

INSTALLATION INSTRUCTIONS

INDIGO ELECTRONICS AT-4T THERMOSTAT KIT ATOMIC 4 - MECHANICAL FWC

☑ The Indigo Thermostat Kit is designed for use with both Raw Water Cooled (RWC) engines and those converted to Fresh Water Cooling (FWC). The housing is the same for both applications except for a difference in the size of the re-circulation hole (orifice) at the bottom of the bottom piece. The RWC model has a smaller hole and this hole can be drilled out to make it suitable for FWC use. One 140°F thermostat is available for the RWC (NAPA SME18-3551 or Sierra 18-3551). Two thermostats are available for the FWC Model. The 160°F version is NAPA THM38 and the 180°F version is NAPA THM138.

There are 6 main components to this installation process:

1. Removal of the existing thermostat.
2. Installation of new Thermostat Housing.
3. Installation of new tee in antifreeze circuit.
4. Installation of the re-circulation hose.
5. Installation of the heat exchanger hose.
6. Filling and testing.

For Customer convenience, an Installation Hardware Package is available which provides all of the fittings for the Thermostat Kit. Pricing is available at www.atomic4.com/thermostat.htm

Engine Temperature Observations

During the development and testing phase of this Thermostat Kit, an interesting and pertinent observation was made regarding the engine temperature as indicated by the temperature sensor located in the head (the traditional Late Model location). The temperature indicated is from 1°F to 10°F hotter than the actual coolant, depending on load. With the original thermostat arrangement, you have no way of seeing or determining this as there is

a great mixing of coolant at the exit from the original thermostat housing. Since this new Thermostat Kit has the thermostat positioned where the coolant exits the exhaust manifold, the temperature of the coolant entering the thermostat housing can readily be measured. Since the coolant at this point has now passed through the exhaust manifold, it was my expectation that the temperature would be a few degrees higher than that indicated on the head sensor. This was not the case. At idle, they were about the same but at full load, there is about a 10°F spread. The reason for this appears to be the fact that the head sensor is being heated not only by the coolant but by heat being transferred through the metal of the head directly from the #1 combustion chamber.

Based on testing of this kit, it is recommended that a tee be installed where the coolant exits the manifold and the new thermostat housing be mounted on the leg of the tee pointing away from the manifold. The other leg of the tee would then receive the temperature sensor traditionally mounted in the forward end of the head. See image below



The traditional sensor opening in the head is now an excellent place to install a high temperature alarm such as the Cole Hersee Model COL-M40177BP.

Engine Preparation

Drain the antifreeze from the engine. Place battery disconnect switch in “Off” position.

Thermostat Removal

1. Remove the existing thermostat from its housing on the forward end of the engine. The bypass hose which runs from the antifreeze inlet on the side of the engine to the thermostat housing is no longer needed as all antifreeze will now pass through the engine. The bypass can be eliminated in one of two ways:

- a) The 90° fitting on the thermostat housing can be plugged with a 1/8” NPT socket head pipe plug by removing the existing 90° fitting and installing the new fitting with pipe plug provided in kit. In this manner, the hose is left in place but no flow can pass through it. Replace gasket under thermostat housing.
- b) The 90° inlet fitting on the original thermostat housing can be removed and the opening plugged with a 3/8” NPT pipe plug. Replace gasket under thermostat housing. The tee fitting on the side plate of the engine can then be removed. This requires removal of the side plate as there is most likely a diverter cap on the inside which directs the coolant flow aft within the block. With the plate removed, remove the diverter cap fitting and then the external tee. Replace the tee with the 90° fitting removed from the thermostat housing and re-install the diverter fitting being sure that the opening points aft and slightly downward. Replace the side plate using a suitable sealant on the plate (such as Permatex Form-a-Gasket).

Thermostat Housing Installation

As received, the Thermostat Housing is loosely assembled with the thermostat that you specified installed inside. The nuts which hold the two halves together are only slightly tightened for shipping purposes. **NOTE: The top piece can be installed either as shipped or rotated 180°.**

The preferred location for the new Thermostat Housing is to attach it to a 1/2” elbow screwed into the forward (flywheel end) of the exhaust manifold. In order to accommodate this location, the existing hose routing from the original thermostat housing to the exhaust manifold will have to be changed. This will require a longer hose running from the original thermostat housing to a 1/2” elbow screwed into the aft (transmission) end of the exhaust manifold. Relocate the hose barb fitting from the forward end elbow to the aft end elbow. Be sure this new hose makes a nice smooth curve as it sweeps aft (no kinks).

