



928 Motorsports Supercharger Installation

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1987/95 32v Porsche 928 Stage 1 (Non-Intercooled)





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Toll-Free Tech Hot Line:

877-FOR-928M

877-367-9286

Please do not copy this manual and give copies to your friends. Our ability to bring you this supercharger kit at this price relies on our customers coming to us for our knowledge and experience in supercharging these cars.

Much of this information is hard fought and the product of multiple trials and errors. Please do not give any section of this manual to your friends, but rather, encourage them to contact 928 Motorsports, LLC for their own kit. **THANK YOU!**

Thank you for your purchase. We have included an entire set of silicone vacuum hoses and a 928 Motorsports coffee cup at no charge for you.



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We recommend that you steam clean or power wash your motor before beginning the supercharger installation. It's more fun to work on a clean motor than a greasy one.

NOTE: "Left" and "Right" are used in this manual frequently. Left and Right are always as seen from the driver's seat, as you sit in the car.

Phase 1: Preparation of your Motor

No special preparation to your 928 motor is required for the installation of this kit. The Air Pump and the EGR system is left alone, removing it is not necessary. The catalytic converter is also not affected.

However, it is important that the engine be running correctly before the supercharger is installed. If your engine is already running poorly, diagnosis of any problem will be complicated further by the supercharger, so it is much easier to attend to any problems or perform any maintenance needed now.



Give your engine a good tune-up, check the age and condition of the ignition wires and the timing belt. Replace as necessary. Inspect all the vacuum lines—some of them will have boost now and if they are brittle, they will crack (if they aren't already). A free set of silicone vacuum lines has been included for this purpose. Finally, change the spark plugs to one heat range colder than stock. Call us for a spark plug recommendation if you like.

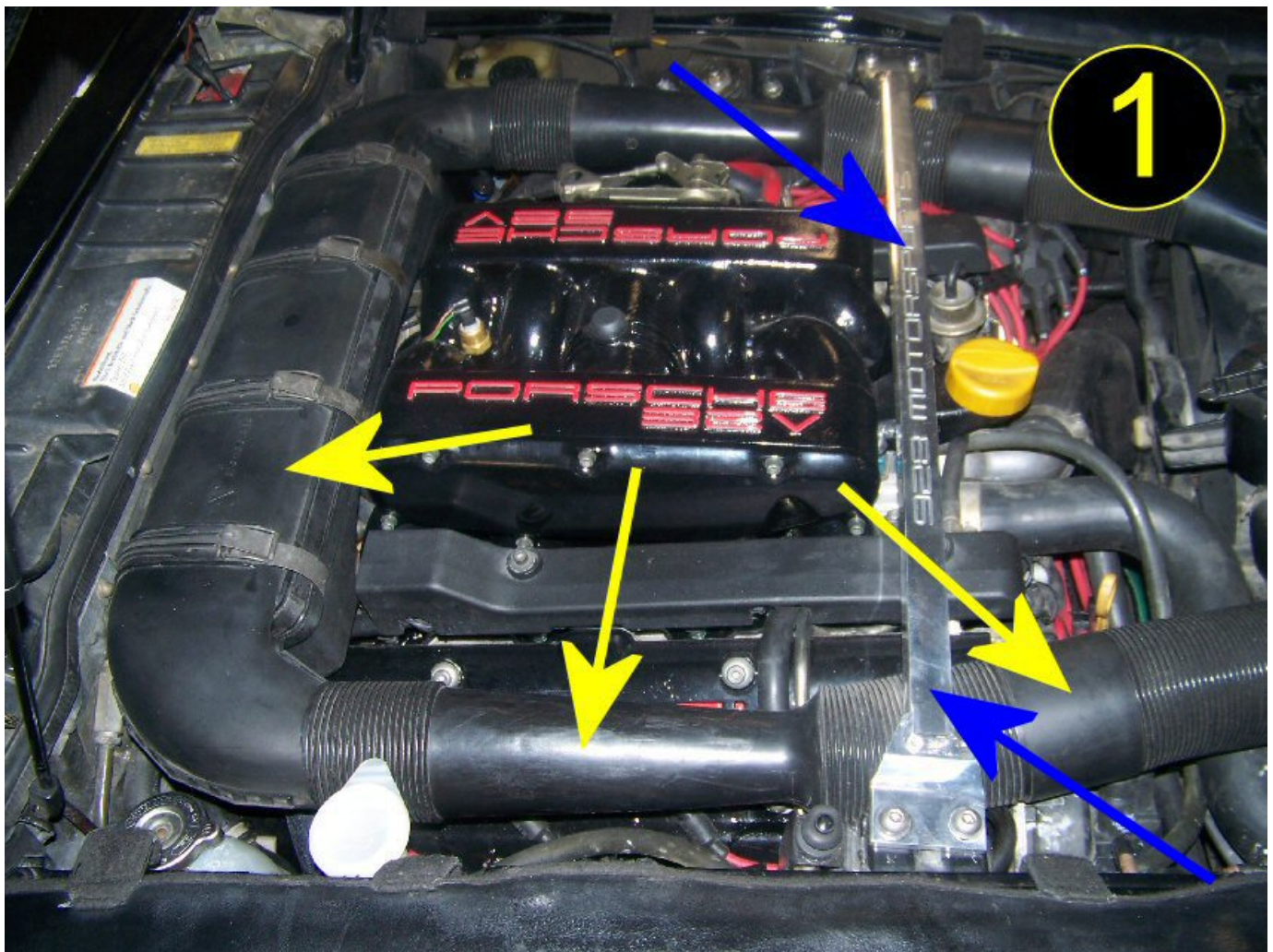


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Start by removing the plastic cold air intake tubing and the top of the air filter housing as shown by the yellow arrows in Picture 1. The tubes just pull off, and the top of the air filter housing is secured with rubber hook straps.

Also remove the strut brace as shown by the blue arrows.





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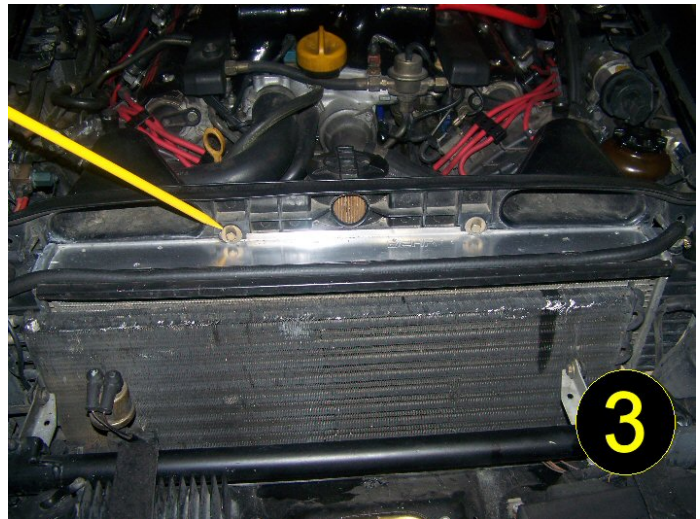
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Making some room to work:

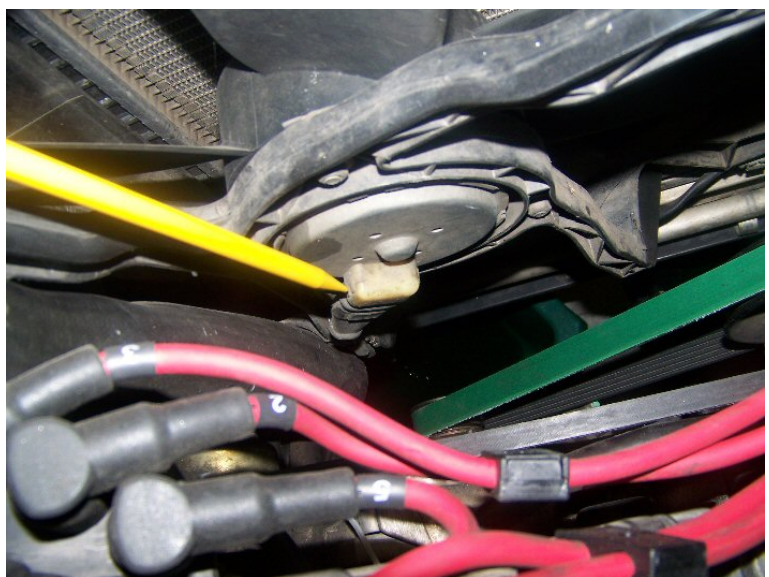
We begin our installation by removing a few things to allow us clear access to the motor.

Remove the two 10mm bolts that secure the upper fan shroud at the top as shown in Picture 3.

Remove the upper radiator hose completely at this time.



In the center of the fan shroud is a air filter housing for the EGR system. Loosen the clamp and remove the hose that is attached to it.



Disconnect the electrical plugs at each of the two fans, and loosen the wire looms from the fan shroud.

Locate the hose clamp around the power steering reservoir and remove the clamp. This allows the reservoir to be pushed out of the way when we lift out the shroud in a moment. The reservoir does not have to be drained.



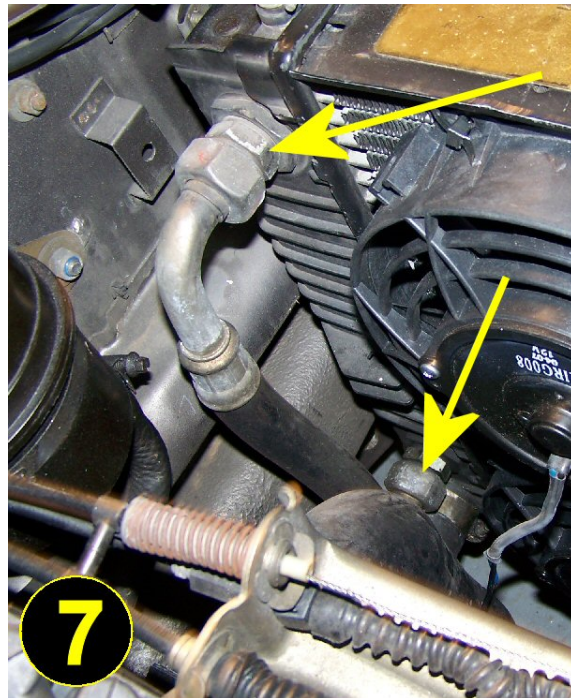
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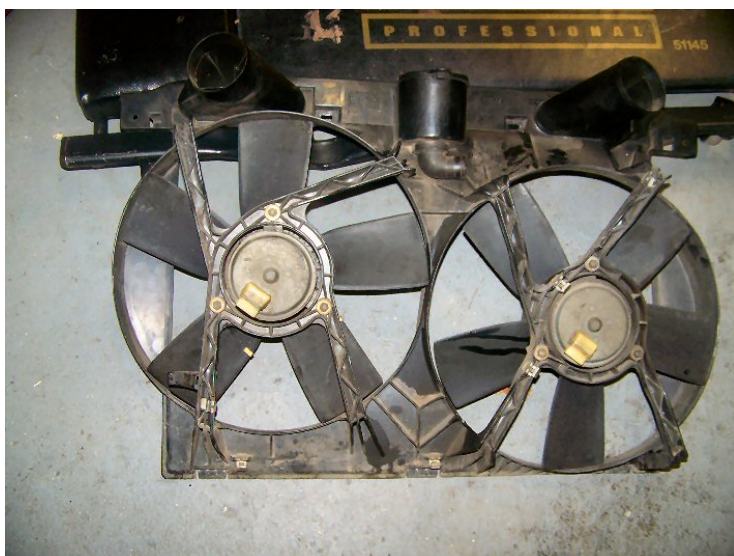
Using two wrenches in opposition, remove the oil cooler lines where they connect to the radiator end tanks as needed. The number of integral oil coolers in the radiator end tanks varies with the options on your car.

This picture on the right has no fan shroud. It is just for illustrative purposes. Your oil cooler fittings will be harder to see. .

You should be able to push the power steering reservoir toward the motor and wiggle and lift the fan shroud up and out of the car now. It is a tight fit! Sometimes this is easier with two people, one lifting on each end of the shroud.



When out of the car, it looks like this:

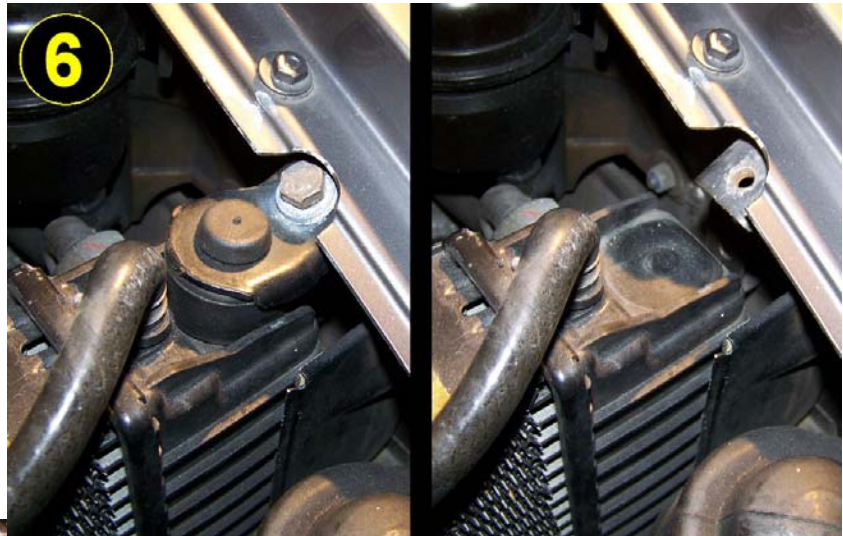




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Now remove the radiator hold-down clamps, one on each end of the top of the radiator as shown in Picture #6.



Loosen the clamp and remove the small vent hose from the top of the radiator end tank as shown here:

The hose you just unclamped lays in a metal tray that is hooked on to the top front of the radiator. Lift that up and swing it to the side and out of your way now.

Underneath the radiator, you will may see a blue plastic drain tap. We recommend that you not use it to drain your radiator, as they often break. Instead, position a drain bucket below the lower radiator hose, loosen the clamps on each end, and remove the hose from the car.





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Lean the radiator toward the engine at the top to allow access to the fan switch found at the bottom front left end tank. Disconnect the wire connector from this fan switch. It will not be going back on.



You should now be able to pull the radiator straight up and out of the car. This can be done with one person if you are careful, although it is easier with two.

Set the radiator aside for now. It's not a bad time to inspect the plastic end tanks for cracks if it is the original radiator.

Go back to the fan switch connector that you unplugged above. Install a blue Scotch-lock in that wire harness a few inches from the connector. This will jumper the two wires together, enabling the auxiliary fan to run whenever the ignition key is on.



Check for debris trapped between the radiator and the AC condenser core. Hook up a shop vacuum and clean that out! It doesn't hurt to vacuum out the fins of the radiator you just removed, either. You will not have this good of access to it for a long time.

This is good preventative maintenance to help your 928 run cooler.



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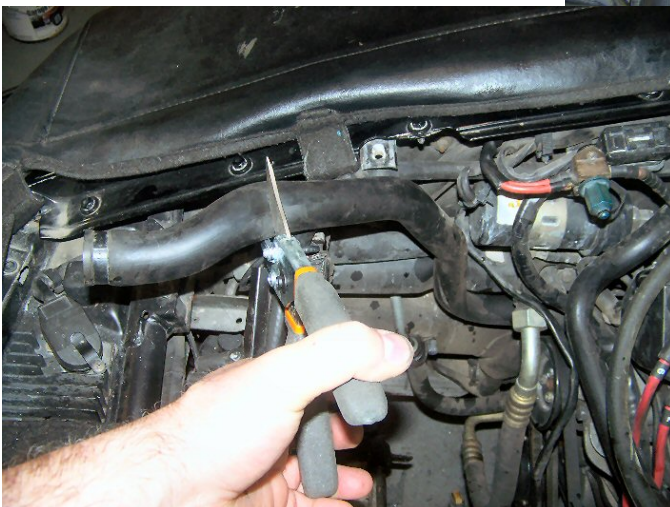
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Now lets find a new home for that EGR air inlet hose we removed a moment ago.

We are going to be turning it forward and tucking it alongside the air conditioning condenser core. When we are done, it will look like this:

This will allow the EGR system to continue to function and grab cool air from in front of the radiator.



Measure how much hose you need and trim off the excess. Then route the hose as shown.



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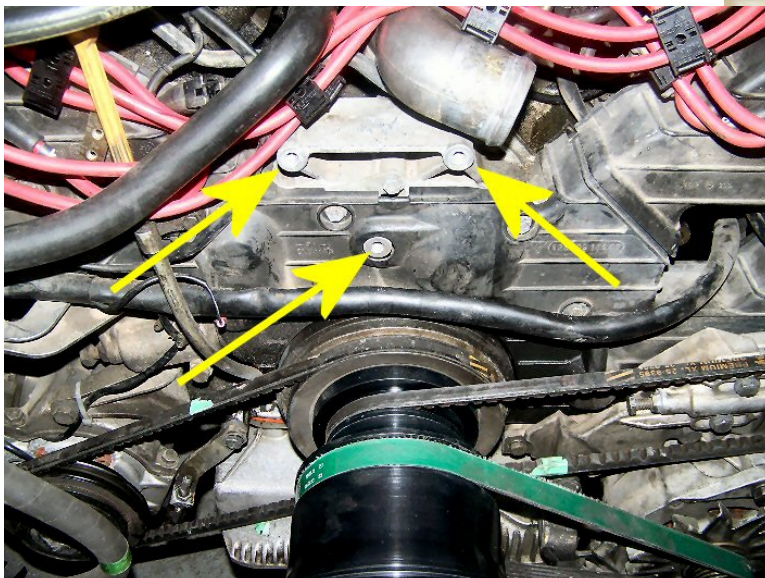
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Remove the Front Engine Lift Hook:

Remove the 2 nuts that secure the ignition wire loom to the front engine lift hook, and then remove the three 13mm bolts that hold the lift hook to the motor.



Remove the two ignition wire loom blocks as shown.



Because our supercharger mounting bolts are longer than the lift hook bolts you just removed, be sure to clean out the bolt holes.

Running a tap or rethreading tool into those 3 bolt holes isn't a bad idea, either. The thread is M8 x 1.25.



