optional command microphone emit call beeps.

③ Push and hold **[PTT]** and speak at a normal voice level into the microphone.
- "TALK" or "LISTEN"* appears on the caller or listener function display.
  * "TALK" or "LSTN" appears on the HM-157.
- To adjust the IC-M504's speaker output level, rotate **[VOL]**.
- To adjust the HM-162's speaker output level, rotate **[SELECTOR]** after pushing **[VOL]** on the HM-162.
- To adjust the HM-157's speaker output level, push **[▲]** or **[▼]** after pushing **[VOL• DIM PA/RX]** on the HM-157.

IC-M504 (caller)

HM-162 (listener)

HM-157 (listener)

④ After releasing **[PTT]** you can hear the response through the speaker.

⑤ To return to the normal operation, push **[LO/DX•IC•SCRM]** momentarily.
- **[16•9]** and **[DISTRESS]** keys are also available.

- While in the Intercom mode, the transceiver functions (transmit and receive) are interrupted. If the transceiver is in transmit condition, the Intercom function is not available.
- When a DSC call is received, the intercom function is interrupted with an automatic return to the transceiver mode. The transceiver's display indicates 'Receiving DSC calls.' (p. 41)
- When a WX alert is received, "WX ALERT" blinks and a beep sounds. The WX alert sounds after the Intercom use is finished.

■ RX Speaker function

The IC-M504 has an RX Speaker function. When this function is turned ON, the received audio can be heard on the deck or tower via an external speaker or hailer speaker.

Connect an external speaker or hailer speaker as described on p. 58.

① Push and hold **[HAIL•RX]** for 1 sec. to enter the RX Speaker mode.
- "RX" appears
- Rotate **[DIAL]** to adjust the audio output level, push **[DIAL•ENTER]**.

Push and hold [HAIL•RX] for 1 sec.

② To return to normal operation, push and hold **[HAIL•RX]** for 1 sec.

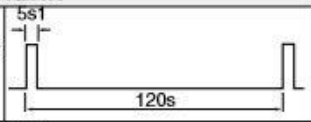
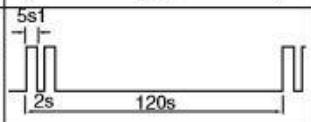
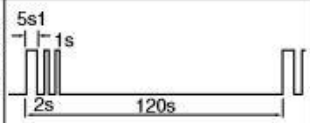
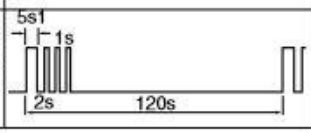
While in the RX Speaker mode, rotate **[DIAL]** while pushing and holding **[HAIL•RX]** to adjust the audio output level. After adjusting, push **[DIAL•ENTER]**.
- Rotate **[DIAL]** within 1 sec. after pushing **[HAIL•RX]**. Otherwise the transceiver returns to the normal operation.

c) Fog Signal Horn

■ Automatic foghorn function

The automatic foghorn function sounds a horn repeatedly until the function is turned OFF. Four patterns are available for varying conditions.

The foghorn outputs from the hailer speaker. To use this function, the hailer speaker must be connected to the transceiver. See p. 58 for connection details.

TYPE	PATTERN	USAGE
UNDERWAY	One 5-second blasts every 120 seconds. 	Motor vessel underway and making way.
STOP	Two 5-second blasts (separated by 2 seconds) every 120 seconds. 	Motor vessel underway but stopped (not making way).
SAIL	One 5-second blast followed by two 1-second blasts (each separated by 2 seconds) every 120 seconds. 	Sailing vessel underway, fishing vessel (underway or anchored), vessel not under command, a vessel restricted in her ability to maneuver (underway or at anchor), or a vessel towing or pushing another ahead.
TOW	One 5-second blast followed by three 1-second blasts (each separated by 2-seconds) every 120 seconds. 	Vessel under tow (manned).

The audio frequency of the foghorn is selectable.
See p. 57 for details on selecting the audio frequency.

d) Hailer

■ Hailer operation

The IC-M504 has a hailer function for voice amplification over a loudspeaker, making it unnecessary to leave the bridge to talk a hailing party.

Connect an external hailer speaker (25 W nominal at 13.8 V/4 Ω) as described on p. 58.
- Transmitting is not possible during hailer operation.
- The received signal is muted during hailer operation.

① Push **[HAIL•RX]** to enter hailer mode.

