

How to Desmog an FJ60

This document tries to describe how to desmog an FJ60 2F engine while keeping the HAC, HIC, HAI, PCV, EVAP, AC idle up and deceleration fuel cut systems operational (see the Notes section for descriptions of these systems from the FSM). These instructions are for a vehicle running a stock carburetor, so things will be different if you have anything else.

Included here is (i) a **Parts List**, (ii) a **Task List** and (iii) detailed information about **Vacuum Line Routing** including pictures where each port is labeled for reference. There's also a **Reference Material** section including the original diagrams from JimC (you're HIGHLY encouraged to study these diagrams until you understand them), and a set of excellent and very useful photos posted by mwebfj60 in the thread "[My Desmog Keeping HAC Lots of Pics](#)".

The **Parts List** should be viewed as something that you can change if you want to approach things differently. There might be better parts/tools for doing a certain thing, so if you see a better way of doing something and are comfortable with it then go for it. Just recognize that, for the most part, you'll need to have some solution for the issue that each part is intended to address.

The **Task List** is a list of the things that need to be done, in the rough order in which to do them. Think of it more like a check list.

The **Vacuum Line Routing** section is pretty detailed. This seems like the most confusing part and I wanted to be sure it was accurate before tearing into everything and starting to chuck parts in the trash.

Nearly all of this information and plan was compiled from reading (and re-reading) "[My Desmog Thread](#)" started by mud user fowldarr in November 2007, and as of April 2011 there were 38 pages and 750 posts. The thread has a ton of useful information in it, but is pretty scattered. This doc grew out of trying to organize what I'd learned from reading the thread, understand what I was going to do before doing it, and wanting to have the parts on hand before starting the actual work. I didn't figure *any* of this stuff out myself - I just read the thread, organized the info so it would make sense to me, and then wrote it down. The pictures and comments from JimC were essential, and so were all of the comments/discussions between other folks. Some of the other pieces of information here were pulled from the FSM and from other threads on IH8MUD.COM.

DISCLAIMER!! I'm not an expert by any stretch and can't promise that these instructions are either complete or correct. You're on your own. If you have questions you'll get the best results posting your questions on the forum and waiting for answers from the real experts. If you see things in this document that are wrong or could be improved, please PM me on IH8MUD.COM, my username is "borick".

WARNING! Tampering with federally mandated emissions control equipment on a street driven vehicle is a federal crime. This information is presented for entertainment purposes only.

THANKS! to JimC, not only for all of his invaluable posts on "[My Desmog Thread](#)", but also for reviewing, editing, improving and correcting this very entertaining document.

1 Parts List

1.1 Recommended Parts

- Plug and Cap set from JimC
- AIR pump Idler Pulley from JimC (or de-vane your smog pump)
- Silicon vacuum tubing (i.e., from McMaster-Carr):
 - 3mm: 32 ft (McMaster Carr part #5041K22)
 - 6mm: 12 ft (McMaster Carr part #5041K24)
- Block-off plate and gasket for EGR "J" pipe:
 - Can make a plate yourself
 - or buy it from MAF (part# 25601)
 - or weld a coin of 1" bar stock into the exh manifold EGR opening
 - or the J pipe can be cut off, end of tube mashed flat and welded shut.
 - Some people recommend RemFlex gaskets, others prefer the OEM graphite gasket.
- Rubber or nylon caps for the AIR fittings on the air cleaner:
 - These are included in the Plug/Cap set from JimC

1.2 Optional Parts

- Rebuilt & desmogged 81-87 USA spec carb from JimC
- Recurved distributor from JimC:
 - JimC says: the recurve is nice, but not required
 - Can use an OEM, non-USA, vacuum advance points distributor from SOR, if downgrading from the waterproof electronic ignition is not a concern.

1.3 Fabrication Work

- EGR tube that connects the PCV valve to the intake manifold needs plugged
 - Cutting required
 - Welding (or JB-Weld) required
 - Weld a piece of ½" bar in the EGR opening, or use JB-Weld with (i) a pipe cap, or (ii) a bolt and cut off the bolt head after the JB-Weld sets
 - MAF makes a part to replace this (part #25601-INPLATE); using this part will lose the PCV inlet pipe and mounting point for the carb cooling fan sensor
- If not getting this from MAF:
 - Folks have used 1/8" or 3/16" plate steel to make their own
 - Trace an outline on the steel using the gasket, cut it out and drill the bolt holes

1.4 Other Things You Might Want To Do

- Replace air cleaner hex-nut over carburetor with a wing-nut (Toyota PN 90175-06003)
- Replace rotten vent hose on top of charcoal canister (Toyota PN 77759-14011)
- Replace manifold gasket, with a quality graphite gasket from Remflex, FelPro or Toyota
- Adjust valves
- Adjust idle, fast idle, and idle mixture

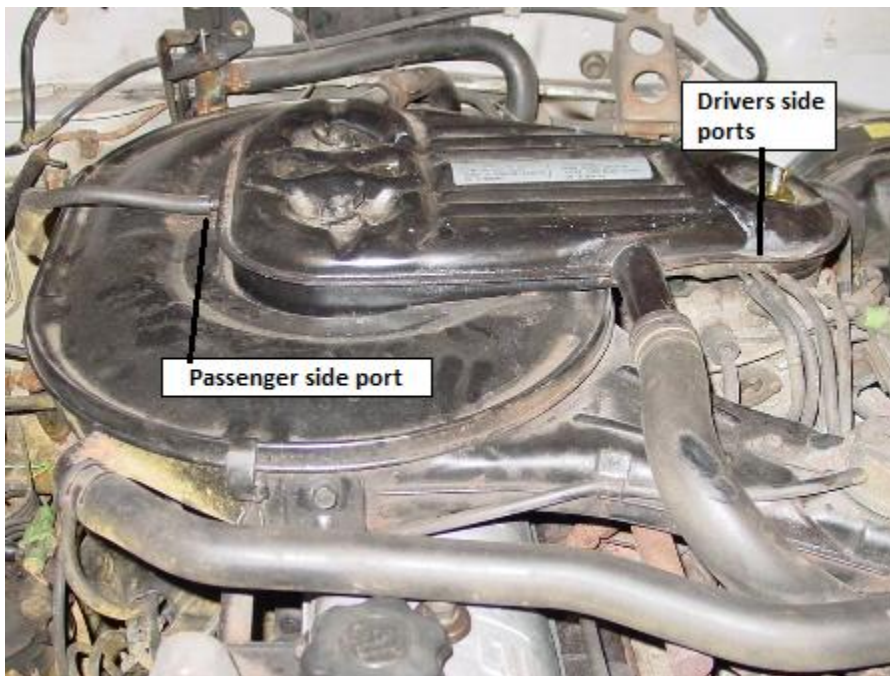
2 Reference Diagrams for Vacuum Line Routing

