

OPERATIONS MANUAL

for

braesail

Welcome aboard! We are so glad that you've chosen *Braesail* as your vacation yacht! We're certain that you'll enjoy cruising along the coasts and among the beautiful islands of the Pacific Northwest!

We hope that this manual will help you become familiar with the boat and its equipment, features, and safe operation. If you want more detail on any feature, please consult the manuals stored on the thumb drive in this binder.

Do remember that this is a non-smoking vessel, and always smoke outside the cabin and away from the decks. If you have questions about the boat or about places to visit, please don't hesitate to ask the AYC staff.

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About braesail

A quick word about the name of the boat you are about to share: When we first bought a share in a 27-foot Ericson, our first “real” boat, she was named *Sagres* (she is actually *still* named *Sagres*), after the town in Portugal from which Prince Henry the Navigator (1394-1460) was said to have sailed in his exploration of North West Africa, Cape Verde, the Azores, and the Maderas. We named her (his?) dinghy *Prince Hal*, because we hoped the dinghy would always return to *Sagres* (it has), and the autopilot (actually a little tiller pilot) got the moniker “Prince Henry” (the navigator). When we bought the boat that you are about to charter, we looked for a similar medieval nautical name. After much research, we discovered the medieval name for the island on which St. Brendan the Navigator (ca. 490-ca. 570) spent the weeks around Easter during his voyages of exploration: *Braesail*. We pronounce the name “**Bray** – sail”, though if you want to impress your friends, the medieval Celtic pronunciation is “brah-eh-**sah**-eel”. The name entered the European sailors’ vocabulary through Portugal, and still lives on as the name of a country in South America: Brazil. The name of the dinghy is *Coracle*, which is Irish for “small boat,” and the name of St. Brendan’s craft in the early stories. We actually wanted to call the dinghy *Curragh* (pronounced **coo**-rahk), but guessed that no one would be able to say or spell the medieval Celtic name. The autopilot functions much better if you address him as “St. Brendan” (the navigator, of course). If you want to read one of the earliest sailing exploration tales, Brendan’s voyages were written down in *Navigatio Sancti Brendani Abbatis*. There is a copy of an English translation, *The Voyage of St. Brendan*, in *Braesail*’s library. Enjoy the read!

Walt and Lorelette Knowles

Checklists

The following checklists are here to give you a quick routine for safe and effective operation of *Braesail*. They summarize information in the rest of this manual, but they do not substitute for knowledge of the systems.

At the beginning of the day

The boat

- Level of black water in holding tank < 5 lights
- Level of fresh water > ¼ full
- Battery voltage > 12v
- Battery charge level > -150 Ah
- Refrigerator < 42° F
- Freezer < 22° F
- Fuel > ¼ tank

The crew

- Everyone healthy
- Everyone happy
- Tasks / responsibilities assigned and accepted
- Everyone knows where safety equipment is located
- Everyone has their life jackets on or ready

The engine

- Lubrication oil level in range
- Coolant level in range
- Belt in good shape
- Primary fuel filters clear
- No signs of leaks

At start-up

- All cabin and cabinet doors and drawers latched and/or locked
- All lines clear of prop and thruster
- Mount extension microphone on binnacle
- Turn Navigation instruments on
- Turn Start battery on
- All instruments operating
- Turn engine on
 - Oil pressure light comes on
 - Battery charge light comes on
 - Alarm sounds
- Start engine
 - Warnings silence and lights go out within 3 seconds
 - Oil pressure > 3 bar
 - Check exhaust and water flow
- Switch thruster from “Charge” to “On” (if using thruster)
 - Power up thruster
 - Check thruster operation by a single burst

Departure

- Examine and evaluate winds and currents and how they will affect your departure
- Crew briefed on how boat will leave anchorage or marina
- Crew briefed on day's course
- Crew briefed on weather, wind and currents
- Crew briefed on possible hazards
- Crew briefed on beautiful sights and experiences expected that day
- VHF radio on and tuned to Channel 16
- Dinghy is properly secured for day's passage

From an anchorage

- Windlass power on main power panel on
- Weigh anchor by powering boat to anchor by engine and using windlass to lift anchor and rode
- Secure the anchor by attaching the safety clip

From a mooring buoy

- Power forward toward the mooring buoy to release tension on the mooring line
- Release the mooring line and pull the line through the ring
- Stow the mooring line

From a dock

- Plan your departure
- Always have a "Plan B" ready
- Inform your crew
- Disconnect shore power
- Prepare your lines
 - Stow lines that are not needed to hold the boat in position or control the departure
 - Ready your lines for quick release
 - Assign a crew member to each active line
- Prepare an emergency fender (or a control fender, as appropriate)
- Communicate constantly while departing a dock
- After you are in clear water, stow lines and fenders

- Switch thruster to "Charge"

Arrival

- Examine and evaluate winds and currents and how they will affect your arrival
- Know the tides for your time in this location
- Crew briefed on how boat will arrive at anchorage or marina
- Crew briefed on wind and currents
- Crew briefed on possible hazards

At an anchorage

- Identify your anchoring point
- Sound your swinging area
 - Are there ledges from which your anchor will drop if it drags?
 - Are there bars on which you could go aground?
 - Are there ledges onto which you could be pulled when stern tied?
- While drifting (or idling) in reverse, lower the anchor to the bottom and pay out the rode to a 3:1 scope along the bottom
- Let tension develop on the rode to set the anchor
- Pay out the rode to a 5:1 scope and apply tension to verify that the anchor is set
- Attach the anchor bridle and release tension on the windlass

Stern tying

- Have your dinghy ready prior to anchoring
- Pay out rode to a 6:1 or 7:1 scope, if there is room, to get you as close to shore as possible
- Set your stern tie
- Bring in your anchor to 4:1 scope while paying out your stern tie
- Balance scope and stern tie for gentle tension at high tide.

At a mooring buoy

- Approach the buoy from upwind with the buoy about 10 feet behind the bow
- Allow the wind to drift you down on the buoy
- Capture the ring on the buoy with the boat hook. Do not try to maneuver the boat with the boat hook!
- Be prepared for the ring to be stuck to the buoy; have crew ready to lift the ring or reach the rope into the buoy
- Thread the mooring line to the opposite bow cleat from its bitter end cleat
- Leave about 8-10 feet of line on each leg of the mooring line

At a dock

- Plan your arrival
- Always have a “Plan B” ready
- Inform your crew
- Prepare your lines
- Assign a crew member to each active line
- Prepare an emergency fender (or a control fender, as appropriate)
- Communicate constantly while arriving at a dock

Shutting down

Engine

- Put engine in neutral idle for five minutes to cool down
- Stop engine by pressing the red “STOP” button
- Turn engine key to “OFF”
- Turn off the Start battery switch on the main electrical panel
- Turn off the Windlass switch on the main electrical panel

Boat

- Center the rudder
- Neaten all lines and fenders
- Secure all furlers
- Turn off the VHF radio
- Remove extension microphone from binnacle
- Turn off running lights
- Turn on anchor light if in an anchorage
- Level of black water in holding tank < 5 lights
- Level of fresh water > ¼ full
- Battery voltage > 12v
- Battery charge level > 150 Ah
- Refrigerator < 42° F
- Freezer < 22° F
- Fuel > ¼ tank

The crew

- Everyone healthy
- Everyone happy
- Everyone relaxed from a great day on the Salish Sea
- Everyone knows where safety equipment is located

braesail Operations Manual

Boat Operation

Crew assignment

Braesail is a large and complex boat, but she is easily managed by as few as two people. The key is for each member of the crew to have their own tasks for each part of the voyage. Take a few minutes at the beginning of your trip to decide who is responsible for each of the various tasks. The following jobs are often forgotten until the crew finds out that no one has them as responsibilities (and that makes for an unhappy crew):

- Mooring line management
- Fender management
- Shore power management
- Dinghy management
- **PFD check (*nobody goes on deck on Braesail without their PFD on and adjusted—particularly all kids! And children love to call parents out when they violate this rule.*)**
- Instrumentation power
- Deck organization
- Below-decks organization
- Engine inspection
- Sailing inspection
- Tasks for tying up at a dock
- Tasks for leaving a dock

Engine inspection

Remember to perform your engine “WOBBS” check every morning: **W**ater (coolant), **O**il level, **B**ilges (inspect and pump out if needed), **B**elts, and **S**ea strainer.

Check the level of COOLANT in the expansion tank. When the engine is cool, the expansion tank should be about half full. Fill to the MINIMUM mark if it falls below that level. Engine coolant is a mixture of 50% antifreeze and 50% water, custom mixed by Yanmar. There is a gallon of coolant on the shelf in the engine room. *Except in an emergency, do not use any other coolant than this premix.* Check the level of OIL in the engine with the dipstick located on the starboard side of the engine, just forward of the head door jamb. A pair of etch marks on the dipstick indicates the proper oil level. Do not overfill! Make sure that the dipstick is put back in firmly. Check the oil using a paper towel, not a dishtowel or other linen, and check the general condition of BELTS, HOSES, and FUEL LINES.

Make sure that the RAW WATER THROUGH-HULL is in the “open” position (lever in line with valve). Your through-hull and strainer are located on the port side of the engine room, right behind the central door jamb.

Check the RAW WATER STRAINER for debris each week, or if the engine begins to overheat. To check the strainer, close the seacock, open the strainer cover by loosening the two wing nuts on the top, clean the strainer, and reassemble. Be careful to seat the gasket properly or you will have a leak. BE SURE TO REOPEN THE THROUGH-HULL!

Engine

Braesail has a 75-horsepower turbo-diesel engine, which drives a folding three-bladed propeller through a reversing gear box and clutch. The combined shift lever and throttle control is located on the right on the binnacle. To increase RPMs while in neutral, press the black button in the lever shaft and move the throttle while holding it in.

Full engine instrumentation is on the binnacle as shown in Figure 1.

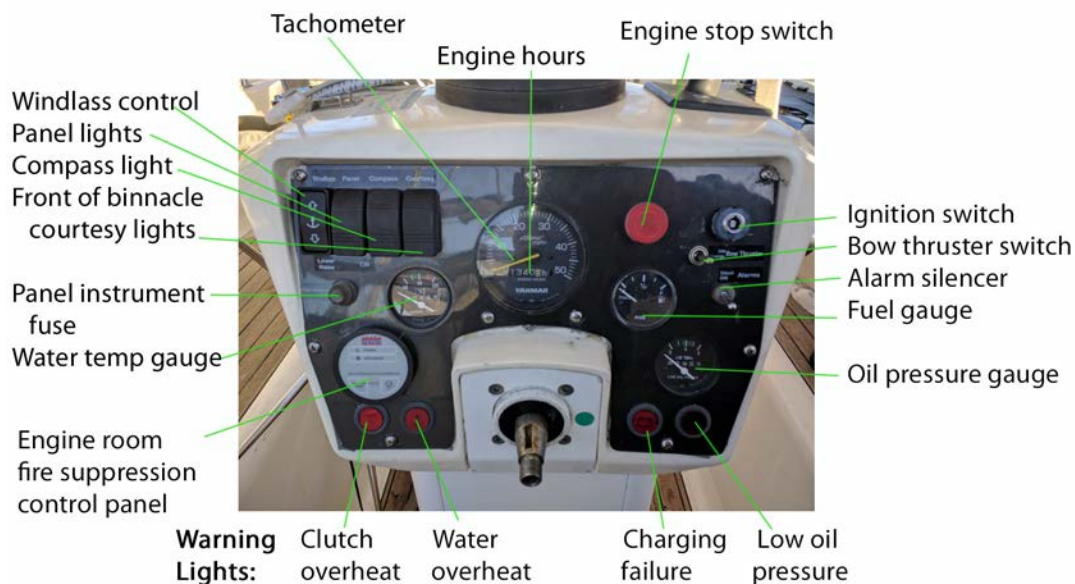


Figure 1: Binnacle Engine Instrumentation

The engine will propel the vessel to about 7 knots in calm water at about 2700 RPM. Your best cruising is achieved at about 2500 RPM and 6 kts for longer periods.

Using higher throttle settings will produce very little increase in forward speed, but will greatly increase fuel and oil consumption and engine wear. Because of this, we ask that you generally limit the use of higher power settings to real emergency situations. However, running the engine at about 3200 RPM for 10-15 minutes every few days does help to clean carbon build-up from the engine, and you might do this when you are fighting a current or when you'd like to reach a destination a little more quickly!

Braesail exhibits some “prop walk” to the port when in reverse, but not in forward. When in reverse, be careful to keep a firm grip on the wheel and use only low RPMs.

Engine raw water through-hull and strainer

In most cases, the ENGINE WATER THROUGH-HULL is left open. Before starting the engine for the first time, check that the ENGINE WATER THROUGH-HULL valve is open.

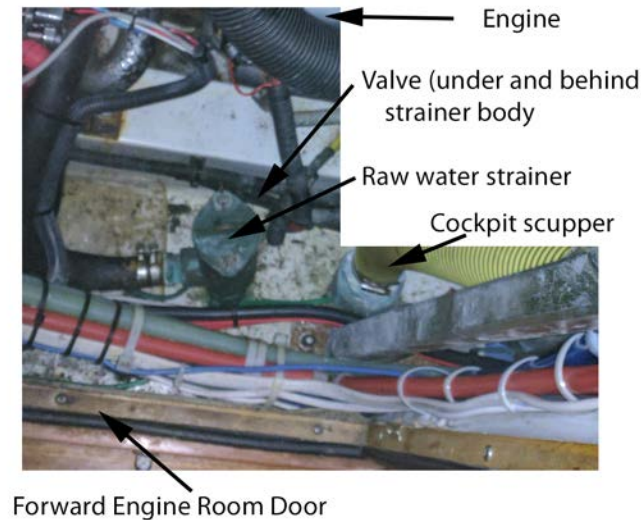


Figure 2: Engine Raw Water Through-Hull and Strainer

Should the engine water temperature suddenly rise above its usual 80°C range, immediately throttle down to an idle, let the engine cool, and shut it down. Check to see that the RAW WATER STRAINER is not fouled and clean it if it is:

- Close the through-hull valve
- The bronze strainer has two wing nuts on top holding the top in place. Loosen these so that you can rotate the top of the strainer (one side of the top is captured so it won't fall into the bilge) to free the stainless-steel strainer
- Remove and clean the strainer
- Crack the through-hull at the base of the strainer to rinse a little water (a cup or two) through
- Replace the strainer, close the top, and tighten (with your fingers—no tools!) the wing nuts on the strainer
- Open through-hulls and check for leaks
- Start the engine

Starting

Turn on all your appropriate navigational instruments before starting the engine (see *Navigational Instruments*).

PUT ON YOUR PFDs, close or catch all cabinet and cabin doors, and stow all your loose items.

Make it a boat rule: unless you are at the dock, do NOT enter the cockpit without your PFD on and properly adjusted. Accidents happen, and thermal shock in 50° F water will cause you to aspirate sea water and drown. Your PFD will keep your head out of the water and give you the opportunity to sail another day!

On the main power panel, switch on the START-BATTERY (see Figure 3).



Figure 3: Start Battery Switch

Verify that the voltage on the starting battery is above 11 volts.

If the engine is very cold (below 32° F), pre-warm by turning the ignition switch counter-clockwise to the GLOW position and hold it for 10 seconds. This will light glow plugs to make it easier to start. Release the switch and continue.

Turn the key clockwise to the ON position. Your oil and charging alarms will sound at this point. Continue turning clockwise to the START position. The engine should start in less than 5 seconds. Release the switch and let it return to the ON position. After the engine catches, look over your port stern quarter to see that water is exiting with the exhaust.

Allow the engine to warm up by letting it idle for about 5 minutes at around 750 RPM before putting it under load.

Do not hold the key in the START position for more than 10 seconds at a time. If the engine does not start immediately, WAIT for about one minute before trying again. NEVER TURN THE KEY OFF WHILE THE ENGINE IS RUNNING! You will do serious alternator damage, and you will be unable to stop the engine unless the key is in the ON position. The key should always remain in the ON position when the engine is running.

Shutdown

Place the transmission in neutral and allow the engine to cool down for a few minutes. This is usually about the amount of time it takes to secure your dock lines and plug into shore power. Press and hold the red button adjacent to the ignition switch until the engine comes to a full stop (See Figure 1). Alarms will sound until the key is turned to OFF. Turn the key to the OFF position after the engine has stopped completely.

Fuel filters

Braesail was equipped to sail into the tropics and away from the stable and high-quality fuel you will find in almost every fuel dock in the Salish Sea. We've never had fuel problems in the Inside Passage, but *Braesail* is ready for them with a duplex fuel filter.

