

E36 M/S 50 Manifold Conversion



This modification is not a factory approved modification, and engine damage may occur. Any and all work completed must be in accordance with the manufacturers repair manual and all best practices adhered to. This modification may also violate federal, state, and, or local laws. You, the consumer, accept all liability for these modifications.

READ THESE INSTRUCTIONS COVER TO COVER SEVERAL TIMES BEFORE BEGINNING ANY PART OF THIS PROCEDURE!!

Do You Need to Do Other Service Items?

This is the perfect time to plan out all of your other inspection II and general servicing items. Such as: spark plugs, valve cover gasket and rubber sealing washers, ICV cleaning, power steering hoses or fluid top-off (the reservoir is so accessible with all the manifold and accessories removed), Injector cleaning or upgrade, ASCectamy, coolant hose that lives underneath the manifold, and anything else you may have been wanting to do. So plan those jobs and gather your parts and supplies. And email me or call me if you have any questions about other service items.

Tools Required

Fire Extinguisher - this is the most important tool you need if you are going to be working on any part of any vehicles fuel system. I can't stress this enough. **YOU NEED TO HAVE A FIRE EXTINGUISHER CLOSE AT HAND FOR THIS ENTIRE JOB.** So, if you don't have one, go get one and keep it within arms reach of you at all times!!!

The install can be completed with a standard set of small hand tools commonly found in the DIYer tool box. Such as: 1/4" and 3/8" drive ratchets and metric sockets w/extensions of various lengths; small metric combination wrench set; screw driver set of various lengths and types. However, some special tools make the job a little easier like; 1/4" drive U-joint sockets or a U-joint adaptor; A Dremel or some other small powered metal cutting tool; etc.

Thread locker - Loctite or something similar.

Carburetor Cleaner – for ICV

Rubber lubricant - I use P-80 for rubber parts/hoses/o-rings during assembly. (Some people use dish soap)

You will need several shop rags and paper towels for possible fuel spills.

I also recommend putting a blanket or some type of fender covers on the front fenders before beginning.

Photos and General Description of Associated Parts

These are PHOTOS OF PORTIONS OF THE INSTALL. Not install instructions on there own. Please read everything before beginning.

Figure #1 – Charcoal Canister Solenoid: Usually mounted on this bracket here. However, on '96/'97 M3s and 328s it is mounted below the MAF sensor on a bracket bolted to the left wheel well.

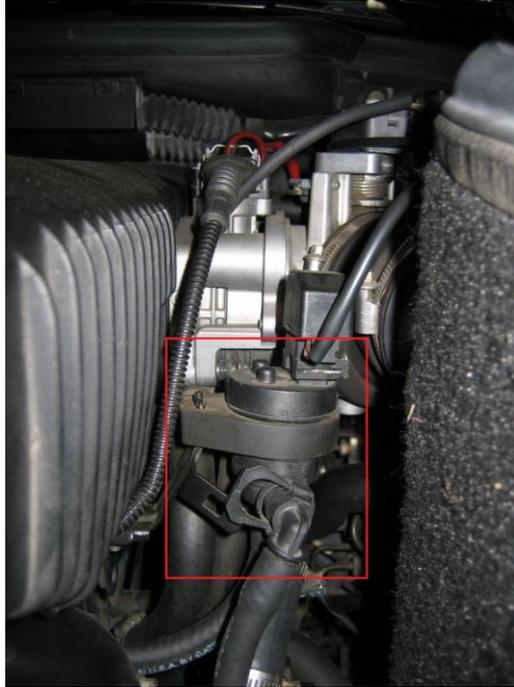


Figure #2 – Secondary Air pump Solenoid: Usually mounted on a bracket bolted between Intake runners #1 & 2 on your OE manifold. (shown here already mounted on a M50 manifold between runners 1 & 2) (**NOTE:** The vacuum line and check valve in this picture is routed by an alternate method than these instructions outline.)



Photos and General Description of Associated Parts

Figure #3 – Crank Vent/ICV Bracket: Originally bolted to the bottom of the OE manifold. (shown here with the piece already cut out and modified for the M50 manifold conversion)



Figure #4 & 4a – Measurement between front of front fuel rail mount and back of rear fuel rail mount. And a pic of a modified fuel rail mount.



Photos and General Description of Associated Parts

Figure #5 – Holes drilled between runners #1 & 2 for the vacuum lines for the secondary air pump solenoid.



