

Chapter 5 Generator

Overview

Early and later AT34s have a Northern Lights Genset. Early boats have a M643 5 Kw, and later boats (after hull#50 or so) have M673L 6 Kw (West Coast) or M753W2 8 Kw (West Coast). About 30 (or so) AT34s from around Hull#20 to #50 have an Onan MDKAU 5 Kw generator. I have one in “Tardis” AT34 #048.

Northern Lights generator seem to have a good reputation; the Onan does not.

All generator parts seem to be exorbitantly expensive! Onan parts cost far more than the equivalent heavier-duty Cummins ones. The diesel engine in the Onan is made by Kubota (it's a Kubota model Z402), and many spare parts are ‘Onan-branded’ Kubota ones. I've listed the cross-reference numbers that I know about.

All the user-serviceable items on an Onan are on the front and right side of the soundshield, so the generator is mounted towards the aft end of the engine room port side. The Northern Lights genset has the serviceable items on the left side, so it is mounted further forward, with the muffler aft.

Starting the Generator

- Visual check the Coolant level
- Check Engine Oil level – initial reading is always low – wipe and recheck for accurate level
- Intake thru-hull open
- Strainer clear
- Outlet thru-hull open – located on Port side of engine room – above water line
- Press and **HOLD** Generator start switch – either on salon bulkhead OR on Genset
- Yellow LED flashes quickly for pre-heat (approx 10-20 sec), then engine starts then LED goes out – steady green comes on. Release switch when steady green comes on.
- Any flashing LED after start indicates problem
- Electrical Panel:
 - AC Loads OFF, AC Master OFF
 - Slide lockout selector switch up to allow Generator ON
 - Add loads individually - Largest first
 - Big (16 KBTU) Air Conditioner (**see Air Conditioner Startup checklist first!**)
 - Small (10KBTU) Air Conditioner (**see Air Conditioner Startup checklist first!**)
 - Battery Charger
 - Water Heater
- Monitor AC Ammeter. The maximum load for a 5 KW genset is approximately 42A @ 120 V. For a 6KW genset, it is approximately 50A @120 V, and for an 8 KW genset, it is approximately 67 A @ 120 V. (The formula, for those who didn't major in electrical engineering, is Watts = Volts times Amps.)

Gauges

The Onan and Northern Lights gensets are designed for unattended operation, so they don't normally have any external gauges or instruments. There are many automatic sensors monitoring temperature, oil pressure, raw water flow, voltage etc, which will instantly shut-down the engine. A LED (Yellow on the Onan, Red on the NL) will flash a differing number of times to indicate the diagnostic code. See the owners manual

Charles Pope (AT34 #070 "Oops") reports that he installed an instrument panel which can be purchased from Northern Lights and added with a simple cable harness change to monitor engine operation.

There is a similar Onan optional panel that can be added.

Fuel

Generator fuel routing

From the generator Racor 500 filter, a fuel line runs down the port side of engine room to the generator sound shield. Inside the generator sound shield, the fuel line feeds into a secondary fuel filter (usually a proprietary version from the generator manufacturer).

A fuel return line feeds from the generator sound shield down the port side of the engine room and through the aft engine room bulkhead on the port side. The line feeds into a second manifold that is mounted in the tank room. From that manifold, the generator return goes overhead of tank room on port side through a valve on the top of the port side fuel tank.



The generator draws from both the port and starboard tanks, but only returns to the port tank. The generator uses between 0.5 and 1 gall/hr depending on the load. The rate of fuel returned from the generator is low enough that the inter-connection between the fuel tanks allows for them to stay reasonably even.

Primary Fuel Filter

This Racor 500 is a smaller version of the engine Racor 900, and is changed in exactly the same manner. I use a 10 micron element (Racor part#2010TM, blue top).



As with the engine primary filter, the generator Racor filter **will not pass fuel unless an element is in place**. There is a check-valve inside the filter body to prevent this.

If you're really stuck with a clogged filter and no spares, you can punch-out the little bypass hole in the top of the element. This will allow the fuel to flow, but it won't be filtered!

Secondary Fuel Filter

This is inside the soundshield, and appears to be an Onan-made component. The Onan part# 0149-2106, and it costs more than the engine filter, despite being 1/3 the size!

It is changed in the same manner as the engine primary filter. However, the Onan is 'self-priming' (by holding the start switch to the left) so it is not necessary to completely fill it with fuel.

The Northern Lights Fuel Filter is part# 24-52020.

Air

The Onan generator does not have an air filter. Intake air comes through baffled slots in the soundshield, and into the intake manifold of the Kubota diesel.

Neither the Onan nor the Northern Lights generator has a turbocharger.

The Onan runs at a constant 2900RPM, the Northern Lights at 1800RPM.

Exhaust Muffler

The generator has a small fiberglass waterlift muffler, which works just like the larger engine muffler, and is normally about ¾ full of water. It is manufactured by UniCraft of Bellingham WA.

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The main difference is that it separates exhaust gases from the cooling water, to eliminate that annoying 'splash-splash' sound of most generators. Cooling water is injected at the exhaust elbow, and the cooled gases and water go into the muffler. The gases bubble-up through the water and exit at the *top* of the muffler and go out of a thru-hull just *above* the waterline on the port side. The water exits at the *bottom* of the muffler, and goes out of a thru-hull *below* the waterline.

