SEA FROST®

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OPERATION & INSTALLATION INSTRUCTIONS
SA3.5 & SA4
110-VOLT(404-A) Series

SEA FROST
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BARRINGTON, NH 03825
U.S.A.
(603) 868-5720

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Aspects of the SEA FROST design are covered by
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SA3.5 and SA4 OPERATION

Both the SEAFROST SA3.5 and SA4 systems are an electrically driven refrigeration plant. Operation of the compressor will cool the cold plates in the boat's icebox providing refrigeration.

The SA3.5 and SA4 are water-cooled. Water should begin to flow from the discharge at the same time the unit starts. Be sure the water is flowing. **If no water flows, stop the system and inspect the water pump and sea strainer for obstructions.** (See trouble shooting and maintenance sections.)

After starting a warm system check the plates for a temperature drop. If a temperature drop is not indicated, stop the unit and read “Checking the Charge and Reading the Sight Glass” section.

MAINTENANCE

Like your engine, your SEA FROST needs periodic checking.

ROUTINELY CHECK:

1. The refrigerant charge. (see: Checking The Refrigerant Charge) *NEVER OPERATE SYSTEM WITHOUT PROPER CHARGE*.

2. All components, all tubing, fittings and hose clamps for corrosion and wear. *BE SURE TO LOCATE AND INSPECT ALL FITTINGS AND COMPONENTS IN THE SYSTEM. KNOW THE LOCATION OF ALL CONNECTION POINTS.* Spray with a rust inhibitor REGULARLY. Corrosion unchecked in the marine environment will severely reduce the life of your system.

SEA WATER STRAINER

The water pump is protected from damage and blockage by a seawater strainer. This strainer must be inspected and cleaned routinely.

ROUTINE SERVICE AND INSPECTION

We recommend sea strainer inspection before leaving the boat unattended dockside with the unit on. A visual inspection may be adequate depending on the type of strainer. To clean most types of strainers, close the seacock, open the strainer, remove the screen or basket, clean, reassemble and open the seacock. Operate the system and check for water flow and leaks around the strainer opening.

PUMP IMPELLER INSPECTION

The LC2 pump is a sealed liquid cooled magnetic drive centrifugal pump. The impeller may be inspected for obstructions and wear by first closing the seacock. Drain the pump housing by removing a hose.

It is **IMPORTANT** that **NO WATER** flows between the plastic housing and the pump body. The screws that hold the cover also seal the housing. Water behind the housing will ruin the motor bearings. **BE SURE THE PUMP HOUSING IS ABSOLUTELY DRY BEFORE DISASSEMBLY.**

Remove the screws holding the inlet fitting plate (larger hose size). The impeller may be removed with its ceramic seal and thrust washer. Reassemble in the reverse order. An exploded diagram is in this manual. Observe the "O" ring that seals the housing cover plate. Make sure they are in good condition. Open the seacock and Inspect for leaks.

NEVER OPERATE THE PUMP WHILE DRY. IF IT IS SUSPECTED THAT THIS CONDITION HAS OCCURRED, INSPECT THE IMPELLER AND HOUSING FOR WEAR.

CHECKING THE REFRIGERANT CHARGE

The system is fitted with a sight glass located in the top of the RFD. The charge level should be inspected to be sure refrigerant is of the proper amount and that there are no slow leaks. Switch the unit on and immediately inspect the sight glass.
A high velocity white foam should be observed and after a minute or two show a black or clear condition. **A clear glass and an empty glass will look the same.** A transition must be seen to be sure refrigerant is present. Do not operate a low or empty system. See the Leak Checking and Adding Charge sections.

LAY-UP (WINTERIZING)

Flush the pump and condenser with plenty of fresh water. Pressure water should be flushed through the inlet side of the water pump. In freezing climates Anti-freeze should be pumped through, after flushing, by operating the system for a very brief period. Connect a short hose to the suction side of the pump to draw from a bucket. Run the pump (switch on unit) until antifreeze is pumped through the seawater circuit. The pump is not self-priming and may require filling the hose and pump with a funnel.

DO NOT RUN THE PUMP DRY. It is water lubricated.

INSTALLATION ~ WORK HABITS

Installer's care should be stressed. No matter how good SEAFROST equipment is, its performance and life are in the hands of the installer. To insure your work:

1. Read this manual.
2. Reread any aspect you don't understand.
3. Follow Swagelok fitting instructions carefully.
4. Spend enough time leak checking to be sure there are no leaks.
5. Thanks from all of us who have to guarantee your work.

There are two contaminants that will give you problems in any refrigeration system. They are WATER and DIRT. Moisture is always present and cannot be eliminated; water in this case refers to puddles and drops. Dirt is any solid. The installer's habits will be most important in ensuring a trouble-free start-up. We have added a large receiver filter dryer (RFD) to take care of all dirt and moisture that might get into the system during a careful installation. Moisture in the system is boiled off when the system is evacuated, or it is captured in the desiccant. There is a screen in the expansion valve to prevent dirt from plugging it.

Excess moisture that the RFD can't handle will plug the expansion valve with ice. This ice stops the cycle. The only cure is to discharge the refrigerant, replace the RFD, re-evacuate the system, and recharge it. This remedy takes time and is somewhat costly. Keep the system clean when installing it to save time for something more fun.

CONDENSING UNIT LOCATION AND MOUNTING

The design of the condensing unit allows placement of the unit in an enclosed space such as a cabin locker, storage locker or engine area. Service access and installation require that the front and left end (water fitting end) be accessible.

Mount the condensing unit level. (The compressor is at the bottom). The unit may be bulkhead or platform mounted. Pilot holes have been pre-drilled for the aluminum angle clips.

