



Fast Forward Superchargers

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www.fastforwardsuperchargers.com

Fast Forward Supercharger Kit

94-97 Mazda Miata

Kit part number FFS-9497-HS-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: (2)12mm, a 14mm, 15mm, 17mm, 22mm (or adjustable wrench), a 1/2", and 7/8" combination wrenches
- Sockets: 7/16", 17mm, 16mm, 14mm (deep), 12mm, 10mm, 8mm. A torque wrench is also recommended 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)
- Misc: dead-blow hammer, thread sealing tape (i.e. Teflon tape), heat gun or lighter, #29 drill bit, electric drill, ruler or straight-edge, paper clip, and utility knife.

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 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. Supercharger under bracket support.**
- 10. 7' of 3/8" vacuum hose.**
- 11. Idle Air Control mounting plate and bracket.**
- 12. Jackson Racing Power Card Pro and harness assembly.**
- 13. Dummy Throttle Body.**
- 14. 5th injector fuel hose assembly.**
- 15. Fuel injector.**
- 16. Fuel injector hose removal tool.**
- 17. Idle adjust Allen wrench**
- 18. Auto-Tensioner bar.**
- 19. Tune-up label to be placed/located adjacent to, but not covering, the vehicle manufacturers Vehicle Emission Control Information (tune-up) label**

Preparation and Removal of OEM Components

Prior to Installation:

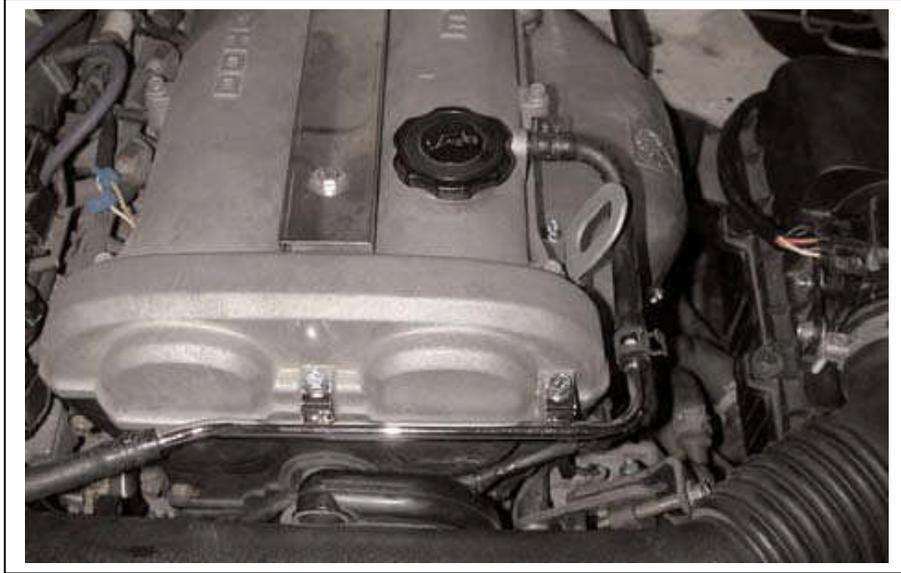
- We highly recommend 92 or better octane but you should use a *minimum* of 91 octane, major brand fuel for at least two tank fills prior to installations (use of high octane fuel will be required after supercharger is installed).
- If you have not done so within the last 3,000 miles, you should change 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) pre-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.

Installation:

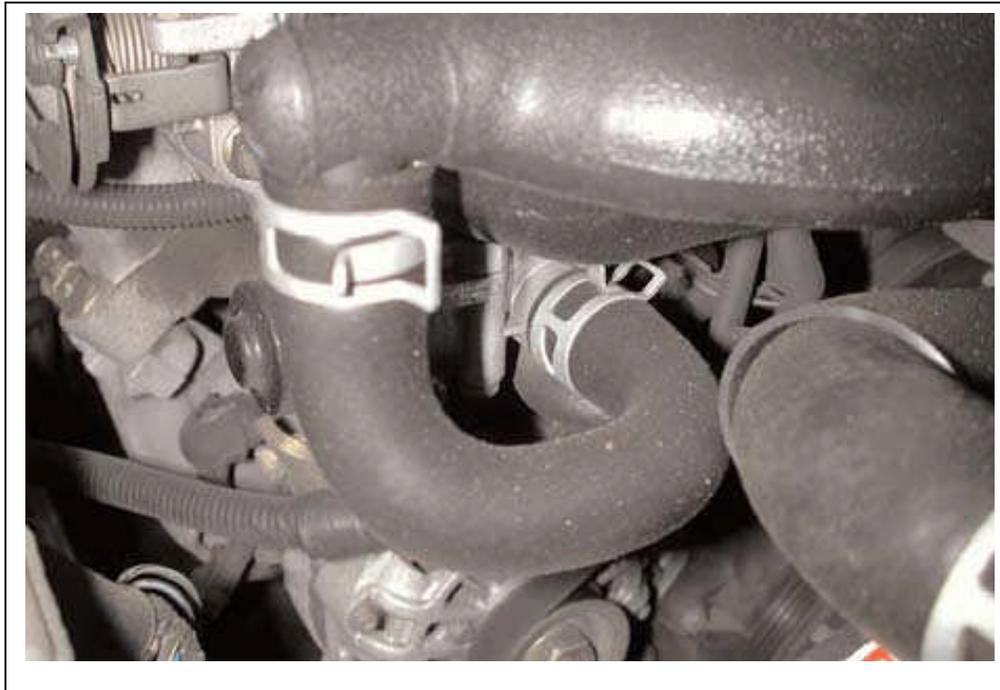
1. Use a pair of needle nose pliers to release the clamp securing the PCV hose to the valve cover, connected near the oil filler cap. Disconnect the hose. Illustration 1



- Using a 10mm socket, remove the two bolts securing the metal tube to the front of the valve cover. Illustration 2



- Use a pair of needle nose pliers to release the clamp securing the large hose to the idle air control motor, under the passenger side of the cross tube. Disconnect the hose. Illustration 3



4. Then, using an 8mm socket or a Phillips screwdriver, loosen the clamps securing both ends of the cross tube. If you have cruise control, you will also have to remove the vacuum line from the intake manifold nipple and from the points where it attaches to the cross tube. Remove the cruise control vacuum line from the cruise actuator as well and save it for use in a later step. Then remove the cross tube. Illustration 4



5. Disconnect the electrical connector at the mass airflow sensor (MAF). Release the clips securing it's harness to the air box. Using a 10mm socket remove the two bolts securing the MAF to the air box. Remove the MAF from the air box and remove the rubber donut seal (which seals it to the air box) from the sensor. Set the MAF aside in a safe place for later use. Illustration 5

