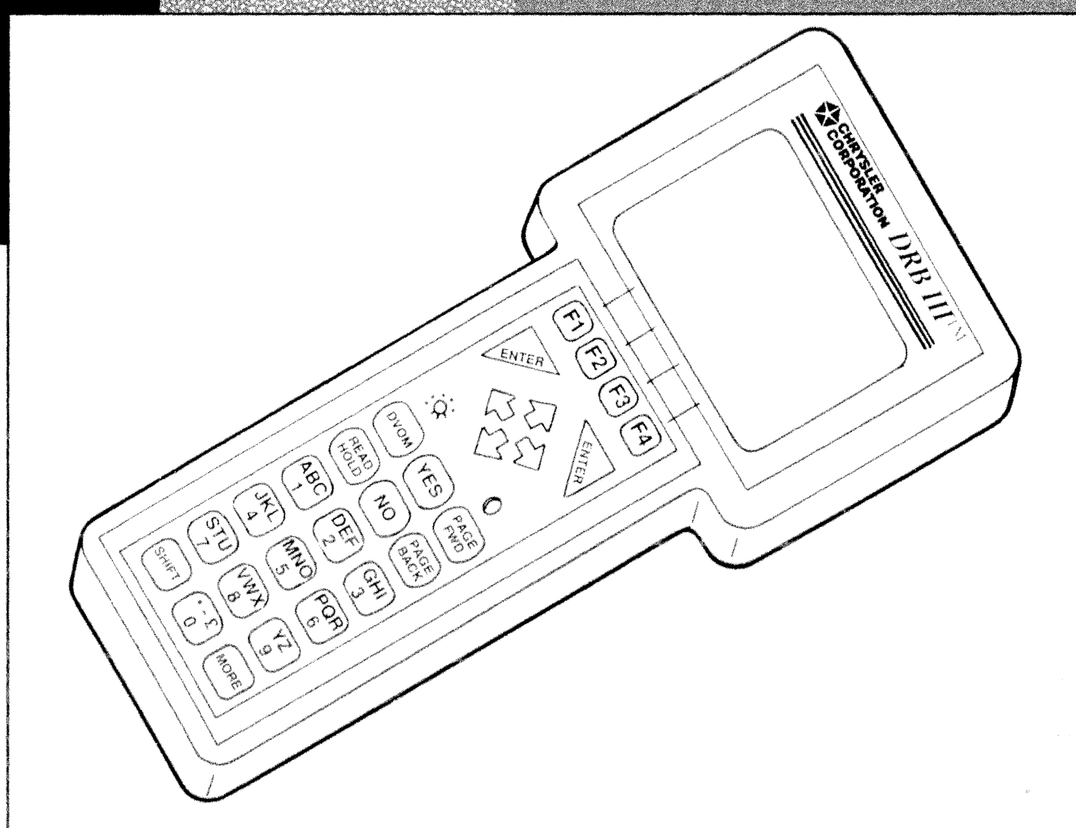
1995 Eagle Talon

On Board Diagnostics



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Student Reference Book

SAFETY NOTICE

This publications purpose is to provide Technical Training information to individuals in the automotive trade. All test and repair procedures must be performed in accordance with manufacturers service and diagnostic manuals. All ***warnings, cautions,*** and ***notes*** must be observed for safety reasons. The following is a list of general guidelines:

- Proper service and repair is critical to the safe, reliable operation of all motor vehicles.
- The information in this publication has been developed for service personnel, and can help when diagnosing and performing vehicle repairs.
- Some service procedures require the use of special tools. These special tools must be used as recommended throughout this Technical Training Publication, the Diagnostic Manual, and the Service Manual.
- Special attention should be exercised when working with spring-or tension-loaded fasteners and devices such as E-Clips, Cir-clips, Snap rings, etc., careless removal may cause personal injury.
- Always wear safety goggles when working on vehicles or vehicle components.
- Improper service methods may damage the vehicle or render it unsafe.
- Observe all ***warnings*** to avoid the risk of personal injury.
- Observe all ***cautions*** to avoid damage to equipment and vehicle.
- ***Notes*** are intended to add clarity and should help make your job easier.

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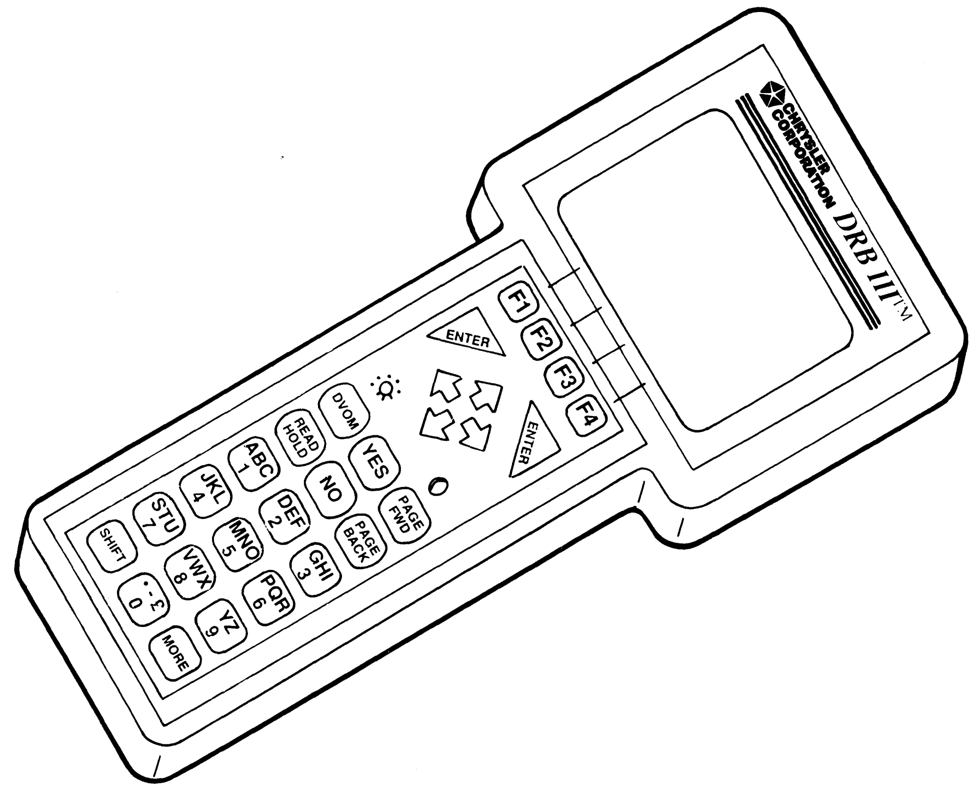
On-Board Diagnostics



On-Board Diagnostics

On-Board Diagnostics

TABLE OF CONTENTS

On-Board Diagnostics

Table 1 Diagnostic Trouble Code Descriptions

Flash Code	J 2012-Code*	MIL On OBDII?	Diagnostic Trouble Code Text	See Page	Non-OBD II 1995 Talon ATX	MIL ON? 1995 Talon ATX (OBDI)
11		No	No Crank Reference Signal at PCM	51	Yes	No
11	P 1390	Yes	Timing Belt Skipped 1 Tooth or More	52	Yes	No
11	P 1391	Yes	Intermittent Loss of CMP or CKP	51	Yes	No
12		No	Battery Was Disconnected (Flash Code Only)	54	Yes	No
13	P 1297	Yes	No Change in MAP From Start to Run	54	Yes	Yes
14	P 0107	Yes	MAP Sensor Voltage Too Low	56	Yes	Yes
14	P 0108	Yes	MAP Sensor Voltage Too High	56	Yes	Yes
15	P 0500	Yes	No Vehicle Speed Sensor Signal	57	Yes	Yes
16	P 0325	No	Knock Sensor #1 Circuit (Talon Only)	59	Yes	No
17		No	Engine Is Cold Too Long	60	Yes	No
17	P 0125	Yes	Closed Loop Temp Not Reached	60	No	No
21	P 0134	Yes	Upstream O2S Stays at Center	61	Yes	Yes
21	P 0133	Yes	Upstream O2S Response	15	No	No
21	P 0139	Yes	Downstream O2S Response	15	No	No
21	P 0135	Yes	Upstream O2S Heater Failure	20	No	No

Flash Code	J 2012-Code*	MIL On OBDII?	Diagnostic Trouble Code Text	See Page	Non-OBD II 1995 Talon ATX	MIL ON? 1995 Talon ATX (OBDI)
21	P 0141	Yes	Downstream O2S Heater Failure	20	No	No
21	P 0132	Yes	Upstream O2S Shorted to Voltage	62	Yes	Yes
21	P 0138	Yes	Downstream O2S Shorted to Voltage	62	No	No
22	P 0117	Yes	ECT Sensor Voltage Too Low	63	Yes	Yes
22	P 0118	Yes	ECT Sensor Voltage Too High	63	Yes	Yes
23	P 0112	Yes	Intake Air Sensor Voltage Low	66	Yes	Yes
23	P 0113	Yes	Intake Air Sensor Voltage High	66	Yes	Yes
24	P 0122	Yes	Throttle Position Sensor Voltage Low	68	Yes	Yes
24	P 0123	Yes	Throttle Position Sensor Voltage High	68	Yes	Yes
24	P 0121	Yes	TPS Voltage Does Not Agree With MAP	70	No	No
25	P 0505	Yes	Idle Air Control Motor Circuits	71	Yes	Yes
25	P 1299	Yes	Vacuum Leak Found	71	Yes	Yes
25	P 1294	Yes	Target Idle Not Reached	72	Yes	Yes
27	P 0201	Yes	Injector #1 Control Circuit	74	Yes	Yes
27	P 0202	Yes	Injector #2 Control Circuit	74	Yes	Yes

Flash Code	J 2012-Code*	MIL On OBDII?	Diagnostic Trouble Code Text	See Page	Non-OBD II 1995 Talon ATX	MIL ON? 1995 Talon ATX (OBDI)
27	P 0203	Yes	Injector #3 Control Circuit	74	Yes	Yes
27	P 0204	Yes	Injector #4 Control Circuit	74	Yes	Yes
31	P 0443	Yes	EVAP Solenoid Circuit	76	Yes	Yes
31	P 0441	Yes	Evaporative Purge Flow Monitor Failure	78	No	No
32	P 0403	Yes	EGR Solenoid Circuit	80	Yes	Yes
32	P 0401	Yes	EGR System Failure	43	Yes	Yes
33		No	A/C Clutch Relay Circuit	82	Yes	No
34		No	Speed Control Solenoid Circuits	82	Yes	No
35	P 1491	Yes	Radiator Fan Control Relay Circuit	87	No	No
35	P 1490	Yes	Low Speed Fan Control Relay Circuit	85	Yes	No
35	P 1489	Yes	High Speed Fan Control Relay Circuit	85	Yes	No
36	P 0411	Yes	Too Little Sec. Air or Too Much Sec. Air (Talon Only)	87	No	No
36	P 0412	Yes	Secondary Air solenoid Circuit (Talon Only)	87	No	No

On-Board Diagnostics

Flash Code	J 2012-Code*	MIL On OBDII?	Diagnostic Trouble Code Text	See Page	Non-OBD II 1995 Talon ATX	MIL ON? 1995 Talon ATX (OBDI)
37	P 1899	Yes	Park/Neutral Switch Failure (Neon With Auto Trans Only)	88	No	No
37	P 0743	Yes	Torque Converter Clutch Solenoid CKT (Neon With Auto Trans Only)	90	No	No
41		No	Generator Field Not Switching Properly	90	Yes	No
4[illegible]		No	Auto Shutdown Relay Control Circuit	91	Yes	No
42		No	No ASD Relay Output Voltage at PCM	92	Yes	No
42		No	Fuel Pump Relay Control Circuit	92	Yes	No
42		No	Fuel Level Sending Unit Volts Too Low (Neon Only)	93	No	No
42		No	Fuel Level Sending Unit Volts Too High (Neon Only)	93	No	No
42		No	Fuel Level Unit No Change Over Miles (Neon Only)	93	No	No
43	P 0351	Yes	Ignition Coil #1 Primary Circuit	94	Yes	Yes
43	P 0352	Yes	Ignition Coil #2 Primary Circuit	94	Yes	Yes
43	P 0301	Yes	Cylinder #1 Misfire	37	No	No

Flash Code	J 2012-Code*	MIL On OBDII?	Diagnostic Trouble Code Text	See Page	Non-OBD II 1995 Talon ATX	MIL ON? 1995 Talon ATX (OBDI)
43	P 0302	Yes	Cylinder #2 Misfire	37	No	No
43	P 0303	Yes	Cylinder #3 Misfire	37	No	No
43	P 0304	Yes	Cylinder #4 Misfire	37	No	No
43	P 0300	Yes	Multiple Cylinder Misfire	37	No	No
44		No	Battery Temp Sensor Volts Out of Limit (Neon Only)	96	No	No
46		No	Charging System Voltage Too High	96	Yes	NO
47		No	Charging System Voltage Too Low	96	Yes	No
51	P 0171	Yes	Fuel System Lean	28	Yes	Yes
52	P 0172	Yes	Fuel System Rich	28	Yes	Yes
53	P 0605	Yes	Internal Controller Failure	97	Yes	Yes
53	P 0605	Yes	PCM Failure SPI Communications	97	Yes	Yes
54	P 0340	Yes	No Cam Signal at PCM	98	Yes	No
55			End of Messages (Flash Code Only)	99	Yes	No
62		No	PCM Failure SRI Mile Not Stored	99	Yes	No
63		No	PCM Failure EEPROM Write Denied	99	Yes	No

Flash Code	J 2012-Code*	MIL On OBDII?	Diagnostic Trouble Code Text	See Page	Non-OBD II 1995 Talon ATX	MIL ON? 1995 Talon ATX (OBDI)
64	P 0422	Yes	Catalytic Converter Efficiency Failure	24	No	No
65	P 1596	Yes	Power Steering Switch Failure	100	No	No
66			No CCD Messages From TCM (Talon With ATX Only)	101	Yes	No

On-Board Diagnostics

INTRODUCTION

Student Learning Objectives

After completing this course, the technician will be able to perform the following on an Eagle Talon and/or Dodge/Plymouth Neon:

- Identify and interpret diagnostic information from the Powertrain Control Module (PCM).
- Identify proper operation of the Malfunction Indicator Lamp (MIL).

On-Board Diagnostics

General Information

The 1995 Neon is the first Chrysler vehicle to contain the new OBD II emissions diagnostic system. The 1995 Eagle Talon also receives the new OBD II diagnostic system as long as it is not equipped with a 2.0L DOHC Non-turbo engine coupled to an automatic transaxle. OBD II stands for On Board Diagnostics II, the latest evolution of on vehicle emissions diagnostics that began on Chrysler vehicles with OBD I. OBD II was developed to allow Chrysler vehicles to meet the requirements of the Federal Clean Air Act and California Air Resources Board (CARB) legislation.

This document provides information regarding diagnostics for the Neon which is equipped with OBD II diagnostics and Talon's equipped with OBD I (2.0L DOHC Non-turbo engine with an automatic transaxle) and OBD II (2.0L DOHC Non-turbo engines equipped with manual transaxles) diagnostics.

It is impractical (and very expensive) to provide every vehicle on the road with the equipment necessary to measure emissions of carbon monoxide (CO), hydrocarbons (HC) and oxides of nitrogen (NOx). Instead, the proven emissions and powertrain control devices available for these vehicles are checked for proper operation.

The above legislation requires that the driver be informed when an emissions related system or component malfunctions or deteriorates to the extent that vehicle emissions exceed certain thresholds. To do this, the malfunction indicator or CHECK ENGINE light (fig. 1) on the instrument panel is illuminated. The law states that the Malfunction Indicator Light (MIL) must be illuminated no later than the end of a second consecutive trip in which a failure of this type is observed, and illuminated immediately if catalyst damage is about to occur due to engine misfire.

In addition to illuminating the MIL, a diagnostic trouble code (DTC) is stored in the Powertrain Control Module (PCM), and can be retrieved by a service technician using a diagnostic scan tool.

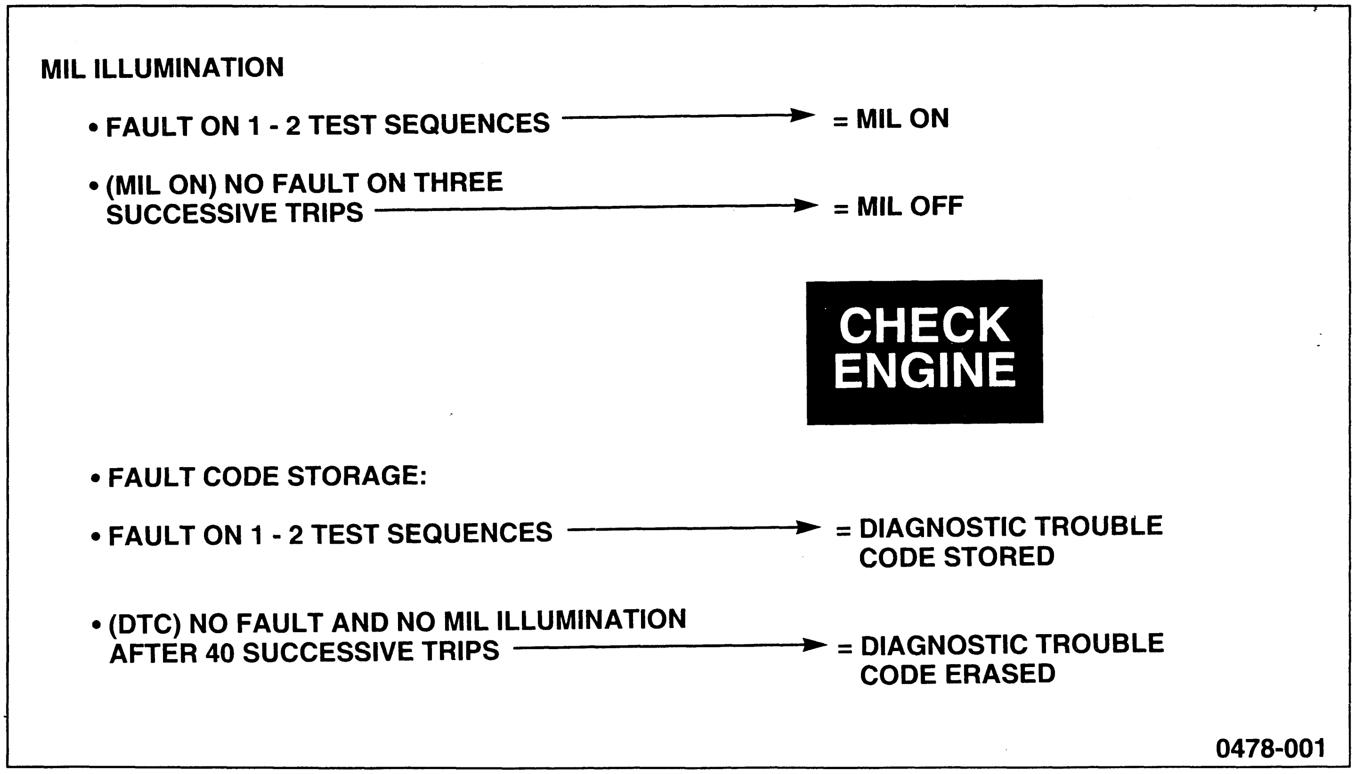


Figure 1 Malfunction Indicator Light (MIL)

To meet the requirements, the following systems must be monitored:

- Catalyst
- Fuel System
- Misfire
- Oxygen Sensor and Oxygen Sensor Heater
- Evaporative System (Purge)
- Exhaust Gas Recirculation (EGR)
- Secondary Air Injection Systems (Eagle Talons Only)
- Any other input or output component that can affect emissions

On-Board Diagnostics

You may be familiar with the monitors available on the DRB diagnostic scan tools. They allow you to monitor the operating conditions of vehicle components. The OBD II system monitors are different. They are checks made by the PCM's software to determine not only if these specific systems are operating, but whether they are operating within pre-established limits. While OBD I tests measure a *component's* electrical operation, OBD II monitors check a *system's* performance.

Warranty Requirements

Emissions related components must remain operable for the useful life of the system. This is defined as ten years or 100,000 miles, whichever comes first, for both federally and California certified vehicles. Chrysler must demonstrate that emission systems are durable enough to meet this requirement **before** the government will certify these vehicles for sale.

Warranty periods as required by the legislation are indicated in the chart below:

Table 2 OBD II Emissions Warranty

FEDERAL	2 years/24,000 miles	Emissions related components
	8 years/80,000 miles	Major emissions related components
		1. Catalyst
		2. Powertrain Control Module
CALIFORNIA	3 years/50,000 miles	Emissions related components
	7 years/70,000 miles	Refer to the selected high cost components as defined in section 2G of the warranty policy and procedures manual.

The California Air Resources Board (CARB) monitors emissions system repairs from several California dealers. If a specific component or system fails on more than 4% of the vehicles sampled, Chrysler is required to research and evaluate the reasons. If the failure is not attributable to owner negligence or misuse, a component failure rate of 4% could lead to vehicle recalls. The federal government is considering a similar program. Chrysler is relying on its technicians throughout the country to appropriately diagnose emissions concerns and replace only those parts that have failed. The sloppy practice of "hanging" parts on a car under an emissions warranty could lead to an unnecessary (and expensive) fleet wide recall.

DIAGNOSTIC SYSTEM OPERATION

Powertrain Control Module (PCM)

There is a large number of components responsible for controlling vehicle emissions. It is the job of the PCM to coordinate their operation and keep them functioning in the most efficient manner possible. The PCM is also responsible for determining if the systems are operating properly. A new piece of software, designed specifically for this job, is the "Task Manager."

Task Manager

During the course of the vehicle's operation, many diagnostic steps must be performed. Most of these must be performed under specific operating conditions (engine temperature, rpm, etc.) to be accurate. A fault may have to occur more than once before the MIL is illuminated and a DTC is recorded. The PCM contains Task manager software to organize and prioritize the diagnostic procedures and the protocol for recording and displaying their results. Listed below are the responsibilities of the Task Manager software:

- Trip Indicator
- Test Sequence
- Readiness Indicator
- DTC Identification, Maturation, and Erasure
- Freeze-Frame Data Storage and Erasure
- Freeze-Frame Priority
- MIL Illumination
- Test Status

Trip Indicator

The Task Manager reviews PCM inputs during each key cycle to determine if the conditions required for each individual test have been met before it allows that test to be performed. Requirements vary with each test, but typically include information such as elapsed time since start-up, engine coolant temperature, rpm, MAP, and throttle position.

"Trip" is a difficult concept to define because the requirements for a trip vary depending on the test being run (fig. 2). These conditions can include seemingly unrelated items such as driving style, length of trip, and ambient temperature. The minimum requirement for a trip is that it includes one key cycle and usually some drive time before a test is performed. Vehicle tests vary in length, and may be performed only once per trip, or may be performed continuously. If the pertinent enabling conditions are not met for the O_2 sensor, catalyst, and EGR monitors during that key cycle, the tests may not run at all.

Note: *California and some other states require the PCM to indicate that all monitors have passed before issuing license plates. Removing the vehicle's battery to erase DTCs before testing erases any record of passing a monitor. If the monitor does not complete a trip on subsequent key cycles, the vehicle can fail a licensing test.*

Test Sequence

What constitutes a particular OBD test is important because, in many instances, the vehicle must fail a test more than once before the MIL is illuminated and a DTC is recorded. Tests that illuminate the MIL when a single failure is recorded are known as "one trip" monitors. "Two trip" monitors allow the system to double check itself and help prevent unnecessary MIL illumination.

If the conditions to run the test are not met on consecutive key cycles, the information from the first test is not lost. The Task Manager waits until the next time the appropriate test conditions occur, and then continues the count.

There are times when a test is held up, **pending** the resolution of a related problem as indicated by the MIL. Testing the system or component at this time guarantees it will fail erroneously, so the Task Manager doesn't bother.

At times there are other tests running or existing faults that **conflict** with the operation of a test. In that case, the Task Manager chooses not to run the test. No trip is completed.

A test may run, yet have its results **suspended** until the results from another monitor are received. Once that occurs, a test is completed.

If this is a "two trip fault" and the test failed the first time, a malfunction on the second consecutive time the test is run (even if there were key cycles between the tests) will illuminate the MIL. If the malfunction does not occur the second time the test is run, the MIL does not illuminate and no DTC is recorded.

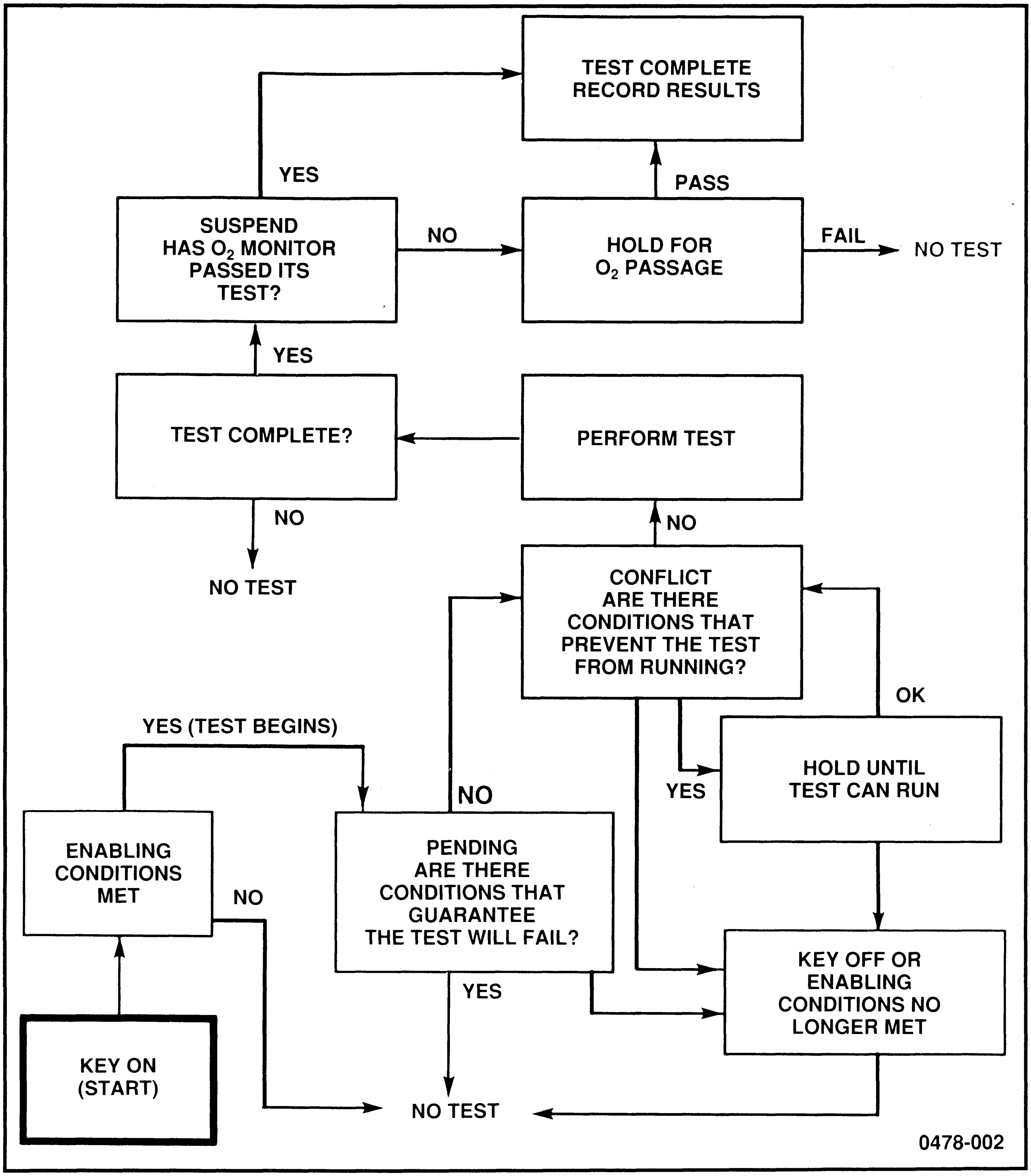


Figure 2 Test Sequence Decision Tree

The Task Manager can turn off the MIL if it records three consecutive trips when the system passes the test. However, with the misfire and fuel monitors, the system must past the test under the same circumstances (within 375 rpm and within 10% of the load) under which it failed the test. More information on this is presented in the sections on DTC maturation and freeze frame that follow.

In summary, it is the task manager's job to determine if the conditions are appropriate for a test to be run, know the definition of a trip for each test, and record the results of each test when it is run.

Readiness Indicator

The readiness indicator identifies whether or not all of the monitors have been run. This indicator is used when an emission Inspection Maintenance (IM) test is performed. EPA regulates that certain cities perform an IM test before license plates can be issued. One of the regulations that EPA uses on OBDII equipped vehicles is that, in order to pass the IM test, the vehicle must have had all of the monitors run at least once, and passed. If any monitor fails, the MIL is illuminated, and the vehicle must be serviced before license plates can be issued.

Note: *If battery voltage is lost to the PCM, the readiness indicator is reset. If the readiness indicator is reset, all of the monitors must be run before the vehicle can pass an IM test.*

DTC Identification, Maturation, and Erasure

Once a test has been run, the Task Manager determines whether the system has passed or failed. It must then determine if the test has failed the specified number of times required to illuminate the MIL. If not, the Task Manager stores a **maturing code**. When this test is run again (on the next "trip"), the results are once again either pass or fail. If the component fails the test, a code "matures," and a DTC is set. The MIL is illuminated if an emission component is involved. If the component or system passes the test a specified number of times, the maturing code is erased.

Note: *It is important to understand that a system need not fail a test under exactly the same conditions for a code to mature and trigger the MIL. It must, however, pass a test under the same conditions it failed the* ***first*** *time in order to begin the erasing procedure for the misfire and fuel system monitors.*

DTCs are erased if the   if the MIL has been extinguished and the system or component passes the diagnostic test for 40 subsequent warm-up cycles. That is why it is best to attempt to diagnose intermittent problems soon after they occur. While a DTC may have been available initially, subsequent trips (that passed the diagnostic test) will have erased the code. The OBD II system, based on the latest inputs it receives, reconsiders its diagnosis for intermittent problems.

Of course, a diagnostic scan tool can be used to erase DTCs at any time. In addition, DTCs (along with records of successful trips) are erased whenever the vehicle's battery is disconnected.

Freeze Frame Data Storage and Erasure

All OBD II monitored systems provide "freeze-frame" data on the vehicle's operating conditions when a maturing code was set. This information can be retrieved using the DRB III diagnostic scan tool (fig. 3), and may help a technician pinpoint the source of a concern more quickly. When there are multiple monitor failures, the first to occur is stored in the freeze frame. The exceptions are the misfire and fuel system monitors. They have priority and can write over other freeze-frame data. Information in the freeze frame includes:

- Diagnostic Trouble Code (DTC)
- Engine rpm
- Engine load
- Fuel trim (short term and long term)
- Engine Coolant Temperature (ECT)
- Manifold Absolute Pressure (MAP)
- Operation mode (open or closed loop)
- Vehicle speed

Freeze-Frame Priority

The freeze frame indicates only the operating conditions under which the maturing code was set. While these conditions are usually the same as those that trigger the maturation of the DTC, there can be exceptions. This first condition is important for fuel system and misfire DTCs, as it is the condition the vehicle must repeat successfully during a test to allow the Task Manager to erase a DTC and turn off the MIL on its own.

