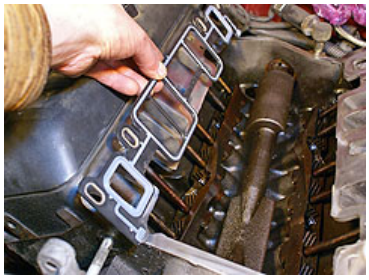


**GM Truck - Fixing A Serious Coolant Leak:**

# Replacing Intake Manifold Gaskets On A 1999 GMC Jimmy With A 4.3 Liter V6 Engine

***This Article May Also Apply To Full-Size GM Pickups, Tahoe, Yukon, and Suburban With 5.7 Liter V8 Engines***

| **In This Article:**<br><br>Parts are removed from the top of the engine until the intake manifold is exposed. The manifold is removed, cleaned and replaced with new gaskets. | **Related Articles - GMC Jimmy / Chevy Blazer:**<br><br>• Rebuilding This Engine To Fix A Rod Knock<br>• Replacing A Water Pump<br>• Removing Air Ducting<br>• Draining The Coolant<br>• Removing Radiator Hoses<br>• Moving The A/C Compressor |
|---|---|
| **Skill Level:** 3-4 (Intermediate to Advanced) | **Time Taken:** About 16 Hours |

By Bruce W. Maki, Editor

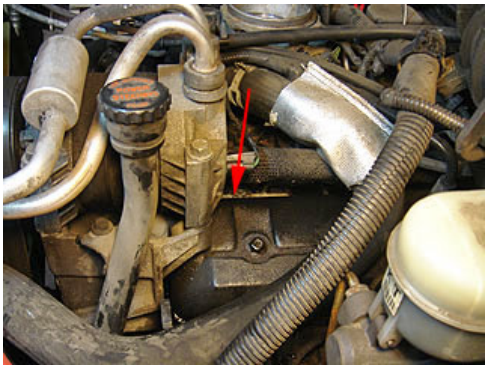
## Introduction:

This 1999 GMC Jimmy had developed a serious coolant leak. The engine would lose about a **gallon** of coolant after 20 miles of driving.

I had replaced the water pump less than a year earlier, and initially I thought the pump gasket was leaking. When I leaned over the engine and looked straight down where the red arrow is pointing, I could see coolant dripping from the area near the right-hand mounting surface of the pump.

But an employee at a local auto parts store suggested that possibly the source of the leak was the intake manifold gasket, not the pump.

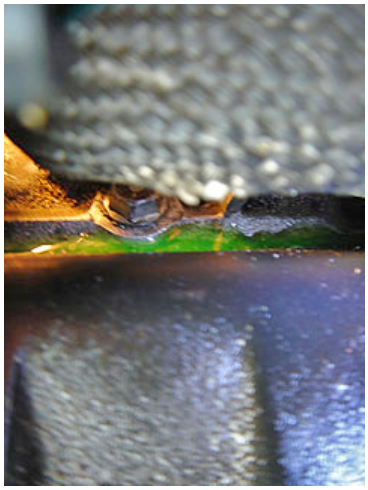
To inspect the area in question, I had to remove some of the air duct components.



The arrow points to the area I needed to inspect.

This is the driver's side of the engine, just behind the air conditioning compressor.

After I cleaned up the dirt from the area between the intake manifold and cylinder head, I started the engine. Within a few seconds this pool of coolant appeared.



This confirmed my suspicions... the coolant was leaking from the intake manifold gasket, not the water pump.

This was not good news. As I looked at the engine I began to realize what a long project this would be... the engine is hiding beneath a tangled web of wires and hoses.

To get some extra guidance, I bought a Chilton's Repair Manual. But I didn't buy the book for the GMC Jimmy and Chevy Blazer. Instead, I bought the manual for full-size trucks (Chilton's book number 28624), which covers my 1996 GMC Yukon. We plan on keeping the Yukon, but we may sell the Jimmy someday soon.

The full-size truck repair manual covers procedures for the 4.3 liter V6 engine that GM puts in the Jimmy/Blazer, because that V6 is the base engine in GM's full-size trucks.

Chilton's procedures worked for me, but they can be frustrating because they omit essentially ALL of the details that would be needed by anybody who is not an experienced auto mechanic. Wait... don't people like you and me buy these Chilton's books precisely because we are **NOT** experienced mechanics?

## Summary Of Procedure:

Based on information from my mechanic's traning, the Chilton's book and Haynes repair manual for GM full-size trucks, I made this quick summary of the procedure for replacing the intake manifold gasket:

### Removing The Upper Intake Manifold (a.k.a. Plenum):

- Disconnect Battery (may not be absolutely necessary, but a good practice to avoid shorting a positive wire to ground).
- Remove serpentine belt.
- Drain the coolant.
- Remove air cleaner ducting and disconnect wires.
- Disconnect throttle linkage and bracket.
- Disconnect cruise control cable.
- Remove brake booster vacuum hose at manifold.
- Remove PCV hose.
- Remove ignition coil and bracket.
- Remove purge solenoid and bracket.
- Relieve fuel pressure at test port.
- Remove fuel lines and bracket.
- Remove upper intake manifold.

### Removing The Lower Intake Manifold:

- Remove the distributor. Label the spark plug wires.
- Remove heater hoses and bypass hose.
- Remove upper radiator hose.
- Remove sensors and bracket on right side.
- Disconnect EGR tube, remove clamp and bolt.
- Remove PCV valve (and replace).
- Unbolt A/C compressor and move it aside.
- Loosen compressor bracket and slide forward, but do not remove it.
- Remove alternator bracket bolt (or remove alternator and set aside)
- Unplug all vacuum lines from intake manifold.
- Unplug all electrical connectors from manifold.
- Mark the location of intake manifold bolts. (Oops... I didn't do that.)
- Remove intake manifold bolts, and manifold.
- Clean mating surfaces

### Installation:

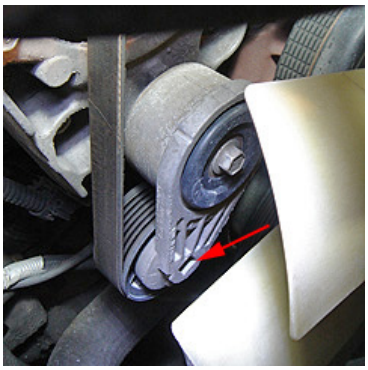
- Set new gaskets in place and apply silicone to flat areas on front and rear of engine block.
- Apply thread locking compound to manifold bolts.
- Install manifold and tighten bolts in proper sequence.
  **Torque: 1988-95** model years: 35 ft-lbs.
  **1996-2000** model years: Tighten in three stages... 2 ft-lbs, then 9 ft-lbs, then 11 ft-lbs.
- Install distributor.
- Install upper intake manifold.

The remaining installation procedures are generally the reverse of removal.

## Start:

### Removing The Serpentine Belt:

The serpentine belt is removed by rotating the automatic tensioner and slipping the belt off the easiest point, which is the idler pulley



There is a 3/8" square hole in the automatic belt tensioner (red arrow).

To rotate the tensioner, I inserted a 3/8" drive ratchet into the square hole and pushed the ratchet to the left (arrow). Then I slipped the serpentine belt off the idler pulley.

I found it best to start with the ratchet handle **straight up**, because when the belt is removed the tensioner will **rotate back**, and the wrench handle can hit the water pump pulley, making it impossible to remove the wrench.

### Draining The Coolant:

I opened the drain valve on the radiator and placed a dishpan under the front of the car to catch the coolant that flowed from the drain hose.

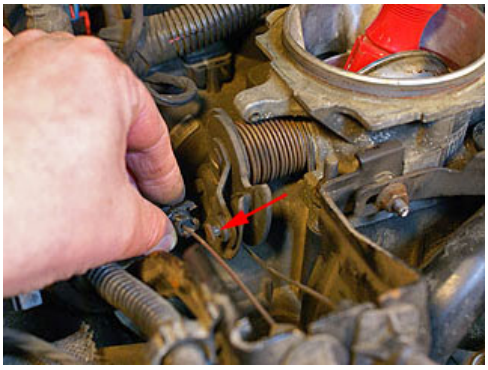
For more details, see Draining Coolant On A GMC Jimmy or Chevy Blazer.

**Removing The Intake Air Ducting:**

To reach the engine I removed the air ducting all the way to the air filter box.

For more details see Removing Air Ducting On A Blzaer/Jimmy

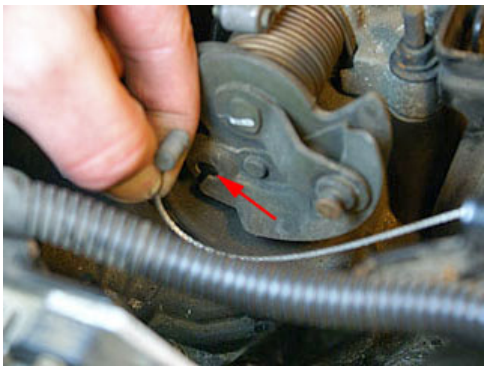
## Disconnecting The Throttle Cables:



I opened the throttle plate by hand and placed a screwdriver handle (that red thing, upper-right) in the throttle body to hold the plate open.

