

Version: 1.1

Volvo 850 / V70 / S70: Procedure for replacing air conditioner evaporator

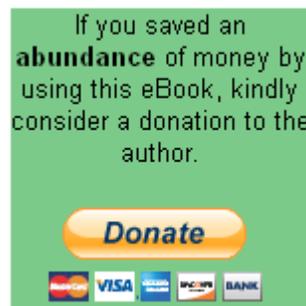
I hope that you find this document useful, whether for performing your own repair, or for guidance (or even additional help) for working with your independent mechanic.

I wrote this guide because I wanted to try to help other folks avoid a costly dealer repair bill for their beloved Volvo. These cars are wonderfully built, safe and excellent performing vehicles. Unfortunately, they do have a few weaknesses; the air conditioner evaporator being one of the most expensive – if you have your dealer perform the repair.

Please do not be offended by my request for a donation – but keep in mind that the directions I've provided here are designed to save you a tremendous amount of money by giving you the confidence and insight to complete this repair on your own. I really don't like it when websites charge money for content, so I elected to provide this guide completely free of charge.

However, if you find that instead of paying your Volvo dealer \$1500 to \$1900 to have this repair done you finished it with a few simple hand tools and under \$300 worth of parts, you may be wondering *“how can I thank that guy from woodjoiner.com for the time he took to not only document this repair, but to publish it for free?”*

If you are so moved, I would be humbly grateful for any token of appreciation you may wish to render, via a nominal PayPal donation. Please visit www.woodjoiner.com/volvo/ to do so. If anything, it will help prove to my wife that people are indeed thankful for all the time I spend on the internet providing help and advice :-)



With kind regards,
-CC

Vehicle used in this document: 1997 850GLT Wagon

Precautions:

1. This is not a difficult repair, however it is very time consuming and it requires disconnecting electrical systems within the vehicle – including the front airbags. It also suggests having the front end of the vehicle jacked up off the ground, to allow the steering wheel to freely turn as part of its removal. **If in doubt, bring the vehicle to an authorized repair center to have this work done.**
2. It will likely take more than one day to complete this repair. During this time, the ignition key will be in the steering column cylinder, and depending on when your workday ends, you may have to leave the vehicle unattended with the key inside. Be sure to have an extra key handy so you can mechanically lock and unlock the vehicle, to prevent theft, if the vehicle is left in an unsecured area.
3. Removing the dashboard from the vehicle may require two people, at the point when the dashboard is to be physically lifted out of the vehicle.
4. Do not vent the AC system directly to the outdoors. It is in violation of federal law to knowingly allow refrigerant gases to escape to the atmosphere. Significant criminal and/or civil penalties may be incurred. The evacuation and reclamation of the refrigerant gas in the vehicle must be performed by a licensed repair facility.
5. If you do undertake this repair, be sure to follow the battery reconnection process described in this document at step #9 – to avoid setting the vehicle's SRS error light (which can only be reset by the Volvo dealer).

Warning: Performing this repair may cause the vehicle's airbag(s) to accidentally deploy. While a rare occurrence, there is nonetheless the risk of this happening. Accidentally re-energizing the vehicle's electrical system, local electrostatic discharge, improperly re-installing the airbag(s), or other events may cause the airbag(s) to deploy. While working near the airbag(s), never put yourself or anyone else in the "line of sight" of deployment of the airbag(s). When removing the airbag, always hold it or carry it with the cover facing away from your body. Never place the removed airbag on a metal surface. Never use an ohmmeter to check the resistance across the wiring pins of an airbag. Never allow children or animals near a disconnected airbag. Severe personal injury or death can result from a close-range deployment of an airbag.

If in doubt about ANY aspect of this repair, as it relates to the vehicle's airbag(s) or control circuitry, consult your Volvo dealer to have this repair work done.

The procedure to replace the evaporator in this vehicle is broken down into ten overall steps:

1. Perform the preliminary preparation.
2. Perform the under-hood disconnects.
3. Remove the center console.
4. Remove the steering wheel.
5. Remove the dashboard.
6. Remove the knee bolsters.
7. Disconnect and remove the climate control unit.
8. Replace the evaporator, within the climate control unit.
9. Reassemble.
10. Pump down and recharge the air conditioning system.

Tools Required:

- a. 3/8" and 1/4" socket drivers
- b. 3/8" and 1/4" socket extensions
- c. Torx™ bits 1/4" drive: T15, T20, T25
- d. Torx 3" long bit: T30
- e. Torx 6" long bit, or screwdriver: T15
- f. 3/8" standard sockets: 18mm, 13mm, 12mm, 10mm
- g. 1/4" standard socket: 8mm
- h. 3/8" Allen (hex) bit: 6mm
- i. 1/4" blade standard screwdriver
- j. Small jewelers screwdriver, or mechanic's pick (for removing glove box guides)
- k. Very small Allen™ wrench (1/32"), or machinist's drift (for removing ignition key cylinder)
- l. Wire cutters
- m. Long-nosed pliers
- n. Large pliers, or slip-joint pliers (for releasing drain hose clamps on cowling cover)
- o. Set of Garter spring connection release tools (1/2" and 5/8" required) Snap-on tool # ACT118B, or equivalent.