② Push and hold **[PTT]** and speak at a normal voice level into the microphone.
- "TALK" appears.
- "WAIT" appears at the channel comment indicator when the optional command microphone is in use.
- To adjust the hailer level, rotate **[DIAL]**.

③ To return to normal operation, push **[CLR]** or **[HAIL•RX]**.

- While in the hailer mode, the transceiver functions (transmit and receive) are interrupted. If the transceiver is in transmit condition, the hailer function is not available.
- When a DSC call is received, the hailer function is interrupted with an automatic return to the transceiver mode. The transceiver's display indicates 'Receiving DSC calls.' (p. 41)

4. Multifunction Displays

Details for the operation of the Radar/Chart Plotter MFDs are in the Lighthouse Operating Manual stored with the other operating manuals. Summary cards are in the navigation table desk top that should enable one to do the basic functions. The MFD at the helm station is the master station and must be on for the GPS and the Radar to function.

To turn the unit on you must hold the power button in for a few seconds. To turn the unit off you must hold the power button in while a countdown sequence is completed on the screen. The radar consumes appreciable power when transmitting so it is wise to keep it on standby when the conditions allow you to do so safely. To change from standby to transmit or from transmit to standby briefly press the power button.

These MFDs have the ability to display charts, radar and ships operating data. Screens can be customized and you can split the screen into as many as four display areas.

5. Instrument Displays

The electronics system is the Raymarine version (Seatalkng) of the NMEA2000 standard. It is a networked system where all of the data generated by any of the instrument systems is available to all of the instrument displays. It takes considerable practice to understand how to change the data displayed on each of the instruments and is best done with the operating manual for the instrument or for the MFD in hand. The operating manual binder contains all of the individual manuals for each instrument.

H. Sail Handling

1. Mainsail Reefing System

The procedure for reefing the mainsail is to first bring the boat to a close haul or tight reach course (if you are doing this single handed it is best to be a little bit off the wind since the autopilot will not respond to a wind shift and may lose speed if the wind shifts forward during the reefing maneuver) and then loosen the main sheet until there is a large bubble at the luff of the mainsail. This relieves all pressure on the luff and the sail can be easily lowered or raised while still sailing. Check to see that the topping lift is taunt and secured so that the boom will not come down on to the Bimini when the halyard is released. Next, release the main halyard and have someone at the mast pull the mainsail down until the appropriate reefing cringle can be hooked over the reefing hook. Then tighten the main halyard until the proper tension is felt at the luff of the sail. Next tighten the appropriate reefing outhaul until the foot of the sail is tight. The electrically operated secondary winch on the port side of the companionway is be used to tension the main halyard. The manual wench on the starboard side can be used to tighten the reefing outhaul. Be careful to not overtighten as the winches are very powerful and can rip the sail if tensioned too much. When the foot is tightened appropriately, the cringle at the leech of the sail through which the outhaul passes should be close to the boom, the leech of the sail should be supporting the boom and the topping lift should be loose. Finally, steer back to the desired course then trim the main.

To shake out a reef bring the boat back to a close haul or tight reach course and loosen the main sheet until there is a large bubble at the luff. Release the reefing outhaul line and be sure that it is running free. Then release the main halyard about two inches and have crew go to the mast and remove the reefing cringle from the reefing hook. Raise the main using the electric secondary winch. It is better if the crew at the mast can raise the main by swaying the halyard (pulling the halyard perpendicular to the mast then down) with someone at the winch taking up the slack. The winch should only be needed for the last inch or so of halyard tensioning. If you use the winch to raise the sail (necessary if you do not have a second person to work at the mast) be very careful to winch slowly and allow a few seconds between turns on the winch to allow the sail slugs to work their way up the mast as they may tend to bind even though there is no significant pressure on the luff of the sail. The winch is powerful enough to rip the head out of the main if you continue to crank and the slugs are jammed. While raising the sail be sure that the reefing outhaul line is running free and has not jammed as you can rip the leech of the sail if the outhaul is preventing the leech of the sail to rise while you are cranking up on the halyard.

2. Jib Reefing System

The jib is most easily reefed while running off the wind on a very broad reach. On this point of sail you ease the jib sheet until the sail begins to luff and then pull in on the furling line. You should be able to do this by hand but the manual secondary winch may be used if needed.

