



Fast Forward Superchargers

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Also see our forum for more info...

www.fastforwardsuperchargers.com

Fast Forward Supercharger Kit

90-93 Mazda Miata

Kit part number FFS-9093-CS-CA

Welcome to the World of Supercharged Excitement!

Picture yourself on that Sunday afternoon drive through the mountains. Normally you would start to climb that mountain road and plant your foot to the floor with not much happening. Now picture yourself in your new Fast Forward Supercharged Miata on that same road, actually accelerating as you climb that steep incline. After doing your installation per the following instructions, you will be driving that dream. The average person can do the install in a weekend and an experienced mechanic should be able to accomplish same in 8 to 10 hours. Be assured we will be there for you if you should run into any difficulties.

Tools:

Common mechanics' tools will be needed. Following is a list of tools that may be necessary depending upon how your Miata is currently equipped.

Wrenches: 18mm, 17mm, 14mm, 13mm, 12mm, 10mm. A torque wrench is also recommended.

- Sockets: 3/4", 1/4", 5/16", 17mm, 14mm, 13mm, 12mm, 10mm, 8mm, and assorted extensions may come in handy as well.
- Screwdrivers: Phillips and Flat Head.
- Pliers: Slip Joint and Needle Nose.
- Allen Wrenches (Hex Key): Various Metric
- Wiring Tools: Wire stripper/cutter, Crimper (although we suggest the use of a soldering iron & solder for electrical connections when possible).
- Other: Thread locking compound (Loc-Tite Blue), Ultra Black Gasket, utility knife, electrical tape, and extra zip-ties to help tidy up the wires and hoses.
- Fuel Hose removal tool (Supplied in kit)
- Idle adjust Allen wrench (supplied in kit)
- Long shank Allen wrench for the hard to reach cover plate bolts (supplied in kit)
- Belt Tensioner bar (supplied in kit)

Torque settings

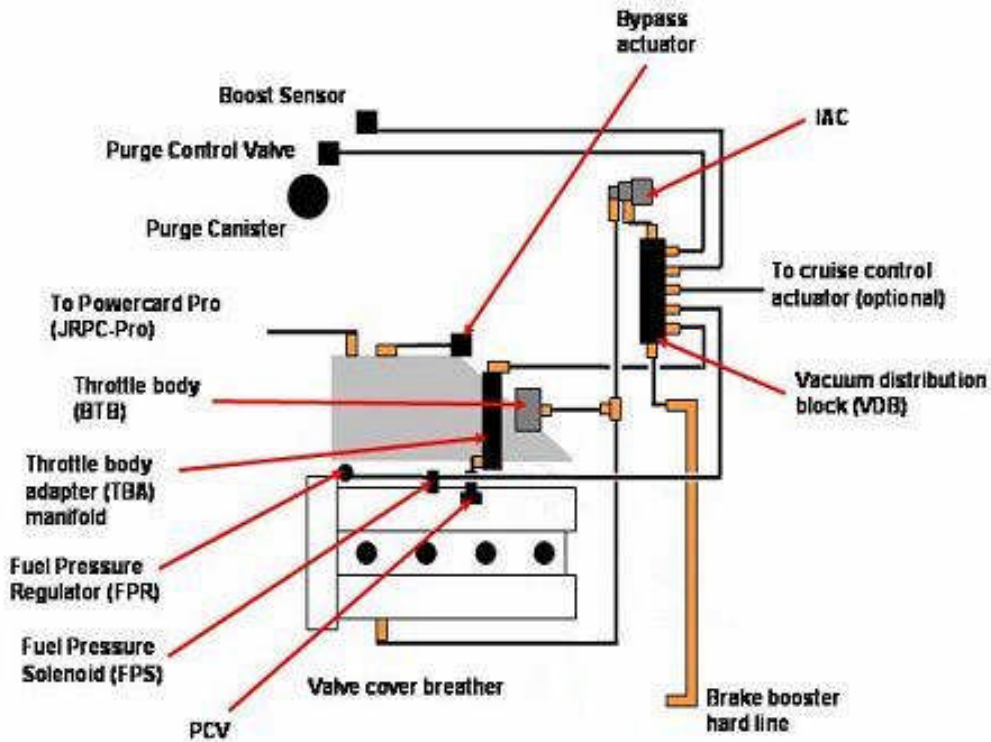
1. All 6mm bolts 8-10 Ft-Lbs
2. All 8mm Bolts 12-14 Ft-Lbs
3. From the Mazda manual, manifold nuts are 17-21 Ft-Lbs
4. Mazda calls for the four 6mm crank pulley bolts to be 8.7-13 Ft-Lbs
5. The nose pulley on the supercharger is torqued at 45 Ft-Lbs

Parts Included with the kit

- 1. Supercharger and Intake Manifold assembly.**
- 2. Air Filter.**
- 3. Crank Pulley, spacer and four 6mm bolts.**
- 4. 6 rib serpentine belt.**
- 5. Four BKR7EIX spark plugs.**
- 6. Small package of spark plug thread anti-seize.**
- 7. Auto-tensioner assembly.**
- 8. 26" section of 3" reinforced hose with two 3" hose clamps.**
- 9. Manifold under bracket with two bolts to mount to engine.**
- 10. 7' of 3/8" vacuum hose.**
- 11. Water bottle re-locate bracket with two bolts and nuts.**
- 12. Vacuum distribution block.**
- 13. Idle Air Control mounting plate and bracket.**
- 14. Jackson Racing Power Card Pro and harness assembly.**
- 15. 5th injector fuel hose assembly.**
- 16. Fuel injector.**
- 17. Fuel injector hose removal tool.**
- 18. Idle adjust Allen wrench**
- 19. Long reach Allen wrench for the top bolts on the Intake Manifold.**
- 20. Auto-Tensioner bar.**
- 21. Fuel rail and brass FPR adaptor.**
- 22. Tune-up label to be placed/located adjacent to, but not covering, the vehicle manufacturers Vehicle Emission Control Information (tune-up) label.**

Vacuum Hose Routing Diagram

'90 - '93 Fast Forward Superchargers Vacuum Hose Routing Diagram

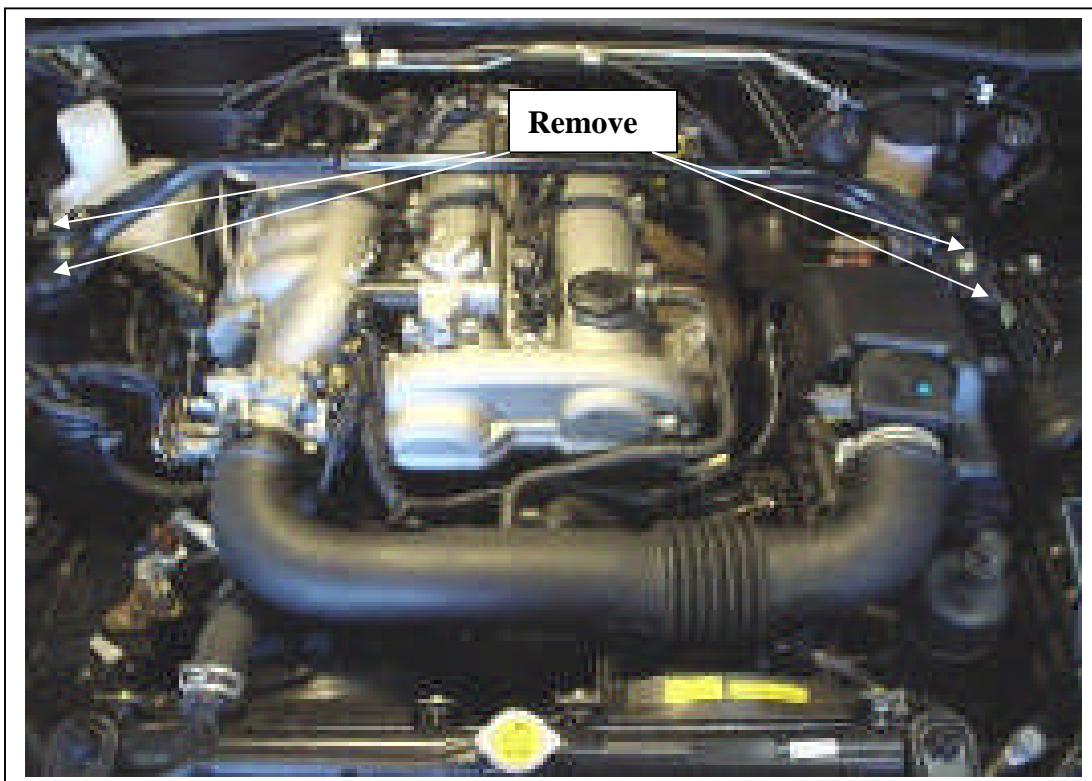


Preparation and Removal of OEM Components

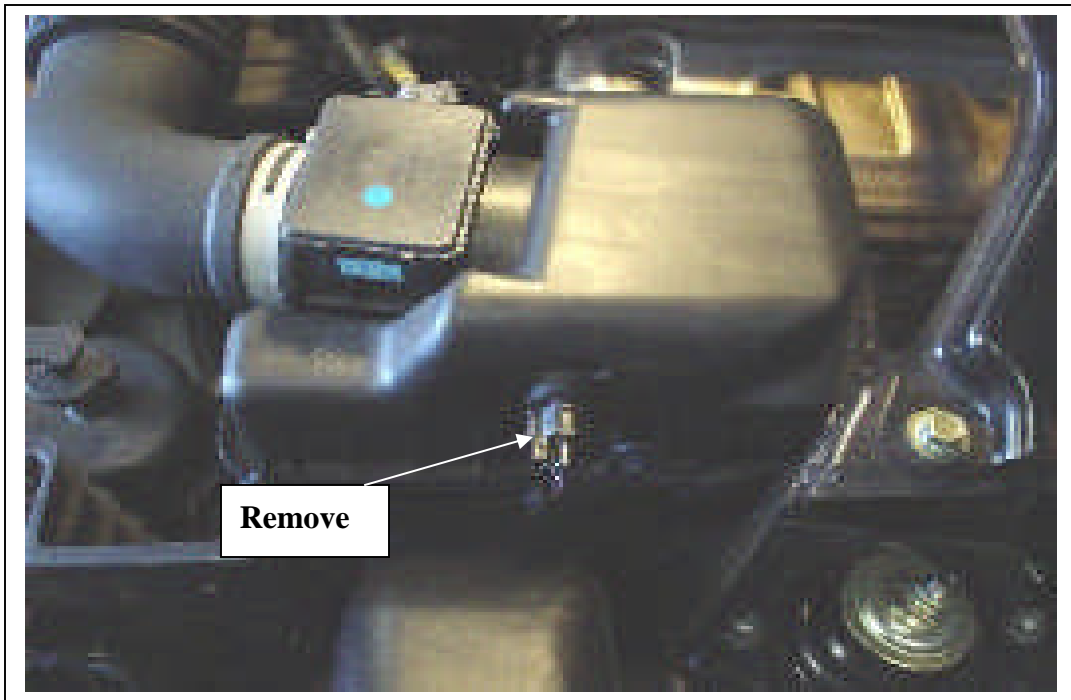
Prior to Installation:

- We highly recommend 92 or better octane but you should use a *minimum* of 91 octane, major brand fuel for at least two tank fills prior to installations (use of high octane fuel will be required after supercharger is installed).
- If you have not done so within the last 3,000 miles, you should change your oil and oil filter. We highly recommend the use of synthetic oil with any form of forced induction.
- Be sure that your car's cooling system is adequate (flush and new coolant).
- The kit comes supplied with a colder range spark plug (BKR7EIX) gapped at approximately .030 - .032.
- Before beginning work, disconnect the negative terminal from your battery.
- We recommend placing the car on four jack stands (never use a floor jack to hold a car up).
- We recommend replacing the power steering / air conditioning drive belt during the install.
- Note – Some pictures may vary from actual. As most items from 94-97 are very similar, we have used some pictures interchangeably.

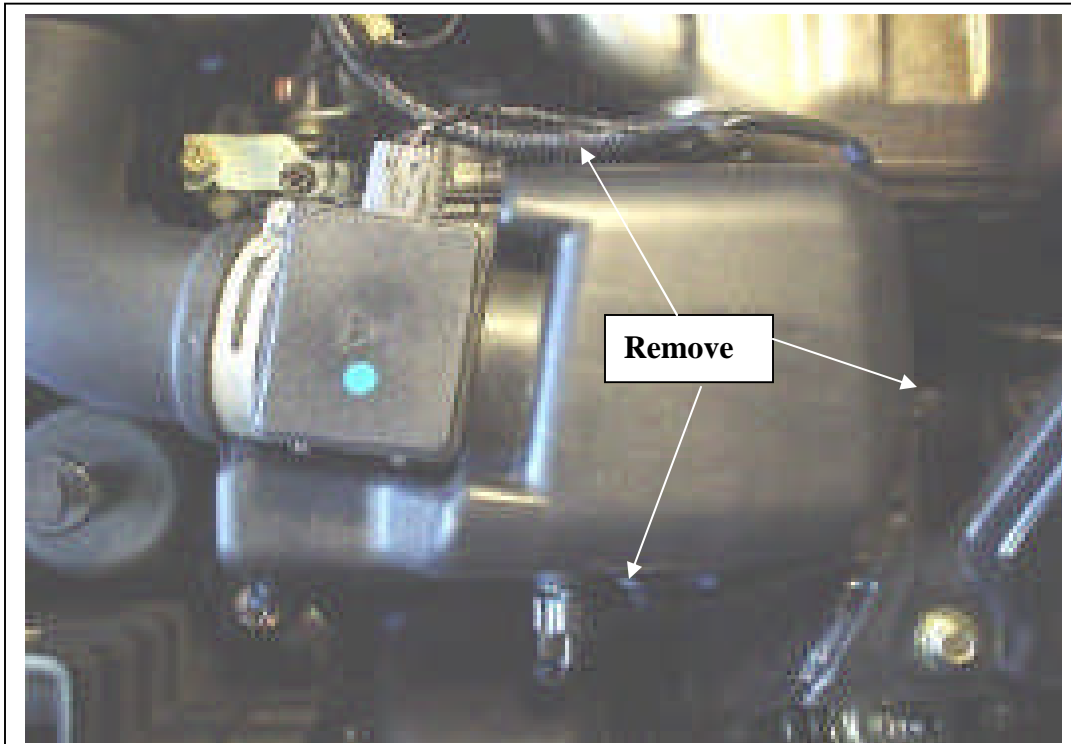
1) Begin by removing the four 12mm bolts holding the strut tower brace and remove.



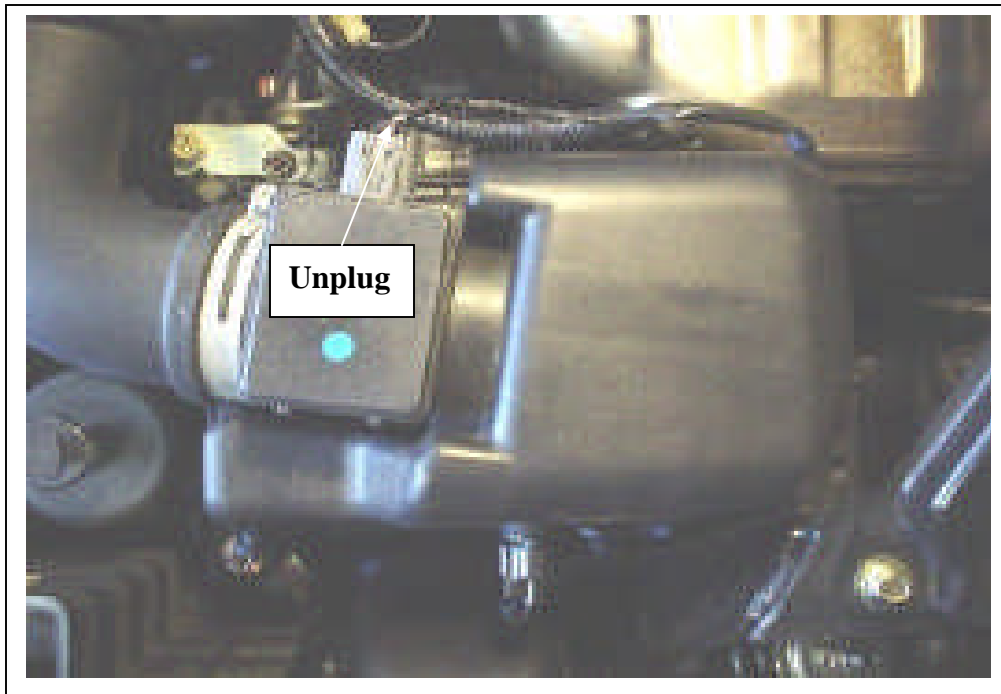
2) Remove the Intake Air Temperature (IAT) sensor from the air box. It just pulls out with a little twisting motion.



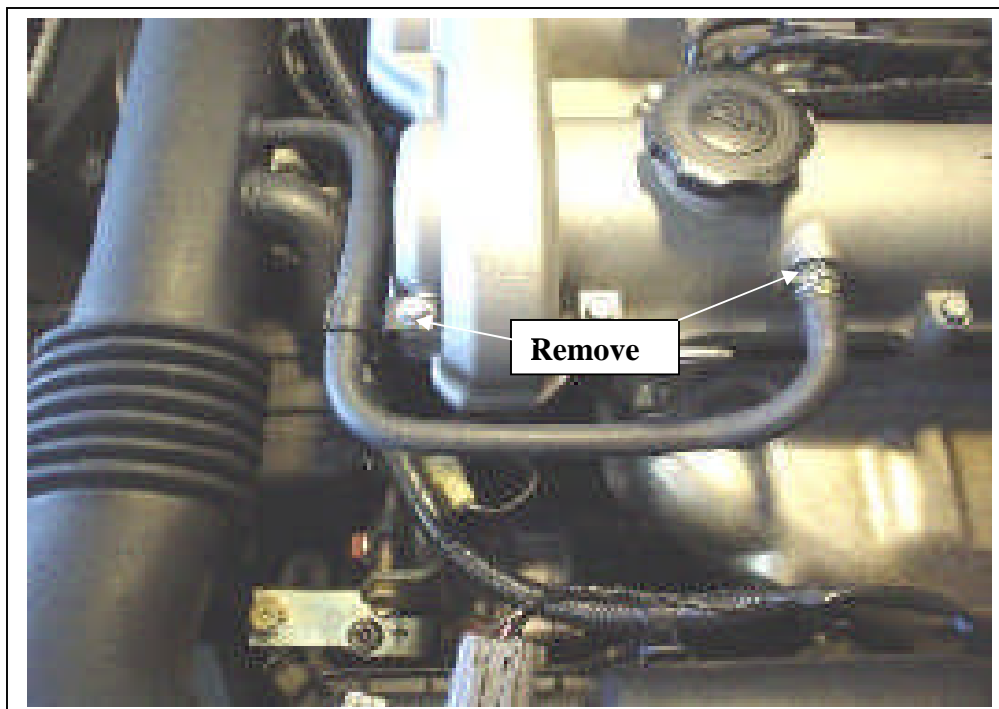
3) Remove the three clips holding the IAT harness to the air box.



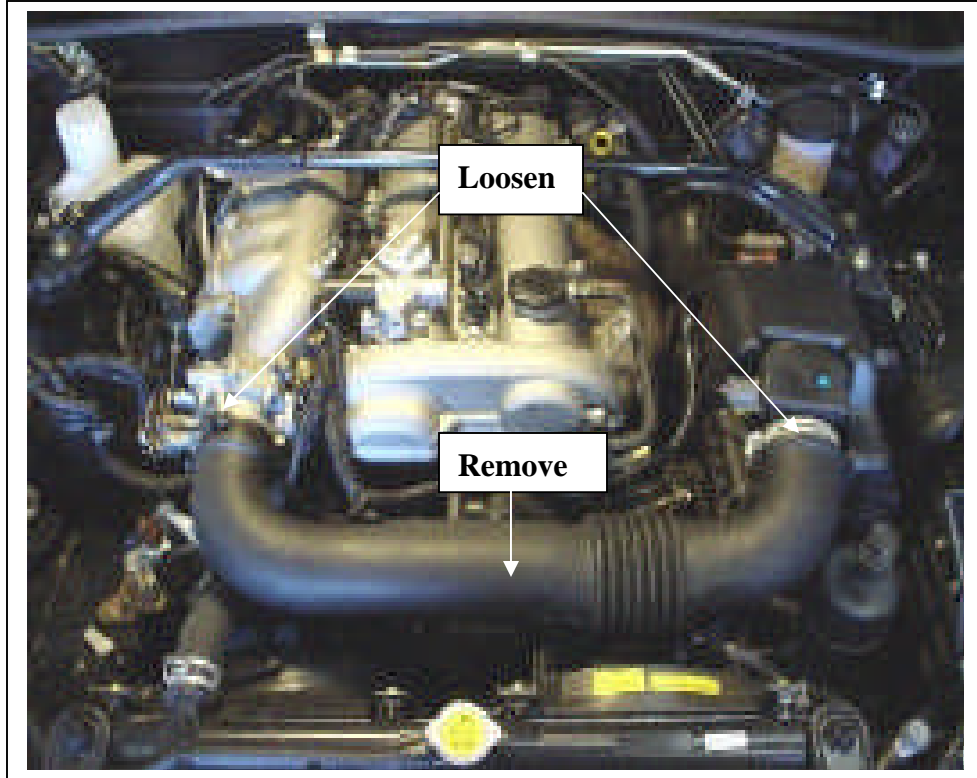
4) Unplug the Mass Air Flow (MAF) sensor connector.



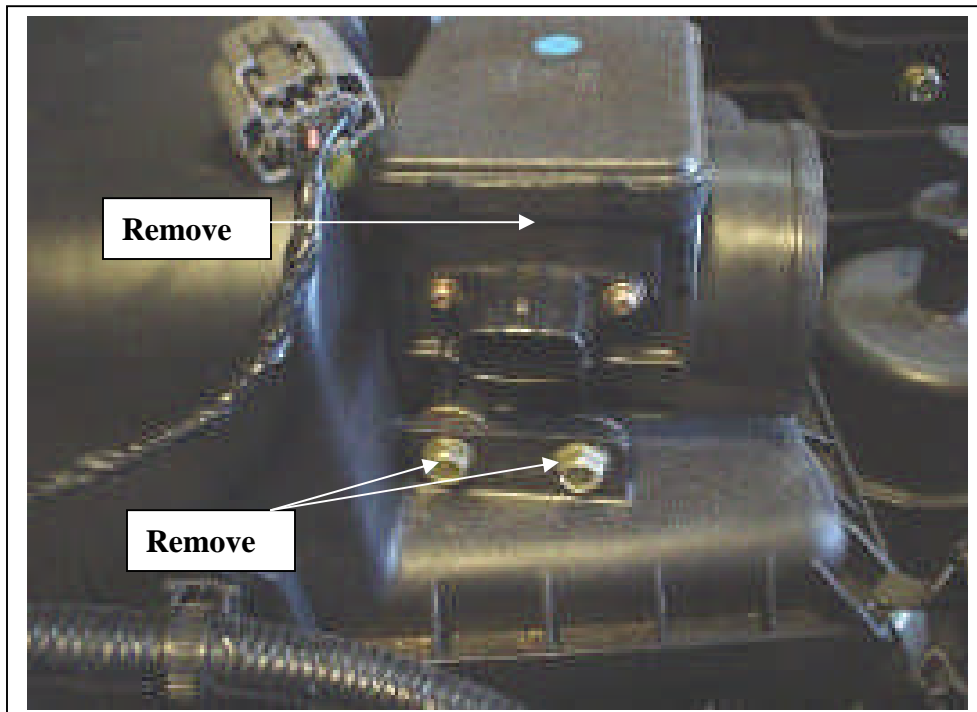
5) Unclamp and remove the valve cover breather hose from the valve cover on the driver's side. Remove the 10mm bolt holding the breather hose bracket.



