ENGINE CONTROLS AND FUEL SYSTEMS

Spring 2000

TechPro Bulletin

READER INPUT REQUESTED

We try our best to make sure that our tech tips remain interesting to you, and, we would like to keep it that way. One way of doing that is to get some input from you. If there are any subjects that you would like to see discussed in future articles, please give us your suggestions. Just mail your request to

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FORDS W/ EEC IV SYSTEM- CAR RUNS POORLY, SCANNER DISPLAY IS BLANK

The vehicle symptoms include: poor running, Check Engine light illuminated, and the scanner display becomes blank when it is connected. It's no secret that all power and ground circuit integrity is critical for a computer controlled vehicle to operate properly, and Fords are no exception. A large number of sensors (such as: the Throttle Position sensor, Manifold Absolute Pressure sensor, Coolant Temperature sensor, and the Manifold Air Temperature sensor) are grounded at pin # 46 of the ECM. Even one of the terminals of the diagnostic connector is grounded at pin # 46 *(see diagram #1)*. This ground circuit is controlled through the ECM. The only time the ground is provided is when the ignition key is in the "On" position. When this ground circuit has a large enough voltage drop (that's over .050volts, or 50 millivolts), the voltage signals provided by certain sensors, which the ECM is using to control

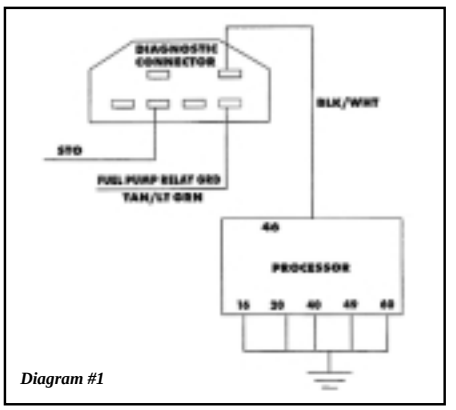

Diagram #1

fuel delivery and spark advance, will be incorrect, creating driveability problems and scanner communication problems. In addition to checking pin # 46 it's important to check the other grounds as well when diagnosing intermittent driveability problems. These grounds are also located at pin #'s: 16, 20, 40, 49, and 60.

Scott Milch- Standard Plus Technician

The air flow sensor contains a switch which grounds the windings of the circuit opening relay (or fuel pump relay). If you unplug the airflow sensor and the pump stops running, you're on the right track *(see diagram # 2)*. The only time the airflow sensor grounds the relay is when the sensor plate is open. If the fuel pump runs constantly when the key is on, and the engine is not running, then this indicates that the flap in the sensor is stuck open. Carefully inspect the sensor for binding. This would also explain the rich running condition. The air flow sensor, being out of position, is misleading the ECM into thinking that the engine is under load, which would cause the ECM to add fuel unnecessarily, resulting in an over rich condition. Outside of cleaning, no other repair is recommended other than replacement of the sensor.

Pat Sugar- Top GunTechnician

RICH RUNNING TOYOTAS

If you come across a Toyota with a vane type airflow sensor and the customer is complaining of black smoke out of the tail pipe and poor fuel economy, check for a binding airflow sensor plate. A lead into solving this problem would be that the fuel pump is running constantly when the ignition key is in the "On" position.

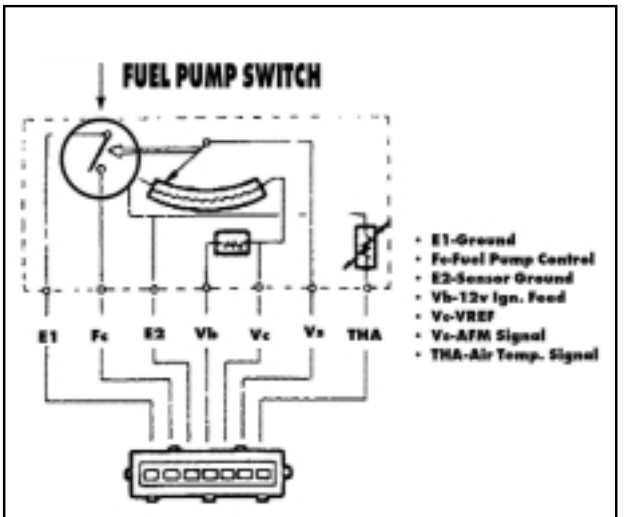

Diagram #2

GM VEHICLES CODE 43- ELECTRONIC SPARK CONTROL SYSTEM

This tip concerns itself with those systems that do not use an external spark control module. Unlike the ESC systems that use an external module, this system can set a code 43 immediately after starting the engine.