If you must reef the jib while on a close reach you will probably have to use the secondary winch to pull in the furling line. Ease the sheet as much as possible without the clew flogging too much and crank in the furling line as quickly as possible. In a strong wind the clew will be very dangerous to any crew members on the deck and all crew should be kept as far away from the clew as possible. This puts great pressure on the reefing equipment and should only be done when it would be dangerous to fall off on to a broad reach long enough to reef on that point of sail.

3. Spinnaker System

An asymmetric spinnaker is stored in the sail locker. To raise the spinnaker lift the spinnaker bag to the top of the hatch with the ring outside the hatch and the bag hanging into the sail locker. Attach the spinnaker halyard to the head of the spinnaker and attach the spinnaker sheets to the two clews of the spinnaker. Run the sheets outside of all rigging and lifelines to blocks that have been attached to the toe rail near the widest part of the hull. A plastic tacking device should be placed around the furled jib and a downhaul line run from the tacking device through a snatch block on the bow and to one of the forward cleats. The tack of the spinnaker is attached to the tacking device. Steer the boat on a very broad port reach. Raise the spinnaker to within a foot of the top of the mast. Attach a snatch block to the bow pulpit and put the spinnaker sock line through the block. When the crew is ready to deploy the spinnaker, raise the sock using the continuous loop sock line that is through the snatch block attached to the bow pulpit while a crew member trims the starboard sheet.

The easiest method of gybing is to lower the sock, gybe the boat and manually take the spinnaker across the front of the forestay. Then raise the sock and deploy the spinnaker on the starboard

tack. An alternative method is to steer nearly dead down wind and let the spinnaker sheet loose so that the spinnaker flies out in front of the boat. Then pull on the lazy spinnaker sheet to bring the clew of the spinnaker around the front of the head stay and steer off on the new heading while sheeting in the spinnaker.

To douse the spinnaker steer so that the mainsail is blanketing the spinnaker then release the snap shackle that is attached to the tack of the spinnaker (a process known as "blowing the tack"). Release the sock line from the snatch block and bring the sock down dousing the spinnaker.

When the spinnaker sock is completely down, slowly release the spinnaker halyard while a crew member stuffs the spinnaker into the spinnaker bag that is suspended at the opening to the sail locker with the plastic ring in the bag opening. Once the entire spinnaker body is in the bag, release the sheets and the tack of the spinnaker and then release the head and stuff the remainder of the spinnaker into the bag. Remove the tacking device from the jib stay. Unless you plan on deploying the spinnaker again in the near future, the blocks should all be removed and stowed.

4. Whisker Pole Operation

A whisker pole for use with the jib is mounted forward of the mast. There are three controls for this pole: a topping lift, a downhaul and a pole lifting line at the pole base. The pole rides up and down the mast on a track and has a continuous line that is used to adjust the height of the base where it is attached to the mast. A snatch block is attached to the toe rail at the bow and the downhaul is run through this block and back to a block at the base of the mast then to a cleat on the mast. The base of the pole is lifted with the continuous line and the topping lift is adjusted to keep the outboard end of the poll off the deck. The jib sheet that is to be used is clipped into the outboard end of the pole and the pole is adjusted using the three control lines so that it is parallel to the water and about four feet off the deck. When the jib is sheeted in, the pole will be pulled aft. Be careful to ensure that it is not pulled so far aft that it puts pressure on the shroud. The downhaul is tensioned to keep the pole forward and off of the shroud. The jib may have to be furled to the first reef point to give good shape because it is a 135% jib.

IV. Specifications and Equipment Data

A. Boat Specifications

Length overall:	13.5m/44.3 feet
Waterline length:	39 feet
Beam:	4.1m/13.6 feet
Draft:	1.90m/6 ft. 3 in.
Mast height:	56 ft. 3 in. (from the waterline; does not include antennas)
Rating Measurements:	I = 50 ft. 11 in.; J = 15 ft. 1 in.; P = 46 ft. 10 in.; E = 16 ft. 10 in.
Auxiliary Diesel:	Yanmar 4JH2E (50 hp)
Displacement:	9318 kg/20500 lbs
Fuel Capacity:	200 liters/53 gallons
Water Capacity:	770 liters/200 gallons
Sail area:	82m2/884 sq. ft.
Refrigeration:	Two systems: Engine driven; Battery driven
Berths:	6
Heads:	3
Showers:	3 plus swim platform shower