- p. Suitable automotive jack and jack stands (ramps will not work)
- q. A Sharpie™ fine-point marker
- r. A suitable container for keeping removed parts and hardware
- s. Blankets or plastic for protecting the vehicle's seats and carpeting
- t. A bucket or suitable container for catching any spilled engine coolant

Optional Tools (for convenience):

- a. Torx screwdrivers T15, T25
- b. Small right-angle ratchet drive screwdriver, with Torx bits T15 and T25, and Philips bit
- c. A set of 3/8" deep metric sockets
- d. A digital camera for recording component locations and wiring routes



Consumables required:

- a. Appropriate PAG oil, as specified by the Volvo dealer (based on manufacturer of AC compressor for the year/model vehicle you are repairing). See Appendix A for more details.
- b. Penetrating oil, for releasing rusted under-hood parts
- c. Evaporator o-rings (there are two on each port!)
- d. Heater core junction o-rings (and optionally spacers and retaining clips)
- e. Nylon cable ties
- f. Cabin fresh-air pollen filter and retaining bracket (as per engineering change, if not already present on vehicle)
- g. Replacement evaporator
- h. Replacement receiver/drier and o-rings (optional, but highly recommended)
- i. Replacement heater core (optional, if needed)

Optional work items:

- a. Replace AC receiver/drier (also called accumulator) – this is not required, but it is highly recommended.
- b. Replace any burned out bulbs in instrument panel or center console.
- c. Perform instrument cluster odometer gear repair.
- d. Replace heater core.
- e. Upgrade stereo system and/or dashboard speakers.
- f. Any other in-dash wiring (GPS antenna, mobile phone, hood lock cable, etc. Now is your chance!

Step 1: Preliminary Preparation:

- a. Study these instructions in entirety.
- b. Have the vehicle's air conditioning system evacuated by a qualified licensed repair facility.
- c. If your radio has a security code, make sure you have it since you will be disconnecting the vehicle's battery.
- d. Acquire the necessary tools and consumables to complete the repair.
- e. Locate a suitable, well-lighted work area, preferably indoors on a level surface suitable for jacking the front of the vehicle off the ground.
- f. Solicit the help of a friend, if required.
- g. If equipped with electrically operated seats, move the both the driver and passenger seats as far back from the dashboard as possible.
- h. Make sure the fresh air damper is not set to 'recirculation'.

This completes Step 1.

Step 2: Perform under-hood disconnects:

- a. Disconnect and remove the battery from the vehicle. Some instructions suggest only disconnecting the negative battery lead, however it has been my experience that this is not safe enough. The negative battery lead tends to have a 'memory' and may flex back into position and inadvertently touch the negative battery terminal. Tying down or clamping the negative lead away from the battery is also an alternative.
- b. Remove the windshield wiper arms, and plastic cowling cover:
 1. Remove windshield wiper arm nuts.
 2. Remove five Torx screws holding down the plastic cowling cover.
 3. Release the hose clamps which retain the two cowling cover drainage hoses.

4. Pull the hoses off from the cowling cover (note: be sure the hose clamps don't slip down to the bottom of the hoses; it is very difficult to retrieve them – especially the one on the driver side of the vehicle).
5. Pull the cowling cover toward the front of the vehicle, and remove it.



- d. Remove the four bolts (or screws) that retain the top of the dashboard:

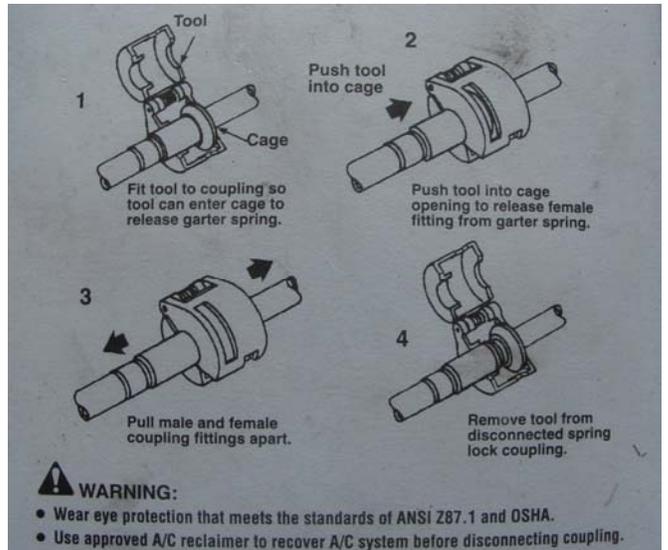


- e. Move to the front right side of the vehicle, and locate the AC fixed line and accumulator bracket hold-down bolt (it is a 6mm Allen hex-head bolt), located on the body of the vehicle, near the windshield washer reservoir. Remove this bolt:

- c. Remove the windshield wiper mechanism:
 1. Remove the two nuts holding down the mechanism
 2. Disconnect the two electrical connectors
 3. Pull the mechanism out of the rubber retaining grommet, and remove it from the vehicle.



- f. Disconnect the evaporator.
1. Move to the right side firewall, and locate the evaporator inlet and outlet pipes. Using the Garter spring release tools, disconnect the fixed lines from the evaporator. Also, disconnect the single electrical connection from the sensor on the low pressure line. If the junction has the protective plastic ring in place, move it aside before attempting to employ the spring release tool (see the white ring shown in the next photo). Be sure the spring release tool is inserted correctly, with the “cage” side of the tool facing toward the front of the vehicle (see the photo of the instructions for the tool). Pull the tool into the spring, which expands the spring and separates it from the flanged end of the junction – allowing the junction to be pulled apart. If the junction is has significant internal corrosion, it may be difficult to separate. Penetrating oil may help. Normally, only a remedial amount of pulling force is required. Do not attempt to use any pliers, or pry bars to separate the junction – you may damage the fixed AC lines, or some other part of the vehicle.
 2. Remove the single nut that retains the evaporator pipe retaining bracket, and remove the bracket and rubber gasket from the firewall.



