



## ***KALLISTO*** Owner's Notes for Guests

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*Welcome aboard KALLISTO!*

*KALLISTO is a 2010 Jeanneau Sun Odyssey 39i Performance, with 3 staterooms, 2 heads, generous water capacity and ample storage for food and gear. With a 7' 2" draft, 60' mast, traditional loose foot main with ample battens and a powerful foresail KALLISTO is a very rewarding boat for enthusiastic sailors. The boat's helm behavior and balance are remarkably sweet natured.*

*KALLISTO's characteristics and equipment are well suited to typical charter season sailing conditions in the San Juans and destinations north. She sails happily in light airs, accelerates swiftly, points pleasingly high and is always ready to take full advantage of stronger winds. Amenities and systems on KALLISTO are focused on improving the coastal cruising experience while remaining reasonably simple to operate; along with her excellent performance KALLISTO is full of features for making life on a boat pleasant.*

*KALLISTO has been with San Juan Sailing since her commissioning. Second and present owners Ann and Doug Bostrom have chartered various boats of all descriptions in both hemispheres over the years and bring a charter guest's perspective on what can help to maximize fun and convenience while enjoying and caring for another person's boat.*

*As a package KALLISTO is a nifty synthesis of performance and comfort.*

**Why KALLISTO?** *The word "KALLISTO" in Greek means "most beautiful." We hope that you agree she is. In Greek mythology KALLISTO was a daughter of the Arkadian King Lykaon and a hunting companion of the Goddess Artemis. She was seduced by the God Zeus, and bore a son named Arkas. Zeus' jealous wife, Hera, transformed KALLISTO into a bear. Later Arkas became a hunter, and in order to spare KALLISTO from his arrow, Zeus transferred her to the stars to become the constellation Ursa Major. That theme is seen in our spinnaker.*

### ***About these owner's notes:***

A fully built-out cruising sailboat is a very complex system. Although there are elements of commonality between all sailboats, a myriad of specific choices go into the construction and equipment of any particular boat. Whether you're an experienced sailor or newer to the game, you'll likely benefit from taking some time to read these notes. Once underway the chances of a calm moment for studying up on features making your trip more fun will be scant.

**Thanks for reading this!**

***Two symbols appear throughout this guide:***



*Indicates a safety-related hint or caution*



*Describes a helpful hint or boat quirk*

### ***Charter Boat Stewardship***

Operating a boat in charter with a popular fleet involves an amazing chain of stewardship, with many hands on a given boat as she keeps a busy schedule. In high season, vessels in service with San Juan Sailing return to harbor late on a Friday morning and must be fully cleaned, scrupulously serviced, fully restocked and ready for preboard of the next crew, all in a mere 6 hours of effort that sometimes approaches the level of synchronized dancing.

Our charter guests are part of this symphony of care and coordination. Lockers left with contents appropriately returned and distributed, deck keys returned to where deck keys live, PFDs returned to dry stateroom lockers and general ***“how would I like to find this?”*** thinking is a serious help to making the next crew's outing as enjoyable as that crew disembarking.

***We sincerely Thank You*** for anything you may be able to do to help make *KALLISTO's* next crew find everything in its place when needed, with any discrepancies you may have encountered or that have developed during your cruise remedied thanks to your advice and notice to San Juan Sailing.

# Kallisto Deck Locker Location Diagram

Sheets, docklines, spinnaker  
(when aboard and at ready),

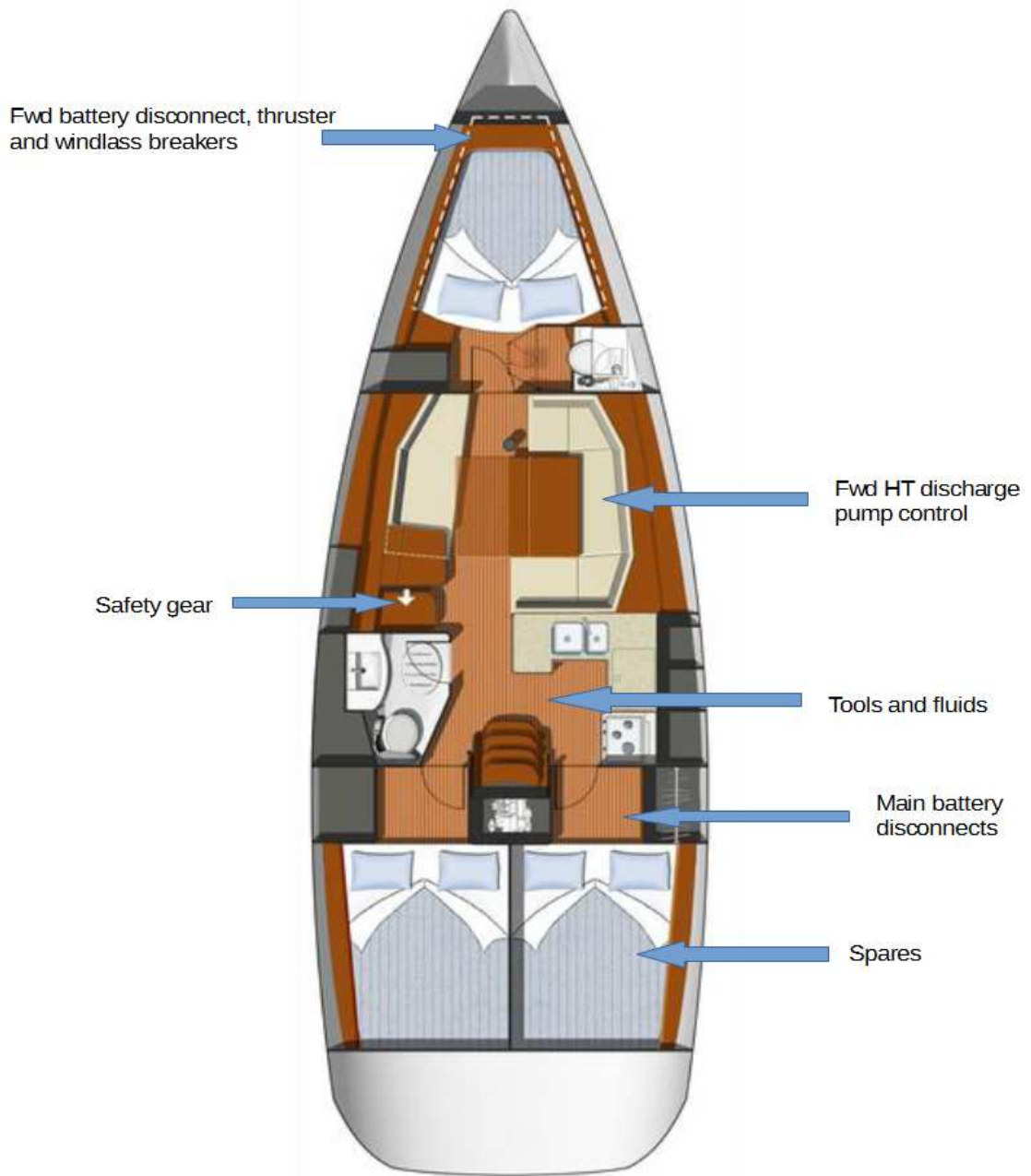
Fenders,  
Secondary anchor  
rode

Stem tie line,  
Crab pot.

Shore power lines,  
Potable water hose,  
Cleaning supplies.

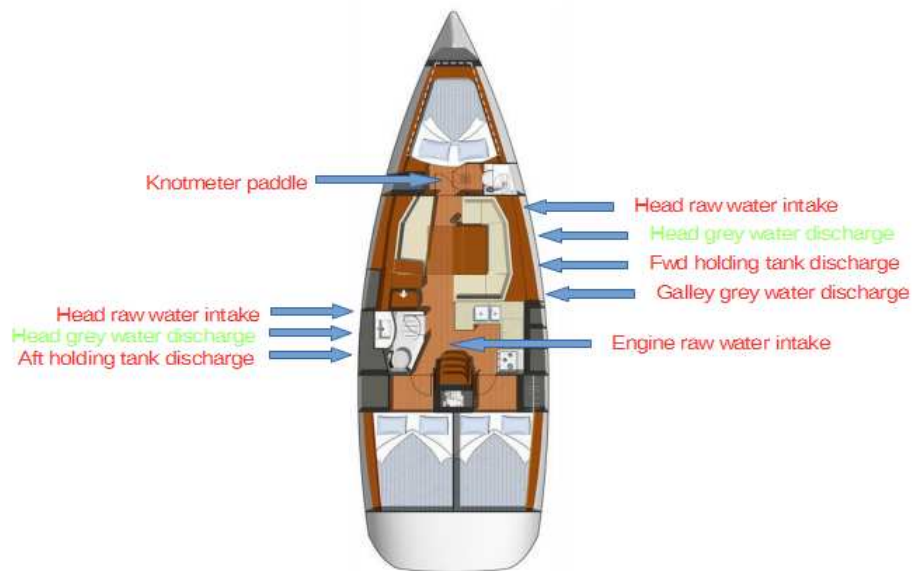


# Kallisto General Location Diagram



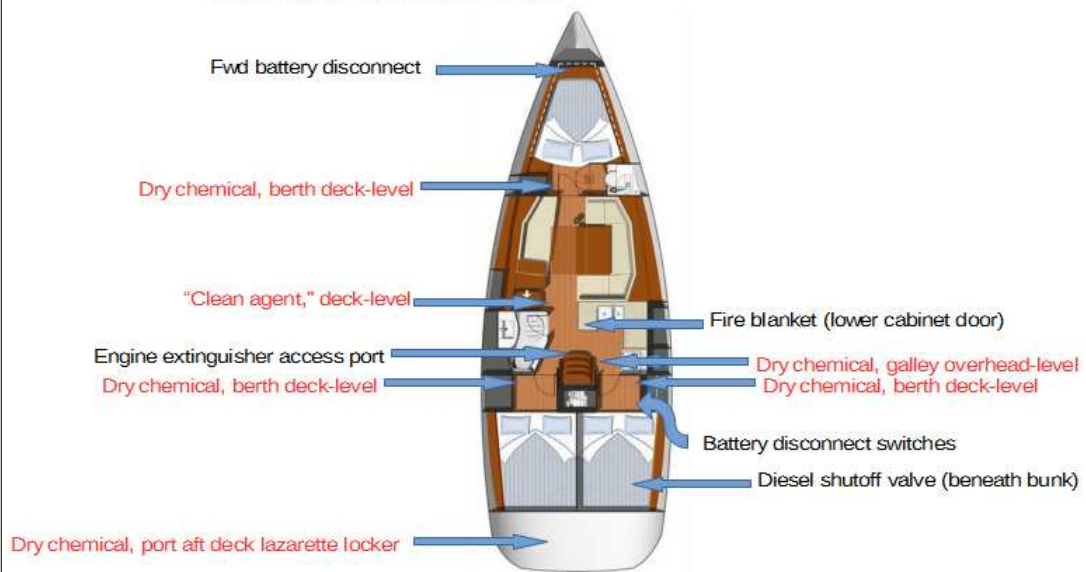
## KALLISTO thru-hull locations

Items in red are below unheeled waterline



## KALLISTO fire management locations

- Smoke detectors are on overhead of berths, saloon. Detector button silences nuisance alarms.
- Emergency exit possible through overhead hatches in forward berth, saloon.
- Stop engine to stop engine ventilation before attempting to use engine extinguisher port.
- Fire extinguisher locations shown in red.



**Notes and suggestions for our next revision:**

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*(alphabetical by topic/subject)*



## KALLISTO Specifications:

Year Built: 2010  
LOA:38' 11"  
LWL: 35.2"  
Beam: 12'9"  
Draft: 7'2"  
Air Draft/Mast Height Above Waterline: 62' with antenna  
Dry/Light Displacement: 15760 lb.  
Maximum Displacement for CE "A" conditions rating: 19,280 lb.  
Wet Payload for CE "A" conditions rating: 2,200 lb. (wet displacement includes full holding tanks)  
Disp/LWL: 150.8  
Beam/LoD: 0.3  
Sail Area/Disp: 21.1  
Engine: Yanmar, 39HP  
Fuel consumption: 0.6GPH @6knt.  
Fuel Capacity: 34 gal.  
Thruster: Low drag, low weight Lewmar 110TT, 65 lbs. thrust  
Potable Water Capacity: 90 gallons  
Holding Tank Capacity: 35 gallons, 12+23 in two tanks fore and aft respectively  
Refrigerator capacity: 35 gallons, 4.6 cubic feet  
Domestic Batteries: 300AH nominal, 225AH usable  
AC Inverter: full sine, 2.7kW  
Permanent Berths: 6 in 2:2:2 cabin arrangement  
Headroom in Saloon Center: 6'3"

**Ground Tackle:**  
Main anchor: 44# Lewmar Claw w/300' 5/16" chain rode  
Secondary anchor: 15# Bruce aluminum w/50' 5/16" chain, 260' 5/8" nylon rode

**Navigation Aids:**  
AIS (Si-Tex)  
Radar (Raymarine 4KW digital)  
Autopilot (Raymarine SPX-30, SmartPilot head)  
2 multi-function chart plotter/displays (Raymarine Axiom Pro)  
3-D sonar (Raymarine RV-212, dual transducer)  
6 multi-function instrument displays (5x Raymarine ST-70, 1x ST-60 Multi)  
DSC VHF w/cockpit controls (Standard Horizon)

**Safety:**  
4 smoke detectors/alarms  
Carbon monoxide detector/alarm  
Propane leak detector/alarm  
6 fire extinguishers  
Fire blanket  
2 bilge pumps, ~2,000GPH combined capacity  
Portable electric crash/dewatering pump w/30' 3" collapsible hose, ~6,000 GPH  
First aid kit  
USCG-required signaling, flotation and other gear (electronic flares)  
Jacklines, 2X harnesses

**Entertainment:**FM/AM/CD/MP3/iPod/iPhone/Bluetooth/DVD compatible receiver, 22" HD display, off-the-dock Internet

## Anchors & Stern Tie

*KALLISTO* is equipped with two anchors. The **primary bow anchor** is a 44 # Lewmar Claw (Bruce) with 300 feet of 5/16" hi-test chain. The chain is marked at 25' intervals by yellow rope rove into the links (ignore residual yellow paint). 15' before reaching the bitter end, the chain is marked with red paint and red line rove into the links. **If you see red, STOP** paying out chain as you are about to spill the chain off the gypsy.

