XC90 V-8 Volvo

The Alternator Replacement Challenge

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Driving a vehicle with 211K miles is akin to playing Russian roulette with respect to the reliability of the charging system. At this point, the alternator is near the end of its duty cycle and could fail any moment. So driving far (exceeding AAA 200 mile free towing limit) is a white knuckle experience. When the dreaded "charge" light appears in the instrument cluster, the car can be driven another 20 miles or so before it quits leaving car and driver stranded. So, for the last several months, I've debated when to change the alternator. To prepare myself, I viewed one YouTube video (did anyone else dared do this?) and acquired a replacement. I opted for a $200 remanufactured alternator as opposed to the "genuine" Bosch $800 alternator.

THE CHALLENGE

This job is labor intensive and difficult because the alternator is buried beneath the engine and within mere inches of the passenger compartment firewall. Tiny hands and unique tools (speed wrenches) are needed to complete this task. Again, curses to the Swedish engineers and Ford's "we don't care" management for allowing this design to go into production; essentially stuffing the Yamaha V-8 into the XC-90 engine compartment. Two days (warm and sunny) were needed to complete the swap. I figure a Volvo shop could complete the swap in 8-10 hours ($1800-$2500) including the alternator cost.

Having just successfully completed the swap, I intend to provide a blow by blow account so anyone else can complete this task more quickly than I. Assistance by a helper with extremely small hands is helpful.

Tools: A full set of metric 3/8" and 1/4" drive sockets and assorted extensions is essential. Full complement of open end and box wrenches in various lengths essential. Flex swivel head speed (ratchet) box wrenches (10mm and 13mm) absolutely critical. A 10mm extended reach (12"-14") flex swivel ratchet speed wrench is more valuable than gold.

With the front of the car elevated, I began by removing the belly pan and power washing the engine bay above and below to remove all grease and grime. This is essential, because greasy stuff is slippery and you must be able to see in clear detail and manipulate tools in a confined space.

Next is a list of "things" you must remove to gain access to the alternator.

Disconnect battery, lift ground terminal. Make certain the vehicle has been resting for 5-10 minutes before disconnecting; otherwise the various computers will not have completed their shut down cycle. It's akin to pulling a power cord on a live computer; the problems materialize on the reboot. You don't want to unintentionally add to your misery.

Underneath: remove passenger side wheel, brake caliper (suspend it), disconnect sway bar link at strut), disconnect tie rod at wheel, disconnect right front axle, remove plastic dust shield over axle, disconnect fuel lines just behind the engine cradle (right side), disconnect strut from the axle assembly and loosen the three 13mm bolts fastening the strut to the tower to more easily remove and reinsert the axle.

Engine Bay: remove power steering reservoir, the coolant reservoir, the serpentine belt, the belt tension assembly, pull the fuel lines up into the engine bay away from the work area. I also removed the bolt at spark plug #2 attaching the fuel lines to the engine to facilitate manipulation.

End of day #1: Have a beer, maybe two.

Day #2: Alternator removal

The alternator is attached to a bracket; three bolts fasten the bracket to the block. Two on the bottom and one center top. The DC power cable and field wire (green) attach to terminal connectors at the top. Removing the 13mm nut holding the red power cable to the alternator is best done after the three bolts have been removed. Likewise the field wire connector.

There is little clearance between the three bolts and the fire wall. From below, use the 10mm swivel head ratchet wrench (not socket wrench) to remove the two bottom bolts. From the engine compartment, remove the top bolt with the extended reach 10mm swivel head ratchet wrench. Once the alternator is free, use a 12" to 24" one-quarter inch extension 13mm socket combination to remove the 13mm nut and free the DC power cable. Then pull the field wire connector from its receptacle. Now, drop the alternator and remove it through the bottom opening where the drive axle was located. The alternator cannot be removed before clearing the fuel supply and return lines as they block the opening.

Note: I got lucky here. I noticed the right motor mount had broken free, the rubber bushing had disintegrated. I placed my floor jack beneath the oil pan and gently raised the engine as far as possible thus increasing the clearance between the alternator connector and firewall; the additional space facilitated alternator removal and installation. Consider this tactic, even if you have to disconnect the motor from the right side mount. BTW, I replaced the worn motor mount and sway bar link.

Lunch

Removing the alternator was a long and involved process. So, before installing the replacement alternator I had to know if it, in fact, was a defective free unit. Previous experience taught me that rebuilt components can be defective. I did not want to install the alternator to discover it was defective and begin anew. So, I brought it to my local parts supplier and requested it be tested. First test, F A I L. Inspection revealed the drive belt was not sufficiently tight. Subsequent testing resulted in a P A S S.

