Silver Bullets

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—By John Forro and Ralph Birnbaum

Introduction

Hello, and thank-you for purchasing this Tips and Tricks manual. We should start by explaining what a **Tip** or **Trick** is.

- A **Tip** is considered to be anything that we feel will make a particular diagnosis easier. Tips include common faults, common occurrences, or even common repair procedures. In short, a Tip is a description of a *pattern failure*.

- A **Trick** is any test procedure that will help cut our diagnostic times or improve the accuracy of our diagnosis when we are presented with particular driveability complaint. Imagine how powerful this manual can be.

If you find yourself faced with a particularly tough driveability-related concern, simply turn to the vehicle section for the car and match its symptoms to the tip or tips that most accurately describe the complaint.

Although we cannot guarantee that all of your vehicles or their symptom will be listed, we do feel that the most common ***problem-children*** will be addressed here.

We have gathered this information through years of full time diagnostic experience. We are known throughout our neighborhood as the shop to send the real-head ache jobs to. We also have our own mobile diagnostic service, which we use to help other local shops arrive at various diagnostic conclusions on their own headache jobs. Let us put that experience to work for you through the words in this manual.

This manual covers only domestic vehicles. Be sure to watch for our import vehicle tips manual and our OBD II manual, coming in the near future.

How to Use This Book

This book starts off with a brief section of general concepts. Think of these as warm-up exercises to keep us from straining any mental muscles as we sprint through the quick tips sections.

Section One looks at common problem areas and techniques that might apply to any vehicle.

After that, we go right to vehicle-specific tests and common tips on GM, Ford, and Chrysler. Each manufacturer has its own section, and the tips are numbered.

Photos and illustrations have been added to help you identify a specific component or its location. In some cases, a schematic is used to illustrate how a circuit is wired.

Have fun. Make money.

General Concepts

Computer Stategies

We should always be aware of the various strategies that are engineered into the modern automobile computer, and use them to speed our diagnosis. But be careful, each manufacture has its own versions of a backup strategies to keep the vehicle running when a sensor input fails. These include some backup, failsafe or limp-in modes of operation designed to keep the vehicle running long enough to get it in for service. Backup strategies can make diagnostics tricky, especially with PCMs that substitute values for failed sensors. Remember that the values you see on a scan tool are sometimes calculated substitutions, not live data.

Sensors

If you suspect that a particular sensor is the cause of a performance complaint, try unplugging the sensor. Let the computer substitute a value. If the vehicle runs better with the substituted value, you may be onto something.

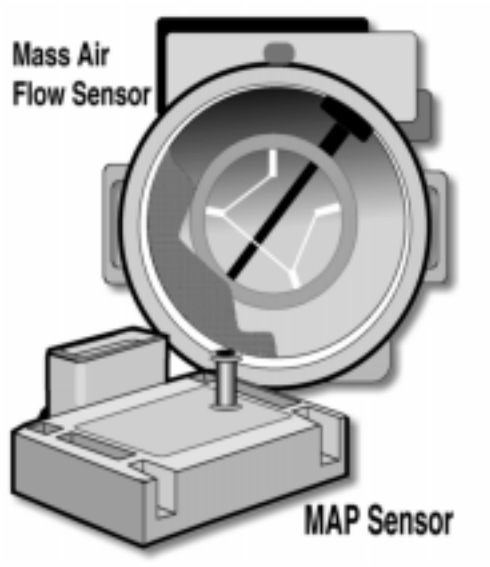
Another test option is to substitute a signal of your own. If the PCM accurately displays the analog voltage or frequency you "insert" into the circuit, you'll have a good indication that the PCM is receiving the signal through the circuit and that it's capable of interpreting and displaying the correct value. We recommend using a **Sensor Simulator** tool whenever possible to make this process easier.

Sequential Injection

It's normal for the computer to fire the injectors non-sequentially in a sequential fuel injection system until the engine speed reaches about 400 RPM or more. If the computer does not allow non-sequential injection below these speeds, it could cause a hard-start condition. On the other hand, if the computer continues to fire the injectors non-sequentially with the engine running (instead of switching to sequential injection) the engine may experience poor performance or reduced fuel economy.

Speed Density Versus Volumetric Systems

There are two basic types of fuel control strategies: **speed density** and **volumetric**.



Speed Density simply means the vehicle has either a **Map** (**M**anifold **A**bsolute **P**ressure) or vacuum sensor used to determine the amount of engine load.

Volumetric means that the computer will use an air flow measurement sensor such as a **Vane** or **Mass Air Flow sensor** to measure the total volume or mass of air coming into the engine.

A manifold vacuum leak in a **speed density** system fools the MAP into requesting more fuel. A similar leak in a volumetric system will cause a lean condition, however, since the leak allows air to enter the engine that the **air flow** sensor does not measure. If the air flow sensor doesn't detect the air flow, it won't request more fuel.

Analog to Digital Coverters (A/D Converters)

All automotive computers need to see all signals in a digital format. While it is true that some sensors will have an analog-to-digital converter built inside of them, most signals will rely on the computer's internal analog-to-digital converter to accurately convert these signals.

To test the computer's analog-to-digital converter, simply unplug the throttle position sensor and jump the reference and signal wires. Attach a scope to view this signal. We should have a straight reference line voltage trace on the scope display with no variation in the waveform.

Snapshots

To set any trouble code the computer typically needs to see the fault occur for three frames. If we have an intermittent glitch with any sensor that only lasts for 2 frames, the computer may not set a code but can still suffer a driveability problem. To aid in the diagnosis of no-code driveability we should be sure to take a movie or snapshot of the datastream ***while the problem exists***.

Lab scope Tricks

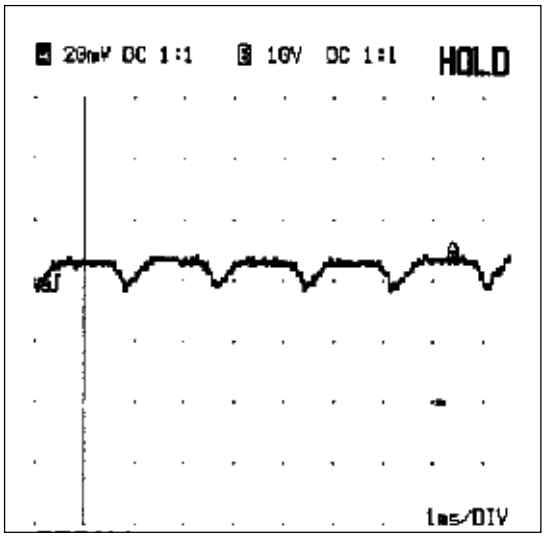
If you think that the computer is dead or that it is causing a parasitic draw, try attaching your lab scope to the serial data line of the ALDL. If the computer is functioning, the scope trace will display square wave patterns.

To make a quick oxygen sensor cross count test, simply set your scope for 200ms and 200mv per division. Then while monitoring the oxygen sensor's signal we should see 3 cross counts for a carbureted vehicle, 6 cross counts for a fuel injected vehicle and 8 for a sequentially injected vehicle. If we have any less, we should suspect a lazy oxygen sensor.

Fuel Pump Current Waveforms

A great way to tell if a fuel pump is failing is to view the pump's amperage waveform. To do this all we need to do is attach our low amp inductive pickup around the fuel pumps power wire.

Any signal varying greatly from the following example should be questioned.



Oxygen Sensor Quick Trick

Here's a quick trick to see if the computer is in control of the fuel mixture. Start by connecting your lab scope so you can view an injector signal waveform. Then unplug the oxygen sensor, and hold the computer side of the oxygen sensor signal return wire in one hand. With your other hand, touch the battery positive post. The high voltage passing through your body should drive the mixture lean, and the injector pulse width should narrow. Next, move your hand from the positive to the negative battery post. The low voltage passing through your body should drive the mixture rich, and you should be able to see the injector pulse width increase as the PCM tries to add fuel.

Ignition Scope Quick Tricks

Trick: If you are getting any type of weird scope patterns, try moving your #1 trigger to another cylinder. If the pattern straightens out inspect the #1 cylinder and its components for faults.

Trick: If you are ever faced with poor power contributuion in one cylinder and can't determine exactly what the problem is, try pulling that cylinder's plug wire off and let it arc to ground. If your scope pattern shows the firing voltage for that cylinder shooting high off the screen as you do this, suspect an ***internal*** cylinder fault such as a bad plug, sticking valve, or lack of compression. If the waveform does not go high, then suspect an ***external*** problem such as a bad plug wire, cap, rotor, or coil.

Backfire Concerns

If the vehicle backfires when you take your foot off the gas, you should suspect either a faulty diverter valve or improper vacuum hose routing to the diverter valve.

If the **diverter valve** is melted, then you probably have a failed **exhaust check valve** that allowed exhaust to travel upstream to the diverter valve.

Checking the Injector Harness

If you suspect that you have a bad wire in the injector harness, try this:

- Run the fuel pump to build pressure in the rail
- Unplug the computer
- Apply power to the hot side of the injectors. Disconnect the computer and ground each of the injector driver circuits, one at a time, at the PCM harness connector. If the harness between the PCM and injectors is in good shape, we should see fuel pressure drop each time we ground an individual injector, and it squirts fuel.

Thinking Like the Computer!

Try to think like the computer! Analyze the exact vehicle operating conditions when a complaint is noticed. Use your own personal computer (brain) to match the sensor inputs to the computer strategy being used when the problem occurs. Then test the various sensors and their circuits used by the computer in that operating mode. It may help you to break down your test strategies into the following three groups:

Key on/engine off

In this mode, the only inputs the computer needs to see are the coolant temperature, MAP (or BARO), and throttle position.

Key on/engine cranking

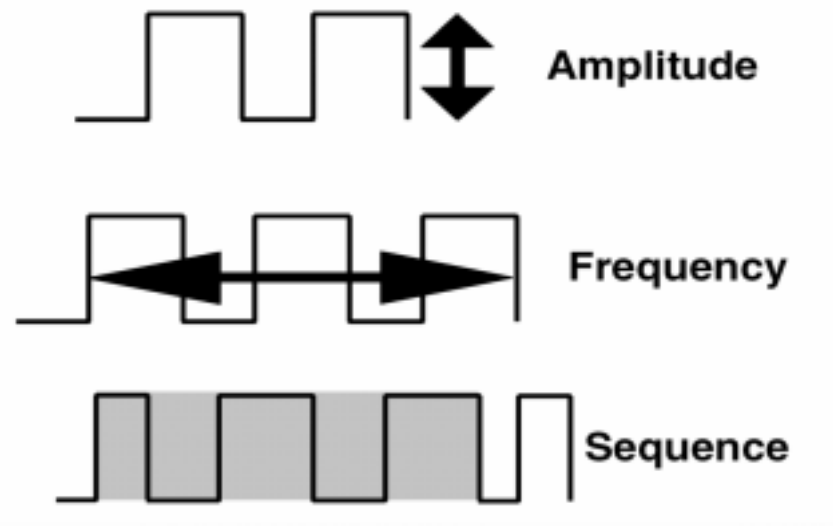
In this mode, the computer will need to look at the same three signals—plus the RPM signal. The computer will continue to use these critical inputs to control fuel and spark until it enters closed loop.

Closed loop operation

In this mode, the computer will use all of its various sensors and look at the oxygen sensor input to maintain fuel control in closed loop.

Signal Amplitude, Frequency, and Sequence

All computers will look at **amplitude**, **frequency** and **sequence** on most of their repetitive signal inputs. Remember this when checking the various waveforms on any vehicle. The signal voltage must reach both the minimum and maximum levels (amplitude). It must occur at the correct speed (frequency). In cases where signal pulses are used to properly time a response, the sequence of these pulses is also critical.



Bidirectional Testing

If you are fortunate enough to have bidirectional tests available to you through your scan tool, be sure to use them! They cut your efforts in half. If you tell a component to turn on, and it does, then you know that the device and the wiring are both good. Now you only need to concentrate on the other half of the circuit.

Quad Drivers

One of the biggest problems with OBD I is that it won't set trouble codes for all output devices.

A perfect example of this is a fuel injector. Most output devices receive voltage at one terminal and the computer grounds the other terminal to turn them on. Some computers commonly use power transistors or quad drivers to control these circuits.

A quad driver typically controls the ground side of as many as four separate components. If you're working on a vehicle that has a shorted injector operated by a quad driver, the computer is apt to set a false trouble code for another component that is controlled by the same quad driver. The computer only sees the higher current in that quad driver circuit. It will then give us a trouble code for another device connected to the quad driver, when the injector is causing the high current flow.

Viewing AC Signals

Remember, that when viewing any AC signal, we are seeing both positive and negative voltages. We must keep this in mind when we attach our scopes. If our scope has only 1 ground lead, then we can only look at one AC signal at a time, even if we have a two or more channel scope.

Module Quick Test

Trick: To determine whether or not an igniton module is triggering a coil pack, try removing the coil pack from the module and connecting a test light across the two terminals that feed the coil pack. Then crank the engine and see if the light blinks. If it does, then the module is triggering the coil. If it doesn't, suspect the module, a problem in the module's power or ground circuits, or a missing crankshaft combination sensor signal input.

Chapter One

All Makes

This chapter contains diagnostic tricks that can be used to help diagnose various complaints on all vehicles. A quick glance through this chapter may save you some time.

1-1 Heat it Up!

If you are faced with a hot-cut out scenario, try heating up the fuel injectors and ignition components with a heat gun or a hair dryer.

1-2 Using the Four-Gas to Find Leaking Injectors

If you suspect leaking fuel injectors, try removing all the spark plugs. Then insert the wand from your emisssions analyzer into each cylinder. Note the readings at each cylinder.

Any cylinder with an extremely high HC reading probably has a leaking injector.

Sample HC Readings from 6-Cylinder Engine with Leaking #1 and 2 Injectors

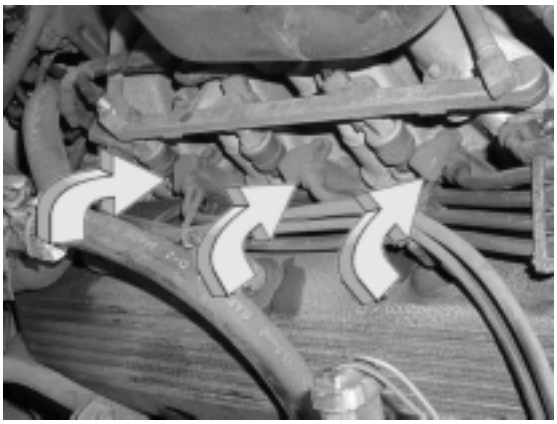
Cylinder	HC/PPM
#1	5800
#2	9500
#3	110
#4	90
#5	120
#6	85

1-3 Checking for EGR Cross-Leaks

On all vehicles that have an EGR valve, once you have eliminated all other possible causes for a lean misfire, try checking the EGR valve for cross-leakage. This is done by turning the EGR valve upside down and adding a small amount of water to the pintle port. Then blown air (about 10 psi) into the other port. If you see bubbles in the water as you do this, the EGR pintle is leaking.

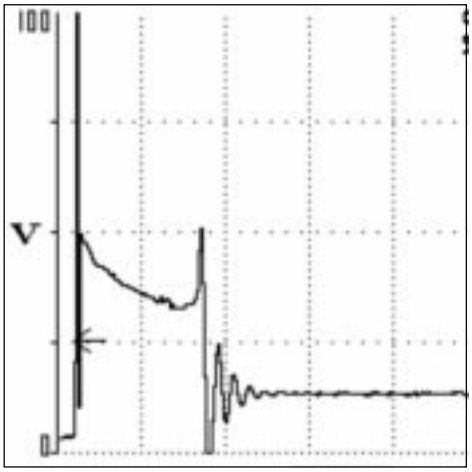
1-4 Hemi Engine Plug Wire Leak Test

On all Hemi-type engines that runs like they have secondary ignition leakage under load, try taping each of the plug wire boots with electrical tape and seeing if this helps the problem. If it does, then you will need to replace the wires.



1-5 When You Can't Get a Secondary Pattern

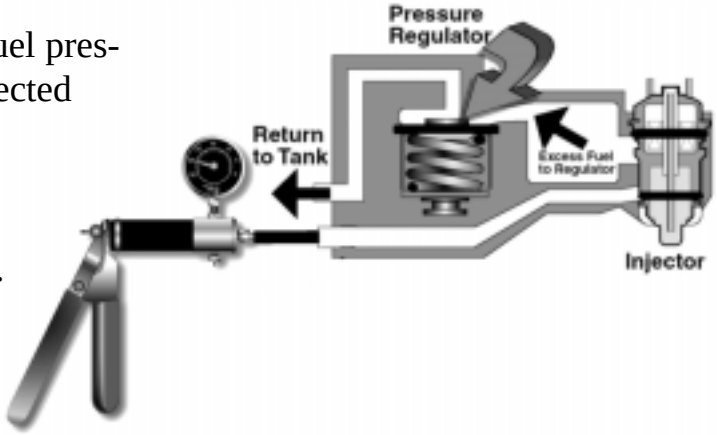
If you have one of those cars where connecting the scope to the secondary is almost impossible, but need to view the ignition patterns, attach your scope to the ignition primary and view its signal instead.



1-6 Checking a TBI Fuel Pressure Regulator

If you suspect that you have a bad fuel pressure regulator in a throttle body injected vehicle, try this: Removing the fuel lines. Then, using a hand vacuum pump, apply vacuum to the supply side orifice. It should hold vacuum.

If it doesn't, suspect a bad regulator.



1-7 Injector Leak Test at Fuel Rail

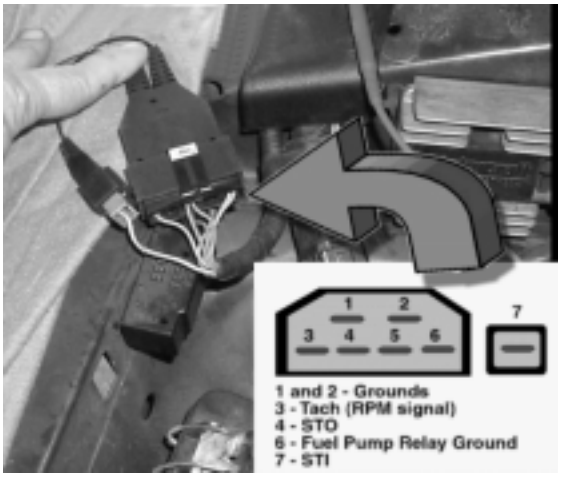
Another sure-fire test for confirming leaking injectors is to simply remove the fuel rail without removing the fuel lines.

With the fuel rail in plain sight and the rail pressurized, watch for fuel dripping from any of the injectors. Obviously, this test is for vehicles with fuel rails that are easy to remove!

1-8 Powering Up a Fuel Pump

If you want to power up the fuel pump for any reason:

- Look for the fuel pump test lead on General Motors products,
- Ground pin 6 on Ford's DCL
- Use your scan tool to operate the pump in Chrysler's ATM mode



1-9 How to Test a Fuel Pump

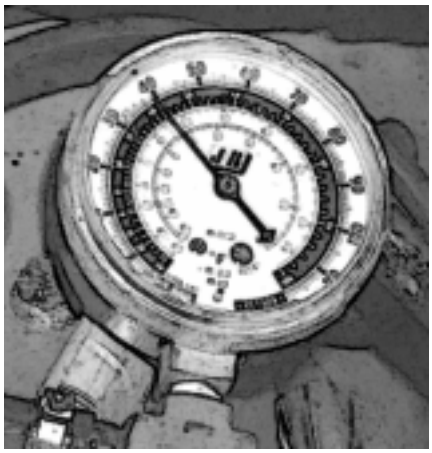
While performing fuel pressure tests be sure to test ALL of the following:

- Key-on pressure
- Cranking pressure
- Running pressure
- Dead head pressure
- Fuel pump volume

1-10 Rest Pressure and Fuel Alcohol Content

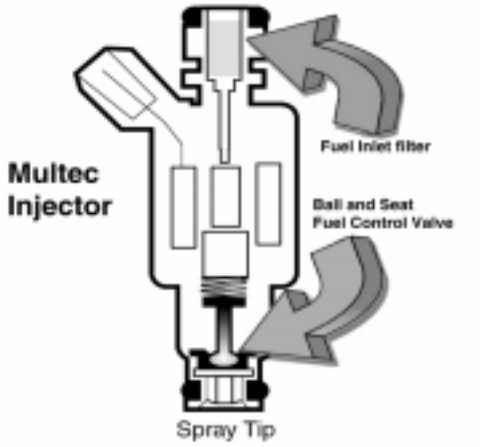
We can do a quick check for high fuel alcohol content by running the engine until it gets hot with a fuel gauge attached. Then shut off the engine and watch the fuel pressure gauge.