In order for the ECM to detect engine detonation, it must be connected to a knock sensor. In order to verify knock sensor circuit integrity, the ECM supplies a 5 volt reference signal. The knock sensor has an internal resistance range of 3.8K ohms to 4.8K ohms. This resistance will lower the 5 volt reference signal to approximately 2.5 volts. If the DC voltage drops lower than 1.25 volts or rises higher than 3.75 volts, a voltage comparator in the ECM causes a code 43 to set.

Failure mode includes: no ignition timing retard when the engine detonates, and less spark advance timing during light throttle loads. It is possible to install the incorrect sensor since they look the same. If you install a sensor with a higher resistance, it will change the voltage reading to be out of specification, and cause code 43. Also, make sure the sensor is properly torqued to 14 ft-lbs. If the sensor is not properly tightened, its sensitivity will be affected.

Jeff Auerbach-Domestic Specialist

MAZDA 626-1988 TO 1992 W/ 2.2L ENG.- NO START, HARD START, STALLING, &/ OR SURGING

These symptoms are created as a result of a lean condition. Normally, air flows through the Air Flow meter, then through the Air Induction tube to the throttle body. If you examine the bottom of the air tube, you will see a short section of tube leading into a large plastic box called a Resonance Chamber *(see diagram # 3)*. The purpose of this chamber is to dampen the pulses generated by the four cylinder intake, so the Air Flow meter has a smooth signal. Old age usually takes its toll on plastics. Also, if the engine should backfire,

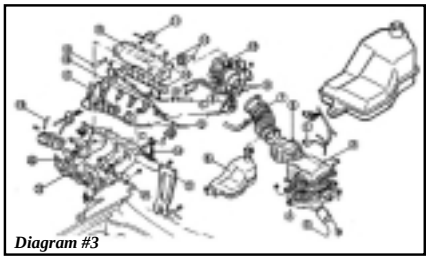

Diagram #3

this chamber may rupture or crack. The size of the crack determines the severity of the driveability problem. What usually happens is that the Resonance Chamber splits along the seam, which makes it difficult to notice. Taping or using epoxy to repair the crack usually solves the problem temporarily. The only recommended fix is to replace it.

Kerry Jonsson-Asian Specialist

DODGE DAKOTA 1991-95 - NO START, INTERMITTENT STALLING

The problem may be a no start, or an intermittent stall with a hard start. This symptom is caused due to no power to the ECM's memory circuit and to the ASD and fuel pump relays.

The power to the ASD and fuel pump relays are supplied by the 30 amp maxi fuse "D", which is located in the engine compartment power distribution center. Power to the ECM is then routed through a splice *(designated as "S115"-see diagram #4)* , Which is located in the main computer harness which is on the driver's side inner fender well. Checking the integrity of this splice first could be a time saver. The plastic which covers this splice has a tendency to collect moisture, salt, etc.

(Continued on next page)

SUBARU-1989 TO 1993 W/1.8L ENG.- NO START

If you are working on an '89 -'93 Subaru L series or Loyale with a 1.8L single or multi-point fuel injection system that's a no start, has spark and fuel injector pulse, but no fuel pressure, here's something to keep in mind. Before investigating the fuel pump circuit, please be aware that most wiring diagrams for these vehicles indicate that the blue and black wire from the fuel pump relay coil is grounded by the ECM. That would be at pin #47 for the single point injection system, and pin #6 for the multi port system. This is true for vehicles that do not have automatic shoulder belts.

For models equipped with automatic shoulder belts, the fuel pump relay's winding is grounded by a Revolution Sensor or fuel cut unit. This unit is similar in operation to the fuel pump relay used on many European models *(for example, Volkswagon)*. When this unit receives a tach signal from the ignition coil negative terminal, it grounds the blue and black wire, thus energizing the relay. The Revolution Sensor is usually located just above the hood release cable handle. Refer to the chart for proper operating voltages.

Peter McArdle- Aisian Specialist

IGNITION KEY POSITION

WIRE COLOR	KEY "ON" (ENGINE OFF)	ENGINE RUNNING	ENGINE CRANKING
BLUE/BLACK	battery voltage	grounded	grounded
GREEN/WHITE	battery voltage	battery voltage	battery voltage
BLACK/WHITE	0 volts	0 volts	battery voltage
BLACK *(this is a constant ground)*	less than .050 volts	less than .050 volts	less than .050 volts

YELLOW - *tach signal from ignition coil negative.*

(Continued from page 2)

which leads to corrosion of this splice, cutting power to the ECM. This splice is a problem which needs to be repaired and protected to prevent another failure.

Phil Austin-Chrysler Specialist

This problem may be seen in carbureted or fuel injected vehicles. Although the problem seems confusing at first, the fix is quite simple both in diagnosis and repair. The only tool required is a vacuum gauge with a "tee" fitting.

