Porsche 928 Supercharger Installation Manual

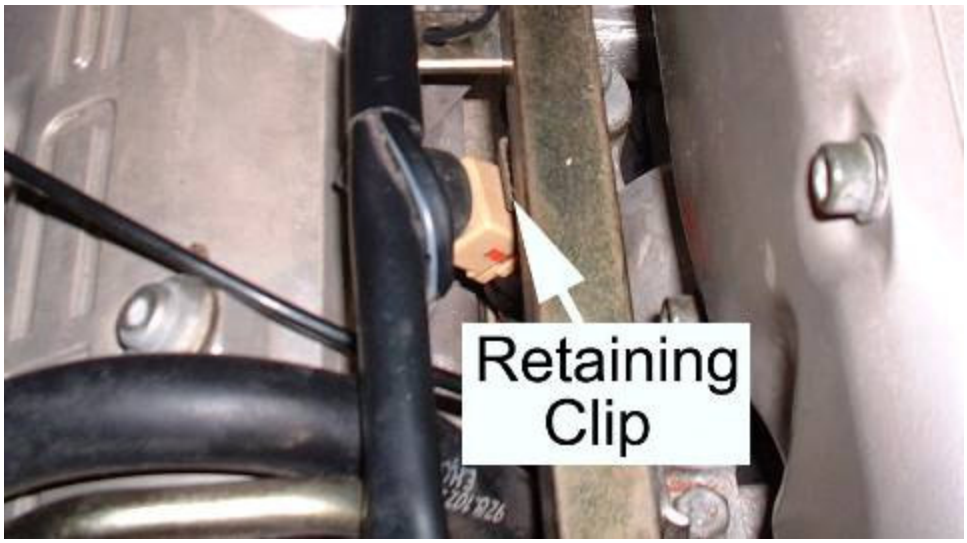
Version 4.1

This manual will detail the installation procedure of the supercharger kit on your Porsche 928. While the installation is not difficult, some mechanical ability and knowledge of the 928 is expected. The manual has been divided into several sections. The sections can be done in any order desired, and the car can be driven at the completion of each individual section. The installation is not considered complete until all sections are finished, and the car should NOT be driven hard until the full installation has been completed. The installation should only be done on a mechanically sound engine. A compression or leak down test is suggested before the supercharger kit is installed, to help ensure that there are no mechanical problems that the owner may not yet be aware of. While the supercharger kit should not cause any mechanical problems if correctly installed, it will accelerate already existing problems that may be present. Changing the car's fuel filter is suggested if it hasn't been done fairly recently. While the installation of the kit will not necessarily increase emissions, testing procedures, standards, and laws relating to emissions vary from one geographical area to another, and the installation should therefore be considered for off-road use only.

Fuel System and Crankcase Breather:

The changes to the fuel system consist of replacing the fuel injectors, and modifying some of the fuel line plumbing.

- Disconnect the battery.
- Remove the air intake tubes and air box.
- Remove the throttle cable bracket assembly from the driver side of the intake manifold. It is not necessary to disconnect any of the cables, only to remove the bracket from the manifold so that it may be positioned out of the way.
- Remove the fuel rail covers and disconnect the fuel lines from the front and back of each fuel rail. Make sure to use two wrenches, counter-holding to avoid bending anything. Have some rags ready as there is a bit of fuel that will leak out at each fitting. Once the rag is saturated, IMMEDIATELY put in a metal container and place somewhere outside where it is well ventilated.
- Remove the two nuts and washers securing each fuel rail to the intake manifold, **being careful not to drop them**. The use of a magnet, or stuffing a rag into the openings leading under the manifold, will help prevent the nuts and washers from going down there if accidentally dropped.
- Remove the square retaining clips that hold each fuel injector to the fuel rail by pulling outwards with a screwdriver or long nose pliers.



- Carefully pull the fuel rail straight upwards from the injectors. It may be somewhat difficult to get the fuel rails off of the injectors, so you may need to pry them off. Use a rag on the cam cover and pry on that, being careful to try and lift the fuels rails straight up. Once the fuel rails are off, the fuel injectors each pull out of the intake manifold. It's a good idea to clean the area to make sure that no dirt falls into the injector's bores when they are removed. Spraying some WD-40 where the injectors go into the manifold, and gently wiggling them around, makes removal easier.
- Remove the electrical connector from each fuel injector and unplug the knock sensor wiring that's located on top of the passenger side fuel. The connectors have small wire spring retainers on either side. Use two very small screw drivers to release the springs so that the connectors can then be pulled off the injectors. You may be able to grab the connector with you fingers and pull it off by wiggling it back and forth. Remove the plastic clips securing the wiring harness to each fuel rail, first before you pull out any injectors. These will probably break off, so don't worry about them, the harness will be secured with wire ties during reinstallation. It is extremely important than NOTHING be dropped down into the injector ports. When you pull out an injector, immediately cover the port. A suggestion would be to pull out each injector one by one and then used the old injector as a plug to keep stuff from falling into the ports.

Using two small screw drivers to pry the injector spring keepers back. You can also just try to pull the connector off with your fingers.

- Remove the fuel pressure regulator, the fuel pressure damper, and their mounting brackets

from the back of the engine. There is one nut and one bolt (torquex or metric allen) on each side of the engine securing them. This can be done while leaving the fuel line that runs between the regulator and damper connected to them, and removing everything as one assembly. Again have rags ready to catch the fuel that will leak from these fittings. The section of fuel line and bracket are then removed from the pressure damper. Leave the part of the bracket on the damper that is bolted to the back of it. You can use it to remount it back on the engine.

Driver side bracket mounting

Passenger side bracket mounting

Fuel Pressure regulator, damper, and bracket assembly as removed from car on the 89GT the air box brackets (wings with rubber mounts) are separate from the regulator and damper brackets. The fuel supply line on the 89 GT is steel at the regulator fitting, not rubber.

Only damper is reused. For 89 and later the bracket bolted the back of the damper ends at the first bolt hole, so it can be left in place for remounting the damper to the engine if you wish to leave it in there.

- Reinstall the nut and bolt from the passenger side, and the nut from the driver side that were removed above. Do not install the bolt from the driver side yet. The damper can be reinstalled In this position with the bolt. Note, the bolts on each side are tapped into the water jacket. When you remove them you will notice a small amount of coolant. It should not leak out as the holes are at a high point on the block.

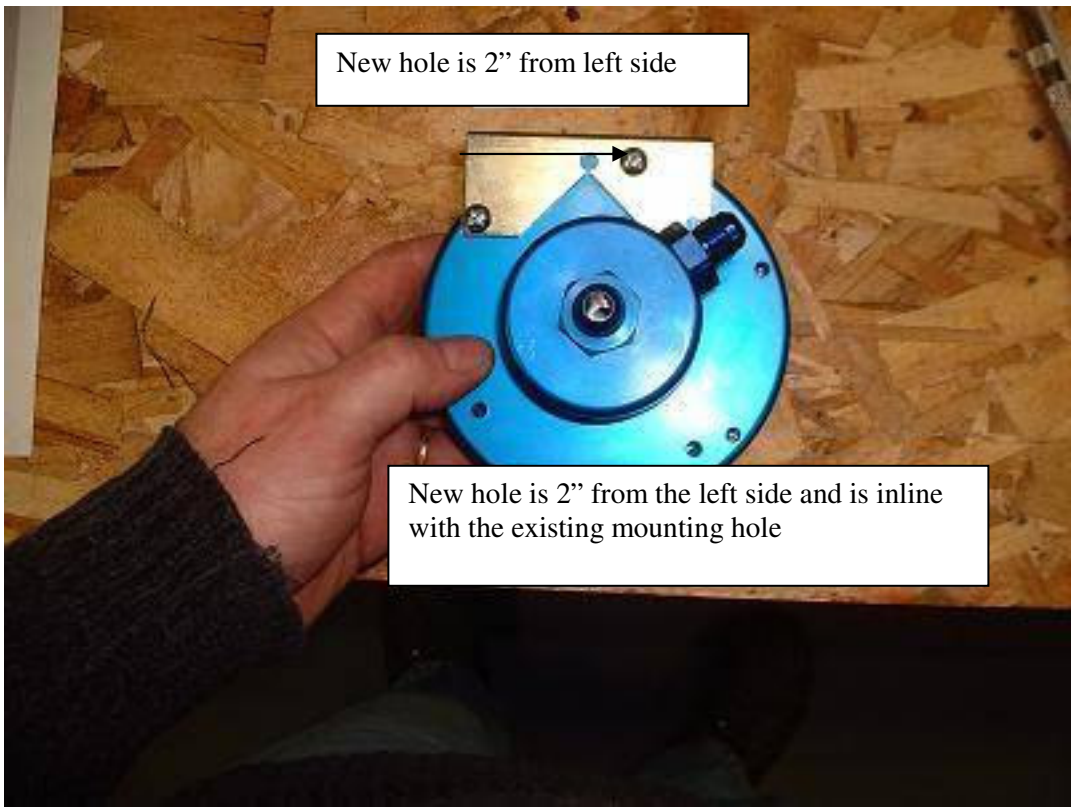
Break the bracket for the knock sensor plug off of the top of the passenger side fuel rail by bending it back and forth. Remove any sharp edges left on the fuel rail with a file. This is best done while the fuel rail is off of the engine.