Tip: Cover the ends of the exposed fixed pipes with small plastic bags, and a suitable rubber band or cable tie, to block off the fixed pipes from absorbing moisture from external air.

- g. Move to the left side of the vehicle, and locate the heater core inlet and outlet hoses, at the firewall.

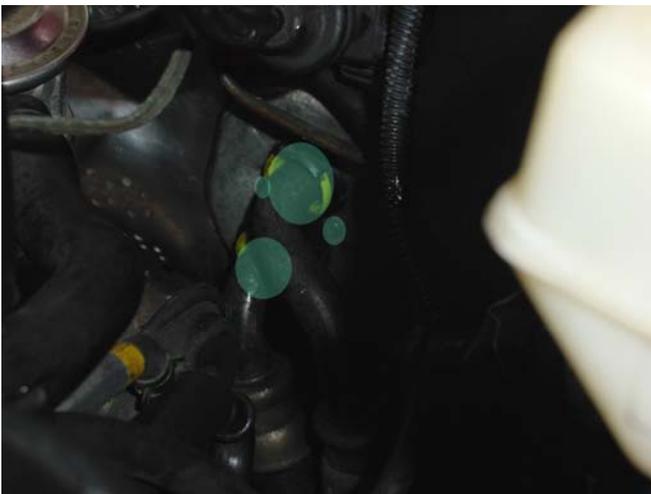
At this point you will need to do one of the following, to keep the engine coolant from spilling.

1. Drain the cooling system.
2. or, clamp the hoses.
3. or, plug the ends of the hoses
4. or, place a bucket or container under the vehicle, to catch any spilled engine coolant – and when disconnecting the hoses from the firewall junction, pull them up slightly (thus reducing the amount of coolant loss).

Tip: I personally prefer the last option, as I do not like to mechanically clamp or plug the hoses, since there is a chance of damaging them. Draining the system will work, but seems to be overkill.

Firmly grasp the plastic retaining ring (yellow ring, in the next photo), and push it into the firewall fitting while squeezing the retainer closed at the same time. Then, pull the ring and hose away from the firewall, thus disconnecting the hose from the fitting.

Next, remove the two Philips head screws from the heater core junction retaining bracket, and remove the bracket and rubber gasket from the firewall.



Tip: If you have a wet/dry shop vacuum you may want to suck out the remaining engine coolant from the heater core, at this point. This makes removing the climate control unit from the interior of the vehicle less prone to spilling coolant in the passenger compartment.

Tip: Optionally (but HIGHLY recommended), at this point you may wish to replace the receiver/drier, which is located at the front right side of the vehicle, under the area where you removed its retaining bracket 6mm Allen bolt. You'll need to jack the vehicle up in front, and remove the protective splash guard from under the radiator. Loosen the 10mm bolt that retains the receiver/drier to its bracket, and disconnect the inlet and outlet hoses (you'll need to use your Garter spring disconnect tool on the smaller hose). The larger pipe can be a real chore to loosen - I believe it is a 26mm or 28mm fitting. Be sure you have a replacement receiver/drier on hand, as well as enough of the proper viscosity PAG oil to replace the oil that is contained in the old receiver/drier. I just spilled out the old oil into a graduated container so I could directly read the amount of oil I needed to replace. If unsure, three ounces of oil is normally found in the receiver/drier. Be sure to use new o-rings, and lubricate the o-rings with PAG oil before reassembling. Reassemble quickly, as you do not want the internals of the receiver/drier or the compressor piping to be exposed to outside air for too long.

This completes Step 2.

Step 3: Remove the center console

- a. Open the armrest storage compartment, and pry up the parking brake adjuster access cover.



- c. In the front courtesy compartment of the console, locate the OBD-II connector cover, and pry it off. Under this cover you will find one of two retaining screws that need to be removed. The other screw is located near the 12v accessory receptacle.



- b. Remove the two console retaining screws found under this cover:



- d. Pry up the front console courtesy compartment. Disconnect the OBD-II connector by sliding it off of its mounting post. Disconnect the 12V accessory receptacle wiring. Remove the bulb/socket. Locate the four remaining screws that hold the center console in place, and remove them. Locate the console electrical connector, and disconnect it.



If your vehicle is a manual transaxle, you may need to unscrew the shift knob. I'm not sure, since my vehicle is an automatic, and the gear selector lever stays in the car, for this repair.

- e. Pry out the decorative cover from beneath the parking brake lever, and pull the parking brake up (to facilitate removing the center console).



- f. Next, pull the center console up from the rear, and toward the back of the vehicle. You will be "tilting" it up and out. Set it aside, in a safe place.

This completes Step 3.

Step 4: Remove the steering wheel

Tip: Some instructions have you perform this step with the vehicle parked, on the ground. I do not recommend this, since you will need to turn the steering wheel 90 degrees in both the left and right directions. Doing this to a stationary vehicle puts tremendous pressure on the steering rack - and can cause damage. I highly recommend that you jack up the front end of the vehicle, and place the frame upon suitably rated jack stands - so that the front wheels are slightly off the ground. Be sure to set the parking brake, and follow all normal precautions when jacking the vehicle off the ground. Never allow the vehicle to be supported only by the jack - always use jack stands.