PLATE MOUNTING

The Sea Frost evaporator plates mount with a Wellnut expandable neoprene blind hole fastener. A template or the plate itself should be used to locate the mounting holes. Drill a 3/16" pilot hole. Increase this hole to 3/8". Screw size is 10-24.

Larger plates may be supplied with 1/4” mount screws. Enlarge the pilot hole to 1/2”. The screw size is 1/4”-20.

QUICK CONNECT FITTING INSTRUCTIONS

Aeroquip quick connect fittings are used in this pre-charged system. These fittings reseal upon disconnecting and do not leak during assembly.

If installing this compressor in an existing system. Use LSA line adapters to interface with the new compressor. Attach, evacuate using a vacuum pump, leak check, and then add a vapor charge of R-134a before connecting to the pre-charged condensing unit.

In a pre-charged system installation make all the connections up to the compressor first. The last two connections should be the suction fitting then the discharge fitting.

To assemble, remove the heat shrink and plastic cap. Be sure the threads and the end of the fittings are clean.

Finger tighten the fittings to avoid cross threading. Tighten to wrench snug and then pull up 1/16 turn.

When making all connections, USE TWO WRENCHES. Don’t allow the fittings to turn or twist when tightening.

VALVE UNIT (thermostatic valves)

For corrosion protection and serviceability the valve control unit (V/U) should mount outside the insulated space. The valve will attract moisture and drip if it is not well insulated with the valve blanket and additional insulation. Insulate the valve after installation and leak checking. In certain applications it may be necessary to mount the valve inside the cabinet. Refer to schematic drawings when connecting more than one plate.

Before cutting the tubing:

1. Leave a **minimum** of one inch of tube beyond a bulkhead.
2. Allow room for wrench access.

- 90-degree elbows can be installed on the valve unit to reduce space requirements if necessary.
- The tubing will support the valve unit.
- The tubing must bottom in the fitting. Refer to the Swagelok assembly instructions.

EXPANSION VALVE (CPV) – on evaporator plate systems

Connect the expansion valve to either of the 3/8" tubes from the plate. In a two-plate system connect to one of the tubes on one of the plates and connect a jumper between the plates as in the drawing included. Please contact us for advice when connecting to a two-plate system.

The valve should be located to allow access to the screw cap on top of the valve. It is preferable that the cap be up.

Trim the tube ends on the plate as necessary. However, allow at least 3/4" to insert into the fitting. Refer to the Swagelok installation instructions.

The expansion valve can be mounted inside the box or outside. If it is mounted outside it will need to be insulated with cork tape and foam to prevent unwanted sweating and dripping.

Stainless steel Swagelok fittings must be used on stainless steel tubing.

THERMOSTAT LOCATION

The thermostat is low voltage and is connected and powered by the transformer in the compressor cabinet. Mount the thermostat in a convenient location where the sensing bulb will reach the box. The probe temperature is displayed when 110-volt power is available.

Thermostat Wiring (Low voltage powered thermostats)

The Electronic Temperature Control operates on low voltage (24VAC) supplied by the transformer in the compressor cabinet. A 15' wiring harness is fitted to the thermostat. Use red, blue, and white wire to extend this harness if a longer length is needed. Attach the wires to the terminal strip using #8 ring terminals, matching corresponding wire color.

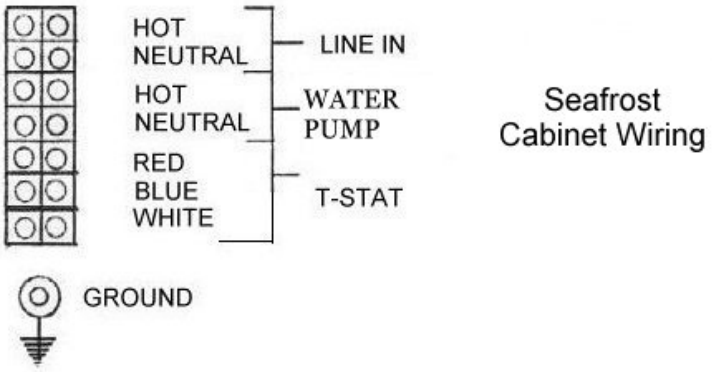
With other thermostats connect the blue and red wires only to a make and break switch thermostat. This is normally closed.

Never apply power to the red, white or blue terminals.

With line switching thermostats jump red and blue on the terminal strip.

Do not connect the white terminal. This is the transformer common and not used with un-powered and line switching thermostat.

White = transformer common
Blue= transformer 24-VAC
Red= relay



Seafrost
Cabinet Wiring

110-VOLT CIRCUIT

A separate 15-amp breaker is required for the 110-volt supply. This circuit powers the thermostat through a built in transformer*. For operation, it is necessary to have power at all times.*

Line voltage thermostats will switch the line and turn on the transformer to start the compressor.

BF (Ranco) Electronic Thermostat Operation

The thermostat is pre-set and locked at the factory. When locked the keypad is disabled and changes to the settings cannot be made. To change the settings the lockout switch must be placed in the unlock position.

To access the lockout switch:

1. Switch off the power.
2. Remove the four screws and cover.
3. Slide the lockout switch to the right to the unlock position.
4. Replace the cover.
5. Re-power the system.
6. To program refer to table below.

