



ASPEN
POWER CATAMARANS

C108 OWNERS MANUAL



SECTION	TOPIC	PAGE
SECTION 1	Specifications	4 – 6
	Service Points	7
SECTION 2	Aspen Warranty	8
	Boat US Membership	9
SECTION 3	Getting Started	10 – 12
	Batteries & Chargers	13 – 16
	AC / DC Panels	17 – 19
	Tank Gauges	20
	Fuse Panels	21 – 23
	Pump Locations	24
SECTION 4	Equipment & Systems	25 – 28
	Air Conditioning Unit	29
	Anchor Operation	30 – 31
	Tilt Helm & Curtains	32 – 33
	Fuel System	34
	Raw Water Ball Valves	35
	Motor Pod Drain Valves	36
	Fresh Water System	37 – 38
	LPG System	39 – 41
	Teak Care	42
	Zinc Replacement Thruster	43
	Trailer	44 – 45
	Lifting Strap	46 – 47
	Dinghy Launch	48
	Outfitting Your Boat	50 – 58
	Open Hull Photos	59 – 61
SECTION 5	Troubleshooting	62 – 66
	Thruster Maintenance	67 – 74
	Winterizing	75
SECTION 6	Larry’ s Notes: Thruster Logic & Strategy	76
	Larry’ s Notes: Toilet Logic, Details, Magic	77 – 81
	Anchoring Woes	82 – 86
	Service Schedules	87 – 89

VESSEL SPECIFICATIONS

VESSEL NAME:	
HULL IDENTIFICATION NUMBER:	
MANUFACTURER: <i>Aspen</i>	MODEL: <i>C108</i>
LENGTH OVERALL: <i>37'-8"</i>	
LENGTH AT WATER LINE: <i>35'</i>	
BEAM: <i>10'8"</i>	DRAFT: <i>31" 22" Trimmed</i>
DISPLACEMENT: <i>9,700lbs</i>	HULL MATERIAL: <i>Fiberglass</i>
BOTTOM PAINT: <i>SeaHawk Biocop</i>	

ENGINE	Yamaha F200XB –Yamaha F115
--------	----------------------------

DINGHY	
--------	--

ELECTRONICS	GARMIN AIS800	
	GARMIN Reactor 40 CCU	
	GARMIN GMR18XHD RADAR	
	GARMIN GHC20	
	GARMIN GPS MAP 8610	
	GARMIN 8612xsv	

CAPACITY SPECIFICATIONS

Unit	Capacity		Material
Holding Tank	30	Gallons	Polypropylene
Starboard Water Tank	24	Gallons	Polypropylene
Port Water Tank	26	Gallons	Polypropylene
Port Fuel Tank #1	43	Gallons	Aluminum
Port Fuel Tank #2	44	Gallons	Aluminum
STBD Fuel Tank #3	97	Gallons	Aluminum
Engine Oil – 200hp	4.76	Quarts	Yamaha Lube 4M FC W
Engine Oil – 115hp	3.9	Quarts	Yamaha Lube 4M FC-W
Hot Water Tank	6	Gallons	
Batteries House Bank		Amp Hours	

ENGINE SPECIFICATIONS

(Reference only – check your engine owners manual)

ENGINE MANUFACTURER: YAMAHA 200 & 115	
MODEL NUMBER: <i>F200</i>	MODEL NUMBER: <i>F115</i>
SERIAL NUMBER:	SERIAL NUMBER:
FUEL TYPE: <i>Gas</i>	FUEL TYPE: <i>Gas</i>
ALTERNATOR AMPERAGE: <i>50</i>	ALTERNATOR AMPERAGE: <i>35</i>
PROPELLER DIAMETER: <i>14.5"</i>	PROPELLER DIAMETER: <i>13.125"</i>
PROPELLER PITCH: <i>13" SS</i>	PROPELLER PITCH: <i>16" SS</i>
NUMBER OF BLADES: <i>3</i>	
PROPELLER MATERIAL: <i>Stainless Steel</i>	
PRIMARY FUEL FILTER: <i>6P3-WS24A-01-00</i>	PRIMARY FUEL FILTER: <i>6D8-WS24A-00-00</i>
INLINE FUEL FILTER: <i>69J-24501-10</i>	INLINE FUEL FILTER: <i>68V-24502-30-00</i>
ENGINE OIL TYPE: <i>YAMAHA LUBE</i>	
OIL FILTER: <i>69J-13440-03-00</i>	OIL FILTER: <i>5GH-13440-70-00</i>
ENGINE OIL QUANTITY: <i>4.76 qt</i>	ENGINE OIL QUANTITY: <i>3.9 qt</i>
SPARK PLUGS: <i>LFR5A-11</i>	SPARK PLUGS: <i>LFR6A-11</i>

SERVICE POINTS & PARTS

(Reference only – check your engine owners manual)

1	OIL CHANGE		
	Yamaha Lube (115hp)	4M FC-W	3.9 qts
	Yamaha Lube (200hp)	4M FC-W	4.76 qts
	Oil Filter (115hp)	5GH-13440-70-00	1
	Oil Filter (200hp)	69J-13440-03-00	1

2	GEAR OIL CHANGE		
115hp	Yamaha Marine Gearcase Lube	SAE 90 API GL-4	.70 qt
200hp	Yamaha Marine Gearcase Lube	SAE 90 API GL-4	1.036 qt

3	ZINCS		
	Trim Tab Zinc (115hp)	6EF-45371-01-00	1
	Engine Zinc (115hp)	67F-11325-01-00	1
	Trim Tab Zinc (200hp)	61A-45371-00-00	1
	Engine Zinc (200hp)	6G5-45251-02-00	1

Aspen Power Catamarans Consumer Warranty

At Aspen our goal is to build your new boat with the best materials available from the world's premier vendors. These are installed by very well trained experienced builders. Each system is fully function tested in our plant and then water tested during factory sea trials prior to delivery. So our expectation is that new owners will have a very very short list of items that need addressing after delivery.

Basic Agreement:

On the issues where we erred we will take full responsibility and exceed your expectations in every way during its service. In short, we will be 110% responsible for our work, materials and equipment; we will also manage the suppliers warranty's when possible.

Aspen or our agent will provide dockside service at your marina for the first 3 months at our expense. There after Aspen will cover all parts and labor but dockside transit expenses are not covered. If the boat is located outside Puget Sound we will mutually agree to a local service provider and with your call Aspen will contact and manage the service at our expense. Aspen will provide parts and freight to the boat/service company. For complex projects, Aspen may send a team to the boat for service. In the rare instance the boat needs to return to the factory the cost of its return will be the responsibility of the owner.

What is Covered:

Hull, Deck small fiberglass parts, structural 10 Years

Tanks, Steering, shaft, prop, rudder, 5 Years

Electrical Harness switches, breakers, fuse holders, 5 Years

Gel Coat blistering, crazing, 5 Years

Engine Transmission, (by vendor) Cummins/Volvo Twin Disc, 2 years

Electrical components, water pump, bilge pumps, 2 Years

Hardware, components 3 years

Electronics (by vendor) typically 2 years

What is Not Covered:

Damage from abuse, impacts or groundings or commercial use

Damage from acid washing gel coat by boat cleaning companies

Normal wear and exposure in normal use under normal conditions

Transport or any expense associated with it being out of service I.E. living expenses, personal transportation

Transferability: Yes, first 3 years with a \$695 service fee

Extended Warranty Available: Yes Bow to Stern w/engine and gear, 5 years (Brunswick)
(Contact Aspen for Price)



Welcome Aboard! Aspen Power Catamarans has purchased a BoatU.S. Membership with Unlimited Saltwater & Freshwater Towing Service for you!

Your BoatU.S. Membership #: _____

Your Membership & Towing Service* starts on _____ & is valid until _____

Your Membership includes the benefit of our Unlimited Towing Service that provides payment for on-water towing, jumpstarts, soft ungroundings and fuel delivery. You now have access to the nation's largest towing fleet with over 600 towboats in 300+ ports nationwide and your towing service applies to all recreational boats you own, borrow or charter.

If you need assistance on-the-water or on-the-road, you can reach our 24/7 Dispatch Center by calling 800-391-4869, hailing TowBoatU.S. on VHF 16 or by using the BoatU.S. smartphone app (BoatUS.com/app.)

Other Membership Benefits include:

- Discounts on fuel, transient slips, repairs & more at over 1,000 boating businesses
- Roadside assistance for boaters who trailer their boat
- Earn \$10 reward certificates for every \$250 spent at our retail partner West Marine
- Subscription to BoatU.S. Magazine - 6 issues per year
- Low-cost boat and PWC insurance from dedicated experts
- Representation for boaters from local issues to Capitol Hill

About BoatU.S:

Boat Owners Association of The United States (BoatU.S.) is the nation's leading advocate for recreational boaters providing its over half-million members with government representation, services such as 24-hour on water boat towing as well as roadside assistance for boat trailers and tow vehicles, feature-packed boat insurance programs, money-saving benefits that include marina and West Marine shopping discounts, and vital information that improves the boating, fishing and sailing lifestyle. Its member-funded BoatUS Foundation is a national leader promoting safe, clean and responsible boating.

Questions about BoatU.S. or your Membership?
Visit www.BoatUS.com or call 800-395-2628

***Details and exclusions of Water & Roadside Towing can be found online at BoatUS.com/towing/agree.asp or by calling 1-800-888-4869.**



INSURANCE



ON WATER TOWING



TRAILER ASSIST



DISCOUNTS



MAGAZINE



SAFETY



ADVOCACY

GETTING STARTED

ANCHORING

The anchor is on the bow roller. Note: if the winch runs but the line/chain is not coming in, the clutch is most likely not snugged up. Using the wrench (Lewmar) from the blue owner's info bag, insert it in the top of the winch and tighten clockwise. Test again, be careful not to tighten too far as the bow roller can be bent with the motor's force.

BATTERIES

One house and the start battery are located in the starboard aft cockpit lazarette compartment. The main house battery is located starboard mid ship under the ¼ berth.

BILGE PUMPS

There are 3 bilge pumps per hull – each in watertight compartments. All bilge pumps are on automatic float switches and powered by full time power, even if the switches at the dash are off. (Power comes from hot float breaker)

DINGHY

Always wear your life jacket when using the dinghy. The dinghy typically has a 450lb capacity and allows 3- 4 people on board safely.

FUEL TANKS (Standard)

2 tanks holding 30 gallons each (port side), and a 3rd tank holding 70 gallons (starboard side). Expedition tanks hold 180 gallons, 103 starboard, and (2) 38-gallon tanks to port.

HOLDING TANK

The holding tank holds 30 gallons. To empty, be 3 miles offshore (if legal in your state) and hold macerator switch on to dump. It's best to do when the engine is off so you can hear the change in motor speed when the tank is dry. There is also a pump outfitting on the step through at the transom gate.

HEATER

Wallace 30D runs off auxiliary (3 gallon/kerosene) fuel tank located in port hull (Forward lazarette locker). Or optional Propex propane heater behind the refrigerator running off the propane tank in the port aft cockpit storage locker.

HOT WATER

There is a 6-gallon hot water tank – 110V located in the starboard lazarette.

SAFETY EQUIPMENT (Option)

Aspen boats are typically equipped with 8 life jackets: two under the helm seat (suspender inflating type), 4 in the starboard aft cockpit storage compartment, and two under the master bed. The flare kit and first aid kit are also stored under the helm seat. Fire extinguishers are located to port side of helm and on the aft wall of the ¼ berth.

GETTING STARTED *CONTINUED*

SHORE POWER

Boat comes equipped with a 30-amp service cord. **Note:** It's best not to exceed a 25-amp draw or plug damage may occur. Be sure to twist lock to cord in place for complete connection at the pedestal.

STOVE:

The stove is propane and has a 15lb propane tank. Remember to turn the tank on at the bottle, and then push the toggle switch next to the sniffer control to feed it power. Then turn on the sniffer control unit to the right of the stove. Turn switch at stove off after use and close bottle if leaving the boat for an extended period. **Note:** When starting the burner, you must hold the control knob in for 10 seconds after it's lit to heat the blowout safety sensor while pushing the ignition button.

WATER

The boat has 2 water tanks, one in each hull. To activate the port tank, switch the water pump switch at the dash to port side. To activate the starboard tank, move switch to starboard. If switch is centered, both pumps are off. Capacity is 50 gallons. Remember to not run water continuously to conserve your water supply.

QUICK START

The main battery switches are typically left on, the AC and DC breakers at the helm are switched on or off as needed.

A. ENGINE CHECKS: engine oil level should be checked monthly or at the start of each major trip. Before starting, prime both engines' fuel systems by gently squeezing the fuel primer bulb located port and starboard lazarette aft. Squeeze bulb until fuel priming bulb becomes firm. This greatly reduces cranking time after the engine has set unused for more than 2 days.

B. COVERS & CUSHIONS: aft deck cooler should be pulled out of the ¼ berth and placed on the non-skid mat.

C. READY INSTRUMENTS: no action needed.

D. POWER PANELS: DC switches are normally off when leaving the boat for an extended period of time. This kills power to 95% of the DC equipment. Note: if you want the refrigerator left on, the lower sub-panel switch must be on. AC panel breakers are also typically all on except the hot water 110V heater breaker – use this only when needed as, with other loads, you can exceed 30 amps.

E. START ENGINE: assure throttles are in neutral position. Slip the safety lanyards in. Turn the key until engine starts.

F. CASTING OFF: remove lines in appropriate manner and stow safely. Then remove fenders/lines and stow safely. Never leave lines on cleats while underway.

G. UNDERWAY: attentive helmsman at all times.

H. ARRIVING AT MARINA: place fenders on proper side. Remember that neutral is your friend. Use thrusters once, near dock. 5 second bursts—not more than 30 total.

I. ANCHORING: remove snubber line (safety line/bungee on anchor). Check to see line in locker is clear and not bound by stored gear. Either at the helm or on the deck, lower the anchor using switch pad. While retrieving, be sure to clean anchor (bounce while in water) to clear mud and debris before it gets on the deck and in the anchor locker.

General Note: If you activate the depth sounder/chartplotters while on land you must deactivate the depth sounder module, or the transducer will overload and be damaged.

GETTING STARTED *CONTINUED*

BOTTOM PAINT

We use SeaHawk Biocop paint (PN 1205-1), typically black. This paint is good for boats stored in and out of the water. We also protect the transducer and metal parts optionally with non copper biocide antifouling Pettit paint (PN: MDR-720).

PAINTING PROCEDURE

The typical yard will make a major mess of bottom painting an Aspen, as they do not care about how smooth the final finish is. Their goal is gobs of paint fast, no finesse, paint spurs are OK.

Our goal is a smooth finish that keeps the boat speed at 100% of new. We mix the paint extremely well, then strain it so it flows well when you apply it with a marine FOAM roller (you'll need 9" roller on large surfaces and 4" to move fast in detail areas). We quickly roll the paint in an area about 3 feet long by 3 feet high, and then put the roller down and go over this area with a quality 4" finish paint brush lightly TIPPING the surface. When you do it right, the paint lays down very flat – no lines are present, and no paint spurs are sticking up – smooth as Formica. The key to this is tipping while the paint is still wet, roll the next section forward 3 feet and tip it while the first is still WET so you don't get scuff lines in the paint at the transition points. Try to end your painted sections on a chine or other hull feature for a smooth finish everywhere. You might be asking, why do it this way? Aspens are a displacement hull, so when it's running all – 100% of the hull stays in the water. If you turn this surface into 36 grit sandpaper, it drastically slows down the boat. We had one owner whose yard did a very lumpy paint job and he lost 5mph off his cruise and top speed. The whole paint job had to be sanded off.

We do two coats on all surfaces, a third on the sides and sun exposed areas, and a fourth on the bow. On re-coat jobs, it typically takes a day to prep the surface and a day to do the coating. Note: The paint is ablative which means the glue that holds it together slowly dissolves over time. Due to this every 4-5 years, you will need to strip all the paint off and start at fresh fiberglass. You'll know its time when it starts to flake off after a season of use. Note 2: Bottom paint is a wear item like car tires, it typically lasts 12-18 months before recoating is needed. Note 3: When/If you decide to have a diver clean the bottom it's best to scrub with a piece of Berber carpet or equivalent, never use a coarse Scotch-Brite or pad unless you plan to repair soon.

PRODUCTS NEVER TO USE ON YOUR BOAT

Swimming pool cleaner (Muriatic Acid)

Soft Scrub with bleach

Comet

Scotch Bright Sponges

Toluene

Acetone

Anything really strong will take the expensive UV stabilizers out of the gel coat surface. And with no UV protection, the boat will chalk and age.

BATTERY SWITCHES

The C108 has five main battery switches:

1	EMERGENCY PARALLEL	Starboard cockpit
2	ENGINE ON/OFF	Starboard cockpit
3	HOUSE ON/OFF	Starboard ¼ berth
4	BOW THRUSTER	Starboard ¼ berth
5	STERN THRUSTER	Starboard ¼ berth
6	INVERTER (under bed)	Starboard ¼ berth

Normal operation position is to leave both House, Electronics, and Engine switches in the ON position. Emergency Parallel should be in the OFF position and is rarely used and is then only for 3 to 5 minutes max.

Thruster battery switches are located as noted above and are normally ON. ***These must be switched OFF when swimmers are in the water, or for service.*** The thrusters are very powerful and will suck objects in the water toward them. Do not operate the thruster for more than 30 seconds in one docking or the motor's thermal breaker may shut the motor off until it cools down.

The batteries have three charging sources:

1. 1 MasterVolt charger (25-amp output for the Start Battery & 25A for the House Battery). Works when shore power is connected and AC breakers at dash are switched on.
2. 2 130 watt solar chargers (12A) while anchored – automatic.
3. 1 50-amp & 25-amp engine-driven alternators.

The boat has a **Blue Sea Voltage Sensitive Relay** (black box located near the switches) that disconnects the House Batteries from the Start Battery when the voltage on the Start Battery drops below 12.3 volts. Once the charging system has brought the Start Battery back to 12.3 volts, it reconnects to the House Battery Bank for charging while underway.

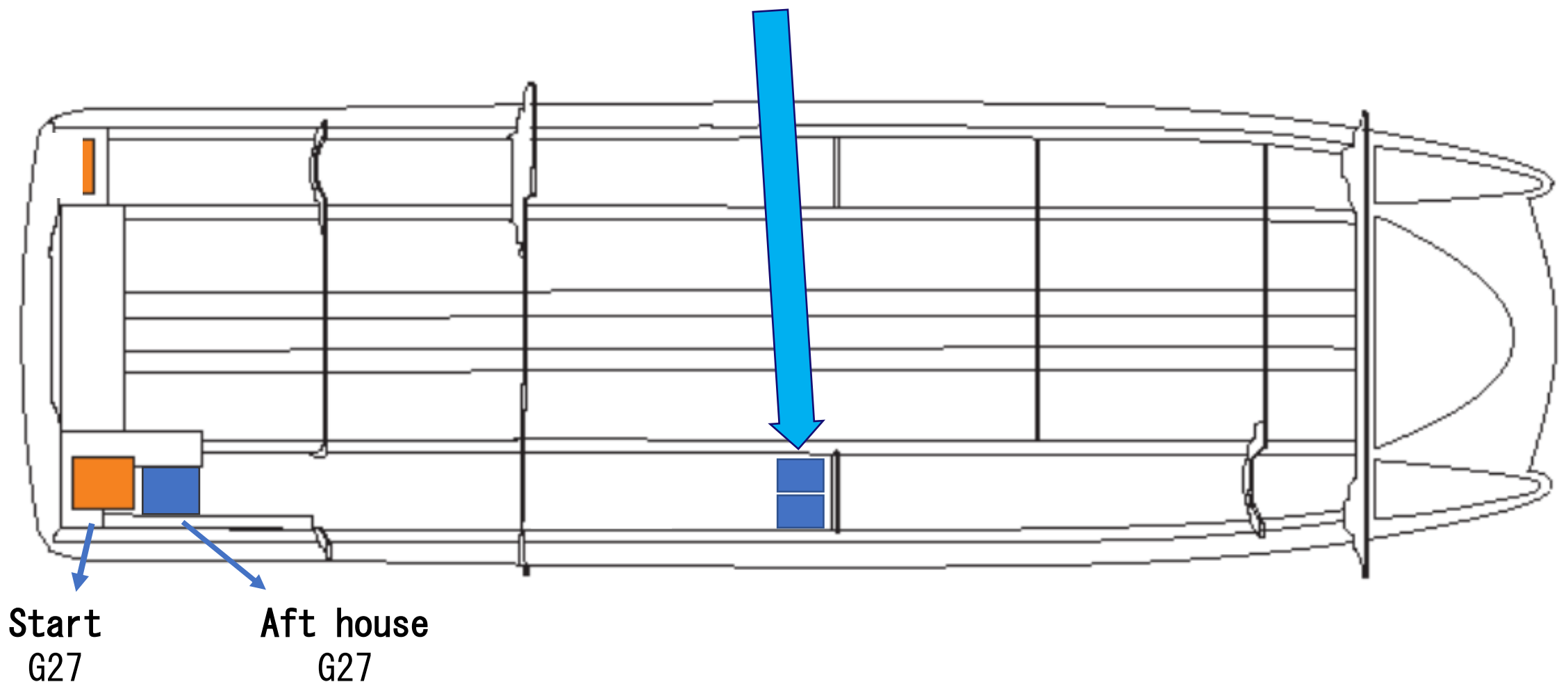


BATTERY LOCATIONS

HOUSE BATTERIES (Standard)

Golf Cart 6Volt Deep cycle, AGM lead acid, in series for 12V house supply.

(under bed cushion)



ENGINE START BATTERY

LEAD ACID G27

Note: on Generator boats we double up the start batteries and locate in aft starboard hull for weight and balance issues.

HOUSE BATTERY Inverter Room



The first cushion in the starboard stateroom is removable. Under is a removable access plate. This space has 2 golf cart house battery's (AGM) style, the optional 2000-watt charger (100 amp-12v/2000-watt 110V) inverter as well as a Master Volt duel out put 20-amp charger for the house and start battery bank. It also includes a raw water pump to supply the heads flush water.



Battery /Inverter room ventilation. Outlet. Inlet behind head bowl.

INVERTERS & CHARGERS (Magnum & MasterVolt)

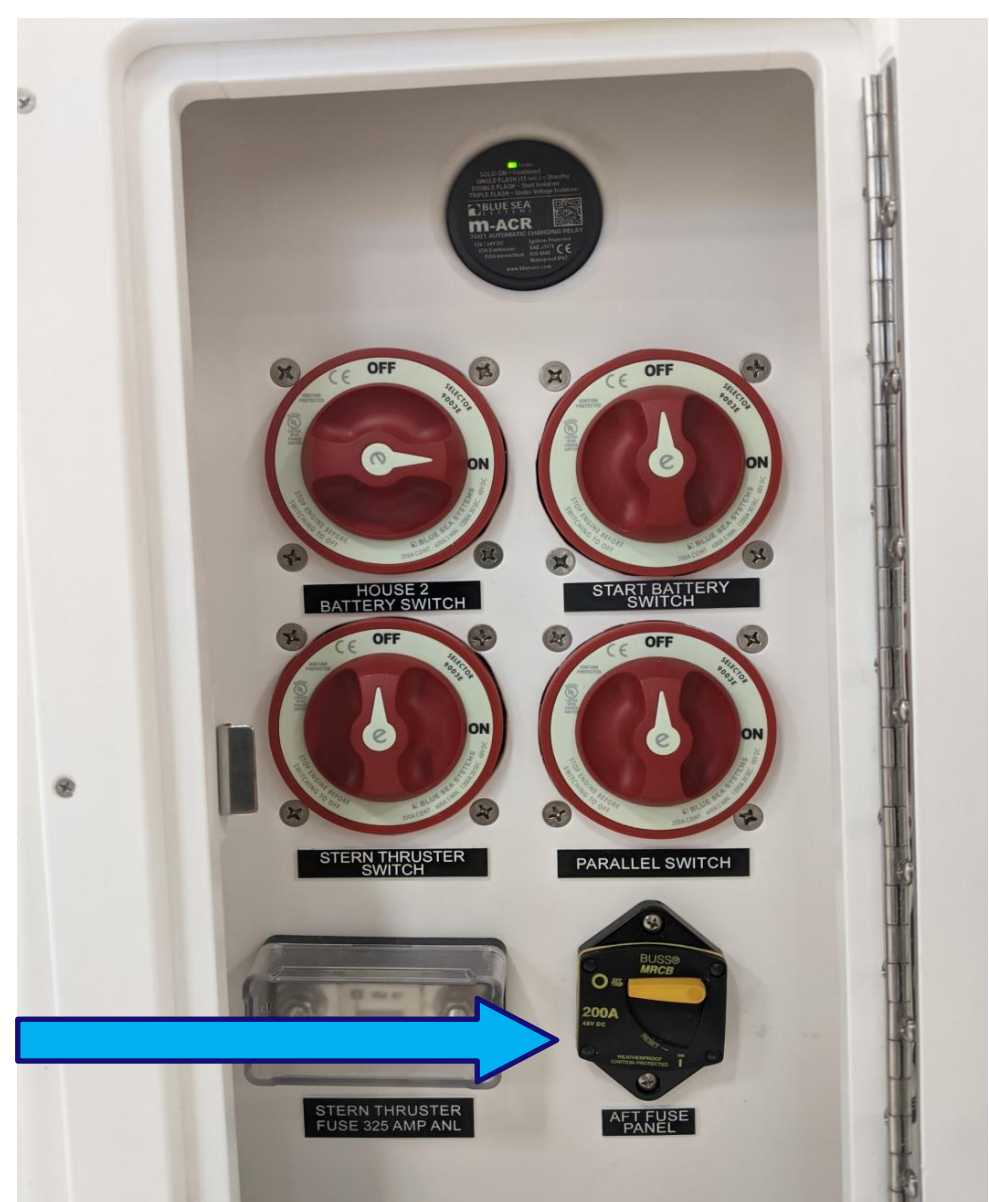


Under
Starboard
¼ Berth

The 25 Amp 3 channel House MasterVolt automatic charger is wired to come on when the boat's shore power is connected and the A/C breakers at the dash are in the ON position. The chargers are four-stage, smart units that charge aggressively when the battery is low and then ramp down as it charges. They stop completely when the battery is fully charged and do a small topping charge weekly. The design greatly extends battery life and prevents overcharging and subsequent battery damage. **Note 1:** You must use AGM batteries as they do not out gas **Note 2:** chargers will only charge if they see voltage. If batteries are dead, you will need to use the Emergency Parallel Switch and charge for a maximum of 4-6 minutes.

