Installation of the Vanistan Fan-Equipped Oil Cooler Kit on a 1.9 Wbx

Parts included in the kit:
(1) Mocal thermostatic sandwich adapter with BSP-8/JIC-8 male/male adapter fittings installed
(1) ¾"-16 female/male nipple extension fitting to secure sandwich adapter
(2) 18mm banjo to JIC-8 male adapter fittings
(2) 18mm banjo bolts
(4) 18mm copper crush washers
(2) oil hoses with straight JIC-8 spin-on fittings. The hoses are of equal length.
(1) oil cooler/fan assembly with main cooler support plate, temp probe and wiring attached
(1) rear cooler support plate
(2) rear cooler support plate securing tabs
(1) 2.5" flexible duct hose
(1) #40 hose clamp for flex hose.
(4) #10x1/2" hex-head sheet metal screws
(2) M4 hexbolts
(2) M4 plain nuts
(2) M4 flat washers
(2) M4 nylock nuts
(1) Thermostatic relay controller
(1) M5 nut and washer
(1) tandem hose bracket with two black plastic saddle clamps, cover, and bolt
(2) M8 x 25mm hex-head bolts and flat washers

Tools needed:
1" thin-wall deep socket wrench for sandwich adapter retainer/nipple extension. Two 22mm or 7/8" open-end wrenches
27mm or 1 1/16" open-end wrench or large crescent wrench
#2 Phillips screwdriver
7mm combination wrench
7mm socket
5/16" socket
5/16" combination wrench
Electric drill.
1/8" drill bit
center punch
bent scribe
Voltmeter or 12V testlight
13mm box end or socket wrench
6mm Allen wrench

Note: If your 1.9 wbx is using the stock exhaust pipes, you will need to use a shorter oil filter. The filter to fit any year Saab 900 or 9000 will fit and has the correct specs for the wbx. The Mann part number is W712/80. Switching to the stock 2.1 exhaust or my stainless tuned WBXaustSS allows use of the normal wbx filter size.

All directions are from the driver's point of view; front is always toward the front of the vehicle, left is always toward the driver's left, etc.

First remove the right rear taillight assembly's 4 Phillips-head screws. Disconnect the electrical plug and set the tailight aside. Much of the cooler installation will be performed by working thru the taillight opening.

Loosen the upper clamp on the Air Flow Meter S-boot, undo the AFM electrical connector, and remove the air filter housing from the vehicle. Then remove the plastic or fiberboard blockoff plate that covers the cavity at the base of the right rear D-pillar by prying off the small retainer clips. Discard.

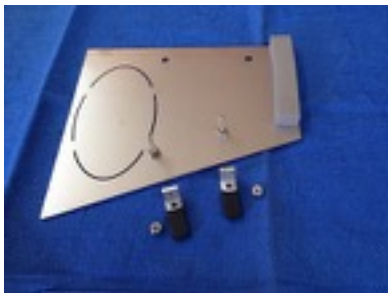
Install the Cooler/Fan Assembly

The cooler/fan assembly will be mounted within the D-pillar cavity, with both its hose fittings facing to the rear.

Take the cooler/fan assembly and insert it temporarily into the cavity space. You have to tilt the bottom edge into cavity first to clear the little stud that formerly held one of the clips for the blockoff plate that you have already removed. The stud can be broken or cut off if desired or if it interferes with the installation.

Push the assembly flat against the front wall of the cavity, and slide it into the cavity so the the left edge of the front cooler support plate aligns with the edge of the cavity wall where it meets the main engine bay. The assembly should be resting flat on the floor of the cavity. The photoat left shows the assembly in position.
While holding the assembly in this position, mark where the two screw holes are in the forward cooler support plate. Use a marker or bent scribe to make center marks for the two holes that are against the cavity forward wall.

Then remove the cooler/fan assembly from the cavity. Center punch the two hole marks, then drill the two holes with a 1/8" bit. To make it easier to start the two sheet metal screws straight in the drilled holes when the cooler is final installed, you may pre-thread them partway into the holes now with the assembly removed.