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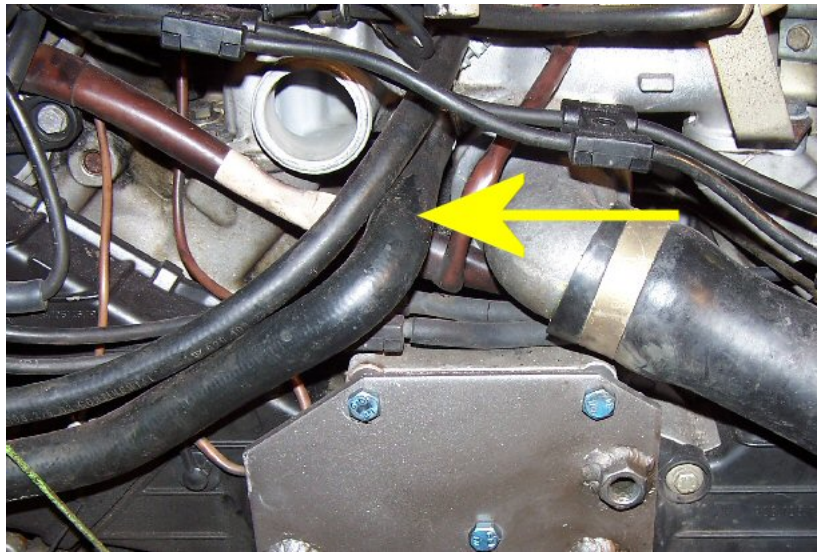
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Adjusting the Reservoir Water Line:

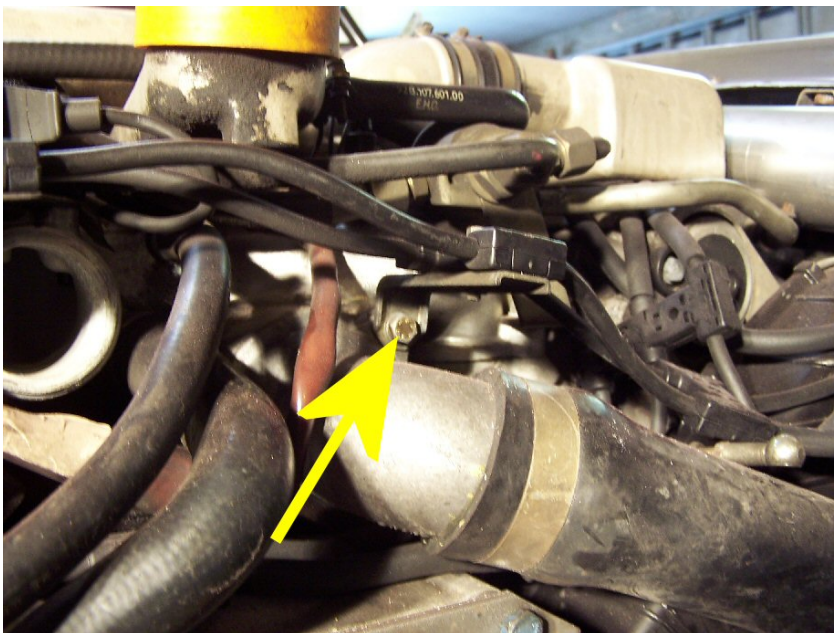
Just to the side of the spot where the upper radiator hose was connected to the engine, you will find a 1" diameter hose that travels past the right front head and down the right inner fender to the coolant reservoir.

Loosen the clamp at the motor for this hose, and pull the hose off.

Cut off about 2 inches of hose, and re-attach to the engine. Note: this hose is flared at the end, do not cut off all of the flare or you will not get it back on to the motor!



Making clearance for the Supercharger Intake:



Remove the bolt that holds this spark plug wiring harness holder to the engine, and remove the small 6mm nut that holds the spark plug wires to it from the top. This will not be going back on the engine



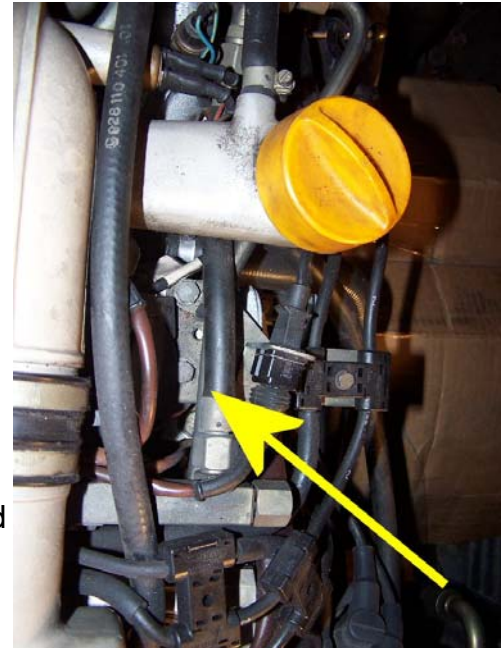
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There may be a diagnostic plug-in at the front of the motor that we know need to relocate. This yellow arrow shows where it is. This is common in 1988-1995 models, less so in 1987.

These next two pictures show what it looks like on the motor, and also what it looks like off the motor.

Remove the metal supporting bracket for the diagnostic plug, the cover for the plug, and the spark plug wire holder. The diagnostic plug can stay, just lay it down now about where it used to be. All the spark plug wires should be loose now as they cross the front of the engine. They can still be loomed together, but they should no longer be bolted down to fixed mounts.



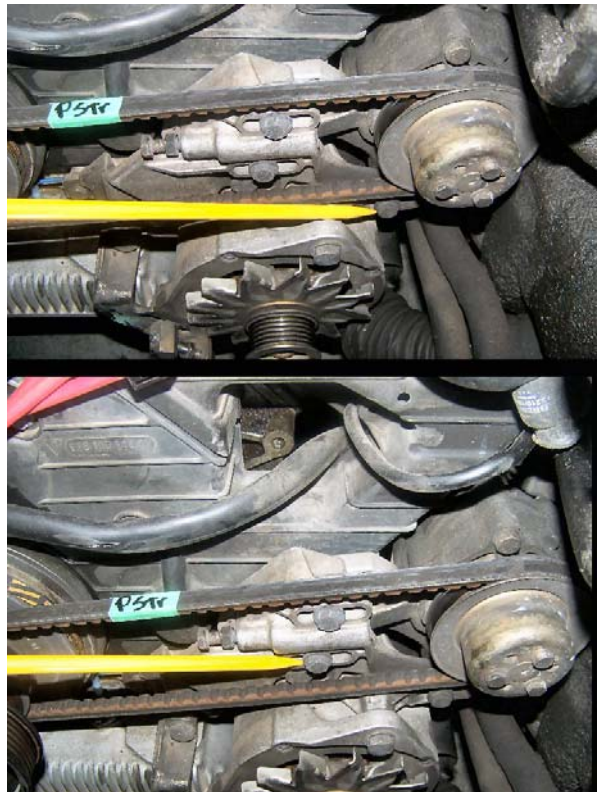
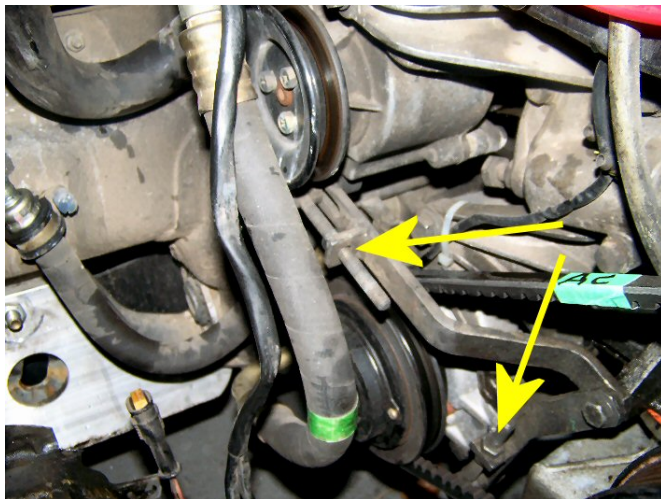


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Removal of the Crankshaft Pulley:

Start by labeling all the belts on the motor. Wrap them with masking tape and write onto the tape. This will make assembly go much faster later. Then remove all the belts by loosening the slider bolts and the pivot bolts as shown.



The next step is to remove the crankshaft pulleys. They are held in place by a single 27mm bolt in the center.



You will need a 27mm socket (or a 1 1/16" socket) and a big breaker bar or 3/4" drive ratchet. But, [read to the end of this section before trying to break torque on that crankshaft bolt.](#)

The engine must be "locked" so we can break torque on the crankshaft pulley bolt. Picture 18 shows a flywheel locking tool and the next page shows how to use it.

You will need to buy or borrow a flywheel lock tool to hold the crank shaft while you break torque on the crankshaft pulley bolt. The tool looks like the picture in photo 18. We also have this flywheel lock tool for sale and for rent if you need one. Just call.



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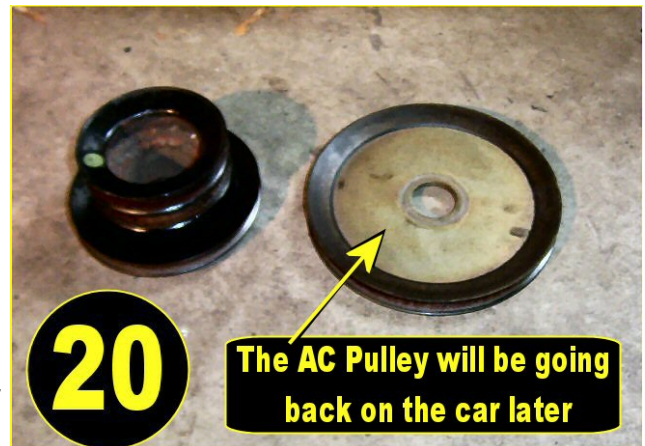
Manual Transmission Cars:

Remove the slave cylinder with a 13mm socket or wrench and just pull it out of the way and over to the side a little. You will have to pull out the clutch release rod temporarily, but you do not have to disconnect any hydraulic lines. Slide in the special tool to engage the ring gear and bolt it in place with the slave cylinder bolts you just removed. (Photo 19).



Automatics:

Remove the cover plate over the access hole on the bell housing and install the fly wheel lock in the same place as the manual trans cars. NOW you will be able to break torque on that crankshaft bolt, and remove the two pulleys – the power steering/alternator assembly and the Air Conditioner pulley. (Photo 20). **Pay attention to the special washer under the larger crankshaft center bolt as you need to put it back facing the same way again later.**



The Air Conditioner pulley will be going back on the car later.

At this point, your motor should look like this: (Photo 21).





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Phase 2: Installation of the Supercharger

Crankshaft Pulley Installation:

Stage 1 kits: Place the air conditioning pulley back on the crank shaft as shown in picture 35. It remains loose until sandwiched in place, so do not be concerned if it wobbles at this point. Now take the large aluminum 928 Motorsports pulley and push it on to the end of the crank shaft.



Stage 2 kits: The crankshaft pulleys for our Stage 2 kits are keyed into the harmonic balancer. Replace your AC pulley with the one provided from the kit that has two holes in it.

Place the modified AC pulley onto the pins in the crank pulley, and slide them both on to the front of the crankshaft at the same time. Send your old AC Pulley in to 928 Motorsports for a \$20 credit.





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Take the 27mm bolt and washer we removed in photo 17, replace the bolt with the LONGER one provided in your kit (as shown in photo 36). Be sure you re-use the original washer that you removed and face it in the same direction as before.



Put a little Loctite blue (supplied) on the threads of this bolt to get a true torque, and then tighten it to 218 ft/lbs.



Note, some crankshafts are threaded deeper than others. If the new bolt we supplied bottoms out in the hole before clamping the pulleys tight, just insert the hardened washer we have supplied beneath it.

Now, remove the locking tool from the flywheel if you installed one, and replace the clutch slave cylinder and push rod.



You can put the alternator, air conditioner, air pump, and power steering belts back on and tighten them.

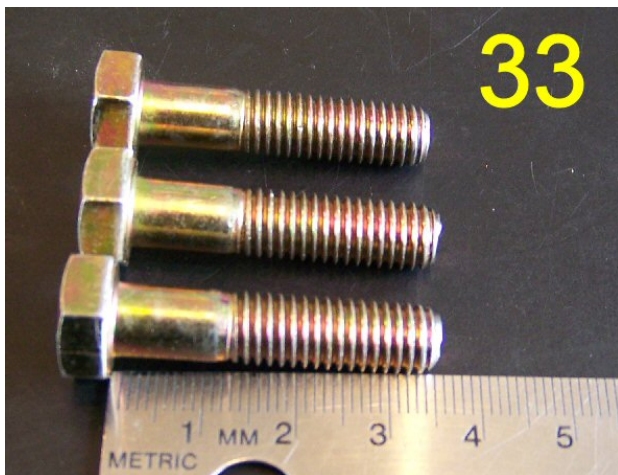


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Mounting Inner Supercharger Mount:

The Second step in the assembly is to mount the steel inner supercharger plate to the front of the engine. Hold the supercharger plate in your hand so that you have it oriented as shown in picture 32 below. From the kit select the three 35 mm long by 6 mm metric bolts. They can be seen in picture 33.



Add a drop of Loctite blue to the threads to keep them from backing out. You may want to clean up the threaded holes in your motor with a metric tap if you see signs of corrosion before proceeding.

Because of the precise drilling and machining in the 928 Motorsports mount, you will have to turn in each bolt several times and then move to the next bolt, turn it several times, move to the next bolt, turn it several times and so on, until the supercharger mounting plate is flush up against the motor before you can begin to torque them.



Washers are not necessary underneath the bolt heads as we used washered bolts that do not require separate washers. Torque to 25 ft. lbs.

When mounted to the motor, the plate will look like Photo 32



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Mounting the Outer Supercharger Mount and the Head Unit:

The Raptor supercharger head unit comes pre-mounted to the bracket as shown in picture 36. The mounting screws are already torqued by the people at 928 Motorsports for you.



Take the Z-shaped support bracket from your kit and bolt it to the inner mount with the short 8x15mm bolt as shown in picture 34.

Do not put the final torque on that bolt just yet.

Note how the loom for the engine wiring harness goes above the z-bracket.

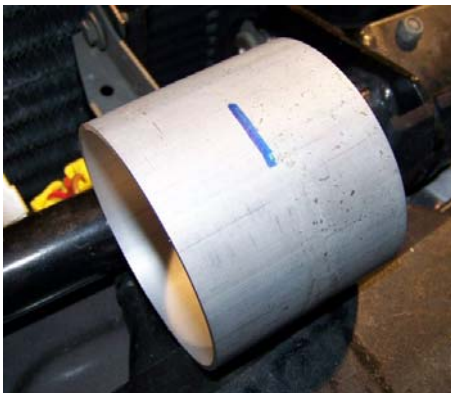
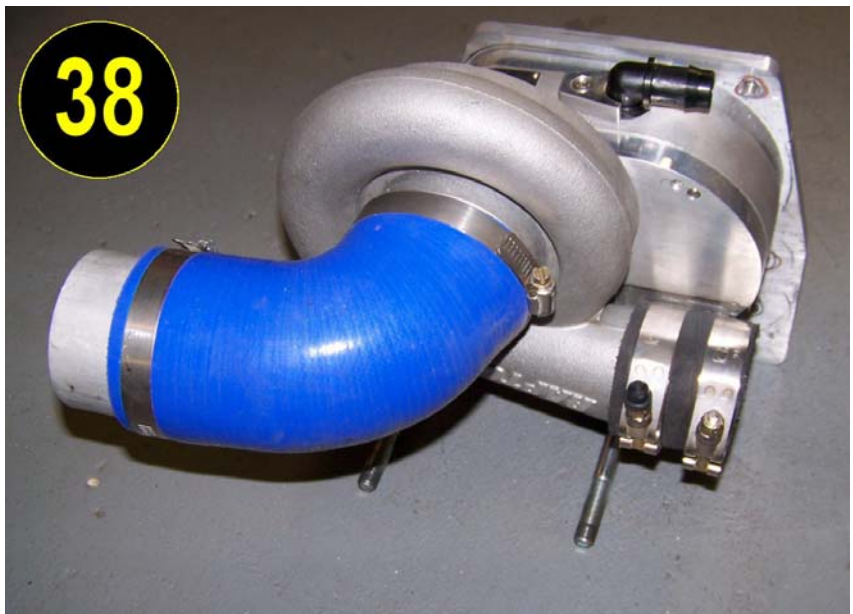


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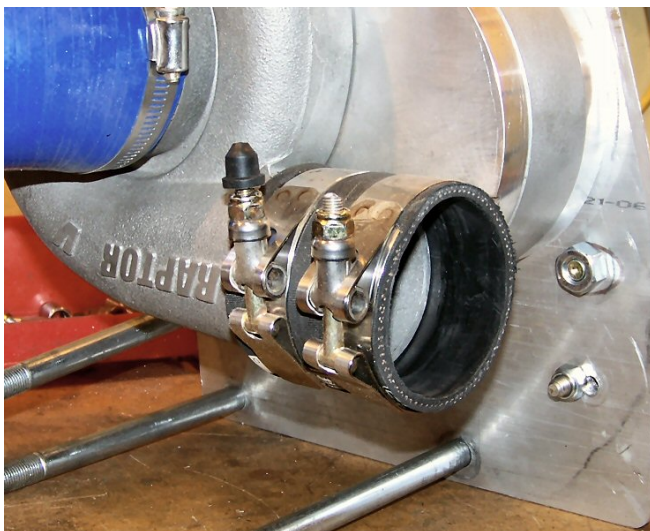
There are a few parts we can assemble now on the workbench much easier now than later when they are on the car.

Find the 3" 90-degree silicone elbow that has a very short leg (about 2.") in your kit and install it onto your Raptor intake now. A thin coat of Dawn dishwashing liquid will make this easier. Point is as shown in the picture 38, and clamp it in place with one of the #52 worm gear clamps.



Find the 3" aluminum hose sleeve and draw a line in the center of it with a marker. It goes

into the hose halfway—just up to the marker line, and is clamped with another #52 hose clamp.



Now find the three inch length of 2 1/2" black hose and secure it to the outlet of the supercharger with one of the small T-blot clamps as shown. A second t-bolt clamp is placed on the hose also, but not tightened.



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Locate the three long, heavy bolts supplied from your kit and the three stainless steel spacers.

Slide all the bolts through the mounting plate, and slide the spacers over the bolts now as shown.



You can also pre-mount the belt tensioner to the bracket now, but only install the top bolt at this time.

Tighten the top bolt just enough so that the belt tensioner will swing on it. We will want it to be able to pivot. Picture 46





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Now place a piece of cardboard over your crankshaft pulley to protect it while we install this assembly. You can do this next step alone, but it is easier with two people.



Put a drop of the Loctite blue on the threads of each of the 3 large mounting bolts.



Lower the assembly into place, and while your partner takes the weight off of it, you will be able to start the bolts into the mounting nuts easily.

Torque to 80 ft/lbs.



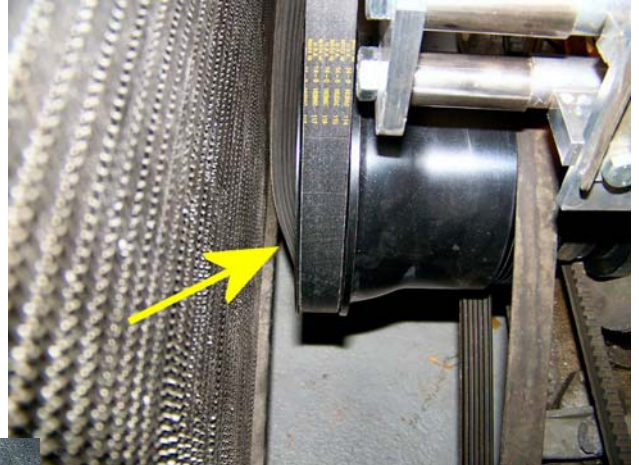
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Its time to put the belt on the supercharger now. Your 928 Motorsports supercharger kit has been designed to allow great flexibility in tuning, and includes fitments for several different pulley and belt combinations.