- a. Put the key in the ignition, and turn it to position 1 (I), so that the steering wheel lock is disengaged.
- b. To avoid damaging the horn, you will remove the Torx screw from the back of the steering wheel, on the RIGHT side, first. Rotate the steering wheel 90 degrees to the left, and locate the hole on the back of the steering wheel where the Torx airbag retaining screw is. Loosen this screw using your long Torx bit. The screw will fully loosen, but it will stay in the back of the steering wheel.
- c. Repeat this procedure for the left side screw.
- d. Carefully pull the airbag away from the front of the steering wheel, and disconnect the airbag connector from the back of the airbag. Place the airbag in an electrically "calm" location (i.e. do not set it on a metal counter, or on the ground. A paper shopping bag, then stowed in the back seat of the vehicle is a reasonable method).
- e. There is a plastic strip with writing on it attached to the airbag wiring connector. Pry the T20 screw from the end of this strip, out of the rubber base within the steering wheel, but leave the T20 screw in the plastic strip.
- f. Set the steering wheel in the dead-ahead position.

- g. Remove the 18mm bolt holding the steering wheel in place - but DO NOT remove the steering wheel. First, clean off the splined end of the steering wheel mounting shaft, and use your Sharpie marker to mark both the splined end and the steering wheel receiver - thus establishing a locating mark to assure that you can replace the steering wheel in the exact splined-tooth position from where it was removed.
- h. Pull the steering wheel off, being careful to feed the airbag wiring and plastic strip through the hole in the steering wheel. Note that when reassembling, the wiring junction on the rotating collar below the steering wheel will need to be in approximately the one o'clock position.
- i. Set the steering wheel aside, in a safe place.
- j. If you jacked it up, lower the vehicle back down to ground.

Tip: Note that when reassembling, you will tighten the RIGHT side airbag retaining screw first, to assure that the horn will work properly.

This completes Step 4.

Step 5: Remove the dashboard

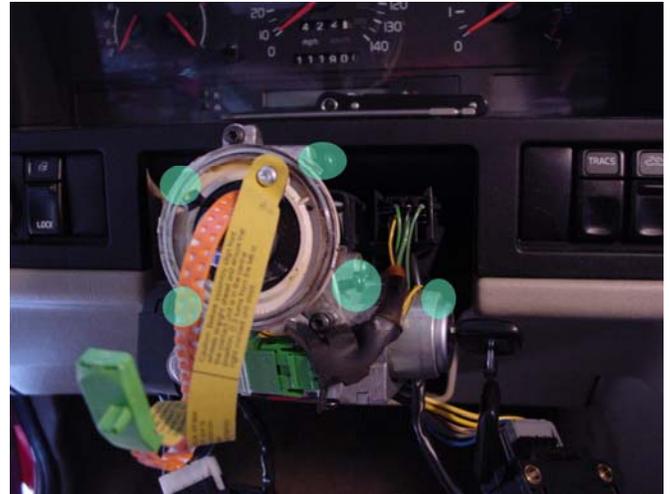
Tip: After removing screws, partially thread them back where they belong - so you know where they go, and they don't get lost.

- a. Remove the decorative trim panel below the steering wheel. Remove the four Torx screws from the lower steering wheel housing cover. The two screws closest to the steering wheel are in deep wells within this housing cover, and will require your long Torx T15 screwdriver or bit. Remove both the top and bottom housing covers. You may need to put the vehicle in 'park' and remove the ignition key to make it easier to remove the top housing cover.

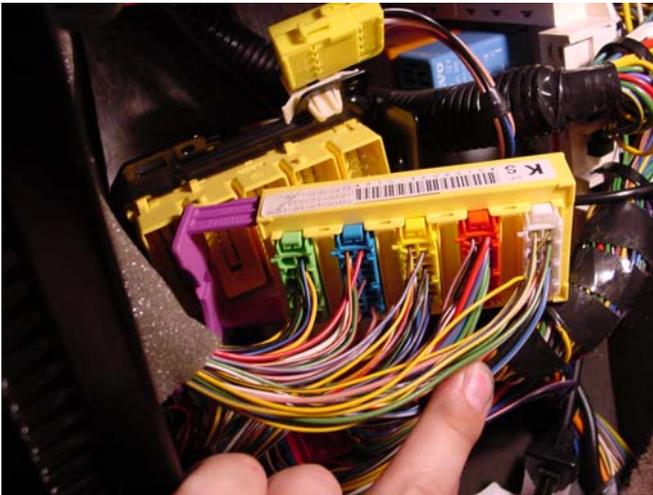


- b. Unscrew the Torx screws that retain the turn signal stalk and the wiper control stalk. Leave the controls hanging, and thread the Torx screws back into the receiver, for safekeeping.
- c. Put the key back in the ignition. Make sure the gear selector is in the furthest aft position (e.g. drive 'L'). This is to assure that when removing the dashboard you have clearance and will not be blocked by the gear selector.

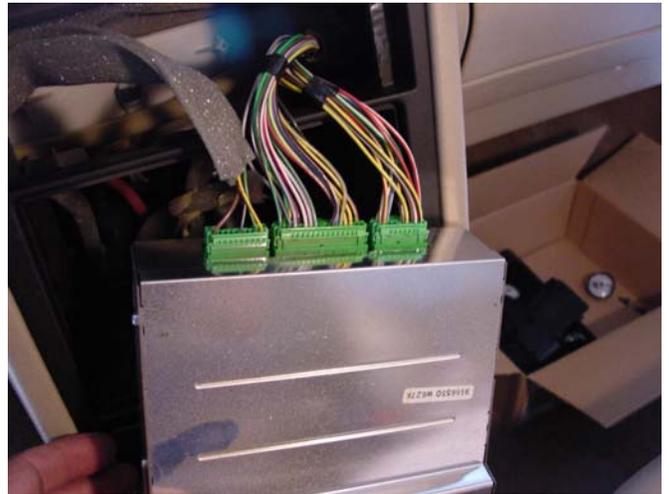
- d. Locate the release hole at the top of the ignition key cylinder housing. Using a small drift or a small Allen wrench, press into this hole and "wiggle" the ignition key until the entire cylinder assembly comes out of the retainer. Store the key and cylinder in a safe location.
- e. Put the airbag retaining strip (T20 screw) into the temporary storage location on the rotating contact ring, so that the airbag connector is not hanging/flopping around and likely to be caught upon and damaged:



- f. Now working underneath the dashboard on the left side, look up at the wiring connector blocks found up behind the knee bolster. There are three of these large connector blocks. The one closest to the passenger side of the vehicle needs to be unplugged. These are “zero force” connectors, and are disengaged by pulling out the end tab mechanism from the short end of the connector block, and simply separating the block from its receiver. The tab I am referring to is the purple tab in the next photo:



- h. Remove the climate control interface. If it's an electronic unit, this is very simple: push on the back of the unit by reaching up from behind the radio cavity, and “pop” the climate control interface out of the dashboard. Then, disconnect the electrical connectors on the back of it. If it is a non-electronic unit, you'll have to remove the knobs on the front of the unit and remove the Torx screws found underneath them. You'll also have to remove two additional screws once you push the cover of the unit off, from the back.



- g. Remove the radio. If it is a factory radio, this is very simple. Locate the indented release levers on either side of the face of the radio, and press them in using a standard screwdriver (careful to not scratch the radio). The lever will press in, then “pop” out – allowing you to pull the radio from its receiving cage. Then, unplug the electrical connectors from the back of the radio.

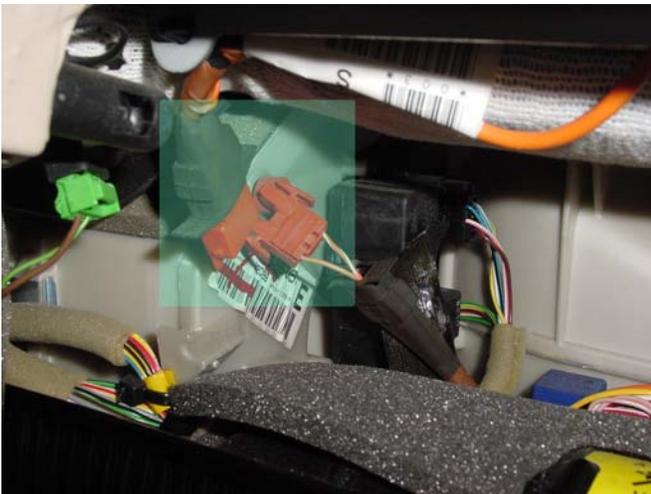
- i. Move to the right side of the passenger compartment, and remove the decorative panel below the glove box.



- j. Open the glove box, and remove the retaining arms by pushing a small (very small) screwdriver or mechanic's pick into the slot on the glove box cover, to release the retaining arms. Remove all the Torx screws that hold the glove box itself into the dashboard.



- k. Once the glove box is removed, locate the airbag connector, and disconnect it.



- l. Locate the two bottom dashboard retaining bolts, one on each side of the passenger compartment – and remove them.



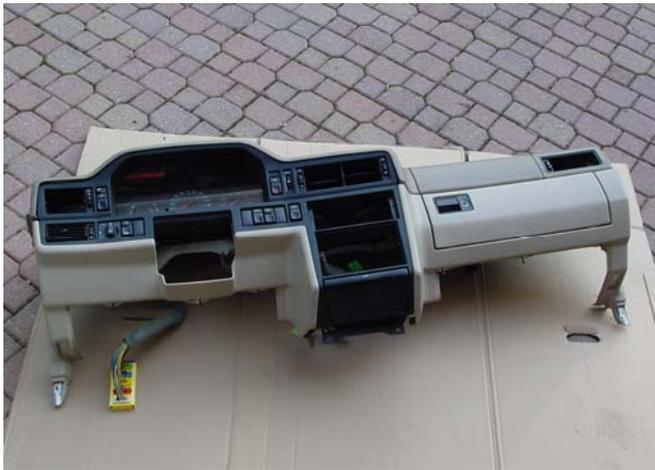
At this point, the dashboard is ready to be lifted out of the vehicle.

Tip: Notice that I did NOT remove the top of the dashboard. This is an optional exercise that can be more easily accomplished once the dashboard is removed from the vehicle. You may wish to do this if you want to remove the instrument cluster, to repair the odometer or replace burned out bulbs (for example). Removing the top of the dashboard is well documented at various websites, so it will not be repeated here. It simply involves removing the top row of air vents, the two side defogger vents, the dashboard speakers, and all the Torx screws holding the top of the dashboard in place.

It's a good idea to have a friend help you maneuver the dashboard out of the vehicle. One person can lift either side of the dashboard by sliding it toward the rear of the vehicle first, then tilting it from the top toward the back of the vehicle, assuring clearance of the turn signal and wiper control stalks as well as the gear selector lever. Be sure that you are working "together" and one person is not placing opposing torque to the other, on the dashboard. It is easy to warp the top of the dashboard, or crack it.

Check carefully for any hoses, cables, or wires which might still be attached to the dashboard, as you lift it out. Your vehicle may be different than mine – and there may be additional connections!

Here is what your interior ought to look like now that the dashboard is removed:



This completes step 5.

