NW Explorations

Penalty Box III

Nordhavn 55 Yacht

Operating Manual

(May 2023)

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Table of Contents

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1.0 Introduction

Welcome aboard Penalty Box III, a 55-foot Nordhavn Yacht which can accommodate six guests comfortably in three staterooms. She is powered by a single 325 horsepower John Deere diesel engines. There are helm stations in the pilot house and on the flybridge with fore and aft wing stations for docking. The flybridge and walk around deck provide safe and secure passage around the boat while underway or at the dock. The single engine, bow thruster, and stern thruster make maneuvering Penalty Box III surprisingly easy and fun to operate.

The owner of Penalty Box III is a serious fan of the Seattle Kraken hockey team. You can imagine where he spent most of his hockey career.

1.1 Objectives

This operating manual is an introduction to the motor yacht Penalty Box III, and her features such as the safety, electrical, domestic, propulsion and control systems. This manual will help you operate this vessel with confidence however, this manual is not intended to replace a basic understanding of seamanship. It is the responsibility of the charter guest to have knowledge of the 'Rules of the Road,' and basic skills of navigation, boat handling, and interpretation of weather conditions. This knowledge can be gained through powerboat training classes offered by NW Explorations.

Motor yachts are propelled and control with complicated equipment. This manual is intended to provide a 'working' explanation of how these systems operate. For an in-depth explanation of how a particular system operates, you are encouraged to study the manuals that can be found onboard, or on the internet. For example, to fully understand the use of electronic navigation systems, we recommend reviewing instructional videos that can be viewed at the manufacturer's website or, on YouTube.

1.2 Disclaimer

NW Explorations assumes no responsibility for any errors or omissions of this operating manual and represents only that the writings and illustrations herein represent our "best efforts" to provide a comprehensive overview of the vessel, so that it can be operated by a person who has the necessary experience and/or training to operate such a vessel given the additional information herein.

You should be aware that this operating manual is provided as a convenience to the owners, crew members, and guests on this vessel, and is not complete in every detail. Given the complexity of this boat and its systems, it is not possible that all conditions, contingencies, and operating details can be included, both because of space limitations and because of ordinary oversight as contingencies are speculated upon by NW Explorations. Likewise, it is possible either through oversight and/or changes in the vessel because of additions, modifications, or deletions to or of equipment since publication of this manual, that items discussed will operate differently than described, be absent from the vessel, or be added to the vessel without discussion in this volume.

As a vessel owner, crew member or charter guest on this vessel, you are here at your own risk, and it is your responsibility to be trained and prepared to operate the vessel. If you do not feel competent to undertake any or all operations detailed in this operating manual, contact NW Explorations for addition training.

1.3 Important Boat Numbers and Information

Vessel Name	**Penalty Box III**
Vessel Official Number	1198403
Hull ID Number	PAI55020K606
MMSI Number	367578330
Dimensions	
Length over all (LOA)	56 feet – 1 inch
Length water line (LWL)	50 feet – 10 inches
Beam	18 feet
Draft	6 feet – 6 inches
Displacement (dry)	115,000 pounds
Shore power connection	240-volt, 50-amp
Capacity	
Sleeps 6	two guests in each of 3 stateroom
Fuel	2,250 gallons in four tanks
Fresh water	600 gallons in two tanks
Holding tank	120 gallons
Gray water holding tank	110 gallons
Fluids	
Fuel	#2 Diesel
Motor oil; mains	Delo 400 - 15/40
Transmission oil	30 weight motor oil
Engine coolant	CAT DEAC
Generator motor oil	Delo 400 - 15/40

Operating Parameters (Estimated)

RPM	Speed (knots)	Fuel Consumption (gals/hour)	Nautical Miles per gallon
600	4	0.6	6.7
800	5.2	1.0	5.2
1,000	6.2	1.7	3.6
1,200	7.1	2.6	2.7
1,400	8.4	3.7	2.3
1,600	9.4	5.4	1.7
1,800	10.0	6.5	1.5
2,000	11.1	9.0	1.2

NW Explorations Service Shop:
If you have any problems or any questions you may call the service department for help.

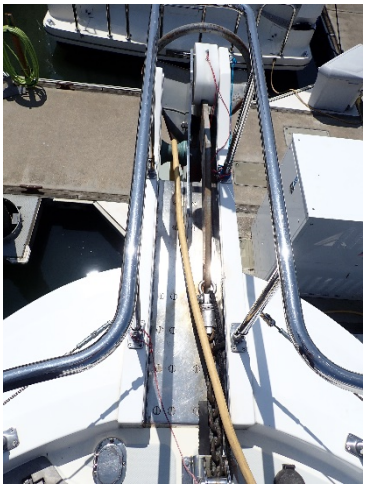
NW Exploration Service Shop: 360-393-5309

2.0 General Description

- Exterior
- Interior
- Flybridge
- Deck equipment
- Shore power connections

Penalty Box III is a traditional pilothouse style boat with a walkway on the starboard side. The asymmetric cabin provides more interior volume for the salon, galley, main cabin, and guest accommodations. The high bow adds reserve buoyancy for coastal cruising and fullhead rfoom in the forward cabin.

2.1 Exterior



At the bow, a bowsprit with anchor roller supports a 155-pound Rocna anchor. Foot switches to raise and lower the anchor and chain are at the base of the windlass platform. The chain falls from the windlass gypsy through a hawsepipe directly below into a chain locker. An anchor washdown nozzle is permanently mounted below the anchor roller to rinse the anchor and chain as they are being raised. Washing mud off the anchor and chain keeps the anchor locker clean and reduces odor. An anchor bridle is stored in the starboard-side locker behind the Portuguese bridge along with spare lines.

A receptacle for 240-volt 50-amp shore power service are at the bow (starboard side) The 50-foot shore power cord can be stored in the port side locker behind the Portuguese bridge. A cablemaster retractable shore power cord is located at the stern, on the starboard side. To power the cord out, the cablemaster breaker on the 24-volt electric panel must be turned on.

The aft cockpit is at the same level as the swim platform. This makes easy access to the swim platform and inflatable tender. Under the cockpit floor is the lazarette storage compartment with extra lines, water hose, cleaning supplies, and other spare equipment. Access to the rudder posts and steering system are also in the lazarette. The starboard fuel tank fill cap is on the starboard side deck.

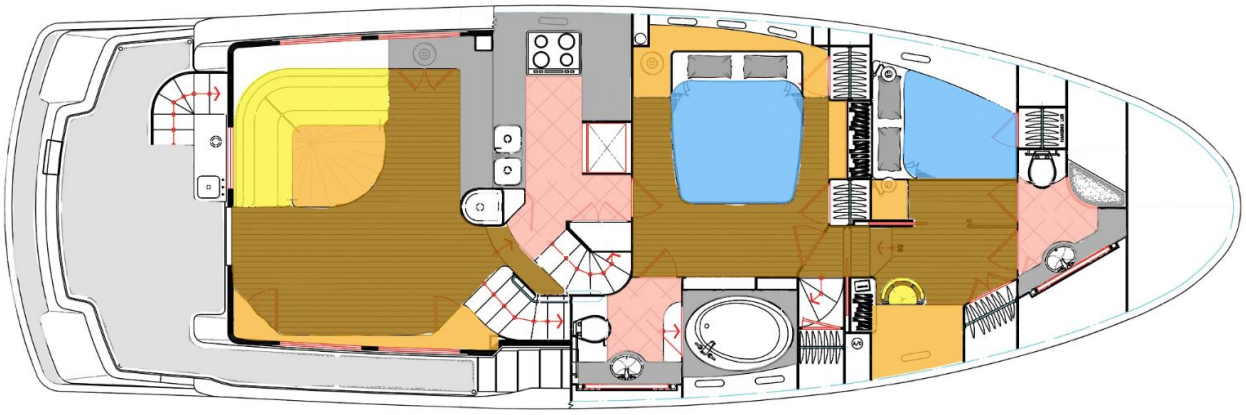
The port fuel tank fill, waste tank pump out and both water tank fills are along the port side of the aft cockpit.

Penalty Box III has stainless steel rails along the starboard side walkway. A gate along the starboard side opens for mid-ship access from the dock; for safety, these gates should be kept closed when not in use.

The swim step is a secure platform to board onto the boat and onto the inflatable tender. A swim ladder is attached on the swim step to help swimmers to climb up onto the swim step.

2.2 Interior

Penalty Box III has a 3-cabin configuration with the galley and owner's cabin two steps down from the salon level. The forward cabin is two steps up from the owner's cabin. The forward cabin i



From the cockpit, you will enter into the large comfortable salon with a leather L shaped settee and teak inlay table on the port side. An entertainment center and two leather lounge chairs are on the starboard side.

The U-shaped galley is two steps down from the salon. Galley appliances include a four-burner gas cooktop ,electric range, subzero refrigerator and freezer, and convection microwave all surrounded by a black, silver and copper flecked granite countertop.

The owner's cabin is forward of the galley with a queen-sized walkaround bed, and ample storage in hanging closets and drawers. The owner's head includes a soaking tub and shower, Tecma electric toilet, and vanity with granite counter top.

The forward stateroom is two steps up from the owner's stateroom or is accessed from the stairway leading down from the pilothouse. This stateroom includes an office area, double berth and private head with shower, toilet, and vanity.

Under the floor hatch in the office area is a very large storage area also known as the basement. This serves for both storage and mechanical equipment; the anchor washdown pump and through hull valve is located in the basement.

A third stateroom is just aft of the pilot house and has a double berth, private shower, and shares a toilet with the pilothouse for other watch keepers.

Toilets in each of the heads are Tecma electric toilets and use freshwater to flush waste to the blackwater holding tank.

To be edited: The rest of the document is from a GB 46.

A monitor for the holding tank is next to the toilet-flush controls. This monitor indicates when the tank is empty, low, mid, and full. When the monitor indicates 'Full,' it is time to find a pump-out station. With four guests this will need to be done every two or three days. There are several pump-out stations in the San Juan Islands including Roche Harbor, Friday Harbor, Doe Bay, Rosario Resort, and Reid Harbor on Stuart Island. Plan to pump out when you are at these destinations. Please do not wait until the tank is full.

2.3 Flybridge

The flybridge with a helm station and navigation equipment is above the pilot house cabin This upper helm station has engine controls and gauges and with a remote autopilot control, chart plotter, depth sounder, and VHF radio. Storage areas for equipment, and extra PFDs, under the helm dashboard and flybridge furniture. A fully enclosed bimini provides a warm and dry space and shade making the flybridge a comfortable area for travel and entertainment.

2.4 Sundeck

The inflatable tender is secured to its bunk on the sundeck above the master stateroom. The tender is lifted with an electric winch on a davit that lifts and pivots over the starboard side where the tender is lowered into the water. Launching the tender is a little awkward so, please review the checklist and procedures for launching the tender prior to your first attempt (Section 10). Rule number 1, you must always be sure the two transom drain plugs are installed. The lower plug is inserted at the outside bottom of the transom. The upper plug is hidden by the outboard motor and is inserted under and behind the helm seat.

A stainless-steel barbecue is attached on the transom handrail with the propane tank secured directly under the barbecue.

3.0 Safety Equipment

Anchor

The main anchor is a 66-pound Bruce anchor permanently rigged at the bow.

Personal floatation devices (PFDs)

Type III Inflatable and vest PFDs are stored in the hanging lockers.
Additional PFDs are in the flybridge storage lockers
A life ring is hanging from the aft rail of the flybridge.
A Life Sling man overboard system is mounted in the cockpit on the aft bulkhead of the master cabin on the starboard side.

Fire extinguishers are mounted throughout the boat:

Forward cabins: on the overhead above the dryer.
Main cabin: port side forward of cabin door, under serving counter
Master stateroom: port side under cabinet countertop
Engine room has an automatic thermal activated with manual control at the lower helm.

Flares and emergency signals are in the cabinet under the lower helm seat by the starboard doorway.

Horn: a compressed-air horn is activated by a push button at both the lower and upper helm station. A handheld horn is stored in the bottom drawer under the helm seat.

Navigation and anchor lights are switched on at the 12-volt DC panel.

Marine Pollution (MARPOL) required placard is attached inside of the engine room door.

First-aid kit is stored in the forward head.

VHF radios are at both the lower and upper helm stations and a handheld VHF radio is available for use in the tender.

Smoke and carbon monoxide alarms are attached to a bulkhead in each stateroom.

Bilge pumps:

3 automatic bilge pumps with float switches area fixed in the bilges
Manual pump is below the floor hatch at the top of the master stateroom steps.

Boarding steps: The board steps at the dock may be carried with you for safe mid-ship access

Swim step: the swim step is a safe place to step between the boat and dock or the tender

Swim ladder is attached on top of the swim step

Ground Fault Circuit Interrupter (GFCI) GFCI switches are located to the starboard of the helm station.

4.0 Domestic Systems

- Freshwater
- Galley appliances
- Marine toilet
- Shower
- Furnace
- Air Conditioning
- Entertainment Center

This section describes the operations of systems used to make life aboard more comfortable.