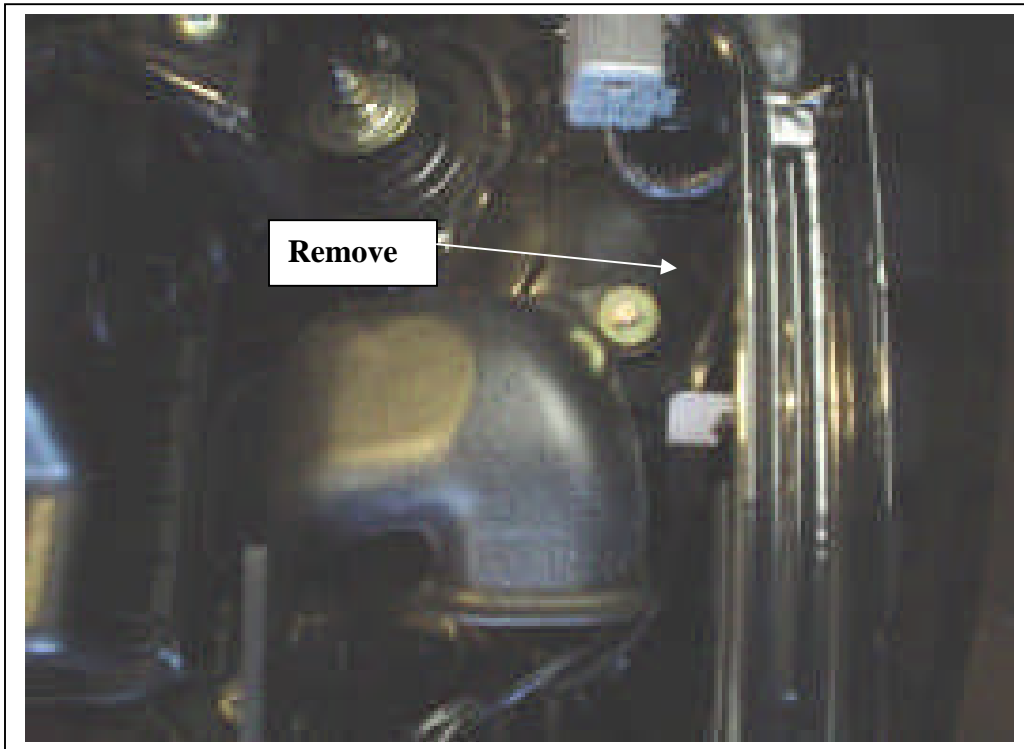
6) Loosen the crossover tube clamps and remove the crossover tube.



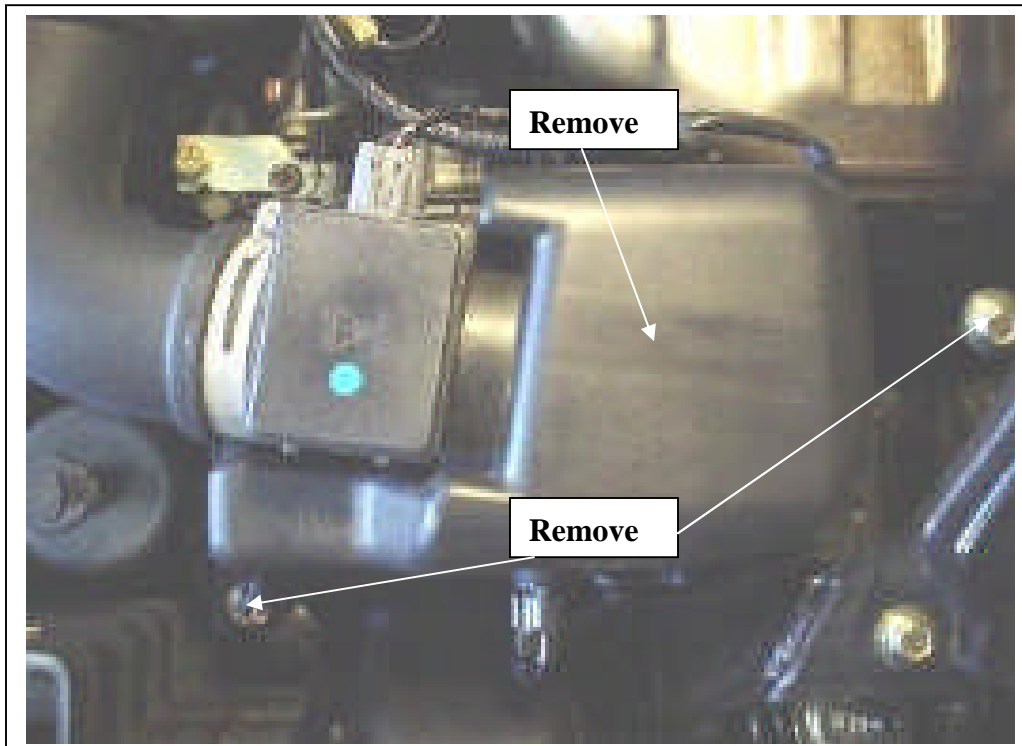
7) Remove the two 10mm bolts from the MAF sensor and remove the MAF sensor.



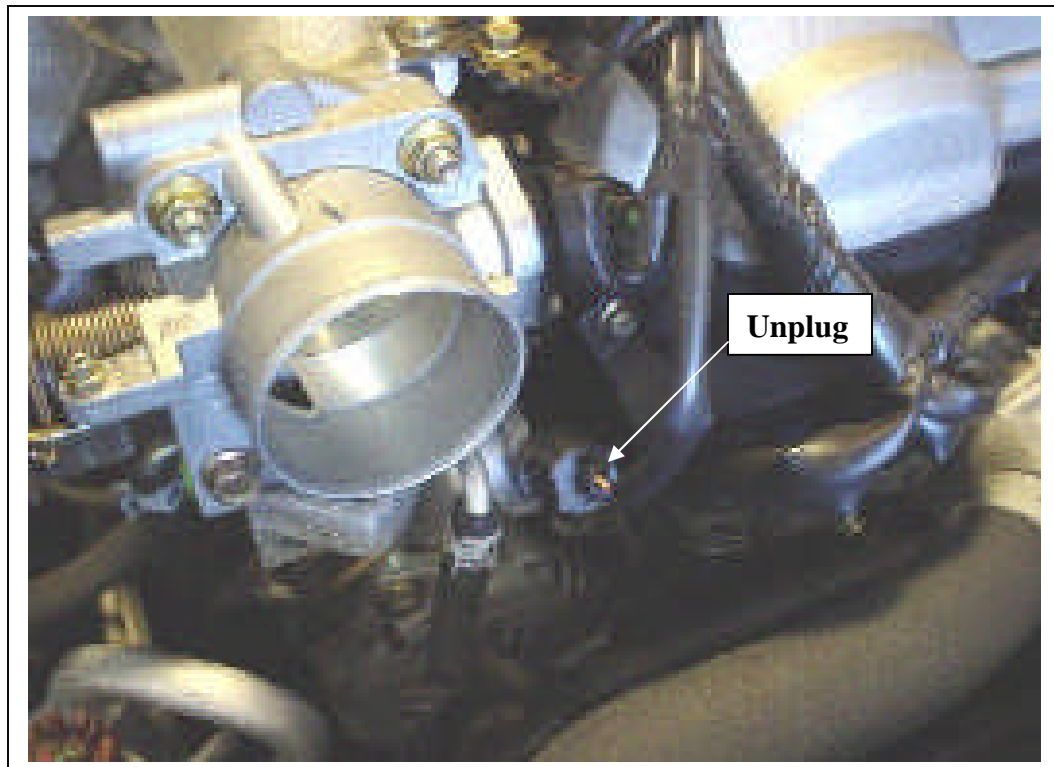
8) Remove the 10mm bolt from the air box snorkel.



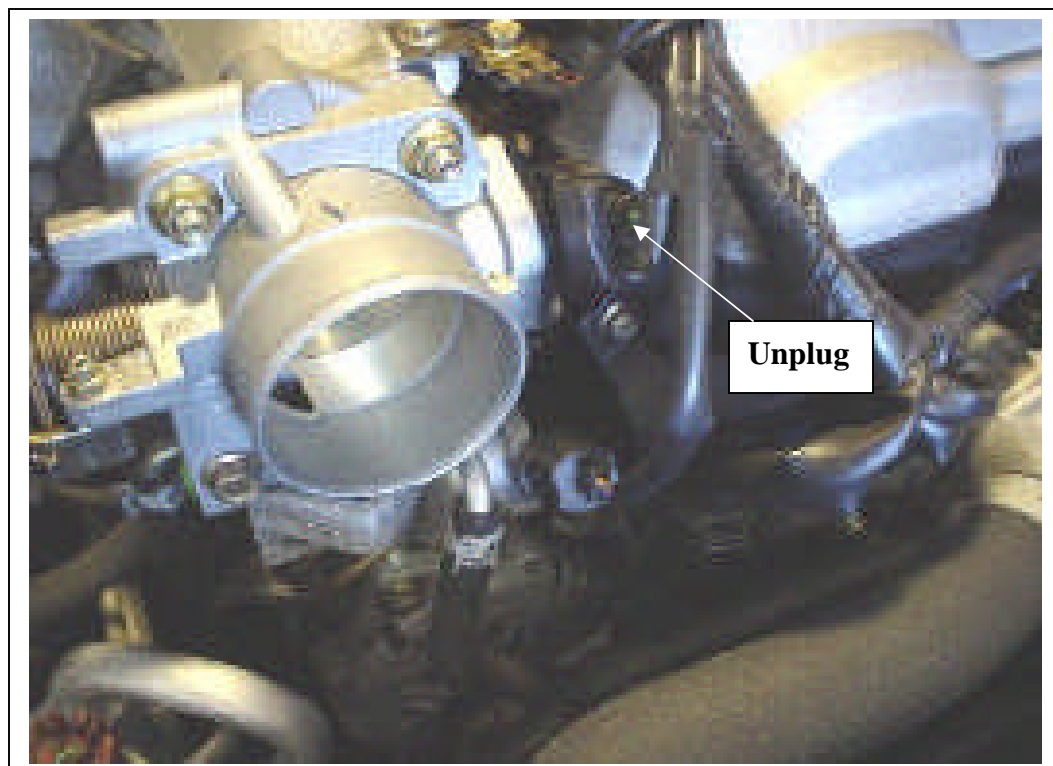
9) Remove the two 12mm bolts holding the air box to the chassis and remove the air box.



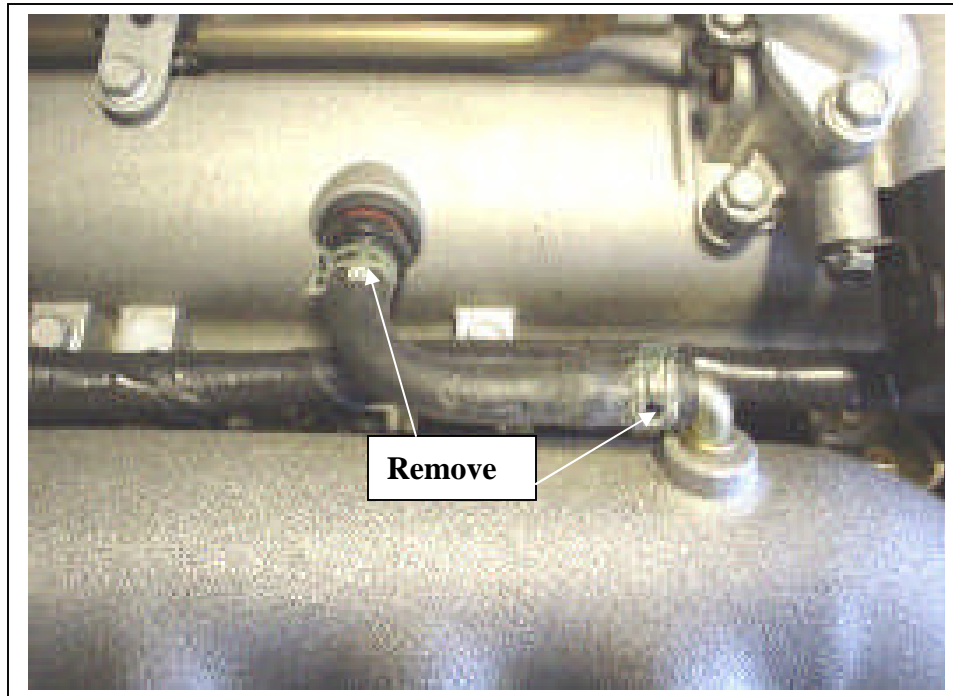
10) Unplug the Idle Air Control (IAC) connector.



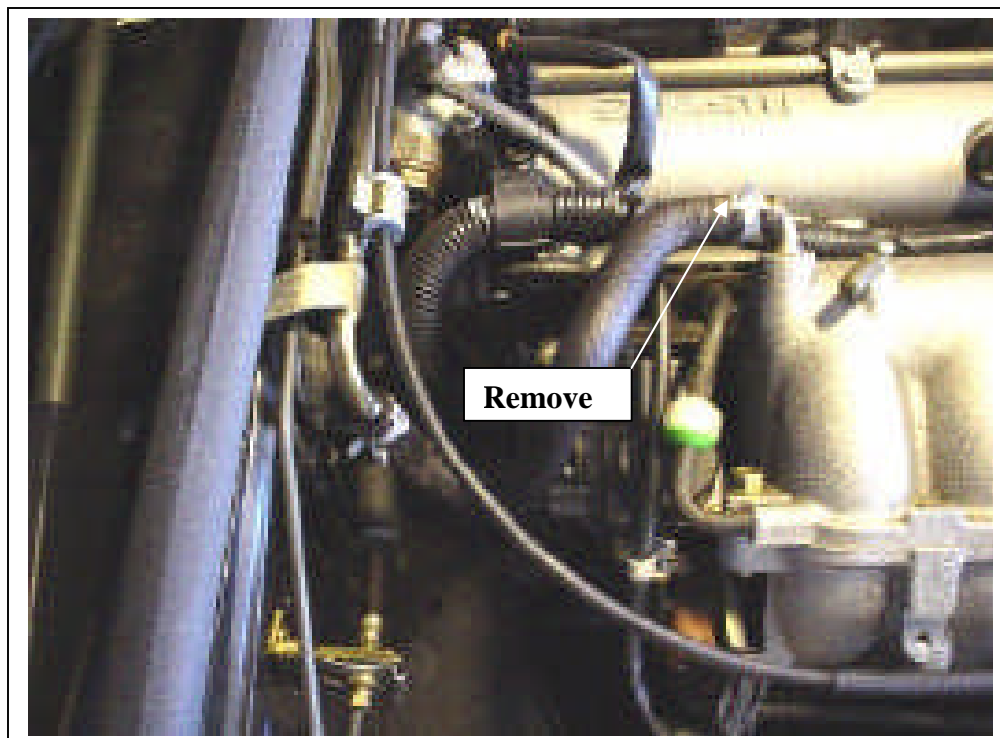
11) Unplug the Throttle Position Sensor (TPS) connector.



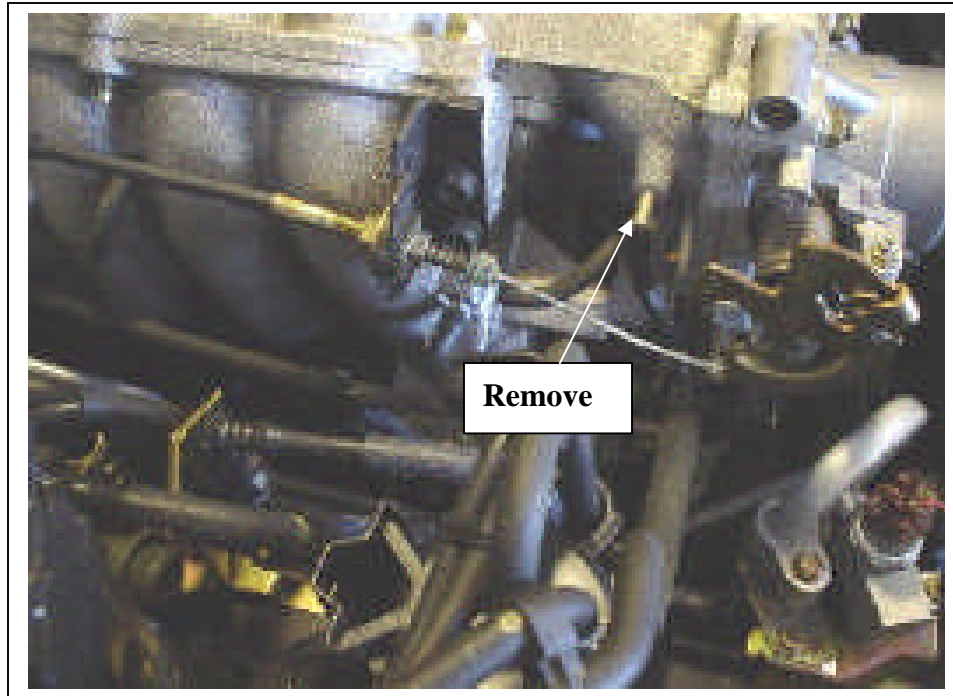
12) Unclamp and remove the Positive Crankcase Ventilation (PCV) hose.



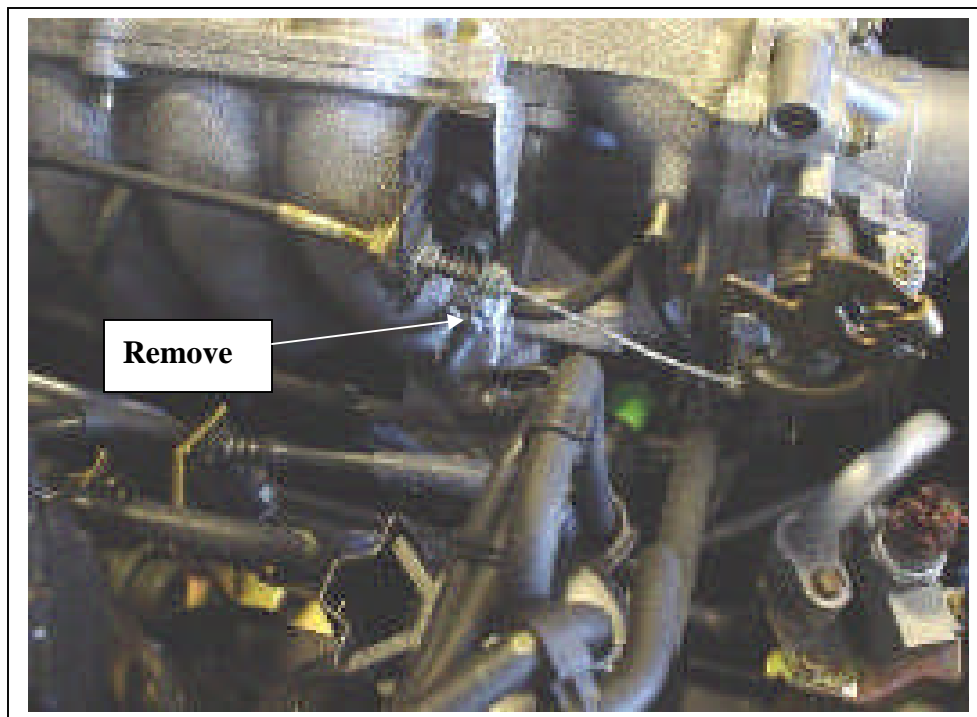
13) Unclamp and remove the brake booster hose.



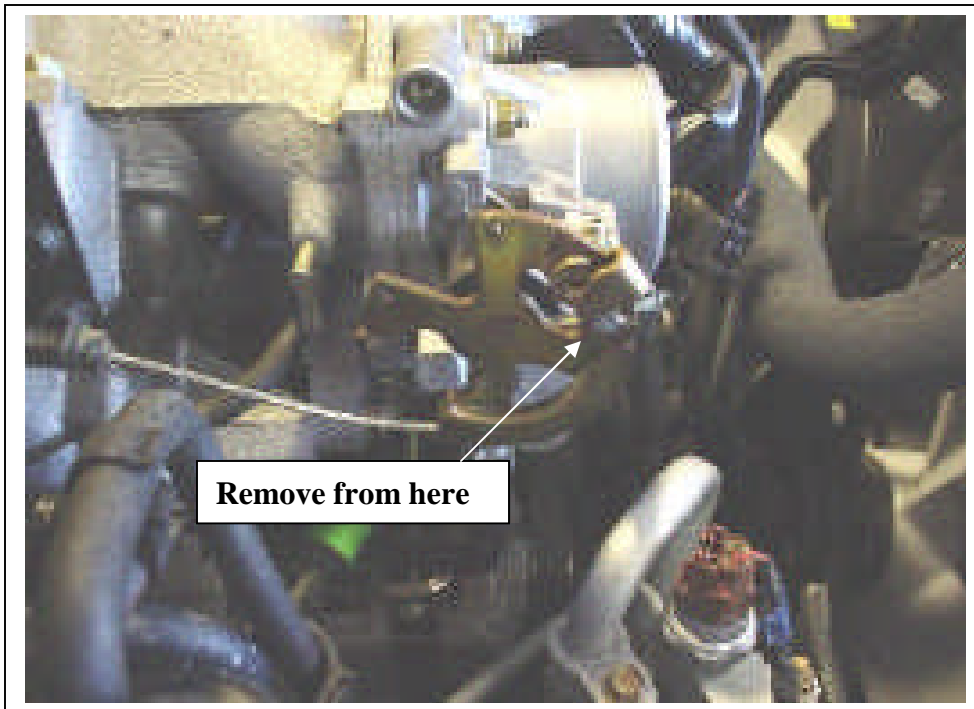
14) Remove the purge control hose from the intake manifold.