- At this time you can also remove the tap nut on the end of the passenger side fuel rail. Use two open ended wrenches, with one of them placed on the very end of the fuel rail. The nut is on tight. Don't bend the fuel rail. Perhaps a sharp blow with a rubber mallet will break the nut loose if it is difficult to do by hand. There is a steel ball inside the cap nut that blocks off the orifice in the fuel rail. Remove that also. Test fit your fuel pressure gage onto the end of the fuel rail.

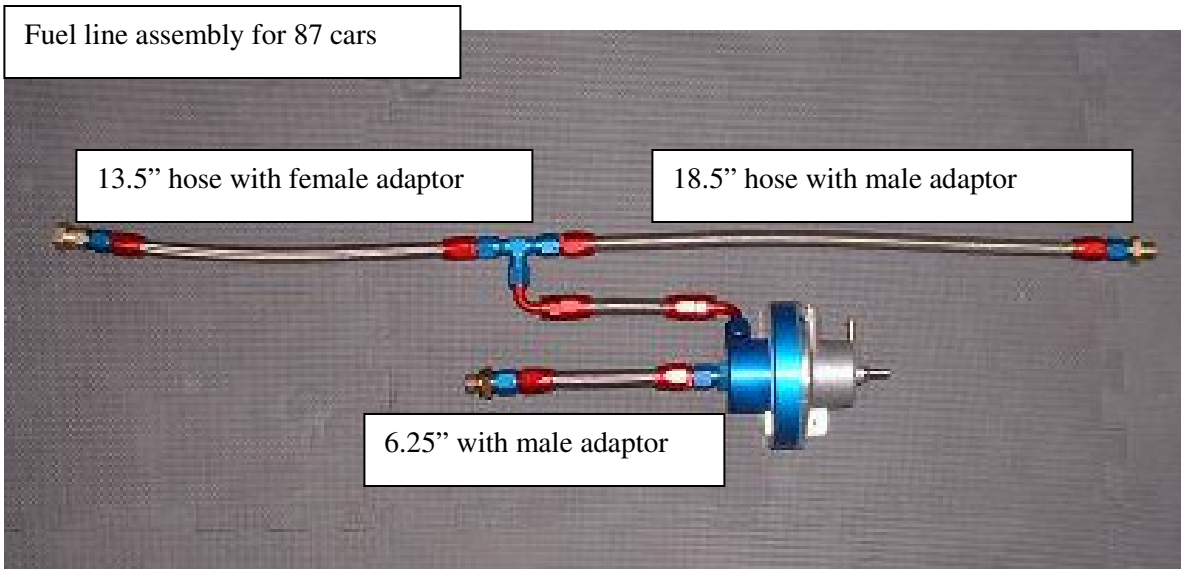
Knock sensor bracket is removed from fuel rail. File it down so there is no sharp edge left.

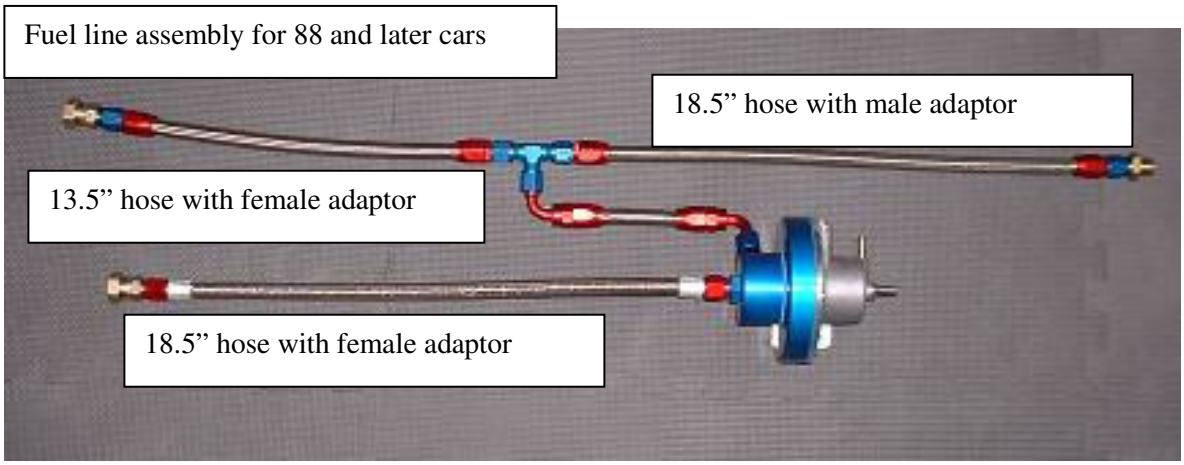
Note: The bottom "O" rings that came installed on your new fuel injectors are too small to properly fit into the injector bores of your intake manifold, and must be replaced. Carefully remove the lower "O" rings from the new fuel injectors with a small screwdriver, or other suitable tool. Install the larger "O" rings that are provided onto the new fuel injectors, being careful not to damage them. You can use the old injectors as plugs in the injector ports, until you install the new injectors.

- Lubricate the "O" rings on the fuel injectors and carefully push them into the fuel rail, making sure that they are not pinched or are moved out of position on the injectors. Install the square retaining clips to hold the injectors into the fuel rails, making sure they are properly seated. It is extremely important that you get these secured properly or there would be potential to blow the injector out of the fuel rail with the fuel pressure.
- Position the fuels rail so that the injectors are lined up with their bores in the intake manifold, push the rails downwards firmly, and install the washers and nuts to secure the fuel rails to the intake manifold. Reconnect the fuel lines at the front of each fuel rail, again using two wrenches to avoid damaging anything. Install the fuel pressure gauge on the front end of the passenger fuel rail with the supplied fitting if you have not already done so..
- Plug the electrical connectors back onto the fuel injectors. Since the original plastic clips holding the wiring harness to the fuel rails probably broke when removed, wire ties are used to secure the harness to the fuel rails. The knock sensor connector is plugged back into the wiring harness, and is also secured with a wire tie.
- Make sure all the fuel connections are tight., but don't bend anything.



Note: The “Boost” and “Vacuum” adjustments should be turned in all the way until they are firmly seated, do not over tighten. The rest of the components that come with the FMU are not used in this application. The FMU as you see it here is ready for installation.





- Using sheet metal screws, attach the bracket for the fuel management unit (FMU) to the firewall in the location shown below, and then mount the FMU to the bracket.

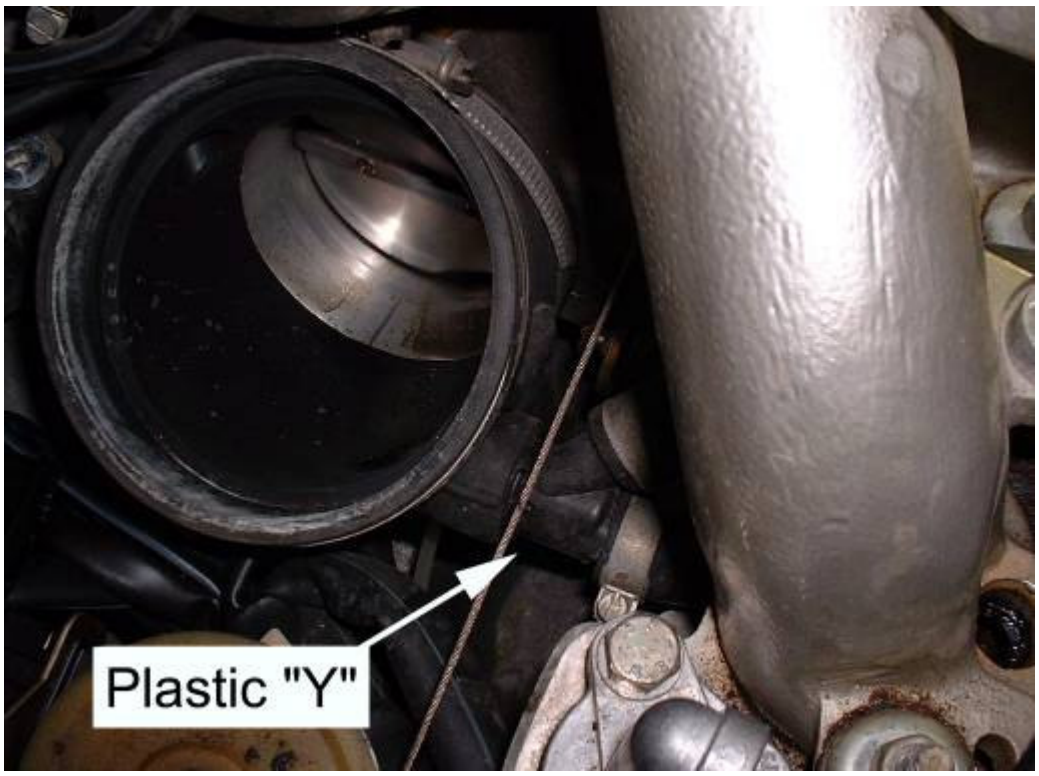
- Install the fuel pressure damper in its stock location on the back of the driver side fuel rail. The fuel pressure regulator and brackets that were removed are not reused. The supplied fittings and hose are then used to connect the fuel supply line, fuel pressure damper, FMU, and the fuel to gas tank return line as shown below. The fuel to tank return line, and its connection to the FMU, will vary slightly depending on the model year of the car.