A relatively strong but easily cut rope section serves as a mechanical fuse past the chain rode and as a way of easily slipping the ground tackle should it become necessary.

The **secondary anchor** is an aluminum 15 # Fortress, light but competent, with 50 feet of chain and 260 feet of nylon rode. Because the rode and anchor as an assembled unit are hazardous to move around together, the secondary anchor itself is stowed in the bow anchor locker, while the rode is in the port aft deep cockpit locker. Use the boat hook to pick up the handle of the bucket containing the chain portion of the rode and heave it up.

**Safety Note:** The chain portion of the secondary rode weighs 58 pounds and presents a potential injury hazard while being lifted out of the locker.



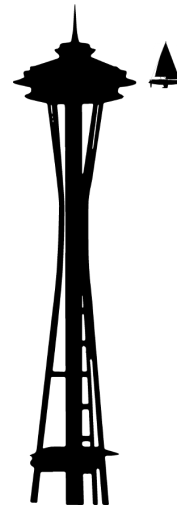
A rule of thumb anchor scope to use in the islands is 4-to-1 for the highest water depth you'll encounter in the spot where you choose to drop anchor. Tides are large in our area; check your tide data to know how much water you may gain and how much water you will lose as the tide floods in and ebbs out during your stay as this may significantly affect your scope.

It's worth checking set; after you have paid out the suitable amount of chain, 1 or 2 minutes of gentle reverse power (perhaps 1200-1300 RPM) sets the anchor and tests holding power while you sight a fixed object to confirm movement has stopped. If you wish to sleep even better or are expecting 30 knot winds, throttle up to about 1500 RPMs in reverse for another 30 seconds to prove to yourself that the anchor is set well!

For storm conditions (sustained winds of 25+ knots), extend your scope to 7 or even 10-to-1 provided you have room to leeward. Otherwise, set two bow anchors in a v-type pattern for extra holding power. The secondary anchor can easily be dropped and recovered from the dinghy.

The **stern tie line** is a 600 foot reel of yellow polypropylene line for stern ties, located in the aft-most center cockpit locker on an axle.

The easiest way to use the reel is from its normal position in the stern locker. Otherwise, you can put the boat hook through the reel and place it on the stanchions on the rail hooks provided.



*KALLISTO, rode and Space Needle, to vertical scale.*

We recommend using appropriate gloves while handling polypropylene line in the lengths necessary for stern tying as the line is not at all “palm friendly.” Gloves are available in the tool space at the bottom of the companionway. Please put them back fully dry.



*Stern tie in default position*

The stern tie axle in the aft locker is designed to allow the reel to “jump out” if too much tension is applied to the line (a lot).

It *almost* goes without saying that you’ll need to cleat-off both ends of the stern tie line on *KALLISTO*’s sturdy stern cleats. **Neither the reel axle nor the pushpit rails are adequate to handle a working load from the line.**

With 600’ of rope available, usually you’ll have enough scope to take a loop from the stern and around a (sturdily attached) object on shore, then back to the boat, cleating port and starboard.

**With the amount of activity in our operating area in the long run it’s harmful to draft living trees for stern tie duty.** You may have no alternative but using a live tree for stern tie is best avoided if possible.

Please do not store the stern tie reel and line in any but the aft-most center stern locker; the line absorbs quickly but drains slowly a lot of salt water which we do not want draining into *KALLISTO*’s bilges.



## **Anchor Windlass & Anchor Operations**

**Safety Note:** The windlass produces high torque and is geared down at a high ratio. Fingers or other extremities caught in the windlass gypsy or trapped by chain in other areas of chain movement will not be noticed by this apparatus. Please use all due caution when operating the windlass, particularly during steps requiring intervention by hand. Never allow children to be in the vicinity of an operating chain windlass and do not let yourself become harried or distracted while manipulating the windlass yourself. Pause to consider before and while using hands around the windlass and chain, if it becomes necessary to use hands on the rode.



### **General:**

- Windlass power is received from the engine starter battery and a forward auxiliary battery. The windlass will **only** operate while the engine is running!
- The up-down controller for the windlass is located inside the chain locker (leave plugged in please).
- *KALLISTO* has a wonderfully deep chain locker but chain being it what it is, the links dropping off the gypsy sometimes bunch up under the windlass; you might

need to push the resulting heap down several times to the bottom of the chain locker to prevent the chain from jamming in the windlass. The boat hook is ideal for this as it keeps your own appendages away from the gypsy etc.

### **Review on deploying and setting anchor:**

- Use the controller to ease out some slack in the chain, across the locker
- Ease the anchor over the rollers by foot or hand
- Without delay so as to avoid bashing the hull, continue lowering the anchor



**Safety Note: Anchoring is not complete until the snubber is set on the rode.** Failure to set a snubber is not only poor seamanship but puts the boat and crew at risk in the event that the windlass is damaged by shock and can no longer move chain. This is a cruise-ending event but easily avoided with the use of a snubber.

**A fixed snubber is mounted on deck. Use the full length of the snubber and deploy chain until the chain is slack and the snubber taut.**



*Correctly deployed snubber: chain slack and snubber taut*

### **Anchor retrieval review:**

- When retrieving the anchor, never use a windlass to pull the boat forward to the anchor
- If you don't have back pain or other requirements for help:  
Once the anchor breaks surface, finish retrieval by hand
- Some of us have trouble handing the anchor manually:  
After the anchor breaks surface and as it approaches the rollers, "bump" the controller so that the anchor has an opportunity to

rotate on its own (it will) and come in. *Don't allow the chain to become taut under windlass power.*

- *KALLISTO's* 1kW anchor windlass is easily capable of working the rode in a deep anchorage. If you encounter a stalled windlass you've likely become fouled or the anchor is so deeply set that additional measures will be needed.
- DO NOT use the windlass power to take up the last few inches of slack. Just take the extra chain and snug it up and hand-set the chain back onto the gypsy.
- After raising, use the snubber and starboard cleat to fix the anchor chain, ensuring it cannot slip off the rollers if the windlass brake should become unset.

## Barbecue

### General:

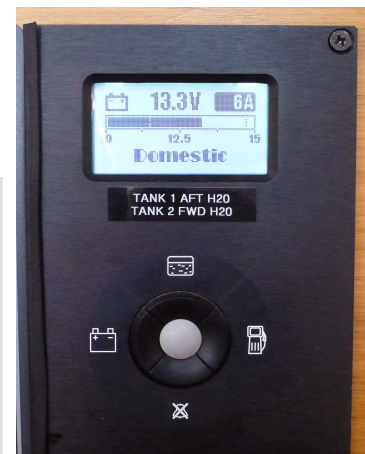
- The solenoid valve control in the galley controls the BBQ as well.
- Turn the control to the “on” or “light” position, and with the LID OPEN, light the burner through the opening at the bottom of the grill using the galley stove lighter.
- The barbecue cooking surface is fairly massive. For grilling meat or fish directly on the grill, allow plenty of warmup time.
- Please make up an aluminum foil, grease tray to fit on the bracket under the BBQ. Otherwise, the grease drips on the transom and the teak step, which is difficult to clean.
- The degreaser in the galley and long-handled brush will deal with spills to the transom but the less to clean the better, of course.
- During breezy conditions you may find that the ignition hole in the lower center front of the barbecue is letting in too much wind and upsetting combustion. Stuff a piece of aluminum foil into the hole to correct this.

*As a courtesy to the next crew, please use the wire brush attached to the BBQ to clean it after use.*

## Batteries & Charging

Batteries are a fairly big deal when it comes to cruising on boats. We’re accustomed to infinite electricity from our utility service at home but when on a boat we have to pay attention to our electrical consumption more closely. If we don’t pay attention, various disappointments will ensue. Please forgive us while we possibly over-explain how to use *KALLISTO*’s batteries.

**i** *KALLISTO* is equipped with LiFePO<sub>4</sub> (lithium iron phosphate) batteries. **LiFePO<sub>4</sub> voltage profile during discharge is very different** from that of the older lead-acid technology. For the user, this is reflected in a longer and flatter discharge voltage curve, with the batteries reaching 70% discharge at 12.8V under typical loads. **Recharge at 12.8V.**



*Scheiber battery display*

**“How long will batteries last and please skip the man-splaining:”**

- In practice we have found that an overnight stay in cooler weather (45 F) with typical battery usage for cooking, sanitation, lighting, refrigeration, “device” charging and overnight heating at 65 degrees leaves the batteries at ~70% capacity. During summer and/or when the boat furnace is not in heavy use, this time will be extended.

- The electrical system will automatically disconnect many non-safety loads if you over-discharge, requiring you to recharge before using potable water, flushing toilets etc.

#### **How to check available charge and discharge rate:**

- **State of Charge (SOC):** Press “Meter” on Magnum panel twice. Turn the knob so that “BM: SOC” appears in display. Push the knob.
- **Discharge rate:** Press “Meter” on Magnum panel twice. Turn the knob so that “BM: Meters:” appears in the display. Push the knob, rotate to select “DC Amps,” push again.

**Recharge when you reach 12.8V.** Fully charging requires several hours of engine operation or shore charger connection.

#### **Charging:**

An important benefit of LiFePO4 batteries is that they don’t mind sitting in a partially discharged condition. For those of us trained to properly try to keep lead acid batteries as full as possible this is a bit of a mental shift. There is more of an option to be calculating about battery usage, possibly to forestall engine charging for one more night if underway use of the engine is planned for the next day.

The house bank stores a total 300 amp-hours in LiFePO4 (lithium iron phosphate) batteries. Except in emergencies or when coping with a failed alternator, for long term health batteries shouldn't be depleted much below 20% capacity, meaning **there are 240AH of routinely usable electrical reserve power available on the boat.**

#### **Charging at the dock with shore power:**

- The Magnum inverter/charger panel will indicate the status of the shore charging process.
- Recharging at the dock is limited somewhat by the AC supply from the dock outlet.
- Expect a full charge to require about 6-7 hours from complete depletion of usable battery capacity.

#### **Charging with engine and alternator:**

- At typical cruising RPM and starting from full depletion, about 3 hours are needed to completely charge batteries.
- For charging while on the hook or ball, note that the alternator will not effectively charge the batteries at low or idle speed; it will require many hours to charge with the engine running slowly. At 1,500 RPM batteries will be *fully* charged after about 4.5 hours.
- Running the engine for prolonged periods at low RPM will cause coking problems. 1,500 RPM is a reasonable speed for charging while stationary. **Again, 1,500 RPM is appropriate for charging while not underway.**

#### **Details:**

Two nominal 100W solar panels located on the companionway hatch garage and dodger supplement the electrical supply and are helpful for offsetting navigation and

refrigeration loads while sailing. In fair conditions these panels will supply enough juice to make quite a difference in battery charge state when reaching a mooring after being underway all day under sail. They're also quite helpful while on the hook or a mooring ball. When moored, a fanatical skipper will find it helpful to use the traveler to adjust the boom so as to reduce shading of the panels.

The engine starter battery is a single high-amperage-output model specifically designed for starting diesel engines and is normally paralleled with the forward windlass/thruster battery.

Battery voltage and current domestic bank DC electrical discharge rate in amperes can be monitored on the Scheiber monitor panel at far right of *KALLISTO*'s nav desk panels. Push the button with the battery icon to cycle through voltage readings for the starter and domestic batteries.

If the domestic battery discharge rate is at least 1 ampere, the discharge rate will be shown at upper right of the Scheiber panel. In the illustration, 6 amperes are flowing out of the domestic battery.

Some system current demands (significantly the heater) are not reflected on Scheiber panel. More comprehensive battery information can be obtained via the Magnum inverter/charger panel as detailed [above](#).

To help with battery usage planning, here are consumption figures for some single loads on *KALLISTO*'s batteries (you'll need to consider how things add up):

Load	Hours available
Anchor light	1,575
Stereo	225
Generous onboard lighting	90
All nav with autopilot active	56
Laptop via inverter	50
Diesel heater	37
Hairdryer via inverter	1.75



### Low Voltage Disconnect

Because most of us now expect and are largely trained to rely on electricity for safe operation of our vessels, *KALLISTO*'s electrical system prioritizes battery loads and reserve power so as to preserve power for navigation. When battery voltage reaches 12.2 volts, most domestic loads (water pressurization, TV and stereo etc.) will be dropped automatically by a “Low Voltage Disconnect” contactor, or “LVD.” Before this happens a yellow light will flash for 10 minutes on the navigation alarm panel, affording an opportunity to start the engine and recharge. If this advance warning is not noticed and power drops at an inopportune moment, flipping the “LVD Reset/Off” switch leftward to “10 min override” will restore domestic power for 10 minutes.



*Protection built into the domestic batteries will disconnect them from loads if the batteries should fall to drastically low levels. If this should happen, start the engine and charge immediately. In practice this should never happen.*

### Battery disconnects:

Disconnects for the engine and domestic batteries are located in the port aft berth on the bulkhead at the head of the bunk. Circuit protection for the forward battery supply cables is located on the same panel.



