

Chapter 7 Air Conditioning and Heating

Reverse Cycle Air Conditioning

West coast owners can probably skip this section (they probably don't have air conditioning).

The smaller unit is 10,000 BTU unit, which draws 14A from the shore power circuit (and *much* more at startup). It is located under starboard pilot house seat. The control panel for this unit is located on the side of the refrigerator cabinet. The unit forces cold or warm air into the duct which runs up the wall on the starboard side of the main salon between the pilothouse and the galley. There are 2 vents in this duct.

The larger unit is 16,000 BTU, which draws 18A. It is located under port pilot house seat. The control panel for this unit is in the stateroom on the port side of the boat – easily accessible from the bed. The unit is designed to feed vents located in the port side of the stateroom, the head (luxury!) as well as the duct and vents on the port side of the main salon.



Some vessels may have different options:

- “Mer Sea” (AT34 #039) has two 16000BTU units
- “Freedom” (AT34 #011) has an additional 5000BTU unit serving the stateroom only.

My units were manufactured by:

Polar Bay.

4387 Westroads Dr

West Palm Beach FL 33407

561-844-8811 866-844-8811

I think other manufacturers have been used.



You can run both air conditioner units at once if there is sufficient power. That means having *both* shore power cords plugged-in, or running the generator.

There is a *large power surge* - around 3.5 times the running power – at startup. That means the large unit momentarily draws around 60A !.

It is *much* easier on the electrical system to start the larger one first...

Raw water intake

The raw water for cooling (air conditioning mode) or heating (reverse-cycle heating mode) comes into the boat on the forward starboard side of the engine room, through a ¾ inch thru-hull. There is an external strainer on the outside of this thru-hull.

It goes into a Groco ARG750 bronze strainer with a Monel basket, (the same model used for the generator) and then goes into the 120V water pump. From there, the clear water hose travels up the forward bulkhead, across the overhead and along the aft engineroom bulkhead to the air conditioners. The same water supply feeds both air conditioners – there is a ‘Tee’ piece for the starboard unit, then the hose goes to the port unit.

The water is discharged via the third of four above-water thru-hulls on the port side, and the second of two on the starboard side. Since both units share a common pump, water should be discharged from both sides if either unit is running.

The small above-water thru-hulls are:

Port side:

- Forward-most thru-hull is for the fwd bilge pump
- Second one is for the shower sump
- Third is for the air conditioner condensate drain
- Fourth is for the cooling water discharge

Starboard side:

- Forward-most thru-hull is for the condensate drain and the hot water heater overflow
- Second one is for the cooling water discharge

Startup checklist

- Ensure air conditioner water pump thru-hull is open. It is located in the starboard side of the engine room.
- Turn on the transfer switch on the electric panel OR plug in the second shore power cord.
- Electric panel:
 - Air Conditioner Pump ON
 - Air Conditioner ON – if air conditioning is required in salon only (starboard vents)
 - Air Conditioner 2 ON – if air conditioning is required in stateroom and main salon (port vents)
- Press On/Off switch on Air Conditioner control panel.
 - Main salon control panel is on wall in walkway between salon and pilot house (by fridge)
 - Stateroom control panel is on port side of stateroom.
 - Set desired temperature
- Check that water is coming out from the air conditioner water pump. Water should be coming out of BOTH sides of the boat if either air conditioner is on (they share a common pump). The water outlets are located just below the pilot house doors, just above the water line. If no water is coming out, turn off the air conditioner(s) at the control panels first, then turn off breakers.

The 120V Air Conditioning pump on my boat **is not self-priming**. If the boat is hauled-out with the thru-hull open, it will lose the priming supply of water. If the air

conditioning is operated, the pump will have an air-lock, and not move water, and the system shuts-down with an error code.

To Prime the pump:

- Open the thru-hull
- Loosen 3 or 4 of the screws holding the pump body to the strainer
- Turn on the air conditioning, and *gently* tilt the pump away from the strainer. This should allow a little water to leak, but will prime the pump
- You should be able to see water flowing up and through the clear hoses.
- Tighten-up the screws again.
- Resolve to close the thru-hull the next time the boat is hauled-out....

Heating

Reverse-Cycle Air Conditioner

The air conditioners use slightly less power when used to heat than they do when used to cool - but it's still a lot.

The air conditioner extracts heat from the raw water that it pumps through, so the efficiency drops as the water gets colder. I'm told (although I've never tested this and don't want to) that when the water temperature is below 40 deg F the reverse-cycle heaters no longer work.

Heatercraft Engine Coolant heater

Manufacturer

Heater Craft Inc

672 Boekel Rd

Idaho 83858

Telephone: 208-687-4400

<http://www.heatercraft.com/>

This heater is installed under the stairs leading down to the stateroom, and is accessed by removing the lower 2 steps (4 screws for each).