If the gauge needle continues to climb over the next 3-5 minutes, be suspicious of high alcohol content in the fuel.



1-11 Plugged Injector Screens

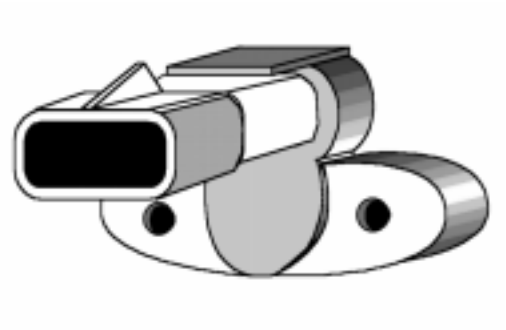
Remember, even if we have good fuel pressure we can still have plugged injector screens causing reduced fuel delivery at one or more of the cylinders.



1-12 Failed TPS and Clear-Flood

If you encounter a no-start with good spark and proper fuel pressure, check the throttle position sensor voltage.

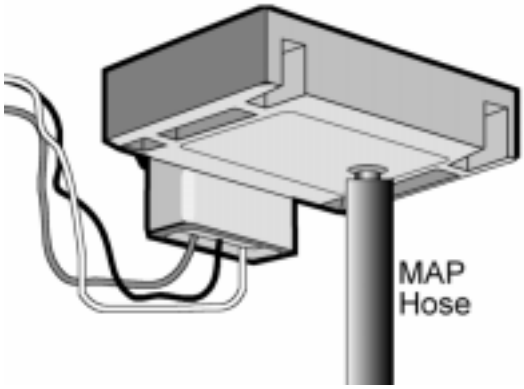
If TPS voltage is higher than 3.5 volts, some computers will enter clear-flood mode. This is often the result of TPS damage caused when carburetor spray cleaner enters the sensor through the throttle shaft during throttle bore cleaning.



1-13 MAP Sensor Hoses and Rich Running

If you ever have a throttle body vehicle that has a hard-starting or rich-running complaint, be sure to check the MAP sensor hose to be sure that it is free from obstruction.

This hose has a tendency to fill with carbon.



1-14 Knock Sensor Quick Test

If the engine you are working on is loud, and it has a complaint of a lack of power, try unplugging the knock sensor and see if that helps.

Critical Sensor Inputs

Remember that the critical sensors the computer uses for starting the engine are the coolant temperature, MAP (or BARO), throttle position and RPM sensors.

Other, less critical sensors could cause a no-start only if they short to ground and prevent one of these critical sensors from working properly.

No-Start Test Light Quick Test for Spark

On most vehicles, if you have the ignition ON and momentarily touch the coil's negative to ground using a test light, you should emit a spark from the coil wire.

Roll-over Valves and High Fuel Pressure

If we have abnormally high fuel pressure on a throttle body and eliminate all "normal" causes, you may have a faulty roll-over valve in the fuel tank, causing high in-tank pressure.

Rap the Tank

If you have a no-start with an in-tank fuel pump and no fuel pressure, take a large rubber mallet and bang the fuel tank once or twice.

If the fuel pump brushes are severely worn or sticking, the vibration may shake them and restore the connection between the brush faces and commutator bar. At least you won't have to push the car into the shop to replace the pump!

1-19 What Causes High-Idle Conditions?

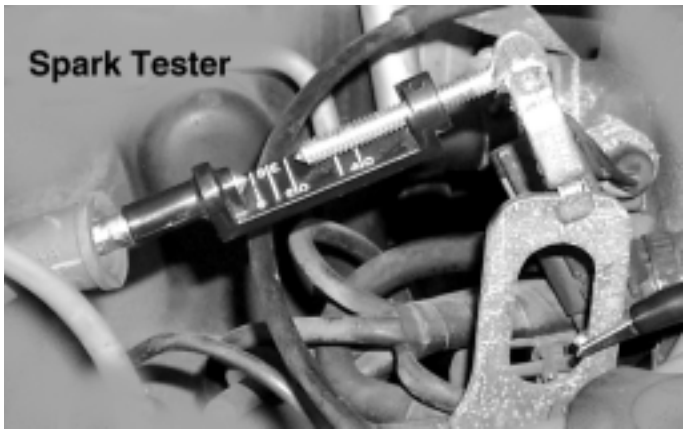
High idle is usually caused by *vacuum leaks*.

Verify proper minimum air rate on fuel injected vehicles.

Verify proper choke operation on carbureted vehicles. Check for binding/bent linkages.

The only causes for dieseling on fuel injected vehicles are leaking fuel injectors and bad pressure regulators. It takes fuel to diesel!

1-20 Checking All Cylinders for Spark



It's often easy to check for spark right at the coil wire.

But be sure to check for spark on multiple cylinders with the engine cranking. This will eliminate the possibility of a no-spark caused by a bad coil wire or a stripped distributor drive gear.

1-21 Heat Gun Simulations

Using a heat gun to heat up suspected electrical components will help in diagnosing temperature-related failures.

Many electrical components begin to break down only when exposed to high underhood temperatures, not just injectors and ignition coils!

Fooled Rich

Remember that lean exhaust codes can be caused by leaking exhaust systems.

These leaks can allow outside oxygen to be drawn into the exhaust ahead of the oxygen sensor. This "fools" the oxygen sensor, making it think the mixture is too lean.

Reference Wiring Check

To test the harness integrity on most sensors, simply jump the reference to the signal wire at the sensor connector.

You should be able to read the voltage change on your scan tool.

Sequential injector Firing Cam Sensor Quick Test

If you have a cam sensor code, the system will switch from sequential to non-sequential injector firing.

This is a quick test to see if it is a current code or not.

High Oil Pressure and Misfires

If you've already interrogated the usual suspects (fuel, ignition, cranking compression, etc.) but still have a mysterious, general misfire condition, check the oil pressure.

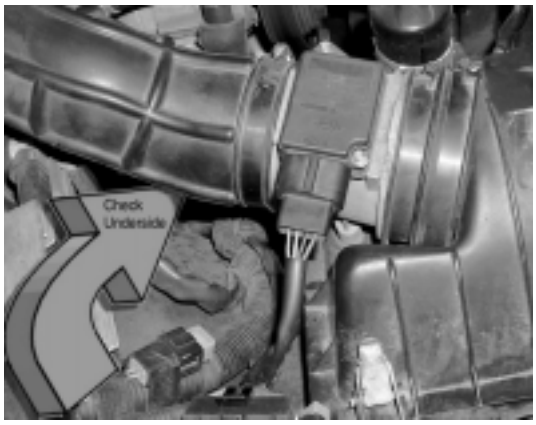
A sticking oil pressure relief valve in the oil pump can increase oil pressure to a point where the hydraulic lifters over-pump, holding the valves open.

1-26 False (Pirate) Air

On all volumetric vehicles (those with a MAF or Vane Air Flow Sensor) that have a hesitation, inspect the fresh air snorkel tube for cracks.

False, or "Pirate" air can reduce air flow through the sensor and cause a lean condition.

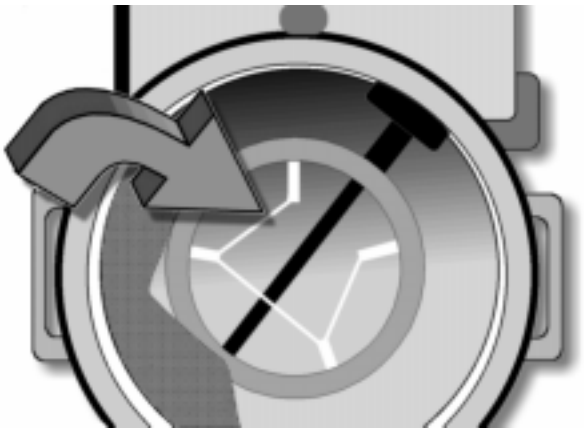
Cracks are usually found on the bottom side of the duct, so duct removal and careful inspection will be necessary.



1-27 MAF Sensor Wire Contamination

All vehicles that use a Mass Air Flow sensor will have a hot wire on them that has a tendency to get carboned up.

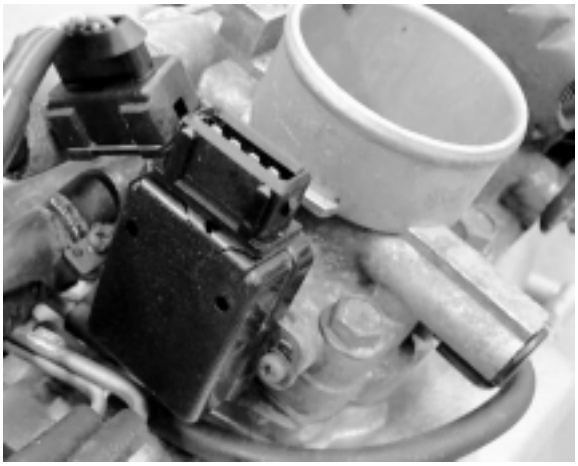
You may need to flush the wire clean with carb cleaner.



1-28 Try a New TPS

If you have eliminated ALL other possibilities for a hesitation, you may want to try a new TPS.

Even if it's displaying a good waveform, it may not be responding to throttle opening with the correct voltage signal.



1-29 A Shot of Propane for No-Starts

If you have a no-start caused by lack of fuel, use propane to start the engine so you can drive it into your shop.

Simply insert the propane tool into the intake snorkel tube and limp it in.

1-30 No-Starts Caused by Restricted Exhaust (Quick Test)

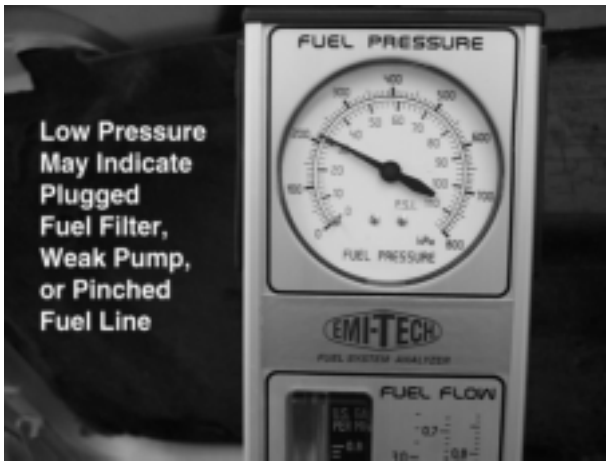
If you think that the reason for the no-start is a restricted exhaust, try removing the oxygen sensor (or EGR if that's easier) and then see if it starts.

If the exhaust is actually restricted, this will usually relieve enough backpressure to allow the engine to start.

1-31 Checking Cranking Fuel Pressure

Be sure to check both key-on fuel pressure and then, without cycling the ignition key, relieve the pressure in your gauge and continue to check the cranking fuel pressure.

If you fail to check fuel pressure in this manner, you may overlook the reason for hard-start or extended cranking concern.



Chapter One

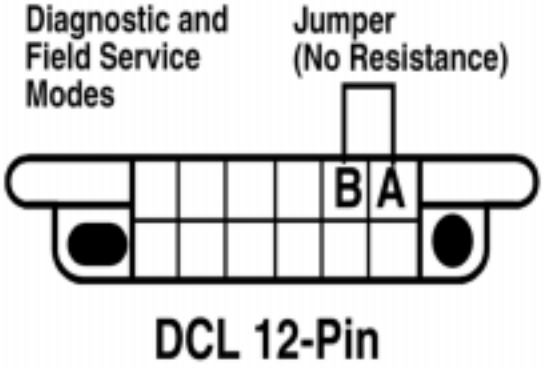
General Motors

2-1 2.5L Main Power Connector

If you are confronted with a cutout or surging condition on a 2.5 liter vehicle, check the main computer power connector that is located by the battery. It has a connector like an oxygen sensor has.

2-2 Looking for Shorted Components

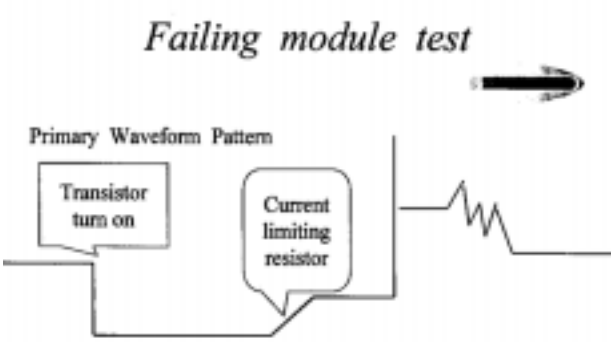
If you suspect that you have a shorted component on a GM vehicle, place the vehicle into field service mode with your scan tool (or by jumping terminals A and B in the ALDL connector). Watch Check Engine Light. If the CEL goes out or becomes very dim, start unplugging components one at a time until the CEL gets brighter and starts flashing a code 12. The last component you disconnected should be replaced.



DCL 12-Pin

2-3 Ignition Coil Current Limiting Resistor and No-Starts

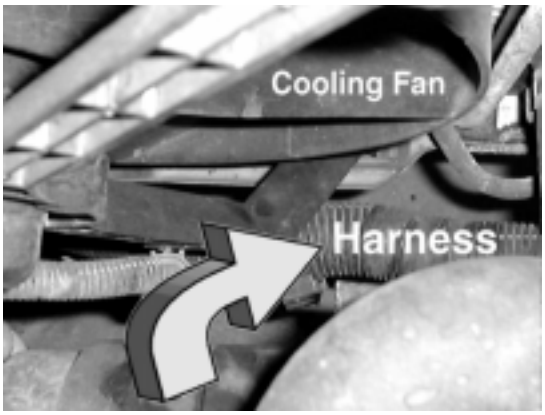
If you have a no-start caused by a bad ignition coil, be sure to check the control module's current limiting resistor. If the resistor is bad it will surely destroy a new coil very quickly.



2-4 2.8 and 3.1L EST Codes

On 2.8 and 3.1 liter engines with any sort of EST codes, inspect the wiring harness that runs along the radiator's valley pan.

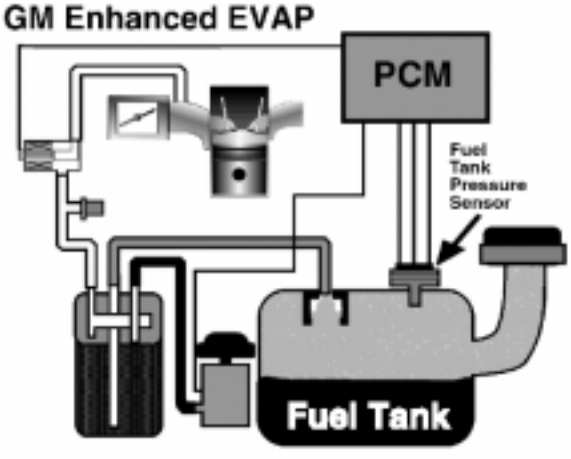
Look for signs of corroded wiring.



2-5 4.3L OBD II Various Sensor Codes

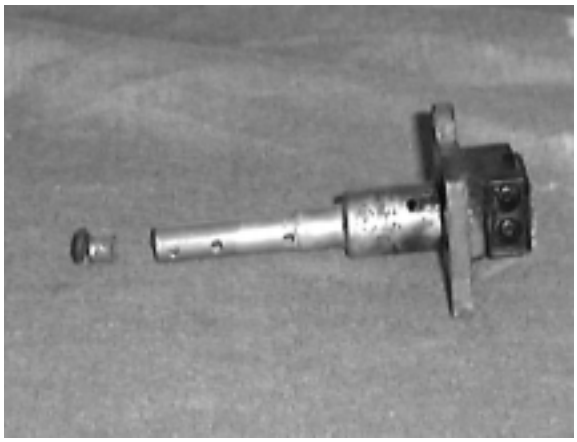
On all 4.3 liter OBD II vehicles with the following codes: P0107, P0122, P1107, P1408, you should suspect a shorted fuel tank pressure switch.

These codes can also be present, even if the pressure sensor is good. In some cases a PCM reflash is the correct fix.



2-6 Failed MC Solenoid / Carbureted 2.8L

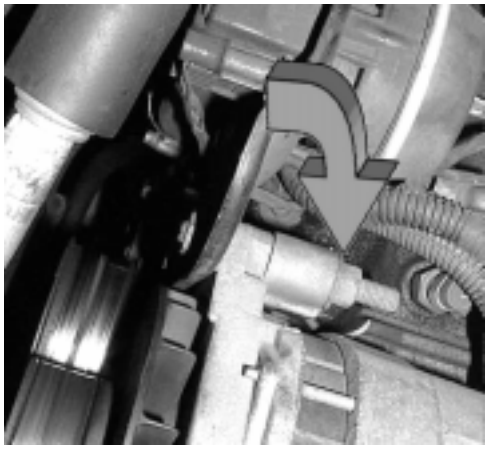
On carbureted 2.8 liter vehicles with a rich or lean exhaust code or an M/C solenoid code, remove the M/C solenoid and inspect the tip to make sure it is not broken off inside the carburetor.



2-7 Where Caddy Grounds Go Bad

If you are confronted with any unusual electrical problems on any GM vehicle (especially Cadillacs), suspect poor grounds.

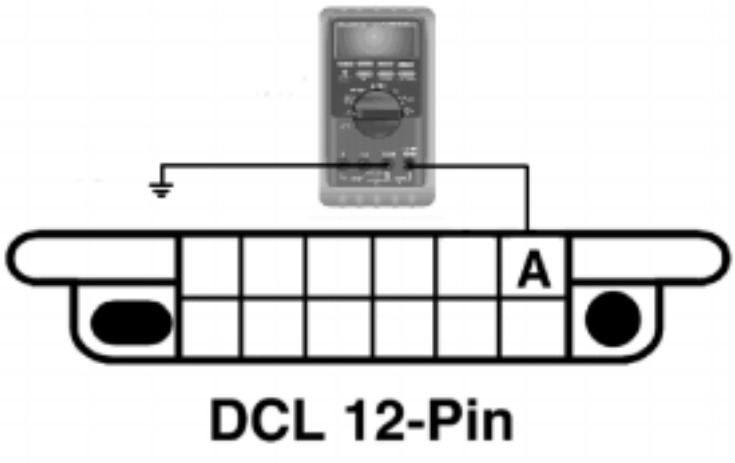
On Cadillacs, the grounds that seem to go bad are the ones at the alternator bolt.



2-8 Where to Check GM Computer Grounds

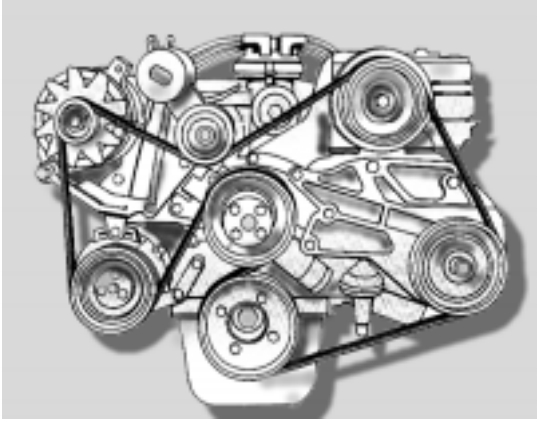
You can check half of the computer's grounds on an OBD I GM vehicle at terminal A in the ALDL connector.

You can perform a standard voltage drop test at this point.



2-9 No-Cranking and Drive Belt Removal

If you ever come across a General Motors vehicle that won't crank, try removing the drive belts to eliminate the possibility of having a bad alternator or other accessory.