There are two main reasons for locating the new thermostat housing on the forward end:

- The forward end is normally much more accessible than the aft end (except on a V-Drive model). This greatly facilitates installation and any maintenance required.
 - Some evidence suggests that by having the coolant enter the exhaust manifold at the aft end (which is traditionally lower than the forward end) there is less chance for any air being trapped in the forward end of the manifold and thus potentially cause corrosion inside the manifold.
2. Remove the upper half of the Thermostat Housing and the Thermostat itself.
 3. Attach the bottom half of the new Thermostat Housing to the 1/2” elbow on the forward end of the manifold utilizing a 1/2” close nipple screwed into both pieces. There is only one 1/2” NPT connection on the bottom half housing and it has an “T” (for Inlet) cast into it near the connection.

Be sure to seal the pipe threads with Teflon tape or pipe dope.

If another location is more convenient for your particular installation, then by all means utilize that location. Three possibilities are: Attached to the aft end of the exhaust manifold, attached to the heat exchanger, or mounted on a vertical surface.

Hose Routing Summary:

- 1. Re-circulation hose runs from bottom half “R” connection on new thermostat housing to a tee installed between the “cold” connection on heat exchanger and antifreeze pump inlet (suction).**
- 2. Hot antifreeze hose runs from top half “E” connection on new thermostat to the “hot” connection on the heat exchanger.**

Configuration/Installation of Re-Circulation Hose

One of the remarkable features of this new Thermostat Kit is its ability to re-circulate all or some portion of the coolant. During warm-up, all of the coolant is re-circulated (bypassing the heat exchanger) which speeds warm-up and helps keep temperatures within the engine more uniform. Once the thermostat is controlling the engine temperature, some portion of the coolant is still re-circulated (depending on engine load and raw water temperature), again helping to keep engine temperatures more uniform. With the engine temperature gauge reading 180° F, the coolant entering the side cleanout plate is at about 140° F as opposed to being at or close to raw water temperature.

4. Re-circulation is accomplished by allowing hot antifreeze from the new Thermostat Housing to be introduced into the antifreeze pump suction via a new tee connection. It makes no difference where the new tee is located in the hose from the heat exchanger cold antifreeze connection to the antifreeze pump ... either at the heat exchanger or at the antifreeze circulating pump. Suitable hose barb fittings, a threaded tee, and probably a short pipe nipple will be required

5. The re-circulation path is established by running a hose from the 3/8” NPT connection on the bottom of the Thermostat Housing (there is an “R”, for Re-circulation, cast into the housing near this connection) to the new tee just installed. A 3/8” NPT x 1/2” hose 90 degree fitting is supplied. Route the hose in the best location to suit your engine compartment and the location of your heat exchanger

Configuration/Installation of Heat Exchanger Hose

6. Install the new Thermostat in the bottom half Thermostat Housing with the **Spring Side Down**
7. and attach the upper half Thermostat Housing to the bottom half being sure to install the joint gasket. Tighten the two 5/16” nuts with a 1/2” socket or combination wrench to about 10 ft lbs torque.



8. Install a 3/8” NPT x 1/2” Hose Barb fitting in the 3/8” NPT connection on the top half Thermostat Housing (there is an “E”, for Exhaust, cast into the housing) Be sure to seal the pipe threads with Teflon tape or pipe dope. The other connection on the upper half should already be sealed with a pipe plug. (this connection is only used on RWC installations)
9. Install a piece of 1/2” ID hose (if that is the size chosen) between the hose barb fitting installed in Step 7 and the existing hose barb fitting on the

hot antifreeze connection on the Heat Exchanger. Be sure to make this a nice smooth run of hose with no kinks.

Installation with Domestic HW Tank

NOTE: Incorporating a HW tank in the antifreeze circuit is only recommended if you are using a mechanical rubber impeller pump for antifreeze circulation.

If a domestic HW tank with a built in heat exchanger is to be used, it should be installed between the discharge of antifreeze from the new Thermostat Housing and the Heat Exchanger. In this location, the heating of the domestic HW and subsequent cooling of the antifreeze will have no impact on the performance of the thermostat. See drawing below.

