1976 Palm Beach
TZE166V100710

Fuel Injection for the GMC

by RJW

This is about how a not very experienced, “shade tree mechanic” figures out how to install Fuel Injection in his GMC Motorhome. This presentation is for those non-engineer/professional mechanic types that want to install TBI.

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TBI Presentation DISCLAIMER

DISCLAIMER:

Information presented by GMCES is intended only to communicate thoughts, ideas, opinions and procedures to and from GMC owners; there is no attempt to replace or supersede recommendations from General Motors Corporation or any other component manufacturer. All opinions expressed are those of the authors and not GMCES. Mention of any product does not constitute endorsement by GMCES. Neither the authors nor GMC Eastern States assume any responsibility for what you choose to do to your coach.

THANKS

There were many GMC Motorhome owners that helped me either directly or indirectly with this project. I couldn't have done it without their help. Here's a partial list in no particular order:

Bartz, Harms, Kosier, Greenwood, Henderson, Fisher, Moore, Stora, Mumert, Taylor, Wheeler, Hendrickson, Douglas, Worobec, Hall, Drewes, Berry, Gregg, Sharpe, Ferguson, Wingerter, Zingle and several others, but I can't remember their names.

Throttle Body Injection

There a number of fuel injection schemes. I will mention two of them and only focus on one:

Throttle body injection
Throttle-body injection (called TBI by General Motors was introduced in the mid-1980s as a transition technology toward individual port injection. The TBI system injects fuel at the throttle body (the same physical location where the carburetor introduced fuel). The induction mixture passes through the intake runners of the intake manifold just like a carburetor system. The justification for doing TBI was its cost. Many of the carburetor's supporting components could be reused such as the air cleaner, intake manifold, and fuel line routing. This postponed the redesign and tooling costs of these components. Most of these components were later redesigned for the next phase of fuel injection's evolution, which is individual port injection, commonly known as Port Fuel Injection. TBI was used briefly on passenger cars and Jeeps during the mid-1980s, and by GM on heavy duty trucks all the way through 1995.

Multi-point fuel injection

Multi-point fuel injection

Multi-point fuel injection injects fuel into the intake manifold just upstream of each cylinder's intake valve, rather than at a central point as in Throttle-body injection. MPFI systems can be sequential, in which injection is timed to coincide with each cylinder's intake stroke, batched, in which fuel is injected to the cylinders in groups, without precise synchronization to any particular cylinder's intake stroke, or Simultaneous, in which fuel is injected at the same time to all the cylinders.

Port Fuel Injection can be installed in GMC Motorhomes. However at the present time, due to the characteristics of the intake manifolds, it is limited to the 403 Oldsmobile and 500 Cadillac engines. There is an aluminum manifold for the 455 that will also accommodate Port Fuel Injection.

I wanted a simple fuel injection system for my GMC motorhome, therefore I went with Throttle Body Injection.

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Why Bother With Fuel Injection and its Cost?

That's a good question and one that my wife has asked me a few times. Here are a few of my reasons:

I heard that it can cost upwards of $350 to have a Quadrajet carburetor overhauled. I'd rather spend the money on new technology. I don't know how much longer my carburetor will last until it needs attention.

I'm tired of fooling with the choke to get my engine started. It often takes 20 seconds or more of cranking to start my cold engine. Can that be good for the engine?

I'd like a smoother running engine, which is supposed to be an advantage of fuel injection.

I'm not sure that I'm getting the best gas mileage possible with my Quadrajet.

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Why Bother With Fuel Injection and its Cost?

It seems like most mechanics these days have no knowledge of carburetors.

Mechanics these days are very familiar with electronic fuel injection.

I like computers and like the idea of a computer running my engine. After all my other cars have computers.

Parts for GM TBI systems are supposed to be available everywhere, I'm not so sure about availability of 1970s carburetor parts.

Also, TBI is another thing for me to tinker and play with.

Plus ,there was a group buy on a Howell TBI system and I always take advantage of group buys.

Buy a Kit or Men's Mall?

OK I've decided to install fuel injection. I'm going to throttle body because I have a 455 and I want as simple a installation as possible.

I've head that most of the parts are available at junk yards (men's malls) and auto parts stores. All you have to do is know what to buy and have the time to go to the various stores.

No, I don't want to fool with it, I'm getting a kit.

Where to Buy the Kit?

In my case I didn't plan on getting doing fuel injection until I got wind of a group buy on the GMCnet internet mail list. I admit it was an impulse purchase.

The group buy was for the Howell TBI system. Before I committed to the purchase, I found out about several other advantages to Howell's package:

The Howell facility is less than an hour from my house.

I'd heard from several people that Howell has great tech support.

They already had a GMC Motorhome kit.

Several GMC owners I respect also have Howell kits.

TURBO CITY
Performance Headquarters
Tomorrows Hi-Tech Performance Today!

AFFORDABLE FUEL INJECTION

HOWELL
ENGINE DEVELOPMENTS INC.

MEGASQUIRT
www.megasquirt.info

I admit to knowing nothing about the other companies offering fuel injection kits.

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Howell's Kit

The following is from the information that was shipped with my kit.

THIS SYSTM IS BASED ON THE PRODUCTIONGM (Chevrolet or GMC) THROTTLE BODY FUEL INJECTION AND ELECTRONICS USED FROM 1987-1989, ON 454 CID V-8 ENGINES. ALL BACKUP SYSTEMS AND "ON VEHICLE" DIAGNOSTICS FUNCTION SIMILAR TO THOSE MODEL YEAR PACKAGES. THIS SYSTEM DOES NOT CONTROL SPARK TIMING AS ON 87-89 GM ENGINES, BUT RELIES ON A TACH SIGNAL FROM THE PRODUCTION OLDS HEI ELECTRONIC IGNITION FOR RPM INPUT TO THE ECM.

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Howell's Kit

From their website:
http://www.howellefi.com

GMC Motorhome TBI kit 1973-78

Kit converts 455 and 403 Olds engines used in 1973-78 GM Motorhomes to throttle body fuel injection system similar to system used on 1987-89 454 Chevrolets. Uses stock air filter and clears engine cover without modifications. Adapts to stock Olds intake manifold. Uses stock Olds HEI distributor, and controls EFI only.

Details

Weight	18.00 lbs
Price:	**$ 1,200.00**

Options

Select engine size: 403

Quantity: 1

Add to cart Go

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They don't mention here that you need to upgrade to HEI if have a 1973-74 coach with points ignition.

Howell's Kit

From their website:
http://www.howellefi.com

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Contents of Howell's Kit

KIT COMPONENTS:

1. Two barrel TBI unit with integral TPS and Idle Air Control.
2. Electronic control Module (ECM) GM PN 1227747.
3. Howell wiring harness connecting engine to vehicle ECM.
4. Calibration Prom matching TBI to Olds 455 or 403 engine.
5. Cal-pack (V-8), for limp-home operation.
6. Manifold vacuum sensor (MAP).
7. Engine coolant sensor & 3/8" to ½" NPT bushing adaptor.
8. Exhaust Oxygen sensor & 18MM mounting bung.
9. Electric fuel pump—high pressure, in-line.
10. High flow fuel filter, in-line.
11. Fuel line kit.
12. Fuel pump relay.
13. Small parts kit for routing and mounting components.
14. Service manual-basic troubleshooting and operating information.

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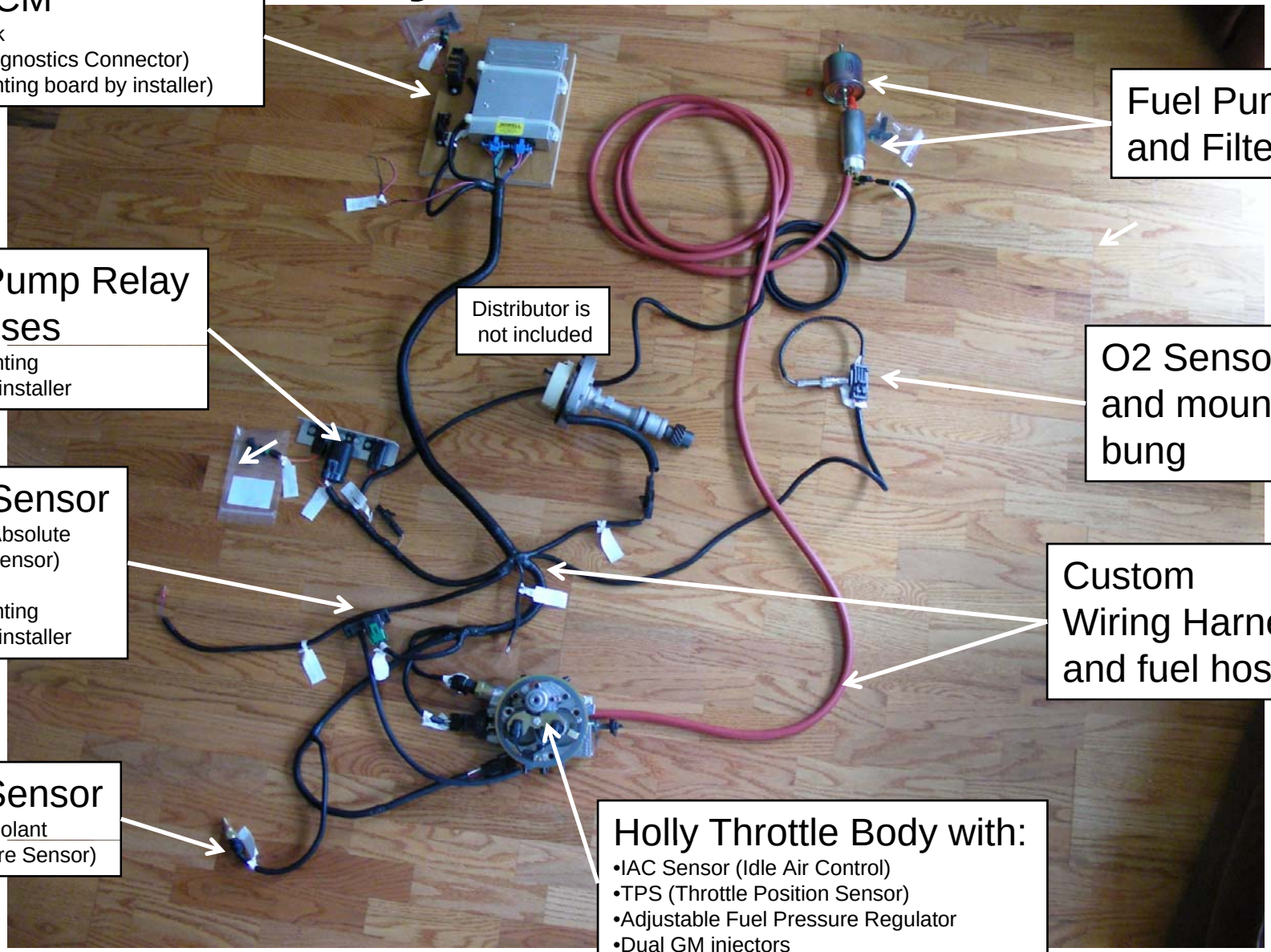
My Kit Contents



GM ECM
•Fuse block
•ALDL (Diagnostics Connector)
Note: mounting board by installer)

Fuel Pump and Filter

Fuel Pump Relay and fuses
Note: mounting bracket by installer

Distributor is not included

O2 Sensor and mounting bung

MAP Sensor
(Manifold Absolute Pressure Sensor)

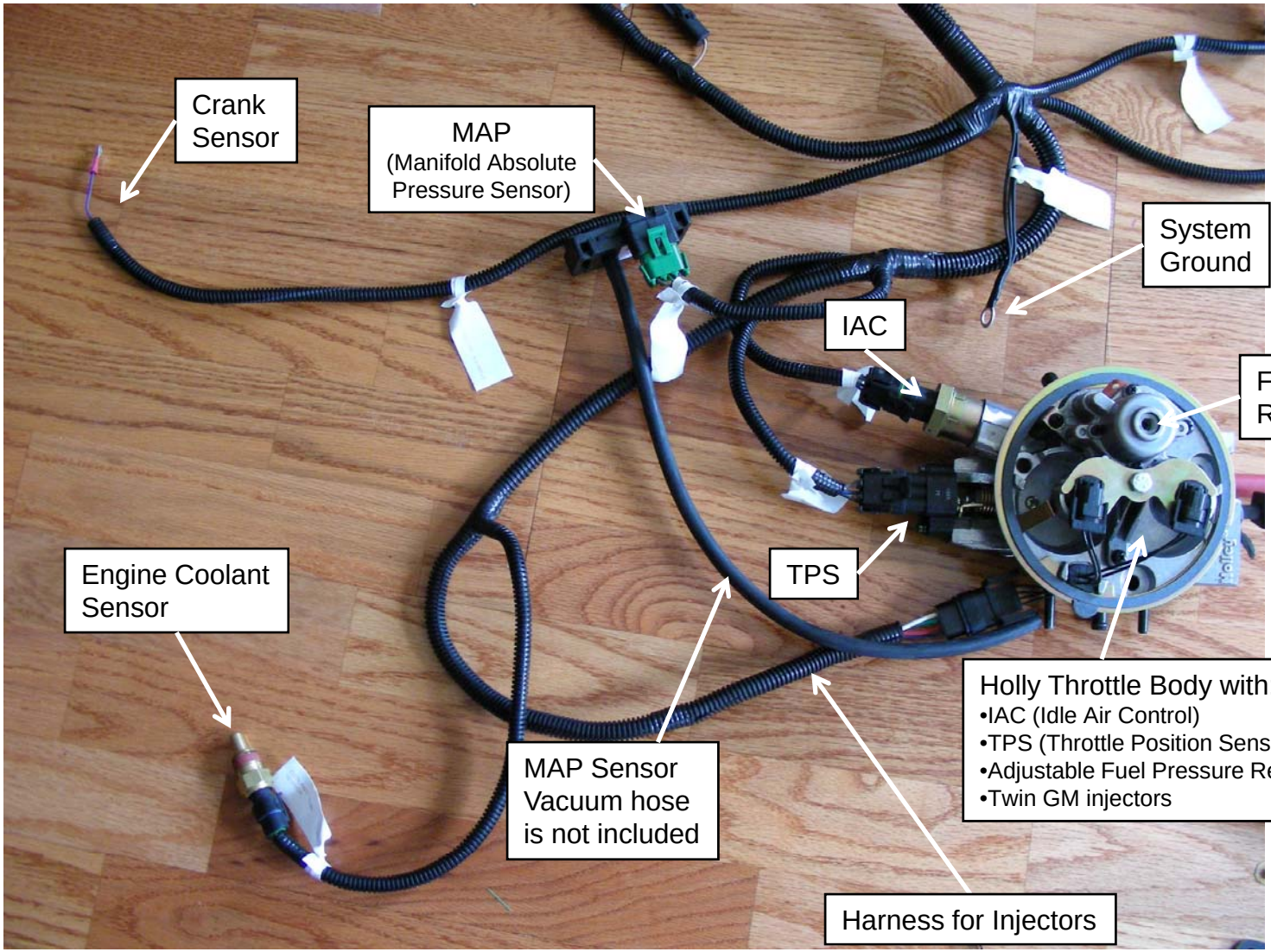
Note: mounting bracket by installer

Custom Wiring Harness and fuel hose

ECT Sensor
(Engine Coolant Temperature Sensor)

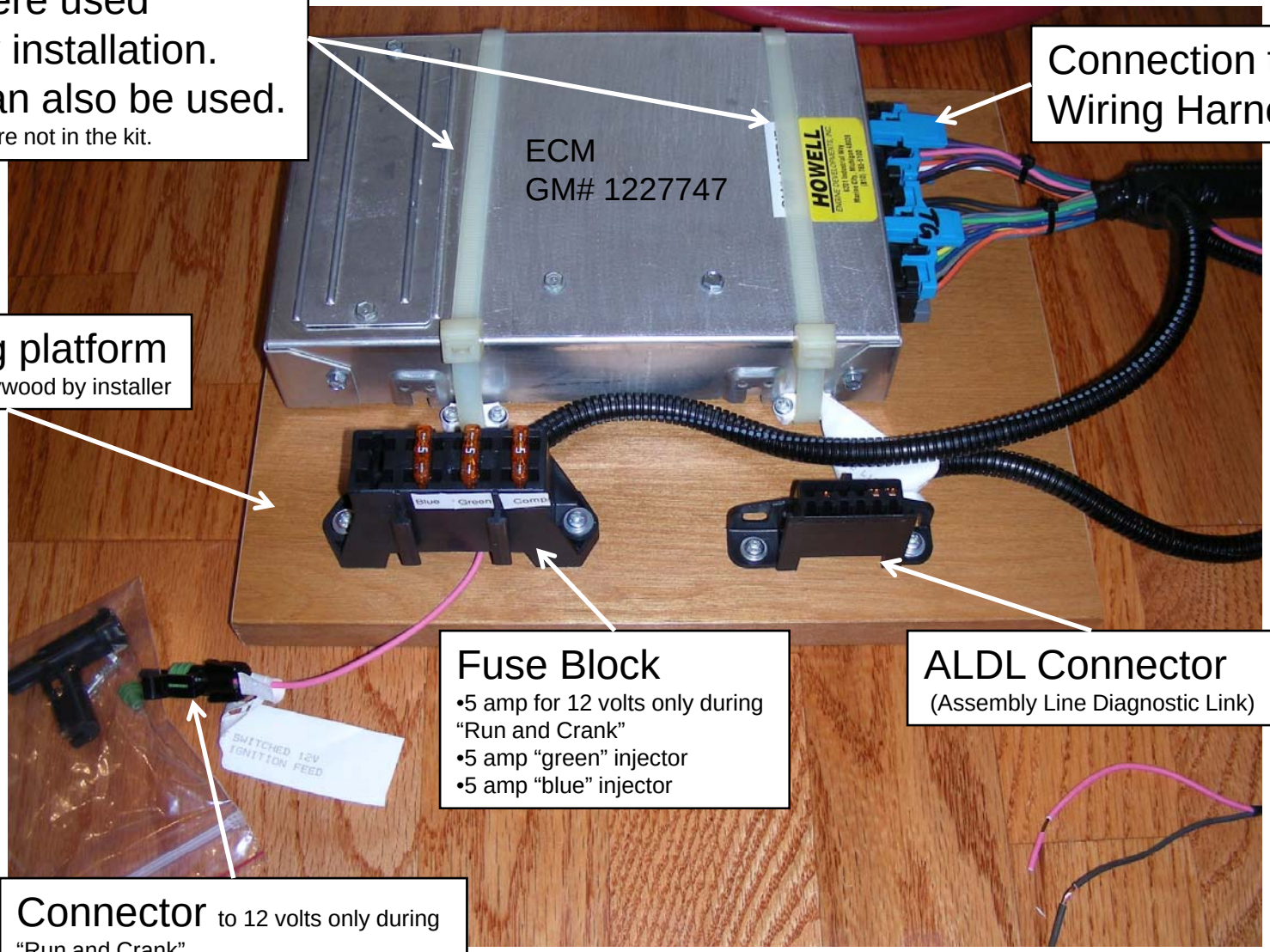
Holly Throttle Body with:
•IAC Sensor (Idle Air Control)
•TPS (Throttle Position Sensor)
•Adjustable Fuel Pressure Regulator
•Dual GM injectors

My Kit Contents



My Kit Contents

Jumbo sized tie wraps were used to simply installation. Velcro can also be used.
Note: These were not in the kit.



Connection to Wiring Harness

Mounting platform
¾" x 10"x10" plywood by installer

Fuse Block
- 5 amp for 12 volts only during "Run and Crank"
- 5 amp "green" injector
- 5 amp "blue" injector

ALDL Connector
(Assembly Line Diagnostic Link)

Connector to 12 volts only during "Run and Crank"

My Kit Contents

Miscellaneous bits and pieces from Howell's kit

Installation Instructions

I'm going to go step-by-step through the installation instructions provided with my kit and explain what I did.

INSTALLATION INSTRUCTIONS
TWO BARREL, THROTTLE BODY FUEL INJECTION FOR OLDSMOBILE V-8 ENGINES IN GMC MOTOR HOMES

Installation procedure will be separated into the following categories:

1. Preparation of motor home for TBI installation.
2. Removal of non-required parts from carbureted engine.
3. Installation of TBI and engine hardware.
4. Installation of Electronic components and wiring harness.
5. Calibration PROM and vehicle ECM.
6. Initial vehicle startup and operation.
7. Initial driving impressions.
8. Tuning and troubleshooting.

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Installation

1. Preparation of motor home for TBI installation
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Installation

1. Preparation of motor home for TBI installation

SEE NOTE ON OXYGEN SENSOR, PAGE 2 BEFORE THE FOLLOWING STEPS

1. Jack up front of motor home and support with jack stands. Raise high enough to allow access to the underfloor area and cross members just ahead of the fuel tanks.
2. Raise engine cover to allow access to top of engine and disconnect the battery (optional).
3. Remove left and right hand front wheel inner fender liners.
4. Remove and set aside air cleaner assembly.

•The first thing I did was have the O2 sensor bung installed at a muffler shop.

Oxygen Sensor Installation

4. OXYGEN SENSOR—At this point, you may want to install the bung that mounts the Oxygen sensor. This can be done without removing the exhaust system. Drill or burn a 7/8" hole approx 3" downstream from the LH exhaust manifold flange (FIGURE 2). The supplied 18MM bung can then be welded into the exhaust pipe. The Oxy sensor can be mounted vertically, or at an angle, depending on your ability to create the correct hole in the pipe for the bung. NOTE: if you do not have in house equipment to make the correct hole in the exhaust pipe and weld in the bung, you may want to have this done at a muffler shop before starting the TBI installation. When the bung is in place, you may install the Oxygen sensor.

Oxygen Sensor Installation

This muffler shop is a bit out of the way for me now, but I trust them. They also fabricate the exhaust pipes that Cinnabar sells.

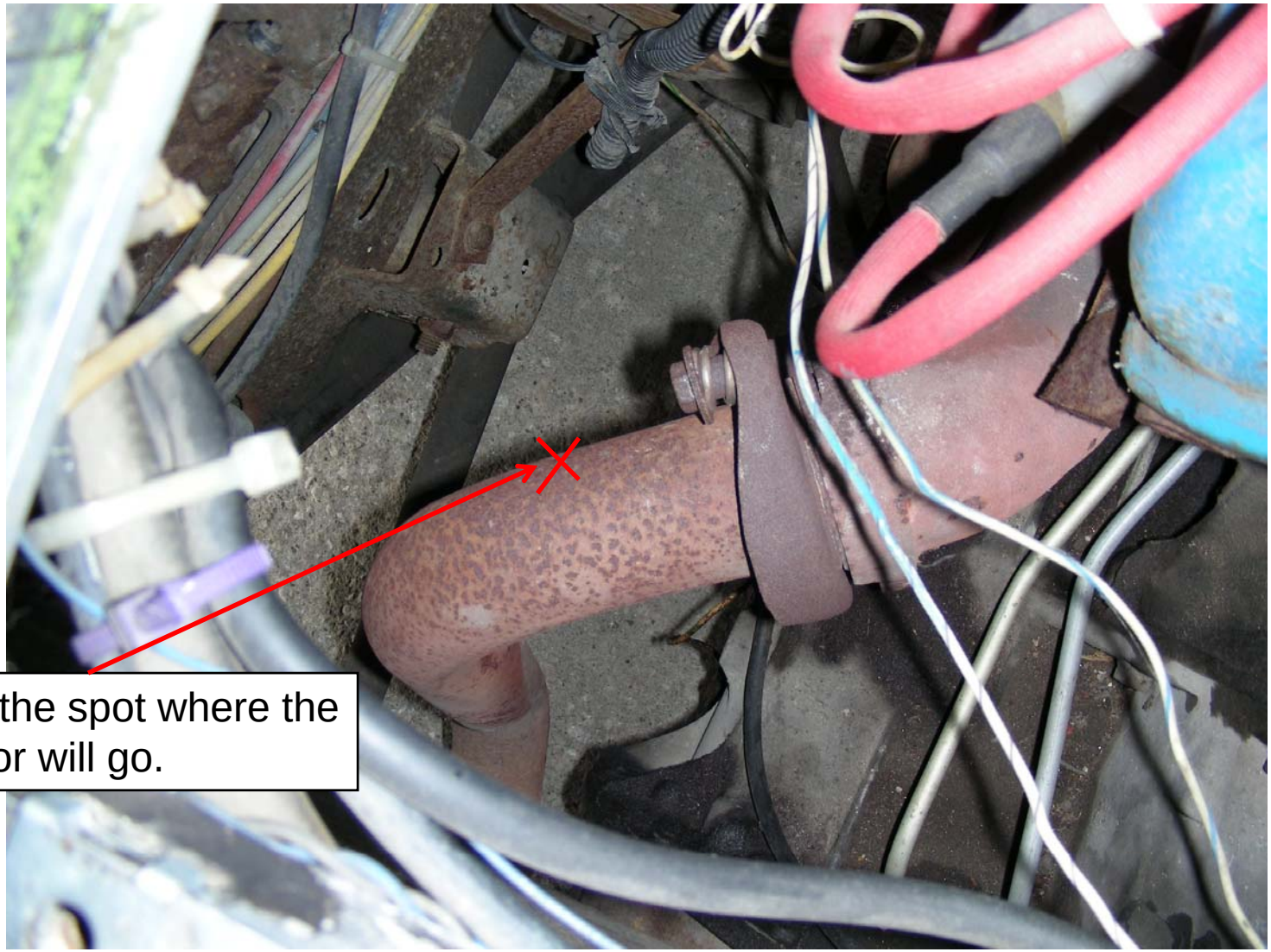
Oxygen Sensor Installation

Tracy's Old Castle Shop
2905 Main Street
Marlette, MI 48453
PHONE: (989)635-7485
Dan Tracy

Oxygen Sensor Installation

Getting ready to pull in to one of their service bays. They have a hoist that is big enough for GMC's. This trip I didn't need to be hoisted

Oxygen Sensor Installation



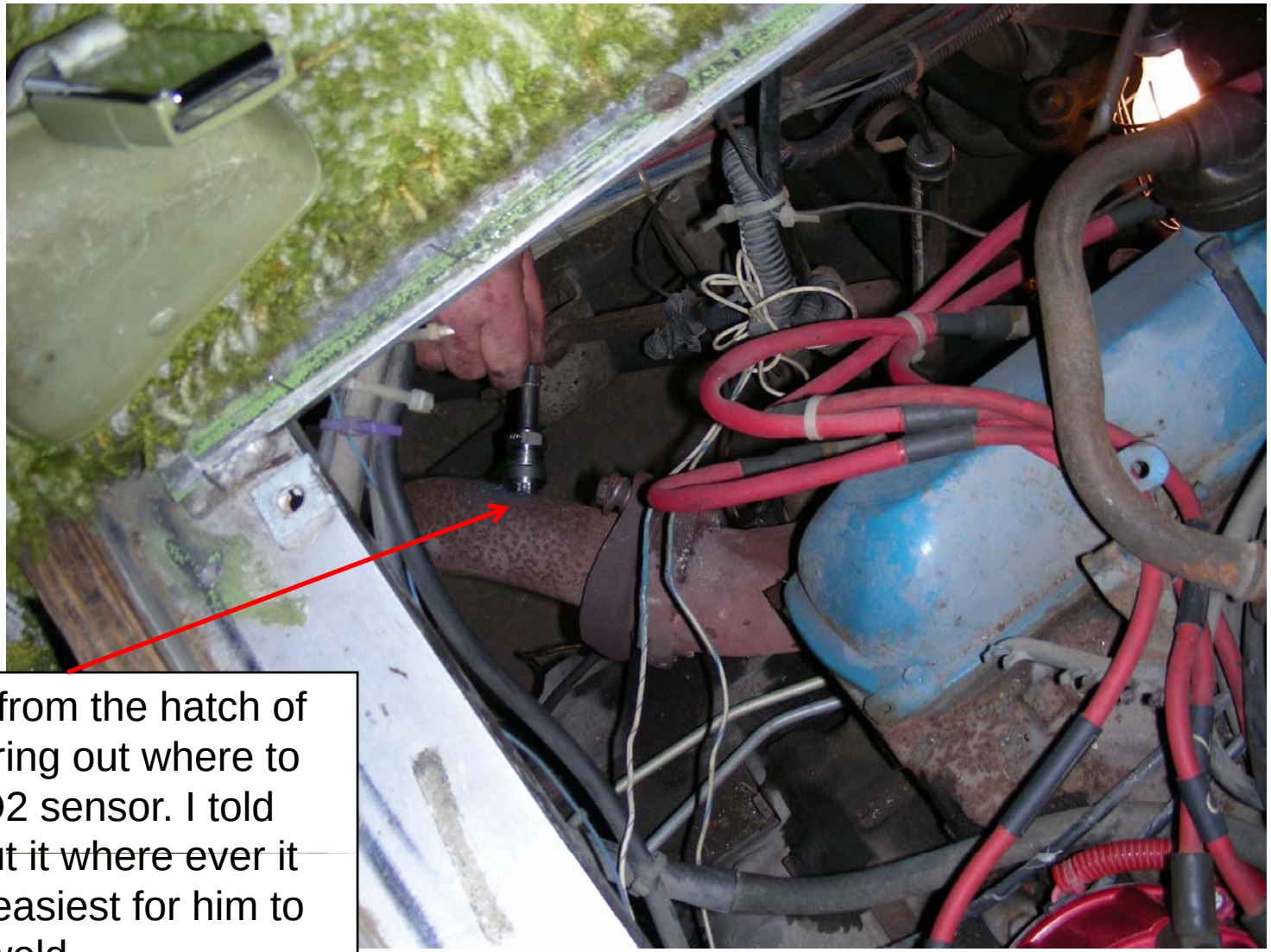
Oxygen Sensor Installation

That’s Tom Tracy deciding the best way to get in there to cut a hole and weld in the bung.

Oxygen Sensor Installation

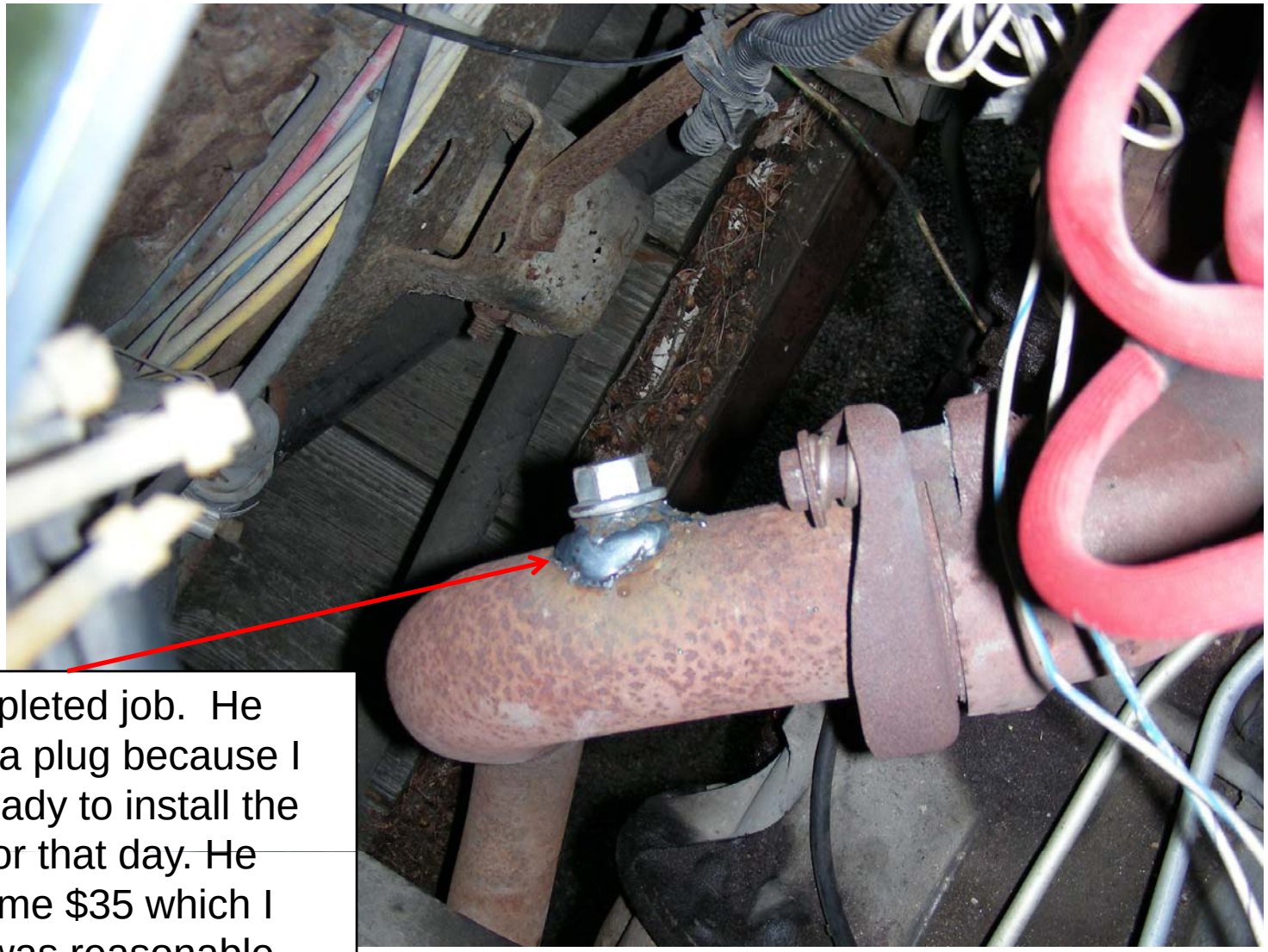
Tom decided this would be the easiest approach. He didn't want to do it from inside my coach for fear of damaging something. This is where removing the wheel well liner would have helped. We left the wheel on too.

Oxygen Sensor Installation



My view from the hatch of Tom figuring out where to put the O2 sensor. I told him to put it where ever it was the easiest for him to cut and weld.

Oxygen Sensor Installation



The completed job. He installed a plug because I wasn't ready to install the O2 sensor that day. He charged me $35 which I thought was reasonable.

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Installation

1. Preparation of motor home for TBI installation

SEE NOTE ON OXYGEN SENSOR, PAGE 2 BEFORE THE FOLLOWING STEPS

1. Jack up front of motor home and support with jack stands. Raise high enough to allow access to the underfloor area and cross members just ahead of the fuel tanks.
2. Raise engine cover to allow access to top of engine and disconnect the battery (optional).
3. Remove left and right hand front wheel inner fender liners.
4. Remove and set aside air cleaner assembly.

- I put my GMC on my neighbor's service ramp.
- I took my engine cover off, but that should be obvious shouldn't it?
- I didn't disconnect my battery.
- I didn't remove my wheel liners, but in retrospect it would have made things easier.

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Installation

My GMC on my neighbor’s service ramp. I can stand up straight while working under there.

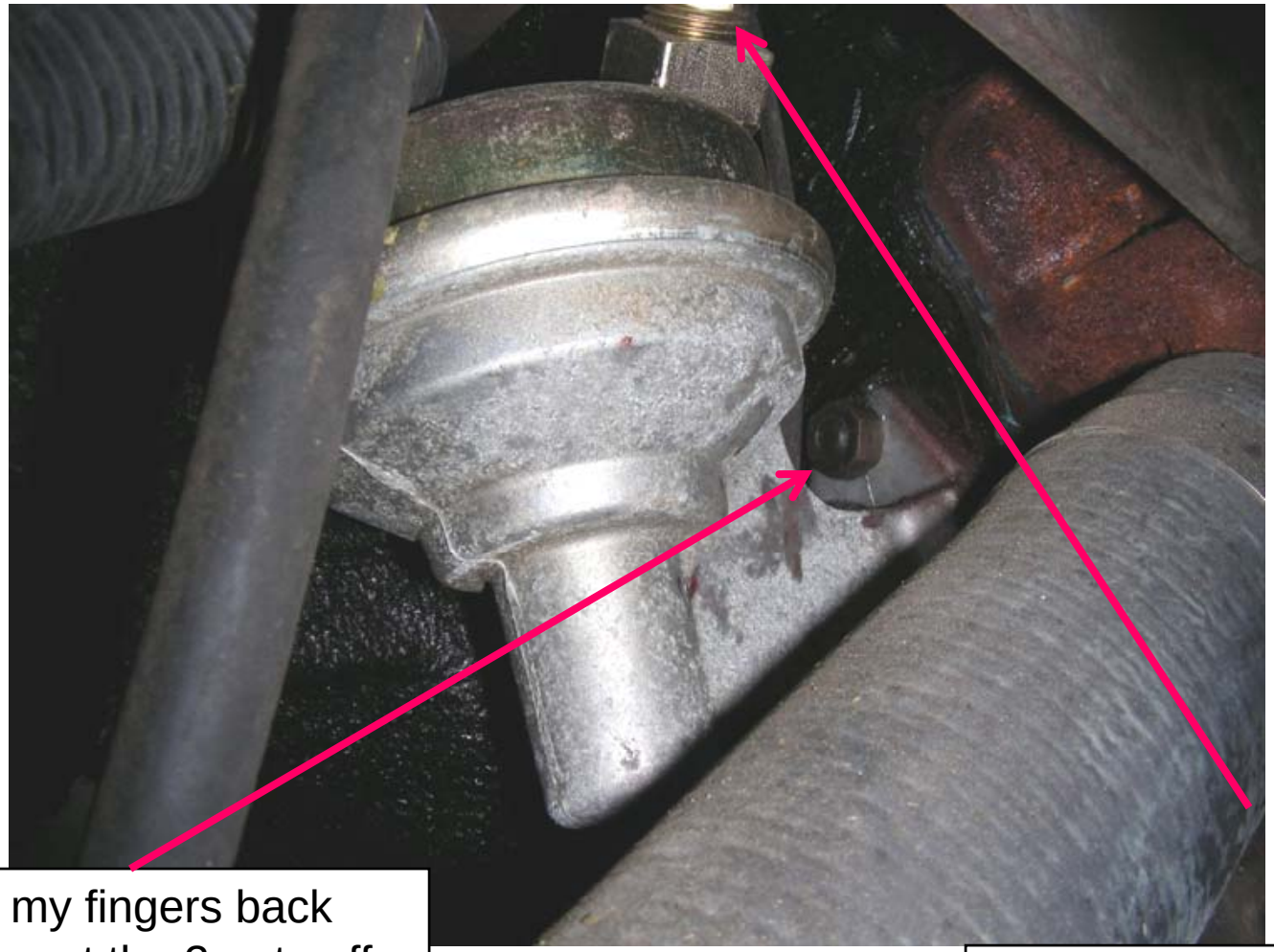
Installation

2. Removal of non-required parts from carbureted engine

Remove the mechanical fuel pump and fuel lines form the carbureted engine. Install the supplied fuel pump block off plate and gasket from your HED kit. Use RTV or other gasket sealer to assure no oil leaks.

When I installed the fuel pump at the same time I installed my new aluminum radiator, I didn't realize how hard it is to get in there. I'm glad I never had to remove and replace the fuel pump on the side of the road. I also removed the fuel pump to carburetor fuel line at this time.

Removal of Fuel Pump



Getting my fingers back there go get the 2 nuts off was sort of a challenge.

It was also a challenge to get the steel fuel line loose.

Installation

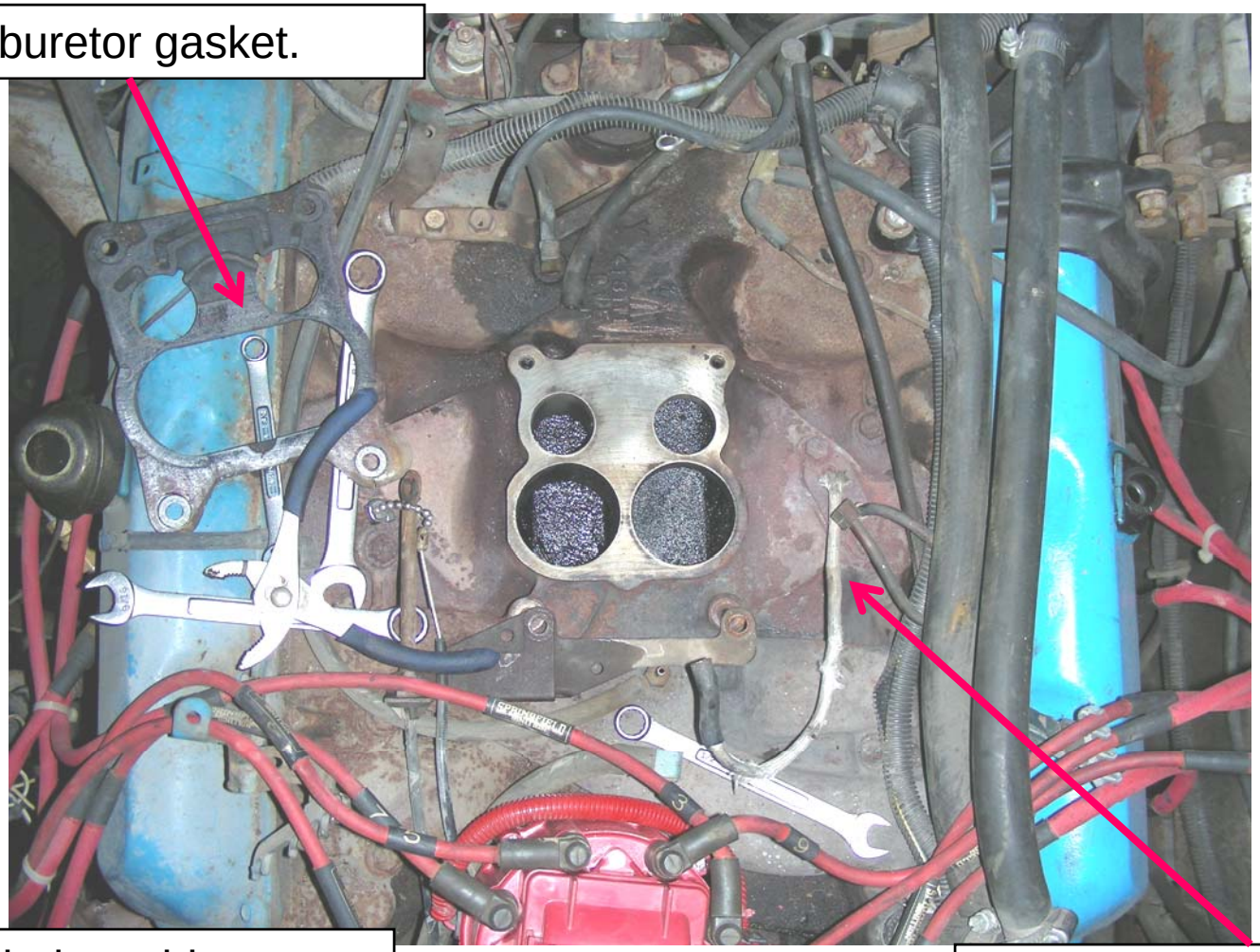
2. Removal of non-required parts from carbureted engine

Trace all vacuum line and label them if necessary so you will know their function when the time comes to reconnect them. Remove the carburetor and gasket. Make sure the carb mounting surface is clean and free of any gasket material.

For the most part, I removed all the vacuum lines and threw them in the trash. It seems that most of them were related to the carburetor and HEI ignition. I also didn't have the old vacuum operated cruise control so I didn't have those lines to worry about.

Removal of Quadrajet

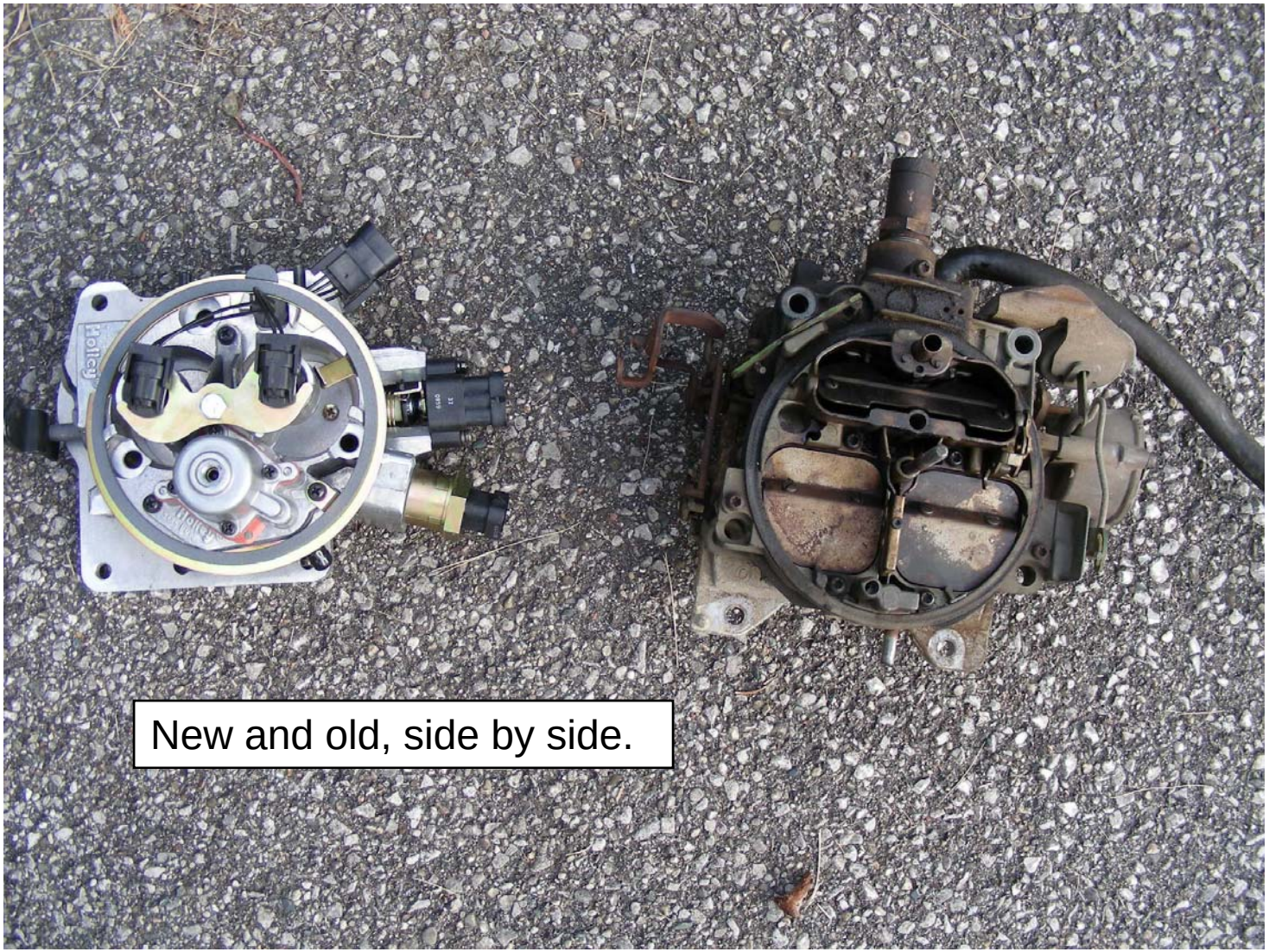
Old carburetor gasket.