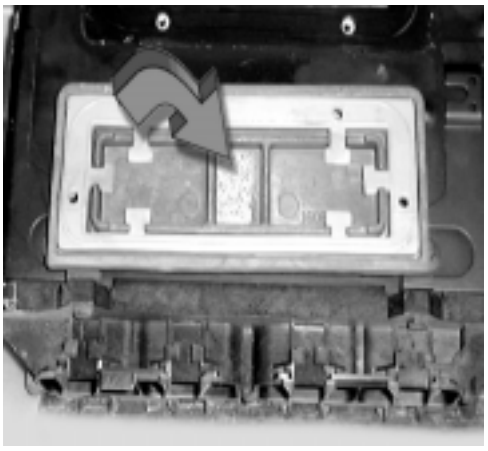


2-10 3800s and Dual Battery Cable Corrosion

If you have a General Motors product with a 3800 motor, it will probably have two positive battery cables coming off the battery. This double cable piggy backing design is prone to an extraordinary amount of corrosion. Make sure you check and clean these cables regularly.

2-11 ECM Cork Spacer Removal

Be sure to remove the cork spacers from the new computer PROM cover before reinstalling the cover plate. Failure to do so will result in internal computer damage.

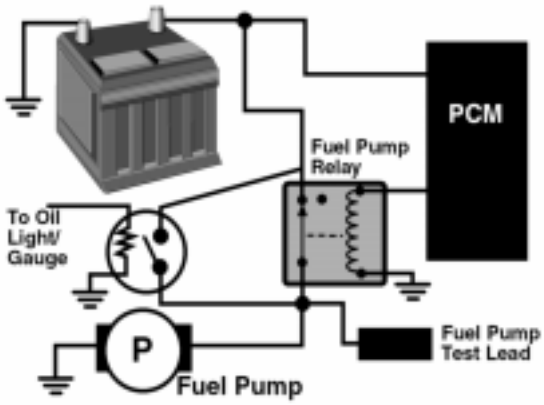


2-12 GM Fuel Pump Relay Test—No-Starts

Extended crank times can be caused by a failed fuel pump relay on a GM product.

Unplug the oil pressure switch and see if the vehicle starts. If it fails to start, this tells us that the fuel pump relay is bad.

Why? With the bad relay, the vehicle is starting off the oil pressure switch, which doesn't close until the engine is cranked long enough to build oil pressure.



2-13 GM Float Level Test (Long Crank)

If you have any carbureted vehicle that has a long crank time after sitting all night, check the fuel level inside the float bowl **before** you start cranking the engine. Use the float gauge stick included with your Thexton C-3 adjustment tool set. If the reading is less then 11/32 inch, you should suspect leaking float bowl plugs on the underside of the carburetor. Reseal them when doing a carburetor overhaul.

2-14 GM No-Spark (Anti-Theft)

For no-starts on General Motors vehicles that have a little resistor chip in the ignition key:

Put the vehicle in back up spark/ fuel mode with your scan tool. If the vehicle starts, check for broken white wires for the anti-theft system inside the steering column. To verify your diagnosis, measure the resistance of the chip in the ignition key. Follow the wires to their connector underneath the dash and install the same value resistor across the connector.

2-15 GM HEI No-Spark Quick Test

If you have an HEI ignition system with a no-spark condition, plug in your pistol-type soldering gun. Then, with the soldering iron trigger depressed, pass it over the ignition control module. If you emit a spark from the coil, the coil and module are good. Suspect a faulty pickup coil as the cause for the no-spark condition.

2-16 Cadillac No-Crank/False Codes

If you are working on a Cadillac vehicle that won't crank or it has false trouble codes, be sure to check the grounding stud for both the negative battery cable and the computer, which are located down by the starter motor. This connection has a way of working itself loose.

2-17 GM No-Start (Faulty Injector)

If you ever come across a 4-cylinder vehicle with a no-start condition, but all scan data parameters look normal, see if the injector seems to spray very heavily during cranking.

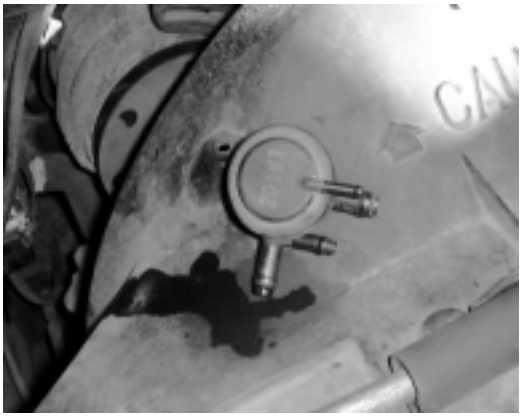
If it does, the most likely fix will be to replace the fuel injector itself.

2-18 GM No-Start/Stall from Bad TCC Solenoid

On all General Motors front wheel drives with a torque converter clutch that cut-out hot and won't restart until you let the engine cool off, suspect a bad TCC solenoid. The torque converter clutch stays engaged when you come to a stop and stalls the engine. This symptom feels the same as it does when you come to a stop a vehicle with a manual transmisssion without stepping on the clutch.

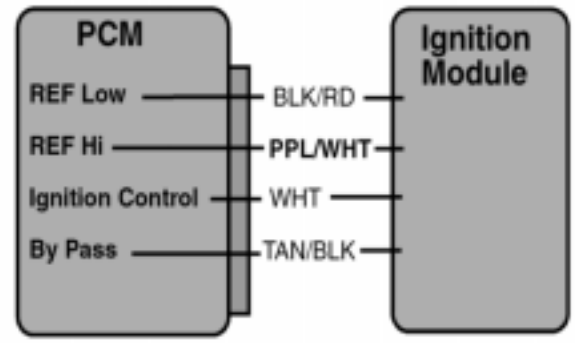
2-19 GM Carb Extended Crank (Hot-Soak)

If you have a carbureted General Motors vehicle that has an extended crank after a hot soak, be sure to check the carbon canister purge valve for raw fuel.



2-20 GM No-Spark (Purple-White Wire)

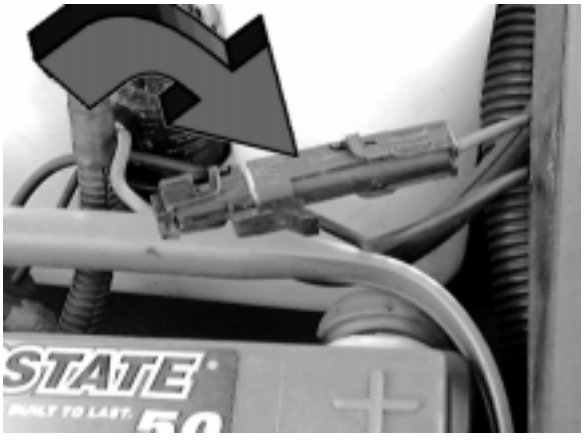
On any General Motors vehicle with a no-start, no- spark condition, check for a signal on the purple and white (PPL/ WHT) wire at the ignition module. You should have a nice square wave with an amplitude of at least 5 volts during cranking. If you don't, suspect a bad crank, combination or pickup sensor.



2-21 GM Fusible Link Corrosion (No-Start)

Check the condition of the fusible link connector coming off the battery positive cable on General Motors front wheel drive vehicles.

This connector has a tendency to corrode causing a no-start or intermittent cut out.



2-22 Resetting a Saturn

If you ever receive the “no communication” message from a Saturn, try shutting off the vehicle and waiting for 5 minutes.

This will usually reset the PCM and allow communications.

2-23 No-Spark Quick Test

If you a no-start due to a lack of spark and injector triggers, attach a test light to the positive battery cable. Then, tap the purple/white wire from the module with the tip of the test light.

If the noid flashes as you tap the test light on the wire, you will need to replace the control module.

2-24 2.5L Repeat TPS Failures

If you are confronted with repeated failures of the TPS on the 2.5 liter engine, be sure that the EGR heat shield is installed.

2-25 CEL Flickers—’80s Cadillac

If you have a flickering check engine light on 80’s V-8 Cadillacs, but have no trouble codes, inspect the ground screw inside the distributor.

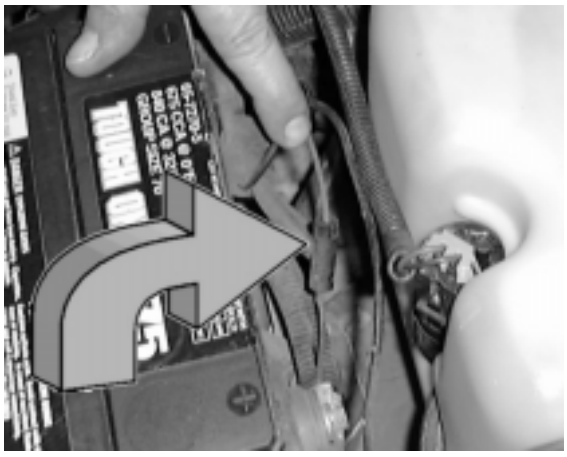
You may need to place a small star washer underneath the screen to improve the ground.

2-26 GM Computer Failure after MEM-CAL Replacement

If you ever have a no-start shortly after replacing the MEM-CAL in a GM computer, suspect a bad computer.

The downward pressure used to push the MEM-CAL into position has caused an internal board failure.

2-27 2.5L Fusible Link No-Start Problem



On front wheel drive vehicles with the 2.5 liter engine, be sure to check the fuse link red wire by the battery positive cable for signs of corrosion.

This will cause a no-start.

2-28 QuickTest for 2.8 and 3.1 L No-Starts Caused by Injectors

Next time you get a 2.8 or a 3.1 liter vehicle in for a no-start, try unplugging the two injectors you can get at, and see if it starts.

If it does, suspect one or more shorted injectors.

2-29 Lying Cadillac Fuel Gauges

On all Cadillac's with a no-start condition related to no fuel pressure, be sure there is fuel in the tank.

These vehicles are notorious for loose baffles inside the fuel tank that make the gauge read higher than the true fuel level in the tank.

2-30 Corvette No-Crank

On all Corvette ZR1 engines that won't crank, be sure to check the starter motor to see if it is corroded.

If it is corroded then you will have to replace the starter motor and drill a bigger hole in the starter mounting V-area.

2-31 Tracker With No Injector Triggers

On GEO Trackers with a 1.6 liter engine, if you have no voltage or injector trigger pulses at the injector, suspect a bad PCM.

This system supplies both power and triggers to the fuel injectors.

2-32 Late '80s Riviera No-Start and Intermittent CEL

On the late 80's Buick Riviera's if you have a no-start or intermittent check engine light, check the wiring harness near the exhaust shield by the power brake booster for chafing.

If the harness is damaged, repair it and secure it safely away from the shield with tie wraps.

2-33 Testing 2.8 and 3.1L Crankshaft Sensor Harnesses

To test the 2.8 and 3.1 liter crankshaft sensor harness you should:

- disconnect the sensor plug at the module
- connect your ohmmeter across its terminals
- jiggle the harness to see if there is an intermittent open

The harness wires are purple and yellow.

2-34 Water Pump Replacements and No-Cranking on 2.8 and 3.1 L

If you have no-cranking RPM on a 2.8 or 3.1 liter engine and the water pump has recently been replaced, be sure to check the crank sensor harness for any signs of damage.

2-35 3.8L No-Starts and PCV Hose/ Grommet Leaks

On a 3.8 liter vehicle with a no-start condition that has spark, fuel pressure, and injector pulses, be sure to check the PCV hose and grommet to make sure that they are intact.

2-36 3.8L Timing Gear Wear Quick Check

You can check for timing gear wear on the 3.8 liter engine by removing the cam sensor and watching the chain through the hole while turning the crankshaft.

2-37 3800 No-Start in Cold Weather

If a 3800 engine fails to start at temperatures below 10 degrees Fahrenheit, suspect a leaking coil pack.

2-38 Lying S-Series Fuel Gauges and No-Starts

If you ever have a no-start due to lack of fuel pressure on an S-series truck, make sure there is fuel in the tank.

These vehicles are notorious for loose fuel tank baffles that cause the fuel gauge to read higher than the actual fuel level in the tank.

2-39 VORTEC Fuel Pressure 51 PSI Ain't Enough!

Make sure you have adequate fuel pressure for the 4.3 liter VORTEC motor.

It should be 55-60 PSI when cranking and running.

2-40 IAC Spring Color and Unstable Idle

If you ever have a vehicle that stalls or has a sporadic idle flare-up, be sure to check the idle air control valve spring color to be sure that it is the correct one for your application.

2-41 PROM Replacement for Stalling in Gear

Many GM vehicles that stall when you shift into gear will require a prom replacement.

2-42 Rough Idle and IAC Counts

On all fuel injected GM vehicles that stall or have a rough idle, be sure to scan the IAC counts in the data stream.

If they are over 30 in neutral with the vehicle in closed loop and all accessories off, then suspect a dirty throttle bore.

2-43 No-Starts and OBD II 6-Cylinder PCM Failures

On all OBD II 6-cylinder GM vehicles with a Diagnostic Trouble Code of P0601 or a no-start condition, suspect bad diodes inside the vehicle computer.

Replacement of the computer is the cure.

2-44 5.0 and 5.7 Shorted Injector Harness, Blown Fuse, and No-Start

On 5.0 and 5.7 liter trucks with a no-start/no injector triggers condition accompanied by a blown ECM fuse, check the injector harness by the air cleaner for a short to ground.

2-45 No-Starts on 5.7 L TBI Trucks

On 5.7 L TBI trucks with no spark, injector triggers, a dead fuel pump, and 0.5 volt on all the reference wires, check the orange wire or the gray fuse link harness down on the frame rail for corrosion and/or breaks in the wiring.

The bulkhead connector should also be checked for corrosion and poor connections!

2-46 5.7 L No-Starts with Code 42

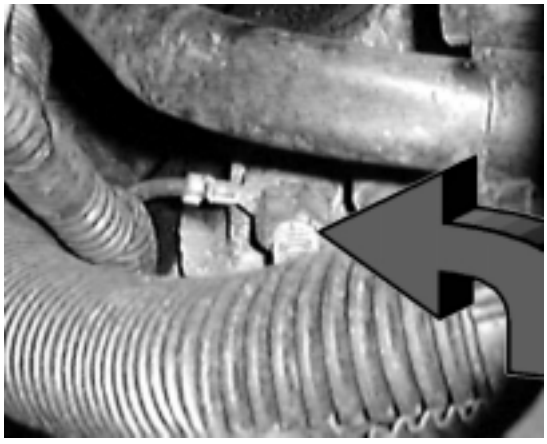
On 5.7 liter trucks with a no-start condition and intermittent code 42, try tapping into the purple and white wire near the module with a test light connected to twelve volts.

This should make the noid light flash and the pump relay click. If it does, check or replace the ignition control module and remove any white oxidizing powder from the inside of the distributor.

2-47 Poor Transaxle Ground Causes Misfire 2.8 and 3.1L

On all 2.8 and 3.1 liter motors that have a backfire or miss under load, be sure to check for a poor ground connection at the transaxle.

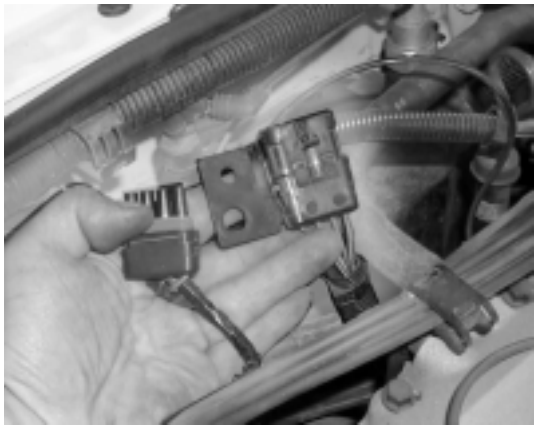
This is the ground for the ignition circuit.



2-48 Checking Multec Resistance 2.8 and 3.1L

On 2.8 and 3.1 liter engines that have a rough idle, be sure to check the multec injectors for proper resistance. This can be done at the 4-wire connector by the back valve cover or at the blue PCM connector (pins D-3 and D-9).

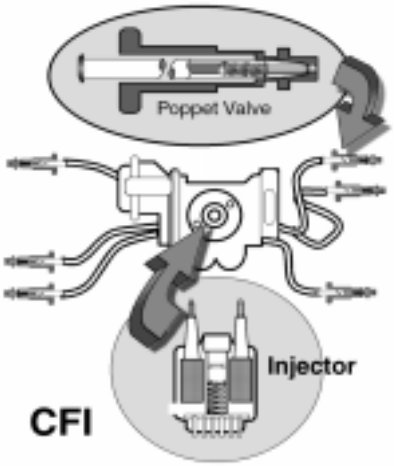
Remember you are testing these in two pairs of 3 injectors each, so both injector groups must have the same resistance.



2-49 Rough Running 4.3L CPI

On all 4.3 liter CPI injected vehicles that have good fuel pressure but still run rough, check for dirty poppet valves.

These can be cleaned, or replaced as an assembly that comes with a new fuel injector.



Unplug the Alternator to Find a Bad Injector on 2.0L

If you have 2.0 liter engine that will not idle, try unplugging the alternator. If it idles with the alternator disconnected, suspect a bad injector.

2.5 L Grand Am Stalls When Placed in Gear

If you have a late 80's 2.5 liter Grand Am with a code 35 that stalls when you put it into gear, remove the top of the throttle body and replace the bad gasket.

Stalling-Poor Performance— Distributor Pick Up Problems

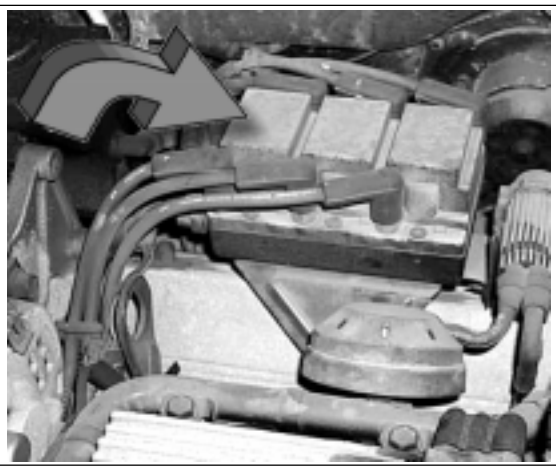
On all GM 6 and 8-cylinder trucks and cars that have a tendency to stall (or that have poor performance), be sure to check the distributor pick up assembly for weak magnets or a magnetized distributor shaft.

Cracked Distributor Rivets and 8-Cylinder Truck Stall/Hesitation

On all 8-cylinder trucks that stall or hesitate when in drive or reverse, check the spark voltage. If it's higher than normal, check for cracks by the rivets in the area where the distributor rotor bolts down.

If you find cracks, you will need to replace the distributor assembly.

2-54 C3I Type 2 Misfire



If you have an intermittent misfire complaint in a vehicle with C3I, type 2 DIS ignition coils, check the secondary resistance of the coils, both hot and cold.

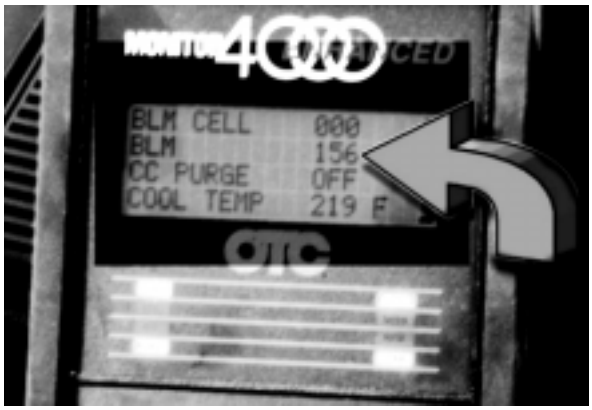
They should have 5,000-7,000 ohms. If not, replace them.

2-55 Optical Distributor Misfires

On all GM V-8 engines with an optical distributor that experience a misfire, lack of power, or a no-start condition, suspect the distributor assembly.

You must remove the water pump to service this distributor.

2-56 Block Learn and Integrator



Be sure to check integrator and block learn fuel trim as a clue to possible vacuum leaks or high fuel pressure/leaking injector problems.