Then I grabbed the throttle cable connector and pushed it off the mounting peg (red arrow). I found it easiest if I turned the connector so the **cable pointed up**, then I could just **push straight down** to remove the connector clip.

Then I removed the cruise control cable by curling the wire and sliding the cable end **sideways** out of the hole in the metal bracket (arrow).



I removed the first throttle cable bracket. I used a 10mm socket to remove the two nuts.

Then I removed the second throttle cable bracket. There were 3 fasteners and they all required a 10mm socket.

I moved the throttle cables and brackets far out of the way.

I removed the upper radiator hose.

Read more details...

## Removing Electrical Connectors:

I removed several electrical connectors and moved the wire harness aside.

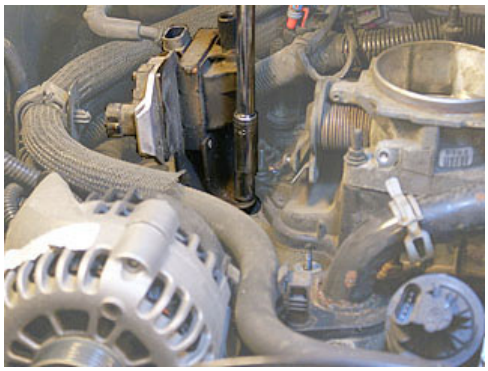
I removed four more electrical connectors (red arrows) that

were part of a thick wiring harness that runs across the engine.

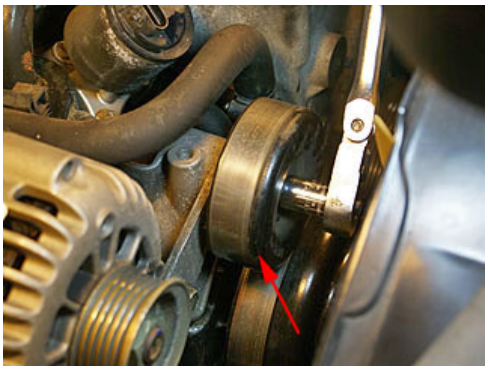
I removed the ignition wire at the ignition coil.

I just grabbed the boot firmly and pulled upwards.

I removed the ignition coil. This required removing two bolts with a 10mm socket.



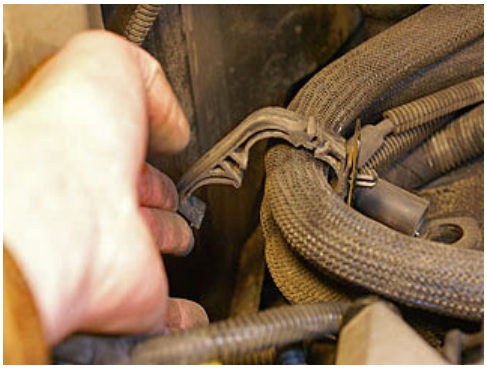
### Removing The Heater Hoses:



Using a 13mm short socket, I removed the **idler pulley** (red arrow). This is necessary so I can reach the heater hose connections.

I opened up this dual hose-holder with a small flat screwdriver.

GM uses several plastic brackets to secure hoses and wires, and these can be a pain-in-the-rear to open.



I removed the clamps at the firewall and then I pulled the hoses off.

I removed the front end of one heater hose where it connected to the water pump.

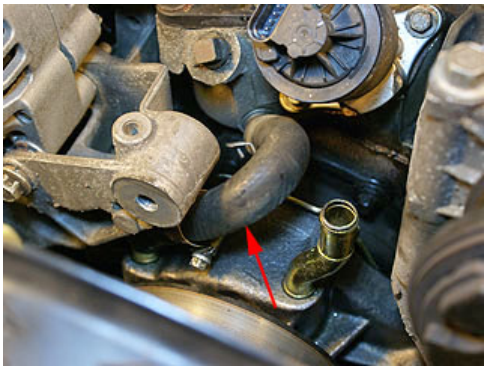
I removed the front end of the other heater hose. (I suspect this is the "return" hose).

**BUT...** Before doing this, I **disconnected the car's battery**. I realized that my pliers were very close to the alternator output wire, which is directly connected to the battery.

While there is only a small chance of creating a short circuit, I don't want any trouble. Besides, I'll clean up the battery terminals and apply some dielectric silicone grease to prevent corrosion. Corroded battery terminals are a common problem on GM trucks of this vintage, and it can prevent the truck from starting.

I also needed to remove this "crossover" hose (red arrow) that runs from the water pump to the intake manifold.

But... I did this later, after the alternator had been removed and the bracket moved forward, so I had more room to work.



**I removed the alternator.**

This involved removing the large wire, whose connector is hidden behind a rubber boot. The wire is fastened with a nut that require a 13mm socket or wrench to remove.

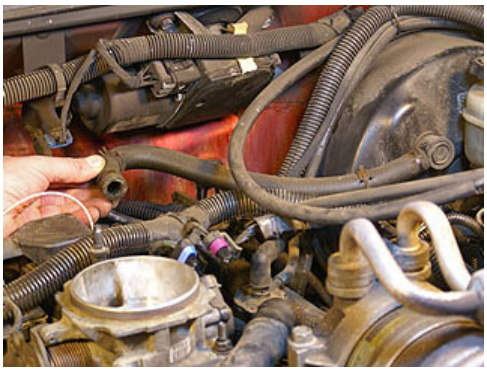
There is another wiring connector, which can be removed by lifting the release tab with a small screwdriver.

Then I removed 3 bolts using a 13mm socket. Once the bolts were removed I used a large pry bar to lift the alternator off the mounting bracket.

You can read more about removing this alternator in an article I wrote a few years ago.

I disconnected the vacuum hose that feeds the power brake booster.

While it may not be necessary to completely remove this hose, I did anyway because it gave me more room to work.



I unbolted the air conditioning compressor, using a 13mm socket and wrench.

I removed the air filter and placed the A/C compressor in the

air filter box. I didn't want it to fall and damage the hoses.

Read more about moving the A/C compressor aside.

**This should be obvious: DO NOT DISCONNECT ANY AIR CONDITIONING LINES.** That would cause the refrigerant to leak out, which would require professional service to refill.

## Moving The A/C Bracket:

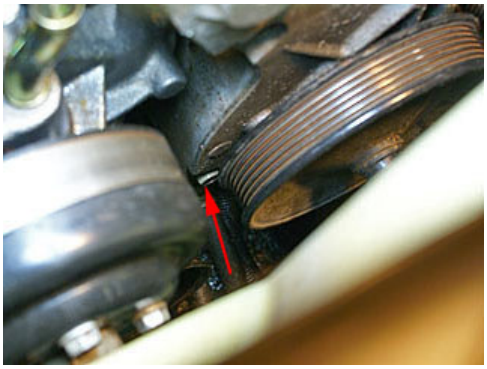
The air conditioning compressor bracket also needs to be unbolted and **moved forward** to get it out of the way. But the power steering pump is attached to this bracket, so the bracket cannot be completely removed without disconnecting hoses.

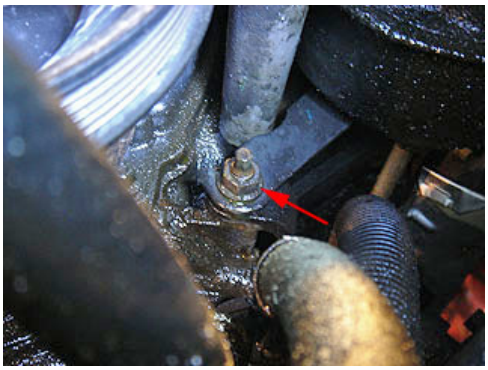
The arrows indicate the fasteners near the top... 2 bolts and a nut. These required a 14mm socket.

But... there was a **fourth bolt** way down low on the left side.

I was able to remove this bolt with a 14mm deep socket. The 3 bolts are all the same length, so I didn't need to keep track of which locations they came from.

But... the compressor bracket ***still*** couldn't be moved. Upon closer inspection I realized that the power steering pump was attached to a "hang hook", which appeared quite difficult to remove because the fasteners were so hard to reach.





This bolt connects the bottom of the hang hook to the engine. I was able to remove this with a 14mm deep socket and a 2-1/4" extension. I got underneath the car and placed the socket and extension on the nut, then I inserted the ratchet **from above** and loosened the nut.

By the way, there is a plastic splash guard under the front of the car, which I had removed before starting this job.