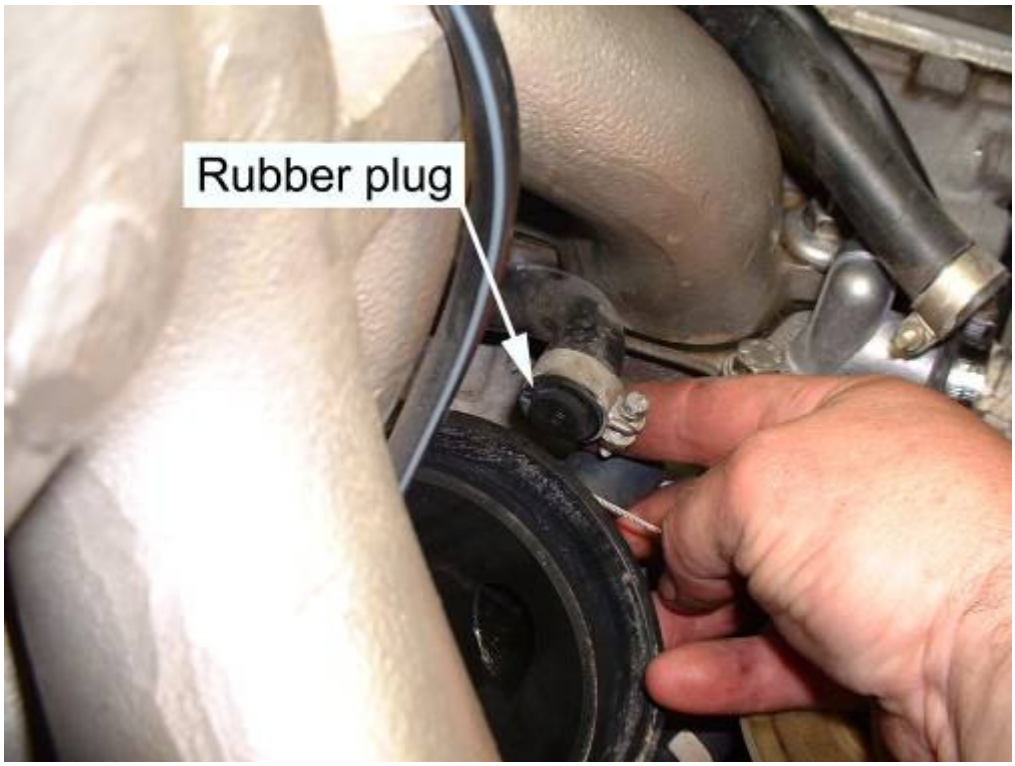
1987 Fuel to tank return line

FMU to fuel tank return connection points

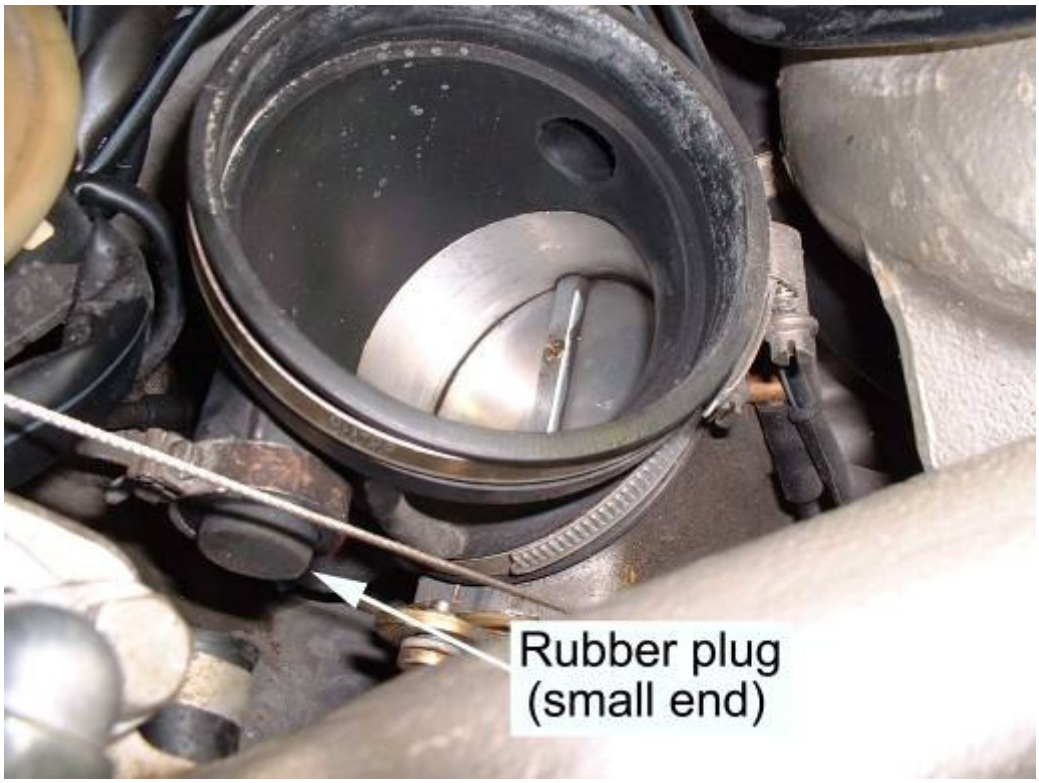
Fuel line routing (’87 model year pictured)

- Install the vacuum line to the fuel pressure damper, and connect the vacuum line that originally went to the stock fuel pressure regulator to the vacuum port on the FMU pictured above.
- Remove the plastic “Y” connector from the passenger side of the rubber boot between the airflow sensor and throttle body. Plug the hose that runs forwards under the intake manifold, and the hole in the rubber boot. Insert the plug into the hole from the inside, so that the larger end of the plug is inside of the rubber boot.



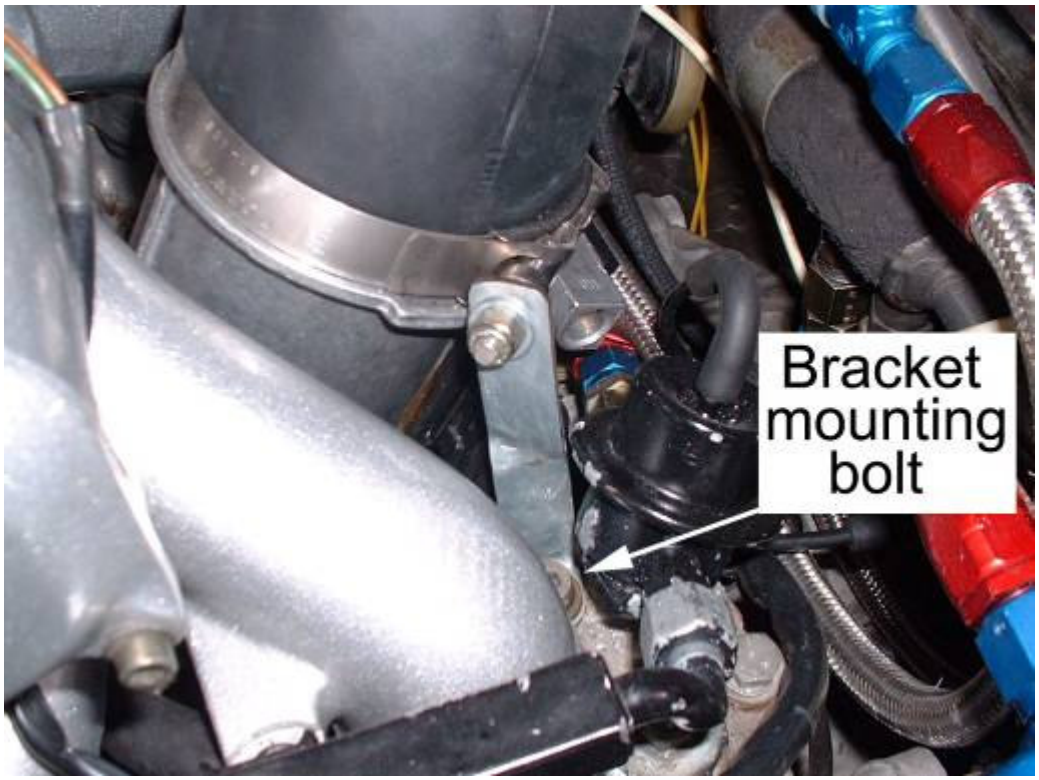


Use the smaller rubber plug supplied to plug this hose.