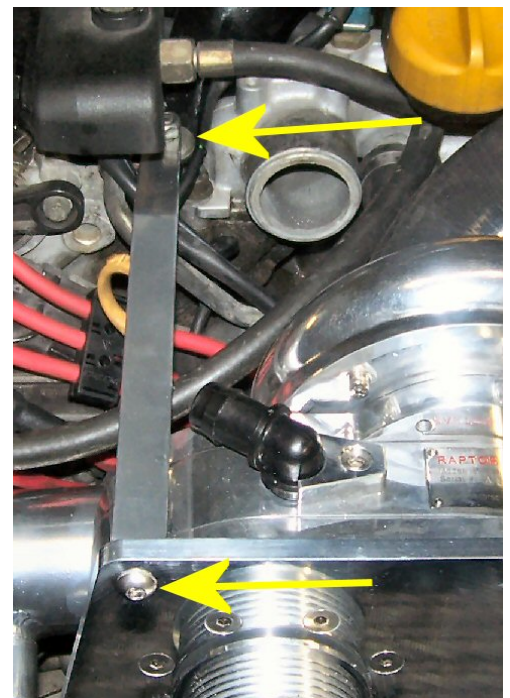
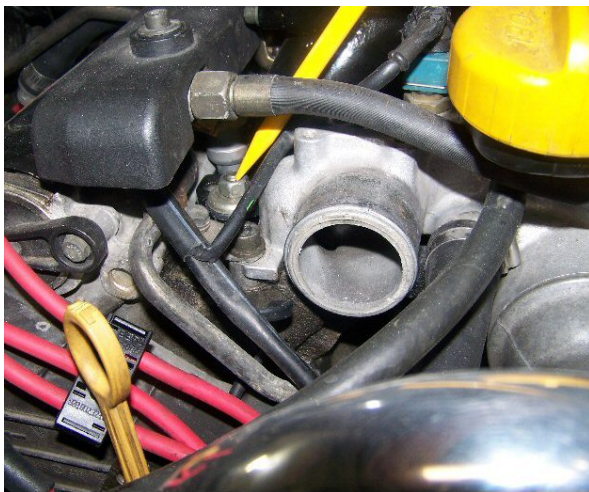
Put the supercharger belt supplied over the head unit pulley and around the crankshaft pulley. Depending on the pulley and belt you are using, the belt may be snug and not easily fit around the crankshaft.

Once the pulley is wrapped about 2/3rds the way around the crankshaft pulley, turning the start motor briefly will spin the belt on the rest of the way easily.



Now it is time to install the supercharger top strap. It looks like this in your kit:

Remove the first 13mm intake manifold bolt from cylinder number 1 and insert it through the top strap, and then re-install back into the motor. See next page for more pictures.





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The front of the top strap is held to the supercharger bracket by a 40mm long allen-head bolt supplied.

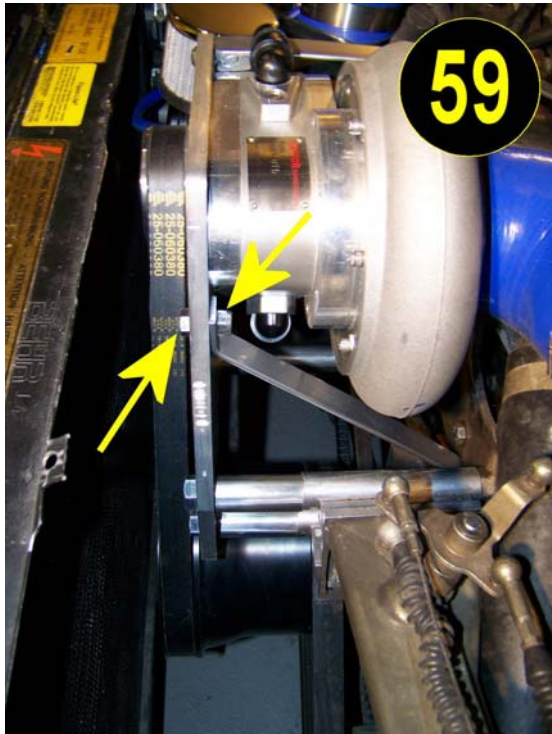


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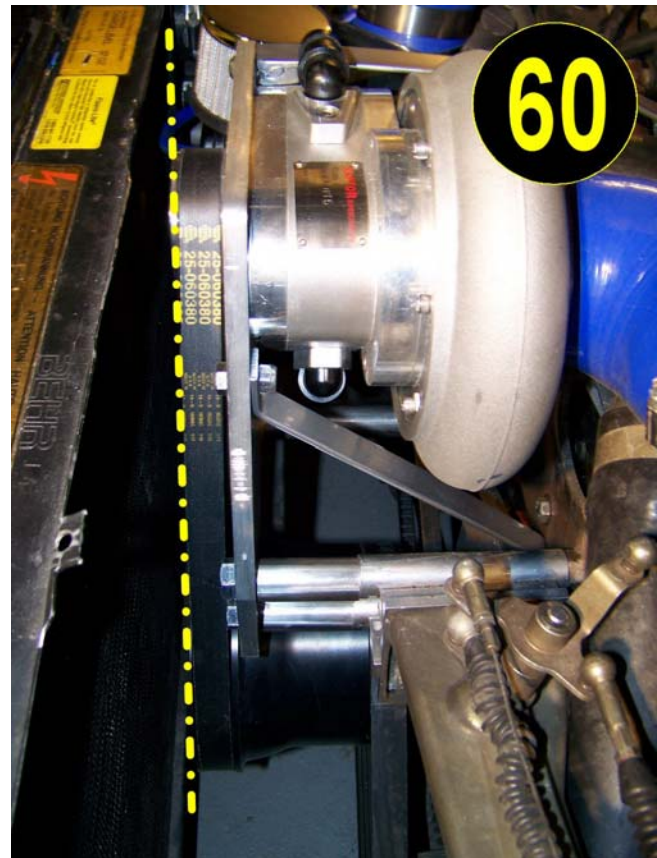
Finally, we need to put the bolt through the Z-strap and the front bracket as shown in Picture 59.

You can now tighten all the supercharger mounting bolts fully. Note we have not tensioned the belt as yet.

Now that we have mounted the supercharger head unit to the motor, we want to confirm that the pulleys are lined up as they should be.

Place a straight edge across the crankshaft pulley and see if it lines up with the front of the supercharger pulley. They should. This will provide long belt life and eliminate belt slippage for you. See photograph 60.

The supercharger can be moved in or out if needed by adjusting the stainless steel spacers.





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Installing and Adjusting the Belt Tensioner:

The belt tensioner should already be mounted to the supercharger bracket at this point, as we installed it before we lowered the supercharger assembly into the car.

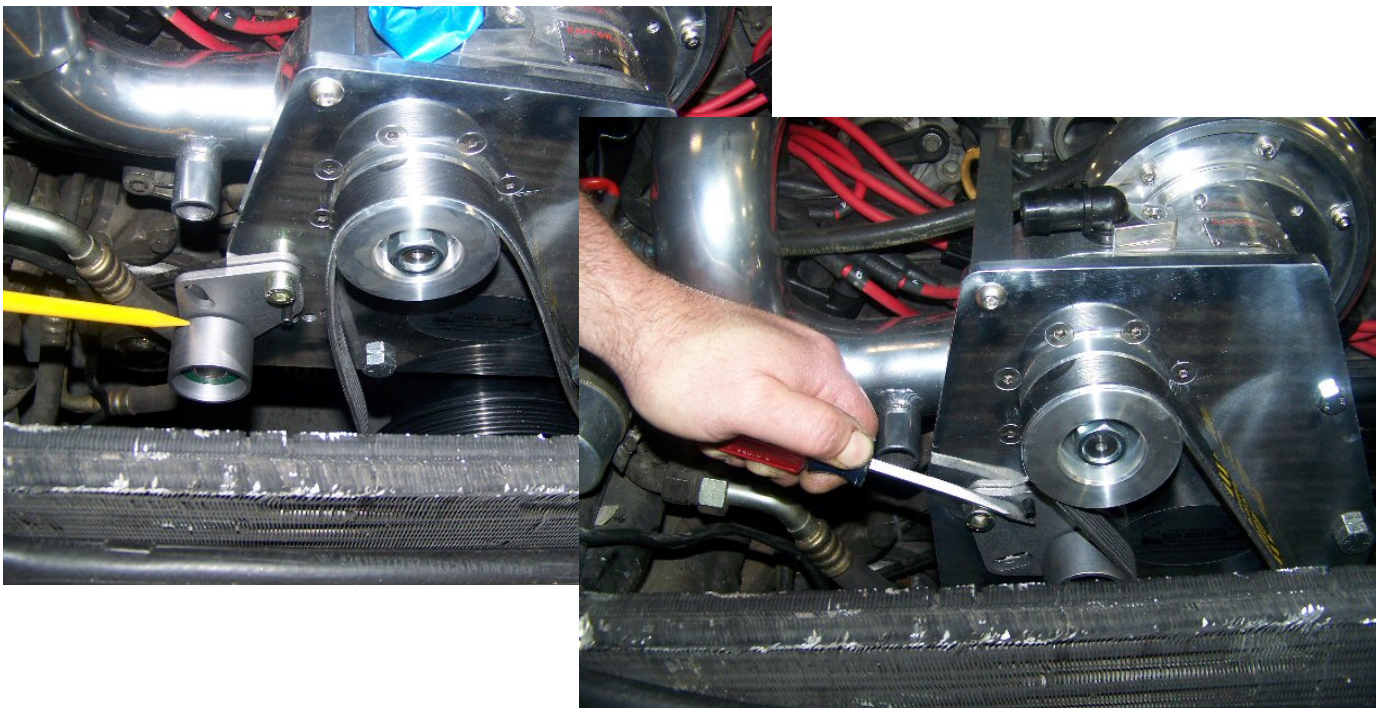
You have a choice of three holes to use for the adjustment bolt on your belt tensioner, provided so you can have a great range of adjustment for various belt and pulley combinations.



Swing the belt tensioner into the belt as far as you can with your hands and insert the adjustment bolt through the swing slot and into the hole that will provide the greatest belt tension.

Put the locknut on the backside, and take up the slack. The head of the top bolt is extra thick so you can pry against it to adjust your belt tension as shown below.

Insert a suitable pry bar over the bolt head and under the pin provided and pivot the tensioner to tighten the belt. Have a helper hold the pry bar in this position while you tighten the nut on the backside to hold it there.





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When the belt tension is correct, it should have only about 1/4 to 1/2" of lateral movement in the belt when you push on it with your finger mid-way between the supercharger pulley and the crankshaft pulley. Picture 70.

Be sure to return here and check the belt tension again after about 300 miles as the supercharger belt will have worn into the pulley grooves deeper, and will need to be re-tightened.



The front of your supercharger near the pulley should always be clean when you inspect it.

If you ever see black dust there, your supercharger belt is slipping and needs to be tightened.

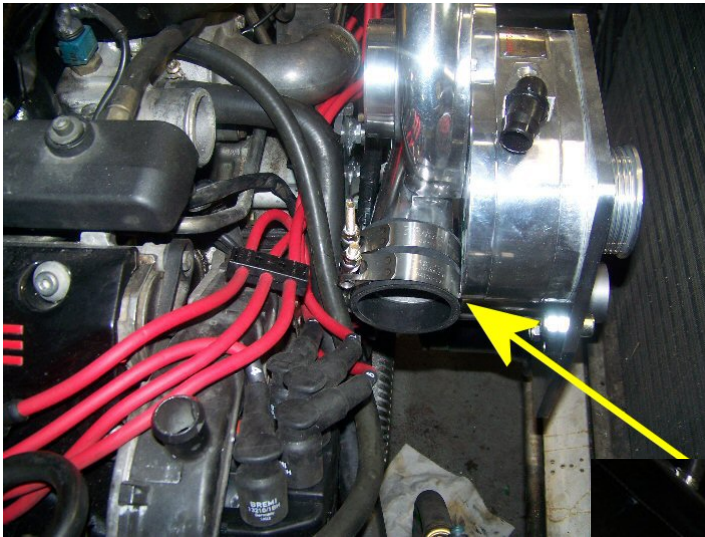


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Installing the Blow-Off Valve:

Check that the outlet of the supercharger is level and directly pointed at the right front fender. Rotate the outlet volute if needed.



On Page 19 we placed the 2.5" black hose onto the outlet nipple of the Raptor, and added the two smallest T-bolt clamps to it. Your install should now look like this.

Locate the custom supercharger outlet tube from your kit that looks like this:



...and the Blow Off Valve assembly





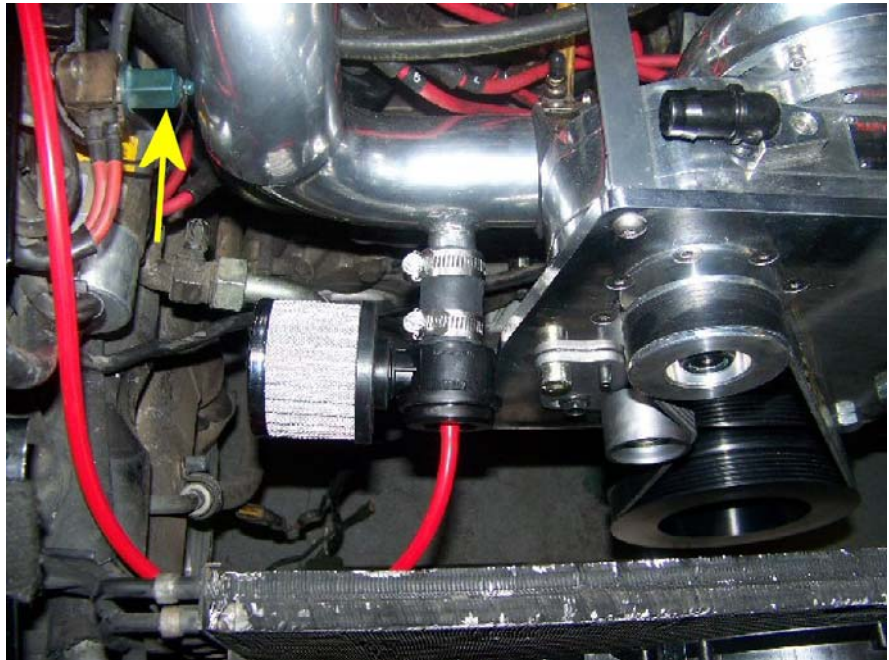
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Slip the outlet tube into the rubber sleeve on the end of the supercharger so it looks like this:

You may have to gently bend the forward battery post a little to one side to get clearance. Make sure the forward battery post has a cap on it as shown.

The blow off valve attaches to the supercharger outlet tube with a 3" long section of 1" hose and two #12 hose clamps as shown.



After the clamps are tight, they must be trimmed so they will not poke into the upper radiator hose we will be installing next. Leave about 3/8" above the nuts. You can use a bolt cutters or an air cutoff tool to cut them off. Plug all intakes that are open with rags first!



Then cover the tips of the bolts as shown with the rubber caps provided.





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Now it is time to re-install the radiator.

Some radiators are taller than others.

Because of this, we will be checking to see whether the hood will close correctly after we put our new air filter assembly on top, and before we permanently mount the radiator and fans. On some cars, we may have to move the radiator down about 1/2 inch to get the hood closed.

Slide the radiator back in and onto its rubber mounts in the same position it was before at this time.

We need to prepare the top of the radiator to receive our air filter assembly.

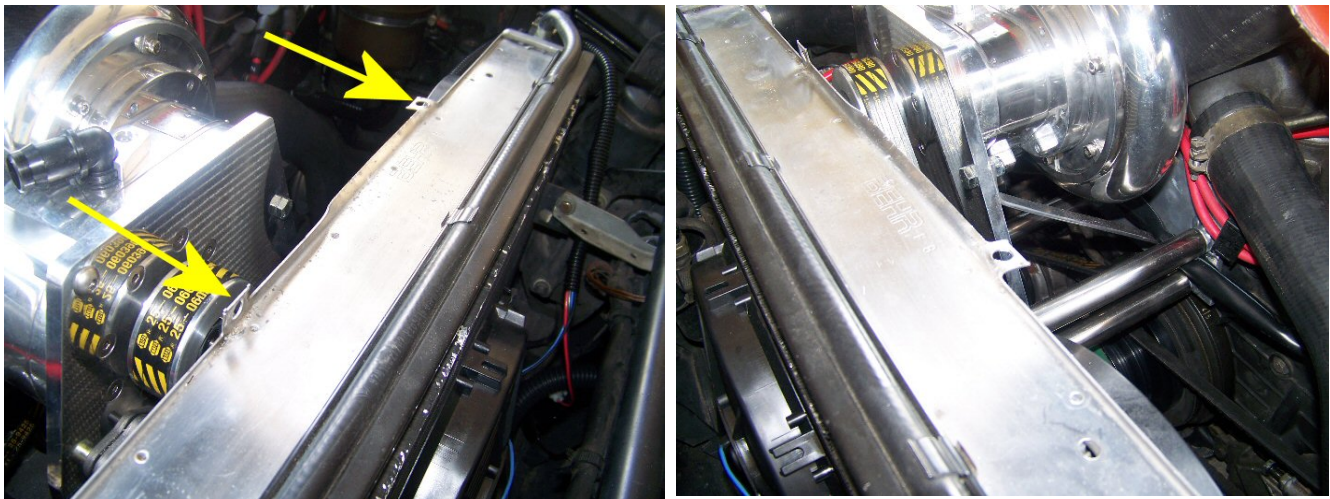




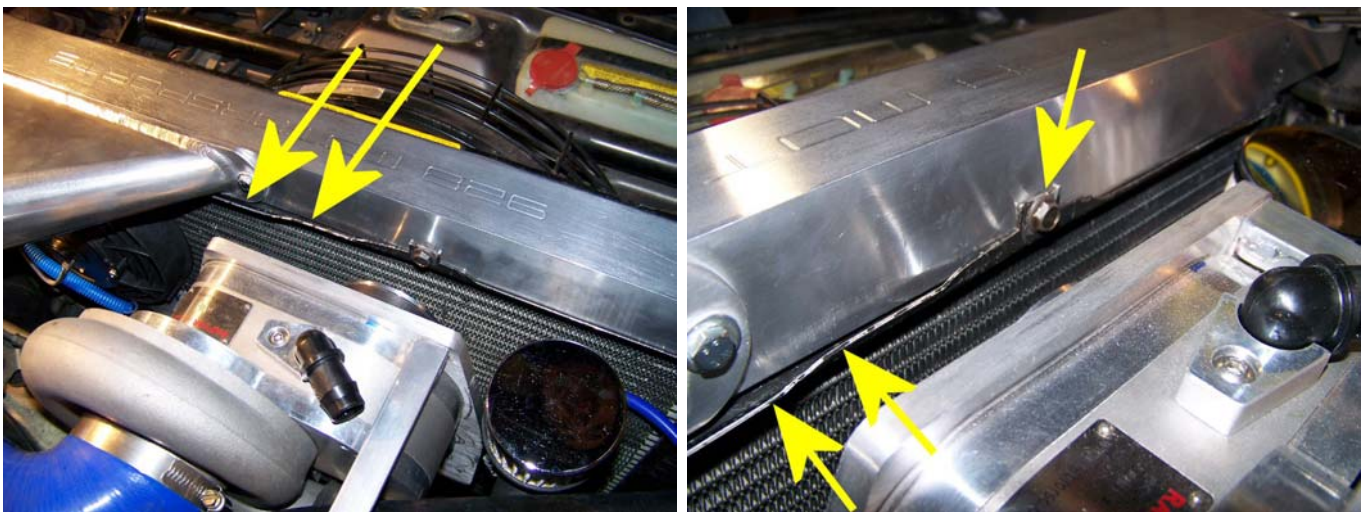
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On the top of your radiator, there are two tabs with holes in them that held the old air dam down. The tab on the right side, (nearest the supercharger) is fine just as-is. The tab on the left side must be folded down flat. Take a pliers and fold it flat as shown and test-fit the air filter assembly. The air filter assembly must fit down flat on top of the radiator. You will also need to bend some of the lip outward too in order to accomplish this. Also: if there are any clips at the front edge of the top of the radiator, remove them. These pictures will explain:



The air filter assembly is held in place by one bolt as shown.