2.1 Air Cleaner

2.1.1 Air Cleaner Cover

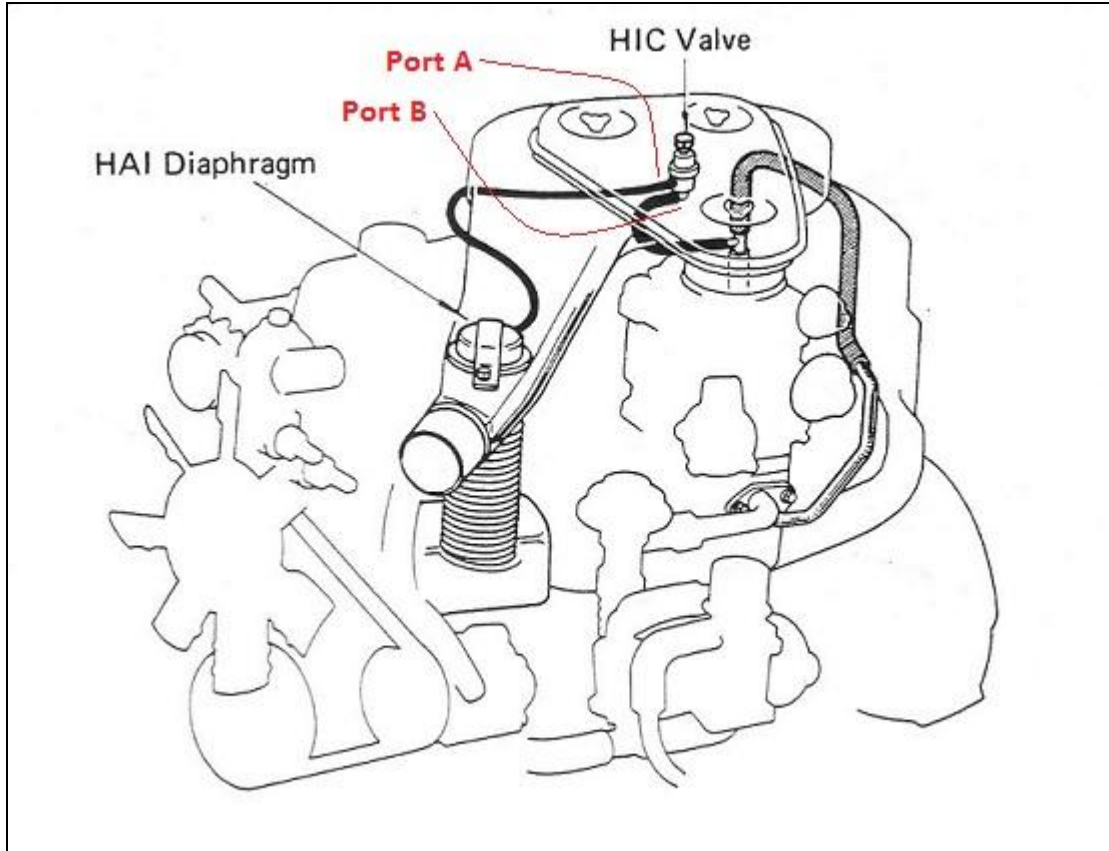
There are 3 vacuum ports on the air cleaner lid on the driver side, above the carburetor. All three of these are vents to atmosphere, so it doesn't matter which port is used.

There is also one larger port on the passenger side of the air cleaner lid, used for the distributor vent.



2.1.2 HIC and HAI

This diagram shows the location of the HIC and how the HIC ports are labeled. It also shows the location of the HAI diaphragm and PCV valve, and the routing of vacuum lines from the HIC to the HAI and PCV. There are two ports on the HIC and one port on the HAI.



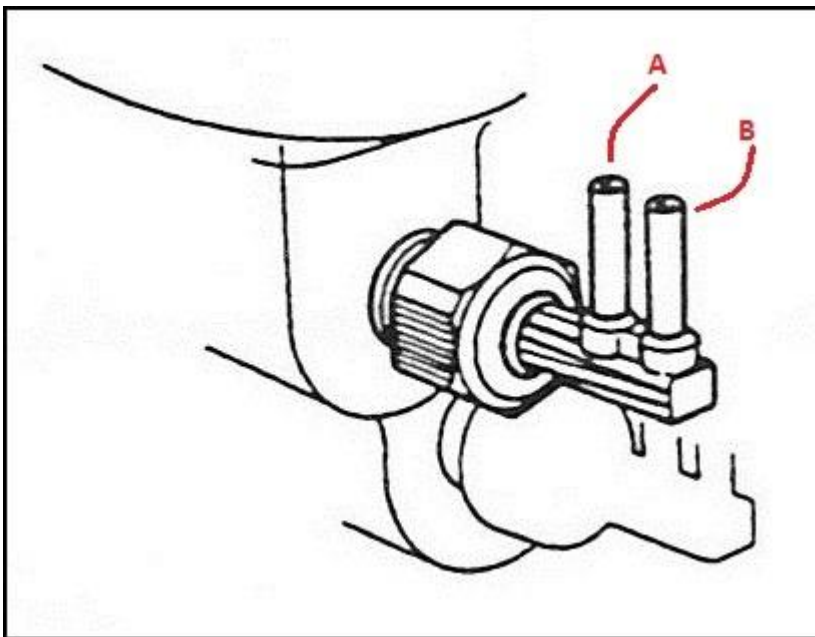
2.2 BVSV

There are two BVSVs on the stock cruiser located in the lower thermostat housing (they're referred to as "BVSV(1)" and "BVSV(2)" in the FSM). BVSV(1) will be kept after desmogging because it's part of the EVAP system, where BVSV(2) will be removed and the hole plugged.

Both BVSV(1) and BVSV(2) are shown in the diagram below. BVSV(1) is in the foreground and has the labeled ports (a) and (b). BVSV(2) is outlined in the background behind and below BVSV(1).