4.1 Freshwater

A total of 276 gallons of freshwater is stored in two tanks: a forward tank and a mid-ship tank. These tanks are connected to each other and to a freshwater pump. The water is pumped into an accumulation tank that has an air bladder inside, the air in the bladder is compressed thereby creating the pressure that pushes water to the galley and bathroom sinks and marine toilet. The freshwater pump has a breaker switch on the 12-volt DC panel that must be turned on for the pump to work.

4.1.1 Hot Water

Freshwater is heated in a 20-gallon tank with 120-volt AC electrical power from the generator or shore power or, by heat from the port engine while the boat is underway. Be careful, the water can get very hot. The water heater is on the port side of the engine room and the water has a long way to travel to the showers on the starboard side of the boat. Be patient, the hot water will get to the shower, and it will be hot.

4.1.2 Water fill

The water tanks are filled through two deck fill pipes on the port side-deck. The deck fill caps are stamped 'WATER.' Fill the forward tank first and then the midship tank.

Warning: The aft water fill pipe is close to the port-side 'DIESEL' fill pipe. Be careful to fill the water tank and not the diesel tank.

4.1.3 Watermaker

Arctic Star is equipped with a FCI Max-Q watermaker that can produce one gallon of potable water per minute. The watermaker is mounted in the forward bilge area with a control panel installed on the overhead dashboard. The watermaker requires 120-volt AC electrical power from the generator. Operate the watermaker only while you are underway in clean and clear seawater. Suspended sediment in the seawater such as glacial till will clog up the seawater intake filters very quickly.

To start the watermaker, have the generator running and the 'Watermaker' breaker switch turned on. The MAX·Q+ logo will appear on the touch-screen control panel; touch the screen and the startup display will appear. Press 'Start;' the watermaker will automatically go through its start-up sequence and will begin filling the freshwater tanks. When the tanks are full, water will dribble out of the water tank vents outboard of the port side deck. When the tanks are full, press the 'Stop' button and the watermaker will go through the flush and shut-down sequence and then turn off. Allow the watermaker 10 minutes to flush and shut down before stopping the generator. The watermaker requires a high electrical load so when it is running do not use other high-load appliances such as the microwave.

4.2 Galley Appliances

Arctic Stars' galley is equipped with similar appliances as your home kitchen, microwave, coffee pot, refrigerator, freezer, and electric range. The microwave and coffee pot require 120-volt AC power and are plugged into a circuit that is powered through the inverter system; you can make coffee and use the microwave when at anchor and without the generator running however, this will use power from the house battery bank and the battery level must be monitored.

Note: Use of microwave and coffee pot without the generator running will deplete the house battery bank. Monitor the battery levels when operating these appliances when at anchor and the generator is not running.

4.2.1 Refrigerator and Freezer

The refrigerator (top) and freezer (bottom) run on 120-volt AC power when the generator is running or when the boat is connected to shore power. The refrigerator compressor is in the engine room and is cooled with seawater; when the unit is running, seawater drains out a thru hull near the waterline on the port side. This system uses a cold plate at the back of an insulated cabinet. The cold plate is chilled and retains the cold very efficiently keeping the space inside of the cabinet cool. When at temperature, this system needs to be run only for an hour or two in the morning and in the evening when the generator is running. The freezer is cooled with a cold plate set at a lower temperature. A deep-freeze cabinet is under the counter-top to the left of the stove.

Fresh produce will freeze if it is placed too close to the cold plate. We recommend that you store produce in the front of the refrigerator cabinet or, keep fresh fruits and vegetables in the cooler on the flybridge.

4.2.2 Stove

An electric princess marine stove has a three-burner cooktop and an oven that operates with 120-volt AC power; the generator must be running, or the boat must be connected to shore power. Be sure the stove breaker switch is turned on. Because of limitations in the power on a boat, you can use all three burners, or two burners and the oven, but not all three burners and the oven. There is a switch on the front of the stove labeled “Oven/Top.” When set to “Oven,” only two burners will work. The other switch controls the oven light.

Note: When underway vibration may cause the hook holding the stove-lid up to become disengaged; while underway, secure the hook with a rubber band or twist tie.

4.2.3 Barbecue

The propane barbecue is mounted on the transom. To operate, connect the propane hose from the tank to the grill. The regulator must be turned at an angle (about 45°) so that the connector barrel fits into the barbecue. Turn on the propane tank valve and then push down on the regulator valve and turn to the high position. Push down on the ignitor to light. If the ignitor does not spark, use one of the barbecue lighters from the galley.

Hint: These barbecues are hot; Use medium flame for cooking.

4.2.4 Ice Maker

The ice maker under the dry bar runs on 120-volt AC power and will continue to run through the inverter when the boat is not connected to shore power and when the generator is not running. This unit is a low power draw but, can deplete the house batteries over an extended time.

To make ice:

1. Turn on the freshwater pump breaker switch on the 12-volt DC panel ('F.W. Pump')
2. Turn on the Ice Maker breaker switch on the 120-volt AC panel Be sure the ice maker unit is turned on; the switch is below the ice maker door
3. Be sure the wire arm is in the down position.

4.2.5 Vacuum Cleaner

There are two vacuum cleaners onboard. They are in the master cabin hanging locker.

4.3 Marine Toilet

Both the forward and aft heads have Dometic brand MasterFlush electric toilets that uses freshwater to flush waste into the holding tank. The 'Electric Head' breaker switch on the 12-volt DC panel must be turned on.

Two rocker switches operate the toilet:

1. Pressing toggle-1 adds water into the toilet bowl.
2. Pressing toggle-2 adds water as waste is pumped from the toilet bowl.
3. Pressing toggle-3 is the dry flush which pumps liquid from the toilet bowl without adding water.

Freshwater is used in the MasterFlush toilets to reduce the odor associated with older marine toilets.

<u>Important:</u> The only stuff that goes into the toilet is whatever you have already eaten, and some toilet paper. Do not put baby wipes, paper towels, or feminine products into the toilet, they <u>will</u> clog the toilet.

MasterFlush toilets macerates the waste and pumps it into the 30-gallon holding tank. A monitor of the level of the holding tank is placed next to the toilet flush control in the aft head. This monitor indicates when the tank is empty, low, mid, and full. When the monitor indicates full, it is time to find a pump-out station. With four guests this will need to be done every two or three days. There are several pump-out stations in the San Juan Islands including Roche Harbor, Friday Harbor, Doe Bay, Rosario Resort, and Reid Harbor on Stuart Island. Plan to pump out when you are at these destinations. Please do not wait until the tank is over full.

4.3.1 Waste Pump Out

Discharge of untreated sewage is not allowed in the Salish Sea. The holding tank must be pumped out at a proper pump-out stations. The procedure is relatively simple:

Dock port side to the pump-out station if possible.

1. Put on a pair of disposable latex gloves if available
2. Remove the 'WASTE' deck plate on the port side deck
3. Firmly set the waste suction hose fitting into the waste pipe
4. Turn on the waste suction pump and open the valve at the boat-end of the hose.
5. When the pump starts to suck air out of the holding tank, turn off the pump and close the valve.
6. Rinse off the deck and tidy up the pump out facility.

While cruising in British Columbia, pumping blackwater overboard in the open passages is allowed however, do not pump out into anchorages, bays, or marinas. To pump out the holding tank overboard where allowed, you must be sure that the thru-hull valve is open. This valve is in the cabinet outboard of the aft toilet. Ask your check-out skipper where the holding tank pump is located and to check the thru-hull valve.

1. Turn on the 'Macerator Pump' breaker switch on the 12-volt DC panel.
2. Have a crew member monitor the holding tank level and when it is empty turn off the macerator pump. This will take several minutes.

Note: Most of our boats have a timer switch that shut off the macerator pump after several minutes. Arctic Star is not one of these; you must remember to turn the breaker switch off to prevent burning out the pump. Setting a timer on your phone for 10 minutes would work well.

4.4 Showers

Each shower drains into a sump below the teak grate in the shower and this gray water is pumped overboard. The shower 'Drain Pump' breaker switch on the 12-volt DC panel must be turned on and the chrome pull switch in the shower must also be turned on. This pull switch is on the starboard wall of the shower and behind the shower curtain in the aft shower. When taking a shower, keep in mind to conserve water, and please wipe the walls down with the squeegee the is hanging up in the shower. We recommend using the NutriBiotic all-natural skin cleanser that is provided in the shower and at the sinks for washing. This product is biodegradable and will have minimal impact to the marine environment.

4.5 Furnace

A Webasto furnace provides heat to each stateroom and the main cabin. The furnace burns about one-half gallon of diesel fuel per hour to heat water/coolant that is circulated throughout the boat. Fans blow heated air into the cabins at several locations throughout the boat. The power switch is on the pillar aft of the helm seat. Simply tun on the switch to 'System Heat' and then select the desired temperature at the thermostat that is to the port of the helm station and in the two staterooms; the boat has three heating zones. Be sure to have the fan controls on low or high; these fans are controlled by the thermostat and will run to provide heat when needed. If the fans are turned off, heat will not be circulated in that location.

System heat switch and heater fan control

The furnace is powered by 12-volt DC from the house batteries and uses a moderate load. Be sure to monitor the battery level while at anchor. When the house battery bank reaches 12.2 volts, you should run the generator to recharge the batteries. If the battery voltage gets too low, the furnace will shut down to conserve the battery. When this happens, turn the control switch to the off position to reset the furnace.

Note: The furnace is mounted in the engine room with the exhaust mid-ship on the port side. Avoid hanging fenders near the exhaust, the hot exhaust will melt the fender.

Do not hang fenders near the furnace exhaust port is midship on the port side.

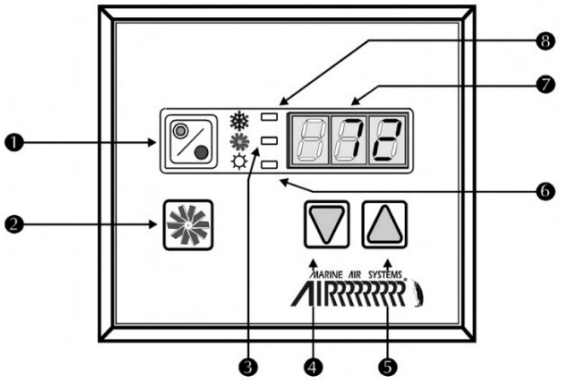
4.6 Air Conditioner

Master stateroom air conditioning and heating controls.

Arctic Star has three Marine Air Systems air conditioning units. These reverse-cycling units can cool or heat the cabin as desired with dry air. The salon and each stateroom have an independent unit with a control panel to program the zone temperature. This system uses 120-volt AC power, you must be connected to shore power or have the generator running. The air conditioning system uses seawater to exchange heat and water will be flowing out of thru hulls near the waterline when these units are running.

To operate the Marine Air System:

1. Be sure the seawater strainer is clear of debris.
2. Turn on the 'A/C Pump' breaker switch and desired air conditioning unit breaker on the AC panel.
3. Press and release the power button to toggle between on and off.
4. The fan icon button manually selects fan speed or the automatic mode.
5. Press and release the up or down buttons to display the current temperature set point. The temperature is increased or decreased by one degree with each press.



1-Power, 2-Manual fan speed,
3, 6, & 8-LED indicator,
4 and 5-Temperature control,
7-Temperature set point.

6. The LED display indicates when the unit is in the cool or, heater mode and when the fan is in the manual mode.

4.7 Entertainment Center

Arctic Star has a DVD player with a 36-inch monitor and a selection of movies to watch. The TV monitor has HDMI connections so that you can connect your own device for viewing. The monitor and DVD player are powered by the 120-volt AC system and plugged into the port-side outlets which are powered through the inverter; you may use the DVD player and TV while at anchor without the generator running. Be sure to monitor the battery levels.

A 12-volt DC Fusion stereo is mounted in the cabinet below the TV monitor. The Fusion stereo has touch-screen operations to select AM/FM radio, or input with Bluetooth or Apple Airplay.

Dial	• Turn to adjust the volume. • When adjusting the volume, press to switch between zones. • Turn to move through the menus or adjust a setting. • When in a menu, press to select the highlighted option. • Press and hold to activate certain functions such as opening the radio presets or muting all connected stereos from the mute screen (*Muting all Connected Stereos*, page 2).
⏻	• Press to turn on the stereo. • Press to mute the audio. • Press and hold to turn off the stereo. • Press and hold to open the power menu.
☰	• Press to open the menu. • Press to return to the previous screen from the menu. • Press and hold to exit the menu.
⏎	Press to change the source. **TIP:** You can turn the dial to browse, and press the dial to select the source. Press and hold to open the GROUPS menu.

5.0 Electrical Systems (Power Management)

- 120-volt AC Electric system
- Generator
- 12-volt DC Electric system
- Inverters/Charger

Management of the electrical power systems is an important topic. There are two electrical systems on board. The 120-volt AC power is provided when connected to shore power or, when the generator is running. Electrical power can also be stored in batteries that provide 12-volt DC power for a limited time. Monitoring the battery levels is imperative to keeping all the boat systems operating normally. The rule of thumb is to begin charging the batteries when they reach 12.2 volts. When the batteries are at 12-volts, they are a half capacity and below 12-volts will shorten their expected lifespan. AC power can also be produced by inverting 12-volt DC power to 120-volt AC power. The inverter is connected only to a few of the circuits. Electrical power is distributed through the breaker panels which are on the ports side of the lower helm. The upper portion of the distribution panel is for the 12-volt DC system and the lower half is for the 120-volt AC system.