*Never turn a battery switch to “off” while the engine is running! This can blow the diodes on the alternator, may destroy important navigational equipment and your batteries will no longer charge.*

## Bilges and bilge pumps

*KALLISTO* has several bilge pumps and a high bilge water level alarm:

- A small primary electric pump located in the bilge sump handles routine bilge duties such as evacuating melted ice water from the refrigerator.
- Located above the sump level, a more powerful electric “casualty” pump (~1,700GPH) is intended to assist with more serious leakage problems.
- A hand-operated pump in the cockpit acts as a backup to the bilge sump pump and as a pump of last resort in cases of emergency.

- A visible and audible alarm will activate if bilge water should rise above the level normally handled by the sump pump.
- **A portable high capacity evacuation pump is also on the boat;** see the Emergency and Safety Equipment section of these notes for details.

**Pump operation:**

- Operation of both electric pumps is normally fully automatic.
- Both electric pumps can be tested and operated manually using their respective switches at lower right of the DC distribution panel (illustration 6).
- Whether in manual or automatic operation, a red light will flash next to an operating pump's auto/manual switch on the panel.
- All bilge pumps overboard discharges are at the transom; water continuously draining over the transom should be investigated regardless of whether the bilge alarm can be heard or seen.

**Manual bilge pump:**

The manual bilge pump folds and closes as not to clutter the cockpit, thus is a little hard to find and use for the first time. It is installed just beneath and inboard of the starboard helm. These photos show how the manual pump deploy and operates:



*The manual bilge pump cover*



*Manual bilge pump lever unfolded and extended*

**Monitoring the bilge:**

It's good practice to check the bilge for unusual amounts of water each day, morning and evening. *KALLISTO* has a bilge sump for collection and disposal of condensation, routine leakage through deck fittings, ports accidentally left open, refrigerator flushing and the like. This sump is located immediately aft of the mast, and ordinarily water should be well below the top of the sump. If there is substantial water in this area it is cause for further investigation.



**If excess water is found in bilge or bilge alarm sounds:**

- Check to make sure the breaker “Bilge 1” on the main breaker panel is switched on.
- Use the “Bilge 1 Auto/Man” switch at lower right of the DC distribution panel to manually test the bilge pump.
- If the pump actuates (clearly audible in normal circumstances), the float switch is defective. If the pump fails to actuate then the pump is defective. In either case, please notify San Juan Sailing so that repairs may be arranged.
- While the primary pump is out of service, use the cockpit hand-pump to manage water in the bilge sump-- the cockpit pump draws from the bilge sump.
- If there is a substantial amount of water in the bilge, well above the sump level, **taste it. If it’s salt you need to discover where it’s coming from, immediately.**



*Note that the refrigerator drains into the bilge; most of the water that accumulates in the bilge sump is from melting ice and condensation. The mere presence of water in the sump is not a matter for concern. Frequent operation of the pump should be investigated.*

### **Secondary bilge pump**

The secondary bilge pump is located beneath the deck just ahead of the aft settee.

Unlike “Bilge 1”, the higher capacity “Bilge 2” is a centrifugal pump and depends on water cooling of its bearings and motor. It should not be operated in a dry condition.

If the secondary bilge pump is called into play it’s likely you’re facing an emergency. Continued efficient operation of the pump becomes very important. **Expect debris from bilges to interfere with pump operation. Ensure the inlet screen is kept clean while the pump is needed and running.**

### **Bilge High Water Level Alarm:**

In sea stories it's often the case that flooding bilges are only noticed when floorboards float. *KALLISTO* has a high bilge water level alarm that will sound when the sump is full but before the secondary bilge pump activates. If the alarm sounds and investigation reveals water in the bilges (check the space with the bilge sump, at the floorboard indicated with red dot on the handle), urgent response is indicated. Taste the water in the bilge; if it's salt water then you have a sea water leak large enough to overwhelm the sump pump and need to swiftly execute a response.



*Bilge high water alarm*

In a flooding emergency you'll need the engine, for electricity to power pumps, navigation, communications. As it may be impossible to start the engine should the starter motor become soaked, **start the engine as soon as you feel concern about flooding.** If you have any doubt about being able to manage the flooding, issue at minimum a “PAN” call to alert possible local help and if need be issue a “MAYDAY” via DSC and voice.



## Bow Thruster

*KALLISTO* is equipped with a bow thruster, the equivalent of an invisible crew member who can walk on water and shove the bow port or starboard. If you're short-handed or have a green crew who need a bit more time to go through docking procedures the thruster can lend a hand and buy time while shrinking the yelling coefficient of docking.



*Thruster control*

The bow thruster is intentionally sized quite modestly so as to avoid weight gain, loss of buoyancy and increased drag in the performance-critical entry area of the boat.

Nominal thrust is 65 lbs., the equivalent of a fairly heroic push on the boat by a person.

### **Thruster operation:**

- Activate the thruster by pushing the button on the thruster panel, located at the starboard helm position.
- “Ready” is indicated by the flashing red pilot light.
- Push the boat's bow starboard or port by pushing the control lever to starboard or port. There is no automatic timeout on enabling the thruster-- turn the unit off when done so as to avoid accidental activations.

### **Thruster thermal protection:**

- Like all electric thrusters this one has a powerful motor but is not able to operate for extended periods of time.
- The thruster is rated for 7 minutes of operation in a given session of more or less continuous action.
- If you overdo it with the thruster, a thermal trip will engage and the thruster will be disabled until it cools.
- You'll need to wait about 20 minutes before resuming operation, with the second and subsequent session times being much shorter before trip-out due to accumulated heat.
- In practice the thruster is mostly only “blipped” for a few seconds at a time; 7 minutes essentially amounts to “forever” in terms of actual docking activity.

### **Thruster electrical supply:**

- The thruster and windlass draw from the engine starter battery and also share an auxiliary battery, the auxiliary battery being located along with the thruster in the forward-most accessible space beneath the v-berth.
- Circuit breakers protecting the power supply from aft and the windlass are in the same space, as well as a disconnect switch for the forward battery.

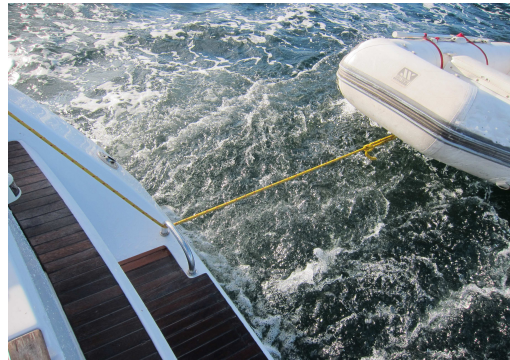
- The thruster fuse is adjacent to the forward battery. A spare fuse for the thruster motor is attached to the thruster. However, a blown fuse should not be replaced until a definite reason is established for losing the first fuse.

Foreign objects dragged into the thruster tunnel are the most likely cause of a blown fuse and generally will need to be cleared before there is any point in replacing the fuse. **Do not attempt to clear a jammed thruster on your own** -- reaching into the submerged tunnel is a hazardous operation with risk of serious injury or worse, and even trying to pull an object protruding from the tunnel is prone to problems with miscommunication leading to harm. Instead, **avoid using the thruster in water with obvious debris floating in it.**



## Dinghy

*KALLISTO* has an inflatable, AB, 10' aluminum RIB dinghy, one seat, oars and an outboard engine. (See "Outboard" section.) In order to lock the oars in place for use, insert the oarlocks with the hand grip facing outboard, then rotate the oar back inboard.



*Optimum dinghy towing*

Towing works best when the dinghy is brought close to the boat – pay out only about 4 or 5 feet of painter line from the stern cleat to the bow of the dinghy. Better yet, lead the painter through the starboard grip on the transom step. At the correct length the dinghy will be continuously surfing *KALLISTO*'s wake, assuming the boat is traveling at typical cruising speed.

This method of towing the dinghy with the painter led under the transom grip works excellently; the dinghy will "hunt" far less and you'll even notice that the autopilot works a little less hard because it's not constantly fighting a veering tow. **Highly recommended.**

Tie the painter off twice – once at a cleat with a standard cleat hitch, then the bitter end to the stern rail. SJS has recovered dinghies "lost at sea" by others who relied on a single cleat hitch.

**Belay the dinghy to the starboard side of the boat, paying attention to it not being able to drift under the heater or engine exhaust. If you use the preferred short leash method shown in the illustration, the dinghy will not be able to come in contact with exhaust.**



Please take special care when beaching the dinghy (refer to the dinghy beaching procedure in your charter guest book). Most of the beaches you will land at are strewn with barnacle-covered, bottom-slicing rocks.

### When approaching/reaching the shore:

- Weight the dinghy aft by moving crew aft.
- Disembark over the bow.
- Lift (don't drag) the dinghy above barnacle height using the handles on either side
- Also remember to secure the painter under a rock or to a large driftwood log so your dinghy won't float away – we have very large tidal fluctuations! The painter is a soft, yellow, 3/8" bouyant line.
- There is a second 30' length of line stowed in the port cockpit locker for use at low tide on a long beach.

Easy to forget: **if for some reason you have a long length of dinghy painter deployed, take it up before anchoring, mooring or docking.**

Don't let the oil pressure alarm on the engine be the harbinger of a stalled engine due to wrapping the painter in the prop while backing down!



Also please note that the velcro straps provided in the dinghy for oar storage are effectively useless. Tie the oars through the locks and a hull handle when towing the dinghy, lest they be lost during a flip. Better yet, stow them in *KALLISTO's* port aft deep locker when not in use.

## Docking

For many sailors docking is a relatively stressful time. Taking into account that even experienced sailors can be very tired after a long day of fun, make the process easier by having a plan:

- On what side will your crew need to deploy fenders and docklines? Who will perform what role? Are all the parts ready?
- Can you staff a roving fender?
- What's the wind doing, compared to your slip's orientation?
- It's well worth getting an assigned slip number and checking your Waggoner so that you know in advance what you'll encounter reaching the dock. If you're not happy with your slip assignment it doesn't hurt to mention that to the port staff and ask for an alternative. Sometimes harried dock staff will assign a 39' boat to a 15' slip-- don't be too stoic about making this work.

### Vessel particulars when docking:

- Make bow thruster ready for use; switch on, blip port, wait a second, blip starboard.
- *KALLISTO* carries momentum very well and remains quite responsive to the helm at very low speeds, so your final approach and turn in toward your slip can usually be done with the shifter in neutral; you'll certainly need no more than "idle speed forward" (unless there are high winds).
- **Note that despite favorable testing results, *KALLISTO's* prop is not as authoritative in reverse as in forward. Bear in mind that quick reversals will need a commensurately authoritative hand on the throttle.**



**San Juan Sailing** says: 'When coming into our docks in high winds or if you'd just like a little assistance upon arrival, simply hail "San Juan Sailing" on VHF channel 80. We'll be glad to offer some "coaching" and/or catch your lines. In fact, most marinas in the islands will help you if you hail them and ask for assistance. Asking for docking assistance, especially in windy conditions or with an inexperienced crew, is a sign of prudent seamanship.'



Excellent advice! Asking for help is much less embarrassing than performing a lot of unnecessary dockside drama. Many docks in summertime are littered with loafers waiting to lend a hand. Sober volunteers are wonderful even when they're a bit too full of advice.

## **Dodger**

Our dodger not only protects the crew from the weather when in the cockpit, but it has several stainless steel grab handles for safety.

Please don't remove panels from the dodger as they're quite tricky to reattach and easily damaged when dismounted.

The dodger's plastic "glass" is vulnerable to scratching from salt crystals, especially after sailing into a challenging breeze. When salt spray on the glass dries in the wind, tiny salt deposits are left behind and tend to obscure your vision. Please avoid directly touching salty glass with a damp rag or sponge as attempting to wipe salt crystals even with a damp rag will leave scratches. Instead and if vision is becoming a problem, use a container to sluice fresh water on the windows. Or, wait until you're at a dock where you can hose off the salt crystals.

**CAUTION:** *We have found that most spray sunscreens react chemically with the Plexiglas. So please inform your crew to spray sunscreen downwind of the dodger glass. And please don't lean against the dodger with sunscreen on your back and shoulders.*



## **Electrical Panels**

Most switches (circuit breakers) at the panel board are self-explanatory. Certain switches are always to be left on; these switches are marked with colored dots or protective and discouraging covers.

A full list of breakers and fuse-protected branch circuits and locations is in an appendix at the end of these notes.

## **AC Panel & Loads**



**AC (120V) Shore Power.** AC outlets function while connected to shore power or when the inverter is operating, in either case when the AC Outlets breaker is in the “on” position. The water heater and battery charger operate only while on shore power.

**Shore Power A/C Circuit Breaker.** 30A breaker at top of AC distribution panel should never trip. Simultaneously running the electric space heater, warming the hot water heater and bulk charging batteries might cause a trip. Reduce loads and reset the breaker.

**Battery Charger.** The Battery Charger breaker switch must be turned “on” for shore power to charge the batteries.

**AC Outlets.** The vessel charger/inverter is involved as an alternate source of power to AC outlets. When connecting or changing AC power sources, before power to outlets is available there will maybe a short delay while the charger/inverter takes stock of the situation.

## DC Panel & Loads

Many DC breakers are self-explanatory. Here we call out a few to highlight details of operation.

**#1 Bilge & #2 Bilge.** These provide power not only to bilge pumps but also other important life-safety equipment, such as propane leak alarms, fire sensors and the like. **Do not turn these breakers off;** in the normal course of affairs both bilge pump breakers should always be left on, as hinted by guards. Manual bilge pump actuation is via a pair of switches at lower right of the DC panel.