The above two pictures were taken from both sides of the car.

- Install the rubber elbow onto the airflow sensor, but do not tighten the clamp yet. The elbow is a tight fit on the airflow sensor, but it will go on. Make sure that it's all the way down on the airflow sensor. Install the supplied bracket onto the engine using the bolt from the fuel pressure damper's original mounting bracket. Position the bracket and the rubber elbow's clamp so that the bolt of the clamp fits through the hole at the top of the bracket. Tighten the clamp securing the rubber elbow to the airflow sensor, the bolt securing the bracket to the engine, and install a washer and nut onto the clamp's bolt, to attach the bracket to the clamp.



- Install the crankcase breather pieces as shown below. The hose from the lower rear pipe connection attaches to the oil drain at the bottom of the air/oil separator. Connect a length of hose to the output of the air/oil separator, and route it so that it exhausts the blowby gasses out the bottom of the engine compartment.

- Use the provided set screw to plug the hose connected to the side of the oil filler neck. Wind it in far enough so you can completely install the hose on the fitting. See next picture.

- Install the throttle cable assembly onto the side of the intake manifold Check to make sure all fuel connections are secure. Connect the battery and remove the fuel pump relay. Connect a jumper wire between terminals 30 and 87 of the relay's socket. Thoroughly check for any fuel leaks at all fuel line connections, and also where the fuel injectors fit into the fuel rails. If no leaks are found, adjust the fuel pressure to about 35psi. Remove the jumper wire from the fuel pump relay's socket and replace the fuel pump relay.
- If the remainder of the system has not yet been installed, the air filter may be clamped onto the rubber air intake elbow. Start the engine and let it idle. The engine may initially idle roughly. While the engine is idling, adjust the fuel pressure to 30psi, and continue to let the engine idle for several minutes. The engine should begin to run more smoothly after a short while, as the fuel injection computer adjusts the mixture. The car may be driven at this point.

Pulleys:

The crankshaft, power steering, and air pump pulleys must all be removed. Unless using an impact wrench a flywheel lock is usually used to remove the crank pulley. On a manual transmission car, the transmission may also be put in 5th gear, with the clutch out and the parking brake applied. You could take the car to a Porsche shop and have them install the pulleys for you, or possibly borrow/rent their flywheel lock tool and do it yourself.

- Loosen the bolts securing the power steering pump and air pump pulleys and then remove all accessory belts from the front of the engine. It's helpful to label the power steering and air pump belts, as they will be reused and are easy to mix up. If your car is a 1990 or later you will get a new ac belt as part of the kit.

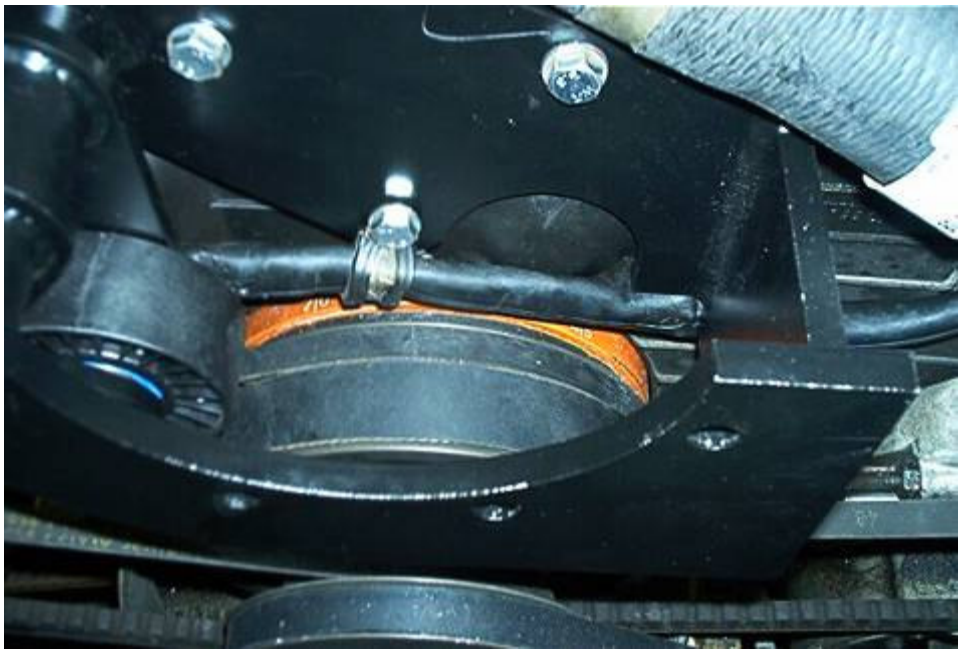
- Remove the pulleys from the power steering pump, air pump and the crankshaft. The bolt securing the crankshaft bolt is usually very tight, and will require an impact wrench or a breaker bar with an extension to remove. Once the bolt is out, the pulley should pull off, but may require some wiggling to do so.

- Install the new crankshaft pulley and tighten the bolt securing it to 218 ft/lbs. Using the spacers and longer bolts provided, install the air pump and power steering pump. Install the A/C, supercharger, power steering, and air pump belts. The alternator belt supplied is installed in place of the one originally on the car.

Supercharger Installation:

- Drain the radiator and remove the lower radiator hose (left side of car). Disconnect the engine ends of the upper radiator hose and the coolant reservoir hose located just beneath it. You will need to shorten these as shown in the pictures. Remove the fan shroud with the electric cooling fans. You also need to remove the engine lift bracket from the front of the engine or it will interfere with the supercharger plumbing.

- Position the wiring back out of the way and secure the supercharger bracket to the front of the engine with the supplied bolts. Use Loctite on the bolts and torque to 25ft-lbs