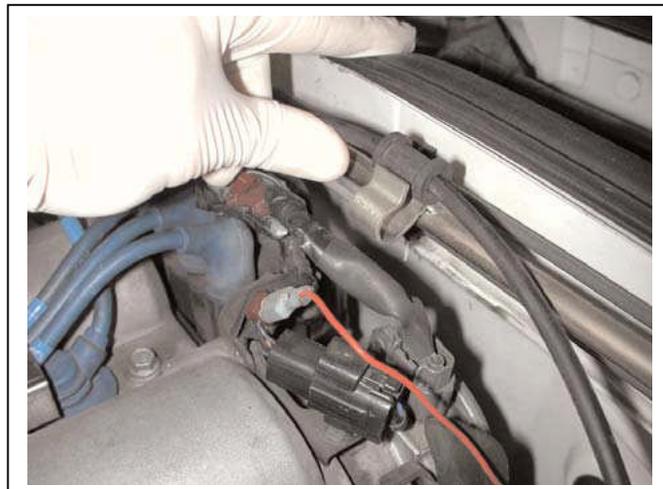
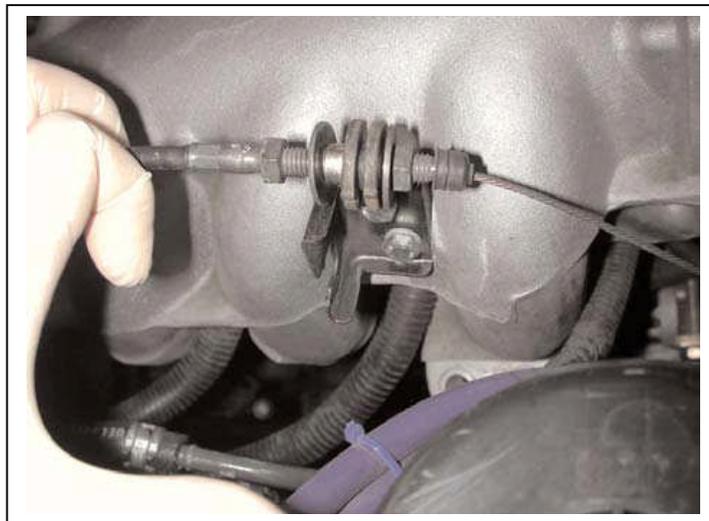


- Using a 12mm socket, remove the three (3) bolts securing the air box to the car. Using a 10mm socket, remove the bolts that secure the intake snorkel to the inner fender. Remove the air box and snorkel as an assembly and set it aside. Use a 10mm socket to remove the three bolts securing both of the air box brackets. Set the brackets aside. Illustration 6



- Back on the other side of the engine compartment, disconnect the electrical connectors at the throttle position sensor and at the idle air control motor. Using two 12mm combination wrenches, loosen the nuts securing the throttle cable to its bracket on the side of the intake manifold. Once the nuts have been loosened, push the sleeve out of the center of the rubber grommet. Then slide the grommet and cable out of the bracket. Disconnect the cable from the throttle bell crank. Use a 10mm socket to remove the throttle cable bracket from the intake manifold. Unclip the cable from the firewall mounting brackets and pull it over to the driver's (left) side of the car. Illustration 7

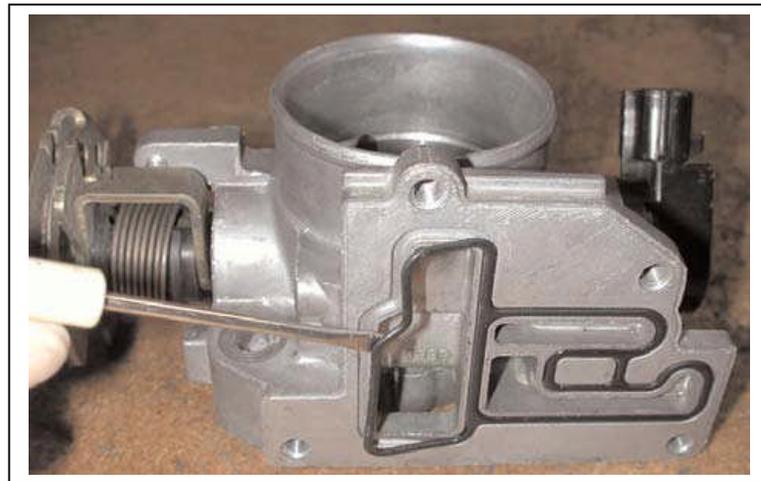
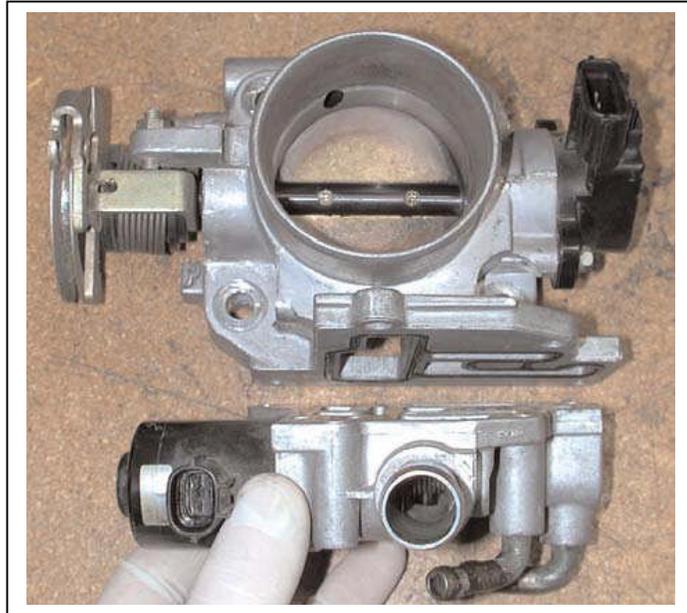