2-57 GM 8-Cylinder C-3 Vacuum Hose Problems

On all 8-cylinder General Motors vehicles with a C-3 carburetor, be sure to check the vacuum hoses located at the front and rear of the intake manifolds.

2-58 Choke Pull-Off Vacuum Test KOER

When adjusting the choke pull-off on any carbureted vehicle, remember that when the engine is running, incoming air will open the choke plate farther than the amount of choke break we simulate when test the choke break diaphragm with our hand vacuum pumps.

2-59 Carbureted GM Cars With Miss or Lean Condition

On all carbureted vehicles that have a miss or lean condition, check the vacuum hose that comes directly off the intake manifold right in front of the carburetor.

They have a tendency to split.

2-60 Oil-Fouled Spark Plugs

On all GM products that have a tendency to oil-foul the first or last spark plug in the cylinder head, remove valve cover and check to be sure that the oil return drains are open.

2-61 3800 Number 6 Injector Failure

If cylinder # 6 in a 3800 has a bad injector, you will need to replace the injector and add the insulating washer under the EGR bolt closest to the faulty injector. This insulating washer keeps heat from the EGR from transferring through the EGR bolt to the injector.

2-62 Regap 2.0L Plugs

GM has released a bulletin for all 2.0 liter engines instructing you to re-gap the plugs to 0.35 in-stead of the original 0.60.

The large plug gaps were causing false misfires.

2-63 Quad Four Cold Start Misfire

On all Quad 4 vehicles that have a cold start-up misfire, check the head gasket.

These engines may be eleigible for a limited mileage warranty repair.

2-64 Unclogging Carb Idle Circuits

On all carbureted vehicles: If you suspect that you have dirt in an idle passage causing a miss, try sucking the dirt through the venturis by holding the RPM at 2000 and momentarily closing the choke plates.

You can also slap the palm of your hand over the carb throat at high RPM to get the same effect.

2-65 Flushing Dirt From Needle Valves

If you have dirt stuck on a carburetor needle valve, try pinching off the fuel inlet line and cranking the engine until all the fuel inside the float bowl is used up.

Then release the inlet line quickly. The first spray of fuel will wash the dirt away.

2-66 Rough Running/Misfire on 2.0 and 2.5L

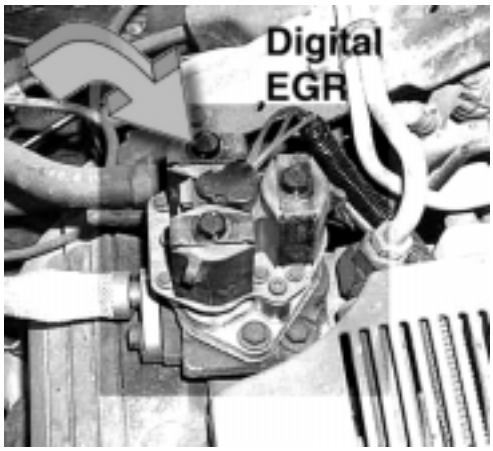
Most rough idle or missing concerns on the 2.0 and 2.5 liter engines are related to secondary ignition leakage or vacuum leaks.

Be sure to inspect both items very closely.

2-67 Cold Fuel Vaporization Aid 2.0L

If you are confronted with a 2.0 liter throttle body with a cold engine roughness, install a shield under the TBI inside the manifold to aid in cold fuel vaporization.

2-68 Digital EGR and Misfire at Idle—3.8 and 3800



On any 3.8 or 3800 engine that has a misfire at idle, inspect the digital EGR valve to make sure that it is closing all the way. This can be done with a visual inspection. Look for black soot around each of the solenoids. The evidence of soot would mean that it was stuck at one time.

To test this valve, ground each of the wires except the red one. Each time you ground a wire, the valve should open the appropriate solenoid.

2-69 Bad Injector Assemblies 4.3L

On 4.3 OBD II vehicles with a misfire (especially on cylinder # 6), suspect a bad injector assembly.

2-70 4.3L Linear EGR Sticks

On all 4.3 liter vehicles that use the linear EGR valve, try tapping on the bottom of this valve.

It has a tendency to get stuck open and cause a rough idle or miss.

2-71 Sulfur-Stinking S-Series

If you are confronted with an S-series truck that has a strong sulfur smell, you should consult the technical manual for this vehicle.

GM has an updated catalytic converter for these vehicles.

2-72 Magnetized Distributor Shafts and Misfire on 5.0 and 5.7L

An intermittent misfire on 5.0 and 5.7 liter engines may be the cause of a magnetized distributor shaft.

2-73 EGR Shield and Premature TPS Failures on 2.5L

If you have a bad TPS on a 2.5 liter engine, be sure to replace the EGR shield or the new TPS will fail prematurely.

2-74 Heater Grids and Poor Varajet Performance

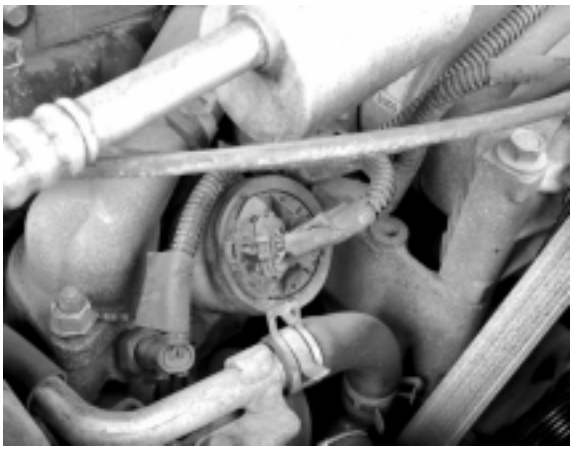
If you have a bad hesitation or poor performance on a 2.8 liter engine with a Varajet carburetor, check the heater grid plate located under the carburetor.

It should have 3 ohms of resistance.

2-75 Updated Parts for Quad Four Misfire

On all Quad 4 engines that miss, fail to start or backfire: Replace the plug wire boots and check to be sure that the updated yellow ignition coils and white coil covers are installed.

2-76 5.7L Rough Idle and EGR



If you have a 5.7 liter that has a rough idle when shifted into gear, check to see if the EGR valve is opening too soon.

These valves have weak springs and should be replaced.

2-77 Coil Mounting and False Misfire on 5.0 and 5.7L F-Body

On 5.0 and 5.7 liter F-body cars that have a misfire under load (especially when wet):

Inspect the ignition coil to be sure that the primary side is facing the distributor cap.

Putting the coil wire close to the distributor cap can cause false triggering of the pickup inside the distributor body.

2-78 Where's the S-Series Timing Connector?

The timing connector on GM's S-series trucks is located inside the passenger compartment on the right hand side below the dash, underneath the carpeting.

2-79 MAP Sensor Hoses and V-8 Truck Surge at Idle or High Idle

On all V-8 trucks that have a surge or high idle, check the MAP sensor hose for fuel. If fuel is found inside the hose, you should reposition the MAP to the air cleaner.

Note: MAP voltage will be high.

2-80 Bad Injector Causes No Power on 2.0 and 2.5L

A common fault for a no-power complaint on 2.0 and 2.5 liter engines is a bad fuel injector.

Note: You may have good fuel pressure, but the datastream will show a lean condition.

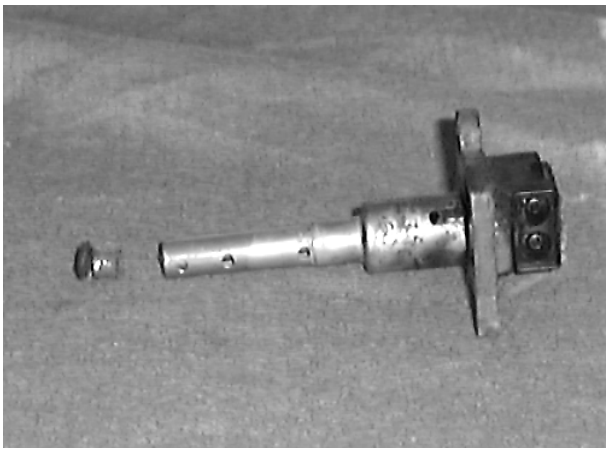
2-81 Cadillac No-Power and Distributor Gear Wear

On Cadillac 4.1 and 4.5 liter engines that have a lack of power, be sure to check the ignition timing.

If the timing is incorrect, suspect distributor gear wear.

There is a replacement distributor gear available. If you purchase a rebuilt distributor, make sure the rebuilder has installed the updated drive gear or you may end up with camshaft damage.

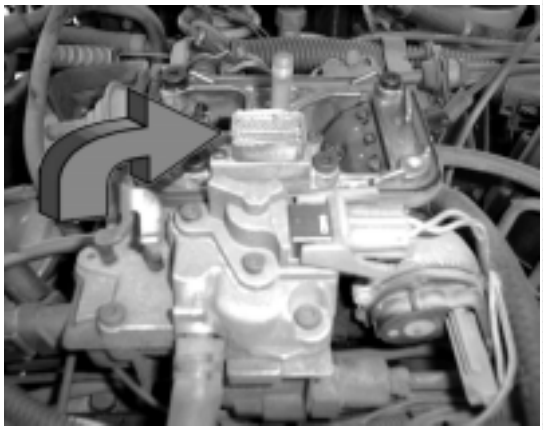
2-82 Broken Mixture Control Solenoid Tips on 2.8L Carbureted



2.8 liter carbureted vehicles are prone to having the tip of their mixture control solenoid break off inside the carburetor.

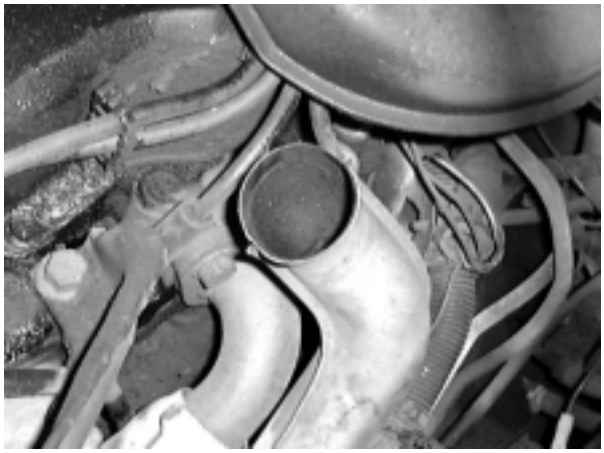
You will need to remove the solenoid to inspect for this condition.

2-83 Varajet Hesitation and Double-D Screw



If you have a slight tip-in hesitation on a Varajet carburetor in 2.8 liter engines, try removing the screen on the top of the carburetor and turning the double-D screw half a turn at a time to see if that cures the problem.

2-84 Cracked Manifold Causes Lack of Power on 2.5L



On any 2.5 liter engine with a lack of power, be sure to visually inspect the air cleaner element. If it is black and sooty, suspect a cracked exhaust manifold.

You can verify your diagnosis by driving with the fresh air tube off to see if the symptoms disappear.

Collapsed Air Duct and Poor V-8 Truck Performance

On V-8 trucks that have a poor-performance complaint, see if the TSB concerning a collapsed air duct inside the fender applies to your vehicle.

IAC Low-Idle High on 3.4L Suspect Intake Gasket

On 3.4 liter engines with high RPM and IAC counts at 0, suspect a bad intake manifold gasket on the back side of the engine.

TBI High Idle Caused by Leaking Throttle Body Base Gasket

On all throttle body engines that have a racing idle, suspect a bad throttle body base gasket.

Grand Ams With Ringing Noise

On late 80's and early 90's Grand Ams with a ringing noise while driving, inspect the VSS heat shield located on top of the transaxle.

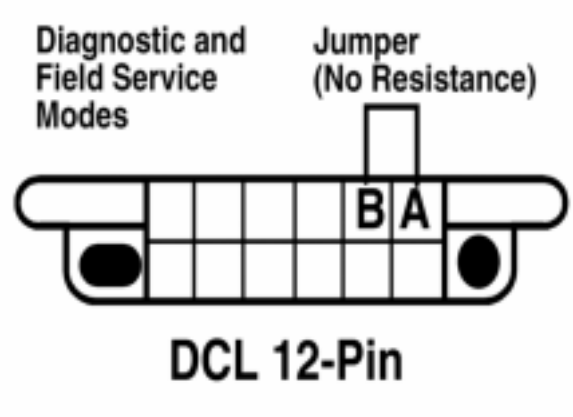
2-89 EST Quick Test

If you want to perform a quick test to see if the electronic spark timing (EST) is functioning on any GM vehicle, try this:

Hold the engine at 2000 RPM.

Disconnect the bypass lead or enter field service mode through your scan tool.

If everything is functioning you should hear the engine speed drop.



2-90 Underhood Insulation and Low Power Complaint on Cavalier

On all Cavaliers that have a complaint of no power, check the underhood insulation.

The insulation blanket frequently comes loose from the hood fasteners and blocks the fresh air inlet of the air cleaner.

2-91 Injector Driver Circuits at PCM 2.8 and 3.1 L

On 2.8 and 3.1 liter vehicles, the injector driver circuits are in the blue-colored plug at the PCM.

Test at pin cavities D-3 and D-9.

2-92 Early '90s TPS Update

On all early 90's General Motors products that have a TPS code, perform normal diagnostics first. Even if the throttle position sensor passes normal tests, you may still need to install a revised TPS from GM.

2-93 Problem Computers and Tap Tests

GM has a list of troublesome computers that are prone to a whole host of driveability concerns. You should perform the tap test on any computer that is suspect.
(A complete list of problem computers and their replacements can be found at the end of this chapter.)

2-94 ESC Codes

On all V-6 and V-8 engines that use an ESC module, if you get a code for the ESC circuit be sure that the knock sensor is plugged in and working.

2-95 EST Quick Tests with Lab Scope

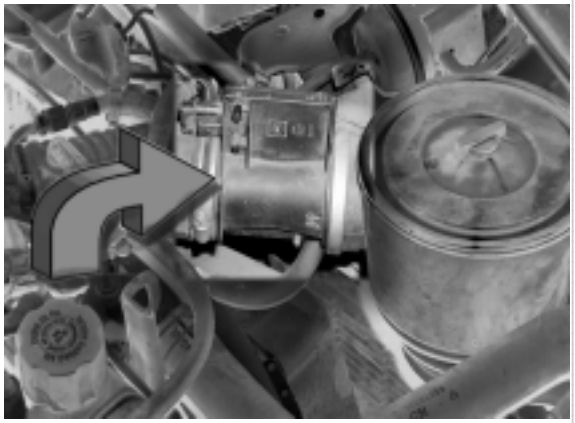
Here's a quick test for GM's EST trouble code 42:
Erase the existing code and see if it will reset. (It must be a hard code for this procedure to work.) **Backprobe the white wire at the module with your lab scope lead.** KOER you **should** have a nice square wave signal (you won't if there's a hard code). Remove the white wire from the module connector but leave the scope connected to the wire. Do you have a nice square wave now? If so, you will need to replace the module. If not, you probably have a bad computer.

2-96 Tap Tests

On any General Motors vehicle, all of the following components should be lightly tapped to see if there is any change in engine operations.

Mass Air Flow sensor, Crankshaft sensor, Combination sensor, and the PCM.

All of these can cause hesitation, stalling, or other performance problems.

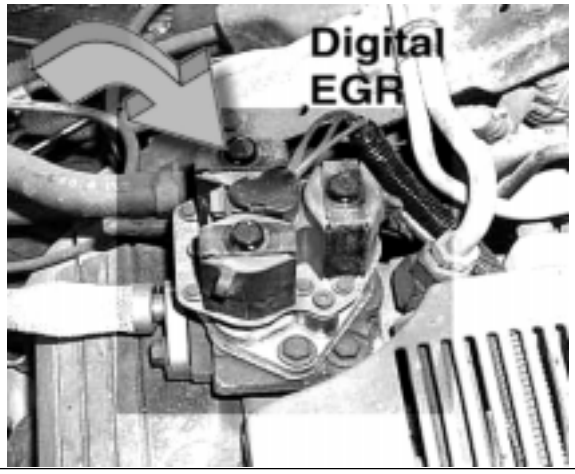


2-97 3800 Codes 32 or 26 and Digital EGR Problem

On the 3800 engines that have a code 32 or 26, suspect the Digital EGR valve as the problem.

You can test this EGR by grounding each of the wires (except the red wire) with the engine running, whiled listening for an RPM change.

The solenoids in this valve can stick, causing a rough idle.

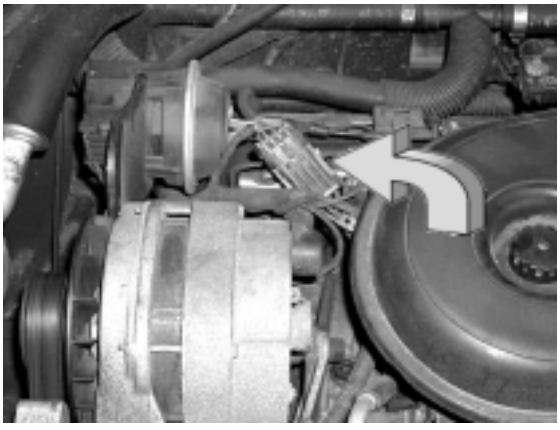


2-98 Cadillac Injector Resistance 4.5 and 4.9L

On all Cadillac 4.5 and 4.9 liter engines with port fuel injection, make sure the injectors each have 17 ohms of resistance.

If the measured resistance is lower, the injector(s) will need to be replaced.

The photo shows the injector harness connector.



2-99 Monte Carlo/Grand Prix OBD II Air Pump Codes

On V-6 OBD II Monte Carlo and Gran Prix with a P0410 Air Pump code, check for water entering the air pump through the vacuum lines and the atmospheric vent.

If you find moisture, reposition the vent on the pump hose tee so it faces downward making it easier for moisture to drain from the vent.

2-100 1992-93 Buick Wire Harness Chafing (Multiple Symptoms)

On all 1992 and ‘93 Buicks with any codes or electrical problems at all, you should inspect the wiring harness by the power brake booster for chafing.

2-101 2.0 and 2.5L Map Hose Failures

On the 2.0 and 2.5 liter engines the MAP sensor (and other vacuum hoses) have a tendency to split or collapse.

2-102 Early 2.5L Map or TPS Codes

On early GM 2.5 liter engines with a MAP or TPS trouble codes, be sure to inspect the harness for chafing where it feeds through the alternator bracket.

2-103 GM Output Device Resistance

All GM's output devices must have at least 20 ohms of resistance (except fuel injectors).

2-104 Removing the *&^%&*!!! Crank Sensor

If you are having trouble removing the crank sensor on any GM vehicle, try squirting some X-66 (top engine cleaner) on it, this will usually free it up.

This stuff is also great on rusted bolts! Just don't get on your skin or in your eyes!

Notes

2-105 Early 2.5L Stalling and /or Code 44

On early 2.5 liter VIN R & U motors, if you are faced with a cold stalling complaint or a code 44 for lean exhaust, check for a restricted fuel injector.

Use integrator and block learn values as a guidelines (they will both be high). Another way to test is to pinch off the return line (increasing fuel pressure) look for fuel trim numbers to stabilize.

2-106 5.0L Map Sensor Relocation

On all 5.0 liter trucks and vans with MAP sensor codes, move the MAP sensor to the air cleaner and keep its hose away from the EGR valve.

2-107 5.0 and 5.7L MAF Burn-Off Codes

On all 5.0 and 5.8 TBI motors with MAF burn-off relay codes, inspect the crankcase vent hose located by the valve cover for splits or cracks.

2-108 Rochester Choke Problems

One of the biggest problems with Rochester carburetor chokes that fail to work is a poor connection at the electric choke wire connection on the electric choke housing.

To cure these problems, clean the terminal on the choke housing and solder the blue choke wire directly to the choke housing connector. Be sure to insulate the soldered connection.