Should the Task Manager determine that the DTC can be erased, the freeze frame related to that code is also eliminated.

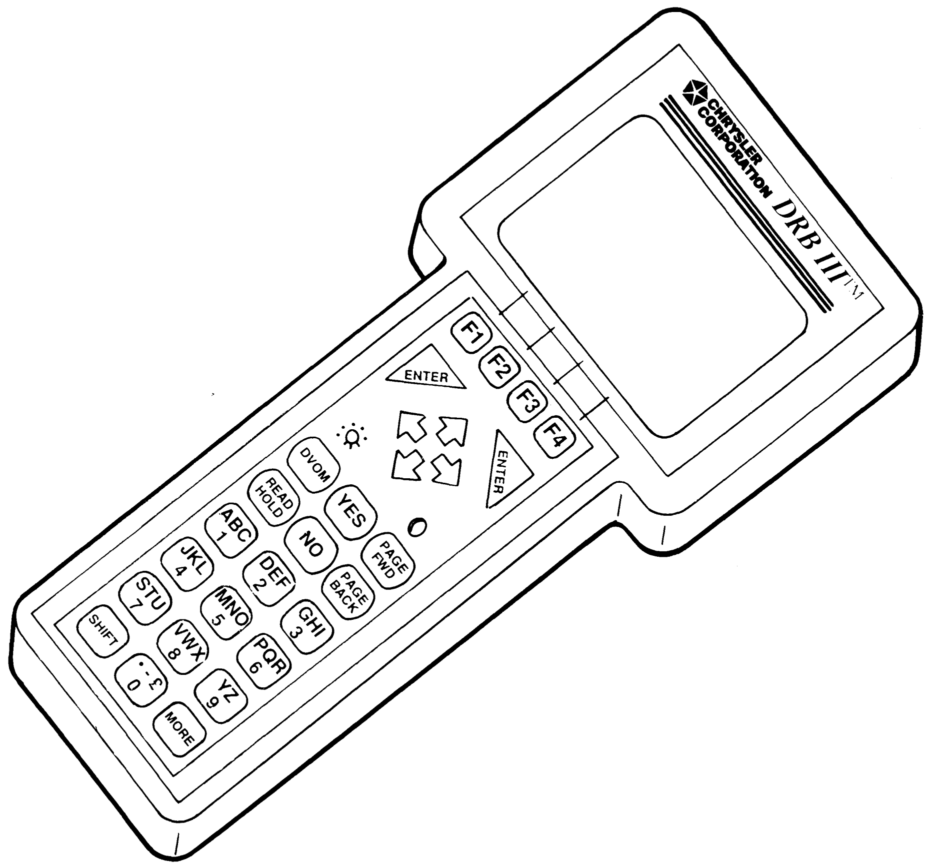


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Figure 3 DRB III Diagnostic Scan Tool

MIL Illumination

As described earlier, the PCM Task Manager is responsible for operation of the MIL. This is an important function, since unnecessary operation of this lamp has a negative effect on customer satisfaction. In order for the MIL to be extinguished, the most recent malfunction must pass diagnostics on three consecutive trips after the MIL has been illuminated if the MIL was illuminated from one of the major monitors.

If a DTC is stored due to misfire or fuel system related problem, the PCM requires that the engine return to the operating condition at which the trouble originated and be diagnosed once again. The PCM must perform this task and pass three consecutive times to extinguish the MIL. This task may be quite difficult to perform, for example: If the problem initially appeared at WOT and high rpm, the customer may not revisit that driving condition for quite some time. Because the PCM has not had the opportunity to retest under those conditions, the MIL remains illuminated long after the concern has been eliminated. Even if another malfunction occurred after the misfire or fuel related problem, the PCM reverts to the procedure to extinguish the MIL for misfire and fuel monitor.

If the vehicle is driven while the engine is misfiring, and the misfire is severe enough to cause catalyst damage, the MIL will flash. If the condition that caused the sever misfire disappears, the MIL ceases to flash but remains illuminated until the criteria has been met that can cause the MIL to be extinguished for misfire or fuel monitors. Continued vehicle operation while the MIL is flashing is not recommended.

Finally, if a comprehensive monitor caused the MIL to be illuminated, the PCM must first recognize that the engine has been run for at least two minutes then, pass or abort the O_2 and EGR monitor before it can verify that a previously malfunctioning component is meeting the normal operating conditions of that component. Also, on Eagle Talon's, the secondary air injection monitor must have either run or aborted before the component can be verified.

Anytime the MIL is illuminated, a DTC is stored. The DTC can self erase only when the MIL has been extinguished. Once the MIL is extinguished, the PCM must pass the diagnostic test for the most recent DTC for 40 warm-up cycles. A warm-up cycle can best be described by the following:

- The engine must be running
- A rise of 40°F must occur from the time when the engine was started
- Engine coolant temperature must reach at least 160°F

Once the above conditions occur, the PCM is considered to have passed a warm-up cycle. Do to the conditions required to extinguish the MIL and erase the DTC, it is most important that after a repair has been made to erase all DTC and then verify the repair.

As in the past, the MIL can be used to produce diagnostic trouble codes. Quickly turning the key to the RUN position three times allows the MIL to flash out any existing flash codes.

Test Status

There are many tests waiting to be performed once the vehicle is started. It is the Task Manager's job to ensure that these tests are performed under the appropriate conditions.

An additional job of the Task Manager is to prevent false DTCs from being stored. The Task Manager accomplishes this by not running certain tests when it recognizes that faults already in the system or tests currently being run could cause the next test to fail erroneously. For example:

- The test for the catalyst monitor does not run if the MIL is illuminated due to an oxygen sensor fault. The oxygen sensor is a key component in the catalyst monitor test. If the sensor is not functioning properly, there is no reason to run the catalyst monitor – it may not pass. This test will not be run, **pending** repair of the sensor fault.

- The Task Manager does not run the test to monitor catalyst operation if the EGR monitor test is being run. The EGR monitor is an "intrusive" test, and will cause the catalyst monitor to produce data not representative of normal operating conditions. This represents a **conflict** of test data. The Task Manager will wait until the EGR monitor is finished before running the catalyst monitor.

- Finally, the results from the catalyst monitor are always held until the oxygen sensor test has been completed successfully. The results from the test are **suspended** until the required prerequisite test has been completed.

By reviewing these guidelines, the Task Manager avoids storing DTCs that are the result of failure of other components in the system. The Task Manager allows you to use the diagnostic scan tool more confidently in diagnosing and repairing a fault.

MAIN MONITORS

To meet OBD II requirements, the on board diagnostic system must monitor the **rationality** of input signals and the **functionality** of output responses that can have an effect on vehicle emissions. In addition, there are several "main monitors" that review the result of system operations and their effect on emissions. The main monitors are as follows:

- Catalyst
- Fuel System
- Misfire
- Oxygen Sensor
- Exhaust Gas Recirculation
- Secondary Air Injection (Eagle Talon Only)

Each of the main monitors is listed below with a brief background explanation and a description of how the monitor operates. Also, a list of the enabling, pending, conflict, and suspend conditions is included. Following these conditions is the diagnostic trouble code (DTC) produced by the monitor, the DTC flash code number and a number, referred to as a "SAE J 2012, or P" code. SAE J 2012 codes are required by law for use with generic diagnostic scan tools. Finally, each section contains a list of the components that could possibly cause the monitor to fail.

Oxygen Sensor Monitor

Background

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element in this system is the upstream oxygen (O_2) sensor mounted in the exhaust manifold (fig. 4).

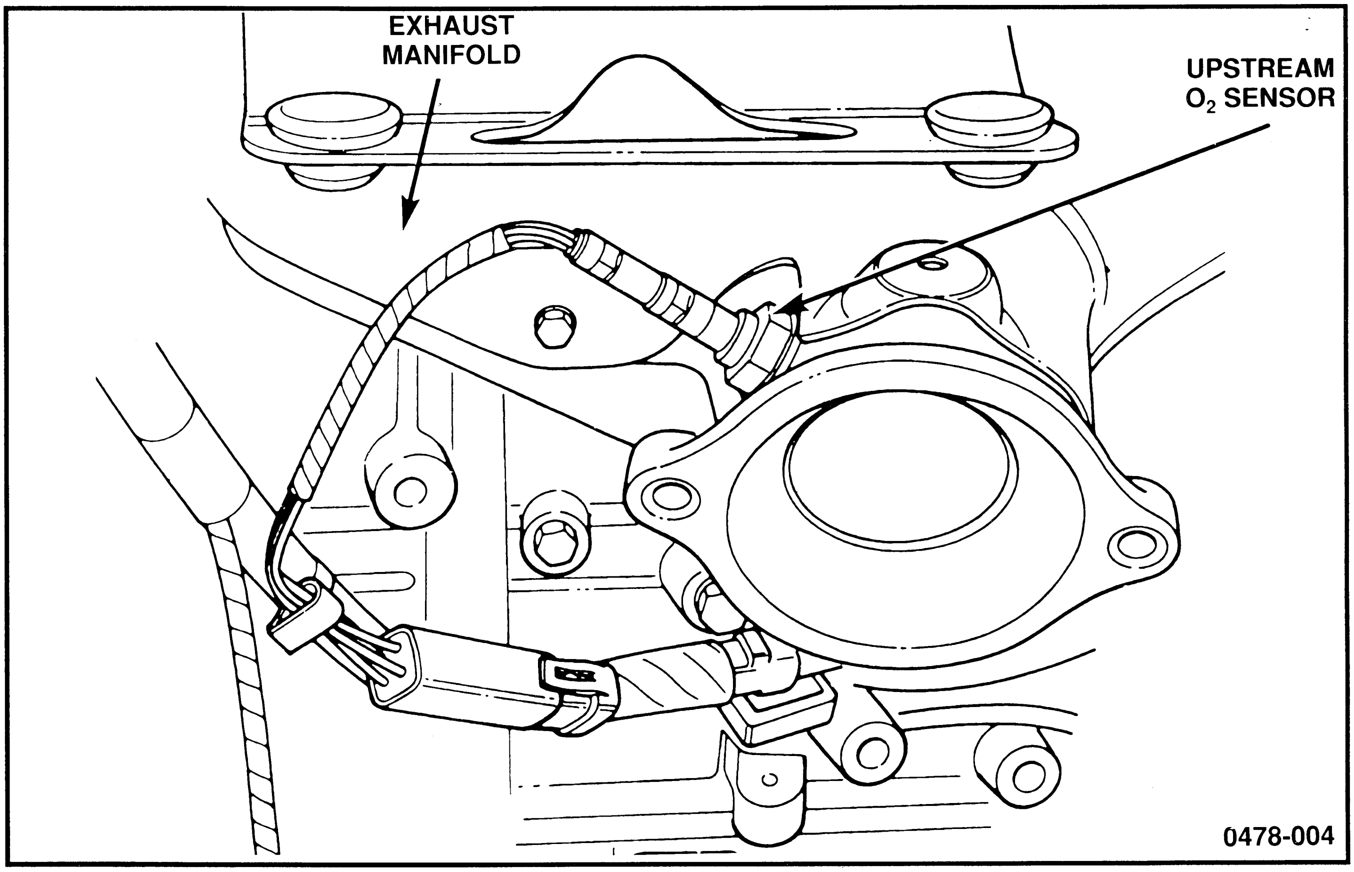


Figure 4 Oxygen Sensor

Operation

Once it reaches its operating temperature of 572° to 662° F, the sensor generates a voltage inversely proportional to the amount of oxygen in the exhaust. This information is used by the PCM to calculate the fuel injector pulse width necessary to provide the critical 14.7:1 air/fuel ratio (stoichiometric).

A properly operating sensor must be able to generate an output voltage within its operating range of 0 to 1 volt, as it is exposed to different O_2 levels. It also must be able to detect these changes quickly. To detect a shift in the air/fuel mixture (lean or rich) the output voltage must change beyond a threshold value. A malfunctioning sensor could have difficulty changing beyond the threshold value.

While there are existing tests to determine if an O_2 sensor is shorted to voltage, contains an open circuit, or does not function at all, prior to OBD II, it was impossible to identify sluggish or marginal sensors.

A slow response rate (fig. 5), or reduced voltage output are both signs of an improperly operating oxygen sensor. This could mean longer instances of combustion of less-than-optimum air/fuel mixtures, which can significantly increase emissions.

The O_2 sensor must have a voltage output of greater than 0.745 volt in order to pass the test. It must also switch more times during a 120-second period than a pre-determined threshold (to demonstrate quick response), or produce a pre-determined number of steep-slope switches (demonstrating dynamic range and quick response) over the same time period. Data is not stored unless idle time exceeds ten seconds.

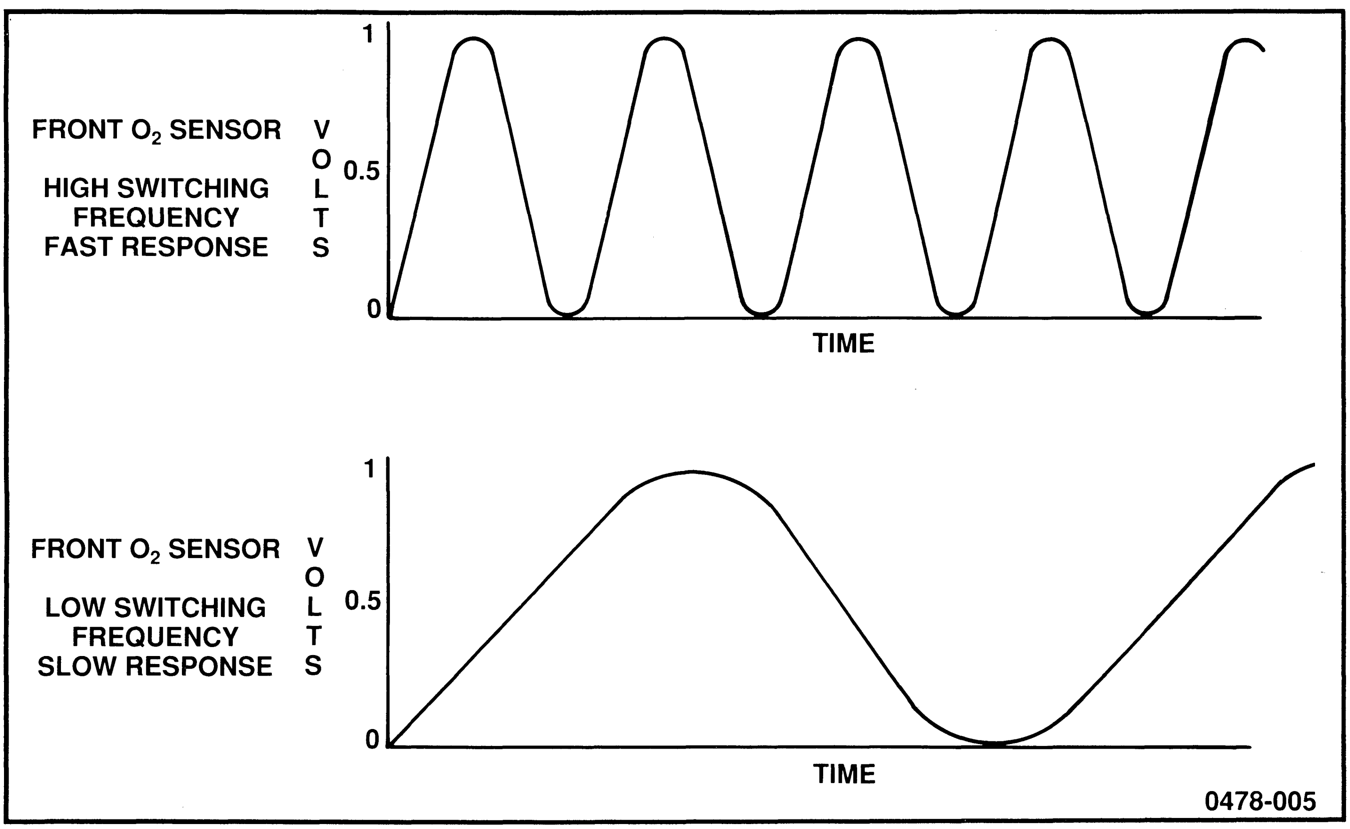


Figure 5 Switching Frequency Response

Enabling Conditions

The following conditions must be met before the oxygen sensor monitor will run:

- Engine coolant temperature greater than 170° F
- Approximately three minutes elapsed time after start-up
- Vehicle has operated at more than 24 mph and 170° F for a cumulative total of at least two minutes
- Vehicle is in drive (automatic transmission only)
- High-pressure power steering switch is off
- Vehicle is at idle with rpm between 512 and 864
- This test may be inhibited if the A/C is cycling too rapidly. (Testing with the A/C off is suggested.)

Pending

The oxygen sensor monitor does not run if the MIL is illuminated due to one of the following:

- Misfire DTC
- Upstream O_2 heater DTC
- Vehicle speed sensor DTC
- The vehicle is in the limp-in mode due to MAP, TPS, or engine temperature DTCs
- Park/Neutral switch rationality DTC
- Front O_2 sensor electrical DTC

Conflict

The oxygen sensor monitor does not run if any of the following are present:

- Fuel system rich intrusive test
- Time after start is less than 60 seconds
- One trip misfire maturing code
- One trip upstream O_2 heater maturing code

Suspend

There are no suspend conditions for the oxygen sensor monitor.

The O_2 monitor runs once each trip after the enabling conditions have been met. The MIL is illuminated and a DTC stored if the O_2 sensor does not produce a 0.745 volt output and/or does not perform enough switches within the test threshold for two consecutive trips. The message on the scan tool screen appears as follows:

Upstream O2S Response
Flash Code – 21   J 2012 Code – P 0133

The lamp extinguishes if the conditions causing it to illuminate are not repeated for three consecutive trips. The DTC is erased from memory if the monitor passes for 40 consecutive warm-up cycles.

A malfunction of the O_2 sensor could possibly be caused by problems with any of the following components:

- Exhaust system (leaks)
  - Pipes
  - Manifold
  - Catalytic converter
  - Seals
- Wiring (fig. 6) and harness and connectors
- Fuel
- PCM

The fault trees in the Diagnostic Procedures book can help you isolate the source of the problem.

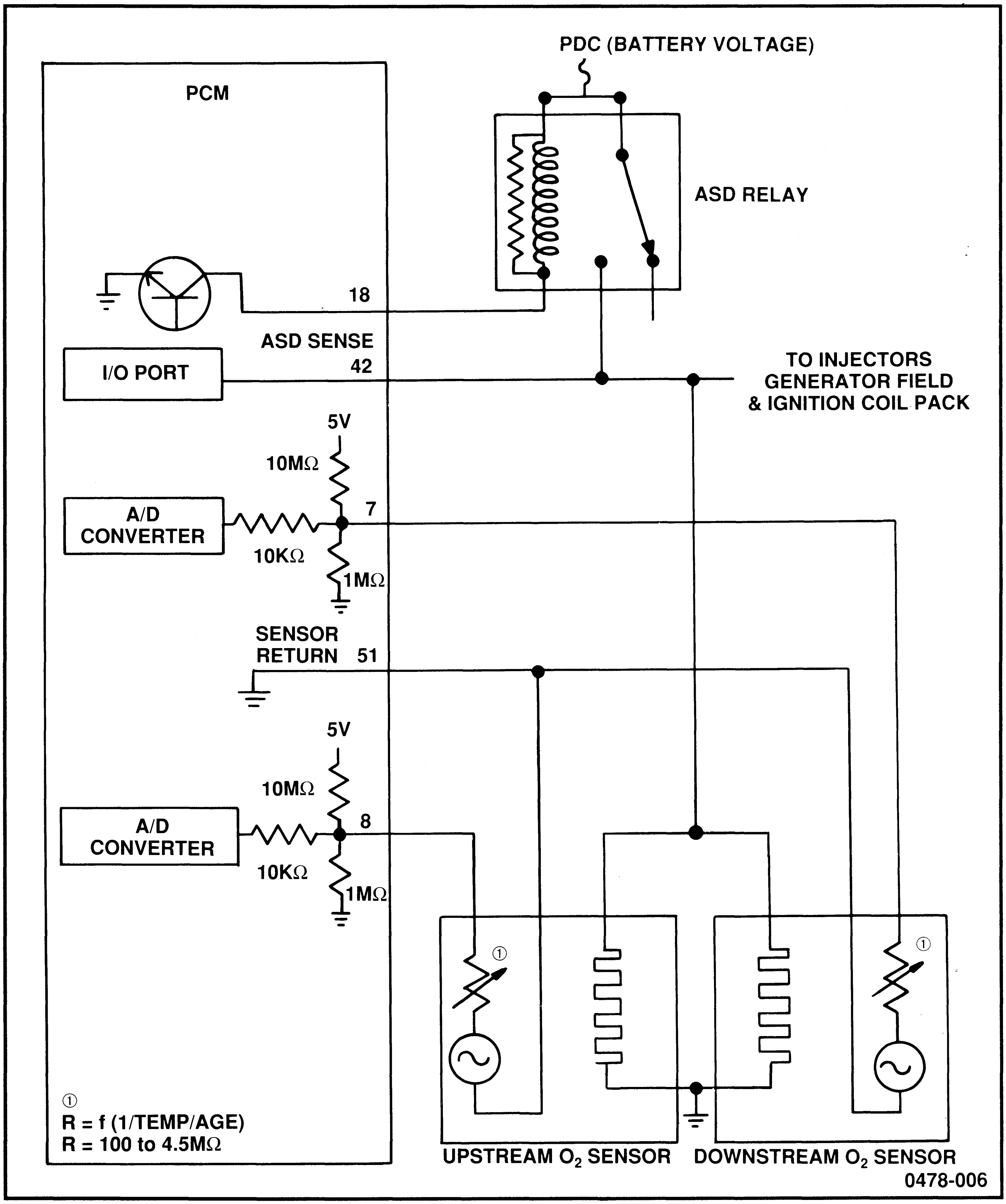


Figure 6 O_2 Sensor Wiring

O_2 Heater Monitor

Background

For the O_2 sensor's to function properly, they must be heated to approximately 572°-662° F. To assist the O_2 sensor's in achieving this temperature, they are equipped with Positive Thermal Coefficient (PTC) heater elements. Both the upstream and downstream O_2 sensors' heater elements are fed battery voltage whenever the ASD relay is energized (fig. 6). The ground for the heater elements is routed through the O_2 sensors' 4-pin connectors to an external ground (fig. 6). As current flows through the heater elements, the temperature of the O_2 sensors increase. As the temperature increases, the resistance of the elements increase, causing the current flow to decrease. The O_2 sensors' heaters combined with exhaust gas under most normal conditions, maintain the temperature of the sensors to around 1200° F.

After the engine has started, the upstream O_2 sensor's information is used by the PCM to assist in the air/fuel calculation. If the sensor is not up to operating temperatures, the information given by the sensor may be inaccurate, possibly causing an increase in emissions.

Information provided by the downstream O_2 sensor is used by the PCM to calculate the efficiency of the catalytic converter. The sensor must be heated to allow it to function normally, otherwise, the catalytic converter test may be invalid.

Operation

The resistance of an O_2 sensor changes with temperature and age. It's resistance normally is between 100 ohms to 4.5 megohms. When the temperature of a sensor is increased, the resistance of the sensor decreases. Inversely, as a sensor ages, the resistance increases. It is the resistance of the sensor's output circuit that is tested for proper heater operation, not the heater element itself.

The test begins approximately five seconds after the engine has been turned off as long as the ignition voltage is off and battery voltage is greater than 10 volts (the PCM still operates even though the key is in the OFF position and remains in operation for a finite amount of time). Once the timer has timed out, the PCM sends a 5 volt bias (fig. 7) to the O_2 sensor's output wire once every 1.6 seconds, and keeps it biased each time for 35 ms. During this portion of the test, the PCM monitors the voltage on the output wire of the O_2 sensor. As the sensor cools down, its resistance should increase, causing the PCM to register an increase of voltage. The PCM determines if an O_2 sensor has cooled enough by detecting an increase of 0.49 - 1.56 volts higher than what the PCM detected at the beginning of the test. The maximum amount of time to perform this portion of the test is 144 seconds.

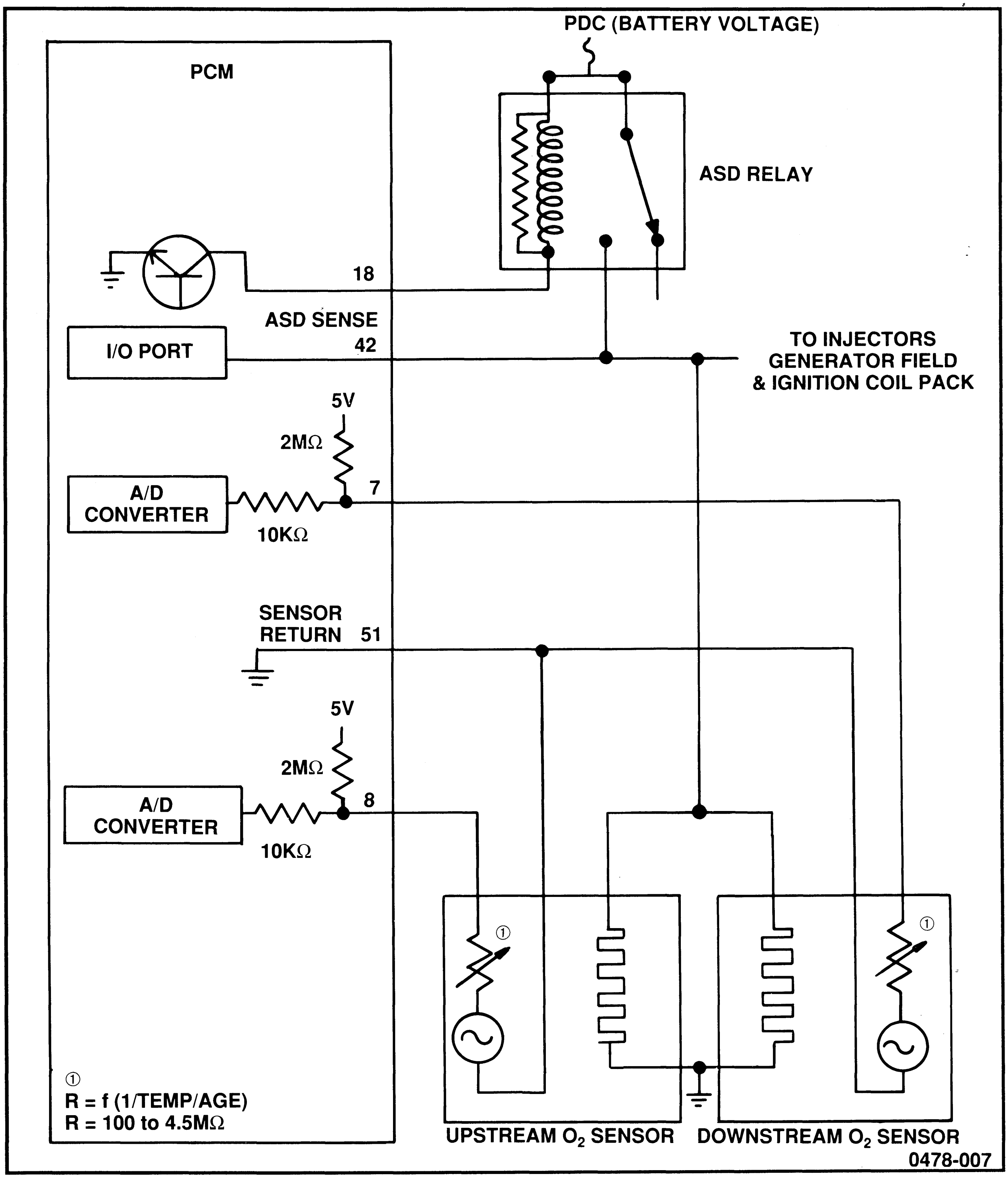


Figure 7 O_2 Heater Monitor Circuit

When the O_2 sensor has cooled enough, the PCM energizes the ASD relay for the next 48 seconds. With the relay energized, current should flow through the heater element causing an increase in temperature at the sensor. As the heater warms the O_2 sensor, resistance of the O_2 sensor's output circuit should decrease. As the resistance decreases, voltage at the PCM decreases. While the ASD relay is energized, the PCM pulses the 5-volt biased signal 30 times. Each time the biased voltage is activated, the PCM senses for a voltage drop. The O_2 heater monitor test passes if the PCM detects at least 0.157 volt decrease in 15 out of the 30 pulsed signals.

Enabling Conditions

The following conditions must be met before the O_2 sensor heater monitor can run.

- The engine must have been running for at least 5.1 minutes before the test can be performed
- The engine cannot be running
- Battery voltage must be at least 10 volts
- 5 seconds must pass after the engine has been shut down to dissipate any gasses

The test aborts any time the key is cycled to run.

Pending

The O_2 sensor heater monitor test does not run if the MIL is illuminated due to:

- Upstream or downstream O_2 sensor failure

Conflict

There are no conflicting conditions.

Suspend

There are no suspend conditions.

The O_2 sensor heater monitor is tested once each time the engine is turned off, as long as the enabling conditions have been met. The MIL is illuminated and the DTC is stored if the O_2 sensor's circuit does not show the appropriate decrease of voltage during the test for a total of two consecutive tests. Because the key is off during the test, the MIL illuminates and the DTC is stored only at the beginning of the next key cycle. The message on the scan tool appears as follows:

Upstream O2S Heater Failure
Flash Code - 21   J 2012 Code P 0135

Downstream O2S Heater Failure
Flash Code - 21   J 2012 Code P 0141

The MIL is extinguished if the conditions causing it to illuminate are not repeated for three consecutive trips. The DTC is erased from memory if the monitor passes for 40 consecutive warm-up cycles.

A malfunction in the O_2 sensor's heater could possibly be caused by problems with any of the following components:

- Upstream or downstream O_2 sensor (heater element)
- O_2 sensor related wiring or connectors (heater circuit)

The fault trees in the Diagnostic Procedures book can help you isolate the source of the problem.

Catalyst Monitor

Background

Current vehicles use a three-way catalytic converter to reduce emission of harmful gases. The converters are referred to as three-way because they specifically address three pollutants (hydrocarbons, carbon monoxide, and nitrogen oxide) produced in the combustion chamber. The catalyst monitor uses a pair of inputs to indirectly measure how effective the catalyst is at reducing emissions.

Operation

O_2 sensors located above (upstream) and below (downstream) the catalytic converter (fig. 8) are able to monitor the efficiency of the converter. The dual O_2 sensor strategy is based on the fact that, as a catalyst deteriorates, its oxygen storage capacity and efficiency are both reduced. By monitoring the oxygen storage capacity of the catalyst, its efficiency can be indirectly calculated. The upstream sensor detects the amount of oxygen in the exhaust gas before it enters the converter. This sensor should switch fairly rapidly.