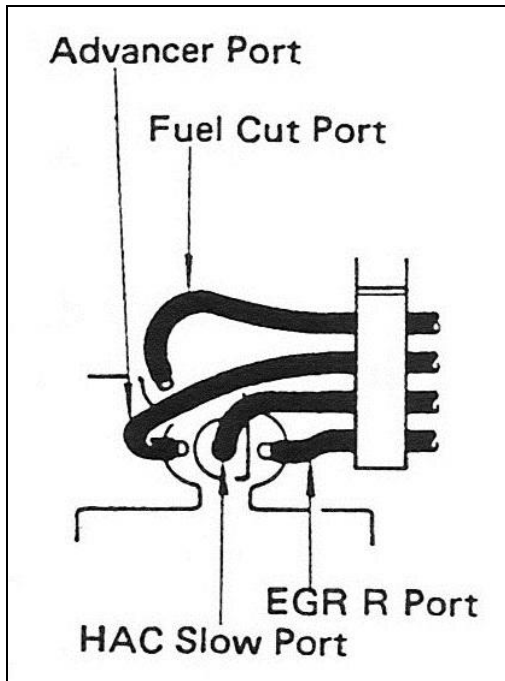
Note that these valves are not identical - they operate at different temperatures. If BVSV(1) is damaged, BVSV(2) can be used instead but the engine will run poorly during the warmup phase.

Maybe another pic here would be useful to show the location of the BVSVs.

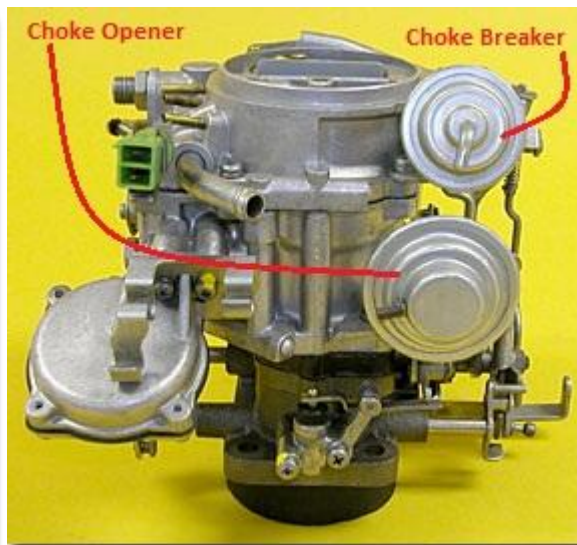


2.3 Carburetor

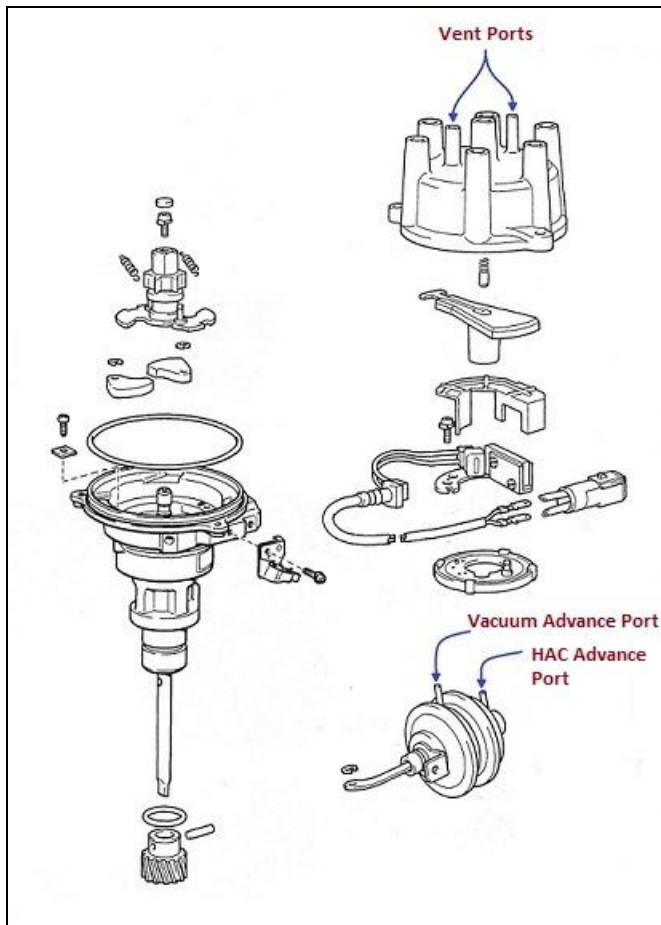
These four ports are located on the side of the carburetor facing the valve cover. They are hard or impossible to see without first removing the air cleaner.



The first picture below shows ports (a), (b) and (c) which are located on the side of the carburetor that faces the front of the vehicle. The second picture shows the Choke Breaker and Choke Opener which are located on the side of the carburetor that faces the driver side fender.

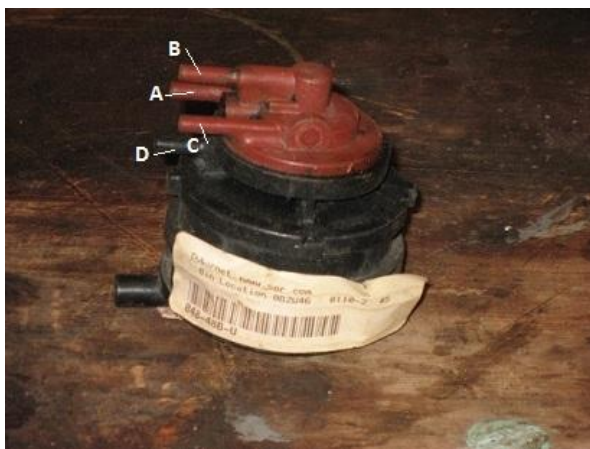


2.4 Distributor



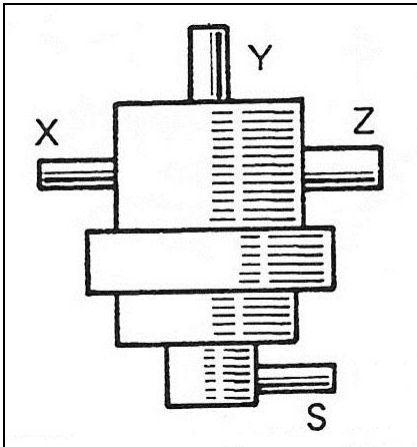
2.5 HAC

This is the best picture I could find of an HAC valve. Note that the large opening/port at the bottom of the valve (black in color) should stay open to atmosphere. In the picture below, port (a) is the furthest away, (c) is the closest, (b) and (d) are both centered between (a) and (c), (b) is on the top and (d) is on the bottom.



2.6 VTV

There are two VTVs that will stay in use after desmogging: one for distributor ventilation, the other for the EVAP system. These two valves are identical.



2.7 Fuel Cut Vacuum Switch

The Fuel Cut Vacuum Switch is a vacuum sensing switch mounted on the emissions rack on the driver-side inner fender. It is distinguished from the other switches & valves because it has only one wire and one vacuum hose connected to it.

