

Desmogging a 3F-E

By Dan Moeller a.k.a. Spook50

Note: This was done on an FJ62's engine. An FJ80's 3F-E should be the same, but I can't guarantee it.

Desmogging an engine is somewhat of a controversial issue. According to federal pollution control laws, this is **ILLEGAL**. As a disclaimer, I must express that tampering with smog control systems (with the exception of actually maintaining the system) on pollution controlled vehicles is a violation of federal laws and punishment is subject to the laws governing your area. Also, the purpose of this writeup is to illustrate how I desmogged my vehicle, and to provide tips to anyone looking to do the same. Any modification to your vehicle as a result of this writeup is at **YOUR OWN** risk and/or expense. In other words, I'm not going to buy you a new engine if you fuck it up; nor will I claim any responsibility if you get into any legal trouble as a result of desmogging..

Now that all that is out of the way, let's get started. There are a lot of issues concerning desmogging an engine. These range from the legal ramifications, to whether or not it's simply worth the work involved. Desmogging an engine will help free up a small amount of horsepower, though the amount of horsepower varies from engine to engine. On a 3F-E, the gain is minimal. I could feel a slight increase in overall performance, and low end torque was slightly improved. Obviously, this in no way, shape, or form will make your engine hold its own against the likes of a 426 HEMI. The biggest benefit to desmogging the 3F-E in our Cruisers is the massive amount of real-estate you'll free up under the hood.

Now for the cons. First of all, it's a rather involving task. I did all the extra stuff that, while not crucial to the desmogging process, cleaned up the engine compartment greatly, and put the engine that much closer to what a "factory smog-free" 3F-E might have been. It's also somewhat costly. There were several miscellaneous parts to buy in the process (one of which needed to be custom made.) of desmogging. A parts list follows.

- Seven 1/8" vacuum plugs.
- "HELP!" brand # 02254 bypass caps
- Dayco Part # 22528 belt.
- Toyota EGR intake manifold gasket. May need to be ordered.
- Four Toyota part # 90340-14001 plugs. Some like to use 1/4 NPT plugs, but the Toyota parts are made just for what we're doing, so I opted for those.
- High temp thread sealer
- Catalytic converter straight pipes. These can be either welded on or custom made as bolt-on. It cost me \$90 to get my pipes, do to having them bolt-on. Having them welded in place will most likely be much cheaper (but irreversible).
- Intake manifold EGR block-off plate. This is custom cut to match the EGR gasket. I had mine cut from 1/8" stainless steel, which cost about \$65 and took a few days, so get this done early on.
- Exhaust manifold EGR plug. Lowes carries both a single cast plug and a brass fitting that will fit the exhaust manifold. I opted for the brass fitting with a small

plug to fit that, as both were NPT spec; and brass, being a softer metal, will form a positive seal against the manifold's threads. The part #s are A-870 for the fitting and A-823 for the plug. Plumbing section of course.

There are basically three major steps to desmogging a 3F-E. I'll break this down into three sections so I can more easily explain what I did.

Section 1 – Remove catalytic converters

This was the first thing I did to desmog my truck. It will allow your exhaust to breathe much better, and the reduced backpressure will NOT interfere with the operation of your engine or its ECU. I wanted something that I could reverse if need be, as I wasn't sure if I'd end up having to replace the cats in the future. As it turns out, my '88 FJ62 will be old enough to not require smog checks by the time I'm a civilian again and living in a smog controlled area. If you want a guaranteed seal where the cats are removed, you can simply weld new pipes in place. My flanges like to leak around the gaskets occasionally, and I'm now wishing I had gotten them welded. Having the pipes made a big difference in the amount of power my truck had on the highway, and it sounds a lot better too (with a Flowmaster 50 series muffler and 2.5" pipe from the Y-pipe back).