5.1 120-volt AC System

5.1.1 Shore power (50-amp, 240-volt)

The AC power system is like the electrical power at your home. When connected with shore power the 120-volt AC system will have power; outlets and appliances will operate normally. Arctic Star is set up for 240-volt 50-amp power supply needed to power the electric stove and air conditioning system. Shore power is supplied through two 120-volt leads that are split in the

AC distribution panel. The shore power cord can be plugged in either at the forward or aft connection depending on which is more convenient to the location of the dock-side power supply.

The procedure for connecting with shore power is:

1. Be sure the AC Power Selector switch is in the ‘OFF’ position,
2. Be sure the dockside 50-amp breaker switch is in the ‘OFF’ position,
3. Plug the shore power cord into the 240-volt 50-amp dock side receptacle and into the boat receptacle,
4. Turn on the dockside 50-amp breaker switch,
5. Turn the AC Power Selector switch to FWD or AFT shore power,
6. Check the AC voltmeter and amp meter on the starboard side of the helm to be sure that power is coming to the boat. The voltmeter will read 120 volts for both Leg-1 (A1+V1) and Leg-2 (A2+V2). The ammeter will have different readings for the two legs.

Voltmeter on left will indicate when 120-volt supply is connected with the AC circuit panel and ammeter on right will indicate how much power is being used. The dial between the two meters switches from leg 1 and leg 2 of the power supply.

If power is not coming to the boat, check:

1. Dockside 50-amp breaker ON?
2. 50-amp plug in the correct position?
3. AC selector switch in correct position?
4. Master Switch (‘1 AC SUPPLY 2’) ON?

When departing from the dock, the procedure to disconnect the shore power is:

1. Turn the AC Selector switch to the OFF position,
2. Turn the dockside breaker switch OFF,
3. Unplug the shore power cord,
4. Stow the cord in the lazarette at the stern of the boat.

The Master Switch breaker or dock breaker may be tripped if the load exceeds 50 amps. When you first plug into shore power the battery charger will likely have a high demand so, you should turn off other high load circuits such as the water heater and refrigerator. After an hour or so, the battery charger will have a lower demand and the water heater and refrigerator can be turned on.

5.1.2 AC Distribution Panel

The lower portion of the distribution panel has a column of breaker switches that when 'ON' supplies 120-volt AC power to the circuit (see below). The AC Power Selector switch is in the lower right-hand corner, this selects where the power supply is coming from. The master switch that is labeled '1 AC SUPPLY 2' should always be in the ON position. In the upper right corner are the generator controls. The generator also produces power that supplies the 120-volt AC distribution panel.

Breakers on left side of panel

Breaker Label	Use
Port outlets	AC outlets on port side
Stbd outlets	AC outlets on starboard side
Microwave	Power to microwave
Icemaker	Power to icemaker
Engine Rm Lts	Power to engine room lights
Inverter	Power to inverter
Water Heater	Power to water heater
Backup Charger	Power to battery charger
Fridge	Power to refrigeration system
Stove	Power to stove/oven
Washer	Power to washer
Dryer	Power to dryer
Trash Compactor	Power to trash compactor
Water maker	Power to water maker
Spare	
Helm outlet	Power to outlet at helm

Yellow: use as needed
Green: Always leave on

Four additional breakers are to the left of the AC Power selector switch

Breaker	Use
A/C pump	Main seawater pump-must be on for all A/C units to operate
FWD A/C	Power to forward cabin A/C
SAL A/C	Power to main cabin A/C
AFT STRM A/C	Power to master stateroom cabin A/C

5.1.3 Reverse Polarity

Reverse polarity means that the wiring at the dock is reversed compared to the wiring on the boat; the 120-volt AC power is connected to the neutral wires which can be dangerous. The reverse polarity alarm light will illuminate if the wiring at the shore power supply is not correct. If the light turns on when you turn the AC Power Selector to shore power, immediately turn the

selector switch off and contact the dock manager. You may need to run the generator rather than use the shore power. Fortunately, most docks have had their power supply upgraded and have been wired correctly.

5.2 Generator

The 12 Kw Northern Lights diesel-powered generator produces AC power to keep the batteries charged and provide power for the AC electrical system. When the generator is running, power is supplied to the inverter/charge that charges the house bank of batteries and the starting batteries for the two main engines. The generator also charges its own starting battery with its alternator. The generator should be running when you operate high load equipment such as the anchor windlass or davit for launching or loading the inflatable tender. These winches require a high load and can quickly draw down the house bank of batteries. We recommend that you start the generator as you reach your destination and prepare to anchor.

Note: After you have anchored and launched the tender, let the generator run for at least an hour to charge the batteries and to run the refrigerator and freezer. The generator must be running to operate the stove, refrigerator, freezer, and to operate the air conditioning system.

5.2.1 Starting the Generator

1. Be sure the AC Power Selector switch is in the OFF position,
2. Press the preheat/shutdown bypass toggle switch and hold for 15 seconds,
3. Hold the preheat/shutdown bypass toggle and press the start toggle until the generator is running, release both toggle switches.
4. Check the generator exhaust and listen for gurgling of sea water being expelled below the water line. The water will not be expelled through the exhaust port. Be sure that fenders and lines will not obstruct the exhaust; if a fender is near the exhaust port, it will be melted.
5. After a brief warmup of a minute or two, turn the AC Selector Switch to ‘GEN’
6. Check the AC voltmeter and amp meter to be sure AC power is on
    a. If not, check the Master Breaker switch is ON.

The AC voltmeter is to the right of the helm and reads 120 volts when the generator is running or when the boat is plugged into shore power. The ammeter indicates the amount of power being used to charge batteries and other AC power uses. The dial between the two meters switches between leg 1 and leg 2. Each leg should read 120 volts on the voltmeter however there will be a difference of power demand registering on the ammeter.

5.2.2 Stopping the Generator

1. Turn the AC Selector switch to the OFF position,
2. Allow the generator to cool down for three minutes or so,
3. Press and hold the ‘Stop’ button until the generator stops running.

Maintenance

The NW Exploration technician services the generator prior to each charter and on a regular schedule and daily checks of the oil level is not necessary. During the daily engine room check, include inspecting two items at the generator:

- Fuel filter located to the port of the generator aft of the main fuel filters
- Seawater strainer located under the teak grate at the aft of the engine room, below the fuel manifold.

5.3 12-volt DC Electrical System

Most of the onboard electrical components operate with 12-volt DC power that is stored in a bank of batteries that we call the 'house bank'. There are also batteries for starting each of the two main engines and the generator. The house bank and starting batteries are isolated from each other so that the starting batteries cannot be used for cabin lights or other domestic and navigation needs. When the batteries are being charged with shore power, or the generator, then all batteries are being charged.

5.3.1 12-volt DC Distribution Panel

The 12-volt DC distribution panel is the upper portion of the electrical panel at the port side of the lower helm station. The row of battery switches at the lower right-hand corner of the panel connects each bank with the associated 12-volt DC circuits.

Breaker switches on the 12-volt DC panel provide power to the various circuits as listed below.

Circuits highlighted in green can always be left ON and circuits highlighted in yellow can be turned ON as needed.

Note: The Bilge pump breakers must always be in the ON position and the bilge toggle switches must be down in the AUTO position. The pump is then control by a float switch that turns the pump on when there is water in the bilge. If the bilge pump toggle switches are in the MANUAL position, the pumps will run continuously and will eventually burn out. If the breaker switches are in the OFF position, they will not pump water out of the bilge.

On the top right-hand corner of the 12-volt DC panel are the main engine breaker switches and start and stop button. These will be discussed in Section 6.4.

Breaker	Use	Breaker	Use
Horn	Ship's horn		
Wiper	Power to wiper panel	S.W. Pump	Power to salt water washdown pump
Nav & Inst lights	Power to running and instrument lights	Rudder indicator	Turns on rudder indicator
Anchor light	Power to anchor light	Sat. TV	Not operable
Spreader lights	Deck lights from mast	Trim tabs	Power to trim tabs
Fwd cabin lights	Power to forward cabin lights	Stbl Master	Turns on stabilizer controls
Salon lights FB Freezer	Power to main cabin lights And flybridge freezer	Stbl Pump	Turns on stabilizer hydraulic pump
Aft cabin lights	Power to aft cabin lights	Engine Room Lts	Turns on engine room lights
Courtesy lights	Turns on side deck lights	FWD Bilge Pump	Always leave in ON position Toggles in AUTO position
Galley Vent	Power to vent above range	MID Bilge Pump	
Head vent	Power to vents in both heads	AFT Bilge Pump	
Drain pump	Shower drain pumps		
F.W. pump	Fresh water pump		
Spare/Downrigger	Power to downrigger outlet		
Macerator pump	Turns on holding tank overboard pump		
Electric head	Power to electric toilets		
Davit	Power to tender davit		

Yellow: use as needed
Green: Always leave on

A subpanel of breaker switches for the navigation electronics and stereo is mounted on the overhead dashboard above the lower helm station. This will be described in Section 7.

5.3.2 Monitoring the House Battery Bank

The easiest way to monitor the house battery bank is with the Inverter control display and the DC voltmeter on the panel to the starboard side of the helm station. When the inverter/charger is charging the batteries, the display will read 13 volts or more. When at rest, when the battery charger is not on and there is only a light load on the batteries the meters will display 12.8 volts or less:

13+ volts	Batteries being charged.
12.8 volts	Battery fully charged
12.4 volts	Battery moderately charged
12.2 volts	Battery low charge, **time to begin charging**
12.0 volts	Battery near 50% charge
11.5 volts	Battery seriously depleted and may be damaged

5.4 Inverter/Charger

Two Magnum Energy Inverter/Chargers are the interface between the 120-volt AC system and the 12-volt DC system. When powered with shore power or onboard generator, these units will convert the 120-volt AC power to 12-volt DC and charge the batteries. When powered with 12-volt DC, it can invert the power to 120-volt AC for selected circuits. These 'smart' units will automatically switch from inverting to charging depending on the input. The inverter units are mounted in the engine room outboard of the starboard engine and have control panels mounted to the starboard side of the lower helm station. Arctic Star has two Inverters to double the power for charging the batteries. Only one inverter is used to invert DC to AC power for the selected AC circuits.

The display has LED lights on the left side indicating the inverter/charger status and below are ON/OFF buttons to manually turn these functions on or off. The LCD display has two lines that describe which function is active and the status (top line) and the battery charge information (bottom line). When 120-volt AC power is supplied the display will indicate charging at one of three levels:

1. Bulk Charging – high power; the charger is delivering maximum current
2. Absorb Charging - moderate power; the charger is delivery a constant current
3. Float Charging – low power; charger is maintaining fully charged batteries

The display will indicate when Full Charge has been reached; this is the battery saver mode, and the charger will maintain charge without overcharging.

The bottom line will indicate the battery voltage with charger applied and amps or power being applied to the batteries.

5.4.1 Inverting

When the system does not have 120-volt AC input from shore power or the generator, the Magnum unit will invert 12-volt DC power from the battery to 110-AC power for selected circuits including:

- Port and Starboard outlets
- Microwave
- Icemaker

Inverting power has a cost; DC power is consumed to invert to AC power. Inverting from DC to AC is not 100% efficient and the higher the power demand, the less efficient inverting becomes. Using high load demand appliances such as the coffee maker, microwave or hair dryer will have a noticeable draw on the house battery bank however charging electronic devices such as cell phones and tablets will not have a significant impact although several devices all charging at the same time can add up. It is surprising how much power is required for making a pot of coffee in the morning. When using the inverter consider the load that is required for each device and after you have had your cup of coffee, check the voltage level of the batteries and consider starting up the generator. The table below lists the power demand of the various appliances on board.

Device	**Power Required (DC amps)**
Computer	25
Coffee maker	100
Hair dryer	84
Microwave	84
Toaster	100

If the LCD light indicates a fault you will need to consult the Magnum Remote Control Owner's manual to determine the best remedy to a specific fault.

6.0 Engines and Engine Room

- Diesel engines
- Daily engine room check (5 items)
- Fuel Management
- Engine controls
- Engine gauges
- Startup procedures

Arctic Star is powered with two Caterpillar 3126B diesel engines with maximum output of 420 horsepower each. Diesel engines are very dependable, and our technicians maintain these engines to high standards. Diesel fuel is very safe, the fuel is not as volatile as gasoline; diesel fuel will not ignite by a spark like gasoline will. Diesel ignites when it is injected into the cylinder chamber under high pressure and heat. An electrical spark is not required for combustion inside the cylinder. Diesel engines will continue to run providing there is a constant supply of fuel and air to be compressed in the cylinder, and that the engine is properly lubricated and cooled.