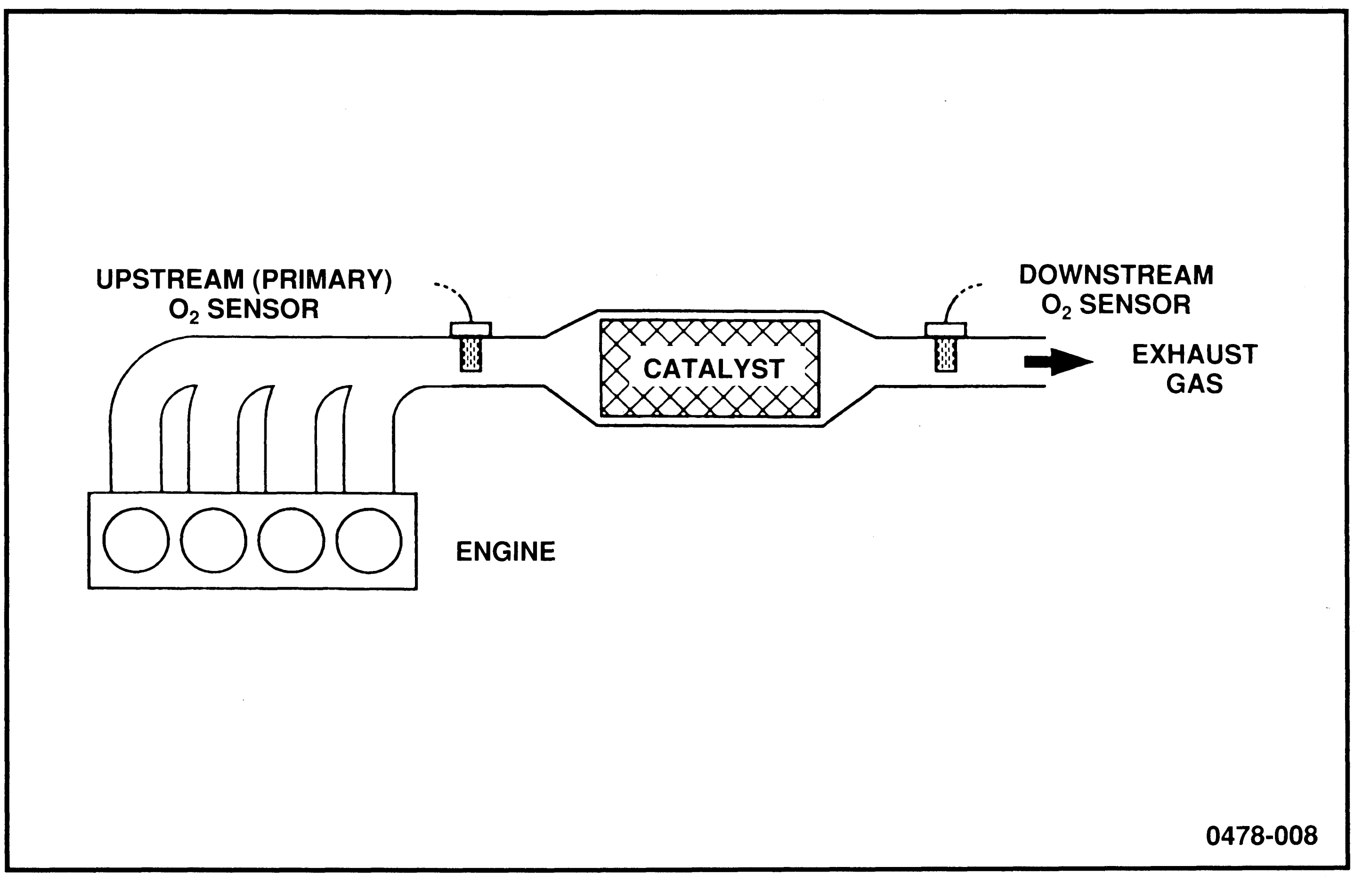


Figure 8 Oxygen Sensor Locations

A functioning converter stores oxygen so that it can be used for the oxidation of hydrocarbons (HC) and carbon monoxide (CO). The downstream sensor detects a lower oxygen level in the exhaust than does the upstream sensor. It indicates this by switching at a significantly slower rate than does the upstream sensor.

As the converter deteriorates and loses its ability to store oxygen, the switch rate at the downstream oxygen sensor approaches that of the upstream sensor (fig. 9). The system is monitored so that when the switch rate of the downstream sensor reaches 90% of the switch rate of the upstream sensor (automatic transmissions), the MIL is illuminated. The threshold for manual transmissions is 70%. At this point, exhaust emissions are projected to exceed the legal limit.

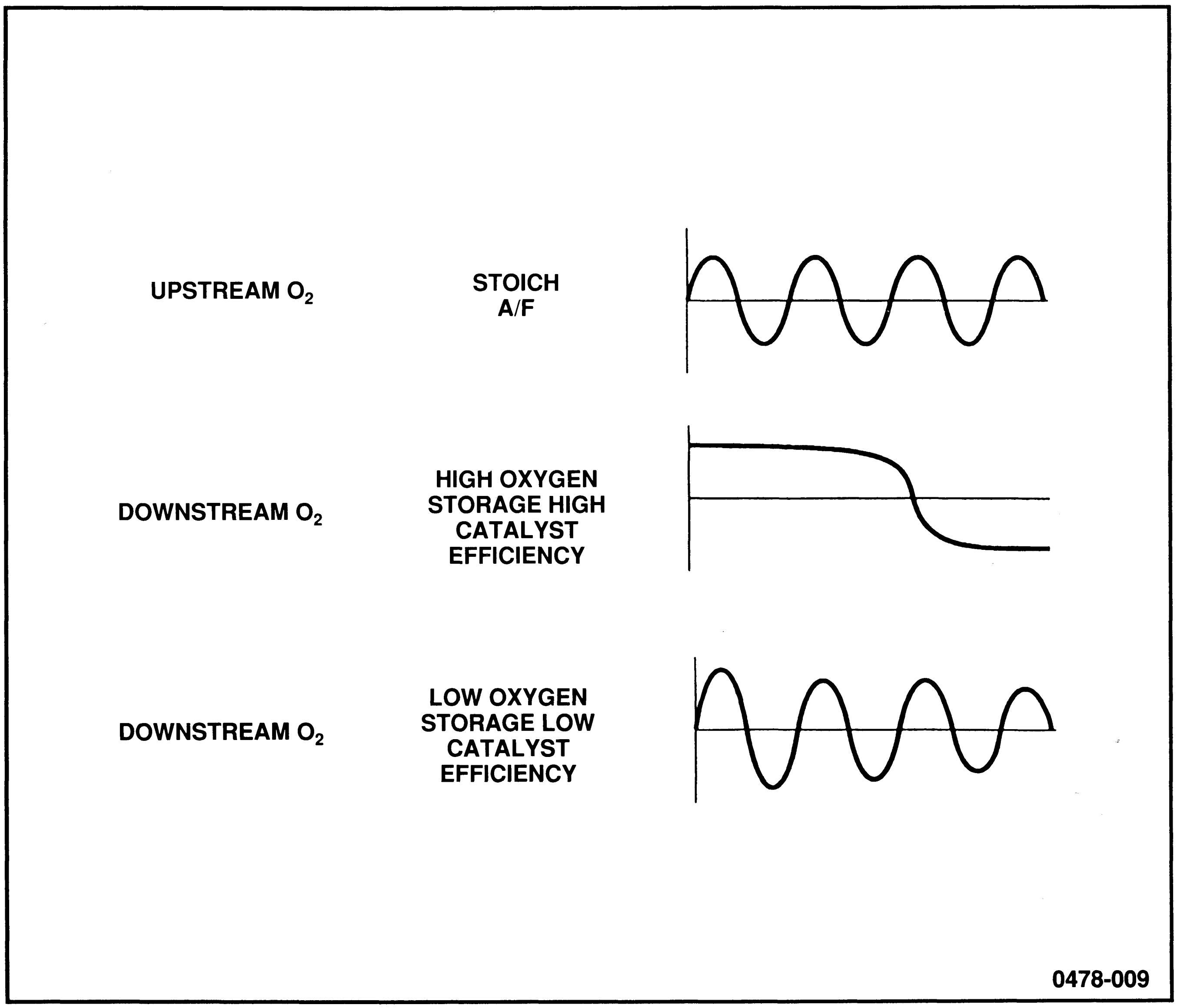


Figure 9 Upstream vs. Downstream Switching Rates

Enabling Conditions

The following conditions must be met before the catalyst monitor will run:

- Engine coolant temperature greater than 170° F
- Vehicle speed greater than 20 mph for 2 minutes
- Open throttle
- Closed loop operation
- Rpm between 1,248 and 1,952 (auto), or between 1,248 and 2,400 (manual)
- MAP voltage between 1.50 and 2.60

Pending

The catalyst monitor does not run if the MIL is illuminated due to one of the following:

- Misfire DTC
- O_2 monitor DTC
- Upstream O_2 heater DTC
- Downstream O_2 heater DTC
- Fuel system rich DTC
- Fuel system lean DTC
- Vehicle is in the limp-in mode due to MAP, TPS, or engine temperature DTC
- Upstream O_2 sensor rationality DTC
- Downstream O_2 sensor rationality DTC

Conflict

The monitor does not run if any of the following are present:

- EGR monitor is in progress
- Fuel system rich intrusive test is in progress
- Purge monitor is in progress
- Time since start is less than 60 seconds
- One trip misfire maturing code
- One trip O_2 monitor maturing code
- One trip upstream O_2 heater maturing code
- One trip downstream O_2 heater maturing code
- One trip fuel system rich maturing code
- One trip fuel system lean maturing code

Suspend

Results of the monitor are not recorded until the O_2 monitor passes.

Catalyst efficiency is monitored once each trip. The MIL is illuminated and a DTC stored if the switch rate of the downstream O_2 sensor reaches 90% of the upstream sensor's switch rate for vehicles equipped with an automatic transmission and 70% for vehicles equipped with a manual transmission for a total of two consecutive trips. The message on the scan tool screen appears as follows:

Catalytic Converter Efficiency Failure
Flash Code – 64 J 2012 Code – P 0422

The MIL is extinguished if the monitor can pass a tougher criteria (downstream sensor switch rate at less than 80% of upstream sensor for automatic transmissions and 60% for manual transmissions) for three consecutive trips. The DTC remains in memory until the monitor has passed this higher criterion for a total of 40 warm-up cycles with no failures.

This malfunction could possibly be caused by problems with any of the following components:

- Catalytic converter
- Exhaust manifold (leaks)
- Wiring harness/connectors
- PCM
- O_2 sensor

The fault trees in the Diagnostic Procedures book can help you isolate the source of the problem.

Note: *If the MIL were illuminated by a failed catalytic converter or O_2 sensor, engine problems may have been the cause of the failure. If fuel, coolant, or oil are passed through the exhaust, catalyst, or O_2 sensor, contamination may result. Before the vehicle is returned to the customer, inspect for the following:*

- *Worn engine piston rings*
- *Worn engine cylinder head valves and/or guides*
- *Leaking head gasket*
- *Cracked cylinder head*
- *Fuel contamination and quality*

Fuel System Monitor

Background

To control the level of undesirable emissions, the fuel system must be able to maintain strict control of the air/fuel ratio. The stoichiometric air/fuel ratio (14.7:1) is optimum. At that ratio, the best balance between the production of HC's and CO's (which drop as the mixture becomes leaner) and NOx (which increases as the air/fuel mix becomes leaner) can be found (fig. 10). This is also the point where the catalytic converter is most efficient at converting all three gases to less harmful compounds. The goal of the PCM is to examine input information and control outputs to produce a constant stoichiometric ratio.

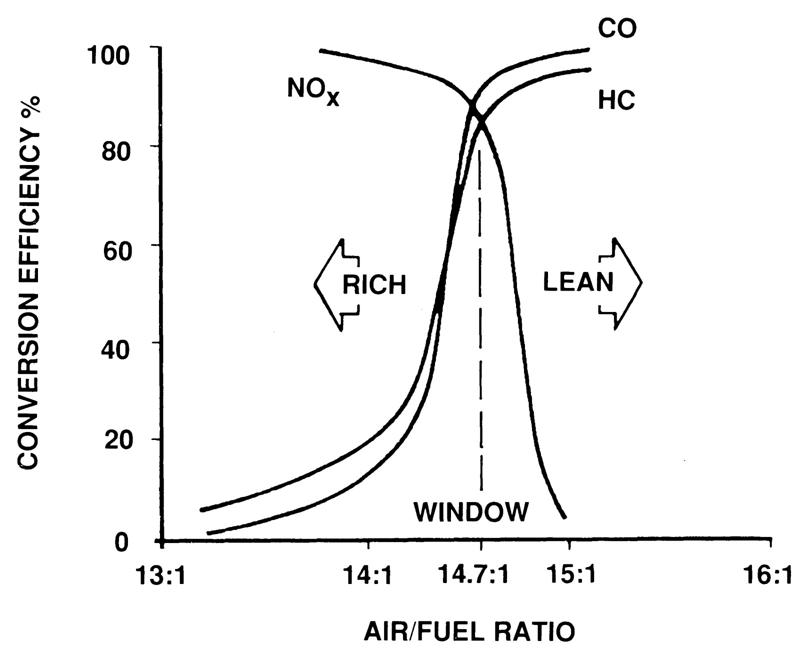


Figure 10 Conversion Efficiencies of a Three-Way Catalyst

Operation

The Powertrain Control Module (PCM) varies the pulse width of the fuel injectors to provide precise control of the air/fuel mixture. Wider pulse widths increase the volume of fuel delivered to the cylinders. The PCM uses the input from a number of sensors in its attempt to reach and maintain this air/fuel ratio. Manifold Absolute Pressure (MAP) and the O_2 sensor have the greatest influence (authority) over injector pulse width. Other inputs such as the Throttle Position Sensor (TPS), Engine rpm, Engine Coolant Temperature (ECT) Sensor, Intake Air Temperature (IAT) Sensor, Vehicle Speed Sensor (VSS), and battery voltage all have varying levels of influence on pulse width, depending on the circumstances.

As noted earlier, the Neon uses two oxygen sensors (fig. 11), both of which monitor the oxygen content of the combustion byproducts on their way out of the engine as exhaust. Only the upstream sensor has authority over fuel injector pulse width.

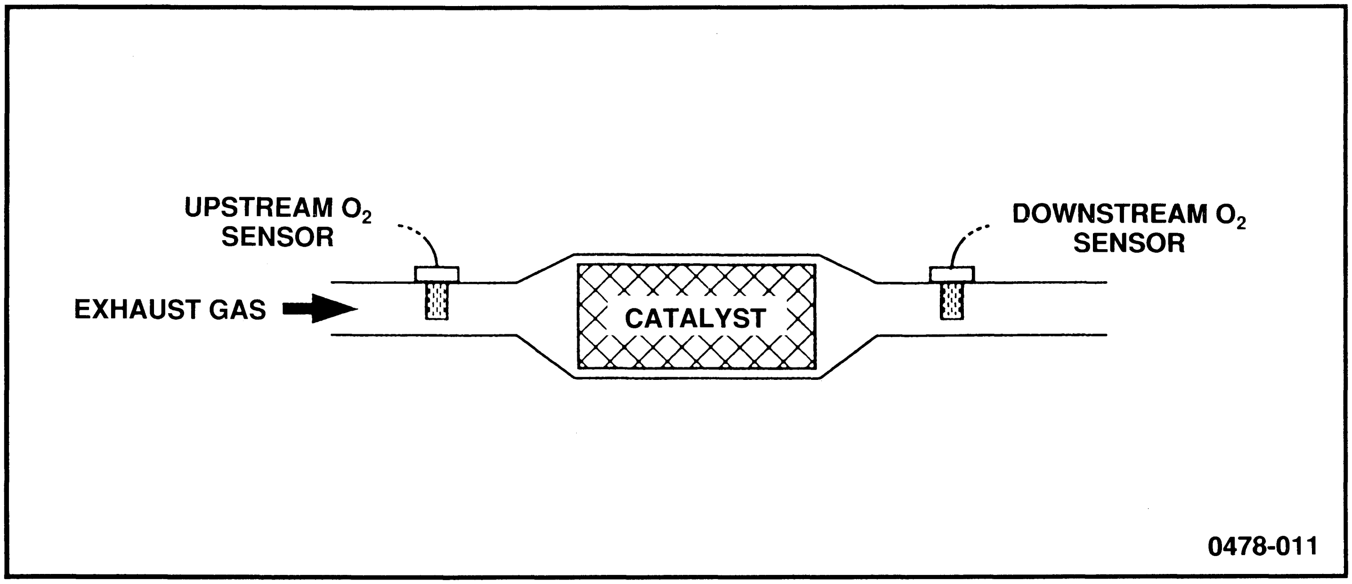


Figure 11 O_2 Sensors

If a large amount of oxygen remains following the combustion process, the upstream O_2 sensor produces a low voltage. This indicates a lean condition caused by an air/fuel ratio greater than stoichiometric. Little oxygen in the exhaust allows the sensor to produce a higher voltage, indicating a rich condition where the air/fuel ratio is less than stoichiometric

Upstream O_2 sensor feedback to the PCM is used to fine tune injector pulse width to maintain stoichiometry and meet emission standards. It can increase or decrease injector pulse width by as much as 50%. Pulse width is calculated from the data supplied from the MAP, TPS, ECT, IAT, upstream O_2 sensor, battery voltage, rpm, and VSS.

To control air/fuel ratio feedback, the PCM uses short term correction and long term memory. Before the PCM can alter the programmed injector pulse width, it must enter closed loop operation. The requirements for closed loop operation are listed below:

- Engine temperature exceeds 35° F
- O_2 sensor is in the ready mode
- All timers have timed out following the Start to run transfer. (The length of these timers varies with engine temperature)

35° F – 41 sec.
50° F – 35 sec. (36 sec. for Eagle Talon)
70° F – 22 sec. (19 sec. for Eagle Talon)
167° F – 11 sec.

Once in closed loop control, the feedback systems begin to operate. Short term correction works with long term correction, which is broken down into 14 different cells. Two of these cells (12 and 13) are used only during idle. Each cell represents a manifold pressure and rpm range, and can be accessed with the DRB III diagnostic scan tool.

Table 3 Neon's Long Term Memory Cells

ABOVE 2048 RPM	1	3	5	7	9	11	13 Idle Neutral MTX
BELOW 2048 RPM	0	2	4	6	8	10	12 Idle Drive ATX ONLY
Map Voltage		1.38	2.0	2.64	3.26	3.9	

Purge free cells are cells that parallel purge normal cells. On a Neon, the purge free cells are as follows:

1. Idle purge free cell = Cell 13 for vehicles equipped with a manual transaxle and
   Cell 12 for vehicles equipped with an automatic transaxle
2. Purge free cell 2 = Cell 2
3. Purge free cell 3 = Cell 5

Table 4. Eagle Talon (with an automatic transaxle) Memory Cells

ABOVE 1984 RPM	1	3	5	7	9	11	13 Idle Neutral
BELOW 1984 RPM	0	2	4	6	8	10	12 Idle Drive

Map Voltage 1.38 2.0 2.64 3.26 3.9

On a Talon with an automatic transaxle, the purge free cells are as follows:

1. Idle purge free cell = Cell 12
2. Purge free cell 2 = Cell 4
3. Purge free cell 3 = Cell 3

Table 4. Eagle Talon (with a manual transaxle) Memory Cells

ABOVE 1952 RPM	1	3	5	7	9	11	13 Idle Neutral
BELOW 1952 RPM	0	2	4	6	8	10	12 (not used)

MAP Voltage 1.38 2.0 2.64 3.26 3.9

The purge free cells for the Talon with a manual transaxle are as follows:

1. Idle purge free cell = Cell 13
2. Purge free cell 2 = Cell 4
3. Purge free cell 3 = Cell 6

There are a total of 17 long term memory cells. The purge free cells parallel the same structure as the purge normal cells. Purge is allowed to function normally in the purge normal cells, where as in the purge free cells, information is not corrupted by the evaporative canister.

For example:

In order for the PCM to update cell 3, the MAP sensor must be indicating that the voltage is between 1.38 and 2.0 volts, and engine rpm is greater than 2048.

If, during vehicle operation, the oxygen sensor registers a rich or lean condition in this cell, the cell will require updating to aid in fuel control. The short term correction is used first. It starts increasing pulse width quickly (kick), then ramps up slowly (fig. 12). Each control is in inverse relation to the signal sent from the O_2 sensor.

For example:

The O_2 sensor switches lean to rich. Short term compensation kicks-in lean, then ramps lean until the O_2 sensor switches lean. At this point short term compensation reverses the process.

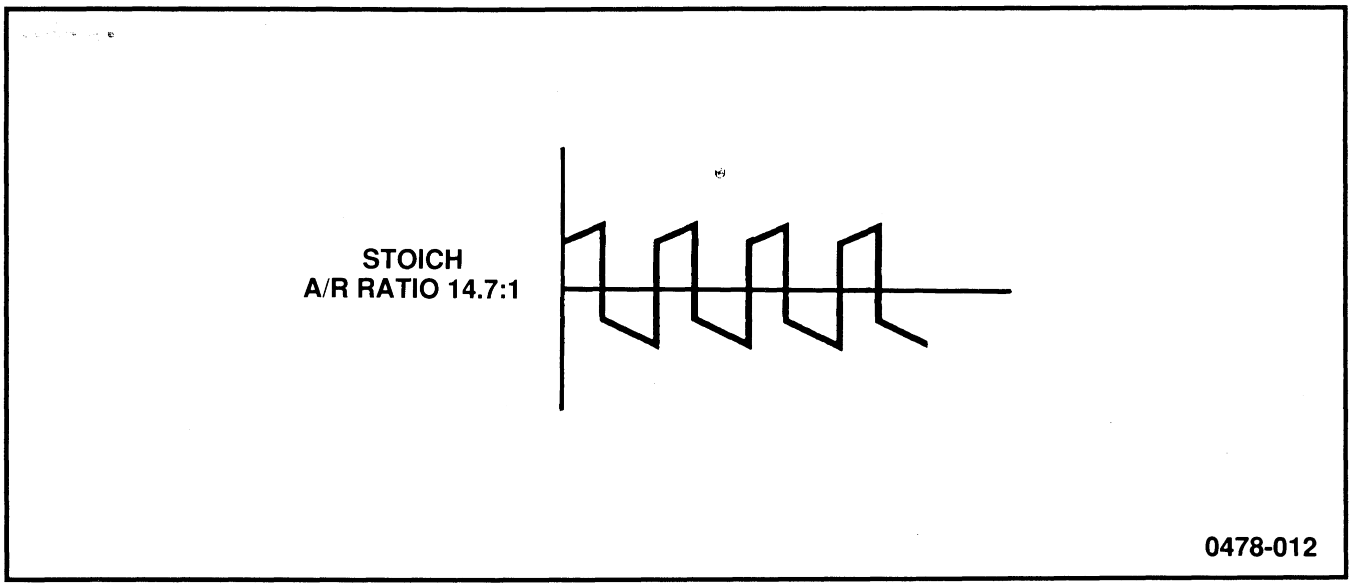


Figure 12 Short-Term Fuel Compensation

If the oxygen sensor shows lean, the short term compensation goes rich and multiplies the pulse width from long term memory in that cell by an amount greater than 1. If the sensor shows rich, the short term compensation drives the pulse width narrower by multiplying by a number less than 1 (perhaps 0.97). The short term compensation can multiply pulse width by as much as 1.25 or as little as 0.75 to compensate for lean or rich conditions. In that way, the short term compensation can increase pulse width by up to 25% (by multiplying by 1.25), or decrease pulse width by up to 25% (by multiplying by 0.75).

Example:

Pulse width 0.05 x 1.25 = 0.0625 (an increase of 25%)

Pulse width 0.05 x 0.75 = 0.0375 (a decrease of 25%)

Long term memory also has control over pulse width by being able to increase or decrease the pulse width stored in the cell by up to 25%. Long term memory is retained by the battery in the PCM, while short term correction is lost whenever the ignition is turned off.

The long term memory works to bring the short term correction to the point where the average percent of pulse width compensation it provides in this memory cell is 0% (fig. 13). The long term memory returns to this level of pulse width compensation the next time the PCM enters this cell. It is in this way that the PCM is continually relearning the most appropriate level of control, even as the vehicle ages, internal engine components wear, and operating conditions change.

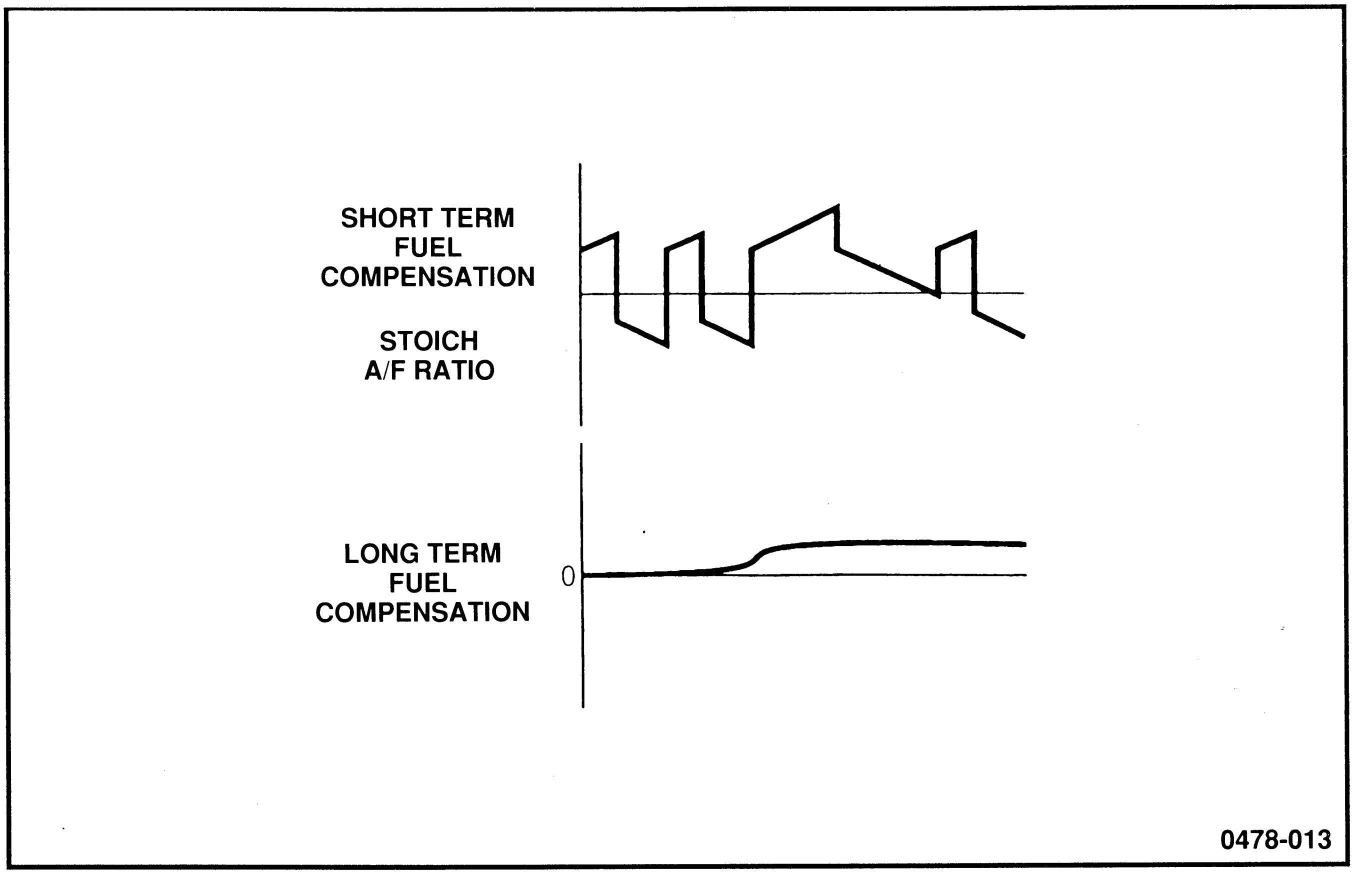


Figure 13 Long-Term Memory Adjusts Fuel Compensation

There are several "purge free" cells. These cells contain information on how much effect the canister has on the air/fuel ratio. The purge solenoid is turned off to shut off the purge flow, and the cell is allowed to register any purge corruption. The monitor looks at the combination of short and long term fuel control values to see if the system is in control.

Enabling Conditions

The following conditions must be met before the fuel system monitor will run:

- Closed loop operation

Pending

The fuel system monitor does not run if the MIL lamp is illuminated due to one of the following conditions:

- Misfire DTC
- Purge monitor DTC
- Upstream O_2 sensor heater DTC
- EGR monitor DTC
- Vehicle is in limp-in mode due to MAP, TPS, or engine temperature DTC
- Camshaft/crankshaft sensor failures
- EGR solenoid DTC
- Purge solenoid DTC
- Upstream O_2 sensor rationality DTC

Conflict

The fuel system monitor does not run if any of the following are present:

- One trip misfire maturing code
- One trip purge monitor maturing code
- One trip upstream O_2 sensor heater maturing code
- One trip EGR monitor maturing code

Suspend

There are no suspend conditions for the fuel system monitor. However, the monitor may be disabled if the fuel level reaches 0.60 gallon or less.

Talon's equipped with automatic transaxles (OBD I diagnostics), continuously monitor the fuel system once in closed loop. The test fails if the fuel control system reduces injection pulse width by 25% from long term memory and 25% from short term compensation due to a rich condition, or increase injection pulse width by 25% from long term memory and 25% from short term compensation due to a lean condition. Furthermore, both the rich or lean condition must remain at these values for a total of eight minutes while in closed loop.

For all Neons' and Eagle Talons' equipped with manual transaxles (OBD II diagnostics) ,the fuel system is continuously monitored during each trip once the enabling conditions have been met. The test fails if the fuel control system reduces pulse width by 25% long term memory and 7% short term compensation due to a rich condition, or increases pulse width by 25% long term memory and 12% short term compensation due to a lean condition. The MIL illuminates and a DTC is set when the adaptive fuel system exceeds these limits for two consecutive trips. The message on the scan tool will appear as follows:

Fuel System Rich
Flash Code – 52   J 2012 Code – P 0172

Fuel System Lean
Flash Code – 51   J 2012 Code – P 0171

When the PCM stores a maturing code, it also stores a freeze frame of the vehicle operating data at the time the fault was set. This information is accessible with the DRB III diagnostic scan tool. The MIL extinguishes if the malfunction causing it to illuminate is not repeated for three consecutive trips monitored within 10% of the load value and 375 rpm of the original freeze-frame conditions.

Malfunction of the fuel monitor can possibly be caused by problems with any of the following components:

- Catalytic converter
- Intake air temperature sensor
- Ignition coil
- EGR valve assembly
- PCM
- Valves (worn)
- Piston rings (worn)
- Head gasket
- Head (cracked)
- Exhaust manifold
- Fuel pump
- Fuel filter
- Ignition secondary wires
- Injectors
- Map sensor
- O_2 sensor
- Fuel pressure regulator
- Fuel pump relay
- Spark plugs
- Wiring harness/connectors

The fault trees in the Diagnostic Procedures book can help you isolate the source of the problem.

Misfire Monitor

Background

Misfire is defined by the California Air Resources Board as the lack of combustion in a cylinder due to absence of spark, poor fueling, compression, or other cause. As a result, the air/fuel mixture will not burn, and during the exhaust stroke, it enters the exhaust system. The raw fuel and excess oxygen adversely affect the fuel system's feedback mechanism (the oxygen sensor) and can cause permanent damage to the catalytic converter.

Operation

The OBD II misfire monitor uses information provided by the crank position sensor to determine engine rpm and detect slight variations due to engine misfire. Crankshaft rpm is calculated between the 69° and 9° falling edges of the crankshaft position sensor signal (fig. 14).