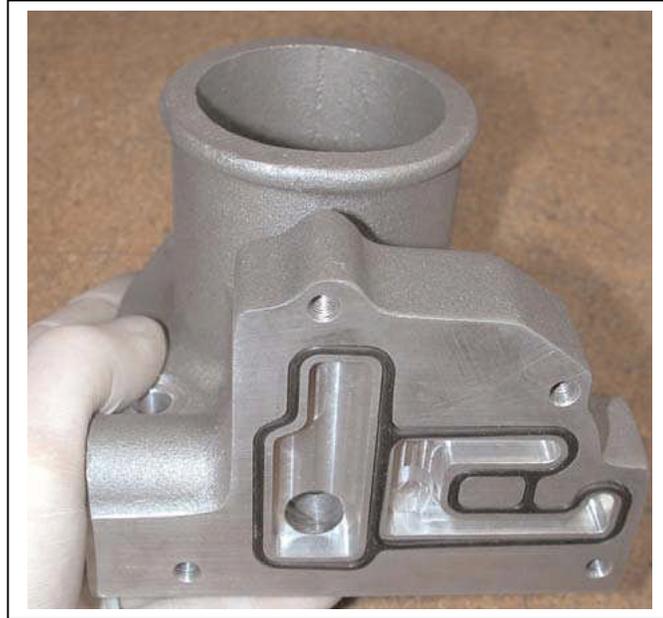
8. Use two pairs of needle nose locking pliers to pinch off the two small coolant hoses leading to and from the idle air control motor. Using a pair of needle nose pliers, release the clamps on the two small hoses. Disconnect the hoses. Next, using a 12mm socket, remove the two bolts and two nuts securing the throttle body to the intake manifold. Slide the throttle body off of the studs. Use caution when removing the throttle body not to damage the original throttle body gasket. Illustration 8



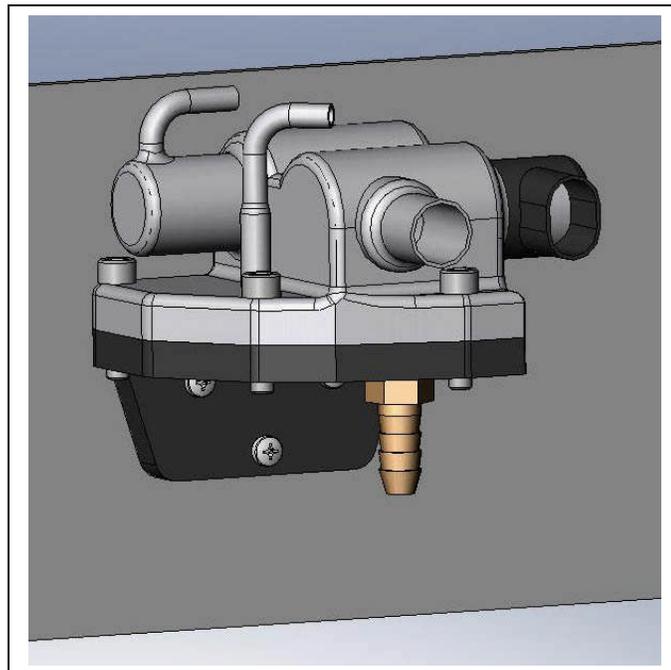
9. Take the throttle body to a worktable and use a #3 phillips-head screwdriver to remove the four (4) screws securing the idle air control motor to the throttle body. If the screws are really tight, pliers can be used from the side to loosen them. Gently separate the idle air control motor from the throttle body, taking care not to damage the o-ring gasket. The o-ring gasket will want to stay with the throttle body. Carefully use a small flat blade screwdriver to pick it out of its channels. Illustration 9



10. Locate the dummy throttle body from the kit. Install the o-ring gasket from the previous step into the channels in the bottom of the dummy throttle body. Make sure that each section of the o-ring fits all the way down into the groove. Then attach blank off plate to the dummy throttle body with the factory bolts. Tighten to 9 ft lbs. Illustration 10

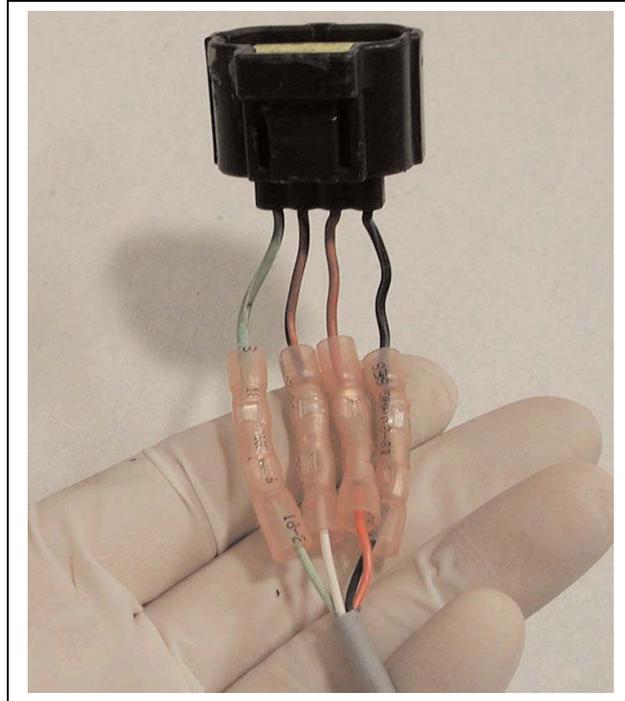


11. Locate the Idle Control remote mounting plate and bracket. Mount the Remote IAC plate and bracket to the firewall with the 3 self tapping screws. Also locate four M6 x 10mm flange head bolts in the hardware bag. Apply a thin coating of Ultra-Black to the IAC valve and attach it to the IAC remote mounting plate using the four M6 x 10mm bolts. Tighten the bolts in a cross pattern to 9 ft. lbs., using a 10mm socket. Illustration 11

