

INSTALLATION INSTRUCTIONS

INDIGO ELECTRONICS AT-4C FRESH WATER COOLING ATOMIC 4

Engine Preparation

Performance and reliability of the Atomic 4 can be enhanced during the fresh water cooling conversion by addressing three areas:

- Cooling water passages
- Existing water pump
- Existing water hoses

Cooling water passages suffer from corrosion and salt build up when sea water is used to cool the engine directly. If no serious cooling problems have occurred, a minor cleaning of the passages should be sufficient. This would include removing both the plate on the starboard side of the block where cooling water is introduced to the block and the thermostat housing. With these removed, the exposed areas can be mechanically cleaned of loose rust and scale. Back flushing with pressurized fresh water through the thermostat opening is also recommended to promote flushing rust and scale and also to verify that the cooling passages between block and head are open. Back flush the exhaust manifold as well by introducing pressurized fresh water into the discharge fitting on the aft end of the manifold. If the above recommendations do not yield unobstructed water flow, it may be necessary to remove the head and manifold for more extensive cleaning such as a Muriatic Acid flush. To begin this process, remove the thermostat and pinch off the bypass hose (the one that runs from the clean out plate on the alternator side of the block to the thermostat housing) with vise grip pliers or similar. Then, mix a solution of 1/3 gallon of Muriatic Acid to 5 gallons of water and then fill the block, head and manifold with the mixture by running a hose from the original water pump suction to the bucket of diluted acid and running the engine. Once the engine cooling passages are full of the mixture, stop the engine and allow the mixture to work on the engine for 30 minutes. Then flush with fresh water and repeat one or more times until the mixture has little reaction within the engine.

The **existing water pump** should be opened and the impeller inspected. If any vanes are torn or show

signs of distress, the impeller should be replaced. It is best to replace the cover gasket to prevent a future leak. Replace the existing grease cup with a 1/8 pipe plug (provided in kit) as the antifreeze solution has excellent lubrication properties and leakage from grease cup may occur if left in place.

NOTE: The original style pumps (both Oberdorfer and Sherwood) do not have bearings. The shaft is positioned by the pump housing itself and as such, will cause the lip seal to leak coolant as the pump housing wears. This is a very significant source of antifreeze loss with a Fresh Water Cooled engine and should be remedied as soon as discovered. Moyer Marine Inc. (www.moyermarine.com) now offers a **replacement pump** which does have bearings and is a far superior replacement pump.

The **existing water hoses** between the existing water pump, block inlet tee, thermostat bypass, and thermostat discharge should be replaced if more than a year or two old.

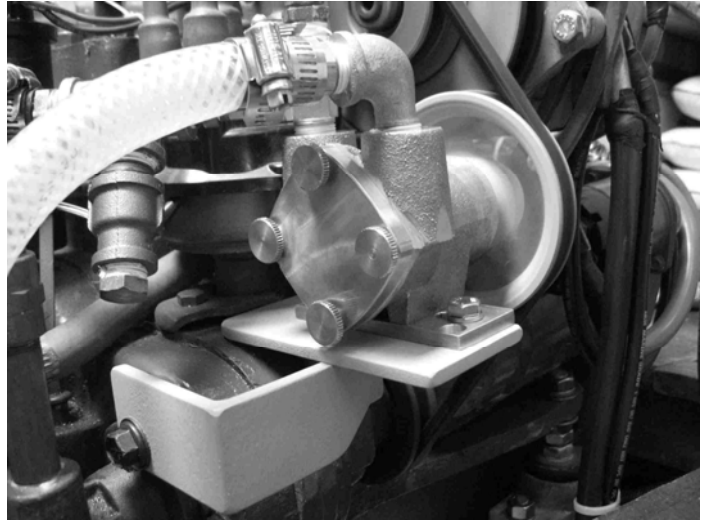
Pump Installation

NOTE: If engine is equipped with the older style transmission housing with an oil fill cap just aft of the accessory drive, it will be necessary to replace the hinge pin and the two machine screws associated with the cap and spring clip. If the kit was ordered for an older style transmission housing, a new pin and machine screws will be provided. With the new hinge pin installed, opening of the oil fill cap will be accomplished by removing the pin each time.

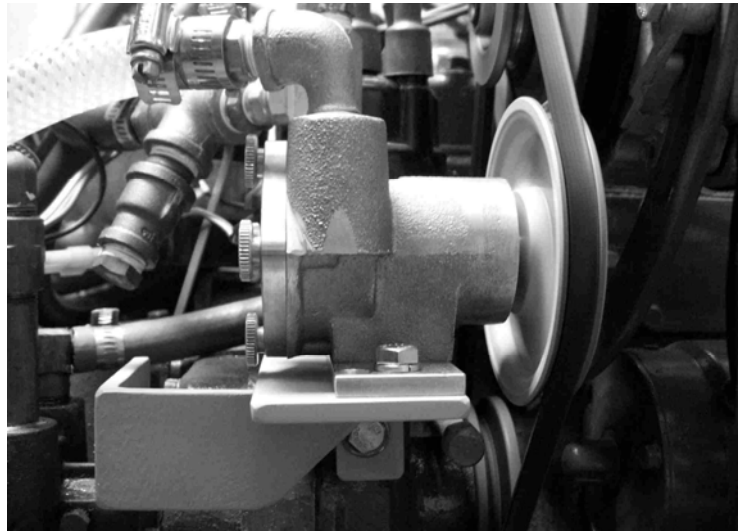
- If engine is equipped with the older style **Prestolite** (Autolite) distributor, it will be necessary to file/grind a 1/2 x 3/8 deep notch in the foot of the pump bracket where it snuggles up to the distributor to accommodate the bolt which holds the distributor in place.