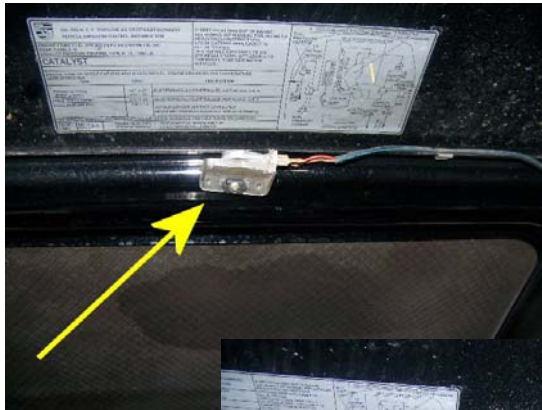




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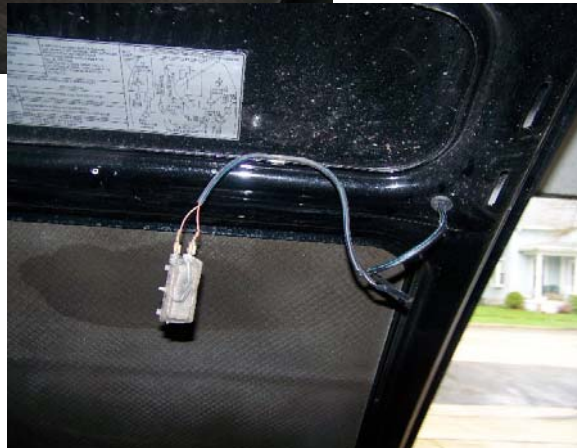
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We will come back in a few moment to connect the hoses, but do not do that now. We want to find out whether you can close your hood OK before we proceed any further.



If your 928 is equipped with a hood-mounted engine light in this location it will have to be removed.

Unscrew it from the hood, and open up the round wiring cover at the base of the hood near the hinge. Unplug the wires and pull them out.



Now try gently to close the hood again. It should close and latch normally.

If the hood closes normally, proceed to the next page.

If the hood hits the air filter assembly before it can close, continue here.



Because your radiator is apparently one of the late-model units that are taller than the earlier models, we need to drop the radiator down just a bit to make room for the air filter assembly.

Pull the radiator back out (the air filter assembly can stay attached) and remove the two lower radiator mounts that it sits on. They are held in place from the bottom with 13mm nuts. Use a hacksaw to remove 1/2" from the top of them (as shown here) and re-install them into your 928.



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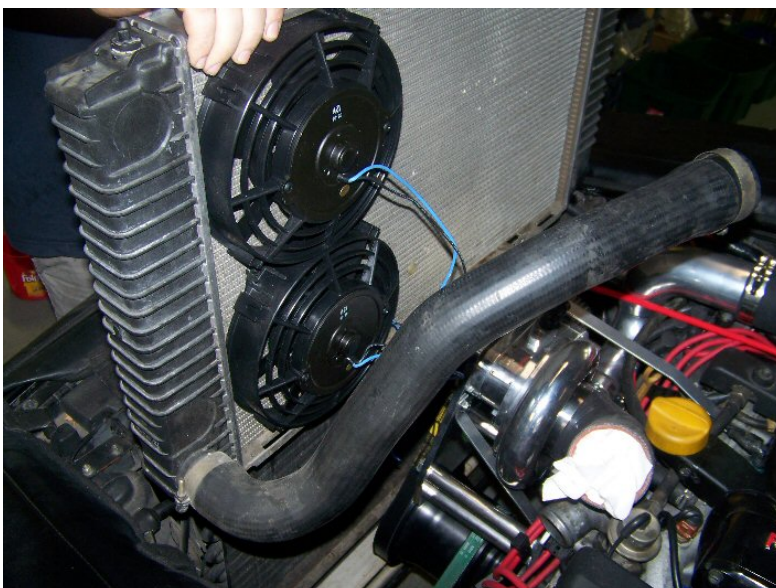
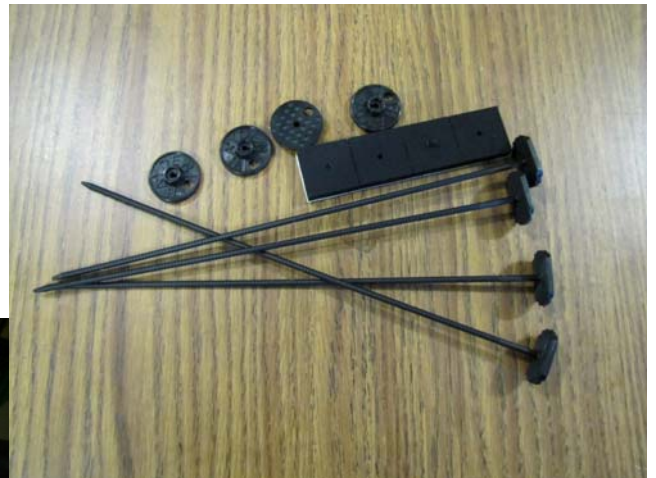
Test the hood closure again, and repeat if necessary. When the hood closes correctly, pull the radiator out one last time so we can install the electric fans on to it. (They are much easier to install with the radiator out of the car). **Take the air filter assembly off just for now.**

Take a look at the two 8" hi-volume electric fans included in your kit. They each have one flat side. They need to be mounted so the flat sides face each other to fit on the radiator correctly.

Starting with the bottom fan, mount it to the radiator core with the flat side up. The top fan gets mounted with the flat-side down.



Each fan gets attached to the radiator with 4 special fan mounts. The neoprene anti-vibration pads are used between the fan and the radiator core. Simply thread the fan mounts through the mounting holes of the fan, through the anti-vibration pads, then the radiator, and lock on the back with the push-on mount. Trim the extra length off as needed.



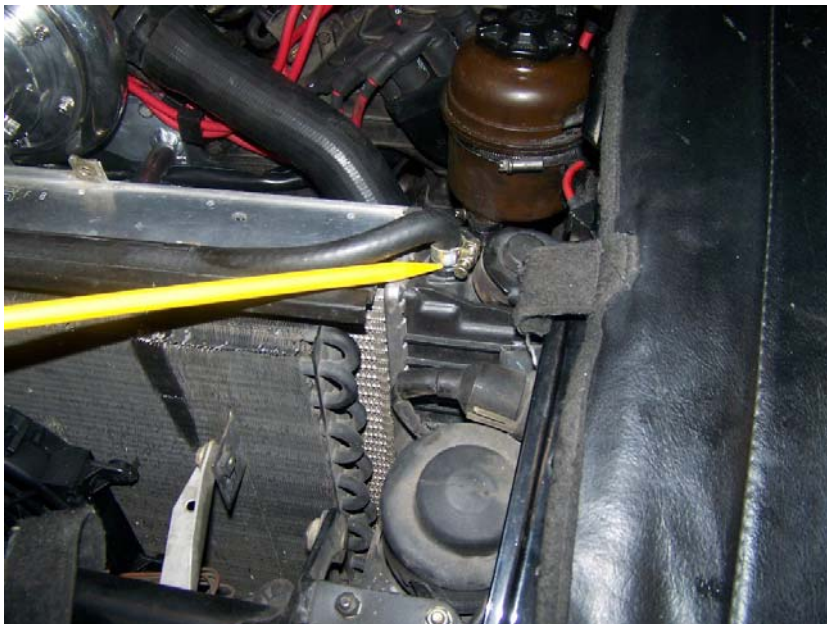


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When finished mounting the fans, slide the radiator into place.



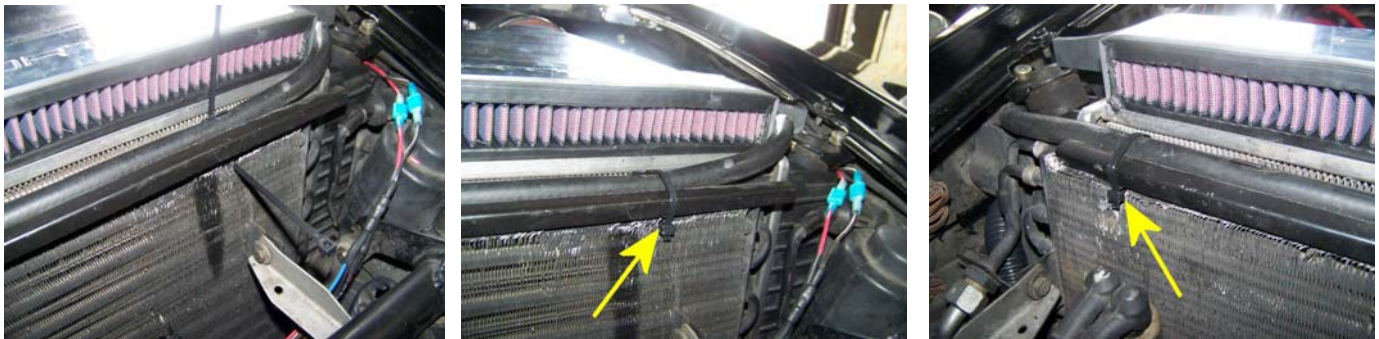
Bring the small radiator air bleed hose back over and attach it to the nipple on the left end tank now.



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The small air bleed hose you just attached sits within a metal carrier on some models. That carrier used to be attached to the front of the radiator. This time, we are going to move it forward and down only slightly and will use it to cover the top of the AC condenser core instead. Attach it to the top of the AC evaporator core with two cable ties as shown. Tip the radiator back at the top to make room behind the AC core and the installation easy.



If your 928 has no metal carrier for this vent hose, position the vent hose between the radiator and the air conditioning cooling core (where it was when we started).





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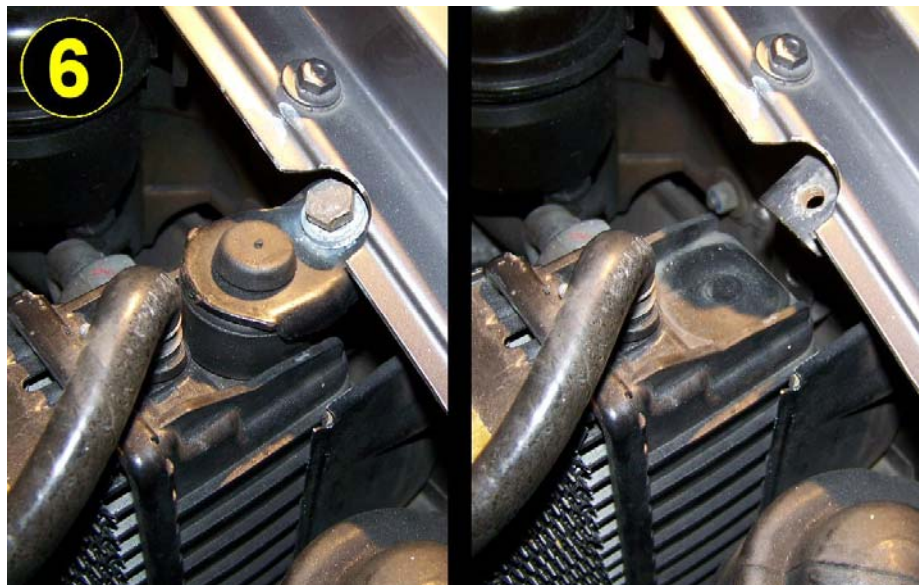
Attach the lower radiator hose to the motor now.

Re-attach any oil lines or transmission lines to the radiator at this time also.

Note that the original fan shroud is not going back on the car.

Now you can re-install the radiator hold-down clamps.

And you can re-install the air filter assembly now on top of the radiator.





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Mounting the Raptor Fan Assembly:

Your Raptor supercharger is the only air-cooled centrifugal supercharger in the world. Where many supercharger head units use hot engine oil to cool the bearings, the Raptor uses much colder air from in front of the radiator to cool the bearings. This increases bearing life, but more importantly, it lowers the temperature of the charged air significantly to add HP and engine safety to your installation.

Before we proceed, let's check that the grille and louver system is correct, and change it as needed.

1987 to 1990 with Moveable Grille Louvers: Porsche 928's from these years were equipped with movable grille louvers operated by an electric motor mechanism. This system was known to cause overheating when it failed and was discarded by the factory in 1991. As a service bulletin, all 928's that had moveable louvers were upgraded to the later version (1991—1995) with fixed louvers.

Your 928 may or may not have the upgrade in it. Here is what to look for: >>>>

If you see this electric motor on your 928, your car still has the removable louver system in place.



Take a moment now to remove that electric servo motor and unplug the wiring. Remove the mechanism, and affix the louvers in the wide-open position.

1991 to 1995 with Fixed Grille Louvers:

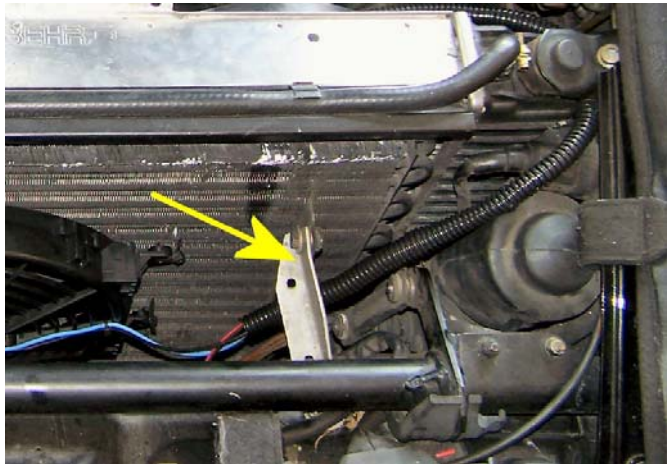
Looking through the front louvers on your fixed-louver 928 you will see a pair of vertical supports right behind the louvers themselves. We will be attaching the cooling fan blower for the Raptor to the one on the driver's side of the car.



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You may want to loosen the bracket shown in this picture and swing it to the side. That will give you more room to work on the louvers and to place the Raptor cooling fan in front of the radiators.



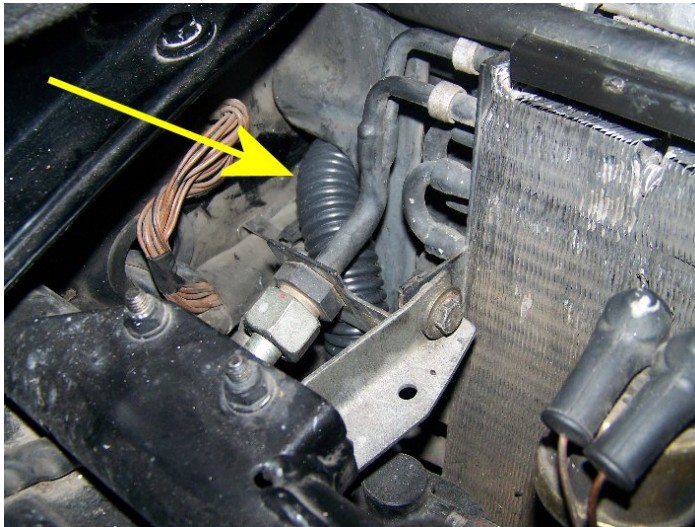
Before you mount the Raptor cooling unit, take the 1" convoluted tubing within your kit and push it into the hole in the side of the fan assembly. Also locate the wiring for this fan—it is red and black and bonded together. There are two of these wire sections in your kit. The one with the heavy wires are for the fans, the smaller one is used here on the Raptor fan. Attach the wires to the junction block on the side of the fan assembly now.

You can mount the Raptor cooling fan anywhere in front of the radiators. Simply secure it in place with the long cable ties provided.



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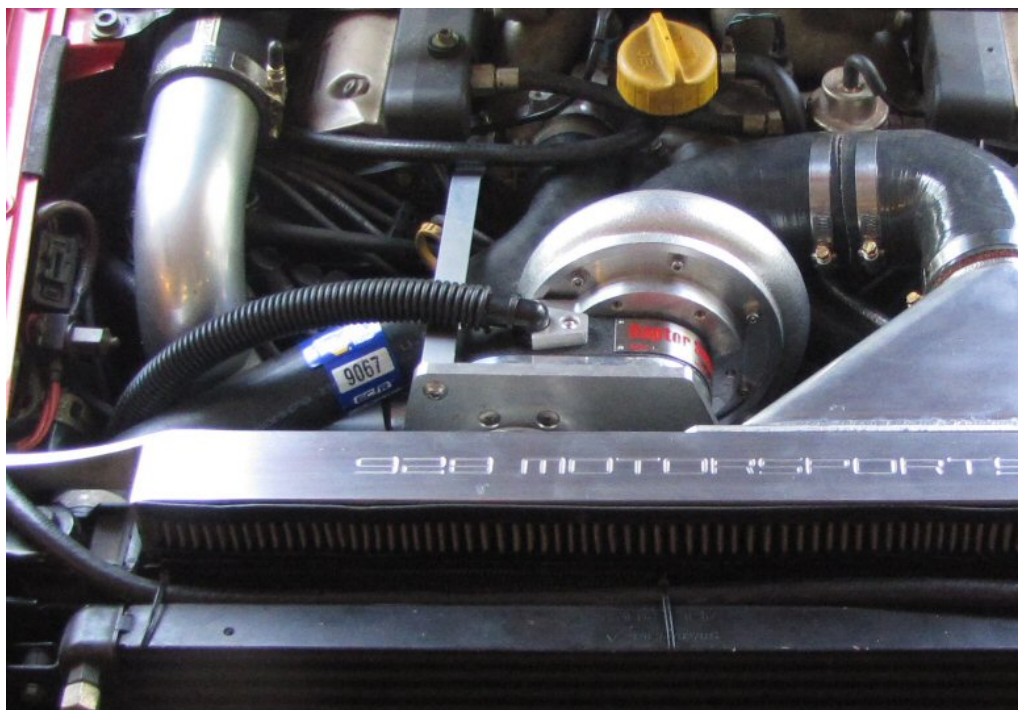


Route the tubing as shown across the front of the radiator, around the right side between the radiator and the inner fender, and to the Raptor.

Push the tubing over the black barbed nipple provided on the top of the Raptor. You will have to push hard! You will need to trim this tubing to length, we sent you more than you need.

Secure the flex tubing in several places along its run so it cannot get loose.

Later, when the fans are on and you want to “test” to make sure the supercharger is receiving cool air across the bearings, simply loosen the screw on top that holds the black nipple in place to check for air movement while the ignition is on. You should feel a gentle breeze coming out.





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Wiring the electric fans:

The car had one or two electric radiator fans when we started. You might remember you unplugged them in order to remove the fan and fan shroud. We will use that wiring harness to power our fans. Its already fused and ready-to-go.