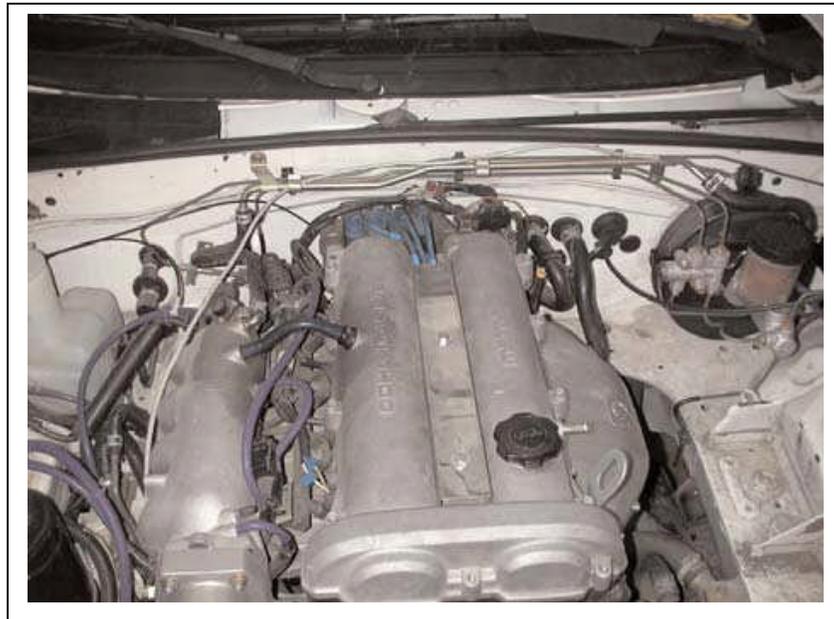


12. Find the four wire sheathed cable and eight inline butt connectors. These will be used to add the required length to the Throttle Position Sensor harness. Remove the first three inches of covering nearest to the Throttle Position Sensor (TPS) connector. Then cut all four wires at a spot 2" from the TPS harness connector. Strip a 1/4" of insulation from both sides of the cut wires. Crimp an inline connector onto each one of the stripped wires. Now take the provided sheathed cable and carefully cut 1-1/4" of the outer covering off from both ends, exposing the four wires within. Then strip 1/4" of insulation from each wire at both ends of the sheathed cable. Disregard the non-insulated ground wire contained within the sheathed cable. Starting with the wires at the TPS connector, crimp the green wire of the sheathed cable to the butt connector on the green wire of the TPS connector. Then crimp the red wire of the sheathed cable to the butt connector on the red wire of the TPS connector. Crimp the black wire of the sheathed cable to the butt connector on the black/blue (black with blue stripe) wire of the TPS connector. Crimp the white wire of the sheathed cable to the butt connector on the red/black (red with black stripe) wire of the TPS connector. Repeat this process with the other end of the sheathed cable and the factory harness, paying attention to the wire colors. Once all of the wires are crimped, apply heat to the connectors to shrink the tubing. Wrap both ends of the extension harness with the included electrical tape to protect the butt connectors from moisture. We have included 1/4" split loom if you would like to cover the entire harness. Illustration 14





13. Run the extension harness around the outside of the intake manifold, up to the throttle cable clips on the firewall. Hook the harness into both throttle cable mounting clips and lay it across to the brake master cylinder for now. Illustration 15



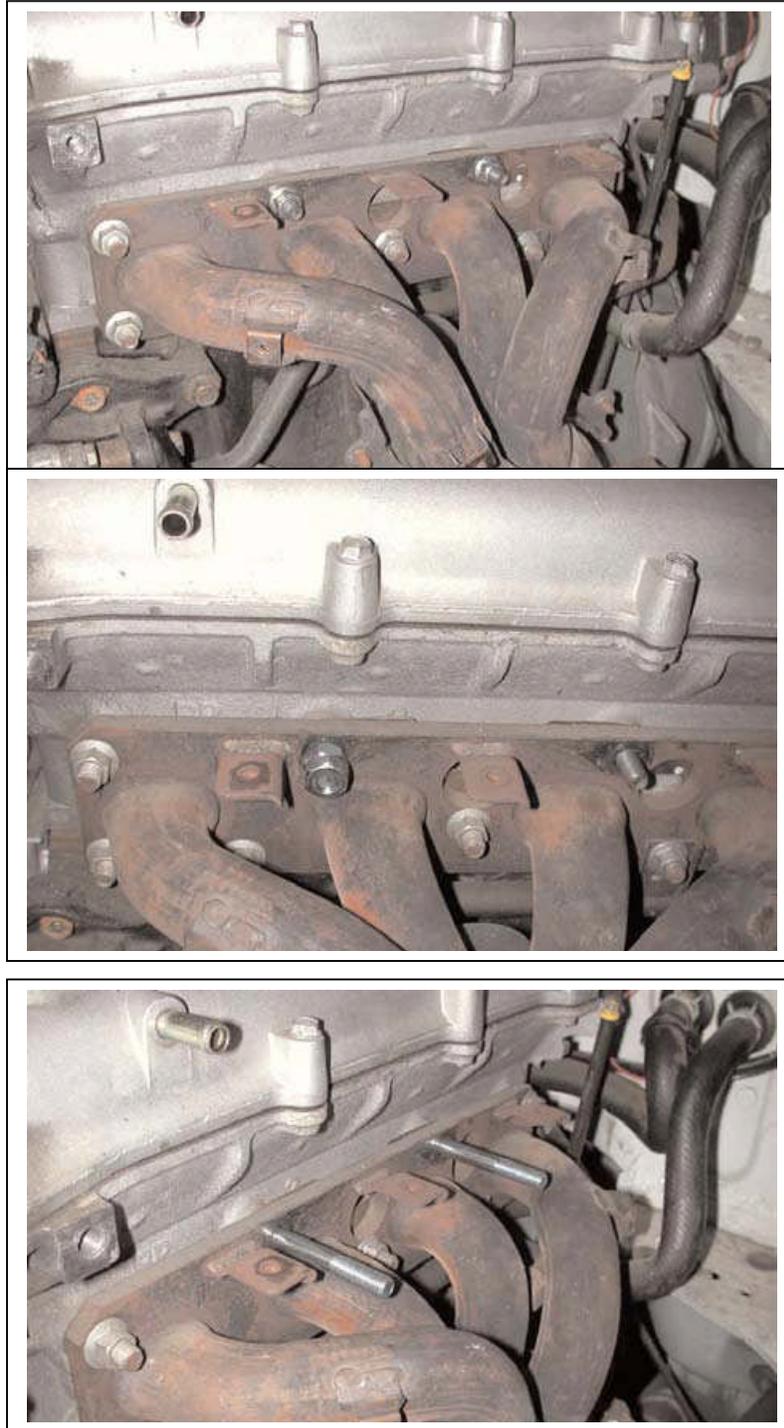
14. Use a 12mm socket and combination wrench to loosen the power steering slide lock bolt. Then loosen the tensioning bolt. Use a 14mm deep socket and combination wrench to loosen the power steering pivot bolt. You may have to rotate the pulley to access this bolt. Using a 14mm socket loosen and remove the slide anchor bolt at the engine. At this point the power steering pump should be able to pivot. Push the pump downward towards the air conditioning compressor and remove the belt. Now, use a 12mm socket to remove the bolt securing the power steering hose to the bracket. Using a 14mm socket, remove the two bolts that are fastening the power steering bracket to the power steering pump. Remove the whole tensioning system including the tensioning and power steering brackets. Then, remove the nut from the power steering pivot bolt. Illustration 16



