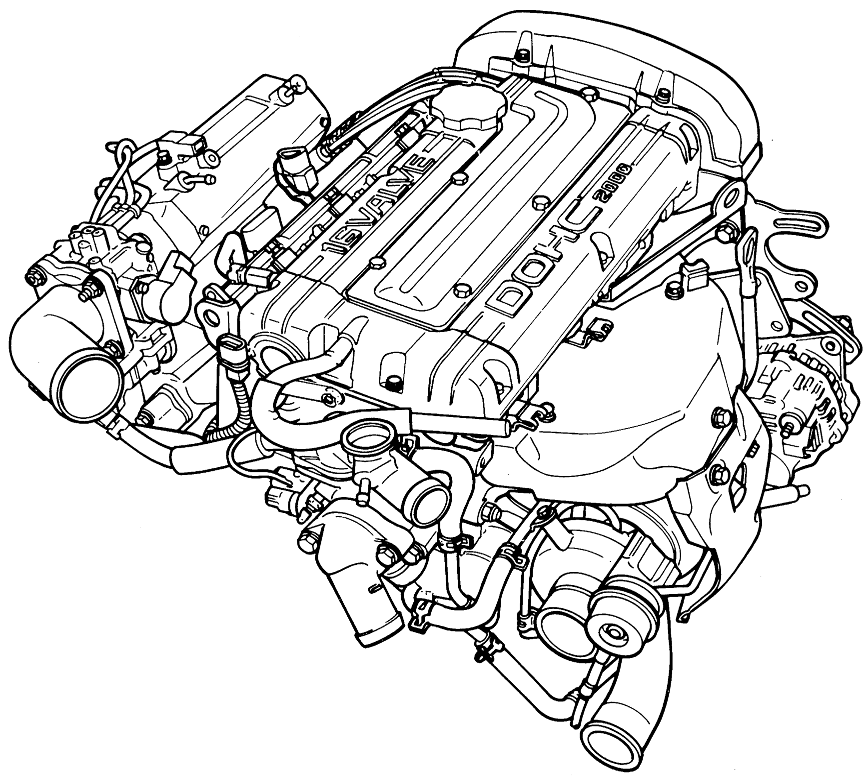
1995 Eagle Talon

2.0L DOHC Turbo

Fuel, Ignition, and Emission Systems



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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.
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- 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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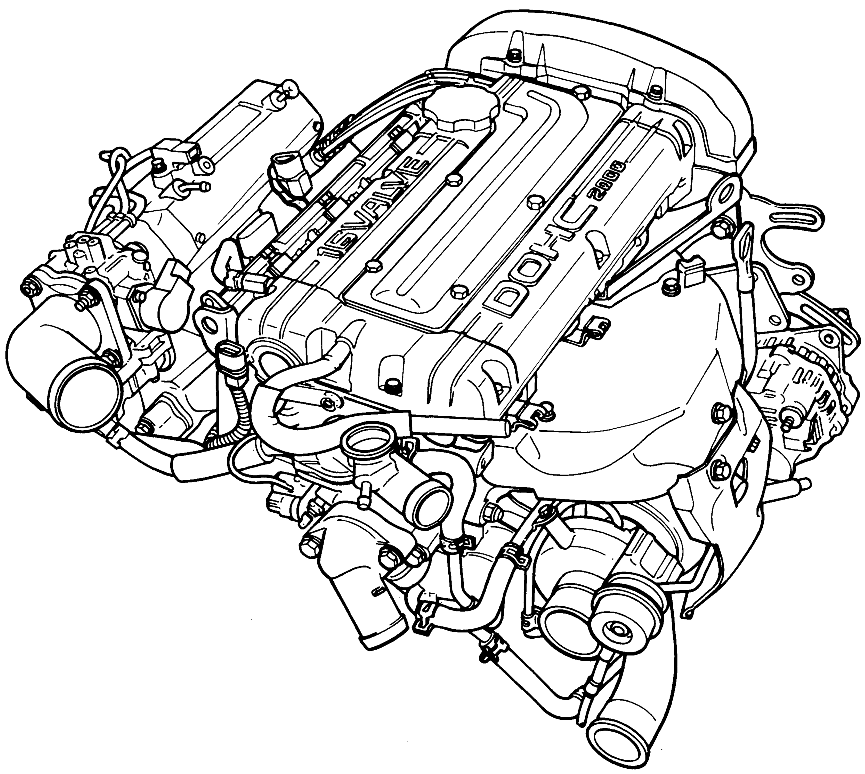
2.0L DOHC Turbo Fuel and Ignition



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INTRODUCTION

Student Learning Objectives

After completing this course, the technician will be able to:

- Identify and locate the following Fuel and Emissions components-
  - Air By-pass Valve
  - Air Cleaner
  - A/C Control Module
  - A/C Switch
  - A/C Relay
  - Barometric Pressure Sensor (BARO)
  - Camshaft Position Sensor (CMP)
  - Catalytic Converter
  - Crankshaft Position Sensor (CKP)
  - Data Link Connector (DLC)
  - EGR Valve and Solenoid
  - Engine Control Module (ECM)
  - Engine Coolant Temperature Sensor (ECT)
  - Evaporative Canister
  - Fuel Cut-off Valve
  - Fuel Injectors
  - Fuel Pressure Regulator
  - Fuel Filter
  - Fuel Pump
  - Fuel Pump Check Terminal
  - Fuel Rail
  - Generator
  - Idle Speed Control Stepper Motor (IAC)
  - Ignition Timing Adjustment Terminal
  - Inhibitor Switch
  - Inlet Temperature Sensor
  - Intake Air Temperature Sensor (IAT)
  - Knock Sensor (KS)
  - Malfunction Indicator Light (MIL)
  - Manifold Differential Pressure Sensor (MDP)
  - Multi-port Fuel Injection Relay
  - Outlet Temperature Sensor
  - Power Steering Pressure Switch
  - Power Transistor and Ignition Coil
  - Starter Relay
  - Tachometer Check Terminal
  - Throttle Body

  - Throttle Position Sensor (TPS)
  - Transmission Control Module (TCM)
  - Turbocharger
  - Upstream and Downstream Oxygen Sensors
  - Vehicle Speed Sensor (VSS)
  - Volume Air Flow Sensor (VAF)

- Identify which components from the previous list are ECM inputs or outputs.
- Identify whether a component is part of the emissions system, fuel system, ignition system, or a combination of systems.
- Recognize the signals generated by the crankshaft and camshaft position sensors.

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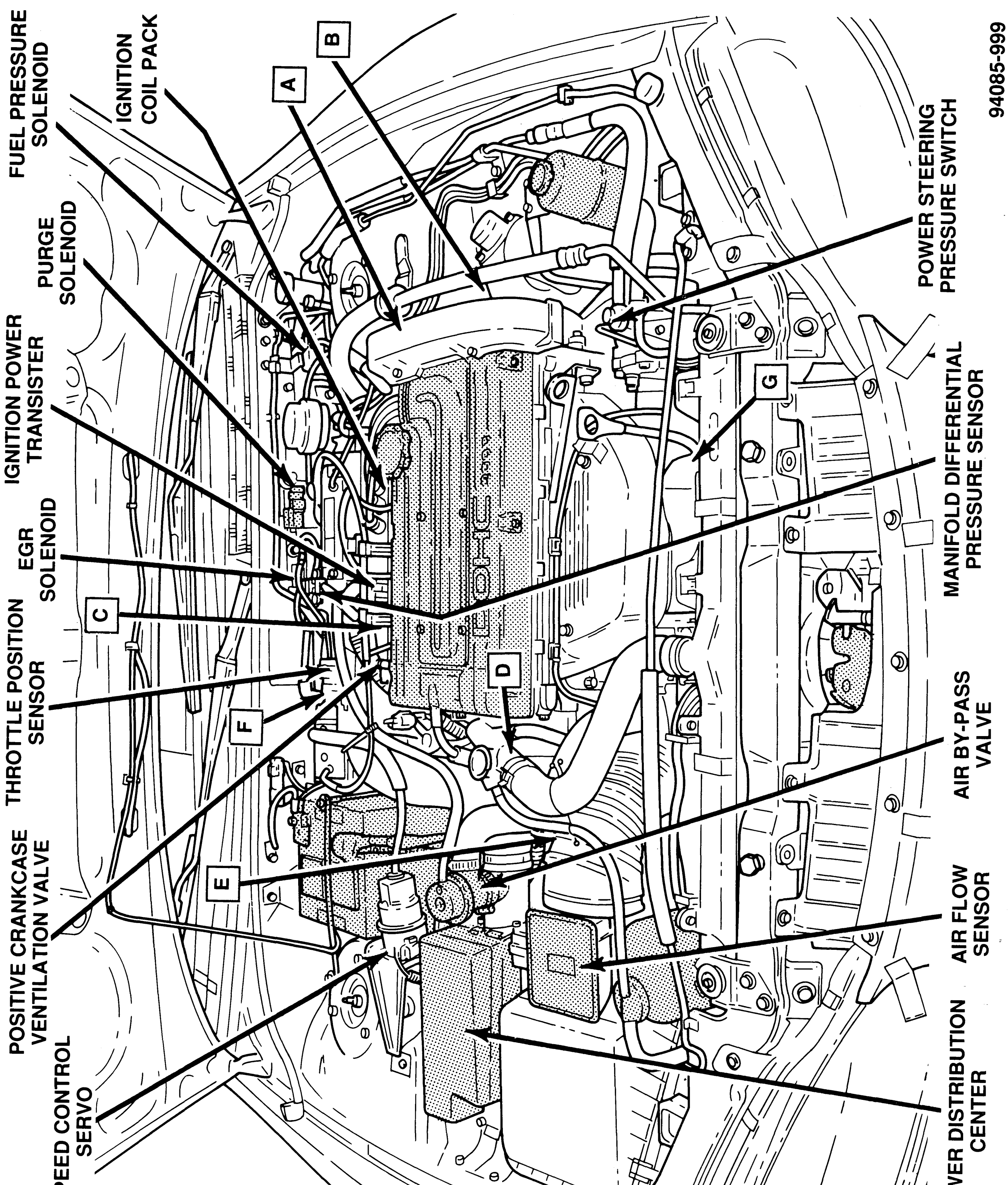

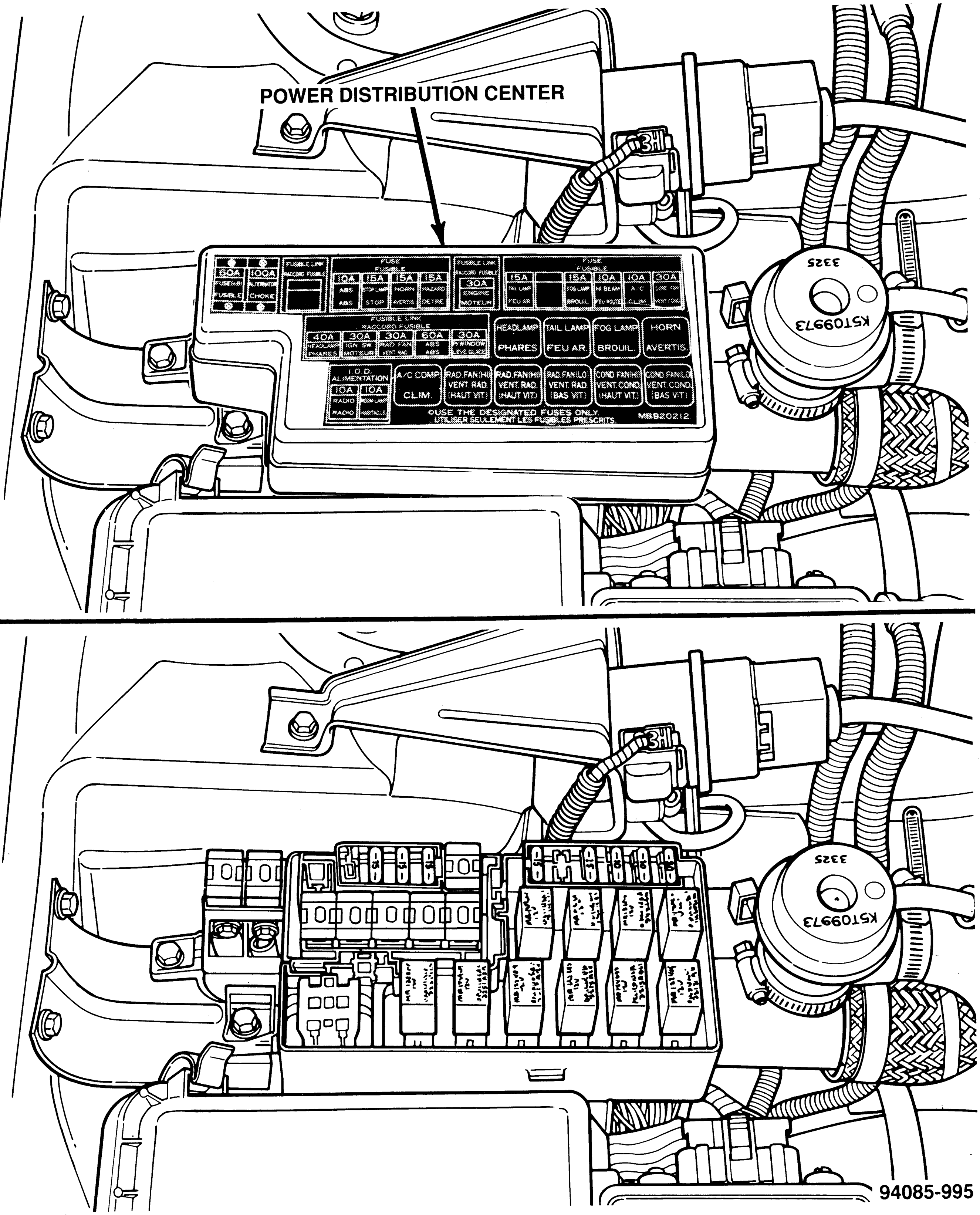
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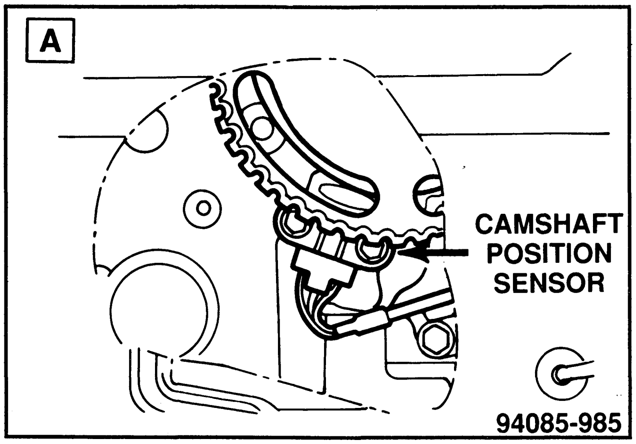
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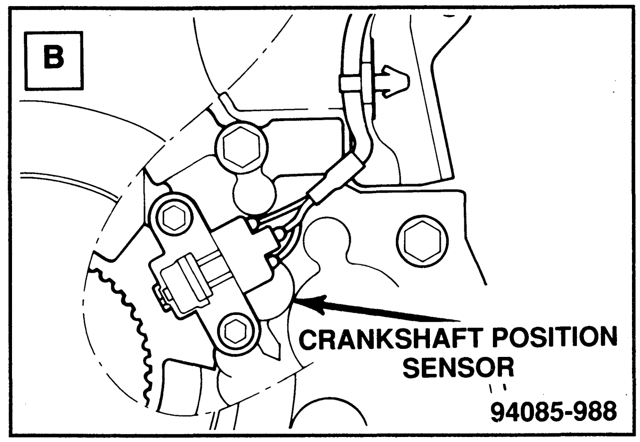
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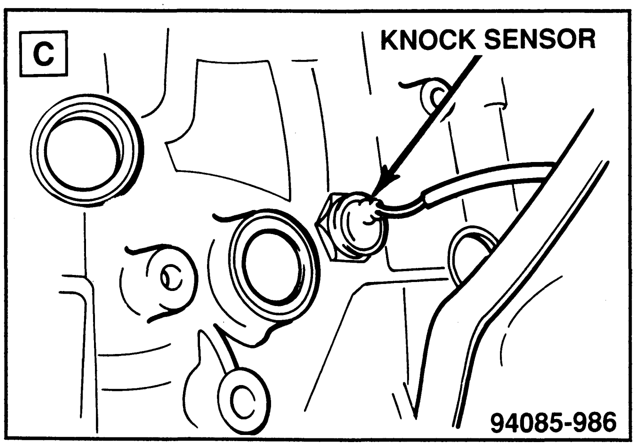
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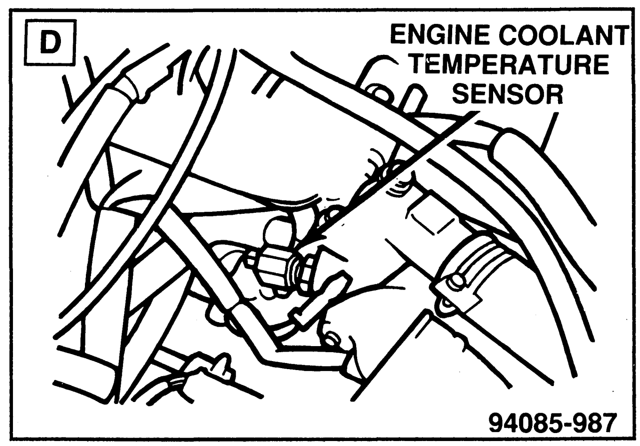
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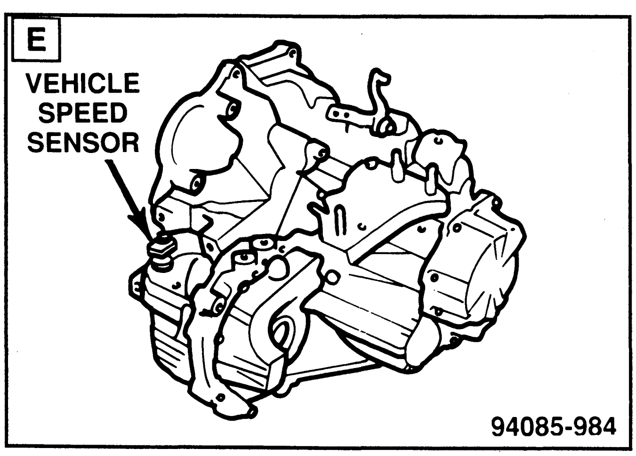
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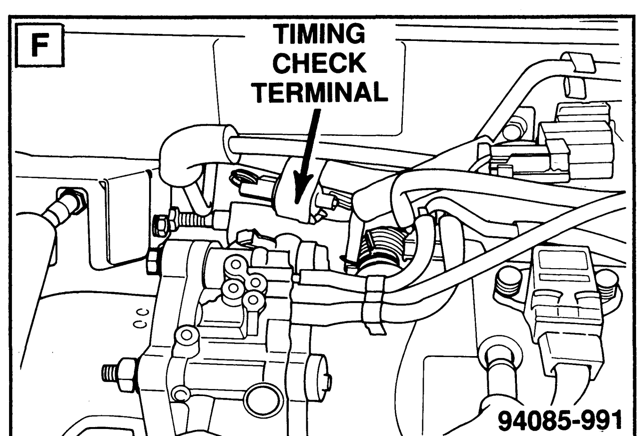
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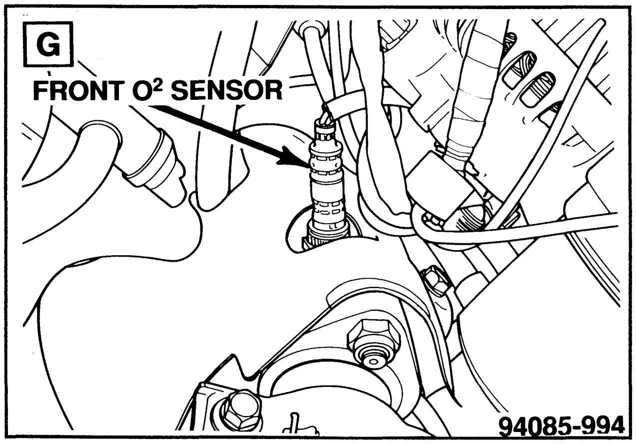
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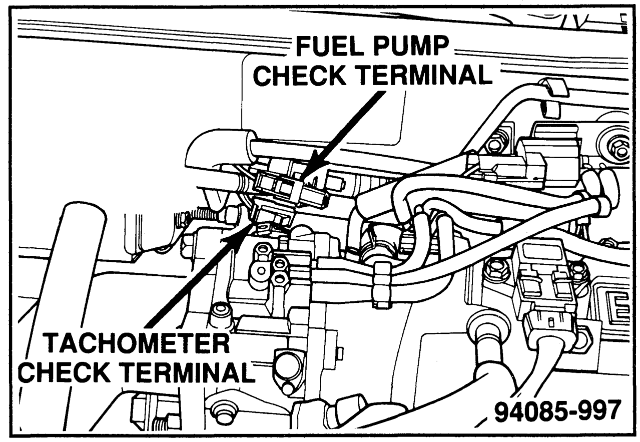
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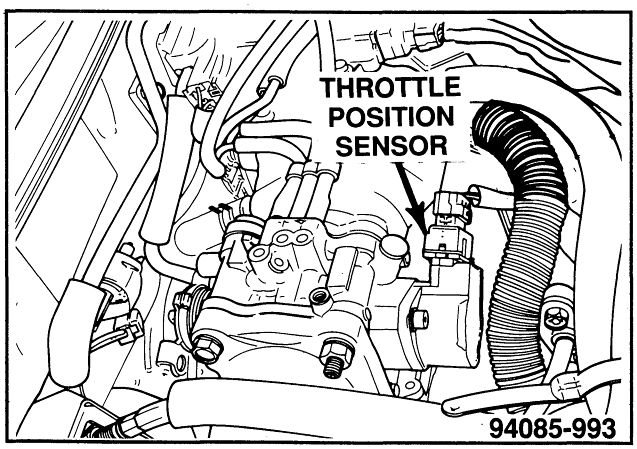
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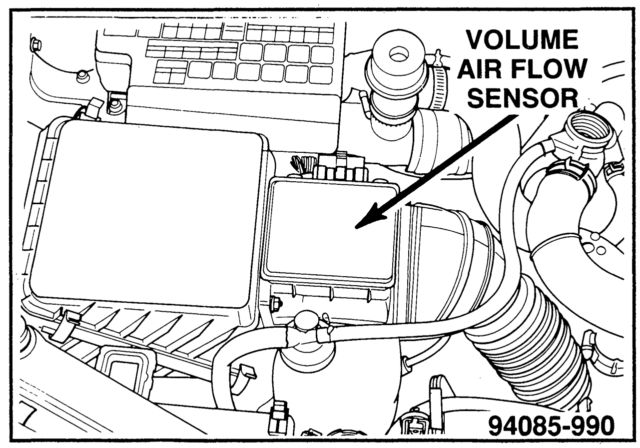
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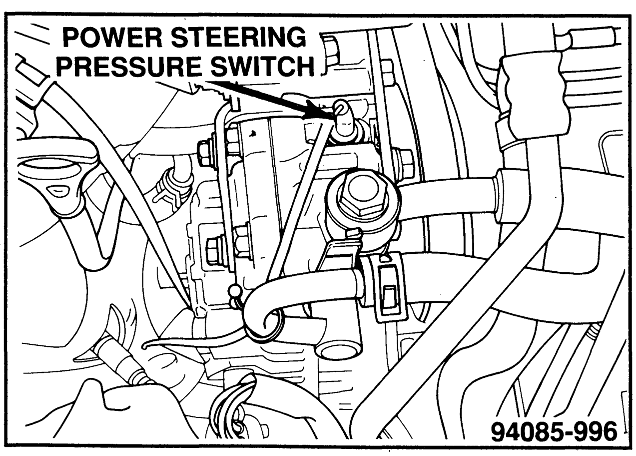
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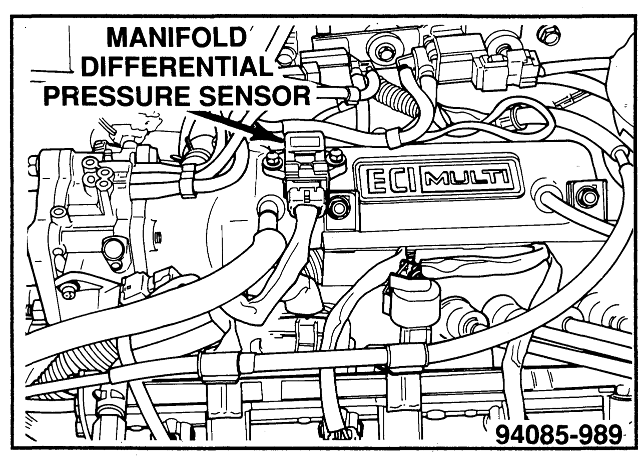
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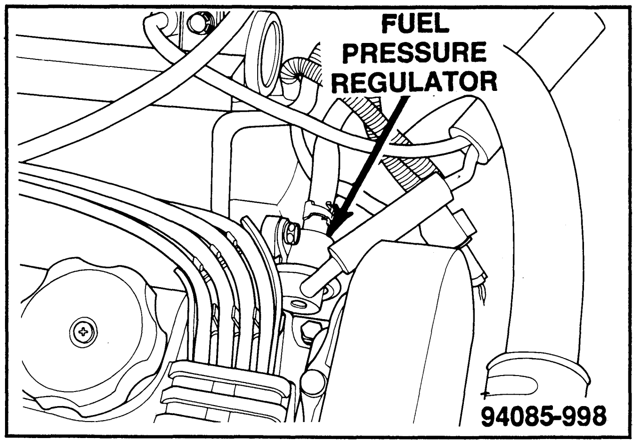

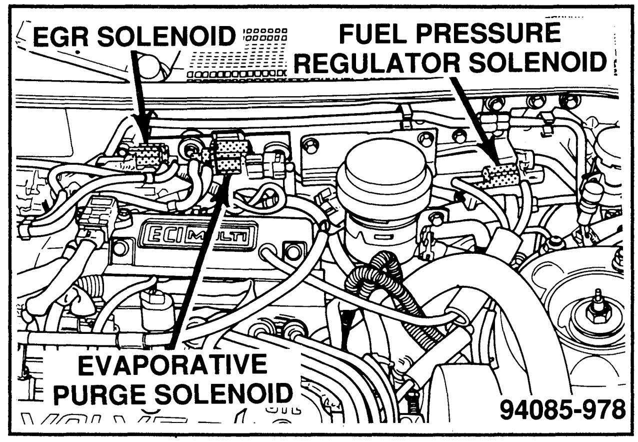

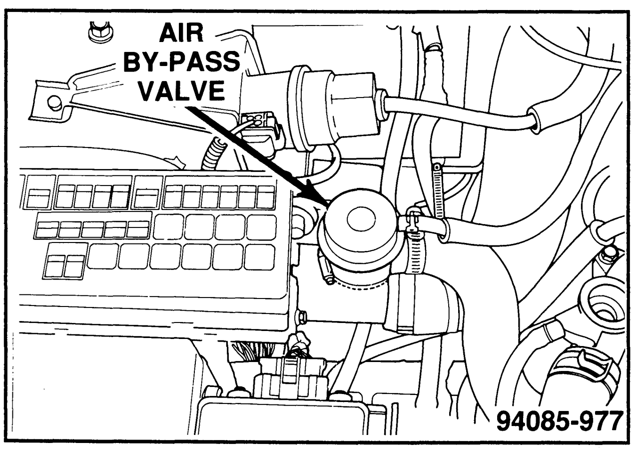

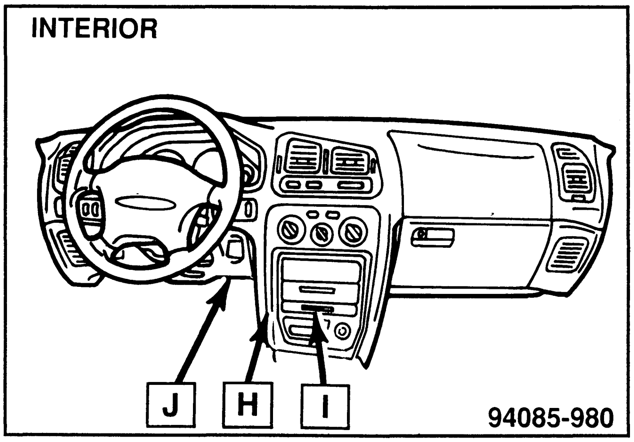
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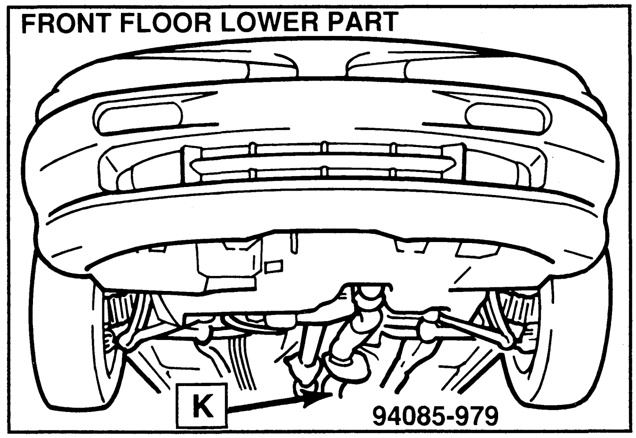
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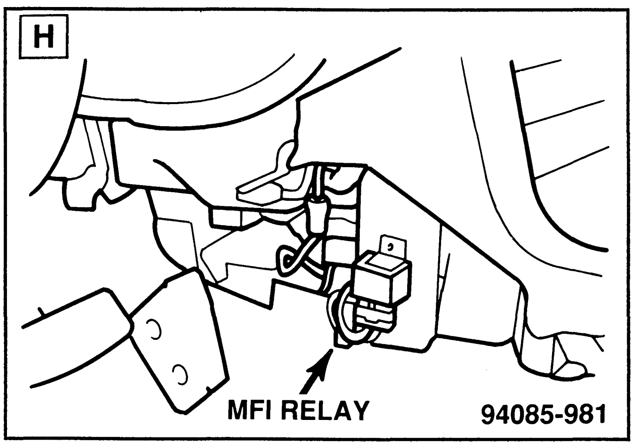
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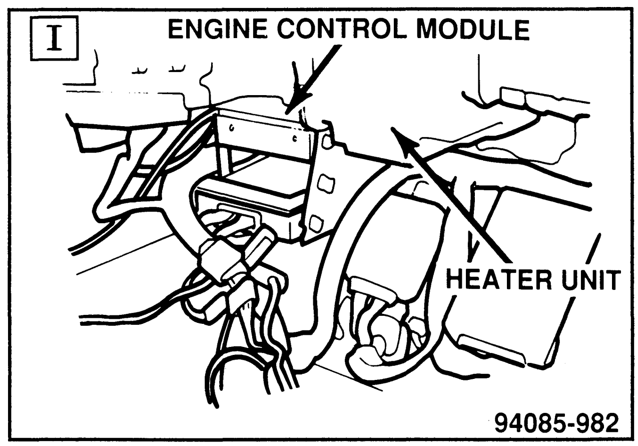
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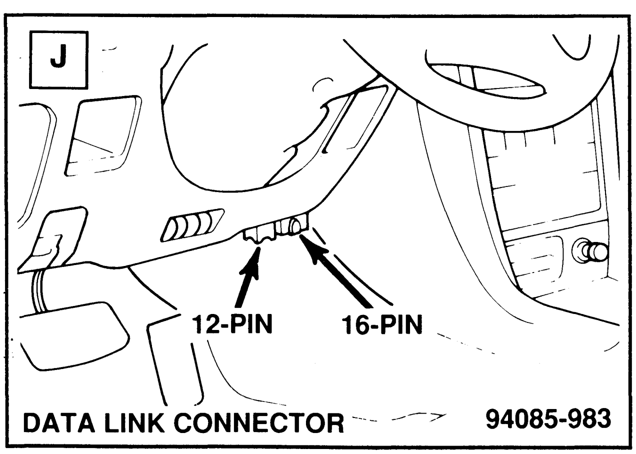
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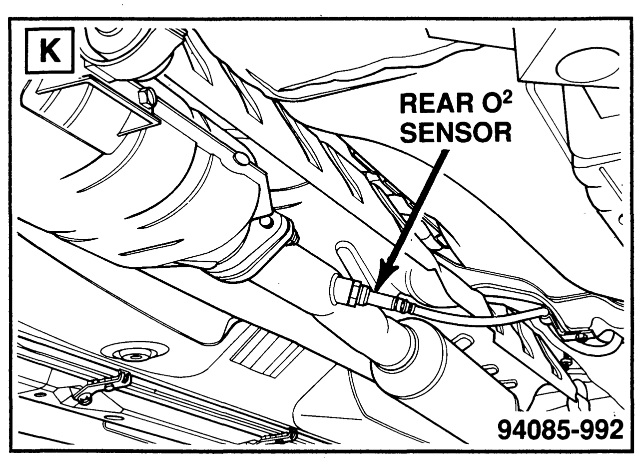
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2.0L DOHC Turbo Fuel and Ignition

General Description

This publication contains information on the fuel, ignition, and emissions system used on the 1995 Eagle Talon with the Mitsubishi Motors Corporation (MMC) 2.0L turbocharged engine. MMC's designation for this engine is the **4G63 D4 I/C T/C**.

4 = Four cylinder
G = Gasoline powered
63 = MMC's development order
D = Double overhead cam
4 = 4 valves per cylinder
I/C = Intercooled
T/C = Turbocharged

The fuel system utilizes a sequential multiport fuel injection system with an in-tank electric fuel pump. A Direct (distributorless) Ignition System (DIS) is used. The system meets the requirements of the federal emissions standard, "On Board Diagnostics II (OBD II)."

The MMC 2.0L multiport fuel injection system is a mass air flow type of fuel injection system, which uses the Crankshaft Position Sensor (CKP) as the most important sensor. The Volume Air Flow sensor (formerly referred to as "Mass Air Flow Sensor") is the second most important sensor. Listed below are the sensors in order of importance, and what effect they have on injector pulse width and/or ignition timing.

1. **Crankshaft Position Sensor (CKP)** - The engine will not run without this sensor. It is used for the rpm input to determine ignition coil dwell and timing, and to start injection. This sensor, along with the Cam Position sensor (CMP), determines which ignition coil and fuel injector is to be fired, and when.

2. **Volume Air Flow Sensor (VAF)** - This sensor determines the amount of load on the engine. The ECM adds fuel based on the signal from this sensor. More air flow results in more fuel to the engine. The VAF sensor also has an effect on ignition timing. The more load there is on the engine, the less spark advance there will be.

3. **Throttle Position Sensor (TPS)** - This sensor can increase injection pulse width by as much as 500% during hard acceleration, or can decrease injection pulse width by about 70% during deceleration. Timing is also effected; spark advance decreases during acceleration.

4. **Engine Coolant Temperature Sensor (ECT)** - This sensor can increase injection pulse width by as much as 60% at -22°F; however has no effect on a pulse width with a fully warm engine. Also, timing is increased with a cold engine.

5. **Barometric Pressure Sensor (BARO)** - This sensor can increase injection pulse width by about 12% when at or below sea level, and decrease injection pulse width by about 50% above 8,000 feet altitude. Also, timing is advanced when above sea level.

6. **Intake Air Temperature Sensor (IAT)** - This sensor can increase injection pulse width by about 23% at -26°F, or decrease injection pulse width by about 17% with the engine fully warm.