1. Using a 9/16" open end wrench, loosen nut on bolt which holds alternator to bracket on head of engine. Using a 1/2" box or open end wrench, remove 5/16" bolt and washer from alternator where alternator is held in position by tension adjustment arm. Swing alternator position down to relieve belt tension. Remove existing belt.

2. Install the new belt supplied by first positioning belt on accessory drive sheave. Next, land belt on alternator sheave by first raising alternator as far as possible to get belt between alternator sheave and distributor and then lowering alternator to position belt on alternator sheave.

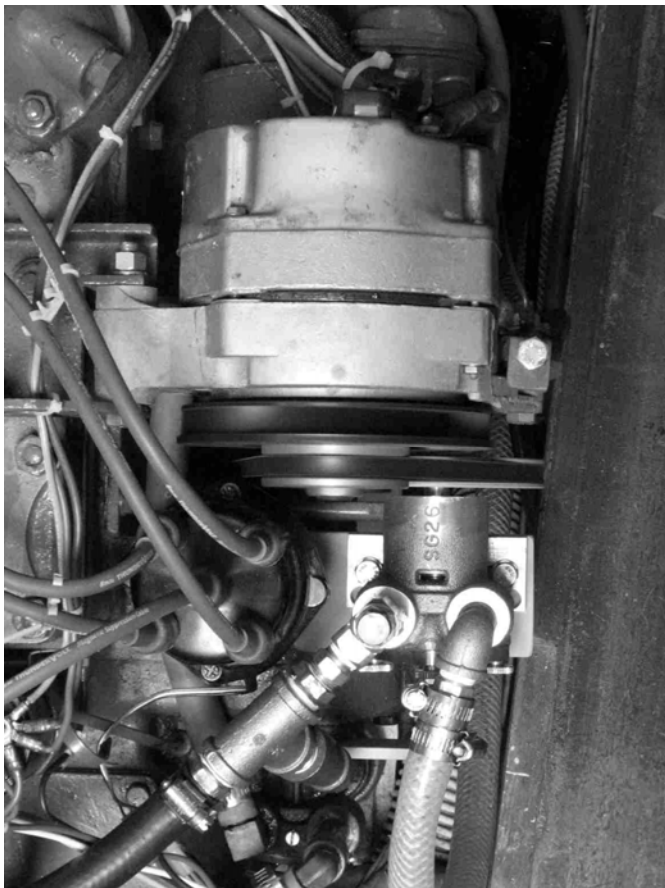


MMI Pump and Bracket from Starboard Aft Side



MMI Pump and Bracket from Starboard Side.

3. Using a 9/16" box or open end wrench, remove upper 3/8" bolt from existing water pump. Mount bracket with new sea water pump around and over accessory drive such that: 1) base to which pump is attached lands on flat surface adjacent to distributor, 2) piece of flat bar on underside of bracket snuggles up against vertical surface of accessory drive housing, and 3) 1/2" hole in aft leg of bracket lines up with upper hole for existing pump. **NOTE:** It will be necessary to "tuck" the sheave on the new pump under the new belt as you install the pump and bracket. Using a 9/16" box or open end wrench, attach bracket to engine by installing special 3/8 x 1 1/4" flange head bolt and special 3/8 "belleville" lock washer (provided in kit) through hole in aft leg and into upper tapped hole for existing pump (where 3/8"



MMI Pump and Bracket from Above.

bolt was removed at beginning of this paragraph). There is considerable clearance in hole in bracket for this 3/8" bolt to allow for proper fit up of bracket. Tighten 3/8" bolt so as to just hold bracket and pump in place. Tap bracket inboard to insure that flat bar is tight against vertical surface of accessory drive and tap bracket down to insure that base to which pump is attached lands on the flat surface adjacent to distributor. With both of the above fit up conditions met, fully tighten 3/8 bolt (about 35 ft lbs torque) so that "belleville" washer is completely flat and bolt is **tight**. With the belt fully tensioned, pump and bracket will be securely held in place with the forward piece of flat bar on bracket resting squarely on vertical surface of accessory drive housing. For an even more rigid installation, this forward flat bar can be secured to the accessory drive housing with a 5/16" bolt. If access allows, there should be enough stock to allow a 5/16 x 1/2" deep hole to be drilled and tapped in the accessory drive housing, in line with hole in flat bar on bracket, without breaking through. (On older style blocks, a tapped hole may already exist. If this is the case, there will be a cap in a bored hole on top of the accessory drive which was for a mechanical tachometer. If may be necessary to drive cap down flush to allow installation of pump bracket.) Install the 5/16 x 5/8" stainless steel bolt and special 5/16 "belleville" lock washer (provided in kit) in tapped hole in accessory drive housing.

4. The pump can be moved inboard or outboard about 1/4" and cocked slightly relative to the bracket by loosening the two 5/16" bolts that hold the pump base to the bracket. The side to side clearance allows the pump to be moved inboard to gain more clearance on the starboard side or to move outboard to help with belt tension. In order to obtain proper belt tension, it may be necessary to obtain a longer alternator adjusting arm depending on the final pump position. (Available from Indigo Electronics) The extra fore and aft clearance in the base bolt holes allows the pump to be cocked one way or the other to improve alignment of the pump sheave relative to the accessory drive sheave as viewed from the top. Adjust pump as necessary for best alignment. Retighten bolts

5. Rotate new pump (counter clockwise direction when looking aft) to position set screw in sheave such that it can be easily loosened. Loosen set screw in sheave with 5/32" allen wrench (provided). Install

new 5/16 x 3/4" stainless steel hex head bolt and lock washer (provided in kit) through tension adjustment arm and into the alternator tapped hole. Lift alternator to put enough tension on belt to allow alignment of sheaves (deflection of belt between accessory drive sheave and new pump to be about 1/4" with about 5 pounds force at mid span of belt). Tighten alternator pivot bolt in bracket on head. This should improve alignment of sheaves.