Pictured below is a modified bracket showing the EVAP VTV (top) and the fuel cut vacuum switch (bottom).



3 Tasks

Save the stuff pulled off the Cruiser if it's in good shape and make it available to other Cruiser owners on IH8MUD.COM (not everyone wants to desmog, and owners in states with annual emissions testing need to have this equipment on their vehicles).

3.1 2 days prior

Spray bolts with PB Blaster: air rail, etc.

3.2 1 day prior

Spray bolts with PB Blaster: air rail, etc.

Make sure you have all your parts and tools.

3.3 Desmog Day

Note that it could easily take you more than a day (or two) to get through all of this, even if you're completely prepared. Plan accordingly.

3.3.1 Air Cleaner

- Remove all attached vacuum lines and hoses
- Cut off unneeded clips & clamps:



- Service air cleaner assembly: clean inside & out, replace missing airfilter seals

- Install 22 & 25mm caps (from JimC) on the two large hose ports:



3.3.2 Remove Vacuum Lines

After removing the vacuum lines you can toss them out - pretty much none of them will fit with the new routing. Remove vacuum lines from:

- Distributor
- Carburetor
- All valves: VTV, VCV, VSV, BVS, ABV, ...
 - *NOTE: BE CAREFUL! nipples on plastic valves can be brittle and easily broken*
- Vacuum switch for the idle solenoid
- Finally, remove the vacuum spaghetti metal-piping thing

3.3.3 Remove Valves

Remove all valves - ABV, VTV, VSV, ... - except for the following:

- *NOTE: BE CAREFUL! the valve nipples can be brittle and easily broken*
- BVS(1)
- VCV for EVAP (driver side)
- VCV for Distributor ventilation (passenger side)
- Decel vacuum switch
- AC idle up VSV, typically mounted under a 10mm hex head bolt at the headlight washer reservoir
- Optionally, the HAC valve can be retained if the vehicle will be transiting from low to high altituded (HAC valves are failure prone with age, so test the valve before re-installing)

3.3.4 Remove Air Rail

It sounds like some folks have left the air rail in place either temporarily or indefinitely, but most people remove it entirely and plug the holes using parts from the JimC kit or the Toyota OEM AIR port plugs.

The rail has a check valve that *should* keep exhaust gas from leaking out of the disconnected rail, but the check valve is often failed due to age. If the check valve is bad, then the disconnected rail cannot be safely left in place.

The air rail comes off easy for some people. If the 17mm nuts all come off with an open end wrench, congratulations, you have a sellable rail. If the rail is behaving normally, i.e. is rusted through or impossible to remove with an open end wrench, then try this removal technique:

- Use a sharp chisel to shear off all 6 of the rusty tubes, right on top of the nut
- Put on a 17mm short socket using a long flex ratchet
- Wrench the nut off the top of the fitting
- Put a 17mm mid socket on the fitting in the head w/ long flex ratchet and wrench it out of there
- Install allen plug

3.3.5 Remove EGR System

- Unscrew flexible metal hose from EGR valve
- Loosen two large bolts holding on EGR cooler enough to pull it away from the block
- Unbolt EGR "J" pipe from the exhaust manifold
- You should now be able to remove the "J" pipe by jiggling the EGR cooler
- Remove two large bolts from EGR cooler and remove it
- Install block-off plate and gasket on exhaust manifold, or weld coin into bottom of exhaust manifold:



- PCV/EGR tube on intake manifold (below carb on driver's side):
 - Unbolt and remove
 - Either:
 - Cut as described in: <http://www.ih8mud.com/tech/2f-egr.php>
 - Weld plate over EGR inlet, or use JBWeld with a pipe cap or bolt
 - Reinstall
 - Or:
 - Install plate from MAF

3.3.6 Remove Smog Pump

- All hoses, etc.
- De-vane and reinstall, or install JimC idler pulley (or equivalent)



- There's a metal pipe that comes off the smog pump, runs along the driver-side fender, turns into heat-insulated rubber hose under the brake master cylinder, then back into steel pipe down under the floor to the front of the cat. The metal pipe off the pump can be removed, then there's a decision to make about how to deal with the rubber hose and the metal pipe that connects to the cat. The choice is as follows (from JimC):
 - The proper fix is to drop the front exhaust pipe, cut the air pipe off, then weld the hole shut:



- The hillbilly fix is to cut the rubber hose under the master cylinder, then stuff a big bolt or a rock or a stick in it (secure the bolt with a hose clamp to keep it in place)

3.3.7 Catalytic Converter

- The cat does not have to be removed. Without the AIR system, the cat should not get hot enough to melt down.
- If removing the cat, cut off temperature sensor at floor, leaving grommet in place to seal hole.

3.3.8 Replace Carburetor and Distributor

Remove your old carb and distributor and replace them with the spiffy rebuilt ones from JimC.



3.3.9 Route Vacuum Lines

Grab your two rolls of vacuum line (3mm and 6mm) and something to cut them with, then start working through the **Vacuum Line Routing** section to get things connected.

3.3.10 Set Timing

Set the ignition timing per instructions.

3.3.11 Adjust Carburetor

Adjust carburetor idle, fast idle, idle mixture per instructions.

3.3.12 Install Air Cleaner

Install the air cleaner and hook up the final vacuum lines.

4 Vacuum Line Routing

The vacuum line routing is described for each major component that remains after desmogging. Each major component is described in its own section, and each section refers to the ports and labels that were given in the section above. This means that if two components are connected together by a vacuum line then you'll see that line mentioned in both sections. This seemed like the best way to describe things so that it was easy to verify that each individual component has the lines routed properly.

NOTE: There are several places in this section where the text "unchanged from stock" is used to note that the routing is the same as the stock routing. I put this in places where I was sure (or pretty sure) it was true. There are probably cases where the routing is stock but the note is missing.