7. **Oxygen Sensor (O_2)** - This sensor can indirectly increase or decrease injection pulse width by about 17% only while in closed loop. This input will update the short term fuel trim (adaptive memory).

Fuel Trim (FT)

Also referred to as "adaptive memory," this system uses a short term and a long term fuel trim. The short term is updated only in closed loop, based on the O_2 sensor signal. The short term fuel trim will, in turn, update the long term fuel trim, which affects fuel in open or closed loop. The short term can increase or decrease fuel by about +/- 17%, while the long term can increase or decrease fuel by about +/- 25%.

FUEL SYSTEM COMPONENTS

Fuel Tank

The Talon uses a 16-gallon fuel tank, located at the rear of the vehicle, between the frame rails, under the rear seat floor. The fuel tank for 2WD vehicles is made of stamped steel (fig. 1)

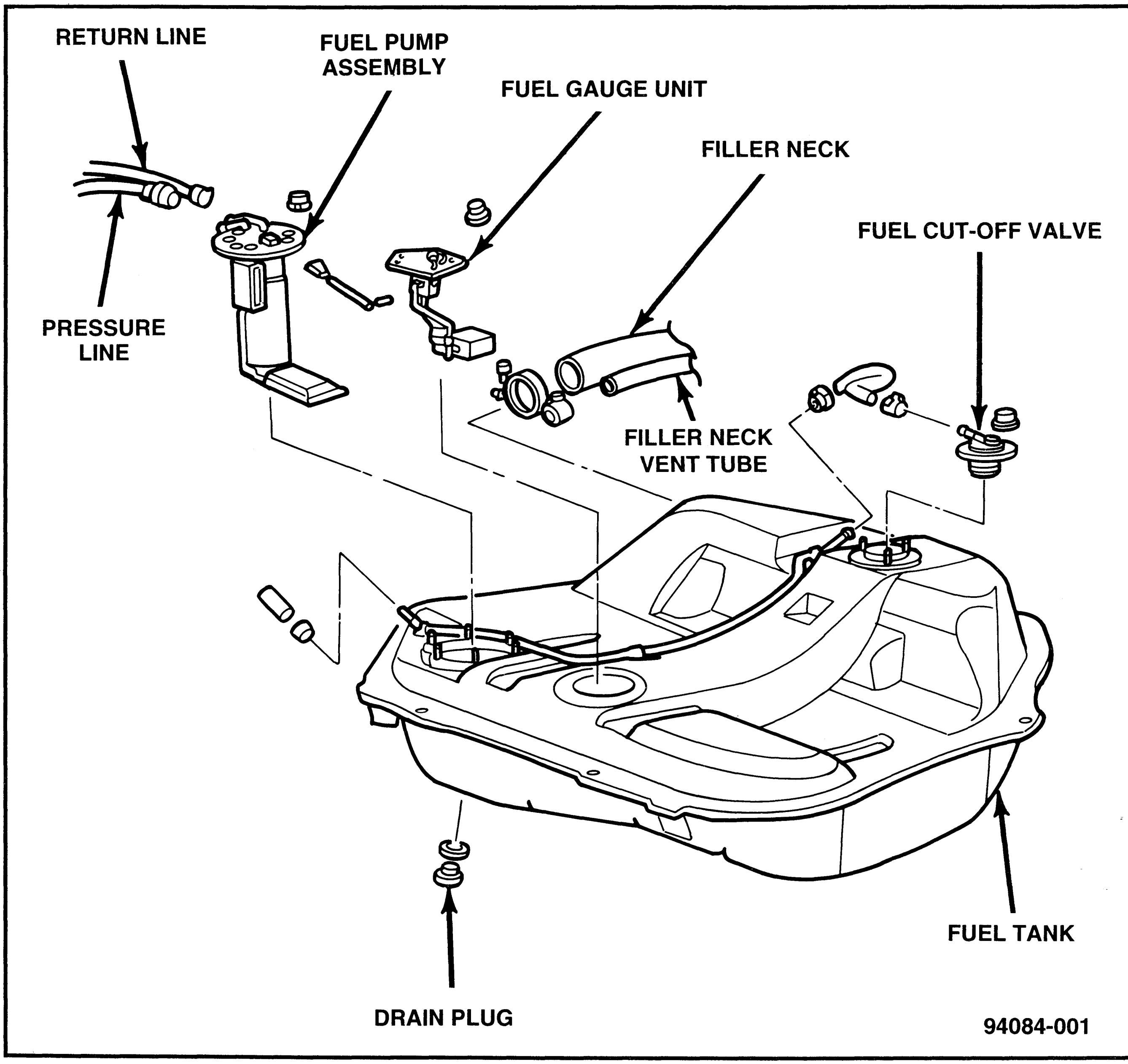


Figure 1 2WD Fuel Tank and Components

AWD vehicles use a saddle fuel tank that is made from a high-density polyethylene (HDPE) material and blow-formed into an integral fuel tank (fig. 2). The tank uses a fuel pump module, which is attached with a threaded resin cap instead of screws. The pump module contains an electrically operated pump, a gauge sending unit, and a jet pump.

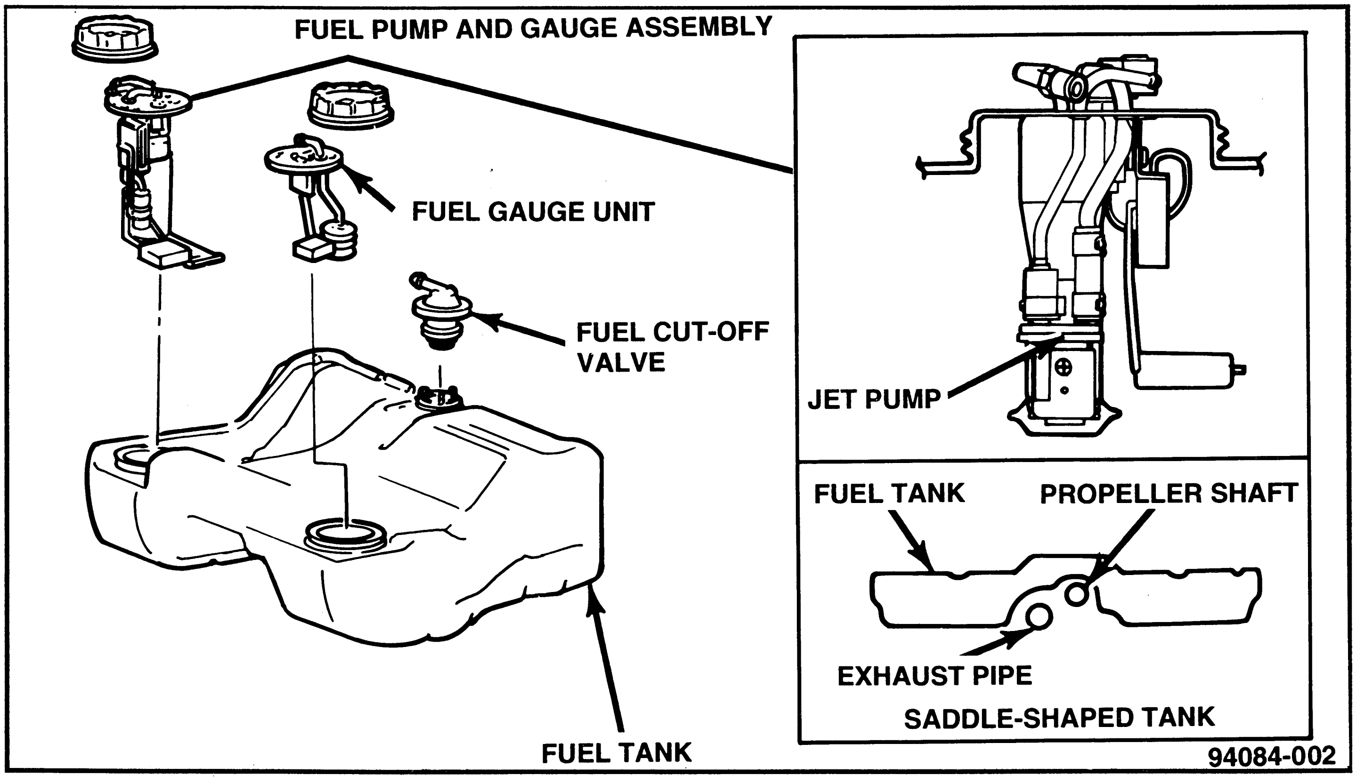


Figure 2 AWD Fuel Tank Assembly

There is a second gauge sending-unit assembly inserted into the left-hand side of the saddle tank. This sending unit is installed so that the fuel levels in both sides of the tank are considered when calculating fuel level. Since the sending units are connected in parallel, the fuel level is an average of the two sides of the tank (fig. 3).

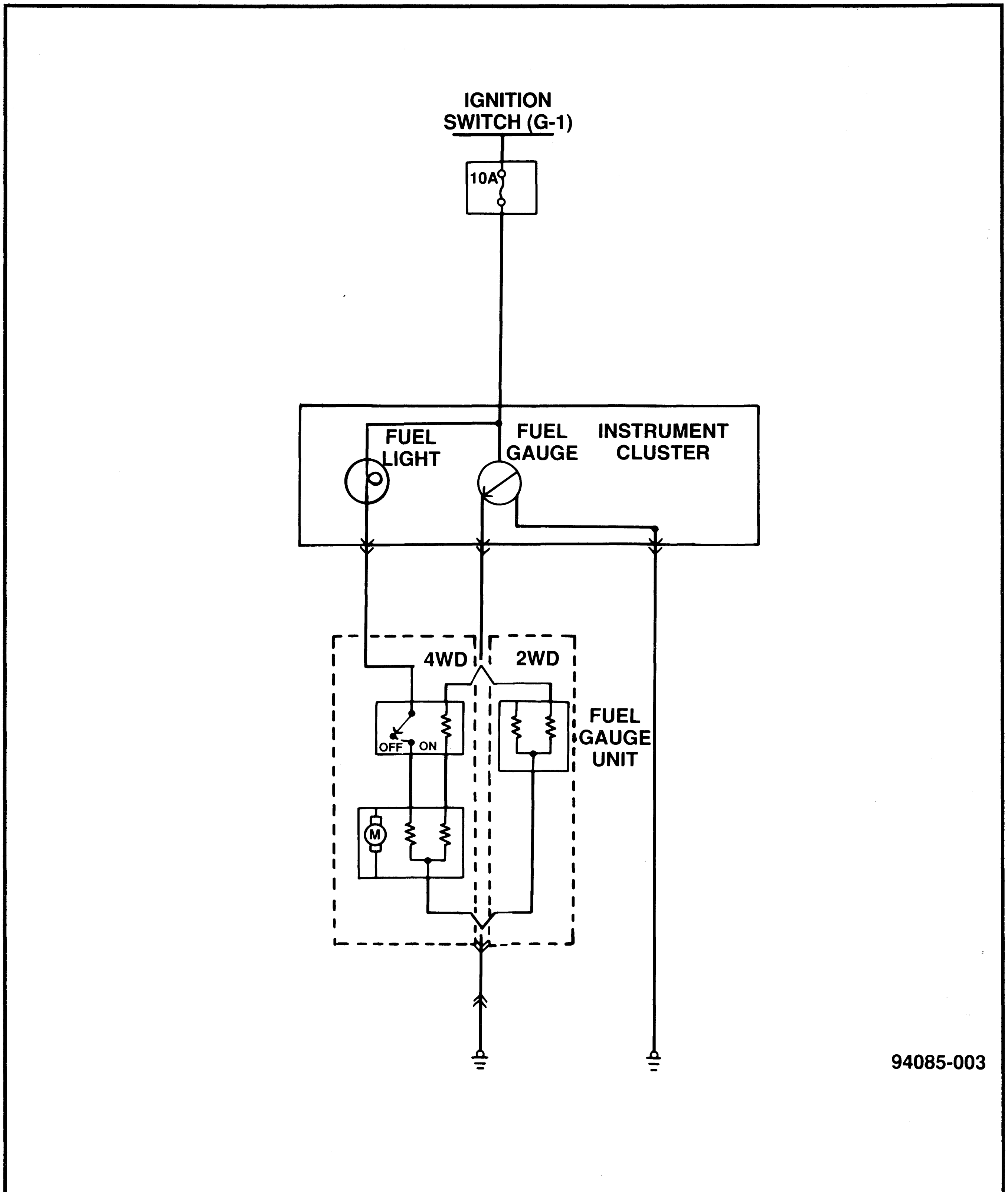


Figure 3 Fuel Level Sending-Unit Circuit

A jet pump is installed on the pump module to transfer fuel from the left side of the tank to the pump side of the tank (fig.4). Fuel returning from the fuel rail is fed through the jet pump. A line attached from the left sending unit assembly to the pump module assembly is connected to the jet pump, and fed to the tip of the jet pump's nozzle. As fuel moves past the nozzle, a low-pressure area is formed at the tip of the nozzle, drawing the fuel from the left side of the tank to the pump module side of the tank.

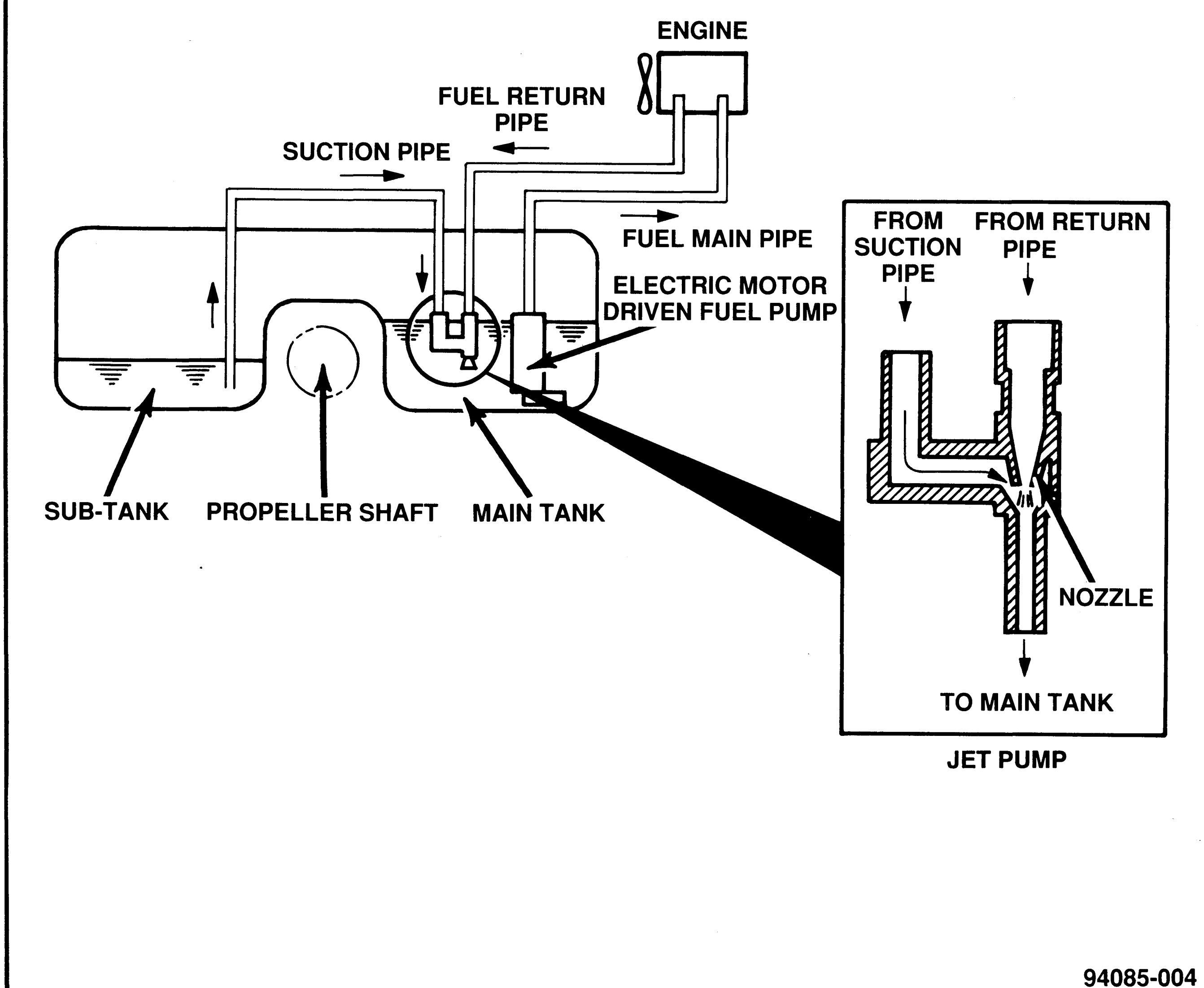


Figure 4 Jet Pump Operation

Fuel Cut-off Valve

The fuel tank is equipped with a fuel cut-off valve (fig. 5) to prevent fuel from entering the ~~evaporator~~ when the vehicle fuel tank is overfilled or when the vehicle moves around sharp corners and the fuel sloshes up to the valve. The valve also prevents fuel from leaving the fuel tank through the ~~evaporator~~ hose is the vehicle overturns.

During normal operation the weight of the valve overpowers the force of the spring, opening the passage for fuel vapor.

When the fuel level is high or when driving around sharp corners the liquid fuel causes the float to rise, closing the port preventing liquid fuel from entering the ~~evaporator~~ line.

I the vehicle overturns gravitational pull on the float is great enough to overcome spring pressure and close the port, preventing any fuel spillage through the ~~evaporator~~ line.

In addition, if the float sticks, causing the valve to remain closed, there is a relief valve that provides a means through which fuel vapor can escape to the ~~evaporator~~.

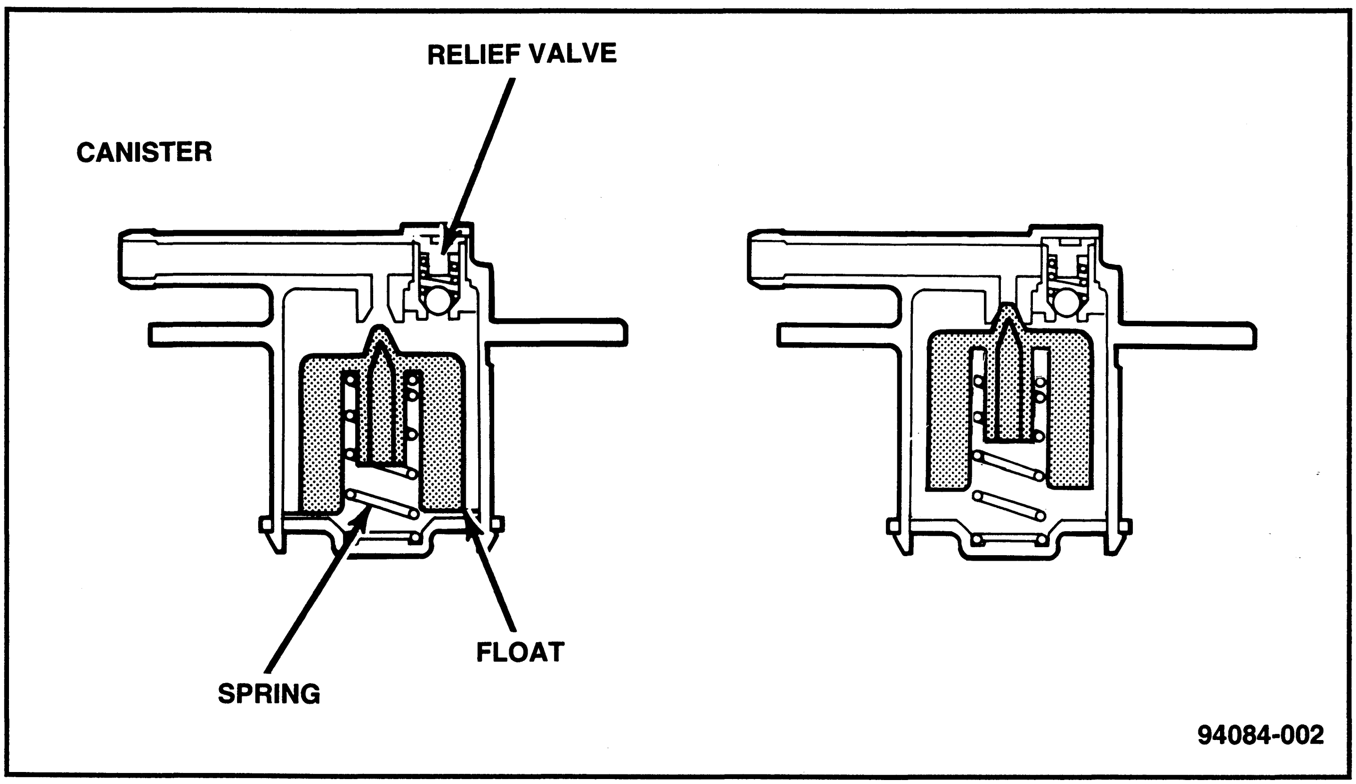


Figure 5 Fuel Cut-off Valve

Evaporative Control System

The evaporative control system consists of a fuel cap, fuel cut-off valve, vapor line, fuel tank overfill limiter valve, evaporator canister, purge solenoid, purge control valve, and an intake manifold vacuum line (fig. 6).

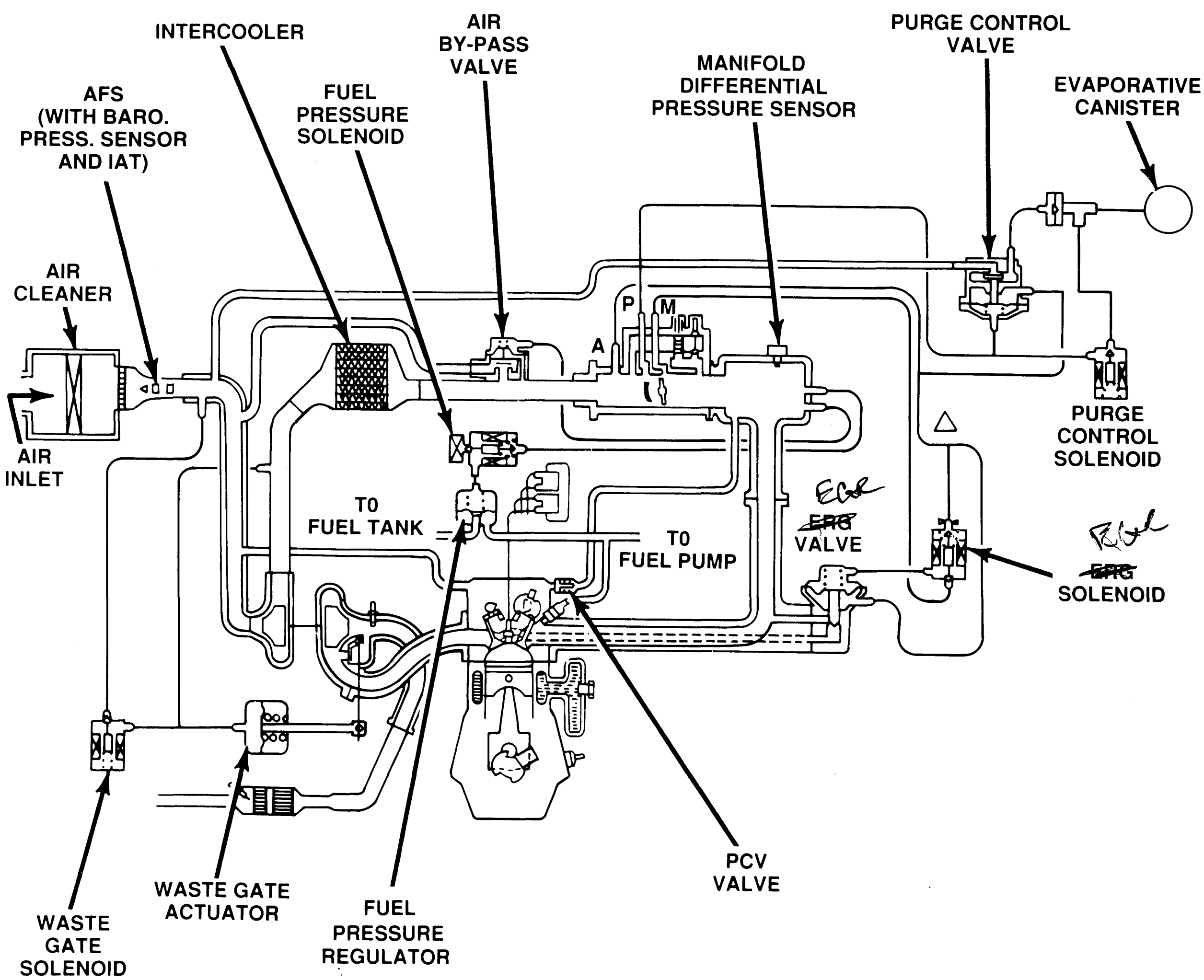


Figure 6 Hose Routing

The fuel filler cap is equipped with a screw-on lock mechanism (fig. 7). The cap is designed to increase impact resistance in a collision. Even if the lug on the cap is knocked off, the screw-on portion of the cap will remain on the filler neck. This improves safety, preventing fuel from leaking out even if the vehicle is overturned in an accident. In addition, a ratchet mechanism has been added to the filler cap lug to keep the tightening force on the filler cap constant. Also, the cap is equipped with a valve to relieve pressure extremes in the fuel tank.

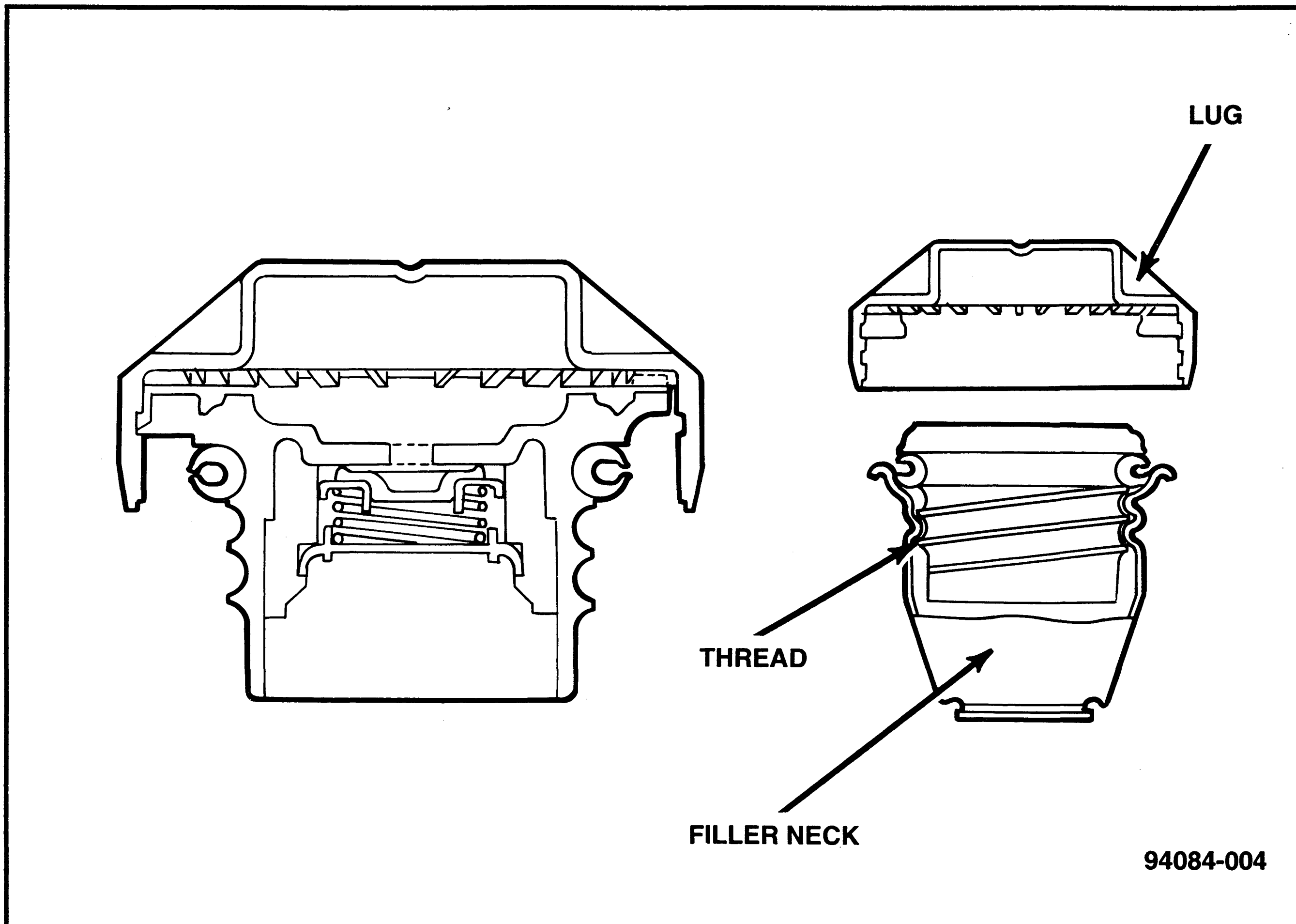


Figure 7 Fuel Filler Cap

The overfill limiter is installed in the vapor line between the fuel tank and the evaporator canister, and is mounted next to the canister. The overfill limiter consists of a pressure relief valve, an orifice, and a vacuum valve (fig. 8). The pressure relief valve is designed to open when the fuel tank's internal pressure has exceeded normal pressure. An orifice, installed in the valve, allows fuel vapors to reach the canister. A vacuum valve allows pressures to equalize between the evaporative canister and the fuel tank if the pressure in the tank drops below a predetermined value.

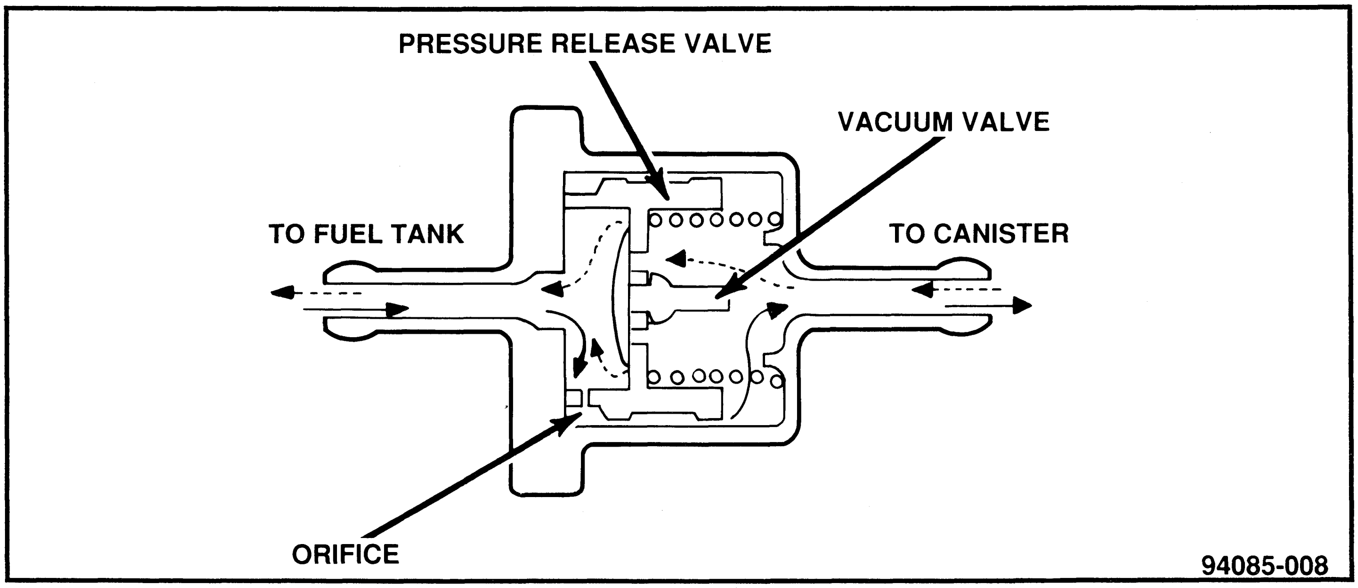


Figure 8 Fuel Tank Pressure Relief Valve

The evaporative canister is mounted on a plastic bracket, behind the passenger side of the front fascia. The canister temporarily stores fuel vapors until they are drawn into the combustion chamber (fig. 9).

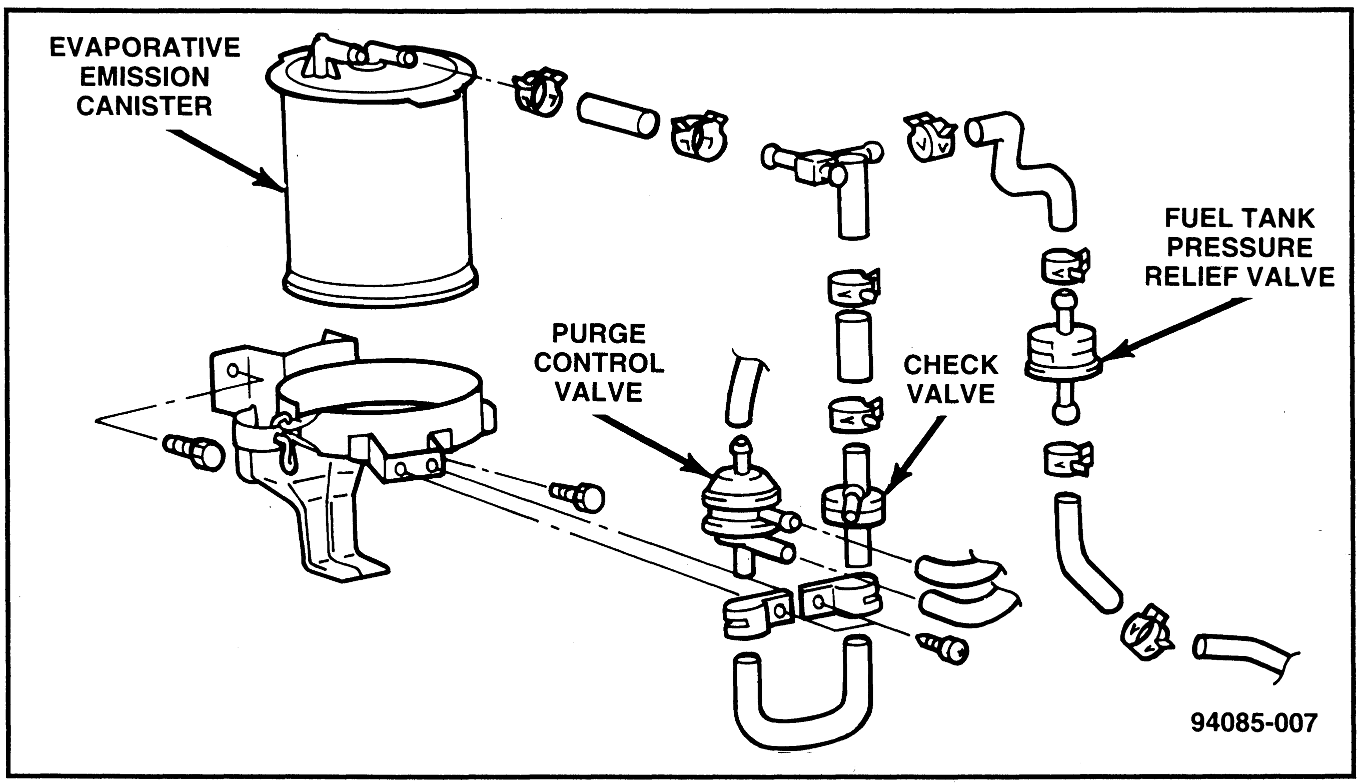


Figure 9 Evaporative Canister and Components

Mounted beside the canister is a purge control valve (fig. 10), used to control the flow of vapors to the turbocharger inlet. The purge control valve is operated by the purge solenoid (fig. 10).