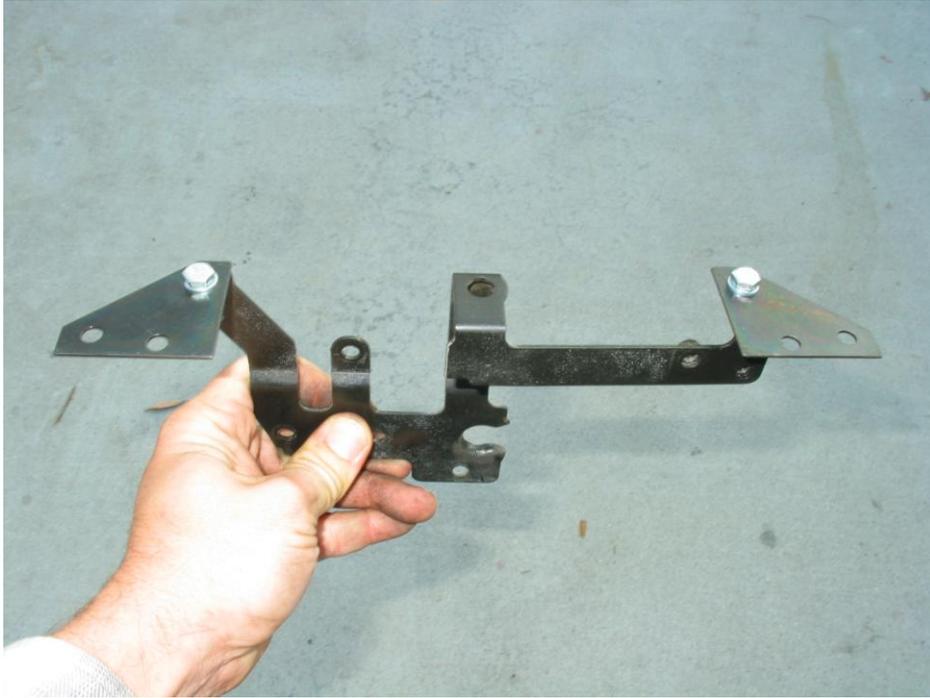
Figure #6 – IAT Sensor: Mounted in the bottom of the OE throttle body boot.



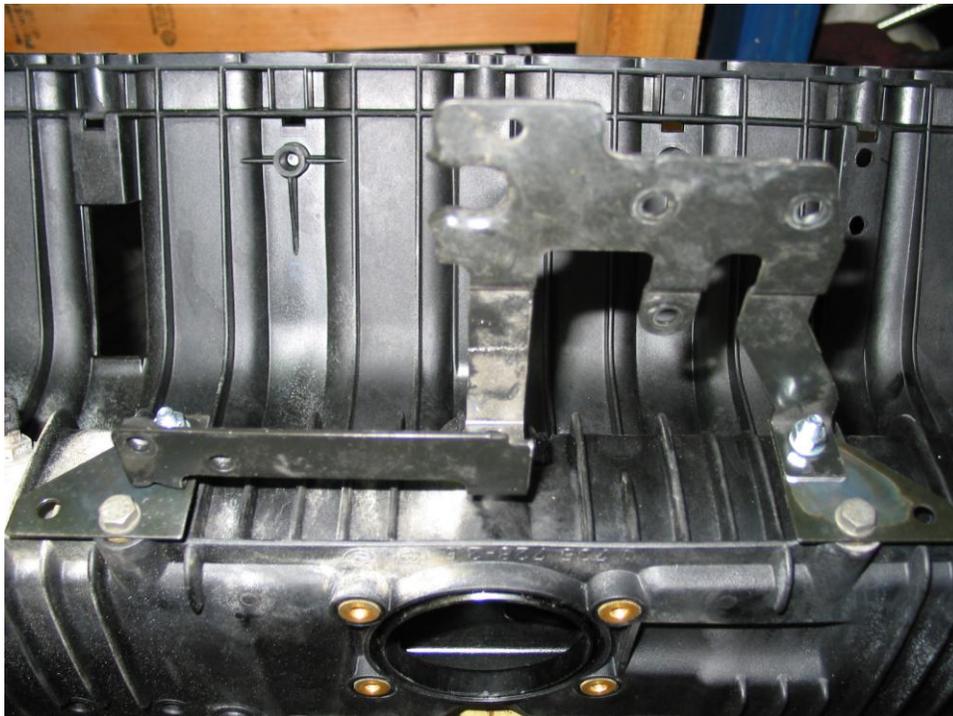
Figures 7a – 7f: This is a series of pictures detailing how the brackets will be attached to the manifold. In these pictures you can see the orientation of the holes in the brackets, the hardware for the brackets, and how it will look when everything is bolted together. (next page)

Photos and General Description of Associated Parts

7a: Triangle brackets installed onto the modified OE crank vent bracket. Note the orientation of the holes and the hardware.