4.1 From Distributor

- One **Vent Port** to VCV for distributor ventilation port (z)
- Second **Vent Port** to the air intake filter on the passenger-side firewall, behind the washer reservoir (unchanged from stock)
- **Vacuum Advance Port** to carb **Advancer Port**
- **HAC Advance Port** to HAC port (d) via "T" fitting

4.2 From Carburetor

- Port (a) to HAC port (c)
- Port (b) to Choke Breaker via VTV (unchanged from stock)
- Port (c) to HAC port (a)
- **Advancer Port** to distributor **Vacuum Advance Port**
- **Fuel Cut Port** to Fuel Cut Vacuum Switch (unchanged from stock)
- **HAC Slow Port** to HAC port (b)
- **EGR R Port** to BVS(1) port (a)
- A/C idle up (right beside electrical connector) to AC VSV on driver fenderwell
- Choke Opener to air cleaner cover on the driver side (If CO is still on carb)

4.3 From BVS(1)

- Port (a) to carb **EGR R Port**
- Port (b) to VCV for EVAP port (s) (unchanged from stock)

4.4 From VCV for EVAP (driver side)

- Line (x) to air cleaner cover on the driver side
- Line (y) to carb insulator (unchanged)
- Line (z) to EVAP canister "Purge" line ("Purge" is marked on the canister)
- Line (s) to BVS(1) port (b)

4.5 From VCV for Distributor Ventilation (passenger side)

- Line (x) to distributor cap via "T" connection with line (z)
- Line (y) to air cleaner cover on the passenger side
- Line (z) to distributor cap
- Line (s) to gas filter (manifold vacuum fitting)

4.6 From HAC

I believe that all HAC routing as described here is unchanged from stock.

- HAC port (a) to carb port **C**
- HAC port (b) to carb **HAC Slow Port**
- HAC port (c) to carb port **A**
- HAC port (d) to "T" fitting:
 - One leg of the "T" goes the distributor **HAC Advance Port**
 - Other leg of the "T" goes to the Gas Filter via a check valve

4.7 From Gas Filter

There are three ports on the Gas Filter but only 2 are used after desmogging. All three are vacuum sources so it doesn't matter which lines connect to which port.

- The first line connects to VCV for Distributor Ventilation port (s)
- The second line connects to HAC port (d) via a "T" fitting and check valve
- The third line is unused and should be plugged

4.8 From Air Cleaner

4.8.1 Air Cleaner Cover

- Three ports on the air cleaner cover, driver side:
 - One port to VCV for EVAP port (x)
 - Second port to carb Choke Opener
 - Third port is unused and should be capped
- One port on the air cleaner cover, passenger side:
 - To VCV for Distributor Ventilation port (y)

4.8.2 From HIC

The HIC (Hot Idle Compensator) is the white valve on the bottom of the air cleaner on the passenger side. Routing from the HIC is unchanged from stock.

- HIC port (a) to HAI diaphragm on air cleaner snorkel
- HIC port (b) to "T" fitting above PCV valve.

4.8.3 From HAI

The HAI (Hot Air Intake) diaphragm is the big round silver thing on the air cleaner snorkel. It has a single vacuum hose port.

- Single port connects to HIC port (a)

The following note from JimC may be handy if you'd like to keep the HIC function but not the HAI function: "The HIC valve does control the HAI for faster warmup. The HIC also provides (as the name indicates) Hot Idle Compensation, raising the idle speed when engine bay temps are high, to help turn the fan & WP faster and cool things off. So, if the HAI is undesirable, just cap off the HAI vacuum nipple on the HIC valve. HAI will be disabled, but the HIC function will remain."

4.9 From Fuel Cut Vacuum Switch

This vacuum switch has a single port on it.

- To carb **Fuel Cut Port** (unchanged from stock)

4.10 From PCV Valve

Routing from the PCV (Positive Crankcase Ventilation) valve is unchanged from stock.

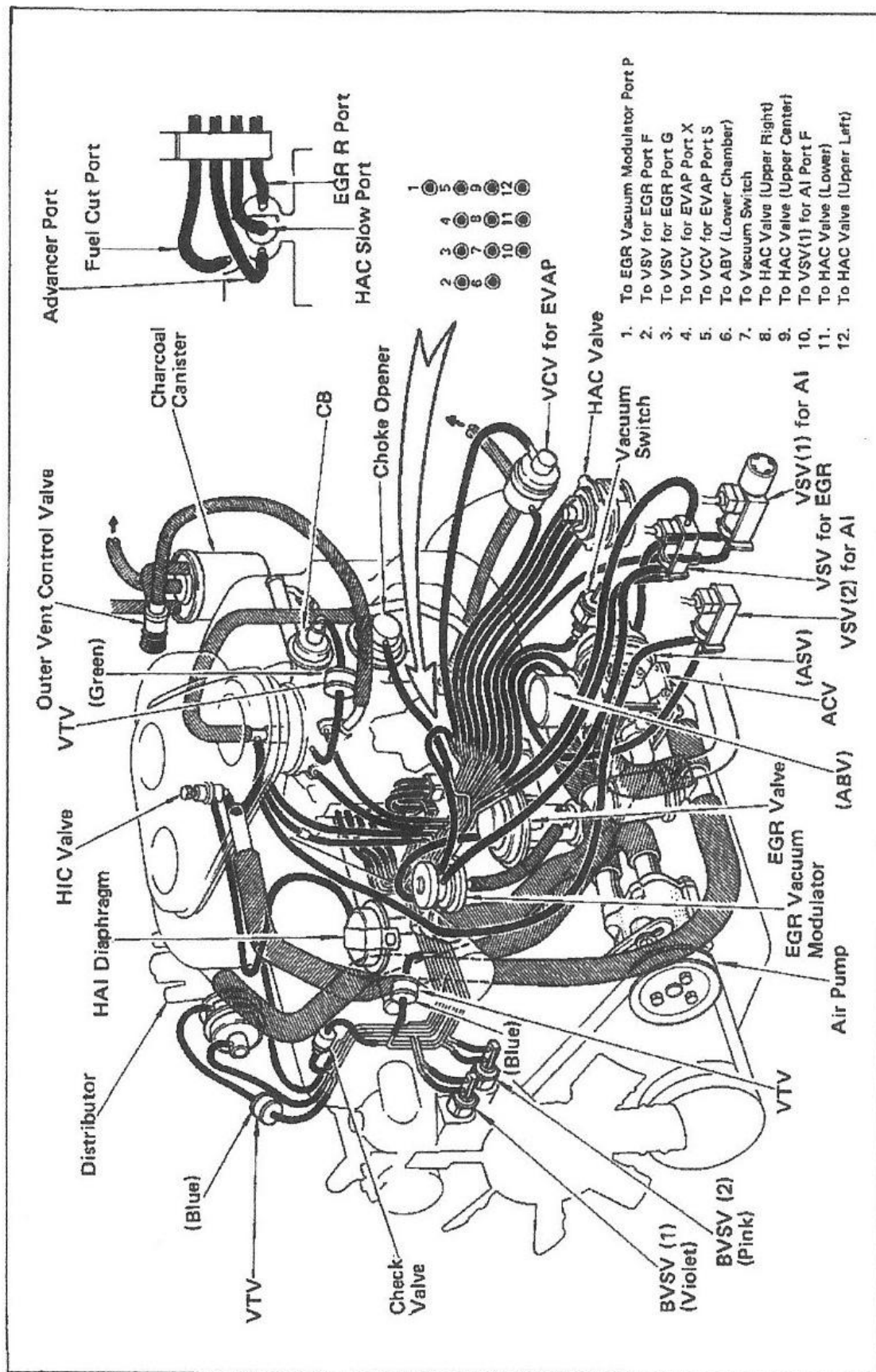
- A large hose runs from the PCV valve and around the back of the engine to the PCV inlet plate on the intake manifold on the driver side, just below the carburetor. There should be a "T" fitting in this large line close to the PCV valve.
- From the "T" fitting, a smaller line connects to HIC port (b).

