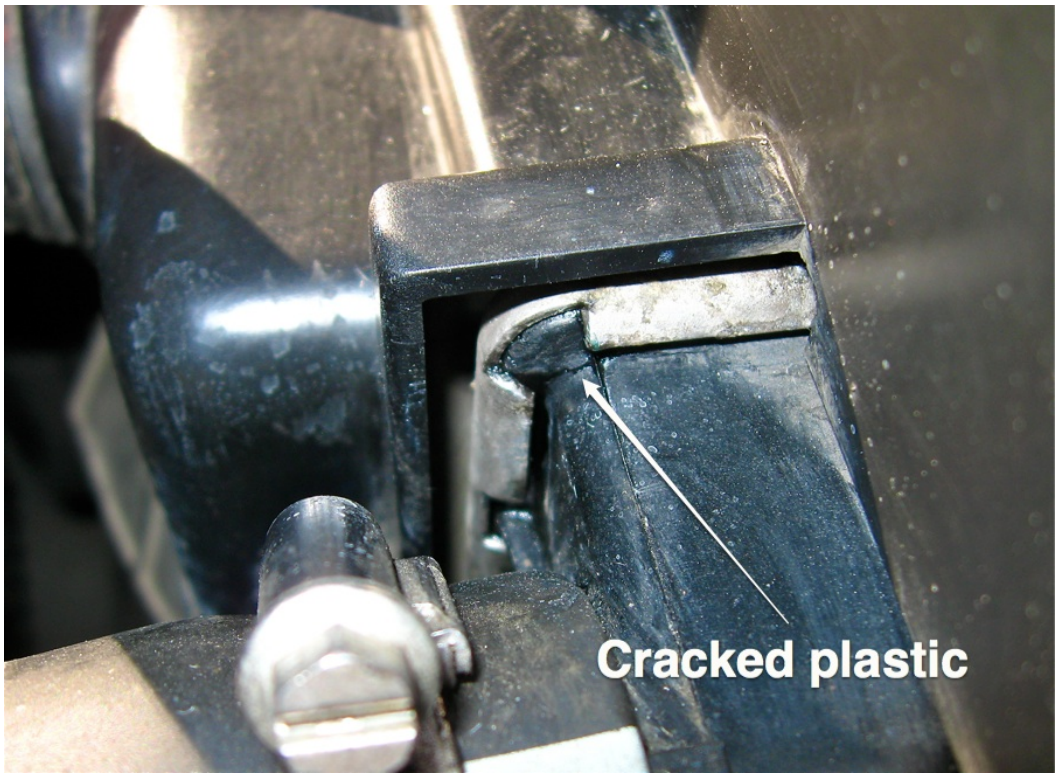
This write up covers removing and replacing the radiator on a '97 855 GLT wagon with light pressure turbo and automatic transmission. This car has 162K miles. The radiator, which was original, developed a crack in the plastic near the metal crimps at corner near the upper coolant inlet.



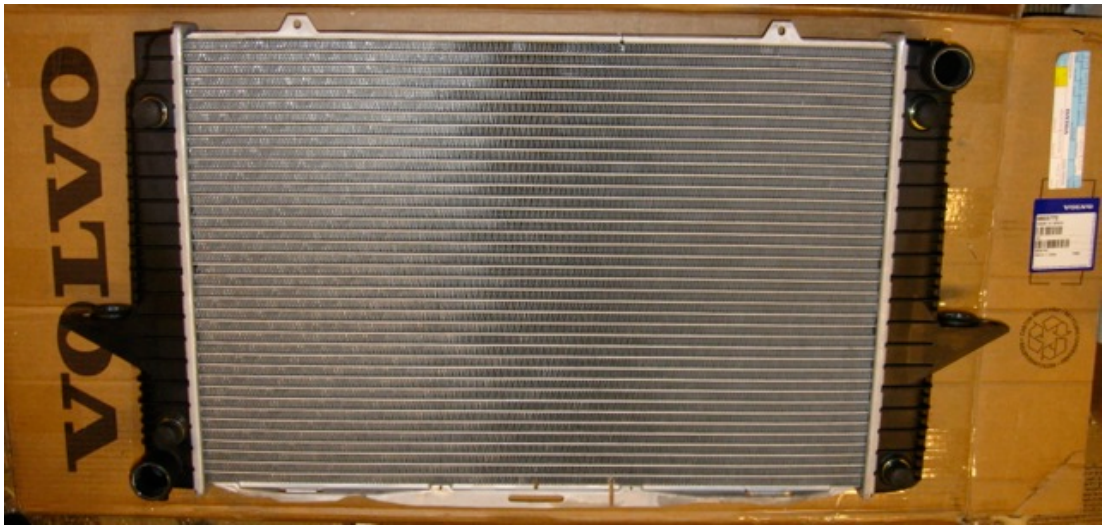
Though there are some good guides on this job that have already been written up, I couldn't find a guide to doing this job that included swapping over the intercooler to the new radiator so I decided to write up my experience. The Haynes manual procedure was well organized but lacked detail. It also has the flaw of describing the radiator as coming out of the top of the car. I wouldn't recommend this approach– it's much easier in my opinion to lower the radiator and remove it from the bottom of the car. The Chilton manual, while generally second rate and often worthless, was more detailed than the Haynes in this particular area. It correctly in my opinion shows removing the radiator from the bottom and has good photos of the fan shroud and radiator removal. I recommend checking it out for this job.

I also consulted the write up on volvospeed.com as well as the VADIS parts list and replacement procedure (which was very brief).

This job was not too hard technically and doesn't require too many specialized tools but there are lots of pieces that need to be removed or relocated in order to get the radiator out and back in. The job took me about 8 hours over two days. After I had rested up for a day, I took the old radiator apart at the end caps to see how the engine oil and automatic transmission fluid coolers were set up and to

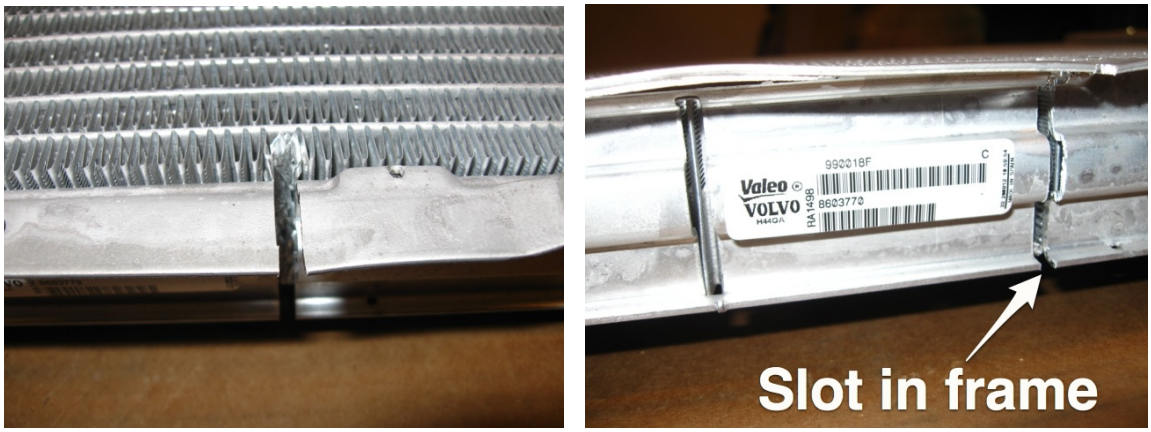
get a look at the crack in the end cap. Photos of the disassembled radiator are at the end of this write up.