The **Full-Time Power Breaker** is **always on**. This 12V hot float breaker is just inside the battery switch compartment. **It is important to leave this on** as it supplies power to the boats six automatic bilge pumps and other devices that need power to save memory settings. It is not affected by the battery switch position.

NOTE: *If the breaker has popped or fuse is burned out, there is no bilge pump protection from leaks.*



AC / DC PANELS

The AC and DC panels are both Blue Sea Systems premium panels.

DC Panel: The DC panel is fed from the House batteries. It includes both voltage (pressure) and amp (volume) gauges to manage your power during the day. Reducing amps used is important to extend battery life. While boating, turn all of the breakers ON. The small black buttons switch will allow you to toggle to show the Engine battery voltage and House battery voltage. These DC breakers then feed the dash DC switch panels (see next page) and the fuse blocks for electronics and pumps. A DC shunt is standard for the amp meter.

NOTE: On DC panel with bilge pump switches, the top three switches correspond with pumps on the starboard hull and the bottom three switches correspond to the pumps on the port hull. First pump is forward, second is mid-ship, and third is aft in the port lazarette. On starboard side, the shower pump is mid-ship.

AC Panel: This panel is fed from the 30-amp shore power connection. Typically, all breakers, except for the hot water heater, are left **ON** to energize the boats outlets.

If the red reverse polarity light is lit (second bulb down), see your dock master before continuing. It is possible some boat systems could be damaged.

NOTE: Turn on hot water only when needed.

NOTE: This panel is fed through the whole boat GFI, mounted just behind the deck side shore panel connection. The whole boat GFI does have a reset button on it.

BOAT GFI: Located on far port side behind the dash above the Master Stateroom bed.



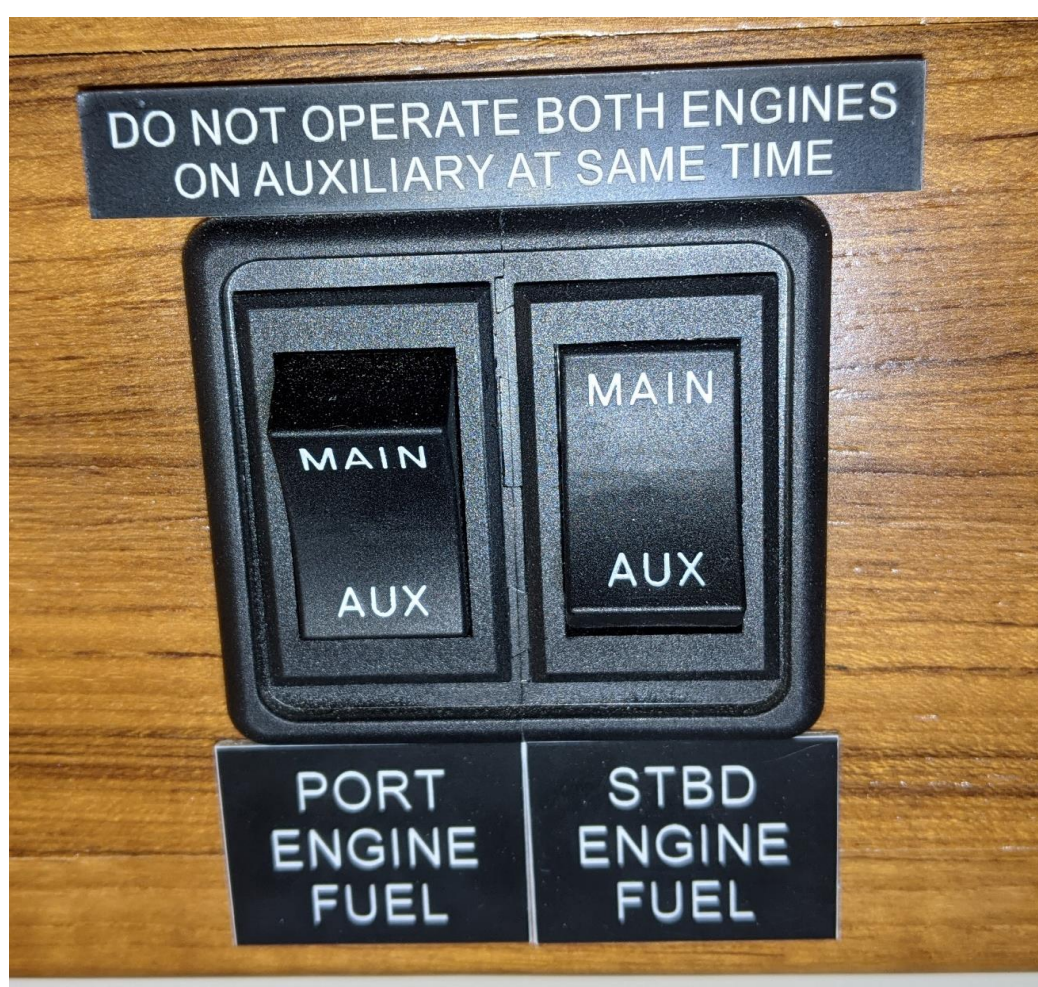
DC PANEL LAYOUT

PUMPS PANEL: The pump panel controls the bilge pumps and shower sump pump. Most of these are automatic, but these switches allow you to manually turn on each of the six pumps for each water-tight compartment. Except for the freshwater switch, these switches are normally in the off position. These panels are fed from the sub panel breakers on the main DC panel. **The automatic portion of the bilge pumps is not affected by this panel.**

SHIP SYSTEMS PANEL: This panel includes controls for navigation lights, blower, and many other ship systems. Like the Pumps Panel, it is fed from the main DC sub panel breaker.

These switch units have separate automotive blade fuses under the plastic snap cover ranging from 5- to -20 amps. If a fuse has blown, determine and fix the cause and replace the fuse. (Possible causes could be debris in pump, shorted wire.)

To access fuses, carefully pop the grey cover off with a flat-blade screwdriver or tape-wrapped dinner knife. Pull rubber gasket over fuses and replace fuse.



FUEL SWITCHES: It allows you to draw engine fuel from any each of the 3 tanks. Aux is the port aft tank and either engine can draw from the port aft tank. Port main is the primary fuel supply for the 115 HP. The starboard main is the primary fuel for the 200 HP. The reason we don't recommend running both engines on aux is that the fuel demand could exceed the flow capacity of the system causing lean combustion and piston overheating.

SHORE POWER DISCONNECT



1) SWITCH OFF BREAKER

**NOTE: When reattaching the cord, you MUST twist to lock and get a complete connection.*



2) UNPLUG CORD



** NOTE: NEVER LEAVE A HOT OR LOOSE CORD ON DOCK, IT COULD SHOCK SWIMMERS IF IT FALLS IN THE WATER. IF A CORD DOES FALL IN THE SALT WATER, REPLACE THE ENTIRE CORD; A FIRE COULD OCCUR AS IT CORRODES INSIDE.*

TANK GAUGES & SOLAR PANEL CONTROLS



TO READ TANK LEVEL:

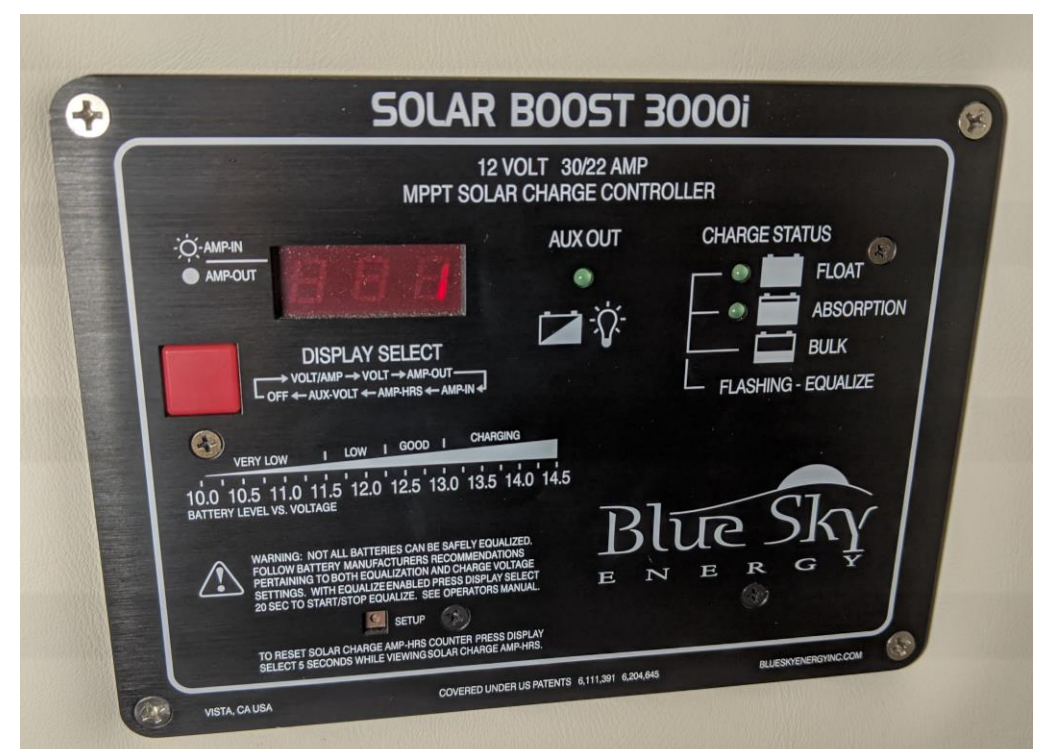
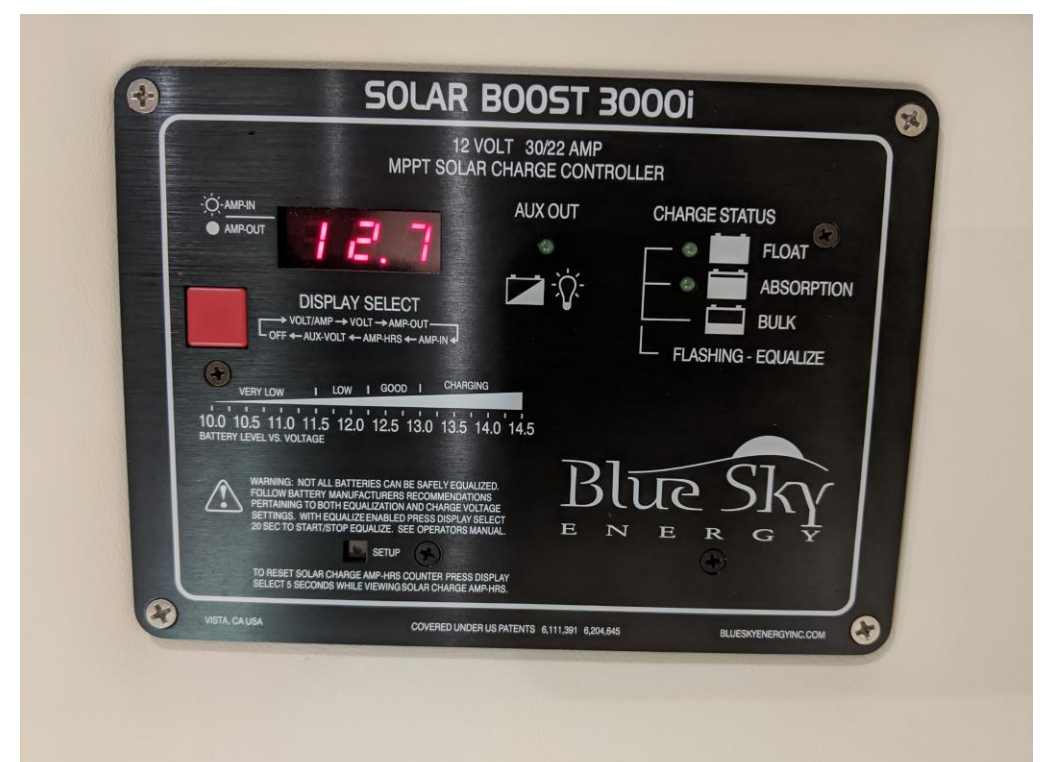
Left Gauge = Left Water Tank
Center Gauge = Waste Tank
Right Gauge = Right Water Tank

SOLAR PANEL CHARGE CONTROLLER

The Solar Boost 3000 is a premium charge controller that helps capture all the sun's peak mid-day energy. **The unit is automatic and requires no operator input.**

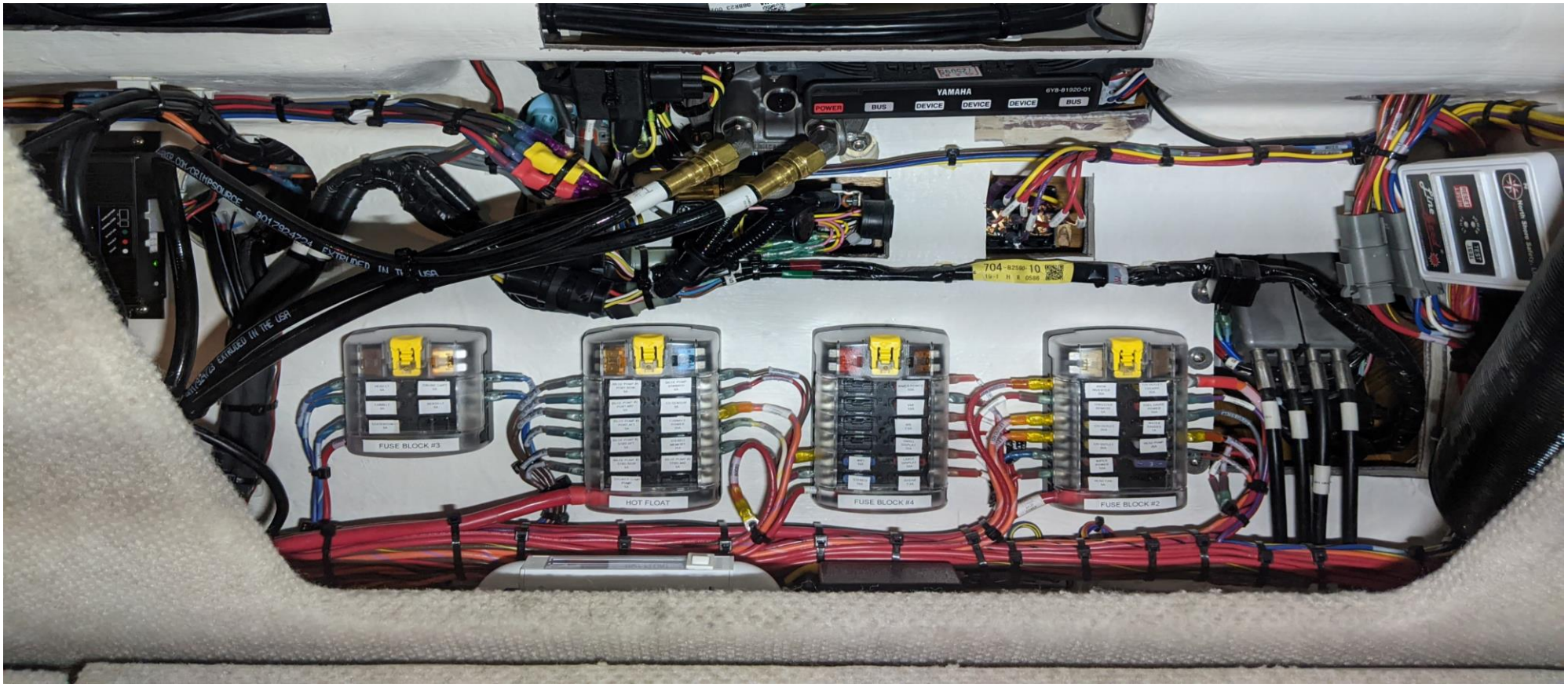
As the batteries become fully charged, the system automatically ramps down its charge, so batteries are not overcharged.

It also automatically shuts down if it senses another charge source (engine or battery chargers). The slide switch is useful to see the current voltage and input of the battery bank. If the batteries are low and the sun is bright, the unit will put out up to 11-amps.



NOTE: *If it seems not to be charging, the batteries may be full, or the Kayaks could be blocking the sun. 1 sq ft. of shade on the solar panel will disable 2 sq ft. of panel.*

FUSE PANELS BEHIND DASH



FUSE HOLDERS (BLUE SEAS): GM AUTO BLADE FUSE-TYPE (FULL SIZE)

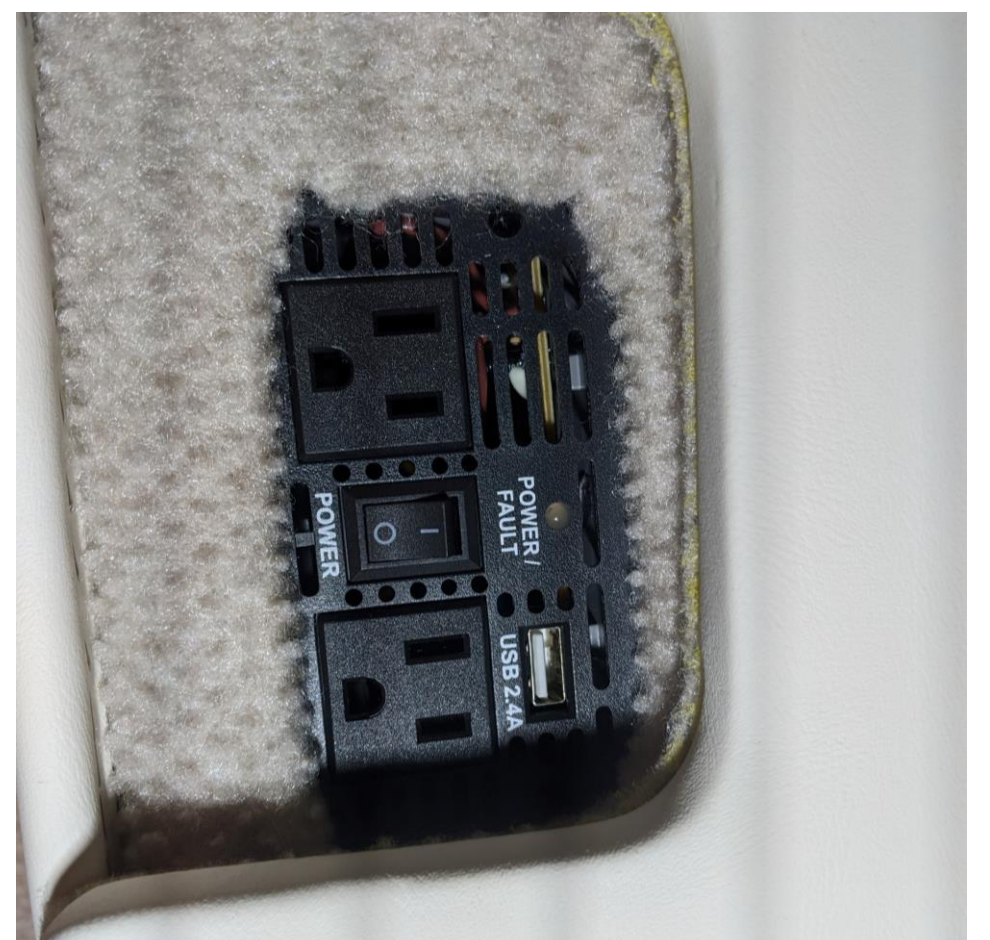
There are 4 fuse blocks behind the dash (Blue Seas USA). The center fuse block is (Hot Float) This block always has power to run automatic bilge pumps and supply power to devices like the Carbon Monoxide sensor and computer memories. The other fuse blocks are grouped as to task IE Bilge Pumps, Electronics, and ships systems. Each cover has a label showing what each fuse does and its rating. Be sure to put the same size back in if one blows and determine what caused it to fail. Bilge fuses often blow due to debris in the pump for instance.

400-watt 12V to 120V inverter for laptops and for charging phones.

Note 1: Inverter will beep during thrusting if left on (low voltage alarm)

Note 2: There is a Carbon Monoxide detector under the edge of the bed.

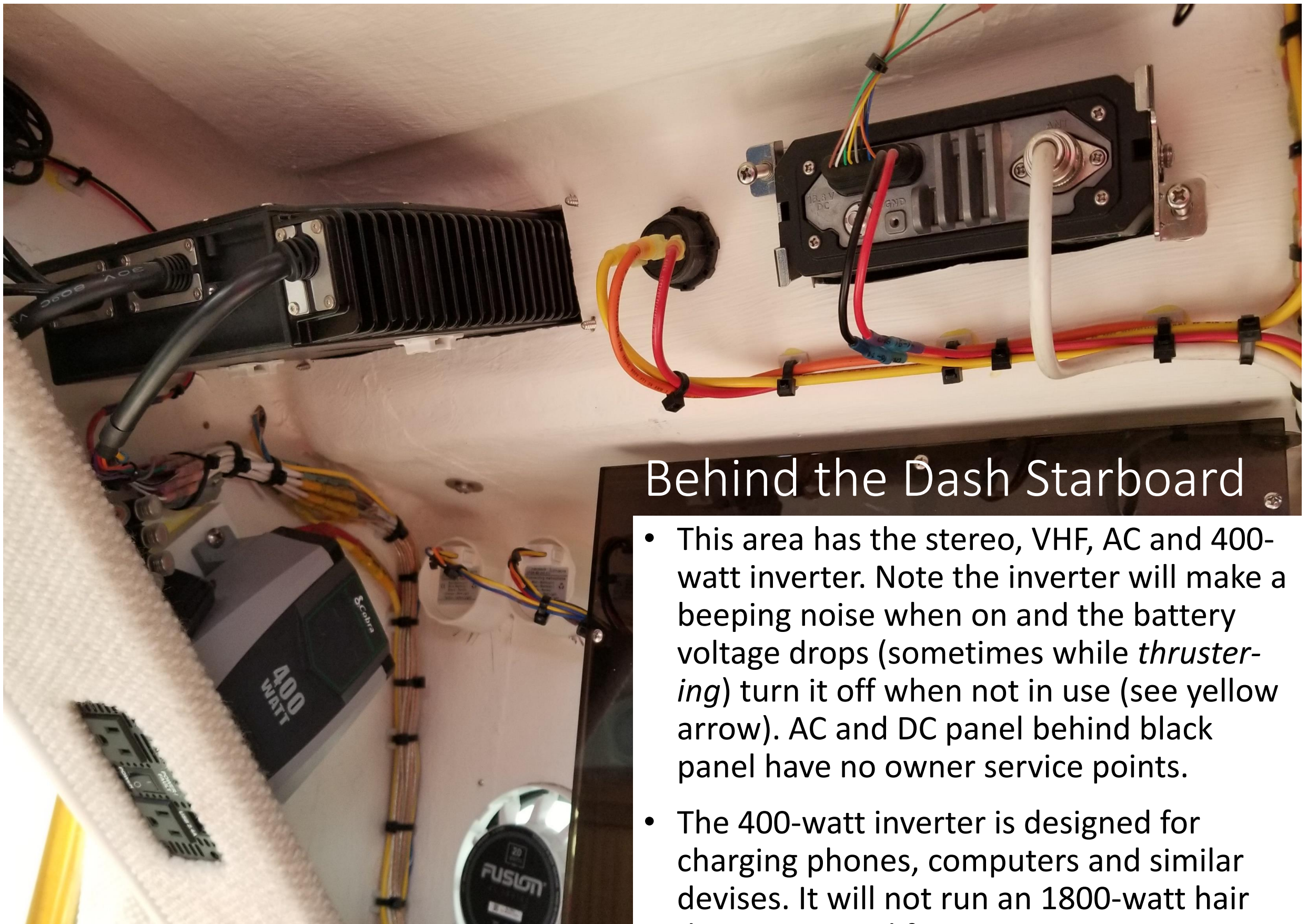
Note 3: Carbon Monoxide detectors age out and must be replaced every 4-5 years





Whole Boat GFI (EFI): This device behind the dash is similar to a GFI outlet that protects against electrical shock. If you find after plugging in and turning on all breakers you still don't have power, then check this unit. If its tripped and power is restored by pushing the button your good to go. If it trips a second time you must determine what the cause is. Some thing got wet that should not be wet or a device or wire has failed in the system. Do not attempt to bypass the unit.