Note: On some engines, the alternator adjusting arm is not long enough to accommodate the new longer belt. A longer arm is available from Indigo Electronics.

5. With ignition switch off, crank engine for several seconds. The sheave on the new pump should move either forward or aft on its own accord so as to properly align itself with the other two sheaves. It may need a little help as the fit is fairly snug. Once aligned fore and aft, rotate pump sheave to position set screw over flat on pump shaft. **Make sure set screw lands squarely on the flat of the shaft.** **Securely tighten set screw** and install locking stainless set screw (provided in kit) on top of already tightened set screw. Final position of sheave should leave approximately 1/8" axial clearance between sheave and alternator fan and approximately 1/8" axial clearance between sheave and pump body. If latter clearance is too tight, it will be necessary to install a stainless steel, 3/8" flat washer between the pump bracket and old water pump (where the new 3/8" bolt was installed in Step 2) so as to move the bracket and pump aft the thickness of the flat washer. If it is necessary to move the bracket aft, it will be necessary to move the sheave forward on the pump shaft a corresponding amount.

6. Fully tighten 3/8" bolt on aft end of pump bracket. Adjust tension on belt by lifting alternator. When belt is properly tensioned, about 5 pounds of pressure with the thumb, at a point midway between the new pump and the alternator, should deflect the belt about 1/4". You should be able to wiggle the belt athwartships fairly easily. With the engine running and a decent load on the alternator, the two legs of the belt between the accessory drive pulley and the pump and the pump and the alternator should appear very straight and tight. The other leg of the belt between the alternator and the accessory drive pulley should be oscillating side to side about 1/8". **It is**

very important that the belt not be overtightened as that will lead to early failure of the new water pump and alternator.

Heat Exchanger

7. Determine an appropriate location for the heat exchanger. Vertical mounting is preferred but it can be mounted at up to 45 degrees off vertical. When choosing a location, consider the following:

- The heat exchanger should be as close to the engine as possible to keep hose runs to a minimum. Preferably, the HE fill cap should be slightly higher than the highest point on the engine.
- The coolant level will require checking periodically so access to the pressure cap should be considered. An automotive style coolant recovery kit is provided to aid in this periodic check.
- A consumable anode is installed in the heat exchanger which must be accessible for annual replacement. Orient heat exchanger for access.
- Four hose connections will be made (two sea water, two antifreeze). Consider these when orienting heat exchanger.

8. Mount heat exchanger with brackets provided. Mount angle iron bracket to vertical or angled surface selected for heat exchanger location. Fasteners will be required (not supplied in kit) to attach bracket to vessel as so many possibilities exist that a standard package is impractical. Stainless steel 1/4" through bolts with lock washer and nut are recommended. The two large circular clamps fit around the 3.5" diameter part of the heat exchanger about 6" apart. Be sure to orient the heat exchanger for optimum location of hose connections. It may be necessary to obtain and install brass 3/8" nipples and 90 degree elbows to obtain desired orientation. Using 1/2" open or box end wrenches, attach each circular bracket to angle iron bracket using 5/16 x 1 1/2" bolts, lock washers, and nuts (provided in kit). The larger diameter holes in the bracket are used with each 5/16 x 1 1/2" bolt passing through both "ears" on the circular bracket and then through the hole in

the angle iron bracket before receiving the lock washer and nut. Tighten 5/16" bolts to lock heat exchanger in position.

Thermostat

9. Proper functioning of the thermostat is critical to maintaining proper operating temperatures with your new fresh water cooling system. When the thermostat housing is removed for cleaning of the head, examine the thermostat carefully and check it for proper operation by immersing in a container of heated water. Additionally, carefully examine the housing itself for excessive corrosion of the control surfaces. The housing is designed with a "boss" at the top on the inside which connects to the bypass hose coming from the tee on the water inlet plate on the side of the block. The lower-most machined surface on this "boss" is designed to be about 3/8" above the top surface of the thermostat when installed. In this manner, the housing "boss" plays a major role in temperature regulation in that opening of the thermostat closes off some of the bypass coolant flow thus forcing more flow through the block. Historically, the "boss" quickly gets corroded away in salt water, leaving a gaping hole above the thermostat thus allowing bypass coolant to flow unchecked. Such a condition will cause the engine to run too hot as there will be insufficient coolant flow through the block. A new bronze housing is available from Moyer Marine Inc. (www.moyermarine.com)

Good News An entirely new thermostat is now available from **Indigo Electronics**. It is very similar in concept to the original Atomic 4 "Dole" thermostat but features a new Silicon Bronze thermostat housing and two different double action thermostats (160°F and 180°F) readily available through NAPA Auto Parts stores. This new kit eliminates the current thermostat and bypass hose going from the side plate on the block to the thermostat housing and controls the temperature of the antifreeze coming from the engine. All coolant flows through the engine all of the time with a portion being re-circulated to yield much more uniform temperatures within the engine, faster warm up, and more precise temperature control. A three-way valve can be

incorporated to bypass the thermostat and thus cool the engine to about 120°F for those times when you may want to cool the engine down before shutdown on a hot summer day. Sketches of the valve and system arrangement are enclosed. Also, a photo is included to show one possible mounting configurations of the thermostat housing on the exhaust manifold.



Thermostat Performance

Engine RPM at Load	2000
Engine Temperature Normal Gauge	186F
Coolant entering Thermostat	175F
Coolant entering Engine	133F

Note: Regarding Antifreeze Pump Impeller – With the engine operating at 180° F with this valve, the antifreeze entering the antifreeze pump will be at about 150° F. **DO NOT USE A “GLOBE” IMPELLER** for this pump as that brand of impeller becomes too flexible at about 120° F and stops pumping antifreeze, causing rapid overheating of the engine.