Bad PCM's

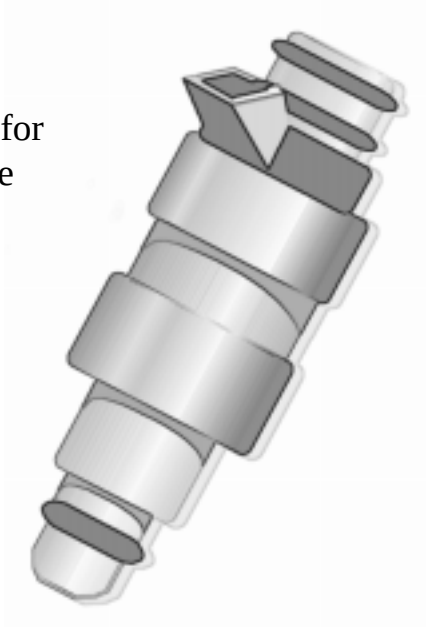
By this time I am sure that you have all heard of the GM tap test on their list of bad computers. Here is the final most up to date list of bad computer part numbers and their replacements if they have any.

Bad #	Updated #
1226864	
1226867	
1226868	
1227148	
1227165	
1227727	16198260
1227730	16198262 or 16196344
1227747	
1227748	
1227749	16198263
1228253	16198264
1228321	
1228330	
1228706	16198266

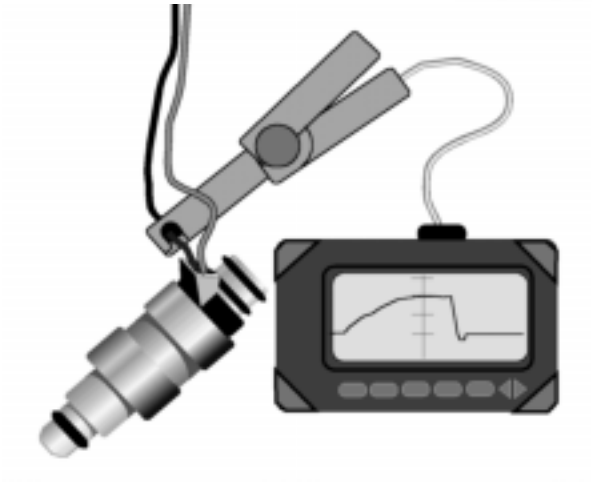
GM Injector Resistance Values

The following is a list of all the injector bank resistances for multi port fuel injected GM vehicles. Note that these are taken at room temperatures.

- 2.3 liter = 2.3 ohms each (1.0-1.3 ohms per pair)
- 2.8 and 3.1 liter = 12 ohms for each injector (4.0-4.2 ohms per bank)
- 3.0 liter = 14.5 ohms each
- 4.5 and 4.9 liter = 17 ohms each
- 5.0 and 5.7 liter = 16 ohms each



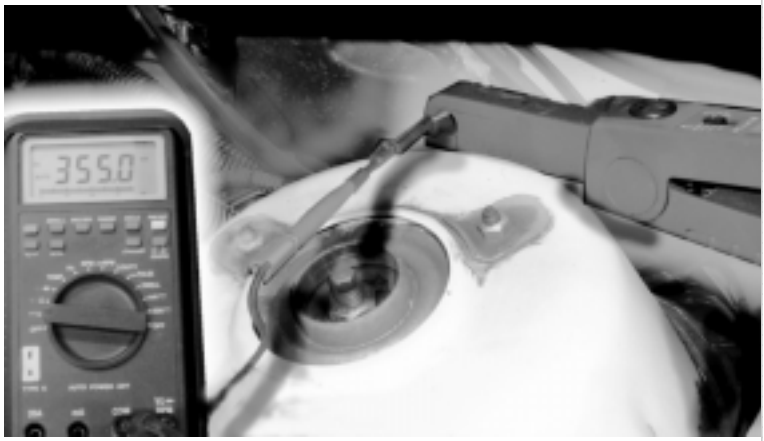
Whenever we suspect that we have a problem with the injectors, we should try to view their amperage waveforms. It will be easier to find opens and shorts using this method.



If you are working on a throttle body injected vehicle with the complaint of poor mileage, after checking all the basics, be sure to view the injector waveforms. If ringing is present install a 0.1 microfarad capacitor across the injector terminals. This should cure the problem.

If you are testing a General Motors fuel pump with your lab scope, the maximum amperage draw for throttle body fuel pumps should be 2-3 amps.

The maximum amperage draw for sequential or multi-port fuel pumps should be 4-6 amps (except CPI).



The maximum fuel pump current draw for CPI injected fuel pumps is 8-9 amps.

CHAPTER THREE

Ford

3-1 TBI Quick Test

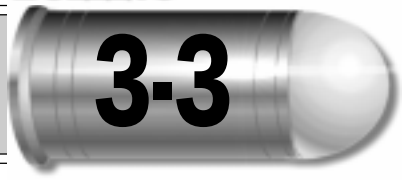
If you have a no-start condition on a Ford TBI and you have good fuel pressure, spark and injector pulses, try unplugging the alternator harness and see if it starts.

If it does, suspect a faulty injector.

3-2 Inertia Switch Locations

Common Inertia switch locations for Ford products:

Most cars = upper left corner of trunk.
No trunk = rear interior trim compartment
Escort = Drivers side up high in fender well
Vans = Drivers side on backside of kick pad
Explorers = Under heater case
Pickups = A small switch with a red washer at top under seat, on the firewall, under dash between steering column and hump or on the firewall on the passenger's side.



Fusible Link No-Starts ('95 and Earlier)

All 9'5 and earlier Fords with a no-start/no spark condition, check the yellow fusible link wire at the starter relay.

This wire has a tendency to break or burn.

Quick Test for Shorted PIP Diode

You can check for a shorted diode in the Profile Ignition Pickup (PIP sensor) by using an ohmmeter. If the diode is shorted, you'll get a continuity reading across the two outer terminals at the module connector.

Also be sure to check the coil.

Checking the Module for Power Before Condemning PIP

If you suspect a bad PIP sensor, first make sure the module is getting 12 volts at th center terminal.

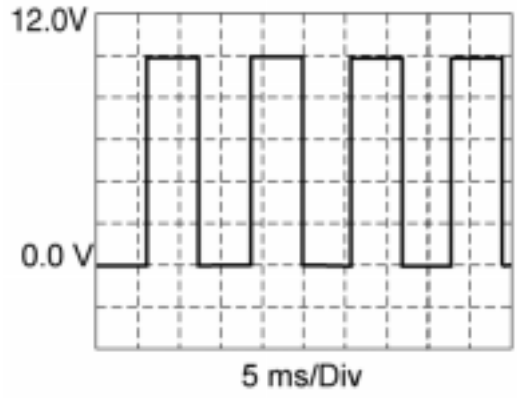
SHO No-Go Chafed Harness

On all Taurus SHO motors that have a no-start or lack of power or erroneous trouble codes present, check the wiring harness for chafing at the lower plenum bracket.

3-7 Long Cranking Times Caused by Faulty CID Sensor

If you have a long extended crank time with good spark and fuel pressure, you should suspect a faulty Cylinder Identification Sensor (CID).

Basically the computer is guessing when to fire the injectors. This can extend cranking times until the PCM guesses right!

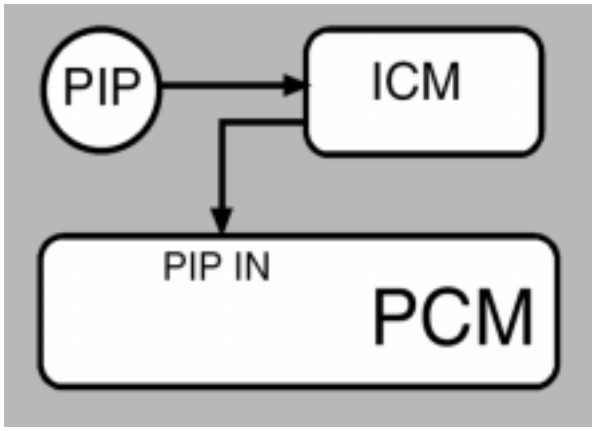


3-8 Missing PIP Sensor Signal in Closed Bowl and Distributorless Ignitions

On closed bowl and distributorless ignition Ford ignition systems, the PIP signal goes in 2 directions from its source.

It goes through the ICM to the PCM. A missing PIP signal at the ignition module results in no-spark.

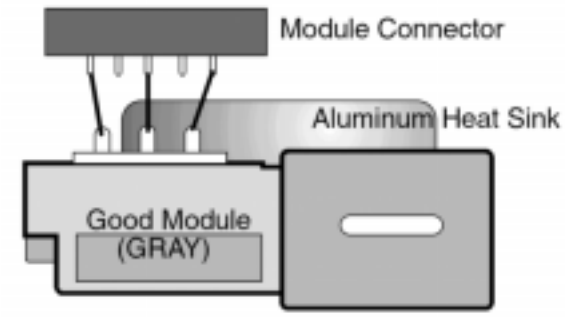
A missing PIP signal at the PCM can cause a no-start caused by lack of fuel.



3-9 Ford Module Tester

You can make a module tester that can be used on all vehicles with a distributor by following the accompanying schematic.

We suggest soldering all connecting wires to the module and insulating them with heat shrinkable tubing.



3-10 PIP Sensor Quick Test (Fuel Pressure)

If you suspect that you have a bad PIP sensor on a Ford vehicle, attach a fuel pressure gauge and see if you have cranking fuel pressure. The computer uses the PIP or RPM signal to keep the fuel pump relay closed while cranking and running.

3-11 Why Inertia Switches Die

If the inertia switch is burnt, suspect a bad fuel pump or a shorted harness that cause high current in the inertia switch circuit.

3-12 Is it the Module or the PIP?

To test whether you have a bad module or a bad PIP sensor on a Ford, remove the module from the distributor, but leave the harness connected. Then ground the far right terminal with your test light (as shown) while cranking.

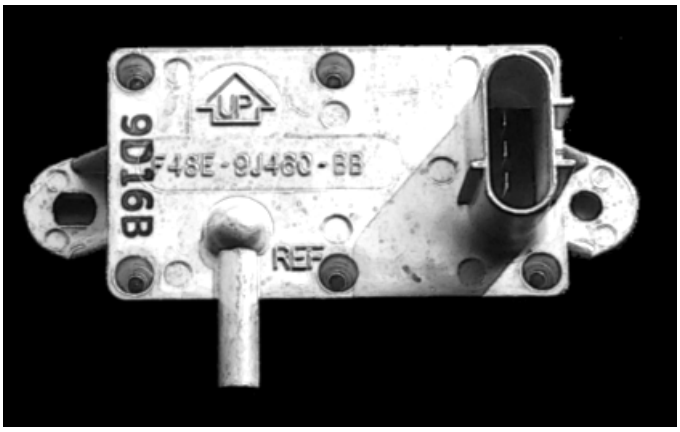
Tap the tip of a test light clipped to ground on the othe terminal closest to the harness.

If you get spark, suspect a faulty Hall effect sensor. No spark? Suspect a faulty module.

3-13 No-Starts Caused by DPFE Shorting Reference Voltage to Ground

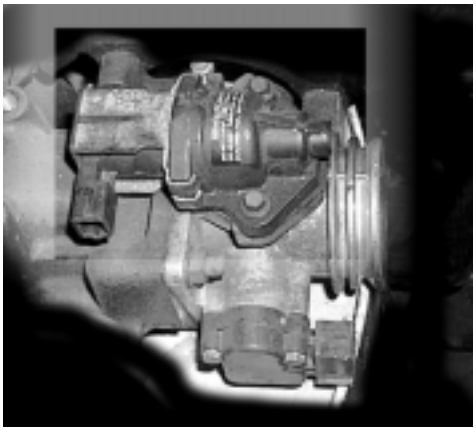
If you ever come across a Ford product with a no-start condition and all the sensors reference voltages are 0.5 volts, try unplugging the DPFE sensor to see if this helps.

This sensor shorts out internally—quite regularly.



3-14 Fast Idle After Cruise - Faulty Idle Bypass Valve

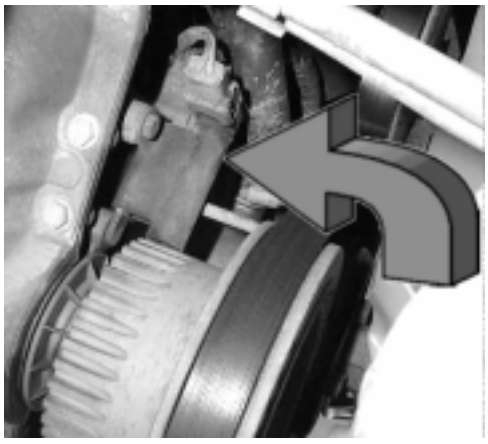
If you have a Ford that runs fast immediately after exiting a freeway, suspect a bad idle air bypass valve.



3-15 4.0L No Spark/Fuel Pressure

On 4.0 liter vehicles that have no spark and no cranking fuel pressure, be sure to check the crank sensor harness.

This harness usually loosens from its holder and then rubs in two on the water pump pulley.



3-16 Tracer No-Starts—Main Relay Corrosion

On 1.6 liter Tracers that have a no-start condition, check the main relay for corrosion.

If corrosion is present, clean all connections.

Then replace the relay and relocate it to the fender.

3-17 No-Start Rangers with EGR Codes

On 1992 and ‘93 Rangers that don’t run or have EGR codes present, check the EGR vent solenoid filter for moisture.

These filters can get wet from water dripping off the hood.

3-18 Frozen Vane Air Flow Meters—2.3 L Turbocharged

On 2.3 liter turbocharged vehicles that won’t start or set a code 66 when outside temperatures are below 32 degrees Fahrenheit, suspect a frozen vane in the air flow meter.

This is usually a result of moisture entering from the air cleaner stud grommet.

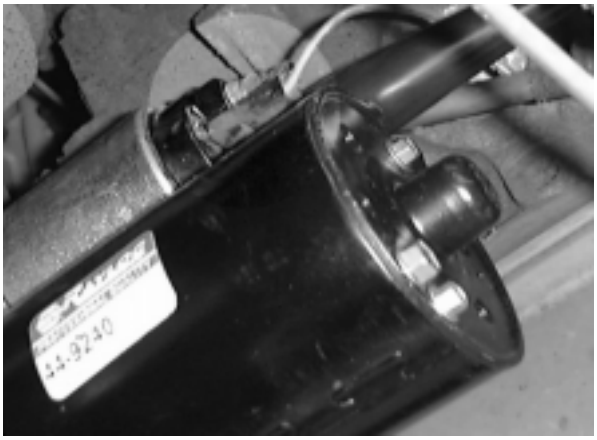
3-19 No-Starts from Open Fuel Pump Resistor Circuit

Some Ford products will use a fuel pump resistor wire in the power feed to the fuel pump. Be sure to check the vehicle wiring diagram to see if your vehicle uses one.

This could cause a no-start if it goes bad or if it has been cut.

3-20 No-Crank on Gear-Reduction Starters

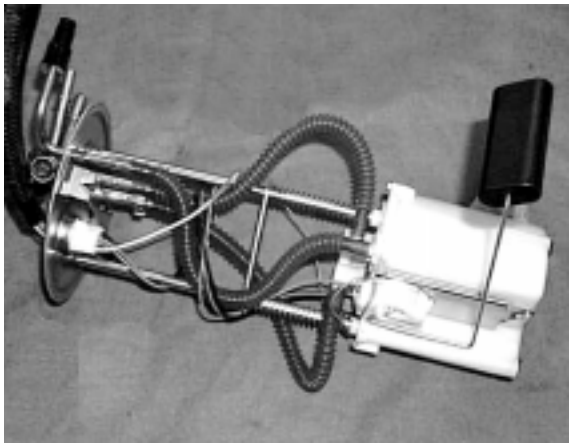
On all Ford products with a gear-reduction starter motor that exhibit a no-crank condition, suspect the push-on electrical terminal and its mating connection at the starter.



3-21 Fuel Pump Failure Caused by Sticking Pressure Regulator

On Ford vans that have repeated fuel pump failures (that may even cause the fuel pump pickup hose to blow out), suspect a bad fuel pressure regulator that is causing extremely high fuel pressure.

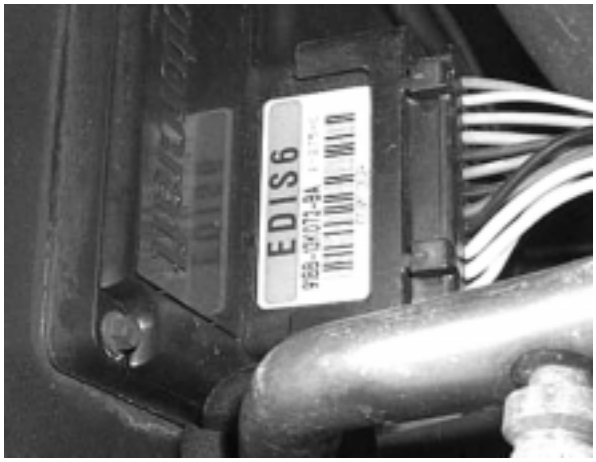
This condition usually shows up after approximately 30 seconds of engine running time.



3-22 4.0L No-Spark from Bad Ground

On all 4.0L Ford vehicles with EDIS that have no spark, be sure to check the ignition ground terminal or the big black wire that goes from the module to the battery.

It has a tendency to go bad because the module is mounted in a highly corrosive environment in front of the battery.



3-23 Poor Grounds on T-Bird/Cougar (Can't Stop Those Dancin' Feet!)

On 1989 and '90 Thunderbirds and Cougars that don't start, or whose power accessories fail to operate, check the ground connectors located behind both front kick pads.

This is a common problem, especially if the customer has "happy feet."

3-24 No-Crank V-8 from Waterlogged Neutral Safety Switch

If you have a no-crank condition on a full-sized V-8 Ford vehicle, check the neutral safety switch for corrosion.

If corrosion is found, replace switch and connector, and reposition the drain hose for the windshield wiper motor.

3-25 Stuck Sending Units and No-Starts

On Ford pickup trucks that have a no start due to lack of fuel pressure, **be sure that there is fuel in the tank.**

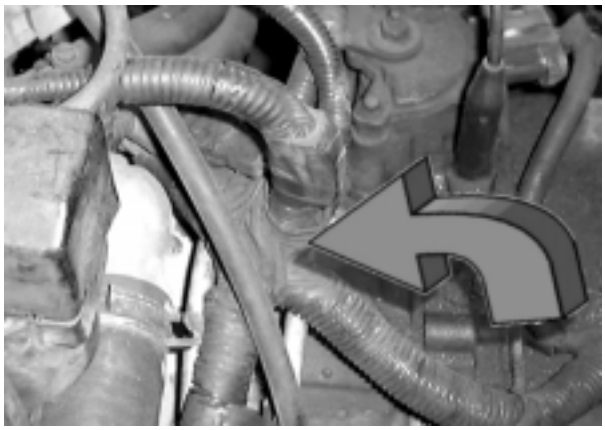
These trucks are notorious for the fuel sending unit float assembly getting stuck on the internal fill pipe, leaving you to think there's fuel in the tank when it's really empty!

3-26 Contour Whistle, Hesitation

On 1995-97 Contours that stall, hesitate, or make a whistling noise when decelerating, install a new, updated inlet snorkel tube.

3-27 1992-93 Taurus No-Start from Chafed Harness

On 1992 and '93 Taurus (non-SHO) vehicles that exhibit a mysterious no-crank condition, check the wiring harness by the transmission for chafing.



3-28 Ford Van Wiring Problems

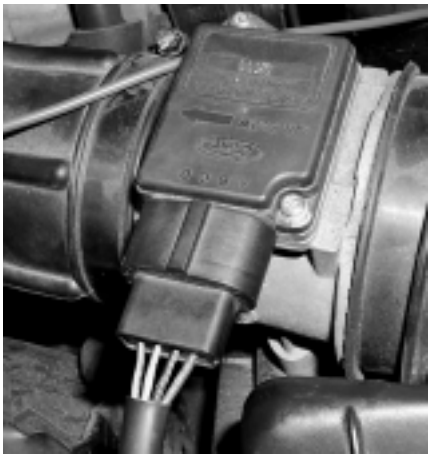
On Ford vans that will not start until the ignition key is released, check the 4-wire connector that is located above the master cylinder.

This harness usually becomes corroded and will need to be repaired or replaced.

3-29 1.9 Escorts Stall When Warm—Check MAF

On all 1.9 Escorts that stall when warm, suspect a bad Mass Air Flow sensor. To test this sensor, look for signal voltage of 0.7 volts at idle and a minimum voltage increase of 2.0 volts when you snap the throttle.