Note: The boat has two other normal GFI outlets. One in the head that also protects the outlet under the dinette and another GFI behind the helm seat. If the outlets are not working push to re-set the GFI.



Behind the Dash Starboard

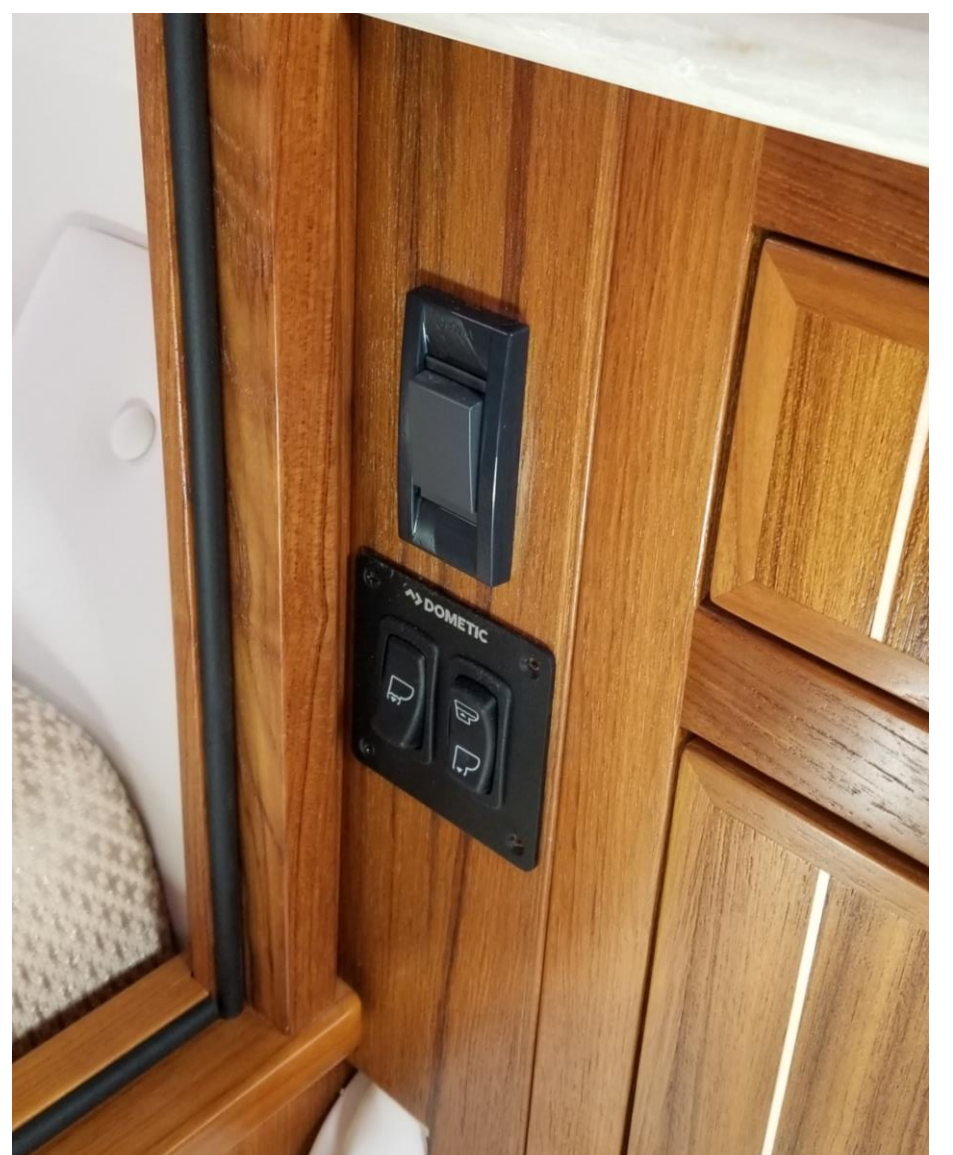
- This area has the stereo, VHF, AC and 400-watt inverter. Note the inverter will make a beeping noise when on and the battery voltage drops (sometimes while *thruster-ing*) turn it off when not in use (see yellow arrow). AC and DC panel behind black panel have no owner service points.
- The 400-watt inverter is designed for charging phones, computers and similar devices. It will not run an 1800-watt hair dryer = popped fuse.

Bath Fan/Head Switches.

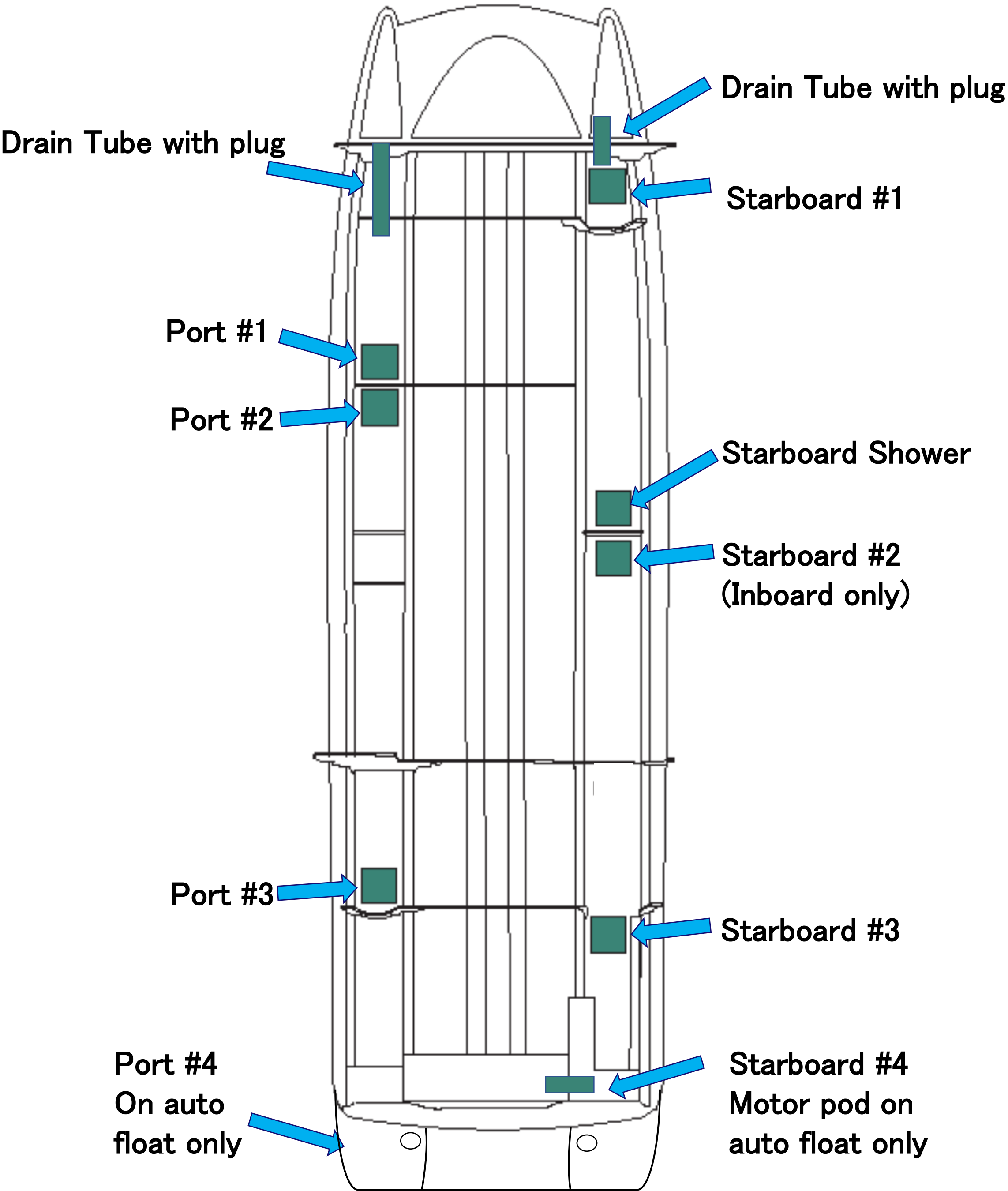
Top switch= Fan
Lower switch closest toggle up fills bowel, toggle down empty's bowel while adding water. Far switch just empty's bowel.

Note: When you flush other than liquid you must run the water in switch for at least 6 seconds to clear the bowel and push the debris through the hose to the tank. The tank needs some water with each flush. If you don't the solids to liquid ratio gets so thick the macerator pumps will not pull it out.

Note:2 After you pump out or suck out the waste tank you must before head use add toilet chemical (Oxie Clean 2/3 cup or head detergent) into the bowel, then 3 half bowels of water. The goal is to get 1-2 inches of water in the bottom of the tank before solid debris. If you don't you can have stalactite type blockage near the inlet pipe.



BILGE PUMP DIAGRAM



EQUIPMENT SYSTEMS

Before getting under-way, there are key things to do and check:

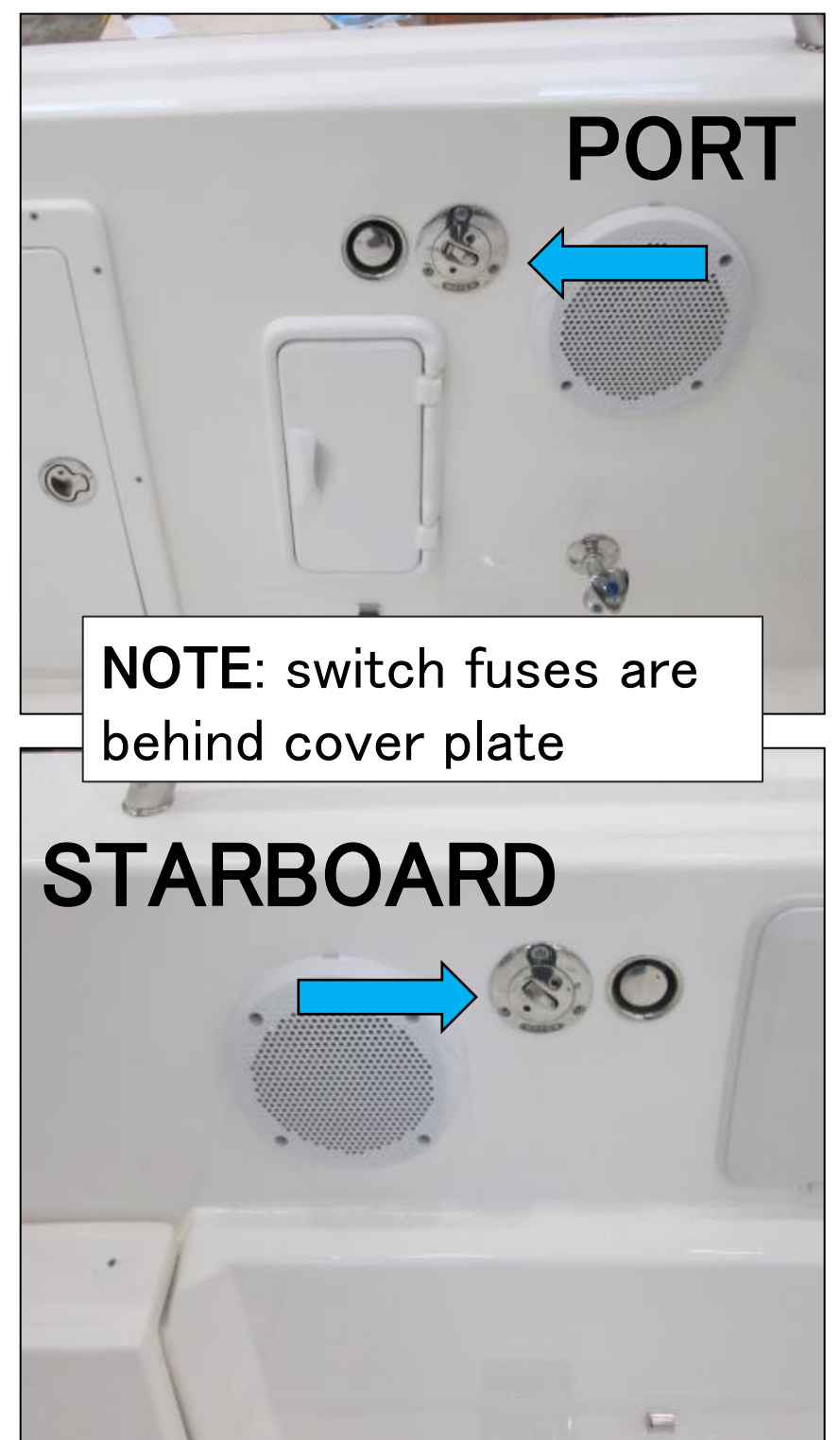
1. Check all safety equipment, bilges, machinery spaces, and service points.
2. Turn on battery switches in the cockpit. Check voltage on the House & Engine Start batteries & make sure you have adequate voltage on all systems.
3. Check all seacocks & make sure they are in the open position. If handle is parallel to the valve, it is open. If the handle is 90 degrees to the valve, it is closed.
4. Check tank capacity levels. Fill water tanks (port, starboard, cockpit fwd walls) & fuel tanks as needed. Be sure water is good – taste it! During long inactive periods, add a little chlorine to keep the water fresh. **Note:** Fuel & water are your heaviest loads. Take what you need plus a good safety margin.
5. Check engine & generator fluid levels and top off as needed.
6. Start Engine. Allow to idle while checking all of your gauges and make sure you have proper readings according to the Engine Manufacturer Specifications.
7. Always remember to follow safe navigation practices.

*Stow fenders,
dock lines &
kicker motor in
aft compartment*



*Switch on
engine
blower*

*Switch on
refrigerator,
Lower left DC panel*



EQUIPMENT SYSTEMS:

THRUSTER, RADIO & WIPERS



Thruster: These side power units are very handy while docking.

Caution: *Be certain no one is in the water near the boat when the thruster IS on. The thruster works like a vacuum, sucking from a large area.*

To use, ensure battery switches are on, then press both ON buttons simultaneously. A green light will illuminate signaling the joy sticks are ready. Press bow stick left, and boat will go left.

Use in 5 - 10 second bursts and never for more than one minute of continuous use to make sure motor keeps cool. Unit shuts off automatically after three minutes of inactivity.

A wireless remote is available for solo docking.

NOTE: *When using thruster, make sure inverters are off. Otherwise, the low voltage alarm will ring on the inverter. Thrusters use a lot of voltage and may even cause low voltage on the chart plotter.*



GARMIN VHF Radio

Turn on by rotating top right knob. Most conversations with other boaters will be on low power. Channel 16 is used only for hailing. Switch to Channels 72 or 68 for other communication. Weather information is available by pushing the WX button. Use the lower knob to squelch background static.



Wiper Motor

The controls are on the left side of the dash. The wipers have two speeds. Push the control to wash. Wash tank is in the back corner of the storage bin, behind the refrigerator, under the helm seat. You will have to remove safety gear to gain access. Rain-X works great on front and side windows to aid in visibility.

EQUIPMENT SYSTEMS: ENGINE & SAFETY GEAR



Starting Engine: Once batteries are on you can start the engines. The key switches are mounted port switch, port engine, starboard switch, starboard engine. Turn the Key switch to the right release after engine starts repeat for next engine.

Note: Safety lanyard must be slipped in and motors in neutral for engines to crank/run

If you lost your safety lanyard in an emergency the button can be pulled out and a zip tie slipped under to get running



Engine Computer: The engine computer is very useful as it allows you to view engine data. For both the 200 hp and the 115 hp

NOTE: *If you hear a horn or beeping sound while underway you must stop and determine the cause. Engine manuals can be found under the helm seat in a black briefcase.*



**Safety Gear
Storage/Owner
Manuals**

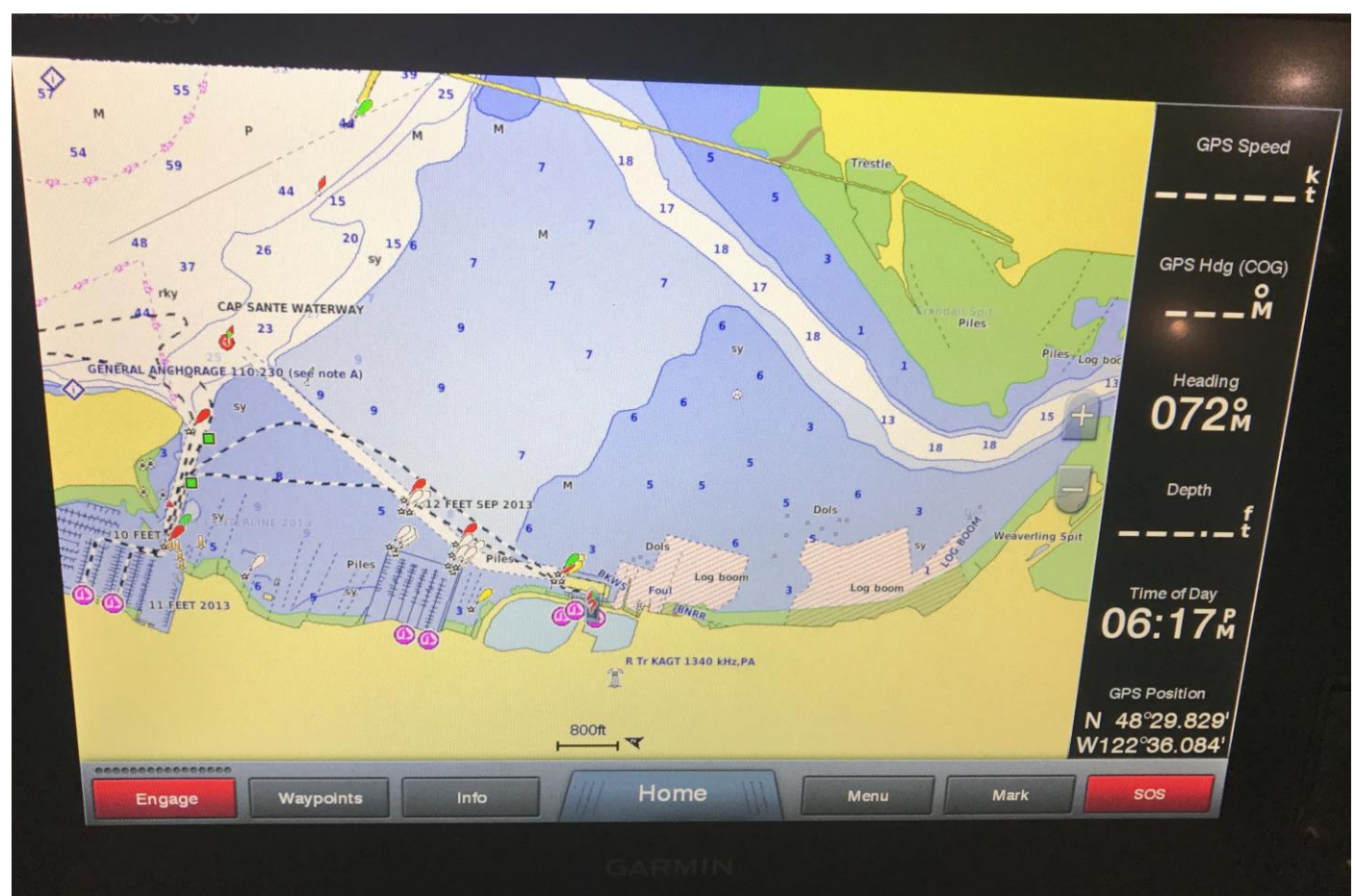
EQUIPMENT SYSTEMS: GARMIN CHART PLOTTER



To start the chart plotter, locate the power button at the bottom right of the unit. Press and hold the power button for three seconds. The unit will start in approximately ten seconds.

1) Press “Charts”

2) Press “Navigation Charts”



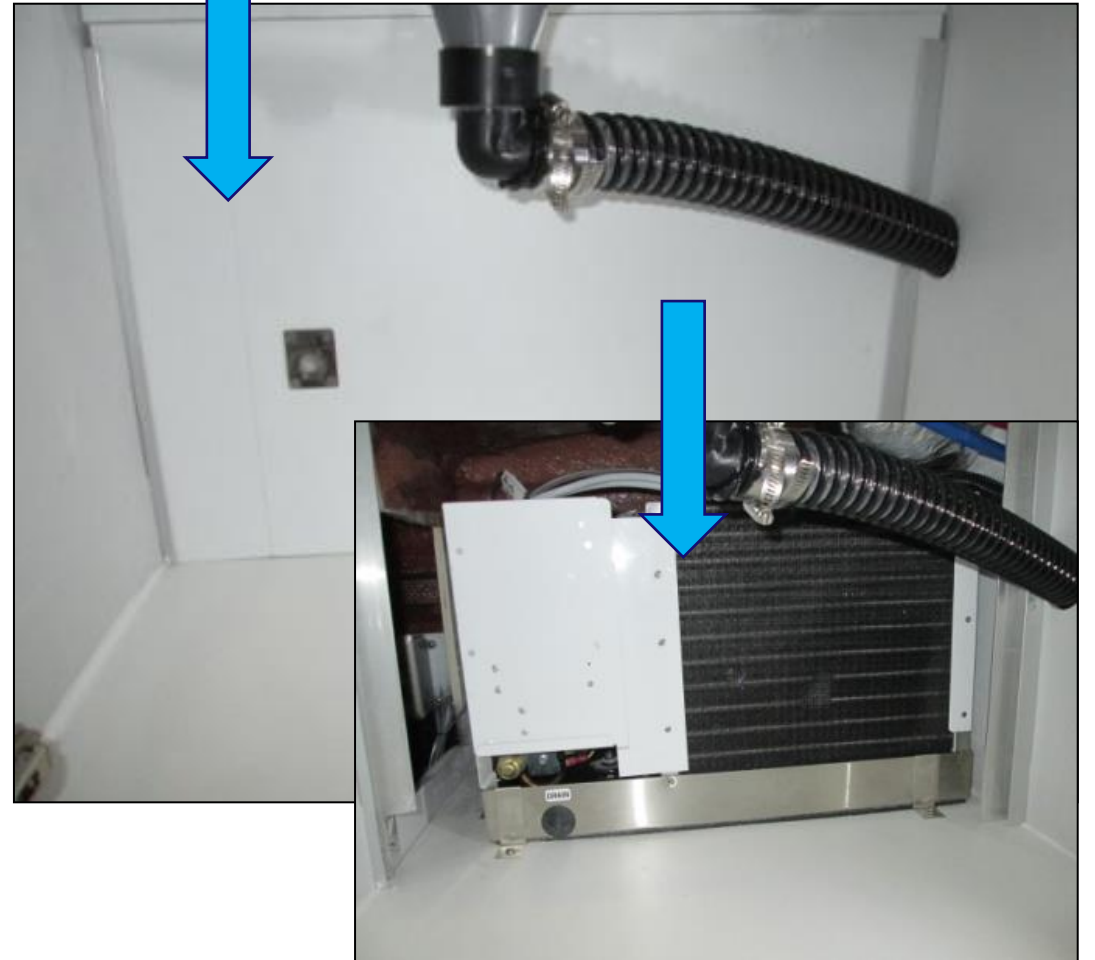
The screen will display chart and data fields. To zoom in, press the + key; to zoom out, press the – key. To change the page to sounder, press the home button and toggle to the desired page.

NOTE: *To dim the unit at night, tap the power button and use the active button to adjust light level. You must turn the light level back up when done or the screen will be black the next day, making it difficult to see the buttons.*

GARMIN HELP LINE #1-800-800-1020

AIR CONDITIONING UNIT (Option)

The unit is located under the sink.



Quick-start Operations Checklist:

- 1) Ensure seawater-intake ball valve is open.
- 2) Make sure the control is powered off.
- 3) Turn on the air conditioner circuit breaker. If the seawater pump has its own circuit breaker, turn that on also.
- 4) Turn the control ON.
- 5) Press the Fan button. Verify that the fan is running and that there is steady airflow out of the supply-air grille.
- 6) Select a temperature set point lower than the current cabin temperature. This starts the compressor and seawater pump.
- 7) Check for a steady solid stream of water from the overboard discharge.
- 8) Verify that there is a steady airflow out of the supply-air grille.

For more specific operation instructions, see your AC Unit owner's manual for further detail.

The vents are located in the salon, at the dash and in the master stateroom. Do not block the flow as this will freeze the heat exchanger and cause it to shut down.

Note: *If a vent is not flowing, remove the grill and twist the inside valve open.*

LEWMAR WINDLASS



The Lewmar Windlass is mounted on the front deck. For ease of use, it has power controls located at both the helm and front deck. The unit uses 5/16" chain, typically 40', and 250' of ½" line, typically triple-braid, that's been woven to the chain. The capstan can handle both the chain and line, transitioning automatically as the line moves through. When the line is new, it is a good idea to remove the anchor at its swivel and run the line up and down (in deep water) two-to-three times to clear any kinks in the line.