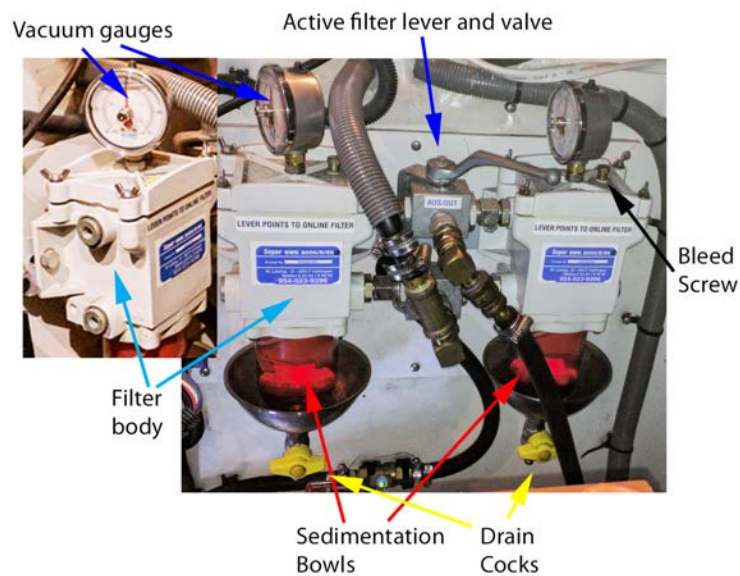


Figure 4: Dual Fuel Filters

Normally, the VACUUM GAUGE for the active filter runs between -1 and -3 inHg. If a gauge shows less than -8 inHg—in other words, a larger negative number (or if the red needle—the maximum marker—shows less than -8 inHg), the filter is probably clogged. If you are underway with a clogged filter, simply swing the ACTIVE FILTER LEVER to the other filter, and fuel will be drawn through the other filter.

Often you may unclog the filter:

- Crack the bleed screw
- Let the water and dirt drop to the bottom of the sedimentation bowl
- Place a container (you'll find one in the cabinet under the pilot berth) under the drain cock and open the cock
- Drain the water and dirt
- Close the cock. If more water and dirt accumulates, drain it out
- Close the bleed screw

Normally, the fuel system will self-bleed unless you have removed a large amount of water or fuel from a filter or had to change the filter itself. Switch the filter back to the (formerly) clogged filter and let the running engine prime itself. It may briefly cough as it “spits” out the air. If you need to bleed the fuel system, follow the instructions on page 22 of the 4JH3-TE Operation Manual.

There are spare filters and O-rings in the drawer in the pilot berth should you need to change them, but even if you clog one filter, the likelihood is quite small that you will clog a second in these waters.

Lubrication and other fluids

Application

Fuel Oil
Engine Lubrication
Clutch Lubrication
Engine Coolant

Rating

#2 Diesel
15W40, CD or better (DELO 400)
20W or 30W engine oil
Yanmar Premix

Table 1: Engine Fluids

VHF Radio



Figure 5: Navigation Station Lower Forward Panel

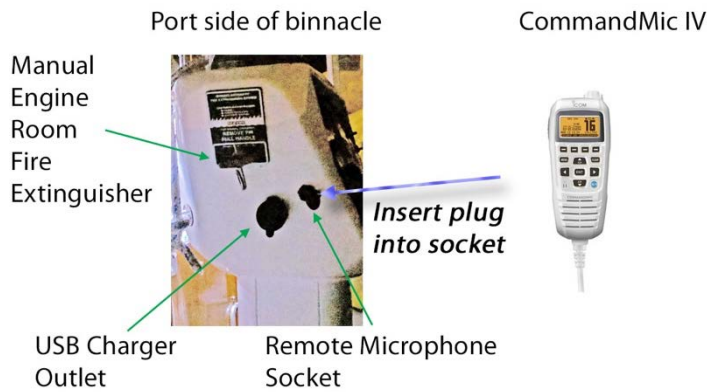


Figure 6: Remote Microphone on Port Side of Binnacle

You are legally and morally required to monitor VHF Channel 16 when underway. Not only that, it's a smart thing to do, and it's often entertaining.

The REMOTE MICROPHONE for the binnacle is kept in the upper drawer in the navigation station desk. Plug it into the REMOTE MICROPHONE SOCKET on the port side of the binnacle. The VHF RADIO is powered with the NAVIGATION INSTRUMENTS breaker on the Main Power Panel. Rotate the VOLUME knob on the upper right of the ICOM IC-M510 VHF RADIO to turn the VHF Radio on and adjust the volume to a comfortable level below decks. At the helm, turn ON the REMOTE MICROPHONE (if necessary) by pressing the PWR key on the top of the microphone for 2 seconds. Adjust the volume to a comfortable level. Clip the microphone into the holder on the top of the lower binnacle.

Channel	USE
5A	Vessel Traffic System <i>NORTH</i> of Lagoon Point (Middle of Whidbey Island)
9	Secondary Hailing
10	Winchelsea ("Whiskey Golf") control
13	Vessel Bridge to Bridge
14	Vessel Traffic System <i>SOUTH</i> of Lagoon Point (Middle of Whidbey Island)
16	International Calling and Distress Do not use Ch. 16 for radio traffic! Move to a working channel as soon as you have established contact!
22A	US and Canadian Coast Guard
28	Automated Radio Check
68	Most Canadian Marinas and Harbor Control
68, 69, 71, 72, 78	Recreational Working Channels
70	DSC

Table 2: VHF Channel Use in Nearby Waters

DISTRESS CALLING

If you have not done so already, **HAVE ALL CREW MEMBERS PUT ON THEIR LIFE JACKETS!**

If you, *Braesail*, or a nearby vessel are in *immediate and serious distress, with risk to life, limb, or vessel*, make a DISTRESS CALL using the VHF RADIO. After you have made a VHF Distress Call, feel free to use your cell phone to make additional distress calls. However, ALWAYS MAKE THE VHF CALL FIRST.

There are two ways of making a distress call. The first—and best—way is to use DSC.

- Lift the red DISTRESS cover in the center of the radio or side of microphone
- Press the button *underneath the red DISTRESS cover* for 5 seconds
This will transmit a distress notification, along with your location, to all nearby stations, and particularly to the Coast Guard. You may hear someone else's distress call: Your VHF will blast (at full volume) a claxon for about 5 seconds, and switch to Channel 16. Offer help if appropriate
- Once your call is acknowledged (usually by the Coast Guard), your VHF Radio will shift to Channel 16
- Communicate, slowly and calmly, the nature of your distress

The other way is to use a **Manual Call** (You can do this from the Remote Microphone at the binnacle):

- NOTE YOUR LOCATION. Your exact coordinates are normally displayed at the top of the Radar/Chart-plotter display and on a page of data on the I70 display. If your instrumentation is nonfunctional, identify land or sea marks which will help aid find you
- Shift the VHF to Channel 16
- Press and hold the PUSH-TO-TALK key for the following message:
 - MAYDAY, MAYDAY, MAYDAY
 - This is the sailing vessel *Braesail, Braesail, Braesail*. Station Whiskey Delta Indigo Seven Nine Zero Six
 - MAYDAY. *Braesail*
 - Give your location (for example “LOCATION is 48 degrees 31 point 4 minutes NORTH, 122 degrees 46 point 6 minutes WEST” or “In THATCHER PASS, about 1 mile DUE NORTH of Jones Island)
 - Describe the nature of distress (sinking, fire, medical, etc.)
 - State the type assistance desired
 - State the number of persons on board (for example, 4 adults and 2 children
 - Give any other information which will enable a respondent to find and help you
- Say “OVER” and release the PUSH-TO-TALK KEY

Navigation Instruments

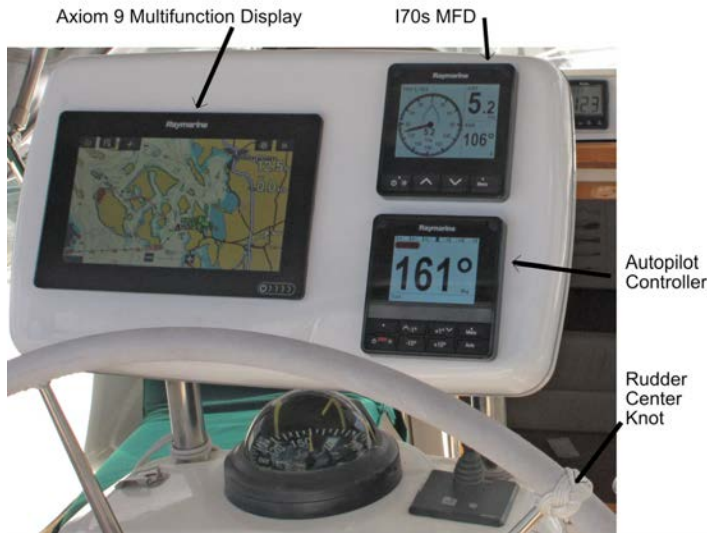


Figure 7: Upper Binnacle Navigation Instrument Displays

Your NAVIGATION INSTRUMENTS are crucial aids to the safe and easy sailing of *Braesail*. Power them up and make sure that they are functioning properly before leaving the dock.

Almost all navigation information is available to you on both the AXIOM 9 MULTIFUNCTION DISPLAY screen and the I70s MULTIFUNCTION DISPLAY. In addition, most of the information is broadcast on WiFi.

You normally don't even need the AUTOPILOT turned on, and the AYC Fleet Captains strongly urge against its use. The owners don't use the AUTOPILOT except on long passages on open water, except for the rudder position indicator on the AUTOPILOT CONTROLLER. You don't even need that, because there is a nice, old-fashioned Turk's-Head RUDDER CENTER KNOT on the wheel, and that's what we use when docking or departing to know the rudder position.

Instruments on the Companionway Arch



Figure 8: Companionway Arch Instruments

Information about *Braesail* and her performance is echoed on the instruments on the companionway arch. The DEPTHSOUNDER is calibrated to show the waterline depth from a sender just forward of the keel. **The minimum safe operational depth of Braesail is 7.0 feet or 2.2**

metres. The WIND INSTRUMENT shows apparent conditions at the top of the mast. If you want TRUE wind readings, these are available on all the Multifunction Displays. The I70 is set up with what the owners think are the most useful pages. They aren't the same as the I70s on the binnacle, because we have a number of full page displays programmed into this location.

Manuals for all the instruments and radios are in the binders in the starboard cabinet in the forward stateroom and on the thumb drive in the gray binder.

Getting underway

Disconnect shore power

To disconnect your shore power, first turn off the SHORE POWER BREAKER on the MAIN PANEL. Turning off the boat's shore power first will protect *Braesail's* electronics from any accidents.

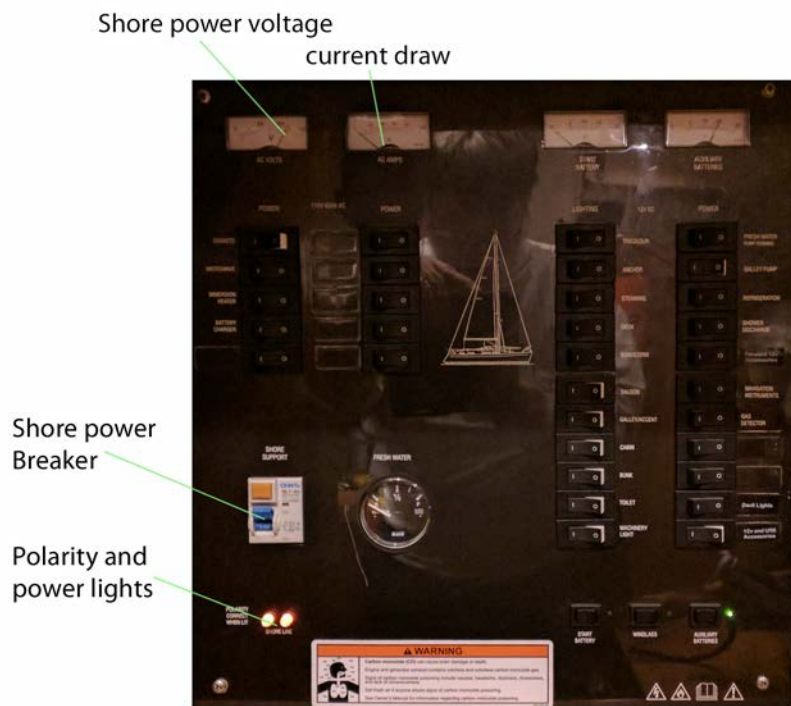


Figure 9: Shore Power Support

Braesail is equipped with a full SmartPlug ELCI protection system. Switch the breaker on the port stern to OFF. Go ashore and turn off the AC POWER CIRCUIT BREAKER on the shore power pylon on the dock, and only then disconnect the cord from the pylon. Disconnect the POWER CORD from the boat power inlet located on the port side of the stern.

Bow thruster

To power up the BOW THRUSTER, first switch the BOW THRUSTER CHARGING SWITCH to ON. (See Figure 1.)

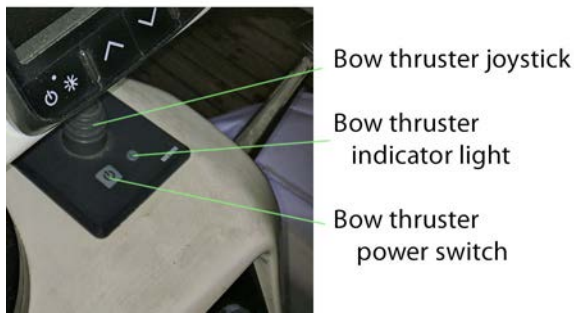


Figure 10: Bow Thruster Controls

Press the BOW THRUSTER POWER SWITCH. The thruster control panel will begin to beep and the BOW THRUSTER INDICATOR LIGHT will flash. Press the BOW THRUSTER POWER SWITCH a second time within about 5 seconds. (This second press is a safety feature to avoid accidental activation of the thruster.) The BOW THRUSTER INDICATOR LIGHT will show a steady green. Press the BOW THRUSTER JOYSTICK to left or right to make sure that the BOW THRUSTER is ready. *NOTE: There is a 2-second lockout between directions of thrust to protect the thruster gearbox.*

You push the BOW THRUSTER JOYSTICK in the direction you want the bow to move. In other words, press the JOYSTICK to starboard to move the bow in a starboard direction and to the port to move the bow in a port direction.

When you are away from the dock, return the BOW THRUSTER CHARGING SWITCH to CHARGE. There is an auxiliary battery in the bow to boost voltage to 24 volts. If you don't return to CHARGE, you will run the battery down and have no bow thruster when you need it.

Leaving the dock

The most important task in leaving the dock is *planning with your crew*. What are currents, wind, and other boats and hazards doing? Plan your exit and inform your crew, and you can get away from almost anything!

Close the PORTLIGHTS and the HATCHES in the forward stateroom, forward head, and crew cabin.

Once outside the marina, idle the engines while a crewmember brings in and stores the fenders and dock lines.

Docking

Have your crew make ready the lines and fenders in plenty of time and explain clearly how you intend to dock. Have bow, stern, and breast (spring or mid-ship) lines prepared so that they lead OUTSIDE the lifelines to the boat's mid-section (the widest part) where the gate in the lifelines has been opened, allowing your crewmember to STEP off easily and safely and secure the dock lines, beginning with the breast (spring) line. *Braesail* has tall topsides; it's a long way down. Because of this, she has a step fender which can be tied to

the base of the gate to make it very easy to get off safely. A doubled half-hitch works very well, but make sure it is securely tied before you use it.

Roll up and snap or stow the door panel on the cockpit enclosure on your approach side so that you will have clear vision and communication from the helm. Position your crew, and as you approach the dock, have them keep a close watch on wind and currents.

NEVER JUMP FROM THE BOAT'S DECK TO THE DOCK!

As you are coming alongside the dock, have your best communicator stationed amidships to give you distances from the boat to the side of the dock; it is often difficult to judge how close the dock is. Calling out distances (*i.e.*, 20 feet, 10 feet, 4 feet, *etc.*) will help a great deal in successful docking.

If you find that you are too far away from the dock, GO AROUND and try again. **THERE MUST BE NO HEROIC LEAPING OF CREWMEMBERS TO THE DOCK!** Actually, there **is** no “heroic” leaping to the dock. Leaping onto the dock is *always a mistake*, and it is never heroic, but always *foolish*. We love *Braesail* and want you to enjoy her without a scratch, but even holing and sinking her is less a catastrophe than a crew injury. Losing someone overboard is disastrous!

Fueling

You will need to fill the fuel tank before returning to your slip at the end of your charter. The fuel tank holds 110 gallons of diesel fuel. Before pumping fuel, have oil/fuel sorbs handy to soak up any spilled fuel. You should have a rough idea of the number of gallons you will need after checking the engine hour indicator. *Braesail* uses about 1 gallon of fuel per hour while cruising normally and 1-2 gallons per day for heating under typical winter conditions. You can have someone turn on the engine key occasionally to check the fuel gauge. The filler vent for the tank is directly below the helmsperson’s seat, and when the tank is almost full, the sound coming from that vent will change from a smooth “whoosh” to a very “bubbly” sound. When you hear the change, slow your pumping rate.

Fuel gauge reading	Fuel needed to fill
empty	110 gals / 400 l
1/8	95 gals / 350 l
1/4	80 gals / 300 l
3/8	65 gals / 250 l
1/2	55 gals / 200 l
5/8	45 gals / 150 l
3/4	30 gals / 100 l
7/8	15 gals / 50 l

Table 3: Approximate Fuel to Fill Tank

The FUEL DECK CAP is located in the center of the floor of the cockpit. CHECK TO MAKE SURE THAT YOU HAVE THE CORRECT DECK OPENING! Use only #2 DIESEL fuel! Do not add

water to the water tanks or pump out the holding tank at the same time that you're fueling. *Only one hose to Braesail at a time, please!*

Place the DIESEL nozzle into the tank opening, pump slowly and evenly, and notice the sound of the fuel flow. Pumping too fast may not allow enough time for air to escape, and this might result in spouting of fuel from the tank's opening. The sound might indicate that the tank is nearly full. Do not "top off" the tank. When the hose trigger activates, the tank is full, unless you are fueling from a very high-rate pump. Always be prepared to catch spilled fuel with an oilsorb. Spillage may result in a nasty fine (nearly \$1000 in 2018 for an accidental spill) from law enforcement! Replace the deck cap when you've finished.