Here is what we want to connect to that circuit:

- 1) The two new puller fans behind the radiator
- 2) The Raptor Cooling Fan
- 3) The Optional Aux Fan in front of the radiator (if so equipped)

In this picture, we have joined the two wires coming out of the Raptor blower to the wires coming out of the optional Auxiliary fan, and ran the combined wiring harness around the radiator at the side (there is a nice pass-through under the radiator hold down clamp) to the other side.



The wires continue on the back of the radiator to the fans, and down.

Switch to the larger twin electrical wire provided once the two fans behind the radiator are in the circuit. Use the blue butt-type electrical connectors supplied to join your wires two-into-one and down to the bottom of the car.

See next page for more.



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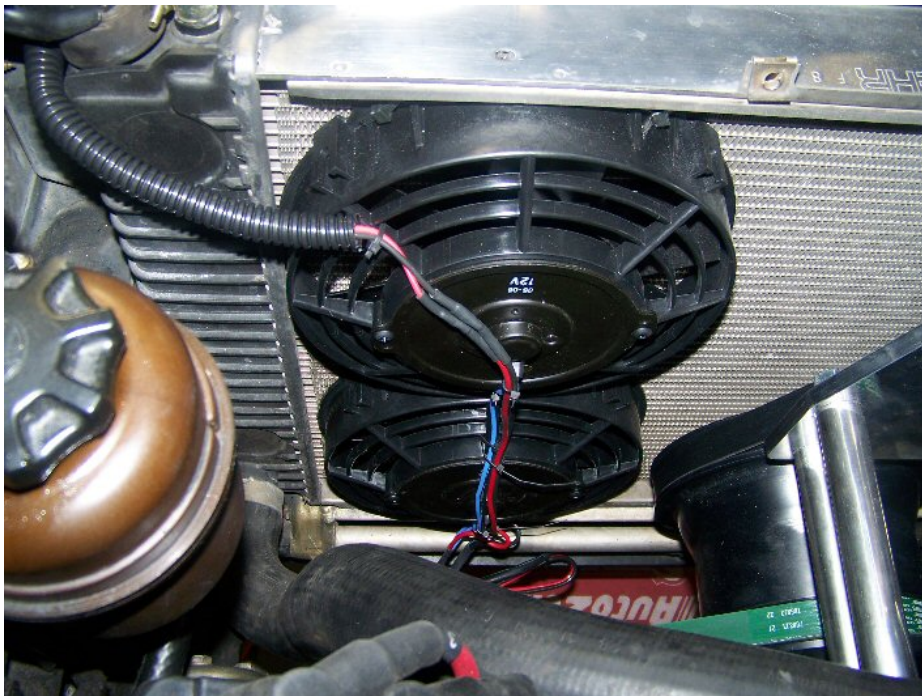
At this point, you should have only two large wires coming down from the fans to below the radiator, as you have spliced all the other connections to them upstream.

Attach them to the factory wiring harness for the fans that is waiting there. Use a test light to confirm which wire is hot when the ignition is on, and attach the red wire to it. The black and brown wires are grounds.

Test your connections now by turning the key on. When you turn the key to the “run” position all four electrical fans should operate, check each of them. If the test is not successful, check your connections.



If the test is successful, loom the wires together with cable ties again to prevent them from working loose or getting into a belt or mechanism and getting pinched. Finally, install the split hose loom we have provided to keep the connections dry and looking nice.



Also tie up the factory fan wiring harness with more cable ties so that it does not fall down or become entangled in the belts.



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You can now re-install your air filter assembly and the 90 degree silicone elbows that connects the air box to the supercharger inlet hose. Use the 3" aluminum coupler provided to attach the hoses to each other. Add your hose clamps, and you are done.



Note that we use worm gear hose clamps on the inlet side (because it is not pressurized) and we use t-bolt clamps after the supercharger because everything after the supercharger is pressurized.



AIR FILTER MAINTENANCE This air box assembly uses a permanent air filter media made for us by K&N. Do not throw it away. When service becomes necessary, remove the air box from the vehicle (one bolt holds it to the top of the radiator and remove one hose clamp). The air filter with carb spray and let dry. Re-oil the air filter with K&N air filter oil per K&N's instructions, do not over-oil.



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Now it is time to install the special upper radiator hose that has been supplied in your kit. New radiator hose clamps have been supplied for this.

Note that, when it is installed correctly, it clears all the obstacles on its way to the radiator inlet.



We are done at the front of the motor for now. Stuff a rag or a towel into the open supercharger outlet for the moment to prevent anything from falling into it.



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Removal of Air Filter Box:



Now it is time to remove the rest of the air box and set it aside. Lift out the air filter media if you have not already.

In the air box bottom you'll find two 13mm bolts in each corner of the air box as shown below. These have to be removed.

Wiggle and lift the air box bottom and it should come off.



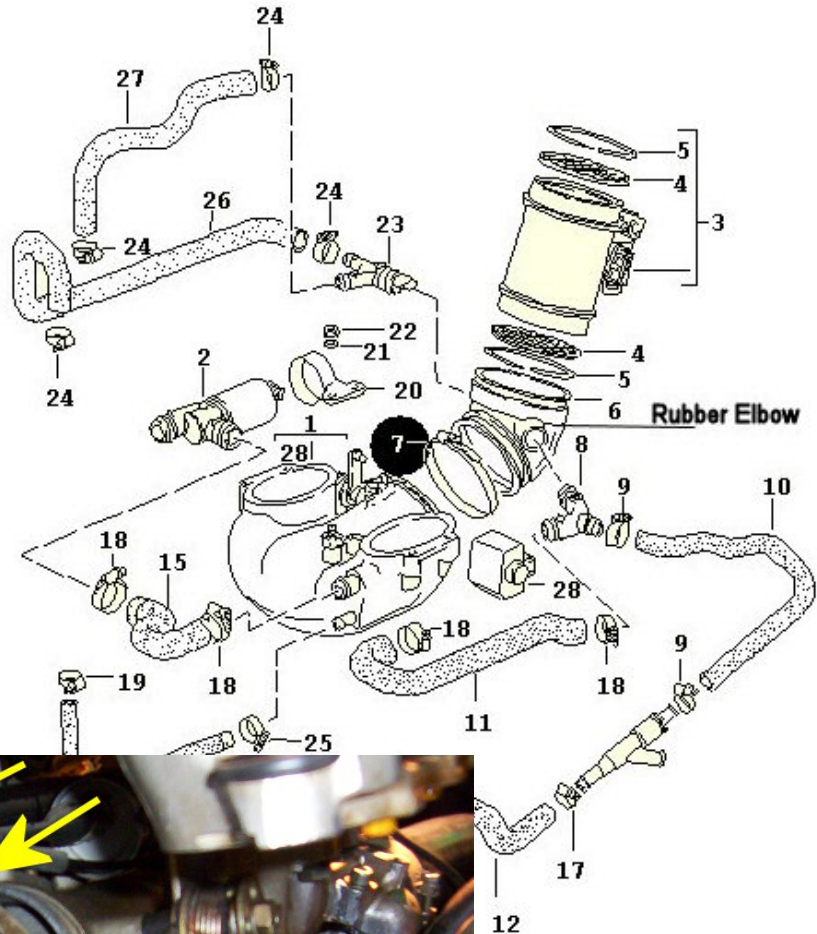
The back of the engine should now look like this:



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The Mass Air Flow (MAF) sensor is the assembly shown as item 3 in this schematic. It nests into a black rubber elbow as shown. The rubber elbow has a clamp on both ends of it.



Loosen the clamp at the base of the MAF sensor that holds it into the black rubber elbow. Then remove the MAF sensor by pulling up on it, wiggling it a bit from side-to-side as you do.



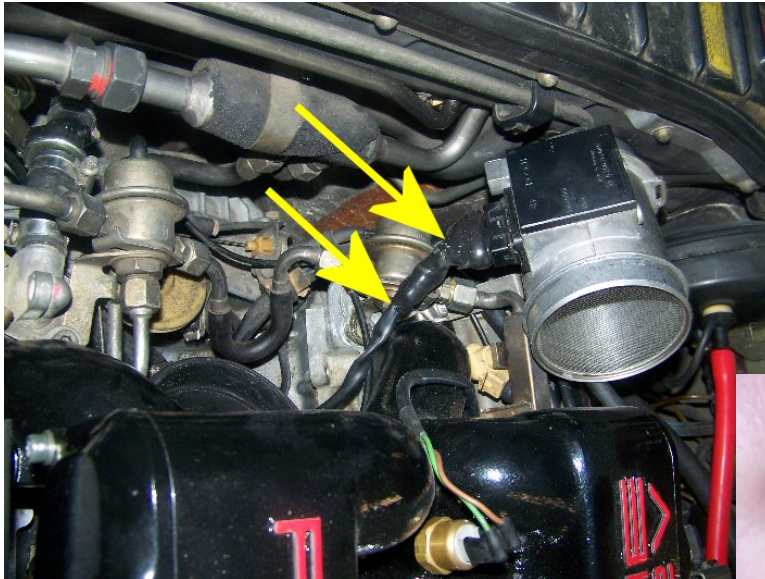
Disconnect the electrical connector that is attached to it, and set it to the side.

Pay attention to the arrow on the outside of it showing the direction of air flow through the MAF sensor.



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Inspect the condition of the wiring harness you just disconnected from the MAF sensor. If it is cracked or damaged, repair it now. We have self-fusing silicone tape just for this purpose if you need it.

A typical old wiring harness connector. This one is to the MAF sensor



The wires are good, but the outer loom is cracked and will allow moisture in.



Look down into the intake manifold where you just pulled out the MAF sensor. You may see a puddle of oil in the bottom of the air inlet as shown. This is normal, just soak it up with paper towels. It was caused by the crankcase ventilation (PCV) system. (More on that later)

You can clean up the engine valley and the area around the mass-air flow sensor now with rags and carb spray if you like. After your clean-up is over, stuff a clean rag into the intake opening while we move on to work on other things. This will help keep any debris from falling into the open intake.



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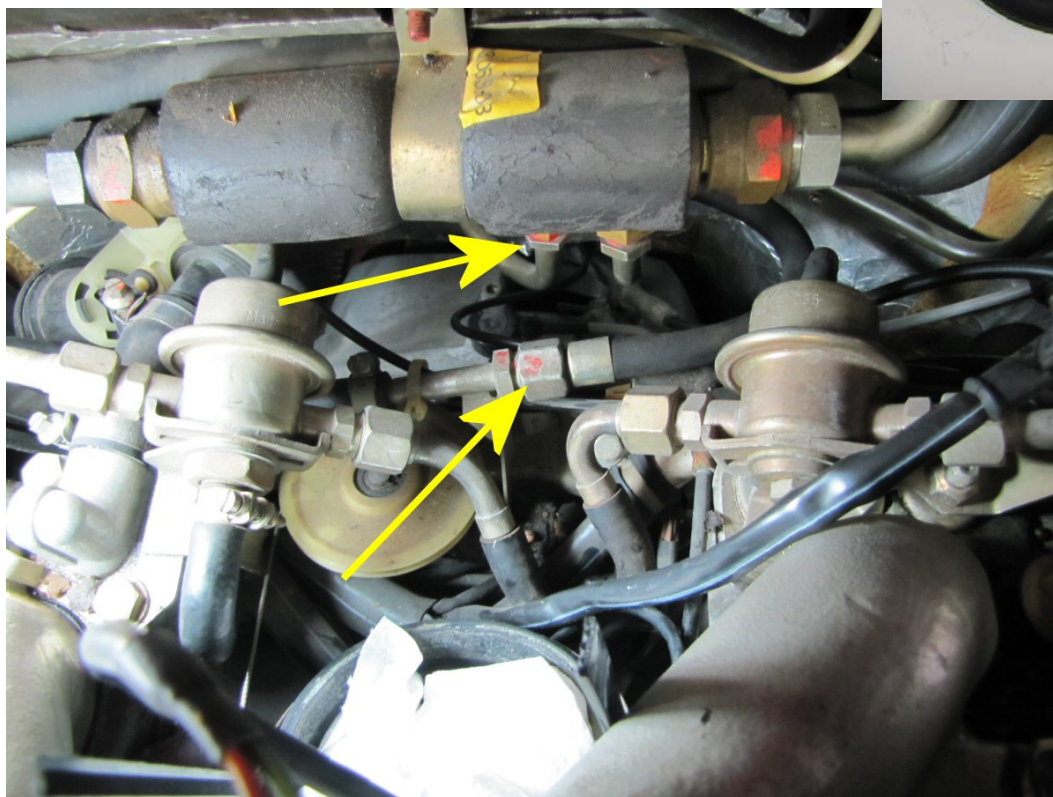
Installing the Fuel Management Unit (FMU) 1987 models:

The Fuel Management Unit (FMU) supplied with your kit is used to increase the fuel pressure to the injectors as the boost developed by the supercharger also increases. This provides a steady enrichment in fuel delivered to every combustion chamber just as those chambers are getting more air. This prevents damage to your motor and increases the horse power tremendously.

The FMU we supply is a "2nd Generation" model, and much more accurate and adjustable than early-style FMU's were.

To begin: we need to remove the existing fuel return line so we can plumb in our FMU. When working with fuel lines **ALWAYS USE TWO WRENCHES IN OPPOSITION** when tightening or loosening the fittings.

Remove the small fuel line that looks like this:>>>



By disconnecting it at the two connections shown here:



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Installing the Fuel Management Unit (FMU) 1988-1995 models:

The Fuel Management Unit (FMU) supplied with your kit is used to increase the fuel pressure to the injectors as the boost developed by the supercharger also increases. This provides a steady enrichment in fuel delivered to every combustion chamber just as those chambers are getting more air. This prevents damage to your motor and increases the horse power tremendously.

The FMU we supply is a "2nd Generation" model, and much more accurate and adjustable than early-style FMU's were.

To begin: we need to remove the existing fuel return line so we can plumb in our FMU. When working with fuel lines **ALWAYS USE TWO WRENCHES IN OPPOSITION** when tightening or loosening the fittings.

Remove the small fuel line that looks like this:>>>

By disconnecting it at the two connections shown here:





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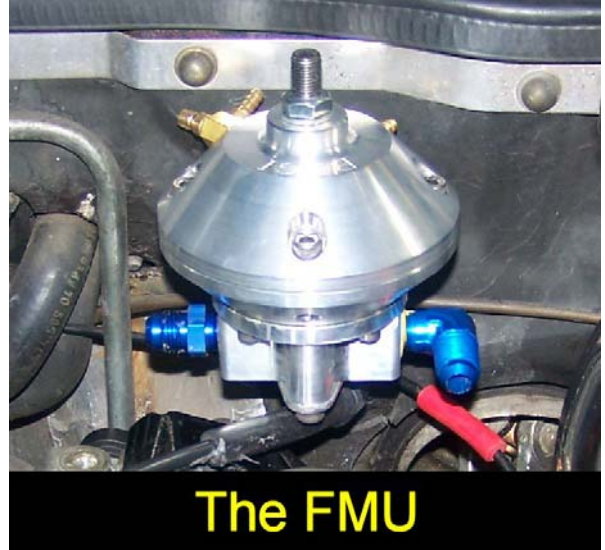
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Just for your information, that horizontal tube at the back of the firewall with the black insulation around it is actually a fuel cooler where Porsche uses the air conditioning system to chill the gasoline before it returns to the gas tank.

Using the photos below as a guide, install the new braided stainless steel lines from your kit and route them the same way we have in these pictures.

Make all connections just finger-tight at this time.

IMPORTANT: the line from the motor goes to **IN** (stamped on the inlet of the FMU), the line exiting the FMU goes to the fuel cooler on the firewall.



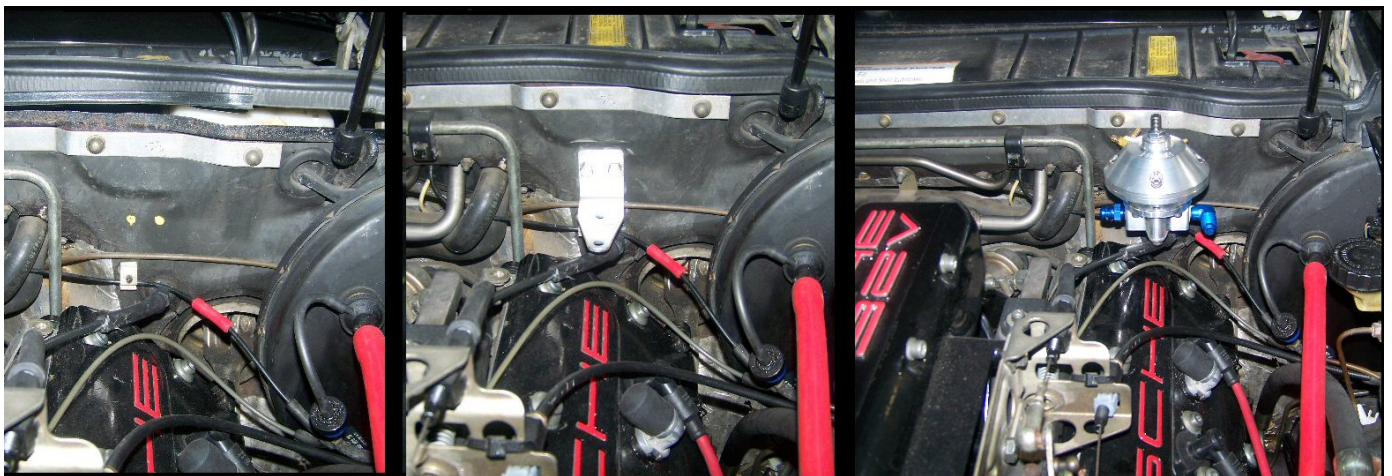


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Read Next Page Also Before Proceeding



Once the fuel lines are attached, hold the FMU up to the firewall and mark the mounting holes for drilling. Make sure you locate the FMU low enough to allow the hood to close. Remove the mounting bracket from the bottom of the FMU to use as a drilling template.



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If you have a cover over the top of your cowl (it covers the windshield wiper motor and the area between the firewall and the base of the windshield), remove it now.

Check to make sure that where you have marked to drill, that you are not going to hit an air conditioning line or a wire harness on the back side of the firewall.

The FMU is mounted with two M6 x 15mm long bolts and nuts.

The firewall may appear soft, but that is just a sound deadening cover, there is metal underneath.



This photo shows the FMU mounted with all the fuel lines in place.