I knew I'd never be able to reattach the DC power cable and the field connector to the alternator once it was attached to the block. I reasoned it was impossible to attach them

without having small flexible non arthritic 75 year old hands. So, I needed a work around. I purchased a 12" four (4) gage length of connector battery cable and attached it to B+ on the new alternator. Note: A connector battery cable has an "eye" terminal at each end.

I cut the field wire 2" from the connector and soldered a 14" length of 18 gage green stranded wire to the 2" tail of the field terminal connector, plugged it into the alternator receptacle and zip tied the field wire to the power cable. The ends were to be mated to the original power cable and field wire once the alternator was in place.

Alternator installation was completed in 30 minutes, another 30 minutes were spent tying the power and field wires to their counterparts and threading a new serpentine belt. Now it was a matter of replacing all the stuff that had been removed or pushed out of the way. New parts were installed where necessary. Three hours later, all was in place. Total job parts cost ~$450. Labor 16 hours, although some of that time included acquiring replacement front end parts.

Dinner

The following morning, I reviewed all work to make certain I'd not skipped a step, neglected to tighten something or misconnected a line. Closely inspected my "work around" power and field wire solution.

I'd one "extra" 8mm bolt and was determined to identify where it belonged. When you have parts left over, it means a step was missed. You work at it until you determine where it attached. Close inspection revealed that I'd forgotten to attach the fuel lines to the cylinder head adjacent to spark plug #2. After doing so, I was secure in the knowledge that the job was correct. (Close inspection means using a narrow beam flashlight to inspect work, the beam directs your attention and missed or incorrect work stands out.)

WARNING: Before reconnecting the battery make certain it is fully charged.

The battery was reconnected, systems powered and engine started. All worked perfectly. Now I have peace of mind knowing the XC90's electrical charging system will not fail. The bonus is those annoying clanks and clunks emanating from the front end disappeared.

A long time ago, I worked in a shop where the mechanics kicked extra fasteners under the bench. Their times were shorter than mine on complicated tasks; but I'd no call backs. Sometimes management gave me their jobs to fix "right," which resulted in clients insisting that only I work on their vehicle. This was embarrassing.

Would I do an alternator swap again?

Yes, I would, if it meant keeping a perfectly good vehicle out of the scrap yard. Would a V-8 Volvo owner pay $2500 to replace an alternator on a 10 year old vehicle, probably not; especially when necessary worn front end part replacements push the cost upward.

This is a project a DYI with a good tool assortment and mechanical talent could easily tackle. Steady and methodical is essential, you need a spare set of hands to jockey and hold the new alternator while it is attached to the motor.

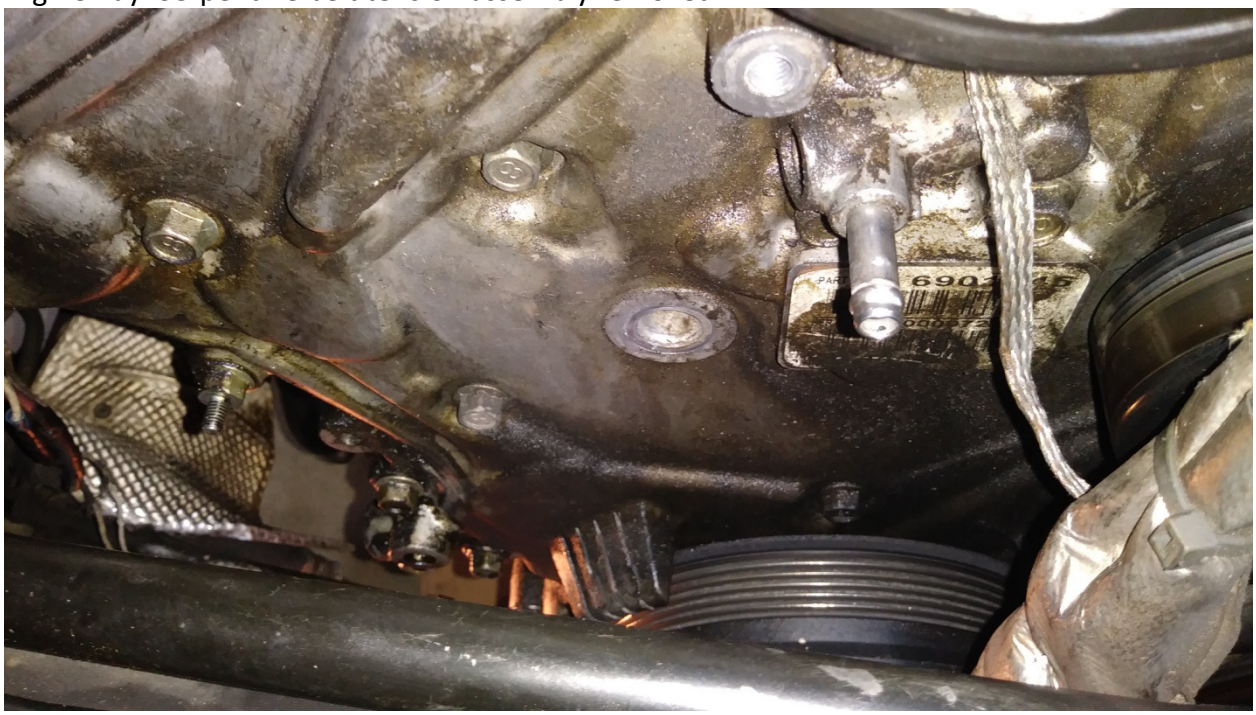
If you have questions, I'm at: rfsepe@gmail.com