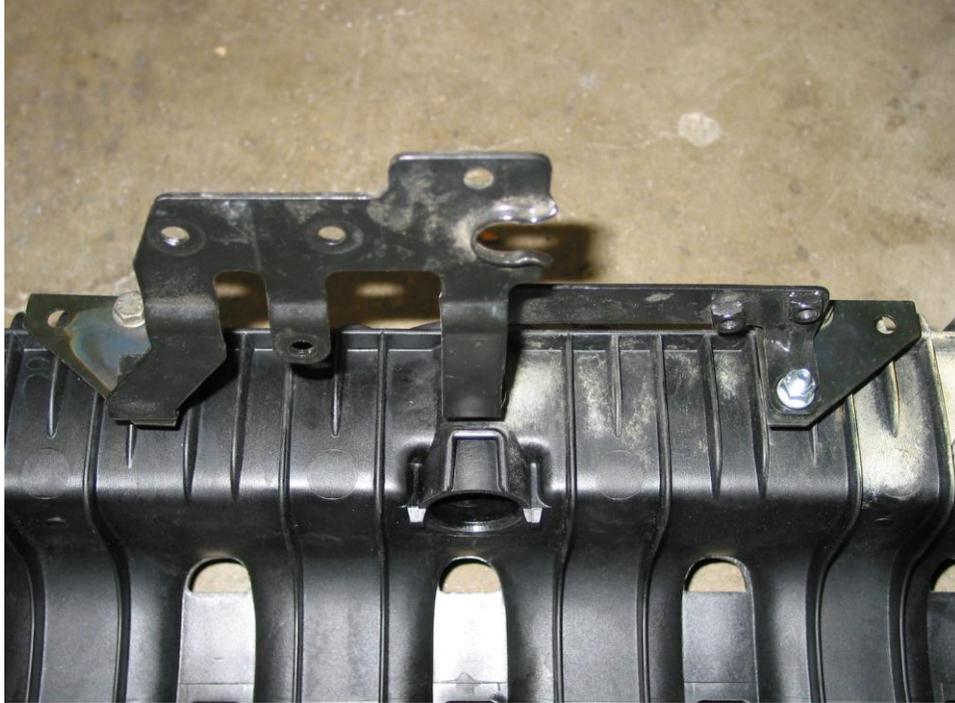


7b: Test fit the brackets, apply thread locker, and tighten the bolts holding the triangle brackets to the crank vent/ICV bracket.

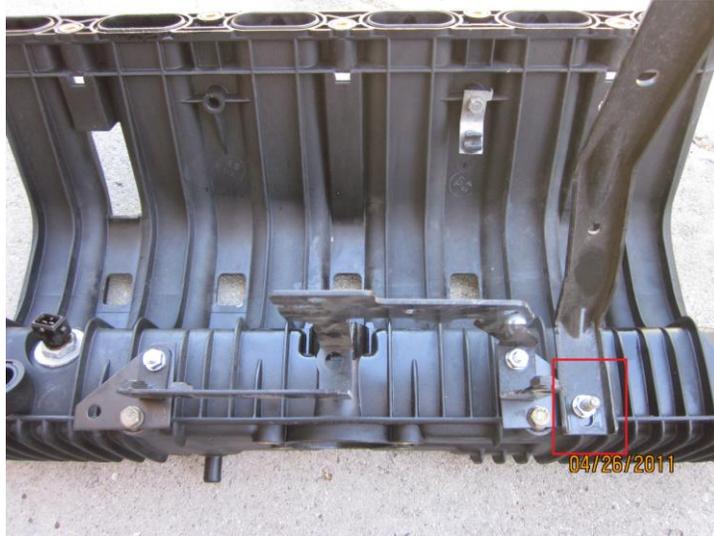


Photos and General Description of Associated Parts

7c: Make sure the triangle brackets are square with the long side of the manifold plenum before you tighten the bolts to the crank vent/ICV bracket. This will help with bolting everything together later. **LEAVE THE BOLT LOOSE PICTURED IN 7D.** Use thread locker on everything.

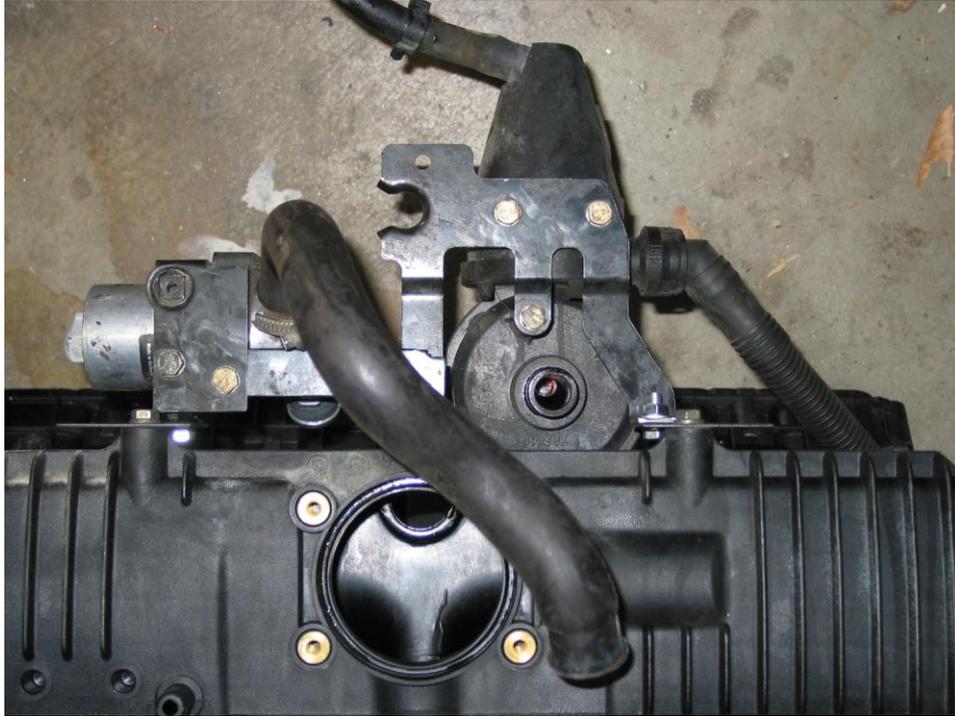


7d: This bolt: needs to remain just finger tight until after the entire package is dropped into the engine compartment and the manifold support bracket is bolted onto its stud. This is also where the bracket for the Purge Valve goes on 97 and sub engines.