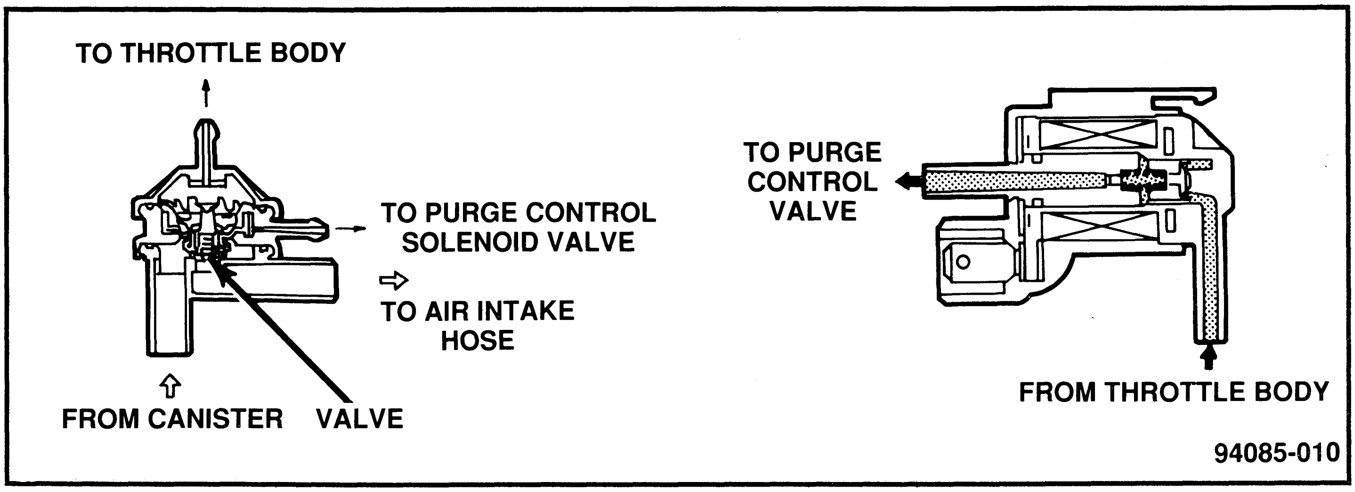


Figure 10 Purge Control Components

The purge solenoid is located on the bulkhead, behind the engine. The solenoid is spring-loaded closed. When the ECM grounds the purge solenoid, the solenoid opens, allowing the vapors to be purged through the solenoid to the intake manifold. With the solenoid de-energized, opposing pressures acting upon the purge control valve can cause the valve to open. With the purge control valve open, vapors can be pulled through the turbocharger inlet. This allows the canister to be purged during vacuum or boost conditions.

The purge control valve has two large black hoses to draw the vapors through; one goes to the canister, and the other goes to the turbocharger inlet. The purge control valve also has two smaller "control" hoses, one black and one with red stripes. The purge control valve opens to allow canister vapors to purge through the air cleaner when the vacuum is greater than 2 in. of mercury on the red striped hose, or when the boost pressure is greater than 2 psi on the black hose (fig. 11).

Note: *A pressure differential of more than 2 psi between the two smaller hoses will allow the canister to purge through the two larger hoses.*

The purge solenoid is fed battery voltage from the MFI relay, and the ECM controls the ground on ECM pin 9 (LG/BK) (fig. 12). The ECM de-energizes the solenoid whenever the ECT sensor indicates less than approximately 140°F. With the solenoid de-energized, both ports are connected. This puts equal pressure on the two small hoses of the purge control valve, shutting off purge. The ECM also shuts off purge (de-energizes the solenoid) whenever the ECM senses less than 100 Hz from the VAF sensor. Above 140°F from the ECT sensor and 100 Hz from the VAF sensor, the ECM allows purge for three minutes, then shuts off purge for 20 seconds. This cycle continues as long as the ECM senses more than 100 Hz from the VAF sensor.

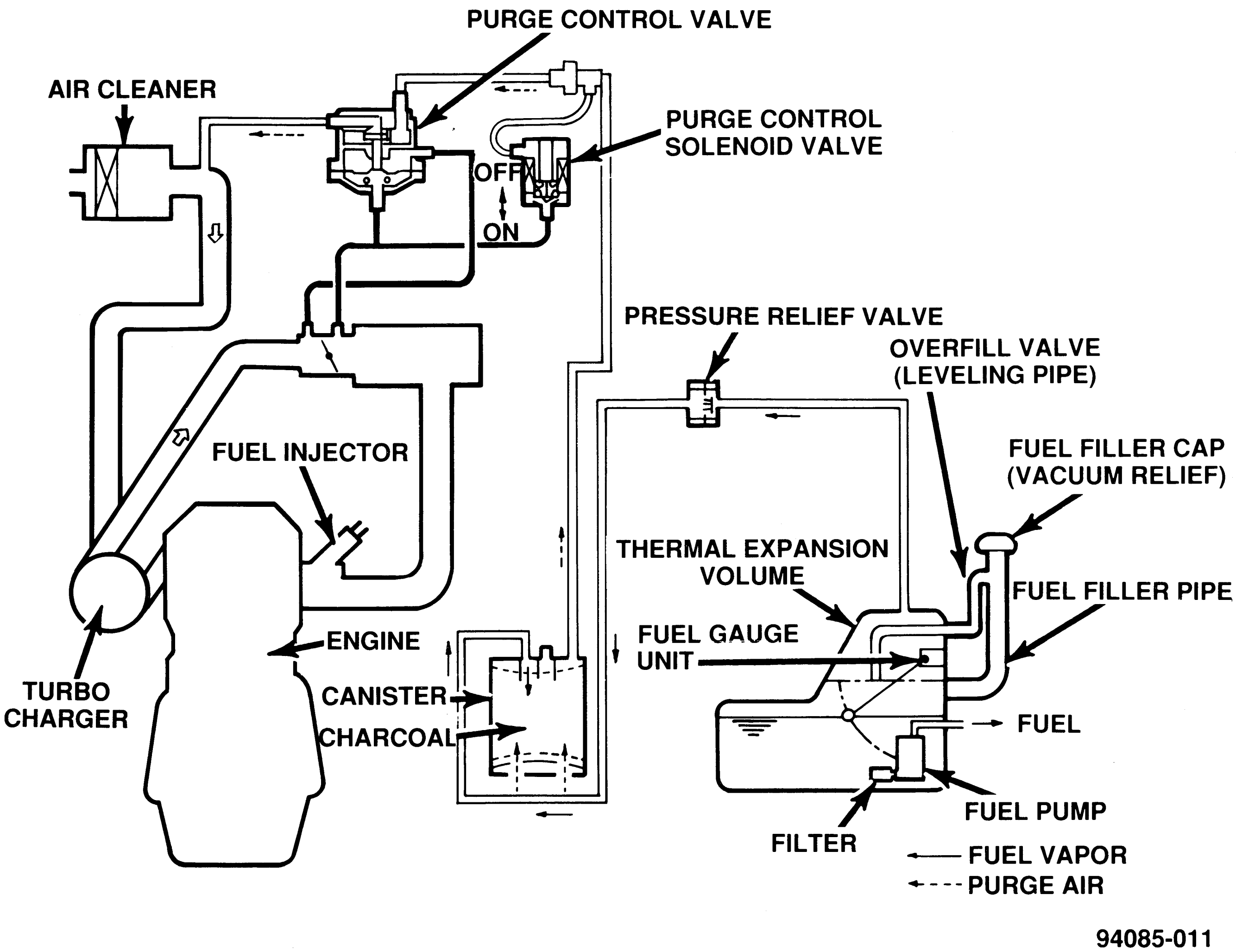


Figure 11 Evaporative Canister and Components

Diagnosis

There are two DTCs related to the evaporative emission system. The first is an electrical check of the solenoid (OBD II DTC P 0443). The current flow must be greater than 0.22 amps when the solenoid is energized and less than 0.22 amps when the solenoid is de-energized. The second DTC is a mechanical check. The following conditions must be met for the mechanical check to be performed:

1. The system must be in closed loop
2. The power steering switch must be off
3. The ECT sensor must be indicating a temperature greater than 180°F

When the previous conditions are met, the ECM de-energizes the solenoid and stores the short term trim and the IAC motor steps. The ECM then energizes the solenoid (allows purge) and looks for a minimum of 3% short term fuel trim change and a minimum of a two step change in the IAC motor. If the minimums are not present, an OBD II DTC P 0440 is set in memory.

An actuator test can be performed with the DRB III scan tool. During the test, the ECM energizes and de-energizes the purge solenoid every six seconds for up to five minutes. As the ECM energizes and de-energizes the solenoid, it should click. With a hand vacuum pump, check that the solenoid valve opens and closes every six seconds. The electrical portion of the purge solenoid can be checked using the same procedures used for the wastegate solenoid (see page 95). The solenoid resistance value should be 36-44 ohms. The mechanical portion should be checked by verifying the vacuum hose routing as per the Service Manual. The Service Manual also has a check for the purge control valve in Group 25.

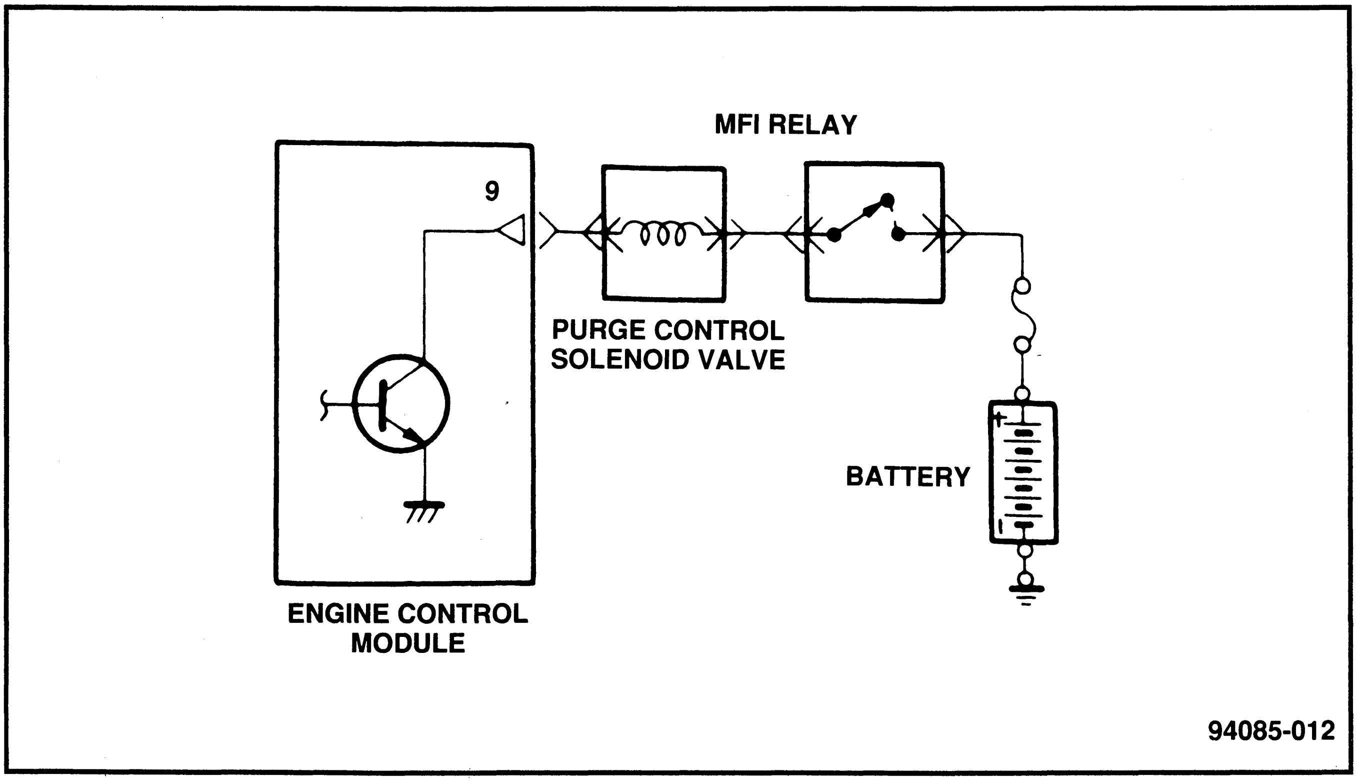


Figure 12 Purge Control Circuit

Fuel Pump Module

The Talon uses an in-tank fuel pump module (fig. 13). The fuel pump is mounted on top of the tank, and is accessed from a service port through the rear seat floor. The pump module uses an impeller pump, which is driven by a 12-volt DC motor. The motor is activated any time the Multiport Fuel Injection (MFI) relay is energized. The pump contains a check valve on the outlet port that prevents fuel from returning to the tank through the pump when the pump is off. A fuel level sending unit is mounted separately on top of the tank in 2WD vehicles.

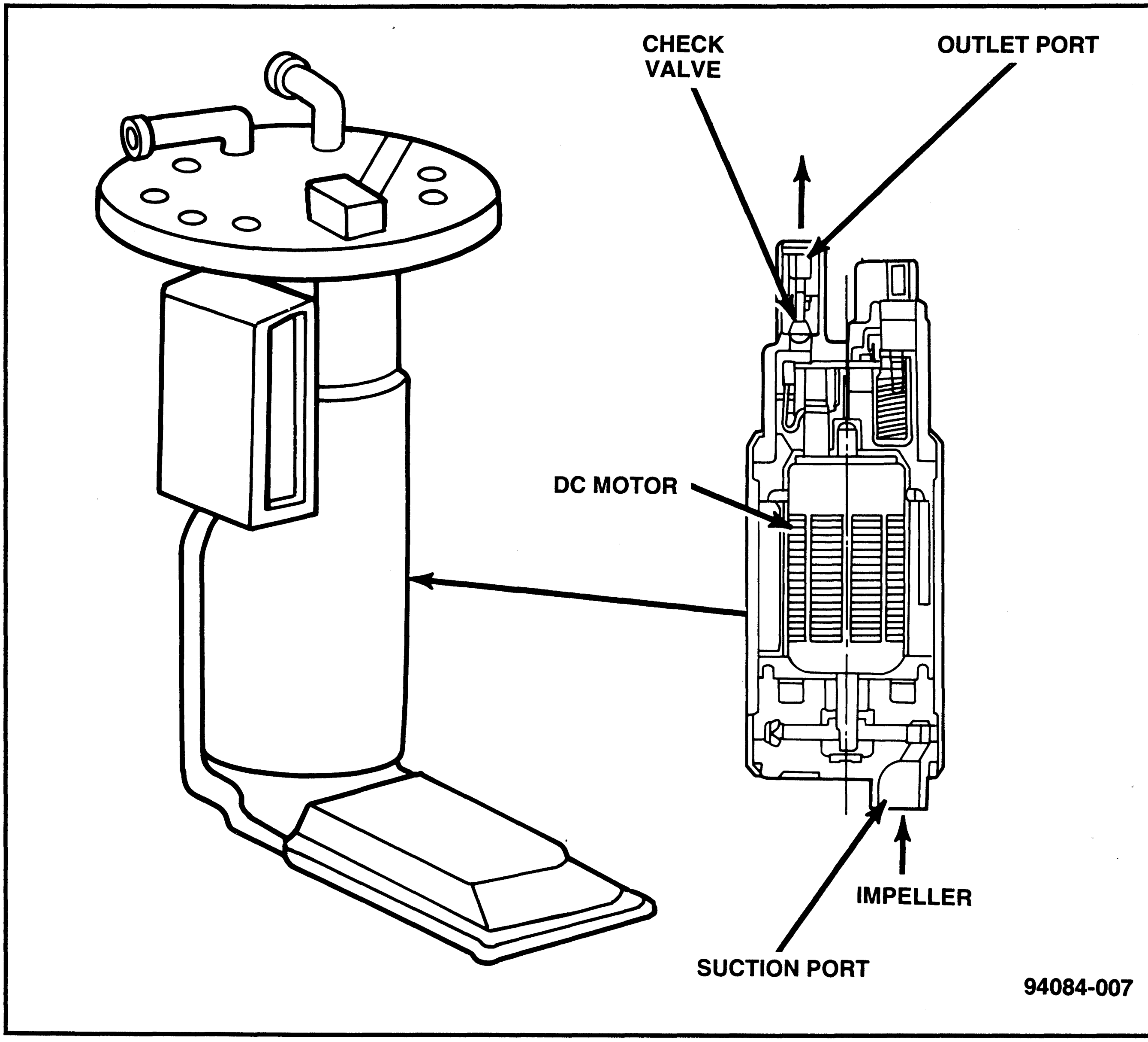


Figure 13 Fuel Pump Module

Fuel Filter

The fuel filter for the Talon is mounted in the engine compartment below the battery tray. The filter is fitted with a flare fitting on the pump side, and a banjo fitting on the fuel rail side (fig. 14). Banjo fittings are sealed between the fitting and the filter with a copper gasket. A hollow (eye) bolt with a drilled port is used to attach the fitting to the filter.

Caution: *When replacing the filter, never reuse the copper gaskets, and always torque the fuel line eye bolt to 22 ft.-lbs.*

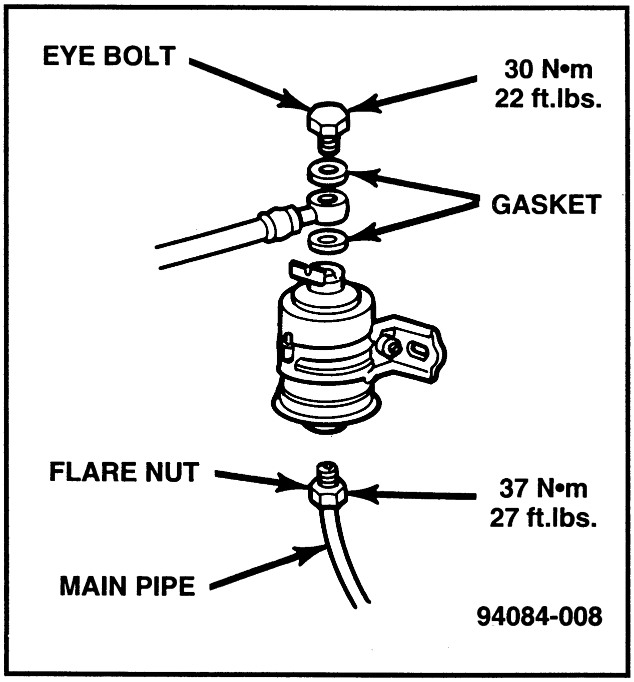


Figure 14 Fuel Filter

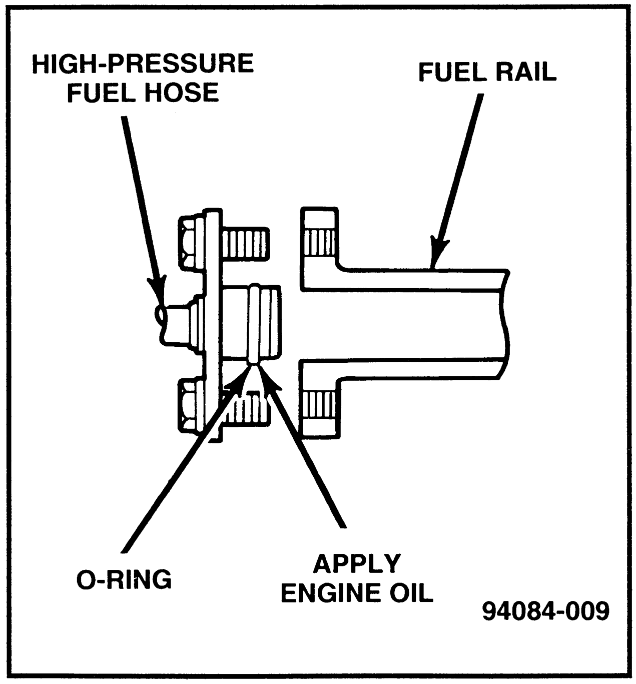


Figure 15 Hose Union

Fuel Lines

The high-pressure line from the tank to the filter is made of steel, except for a high-pressure flexible hose from the pump to the steel line. A high-pressure flexible rubber hose is used from the filter to the fuel rail. As mentioned earlier, the filter side of this hose is fitted with a banjo fitting. The fuel rail side of this hose is fitted with a hose union (fig. 15). The union is attached to the fuel rail by two attaching bolts, and is sealed by a single O-ring.

Caution: *When installing the high-pressure fuel line to the fuel rail, oil the O-ring with engine oil; then re-torque the union bolts to 4 ft.-lbs.*

Fuel Pressure Regulator

System pressure is controlled by a fuel pressure regulator mounted at the forward end of the fuel rail (fig. 16). The regulator contains a calibrated spring and a diaphragm that actuates the regulator valve (fig. 17). Fuel pressure operates on one side of the diaphragm, while manifold pressure operates on the other side. When the pump delivers fuel to the fuel rail, the diaphragm of the regulator opens the valve to the return line, allowing fuel to return to the tank. The spring on the opposite side of the diaphragm attempts to close the valve, causing an increase of pressure on the fuel rail. Fuel pressure is regulated to a nominal pressure of 43 psi.

To check fuel pressure, follow the Service Manual procedure for bleeding off the fuel pressure. Remove the fuel line at the fuel rail, and connect Miller special tool MD998742 in series with the fuel line and the fuel rail using the long 10 mm bolts supplied with the tool, which serves also as a standard Schrader valve to allow a connection to a fuel pressure gauge. Check fuel pressure using the DRB III scan tool under the fuel pump actuator test, or jump battery voltage to the fuel pump check terminal. The terminal is a single-wire black connector with a BK/BL wire, located behind the engine at the center of the bulkhead.

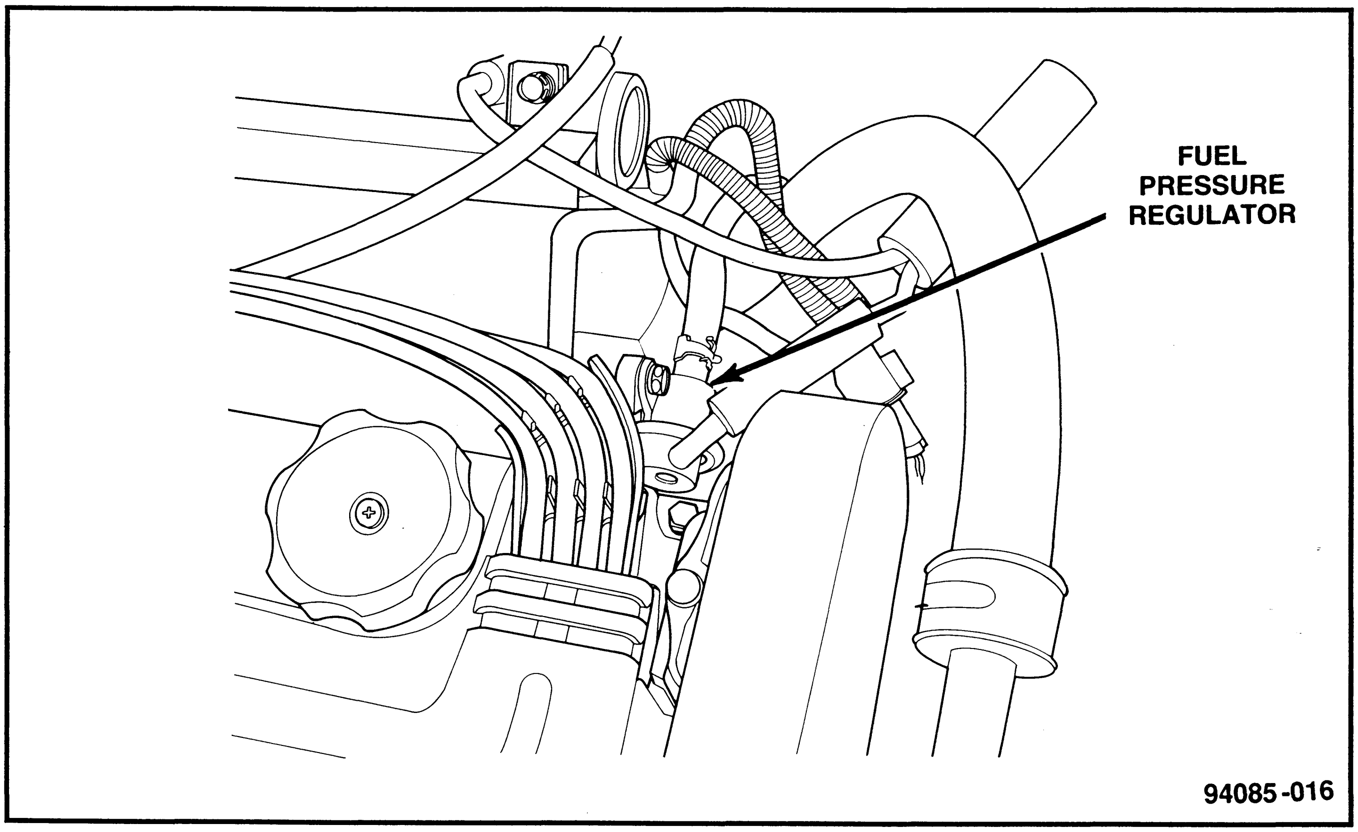


Figure 16 Fuel Pressure Regulator

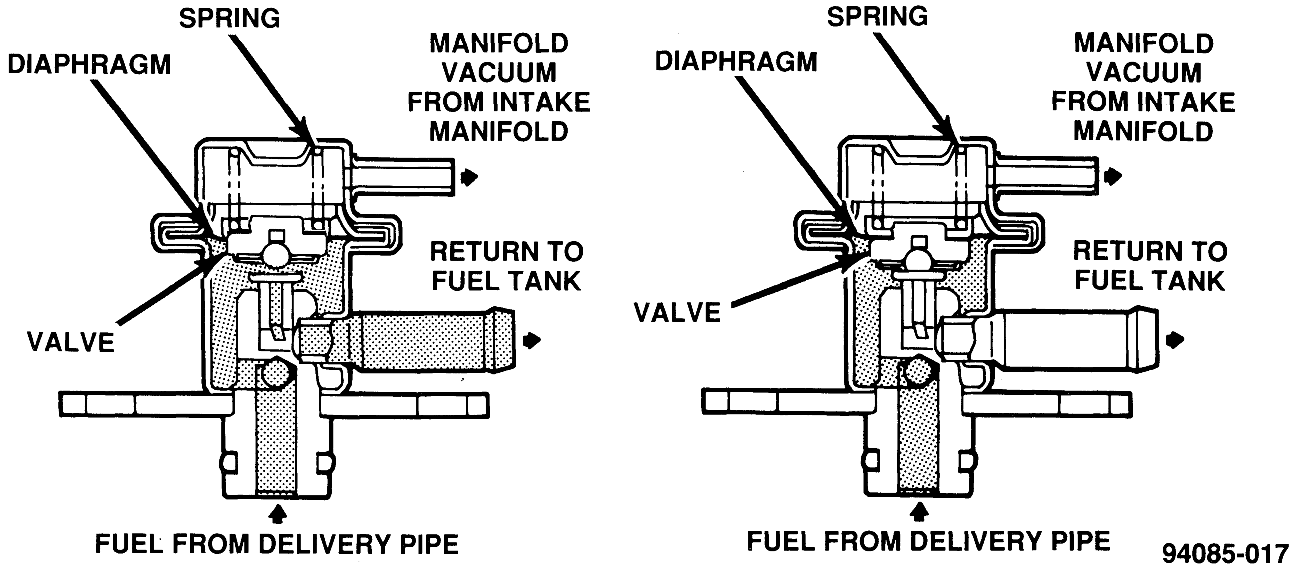


Figure 17 Fuel Pressure Regulator Operation

A vacuum hose is connected from the intake manifold to a fuel pressure solenoid, and from the solenoid to the fuel pressure regulator. The connection to intake manifold pressure is necessary to maintain a constant pressure differential across the injector between the fuel rail and the intake manifold (fig. 18). The fuel pressure regulator regulates fuel pressure, based upon the amount of intake manifold vacuum or turbocharger boost pressure. When manifold pressure decreases, the pressure at the tip of the injector decreases. Conversely, when manifold pressure increases, the pressure at the tip of the injector increases. This change of pressure can cause the flow of the injector to change if fuel pressure doesn't change accordingly. For every pound of pressure change in the intake manifold, the regulator changes equally.

Example:

When intake manifold vacuum is at a steady 20 in. Hg (-10 psi), the regulator drops fuel pressure by 10 psi, to 33 psi. Conversely, if turbocharger boost pressure is maintained at 5 psi, the regulator increases pressure by 5 psi, to 48 psi.

The fuel pressure solenoid, when energized, blocks manifold pressure during a hot restart. When the engine first starts, manifold pressure is normally routed to the fuel pressure regulator, which causes the fuel pressure to drop. Any time pressure is decreased on a liquid, the boiling point decreases. If the fuel in the fuel rail is close to a boiling point, dropping the fuel pressure to the regulator during a hot restart, fuel pressure remains stable and the fuel is prevented from boiling.

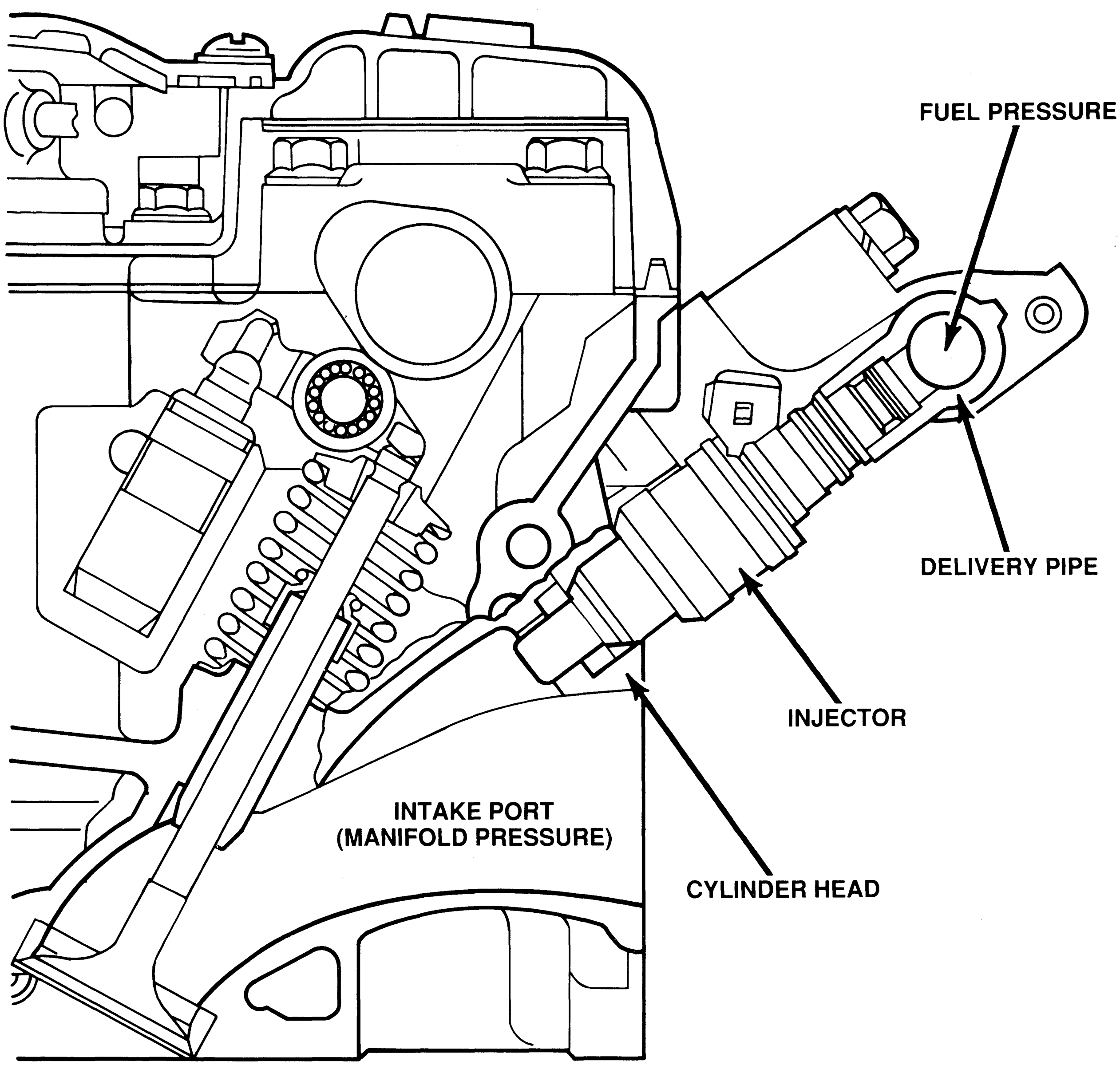


Figure 18 Injector Positioning

Battery voltage is fed to the fuel pressure solenoid from the MFI relay, and ground is supplied by the ECM on pin 3 (BL/RD). The ECM energizes the fuel pressure solenoid if, during cranking, the IAT sensor indicates greater the 122°F and the ECT sensor indicates greater than 194°F. This blocks manifold vacuum from reaching the fuel pressure solenoid, and keeps the fuel pressure at the nominal value of 43 psi. The ECM also increases the fuel injector pulse width to help purge any fuel vapors from the fuel injectors and the fuel rail. The ECM keeps the fuel pressure solenoid energized for two minutes to aid hot restarts.

Diagnosis

An actuator test can be performed with the DRB III scan tool. During the test, the ECM energizes and de-energizes the fuel pressure solenoid every six seconds, for a maximum of five minutes. With the ECM energizing and de-energizing the solenoid, the solenoid valve should click. A hand vacuum pump connected to the fuel pressure regulator port of the solenoid can be used to check that the solenoid holds and bleeds vacuum every six seconds. The fuel pressure solenoid resistance value should be 36-44 ohms.

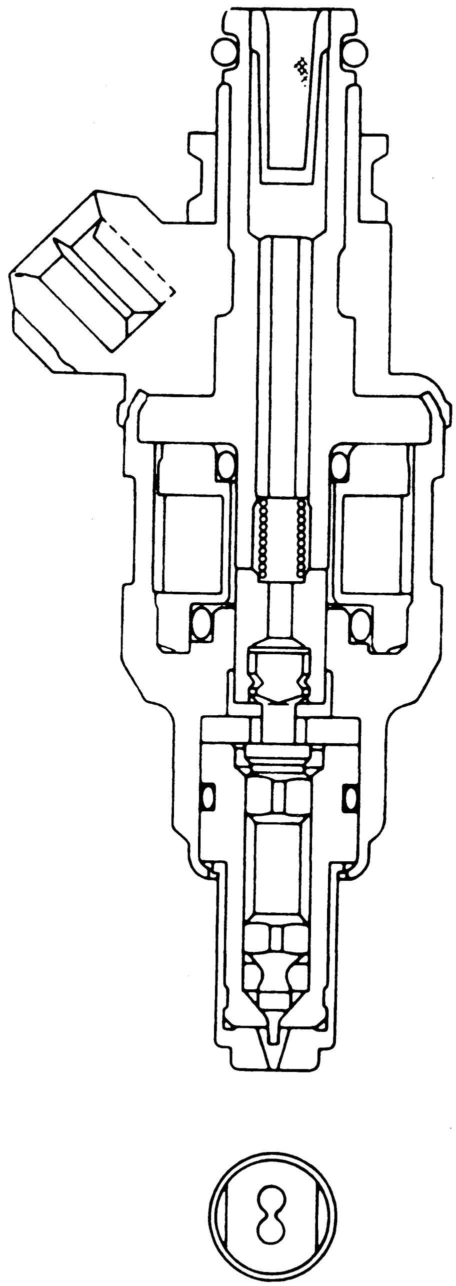
See the section on the MFI relay for more details on troubleshooting this circuit if the fuel pump does not operate. Also, remember that the fuel pressure specifications listed are with no vacuum or boost at the fuel pressure regulator.