I didn't label anything as suggested. I trusted my memory.

Choke Stove and its vacuum lines still in place. They were removed next.

Removal of Quadrajet



New and old, side by side.

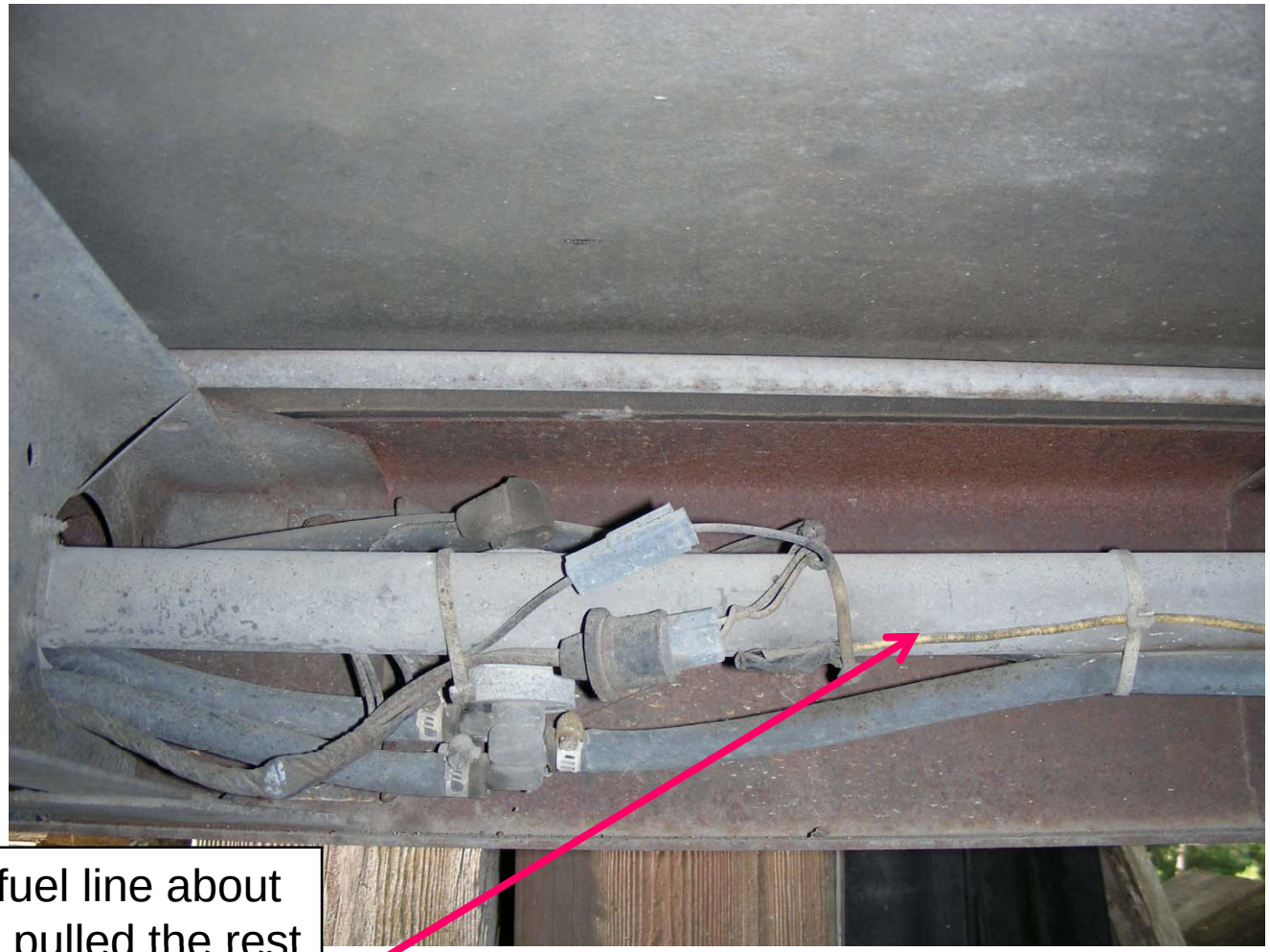
Installation

2. Removal of non-required parts from carbureted engine

Remove motor home fuel line and any hoses, back to the crossmember ahead of the switching valve just in front of the fuel tanks. To prevent fuel loss and facilitate fuel pump installation, use a pair of Vice Grips or other clamps to pinch off the fuel line between switching valve and crossmember. You can later cut this section of line to the correct length to connect to the new fuel filter.

I used the Vice Grip technique to close off my fuel line. I didn't remove all of the fuel lines, including a steel line that runs under the radiator. I left them in place because it seemed more work to take them out.

Removal of Fuel Lines



I cut the fuel line about here and pulled the rest out as far as I could go toward the front of the coach.

Installation

2. Removal of non-required parts from carbureted engine

Remove any other vacuum solenoids or electric choke wiring that may be on your engine. California emission vehicles have extra vacuum controls and two canisters to collect fuel tank fumes. Many motorhomes have been refitted with later model Rochester carburetors, so what you find under the engine cover may not match your service manual.

I didn’t have any of this extra stuff, so this part didn’t apply to me.

Installation

3. Installation of TBI and engine hardware

INSTALLATION OF TBI AND ENGINE HARDWARE

1. Install the supplied Holley 4 barrel to 2-barrel adaptor plate, (FIGURE 1) using Oldsmobile PN 22508038 carb gasket (supplied). NOTE: machining that will allow a vacuum leak if it is not sealed as follows: after bolting down the plate, fill the right rear counter bore and surrounding edge of plate with automotive gasket quality RTV. Position the TBI gasket on the plate with all holes aligned and make sure the RTV fills and supports the right end that hangs over the edge of the plate. This will insure no vacuum leaks when the TBI is installed. Follow the instructions in the adaptor kit to plug the unused TBI hold down bolt holes.

This part was fairly straight forward except for the part about installing the carburetor gasket. The carburetor gasket supplied had some areas that were cut out that could cause vacuum leaks. Paul Bartz told me about this and recommended a different gasket.

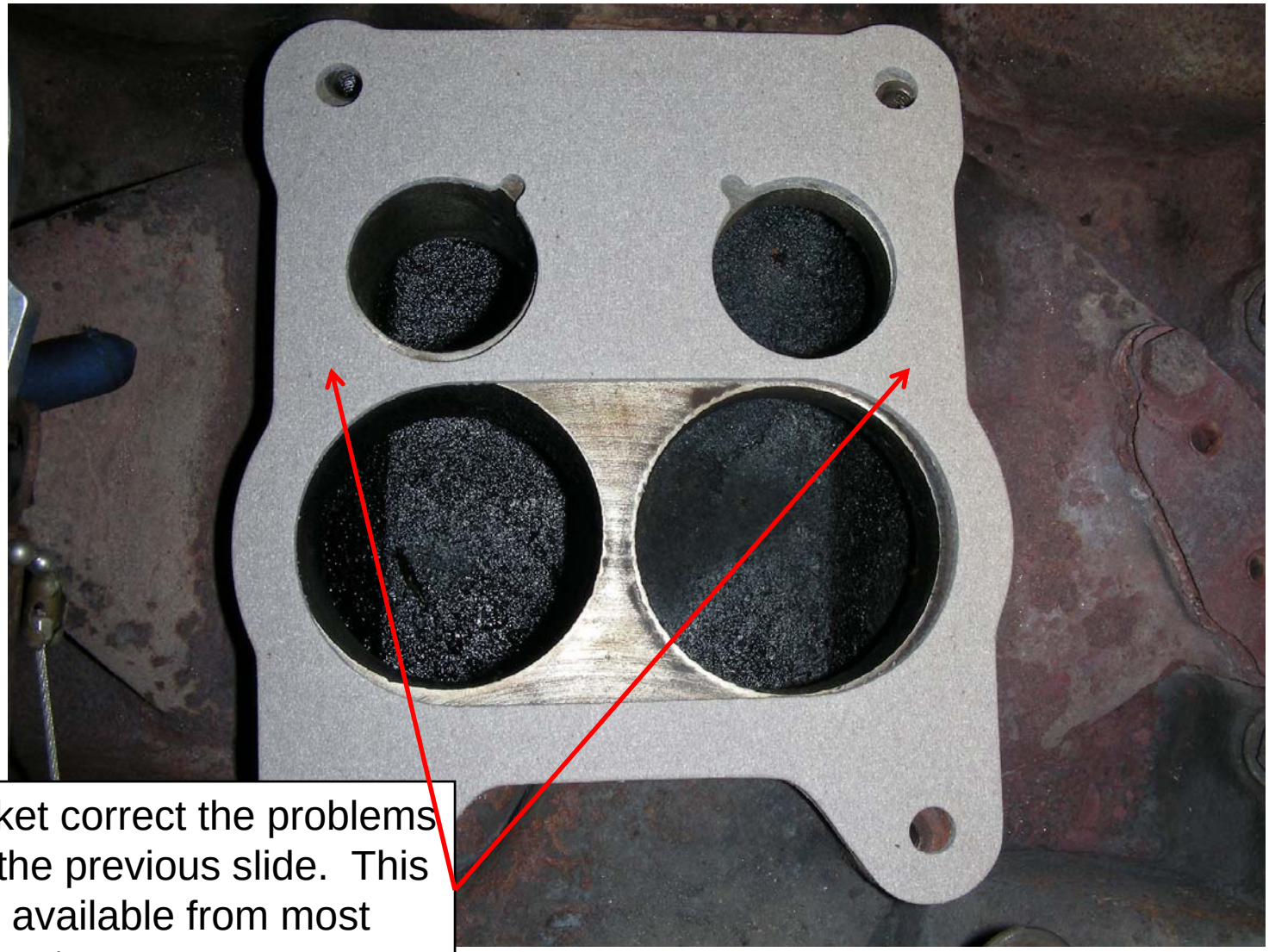
I also filled the right rear counter bore as indicated, although I have to admit, it didn't look like it would make any difference.

There were no instructions in the adapter kit I received.

Problem with Howell's Kit

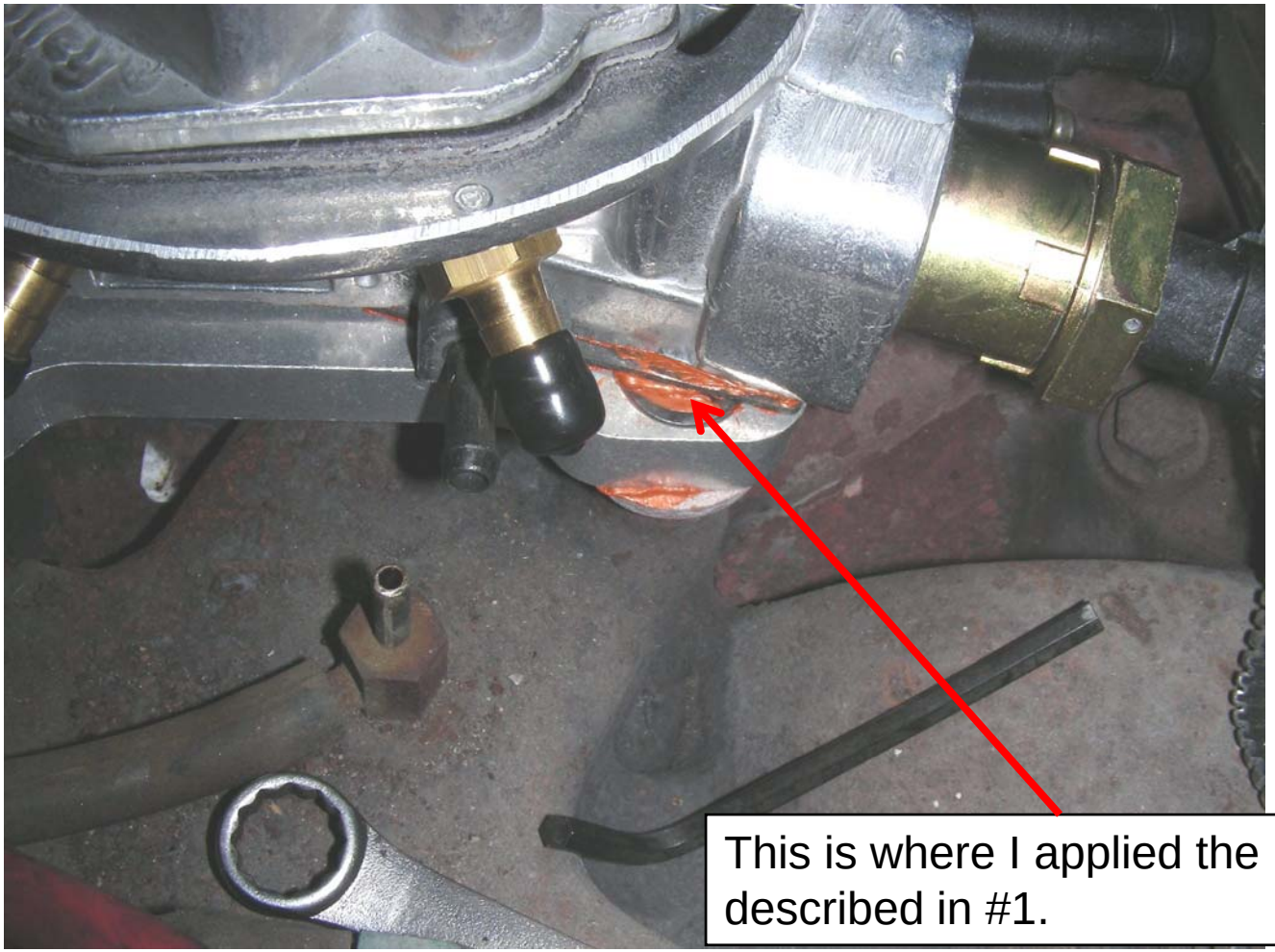
Paul Bartz pointed out to me that the gasket Howell provides to go between in intake manifold and the throttle body is cut wrong. Note the areas where there would be leaks.

Problem with Howell's Kit



This gasket correct the problems noted in the previous slide. This gasket is available from most auto parts stores.

Installation



Extra Parts I Bought

Thick Quadrajet to manifold gasket to replace the thin gasket in Howell's kit.

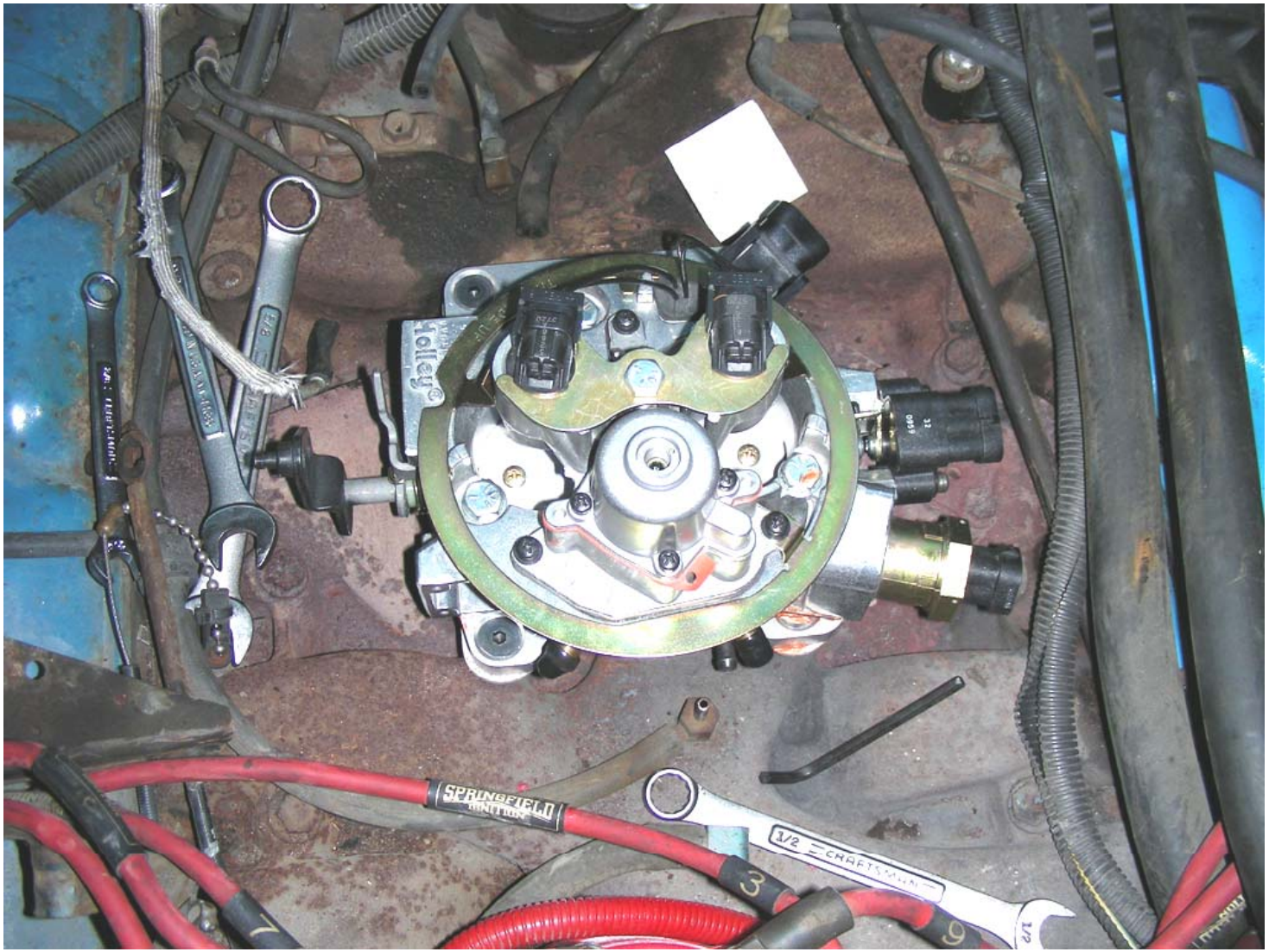
Installation

2. Install the TBI unit with the supplied gasket and hold down bolts. (Make sure the bottom ½" of throttle lever has been cut off the TBI to clear the intake manifold before bolting down permanently).

This was straight forward about installing the TBI unit.

However, I have no idea what they were talking about when it said to "make sure the bottom ½" of the throttle lever has been cut off the TBI". My throttle lever seem to fit just fine and cleared the intake manifold without cutting.

Throttle Body Installed



Installation

3. Connect vacuum lines as follows: PCV to 3/8" outlet on front. Distributor vacuum to passenger side vacuum outlet. Canister purge to the #1 port directly below the PCV line. MAP vacuum line from the rear of TBI. Left hand vacuum outlet can be used for any other full time vacuum requirement.

This part was vague and misleading. Apparently after this was written, Holly changed the configuration of the Throttle Body.

I attached the PCV vacuum line to the front of the throttle body.

I didn't bother with distributor vacuum because I went to ESC and that doesn't use vacuum.

I don't know what they were talking about with "Canister purge to #1 port". Maybe I screwed up there.

Holly changed the location for the MAP vacuum line. If you do it the way the directions state, you did it wrong and I suspect many did. The corrected location is the front, not the rear.

I blocked the left hand vacuum port with a cap.

Installation

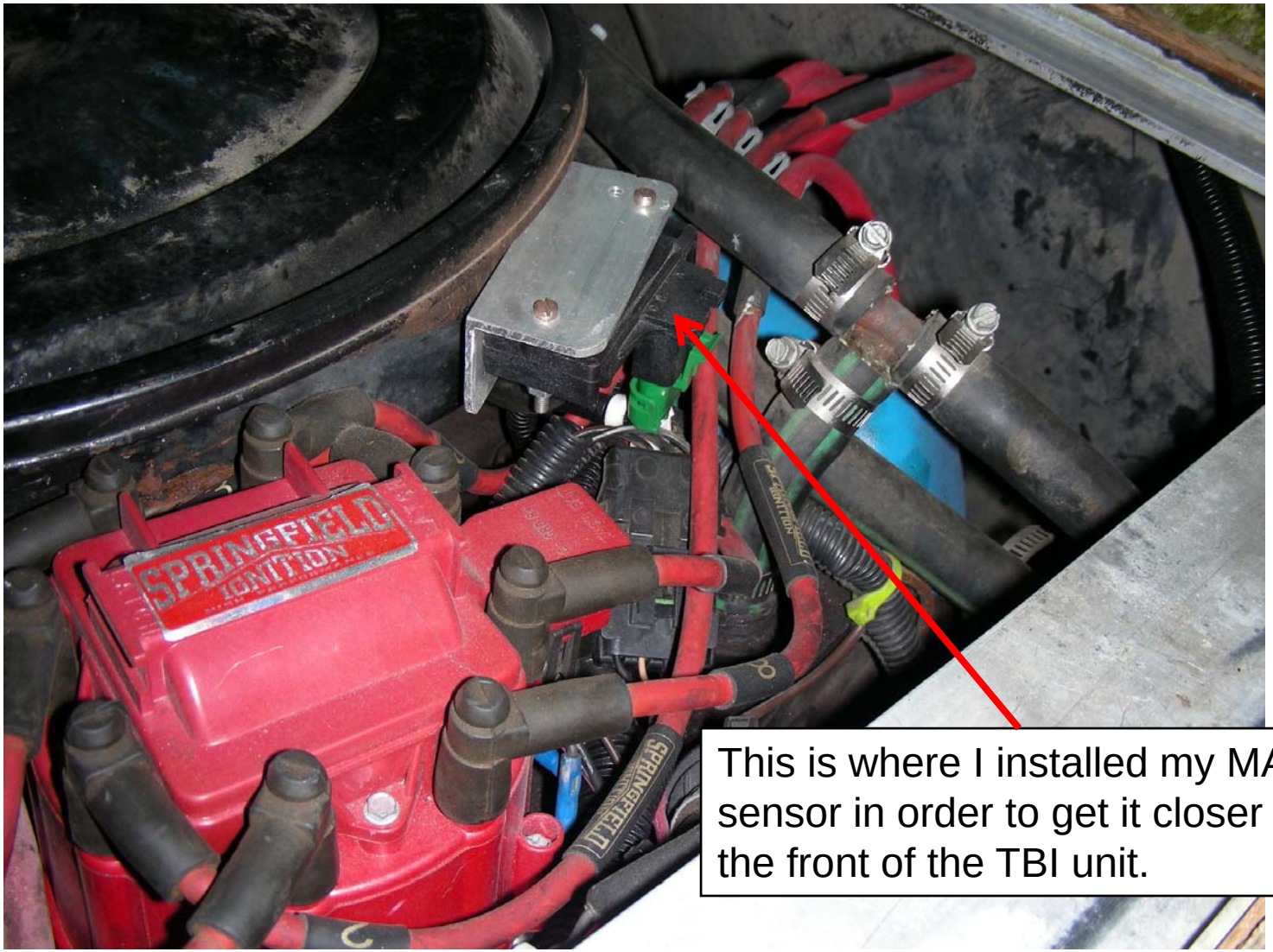
5. Connect vacuum lines as appropriate for your engine. MAP and AIR diverter valves require full time vacuum. EGR and Cannister purge lines use ported vacuum (no vacuum when the throttle is closed). GM TBI units have a vacuum connector on the rear that is designed for MAP vacuum. Holley 670 TBI units have a similar connector, but DO NOT USE IT FOR MAP VACUUM!! Instead, use one of the full time vacuum ports on either side of the front of the TBI unit.

I found out about this, during a conversation with Howell Tech Support. Apparently, they sent all 20+ group buy purchasers of us the wrong instructions. To connect the MAP sensor vacuum hose to the wrong port could cause a loss of performance.

The wiring harness we all received is built with the MAP sensor being connected to the rear port. There is not enough wire to allow the MAP sensor to be connected within Howell's recommend distance of 12" of vacuum hose.

I put my MAP sensor on the air filter housing, as that was the best location. It was also a location recommend by Howell tech support.

Problems with Howell's Kit



This is where I installed my MAP sensor in order to get it closer to the front of the TBI unit.

Installation

4. OXYGEN SENSOR—At this point, you may want to install the bung that mounts the Oxygen sensor. This can be done without removing the exhaust system. Drill or burn a 7/8" hole approx 3" downstream from the LH exhaust manifold flange (FIGURE 2). The supplied 18MM bung can then be welded into the exhaust pipe. The Oxy sensor can be mounted vertically, or at an angle, depending on your ability to create the correct hole in the pipe for the bung. NOTE: if you do not have in house equipment to make the correct hole in the exhaust pipe and weld in the bung, you may want to have this done at a muffler shop before starting the TBI installation. When the bung is in place, you may install the Oxygen sensor.

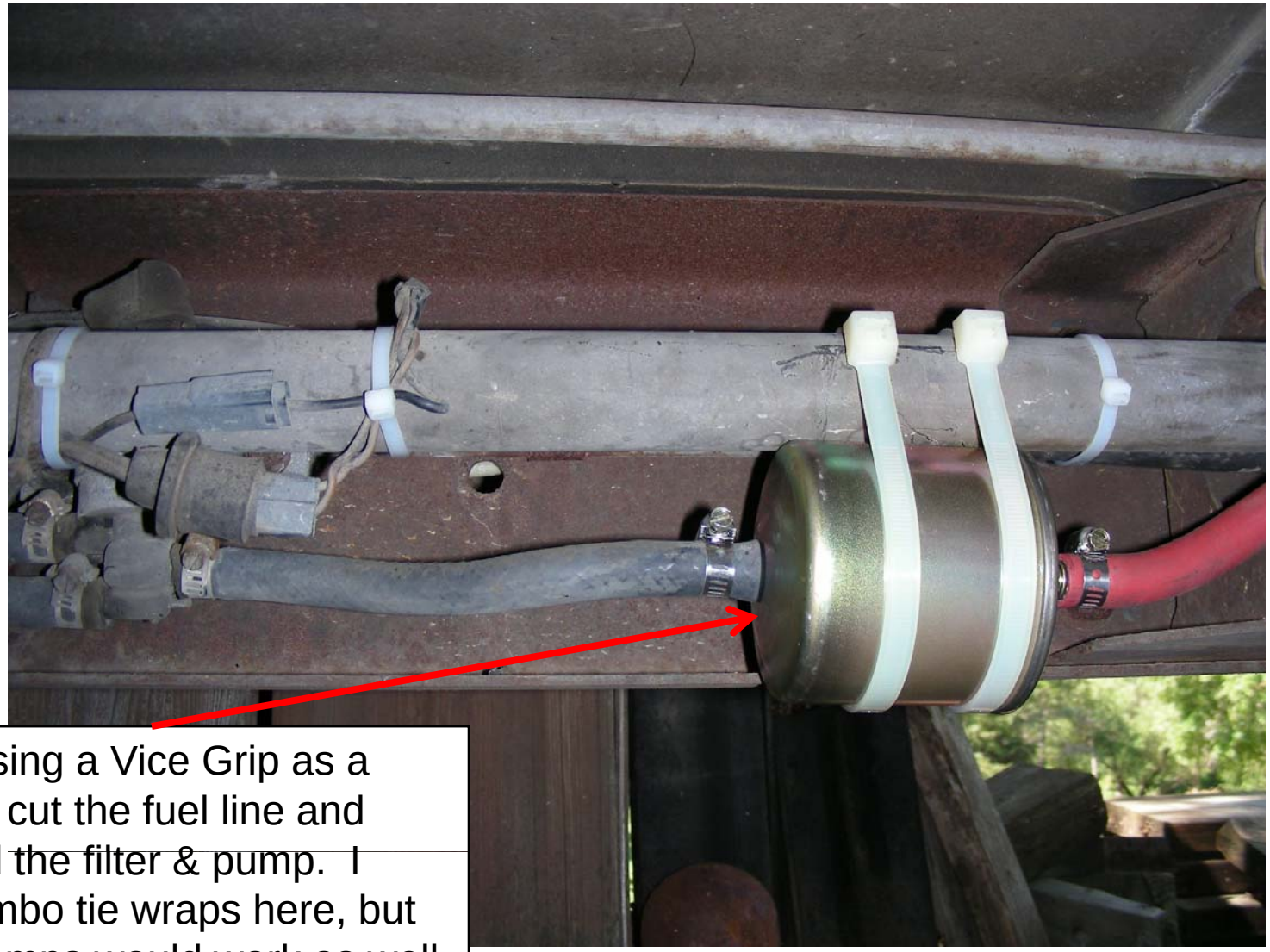
We already installed the O2 sensor earlier.

Installation

5. FUEL LINES AND FUEL PUMP—Before proceeding further in the engine compartment, you should have the fuel pump and filter in place. The fuel pump is an in-

One of the things I did before I installed the throttle body was install the fuel pump and filter.

Fuel Filter Installation

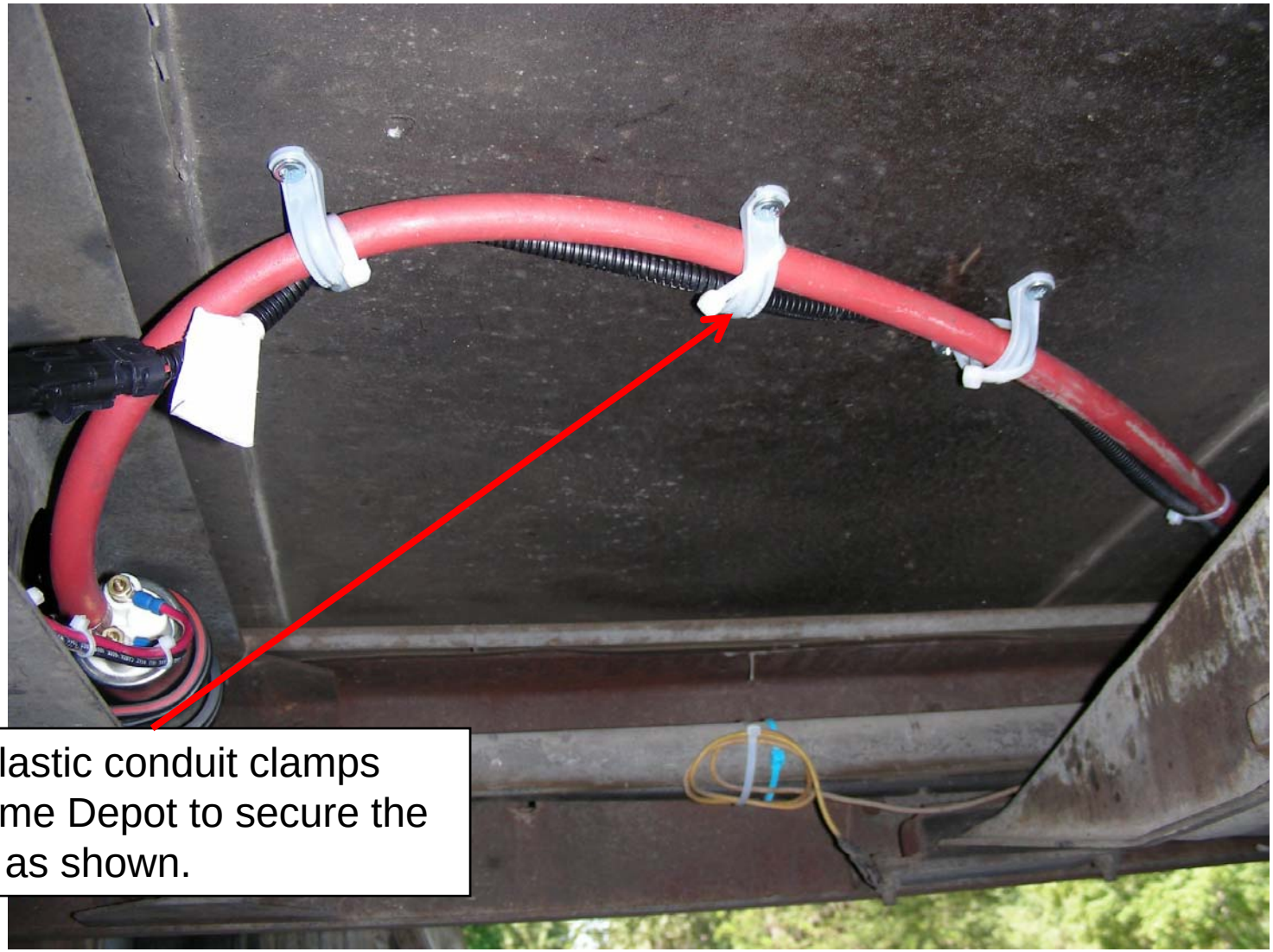


While using a Vice Grip as a clamp, I cut the fuel line and installed the filter & pump. I used jumbo tie wraps here, but hose clamps would work as well.

Fuel Pump Installation

The fuel pump is attached here with the brackets from the kit.

Fuel Line Installation



I used plastic conduit clamps from Home Depot to secure the fuel line as shown.

Fuel Return Installation

the pump. Your bypass return fuel line is ¼" hose and is routed from the right rear of the TBI along the back of the engine compartment, discharging into the fuel fill pipe going to the fuel tanks. To install this return fitting, use the following procedure: From inside the coach, punch a hole in the gas fill pipe at or below the TBI level, using an awl or sharpened punch, enlarge and round out the hole with a grease on the tap to catch metal particles, and install the supplied ¼" hose nipple with pipe sealer to prevent fuel leakage.

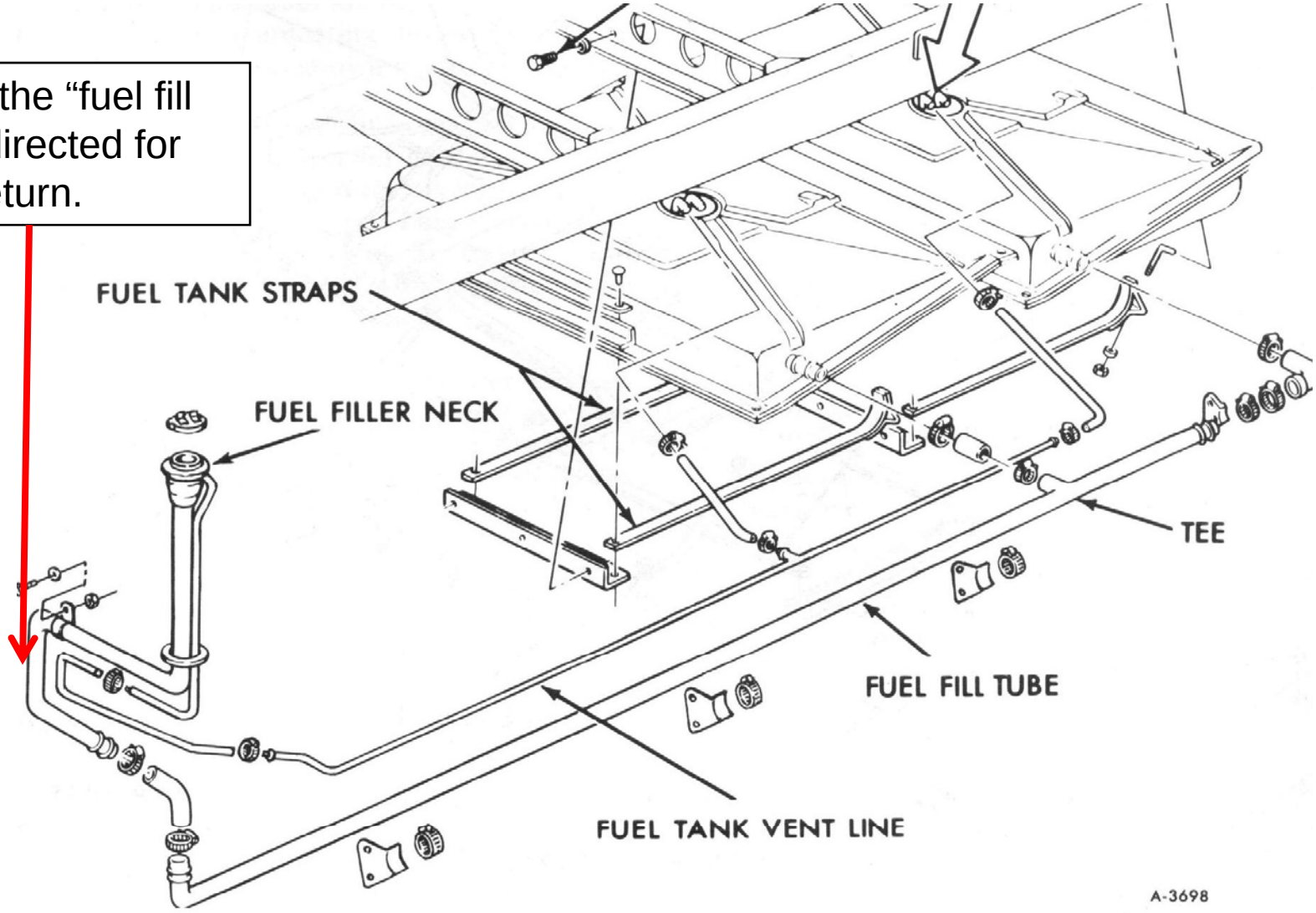
Installing the fuel return line was something I thought about quite a bit. I ended up drilling a hole in the fuel filler pipe. I used a tap as described to allow me to install the provided nipple. I took steps to keep it safe.

Another approach would be to tie into the "fuel tank vent line" with a "T". The vent line runs parallel to the fuel filler.

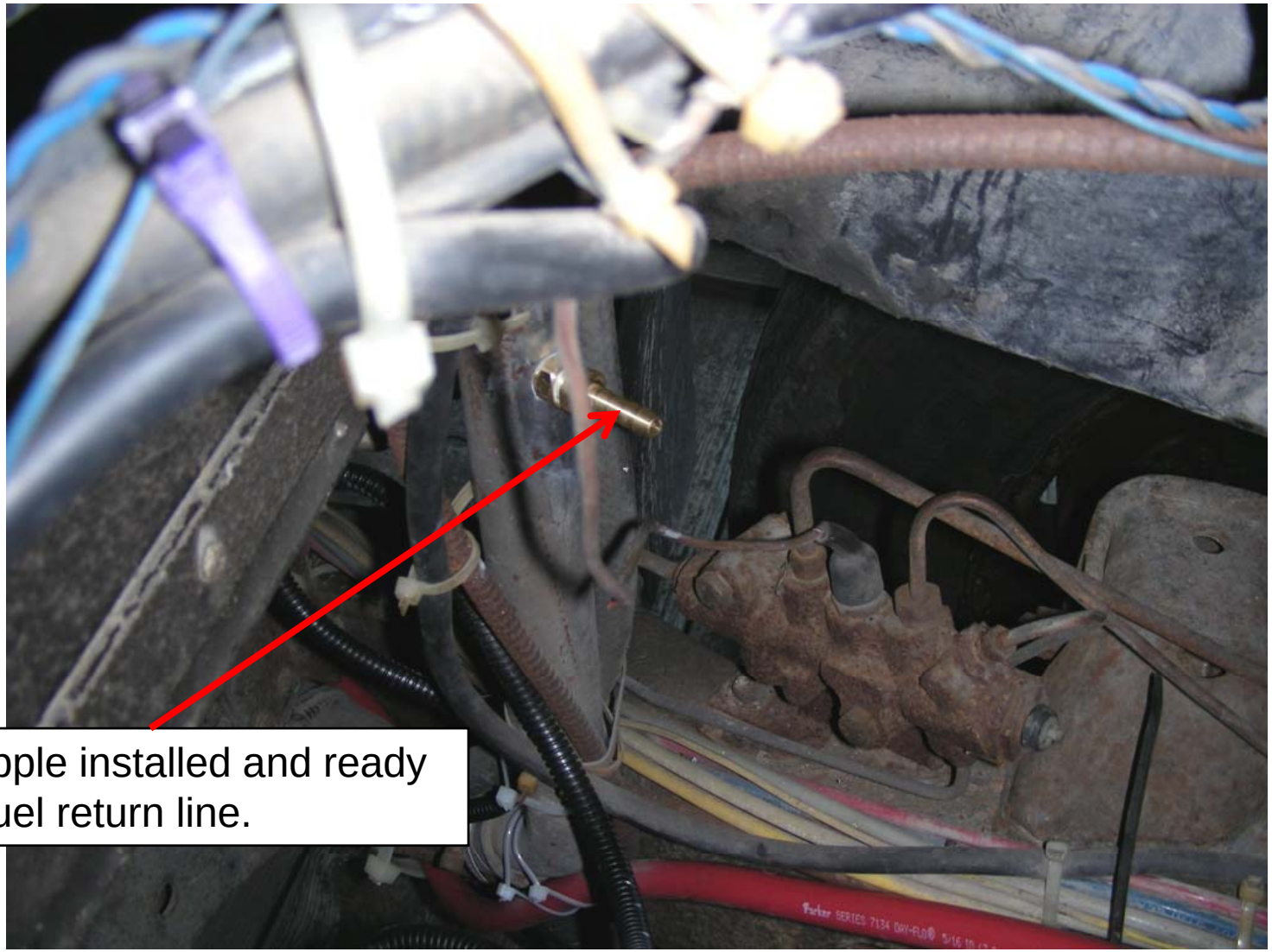
The ¼" hose mentioned is not used. Instead use the larger fuel hose that is used to supply the throttle body.

Fuel Return Installation

I tied into the “fuel fill tube” as directed for the fuel return.



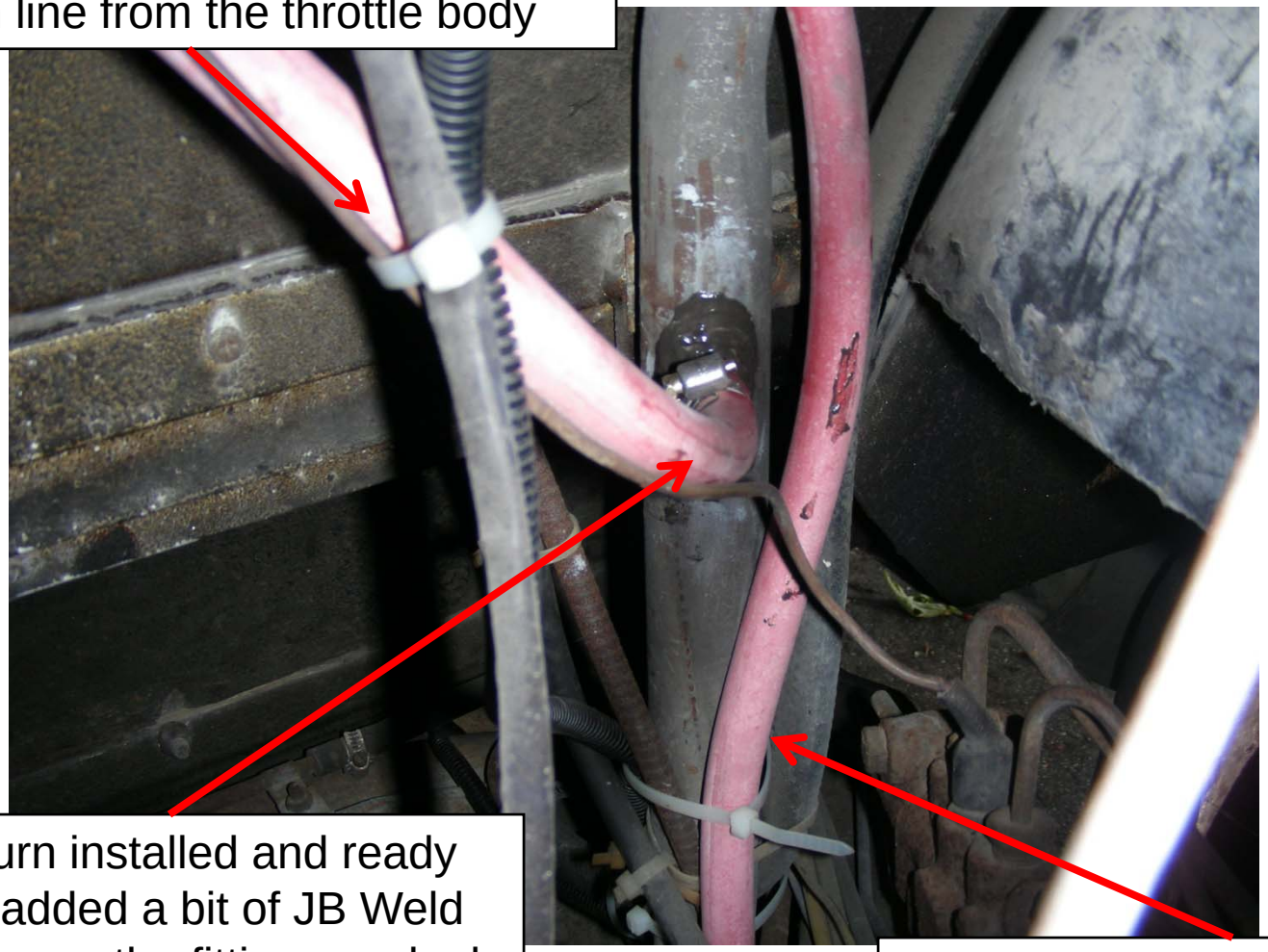
Fuel Return Installation



Hose nipple installed and ready for the fuel return line.