**Cabin Lights.** All cabin lights are fed via a single breaker, with most lights switched individually at individual locations so as to afford maximum flexibility and economy. All cabin lights are LEDs and consume very modest power; there is no need to huddle in the dark on *KALLISTO*; even operating all interior lamps simultaneously consumes only about 5A.

**Running Lights.** Please be advised that night passage making is not permitted under terms of your charter agreement with San Juan Sailing. Use running lights in cases of reduced visibility (like fog or on the rare days in the Pacific Northwest when there’s heavy overcast). If you find yourself in a pickle and running in the dark, the rule is that these lights must be on after sunset.

**Steaming Light.** Steaming light should be on when motorsailing, day or night.

**Anchor Light.** Should be on all night in an anchorage. (this is an LED and won’t deplete the batteries.)

**Foredeck Light.** Useful for trips forward to check mooring/anchoring integrity with both hands free from flashlights. This light is also handy as a porchlight of sorts when returning to the boat at night. This light uses about 1A and won't have a serious impact on battery life if left on for a few hours.

**Accessory.** *KALLISTO* is equipped with 12-volt DC "cigar lighter" type DC outlets in all cabins and at the nav desk. As well, each cabin has dual USB charger outlets for phones, tablets, etc. Sleeping cabin DC and USB outlets are controlled with the Accessory breaker. Devices connected to cigar lighter sockets should be restricted to those with relatively modest power consumption.

**CPAP:** The vessel has successfully supported simultaneous use of two CPAP machines of the style that can run on 12V in routine overnight use with a negligible effect on batteries. If in doubt, check the DC amps indicator with the CPAP machines on and off so as to ensure you won't deplete batteries.



**Water Pressure.** This pump pressurizes a small accumulator tank located on starboard behind the aft-most salon seat back and shuts down when the tank is at "working pressure." If you don't hear the pump start up when you turn it on at the panel board, this generally means that the system is already at working pressure.

**Forward and Aft Head Pumps.** Both heads need electrical power to operate toilet flush and shower sump pumps, etc. These breakers you'll want to leave on when the boat is occupied. Leave off when crew are gone.

Each head has an illuminated holding tank gauge. Advise your crew: **"If it ain't glowin', you shouldn't be goin'."**

## Emergency / Safety Equipment

We've tried to provide a fairly comprehensive and robust set of safety and emergency gear on *KALLISTO*, based on real-world incident data gathered from the US NTSB and the UK MAIB and taking into account the boat's typical cruising grounds. If you feel we could do better, suggestions are welcome!

Most emergency gear is stored in the locker beneath the nav desk seat. Please ensure that any items in this locker you must use are properly returned. If any expendable items are used, please make a note of it at the end of your trip (you will not be billed for use of emergency gear).

We highly recommend locating and sighting all of the emergency gear on the boat, before it's necessary.

**First Aid Kit:** A complete first aid kit is **located in the aft head vanity**. Please note any usage of these items so they may be replaced for the next guest.

**Flares:** Visual day/night distress signals are located under the nav table seat. Due to the various hazards and maintenance problems of pyrotechnic flares, the boat is equipped with electronic flares.

**Flashlights:** LED flashlights are clipped port and starboard alongside the inside companionway handrails. On/Off buttons are on the end of the flashlight opposite the lens. An additional small flashlight is inserted in a pocket on the bottom middle aft edge of the dodger.

**Fire Extinguishers:** There are six fire extinguishers on *KALLISTO*, rather a lot but they're often not useful unless they're immediately to hand and on the right side of a fire, which turns out not to be the case all too often. So we've littered the boat with extinguishers. Extinguisher locations are in the diagram included with these notes.

Sad for a boat owner to say, for all but the most trivial fires your primary objective in using a fire extinguisher will probably be to save your crew and yourself, not the necessarily the boat. Think about salvaging the boat only after your own safety is assured. Maybe the boat needs to be saved to save you and if so that's great, but please think of human safety first and foremost. In a serious fire situation you should be buying time to communicate and evacuate, with further assessment of the situation and/or incidental boat saving a secondary goal.

A large and highly effective "clean agent" extinguisher is attached to the inboard nav desk seat base. Smaller dry chemical extinguishers are in the galley at the top of the companionway, in each of the cabins attached to the hanging lockers, and in the cockpit port lazarette locker.

If possible, for best efficacy in case of need choose the large “clean agent” extinguisher located at the nav desk seat.

A fire extinguisher port is located in the companionway steps and allows an extinguisher nozzle to be inserted so as to flood the engine compartment with extinguishing agent. ***If at all possible, use the extinguisher mounted on the nav desk seat should it be necessary to combat an engine fire***; the larger extinguisher with better dispersion will more effectively knock down and extinguish flames in the deeper recesses of the engine compartment. If engine ventilation is still running when you attempt to extinguish a fire, chances of success are much diminished. **Turn off the engine to stop engine ventilation before using the extinguisher port.**

Note that dealing with a fire of any but the most trivial nature should include at least a “PAN PAN PAN” radio call so as to minimally establish a means of assistance and a possible exit path from the boat. **In the case of a fire that has taken hold, use available time purchased with extinguishers to try to get a VHF MAYDAY out using both the emergency DSC button (first!) and voice, and assembling your crew and any gear necessary for leaving the boat.** If you can't access the VHF below, use the remote VHF remote access microphone located in the cockpit.



**Fire Blanket:** Especially for possible galley disasters a fire blanket is quick and effective. A fire blanket may be found hanging inside the lowermost inboard galley locker, below and to the left of the sink.

**Emergency Tiller:** It sort of looks like a metal pipe, with an “elbow” bend in it. It's located in the starboard cockpit locker. The rudder post attachment point is at the aft end of the cockpit. To remove the cover, insert a winch handle in the star-shaped fitting and unscrew. *Emergency tillers are fairly exhausting to use; plan on frequent relief if dealing with extended rudder operation with the emergency tiller.*

If you test the emergency tiller (and nothing wrong with that), please make sure the deck plate is snugged down properly with the o-ring clean of debris when done, so as to avoid leakage below decks.



**Crash/Evacuation Pump:** Stored beneath the forward outboard corner of the aft starboard bunk is a portable 12VDC electric pump with a nominal capacity of 8,000GPH. Coupled to the 30' of 3” firehose included, this pump has an effective capacity of about 6,000GPH. The included cable harness and switch should be connected directly to 12VDC battery posts or equivalent capacity 12V terminals. Power consumption is large; extended use will soon require recharging of batteries via engine or other means. You'll need to attach the hose to the pump; clamps are attached to the pump body for this purpose.

Flooding is one of the more frequent calls for help you'll hear on VHF; perhaps you can save the day for somebody if you hear a call for help within reach of *KALLISTO*. If you feel as though offering this pump will help another vessel at risk, feel free to do so. Record the name and port of the affected vessel and if safe and convenient please try to recover the pump when the incident is concluded. If the pump is lost as part of an effort to help another vessel, we're OK with that but please let us know so we can arrange a replacement.

**Horn:** A hand-powered (and obnoxiously loud) air horn signal is located under the nav desk seat. As well there is a disposable gas cylinder type. The hand-powered unit is much more fun to operate and as well will operate longer. Gas cylinders will only provide about 60 signals, barely enough for a typical short encounter with fog.

**Safety harnesses, tethers and jacklines:** Beneath the nav station seat are a set of jacklines for port and starboard application to D-rings found on deck fore to aft, as well as two sets of safety harnesses and tethers. Mostly of potential application when sailing to points north such as Desolation Sound, these safety appliances require familiarity and some training in order to be effective; only qualified crewmembers should employ jacklines, harnesses and tethers except in cases of duress.

**CO and smoke detectors:** A CO detector is located in the aft port cabin. Any activity on the part of this detector should be cause for suspicion and investigation. Potential culprits might be failure of the exhaust systems of the diesel engine or heater.

*If the CO detector sounds*, respect it until it's proven a liar. These devices are very reliable so if the detector generates an alarm, take swift action. Turn off the remote propane valve and cabin heater if in use. Make sure the VHF radio is on. Leave the cabin of the boat and use the external handles on the deck hatches to open them for ventilation. Wait for a generous period of time before reentering the boat (and of course wait for the alarm to silence) and then in conjunction with San Juan Sailing investigate what might have been the problem.

There is a battery powered, independent smoke detector in each cabin. Particularly in the case of the saloon detector (located just ahead of the mast compression post at the head of the cabin) a confined space such as *KALLISTO*'s belowdecks might result in a false alarm, especially due to cooking fumes. A button on the side of each detector will allow the detector alarm to acknowledged and temporarily silenced.



*LPG leak detector*

**Propane Leak Detector:** Leaking propane is denser than air and can collect in lower recesses of the boat without necessarily being obvious. A detector for this potential hazard feeds a display and control head, located just forward of the galley and facing forward. If the detector sounds, leave the cabin immediately, without manipulating any electrical switches. Using the manual valves in the propane locker at starboard aft of the cockpit, turn off propane supply. If at dock, leave the boat entirely and seek further instructions from San Juan Sailing. If under way or at anchor or a mooring buoy, open as many deck hatches from outside as possible and then wait a generous period of time before reentering the boat. If the VHF is already on, it's safe to use the remote mic in cockpit but do not reenter the boat and manipulate breakers etc. until time has passed for gas to dissipate. The detector alarms at 20% of the concentration needed for ignition and is located where the concentration of leaking gas would likely be highest; the intention here is to provide an early alert, long before gas becomes an explosion hazard.

**Radar reflector:** *KALLISTO* is fitted with a Tri-Lens radar reflector, mounted above the radar antenna. This unit takes the place of the standard collapsible corner reflector.

**PFDs and throwable flotation:** Two automatic inflatable PFDs are in each cabin's hanging locker. As well, two throwable flotation cushions are provided per regulations. **Please let us know if you find fewer than 6 PFDs on the boat, or if you find a throwable flotation cushion to be missing.**

Please return PFDs to their normal location when finished with them. Do not leave PFDs in deck lockers or other non-standard locations when ending your charter. **PFDs need to be in predictable and known locations in order to be reliable safety appliances in an emergency.**



***Annapolis Book of Seamanship:*** Compared to swifter vehicles such as airplanes, one of the great things about boats is that emergencies may unfold over a leisurely period of time, making due consideration and formation of a plan much easier. Many “emergencies” turn out as nearly routine operations when just a little more information is available. Thus the *Annapolis Book of Seamanship* may be considered an emergency response tool. A copy is in the book rack beneath the nav desk.

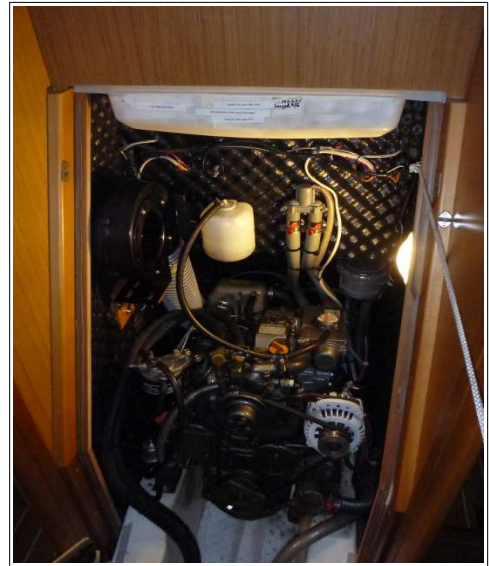
## Handling Under Power

### Propulsion:

*KALLISTO* has a 3-bladed folding “Flexofold” prop for sailing efficiency, gaining you a additional speed under sail.

**Ensure the prop folds** after using the engine. after engine shutdown and once under sail, with the boat moving more than a couple of knots, click the throttle back to the reverse idle position, wait a few seconds, then return to neutral. If you hear or feel an unusual whirring/thrumming sound or vibration while under sail, the prop is not folded.

There are **many crab pots** during certain times of the year in our cruising grounds. A rope cutter on the prop shaft improves luck in case you encounter a crab pot line, but of course it’s better to make even more luck by not running over pot floats.



*The Engine*


### Reverse:

- *KALLISTO* “walks to port” such a small amount that -- unless a reversing operation near the dock is very prolonged -- prop-walk is not noticeable.
- As with any other boat, **allow the shaft to come to a halt** when changing from forward to reverse and vice versa. If this needs to be done very quickly, it’s a hint of too much speed on the boat.
- Whatever the formal testing indicated, *KALLISTO*’s **reverse is not as powerful** at any given revolution setting in reverse compared to forward. In reality she’ll stop in a very short distance but this requires authoritative use of the throttle.
- The rudder is an unbalanced design and needs to be held firmly when reversing at any significant speed

### Forward:

- *KALLISTO* is very responsive to a strong blip of the throttle with rudder set hard over; the technique is very rewarding in this boat.
- **Allow the shaft to fully stop when changing from forward to reverse.** “KLUNK!!” is very hard on the transmission!

## Engine Operation

 Absolute maximum RPM for the engine is 3,200. The engine manufacturer specifies that this speed not be used more than 5% of engine operation time. Operation from 2,800 RPM to 3000 RPM should not be for more than 20% of engine operation time. Please **DO NOT EXCEED 2800 RPM except in cases of genuine need for emergency speed.**

*KALLISTO's* engine is a very reliable Yanmar 3JH with 3 cylinders and 39HP output.


### Engine monitoring:

Tachometer, oil pressure and coolant temperature are available on the boat's instrumentation network. In particular it's helpful not to need to stoop to see the engine RPMs.