Filling with Antifreeze

10. Fill the heat exchanger completely full of antifreeze. The heat exchanger fill opening should be higher than the new Thermostat Housing and thus the system will fill completely due to the vent hole in the new Thermostat flange. In the event that the heat exchanger fill opening is lower than the new Thermostat Housing, it will be necessary to open the new Thermostat Housing and fill it completely full of antifreeze and then close it up. It will be necessary to top-off the heat exchanger several times during this process.
11. Start engine and observe (for about 1 minute) that the heat exchanger remains full of antifreeze. Top off as necessary. Install the cap on the heat exchanger and continue to warm engine. If the raw water temperature is below about 75° F,

engine temperature may not get up to 180° F with the engine in neutral (essentially no load). Once the engine is put in gear and a reasonable load applied, the normal operating temperature of about 180° F will be obtained.

12. Once fully warmed up, check the system for antifreeze leaks. Correct as necessary.

Thermostat Performance

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

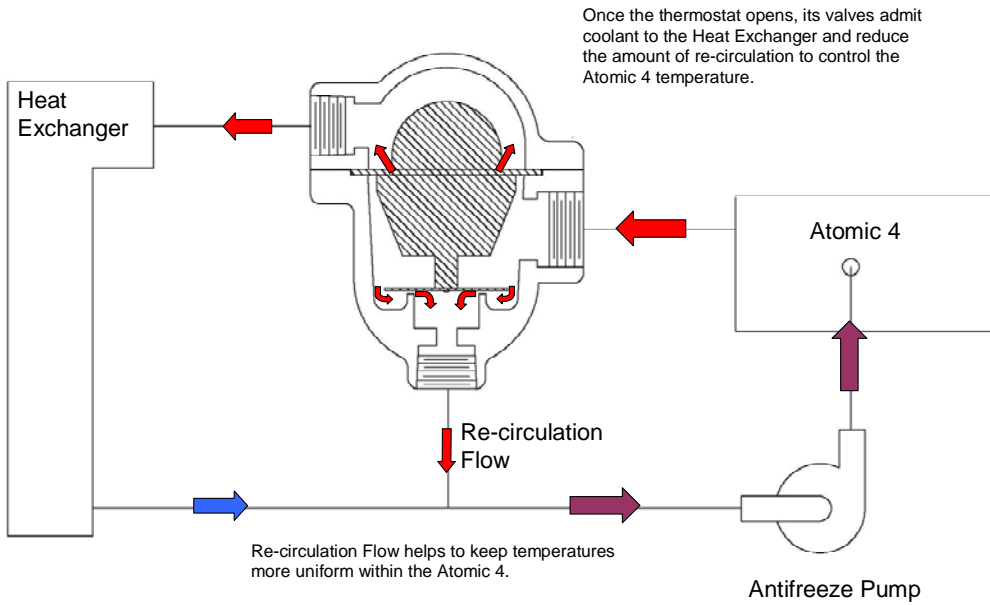
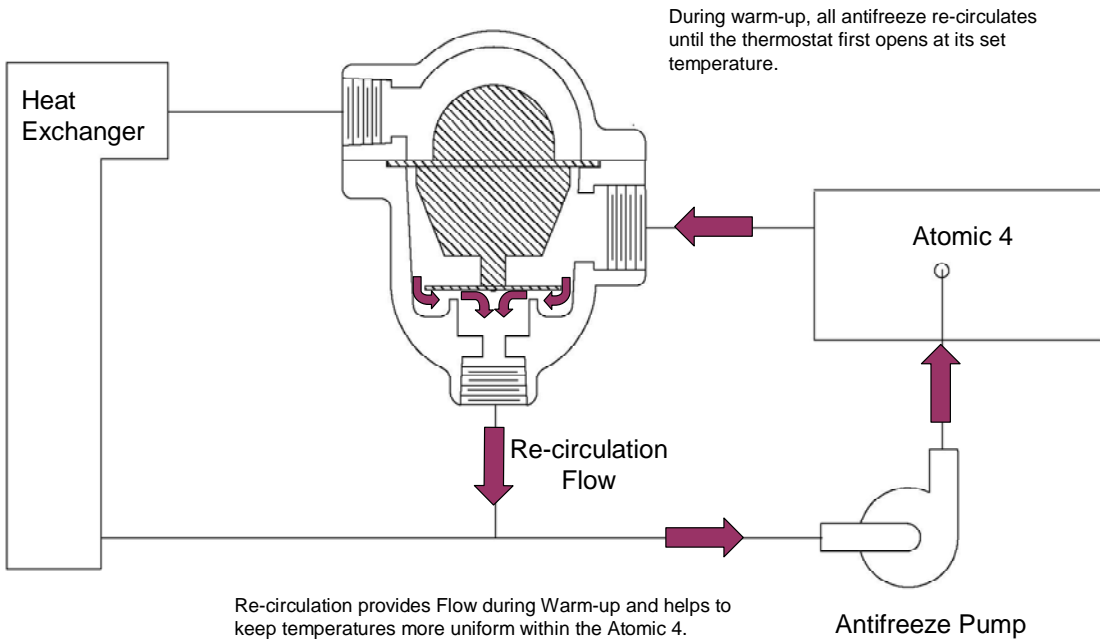
Engine Cool Down Option