Tip: Before lifting the dashboard out of the vehicle, it's a good idea to have a place to store it picked out. I used a large sheet of cardboard, out on my driveway (later moved to inside the garage). You'll see in the above photo that I had already removed the top vents in preparation for removing the top section of the dashboard.

Step 6: Remove the knee bolsters.

- a. First, peel back the carpeting from each side of the center console, and locate and remove the stiff backer boards found underneath this area of the carpeting.
- b. Next, remove the nut from the inside (closest to the center console) of the knee bolster which retains it to the climate control system housing, near the rear seat vent ducts.
- c. Next, remove the two bolts that retain the knee bolster to the body of the vehicle, near the front door hinges.
- d. Next, remove the bolt (single bolt on the right side bolster, two bolts on the left side bolster) that retains the bolster to the body of the vehicle, near the base of the center console.
- e. The knee bolster should now be able to be lifted out of the vehicle. Perform this procedure for both the left and right bolsters.



This completes Step 6.

Step 7: Disconnect and remove the climate control unit

Tip: After removing screws, partially thread them back where they belong - so you know where they go, and they don't get lost.

- a. Pull the wiring (but do not disconnect it) away from the blower motor, and locate the Torx screws that retain the blower motor. Remove the blower motor and allow it to hang freely inside the passenger compartment.
- b. Tucked up next to the blower motor, on the right side, is another one of those large "zero force" multi connectors. You can barely see its purple pull-tab in the following photo. You may wish to pull this connector out of the way, to make removing the climate control unit easier (you do NOT have to disconnect the connector).



- c. Now, working toward the left of the blower motor, twist and remove the small sensor, then remove the single Torx screw that retains the blower resistor module, then remove the three Torx screws that retain the relay bracket. Let these items swing freely into the passenger compartment, once removed.



- d. Disconnect the electrical connectors from both of the damper control motors on the right side of the climate control unit. In the following photo, one of these connectors has already been disconnected (and is highlighted). The other is still attached to its damper motor.



- e. Now, moving to the two rear seat ducts at the center console cut the two wire ties that go around those large air ducts. Be very careful to NOT accidentally cut any wires! That wire in the orange flex tubing is for the driver's airbag.
- f. Pull the air ducts away from the climate control system.



- g. Now, moving to the left side of the vehicle, locate the wire tie that is holding the airbag wire flex tubing to the steering receiver. Cut this wire tie – but be careful to not ruin the plug-in base of the wire tie (you can reuse it with a new wire tie, later).

- h. Remove the brace from the left side of the steering receiver. Not shown in the photo, there is another bolt securing the left side of that brace to the vehicle. Remove the brace entirely.



- i. Now that the airbag wire flex tubing is free, carefully pull it up and around the front of the steering receiver. You want it to “drape” loosely underneath the steering assembly.
- j. Next, look underneath the steering assembly, on the side of the climate control system housing. You'll see the vacuum device for the cruise control, which is held to the climate control system housing with a single Torx screw. Remove this screw, and allow the cruise control vacuum device to swing freely, away from the climate control system housing.



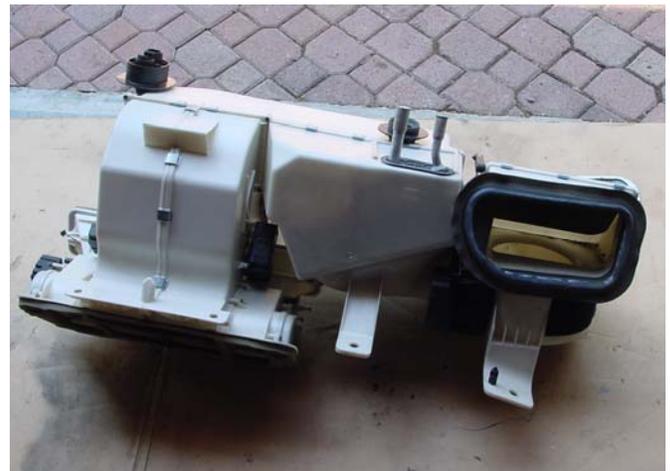
- k. Now, looking at the top of the climate control system housing, locate the four bolts that retain it to the body of the vehicle, underneath the windshield. Remove these bolts. Also, look underneath the climate control system housing and disconnect the condensate drain line (it simply pulls up from the floor of the vehicle). Be careful that there may be water and/or engine coolant in this line – don't allow it to leak onto the carpeting.



At this point, the climate control system can be lifted out of the vehicle. Pull it toward the back of the vehicle, making sure that the evaporator and heater core inlet/outlet pipes clear the firewall. If you did not suck out the engine coolant from the heater core using a shop vacuum, be very careful to keep the entire assembly tilted back from the top, so that any coolant contained in the heater core will not leak out into the interior of the vehicle.

Again, this is best done as a two person job – with one person on either side of the unit, and both people assuring that all wiring has been properly disconnected, and nothing is being 'caught' on the climate control unit as it is being lifted out of the vehicle.

Here are a couple of photos showing what the interior of the vehicle look like once the unit is removed, and a photo showing the unit placed on the driveway:



This completes Step 7.

Step 8: Replace the evaporator, within the climate control unit

- a. Remove the Torx screws and metal spring clips that retain the top of the evaporator housing cover. Then, lift the old evaporator out of the climate control system housing. Remove any rubber gaskets at the inlet/outlet of the evaporator.