Hose Installation

10. The existing sea water suction hose must be rerouted from the fitting on the existing pump to the **outboard** hose fitting on the new pump. The hose fittings on the new pump are designed for 5/8" ID hose. It is recommended that new 5/8" ID hose be run between the new pump suction and the sea water hull connection with an appropriate new hose fitting installed at the hull connection if needed. A new

hose clamp is provided for the new pump suction connection.

11. Install a 5/8" ID piece of hose between the new pump **discharge** (**inboard** hose fitting) and one of the sea water connections on the heat exchanger. The sea water connections are the hose barb connections made into the heat exchanger near the top clean out. Secure hose at each end. (Hose clamps provided in kit).

12. Install a 5/8" ID hose between the heat exchanger sea water discharge and the existing fitting to which the sea water discharge from the exhaust manifold connects. Again, it may be necessary to provide a new fitting to accommodate the 5/8" ID hose. Secure hose at each end (Hose clamp provided in kit for heat exchanger end).

13. Install a 5/8" ID piece of heater hose between the existing pump suction (old sea water suction connection) and the bottom 5/8"NPT (antifreeze) connection on the heat exchanger. If hose routing permits, screw a 5/8" hose x 1/2" NPT fitting (provided in kit) into the heat exchanger connection using pipe dope on threads. If routing is a problem, provide and install appropriate fittings to facilitate routing. **Be sure to hold back on the hex portion of the female connection on the Heat Exchanger when tightening fittings.** Secure hose at each end (Hose clamps provided in kit).

14. Install a piece of 5/8" ID heater hose between the old sea water discharge fitting on the exhaust manifold and the upper 5/8" NPT (antifreeze) connection on the end of the “leg” of the heat exchanger. If hose routing permits, screw a 5/8" hose x 1/2" NPT fitting (provided in kit) into the heat exchanger connection using pipe dope on threads. If routing is a problem, provide and install appropriate fittings to facilitate routing. **Be sure to hold back on the hex portion of the female connection on the Heat Exchanger when tightening fittings.** Secure hose at each end (Hose clamps provided in kit).

15. Check all hose routing to insure that hoses are clear of all sources of damage such as the propeller shaft, coupling, and the exhaust piping. Secure out of harms way as necessary.

Initial Engine Operation

1. For about the first 10-20 hours of engine operation following conversion to Fresh Water Cooling, it is recommended that the system initially be filled with plain fresh water instead of an antifreeze solution. Furthermore, it is **strongly** recommended that a simple temporary “filter” be installed at the hot coolant inlet to the Heat Exchanger. There will be a significant amount of rust scale and debris that will be flushed out the of the block, head, and manifold into the Heat Exchanger where it can block the small openings (about .040”) between the cooling tubes. Several filter configurations are available. The most inexpensive is simply a 1½” PVC tee with a 1½” x ½” female NPT PVC reducing bushing glued into each end, and a 1½” PVC plug simply pushed into the side leg (no glue) and held in position with a tie-wrap. A medium bronze wool or medium stainless steel wool pad is then pushed into the tee via the side leg (with the PVC plug removed) to filter the coolant coming in and exiting through the other two legs of the tee. Hose barb fittings, sized to suit the hose bringing antifreeze to the heat exchanger, are installed in the two legs of the tee which have the ½” female NPT connections. A “Filter Assembly” is Shown disassembled below:



2. For a more permanent “filter assembly”, galvanized fittings can be substituted for the PVC. While more expensive, such a “filter” will be less prone to any leakage. It has been found that the PVC material will allow some coolant leakage at the plug and screwed in hose barb fittings when hot.

NOTE: SEE DETAILED INSTRUCTIONS FOR “FILTER” CONSTRUCTION AT THE END OF THESE INSTRUCTIONS. PVC and galvanized fittings are available at Lowes or Home Depot and bronze wool is available at West Marine. Although PVC is generally not rated for 180°F use, it has been found to hold up satisfactorily in this application for the short duration of use and the low pressure (less than 7 psi).

3. Fill the Heat Exchanger with plain water. It will be necessary to add more water as the coolant fills all of the internal passages. Fill the Heat Exchanger completely full.

4. Start the engine (don't forget to open the sea water hull valve) and ascertain sea water is coming out of the exhaust. Add additional clean water as necessary. Install pressure cap on the heat exchanger and operate engine to bring it to operating temperature. When hot, check for and correct any leaks.

5. Run the engine at various speeds and power levels and periodically check the condition of the “filter pad” by cutting the tie wrap and removing the PVC plug. Be sure to relieve any pressure on the system by loosening the heat exchange cap prior to cutting the tie wrap. When it has accumulated a reasonable amount of debris, remove the “filter pad” and replace with a new one. After about 10 hours (or until the filter remains clean), the plain water can be removed from the engine.

6. Fill the Heat Exchanger with a 50/50 mixture of antifreeze (never exceed 50% full strength antifreeze in the solution). It will be necessary to add more 50/50 mixture as the coolant fills all of the internal passages. Fill the Heat Exchanger completely full.

7. Start the engine (don't forget to open the sea water hull valve) and ascertain sea water is coming out of the exhaust. Add additional antifreeze coolant as necessary to fill the system.

8. Check the “filter” after about 10 additional hours of operation. If clean, less than about 15 pieces of debris present, remove the “filter assembly”. If there are more than 15 pieces present, change the “filter pad” and leave it in place for another 10 hours of operation and check again. Repeat this process until a “filter” is obtained with less than 15 pieces of debris.

16. A coolant recovery bottle is provided to recover antifreeze when the system heats up. It can be mounted at whatever elevation is convenient relative to the engine. It may be necessary to purchase an additional piece of hose if the clear plastic one provided is not sufficiently long. Connect the

coolant bottle hose to the small piece of tubing just beneath the fill cap on the heat exchanger.

18. Conduct a sea trial and determine operating temperature at cruising speed. Optimum engine performance is obtained at about 180° F at cruise speed.