Warning: *Release fuel system pressure before servicing fuel system components. The procedure is described in the Service Manual. Service vehicles and fuel system components in well-ventilated areas and avoid sparks, flames, and other ignition sources. Never smoke while servicing the vehicle's fuel system.*

Fuel Injectors

The Talon uses top-feed injectors. The injectors mount to the fuel rail with push-on retaining clips, and use O-rings to prevent leakage between the injectors and the fuel rail. The injectors have an impedance of 2-3 ohms, and are fed battery voltage from the MFI relay through four 6 ohm resistors (one for each injector).

MMC uses this style of pintle injector for other DOHC engines. Fuel is dispersed through two openings at the bottom of the injector (fig. 19). This design allows for an atomized spray of fuel to each intake valve. Because of this design, the injectors must be installed with the nozzles pointing toward the intake valves. This is accomplished by a unique clip that maintains the proper position.



6 ohm ~~series~~
in series

2 1/2 ohm's

Figure 19 Fuel Injector

AIR INLET SYSTEM

Air Cleaner

The Talon uses a rectangular air cleaner assembly with a replaceable dry filter element. The two-piece housing is held together by spring-band clamps, and is mounted to the engine's throttle body. An air duct supplies outside air for the system.

IGNITION SYSTEM

Ignition Coil

The Talon uses a Direct Ignition System (DIS) with a single coil-pack mounted to the top of the engine (fig. 20). The pack contains two independent coils, one for each pair of cylinders. Coil 1 serves cylinders 1 and 4, and coil 2 serves cylinders 2 and 3. Each coil fires two spark plugs simultaneously in a series circuit. One cylinder is fired on the compression stroke, while its companion is fired on the exhaust stroke. The coil's primary circuit is controlled by a power transistor unit.

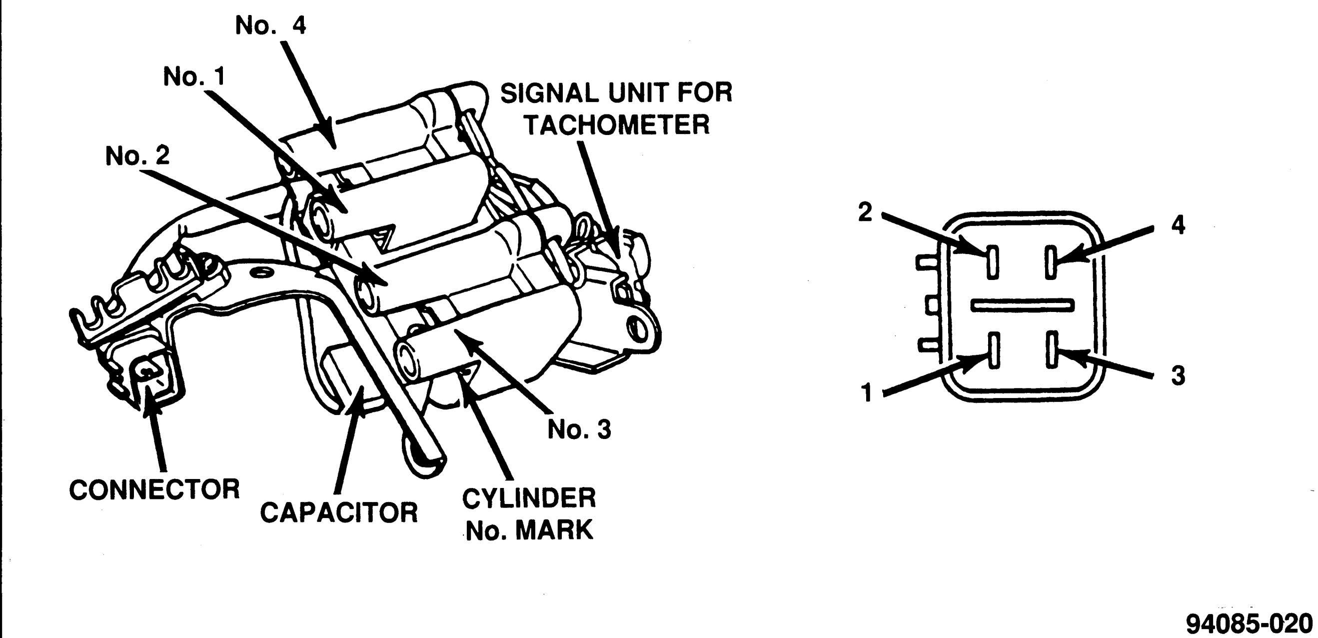


Figure 20 Ignition Coil

2.0L DOHC Turbo Fuel and Ignition

Engine Control Module (ECM)

The ECM is located in the front of the center console, behind the radio. The ECM memory has been increased to handle the OBD II requirements. The ECM now has 76 pins and 4 connectors, compared to the 1994 MMC 2.0L Turbo engine, which used 64 pins and 3 connectors. The ECM pin numbers, the sensor connector pin numbers, and the wiring color codes are referenced in the 1995 Eagle Talon Service Manual.

The ECM controls operation of the fuel, ignition, emissions, and charging systems. It receives information from input sensors that monitor engine operating conditions. After processing this information, the ECM operates outputs that regulate engine performance. This cycle of input/processing/output ensures that the engine meets emissions, performance, fuel economy, and driveability requirements. The cycling also provides for diagnostic capabilities.

The ECM controls operation of the ignition system by providing signals to a power transistor unit that controls the ignition coil. The ECM adjusts ignition timing to meet changing operating conditions as determined by data received from several ECM inputs.

The ECM controls injector operation by providing battery voltage through the MFI relay, and ground for individual injectors. The ~~PCM~~ adjusts injector pulse width by varying the duration of the ground path provided to each injector. The ~~PCM~~ processes the data received from several inputs to determine the optimum injector pulse width for each operating condition.

For better control of the charging system and idle quality, the ECM is able to control the output of the generator. On previous systems, a load on the generator could cause the generator to draw substantial power from the engine. The demand could have been large enough and quick enough to cause the idle quality to deteriorate. With the ECM controlling the charging rate, the engine load from the generator can be applied smoothly.

ECM INPUTS

Crankshaft Position Sensor (CKP)

The CKP sensor has been moved from the rear end of the intake cam to the crankshaft sprocket to detect crank angle directly from the crankshaft (fig. 21). Also, the type of sensor has been changed from photo diode to a Hall element. The CKP sensor is used by the ECM for an rpm input. This sensor, along with the Cam Position sensor (CMP) determines which ignition coil to fire and which fuel injectors to turn on. Without this input, the engine will not start. A flux screening plate is mounted on the rear of the crankshaft sprocket, and contains two vanes, or shudder blades, evenly spaced 180^0 apart.

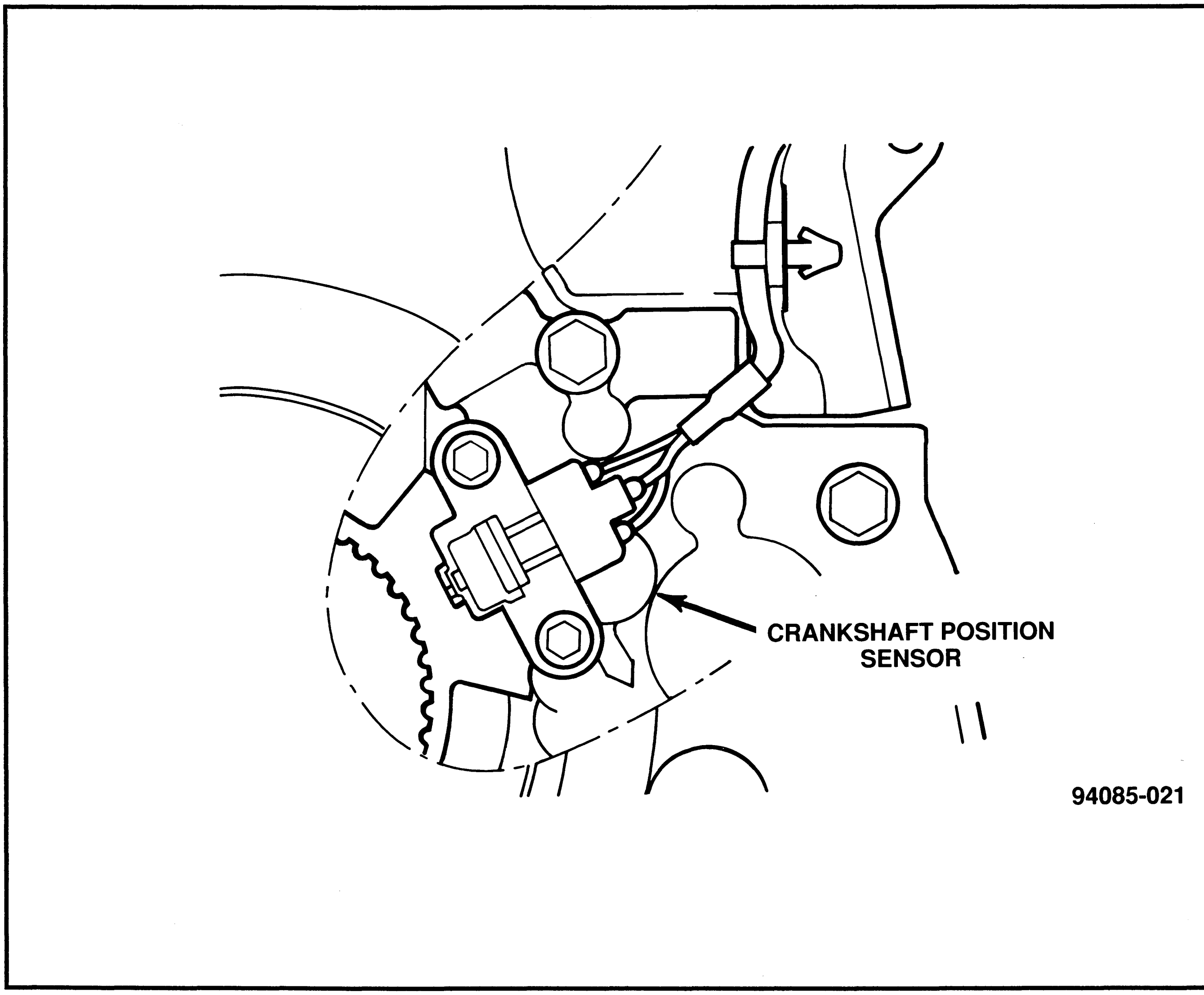


Figure 21 Crankshaft Position Sensor

As the crankshaft rotates, the leading edge of the flux screening plate passes through the CKP sensor at 75° BTDC, and the trailing edge leaves the sensor at 5° BTDC.

The CKP sensor uses a 3-way connector, and is fed 12 volts from the Multiport Fuel Injection (MFI) relay (formerly called the "control relay") on pin 3 (RD) to power up the sensor. 5 volts are fed from the ECM to pin 2 (BL/WT), and ground is supplied on pin 1 (BK) (fig. 22).

As the crankshaft rotates, the shudder blades pass through the sensor. When a shudder blade is between the Hall element and the magnet of the CKP sensor, the flux from the magnet is "blocked" by the shudder. This turns off the Hall element; thus the voltage on pin 2 of the CKP sensor goes "high" (5 volts). When the shudder is not between the Hall element and the magnet, the flux from the magnet passes through the Hall element which ground the 5-volt signal from the ECM. (See Publication 81-699-0201, p. 14-6 for a more in-depth description of a Hall element.) The signal received by the ECM is a digital 5-volt square wave, two pulses per revolution of the crankshaft.

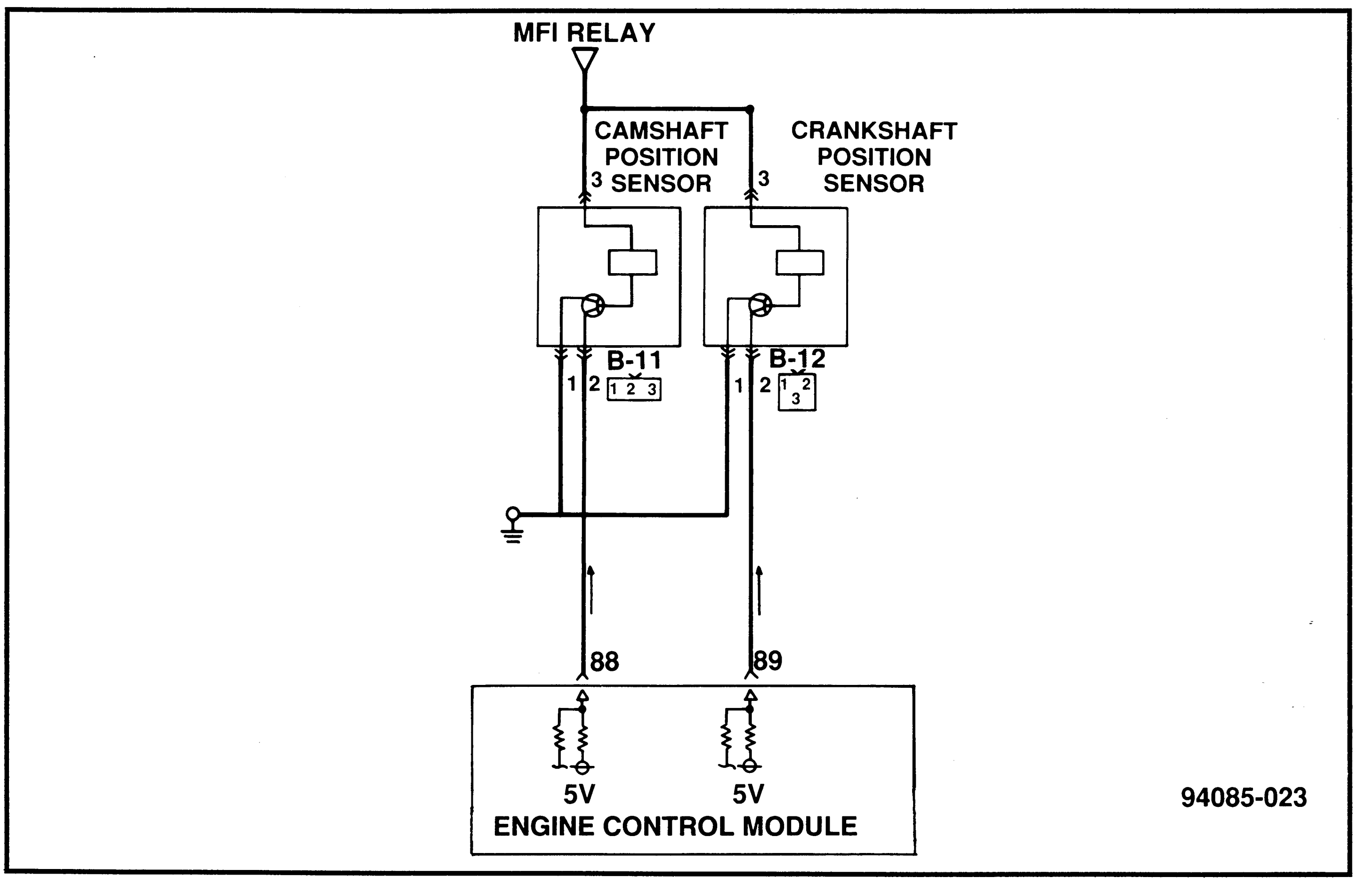


Figure 22 Crankshaft and Camshaft Position Sensor Circuits

Diagnosis

A Diagnostic Trouble Code (DTC) 22 (OBD II DTC P 0335) is set in the ECM if the CKP sensor signal is not present during engine cranking. The ECM monitors the voltage at pin 71 of the ECM which should have battery voltage with the ignition switch in the "start" position. The ECM will then look for a change in state (5 to 0, or 0 to 5 volts) in the CKP sensor circuit (ECM pin 89). If no change is detected, a DTC is set in memory. You can also check the rpm input with the DRB III scan tool. If cranking rpm is seen on the DRB III scan tool, the CKP sensor signal is good.

Misfire Monitor

The CKP sensor is monitored for a fluctuation in crank angle acceleration between the time the ECM sees one shudder blade pass through the CKP sensor and the time it takes for the other shudder blade to pass through the CKP sensor. The ECM monitors for a misfire only when the following conditions are met:

- Engine speed must be between 500-3500 rpm
- Calculated engine load must be greater than 30%

If the ECM detects that a misfire has occurred, a DTC is set in memory. These will be OBD II DTC P 0300 for a random misfire, or DTCs P 0301 through P 0304, depending upon which cylinder is involved. For more information on OBD II and OBD II diagnostics, refer to the Talon's OBD II Student Reference Book.

Cam Position Sensor (CMP)

The CMP sensor is located on the intake camshaft, and is a Hall element sensor (fig. 23). The CMP sensor is used along with the CKP sensor to determine which ignition coil to fire and which fuel injectors to turn on. If the CMP sensor signal is not present during cranking, the engine will start and die. If the CMP sensor signal is lost while the engine is running, the engine will continue to run, but if the engine is shut off, it will start and die when a restart is attempted.

The CMP sensor uses a 3-way connector, and is fed battery voltage on pin 3 (RD) from the MFI relay to power-up the sensor. 5 volts are supplied from the ECM (pin 88) to pin 2 of the CMP sensor (BL/RD), and ground is supplied on pin 1 (BK) (fig. 22).

The flux screening plate is mounted on the intake cam timing gear, and has two shudder blades. The wide blade enters the camshaft position sensor 40^0 BTDC of cylinder 4, and leaves the sensor at 50^0 ATDC of cylinder 2. The narrow shudder blade enters the sensor at 130^0 BTDC of 3, and leaves the sensor at 50^0 ATDC of cylinder 3.

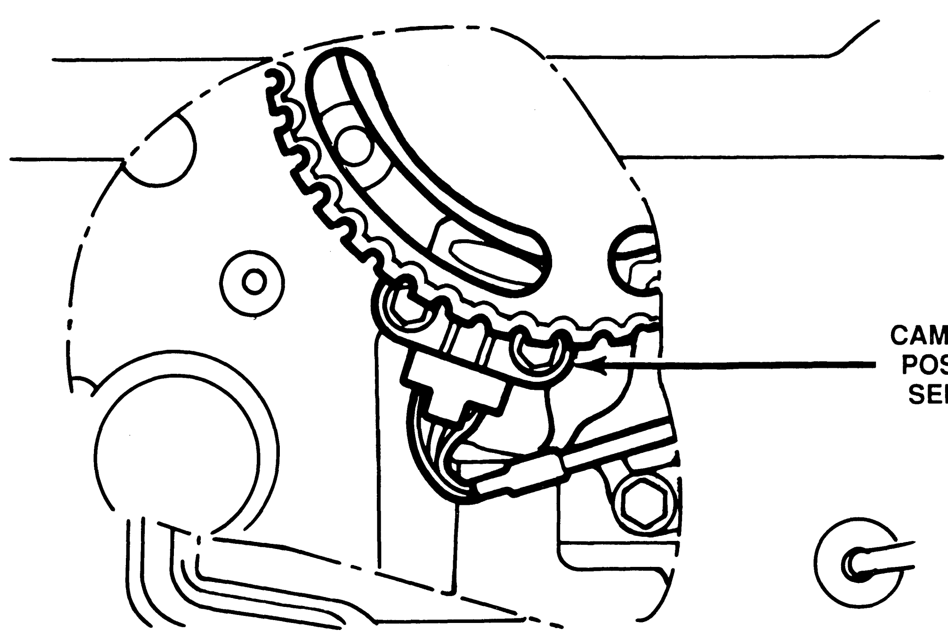


Figure 23 Camshaft Position Sensor

The Hall element portion of the CMP sensor functions the same as the CKP sensor. As The shudder blades pass through the Hall element, the 5-volt signal from the ECM is turned on and off. When the shudder blade passes between the Hall element and the magnet, the 5-volt signal from the ECM goes "high" (5 volts), and when the shudder blade is not between the Hall element and the magnet, the signal goes "low" (0-1 volt). The signal received by the ECM is a digital 5-volt square wave, two pulses per revolution of the camshaft (one pulse per crankshaft revolution, either cylinder 1 or 4 shudder blade).

Figure 24 can aid in the understanding of how the CKP and CMP sensors function together to properly provide ignition timing and injection pulse width and timing.

Diagnosis

The CMP sensor signal is monitored by the ECM of pin 88 whenever there is a CKP sensor signal. If the CMP sensor signal is lost for 4 seconds, a DTC 23 (OBD II P 0340) is set in memory. Check the voltage at the 3-way CMP sensor for battery voltage on pin 3 (RD), ground on pin (BK), and 5 volts on pin 2 (BL/RD). With the sensor plugged in, monitor the voltage on pin 2 while cranking the engine; the voltage should toggle between 0 and 5 volts.

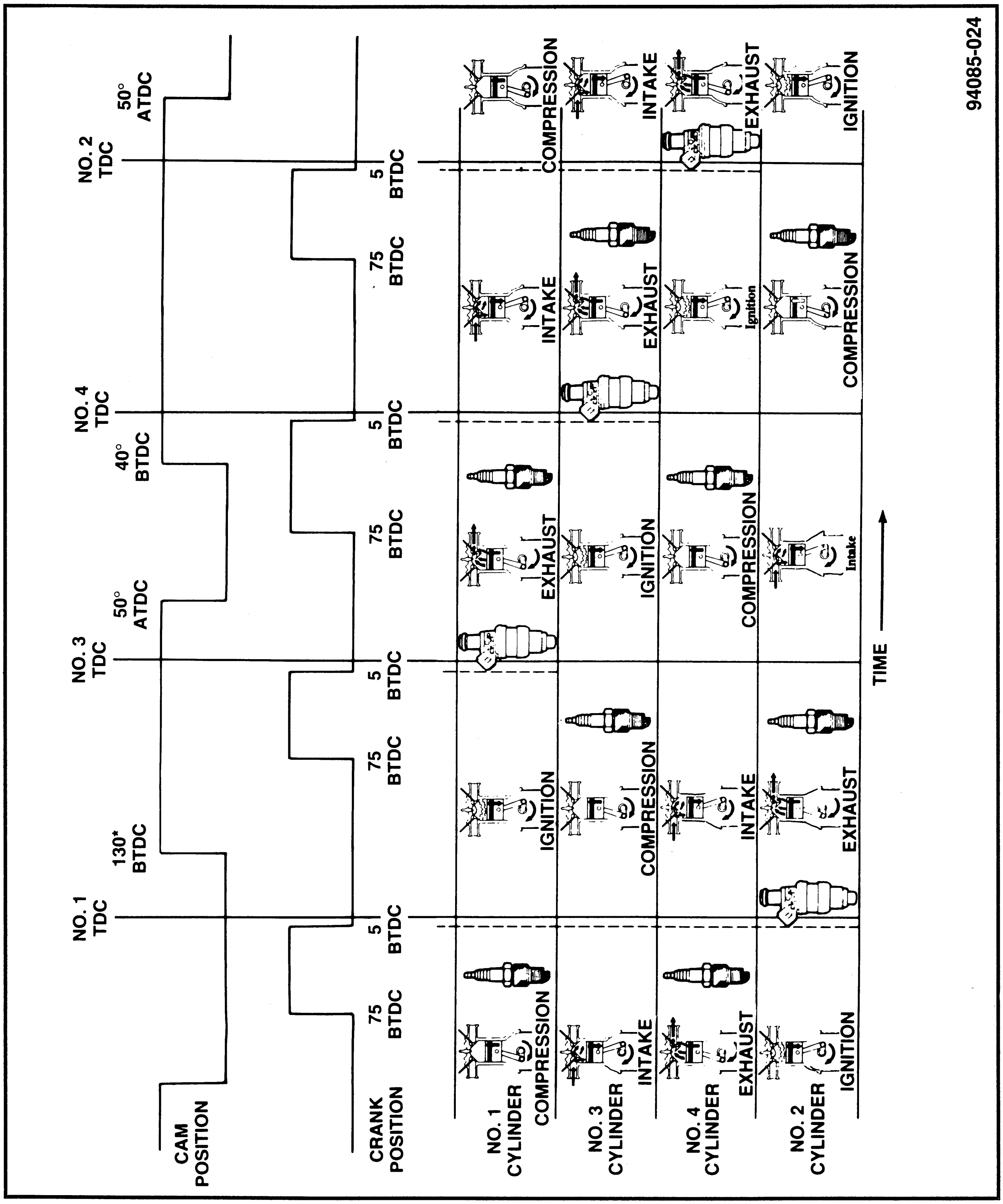


Figure 24 Timing Events

Volume Air Flow Sensor (VAF)

The VAF sensor used on this system is a pressure detection type, which measures the amount (volume) of intake air. The sensor is mounted inside the air inlet hose (fig. 25), and is used with the CKP sensor to determine the base pulse width for the fuel injectors. The Barometric Pressure sensor (BARO) and the Intake Air Temperature sensor (IAT) are attached to the VAF sensor. The VAF sensor uses the Karman vortex phenomenon to detect the amount of intake air passing through the air inlet hose. Refer to Publication 81-699-0114, p. 14-7 for more in-depth description of how this sensor operates.

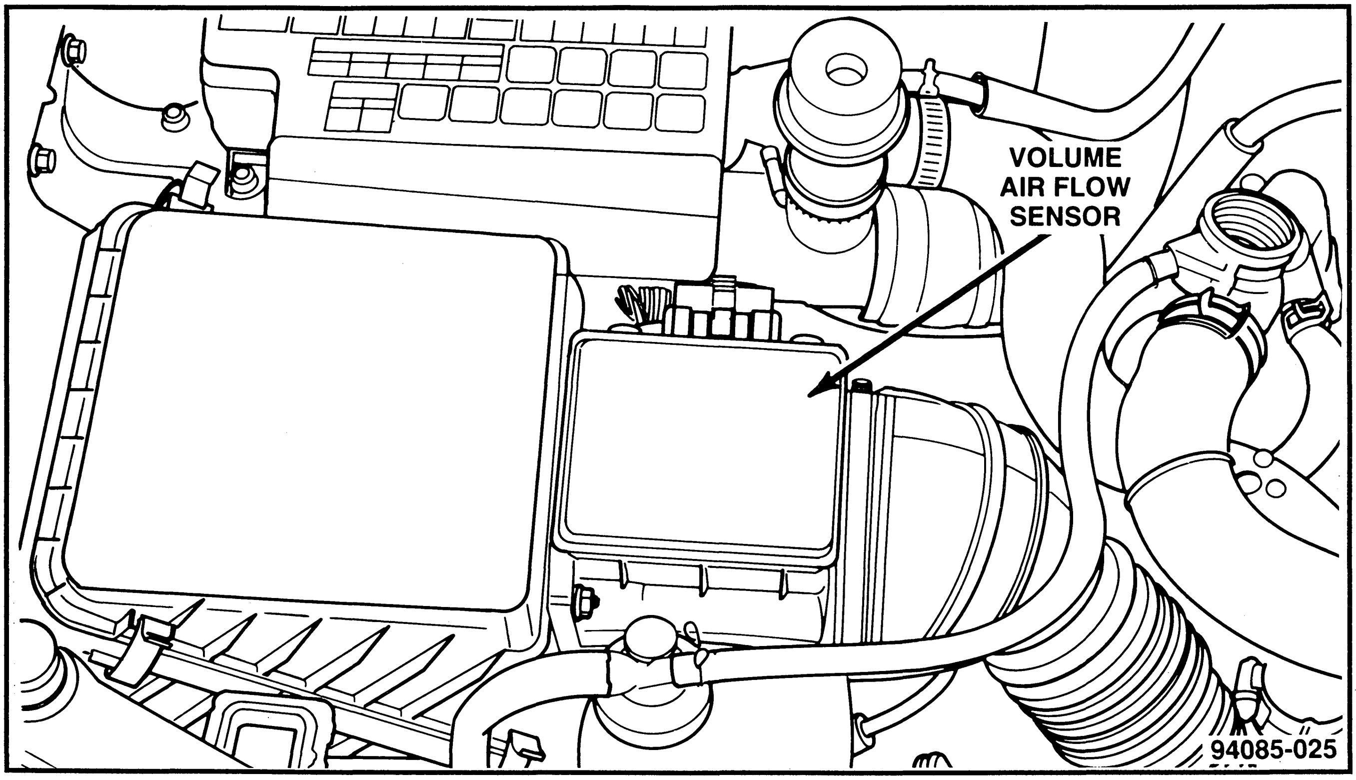


Figure 25 Volume Air Flow Sensor

The VAF sensor toggles on and off a 5-volt signal from the ECM, based upon the air flowing through the sensor. The signal received by the ECM is a 5-volt square wave. The ECM then "counts" the frequency of the cycle (Hertz, or cycles per second) (fig. 26). The more times per second that the VAF sensor grounds the 5-volt signal from the ECM, the more air flows through the engine. With the key on, and the engine not running, the VAF sensor keeps the 5-volt signal grounded.

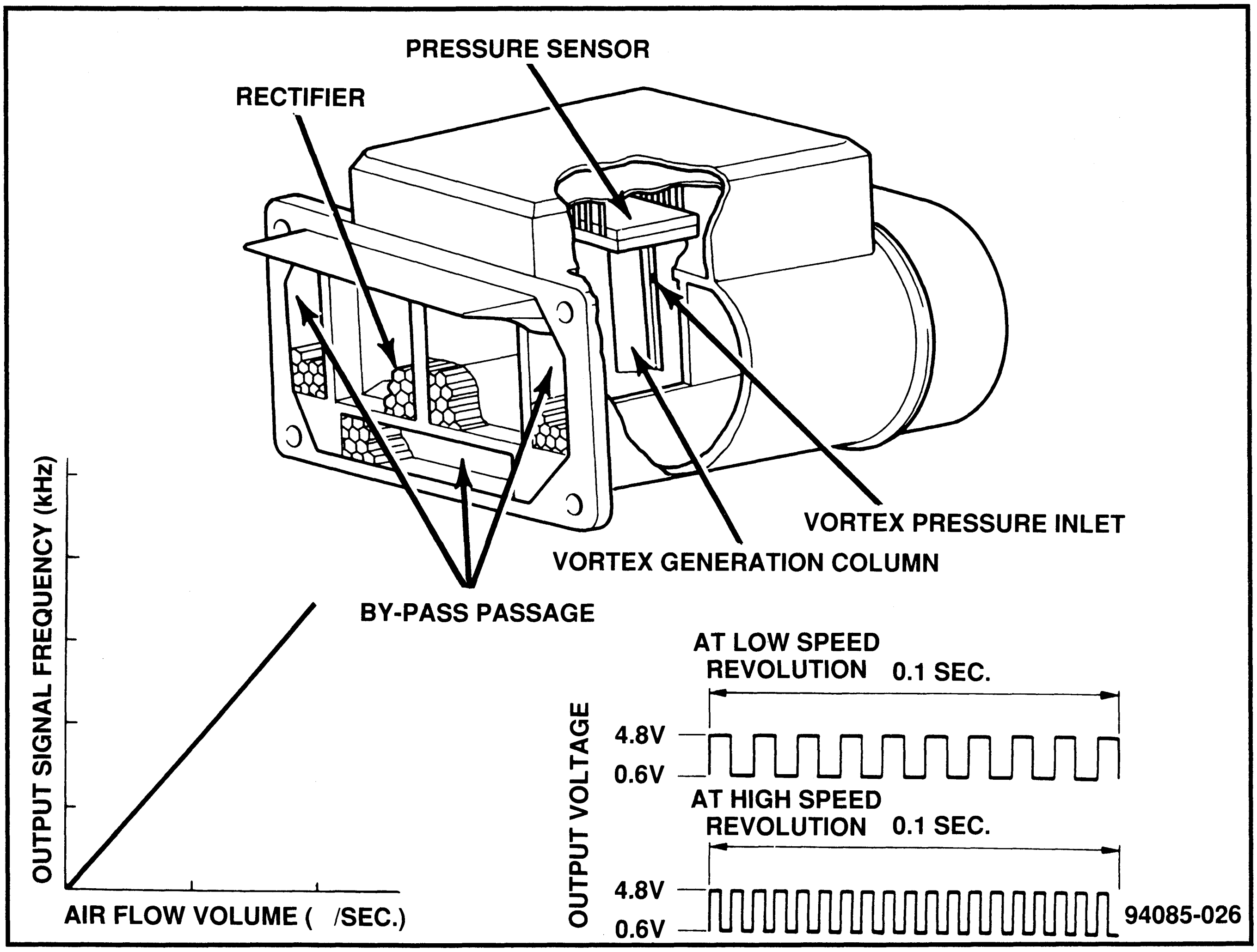


Figure 26 Volume Air Flow Sensor's Components and Operation

The VAF sensor uses an 8-way connector, and is fed 12 volts on pin 4 (RD) from the MFI relay to power-up the sensor. The 5-volt signal is fed from the ECM (pin 90) to pin 3 (BL/YL), and ground is supplied through pin 5 (BK). Pin 7 (RD/WT) is the air flow reset signal (fig. 27).

The air flow reset signal is used by the ECM to act as a "noise filter" switching device. The VAF sensor sends 6-9 volts to the ECM (pin 19). The ECM grounds this circuit when the throttle is closed, to change the frequency of a "noise filter" inside the VAF sensor. This circuit is used on all of the pressure detection VAF sensors because at low air-flow conditions, turbulence in the air cleaner can corrupt the ECM's air flow signal. The ECM grounds this circuit to change to a high frequency filter at closed throttle to improve the measuring performance of the VAF sensor. With the throttle open (input from the idle switch), the ECM switches to the low-frequency filter. The remaining pins on the VAF sensor are discussed later.