6.1 Engine room check

Before getting underway, we advise that you enter the engine room look around at all the equipment. The easiest way into the engine room is through a small door under the steps leading down to the galley. Remember to turn on the engine room lights on the 120-volt AC panel; these are brighter than the 12-volt DC lights. The main objective of the engine room check is to monitor the general condition of onboard equipment. While you are in the engine room, look around and ask yourself, “does everything look right?” To help with this, complete follow the checklist:

Engine room Checklist		
	Seawater strainers	Main engines and generator sea strainers clear of excessive debris
	Coolant level	Between the Cold and Hot level; main engines
	Oil drips	Check the oil absorption pads under main engines for significant oil leaks
	Fuel filters	Fuel is clear amber without significant sediment and water is absent
	Engine oil	Between the low and high marks

6.1.1 Seawater strainers

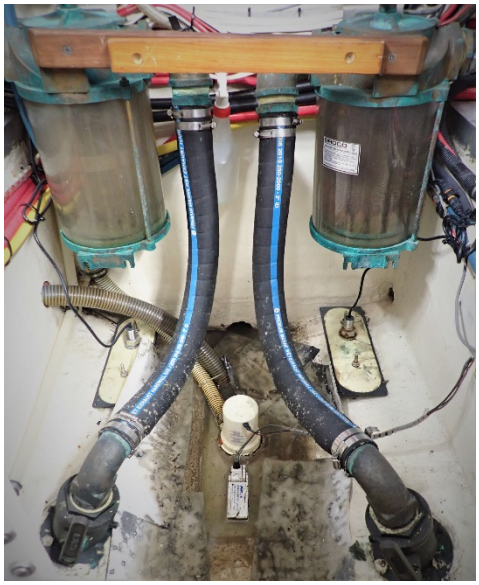
Coolant (antifreeze) circulates through the engine and absorbs heat; the hot coolant is then cooled by seawater that is pumped through a heat exchanger and then overboard through the exhaust port at the stern. Seawater is pulled in through seawater strainers that are forward of each engine in the center of the forward bulkhead. To check these, place a flashlight to one side of the seawater strainer, you should be able to see into the basket. There may be some seaweed in the basket. If you can see light shining through, then it is OK. If there is excessive debris, the basket may need to be cleaned. Keep the condition of the seawater strainer in mind. Monitor the engine temperatures as you are cruising. If the temperature exceeds 205°F check

the seawater flow at the exhaust port at the transom. If the seawater seems constrained, then the seawater strainer may need to be cleaned.

There are also seawater strainers for the watermaker, generator, air conditioners and refrigeration systems that you should also monitor.

To clean the seawater strainer:

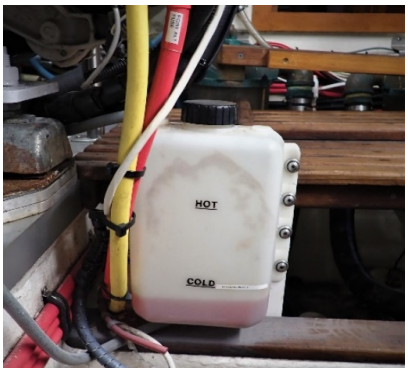
1. Seawater is supplied through two thru hull valves located under the grate at the forward end of the engine room.
2. Close the thru hull valve by turning the handle perpendicular to valve,
3. Open the top of the strainer using a wrench which is in the tool bag,
4. Pull out the basket and dump the debris into the garbage. Replace basket into strainer,
5. Screw the top back into position and tighten to snub, do not overtighten,
6. Open the valve at the bottom of the seawater strainer.
7. Start up the engine and check for water flow through the exhaust port at the transom.
8. Check for leaks at the seawater strainer.
9. Monitor engine temperature.



The sea strainer thru hulls and valves are under the teak grate at the forward end of the engine room.

6.1.2 Coolant level

Coolant will expand as it absorbs heat from the engines and excessive coolant flows into an expansion tank. A tank is mounted on the forward end of the starboard engine and the port engine coolant expansion tank is mounted inboard of the engine near the floor. The level of coolant should be between the 'Cold' and 'Hot' level. If the level is significantly below 'Cold' then add coolant into this expansion tank. When you conduct the engine room check, inspect the coolant level in these expansion tanks.



The expansion tank for the port engine is near the floor

The expansion tank for the starboard engine is outboard and forward of the engine.

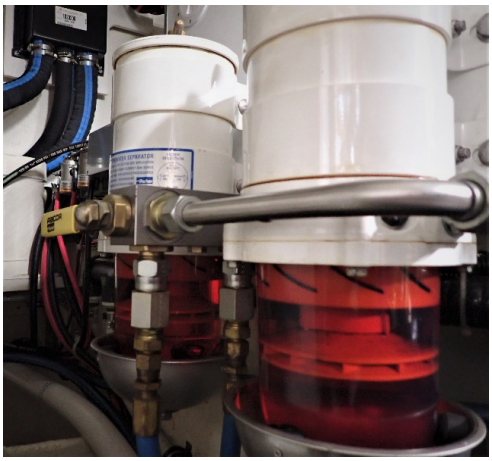
6.1.3 Oil drips

Under each main engine is an oil pan that is lined with oil absorption pads. Visually check these for significant oil drips. There will be small drips here and there, monitor these. If an oil drip becomes significant such as a 2 or 3-inch diameter spot, try to locate the source and then call the service shop.

6.1.4 Fuel filters

The primary fuel filters are to the starboard and port side of the generator. These filters collect sediment and separate any water that may be in the fuel. Place a flashlight to the side of the bowl at the bottom of the fuel filter housing and you should see clean amber diesel fuel with a little sediment. The diesel fuel may have a red die added to it so, variation of color is OK. If you see a clear colorless fluid, it is water - Call the Service shop right away. If there seems to be excessive sediment and the amber diesel fuel is cloudy, keep this in mind, you may need to switch to the backup fuel filter if the engines are not pulling enough fuel.

These Racor brand fuel filters are set up in pairs; one of the filters is active with fuel flowing through the filter to the engine. The second filter is the backup filter and ready to be used when the first filter is clogged. Between the two filter units is a valve with a handle that has a point at one end. This points toward the filter being used. If the RPM of one of the engines begins decrease, you will need to switch to the backup fuel filter.



The valve handle has a pointed end that points to the filter that is active. To switch, turn the valve to point to the backup filter.

To switch fuel filters:

1. Slow the engines down to idle and shift the engines out of gear,
2. Have a crewmember take watch as you enter the engine room,
3. Turn the valve handle at the front of the Racor filter so that it points toward the backup filter.
4. Check the fuel filter of the other engine, if there is excessive sediment, switch that filter as well.
5. Let the engine idle for a minute before increasing the throttle to cruising speed

Between the two filters is a vacuum gage that indicates the pressure (vacuum) of fuel being pulled through the filter. If the needle is in the red zone, it is time to switch to the backup fuel filter.

6.1.5 Engine oil level

We use the dipstick to check the level of lubricating oil in each engine. The dipsticks are on the inboard side of each engine toward the aft end. Use a paper towel to wipe the dipstick as you pull it out and then reinsert it. Remove the dipstick again and read the level of oil on the dipstick, it should be between the high and low marks. If it is below the low mark, add about a quart of oil, let it settle for a minute and then check the dipstick again. The dipstick and oil fills are illustrated below by arrows.

Port engine

Oil Fill, starboard engine, forward end.

Dipstick, starboard engine.

Checking the oil in the generator daily is not necessary. Our technicians service the generator before each charter and complete any required maintenance task needed. If you feel compelled, you may check the oil once on a weekly basis. The dipstick is on the starboard side of the engine inside of the generator compartment and is accessed through an inspection port.

Checking the transmission oil is not necessary. Our technicians check this before each charter and complete any required maintenance task needed. You should however look around the transmission for any leaks.

As you exit the engine room, look around and be sure everything looks as it should. Be sure to turn off the engine room lights at the electric panel after you leave.

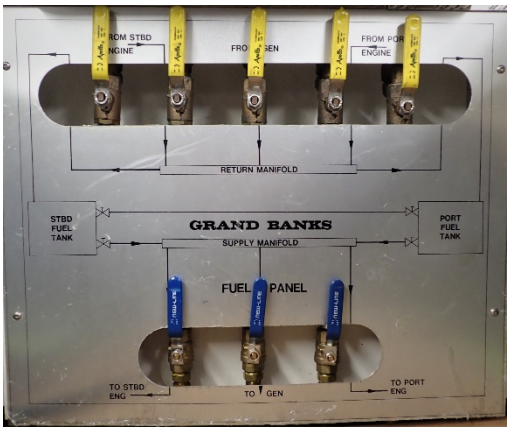
6.2 Fuel Management, Fuel manifold and Fuel level

Diesel fuel is stored in two 300-gallon tanks mounted on starboard and port side at the aft end of the engine room. These tanks are filled from a pipe on both the starboard and port side decks. The deck plates are stamped with 'DIESEL.' On the port side, the deck fill is close to the water fill and the waste pump out and it is easy to get these mixed up. Be careful to pump fuel into the correct tank. As you are fueling listen to the sound of fuel flowing into the tanks, when the sound changes or when you hear gurgling stop filling the tank. We recommend that a crew member should be in the engine room watching the fuel level rise in the sight-glass tube. This crew member an communicate with a handheld VHF radio or by cell phone. When the level disappears into the valve fitting at the top of the sight glass, continue to fill for one minute then tank is full and fueling should be stopped. Another crew member may monitor the fuel gauges on the overhead dashboard.

Arctic Star's cruising range is 350 to 400 nautical miles running at 10 knots with a 10% reserve. There will be no need to fuel up on a one-week charter until your return to the harbor.

6.2.1 Fuel Manifold

The fuel manifold is located at the aft end of the engine room under the generator and is used to direct the flow of diesel fuel from the tanks, through the filters and to the engines. The engines do not use all the fuel that is supplied to it, some of the fuel is returned to the fuel tanks. The fuel manifold also directs the return flow. For simplicity, we keep all the fuel valves open. This allows the fuel to be supplied from both tanks, and to be returned to both tanks and, for fuel in both tanks to remain at equal level. Please be sure that all valves are open on the fuel manifold.

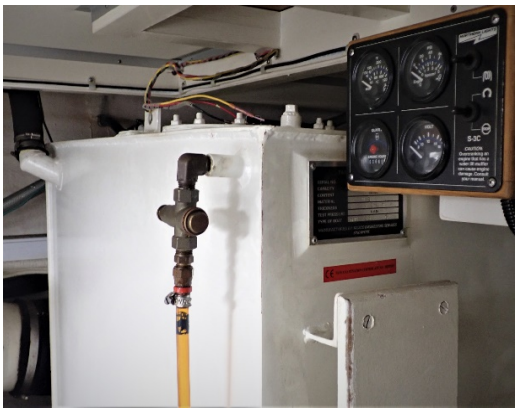


All valves on the fuel manifold should be kept in the open position as shown above.

6.2.2 Fuel Level

Every few days you may wish to check the fuel tank level; to do this, open the valves at the top and bottom of the fuel sight glass and the level of the fuel in the tube will equalize with the level of fuel in the tank. On Arctic Star, the valves are push button valves and a little sticky. This procedure takes two hands, one at the top and one at the bottom.

At 10 knots your cruising range will be 350 to 400 nautical miles so, if you are taking a 1-to-2-week charter, you will not likely need to refuel until the end of your charter.



The 300-gallon fuel tanks have a sight-tube that indicates the level of fuel. You need to push in the valves at the top and bottom get an accurate reading.

6.3 Engine Controls and Gauges

Arctic Star is fitted with standard engine controls at both the lower and flybridge helm stations. The gear shifters on the left have black knobs and the throttle control is to the right and has red knobs. When you shift in and out of gear, the engine should be at idle RPM. When you shift from forward to reverse, and vice versa, you should pause in neutral for a count of 3 to allow the engine and transmission to settle into idle RPM.

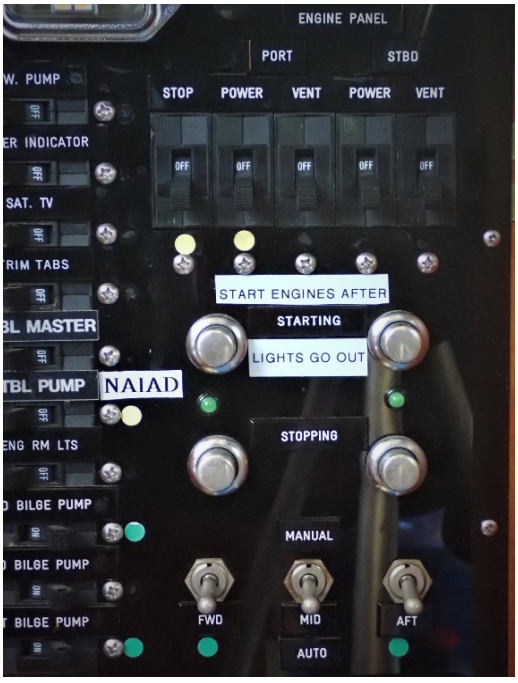
Three gauges for each engine are clustered in the center of the helm with additional display of rudder indicator, ammeter, and battery monitor.