*(I colorized this picture to make it easier to understand. The red area is the power steering pump;, the green parts are the hang hook.)*

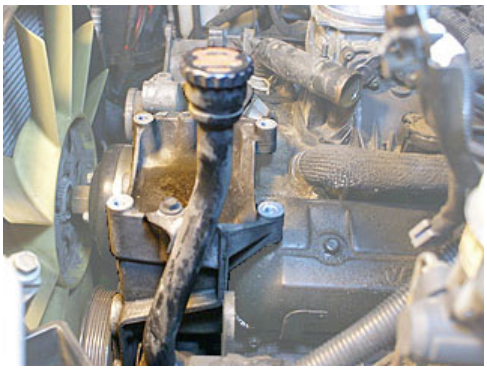
This other fastener (red arrow), which is a **stud with a nut**, also connects the hang hook to the engine, just a few inches higher up.

Removing this nut was a b-i-t-c-h. A 14mm **deep** socket was too long (the ratchet hit the steering column) and I when I put a 14mm **short** socket on my ratchet I couldn't engage the hex on the nut. I was about to go buy a set of "mid-length" sockets, but I tried something else. I placed the short socket on the nut, then I slipped the ratchet into the socket *part way*. I turned the ratchet and the nut came off. Whew!

The good news was... this engine has been leaking so much oil and coolant that both of these nuts had no corrosion, so they came off without a fight.

Finally, I was able to slide the A/C bracket forward.

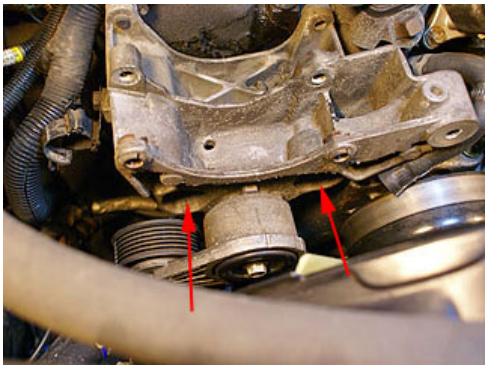
This picture shows the A/C bracket in the normal position...



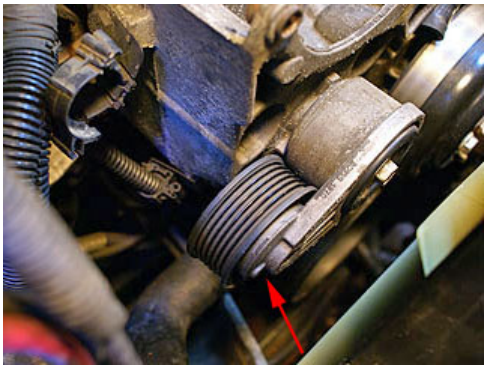
... and the bracket after being pulled forward about 2-3 inches. The movement is limited by the upper-most power steering hose. By making a slight U-bend in the hose I was able to bring the bracket forward as far as possible without sliding it off that long stud.

## Moving The Alternator Bracket:

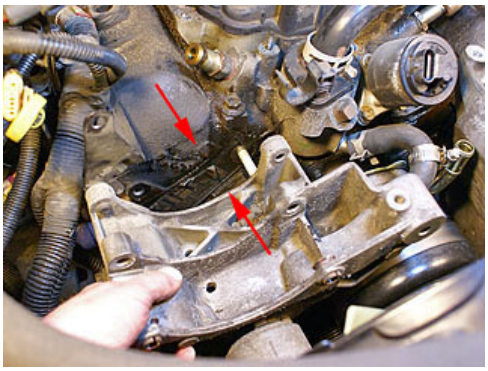
There are 3 fasteners on the alternator bracket: A bolt and nut near the top, and a bolt at the bottom left. All of these required a 14mm socket.



This photo shows the general location of the lower bolt (red arrow). It's below the serpentine belt tensioner, and it's not too hard to reach with a deep socket or a short extension.



First I ***loosened*** the lower bolt and upper nut. Then I used a 3/8" breaker bar (a ratchet would work fine) to rotate the serpentine belt tensioner **out of the way** of the upper left bolt. I removed the upper left bolt, then I released the tensioner and removed the other bolt and nut.



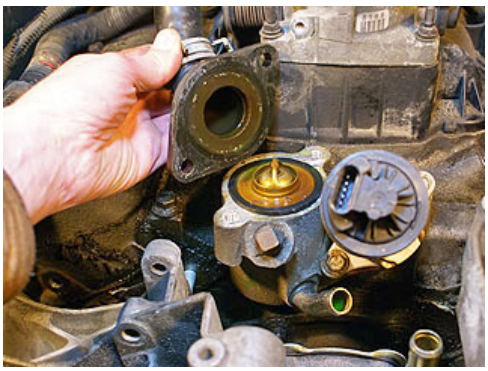
After the bolts and nut were removed, I slid the alternator bracket forward about 2 inches, which is indicated by the gap between the two arrows.

## Removing The Thermostat and Tube:

It is possible to replace the intake manifold gasket without removing the thermostat and this tube. But I decided to replace the thermostat because it only cost $9, and this part will eventually wear out.

This hose-holder clip just pulled off the threads of the stud.

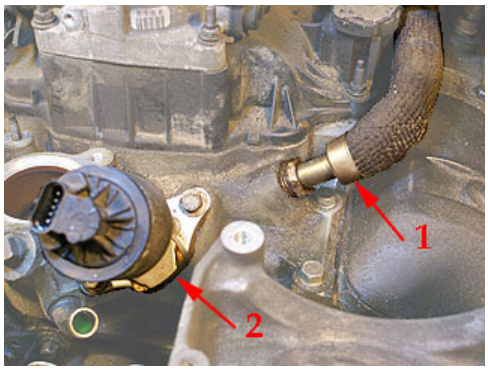
Then I removed the stud-bolts with a 13mm deep socket and extension.



I used a small prybar to break the thermostat housing free from the intake manifold. The thermostat sits in a recess in the manifold. The thermostat has its own rubber gasket, so there is no other gasket required.

## Disconnecting The EGR Tube:

I believe this tube (1) is the EGR (exhaust gas recirculation) tube, and the motor (2) controls the EGR valve which is buried inside the intake manifold.




I was able to loosen the tube fitting with a 22mm open-end wrench. A 7/8" wrench fit kinda sloppy, but it also turned the fitting.

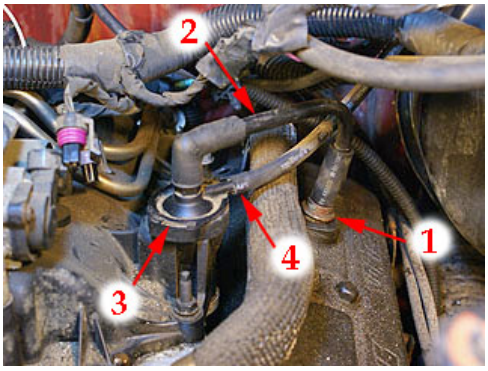
There was also a hold-down bracket on the EGR tube towards the back of the engine, which I removed. The upper arrow indicates the bolt for that bracket.

The lower arrow points to a metal bracket that supports some wires. I also removed this bracket. Note that the bolt **below** this bracket is for the upper intake manifold.

Also, directly in front of that hold-down bracket, there was a bracket that held the throttle cable. I removed that bracket too.

When I removed that back bracket, I was able to move the EGR tube a little farther to the right. Since the tube is metal, it's not very flexible, and I didn't want to kink it.

## Removing The PCV Valve:




These parts are used for the positive crankcase ventilation system.

**1**: The PCV valve. This should be changed periodically.

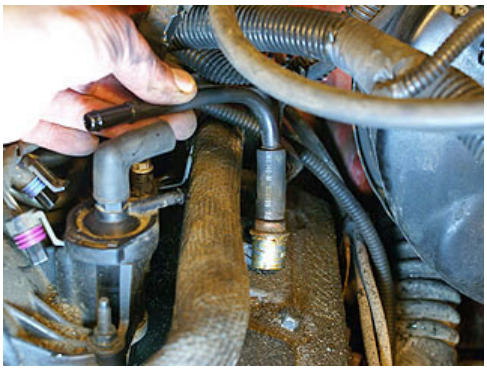
**2**: A tube that connects the PCV valve to the upper intake manifold. I disconnected this hose by pulling on it.

**3**: Plastic connector device that is mounted on the upper intake manifold. There is nothing special inside this device.

**4**: A vacuum hose that runs toward the firewall on the driver's side. I disconnected this hose and set it aside.

I disconnected the hoses and removed the PCV valve from the right-hand rocker cover.

The PCV valve just pulls out.



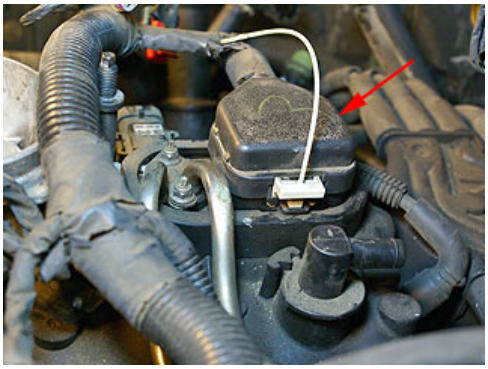
## Miscellaneous:

I tagged these small vacuum hoses (I think they are part of the evaporative emissions system) so I could remove them and get them out of my way. This may not be necessary.