The windlass has a friction clutch built into the capstan. Its tension is adjusted by turning the SS knob and tightening clockwise for more friction, counterclockwise for less friction. This is a delicate procedure, as too little tension causes the clutch to slip when lifting under-load. Too much tension while the anchor is lifted can cause damage. When the anchor rode has been purchased from Aspen, it includes depth markers every 30ft to aid in anchoring. The owners bag includes a Lewmar wrench for clutch adjustment.



The windlass breaker is located in the master staterooms hanging locker, just forward of the bow thrusters service hatch. **Note:** *The anchor line end must be secured to the bitter end cleat in the anchor locker. Be sure to secure the anchor with a bungee or line while underway.*

ANCHOR DETAILS

WINDLESS WITH CLEAT AND ROLLER
(Be sure to add bungee or snubber to secure)



LINE AFTER STACKING – DETANGLE



ANCHOR DEPTH MARKERS



WINDLASS WRENCH



Use wrench to tighten/loosen clutch, capstan.

Note: The wrench is key to adjusting how much force the windlass pulls in with. Too tight and you will damage the roller assembly.

TILT HELM & CURTAINS



The Tilt Helm lever is located under the steering wheel.



The hydraulic fluid (Teliflex) fills at the top under rubber cover.



Running attitude, 16 Kts, tabs down.



Master Curtains snap in. Each is Labeled Port/Starboard with arrow showing forward. Fold and store in headboard bookshelf.

SHOWER CURTAIN & SPRAYER

First, set water to preferred temperature. The sink wand lifts to hanger near the door. The curtain from shelf behind door is snapped into the ceiling buttons. Dry door and shower floor when done. Door can be left open or closed while showering. The automatic sump pump under the head evacuates the water.

Note: To conserve water, “boat” showers are recommended. Get wet, turn off water, soap up, rinse off!

Before leaving the boat for an extended period of time, sponge out the sump under the toilet to eliminate odors.



Sprayer has three positions:

OFF



ON



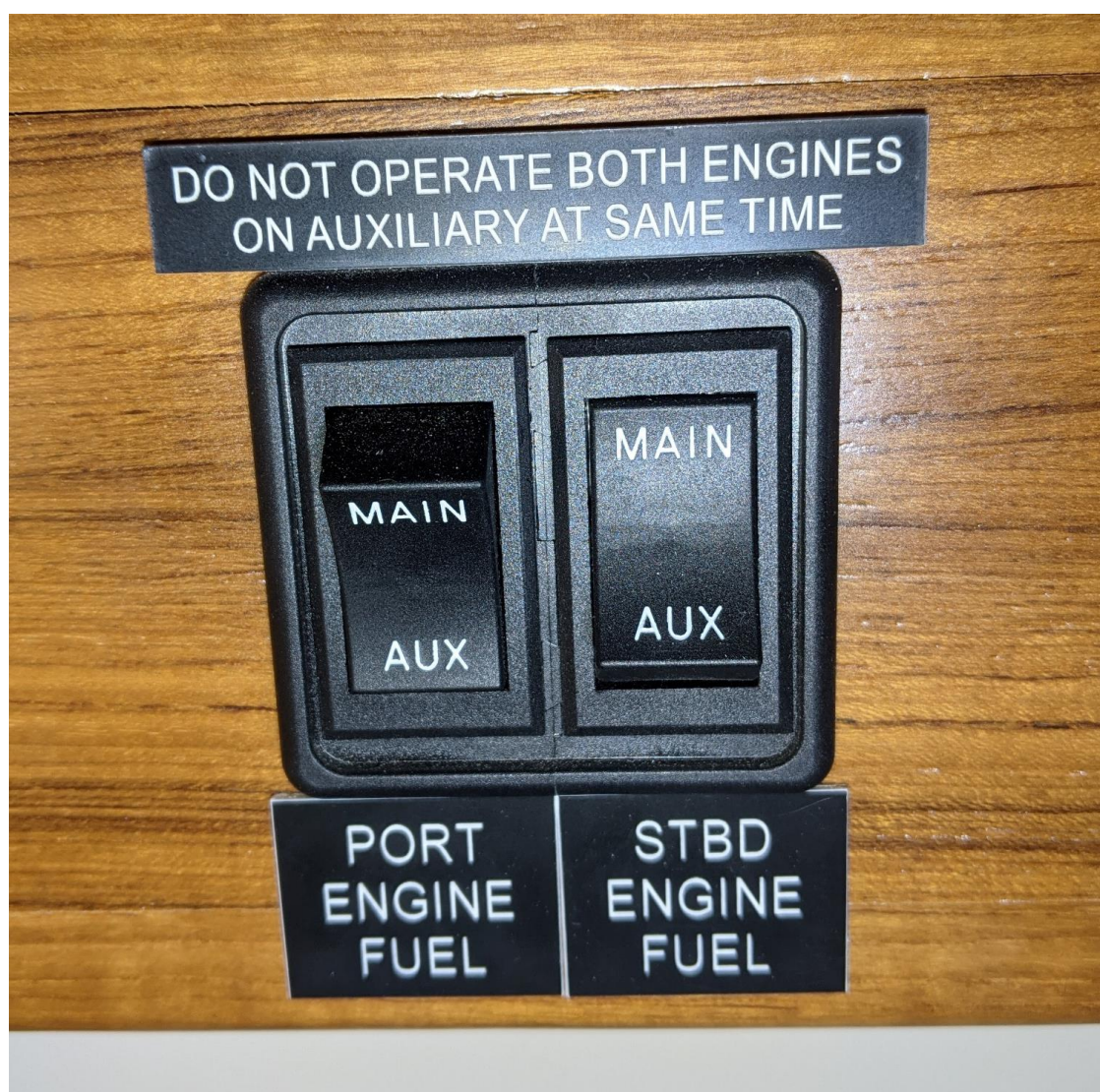
ON FULL TIME



FUEL SYSTEM: FILTERS & PRIMING



The C108 fuel system includes three filters and a two electric switching valves at the dash that control a spool valves near the filters (starboard forward hatch). In normal operation, the switches will be in the main position. (never operate both engines in the AUX position at the same time you may starve the engines of fuel and damage them. Each switch controls the main and auxiliary tanks for both engines. The 200 Hp engine feeds from the starboard 70-gallon tank. The 115 hp engine feeds from the port 37-gallon tank. The auxiliary tank is 37-gallons and also, in port hull. Either engine can use aux.



The Fuel Tank Switch's is located on the left side of the dash. Select the desired tank by pressing the switch of the desired tank.

Note: The port side fuel fills are oriented, so the outside fill is Main, inside is Aux.

RAW WATER BALL VALVE

There is one raw water valve on the boat located starboard forward lazarette open the starboard hatch forward inboard you will see the thru hull valve. The one valve has two $\frac{3}{4}$ " hoses coming off of it. One hose feeds the seawater washdown pump and the other feeds the seawater to the toilet.



Raw Water
Valve OFF

MOTOR POD DRAIN VALVES

Port & Starboard motor pods are equipped with one way drain plugs. Starboard drain plug is located directly on the transom center line. Port drain has a hose running forward of the waste tank and a valve at the end directly above the bilge pump. Always keep drain plugs in the open position so you can see if there is a leak in the motor well itself. Plugs are provided if needed and tethered nearby.



Starboard Side

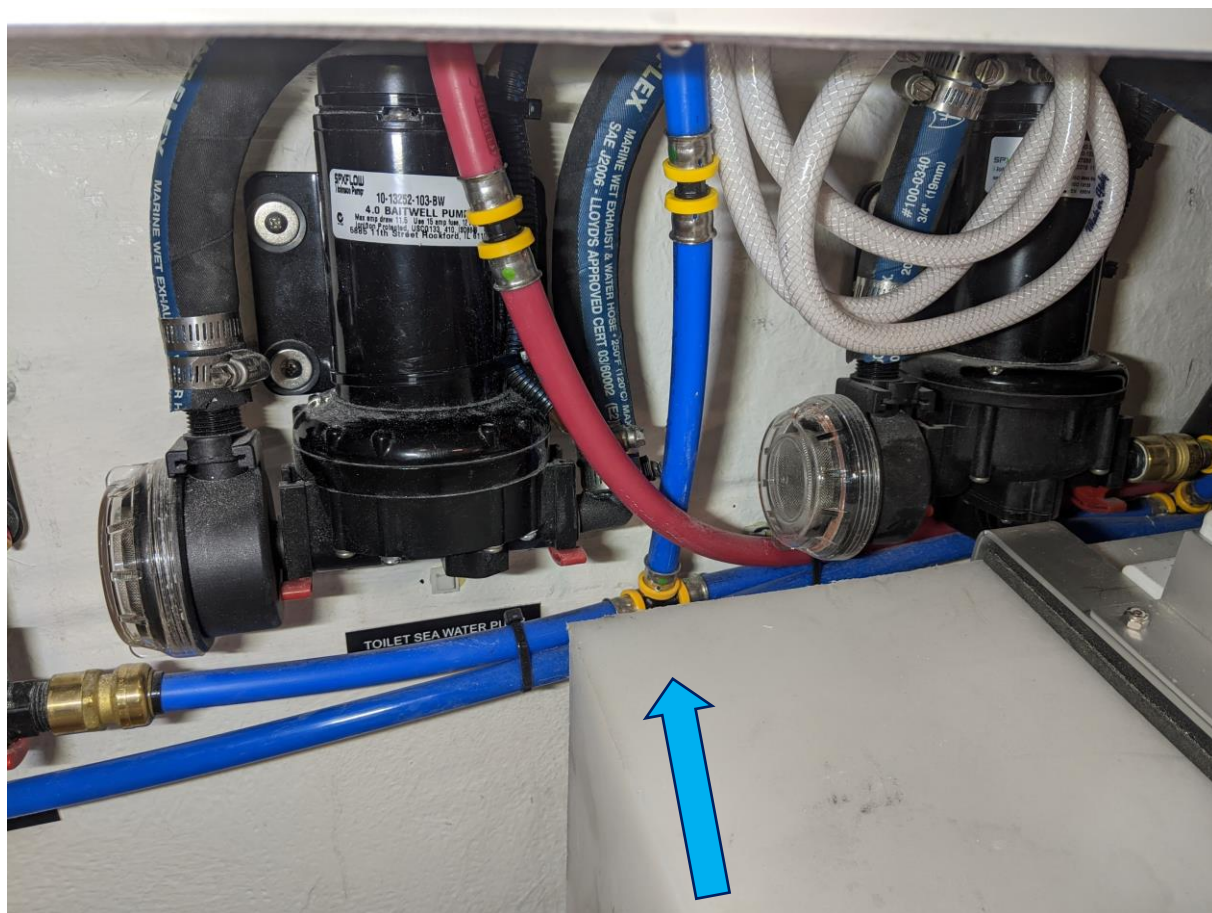


Port Side

The plugs are set so water from the aft of each main hull can flow into the motor pod and be pumped out by the pods bilge pump. But water from the motor pod cannot run forward into the main hull.

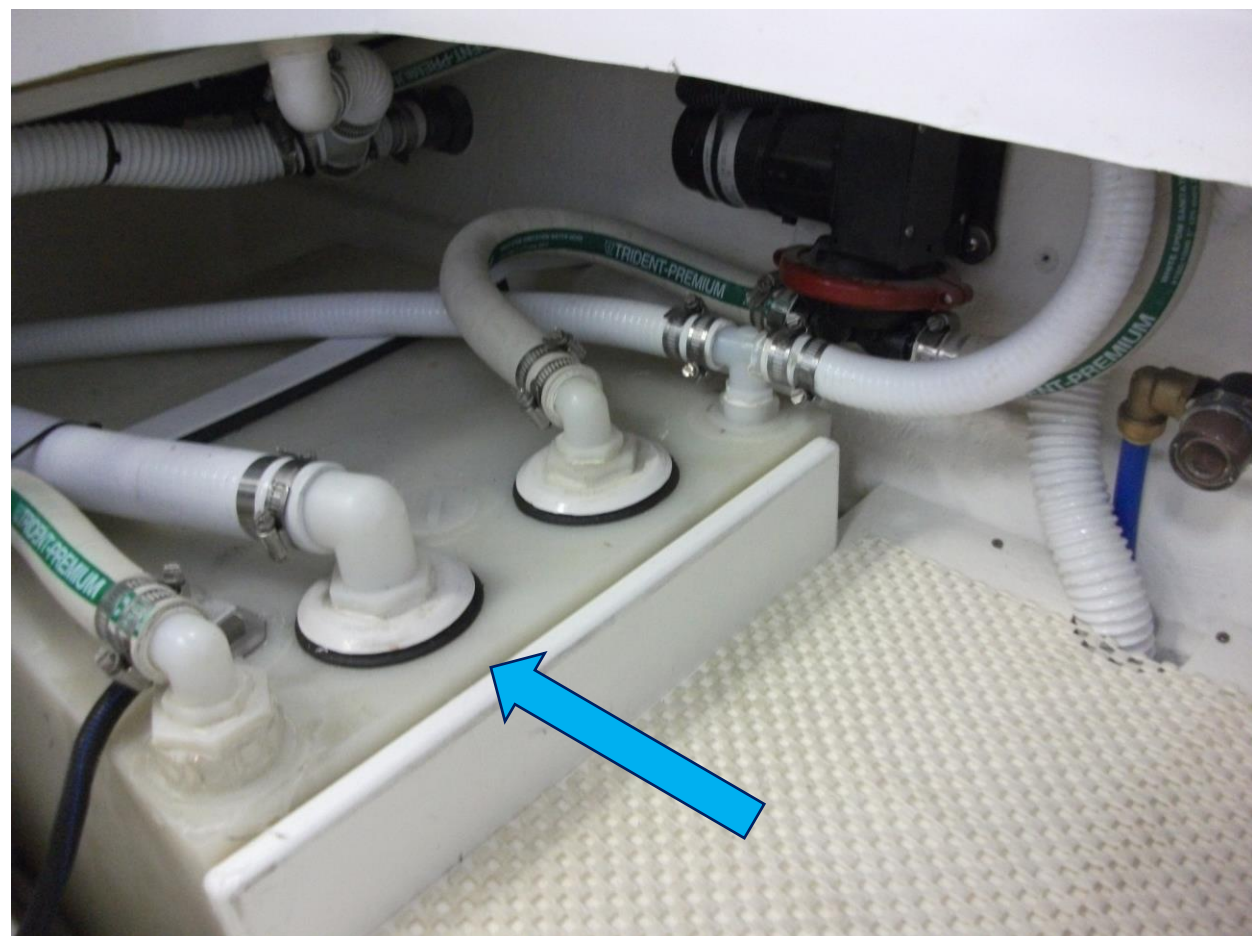
LAZARETTE EQUIPMENT

Pressure Water Pump & Strainer The C107 has two water tanks (24 gallons port side forward under ¼ berth and 26 gallons Starboard side) each has a dedicated pump. The freshwater pump switch is located on the dashes lower DC switch panel. Two tanks are provided so owners can use water to trim the boat port to starboard if needed. Water like fuel is a heavy cargo, top off only if you need it. Water Tanks must be drained, and system primed with RV antifreeze during winter storage.



Sea water wash down pump And Fresh water pump located port laz outboard aft

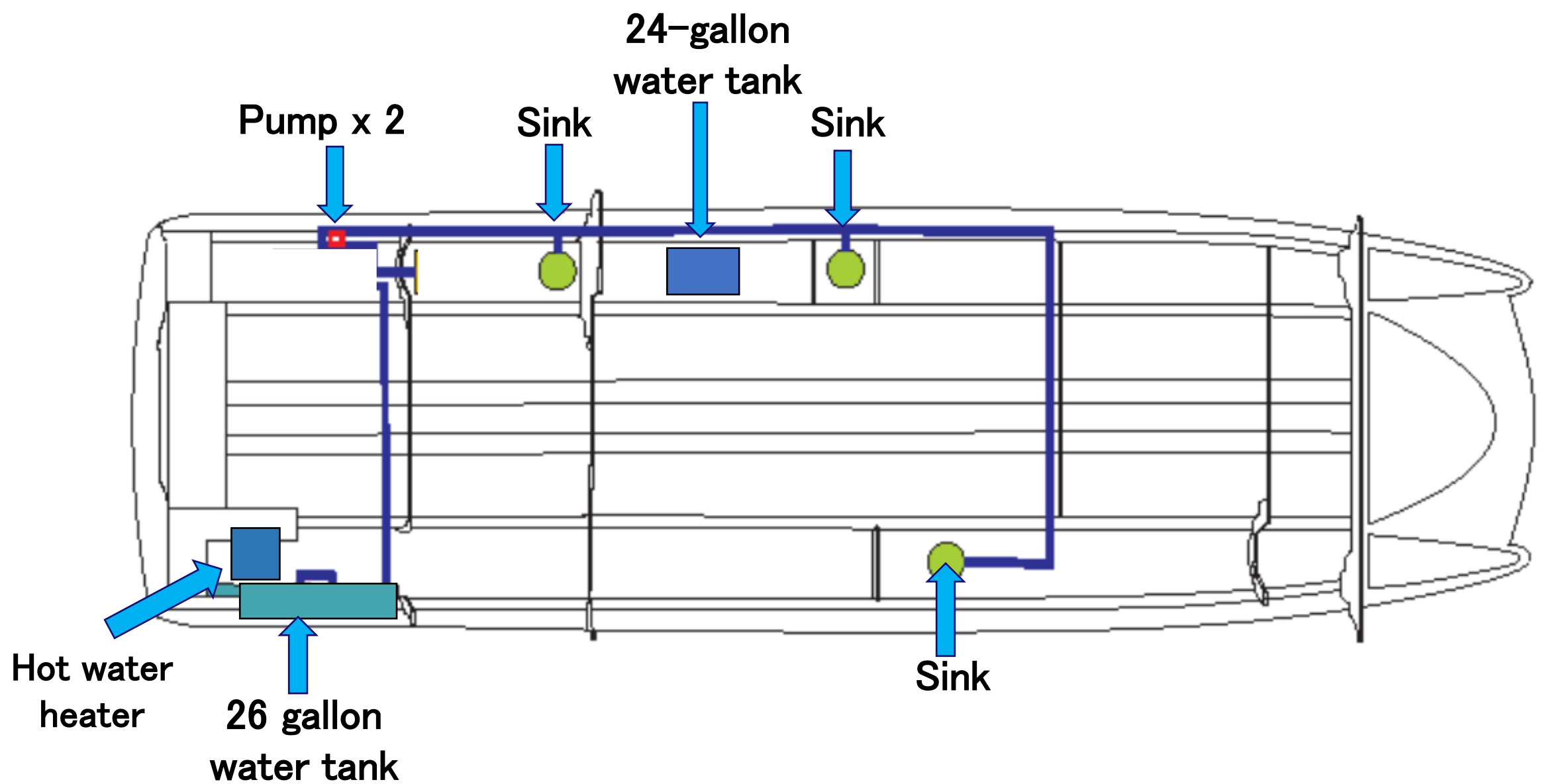
6 Gallon SS Hot Water heater SS is located in the starboard lazarette. It runs on 120 V while at dock. Note it draws 1800 watts so you will not be able to run large additional loads while the water heater is on. Switch its breaker on only when hot water is needed. On inboard models, while cruising, the engine's hot water is plumbed through the heater to heat water.



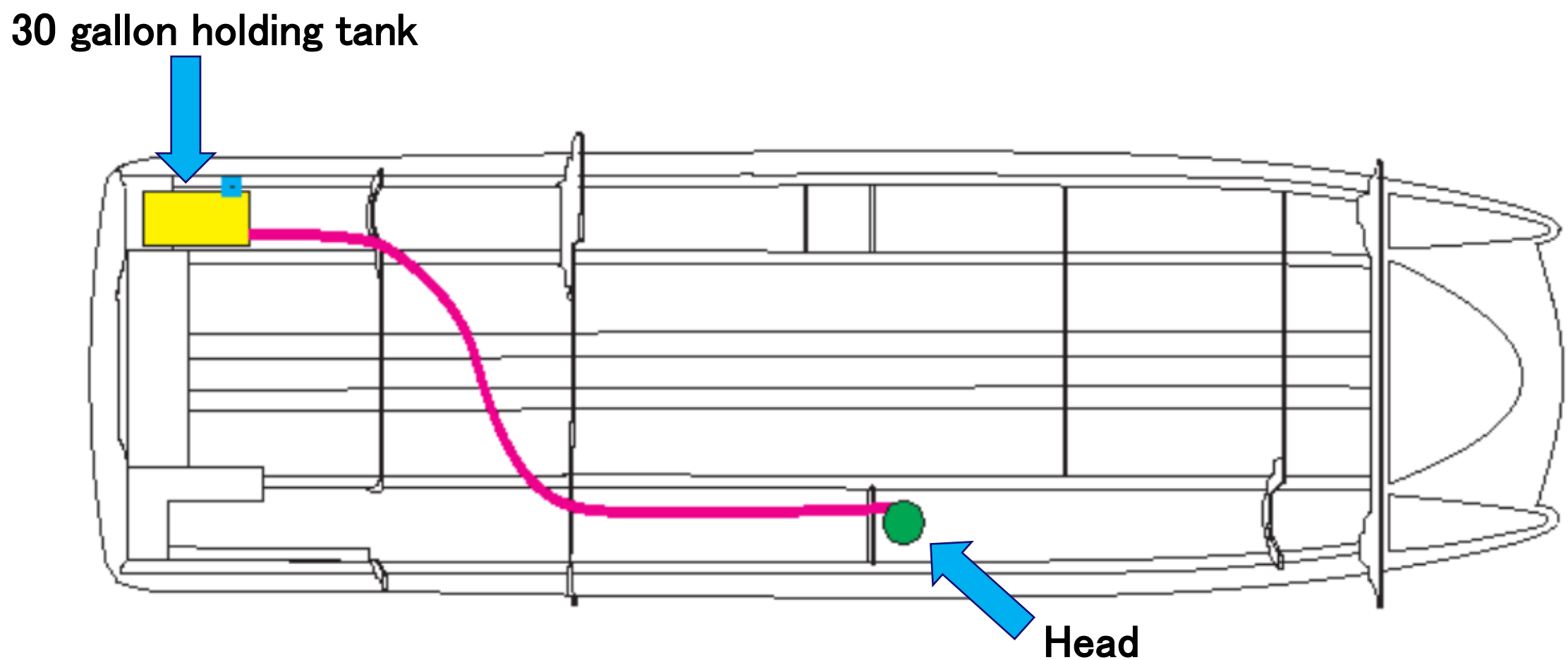
The black water holding tank is a 28-gallon tank. It is equipped with a Wema sensor gauge system located to the right side of the dash. If the tank is full the head will not flush. You must be three miles offshore and in an area with current that will flush to use the macerator switch at the dash. The tank can also be emptied at a pump-out station using the fitting near the transom door. The tank includes two dip tubes so there is no Y-valve to switch. Overboard discharge pump located outboard of tank.

NOTE: *Shut the boat off to hear the change in tone when the tank is empty.*

WATER SYSTEM DIAGRAM



HOLDING TANK DIAGRAM



LPG TANK

STORAGE & OPERATION



Propane tank is in the Port Cockpit storage locker. Note: Locker is plumbed with a hose to a through hull overboard so a gas leak would not enter the boat. If you ever smell gas stop-turn off valve and open boat to clear fumes. Find leak.



To use, make sure hose connection is tight, **open valve**, gauge will show approx. 90 Psi. If you hear a hissing or smell gas turn valve off ,check connections w/ soap 50/50 water solution.. 15-pound tank will typically last 2-4 weeks.



Electric shut off valve only comes on if gas controller by sink is on and sniffer smells no gas.



The tank must be centered in compartment to latch lid in place.

LPG CONTROL DETECTION SYSTEM



The propane sniffer control unit is just fwd of the sink. This unit's power may be switched with the black switch just below it. The sniffer is very sensitive and false alarms can be disconcerting. When its off, the solenoid valve at the tank is closed. When stove is not in use, tap the control button and turn the gas off . It will take about 30 seconds before the sensor can be turned to ON position.



Green light when Power is ON, but unit is OFF.