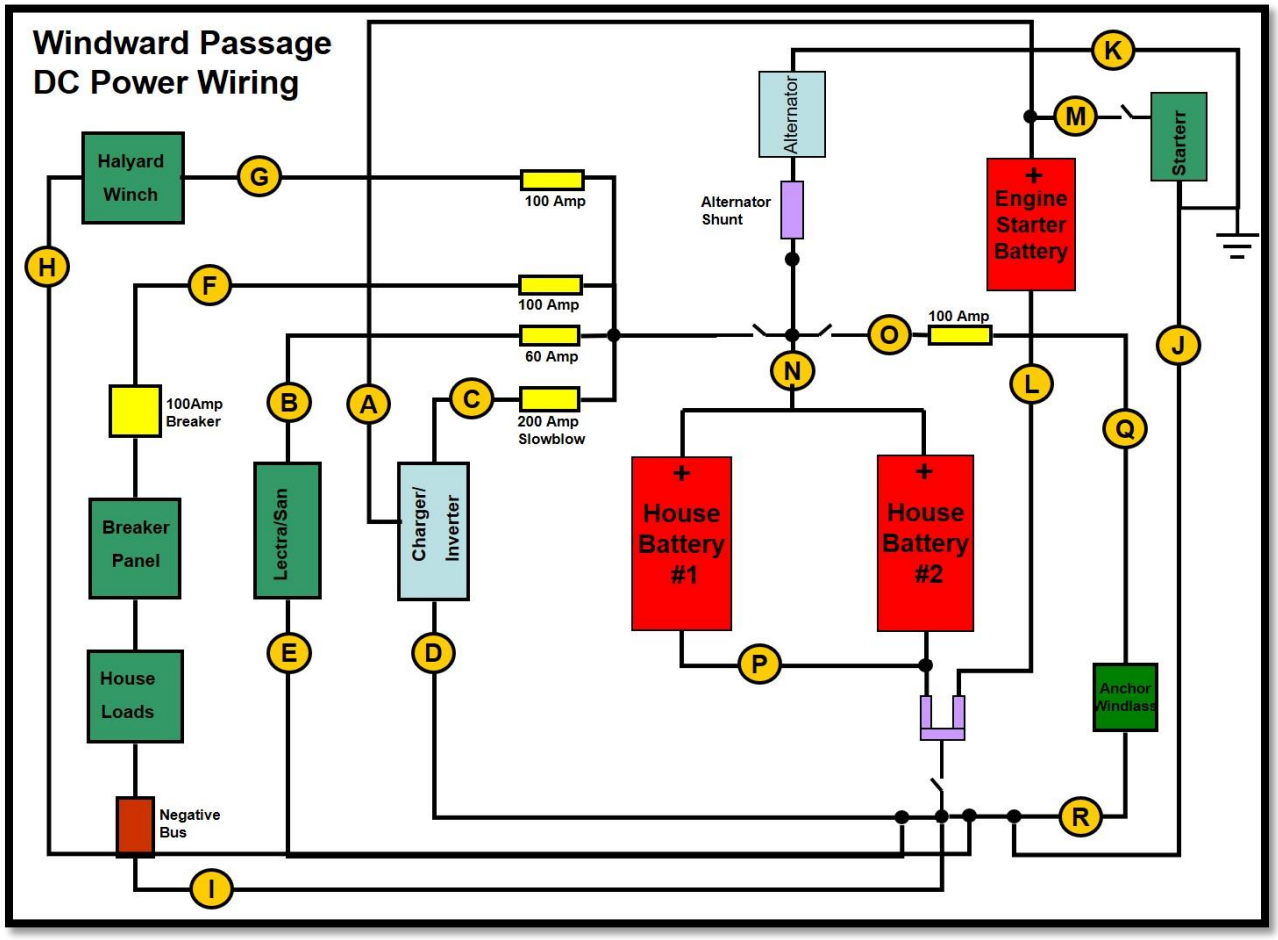
Note on Rating Measurements:

"I" -The height of the foretriangle. It is measured from the deck to the highest useful point on the forward side of the mast. This can be the intersection of the forestay and the mast or the top of a spinnaker block if one is mounted above the forestay. Prior to the IOR rule, this measurement was defined as "P_2".
"J" - The base of the foretriangle. Measured from the center of the stay at the stem to the front of the mast horizontal to the waterline.
"P" - The longest reach of the mainsail along the mast. Stretch is often limited by bands when measuring boats for racing.
"E" - The longest reach of the mainsail along the boom. Again an outer band is used to limit stretch for rating purposes. Prior to the IOR, this measurement was designated "B".