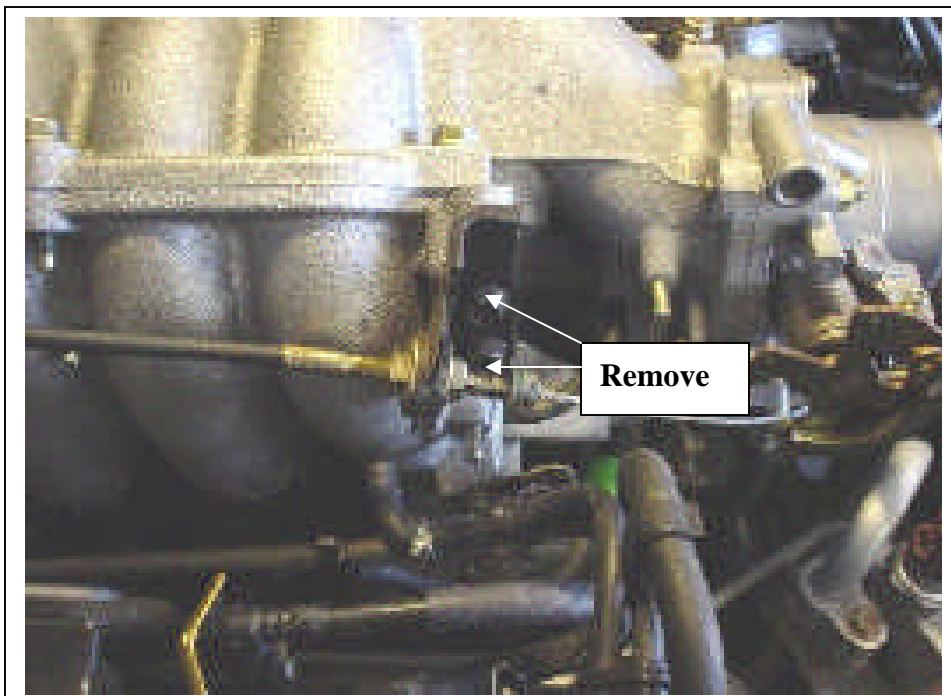
15) Unclamp and remove the boost sensor hose.



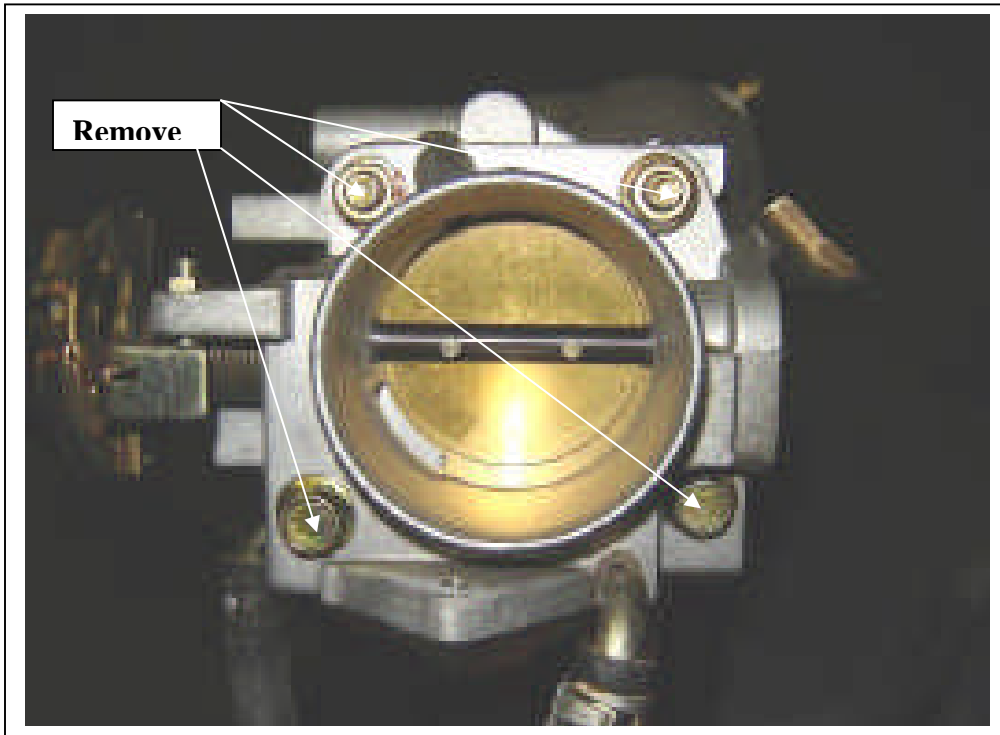
16) Remove the throttle cable from the throttle body by opening the throttle to the fully open position and slipping the cable end out of the hole.



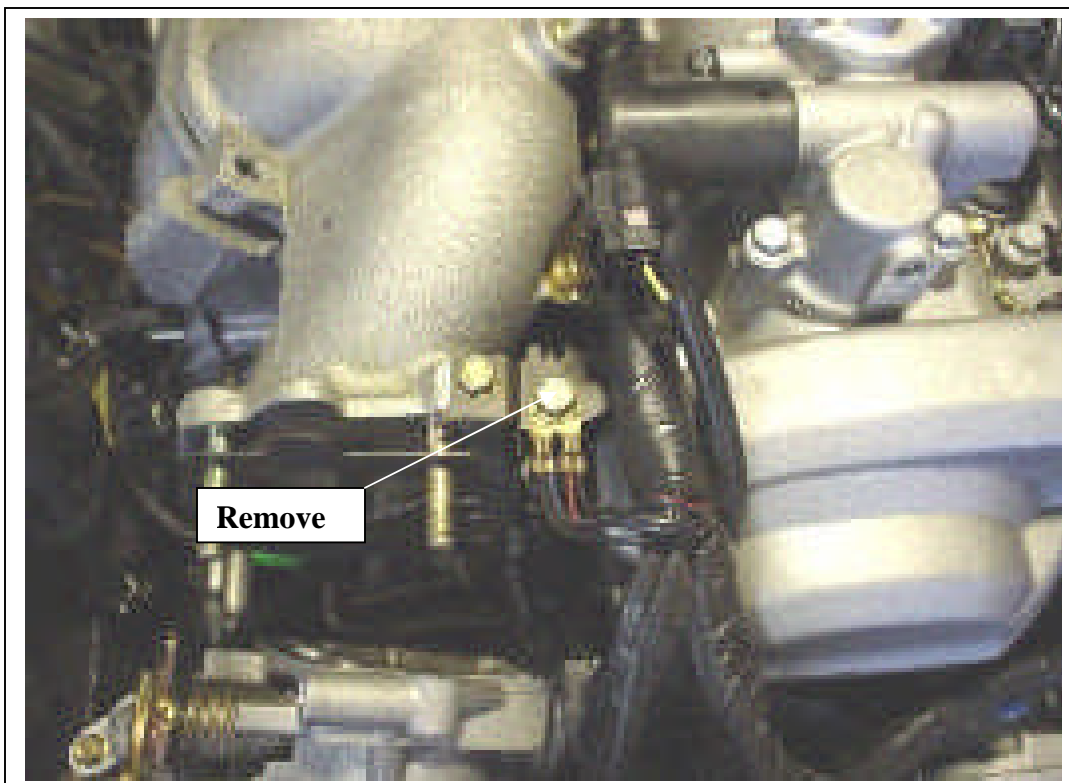
17) Remove the two 10mm bolts from the throttle bracket and remove the throttle bracket. Remove the top bolt first to allow easier access to the lower bolt.



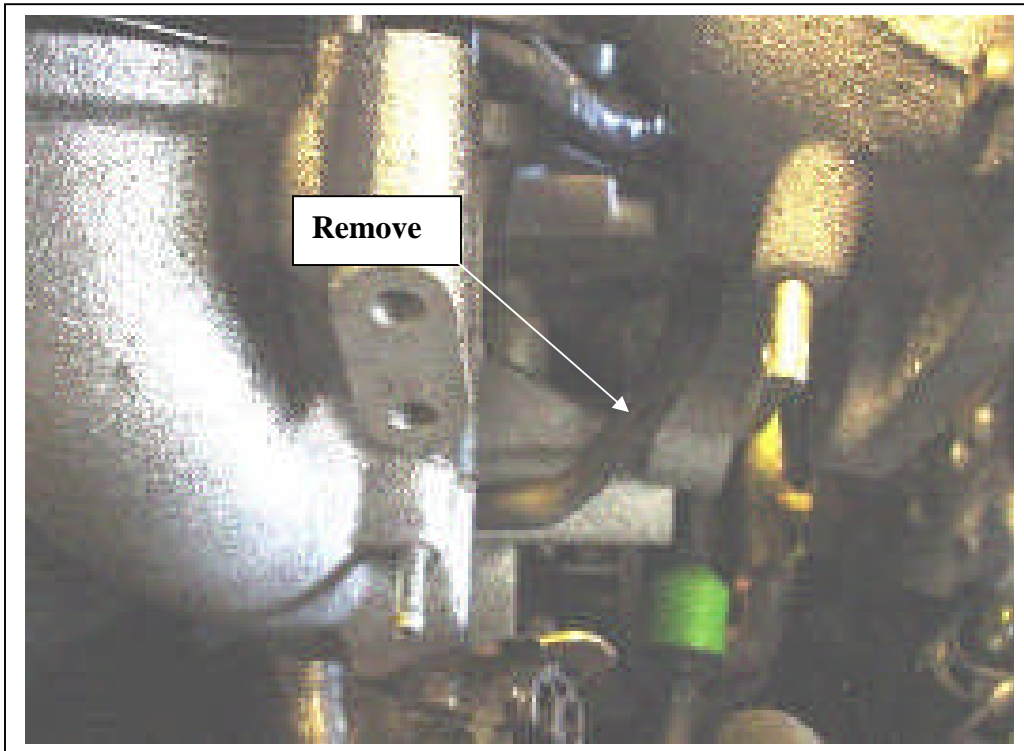
18) Remove the two 12mm nuts and two 12mm bolts from the throttle body and move it out of the way leaving the coolant hoses connected. Put a rag over the nearby A/C lines to protect them from damage.



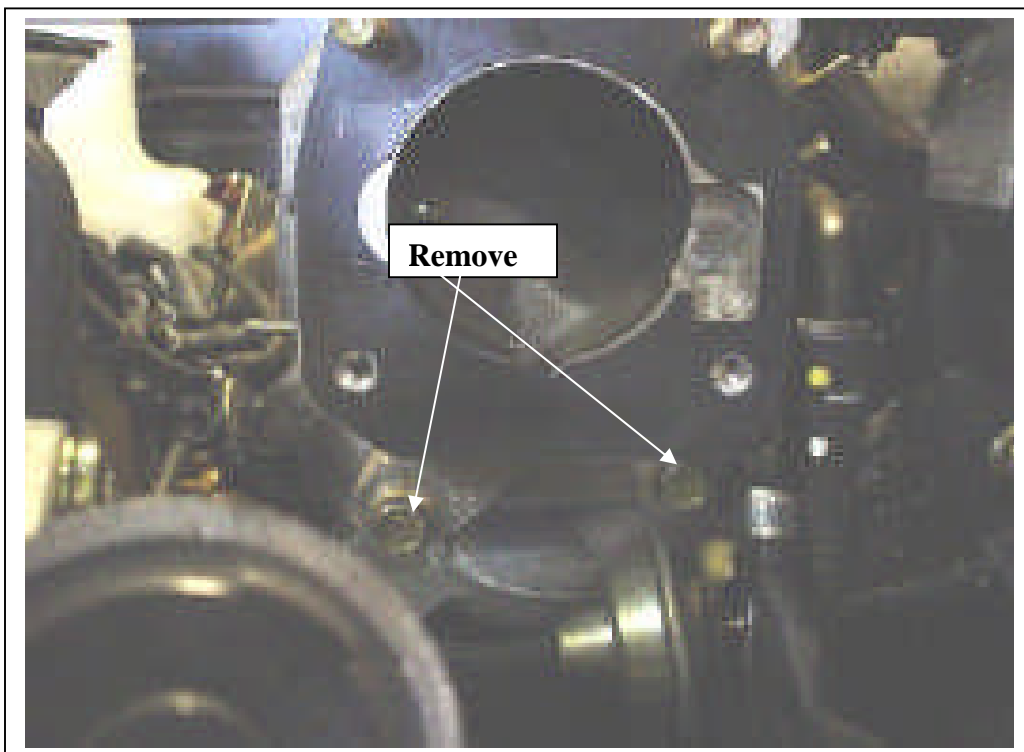
19) Unbolt the ground wiring harness from the top of the intake manifold. Save the bolt for reuse. Note: This picture is from an 01-05. Your valve cover will look different.



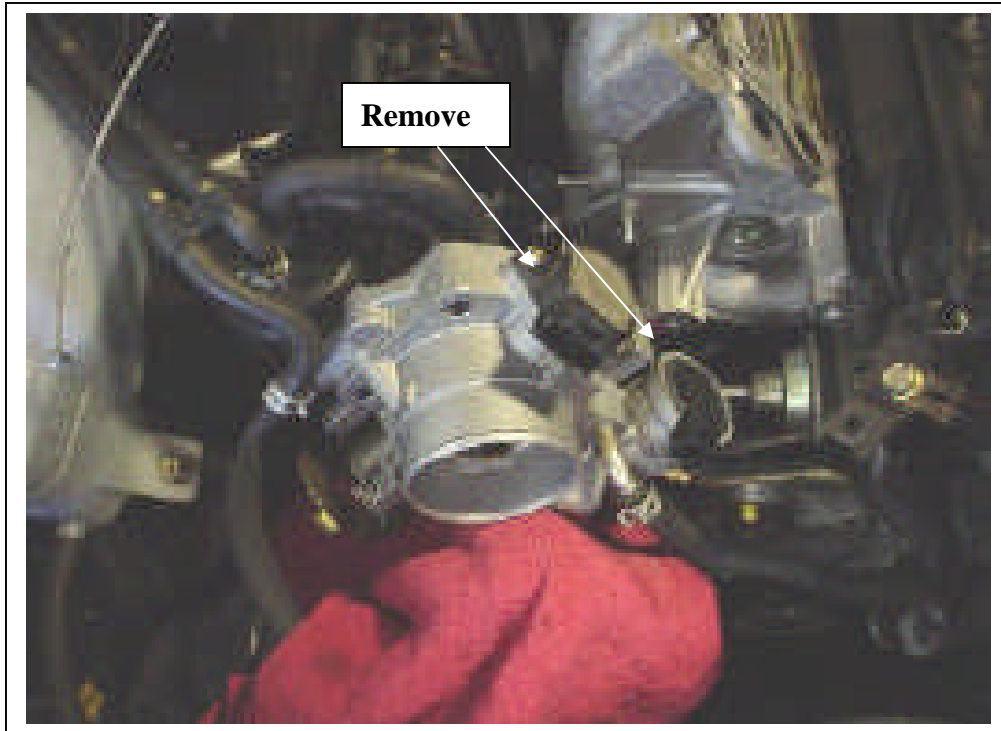
20) Remove the short hose connecting the upper and lower intake manifold.



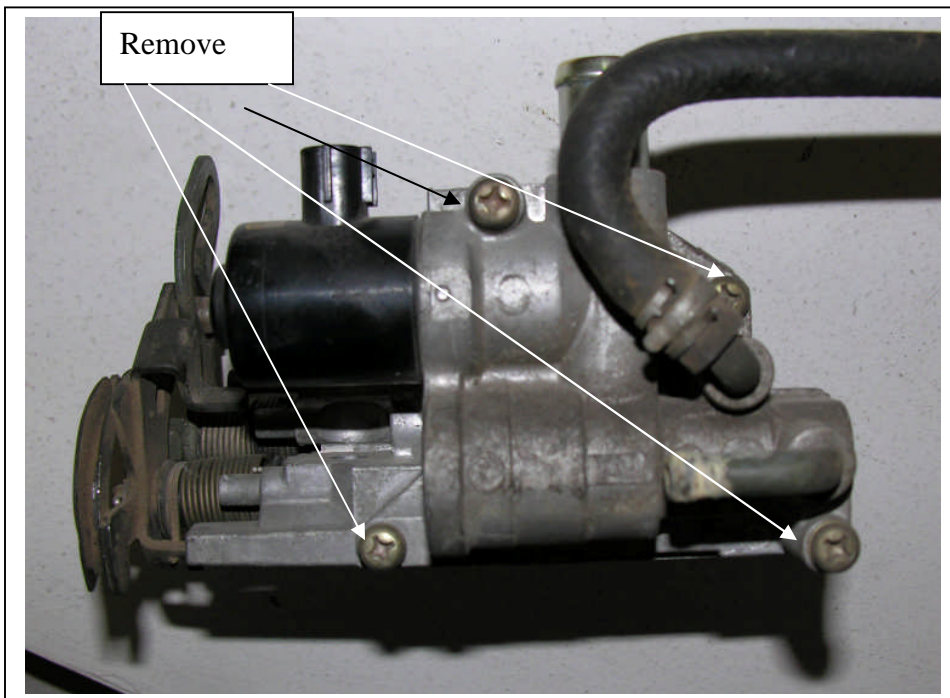
21) Remove the two 12mm bolts from the front of the intake manifold.



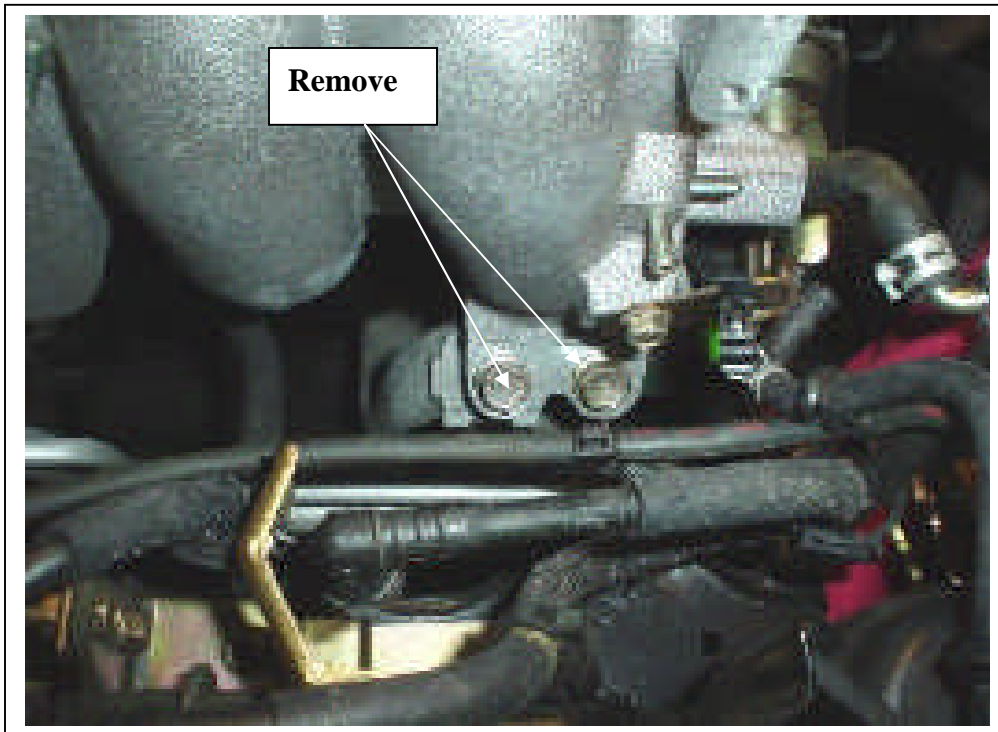
22) Remove the two 7mm bolts from the TPS and remove the TPS. Save the TPS and bolts for reuse.



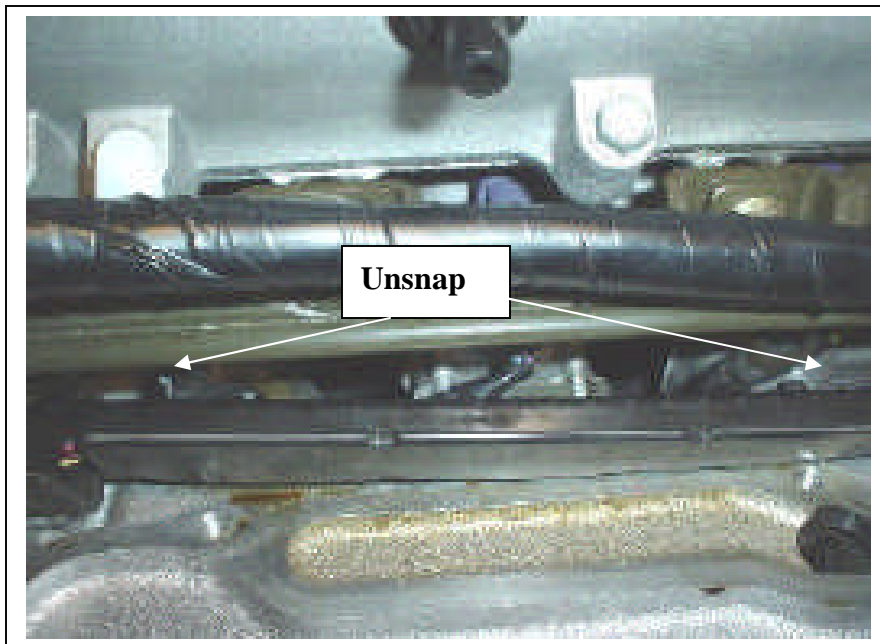
23) Remove the four screws from the IAC and carefully remove the IAC.



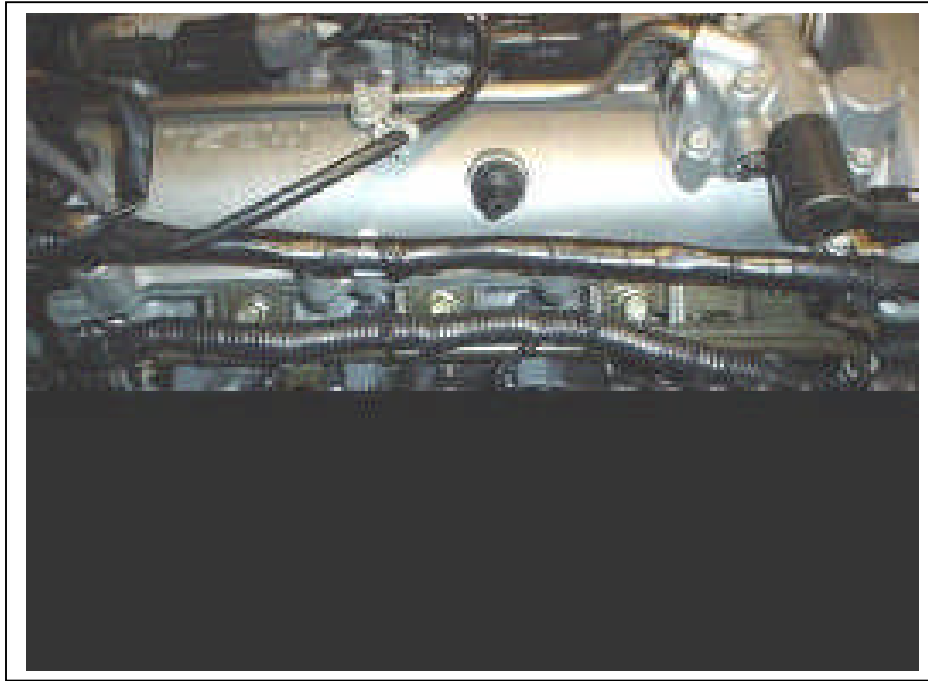
24) Remove the two 14mm bolts from the intake manifold support brace.