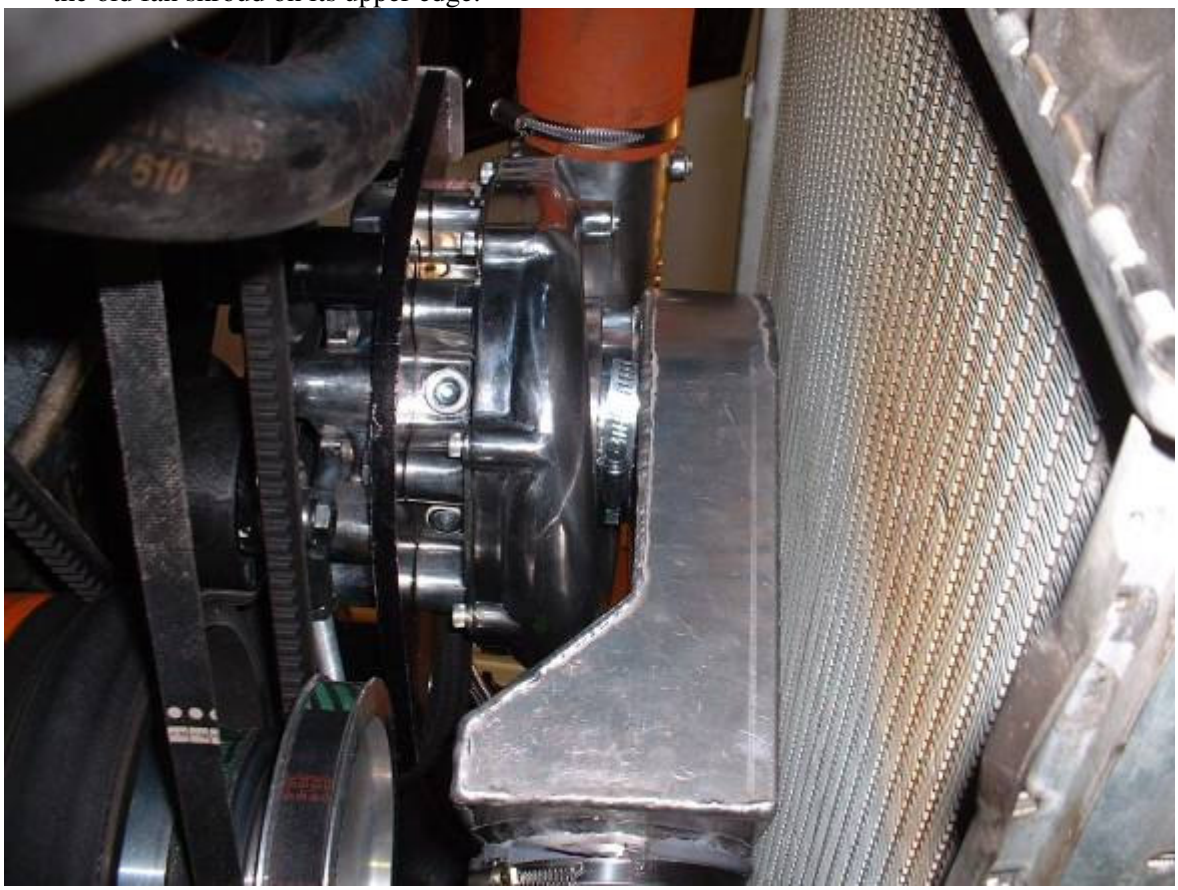
- Remove the oil dipstick tube and install the supplied replacement. Shorten the upper radiator hose and the coolant reservoir hose, so that they are clear of the supercharger bracket when in their installed positions.
- Use the supplied clamp to attach the wire loom to the lower bracket bolt as shown above.

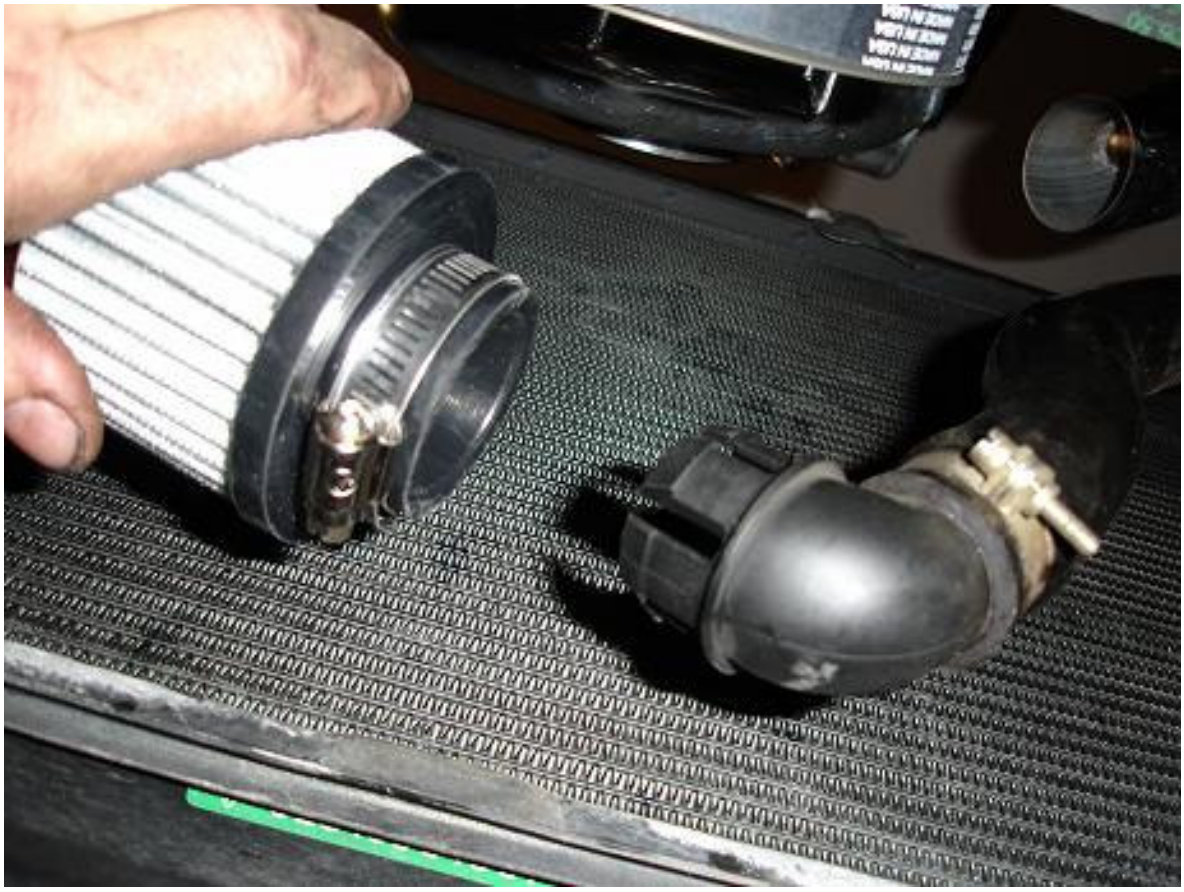
- The supercharger as shown below is ready to be placed into the bracket.

- Lower the supercharger into the sc bracket but don't install the bolts yet. Remove radiator stays on the top sides of the radiator and also the brackets on the front of the ac condenser. Next, remove the screw clamp form the intake box and slide it onto the sc inlet while pulling the radiator towards the front of the car. Once it is in position you can replace all the mounting hardware including the screw clamp on the air box and the screws for the supercharger. Once you have the sc bolts in place and tightened you can place the sc belt and tighten with the tensioning nut, then tighten a second nut against it to prevent loosening.

- Connect the supplied oil return line from the supercharger to the fitting on the new oil dipstick tube. Install the upper radiator hose, coolant reservoir hose, and the supplied lower radiator hose, making sure that they do not contact the supercharger or it's mounting bracket.

- Bolt the brace to the top of the supercharger bracket and to the two existing tapped holes on top of the engine. Install the aluminum piece on the top of the radiator, using the rubber seal from the old fan shroud on its upper edge.





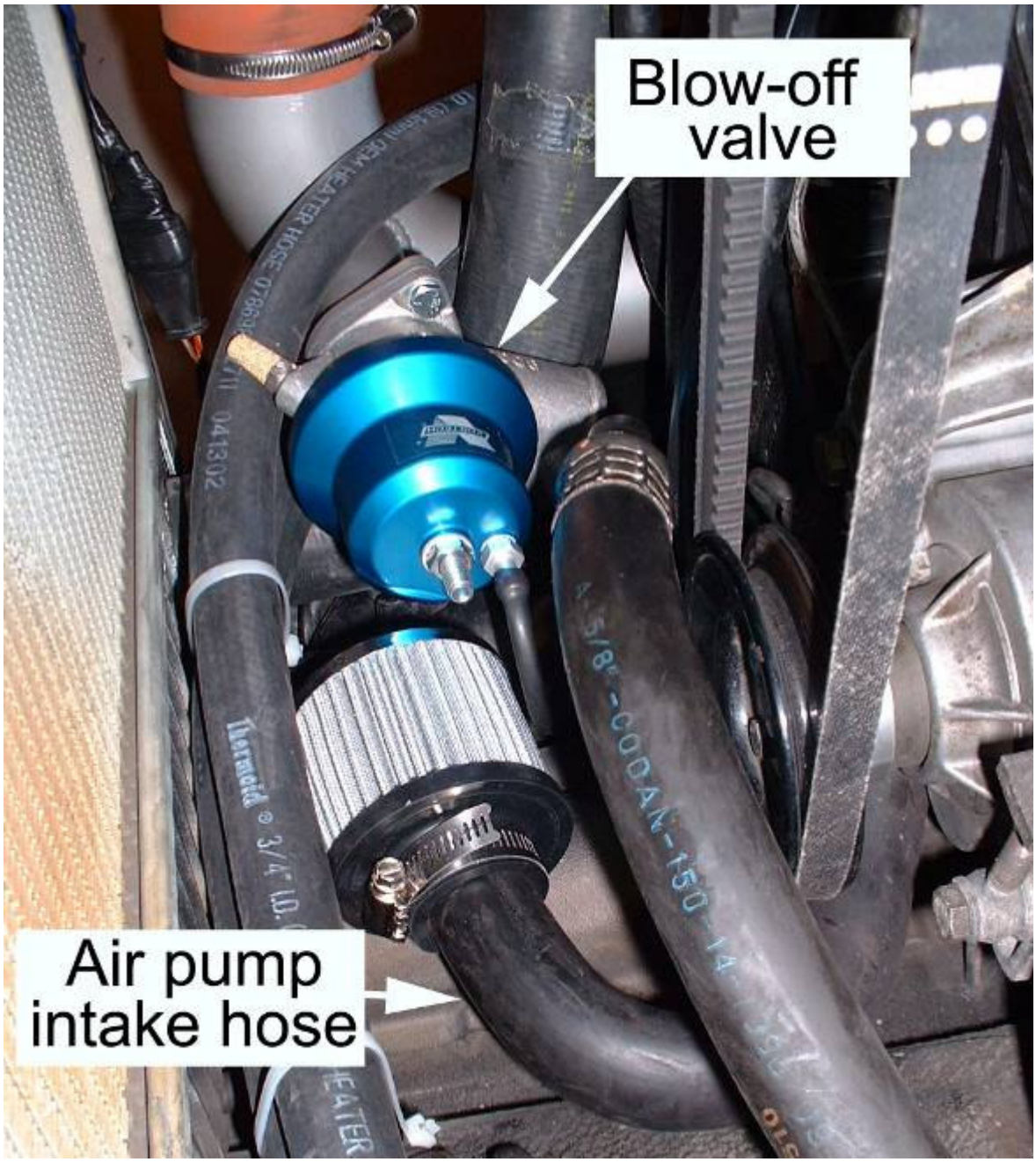
Installing the fans:

Remove the screws for the fan motors and attach the brackets as shown above. This is the orientation of the fans as you would see them looking into the back side of the radiator. The bottom of the 2" wide bracket slips into the slot on the bottom edge of the radiator. The top of the bracket get secured to the new air dam that is mounted to the top of the radiator. You will have to drill the holes into the air dam to mount the fans and use the supplied fasteners with the nylock nuts. Connect each pair of fan wires together and plug the electrical spades into the stock fan wire harness on the car. The black wires should be aligned with the brown wires on the stock harness. Once mounted on the car verify that the fans are rotating in the right direction (pulling air). You can do this by disconnecting the two wires from the temperature sensor located on top of the intake manifold and temporarily connect them together. Hold down the hood switch that's located on the passenger side fender. This will cause the cooling fans to operate. If the fans are blowing in the wrong direction, reverse the wires at the connection to the wiring harness.

- Remove the engine oil filter and install the oil feed adapter for the supercharger in its

place, and then install the supplied oil filter onto the adapter. Connect the oil feed line from the adapter to the supercharger, carefully routing it to avoid any rubbing or tight bends.

- Install the blow-off valve onto the air intake tube and attach the tube to the supercharger's outlet. Cut the air pump's intake hose and clamp the small filter onto its end so that the filter fit's below the blow-off valve. Connect a vacuum line to the vacuum port on the blow-off valve and route the line back to the rear of the engine. Install a "T" fitting in the line supplying vacuum to the FMU, and connect the vacuum line from the blow-off valve to the "T".

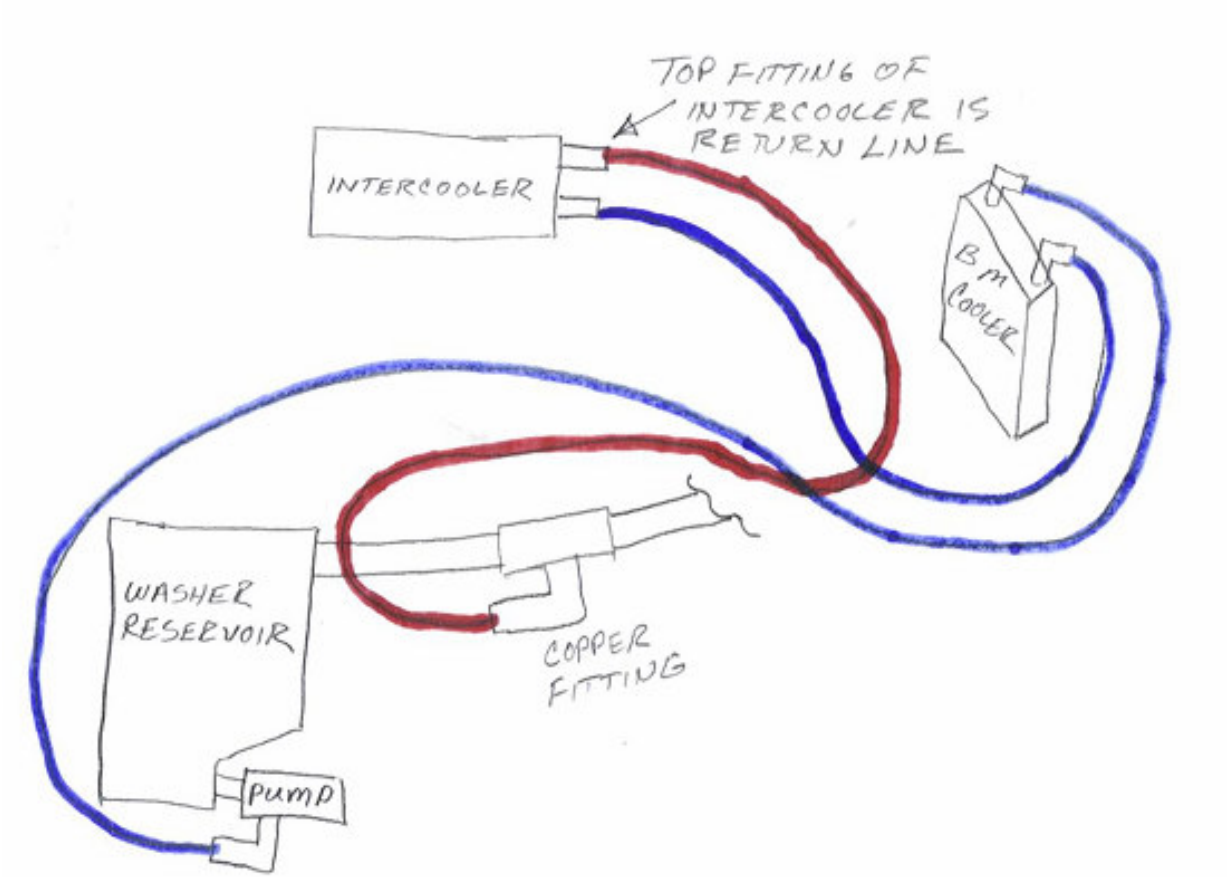


- Position the intercooler and connect it to the rubber intake elbow and the intake tube with the supplied sleeves and clamps. The breather system tubing should fit between the intercooler and intake manifold as pictured. Make sure all clamps are securely tightened when everything is properly positioned. Use a wire tie to secure the rubber cap on the top of the intake manifold. This will prevent it from coming off under boost.

- Clamp the flexible intake air ducting to the airbox on the front of the supercharger. Route the ducting down and to the driver side at the front of the car. The air filter is clamped onto the end of the duct and positioned in the area underneath the driver side headlight. A section of the duct may need to be slightly flattened into an oval shape to allow the front spoiler and belly pan to be installed properly. Check to make certain everything is clear of any moving parts, and start the engine. Check for any leaks, strange sounds, and anything rubbing anywhere. The car may be driven at this point.

While the supercharger will now be operational and making boost, it is important to remember that the installation is not yet complete. The intercooler is not yet functional. If you must drive the car at this stage, as tempting as it will be, **DO NOT DRIVE THE CAR HARD IN THIS CONDITION.**