Caution: Clean up splatters and spillage immediately for environmental and health reasons, and wash your hands thoroughly with soap and water.

ANCHORING

Tackle

The primary WORKING ANCHOR is a 20 kg (44 lb.) Delta anchor and is attached to 200 ft. of chain and 200 ft. of nylon rode. It is stowed on a roller in the bow anchor locker. Its rode is managed by a Lewmar V3 windlass, operated by a remote connected in the anchor locker and a control on the binnacle.

In addition, there is a 43-lb. Danforth anchor stored as spare in the anchor locker. It's on 50 ft. of chain and 100 ft. of nylon. There is a chain hook and 100 ft of bridle in the anchor locker.

The remote for the windlass is stored in the upper drawer in the navigation station desk.

The anchor locker should normally be secured. It may be opened using the T-handled hex key which hangs on the binnacle. A spare key is kept in the navigation station desk.

Operation

The windlass must be powered up in order to be operational. First, have the engine running, and then go to the main electrical panel and turn on the WINDLASS switch.



Figure 11: Windlass Switch

Let out sufficient rode by using the controls (or manually, below) for your depth of anchoring. With an all-chain rode, four-to-one scope is normally adequate in local waters during most of the cruising season, but you are responsible for the safe anchorage of *Braesail*. Best practice for anchoring is:

- Check your tide tables. How far up and down will you float? Remember that your scope should be calculated at highest tide. Make sure that you have enough depth at low tide for *Braesail's* 7-foot-deep keel.
- Determine your anchoring circle. Take the length of the rode you will let out, add 25 feet for the anchor to drag when setting, and add 50 feet for *Braesail*. At 4:1 scope, that might be 100 feet in 20 feet of water (remember, the bow roller is about 5 feet above the surface), plus 25 feet, plus 50 feet, for a total of 175 feet.
- Sound the circle to make sure you have adequate depths.
- Return to the center of the circle and lower the anchor to the bottom.
- Put *Braesail* in slow reverse and pay out your rode at the same rate as you are reversing so that you lay a nice straight line of rode on the bottom.
- When you have payed out your rode, put *Braesail* in neutral and let her momentum set the anchor.
- Once *Braesail* has stopped, put her in slow reverse (about 1200 rpm) to test and deepen the set. Have your bow crew verify that the rode is taught while your helmsperson verifies that *Braesail* is not dragging the anchor. (And, of course, if you are dragging, pull up the anchor and try again!)
- When the anchor is set, clip the bridle onto the chain and cleat it off to both sides of the bow. *Braesail* rides much more comfortably with a double bridle.

Then let out about 5 feet of rode so that there is no tension on the windlass—and that there won't be should a wind come up.

Chain mark pattern	Length of chain
Red	30 feet
Purple	60 feet
Green	90 feet
Yellow	120 feet
Pink	150 feet
Blue	180 feet
End of chain	200 feet
Markers in rope	Every 50 feet
End of rope	400 feet

Table 4: Rode Markings

Retrieving the anchor

The windlass is designed to lift the anchor and rode; it is not designed to move the boat about. (The anchor and chain, fully extended, weigh about 500 lbs.; *Braesail* displaces about 33,000 lbs.) Use the boat's engine to keep the chain vertical in the water while you weigh anchor. One of the best ways of doing this is for the bow crew to signal the helm by pointing at the anchor. Pull the chain up to approximately the depth of the anchor, and then gently run the boat over the anchor to break it free, and then retrieve the chain and anchor.

Mooring cans (anchoring buoys or balls)

The Washington State Parks sticker on *Braesail* allows you to hook the boat onto the MOORING CANS or BUOYS in the marine parks without charge.

NOTE: Mooring buoys in Washington State Marine Parks are limited to boats of 45 feet in length or smaller. *Braesail* is registered at 45 feet (her design LOA is 45 feet, 9 inches), so you are permitted to use the buoys. However, you are at the upper design limit, particularly of the older buoys. Don't use a buoy if the expected overnight winds will exceed 15 kts; tie to a dock or even better, anchor out.

You need only to register at the kiosk that is usually located at the heads of the park docks. Mooring buoys have a metal triangle at their tops to which are attached metal rings. The ring is attached to the chain that secures the boat through the buoy to the sea floor, and IT IS VERY HEAVY.

Approach the ANCHORING BUOY while traveling almost into the wind as you would when anchoring. Have crew members on the bow, one with a boat hook and one with a mooring line secured to a bow cleat. As you are coming up slowly to the buoy on its windward side, have the crew member holding the boat hook point at the buoy with the hook so that the helmsperson always knows where the buoy is. Hook the buoy's ring with the boat hook and bring the boat up to the buoy (the wind should push the boat into the buoy) and hold the boat stationary with respect to the buoy (if your helmsperson is really good, you don't even need to use the boat hook). Thread your mooring line through the

ring (you may be able to lift it, but they are often fouled and thus the ring cannot be lifted). If you have a full crew, it is often easier to do this as a two-person task. Release the boat hook's hold on the ring; if your mooring line is led out of the starboard chock, bring the end of the line back through the port side. You will essentially create a bridle with about 10 feet of slack from the mooring cleat on the boat to the buoy. As with anchoring, attaching the bridle to both cleats will reduce the amount of swinging.

Stern-tying

Braesail is equipped with 500 feet of braided polypropylene float line to serve as a STERN-TYING LINE. It is stored on a reel on the arch above the gate that allows access to the swimming (stern) platform. It is covered with a gray Sunbrella cover to protect the line from UV exposure—float line degrades fairly quickly in sunlight.



Figure 12: Stern Tie Reel, covered and uncovered

Many bays in British Columbia (and a few in Washington, particularly in the northern San Juan Islands) have steep under-water slopes or limited swinging room. If you drop your anchor on one of these slopes and the wind or current pulls the boat towards the center of the bay, your anchor will not hold. For this reason, it is the custom in such bays to take a stern line ashore and tie it to a ring that has been secured to a rock. In places where there are no rings you may be able to use the trunk of a sturdy tree instead, but only if the tree is on public property and there are no signs prohibiting this practice. If it safe to do so and the depth allows, set your anchor from 150 to 250 feet from shore, depending on depth and appropriate scope such that your stern will be about 40 to 90 feet from shore when you back away from your anchor towards the shore. Have someone watch the depth and look for rocks as you back, since your stern depth will probably be shallower than the depth indicated by the sounder that is mounted amidships.

Remember: the rudder extends 6 feet below the waterline and is only a few feet forward of the stern. It is also the most fragile part of *Braesail's* underbody. Many of our favorite anchorages in the Gulf Islands have a shallow shelf extending thirty to forty feet from the shore that will be less than six feet deep on an extreme low tide. Make sure you have enough depth. There is a hand sounding line in the navigation station

bench locker that you can use to check your real depth at the stern. Use it when you are stern tying. Not only does it keep you safe, dropping a hand sounder makes you look like a real sailor!

When there is not enough room in an anchorage to allow safe swinging of the boat at anchor, and to provide room for the maximum number of boats, the bow anchor is set first at a safe distance from shore and then the stern of the boat is attached, via the stern-tying line, to a chain, ring, tree, or rock on the shore behind the boat as mentioned above. One crew member takes the free end of the yellow stern-tying line and brings it into the dinghy while another crew member stands beside the spool to pay out the line as it is rowed ashore. Beach the dinghy carefully (avoid sharp rocks and shells that can rupture the dinghy's pontoons!) and secure it so that it will not float away while the end of the stern-tying line is being attached to a chain or ring mounted in a rocky wall, or is tied around a tree or rock. When the line has been secured, the dinghy, with the end of the line in the hand of the crew member, is rowed back to the stern platform and brought aboard, and both ends of the line are fastened to stern cleats, one on each side of the stern. The lines are adjusted so that *Braesail's* stern lies a safe distance from the shore, given rising falling tides, wind conditions, etc.

Pro tip for adjusting the stern-tying line: If you are tying to a tree or some other object on shore, or even if you are some ways from shore and tying to a ring, pull all the line from the reel and have your deck crew cleat the bitter end. Pull the line around the shore point, and tie an open angler's knot or oysterman's stopper in the part of the line between *Braesail* and the shore point, such that if you pull the line from the deck, the knot will pop out. Make a generous loop in the free end of the line, feed it through the open loop in the oysterman's knot and tighten the oysterman's knot around the loop.

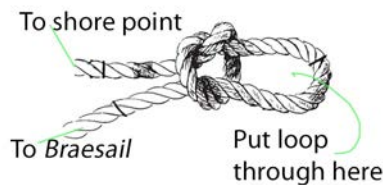


Figure 13: Open Oysterman's Knot for Temporary Stern-Tie

You now have a stable tie to shore to keep *Braesail* from drifting while you row back to her, and you won't have to pull your way back to her, hand over hand, either. Bring the free end of the stern-tying line back to *Braesail*, pull hard on that end to pop it out of the knot, and then jerk the bitter end of the line to pop the oysterman's knot. Then tighten both lines. *Voilà!* Low stress stern tying.

To release the stern-tying line before departure from the anchorage, simply release one end of the line, pull it away from its anchoring point on the shore, and wind the line back around the spool. Then raise the anchor at the bow of the boat.

DAVITS, DINGHY and STERN PLATFORM

Coracle, the dinghy for *Braesail*, is your passport to adventures on the shore. Its capacity is about 750 pounds according to its manufacturer, but we like to think of this conservatively as three people, an outboard, and a couple of bags of groceries. That's really measured by how hard you can row if you forgot to fill up the outboard motor's tank with gas.

Most of the time when you are cruising you will tow *Coracle*, the dinghy, behind *Braesail*. However, on longer or rougher passages (for example, when crossing Georgia Strait from Nanaimo to the Sunshine Coast), you will want to put *Coracle* up on the davits.

Towing *Coracle*

Do not tow the dinghy with the outboard motor in place. Always put the outboard motor on *Braesail* before departing your anchorage.

We have found that towing *Coracle* will decrease *Braesail*'s speed by about ¼ knot or less. The way to minimize the drag is to use a short painter. The length of the painter is determined by conditions; start with around 10 to 12 feet and adjust the painter so that *Coracle*'s bow is just slightly lifted. This will enable *Coracle* to get on plane at normal cruising speed for *Braesail* (empty, *Coracle* planes at about 5.5 kts). In addition to avoiding the loss of or damage to the outboard, allowing *Coracle* to plane is a significant reason for removing the outboard; a weight of 35 pounds on its stern will make *Coracle* wallow rather than plane.

Losing a dinghy while underway or while at anchor can be a minor disaster. The right knots are the solution. The bitter end of the painter (the line from the bow of dinghy) should be tied to one of the stern mooring cleats with a triple turn around the cleat. Tie a proper cleat hitch followed by a turn around the hitch. Finally tie a pair of half hitches on the standing part of the painter. It may sound excessive, but it's far better than having to swim to shore after losing your dinghy—and trying to stern-tie in cold water!

Lowering the dinghy

The davits on *Braesail* are 100% manual. Two line clutches on the lower port side of the arch control the lines. Put on your sailing gloves so you can manage these lines. Unwind the two davit lines and toss them down the deck, and untie the two stabilizing lines from the arch. While *Coracle* has a self-bailing scupper to protect you if you forget, do remember to put the plug into the scupper. Release the bow clutch and let down the bow to about the half-way point. Then let down the stern, and finally drop the bow.

Going ashore

When heading to shore, use EXTREME CAUTION. Choose an area free of any large rocks, especially those covered with oyster or other sharp shells, that might damage the dinghy in beaching. Make sure the engine is tilted up while you are still a safe distance from shore so that the prop does not hit the bottom or shear the pin. Lift up on the dinghy to bring it up to higher ground. NEVER drag it! Secure it when leaving because tides come up very quickly. When returning to the boat, leave your shore shoes in the cockpit and slip on your deck shoes or slippers to keep the boat neat and tidy and free of sand and seaweed.

Pro Tip: Never use the outboard when stern-tying. Just leave it on the rack and row ashore. You won't bang up the prop, catch and tangle the stern-tying line in the prop, or have to deal with any of a hundred other hazards and distractions.

Note: There is a black rubber-covered cable stored in the starboard lazarette for locking *Coracle* to a dock or a shore object.

Raising the dinghy

Put the outboard motor on its mount before raising *Coracle*. Do not attempt to raise or lower the dinghy with the outboard motor on *Coracle*. Clip the lifting lines to *Coracle*. Things go best if you point the bow of the dinghy to the port side of *Braesail*. You should be able to pull the inside plug on the scupper so that the dinghy will drain. Come aboard and lift *Coracle*, bow first, then stern. Use the strength in your legs to pull the line—don't try to do it with just your arms!

Pull *Coracle* all the way up, and then tie the stern stabilizing line. Let down the dinghy to tension that line. Loosen the bow line and tie the painter to the arch. Raise the bow to tension the painter. Coil and stow the davit lines.

Running the outboard

Coracle is provided with a Honda BF2.3DH air-cooled outboard. Wide open, the outboard will drive *Coracle* at almost 5 kts with one person aboard. That is not enough to plane a RIB this big, so you will waste a lot of fuel if you attempt to get it to plane, and with all of 0.29 gals of fuel in the tank, you don't have a lot to waste. When running at just above half throttle, *Coracle* can be used for over an hour and a half at just over 4 kts with two people on board. Take your time and enjoy your anchorage!

The little Honda has a centrifugal clutch; the prop starts to spin at about 900 engine RPMs, just above the *START* label on the throttle. It takes a little getting used to, particularly in approach and departure. It doesn't have a reverse gear; if you need to reverse, idle the engine, flip the steering handle over, and spin the engine around.

To start the outboard:

- PUT YOUR LIFE JACKET ON**
- Check the oil level in the glass and make sure it's in the center
- Top up the fuel and let any spills evaporate
- Attach the EMERGENCY STOP LANYARD to **you** and to the EMERGENCY STOP SWITCH
- Open the vent on the tank cap by turning it to ON
- Open the tank valve by pulling the FUEL VALVE LEVER forward
- Pull out the CHOKE
- Set the throttle to *START*
- Pull the recoil starter cord. It almost never starts on the first pull of the day, but nearly always on the second
- After the motor warms up, push the choke in, and power up

To stop the outboard:

- Throttle down to idle
- Press the EMERGENCY STOP SWITCH to stop the motor and remove your EMERGENCY STOP LANYARD
- Close the vent on the tank cap by turning it to OFF
- Close the tank valve by pushing the FUEL VALVE LEVER to the back of the motor case
- Tilt the propeller shaft to the 75° position unless you are removing the motor from the dinghy

There is a 10-foot coiled cable, stowed in the starboard lazarette (when cruising we leave it in the cockpit), for securing the dinghy and motor to a dock. We've never had any hint of a theft problem, but have heard about such problems from others, and locking *Coracle* and its outboard motor made us feel more confident when we were anchored in urban areas like False Creek in Vancouver. We lock the motor to the dinghy by locking the clamp screws so they can't be turned (just as you found them on the rack), and use the cable with the other lock through the lifting ring in *Coracle's* bow.

Stowing the outboard

The outboard is stowed on a rack beside the port perch (jump seat). Clamp it down tight, and lock it to the rack with the brass combination lock. The brass lock has the code **1946**, and the silver colored lock has the code **LADS**.

Stern platform

The stern platform is lowered and raised with a line to the port of the gate. Free the line from the clutch, and a gas spring will move the platform out so that you can lower it. Have a good hold on the line so that it doesn't fall free. Let the platform down, and then put about an inch of tension on the line to provide support. There is a step that folds down from the stern; drop it to step onto the platform.

There is a ladder, stowed in the port lazarette, that you may attach to the platform if you are actually going to swim from the stern platform (and if you get all the way up into Pendrell Sound — <http://salishseapilot.com/2017/06/02/pendrell-sound-famously-tepid/> — we really recommend the experience of swimming in 75° water while looking up at sparkling glaciers!). Tie its tether onto one of the stanchions on the stern platform, and then fit it into the two sockets on the aft edge of the platform. Naturally, you need to remove it before raising the platform. The ladder may also be fit into the sockets at each of the lifeline gates on the sides of the boat, but we have found that the Fender2Step is just as effective—and won't damage the topsides.

To raise the stern platform, fold the step up, then pull the line to the port of the gate until the platform closes. Snap the line into the clutch, and then wrap it around the two horns above the cleat and secure it.