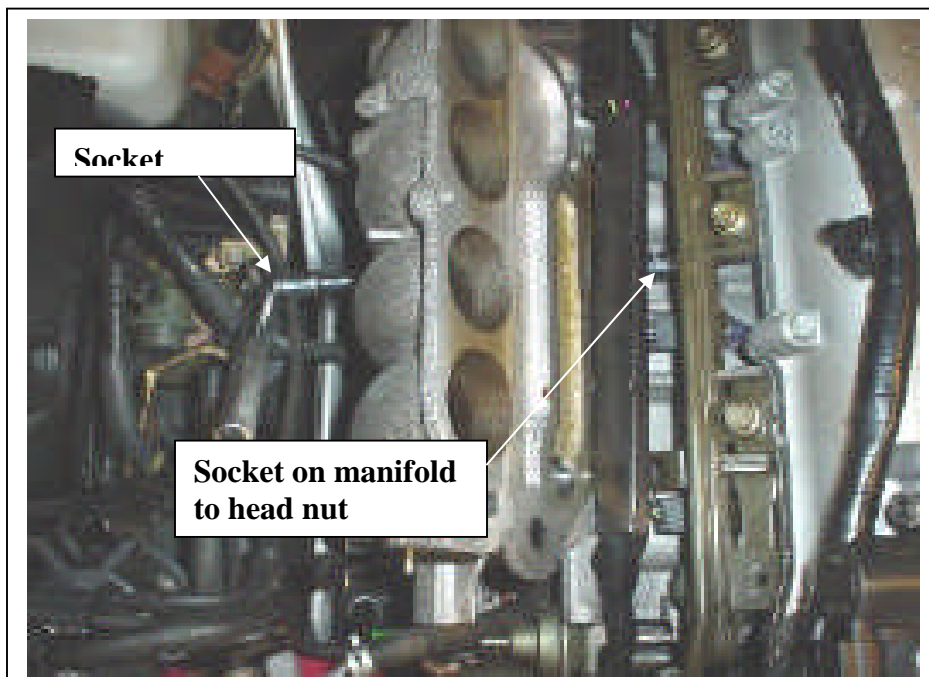
25) Pull the injector harness off at the two snaps. It pulls straight off.



26) Remove the injector harness cover and remove the tape from the wires. Carefully unplug the harness from the four injectors making note of which plug goes to which injector. Then re-tape the harness (without the cover) and attach it above the fuel rail with zip ties as shown. Connect the four electrical connectors back to the four injectors.



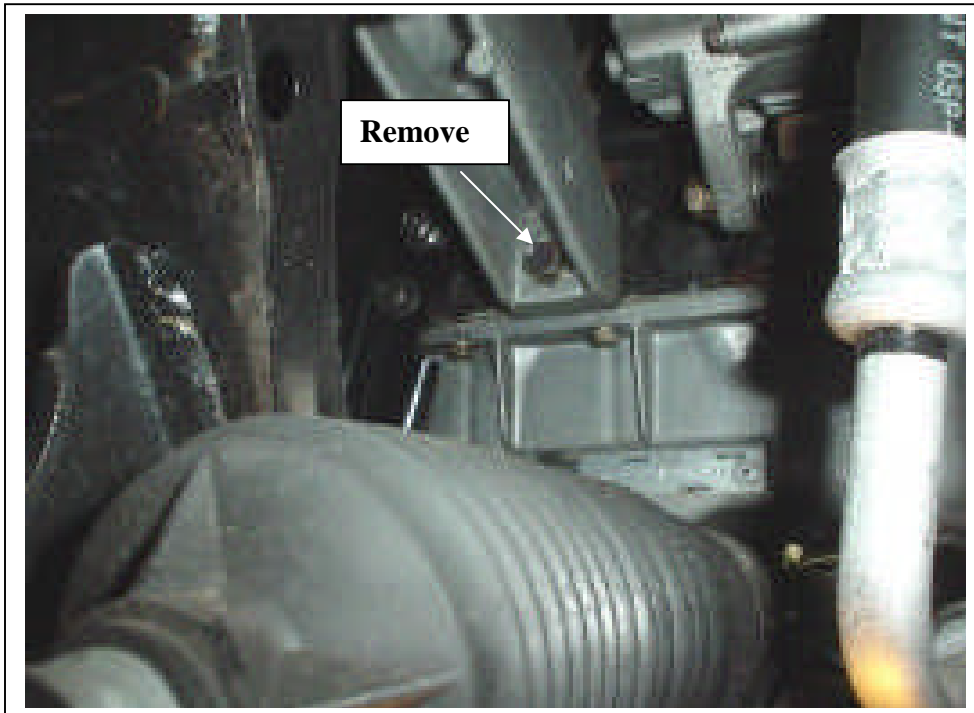
27) Remove the nine 12mm intake manifold to head nuts. Use a 3/8" drive with a long extension as shown. The lower nuts might be easier to remove with an open end wrench or crow foot. If you use a socket, make sure it is fully engaged to the nut or you may damage the nut. Some installers have had great success with a 1/4" drive shallow 12mm wobble socket.



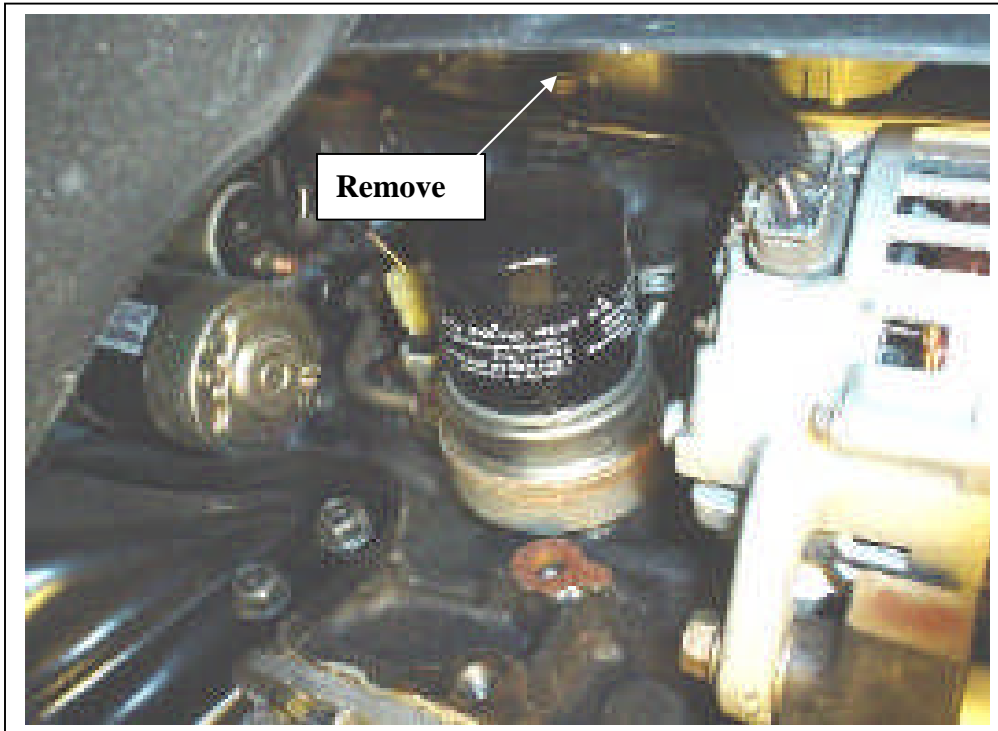
28) Remove the nine 10mm bolts and two 10mm nuts from the splash pan. To access the one 10mm nut on the driver's side, remove the bolt in the picture and open cover enough to unbolt the nut. Remove the splash pan. Save all the nuts and bolts to later put the splash pan back on.



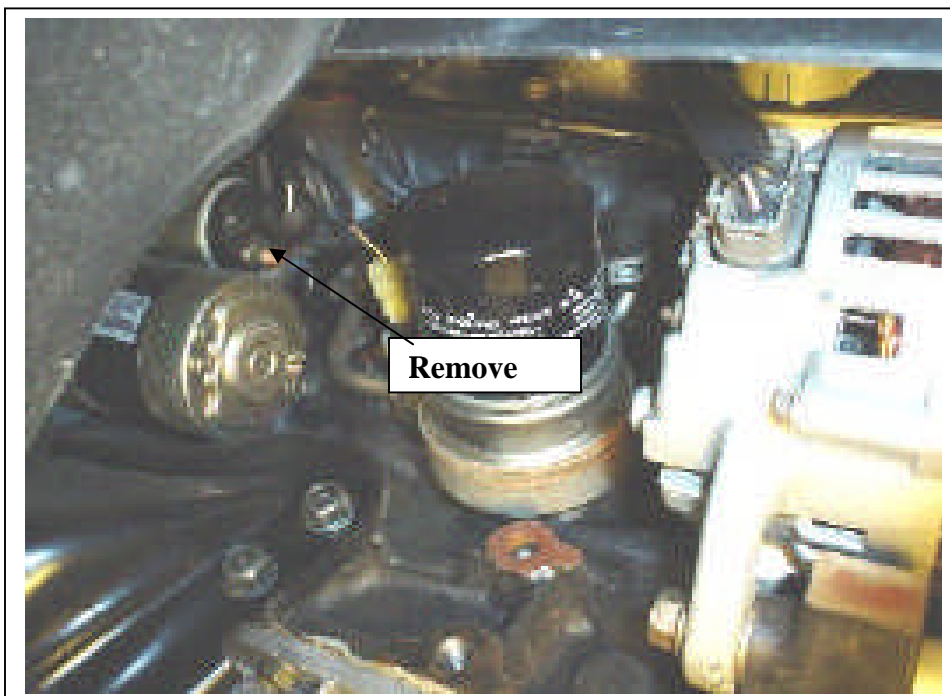
29) Remove the lower 14mm bolt from intake manifold support brace and remove the support brace.



30) Remove the 10mm bolt holding the wire harness under the intake manifold.



31) Remove the 10mm bolt holding the oil line under the intake manifold. It is behind the fuel hose in the picture.



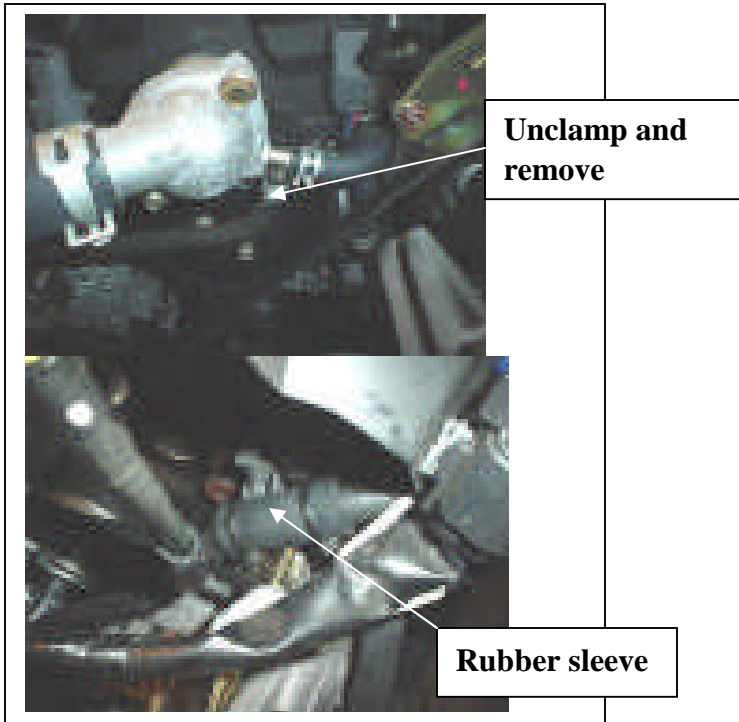
32) Tilt the intake manifold up and remove the 10mm bolt holding the fuel hose under the intake manifold.



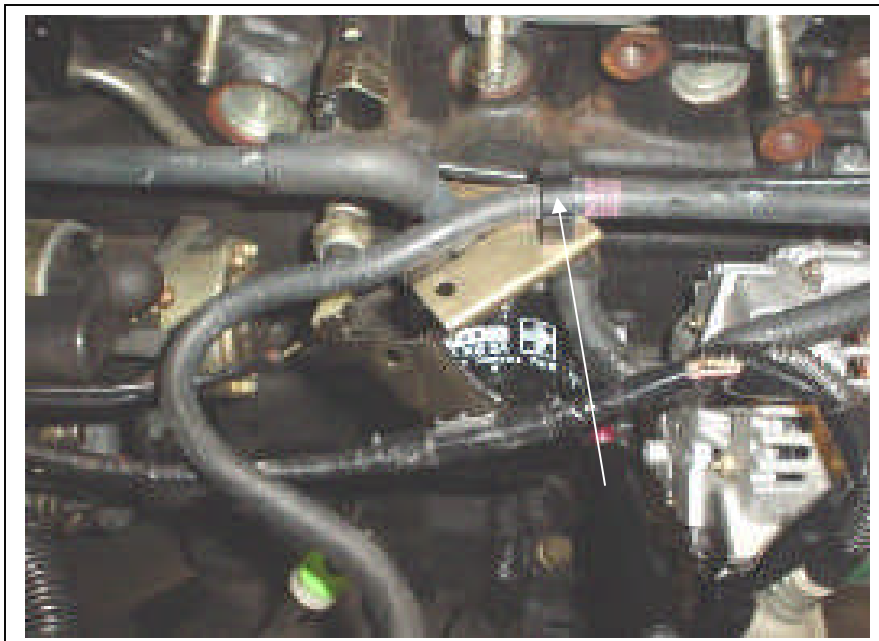
33) Remove the lower intake manifold. Save the Intake Manifold Gasket for use with the install of the new Intake Manifold.



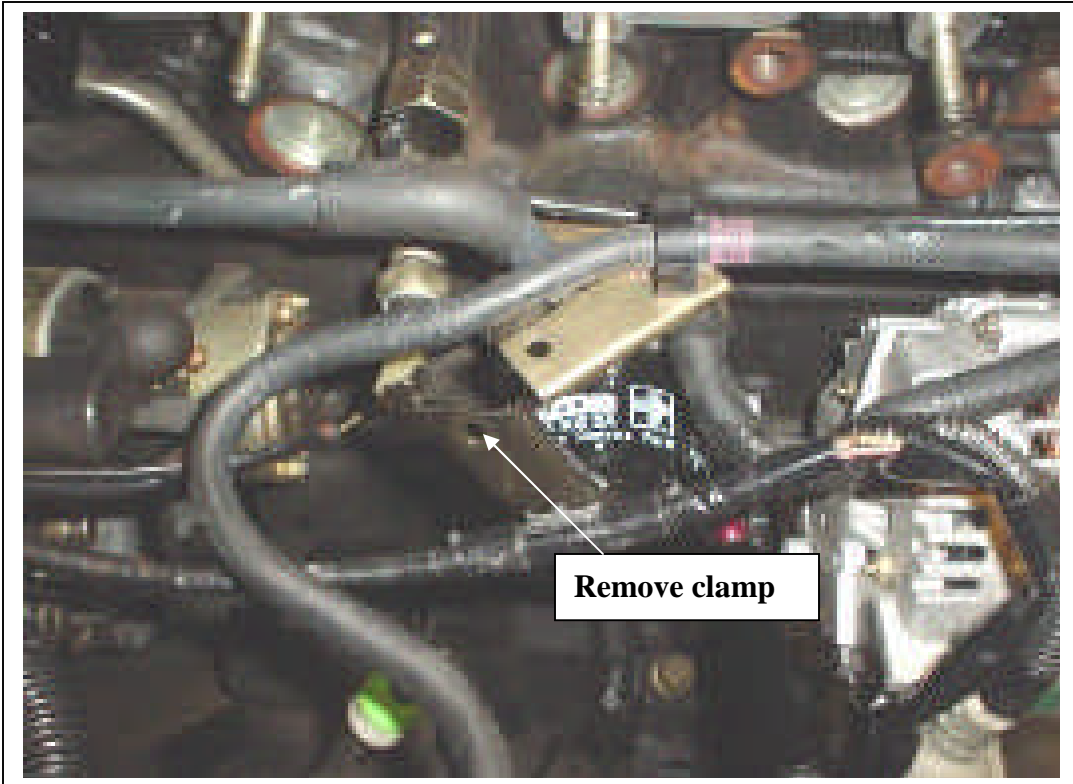
34) Unclamp the hose on thermostat side going from throttle body and remove. Put the two removed clamps and rubber sleeve on the replacement coolant hose. Attach the replacement coolant hose to the thermostat barb and zip tie the rubber sleeve as shown to protect the coolant hose from the alternator bracket.



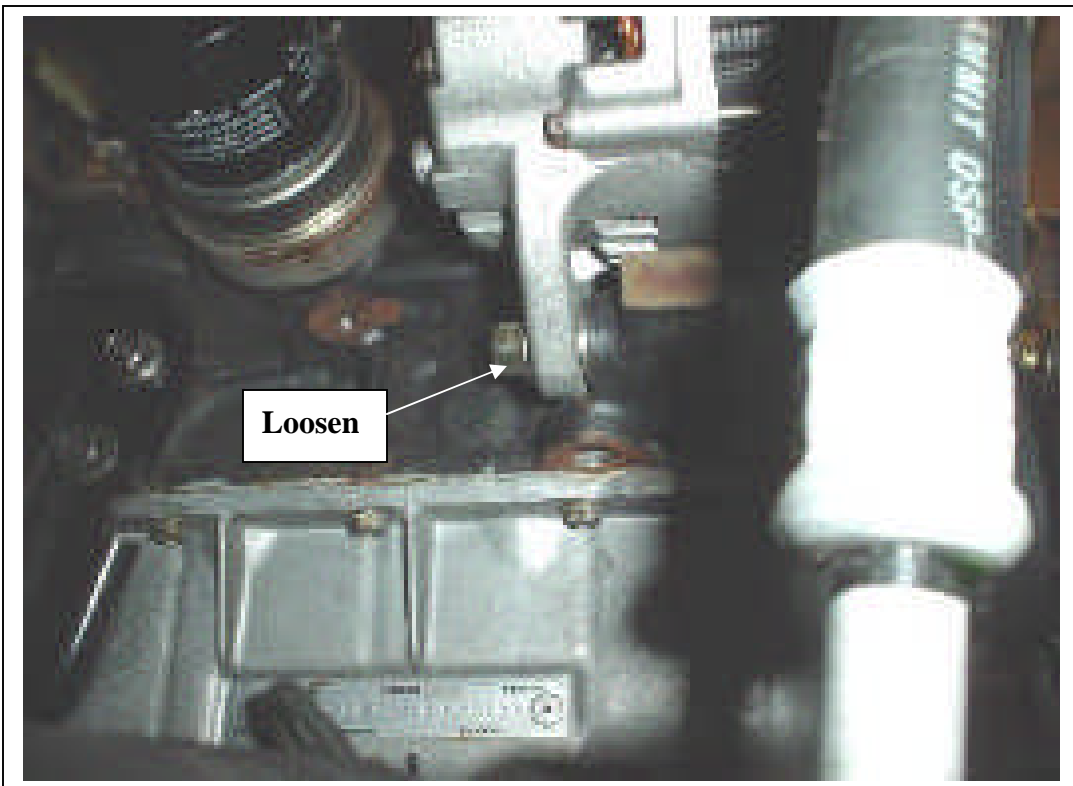
35) Remove the clamp from the fuel hose as shown.



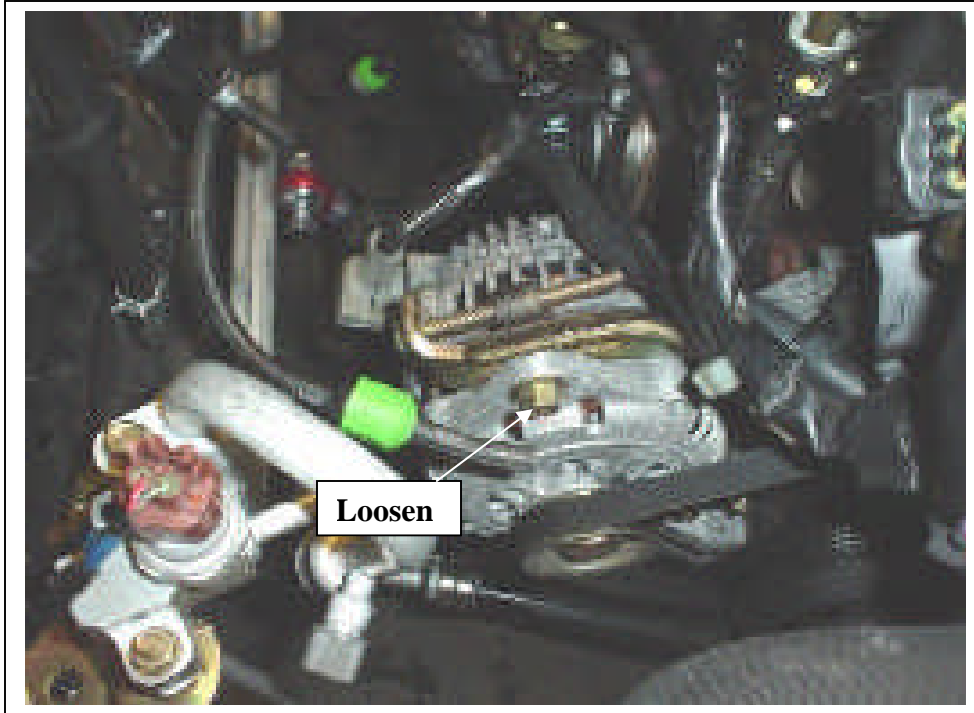
36) Remove the clamp from the wiring harness as shown.



37) Loosen the alternator 14mm pivot bolt.



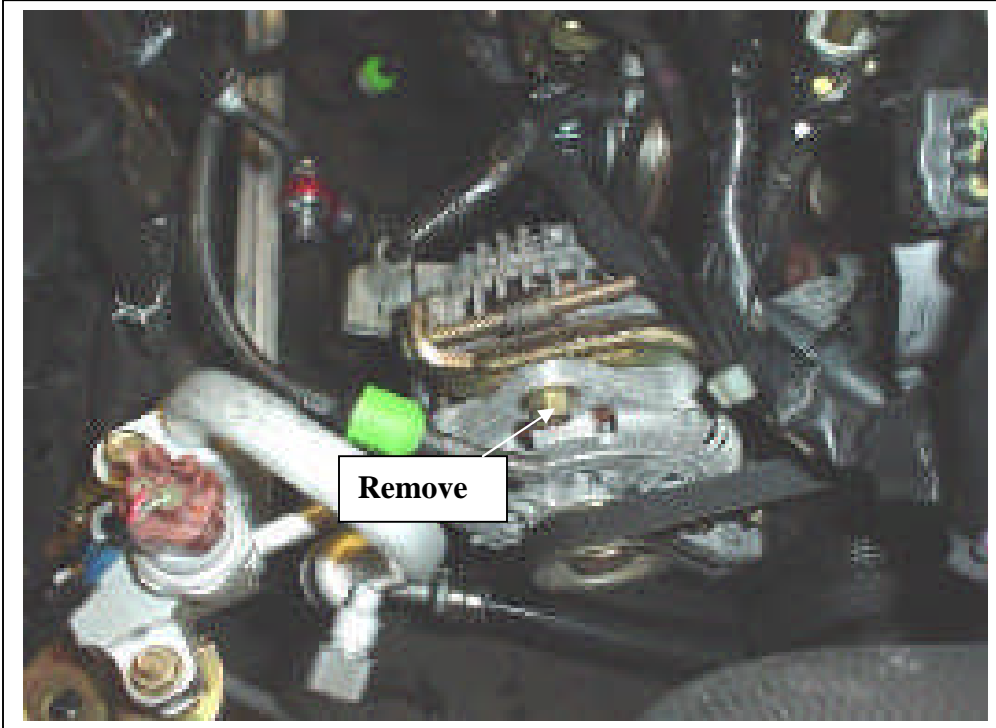
38) Loosen the 12mm alternator tension hold bolt.