5 Reference Material

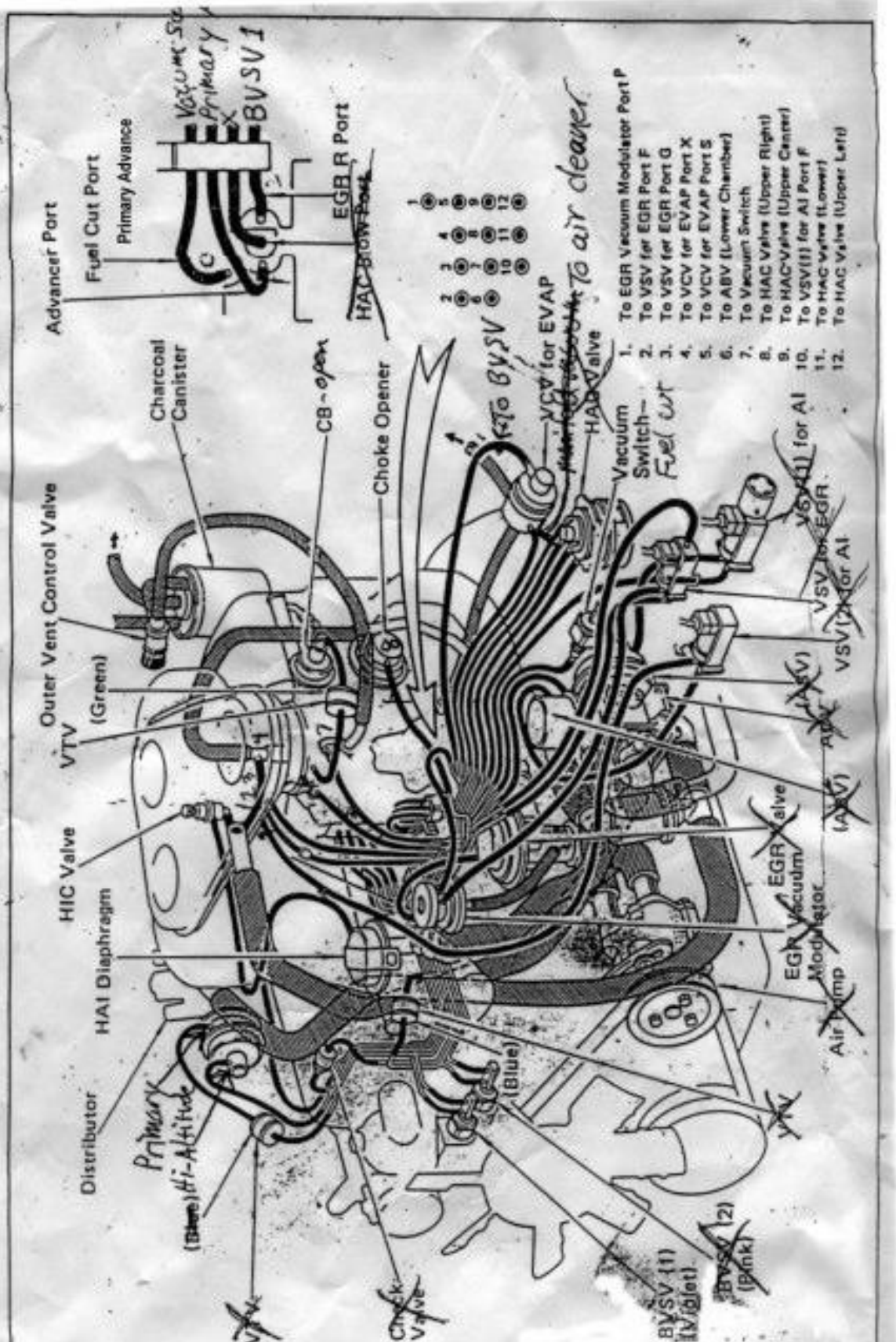
5.1 JimC Desmog Diagrams

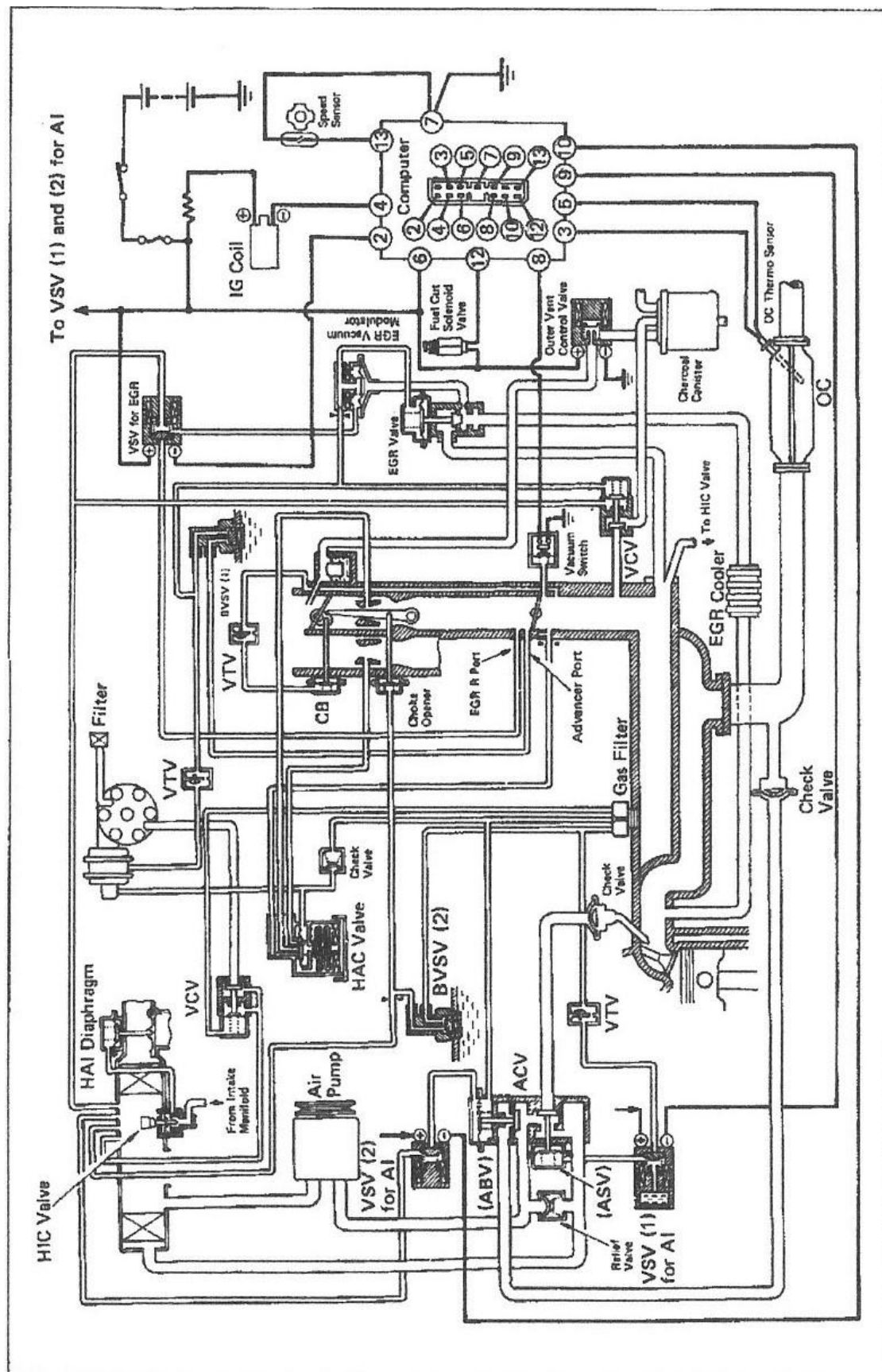
I believe these diagrams posted by JimC are where it all started. They are modified versions of the "component layout and schematic drawing" from the 2F Emission Control Repair Manual. They show everything - which components are removed in a desmog, and how to route the vacuum lines. You're encouraged to study them closely - and compare them to the originals - until you understand them.