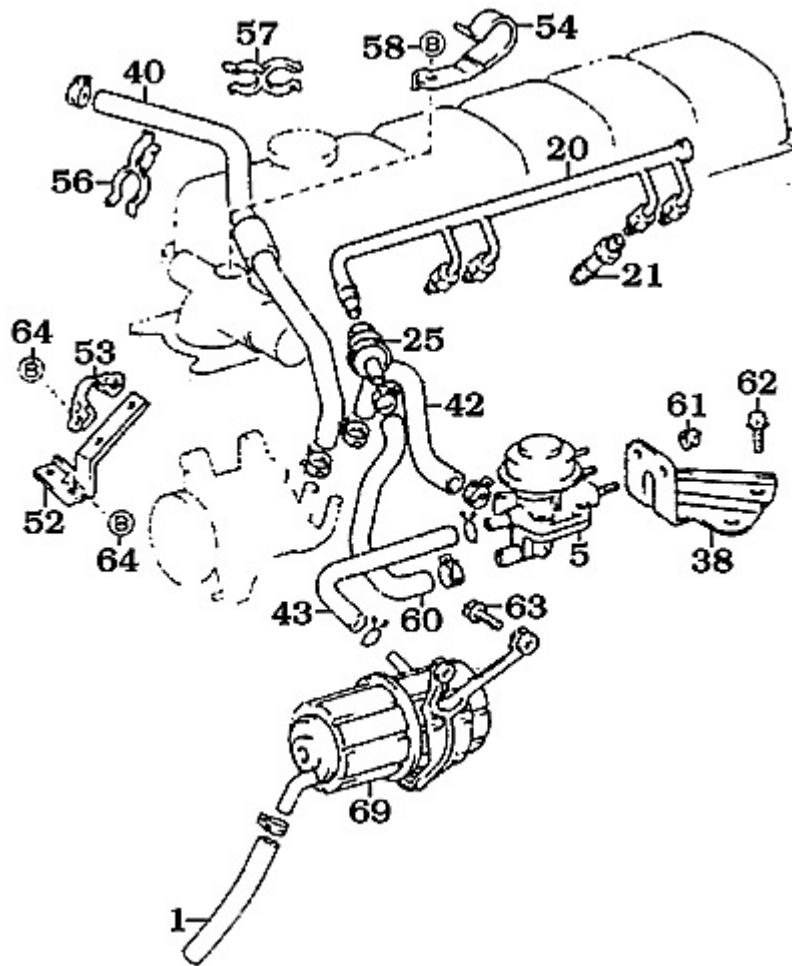
I highly recommend finding a small performance exhaust shop local to your area that you can go to. Larger shops like Midas or ones that do work for any fleet company will most likely not do this for you (again, federal pollution control, and they are watched for just such jobs). Be ready to pay with cash, too. This keeps it under the table and keeps both of you out of trouble in case some tree hugger gets nosy.



Bolt-on cat replacements to free up the exhaust. If you want the most free-flow system you can get for a 3F-E, you can buy headers and larger downpipes leading to the forward cat flanges. This is not an endorsement, but Man-A-Fre sells both. Be warned: it's costly, and the effectiveness of 3F-E headers is often debated.

Section 2 – Disable & remove air injection system

Here's where it's going to start getting tricky. I've included some pics to help out a bit. First, look at your air pump. You'll notice that there are two hoses connected to it. One leading to the union between the air filter housing and the MAF, and the other leading to the VSV (part # 5 in the pic).



Use this pic for part references

Remove these hoses and leave the air pump alone for now. Cap the fitting on the air filter housing. I couldn't find a perfect sized cap, but the "HELP!" bypass cap worked well enough. Took a little work to get it on there, but at least I know it's a nice tight seal that won't come loose anytime soon. Remove the silencer mounted just forward of the fender (part # 69 in the pic) and cap its hose connection on the VSV as well. At this point, you can continue on to the removal of the VSV, or simply cap the VSV's hose connection for the time being. I recommend doing that for now, as that's what I ended up doing, and it gave the ECU a chance to "learn" that the air pump isn't pulling air out of the intake anymore. The first two or three times you start and run your engine, it'll idle high (about 1000 RPM). I drove it several times, each over 15 minute drives to allow the ECU's programming to change. You'll have to do this every time you disconnect your battery for extended periods of time also, as the ECU by default expects the air pump to be there.