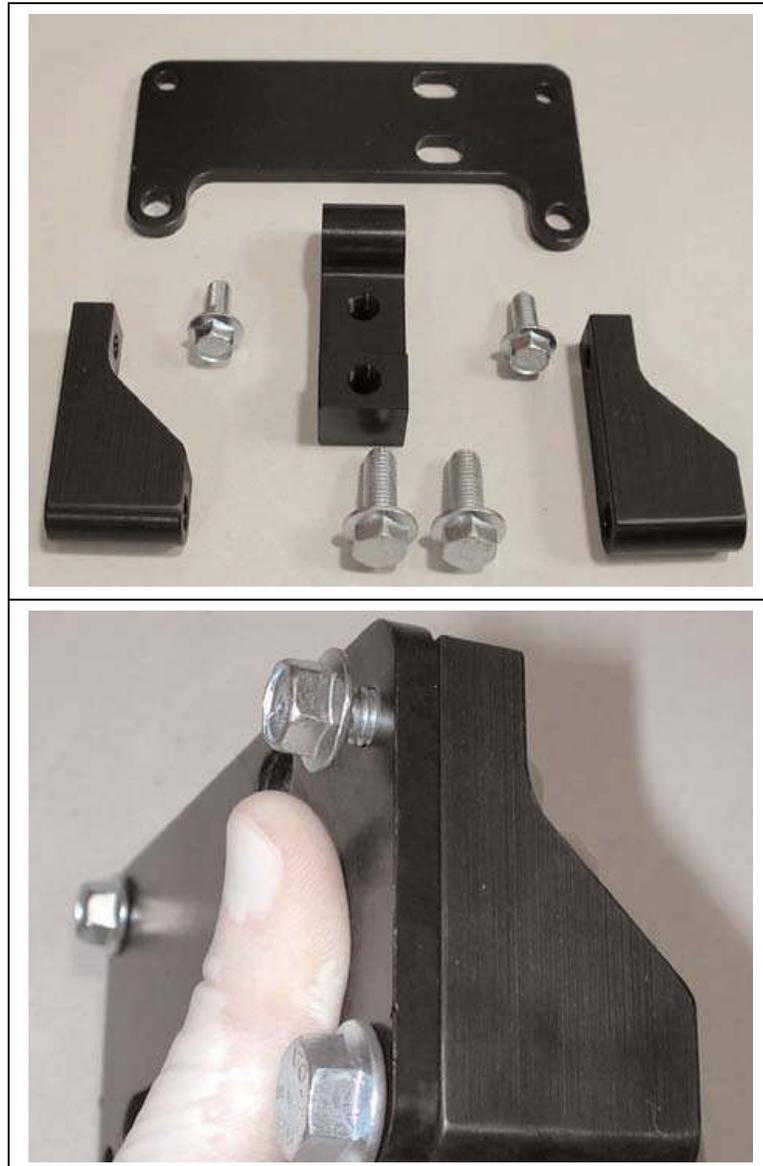
15. Gather together the new power steering hose support bracket and the supercharger strap bracket. Using a 22mm combination wrench slightly loosen the power steering hose on the top of the power steering pump and swing the hose to clear the new power steering hose support bracket. Then install the new hose support bracket in the same place as the factory bracket. Temporarily install the upper bolt to help with alignment. Tighten the bolts to 36 ft lbs.
16. Using a 14mm socket, remove the front engine lift eye. Using a 10mm socket, remove the seven bolts and three nuts securing the heat shield to the exhaust manifold. Remove the heat shield. Illustration 19



17. Use a 14mm socket to remove the nuts on the two center studs securing the exhaust manifold to the cylinder head. Install the two M10 nuts supplied in the kit onto one of the studs and tighten them together. Now use them to unscrew the stud. Repeat for the other stud. Install the new studs using the same method. Thread them in until they are snug, but do not over tighten. The short thread will go into the head. Illustration 20



18. Gather together the two exhaust mount blocks, the side plate and the side plate block. Also gather together two coarse-threaded M10 x 25mm flange head bolts and two M8 x 20mm flange head bolts. Apply thread lock to the two M8 bolts and use them to attach the exhaust mount block to the side plate. Drop one of the M10 bolts into the lower hole in the side plate and then tighten the M8 bolts to 18 ft lbs. This will align the lower hole in the block to the hole in the plate. Remove the M10 bolt and apply thread lock to both of the M10 bolts. Thread them loosely into the side plate block through the holes in the side plate. Illustration 21





19. Take the side plate assembly and slide it onto the two exhaust studs previously installed on the head. You may need to use a dead-blow hammer to lightly tap it into place against the exhaust manifold. Slide the side plate block all the way forward. Slip on two 10mm lock washers and start the two 10mm nuts used to install the studs. Use a 17mm socket to tighten them to 36 ft lbs. Illustration 22

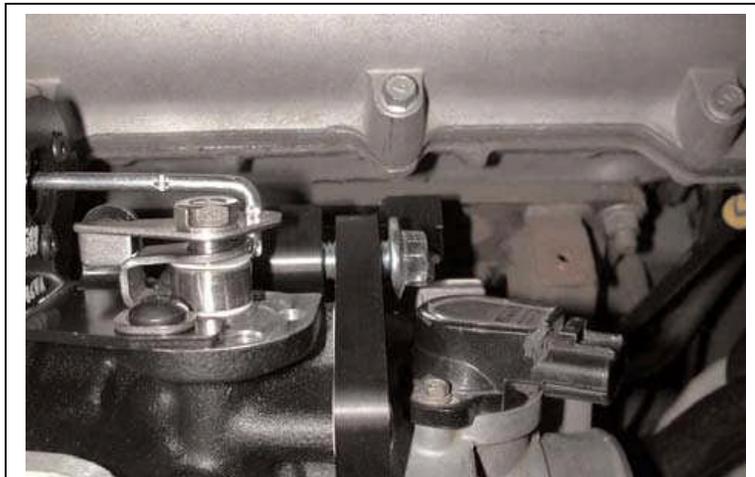
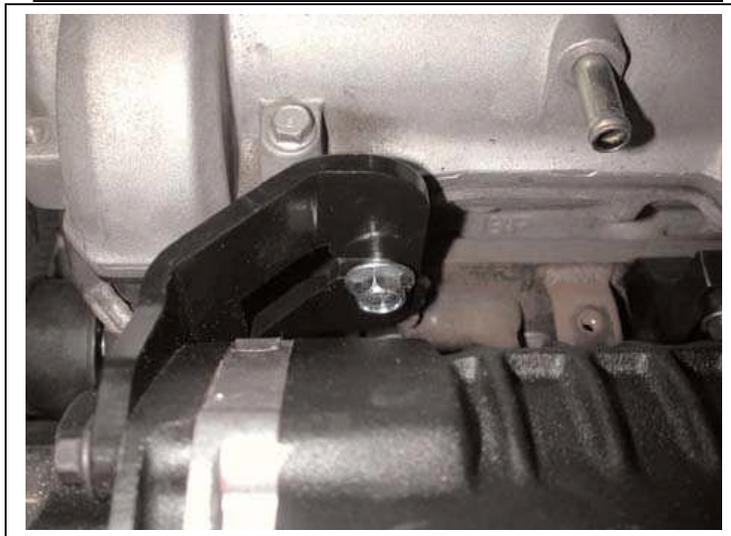