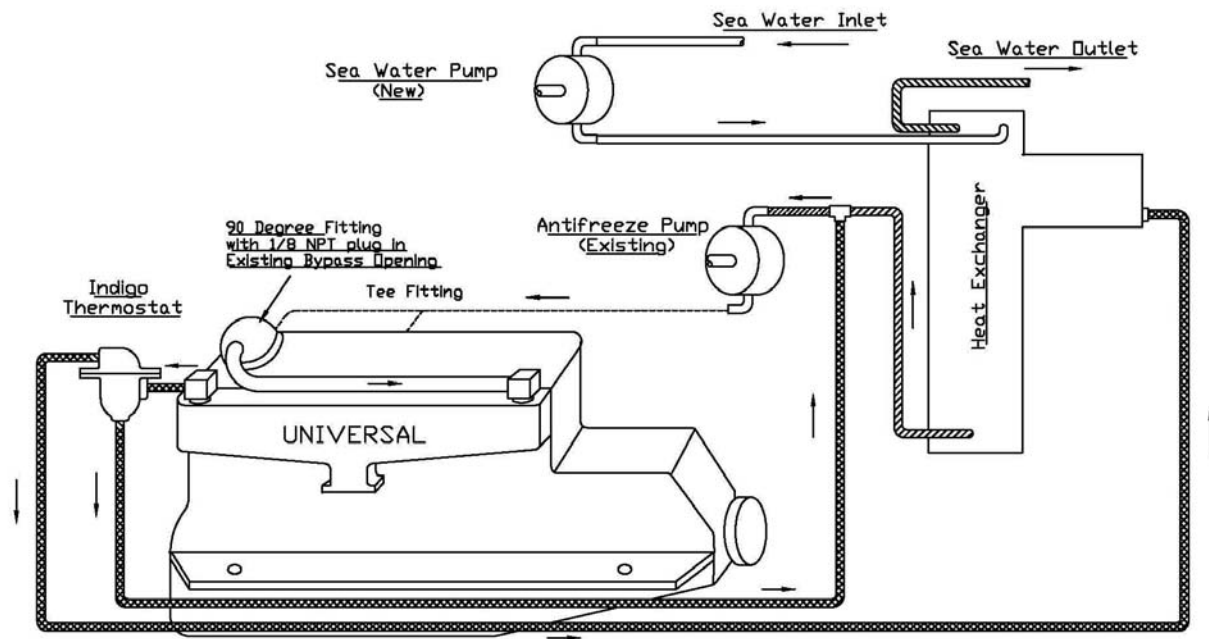
Reducing the engine temperature can be a real bonus in the summer time in that the engine temperature can be reduced during the last 30 minutes of motoring on a hot day, thus helping to reduce the residual heat in the engine box when the engine is shut down. Installation of a 3-way valve provides a means of accomplishing this.

1. Obtain a 3 way valve and install it in the re-circulation hose such that the re-circulating coolant can be directed to either the tee at the heat exchanger (normal routing) or to a tee (which would have to be installed) in the hose that goes from the Thermostat hot outlet to the Heat Exchanger. See last drawing below.
2. By positioning the 3 way valve such that the re-circulating coolant goes to the hot inlet of the heat exchanger, you have essentially bypassed the thermostat and thus substantially reduced the engine temperature.