B. Electrical Wiring

The power wiring diagram is shown on page 36. The descriptions for the individual wires are given on page 37. Details for the various circuits are given on page 38-39.

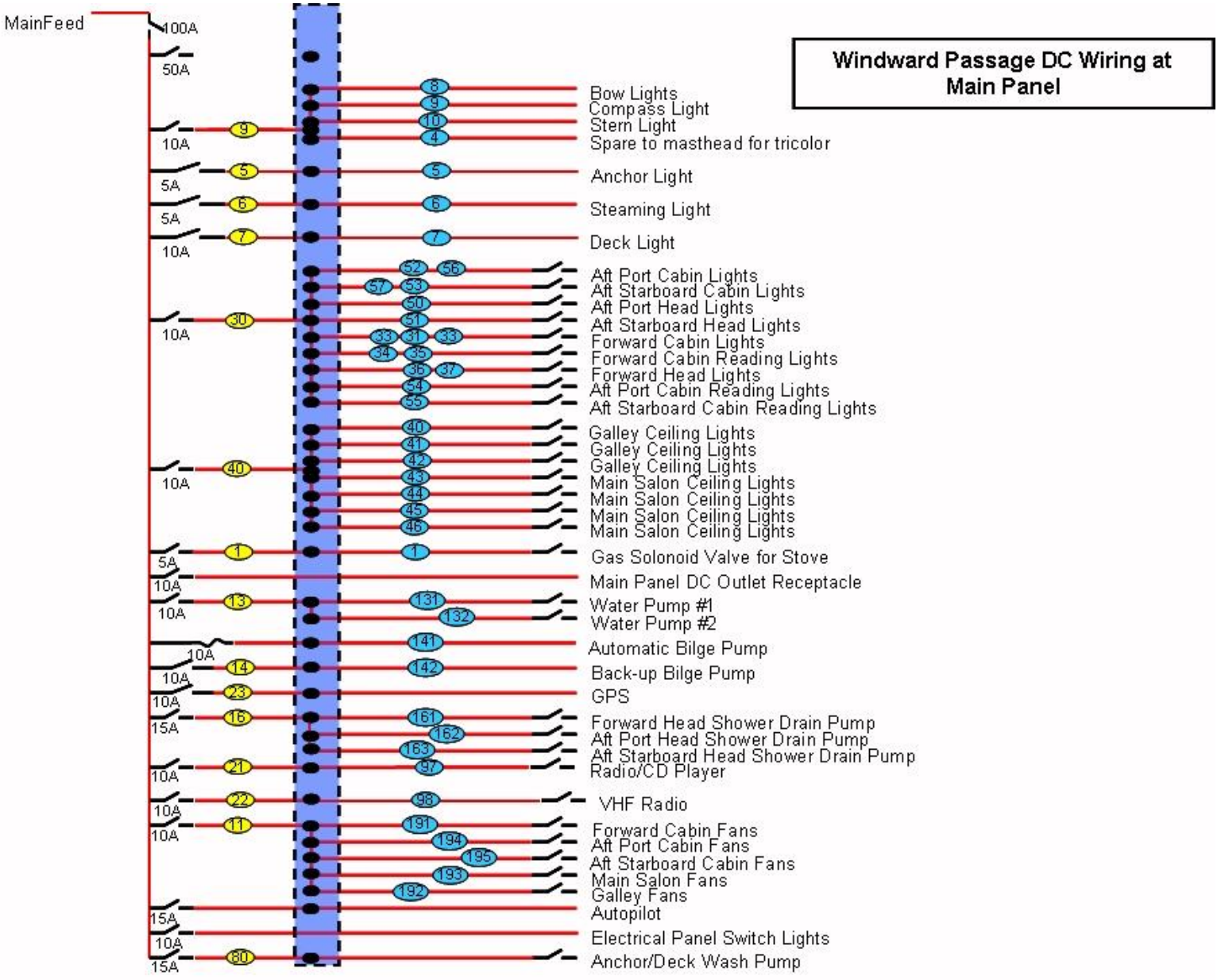
1. DC Power Wiring



2. DC Wiring Details

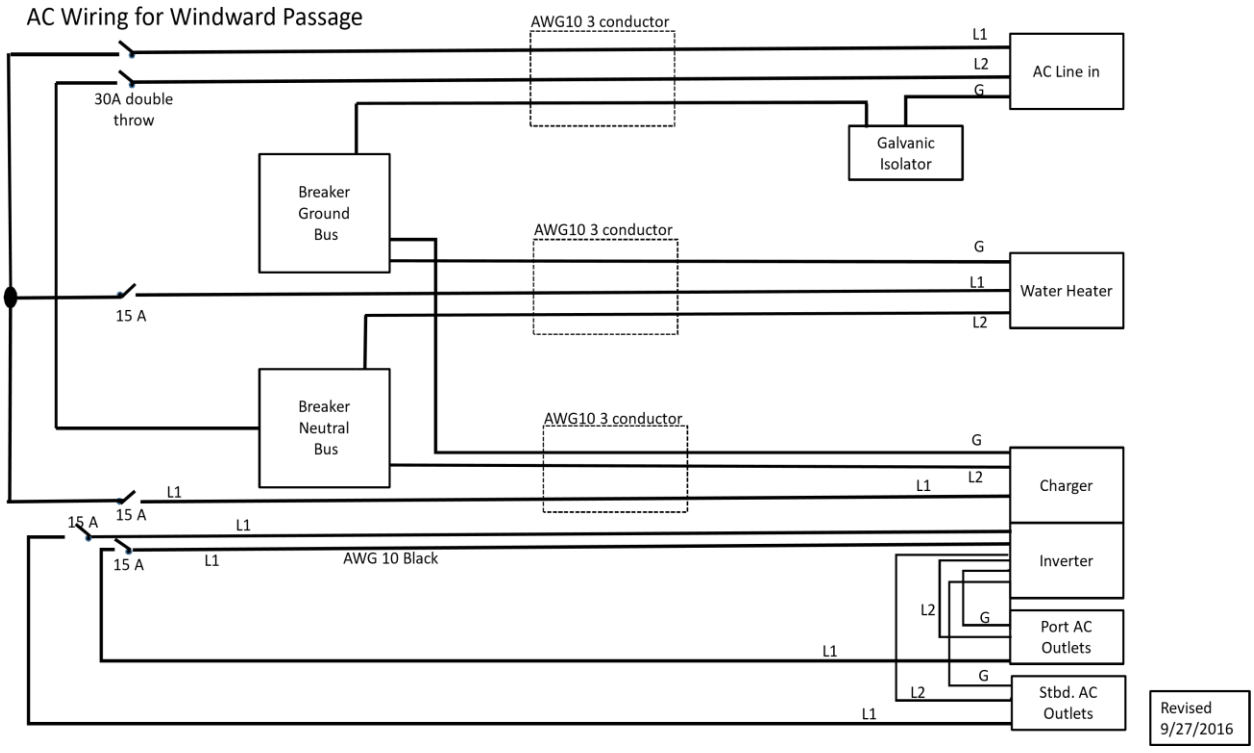
DC Power Wiring Details						
Line	Amps	Length (ft.)	Needed AWG	Actual AWG	Color	Function
A	15	12	12	12	Red	Echo charge to starting battery
B	50	10	6	4	Red	Power to Electra-Scan Unit
C	125	10	0	0	Red	Positive connector for Inverter/Charger and house batteries
D	125	10	0	0	Black	Negative lead from Inverter Charger to house batteries
E	50	10	6	4	Black	Negative lead from Electra-Scan unit to house batteries
F	100	22	00	00	Red	Power from house batteries to distribution panel
G	30	22	4	6	Red	Power from house batteries to electric winch
H	30	22	4	6	Black	Negative from electric winch to house batteries
I	100	22	00	00	Black	Negative from distribution panel to house batteries
J	145	5	00	0	Black	Negative from dual shunt to boat ground
K	100	3	0	Direct	Black	Ground from alternator (inside engine space)
L	200	5	0	0	Black	Negative from starting battery to shunt
M	200	5	0	1X35	Red	Power from starting battery to starter
N	145	3	00	1X50	Red	Power from house battery to main switch
O	100	4	1X50	1X50	Red	Power to anchor windlass circuit breaker
P	145	1	00	1X50	Black	Return from shunt to negative pole of house battery
Q	100	30	1X70	1X70	Red	Power to anchor windlass circuit breaker
R	100	30	1X70	1X70	Black	Return from anchor windlass to house battery negative