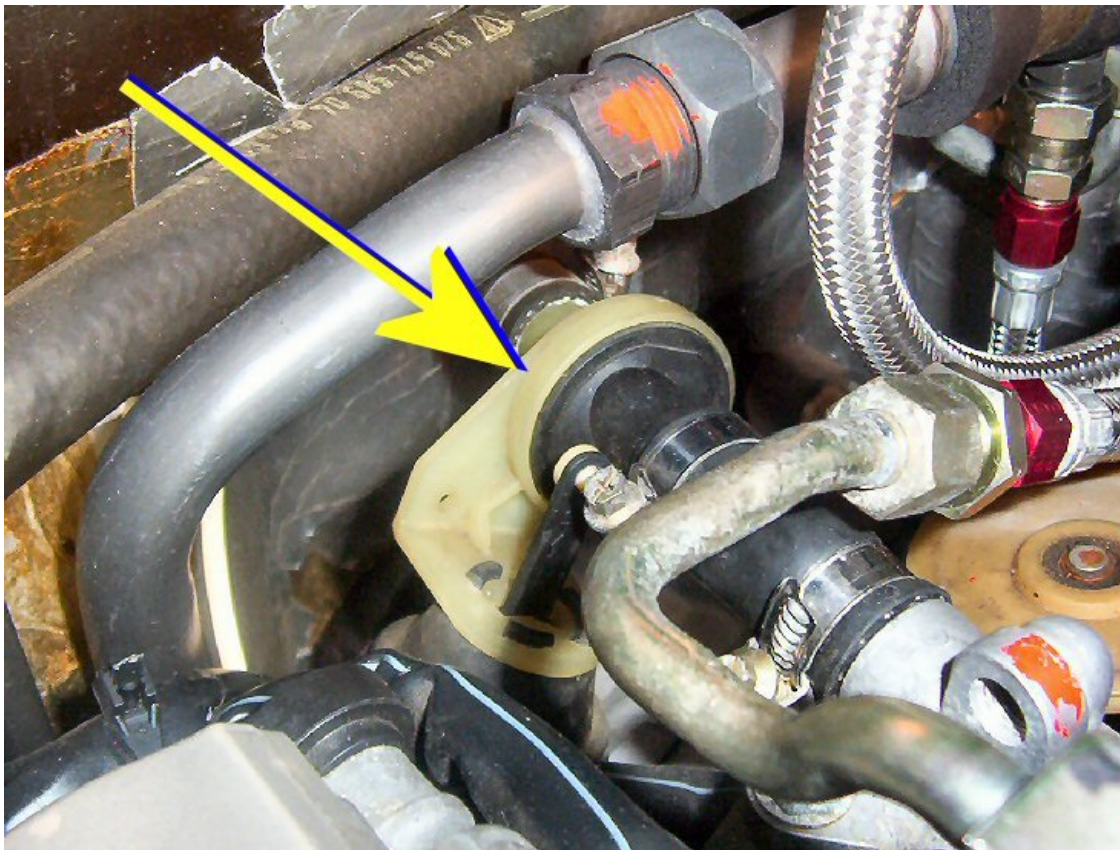
Now go back and tighten each fuel fitting with two wrenches in opposition.



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This is also an excellent time to replace the plastic heater valve if you have one. We have had customers who, after supercharging, have accelerated so quickly that the surge from the water pump split the plastic open and they dropped all of their coolant! A replacement steel heater valve is available at 928 Motorsports if you would like to replace it now.





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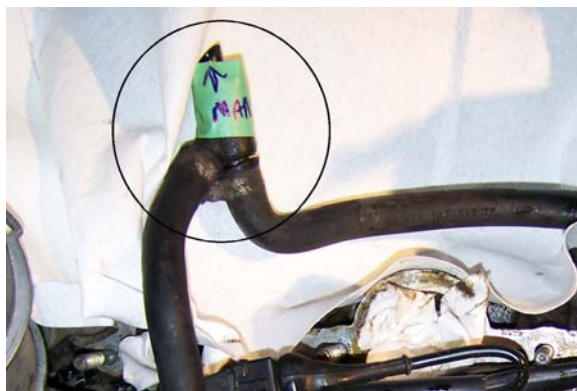
Modifying the Crankcase Ventilation System:

All engines have a way to ventilate the blow-by gases that get past the piston rings and into the bottom of the engine. Commonly, these "PCV" systems (for Positive Crankcase Ventilation) are plumbed back up into the intake manifold so the vacuum located there can suck the crankcase vapors out.

Problem is: after we install the supercharger, the intake manifold will be pressurized, and no longer have a vacuum. If we leave the PCV hoses connected as they are now, we will blow boost into the oil pan and pressurize the entire motor. In that circumstance, performance would be poor and a number of oil seals and gaskets would get blown out.

The correction for this is not complicated. In this kit, we have supplied you with the fittings and the hoses and now the know-how to ventilate your engine correctly after supercharging.

Start by removing the hose tee from the right side of the rubber intake elbow and plugging it with the custom aluminum plug provided as shown.

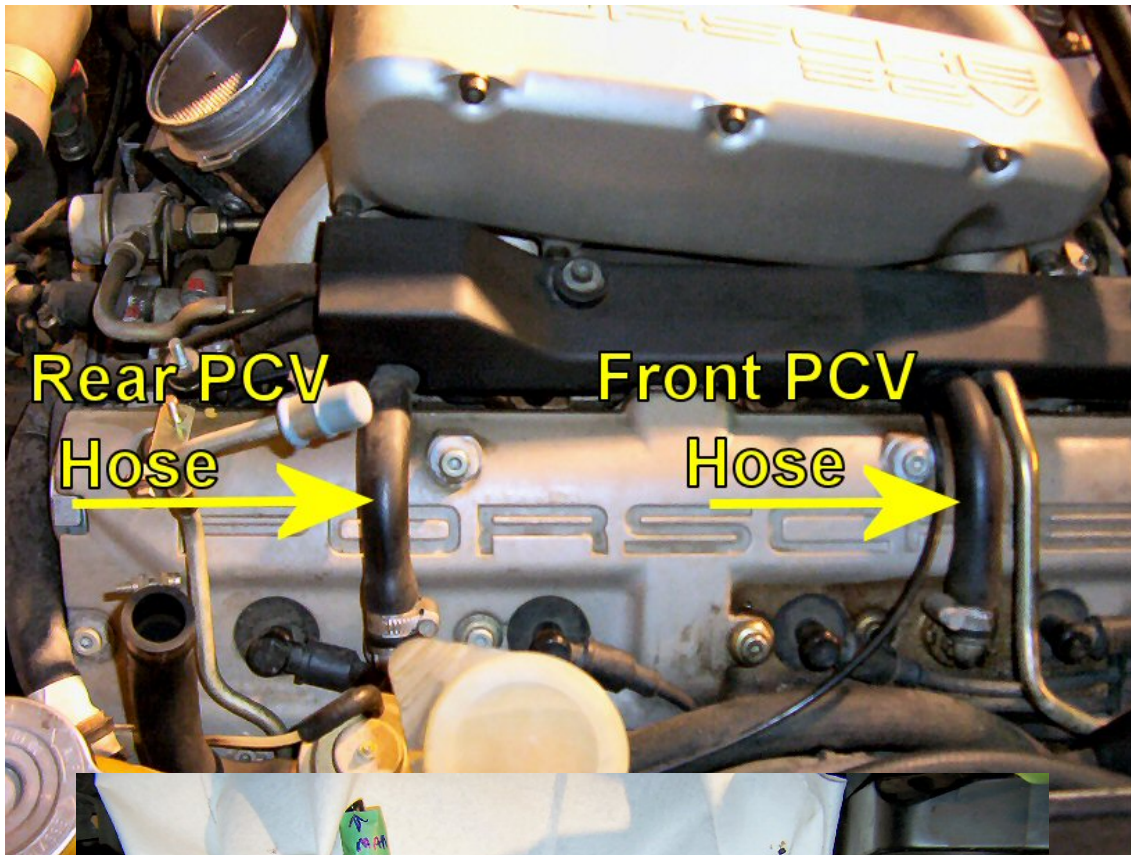




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Locate the two PCV hoses that exit the right cam tower as shown.
We will deal with them one-at-a-time.





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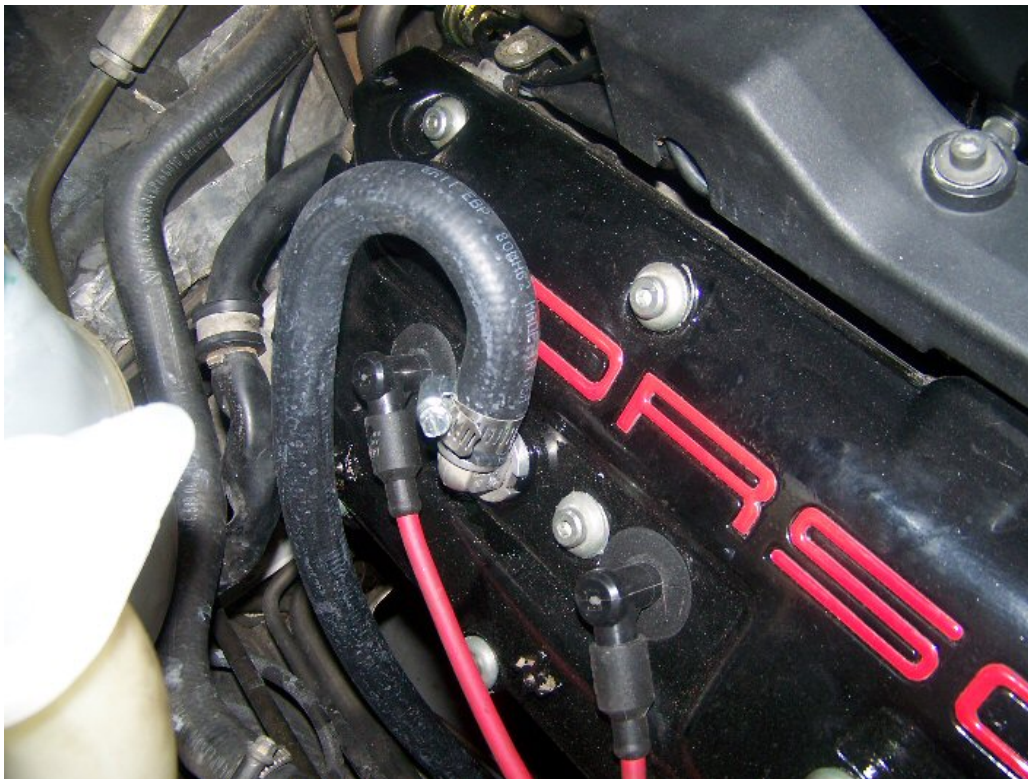
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The REAR PCV HOSE: remove it from the hose nipple on the cam tower, and follow it up to the tee that entered the rubber inlet elbow that we removed on page 51.

This hose comes off the car and is replaced with the one supplied in your kit.

Locate the hose in your kit shaped like a long candy cane.

Install it onto that cam cover nipple with a clamp as shown. The end of the new hose hangs down between the frame and the oil pan. You can find a loop of hard brake line in that location that you can tuck this hose behind, it does a nice job of preventing the hose from swinging inward toward the headers or exhaust manifolds.

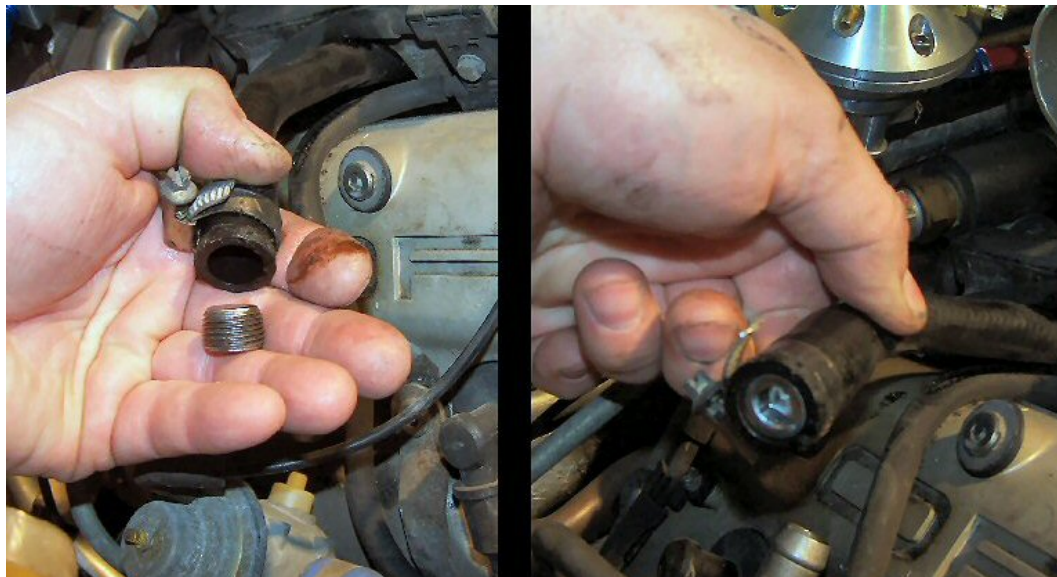




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The REAR PCV HOSE (continued) : Also attached to the tee that we removed on Page 51 is a hose that runs forward under the manifold and connects to a nipple on the oil filler neck at the base. We will simply plug this hose and leave it lay down in the engine valley below the manifold.



Remove the plastic tee from the end of the hose and use the brass threaded plug and hose clamp supplied to plug it.



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The FRONT PCV HOSE: follow it from the camshaft cover under the intake manifold and to the nipple at the base of the oil filler neck.

Inspect it for any cracks or breaks—it is often in very bad shape on these engines. Replace if necessary, a break in this hose will spew oil over the top of your motor and we don't want that!

At the back of the right camshaft cover and near the coolant reservoir, you should find an open rubber hose pointed upwards. This used to go to the air filter box. Loosen the clamp that holds it to the EGR valve, and rotate the rubber elbow it so that it now points down. Done.

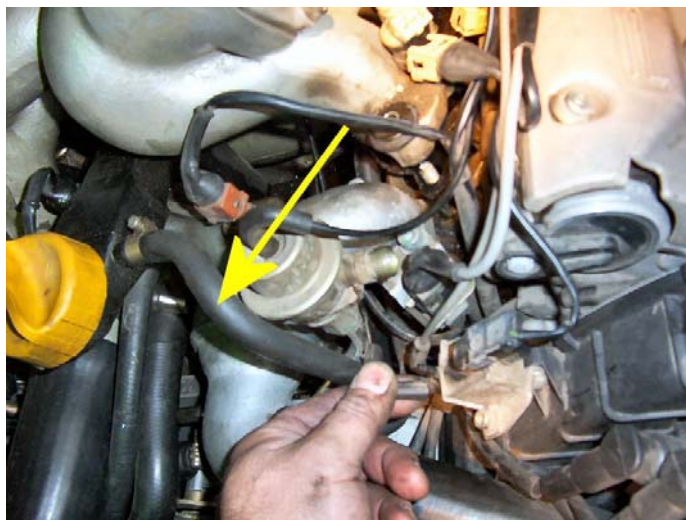




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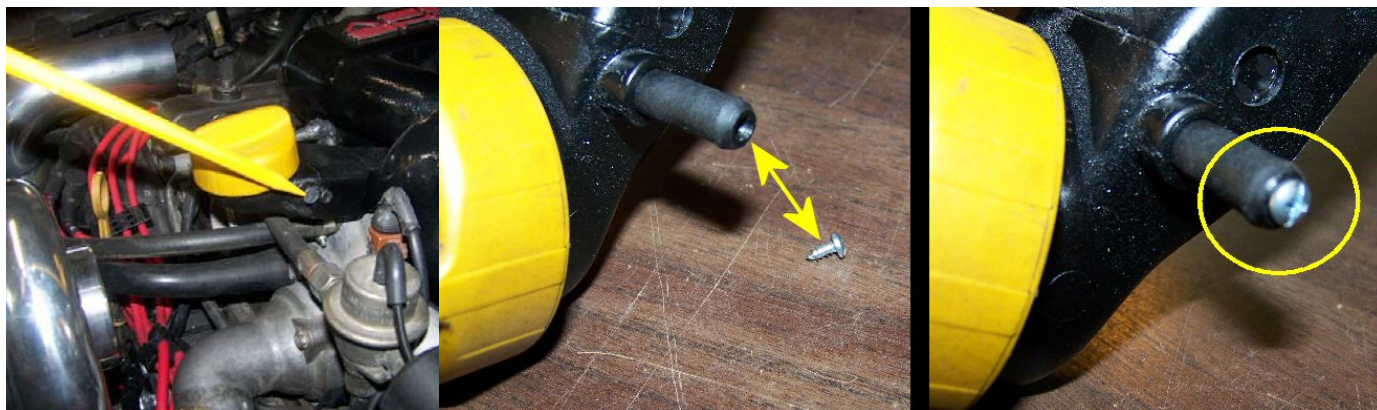
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At the front of the motor, locate the small hose that attaches near the oil filler cap. Note how this hose runs from the oil filler neck under the front of the manifold and to a nipple on the base of the intake.



We need to plug this line also, or boost from the intake manifold will pressurize the crank case through this hose.

Remove the hose from the nipple where it connects to the filler neck. Insert the small screw provided into the nipple to plug it, and re-attach the hose and clamp. This successfully plugs both the nipple and the hose with one step.





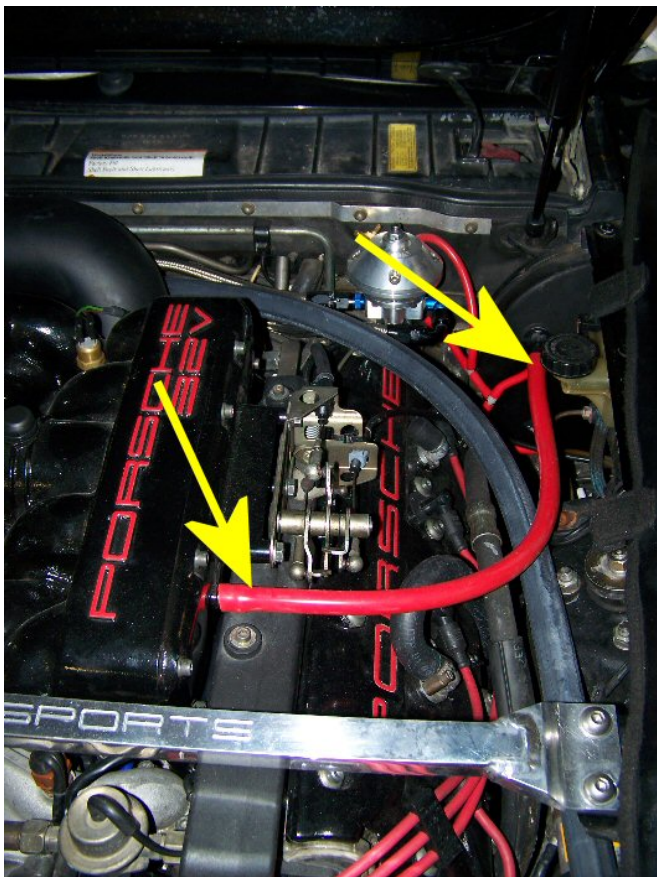
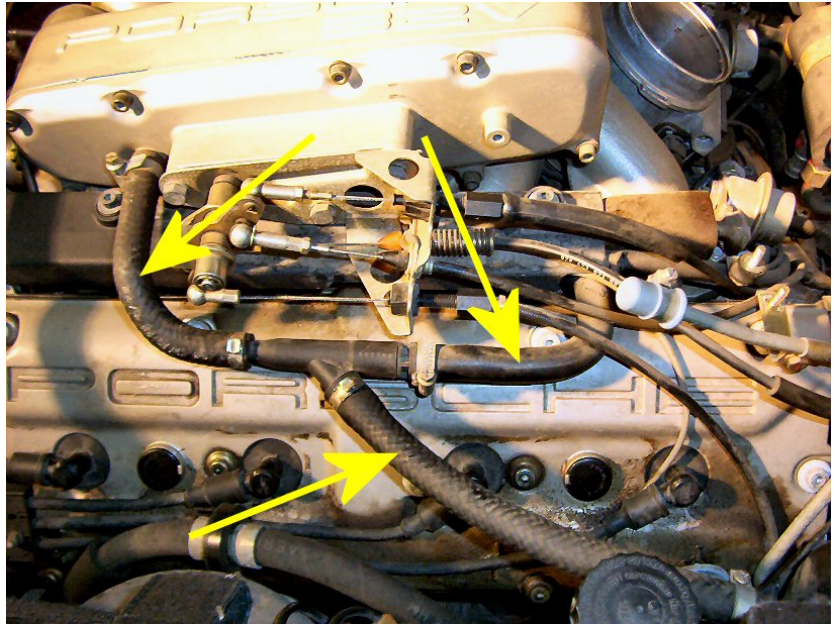
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On the left side of the intake plenum, you will find this hose assembly that goes from the manifold to the brake booster. Remove it.