Install the two M4 hexbolts thru the two small holes in the rear cooler support plate and run the two M4 plain nuts all the way down the bolts as shown at left. Tighten the bolts and nuts firmly so the bolts act as studs and won't turn when you run the last two M4 nylock nuts down them in the next step.

Take the rear cooler support plate, and slip it into the cavity. In final position it should be vertical and backed up against the body gusset visible thru the taillight opening as shown at left (the duct hose is not being used in this photo; later photos show how the duct hose fits thru knocked-out oval in the support plate). Put the two rear support plate retaining tabs over the bolts in the plate, and put an M4 washer and M4 nylock nut on each bolt. Position the tabs over the body gusset as shown, and tighten the nuts just enough to hold the support plate loosely in place.

Slip the cooler/fan assembly back in place. It may help to use your bent scribe to pull the rear cooler support plate back to allow enough clearance to move the cooler/fan assembly into place.

When it is slid all the way in, attach the front plate to the front wall of the cavity with two of the #10 hexhead sheet metal screws.

Align the holes in the edge of the rear cooler support plate with the clipnuts in the bent flange at the rear edge of the cooler/fan assembly. Attach the relay controller base and rear cooler support plate to the cooler/fan assembly with two of the #10 hexhead sheet metal screws provided. The controller base's wiring connector socket should be on top.

Final check the overall position of the cooler/fan assembly, that the cooler face is parallel to the lower edge of the cavity opening, etc. Gently tighten all the sheetmetal screws and the two M4 nylock nuts to secure the assembly in place.Insert the wiring harness connector into the controller base socket, latch tab upwards, and push it in until the latch tab clicks.

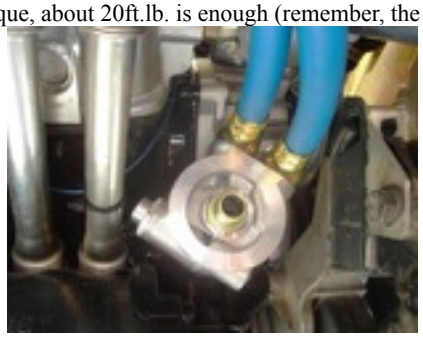
Install the Hose Bracket (bracket supplied is not the same as shown in pictures)**:**

Bolt the hose bracket to the water outlet flange on the forward side of the left cylinder head. On your 1.9 wbx, this flange will be closed off with a flat steel cover. Remove the two bolts (usually 6mm Allen head bolts) but leave the cover in place without breaking the seal, and secure the hose bracket over the cover using the longer hex-head bolts and flat washers provided..

When installed the main body of the bracket will be positioned as in the picture below, with the bracket saddle hanging towards the rear of the van. The bolts should be torqued to 18-20ft.lb. Remove the bracket's bolt, top cover, and upper plastic saddle piece and set aside. *(note: new bracket will be oriented as the one in picture below, so the upper part of it points to the rear of van and sloping to the left.)*

Fit the Banjo Adapters to the Sandwich Adapter

Fit one of the copper crush washers to each of the banjo bolts, slip one banjo bolt thru each of the banjo adapter fittings' eye, and slip a second bonded sealing washer over the threaded end of the banjo bolt. Loosely thread the banjo bolts into the sandwich adapter outlet ports. Hold the sandwich adapter as shown in the picture below left. The rubber seal is facing you (towards bottom of picture). I recommend you hold the sandwich adapter in a wooden-jawed vise, or clamped to a tabletop using blocks of wood, a rag, or some other material that won't mar the rubber seal or the machined aluminum filter sealing surface. Tighten the banjo bolts so that the fittings are leaving the sandwich adapter at the angle shown, about ten degrees from perpendicular (hoses are shown rather than adapters, but the angle must be the same). The banjo bolts will torque down firmly and won't turn much further once the fittings are snugged down, so don't apply too much torque, about 20ft.lb. is enough (remember, the bolts are hollow, so they can be broken!)