Parts List

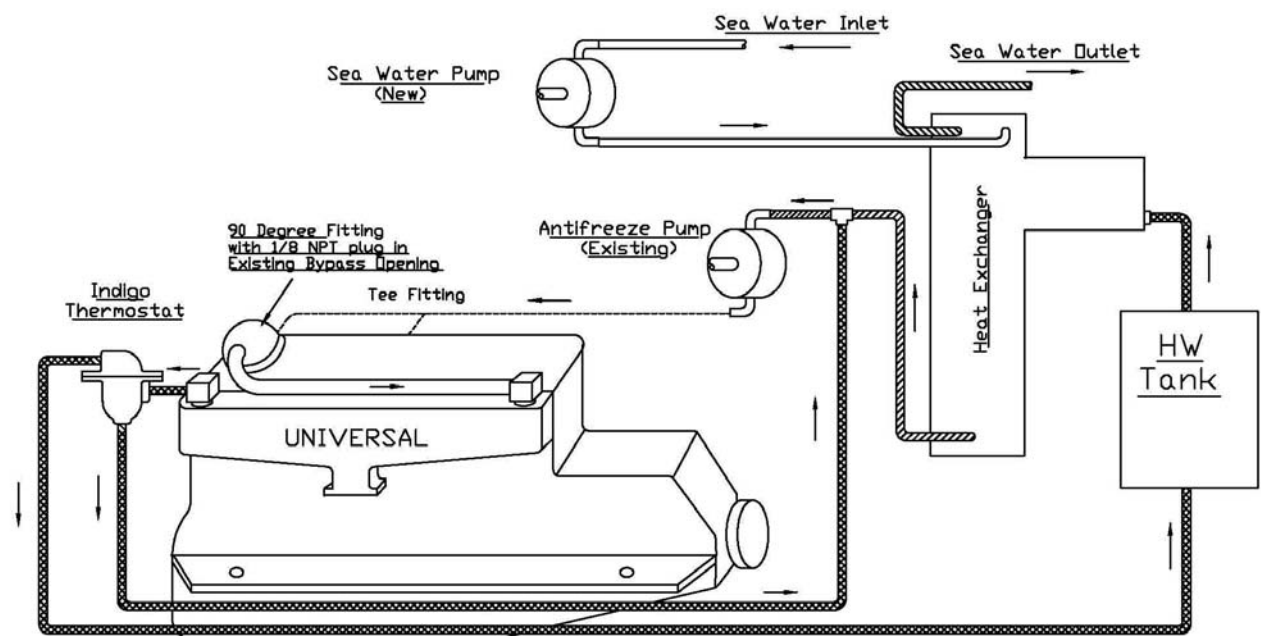
<u>Part No.</u>	<u>Quantity</u>	<u>Description</u>
PARTS INCLUDED WITH KIT		
1	1	New Thermostat Housing
2	1	New Thermostat – Either 160F or 180F
3	1	¼ NPT Socket head pipe plug
4	1	New Thermostat Housing Gasket
5	2	5/16 – 18 X 1” Stud
6	2	5/16 – 18 Nut
7	2	5/16 Lock washer
8	1	Old thermostat housing gasket
9	1	90 Degree hose barb fitting – 3/8 NPT x ½ hose with 1/8 NPT plug installed in hose barb end – original bypass connection on original Thermostat Housing.
10	1	½” Close Nipple to attach Thermostat to existing ell fitting
PARTS NEEDED		
1	1	½” Nipple of length to suit other installation location
2	1	Tee, nipple and hose barb fittings to be installed in Cold Antifreeze hose for re-circulation
3	1	3/8NPT x ? hose barb fitting for heat exchanger connection on Thermostat Housing
4	1	90 Degree hose barb fitting – 3/8 NPT x ½ hose - re-circulation connection on new Thermostat Housing.
5	1	Suitable heater hose to make up to connections