Fuel Return Installation

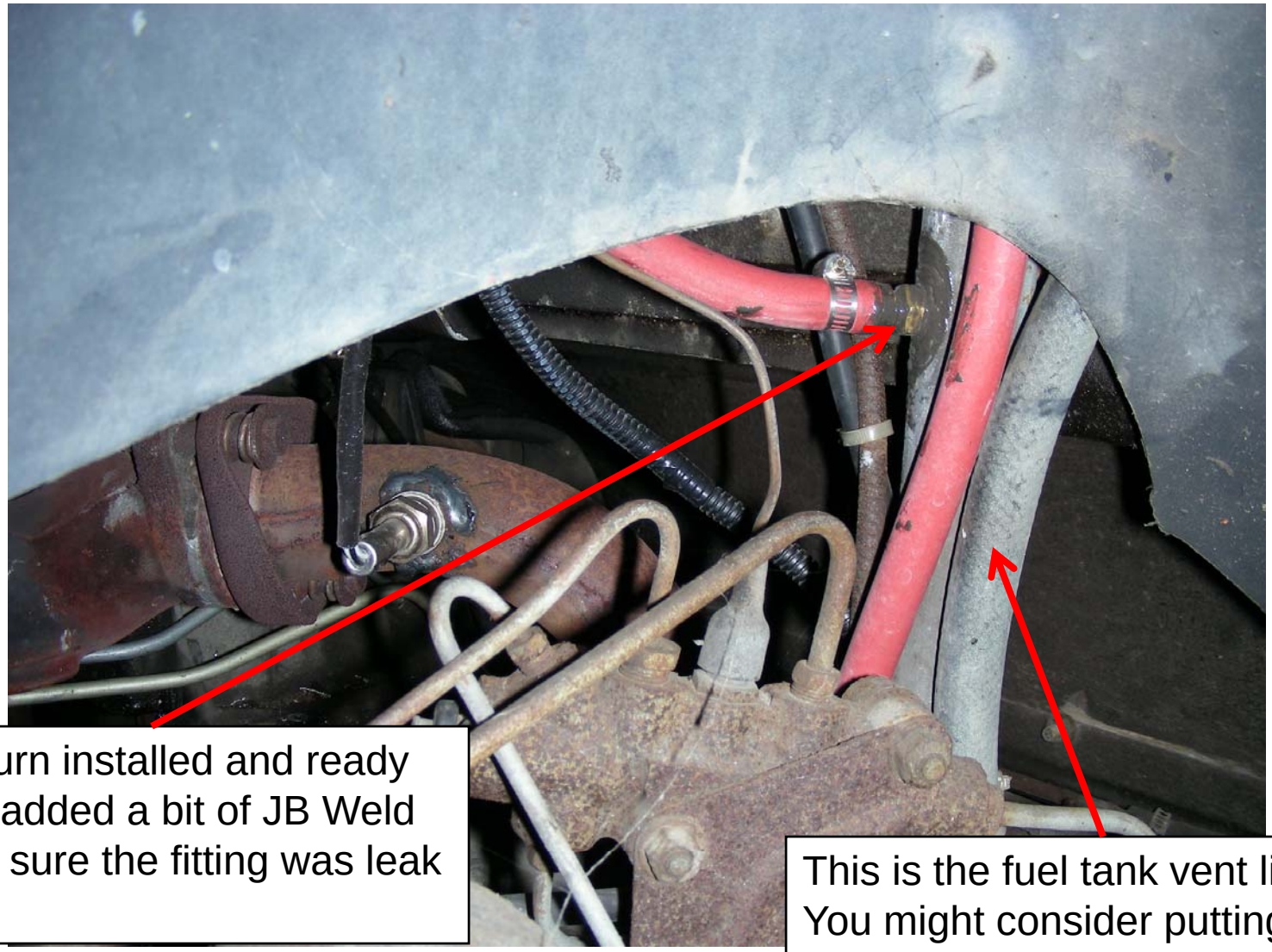
Fuel return line from the throttle body



Fuel return installed and ready to go. I added a bit of JB Weld to make sure the fitting was leak free.

Fuel line from the fuel pump.

Fuel Return Installation

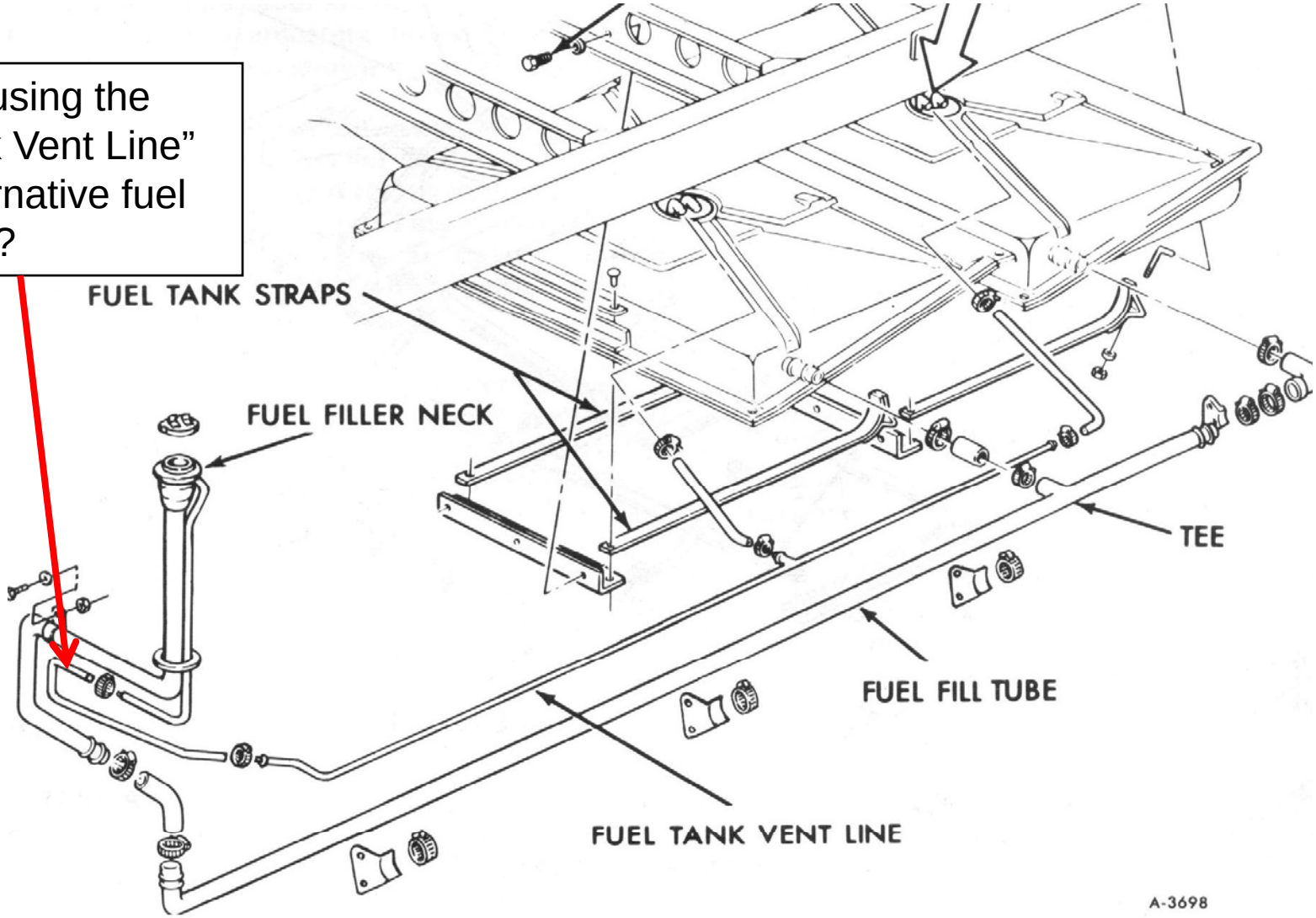


Fuel return installed and ready to go. I added a bit of JB Weld to make sure the fitting was leak free.

This is the fuel tank vent line. You might consider putting a T in this and running your fuel return back through this

Fuel Return Installation

Consider using the “Fuel Tank Vent Line” as an alternative fuel return line?



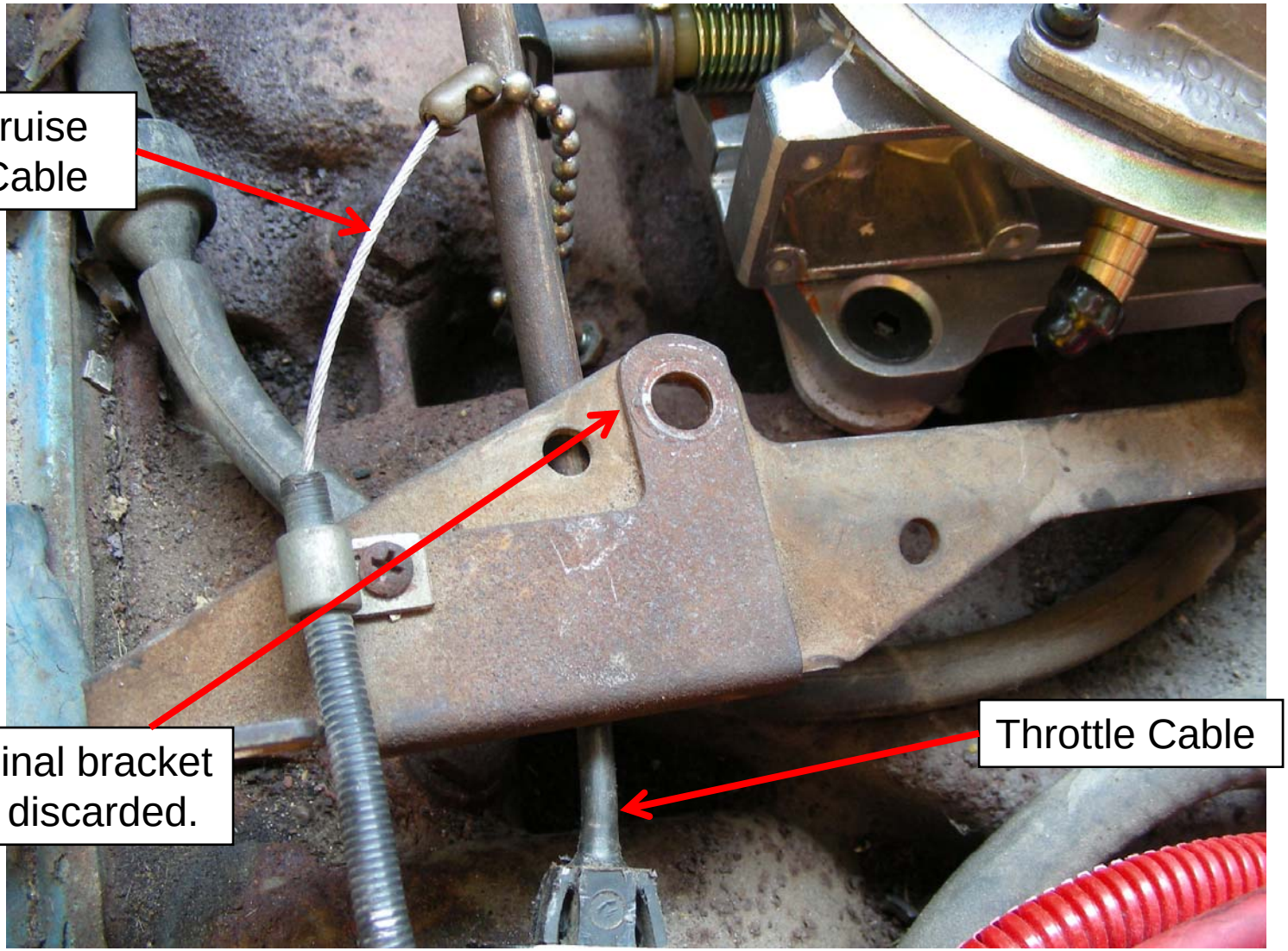
Installation

6. THROTTLE AND CRUISE CONTROL CABLES attach to studs on the throttle lever. There is sufficient torsion spring return on the 2-barrel TBI units, so you should not need a separate return spring. Transfer the cruise control stud from your Quadrajet throttle lever to the TBI lever. Install it pointing towards the TBI for best alignment. Remove the rubber grommet from your throttle cable and the cable end should now fit over the pin on the throttle lever. With three ¼" washers and a GM #1247872 spring clip you can retain the throttle cable. The throttle cable housing will be correctly retained and positioned using the special bracket supplied with your HED kit. It installs under the next to rear intake manifold bolt on the drivers side of engine. Check for wide-open throttle after everything is connected and bend or reposition this bracket if necessary to achieve WOT. The cruise control cable is adjustable, but the metal tube over it needs to be shortened by approx 3".

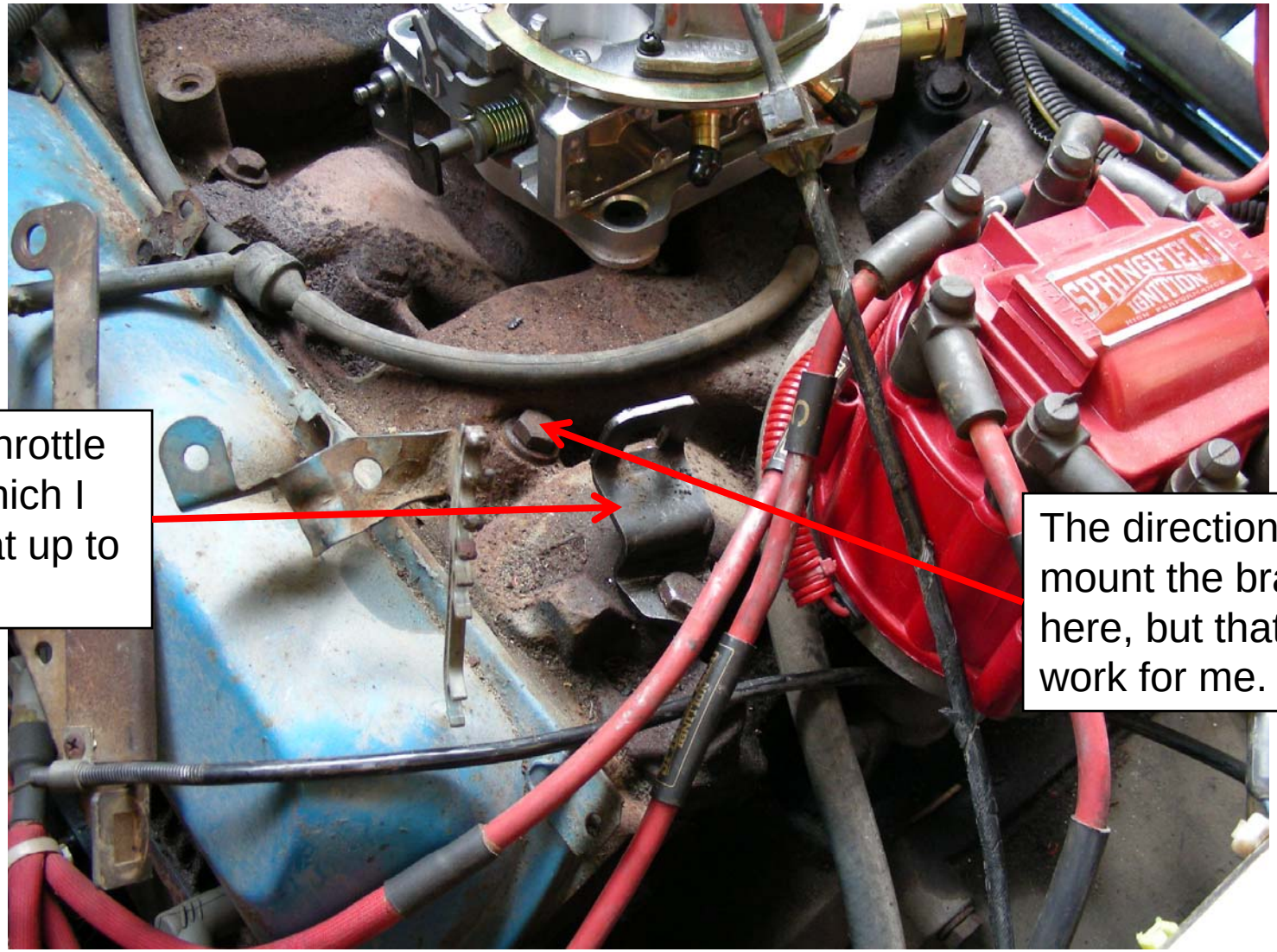
This is pretty confusing. The bottom line is you use this crappy bracket they provide to mount the throttle cable. The bracket has to be beat up to make it fit. The end of the throttle cable has to be trimmed so it can be retained by the bracket.

Since I don't have the OEM Cruise Control the kit assumes, I had to figure out how to do that too.

Cruise/Throttle Cables



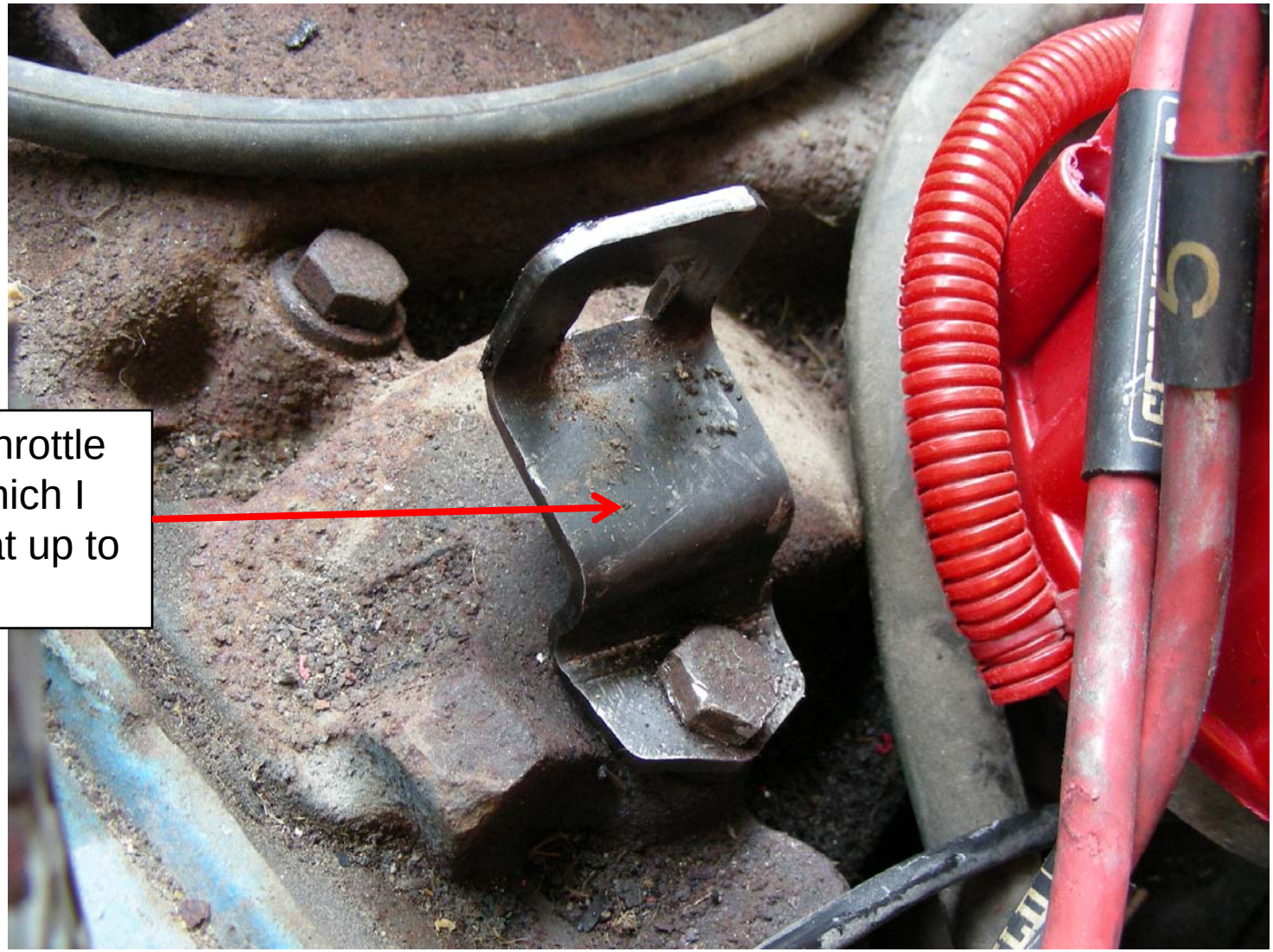
Cruise/Throttle Cables



The new throttle bracket which I had to beat up to make fit.

The directions say to mount the bracket here, but that didn't work for me.

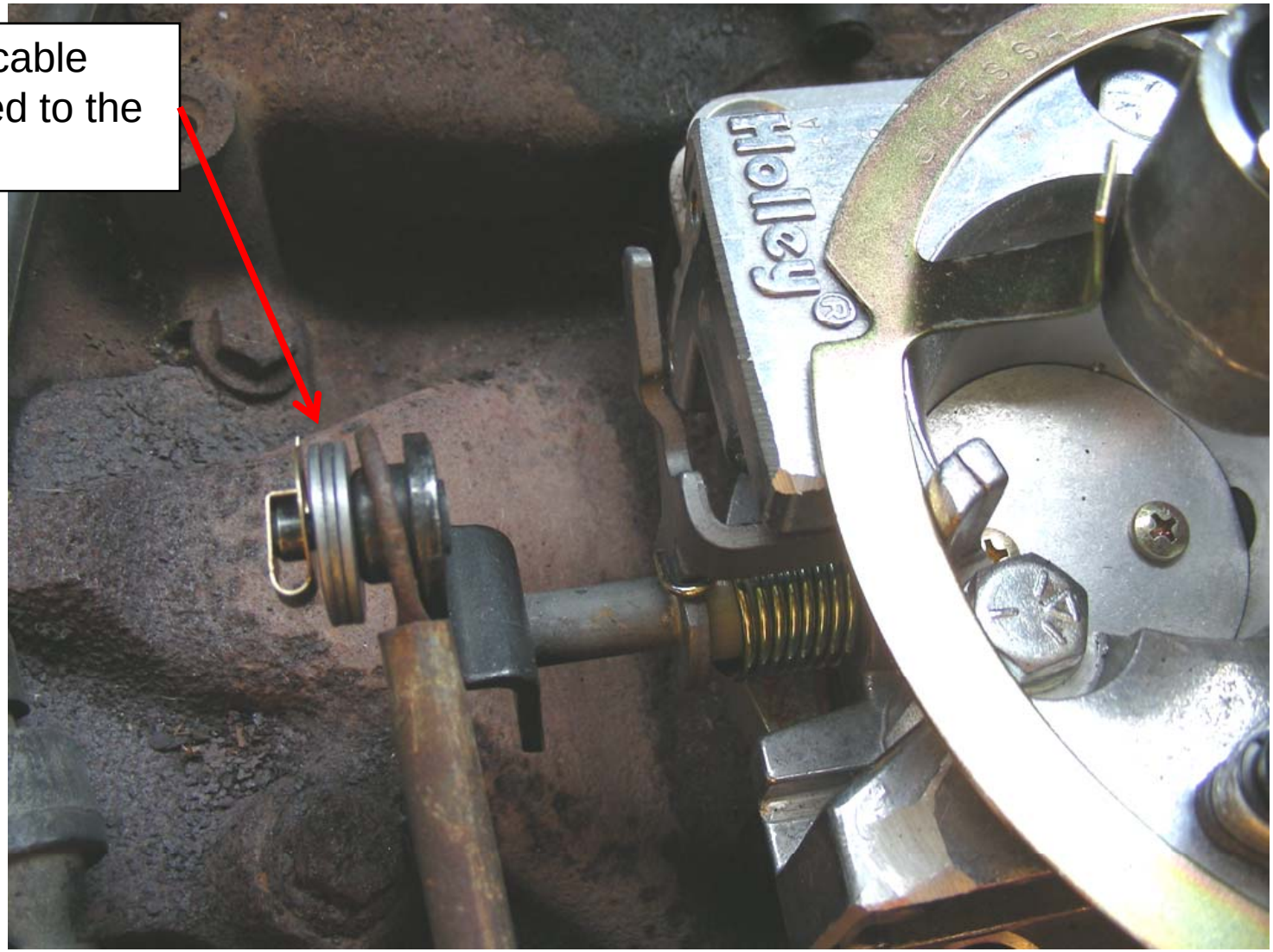
Cruise/Throttle Cables



The new throttle bracket which I had to beat up to make fit.

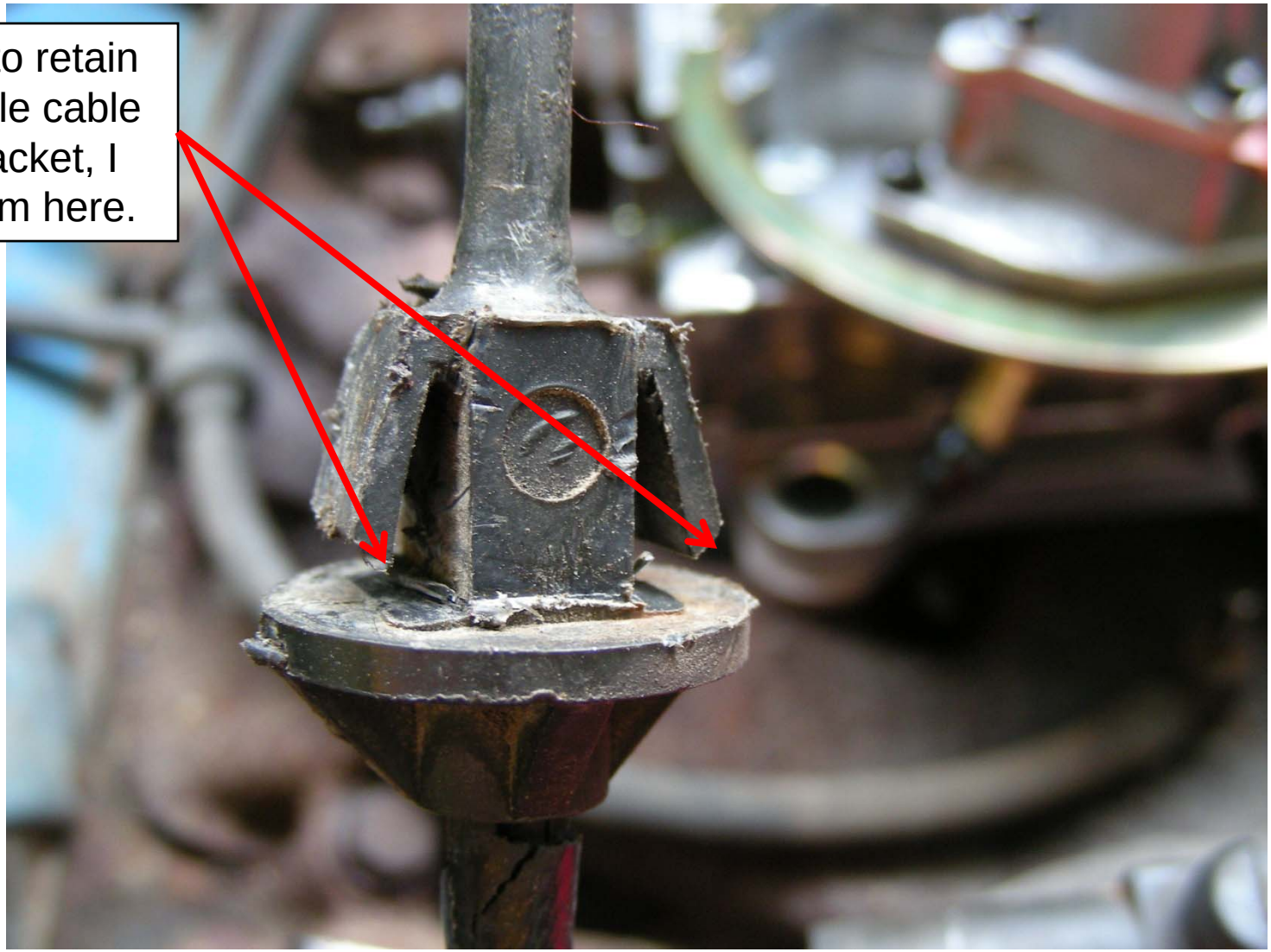
Cruise/Throttle Cables

Throttle cable connected to the throttle.



Cruise/Throttle Cables

In order to retain the throttle cable in the bracket, I had to trim here.



Air Cleaner

7. AIR CLEANER—To properly position your motorhome air cleaner assembly, you must use the supplied ¾" spacer (FIGURE 4) to raise it up for TBI injector clearance. (TBI air cleaner flange is ¾" lower than your old Q-jet AC flange). You will also have to create some clearance above the distributor since the air cleaner has been shifted slightly rearward. To do this, trim the forward edge of the spark plug wire retaining ring and indent the bottom rear corner of the air cleaner housing with a ball peen hammer until the necessary clearance is created. Included with your TBI kit is a length of ¼" threaded rod. Cut it to the proper length and install it in the TBI for your air cleaner hold down stud.

This a fun part. You get to beat the crap out of back of your air cleaner housing to allow it to clear the distributor. I didn't do a very nice job, but it fits.

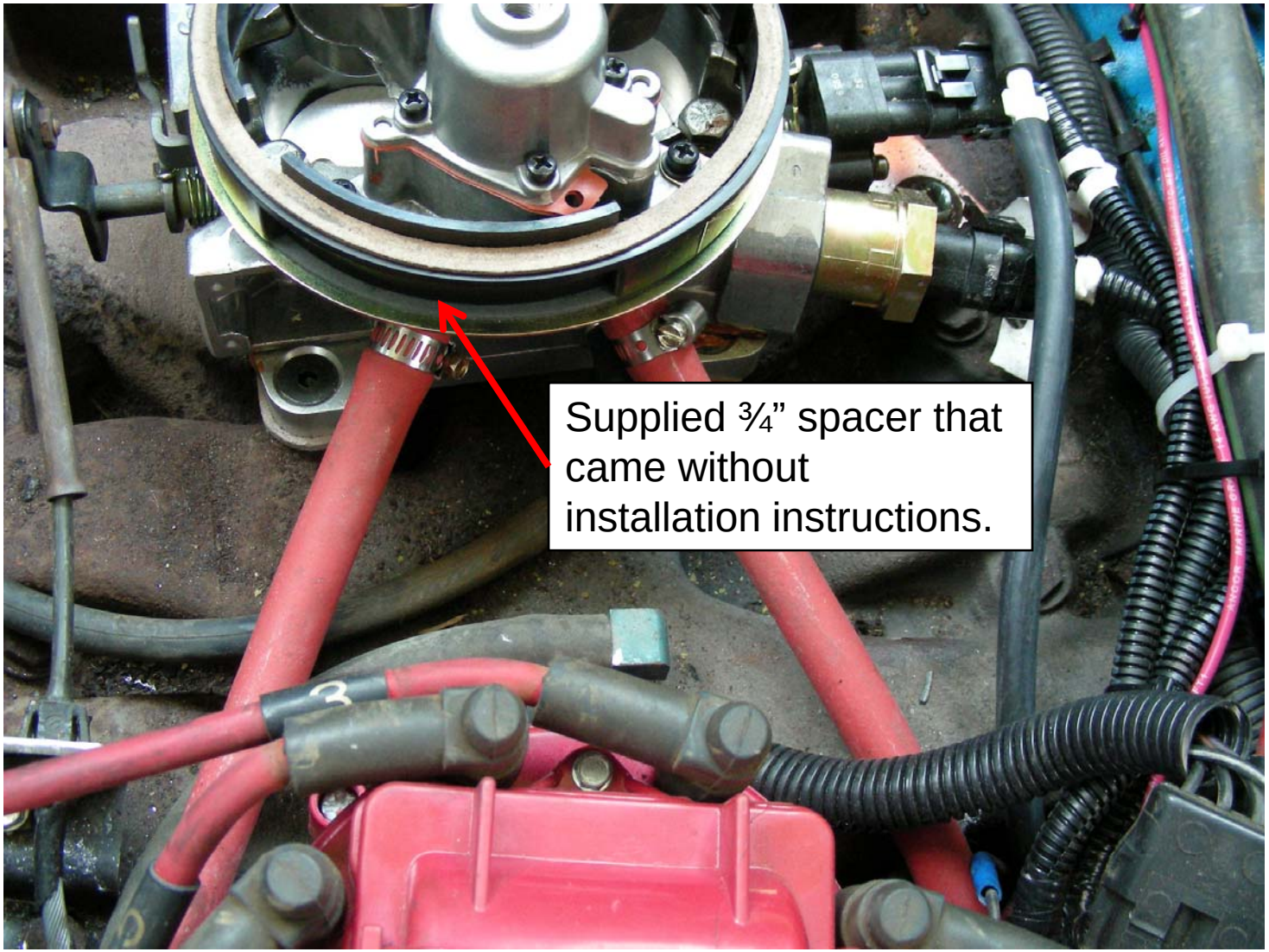
Also, I didn't get the ¼" threaded rod in my kit. No problem, I just cut the head off a ¼" bolt.

There are no instructions on how to use the supplied ¾" spacer and gaskets. You just kind of have to fool with it to make it fit.

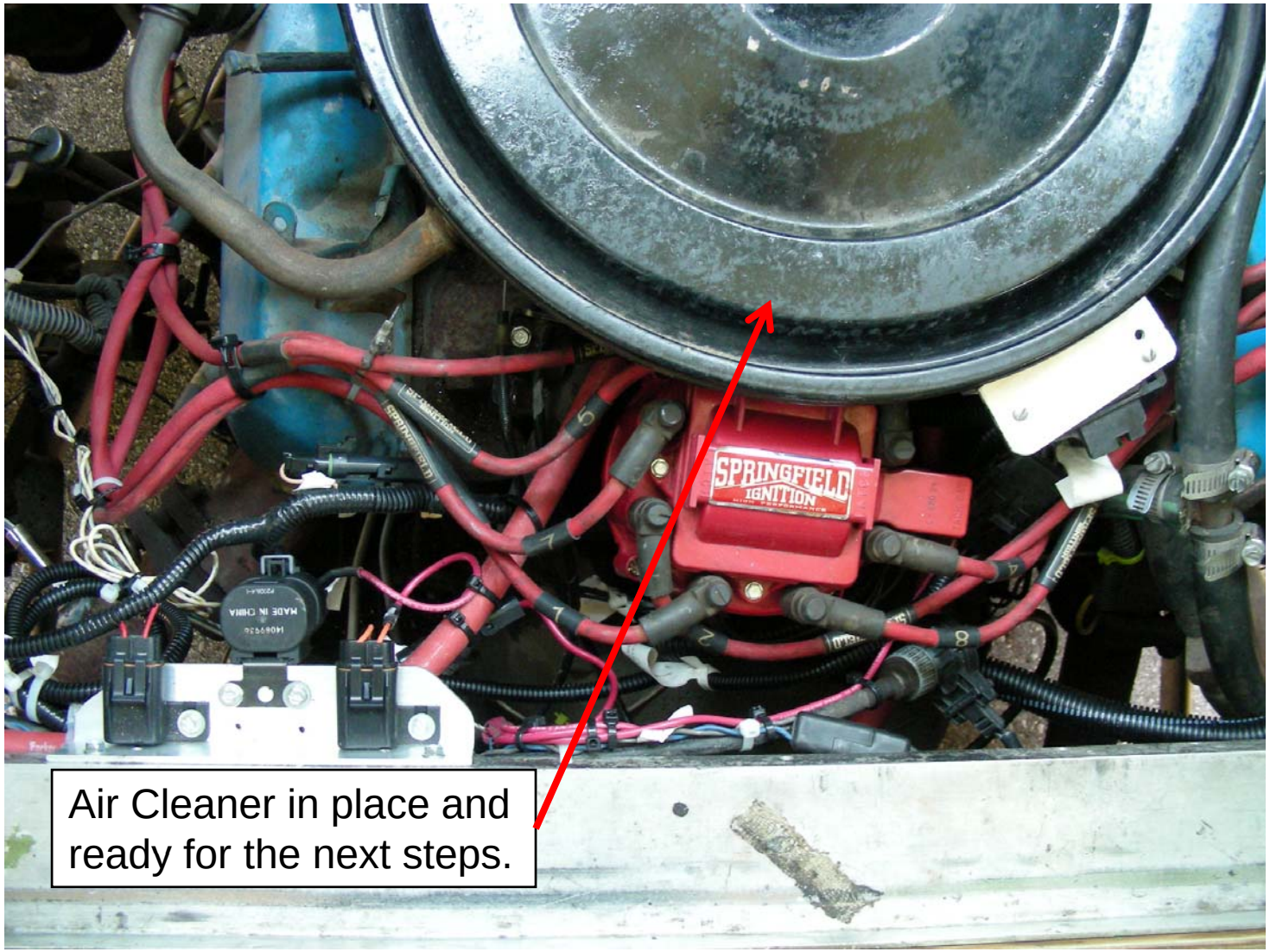
Air Cleaner

I beat the Air Cleaner in to provide clearance for the distributor. This is because the TBI sets the Air Cleaner back from OEM.

Air Cleaner


Supplied ¾” spacer that came without installation instructions.

Air Cleaner


SPRINGFIELD
IGNITION
Air Cleaner in place and ready for the next steps.

Electronic Components & Wiring

4. Installation of Electronic components and wiring harness

The Howell HP/TBI wiring harness supplied with your system does all the interconnecting wiring from the engine sensors and TBI to the GM vehicle ECM. It is designed to fit your motor coach with a minimum of left over wire when properly installed. The ECM, fuse block and diagnostic connector will be located in the compartment under the front passenger seat. You will need a 2" hole in the floorboard directly under the seat (10" right and 14" from rear edge of the engine opening, see FIGURE 5). Since this is plywood, it can easily be drilled with a hole saw from below.

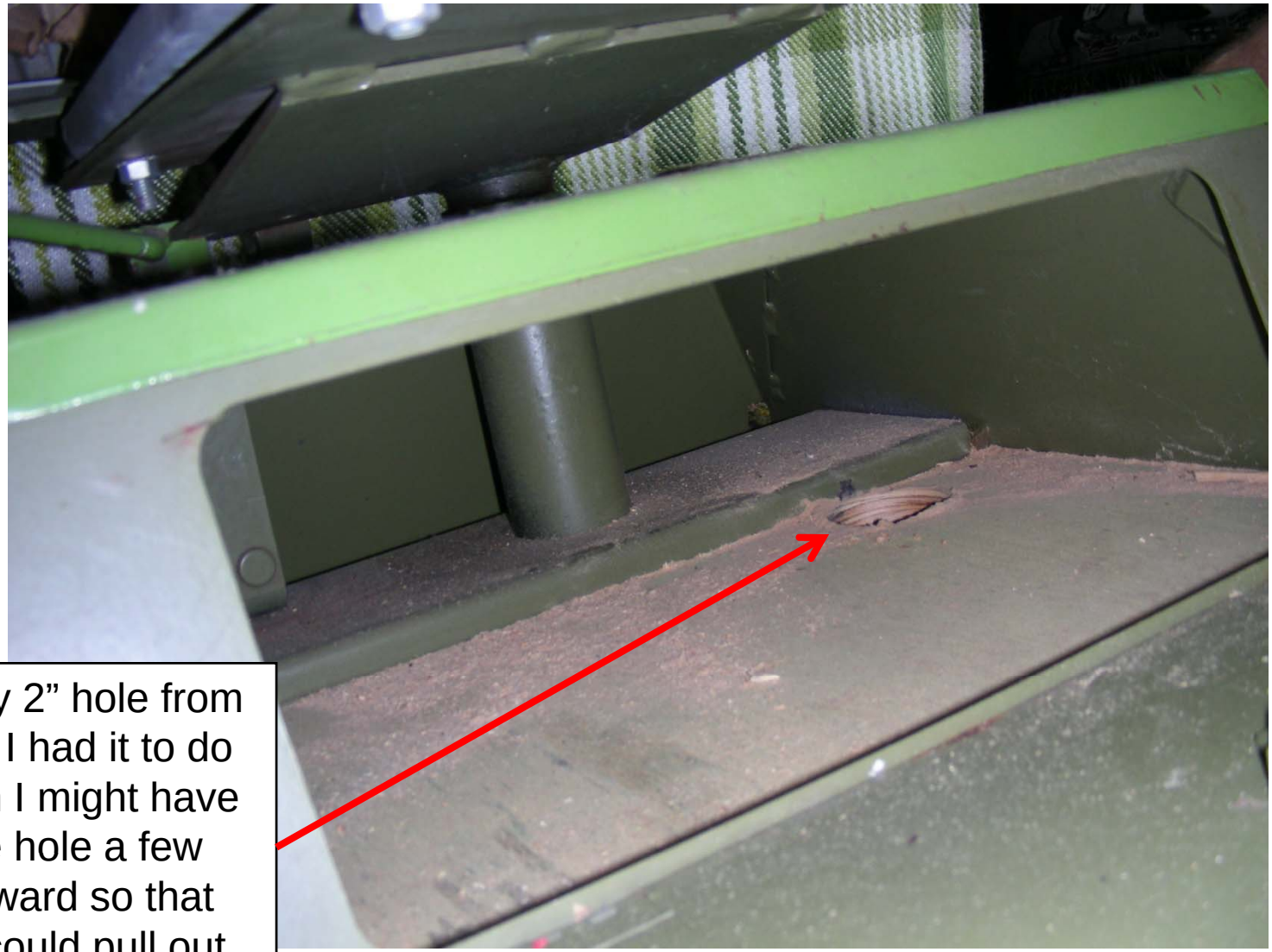
They are correct in that there is very little extra wire in the harness. There is for the most part, exactly enough. I did have to splice some extra wire in just a few places.

Since I had a right angle drill, I decided to drill the 2" hole from inside the passenger seat compartment. I think this was much easer than drilling from under in the engine compartment.

Electronic Components & Wiring

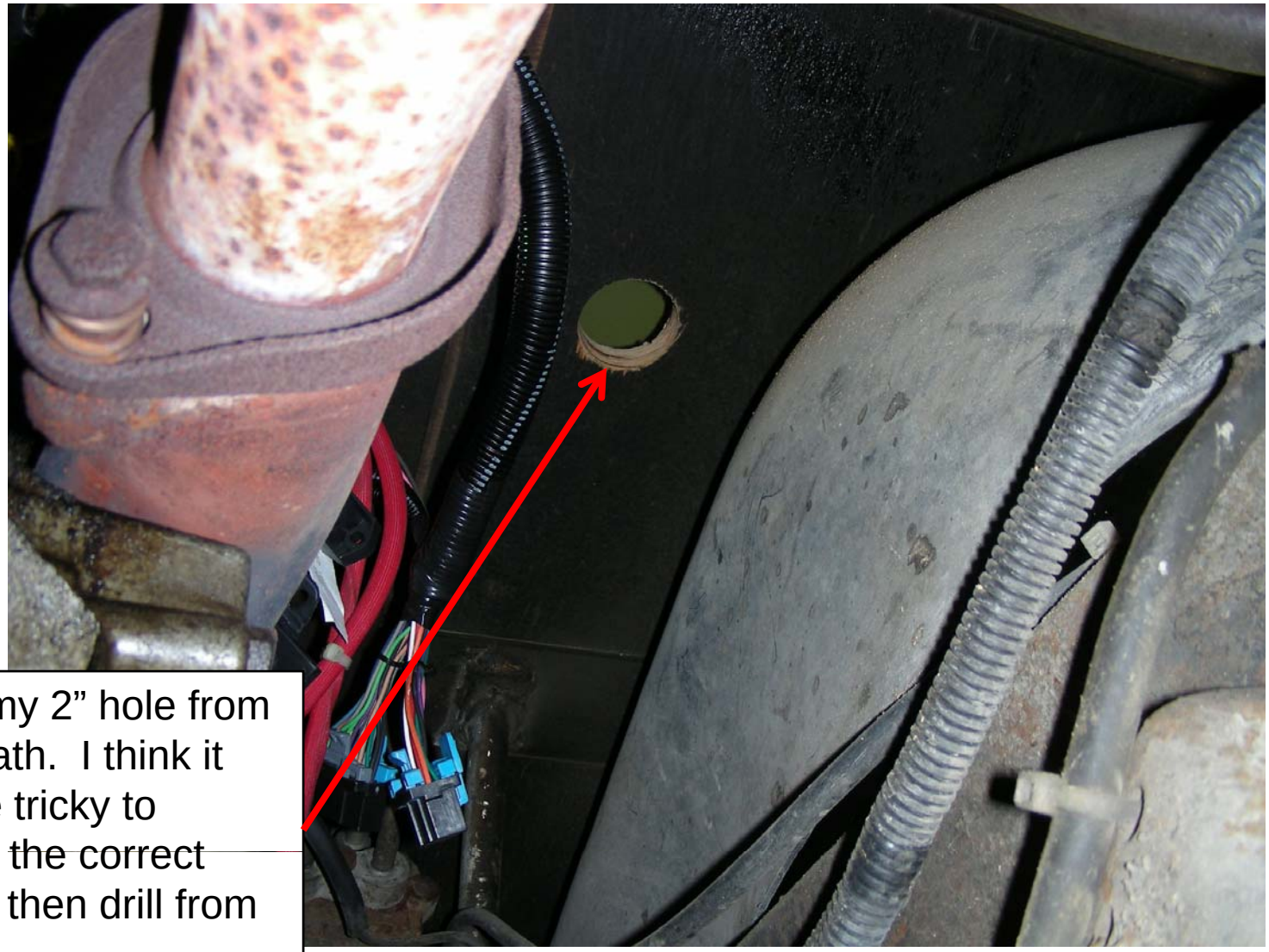
My right angle drill which made this job much easier.

Electronic Components & Wiring



View of my 2” hole from the top. If I had it to do over again I might have moved the hole a few inches forward so that the ECM could pull out farther.

Electronic Components & Wiring



View of my 2” hole from underneath. I think it would be tricky to measure the correct spot and then drill from here.