19. After about 1 hour of operation, readjust belt tension (deflection of belt between accessory drive sheave and new pump to be about 1/4" with about 5 pounds force at the mid span of belt). **Do not overtighten.**

Troubleshooting

High Temperature

Note: Even small antifreeze leaks can lead to serious overheating as the quantity of antifreeze within the system is rather small and can be quickly depleted by even a 10 drop per minute leak.

- Insure that sea water hull valve is open.
- Verify sufficient antifreeze in heat exchanger
- Verify proper sea water flow in exhaust. If not sufficient, check for:
 - Loose belt.
 - Pump sheave loose on shaft.
 - Obstruction in sea water hose.
 - Obstruction in sea water hull valve.
 - Obstruction in sea water side of heat exchanger or fitting in heat exchanger.
 - Failed sea water pump impeller.
- Check for failed antifreeze pump impeller.

Squealing Noise

- Check for loose belt.
- Check for loose sheave on pump shaft.
- Check for failed pump bearing.

Antifreeze leak at antifreeze pump

- Check for leak at pump cover plate.
- Check for failed pump seal.
- Check for loose hose clamps at pump connections.
- Remove grease cup if still installed and plug opening.

Sea water leak at sea water pump

- Check for failed pump seal. Sea water will be leaking from drain hole at bottom of pump.
- Check for loose hose clamps at pump connections

Maintenance

Anode- In order to prevent electrolytic deterioration of the sea water side of the heat exchanger, a special aluminum anode is provided in the heat exchanger. It is a special material and has a wire in the center to prevent the aluminum piece from falling off before all of it is consumed. It is located on the top of the long leg (looks like a hex head pipe plug) and should be replaced on an annual basis to provide ongoing protection. The anode is a standard "pencil" type with a 3/8 pipe plug on the end. The anode itself is 1/2" in diameter and extends 1 1/4" beyond the end of the plug. Standard zincs are available as most marine supply houses. You may have to cut off some from a standard zinc in order to get it to fit into the heat exchanger. **It is best to replace the anode with the same kind as provided. They are available from Indigo Electronics.**

Belt - Inspect the belt on at least an annual basis. Verify proper tension and belt condition. Replace as required. The belt is a rather special, heavy duty type. Specifically, it is a Browning 3VZ280. They are carried by W.W. Grainger as P/N 2L379.

Pump Impeller – The impeller is the same as that used in the Oberdorfer pumps originally supplied on the Atomic 4s as seawater pumps. West Marine carries the impeller or contact Moyer Marine Inc. (www.moyermarine.com) at 717-625-3891

Winter Lay-up – If freezing temperatures will be encountered during periods of inactivity, precautions must be taken to prevent raw water in the raw water loop from freezing and damaging the raw water

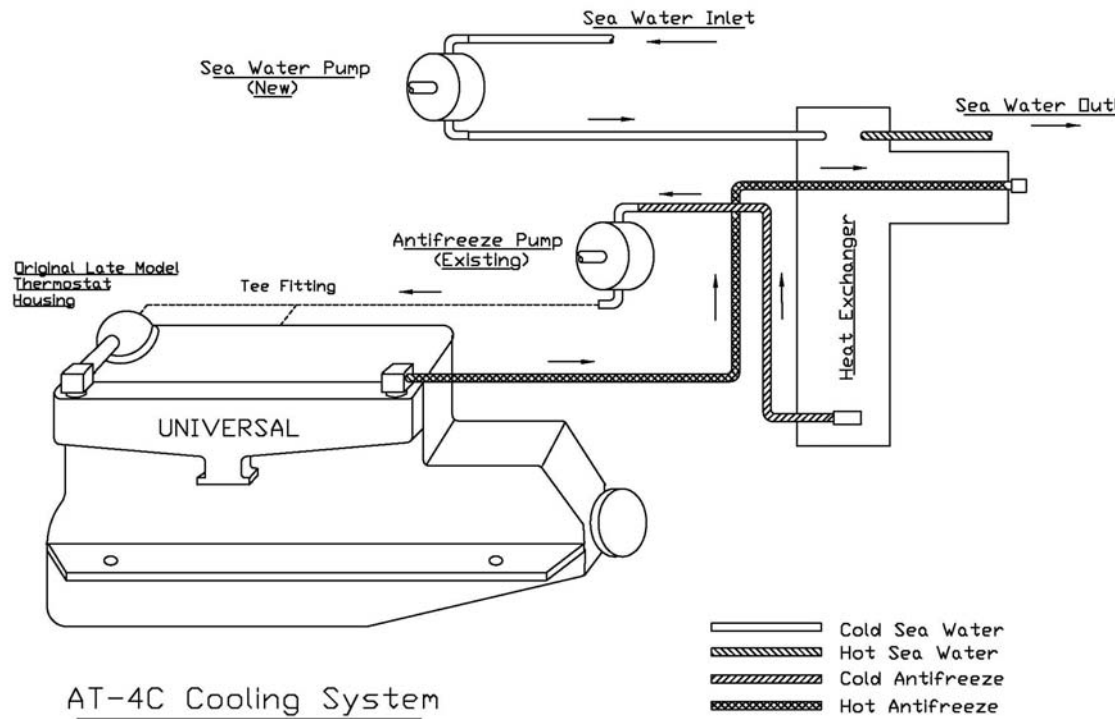
pump, the heat exchanger, and hoses or fittings. The preferred method for accomplishing this is to suck antifreeze (preferably the kind sold for RVs as it is non-toxic) into the system via the raw water suction line. On my own boat, I close the thru hull for the raw water supply, open the raw water strainer at the strainer basket access, and then run the engine at a

very slow idle while pouring antifreeze into the strainer. A gallon is more than sufficient.