Remove the engine oil filter and wipe the filter mounting flange clean. Make sure the pipe nipple in the crankcase has not unscrewed, screw it into the case as far as you can by hand, there should be only about 7/8" to 1" exposed. Coat the rubber sealing surface of the sandwich adapter lightly with clean oil, and install the adapter to the engine block's oil flter flange. Tighten the nipple extension screw with the 1" deep socket to about 30-35 ft.lb. The adapter may try to turn as you tighten the extension, if so, loosen and swivel it against the direction of tightening a bit to compensate so that when tight the fittings are in the position shown above right, and are not touching any part of the engine nearby *(once again, hoses are shown but the adapter fittings must be in the same position and angle)*.

Route the Oil Hoses

Make sure the fittings are clean, and use no sealant or tape on them; they thread up dry. Loosely thread the female swivel end fittings to the elbow fittings on the cooler. The hose connected to the top fitting on the oil cooler. is the return hose, so to keep track of it by putting put a wrap of tape on its opposite end. Don't tighten the fittings yet, leave them loose enough that the hoses can swivel at the fittings.

Now run the free ends of both hoses across the engine bay at an angle toward the support bracket and lay both hoses in the bracket saddles. Lay the upper bracket saddle piece over both hoses, fit the top cover and bolt, and run the bolt down just enough to hold it all together.

Then route the free ends of the hoses in a curve around the left end of the engine and thread them onto the banjo adapter fittings. The hose from the upper fitting of the oil cooler. must connect to the forward-most fitting on the sandwich adapter, which is the return port. This is so the thermo-couple senses the temperature of the oil returning to the engine, so that the fan only runs when passive cooling is not enough; otherwise the cooler unit could overcool the oil under some conditions, which is undesirable.

Before tightening the bracket, adjust the position of the oil hoses in the bracket to get the final curve around the end of the engine as shown at left, so that the hoses curve smoothly without actually touching the valve cover, cylinder head, or the side of the engine bay *(bracket supplied is not the same as shown in pictures).*

Once the curve of the hoses is set and they are secured in the bracket, you can tighten the swivel fittings at the oil cooler, using the two 22mm (7/8") open-end wrenches. *Always hold another wrench on the stationary fitting in order not to stress the hex bosses of cooler itself; they can be broken off easily!* The spin-on fittings don't need to be very tight; this type of fitting makes a good seal dry with only moderate torque., about 15-20 ft.lb. Then tighten the fittings at the sandwich adapter as well (a counter-wrench isn't needed here, but do not overtighten.

Install Intake Duct Hose

The air filter housing's inlet horn has to be cut off partly to fit the intake air flex hose to it. Saw off the curved end of the inlet horn just after the start of the curve. The altered air horn will look like the picture below left

Refit the air filter box to the vehicle, reconnect and tighten the S-boot clamp to the AFM, and be sure the AFM connector is reconnected firmly.

Insert the free end of the duct hose thru the oval hole in the rear cooler support plate and slide it thru, as shown below left. Fit the flex hose to the altered air inlet horn and secure with the #40 hose clamp provided. This assures the engine will get fresh cool air from the D-pillar vent instead of hot air from the engine compartment.

Install Wiring

The bundle of four wires should extend alongside the oil hoses toward the alternator. The red wire with large ring terminal should be attached to the main positive post on the alternator, the stud with two thick red wires already bolted to it. *Be careful when working on this connection because it is direct to the battery with no fusing; as a precaution you should disconnect the ground cable from the vehicle battery first.* You can use an extra M8 x 1.25 hex nut to secure the ring terminal to the alternator post if there are enough threads exposed, otherwise remove the nut that is there and add the ring terminal to the others on the post and secure with the nut.

The black wire with small ring terminal is grounded; it can attach to any of the alternator chassis thru-bolts, there are several around the perimeter of the chassis. Slip the ring terminal over the bolt end and secure with the M5 nut and washer provided.

Lastly, the yellow wire has to be connected to a switched 12V power supply, so that the fan will only run when the ignition is on. There are two locations close to the oil cooler where this can be attached:

On most Vanagons equipped with power steering, there is a P/S pressure switch mounted to the P/S pump, just to the right and below the alternator (pic at left). Disconnect the two wires from the pressure switch, connect your testlight or voltmeter to ground, switch on the ignition, and probe both wires; one should go hot, the other does not. Mark the hot wire with tape or marker, turn the ignition back off, and push the hot wire's connector onto the yellow wire's piggyback connector. Now the ganged wires and the other wire can be reattached to the pressure switch. It doesn't matter which spades on the switch they go to, it has no polarity.