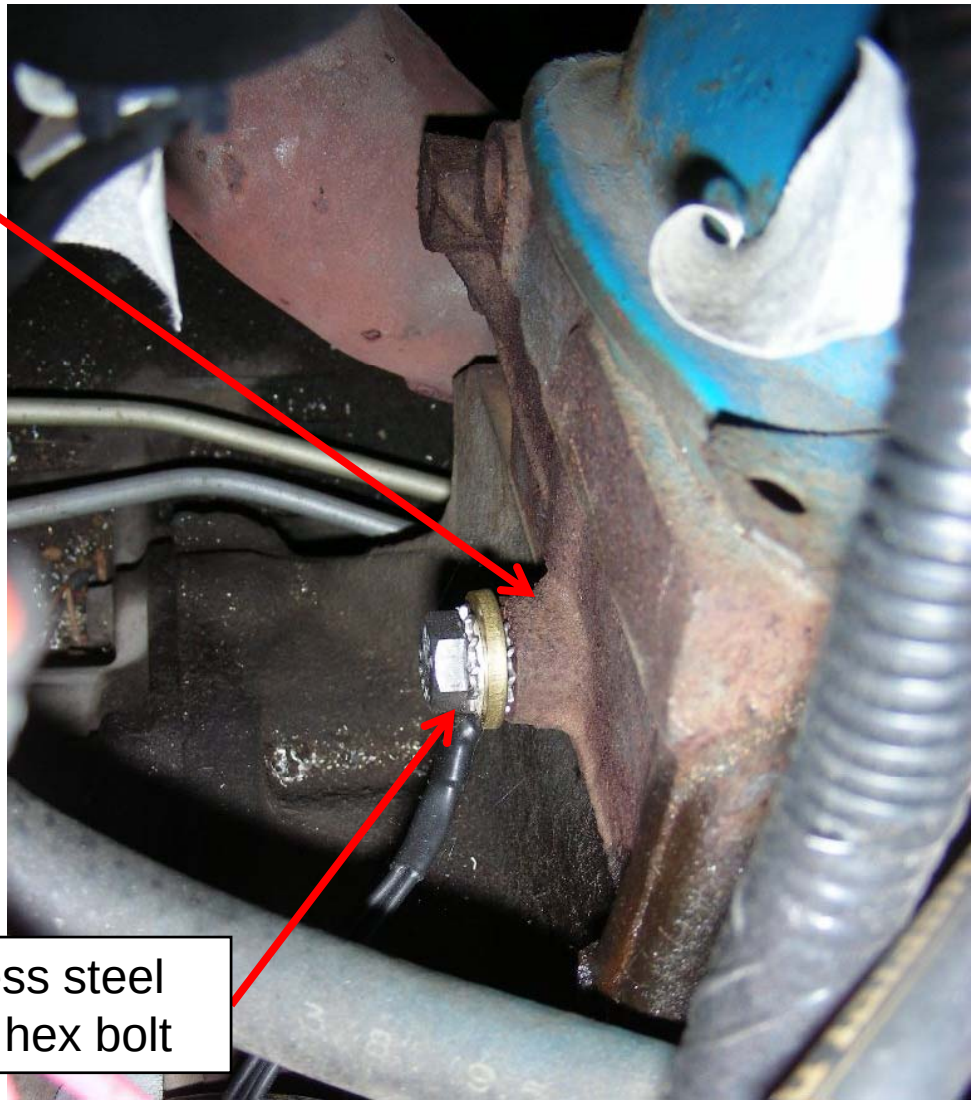
Electronic Components & Wiring

1. The harness grounds attach at the back of the right hand cylinder head and locate the harness position a the back of the engine. The engine trunk portion moves forward from the point.

I connected the harness grounds to the left hand (driver's side) cylinder head.

Electronic Components & Wiring

There is a threaded hole in the driver's side cylinder head that can be used for the TBI system ground attach point.



Brass 3/8" washer & stainless steel star washers & 3/8"-16x3/4 hex bolt

Electronic Components & Wiring

Brass 3/8” washers & stainless steel 3/8”-16x3/4 hex bolt to connect TBI wiring harness ground wires to driver side cylinder head

Paul Bartz recommended that I get these parts.

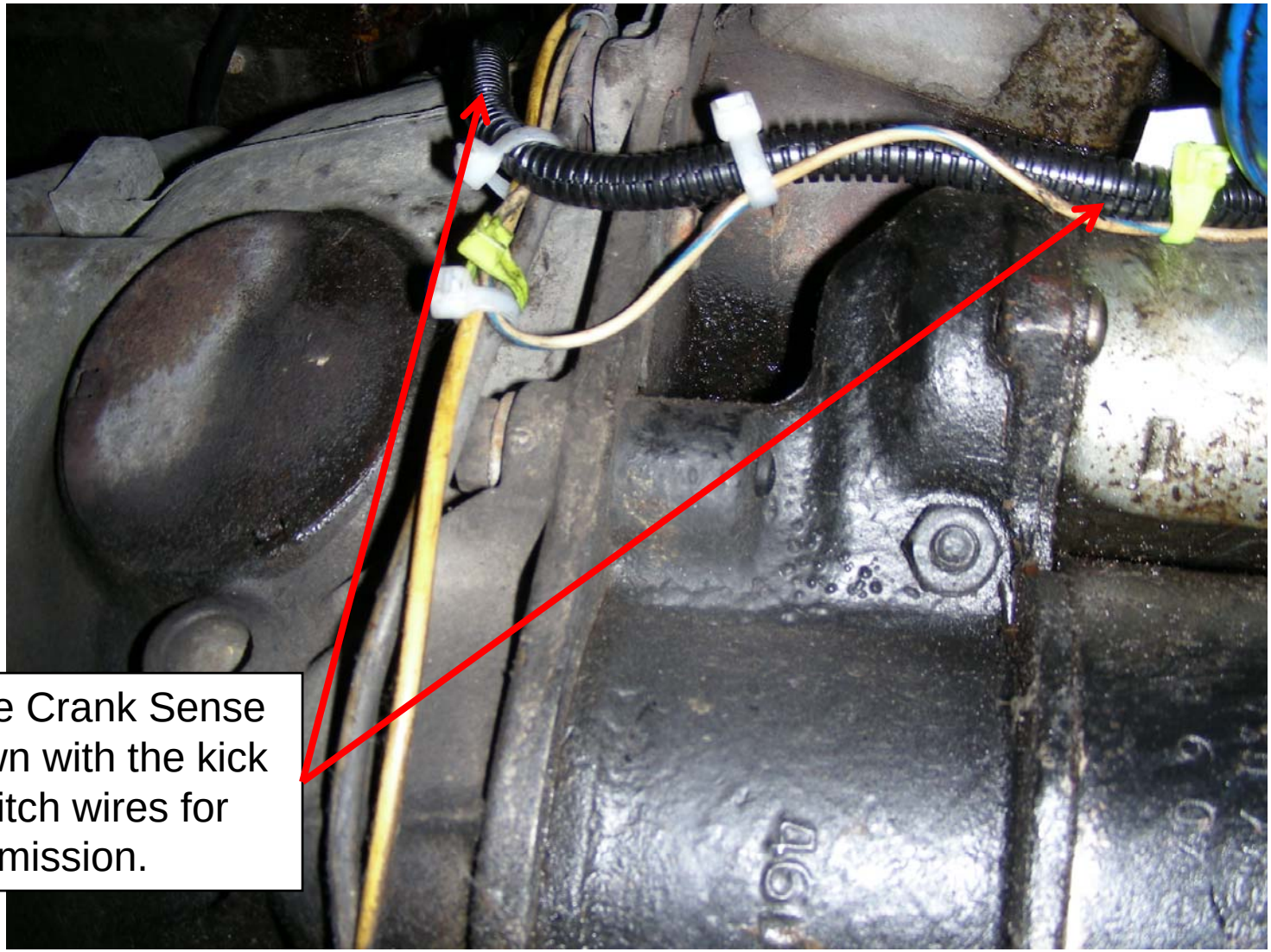
Electronic Components & Wiring

2. After the grounds are secured, route the labeled purple wire to the starter solenoid (some harnesses do not have this wire). Connect sensor wire should be long enough to attach to your previously mounted Oxygen sensor. If necessary to extend it, cut and solder splice on the harness side, not the Oxy sensor lead wire.

The purple wire in the harness was exactly the right length.

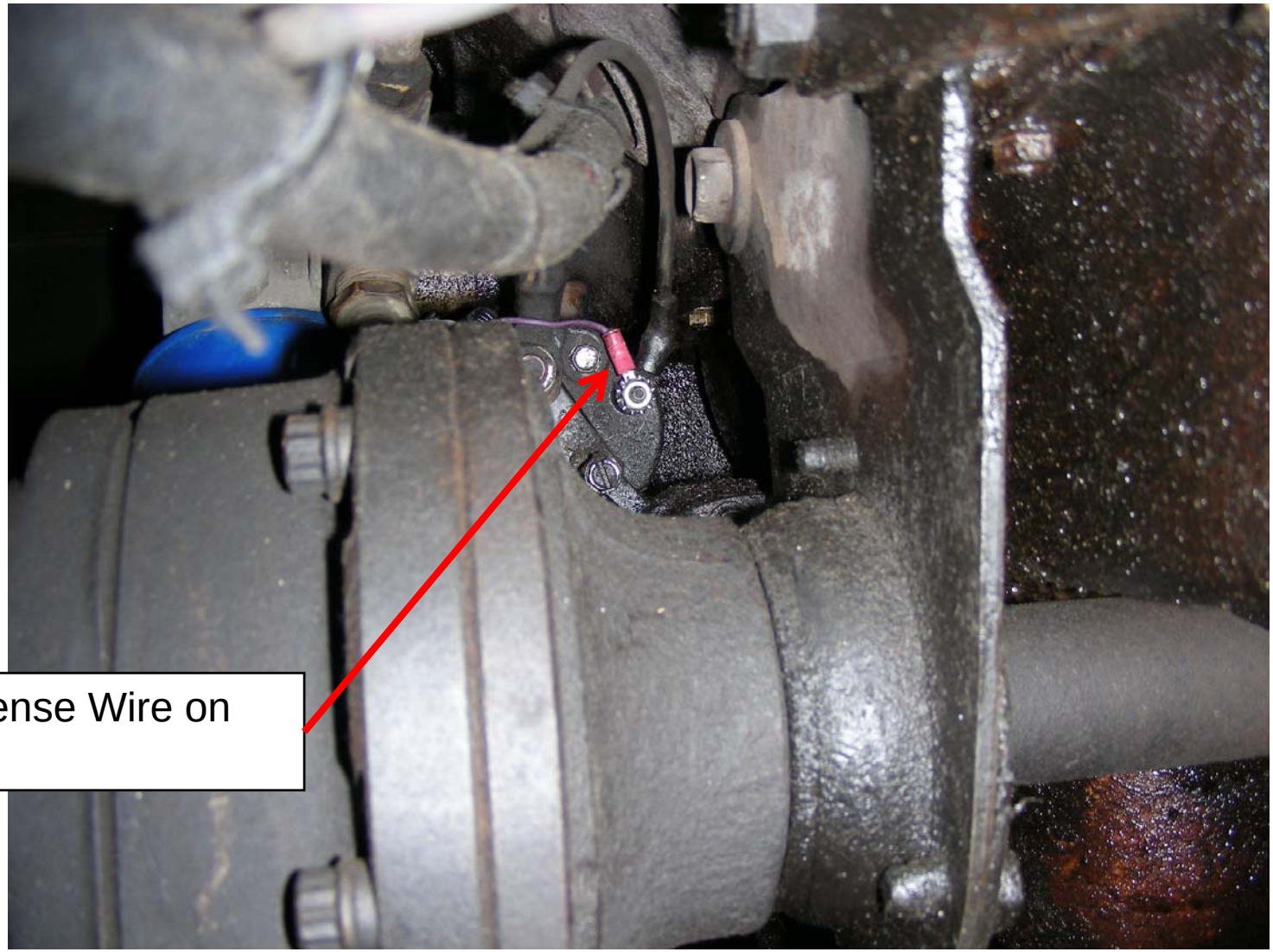
Also the Oxygen sensor wire was correct.

Electronic Components & Wiring



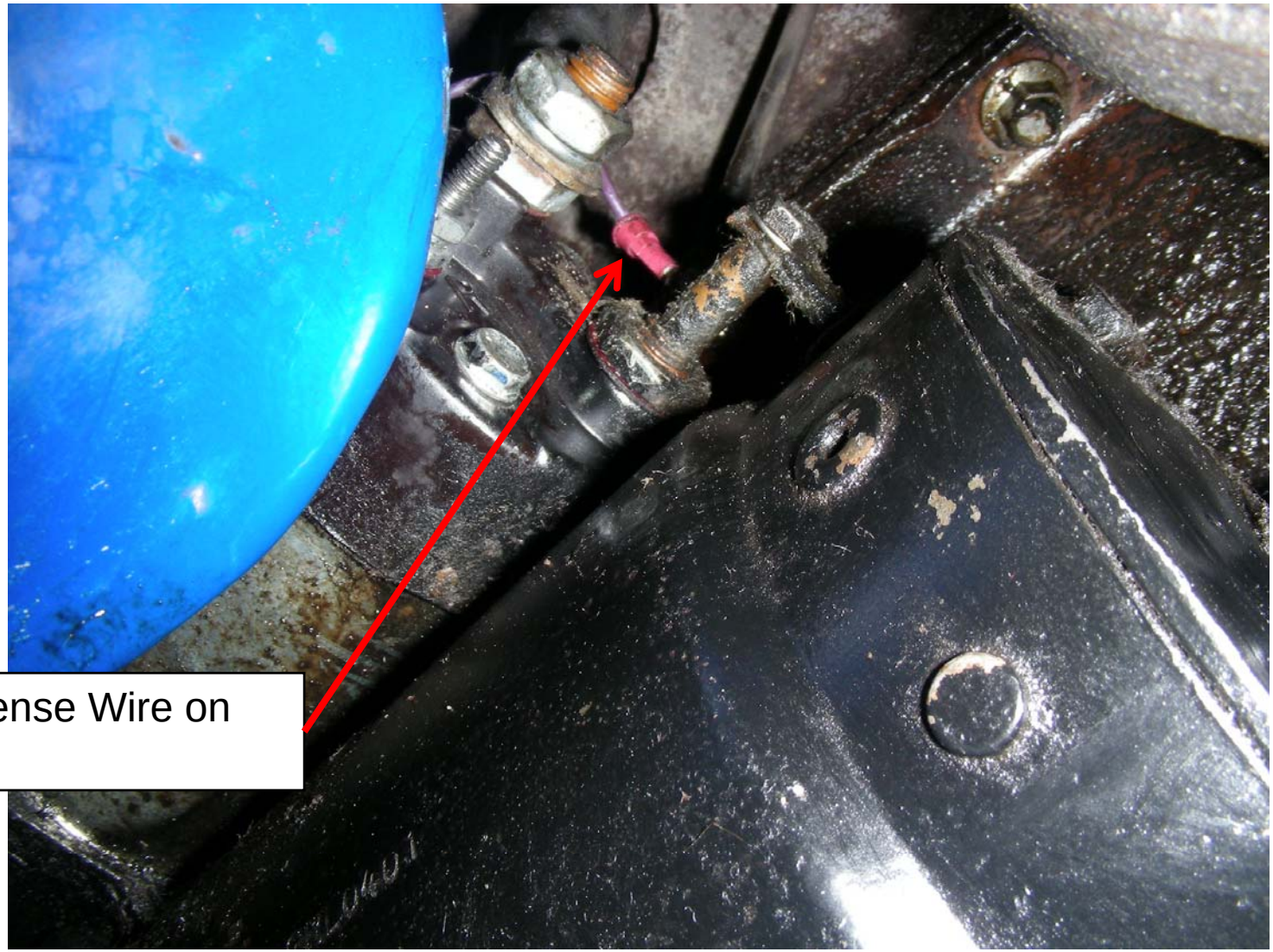
Route the Crank Sense Wire down with the kick down switch wires for the transmission.

Electronic Components & Wiring



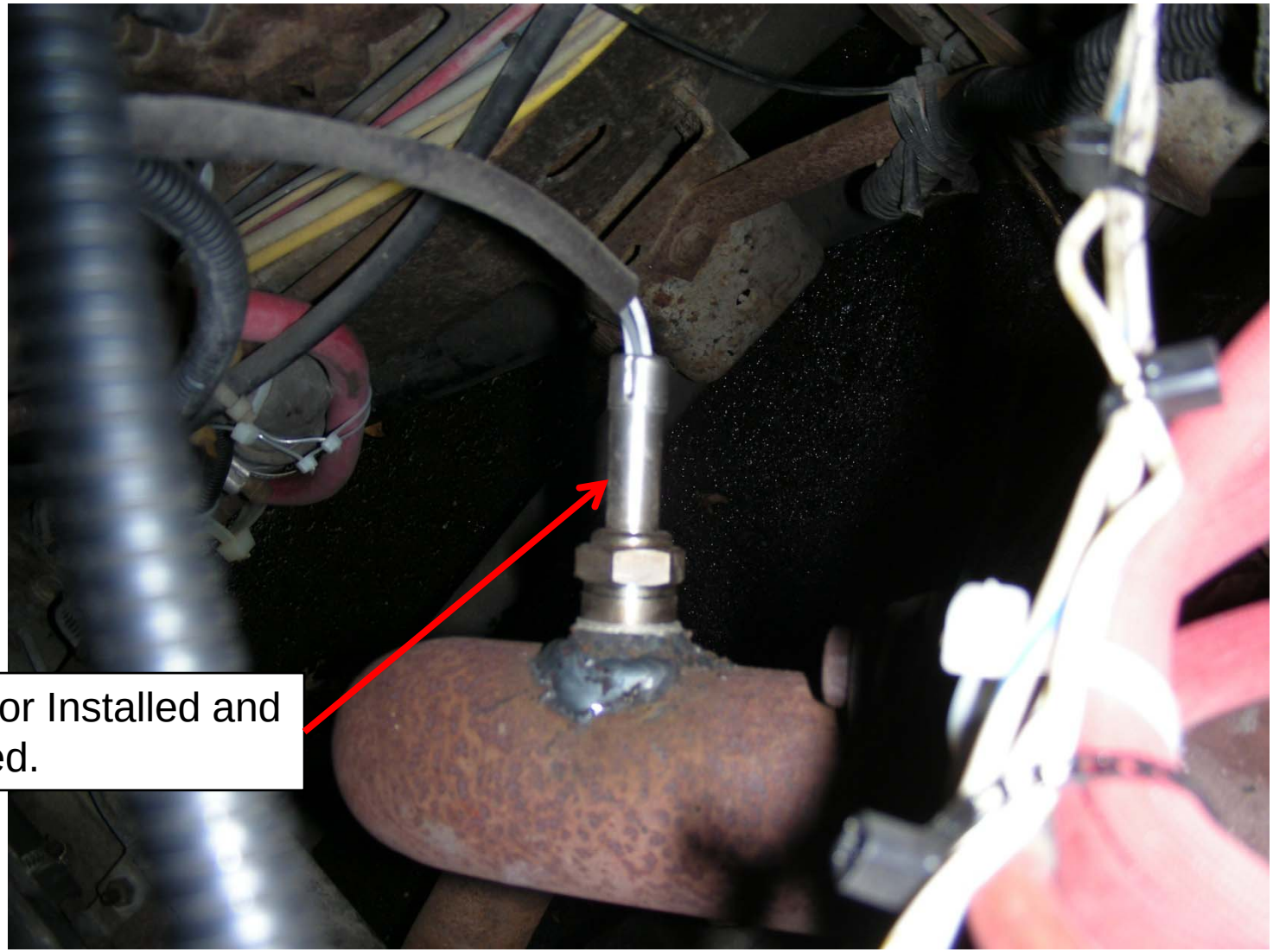
Crank Sense Wire on Starter.

Electronic Components & Wiring



Crank Sense Wire on Starter.

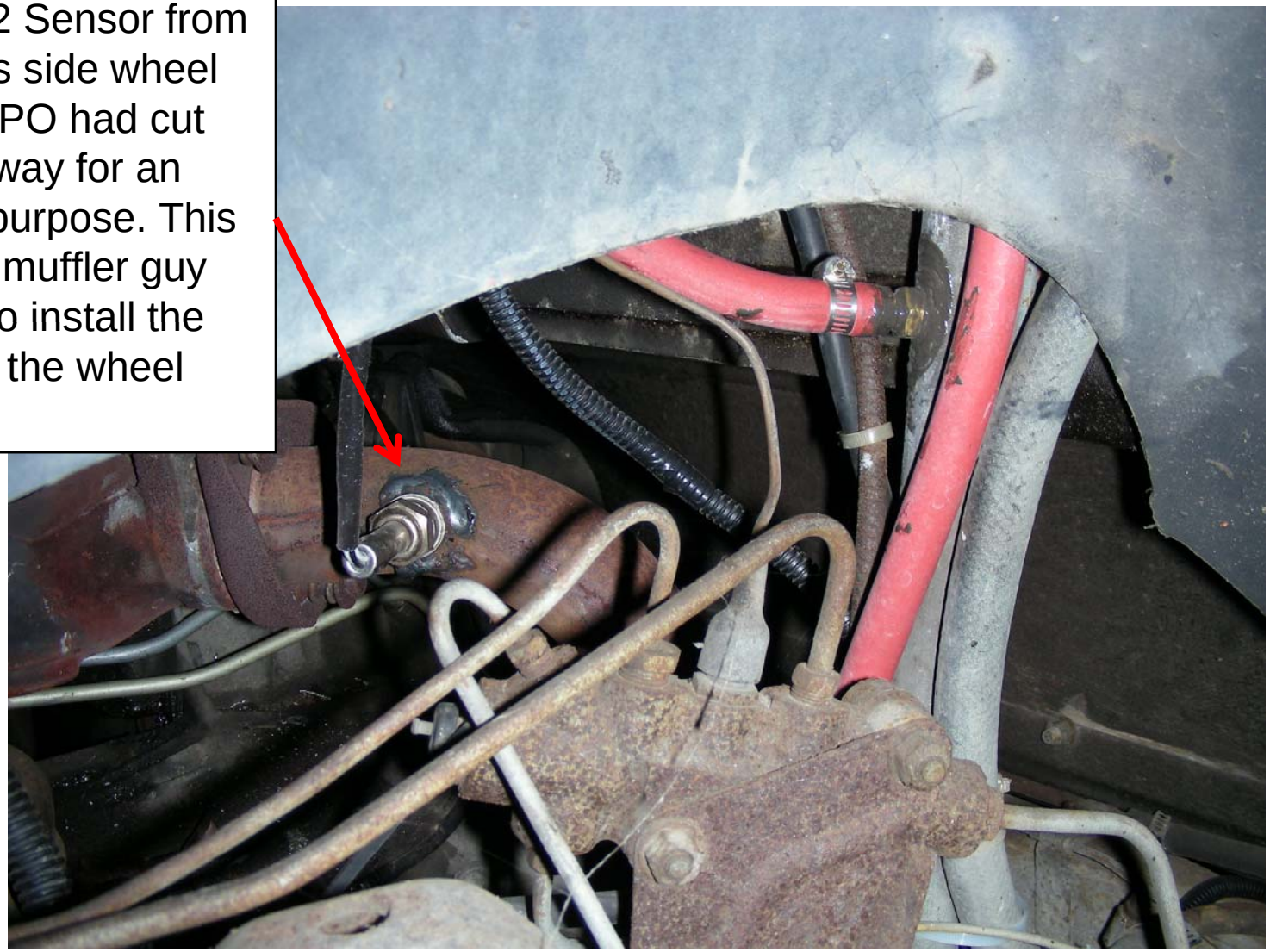
Electronic Components & Wiring



O2 Sensor Installed and connected.

Electronic Components & Wiring

View of O2 Sensor from the driver's side wheel well. The PO had cut the liner away for an unknown purpose. This is why my muffler guy was able to install the bung from the wheel well.



Electronic Components & Wiring

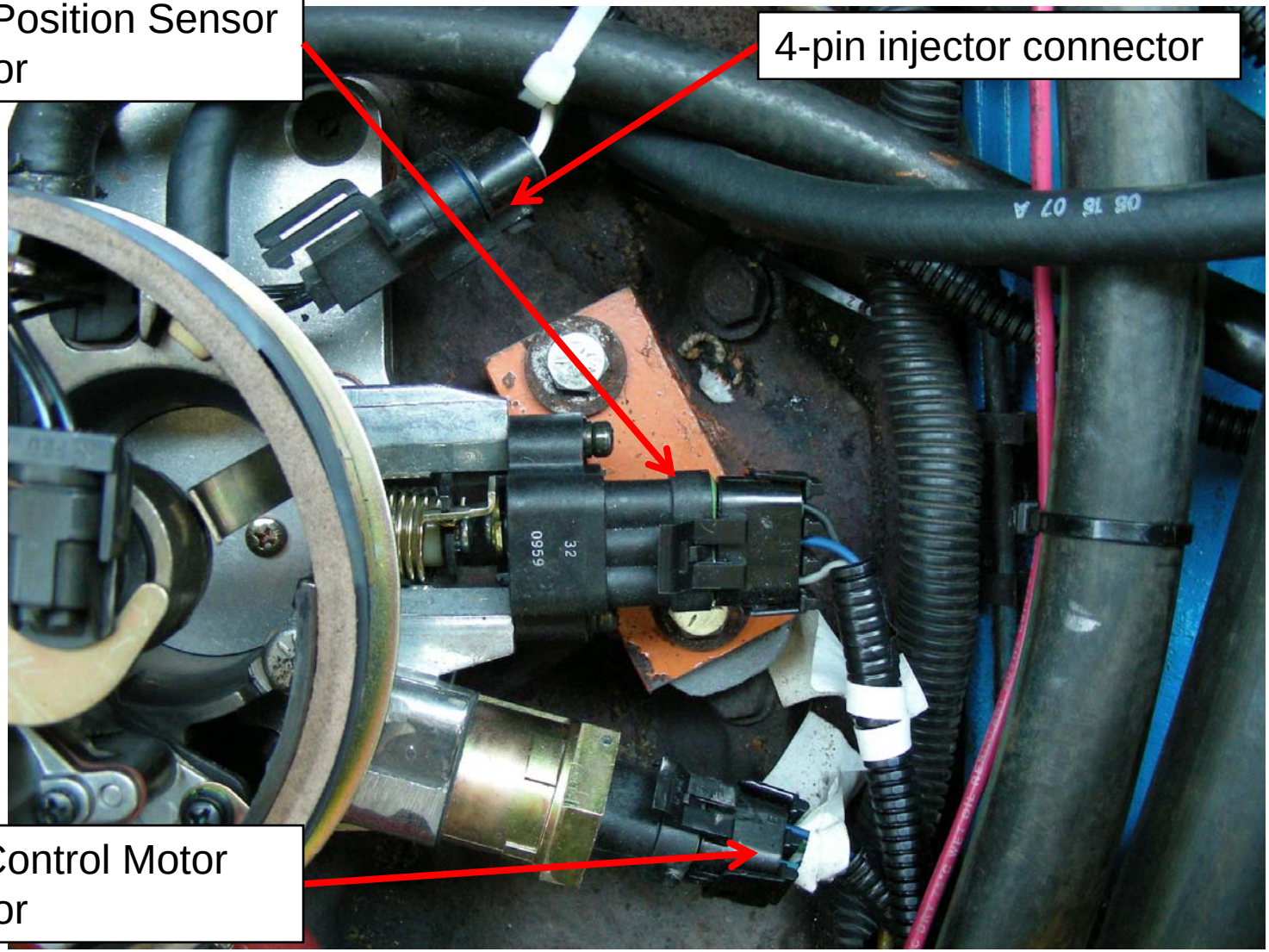
3. Moving forward, connect the 4-pin injector connector at the front of the TBI and plug in the throttle position sensor and idle air control motor. The MAP sensor (Green) connector also branches here and connects to your MAP sensor. The MAP sensor can be mounted in any convenient location near or on the engine; however, it should be mounted WITH THE VACUUM LINE POINTING DOWN, and level with, or higher than, the TBI base. (A convenient place is the engine opening flange at the rear of the engine.) The MAP sensor should have its own vacuum line from the rear of the TBI and NOTHING should be teed into the line.

Connecting the injector, throttle position sensor and idle air control is simple. Make sure that you have already addressed the issue of the Choke Stove. This will be described later in the presentation.

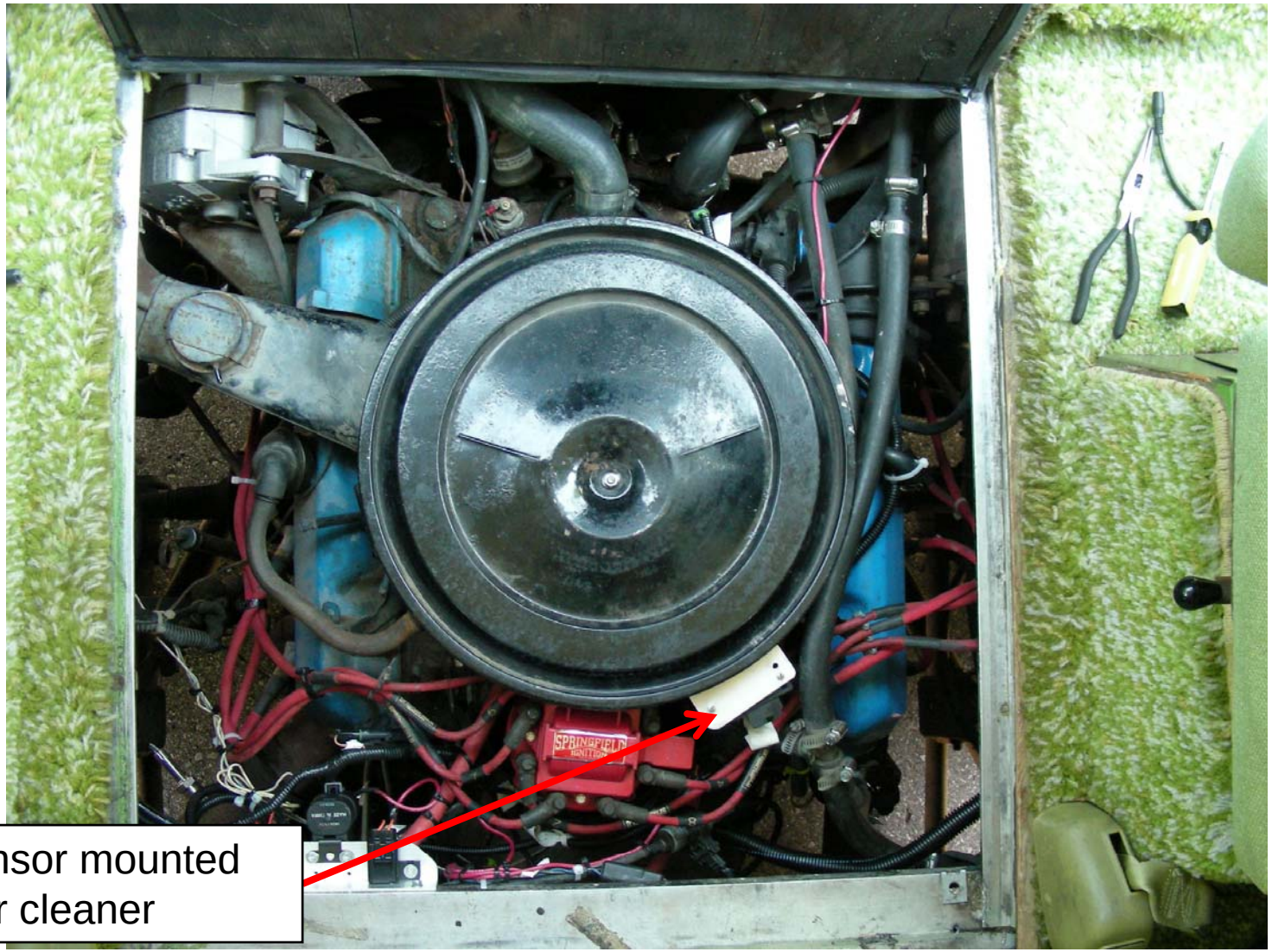
However, the instructions are wrong for the MAP sensor. It can't be connected from the rear of the TBI. Also, instead of installing it on the rear of the hatch, I installed in on the air cleaner to keep it close to the front of the TBI.

I think some of the group buy people have it installed wrong.

Electronic Components & Wiring

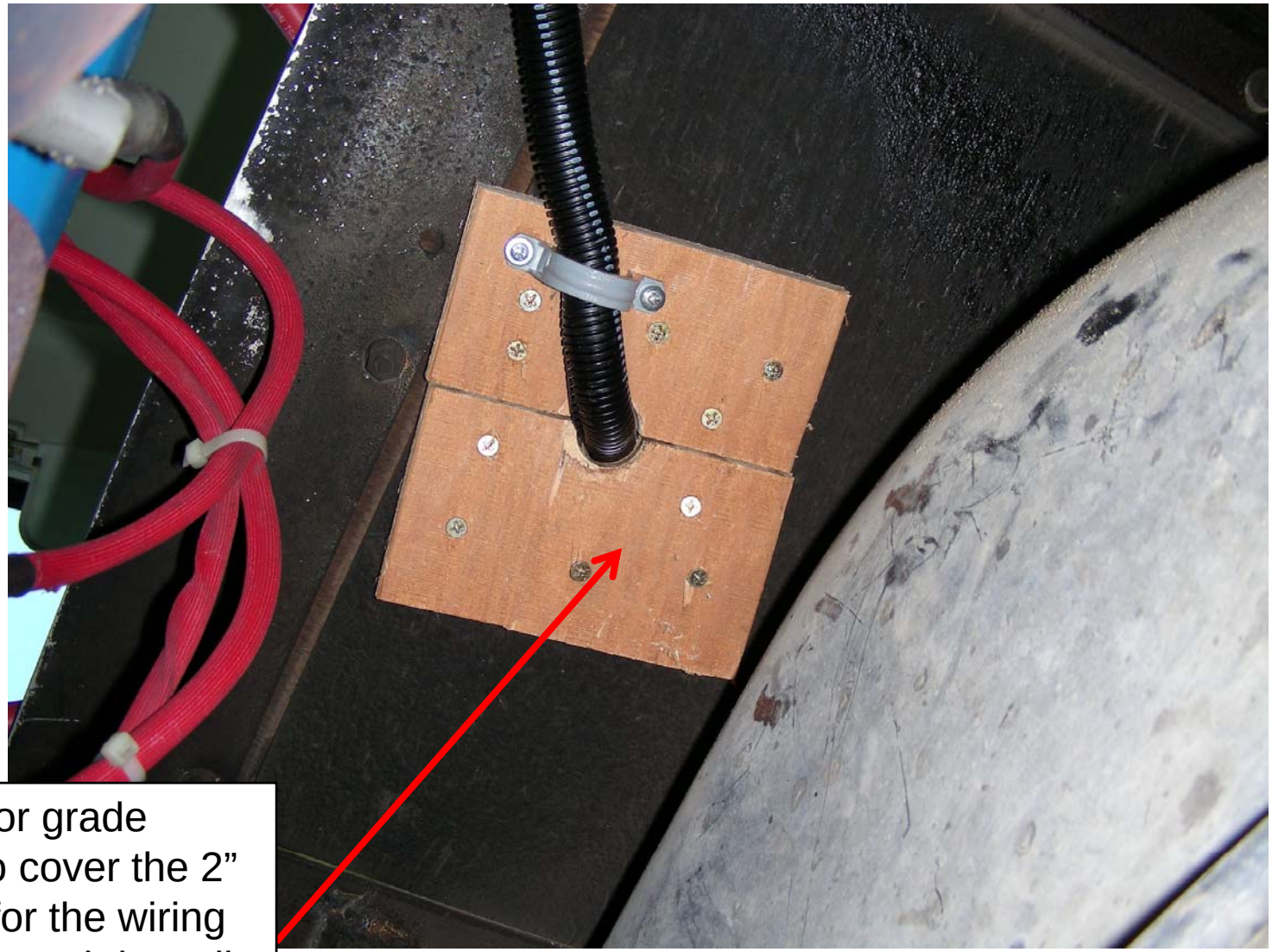


Electronic Components & Wiring



MAP Sensor mounted on the air cleaner

Harness to ECM Installation

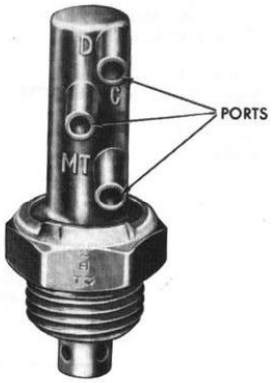


5/8” exterior grade plywood to cover the 2” hole I cut for the wiring harness. I used drywall screws to attach this to

Electronic Components & Wiring

4. At the front of the engine, the coolant sensor is mounted using the supplied ½" to 3/8" NPT bushing. Use Loctite or equivalent, pipe sealer on the bushing. Connect the harness to the coolant sensor. This completes the connections on the engine.

They don't really tell you where to put the coolant sensor. If you keep the TVS, because you didn't upgrade to Electronic Spark Control, you will have to use a "T" or something to share the fitting where the OEM coolant temp sensor is installed.

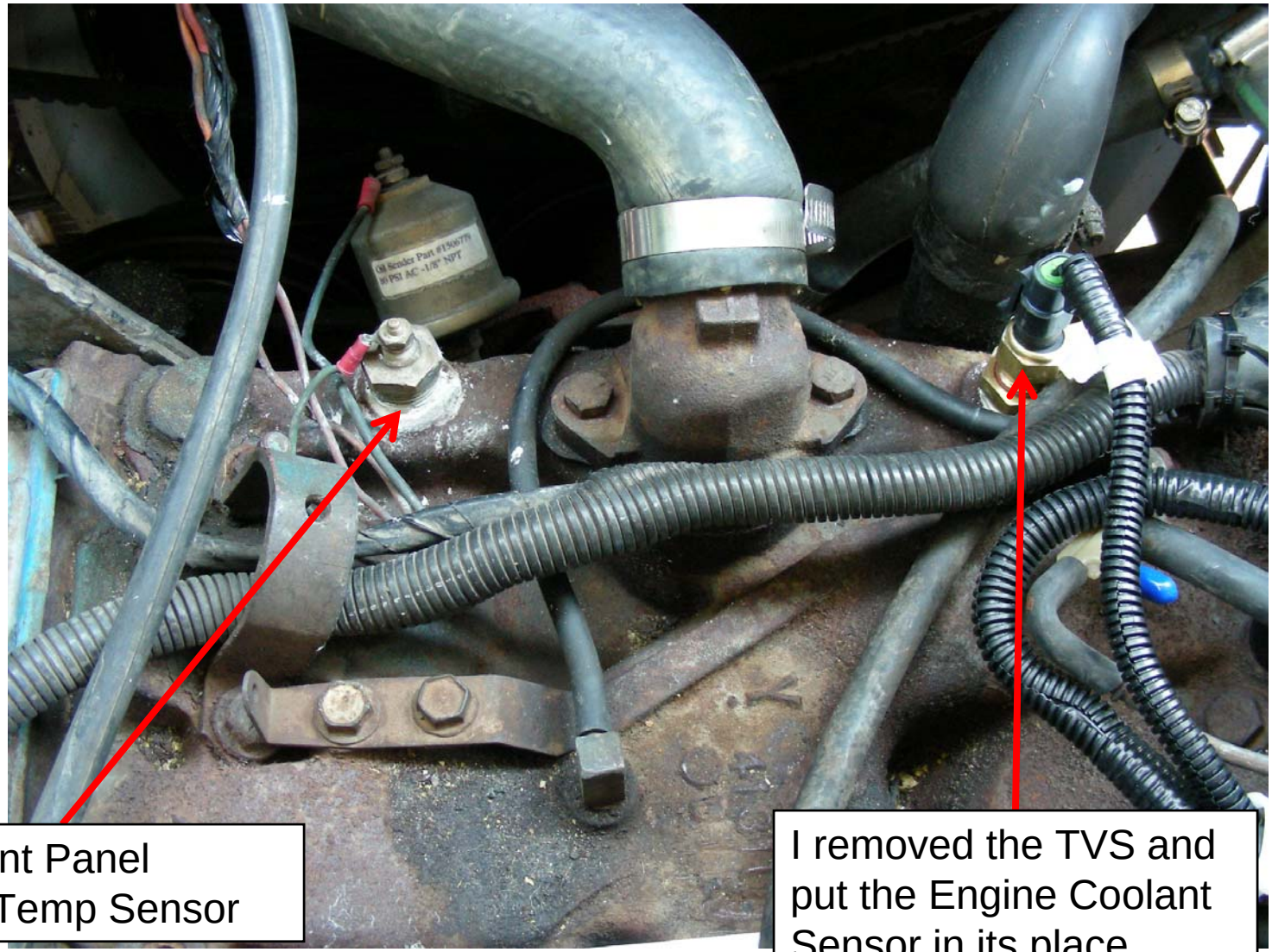


TVS

In my case I removed the TVS unit and its vacuum lines and replaced it with the Coolant Temperature Sensor.

To keep coolant from leaking out I plugged the hole with paper towels while I maneuvered the ECT into place. I spilled very little coolant in the process.

Electronic Components & Wiring



Instrument Panel
Coolant Temp Sensor

I removed the TVS and put the Engine Coolant Sensor in its place.

Electronic Components & Wiring

5. At the rear of the engine, a separate branch tees off the main trunk and contains the fuel pump relay, battery power and fuel pump power connectors and fuses. These can be permanently attached to the engine firewall on the right side (FIGURE 5).

I installed this stuff on the left side. It seemed to be the best place for easy access. The location they suggest is out of the way and would be hard to access to replaced fuses etc.

Electronic Components & Wiring

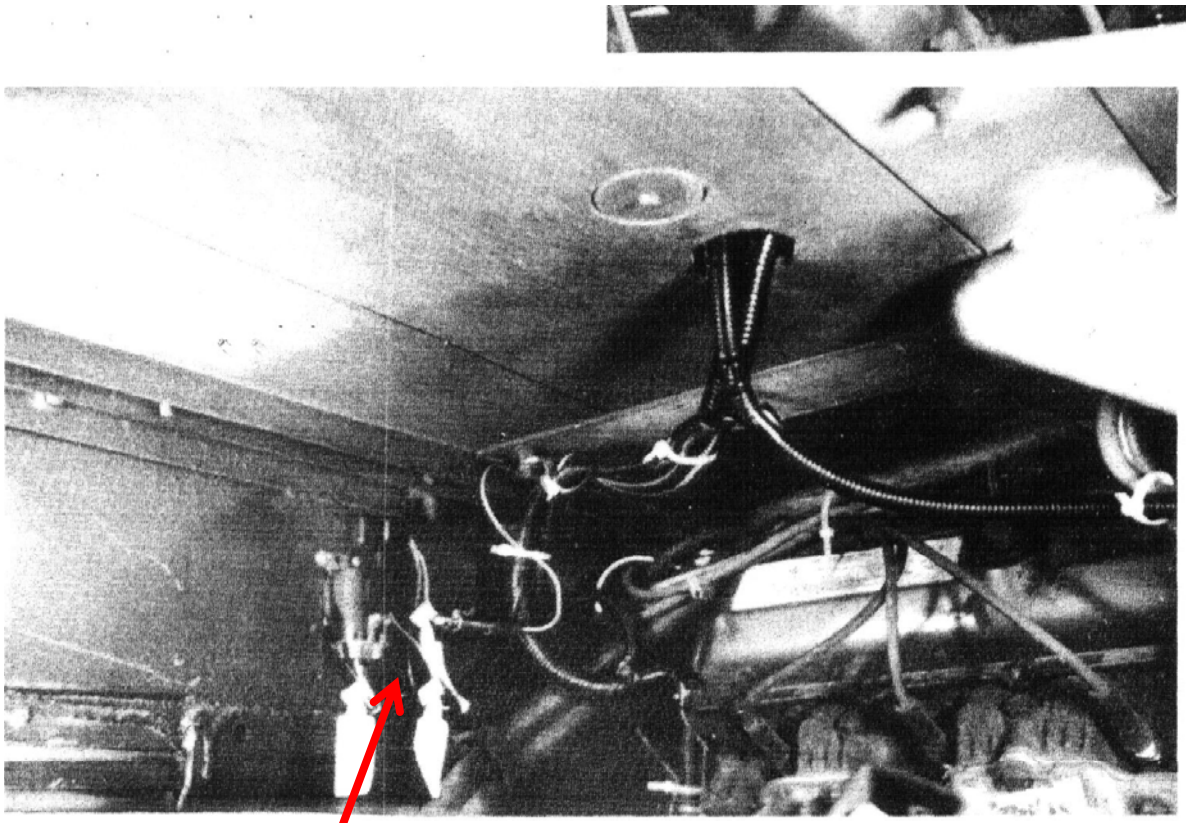
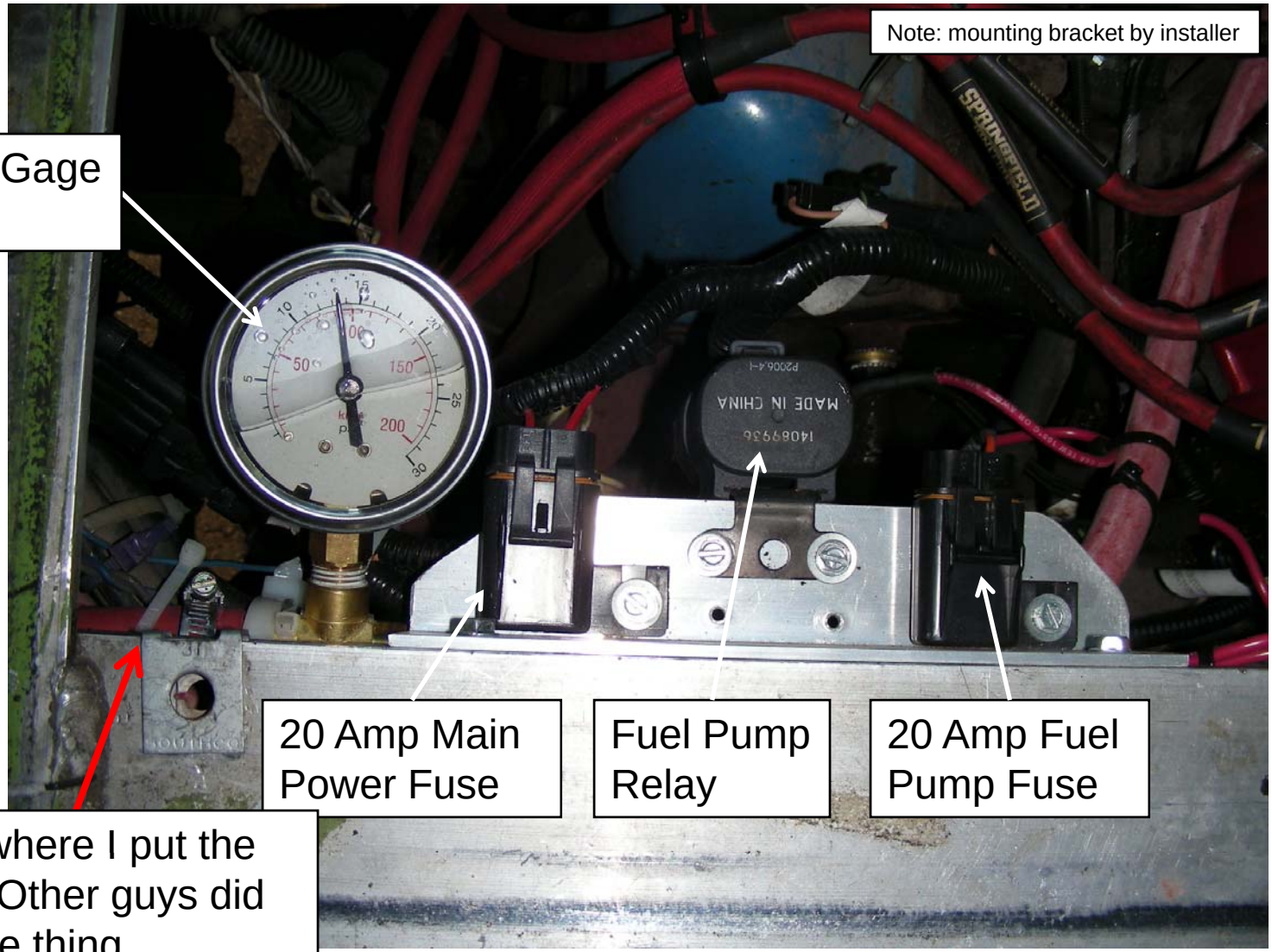


FIG. 5 Hole drilled below passenger seat to route harness to ECM in underseat compartment. Fuel pump relay and fuses also visible against rear bulkhead.