Old evaporators are usually pretty fouled up due to Volvo's lack of foresight in supplying a simple paper filter, which would have helped prevent this entire mess in the first place. Here's a photo of the old evaporator next to the new replacement unit:



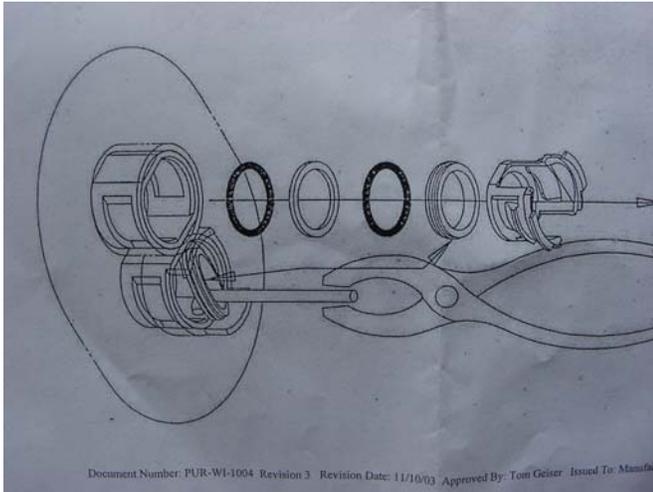
Tip: Note that the replacement is almost identical to the old one - including the retaining clip on the larger pipe, and the angle and spacing of both pipes. This is of critical importance for reassembly - those fixed pipes that go into the evaporator are not too 'forgiving' when it comes to misalignment. Make sure your replacement evaporator is either identical, or you are able to bend the pipes slightly to get them to match the configuration of the old unit.

- b. Before putting the new evaporator in the climate control housing, carefully remove the foam from the old evaporator (I was able to use my fingers to peel it off), then clean it thoroughly and allow it to dry. Next, use some good spray adhesive (3M Super 77 is my favorite), and spray the back of the foam - then apply it to the new evaporator. Some evaporators (i.e. from the Volvo dealer) come with the foam already installed, so you don't have to worry about this step.

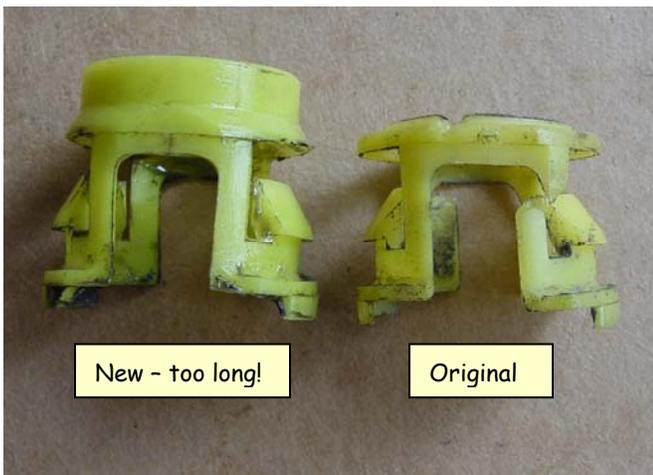


- c. At this point, it's a really good idea to also disassemble the housing around the heater core, and inspect the heater core for any damage or leaking. If you need to replace that heater core NOW is the time to do it!
- d. Also, before replacing the evaporator within the climate control housing, be sure to thoroughly clean out the housing using a good household cleaner. Get rid of any mold, mildew, or other nasty things that may be lurking in there.

- e. Next, be sure to replace the o-rings on the heater core inlet/outlet. I used a kit that included the o-rings and the spacers, as well as the o-ring retainer and the hose-locking clip. Here is what the instructions looked like on the kit:



One problem I ran into was when plugging the heater hoses back into the firewall junction, using the new retaining clips – I found that the new retaining clips were about 3mm longer than the old ones (!). Of course, I found this out after I had cut the old clips off. I had to grind down the new clips to match the size of the old ones. It worked, but in retrospect I should have probably just left the old clips in place.



This completes Step 8.

Step 9: Reassemble

The reinstallation of everything is pretty much the reverse of what was done to disassemble. Here are some things to pay attention to:

- a. Fill the evaporator with 1-2/3 ounces of PAG oil, before putting it back into the climate control housing.
- b. Be careful when putting the climate control system back in. Make sure everything lines up, and that you don't damage the inlet/outlet ports on either the evaporator or the heater core.
- c. Make sure you reroute the airbag wiring around the steering assembly the right way, and use a wire tie to hold it in place.
- d. Be sure to reinstall the other wire ties, as required. Route all wiring carefully.
- e. Be very careful with the dashboard – especially the bolt tabs at the leading edge (which receive the through-firewall bolts). If you break any one of them you'll have to either replace the dashboard, or effect a complex repair (using Fiberglas).
- f. When reinstalling the four bolts that go through the firewall, into the dashboard tabs, start with the bolts closest to the vehicle doors, first. With the doors open, reach in and grasp the dashboard as you tighten those bolts – to assure that the dashboard is seated correctly. Then, tighten the inner bolts.
- g. Be sure to use new o-rings on the evaporator fixed pipes that go into the evaporator from within the engine compartment. Don't use cheap "generic" o-rings – get the real ones from Volvo.
- h. Make sure you lubricate the o-rings with PAG oil before reassembly.
- i. Torque everything appropriately. Check with the Volvo dealer, if unsure.
- j. Make sure you line the steering wheel up using the marks you made previously.
- k. Put in that new cabin filter and retaining bracket. This will keep your new evaporator healthy. Here's what it looks like:



Step 10: Pump down and recharge the air conditioning system

I'm not going to go into any detail here... suffice to say that your system needs to be pumped down and refilled with the correct amount of R134a. I have a friend who has the equipment and know-how to do this, so I'm going to leverage his help. Otherwise, I would probably have tried to rent the equipment to do it myself, or have an air conditioning specialist do it.