BOAT SYSTEMS

Electrical Systems

There are four main electrical systems on *Braesail*:

- 110 volt AC shore power
- 12 volt DC battery power
- 12 volt alternator charging system
- 40 volt solar charging system (reduced to 12 volts by the charging controller)

all connected together by

- the Inverter / Charger

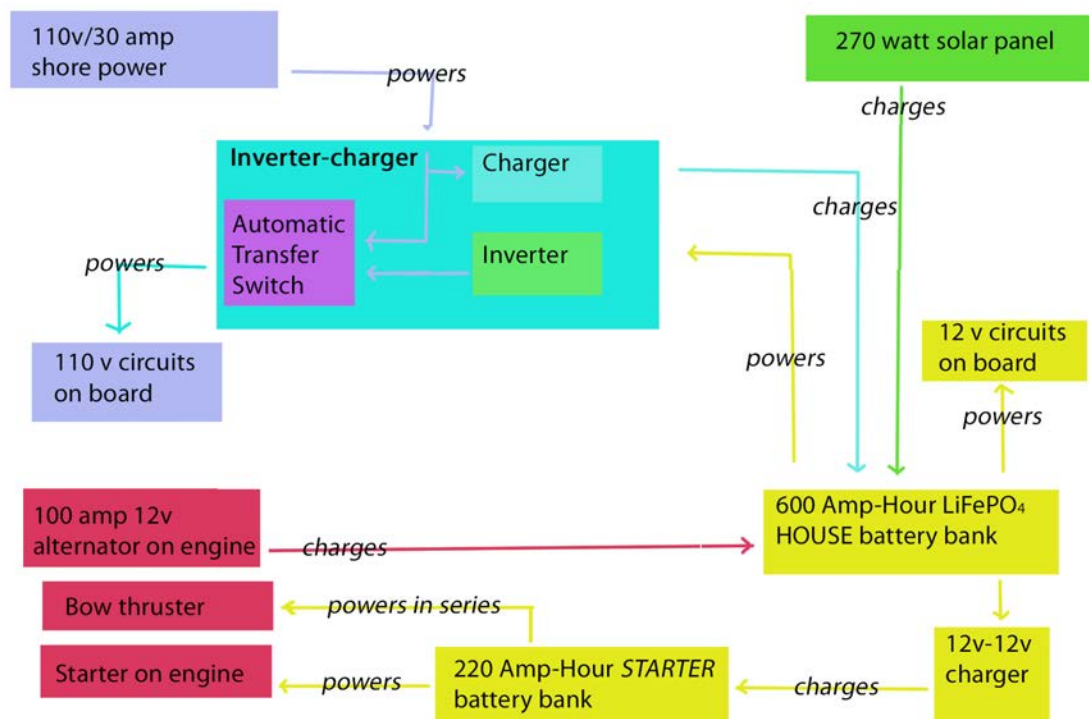


Figure 14: Electrical Block Diagram

Charging/Starting System

This is the *only* part of the electrical system that really matters—it starts the diesel engine, which needs to be operational in order to raise the anchor. Everything else is for (sometimes very important) convenience and comfort.

The alternator on the engine charges the house batteries. There are three 200 amp-hour lithium-iron-phosphate (LiFePO₄) batteries in *Braesail*'s house bank, which is under the bed in the aft stateroom. There are two Group 31 AGM batteries in the starter bank, one under the bed in the aft stateroom and one under the v-berth in the forward stateroom. They are normally switched to be in parallel. When you switch the BOW THRUSTER CHARGE SWITCH (see above) to ON, the forward battery is placed in series to provide 24v power to

the bow thruster. The alternator does not charge the starter battery, rather a 12v-12v DC charger keeps the starter (and thruster) battery charged. This bit of high-tech equipment is because LiFePO₄ and AGM batteries have different charging voltages and currents.

Checking battery state

Braesail is equipped with a Victron Energy Cerbo monitor, mounted on the panel just forward of the main power control panel.



Figure 15: Secondary Power Control Panel

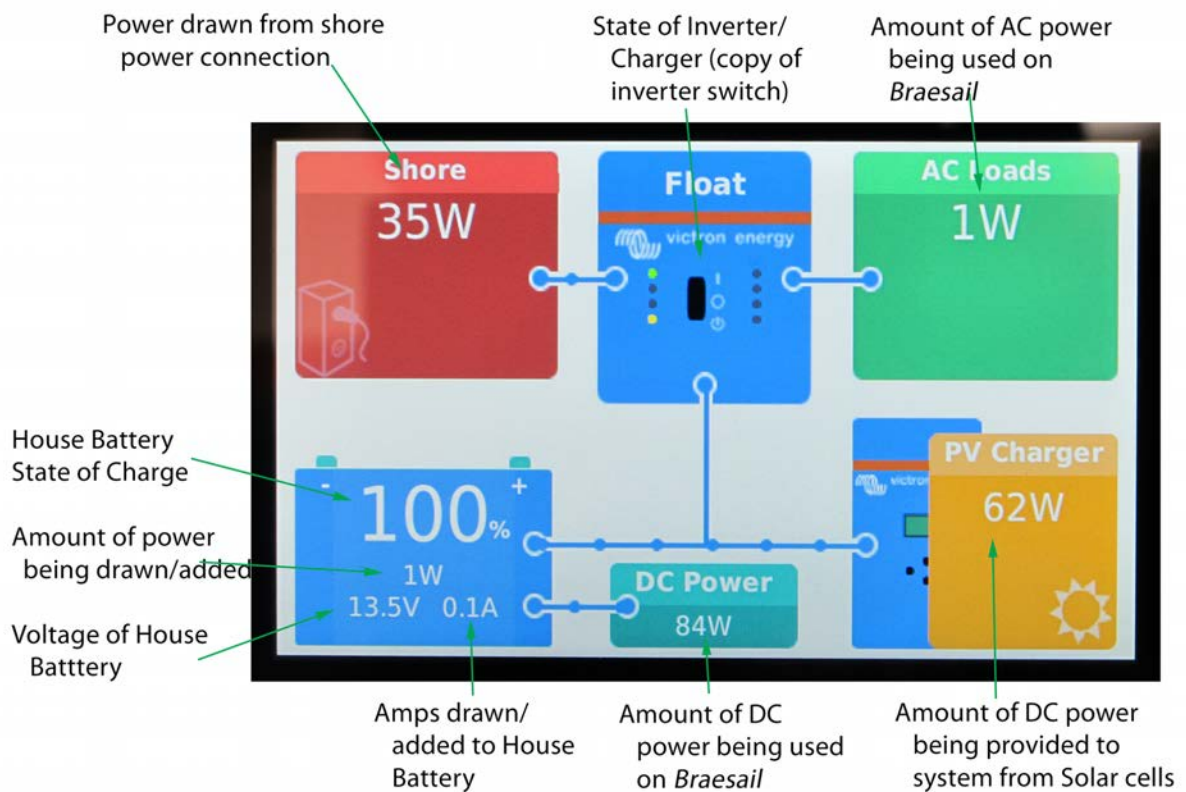


Figure 16: Victron Energy Cerbo Battery Monitor Display

The power monitoring system display (Cerbo) is controlled by the **Navigation Instruments** breaker on the main panel. In addition, it is available on the Axiom Multifunction Device in both table and graphical forms. The various components of the power system track their own loads in non-volatile memory, so neither the display or instruments need to be turned on in order to track and record power usage. The display, since it is the component that uses the most power, is set to turn itself off after a few minutes of idle time.

If you swipe across the screen, you will see different forms of the display, and a bottom line that has two buttons: **Pages** and **Menu**. Please do not use these options unless you are directed to do so by Anacortes Yacht Charters.

All AC power on *Braesail* goes through the Inverter/Charger, and the Inverter/Charger must be turned on in order to use shore power. If you are plugged into shore power and you show “---” or “0W” on the **Shore Power**, turn the Inverter/Charger on.

AC Loads will normally be quite small—on the order of 25 watts or less—in normal operations. This load is due to some small chargers for portable radios, spotlights, and the parasitic draw of the microwave. If you are concerned with that load, simply turn off the **Sockets, Microwave** (and of course the **Immersion Heater**) breakers.

The state of the **House Battery** is shown in the lower left corner of the display. This area shows the **State of Charge** as a percentage, based on the amount of power drawn from or

added to the batteries. Thus, if you have used 2000 watt-hours of power from the batteries (without adding any power from the solar array or shore power), this area will show 75% (of the 8 kilowatt-hours of battery capacity). In our testing after installation, we never saw the meter go below 80%, given solar power and engine propulsion use, so you probably won't need to plug into shore power during your charter. Do not let the batteries fall below 30% capacity, or you may find that various appliances and electronic equipment will turn themselves off to protect the batteries. **The battery management system built into the power system will refuse to provide power at approximately 20% State of Charge.** (This cutoff is calculated based on battery voltage, which doesn't map exactly onto power used.) The amount of power being drawn from (negative number) or added to (positive number) the battery system, regardless of source (shore, alternator, or solar) or sink (DC systems or Inverter/Charger) is right below. The last line of this area shows battery voltage and amps drawn or added.

DC Power shows the amount of power the DC system (lighting, refrigeration, heating, instrumentation, and other incidental uses) is drawing from the batteries.

PV Charger shows the amount of power the solar controller is providing to the battery. If the battery state is less than about 95% full, this is essentially the output from the solar array. As the battery approaches full, it accepts less of what the PV Charger is offering. As a result, you may be in midday sun (when the picture of the display was taken) or on shore power, and the value will be much less than the 250W that the array is able to generate in best conditions.

NOTE: LiFePO₄ batteries are considered “normally charged” at about 80% State of Charge. As a result, the alternator moves from bulk (high amperage) charging to absorption (lower amperage) and to float charging (trickle charge) at approximately 85% State of Charge to protect both the alternator and batteries. When you are out cruising, don't expect that the batteries will end up much above 95% State of Charge.

Shore Power Charging System

Shore power is connected to *Braesail* through the connector on the port stern. *Braesail* is protected by a Residual Current Device (that's British for a “Ground Fault Circuit Interrupter” or GFCI) located in the main electrical panel. It is then fed to the Victron Energy MultiPlus 3000, mounted on the aft bulkhead of the engine room. The MultiPlus INVERTER produces a phase-pulsed *modified sine wave* AC output at 50v and about 200ma, which is used to detect loads. Once a load is detected, the INVERTER switches to a *true sine wave* AC mode, which should be just fine for the fussiest electronic devices.

The Inverter/Charger has three main components:

- Battery Charger (110v to 12v)
- Inverter (12v to 110v)
- Transfer Switch

The MultiPlus is designed as an Energy Storage System inverter, which means that if you are plugged into very limited shore power (that's not very likely in the southern part of the

Salish Sea), the inverter will synchronize with shore power and supplement from the battery. The output of the TRANSFER SWITCH is protected by the SHORE POWER BREAKER (see Figure 17).

ELCI Controls

Braesail is equipped with an Equipment Leakage Current Interrupt (ELCI) system in its shore power. While it isn't required in most marinas in our cruising grounds, more and more marinas are requiring testing on hookup or simply refuse to provide shore power if your boat doesn't have this system. There are three SmartPlug covers on the port stern:

- SmartPlug power inlet
You must use a SmartPlug shore power cable connector in this inlet—an old-fashioned twist lock just won't fit
- Shore power circuit breaker
You should turn this breaker off prior to disconnecting the shore power cable and turn it back on once you have turned on shore power at the pylon
- ELCI breaker controls
If you trip the ground leak detector, you'll need to reset the detector and reset the Shore Power circuit breaker

Connecting to Shore Power

There is a single 110v 30-amp connection for shore power. There is one 75-foot and one 25-foot shore power cable (these are kept in the port stern lazarette), and there are 15- and 20-amp adapters kept in the drawer in the navigation station. There are additional adapters in a bag in the port stern lazarette.

Always turn the BREAKER on the shore power pylon OFF, the BREAKER on the main power panel OFF (see Figure 18), and the INVERTER OFF before connecting or disconnecting shore power. Then power up the pylon, check that both the power and polarity lights are lit on the MAIN POWER PANEL, and then turn the MAIN SHORE POWER BREAKER on. You should see approximately 120v on the AC meter, and the CHARGE light on the INVERTER/CHARGER CONTROL PANEL should light (See Figure 17). This is a good time to turn on the power to the HOT WATER HEATER (IMMERSION HEATER BREAKER on the MAIN POWER PANEL, Figure 18).

Inverter/Charger Control Panel

The INVERTER/CHARGER is controlled by a panel directly forward of the navigation station.

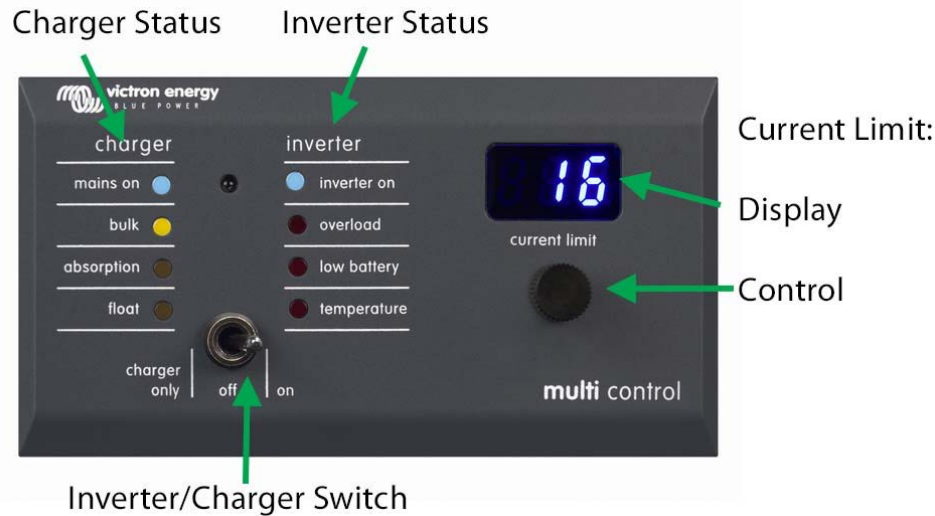


Figure 17: Inverter/Charger Control Panel

The control normally used on this panel is the INVERTER/CHARGER SWITCH. Press it to the left to turn just the CHARGER (and transfer switch) on, and to the right turn the INVERTER on. CURRENT LIMIT should normally be left at 28 amps, but if you have plugged into a 15 or 20 amp pylon, it's wise to adjust this to an amp or two lower than what you are supplied. This will keep your consumption of shore power from tripping the breaker on shore.

When the power system is connected to shore power, you will see MAINS ON lit. One of the three charging status lights, BULK, ABSORPTION, or FLOAT will also be lit. If the INVERTER is ready or operating, the INVERTER ON light will be lit. You should never see one of the warning lights lit: OVERLOAD is protected by the main breaker and TEMPERATURE is hotter or colder than we ever get in this area. If LOW BATTERY is lit, check the CERBO DISPLAY for the Battery State of Charge. The inverter is set to not draw the battery below 20%.

When you use the INVERTER, be aware that current draws are considerable. For example, the microwave oven draws 8 amps at 120 volts AC (1000 watts). This translates to 90 amps at 12 volts DC. Ten minutes of full power microwave use consumes almost 20 amp-hours. While there is a lot of battery capacity on *Braesail*, it's not unlimited, so conserve your power! **Especially make sure that the Hot Water Heater (Immersion Heater breaker) is turned off when you are using the inverter or when you are on a 15 amp shore power source.**

110v Circuits on Board

There are only three 110v AC user circuits, since *Braesail's* electrical systems are designed to operate at 12v DC—even most of the charging systems for electronic equipment. These are all controlled from the AC ELECTRICAL PANEL in the navigation station.

power into the batteries. For most of our long cruise in the summer of 2017, the solar panel provided around 100 amp-hours of power per day. That's enough to keep the batteries in good shape for three to five days without using the engine or connecting to shore power. You can track the solar performance on the CERBO DISPLAY on the SECONDARY POWER PANEL (Figure 15)..

12v Circuits on Board

Almost all of *Braesail's* electrical usage is 12-volt, and a typical daily use is between 100 and 150 amp-hours. That sounds like a lot, but it comes to 1.5 – 2.0 KW-hours, which is probably a rounding error percentage of the power you use in your home. Given the size of *Braesail's* battery bank and its sources of electrical power, you will want to exercise care in power consumption, but you don't need to be a miser. The two big consumers of power on *Braesail* are the INVERTER (my morning cup of coffee provided by a little espresso maker costs 15 amp-hours) and the REFRIGERATOR and FREEZER (*Braesail's* fridge is fairly efficient, but it chewed through about 30 or so amp-hours per day in the summer of 2022).