I'm guessing that this device is the evaportive emissions purge solenoid that is mentioned in the Chilton's book.

I removed the pair of screws and moved it out of my way.

## Disconnecting The Fuel System Components:



This 1999 GMC Jimmy has Central Sequential Fuel Injection (CSFI), where the fuel injectors are buried inside the intake manifold. There is a large electrical connector (red arrow) that controls the fuel injectors

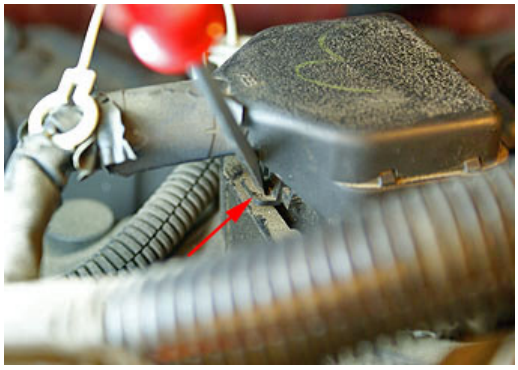
### Removing The Central Sequential Fuel Injection (CSFI) Electrical Connector:

First I pulled this white release "pin" upwards to remove it.

Then I used a small flat screwdriver to pull this "U"-shaped tab outwards.

There was another U-shaped tab on the other side of the connector, under the incoming wires. I pulled this outward with a screwdriver.

It was kinda tricky to keep these tabs from re-engaging. I pulled the connector upward after releasing the tab, so it wouldn't re-engage.

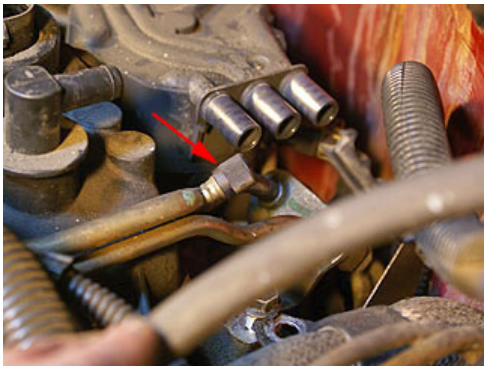


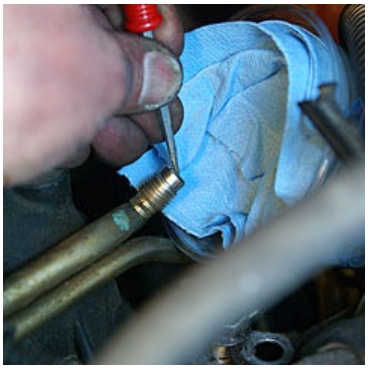
I grabbed the connector body and pulled upwards and it came out.

Notice how clean it is inside this connector. That's good.

## Removing Fuel Lines:

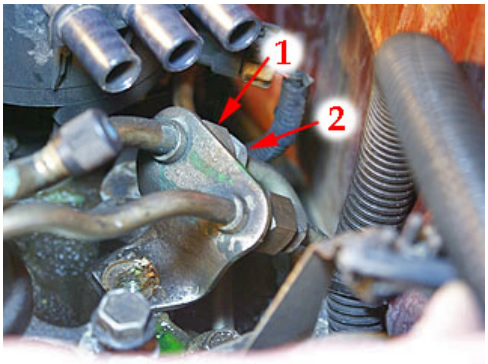
Under this cap is a **fuel system test port**, which is like a large tire valve.





First, I removed the fuel filler cap, to allow air to enter the system.

Then I placed a small plastic cup and a paper towel under the test port. I used a small flat screwdriver to push in the center pin. But... no fuel came out, which tells me that the pressure in the fuel system had gone away, possibly because of a leaking check valve at the fuel pump, or a leaking fuel injector.




This is the rear fuel line connection. The larger tube is the fuel supply line, and the smaller tube is the fuel return line that goes back to the tank.

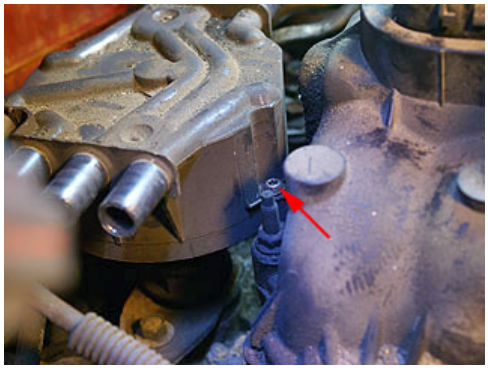
**1**: Female threaded connector. **These won't turn**... they are attached to the metal bracket. Holding these required a 19m wrench.

**2**: Male threaded tube fitting. Turning this fitting required a 16mm wrench.

But... I couldn't remove the fuel line connection with the distributor cap in the way.

So I removed the spark plug wires. Note that my numbering was wrong, but that doesn't matter as long as the wires go back in the same locations.

**Removing The Distributor Cap:**



The distributor cap is secured with two small **Torx**-drive screws. These required a **T20** bit. Each screw is located at the bottom of a notch in the cap.

I used a T20 bit on a 1/4" extension to remove these screws.

Once the screws were removed, I lifted the distributor cap off.

Note that this cap does not have "captured" screws that stay with the cap. These screws can be dropped easily. I used a telescopic magnet to pick the screws up after I loosened them.

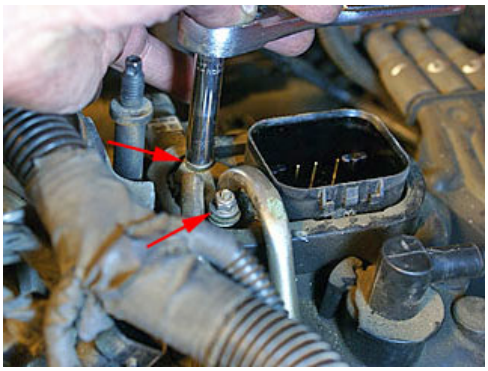
I used a 16mm open-end wrench on the fuel line connectors. I also held the larger nut with a 19mm open-end wrench, but I didn't show it in the picture because then you couldn't see a darn thing.

There was very little room to maneuver at the back of the engine, and I did not expect this to be easy. But, the fittings came loose without much effort.

I backed off the fuel line fittings until they were free, keeping a paper towel nearby to catch any spilled fuel.

Next I removed this bolt (arrow) that held the fuel lines at the back of the engine.

This required a 10mm socket.



Using an 8mm socket, I removed two nuts (red arrows) where the fuel lines enter the fuel injection unit.

Then when I pried on the fuel lines, they lifted out of the fuel injection unit.

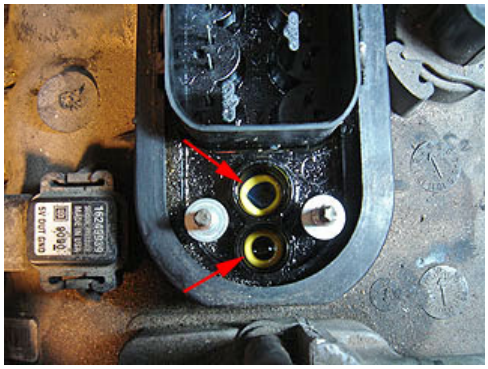
Be careful when prying on fuel lines... it's possible to puncture a line.

I lifted the fuel lines out.

But... before doing this, I **cleaned the area** around these tubes with a spray can of automotive brake parts cleaner and some Q-tips. There was a lot of dirt around this area, and if any of that grit gets into the fuel system it can ruin one or more fuel injectors.

Close-Up View, Looking Straight Down:

Note the yellow o-rings in each fuel connection (arrows). Underneath the yellow o-ring is a metal washer and a black o-ring. One set of these o-rings came out when I first removed the tubes.



## Removing The Upper Intake Manifold:

At this point the upper intake manifold and throttle body were ready to be removed.

I used a bungee cord to lift that big wiring harness out of the way.

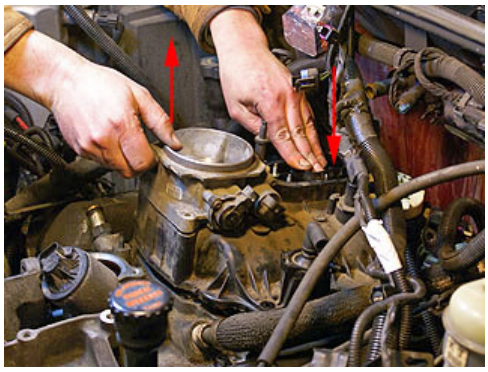
I used a 10mm deep socket to remove the bolts along the side of the upper intake manifold.