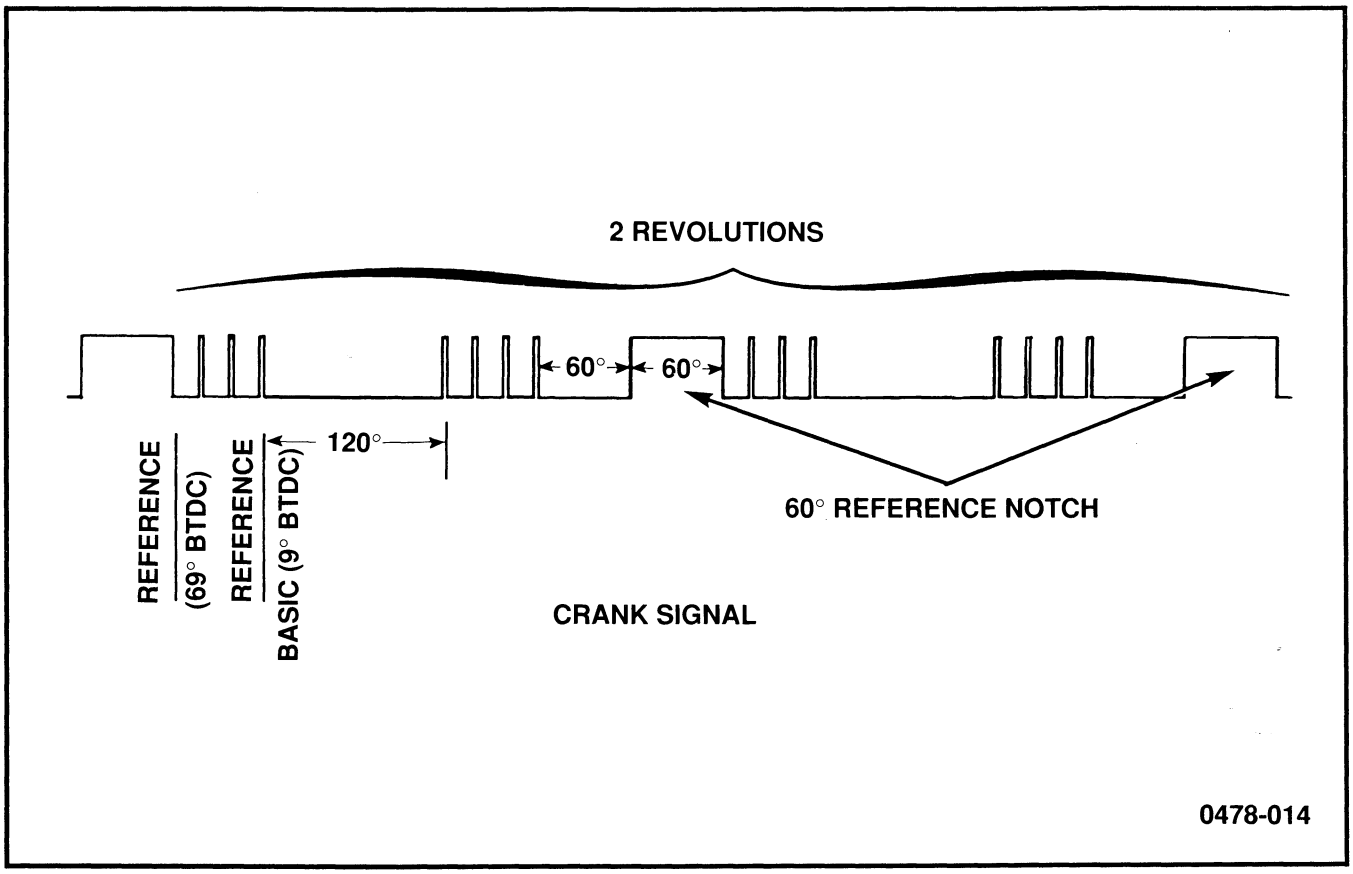


Figure 14 Crankshaft Position Sensor Signal

The threshold for determining what amount of rpm change indicates misfire varies with engine speed and load. This is required because, as engine speed increases or load decreases, the overall effect of a single cylinder misfire diminishes due to the momentum of the crankshaft.

The misfire monitor contains an adaptive feature that can take into account component wear, sensor fatigue, and machining tolerances. The PCM notes rpm variance between cylinders during normal vehicle operation, and then uses these figures as a foundation for calculating the threshold at which rpm variance is considered to indicate misfire.

Note: *The PCM requires normal vehicle operation to update its memory. Because the PCM has no reference for "normal operation," the PCM considers a misfire condition to be normal if the vehicle was misfiring when the PCM was replaced. The same situation can occur any time battery power to a PCM is lost and a vehicle is misfiring when the controller is reconnected.*

The misfire monitor triggers operation of the MIL under two different operating situations:

1,000 Rev Misfire

Misfire is continuously monitored (in 200 revolution segments) once the enabling conditions have been met. If the monitor detects misfire in more than 2% (automatic transmission) 1.6% (manual transmission) of the engine cycles in a 1,000 revolution period, a temporary fault is set. Freeze-frame data of the operating conditions during the last 200 revolutions of that 1,000 revolution period is stored. As with other monitors, failure of the misfire monitor on the next trip matures the code, and the MIL illuminates and a DTC is stored. It is important to note that two trips are required for the code to mature. Continued misfiring during the initial trip does not illuminate the MIL unless it exceeds misfire in more than 15% of cylinder firing opportunities.

200 Rev Misfire

If the monitor detects misfire in more than 15% of cylinder firing opportunities during any 200-revolution monitored segment, the MIL immediately begins flashing, a DTC is stored, and the freeze frame is stored with information regarding the conditions during which the misfire occurred. This indicates that engine misfire has reached the point at which damage to the catalytic converter is likely to occur. The vehicle defaults to open loop operation to prevent the adaptive fuel controls from dumping additional fuel into the cylinders and accelerating damage to the catalyst. Driving the vehicle while the MIL is flashing is not recommended.

Once out of the operating condition where the 15% misfire is occurring, the MIL will stop flashing but remain illuminated. The vehicle may be driven, but should be serviced immediately.

Because some misfire is a common occurrence in a number of driving conditions, MIL illumination due to misfire may occur when no component has failed. Try to identify conditions that could trigger the misfire monitor that are **not** related to component failure. Examples of these include:

- Damp ignition system components (high humidity)
- Low fuel/running out of gas (monitor triggers as engine sputters)
- "Lugging" the engine (manual transmission)
- Pulling heavy loads
- Low quality gasoline

In addition, the following situations could mistakenly trigger the MIL:

- Large potholes
- Extended rough road operation

As advancements in computer technology occur, Chrysler's engineering efforts continually decrease the chances of setting a false misfire fault.

Enabling Conditions

The following conditions must be met before the misfire monitor will run:

- MAP voltage is less than 1.60
- Rpm is between 2,200 and 2,800
- Engine coolant temperature is greater than 176° F
- The engine has made a start-to-run transfer
- Vehicle speed less than 3 mph

Pending

The misfire monitor does not run if the MIL is illuminated due to one of the following:

- The vehicle is in the limp-in mode due to MAP, TPS, camshaft or crankshaft position sensors, or engine temperature.
- A speed sensor DTC

Conflict

The misfire monitor does not run if any of the following are present:

- One trip fuel system rich maturing code
- One trip fuel system lean maturing code
- One trip purge monitor maturing code
- One trip EGR monitor maturing code

Suspend

There are no suspend conditions for the misfire monitor.

Because false misfire readings could be a customer concern, there are several conditions under which the misfire monitor is disabled. These include:

- Low fuel level (less than 0.60 gallon on Neons that use a fuel level input to the PCM)
- Periods during which MAP voltages change quickly
- Severe engine deceleration
- Throttle toggles between open and closed
- Engine cranking (below 598 rpm)
- Rpm greater than 3,000 (automatic transmission), or greater than 3,500 rpm (manual transmission)
- Full lean or deceleration fuel shut-off
- Cold starts (engine coolant below 100° F)

If a misfire is detected and a DTC stored, the message on the diagnostic scan tool screen appears as follows:

Multiple Cylinder Misfire
Flash Code – 43 J 2012 Code – P 0300

Cylinder #1 Misfire
Flash Code – 43 J 2012 Code – P 0301

Cylinder #2 Misfire
Flash Code – 43 J 2012 Code – P 0302

Cylinder #3 Misfire
Flash Code – 43 J 2012 Code – P 0303

Cylinder #4 Misfire

Flash Code – 43 J 2012 Code – P 0304

The MIL goes out if the misfire condition does not recur during three consecutive trips where the vehicle is operated within 375 rpm and 10% of the load condition is stored in the freeze frame. The DTC is erased from memory following the successful completion of 40 warm-up cycles.

A misfire condition could possibly be caused by problems with any of the following components:

- Spark plugs or wires
- Coil
- Crank position sensor
- Timing belt
- Cam or crank sprockets
- Piston rings (worn)
- Valves (worn)
- Head gasket
- Head (cracked)
- Fuel lines and filter
- Fuel rail
- Fuel pump module
- Fuel pressure regulator
- Injectors
- Exhaust pipes and muffler
- Catalytic convertor
- Fuel pump relay
- Wiring harness and connectors
- Crankshaft

The fault trees in the Diagnostic Procedures book can help you isolate the source of the problem.

Exhaust Gas Recirculation Monitor

Background

Exhaust Gas Recirculation (EGR) is a method of reducing oxides of nitrogen (NOx) emissions by introducing non-combustible exhaust gases into the combustion chamber (fig. 15). These gases absorb heat and reduce the high cylinder operating temperatures where NOx is most likely to occur. Lower combustion chamber temperatures result in lower NOx emissions.

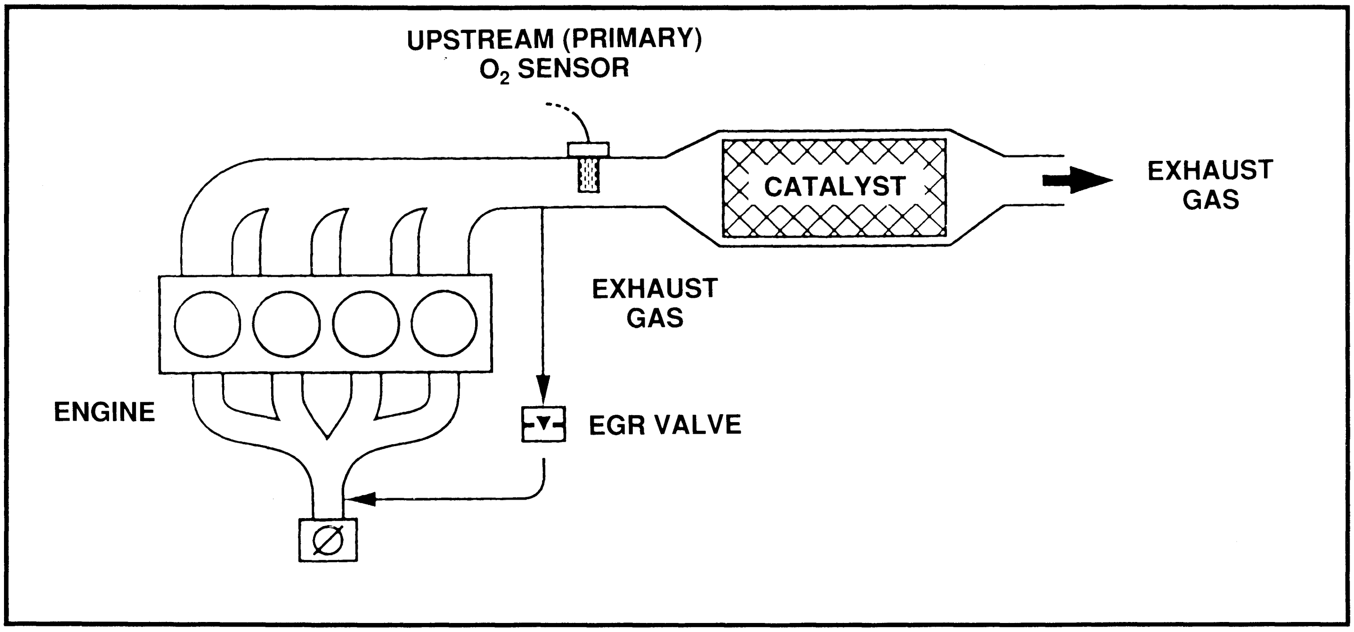


Figure 15 Exhaust Gas Recirculation System

Operation

The EGR system consists of a vacuum solenoid, back pressure transducer, and a vacuum operated valve (fig. 16). When activated, the solenoid allows vacuum to act upon the transducer. Negative exhaust back pressure allows manifold vacuum from the solenoid to vent to the atmosphere. Positive exhaust back pressure causes the transducer diaphragm to modulate. This allows intake manifold vacuum to reach the EGR valve. The combination of vacuum on one side of the valve diaphragm and exhaust back pressure on the other allows exhaust gases to be introduced into the intake manifold.

An EGR system that is stuck in the closed position prevents the system from decreasing NOx emissions. A system stuck in the open position can increase hydrocarbon emissions, fuel consumption, and produce rough engine operation.

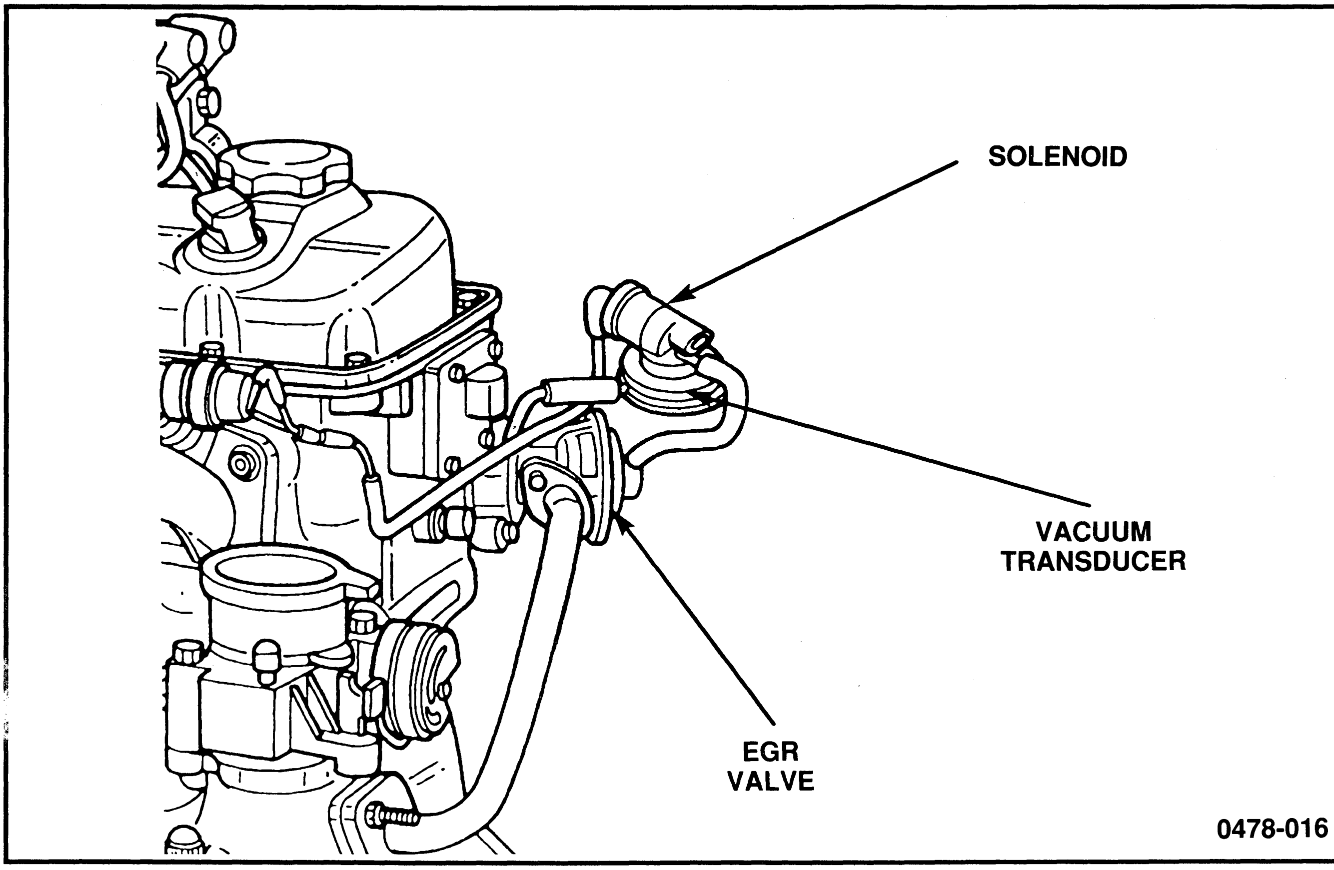


Figure 16 EGR Valve and Transducer

To detect operation of the system, automatic fuel compensation is temporarily disabled, the EGR solenoid is turned off, and the O_2 compensation control is monitored. If the EGR system is operating properly, turning it off shifts the air/fuel ratio in the lean direction (fig. 17). O_2 sensor data should indicate an increase in oxygen in the exhaust gases, and cause the short term control to shift to rich. The amount of the shift indirectly monitors the operation of the system.

Enabling Conditions

The following conditions must be met before the EGR monitor will run:

- Engine temperature is greater than 170° F
- More than three minutes have passed since start-up
- Engine rpm is between 2,248 and 2,688 (auto) or between 1,952 and 2,400 (manual)
- MAP voltage is between 1.80 and 2.70
- TPS voltage is between 0.6 and 1.8
- Vehicle speed exceeds 40 mph
- Short term O_2 controller is adjusting pulse width by less than + 4.4%

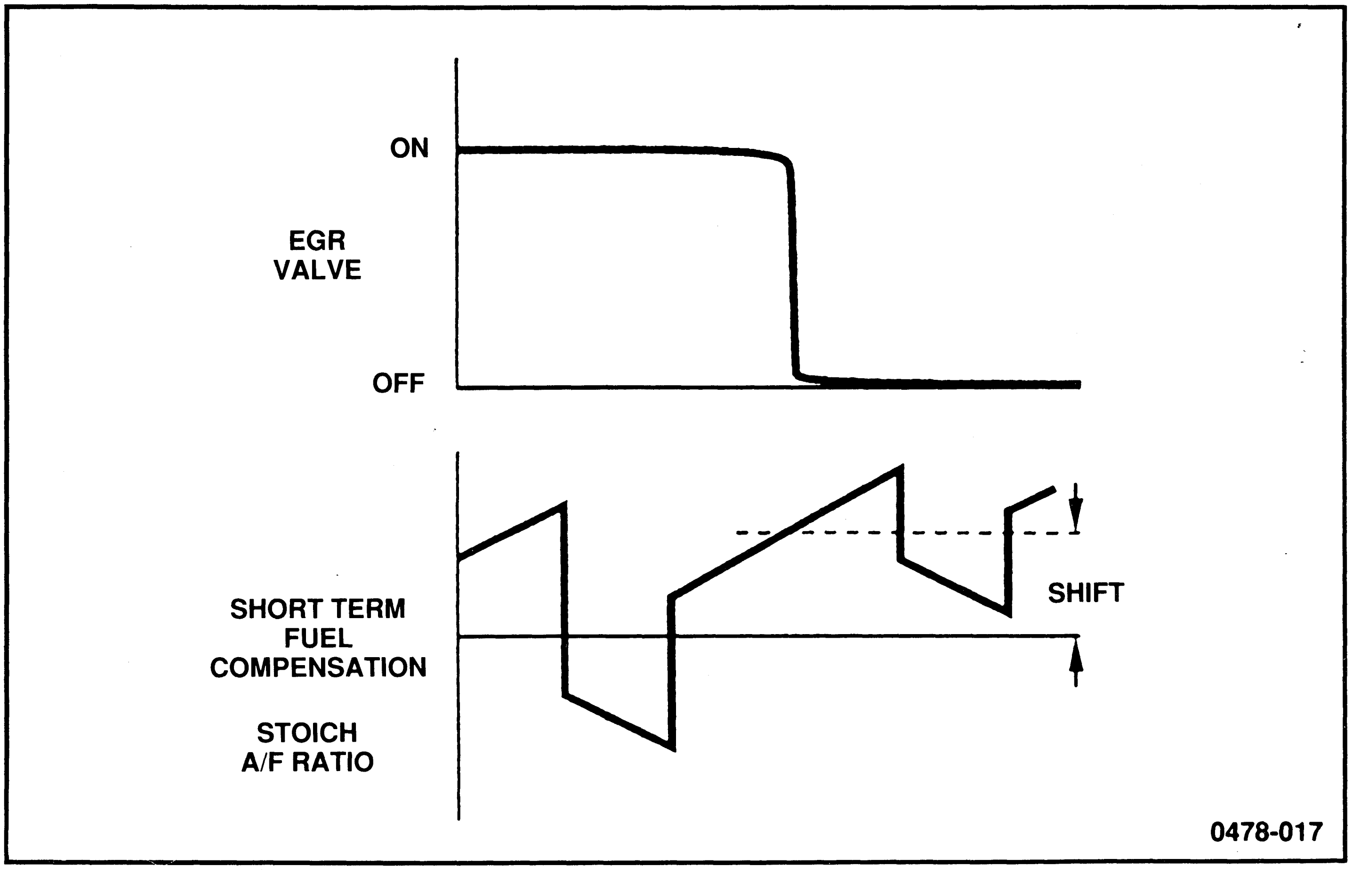


Figure 17 Fuel System Compensation Shift

Pending

The EGR monitor does not run if the MIL is illuminated due to one of the following:

- Misfire DTC
- O_2 monitor DTC
- Upstream O_2 heater DTC
- Fuel system rich/lean DTC
- Upstream O_2 shorted high
- Vehicle is in limp-in mode due to MAP, TPS, or engine temperature DTC
- Vehicle speed sensor DTC
- EGR solenoid DTC
- Cam or crank sensor DTC

Conflict

The EGR monitor does not run if:

- The fuel system rich intrusive test is in progress
- Purge monitor is in progress
- Catalyst monitor is in progress
- Time since start is less than 60 seconds
- One trip misfire maturing code
- One trip O_2 monitor maturing code
- One trip upstream O_2 heater maturing code
- One trip fuel system rich maturing code
- One trip fuel system lean maturing code

Suspend

Results of the EGR monitor not are not recorded until the O_2 monitor passes.

This monitor is performed once each trip. If the measured change in the short term shift during the test is less than 7.4% or greater than 20.5%, the monitor fails, and a maturing code is stored. The MIL illuminates and a DTC is stored if the monitor is outside this range for a total of two consecutive trips. The message on the diagnostic scan tool screen appears as follows:

EGR System Failure
Flash Code – 32   J 2012 Code – P 0401

The MIL extinguishes if the EGR monitor passes for three consecutive trips. The DTC is erased after 40 successful warm-up cycles.

Malfunction of the EGR monitor could possibly be caused by problems with any of the following mechanical components:

- EGR valve assembly
- EGR tube
- Wiring harness and connectors
- Vacuum hoses

Secondary Air Injection (Eagle Talon Only)

Background

Secondary air injection is used anytime the catalytic converter does not warm-up quick enough after the engine has started. Air is injected through an electronically controlled aspirator upstream of the catalytic converter. The extra oxygen allows for a quick temperature rise in the converter during warm-up cycles. The Eagle Talon requires the use of the secondary air injection system due to the location of the exhaust manifold (front exhaust) in relation to the catalytic converter (under the floor pan).

Operation

The secondary system consists of a vacuum solenoid, a vacuum actuated aspirator valve, and hosing routed from the valve to the air cleaner and from the valve to the exhaust pipe. When the PCM energizes the secondary air solenoid, vacuum is routed to the aspirator control valve. Vacuum applied to the valve opens the valve which allows air to be injected upstream of the catalytic converter.

The PCM energizes the solenoid during the following engine operating conditions:

- Engine coolant temperatures less than 120°F - solenoid is energized for 115 seconds after the start-to-run transfer
- Engine coolant temperatures greater than 120°F - solenoid is energized for 19 seconds after the start-to-run transfer
- Engine coolant temperature between 140° - 154°F - solenoid is energized during the deceleration mode

Air that is injected continuously may cause premature catalytic converter damage and will cause the O_2 sensor to indicate an air/fuel ratio that contains too much oxygen (too lean). In turn, the PCM increase the injection pulse width, resulting in an increase of emissions. If the Talon's secondary air injection system doesn't function at all, the catalytic converter may not warm-up quick enough. If the catalytic converter doesn't warm-up quick enough, periods of higher than normal emissions may be detected. The catalytic converter will eventually reach operating temperatures but not as rapidly as it should.

To detect operation of the system, automatic fuel compensation is temporarily disabled and the O_2 compensation control enriches fuel by adding in approximately 10%. The maximum amount of time the this portion of the test runs is approximately 18 seconds. When the downstream O_2 sensor switches rich, the secondary air injection solenoid is energized. If the secondary air injection system is functioning properly, energizing the solenoid causes a shifts in the O_2 sensor reading to the lean direction. This must occur in less than 19 seconds.

Enabling Conditions

In order for the PCM to begin testing the secondary air injection system, the following conditions must be met:

- The test is run during idle only
- Idle rpm must never drop below 704 rpm during the test
- Engine has been running for at least 10 1/2 to 15 minutes
- Engine coolant temperature indicates that the engine temperature is above 170°F

Pending

The secondary air injection monitor does not run if the MIL is illuminated due to one of the following:

- Misfire DTC
- O_2 monitor DTC
- Upstream or downstream O_2 heater DTC
- Fuel system rich/lean DTC
- Upstream O_2 sensor shorted high
- Vehicle in limp-in mode due to MAP, TPS, ECT DTCs
- Vehicle speed sensor DTC
- Secondary air injection solenoid DTC
- Camshaft or crankshaft positions sensor DTC

Conflict

The Secondary air injection monitor does not run if:

- The fuel system rich intrusive test is in progress
- Purge monitor is in progress
- Catalyst monitor is in progress
- EGR monitor in progress
- one trip misfire maturing code
- one trip O_2 monitor maturing code
- One trip upstream or downstream O_2 heater maturing code
- One trip fuel system rich/lean maturing code

Suspend

Results of the secondary air injection monitor are not recorded until the O_2 monitor passes.

This monitor is performed once each trip. If the O_2 sensor does not shift in the 19 second time frame during the test, the monitor fails and a maturing code is stored. The MIL illuminates and a DTC is stored if the monitor fails two consecutive trips. The message on the diagnostic scan tool appears as follows:

Too Little Sec Air
or Too Much Sec Air
Flash Code — 36 J 2012 Code — P 0411

The MIL extinguishes if the secondary air injection passes for three consecutive trips. The DTC is erased after 40 successful warm-up cycles.

Malfunction of the secondary air injection monitor could possibly be caused by problems with any of the following mechanical components:

- Secondary air injection solenoid
- Aspirator valve
- Vacuum hose or air injection tube leaking

COMPREHENSIVE COMPONENTS

Diagnostic Trouble Codes (DTCs)

The Diagnostic Trouble Codes (DTCs) available for the remaining components on the 2.0L engine are listed on the following pages. In many cases, these codes are carried over from the OBD I diagnostics. Each listing includes a brief explanation of the J 2012 code and its number, and is preceded by the flash code produced by the Malfunction Indicator Lamp (MIL) on the instrument panel.

Several tests are made on comprehensive components. Components are tested for electrical opens and shorts. Inputs are tested for rationality: Does the signal make sense when compared to other signals? Outputs are tested for functionality: Does the change in inputs make sense after an output actuation?

Note: *Unlike previous Chrysler products, the Neon and Talon's DTCs cannot self erase after 50 warm-up cycles. Also, the MIL will not extinguish after the key has been cycled. If the MIL illuminates, a DTC is stored. Once the MIL is on, the PCM requires that the EGR monitor, and O_2 monitor be run or aborted, and on the Eagle Talon, the secondary air injection monitor must be run before the PCM can diagnose a previously malfunctioning component. The PCM also requires that this occur three times before the MIL is extinguished. Once the MIL is extinguished, the DTC can be self-erased after 40 warm-up cycles.*

11 No Crank Reference Signal at PCM

The Crankshaft Position (CKP) sensor, located on the engine block just above the oil filter, is a Hall-effect sensor that provides a voltage signal to the PCM at pin 25. Voltage alternates between 0 and 5 volts as the crank turns. The PCM supplies 9 volts to the sensor through pin 44, and a sensor ground at pin 51 (fig. 18).

Enabling Conditions

This DTC can be enabled in one of the two methods listed below:

1. No crank pulses detected after the battery has been disconnected
2. During cranking, the Camshaft Position (CMP) sensor indicates that the camshaft is rotating, and there are no pulses from the CKP sensor

No CKP sensor edges detected for 5 seconds during one of the two conditions causes the PCM to store the DTC in its memory. The test is run during start-up, and the engine will not operate without a signal from the crank position sensor.

The MIL is not illuminated, because an engine that does not run does not produce any emissions.

This malfunction could possibly be caused by problems with any of the following components:

- CKP sensor
- Related wiring and connectors for the CKP sensor (Open or short circuit)
- PCM
- Crankshaft tone wheel

11 Intermittent Loss of CMP or CKP - (P 1391)

The MIL is illuminated and the DTC is stored if the PCM detects no overlapping pulses between the cam position and crank position sensors for a total of 5 seconds.

This malfunction could possibly be caused by the same components as the previous DTC or by components that may cause a cam position sensor DTC (code 54, page 87).

11 Timing Belt Skipped 1 Tooth or More – (P 1390)

The 2.0L engine doesn't have broken belt valve clearance. Therefore, if the camshaft were allowed to be out of synchronization with the crankshaft, the valves might interfere with the pistons. The PCM uses voltage signals generated by the cam (pin 26) and crank (pin 25) sensors to determine engine synchronization. If these signals become out of sync, not only **may** engine damage occur, but an increase of emissions and decrease of performance **will** occur.

Enabling Conditions

The following conditions must be met before the Cam/Crank Timing signal can be tested:

- Engine rpm must be between 575 and 960 (automatic transaxle), or between 1,055 and 4,000 (manual transaxle)
- Vehicle must be running at a steady state based upon information from the TPS and MAP sensor.
- Engine coolant temperature must be at least 170°F
- 61 seconds have elapsed since the start-to-run transfer

Pending

The Cam/Crank Timing DTC will not be monitored if there is a malfunction with the CMP and/or CKP sensors.

The PCM monitors the 69° edges of the crankshaft from the CKP sensor. It also monitors the falling edges of the CMP sensor. The angle at which the two sensors are during the initial build of the vehicle is loaded into an EEPROM. The DTC is set if the angle between the CMP and CKP sensors exceed a pre-programmed amount. (Nominally, the starting angle will be 30°; the minimum angle is 8°; the maximum angle is 56°.)

The Cam/Crank Timing test runs continuously once the enabling conditions have been met. The MIL illuminates and the DTC is stored if the angle between the CMP and CKP have exceeded the threshold.