Be careful at the nipple to the brake booster, they tend to be brittle.

You will find the rear-most hose goes thru the last two intake runners and into the black rubber intake elbow below the MAF sensor.



Remove the hose from the tee, and install a cap and clamp in its place from your kit.

In your kit you will find a 20" section of special (350 psi) black reinforced hose. Use this to connect from the hose barb on the intake manifold to the brake booster.

It should make a nice, easy curve back to the brake booster, just like the red hose in this photo:





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Re-install and Lock Down MAF Sensor:

Start by re-installing the black rubber intake elbow (now modified with a plug on one side and a cap on the other) onto the intake manifold and tightening the clamp that holds it there.



Locate the large tie-down straps from your kit as shown. These are special straps that have a tensile strength of 250 pounds. We will be tying down the MAF sensor with them so it does not pop out under boost.

When they are installed, they will be one on each side of the MAF sensor, and they slide through the loops on the sides as shown in this picture:



Place two straps under the hose clamp at the mouth of the black rubber intake elbow as shown. Orient the straps in the 3 and 9 o'clock position.

Inspect the intake opening now for debris and vacuum it out if needed before proceeding.



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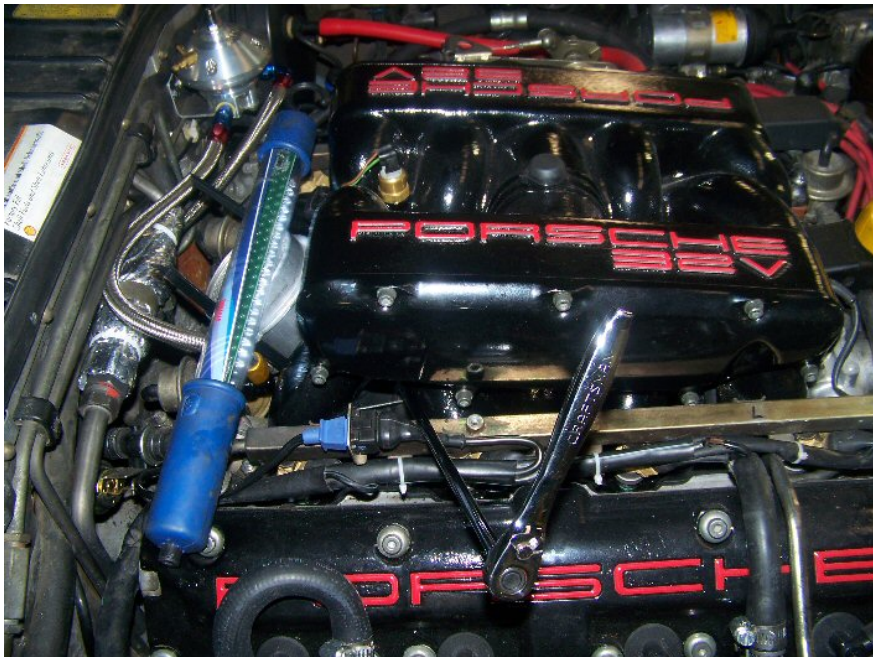
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Re-attach the wiring harness to the MAF Sensor . Orient the MAF sensor with the arrow that shows the direction of air flow pointed in the right way.

Now slide the MAF sensor over the tie-down straps and back into position in the black rubber intake elbow.



Tighten the hose clamp at the base of the MAF sensor now.



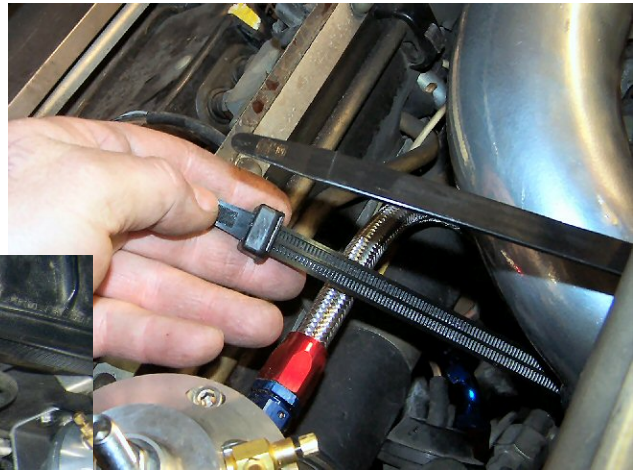
We find that you can most easily do this with a universal joint on a socket with a long extension, like this:



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Slide the locking clamps down the straps and tight up against the MAF, as shown.



Snip off the extra strap material when finished.





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Running Vacuum to the FMU:



Refer to the photos below.

Cut the hard plastic vacuum line that exits the brake booster and insert the vacuum tee provided with some short sections of silicone hose.

The vacuum line connects to the barbed nipple at the top of the FMU.

The other small brass connector on the top of the FMU that has the thumbscrew on it does not receive any line at all. It is open to the atmosphere.

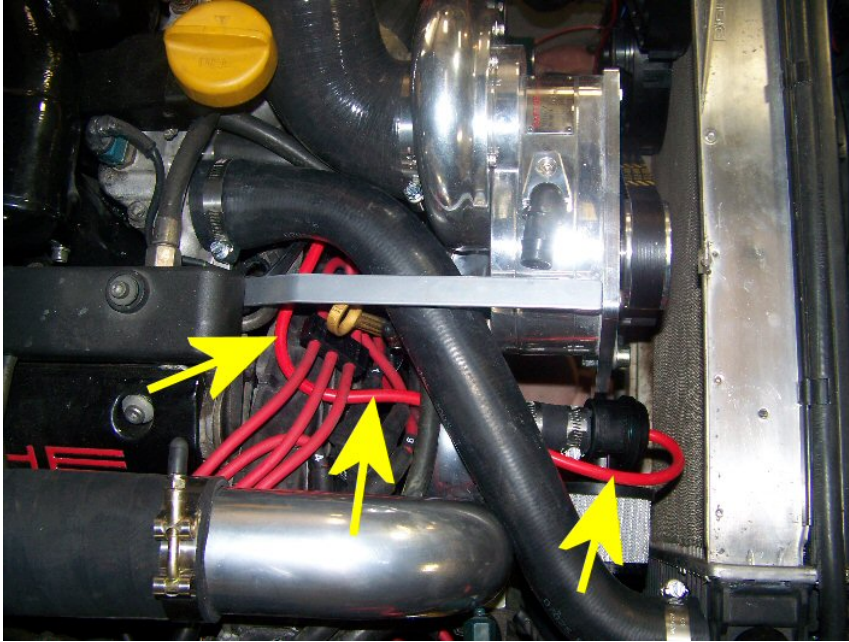




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Running Vacuum to the Blow-Off Valve:



Attach a vacuum line to the blow off valve and run it as shown across the front of the motor.

Route it in such a way that it will not droop down or become entangled in any moving parts.

At the front of the left fuel rail, locate the vacuum line shown and install another tee there. Attach the line from the blow off valve to it.





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Installing The Intake Tubing: (Stage 1 Kit)

This picture will remind you what the finished tubing installation should look like:





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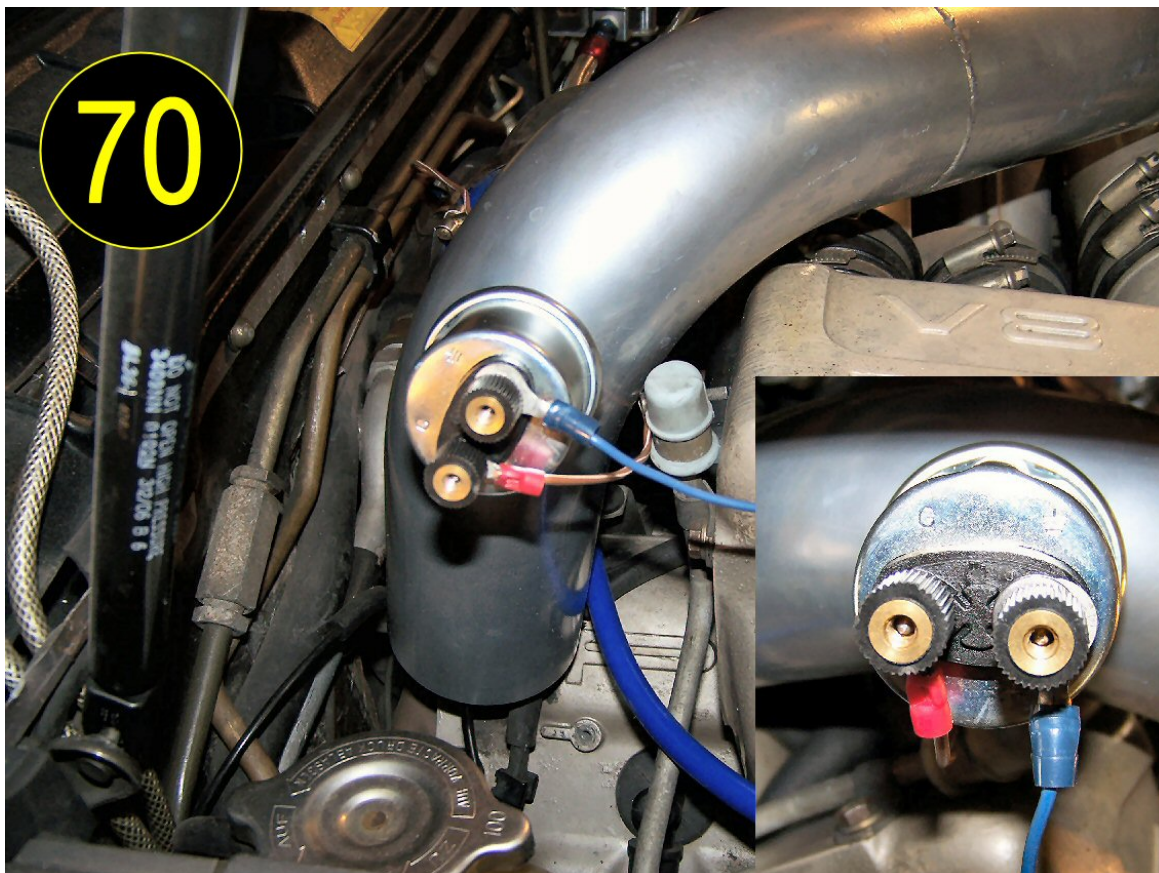
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Locate the large air intake tube shown, and the boost pressure sending unit from your kit.

Put a thin bead of JB Weld on the threads of the boost pressure sender and screw it into the tube. The hole has already been drilled and tapped for you.

Set it aside for the epoxy to firm up.

If you have the optional gauge kit, remove the 16 gauge red and blue wires. Strip and crimp ends onto them as shown, and install under the terminals of the boost pressure sender as shown in Picture 70 below. Make certain the black wire is attached to the terminal with the ground symbol above it, and the blue wire is attached to the terminal marked "G" for "Gauge".





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Put the large 3.5" 90-degree elbow onto the MAF sending unit and secure it there with the 3.75" to 3.5" reducing collar provided and two T-bolt clamps as shown. The clamps are two different sizes.



On the end of the 3.5" tube, install the 3.5" to 2.75" reducing coupling and two t-bolt clamps. You will use the very large (4.0") t-bolt clamp and one of the 3.0" t-bolt clamps on this connection.

The mandrel bent tube with the boost temp sender in it now is installed, and connects as shown.

If you have the optional gauge kit, you can now take the black wire that was attached to the boost pressure sender and mount it to a good ground.

I recommend the stud that secures the fuel cooler. It is welded to the firewall, and makes an excellent ground.



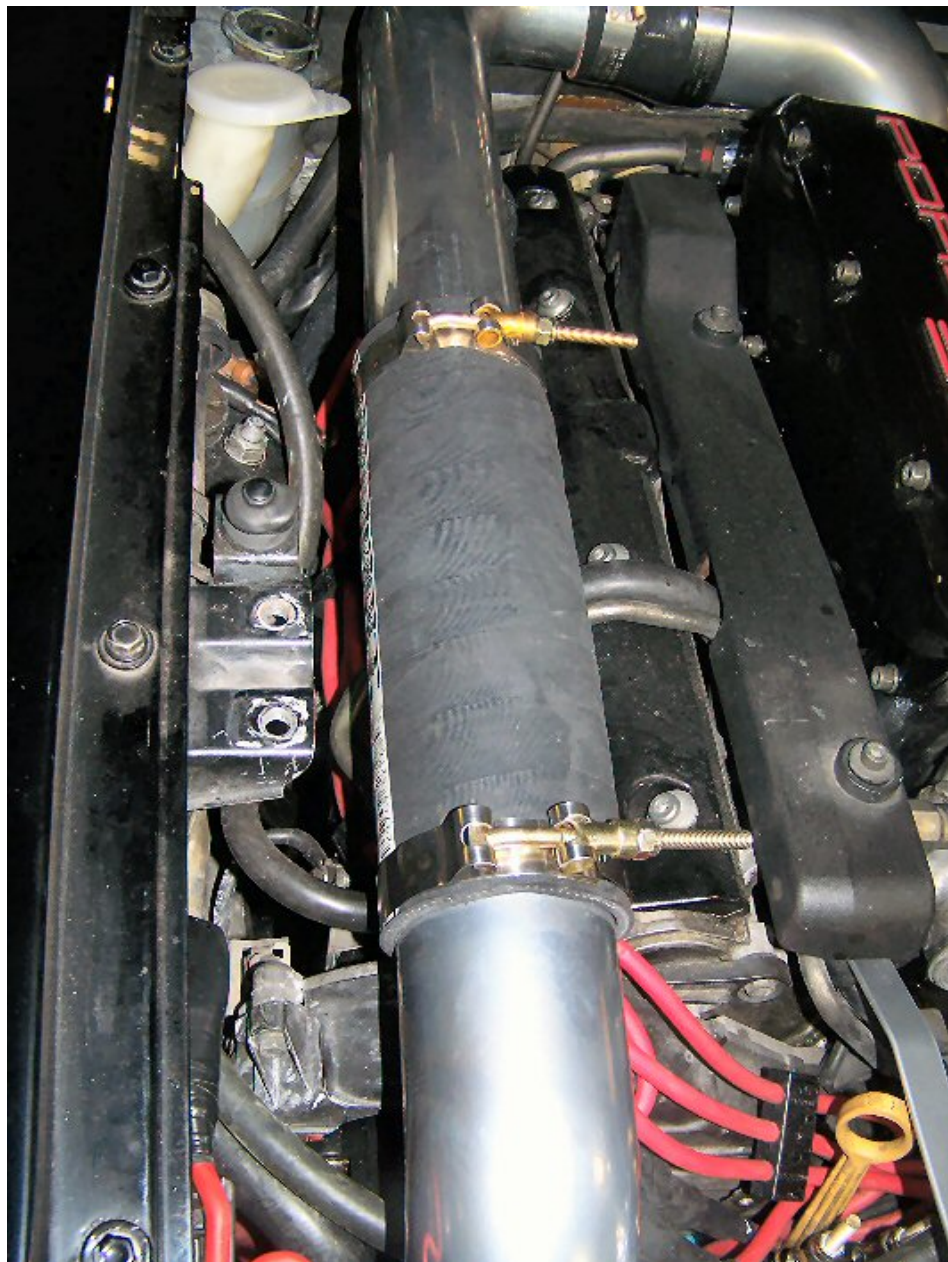


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Next, add the 10" long section of black hose as shown, and a clamp around it.

The black hose under the suspension cross brace gives the system a little give when the engine rocks on its rubber mounts during acceleration.





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Trimming T-Bolt Clamps

You have installed several T-bolt clamps during this build. After these clamps were tightened, you will have long threaded ends sticking out. It is safe to trim these back a bit to improve the appearance of the installation.

Place a beach towel or old sheet over the engine and use an air-powered cut-off tool, a hack-saw or even a bolt cutters to lop off an inch or so. Do not remove too much - you want to be able to remove and re-install these clamps again in the future. Finish the ends of the bolts with a file to remove the burrs. Black rubber bolt-end caps have been provided for each of these t-bolt clamps for cosmetic purposes. Slide one onto the end of each belt to dress-up the install. You can shorten them with a scissors if they are too long.





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Replacing Old Vacuum Lines

Your kit came with a set of silicone hoses from us without charge. Check over your vacuum lines now and replace any that look suspicious. The rubber in the factory vacuum lines has been under attack by heat and ozone and they may be cracked and brittle.

The key is to remove only one vacuum hose at a time, compare it to a hose from the kit and cut a length to match. Put the new hose back on to the car, and repeat. Do only one vacuum hose at a time and you will not have nay errors.

Do not use silicone hose for fuel or fuel vapor. Gasoline dissolves silicone. Use silicone hoses for vacuum and small water lines only. The silicone is very durable and will never harden or crack.

Check For Leaks:

This installation has required you to remove and replace several fuel lines. These must be checked for leaks at every fitting and junction the first time the engine is started. DO NOT SKIP THIS STEP.

Have an associate start the 928 now.

The first time you start your 928 supercharged, expect the idle speed to change several times in the first minute. This is normal. This will only happen this one time, as your on-board fuel computer adjusts to the supercharger and the FMU.

With the engine at idle, **check for fuel leaks**, especially all those braided lines that we attached at both the front and the back of the motor and the FMU (Fuel Management Unit). Run your fingers around every fitting as the engine runs and when you remove your fingers, they should come up dry. If there is any gasoline on your fingers when you removed them from the fitting, shut off the engine and re-tighten those fittings. Re-test.



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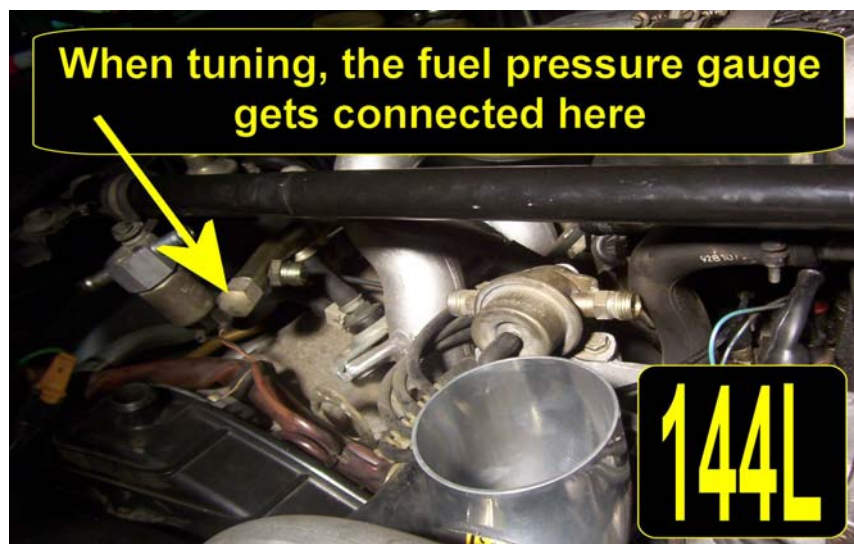
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Tuning the Installation:

The LH-Jet system has a “learning computer” in the system that will automatically adjust the air/fuel mixture at idle to work with your new supercharger. As such, tuning this installation is easy. HOWEVER—that does not mean it can be overlooked. It is VERY IMPORTANT that we set up the FMU so we never run lean when under boost.