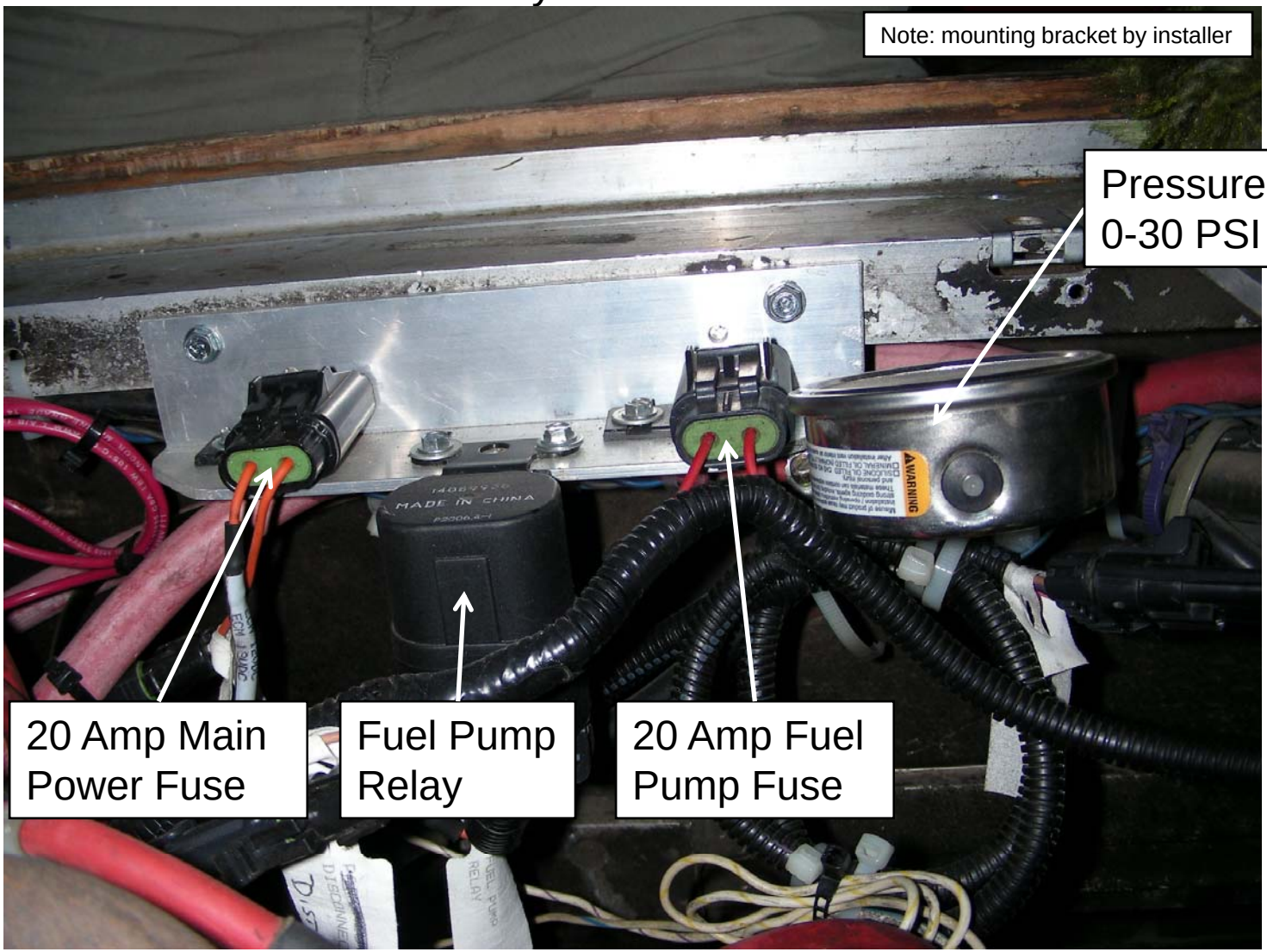
Do as they say and everything will be out of the way. I'd rather not do it that way.

Electronic Components & Wiring



Fuel Pump Relays and Fuses

My Installation

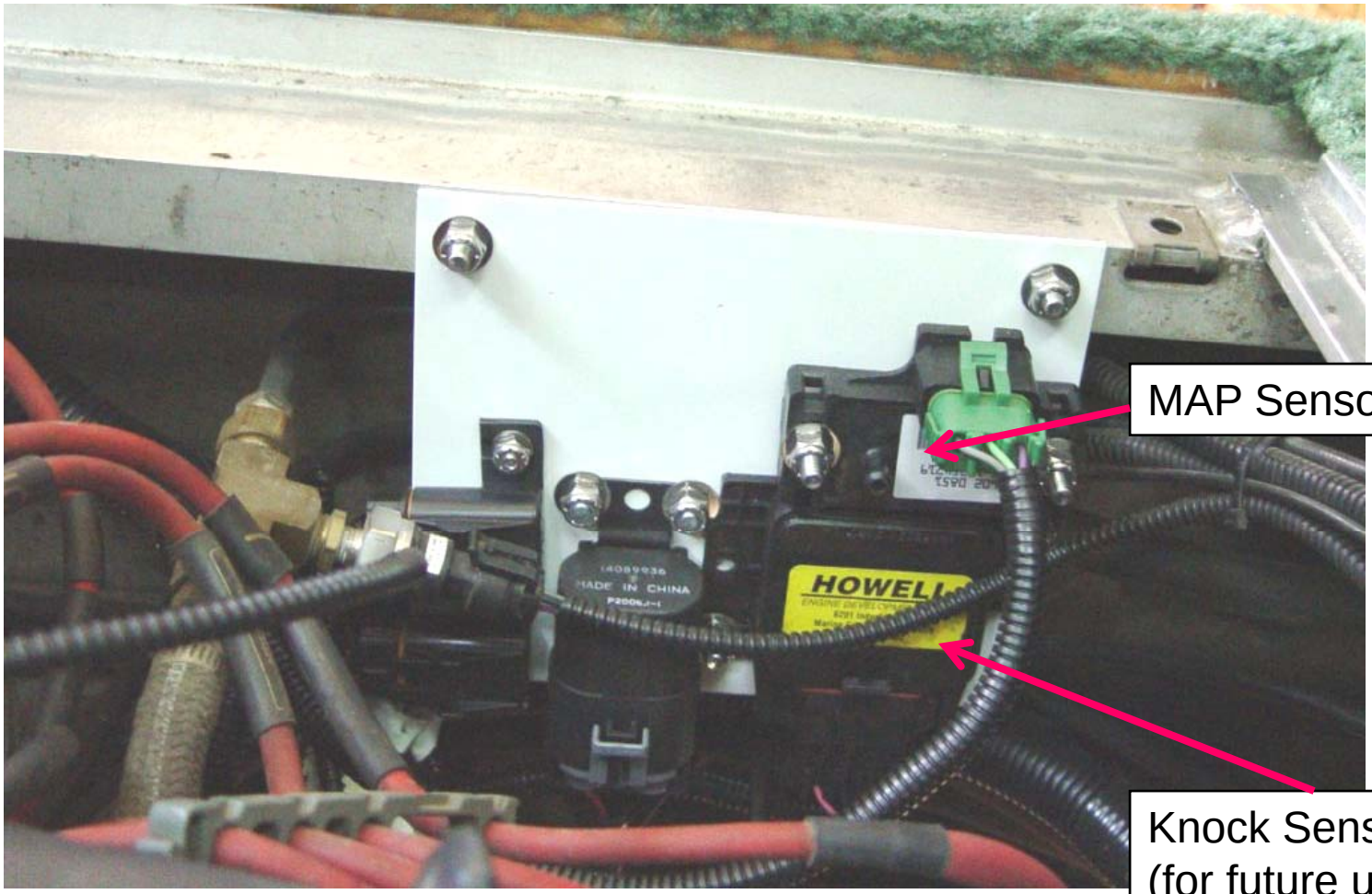


Fuel Pump Relays and Fuses

Bobbie Moore's Installation

Fuel Pump Relays and Fuses

Paul Bartz's Installation



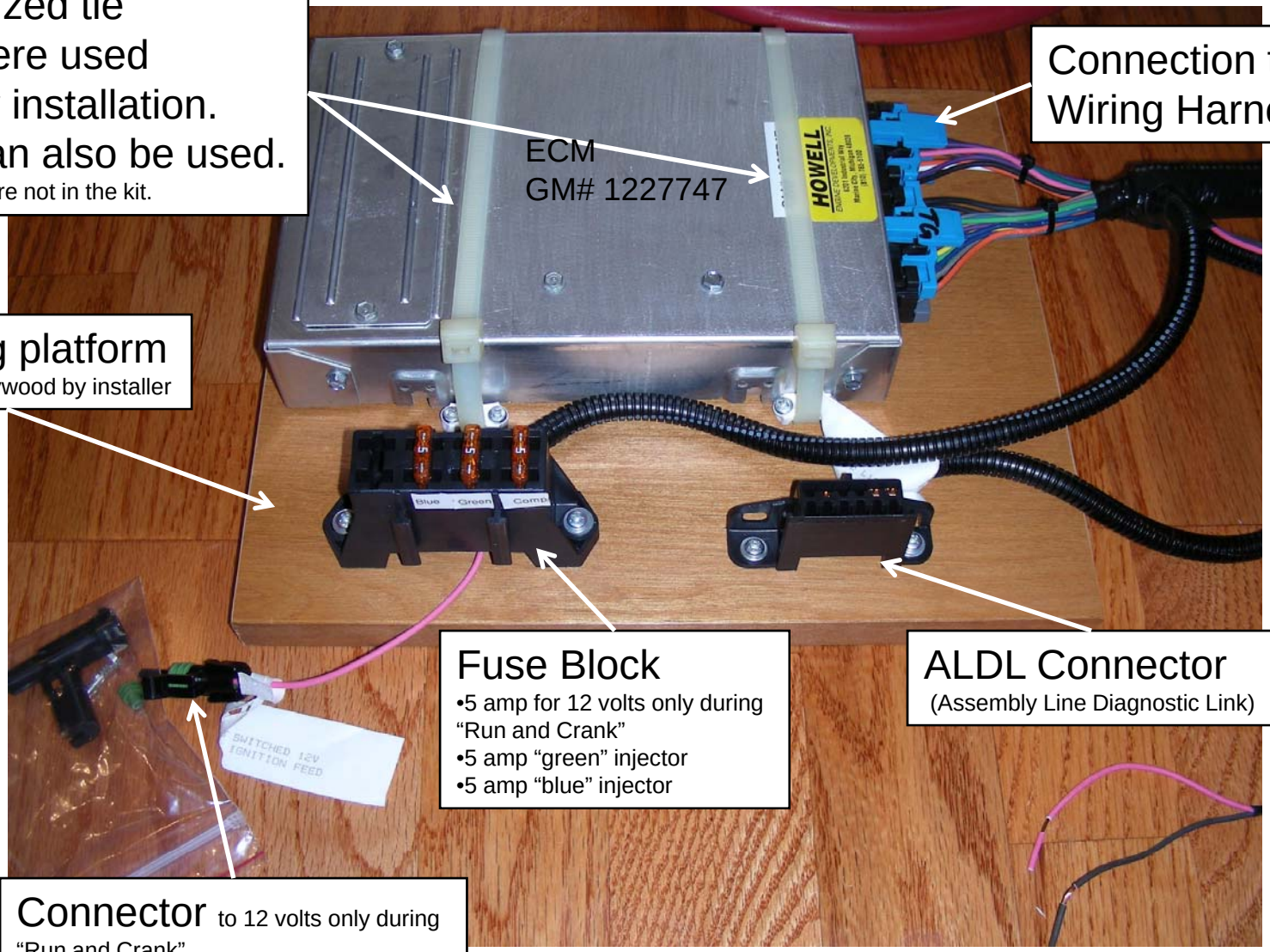
Electronic Components & Wiring

6. INSIDE THE VEHICLE—Mount the ECM, fuse block and diagnostic connector, to a 10"X10" piece of light plywood (FIGURE 6). This holds everything in position, but is easily removed for service. (Velcro is a suitable material for mounting the ECM to the plywood.) CAUTION: The ECM needs some air circulation for cooling, so don't put it under the carpet. Use a Radio Shack or automotive bulb socket and 12V bulb for the SES light and mount it where it can be seen from the drivers seat. (Drivers side of the passenger seat mount is a good place.)

I pretty much followed their instructions for this part. Instead of Velcro I used some jumbo tie wraps. I got my SES light from Radio Shack and mounted it on the passenger side seat pedestal

Electronic Components & Wiring

Jumbo sized tie wraps were used to simply installation. Velcro can also be used.
Note: These were not in the kit.



ECM
GM# 1227747

Connection to Wiring Harness

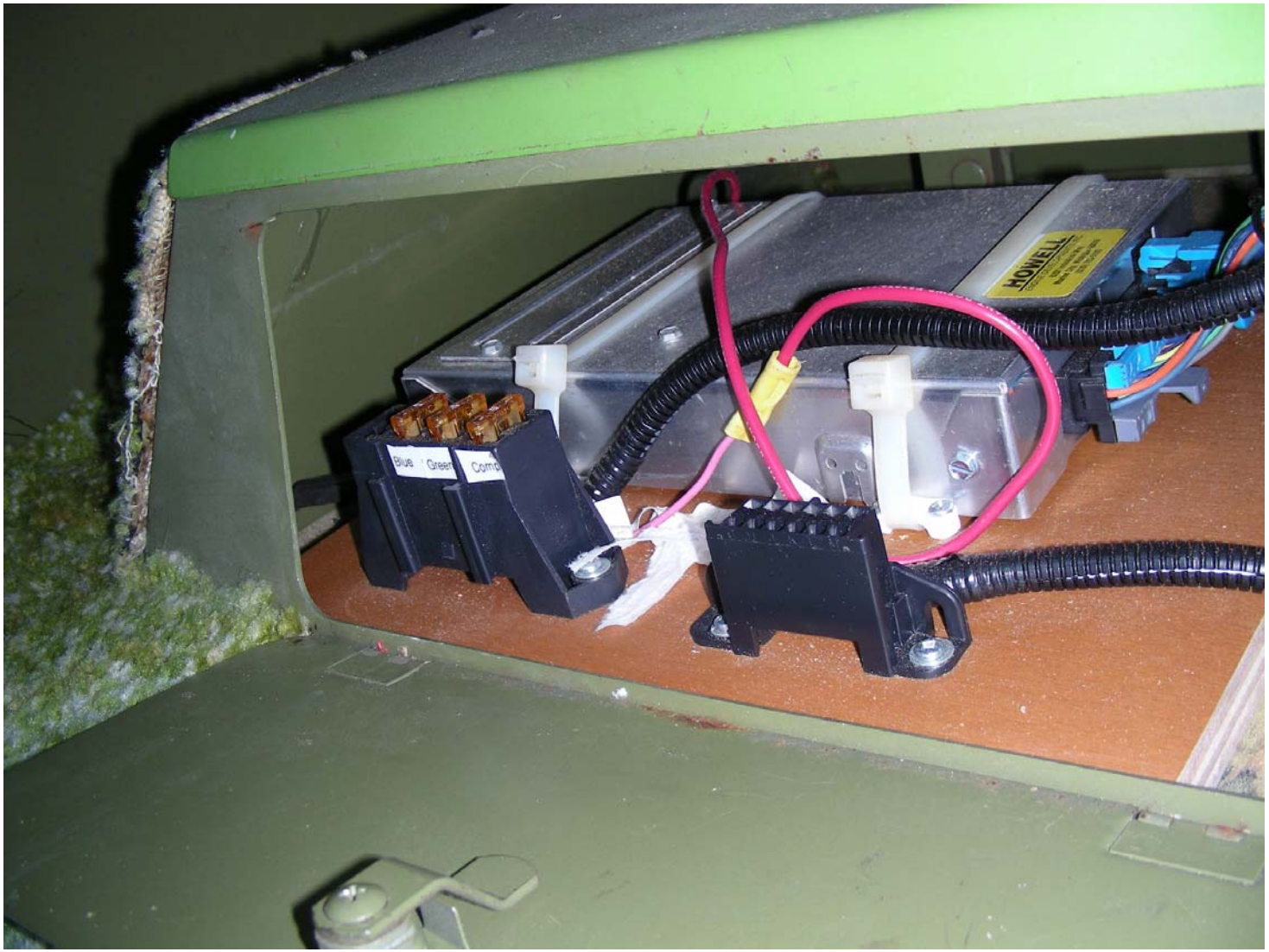
Mounting platform
¾" x 10"x10" plywood by installer

Fuse Block
- 5 amp for 12 volts only during "Run and Crank"
- 5 amp "green" injector
- 5 amp "blue" injector

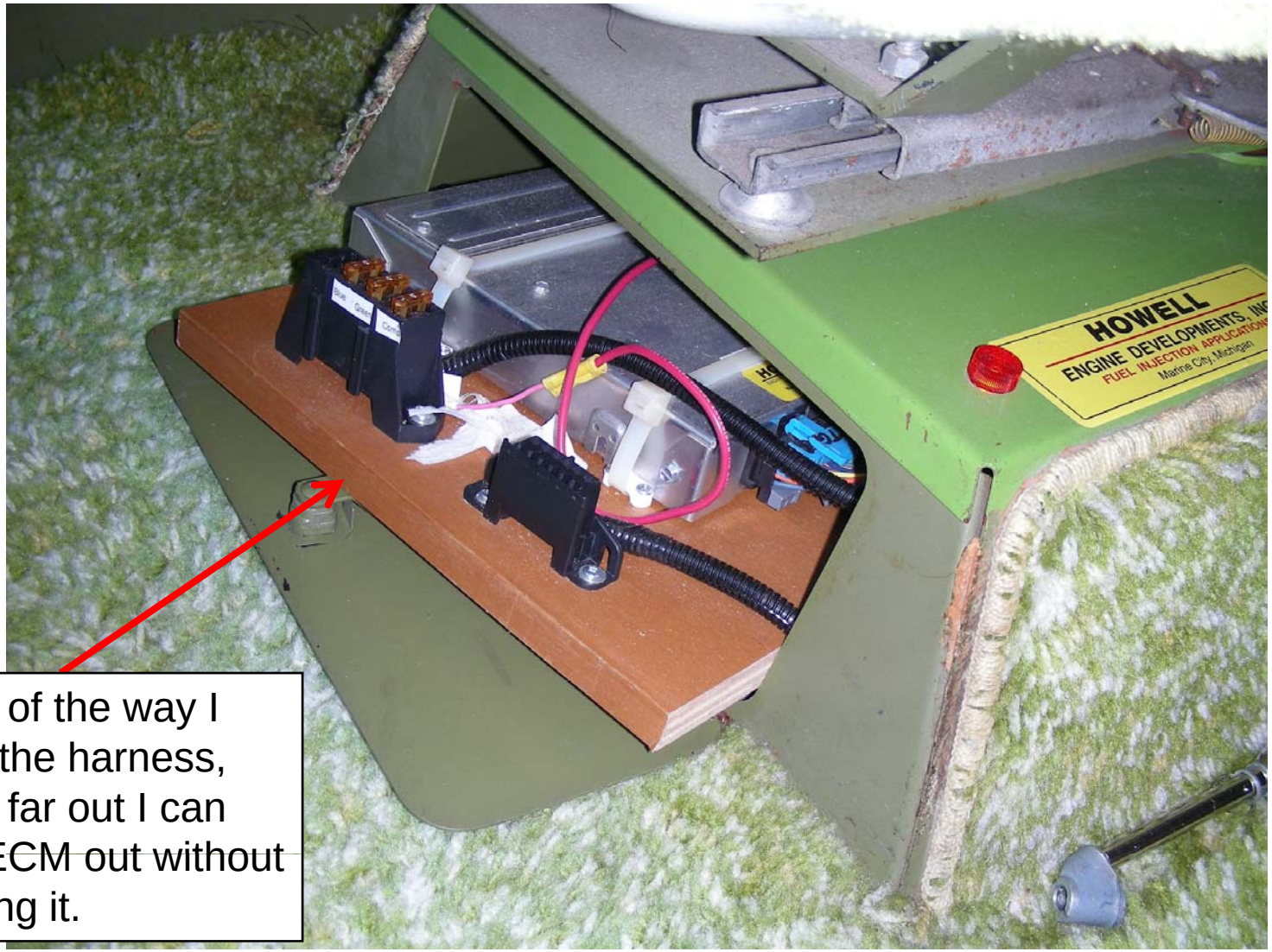
ALDL Connector
(Assembly Line Diagnostic Link)

Connector to 12 volts only during "Run and Crank"

Electronic Components & Wiring



Electronic Components & Wiring

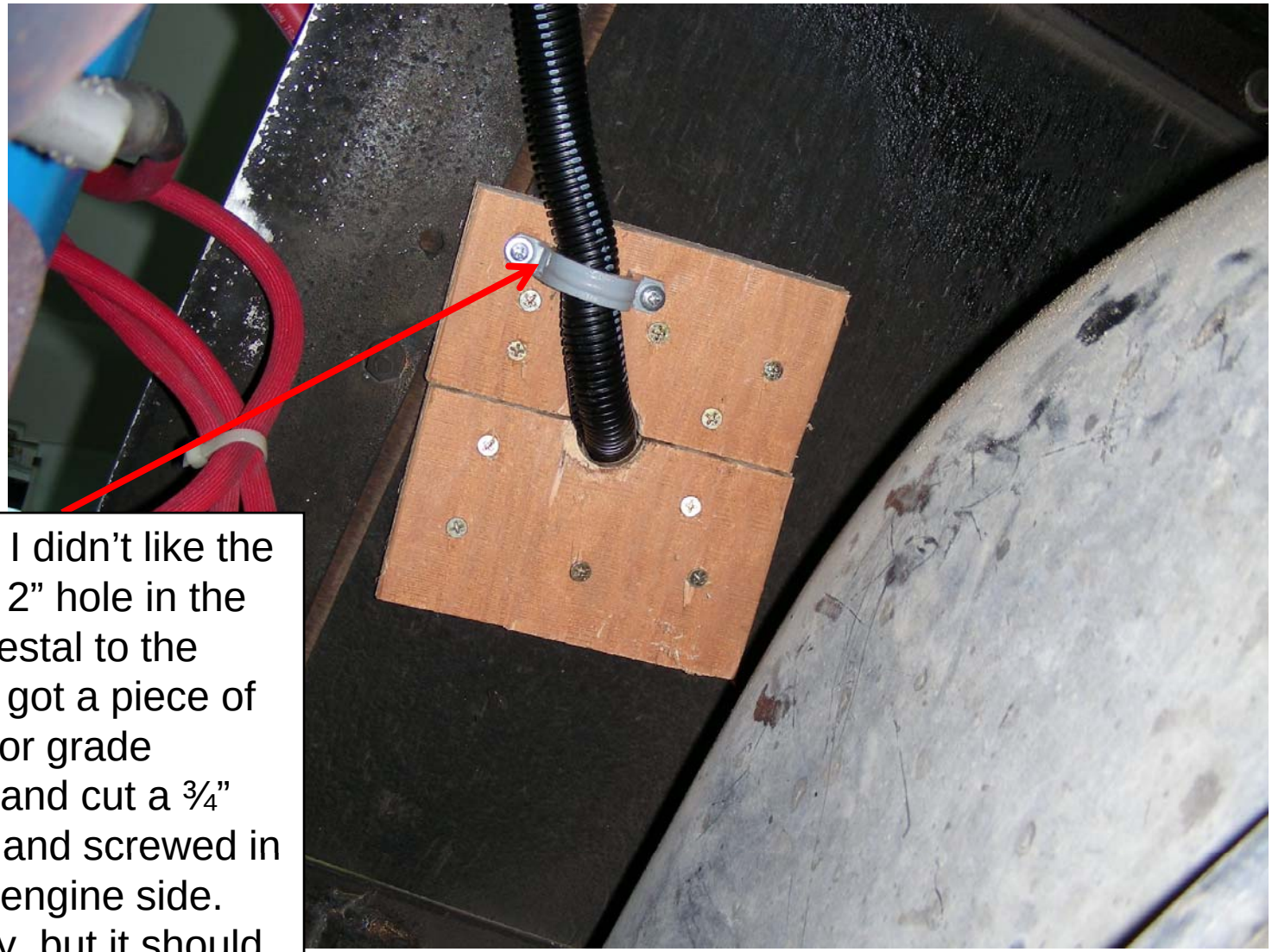


Because of the way I installed the harness, this is as far out I can pull the ECM out without unplugging it.

Electronic Components & Wiring

"Service Engine Soon" light was installed here because it was easy and in full view of the driver. Someday I might install one on the dash.

Electronic Components & Wiring



Because I didn't like the idea of a 2" hole in the seat pedestal to the engine, I got a piece of ½" exterior grade plywood and cut a ¾" hole in it and screwed in from the engine side. Not pretty, but it should work for a while.

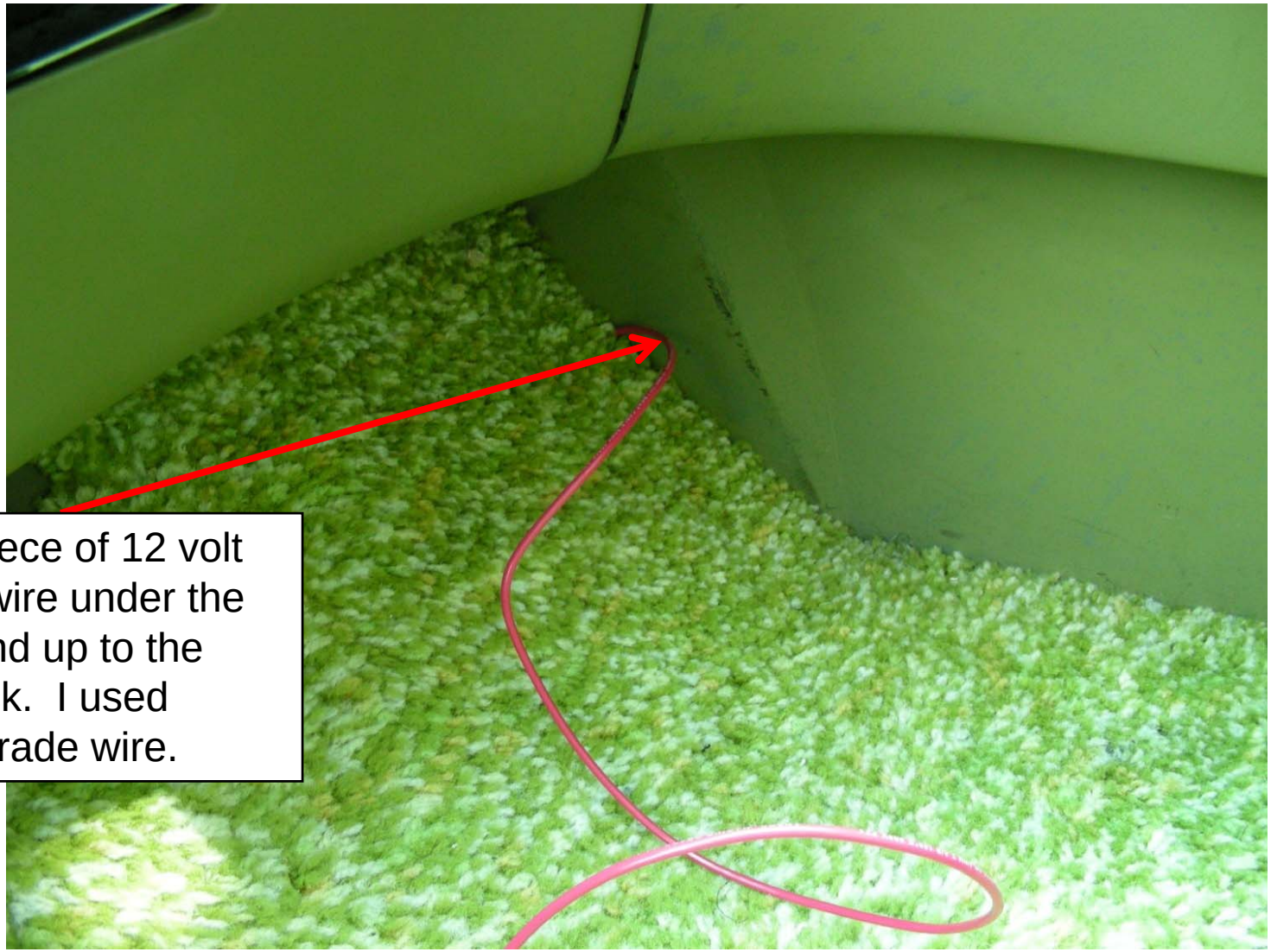
Electronic Components & Wiring

7. Using one of the single weatherpack connectors and terminals supplied, run a 14 or 16 gauge wire, from the ECM fuse block to a 12V source on the GMC fuse panel that has current when your ignition key is in the RUN AND CRANK positions. (Not an accessory position, which loses power during cranking.) The GMC motor home fuse panel is located in the glove box in front of the passenger seat and has a vacant IGN labeled terminal that works fine.

I didn't have a IGN terminal in my 1976 fuse block. I think it was later coaches (77-78) that had the IGN terminal.

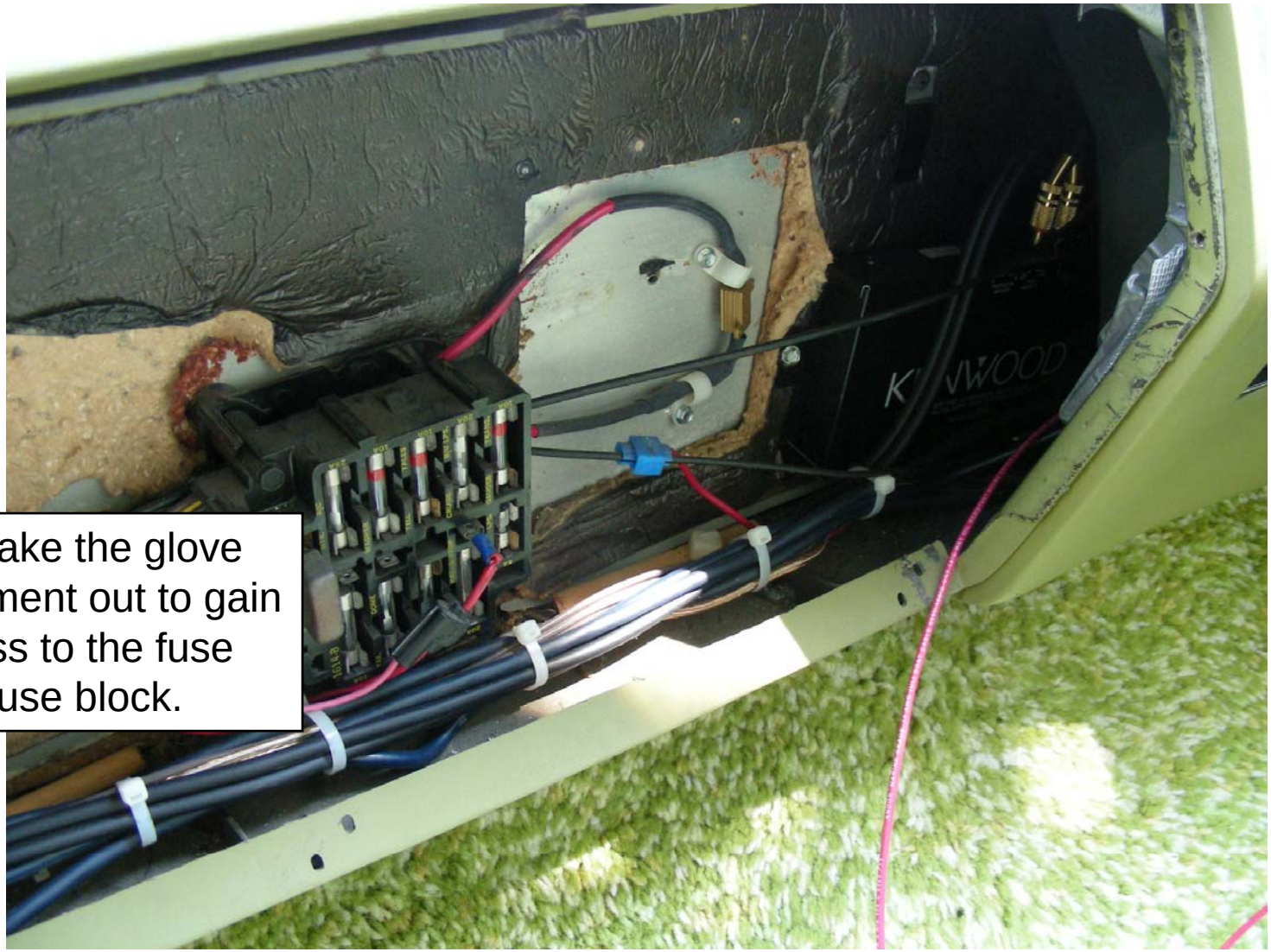
Therefore I had to find one that was on only during RUN AND CRANK.

Electronic Components & Wiring



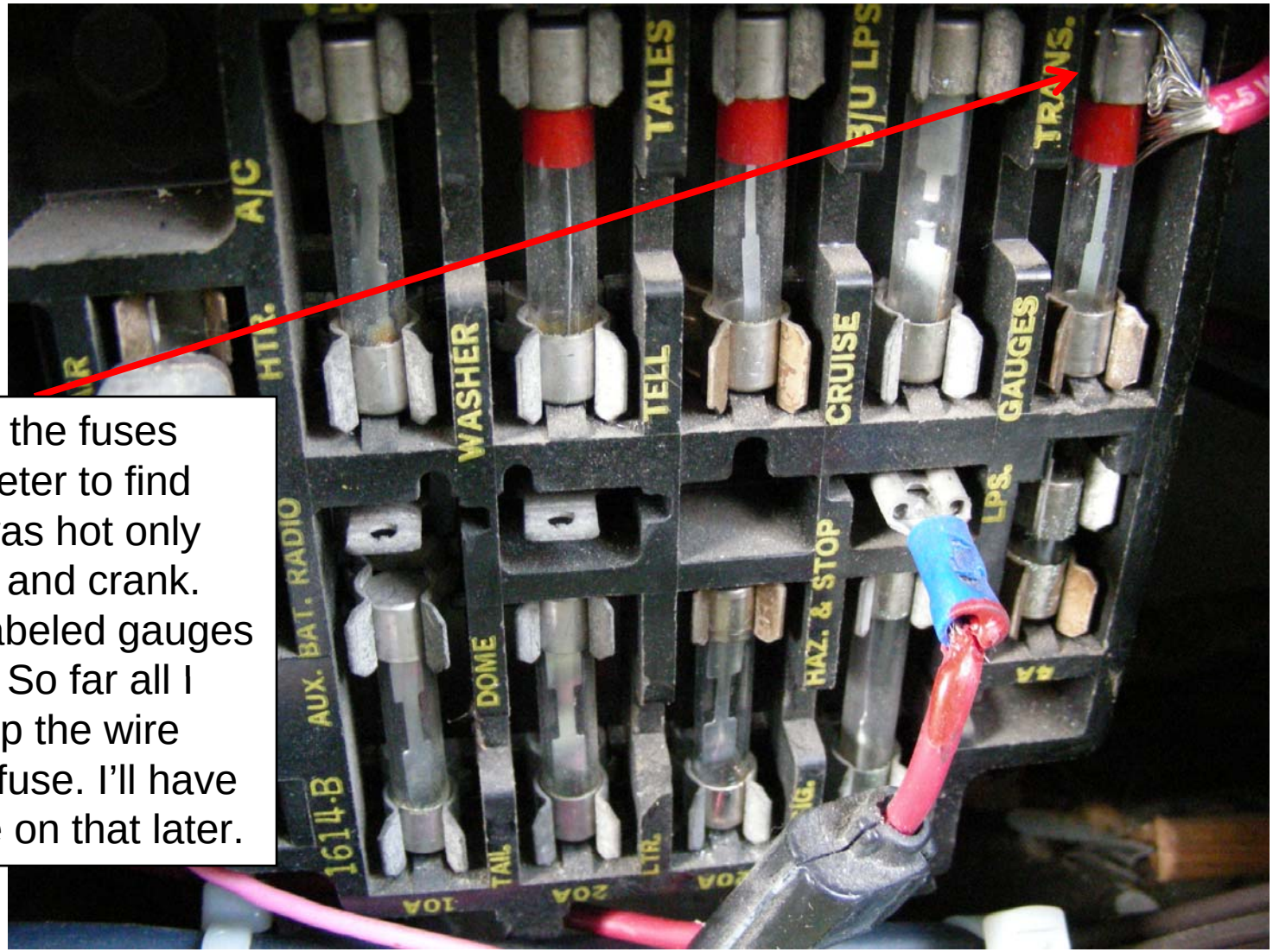
I ran a piece of 12 volt hookup wire under the carpet and up to the fuse block. I used marine grade wire.

Electronic Components & Wiring



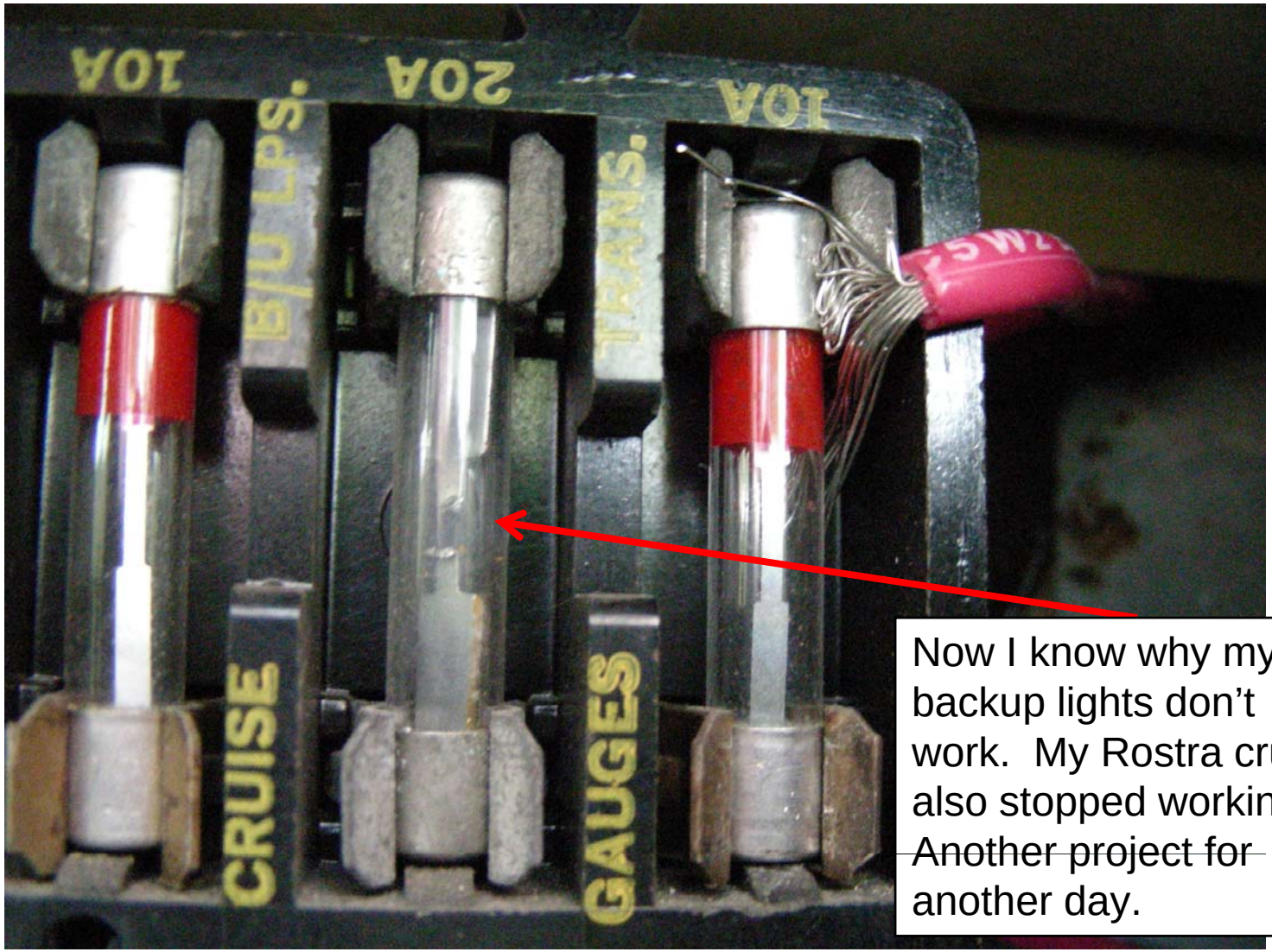
I had to take the glove compartment out to gain full access to the fuse chassis fuse block.

Electronic Components & Wiring



I tested all the fuses with my meter to find one that was hot only during run and crank. The one labeled gauges fit the bill. So far all I did was slip the wire under the fuse. I'll have to improve on that later.

Electronic Components & Wiring



Now I know why my backup lights don't work. My Rostra cruise also stopped working. ~~Another project for~~ another day.

Electronic Components & Wiring

Here is Mr. Bartz's fuse block. His later model GMC has an IGN terminal.

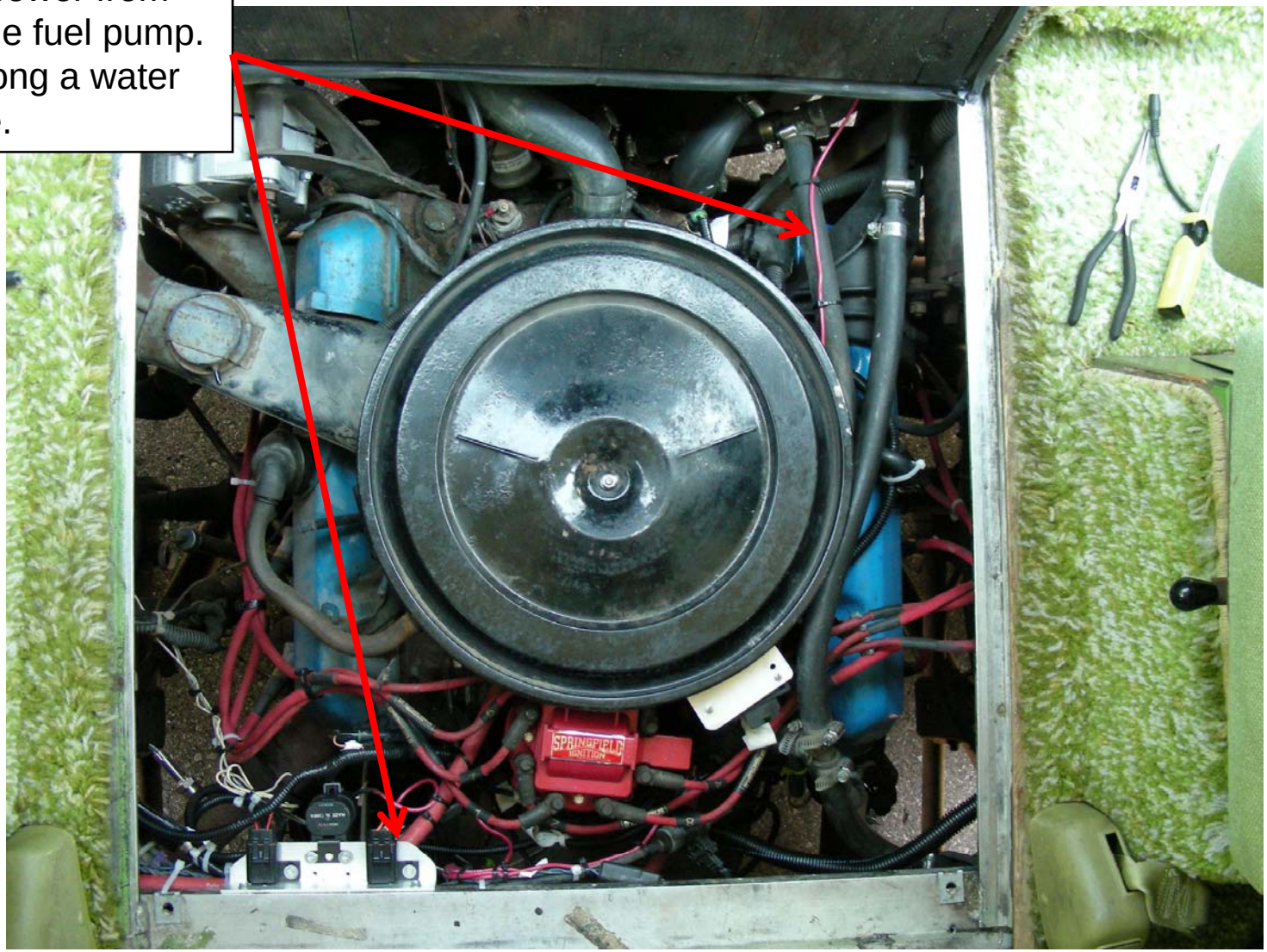
Electronic Components & Wiring

8. ON THE ENGINE SIDE OF FIREWALL—Supply battery power to the labeled ORANGE wire and sealed fuse location near the fuel pump relay. Use 14-gauge wire for this lead and a weatherpack connector to connect at the sealed fuse.