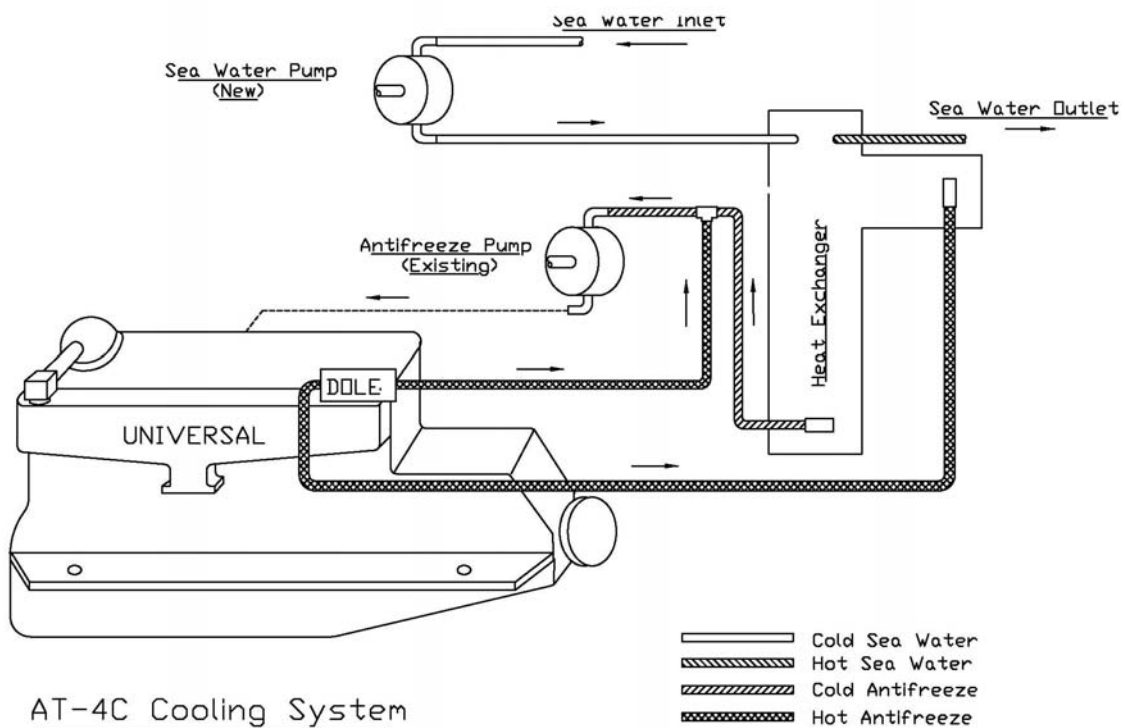
Another option is to drain the Heat Exchanger by loosening the bottom end cap by loosening the center bolt about two turns and allowing the seawater to drain into the bilge.

AT-4C Parts List **W/O TCV**

<u>Description</u>	<u>Quantity</u>	
Monitor Heat Exchanger	1	
Mounting Bracket (Primed only)	1	
Mounting Clamps	2	
Bolt, nut, washer for clamp	2	
5/8 Hose x 1/2 NPT Fitting	2	
Hose Clamp	4	
MMI Pump	1	
Bolt, washer for pump	2	Installed
5/8 Hose x 3/8MPT Fitting	2	
Hose Clamp	4	
Sheave	1	Installed (Temporary)
Belt	1	
Locking set screw	1	
5/16" Bolt & lockwasher for Alt. tension arm	1	
5/32" Allen wrench	1	
Pump Mounting Bracket (Primed only)	1	
5/16 x 5/8" Bolt & Belleville lock washer	1	
3/8 x 1 1/4" Flange Hd. Bolt & Belleville lockwasher	1	
1/4 NPT Pipe Plug for Existing Pump	1	
Coolant Recovery Bottle with Hose	1	