If the van doesn't have P/S or doesn't have a P/S pressure switch, you will connect the yellow wire inline with the fuel pump power connector. The fuel pump power wire exits the engine bay thru a small opening in the right-forward corner, directly forward of the air filter housing. Find the fuel pump power wire connector there, disconnect, and connect the male and female connectors of the yellow oil cooler power wire adapter inline., as is shown in the picture at left.

The green wire is unused in this application. It is a positive trigger wire; applying positive power to it would make the fan run regardless of temp.

Priming, Starting, Leak-Checking
If your 1.9 wbx has the stock exhaust pipes, you will need to use a shorter filter. The filter to fit any year Saab 900 or 9000 will fit and has the correct specs for the wbx.

Prefill your oil filter with clean oil and reinstall hand tight. The filter seals swell in use so the filter will become tighter, so it's important not to overtighten when installing. Overtightening the filter may result in the sandwich adapter moving or the spigot extension fitting loosening when you try to remove the filter. If this ever occurs, recheck the sandwich adapter position and tightness of the spigot extension fitting before installing the filter again, and use less torque on the filter next time.

Start the engine and shut down after the oil pressure warning light goes out. The oil cooler will self-prime when the engine runs, and doesn't need any air bleeding, nor does it need to be specially drained during a routine oil change. It adds about 1 pint (~500ml) to the engine oil capacity. After getting oil pressure, let the oil settle for several minutes and check the level, you will probably need to add about a pint of oil to bring the level back up after the cooler circuit is filled.

As always with waterboxer engines, the oil level should not be filled to the top notch on the dipstick, but instead kept between the notches, closer to the lower notch is generally a better level to keep the oil at. The cooler will not effect where you keep the oil level once it has been primed.

I like to leave the taillight assembly out until the engine has been run warm, so I can more easily check that all the oil cooler fittings are leak-free. Once you have verified that, reconnect and remount the tailight assembly.

The cooler takes advantage of ram-air flow down the D-pillar when the van is moving, which at speeds above 30mph is quite adequate to keep the oil at less than 225F under most conditions. At lower speeds, rpms are generally lower and the oil doesn't heat up much.

The thermostatic valve in the sandwich adapter allows for quick warmup and prevents overcooling because it allows oil to bypass the cooler until the oil temp has reached 180F (82C), but even while the bypass is open it creates a slow flow of oil thru the cooler circuit so the cooler is not holding a slug of cold oil when full flow is diverted to it.

The fan comes in when oil temp climbs but roadspeed is too slow to produce good ram air flow thru the cooler, such as when slowly climbing rough backroads in low gears with relatively high engine rpms.

Notes on oil hoses: Handle the oil hoses gently, avoid kinking or sharp bends. Take care when using any sharp tool near hoses. When installing, avoid forcing hoses to bend within 2" of the end fitting.

Hoses should be inspected regularly for physical damage, loose fittings, or developing leaks. Hoses can be kept clean by wiping down with a rag sprayed with WD40.

The oil hoses can be bundled together with wire ties at intervals, and the controller wire bundle tied along the hoses between the cooler and alternator. Additional protection such as sleeve wraps can be applied as you see fit. One place that I think it is wise to cover them with something fairly tough is where they cross the plane of the engine drive belts above the alternator, so they aren't lacerated if a belt gets thrown or breaks. Some heavy polyethylene plastic cut from a container, or some aluminum flashing sheet can be used to make a sleeve around both hoses there, held in place by zip-ties. Be careful that anything used to cover hoses does not have sharp edges that could lacerate them.

All hoses have a limited service life, these can be expected to provide good service for about 6 years, regardless of mileage. I can supply replacements on request for a reasonable cost.

If leaks develop near the swivel ends where oil begins to seep from between the rubber and the fitting barb, a common ¾" hose clamp placed around the hose within about ¼" of the end of the rubber, and tightened gently, will stop the seepage and can be used that way as long as needed.

Enjoy your Vanistan oil cooler!
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