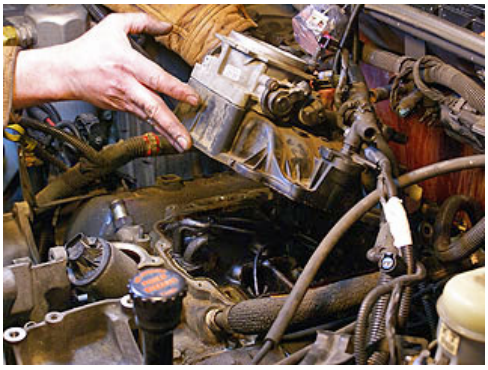
Two bolts had already been removed when I took off the purge valve.

There were two long bolts at the front of the throttle body, and two regular bolts at the rear of the upper intake manifold.

Once all the bolts were removed, the manifold was loose but it wouldn't lift up.

I pressed down on the fuel injection part while I lifted the front of the throttle body.





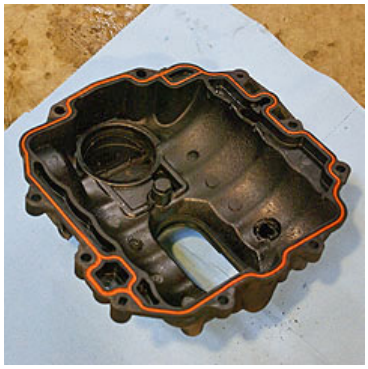
Then the upper intake manifold was completely free.

The view from the front. I was surprised at how dirty this was. I believe the black stuff is oily residue that is drawn

into the engine from the crankcase. I'm not sure if this stuff does any harm.

The bottom of the upper intake manifold, which is also called the *plenum*.

The orange line is a rubber gasket that sits in a deep groove in the manifold.

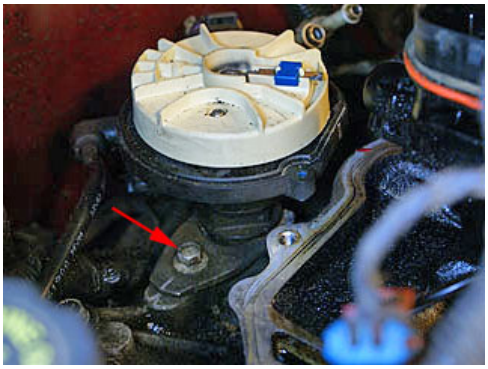


Top view.

I later learned that the throttle body could've been removed easily.

I used mineral spirits and a brush to clean the areas between the intake manifold and the cylinder heads. There was a lot of dirt and grit on the engine, and I didn't want this to get inside the engine when I removed the manifold.

## Removing The Distributor:



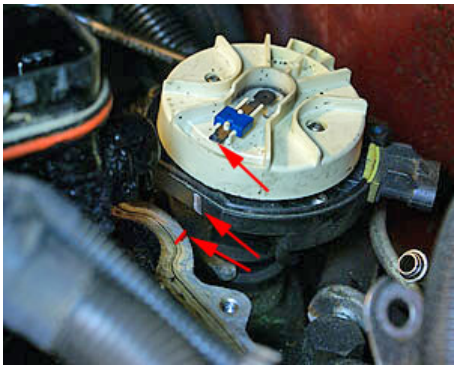
The distributor is held down with one bolt (red arrow).

However, reaching this bolt with a wrench can be very difficult. Some mechanics use a special tool called a "distributor wrench" which is basically an L-shaped wrench that can reach under the distributor. But I didn't have one.

There is an electrical connector on the back-right of the distributor, which I had unplugged earlier.

I made match marks on the distributor body (middle arrow) and on the intake manifold (lower arrow) to indicate the original rotor position when the distributor is replaced. (The upper arrow indicates the tip of the rotor.)

To make the mark on the distributor body, I used a silver-colored Sharpie marker. Other good marking methods are paint markers or White-Out correction fluid.



To make the match-mark on the lower intake manifold, I used a **red marker AND a scratch-awl**. It's important to make a decent scribe mark in the metal, because after the manifold is cleaned up with an abrasive disc the mark will be hard to see.

Using a **short** 10mm wrench, I was able to loosen the distributor hold-down bolt.

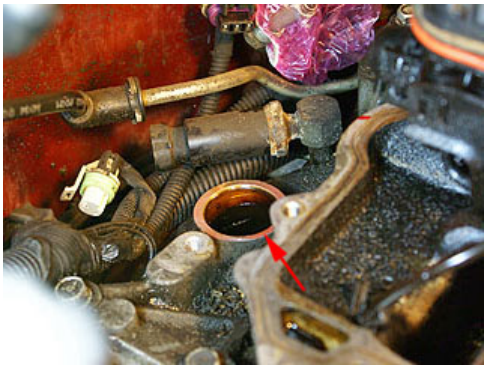
After I removed the bolt, I pulled the distributor straight up. The entire unit wanted to rotate as I lifted, which is normal.

The distributor after being removed.

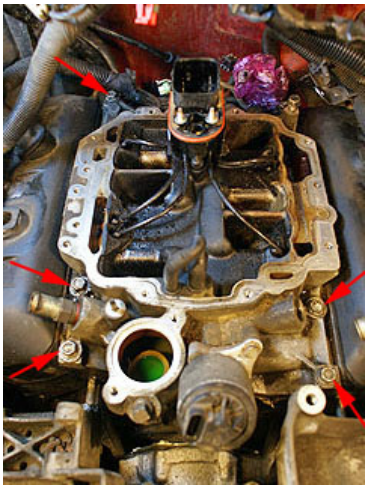
**IMPORTANT:** Resist all temptation to play with it and turn the shaft. Nothing good can come of it.

The distributor mounting hole.

Note that there is a fiber gasket between the distributor and the metal ring around this hole. The intake manifold gasket set that I bought included a new fiber washer, although the old one probably could've been re-used.



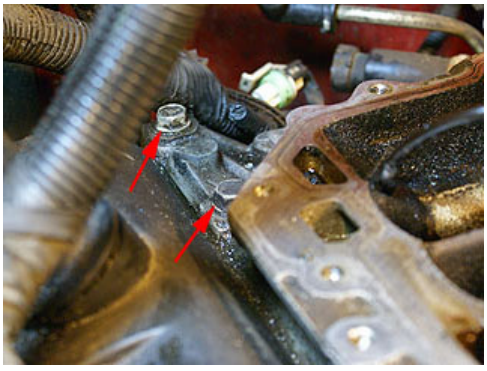
### Finally... Removing The Lower Intake Manifold:

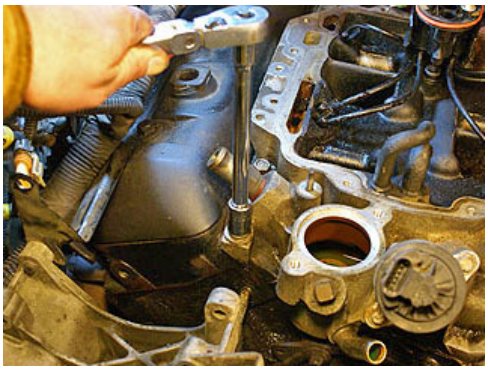


The lower intake manifold was ready to be removed.

There are 8 bolts to remove... 4 at the front, 4 at the back. I added red arrows to indicate all the bolts that are visible in this photo.

The two bolts (arrows) are at the back left side. There are two similar bolts on the right side, but it's difficult to take a picture of them.

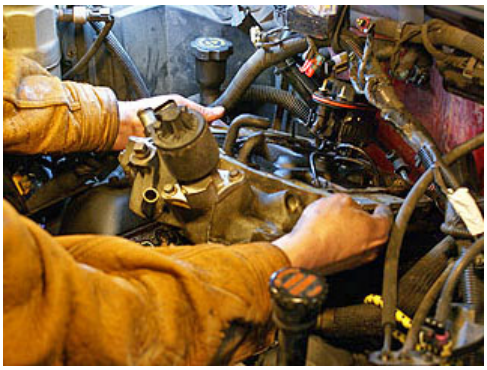


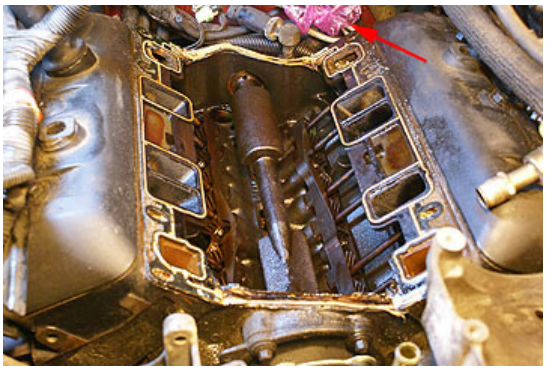


I removed the bolts with a 13mm socket, long extension and ratchet. First I **loosened each bolt** and then I removed them all.

I used a pry bar to loosen the intake manifold, by prying under the front of the manifold just above the timing chain housing.

Then I lifted the intake manifold off the engine.