Electrical Control Panel

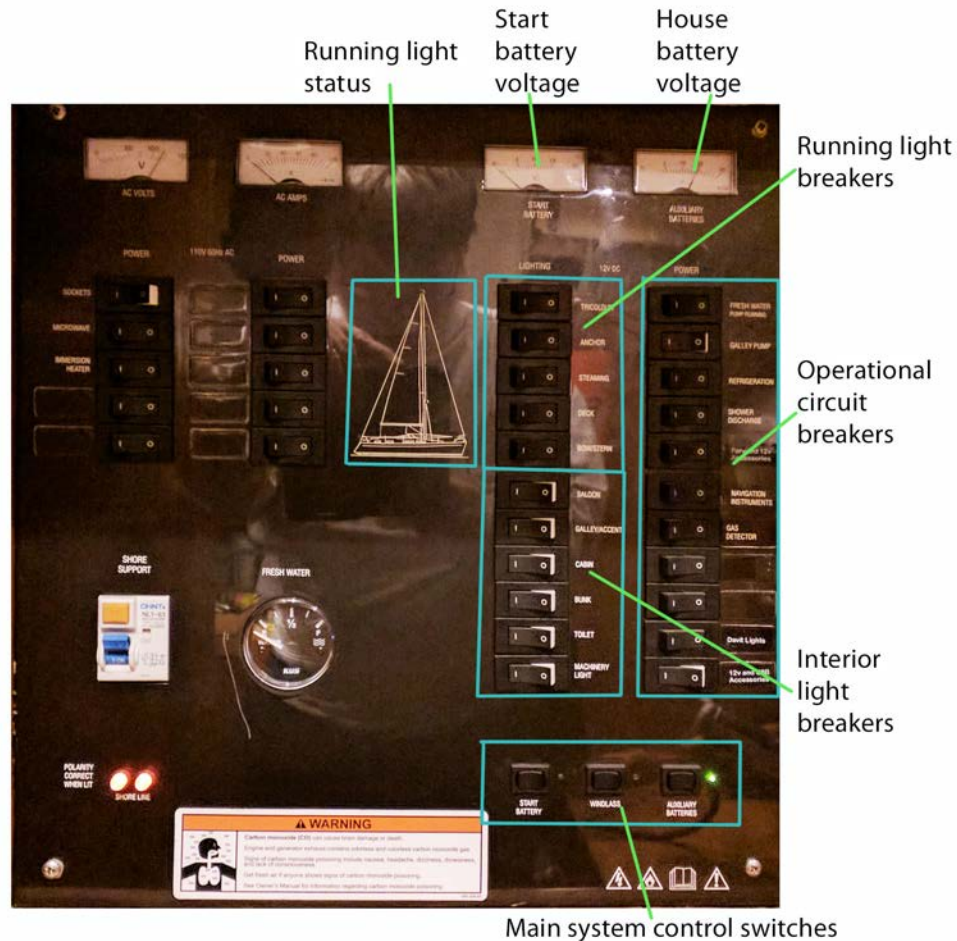


Figure 19: DC Portion of Main Electrical Control Panel

Main System Control Switches

These three switches control relays adjacent to the battery banks. AUXILIARY BATTERIES energize the house batteries, START BATTERY energizes the starter battery for the engine, and the WINDLASS energizes the anchor windlass from the house batteries. **NOTE:** the engine must be running and the AUXILIARY BATTERIES must be on in order to turn the ANCHOR WINDLASS on.

Voltage Meters

There are meters for both battery banks. The meters will show 0 volts if their corresponding battery banks are not energized (you can see the battery voltages at any time with the BATTERY MONITOR, above), and will show their current output voltages once they are turned on.

Running Light Status

This panel shows which of the running lights are turned on.

Running Light Breakers

Each of the running lights has its own breaker:

- TRICOLOUR controls an Aqua-Signal Series 40 Tricolor light at the top of the mast. It is used *only when sailing*, not under power
- ANCHOR controls another lens of the Tricolor. The ANCHOR LIGHT is also controlled by a photo sensor, so it is not lit during the day, even if it is turned on
- STEAMING controls a light on the forward edge of the mast. It should be lit, along with the BOW/STERN lights when powering in a limited visibility situation
- DECK controls a high-powered floodlight on the forward edge of the mast
- BOW/STERN controls deck-level starboard, port, and stern lights. These lights should be used with the STEAMING light. They should not be used with the tricolor light

Interior Light Breakers

This set of breakers controls lighting throughout *Braesail*. All of the interior lighting on *Braesail* consists of LEDs.

- SALOON controls the lights throughout the saloon
- GALLEY/ACCENT controls lights in the galley, the navigation station, and the courtesy lights throughout *Braesail*
- CABIN controls general lighting in the cabins throughout *Braesail*
- BUNK controls the reading lights on each bunk throughout *Braesail*

- TOILET controls lighting in the heads
- MACHINERY LIGHT controls the lights in the engine room

Operational Circuit Breakers

- FRESH WATER controls the fresh water pump located in the compartment under the entrance to the navigation station. It is good practice to turn this breaker off when underway.
- GALLEY PUMP controls a discharge pump from the basins in the galley
- REFRIGERATION controls the compressor, pumps, and lighting for the refrigerator and freezer
- SHOWER DISCHARGE controls bilge pumps from the showers in the forward and aft heads
- FORWARD 12v ACCESSORIES controls chargers and accessory sockets in the forward cabins. There are both a 12v socket and a 4.8-amp USB charger in the forward head cabinet, a 4.8-amp USB charger in the forward stateroom, two 4.8-amp USB chargers in the aft stateroom, and a 4.8-amp USB charger in the crew cabin
- NAVIGATION INSTRUMENTS controls the Raymarine instruments (knot log, depth sounder, masthead wind, and the SeaTalk network), the AIS transponder (AIS, GPS, WiFi instrumentation, NMEA conversion), and the VHF radio
- GAS DETECTOR controls the propane gas detector, and the gas control solenoid
- DAVIT LIGHTS controls lighting under the dinghy arch
- CABIN FANS controls fans in the forward and aft cabins
- AFT USB CHARGERS controls USB chargers in the aft cabin
- FWD 12v AND USB controls USB chargers in the forward cabin and forward head. It also controls a 12v socket in the forward head
- 12v AND USB ACCESSORIES controls the charging of various pieces of equipment around the navigation station, a 4.8-amp USB charger and 12v socket in the navigation station, and USB chargers in the aft stateroom

Additional DC Breakers

There are three primary circuits on the forward panel:

- AUTOPILOT controls power to the autopilot controller and ram. Due to the way that Raymarine recognizes rudder position, this breaker also needs to be on if you want to display rudder position on the instrumentation
- HORN controls power to an electric horn mounted high on the mast
- CHARTPLOTTERS AND RADAR controls power to the two chartplotters (one on the binnacle and one at the Navigation Station as well as the radar)

Secondary DC Breakers

Immediately below the MAIN POWER PANEL is a compartment with secondary DC breakers.



Figure 20: Secondary DC Breakers

These breakers either distribute power from the operational circuit breakers (above) —by providing separate circuits for the VHF and navigational instruments, for example—or they provide protection for circuits which should never be turned off when the boat is in use—to the high-power contactor solenoid control circuits for switching the batteries, or to bilge pumps and alarms, for example. All of these breakers are normally ON. They are not normally for user access, but you may be asked to check them should a system fail to operate. (Note to support personnel: the breakers for the bilge pumps are to the right of this picture, behind the non-opening lower panel. You can just reach them through this opening door.)

WATER SYSTEMS

Fresh Water Tanks

There are two FRESH WATER TANKS on *Braesail*, located beneath the cabin sole of the saloon on port and starboard, each holding 105 gallons. They are filled via a deck fill on the port deck, just forward of the navigation station. The vent for each tank is behind the grills on the transom. The two tanks are connected by a 1-inch pipe, and water is drawn for the fresh water system from the port tank.

Water Level Gauge

The WATER LEVEL GAUGE is mounted on the Main Power Panel. It actually measures the level in the port fresh water tank. It is activated only when the FRESH WATER PUMP BREAKER is turned ON. There is also an ultrasonic gauge for each tank, and they are displayed on the Cerbo.

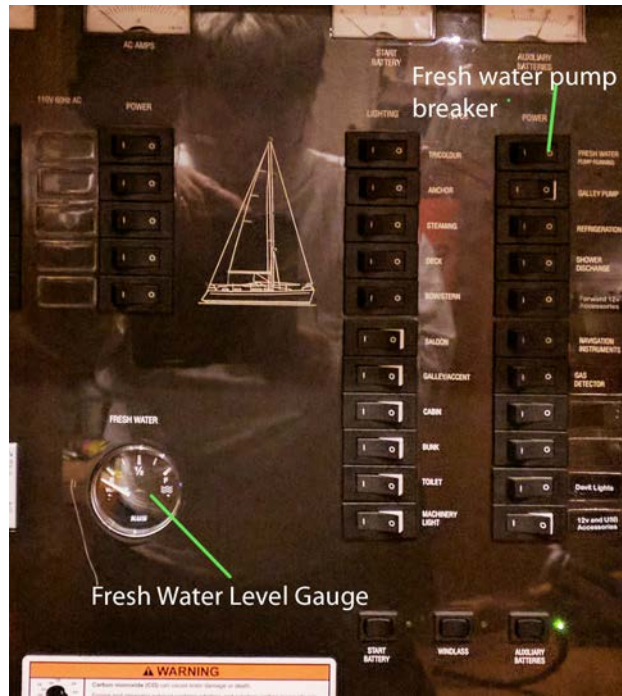


Figure 21: Fresh Water Electrical Controls

Filling the tanks

Because the starboard water tank is filled from the bottom by a gravity feed, you can easily think that you have filled the FRESH WATER TANKS when they are only about $\frac{3}{4}$ full. Our procedure for filling the tanks takes this into account. There are two hoses, one 50 feet long and one 25 feet long, stored in the port lazarette, certified for potable water use; these are to be used for filling the FRESH WATER TANKS. **Do not use any other hoses for filling Braesail's FRESH WATER TANKS.**

Do not fill the water tanks when you are filling the diesel tank or emptying the holding tank. Follow the rule of “One hose to Braesail at a time”

- Fill the tanks at full water flow
- When water starts to splash out of the port water tank vent in the transom, cut the water flow back to about $\frac{1}{4}$ of full flow (besides letting you know the tank is full, this rinses any dust—or critters—out of the vent tubes)
- Water may bubble out of the port vent, but let it run until it splashes out of the starboard water tank vent
- Wait a minute or two for the levels to equalize
- Top up the tank (you can see the water level in the filler tube)
- Check that the water level gauge is reading FULL

Fresh Water Pressure Pump

The FRESH WATER PRESSURE PUMP is located in the locker under the cabin sole adjacent to the navigation station. A spare is kept in the locker in the pilot berth. Activate the FRESH WATER PRESSURE PUMP on the MAIN ELECTRICAL PANEL (see Figure 19). There

are two pressure vessels in the fresh water system, one adjacent to the FRESH WATER PUMP in the cold-water line, and one in the engine room, next to the HOT WATER HEATER, and it serves as the expansion tank for the hot water line. With these two pressure vessels, it will take about 30 seconds for the water system to come up to full pressure from being shut off. If you are used to usual sailboat pressure water systems, you will probably think that the pump runs longer than usual when pressurizing the water system. You'll be correct, but the pump also runs a little less frequently (there's about a gallon capacity in the pressure vessels).

Hot Water Tank

Braesail is equipped with a 6-gallon HOT WATER TANK, located on the shelf in the engine room. It heats up any time you run the engine, since one of its heat exchangers is plumbed into the engine's fresh water cooling circuit. You can also heat the tank using shore power (or, if you forget to turn it off, from the inverter). The 110v heat is set to heat the water to 125° F. You can also heat it from the Kabola diesel boiler (see details in that section). The diesel boiler thermostat for hydronic heating should be set to just below around 50° C (which is 122° F), so that the hot water heater isn't forcing the diesel boiler to run when you are on shore power. **NOTE: Do not use the HOT WATER TANK if you are low on fresh water. Turn off the AC to the HOT WATER TANK if your water level falls below 1/8 full.**

Hot water heater

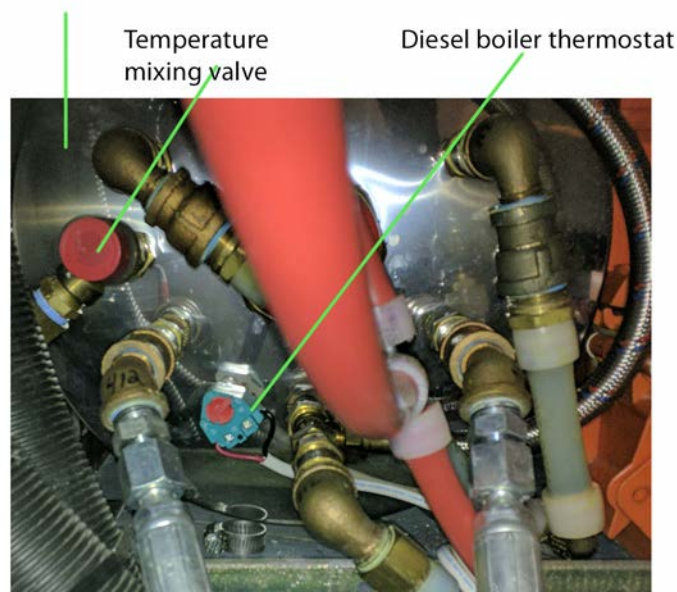


Figure 22: Hot Water Heater

The TEMPERATURE MIXING VALVE on the HOT WATER HEATER is set to approximately 110° F. This reduces the chance of scalding, particularly when the water has been heated to engine temperature (75° C or 170° F).

Pro tip for hot showers: take your showers just after running the engine for at least 30 minutes. You'll have about 15 gallons of shower-temperature water available free!

Showers

Before taking a SHOWER in either head, make sure that water pressure and SHOWER DISCHARGE sump pump breakers are on. Take only very short “boat” showers, turning the water off between soaping/shampooing and rinsing, applying conditioner and letting it act, and final rinsing. Turn the shower discharge switch (below the edge of the basin in the aft stateroom near the shower entrance, and in a corresponding position on the front of the below-basin cabinet in the forward stateroom) to its ON position just after you begin your shower to pump water out of the shower, and turn the discharge pump OFF when the water is off DURING and shortly AFTER your shower). To keep the shower area tidy, wipe down the shower stall walls and floor with a sponge. Make sure that the faucets and nozzles are shut off completely after use. Check for the accumulation of hair in the shower and basin drains.

SANITATION SYSTEM

Braesail's holding tank, under the sole of the saloon, is as big as will fit between the floors and stringers: 30 gallons. That's about two-week's worth of use if you are single-handing her (but you wouldn't be, because you, like us, want to share this beautiful boat), or less than a week's worth for a couple, or about three days for two couples. You get the idea. The toilets fill the holding tank with about 1 gallon of liquid per flush.

You may not discharge effluent into any of the US waters into which you may take *Braesail*. That's not all that bad, because there are lots of pump-out facilities around. You may discharge in Canadian waters (and check the rules) that are free-flowing tidal waters, but do not do so in harbors or in constricted areas. That's good, because there aren't that many pump-out stations once you are north of the border. It's wise to plan ahead.

The sanitation system is simple. It's meant to be easy to do it right, and difficult to do wrong. In a schematic, it looks like this:

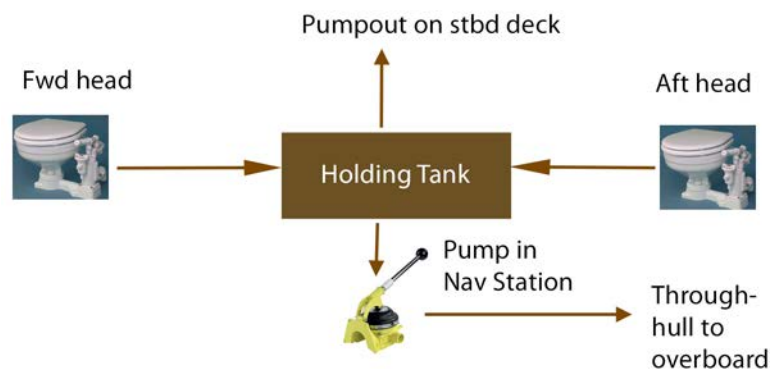


Figure 23: Sanitation Schematic

All black water goes to the holding tank. Make sure that you don't overfill the tank, (you did check that only five lights on the Holding Tank Level Gauge were lit, right?) as you shouldn't use the heads if the tank is full—it will dump effluent into the ocean, or if you are tied up just right, it will dump effluent onto the dock where you are tied up, through the vent for the holding tank.

Holding Tank Gauge

The most important visible part of the SANITATION SYSTEM is located on the face of the cabinet next to the toilet in the forward head: the HOLDING TANK LEVEL GAUGE.



Figure 24: Holding Tank Level—Forward Head

Each of the eight LEDs on the HOLDING TANK LEVEL GAUGE represents about four gallons in the holding tank. Because the sender is mounted above the bottom of the tank, the second light comes on at about 10–12 gallons. Start planning to pump out when the last green LED lights. Stop using the heads if the second red LED (known on *Braesail* as the “Red Light of Doom”) is lit. But the real doom is not the light, but what happens if the HOLDING TANK is overfilled. If you are lucky, excess sewage will be expelled through the holding tank vent, and then you will have an extra cleaning fee from the charter agency and (in early 2018), a potential fine of up to \$2500. If you aren’t lucky, you could detach a hose, clog vents, or even burst the tank. Don’t even think about the stench, the mess, the cleanup, or the repair!

Pumping Out

At a Marine Pump-out Station

The PUMP-OUT FITTING is located on the starboard deck adjacent to the saloon. The cap is sometimes a little sticky, so a deck key is kept next to the pump-out adapter to loosen it—it won’t take much force (both the deck key and the adapter are stored in the cabinet above the basin in the forward head). Once you have removed the cap, fit the pump-out adapter to the deck plate.



Figure 25: Pump-Out Adapter

Most pump-out hoses will clamp onto this adapter, sealing the sewage. Even if it has only the “old fashioned rubber nozzle,” please use the adapter, as it makes for a better seal and keeps the decks cleaner.