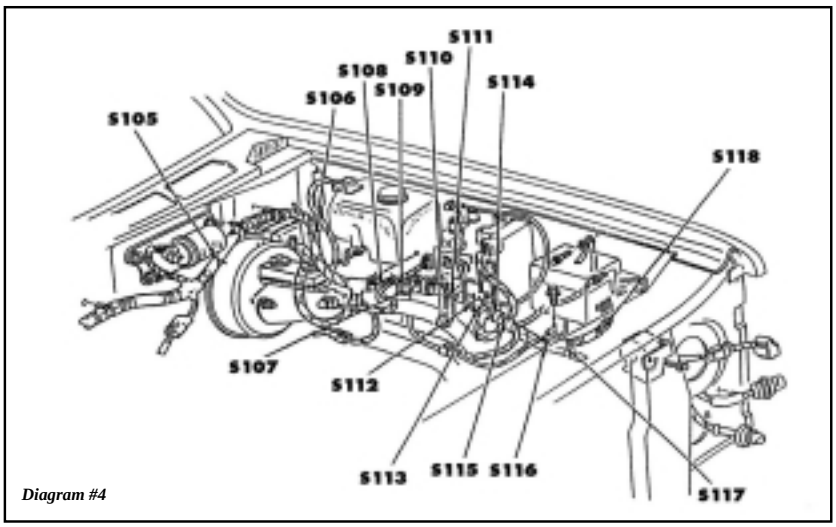

Diagram #4

HONDA VEHICLES- ENGINE SURGE AT STEADY SPEEDS

A common Honda owner complaint is an engine surge that occurs while the vehicle is at a steady speed, while being non-existent at idle and when under load.

Honda feedback carburetor systems control their fuel mixture by creating different amounts of vacuum leaks. The larger the leak, the leaner the mixture. The reverse is also true. The smaller the leak, the richer the mixture. This is accomplished by the operation of vacuum diaphragms called air control valves with pulsed vacuum control signals. These vacuum signals are produced by electric vacuum solenoids called frequency solenoid valves, which are controlled by the ECM based on oxygen sensor readings. Honda realized early that load conditions affected manifold vacuum directly. This being the case, it makes it difficult to control a system with vacuum if the vacuum supply is constantly changing. In order to solve this problem, Honda uses a vacuum regulator which it calls a constant vacuum valve, or, a constant vacuum control valve. In using this, Honda was able to control their feedback systems under various load conditions. Similar strategy is used on the fuel injected models for EGR control.

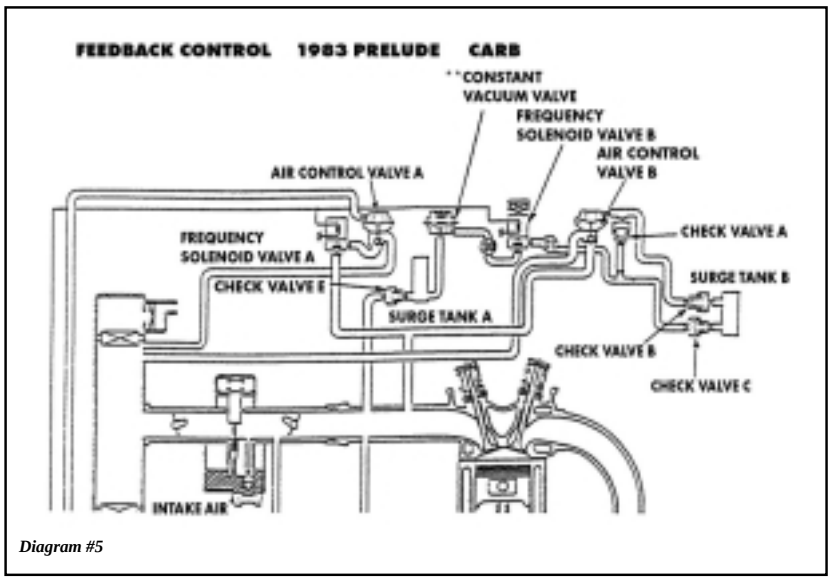

Diagram #5

If a constant vacuum valve fails where the vacuum control valves are exposed to full manifold vacuum, surge conditions can arise when the vacuum signal changes too quickly. If the valve fails where the control valves see no vacuum at all, few driveability problems would result, however, emissions and fuel economy will change for the worse.