Gauge	Idle	Cruising
Tachometer (RPM)	600 to 800	1600 – 2200
Water Temperature (°F)	160° - 205°	
Oil Pressure (psi)	35 psi (or lower)	35 – 70 psi
Hour meter	Digital readout at bottom of tachometer	
Rudder indicator is left of center and shows the position of the rudders		
Ammeter (Amps) to right of center	Positive charge (needle is slightly to the right of center)	
Blue Seas monitor	Displays starting batteries status	

6.4 Engine Startup

Start switches for the engines are at the upper right of the 12-volt DC panel. There are 5 breaker switches:

Stop solenoid	Power to the fuel solenoid to allow stopping the engines
Port power	Power to the port engine
Port vent	Turn on portside vent
Starboard power	Power to the starboard engine
Starboard vent	Turn on portside vent



The ‘Stop’ breaker switch provides power to the fuel solenoid valve that is used to stop the engines. The default position of this valve is open so that diesel fuel will continually flow to the engines. When the ‘Stopping’ buttons are pushed, the valve is closed, the flow of fuel is stopped, and the engines stop running. If you push the ‘Stopping’ buttons and the engines continue to run, then check the ‘Stop’ breaker switch and be sure it is in the on position.

The ‘Power’ breaker switches provide power to each engine to allow them to run. When the breaker is switched on, the low-oil pressure alarm will sound until the engine is started and the oil pressure rises to normal operating level and the alarm will stop

The ‘Vent’ breaker switches turn on the engine room fans. Use these fans when you are underway to blow fresh air into the engine room.

6.4.1 Starting Procedure

1. Be sure the engine throttle controls are at idle
2. Switch the ‘Stop’ breaker switch to the ‘On’ position
3. Switch both the port and starboard engine ‘Power’ breaker switch to the ‘On’ position
4. Wait until the pre-heat lights go out.
5. Press the port engine start button until the engine starts
6. Press the starboard engine start button until the engine starts
7. Turn both engine room vent fans on
8. Check for seawater flow out of the exhaust ports at the stern of the boat
9. Run the engine at idle or low RPM until the water temperature reaches 140°F; this can be done as you untie the boat and maneuver out of the harbor at idle speed.

6.4.2 Stopping Procedure

1. Let the engines run in idle for 5 minutes to cool down the engine; this can be done as you idle into your destination to anchor or dock.
2. Press the ‘Stopping’ button for each engine. The low-oil pressure alarm will sound as the oil pressure drops below the normal operating level.
3. Turn the breaker switch of both engines to the ‘Off’ position.
4. You may run the fans for several minutes to cool the engine room. These fans are powered from the 12-volt DC house bank and will deplete the batteries if left on too long.

6.5 Bow Thruster

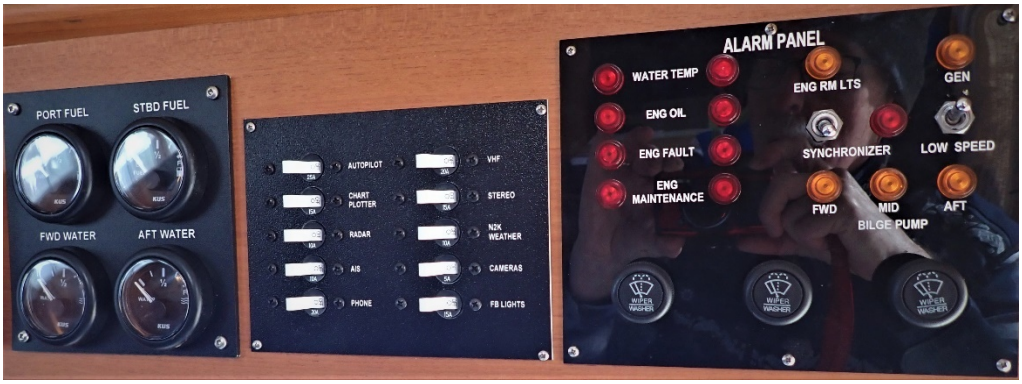
The Side-Power bow thruster joystick control is to the right of the engine controls. To operate, press ON and ON simultaneously. Test the thruster with a quick push of the joystick in both directions. The bow will be moved in the same direction that you move the joystick; push the joystick to the starboard and the bow will move to the starboard. This thruster unit will turn off automatically if not used for three minutes or, if over used and electric thermal shut off switch will trip. If this occurs, you will need to let the unit cool down. If the thruster will not turn on, check the breaker in the forward stateroom, it is located below the bunk behind the louvered doors. The breaker switch is a big red button which is a pull-on, push-off. Be sure the button is pulled out.

The bow thruster circuit breaker is in the forward stateroom in the cabinet under the bunk. The normal ‘On’ position is pulled out.

7.0 Electronic Aids to Navigation

- VHF radio
- Autopilot and Ruder Angle Indicator
- Chart plotter
- Radar
- Sounder
- Automatic Identification System (AIS)

Arctic Star is equipped with a variety of electronic equipment to aid with navigation and cruising safety. Each device has a dedicated, or shared circuit on a 12-volt DC subpanel on the overhead dashboard above the lower helm station. Each breaker switch must be in the 'ON' position.



7.1 VHF radio

Arctic Star has an ICOM m605 VHF radio at the lower helm station with a remote microphone on the starboard side of the helm station and a second microphone/keypad is mounted in the flybridge. A handheld VHF radio is usually kept in its charging cradle on the bookshelf at the aft port side of the amin cabin. The ICOM M605 radio is mounted on the overhead dashboard and is turned on by pushing in on the power button below the keyboard at the lower right-hand corner of the radio.

These radios are used to monitor channel 16, the emergency calling and hailing channel. If you wish to communicate with another boat, follow these procedures:

1. If the boat is close, use low power
2. On channel 16 call the boat two or three times followed by your boat name
   "*Patos, Patos, Patos, - Arctic Star"*
3. When the receiving boat replies:
   "Arctic Star, Patos; go ahead" give instructions for switching to a selected channel
   "Patos, switch to channel 68" (68, 69, 71 and 72 are recreation boating channels)
4. Go to channel 68 and listen to see if the channel is clear, do not interrupt another conversation and again switch to low power if they are close by and call them again: *"Patos, Patos – Arctic Star channel 68"* and they will reply: "*Arctic Star – Patos, what's up?"* and then you can continue your conversation.
5. To end your conversation, indicate that you are clear and switching back to channel 16: *"Arctic Star clear and standing by on channel 16"*.

The weather forecast is updated three times each day and is continuously broadcast on the WX channel. Press the CH/WX button along the bottom of the screen and then switch through the channels until you find the appropriate forecast. If the CH/WX button is not shown along the bottom of the screen, press the > key until the CH/WX selection is shown in the menu at the bottom of the screen.

The handheld radio should be taken whenever the tender leaves the boat. You can either standby on channel 16 or select a different channel to standby on. We often use channel 88a for our flotillas. Select a channel on the handheld and then press and hold the lock button to avoid accidentally switching channels. The same channels should be selected on the radios onboard Thea. To call the tender follow the same procedures as above, if the tender is close by, use low power.

"*Arctic Star tender, Arctic Star tender – Arctic Star"*
When the tender returns your call, you can continue your conversation.

7.2 Autopilot and Rudder Angle Indicator

Arctic Star is equipped with a Garmin autopilot that is interfaced with the Garmin chart plotter. This network can steer the boat on a selected route to a selected waypoint compensating for set and drift from wind and currents. The autopilot control screen is between the engine throttle and gear shifter. Along the bottom of the autopilot control screen is a rudder angle indicator. Another rudder indicator is on the lower helm dashboard.

The autopilot can work in three basic modes:
Standby: The person on watch has manual control of the helm
Heading Hold: The autopilot will maintain a compass course
Follow Route: The autopilot will steer to selected waypoint

You will primarily be using the STBY and ENGAGE buttons to enter autopilot mode or manual steering mode. If you need to dodge an object such as a log or floating debris, push STBY and hand steer to avoid the object then return to your compass course and push the ENGAGE button. To adjust your course as needed press the buttons below the arrow keys to add or subtract one degree.

An autopilot control panel is also mounted on the flybridge helm. You have control of the autopilot from either unit. That is, you may engage the autopilot at the lower helm and then move to the upper helm and use the control unit at the upper helm.

7.3 Chartplotter

Arctic Star has Garmin GPSmap 8616xsv chartplotter networked with three multifunction display (MFD) screens, autopilot, radar, and sounder. Touch-screen menus are intuitive and are user friendly. If you use Navionics on your cell phone or tablet, you will learn to use the Garmin chart plotter easily. This is an advanced navigation system, and it will be helpful to study the operator's manual at the link below:

https://www8.garmin.com/manuals/webhelp/gpsmap8400-8600/EN-US/GUID-CD715165-98FB-4E83-B611-55737950567B-homepage.html

There are also several YouTube tutorials that will help you become familiar with this system. These are third-party produced videos that are not endorsed by Garmin and not endorsed by NW Exploration however, some useful tips can be gleaned from these videos. The 1st link below is an in-depth tutorial with a Garmin representative and the second is a video produced by the manufacturer of Ranger Tugs and Cutwater boats:

1. https://www.youtube.com/watch?v=PvXJefVlrnE
2. https://www.youtube.com/watch?v=O_9h1XNBN4A

Online video tutorials for specific topics can be viewed from the Garmin website:

https://www.youtube.com/playlist?list=PLZQteomUj15N9sa_ObaGL_zYO8DX-8liE

Note: Electronic aids to navigation are tools to assist you with navigating through the islands and reefs in our cruising area. You are, however, responsible to always know your location, and to operate in a safe manner. Rule 5 of the Navigation Rules of the Road state:

> "*Every vessel shall at all times maintain a proper lookout by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision*." (COLREGS Rule #5).

We recommend that as you are learning to use the chart plotter, a second crew member should be with you to keep watch as you are cruising. It is quite easy to become distracted with the navigation electronics.

To boot up the chartplotter:

1. Turn on the breaker switches at the electronics subpanel on the overhead dashboard.
2. The screens may boot up or you may need to press the power button at the lower right corner.
3. A warning will appear:
    a. "….You assume all risk for the use of this device."
    b. Press ACCEPT
4. The screen will open to the page that was last used.

The HOME menu at the bottom of the screen brings up choices for the view on the screen. You may need to swipe up from the bottom to bring up the menu bar.

This Gamin GPS map system is capable of advanced route planning and navigation which is beyond the scope of this operating manual. Below are some basic uses of the system.

Stop panning
As you move the chart around on the screen, the 'Stop Panning' box will appear in the lower right corner. Touch this box and the chart will return to the ship's position.

Owner's manual
The owner's manual can be accessed on the screen: Select the Info Menu then scroll down on the menu to the right, touch Owner's Manual. You will be able to search for a topic.

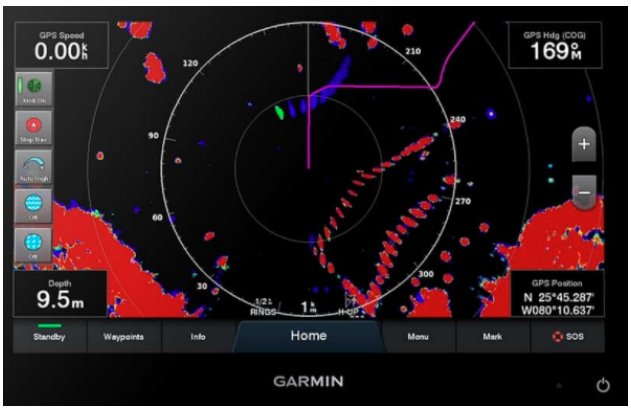
Tides and currents
To view information on tides and currents at nearby stations
Select Info > Tides and Current

Steering to a waypoint:
The easiest way to select and steer to a waypoint is to touch the screen where you wish to go; a target will appear on the screen and a drop-down menu will appear at the top of the screen. Press 'Go To' and a magenta route line will appear on the screen. Then the autopilot dialog box will pop up; do you want to Engage the autopilot. If you select 'Engage' on the chart plotter screen, the pilot will steer to the waypoint and will adjust for set and drift. If you select 'Cancel' and then 'Engage' at the autopilot control screen, the autopilot will hold the current compass heading and will not adjust for the wind and current effects on the boat.

To stop navigation
Select Menu > Stop Navigation.
Or touch the Stop Navigation icon in the upper left corner of the screen: 

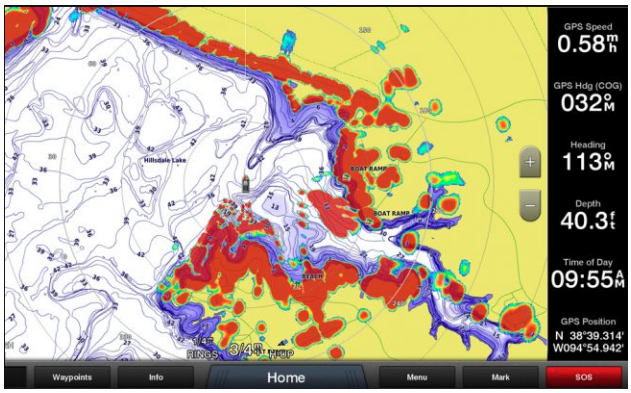
Man overboard – SOS:
In an emergency, press the SOS button for one second. This button is to the right of the menu bar. The position will be marked on the chart. Then press the type of emergency. For a man overboard you may select to return to the position of the man overboard. Be sure to throttle back so that the boat does not make a full speed U turn.