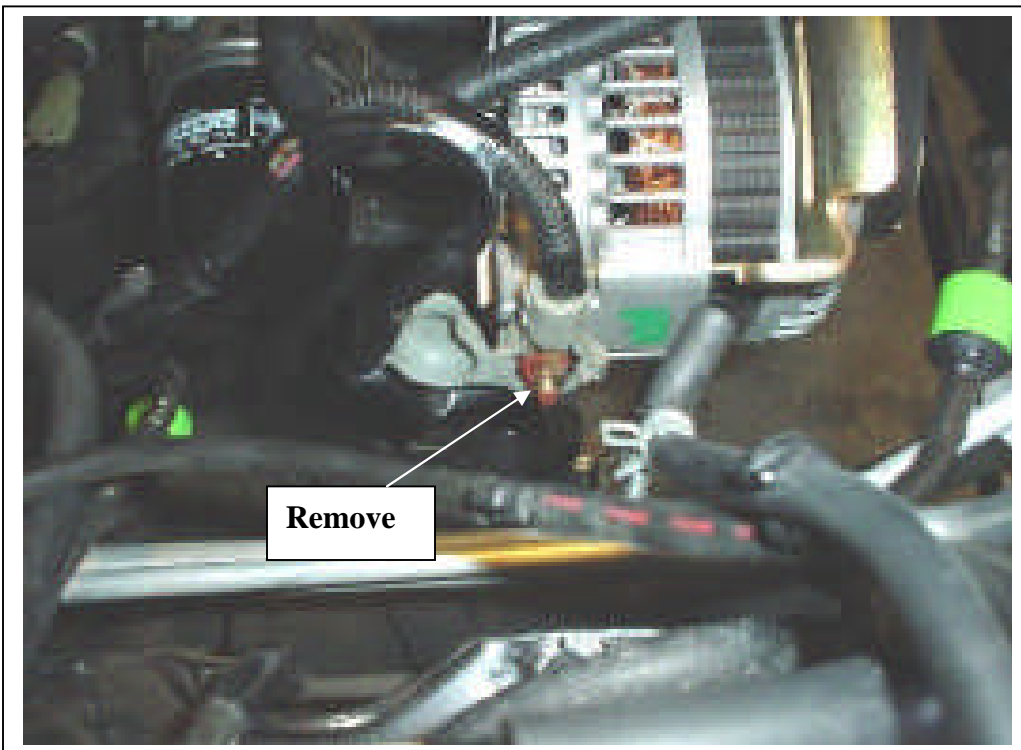
39) Remove the 12mm alternator tension bolt and remove the belt from the alternator. Save the bolt and belt for reuse.



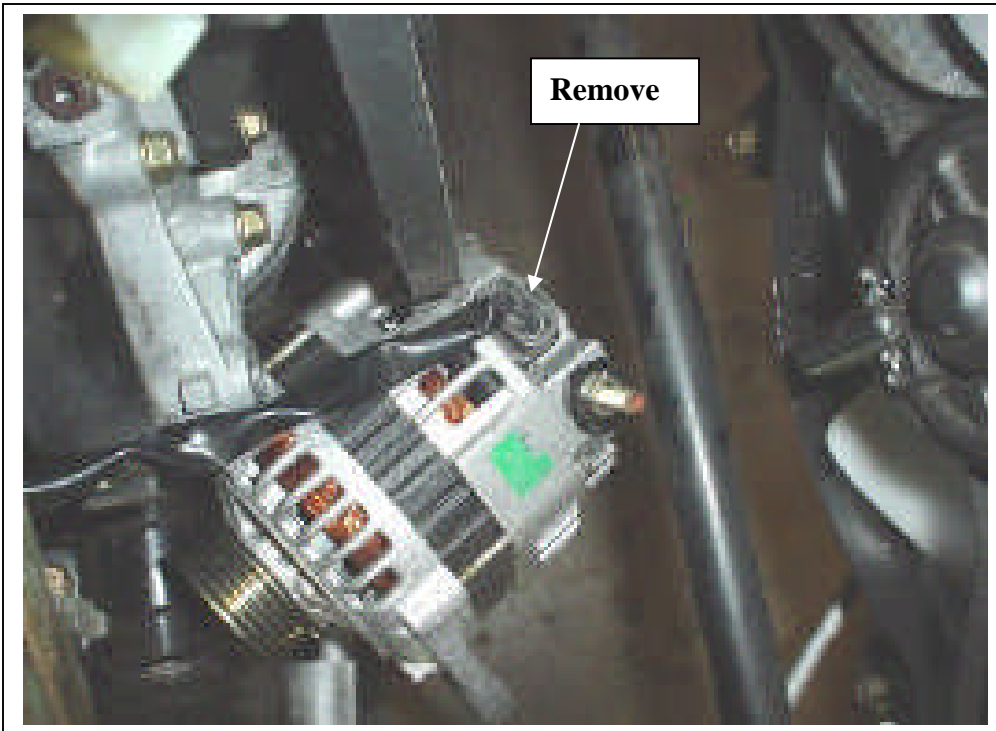
40) Remove the 12mm alternator tension hold bolt. Save the bolt for reuse.



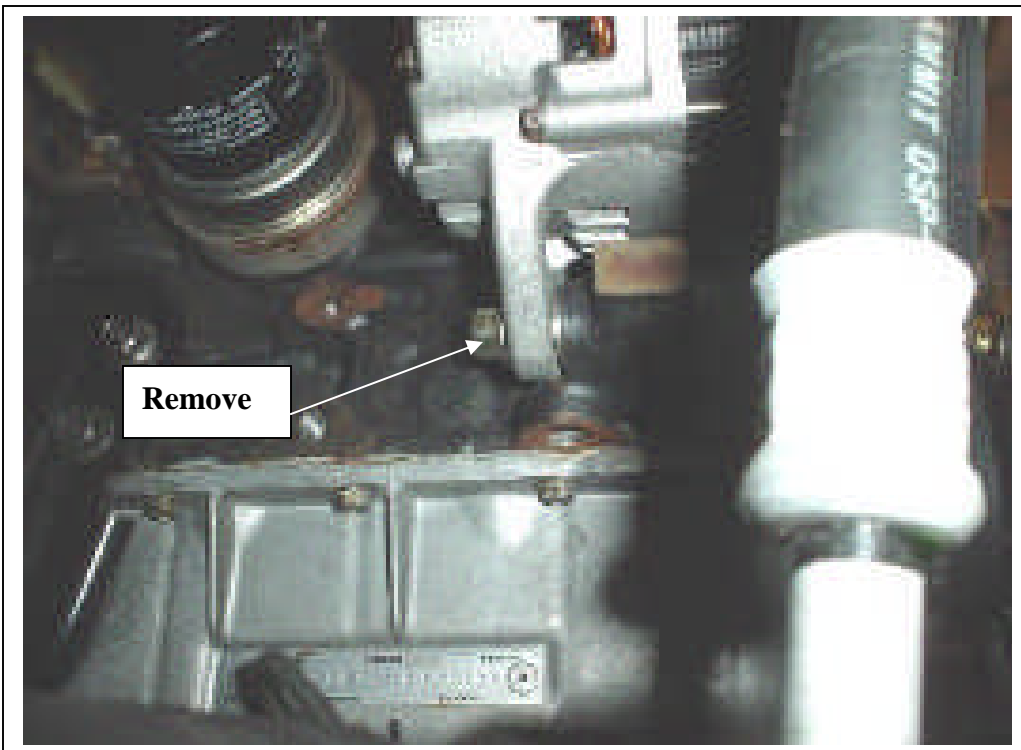
41) Remove the 12mm nut holding the alternator main wire. Save the nut for reuse.



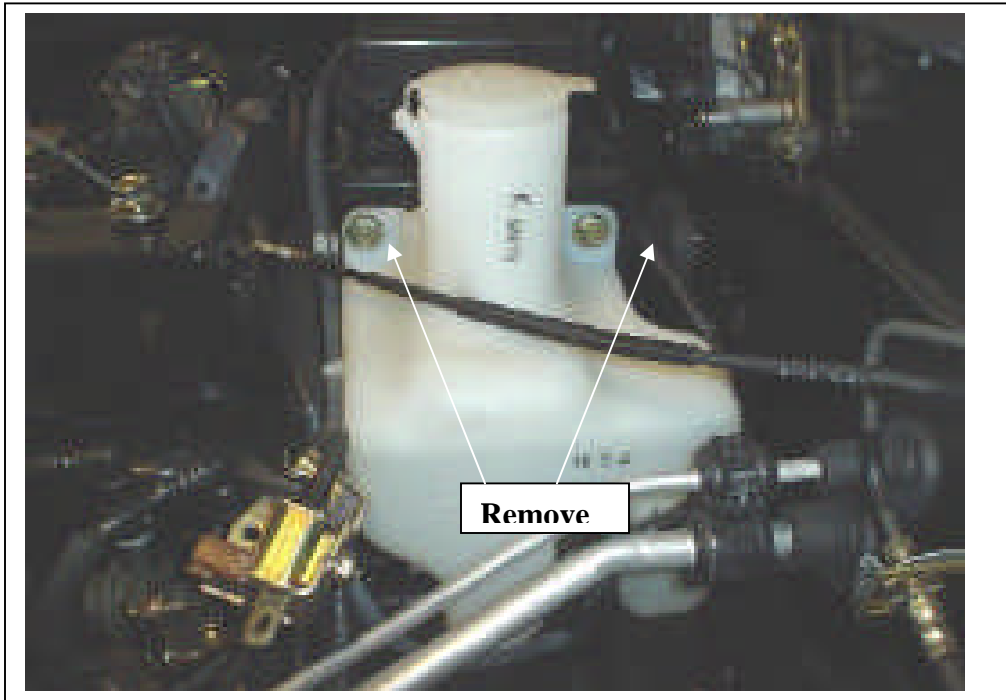
42) Unplug the alternator wiring harness.



43) Remove the 14mm alternator pivot bolt and remove the alternator. Save the bolt for reuse.



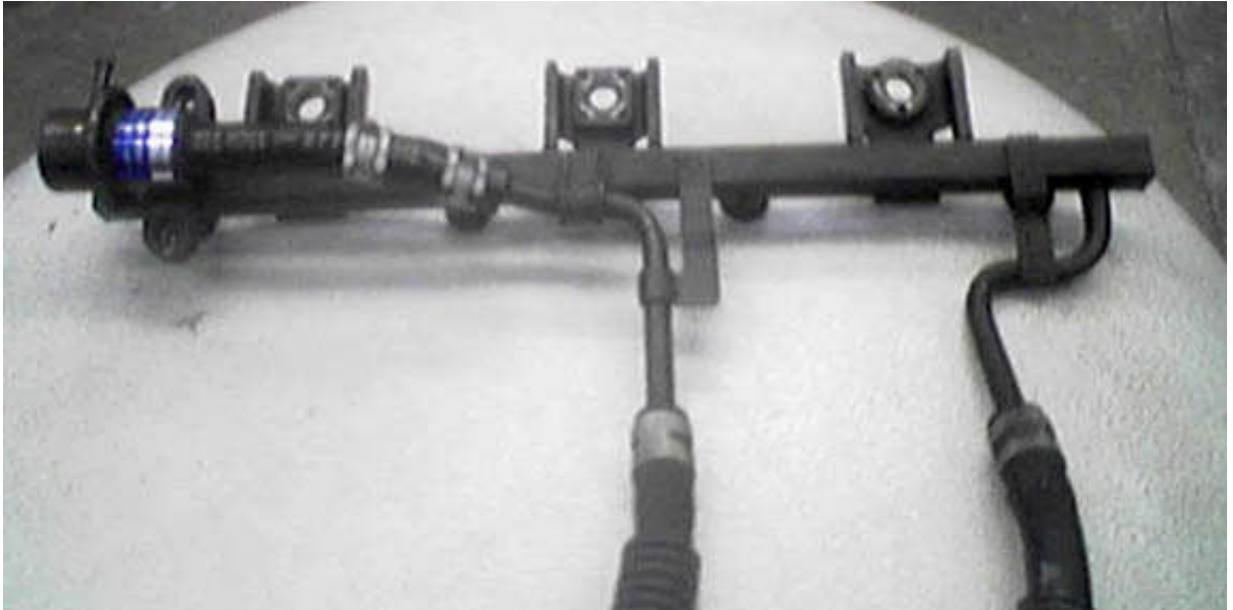
44) Remove the two 10mm bolts holding the washer bottle and move the washer bottle out of the way. Save the bolts for reuse.



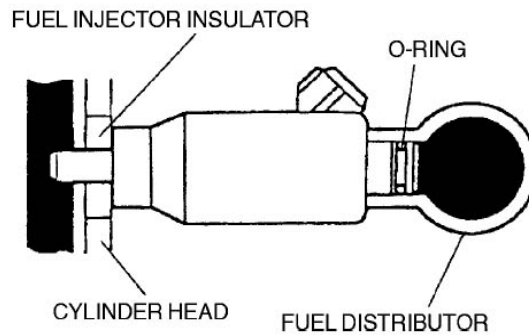
45) Remove the Fuel Pump relay located under the dash just to the right of the steering column and with the car out of gear and clutch depressed, crank the engine for 5 seconds to remove pressure from the fuel rail.



46) Remove the 3 bolts holding the fuel rail (Fuel Distributor) to the head. Remove the original fuel rail and fuel injectors.



47) We highly recommend that you replace the Fuel Injector Insulator and O-Ring with new parts as the old parts are probably hard from age and heat and may not make a good seal.



48) Remove the Fuel Pressure Regulator (FPR) from the original fuel rail and save it and the screws for re-install on the new fuel rail.



Supercharger Installation

1) Install the supercharger intake manifold using the original Intake Manifold Gasket and nine 12mm nuts (Note: Do **NOT** use Loc-Tite on these nuts). The top five nuts can all be accessed with an open end wrench from above. The lower nuts are most easily tightened with an open end wrench from below the car. Ignore the injector wiring harness in this picture as you have already properly rewrapped and attached it above the fuel rail. (Note: the picture here is of a 99 with the fuel rail attached. Your fuel rail will not be there.)

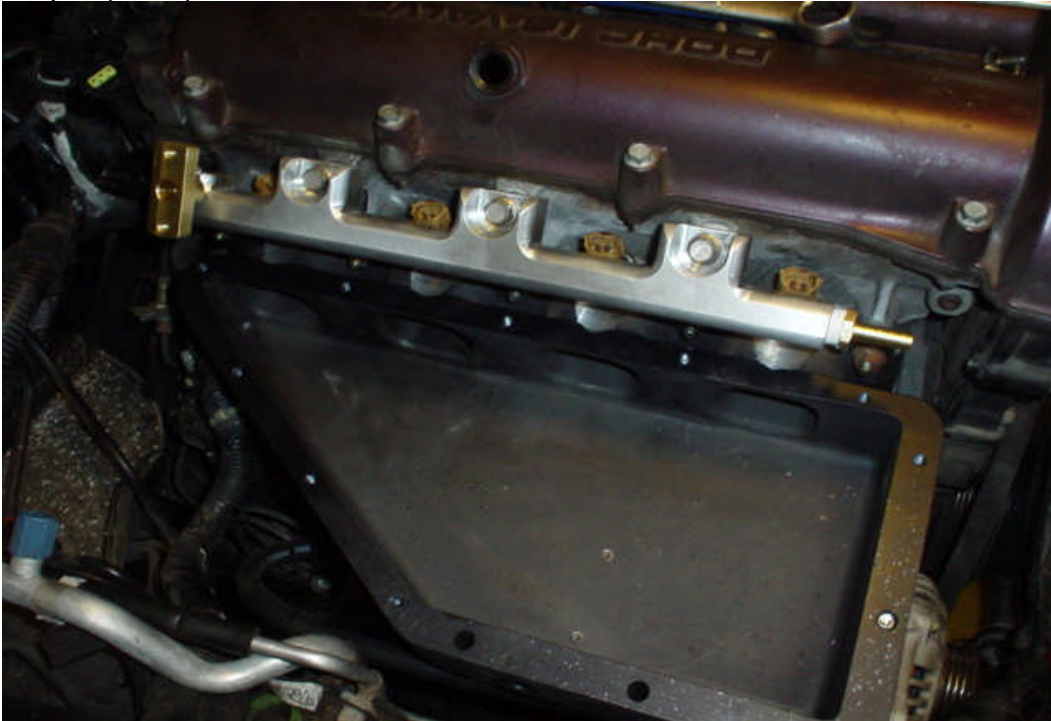


2) Install the fuel injectors and the new fuel rail. Replace the bolts.

Fuel Injector Installation Note

1. Use new fuel injector O-rings and insulators.
2. Apply a small amount of engine oil to the O-rings and install them into the fuel distributor.
3. Verify that the O-rings and the fuel injector sealing surfaces are free of foreign material.
4. Clean with gasoline if necessary.
5. Install the fuel injectors in the fuel distributor with light twisting motion so that the O-rings will not be folded.

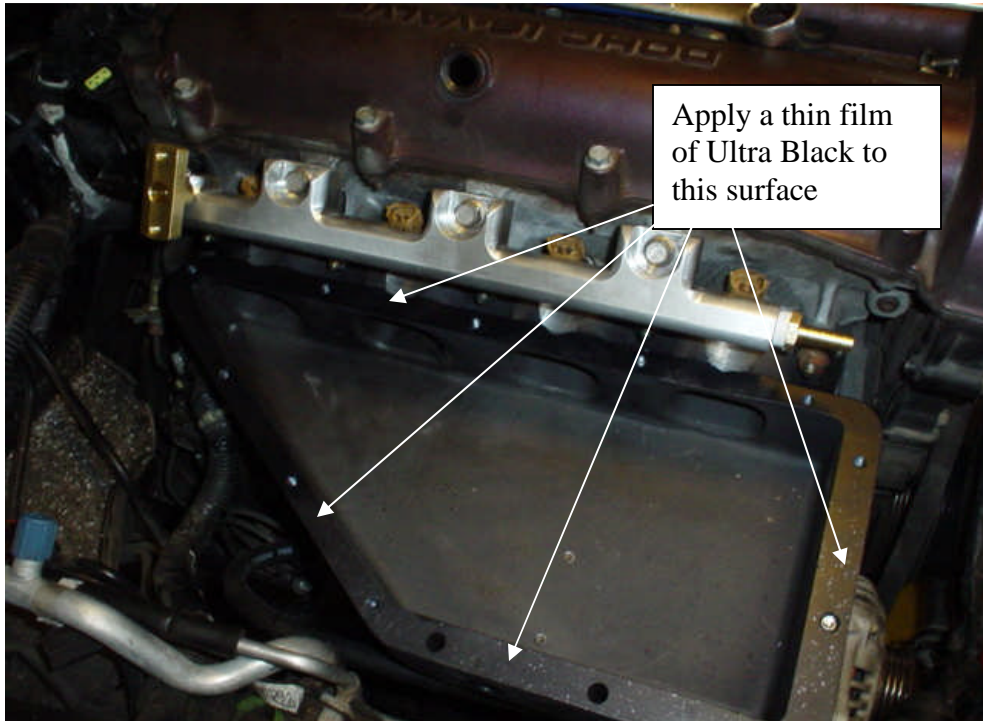
Step 3 (cont.)



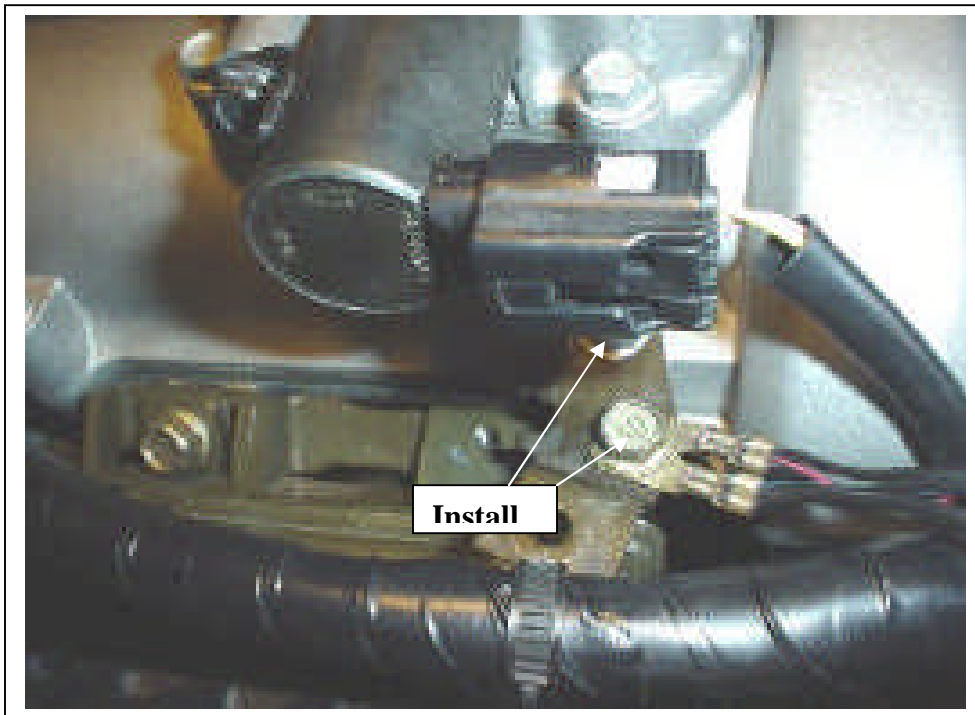
4) Remove the throttle body from the throttle body adapter by removing the four Allen head bolts. Remove the throttle body and the throttle body adapter from the supercharger by removing the four Allen head bolts. Save all the bolts for reuse.