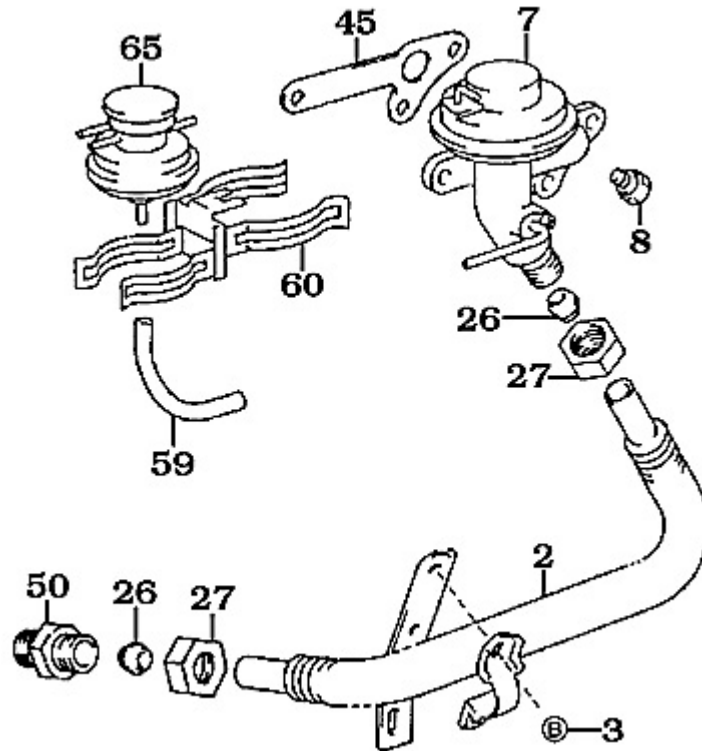
Now, before tackling all the crap mounted on the fender (yes, all of it will be gone by the time you're done), remove the air pump and replace its belt with your Dayco belt. This new belt will bypass both the air pump and the alternator, and it'll be necessary to adjust the idler pulley underneath the power steering pump quite a bit, which is a pain.

Now to remove the VSV and air injection manifold and injectors. Removing the air injection manifold (part # 20 in the pic; injectors are #21 and there will be four of them) isn't really necessary, but odds are that the large check valve (part # 25 in the pic) on it is bad and you'll be leaking exhaust like crazy once you disconnect it from the VSV. Disconnect the hose between it and the VSV, remove the VSV assembly and cap the vacuum line fittings on the vacuum solenoids that lead to it. Now, to remove the air injection manifold I found it helped quite a bit to remove the valve cover from the cylinder head. This let me get a wrench in there (you'll be reaching between the intake manifold runners) to get at the air injectors. Get some carb cleaner or similar solvent and spray around the air injectors so as to avoid getting contaminants into the cylinder head when you remove them. Undo all four air injectors and pull the manifold out. It's a pain to get at, and VERY flimsy, so you'll likely damage it during the removal process. If you don't plan to "re-smog" your truck, don't worry about it and just yank it out. Here's where those plugs come in. Apply a small amount of your thread sealer and install the plugs with an allen wrench.

Next, to remove the vacuum solenoid assembly from the fender, first disconnect the electrical connectors from it, then disconnect the vacuum lines leading to the hard lines on the intake manifold. Cap the hard lines and now you can remove the solenoid assembly from the fender.

Section 3 – Disable & remove EGR system

This made a HUGE improvement in how smoothly my engine ran and how well it started up. Idle was greatly improved and my highway power seems to have improved a decent amount since I did this. I also noticed no change in overall mileage.



Use this pic for part references

It's a very wise choice to start spraying the EGR union (part # 50 in the pic) with Kroil or PB Blaster several times daily a week or two before beginning. Mine was stuck good to the exhaust manifold, and along with daily soakings with PB Blaster, I still needed an impact wrench set to its highest torque value to get the union out. It's a bear of a task, so be ready for some grunting and bloody knuckles. Make sure you have your intake manifold EGR gasket, NPT union and plug, and block-off plate ready when you tackle this. The EGR system comes off as somewhat of a complex assembly, so be prepared.



The entire EGR assembly removed from my truck. That black tube that extended into my intake manifold was very thickly caked with nastiness.