- Repeatedly press the up or down arrow on the inboard starboard ST70 helm display to access engine parameters.
- The electronic tach display is damped, so when using it to adjust RPM, advance or retard the throttle relatively slowly.
- Oil pressure, coolant temperature and alternator problems will cause a lamp to illuminate and a horn to sound at the helm engine controls. A separate alarm monitors raw water flow (covered later in this section).

### What RPM to run?

Experimenting with adjusting the throttle between 2000 and 2800 RPM reveals that running at 6.5 knots at 2200 RPM is a much better deal than increasing fuel consumption a lot to get the last knot of permissible engine-powered speed from the boat by running at 2800 RPM. In sum, extra RPMs beyond 2200 are rarely worth it.

 Precise passage planning and dead reckoning in the San Juans is extremely difficult due to constantly shifting currents. We've found that planning on an average speed of 5 knots when under power generally produces decently reliable ETAs.

**With winds of 8-9 knots or better *KALLISTO* can very often travel faster (attain better overall VMG) under sail than power.**

 The engine compartment contains exposed moving parts that could cause injury, including belts and pulleys. To ensure that confusion can't lead to an injury, **remove the key from the ignition switch prior to checking belt tension, oil level etc.** Although it's best avoided, if it is necessary to start the engine with the compartment open use extreme caution, **do not allow clothing or hair to dangle near the engine when it is operating, and be extremely aware of where your hands and fingers are going in relation to the engine.**



## Engine starting for day's underway review:

### 1. Check the oil level:

- The dipstick is accessed by opening the small hatch on the engine casing in the starboard aft cabin.
- The dipstick is on the starboard side of the engine and features a yellow knob/handle.
- The dipstick will generally read “dry” on the first pull. **Don't panic! In order to get a reliable reading, pull the dipstick and replace it 3 times, reading the third dip.**
- Expect the oil to be black, normal for a diesel after only a few hours of operation.
- There is a wide gap on the dipstick between the full line and the fill line. **Do not overfill.**
- In order to ease measuring, filling and to help avoid spills, small bottles of oil



Engine oil bottles

- each containing a fraction of a dipstick are provided in a tray on the starboard engine access hatch. A wiper rag for the stick is also in this tray.
2. Check the coolant level. Anywhere between the two lines (high and low) on the overflow reservoir is “good.”
  3. While you have access to the front of the engine, check for belt tightness and leaking fluids. The serpentine alternator and fresh water pump belt should depress 1/4-1/2 inch with a couple of pound of finger pressure.
  4. Take a look at the engine raw water strainer. If it's **significantly** fouled, use the special wrench provided to loosen, remove the basket and clean it. Please use a rag to control escape of salt water over the engine, alternator etc.
  5. Look over the stern for kelp, logs or branches that could foul the propeller.
  6. Insert the key and turn it clockwise, to the first click. The engine alarm will sound (normal) and you'll hear the engine compartment blower begin running.
  7. Start the engine:
    - Turn the key further clockwise to start the engine. Expect the engine to start immediately.

- If the engine doesn't start after 10 seconds of cranking, turn the key counter clockwise to the off position (*and please make a note to let us know as this is highly abnormal*). Wait 15 seconds and try again.
  - **Per manufacturer instructions, if the engine has not been started for two or more days, turn the engine over without starting by pressing the "STOP" button and running the starter motor for a couple of seconds, allowing lubricant to be circulated prior to running.**
8. After the engine starts, release the key and **check over the port aft quarter for water gurgling out the exhaust**. If no water appears in the exhaust within 1 minute, **stop the engine and investigate why the raw water supply is not working**. Once you're satisfied all is well, push in the clutch button and advance throttle to reach approximately 1200 RPM for warmup.
  9. While the engine warms, check your fuel level. *KALLISTO* has a fuel gauge on the display on the electrical panel down below. To activate the gauge, press the button marked with a fuel dispensing pump, twice.
  10. Please allow 5-10 minutes of warm up before placing a load on the engine.

**Loss of oil pressure:**

If you lose oil pressure a buzzer will sound and the the oil icon warning light will light up. **If the oil light is illuminates while the engine is running, shut down the engine immediately, check the oil level, and contact San Juan Sailing.** Loss of oil pressure due to low level is highly abnormal and so we definitely need to hear about it.

### Engine Overheat:

If the engine alarm sounds and the temperature icon illuminates while the engine is running, **stop the engine**. Nearly always the problem is no more serious than eelgrass or other debris plugging up your raw water strainer. The best upfront solution to this problem is prevention—keep an eye peeled for debris mats, especially along “soapy” looking tide and eddy lines in the water. Either avoid the mat, or if you can’t then pull the throttle back to idle as you pass over.

To clear detritus from the raw water strainer (above the water line in the engine compartment in *KALLISTO*):

- Open the strainer with the provided strainer wrench
- lift the filter basket out to dump detritus.
- Replace the basket lid and tighten by turning it clockwise until the lid is seated firmly on the rubber gasket. **Use only the provided red plastic filter wrench and do not over-torque.**



Figure 1: Raw water strainer and wrench

If upon restarting the engine overheats again, check the seal around the rubber o-ring gasket between the strainer and the lid. If the gasket is not seated, the pump will not prime.

If the above fails to solve the “engine overheat icon illuminated” problem, call San Juan Sailing for assistance.

### Exhaust Overheat Alarm

If the raw engine cooling water supply fails, engines with wet exhaust systems may experience dangerously high exhaust temperatures before the engine block has time to overheat and generate an alarm. *KALLISTO* is equipped with an exhaust temperature alarm; if exhaust temperature becomes too high an audible alarm will sound, with a flashing light on the nav desk alarm panel identifying the cause of the alarm.



### Troubleshoot exhaust overheat:

- Check raw filter basket as detailed above.
- With advice and counsel of San Juan Sailing if possible, check condition of raw water pump impeller. A kit with the necessary nutdriver and a set of spare parts is in a tray in the engine compartment, on the port bulkhead.



*Impeller service kit*

**If the exhaust temperature alarm sounds, shut down the engine as soon as possible. Failure to shut down the engine with an overheating exhaust exposes your crew and the boat to serious danger from fire.** Inspect the exhaust outlet of the engine and general exhaust system for signs of overheating needing immediate intervention. If any signs of damage are found, call San Juan Sailing for advice on how to proceed.



### Engine Shutdown.

**USE THE STOP BUTTON** to stop the engine before switching off the key. Shutting off the engine key with the engine running can damage the diodes on the alternator. If you have a less experienced person at the helm it's worth a reminder about using the stop button to shut down the engine. Most of us are highly habituated to automobiles in our muscle memory.



Before being shut down, the engine needs a bit of time to cool down after working. Bring the engine to idle and the gearshift to neutral. Allow the engine 5 minutes to cool down. Then push the fuel cutoff button located next to the key. After the engine stops, turn the key to the “off” position (turn it counter-clockwise) and remove it.

### Fuel Tank, Fuel Consumption & Fueling

*KALLISTO* has a 34-gallon fuel tank. At 2000 RPM (nominal 6 knots) the engine consumes approximately 0.6 gallon of diesel per hour. Leaving a ¼ tank safety margin, that's about 42 hours of underway operation available, or roughly 300 miles of range.

*KALLISTO*'s fuel gauge (like many boats) **is not terribly accurate**, especially at the top of the gauge range. We've found that consumption seems peculiarly low during the first portion of a full tank. The mystery is resolved by noting that it takes 13 gallons of fuel to fill the tank when the gauge reads three-quarters full, meaning that 1/3 of fuel is depleted when the gauge indicates ¼ of a tank consumed. As the tank empties the reading becomes more reflective of actual consumption.

To avoid the possibility of sucking air when the fuel level approaches 1/4 of a tank, refuel when the fuel drops below 1/2 full and before it reaches 1/4 full. Sucking air is particularly possible when motorsailing with significant heel. The San Juans are very unforgiving even to a sailboat, when there's no engine *and* no wind.

**Maxim:** the faster you travel under engine power, the shorter the distance you'll go before your fuel is exhausted.

**Refueling:**

- Locate the deck key (normally in the cockpit table forward cuddy)
- The filler fitting is located on the starboard aft quarter and can be opened with the deck key. As with all deck fittings, do not use a winch handle.
- Please be very careful when fueling so to avoid spills, for which there is zero tolerance in US waters. Closely monitor fuel flow from the bowser.
- Fill slowly and carefully. Be very careful of drips when removing the hose.



To make filling less stressful and spill-free more likely, *KALLISTO* is equipped with a fuel vent whistle, a device inserted low in the fuel tank vent line and which stops whistling when filled with diesel. You'll hear a slightly eerie whistling/moaning sound as the tank fills and air is pushed out. **When the whistling stops, stop filling.** The tank is full when the whistle stops.

## Heads, Toilets & Holding Tanks

### **Toilet Paper: where does it go?**

Before we get to particulars on toilets there's something we must discuss.

It's very much the tradition on boats that what goes down the toilet should only be whatever originally started its journey by mouth. This is excellent advice and pretty much will guarantee that a toilet never clogs. However, given our usual landside practice this advice sticks in some folks' craws.

The toilets on *KALLISTO* are such that a “reasonable” amount of toilet paper won't present any problems. However, “reasonable” is an elastic definition. There's no standard for this particular judgment.

If a head clogs on *KALLISTO* and toilet paper or other debris more obviously inappropriate for disposal in a toilet is found “in the mix,” company policy is that you will be responsible for costs of remedying the problem.

We recommend sticking with sailor tradition on this matter.

The toilets on *KALLISTO* are basically kitchen sink garbage disposals attached directly to a toilet bowl. However, as with other sanitation devices they cannot handle fibrous material. Attempting to flush fibrous material (“baby wipes,” feminine sanitary products, cotton balls etc.) risks loss of the affected toilet, a cruise-altering event.



*KALLISTO* has two heads each with a complete sanitation system, together providing 100% redundancy and ensuring availability of a functioning toilet at all times. Each head is more or less identically equipped, with the only difference being that the forward head uses an ejector pump to empty its holding tank, while the aft head is a gravity-drain arrangement.

### **Shower:**

The vanity faucet in each head doubles as a shower head. Gently pull the head from the vanity, extending the hose for use. (sometimes the hose becomes snagged on a valve or other protuberance inside the vanity, easy to clear but annoying which is why we're contemplating a hose bag or other fix). The aft head has a bracket on the inboard bulkhead to hold its shower head.

Both heads are equipped with an automatic shower sump pump which operates as necessary. To make a sump extra dry or in case of an automation failure a manual switch is provided, mounted on the vanity.

### **Toilets:**

Each head is equipped with a highly efficient Raritan electric marine toilet with tank-capacity-saving automation features. Each toilet can employ either sea or fresh water for

flushing, meaning that flush water is always available. Automatic flushing minimizes holding tank usage by metering flush water, presuming that crew are familiar with sensible use of the equipment. In case this automation fails, simple and reliable override controls still allow manual operation of the toilet.



Automation gets crew “roughed in” on efficient operation. That said, by carefully using the manual buttons on the toilet control panels tank duration can be further optimized.

Each head is equipped with a holding-tank gauge, indicating when the tanks need to be emptied. If the tanks are overfilled, ideally the excess will be embarrassingly ejected out of the side of the boat via the vent, possibly onto a dock. Less ideally, a joint in the pumpout or vent system might leak, fouling the interior of the boat. Keep an eye on tank gauges and plan pump-outs or legal dumps as needed.



**Note that due to a quirk in tank geometry in combination with the ultrasonic level sensor, the aft gauge may flip back to “FULL” when the tank is completely emptied.** The gauge will revert to normal operation once the tank begins to fill again.

### **Aft Head Dump:**

(These instructions pertain for guest crews taking *KALLISTO* into Canadian waters; crews visiting US waters won’t need to use the aft holding tank valve as doing so is generally illegal)

The aft head is equipped with a 23 gallon holding tank. The tank will handle roughly 58 “Light Flush” automatic flushes, or 38 “Normal Flush” cycles.

Dumping the aft holding tank requires opening the deck access hatch at the base of the toilet and moving the through-hull lever to point inboard. Full emptying requires 30-60 seconds. Move the lever back to the forward-pointing position to close the valve.

### **Aft holding tank dump valve handle**

*KALLISTO*’s aft holding tank is a gravity-drain type employing a 3” ball valve located in an awkward position to reach. Even after we refitted and reconstructed the aft head as part of the toilet upgrade process and included an eye to improving access to the valve, it’s still a bit of a bear to reach.

We’ve solved this problem by having a custom metal extender handle fabricated to improve reach and advantage on the valve.

The handle consists of a stainless C-channel and offset handle. The C-channel engages with the handle of the ball valve, while the handle provides leverage to turn the valve, all of this from above deck level.



The following photos provide a guide to using the handle:



*The handle lives in the aft head vanity cabinet*



*The ball valve is located under an inspection cover outboard of the aft toilet*



*The valve handle is visible below the cover*



*Drop C-channel over valve handle so that walls engage with handle*



*Turn handle 90 degrees clockwise with C-channel engaged on valve handle*



Note that the valve is lubricated with grease. In cool or cold water the valve is more difficult to turn. The handle is quite sturdy and should afford leverage to move the valve even when very cold. Steady pressure will cause the valve to first creep and then move more freely.

**Remember to close the valve!** If you are visited by the Coast Guard in US waters with an open sewage valve, you will likely have an unpleasantly very memorable day. Most USCG visits to boats with toilets begin with a beeline to sewage valves. Dump legally, remember to close the valve after a legal dump.



The aft head is equipped with a small exhaust fan in constant operation (solar powered). Closing the door to the head will leave the space ventilated without affecting the rest of the boat. This is particularly handy when it's raining as the port in the head admits rain when open.

### Forward Head

Forward holding tank capacity is 12 gallons, allowing approximately 30 “Light Flushes” or 20 “Normal.”