If you don't measure these voltages, then you probably have a bad Mass Air Flow sensor.



3-30 EEC-IV CFI Stalling from Bad Injector Dumping Fuel

On all EEC-IV vehicles with CFI injection that stall out when hot, try to look into the throttle body right when the engine stalls.

If the fuel appears to be dumping from the injector right when the engine stalls, suspect a bad injector.

3-31 Escorts Won't Keep Running with Ignition Key in Run Position

On 4-cylinder Escorts with a 1.9 liter that stall when the ignition key returns to the run position, check the 6-wire connector by the right spring tower.

Pay particular attention to the yellow wires.

3-32 Inlet Screen Sends Tracer Lean

On all Escort/Tracers with a lean condition, stalling complaint, or a converter that has melted down: Suspect the throttle body inlet screen (part # E53Z-9F525-A).

If this screen becomes plugged, you may still have normal fuel pressure gauge readings, but you will have lean misfire.

3-33 Aerostar PCM Shuts Off Fuel Pump

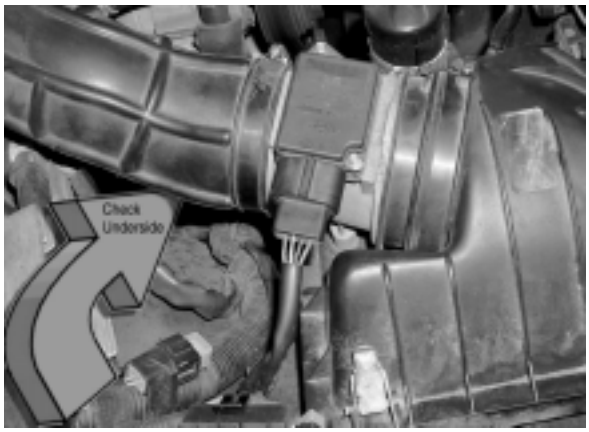
On 1987 3.0 liter Ford Aerostars that stall at low idle or cruise, suspect a bad PCM.

3-34 Poor TFI Ignition Module Ground

On all EEC-IV vehicles that have a thick film ignition module, if you determine the cause for a stalling condition is an intermittent loss of spark, suspect a poor ignition module ground.

To repair, simply remove the module and clean the mating surface. Reinstall the module, but be sure to squirt some RTV in the module screw opening to prevent this from happening again.

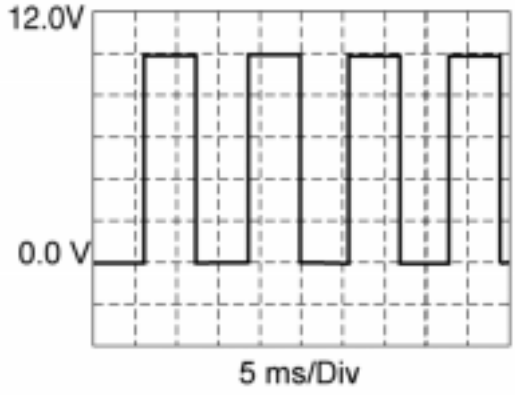
3-35 Shake Its Snorkel to Locate False Air Leak and Correct Stalling



All Ford vehicles that are of the volumetric family (not speed density), grab the air cleaner snorkel tube and shake it with the engine idling.

If it stalls, suspect a cracked inlet snorkel tube that's allowing false air to enter the intake downstream of the air flow sensor.

3-36 PIP Voltages and Misfires



A common cause for intermittent misfires on Ford products is improper voltage amplitude on the PIP signal.

Be sure that the high side of the square wave reaches at least 10 volts, and that the minimum voltage is below 0.7 volt.

3-37 Snorkel Tube Installation on Escort, Tracer, and Probe

It is vitally important for all 1.9 Escorts and Tracers and 2.0 Probes to have their inlet snorkel tubes installed correctly—and tightly.

A poor-fitting snorkel can result in a no-start condition.

3-38 Vans That Stall Over Bumps— Loose Battery Ground

On 6-cylinder Vans that stall going over bumps, suspect a loose battery ground cable where it attaches to the engine block.

3-39 Rich Running Carbs/ Power Valve Leaks

On carbureted Ford vehicles that run rich and rough: Pull the hose off the power valve nipple located at the base of the carburetor, and check for raw fuel.

If fuel comes out of the hose, you will need to replace the power valve. (If this vehicle backfires, correct the cause of the backfire or it may damage the new power valve.)

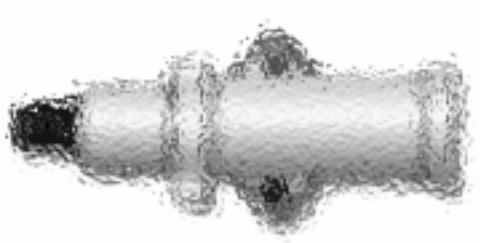
3-40 Runs Rough/Stalls IABV Spacer Kit

For all Ford vehicles that use Idle Air Bypass Valves and run rough or stall, there is a kit available from Ford that allows you to place a spacer underneath the IABV and adjust it for a smooth idle.

The TSB reference number for that kit is 91-25-7.

3-41 8-Cylinder Start and Stall Cold—Frozen IABV

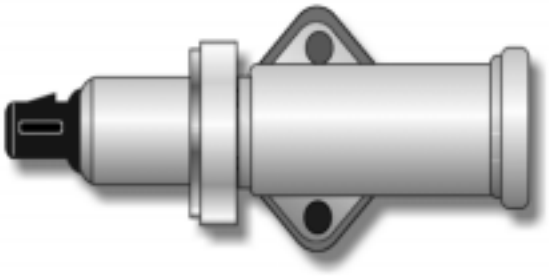
On all 8-cylinder vehicles that start and stall or simply stall at idle at temperatures below 32 degrees Fahrenheit, suspect a freezing idle air bypass valve.



The fix is to replace the IABV and reroute the PCV breather hose from the throttle body to the air cleaner.

3-42 Installing the Correct IABV

If your vehicle runs very rough or stalls after you have replaced the IABV, be sure that you did not install a replacement containining a diode.



This can be tested using your ohmmeter.

3-43 1.9 and 2.3L Tempo/Topaz Stalling/Rough Running (IABV Wires)

On 1.9 and 2.3 liter Tempos and Topaz vehicles that run rough or stall, be sure to check the harness for the Idle Speed Control Motor to see if it is pulling out of its connector and shorting to the intake manifold.

3-44 1998/'99 Continental Misfire

On 1998 and '99 Continentals that run rough or miss, remove the coils and check for moisture inside the plug wells.

If moisture is found, install a small bead of RTV around the wire harness grommet inside the valve covers that leads to the coil assemblies.

3-45 Scoping Coil-Over-Plug Ignition Patterns

Be sure to attach your ignition scope to the individual coil primary wires when you want to view the pattern on coil-over-plug ignition systems.

3-46 4.0L Misfire Caused by Vacuum Leaks

On 4.0 liter engines that run rough or misfire, be sure to check for vacuum leaks around the upper and lower intake plenum gaskets.

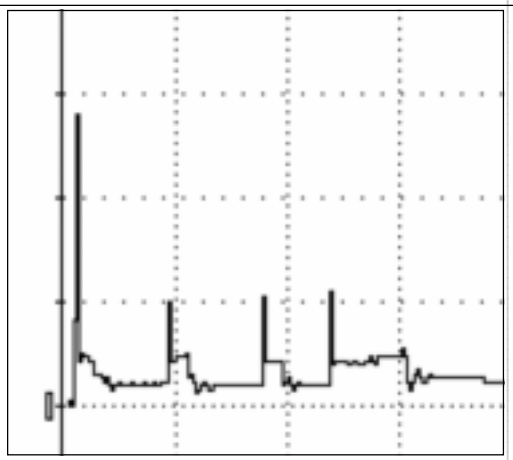
3-47 Checking Exhaust Backpressure at DPFE

A quick check for restricted exhaust on Ford products is to remove the small exhaust hose at the DPFE sensor and attach a pressure gauge to it.

Pressure should not exceed 2.0 PSI at any engine speed.

3-48 Ford Multistrike Ignition

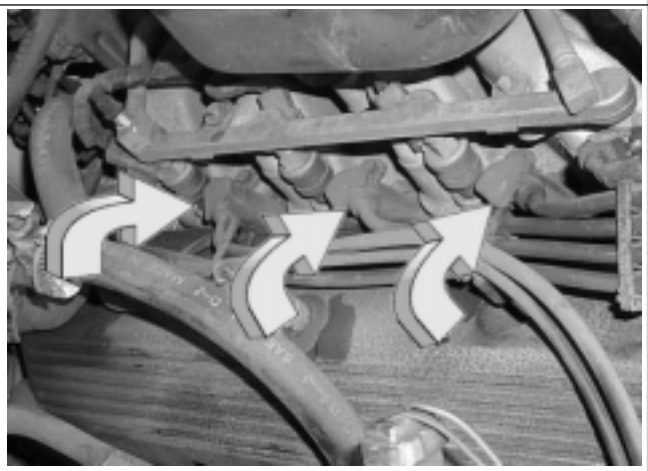
A scope pattern like this is normal below 1000 RPM on multistrike ignition systems used in Ford 1.9 and 4.6 liter engines.



If you remove the octane shorting bar (or raise the engine speed above about 1000 RPM) the ignition will revert back to normal, single-strike firing.

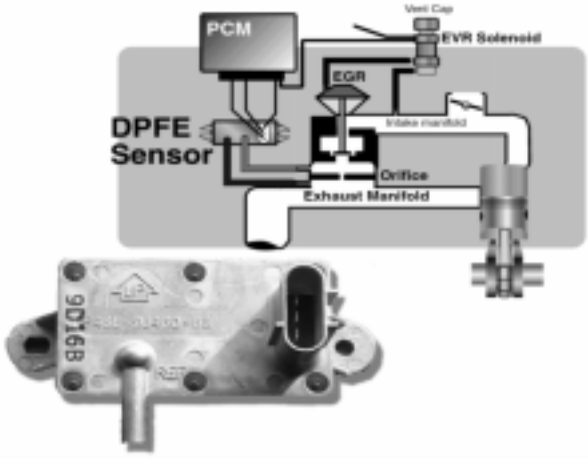
3-49 4.6L Misfire— Don't Forget the Plug Wires

Be sure to check the plug wires on the 4.6 liter vehicles for arcing.



3-50 Plugged Exhaust= Melted DPFE

On all Ford vehicles that have a melted Differential Pressure Feedback EGR (DPFE) sensor, suspect a restricted exhaust.



3-51 Holley Hesitation

On all Ford trucks that use the Holley carburetor, be sure to check for proper engagement of the accelerator pump arm.

This has a tendency to get hung up, resulting in a hesitation.

3-52 High Idle from Sticking Transmission Linkage

On any 4-cylinder Ford product that has a high RPM, you should inspect and lube the transmission linkage.

This will usually corrode and not allow the throttle to close.

3-53 4.6L High Idle

On 4.6 liter vehicles that have a high idle, check the vacuum hose located in the rear of the engine on the right side of the “periscope” that houses the throttle plates.

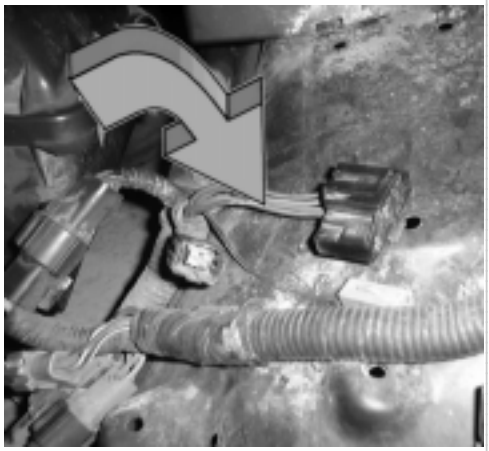
It usually collapses and cracks.

3-54 Map Hose- Rich Running

On1.9 and 2.3 liter Fords that run rich or have a code for a MAP sensor, check for a MAP sensor hose restriction, usually located right at the intake.

3-55 EEC-IV Runs Fast with No Power and CEL Flashes After Startup

If you encounter an EEC-IV vehicle that runs fast when first started for approximately three minutes, then has low power and the check engine light flashes once—and then the problem is gone until the next time you start the vehicle—inspect the STI lead on the DCL to see if it is grounding to sheet metal. This causes the causing the system to enter KOER self-test mode.



3-56 Poor Performance, No Codes

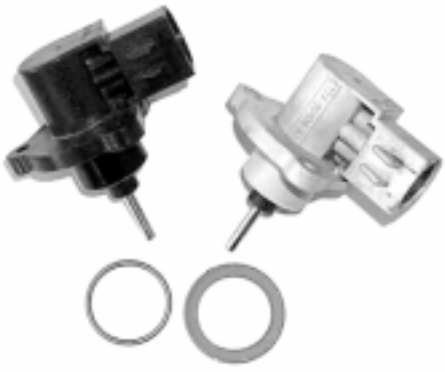
Before you look for complicated causes for a Ford driveability concern—that may not be accompanied by any code—check the main ground connector located right off the battery ground cable.

Ford runs all computer grounds through this connector. The best way to test this ground is by doing a voltage drop across it while in the output state test mode on your scan tool.

3-57 Adjusting the EVP

Did you ever get a code for EGR and EVP on a Ford product? (Ha-Ha)

If you want to get rid of this code once and for all, you must set the KOEO EVP voltage to 0.80 volts (if it's a black sensor) or 0.60 volts (if it's a white sensor).



Adjust the voltage by using different thickness o-rings that are included in the box with the new EVP.

3-58 4.0L EVAP Code (OBD II)

On 4.0 liter OBD II trucks with a code PO1443 for the EVAP system, make sure the EVAP sensor's harness has not rubbed through on the power steering bracket.

3-59 4.8, 5.0, 5.8L High Idle

On all Ford vans with a 4.9, 5.0, or 5.8 liter engine that have a high idle, suspect a worn throttle shaft that is binding, causing the throttle to stick.

3-60 Grand Marquis EGR Codes

On 1990-94 Grand Marquis with EGR codes, suspect plugged exhaust passages.

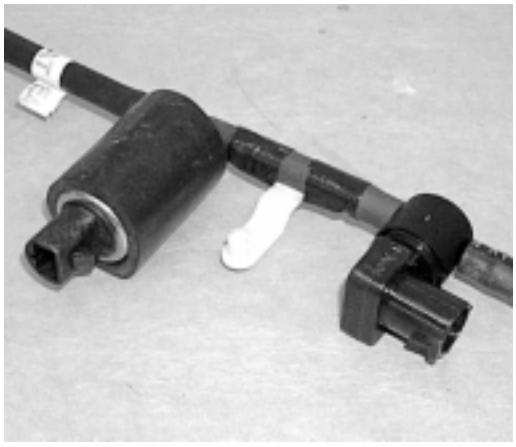
3-61 F-Series Wiring Harness Routing

On 1995 F-series trucks with any code at all, check to be sure the engine wiring harness is routed correctly in its bracket, and that it is not touching the left exhaust manifold.

3-62 OBD II EVAP Codes- Ranger

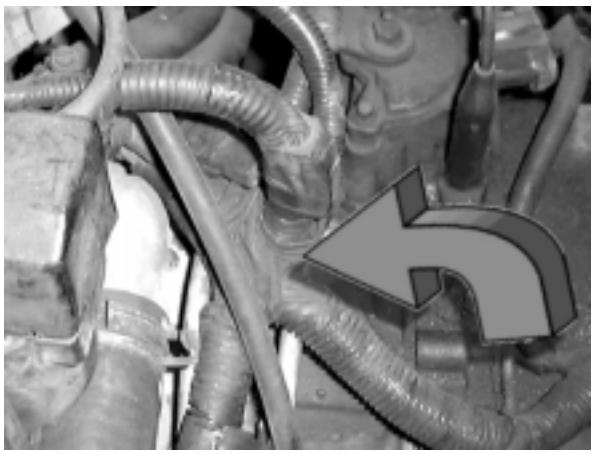
If you are working on an OBD II Ford Ranger with a 2.3 or 4.0 liter engine and you have a trouble code for the EVAP system, the fix will most likely involve replacing the EVAP sensor and valve.

They are sending low voltages.



3-63 Taurus/Sable CTS/TPS Codes

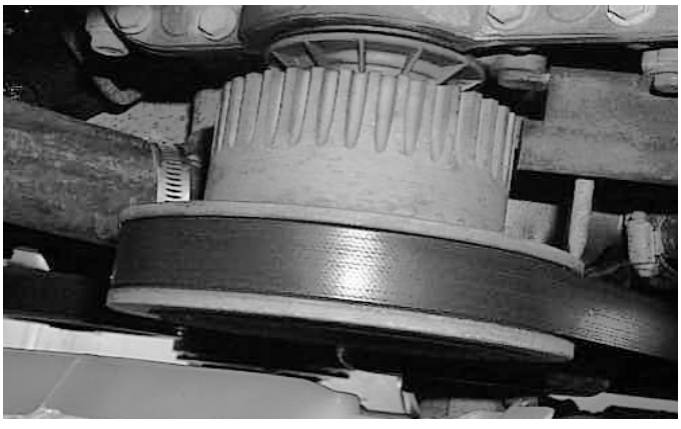
If you have a 3.0 liter Ford Taurus or Sable with a CTS or TPS code, remove the air cleaner box and inspect the PCM harness by the transaxle for chafing.



3-64 4.0L Harmonic Balancer Noise

4.0 liter Ford engines are prone to having their harmonic balancers come apart.

This will cause a very strange rhythmic noise.



3-65 Ranger Spark Knock at Idle

If you run across a Ranger with a 2.3 liter that spark knocks at idle, first check for carbon buildup in the cylinders and a coolant temperature sensor problem. If neither of these conditions is present, replace the PCM.

3-66 2.3 L Topaz Harmonic Balancer Noise

The 2.3 liter Topaz has been prone to have loud harmonic balancers.

3-67 4.6 L Spark Knock

If your 4.6 liter Ford has a spark knock, there is a good chance that the EGR passages are full of carbon and will need to be cleaned.

3-68 OBD II EGR Codes (F-150 and Expedition)

On 97 F-150 trucks and Expeditions with a code PO455, check the vacuum hose harness back by the EGR valve for burning.

3-69 Octane Shorting Bar and Spark Knock

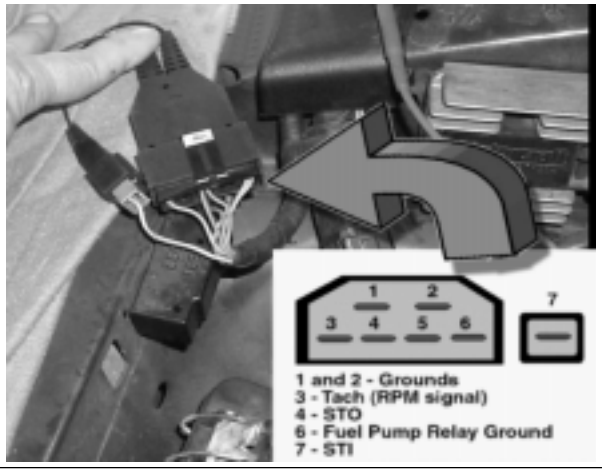
On all 1993 and later Fords that have a tendency to spark knock, remove the octane shorting bar.

This will retard the timing 3 degrees.

3-70 Fix the Connector Before Scanning

You may have to repair or replace the DCL connector on a Ford vehicle to obtain scan tool communications.

The problem is usually a matter of corrosion inside the connectors and wires.



3-71 Locating the Main Computer Ground

On all Ford vehicles, the main computer ground is located directly off the negative battery cable in a large pigtail connector.

This is very prone to corrosion and should be inspected or replaced, if necessary.

3-72 Locating the Computer Power Source

All Ford vehicles use a power relay to supply the 12 volts to the computer and its components. These relays fail with age and begin to supply less then adequate voltage. Be sure to check for proper output voltage.

3-73 Probe M/T Scan Tool Connection- Look for the Single Wire!