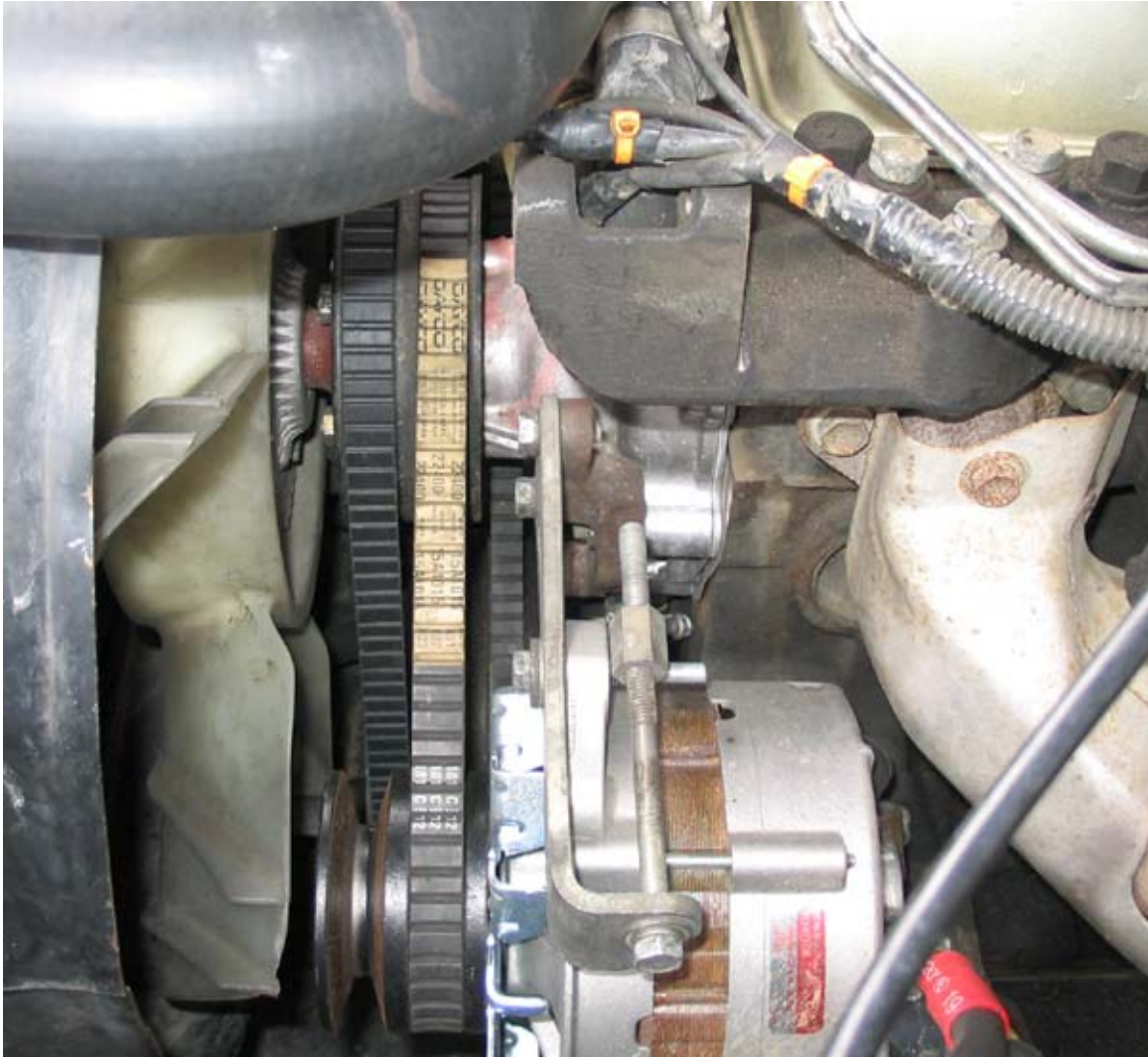
First, disconnect the vacuum hoses leading to the two large valves and cap the hard lines leading to the intake manifold and thermostat housing. Now unbolt the EGR tube's support bracket from the exhaust manifold and undo the large bolt that secures the EGR line to the union. Next, unbolt the assembly (there are three bolts) on the intake manifold and pull the assembly away. It extends quite a ways into the manifold, which I thought was interesting. Look at all the crap built up on it. Makes you wonder what the insides of your intake manifold and cylinder head look like, doesn't it? Attach the gasket and block-off plate to where the system went into the manifold. Now, using whatever method you can to break it loose, remove the EGR union from the exhaust manifold. It seems to be made from some pretty stout steel, so it shouldn't break on you. Once that's out, insert your brass plug and tighten it down (not all the way. Remember, NPT threads are tapered, so it'll stick out a little ways) enough to form a seal. Now double check for any uncapped vacuum lines and make sure all your caps and plugs are snug. That does it. You've successfully desmogged your 3F-E engine. Take it for a drive and see if you can feel any difference in power or smoothness. Notice that you have much more room you have in your engine compartment now, too. Time for that dual battery setup, perhaps? I've included a few pics of my desmogged engine so that you can get an idea of how much space you free up before starting this project.