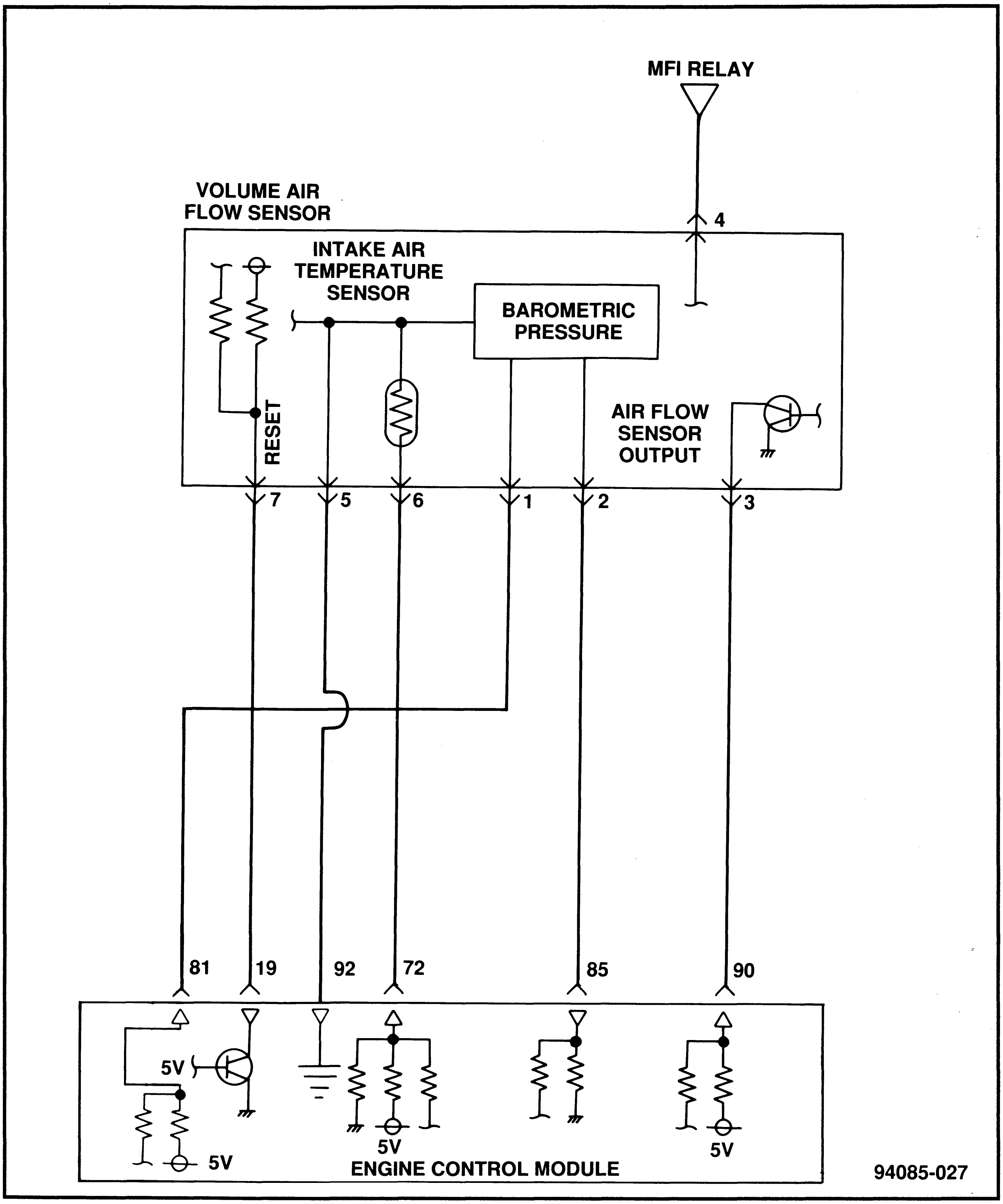


Figure 27 Volume Air Flow Sensor Circuit

Diagnosis

If the engine speed exceeds 500 rpm, the ECM monitors the frequency on pin 90. If the frequency drops below 3.3 Hz for 4 seconds, a VAF sensor DTC 12 (OBD II P 0100) is set in memory.

At this time, the ECM substitutes the TPS and rpm signals for the missing VAF sensor signal so that the engine will continue to run. also, the Idle Air Control motor (IAC) is set at a fixed value. It is important to remember that the sensor must fail completely for a DTC to set.

A VAF sensor also may lose calibration and fail to recognize the correct amount of air flow, causing the engine to run "too rich" or "too lean." To check for this, read the frequency with the DRB III scan tool.

At key-on and with the engine off, the display should read 0 Hz. At idle, the display should read approximately 50 Hz, and should increase as load on the engine is increased. This procedure can be very subjective, as there are many things besides a bad VAF sensor that can indicate a higher or lower than normal Hz display. For example, a vacuum leak may indicate a higher than normal frequency reading at idle because the Idle Air Control (IAC) motor is open farther than normal to compensate for the vacuum leak. Be sure to check all the basics before condemning a VAF sensor.

Barometric Pressure Sensor (BARO)

The BARO sensor is part of, and is mounted inside the VAF sensor. They cannot be serviced separately. This sensor operates similarly to a MAP sensor. Its function is to send a signal to the ECM that corresponds to the atmospheric pressure conditions. Atmospheric pressure (barometric pressure) is affected by conditions such a altitude and weather changes. Barometric pressure input is required by the ECM to alter fuel and timing calculations to that barometric pressure changes will not cause an increase in emissions. The ECM increases pulse width by up to 12% when the vehicle is below sea level, and decreases pulse width up to 50% when it is above sea level. The ECM advances timing about 1^0 per 1,000 feet above sea level.

The BARO sensor uses a strain gauge that changes its resistance in proportion to atmospheric pressure. Pin 1 (DG/YL) of the VAF sensor is a 5-volt feed from the ECM (pin 81) (fig. 27). Pin 2 is the signal-out (barometric pressure), and Pin 5 (BK) is the ground. The voltage at Pin 2 of the VAF sensor (Pin 85 of the ECM) is an analog input that varies from 0 to 5 volts, based upon altitude (Table 1).

Diagnosis

If the output voltage on Pin 85 of the ECM ever drops below 0.2 volts or is above 4.5 volts for 4 second, a DTC 25 (OBD II P 0105) is set in memory. The default value is 4.0 volts or sea level. To check the calibration of the BARO sensor, the DRB III scan tool displays the BARO value in inches of mercury absolute (IN HG ABS). Use Table 1 to determine if the calibration is correct. Remember that weather conditions and altitude affect the actual readings.

Table 1 Barometric Pressure Sensor Calibration Chart

Altitude (ft)	Approximate Voltage	Approximate Barometric Pressure Reading
-1,000	4.2 volts	31.01 in. Hg
Sea Level	4.0 volts	29.92 in. Hg
2,000	3.7 volts	27.82 in. Hg
4,000	3.5 volts	25.84 in. Hg
6,000	3.2 volts	23.97 in. Hg
8,000	3.0 volts	22.22 in. Hg
10,000	2.7 volts	20.57 in. Hg
12,000	2.5 volts	19.02 in. Hg

Intake Air Temperature Sensor (IAT)

The IAT sensor is part of, and is located inside the VAF sensor. They cannot be serviced separately. The IAT sensor is a negative temperature coefficient (NTC) thermistor that measures the ambient temperature for the ECM. The ECM uses the IAT sensor to increase injection pulse width when the air is dense due to low temperatures (high resistance) and to decrease injection pulse width when the air temperatures are high (low resistance).

The IAT sensor is fed 5 volts through a 2,200 ohm resistor from the ECM on pin 6 of the VAF sensor (pin 72 of the ECM, RD/BL), and uses pin 5 of the VAF sensor for ground (fig. 27). There is also a 33,000 ohm resistor (inside the ECM) tied into pin 72 of the ECM ground, making the IAT sensor reading more linear (Table 2).

Diagnosis

If the voltage on pin 72 of the ECM drops below 0.27 volts (IAT sensor less than 140 ohms) or exceeds 4.5 volts for 4 seconds (IAT sensor greater than 50,000 ohms) a DTC 13 (OBD II P 0110) is set in memory. The default value is 77°F. To check calibration of the IAT sensor, the DRB III scan tool displays the IAT sensor reading in degrees F, and also displays the IAT sensor voltage. The temperature displayed should be close to ambient air temperature. Table 2 also can be used to check calibration of the IAT sensor.

Table 2 Intake Air Temperature Calibration Chart

Temperature (°F)	Voltage	Resistance (ohms)
-22°	4.33 volts	24,981
-4°	4.13 volts	15,279
32°	3.39 volts	6,011
68°	2.63 volts	2,636
104°	1.78 volts	1,263
140°	1.13 volts	655
176°	0.71 volts	368
212°	0.44 volts	214

Engine Coolant Temperature Sensor (ECT)

The ECT sensor is located on the thermostat housing. Like the IAT sensor, the ECT sensor is an NTC thermistor, and identifies for the ECM the temperature of the coolant inside the engine (fig. 28). The ECM uses the input from the ECT sensor to increase injection pulse width (by approximately 60% at -22°F) when the engine is cold. As the engine temperature increases, the affect on injection pulse width decreases. It has no affect on fuel when the engine is at operating temperature. Also, the ignition timing is advanced on a cold engine. At -22°F the ECT sensor input provides up to an additional 14) of spark advance. As the engine temperature increases, the effect on spark advance decreases. At 95°F the ECT sensor has no effect on timing.

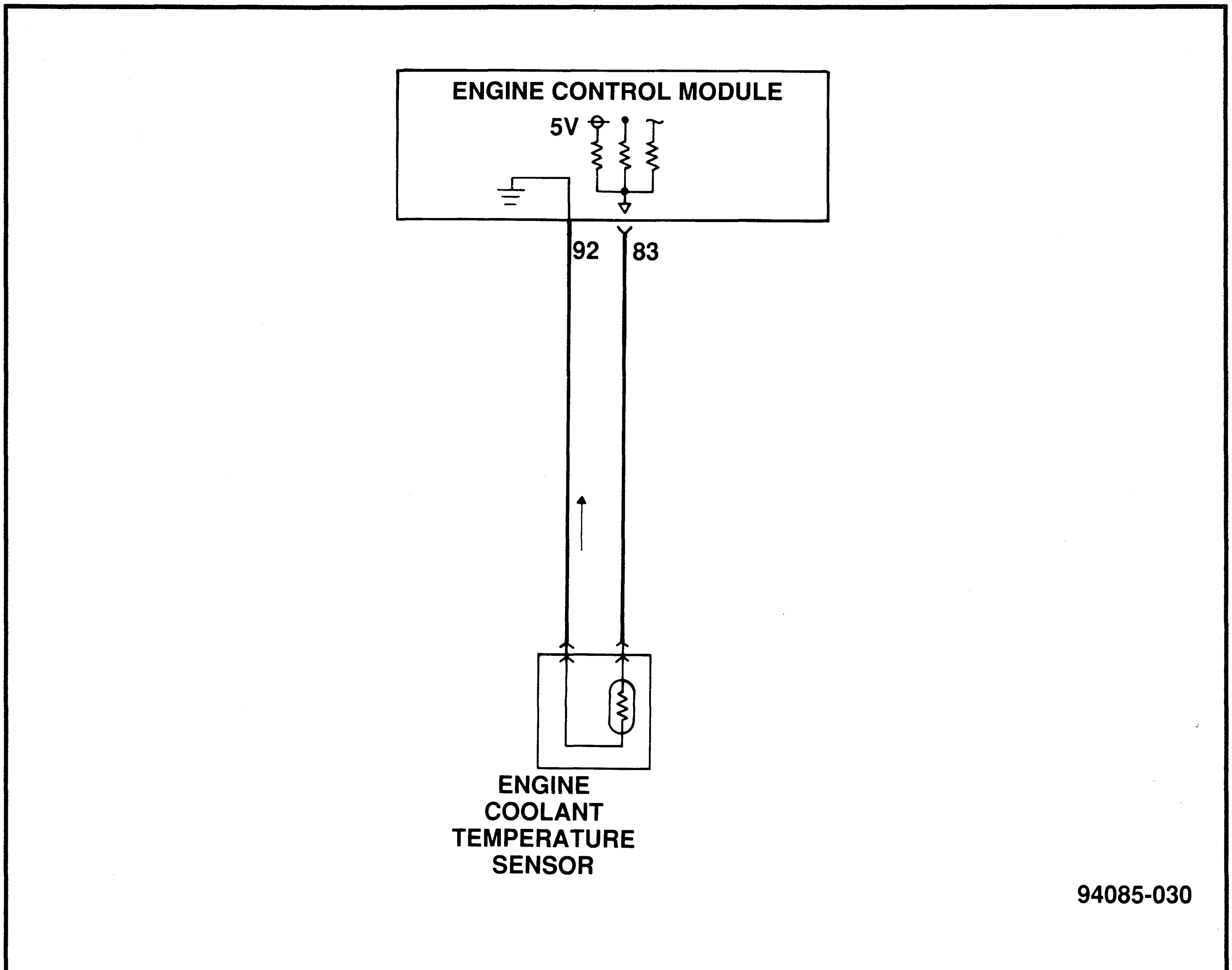


Figure 28 Engine Coolant Temperature Sensor Circuit

The ECT sensor functions similarly to the IAT sensor. It uses a 2-way connector, and is fed 5 volts at the ECT sensor pin 2 (ECM pin 83, BK/WT). The 5 volts from the ECM is fed through a 2200 ohm resistor, and is also tied into a 39,000 ohm resistor to ground to make the signal more linear. The ground is supplied on ECT sensor pin 1 (BK) (fig. 30). The ECT sensor also affects radiator fan control. (See radiator fan control relays in the Output section.)

Diagnosis

If the voltage on ECM pin 83 drops below 0.11 volts (ECT sensor less than 50 ohms) or exceeds 4.6 volts (ECT sensor above 72,000 ohms) a DTC 21 (OBD II P 0115) is set in memory. The default value is 176°F. To check calibration of the ECT sensor, the DRB III scan tool displays the ECT sensor reading in degrees F, and also displays the ECT sensor voltage. The temperature displayed should be close to ambient temperature with a cold engine. Table 3 also can be used to check calibration of the ECT sensor.

Two additional tests have been added to meet OBD II requirements:

1. With the engine running, if both the IAT and ECT sensors detect temperatures greater than 68°F, the ECM looks to see that the ECT sensor indicates 104°F in less than 300 seconds.

2. With the engine running, when the ECT sensor indicates 104°F, the ECM monitors and verifies that the ECT sensor's value does not drop below 104°F for more than 300 seconds.

If either of the above conditions is met, the ECM sets an OBD II DTC P 0115 in memory.

Table 3 Engine Coolant Temperature Sensor Calibration Chart

Engine Temperature (°F)	Voltage	Resistance (ohms)
-22°	4.41 volts	28,432
-4°	4.19 volts	16,069
32°	3.50 volts	5,911
68°	2.57 volts	2,474
77°	2.32 volts	2,000
104°	1.65 volts	1,114
140°	0.99 volts	551
176°	0.59 volts	296
212°	0.34 volts	164
230°	0.23 volts	106

Throttle Position Sensor (TPS)

The TPS is located on the throttle body (fig. 29). Its input provides the ECM with the throttle angle and rate of change (how fast the throttle is opened or closed). The TPS input can provide as much as 500% increase in pulse width on a hard acceleration, or can decrease pulse width by 70% on a quick deceleration. The TPS input can also reduce spark advance when the ECM recognizes Wide Open Throttle (WOT).

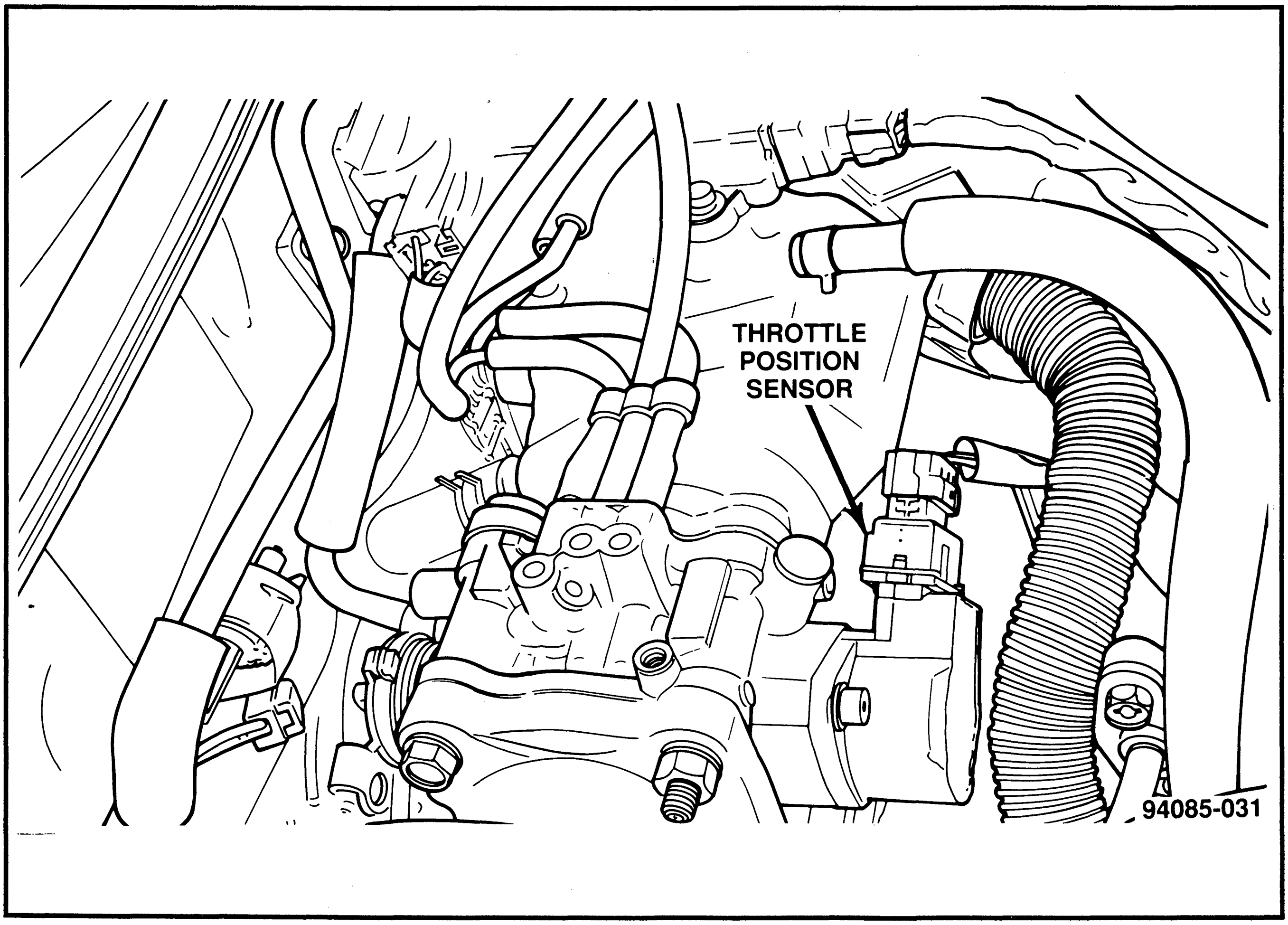


Figure 29 Throttle Position Sensor

The TPS is a resistance strip with a "rake" that moves with the throttle shaft. The TPS output voltage varies depending upon the position of the rake on the resistance strip. The TPS uses a 4-way connector, and is fed 5 volts on pin 1 (DG/YL) from ECM pin 81. The TPS output voltage comes from pin 2 (BR/RD) of the TPS (ECM pin 84) which is connected to the rake. The output voltage is a 0-5 volt analog signal that varies with throttle opening. Closed throttle voltage is approximately 0.5 volt, and the voltage increases with throttle opening, up to approximately 4.5 volts at WOT. Ground is supplied on pin 4 of the TPS (BK) (fig. 30). Pin 3 on the TPS is for the Closed Throttle Position switch (CTP), which is discussed later.

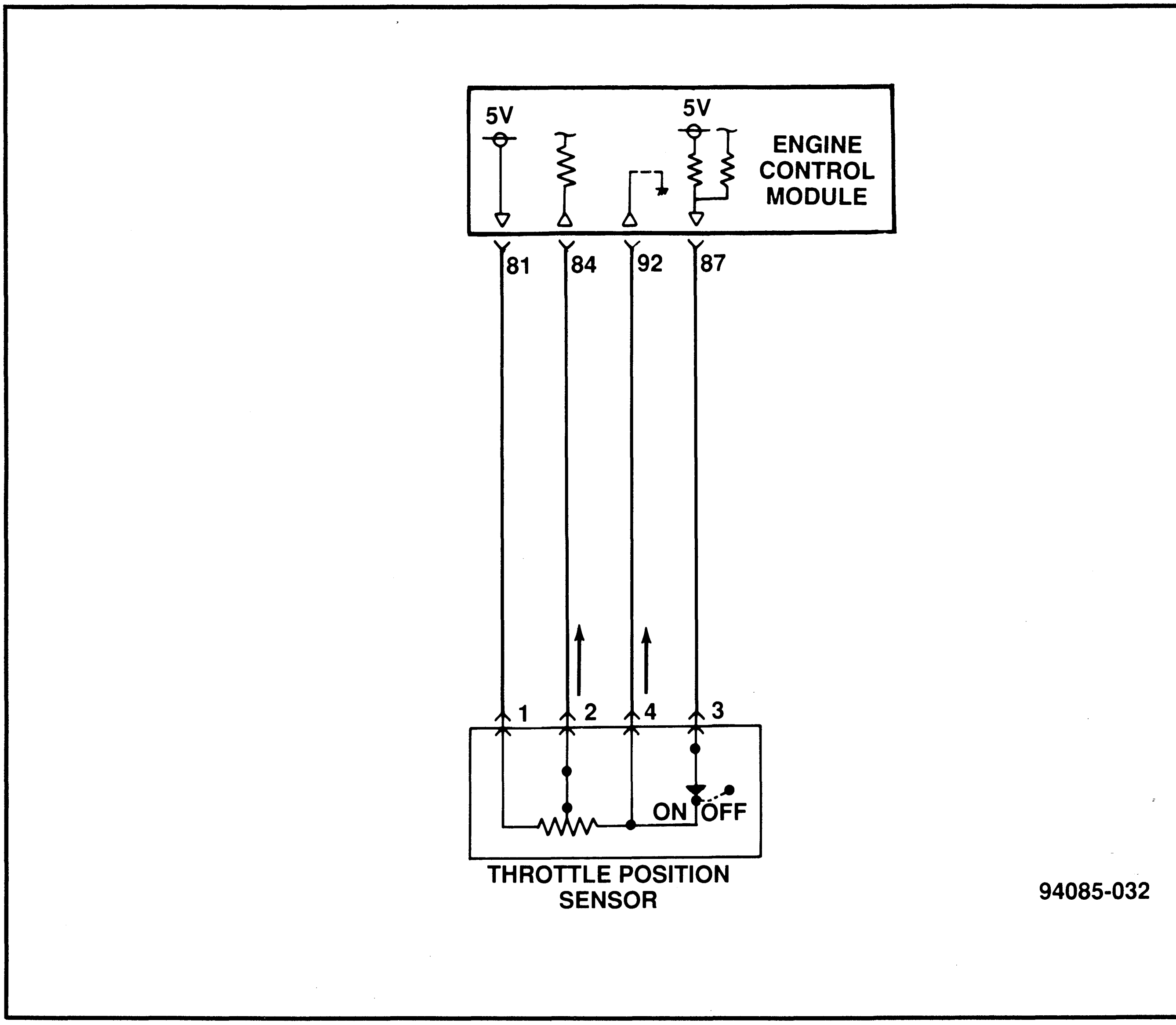


Figure 30 Throttle Position Sensor Circuit

Diagnosis

The TPS output voltage at pin 84 of the ECM is monitored. If any of the following conditions are met, a DTC 14 (OBD II P 0120) is set in memory, and there will be no increase or decrease of injection pulse width or spark advance based upon inputs from the TPS.

1. TPS voltage greater than 2.0 volts with the Closed Throttle Position (CTP) switch closed

2. TPS voltage less than 0.2 volts

3. TPS voltage greater than 4.6 volts with the engine rpm less than 3,000 rpm, and less than a 30% load on the engine (calculated from the VAF sensor)

The DRB III scan tool displays the TPS voltage. With a closed throttle, the voltage should be 0.3-1.0 volt and as the throttle is opened, the voltage should gradually increase to 4.5-5.5 volts at WOT. The TPS on this system is not adjustable, but the CTP switch, located inside the TPS, is. (See Closed Throttle Position switch.)

Power Supplies and Grounds

Ignition Switch - Start

During engine cranking, battery voltage is supplied to the ECM on pin 71 (YL) (fig. 31). This input is used by the ECM to ground the MFI relay, providing battery voltage for the fuel pump during cranking. It is also used for diagnostic purposes to detect a failure in the CKP sensor during cranking.

Diagnosis

The DRB III scan tool displays the ignition switch "STARTER" input as "HIGH" with the engine cranking, and "LOW" with the ignition switch in the ON or RUN position.

Ignition Switch - Ignition Key on Feed
MFI Relay Ignition Feed Input

When the ignition switch is turned to the RUN position, battery voltage from the ignition switch is fed to ECM pin 82 (BK/WT). Also, when the key is turned on, the ECM grounds pin 38 (BL/DG) (fig. 31). This circuit is an output of the ECM, for one of the two pull-in coils of the MFI relay. When pin 38 is grounded (anytime the key is on), one set of contacts in the MFI relay closes, which inputs battery voltage to the ECM at pins 12 and 25 (RD). This circuit also powers-up the VAF, CKP and CMP sensors, all ECM controlled solenoids (wastegate, EGR, purge, and fuel pressure), IAC motor, fuel injectors, and O_2 sensor heaters.

Diagnosis

If there is no ignition voltage on ECM pin 82, the DRB III scan tool displays a "No Response" message, and the engine will not start. This circuit is fed battery voltage from the ignition switch's 30-amp fuse link in the centralized junction (fuse/relay box under the hood) through the ignition switch to ECM pin 82 (with key on). The DRB III scan tool displays the ignition switch voltage as "Voltage Sense". The problem is that if this input is not present at the ECM, the ECM does not power-up, and the DRB III scan tool displays only "No Response".

If there is no ignition voltage input on ECM pins 12 and 25, there also is "No Response" message on the DRB III scan tool, and the engine will not start. A quick check of this circuit can be done by disconnecting one of the fuel injectors and checking for battery voltage with the key on. The voltage at both fuel injector wires should be approximately battery voltage. One wire is the feed from the MFI relay, and the other is a diagnostic feed from the ECM. If the control relay is not powered-up, there will be no voltage on either wire.

Battery voltage to this circuit of the MFI relay comes from the MFI 20-amp fuse in the centralized junction. If the fuse if good, check the ECM pin 38 to ensure that it is grounding the MFI pull-in coil when the ignition is turned on. If it is, either the MFI relay or the connecting wiring is bad. If any of the three circuits discussed here (ECM pins 12, 25, or 82) is bad, the symptoms are similar: no start, no response on the DRB III scan tool. Be sure to check all ECM fuses and all three circuits before replacing either an MFI relay or an ECM.

Battery Voltage (B+)

Direct battery voltage is fed to the ECM on pin 80 (RD/BL) (fig. 31). MMC refers to this circuit as the "backup power supply." The purpose of the circuit is to retain diagnostic trouble codes in memory and to store any memory functions (fuel trim, OBD II monitors, etc.). The circuit is fed direct battery voltage from the 10-amp fuse in the fuse box (located in the left kick panel area) called the "room" fuse.

Diagnosis

If the room fuse is faulty, the DRB III scan tool will not power-up. The backup power supply circuit also feeds power to the Data Link Connector (DLC). If the circuit is open only to the ECM, the ECM will not retain any DTC's. They would be cleared when the key is turned off.

5-Volt Power Supply

The ECM 5-volt power supply is on pin 81 (DG/YL), and is a direct 5-volt feed to the BARO sensor, the TPS, and the MDP sensor. Check for 5 volts at any of the sensors mentioned.

Ground Circuits

ECM ground is supplied on pins 13 and 26. The sensor return ground is on ECM pin 92 (BK) (fig. 31).

Diagnosis

With the key off and the ECM disconnected, there should be continuity to ground on pins 13 and 26.

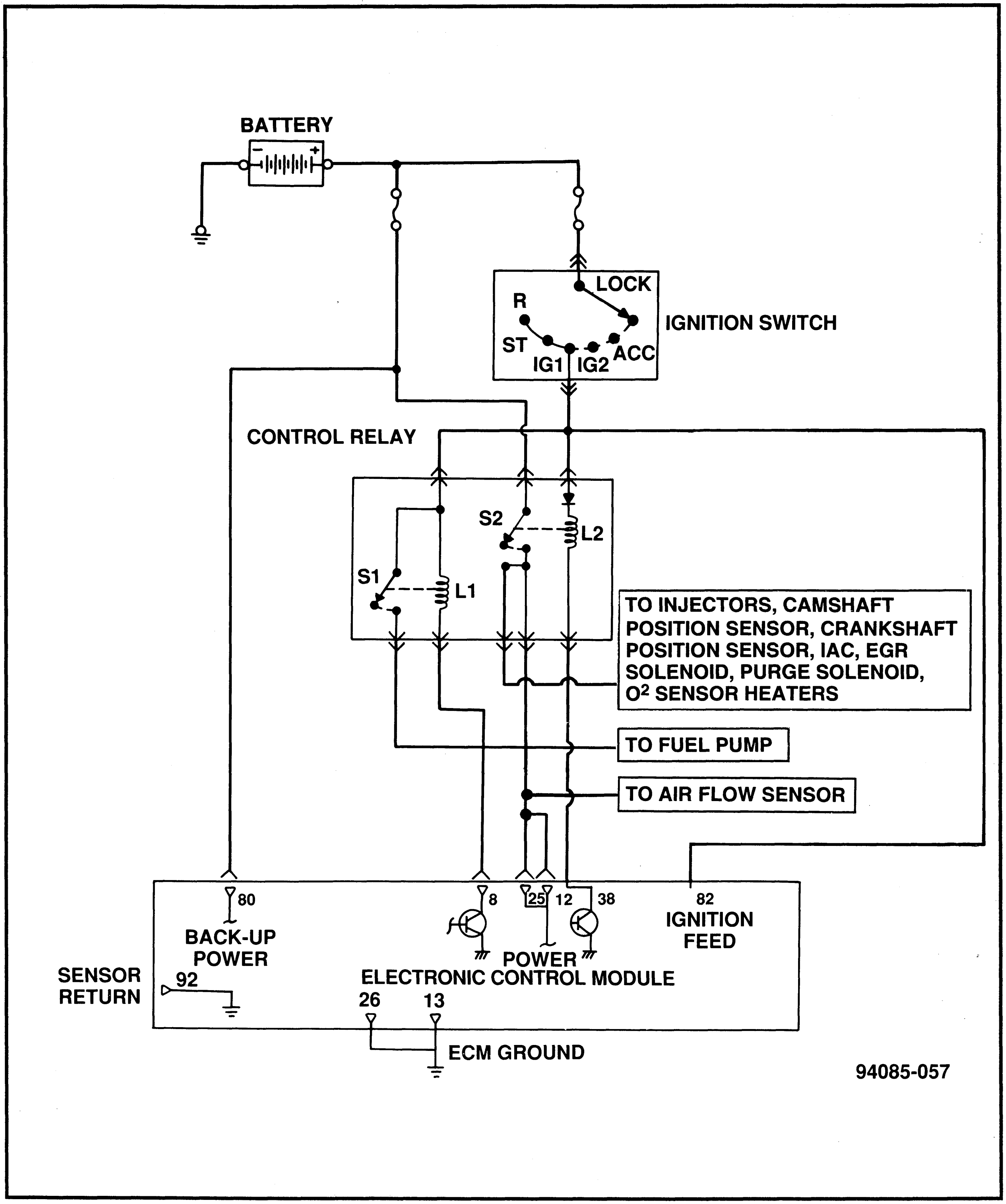


Figure 31 Power Supplies and Grounds

Knock Sensor (KS)

The Knock Sensor is mounted on the rear of the cylinder block (fig. 32), and is a piezoelectric element that detects vibration of the cylinder block caused by detonation. The Knock Sensor converts vibration into an electronic signal, and inputs this signal to the ECM.

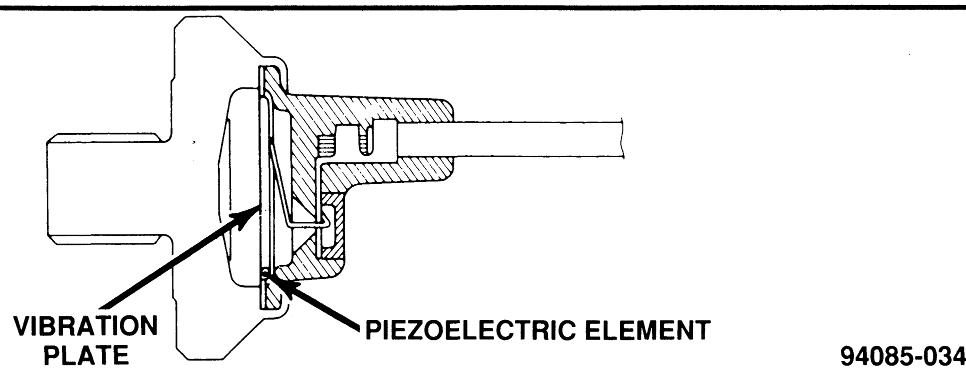


Figure 32 Knock Sensor

The Knock Sensor uses a 2-way connector. Pin 1 (WT) goes to ECM pin 78, and pin 2 (BK/WT) is connected to ground (fig. 33). The wire to the ECM is shielded to prevent electrical interference from affecting the Knock Sensor circuit. The Knock Sensor is grounded to the engine block. The amount of voltage the ECM receives determines the amount of timing retard that takes place.

The maximum amount of timing retard is approximately 3° to 5°. The ECM does not retard timing based upon information from the Knock Sensor if the engine speed is less than 2000 rpm. The information that the Knock Sensor provides is stored in an adaptive memory. This memory is used so that detonation does not occur at every start-up. Turbocharger boost control can be affected by the Knock Sensor adaptive memory. The ECM regulates boost control based upon information from the Knock Sensor's adaptive memory cells.

Diagnosis

If the Knock Sensor circuit becomes open or shorted to ground for 4 seconds, a Knock Sensor DTC 31 (OBD II P 0325) is set in memory. The knock sensor voltage cannot be read directly by the DRB III scan tool, although ignition timing advance can be read. The 8-volt reference voltage used on previous models is no longer used.

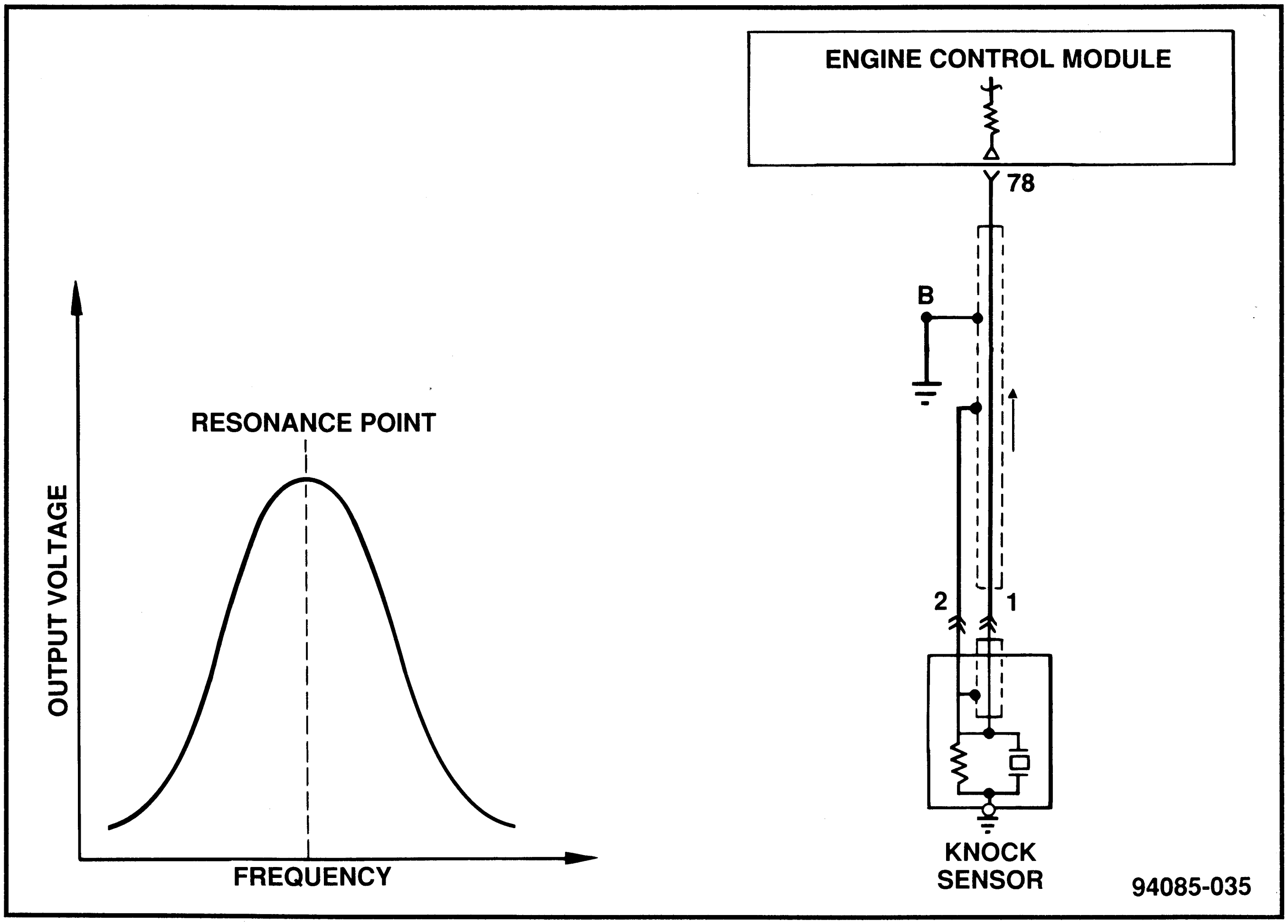


Figure 33 Knock Sensor Circuit

Oxygen Sensors (O_2S)

The Talon uses two 4-wire heated oxygen sensors. The front, or upstream sensor is located in the exhaust manifold (fig. 34). The rear, or downstream sensor is located in the exhaust pipe after the catalytic converter (fig. 36). Both sensors operate identically, although the input from each sensor is used by the ECM for different functions.