The forward holding tank uses an ejector pump for dumping at sea.

#### To dump the forward tank:

- Lift the middle starboard settee cushion, and the forward board beneath the cushion. Open the larger thruhull in this space (marked, also connected to marked sewage hose).
- Press and hold the pump control switch located in this space for 2 ½ minutes, or until the hoses stops obviously oscillating and the pump speed increases.
- **Close the throughhull when done.**

The vanity sink in the forward head drains into the forward shower sump. If you use a little water and find that the automatic pump does not notice it, the manual switch aft of the sink allows better drying of the sump.

### Holding Tank Capacity, Guests and Boat Endurance

Legal operation of a cruising boat in the San Juans without being tied to pumpout facilities implies close attention to holding tank capacity. **The dominating factor in US waters for how long you can stay away from the dock is how little or much sewage your crew generates, and that number is mostly about how much water is used for flushing.** Left to their own devices, many people use too much water when operating marine toilets. By encouraging your crew to sparingly use the metered automatic flushing available on the boat, you'll extend the boat's endurance away from the dock. Brief your crew that being careful with toilet usage means less hassle and more fun. Remind your crew to use a the vanity shower hose and a toilet brush to fully clean a fouled bowl, rather than less effective and wasteful repeated flushing.



### Backup Manual Toilet Operation

The convenient, efficient automated operation of *KALLISTO*'s heads comes with the necessity for electronic controllers to actuate macerators, pumps and solenoids. If a controller should fail it's still possible to operate the affected toilet by employing manual bypass switches.

As well, the water source supplying the toilet may be selected between sea and fresh, meaning that a dead seawater pump won't stop the toilet from being usable.

**Aft head manual operation:**

- Aft head bypass switches are concealed in the vanity, immediately inside and aft of the vanity door.
- The uppermost switch controls flushing; flip the uppermost switch to the far right (outboard) to flush.
- The next switch down controls filling the bowl; flip the switch to the far right to fill the toilet bowl.
- Leave these switches in the far left (inboard) position for normal operation of the toilet.

**Forward head manual operation:**

- In the forward head, bypass switches are located just behind or outboard of the forward or left lip of the sink when the assembly is folded up for use of the toilet.
- The aft-most switch controls flushing; pull the switch toward you to flush.
- The switch immediately adjacent to the flush switch controls filling; pull the switch toward you to fill.
- 

**Seawater/freshwater flush supply select:**

The remaining switches on both fore and aft bypass panels controls the flush water source for the toilet. Usually these will be set to the “fresh” position.



*KALLISTO* will take on hundreds of pounds of additional weight as holding tanks are filled with seawater, while fresh water is a neutral matter of boat weight. As well, odor control is more difficult with seawater. Toilet flushing uses a small amount of water, and meanwhile when operating legally in US waters, holding tank capacity determines endurance much more than fresh water supply. Unless you're headed to remote locales with genuinely scarce fresh water replenishment opportunities, use fresh water for toilet flushing as a sensible option when sailing in US waters.

Note that at the bottom of the “A” dock ramp at the SJS base there is a portable pumpout cart. It's easy to operate and might be worth considering if you're feeling pressed for time to get off the boat or if skipper and crew are simply tired and would rather avoid an extra docking at the end of your trip. You might instead detail a couple of crewmembers to handle pumpout when you arrive, while you're unloading the boat.



When you pump out the holding tanks at a shore facility, if possible please fill them with about 5 gallons of fresh water through the deck fitting to rinse and then pump out again.  
*Thank you!*



## Heater

The diesel-fired Webasto hydronic cabin heater will make the interior “toasty” within 15-20 minutes. The main heater control and thermostat are located ahead of the white panel holding the VHF radio and MFD, above the navdesk.

### Heater Operation:

- Switch on the toggle switch (and thermostat on/off switch) and use the thermostat buttons to set the temperature.
- The thermostat regulates from the temperature in the salon.
- Each cabin has an on/off and speed control switch controlling the fans at each heat exchanger.
- In the galley the on-off switch for toe heat is just below the propane switch. Heat for the aft head is controlled by the port sleeping cabin control and regulated via a damper in the head.

Note: it takes about 5 minutes for the heater to “cycle up” and get hot. In the process the unit emits a sound reminiscent of a jet afterburner. The noise doesn’t last long.

We've found that operating the fan controls in the “low” position tends to make heater operation more stable and more comfortable, with less on/off cycling and general kerfuffle. Consider using “high” to start cabin warming and then dial back to “low” for steadier heat.

### Fuel and electrical consumption:

- The heater uses about 0.2 gal/hour of diesel in typical conditions with ample ventilation open on the boat.
- Electrical consumption of the heater once warmed up and in steady operating mode is about 5-6A.

There is also a small electric heater stowed in compartment under the aftmost settee cushion, inboard (where you can also find several electric fans for hot days).

Although the diesel cabin heater is protected by various interlocks and self-checks, it's still a combustion device involving flames and exhaust gas. Avoid leaving the heater on while all crewmembers are asleep. Unless conditions are so cold that sleep is improbable, ***the last person to hit their rack in the evening should switch off the heater.***



## Hotspot

*KALLISTO*'s hotspot is connected to the Internet via a 4G modem. Coverage is generally quite good but there are dead zones we know of, such as East Sound on Orcas Island. Generally the modem fails later than phones but it's unfortunately not possible to promise working access in 100% of the San Juans.



*KALLISTO* carries a local wireless hotspot using a 3G/4G cellular modem served by a high-performance antenna located at the first spreader. In some locations you'll be able to access the Internet where your own phone may have difficulty. As well, if you're not able to arrange affordable local data coverage with your own provider this is an alternate means of staying in touch via email, Facebook or the like.

### Operational hints and caveats:

- If you choose to use the hotspot, connect to SSID "*KALLISTO*" using the password printed or handwritten here: **BoundaryPass**.
- The hotspot will be available even if the backhaul modem is not able to form a connection to the Internet. If you connect successfully to the hotspot but your device says it cannot reach the Internet, the modem is out of range of the shore-based cellular system.
- Due to data tariffs and the need to share this modem with other boat visitors over the course of a month, a local transfer cap of 8GB/week is imposed on the total traffic going through the hotspot, all connected devices inclusive. This is adequate for checking the news and weather, updating your Facebook page or even uploading a reasonable number of photos.
- **Disconnect devices from the hotspot when not in use so they do not chatter away your weekly 8 GB.**
- **A single streamed movie can use almost an entire week's allocation. Watching videos is not within the contemplated scope of this feature.**
- **Use shoreside WiFi when available so as to save your allocation.**

## Inverter & AC Power Away From the Dock



**Safety Note:** Being away from the dock usually means that AC outlets and appliances are not live, lulling us into complacency. When running the inverter, 110VAC is present at the electrical outlets on the boat and anything plugged in to those. Although the boat is safely wired and all outlets are protected by GFCI, 110VAC and salt water mixed are a still a possible shock hazard. Extension cords can end up hanging in water, which is why none are carried on the boat. **Don't be tempted to operate AC devices on deck and be aware of additional shock hazards presented by 110VAC in a marine context.**

*KALLISTO* is equipped with a 2.7KW full sine wave inverter. Inverter controls are to the far left of the navigation panel.

#### **Turn on/off inverter:**

- The inverter may be switched on by pressing the lower left button on this control panel. An indicator light “INV” will illuminate.
- Press the lower left button again to turn off the inverter. The “INV” lamp should be off.



*Inverter/charger controller*

#### **Inverter and battery coexistence:**

The inverter will easily supply power for a hairdryer or other substantial load. While short duration, high-rate usage of this kind won't have a serious effect on battery capacity, smaller loads plugged in for hours will. If you're using the inverter to power a laptop computer, don't forget that you're not on the grid! Turn off the inverter if you're not actively using equipment being powered by it.

- Inverter standby power is not a lot (2A) but nonetheless keep the inverter turned off when not using it so as to avoid wasting battery capacity.

#### **Automatic shutoff:**

- The inverter will automatically cease operating when domestic battery voltage reaches 12.2V.

*KALLISTO* is wired such that it is impossible to accidentally attempt to heat domestic water with the water heater via the inverter.

#### **Inverter Cautions:**

Please do not attempt to reconfigure the inverter setup via the control panel. **Battery damage will result from incorrect configuration of the inverter/charger.**



The inverter will switch automatically from shore power to inverter power, if the inverter is selected “on,” meaning that the inverter and batteries will pick up loads when shore power is disconnected. If the electric heater or another large appliance happens to be plugged in and turned on when disconnecting shore power and the inverter picks up the load, domestic batteries will be quickly depleted. Probably the best approach to avoid this is to **select the inverter “off” when connecting to shore power.**

The engine alternator is able to replenish power at less than half the maximum rate the inverter can consume electricity at full output. The engine alternator will not be able to produce power as rapidly as the inverter can consume it. **Do not attempt to continuously run space heaters or the like even with the engine running.**

## Navigation Electronics

While the navigation gear on the boat may seem a bit daunting, becoming reasonably familiar with it is actually a fairly short but very rewarding process. As well, safe operation of the boat demands that at least the skipper and NSO are able to access basic position and situation information from this equipment.

Within the space constraints of these notes it's not possible to fully convey the operational details of the numerous navigation-related devices on *KALLISTO*. Instead, we're presenting some general information and then a brief "boot strap" treatment for the central focus of navigation, the multifunction display (MFD).

### **Power consumption:**

Nav electronics power consumption is remarkably modest and shouldn't be a reason to skimp on situational and navigational awareness. With all displays and sensors running and the autopilot on, current consumed by the equipment averages about 4A. Running the single MFD below deck with its associated sonar transducers requires about 1A, meaning that if you're interested in eventually painting a 3-D view of the bottom where you're anchored, the cost in electricity is minimal.

The ST70 display at the nav station is useful for showing depth, wind speed etc. at anchor and without venturing on deck. As well, an ST60 multifunction display is in the v-berth, and can save you a trip from your cozy bunk on stormy night. The ST60 has the unique advantage of having an extremely dim backlight; it won't bother your sleep but is still easily viewable with sleepy, dark-adapted eyes in case you wake up and are wondering about depth, wind speed etc. With all other instruments switched off, consumption of these two displays and associated sensors is less than 1A, negligible.

The MFDs, wind instruments, autopilot and the supporting cast of characters are mostly RayMarine products. Reference manuals are stowed with other boat technical data behind the forward-most port settee back cushion. Please return these documents to their proper location when you're finished with them.

We highly encourage you to familiarize yourself with this suite of equipment prior to boarding, if you've not been previously acquainted. Here's a list of links directly to PDF versions of operational guides:

[ST-70 instrument displays](#)

[ST-70 autopilot head](#)

[Axiom Pro MFD "LightHouse" basic operations guide](#)

[Axiom Pro MFD "LightHouse" advanced operations guide](#)

These manuals may also be viewed on either MFD display via the built-in PDF viewer.

### GPS/Position:

A GPS receiver mounted on the coach roof is the primary source of position information for the navigation system. This receiver is operational whenever the helm plotter and wind/depth instruments are switched on.

If the primary GPS receiver should fail as indicated by loss-of-fix alarms, a built-in GPS in the helm plotter can be used as a good alternate source of position information. See the MFD operational guide for instructions on doing this, should it become necessary.

### AIS:

The AIS transceiver is always on, has its own separate GPS receiver and is independent of other navigational electronics. AIS consumes a negligible amount of electrical power.

Note that it is quite easy to set up *KALLISTO*'s MFDs to produce an alarm when another AIS-equipped vessel becomes a potential threat of collision. Consider using this feature despite occasional false alarms when entering harbor etc.



### Depth Sounder:

The depth sounder displays show depth from waterline. *KALLISTO* draws 7'2" from the waterline. **Please do not drive the boat into water of depth less than 12' MLT.**

**IMPORTANT:** The key to avoiding rocks is NOT the depth sounder – but knowing where you are at all times. (Rocks are the greatest navigational and safety hazard in the islands – but they are all clearly marked on the charts.)



### MFD:

*KALLISTO* is equipped with two Raymarine Axiom Pro chart plotters, at the helm and at the chart table. These are “hybrid touch” versions of the Axiom series, offering both knobs and buttons as well as tap/swipe touch operation. These devices feature many modes and nuances of operation, far beyond what we can convey here. If you are not already familiar with this type of MFD, you will at least want to become familiar with the [Axiom Pro MFD “LightHouse” basic operations guide](#). More details are available in the [Axiom Pro MFD “LightHouse” advanced operations guide](#).

### MFD power on:

- MFDs remember their last state, so usually they’ll start up when you turn on the “Helm Instruments” (helm MFD) and “Nav Station Instruments” (nav desk MFD) breakers on the DC panel at the nav station.
- If not, press the power button at the lower right corner of the MFD until it beeps and turns on the display.
- After the MFD beeps it takes about 60 seconds to fully start up.
- A disclaimer window will appear. Press the button in the center of the selector wheel to remove the window.
- After starting up, the MFD will ask for acknowledgment of a manufacturer legal disclaimer. Tap “OK” to proceed.



- The MFD will power up with a graphical menu of available choices shown. The most frequently used option is “Chart.” Tap the “Chart” icon to begin normal navigation.

### **MFD power off:**

If you’d like to leave wind and depth sensors on but don’t need the helm MFD running, you can save about 1A of power.

- An MFD can be turned off without using the breaker switch by pressing and holding the power button for 3 seconds.

### **Radar:**

Both MFDs are configured to overlay radar data on the nautical chart display. We encourage use of radar as a means of maintaining situational awareness. Our waters are busy with traffic of all sizes and styles during high season and there are plenty of opportunities for surprises. Surprises lead to hasty decisions. Radar will often spot a low, distant and potentially late-breaking object on the water before human eyes, such as canoes and even some kayakers. Taking away some of that element of surprise ultimately contributes to overall net relaxation and fun.