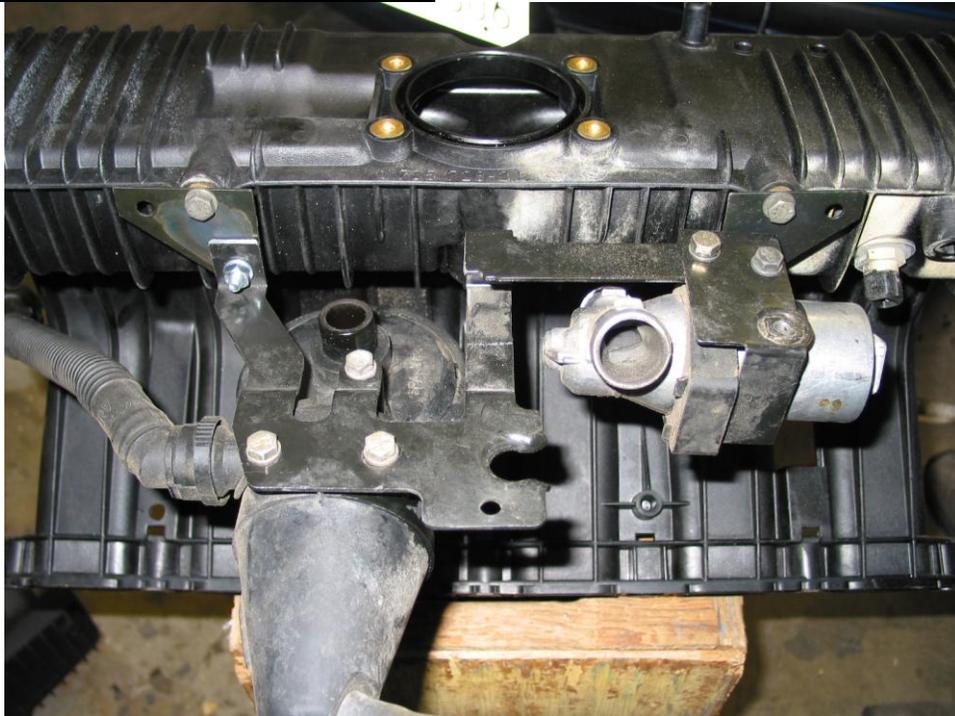


**Photos and General Description of
Associated Parts**

7e: Random pic for reference if needed



7f: Random pic for reference if needed



Photos and General Description of Associated Parts

Figure #8a – M50 Manifold Hose Adapter Installed: The crank vent/ICV and manifold support bracket (I only use the front support but both supports may be used if desired) are installed onto the manifold. The red box is showing where the large BMW connector goes. On the side of that connector is a vacuum port - attach the 16” piece of vac line I sent and route out to the side as the red line shows. That vac line attaches to the bottom port of the Purge Valve.



Figure #8b – Leave this side of the crank vent disconnected until after the throttle body goes on: The reason is because the throttle body coolant lines must go in the middle of the loop where my fingers are.



Photos and General Description of Associated Parts

Figure #10 – New Orientation for the Teed Vacuum Line: Shown installed onto the hard black plastic vacuum line that goes down to the bottom of the engine compartment and under the driver side floor to the fuel pressure regulator.