Step	Display	Description
1	F or C	Fahrenheit or Celsius Scale Press the **set** key once to access the Fahrenheit / Celsius scale. The display will show the current status, either F for degrees Fahrenheit or C for degrees Celsius. *The thermostat has been pre-set at the factory for Fahrenheit.* Press the up or down arrow key to choose between the F and C.
2	S1 (blinking)	Setpoint Temperature Press the **set** key again to access the setpoint. The display will show the current set point. *The setpoint has been pre-set to 0 degrees F.* Press either the up or down arrow key to change the setpoint to the desired temperature.
3	DIF 1 (blinking)	Differential Temperature Press the **set** key again to access the differential. The display will show the current differential. *The differential temperature has been pre-set at 5 degrees F.* Press either the up or down arrow key to increase or decrease the differential setting.
4	C1 / H1	Cooling or Heating Mode Press the **set** key again to access the heating or cooling mode. The display will show the current mode. C1 for cooling or H1 for heating. The Thermostat has been pre-set for C1. ***Do not change this setting.*** The BF does not work in heat mode. Press the set key once more and programming is complete.

Note: Pressing the set key accepts the setting and brings you to the next step. You must push the **set** key through all steps to return to the temperature display to allow the compressor to operate.

TROUBLESHOOTING ERROR MESSAGES	
	Appears when either the up or down arrow key is pressed when not in the programming mode. **To correct:** If the E1 message appears even when no keys are being pressed, replace the control.
E2	Appears if the control settings are not properly stored in memory. **To correct:** Check all settings and correct if necessary.
EP	Appears when the probe is open, shorted or sensing a temperature that is out of range. **To correct:** Check to see if the sensed temperature is out of range. If not, check for probe damage by comparing it to a known ambient temperature between –30 F and 220 F. Replace the probe if necessary.
EE	Appears if the EEPROM data has been corrupted. **To Correct:** This condition cannot be field repaired, replace control.
CL	Appears if calibration mode has been entered. **To correct:** Re-apply power. If the CL message still appears, replace the control.

WIRE ROUTING

The Red, white and blue wire harness connects at the compressor. The probe wire must enter the refrigerated space.

Thermostat Wiring

The Electronic Temperature Control operates on low voltage (24VAC) which is supplied by the transformer in the compressor cabinet.

A 15' wiring harness is fitted to the thermostat. Use red, blue and white wire to extend this harness if a longer length is needed. Attach the wires to the terminal strip using #8 ring terminals, matching corresponding wire color.

OPERATION

The temperature of the probe is displayed when the thermostat head is powered. When the compressor is running the #1 and the ↑D↓ on the thermostat display will be illuminated.

To change the set point temperature

Hold the SET button until ST1 appears. The display shows ST1 and then the current set temperature of 35 degrees. Use the ↑and ↓ arrows to navigate to the desired temperature. Press SET to accept the new value. The display will return to standard view.

To change the degrees of differential
Hold the Program button for more than 5 seconds. Use the ↑and ↓ arrows to navigate to the P-1. Press SET to view the current setting of 5 degrees. Use the ↑ and ↓ arrows to navigate to the desired temperature. Press SET to accept. This will bring you back to P-1. To save and exit hold the program button for 5 seconds.

IR33 THERMOSTAT OPERATION

The IR33 can be located anywhere as long as it is protected from water and spray. The leads to the probe may be extended if the connections are soldered and sealed with heat shrink. See separate manual for this thermostat.

PUMP INSTALLATION

Proper pump installation is important for pump operation. The SA3.5 and SA4 uses a centrifugal pump, which is not self-priming. Air pockets caused by loops or descending lines from one component to the other may cause pump problems. The pump is water cooled and lubricated; it must never be run dry doing so will destroy the pump. A separate through hull fitting 3/4" or larger should be used. It should be as low in the boat as possible and away from head and cockpit drains. A forward facing scoop will prevent problems if the unit is operating underway.

A large seawater strainer should be mounted above the seacock.

The pump should be mounted horizontally and should be higher than the strainer. The discharge should be above the intake. Refer to the drawing at the back of this manual.

WIRING THE PUMP

The cable on the pump may need to be extended. A water proof splice is required. Connect the pump at the compressor terminal strip. The pump will be switched on when the compressor starts.

REFRIGERANT HANDLING AND SAFETY

This is a pre charged unit. Refrigerant handling should not be need however if damage or service must be performed follow these guidelines.

Do not proceed with any aspect of a procedure if you do not fully understand the procedure and know what results to expect. Understand fully that pressure exists in refrigeration systems. Be careful.

REFRIGERANT

SEA FROST is charged with REFRIGERANT-404a. R-404a is a chemical compound of three refrigerants, HFC-125, HFC-143a, HFC-134a. It is almost odorless. Its boiling point is -50 degrees F. at sea level. R-404a is heavier than air and its label and container color is orange. It must be charged as liquid to avoid separating the blend, fractionating.

GENERAL SAFETY THIS IS IMPORTANT. READ THIS!

R-404a is safe if handled properly. Avoid breathing vapors and prolonged skin exposure. Avoid using in areas of open flames. The vapor is heavier than air and may reduce oxygen available for breathing. Use with sufficient ventilation to keep exposure below recommended limits. Liquid R-404a will freeze skin. It's especially dangerous to the irreparable tissues of the eyes.

--WEAR EYE PROTECTION--

Do not pressurize an empty system with R-404a without first evacuating the system with a vacuum pump.

 **DANGER! NEVER OPERATE A SYSTEM WITH THE HIGH SIDE (DISCHARGE) OPEN TO THE REFRIGERANT SUPPLY. PRESSURIZATION OF THE REFRIGERANT SUPPLY COULD CAUSE IT TO BURST.**

PROCEDURES FOR WORKING WITH R-404a

1) A new uncharged system must be evacuated before adding R-404a.

2) A R-404a system must only be pressurized with R-404a or nitrogen.

3) Only service tools dedicated to R-404a are to be used. No parts, tubing, fittings, receivers, driers, service gauges, or any refrigerant carrying components may be fitted to a R-404a system from a used system or from a CFC based system. Damage caused by the use of parts not supplied by Sea Frost for a R-404a system will cancel all claims against Sea Frost.