- Turn on the pump in the pump-out facility
- Open the valve on the handle of the hose
- Verify that the tank is empty by observing that only 1 light on the HOLDING TANK LEVEL GAUGE in the bow head is lit
- When pumping is finished, close the lever on the handle and turn off the pump
- Remove the hose from the deck fitting
- If there is a fresh water hose on the dock, rinse the emptied holding tank by running water into the tank for about 2 minutes. Then pump the tank again to leave it rinsed (for you or for the next charter) to help eliminate head odors
- When you are done, rinse the PUMP-OUT ADAPTER and return it to the cabinet above the basin in the forward head

Manual Pump-Out (overboard)

The holding tank’s contents can be discharged overboard using the MANUAL PUMP **only in Canadian waters that are open and away from anchorages and docks**. (Canadian laws are becoming more restrictive of effluent discharge, so please check local laws to ensure that you are in compliance.) To operate the MANUAL PUMP (a Whale Gusher 10 bilge pump located under the seat cushion at the navigation station):

- Open the HOLDING TANK DISCHARGE THROUGH-HULL, located in the locker in the step into the galley
- Attach the handle to the pump
- Pump until empty. A full tank will typically take 50-70 strokes of the pump; you will feel a distinct change in effort and hear different sounds when the tank becomes empty
- Verify that the tank is empty by observing that only 1 light on the HOLDING TANK LEVEL GAUGE in the forward head is lit
- Close the DISCHARGE THROUGH-HULL
- Remove the handle and replace the navigation station seat cushion

Marine Toilet

Braesail has two heads, each with a toilet, washbasin, and shower, one in the bow and one in the stern. The toilets flush using seawater that is pumped, together with waste, into

the holding tank. It is important that every member of the crew be informed about the proper use of the MARINE TOILET. The valves, openings, and pumps are small and clog easily. **If the toilet clogs, it is YOUR RESPONSIBILITY!** Always pump the head for children so that you can make sure that nothing foreign is being flushed.

Caution: NEVER put paper towels, tampons, sanitary napkins, facial tissue, household toilet paper, or food into the marine toilet. Use only the special dissolving marine toilet tissue provided by AYC. Remember: Except for TP, unless you have eaten it, it does NOT go into the marine toilets!

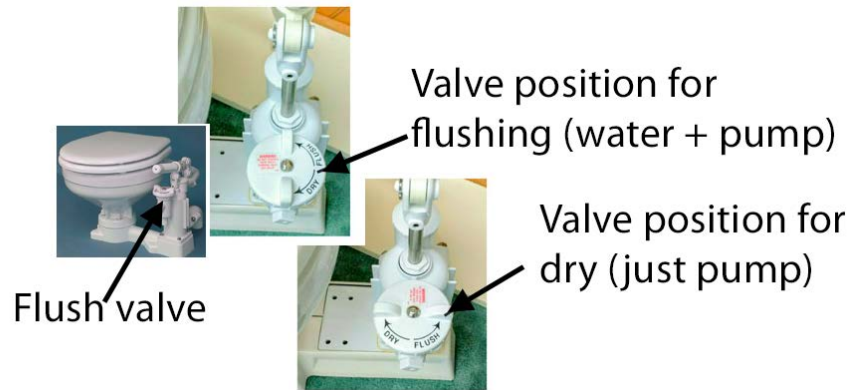


Figure 26: Toilet Valve

To use the toilet, pull the pump handle out so that it is about 10 inches long. Rotate the FLUSH VALVE counter-clockwise, and lift the PUMP HANDLE 3 to 5 times to wet the bowl. After using the toilet, pump the handle 5 to 15 times to move effluent in the hoses, depending on the nature of the bowl's contents; heavy effluent might clog hoses. Then rotate the FLUSH VALVE clockwise to DRY and pump the handle another 10 times, relatively quickly. Repeat the FLUSH and DRY process if the bowl has been filled with feces. Clean the toilet with the toilet brush as necessary. Push the handle back in so that it doesn't get in the way and close the toilet lid to that loose items won't fall into the toilet.

Should the toilet pump handle squeak or stick, it should be lubricated. Put a squirt or two of "pump lube" (located beneath the basin in the aft head), salad oil, or dish detergent into the toilet bowl. Slowly pump the toilet dry to draw the lubrication into the pump unit.

The TOILET THROUGH-HULL for the aft toilet is located in the locker in the saloon sole next to the navigation station; the through-hull for the forward toilet is located in the aft compartment in the entry way to the forward stateroom.

GALLEY

Propane System

Braesail carries two 10 lb. propane tanks in a locker aft of the cockpit entrance on the starboard side. The locker contains the CUT-OUT SOLENOID and the LOW-PRESSURE

REGULATOR as well. The low-pressure line from the regulator runs directly to the GALLEY STOVE.

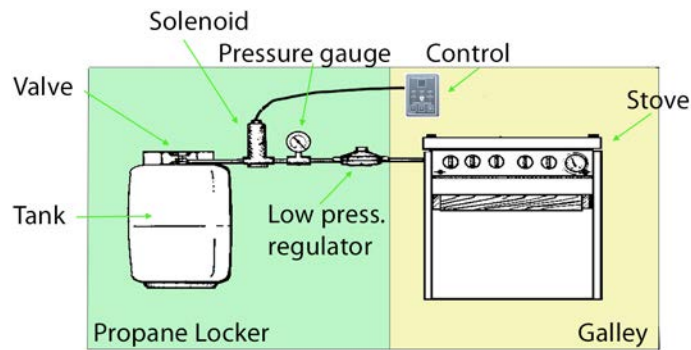


Figure 27: Propane System Schematic

The PROPANE SOLENOID is activated by a Trident LP Gas Control and Detection System, mounted on the column just forward of the galley. This control is equipped with two propane detectors, one in the bilge adjacent to the galley, and the other next to the fitting which feeds propane into the stove. If either of these detectors finds propane, the alarm will sound, and Alarm 1 (galley) or Alarm 2 (bilge) lights will shine on the panel.

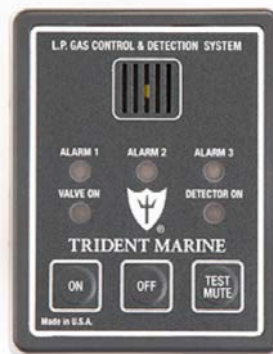


Figure 28: LP Gas Control and Detection Panel

To activate propane flow to the stove:

- Turn on the GAS DETECTOR breaker on the MAIN POWER PANEL
- Open the tank valve on the propane tank connected to the regulator
 - The pressure gauge, mounted on the regulator, will read 60-100 psi; if the gauge is below that, close the valve and swap tanks, as you are just about out of propane. **NOTE:** Like most propane tanks, the thread on the tank fitting is left-hand thread—the reverse of usual fittings. Turn it clockwise to loosen
- The DETECTOR ON light will flash for about a minute after powering the GAS DETECTOR breaker; when the CONTROL SYSTEM is ready, the light will become steady

- Press the ON button to activate the SOLENOID VALVE in the PROPANE LOCKER and begin the flow of propane to the stove. If the stove has not been used for a long while (for a month or longer, which may be the case for the first charter in the season), it may take as long as 10-15 seconds for the propane system to pressurize. Always use a stove-top burner as the first light after an extended shutdown
- Use the stove for cooking only**
- When you have finished cooking, press the OFF button to deactivate the SOLENOID VALVE and stop the flow of propane
- The next time you use the stove, just press the ON button to activate the solenoid and begin propane flow

There is no need to power down the GAS DETECTOR or close the tank valves during your use of *Braesail*. However, when you return her to Anacortes at the end of your trip:

- Close the valves on the propane tanks
- Turn off the GAS DETECTOR breaker

Braesail is quite frugal with her propane usage. In our five-month cruise in 2017, we went through about 1-½ tanks propane.

Propane Stove

The Force 10 stove in the galley has four different burners: a high-output stove, a lower-output stove, an oven burner, and a broiler burner. They are all thermocouple controlled, so that if a burner goes out, the propane is turned off at the burner, and they all light using the same technique:

- Turn the propane on with the GAS CONTROL
- Press in the burner valve, turn it to the “Light” position, and hold the burner valve for a second or two
- Briefly hold down the lighter button; it will click a few times
- Maintain pressure on the burner valve until the burner lights
- Release the lighter button
- After 20 seconds, release the burner valve and adjust it to the heat level you desire

The oven and broiler should be lit with the oven door open. **To open the oven door, press the button to the right of the oven door handle and lift the oven door handle to open.** The broiler is not thermostatically controlled—it is just “hot”, but the oven is thermostatically controlled—once it reaches its set temperature a thermostatically controlled valve will turn the gas down to just maintain temperature.

- To preheat the oven:
 - Turn the propane on with the GAS CONTROL
 - Press in the burner valve, turn it to the “Light” position, and hold the burner valve for a second or two
 - Briefly hold down the lighter button ; it will click a few times

- Once the burner is lit, hold it in for 20 seconds, then set the desired temperature
- Preheat the oven for about 10 minutes. There is an oven thermometer in the cutlery drawer
- Put your food in the oven, but keep an eye on it. The oven is small, so it doesn't have a lot of thermal mass, so its temperature will fluctuate much more than your massive Wolf stove at home
- To broil or toast:
 - Turn the broiler on full for 2-3 minutes to pre-heat the ceramic plate of the broiler
 - Don't use the top position of the oven rack; it's too close to the broiler and it doesn't allow the heat to even out
 - Turn the broiler down to about 2/3 in most cases
 - Put your food on the rack and close the oven door to the "cracked open" position
 - Keep an eye on the food. It's hot in there!

It goes without saying: DON'T BROIL MEAT IN THE OVEN. Use the barbecue, hanging off the dinghy davits. If you try to broil in the oven, you'll splatter debris all over the place, set off the smoke alarm, and generally wish you hadn't done this!

Reminder: when you are finished, turn off the propane at the CONTROL PANEL. Safety first, and **then** *bon appetit!*

Refrigeration

The REFRIGERATOR/FREEZER operates on 12v power and takes a great deal of energy—about 60 amp-hours per day. It is driven from a single water-cooled compressor located in a compartment beneath the companionway stairs.

Mounted to the aft bulkhead of the galley is a wireless thermometer driven by one sensor in the REFRIGERATOR and by another in the FREEZER. It's a good practice to monitor this thermometer on a regular basis.



Figure 29: Refrigerator Thermostat

Mounted just over the galley sink is the thermostat for the REFRIGERATOR/FREEZER. This thermostat automatically adjusts for power in the DC system as well as changes over time, so you only need to set the temperature on it. We find that 37° F is the best setting.

- TEMP UP and TEMP DOWN buttons adjust the temperature up and down by 2° F

- TEMP DISPLAY normally shows the temperature in the REFRIGERATOR; it shows the set temperature when you are adjusting it
- ECO/ITC. ECO uses the least power, but it can't cool a whole refrigerator of warm food. ITC runs the compressor at a higher speed to remove more heat quickly, but it uses more power than ECO. Run ITC only at the dock or when the engine is running.
- ON/OFF turns the refrigeration system on/off

Because the British like their beer warm, you will probably find that the most efficient temperatures for refrigerator operation will be a little warmer than one would expect in a North American fridge. We tend to expect the freezer to be in the 20° F. range and the refrigerator to be in the 37° range. The power to the refrigeration system is controlled by a single breaker on the MAIN POWER PANEL.

To run the refrigerator:

- Open the two through-hulls in the compressor compartment
- Turn on the REFRIGERATION breaker on the MAIN POWER PANEL.
- Set the temperature on the thermostat
- Make sure the door to the refrigerator is **firmly** latched

Because the refrigerator is sea-water-cooled, it has a strainer to keep detritus out of the heat exchanger coils. Normally, you will not have to clear the strainer, but sometimes it will pick up plastic or a bit of kelp, and you will find that the refrigerator is not cooling well or is running more than usual. In this case you will have to clear the strainer:

- Turn OFF the REFRIGERATION BREAKER on the MAIN POWER PANEL
- Close the two through-hulls in the compressor compartment
- The bronze strainer to the port of the compartment has two wing nuts on top holding the top in place. Loosen these so that you can rotate the top of the strainer (one side of the top is captured so it won't fall into the bilge) to free the stainless-steel strainer
- Remove and clean the strainer
- Crack the through hull at the base of the strainer to rinse a little water (a cup or two) through—don't worry, that's the purpose of the bilge pump!
- Replace the strainer, close the top, and tighten (with your fingers—no tools!) the wing nuts on the strainer
- Open both through-hulls and check for leaks
- Turn the REFRIGERATION BREAKER back ON

We normally do this task on the first day of each month, just to make sure that gunk is not building up on the strainer. If you want to feel like a real long-distance cruiser, we invite you to do the same.

The other maintenance task that you probably won't have to do, but that might be necessary on a longer cruise (or if you left the refrigerator door open), is to defrost the refrigerator and freezer. On a longer cruise, this is also a once-a-month task. It's a good

idea to defrost when you'll be running the engine so you will have extra power to cool the refrigerator and freezer back down. To defrost the refrigerator and freezer:

- Turn off the REFRIGERATION BREAKER on the MAIN POWER PANEL
- Open the door of the refrigerator and the hatch at the top of the freezer
- Remove all food. Pack it tightly together and cover it with blankets or comforters so it will stay cold
- Remove the shelves from the refrigerator
- Boil water on the stove. You can splash hot water onto the walls of the freezer and put hot water in pans in the refrigerator
- As the frost loosens on the walls, lift it off and put it in the galley sinks
- Repeat (4) and (5) as necessary. It typically takes us less than an hour to defrost
- Dry out the refrigerator and freezer
- Return the shelves to the refrigerator
- Turn ON the REFRIGERATION BREAKER on the MAIN POWER PANEL
- Return the food to the refrigerator and freezer
- Make sure the door and hatch are closed firmly

Tips for Refrigeration Use:

- Use the ITC setting (intelligent temperature control) while running the engine or while on shore power
- Pre-chill food before putting it in the refrigerator or freezer
- Don't overfill the refrigerator
- Carry an extra bag or two of ice in the freezer (AYC will supply you with two bags of ice. Take advantage of the offer, even if you won't use it as ice!)
- 20° is a bit warm for storing ice cream. Pack your ice cream in that ice you got from AYC (or somewhere else)
- There is a small blue circulating fan in the refrigerator. It runs on two D-cells. Depending on what you have in the fridge and how warm it is, it may be useful in chilling things
- Monitor the amount of power used by the refrigeration system. If it increases, figure out why. You may need to defrost or clean the strainer
- Don't leave the refrigerator door open, or open it frequently. Batch your access, and work quickly. Each time you open the door, you drain cold air out and let warm air in

If you've just bought a load of wonderful fresh vegetables from the Anacortes Farmers' Market (Saturdays during the summer. We recommend it!), you may want to cool off your food faster than the refrigerator is able to. We've found that, if you pick up a pound or two of dry ice at the Anacortes Market or the Safeway and put it in the fridge, it will help cool things down very effectively. It doesn't take up much space, and when it melts, it doesn't make everything wet.

Water in the Galley

Emergency Fresh Water Pump

In addition to the normal faucet in the galley sinks, there is a hand pump in the forward sink. It is plumbed into the starboard fresh water tank. This pump is normally used only in offshore passages, where you don't want to run the water pressure pump because you are conserving every drop of water. Should the water pressure pump fail, the hand pump can be used in an emergency. Open the cabinet under the sink, and you will see a valve on the pipe descending from the pump. Turn the valve handle so that it is in line with the pipe, and you can pump fresh water by pulling the handle of the pump up and pushing it back down. Discard the first few cups of water, as the water in the line feeding that pump will probably have been there since we tested the pump in the spring. Once you have restored fresh water, close the valve in this line.

Draining the Sinks

The sinks in *Braesail's* galley are almost at the water line. Because of this they do not drain well unassisted. There is a waste water pump which drains these two sinks. To drain the galley sinks, turn ON the GALLEY PUMP BREAKER on the MAIN POWER PANEL. On the aft bulkhead of the galley, next to the microwave, is a two-position switch. The top position is a momentary contact, and the bottom position is a continuous contact. Both operate the waste water pump. Press and hold the top position to drain just a little water, or click the switch to the bottom position to keep the pump running when you are rinsing items in the sink or have a lot of water to drain.

SALOON FURNITURE

There are two unusual things about the furniture in the saloon: the table and the side chairs.

The table has two working positions. When it is closed, it is about two feet square and provides lots of room to move about on the settee. To open it, rotate the top 45 degrees until it stops. Then fold out the top so that the fiddles fit into the grooves in the base. You will now have a table that can seat eight for dinner and is almost four feet square. You may be tempted to just unfold the top without rotating, but please don't. It isn't supported that way and it is possible to damage it.

The side chairs are actually composed of a chair back and a hassock for the seat. If the person who last removed the hassocks put them away properly, you'll see two pieces of webbing, one on either side of the hassock seat. Pull on these "straps" and you will be able to lift out the hassocks and use them as seating around the table. When you are finished (and before sailing, naturally), lift the hassocks by the straps and drop them back into the chairs, holding onto the webbing. That way, you'll be able to pop them back out with ease.

HEATING

NOTE: Heating system exhaust exits through a port just aft of the navigation station just below the cap rail in the port topsides. While the boiler is very efficient and the exhaust temperature is quite low at that point

(typically only 250° F or less), it is very important not to hang fenders or run mooring lines close to that exhaust port. That level of heat will rapidly degrade lines and fenders.