You may want to temporarily attach a fuel pressure gauge to the front of the fuel rail. This is a portal provided by Porsche to adjust fuel rail pressures at the factory and provide testing and tuning assistance. It is not required that you install a fuel pressure gauge in that fuel rail to tune your supercharged 928, but it is recommended. Be very careful if you remove the nut on the front of the fuel rail. There is a small ball bearing in there that actually performs the sealing function. Be sure not to drop it and to put the ball bearing back into the cap when this test is finished to make sure that it seals correctly.

We provide a special FMU with our kits that is better than other kit manufacturers supply. This FMU not only can control when it starts to add extra fuel (by the large screw at the top) but you can also adjust the rising rate easily to match the motor/supercharger combination. Other FMU's cannot do this.





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Adjust the static fuel system pressure by the allen screw on top of the FMU as shown in picture 145L. Turn the adjustment screw with the engine running in or out to achieve and idle speed fuel pressure of about 38 to 40 psi, wherever your car runs better.

Then lock the adjusting screw in place on top of the FMU and leave it alone. That should be adequate.

Test-drive the car under load and watch your gauges. The thumb screw on the side of the FMU adjusts how quickly your fuel comes in once the boost starts to come in.



Make several “pulls” on a country back-road, turning the brass thumb screw under the BLUE arrow until the orange needle on the air/fuel gauge holds steady at Wide-Open Throttle right to red-line.



Under full throttle, the air/fuel gauge should remain to the rich-side always. If it goes “Lean” under

boost, get out of the throttle and call us. We will want to adjust the fuel system to get you more fuel.

On steady-state driving, like under cruise-control on the highway, the air/fuel ratio will “hunt”, and the needle will slowly swing back and forth. This is normal and correct.

Your 928 will now be tuned well enough to drive and enjoy safely. If you want to take it to a Dyno, they can tune it their even more accurately.





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Regular Maintenance Items:

The Raptor V Supercharger we use is typically good for about 20,000 miles between rebuilds with no maintenance whatsoever. There is no maintenance necessary.

Gasoline: Use Premium gasoline now, 91 Octane or better. Avoid Ethanol mixes if you can as the actual octane rating received before additives is lower, and the ethanol is hard on the rubber diaphragms in the fuel system.

Octane Booster: Add octane Booster if you are going to go auto crossing or racing just to be safe. A bottle of "Octane Performance Booster" by Solder Seal is about \$1.50 and treats a tank of 20 gallons. It raises 91 octane gas to about 93 octane and is cheap insurance.

Watch the Redline: Pay attention to your dyno results or the dyno charts of others with cars just like yours. Observe where the air/fuel ratio rose above 13.0 to one – and remember to shift before that point for the safety of your motor. If you want a higher shift point contact us – we make pulleys for your kit in several sizes just so we can adjust your shift point to where you want it to be.

Oil Level: Check your oil level more frequently. There is more air passing through your crankcase than before, and more oil is consumed as oil vapor. This is common with supercharged cars. Check your oil level more often.

Oil Type: Change to Synthetic Oil if your motor is all broken in (> 7,000 miles on it).



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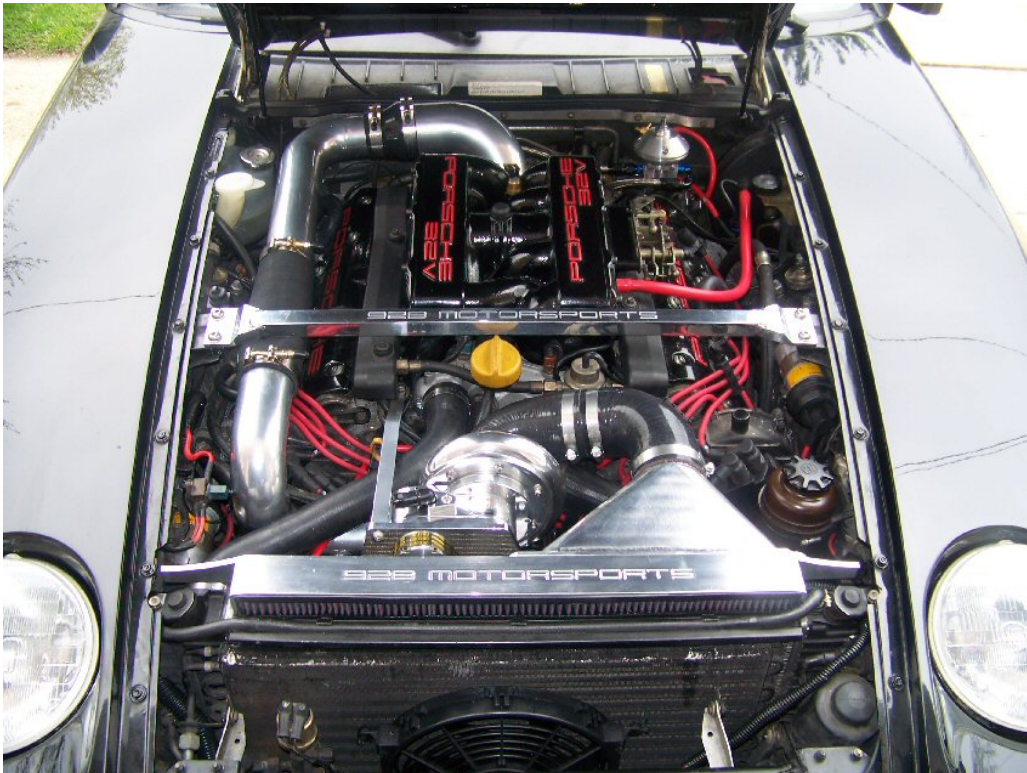
Driving your 928SC:

We recommend for the first 100 miles, you don't take the car all the way to red line as you are seating the bearings in your new supercharger. Make some nice runs with it and run it up to about 4,000 rpm or so and enjoy it. At the end of 100 miles, we want you to check all your belts for tension including the alternator belt, the power steering belt and now your new supercharger belt. It is probable that the supercharger belt will have stretched and will need to be re-tightened. Simply refer back to the section on tensioning your supercharger belt and snug it up a little bit more.

As for driving your supercharged 928, we recommend you be on dry pavement on a straight road when you punch it until you get the feel of the boost coming in and how the car takes off. Note at what RPM the boost really starts to come in hard. Think: if you're in mid-corner and the boost came in like that, it is likely it would kick your rear tires out. Be aware of this.

When accelerating from a stand-still, allow your 928 to weight-transfer correctly before flooring it. This technique as a 'Rolling Throttle'. Roll into the throttle part way to get the weight transferred over the rear tires before depressing it to the floor completely. This allows the weight transfer can take place so you can launch correctly without excessive wheel spin.

Enjoy your supercharged Porsche 928 and call us if you have any questions.



NOTES



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OPTIONAL: Installation and Wiring of the Optional Gauge Kit:

Locate these items from your kit:

13 feet of 20 gauge, blue wire (already attached at one end to the Boost Pressure Sender)

3 feet of 20 gauge, green wire-air fuel gauge between the buffer and the gauge

3 feet of 20 gauge, yellow wire-air fuel gauge between the buffer and the gauge

4 feet of 20 gauge, black wire-ground for both gauges and buffer

9 feet of 20 gauge, red wire-Power supply for both gauges

8 feet of 20 gauge, white-From the O2 line to the air/fuel sensor

Take the 928 Motorsports A-pillar gauge pod unit and snap it in place on the drivers side A-pillar. Review the separate A-pillar Installation Instructions, but do not use any adhesive or glue at this time. You should be able to just press it in place, it will stay there. This is just to give you a reference point of where the gauges are to go.

Go now in to the right front fender well, by the passenger seat and pull back the carpet and plywood that covers the fuse panel.

Make your self a tool to attach wires to so you can push and pull them around. A few moments making the right tool will save hours. You can put a tight hook in the end of a coat-hanger wire, but the one that I have found works best is to put a wire-sized hole in the blade of a long flat screwdriver, as shown.

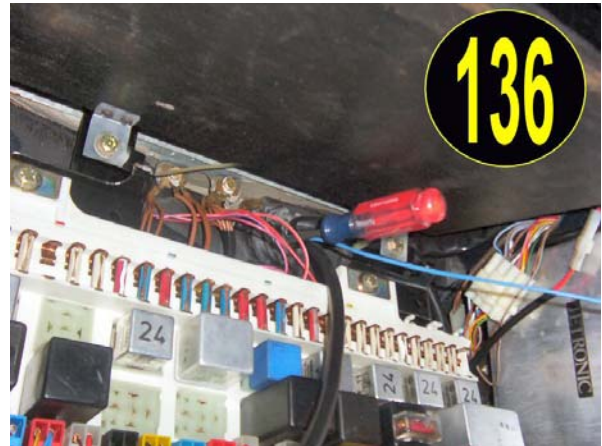




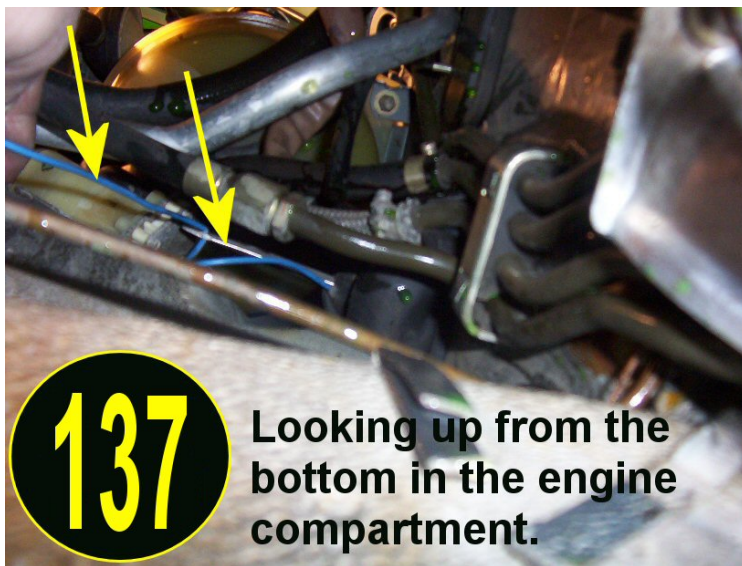
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We need to pull the blue wire in the engine bay through the firewall to the dash. Above the fuse panel you will find a large rubber pass-through (grommet) where all the wires from the engine compartment pass-through into the fuse panel area as shown in picture 136.



Take your long screw driver and carefully push that through the grommet into the engine bay. Now attach the blue wire to the end of it, so when you withdraw your screwdriver the wire comes with it. Pull all the extra blue wire through, but leave enough on the engine side that you can easily attach and detach the intake tube with the boost sender in it if needed later. Picture 137 shows an easy access to the screwdriver from the bottom of the car looking up at the through-wall grommet.



You should now have several feet of the blue wire at the fuse panel.

Add the White and the Red wires as shown in Picture 134.





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We want to pass these wires over the transmission tunnel, between the right foot well and the left foot well. There is ample space to pass these wires from through just behind the heating duct.

Take the screwdriver with the wires attached and from the right side foot well, pass it behind the heater duct, over to the left side and it will come out over top of the accelerator pedal, as shown in picture 135. Remove the tape and pull the wires through with enough cord so that you can reach the gauges.

Be sure to go over the top of the pedal assembly, and above the steering column. Stay away from moving parts.

Routing along the paths of the factory wires is always a good idea.

Leave only enough wire in the fuse panel area to make your connections there easily.



We've learned that one of the easiest ways to route the wires from behind the dash to the gauges is to open the drivers side door and slide your screwdriver tool behind the dash just below where the A-pillar meets the fender. Push a screw driver through the gap where they meet from the outside and it will be able to be seen on the inside if you lie on your back by the pedals. (Put the seat all the way back for comfort).



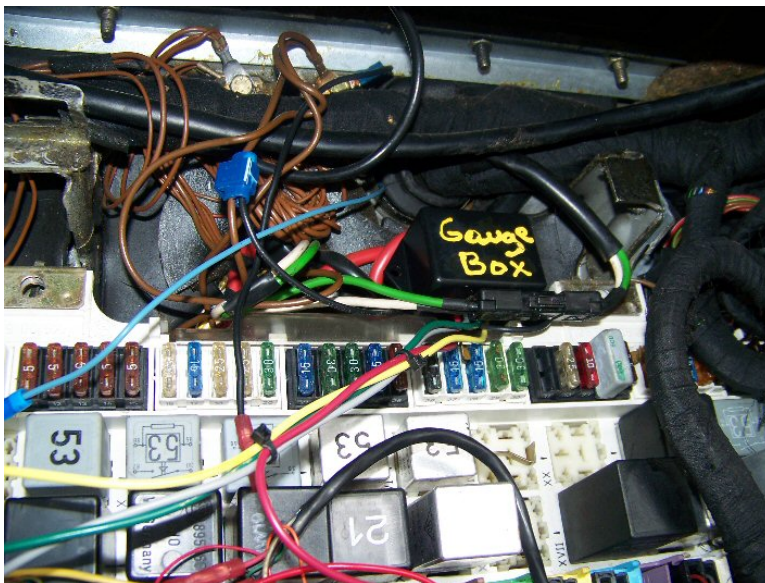
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Now that the screw driver is on the inside, we want you to tape the blue wire, the yellow wire, and the green wire and pull them all up through.

The blue, yellow and green wires will be out on the instrument panel side of the car door and you truck them in behind the dash and they run up the A-pillar gauge pod. Decide now whether you want the boost gauge to be the top gauge and the air/fuel gauge below or the other way around (this is your personal preference). You can press the gauges in place, lightly, at this time. (We have not yet permanently affixed the A-pillar gauge pod. Until we're done here, we will not permanently affix the A-pillar gauge pod.

Pull the wires generally where they need to go, leaving extra at each gauge to make for easy wiring.



You will notice that there is a little black buffer box included with your air/fuel gauge.

This is because, although your O2 sending unit measures your air/fuel richness at 6 times a second, we don't want the gauge to move that quickly, or it becomes very hard to read. The little black buffer box converts the O2 signals into sweeps so you get a chance to read it and the needle doesn't just sit there and vibrate.

The best place to mount this little electronic gauge buffer is above the fuse panel to the right as shown here. Mount it now.

The air/fuel gauge we provide is special. It not only looks like the factory gauges in your 928, but it also will read the signal of your factory O2 sensor, so you do not have to change or install a different O2 sensor.

it is time now to follow the instructions for wiring the gauges that came with each gauge.



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Please note that there is a gray wire coming out of the buffer box which you will connect to the white wire we have pulled over the transmission hump from the right front fender-well.

The end of the white wire gets spliced into the wire from your O2 sensor, as shown in picture 140.

At the bottom of the fuse panel, you will find a connector that looks like the one at the bottom of picture

140. It has a very small black silicone wire coming to it. That is the wire from your O2 sensor. Splice in to the small black wire with a red scotch lock connector (supplied) to our white wire. The other side of this connector has a bright green wire coming from it—do not disturb this side.

Also, in picture 140 you will see a red wire which is going to supply power to the gauges, but only when the ignition key is on. This must be spliced into a power supply in the fuse panel. Take a 12 volt test light and probe the fuse panel, looking for a power supply that comes on only when the ignition key is in the running position. Splice in your red wire using one of the blue scotch locks provided, as shown. The other end of the red wire attaches according to the manufacturers instructions with your gauges. It is not necessary to run a separate red or black wire up the A-pillar to the gauges, but rather you can run one red and one black wire up to the back of the lower gauge, and just daisy-chain them up to the upper gauge also. Do this now, crimping on all your wire ends as you go. A number of small red ring terminals have been provided for your gauges.

Start the car and test the operation of the gauges. The boost gauge may move when you turn on the key, but not again until about 3,000 RPM. If the gauges are working correctly, finish the A-pillar installation according to the instructions included.





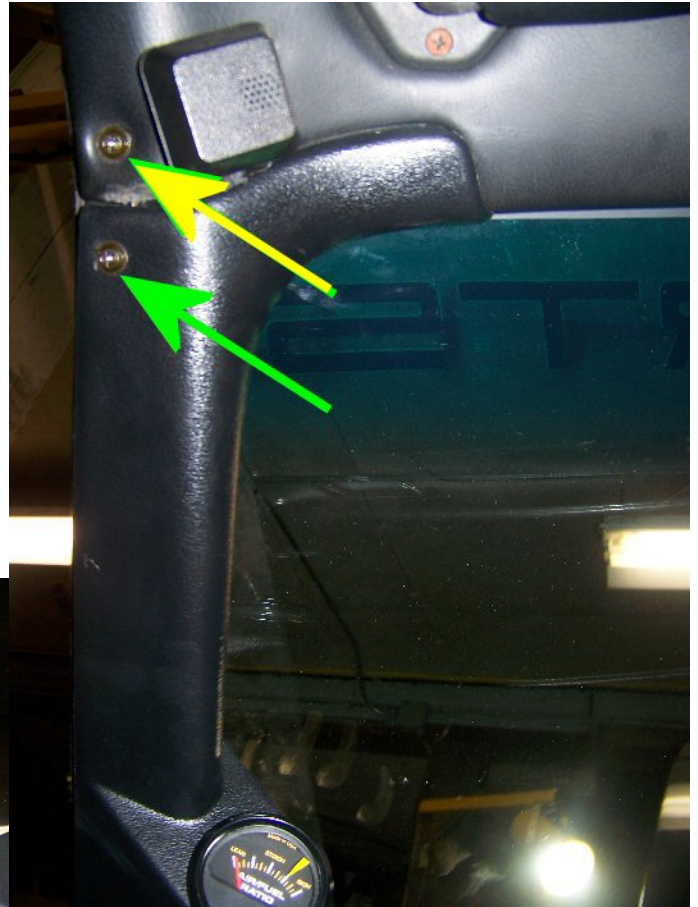
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You may find that your dash has been heat-warped by the sun, and because of this, the A-pillar Gauge Pod is having a hard time clamping on.

That is why there are 3 screws provided with your a-pillar gauge pod. Drill a small hole and install the screws where the GREEN arrows indicate, while an assistant holds the gauge pod just the way you like it.

Replace the factory screw located at the YELLOW arrow so that all 3 screws match and the installation looks factory.



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OPTIONAL: Installation and Wiring of the Optional Auxiliary Fan:

For our customers in hot climates, we have an optional pusher fan that mounts in front of your radiator if needed. This is a big benefit if you are involved in a lot of stop and start driving. It will wire right in to the fan wiring system you already have in place.

Ask 928 Motorsports for details.