Cooling

Just like the main engine, there are separate fresh water and raw water cooling circuits.

Fresh water cooling

This consists of fresh water and antifreeze, and is held in the header tank inside the soundshield, and circulated by an on-engine pump.

There is an expansion tank on the bulkhead which holds 'overflow' coolant when the generator engine heats up.

Raw water cooling

The raw salt or fresh water comes into the boat on the aft port side of the engine room, through a ¾ inch thru-hull.

There is *no external strainer* on this thru-hull.

It goes into a Groco ARG750 bronze strainer with a Monel basket, and then goes into the raw water pump inside the soundshield. On the Onan genset, the pump is a Sherwood G8002 pump.

The raw water goes through the heat exchanger, to cool the fresh water coolant, and is injected into the exhaust at the exhaust elbow. From there it travels into the waterlift muffler and then overboard.



The Monel strainer baskets eventually wear-out – usually at the welds. Plastic or metal replacements available from Groco or Perko.

The strainer 'O' ring is part# is 2-228



The generator water strainer seems to clog-up faster and more frequently than the engine raw water strainer. I think it is not as over-sized as the engine strainer.

Charles Pope (AT34 #070 "Oops") added an additional intake thru-hull to his Northern Lights generator.



Charles reports:

“The second day we owned the boat the generator shut down, and without any instruments it was difficult determining why. I finally determined that it was not getting raw coolant water due to a completely clogged through hull hose (it was so clogged that I took the hose off the through hull valve and NO water came through...). The safety devices with the operational lights do protect the engine operation but one never knows how the engine is performing.

As a result, I have installed a 1¼ in through hull to supply raw water along with the original ¾ in and changed the water strainer to a larger unit to accommodate the larger flow of water. (Adding the larger hose reduces the suction thus avoiding sucking up debris. Thus far we have had no major problems.)”

Sherwood Water Pump

The Onan pump is a Sherwood G8002-001. The 6-bladed rubber impellor is:

- Onan part#0132-0415 (now superseded by 0541-1524)
- Kohler part#359978
- Sherwood part#8000K (West Marine sku#5126685)

The Northern Lights part numbers (courtesy of Pete Balkus) are:

- Raw water pump part# 25-12007
- Impeller kit part# 25-12009
- Jabsco Impeller (3rd party) part# 18673-0001
- Raw Water Pump o-ring (not included with pump) part# 052400400



The Sherwood part is approx half the price of the re-boxed and renamed Onan equivalent.

I only seem to get about 100-150 hours from any generator impellor.

To replace the Onan impellor:

1. Close the generator thru-hulls. Don't forget to open them afterwards, otherwise this might all be for naught.....I hate when that happens.
2. Remove the 2 bolts holding the water pump in position (1/2" wrench), and pivot it.
3. Remove the accessory drive belt, inspect it and replace if needed.
4. The manual says to remove the inlet and outlet water hoses – this is not necessary.
5. Index (i.e. mark) lines on the mounting plate, pump body and backplate.
6. Remove the 4 long bolts holding the backplate on the pump. These also hold the pump to the mount plate, so the whole thing comes apart. This is the reason for marking the relative positions in step 5....
7. Remove the old impellor. It's pretty small and comes out easily.
8. If the impellor failed, find all the bits! There were 6 blades, so try to get all of them. They'll be in the front of the heat exchanger.
9. Assemble the pump body on the mounting plate.
10. Lightly lube the new impellor with hand soap, and insert, compressing the vanes with your fingers.
11. Lightly lube the new 'O' ring with grease, and bolt the backplate in position.
12. Loop the drive belt over the pulley, and pivot the pump into position
13. Bolt the mounting in place. There should be around 1/2" play in the drive belt on the longest section. If you used a new belt, it'll need adjustment in 5-10 hrs.
14. *Don't forget to open the thru-hulls.....*

Zincs

The Onan and NL generators do not have *any* zincs anywhere.

Yeah, I think that's a bad idea, too...

Lubrication

Oil weight

Cummins/Onan recommends 15W/40 oil multigrade, with no recommendation for or against synthetic. I use the same oil I put in the engine, Chevron Delo, but any quality name-brand oil is fine.

Changing the Oil

The generator is also plumbed into the Reverso Oil Change system, along with the main engine and the transmission. The Onan generator engine holds 2.2 quarts of oil.

Uncoil the outlet hose next to the Reverso Pump and put the end into the first container, open the appropriate valve and turn the switch to 'Drain'. Don't forget to close the valve and put the safety cover over the switch when you're done.

The Reverso system can be used to fill the engine with fresh oil, but I prefer to add it manually through the filler cap.



I find checking the Onan oil level difficult, as it has a long dipstick to reach from outside the soundshield into the engine sump. Instead, I measure the amount of oil pumped-out, and add that much new oil.

The normal oil change interval is 300 hours or once each year. Change both BEFORE and AFTER long term storage. We do it between 100 – 200 hours, depending on ease of disposal of the used oil.

Oil filters

We change oil filters every second oil change.

The Onan oil filter is Onan part#185-7444, and I have not found a cross-reference to Kubota or Fram filters.

The Northern Lights M643/673 5.5 Kw generator Oil Filter is 24-02001.