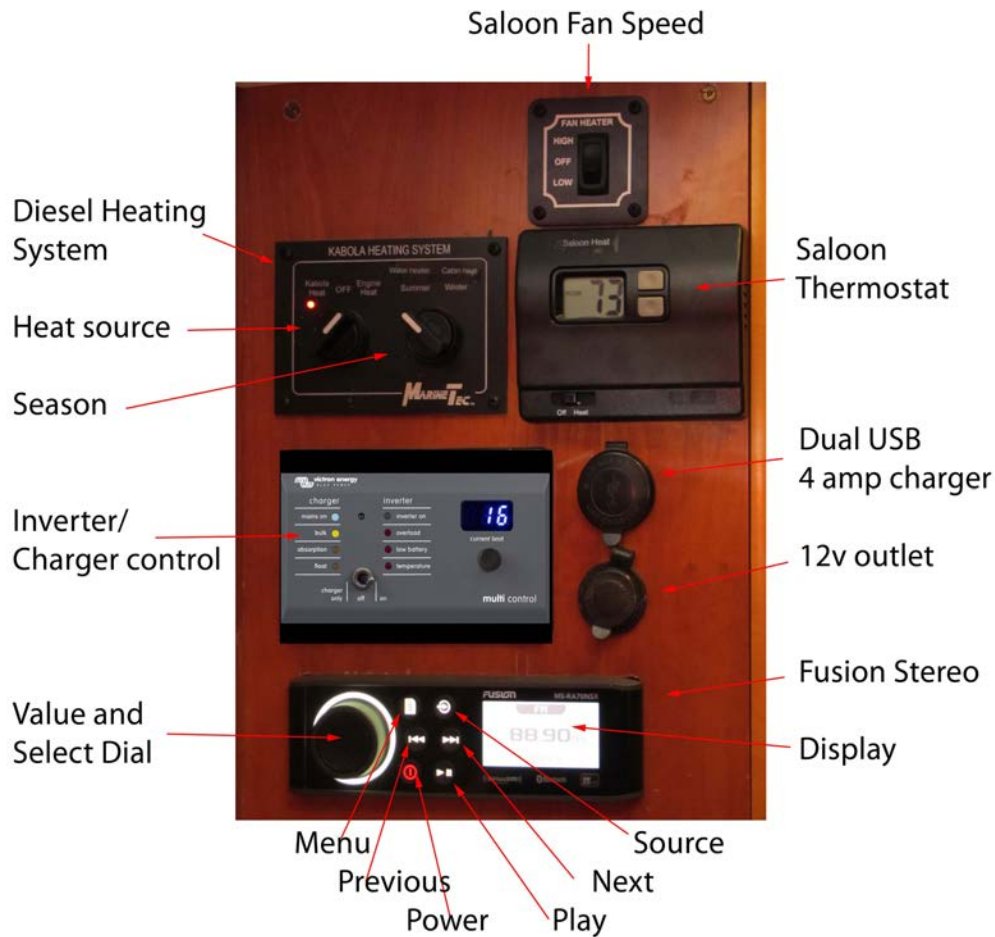


Figure 30: Heating, Inverter, and Entertainment Control Panel

Cabin heat on *Braesail* is provided by a Kabola hydronic heating system. Hydronic heating is like radiator heating, except that the radiators on *Braesail* are forced air heat exchangers. That makes it seem like a forced air system.

The key difference from forced air heat, from your perspective, is that a forced air system gets hot immediately, and the heating system on *Braesail* takes a few minutes to warm up.

Heating on *Braesail* is controlled in five zones, each with its own thermostat, and in one accessory area, which has fan control only:

- The cockpit has a fan control, installed on the bulkhead between the navigation station and the pilot berth. There is no thermostat for this area; the fans run anytime that the system is running and the fan control is ON
- Domestic hot water (see HOT WATER HEATER, above)
- The aft stateroom, with a separate fan control for the aft head mounted on the front of the cabinet under the basin in the head
- The saloon has a thermostat and fan control mounted on the column forward of the navigation station
- The crew cabin has a thermostat and fan control mounted on the port side of the hanging locker
- The forward stateroom has a thermostat and fan control mounted on the forward side of the hanging locker and a separate fan control for the forward head mounted on the front of the cabinet under the basin in the head

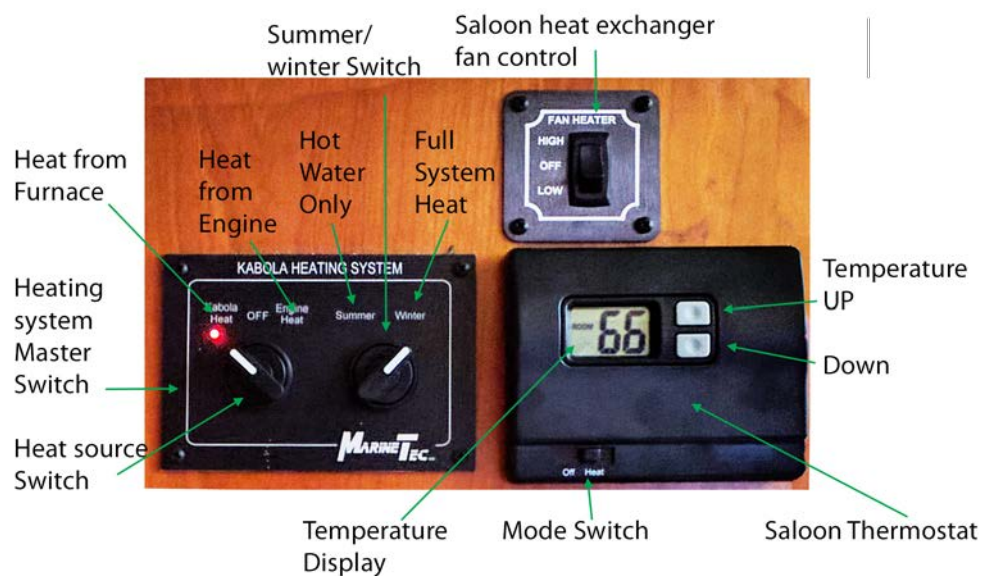


Figure 31: Navigation Station Heating Controls

Master Controls

The heating system is controlled from the HEATING SYSTEM MASTER SWITCH on the forward pillar of the navigation station (see Figure 29).

Power to the heating system is controlled by the HEAT SOURCE SWITCH:

- OFF turns off the heating system and puts the Kabola Boiler in standby status
- ENGINE HEAT provides power to all the room heat exchangers and the system pumps. Heat to the system comes from the engine fresh water circuit through a heat exchanger
- KABOLA HEAT uses the Kabola Boiler to heat the hydronic system and powers all the pumps and room heat exchangers

The SUMMER/WINTER switch controls whether the boiler heats the HOT WATER TANK alone or heats the entire boat. This switch actuates a solenoid valve in the engine room which cuts out the room heating hydronic circuit.

- SUMMER heats the hot water tank alone
- WINTER heats the whole boat

The Kabola boiler and its pumps are powered by a European-voltage inverter that is located in the compartment with the boiler itself under the pilot berth. During the summer, when heat is not needed, we tend to turn this inverter off so that it doesn't draw power or make noise. Turn the inverter on by toggling the front panel switch to the "II" position. (The "I" position is for remote control standby, and the usual position is "off"). Once the inverter is running, you will probably need to turn the boiler itself on, using the switch on its front panel. It will illuminate when it is on.

Room Heat Controls

Room heat is controlled by a THERMOSTAT, and one or two HEAT EXCHANGER FAN SWITCHES.

- THERMOSTATS control the firing of the Kabola boiler.
 - MODE SWITCH:
 - OFF deactivates the thermostat
 - HEAT activates the boiler from the thermostat
 - TEMPERATURE buttons lower or raise the set temperature of the thermostat
 - TEMPERATURE DISPLAY shows the room temperature as its standard display. When you press a TEMPERATURE BUTTON, the set temperature of the thermostat is shown
- HEAT EXCHANGER FAN SWITCHES control the fan speeds on the heat exchangers. The fans run only when their thermostat calls for heat AND the FAN SWITCH is set to HIGH or LOW. Normally, just leave these set on HIGH. Note that the forward and aft staterooms have two FAN SWITCHES, one for the stateroom and one for the head. This allows you to enjoy a warm head for your morning shower without heating up the stateroom (or vice-versa)

The Boiler System

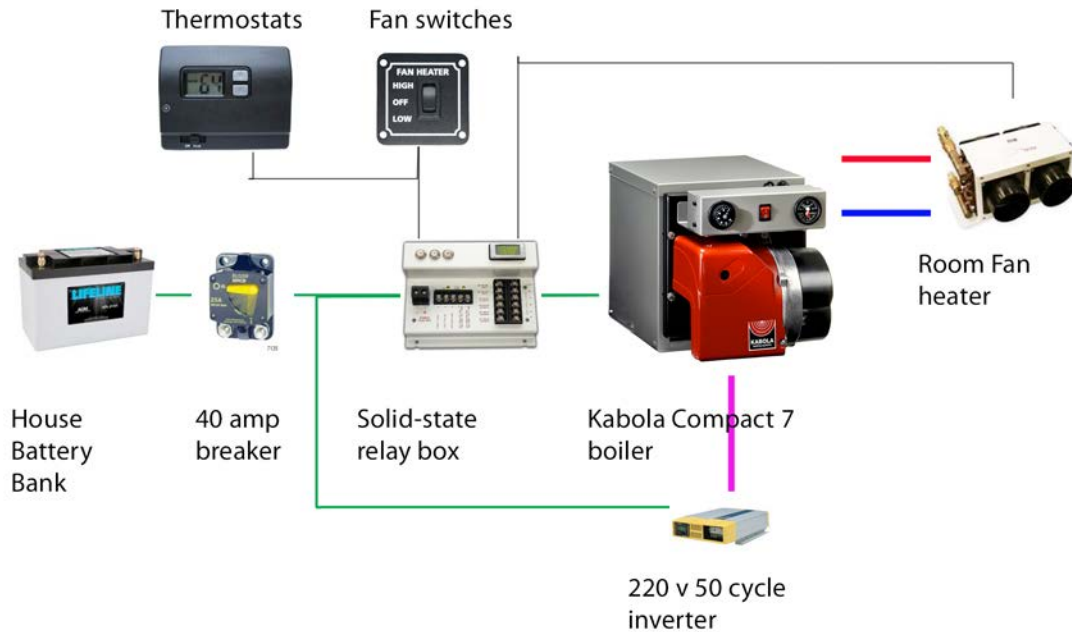


Figure 32: Heating System Block Diagram

Electrically, the heating system is separate from the house system. A 40-amp breaker, located under the port-side chair in the aft stateroom, protects the entire heating circuit. The Kabola boiler runs on European electrical standards: 220v, 50 Hz current. The inverter for that current, as well as the boiler and a relay box, are located in the large cabinet in the pilot berth. All of the thermostats (including the aquastat on the HOT WATER TANK) are switched through the SOLID-STATE RELAY BOX which controls all the room heater fans and turns the boiler on and off. Hydronic pumps are integral to the boiler, and are controlled by pressure and temperature sensors internal to the boiler.

There are two filters in the boiler system: a fuel filter, located in the boiler cabinet, and a hydronic water filter, located behind the central jamb into the engine room. Both of these have an expected life of five years or more, and are checked during annual servicing. Neither should need to be changed in service.

ELECTRONICS AND INSTRUMENTS

Manuals for the various instruments and electronics on board are kept in the binders in the starboard cabinet of the forward stateroom, and on the thumb drive in the gray binder. Please familiarize yourself with these manuals, as the detailed operation of this equipment is far beyond the scope of this manual.

VHF Radio

The ICOM IC-M510 VHF radio is located on the lower forward port panel of the navigation station. Its power is controlled by the NAVIGATION INSTRUMENTS BREAKER on the MAIN POWER PANEL. There is a REMOTE MICROPHONE, an ICOM COMMANDMIC IV,

stored in the upper drawer of the navigation station desk. Plug it into the socket on the port side of the binnacle *before* powering up the VHF Radio.

There is a portable STANDARD HORIZON HX870 PORTABLE VHF RADIO mounted in its charger just forward of the navigation station. This portable VHF is full DSC with GPS and Distress. It is charged by the 12V USB AND ACCESSORIES BREAKER on the MAIN POWER PANEL, and should be kept in its charger at all times when it is not in use.

Monitor VHF Channel 16 at all times when underway

Raymarine Sailing Instrumentation

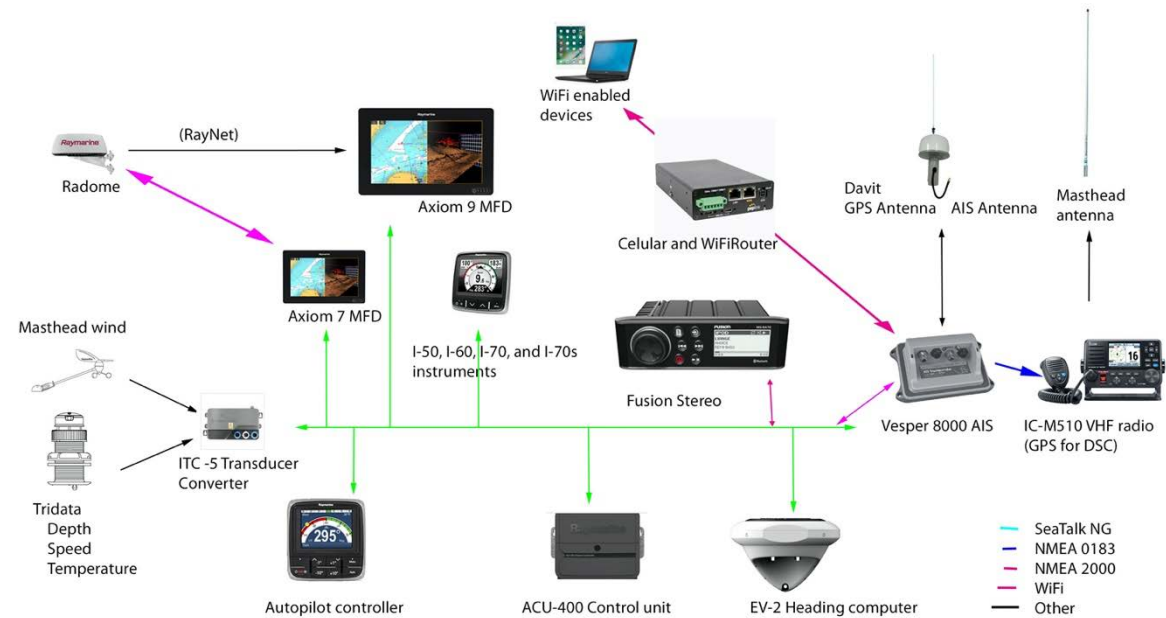


Figure 33: Instrumentation Block Diagram

All the sailing instrumentation on *Braesail* is interconnected, primarily on a SeaTalk 2 backbone. The AIS, GPS, and stereo connect via NMEA 2000 cabling to the SeaTalk 2 backbone. Most of the interconnects and the Vesper 8000 AIS transceiver, and the EV-2 heading computer are located in a compartment behind the settee just forward of the navigation station; the tridata sensor is in a through-hull in the forward compartment in the sole in the entrance to the forward stateroom. The GPS antenna and the VHF antenna for the AIS system are in a combined antenna on the dinghy davits. The masthead wind sensor and the general VHF antenna are at the top of the mast.

Note: The rudder angle sensor on the steering quadrant is integrated into the ACU-400 autopilot controller. To activate the rudder angle display on any of the instruments, the Autopilot breaker on the main power panel must be turned on. All other instrumentation (and the RADAR subsystem) is controlled by the NAVIGATION INSTRUMENTS breaker on the main power panel.

Radar and Chart-Plotter

Effective use of the RADAR AND CHART-PLOTTER requires the interaction of compass, GPS, and radar data. The CHART PLOTTER is loaded with the Navionics charts for North America (United States and Canada), updated to July, 2023.

BE AWARE: Charting for most of the Salish Sea is quite detailed and accurate. In addition, the Navionics community contributed bathyscopic data makes these charts even more complete. *HOWEVER*, there are two significant limitations in our cruising areas:

- GPS accuracy in this area is not accurate to less than 10 metres. That's 40 feet, or almost the length of *Braesail*. That is a significant circle of error, and many of the dangerous underwater features (rocks, etc.) are smaller than potential GPS errors.
- As you go north into Desolation Sound, the Broughtons and further, much of the surveying is 75 or more years old. The accuracy of your charts (electronic or paper) may be only to 200 feet or more. Keep an eye on your depth sounder and leave yourself plenty of sea way.

Radar can make your passage much safer in conditions of limited visibility. Practice using it while you can see everything, and you will improve your ability to understand what it is telling you when it is dark or foggy. (Note that one of the pages on the Axiom 9 is an overlaid RADAR and CHART-PLOTTER. Use of this page will help you to familiarize yourself with what the RADAR displays in conjunction with the chart and the AIS.) However, radar is no substitute for prudent seamanship. **DO NOT** travel in heavy fog, high winds and blowing spray, or other dangerous conditions. RADAR AND CHART-PLOTTERS can fail, and particularly in limited visibility or rough conditions, use paper charts as a constant backup to electronic tools.

WiFi

Braesail has a cellular and WiFi network connected to its instrumentation. The router will connect to the T-Mobile network in the US and to either Bell or Tellus in Canada, and it will connect automatically to open WiFi networks, such as those in many marinas. You are likely to need to log into a marina network from your computer or phone. Because this differs in each marina, you'll have to figure it out yourself.