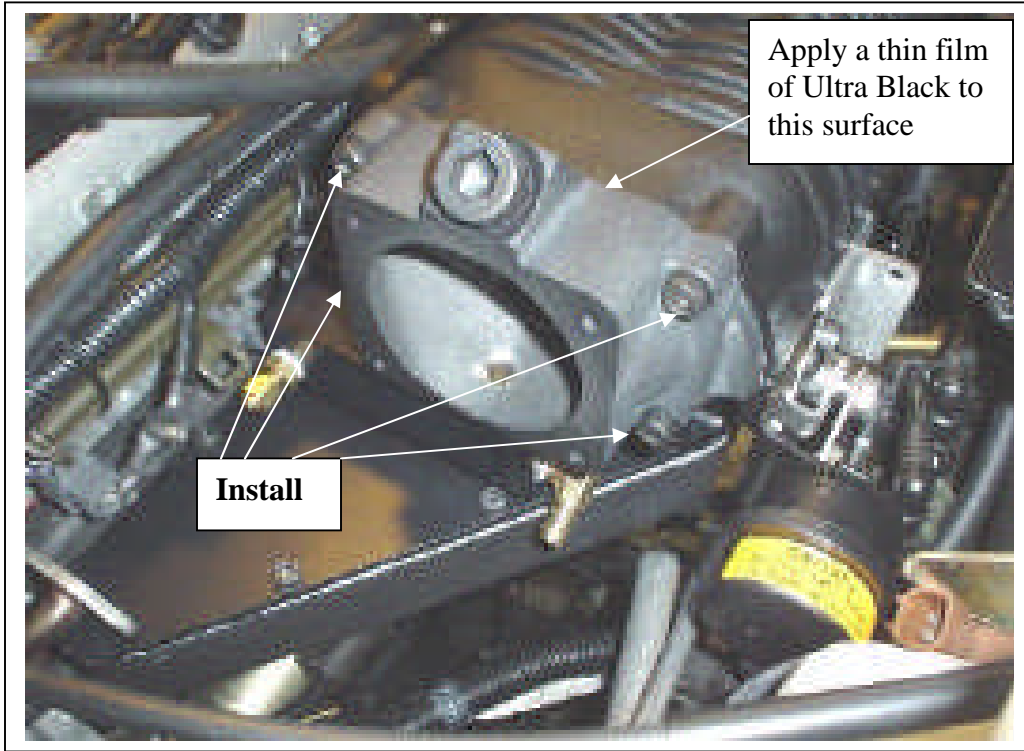
5) Apply a thin film of ultra black to the perimeter surface of the intake manifold and install the supercharger on the manifold. Replace the perimeter bolts.



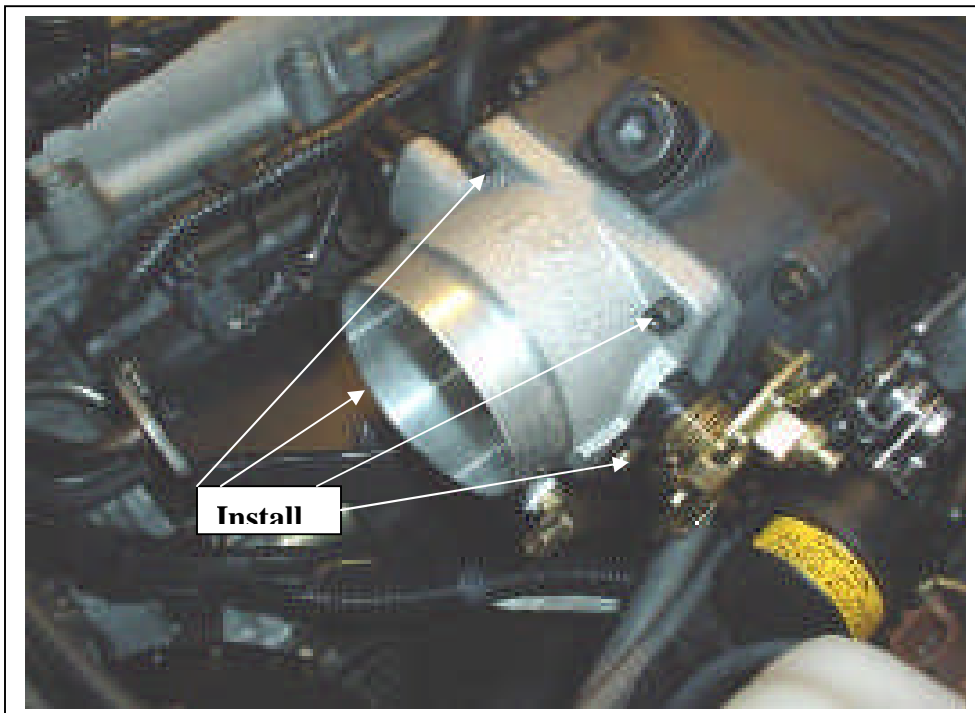
6) Bolt the ground wiring harness to the cam cover as shown using the original 10mm bolt.



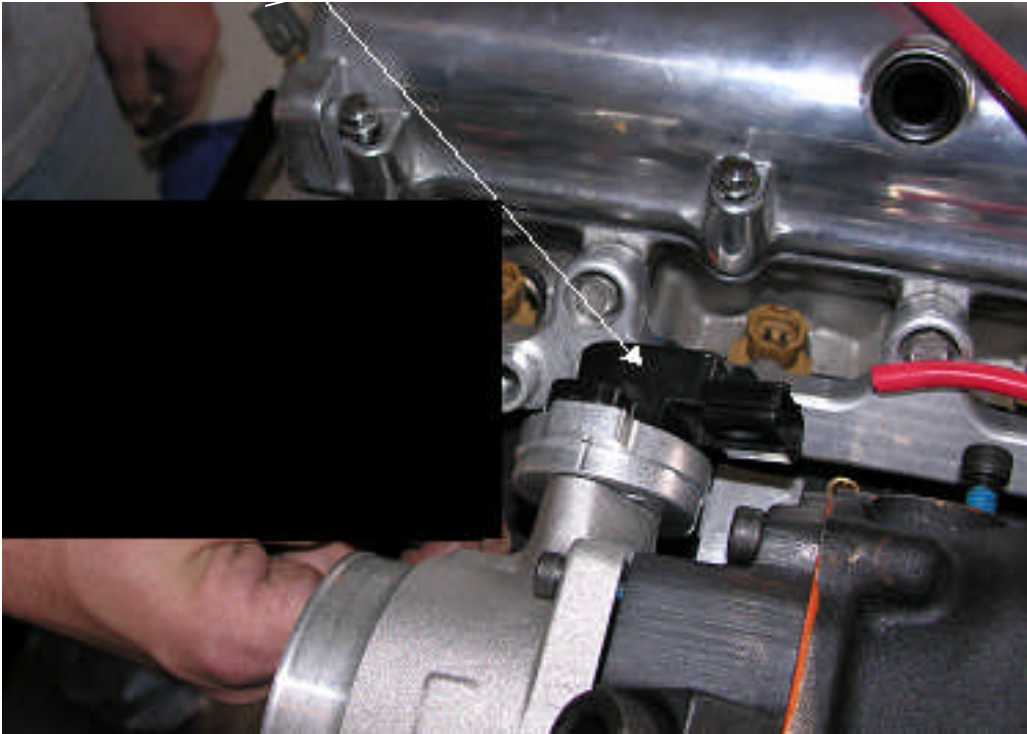
7) Apply a thin film of ultra black to the TBA/SC face and then install the throttle body adapter to the supercharger with the four Allen head bolts.



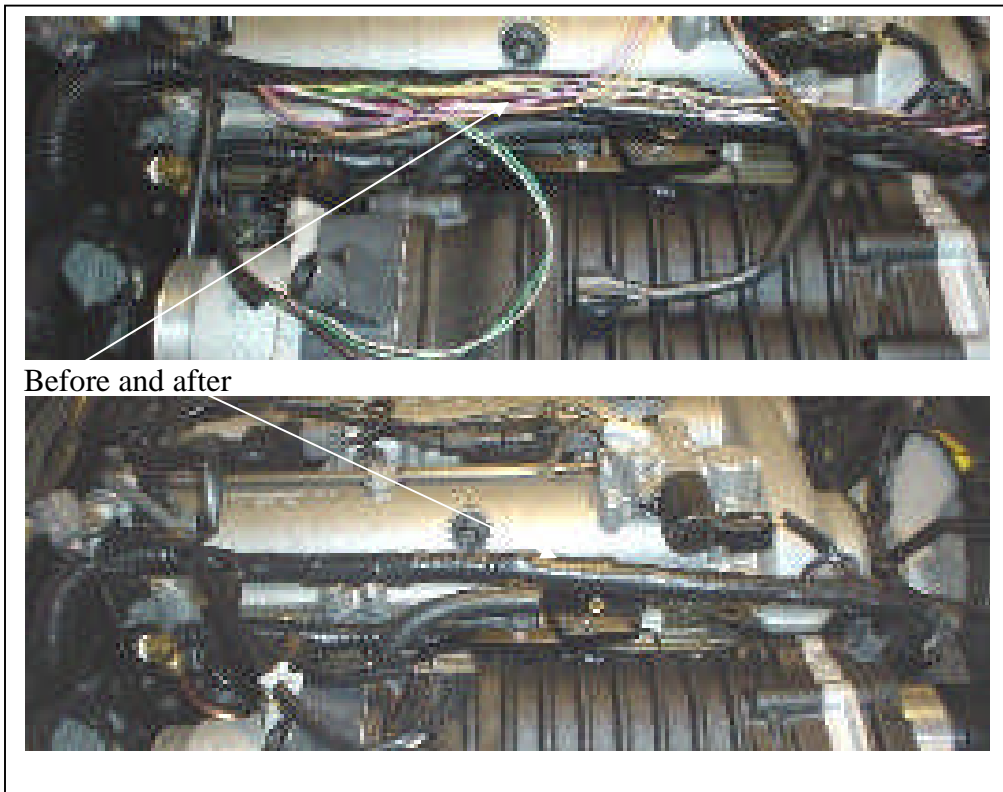
8) Replace the throttle body gasket and reinstall the throttle body with the four Allen head bolts.



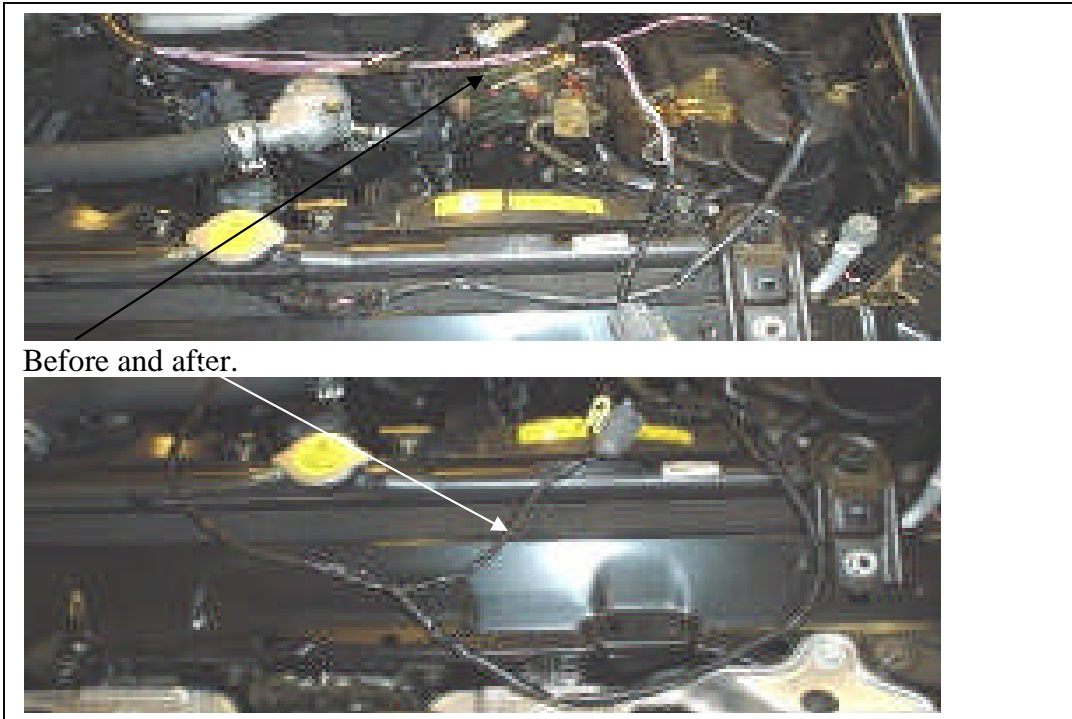
9) Install the TPS with the original 7mm bolts.



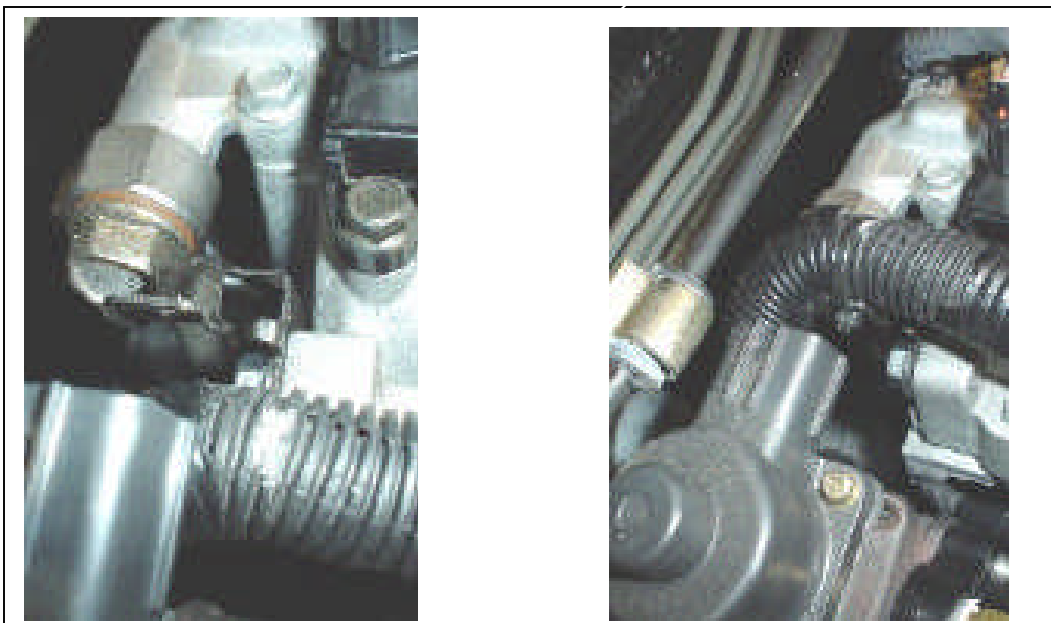
10) Rewrap the wiring harness above the engine as shown. This is to properly locate the electrical connectors for the IAC and TPS.



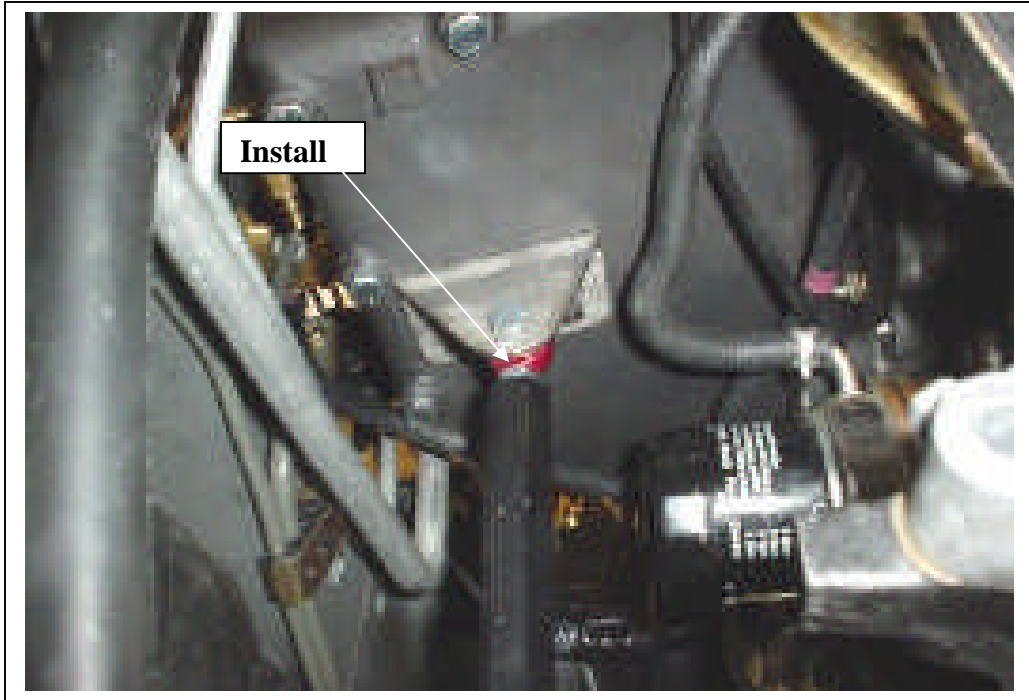
11) Rewrap the wiring harness for the MAF and the intake air temp as shown. The MAF and intake air temp will be relocated under the supercharger intake manifold so make sure they are long enough.



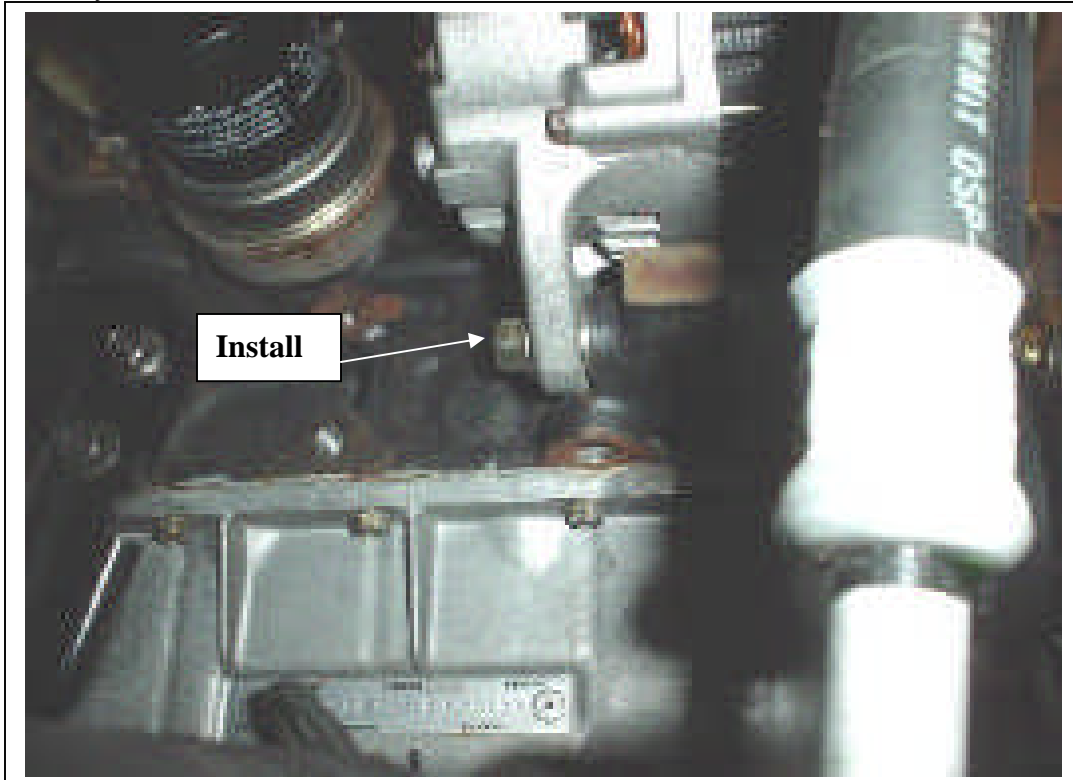
12) Remove the 12mm bolt holding the wiring harness bracket at the back of the engine. Then flip the wiring harness bracket and attach as shown. Zip tie the wiring harness as shown. This is to ensure adequate clearance from the EGR.



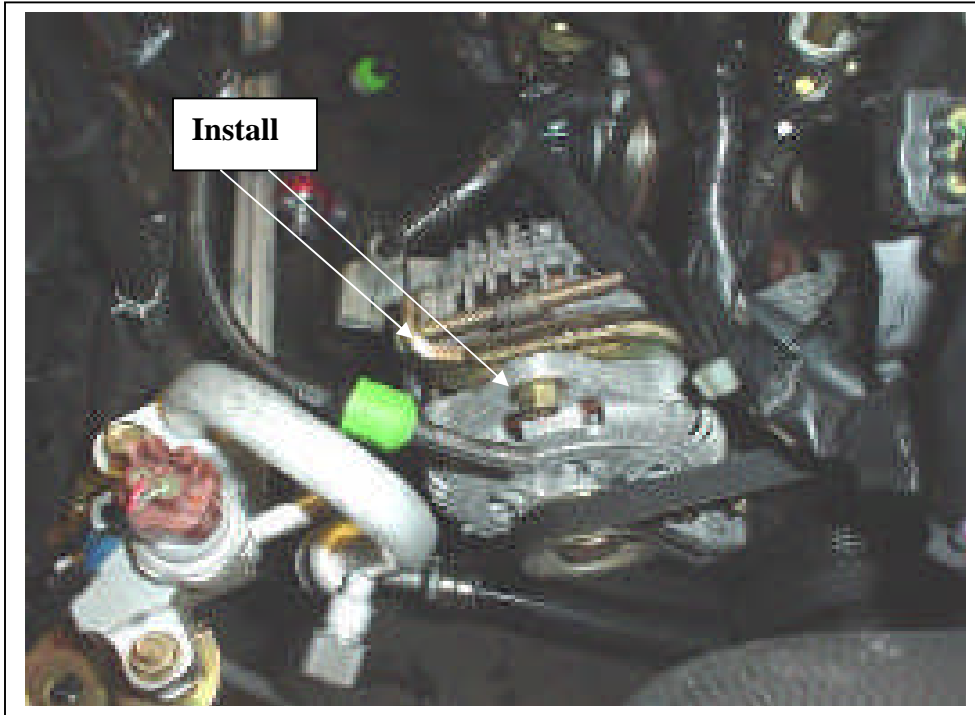
13) Bolt up the brace to the supercharger intake manifold with the 14mm bolts and nut. Do not install the brace to the engine block yet.



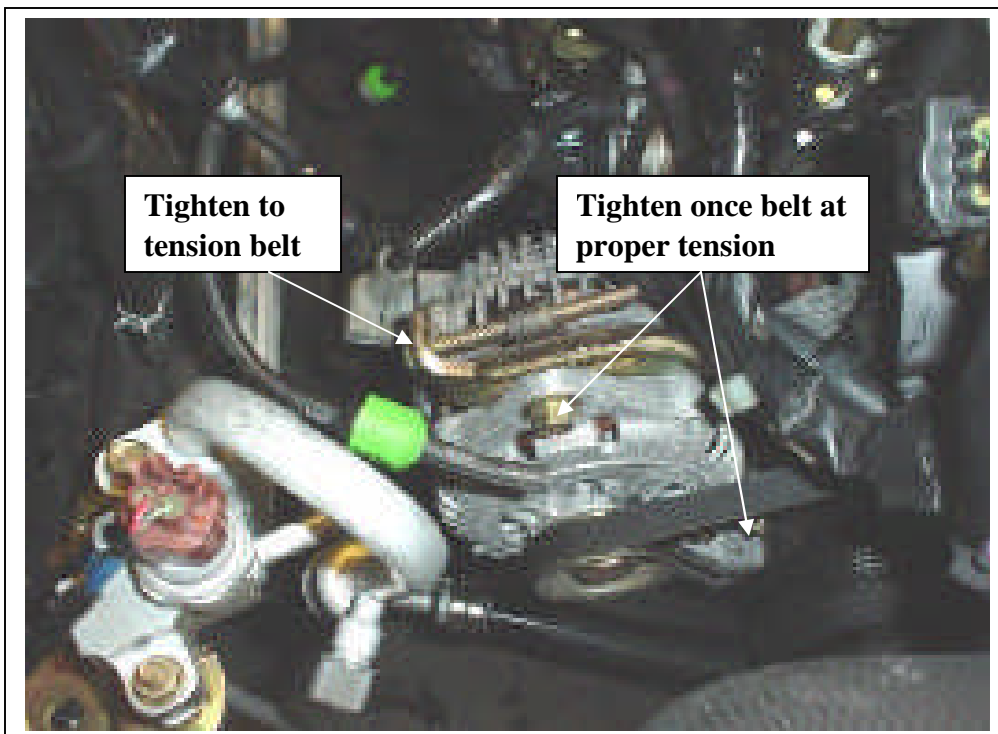
14) Install the alternator and install the 14mm alternator pivot bolt. Do not tighten the pivot bolt yet.