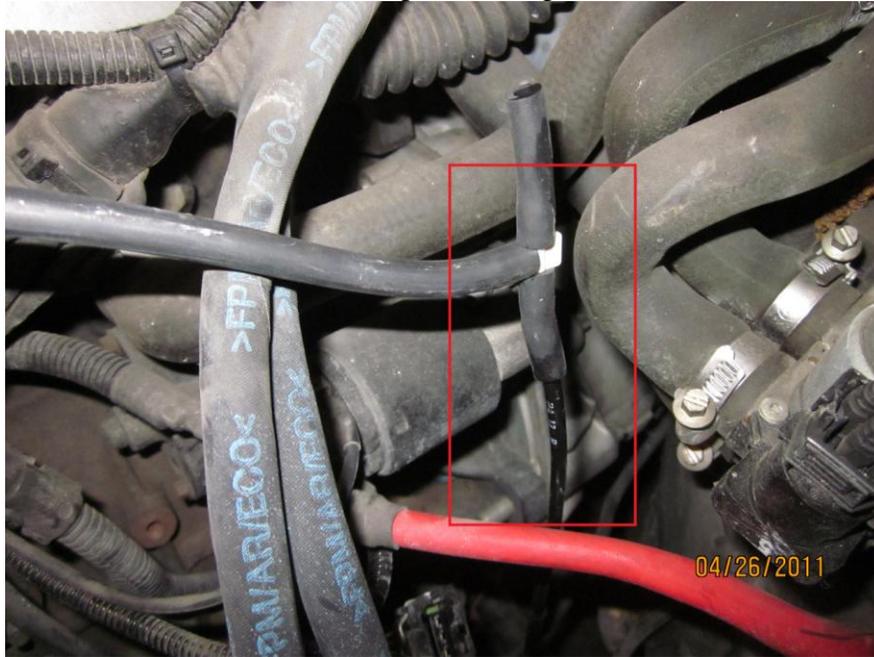
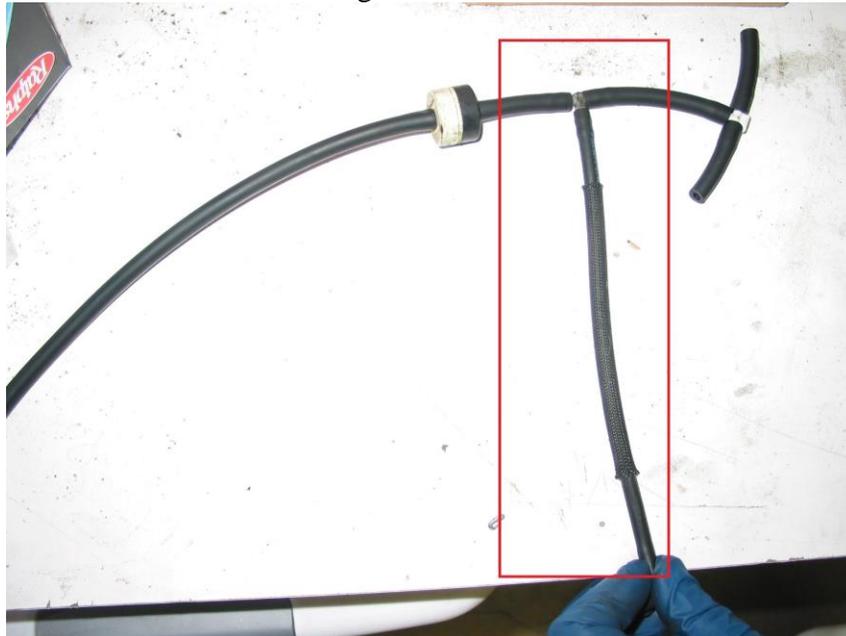


Figure #11 - Teed Vacuum Line For Non M Models: M52 applications must reuse part of the original vacuum line that goes down to the vacuum canister. Cut the long piece of vacuum line I include in the kit and install your OE Tee and OE piece of vacuum line as shown here. Then install as above in figure #10.



Photos and General Description of Associated Parts

Figure #12 – Heater Control Valve: Z models have this mounted here and it interferes with the M50 manifold. You just have to dismount it and let sit like this.



Figure #13 – 2 Washers on top of the fuel rail mount!!! For spacers!! **NOTE:** The fuel rail adaptor brackets and hardware should be installed onto the fuel rail before the fuel rail is reinstalled to the manifold.



Photos and General Description of Associated Parts

Figure #14 & 14a – O2 Sensor Plugs and Wires: Zip-tied tightly between the fuel rail and fuel rail wiring box. (Necessary to get the M50 fuel rail cover to sit nice and low on the manifold)

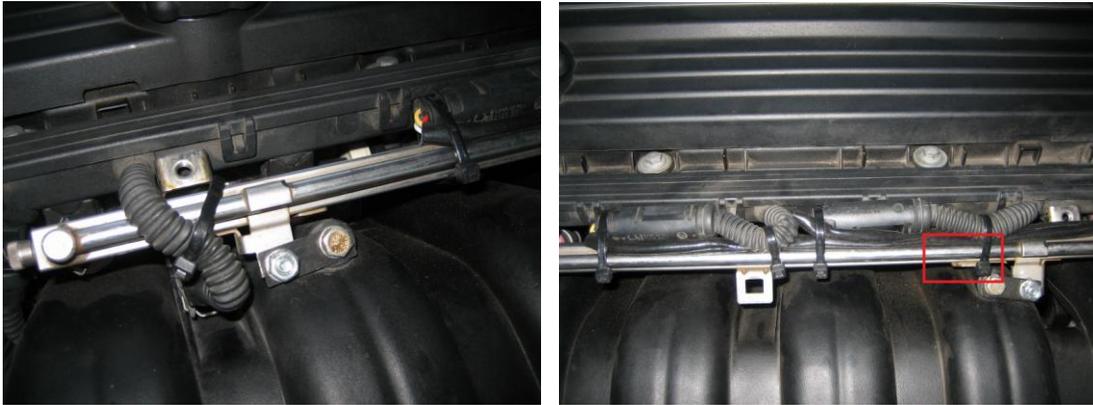


Figure #15a: After installing the hose onto the crank vent (don't use lube) orient the hose clamp so you can get to it from the front of the manifold. Use a long screw driver or an 8mm socket on a long extension.