I ran the wire over the engine and to the battery terminal under the hood.

Electronic Components & Wiring

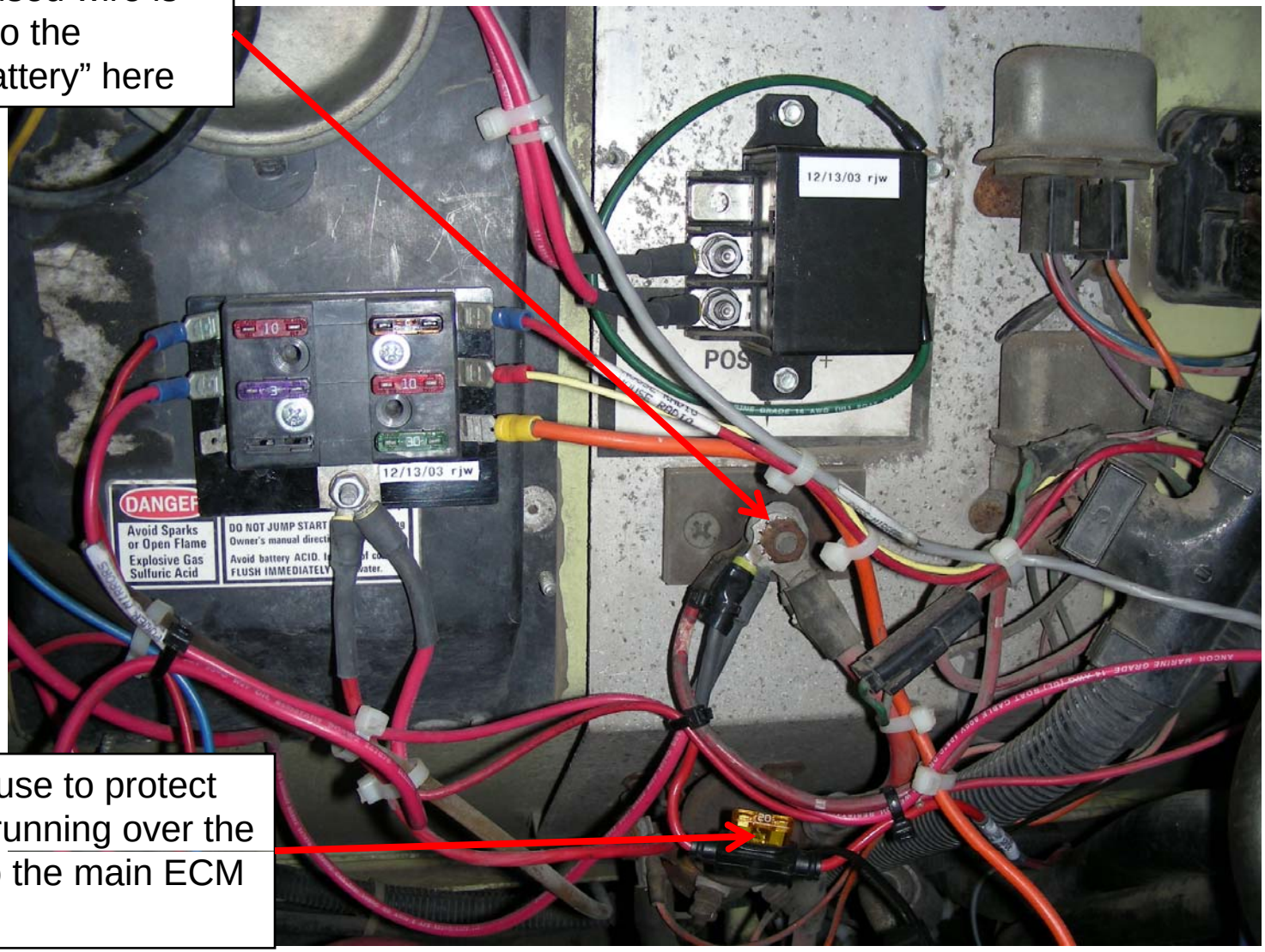
Always on power from fuse near the fuel pump. I ran this along a water heater hose.



1976 Palm Beach
TZE166V100710

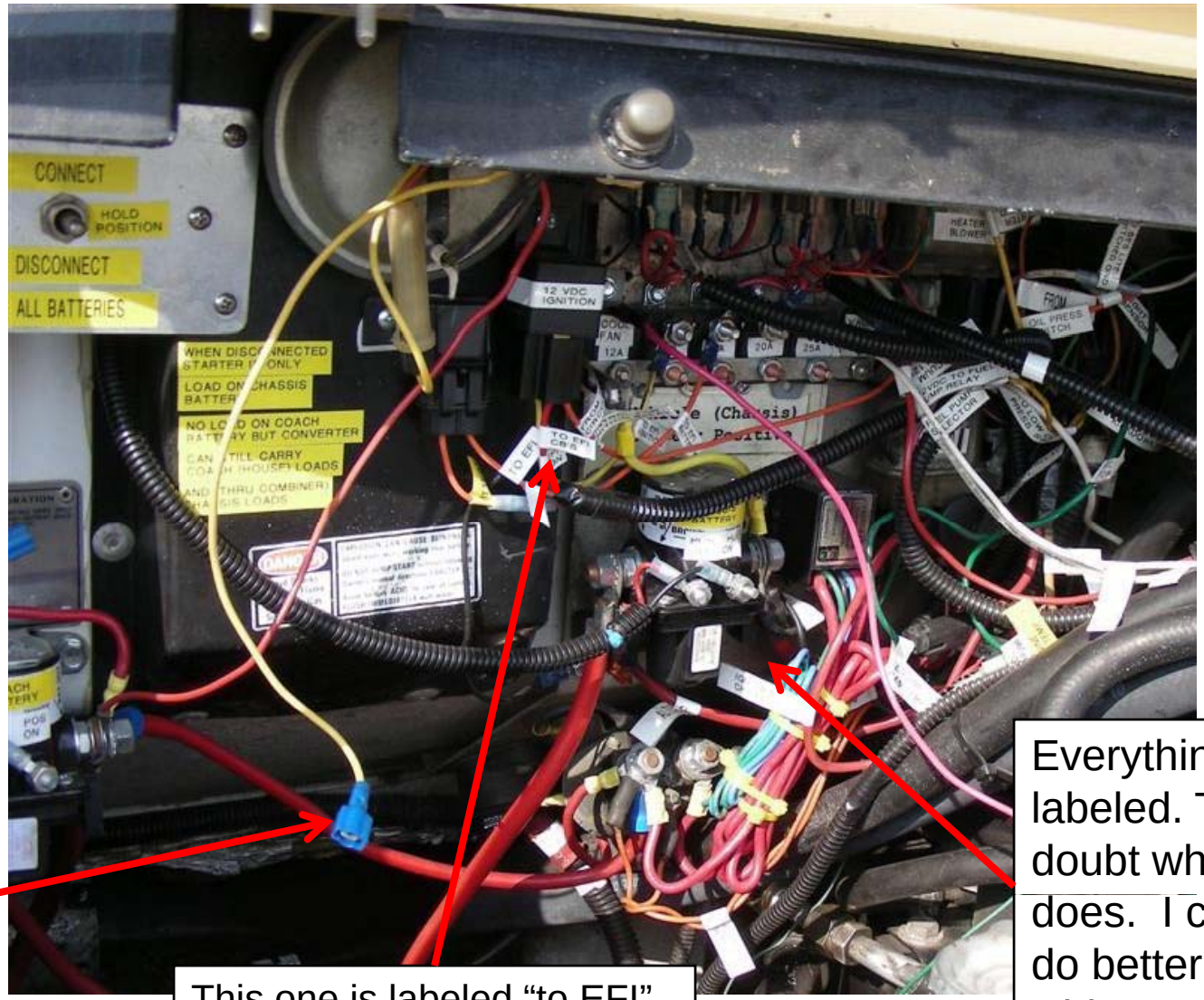
+12 Volts to the ECM

The ECM fused wire is connected to the “Chassis Battery” here



20 amp fuse to protect the wire running over the engine to the main ECM fuse.

The Electric Wiper Guy's Wiring



?

This one is labeled "to EFI"

Everything is nicely labeled. There is no doubt what each wire does. I can only try to do better with my wiring.

Electronic Components & Wiring

9. Using the 10ft. fuel pump power lead supplied, run a power and ground lead from the labeled RED wire weatherpack connector near the fuel pump relay, to the high-pressure fuel pump. Connect this power and ground lead to the fuel pump by plugging the two pin weatherpack connectors together. At the relay end of this power lead, connect the black wire to the engine ground. This completes the electrical harness installation.

This is the last step! In reality I had already done this when I installed the fuel pump

Electronic Components & Wiring

Power and ground for the high pressure fuel pump. The harness provided came all the way back to the connector.

Electronic Components & Wiring

?

Now all we have to do is start it up.

But there is more. How about electronic spark control? I'll talk about that now.

Electronic Spark Control

The base Howell TBI system does not control the HEI distributor. I learned after I got my kit that I could add “Electronic Spark Control” to my TBI system. I did that because I wanted to eliminate having to time the distributor and I wanted to not have to worry about the mechanical advance gumming up and failing to work. I’d head on the internet that that can happen. I also wanted to get rid of the assortment of the vacuum hoses related to the vacuum advance.

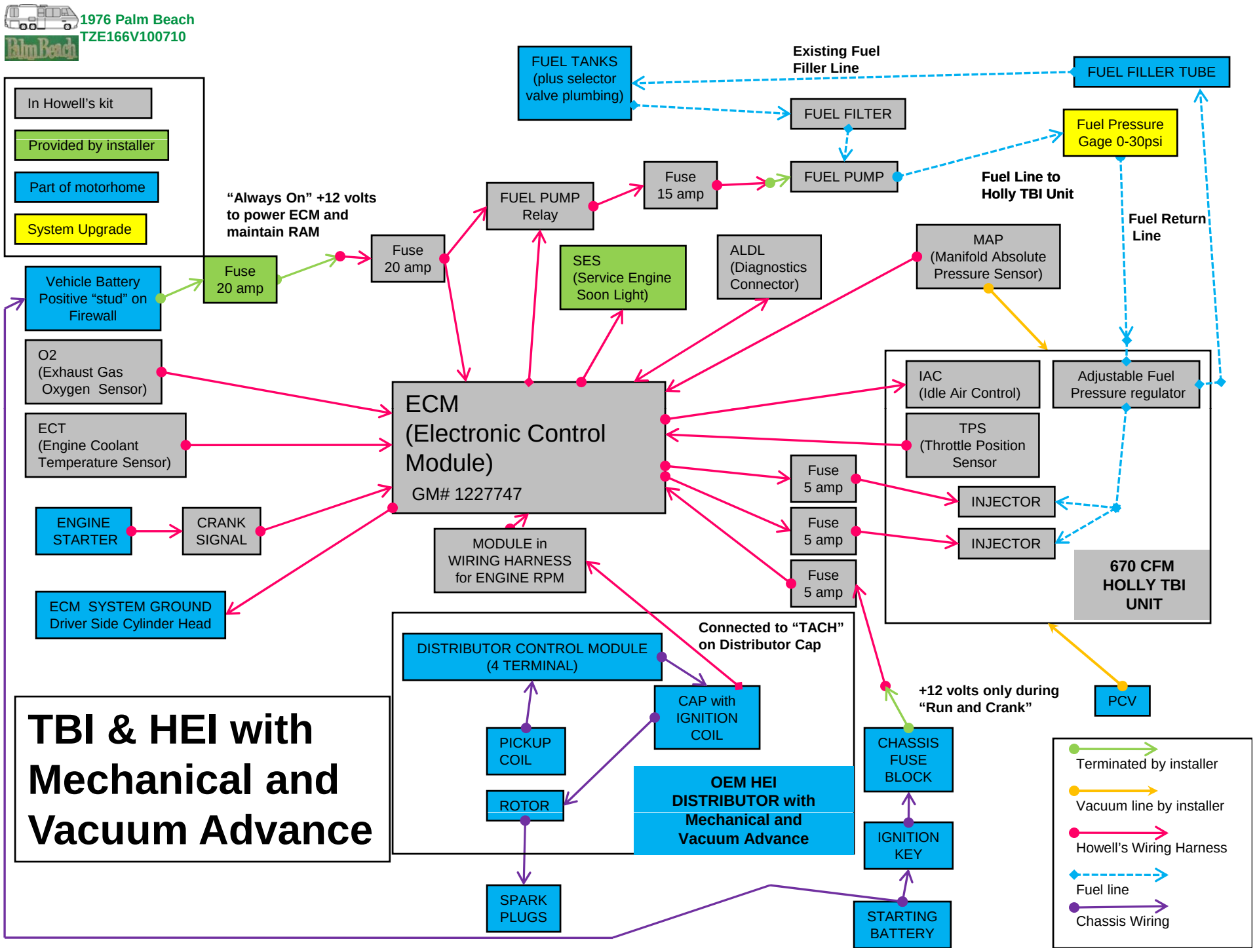
I found out that you have to get a special “computer controlled distributor” that replaced the OEM HEI distributor. The TBI wiring harness has to be modified to accept the new distributor. Also, a “distributor disconnect” is added to the harness to allow you to set the initial timing for the distributor.

AutoZone and other places have rebuilt distributors that are suitable. They are from mid 1980s GM 307 V-8s. It doesn’t come with a cap or rotor. Which means, you will need to keep your original distributor cap and rotor. In addition, there is a wiring harness needed that doesn’t seem to be available from auto parts stores. To obtain this, a trip to the local men’s mall is required.

YOU MUST UPGRADE TO “ELECTRONIC SPARK CONTROL” IF YOUR GMC MOTORHOME STILL HAS “POINTS IGNITION”.

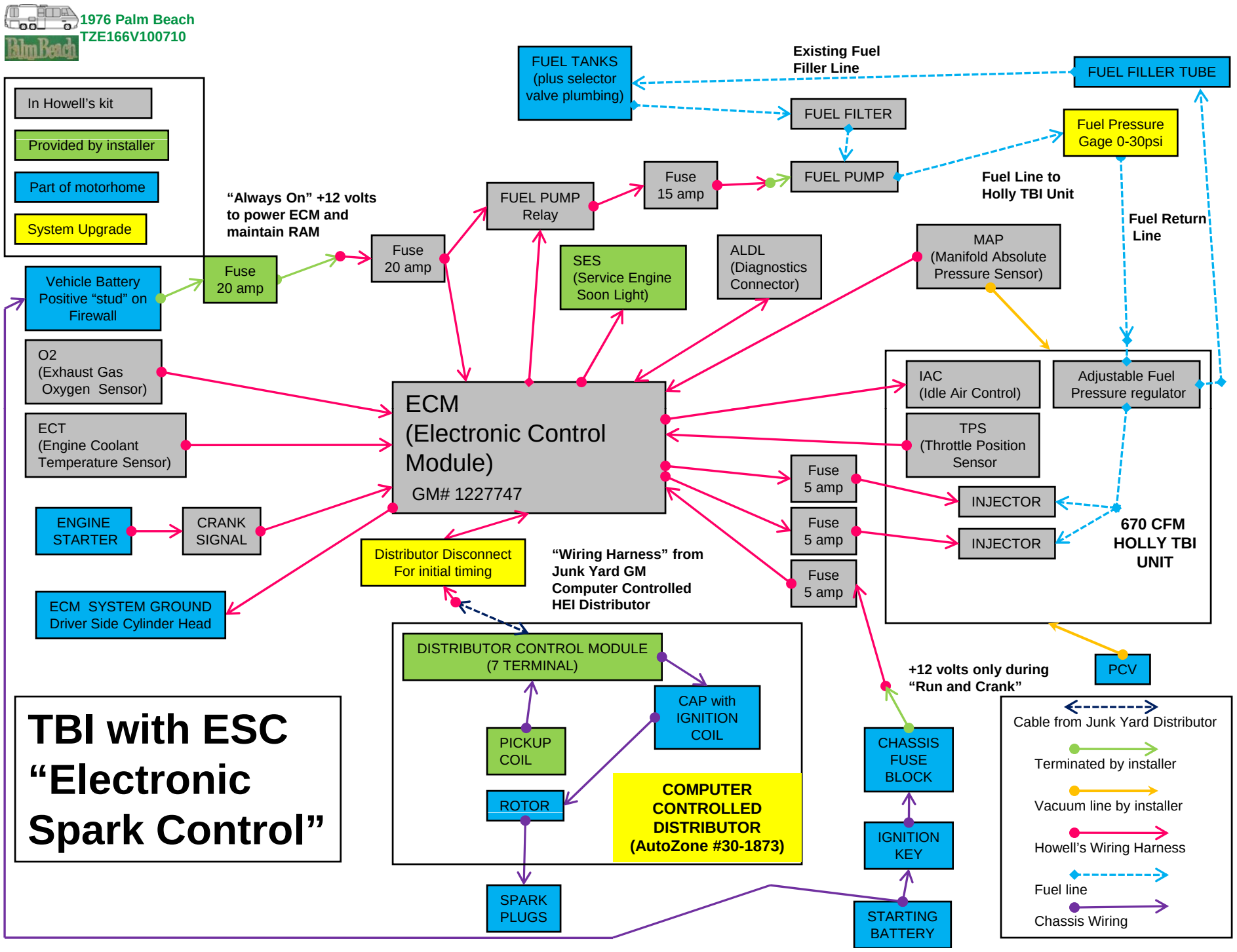
Electronic Spark Control

The following layout is how the TBI is laid out without ESC.


1976 Palm Beach
TZE166V100710
In Howell's kit
Provided by installer
Part of motorhome
System Upgrade
FUEL TANKS (plus selector valve plumbing)
Existing Fuel Filler Line
FUEL FILLER TUBE
FUEL FILTER
Fuel Pressure Gage 0-30psi
FUEL PUMP
Fuel Line to Holly TBI Unit
Fuel Return Line
"Always On" +12 volts to power ECM and maintain RAM
Fuse 15 amp
FUEL PUMP Relay
Fuse 20 amp
Fuse 20 amp
SES (Service Engine Soon Light)
ALDL (Diagnostics Connector)
MAP (Manifold Absolute Pressure Sensor)
Vehicle Battery Positive "stud" on Firewall
O2 (Exhaust Gas Oxygen Sensor)
ECT (Engine Coolant Temperature Sensor)
ECM (Electronic Control Module)
GM# 1227747
IAC (Idle Air Control)
Adjustable Fuel Pressure regulator
TPS (Throttle Position Sensor
Fuse 5 amp
Fuse 5 amp
Fuse 5 amp
INJECTOR
INJECTOR
670 CFM HOLLY TBI UNIT
ENGINE STARTER
CRANK SIGNAL
MODULE in WIRING HARNESS for ENGINE RPM
ECM SYSTEM GROUND Driver Side Cylinder Head
Connected to "TACH" on Distributor Cap
DISTRIBUTOR CONTROL MODULE (4 TERMINAL)
CAP with IGNITION COIL
+12 volts only during "Run and Crank"
PCV
PICKUP COIL
ROTOR
OEM HEI DISTRIBUTOR with Mechanical and Vacuum Advance
CHASSIS FUSE BLOCK
IGNITION KEY
SPARK PLUGS
STARTING BATTERY
TBI & HEI with Mechanical and Vacuum Advance
Terminated by installer
Vacuum line by installer
Howell's Wiring Harness
Fuel line
Chassis Wiring

Electronic Spark Control

Now the layout is with ESC.


1976 Palm Beach
TZE166V100710
In Howell's kit
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Part of motorhome
System Upgrade
FUEL TANKS (plus selector valve plumbing)
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Adjustable Fuel Pressure regulator
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Fuse 5 amp
Fuse 5 amp
Fuse 5 amp
INJECTOR
INJECTOR
670 CFM HOLLY TBI UNIT
ENGINE STARTER
CRANK SIGNAL
Distributor Disconnect For initial timing
"Wiring Harness" from Junk Yard GM Computer Controlled HEI Distributor
ECM SYSTEM GROUND Driver Side Cylinder Head
DISTRIBUTOR CONTROL MODULE (7 TERMINAL)
CAP with IGNITION COIL
PICKUP COIL
ROTOR
COMPUTER CONTROLLED DISTRIBUTOR (AutoZone #30-1873)
SPARK PLUGS
+12 volts only during "Run and Crank"
PCV
CHASSIS FUSE BLOCK
IGNITION KEY
STARTING BATTERY
TBI with ESC "Electronic Spark Control"
Cable from Junk Yard Distributor
Terminated by installer
Vacuum line by installer
Howell's Wiring Harness
Fuel line
Chassis Wiring

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HOWELL
ENGINE DEVELOPMENTS INC.

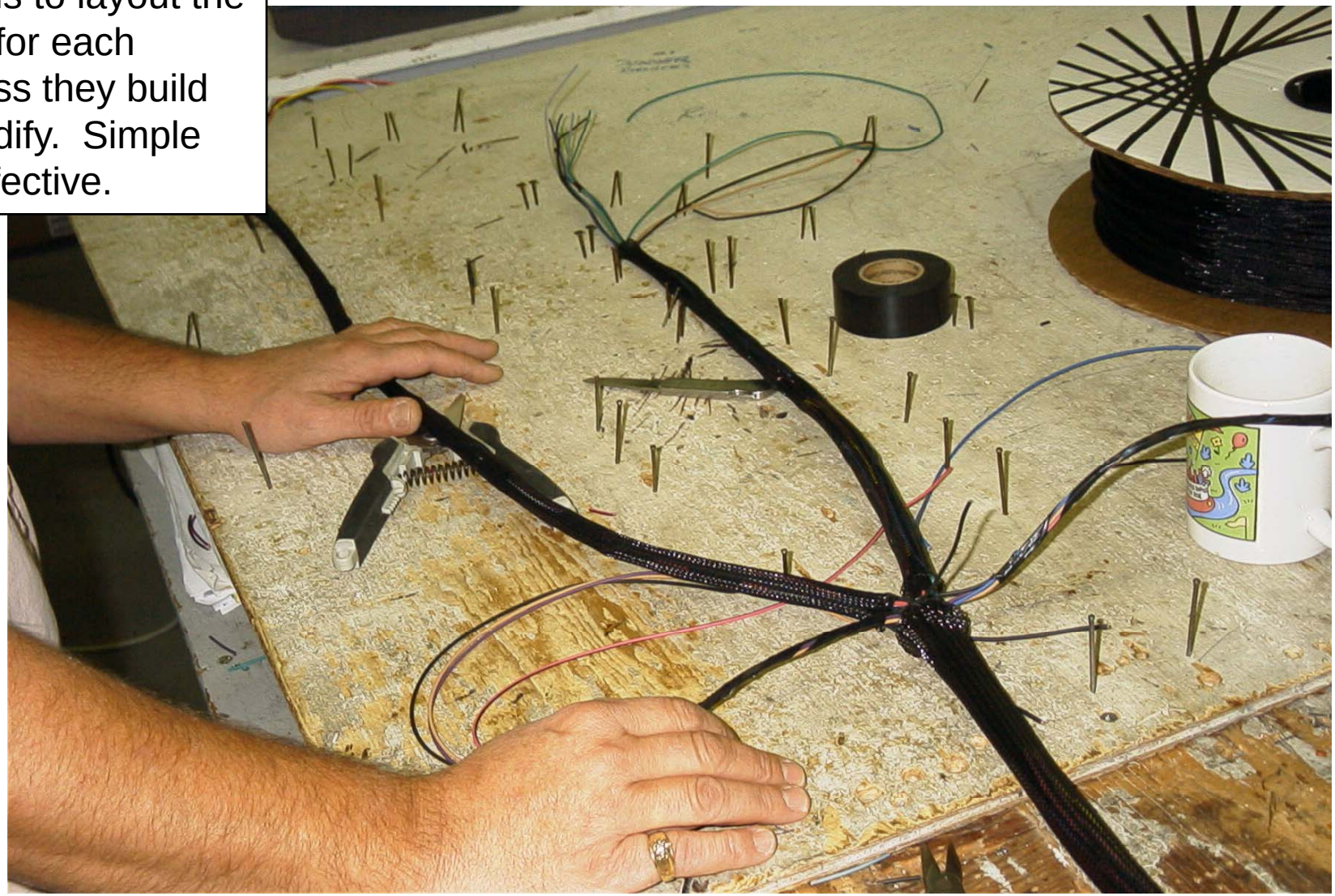
Marine City, Michigan

You can send your harness in or visit Howell for the ESC upgrade if you didn't order your kit with ESC.

Howell's Nail Board

Photo by Paul Bartz

They use boards like this to layout the wires for each harness they build or modify. Simple but effective.



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HOWELL
ENGINE DEVELOPMENTS INC.

Tom working on my harness

I visited Howell to have my system upgraded to ESC. Here's Tom reworking my harness.

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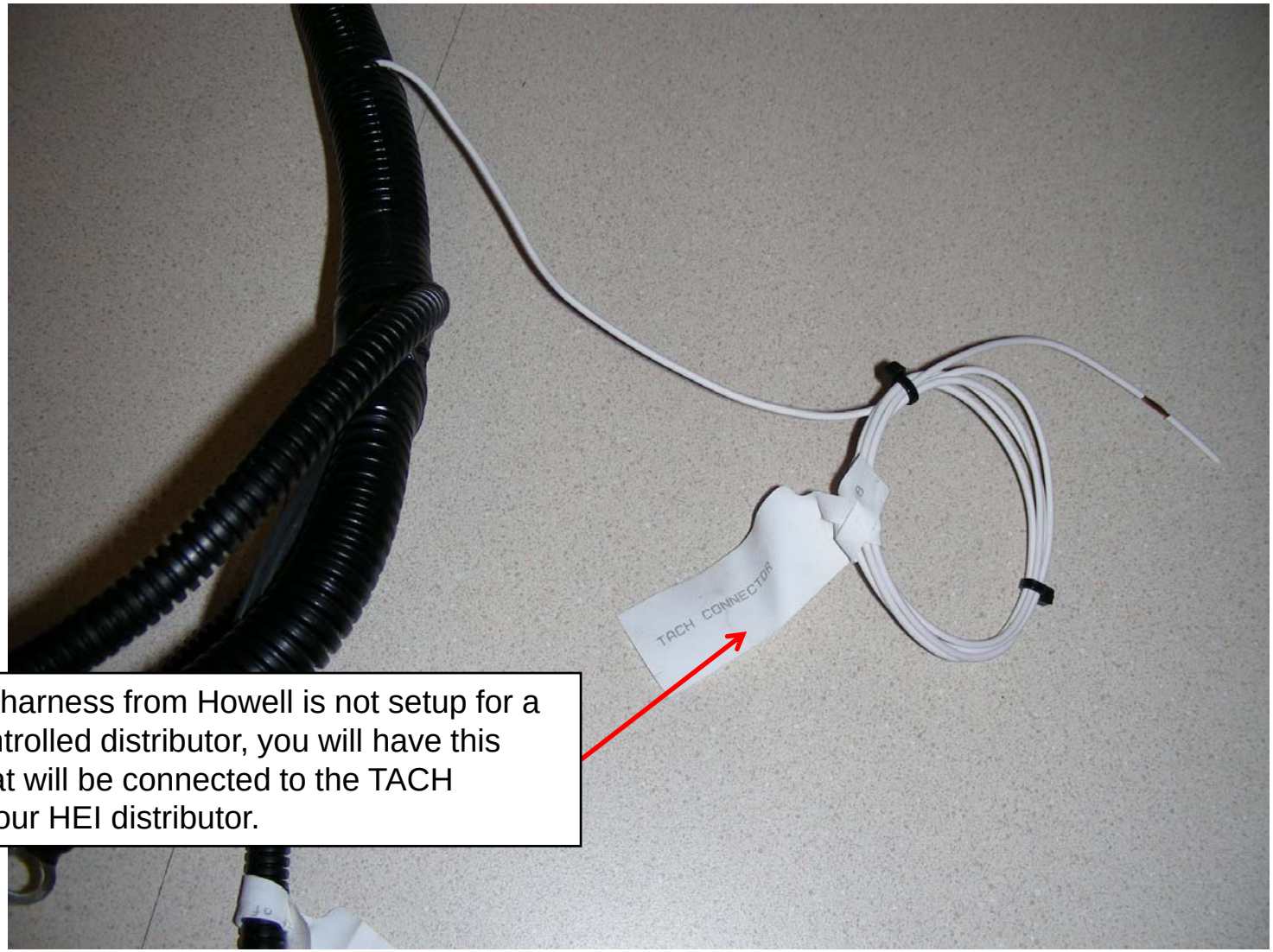
Electronic Spark Control

Computer Controlled Distributor



If your wiring harness from Howell is not setup for a computer controlled distributor, you will have this white wire that will be connected to the TACH terminal on your HEI distributor.

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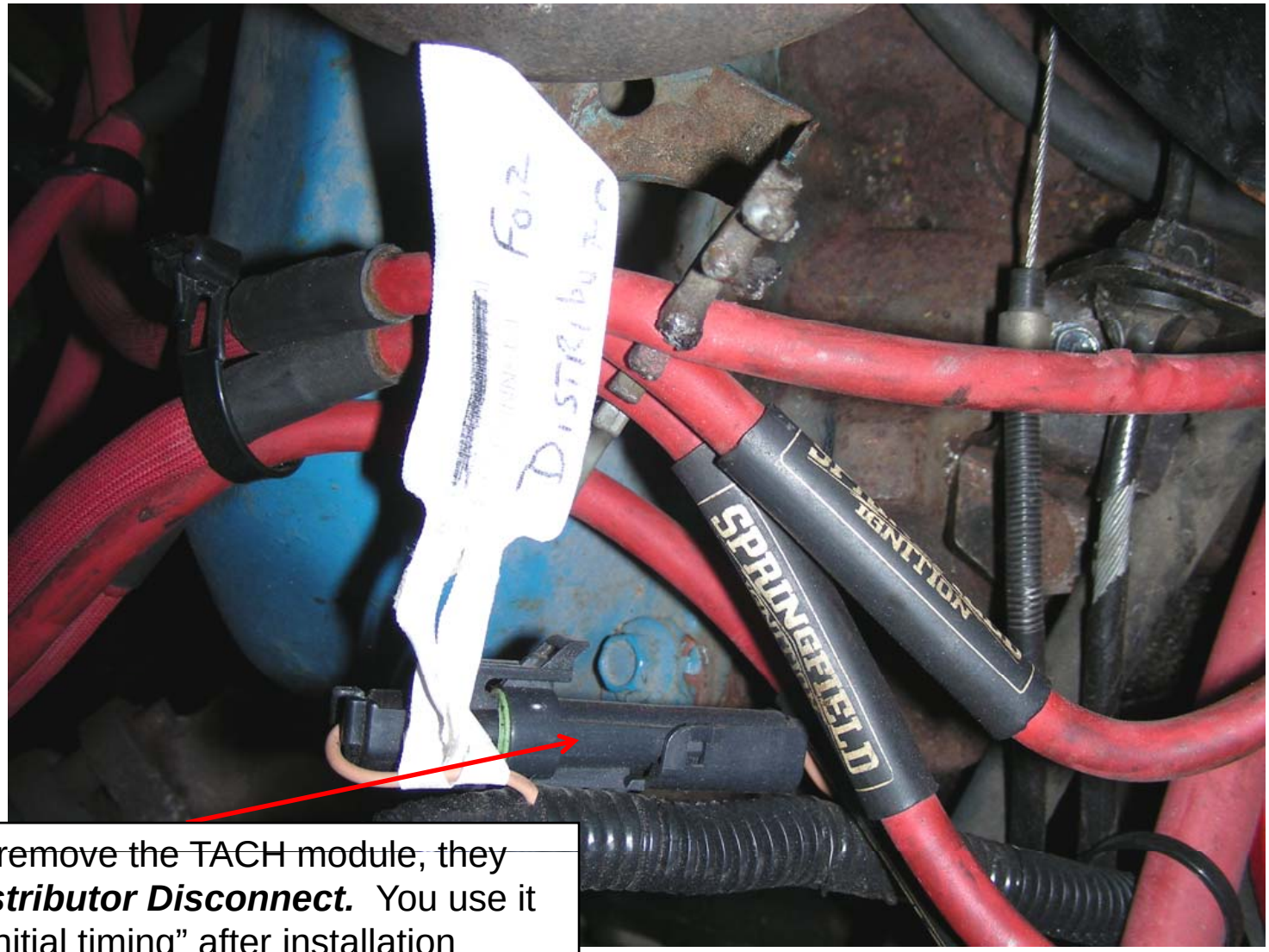
Electronic Spark Control

Computer Controlled Distributor



When they remove the TACH module, they add this ***Distributor Disconnect.*** You use it to set the “initial timing” after installation

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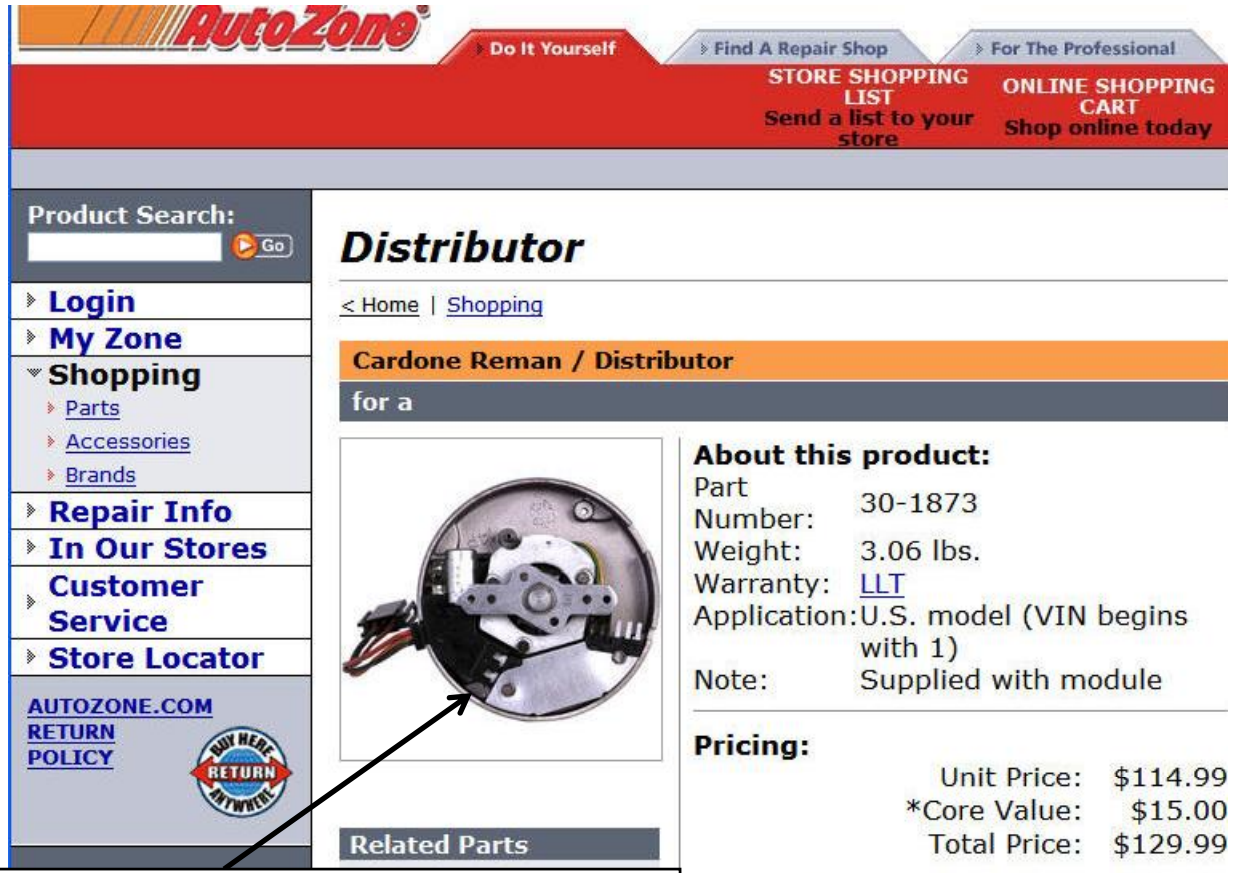
Electronic Spark Control

Computer Controlled Distributor



This is a GM computer controlled distributor. It does not come with a cap, rotor or the “Distributor to ECM Wiring Harness” needed to connect to the TBI system. You can keep the rotor and cap from your existing HEI ignition. The “wiring harness” must come from a junk yard distributor.

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Electronic Spark Control

Computer Controlled Distributor

I went to the Men's Mall and bought this HEI distributor for a mid 1980's GM car. This one was from a 1985 Buick. The proper one does not have a vacuum can. As it turned out I got one for a 6-cylinder. No problem. I kept the coil, rotor, ignition module and the distributor to ECM wiring harness. I threw out the cap and took the housing back to AutoZone to get back my core deposit for the distributor I bought there.

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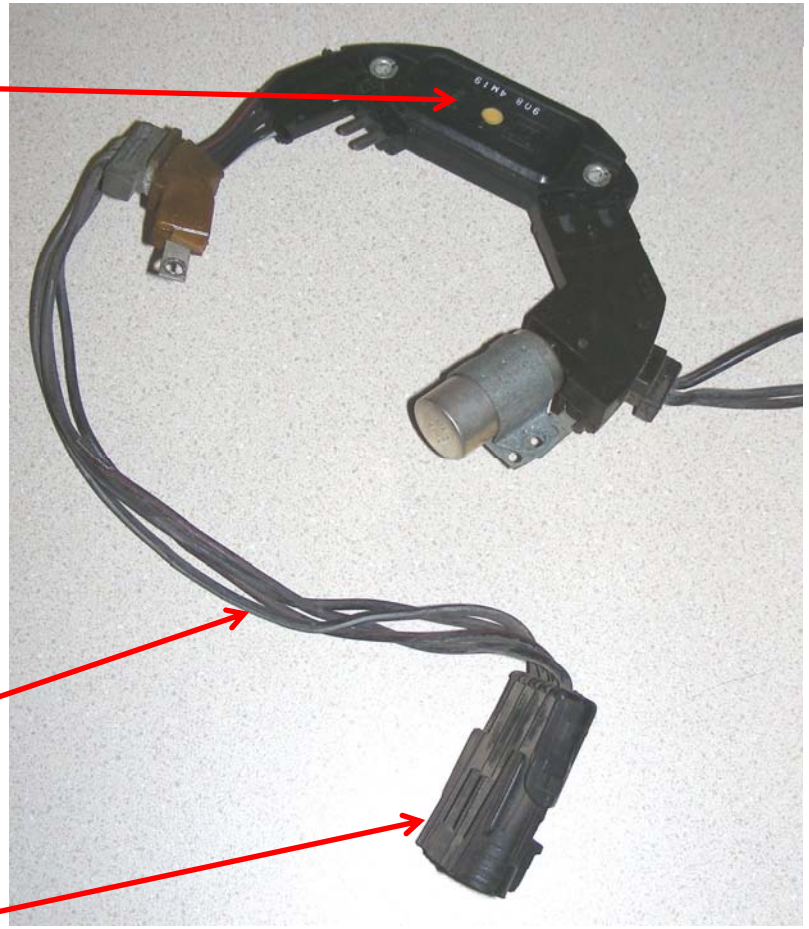
Electronic Spark Control

Computer Controlled Distributor

Keep this ignition module as a spare.



This is the “the distributor to ECM wiring harness” from the donor distributor.

This connector will plug into a matching connector in the Howell TBI wring harness.

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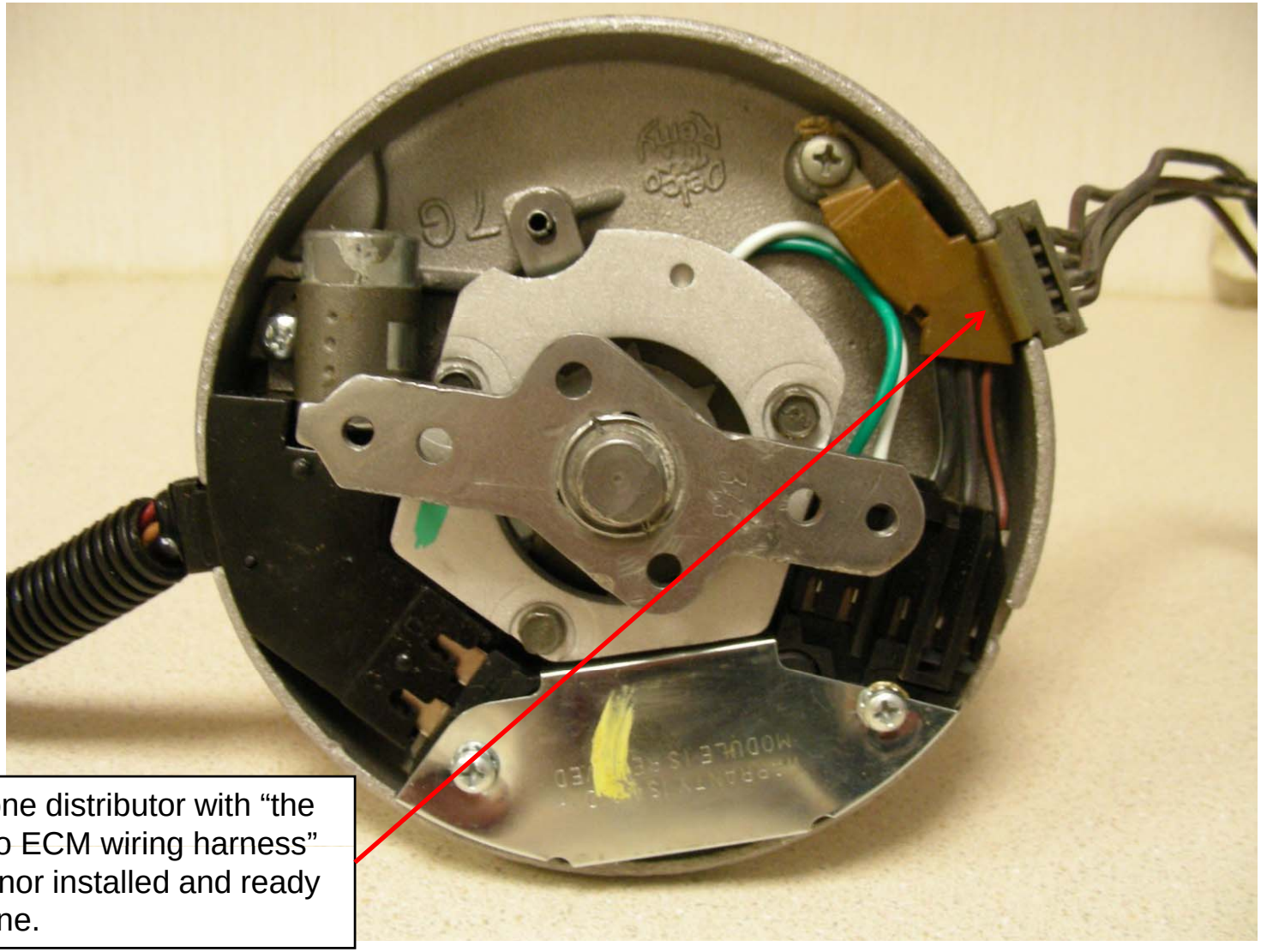
Electronic Spark Control

Computer Controlled Distributor



The AutoZone distributor with “the distributor to ECM wiring harness” from the donor installed and ready for the engine.

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Electronic Spark Control

Computer Controlled Distributor

Another view of AutoZone distributor with “the distributor to ECM wiring harness” from the donor installed and ready for the engine.