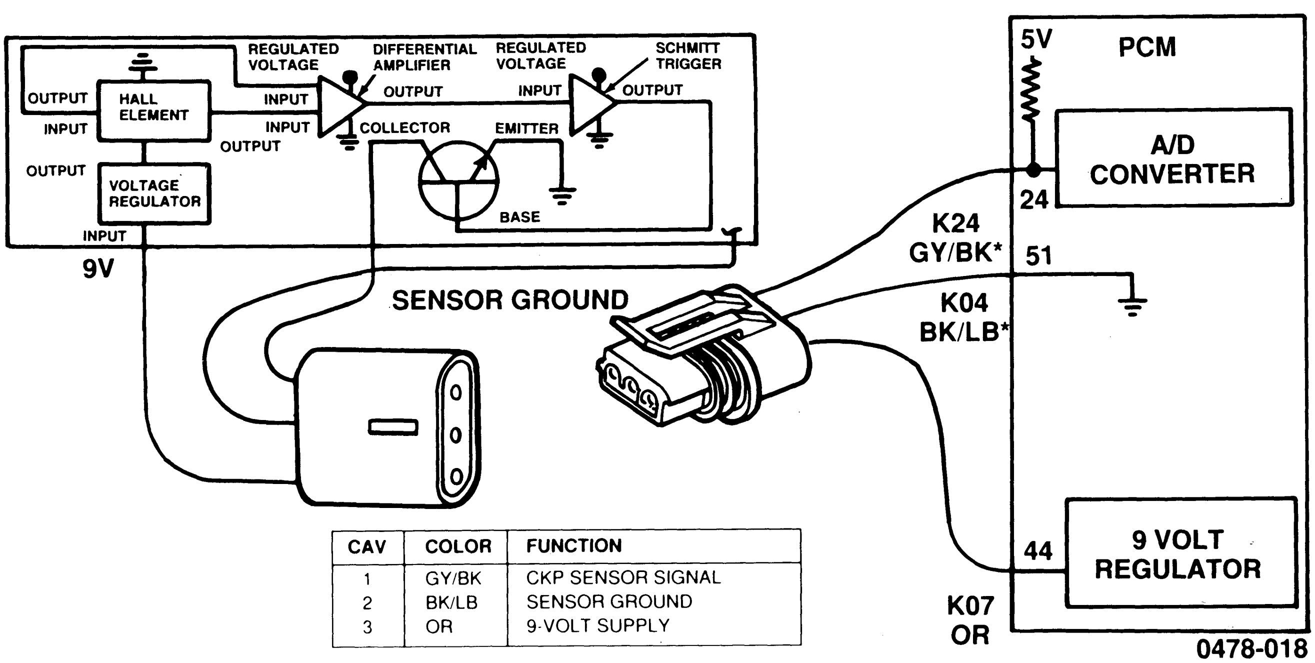
This malfunction could possibly be caused by problems with any of the following components:

- Timing belt (skipped at least one tooth)

The Cam/Crank angle is loaded into the EEPROM at the assembly plant. Manufacturing tolerances may cause the angle to be slightly different than production after certain components have been replaced. The following components, when replaced, require the use of the DRB III scan tool to erase the EEPROM and allow the EEPROM to learn the new angle:

- Camshaft
- Cylinder Head
- Cylinder Block
- CMP Sensor
- CMP Sensor Target
- PCM
- Water Pump

> ***Warning:*** *If the timing belt has been incorrectly installed, and the PCM has had it's EEPROM erased, the PCM learns an incorrect angle and can not identify the camshaft being out of synchronization with the crankshaft.*



CAV	COLOR	FUNCTION
1	GY/BK	CKP SENSOR SIGNAL
2	BK/LB	SENSOR GROUND
3	OR	9-VOLT SUPPLY

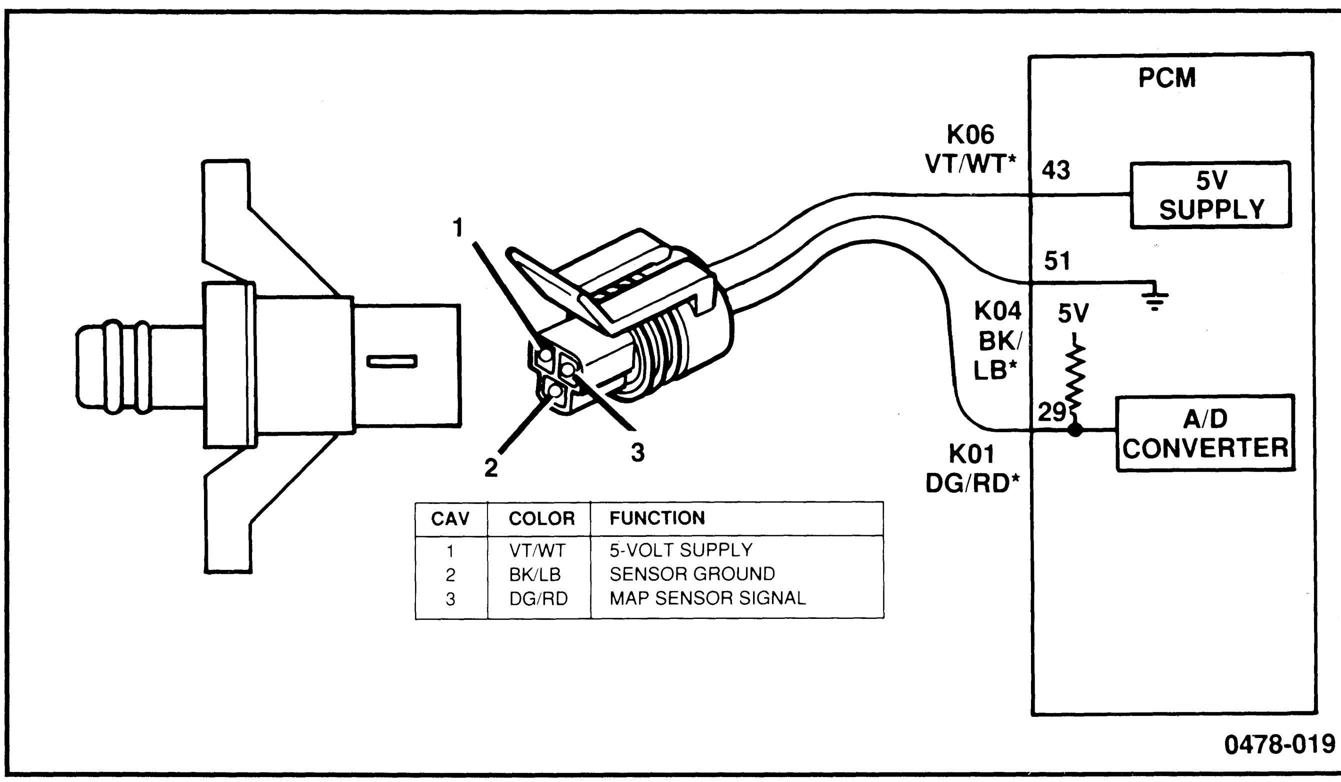
Figure 18 Crankshaft Position Sensor circuit

12 Battery Was Disconnected

This is a flash code only, and produces no message on the DRB III diagnostic scan tool screen.

13 No Change in MAP From Start to Run – (P 1297)

The Neon's MAP sensor is mounted directly to the plastic intake manifold, between the runners for cylinders 1 and 2. It serves as a PCM input at pin 29, receiving 5 volts from the PCM at pin 43, with sensor ground at pin 51 (fig. 19). When the key is turned on, the MAP sensor pulls the voltage down. The amount of voltage drop is based on the barometric pressure of the day (key-on baro. reading). This value is then stored in the PCM's memory, where it can be used to perform several calculations, including the pulse-width calculation. When the engine is started, the manifold pressure should drop, causing the MAP sensor's voltage to be pulled even lower. As the load on the engine increases, the pressure in the manifold increases, causing the voltage drop at the MAP sensor to decrease. At WOT, the pressure in the manifold should be at barometric pressure again. During WOT, the PCM is programmed to update its barometric pressure reading stored from the initial key-on reading, and it updates again, every time WOT is indicated.



CAV	COLOR	FUNCTION
1	VT/WT	5-VOLT SUPPLY
2	BK/LB	SENSOR GROUND
3	DG/RD	MAP SENSOR SIGNAL

Figure 19 MAP Sensor Circuit

Enabling Conditions

This test is enabled by meeting the following conditions:

- The PCM must not be in the start mode
- The PCM can not be in the limp-in mode from another MAP sensor fault
- Rpm is within 64 rpm of the target idle
- Vehicle cannot be moving

If the PCM receives information from the MAP sensor that the barometric pressure is greater than 27.56 in. of mercury, then the PCM must register at least a 3.86 in. of mercury change from the recorded barometric pressure reading, while the engine is running at idle. If the barometric pressure reading is less than 27.56 in. of mercury, the PCM must register at least a 0.12 in. of mercury change from the recorded barometric pressure reading, while the engine is running at idle. (Virtually any change at all will allow the test to pass.) If this does not occur, the PCM assumes that the sensor is no longer able to recognize the actual pressure in the manifold, and enters the limp-in mode. While in limp-in, the PCM uses the throttle position sensor and engine rpm to estimate MAP values.

A single test failure lasting at least two seconds causes the MIL to illuminate and the DTC to be stored in the PCM's memory.

MAP sensor malfunction could be possibly caused by problems with any of the following components:

- MAP sensor
- MAP sensor wiring and related connectors
- O-rings around the MAP sensor (damaged or missing)
- Manifold around MAP sensor (damaged)

14 Map Sensor Voltage Too Low – (P 0107)

Enabling Conditions

The diagnostics for this DTC are performed under the following conditions:

- Rpm between 400 and 1500
- TPS voltage must be less than 1.29 volts above minimum TPS
- PCM not already in limp-in mode

When this code is produced, the MAP sensor voltage has fallen below the minimum acceptable voltage of 0.02 volt. As in the situation above, the PCM estimates MAP value to allow the engine to run.

This malfunction could possibly be caused by problems with any of the following conditions:

- MAP sensor
- MAP sensor output wire (shorted to ground)
- PCM

14 Map Sensor Voltage Too High – (P 0108)

Enabling Conditions

The conditions to enable the test are the same as those of the previous MAP sensor test:

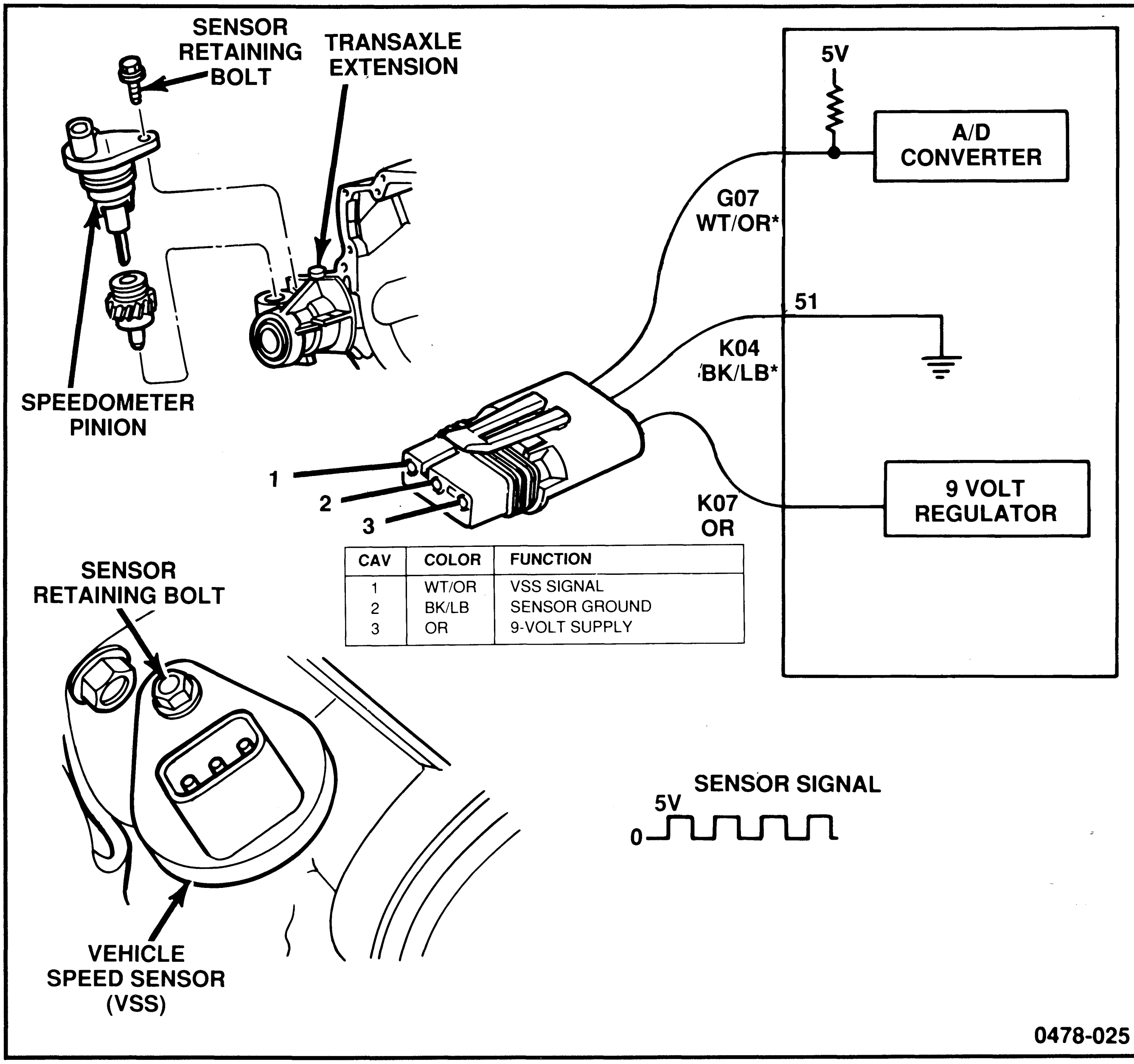
This code is generated when the MAP sensor voltage exceeds the maximum voltage of 4.667 volts.

This malfunction could possibly be caused by problems with any of the following conditions:

- MAP sensor
- MAP sensor wiring or connectors (open-circuited)
- PCM

15 No Vehicle Speed Sensor Signal – (P 0500)

The Vehicle Speed Sensor (VSS), is a Hall-effect sensor mounted on the transmission extension housing. It delivers vehicle speed information to the PCM as an input switching voltage between 0 and 5 volts at pin 5 of the PCM's 60-pin connector (fig. 20). When the PCM recognizes 8000 (4000 for Eagle Talon), 0-to 5-volt switching signals, the PCM assumes the vehicle has traveled one mile. The VSS receives a 9-volt power supply from the PCM on pin 44, and is grounded at pin 51.



CAV	COLOR	FUNCTION
1	WT/OR	VSS SIGNAL
2	BK/LB	SENSOR GROUND
3	OR	9-VOLT SUPPLY

Figure 20 Vehicle Speed Sensor Circuit

Enabling Conditions

To enable the test of the Vehicle Speed Sensor, the following conditions must be met:

- PCM must not be in the start mode
- Engine temperature must be at least 180°F
- The transmission must be in gear if the vehicle has an automatic transmission
- The engine must have been running for at least 31 seconds
- PCM cannot register that the brake is being applied
- PCM cannot be indicating engine is at idle
- Rpm must be 1,792 or higher
- The vacuum indicated by the MAP sensor must be between barometric pressure and ten in. of mercury below barometric pressure

Once the PCM assumes that the vehicle is in motion, information from the VSS is sampled. If the sensor's output voltage indicates a speed less than one mph for 11 seconds, the VSS is then considered to be malfunctioning.

Failure of the VSS is quite noticeable because the speedometer fails to operate. Diagnostic features that depend upon the speed sensor may never execute if the VSS fails, and the speed control will not function (if the vehicle is equipped with speed control). However, since the speedometer is wired independently of the PCM, never assume that the speed sensor has failed just because the speedometer is malfunctioning. Also, never assume that just because the speedometer is working that the PCM is receiving the VSS signal.

The speed sensor is used in the calculation of pulse width (deceleration programs), and is used to aid in the diagnostics of other OBD monitors. Therefore, the MIL is illuminated after the conditions have been met and no VSS pulses are recognized for a total of 11 seconds.

This malfunction could possibly be caused by problems with any of the following components:

- VSS
- 5-volt wire from the VSS to the PCM (open)
- Ground wire from the VSS to the PCM (open)
- 5-volt wire from the TCM to the PCM (open) (Eagle Talon Only)
- TCM (Eagle Talon Only)
- PCM
- Pinion gear on the VSS (damaged)

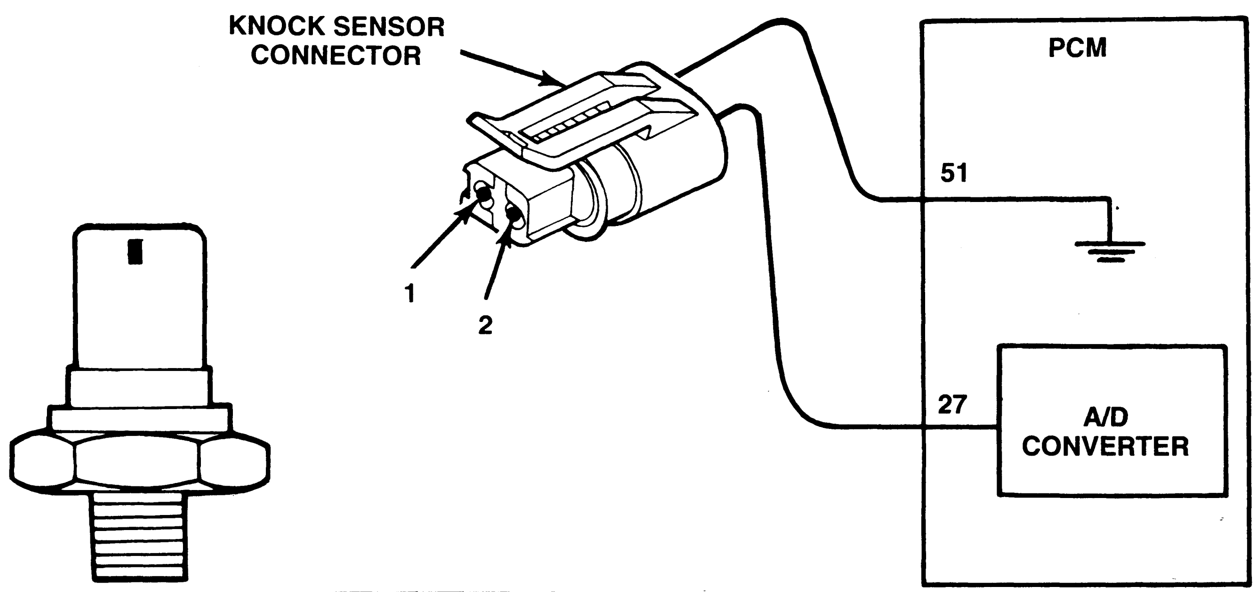
16 Knock Sensor #1 Circuit (Eagle Talon Only)

The knock sensor serves as an input to the PCM to aid in the reduction of detonation by reducing ignition timing. The sensor consists of a piezoelectric material that vibrates as the engine runs, sending an AC voltage signal to the PCM. The voltage produced increases with the frequency of vibration (fig. 21). When the signal reaches a preset threshold, the PCM retards ignition timing to reduce engine knock.

The PCM records a DTC when the knock sensor produces lower than normal voltage while the engine is operating at specific engine loads and rpms.

The Knock Sensor #1 Circuit malfunction possibly could be caused by problems with any of the following components:

- Knock sensor
- Knock sensor wiring or related connectors (open or short)
- PCM



CAV	FUNCTION
1	SENSOR GROUND
2	KNOCK SENSOR SIGNAL

94084-038

Figure 21 Knock Sensor Circuit

17 Closed Loop Temperature Not Reached – (P 0125)

The PCM sends a 5-volt analog signal to the Engine Coolant Temperature (ECT) sensor. The ECT is a thermistor, the resistance of which increases as temperature decreases (NTC-Negative Thermal Co-efficient). The PCM uses this sensor's information to calculate pulse width. It is also used to determine O_2 feedback closed loop timers. If the sensor malfunctions, closed loop may be delayed or possibly never achieved, causing an increase of exhaust emissions.

Enabling Conditions

This DTC will be stored if engine temperature remains below 60° F. for ten minutes of operation and no engine coolant temperature sensor code has been set.

See MIL code 22 for more information

This malfunction could possibly be caused by problems with any of the following components:

- ECT sensor
- Wiring or related connectors of the ECT sensor (corrosion)
- PCM

17 Engine is Cold Too Long

Enabling Conditions

The following conditions must be met before the PCM can detect "Engine is Cold Too Long":

- Engine must have been running for at least 12 minutes
- After the 12-minute timer has timed out, the PCM must detect VSS readings of greater than 28 mph for a total of eight minutes.

The DTC is stored if the ECT does not indicate that the temperature of the engine has exceeded 170° F. after all of the timers have timed out.

This malfunction could possibly be caused by any of the following:

- Extremely cold temperatures
- Coolant thermostat
- ECT sensor
- Related wiring or connectors (corrosion)
- PCM

21 Upstream O2S Response — (P 0133)

See page 15.

21 Downstream O2S Response - (P 0139)

Since the switch rate of the downstream sensor is extremely slow, the PCM waits until it recognizes commands for WOT and/or deceleration from the TPS. When the TPS sends a command to the PCM for WOT, the PCM goes into open loop. While in open loop, the injection pulse width increases to an air/fuel ratio less than stoichiometric. The resulting increase in fuel causes the downstream sensor to switch to a rich signal.

When the TPS sends a command to the PCM for deceleration, the PCM goes into a deceleration open loop and decreases the injection pulse width to an air/fuel ratio that is greater than stoichiometric. This results in a switch to lean signal from the downstream O_2 sensor.

The MIL illuminates and a DTC is stored when the PCM recognizes a slow response from the downstream O_2 sensor switching rich when the PCM enriches the air/fuel ratio during WOT or lean when the PCM leans out the air/fuel ratio during deceleration.

The Downstream Slow Response malfunction could possibly be caused by problems with any of the following components:

- Downstream O_2 sensor
- Downstream O_2 sensor wiring or related connectors (open or shorted)
- Exhaust system (leak)
- PCM

21 Upstream O2S stays at Center - (P 0134)

When the key is turned to the RUN position, the O_2 sensor's output wire is biased inside the PCM with a voltage of 0.45 volts (fig. 6). The PCM monitors the O_2 sensor for a change in the biased voltage. As oxygen in the exhaust supply changes, the O_2 sensor's output voltage changes. A voltage less than 0.45 volt indicates excessive oxygen in the exhaust. A voltage greater than 0.47 volt indicates insufficient oxygen in the exhaust. The PCM uses the information from the O_2 sensor to assist in adjusting the air/fuel ratio to a stoichiometric ratio.

Enabling Conditions

- Engine must have been running for at least two minutes
- Engine temperature must be greater than 77°F

The MIL illuminates and a DTC is stored if, after the enabling conditions have been met, the voltage from the O_2 sensor does not move from the bias voltage of 0.45 volt.

This malfunction could possibly be caused by problems with any of the following:

- O_2 sensor
- O_2 sensor wiring or related connections (open-circuited)
- PCM

21 Upstream O2S Heater Failure – **(P 0135)**

See page 20.

21 Downstream O2S Heater Failure – **(P 0141)**

See page 20.

21 Upstream O2S Shorted to Voltage – **(P 0132)**

Enabling Conditions

- Ignition has been on for at least 204 ms
- PCM not already in limp-in mode

The MIL is illuminated and a DTC is stored if, after the enabling conditions have been met, the voltage on the O_2 sensor output wire exceeds 1.22 volts for a period of at least three seconds.

This malfunction could possibly be caused by problems with any of the following components:

- O_2 sensor
- O_2 sensor 4-pin connector (contaminated with moisture)
- O_2 sensor output wire (shorted to voltage greater than 1.22 volts)
- PCM

21 Downstream O2S Shorted to Voltage - **(P 0138)**

See previous DTC fault (Upstream O2S Shorted to Voltage) for enabling conditions and fault parameters.

22 ECT Sensor Voltage Too Low – (P 0117)

The ECT sensor is located on the rear of the cylinder head, just below and to the left of the camshaft position sensor. It serves as a PCM input through pin 28 (fig. 22 and 23). Data from the coolant temperature sensor is used in most fuel and spark related control functions.

Enabling Conditions

- Ignition must be on and not already in limp-in mode

The MIL is illuminated and a DTC is stored in memory when voltage input to the PCM is below the threshold value of 0.51 volt for three seconds.

This malfunction could possibly be caused by problems with any of the following components:

- ECT sensor
- ECT sensor output wire (shorted to ground)
- PCM

22 ECT Sensor Voltage Too High – (P 0118)

The conditions to enable the test are the same as those of the previous DTC.

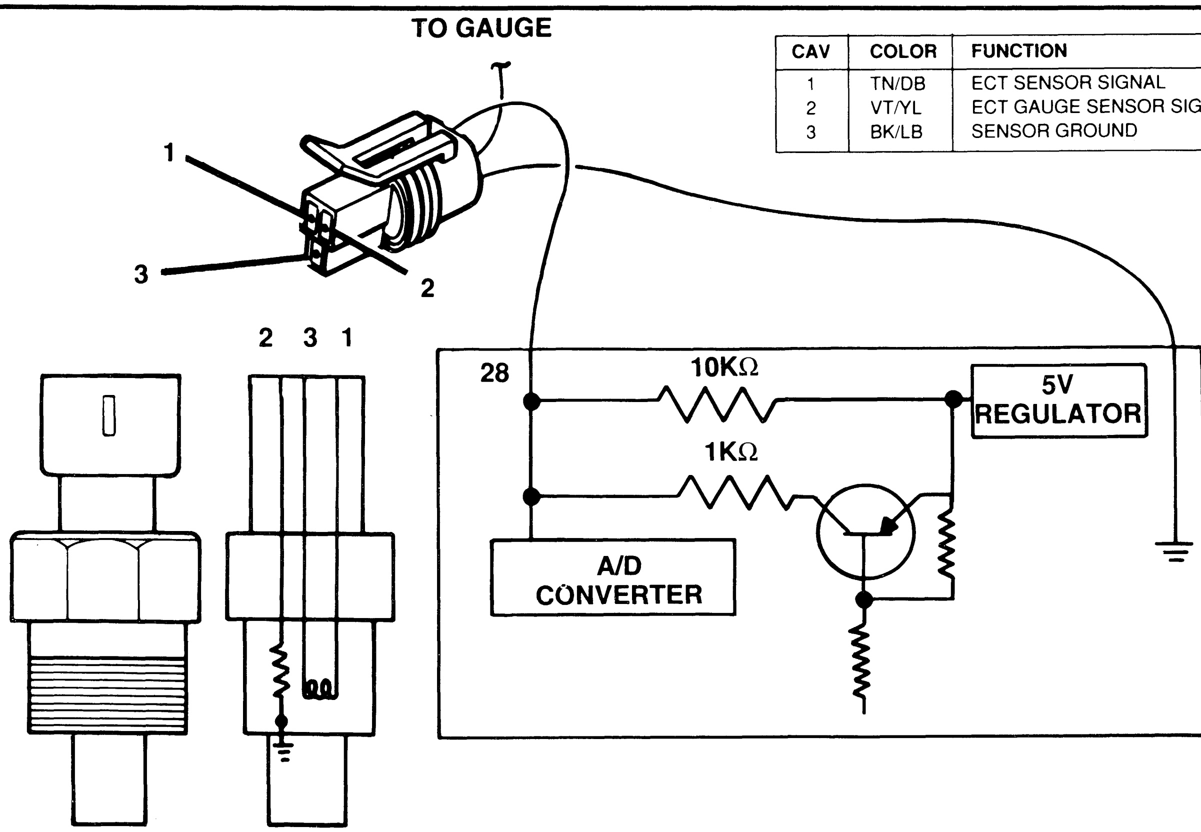
The MIL is illuminated and a DTC is stored in memory, when the ECT sensor output is greater than 4.96 volts for three seconds.

This malfunction could possibly be caused by problems with any of the following components:

- ECT sensor
- ECT sensor wiring or related connectors (open circuited)
- PCM

With both of the ECT sensor DTCs, the PCM uses a default value for the ECT sensor, and the vehicle enters the limp-in mode. The limp-in mode for the ECT sensor includes the following:

- O_2 feedback remains in closed loop
- Hot restart timer reactivated
- The PCM defaults the temperature of the engine to 69°F
- The radiator fan is turned on



CAV	COLOR	FUNCTION
1	TN/DB	ECT SENSOR SIGNAL
2	VT/YL	ECT GAUGE SENSOR SIGNAL
3	BK/LB	SENSOR GROUND

ENGINE COOLANT TEMPERATURE SENSOR
VOLTAGE VS. TEMPERATURE VALUES (COLD AND HOT)

COLD VALUES		HOT VALUES	
DEGREES F	VOLTS RESISTANCE	DEGREES F	VOLTS RESISTANCE
–20	4.70	110	4.20
–10	4.57	120	4.00
0	4.45	130	3.77
10	4.30	140	3.60
20	4.10	150	3.40
30	3.90	160	3.20
40	3.60	170	3.02
50	3.30	180	2.80
60	3.00	190	2.60
70	2.75	200	2.40
80	2.44	210	2.20
90	2.15	220	2.00
100	1.83	230	1.80
110	1.57	240	1.62
120	1.25	250	1.45

0478-021

Figure 22 Neon's Engine Coolant Temperature Circuit

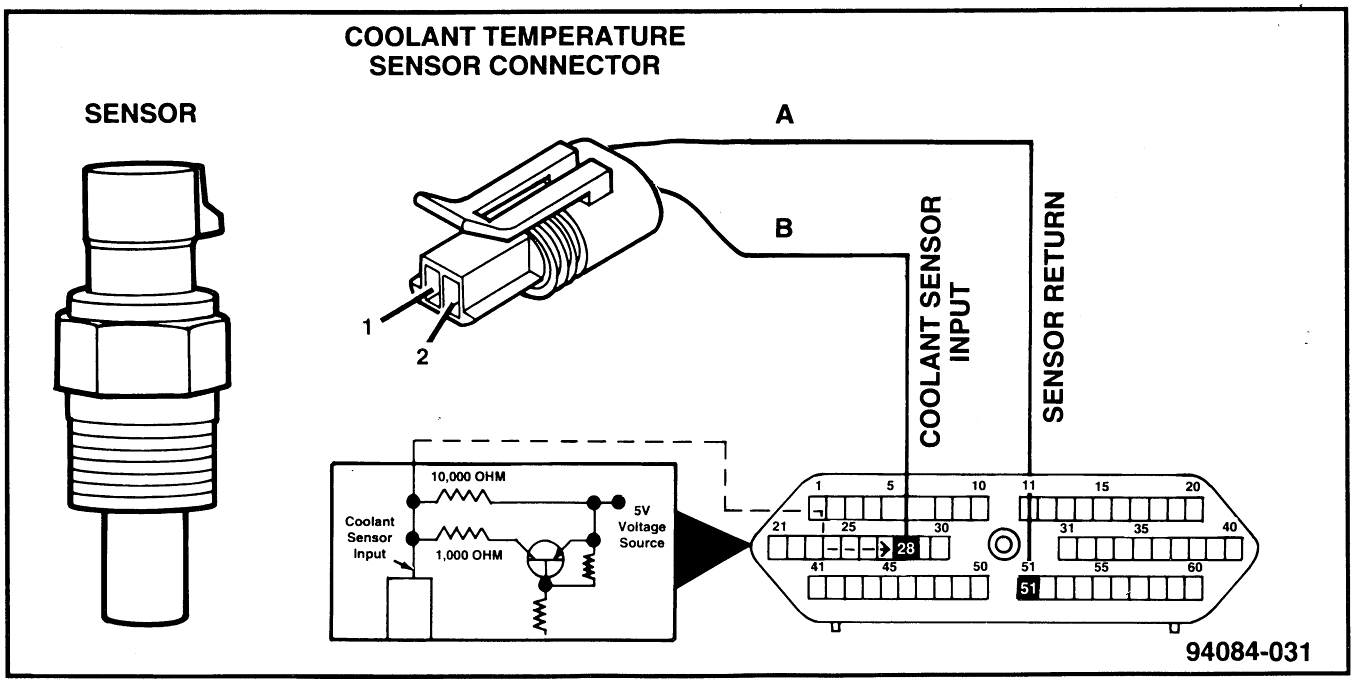


Figure 23 Eagle Talon's Engine Coolant Temperature Sensor Circuit

23 Intake Air Temp Sensor Voltage Low – (P 0112)

Mounted on the plastic intake manifold, the Intake Air Temperature (IAT) sensor serves as a PCM input at pin 6 (fig. 24). When the fuel system is in the open loop mode, the O_2 sensor cannot be used for injector pulse width calculation. In this instance, the system uses information on air mass to determine the correct pulse width necessary to achieve the proper air/fuel ratio. Once in closed loop, the IAT is used by the PCM to assist in air/fuel and spark advance calculations. Because air mass is related to temperature, information from the IAT sensor is used.