7.3.1 Radar



The Garmin MFD can be used for the radar display as well. At the lower helm we generally use the smaller screen for the radar. If the radar screen is not displayed, press the 'Home' menu at the bottom of the screen and then either Combos or Radar at the right-hand side of the display then select the view that you want to use. When the radar is ready to transmit:

Select Menu>Transmit radar
Or touch the Transmit icon in the upper left corner.



The radar can be overlayed onto a chart so that radar targets will be displayed in reference to charted features.

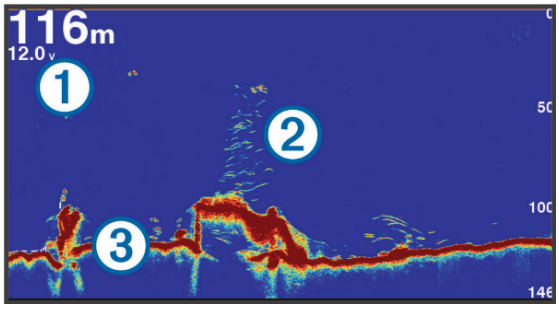
Select Menu > layers > radar then choose the desired view.

Note: Your charter's insurance does not permit operation of the vessel in restricted visibility such as fog. You should learn to use the radar in weather with good visibility to familiarize yourself with operations, and with a second crew member at the helm to maintain a proper lookout.

7.4 Depth Sounder

Water depth can be displayed on the MFD or on the digital MFD on the overhead dashboard. This unit has advanced sounding options such as:

- Dual frequency
- Clear Vu
- Side Vu
- Traditional fishfinder view (right)
  1. Depth
  2. Suspended targets or fish
  3. Bottom



Using a combo screen on the smaller MFD you can see depth information alongside a chart or radar. The display can be calibrated for an off set to depth under the keel however, it is always safer to assume that the depth of the display is from the surface of the water, and that you need to subtract the draft of the boat (4.5 feet) for the depth of water under the keel.

7.5 Automatic Identification System (AIS)

Arctic Star is equipped with Class B AIS. This system sends and receives position and vessel information with other boats. The positions of the nearby boats are displayed on the chart plotter. Additional information of the other vessels can be displayed by selecting the target on the screen. This tool is useful for avoidance of collision and identifying other vessels so that you can call them on the VHF radio.

8.0 Maneuvering Suggestions

- Departing
- Docking
- Close quarter maneuvering
- Bow thruster
- Using the Synchronizer
- Trim tabs

With twin engines and a bow thruster, Arctic Star can be surprisingly easy and fun to maneuver while departing the dock and navigating through the harbor. Captain Joseph D. Coons, an associate of ours prepared an instructional booklet titled “Maneuvering Inboard-Engine Power Boats” which, is available from our charter office or, from the link below. We recommend reviewing this booklet. When maneuvering, use the gears for a few seconds only and then return to neutral and let the boat glide on its own momentum. Keep the momentum going in the desired direction with adjustments by shifting into gear as needed and then back into neutral. The bow thruster can be used to adjust the direction of momentum. Use the bow thruster judiciously; overuse will require correction in the opposite direction.

Maneuvering Inboard-Engine Power Boats

8.1 Departing from a Dock

1. Prior to departure, be sure that the shore power chord is disconnected and stowed onboard.
2. Turn the stabilizer system on and center the fins.
3. Mooring lines should be prepared by having the bow and stern line doubled back to the boat with only a single loop around the base of the cleat or, around the dock rail. This will allow for the boat to be untied from the boat rather than from the dock.
4. Have a roving fender at hand and ready to be deployed where needed
5. Untie the forward and aft and spring lines
6. When the captain calls ‘Cast off lines,’ flip the bow line and stern line away from the cleat and pull the line onto the boat.
7. If the boat is in a slip, slowly back the boat out by using reverse gears of both engines. Initiate reverse with the dock-side engine, this will pull the stern slightly way from the

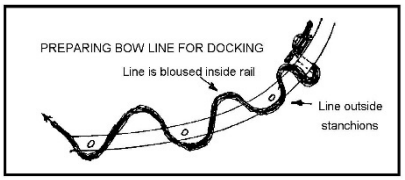
dock. Use reverse gear for a count of 2 and then shift the gear back to neutral. You may also push the bow away from the dock with a short burst of the bow thruster.

8. If you are moored alongside of a dock, twist the stern away from the dock with the dockside engine in reverse and the outside engine in forward. Setting the bow line up as a spring line to prevent forward movement of the boat is helpful.
9. When you are clear from the dock and other boats, you may maneuver as needed.
10. Be sure all lines are free and clear, and stowed.

8.2 Docking

As you approach a harbor, look around at flags and pendants to learn the direction of the wind. Try to determine if there is any current and how it will affect your boat. Be sure that the synchronizer is off and that you have independent control of both engines. Center the stabilizer fins. Usually, it is easier to dock bow in toward the dock or slip.

1. Switch the synchronizer Off, trim tabs in 'Bow up' position, and center the stabilizer fins.
2. Turn the bow thruster on.
3. Have fenders evenly spaced alongside the boat and at the appropriate height to protect the boat from the dock.
4. Have all tie up lines ready to tie up the boat.
    a. Bow line should be threaded out of the hawsepipe and along the gunnel cap outside of the rail stanchions.
    b. Two spring lines should be ready at the midship cleats and hawsepipe.
    c. Stern line should be threaded out of the hawsepipe and ready.



5. Have one crew member at the stern ready to step off from the swim step, if possible, with the stern line.
6. Approach the dock slowly at a 30° to 45° angle aiming to the point where you want the stern to be tied.
7. As you approach the dock, turn the boat with either reverse gear of the outside engine to slow your forward motion, or forward gear of the dockside engine to add a little speed, so that with the momentum of the boat, you slide into position parallel to the dock.
8. Use short bursts of the bow thruster to adjust the angle of approach.
9. Use reverse gear of one engine for 1 second or less to bring the boat to a stop.
10. Have your crew step onto the dock from the stern and tie the stern line and then walk forward to secure the bow line.
11. When the stern is tied, you may use the bow thruster to push the bow into the dock.
12. You may need to use one of the spring lines to slow the forward movement of the boat.
13. Tie the spring lines after you get the boat situated onto the dock.

8.3 Close quarter Maneuvering

Arctic Star has enough power to drive the boat at idle speed; you will not need to use the throttles, only the gear shifters. With twin engines, it is easier to keep the rudders at the center position. You can steer the boat by using forward and reverse gear to twist the boat in one

direction or the other. Imagine that you are driving a grocery cart; forward with the starboard engine will turn the boat toward the port side. Using reverse gear will accentuate the turn and slow the boat down. When you shift between forward and reverse, hold the gear shift in neutral for a count of 3. Shifting directly between forward and reverse can damage the transmission. Take it slow. Shift in and out of gear to keep your speed and momentum in control and give you time to plan you next maneuver. You may also use the bow thruster to steer the boat with short bursts of the thruster.

Plan your maneuver ahead; have a route to the dock in mind and follow the route that brings you into the dock. You will look like a professional.

8.4 Bow Thruster

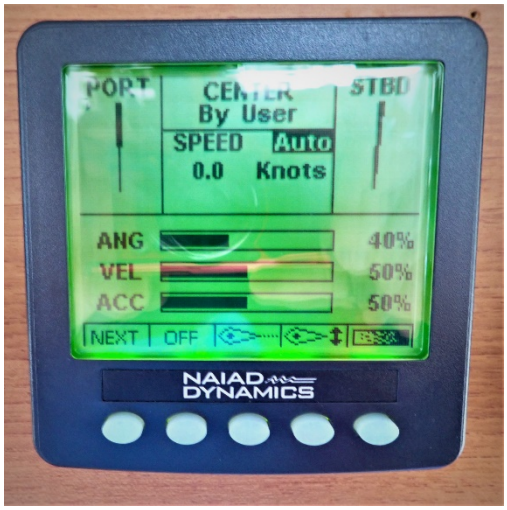
A bow thruster is a wonderful tool to assist with close-quarter maneuvering. Short bursts of the thruster can help to make small adjustments the boats momentum. A push of the joystick to one direction will move the bow in that direction. The bow thruster pushes the bow to one side and since the boat will pivot at its center of lateral resistance (the pivot point), the stern will move to the opposite direction; the bow thruster can also be used to adjust the position of the stern. Use the bow thruster with short bursts so that you do over steer the boat which will require correcting with bursts of the thruster in the opposite direction.

8.5 Stabilizer

Arctic Star is equipped with a Naiad hydraulic stabilizer system that controls the movement of two fins under the boat to reduce the motion of the boat in choppy sea conditions. The roll stabilizer control panel is on the overhead dashboard of the lower helm station and the breaker switches are on the 12-volt DC panel: 'STBL MASTER' and 'STBL PUMP'. This system operates with a hydraulic pump that is driven by the port engine and the system reaches its full effectiveness at cruising speed. When at idle speed the fins should be centered so that they do not interfere with close-quarter maneuvering. Centering the fins lock them in position and they will not turn to counteract the boats motion. The system must be turned on for the fins to be centered; if the system is not turned on and centered, the fins will turn freely and go cattywampus, and then they will interfere with maneuvering.

When you start up the engines to get underway:

1. Turn on 'STBL MASTER' and 'STBL PUMP' breaker switches.
2. Turn on the stabilizer control panel and press the center button at the bottom of the panel, 'CENTER BY USER' will appear at the top of the screen and fins will be locked.
3. To engage stabilizers in choppy water, press the second from right button and ACTIVE will appear at the top of the screen.
4. When you approach your destination, press the center button again and 'CENTER BY USER' will appear at the top of the screen.



8.6 Synchronizer when Cruising

The synchronizer controls the engines so that they operate at the same RPM. This helps with fuel economy and the boat will run more smoothly. A toggle switch for the synchronizer is on the alarm panel on the overhead dashboard at the lower helm and to the starboard of the upper helm.

To engage the synchronizer:

1. Bring the boat up to cruising speed.
2. When the engines are near to the same RPM push the synchronizer toggle switch to the 'On' position and the synchronizer light will come on.
3. Use both throttle controls to adjust the RPM as desired and the synchronizer will automatically bring the engines into synch.
4. The synchronizer will disengage if the RPMs of the engines become too far apart. So, turn off the synchronizer before you throttle back to idle.

The synchronizer toggle switch is in the center of the alarm panel on the overhead dashboard.

You can engage or disengage the synchronizer from either the lower helm or the flybridge helm. To disengage:

1. Be sure both throttles are in the same position
2. Push the synchronizer toggle switch to the off position

8.7 Trim Tabs

Trim tabs are wide flaps under the swim platform at the trailing edge of the hull. These flaps can be adjusted up or down to improve cruising efficiency. When at cruising speed you can adjust the trim tabs to bring the bow down. The control buttons are to the right of the helm. Press 'Bow Down' and watch the speed on the chartplotter, it should increase by a half knot or so.

As you approach a harbor for anchoring or dock be sure to adjust the trim tabs to the full 'Bow Up' position. If the trim tabs are down, they will interfere with maneuvering and may be damaged when backing up.

Trim tab controls are next to the anchor windlass switch to the right of the helm.

9.0 Anchoring

- Anchoring
- Shore tie
- Rafting

9.1 Setting an Anchor

For secure anchoring, choose an appropriate harbor with a soft bottom such as sand, mud, or gravel and with adequate depth so that at low tide, you will still have more than 10 feet under the keel. Cruising guides often describe the conditions of bays and harbors and give tips on where to anchor, look at the charts and chartplotter to locate any rocks, reefs, or other hazards. Then, choose the spot in the anchorage where you have room to "swing" without disturbing other boats. Remember, responsibility for leaving room goes to each successive boat to arrive; the first boat to arrive in an anchorage has priority.

Arctic Star has a 66-pound Bruce anchor with 350 feet of chain for the anchor rode (Table below). We recommend that you anchor with a minimum scope of 4 to 1. That is, let out 4 feet of chain for every 1 foot of depth. So, if you anchor at a depth of 25 feet, let out 100 feet of chain. The 100-foot red mark should be let out into the water, not at the anchor roller. Take the tide into account when considering your depth; if the tide will rise overnight then add the appropriate length of chain so that you will have at enough scope when the tide is at the highest stage. If you expect more than 25 knots of wind, then let out more chain so that the scope is at 6 to 1 or more.

To anchor have one crew at the helm to maneuver the boat and another at the anchor windlass at the bow. The anchor can be lowered and raised using the foot switches below the windlass or with the toggle switch on the windlass panel.

To anchor:

1. Be sure the generator should be running.
2. Turn on the windlass switch that is to the right of the lower helm.
3. Untie the safety line at the top of the windlass.
4. Let out enough chain so that the anchor is ready to lower.
5. When you have found your anchoring location, bring the boat to a stop where you want to lower the anchor with the bow into the wind.
6. Lower the anchor to the bottom before backing away from the anchor.

Anchor windlass is controlled by foot switches near the deck. The windlass handle on deck can be used to push in on the foot switch if needed.