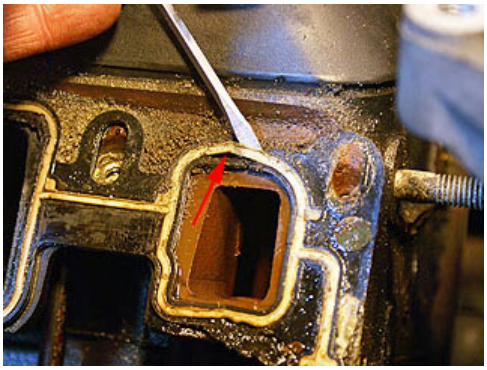
This is the engine with the lower intake manifold removed.

The red arrow points to a **plastic cover** (a Saran Bowl Cover, actually) that I placed over the open ends of the fuel lines. I needed to keep dirt out of the fuel lines because even the smallest piece of dirt could plug a fuel injector.

There were several **small puddles of antifreeze** in here, which must have been spilled as I lifted the manifold off. I used a paper towel to soak up any puddles of coolant, which can create problems when it mixes with engine oil. (Remember... this area is bathed with engine oil.) I'll change the oil after I'm done with this repair, just in case anything gets into the crankcase.

I found this bad spot in the intake manifold gasket at the **front right**. If I pushed on this spot it would move around... as though there was nothing behind it. This is adjacent to a coolant passageway. The coolant leak pictured at the beginning of this article was directly above this spot. I found the "smoking gun".

Directly across the "valley", there was another weak spot in the gasket over the front left cooling passage. When I touched the gasket, the hard plastic backing crumbled, creating a weak spot similar to the one in this picture. The left side was ready to start leaking too.



I've learned that the intake manifold gasket is made from a heavy piece of nylon with narrow beads of silicone on both sides.

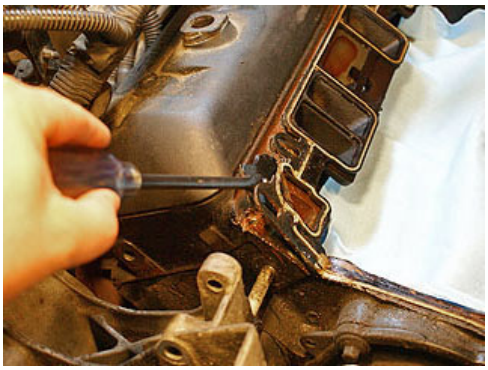
### Why Did This Leak Happen?

In the mid-1990's General Motors began using a new type of coolant called Dex-Cool. After a few years some vehicle owners started experiencing cooling system problems such as leaks at the water pump and gaskets. Dex-Cool has also been shown to cause a sludge buildup that can plug up the radiator, heater core and cooling passageways inside the engine. That last item can cause an engine to overheat and destroy itself.

I've read online that Dex-Cool has been accused of degrading the nylon middle layer in the intake manifold gaskets. When I removed the gaskets they broke around every cooling passageway.

Several years ago there was a class-action lawsuit filed against General Motors seeking monetary damages for owners of vehicles with problems caused by Dex-Cool antifreeze. It's too late to join the lawsuit, the filing deadline was in May 2008.

My wife's car has had regular green antifreeze since I've known her. The original Dex-Cool coolant was replaced by a previous owner. I guess I'm lucky that the car went 160,000 miles before developing this coolant leak.



I spent a few minutes with a shop vac and a small screwdriver to scrape off any dirt and suck it into the vacuum cleaner. I want to avoid getting too much grit in the crankcase.

I removed the gasket with a razor-type gasket scraper.

I also placed two **paper towels over the open area** of the engine, to keep loose debris from falling into the engine and blocking an oil passageway or gumming up the camshaft.

### Extra Deluxe Step:
### Replacing The Valve Cover Gaskets

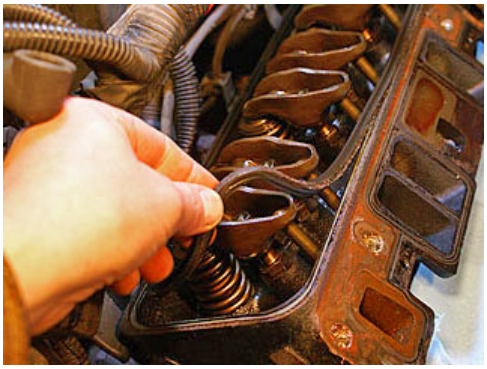
This engine had oil seeping down the front, back and sides, which I'm guessing leaked out around the valve covers. While I had the engine apart, I decided to replace the valve cover gaskets, which cost about $19 at my local CarQuest parts store.

I removed the 3 valve cover bolts with a 13mm socket.

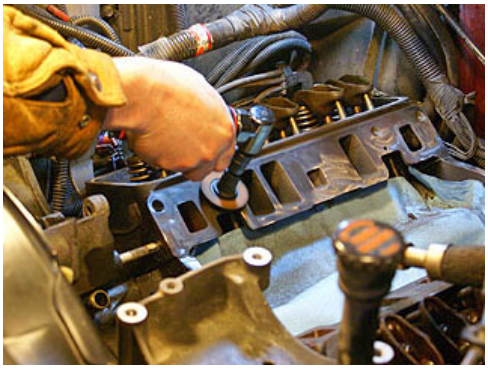

Then I lifted off the valve cover.

And I peeled up the gasket.

This rubber gasket fits into a groove in the valve cover.



## Cleaning Up The Mating Surfaces:



Before replacing the valve covers or the intake manifold, I cleaned up the mating surfaces with a die grinder and a 3M Roloc abrasive disc.

Clean surfaces are very important or the gasket may not seal properly.

I also cleaned out the bolt holes by sucking out the dirt with a shop vac. Then I used a Q-tip soaked in brake parts cleaner to wipe any dirt and oil from the threads.

There were some areas of the valve cover mating surfaces that I could not reach with the Roloc disc, so I cleaned them with a piece of 220 grit sandpaper wrapped around a small block of wood. Then I sanded the valve cover mating surfaces with 400 grit emery cloth and the wood block. I wiped the surfaces clean before installing the valve covers.

The valve cover gasket has a ridge on the top side which fits into a groove in the valve cover.

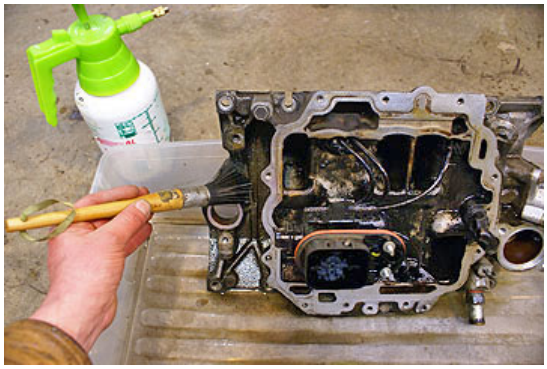
I pressed the new valve cover gasket into place.

I set the valve cover in place and installed the bolts with a 13mm socket.

The torque specification for these bolts is **106 inch-pounds**, which is less than 9 foot-pounds. That's not very tight, so don't overdo it.

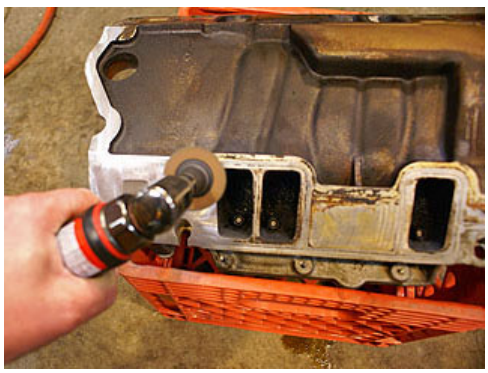
To help with cleaning these parts, I poured some mineral spirits (paint thinner) into a small **garden sprayer** that can be pressurized with a built-in hand pump.

I set the intake manifold in a large plastic bin and sprayed some mineral spirits all over it. Then I scrubbed it with a parts cleaning brush to get the dirt and oil off.

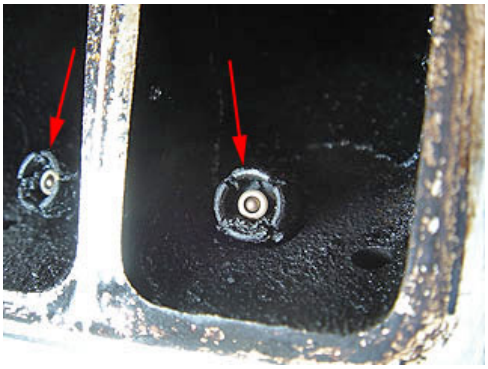


I set the intake manifold on a milk crate and used a die grinder with a Roloc disc to clean up the mating surfaces. First I did the top side.

I turned the intake manifold over and cleaned the mating surfaces on the underside. These are the critical surfaces that mate with the cylinder heads.