4) No oil is to be added to the system but the polyoester oil supplied by Sea Frost, labeled and capped for SA3.5 and SA4 use. No oil is to be added to a system without prior consultation with Sea Frost.

5) The oils used in R-404a systems are extremely moisture sensitive (hydroscopic). Do not leave any tube end or component connection open to air while assembling the system. Be sure to use only new-capped copper tubing and be sure to cap the copper oil after cutting it.

ACCESS TO THE SYSTEM: SERVICE PORTS

The service ports are two small-capped valves mounted on the compressor. The blue fitting is the suction port. The red port is the discharge. These ports are the service access to the system and are covered with caps. Without the caps the valves may leak.

Be sure the caps are installed tightly after charging or service.

NOTE: THIS SYSTEM IS CHARGED WITH R-404a. IT MUST BE CHARGED WITH R-404a ONLY. ONLY DEDICATED R-404a GAUGES AND EQUIPMENT ARE TO BE USED. ANY CONTAMINATION FROM CFC BASED REFRIGERANTS WILL DESTROY THIS SYSTEM.

GAUGES

Gauges must be used in the evacuation and charging. They will provide information on the operation of the system when troubleshooting.

A gauge sets consist of two gauges installed in a manifold with two valves and hoses to connect the gauges to the system. The hoses should be fitted with shutoff valves with in 6" of the connection fitting to prevent excessive venting. The left gauge (blue) is a compound device; it indicates pressure and also vacuum. The right gauge (red) indicates pressure only. The gauge valves open a center port (yellow) to the left or right side respectively. Operation of the gauge valves is only necessary when moving refrigerant or evacuating. With the gauge valves closed, the gauges read the pressures of the connection points.

R-404a SERVICE PORT ACCESS FITTINGS

The R-404a service ports are standard ¼" flare fittings with core valves. Hose ends must have depressor fittings.

CONNECTING GAUGES

Connect hose fittings to the system at the compressor service ports (See Access to the System). The high-pressure port is red; the low-pressure port is blue.

VENTING THE GAUGE SET ~ TO ATTACH TO A CHARGED SYSTEM

If the gauge set has not been purged with refrigerant, vent the hoses for a few seconds by slacking the connections at the manifold body after connecting to a charged system.

DISCONNECTING GAUGES

To disconnecting the gauge set after running the system, turn off the discharge

hose valve first. Disconnect the discharge service hose and re-cap the port on the compressor. With the center port on the gauge set turned off at the refrigerant supply both hand wheels on the gauge set may be opened and the compressor operated to extract the refrigerant from the gauges. When the pressure in both gauges drops to the low side operating pressure turn off the gauge valves and the suction hose end valve. Turn off the compressor. Remove the suction hose and re-cap the service port. (This procedure will remove excess refrigerant from the gauges preventing an excessive discharge of refrigerant.)

Disconnecting the gauge set on a static system may be done by turning off the hose end valves and disconnecting them from the service ports. Re-cap the service ports.

Keep your gauges clean. Inspect the rubber gaskets on the hose ends, leak check gauge valve packing and all hose connections.

Check and reset the "O" on the low side gauge, if necessary.

R-404a Refrigerant must be charged as liquid only to prevent the three components from fractionating.

COMMISSIONING PROCEDURE

EVACUATION WITH A VACUUM PUMP

Evacuation removes air, readying the system for charging.

Connect a gauge set to the service ports. Connect the gauge center hose to a high vacuum pump. Start the pump and slowly open the low side/suction gauge hand wheel. As the vacuum drops below 20 inches open both high and low side hand wheels fully.

EVACUATION LEAK TEST

Evacuate the system to the best vacuum (lowest pressure). As the gauge reaches this low pressure close the valves to the pump. Observe the vacuum gauge and be sure the pressure remains constant for 5 minutes. If the pressure rises rapidly check all the connections again. Re-evacuate to the lowest pressure and test by holding a vacuum with the gauges closed. Be sure the system will hold this vacuum. Proceed by opening the valves and continuing the evacuation process for 30 minutes more. A micron gauge can be used to measure vacuum. **Proper dehydration and evacuation should be in the range of 200 to 500 microns.**

The evacuation leak check is a preliminary check and is not to be considered a system leak check.

NEW SYSTEM CHARGING

INTRODUCING INITIAL CHARGE

After the evacuation leak test and vacuum pump down, shut off the manifold valves, disconnect the center hose from the pump and connect it to the refrigerant supply. Invert the R-404a refrigerant supply, to supply liquid. Vent the hose from refrigerant supply to the manifold. Weigh in the refrigerant. The compressor is off. Charge will be drawn in the low side port. If the pressure equalizes before the full charge is drawn in it will be necessary to start the compressor after the following step in pressure leak checking to finish installing the weighed charge.

LEAK CHECKING

Leak checking is a very important step, which should be done with diligence. A leak will cripple this system. Please take the time needed to be sure all connections are tight. ***Check every connection even the ones that were pre-made in manufacture.***

LEAK CHECKING A CHARGED SYSTEM

ABOUT PRESSURES

Refrigerant in a saturated condition, part liquid and part vapor will exert a pressure that is a function of its temperature. The higher the temperature, the higher the pressure will be.

Avoid leak checking in cold weather or on a cold system. Never leak check the low side connections with the compressor running.

A refrigerant leak will show with moderate pressure. A leak is not a function of pressure. Pressure is only required to aid in detection.

In cold weather, it is possible to raise the pressure in the system by warming the evaporator plates with a light bulb left in close proximity to the plate for several hours.

There are two ways to leak-check a pressurized system:

1. Soap bubbles (a solution of dish soap and water works well).
2. An R-404a electronic leak detector probe, which senses the presence of refrigerant molecules).