New Radiator:
The picture below shows the new radiator (Volvo part # 8603770 – note VADIS version year 2004 lists this part as 8601356 but it has been superseded). It has connections for the transmission fluid cooling lines and the engine oil cooling lines.



New radiator

One notable difference in the design between the old radiator and the new radiator is that the new one has narrow cuts in the main aluminum frame at the top and the bottom. The old one has a continuous solid frame without cuts. I'm guessing that the cuts are to make the radiator a little less rigid so that it doesn't crack as easily from expansion and contraction. Valeo (OEM) makes radiator for Volvo.



Stress-relief slot in radiator (left: top view. right: side view).

The other parts that I bought included a new upper radiator hose (Volvo part # 1335433), 2 "SEMs" screws which hold the radiator to the frame (Volvo 976743), and a new air shield because my old one was bent and cracked (Volvo 9447100). "SEM" stands for preasSEMbled screw and washer (according to boltscience.com). I also bought replacement o-rings for the oil cooler lines and the transmission fluid cooler lines. In the end I reused the original o-rings and haven't seen leaks yet. If they do leak, I'll replace the o-rings as needed.
I got all the parts from Waltrip Volvo in TN.

SEMs screws (Volvo 976743) – hold the radiator through bushings onto frame

Useful tools:
7, 8, 10, 12mm sockets (standard and deep) ¼" drive
¼" drive ratchet
¼" drive extensions (6" and 3")
¼" drive universal joint

Useful tool: ratchet with 6" long ¼" drive extension with a flex joint + socket.

Nylon tie wraps (to hold up the condenser while the radiator and charge air cooler – aka intercooler – are out of the car)
circlip pliers or needle nose pliers to pry open cooling line clips
T25 bit and ratchet
T25 screwdriver

I've written up a high level outline of the procedure to give a sense of the overall sequence of events. Following the high level outline I've included an expanded section that goes in more detail line-by-line with photographs and comments on the individual steps.

Procedure (high level outline):

Removing the old radiator:

1) raise front of car on ramps
2) remove upper fan shroud bolts and screws
3) remove air shield and detach relays from air shield
4) disconnect clips holding vacuum lines and wiring to the fan shroud
5) remove air intake ducting
6) remove screws holding Evap Emissions charcoal canister purge valve
7) remove the cover plate over the throttle to improve access
8) disconnect fan wiring connectors
9) lift fan shroud up and out of the car
10) remove splash shield from under car
11) drain coolant from radiator petcock (13mm socket).
12) remove lower radiator coolant hose clamp and hose and drain more coolant from radiator
13) remove upper radiator coolant hose
14) Remove clips and disconnect engine oil cooling lines (upper and lower) and catch oil (about ½ liter). Cover the lines to exclude dirt
15) remove lower intercooler hose.
16) Remove clips and disconnect automatic transmission cooling lines (upper and lower) and catch fluid. Cover the lines to exclude dirt
17) from the front of the car, remove the upper radiator mounting bolts.
18) tiewrap the condenser to the front rail of the car to hold it in place.
19) remove the lower radiator mounting bolts
20) loosen the SEMs main mounting bolts that hold the radiator.
21) remove the bolts and lower the radiator down to the ground
22) the air pump may block the descent of the radiator (it did on my '97 855 GLT). If so, remove the two bolts on the air pump bracket and lift the air pump up and backwards to allow clearance of the radiator.
23) rotate the bottom of the radiator/intercooler combination forwards and out from underneath the car.

Swapping the intercooler over to the new radiator:

24) loosen the bolts to separate the intercooler from the radiator

25) remove clamp plates from intercooler and clips from radiator
26) Lift intercooler off of old radiator
27) install clips on new radiator (6 side clips and two clips at top)
28) assemble the intercooler onto the new radiator using plates and bolts

Installing the new radiator:

29) position radiator and intercooler under car and lift up into the engine
30) install SEMs bolts into frame and tighten to hold the radiator
31) install lower radiator mounting bolts
32) cut and remove the tiewraps holding the condenser to the frame
33) install upper radiator mounting bolts
34) connect automatic transmission cooling lines and install clips.
35) install lower intercooler hose
36) connect upper and lower engine oil cooling lines and install clips
37) reattach the air pump bracket if needed to unbolt it in step 22
38) install fan shroud. Insert tabs at bottom into slots in radiator
39) connect the fan wiring connectors
40) re-attach the Evap purge valve to the fan shroud
41) install upper intercooler hose
42) install CPU air duct and airbox intake
43) position the relays, wires and vacuum hoses under the air shield
44) clip relays back into the air shield and lower air shield onto the shroud
45) install fan shroud bolts and screws
46) reattach cover plate over throttle

Topping up fluids and checking for leaks:

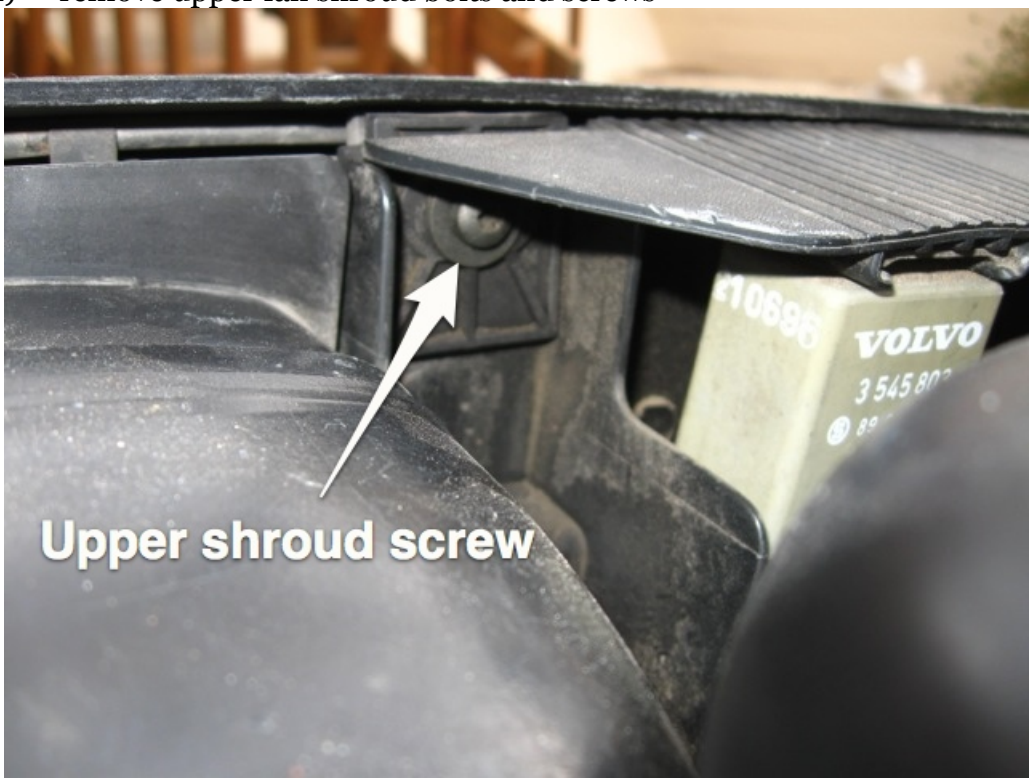
47) refill expansion tank with 50/50 diluted water/coolant
48) top up engine oil
49) start car and check for leaks
50) top up coolant.
51) reinstall the splash shield under the car
52) lower car
53) drive car a short while and check the coolant level again.