Cellular coverage is strongly effected by terrain, particularly in the marine environment. You may find great connectivity at one bouy in a harbor and no signal at another in the same bay. **THERE ARE NO GUARANTEES THAT YOU WILL HAVE SIGNAL AT ANY TIME, AND WiFi IS SIMPLY A COURTESY AND PRIVILEGE OFFERED BY Braesail.**

To connect to the network, use these settings:

Network (SSID):	Braesail_Saloon (in the cabin) Braesail_Deck (in the cockpit or in the aft cabin)
Password:	Braesail23 (case sensitive)

Vesper Marine was recently bought by Garmin and has been absorbed, but at time of writing, Vesper's quite useful mobile app, WATCHMATE, is still available. It includes location data, an anchor alarm, and an AIS display. You can get this app (for free) from the iTunes Store (for IOS devices) or from the Play Store (for Android devices).

To connect other programs to the navigation network gateway, use the following TCP data:

IP Address:	192.168.50.21
Port:	39150

A number of programs will display full instrumentation across WiFi. iNavX, OpenCPN, and Time Zero have been reported to show instrumentation, charts, and RADAR, but all of these are version and operating system dependent. We've been able to use most features on OpenCPN (on Macs) and iNavX (on both IOS and Android). Unfortunately one of the most useful connections, Navionics, will allow interoperation only if the phone or tablet is licensed to the same person as the charts on the Axiom. As a result, we invite you to have fun with this level of integration, but we can't help you make it work.

Global Positioning System (GPS)

A GLOBAL POSITIONING SYSTEM antenna is mounted on the dinghy davits. The GPS receiver is part of the Vesper XB-8000 AIS transceiver. GPS will locate you within about 40 feet, but there are many undersea features that can inspect your keel within that circle of error! GPS is a great locator tool, but it is no substitute for situational awareness. Let your GPS (through the CHART-PLOTTER, the charts on your mobile device, or the charts on your laptop) confirm or challenge your own determination of your location. Never rely solely on electronic means of navigation.

Automatic Identification System (AIS)

The Automatic Identification System is required on all larger vessels. *Braesail* voluntarily participates in the AIS with a class B transceiver. The AIS transceiver is active when the NAVIGATION INSTRUMENTS are turned on. As a result, *Braesail* broadcasts its location, speed, and course for all nearby traffic once every second. Most importantly, both the Coast Guard and Vessel Traffic System monitor AIS. AIS traffic can be monitored on *Braesail* through the AIS overlays on the CHART-PLOTTER display as well as pages set up on the I70 NAVIGATION INSTRUMENTS. The I70 page will give you the relative location of traffic around *Braesail*, and it will identify traffic that is likely to be or become dangerous. It will also display the relative location of some hazards and aids to navigation, because many of these broadcast their locations virtually from Coast Guard installations.

NOTE: AIS transmission may be defeated by setting the AIS to "Silent Mode" in the WatchMate Application controlling the Vesper XB-8000. That means that you'll be able to see other AIS traffic, but it can't see you. Your Fleet Captain should make sure that "Silent Mode" is disabled before turning *Braesail* over to you, but you should check this as well.

This information makes inter-ship communications much more effective. You are much more likely to respond to a call from another vessel when you hear “Sailing Vessel *Braesail*, this is the tug *Artic Venture*,” than when you hear “Sailboat heading north in Rosario Strait off Cypress Island, this is the tug *Artic Venture*.” In the second case, you’ll spend the next few minutes trying to figure out if you are the vessel being hailed. The same is true for much of the commercial traffic in local waters. We have never had a container ship respond to “Big boat heading east in Boundary Passage,” but (in the same location) we have never had a ship fail to respond when, on Channel 5A, we hail: “*Nordhavn Princess*, this is sailing vessel *Braesail*” (using the name of the boat we want to hail, of course).

Because AIS can project time and location of encounter, you can also plot your course through our busier waters. If you are crossing from Saturna Island to Sucia Island and you see a small spec on the horizon that is likely a very large vessel coming your way, AIS can tell you how fast that boat is traveling, what its current course is, and when (and often where) your courses will intersect. You can then set your course so that when it crosses theirs, you will be a long way from each other.

Because heavy boat traffic in our area can move very quickly (we’ve tracked loaded freighters in Boundary Pass and Haro Strait in excess of 15 kts) and they don’t always pay full attention to AIS B stations, you should always display a 20 minute (8-10 mile) radius of AIS activity. You can do that on WatchMate on a tablet or a smart phone, on a computer with plotting software connected to the navigation WiFi on board, or on one of the I70 instruments. You will usually have your CHART-PLOTTER display at a resolution which will not give you that amount of situational awareness.

ENTERTAINMENT SYSTEM

FM/AM Digital Media Player

The FUSION MS-RA70NSX is located in the pillar in front of the navigation station. Besides an FM/AM tuner, it provides a variety of inputs: Aux and USB input (both of these are connected from the panel at the front of the Nav Station) and from a Bluetooth-paired device.



Figure 34: Fusion Entertainment System

Bluetooth pairing

To pair a portable device with the media player:

- Press the SOURCE button; rotate the VALUE dial to BT, and press the dial to select
- Press the MENU button on the media player
- Rotate the VALUE dial to display DISCOVERABLE and press the VALUE dial to select
- Set your portable device into its Pairing Mode, and select FUSION RA-70 when it is detected
- If your device needs a passkey, use “0000”
- Press the MENU button to close pairing
- Operate your Bluetooth device

SAILS AND RIGGING

Braesail is rigged as a sloop. Her sails were new in 2022, and are cruising weight fabric (she sailed to Alaska and back that year). As a result they set well (we can sail well below 40° apparent wind), but you might find them heavier than you might be used to, and as a result, they may take a little trial and error.

Our rule of thumb for sail configuration is:

Wind Speed	Sails
< 5kts	Hoist the “iron genoa” (run the auxiliary engine)
5 – 18 kts	Full main and genoa
18 – 22 kts	Full (or slightly reefed) main and genoa
22 – 28 kts	70% reefed main and genoa
> 28 kts	What are you doing out in my boat in winds like this?

Table 5: Sail Configuration

Running Backstays

In apparent wind under 20 kts, you can usually ignore the running backstays; there just isn’t that much stress on the rigging. However, with stronger winds or if you want to tune the rigging for your particular conditions, the backstays are most useful.

To set a backstay:

- release the green retaining line from cam cleat on the cabin side
- bring the backstay around its block on the aft cabin top and up to the primary winch on its side (if you are flying backstays with the genoa, you’ll be setting the backstay on the windward primary, and the jib on the leeward primary)
- tension the backstay just enough to “do its job” of tuning the rig, or balancing the staysail pull. *Don’t over-tension the backstays. All it will do is distort the rig*

If you furl the main to about 90% it will tack inside the backstays. You can create a completely self-tacking rig by furling the main just inside the backstays, setting both backstays, and setting the staysail. In 12-18 kts, this makes for incredibly fast, comfortable, and lazy sailing.

Running the genoa

A 120% genoa jib is furled on the head stay. To unfurl the genoa, simply make sure its furling line (a black line on the starboard deck) is fair, maintain a light control on the furling line so you don't "pop" the genoa or jerk the head stay (there's almost 600 square feet of sail!), put the leeward sheet around its primary, and pull the leeward sheet to release the jib. It's also wise to do this move while going upwind!

To furl the genoa, you can do it the way it was designed: bring the furling line around the winch on the coaming just aft of the cockpit on the starboard side. Maintain control of the leeward sheet so that you get a nice even furl. Then work *hard*. We think there's just too much friction, and it's too much work this way. We just stand on the deck at the front of the cockpit where we can manage both the sheet and the furling line, pick up the furling line and pull it in. Did we mention that this is very much easier if you are on a port tack? It is!

That winch does come in handy, however, when you are reefing the genoa. It gives you great control.

Running the Mainsail

There are five lines which control deployment of the Mainsail:

- Topping Lift, on the port cabin top
- Vang, on the starboard cabin top
- Boom Outhaul, on the starboard cabin top
- Furler Outhaul, on the starboard cabin top
- Furler Inhaul, on the starboard cabin top

The mainsail is furled on a foil, inside the mast, but much like that of the foresails. It is loose-footed, with the outhaul providing the primary shaping force. Unlike the foresails, the furling line is continuous, fed through a winch and gear mechanism which rotates the foil. When the foil turns counter-clockwise (from the perspective of the top of the mast) the sail is drawn into the mast. **TIP: The mainsail feeds much more fairly if it is deployed and retrieved when on a close starboard tack.**

Boom-furled mainsails have a reputation for being prone to jamming. The key to smooth operation is to manage tension and control. If you operate *Braesail's* main furler smoothly, it will return the compliment. Spend a few minutes familiarizing yourself with the control lines for the main and think about the forces they exert on the sail and the rigging. Your time will be well spent.

To deploy the mainsail:

- Put *Braesail* on a starboard tack, about 30° off the wind
- Release the VANG and leave it loose
- Release the MAINSHEET, and leave one loop around the MAINSHEET WINCH. Fair the lead on the MAINSHEET
- Pull the TOPPING LIFT tight and cleat in its clutch
You now have a fair lead on the BOOM OUTHAUL, and this will make deploying much easier
- Release the FURLER INHAUL and leave it loose (it's the same line as the FURLER OUTHAUL, just pulled in the opposite direction against the furler winch, so it's important to keep these two lines fair)
- Release the FURLER OUTHAUL and leave it loose
- Wrap the BOOM OUTHAUL around the winch
- Controlling the FURLER INHAUL, pull the BOOM OUTHAUL until you have extended the mainsail to where you want it and/or tensioned the BOOM OUTHAUL for optimal mainsail shape
If the BOOM OUTHAUL gets stuck because of tension or friction on the mainsail:
 - Make sure your furler lines are fair
 - Pull about two feet of slack on the mast side of the FURLER INHAUL and cleat it in the clutch (this protects the furler from running away should it suddenly come loose)
 - Pull on the FURLER OUTHAUL to loosen the sail while pulling on the BOOM OUTHAUL
 - Release the FURLER INHAUL and continue controlling it while you pull on the BOOM OUTHAUL
- Cleat the BOOM OUTHAUL
- Cleat the FURLER WINCH control lines
- Release the TOPPING LIFT
- Shape the mainsail as appropriate using the MAINSHEET, TRAVELER, VANG, and BOOM OUTHAUL

You should not need to use a winch handle during deployment, except on the BOOM OUTHAUL as the mainsail deploys.

To retrieve or reef the mainsail

- Put *Braesail* on a starboard tack, about 30° off the wind
- If your situation allows it:
 - Release the VANG
 - Release the MAINSHEET
 - Tighten the TOPPING LIFT
- Release the FURLER INHAUL and wrap three wraps around the winch and into the tailer. Have your winch handle ready, because you will need it
- Release the FURLER OUTHAUL and fair the furler control line
- Release the BOOM OUTHAUL, but maintain control of it
- Maintaining a gentle tension on the BOOM OUTHAUL, winch the FURLER INHAUL in (and keep that furler control line fair!) until you have reached the desired reef or finished retrieval of the mainsail

- Cleat the FURLER INHAUL
- Cleat the FURLER OUTHHAUL
- Cleat the MAIN OUTHHAUL
- If you are reefing:
 - Release the TOPPING LIFT
 - Adjust the MAINSHEET and TRAVELER
 - Adjust the VANG
- If you are furling:
 - Fully tighten the TOPPING LIFT
 - Lightly tension the VANG
 - Pull the TRAVELER fully to one side and cleat it
 - Tension the MAINSHEET

The main problem with furlers is that the furling line gets stuck, jammed, or over tensioned in the process. This is almost always due to not maintaining even tension on the lines controlling the furler (the furling line itself, sheets, or outhauls). This can always be remedied by two actions:

- **ADJUSTING THE ANGLE OF THE WIND to control the tension on the sail**
- **UNFURLING THE SAIL and FURLING AGAIN, maintaining tension**

The most important recommendation we can make for low-stress sail handling is to practice deployment and retrieval at the dock before you leave (this gives you a great sense of where the lines are and where your crew needs to be, and gives you a sense of the static resistances you will encounter from the rigging alone), or if wind conditions in the marina won't allow you to practice, get into the lee of Guemes Island or even Cap Sante and practice there.

ON THE HOOK

COCKPIT ENCLOSURE

The cockpit enclosure is intended for all-season use. Its normal summer set-up is with vinyl-inset door panels for maximum visibility. You will find two additional sets of door panels in the crew cabin. One of these is made entirely of Sunbrella, and is for winter use. (Vinyl does not like to roll up under about 50°F, and below 40°F is likely to crack. *Do not roll the vinyl doors when it is cold!*) In the winter, the enclosure is set up with the Sunbrella door panels.

While there isn't much of a bug problem in our cruising area, there are places where mosquitos, midges, or black flies like to congregate—and often these are adjacent to anchorages. For these places, the third set of panels (screen doors) is essential. Unlike the other two, the screens aren't set up to roll up. That would make it far too easy for the bugs to get in!

Our normal summer practice is to sail with the vinyl windows mounted, and depending on conditions, roll them up or leave them down. Often the most comfortable way is to roll up the leeward door and roll down the windward door. After anchoring, and if we are in

bug season (after about August 15), we roll up both vinyl doors, unzip them from the enclosure (that's the best way to store them overnight—they don't take up much space) and zip in the screen doors.

BARBECUE

The BARBECUE is mounted on the starboard side of the dinghy arch with a Sunbrella cover.

ENSURE THAT NO GASOLINE OR OTHER FLAMABLE MATERIALS ARE NEAR THE BARBECUE.

Remove the cover and place it in cockpit (yes, we had to chase a previous cover in the dinghy, and it almost sank before we caught it). Attach a PROPANE BOTTLE to the regulator. Carefully light the unit; you'll find a long-stem butane lighter in the cutlery drawer in the galley. You'll also find a brush and scraper in the garbage locker in the galley. Clean the BARBECUE after you've used it, and it will be clean and ready when you want to use it the next time.

After using, remove the PROPANE BOTTLE. There is room to store two bottles in the PROPANE BOTTLE BAG attached to the starboard side of the dinghy arch. Once you've used a bottle, the valves are prone to leaking slightly and this is the *only* place safe to store such a bottle, since the propane drains outside *Braesail*.

SAFETY, SPARE PARTS, ETC.

Safety should be paramount in your daily cruising. A crew overboard drill should be discussed and perhaps even practiced with a fender. Remember that your spare lifejackets are stowed in the crew cabin.

Your flares and safety equipment are located on the port side of the companionway stairs, in the locker underneath the navigation station, and in the hanging locker just aft of the navigation station.

Always keep a sharp lookout posted for logs, deadheads, or other flotsam and jetsam. A log hitting your prop can ruin your vacation (not to mention the prop!).

Braesail is equipped with three BILGE PUMPS. The primary pump is located in the compartment at the base of the companionway stairs. It is equipped with an electronic level switch, which triggers the primary pump when about an inch of water accumulates in the bilges. To test this switch and pump, wet a paper towel and place it across the two round sensors on the MAIN BILGE PUMP SWITCH. It will pump for seven seconds after you remove the paper towel. A second automatically-activated bilge pump is adjacent to the mast step. It is set to start pumping when the water gets to about 4 inches deep in the bilges. These two bilge pumps may be operated manually from two switches in the forward lower panel of the navigation station (see Figure 5). The third BILGE PUMP is a manual pump in the cockpit sole. Just aft of the DIESEL TANK FILL is a plastic cover. Lift it off, and you will see a socket for a pump handle. The handle for this pump is in a hanging bag in the wet locker aft of the navigation station seat. Fit this handle into the pump socket, and move the handle fore and aft through its whole range.

It's a pump in the bilge, but not really a bilge pump: *Braesail* has a timer-operated "Dry Bilge" system. It is set to run twice a day for two minutes and will get the last little bit of water out of the bilges.

In addition to the pumps there is a BILGE PUMP COUNTER on the SECONDARY POWER PANEL for each of the . It shows the number of times the aft bilge pump has run since the counter was reset, in the last week, and in the last 14 days. Monitor this counter, and if it seems excessive, contact the AYC maintenance staff. There is also an alarm which sounds a claxon and flashes a strobe should water rise more than an inch above the AFT BILGE PUMP SWITCH. The sensor is located on the forward wall of the compartment under the companionway stairs. Like the MAIN BILGE PUMP SWITCH, this sensor may be tested with a wet paper towel across its sensors.

Supplies and parts for the engine are located under the pilot berth, in the drawers and cabinets. These include oil filters, raw water impeller, fuel filters, belts, and other small parts. Extra oil and coolant are located on the shelf in the engine room. The hex key which opens the engine room doors is found in the armrest of the navigation station.

CRABBING AND FISHING

CRABBING is fun but requires the correct license and season. You will find information about fishing and crabbing regulations on the World Wide Web. There are two folding crab pots with their lines and floats in the starboard lazarette. To open the pots, simply release the stainless steel hooks on both sides of the pot and they will spring open.

Please do not crab off *Braesail's* stern; the crab pot's line can easily become tangled in your prop as you swing with wind or current. It is best to use the dinghy to set your crab pot/ring well away from the boat.

An open can of seafood or cat food works as well as many other baits and is less messy. Please clean up any seaweed or crab shells to keep the boat neat and tidy.

Thank you for choosing
braesail
for your vacation experience.
We hope you enjoy our boat as much as we do!