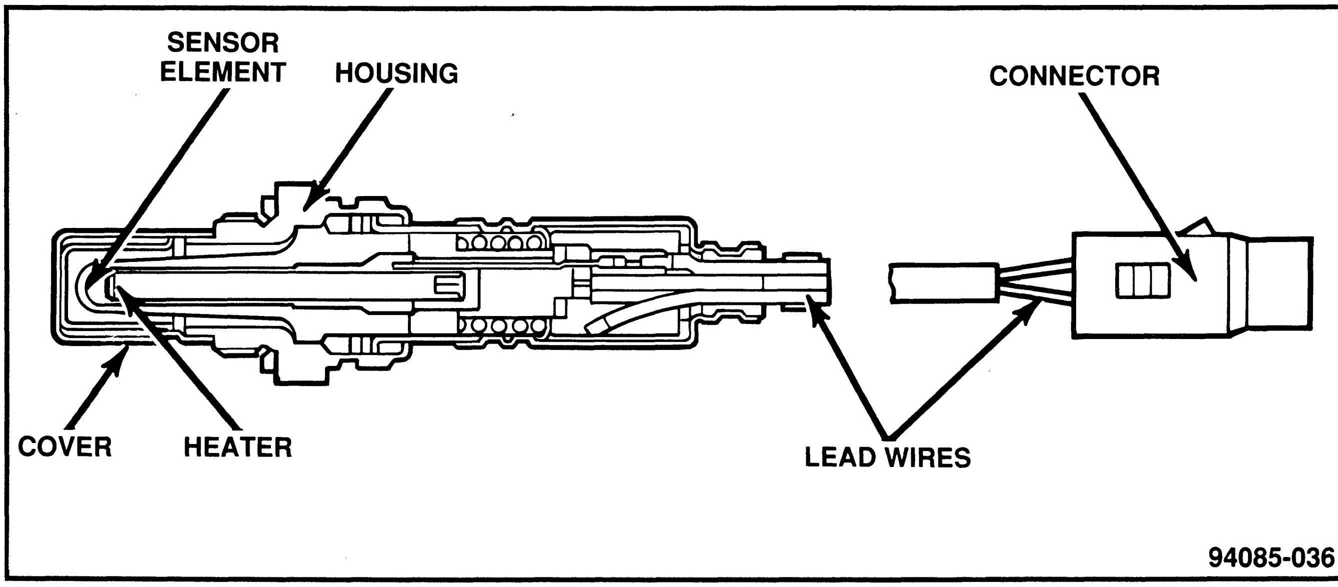


Figure 34 Oxygen Sensor

The oxygen sensors need two things to produce voltage: heat and oxygen. The oxygen sensors must be heated to operating temperature. Each sensor has a 4-way connector, and is provided battery voltage from the MFI relay. The ground for the upstream O_2 sensor's heater is provided by the ECM on ECM pin 60. The ground for the rear O_2 sensor's heater is provided by ECM pin 54. Each heaters resistance value should be approximately 12 ohms at 68°F. The heaters draw about 800 ma when cold.

At operating temperature (about 1000°F), the sensor generates between 0 and 1 volt, based upon the amount of oxygen in the exhaust. ECM Pin 76 (WT) is the oxygen sensor input for the front sensor; ECM pin 75 (WT) is the input for the rear sensor (fig. 35). The oxygen sensor signal-out and ground wires are shielded to prevent electrical interference from affecting the signal.

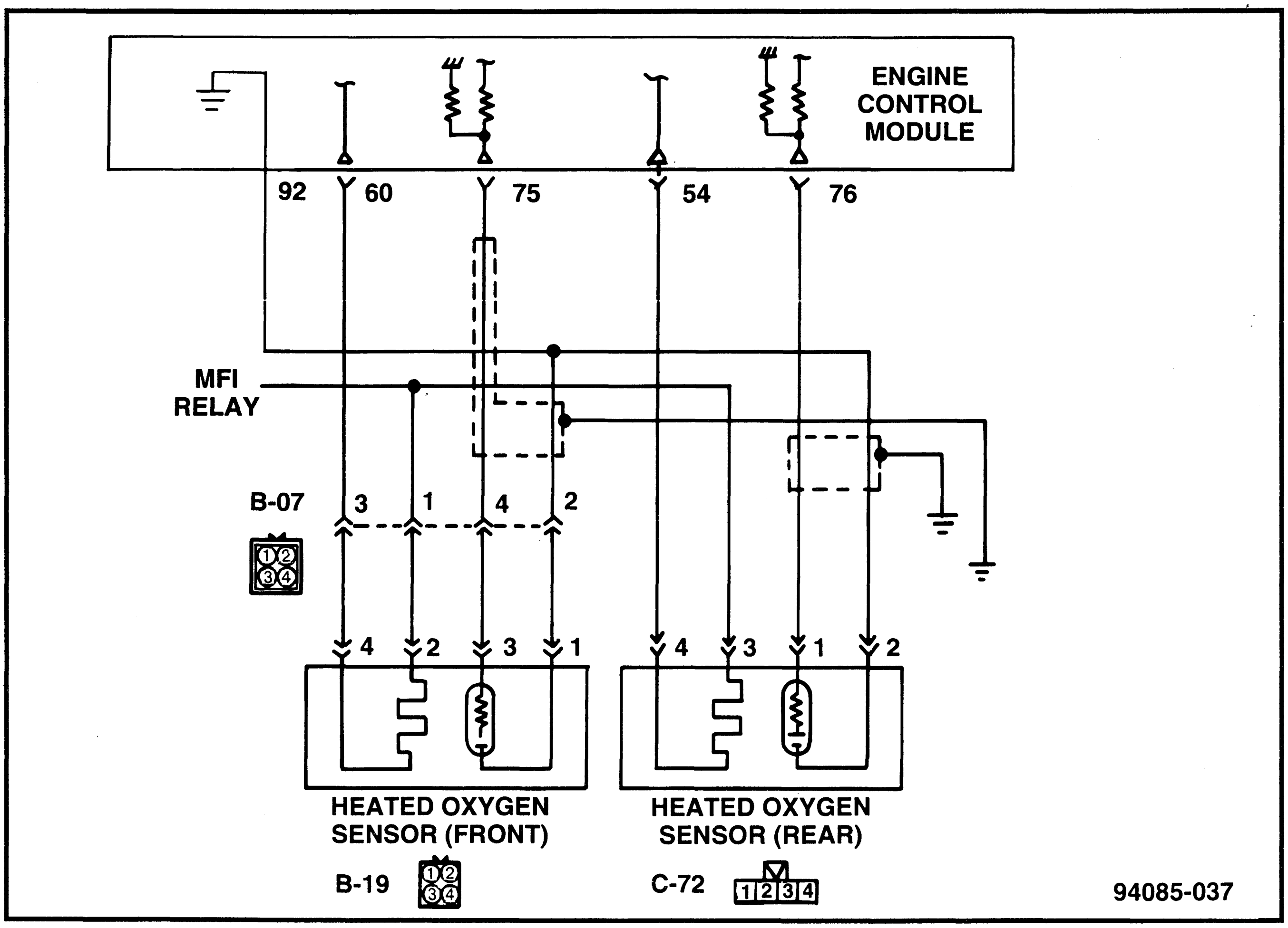


Figure 35 Oxygen Sensor Circuits

The ECM recognizes the air/fuel mixture as rich if the voltage is above 560 mv (0.56 v). The ECM recognizes a lean mixture when the voltage is below 540 mv (0.54 v). Once the system is in closed loop, the front oxygen sensor is used to update the short term fuel trim, which keeps the system at a stoichiometric air/fuel ratio (14.7:1). The short term fuel trim is updated only in closed loop. The short term fuel trim updates the long term fuel trim, which is used in the pulse width formula in open or closed loop. The short term fuel trim can increase or decrease pulse width by approximately 17%. The long term fuel trim can increase or decrease pulse width by approximately 25% (fig. 36).

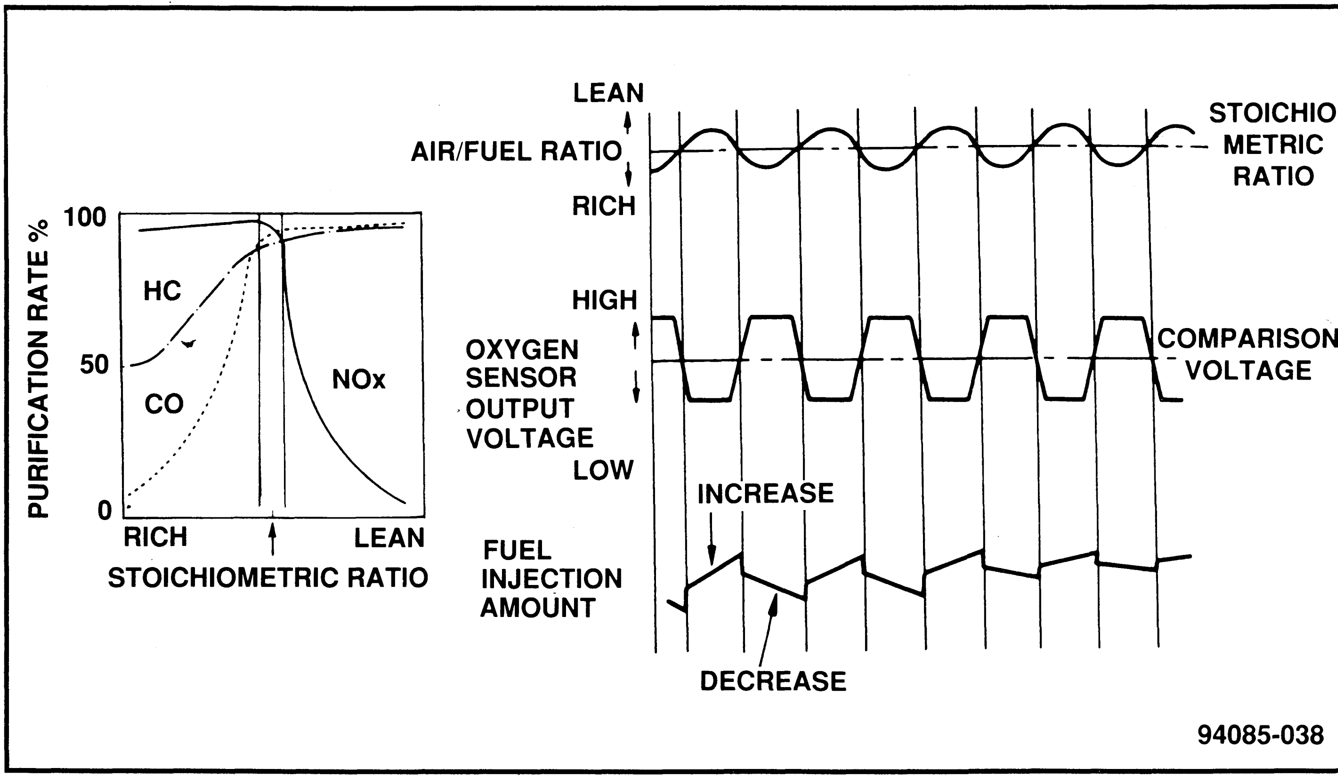


Figure 36 Oxygen Sensor Feedback controls

The requirements for closed loop are:

- The engine must be running for 300 seconds
- The ECT sensor must be indicating temperatures greater than 176°F
- The IAT sensor must be indicating temperatures between 32°F and 131°F.
- The engine speed must be 2,000-4,000 rpm

Once these conditions are met, the system enters closed loop control.

If any of the following conditions occur, the ECM enters open loop control:

- During engine cranking (and until 300 seconds of engine running)
- When the ECT indicates that the temperature drops below 176°F
- During deceleration
- During high-load operations
- When the O_2 sensor does not function properly

The rear oxygen sensor is used to determine catalytic converter efficiency to meet OBD II requirements (fig. 37). Once the rear oxygen sensor is heated, the voltage should be approximately 0.6-1 volt. This is due to the fact that if the converter is functioning properly, most of the oxygen will be used up in the converter. If the rear oxygen sensor frequency mimics the front sensor, it is an indication of a decrease in converter efficiency (fig. 38).

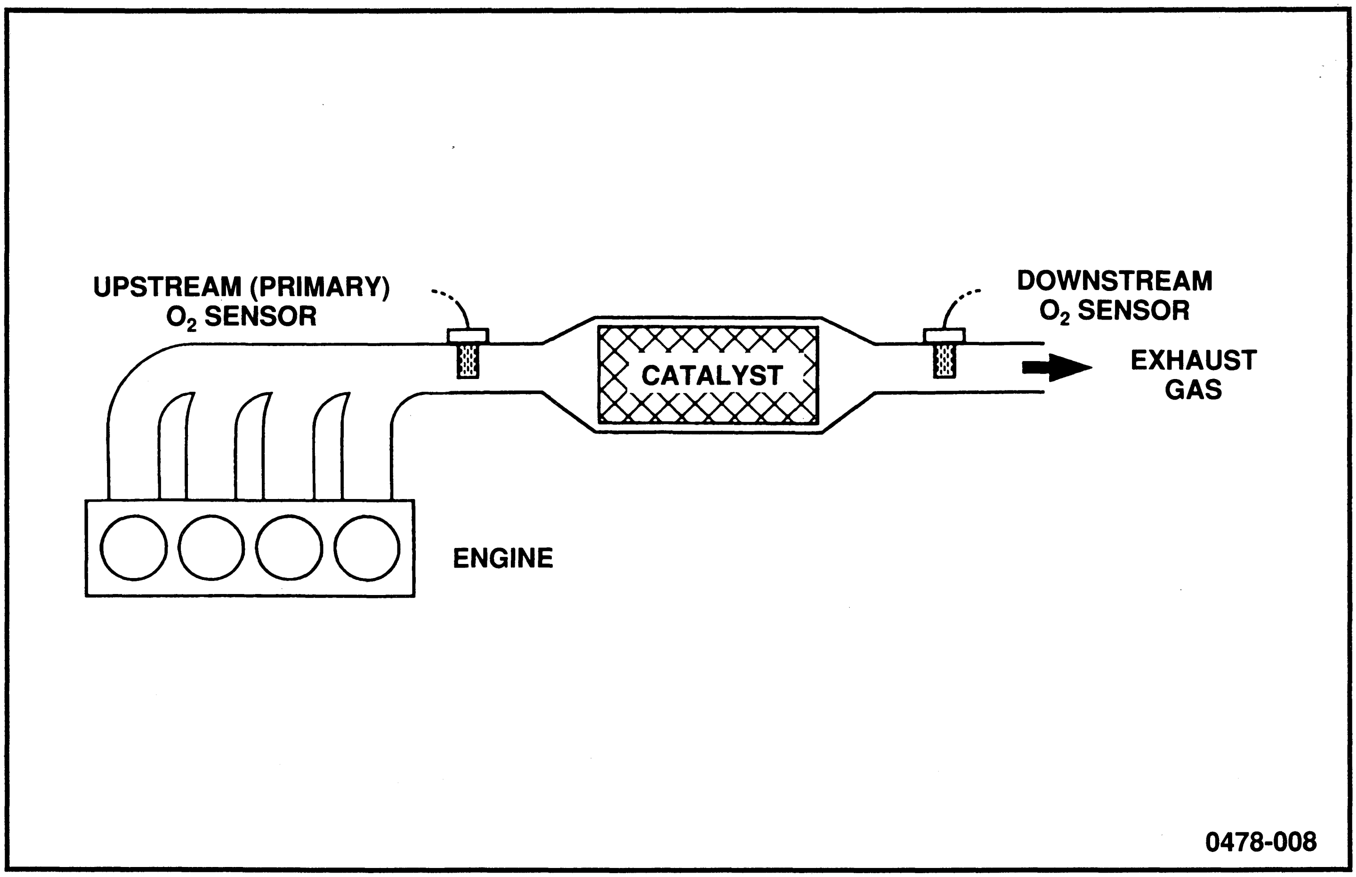


Figure 37 Upstream and Downstream Oxygen Sensors

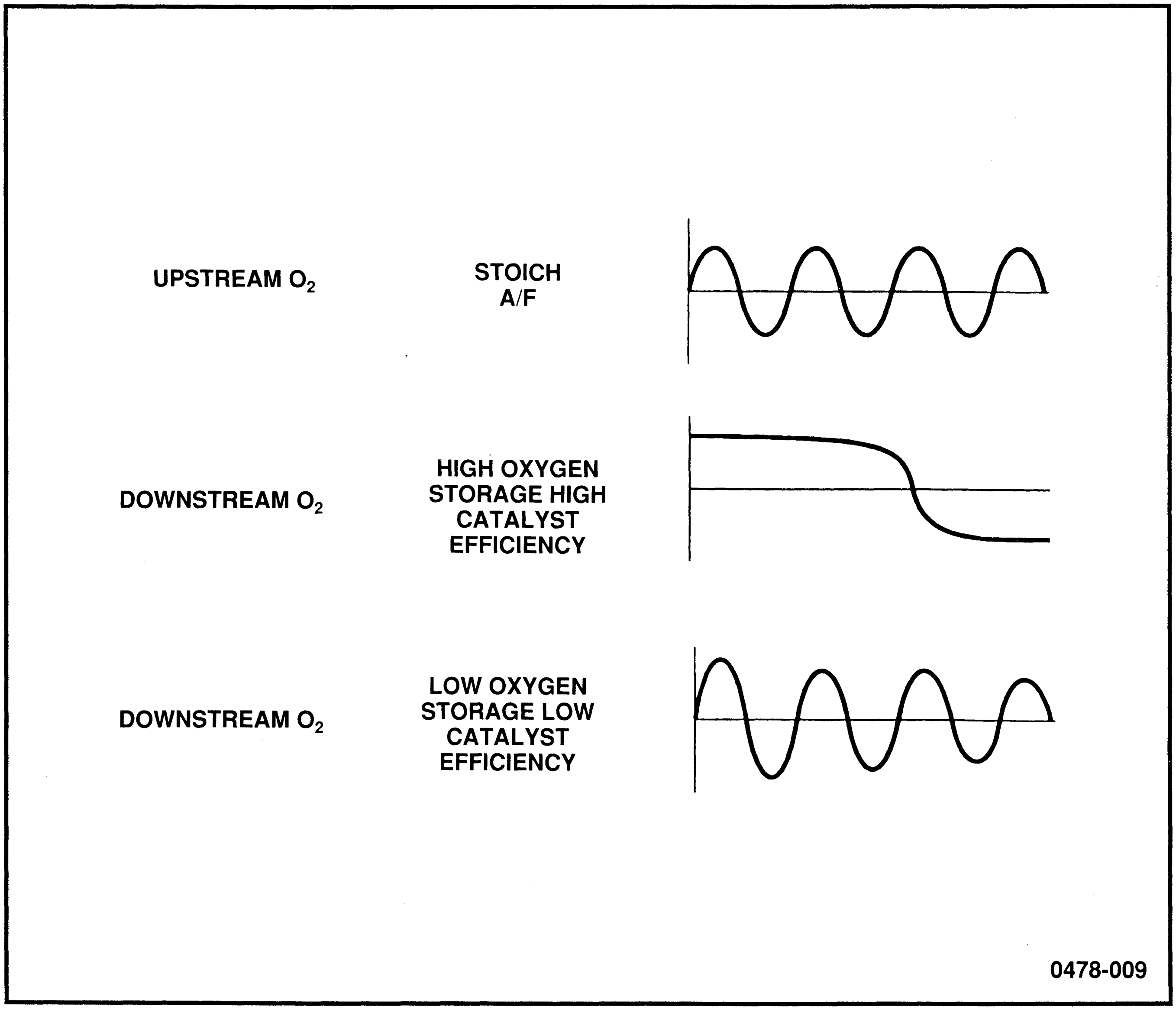


Figure 38 Upstream vs. Downstream Oxygen Sensor Switch Rate

Diagnosis

Oxygen Sensor Heater Circuit Malfunction

Each oxygen sensor heater is monitored by the ECM for current flow, and is checked whenever the ECT sensor indicates a temperature greater than 180°F. If the minimum current flow is less than 20 ma or greater than 6 amps for 6 seconds, an OBD II DTC P 0135 (front) or P 0141 (rear) is set in memory.

Oxygen Sensor Monitor

The front oxygen sensor also is checked by the ECM for response time (the time it takes to switch from lean to rich, or from rich to lean). The oxygen sensor is checked for response time when the following conditions are met:

- The engine must be in closed loop
- The ECT sensor must be indicating a temperature greater than 122°F
- The engine speed must be 1200-3000 rpm
- The calculated engine load must be 25-50%

If the front oxygen sensor does not respond fast enough, a DTC 11 (OBD II P 0130) is set in memory, and the system enters open loop.

Catalyst Monitor

The frequency ratios of the front and the rear oxygen sensors are compared to determine catalyst efficiency. If they match, an OBD II DTC P 0420 for the catalyst is set in memory. The DRB III scan tool displays both front and rear oxygen sensor voltages, and indicates whether the system is in open or closed loop. Once in closed loop, the front oxygen sensor should switch between 0-1 volt, and the rear oxygen sensor should switch between 0.6-1 volt.

Excessive Time to Enter Closed Loop Fuel Control

An OBD II DTC P 0125 is set if it takes an excessive amount of time for the system to enter closed loop. The DTC is set if the system is not in closed loop after the following conditions are met:

- The engine must be running for more than 300 seconds
- The ECT sensor must be indicating a temperature greater than 176°F
- The engine speed must be 2,400-4,000 rpm
- The calculated engine load must be 26-60%

Fuel System Monitor (Fuel Trim Malfunction)

An additional OBD II DTC P 0170 is set regarding the fuel system when the following conditions are met:

- If the long term fuel trim is at -5% and the short term fuel trim is at -17% (the fuel system is running too rich)
- If the long term fuel trim is at +10% and the short term fuel trim is at +17% (the fuel system is running too lean)

Vehicle Speed Sensor (VSS)

The VSS has been relocated to the transaxle housing (fig. 39). Previous MMC 2.0L Turbo systems had the VSS located in the speedometer head. The VSS is a Magneto Resistive Element (MRE) (similar to the Dodge Stealth R/T Turbo). See Publication 81-699-0114, p.8-14 for a more detailed description of how an MRE sensor operates.

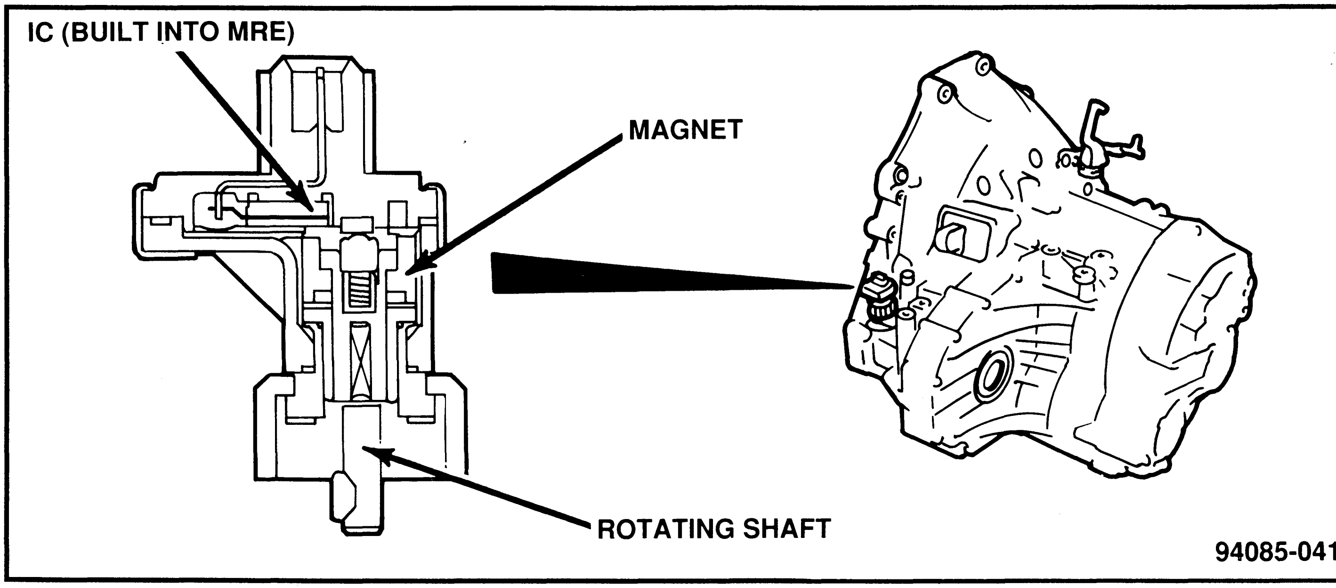


Figure 39 Vehicle Speed Sensor

The VSS uses a 3-way connector, and is fed battery voltage from the ignition switch on pin 1 (BK/WT) (fig. 40). Ground is provided on pin 2 (BK). The ECM (pin 86) sends a 5-volt signal to pin 3 (YL). The VSS signal is shared also with the Transaxle Control Module (TCM) (if the vehicle has an A/T), the speed control module, and the speedometer. The signal is sent also to pin 14 of the data link connector (DLC). As the speedometer drive gear rotates, the 5-volt signal from the ECM is grounded four times per revolution or 4,000 times per mile. The signal the ECM receives is a digital 5-volt square wave. The ECM uses the VSS signal for deceleration fuel-idle speed control. The VSS also has an effect on radiator fan control. (See radiator fan control relays in the Output section.)

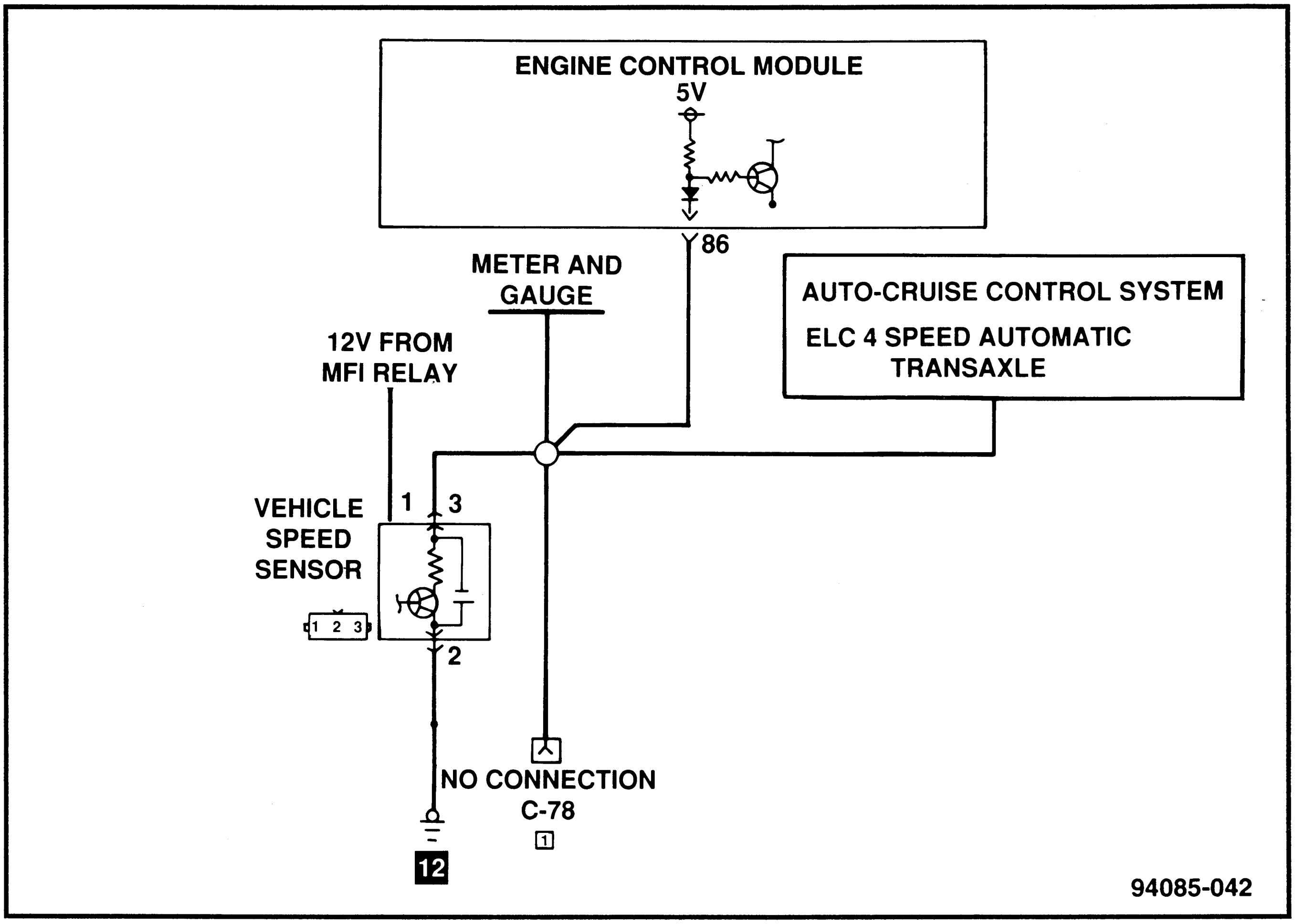


Figure 40 Vehicle Speed Sensor Circuit

Diagnosis

The VSS output frequency is monitored on pin 86 of the ECM. If the following conditions are met, a DTC 24 (OBD II P 0500) is set in memory:

- The CTP switch must be off (open throttle)
- Engine speed must be greater than 3,000 rpm
- The calculated engine load must be greater than 70%

If there is no change in the VSS signal for 4 seconds, a DTC is set in memory. The DRB III scan tool displays the VSS signal in mph.

Remember that if the VSS fails, the speedometer and the speed control will not operate.

Manifold Differential Pressure Sensor (MDP)

The MDP sensor is located on the center of the intake manifold, and senses the absolute pressure in the intake manifold. The MDP sensor functions similarly to a MAP sensor, although the ECM uses this input only to detect a malfunction in the EGR system per the OBD II requirements (used to perform the EGR system monitor).

The MDP sensor uses a 3-way connector. Pin 3 (DG/YL) is the 5-volt feed from ECM pin 81. Pin 2 (BK) is the ground, and pin 1 (LG/BK) is the signal-out wire to ECM pin 73. As the manifold pressure decreases, the voltage decreases on the signal-out wire.

Diagnosis

The MDP sensor is monitored by the ECM for a DTC during the following conditions:

- IAT sensor must be indicating a temperature greater than 41°F
- The calculated engine load is between 30-70%
- ECT sensor must be indicating a temperature greater than 113°F

If, during the above conditions, the MDP sensor voltage drops below 0.02 volts or rises above 4.5 volts for 4 seconds, an OBD II DTC P 1400 is set in memory.

To check calibration of the MDP sensor, the DRB III scan tool displays the MDP sensor in inches of mercury absolute (IN HG ABS).

Air Conditioning Components

Several components are involved with allowing the A/C compressor to function. The ECM controls the A/C relay by monitoring the A/C sense circuit. The sense circuit involves the components listed in Table 4.

Table 4. A/C Sense Circuit Inputs

COMPONENT	LOCATION
Blower Switch	Instrument Panel (fig. 41)
A/C Switch	Instrument Panel (fig. 41)
A/C Automatic Compressor Controller	Right Side of the Evaporator housing (fig. 42)
Evaporator Fin Thermal Sensor	Evaporative Housing (fig. 43)
Air Inlet Thermal Sensor	Evaporator Housing (fig. 43)
Dual Pressure Switch	Engine Compartment on the Left Side
A/C Refrigerant Temperature Switch	Mounted on the Compressor Delivery Port (fig. 44)
Engine Control Module	Engine Compartment on the Left Side (fig. 17)

Blower Switch

The blower switch has four possible motor speed selections (LO, MED 1, MED 2, and HI). The blower switch also has an OFF position (fig. 41). In order to use the defrost or A/C functions, the blower must be in one of the four speed positions. The blower motor electrical circuit also includes a resistor and two relays (one for HI speed and one for the other three speeds).

A/C Switch

The A/C switch must be pushed to the ECONO (halfway in) or A/C position (all the way in) for the air conditioner system to operate (compressor engaged) (fig. 41). An LED in the switch is illuminates yellow when the ECONO position is selected, or green when the A/C position is selected. The A/C switch is part of the auto compressor control systems. Pushing the A/C switch to ECONO position raises the temperature point of which the compressor clutch cycles on and off. This allows the compressor to be engaged only when necessary, which may increase fuel economy while using the air conditioning system.