Detailed line-by-line Procedure

Removing the old radiator:

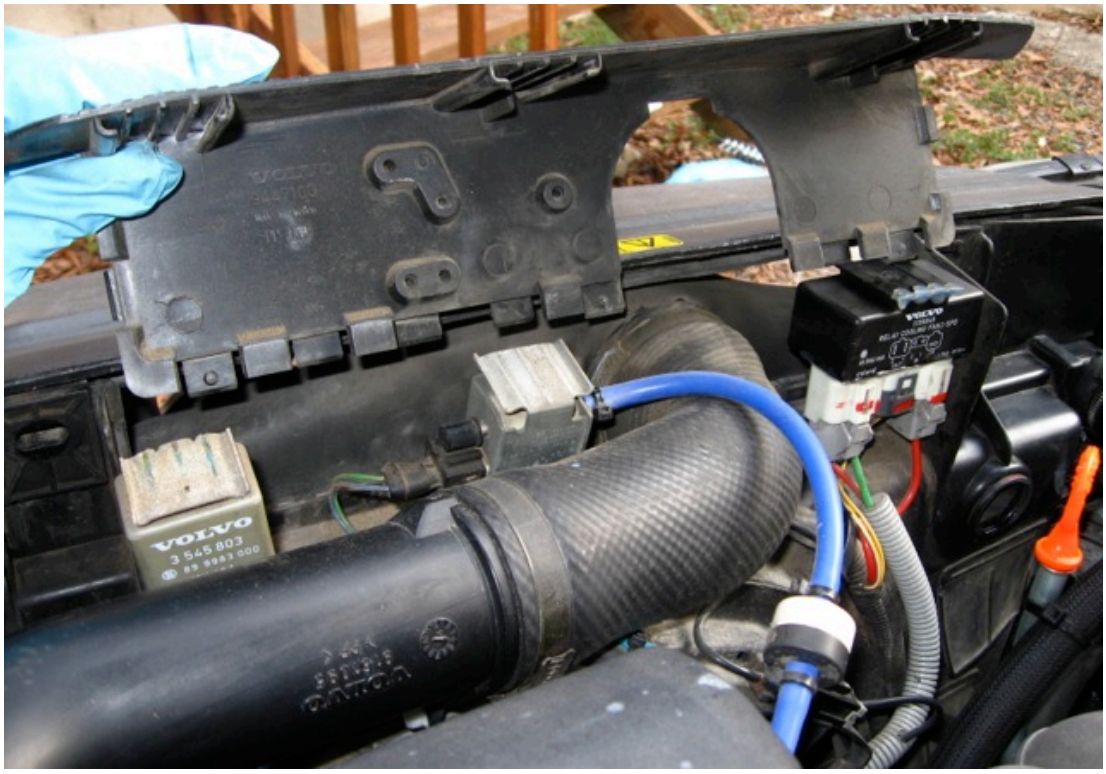
1) raise front of car on ramps. Use jack stands and wheel chocks on both rear wheels to improve safety.

2) remove upper fan shroud bolts and screws

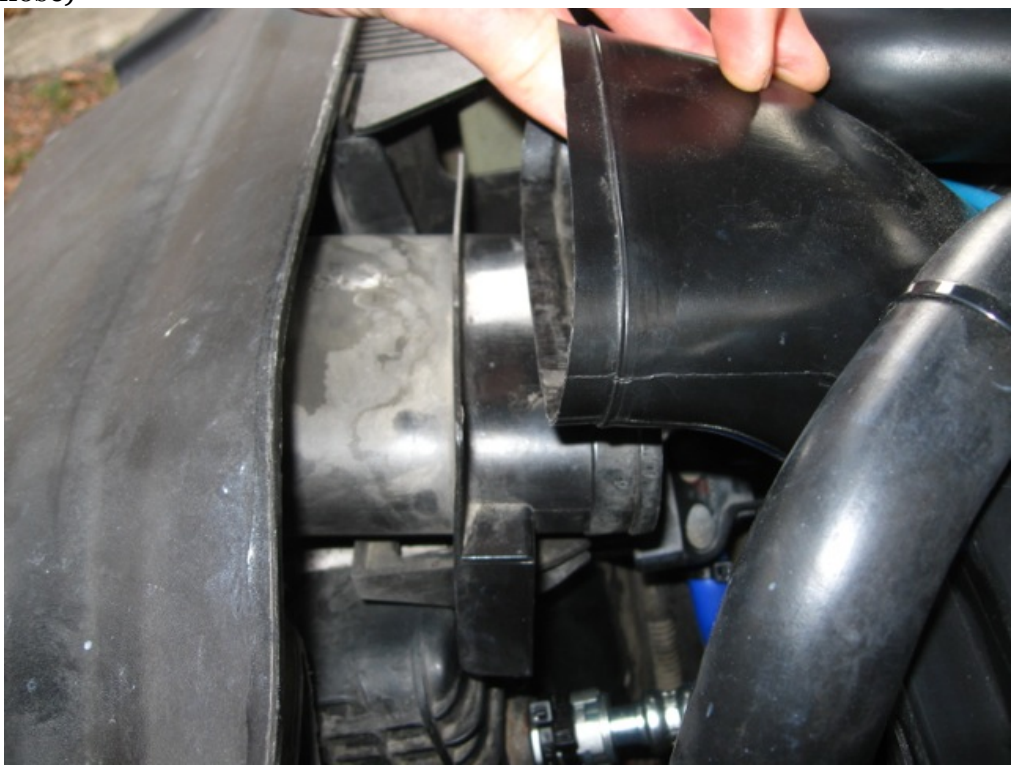


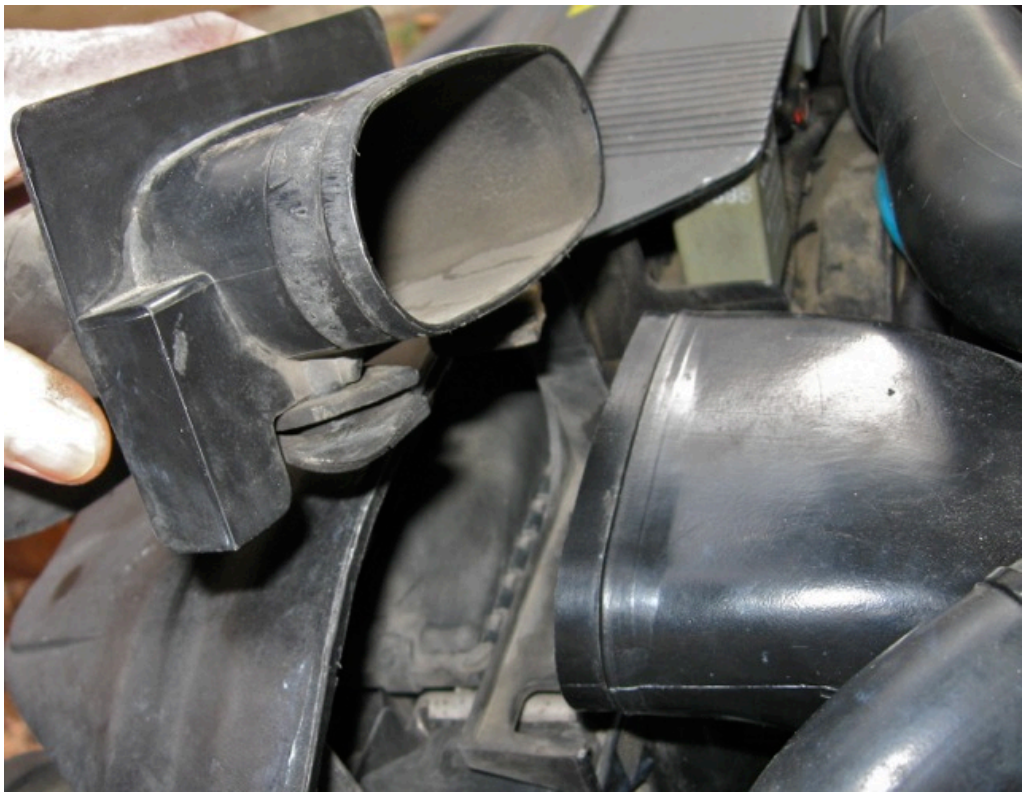

VOLVO
1398845
RELAY COOLING FAN2-SPD
2 1 2 1 30
OUT IN
>PA6 - GF30<

3) remove air shield and detach relays from air shield



4) disconnect connectors holding vacuum lines and wiring to the fan shroud
5) remove air intake ducting (CPU air duct, air box intake, upper intercooler hose)