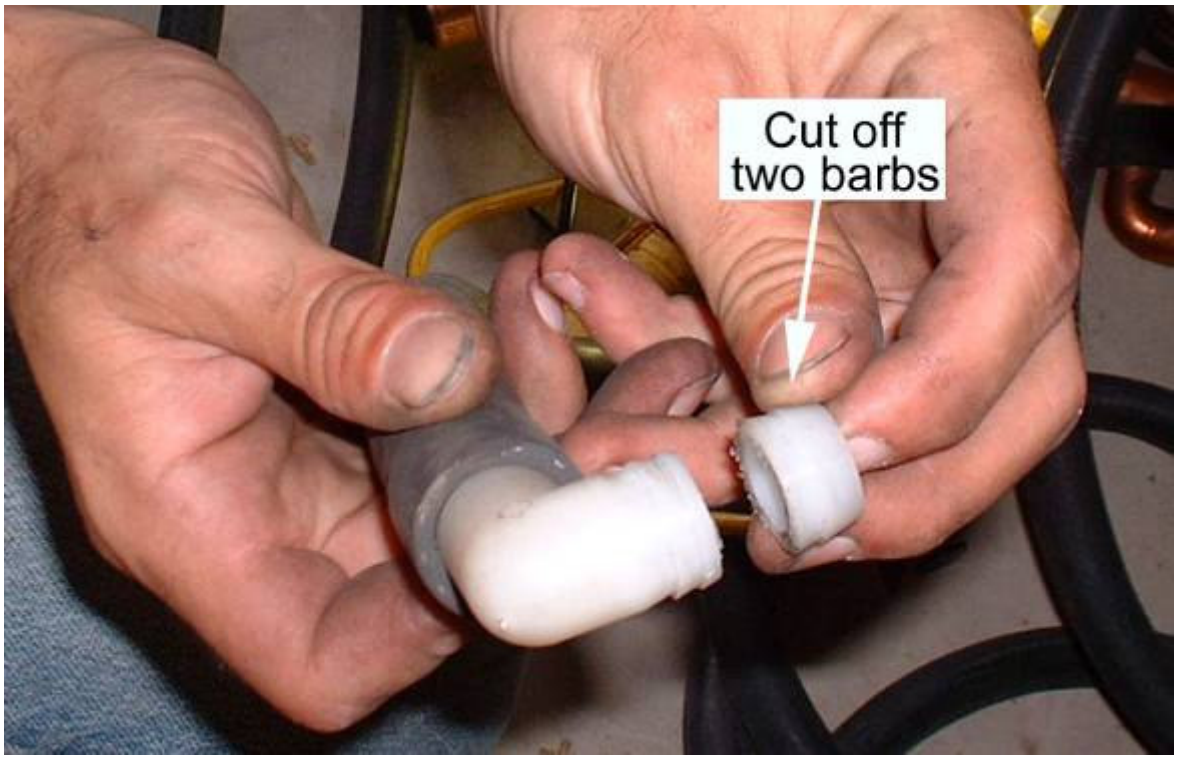
Intercooler pump and plumbing:



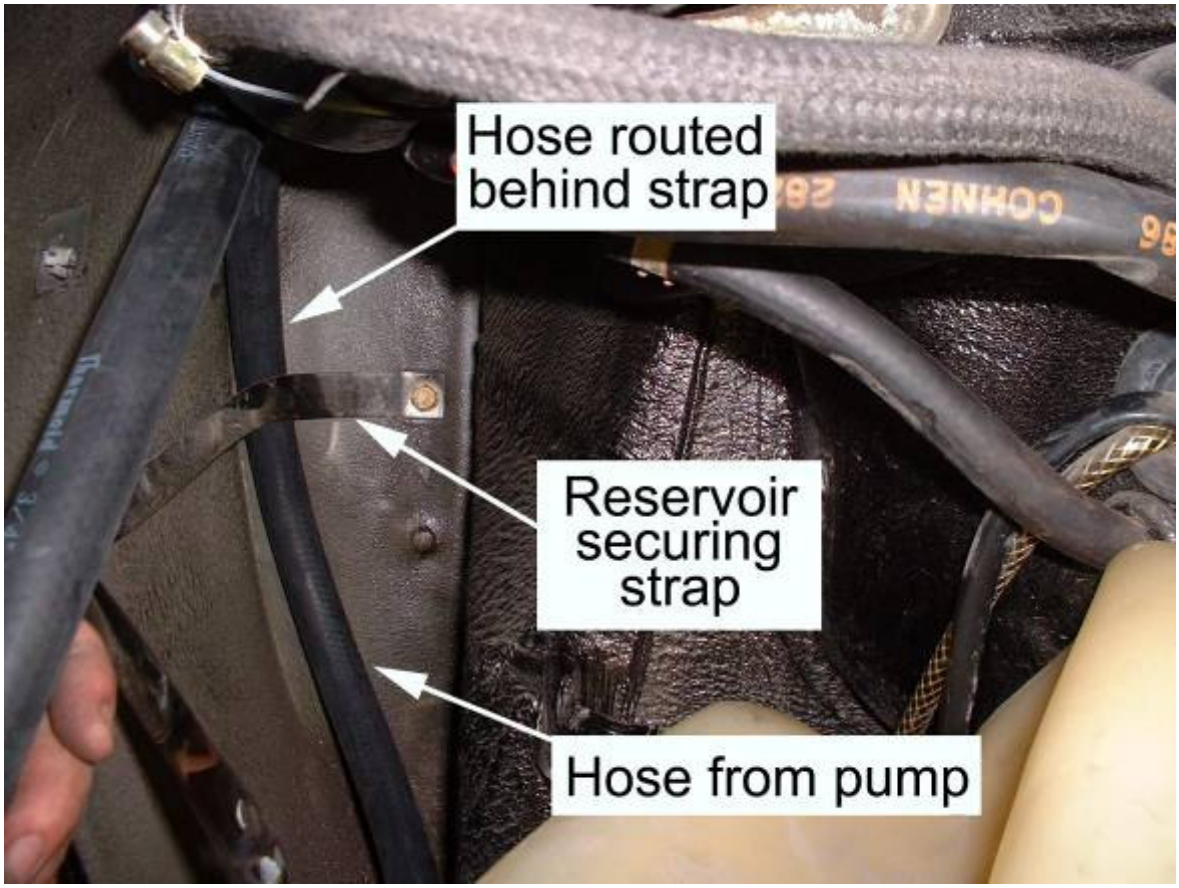
While the actual intercooler was installed in the previous section, it is not functional until the pump, plumbing and radiator to handle its coolant have all been installed and are operational. The windshield washer reservoir is used as the coolant reservoir for the intercooler system.

- Remove the front passenger side wheel and all of the plastic wheel well liner pieces. Loosen the strap securing the charcoal canister so that the canister may be moved out of the way. Disconnect the hoses and wires from the windshield washer reservoir and remove the reservoir from the car. Drain the windshield washer reservoir, and remove the headlight washer pump from the bottom of it.

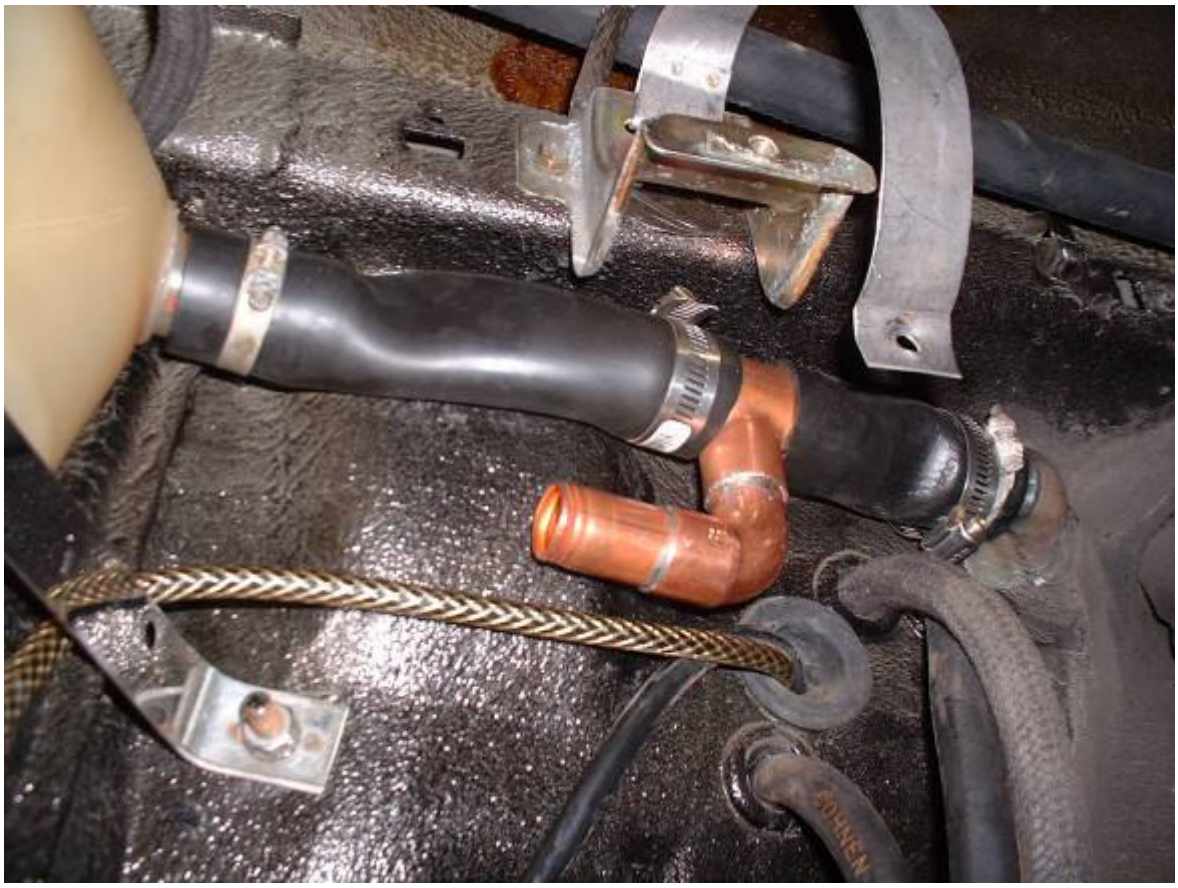
- Install the intercooler pump to the reservoir in place of the headlight washer pump using the supplied fitting and a section of hose. Apply sealant to the threads of the fitting before screwing it into the washer reservoir. Cut two barbs off of one leg of the plastic elbow fitting to shorten it, and attach the shortened leg to the pump. The elbow should be oriented so as to point towards the back of the car when the reservoir is installed. Attach a length of hose to the other leg of the elbow