### **Turn on scanner:**

The scanner can be turned on/off by briefly pressing the MFD power button at lower right of the MFD, then selecting appropriately from the resulting menu of options.

Details of radar operation are covered in the MFD guides linked above. Most daily usage involves range adjustment and targeting.

### **Radar range adjustment:**

With the radar overlay on the chart display, radar range should automatically sync with chart scale.

- **Tip:** anchorages can be crowded in the San Juans during summer. With the view from deck foreshortened and distance difficult to estimate by eye, leaving you with hard stares beamed your way should you misjudge your position. Radar can thus be a big help when dropping the anchor. *Dial the chart scale to fully zoom in with the radar active to see your position in exact plan view against other vessels in the anchorage.*

### **Radar target tracking:**

Radar tracking of targets is a great feature to employ for monitoring vessels not showing an AIS signal. It is extremely easy to set a “target” for monitoring:

- Simply tap on a target to acquire it.
- After a short while the radar will compute time and distance of closest approach, similar to AIS, with this computation’s results refined as time passes.

Automated radar target tracking is quite accurate after the radar has had time to establish a solid fix and track on its target. The time required for this depends on sea state and a

minimum number of antenna sweeps but a reasonably reliable prediction will always be forthcoming given a little time.

**Here’s an incentive to employ tracking on “silent” targets:** failure to transmit AIS position is a mild clue. A silent boat of the size able to carry AIS is what’s technically known as a “noncooperative target.” Lack of cooperation may be a matter of bad habits, or it may simply be a technical fault. Either way, think of radar tracking as a useful backup for a missing AIS signal.

**General notes on situational awareness in the San Juans:**

For sailors new to the San Juans it's hard to over-emphasize the amount of detail lurking invisibly just below the surface and waiting to ruin your day. Please indulge us while we once again emphasize the importance of using the navigational equipment on *KALLISTO*.

For situational awareness at all scales the chart plotter and physical charts should act in concert. The plotter can quickly magnify your view to reveal exact details of harbor depths, rock locations etc. exactly where you are now. Meanwhile, the physical chart gives you a sense of the amount of attention needed in the near future. Actively operate both resources in the cockpit. If you feel as though you’re being a bit too obsessive over zooming in and out on the plotter and choosing the correct page in the Maptech book, you’re doing it right.

**ZOOM** the plotter display in and out frequently to improve your situational awareness. When entering a harbor, rounding a point or approaching an anchorage, remember to change chart scale and increase visible chart details by using zoom.



The MFD becomes your primary navigation tool when you’re in a “tight spot,” such as approaching the entrance to a harbor or cove bounded by charted rocks, Sucia Island’s Echo Bay for instance. With the MFD, you can “zoom in” to make something that’s the size of a dime on a paper chart larger on the screen. You can see more detail and, importantly, any hazards in the area. Your boat’s position on the MFD chart is accurate to within 3 meters – about 10 feet. Use all available chart detail in these situations by zooming “in” chart scale.

**Don’t hesitate to use radar.** We encourage you to use the radar in all conditions. While the radar uses a little bit of extra electricity, it pays off richly in additional situational awareness. Particularly with many kayakers and canoeists in the waters these days, this device can avoid late detection of objects of concern. Finally, **it’s better to practice using radar when you don’t actually need it.**

**Safety Notes on Fog:** A professional mariner in current practice and equipped with good radar can navigate successfully in fog. The rest of us might instead abide by *The First Rule of Navigation In Fog: Don't*. The fog we encounter in the islands usually forms in the wee hours of the morning and burns off by mid-day. So if it’s a little soupy after breakfast, you might put on an extra pot of coffee and relax until it lifts. Never depart from a safe



location into the fog! To do so, even with radar, would be contrary to prudent seamanship of the kind we practice.

In terms of incident reports, apportionment of blame and 20:20 hindsight, fog becomes “reduced visibility” when you can see ¼ mile (about 4 football fields) in all directions. It is safe to proceed CAREFULLY in reduced visibility using your radar to “see” beyond the haze, but be sure to look up from the screen about every 10 seconds and use your eyes to scan the horizon forward, behind, and side to side. A motor yacht, tanker or freighter traveling at 20 knots takes only 39 seconds to travel ¼ mile! You need to see these fast-moving vessels sooner-rather-than-later so you can prepare, if indicated, to quickly take evasive action to avoid an impending collision.

AIS and radar target tracking can be helpful if you find yourself unavoidably plowing through fog. Set up the plotter to alarm on AIS targets within one mile but bear in mind that many vessels do not use AIS. More usefully, use the radar to identify and select targets, which will then be processed as MARPA (Mini-Automatic Radar Plotting Aid) objects with closest-point-of-approach (CPA) computed and alarms sounded according to the minimum CPA you select. You must of course select targets for this scheme to be useful; the process is simple and easy after a brief glance at documentation. This is a perfect example of things to practice before you need them-- by selecting and tracking MARPA radar targets on a bright sunny day you can be ready for the moment when this ability can be of real help. It's the same general deal as practicing plotting your position by visual fix even when you're using a chart plotter.

Note that the San Juans can present you with a situation where your departure anchorage is in sparkling sunlight, but turning a corner you find a bank of solid fog across your course. If this is a mid-day situation, you may find fog burning off even as you approach. If you judge wrongly, enter a bank and find visibility sudden decreasing, immediately turn the boat on the reciprocal heading, get out of the fog, then decide whether to dawdle and wait for burn-off or change destinations. Don't continue into fog while distracted with deciding on a further plan of action. Very often, when your instincts call you to question going forward it's already time to go back.

#### **Radar reflector:**

To improve her visibility to other radar operators, *KALLISTO* is fitted with a radar reflector mounted above her own radar antenna. This unit takes the place of the standard collapsible corner reflector (one of which is nonetheless available, stowed in the nav desk seat).

#### **Knotmeter:**

Powered on with the other electronic instruments.

If the knotmeter or MFDs show a reading of “0.00” for speed while underway, the impeller is most likely clogged with a piece of eelgrass. Usually this is a transient problem- whatever’s jamming will let go. You can also try removing it by traveling for a short distance in reverse.

If the knotmeter is temporarily “out of service,” the GPS input to the chart plotter provides an alternate and quite accurate speed indication called SOG (speed over ground).

**VHF Radio:**

*KALLISTO* is equipped with a dual-head VHF radio, with DSC. A remote microphone with channel controls etc. is mounted on the cockpit table pedestal. The VHF radio is most easily turned on/off via its own breaker on the DC panel and will remember its state though power on/off cycles.

The VHF is equipped with its own GPS receiver. DSC is ready for use in distress situation 1-2 minutes after the VHF is powered up.

VHF power consumption is about 1A.

Each day on anchor or a mooring buoy should start with learning the latest weather synopsis. Press “WX” and then use the channel control to access weather reports.

**Monitor channel 16 (the hailing and distress channel) during your cruise at all times while under way (off anchor, away from buoy or dock).** Not only is this a USCG obligation for vessels carrying an installed VHF radio but more importantly you may save a vessel or a life. At the very least you'll improve your situational awareness.



Radio traffic becomes busy in summertime in the San Juans. The US and Canadian coast guard services will assertively remind radio operators that you may hail vessels on channel 16 but after establishing contact you should immediately switch to a “working” channel. Ask the skipper of the other boat to switch to working channels 78, 79 or 80. If you need a review of VHF radio protocol, you’ll find information located in the onboard Charter Guest Reference Notebook.

San Juan Sailing monitors channel 80 during office hours (closed Sundays).

In a **MAYDAY** situation requiring transmission of a distress call, **FIRST uncover and push for a minimum of 5 seconds the red DSC distress button on the upper right corner of the main VHF radio at the nav desk.** The VHF transmits your your GPS position in a high priority format automatically and persistently. Other DSC-equipped (nearly all these days) radios will respond to this signal in a way that is very difficult to ignore. You can certainly follow up with voice calls but **be sure to start the DSC process first.** The radio display will show progress of DSC acknowledgment and of course you can soon expect a callback from the USCG.



## Outboard

### Outboard Safety Notes:

**Kill-Cord:** The outboard is equipped with a kill-cord intended to be around the coxwain's wrist when operating the motor. There is no guarantee that the throttle will return to idle should an upset result in the dinghy being crewless. **USE THE KILL-CORD.** Search Youtube for “runaway dinghy” for supporting evidence.



**Gasoline Storage:** Gasoline fumes are explosive and a very dangerous fire and explosion risk if gasoline is stored on a boat. Keep the spare gasoline container in the dinghy and tied to the dinghy's transom so it stays upright. NEVER store the spare gasoline container in a locker, lazarette, or any other storage area on your vessel.

*KALLISTO* is equipped with a 4-stroke Honda 2 horsepower outboard. This brand and size has proven to be a practical and VERY reliable dinghy outboard.

Spare gasoline is in a container tied into your dinghy, where it should stay.

The outboard is light so it's easy to transfer from the stern rail outboard mount to the dinghy transom (and vice versa).

PLEASE do not cruise with the outboard on the dinghy. It's not unusual for a dinghy to flip while under tow if conditions are nasty, and the outboard will no longer work after saltwater gets into or even near the intake of the carburetor. If this happens, you will have to condition your rowing muscles until you get back to Bellingham. We also recommend taking the outboard off the dinghy at night for the same reason.



### To Start:

1. Push the fuel valve lever (starboard aft corner of the outboard) aft to open the fuel valve.
2. Pull out the choke switch (starboard forward corner of the outboard).
3. Open the air vent on the top of the fuel cap (top of outboard).
4. Turn the handle throttle to the marked “start” position. For extra convenience, use the lock knob to keep it there.
5. Pull the rip cord until it starts. (You shouldn't have to pull it more than 5 times.)

### When Running:

1. Push the choke back in shortly after the engine starts (after about 10 seconds).
2. For the first few minutes of operation, ease the throttle to desired speed to avoid a stall.
3. There is no transmission-- just throttle up to go forward and throttle down to stop. If you want to go in reverse-- just swivel the outboard around 180 degrees.

**To Shut Off:**

1. Shut the outboard off by pushing in the red shut-off knob.
2. To avoid prop damage, shut the outboard off and raise it out of the water before you reach the shore. Pull the outboard forward and out of the water until it clicks and stays in place.
3. To put the outboard shaft back in the water, release the stainless steel lever on the starboard side of the shaft.

**When Not in Use:**

1. Push the fuel valve lever forward to close (starboard aft corner of the outboard).
2. Close the air vent on top of the fuel cap (top of outboard) by turning it clockwise.
3. Put the outboard back on the outboard mount on the stern rail and tighten both braces.
4. Secure the outboard further by tying the safety lanyard to the stern rail.

When you use the engine for the final time during a trip, please let it empty the carburetor bowl by allowing the engine to run until it stops, with the fuel valve shut. This is a big help in avoiding fouling the carburetor should the engine be idle after your charter. At a fast idle, this requires about 3 minutes.

**Troubleshooting:**

If the engine won't start, review steps 1-5 above to make sure you've done all 5 steps.

- If the outboard is running and you're heading toward shore, and the engine suddenly quits, it's usually that someone has forgotten to vent the fuel cap, or has not opened the gasoline supply valve.
- If the engine is running fine but the propeller isn't moving, the shear pin is probably broken – just take the cotter pin out to remove the propeller and replace the broken shear pin (a spare pin is located forward of the shaft under the handle grip) and put the propeller and new pin back into place.

**Refrigerator/Freezer**

The well-insulated refrigerator must be turned “on” at the electrical panel. The temperature control dial (thermostat) is located inside the refrigerator (duck your head down and look forward to see it - a flashlight helps). Simply leaving this dial set so that the arrow points straight down (to the letter A) produces excellent results. There is a small freezer compartment in the refrigerator. The items you'd like to have coldest (not your lettuce) can be put in the basket that slides underneath the freezer. In general, items at the bottom of the reefer will stay a bit cooler than items toward the top.

A thermometer is provided to help make setting the refrigerator temperature easier, and to help keep peace over whether it's too warm or too cold. Find it strapped to the side of one of the upper baskets.

Spillage of liquids into a boat's refrigerator is not uncommon. In the case of *KALLISTO* it's an easy job to clean the refrigerator. Simply flush (scrub if necessary) whatever was spilled down and into the drain at the bottom of the refrigerator. Whatever is rinsed through the drain will end up confined in the bilge sump and be pumped overboard. ***Finish cleaning by rinsing with ample fresh water (1-2 gallons) so as to dilute the contents of the bilge sump, thereby avoiding rot, fermentation and stink in the cabin.***

## Sails

Safety Note: If going under sail for the first time in a while it's easy to forget some disciplines of how tacking and gybing are handled, particularly in a cruising boat with numerous crew and a lot of stuff on board. Go over these things with your crew before raising sail for the first time:



Before touching a halyard, stow all loose gear above and below decks. In particular:

Loose dishes should be stuffed in the sink if not cleaned and put away.

Personal possessions and in particular toe-smashers and delicate easily broken things should be stowed, wedged on bunks or positioned where fiddles will retain them.

Cabinet doors should be in the locked position and cabin doors either clipped open or fully closed.

Drinks and other spillables secured.

Remind crew members of the often strong dynamics when a sailboat goes on opposite tack or is gybed. In particular, the while *KALLISTO*'s boom is quite high it's still possible to be in the boom's way when going through the wind, a setup for serious injury with any boom on any boat.