POWER
STEERING
DO NOT OVERFILL
USE ONLY
APPROVED
FLUID

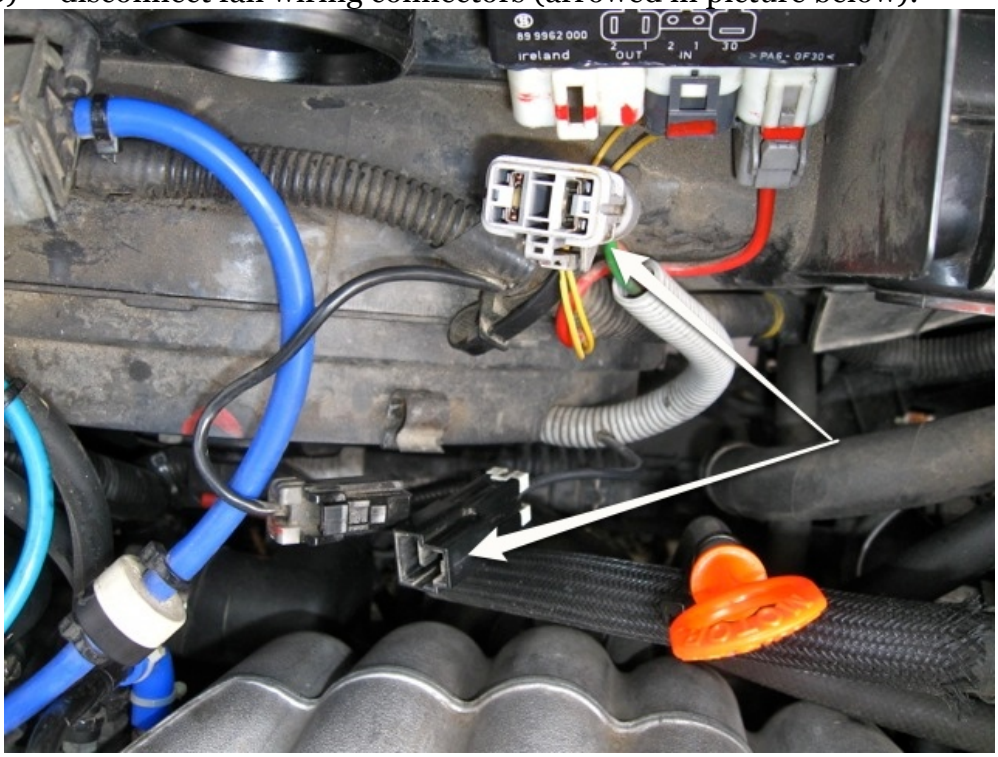
Upper intercooler rubber hose removal:

Upper intercooler metal tube removal:

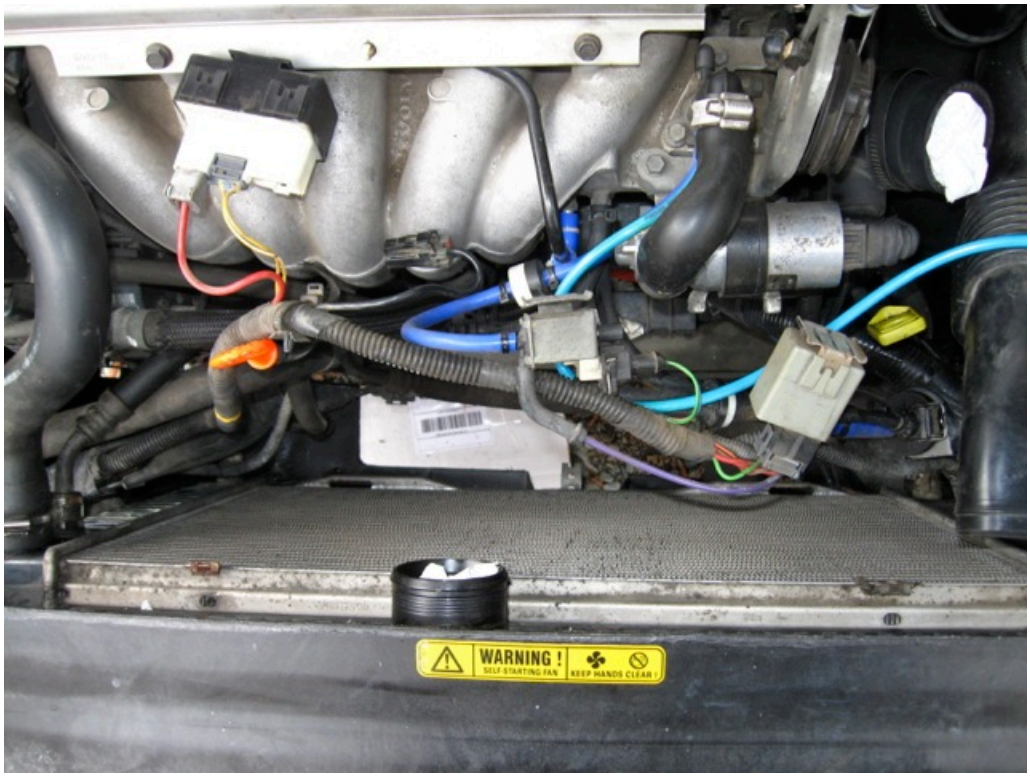
6) remove screws holding Evaporative Emissions charcoal canister purge valve

7) remove the cover plate over the throttle to improve access

8) disconnect fan wiring connectors (arrowed in picture below):



9) lift fan shroud up and out of the car



Pictured above: view of old radiator after lifting the fan shroud out of the way

10) remove splash shield from under car. Note that the splash shield has three clips at the front that connect to the front bumper and a clip at the back that snaps into a slot in the rail at the bottom of the radiator.

11) drain coolant from radiator petcock (13mm socket). I drained about 6.5 liters of coolant.

12) remove lower radiator coolant hose clamp and hose and drain more coolant from radiator

13) remove upper radiator coolant hose (I replaced the upper hose so I removed it from both ends, at the radiator and at the thermostat as pictured below):

14) Remove clips and disconnect engine oil cooling lines (upper and lower) and catch oil (about ½ liter). Cover the lines to exclude dirt.
Use circlip pliers (shown) or needle nose pliers to pry open the upper hose clip:

Cover the fitting on the end of the line with a glove or rag (finger tip from a rubber glove shown below) to protect it from dirt

Lower hose removal (be prepared to catch the oil):

15) remove lower intercooler hose by disconnecting it at both ends: from the intercooler and the pipe leading to the throttle.