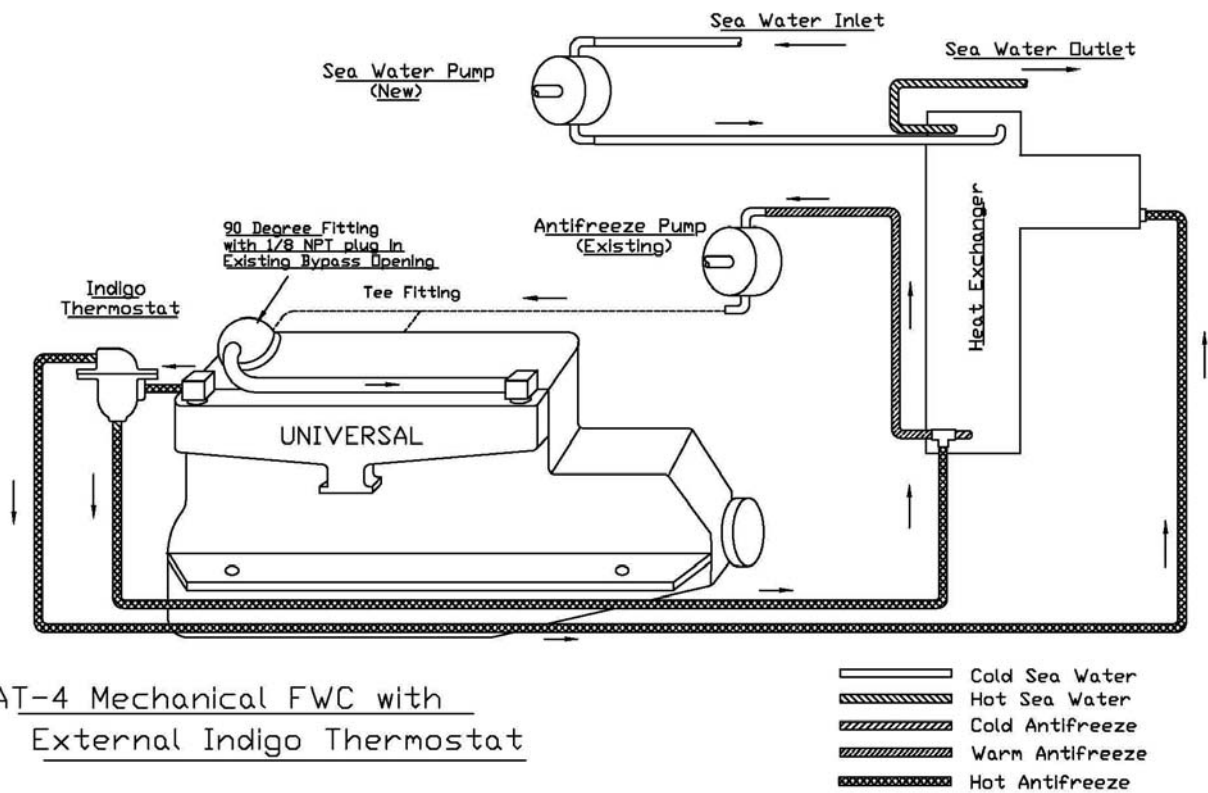


AT-4C Cooling System

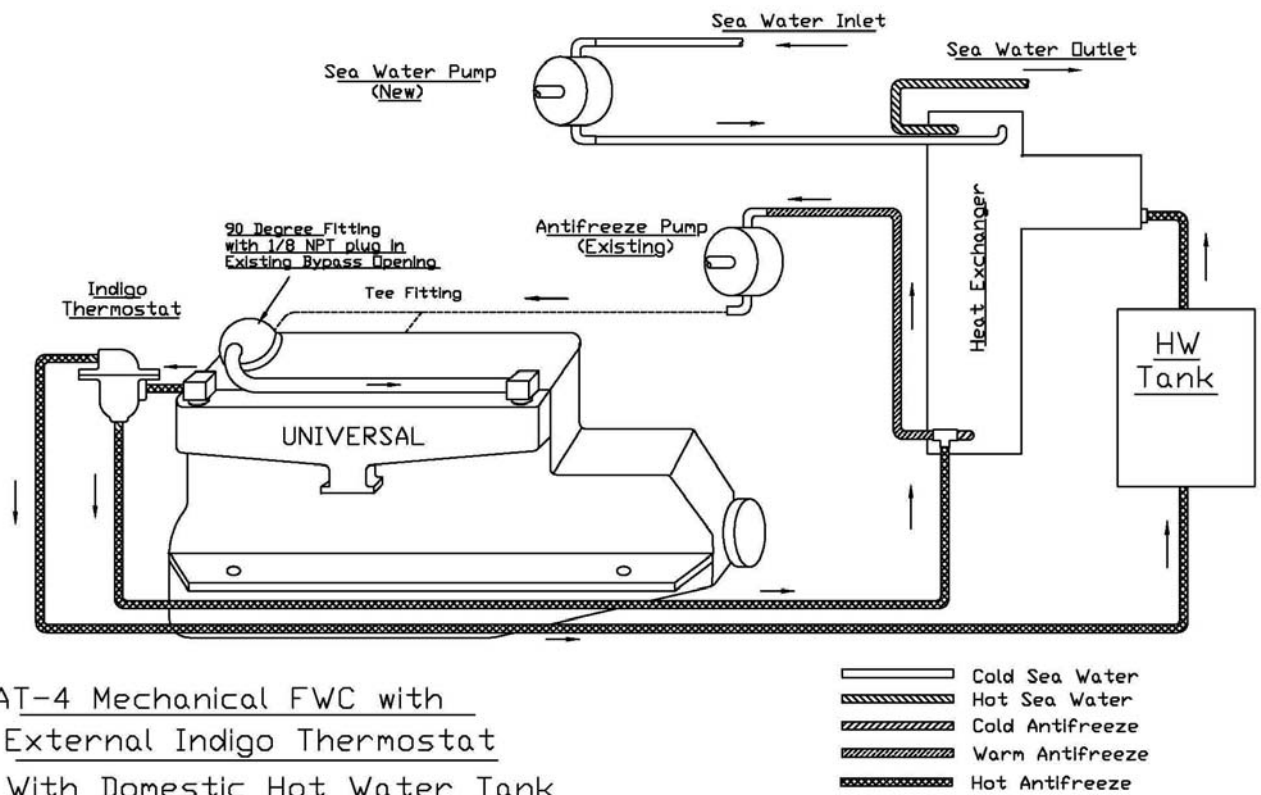


AT-4C Cooling System

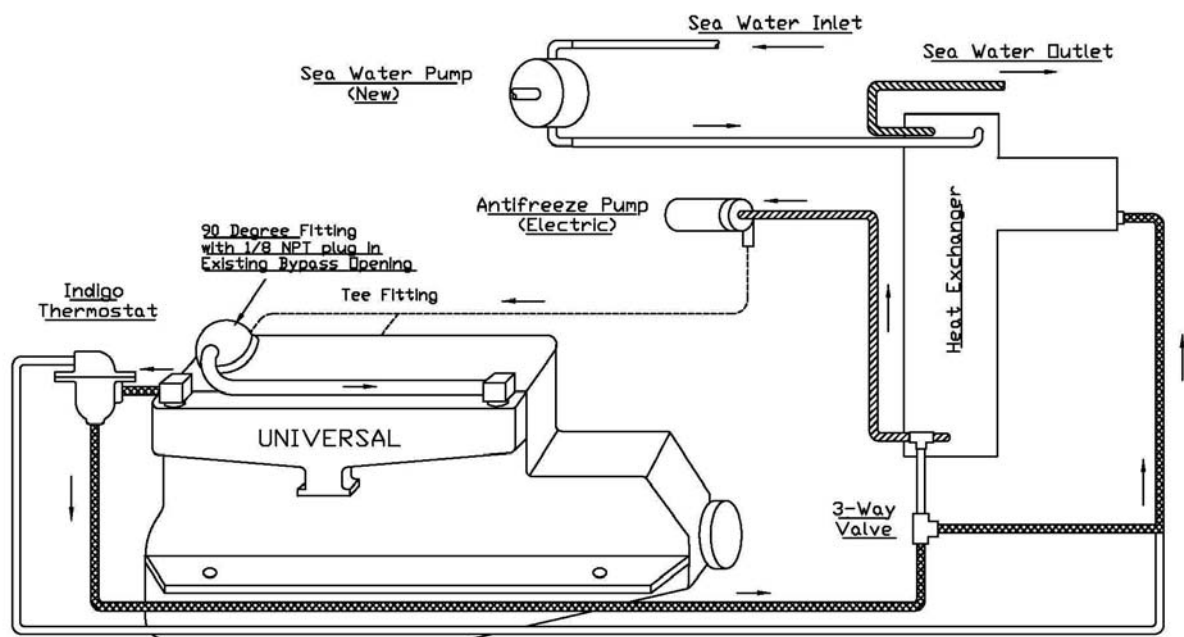
With Dole Thermostat



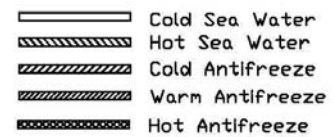
AT-4 Mechanical FWC with
External Indigo Thermostat



AT-4 Mechanical FWC with
External Indigo Thermostat
With Domestic Hot Water Tank



AT-4 Mechanical FWC with
External Indigo Thermostat
With Cool-Down Valve Open



Temporary Filter For Antifreeze Loop

With the installation of an Indigo FWC system on an Atomic 4, the potential exists for rust and scale particles circulating with the antifreeze to accumulate and restrict the flow of antifreeze in the heat exchanger.

It is strongly recommended that a temporary antifreeze filter be installed for the first twenty (20) hours of operation. A very simple filter can be constructed from the following components:

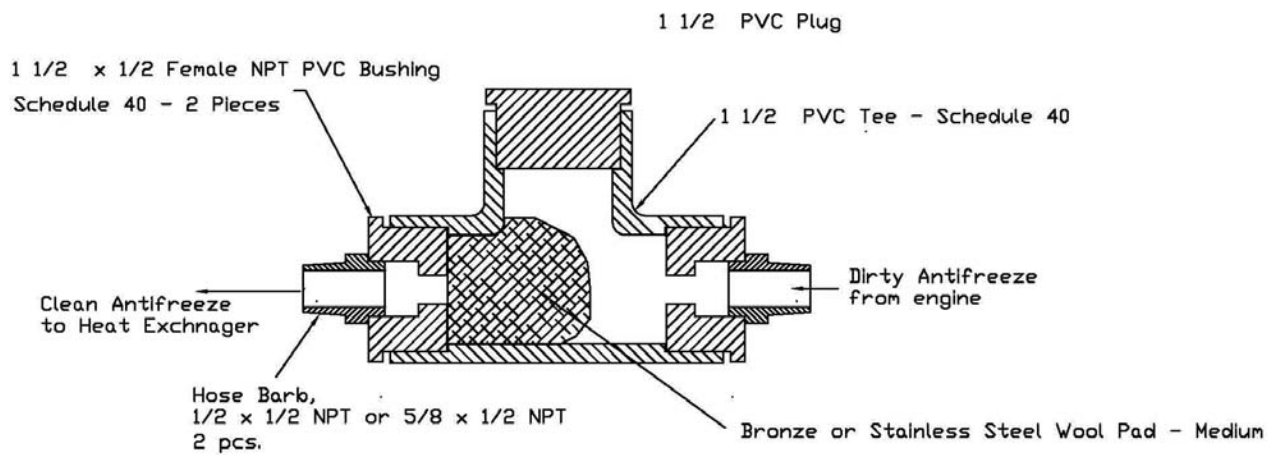
- One 1 ½" PVC tee, Schedule 40
- Two 1 ½" x ½" Female NPT PVC reducing bushings
- One 1 ½" PVC plug
- Two ½" NPT x ½" hose barb fittings (5/8" hose barb depending on your hose)
- One pack of bronze or stainless steel wool pads, medium texture.

Construction:

1. Glue a 1 ½" x ½" reducing bushing into each of the long legs on the tee.
2. Screw a hose barb fitting in each reducing coupling. Use Teflon tape on threads.
3. Push a pad into the side opening on the tee such that it is fully up against one of the reducing bushings so as to catch any debris passing through.