This completes Step 10.

Congratulations! If all went according to plan, you should now have an air conditioning system that is no longer leaking through the rotted-out evaporator.

- I. Be sure to follow the battery reconnection procedure correctly:

Warning: Nobody should be in the vehicle. The ignition switch must be in position 2 (II). First reconnect and tighten the positive battery lead, then quickly snap the negative battery lead in place, and tighten it. Next, switch the ignition off then on again, and check to see that the SRS error light on the instrument panel goes off after about ten seconds.

Interior – completely reassembled:



This completes Step 9.

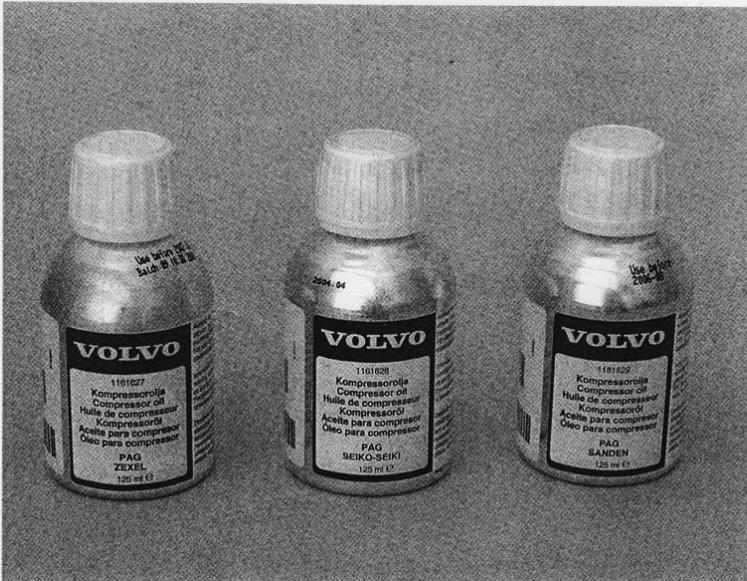
Appendix A: Volvo PAG viscosity

A question often comes up: How do I tell which viscosity replacement PAG oil I should use?

The manufacturer of the AC compressor dictates which type of oil to use. Volvo used compressors from four different manufacturers in cars from this timeframe:

- Zexel
- Visteon
- Sanden
- Seiko-Seiki

It's very important to use the correct viscosity replacement oil – you risk burning out the compressor if you use the incorrect oil. The best way to tell is to find the manufacturer's name on the compressor, and to refer to the following Volvo chart:



Zexel			
125 ml		1161 627-3	
Visteon			
125 ml		1161 627-3	
Sanden			
125 ml		1161 629-9	
Seiko-Seiki			
125 ml		1161 628-1	

A synthetic PAG compressor oil intended for AC compressors which use R134a.
 The oil is sold with different part numbers, depending on the make of compressor.
 Since the oil is strongly hygroscopic (absorbs water), opened packages must be used up at once.

Technical data

	627	628	629
Density at 15° C (59° F):	1005 kg/m ³	1024 kg/m ³	1018 kg/m ³
Base:	Polyalkylene glycol	Polyalkylene glycol	Polyalkylene glycol
Lowest flow point:	-50°C	-45°C	-50°C
Flash point:	+232°C	+244°C	+250°C
Viscosity at 40°C:	45.36 mm ² /s	95.60 mm ² /s	98.77 mm ² /s
Viscosity at 100°C:	9.948 mm ² /s	19.28 mm ² /s	19.56 mm ² /s

As you can see, there are three different viscosity oils available. Find the manufacturer on the chart, then based on the three-digit code find the oil in the table. You can order the oil from your local Volvo dealer, and chances are their parts department may regularly stock it.

Sometimes you can't find the manufacturer name on the compressor. I know on the Zexel, the name is printed on the rotating clutch assembly – so depending on how your clutch stopped rotating you may or may not be able to see the name. It takes hunting, in some cases.

If you really get stuck and can't figure out which model compressor you have – or if you need to buy your PAG oil from an auto parts store instead of the dealer, here is a “poor man's” approach to figuring out which viscosity oil you currently have in your system:

Oil Viscosity Timing Test:

You need one container each of the new oils. I bought the cheap stuff from the parts store; they are marked "low", "medium" and "high" viscosity. They also have the ISO numbers marked on them 46, 100 and 150. I have no idea how those numbers relate to the Volvo viscosity specs, so I assumed that there really aren't that many manufacturers of PAG oil, and they probably all follow the same specs.

Next, pour out a sample of each of the oils into a similar container, to the same level as your unknown oil.

Have a stopwatch or a watch with a second hand ready. Dip a paint stick into the unknown oil, and pull it up. When the oil stops streaming off the stick and starts to drip start counting the number of drips and see how many drips you get in a 20 second time period.

Do this same exact procedure for the three known oils you have. The one that gives the closest number of drips to the unknown oil is the one that matches.

In my case, it was clearly the "low" viscosity oil. I think it would be hard to tell between the medium and high, since their specs are a lot closer together. By the same token, I don't think it's as "fatal" to accidentally substitute medium for high or the other way around.

Like I said, it's always best to determine which model compressor you have and to buy the correct viscosity oil from the Volvo dealer. But, in case that doesn't work out for you there is always the “poor man's” way to do it...