Figure #15b: Throttle body coolant lines routed through the loop in the crank vent hose adapter



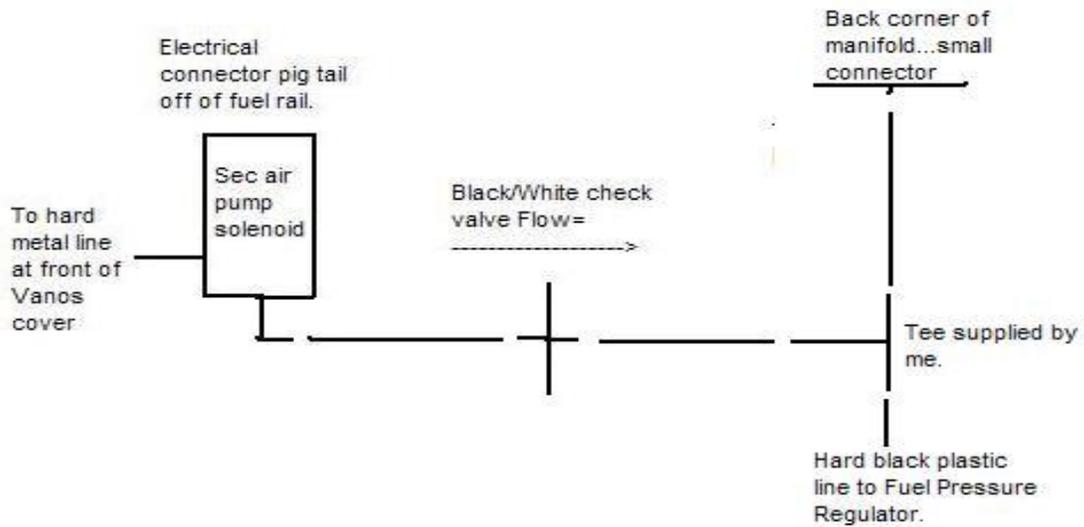
Photos and General Description of Associated Parts

Figure #16 – Bleeding the Fuel Rail: Usually only required if you removed the injectors or the fuel supply/return lines.



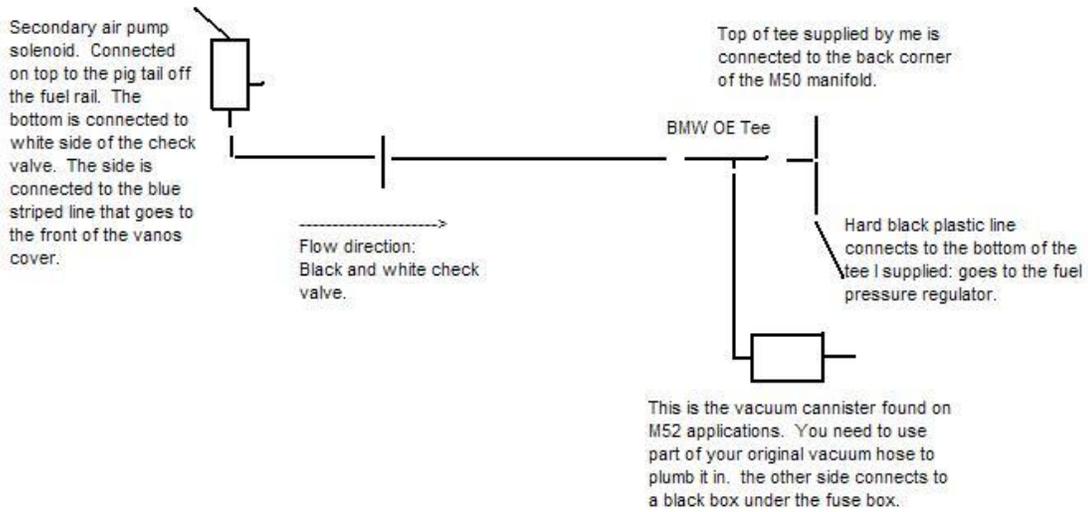
M Model Vacuum Diagram

M Model Vacuum Diagram



Photos and General Description of Associated Parts

Non M Model Vacuum Diagram



Disassembly

1. **TAKE DIGITAL PICTURES AND LABEL EVERYTHING YOU TOUCH WITH LABELS!!**
2. Remove the fuel rail cover, unplug electrical connectors to fuel rail/solenoids, unbolt the rail, and pop it up with a pry bar to remove the injectors from their ports in the manifold. Wrap the injector tips with rags and just set the whole rail assembly over on the valve cover.
3. There is a solenoid on a bracket on the front fuel rail mount. This is the secondary air pump solenoid. Remove it from the bracket (you don't need the bracket anymore) and put the solenoid aside for later install.
4. Unbolt the charcoal canister solenoid (figure #1) and let it just hang.
5. Remove: the mass air flow sensor, intake boot, ASC throttle body, main throttle body, and unplug the brake booster line from the manifold. Pull everything to the side.
6. Underneath the manifold plenum, unplug the IAT electrical, all vacuum lines and unbolt the manifold support brackets, dip-stick bracket, ICV bracket, and crank vent bracket from the bottom of the manifold, and unclip the fuel supply lines from the bottom of the plenum (the clip may break but don't worry) and the dipstick.
7. Push the ICV down out of the manifold. Let it just hang there.
8. Push the crank vent back out of the manifold. Let it just sit there.
9. Unbolt the manifold from the head and remove it.
 - a. If you have problems getting the manifold out you likely have not disconnected the fuel rail supply lines from the bottom. Grab the fuel supply lines and push down on them very hard to break the plastic clip holding them to the bottom of the manifold. (even if you know how to release the clip it will likely break anyway so it's just easier to break it)
10. Remove the vac lines and black/white check valve from the secondary air pump solenoid circuit. Throw the vac lines away but save the check valve and solenoid.
11. Remove the IAT sensor and the bracket from the bottom of the old manifold and modify the bracket as shown in *Figure #3*.
12. Remove the crank vent and ICV from the engine compartment.
13. Clean the ICV.