The enabling conditions are the same as for the ECT Voltage Too Low DTC.

The sensor has a low voltage threshold of 0.51 volt. If the output voltage falls below this threshold for three seconds, a DTC is stored.

This malfunction could possibly be caused by problems with the following components:

- IAT sensor
- IAT sensor output (shorted to ground)
- PCM

23 Intake Air Temp Sensor Voltage High – (P 0113)

The enabling conditions are the same as for the previous DTC.

The high voltage threshold for this sensor is 4.96 volts. If output voltage exceeds this limit for three seconds, a DTC is stored.

This malfunction could possibly be caused by problems with any of the following components:

- IAT sensor
- IAT sensor wiring or related connectors (open circuited)
- PCM

With both of the IAT sensor DTCs, the PCM uses default values for the IAT sensor, and the PCM enters into limp-in mode. During IAT sensor limp-in, the PCM uses the temperature from the ECT sensor as a limp-in value.

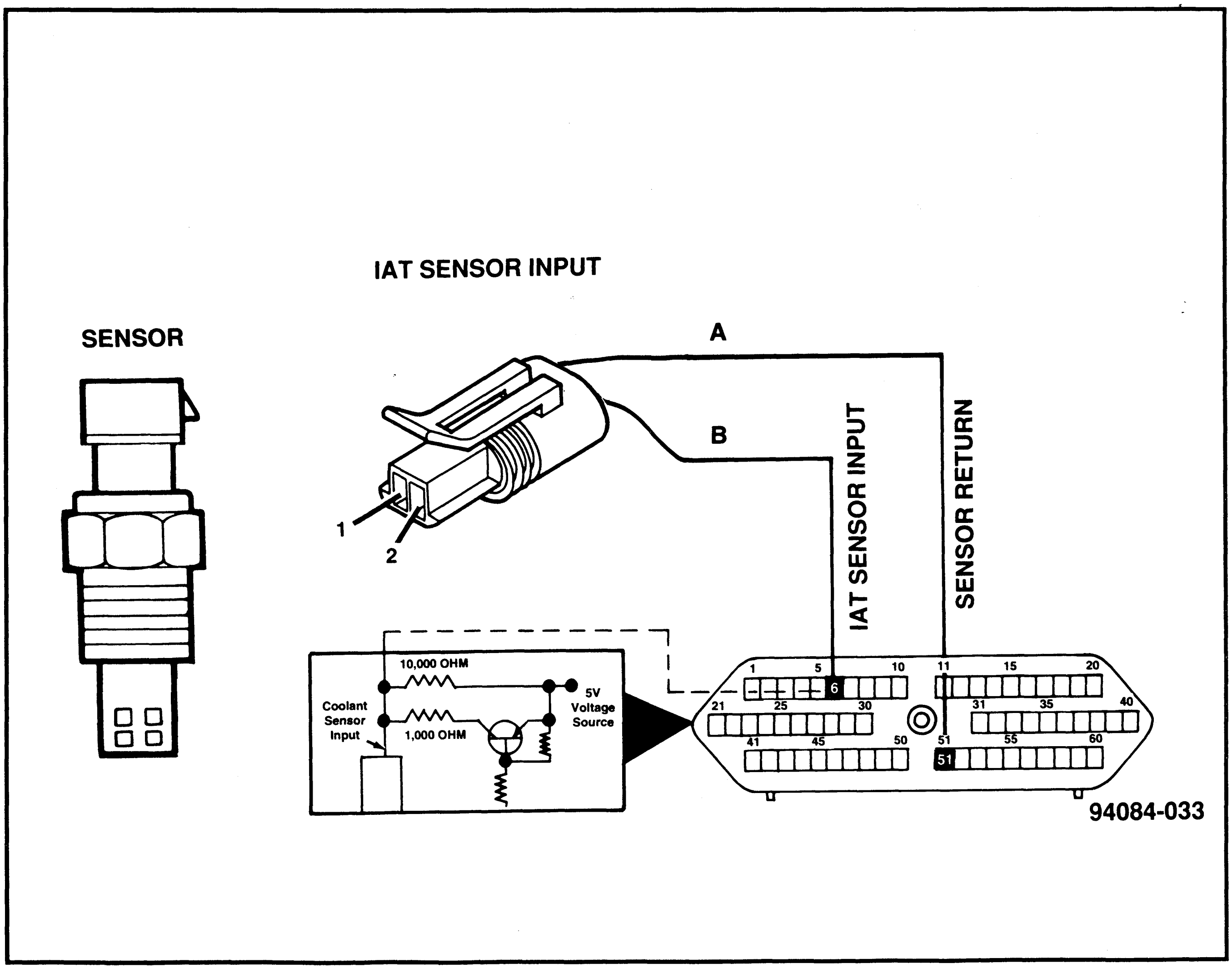


Figure 24 Intake Air Temperature Circuit

24 Throttle Position Sensor Voltage Low – (P 0122)

The throttle position sensor is mounted on the side of the throttle body. The sensor consists of a variable resistor that provides a voltage signal to the PCM at pin 10 based upon the position of the throttle blade. The sensor is supplied with 5 volts through pin 43 of the PCM, and ground at pin 51 (fig. 25). The PCM uses throttle position information to adjust ignition timing and fuel injector pulse width.

Enabling Conditions

- Ignition key must be on, and the PCM not already in limp-in mode

This DTC is set when the voltage input at pin 10 falls below the minimum threshold of 0.157 volt for at least one second.

This malfunction could possibly be caused by problems with any of the following components:

- TPS
- TPS output wire (shorted to ground)
- TPS 5-volt feed (open circuited)
- PCM

24 Throttle Position Sensor Voltage High – (P 0123)

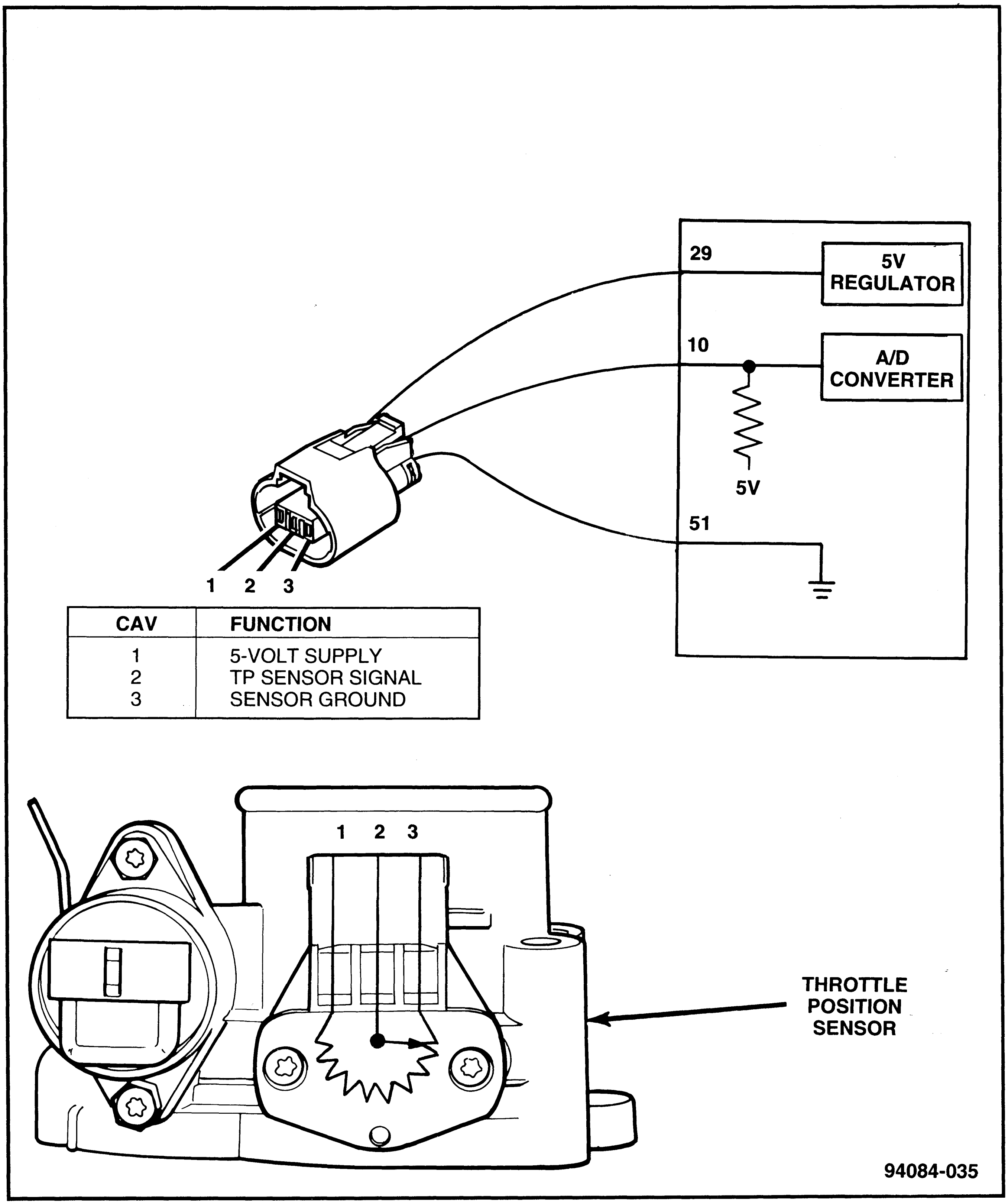
The enabling conditions are the same as for the previous DTC.

This DTC occurs when the voltage input to the controller is above 4.7 volts for at least one second.

This malfunction could possibly be caused by problems with any of the following components:

- TPS
- TPS output wire, ground wire, or related connectors (open)
- PCM

For both of the previous TPS DTCs, the PCM uses default values when the sensor moves out of range and the PCM enters into limp-in mode. Default values are based upon MAP sensor information. When the MAP sensor indicates that the vehicle is at rest, the PCM defaults to the idle program. With heavy loads, the PCM defaults to the WOT program. When the MAP indicates light to heavy loads, the PCM defaults to part throttle.



CAV	FUNCTION
1	5-VOLT SUPPLY
2	TP SENSOR SIGNAL
3	SENSOR GROUND

Figure 25 Throttle Position Sensor Circuit

24 TPS Does Not Agree With Map – (P 0121)

The TPS rationality test is actually two complete and sperate tests. The first test conditions are:

Enabling Conditions

- PCM not in MAP limp-in
- PCM not in TPS limp-in
- Engine rpm indicating idle
- MAP sensor must be indicating that manifold pressure is greater than 4 in. of vacuum

The MIL is illuminated and a DTC is stored in memory if the TPS voltage indicates WOT (greater than 3.75 volts) while the MAP sensor indicates an idle or light load condition. At barometric pressures below 27.56 in. of mercury, the test is very difficult to fail.

The second test condition is:

Enabling Conditions

- PCM not in MAP limp-in
- PCM not in TPS limp-in
- Engine rpm greater than idle
- VSS indicating that the vehicle is moving
- MAP sensor must be indicating that manifold pressure is less than 4 in. of vacuum

The MIL is illuminated and a DTC is stored in memory if the TPS voltage indicates idle (0.70 volt) while the other enabling conditions indicate a loaded cruise condition.

This malfunction could possibly be caused by problems with any of the following components:

- TPS
- TPS wiring (backwards)
- MAP sensor

25 Idle Air Control Motor Circuits – (P 0505)

The Idle Air Control (IAC) stepper motor is located on the throttle body. It is operated as a PCM output through pins 14, 15, 34, and 35 (fig. 26). The IAC is used to maintain engine rpm at idle, and as an off-idle load control (A/C compressor cycling). With the throttle plate completely closed, placing a load on the engine (A/C or power steering operation) might cause the engine to stall or run rough. As the PCM anticipates loads, it operates the IAC motor, opening the throttle bypass passage and allowing more air into the intake manifold. A malfunction of this system could cause rough idle and unstable emissions.

Enabling Conditions

- Battery voltage must be greater than 10 volts
- Ignition voltage must be applied to the PCM

A shorted or open condition in one of the motor circuits for three seconds causes this DTC to be stored and the MIL to be illuminated.

This malfunction could possibly be caused by problems with any of the following components:

- IAC motor
- IAC motor wiring or related connectors (open or short)
- PCM

25 Vacuum Leak Found - (P 1299)

The PCM monitors inputs of the MAP sensor, TPS, ECT sensor, A/C switch, power steering switch, and the generator. The PCM then calculates an expected MAP sensor reading and compares to the present MAP sensor reading. If the calculated MAP sensor value does not match the present MAP sensor value, the PCM assumes additional air is entering the engine combustion chamber. The PCM illuminates the MIL and stores the DTC if the calculated MAP sensor value does not match the present MAP sensor value.

The Vacuum Leak Found malfunction could possibly be caused by problems with any of the following components:

- Throttle body or gasket (vacuum leak)
- Intake manifold (cracked)
- Brake booster diaphragm (vacuum leak)
- PCV valve, etc. (vacuum leak)

25 Idle Speed - (P 1294)

Enabling Conditions

- No IAC motor circuit DTC
- PCM not in limp-in mode from MAP
- PCM not in limp-in from mode TPS
- Engine rpm must be greater than the start-to-run transfer rpm
- PCM not in spark advance default
- Engine rpm must be at idle
- Stop lamp switch must be indicating that the brakes are applied
- VSS must be indicating that the vehicle is not moving
- MAP sensor must be indicating that the manifold pressure is greater than 4 in. of vacuum

Conflict

The test does not run if any of the following conditions are present:

- The Minimum Air Flow test is running
- A/C is on at barometric pressures below 27.56 in. of mercury
- Power steering switch indicates there is a power steering load on the engine when the barometric pressure is less than 27.56 in. of mercury

The MIL is illuminated and a DTC is stored when the idle rpm differs from target idle by 200 rpm for 12 seconds.

The Idle Speed malfunction could possibly be caused by problems with any of the following components:

- IAC motor
- Throttle body (plugged passage)
- Intake manifold (cracked)
- Brake booster diaphragm (vacuum leak)
- PCV valve, etc. (vacuum leak)

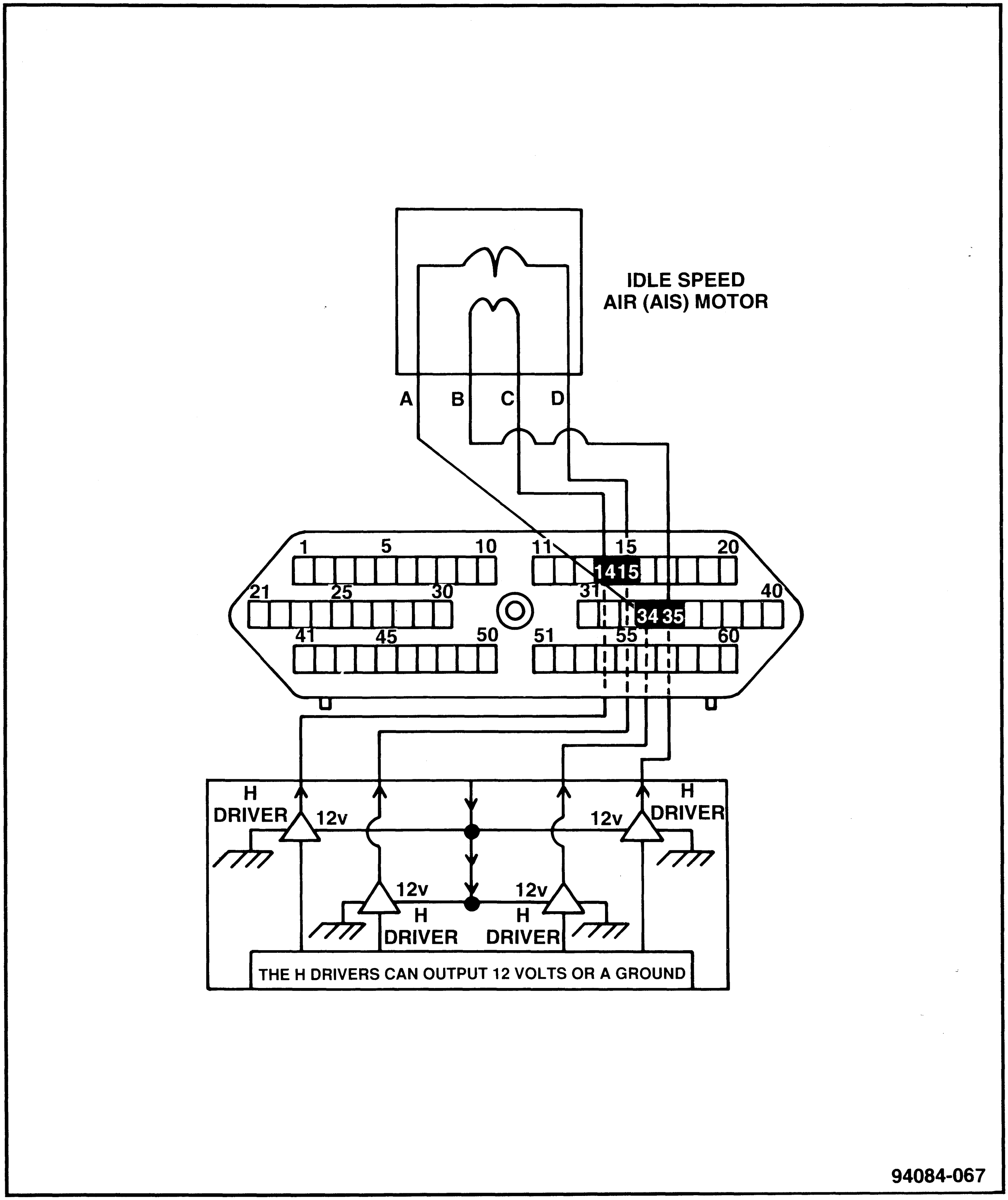


Figure 26 Idle Air Control Motor Circuit

27 Injector #1 Control Circuit – (P 0201)

27 Injector #2 Control Circuit – (P 0202)

27 Injector #3 Control Circuit – (P 0203)

27 Injector #4 Control Circuit – (P 0204)

The PCM energizes the injector's electromagnet to cause the valve inside the injector to open. When the valve in the injector is opened, fuel is allowed to disperse through the injector, directly into the intake manifold. The amount of time the injector is energized (injection pulse width) is dependent upon the inputs to the PCM. The longer the pulse width, the greater the fuel delivery. The ASD relay supplies battery voltage to all four of the injectors; the PCM energizes the injectors by providing a ground (fig. 27).

Enabling Conditions

- Ignition voltage must be supplied to the PCM
- ASD relay must be energized

The PCM monitors the voltage at each of the four injectors' circuits. Grounds for the injector circuits are provided by the PCM at pins 3, 4, 24, and 25. When the PCM de-energizes an injector, electromagnetic induction causes a momentary voltage increase (voltage spike). The PCM monitors this voltage spike to determine if there is an open or short in the injector's circuit.

The MIL illuminates and a DTC is stored if the PCM recognizes an open or short in the injector's circuit for a period of three seconds.

The Injector Control Circuit malfunction could possibly be caused by problems with any of the following components:

- Injector (open or short)
- Injector wiring or related connectors (open or short)
- PCM

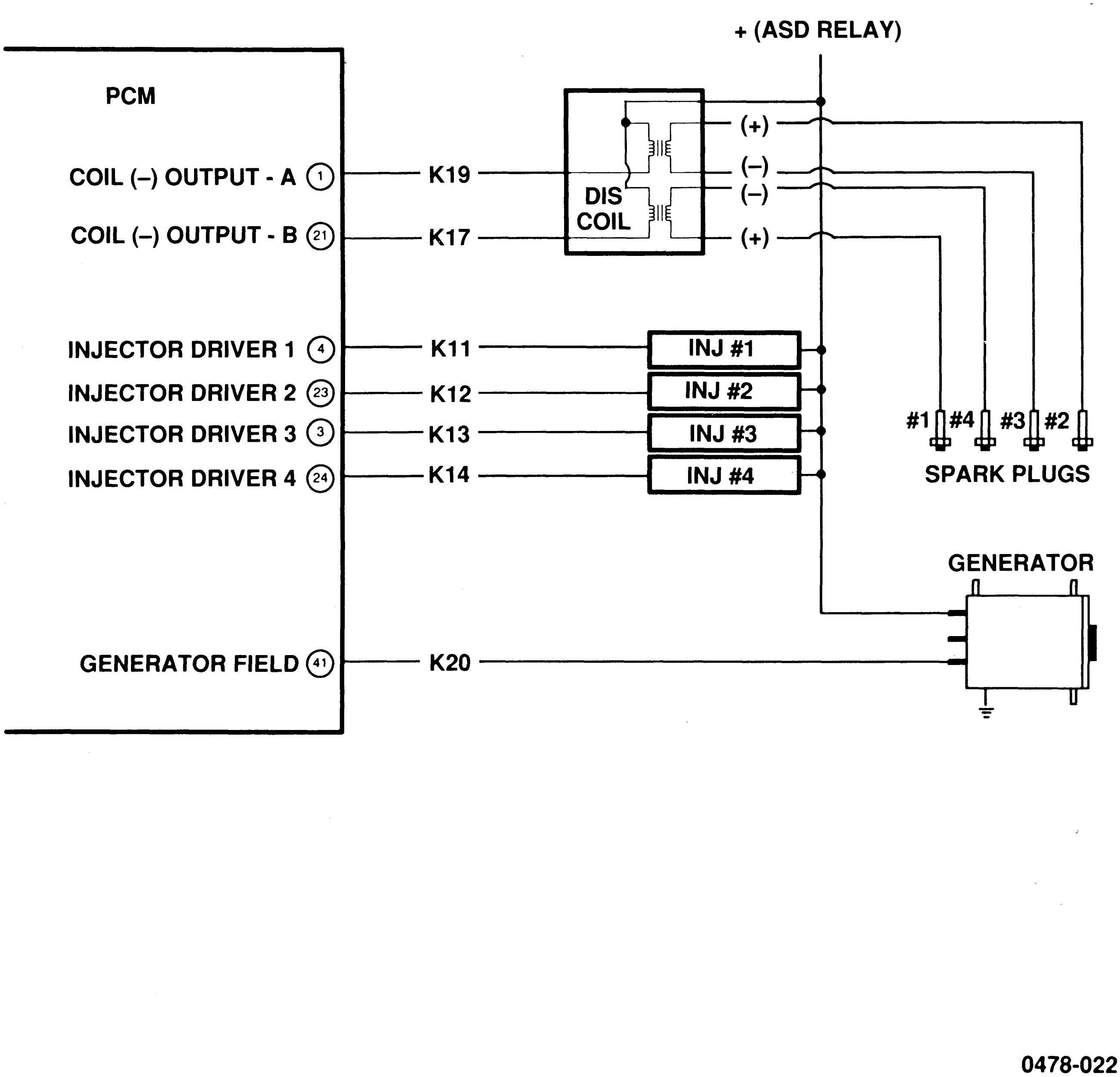


Figure 27 Injector Control Circuit

31 EVAP Solenoid Circuit – (P 0443)

The evaporative purge solenoid is mounted on the passenger side of the engine compartment. It is operated as a PCM output, with pin 16 (fig. 28), providing a switched ground path once the vehicle enters closed loop operation. The PCM operates the ground control side of the evaporative purge solenoid at a duty cycle (ON and OFF several times a second). With the solenoid energized, vapors are allowed to be purged from the canister.

Enabling Conditions

- Battery voltage must be at least 10 volts
- Ignition voltage must be supplied to the PCM

The MIL illuminates and a DTC is stored any time the PCM requests that the solenoid be activated and the voltage at pin 16 of the PCM is high, or when the PCM request that the solenoid be de-energized and the voltage at pin 16 is low. For either condition, the malfunction must be maintained for at least three seconds for the MIL to illuminate and a DTC to be stored.

This malfunction could possibly be caused by problems with any of the following components:

- Duty Cycle Purge (DCP) solenoid (open or shorted)
- DCP solenoid wiring or related connectors (open or short)
- PCM

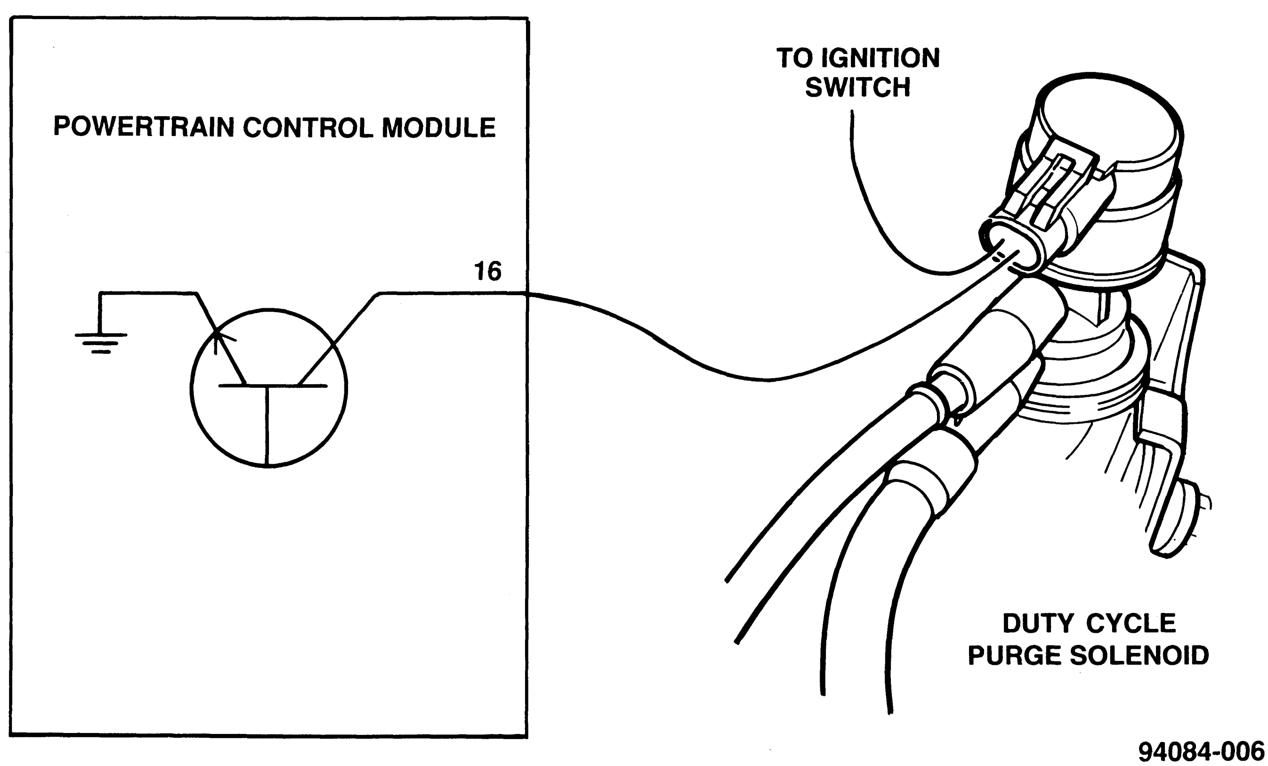


Figure 28 Evaporator Purge Solenoid Circuit

31 Evaporative Purge Flow Monitor Failure – (P 0441)

There are two different tests for the evaporative purge flow monitor. The first test determines how much corruption takes place in the long term memory cells due to an evaporative canister that has absorbed fuel vapors. (See page 29 for information involved with long term memory.) Purge free cells include cells 2 and 5 for all vehicles, cell 12 for vehicles with an automatic transmission, and cell 13 for vehicles with a manual transmission. The PCM de-energizes the DCP solenoid, which blocks the flow of vapors from the evaporative canister to the intake manifold. The amount of injection pulse width correction is then recorded in these memory cells. The PCM recognizes that the DCP solenoid and the evaporative canister are functional if there is a 5% shift in injection pulse width correction from the purge free cells to the purge normal cell.

The second test takes place only if the first does not pass. To enable this portion of the monitor, the following conditions must be met:

- Barometric pressure must be greater than 25.6 in. of mercury
- Engine rpm less than 2048
- MAP voltage between 1.38 volts and 2.0 volts
  (The previous two parameters indicate that the PCM is monitoring in long term cell 2)
- Vehicle speed between 28 - 48 mph
- Based on TPS, MAP, rpm, battery voltage, and generator duty cycle, the engine must maintain a steady operation
- To run the test, these conditions must be held for at least one minute

The PCM de-energizes the DCP solenoid. For the next one-half second, the PCM waits for the MAP to stabilize, then for the next two seconds it averages the MAP voltage. The PCM then energizes the DCP solenoid. For the next one half second, the PCM waits for the MAP to stabilize, then for the next two seconds it averages the MAP voltage. If the PCM fails to recognize a shift in MAP voltage under the previous conditions, one failed count is recorded in the PCM's memory. To fail a trip, the PCM must recognize six failed counts. If one of the test pass, the testing is done. The PCM requires that it fails two trips to illuminate the MIL and record a DTC.

Pending

The evaporative purge flow test does not run if the MIL is illuminated due to:

- Misfire fault
- O_2 monitor fault
- Fuel system rich fault
- Fuel system lean fault
- EGR monitor fault
- MAP fault
- TPS fault
- ECT fault
- DCP solenoid electrical fault

Conflict

The monitor does not run if any of the following are present:

- Catalyst test is in progress
- EGR monitor test in progress, or a one trip EGR monitor fault
- Fuel system rich test in progress, or a one trip fuel system rich fault
- Misfire test is in progress, or a one trip misfire fault
- one trip fuel system lean fault
- one trip O_2 monitor fault

The Evaporative Purge Flow monitor malfunction could possibly be caused by problems with any of the following components:

- Hose from the throttle body to the DCP Solenoid (leaking or plugged)
- DCP solenoid
- Hose from the DCP solenoid to the evaporative canister (plugged)
- Evaporative canister (plugged)

32 EGR Solenoid Circuit – (P 0403)

The EGR solenoid is mounted on the transducer, located at the back of the cylinder head, near the camshaft position sensor. The PCM provides a switched ground path to the solenoid through pin 39 (fig. 28). When the EGR solenoid is energized, vacuum is blocked from entering the transducer. As the engine warms up, the PCM de-energizes the EGR solenoid, applying vacuum to the back-pressure transducer. The back-pressure transducer controls the amount of vacuum to the EGR valve based upon the back pressure in the exhaust system.