TO CHECK WITH BUBBLES

Soap each connection and observe all sides of the connection with a bright light and a mirror. A leak will blow bubbles. Without careful examination and plenty of pressure this test is not reliable.

TO CHECK WITH AN ELECTRONIC DETECTOR

Use a detector designed for R-404a. Slowly trace the area with the probe. Refrigerant is heavier than air, therefore trace below the fitting. Most units can be calibrated to home in on a leak. (See detector instructions). We use and recommend electronic detection. Detectors can accurately detect leaks as low as 1/2 oz loss per year. This sensitivity exceeds S.A.E. leak specifications. Be sure to test the operation of the detector before and after you leak check the system.

IF A LEAK IS DETECTED

Try tightening the fitting nut slightly. (See Swagelok fitting instructions.) If the leak is not stopped, it is possible that the fitting was incorrectly assembled. Discharge the refrigerant, and then disassemble the connection for inspection. After reassembly, proceed with a leak check.

SPECIAL NOTES

- Be aware that propellants and solvents in sprays and foams may upset electronic detectors.
- To confirm a leak detected with a detector use bubbles and be sure it is a leak and not some erroneous vapor that is upsetting the machine.
- Electronic detectors do not function below 40.F.
- A good leak detector is able to pick up leaks as low as 1/2 oz per year.

FINAL CHARGING

This procedure must follow "Evacuation Leak Test" and "Introducing Initial Charge".

1. With the refrigerant supply still attached to the suction service port from the previous procedure, open the can tap valve (or appropriate gauge wheel).
2. While closely observing the sight glass in the RFD, start the compressor by switching on the circuit breaker and then turning on the thermostat.
3. The sight glass will show a stream of foam indicating a partial charge. When a sufficient amount of refrigerant has been added to the system (A new system holds 12 oz.) the sight glass will clear, indicating sufficient charge. See READING THE SIGHT GLASS.
4. When charging a hot system, (cabinet and plates over 80 degrees F) the sight glass will usually clear as the return line at the Valve Unit becomes frosted).
5. When topping a low system when the sight glass runs clear, top off with approximately 4 oz. Remember maximum charge is 18oz.

6. When observation and test operation have been completed, disconnect the gauges and replace the service port caps.
7. Re-check all connection points for leaks.
8. Spray the acrylic coating, or similar rust inhibitor, on all the components and fittings while they are clean and dry.

Systems using a CPV expansion valve will run at a steady (constant pressure) low side pressure regardless of charge amount or head pressure. Do not try to raise low side pressure by adding refrigerant. See: Adjusting the CPV valve.

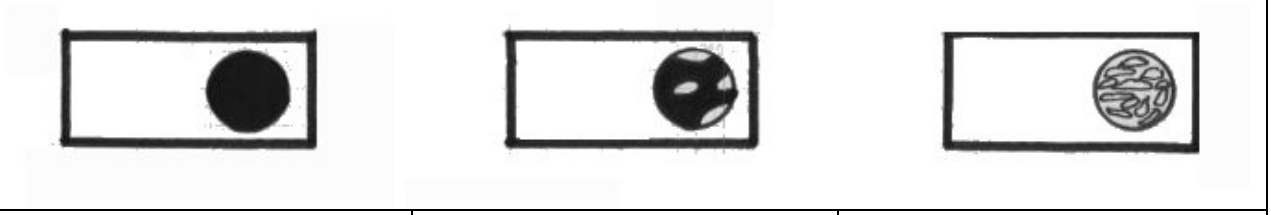
READING THE SIGHT GLASS

A clear sight glass when the compressor is operating signifies a sufficiently charged SEAFROST System. To determine the meaning of "clear", notice the appearance of the RFD sight glass when the system is at rest with the compressor off. This is a "clear" glass.

SPECIAL WARNING: A clear sight glass can also indicate a completely EMPTY system. Any time the compressor is started, a white stream of foam should appear in the sight glass indicating that refrigerant is present. This foam may disappear quite quickly, but IF NO FOAM IS EVIDENT, the system is empty. DO NOT OPERATE THE SYSTEM if empty. Operation in this mode will ruin the compressor. Turn off the main breaker to prevent operation until system can be properly leak tested and recharged.

A white stream of fast moving foam with the compressor operating indicates an insufficient charge level. Watch closely for a transition from foam to total liquid, indicated by a clear sight glass. This transition point can be missed if proper attention is not given. Also, IT IS POSSIBLE for the sight glass to show large bubbles even when the charge is sufficient, so it is important to differentiate between foam and bubbles. The foam condition has velocity and direction; the bubbles are large, temporary, and nearly stationary. Do not try to chase away these larger bubbles with more refrigerant: overcharging must be avoided. Air in the system may give a false sight glass reading, which could lead to overcharging. If in doubt, discharge a suspected overcharged system and charge again. MONITOR THE SIGHT GLASS CONTINUALLY since the glass will not indicate when the system is overcharged.

In a warm system, when the plates are above freezing (32.F) upon start-up, the sight glass may take several minutes to clear. A cold system, in cold water, may show a clear glass within seconds of start-up.