It is plumbed into the engine fresh-water cooling circuit after the hot water heater.

The heating water flows from the starboard side of the engine into the hot water heater on that side of the engine room, then across the engine room on the forward bulkhead, then forward through the bulkhead to this heater. The return hose flows back along the bulkhead to the starboard side of the engine.

I have heard of leaks at this heater unit (i.e. under the stairs) on two boats. As a temporary fix, the hose can be disconnected at the hot water heater, and connected to the return point to 'short-circuit' the system.

Electrical Strip heaters

Manufacturer

King Electrical Mfg Co

9131 10th Ave So
Seattle WA 98108
Telephone: 206-762-0400
<http://www.king-electric.com/>

Salon Heater

My boat has a model KT1215, which is a 1500W unit. It draws around 14A when running, which is approximately the same as my small reverse-cycle air conditioner in heat mode.

Charles Pope (AT34 “Oops”) reports that his AT34 salon unit is model DAW 1215, which has 6 heat settings between 250 and 1500W.

There is an overheat alarm – a red or orange light that flashes and turns the heater off until it cools (note that is similar in function, but in addition to the ‘normal’ thermostat).



The 1500W heaters in the salon have a history of overheating and turning-off.

Since they are made with two 750W elements in parallel, one of these can be disconnected. Tomco have in fact done this on some boats. This will reduce the amount of heat, but keep the heater operating. It will draw approx 7A in this mode.

To disconnect the second 750W element:

- Turn-off the outlets breakers (both of them) and disconnect the shore power TOTALLY.
- Remove the heater face-plate.
- On the right of the heater there is the overheat warning light, and multiple wires behind it.
- Find the one with a Tag on it, and disconnect it. Cap-off BOTH ends of the wire.

Stateroom Heater

My boat has a model PZ1207, which is a 750W unit. It draws around 7A when running.

It also has an overheat alarm – a red or orange light that flashes and turns the heater off until it cools. However, it is a lower-output unit, and has not overheated yet.



Be sure to close the stateroom door before operating this heater, as the wood door is only 1 or 2 inches away from the heater. It will probably heat and warp this door.

Fred Werner (AT34 #044 “Tug 44”) reports:

“I was never satisfied with the temperature control on the built-in electric heaters on my tug, and just the other day the solution dawned on me.

I was tearing out a wall at my girlfriend's new house and moving/replacing some thermostats, and I realized they'd be perfect. You need to get one suitable for "120/240 volt electric baseboards". For example, Home Depot has the Honeywell CT410B model, which breaks both lines. Insert this into the wire supplying the heater. Do not remove the existing thermostat, simply turn it to full heat and forget about it. Use the Honeywell unit both as a temp control as well as a shut off switch.

Costs about 30 bucks, as I recall. Should work nice, and the Honeywell will give you an actual temperature setting in degrees, and it is rated at about 20+ amps, which is more than enough for these heaters."

Espar Diesel heat

OK, East coast owners can probably skip this section (they probably don't have the Espar diesel heater). We don't have one either, so we don't have any first hand knowledge.

Kevin Kirkman (AT34 "Queen Bee" had some problems with the Espar heater, due to leaving it running on a low setting.:

"Sue and I have always used our Espar diesel heater on Queen Bee in the same manner as our forced air furnace at home, set the thermostat set point and forget about it until we were done with our cruise. We have found this to keep the boat very comfortable and dry as the heater cycles on and off as needed to maintain the temperature. This past month the blower motor on the heater failed after about 1.5 years since the boat was new (Feb 2004).

The recommended repair facility is 'Miller and Miller' in Seattle. The service tech was very helpful in the diagnostics of the problem. We were informed the warranty period for the Espar blower motors is 12 months or 1000 hours whichever comes first. The Service rep indicated he normally see between 3500 to 4500 hours on a blower motor before such a failure.

Our Blower motor electronic chip tested out to about 1700 hours of use at the time of the blower failure. Our style of use, of the furnace allowed us to rack up a large number of hours in a short period of time. The blower may have been running most of the time at very low speed and we did not really need what little heat the furnace blower was providing at the time.

When cruising in the fall winter and spring I would guess that our blower motor was running an average of about 10+/- hours a day, so you can see the hours can accumulate very rapidly.

I hope this information helps in the use management of your diesel furnace.

The only scheduled maintenance the technician recommended was cleaning the burn chamber and changing the screens in the burn chamber about every 500 hours or annually.

He indicated the most common failures were glow plugs (inexpensive; do it yourself), bad control boards (expensive, and (least common) blower motors."



Be careful where you place your fenders!
If you put them in front of the diesel heater exhaust, they'll melt !