**Fully close and dog hatches on foredeck, and fold the mast steps.**

*KALLISTO* is a delight to sail, sweetly balanced and with no tendency to gripe, fall-off or misbehave. Her sail plan (a medium-sized furling genoa and battened main) was selected with consideration for short-handed sailing. Once she has way, *KALLISTO* is easily steered with small rudder changes. Her perfect breeze is 10-20 knots with heel at 5-30 degrees. Full sail can be carried in winds up to 18 knots apparent, or about a 25° heel. If you reach the edge of your comfort zone sooner, don't hesitate to shorten your sails. Remember, "Reef often and reef early." You can always shake them out if you decide you've been too conservative.

**Headsail:** The 125% genoa/jib has roller furling for your convenience. Whether fully or partially deployed, you'll have good sail shape. Slight hand-over-hand tension on opposing lines – furling line and sheets – while unfurling or furling prevents problems such as a rat's nest on the drum (should the wind catch the sail and unwrap it violently) or a baggy furled sail.

**When leaving the boat it's a good idea to set a stopper knot in the furling line just aft of the furler clutch, as a backup. From direct experience attempting to save a neighbor's sail during a blow at Squalicum Harbor we can tell you that it's virtually impossible to regain control of an accidentally flying foresail in a stiff wind, and only minutes will pass before the sail is destroyed.**



Reefing the Headsail: Simply ease the jib sheets (keeping control of them) while pulling in the jib reefing line until only the amount of sail you desire is deployed. In light to medium airs you should not have to use the winch to furl the jib. If you cannot furl by hand in easy conditions, forcing the furler with the winch could exacerbate a developing problem. Instead, **before winching**, investigate to see why it will not furl in naturally.

**Mainsail:** The mainsail is a battened, conventional rig with a lazy bag and two pre-rigged reefing lines. When attaching the halyard to the mainsail (we keep the main halyard shackled to the deck fitting abeam of the mast on the starboard side near the toe rail to keep the noise down), be sure not to foul the halyard on the lazy bag lines.

Deploying the main:

1. Steer head-to-wind and maintain.
2. Attach the halyard to the head of the sail.
3. Unzip the lazy bag
4. Release mainsail reefing lines, boom vang **and outhaul** when preparing to hoist the main.
5. Pull down on the halyard at the mast, while someone in the cockpit takes up the slack. If shorthanded, you can pull the halyard from the cockpit – but it takes a fair amount of elbow grease.
6. Then, winch the halyard up the last few inches to eliminate wrinkles in the luff.
7. Adjust outhaul
8. Fall off and you're sailing! Now you're ready to deploy the head sail.

*KALLISTO's* mainsail is built large on top, with as much roach as possible. Keep her close into the wind and pay particular attention to jacklines meeting battens when raising the main.

Reefing the Mainsail: “Reef early and reef often.” This will keep your crew comfortable and you from rounding up. Reefing the main is easy and can be done from the cockpit. Here's how.

1. De-power the main (by heading up or heaving to).



2. Be sure the topping lift has not been loosened, and will hold up the boom.
3. Let the tension off of both the boom vang and the main sheet.
4. Lower the mainsail so that the reefing point you desire is about 24 inches above the boom and cleat off the main halyard to keep tension on the mainsail halyard when reefing down the foot of the main.
5. Pull in on the reefing line (using the winch if necessary) to tighten the sail, which will draw down the reef point much closer to the boom and “shape” the sail.
6. If needed, raise the main halyard slightly (with the winch).

**Plan** on going to the first reef when wind reaches the upper teens. Highly sheltered harbors are a common feature in the San Juans, leading to deception. If there’s any doubt about conditions raise with a reef and then shake out once you’ve gotten a scope on gusts.

**Spinnaker:**

*KALLISTO* has a 1290 sq. ft. asymmetrical spinnaker in her sail inventory. You'll need to have established spinnaker qualifications with San Juan Sailing in order to employ this sail. *We encourage you to do so*; this is a very useful sail for summer sailing in the PNW, let alone photogenic.

## Shower and Hot Water

12 gallons of hot water is stored in an insulated tank under the seat just forward of the galley. This tank is heated either by shore power or the engine.

In practice it's possible to do a load of dishes and then obtain 2-3 economical showers from the tank. The tank retains heat excellently; showers the morning after an arrival are possible.

It takes about 30 minutes of running the engine under load to heat the water tank. When on shore power, you can heat your water electrically by turning the "water heater" switch on the A/C panel to the "on" position. It takes about 2 hours to heat the water electrically from a cold start.



**Safety Note:** the engine heats water to scalding temperatures! Be careful when using hot water.

Experienced cruisers know the sailor's shower: get wet, turn off the water, soap up, rinse off.

On warm, sunny days, an alternative to the below decks shower is the swim platform shower (with hot and cold water) located next to the swim ladder. This is also a good way to rinse off salt after swimming or dirt after going ashore.

## Spares

*KALLISTO* is equipped with engine and general spares. With few exceptions they are located beneath the aft sleeping berth bunk, in clearly marked locations. A few spares are collocated with their subjects, such as spare fuses being in or near their fuse panels.

## Storage

Large amounts of additional storage space for longer trips are available under the v-berth. This is space that is most useful for less frequently accessed items, such as food reserves.

A great deal of more readily accessible storage is available beneath the saloon floors, which are especially ideal for beverages, fruit and other items best kept a little cooler (thanks to cool local waters, wine is particularly well situated here and even beer is drinkable without further refrigeration if you're accustomed to English pub beer).

Unless ports are left open to rain, *KALLISTO*'s bilge spaces are generally dry. All the same, unpackaged clothing and other items likely to absorb water are not a good choice for storage under the floor, or in direct contact with the below-water hull in any space.

When storing beneath the floor, be respectful of vessel operational equipment also located in that space, such as the engine raw water thru-hull, auxiliary bilge pump and switch etc. **Items stowed in the space shared by the bilge sump should definitely be contained in a basket or other rigid container so they don't find their way into the sump.**

Paper labels detaching from food packaging are a hazard to effective bilge pump operation in the rare cases it's necessary. Experienced sailors know that best practice for storing packaged food in bilge spaces means peeling labels off and replacing them with felt marker or other replacement identifiers.

The aft head has storage behind the mirror that will stay dry when using the shower given just a little caution. Pull out on the center of the mirror to access this space.

### Stove/Oven/Galley

The gimbaled propane stove has two burners and an oven. There is no igniter; lighting the oven and burners is done with a stick-style butane lighter.

The propane tank and both propane valves (the hand valve and the solenoid valve) are located in the propane locker in the starboard aft cockpit locker, which is vented and isolated from the rest of the boat. Propane escaping within dangerous- for your safety- please read and follow these procedures:

1. Normally it's left open, but before first use check that the faucet-like hand valve at the connected propane tank is all the way open .
2. Make sure all stove control knobs on the stove are in the "off" position.
3. Turn the electric solenoid switch located at the forward end of the galley to "on." A red light will appear.
4. **To start a surface burner**, light a match or butane lighter, push the burner's control knob in and turn to the left to high. The burner should light immediately. Hold the knob in for 2-3 seconds (warming a thermo-couple) and release. You may then operate the knob like a normal stove.
5. **To light the oven**, hold the lit butane lighter or match down through the oval opening in the oven floor, while pushing and turning the control knob. Hold the knob in for 10 seconds (warming a thermo-couple), then release. You will see the oven flames through the oval opening. Use the small oven thermometer (if not in the oven, should be in the implement drawer) to determine the temperature, and the control knob to raise or lower the heat. Rough indication of settings are on labels adjacent to the knob radius.
6. When finished with the stove, shut off the burner(s), then **shut off the solenoid switch**. No need to shut off the propane tank during the day.
7. When leaving the boat for a significant period of time, we recommend you turn off the active propane tank at the propane locker. That way, should the solenoid valve be slightly leaky there's no chance that propane will leak into the vessel.

While the propane tanks normally last for 4 weeks or more, San Juan Sailing's staff tops them off every 2 weeks, so you'll have plenty for your cruise. In practice you need not skimp on hot food to save propane.

If cooking while underway, gimbal the stove by releasing the latch at lower right (red handled, aft) of the cooker. Then if the boat heels, hot liquids and foods will not readily slide off of the stove. Also, for added security, use the fiddles that hold the pots/pans on the burners. If you have something in the oven, please lock the oven door so the contents cannot slide out onto the galley sole (or someone's feet). A latching mechanism is located in the upper left of the oven door.

**WARNING:** Never cook with boiling water or other spillable high-temperature food in high wave conditions or in strong, gusty winds. **Menu planning for underway should include a weather report.**



When cooking at a dock or in a quiet anchorage, lock the stove in position with the gimble latch (red handle, aft) on the cooker. That way, if someone leans on the stove or grabs the oven handle, it won't tip and spill pot/pans on the cook top, feet etc.



The galley sinks drain via a below-water thruhull. You'll find they drain a bit slowly at first but then pick up speed as air is forced out of the plumbing.

We try to maintain a full complement of cooking apparatus on *KALLISTO*, but of course space is tight and some of the larger items require a bit of maneuvering to remove from storage. Some degree of wear and tear on the cabinets is hard to completely avoid but **please try to be careful of veneer when shifting pots and pans in and out of lockers.**

## Tools

There is a well-stocked tool box under the floorboard in the center of the galley. Tools plunging over the side of the boat or dropped into impossible-to-access void spaces are to be expected; don't be ashamed of this but instead **please let us know if a tool has gone walkabout so we can restock the tool box.**

## Ventilation

With her nearly hermetic construction, *KALLISTO* needs a little thought regarding ventilation. ***With all apertures closed and a crew aboard, humidity will become uncomfortable and destructive, and CO2 in the air unhealthy.***

- Unless you're taking green seas over the boat, leave the hatch ventilators open (push up the little grey plastic disk in the middle of the hatch, inside).

- If it's a decently dry day or night, open the hatches themselves enough to provide sufficient air.
- Keep the companionway overhead hatch open at least a little bit when the boat is occupied.
- When sleeping in the cabins with the doors closed, open a hatch or portlight. The aft cabin overhead hatches can be opened even in heavy rain as the dodger provides ample shelter. The hatches v-berth have an intermediate, cracked position that can be dogged to allow air circulation without rain entering except in very windy conditions.

**Aft cabin powered comfort ventilation:**

The aft cabins are closely adjacent to the engine, which is not particularly well sealed into its space. Particularly after a long engine run occupants may be bothered by engine/machinery odor in the aft cabins. A switch low on the starboard side of the engine casing just outboard of the companionway (in the galley) allows the engine exhaust blower to operate at a low speed when the engine is off, obviating this problem. The blower consumes little amperage in this mode and may be used generously.

**Warm engine blower run-on:**

On very warm days and after prolonged engine operation, the blower may kick on or continue running at a low speed, after engine shutdown. This is to deal with “soak-back” heat added to a cabin that is probably already uncomfortably by itself shortly after engine shutdown. The blower will turn off when the engine compartment temperature drops a bit.

Note that both of the v-berth hatches are a snag hazard for jib sheets when steering through the wind. **Fully close and dog these hatches before raising sails.**



**Water Pressure and Tanks**

**Water Pressure:** The fresh water pump switch is located on the DC electrical panel. Switch the breaker “on” to activate pump. If no pressure was in the system you'll hear the pump operate briefly.

Many skippers turn water pressure “off” when not being used and while motoring, sailing or leaving the boat unattended, in case the active tank should be running dry thus leaving the pump unable to build pressure and vulnerable to burn-out. With nobody below under sail or with the motor running the struggling pump may not be heard.

**Water Tanks:**

*KALLISTO* has two water tanks. The forward tank holds 50 gallons and the aft tank holds 40 gallons. Selection valves are behind the aft, starboard settee back cushion in the main salon, just forward of the water pump itself. There is a manifold with 3 tan-colored knobs. The top one is for the aft tank (Tank 1), the middle one for the bow tank (Tank 2), the lower one is not used. The tan knobs rotate ¼ turn; a molded arrow indicates closed or

open. The remaining, lowermost and unused valve is fixed closed and **should not be opened.**

When the tanks are full, use the bow tank first as with the forward tank full, *KALLISTO* tends to be a little bow heavy. Depleting some of the water weight forward first brings the boat into balance. So, start each away-from-the-dock interval with the forward tank selected. Use only one tank at a time – do not leave both valves open, so that you cannot accidentally lose all your water in the case of a leak or tap left running. **When switching tanks, leave a faucet open until the water begins to flow in order to bleed air from the system.** Otherwise, the pump continues to operate and could overheat without pumping any water.



*Hose stub allows easy filling of water tanks*

**i** *KALLISTO* is at her most sporty with the forward tank mostly or completely empty. The total weight of fully filled fresh water on the boat is about 840 pounds, or maybe 5 additional crew members. Of that, the forward tank is about 417 pounds. While we don't actually *recommend* going out while short on water, you could have an especially frisky sailing day by running on largely empty water tanks or least an empty front tank but with a solid plan for how to refill tanks when the fun is over. A compromise that will suffice for a couple of days would be to run only on the rear tank, with the front tank empty. Keep track of usage with the consumption meter in the galley.

**Water Tank Gauges:** The water tank level indicators are selected and displayed on the Scheiber panel at far right of the electrical distribution panel. Press the top quadrant button to cycle through tanks. It takes a short while for each reading to be obtained and displayed.

**By-the-Gallon usage meter:** The Scheiber meter at the main panel gives only a rough indication of how you're doing with water consumption, tracking only large increments of a quarter of a tank.

Located in the galley and measuring all water usage on the on the boat is a much more precise digital meter. This device is particularly useful for calibrating guests to correct shower usage, dishwashing and the like. **Press the elongated grey reset button when you fill tanks to zero-out and start again.**



*Scheiber water gauge*



*By-the-gallon water meter*