4. Install the plug securely without glue. Cut a notch in each side of the top of the plug such that when you put a nylon tie wrap around the tee and plug, the tie wrap will not slip off of the plug. Install the tie wrap.
5. Install filter assembly in the hose that runs from the exhaust manifold antifreeze discharge to the heat exchanger. Orient the filter assembly such that plug leg of the tee is horizontal to facilitate draining and changing the pad.
6. Fill the system with plain water and run the engine.

The pad may initially become plugged fairly soon after starting the engine. Leave the cap off of the heat exchanger initially and observe the water flow. If it starts to be reduced, check the pad. Otherwise, run the engine for about one (1) hour and then replace the pad. Monitor the water flow in the heat exchanger and monitor the engine temperature for about the next 18 hours of operation. Change the pad as necessary.

NOTE: PVC is not really intended to be used in pressurized systems at 180F. However, for this application, the pressure is very low and the material will withstand the temperature. The assembly may leak some at the plug. Additionally, the threaded hose barb fittings will become loose when hot but nothing will fail. For a more permanent solution, use galvanized pipe fittings such as a 4" x 1 ½" nipple and two 1 ½" x ½" reducing couplings. Once the initial period of operation is past and the system is filled with an antifreeze solution, it is recommended that this filter be removed to avoid leaking antifreeze into the bilge.



Temporary Filter for New FWC Conversion