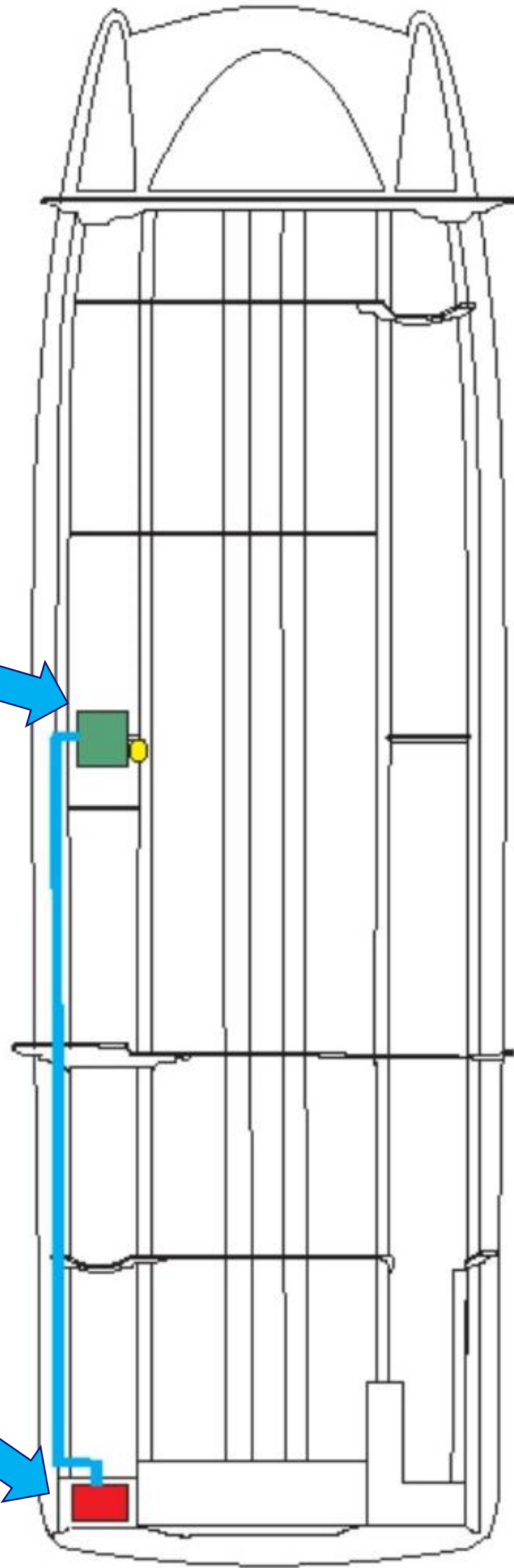
Gas is ON when the green Light is ON.

LPG SYSTEM

STOVE & IGNITOR

Ignitor battery is located in the drawer underneath the galley sink

LPG TANK
Located in port cockpit storage locker



TEAK CARE



Note: Teak surfaces exposed to the sun for extended periods will bleach to a lighter color. Its best when the boats not in use to close the shades or cover the teak with a light-colored towel or similar. Another option is to use automotive style twist and pop shades.



Outdoor Teak Table storage. When leaving the boat, it is best to remove the tables and store inside. The canvas covers are good for when you're actively using the boat, but months of outdoor moisture and temperature cycling can damage the finish.

ZINC REPLACEMENT: THRUSTER

MFG PART #: SM31180A

STARBOARD – BOW



STARBOARD – STERN



TRAILER INFO



Aspens Trailer is built by Float On Trailers in Vero Beach Florida. It is a 10,000-12,000-pound capacity aluminum trailer. The minimum tow truck size is $\frac{3}{4}$ Ton. When the ball weight is set to 6-7% of the towed weight (600-800 pounds) she tows like a dream. Includes a solid winch stand assembly with stair for access while loading. Shown are the optional mag wheels and electric hydraulic breaks (nice for hilly terrain and backing up steep driveways). The design is self centering and loads under power to the winch stand.



Shown are the guide bunks. On west coast ramps the tow truck tires will typically be at the waters edge. On east coast ramps which are steeper you will back in less to get the correct depth.

FOLDING THE MAST FOR TRAILERING

While folding, be careful not to lean on the solar panel glass. Rest the support tube carefully on the SS mast, tip in to cockpit, then lift forward to corner for towing.

NOTE: *It is best to close the door before placing support.*

1. Climb onto Hardtop



2. Remove Pin from Mast



3. Get Support Tube Lined Up



4. Insert Pin Back into Mast



5. Carefully Fold Mast Back



6) Done

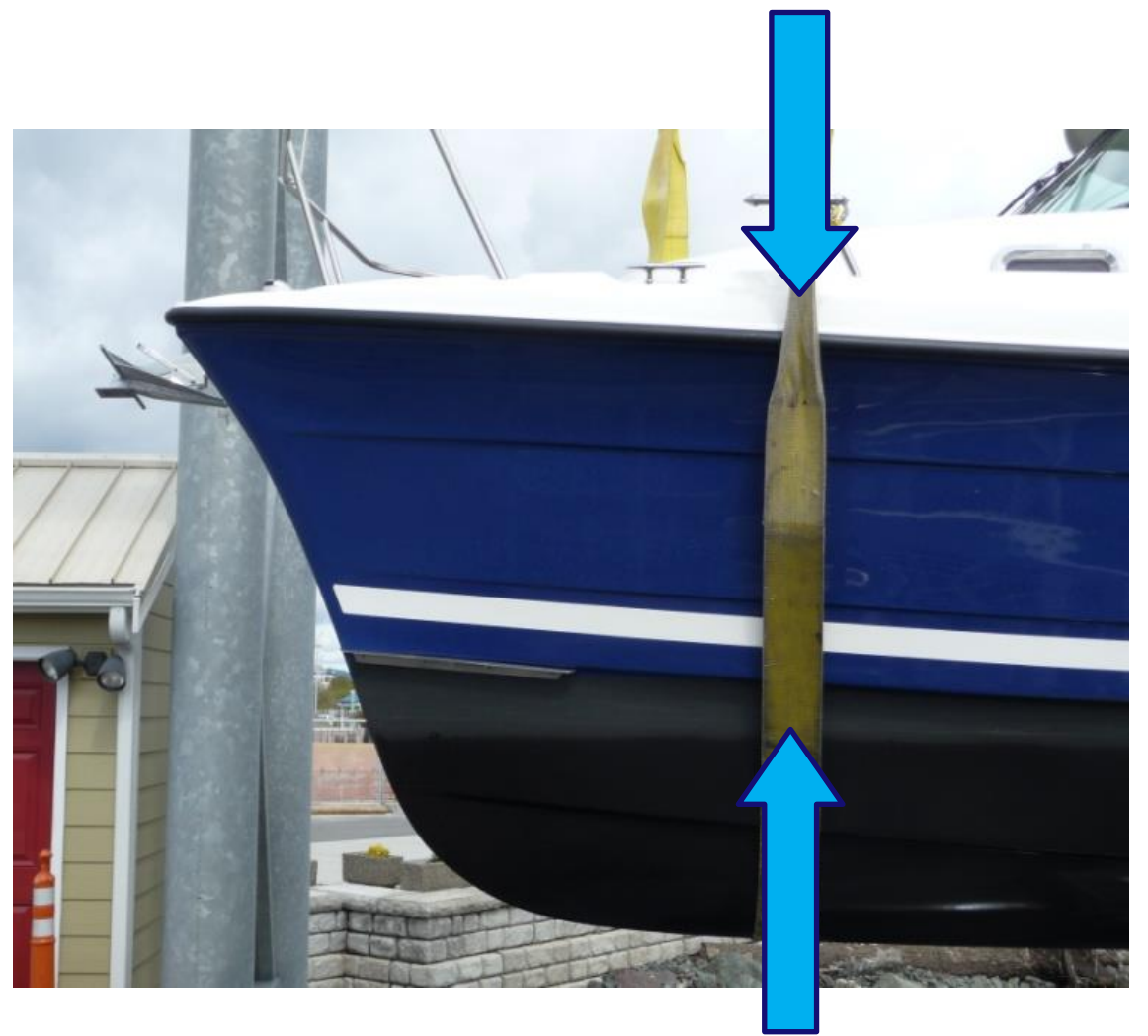


LIFTING STRAP LOCATION

Note: If the spreader bars are less than 11ft., you will need 24" carpeted 2x6's just under the gunwales to spread the compression load from the straps and reduce damage to the gunwale rubber.



Arrows show location of the lifting straps. On the stern the goal is to lift on the keel (Fiber Glass) about 6" forward of the Stainless Sand Bar. **Note:** Be sure to pre-load the starboard side as tension is brought up by pulling the cross bar down closer to the deck/engine load (approximately 10".) This will keep the boat level as it lifts.



The forward Sling goes just forward of the port light well clear of the thruster. The cross bar is typically level for the bow. **Note:** If you lift one end at a time to put blocks in to place the straps be sure to block the trailer frame to support it or you will bend the frame. Add pinch pads if necessary.

BOAT HAULING PROCEDURE

SLINGING THE BOAT

Pre-loading
this strap
down 12-18"
will lift the
boat level.



ZODIAC LAUNCH

1. Un-clip SS support rods



2. Store Rods on transom clip



3. Tip Tender in, leave clipped to boat while mounting motor.



4. Un-buckle engine from aft compartment



5. Support Engine on swim step, step into tender and swing engine to tender and secure.

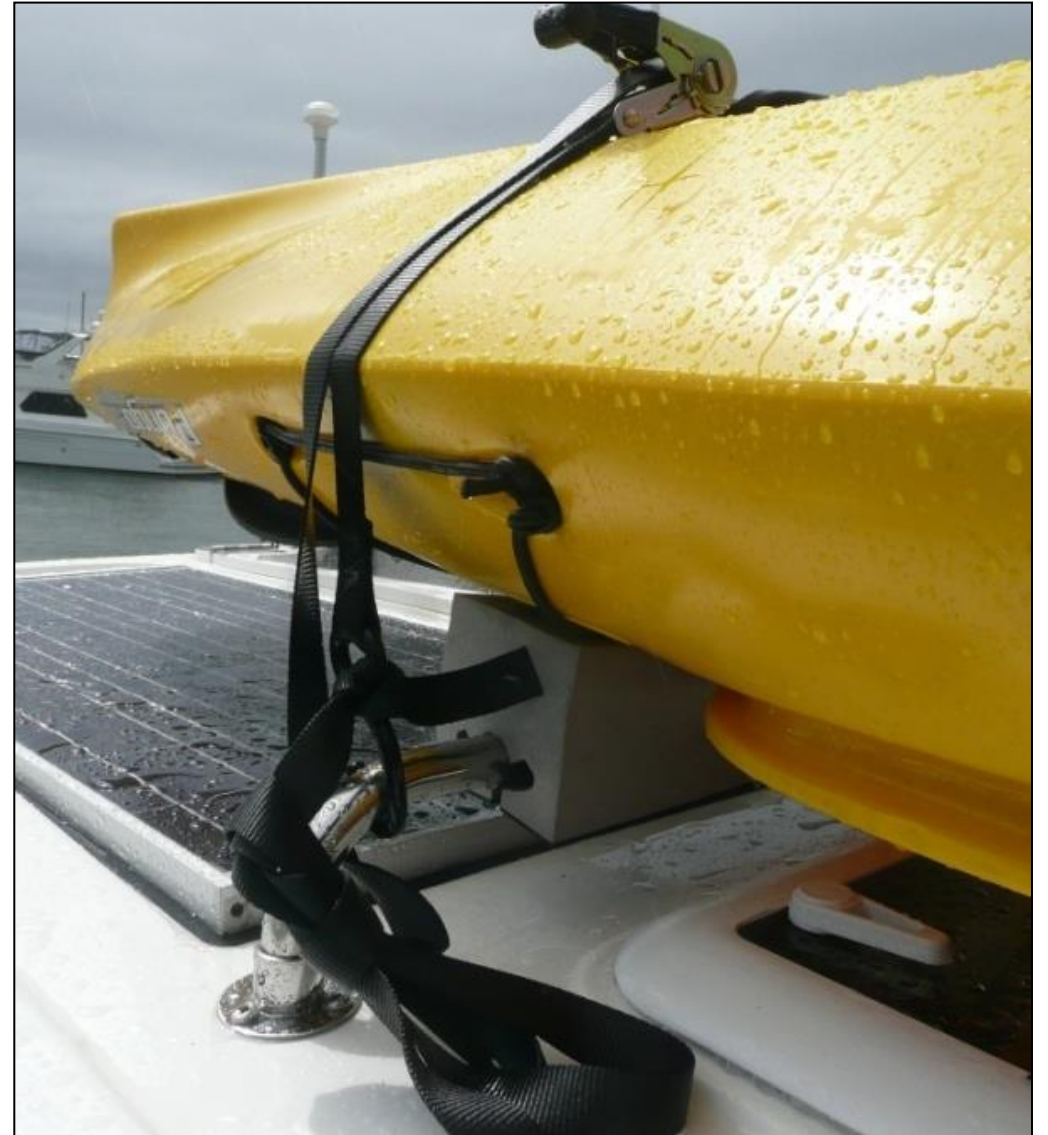


6. When done, rinse engine with hose before storing.

EXTRA DETAILS



Electrical junction box is behind enclosure.



Kayak with ratchet straps and foam pad. Be sure to remove Kayak while towing.

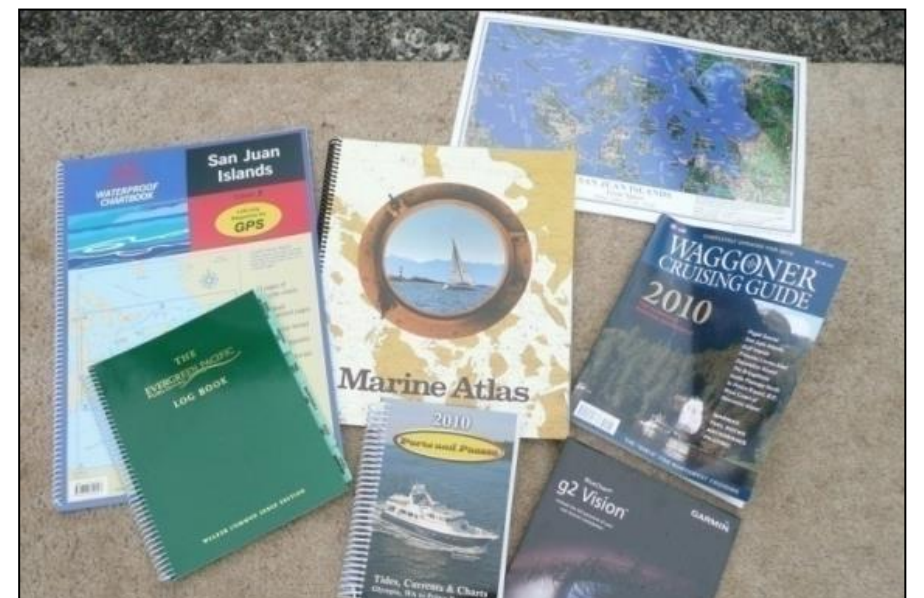


Tender Snubber Ling: used for medium range towing to take wind buffeting out. For long hauls it is best to deflate the tender. The line is also used to help with lower/raise tender.

OUTFITTING YOUR BOAT



OUTFITTING YOUR BOAT



OUTFITTING YOUR BOAT



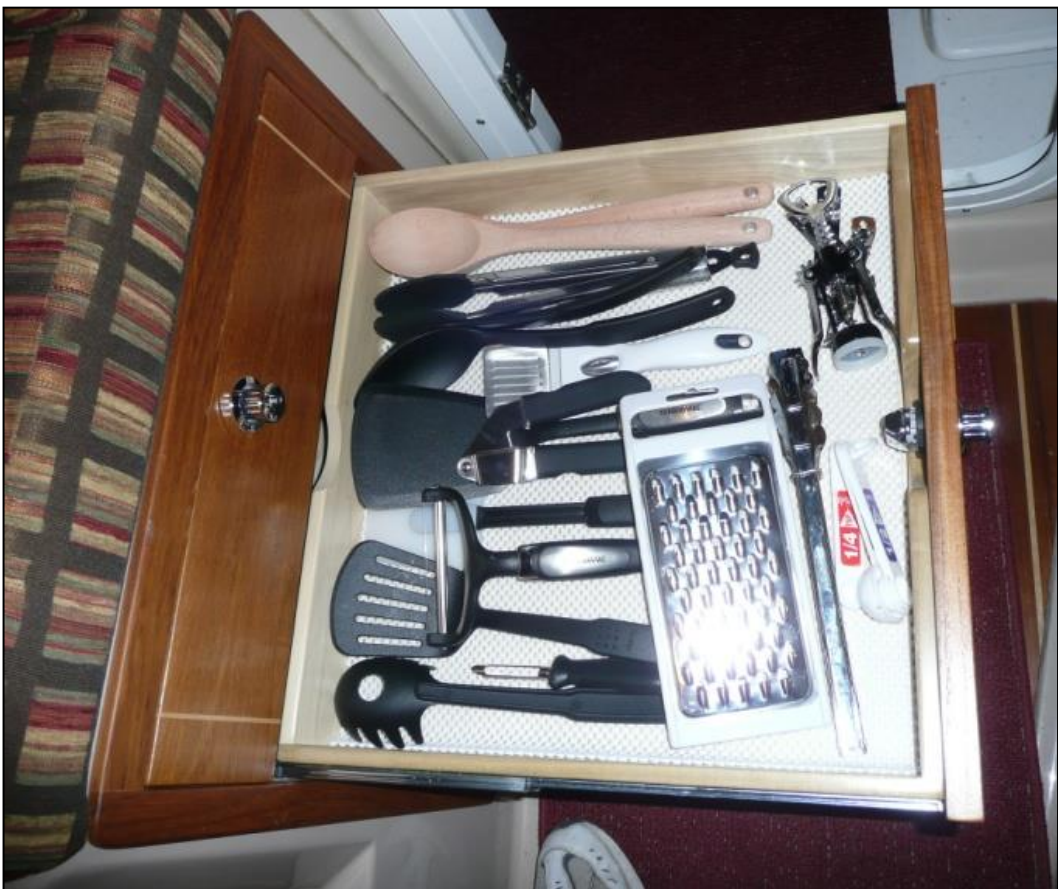
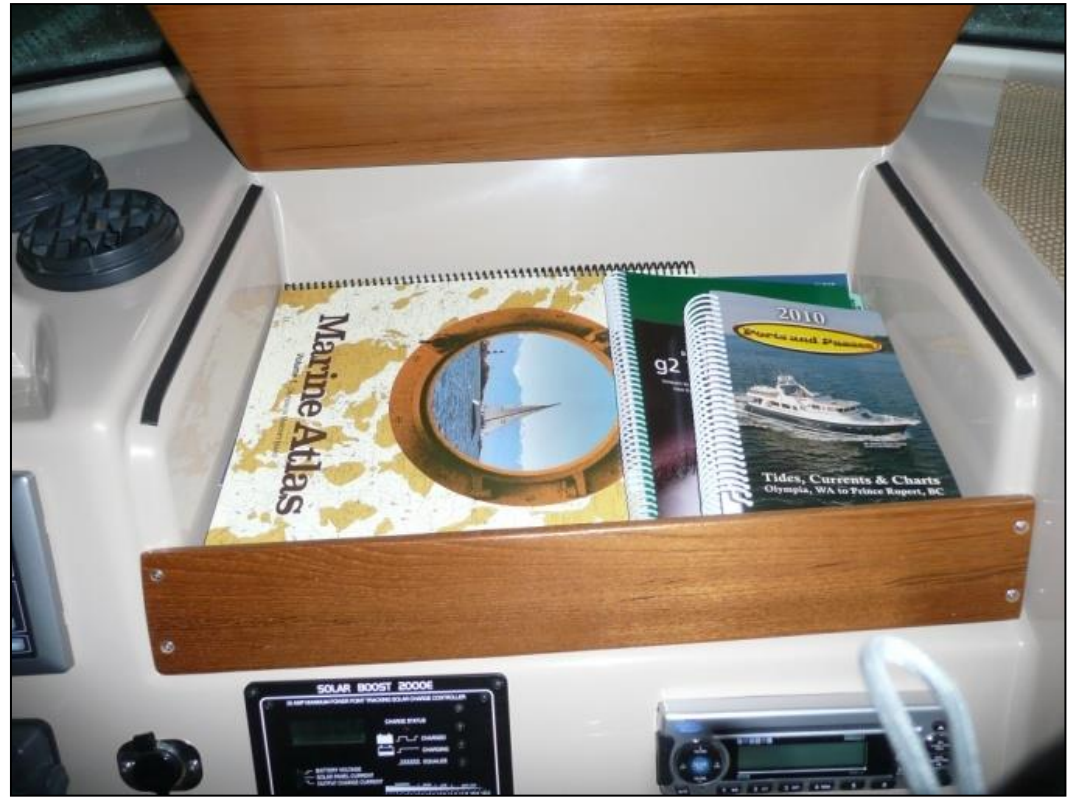
OUTFITTING YOUR BOAT



OUTFITTING YOUR BOAT



OUTFITTING YOUR BOAT



OUTFITTING YOUR BOAT



BOAT CLEANING PRODUCTS



**MAGUIRE' S MARINE BOAT SOAP WITH
WAX KEEPS THE BOAT WAX INTACT.
GREAT FOR GEL-COAT.**



BOAT CLEANING PRODUCTS



T-9 BOESHIELD:

This is wonderful for your engine rooms metal parts, all of them, bronze, SS clamps, motor metal parts, battery connections, bonding system connections and kicker motor. Keep away from plastic, and belts. Light re-coat every 6 months. Wipe up any excess while wet.



303 AEROSPACE PROTECTANT:

This material is for plastic that's out in the sun, I.E. Vinyl seats, Zodiac boats, recoat every 3 months.



MEGUIAR'S FLAGSHIP WAX:

This is a premium wax that provides UV protection. Hand wax once per year in Northern climates, twice in southern. Wax both deck and hull. In the south, even the non skid maybe waxed with a brush.