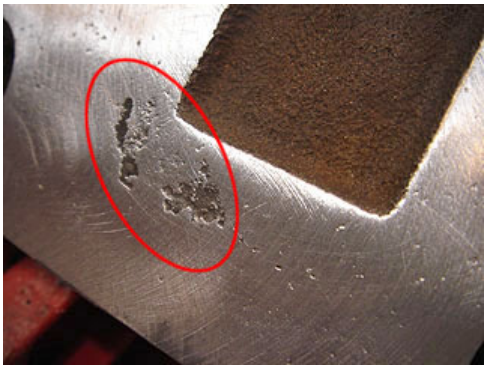


A close up view: These are the fuel injector nozzles. Be



careful with these... the cost almost a hundred bucks ***each***.

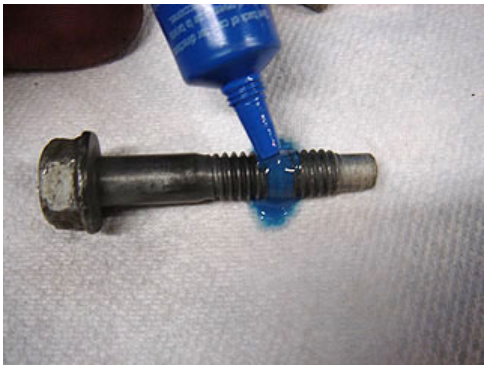
After cleaning the surfaces, I noticed some pitting around the cooling passages where the gasket meets the metal.



## Bolt Prep:

I cleaned up the intake manifold bolts on a wire wheel mounted to a bench grinder. There appeared to be some type of thread locking compound on the bolts.

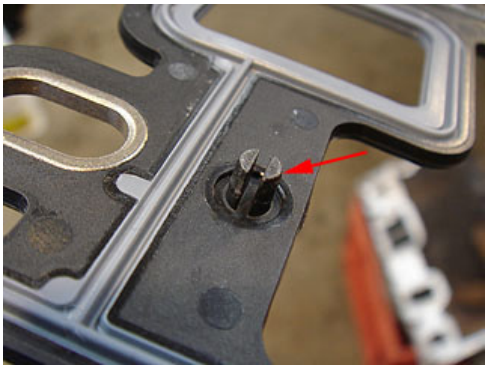
I applied some **medium-strength thread locking compound** to each bolt.



I smeared a **thin** layer of RTV silicone (which came with the new intake gaskets) over the pitted areas around the cooling passageways.

I did this on the cylinder heads (shown here) and also on the intake manifold.

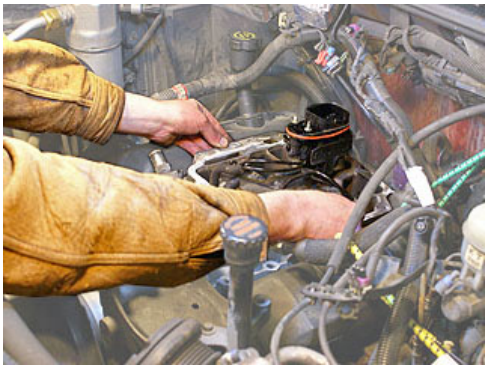
I installed the intake manifold gaskets on the cylinder heads. The gaskets are the same because the cylinder heads are the same.



There are a pair of small tabs on the back of the manifold gaskets. These tabs go into a pair of holes in the cylinder head, so the gaskets don't slide around during assembly.

I applied a bead of RTV silicone sealant to the front and back flat sections of the engine block.

I made sure to apply the sealant a bit thicker at the ends where the flat meets the cylinder head.



I set the intake manifold in place, making sure it wasn't too far forward or rearward.

I installed the bolts and tightened them with a 13mm socket and a 6" long extension.

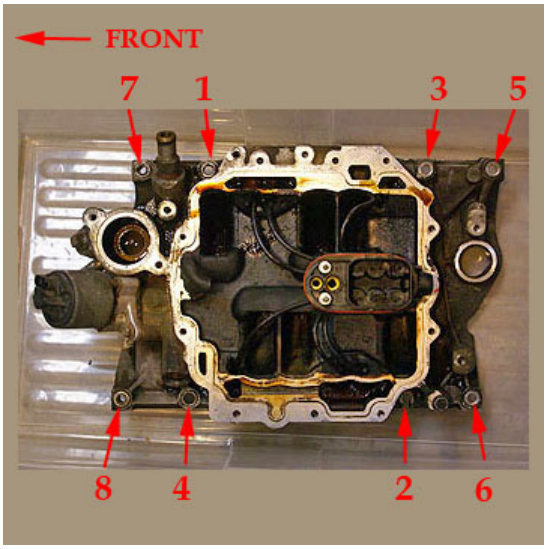
**Intake Manifold Bolt Tightening Sequence**
**1996 to 2000 4.3 V6 Engine:**

I marked up this photo of the manifold to show the bolt tightening sequence.

Basically, the center 4 bolts should be tightened in the usual cross-pattern, and then the end bolts are tightened.

**Torque: 1996-2000** model years: Tighten in three stages... 27 inch-pounds (about 2 ft-lbs), then 106 inch-lbs (about 9 ft-lbs), then **11** ft-lbs.

**1988 to 1995 V6 engines** have 12 bolts instead of 8. The tightening sequence is similar... from the center towards the ends in a criss-cross pattern. The torque requirement is 35 ft-lbs.




I'm told that 1996 to 2000 (and possibly later) small-block GM V8 engines use the same bolt pattern as this V6.

**Note:** Other engines (besides the 1996 and later 4.3 liter V6 and small-block V8) have more than 8 bolts and employ a different bolt tightening sequence. I recommend looking up the tightening sequence in a Chilton or Haynes book, or a dealer service manual. You might find these books at your local library, or maybe an auto parts store has a copy that has aleady been opened. Note that a book for GM full-size trucks may also cover many engine repairs for the Jimmy and Blazer.

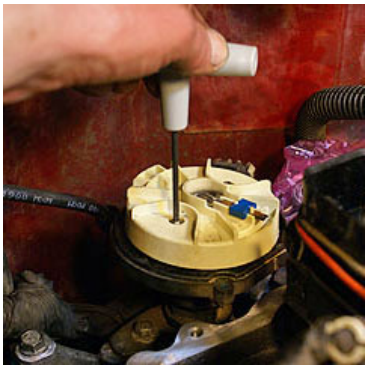
Once the manifold was in place, I **replaced the distributor.** The distributor body needs to rotate as the gears are engaged, so the distributor needs to be inserted with the match-marks turned about 30 degrees counter-clockwise from the original position. Be careful not to turn the distributor shaft.

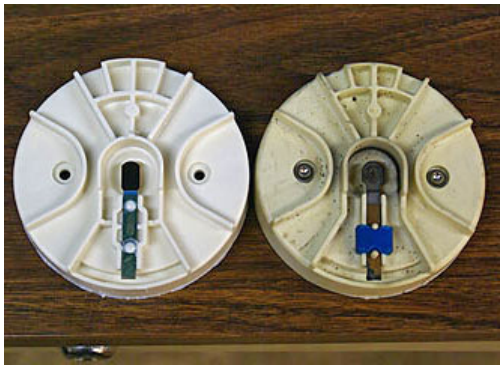
If the distributor rotor is not returned to it's original position the car will not start or it will run badly. Also make sure that the engine is not turned over while the distributor is out of the engine, or the proper distributor position may be difficult to figure out.

**Note:** I replaced the fiber gasket that goes between the distributor and the intake manifold. To keep the gasket in place during assembly, I applied a small amount of Permatex Hi-Tack Gasket Adhesive to the upper side of the gasket.

## Replacing The Distributor Cap And Rotor:

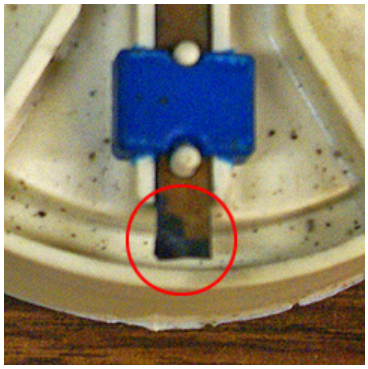
I removed the old distributor rotor with a T15 Torx screwdriver.





Compare the old and new rotors.

An old, worn out and corroded rotor can cause a weak spark, which can result in poor fuel economy. Maybe we'll get better mileage after this.



Notice the corrosion on the tip of the metal on the old rotor. This is typical. I believe this is the first time the rotor has been replaced in 9 years and 160,000 miles.

It's sometimes possible to clean up the rotor tip with emery cloth, but this rotor was badly corroded and worn.

I spent 13 bucks and replaced the rotor.

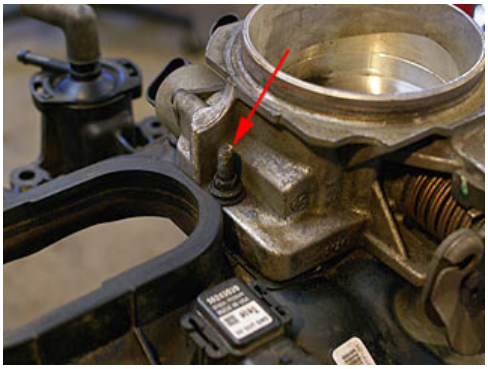
I later replaced the distributor cap, which was rather expensive at $33. It's quite difficult to clean the corrosion from each terminal on the inside of a distributor cap, so replacing makes more sense. Besides, a distributor cap often gets small "cracks" or lines in the plastic where dust collects, and these cracks create conductive paths to ground which reduces the energy going to the spark plugs.