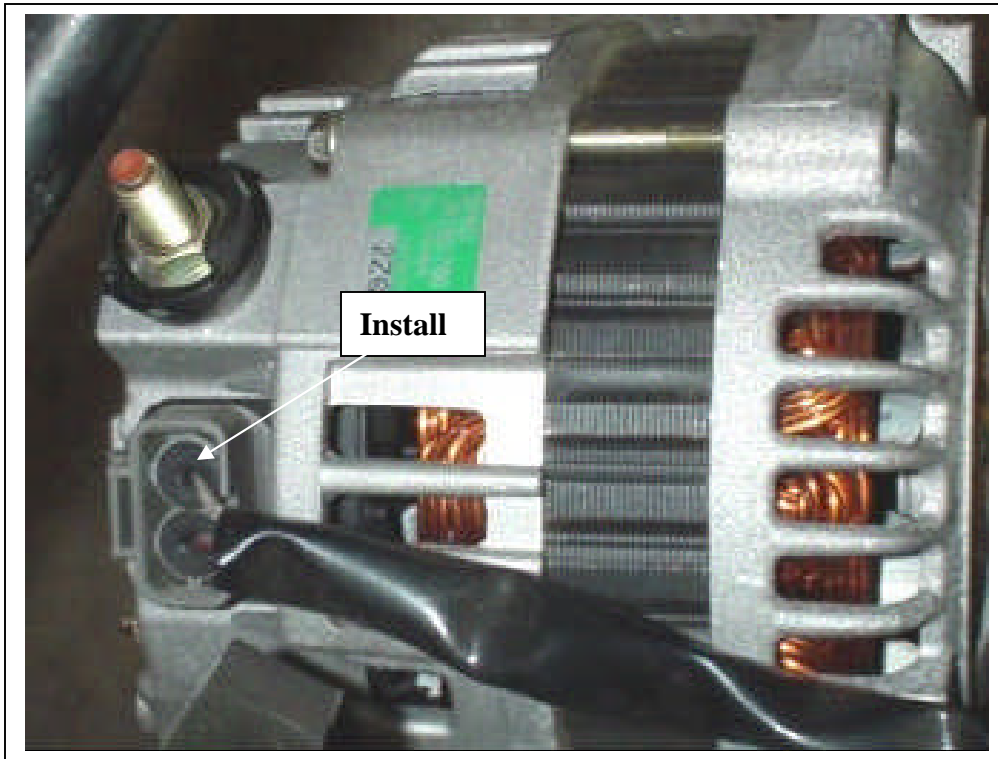
15) Install the 12mm alternator tension bolt and the 12mm alternator tension hold bolt. Do not tighten bolts yet.



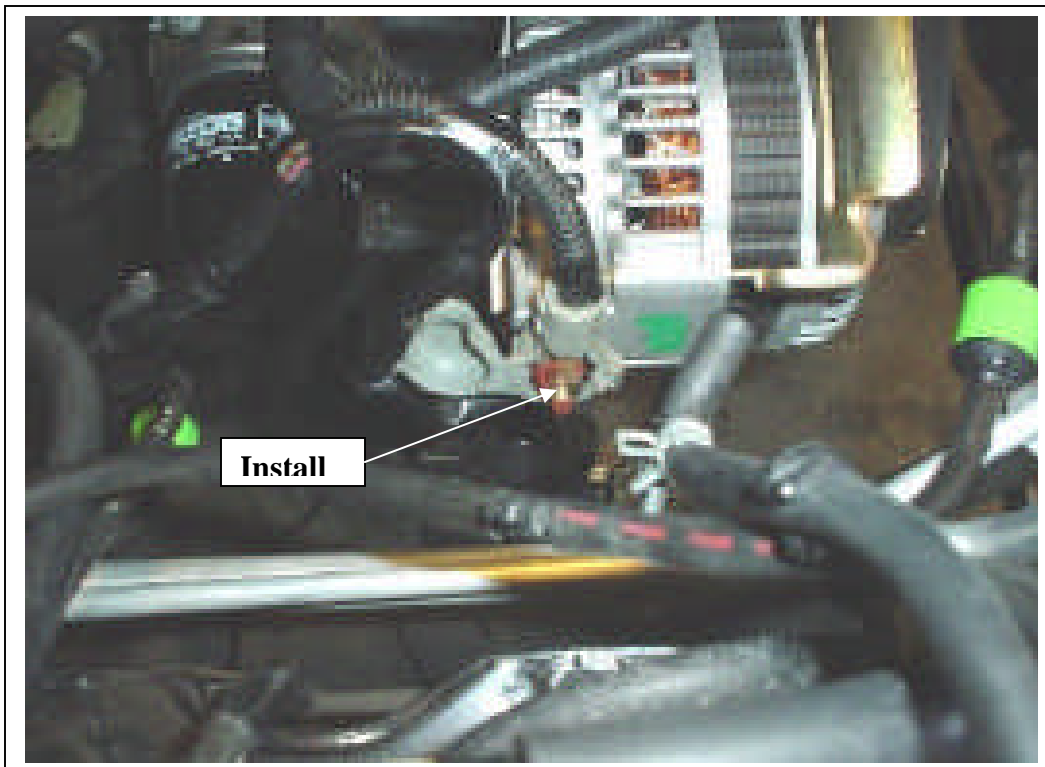
16) Install the alternator belt and tension by tightening the 12mm alternator tension bolt. Then tighten the 12mm alternator tension hold bolt and the 14mm alternator pivot bolt.



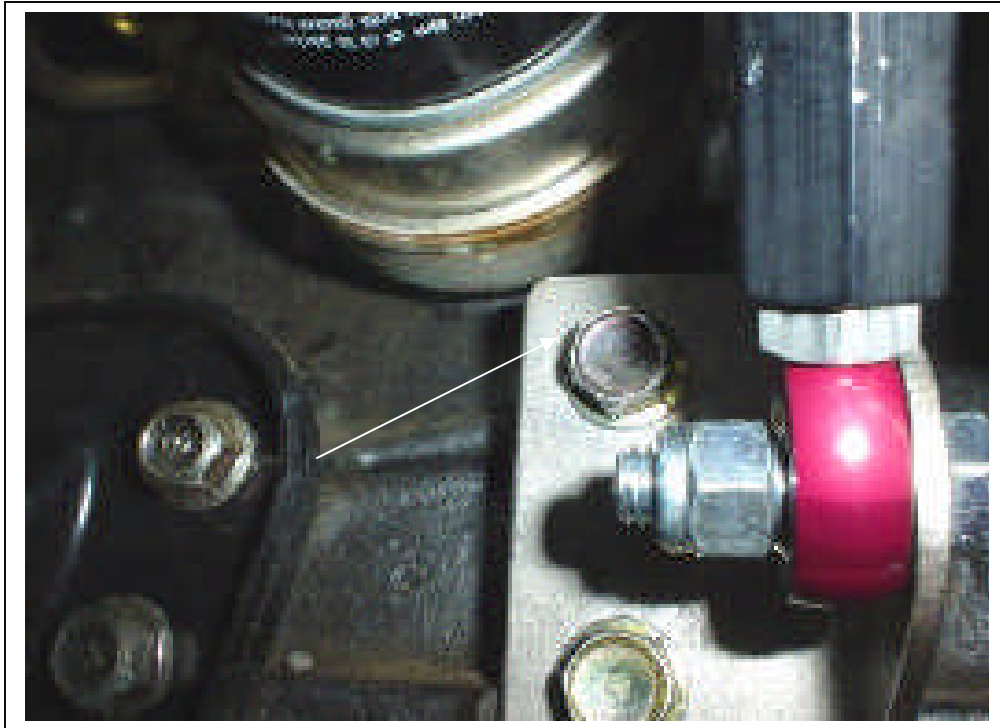
17) Install the alternator wiring plug.



18) Install the alternator main wire and tighten the 12mm nut.



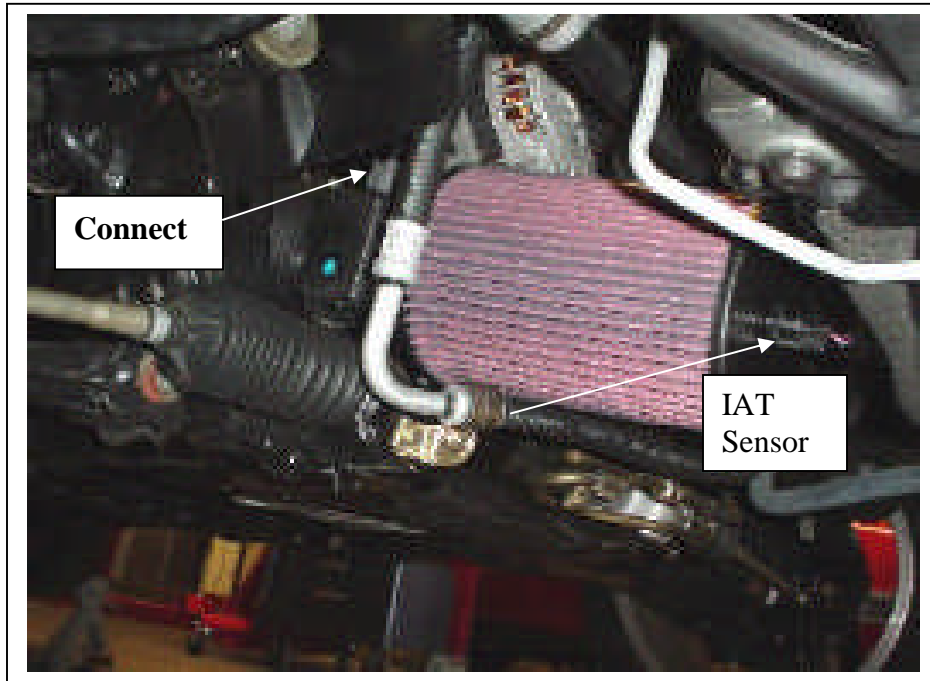
19) Install the supercharger intake manifold brace to the engine block with the two 12mm bolts as shown.



20) Assemble the intake hose, MAF and filter as shown. Note the direction of the arrow of the MAF. This is very important. The arrow indicates the direction of airflow. Run the assembled intake piping from the bottom of the car. Next, attach the hose clamp around throttle body and tighten. You will need to move the rubber collar from the air filter end to the hose end of the MAF. Flip the collar so the raised ridge is against the MAF body. This is used to adapt to the 3" hose.

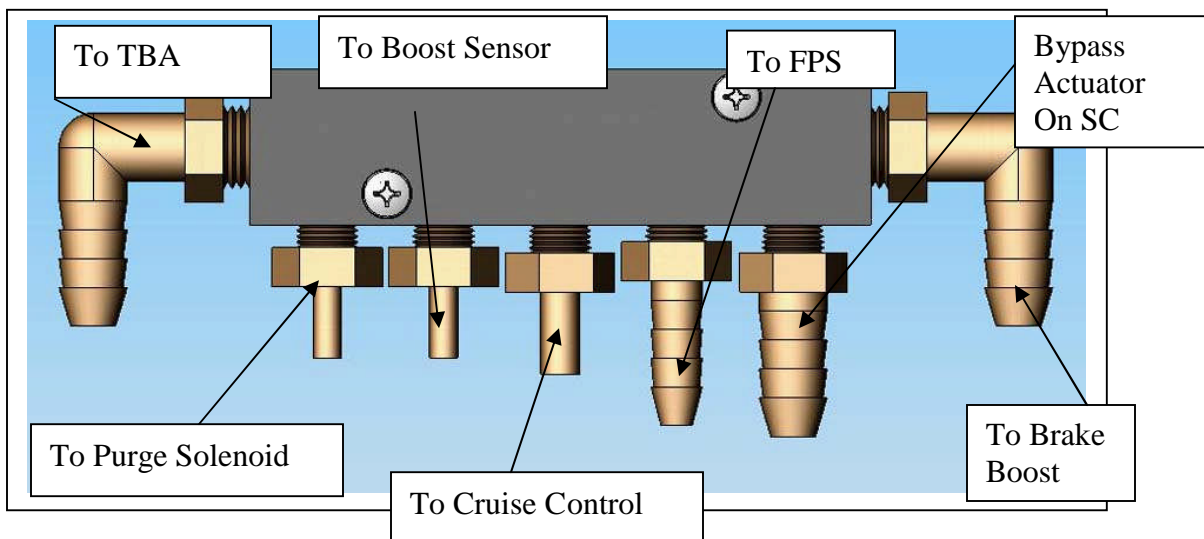


21) Position the filter as shown, and then connect the wiring plug to the MAF.



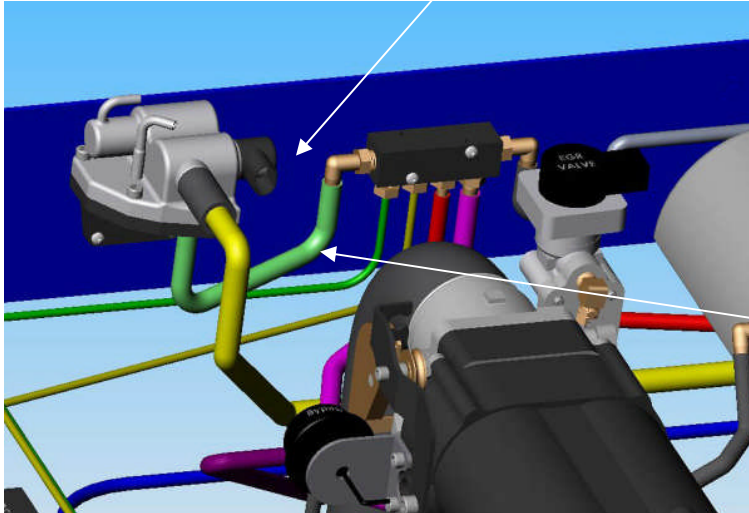
22) Mount the Intake Air Temperature sensor in the end of the air filter as shown in step 21.

23) Install the Vacuum Distribution Block to the firewall with the two self drilling screws supplied. Note: If you don't have Cruise Control, replace the Cruise Control barb fitting with the 1/8NPT plug supplied.



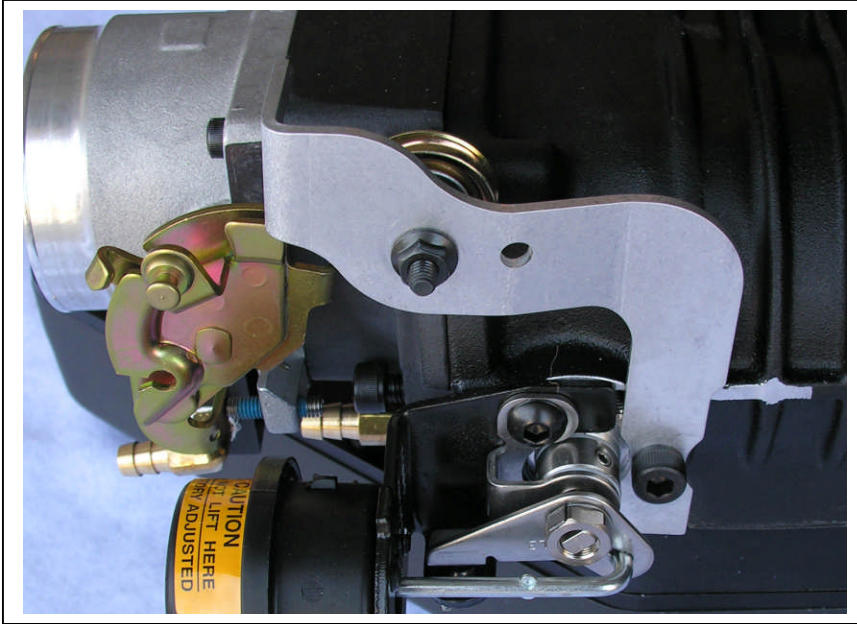
24) Mount the IAC bracket to the firewall or passenger fender as space allows. Install the IAC with the four original screws to IAC adapter plate. Install a 3/8" tee in the hose from the VDB to Throttle body adaptor and run a hose from the tee to the hose barb under the IAC plate. Insert a second 3/8 tee in the hose from the drivers side of the valve cover to the throttle body and connect a hose from the tee to the large port on the IAC using the 5/8 hose adaptor supplied.

25) Connect the wiring plug to the IAC and 3/8 hose form the PCV to the TBA.

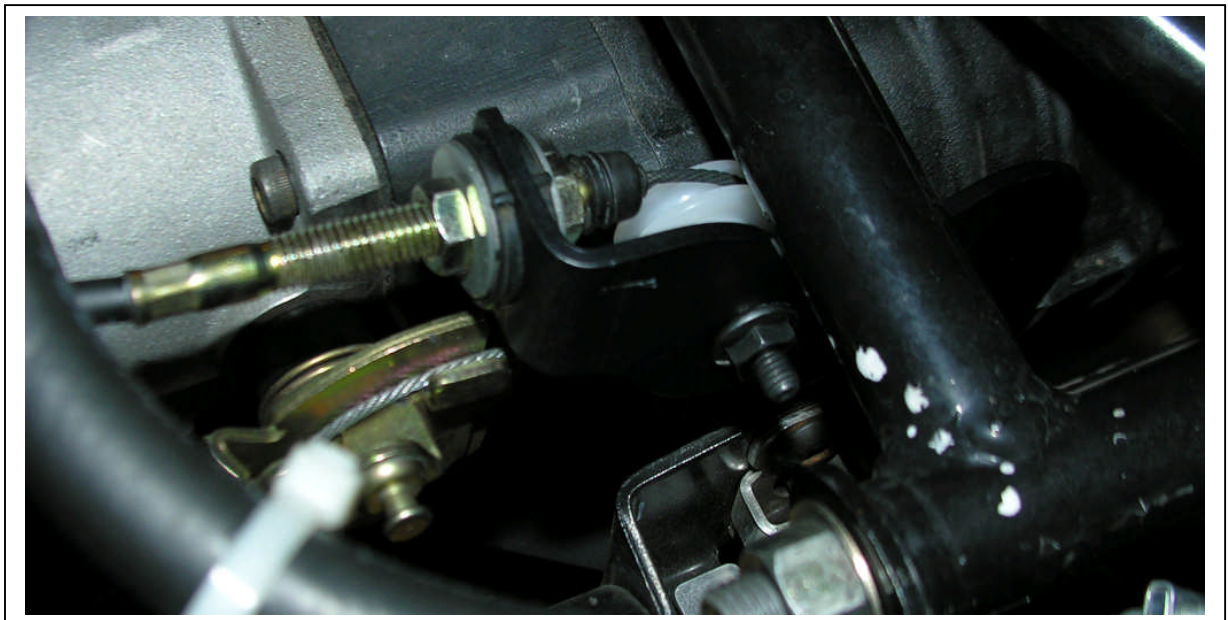


This drawing has been modified. Insert 3/8" TEE in line from PCV to TBA and run hose from the IAC (instead of to the VDB) to the TEE. See Above.

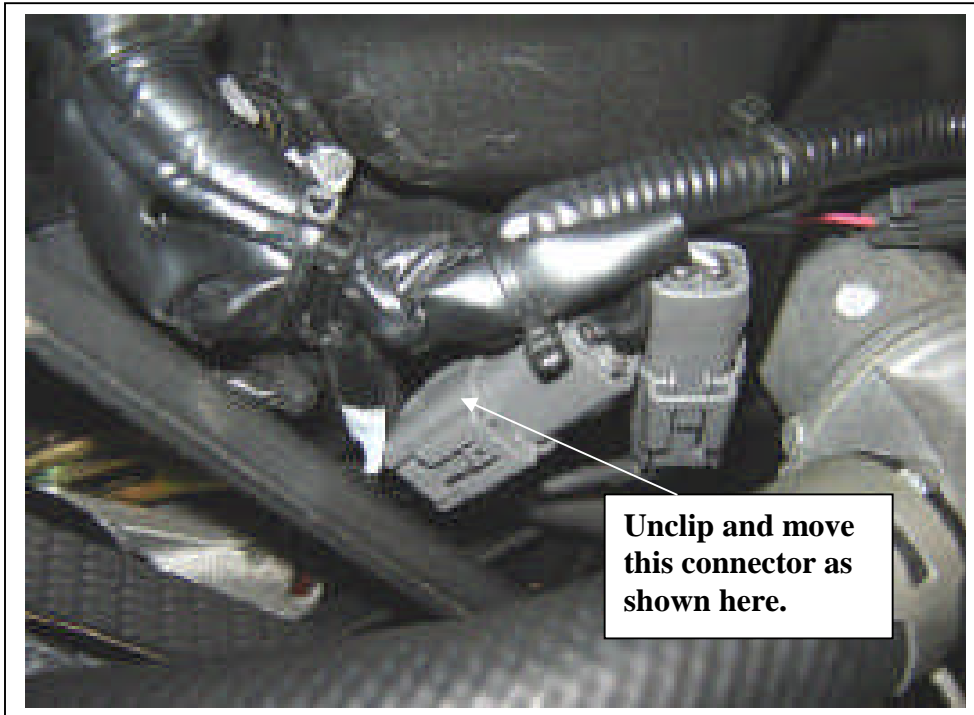
26) Install the throttle cable bracket to supercharger with a 10mm bolt as shown. Check that the throttle operates freely and is able to fully open and close the throttle. If the throttle doesn't fully open and close, this can be adjusted by loosening the two 12mm nuts holding the throttle cable in.



27) Loosen the two 12mm nuts holding the throttle cable in the stock throttle cable bracket and mount to the new throttle cable bracket. Connect the cable to the throttle body and route it over the pulley on the new bracket.