Use extreme caution when hooking up your scan tool on a Ford Probe with Manual transmission.

The Probe's single-wire test connector is located near the side of the strut tower, not inside the diagnostic connector.

3-74 Ford Trucks- Plugged Aspirator Affects Cruise

On Ford trucks that slowly lose speed with the cruise control engaged on a hill, try using a paper clip to clean the aspirator exhaust port on the thermactor pump.

These have a tendency to become restricted with debris.

3-75 Taurus Fuel Odor with the A/C ON

If you ever come across a Taurus with a fuel odor smell on hot days with the A/C on, relocate the fuel vapor vent from underneath the rear seats to a location back by the rear bumper.

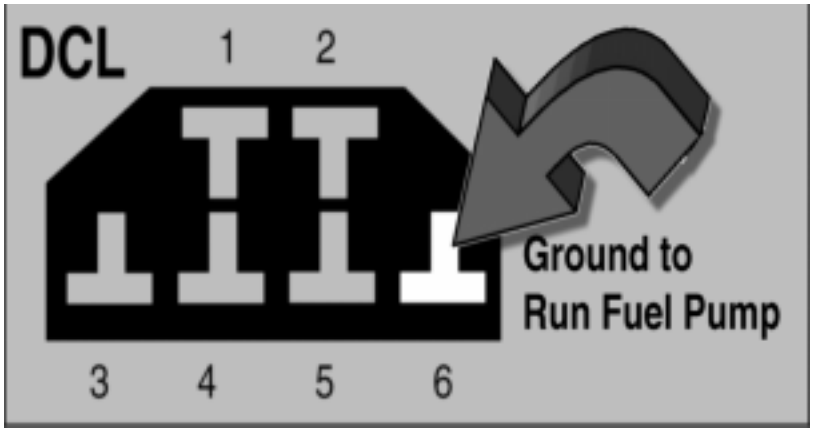
3-76 How to Really Test Power and Ground on a Ford

The best way to test all of the powers and grounds on a Ford vehicle is to place it in **Output Test Mode** with your scan tool.

Then simply perform a voltage drop on the various powers and grounds as the PCM activates various components.

3-77 How to Operate the Fuel Pump

Pin 6 of the Ford DCL test connector is for the fuel pump relay. If, for any reason, you need to activate the fuel pump, simply ground this pin with the ignition on.



3-78 Quick Test for Vacuum Solenoids

If you want to test any device that is controlled by a vacuum solenoid on a Ford, remove the vent cap and place your finger over the bleed hole on top of the solenoid.

This closes the air bleed and applies vacuum to any vacuum-operated device.

3-79 Testing the Ignition Ground Circuit

Be sure to perform a voltage drop test on pin 16 of the computer while cranking. This is the ignition ground circuit located at the module screw connections. If this ground is bad, you will have intermittent misfires.

3-80 Be Careful How You Set Timing

Never set the ignition timing on vehicles that use the TFI module while the crank wire is disconnected from the starter relay. If you've been using a remote starter switch, make sure you have the vehicle starter wire reconnected when you set timing. If you don't, the next time the engine is cranked over, the timing will be retarded during cranking.

3-81 EEC-IV Vehicle Cranks by Itself

If you ever have a Ford EEC-IV vehicle that cranks by itself, check the connector on the TFI module for broken down insulation.

If the wires are touching inside the degraded insulation, you've found the problem.

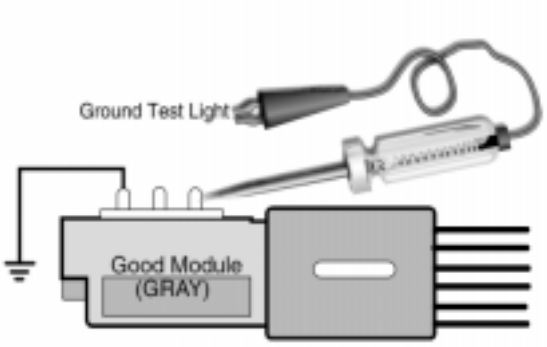
3-82 Correct Coil Current Draw

All Ford coil packs should draw less then 5 amps if they are functioning correctly.

3-83 Testing the PIP Sensor/Module

To test an EEC-IV PIP sensor or module, remove the module from the distributor, but leave the harness connected.

Ground the terminal on the left as shown. Then, with your test light attached to ground, tap the terminal on the right. If you get spark, suspect a bad Hall sensor — if no spark, suspect a bad module or coil.



3-84 Vented Caps and Acid Damage

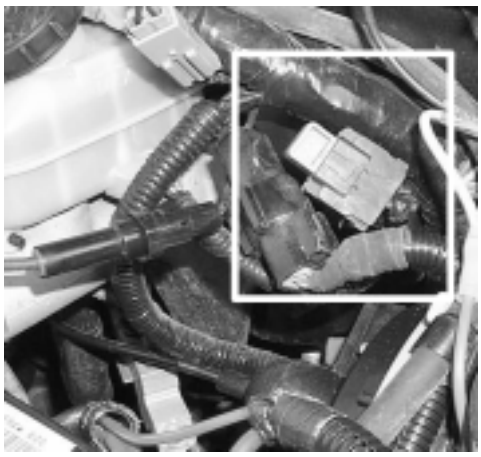
Be sure to use distributor caps that have a vent. This that will allow corrosive nitric acid gases to escape from the cap and also reduce heat.

Acid and heat are what turns PIP sensors into silly putty.

3-85 Octane Shorting Bar

Removing the octane-shorting bar will retard the ignition timing 3 degrees.

(If the vehicle has multiple spark discharge, removing the bar it will turn it into a single spark discharge system.)



3-86 6 and 8-Cylinder Belt Squeal

On all 6 and 8-cylinder trucks with a belt squeal, check to see if the belt wear pattern is located in the center of the water pump pulley.

If it isn't, install the new pulley and bolt kit from Ford.

3-87 Dual Plug Systems Which Plugs Fire When?

On the Dual Plug 2.3 liter engine, the right hand plugs should fire all the time.

Be sure to check for spark on this side of the motor.

3-88 Scoping the Ignition Module

Be sure to inspect the primary waveform on all Ford vehicles.

Any hash in the transistor turn-on area means that the module is about to fail.

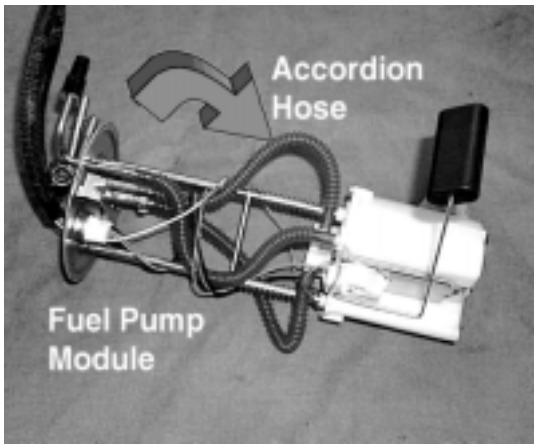
3-89 Throttle Body Systems and Map Sensor Hose Obstructions

On all Fords that have a throttle body injection system, be sure to inspect the MAP sensor hose for cracks or internal carbon build-up.

3-90 When to Replace the Regulator with the Fuel Pump

If are replacing a fuel pump with a new unit that uses an accordion-style pressure plastic hose, be sure to replace the pressure regulator as well.

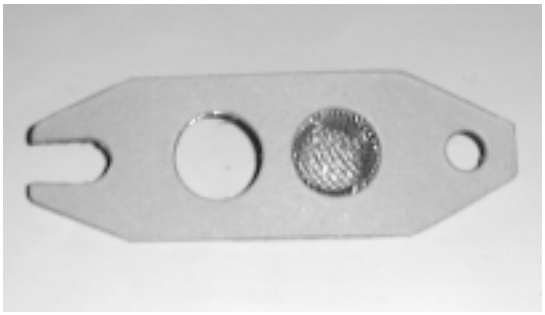
The old regulator operates at a higher pressure and will cause the plastic tube to explode, resulting in a no-start.



3-91 EGR Screen-Type Gaskets

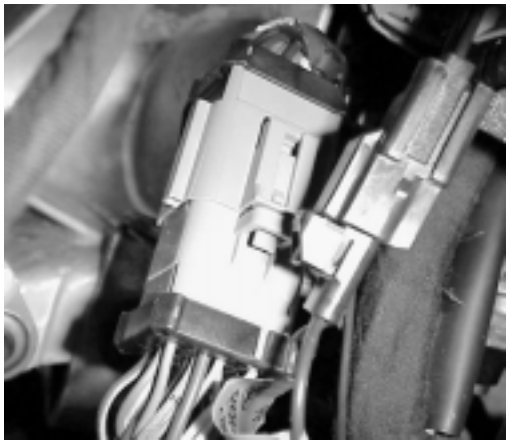
If the vehicle you are working on has spark knock because of a bad or sticking EGR valve and the EGR passages are full of carbon, be sure to install a screen type EGR gasket.

This type gasket will keep a piece of loose carbon from lodging in the valve and holding it open.



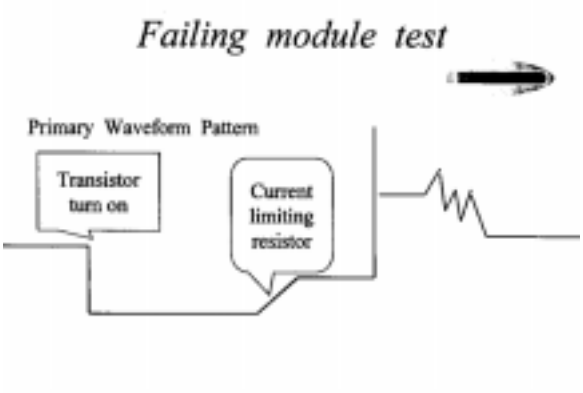
3-92 Aerostar Won't Shut Off

If you ever come across an Aerostar with a manual transmission that won't shut off with the key, or that has flashing dash lights when the clutch is depressed, be sure to check the harness by the clutch pedal for chafing.



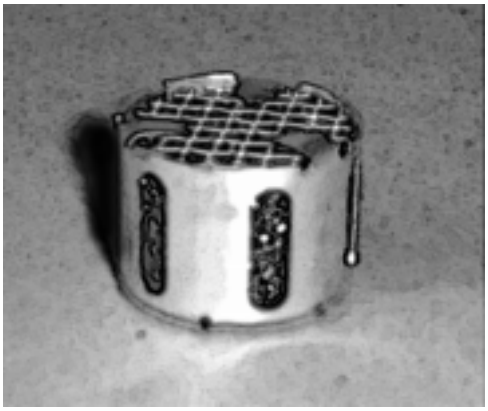
3-93 Current Limiting and Coil Failures

If you have repeated ignition coil failures, be sure to inspect the module's current limiting resistor.



3-94 5.0L Oil Leaks

If you have multiple oil leaks on a 5.0 liter vehicle, suspect a plugged PCV breather, located inside the intake manifold beneath the PCV valve.

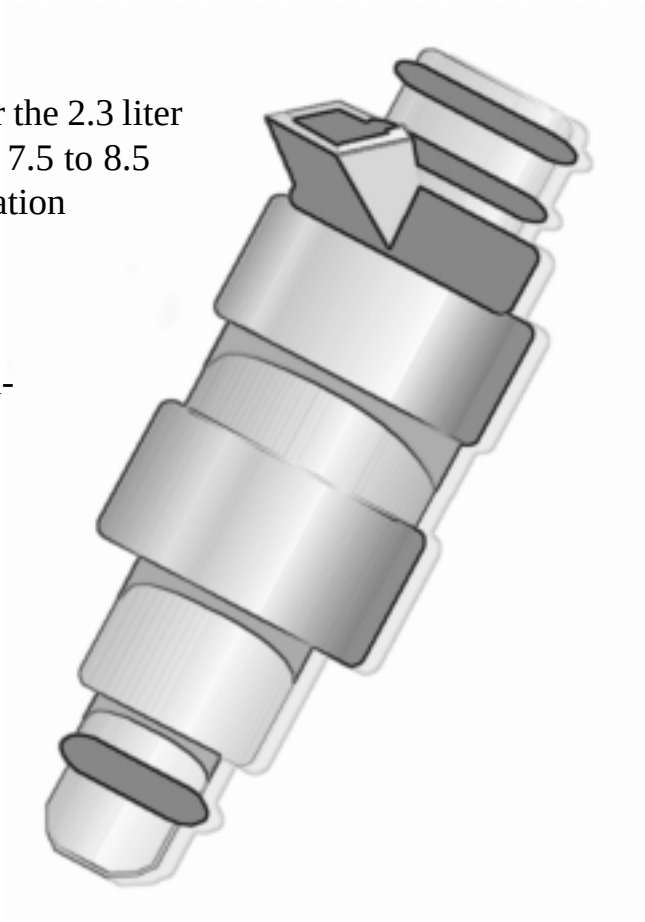


Notes

Ford Injector Quick Tips

The proper fuel injector resistance specification for 1.9 and 2.3 liter turbo vehicles is 2-3 ohms per injector, or 1.5 ohms per pair. Each individual injector should draw between 2-4 amps.

The injector resistance specifications for the 2.3 liter engine are 15-19 ohms per injector, or 7.5 to 8.5 ohms per pair. The amperage specification each injector is 0.5 amp.



Allowable injector resistance for 6-cylinder injectors is 14-18 ohms each, or 4.6 to 6 ohms per bank. The amperage specification for each individual injector is 0.5 amp.

The injector resistance specification for 8-cylinder vehicles is 14-17 ohms each or 3.5 to 4.5 ohms per bank. The amperage reading should be 0.5 amp for each injector.

All resistance values are at room temperature.

Notes

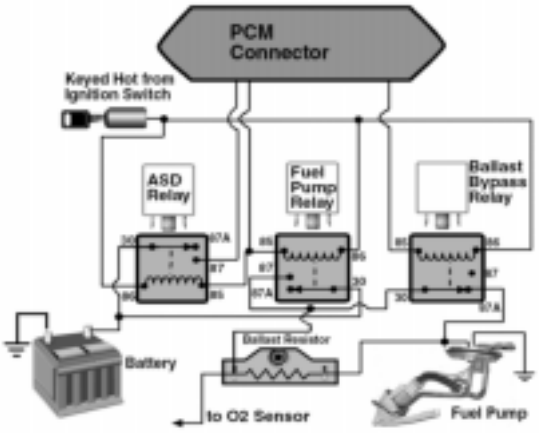
CHAPTER FOUR

Chrysler/Dodge/Jeep

4-1 ASD Relays

All Chryslers get their power for the injectors, fuel pump relay, ignition coils, and the oxygen sensor heaters from the automatic shut down (ASD) relay.

If this relay goes bad, you will have no power to these components. This relay is usually located by the battery.



4-2 Dirty Throttle Bores

The most common cause for hesitation in Chrysler vehicles is dirty throttle plates and throttle bores.

Chrysler recommends using green scotch bright pads to clean the bore.

You can use regular carburetor cleaner to clean the AIS. Be careful, the two AIS attachment screws are really tight!

No-Starts and Anti-Theft

If you have a no-start condition on a Chrysler product, be sure to use your scan tool to check the state of the theft alarm inside the computer. It may be causing the no-start condition.

Frozen Map Sensors and No-Starts

On 2.2 and 2.5 liter engines that won't start in cold weather, inspect the Map sensor voltage. These vehicles have a tendency to have water droplets freeze inside the Map sensor vacuum hose, causing a hard-start and rich running condition.

There is an updated hose with a bleed available from Chrysler.

Shorted Reference Voltage and PCM Shutdown

'87 and later Chrysler vehicles will shut down their computers if the 5 volt reference line becomes shorted ***anywhere*** out under the hood.

When this occurs, you'll also notice that you will have no check engine light.

No-Start Dakotas (Washer Fluid Corrosion)

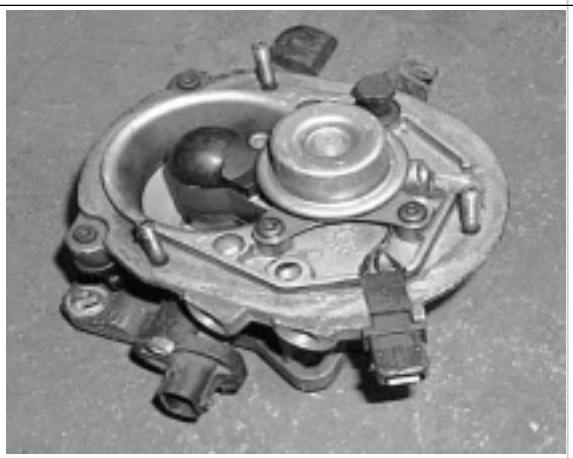
On V-6 Dakotas that have no spark and no fuel pressure, check the red and white wire by the washer bottle. It supplies power to the automatic shut down relay, fuel pump, and the computer.

This wire usually corrodes from the alcohol in the washer fluid.

4-7 No-Start Caused by Bad Injector 2.5L

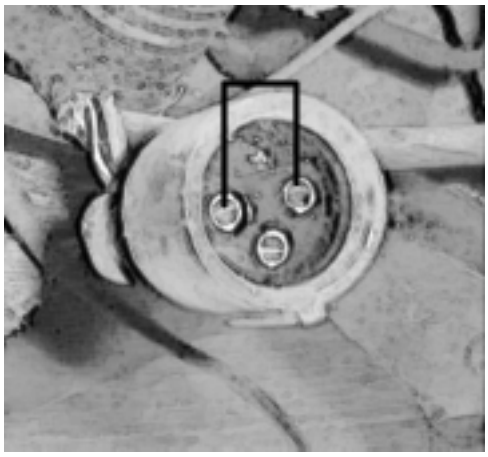
If you have a no-start on a 4-cylinder motor that has good fuel pressure, spark, and injector triggers, suspect a bad injector.

This could also cause a hot cut out complaint, so try heating the injector with a heat gun to simulate a hot failure.



4-8 No-Spark Quick Test

If you suspect that a bad pickup plate is the reason for a no-start on a 2.2 or 2.5 liter Chrysler product, unplug the three-wire connector at the distributor. Insert a paper clip in the two top terminals, then remove it. Every time it is removed KOEO, we should create a spark at the coil wire. If this occurs (and the distributor is turning!) then it is safe to assume that the pickup plate is the problem.



4-9 No-Starts, Erratic Shifts Caused by Corroded EATX Wiring

On electronic transmission vehicles that exhibit transmission problems or no-starts, check for loose or corroded wires at the transmisssion connector.

This can also cause Key-Off battery drains.

4-10 Crank Sensor Looseness Causes Rough Running/Misfire

On all Chrysler V-6 and V-8 engines that mount the crank sensor inside the bell housing: The sensor usually loosens over time causing rough running and misfire.

4-11 3.3L Rocker Pedestal Failures

The 3.3 liter engine is having a tendency to crack the rocker arm pedestal for cylinder # 5.

This will usually emit a clicking sound, and will often be accompanied by a misfire complaint.

4-12 Jeep No-Start from Rear Hatch Ajar (Anti-Theft Override)

On all Jeep products that stall after start up, inspect the rear hatch linkage for any bent components.

This will place the computer into anti-theft mode.

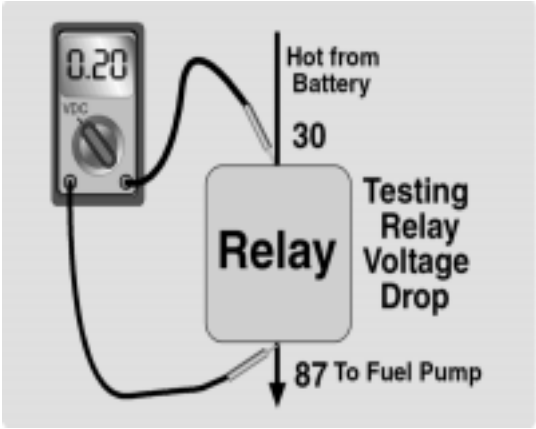
4-13 Jeep Stalling in Drive from Dirty Throttle Bore/AIS

On 6-cylinder Jeeps that stall when placed in gear, try cleaning the throttle bore and AIS assemblies.