7. Continue to let out chain as the boat slowly backs away (shifting in and out of reverse at idle RPM).
8. Stop the windlass when you have reached the desired length of chain measured at the water.
9. Continue to slowly back on the anchor by shifting in and out of reverse until the chain becomes taut and straight. The anchor is now set. Arctic Star has enough power to pull the anchor through mud and potentially break the set so, do not pull on the anchor for more than 5 seconds.
10. When the anchor is set, attach the anchor bridle.
    a. Secure the bridle hook to the anchor chain forward of the anchor roller and then thread the ends of the bridle through the bow hawsepipe and tie them to the two bow cleats.
    b. Let out more anchor chain so that the bridle becomes taut, the anchor and chain is now secured to the bow cleats. Then let out 30 feet or more chain to add more weight to hold the anchor chain and bridle down in the water. This is similar to using an anchor sentinel or kellet.

Windlass panel with windlass power switch and toggle switch for raising or lowering the anchor.

Anchor chain markings

10 feet	Red – Yellow – Red	250 feet	Yellow
50 feet	Yellow	300 feet	Red
100 feet	Red	340 feet	Red – Yellow – Red
150 feet	Yellow	350 feet	bitter end
200 feet	Red		

9.2 Hauling the Anchor

The anchor windlass has a high-power demand from the house battery bank; be sure that the generator is running and charging the batteries before retrieving the anchor. Also, do not use the windlass to pull the boat forward. As you pull in the chain and anchor, move the boat forward by shifting the engines in and out of gear. The chain should be pulled straight up out of the water and your crew at the bow should let you know which direction the boat needs to be moved to keep the chain in position. As the chain is lifted by the windlass and falls into the chain locker, it piles up and may fall over onto itself and become tangled. To prevent a tangle in the chain locker, have one crewmember flake the chain from side to side to prevent it from piling up to high.

To haul up the anchor:

1. The generator should be running and charging the batteries
2. Both engines should be running
3. Turn on the windlass switch that is to the right of the lower helm
4. Turn on the seawater washdown pump ‘S.W.Pump’ breaker switch.
5. Have a crew member at the chain locker to flake the chain as it falls into the locker.

6. With the windlass, pull in the chain and retrieve the anchor bridle.
7. Pull in the chain while moving the boat forward as needed.
8. Rinse mud off the chain and anchor out over the water as it is pulled up.
9. When the anchor is near the surface, use short bursts of the windlass to bring it onto the roller.
10. Rinse off the deck to remove any mud.
11. Secure the anchor and turn off the windlass seawater washdown pump.

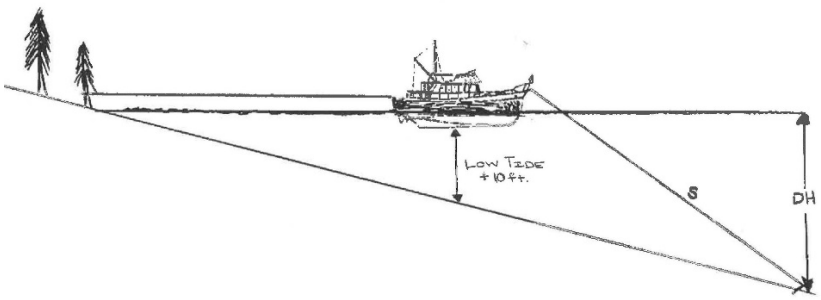
9.3 Stern tie

In many anchorages, especially in the Gulf Islands of British Columbia there are rings or chains secured to the rocky shoreline that are used to tie the stern of the boat toward the shore. Stern tying will keep the boat in position and will eliminate swinging while at anchor. More boats can occupy an anchorage when they are tied to the shore. You can also pass your stern line around a sturdy tree and then return it to the boat. Have your tender launched and tied alongside of the boat before you anchor so that it will be ready to take the stern line to shore.

To stern tie:

1. Select your spot to drop your anchor so that you will have adequate scope when you are stern tied.
2. Anchor as described above and back toward your selected stern tie location.
3. When the anchor is set, have two crew members take the end of the stern tie line to the shore and pass it through the ring, chain, or around a tree and return with the end back to the boat.
4. The person at the helm should keep the boat in position as the tender crew is working with the stern tie line.
5. When the stern tie line is secured, pull the slack out of the line, and adjust the anchor chain as needed.
6. When the boat is in the intended position, set the anchor bridle as described above.

Note: Always take the tide into consideration; at low tide, be sure there is enough depth under the keel to prevent grounding. At high tide, be sure there is adequate scope in the anchor chain.



9.4 Rafting

We often tie our boats up alongside each other on our flotilla trips or in crowded harbors. This is an effective way to reduce our footprint in a cozy cove. The flotilla Captain will first get the lead boat secure in position with an anchor and stern tie and then will call each boat into the raft and coach them as they approach the raft. When all the boats are rafted up, the lead-boat crew will then use our tender to set the anchors and assist with shore-tie lines of the two boats on the ends of the raft. When complete, the raft will be very secure with three anchors out and three stern tie lines.

To raft to another boat, you will need:

1. Fenders set alongside the boat in a position to protect the boat from your neighbor
2. One bow line ready to tie up with your neighbor
3. One stern line leading out through the transom hawsepipe
4. Two long spring lines:
    a. one from midship leading aft
    b. one from stern leading forward

Nine-boat raft in Melanie Cove, Desolation Sound. Three anchors and three stern ties secure the boats in position.

10.0 Inflatable Tender

- Launching the Tender
- Lifting the Tender
- Starting the Outboard Motor

10.1 Tender

Arctic Star has a four-person Highfield center-console rigid-bottom inflatable tender with a 30 horsepower four-stroke Tahatsu outboard motor. A gasoline tank, starting battery, oars and a few spare parts are carried onboard the tender. The tender is lifted from its bunk on top of the sun deck and launched with an electric winch and hydraulic davit that pivots over the starboard side.

Rule number 1: Be sure the plug is secure in the transom before launching.

Rule number 2: You and your crew must be wearing a PFD whenever boarding and operating the tender.

Note: A battery switch is located below the steering wheel. You will need to on the battery to tilt and operate the engine. Please turn the battery switch off when the boat is not in use.

10.2 To Launch the Tender:

Davit control socket.

1. Be sure that the drain plug is secured in the transom.
2. Be sure the generator is running and charging the batteries.
3. Plug the winch remote control into the davit control socket. The remote control is stowed under the cabin-door step at the lower helm station.
4. Connect the winch hook to the tender bridle.
5. Disconnect the hold-down straps that secure the tender to the deck at the stern and untie the bow.
6. Tilt up the outboard so that the lower unit will clear the side-deck rail. The tilt rocker switch is on the side of the shifter handle.
7. Lift the tender to a height where it will clear the side-deck rail.
8. Push the tender over the starboard side and pivot it as you go so that the stern of the tender is toward the bow of Arctic Star.
9. Lower the tender into the water.
10. Have a crew member (who is wearing a PFD) climb down into the tender and disconnect the bridle.
11. Move the tender to the stern of Arctic Star and tie it snug to the swim platform.
12. Return the davit hook to the sundeck and secure it so that it will not move as the boat rocks.
13. Stow the remote control in the step at the lower helm.

10.3 Starting the Outboard Motor

The 30-hp Tohatsu outboard motor uses gasoline that is in the gas tank under the forward seat. This four-stroke motor does not require oil to be added to the gasoline, it is lubricated with oil in the engine.

To start:

1. Turn on the battery switch that is below the helm.
2. Tilt the motor down into the water. The tilt rocker switch is on the side of the shifter handle.
3. Pump the fuel line bulb until it is firm.
4. Turn the key clockwise to the on position and further to engage the electric starter.
5. You may lift the throttle lever on the control unit to help with a cold start, the choke is automatic.

6. Allow the outboard motor to warm up for a few minutes.
7. To shift into gear, squeeze the shifter handle to release the neutral lock.
    a. Push forward to engage forward gear,
    b. Pull backward to engage reverse.
8. Moving the shifter handle past the in-gear position will increase the throttle and speed of the tender.

10.4 Lifting the Tender

To lift the tender and secure it back onto its bunk follow these procedures:

1. Be sure the generator is running and producing power to charge the batteries.
2. Plug the winch remote control davit control socket.
3. Bring the tender along the starboard side with the bow toward the stern of Arctic Star.
4. Lower the davit hook into the tender and connect it to the bridle.
5. Tilt the outboard up to clear the side rail.
6. Lift the tender up out of the water to the height where it will clear the side-deck rail.
7. Pull and pivot the tender into position over its bunk and lower it into position.
8. Secure the tender with the hold-down straps.
9. Disconnect bridle from winch hook and lay the bridle in the tender.
10. Connect the winch hook to its the lanyard.
11. Disconnect the winch remote control and stow it under the cabin doorstep at the helm station.
12. Open the drain plug at the transom to drain water.
13. Tilt the motor down.
14. Turn off the battery switch to avoid draining the battery.

11.0 Checklists and Procedures

- Engine room check
- Startup procedures and stopping main engines and generator
- Departing and approaching a dock
- Anchoring procedure, hauling the anchor

Engine room Check

1. Sea water strainer: should be clear of significant debris and flashlight should shine through
    a. Starboard engine sea water strainer
    b. Port engine sea water strainer
    c. Generator sea water strainer
2. Engine coolant: coolant level should be between the Cold and Hot marks
    a. Starboard and port engines coolant level
    b. Generator coolant level
3. Oil absorbent pads under engines: small drips are OK, monitor larger drips
4. Fuel filters: clear amber with no water.
    a. Starboard engine fuel filters
    b. Port engine fuel filters
    c. Generator fuel filter
5. Engine oil: between the Low and Full marks
    a. Starboard and port engine oil – daily
    b. Generator - weekly
6. Does everything look right in the engine room?

Check fuel tank levels as needed (open valves on top/bottom of sight gauges to check)

Starting Engines

1. Be sure that the gear shifters are in neutral, in the center position.
2. Be sure the engine throttle controls are at idle, all the way aft.
3. Switch the stopping solenoid breaker switch to the ‘On’ position.
4. Switch both the port and starboard engine breaker switch to the ‘On’ position
5. Wait until the pre-heat lights go out.
6. Press the port engine start button until the engine starts.
7. Press the starboard engine start button until the engine starts.
8. Turn both engine room vents on.
9. Check for seawater flow out of the exhaust ports at the stern of the boat.
10. Run the engine at idle or low RPM until the water temperature reaches 140°F; this can be done as you untie the boat and maneuver out of the harbor at idle speed.

Stopping Procedure

1. Let the engines run in idle for 5 minutes to cool down the engine; this can be done as you idle into your destination to anchor or dock.
2. Press the stopping button for each engine. The low-oil pressure alarm will sound as the oil pressure drops below the normal operating level.
3. Turn the breaker switch of both engines to the ‘Off’ position.

You may allow the vents to run for several minutes to cool the engine room. These fans are powered from the 12-volt DC house bank and will deplete the batteries if left on too long.

Starting the Generator

1. Be sure the AC Power Selector switch is in the OFF position
2. Press the preheat/shutdown bypass toggle switch and hold for 15 seconds.
3. Hold the preheat/shutdown bypass toggle and press the start toggle until the generator is running, release both toggle switches.
4. Check the generator exhaust and listen for gurgling of sea water being expelled below the water line. The water will not be expelled through the exhaust port.
5. After a brief warmup of a minute or two, turn the AC Selector Switch to 'GEN'
6. Check the AC voltmeter and amp meter to be sure AC power is on
    a. If not, check the Master Breaker switch is ON.

Stopping the Generator

1. Turn the AC Selector switch to the OFF position,
2. Allow the generator to cool down for three minutes or so,
3. Press and hold the 'Stop' button until the generator stops running.

Departing from the Dock

1. Prior to departure, be sure that the shore power chord is disconnected and stowed onboard.
2. Turn on bow thruster and check operation with a quick burst in both directions.
3. Mooring lines should be prepared by having the bow and stern line doubled back to the boat with only a single loop around the base of the cleat or, around the dock rail. This will allow for the boat to be untied from the boat rather than from the dock.
4. Have a roving fender at hand and ready to be deployed where needed.
5. Untie the forward and aft and spring lines.
6. When the captain calls 'Cast off lines,' flip the bow line and stern line away from the cleat and pull the line onto the boat.
7. If the boat is in a slip, slowly back the boat out by using reverse gears of both engines. Initiate reverse with the dock-side engine, this will pull the stern slightly way from the dock.
8. If you are moored alongside of a dock, twist the stern away from the dock with the dockside engine in reverse and the outside engine in forward. Setting the bow line up as a spring line to prevent forward movement of the boat is helpful.
9. When you are clear from the dock and other boats, you may maneuver as needed.

Approaching Dock

1. Switch the synchronizer Off and trim tabs in 'Bow up' position.
2. Center the stabilizer fins.
3. Turn on bow thruster and check operation with a quick burst in both directions.
4. Have fenders evenly spaced alongside the boat and at the appropriate height to protect the boat from the dock.
5. Have all tie up lines ready to tie up the boat.
    a. Bow line should be threaded out of the hawsepipe and along the gunnel cap outside of the rail stanchions,
    b. Two spring lines should be ready at the midship cleats and hawsepipe,
    c. Stern line should be threaded out of the hawsepipe and ready.