Re-assembly

14. Use the bolts and triangular brackets provided to fit the vent/ICV bracket to the bottom of the manifold.
 - a. Use **Figures #7a-7f** for the orientation of the brackets.
 - b. Bolt the adapter brackets to the vent/ICV bracket, leave slightly loose, **Figure #7a**.
 - c. Use the bolts that originally held the vent/ICV bracket to the manifold to bolt it to the new manifold. **Figures 7b – 7d**. You may need to bend the vent/ICV bracket a little to get the holes to line up for the manifold.
 - d. Once you have it bolted to the manifold, make sure the edges of the brackets are square (you may need to slightly bend the vent/ICV bracket) with the edge of the manifold and then tighten down the bolts securing the adapter brackets to the vent/ICV bracket.
 - e. Use thread locker, original bolts, and bolt the crank vent and ICV back onto the assembly bracket. **Figures 7e and 7f**
 - f. Use a sharp razor knife to shave a sliver (like maybe 1/32”) of plastic off of the BMW hose connector’s plastic retainer barb. This will allow you to remove it once installed without breaking the barb off.
 - g. Put the large black BMW hose connector onto the silicone adapter hose. Leave the clamp loose for now. Install the connector into the manifold port. **Figures 8a and 8b**
 - h. Install the silicone hose onto the ICV and tighten the clamp. You may need to align the hose on the BMW hose connector to get it to line up right. **Figures 8a and 8b**
 - i. Tighten the hose clamp on the connector.
 - j. Leave the silicone hose off of the crank vent for now...you’ll install that after the TB goes on. **Figure 8b**
15. Remove the IAT sensor wire from the wire/hose bundle zip tied to the block.
16. Remove the FPR vacuum line from the wire/hose bundle ziptied to the block and reroute the vac line down and around more towards the back of the manifold area. (FPR Tee’d line pictured #10)
17. Refer to the appropriate vacuum diagram for your model in the photos section and install one side of the new T’d vac line onto the FPR vac line. **Figure #10**
18. If you didn’t buy the manifold from me follow the modifications section for your manifold modifications.

Re-assembly

19. For an M Roadster or Z3, pop the heater control valve out of its mounts and just let it hang there. *Figure #12*
20. Install the M50 manifold, crank vent, ICV as one big bolted together package. You will have to move things around and push and pull things out of the way to make room for everything to go in at once but this method works best.
WARNING: be very careful none of the intake manifold gaskets fall out of their grooves when you are fishing the manifold into position.
 - a. Be sure the forward manifold support bracket goes onto its stud properly...this is why you left the hardware loose for it.
 - b. Be sure that none of the brackets or supports or coolant lines or vac lines or anything is propping up the manifold. Once in correctly the manifold should sit very flush with the head at the top and bottom of the intake runners.
 - c. Torque the nuts holding the manifold onto the head.
 - d. Install the purge valve (Figure #1) onto bracket bolted to manifold (97 and sub cars) and route the 1/4" vacuum line from the BMW hose connector in the back of the manifold to the bottom of the solenoid.
 - i. On pre-1997 cars the purge valve should be bolted to a bracket on the left wheel well underneath the MAF sensor assy. But the vacuum line connection is still the bottom of the solenoid.
 - e. Torque manifold support bracket nuts top and bottom.
21. Connect open side of new 4mm Teed vac line to the bottom back corner of the manifold. Refer to the appropriate vacuum diagram for your model in the photos section.
 - a. Depending on how you routed it you may need to cut 6 or 10 inches off of the OE FPR vacuum line (the very small diam, black, hard plastic line) to keep it from kinking once connected to the manifold at the bottom back corner.
22. Install the secondary air pump solenoid between intake runners #1 and 2.
 - a. Refer to the appropriate vacuum diagram in the photos section. The vacuum source line from the manifold goes through the bottom hole between the intake runners and to the bottom of the solenoid. *Figure #2* (note - the picture does not show the vacuum line going through the bottom hole between the runners)

Re-assembly

- b. The vacuum line that comes from around the front of the VANOS cover goes through the top hole between the runners and connects to side port of the solenoid.
23. Test fit the fuel rail and bend the fuel supply and return lines – You will notice when you try to align the injectors with the ports in the manifold that the fuel rail hits the manifold at the back. Carefully bend the supply and return lines away from the back of the manifold (a small amount) until the injectors line up with their ports without the lines contacting the manifold.
24. Install the new brackets to the fuel rail ensuring that there are 2 washers (used as spacers) between the brackets and the fuel rail as shown in **Figure #13**. You will need to bend up and out of the way one of the O2 sensor brackets so there is room for the bolt (**Figure 14a** the bracket is actually cut off the fuel rail – however I don't recommend cutting the bracket off). Leave the fuel rail adapter brackets slightly loose so they can be aligned to the manifold.
25. Install the injectors and fuel rail. Bolt it down and tighten what was left loose in step 24. Use blue thread locker on all small hardware.
26. Use the throttle body seal supplied in the kit and install the TB. Do not use the OE seals. You must use only the seal provided in the kit.
27. DO NOT USE LUBE ON THE SILICONE HOSE AT THIS CONNECTION POINT!! Connect the silicone hose to the crank vent. Orient the hose clamp so you can use a long screw driver or 8mm socket from the front of the manifold to tighten. **Figure #15a**
 - a. Make sure the TB coolant hoses go through the loop in the silicone crank vent adapter hose. **Figure #15b**
28. Route the ¼” vacuum line that comes off of the side of the large BMW connector in the back of the manifold down and around to the Purge valve (charcoal canister solenoid). Connect this vac line to the very bottom port of the solenoid.
29. Connect the drain hose to the bottom of the crank vent...and make sure it is also still connected to the dip stick tube.
30. Clean and lube the o-ring seals on the large black plastic vacuum line that connects the crank vent to the VANOS cover...then connect it to the vent and the VANOS cover.
31. All other accessories and parts...ASC TB, MAF sensor, CAI or airbox, TPSes, solenoids, etc: install in the reverse order as disassembled.