### Installing The Upper Intake Manifold:

I cleaned up the upper intake manifold with mineral spirits and a brush. I also used carburator cleaner to clean the deposits from around the throttle plate.

Note that the gasket is still in place. I removed it before the final cleaning. Then I carefully wiped the gasket groove clean.

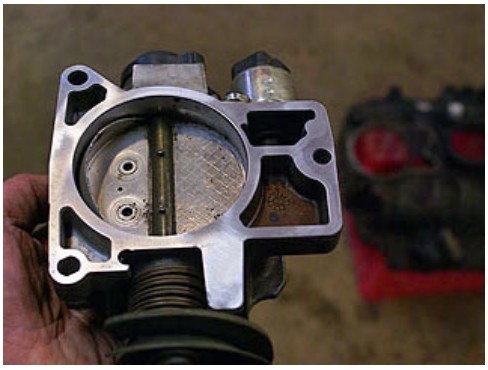
I discovered that the throttle body can be easily removed from the upper intake manifold. I removed the post with a 7/32" socket and a 1/4" drive ratchet.



After the post was removed, there was a nut below it.

Directly below the nut was a large hex head. I held this with a 15mm box-end wrench and removed the nut above, which required an 8mm deep socket.

DO NOT try turning the 15mm hex head screw. It's molded into the plastic.



After removing the throttle body, I cleaned the bottom surface with a Roloc disc on a die grinder.

Then I removed the throttle body gasket with a hook tool.

I cleaned out the gasket groove and installed the new gasket.

Then I installed that **post** that secures the rear of the throttle body. I put some blue thread locker on the bolt threads, about a third of the way from the end.

I installed the new gasket on the bottom of the upper intake manifold.

I also replaced this o-ring around the central fuel injection area.

(The upper intake manifold gasket set came with a replacement for this o-ring and the throttle body gasket.)

Installing the upper intake manifold was not as straightforward as you would think. The manifold "hung up" on the central fuel injection unit. (It did the same during removal.) When I set the manifold in place, it was resting on the injection unit but there was a 1/4" gap between the upper and lower manifolds.

So I started all of the bolts, which meant I had to re-install the purge valve. I hand-tightened each bolt a few turns, then kept repeating the process until the upper manifold was drawn down to the lower manifold.

Then I tightened all the bolts with a 10mm deep socket and a 3" extension. I tightened the bolts in a criss-cross pattern, starting in the middle. These bolts are supposed to be tightened to **88 inch-pounds**, (which is just over 7 foot-pounds) so take it easy.

Once the upper intake manifold was installed, I **installed the fuel lines**. These were a b-i-t-c-h to install. Some tips:

- Make sure the black and yellow o-rings (and washer) are carefully placed in the holes in the fuel injection unit.
- Pour a small amount of gasoline in those holes to lubricate the fule pipes. Without lubrication the pipes don't want to go in easily.
- Insert the fuel lines into the fuel injection unit while making sure the other end is aligning with the fuel lines next to the firewall. Install the metal keeper-plate and thread the nuts part way.
- At the firewall, try threading the tubing nuts into their fittings. Make sure the tube ends are **pushed into** the female fittings, or else the tubing nuts will be difficult to thread into the female fittings.
- If the nuts won't thread, try installing the hold-down bolt to secure the bracket to the intake manifold.
- Tighten the tube fittings with a short 16mm wrench. It's a good idea to hold the female-threaded fitting with a short 19mm or 3/4" open-end wrench.
- Finally, tighten the small nuts at the fuel injection unit (8mm) and the bracket hold-down bolt (10mm).

## Re-Assembly Procedure:

- I replaced the distributor cap with a new one. This required a Torx T20 screwdriver.
- I reconnected the spark plug wires (after installing new wires).
- I plugged in the big connector for the CSFI (fuel injection) unit.
- I reconnected several connectors in the same area: Purge valve, throttle position sensor, idle air control, and a sensor on the top left of the upper manifold (my guess is that it's manifold vacuum sensor).
- I installed the EGR tube with a 22mm open-end wrench.
- I replaced the PCV valve and tube.
- I installed the rear bracket that supports the throttle cable. I wanted to be sure the hose and cable routing was going to work.
- I replaced the power brake vacuum hose.
- I replaced the thermostat (with a new one) and installed the thermostat tube that leads to the upper radiator hose. This required a 13mm deep socket.
- I installed the alternator bracket, which required a 14mm socket.
- I installed the air conditioning compressor bracket with a 14mm socket.
- I installed the alternator and reconnected it. 13mm sockets were used.
- I installed the A/C compressor with a 13mm socket.
- I installed the ignition module and connected the wires. I could have done this much earlier.
- I installed the heater hoses.
- I installed the upper radiator hose.
- I iinstalled the idler pulley with a 13mm socket.
- I installed the throttle cables.
- I reconnected the battery (positive cable first, then negative).
- I refilled the cooling system.

Then I turned the key and the car started up. Wahoo!

After running the car for just a few minutes, **I changed the oil** because I'm certain that some debris got into the crankcase while the intake manifold was off.

So far there have been no major leaks. I did have a minor leak where one of the heater hoses connects to the firewall, but that stopped after a couple of days.

"Burping" the air from the cooling system took a while. Normally I just drive the car for a few minutes with the radiator cap in the first position, which means the cap is on but it doesn't seal completely and the cooling system will not pressurize. Usually any air trapped in the cooling system will work it's way out, but only if the thermostat opens. In cold weather the thermostat may not open right away. Running the defroster helps the engine run hotter because the air conditioning runs (to dry out the air) and the engine works a little harder.

### A Peculiar Problem:

After I put the car back together and changed the oil, I noticed two problems. First, the heater would only blow air through the dashboard ducts... it wouldn't switch to blowing air to the floor or windsheild or anything.

Second, the Jimmy wouldn't shift into 4 wheel drive (it has that push-button 4wd system).

When I was re-connecting the small vacuum hoses, I found an open hose and I couldn't figure out what it connected to. The hose is just in front of the firewall, up high, next to the driver's side fender. I looked all over the place for a vacuum hose connection, using an inspection mirror to see underneath and behind things, and I still haven't found a place for this hose.

But I stuffed a 1/4" bolt in the end of the open vacuum hose to plug it, and suddenly the heater worked properly and the 4 wheel drive worked again.

Vacuum leaks can cause all sorts of odd problems.

## Cost Of This Repair:

**I spent about $50** (plus sales tax) on the necessary gaskets for this project. After buying the valve cover gaskets, a new thermostat, distributor cap and rotor, my total cost came to under $130. I've had the new PCV valve and spark plug wires hanging around my shop for quite a while... I forget what they cost.

An independent auto repair shop quoted me a price of $350 for labor (4.5 hours at $78 per hour) and $120 for parts. And that didn't include any of the extra parts that I replaced. It took me at least 16 hours for this job, over a period of several days. I worked slowly and carefully, because that's how I work when I'm doing a repair for the first time. I put the car together in less than **half the time** I took to dismantle it.

I figure I saved about $400 doing this repair myself, even more if I included the cost of replacing the distributor cap, rotor, spark plug wires, PCV valve and thermostat.

## More Info:

**Tools Used:**

- Ratchets, 3/8", 1/4"
- Extensions, Assorted
- Sockets, Short: 10mm, 13mm, 14mm
- Sockets, Short: 7/32", 5/16"
- Sockets, Deep: 10mm, 13mm, 14mm
- Wrenches: 5/16", Short 10mm, 13mm, 14mm, 16mm, 19mm, 22mm
- Flat Screwdrivers, Small
- Torx Screwdrivers: T15, T20
- Right Angle Die Grinder with Roloc Disc
- Air Compresor
- Air Blow Gun
- Curved Hook Tool
- Bench Grinder with Wire Wheel
- Plastic Dishpan
- Shallow Plastic Container (For Cleaning Parts)
- Funnel

**Materials Used:**

- Lower Intake Manfold Gasket Set, Carquest Part No. GSK MS16168, $24
- Upper Intake Manifold (Plenum) Gasket Set, Carquest Part No. GSK MS14803, $25
- Valve Cover Gasket Set, *(Optional)* Carquest Part No. GSK VS50211, $19
- Thermostat ($9) *(Optional)*
- Distributor Cap ($33) *(Optional)*
- Rotor ($13) *(Optional)*
- Spark Plug Wires *(Optional)*
- PCV Valve *(Optional)*
- Medium-Strength Thread-Locker
- Automotive Brake Parts Cleaner
- Paint Thinner (Mineral Spirits)
- Paper Towels

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Written January 9, 2009
Revised January 24, 2012