RFD SIGHT GLASS DETAIL		
		
Clear or empty	Stationary bubbles	Foam/low

PROPER CHARGE AMOUNT

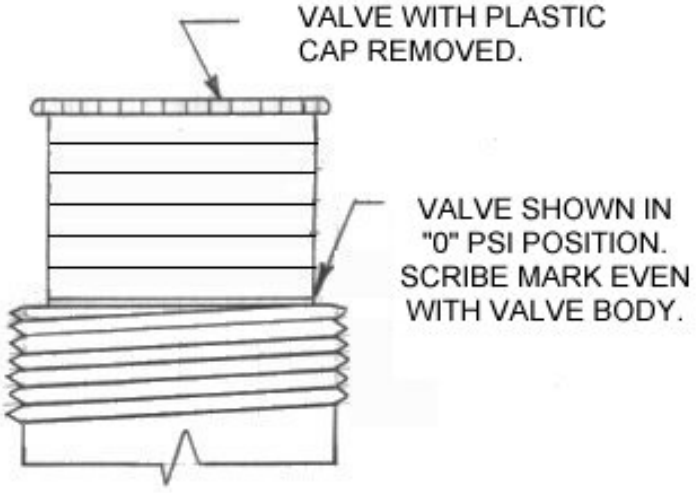
THE SA3.5 and SA4 SYSTEMS ARE DESIGNED TO HOLD 12 OUNCES.

THIS IS THE ***MAXIMUM CHARGE***. The sight glass must clear by the time the Plates reach 32 degrees F.

ADJUSTING THE VALVE (CPV TYPE)

Before operating the compressor, unscrew the plastic cover on the valve body. Note the adjusting knob. Counter-clockwise rotation decreases the pressure. Clockwise rotation increases the pressure. **The approximate valve setting for 15 PSI is 1-1/4 turns CW from the position where the fine threads are even (below) with the valve body.**

Start the compressor. The valve must be **adjusted to a 15 psi** reading on the low side gauge port. Be sure your gauge is set (barometric correction) at O before hook-up. Allow several minutes between each adjustment. Replace cap after each adjustment.



(Moisture may form on the adjusting knob side of the valve and freeze causing the valve to malfunction. To prevent this **replace the cap after each adjustment.** Be sure the valve is dry before final cap replacement. Operate for 30 minutes to confirm proper valve setting and operation.)

The valve may need to be cleared of dirt or chips if

adjustment is not possible. With the compressor running, turn the valve adjustment knob clockwise about 3 turns momentarily, and then back to the proper setting. Do not leave the valve in open position allowing high back pressure, as this may cause the compressor to overload.

After satisfactory adjustment, turn off the thermostat and remove the gauges. Recap the service ports and replace the cover. When the valve has dried, insulate the valve body if it is externally mounted. Insulate the return line; the 3/8" tubing that exits the refrigerated cabinet to the compressor. The valve need not be insulated if it is in the refrigerated space.

Troubleshooting note: The operating **pressure** of the system **will not indicate** the **amount of refrigerant** in the system. The valve will not give proper operation if it is undercharged. The valve pressure can be set with a low charge and is not affected by the condensing pressure. The sight glass must run clear with no foam.

The system requires enough refrigerant to supply liquid to the valve. If the valve has a steady hissing sound then the charge is ok. If the valve is sputtering then it is low. If the valve is making a noticeable roar it is empty. If the low side pressure is properly set the high side pressure will be 180 to 260 psi depending on the seawater temperature (50 to 95 degrees F.) Almost immediately upon start up the valve body will begin to frost.

CHARGING AND OPERATING A TWIN VALVE SYSTEM

Charging with a Thermostatic Expansion Valve System (TXV type)

If the system is a twin valve (2 zone) system the first start up should be with the larger zone running. The sight glass may take a minute or two to clear to low velocity with slow bubbles occasionally. When the cold plate(s) are below freezing switch zones by turning off the operating zone thermostat and switching on the other. The sight glass should, after a few minutes look the same as it did with the other zone on. Switch on both zones and observe the glass. If after 5 minutes the glass is still foamy add 4 to 5 oz of charge to clear the glass. The final check is to switch from both to the smaller zone and confirm that the high pressure maintains the same pressure. If the high pressure climbs turn off the compressor and remove some refrigerant. High pressure should remain steady in any mode. Slight skipping in the glass with both zones running is acceptable. The glass will clear as the plates and boxes get colder.

SPECIAL NOTE

R-404 refrigerant must be handled properly. If you do not have proper gauges, a charging scale or dial a charge cylinder, be careful to avoid over charge. Refrigerant condensing temperature should be between 15 and 25 degrees F. above water temperature. Refer to the R-404a pressure temperature charts.

SPECIFICATIONS		
	BF3.5	BF4
Amp Start (LR)	42	42
A.C. amp draw	5.6	6-9
Horsepower	3/8	1/2
BTU per hour	909 @ -20 F. LBP	1600 @-20 F. LBP
Breaker	15 amp	15 amp
Height	14”	14”
Width	14”	14”
Depth	7 ½”	7 ½”
Air & Water Cooling	Air & Water Cooled (remote pump) pump required)	Air & Water Cooled (remote pumpater))pump required)
Compressor unit weight	44 lbs	46 lbs
Refrigerant Charge (404A)	12 oz maximum	12 oz maximum

CHECKING THE REFRIGERANT CHARGE ~ PERIODIC INSPECTION

Checking the refrigerant charge must be incorporated into a routine maintenance schedule.

1. Locate the RFD (receiver filter drier). The location of this part varies from boat to boat, but it is often found in the engine compartment, in a locker, or beneath the cabin sole. It is a blue metal can about 10” high and 3” in diameter, with brass fittings connecting it to copper tubing. If you do not locate the RFD quickly, follow the route of 1/4" refrigeration copper tubing, the smaller diameter tube, from the compressor to the refrigeration box. Along the route you will find the RFD. The RFD has a sight glass for viewing the flow of the refrigerant.
2. Start the compressor. Check to be sure it is pumping water.
3. MONITOR THE SIGHT GLASS CONTINUALLY. See READING THE SIGHT GLASS. If the sight glass does not show a presence of refrigerant within a minute of operation the system is empty. TURN OFF THE SYSTEM, and follow the procedure in the TROUBLE SHOOTING section.
4. If the white foam is evident watch closely for the transition to "clear". If the glass indicates insufficient charge level (constant high velocity foam), additional charge will be needed. Turn off the compressor until service can be done.
5. Feel the SEA FROST plates in the ice box 10 minutes after start up. If the sight glass clears yet the plates temperature does not drop after 10 minutes operation, turn the system off and follow the procedure in TROUBLESHOOTING.