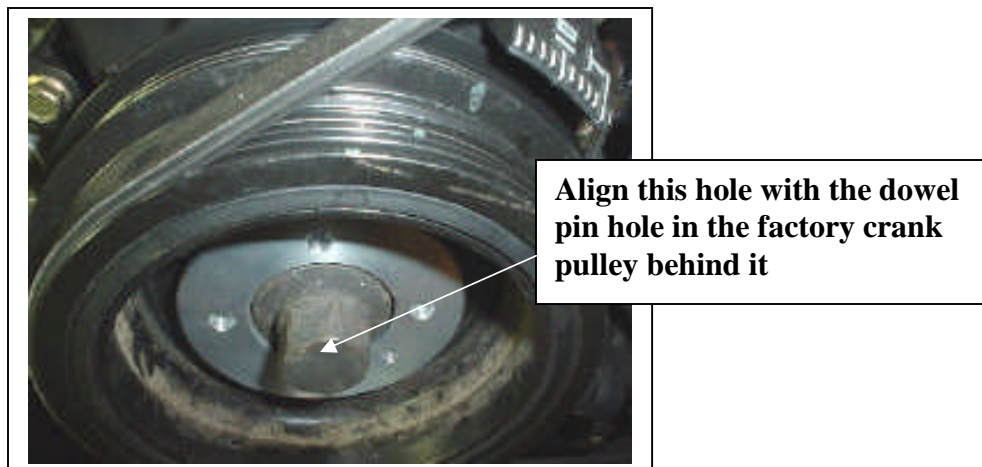
28) Remove the third wiring connector from bracket at front of engine as shown. Zip tie and secure it and the rest of the harness as shown. This is to ensure clearance with the supercharger belt.



29) Remove the four 10mm bolts from the crank pulley. They can be reached with a short extension going around the sway bar. Then fit the supercharger crank spacer as shown. Be sure to line up the hole on the crank spacer with the hole in the crank pulley.

Note #1: Cast factory crank pulleys do not require this spacer.

Note #2: Some factory stamped pulleys have a thin spacer. If so, reuse this thin spacer.

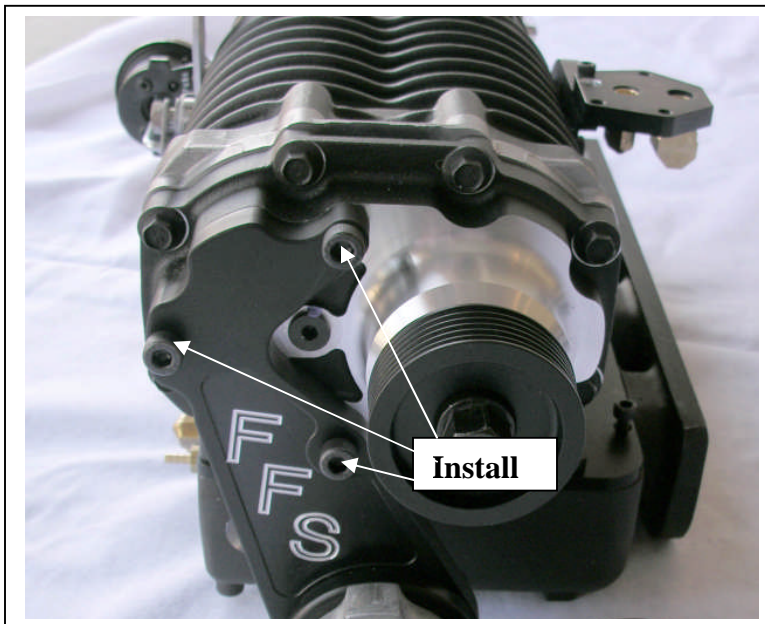


30) Install the supercharger crank pulley with the included four 10mm bolts that are longer than the originals. Be sure to line up the hole on the crank spacer with the hole in the supercharger crank pulley. (Note: Do **NOT** use Loc-Tite on these bolts)

Note: The supercharger crank pulley should have the gap as shown in this picture. If the supercharger crank pulley is too close to the factory crank pulley then this means the included spacer needs to be used. If the supercharger crank pulley is too far from the factory crank pulley then the included spacer should not be used.



31) Install the supercharger automatic tensioner to the supercharger with the three Allen head bolts.



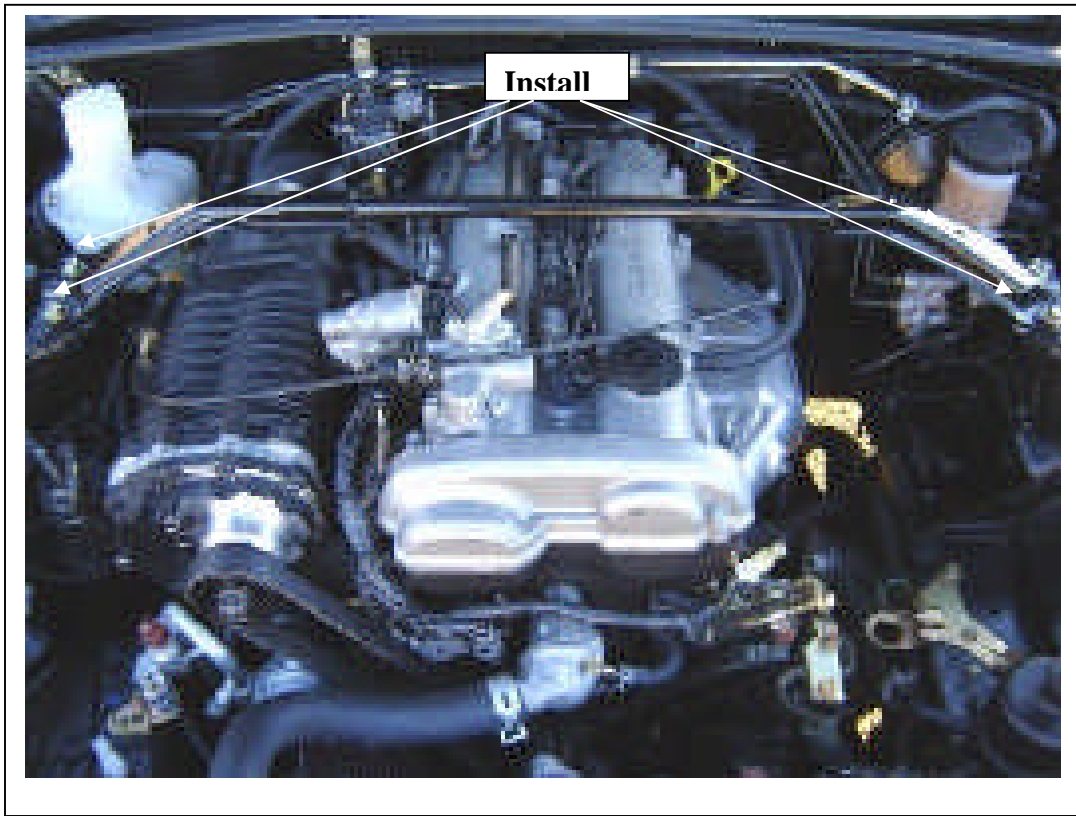
32) Insert the Tensioner tool (supplied) into the automatic tensioner and move in the tightening direction to remove the tension. Have a helper install the supercharger belt on the crank pulley first and then put start it on the ribs of the supercharger pulley. Have the helper rotate the supercharger pulley with an 18mm socket wrench and push on the belt until the belt is fully on both the supercharger pulley and crank pulley. Next, release the tension from the automatic tensioner.



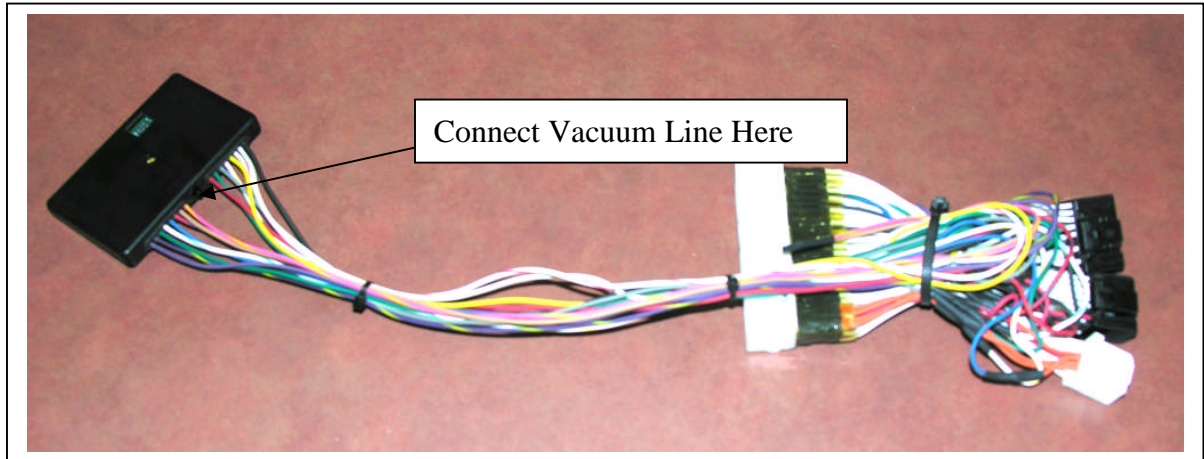
33) Reinstall the splash pan with the original nine 10mm bolts and two 10mm nuts.



34) Reinstall the strut tower brace with the original four 12mm bolts.



36) Install Jackson Racing Power Card Pro. Disconnect the cable connectors from the ECU located behind the seat on the passenger's side and plug them into the female connector on the PC-Pro wiring harness. Then connect the cables from the PC-Pro wiring harness into the ECU. Connect a vacuum line from the PC-Pro to the front 1/8" barb on the intake manifold. The 94-95 ECU has two connectors and the 96-97 ECU has three connectors, as shown.



37) Run the injector cable and the small hard black vacuum tube in a convenient place on the passenger side of the firewall. Then under the passenger carpet to the ECU behind the passenger seat.

38) Install new Spark Plugs (NGK BKR7EIX supplied). Apply a thin film of the anti-seize (supplied) on the threads of the plugs and install. Tighten to 11-16 ft-pounds.

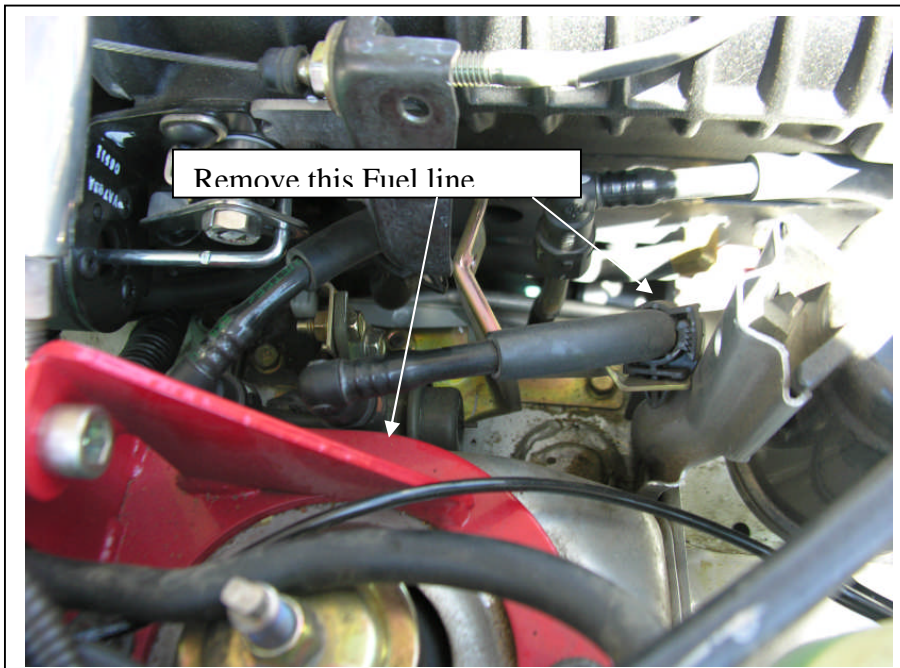


39) Install the additional fuel Injector. Apply a small amount of ultra-black to the threads and install in the right front corner of the intake manifold. Tighten with a pair of pliers on the steel part of the body. Connect the cable from the Split Second controller.

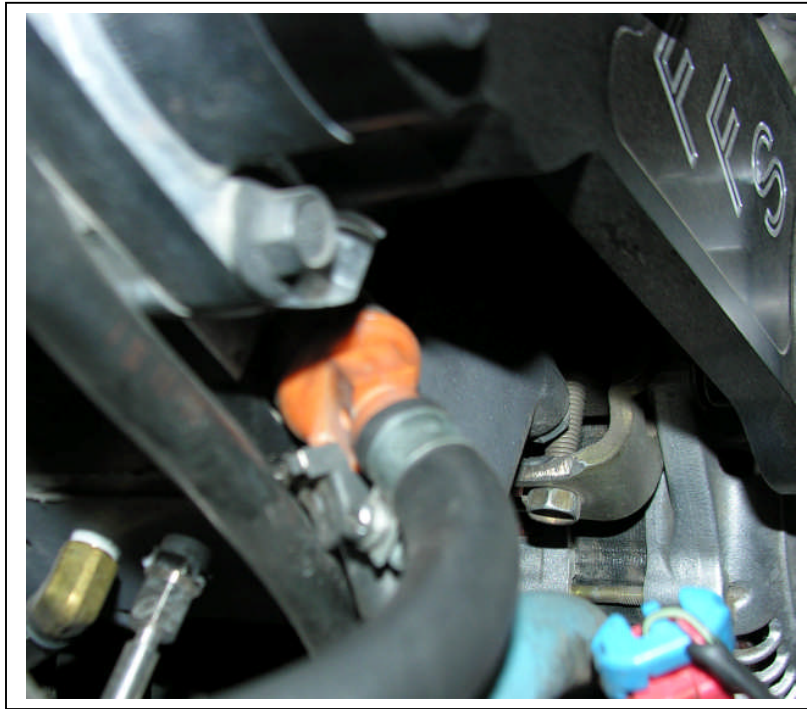


Note: If you need to replace any fuel line with new, use only Goodyear J30R9 or equivalent.

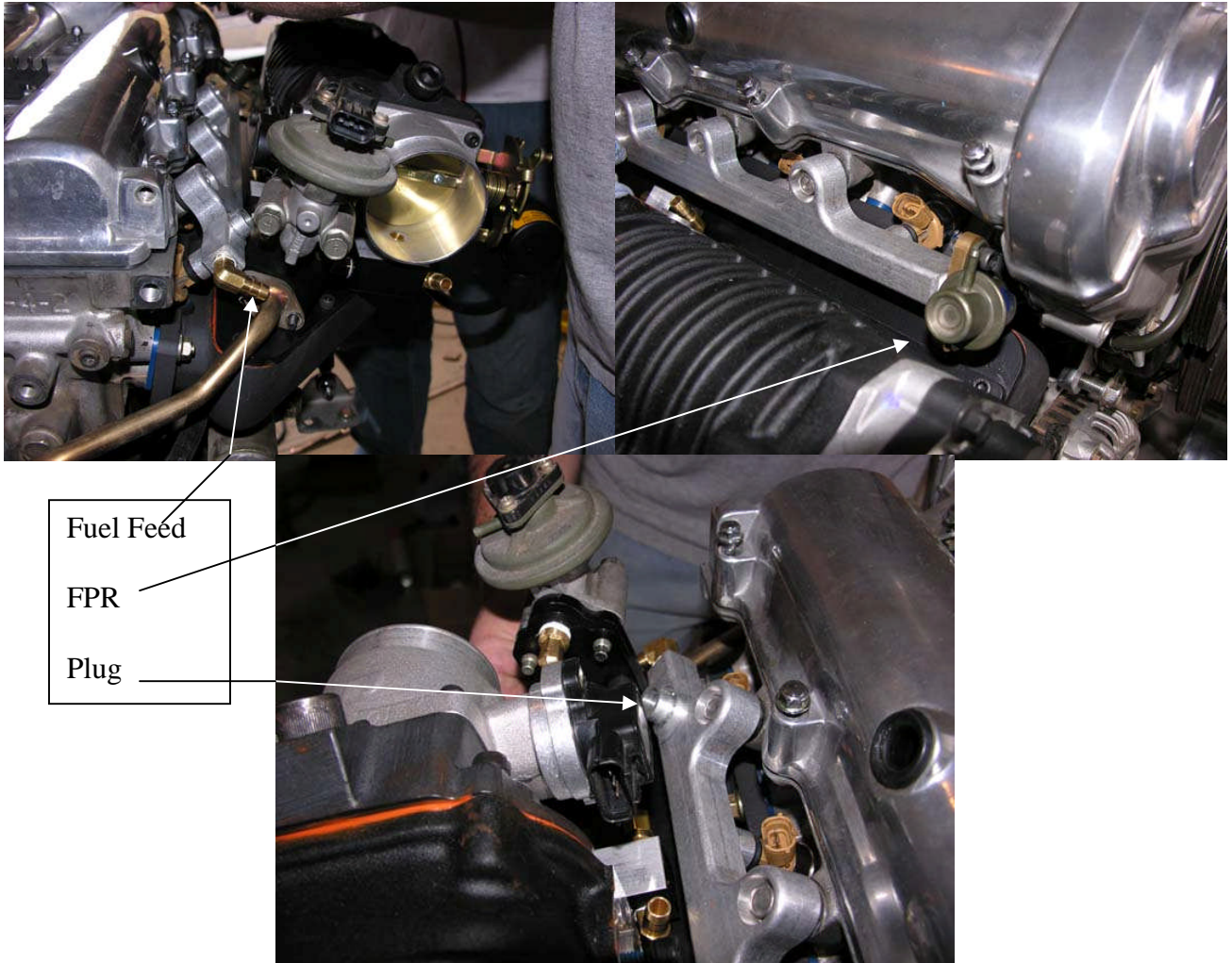
40) On the passenger fender, remove the fuel line shown (using the special tool supplied) and replace with the fuel line and tee supplied. Trim excess fuel line.



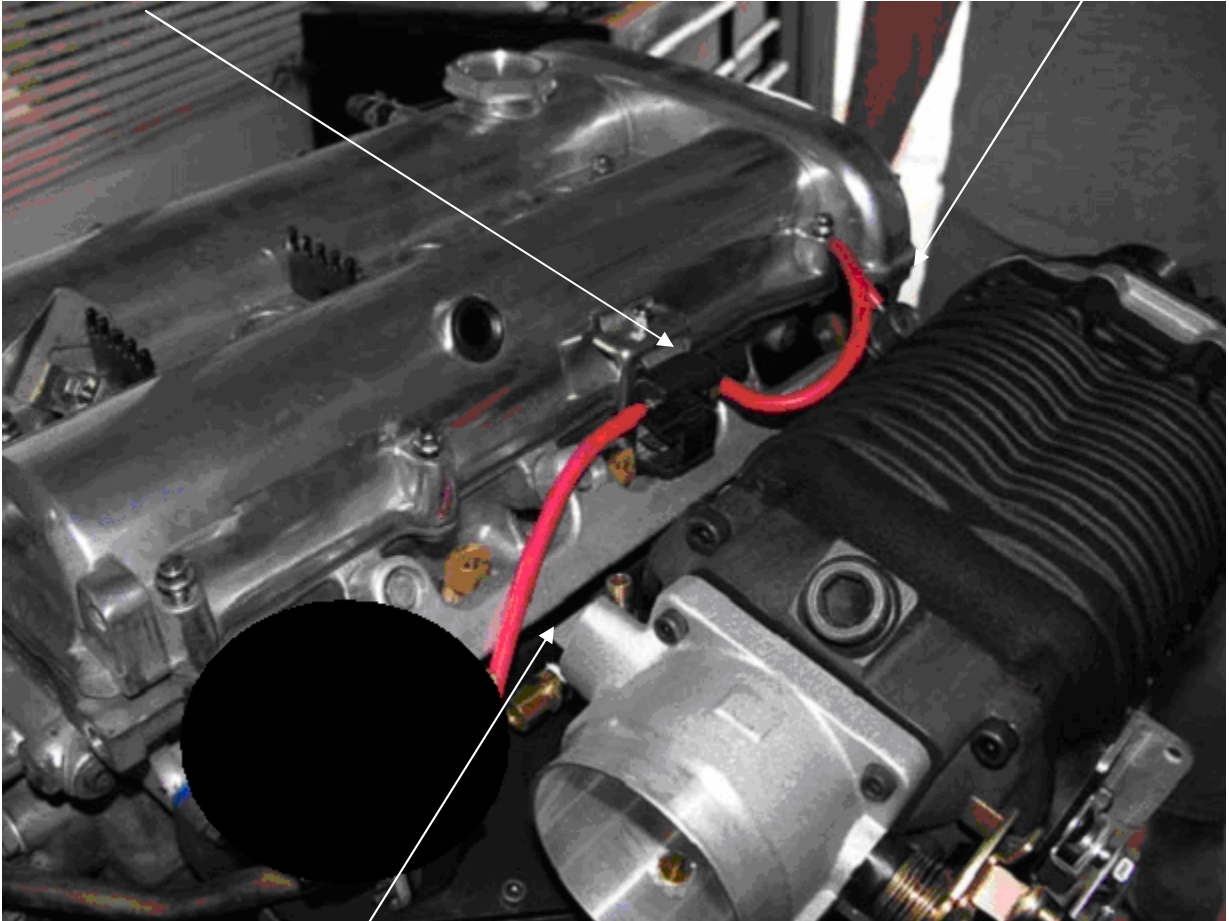
41) Connect the fuel line from the center of the tee to the additional injector.



42) Connect the fuel rail to the original fuel line. The preferred method is to connect the fuel line to the rear of the fuel rail with the FPR on the front end of the fuel rail and a pipe plug in the top fitting.



43) Mount the fuel pressure regulator solenoid to the valve cover bolt as shown. Connect one of the vacuum hoses to the fuel pressure regulator



Route the other vacuum hose to the VDB and connect.

51) Now is the time to go over every nut and bolt and make sure they are all tight.

52) Start the engine and check for leaks on all of the fuel lines. Make sure all hose clamps are tight.

53) Let the engine warm up. While idling, disconnect the IAC valve connector and adjust the throttle stop screw for no change in idle. Re-connect and disconnect the IAC valve connector a couple of times and adjust the throttle stop screw for no change in idle. Then, turn off the engine. Insert a 0.050" feeler gauge between the idle stop screw and throttle arm to force the throttle plate open by 0.050". Disconnect the TPS connector and measure the resistance between the two pins corresponding to the RED and BLK/BLU wires. Loosen the two screws holding the TPS and adjust the TPS until the contact just closes. Tighten the screws to lock the TPS in position. Remove the feeler gauge and monitor the TPS while moving the throttle body arm. The contact should just close before the throttle arm hits the throttle stop screw.

54) If the car idles OK (doesn't have to be perfect) drive it for an hour or so to get it well warmed up. Then park the car, set the brake, and, while idling, disconnect the IAC valve connector and adjust the throttle stop screw for no change in idle. Re-connect and disconnect the IAC valve connector a couple times and adjust for no change in idle. After driving the car for a couple days repeat this procedure. That is the only adjustment required.

55) Confirm base timing is still 10* BTDC.

56) When tuning the fuel, make sure that air/fuel is below 13:1 below 3500 RPM and at least 12.5:1 from 3500 to 5000 RPM and at least 12:1 above 5000 RPM.

57) Place the tune-up label under the hood adjacent to, but not covering, the vehicle manufacturers Vehicle Emission Control Information (tune-up) label.

Facsimile of the tune up label:

KnackToys, LLC
ARB EO No. D-617
Fast Forward Superchargers
Model: FFS-9093-CS-CA
Spark Plugs: NGK BKR7EIX
Spark Plug Gap: 0.8mm (0.032")
Minimum Fuel Requirement: 91 octane gasoline