OPEN HULL

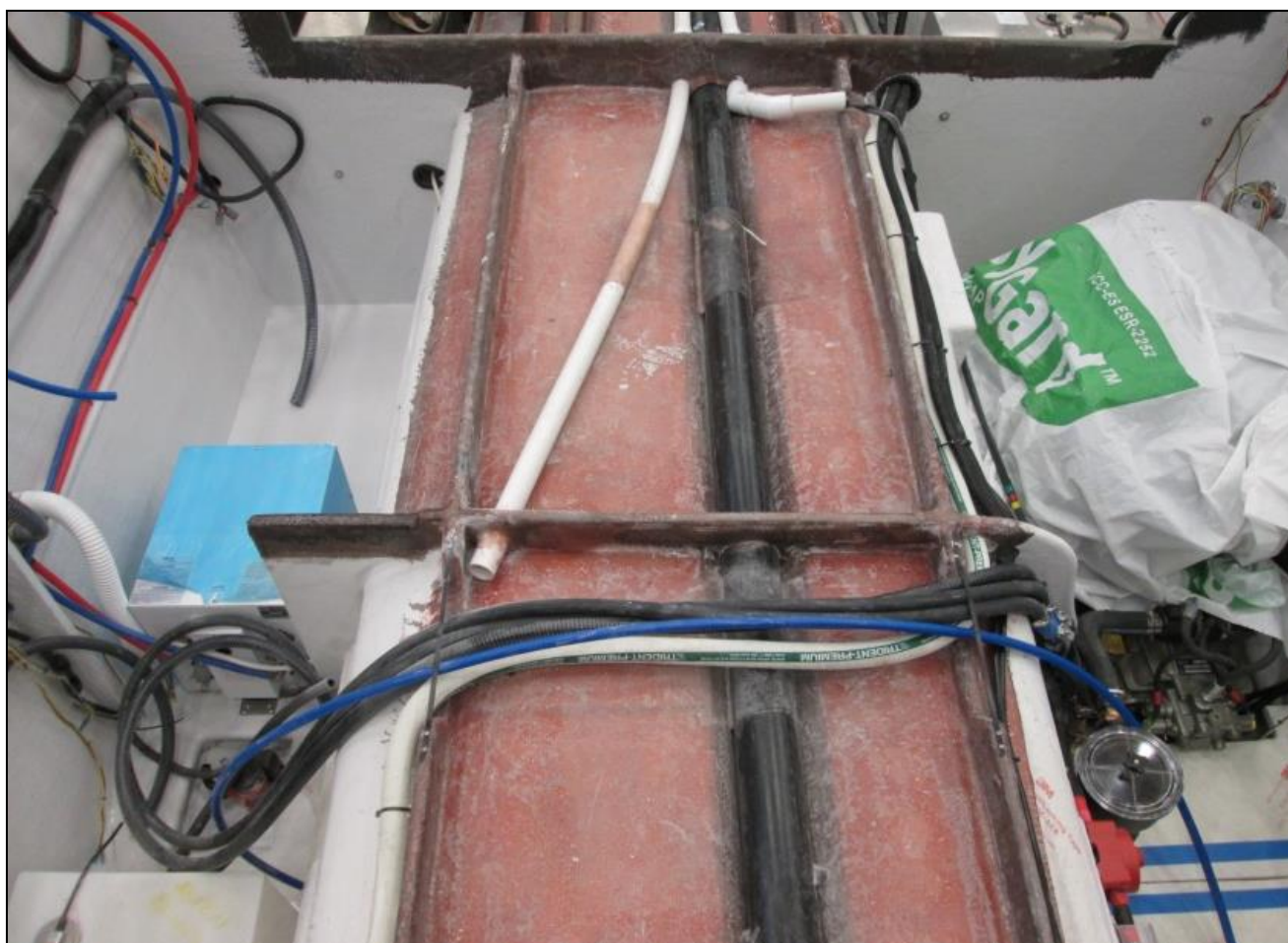
BOW



MIDSHIP

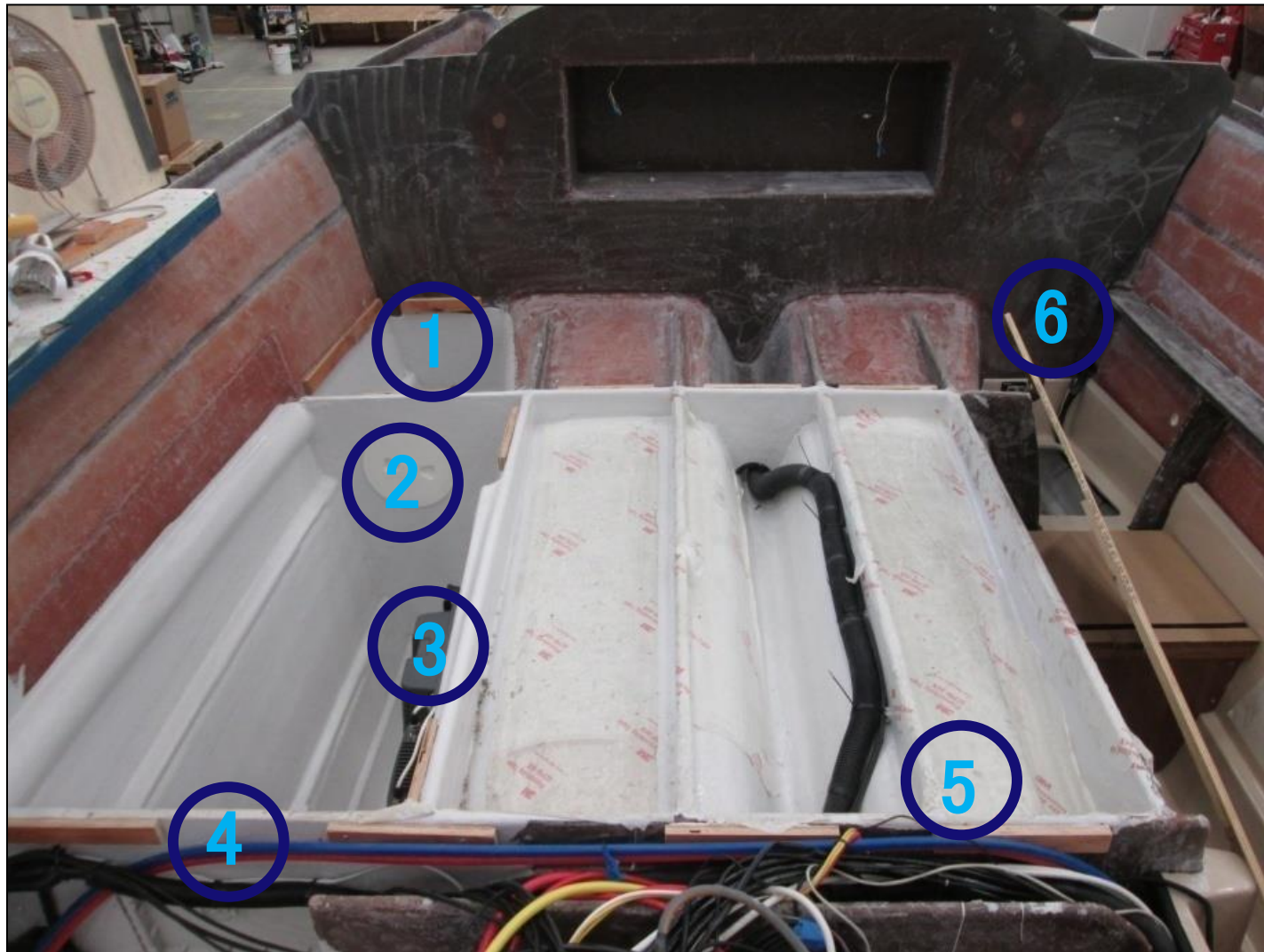


STERN



OPEN HULL

PORT BOW



1 Drain Plug



2 Access Hatch



Optional Garmin
Electronics/ Port
3 Compartment
Under Bed



4 Access Hatch
/ Bilge Pump



5
Optional
Garmin Auto
Pilot Compass

6
Windless Anchor
Breaker
(Located in Bottom
of Hanging Locker)

WATERPROOF PLUGS



TROUBLESHOOTING

This list is developed from common customer questions.

ELECTRICAL

- **I here beeping but can't figure out from where?** There are about 10 devices on the boat that can beep a warning. Here is a list of the most common and what to do.
 - **Co2 Sensor** under bed overhang— comforter covers it, it's tan colored about 3"x3". Its hard wired to the boats hot float power supply (stays on even when battery switches are off). It will beep if it gets low voltage and keep beeping until power is back up to 12v. To reset it, you have to interrupt its power, either by pulling its fuse behind the dash – wait 10 seconds then reinstall, or pop off the hot float breaker near the battery switches and wait 10 seconds then reset it on. Hot float power is always left on. If you leave it off, the automatic bilge pumps are disabled. This sensor is easily damaged and very sensitive. Acetone fumes – hair spray – some aerosol cleaners will damage the sensitive/rare earth metals inside. If this happens it will need to be replaced. Its sensitivity is amazing. It can go off from a dingy motor or generator 50 ft. away if the port lights are open. If you happen to be having a bad night intestinally, it can also go off. But its job is to keep you safe from invisible carbon monoxide fumes in situations like, if your neighbor runs his generator or furnace all night.
 - **400 watt Inverter** in master is standard, under the dinette as an option. These should normally be turned off when not in use. They beep both with high or low voltage (14.8V+ or 11.0 V low), they also beep if overloaded. It's only 400 watts which is fine for a computer or phone charger, but you will overload and pop its internal fuse if you try a 1800 watt hair dryer.
 - **Electronics** in general and auto pilot, especially, have the same beep horn as the above items. The auto pilot will beep incessantly if you're running a set course and it drops its inbound satellite signal. It wants you to note the loss of signal on the screen. It also beeps if it's lost the heading sensor/gyro compass signal. The gyro compass is mounted under the bed on centerline aft. It's important you do not store electrical things there. Things like vacuum cleaners with DC magnet motors really pull on the heading sensor, destroying its effectiveness.
 - **Stove propane Sensor/Auto shut off Computer.** This device is mounted just under the sink, smells for gas and is also very, very sensitive, easily damaged by cleaners. The black unit is in the corner near the floor, under is its sensing unit. To disable, flip the black power switch next to the unit off/down. This will also turn off the computer but also closes the solenoid valve in the propane tank stopping gas flow. It's the most annoying beep.

TROUBLESHOOTING

- **Engine warnings.** These flash on the engine monitor and also beep on the chart plotter. You will see things like “low coolant level” or “over temp” on the engine in both units. These two are tied together through the NMMA backbone that shares information. Normally, resetting the error/acknowledging it on the Volvo/engine display will reset the chart plotter. If the chart plotter continues with its warning, stop and shut the engine and the chart plotter off. Then restart and turn plotter back on. If the engine is warning you they are not normally false, it’s doing what it says and you need to address the issue. If you are getting warnings, for instance, “water in the fuel” erroneously, this sensor may need to be changed. Once they see water they often do not work well in the future. To reset the whole engine to factory, you can pull the main ECU fuse at the motor near the emergency off button (port side mid motor) But you will have to re-teach the throttles to the engine (single station) and so on, so not my favorite solution. You’ll need the owner’s manual to do this.
- **High water Alarm/Pump.** This alarm is behind the dash, it’s tied to a second high capacity bilge pump (2200Gph most models). This pump is mounted 2” above the first pump in the engine room. If you hear a very loud alarm from behind the dash this is probably it. Do not ignore, go look in the engine room, you have big problems. It’s designed so, should you melt a large pressurized hose or blow one off the engine, it will pump big volumes of water. But you need to fix the problem – shut the engine off, this stops the raw water pump.
- **Battery Chargers.** Your Aspen has two chargers, one 12amp dedicated to the engine start battery and a second 20 amp dedicated to the house battery. On boats with 1,000 or 2,000 watt inverters, they have built-in 80-100 amp chargers for the house battery charging. The most common issue with the battery chargers is the owners plugging in to shore power but forgetting to turn on the boats house breaker, dock breaker or charger outlet breaker. Then they leave the boats systems on, like refrigerator and depart for 1-2 weeks. When they come back they have flattened the house batteries dead. Once they do turn on the chargers nothing happens, it’s still dead. The issue is new computerized chargers need even to sense voltage so the computer can calibrate the charge. No voltage no go, even the engine alternator. So if this happens, you will need to switch on the emergency parallel battery switch for 5-10 minutes. Don’t leave on too long, as it’s very hard on the batteries. One is up at, for example, 10,000 ft. (12.7 volts) and the other is flat at sea level. This big difference puts big stress on the batteries, they try to equalize at warp speed. After 5 minutes the house will typically have enough voltage to be seen by the chargers and they will fill smartly. Note: if you leave the emergency parallel on all the time, you run the risk of having both battery banks dead and no way to start the engine.

TROUBLESHOOTING

- **Inverters 1000 – 2000 watt.** These devices take 12-volt power and step it up to 120Volts and also turn it into a sign wave (AC power). What most people don't understand is how much energy is in a typical 120-volt outlet and how that compares to 12V power. The formula is: Volts x Amps = Watts. A typical 120V outlet can pull 15 amps or 1,800 watts. 12V outlet at the same 15 amps (max typical) only produces 180 watts. So, it would take TEN 12V outlets to run one 1800-watt hair dryer. The second factor in inverters is the size/capacity of the house battery bank where they pull the power. Ours typically run from 2ea 70-amp hour (140amp hr. C90) to 2ea 6V 120amp hour (240-amp Hr C100). So, if you're running an 800-watt microwave at 120 volts, your burning 66 amps at 12Volts (a lot). In a C100 you could do this for about 2 hrs. before your house bank got down to ½ charge. However, if you start the engine, warm it up and then run it at fast idle while you're running the inverter, the engines 125-amp alternator will put out approximately 70-80 amps working very much like a generator. Then after you're done with appliances, the house batteries are at, or still near full charge. These inverters are a "pass through type", so when you're hooked to shore power and are switched ON, they feed the shore power automatically through and to the outlets without using 12V battery power.
- **12Volt central breaker panel.** This panel is the central distribution point for 12-volt ships power. It comes from the house batteries, forward in a finger thick cable through the breakers and then out to the ships switch panels, thrusters and also behind the dash to the four fuse panels, ships systems, electronics, lighting and options. The panel includes an LED display that shows both volts and amps being burned. This panel also lets you toggle from house battery to start battery, to read each voltage. Typically, these will be almost the same voltage as the Blue Seas voltage sensitive relay will be engaged and tying the house and start batteries together. But it's important to understand these breakers must be on to get any of the downstream equipment to work.
- **Voltage Sensitive Relay.** This devise is mounted in the transom (3"x4" black box) opposite the battery switches. Its job it to automatically pair both your house and start batteries together so they can share the workload. It does this up to the point that the engine start battery drops below 12.3 volts (the point where you're sure to have power to start) after this voltage, the (VSR) voltage sensitive relay says nope, house you can't have any more power from us, we're protecting the start battery. This protection only works if the parallel switch is off.
- **Dash DC, left of helm switch panels.** The upper one controls the ships pumps manually, the lower one controls ship equipment like Nav lights, horn, macerator pump, refrigerator and freshwater pump. The freshwater pump toggles left for port pump, center for off, and right for starboard water tank. It's important to know that the panel's plastic cover pops off the panels and reveals a rubber boot that covers individual 12V GM type blade fuses for each device. If the fuse has blown it typically is "not the problem", it's the symptom of a problem at the device. Inspect and identify the device before you put in a new fuse. Going larger is almost always the wrong solution.

TROUBLESHOOTING

MECHANICAL SYSTEMS

- **Ships Hydraulic Steering.** Aspen uses a Teleflex Sea Star steering system made in Richmond, BC. The unit's hydraulic reservoir is filled by removing the rubber cover on top, then the black screw cap on top of helm. The boat ships with a clear hose with the fitting to attach to the bottle and the helm (in owner's manual bag). Once hoses are attached, you tip the bottle up and slowly turn the wheel port, then starboard while burping air out. Be careful not to over fill and have lots of rags nearby; this is a messy process. Also, it typically is low only if there is a leak in the system. It is a clear oil that's hard to see and better to touch. Look for loose fittings. Don't fill to the top it, should be down from the threads about 3/8th inch. The oil expands on warm days and will burp out the breather hole in the cap and make a mess.
- **Macerator Pump.** The macerator is a diaphragm type pump located in the port aft lazarette (black pump with red ring around bellows section). To activate, hold on the spring-loaded switch at the dash. The design does not use a lock out key switch as the driver must hold the button to engage and there is no Y valve in the system. We use two dip tubes in the holding tank, one plumbed directly to the suck out fitting and one directly to the macerator. The rules about lockout don't apply as there is no Y valve in the system to position incorrectly. The pump is very robust and can pump amazing things, but it does have valves inside that do not like string, diaper wipes, nuts and non-RV/Marine toilet paper. Nine out of ten times when they stop, it's due to these things. The pump will have to be disassembled, cleaned out and reassembled.
- **Windlass.** The windlass is a Lewmar unit. Use is pretty obvious, but few owners give it the respect it deserves. These are very strong geared down motors. Never try to have two people work the anchor at the same time. Keep your fingers and toes well clear of the chain and line, go slow, think. Tap on the control is good, especially when the anchor is nearing the bow roller. Many owners do not realize the motor's design includes a cone clutch under the tension cap (wheel that moves) this cap (or knob on some models) can be tightened or loosened, allowing the gear motor to slip a bit, rather than pull with full force. This is especially important as the anchor jams into the bow roller in the up position. It can, when locked tight, pull with 700 to 1,000 pounds of force. This can damage the roller and fiberglass. Spray the motor and anchor chain off with fresh water after long trips. Be sure to hook a bungee cord or safety line to the anchor when not in use. We had one owner who had his anchor deploy at cruising speed (loose clutch).

TROUBLESHOOTING

- **Hatches.** Easy to use but many owners miss the “open just a crack” option. If you look at the area where the handle latches, there are two tabs that protrude. If you open the hatch ¼ Inch and twist the latch, it locks in that position. This is handy, allowing some ventilation while keeping 90% of the water out except in big down pours. If you’re latched tight and still getting slight leaking at the gasket, often you can tighten the Philips screw in the handle for extra tension. In some cases, we have also fixed leaks by thinning the handles plastic slightly. If the hatch seems tight yet you’re still getting a drip, check the seal around the outside next to the fiberglass. We have, at times, seen the hatch plastic move just a bit with temperature, heating and breaking the seal.
- **Windows and Screens.** Issues here normally have to do with the screens being stiff to move/slide. The core issue is they ride in a vinyl track that has a center open section in the top so they can slide to this area and be lifted out for window cleaning. Owners will get off track a bit while sliding through this area and if they push really hard, they bend the plastic and derail the screen. The trick is to go easy and push out a bit while sliding. This plastic can be removed but at times the screen will vibrate annoyingly. The second window issue has to do with overloading the gutter tracks weep holes with heavy seas or boat wash hose. This will cause some dripping inside, typically aft. There is no great fix for this. If we increase the height of the inside track, then the screens can’t be removed for cleaning.
- **Engine Raw water Strainer.** This device protects the engine from seaweed and such getting into the engines cooling system. It’s accessed from the Starboard aft engine hatch. Common problems are; A. Owners pull the top off before they turn off the ball valve = wet bilge and lots of excitement. They reinstall the strainer upside down (cone Up) letting debris flow past the mesh without cleaning. The Strainer goes cone down, fitting over the cone at the bottom of the strainer, snug with no slip from side to side. The last area to be careful is with the square O-ring gasket at the top. It is greased with silicone to make assembly easy, but it must be pressed into the gutter all the way around before you push the clear cap back in place and snug the wing nut back on. Note: the wing nut does not have a gasket or O-ring, it fits tight against a machine surface. The VERY IMPORTANT to RE – Open the Ball Valve. Running the engine for even 2 minutes with the valve closed damages the raw water pump (I did this one day).
- **Garmin Electronics.** For set-up instructions, see your Garmin Manual. If your electronics aren't working, it could be a loose plug, the fuse or breaker is off, it's a faulty unit, or it may need an update. You can find updates on the Garmin website, or call their service # for further assistance:
1-800-800-1020



Trouble-shooting Guide for DC Thrusters

Post 2005 thrusters
with IPC control system



Please read over the owners manuals and familiarize yourself with the product. There is a trouble-shooting section in each manual. This guide is meant to be a supplement to these providing illustrated instructions for more detailed trouble-shooting.

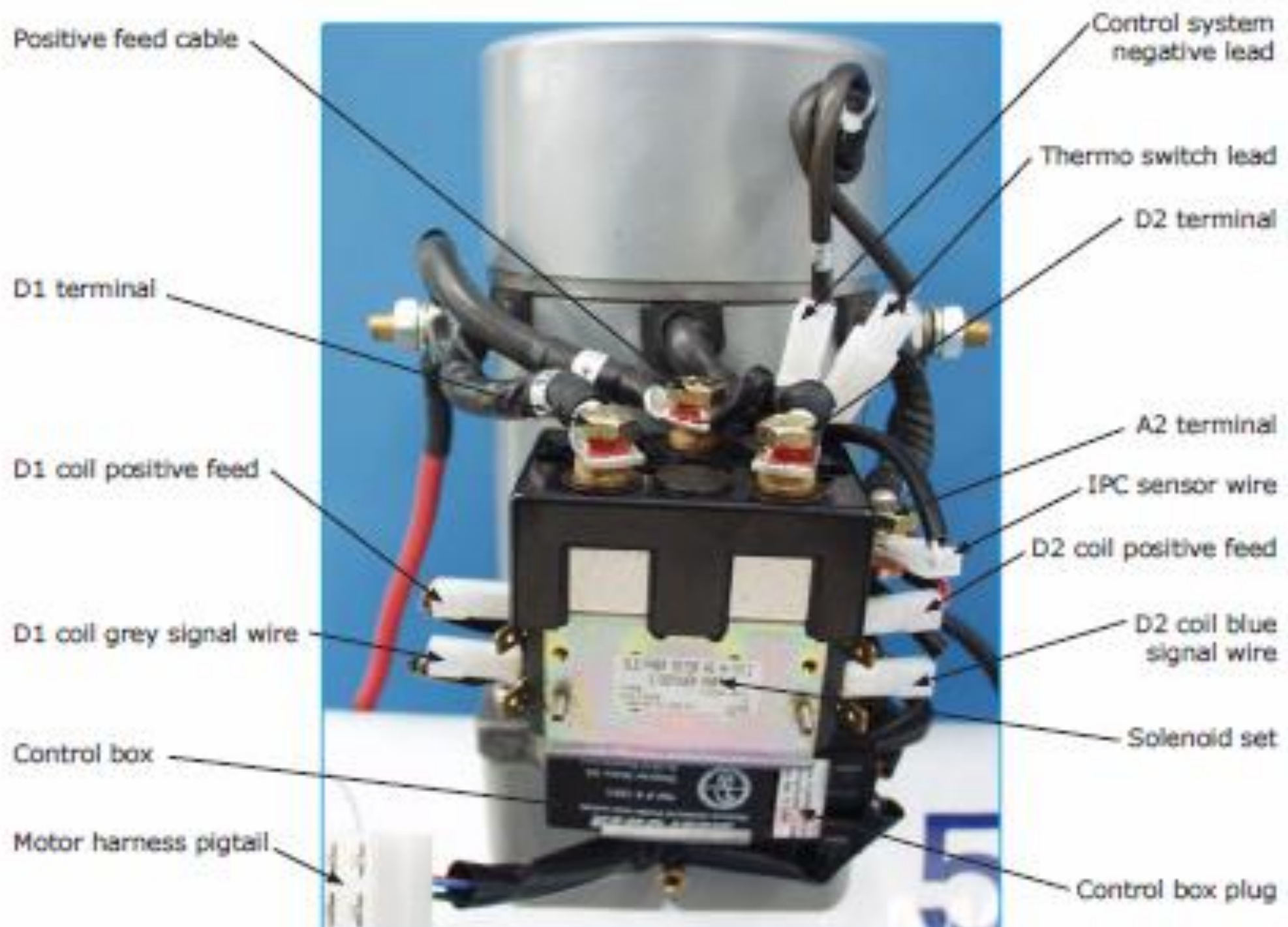
Note: This guide is intended for Thrusters utilizing SIDE-POWER "Plug and Play" wiring only, and not intended for thrusters utilizing SIDE-POWER's Auto-Main Switch or SIDE-POWER's voltage conversion box.

Recommended Tools for Trouble-shooting:

- Metric Allen Wrenches, 4mm to 12 mm
- Metric wrenches or sockets
- Needle Nose Vise-Grips
(for holding jam nuts when removing battery cables from motor)
- Phillips head screwdriver
- Small jumper wire
(with male quick disconnect terminals if available, Fig. A)
- 12" jumper wire with alligator clips
- Multi-meter (with alligator clips if available)



Identifying thruster parts



If Control Panel does not turn on.

(Light between two On buttons does not light)

1. Check battery power.

- The control panel is powered through the bow thruster. The thruster is usually on its own circuit, meaning the positive and negative battery cables run directly between the thruster and the battery. A fuse should be installed on the positive cable within 72" of the battery, check that it is not blown. A battery switch is usually installed in close proximity to the fuse and battery, check that the battery switch is turned on.



Control panel on

2. Check voltage at the thruster.

- You should read battery voltage at the thruster. If there is no voltage at the thruster there is a problem with the power supply, check the battery, fuse, switch, or cabling.



Checking voltage at thruster

3. Check for voltage on the control harness pigtail on motor and at control panel.

- With multi-meter set to DC volts, check from red wire (positive) to black wire (negative) on motor wiring harness pigtail. If there is battery voltage at the thruster battery cables, but no voltage at the motor harness pigtail, then proceed to step 4.

If there is battery voltage on the motor control harness repeat step 3 on control harness at the control panel to ensure there is no fault with the control harness run. If there is battery voltage at control panel then there is a problem with the control panel. Please contact your local Side-Power distributor for service support.



Checking voltage on motor harness



4. Check control system positive and negative.

- Check for voltage between the battery negative stud and red wire on motor harness pigtail.
- **If no voltage is present**, then check that all motor harness and control box plug connections are tight and in place. If the motor harness checks out, then there may be a problem with the control box. Please contact your local Side-Power distributor for service support.



Checking voltage on motor harness to battery negative stud

- **If voltage is present**, locate the control system negative lead and unplug it from the motor harness. With multi-meter set on ohm (Ω), check for continuity between the control system negative lead and the A1 battery negative stud. There should be continuity; ohms will go close to 0 (usually about 0.2 Ω -0.5 Ω).



Checking continuity between negative lead and battery negative post

- **If there is no continuity** between the control system negative lead and battery negative stud, then please contact your local Side-Power distributor for service support.
- **If there is continuity** between negative lead and battery negative stud, reconnect control system ground lead to motor harness, then check for continuity between the black wire on the motor harness pigtail and battery negative stud. Set the multi-meter on diode-test position, showing about 0.5V-0.7V. (A diode is fitted on the black wire).

Note: Be sure to have Positive lead connected to motor pigtail and negative lead to control box plug!

If there is no continuity between these two points then the motor harness has been damaged



Checking continuity between black in motor pigtail and control box plug



If control panel does turn on but thruster does not run, or thruster runs in one direction only.

NOTE: The preceding tests are to be performed while the boat is in the water. Please contact your local Side-Power distributor for service support if you have any questions.

1. Bypass control panel and check thruster control box and solenoid operation.

- Remove control panel and unplug wiring harness or unplug control harness from motor harness pigtail, whichever is more convenient. On the four wire Amp connector (wiring harness if disconnected at control panel or motor pigtail if disconnected at motor), with short jumper wire, jump from red to blue for starboard run, and red to grey for port run.

NOTE: Be careful not to jump red to black as this will permanently damage the control box

- If thruster runs in both directions when jumping red to blue and red to grey on the motor harness pigtail, repeat this test on the control panels harness at the control panel. If the thruster runs then the control panel is likely damaged.
- If thruster does not run, or runs in only one direction, at the control panel, but runs in both directions at the motor harness pigtail, then the harness or terminals are damaged.

NOTE: Be sure that all control panels in the system are unplugged when doing this test!

- If thruster does not run, proceed to step 2.

2. Bypass thruster control box and check thruster solenoid operation.

- Disconnect the white IPC sensor wire on the A2 terminal.



Jumping red to blue on motor pigtail



Jumping red to grey on motor pigtail



Disconnecting white IPC sensor wire



With long jumper wire, jump from negative battery stud to D1 coil grey signal wire for port run, and to D2 coil blue signal wire for starboard run.

- **If thruster runs properly,**
proceed to step 3.
- **If thruster does not run,**
proceed to step 4

3. Checking the thermo switch.

- Locate the thermo switch lead and unplug it from the motor harness. With multi-meter set on ohm (Ω), check for continuity between the thermo switch lead and the battery negative stud. There should be continuity; ohms will go close to 0 (usually about 0.2Ω - 0.5Ω).
 - **If there is no continuity** between thermo switch lead and A1 battery negative stud, then either the thermo switch needs to be replaced or the A1 battery negative stud has been damaged internally. Verify that the A1 Battery negative stud is OK by checking for continuity between A1 and A2. If there is continuity then the A1 battery negative stud is OK.
 - **If there is continuity** between thermo switch lead and battery negative stud then there is a problem with the control box or the motor wiring harness. Please contact your local Side-Power distributor for service support.