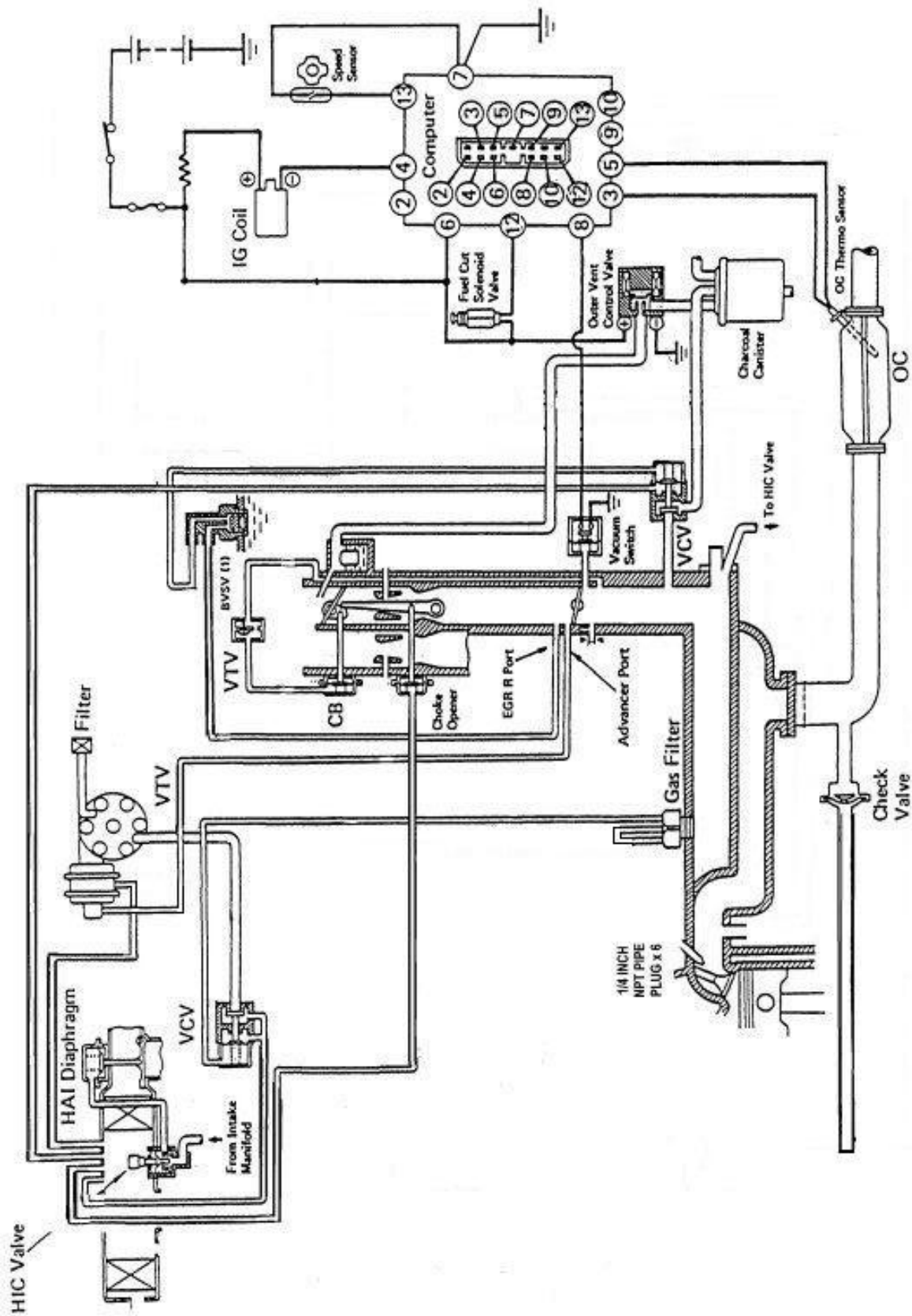
Included below are the originals from the FSM and the edited versions from JimC. The diagrams are shown in pairs: the component layout diagrams are first, followed by the schematic drawings. In both cases, the original diagram is followed by the edited version from JimC.