3. DC Panel Connections

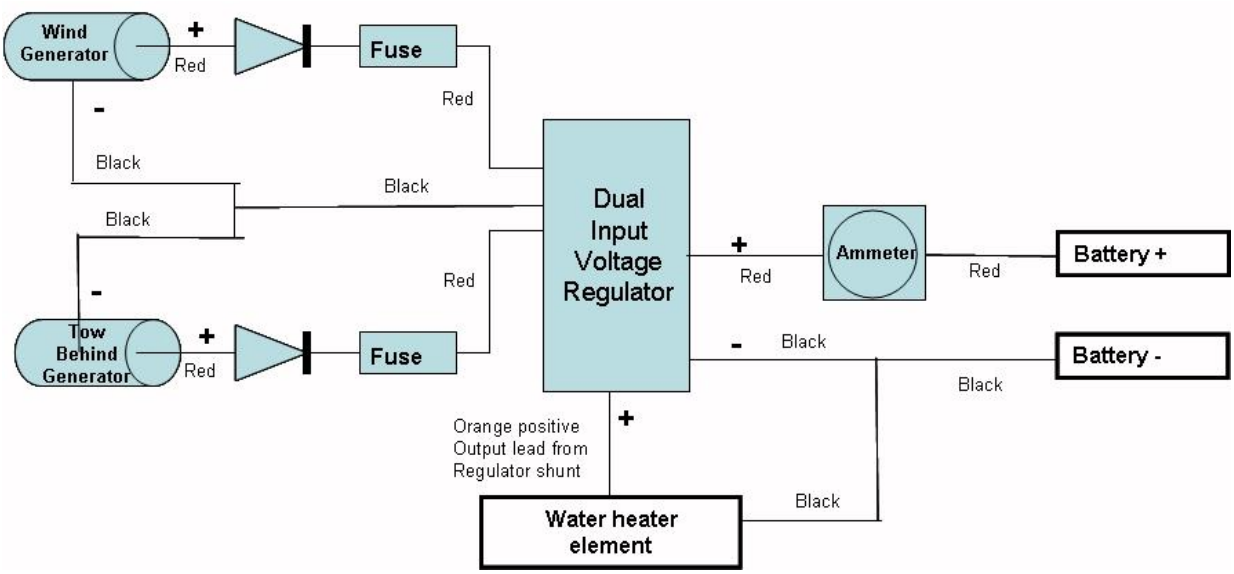


Breaker Listing New Panel												
Left column DC			Center column DC			Right column DC			Right column AC			
Number	Service	Amps	Number	Service	Amps	Number	Service	Amps	Number	Service	Amps
1	DC Main	100	1	Refrigeration	15	1	Auto Pilot	40 TD	1	AC Main Shore	30
2	Nav. Lights	5	2	Refrig. Cooling Fan	5	2	Instruments	15	2	Reverse Polarity	30
3	Steaming Light	5	3	Anchor Wash Down	20	3	Radar	15	3	Battery Charger	30
4	Anchor Light	5	4	12V DC Outlets	15	4	Network	10	4	Water Heater	15
5	Tri-Color	5	5	Refrig. Drain	10	5	VHF Radio	15	5	Unused	
6	Deck Lights	10	6	Shower Pumps	15	6	Main Bilge	15	6	AC Outlets Port	15
7	Salon Lights	10	7	Fresh Water Pump	15	7	Bilge Sump	15	7	AC Outlets Stbd.	15
8	Cabin Lights	10	8	Fans	10	8	Stero	15	8	Unused	
9	Unused		9	Propane	10	9	Unused		9	Unused	
10	Unused		10	Unused		10	Unused		10	Unused	