Jumping ground to grey on D1 coil



Jumping ground to blue on D2 coil

4. Check for solenoid output.

- With jumper wire still attached and IPC wire detached from step 2, check for voltage on the A2 terminal.
 - **If no voltage is present** on A2 terminal then the solenoid pack may need to be replaced. Please contact your local Side-Power distributor for service support.
 - **If voltage is present** on A2 terminal then the motor may be damaged. Please contact Your local Side-Power distributor for service support.



Checking voltage on A2 with ground to blue jumper attached and IPC wire disconnected.



5. Check the operating voltage

- Once the thruster is operating properly, check the voltage between the battery positive post and the battery negative post while the thruster is running. The voltage will drop initially and then should level off after approximately 5-10 seconds.

The voltage should be no lower than 9.5 for a 12 volt thruster and 19 volts for a 24 volt thruster after the voltage has stabilized.

If the voltage does not stabilize and continues to drop below 9.5 or stabilizes below 9.5 for 12 volt thrusters (19 volts for 24 volt thrusters), then the battery source needs to be checked to ensure the amp capacity is sufficient to run the thruster or the cable run needs to be checked for voltage drop. Please contact your local Side-Power distributor for service support if you have low operating voltage.

Distributors

Argentina

Timer S.A.
Buenos Aires
Tel: +54 11 4580 0444
Fax: +54 11 4580 0440
www.timer.com.ar
timer@timer.com.ar

Australia

AMI Sales
Parramatta, NSW
Tel: +61 89 331 0000
Fax: +61 89 314 3029
ami@amisales.com.au

Austria

G. Aachert GmbH
Hard, Ingeratz
Tel: +43 5574 696000
Fax: +43 5574 69600-10
www.aachert.at
office@aachert.at

Belarus

ASA Boat Electro
Vitebsk
Tel: +375 20 436 9100
Fax: +375 20 436 9108
www.asaboatelectro.by
info@asaboatelectro.by

Brazil

Electra Service Ltda.
Guarujá
Tel: +55 13 3354 3599
Fax: +55 13 3354 3471
www.electraservice.br.com
aberton@electraservice.com.br

Bulgaria

Yachting BG
Burgas
Tel: +359 56 919030
Fax: +359 56 919031
www.yachting.bg
info@yachting.bg

Canada

Imbra Corporation
New Bedford, MA
Tel: +1 508 895 3000
Fax: +1 508 895 5059
www.imbra.com
side-power@imbra.com

China/Hong Kong

Storm Force Marine Ltd.
Wanchai, Hong Kong
Tel: +852 2868 0114
Fax: +852 2868 9050
www.stormforcemarine.com
sales@stormforcemarine.com

Croatia

Yacht Supplier
Zadar
Tel: +385 51 704 500
Fax: +385 51 704 500
ay@net.hr

Cyprus

Coast Marine Equipment Ltd.
Limassol
Tel: +357 253 66721
Fax: +357 253 53678
coastm@coastm.net.cy

Denmark

Gertsen & Olesen A/S
Horsholm
Tel: +45 4576 3600
Fax: +45 4576 1772
www.gertsen-olesen.dk
info@gertsen-olesen.dk

Estonia/Latvia/Lithuania

Intec Systems OÜ
Tallin
Tel: +372 5013997
Fax: +372 5440071
www.intec.ee
tony@intec.ee

Finland

Nautilus Oy
Turku
Tel: +358 2 2500 444
Fax: +358 2 2518 472
www.nautilus.fi
nautilus@nautilus.fi

France

Kart Marine Equipment
Nantes
Tel: +33 240 921 584
Fax: +33 240 921 316
www.kart-marine.com
contact@kart-marine.com

Germany

Jobaco GmbH
Norderstedt
Tel: +49 40 525 373-0
Fax: +49 40 525 373-11
Greece
Anathema Marine
Athens
Tel: +30 210 2588 985
Fax: +30 210 2588 989
www.anathemamarine.com
anathema@otenet.gr

Iceland

Marrs GFHF
Reykjavik
Tel: +354 555 6444
Fax: +354 555 7235
www.marrs.is
gummi@marrs.is

India

Indo Marine Engineering Co. Pvt. Ltd.
Pune, Maharashtra
Tel: +91 20 2712 3000
Fax: +91 20 2712 2285
info@indogroup-india.com

Ireland

Sleepner Motor Ltd.
South Brent
Tel: +44 136
Fax: +44 136
andy@sleepne

Israel

Atlanta Marine Ltd.
Tel Aviv
Tel: +972 3 522 7876
Fax: +972 3 522 5150
www.atlanta-marine.com
atlanta@net.net.il

Italy

Salm S.p.A.
Asago-Milan
Tel: +39 02 488 501
Fax: +39 02 488 2545
www.salm-group.com

Japan

Turbo Marine Inc.
Nagasaki
Tel: +81 95 940 7977
Fax: +81 95 940 7979
www.turbo-marine.com
info@turbo-marine.com

Malta

S & D Yachts Ltd.
Cali
Tel: +356 21 339 908
Fax: +356 21 332 359
www.sdyachts.com
info@sdyachts.com

New Zealand

Advance Trident Ltd.
Auckland
Tel: +64 9 345 5347
Fax: +64 9 345 5348
www.advancetrident.com
service@advancetrident.com

Norway

Sleepner Motor AS
Fredrikstad
Tel: +47 69 30 00 60
Fax: +47 69 30 00 70
www.sleepner.no
sidepower@sleepner.no

Poland

Teonus Sea Power SP Z.O.O.
Gdansk
Tel: +48 58 344 30 50
Fax: +48 58 341 87 62

Portugal

Kraut Portugal Lda
Lisboa
Tel: +351 21 953 96 00
Fax: +351 21 953 96 01
www.kraut.com
contact@kraut.pt

Russia

Standarte
Starbeyevo
Tel: +7 485 575 87 23
Fax: +7 485 575 39 77
www.standarte.ru
info@standarte.ru

South Africa

O-Dynamics
Cape Town
Tel: +27 21 555 3220
Fax: +27 21 555 3220
www.o-dynamics.co.za
info@o-dynamics.co.za

Spain

Innasa Marine Products
Girona
Tel: +34 902 300211
Fax: +34 902 300213
www.innasa.com
innasa@innasa.com

Sweden

Sleepner AB
Strömstad
Tel: +46 525 526 50
Fax: +46 525 152 95
www.sleepner.se

Switzerland

Marine Parts Technics AG
Volketswil
Tel: +41 1 997 40 60
Fax: +41 1 997 40 64
www.marineparts.ch
info@marineparts.ch

Singapore/Malaysia/Indonesia/Vietnam/Philippines

Island Marine Services Pte Ltd
Singapore
Tel: +65 6795 2250
Fax: +65 6795 2250
www.island-marine.com
sales@island-marine.com

Taiwan

Mercury Marine Supply
Kachung
Tel: +886 7 3217 293
Fax: +886 7 3214 232

Turkey

Denper Ltd.
Istanbul
Tel: +90 212 346 1320
Fax: +90 212 346 1326
sales@denper.com

UK

Sleepner Motor Ltd.
South Brent
Tel: +44 1364 969 400
Fax: +44 1364 969 399
andy@sleepner.co.uk

United Arab Emirates

Teignbridge Propellers & Marine
Equipment Co. Ltd.
Dubai
Tel: +971 4 334 0084
Fax: +971 4 334 0153
teignpro@teignbr.net.ae

USA

Imbra Corporation
New Bedford, MA

ALL OTHERS:



Sleepner Motor AS
P.O. Box 109,
N-1613 Fredrikstad, Norway
Tel: +47 69 18 00 18
Fax: +47 69 18 00 78
sleepner@sleepner.no
www.sleepner.no



SIDE-POWER THRUSTER SYSTEMS

WINTERIZING YOUR BOAT

1. Drain water tanks, Port & Starboard: Flip on DC breakers, located left side center under glove box. Then push toggle switch for water pump switch (**Left** = port tank, **Right** = starboard tank) and open faucets.
2. Hot Water Heater Drain: Flip open the hot water tank drain (Note: on older boats, open Port Lazarette to access hot water heater) and drain to bilge, then turn on bilge pump to empty over.
3. Put 2-3 gallons of RV antifreeze in each water tank. You will need a funnel with hose attached to get this into the water tank fill as they are horizontal. Then run each pump till red comes out at all faucets.
4. Pump bilges dry and then vacuum the remaining.
5. Pump head out then pour in 1 gallon RV antifreeze until it touch's pump motor. The Head salt water in-feed line will drain when the boat comes out of the water. Run most of it into the waist tank leaving 2" in the bowl and hose. Open the ball valve on the raw water washdown pump so it can also drain out; freezing water in any of the pumps will damage them. Check/drain macerator pump. **(If boat is kept in the water, you need to drain the raw water pick-up manually)**
6. Crank up winch stand so the bow is up. The center hull wave breaker also has a drain plug. With the bow up, this is a good time to check and drain this area, then re-silicone and reinstall the plug now so you don't forget in spring. **(Only done on boats being stored out of water)**
7. Turn off batteries. Coat the battery terminals with boeshield. **(Only done on boats being stored out of water)**
8. Wash Motor with fresh water to spray off any salt. Once dry, coat any metal parts with boeshield, NOT the belts or rubber/plastic parts.
9. Add Fleetgaurd Microbiocide to both Fuel Tanks; an anti-fungal stabilizer per Volvo recommendation.
10. On Cummins motors, pull heat exchanger Zinc (brass hex plug on back side) and check/replace if it's melted. Reinstall snug.
11. Put in some type of heat or dehumidifier. We like a 1500 water boat heater (West Marine \$69), set to 400 watts or 600 watts on a thermostat so it keeps the boat about 50 degrees. This will keep the boat dry and not smelling old. Open all doors and compartments for air flow, even under the bed - both compartments.

THRUSTER LOGIC & STRATEGY

Notes from Larry Graf

Notes as of November 18, 2016:

Bow and Stern Thrusters are wonderful assets while docking. They take 95% of the worry out of docking for most owners, allowing precise positioning. There are, however, some details to understand about the underlying engineering and physics of electric thrusters.

The units range in horse power from 2.5 Hp. on a 32'er to 7 Hp on a 40'er. Most owners don't realize that electric motors of this size draw from **280 amps to 580 amps at 12volts** (a huge load). They work just great if used for a minute or less during each docking – typically 5-10 second bursts six to 10 times to reposition the angle of the boat.

Thrusters should be 10-15% of your docking strategy, basically used to fine tune your main positioning done with the rudder and engine in gear (fwd. or reverse) at idle. Many owners make a game of seeing how often they can dock with no thrusters at all.

Other owners attempt to use their thrusters as 90% of their docking strategy. Getting within 50 feet of the dock and then beginning to thruster all the way to the dock against wind and current. Even at times using both bow and stern thrusters at the same time (= 870 amps on a 40'er). This type of docking is problematic; first it puts a huge instant drain on the battery bank basically ripping large chunks of battery power from the battery's which can heat and damage the battery bank. Next, the motors are basically marineized heavy duty truck starter motors designed for high output but short period of use. If you run them too much, they heat up and eventually shut down from a thermal protective breaker. If you do this regularly the windings in the motor or controller melt and you have a \$2-3K motor to replace. The other problem with getting to the thermal breaker is you then have no thrusters what-so ever for 20-30 minutes until it cools down.

To give you a comparative feel for battery loads, the refrigerator on a 32 Aspen on average uses 4 amps, the house lights use 5 amps if all are on, so 530 amps is a lot of power.

Several owners have asked about **installing more battery's** so they can thruster longer, one even did this. There are several issues with this; first is you still get to the thruster over heat thermal switch, then it's a question of where you put them. The one owner who did put two more Golf Cart batteries did it in front of the current house battery bank. It was an easy install but he then had no access under the floor boards to service or inspect his pumps, shaft seal or shaft grounding brush. Pulling the battery's each time he needed to inspect was not friendly. The next issue is weight and balance; each of these battery's weighs 75 pounds so 150 pounds' and does make the boat list a bit. In the end, this owner pulled the extra battery's back out.

One owner asked about having a **dedicated battery bank** just for thrusters so his house loads could be separate from his thruster loads. He was having issues with the Garmin low voltage alarm going on while thrusting. The first thing to check is the low voltage alarm set point on the Garmin unit. Some were set to 12.5 volts which means if you thruster at all it comes on. I recommend resting it to 10.7 volts, this is above the 10 volts needed for the Garmin units but low enough that during typical docking, the alarm will not go off. My strategy while designing the house battery bank was to size it first for typical thruster docking while still having sufficient capacity to overnight easily without being plugged in. I did assume we'd get 5 amps of Solar Charging while anchored for six hrs. each day. Most owners find they have more than enough power to anchor for 2-3 days during the summer.

One last area that owners have noticed is that their initial thrusting (first minute) is very powerful then they notice **a distinct drop in thruster power**. This stems from the **VSR (voltage sensitive relay)** that typically ties the house and start battery banks together. At the beginning of thrusting, both battery banks are full but after about a minute, the thrusters have pulled enough power out of the combined battery bank to hit the separation voltage on the start battery. From this point on the thrusters are only drawing from the house bank. Once thrusting has stopped, the VSR will typically re-latch the house and start battery's together within 5 minutes. This is the source to recharge the house bank while underway. The other two house bank charge sources are the battery charger or inverter or the solar panels. The reason we install a VSR is so that no matter what loads are being pulled from the house bank the engine always has a dedicated battery for starting. Note: you can disable this protection if you switch the EMERGENCY parallel switch on (not a good idea).

Owners also wonder about the capacity of their house battery banks. When full the C100 32'er has

- C100 Two Golf Cart battery's GC2 group size combined capacity 115 amp hrs. (60 Minutes)
- C120 Four Golf Cart battery's GC2 AGM DC224-6 + 1 ea. G27 Combined 336 Amp Hrs.

TOILET LOGIC: DETAILS & MAGIC

Notes from Larry Graf

Notes as of November 18, 2016:

Marine toilets are mission critical components in cruising but also one of the most problem prone areas for new owners. The goal is reliability and little or no smell while in use or storage. Our toilets are premium Dometic units with a very powerful macerator pump to blend debris into liquid making it easy to move into and out of the holding tank. The hose we use is Trident Marine triple wall premium hose that feeds into a double thick polyethylene holding tank. The triple wall hose and double thick holding tank (1/4") are to eliminate smells wicking into to living spaces. The holding tank is vented overboard with a 5/8" fuel hose on our 32s and 3/4" on 40s. This vent being open and able to breath is critical to limit smells.

In use starting with an empty tank you add typically 1 Cup of Thetford biodegradable liquid holding tank treatment. We find this effective as both a detergent to keep the tank clean over the years and as a very good odor suppressant. Once the treated and before use its important to run 2-3 gallons of water into the head so the bottom of the tank starts with a wet surface. Not doing this can lead to a solids layer developing in the bottom of the tank especially in warm weather.

Now it's ready to use, do what ever comes to mind, but do use RV or Marine toilet paper in a limited way no huge balls. This type of paper dissolves very fast when wet and never coagulates on the bottom of the tank. When flushing you will need to run the pump in the dual position "water in waste out at the same time" for about 5 seconds after bowl clears debris. This gets to the waste down the hose and clear of the pumps valves and such. **Prior to big jobs** It's a good idea to push the switch that add just water to the bowl to fill 2" of water or so in the bowl so you don't get stickies on the bowl. After you flush be sure to leave the opening in the bottom covered with water to seal out any fumes. Watch the gauges as you go, I typically pump every 2 days while out at the 1/2 to 3/4 full point, I like to get rid of this stuff often while it's very liquid and before it ferments. Pumping regularly and especially when you get back from a trip and before the boat sits idle for more than a day or two allows you to empty the tank before the solids can settle to the bottom of the tank. If they settle this sludge can over time and in warm weather start a biochemical reaction that has a horrific phosphorus odor that's very bad, especially when the toilet is flushed pushing new liquid in and pushing old air out of the tank. Your neighbors will notice this smell! Another reason to pump often is if you unexpectedly get full and then continue to pump debris in, it overflows out the tanks vent line (Bad Smell) and often plugs this line. If you have plugged the vent typically as you try to flush things away never to return. They do return the over time- you flush again and darn they return again. The tank is working like a spring. If this happens be sure the tanks empty (look at it if possible) then with a fresh water garden hose 40-80 psi back flush through the vent fitting back into the tank.

TOILET LOGIC: DETAILS & MAGIC

Continued notes from Larry Graf

Note: be positive your back flushing the waste tank vent and not a fuel tank vent, run the macerator pump and listing to the vent often helps identify which vent is waste or follow the vent hose up to the hull side fitting. You do not want water in your fuel.

To empty the holding tank, you have two options; first is to drive over to the marine pump-out station at your marina pull the waste cap (deck trail 40s or cockpit entry 32s) and suck it out. The second option is while offshore away from harbors to activate the macerator pump out switch at the dash. On 40s Both port and starboard can be activated at the same time. The gauges will drop but typically when the gauges hit empty the tanks will continue to pump for an additional 2-3 minutes as the tank sensor doesn't reach the bottom of the tank. Its best on the 40s to do this while at trolling speed, on the 32 and 28s this pumping can be done at speed.

Here's a list of things never too put in your Toilet.

- Diaper Wipes – instant Plug – locks macerator motor – pops fuse
- Feminine Products – will try to eat first 2 but by third and more they plug up hose to tank
- Nuts not chewed – plugs valves – can allow back flow of black water to bowl – bad smell
- Chlorine Bleach – damages rubber parts
- Comet – has Chlorine (limited occasional use OK)
- Seeds- Bones – Jamb macerator
- Home type toilet paper premium brands are worst (thicker)

Leaving The boat more than 2 Days

On our 32s the heads always run on raw water (IE Salt Water). To conserve the fresh water on 40s the boat is pre plumbed so an owner can switch too fresh if he feels he has enough for both domestic and head use. Saltwater is just fine for heads if you understand a few things and follow the shutdown procedure noted bellow, I feel it's sort of a waste of fresh water to wash it down the toilet. Because Salt water is full of microbes (little critters) when you leave the boat and leave saltwater in the toilet bowl the critters first love it and multiply in the warm water. Then they die and then ferment and smell BIG BAD. When you come back to the boat it smells and takes 2-3 hrs. to clear out.

However just a little pre-boat departure procedure can eliminate this. Take the fresh water sink wand stretch it over to the bowel and put in 3-4" of water and flush it out using the flush down only button (no saltwater) then refill 2" more and let it sit. You're done, no smells no salt build up in the waste hoses. In the winter I put RV anti-freeze in the bowl and Thetford treatment in the empty tank with a little RV antifreeze. A second very common fix for the critters is to put a ¼ cup of White vinegar in the bowl before you leave kills the critters – no smell.

Coast Guard Inspections

The Coast guard inspectors are required to see your Y valve is locked in the (waste in Tank Position). Aspen's don't have a Y valve as most boat owners don't position it correctly and things get plugged in the valve. In our design all the waste always goes into the holding tank, you have no way to pump directly from the head to the ocean. Once the waste is in the holding tank you have two options to clear it out. First is the deck waste fitting and a pump out station. Second is the boats macerator diaphragm pump which is controlled by the hold on switch at the dash. Since it only works when you physically hold it on, it meets the requirement. This will take a little bit for the guys to understand. The concept that the tank has two dip tubes down into the waste is unusual.

Transom Deck Vent

This vent fitting being clear is critical to no or limited holding tank fumes. We install it on the transom to keep spray flowing past the hull side from entering the vent. However, because this surface is sloped fwd. if you do overflow your holding tank by accident clearing the debris and vent requires you to unclamp the hose from the fitting wash out the debris and clear the water from the low spot just under the hose connection. The shape of the vent component creates a catch for water and waste once its capped with liquid, the tanks wont vent like new and the aggressive fermentation process begins. One other very important detail is to make sure the screens have been pulled on the waist tank vent. This part is used on all types of tanks many need the screens but for waist vents they are typically pulled out at our factory. The screens plug with this type of fluid and they also can plug from buffing compound/fuzz during annual detailing = bad.

DOES YOUR BOAT HAVE A HEAD? Yeah? More than one? Yeah? That many? How much fun is that? Really? That doesn't sound like much fun at all. You know, you could have potentially avoided that scenario, if you'd spent some time on the, shall we say, pre-digestive end of things, taking care of the common problems and planning for a better-ventilated, better-smelling head compartment. Learn from our primer how to get your head checked — and take care of your boat's toilet and its attendant odors, too.

● Common Issues

Any number of things can go wrong in a marine head, but if you know the most common issues and how to deal with them, you improve your chances of being in the pink (instead of some other color).

1 | CLOGS.

Compared to their terrestrial brethren, marine toilets use very little water during flushing, which is one reason clogs are such a common problem. Another clog-inducing dilemma can be the toilet's multiple valves, pumps and impellers, which can have difficulty passing solid waste (much less paper towels, baby wipes and other products). Marine toilet paper will almost dissolve on contact with water, but so will the cheap, one-ply stuff available most anywhere. For everything else, that old saw about not putting anything in the toilet that hasn't passed through your body first is actually sage advice when it comes to clog-avoidance.

2 | BILGE FUNK.

One of the more unsanitary practices aboard boats is showers that drain directly into the bilge. It's a setup that not only generates odors but also introduces pump-clogging hair and soap scum into the bilge. A common

aftermarket solution is mounting a gravity-fed sump beneath the shower pan, which collects the water and automatically pumps it overboard or to a gray-water tank (using a small submersible pump and float switch mounted inside). A second option is connecting the shower-pan drain hose directly to a diaphragm pump, eliminating the need for a sump, as well as the odors and mechanical float failures often associated with them. Instead of an automatic float, users turn on the pump manually when showering, then off again when finished.

3 | HOSE BUILDUP. Calcium deposits can form inside your sanitation hoses, valves, seacocks, etc., to the point that the system becomes difficult to flush, experiences leaking back into the bowl or simply clogs up. An ounce of prevention is worth a pound of cure or, in this case, pumping two cups of white vinegar through the toilet monthly will help prevent buildup.

Tricks for a Better-Smelling Head

Since there's a fine line between an odor and a scent, we wanted to provide a few tips for elevating the former to the latter.

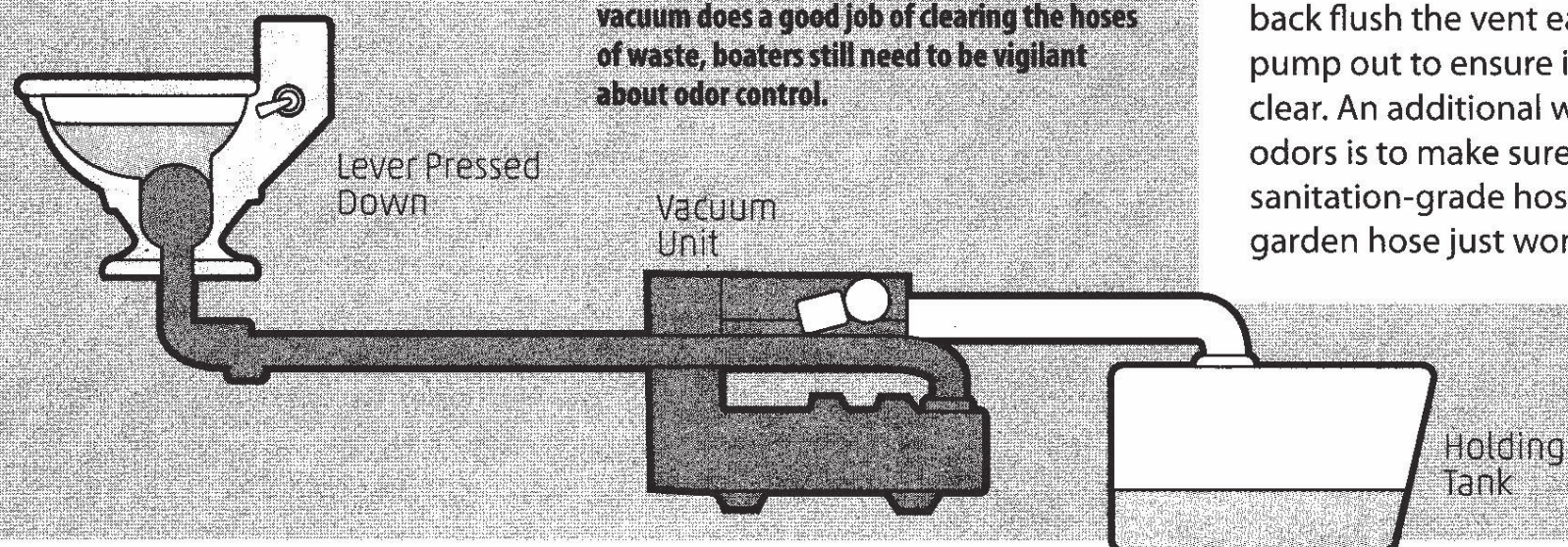
Leaks are one of the most common sources of head odors. Start at one end of your sanitation system and check each hose joint for leaks, ensuring all hose clamps are tight and corrosion free. Install double hose clamps where possible, but only if you have sufficient hose barb to allow it, otherwise you'll simply damage the hose and cause even more leaks.