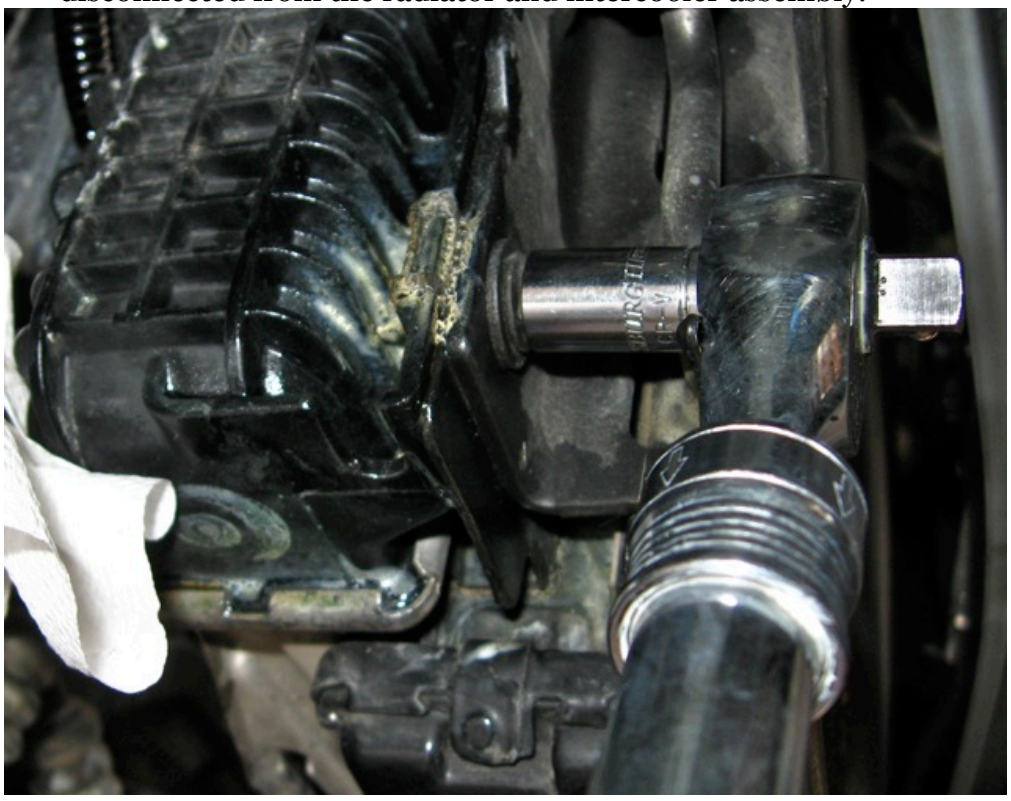
16) Remove clips and disconnect automatic transmission cooling lines (upper and lower) and catch fluid (less than 100ml). Cover the lines to exclude dirt.

17) from the front of the car, remove the upper radiator mounting bolts. The position of these bolts between the radiator and the headlights makes it necessary to have a flexible tool. Note that there is a second bolt below the upper bolt – do not remove the second bolt yet (it will come off after you remove the radiator + intercooler from the car).

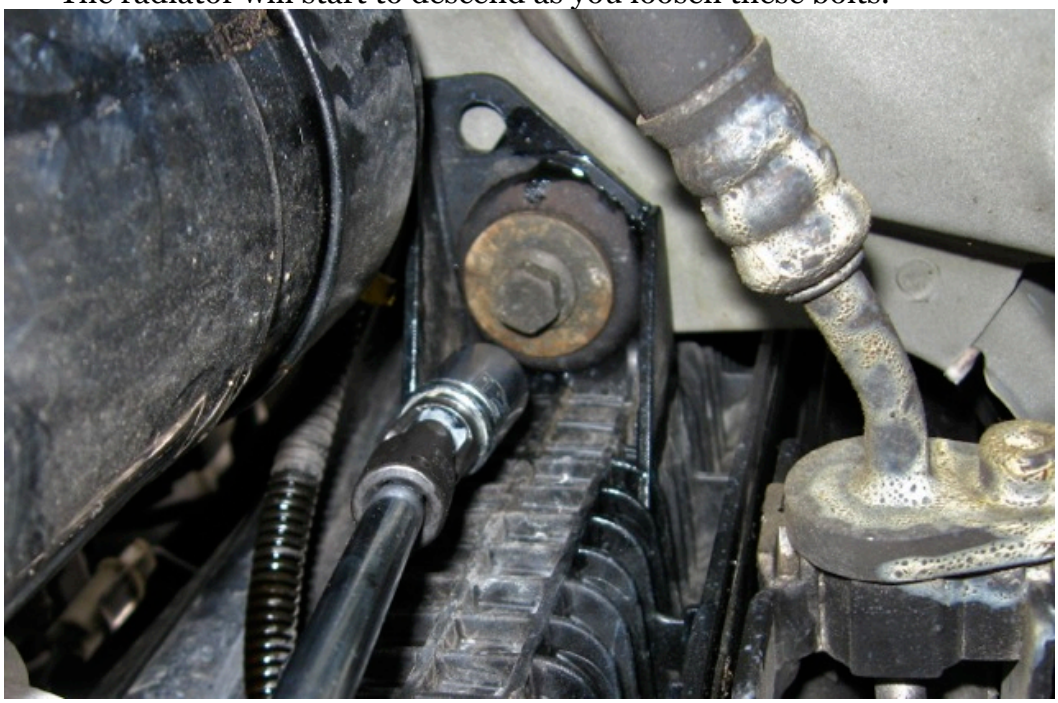
Driver's side bolt (shown below). The bolt on this side is more difficult to reach. I had to guide the socket into position over the upper bolt from inside the engine bay as I maneuvered the flexible extension from the outside.

18) tie wrap the condenser to the front rail of the car to support it and hold it in place. When the lower radiator mounting bolts and SEMs bolts are removed, the support for the condenser will be from the tie wraps in order to keep stress off of the AC refrigerant lines.


19) remove the lower radiator mounting bolts. The condenser is now disconnected from the radiator and intercooler assembly.



20) loosen the SEMs main mounting bolts that hold the radiator to the frame. The radiator will start to descend as you loosen these bolts.