6. Have one crew member at the stern ready to step off from the swim step, if possible, with the stern line.
7. Approach the dock slowly at an angle aiming to the point where you want the stern to be tied.
8. As you approach the dock slowly, turn the boat with either reverse gear of the outside engine to slow your forward motion, or forward gear of the dockside engine to add a little speed, so that with the momentum of the boat you slide into position parallel to the dock.
9. Have your crew step onto the dock and tie up the stern line and then the bow line.
10. You may need to use one of the spring lines to slow the forward movement of the boat.
11. Tie the spring lines after you get the boat situated at the dock.
12. Plug in shore power chord at both the dock and boat then turn on shore breaker switch.
13. Turn AC Power Selector switch to either FWD Shore or AFT Shore.
14. Check the reverse polarity light; it should be off indicating correct polarity.
15. Check AC voltage meter to see if shore power is on.
16. Check Inverter control to see that batteries are being charged, this may take a minute,
    a. Inverter will display: 'Bulk Charging' or, 'Absorb Charging.'

Anchoring

1. The generator should be running and charging the batteries.
2. Turn on the windlass switch that is to the right of the lower helm.
3. Untie the safety line at the top of the windlass.
4. Let out enough chain so that the anchor is ready to lower.
5. When you have found your anchoring location, bring the boat to a stop where you want to lower the anchor with the bow into the wind.
6. Lower the anchor to the bottom before backing away from the anchor.
7. Continue to let out chain as the boat slowly backs away (shifting in and out of reverse at idle RPM).
8. Stop the windlass when you have reached the desired length of chain.
9. Continue to slowly back on the anchor by shifting in and out of reverse until the chain becomes taut and straight. The anchor is now set. Arctic Star has enough power to pull the anchor through mud and potentially break the set so, do not pull on the anchor for more than 5 seconds.
10. When the anchor is set, attach the anchor bridle.
    a. Secure the bridle hook to the anchor chain forward of the anchor roller and thread the ends of the bridle through the bow hawsepipe and tie them to the two bow cleats.
11. Turn off the running lights and turn on the anchor light.

Hauling up the anchor

1. The generator should be running and charging the batteries.
2. Both engines should be running.
3. Turn on the windlass switch that is to the right of the lower helm.
4. Turn on the Sea Water Washdown breaker switch.
5. Have a crew member at the chain locker to flake the chain as it falls into the locker.
6. With the windlass, pull in the chain and retrieve the anchor bridle.

7. Pull in the chain while moving the boat forward as needed.
8. Rinse mud off the chain and anchor out over the water.
9. When the anchor is near the surface, use short bursts to raise it onto the roller.
10. Rinse off the deck to remove any mud.
11. Secure the anchor and turn off the windlass seawater washdown pump.
12. Turn off the anchor light and turn on the running lights.

Launching the Tender

1. Be sure that the drain plug is secured in the transom.
2. Be sure the generator is running and charging the batteries.
3. Plug the winch remote control into the davit control socket. The remote control is stowed under the cabin-door step at the lower helm station.
4. Connect the winch hook to the tender bridle.
5. Disconnect the hold-down straps that secure the tender to the deck at the stern and untie the bow.
6. Tilt up the outboard so that the lower unit will clear the side-deck rail. The tilt rocker switch is on the side of the shifter handle.
7. Lift the tender to a height where it will clear the side-deck rail.
8. Push the tender over the starboard side and pivot it as you go so that the stern of the tender is toward the bow of Arctic Star.
9. Lower the tender into the water.
10. Have a crew member (who is wearing a PFD) climb down into the tender and disconnect the bridle.
11. Move the tender to the stern of Arctic Star and tie it snug to the swim platform.
12. Return the davit hook to the sundeck and secure it so that it will not move as the boat rocks.
13. Stow the remote control in the step at the lower helm.

Lifting the Tender

1. Be sure the generator is running and producing power to charge the batteries.
2. Plug the winch remote control davit control socket.
3. Bring the tender along the starboard side with the bow toward the stern of Arctic Star.
4. Lower the davit hook into the tender and connect it to the bridle.
5. Tilt the outboard up to clear the side rail.
6. Lift the tender up out of the water to the height where it will clear the side-deck rail.
7. Pull and pivot the tender into position over its bunk and lower it into position.
8. Secure the tender with the hold-down straps.
9. Disconnect bridle from winch hook and lay the bridle in the tender.
10. Connect the winch hook to its the lanyard.
11. Disconnect the winch remote control and stow it under the cabin doorstep at the helm station.
12. Open the drain plug at the transom to drain water.
13. Tilt the motor down.
14. Turn off the battery switch to avoid draining the battery.

12.0 Troubleshooting

If you are having trouble, please call our on-call technician at **360-393-5309** for help.

12.1 Engine overheating

An engine will overheat if there is significant debris in the basket inside of the sea strainer that is restricting the flow of water through the heat exchanger and out the transom of the engine

- Is the engine temperature gauge reading higher than 210°F?
- Does the water flow out the exhaust port at the transom seem restricted?
- Is there significant debris in the sea water strainer?

To clean the seawater strainer:

1. Seawater is supplied through two thru hull valves located under the grate at the forward end of the engine room.
2. Close the thru hull valve by turning the handle perpendicular to valve.
3. Open the top of the strainer using a wrench which is in the tool bag.
4. Pull out the basket and dump the debris into the garbage. Replace basket into strainer
5. Screw the top back into position and tighten to snub, do not overtighten
6. Open the valve at the bottom of the seawater strainer.
7. Start up the engine, and check for water flow through the exhaust port at the transom
8. Check for leaks at the seawater strainer.
9. Monitor engine temperature.

12.2 Fuel filter

If an engine begins to slow down for no apparent reason, the fuel filter may be clogged, and you will need to go to the engine room and switch to the backup filter.

To switch fuel filters:

1. Slow the engines down to idle and shift the engines out of gear.
2. Have a crewmember take watch as you enter the engine room.
3. Turn the valve handle at the front of the Racor filter so that it points toward the backup filter.
4. Check the fuel filter of the other engine, if there is excessive sediment, switch that filter as well.
5. Let the engine idle for a minute before increasing the throttle to cruising speed.

12.3 Outboard motor

A cold outboard motor may be reluctant to start, be patient and try a few times. If the motor will not start:

1. Check the gear shift lever to be sure that it is neutral.
2. Check the gas tank vent.
3. Squeeze the fuel line bulb until firm.
4. Advance the free-throttle arm.
5. Try starting again.

12.4 Low battery

Having a low battery may indicate that it has been charged adequately and/or some lights are left on. Check the breaker switches to be sure that unused circuits are turned off.

1. Start up the generator and switch the AC Selector switch to GEN.
2. Be sure the INVERTER and BATTERY CHARGER breaker switches are on.
3. Be sure the MASTER BREAKER switch is on.
4. Check the AC voltmeter, it should read 110 volts or more.
5. The ammeter should read an amp draw of 20 amps or so.
6. Let the batteries charge until the Inverter reads Float Charge.

12.5 Anchor

12.5.1 Anchor chain is stuck in anchor locker

If the anchor chain becomes tangled, it will not come up out of the locker. You will need to sort this out down below in the forward cabin.

1. Turn off the windlass switch.
2. Pull all the bedding and mattress from the forward bunk.
3. Open the chain locker.
4. You may need to pull the chain out of the locker onto the forward bunk. There may be a tarp or a rug from the floor you can use to control the mess.
5. Sort the chain out so that it can be deployed with the anchor.
6. When you pick up the anchor, have a crew member flake the chain in the locker to prevent the chain from piling up and falling over onto itself.

12.5.2 Anchor is stuck on the bottom

If the anchor is firmly attached to the bottom:

1. maneuver the boat so that it is directly over the anchor,
2. pull all the slack chain up so that the chain is straight up and down,
3. Set the brake on the windlass,
4. Motor forward over the anchor in the opposite direction than you set the anchor,
5. You will feel the anchor break loose from the bottom,
6. Release the windlass brake and pull the anchor up.

12.5.3 Anchor windlass will not turn

1. Check the windlass brake, if it is tight, it will prevent the windlass from turning.
2. Check to windlass switch, it should be on, and the light should be on.
3. Sometimes the foot switches fail; try raising or lowering the anchor with the switches on the windlass switch panel.
4. If the windlass switch and light is on, the break is loose, and the windlass still will not turn using the foot switches or switches at the helm, you may need to use the windlass handle to raise the anchor. The handle fits into the collar next to the gypsy chain drum. Using this manual retrieval is slow and tedious but you will get the anchor back.

12.6 Toilet will not flush

If one of the toilets will not flush check the breaker switch on the 12-volt DC panel, it should be on. If both toilets will not flush, the holding tank may be full, and you will need to pump out the holding tank.

12.7 Freshwater does not flow at faucet

Check to see if the 'F.W. Pump' breaker switch on the 12-volt DC panel is on. If the tanks are empty, water from the faucet will be mixed with air and may cause the freshwater pump to lose its prime. You will need to fill the water tanks either at the dock or with the watermaker. When there is water in the tanks, the freshwater pump should prime itself when it operates.

12.8 Hitting a log

Please keep a good look out to avoid hitting logs and other debris in the water. If you do hit a log or debris:

1. Throttle back to idle immediately and shift the engines to neutral until you are well past danger.
2. If the hit was significant, check for damage,
3. Check the bilges for any water coming in,
4. Check the lazarette for water,
5. If water is coming into the boat, you are in an emergency; go to Emergency Procedures.
6. If no water is flowing into the boat, then put the boat back into gear at idle speed, is the boat vibrating?
    a. If so, the propeller and or propeller shaft has been bent. You may be able to motor to a protected harbor at idle speed or with a single engine. Keep both engines running but, if necessary, use only one engine in gear.
    b. Call NW Explorations immediately at 360-393-5309
    c. If not, slowly throttle up to cruising speed and check for vibration. You were lucky this time.

12.9 Hitting a rock or submerged object

1. Throttle back to idle immediately and shift the engines to neutral.
2. Are all crew members onboard and uninjured?
3. If the hit was significant, check for damage,
4. Check the bilges for any water coming in; forward bilge is under the floor in the forward cabin, midship bilge is in the engine room and aft bilge is in the lazarette.
5. If water is coming into the boat, you are in an emergency; go to Emergency Procedures.
6. If no water is flowing into the boat, are you hard aground?
7. If so, are you in immediate danger.
    a. if so, go to Emergency Procedures.
    b. If not, will the rising tide lift you off?
8. Call NW Explorations immediately at 360-393-5309.
9. If possible, launch the inflatable tender and have it standing by.
10. If possible, back off from the rock or object as the tide lifts the boat up.
11. Idle into a protected harbor and dock or anchor.

12.10 Running into a fishing net

Give a wide berth to fishing activities and keep a good look out for nets and other objects in the water. Gill nets are difficult to see until you are close. If you cannot determine where a net ends, head for the fishing boat and pass by in front of the boat, the net is usually attached to the stern of the boat. If you do run into a net:

1. Throttle back to idle immediately and shift the engines to neutral.
2. Do not try to back out, this will foul the propellers and damage the net.
3. Try to push the net away with boat hooks.
4. Launch the inflatable tender and use it to pull the boat out of the net.
5. Allow the fisherman to assist.
6. You may need a diver to help untangle the net from your propellers.

Note: You are responsible for the damage to fishing gear; you will need to contact the fisherman to arrange compensation for any damage to their nets or other fishing equipment.

13.0 Emergency Procedures

Protect your Crew and Yourself

1. Assemble your crew; is everybody OK. Is anybody injured and in need of first aid.
2. Put on life jackets.
3. Contact the Coast Guard with an emergency "MAYDAY" call on Channel 16.
    a. MAYDAY is appropriate if life is at risk.
    b. PAN PAN is appropriate if life is not at risk.
4. If adrift, prepare to anchor to keep the boat from drifting into danger.
5. If the boat is really sinking, consider "beaching it" if necessary.
6. Launch the inflatable tender and prepare to board if necessary.
    a. Take a handheld VHF radio and tender dry bag,
    b. Wear life jackets.

When your Crew is Safe

1. Call NW Exploration at **360-393-5309**.
2. In a true emergency, you are authorized to call for immediate commercial assistance as needed for the safety of your crew and the boat.
3. If not an emergency,
    a. At moderate speed motor to the closest harbor to dock or anchor.
    b. IF needed, a NW Exploration technician will travel to you to assistance.
    c. NW Explorations must give approval for any work completed by other mechanics or vessel-assist if you are to be reimbursed for the cost of assistance.

If you think it may not be an emergency

1. If you have any concern about your long-term safety, contact the Coast Guard, on VHF Channel 16 advising them about your situation, so they can be prepared to provide assistance when needed. You may also use the urgent 'PAN PAN' call on VHF Channel 16.
2. Assign tasks to crew members to monitor the status and safety of the boat and crew while you work to stabilize any damage. For example, delegate your mate to keep a watch for hazards, or to operate the boat on course slowly while you deal with the difficulty.
3. Checklist for solving the problem:
    a. Identify and isolate the problem.
    b. Find the manuals.
    c. Find the tools and parts.
    d. Call NW Explorations for advice and help.

Calling for Assistance

1. If you need assistance, first please call NW Exploration **360-393-5309.**
2. If you need to be towed call:

    Capt. Richard Rodriguez
    Director of Operations
    Zenith Maritime
    360.531.0698
    VHF Channel 16
    Members of TowBoat US may call 800-391-4869

14.0 Index