Enabling Conditions

- Battery voltage must be at least 10 volts
- Ignition voltage must be supplied to the PCM

The MIL illuminates and a DTC is stored when the PCM requests that the EGR solenoid be energized and the voltage at pin 39 is high, or when the PCM requests that the solenoid be de-energized and the voltage at pin 39 is low (open or shorts), for a period of three seconds.

This malfunction could possibly be caused by problems with any of the following components:

- EGR solenoid
- EGR solenoid wiring or related connectors (open or short)
- PCM

32 EGR System Failure – (P 0401)

See page 43.

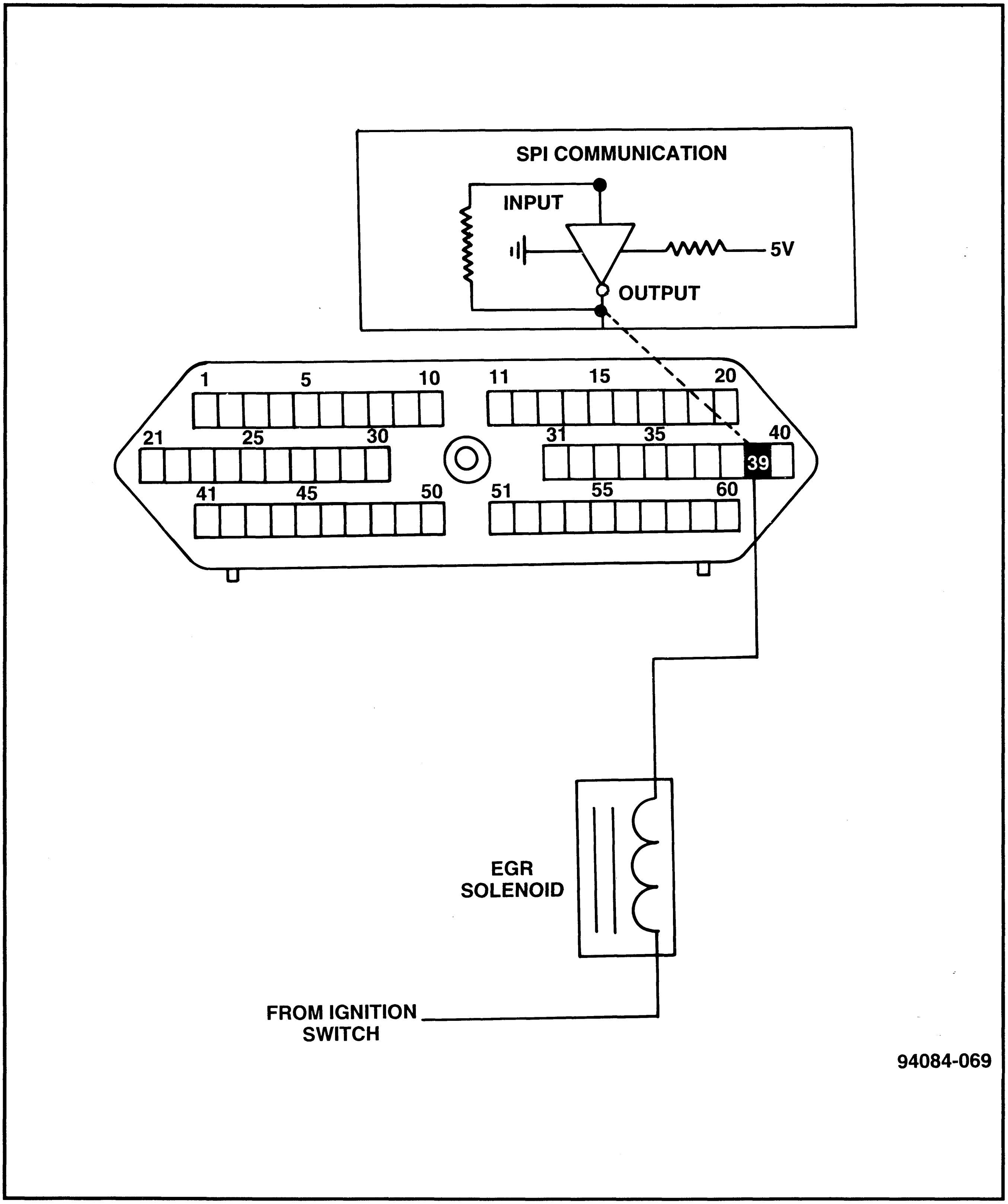


Figure 29 EGR Solenoid Circuits

33 A/C Clutch Relay Circuit

The PCM provides a switched ground to the A/C clutch relay at pin 59. By providing it with authority over A/C clutch operation at all times, the PCM can prevent operation of the A/C clutch in selected situations, such as when A/C is not desired by the driver, during wide open throttle operations, cool evaporator temperatures, high A/C pressures, part throttle launches, or for a brief period at start-up.

This DTC, when set, indicates an open or shorted condition in the A/C relay's electromagnet circuit.

This malfunction could possibly be caused by problems with any of the following components:

- A/C relay
- A/C relay wiring or related connectors (open or short)
- PCM

34 Speed Control Solenoid Circuits

When the PCM receives an ON signal from the speed control switch at pin 31 (pin 55 for Eagle Talons'), the PCM allows battery voltage to be supplied to the speed control solenoids through the stop lamp switch, (speed control relay on Eagle Talons'). When the PCM receives a SET signal from the speed control switch at pin 31, the PCM provides a ground for the speed control vent and vacuum circuits at pins 40 and 60 until the target speed has been achieved. Once the target speed is reached, the PCM toggles the vacuum and vent solenoids to maintain the target speed (fig. 30 and 31).

This DTC, when set, indicates an open or shorted condition in one of the speed control solenoids' circuits.

This malfunction could possibly be caused by problems with any of the following components:

- Vacuum solenoid
- Vent solenoid
- Stop lamp switch
- Vacuum or vent solenoid wiring or related connectors (open or shorted)
- PCM

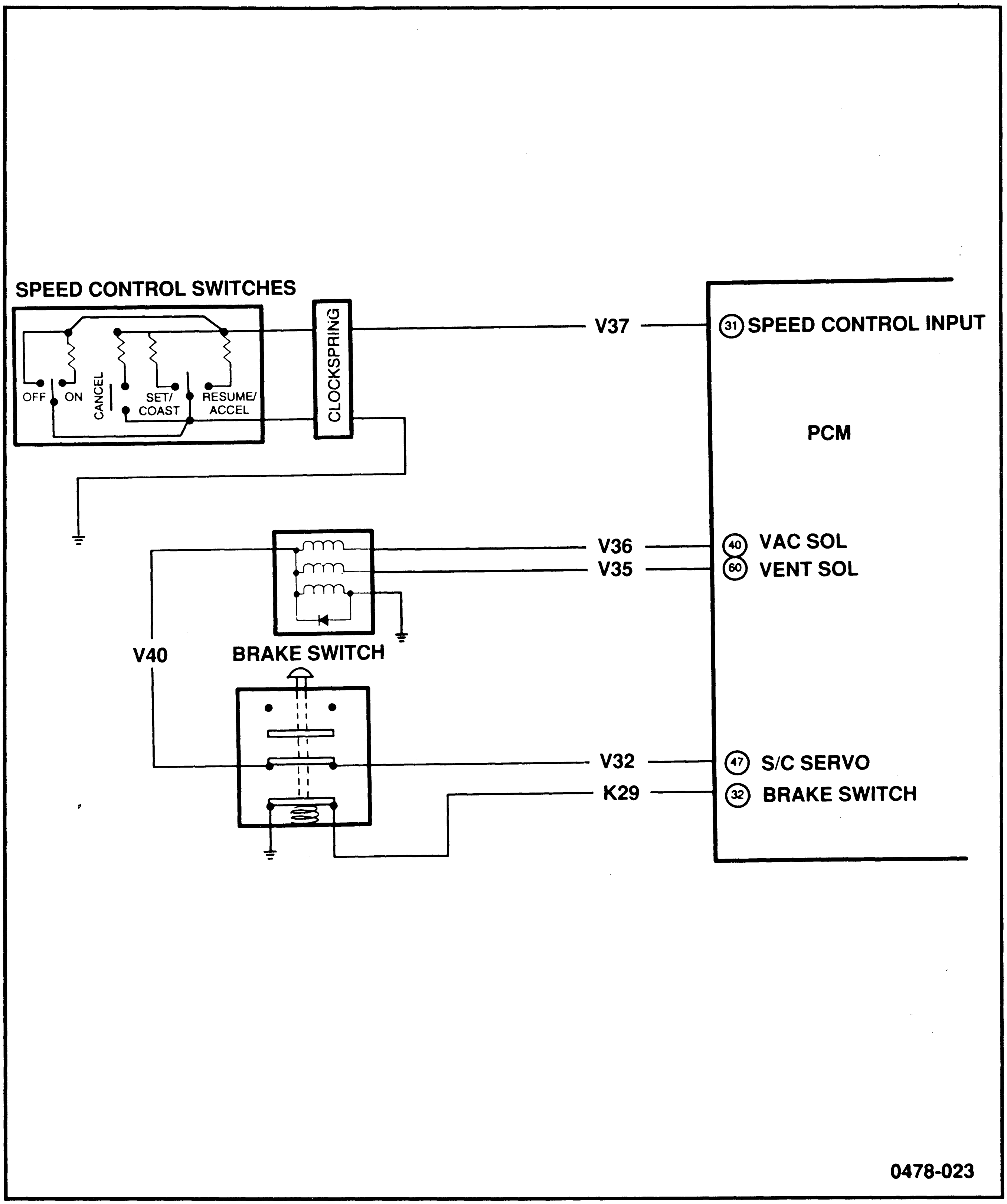


Figure 30 Neon's Speed Control Circuit

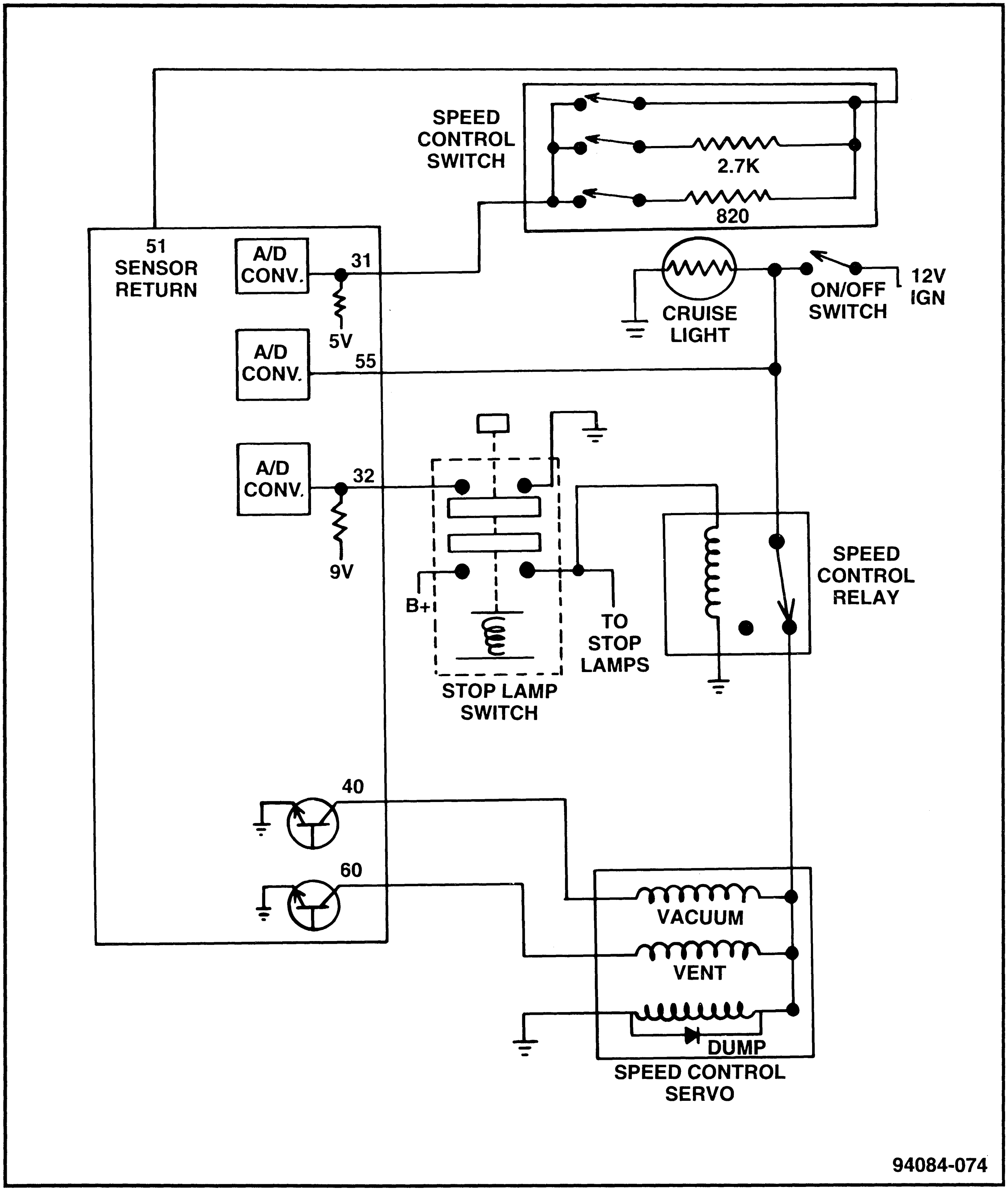


Figure 31 Eagle Talon's Speed Control Circuit

35 High Speed Fan Control Relay Circuit - (P 1489) (Eagle Talon Only)

The PCM operates the high speed radiator fan by providing a ground path for the relay through pin 57 (fig. 32), when the proper parameters have been met from the ECT sensor, VSS, and A/C sense circuit. (Refer to publication 81-699-94084 for proper fan operation.)

Enabling Conditions

- Battery Voltage at least 10 volts
- Ignition voltage supplied to the PCM

A DTC is stored when the PCM recognizes an open or short circuit for a period of three seconds in the high speed radiator fan relay's electromagnet or its related circuit.

Only Eagle Talon's equipped with automatic transaxles are equipped with a two speed fan. The relay for the high speed fan operation is installed in both automatic and manual transaxle packages. On vehicles equipped with manual transaxles, the relay, when energized, doesn't apply voltage to any circuit.

This malfunction could possibly be caused by problems with any of the following components:

- High speed radiator fan relay
- High speed radiator fan relay's electromagnet wiring or related connectors (open or short)
- PCM

35 Low Speed Fan Control Relay Circuit - (P 1490) (Eagle Talon Only)

The PCM operates the low speed radiator fan relay by providing a ground for the relay's electromagnet through pin 19 (fig. 27), when the proper parameters have been met from the ECT sensor, VSS, and A/C sense circuit. (Refer to publication 81-699-94084 for information regarding radiator fan operation.)

Enabling Conditions

- Battery voltage at least 10 volts
- Ignition voltage supplied to the PCM

The MIL is illuminated and a DTC is stored when the PCM recognizes an open or short circuit for a period of three seconds in the low speed radiator fan relay's electromagnet or its related circuits.

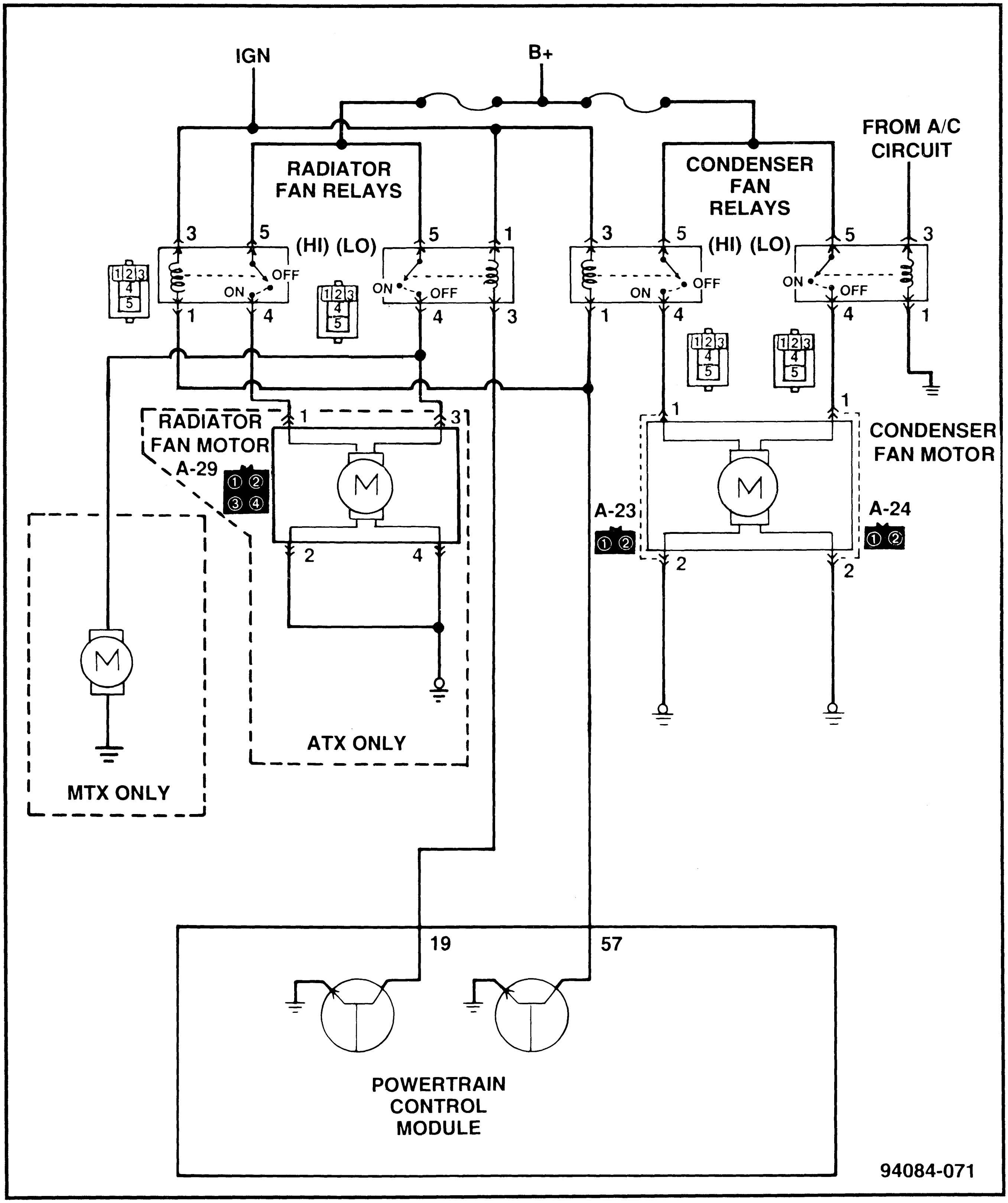


Figure 32 Eagle Talon's Radiator Fan Relay Circuit

This malfunction could possibly be caused by problems with any of the following components:

- Low speed radiator fan relay
- Low speed radiator fan relay's electromagnet wiring or related connectors (open or shorted)
- PCM

35 Radiator Fan Control Relay Circuit - (P 1491) (Neon Only)

The PCM operates the radiator fan by providing a ground path for the relay at pin 19, when the ECT sensor indicates a temperature of at least 212°F, when the A/C compressor is running, during the PCM's anti-steaming function, or when the ECT sensor is malfunctioning and the PCM has gone into limp-in mode.

Enabling Conditions

- Battery voltage at least 10 volts
- Ignition voltage supplied to the PCM

The MIL is illuminated and a DTC is stored when the PCM recognizes an open or short circuit for a period of three seconds in the radiator fan relay's electromagnet or its related circuits.

This malfunction could possibly be caused by problems with any of the following components:

- Radiator fan relay
- Radiator fan relay wiring or related connectors (open or shorted)
- PCM

36 Too Little Secondary Air or Too Much Secondary Air - (P 0411) (Eagle Talons only equipped with manual transaxles)

See page 47 of this publication.

36 Secondary Air Solenoid Circuit - (P 0412) (Eagle Talon's equipped with manual transaxles only)

Enabling Conditions

- Battery voltage must be at least 10 volts
- Ignition voltage must be supplied to the PCM

The MIL illuminates and a DTC is stored any time the PCM requests that the solenoid be activated and the voltage at pin 20 of the PCM is high, or when the PCM request that the solenoid be de-energized and the voltage at pin 20 is low (fig. 33). For either condition, the malfunction must be maintained for at least three seconds for the MIL to illuminate and a DTC to be stored.

This malfunction could possibly be caused by problems with any of the following components:

- Secondary air solenoid
- Secondary air solenoid wiring or related connectors (open or shorted)
- PCM

37 Park/Neutral Switch Failure – (P 1899)

(Automatic transmissions only) The PCM sends out 9 volts from pin 50 to the park/neutral switch. If the switch is positioned in either park or neutral, the voltage is pulled to ground through the switch. If the park/neutral switch is positioned in any other gear, the circuit is opened, allowing the PCM to recognize the 9-volt signal (fig. 33). The diagnostics for the park/neutral switch are divided into two categories. The first is to identify if the park/neutral switch is indicating park or neutral while driving. The second is to identify a condition in which the vehicle is in park or neutral, while the PCM indicates drive or reverse. The conditions necessary to diagnose the first portion of the DTC are listed below:

Enabling Conditions

- Vehicle speed greater than 50 mph
- Engine rpm between 1,984 and 4,480
- TPS voltage is greater than 0.49 volt above minimum TPS
- MAP is greater than 66% of barometric pressure

The MIL is illuminated and the DTC is stored if the PCM recognizes low voltage at pin 50 for a period of ten seconds.

This malfunction could possibly be caused by problems with any of the following components:

- Park/neutral switch
- Wiring from PCM to the park/neutral switch (shorted to ground)
- PCM

The second portion of the test is listed below:

Enabling Conditions

- Vehicle must not be moving
- 15 or fewer crank edges recognized by the PCM (engine cranking)

The PCM recognizes a failed condition when the input at pin 50 indicates either drive or reverse while cranking. The MIL illuminates and a DTC is stored only after the failed condition is indicated and the engine has started.

This malfunction could possibly be caused by problems with any of the following components:

- Circuit between the PCM and the park/neutral switch (open)
- PCM

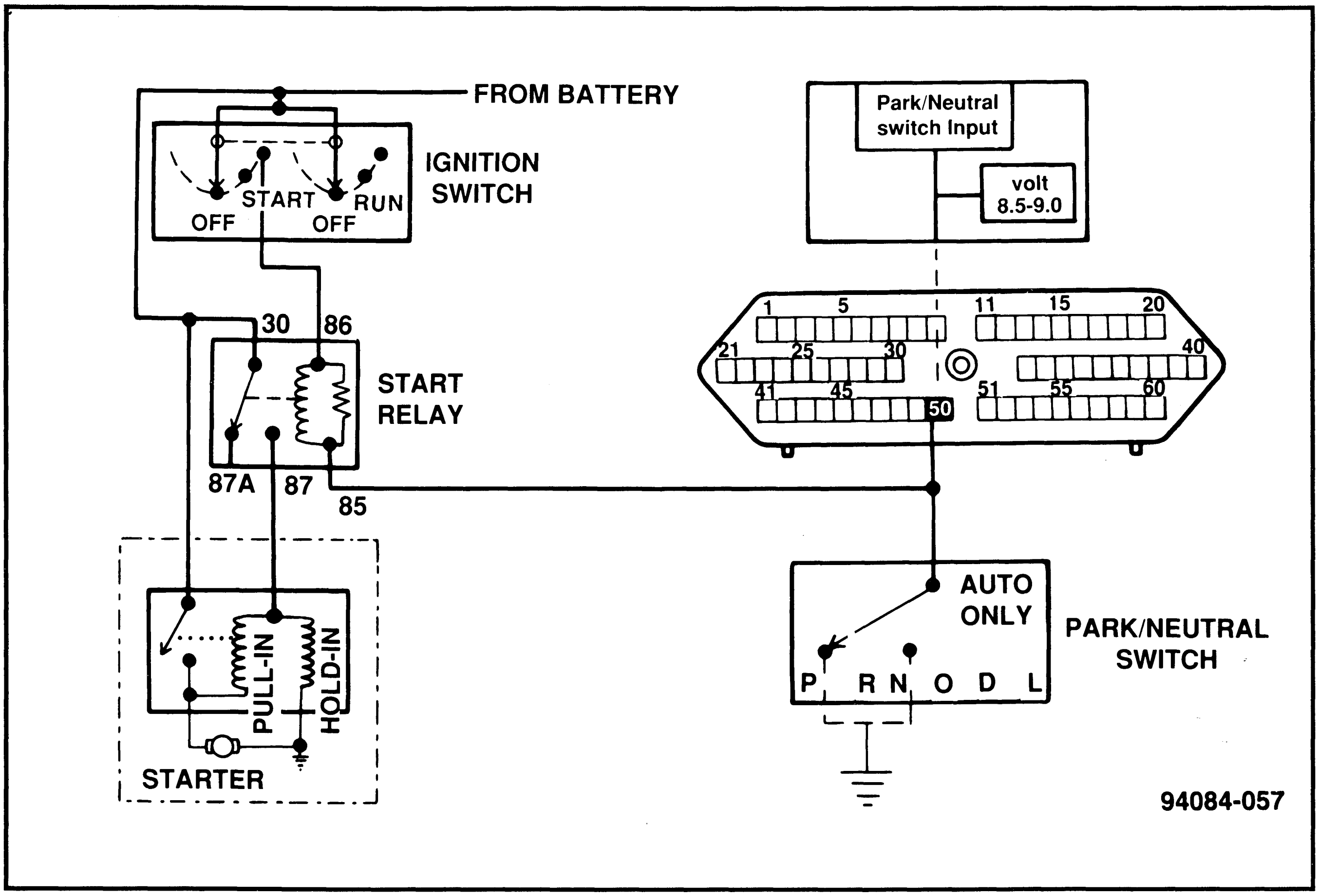


Figure 33 Park/Neutral Circuit

37 Torque Converter Clutch Solenoid Circuit – (P 0743)

(Automatic transmissions only.)

Enabling Conditions

- Battery voltage must be at least 10 volts
- Ignition must be on

The MIL illuminates and a DTC is stored when the PCM recognizes that the voltage at pin 17 is low and the PCM has requested that the solenoid be de-energized, or if the voltage is high when the PCM has requested that the solenoid be energized. The malfunctioning condition must last for at least three seconds.

This malfunction could possibly be caused by problems with any of the following components:

- PTU solenoid
- PTU solenoid wiring or related connectors (open or short)
- PCM

41 Generator Field Not Switching Properly

The PCM controls the generator field by duty cycling the ground signal at pin 41. Battery voltage is supplied to the generator field through the ASD relay (fig. 34). The generator output is based upon the total amount of time the field remains grounded.

The DTC is stored in memory when the PCM cannot de-energize or energize the field of the generator.

This malfunction could possibly be caused by problems with any of the following components:

- Generator (no battery voltage being supplied)
- Generator field windings (open)
- Generator field wiring or related connectors (open or shorted)
- PCM

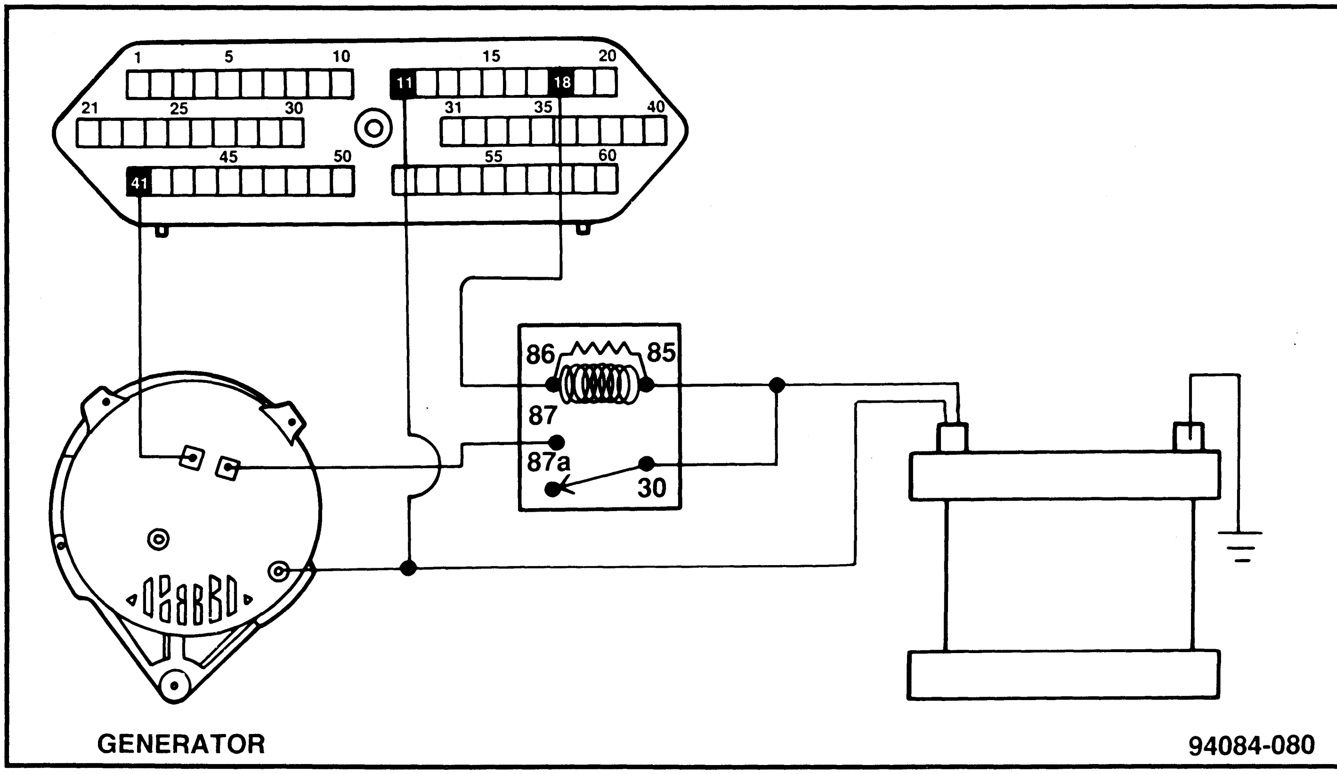


Figure 34 Charging System Circuit

42 Auto Shutdown Relay Control Circuit

The Automatic Shutdown (ASD) relay controls the battery voltage supplied to the fuel injectors, ignition coils, O_2 sensor heaters, PCM pin 42, and the generator field winding (fig. 35). It is located in the PDC. The PCM provides a ground path for the ASD relay at pin 18 when the PCM recognizes an engine rpm signal from the crankshaft position sensor.

Enabling Conditions

- Battery voltage must be at least 10 volts

The DTC is stored in memory if the PCM recognizes high voltage at pin 18 when the ASD relay should be energized, or low voltage at pin 18 when the ASD relay should be de-energized.

This malfunction could possibly be caused by problems with any of the following components:

- ASD relay
- ASD relay's electromagnet wiring or related connectors (open or short)
- PCM

42 No ASD Relay Output Voltage at PCM

The PCM senses operation of the ASD relay by measuring voltage at pin 42. When the PCM energizes the ASD relay, voltage at pin 42 should be high. When the PCM de-energizes the ASD relay, voltage at pin 42 should be low.

The DTC is stored in memory when the PCM recognizes high voltage at pin 42 with the ASD relay de-energized, or low voltage at pin 42 with the ASD relay energized.