20. Locate the M10 x 1.25 x 25mm (fine thread) flange bolt and thread it into the head where you removed the engine lift eye earlier. Screw it into the head until there is about 1/2" of thread left sticking out of the head. Illustration 23



21. Take the supercharger assembly over to the car. Slide the keyhole slot, in the front bracket, over the M10 bolt that was threaded into the hole where the lifting eye was previously mounted. Slip the M12 bolt through the throttle body adapter plate and thread it into the side plate block. Illustration 26

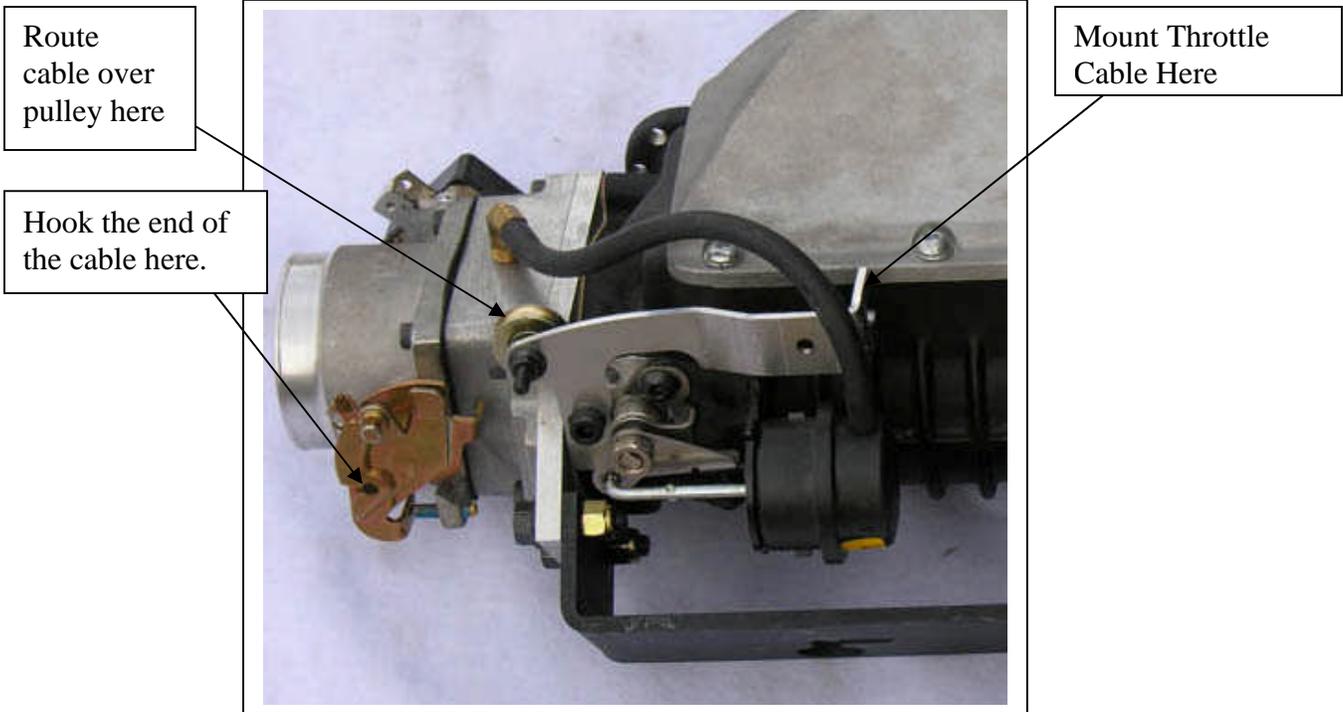


22. While the supercharger is hanging loosely on the engine, hold a straight edge between the supercharger pulley and the power steering pulley. Then slide the supercharger assembly forward or backward to align the front face of the supercharger pulley with the front face of the power steering pulley. Once they are aligned, use a 14mm combination wrench to tighten the M10 bolt at the front supercharger mount to 36 ft lbs. Then use a 16mm socket to tighten the M12 bolt at the back of the supercharger to 45 ft lbs. Now use a 15mm combination wrench to tighten the two bolts securing the side plate block to the side plate. Tighten them to 36 ft lbs.
23. Underneath the supercharger, align the supercharger strap bracket with the rear side of the front tab on the supercharger support bracket. Slip the M10 x 25mm coarse thread bolt through both brackets, start the M10 locknut and tighten using a 15mm combination wrench and 17mm socket. Use a 14mm deep socket and combination wrench to tighten the power steering pump pivot bolt to 36 ft lbs.

Illustration 28



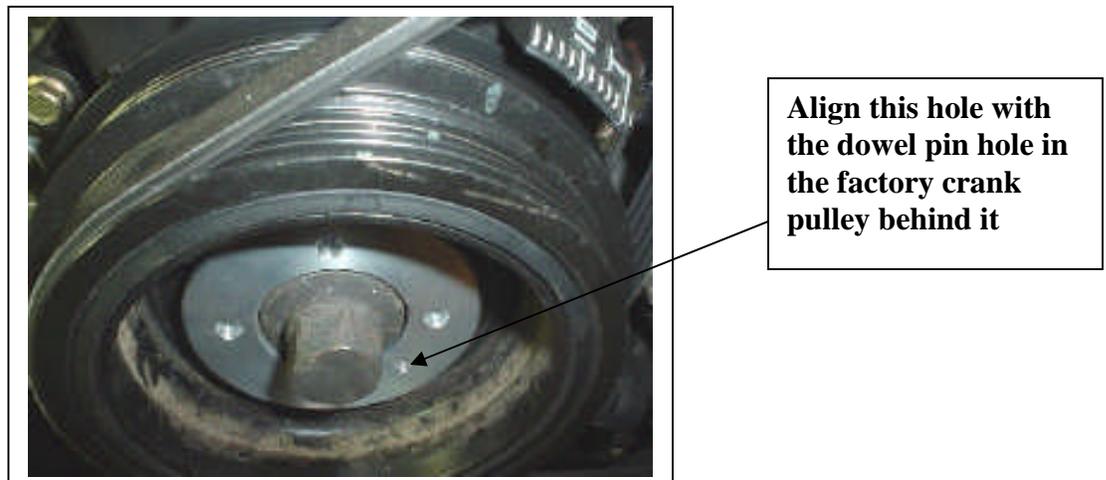
24. Stretch the throttle cable out to the front of the car and install the throttle cable onto the throttle cable bracket. Rotate the throttle bell crank. Hook the end of the cable into the bell crank on the throttle body, route the cable onto the pulley and adjust the adjusting bolt and tighten the two adjusting bolt nuts.