4. AC Wiring at Main Panel



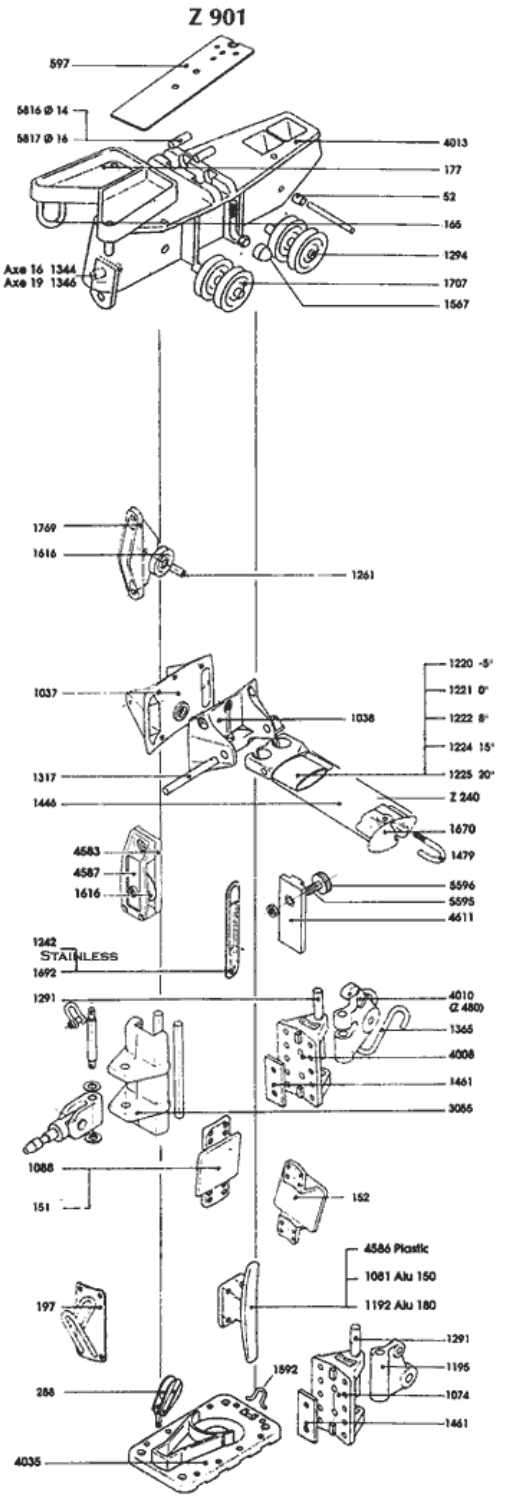
5. Wiring Diagram for Wind and Tow Behind Generators



V. Spars, Running Rigging and Sails

1. Mast

A Z-Spar Z-901 Mast is fitted to Windward Passage. Details shown below.



2. Standing Rigging

Measurement of Windward Passage Standing Rigging		
Measurement made March 3, 2006 with mast off boat		
	Diameter	
Rigging Item	mm	32nds of an inch
Cap shroud - upper section	9.8	12
Upper diagonal	7.9	10
Lower section of Cap	11.5	15
Lower aft	11.5	15
Lower forward	9.8	12
Backstay	8.2	10
Forestay	11.5	15

1. Running Rigging

The lines used for running rigging are shown in the table below. Most of the line is made by New England Rope. Downhauls are not rigged at this time.

The standing rigging is a double spreader, discontinuous shroud, double backstay rigging. The head stay is cut to length and has no adjusting turnbuckle. A ProFurl furling system is fitted with a single luff slot. The size of the standing rigging wire is given in the table below:

Line Specifications for Windward Passage			
	Length	Color	
Application			
Main Halyard	130	Grey	**10mm Marlow D2 Club**
Jib Halyard	130	White	**10mm NER VPC**
Spare Jib Halyard	130	Red fleck	**11mm Marlow doublebraid**
Spinnaker Halyard	130	Gold fleck	**11mm Marlow doublebraid**
Boom topping lift	130	Blue fleck	**10mm Marlow doublebraid**
Main Sheet	100	White	**1/2" NER Regatta braid**
Jib Sheet (each)	55	Blue	9/16" NER double braid
Spin Sheet (each)	90	Blue	9/16" NER double braid
Reefing lines			
#1 Reef	90	Blue	7/16" NER Staset
#2 Reef	100	Red fleck	7/16" NER Staset
Downhauls			
#1 Reef			
#2 Reef			
Furling line	100	Black	3/8" doublebraid
Boom Vang	70		

Approximate dimensions	
Mast top to boom	48 ft.
Mast top to deck	52 ft.
Mast top to furler top	53 ft.
Mast base to winch	14 ft.
Boom length	17 ft.
Deck to water	5 ft. 3 in
Top of mast to waterline	58 ft

2. Sails

The sail inventory consists of a main, 135% Genoa, storm jib, storm trysail, and asymmetric spinnaker.