This malfunction could possibly be caused by problems with any of the following components:

- ASD relay
- ASD relay contacts wiring and related connectors (open or short)
- PCM

42 Fuel Pump Relay Control Circuit

Operation of the fuel pump relay is controlled by the PCM which supplies a ground path for the relay's coil at pin 38 (fig. 35). The relay is energized at the initial key-on for a brief amount of time, and when the PCM recognizes an engine rpm signal from the crankshaft position sensor.

The DTC is stored in memory when the PCM recognizes high voltage at pin 38 when the fuel pump relay is energized, or low voltage at pin 38 when the fuel pump relay is de-energized.

This malfunction could possibly be caused by problems with any of the following components:

- Fuel pump relay
- Fuel pump relay electromagnet wiring and related connectors (open or short)
- PCM

42 Fuel Level Sending Unit Volts Too Low *

The fuel level sending unit is an input to the PCM at pin 13. This input is used to detect low fuel quantity, and when low, disables the misfire monitor and fuel monitor to prevent falsely setting a misfire DTC or a fuel monitor DTC.

This DTC is stored when the voltage at pin 13 is less than minimum amount.

This malfunction could possibly be caused by problems with any of the following components:

- Fuel level sending unit
- Circuit between the PCM and fuel level sending unit (shorted)
- Circuit between the PCM and the junction to the fuel level gauge on the instrument cluster (open)
- Fuel level gauge (on instrument cluster)
- PCM

42 Fuel Level Sending Unit Volts Too High *

This DTC is stored when the voltage at pin 13 is greater than the maximum allowed voltage.

This malfunction could possibly be caused by problems with any of the following components:

- Fuel level sending unit
- Fuel level sending unit wiring and related connectors (open)
- Fuel level gauge (on instrument cluster)

42 Fuel Level Unit No Change Over Miles

When low fuel level is detected, the PCM monitors the voltage from the from the fuel level sending unit for variations in voltage. If the voltage doesn't change for a period of time while the key is on and/or driving, a DTC is stored.

This malfunction could possibly be caused by the following:

- Fuel level sending unit
- Vehicle towed with the key on and low fuel
- Customer operates vehicle for an extended period of time with low fuel, adding only small quantities of fuel when fuel is needed

* These DTCs will be added to the PCM's software during a mid-year running change.

43 Ignition Coil #1 Primary Circuit – (P 0351)

43 Ignition Coil #2 Primary Circuit – (P 0352)

The PCM provides the ground control circuit for the primary side of both ignition coils (coil #1 through pin 21, and coil #2 through pin 1). Battery voltage is supplied through the ASD relay (fig. 35). The PCM energizes the ignition coil to build the magnetic field, and then de-energizes it to collapse the field around the secondary windings. The result is a high-voltage output to the spark plugs.

Enabling Conditions

- Battery voltage must be at least 10 volts
- Engine rpm must be less than 4,480

The MIL is illuminated and a DTC is stored if the peak current in PCM's driver has not been reached. It takes a total of three seconds of failure to set the DTC and illuminate the MIL.

This malfunction could possibly be caused by problems with any of the following components:

- Ignition coil
- Ignition coil wiring and related connectors (open or short in the affected coil's primary circuit)
- PCM

43 Cylinder #1 Misfire – (P 0301)

43 Cylinder #2 Misfire – (P 0302)

43 Cylinder #3 Misfire – (P 0303)

43 Cylinder #4 Misfire – (P 0304)

43 Multiple Cylinder Misfire – (P 0300)

These codes are set by the misfire monitor. See the Main Monitor section, page 35 for more information.

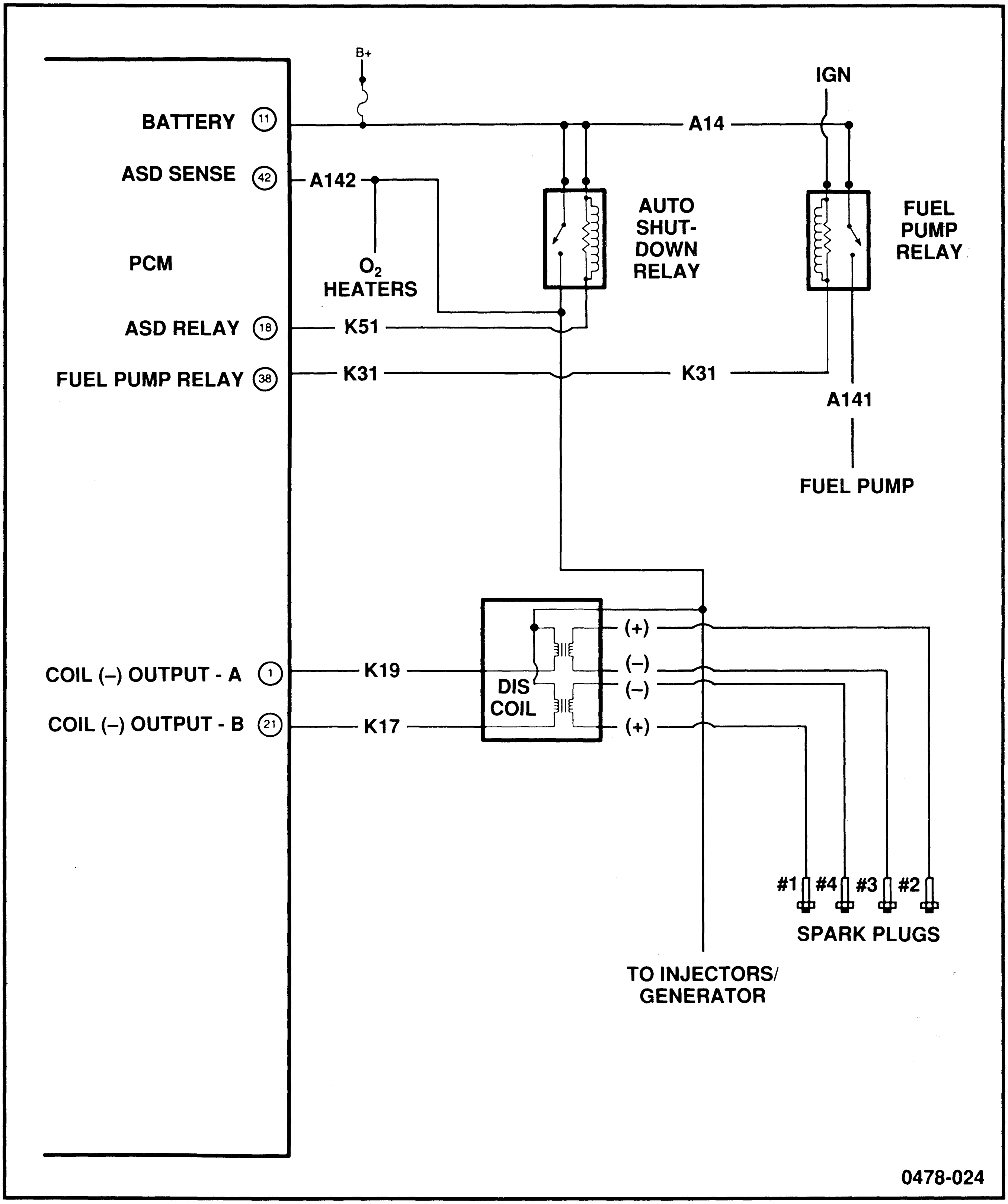


Figure 35 ASD Relay/Ignition Coil Circuit

44 Battery Temp Sensor Volts Out of Limit (Neon Only)

The PCM receives a battery temperature input at pin 49. This input is used to adjust the generator charging rate based upon the ambient temperature around the battery.

The **charge indicator lamp** is illuminated and a DTC is stored when the input voltage is not within the acceptable range of 0.04 to 4.9 volts for a period of three or more seconds.

This malfunction could possibly be caused by problems with any of the following components:

- Battery temperature sensor
- Battery temperature sensor wiring and related connectors (open or short)
- PCM

46 Charging System Voltage Too High

The PCM tries to maintain charging system voltage of between 13.5 and 15.5 volts.

The **charge indicator lamp** is illuminated and a DTC is stored when the battery voltage input is above the target charging voltage during engine operation, and that PCM efforts to regulate the generator field do not decrease the charging voltage.

This malfunction could possibly be caused by problems with any of the following components:

- Generator
- Generator field control wire (shorted to ground)
- PCM

47 Charging System Voltage Too Low

The **charge indicator lamp** is illuminated and a DTC is stored when the battery voltage input is below the target charging voltage during engine operation, and no significant change in voltage has been detected during active testing of the generator output circuit.

This malfunction could possibly be caused by problems with any of the following components:

- Generator
- Related wiring or connectors between the generator and the PCM (open)
- PCM

51 Fuel System Lean – (P 0171)

52 Fuel System Rich – (P 0172)

These codes are set by the fuel system monitor. See the Main Monitor, page 27, for more information.

53 Internal Controller Failure – (P 0605)

During power down, the PCM checks the bitsum.

If the bitsum does not match the calibration, the DTC is stored in memory and the MIL is illuminated.

This malfunction can be caused only by the PCM.

53 PCM Failure SPI Communications - (P 0605)

Serial Peripheral Interface (SPI) is a device in the PCM used to control outputs such as the EGR solenoid.

Enabling Conditions

- Battery voltage must be at least 10 volts
- Ignition voltage must be supplied to the PCM

The MIL is illuminated and a DTC is stored if there is a communication error on the SPI lasting 0.70 second.

This malfunction can be caused only by a failed internal SPI communication. To repair this DTC, the PCM must be replaced.

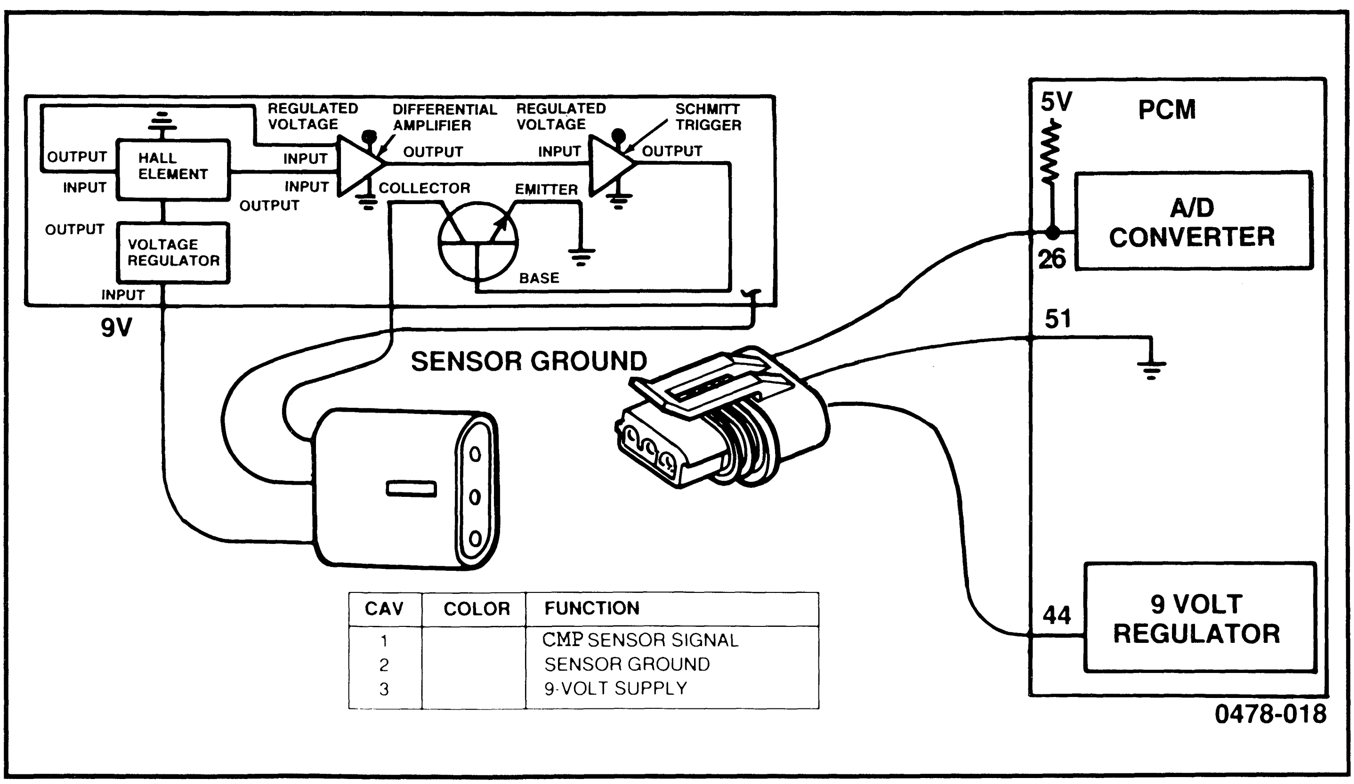
54 No Cam Signal at PCM – (P 0340)

The camshaft position sensor, mounted on the rear of the cylinder head, is a Hall-effect sensor that provides input to the PCM at pin 26 (fig. 37). The PCM uses information from both the camshaft and crankshaft position sensors (pin 25) to determine injector synchronization and cam/crank synchronization. When the camshaft signal is lost, the PCM relies on the crankshaft signal to allow engine operation. This could result in fuel injection being 180° out of phase, which would result in deterioration of engine performance and an increase in emissions. Also, with the cam signal lost, cranking time may increase.

The MIL is illuminated and a DTC is stored when the PCM recognizes signals from the crankshaft position sensor and detects no signals for five seconds from the camshaft position sensor.

This malfunction could possibly be caused by problems with any of the following components:

- Camshaft position sensor
- Camshaft position sensor wiring and related connectors (open or short)
- PCM



CAV	COLOR	FUNCTION
1		CMP SENSOR SIGNAL
2		SENSOR GROUND
3		9-VOLT SUPPLY

Figure 36 Camshaft Position Sensor Circuit

55 End of Message

This is a flash code only, and indicates that no further codes are stored. No message will appear on the DRB III diagnostic scan tool screen.

62 PCM Failure SRI Mile Not Stored

This malfunction is caused by the PCM not being able to store mileage at the EEPROM. The only possible repair is to replace the PCM.

63 PCM Failure EEPROM Write Denied

This malfunction is caused by the PCM not being able to update the EEPROM. The only possible repair is to replace the PCM.

64 Catalytic Convertor Efficiency Failure – (P 0422)

This DTC indicates a failure of the catalyst monitor test. For more information, see page 23 of this text.

65 Power Steering Switch Failure – (P 0551)

The power steering switch serves as a PCM input at pin 56 (fig. 37). Data from this switch allows the PCM to compensate for the additional engine load during steering maneuvers that require high steering pump pressure.

Enabling Conditions

- Open power steering switch indicating high pressure
- Vehicle speed must be greater than 56 mph

The MIL is illuminated and a DTC is stored if the above conditions are detected for a period of 30 seconds.

This malfunction could possibly caused by problems with any of the following components:

- Power steering switch
- Circuit between the power steering switch and the PCM (open)
- PCM

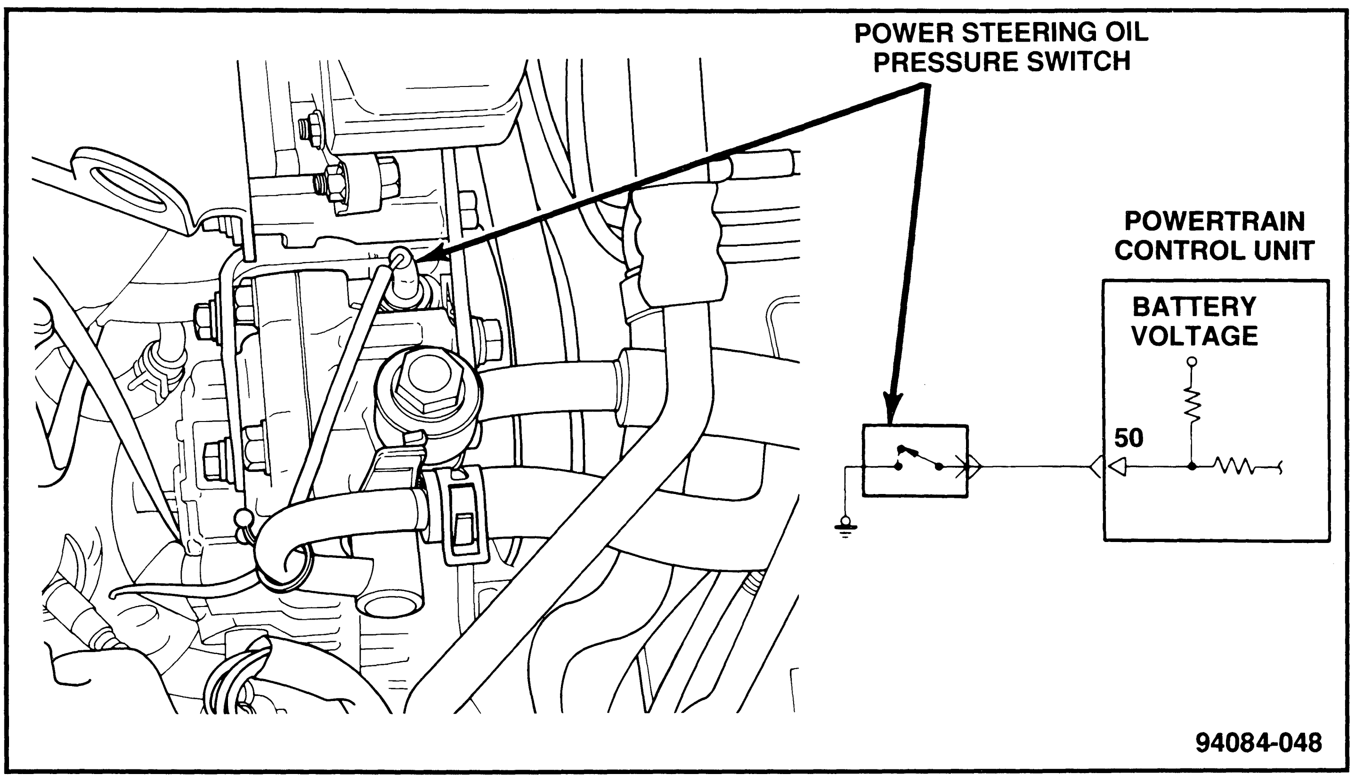


Figure 37 Power Steering Pressure Switch Circuit

Note: *The PCM learns whether or not the vehicle is equipped with power steering by the presence of the power steering switch signal to ground. The PCM's memory of power steering is lost when the battery is disconnected or when the PCM is replaced. To re-initiate the PCM to accommodate the power steering input, the power steering switch must function properly.*

66 No CCD Bus Messages From TCM (Eagle Talon's Equipped With Automatic Transaxles Only)

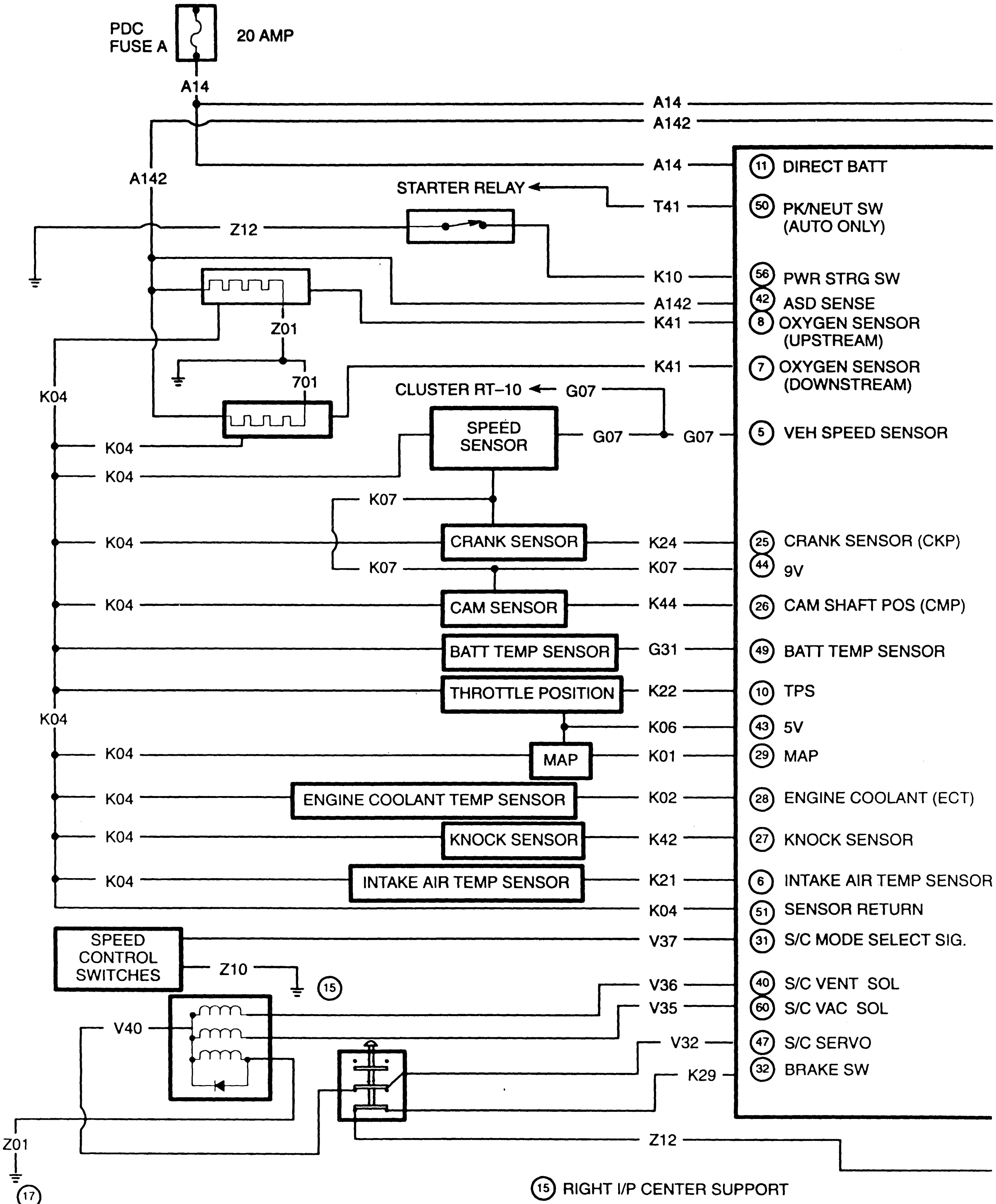
Talon's with an F4AC1 automatic transaxle uses information collected by the PCM. This information is then delivered to the Transmission Control Module (TCM) over a data bus called Chrysler Collision Detection (CCD) system. The TCM uses several pieces of information that the PCM already has available. Instead of having both controllers receive the same inputs, the PCM receives the input, judges the circuit, and then sends the TCM the information. This information is used by the TCM to assure quality shift points during all operation modes.

A DTC is recorded if the PCM fails to communicate with the TCM on the CCD bus.

This malfunction could possible be caused by problems with any of the following components:

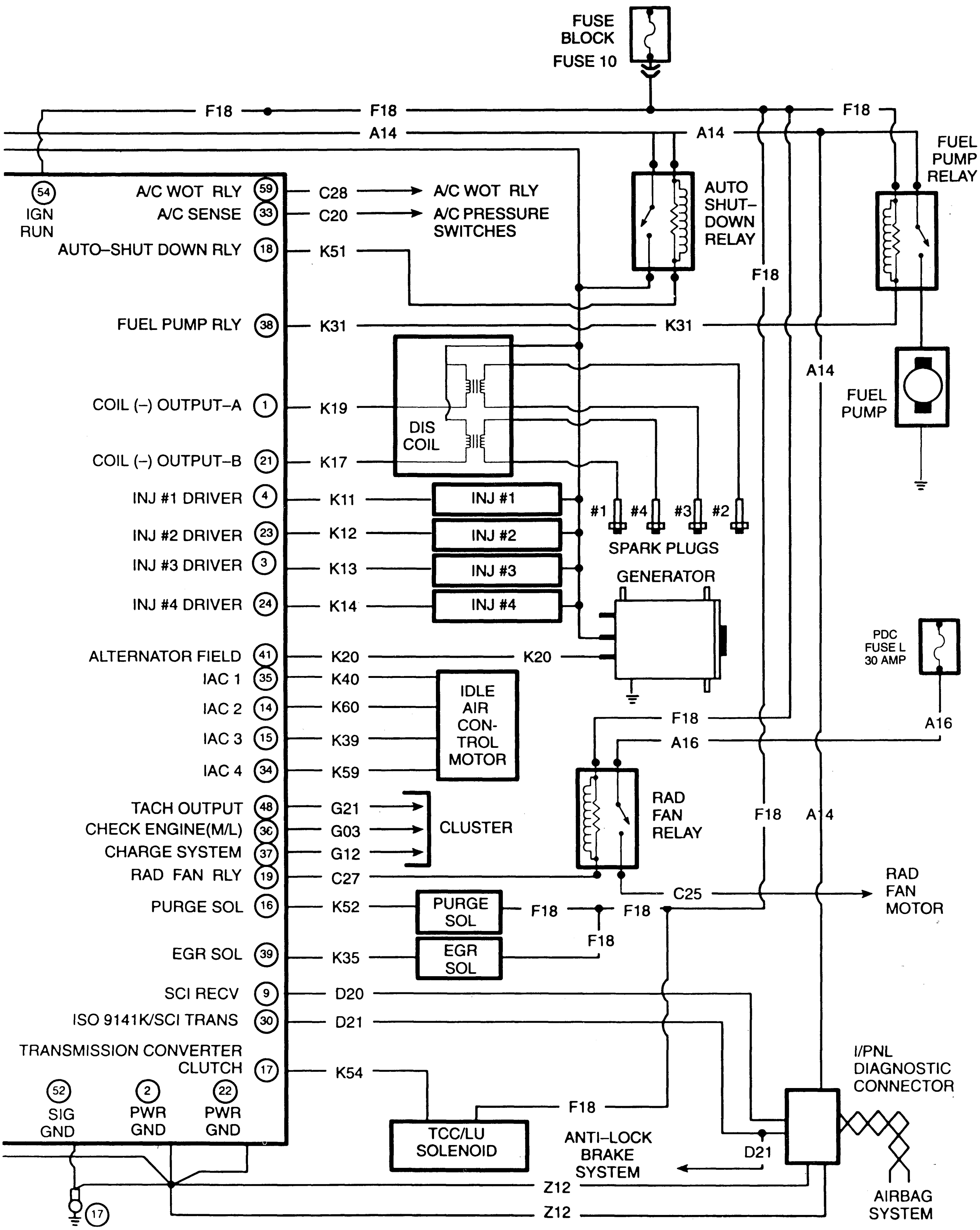
- CCD bus wiring or related connectors (open or shorts)
- TCM
- PCM

Neon Wiring Schematic

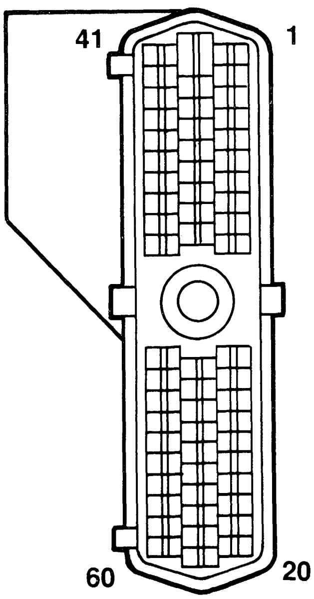


(15) RIGHT I/P CENTER SUPPORT
(16) RIGHT REAR WHEEL HOUSE
(17) LEFT RADIATOR CLOSURE PANEL

Neon Wiring Schematic



Neon 60-Way Connector



VIEWED FROM TERMINAL END

CAV	CIRCUIT	FUNCTION
1	K19 20BK/GY*	IGNITION COIL DRIVER
2	Z12 20BK/TN*	POWER GROUND
3	K13 20YL/WT*	FUEL INJECTOR #3
4	K11 20WT/DB*	FUEL INJECTOR #1
5	G7 20WT/OR*	VEHICLE SPEED SENSOR
6	K21 20BK/RD*	INTAKE AIR TEMPERATURE SENSOR
7	K141 20DG/BK*	HEATED OXYGEN SENSOR 2 (DOWNSTREAM)
8	K141 20BK/DG	HEATED OXYGEN SENSOR 1 (UPSTREAM)
9	D20 20LG	DATA LINK
10	K22 20OR/DB*	THROTTLE POSITION (SENSOR)
11	A14 18RD/WT	BATTERY FEED
12	–	–
13	G4	FUEL LEVEL SENDING UNIT
14	K60 20YL/BK*	IDLE AIR CONTROL #2
15	K39 20GY/RD*	IDLE AIR CONTROL #3
16	K52 20PK/BK*	EVAP/PURGE SOLENOID
17	K54 20OR/BK*	TRANSMISSION TCC LU SOLENOID
18	K51 20DB/YL*	AUTOMATIC SHUTDOWN RELAY
19	C27 20DB/PK*	FAN CONTROL RELAY
20	–	–
21	K17 20DB/YL*	IGNITION COIL DRIVER
22	Z12 20BK/TN*	POWER GROUND
23	K12 20TN	FUEL INJECTOR #2
24	K14 20LB/BR*	FUEL INJECTOR #4
25	K24 20GY/BK*	CRANKSHAFT POSITION SENSOR
26	K44 20TN/YL*	CAMSHAFT POSITION SENSOR
27	K42 20BK/LG*	KNOCK SENSOR
28	K2 20TN/BK*	ENGINE COOLANT TEMPERATURE SENSOR
29	K1 20DG/RD*	MAP SENSOR
30	D21 20PK	DATA LINK
31	V37 20RD/LG*	VEHICLE SPEED CONTROL MODE SELECT SIGNAL
32	K29 20WT/PK*	BRAKE SWITCH SENSOR
33	C20 20BR/OR*	A/C SENSE
34	K59 20VT/BK*	IDLE AIR CONTROL #4
35	K40 20BR/WT*	IDLE AIR CONTROL #1
36	G3 20BK/PK*	CHECK ENGINE LAMP (MIL)
37	G12 20TN/BK*	CHARGE SYSTEM LAMP (CLUSTER)
38	K31 20BR	FUEL PUMP RELAY
39	K35 20GY/YL*	EXHAUST GAS RECIRCULATION SOLENOID
40	V36 20TN/RD	VEHICLE SPEED CONTROL VACUUM SOLENOID
41	K20 18DG	GENERATOR FIELD
42	A142 18DG/OR*	ASD SENSE
43	K6 20VT/WT*	5 VOLTS
44	K7 20OR	9 VOLTS
45	–	–
46	–	–
47	V32 20YL/RD*	VEHICLE SPEED CONTROL SWITCHED IGNITION FEED
48	G21 20GY/LB*	TACHOMETER SIGNAL
49	–	BATTERY TEMP SENSOR
50	T41 20BR/YL*	PARK/NEUTRAL POSITION SWITCH
51	K4 20BK/LB*	SENSOR GROUND
52	Z11 22BK/WT*	SIGNAL GROUND
53	–	–
54	F18 20LG/BK*	IGNITION FEED
55	L1 20VT/OR*	REVERSE INPUT SENSE
56	K10 20WT	POWER STEERING SWITCH
57	–	–
58	–	–
59	C28 20DB/OR*	A/C COMPRESSOR CLUTCH
60	V35 20LG/RD	VEHICLE SPEED CONTROL VENT SOLENOID

On-Board Diagnostics

On-Board Diagnostics

On-Board Diagnostics

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