DISCHARGING THE SYSTEM ~ RECLAIMING / LEGAL REQUIREMENT

Before the connections or components can be disassembled, the system must be discharged. Connect a gauge set to the suction service port and slowly vent the refrigerant (keeping the pressure under 20 psi) into an approved reclaiming system. Do not loosen any connections until the gauge on the refrigeration system shows 10" vacuum for 10 minutes.

TROUBLESHOOTING

The most common problems that can occur in a SEA FROST System are:

- Overcharge or loss of water flow
- Loss of refrigerant charge resulting from leaks.
- Moisture or dirt plugging the expansion valve.
- Compressor damage due to loss of refrigerant charge or damage due to overcharging the system.

STEP 1. Gather information as to the nature of the problem before operating the system. A leak often leaves a trace of oil. Inspect the fittings and tubing for wear, corrosion, and chafe. **Do not operate the compressor until the trouble is corrected.**

a) If the refrigerator box and SEA FROST plates are warm and pressure readings are below 100 psi with the compressor off (in 50 degree F or higher ambient conditions) pressurize system with R-404a and leak-check

b) If pressure reading is over 100 psi with compressor off, start the compressor and check the charge level via sight glass and add charge if needed.

CHARGE LOSS INDICATES A LEAK THAT MUST BE CORRECTED

STEP 2. If a system continues to operate inefficiently after Step 1, check for moisture or dirt plugging the valve. Run the system, observing closely the gauge readings and plate temperature, noting the following.

a) If system is warm upon start-up, a DIRT-PLUGGED Valve will show an immediate deep vacuum reading on low side. Consult Sea Frost to obtain cleaning techniques.

b) MOISTURE-PLUGGED VALVE on a properly charged system is indicated by deep vacuum readings on low side after a few minutes of operation from warm, followed by any combination of these symptoms:

- High side compressor discharge fitting temperature drops from hot to warm.
- Suction line from Valve Unit remains warm.
- Compressor currents draw drops (running amperes).
- Moisture enters either through a low side leak or during initial installation and will freeze at the Valve Unit, reducing or eliminating refrigeration. Turning off system and allowing the valve to warm to above freezing, and then restarting, may temporarily solve the problem. If not, change RFD as follows.

STEP 3. This will require a tech. To change a saturated RFD, allow the system to warm to ambient temperature, thereby preventing moisture from condensing in the circuit upon opening. (A light bulb in the refrigerator box will speed the warming of the plates. Recover the refrigerant from the system through the suction service port SLOWLY to prevent liquid and oil from escaping. WARNING: BEFORE DISASSEMBLY OF ANY PART IN THIS SYSTEM BE SURE CHARGE IS COMPLETELY RECOVERED. With a backup wrench holding the brass body of the Swagelok fittings, loosen and back off the nuts. The tubing may be pulled out of the fittings. Remove the RFD. Replace only with an identical unit by size and color: THE SEAFROST RFD is a drier and also a receiver/filter.

The DESICCANT and the oil in the Sea Frost RFD are special to this system and R-404a. Installation of the wrong part or oil may destroy the system.

NOTE: This system contains a measured amount of lubricating oil. Be sure the RFD being installed is a blue SEA FROST R-404a RFD. Record all component exchanges in this on-board owner's manual.

Follow the "re-make" instructions for Swagelok fittings. Once Swaged the fittings should only be tighten in slight amounts to stop leakage. Overturning the Swagelok fittings will ruin the seal and spring action the fitting uses to compensate for vibration and temperature changes.

Reminder: To ensure the total removal of moisture from the system use a high vacuum pump, and evacuate the system with the highest possible plate temperature (100 degrees F.). A light bulb or heat lamp in contact with the plates is a good technique.

Recharge. Refer to "Recharging section"

MOISTURE IS A SYMPTOM. Carefully leak check the low side of the system if moisture becomes a problem. Moisture leaks in!