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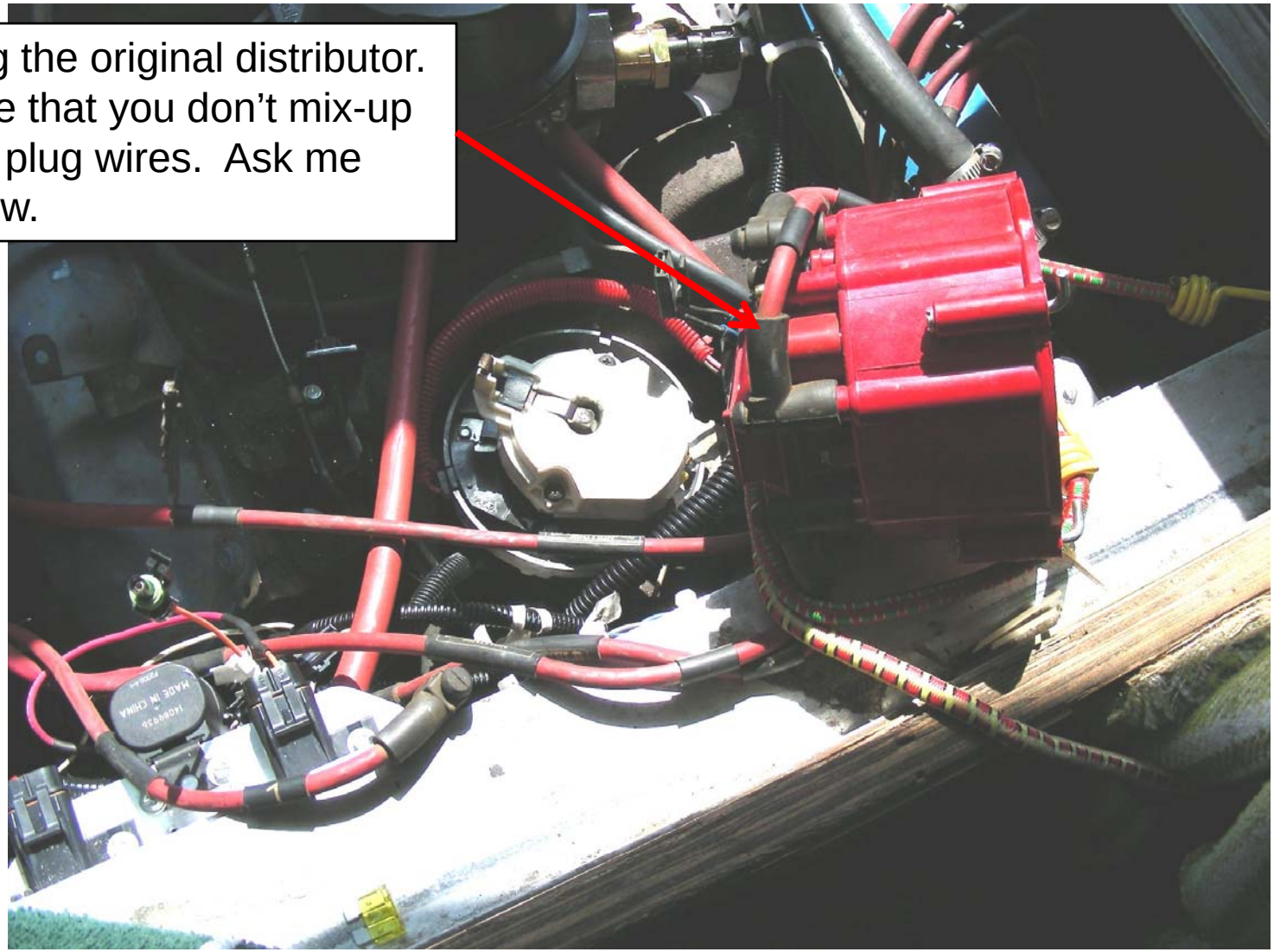
Electronic Spark Control

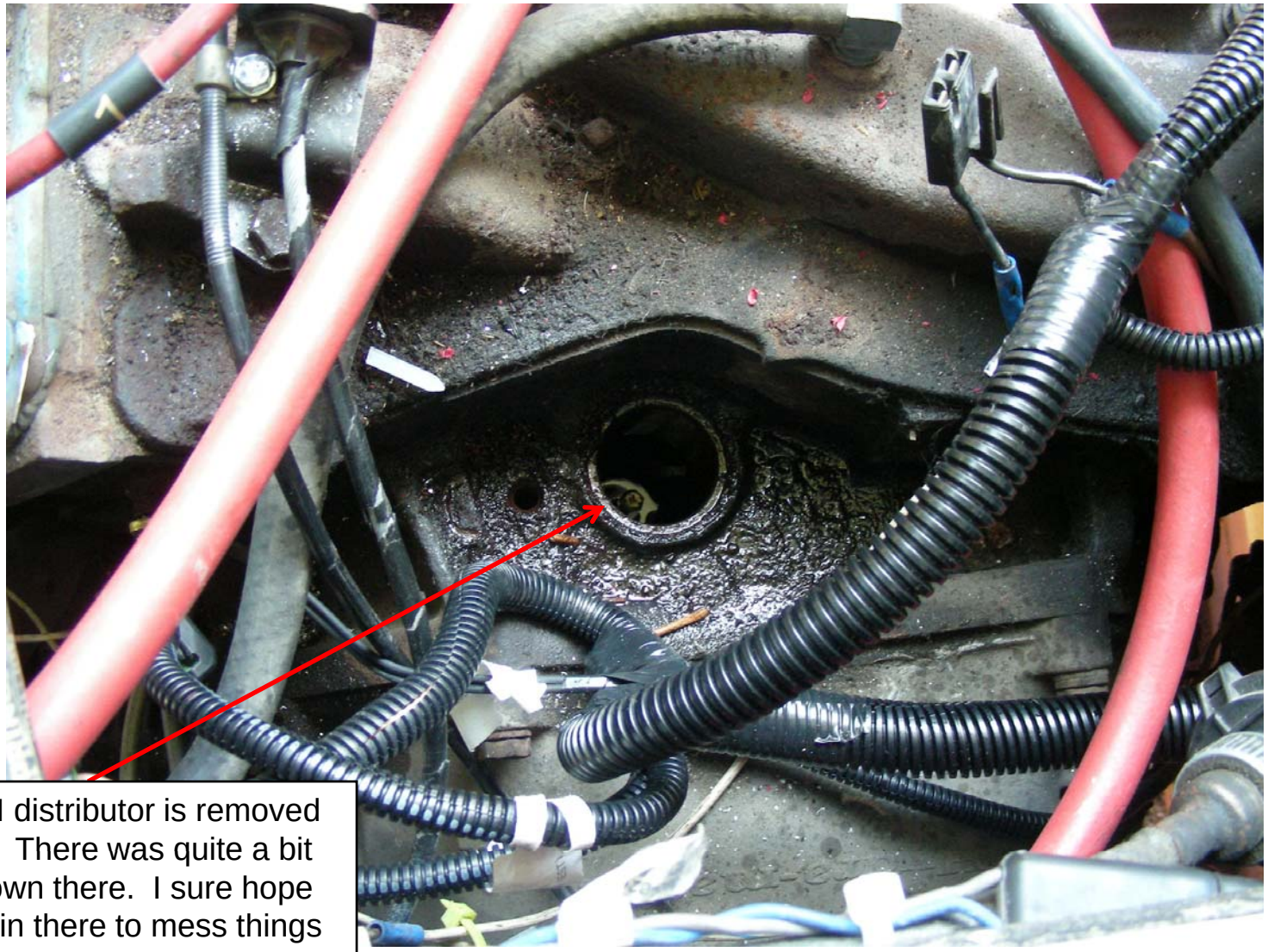
Computer Controlled Distributor

Removing the original distributor. Make sure that you don't mix-up the spark plug wires. Ask me how I know.



Electronic Spark Control

Computer Controlled Distributor



The old HEI distributor is removed in this shot. There was quite a bit of debris down there. I sure hope nothing fell in there to mess things up. It was quite a struggle to get the old distributor out of there.

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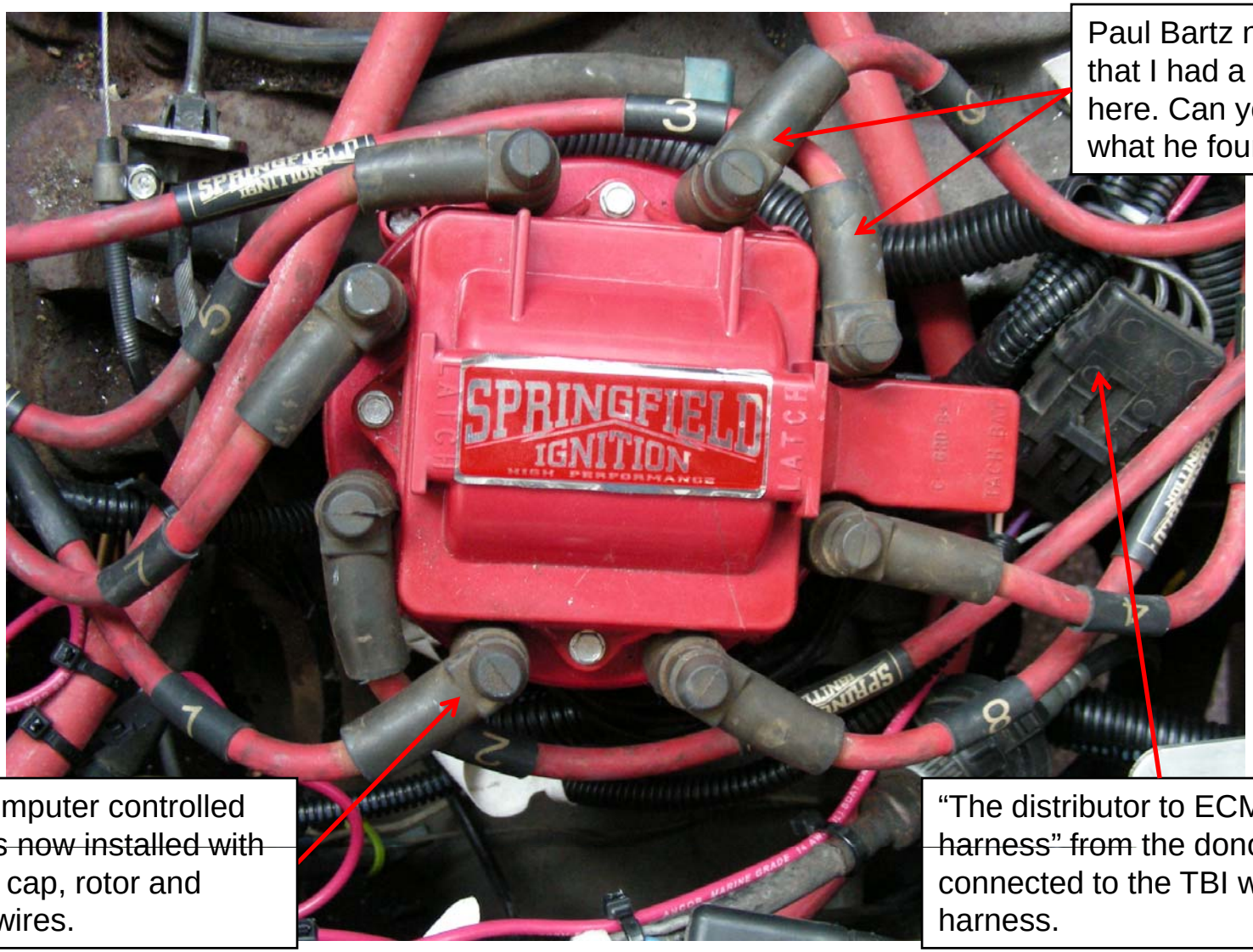
Electronic Spark Control

Computer Controlled Distributor



Paul Bartz noticed that I had a problem here. Can you tell what he found out?

The new computer controlled distributor is ~~now installed with~~ the existing cap, rotor and spark plug wires.

"The distributor to ECM wiring ~~harness" from~~ the donor is now connected to the TBI wiring harness.

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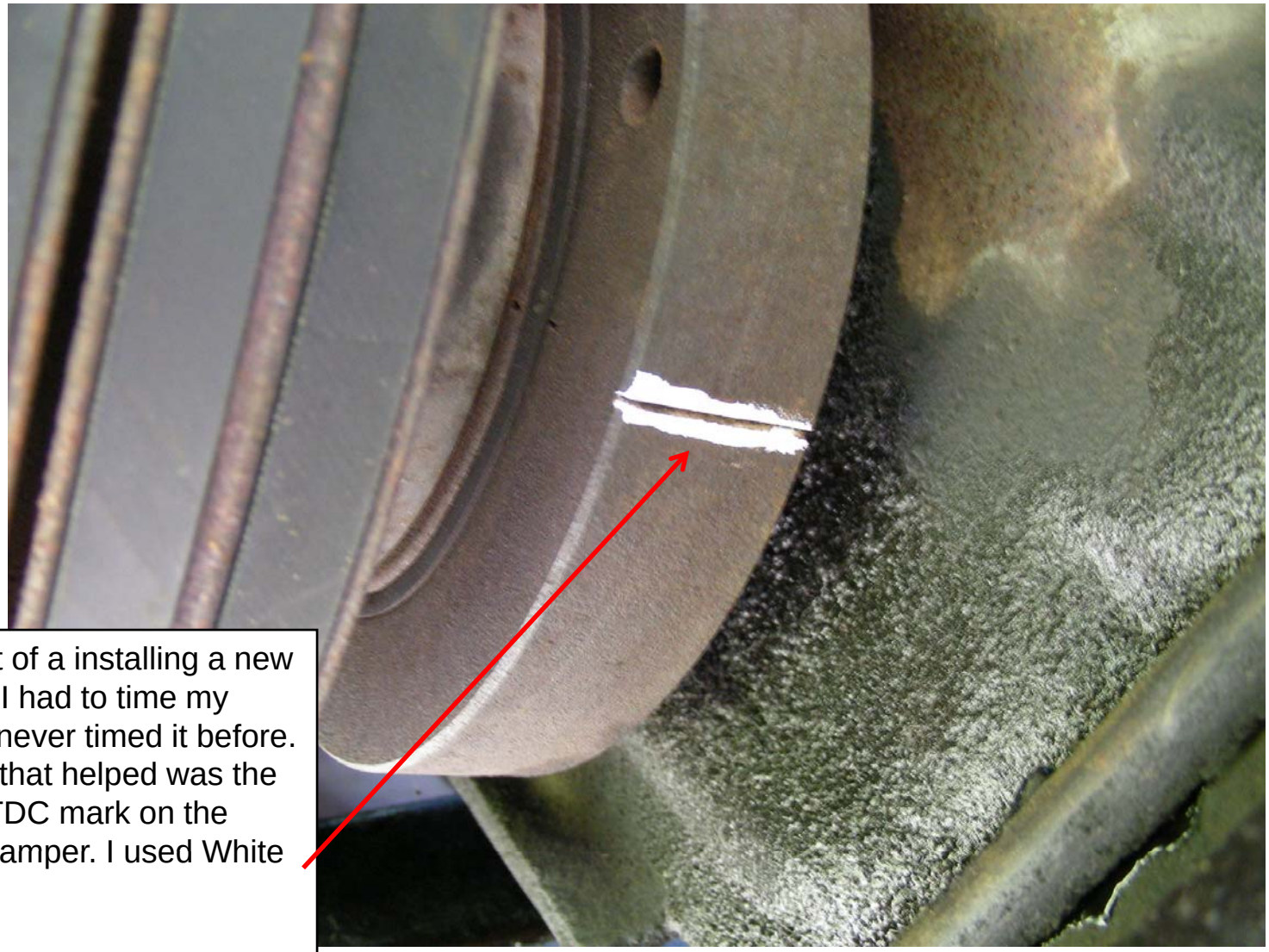
Electronic Spark Control

Computer Controlled Distributor



As a result of a installing a new distributor I had to time my GMC. I'd never timed it before. One thing that helped was the mark the TDC mark on the vibration damper. I used White Out.

I timed it to 4 degrees. The ECM is supposed to do the

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Calibration Prom and Vehicle ECM

CALIBRATION PROM AND VEHICLE ECM

The brain and control center of your new electronic fuel injection is the Electronic Control Module (ECM). It Controls the amount of fuel delivered at any time, based on inputs from the Oxygen sensor, coolant sensor, MAP sensor and throttle position sensor. The correct fuel settings are pre-programmed into the calibration prom and match your engine closely for everything to work correctly. The calibration prom and a smaller removable chip called a Calpack, are pre-installed in your ECM. The Calpack contains back-up or limp-home programs in case one or more sensors fail and the ECM cannot do its proper function. This will keep you from being stranded in even of sensor failure, until you can get the trouble corrected. The "Service Engine Soon" light will come on any time any back-up features are activated.

Now that the system is installed, they want to explain a few things.

Calibration Prom and Vehicle ECM

Your vehicle ECM is GM part #1227747. This is the ECM used in most GM truck TBI engines from 1987 thru 1991.If replacement is necessary, it is available at any GM dealership. It is a rugged, proven design, the result of millions of GM dollars spent on development. It has the ability, operating in closed loop, to learn a calibration that perfectly matches your engine and retain it in memory.

I guess GM spent a few bucks designed this interim system.

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Calibration Prom and Vehicle ECM

An added benefit of the GM ECM is its ability to alert you to a potential sensor or electrical problem by turning on the "Service Engine Soon" light, built into you harness. This light and a common paper clip will allow you to discover and diagnose any reported problems retained in the ECM memory. Procedures for this are outlined in any GM TBI service manual or the Howell HP/TBI service manual that accompanies your TBI kit.

Now I can have a computer tell me what is wrong with my GMC .

Calibration Prom and Vehicle ECM

The CALIBRATION PROM supplied with your kit is mounted inside the ECM under a plate retained by two screws. In the event you need to replace it, follow the instructions below:

1. Remove the ECM from its mounted location. Depress the latches and remove the harness ECM connectors, one at a time, from the ECM.
2. Remove the ECM cover (retained by two screws).
3. Remove the larger of the two cal proms by carefully prying and lifting it straight up.
4. Install the replacement cal prom. (It will only go in one way, so can't be installed wrong.) Replace the cover.
5. Reverse the removal sequence and reinstall the ECM in its vehicle mounting.

CAUTION!! Do not remove the cal prom with harness still connected to the ECM. It may be damaged by 12V power that is always present in the vehicle harness when the battery is connected.

Now that the system is installed, they want to explain a few things.

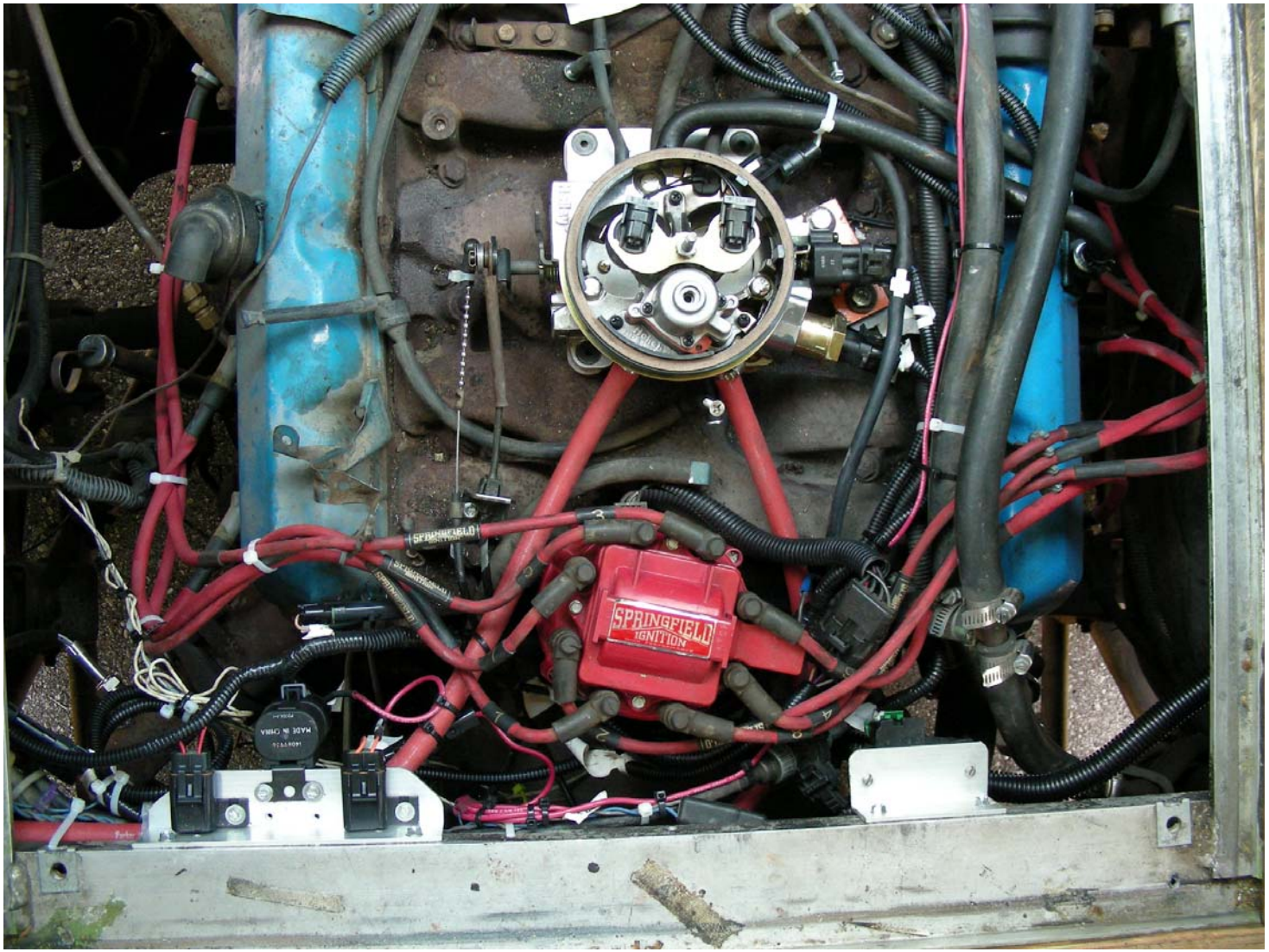
Calibration Prom and Vehicle ECM

INITIAL VEHICLE STTART-UP AND OPERATION

With everything mounted and connected, the vehicle should by ready for start-up. When ignition key is first turned on, listen for fuel pump operation. It should turn on for 2 or 3 second and then the ECM will turn it off until you engage the starter. The first time ignition is turned on it may not be sufficient to fill the TBI and fuel line with fuel. Cranking for a few seconds should complete the filling. The engine should start up and smooth out after a few seconds to purge air from the injectors. Check for fuel leaks and make sure none of your altered wiring or fuel lines are in a position here the exhaust system heat can damage them. MAKE SURE THE COOLING SYSTEM IS FULL.

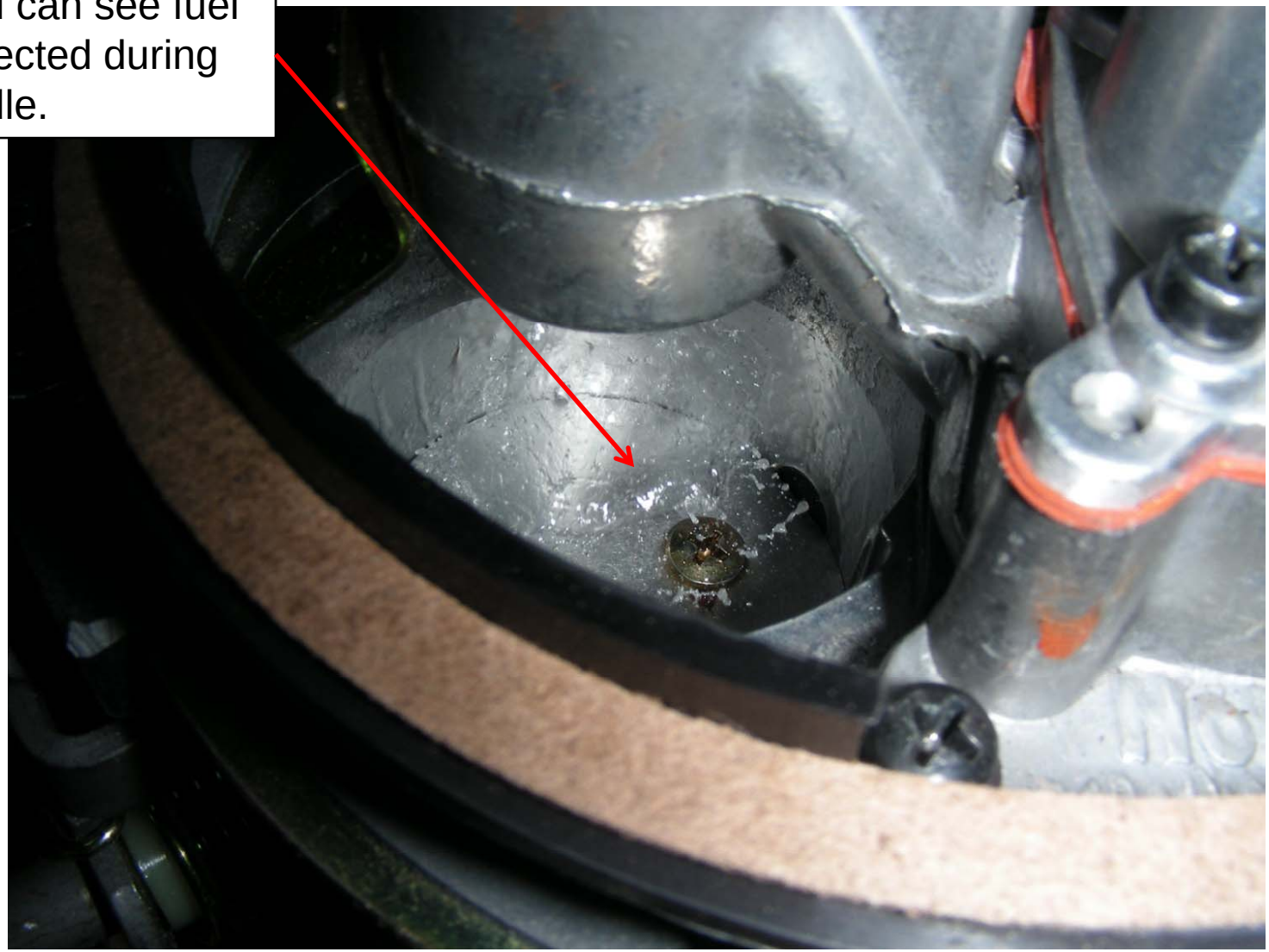
When I did this, the engine started right up.
However, it didn't run smoothly.

Layout Prior to First Starting

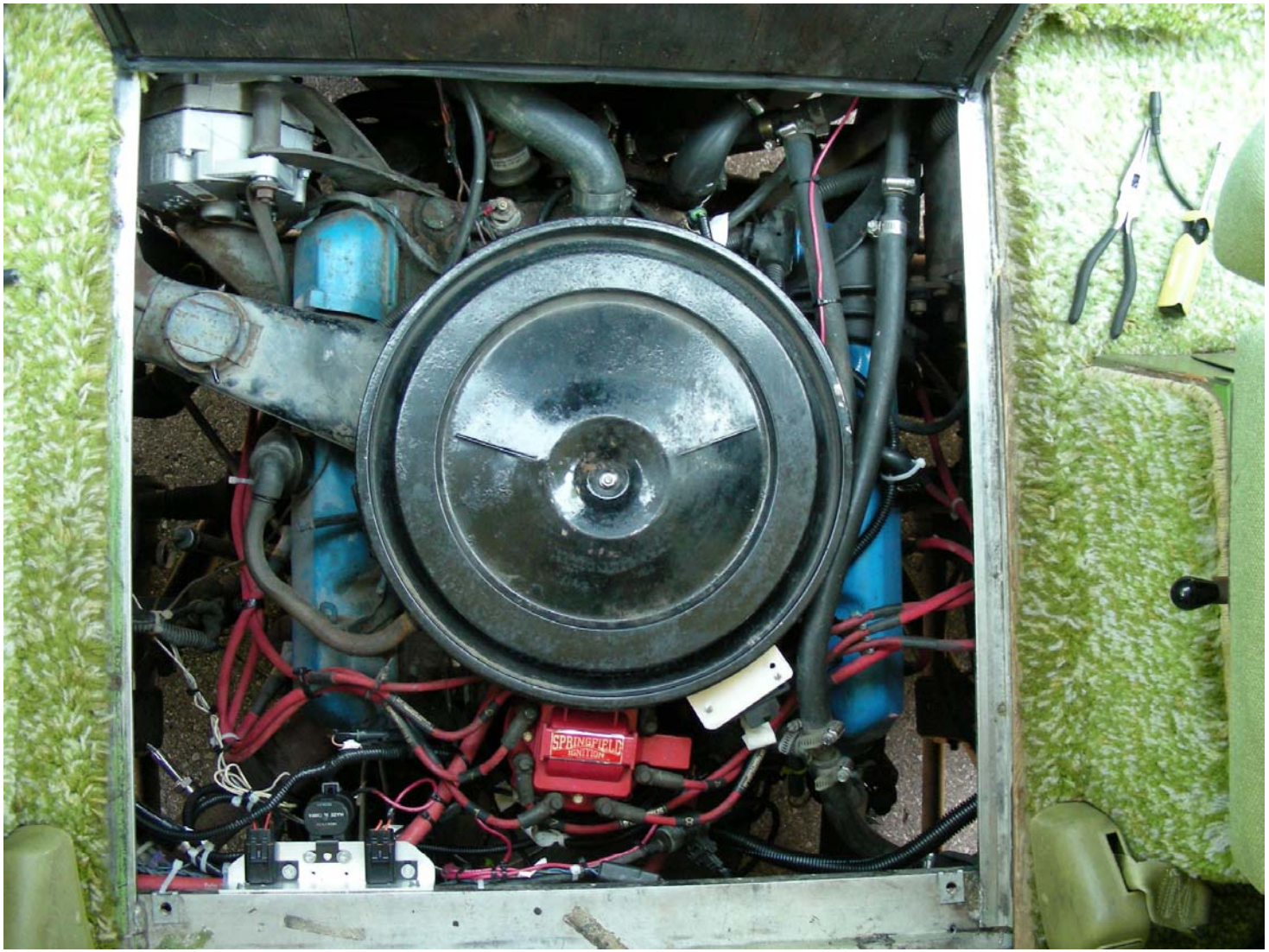


TBI IN OPERATION

Here you can see fuel being injected during engine idle.



TBI IN OPERATION



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HOWELL
ENGINE DEVELOPMENTS INC.

Troy is the guy the gray shirt

I spoke to Troy quite a lot about my problem. To make a long story short I had swapped 2 spark plug wires. Now it runs OK

Choke Stove

While I was making planes to install my TBI system, I spoke with Paul Bartz. He asked me what I was going to do about my ***Choke Stove***. I knew what it was, but didn't under stand the issue. I never thought about it much before.

The Howell installation instructions don't mention the ***Choke Stove.*** The GMC Service manual I have also doesn't seem to mention the ***Choke Stove***.

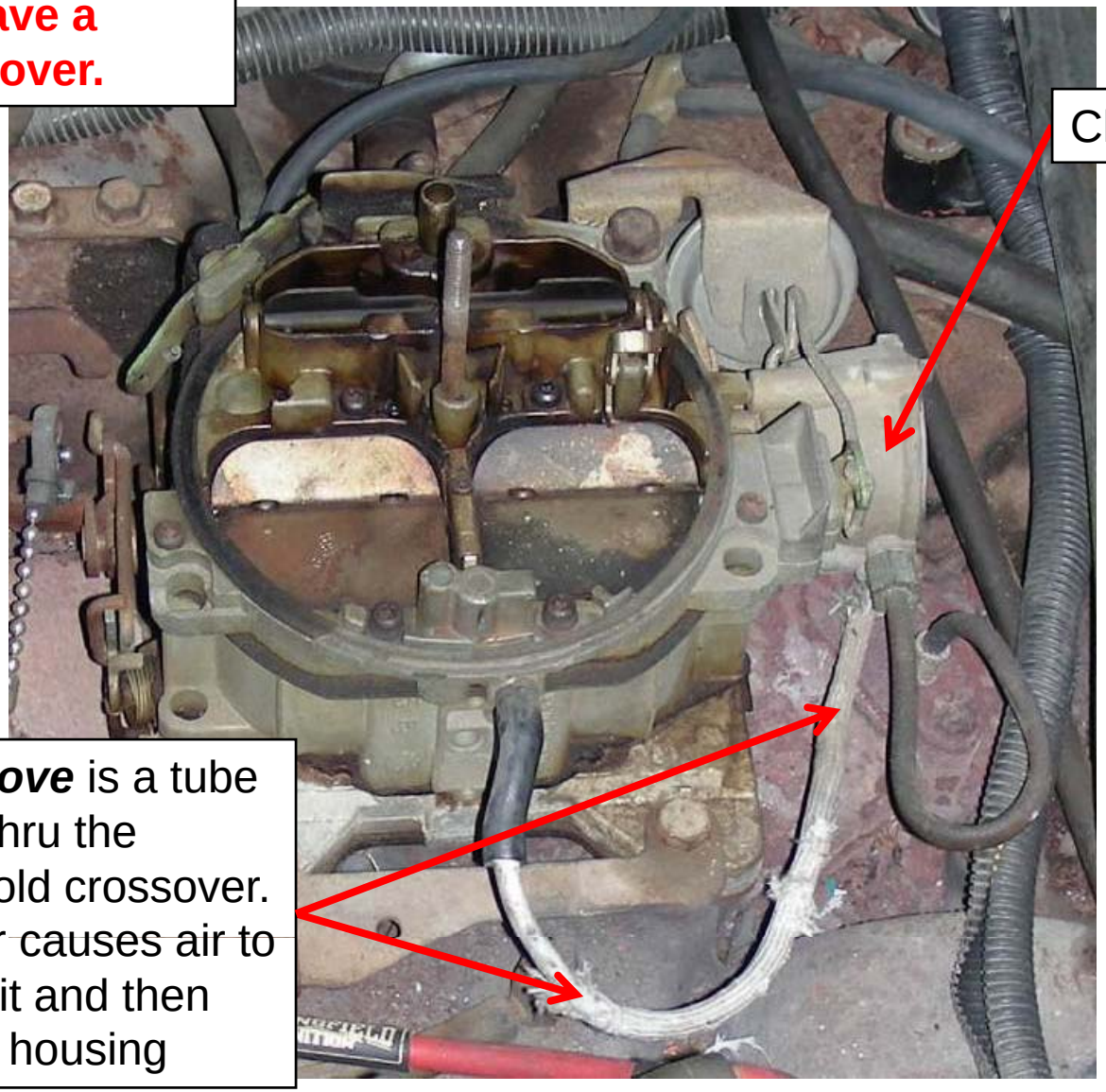
The following is what I learned about the ***Choke Stove***.

This is not an issue if you have a blocked crossover.

The choke stove issue needs to be addressed in all GMC Motorhome!

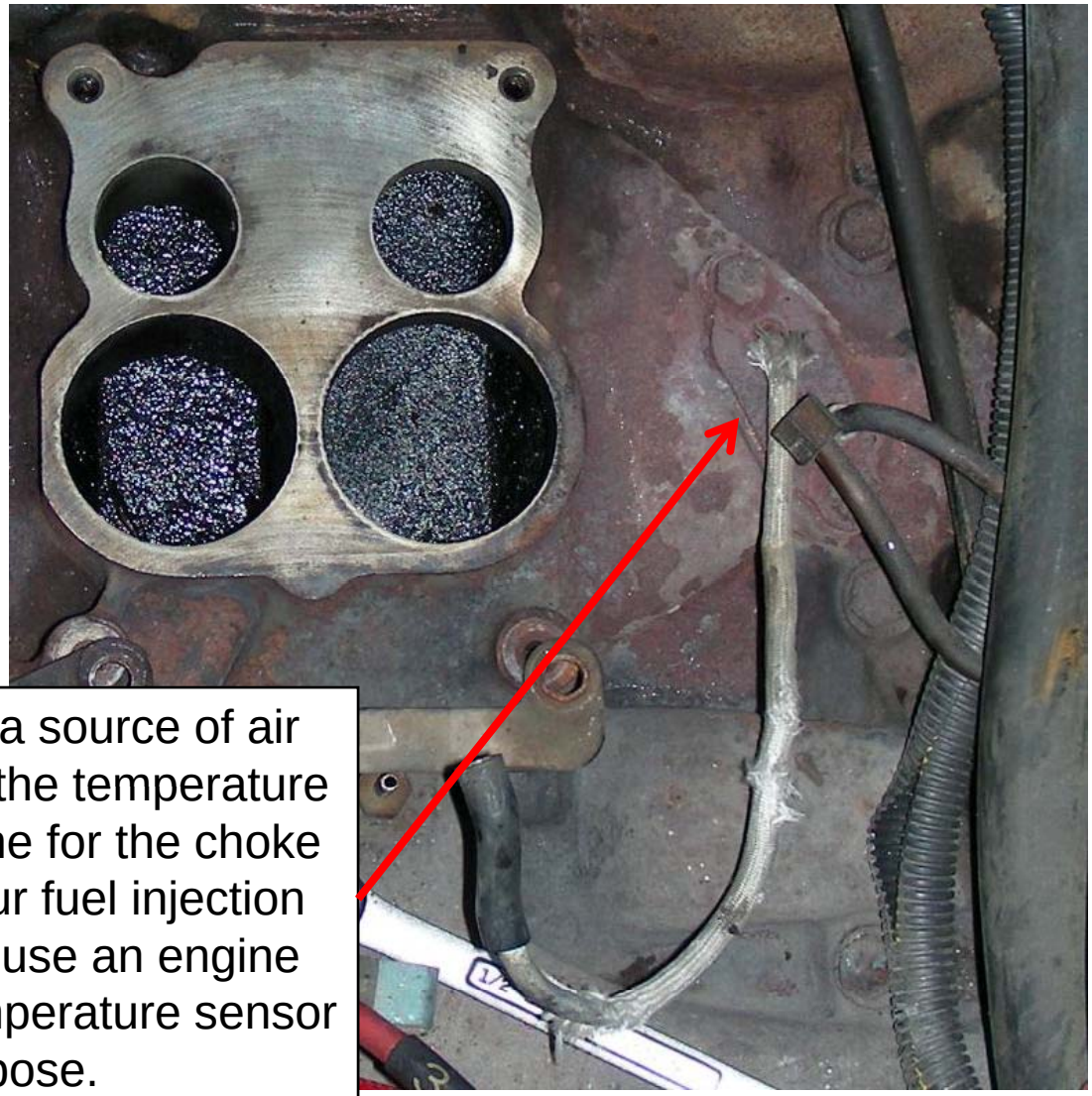
Choke Stove

NOTE: This is not an issue if you have a blocked crossover.



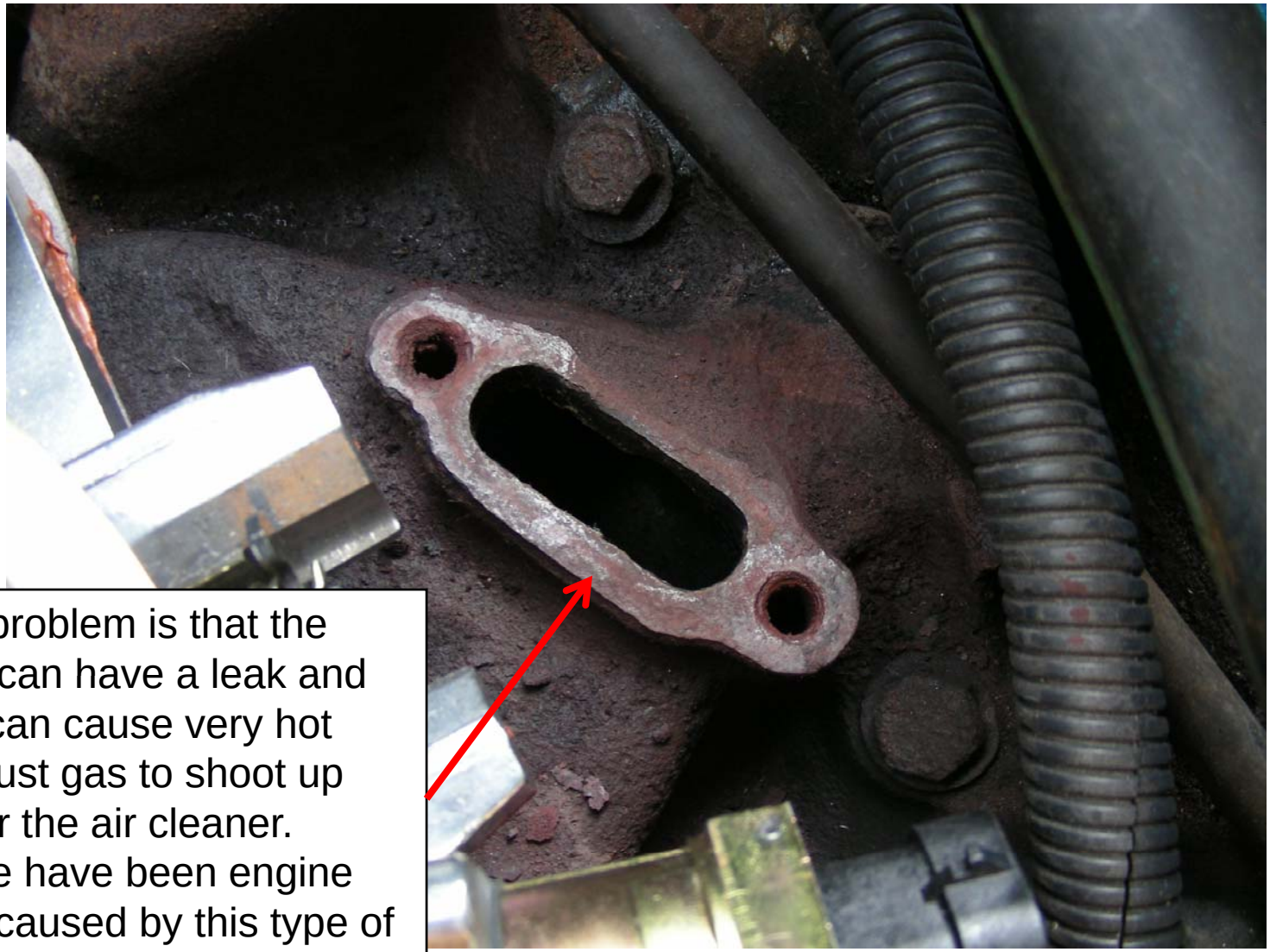
The ***Choke Stove*** is a tube that is routed thru the exhaust manifold crossover. The carburetor causes air to be drawn thru it and then thru the choke housing

Choke Stove



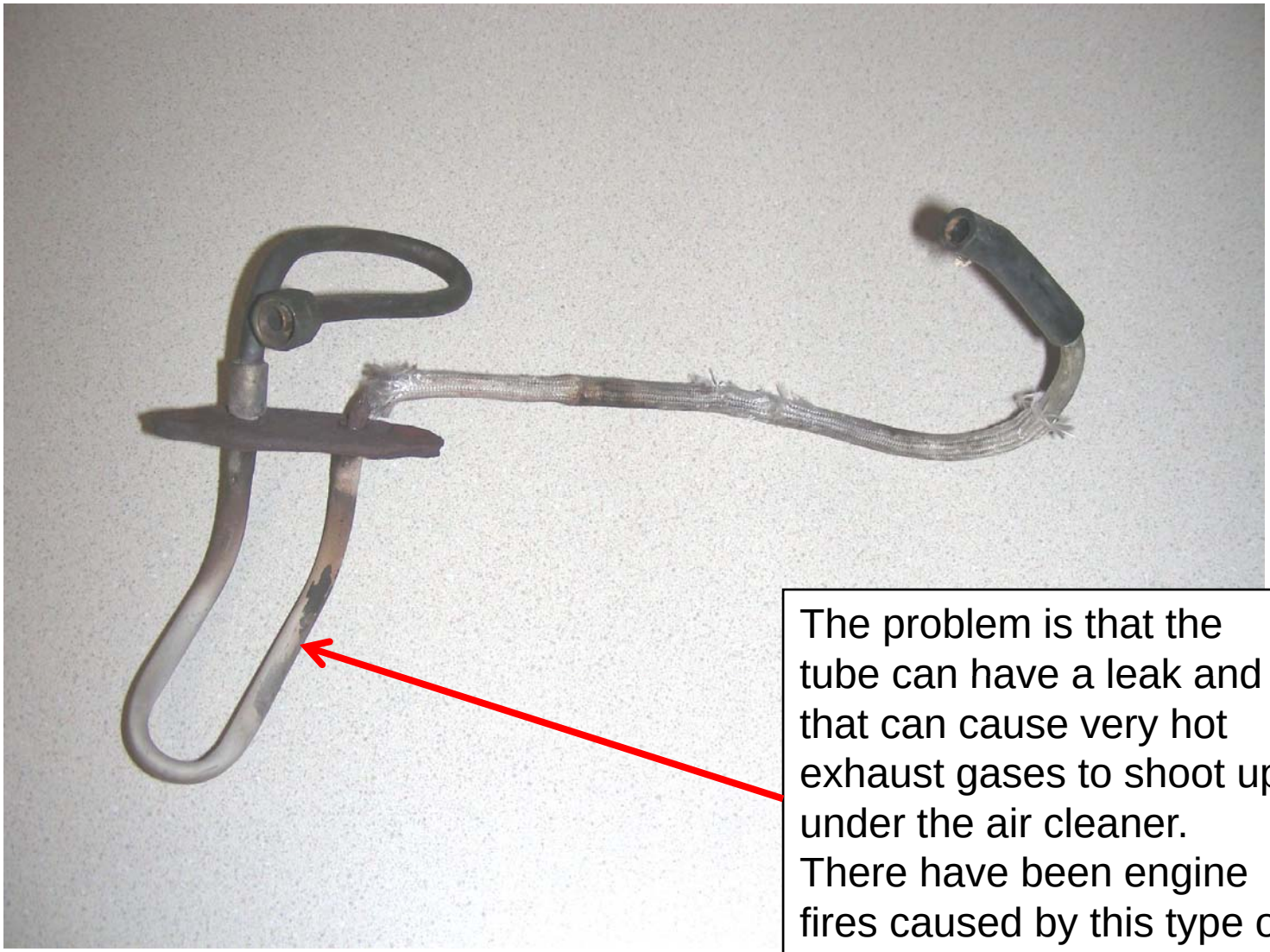
It works as a source of air warmed to the temperature of the engine for the choke system. Our fuel injection system will use an engine coolant temperature sensor for this purpose.

Choke Stove



The problem is that the tube can have a leak and that can cause very hot exhaust gas to shoot up under the air cleaner. There have been engine fires caused by this type of leak.