Cut off
two barbs

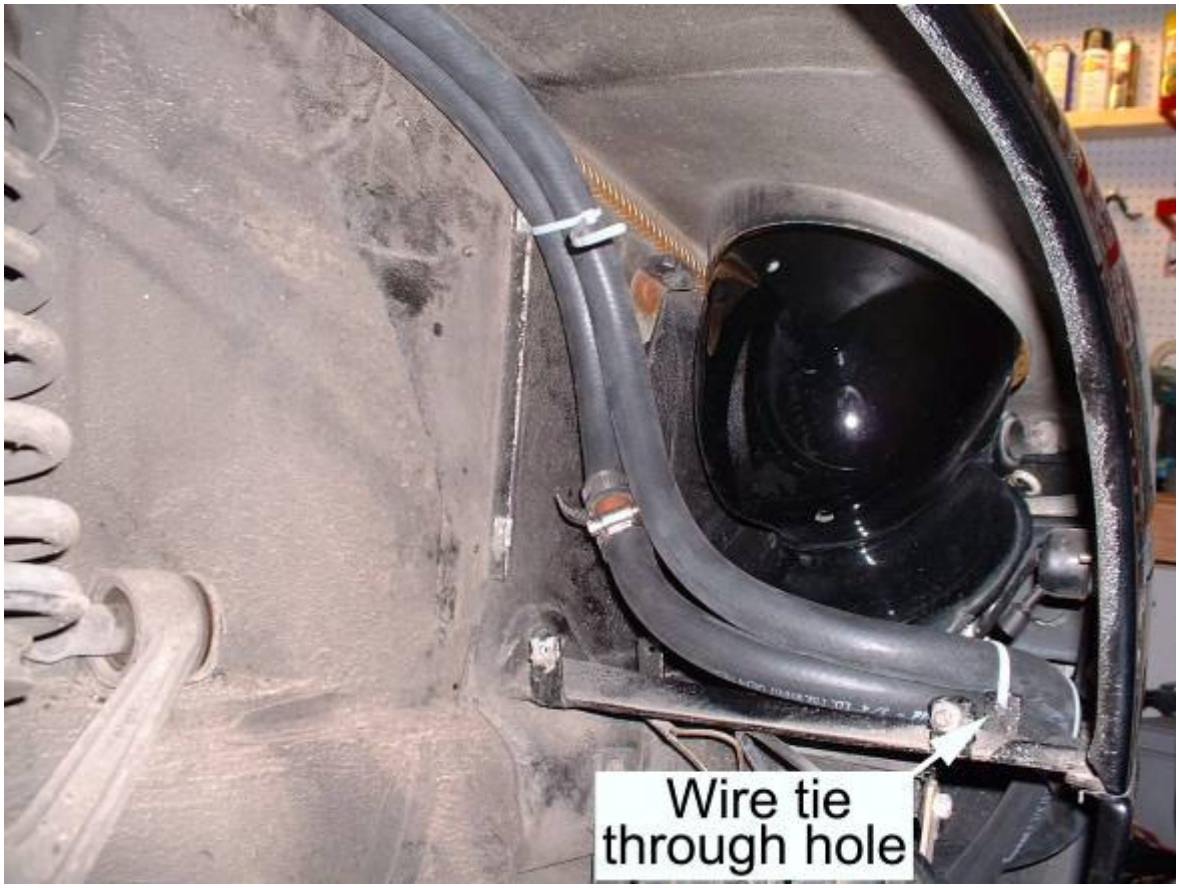
- Route the hose from the plastic elbow so that it runs from the bottom up behind the strap that secures the reservoir in the car. Position the reservoir back in the car with the new hose looping forwards over the top of the reservoir and secure it with its mounting strap.



- Cut approximately a ¾" section out of the hose that connects the washer reservoir to the filler neck, and install the supplied copper fitting as pictured below. Connect a length of hose to the fitting and reinstall the charcoal canister. Loop the hose over the top of the charcoal canister, so that it runs forwards and next to the intercooler hose from the pump. Secure the two hoses together using wire ties.



- Remove the hose associated with the headlight washer system and route the two intercooler hoses as pictured, and out under the car to the area of the tow eye. Make sure that the hoses remain clear of the moving headlight mechanism.



- If your car is equipped with the radiator air intake flaps, disable them in the fully open position. Removing the fuse from the fuse panel does this. On ‘87-’89 cars this should be fuse #23. On ’90 cars it should be fuse #18. Make certain that the flaps are in the fully opened position after the fuse has been removed. On the passenger side end of the lower grill slot there is a small plastic panel that’s secured with two rivets. Drill or grind off the heads of the rivets and remove the plastic panel.

- Hoses are then routed as follows: The hose from the pump goes up along the back of the passenger side radiator end tank and connects to the lower fitting of the intercooler. The hose from the fitting that was installed in the washer reservoir's filler hose goes through the opening created by the removal of the panel in the grill, to the area in front of the air conditioning condenser. An additional length of hose is connected to the intercooler's top fitting, routed down the back side of the radiator end tank, through the opening created in the grill, and to the area in front of the radiator. Secure the hoses with wire ties, making sure they don't come into contact with any sharp corners or edges.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Hoses leading to and from intercooler

- Split two short pieces of hose and slip them over the metal lines on the floor in the area in front of the air conditioning condenser to protect the lines. Attach the two intercooler system hoses to the intercooler radiator, and mount it in position on top of the pieces of slit hose.

- Connect the intercooler pump's wiring to the car's headlight washer pump wiring. The brown wire from the pump connects to the brown wire from the car, and the green wire from the pump connects to the white/black wire from the car. Reconnect the wiring for the low washer

fluid warning sensor.

- Remove the relay for the headlight washer pump from the fuse panel. The relay is not reused. Connect the end of a jumper wire to the fuse panel connection that corresponds to the "P" terminal of the relay. Connect the other end of the jumper wire to a source of switched +12 volt power. Usable sources for this connection may vary by model year of the car, and how the particular car is equipped. Using a volt meter or test light, look for a suitable unused fuse or relay connection. **The connection used must only supply power with the ignition switched on.**

- Fill the windshield washer reservoir. Keep in mind that the same fluid will also still be used to wash the windshield. If you frequently use the windshield washer system, regularly check the fluid level. The system holds approximately three gallons. Three gallons has a significant thermal mass. Use it to your advantage. The more fluid in the system, the more effective the intercooler will be.

- Turn on the ignition and check to make sure that fluid is being pumped through the system. Check for any leaks. After turning off the ignition, check and top off the fluid level in the reservoir. The level may have dropped some due to air having been purged from the system when the pump was initially run. Reinstall the plastic wheel well liner pieces and wheel.

Boost and air/fuel ratio gauges have been included. The location and mounting of the gauges is a matter of personal preference, but a bracket to mount them in the ashtray has been provided. Installation instructions from the manufacturer are included with the gauges. The line supplying the signal to the boost gauge should be connected to a source of manifold vacuum. A good source to tap into for this signal is the vacuum line supplying vacuum/boost to the FMU and blow-off valve.

The installation is now complete. Start the car, listen for any unusual noises, and check for any leaks. Until you are familiar with the new power level of the car, use caution when driving, especially in curves, under less than ideal road conditions, or when near others. Premium gasoline should be used. Drive the car to bring it up to normal operating temperature. Under part throttle the air/fuel ratio gauge should bounce back and forth, roughly around the center of the gauge's range. The boost gauge should climb with RPMs under heavy or full throttle. The air/fuel ratio gauge should indicate a rich mixture under boost, with almost all of its lights illuminated at full throttle. **If the gauge does not indicate a sufficiently rich mixture under boost (green lights lit), immediately let off the throttle.**