Intake manifold EGR gasket and stainless steel block-off plate. Plate can be easily cut to match the gasket by a local sheet metal shop. Obviously the laser etching isn't necessary, but it does add a nice finishing touch.



My intake manifold sans air injection manifold. Doesn't free up space per se, but it does make the engine look much less cluttered, and most importantly, eliminates the possibility of exhaust leaking into your engine compartment.



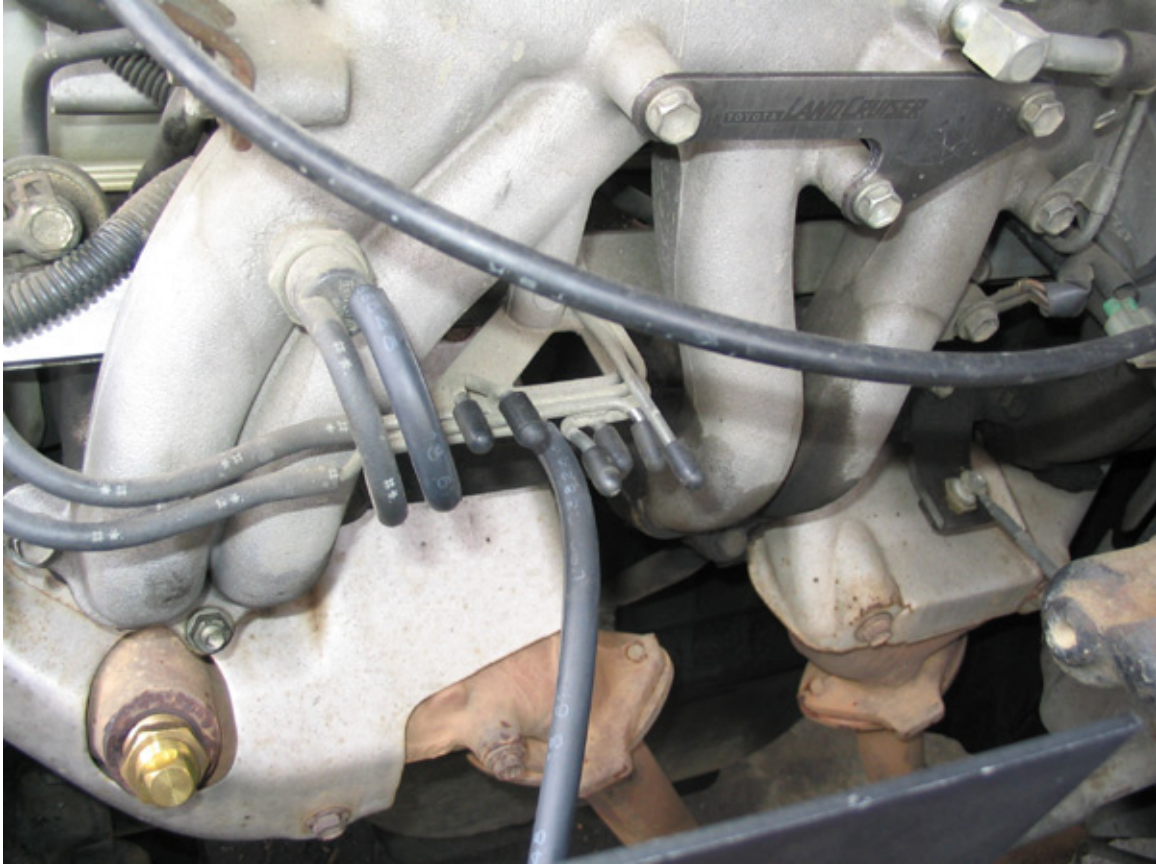
Air pump removed and new belt installed (the forward belt). I'd like to get a bracket designed that would allow installation of a York compressor in its place, but that's low on my current list of priorities.



Fender space freed up (and used) after removal of the solenoid assembly and VSV. I saved the flat bracket and mounted my ignition mount/heat shield to that. The cylindrical part you see just forward of the ignition is the actuator for my cruise control.



Space enough for a battery! The coolant bottle will be replaced with a tubular bottle from Be Cool because my ignition mount sits just slightly too far forward to move the stock bottle far enough back.



EGR system completely removed and hard vacuum lines capped. Also, there is a hose coming from one of the hard lines that would normally be capped, but this goes to my cruise control, and many FJ62s do not have this. It's an aftermarket (Dana I believe) kit that the first owner had installed.