Diagnosis can be accomplished by installing a vacuum gauge between the constant vacuum valve and the control solenoid it supplies. Carbureted vehicles should have a regulated vacuum range of 3. 9 to 7. 9 inches, while fuel injected vehicles should measure about 8 inches. Regardless of the system you are checking, the vacuum reading should be steady. If you have determined that the vacuum readings are out of specification, then replacement of the valve is necessary. These units are normally located in the emissions control box which is in the engine compartment *(see diagram # 5).*

James D'Anna- Top GunTechnician

GM- FULL SIZE TRUCKS- 1996 AND LATER- CHECK ENGINE LIGHT

You may encounter a late model GM truck with constant Check Engine light. Diagnostics reveal a rather long list of codes which include: P0102 (MAF low),

P0135, P0141, P0147 (Heated O2 sensor), P0340 (Cam Sensor circuit). In fact, you may find any number of EGR, Heated O2 sensor, EVAP system, or MAF codes stored. Before doing any diagnostics, record any codes and freeze frame info. Next, clear the ECM memory. If code P0102 returns immediately when you turn the key on, check for a blown ENG. 1 fuse in the under hood electrical center. This fuse supplies battery power to the: oxygen sensor heaters, EGR valve, cam position sensor, EVAP solenoid, MAF sensor, as well as the ECM. Oddly enough, even though this fuse supplies power to the ECM, if this fuse is blown, it will not prevent the vehicle from starting.
Code P0102 (MAF low) is the only code that will reset immediately because it is the only circuit that is monitored in the "key on" position. What usually causes this fuse to blow is a failure of one of the heated O2 sensor connectors which allows moisture and/or corrosion to cause a short.

Joe Dantuono- GM Specialist

CROSSED CONNECTORS- ALL VEHICLES

We have seen this scenario all too often, where a vehicle is brought in with a driveability problem where every thing "seems to be OK". Well, if everything was OK there would not be a problem. Testing of the basics usually leads to nowhere. All we know is that the vehicle is not running correctly. What usually happens after spending much time investigating, is that we discover that two connectors that look similar have been crossed. Which means that the two devices that they are connected to are not functioning correctly. This is usually the result of someone doing some work to the vehicle before you get it. It is helpful to ask the customer if any work has been done to the vehicle prior to the problem appearing. It's amazing what you could find out if you ask, because customers may not think it's important to tell you, or, they just completely forgot about it.That is something that you don't have control over. What you do have control over is to make it imperative to mark EVERY connector that you disconnect when working on a vehicle so that there is no mistake. It's also advisable to make a list of all of the connectors, with its location, that have been disconnected. This way, when it's time to put the vehicle back together, you eliminate the possibility of an unnecessary comeback. Some may say "Well, it takes too much time!" Try timing yourself. It shouldn't take more than a few minutes. As opposed to spending hours on a comeback. You wouldn't believe how many times we've seen this problem.

John Rogers- Domestic Specialist

MITSUBISHI-1995 ECLIPSE W/ 2.0L ENG.- TIMING BELT TIP

Use caution when servicing the camshaft sprockets or timing belt on the '95 Eclipse with the 2.0L non-turbo engines. Some of these engines have two timing marks on each cam sprocket. When installing the timing belt, set the crankshaft sprocket to TDC by aligning the mark on the sprocket with the arrow on the oil pump housing. Next, set the camshafts' timing marks together by aligning the marks on the sprockets. Make sure to use the mark that is closest to the "609" designation on the gear. DO NOT use the mark that is closest to the "2.0 L front" designation. Engine damage may result if the cams are incorrectly set.

Richard Mooers- Aisian Specialist

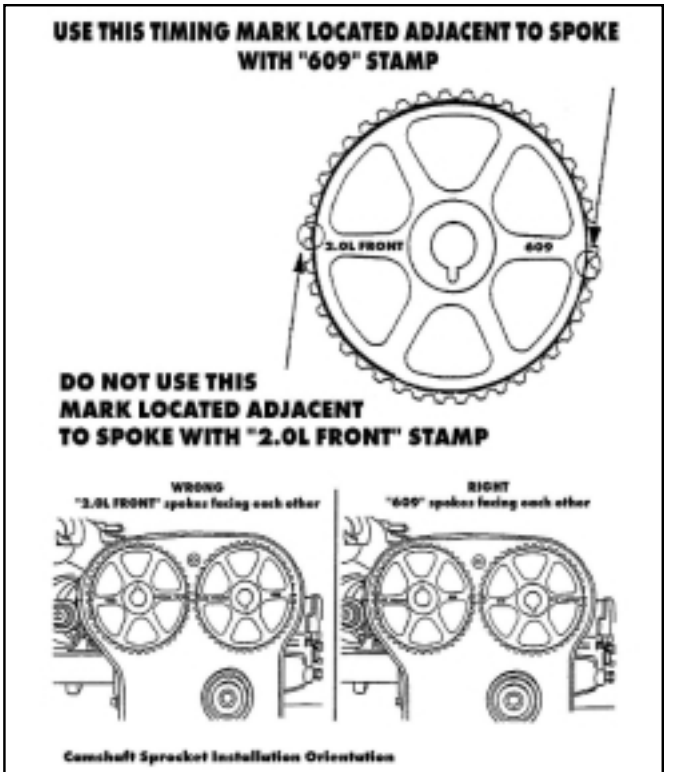

Diagram #6