4-14 ASD Relay High Resistance 3.3L

On 3.3 liter vehicles that have erratic spark or dim noid lights, check for a bad ASD relay.

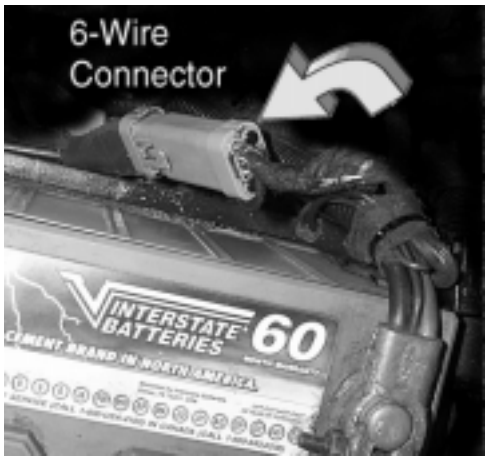
Use a voltage drop test across the relay as shown, or remove the relay and install a fused jumper wire across terminals 30 and 87 in the relay socket to see if the problem goes away.



4-15 3.3L No-Spark or Scan Tool (Corroded 6-Wire Harness)

On 3.3 liter vehicles that have no spark and no scan tool communication, check the 6-wire harness located by the battery.

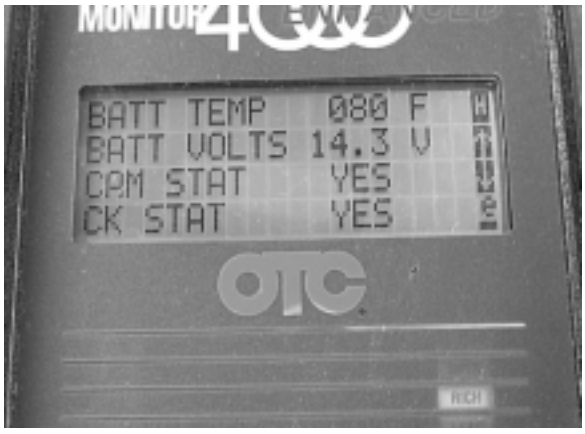
This is the computer harness and it has a tendency to corrode.



4-16 3.3L No-Starts from Missing Cam or Crank Signal Sensor Inputs

On 3.3 liter no-starts, check scan data for **YES** on both cam and crank signals.

Whichever is missing is the sensor or sensor circuit you should suspect!



4-17 3.5L Valve Timing and Flashing Cruise Control Light

On all vehicles with the 3.5 liter engine that have the cruise control light flashing, check the valve timing.

4-18 3.5L Stuck in Second Gear

If you have a 3.5 that is stuck in second gear, check the transmission harness by the steering rack inner tie rod end.

The harness may have slipped out of its bracket by the EGR valve and become pinched.

4-19 Restricted Map Hoses on 5.2L Trucks (Rich Exhaust)

On all 5.2 liter trucks with a code for rich exhaust or MAP sensor, remove the MAP sensor hose and make sure it is not restricted.

4-20 Concorde Ground Problems (Multiple Symptoms)

On Chrysler Concordes with multiple electrical problems, suspect bad grounds at either the left front or the right front frame rail grounding locations.

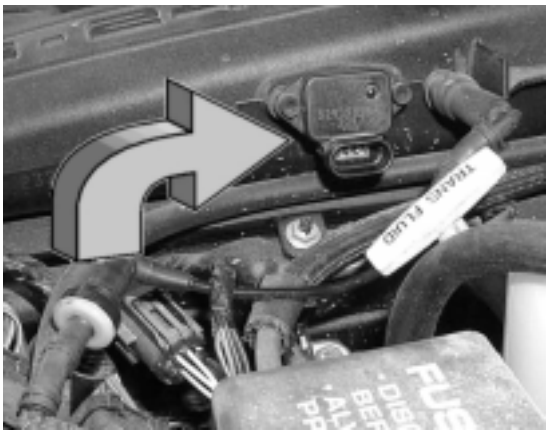
Any and all electrical complaints can originate from these two locations.

4-21 Combined MAP/IAT

Chrysler uses a combined MAP/IAT sensor on some engines.

This is a four-wire sensor. The IAT receives a 5-volt reference from the PCM on one wire. The MAP receives a separate 5 volt refence on a second wire and returns a variable voltage to the PCM based on manifold pressure.

The two sensors share a common ground.

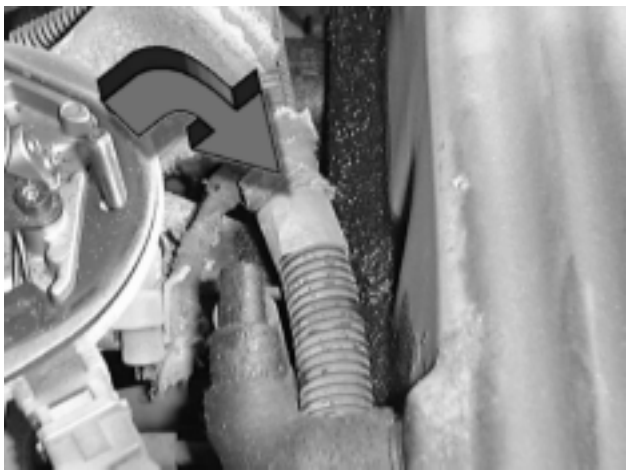


4-22 2.2 and 2.5 Stall Hot from Bad Injector

On all 2.2 and 2.5 liter engines that stall out hot, even though they have fuel good pressure and plenty of spark, suspect a faulty injector.

4-23 2.2 and 2.5 L Stall from Damaged Harness

On all 2.2 and 2.5 liter engines that have a tendency to stall randomly, inspect the wiring harness between the valve cover and the throttle body assembly for chafing.



4-24 Misfire Caused by Loose Distributor Shutter Plates

Intermittent misfires on a 2.2 or 2.5 liter engine may be caused by loose distributor rotor shutter plates.

4-25 3.3L Misfires Caused by Fuel Lines

If you have an intermittent misfire on a 3.3 liter engine, Chrysler has a TSB concerning the replacement of the fuel lines.

4-26 Stalling/No-Fast Idle Quick Test

On 4 and 6-cylinder vehicles with no fast idle or stalling complaints, remove the air cleaner duct and place tape over the idle air bleed. If the idle returns to normal, you will need to replace the Idle Air Control solenoid (IAC).

Each of the 4 windings in the IAC should have 29 ohms of resistance.

4-27 2.2 and 2.5L Rough Running from EGR Cross Leakage

On all 2.2 and 2.5 liter vehicles that run rough, inspect the EGR valve assemblies for cross-leakage.

These valve usually corrode to a point where they create a vacuum leak.

Wiggle them with your hand at idle.

4-28 Rough-Running 2.2L Holley Quick Test

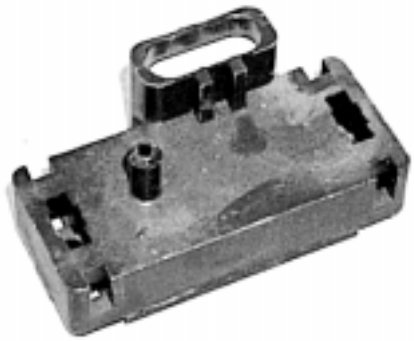
On all 2.2 liter engines with Holley 2-barrel carburetors that run rough, place your finger over the small bleed hole next to the choke plates.

If the engine smooths out you will need to rebuild the carburetor and adjust the fuel mixture.

4-29 No-Starts and Failed Map Sensors

If you have a Chrysler product that will not start, try unplugging the Map sensor electrical connector and try again to start the engine.

If the engine starts with the connector unplugged, suspect a bad Map sensor.



4-30 VSS Trouble Code 1993-94 Shadows

On 93-94 Shadows and Sundances with a 3.0 liter engine and a trouble code for the VSS circuit, you should remove the battery and inspect the 2 wire IOD (ignition off draw) connector for corrosion.

If corroded, re-solder the wires and retest for codes.

4-31 Fuel Pump Access LH

The LH body style has a fuel pump access under the trunk mat.

4-32 Moisture and Map Sensor Codes

On any Chrysler product that has a MAP sensor code, or runs poorly at temperatures below 32 degrees, check for moisture in MAP sensor vacuum hose.

If moisture is found, install a bleed, available from the dealer.

4-33 3.5L Misfire from Intake Gasket Leak

The 3.5 liter engine is sucking in the lower intake gasket by cylinder number 5.

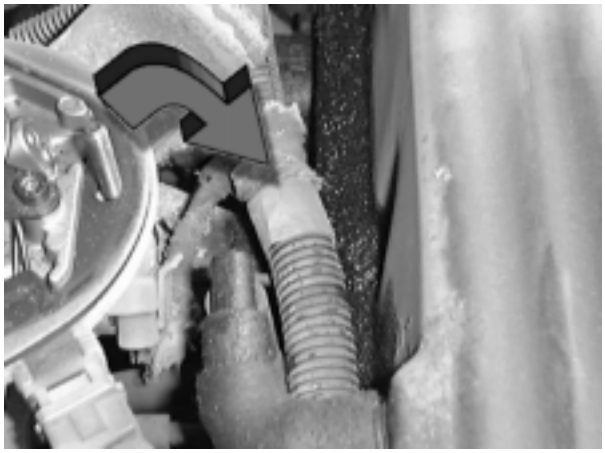
This will cause a misfire.

4-34 3.3L Minivans Need Reprogramming (CEL with No Code)

On all 3.3 liter Minivans that have a check engine light on with no codes stored in memory, you will have to send it back to the dealer so they can selectively reprogram the EGR monitor inside the computer.

4-35 2.2 and 2.5L Wiring Harness Damage (Stalling)

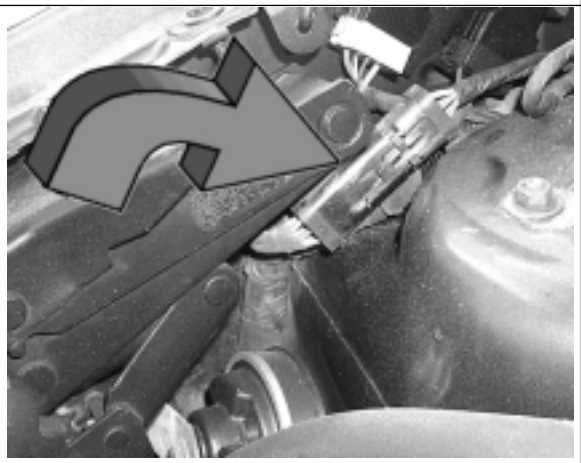
On all 2.2 and 2.5 liter engines that have any code at all, inspect the wiring harness between the valve cover and the throttle body unit for chafing.



4-36 Corroded ABS Connector

On early 90's minivans with the ABS light on, check the air bag harness connector near the right strut tower for corrosion.

Be sure to disconnect the battery cable before working on the air bag system.



4-37 Substituted Values on Scan Tool

Chrysler will use a substituted value for any sensor that fails out of range.

Be sure to view the Sensor Test menus inside your scan tool to get accurate sensor data.

4-38 On and Off Cruise Operation (Faulty Servo)

On all Chrysler vehicles that have the cruise control shut off after 20-30 minutes of drive time, suspect a bad speed control servo.

Check with your local dealer for any parts supersessions that may apply.

4-39 Inop Cruise? Check Brake Lights

If you have a minivan with inoperative cruise control, check the rear brake lights.

4-40 High NOx and Ignition Timing

If the Chrysler vehicle you are working on has either a spark knock condition or a failed NOx emissions complaint, we are told from Chrysler to make sure that the proper base timing has been set. Then we should retard the timing by 4 degrees.

Notes

Chrysler Injector Quick Tips

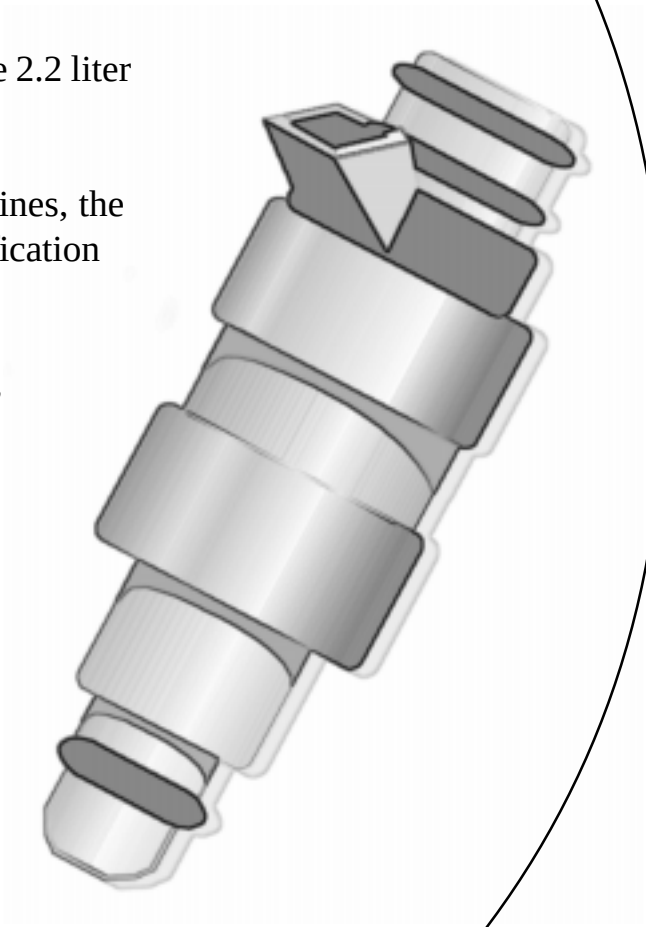
Maximum allowable injector resistances for all 4-cylinder turbos and all 6-cylinder vehicles up to 1992 is 2.4 ohms.

Maximum injector resistance for the 2.2 liter engine is 7 ohms.

On 1986-1987 2.2 and 2.5 liter engines, the allowable injector resistance specification is 95 ohms.

On all 87 and later 2.5 liter engines, the allowable injector resistance specification is 1.3 ohms.

Chrysler does not recommend cleaning the injectors on vehicles with high mileage because they could start leaking after the cleaning process.



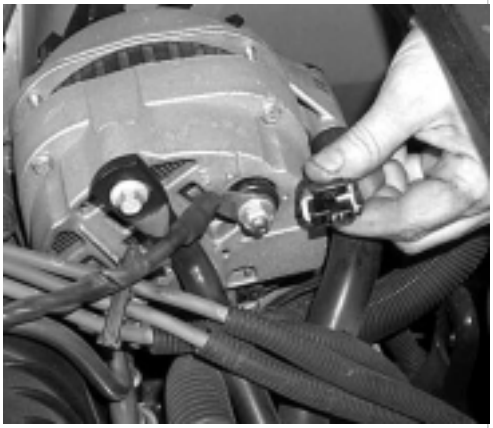
CHAPTER FIVE

Charging Systems

5-1 Two-Wire Alternator Connectors

A quick circuit wiring test can be performed on most standard 2-wire internal regulators by probing the disconnected regulator harness KOEO. You should have 12 volts on the positive stud and also at one of the two terminals at the regulator connector.

The other terminal should dimly light the test light.



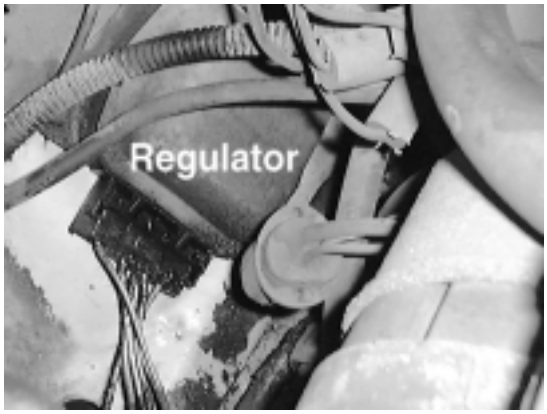
5-2 Drop the Subframe to Replace 3.4L Alternators

You can save time replacing the alternator assembly on a GM 3.4 liter engine if you loosen the subframe.

Make sure you properly support the powertrain assembly, and use **extreme** caution when removing any subframe fasteners!

5-3 Corroded Yellow Lead on Ford External Regulator

If the Ford vehicle you are working on has an external regulator, be sure that the yellow lead has not corroded apart from the regulator connector.



5-4 Frame Rail Harness Damage - Ford

Make sure you inspect the alternator harness connector that is usually found on the frame rail of most Ford vehicles.

It has a tendency to corrode and cause poor connections.

5-5 High Current Connector for Ford Internal Regulators

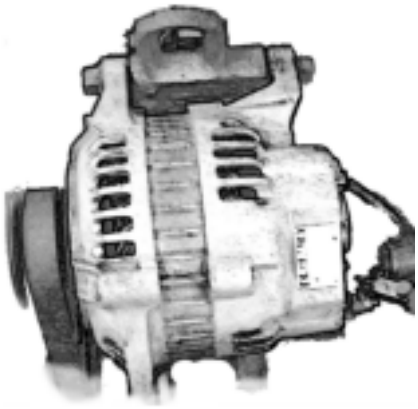
Be sure to replace the connector for the high current circuit found on the new Ford alternators equipped with an internal regulator. This connector will have a tendency to burn unless the connection is very clean.

5-6 SHO Harness Damage Causes No-Charge

If you have a 6 cylinder Taurus SHO model that will not charge, be sure to inspect the alternator harness for chaffing by the front of the radiator fan. When the clips break it allows this harness to engage the cooling fan fins.

5-7 Probe Alternator Pulley

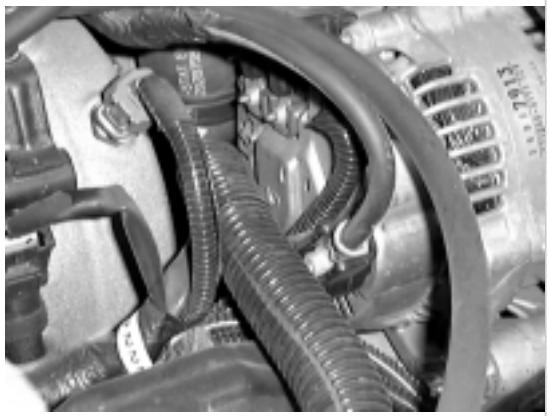
If you have a lack of charge condition on a Ford Probe especially in city traffic with a lot of loads on, you will need to replace the alternator's pulley with an updated kit from Ford which will allow the alternator to spin faster causing a higher output.



5-8 Chrysler Computer-Controlled Charging

Chrysler has placed the voltage regulator inside the PCM since the late 80's. If you have a no-charge in a Chrysler product, you must determine if the regulator is working or not.

You can full-field the alternator using ATM tests in your scan tool. If the alternator charges when full-fielded through ATM, the computer is bad.



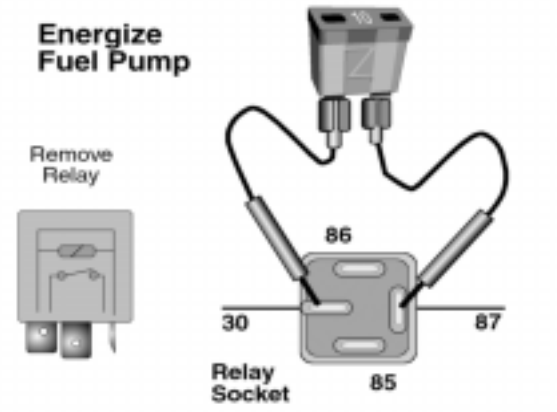
CHAPTER SIX

Cool Tools

6-1 Fused Jumper

If you do a lot of electrical work, be sure to make yourself a fused jumper wire and a fused test lead for you amp meter.

I am sure we have all had to replace the amp fuse in our digital volt ohm meter and we all were probably shocked when we heard the price.



6-2 New Use for Old Extension Cords

You can use the mail end of a common household extension cord to test ISO relay circuits on most vehicles. Cut about six inches of wire from the male end of an extension lead. Then wire a switch across the two leads. Take one of the male spades and turn it 90 degrees. Now, when you place this tool across pins 30 and 87 in an ISO relay socket and close the switch, the load device controlled by the relay should operate. Cool.