Choke Stove



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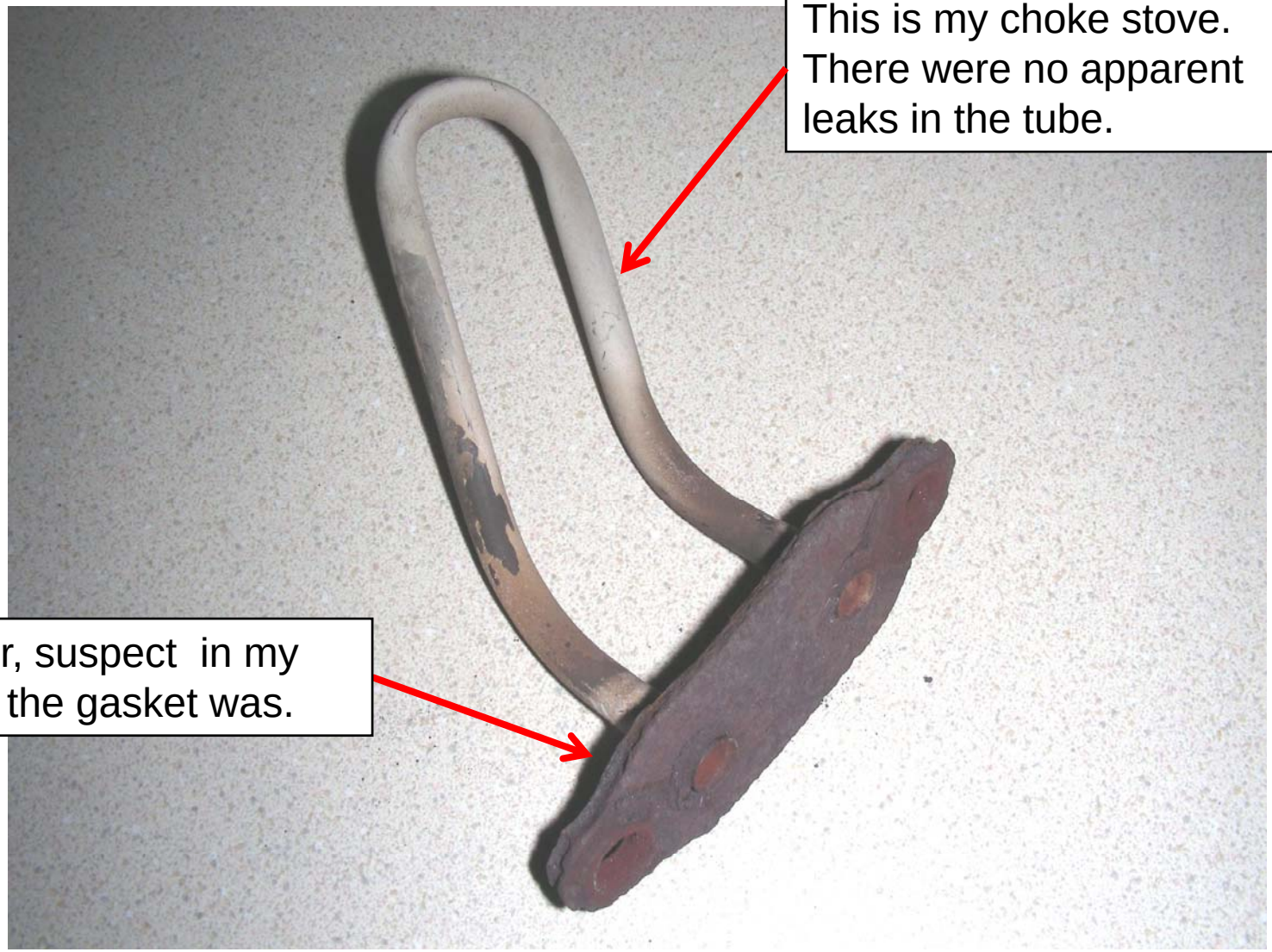
Choke Stove

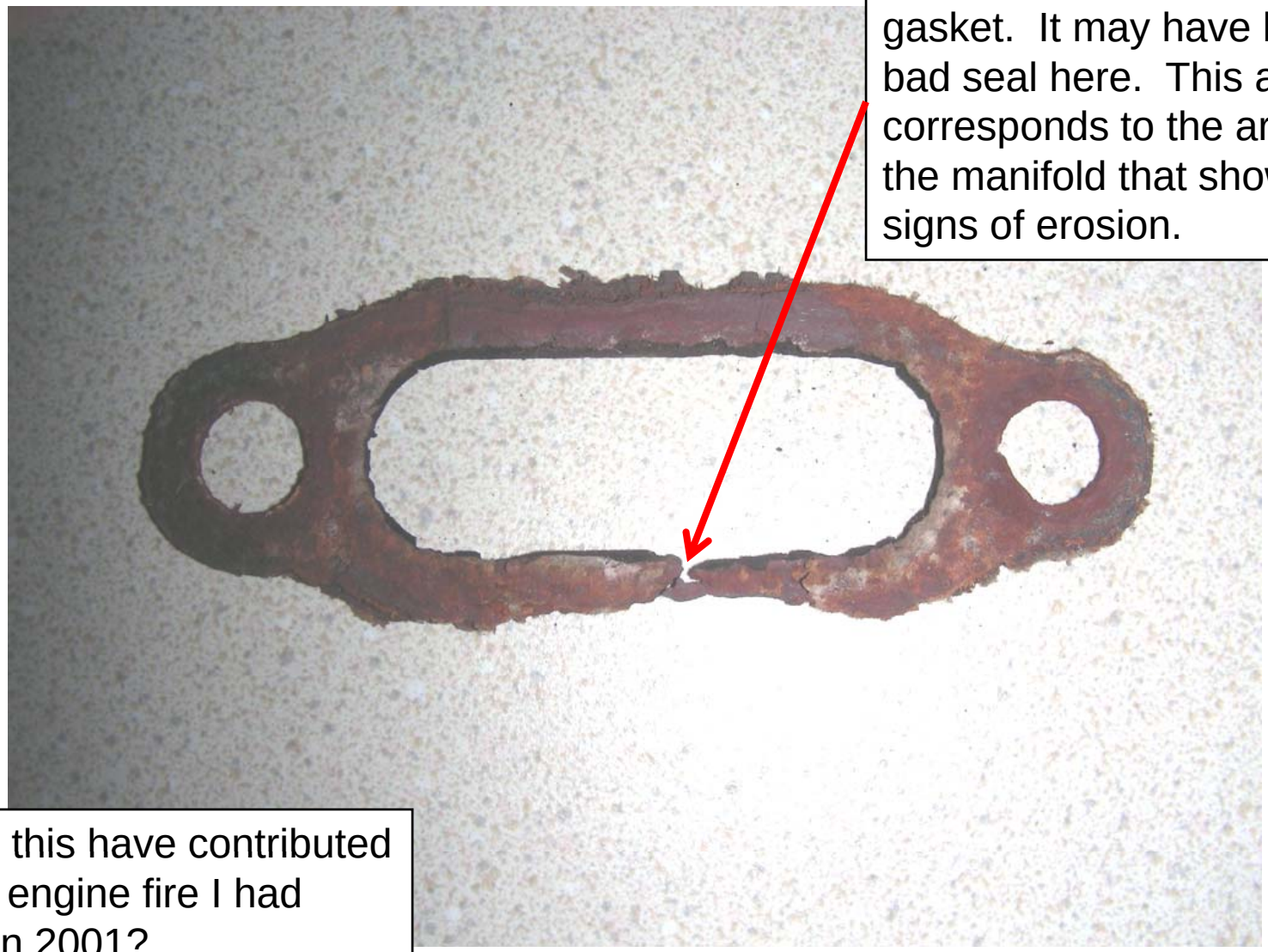


This is my choke stove. There were no apparent leaks in the tube.

However, suspect in my opinion, the gasket was.

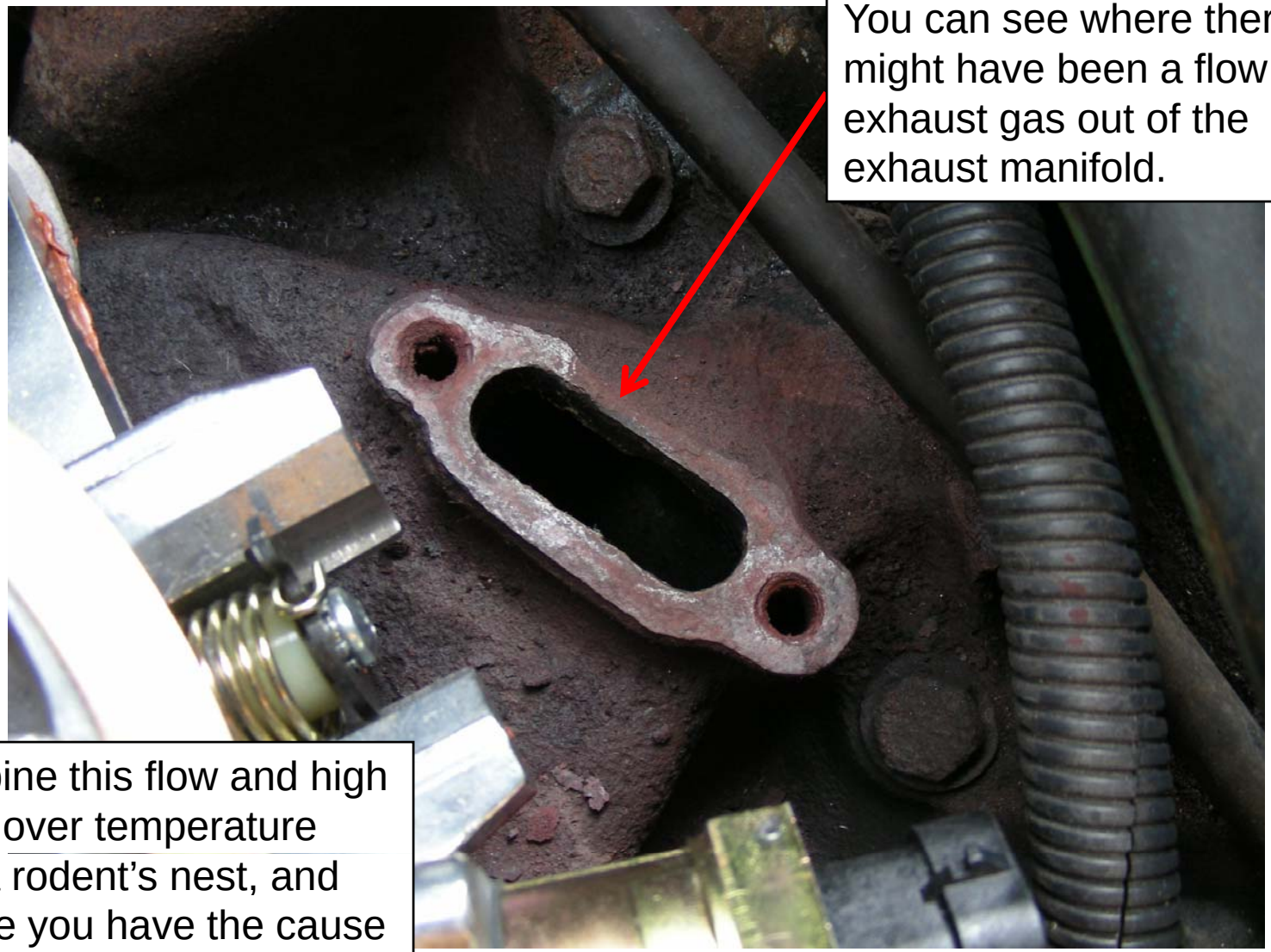
Choke Stove

This was my choke stove's gasket. It may have had a bad seal here. This area corresponds to the area in the manifold that showed signs of erosion.



Could this have contributed to the engine fire I had back in 2001?

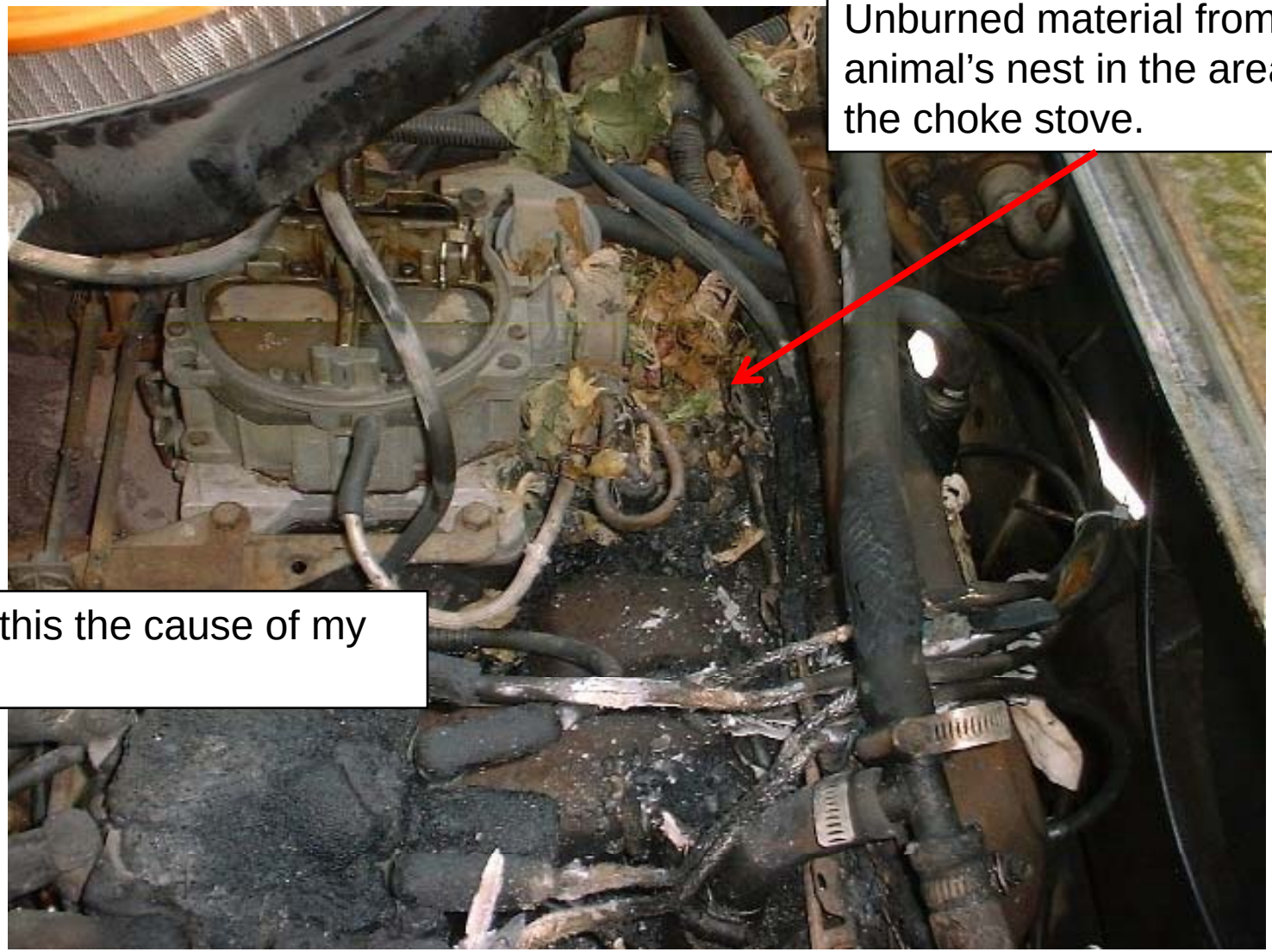
Choke Stove



You can see where there might have been a flow of exhaust gas out of the exhaust manifold.

Combine this flow and high cross over temperature with a rodent's nest, and maybe you have the cause of the fire I had in 2001?

Choke Stove

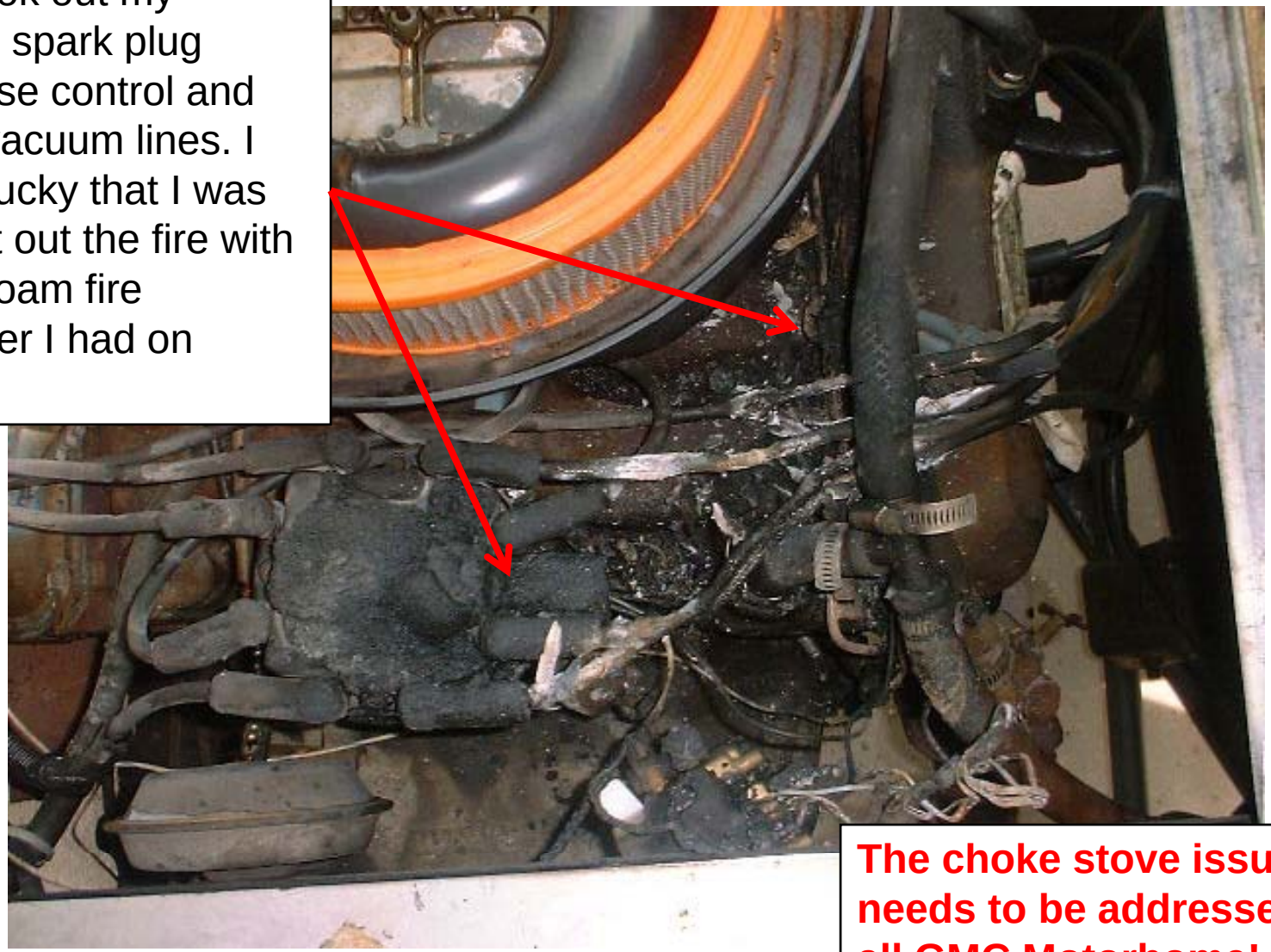


Unburned material from an animal's nest in the area of the choke stove.

Was this the cause of my fire?

Choke Stove

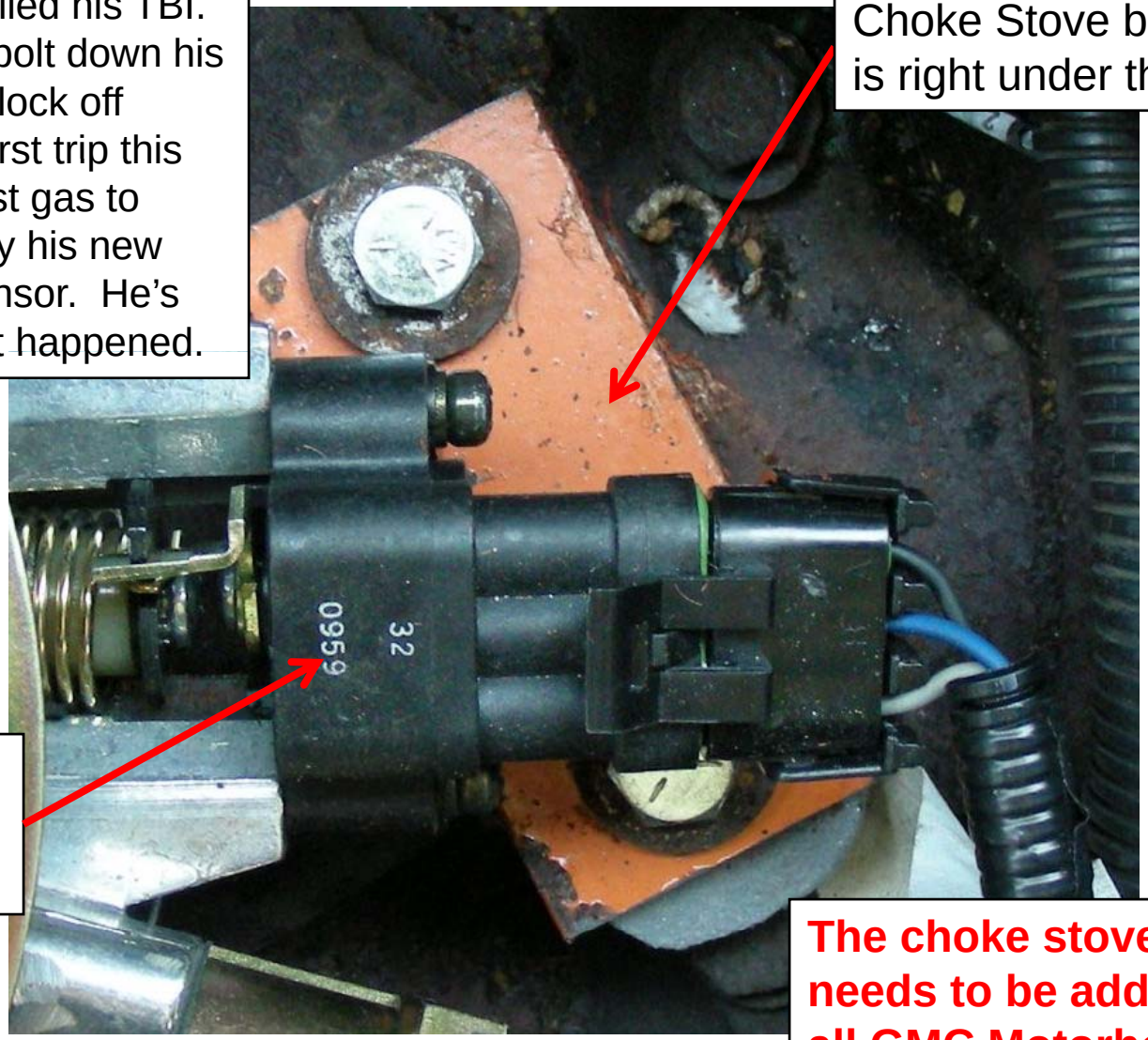
The fire took out my distributor, spark plug wires, cruise control and assorted vacuum lines. I was very lucky that I was able to put out the fire with the large foam fire extinguisher I had on board.



The choke stove issue needs to be addressed in all GMC Motorhome!

Choke Stove

Paul Bartz says he almost had a fire after he installed his TBI. He didn't properly bolt down his new choke stove block off plate. During his first trip this allowed hot exhaust gas to escape and destroy his new throttle position sensor. He's lucky that is all that happened.



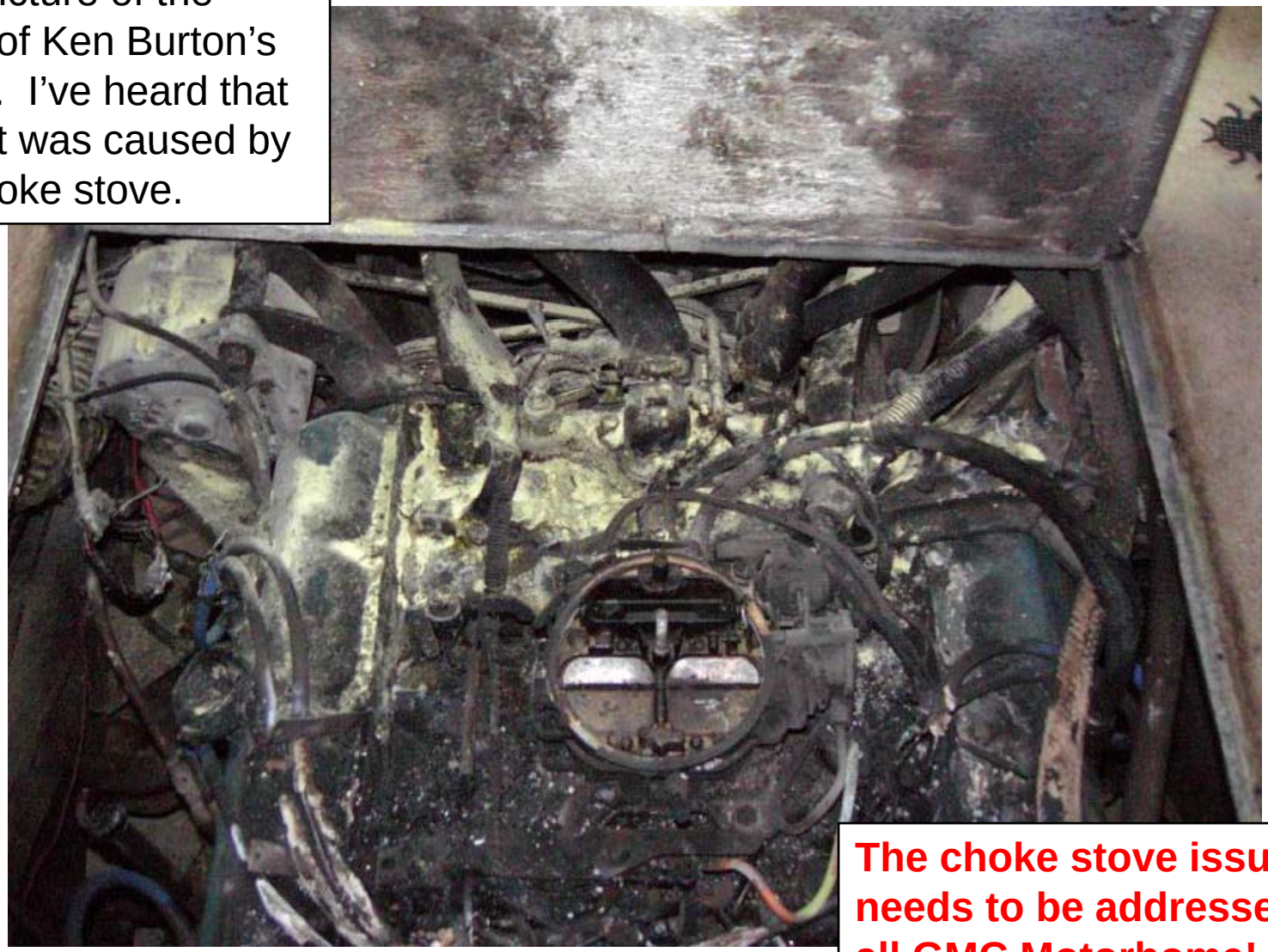
Choke Stove block off plate is right under the TPS.

Throttle Position Sensor

The choke stove issue needs to be addressed in all GMC Motorhome!

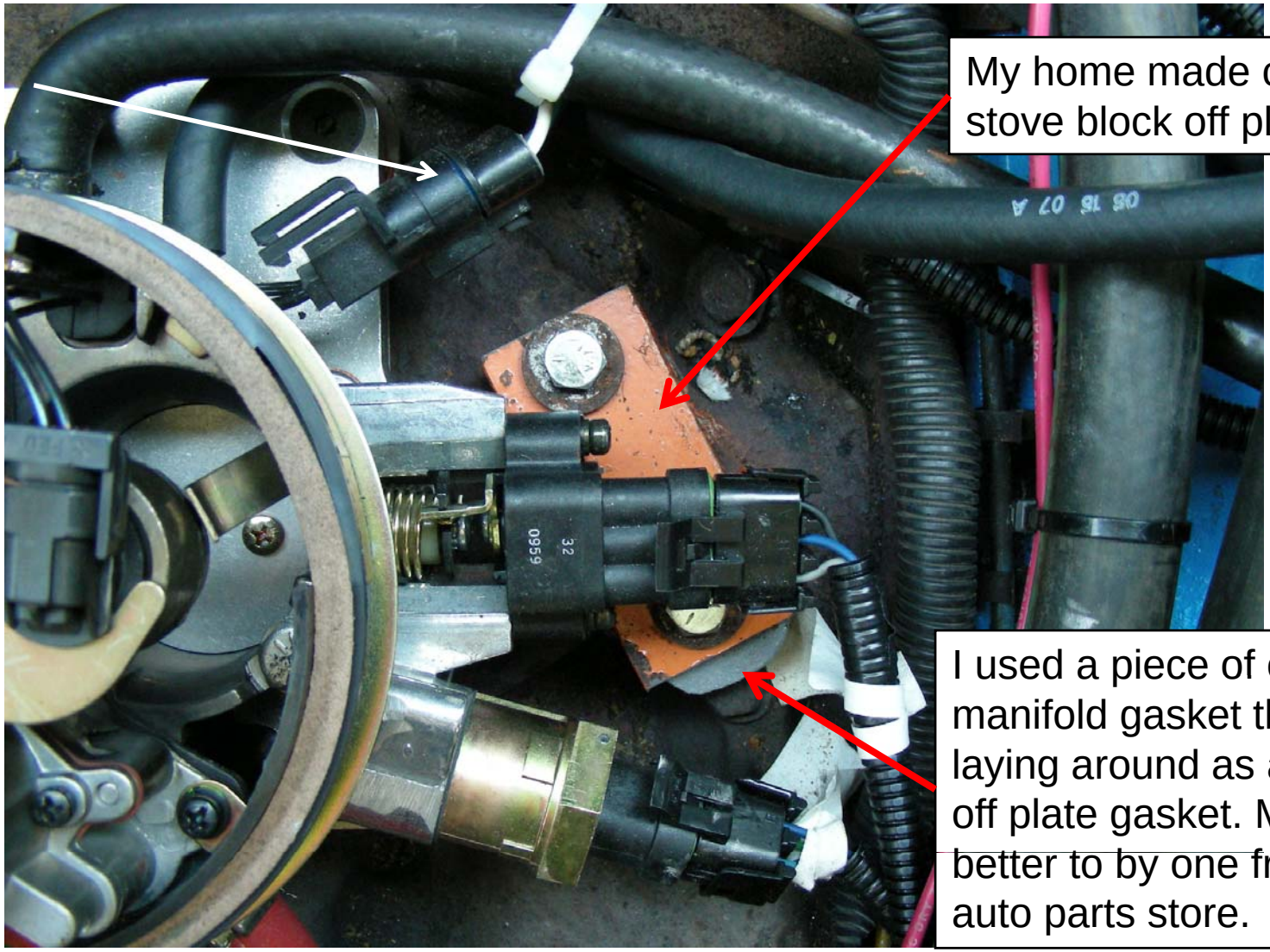
Choke Stove

This is a picture of the aftermath of Ken Burton's recent fire. I've heard that he thinks it was caused by a leaky choke stove.



The choke stove issue needs to be addressed in all GMC Motorhome!

Choke Stove Block Off Plate



Choke Stove Block Off Plate

Choke Stove block off plates are suppose to be available from Dick Paterson. He doesn't sell the gasket.

The matching gasket is available from auto parts stores.

If the crossover in your exhaust manifold has been blocked, I don't believe that you have to worry about this issue.

The choke stove issue needs to be addressed in all GMC Motorhome!

Summary of Parts I Removed

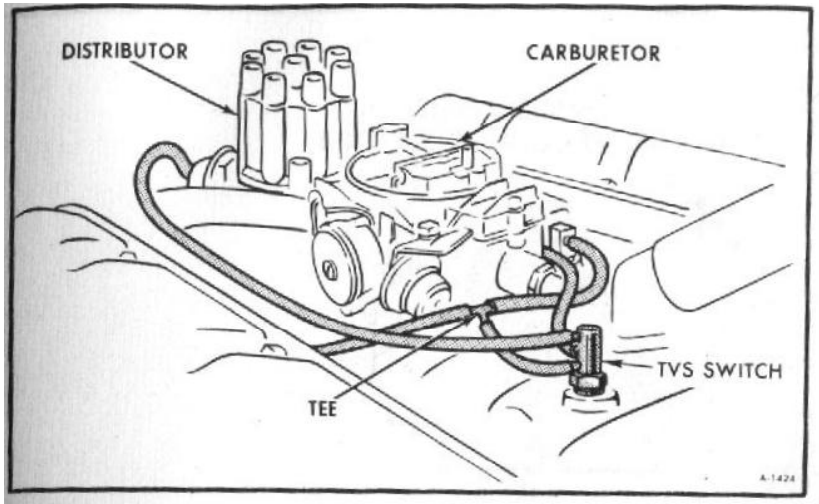
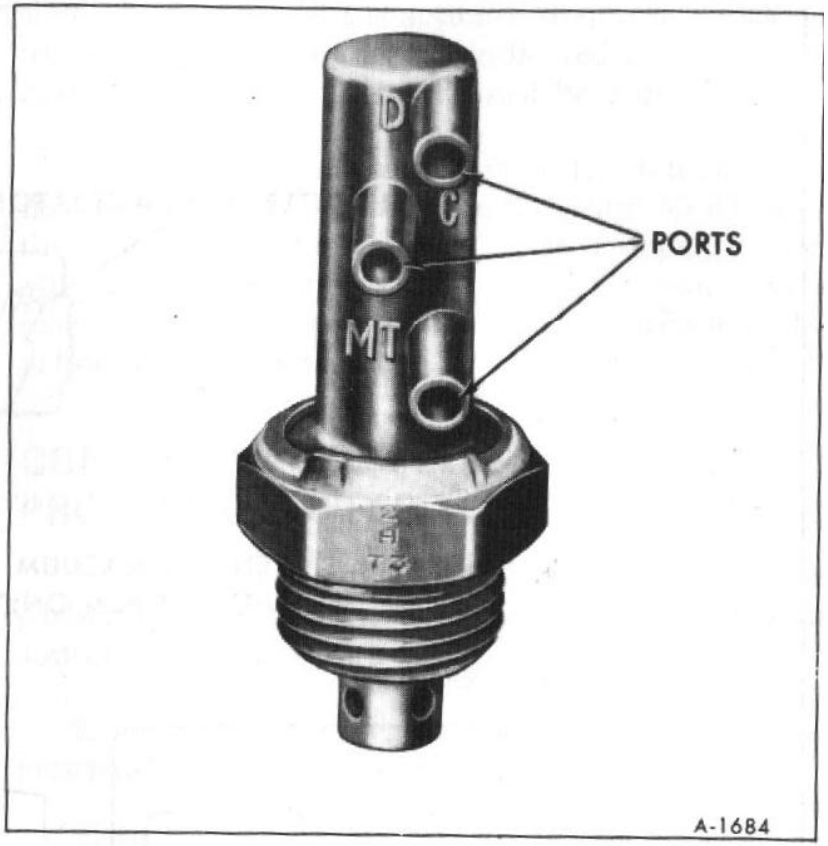
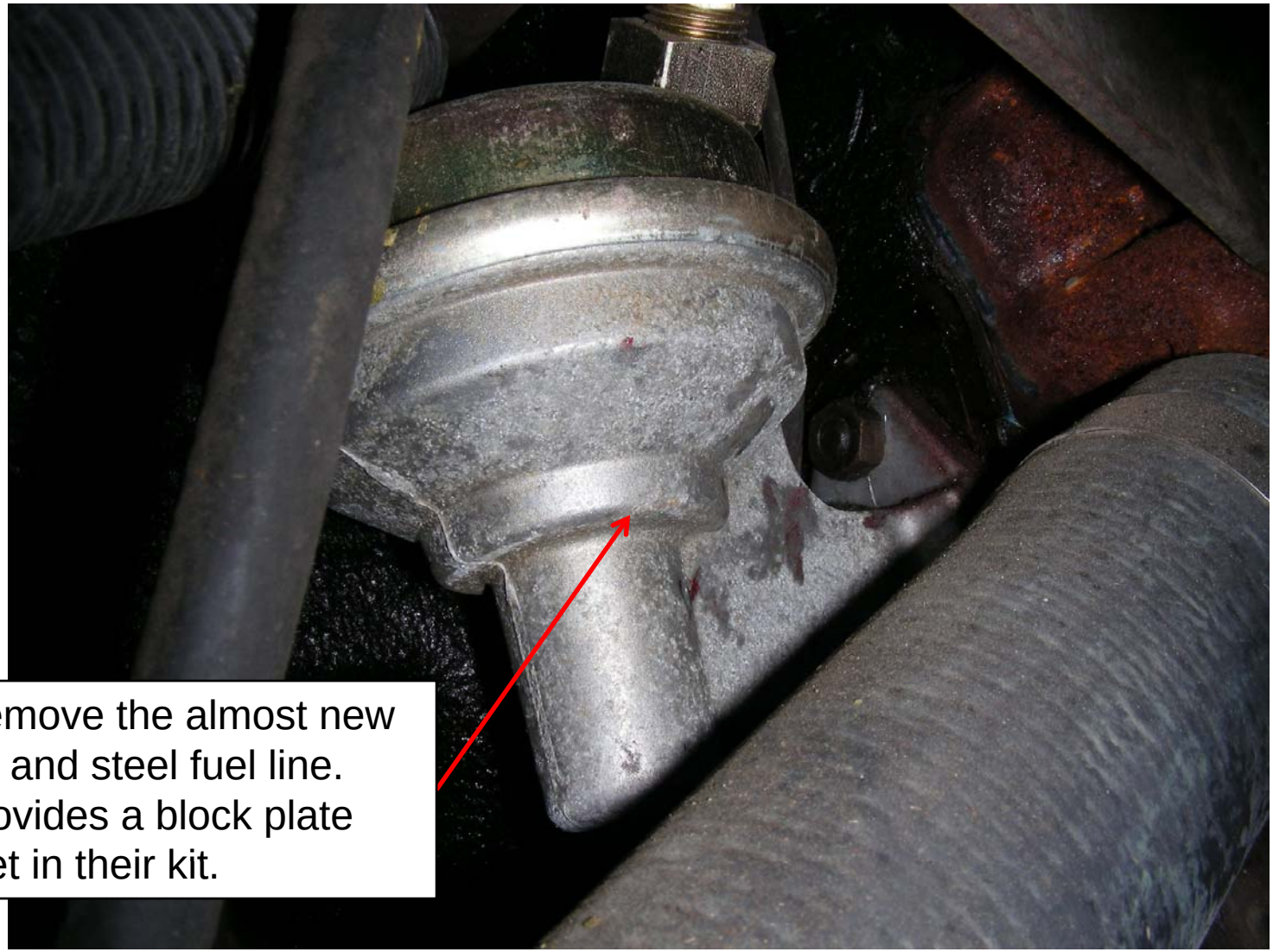


Figure 9—T.V.S. Location (Typical)

the spark timing slightly and speeds up the engine. The result is less heat rejected to the coolant together with higher fan speeds for better cooling action. When the engine has cooled down, 216°F. (102.2°C.) the TVS switch moves the valve back to retard spark timing.

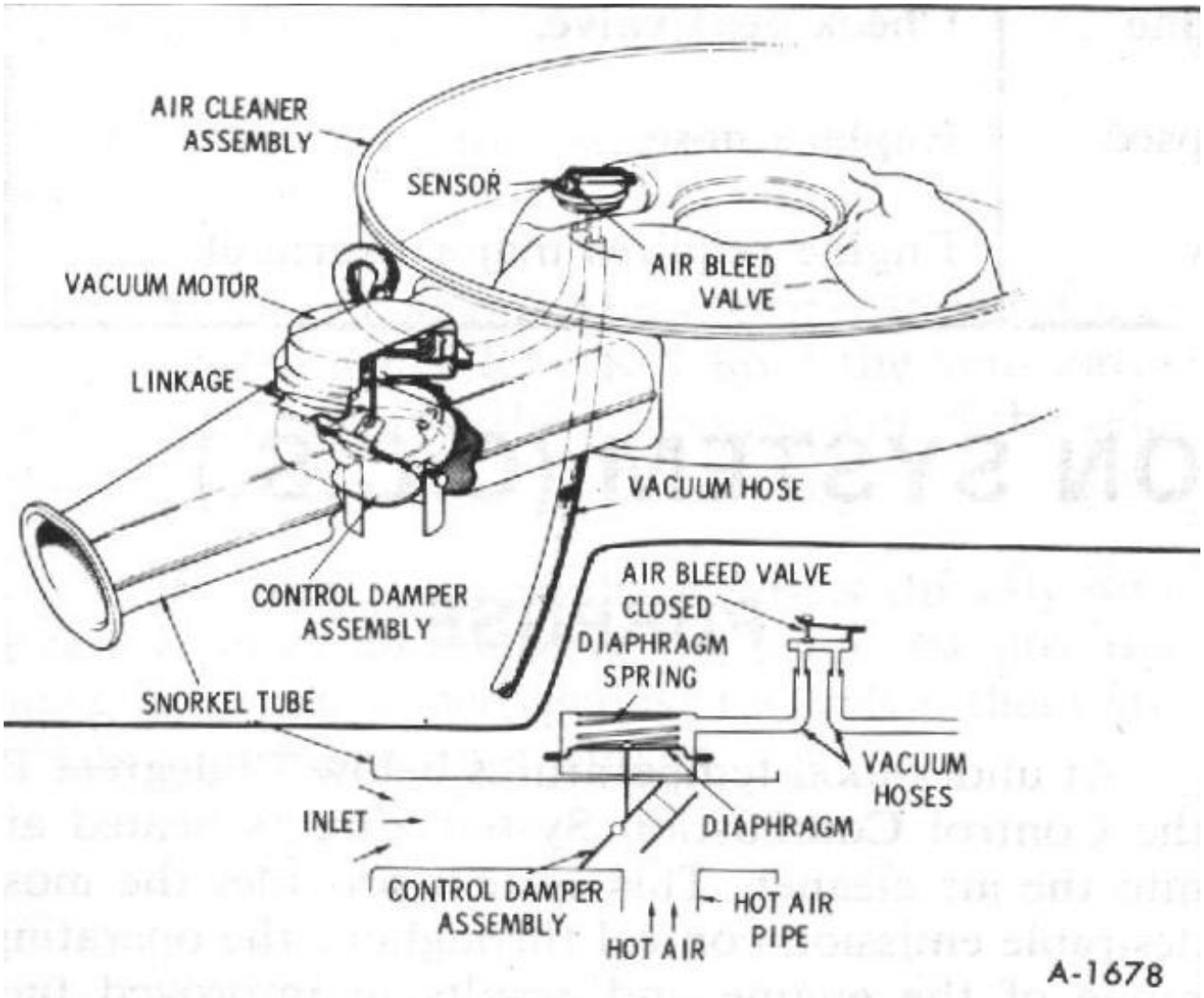


Summary of Parts I Removed



I had to remove the almost new fuel pump and steel fuel line. Howell provides a block plate and gasket in their kit.

Summary of Parts I Removed



Summary of Parts I Removed

Side by side comparison of my old Quadrajet and the new Holly Throttle body

Extra Parts I Bought

Thick Quadrajet to manifold gasket to replace the thin gasket in Howell's kit.

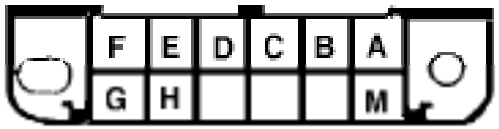
Brass 3/8" washers & stainless steel 3/8"-16x3/4 hex bolt to connect TBI wiring harness ground wires to driver side cylinder head

Paul Bartz recommended that I get these parts.

ALDL Connector

(Assembly Line Diagnostic Link)

Jump A to B to read codes or see if the engine is in “Open Loop” or “Closed Loop” mode.
A paper clip can be used as a jumper.



TERMINAL IDENTIFICATION

A	GROUND	F	T.C.C. (IF USED)
B	DIAGNOSTIC TERMINAL	G	FUEL PUMP (IF USED)
C	A.I.R. (IF USED)	H	BRAKE SENSE SPEED INPUT (CK)
D	SERVICE ENGINE SOON LAMP (IF USED)	M	SERIAL DATA (L4) (SEE SPECIAL TOOLS)
E	SERIAL DATA (SEE SPECIAL TOOLS)		

- There should always be a steady “Service Engine Soon” (SES) light when the ignition is “ON” and the engine stopped.
- With the engine stopped, jump terminals A to B to enter “Non-Scan” Diagnostic Circuit Check. The SES light will flash a number of times, followed by brief pauses to indicate “fault codes”. These codes can be looked up in the service manual to show system faults..
- **FIELD SERVICE MODE:** With the engine running, jump terminals A to B to see if the system is in “Closed Loop” or “Open Loop” modes.
  - SES Light flashes at rate of 1 times per second to confirm “closed loop” mode
  - SES Light flashes at rate of 2.5 times per second to confirm “open loop” mode

closed loop mode means the O2 sensor is being used by the ECM to control fuel delivery and system is operation normally.
open loop mode means the O2 sensor is not being used by the ECM to control fuel delivery. Normally this would be seen only during engine idle conditions.

Driving Impressions

INITIAL DRIVING IMPRESSIONS

The calibration prom supplied with your TBI system is based on a Chevrolet 454 engine calibration, slightly modified for the Olds 455 or 403 engines. It should be a near perfect match for your engine. However, the GM ECM has the remarkable ability to reprogram and adapt a new program to match your engine exactly. It does this by reading information from the Oxygen sensor and adjusting the calibration until it matches GM's original intent. It will adjust this new program as weather, barometer and altitude change and store it in memory as long as the battery is connected and charged. If you disconnect the battery, the ECM will lose the learned program and revert back to the original Howell HP/TBI program. However, it will immediately start learning again as soon as you start driving the vehicle.

Any electronic or engine control problems can be diagnosed by a GM dealer or tune up shop, using their computer diagnostic scanner that plugs into the ALDL or diagnostic connector near the ECM. (When diagnosing with a scanner, enter the engine as an 88 or 89 TBI light duty truck application.) Our service manual also gives techniques for do-it-yourself diagnostics using a jumper, the ALDL connector and "Service Engine Soon" light.

Driving Impressions

First thing, the engine starts right up after only a few seconds of cranking..

It runs much smoother at idle. It used to be that I could see the tail pipe vibrating side to side a lot. In fact, I kept breaking hangers back there. Now it is very smooth. The tail pipe doesn't vibrate at all.

Also, I think I might be getting about ¾ mile more per gallon of gas mileage. Not much, but I'll take it.

Driving Impressions

It is smoother and feels more powerful on acceleration.

On the down side, the fuel pump seems very loud.

Also, I still get the occasional code from the ECM that indicates a too lean mixture. I still don’t know what is causing that.

Was it Worth it?

Sure.

I would do it again.

The next time I could probably do the job in a couple of days.

Howell says it should take 8 hours.

1976 Palm Beach
TZE166V100710

GMC Eastern States Motorhome Club

DONE!