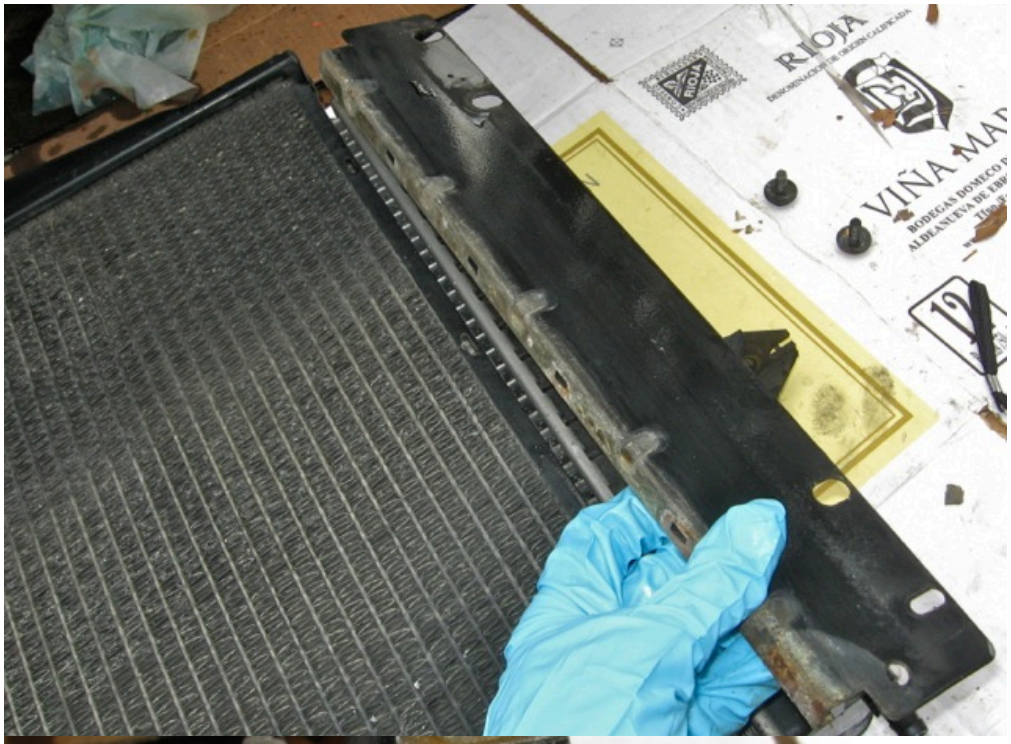
21) remove the bolts as you hold and lower the radiator and intercooler down to the ground. Note the condenser stays in place.

22) the air pump may block the descent of the radiator (it did on my ’97 855 GLT). If so, remove the two bolts on the air pump bracket and lift the air pump up and backwards to allow clearance of the radiator.
23) rotate the bottom of the radiator/intercooler combination forwards and out from underneath the car.

Swapping the intercooler over to the new radiator:

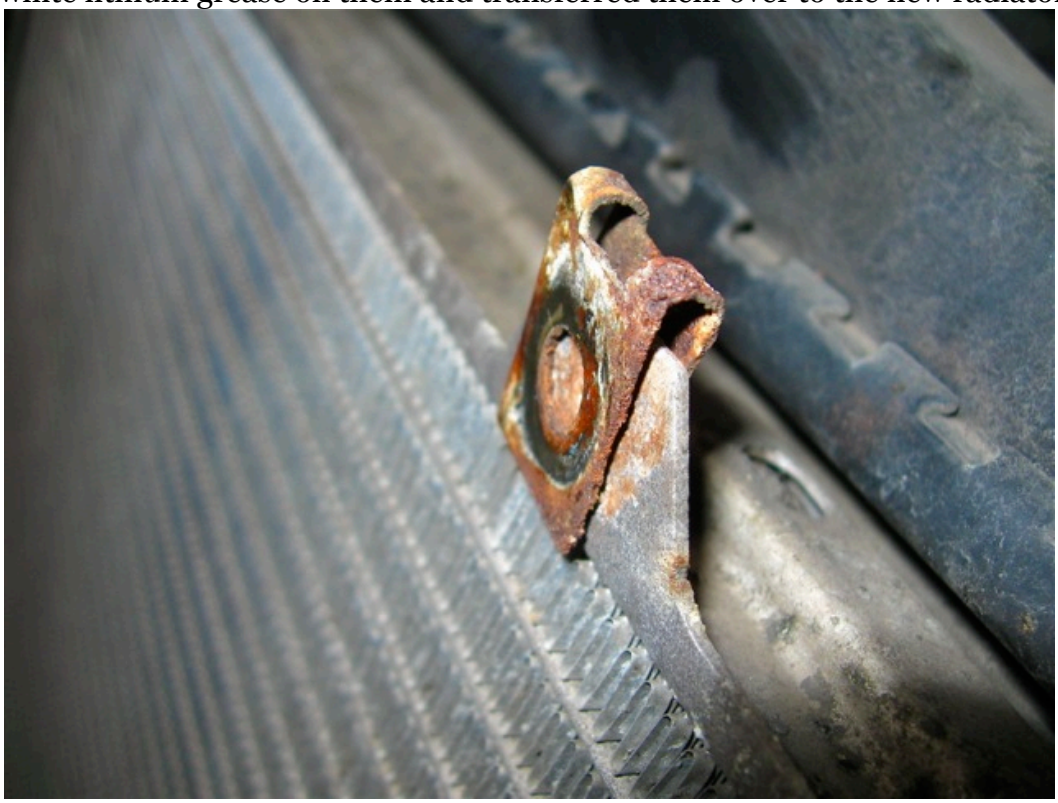
24) loosen the bolts to separate the intercooler from the radiator

25) remove clamp plates from intercooler and clips from radiator


RIOJA
VIÑA


EN

Clips at top of radiator (2 clips). I cleaned these off with a wire brush, put some white lithium grease on them and transferred them over to the new radiator:



26) Lift intercooler off of old radiator:

27) install clips on new radiator (6 side clips and two clips at top). The picture below shows the intercooler in place on top of the new radiator, before the two metal clamping plates have been installed to hold the intercooler against the radiator:

28) attach the intercooler onto the new radiator using the plates and bolts

Installing the new radiator:

29) position new radiator and intercooler under car and lift up into the engine area

30) install “SEMs” bolts into frame and tighten to hold the radiator in position Driver’s side with radiator resting on the air pump:

Driver's side:

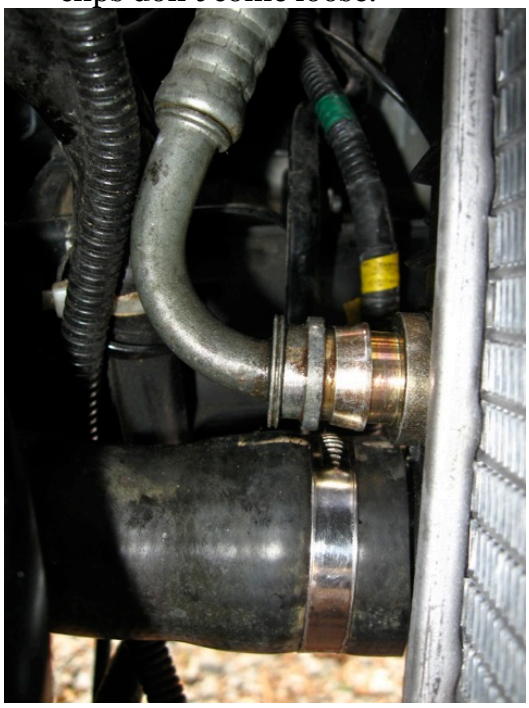
Passenger's side:

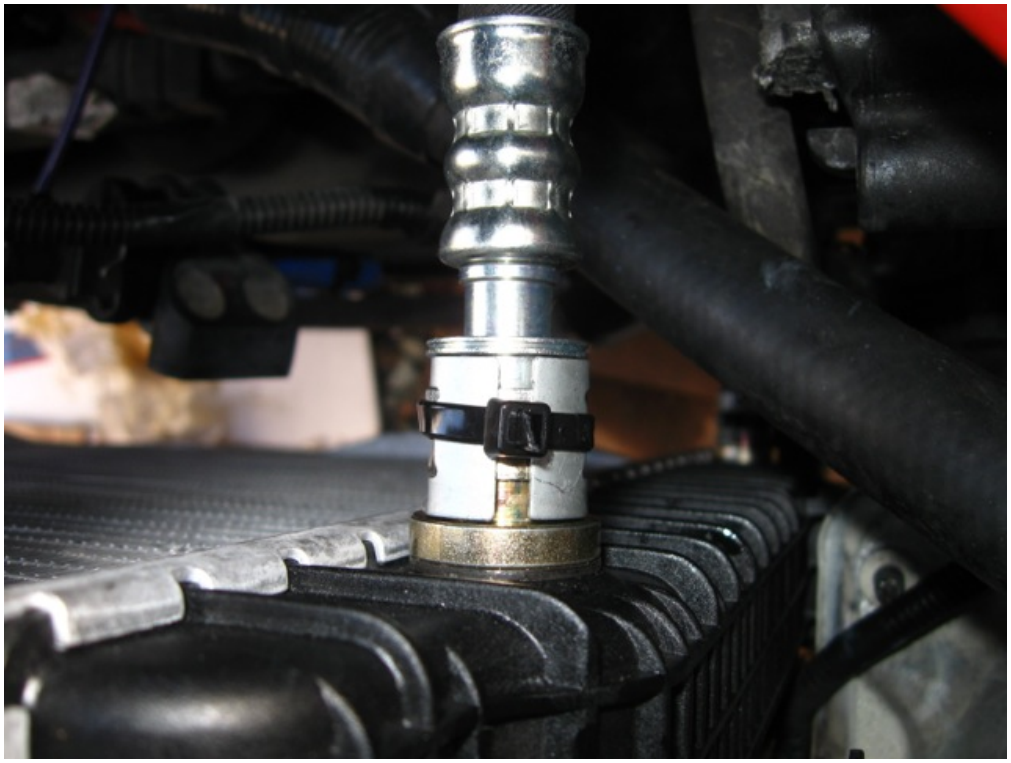
31) install lower radiator mounting bolts – the radiator now supports the condenser again.

32) cut and remove the tie wraps holding the condenser to the frame

33) reinstall upper radiator mounting bolts

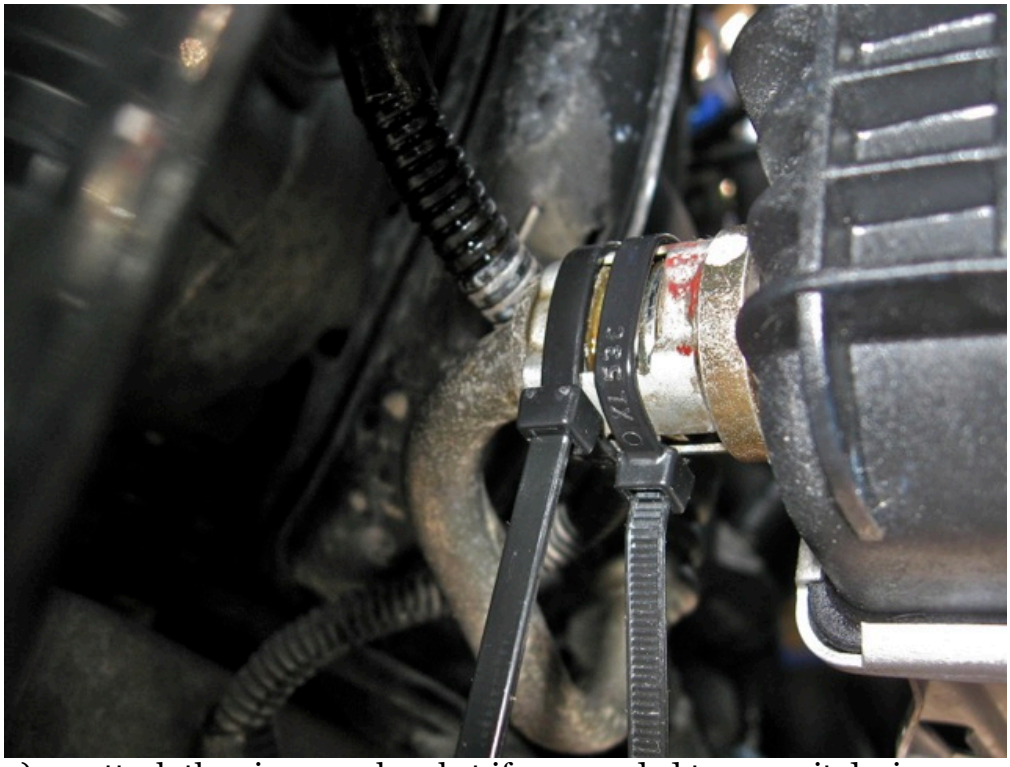
34) connect upper and lower automatic transmission cooling lines and install clips. I applied ATF to the upper hose o-ring so that it would slide in nicely. I reused the original o-ring. I put tie wraps around the clips to insure the clips don't come loose.