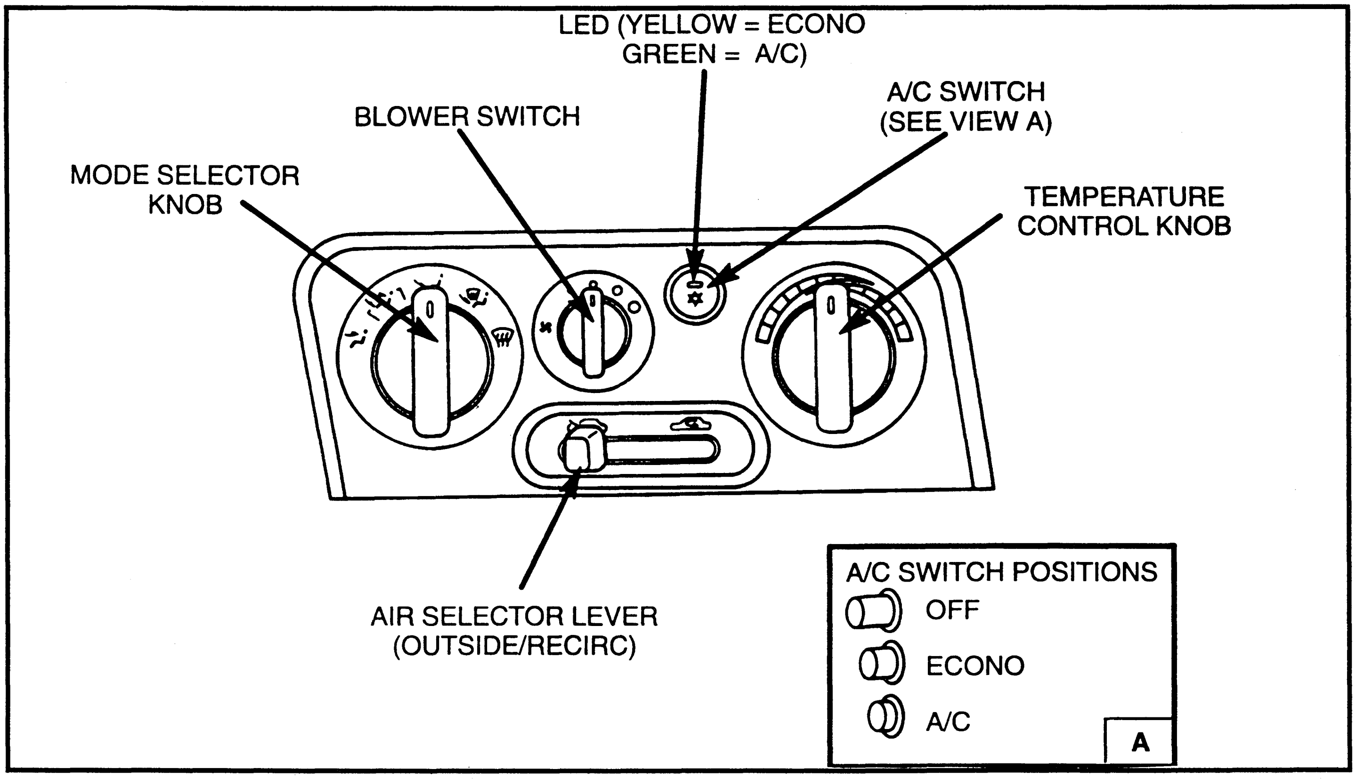


Figure 41 A/C and Blower Fan Controls

Auto Compressor Control System

The auto compressor control system is controlled by the auto compressor control module (fig. 42), which is located under the blower motor assembly. Input signals from the air thermo sensor and fin thermo sensor (fig. 43) are used to control the ON/OFF functions of the compressor magnetic clutch. The air thermo sensor measures the temperature of the air entering the evaporator, while the fin thermo sensor measures the temperature of the evaporator. These signals, plus operator inputs from the A/C control head, are used by the auto compressor control module to determine when the compressor magnetic clutch should be engaged. The purpose of this system is to engage the compressor clutch only when necessary to keep interior temperatures at the desired operator setting during A/C operation.

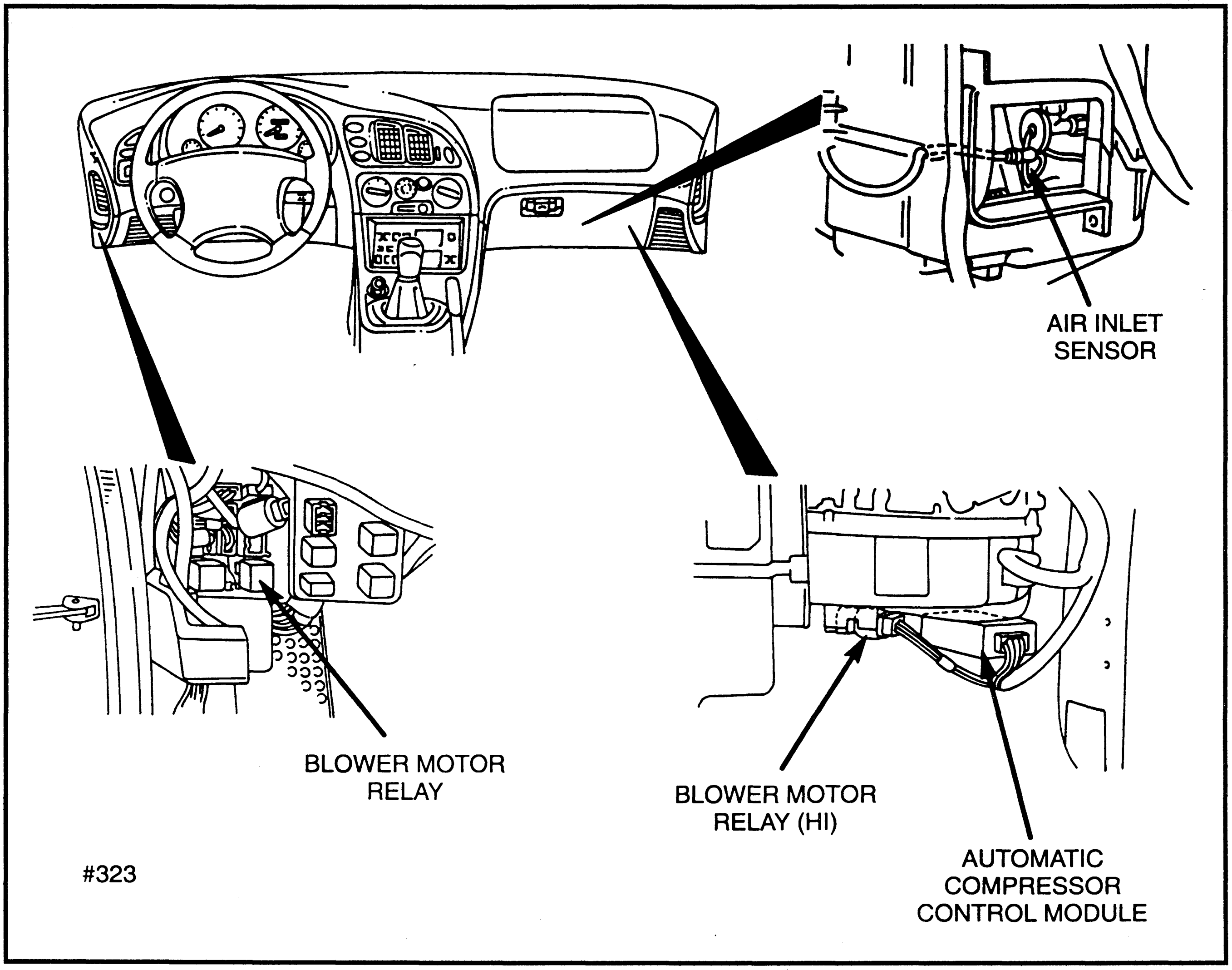


Figure 42 Passenger Compartment Components

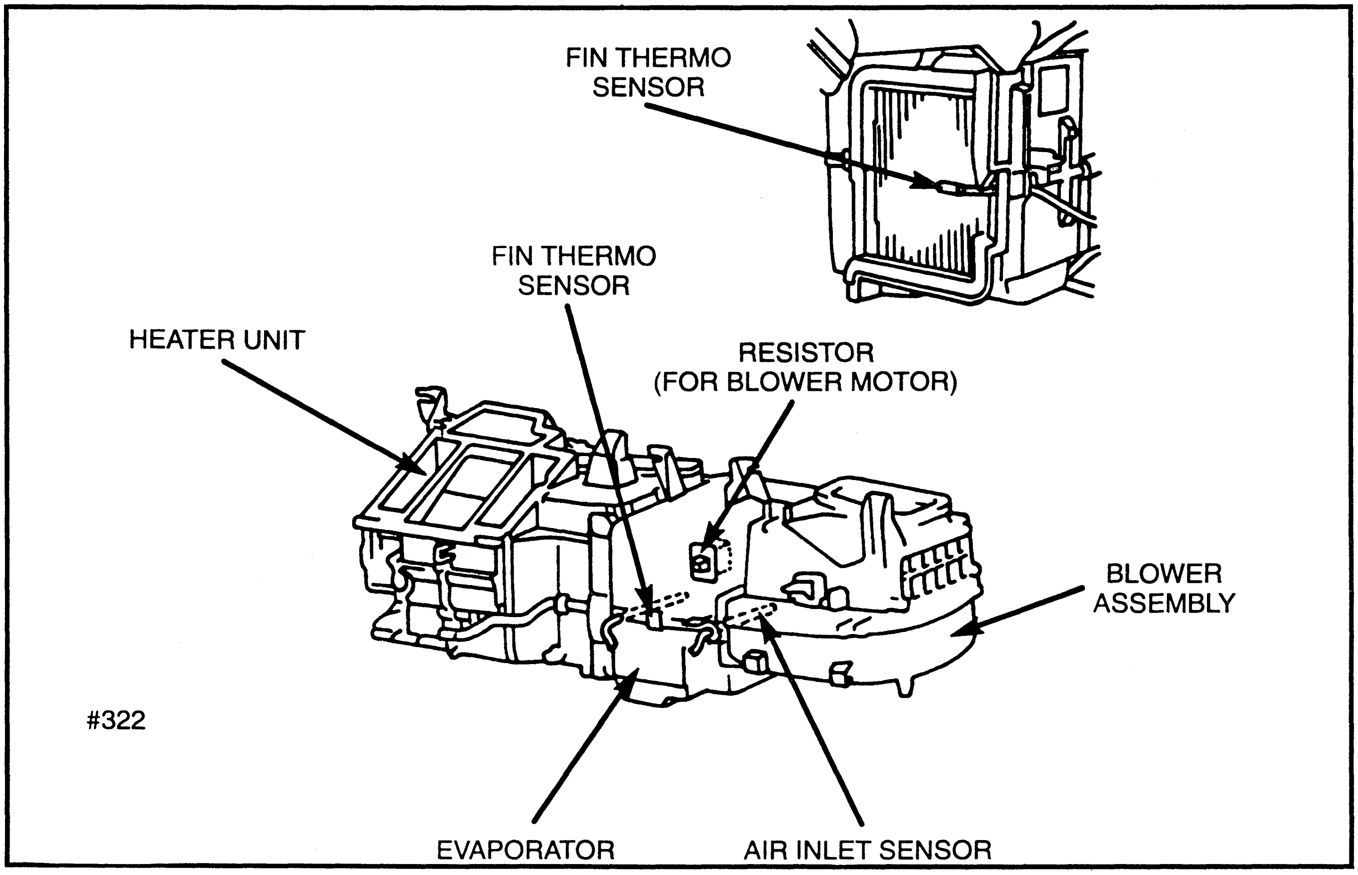


Figure 43 Evaporator Housing

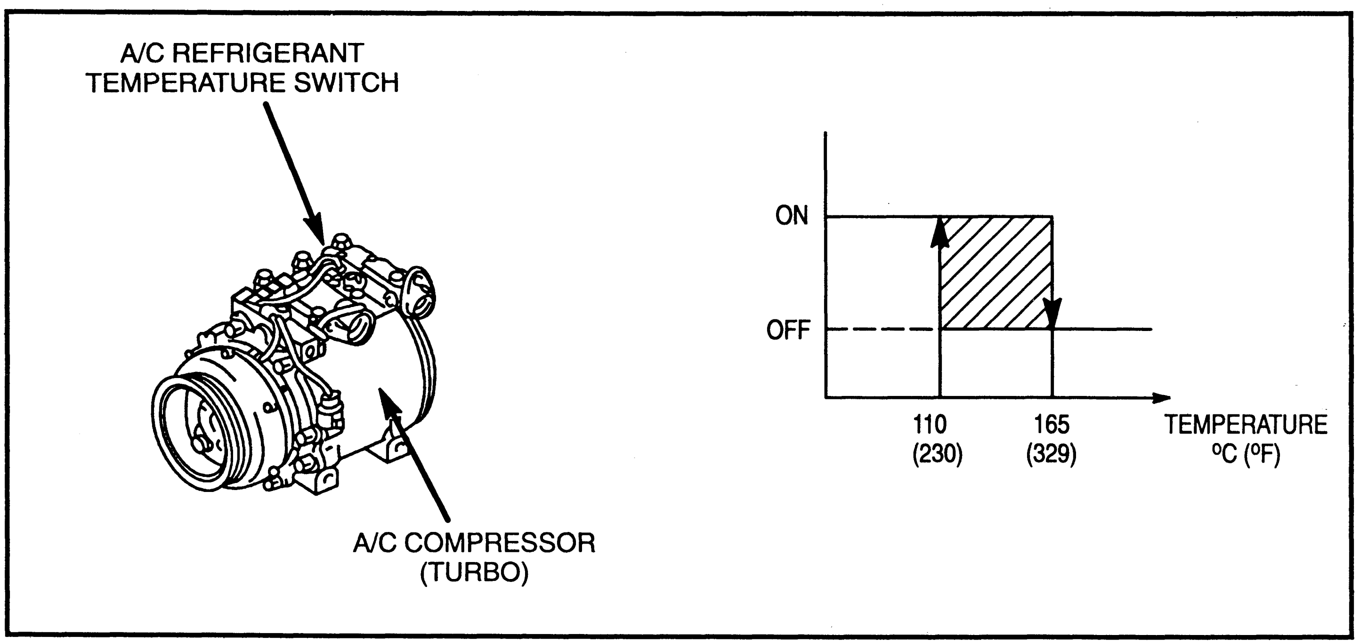


Figure 44 A/C Compressor

Auto Compressor Control Module Inputs

The inputs for the auto compressor control module are as follows (fig. 45 and 46):

- Power Supply and Ground - Battery voltage is provided to the auto compressor control module through terminal one any time the ignition switch is in the run position and a ground is provided through terminal nine (fig.45).

- A/C Switch - The A/C switch is fed battery voltage anytime the blower switch signal is positioned in any of the four blower fan speeds (fig. 45). When ECONO is selected from the A/C switch, battery voltage is applied to terminal two of the auto compressor control module. When FULL A/C is selected, battery voltage is applied to terminal seven. These inputs are used by the auto compressor control module to initialize A/C operation.

- Air Thermo Sensor - The air thermo sensor is used as an ambient temperature input to the auto compressor control module (fig. 46). This input is used in conjunction with the fin thermo sensor to engage the compressor clutch at the appropriate temperature ranges. The auto compressor control module sends a 5-volt reference signal through terminal 23 to the air thermo sensor. The sensor return is sent through terminal 21 of the auto compressor control module. The sensors resistance changes with the temperature of the air thus causing a change in voltage as temperature changes.

- Fin Thermo Sensor - The fin thermo sensor is used to identify the temperature of the evaporator (fig. 46). It is used in conjunction with the air thermo sensor to engage the compressor clutch at the appropriate temperature ranges. The auto compressor control module sends a 5-volt reference signal to the fin thermo sensor through terminal 26. The sensor return is sent through terminal 22 of the auto compressor control module. As temperatures of the evaporator change, the resistance of the sensor changes, thus causing a change in voltage at the signal input to the auto compressor control module.

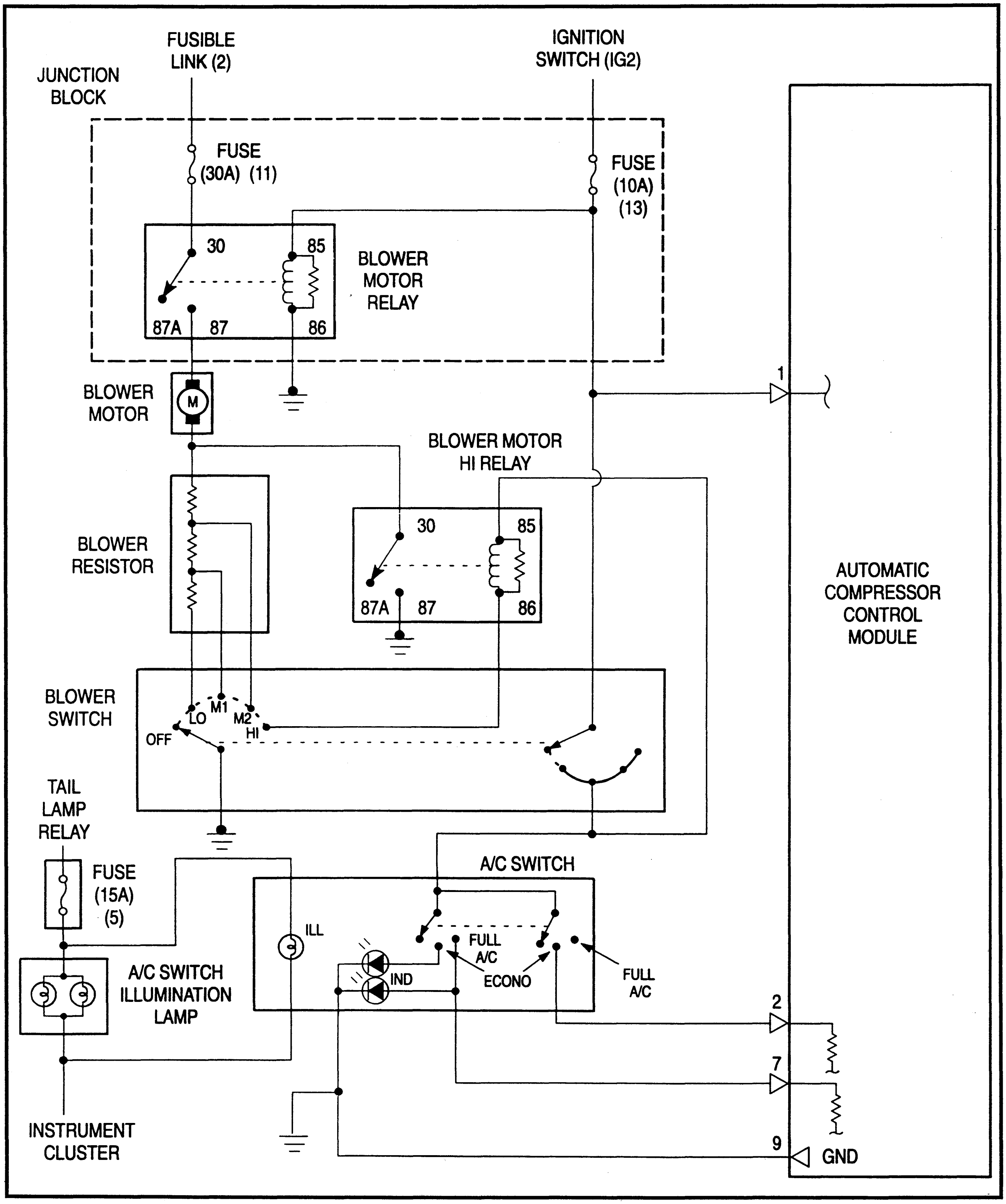


Figure 45 A/C Request Signal

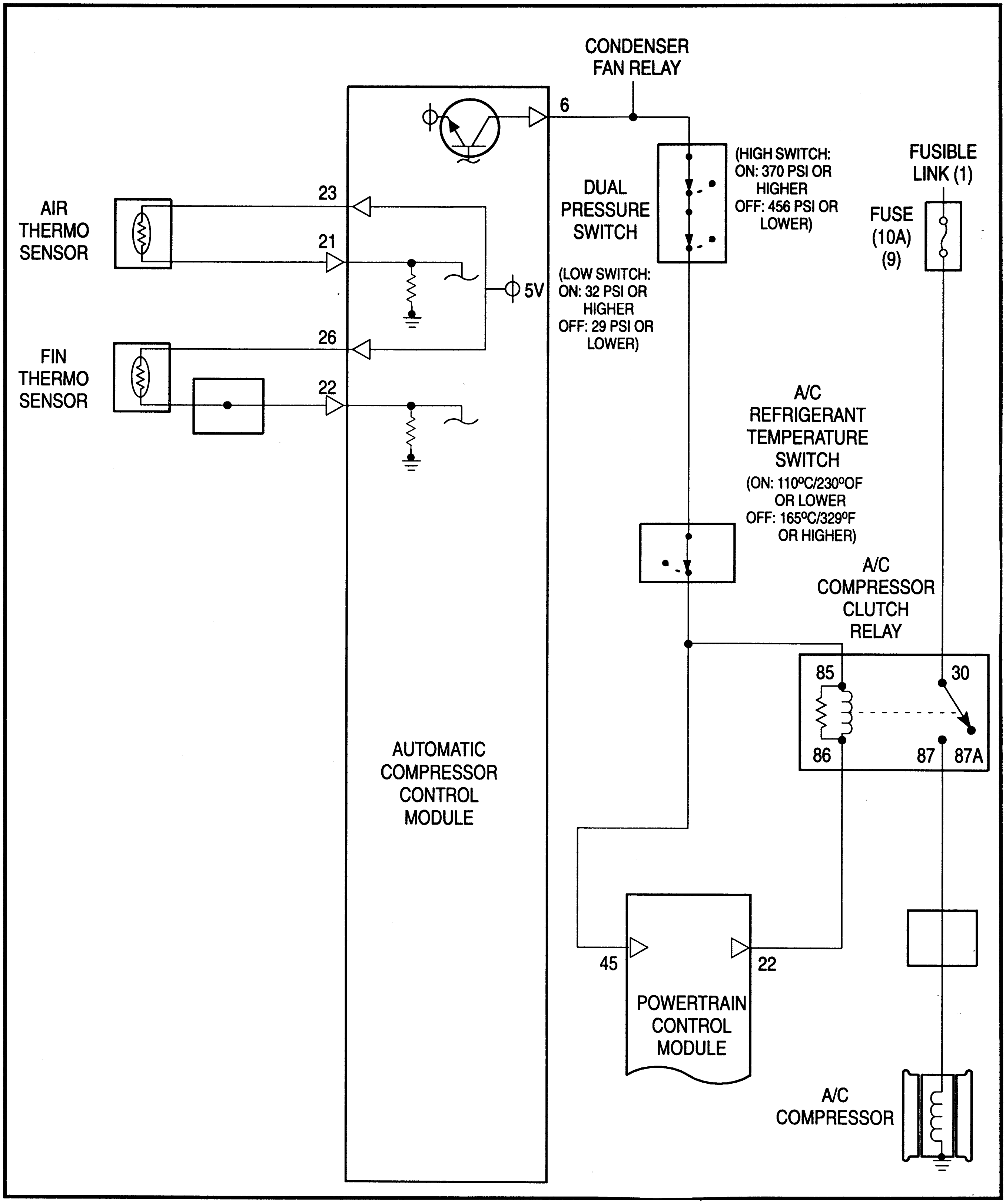


Figure 46 A/C Circuit

Auto Compressor Control Module Outputs

The main output of the auto compressor control module is the A/C request signal (fig. 46). A signal is sent through terminal six anytime that the auto compressor control module requires the compressor to be engaged. The request signal is ON as long as A/C has been selected, and the air thermo sensor and the fin thermo sensor are indicating temperatures within the parameters as indicated in figure 47.

When the auto compressor control module sends the request signal ON, system voltage passes through terminal six to the A/C condenser fan relay. With the request signal ON, the A/C condenser fan relay should be energized.

With the request signal ON, terminal six also provides system voltage to the dual pressure switch. The dual pressure switch is located on the receiver/drier assembly, and is used to protect the compressor from high or low pressure conditions. The LOW switch is ON (closed) at 32 psi (220 kpa) or higher, and OFF (open) at 29 psi (200 kpa) or lower. The HIGH switch turns OFF (open) at 456 psi (3,140 kpa) or higher, which removes power supplied to the compressor clutch relay. The HIGH switch turns ON (closed) at 370 psi (2,550 kpa) which re-engages the compressor clutch.

The compressor is equipped with a A/C refrigerant temperature switch that interrupts current flow to the A/C compressor clutch relay and the ECM if the compressor temperatures are too excessive (fig.46). The contacts are closed at A/C compressor temperatures below 230°F (110°C). The contacts open if the temperature of the compressor increases to 329°F (165°C) or higher. This aids in the prevention of A/C system damage due to high temperatures.

With both the LOW and HIGH pressure switch contacts closed, and the A/C refrigerant temperature switch closed, system voltage is supplied to the A/C compressor relay electromagnet and ECM terminal 45. Once the ECM recognizes the request signal and the ECM's other monitored inputs indicate that the A/C compressor should be engaged, the ECM provides a ground for the A/C relay's electromagnet through terminal 22. With the relay energized, battery voltage is supplied to the compressor clutch coil.

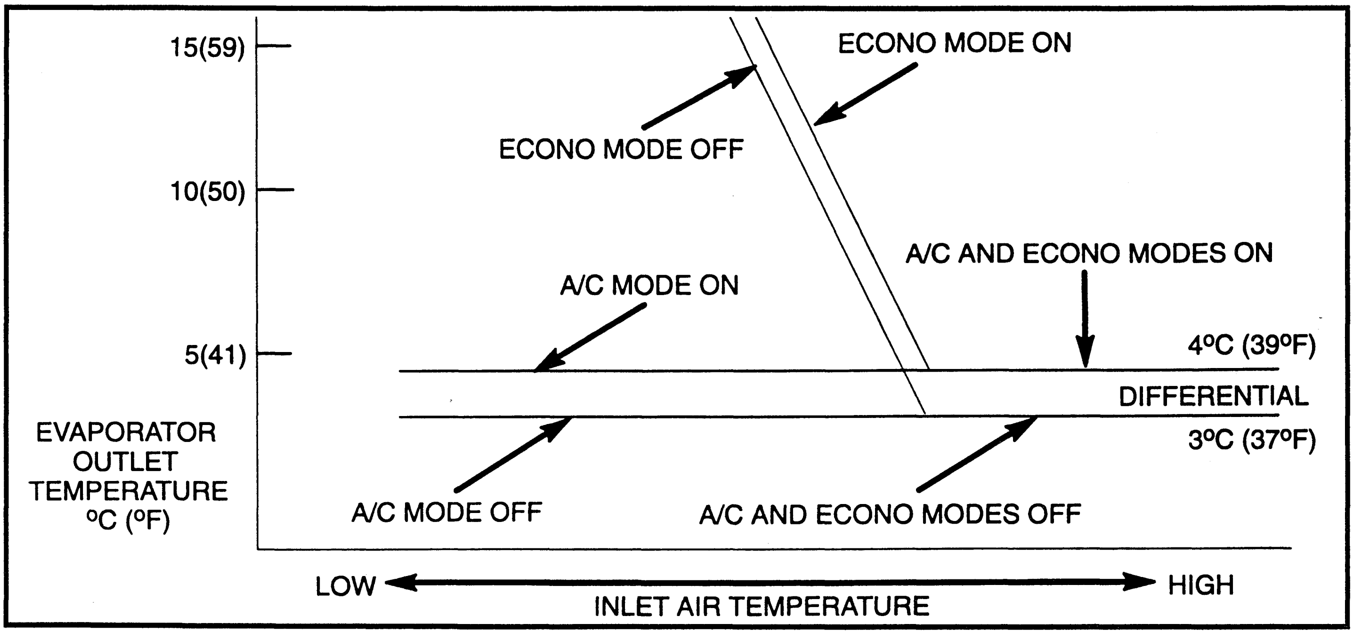


Figure 47 A/C Compressor Cycling Parameters

Inhibitor Switch (Park/Neutral Switch - PNP)

The inhibitor switch is used only with an automatic transaxle, and is mounted on the transaxle. The ECM uses the inhibitor switch input to change the target idle speed and compensate for the initial load put on the engine when the transaxle is put into gear. The ECM accomplishes this by opening the IAC motor's idle passage. The ECM sends battery voltage (through a resistor) from ECM pin 91 (BK/RD) to the PNP switch, which is grounded when the transaxle is in Park or Neutral (fig. 48). The ECM will see a "high" (battery voltage) when in gear, and a "low" when in Park or Neutral. With a manual transaxle, ECM pin 91 (BK) is hard wired to ground.

Diagnosis

The DRB III scan tool displays the inhibitor switch as D/R (in gear) or P/N (in Park or Neutral). With a manual transaxle, the display always will show P/N.

Electrical Load Switch

When the rear defroster and/or the headlights are turned on, battery voltage is sent to pin 24 (RD/DG). The ECM uses this input to compensate for the additional electrical load by manipulating the IAC motor.

Diagnosis

The DRB III scan tool displays the electrical load switch as ON, when the rear defroster and/or the headlights are turned on. The display changes to OFF when the rear defroster and/or the headlights are turned off.

RPM (Tachometer Input)

ECM pin 58 (WT) is used as an input to determine if a there is a problem with one of the two ignition coil's primary circuit. When the ECM turns on and off the power transistors, it looks for a response on pin 58. If the ECM detects an open or short in one of the primary circuits, it shuts off the "failed" primary circuit and the corresponding fuel injectors. The engine will then run on only two cylinders. The signal comes from pin 4 of the power transistor, and is the same signal that drives the tachometer.

Diagnosis

A DTC 44 is set in memory if the ECM detects an open or a short in one of primary circuits. DTC 44 could be caused by a defective coil, power transistor, ECM, or connecting wiring.

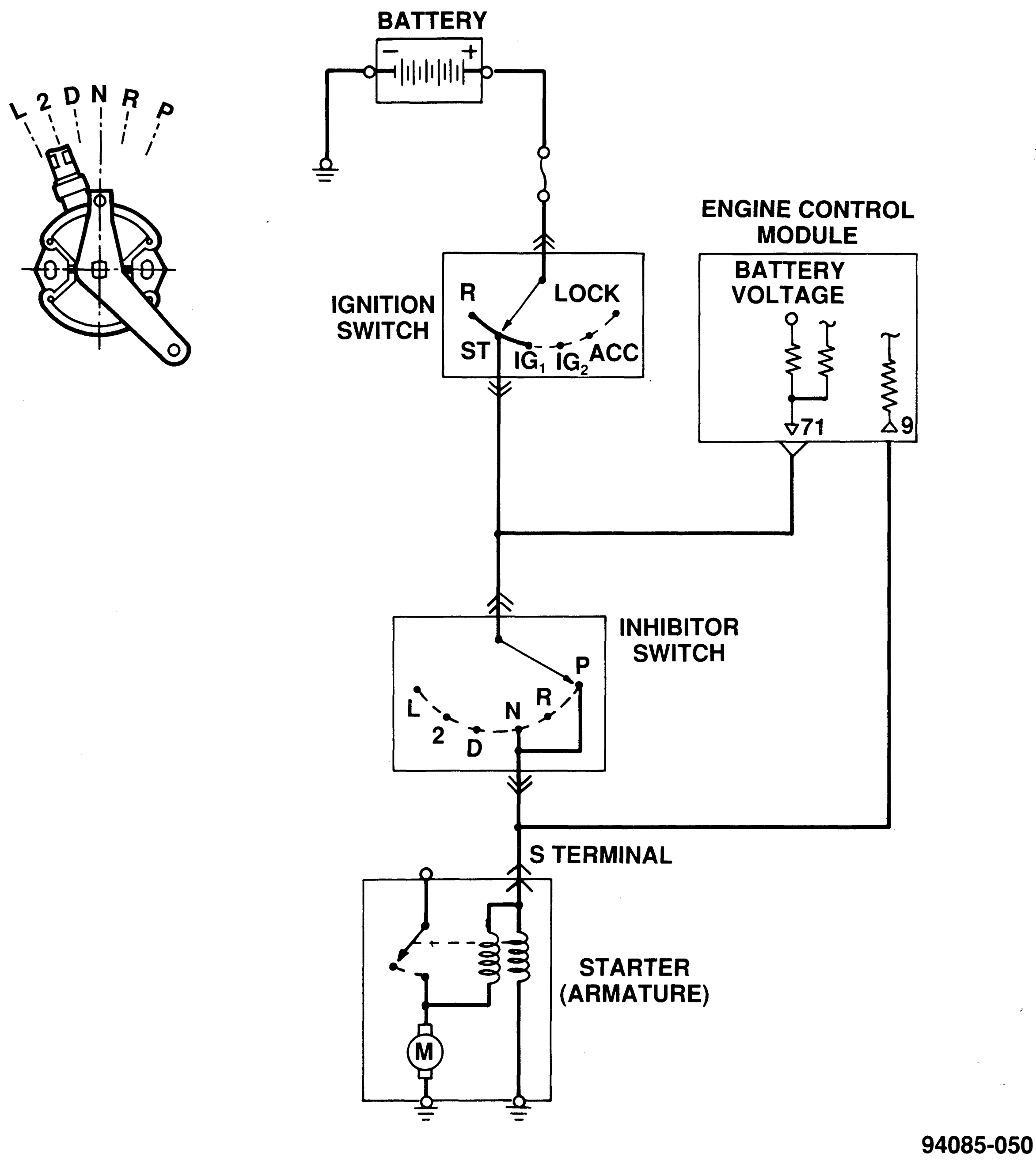


Figure 48 Inhibitor Switch Circuit

Power Steering Pressure Switch (PSP)

The PSP switch is located on the power steering pump (fig. 49), and is used to control target idle speed. The PSP switch is fed battery voltage (through a resistor) from ECM pin 37 (BL/WT). The PSP switch closes at about 280 psi. The ECM will then open the IAC motor to compensate for the additional power steering load on the engine.

Diagnosis

The DRB III scan tool displays the PSP switch as open or closed depending upon whether the PSP switch contacts are open or closed. Start the engine and rotate the steering wheel back and forth to watch the display change.

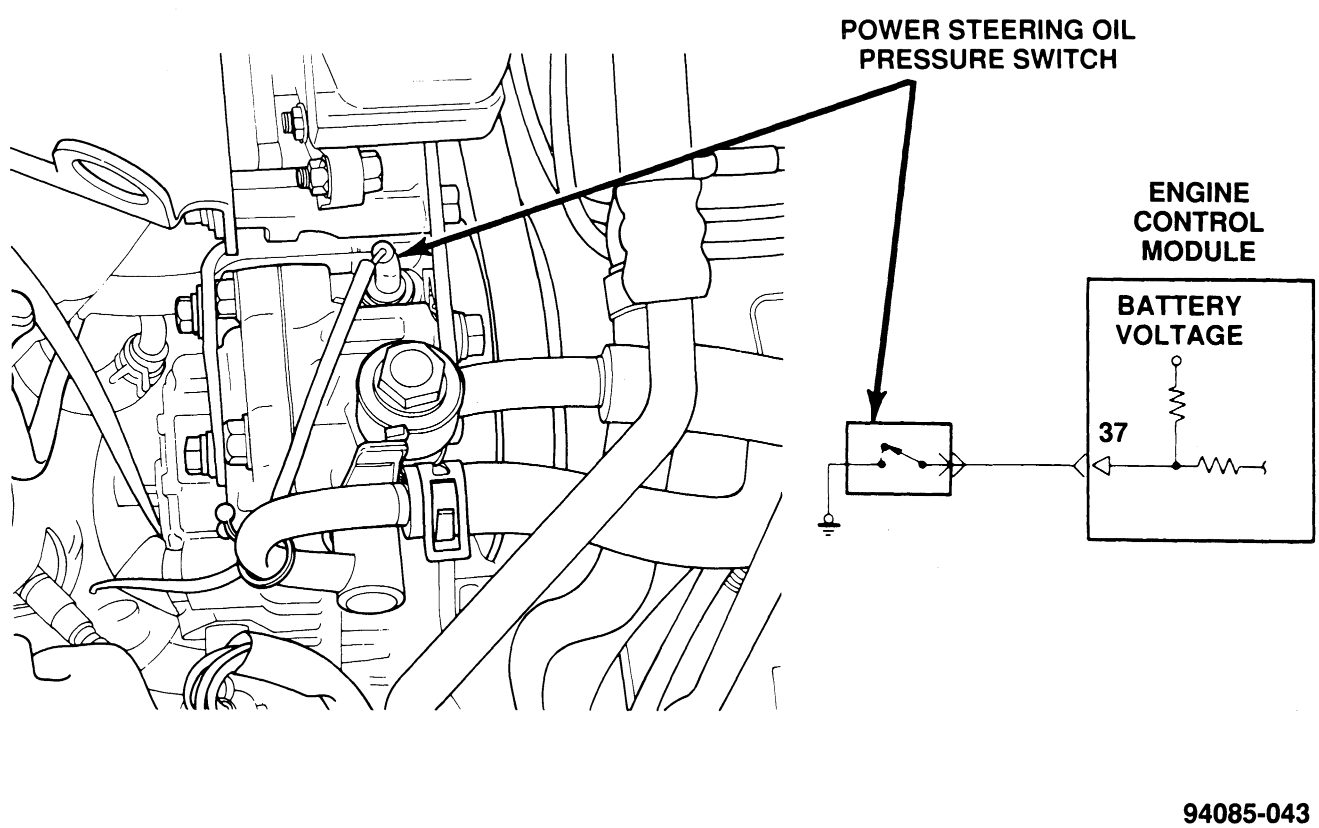


Figure 49 Power Steering Pressure Switch

Generator FR Terminal

The generator FR terminal determines whether the generator field coil is energized or not, and inputs the condition to the ECM. The purpose of the circuit is to monitor generator output and control the IAC motor according to electrical load to prevent variations in idle speed. The ECM sends 5 volts from pin 41 (DG) to the FR terminal on the back of the generator (fig. 72, p. 109). As the field coil is turned on and off by the internal voltage regulator, the voltage cycles between approximately 0 and 5 volts.
(5 volts with no current flow through the field coil; about 1 volt with the generator full-fielded).