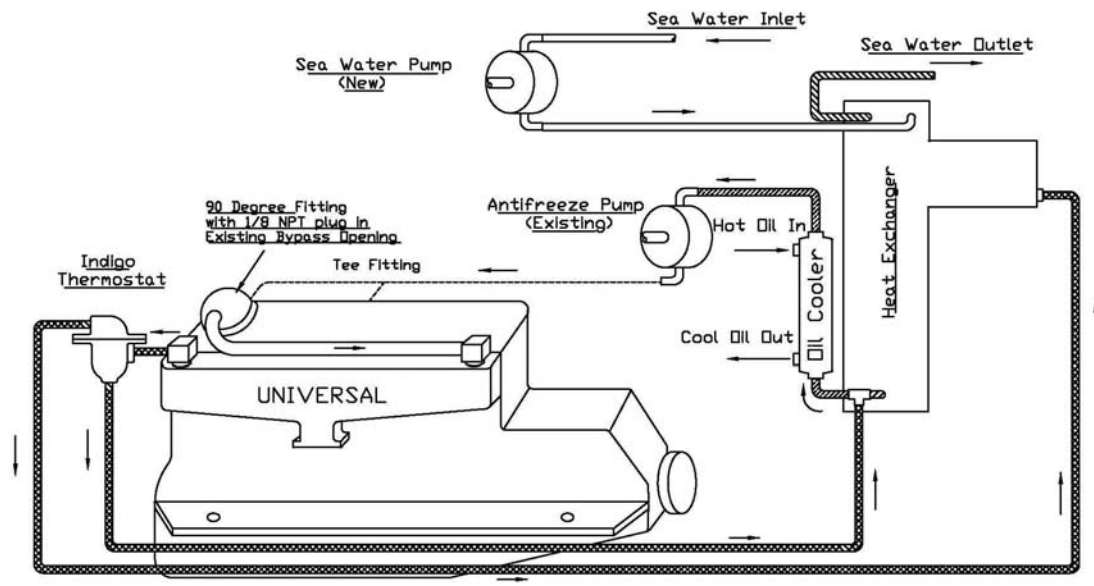
AT-4 Mechanical FWC with
External Indigo Thermostat

- Cold Sea Water
- ▨ Hot Sea Water
- ▨ Cold Antifreeze
- ▨ Warm Antifreeze
- ▨ Hot Antifreeze



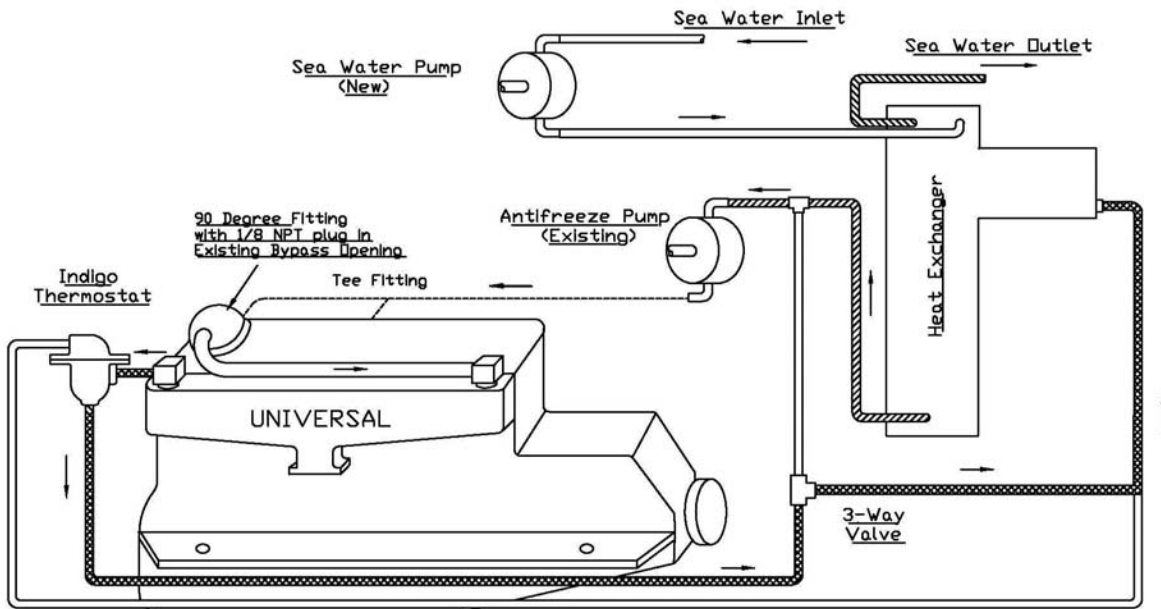
AT-4 Mechanical FWC with
External Indigo Thermostat
With Domestic Hot Water Tank

- Cold Sea Water
- ▨ Hot Sea Water
- ▩ Cold Antifreeze
- ▧ Warm Antifreeze
- ⋯ Hot Antifreeze



AT-4 Mechanical FWC with
External Indigo Thermostat

- Cold Sea Water
- ▨ Hot Sea Water
- ▩ Cold Antifreeze
- ▧ Warm Antifreeze
- ⋯ Hot Antifreeze



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

- Cold Sea Water
- ▨ Hot Sea Water
- ▩ Cold Antifreeze
- ▧ Warm Antifreeze
- ⋯ Hot Antifreeze