CALL US WITH ANY QUESTIONS

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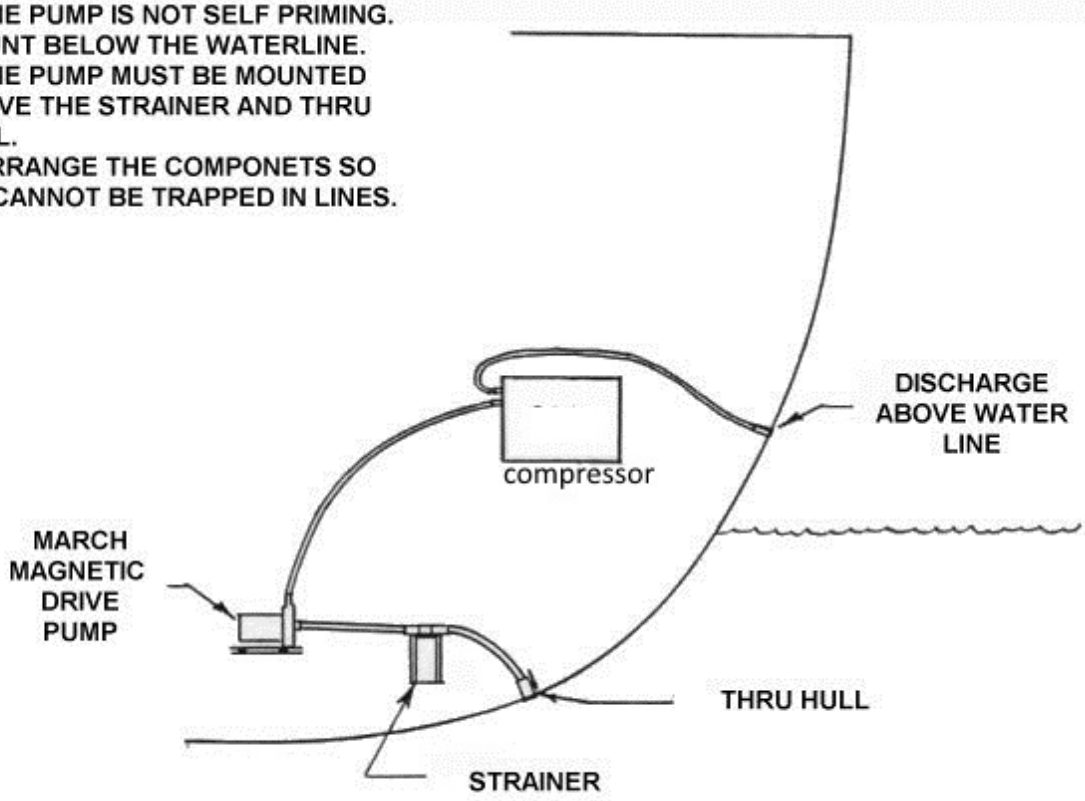
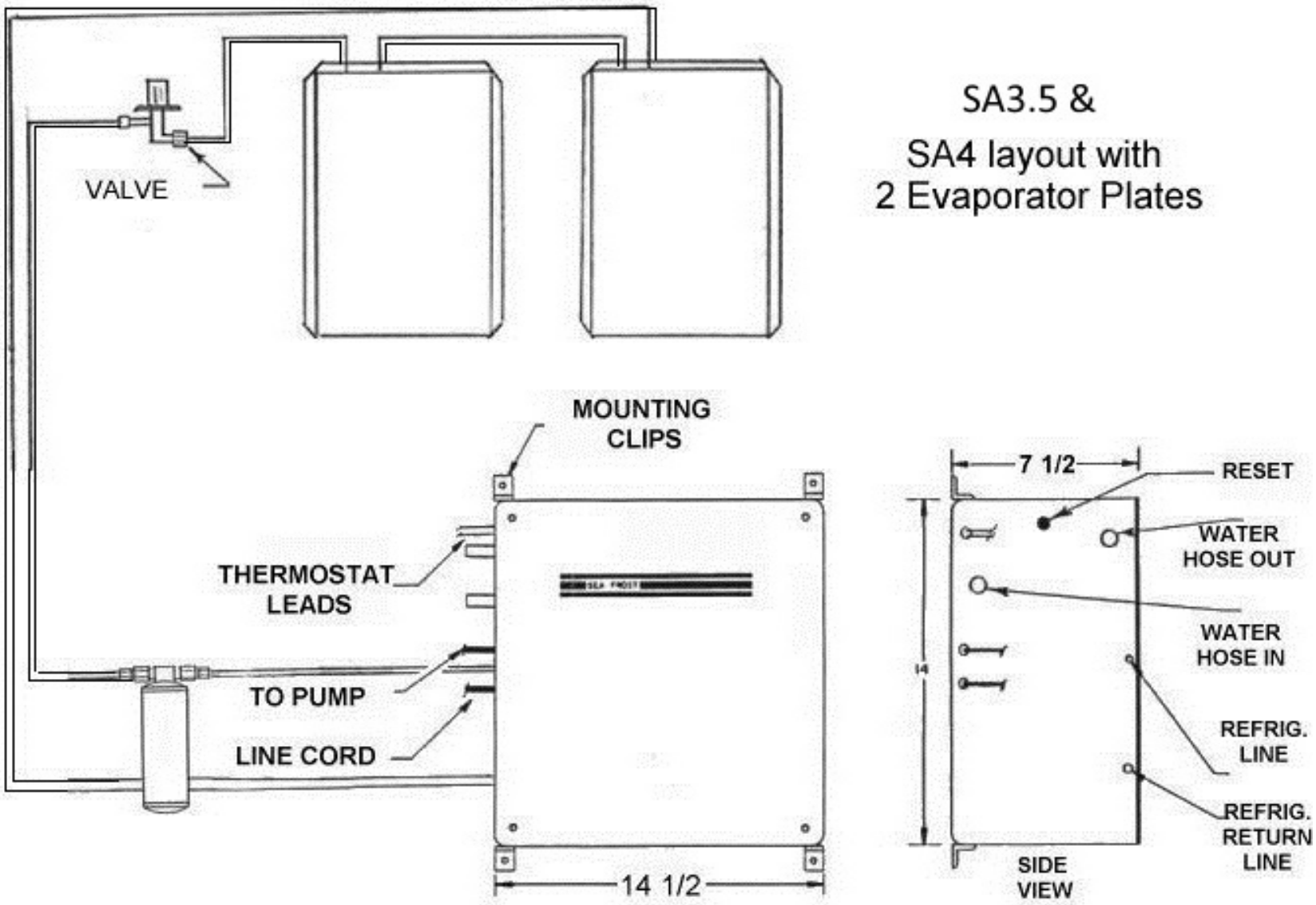
NOTE:
1. THE PUMP IS NOT SELF PRIMING. MOUNT BELOW THE WATERLINE.
2. THE PUMP MUST BE MOUNTED ABOVE THE STRAINER AND THRU HULL.
3. ARRANGE THE COMPONETS SO AIR CANNOT BE TRAPPED IN LINES.





SA3.5 &

SA4 layout with
2 Evaporator Plates

SA3.5 &

SA4 layout with Wrapped Box