Version 2 / 01-May-2011





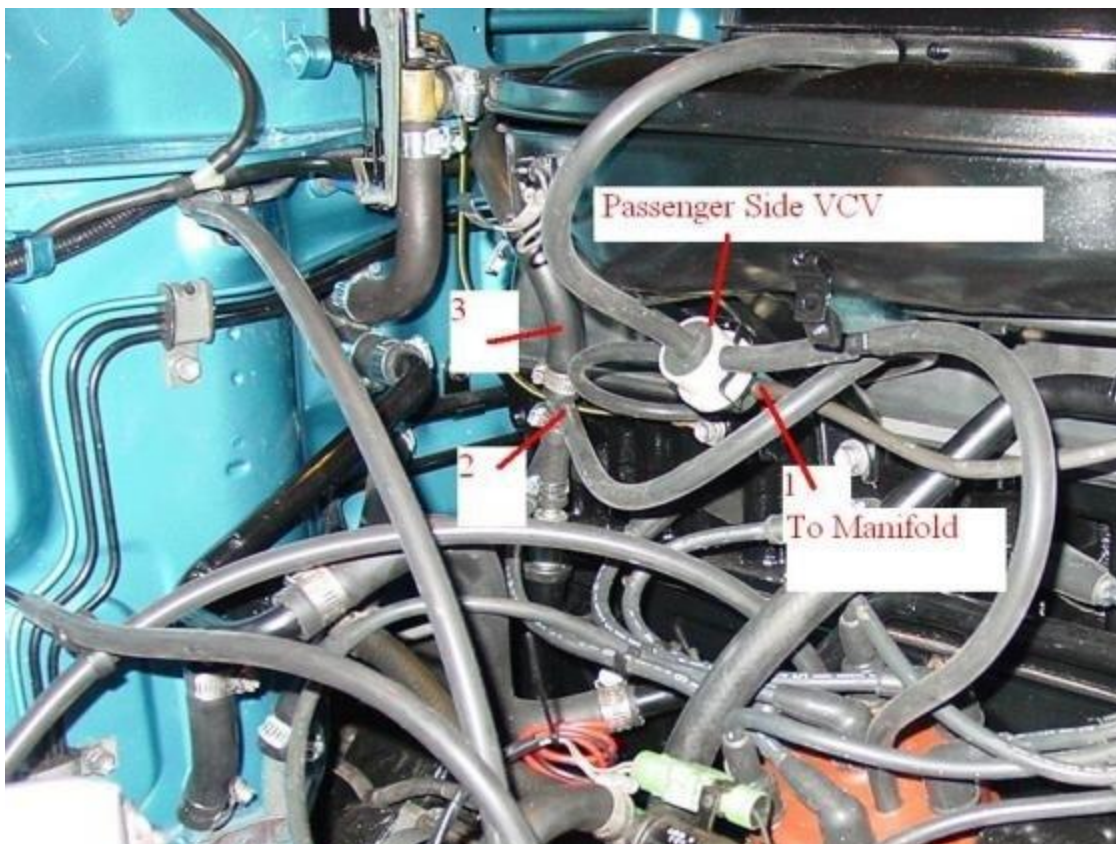


5.2 mwebfj60 Diagrams

The following photos were posted by mwebfj60 in the thread "[My Desmog Keeping HAC Lots of Pics](#)". The thread also has a lot of useful information in it and is a great place to learn more.

These excellent photos are super useful and show detailed, labeled, photos of vacuum line routing. Note that the vacuum port labels used in this document and those used in the photos is not the same, but it should be easy to translate between the two.

NOTE: only a single example photo is shown below. I wasn't able to include the photos in this document because it was too large to post on IH8MUD and I don't have an alternate place to host the document. Unless/until that can be fixed, you'll need to go to the actual thread in the forum to view these photos.



6 Notes

6.1 Choke Breaker (CB)

From the FSM: "This system opens the choke valve slightly to prevent too rich a mixture just after engine starting. However, the choke valve opening is delayed by the VTV valve."

6.2 Choke Opener

From the FSM: "After warming-up, this system forcibly holds the choke valve open to prevent an over rich mixture."

6.3 Deceleration Fuel Cut System

From the FSM: "This system cuts off part of the fuel in the slow circuit of the carburetor to prevent overheating and afterburning in the exhaust system during deceleration."

6.4 EVAP (Fuel Evaporative Emission Control)

From the FSM: "To reduce HC emissions, evaporated fuel from fuel tank and float chamber is routed through the charcoal canister to the carburetor for combustion in the cylinders."

6.5 HAC (High Altitude Compensation)

From the FSM: "As altitude increases, the air-fuel mixture becomes richer. This system insures proper air-fuel mixture by supplying additional air to the primary low and high speed circuits of the carburetor, and advances the ignition timing to improve driveability at high altitude (above 1,198 m (3,930 ft))."

6.6 HAI (Hot Air Intake)

From the FSM: "This system leads a hot air supply to the carburetor in cold weather to improve driveability and to prevent the carburetor from icing in extremely cold weather."

6.7 HIC (Hot Idle Compensator)

From the FSM: "This system allows the air controlled by the HIC valve to enter the intake manifold to maintain proper air-fuel mixture during high temperatures at idle."

JimC comment: Yes, it's safe to run without it. It's more of a convenience, having the idle increase to prevent overheating, and having warm air to the carb on a cold start.

6.8 PCV (Positive Crankcase Ventilation)

From the FSM: "To reduce HC emissions, crankcase blow-by gas (HC) is routed through the PCV valve to the intake manifold for combustion in the cylinders."

6.9 Other Miscellaneous Notes

Trapper50Cal (post #253 of "My Desmog Thread"): *if anyone has "compressed air release" or "Pop" noises emanating from under their glove box inside the cab when they start up, they are experiencing small vapor explosions in their distributor under the cap from the distributor vent not being plumbed correctly (LIKE ME).* (The post also references another thread for more info.)

JimC re: AC idle-up: *The AC idle up gets a vacuum hose from a dedicated fitting on the power brake fitting, goes direct to the idle up solenoid, then direct back to the idle up pot on the carb. [The AC idle-up solenoid is] the solenoid that has 2 vacuum connections (not 1, not 3), and is not mounted w/all the smog solenoids on the smog platform on fenderwell. AC solenoid is usually mounted to the vertical inner fender under a 6mm bolt.*

JimC re: why the distributor needs to be re-curved: *The stock dissy curve is set for use with EGR. EGR slows the speed of combustion, so the ignition point must happen earlier to allow time for the retarded mixture to burn. When the EGR is inoperative, the flame front moves faster, so the dissy needs to be recurved to slow down the advance.*

JimC re: emissions computer removal: *The only thing the emission computer is doing now is controlling decel fuel cut. If the green wire mod is performed, then the computer is completely out of the picture and can be removed.*

JimC re: removing the EGR valve and cooler: *Leave the EGR valve & cooler in place until you definitely have a way to deal w/ removing it permanently. If there is no vacuum to the EGR valve, then the EGR system is dead. The big reason for removing EGR is cosmetics. It looks better without all that non-functional hardware hanging off the manifolds.*