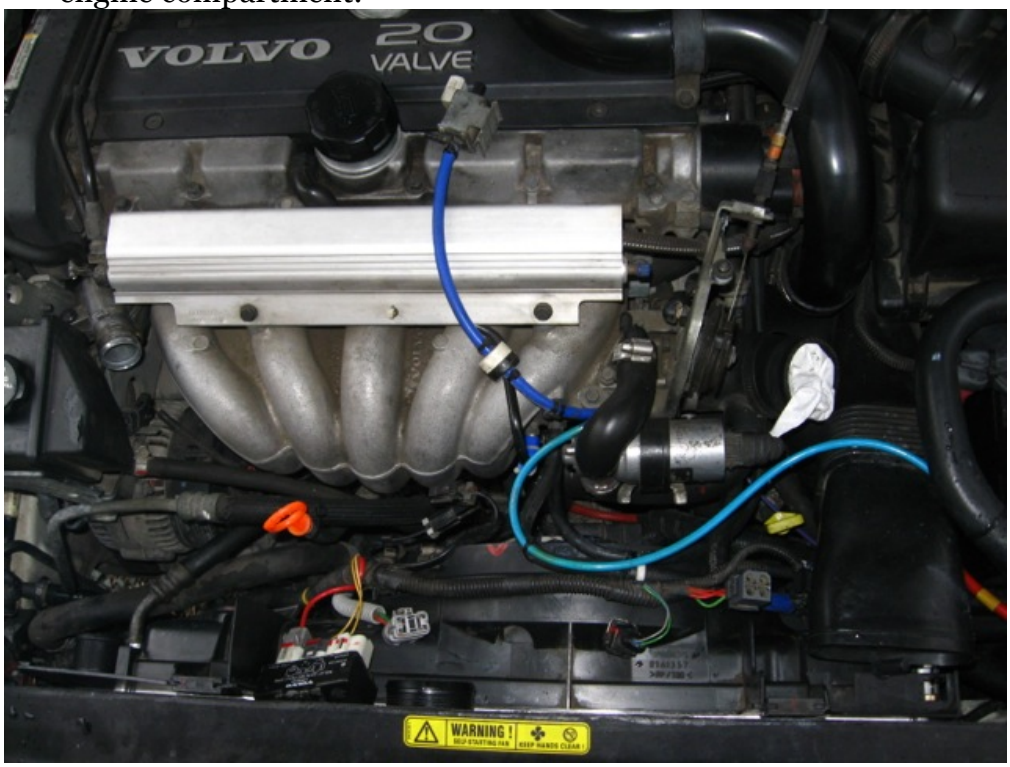


35) install lower intercooler hose

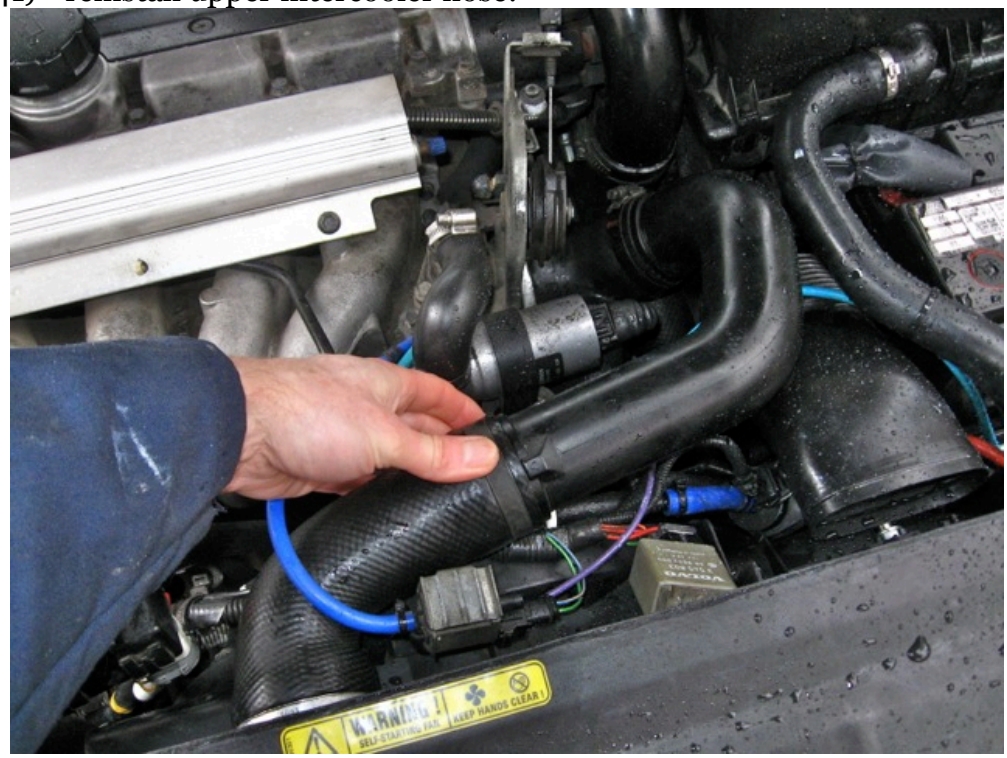
36) connect upper and lower engine oil cooling lines and install clips and tie wraps. I applied oil to the o-rings on these lines to make them go in smoothly. I reused the original o-rings.



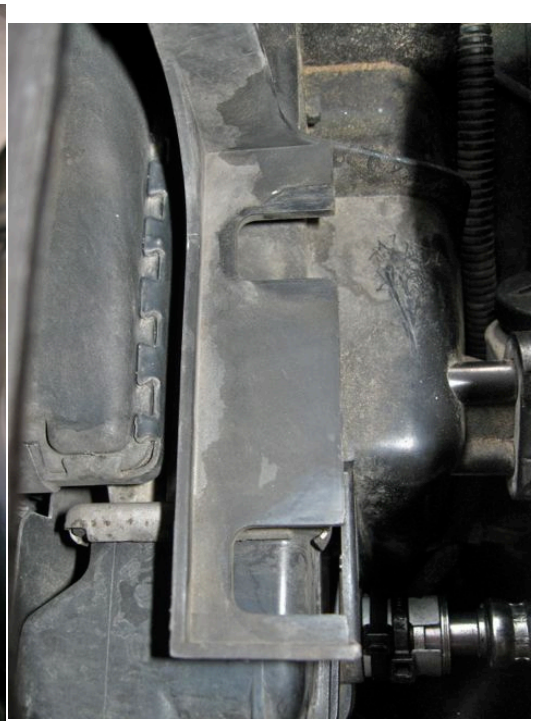
37) reattach the air pump bracket if you needed to move it during removal of the radiator
38) install fan and shroud back into the engine. Insert tabs at bottom into slots in radiator. Image below shows the fan shroud after lowering it back into the engine compartment:



39) reconnect the fan wiring connectors
40) re-attach the Evap purge valve to the fan shroud
41) reinstall upper intercooler hose:



42) install CPU air duct and air box intake. Align the rubber bushings with the slots on the shroud.



Above: realign the rubber bushings (left) to fit into the slots in shroud (right)

43) position the relays, wires and vacuum hoses back under the air shield

44) clip the relays back into the air shield and lower the air shield onto the shroud

45) tighten fan shroud bolts and screws
46) Reattach cover plate over throttle

Topping up fluids and checking for leaks:

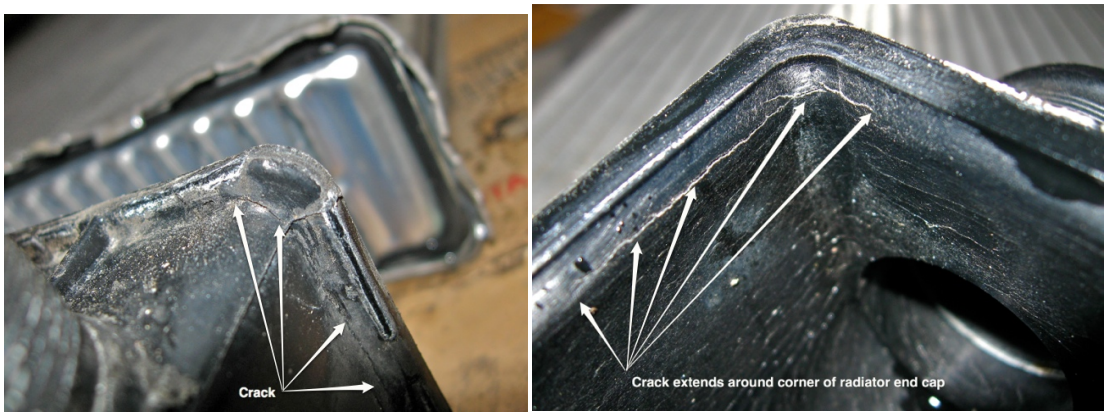
47) refill expansion tank with 50/50 diluted water/coolant

48) top up engine oil
49) start car and check for leaks at the hoses (vacuum lines, intercooler hoses, coolant, oil, transmission fluid)
50) top up coolant. I was able to get about 5.5 – 6 liters of coolant back in at this point (I measured about 6.5 liters drained out originally, and there was some small amount left in the radiator or spilled)
51) reinstall the splash shield under the car
52) lower car
53) drive car a short while to let it fully heat up. Stop engine and check the coolant level again. I find in general that it drops about 1 liter. Top up.

Disassembling the old radiator:

I disassembled the old radiator the next day, after I had rested up a bit. I used a flat blade screwdriver to pry open the tangs away from the plastic end cap, allowing me to pull the end caps off of the core of the radiator. I took some pictures of the crack and the general construction of the coolers in the end caps. The overview picture below shows the inlet side of the radiator with the embedded engine oil cooler. The coolant inlet is at the upper left of the image and the crack is at that corner right next to the inlet connection:

Below are photos of the inlet side of the radiator where hot coolant enters the radiator. It is the part of the radiator exposed to the harshest temperature swings. This would be the most likely place for the radiator to fatigue and eventually fail due to the expansion and contraction caused by temperature cycling. The expansion and contraction cycles cause the plastic to crack over time as the plastic ages and becomes brittle. Perhaps the slots cut in the metal frame on the new radiator will decouple the frame expansion from the end cap and extend the life of the radiator. We'll see! The original one lasted for 160k miles and about 16 years.



Crack as seen from the outside (left) and inside (right) of the end cap. Overall crack length was about 4cm.