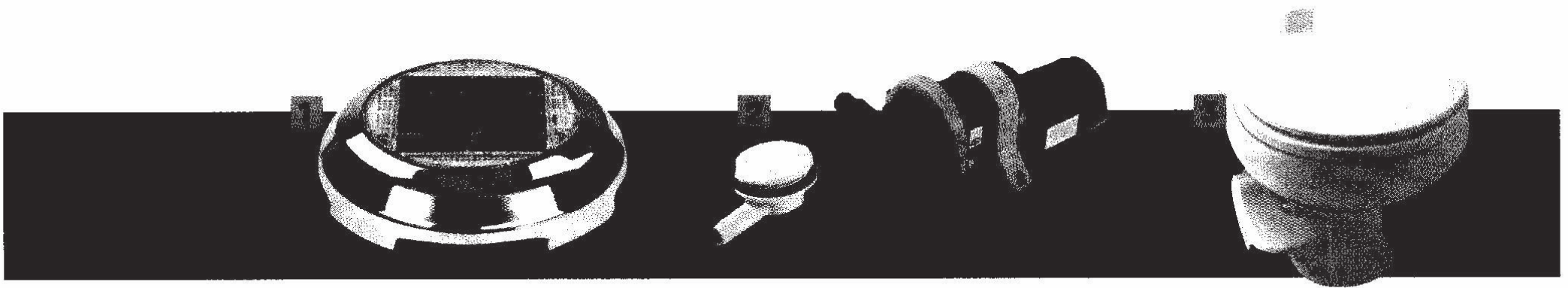
Always use proper sanitation hose when installing or replacing old hoses, including vent hoses. Sanitation-grade hose is expensive but imperative from a head odor-control standpoint. That red heater hose may have been a bargain, but your nose will soon tell you why it wasn't such a good choice to plumb your toilet and holding tank. Premium rubber sanitation hose has a thicker wall and features two-ply reinforcement and a wire helix. It may sound like overkill, but just remember it has to handle human waste that's roughly 30 times more concentrated than typical residential sewage.

Check your system and hose runs for places raw sewage can collect. Hose runs should be kept as short and straight as possible. Holding tank discharge hoses should also be self-draining — deck pumpout fitting hoses should drain back into the holding tank, while overboard discharge hoses should drain to the discharge seacock without loops or low spots.

Check your vent hose for clogging. Clogs are typically caused by overfilling your holding tank, which pushes solids into the hose and vent. When possible, back flush the vent each time you pump out to ensure it stays open and clear. An additional way to prevent odors is to make sure your vent hose is sanitation-grade hose (that length of garden hose just won't cut it).

HOW A VACUFLUSH HEAD WORKS





3 Good Upgrades

If you're looking for ways to improve the head in general, and you don't mind spending a little money, check out a few products that can help.

1 | Add a solar-powered vent to improve ventilation. Good air flow is crucial for head comfort. No great mind wants to contemplate the problems of the world astride a "thought enhancer" located in a stuffy head. Running on solar power during the day while charging a small battery to run at night, solar-powered vents freshen your head 24/7 with a constant flow of air and without the need for external power.

2 | Install a Gulley IC (Intelligent Control) shower

drain from Whale Pumps (whalepumps.com). The Gulley IC is a prewired system that consists of two components: a Gulley IC, essentially a "smart" shower drain, and a Gulper IC self-priming diaphragm pump. The shower gulley has a built-in electronic, water-sensing switch that automatically turns the pump on when water is present and off once the shower is dry. While a bit more expensive than a conventional pre-engineered sump, the Gulley IC system promises

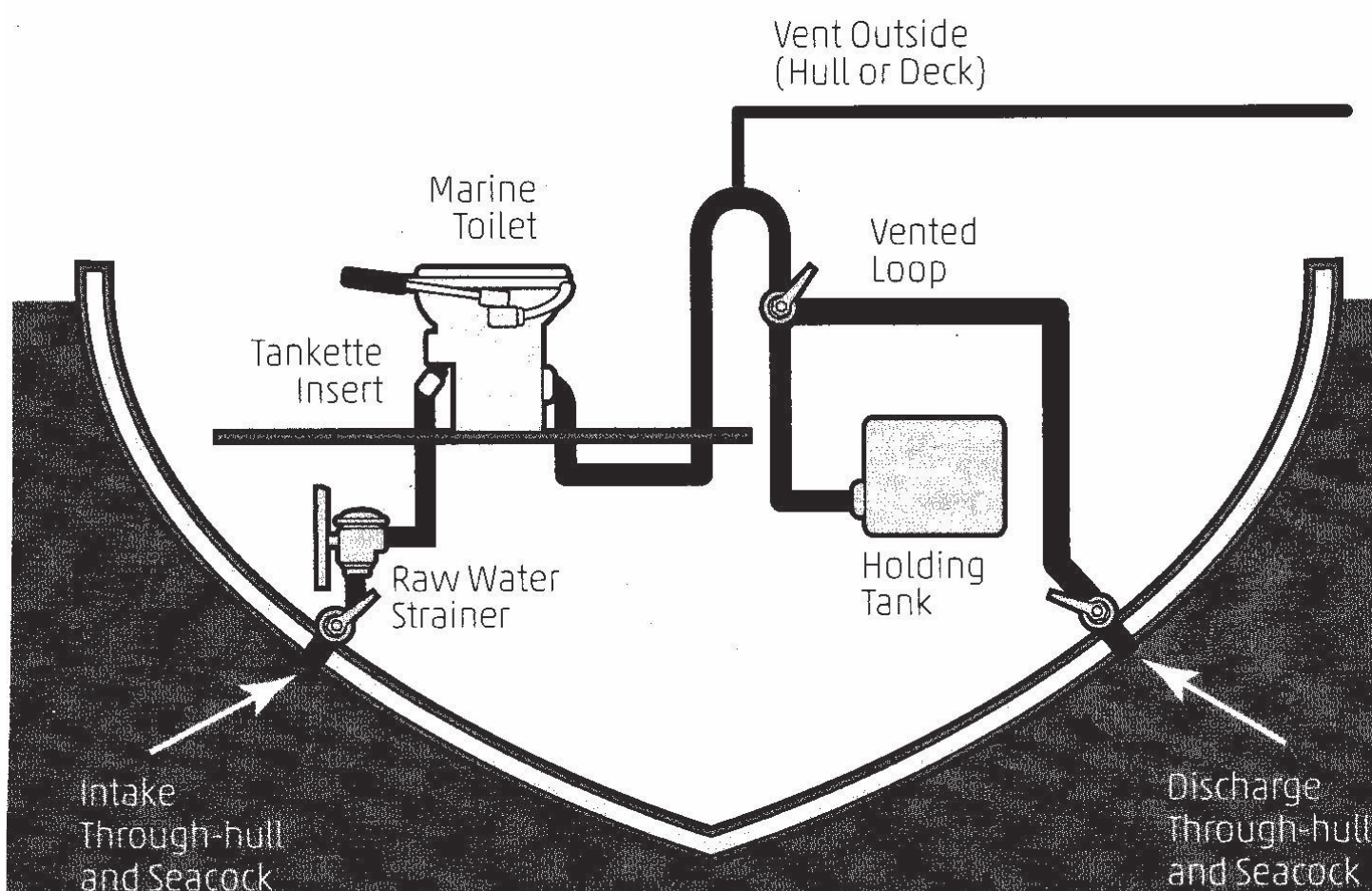
much greater reliability while presenting a good compromise between cost, ease of installation and convenience.

3 | Upgrade your antiquated "seat of ease" with a modern unit. Units such as the Vacuflush system use fresh water for flushing, which eliminates a lot of the smell associated with saltwater flush systems. As it uses a vacuum to pull water to the holding tank, it also does a better job of clearing the hoses of waste (another source of odor).

Head Care

While cleaning to-do lists aren't particularly popular with most boaters, the Head item on the list is even less well-liked. No matter, it has to be done, and if you take care of the frequent tasks, the less frequent ones will be less ... memorable.

A TYPICAL HEAD SYSTEM



EVERY TIME YOU USE YOUR BOAT...

► Flush the head sufficiently to push sewage from the hoses, and rinse behind it. At the end of each trip, pour a half gallon or so of fresh water into the bowl and flush it through the system. Incorporating the task into your buttoning-up-the-boat routine before leaving will solve most odor problems.

► If you do your boating in salt water and your toilet uses raw water for flushing, follow the procedure in item number one (no pun intended): pour a gallon of fresh water into the bowl and flush it through the system at the end of your trip. Salt water contains tiny organisms that will die, decay and

While your system may look slightly different than this one, keeping hose runs short and straight and ensuring proper head cleaning is part of the buttoning-up procedure will keep head odors to a minimum.



Clean your head after each trip, especially the sink and the areas around and behind the toilet, unless you enjoy mid-cruise emergency repairs.

smell. Flushing the salt water from your bowl will help keep it odor free.

- ▶ Clean your head after each trip. Giving sinks, counters, and the areas around and behind the toilet (particularly if you have boating friends with bad aim) a good cleaning with disinfecting wipes or other such cleaners will leave Neptune's throne room smelling clean and ready for your next adventure.
- ▶ Shut all sanitation system seacocks when not in use (to prevent possible back siphoning and flooding).

YEARLY...

- ▶ Shock your holding tank at least once a year (spring or fall) to de-scale the inside and flush the system. Shock treatments (such as the Head-O-Matic Shock Treatment) help prevent odor buildup and can be used a second time if odors are noted mid-season. It is also recommended to shock the tank when you haul your boat out for the winter. Add shock treatment a week or so before the last pumpout, while still

using the boat, which gives the treatment time to slosh around in the holding tank to help de-scale the tank for the winter (it also helps ensure a clean final pumpout).

- ▶ Replace or blow out your vent hose. A clogged vent hose can promote smells and can damage your system due to the buildup of pressure each time the head is flushed. A clogged vent also creates negative pressure when pumping out, which can cause damage and possible collapse of the holding tank.
- ▶ Inspect your shower sump box. Opening it up allows you to clean the strainers, check the float switch for proper operation and check all electrical connections for corrosion and potential failure.

AS NEEDED...

- ▶ Change your hoses. Sewage will eventually permeate your sanitation system hoses, and while the frequency will depend on a number of factors (e.g., quality of hose, installation, use),

five years is probably the maximum time you want to go between changes. To see if your hose is permeated, wipe a section with a warm, damp cloth, drop it in a Ziploc bag, carry it above-decks into fresh air, open the bag and give a sniff.

- ▶ It's a fact: The more poop you have around, the worse things stink. Pump out your holding tank early and often, well before it hits the full mark.
- ▶ Check the holding tank vent line regularly for blockages. Mud daubers and other such insects love to build nests in vent lines, and if the tank is filled to overflowing, bits of sewage can clog the vent line.
- ▶ Rinse and flush the holding tank after each pumpout to dilute residual sewage and reduce odors. After pumping and rinsing, pour a mixture of one cup of liquid Calgon Water Softener to two gallons of hot water into the empty tank, then use the tank and pumpout when needed as you normally would. You can do this after each pumpout; however, the longer the water softener remains in the tank, the better, so try to time it between periods of heavy holding tank use and pumpouts (a week is ideal).
- ▶ Rebuild your toilet (new gaskets, seals, valves, impellers) every two years. The soft parts of your toilet will eventually dry out and become brittle, which leads to cracks and leaks. By replacing these parts on your own terms before they have a chance to fail, you've eliminated a boat owner's number-one nightmare: toilet failure (it never happens at a good time) and the emergency repairs necessary to fix them.
- ▶ To keep your toilet pump operating smoothly, follow your monthly vinegar flush with a dose of oil. The best choice for this is a lubricant specifically designed for use in marine toilets, which not only lubricates the pump wall (for easier pumping) but also helps keep the internal rubber parts oiled and supple. 🐙

Anchoring Woes

While on our owners cruise this year, I was able to observe several non-Aspen owners anchoring techniques, sometimes with a grin. Seems like a lot of boaters do not get this process and then often blame their equipment when their technique was really the issue. We watched one Bayliner owner in Sequim Bay harvest at least two truckloads of Seaweed, in the end giving up and departing.



I love to anchor and 8 of 10 nights on the water I am anchored. I also love Fortress anchors, though others work. In my experience, Fortress anchors hook 19 out of 20 times the first time - they are also light, easy to use, and have amazing holding power.

Here is my anchoring system:

Listen to the weather or ask your phone for a wind forecast for the evening. You are going to want to “set your anchor” into the prevailing wind.

Once in the cove you are hoping to spend the night at, look closely at your chartplotter for obstructions that could be a problem as you swing.

Think about how much swing room you need for 4 to 5 times the water depth. So, if it is 20 feet deep x a scope of 4-5 = 80 to 100 feet of chain/anchor line out.

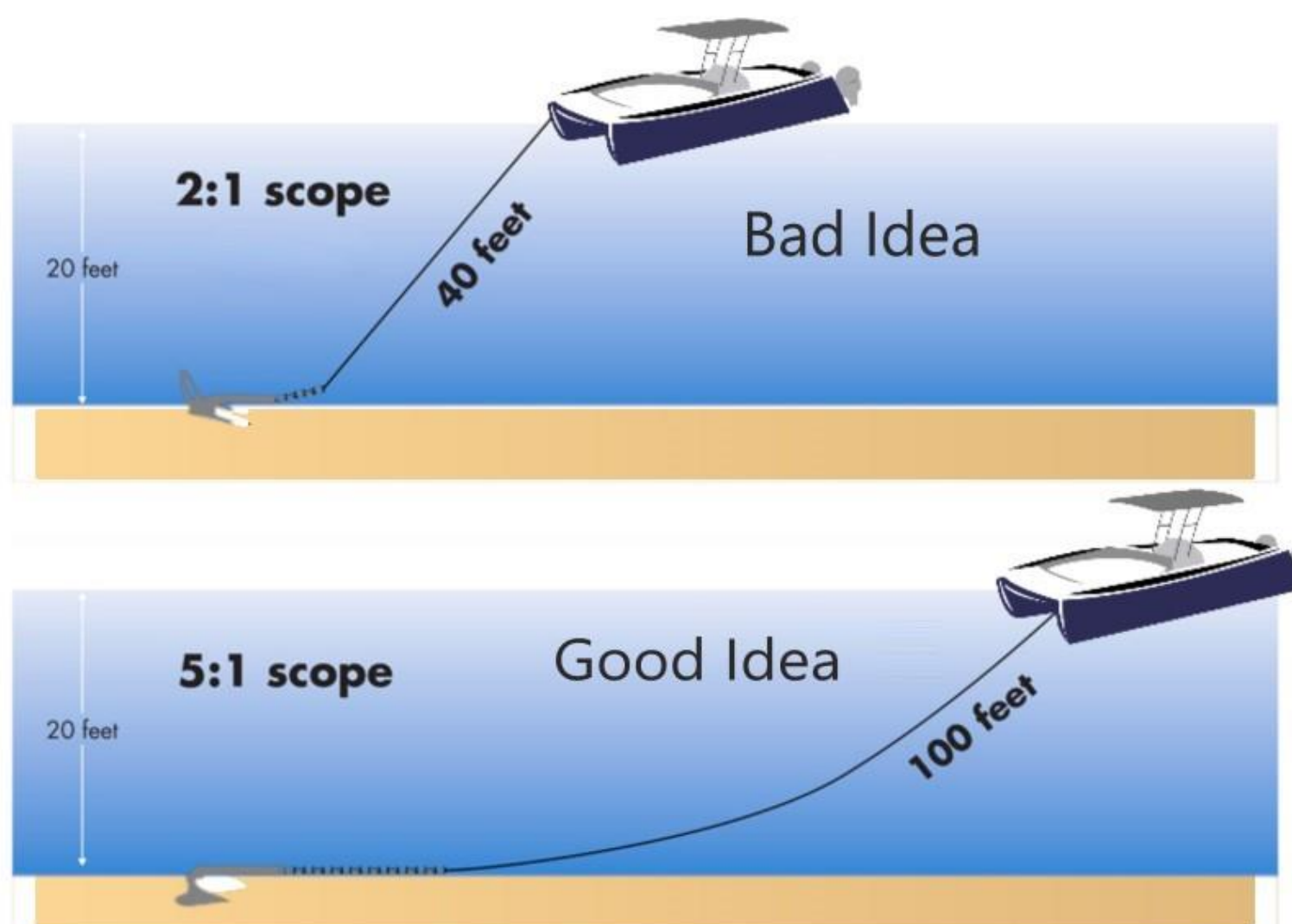
Next, situational awareness – assess the cove. Where are the other boats? Is there a cut in the trees in one area that will make that part of the cove windy? Is it exposed to a large open body of water? If so, it means risk! When the tide changes and the current switches, are you exposed to the current bringing chop and swell into your cozy bedroom?

Anchoring Woes

Once I have picked the cove and basic location (if I have not been there before), I switch my Chartplotter sonar to full screen and troll zig zag through the area I am going to anchor in. I look for unexpected anomalies on the bottom IE, big rocks, log dump cables from (my guess) 80 years ago? I also study the thickness of the sonars bottom and its color, if it is a thin line with yellow that often indicates a hard rock bottom, eelgrass and kelp frequently show up on newer plotters as well. This is all good information in making your anchor drop.

Once I am sure the bottoms likely to work. I move into position to drop the anchor into the expected wind and clear of surrounding boats and their likely swing as the winds change. This is a process of lowering the anchor chain to water depth, say 20 feet plus 5-10 feet, and then letting the wind drift you back, or bump reverse a bit to get the boat slowly gliding aft while you simultaneously lower the rode (anchor line) across the bottom. You do not want to drop the anchor and pile 6ft of chain on top of it and then begin to back down, it's very likely to catch on the anchor's flutes and simply make a blob dragging on the bottom. Keep track of your rode's depth markers, chain is painted white typically at 30 feet, then the first green marker at 60 feet, and often red at 90 feet (Note: 60 feet upside down can be mistaken for 90 feet, so be careful).

The next step is where many, if not most, boaters goof. They begin taking tension up on the rode far too early. Often when the scope ("angle of pull" is still at only two- or three-times water depth, so 40 or 60 feet) The anchor drags along the bottom with no way to dig in. These are the boaters who haul their anchors in with a huge kelp pile with each attempt to anchor. We watched one Bayliner do this 6 times – what a lot of work. The right time to begin putting tension on the anchor is when you have at least 4 times depth so in 20 feet of water that is 80 to 100 feet of rode.



Anchoring Woes

The final step is delicate, with the rode out per the depth noted above, I ease the boat astern. Typically, 2 seconds in reverse then glide 3 seconds in neutral - I do this over and over, gently seating the anchor (if needed you can use the thrusters a bit to keep the boat aligned). Within 30 seconds the boat will stop drifting aft and hold its position. I reference a near object and one onshore maybe a nearby boat and tree onshore. When they stay fixed the anchor has set I continue this gentle nudging (2 seconds in reverse 3 seconds neutral) for another 15-20 seconds to seat the anchor well. It is important to note with our large props you will not typically be able to leave the boat in reverse continuously with a scope of 4 or 5 to one. If you know a blow is coming extend your scope out to 6-7 times one water depth. I then switch off the engine and relax a bit, keeping an eye on how she is swinging for at least the next 20-30 minutes.



Another mistake is overloading the anchor locker (in this instance by 80 pounds 18' from the center of buoyancy). Extra anchors and chain are okay, but store closer to the center of buoyancy (mid-ship). The issue, like in any boat, is adding too much weight forward will cause bow steering in heavy seas.

Common Anchoring Questions:

How tight should my winch clutch be set (knob on side of the windlass)?

- I set mine so with the anchor in the roller, when I grab the chain or line 18" in front of the windless and pull straight up hard, I can make it slip, if I pull with nearly everything I've got. You do not want this clutch so tight that when the anchor is pulled in and hits the anchor roller it bends or makes a jarring crash. With this clutch setting On retrieval, it will pull in 10-15 feet the rode and then slip a bit, wait for the boat to glide into position, then hit the in button again gathering line until it becomes snug, then let the boat glide in again. Your owner's bag includes a wrench if you need a bit more leverage to snug up the clutch.

How do I clean the anchor on retrieval, my deck, chain, and anchor are a gooey mess?

- I use a bouncing technique. I will pull in the rode until I see its dirty then give it a vertical bounce 2-3 times gather more then do it again. Once I see the anchor 1-3 feet underwater, I bounce it up and down until it is clean. Then as it gets close to the roller, I go to just tapping the in button until the anchor is just below the roller. I then step clear of the buttons and by hand pull the anchor up into the roller and square it just so, by hand with a small stack of chain yet to pull in. Then I slowly tap the in button to snug the anchor into the roller assembly. The last step is to put a snubber line or bungee cord from the anchor to the cleat. Give your windless a lot of respect it can cut your finger off effortlessly.

What is the chain for, seems dirty and heavy?

- The chain's weight when tensioned by the boat works to keep the pull on the anchor parallel to the bottom and as a natural spring tensioner. Aspens are rigged with 1.5 times the boat length in 5/16th chain. It is also very good in high abrasion bottoms that might damage a nylon line.

Why not all chain?

- First, its heavy and can upset the boat's balance, heavy seas tracking and ability to lift through large swells. Maybe more important is that being steel as the boat swings at anchor and bobs in seas it transmits a great deal of noise into the boat. The fix for this is two nylon snubbers attached to the chain that reaches down below the surface and take the tension. Fixes the noise but a lot of extra work.

Can I run the windlass while the engine or generator is off?

- Yes, compared to other loads the windless is small and very intermittent.

Should I wash the anchor line and chain after each multiday trip?

- Yes, with freshwater, a rinse will go a long way to keeping the chain rust free and line looking new.

ENGINE MAINTENANCE SCHEDULE

Your Yamaha engine and its equipment are designed for high reliability and long life. The engines are built to withstand the marine environment, but also to have the smallest possible environmental impact. If the engines are serviced regularly according to the schedule, these qualities will be retained and unnecessary malfunctions will be avoided.

The “●” symbol indicates the check-ups which you may carry out yourself.
The “○” symbol indicates work to be carried out by your Yamaha dealer.

Item	Actions	Initial	Every			
		20 hours (3 months)	100 hours (1 year)	300 hours (3 years)	500 hours (5 years)	
Anode(s) (external)	Inspection or replacement as necessary		●/○			
Anode(s) (internal) *1	Inspection or replacement as necessary		○			
Anode(s) (internal) *2	Replacement				○	
Battery (electrolyte level, terminal)	Inspection every 30 days	●/○	●/○			
Battery (electrolyte level, terminal)	Fill, charging or replacing as necessary		○			
Cooling water leakage	Inspection or replacement as necessary	○	○			
Cowling lock lever	Inspection		●/○			
Engine starting condition/noise	Inspection	●/○	●/○			
Engine idle speed/noise	Inspection	●/○	●/○			
Engine oil	Replacement	●/○	●/○			
Engine oil filter (cartridge)	Replacement		●/○			

Item	Actions	Initial	Every			
		20 hours (3 months)	100 hours (1 year)	300 hours (3 years)	500 hours (5 years)	
Fuel filter (can be disassembled)	Inspection or replacement as necessary	●/○	●/○			
Fuel line (high pressure)	Inspection	●	●			
Fuel line (high pressure)	Inspection or replacement or necessary	○	○			
Fuel line (low pressure)	Inspection	●	●			
Fuel line (low pressure)	Inspection or replacement or necessary	○	○			
Fuel pump	Inspection or replacement or necessary			○		
Fuel/engine oil leakage	Inspection	○	○			
Gear oil	Replacement	●/○	●/○			
Greasing points	Greasing	●/○	●/○			
Clamp bracket bolt (through tube)	Inspection and greasing		○			
Impeller/water pump housing	Inspection or replacement as necessary		○			
Impeller/water pump housing	Replacement			○		
Power trim and tilt unit	Inspection	●/○	●/○			
Propeller/propeller nut/cotter pin	Inspection or replacement as necessary	●/○	●/○			
Shift link/shift cable	Inspection, adjustment or replacement as necessary	○	○			
Spark plug(s)	Inspection or replacement as necessary		●/○			

Item	Actions	Initial	Every			
		20 hours (3 months)	100 hours (1 year)	300 hours (3 years)	500 hours (5 years)	
Spark plug caps/spark plug wires	Inspection or replacement as necessary	○	○			
Shift Dampener System (SDS) propeller damper	Inspection or replacement		○			
Water from the cooling water pilot hole	Inspection	●/○	●/○			
Throttle link/throttle cable	Inspection, adjustment or replacement as necessary	○	○			
Thermostat	Inspection or replacement as necessary		○			
Timing Belt	Inspection or replacement as necessary		○			
Valve clearance	Inspection and adjustment				○	
Cooling water inlet	Inspection	●/○	●/○			
Main switch/stop switch	Inspection or replacement as necessary	○	○			
Wire harness connections/wire coupler connections	Inspection or replacement as necessary	○	○			
(Yamaha) Meter/gauge	Inspection	○	○			
Fuel tank (Yamaha portable tank)	Inspection and cleaning as necessary		○			

Item	Actions	Every
		1000 hours
Exhaust guide/exhaust manifold	Inspection or replacement as necessary	○
Timing belt	Replacement	○