Passenger side wheel well.

Observe new sway bar link.

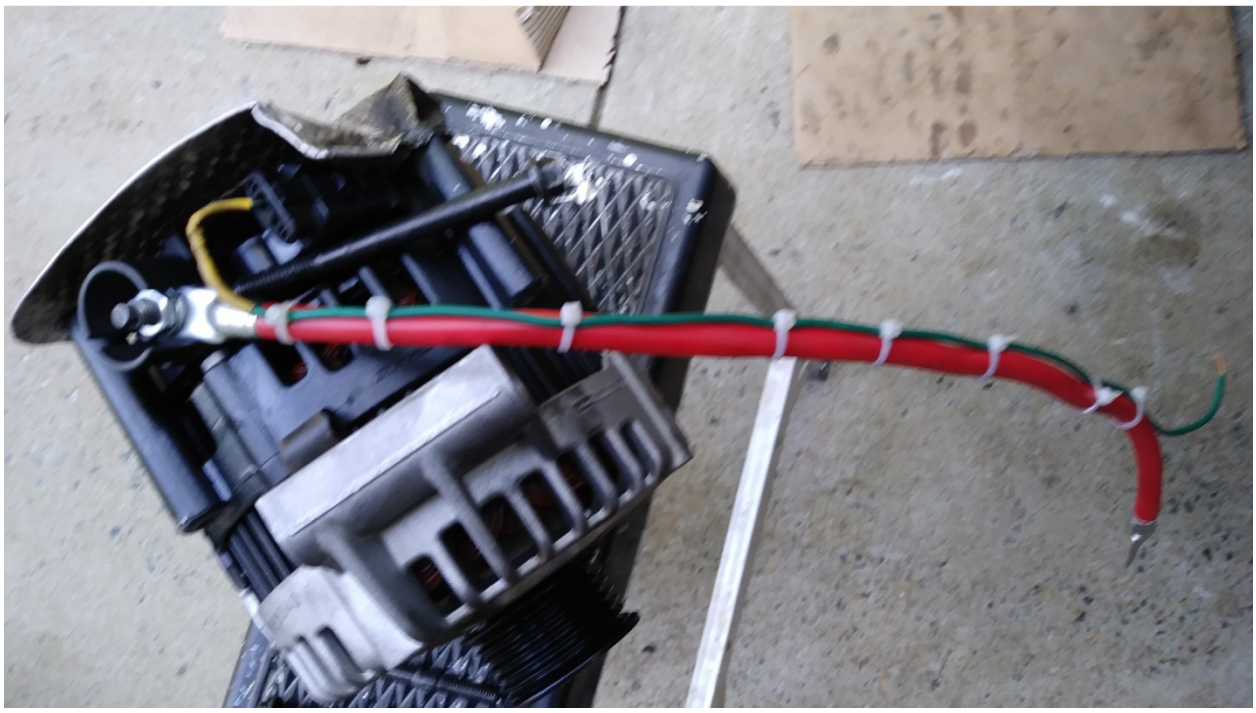
Disconnected fuel supply lines from tank at rear of engine cradle

Engine Bay: Serpentine belt tension assembly removed.



Factory DC power cable and green field wire (sans connector) to alternator. Also shown are the fuel supply and return lines.

Work around power cable and field wire attached to replacement alternator.



Alternator installed with "work around" power cable and field wire.

Work around power cable and field wire joined to factory wiring.

Hint: How do you prevent fasteners from falling out of a bracket to be attached in a downward position? Use a couple of O-rings or a narrow piece of rubber tubing to prevent the fastener from falling out. The tubing shown below is too long; it must be no more than 1/4" long.