25. Remove the four 6mm 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.

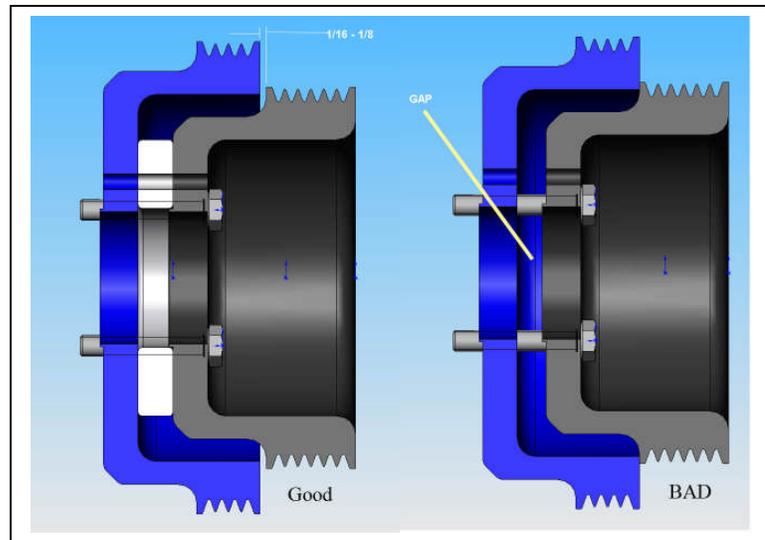
Note #1: Cast factory crank pulleys do not require this spacer.

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



26. Install the supercharger crank pulley with the included four 6mm x 35mm 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.

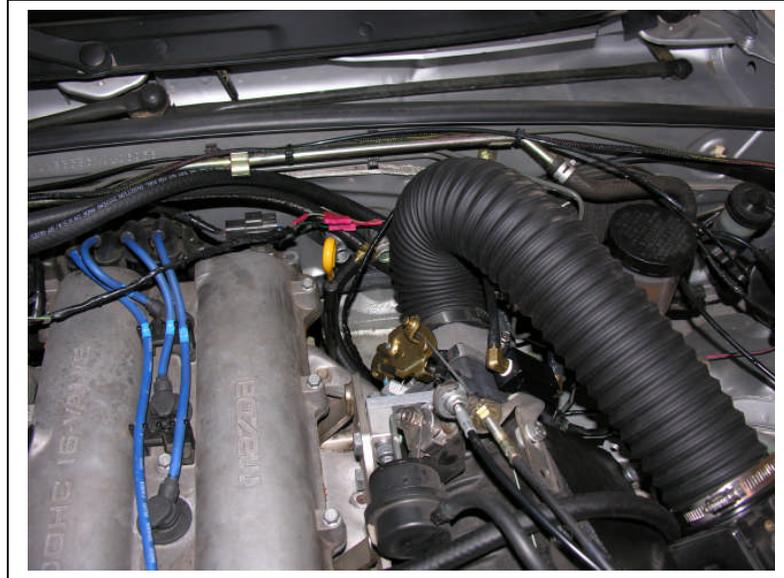
Note: The supercharger crank pulley should have the gap as shown in this picture. If the supercharger crank pulley is too close to the factory crank pulley then this means the included spacer needs to be used. If the supercharger crank pulley is too far from the factory crank pulley then the included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



27. Route the drive belt around the crank pulley and over the supercharger pulley. With the tensioner tool, rotate the tensioner out of the way and drop the belt onto the tensioner pulley. Release the tensioner and remove the tensioner tool. Illustration 30

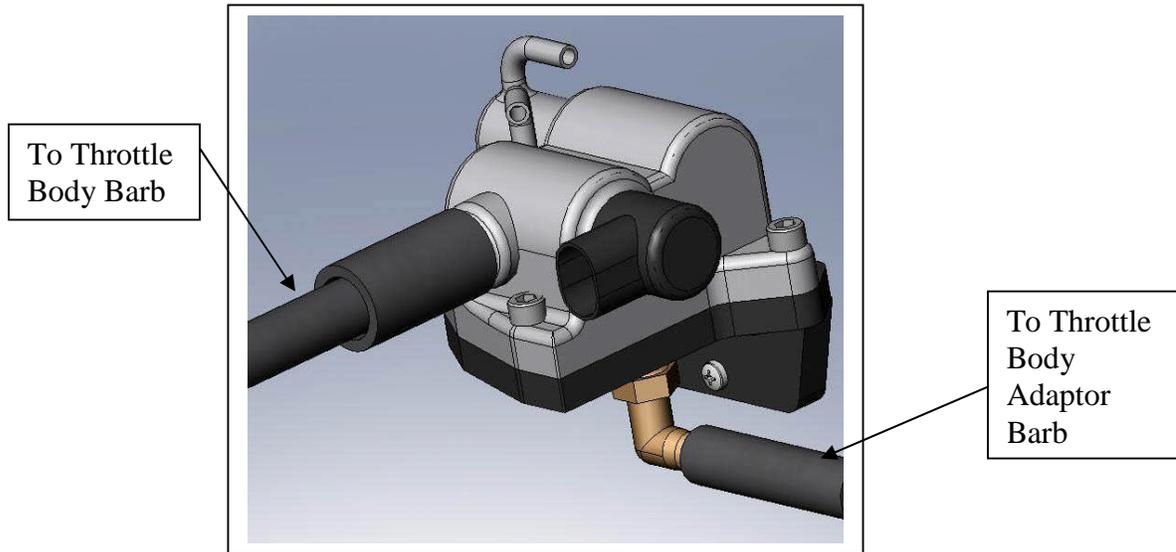


28. Take the 3" flex hose and connect one end to the throttle body. Connect the other end to the MAF. You will need to remove the rubber grommet from the inlet end of the MAF and put it on the outlet end of the MAF to act as a spacer/seal for the 3" hose.



29. Tighten the 3" hose clamps at each end. Attach the Air filter on the inlet of the MAF and tighten the 2.5" hose clamp.
30. Attach the Throttle Position Sensor (TPS) to the throttle body with the two original screws. Attach the TPS cable to the TPS.
31. Install the small plastic restrictor in the 11 inch long piece of 3/8" hose. Use two factory clamps to install the 3/8" hose between the 3/8" barbed fitting on the bottom of the throttle body and the nipple on the driver's side of the valve cover.