Re-assembly

It will take your ECU several miles, some say as much as a weeks worth of driving, to get fully adapted to the new volume of airflow and produce maximum power. **However, the idle should be smooth and the engine should run just as well as it did before the swap within just a few minutes of starting.**

If the engine does not smooth out run normally very soon something is wrong. Recheck all of the electrical connections, vacuum connections, fastener tightness etc.

If you get a CEL pull the code and call me if you need help: 818-472-6631

Manifold Modifications

1. Thoroughly clean the inside of the manifold...if you bought the manifold from me I have made the modifications, pressure washed it inside and out, and cleaned it up a little. **But, you, the installer are the last line of defense against foreign objects inside the manifold.**
2. For the fuel rail to fit and sit naturally there needs to be a maximum measurement from the sides of the manifold fuel rail mounts of 11.25 inches. To get this measurement use a small grinder or hack saw to modify the sides of the mounts on the manifold like *Figure #4 & 4a*
3. Drill (2) 3/8" holes in the M50 manifold between the first and second intake runners: one 1" and one 2" up from the flange: *Figure #5*. Vacuum lines will be passed through these holes.
4. If you sourced your own manifold and there is no IAT sensor installed in it, you need to plug that hole if you're not going to install your OBDII sensor in that location as described in the next section. If the OBDI IAT sensor is still installed, it will serve as a plug for the hole. **NOTE: The OBDI IAT sensor will not work with OBDII wiring/ECU etc.**
 - 4.1. The OBDI sensor hole is 12mm X 1.5mm thread pitch. Use a bolt with gasket sealer to plug it.

If you sourced your own manifold and its part number ends in -612 it is possible that the connector I sent you will not fit. You will either need to drill out the hole so the connector guide barbs can fit into the manifold normally. Or, you can cut the connector guide barbs off of the connector and epoxy the connector into place. Some -612 manifolds have the proper sized hole and some don't.

IAT Sensor Install

There are 2 possible locations for the IAT sensor. Either mounted in the threaded hole in the bottom of the M50 manifold or pressed into the intake boot. I prefer the boot location.

Take the IAT sensor out of the S52 manifold plenum.

1. Remove the green o-ring from the sensor.
2. Drill a hole in the bottom of the intake elbow boot and install the sensor so the rubber of the boot goes into the seal gland on the sensor. I used a 1/4" drill and reamed it out, then a small razor knife to trim the edges. (use lots of rubber lube to install) **Figure #6**

CAUTION: if the IAT sensor is not pointed straight up and down in the elbow it can come into contact with the ASC throttle body butterfly. If this happens the sensor can break and plastic pieces will be ingested into the engine.

OR possible location #2

3. Use a 12mm X 1.5mm die to cut threads onto the plastic body of the IAT sensor. Use high temp silicone sealer on the threaded area of the sensor and screw it into the original IAT location on the bottom of the manifold. (This location is used most often on FI setups where an after cooler may be in use) Note: I don't like this location because it is difficult to get many threads onto the sensor. You may as well drill a hole anywhere in the manifold that is convenient for your application and use a high temp epoxy to install it there.

Fuel Rail Cover Modifications And Install

If you have a M52 cover it will bolt up to the fuel rail without any modifications. However it doesn't look all that great and quite a bit more fuel injector "ticking" is audible.

If you have an unmodified M50 cover it too will bolt up without any mod. But again, same problems above.

If you bought the M50 cover from me then I have already modified it to fit nicely.

To modify an M50 cover simply cut about 3/8ths of an inch off of the mounts that make contact with the fuel rail. Make sure not to use a high speed cutting tool because it may heat up the brass bushing inside the mount and cause it to come loose or fall out all together. The idea is to leave about 1/8th inch of brass behind so the plastic in the mount doesn't get smashed by the bolt.

1. Mount the cover in a vice using rags and wood blocks to keep from marring the finish on the cover. Use a hack saw to cut the mounts down 3/8ths inch.
2. On the fuel rail: remove the O2 sensor wire clips from the fuel rail and zip tie the wires down very tightly to the fuel rail. The clips sit too high and don't let the cover sit down nicely if they are still there. *Figure 14 & 14a*
3. Install the cover and check its alignment...if the cover is up higher on one side or the other it's likely because the wires are propping up underneath.