32. Mount the Idle Air Control (IAC) Bracket on the firewall on the passenger side. Use a thin application of Ultra-Black on the plate and mount the Idle Air Control valve to the plate with the original screws. Cut a 3" piece of the original large IAC hose and attach it to the large fitting on the IAC. Insert a piece of the 3/8" vacuum hose inside the larger hose and secure with the hose clamps. Route this 3/8" hose to the other barb on the throttle body.



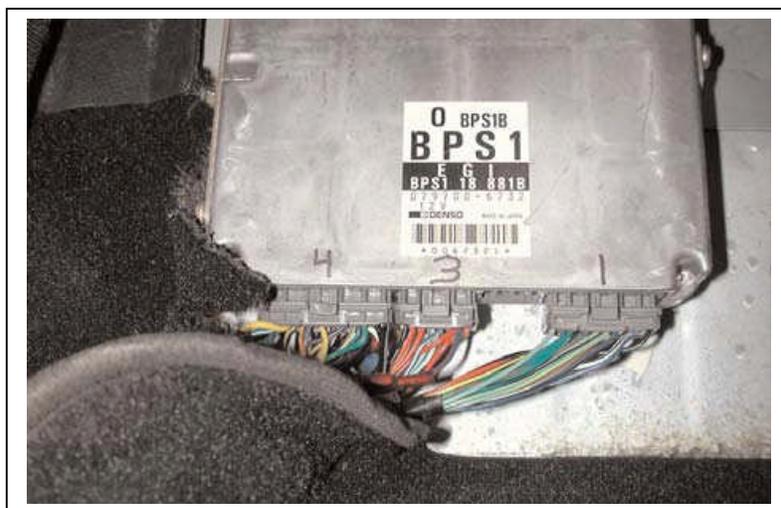
33. Gather together the crossover tube and the remaining two hoses. With the blank side facing up and the tube openings facing away from you, put the small end of the reducer hose on the left hand side and the straight hose on the right hand side. Slip the remaining four clamps over the hoses. Arrange the clamps so that the tightening screw faces up. On the supercharger side, the clamps may have to be staggered so they don't come in contact with the pulley or the power steering reservoir. Do not snug the clamps at this time. Slip the reducer hose over the dummy throttle body. Then slip the straight hose over the supercharger outlet. Position the clamps and tighten them. Illustration 37



34. If you have cruise control, connect the cruise control vacuum hose to the small barb on the throttle body adaptor.
35. Locate the PowerCard Pro harness assembly from your kit. Using a 14mm socket, remove the four bolts securing the passenger seat and remove it from the car. Remove the two push-in fasteners securing the carpet behind the seat. Fold the carpet toward the drivers side of the car to expose the Electronic Control Unit (ECU). You may have to peel back some of the carpet on the floor to expose the wiring harness. Illustration 38



36. There are two different ECU's between 94 & 97. The early 94-95 ECU has two connectors at the bottom and the 96-96 ECU has three connectors. Disconnect all the connectors. Illustration 39



37. Plug in the PC-Pro harness to the ECU and the Miata harness to the PC-Pro harness.

38. Route the included plastic tubing from the intake manifold to the PowerCard location. Be careful not to kink this tube during installation as it will give the PowerCard false pressure readings. Remove the passenger (right side) kick panel trim and the door sill plate. The tube will connect to the intake manifold on the passenger side of the engine. Locate an available vacuum port or tap into an existing vacuum hose using the rubber 90 degree fitting or one of the included tees. Next, route the tube through a hole in the firewall behind the windshield washer reservoir and into the interior. Pull all of the tubing into the inside of the car leaving a small amount of slack for engine rock. Route the tubing to the right, behind the kick panel, under the carpet near the door sill plate, along the door opening, and then under the panel near the door jam. Then on to the PowerCard location. Insert the end of the tube into the "Y" connector on the PC-Pro harness. Note: If you are going to install a vacuum/boost gauge, this tube is the ideal spot to tee in for the gauge. It will then see the same pressure as the cards.

39. Start your engine normally. Approximately four seconds after starting the engine, lights on the PowerCard Pro display will energize. With a proper installation, you will see a continuous sequence of lights run from left to right and back again, then a single steady green light at position one.

NOTE: When driving, it is possible to see the flashing green and red together. This is perfectly normal as most engine ECUs will shut off the injectors under extended periods of deceleration. However, if you get a flashing green and red at idle, PowerCard is not seeing the injector signal and you must recheck your installation.

40. Recover the ECU location with the carpet and secure with the push in fasteners. Reinstall the passenger seat and tighten the four bolts.

Make sure your timing is set to factory specification.

41. 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.

- 42.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.
- 43.Place the tune-up label under the hood adjacent to, but not covering, the vehicle manufacturers Vehicle Emission Control Information (tune-up) label.
- 44.Your Miata supercharger kit is designed to operate on 91 Octane fuel. Make sure that any fuel you use meets or exceeds this octane level. Failure to use at least 91 Octane fuel will result in engine-damaging detonation. Make sure that you run your engine on 91 Octane only, which means you should completely burn up any lower octane gas in your tank and refill it with 91 octane before installing your supercharger. In any case, should you ever hear "pinging" or knocking from your engine when under acceleration, you should take measures to eliminate this detonation, i.e. higher-octane fuel. Mixing fuels of different octane will lower the overall rating and detonation could be a problem.
- 45.Start your engine as you would a standard Miata. Remember to bring the engine up to operating temperature (as indicated by your water temperature gauge) before running it hard. Full boost on a cold engine will greatly increase your engine wear.
- 46.Breaking-in: Your supercharger will work perfectly from the first time you fire it up. However, it does need about 500 miles to fully seat the rotors. Up to that time, you may notice a slight noise coming from the supercharger at idle. This is normal.
- 47.Performance: You will notice that your engine runs stronger during cold days than on very hot ones. This is due to the nature of the internal combustion engine. When the air is cold, the engine receives a denser charge of air, thus more power can be produced. While this is true with any engine, the supercharger amplifies this cold air benefit.
- 48.Every six months or so, check your hose clamps for correct tension. The rubber hoses will take a set and the clamps may not be holding as tight. Also check all mounting bolts and nuts, particularly the throttle cable anchor bracket. Your air filter is a long-life unit needing service only every 15,000 miles. To clean, you can wash the filter element in soap and water. Use a dish detergent soap such as Dawn, etc. Rinse thoroughly and allow to dry.

Facsimile of the tune up label:

KnackToys, LLC
ARB EO No. D-617
Fast Forward Superchargers
Model: FFS-9497-HS-CA
Spark Plugs: NGK BKR7EIX
Spark Plug Gap: 0.8mm (0.032")
Minimum Fuel Requirement: 91 octane gasoline