Diagnosis

If the ECM detects an open in the circuit (5 volts) for 20 seconds, a DTC 64 is set in memory. At that time, the generator G terminal will be off. (See generator G terminal in the Output section for a description of this circuit.)

Closed Throttle Position Switch (CTP)

The CTP switch is incorporated into the TPS. The purpose of the CTP switch is to detect a closed throttle. With a CTP switch contacts closed, the ECM enables the target idle rpm control. Target idle is maintained by "spark scatter" below 1,000 rpm and the Idle Air Control motor (IAC). The CTP switch is used also for deceleration fuel shut-off control. The CTP switch is fed 5 volts from the ECM on pin 87, to pin 3 of the TPS (YL/RD). Ground is supplied through pin 4 of the TPS (BK) (fig. 30). Whenever the throttle is closed, the signal from the ECM is grounded (0-1 volt). As soon as the throttle is opened, the voltage goes to 5 volts.

Diagnosis

The DRB III scan tool displays the CTP switch as open or closed depending upon whether the throttle is open or closed. If either the fixed SAS (Speed Adjustment Screw) or the accelerator cable is misadjusted, the switch may not open and close properly. (See Adjustment section for proper procedures.)

Ignition Timing Adjustment Terminal

The ECM sends 5 volts through pin 52 (BK/DG) to the ignition timing adjustment terminal (fig. 50). The terminal is located under the hood, behind the engine, against the bulkhead. It is a BK/DG wire in a single wire brown connector. When this terminal is grounded, the ECM eliminates the spark scatter used to control idle speed and bring the ignition timing back to basic timing.

Diagnosis

On the 1995 Talon, basic timing is no longer adjustable, but it can be checked with a timing light.

Note: *The DRB* ***MUST*** *be disconnected from the 16-way Data Link Connector (DLC) whenever basic timing is checked. With the DRB connected to the 16-way DLC* ***AND*** *the ignition timing adjustment terminal grounded the ECM drives the IAC motor to the basic idle speed setting (minimum air flow setting). Ignition timing will* ***NOT*** *be at the basic timing setting.*

If only the ignition timing adjustment terminal is grounded, timing can be checked with a timing light. The basic timing should be at 5 BTDC. If base timing is not at 5° BTDC, check the CKP sensor. A DTC 36 (OBD II P 1320) is set when the ignition timing adjustment terminal is grounded, and the MIL will illuminate. This DTC is not stored, and will clear when the terminal is no longer grounded. The ignition timing adjustment terminal can be checked also with the DRB III scan tool. The DRB III scan tool displays ON with the terminal grounded, and OFF when it is not grounded.

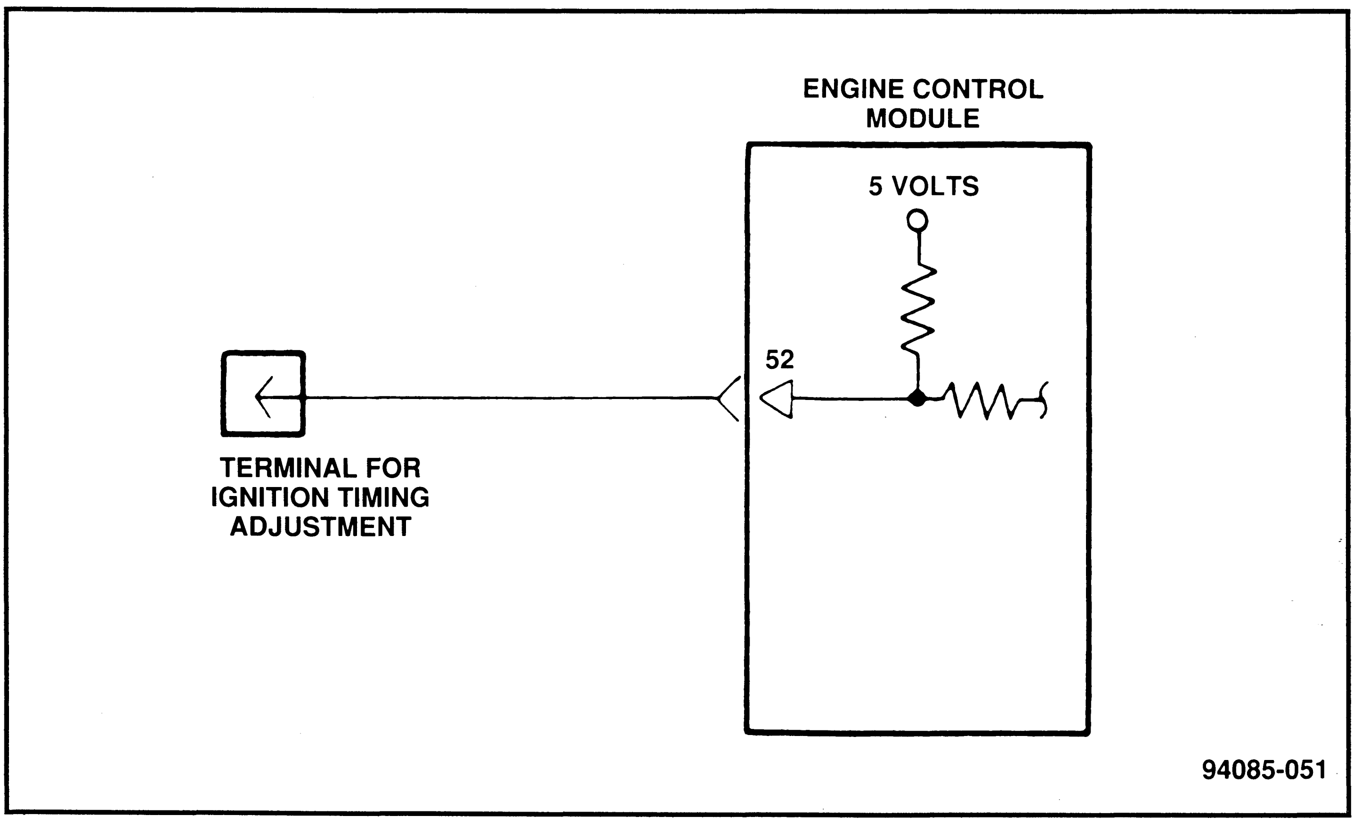


Figure 50 Ignition Timing Adjustment Terminal

ECM/TCM Total Control

Vehicles equipped with an automatic transaxle use a torque reduction system in which the Transaxle Control Module (TCM) can request that the ECM retard ignition timing between shifts to smooth out the shifts. This is similar to the system used previously on the Dodge Stealth. (See Publication 81-699-0114, p.14-19 and p.21-24 for more information.)

The ECM sends 5 volts through pin 46 (OR/BK) to TCM pin 18 (fig. 51). This circuit is used by the TCM to signal a request for torque reduction. The TCM grounds the circuit to "ask" the ECM if conditions allow for torque reduction.

The ECM also sends 5 volts through pin 43 (WT/DG) to TCM pin 4. This circuit is used by the TCM to request the amount of retard needed as determined by the length of time the circuit is grounded by the TCM. The circuit is used by the TCM also to turn on the Malfunction Indicator Light (MIL) (formerly called the Check Engine Light) when a malfunction in the transaxle occurs, to meet OBD II requirements. The TCM continuously opens and grounds this circuit every second to tell the ECM to turn on the MIL when a malfunction occurs in the transaxle.

ECM pin 7 (BK/BL) circuit goes to TCM pin 17, and is an output of the ECM. The TCM sends 5 volts to the ECM, which grounds the circuit identifying that torque reduction is allowed, and then indicates to the TCM how much torque reduction has been given. No torque reduction will be allowed if the ECT sensor indicates a temperature below 140°F.

Diagnosis

A DTC 61 (OBD II P 0700) is set in the ECM if a problem is detected in the torque reduction circuit. Check for 5 volts from the TCM on ECM pin 7 with the ECM disconnected, and check for 5 volts at TCM pins 4 and 18 with the TCM disconnected.

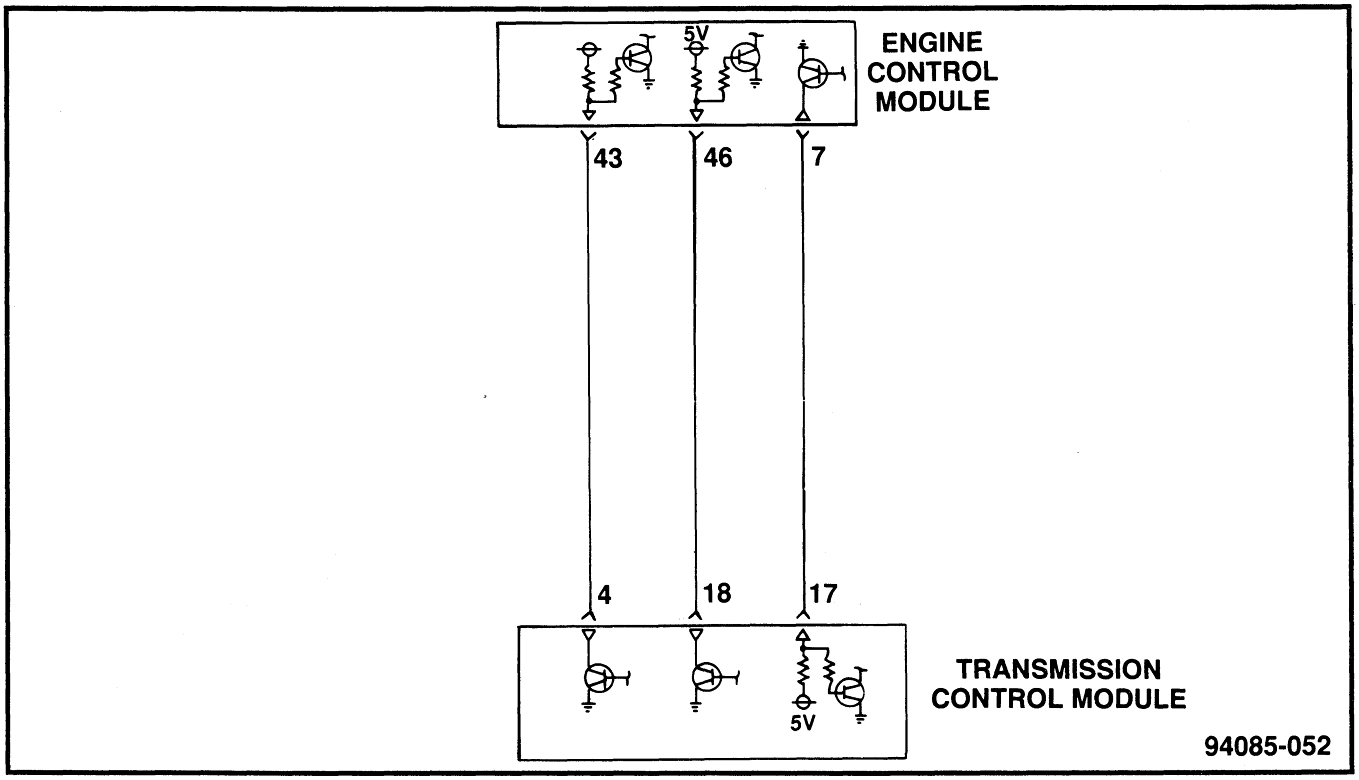


Figure 51 ECM/TCM Total Control Circuit

Data Link Connector (DLC)

The ECM maintains communication with scan tools through the vehicle's Data Link Connector (DLC) (fig. 52). The Talon contains the earlier 12-way DLC and a new 16-way DLC for use with the new DRB III diagnostic scan tool. A special "Y" connector must be used in conjunction with the DRB III scan tool, but the MMC adapter that was previously used is not required. The connector is located under the instrument panel, to the right of the steering column bracket. (See figure 53 for terminal descriptions for the DLCs.)

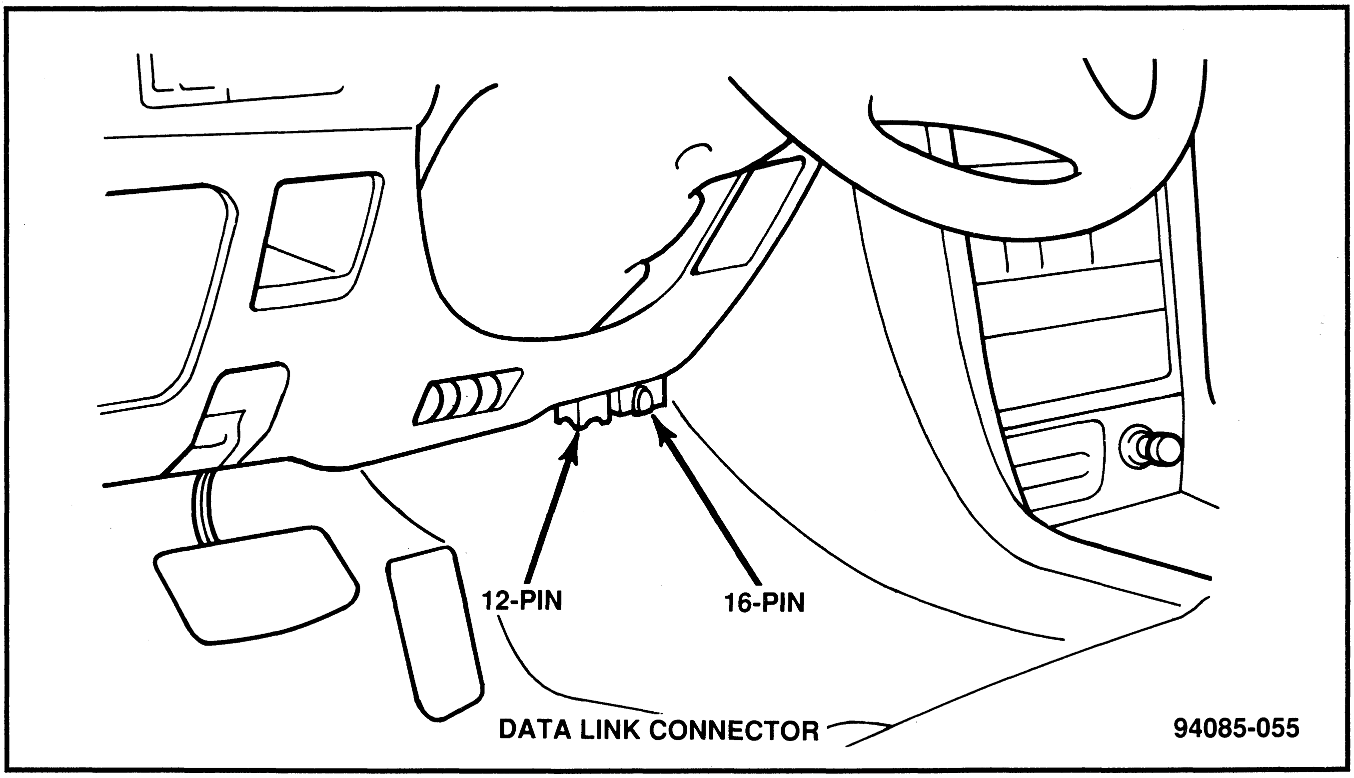


Figure 52 Data Link Connectors

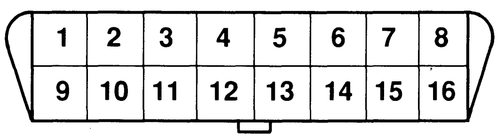
Diagnostic Test Mode Control Terminal (DTM)
Diagnostic Output Terminal

The ECM sends battery voltage (through a resistor) from pin 56 (YL) to pin 1 of the DLC. This circuit is used by the ECM to determine if a scan tool is connected. When the DRB is connected to the DLC, pin 1 of the DLC is grounded, causing the ECM to output data line diagnostics from ECM pin 62 (PK) to DLC pin 7. ECM pin 56 (DLC pin 1) is used also to check minimum air flow. If this terminal and the ignition timing adjustment terminal are both grounded, the ECM is signaled to drive the IAC motor to the basic idle speed setting (minimum air flow). (See the adjustment section for more details on setting basic idle speed.)

Diagnosis

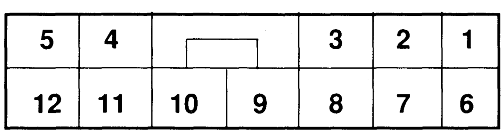
The quick check for this circuit is to see if the DRB III scan tool functions. If the DRB III scan tool functions correctly on other MMC vehicles (using the 16-way adaptor), but is not working on this particular vehicle, check for battery voltage (with the key on) at DLC pin 1, and for 5 volts (key on) at DLC pin 7.

O B D - II connector
(16-pin, female)



Viewed from Terminal Side

No.	Use
1	Diagnostic control signal
2	(J1850 data link) * 1
3	Suspension control
4	Ground
5	Ground
6	Transmission control
7	ISO 9141-K data link ※ SCI-II TX
8	Brake control
9	Pulse signal diagnosis (ETACS)
10	(J1850 data link) * 1
11	Air conditioner control
12	SRS-Air bag control
13	Auto cruise control
14	Simulated vehicle speed signal
15	(ISO 9141-L data link) * 1
16	Battery power (DC 12V)



M M C connector
(12-pin, male)

Viewed from Terminal Side

MMC CONNECTOR (Chassis side)

No.	Use
1	Traction control (TCL)
2	Steering control (4WD or Tilt)
3	
4	
5	Fuel injection *2/※ SCI-II
6	※ SCI-II (EATX RX) '96 model
7	※ CCD bus (+) (TCM) '95 model
8	※ CCD bus (–) (TCM) '95 model
9	
10	
11	
12	

N O T E:

※ : Apply to Chrysler power plant.
* 1 : No wire on MMC & DSM vehicles.
* 2 : Apply to MMC SCI communication Engine.

94084-061

Figure 53 Data Link Connector Terminal Description

ECM OUTPUTS

Malfunction Indicator Lamp (MIL)

The MIL (Check Engine) light is located in the Talon's instrument cluster. The ECM grounds pin 36 (DG/RD) to warn the driver of an emissions-related failure, as required by OBD II (fig. 54). The lamp should turn on also for a 2-second bulb check during every key-on. If pin 1 of the DLC is grounded when the key is turned on, the MIL flashes any DTCs that are in memory.

Diagnosis

If the MIL does not turn on for the bulb check, test fuse 8 in the fuse box (left kick panel). If the fuse is good, check for battery voltage at ECM pin 36. If there is no voltage at the ECM, check the bulb and connecting wiring. If the voltage level is close to battery voltage, grounding ECM pin 36 should cause the lamp to turn on.

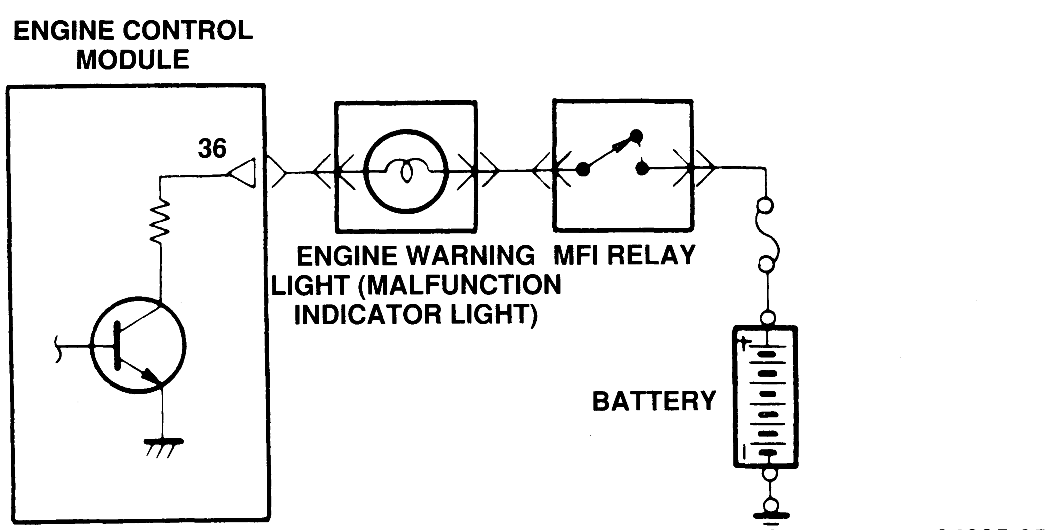


Figure 54 Malfunction Indicator Lamp

Multiport Fuel Injection Relay (MFI)

The MFI relay is located on the right side of the center console, next to the ECM. The MFI relay was formerly called the control relay. The MFI relay is really two relays in one. There are two sets of contacts and two pull-in coils. One set of contacts supplies battery voltage to the fuel pump and the fuel pump check terminal. The other set of contacts supplies battery voltage to the ECM, the VAF sensor, the CKP and CMP sensors, the oxygen sensor heaters, the injector resistors, the IAC motor, and all ECM controlled solenoids (wastegate, purge, EGR, and fuel pressure). Both pull-in coils are grounded by the ECM, but at different times.

The MFI relay uses an 8-way connector (fig. 55). The following is a description of each terminal:

Pin 1 (BK/BL) When the relay is energized, pin 1 supplies battery voltage to the fuel pump and the fuel pump check terminal.

Pin 2 (RD) When the relay is energized, pin 2 supplies battery voltage to the CKP and CMP sensors, solenoids, IAC motor, fuel injector resistors and oxygen sensor heaters.

Pin 3 (RD) When the relay is energized, pin 3 supplies battery voltage to the ECM and the VAF sensor.

Pin 4 (RD/BK) Pin 4 supplies battery voltage from the MFI 20-amp fuse in the centralized junction (under hood relay/fuse box).

Pin 5 (WT/RD) Pin 5 goes to ECM pin 8. The ECM grounds this circuit whenever the engine is cranking or an rpm input is present. This is the ground for the pull in coil controlling the contacts connecting pin 1 to pin 7.

Pin 6 (BL/DG) Pin 6 goes to ECM pin 38. The ECM grounds this circuit whenever the ignition switch is on. This is the ground for the pull-in coil controlling the contacts connecting pin 4 to pin 2.

Pin 7 (BK/WT) Pin 7 supplies ignition switch voltage from the ignition switch fuse in the centralized junction. This circuit feeds the contact that goes to pin 1, and feeds the pull-in coil going to pin 5.

Pin 8 (BK) Pin 8 supplies battery voltage from the MFI fuse in the centralized junction. This circuit feeds the pull-in coil that goes to pin 38 of the ECM.

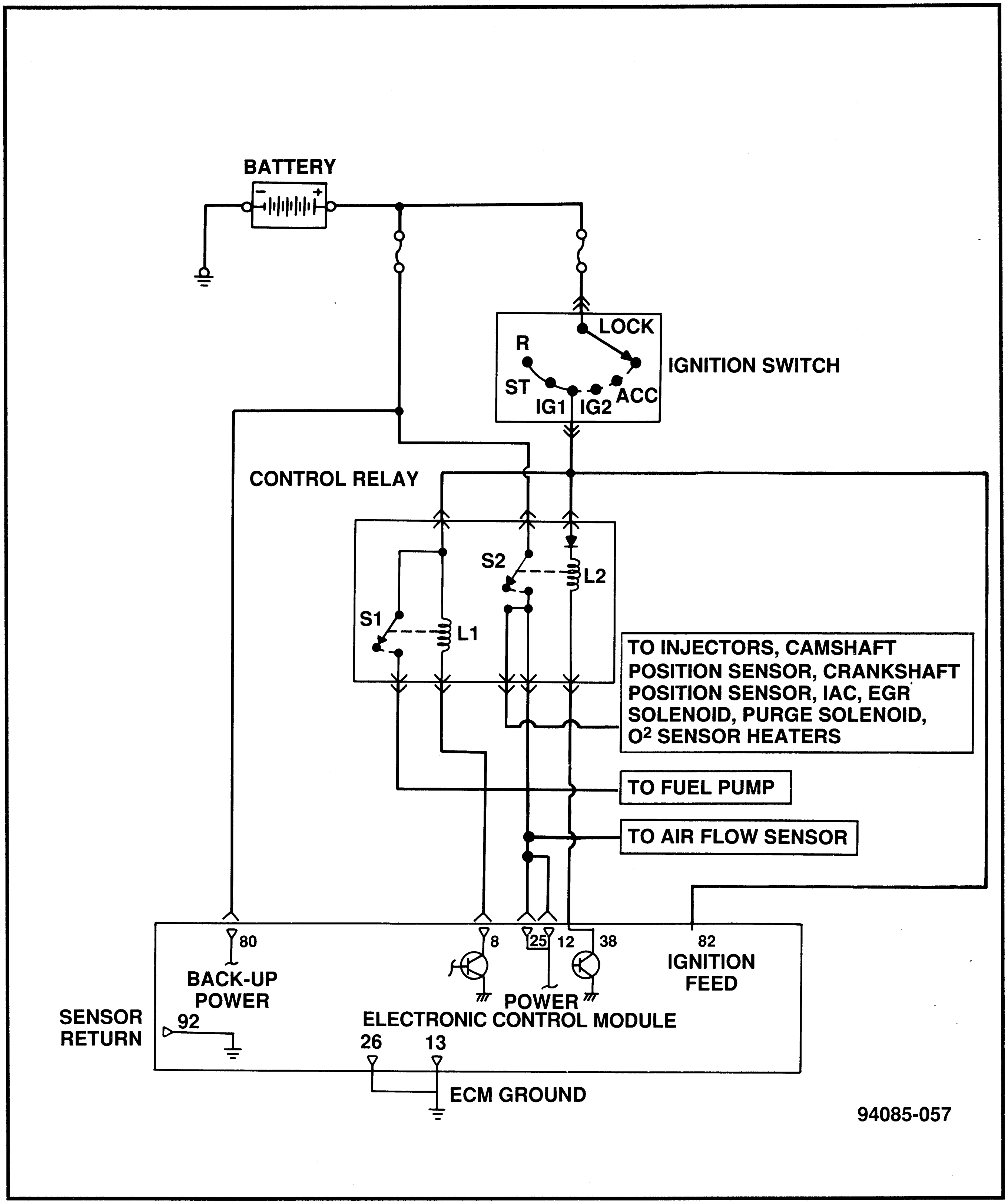


Figure 55 Multiport Fuel Injection Relay Circuit

Diagnosis

If there is a malfunction in either set of contacts in the MFI relay, the engine will not start. There must be a cranking input (ECM pin 71) or an rpm input (CKP sensor) for the ECM to energize the fuel pump. Be sure both the cranking and CKP inputs are functioning before continuing.

An actuator test can be performed with the DRB III scan tool to check the output voltage from MFI relay pin 1 to the fuel pump. The ECM turns on and off (grounds and ungrounds) ECM pin 8 for 6 seconds on, then 6 seconds off. This test continues for 5 minutes unless the test is exited or the key is turned off.

Listen for the fuel pump to run. If the fuel pump is not running, check the voltage at the fuel pump check terminal. The fuel pump check terminal is located behind the engine, against the bulkhead. It is a single-wire, black connector with a BK/BL wire. If, during the actuator test, the voltage cycles between 0 and battery voltage, the MFI relay is functioning. If the pump is not running, there is a problem with the fuel pump or the connecting wiring.

If there is no voltage at the fuel pump check terminal, jump battery voltage to it, and listen for the fuel pump. If there is no voltage during the actuator test, but when you jump the fuel pump, it functions, check the ignition switch fuse in the centralized junction. If it is good, try grounding pin 8 at the ECM to see if the MFI relay clicks and the fuel pump runs. If they do not, the problem is in the MFI relay or the connecting wiring. If the pump runs when you ground ECM pin 8, and you checked both the cranking and CKP inputs for proper operation, the ECM is faulty.

If there a problem with the other set of contacts (no voltage output from MFI relay pins 2 and 3) the DRB III scan tool displays "No Response" with the key on, and the ECM will not power-up. It takes an ignition switch input to the ECM (pin 82) to energize this portion of the MFI relay. Be sure to check this before continuing.

If the ignition switch input is good, check for battery voltage at one of the fuel injectors. You should see close to battery voltage on both injector terminals. One terminal is the feed from the MFI relay, and the other is a diagnostic feed from the ECM for detecting the injector DTC. If neither terminal has voltage, check the MFI fuse in the Centralized Junction. If it is good, check the voltage at ECM pin 38. You should have battery voltage, and if you ground pin 38, the relay should click, and you should have battery voltage at the injectors. If not, the problem is in the MFI relay or the connecting wiring. If the relay clicked and voltage was present at the injectors, and you checked both the cranking and CKP inputs for proper operation, the ECM is faulty.

Power Transistor and Ignition Coil Circuits

When the ECM recognizes an input from the CKP and CMP sensors, it determines which ignition coil to fire, and when. ECM pin 10 (BK/BL) controls the base of the power transistor for the primary circuit controlling ignition coils 1 and 4 (fig. 56). ECM pin 23 (BR/RD) controls the base of the power transistor for the primary circuit controlling ignition coils 2 and 3. The ECM outputs approximately 5 volts from pin 10 or pin 23 to the base of the power transistors. This turns on the power transistor, which will ground the primary circuit of each coil. When the 5 volts from the ECM is turned off, the power transistor will turn off, opening the coil's primary circuit and firing the coil. See Publication #81-699-8020R (1.6L Section) for a more-detailed description of the DIS system.

Both power transistors are serviced as an assembly, and use an 8-way connector. The following is a description of each terminal:

Pin 1 (BL/BK)	Cylinders 2 and 3 coil primary
Pin 2 (BR/RD)	Base of the power transistor for cylinders 2 and 3
Pin 3 (BK)	Ground
Pin 4 (WT)	Goes to ECM pin 58 and to the tachometer (see inputs)
Pin 5	Not used
Pin 6 (BK/WT)	Ignition switch voltage
Pin 7 (BK/BL)	Base of the power transistor for Cylinders #1 and #4
Pin 8 (BK/WT)	Cylinders 1 and 4 coil primary

Diagnosis

If there is a problem with either of the power transistor circuits, the engine will have spark on only two cylinders. The power transistor circuit DTC is 44 (see rpm input). The ignition coil primary resistance should be 0.70-0.86 ohms. Ignition coil secondary resistance should be 11,300-15,300 ohms.

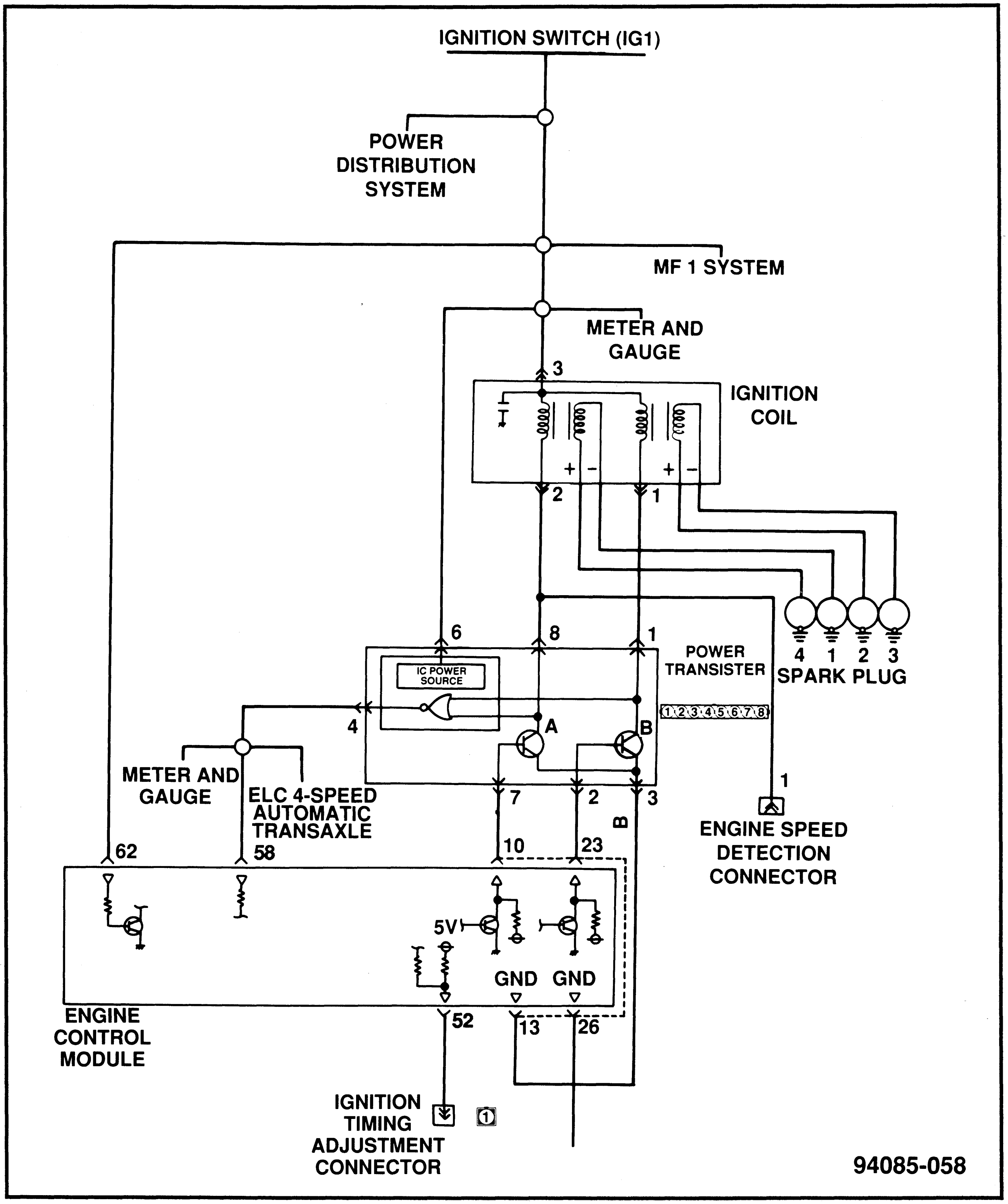


Figure 56 Ignition coil Circuits

Fuel Injectors

The fuel injectors used on this system are low-resistance (2-3 ohms) injectors that are fed battery voltage through separate 6-ohm resistors. Battery voltage from the MFI relay is fed to four 6-ohm resistors, which, in turn, go to each injector. The ECM controls the injector on-times by controlling the ground side of the injector through pin 1 (DG) for injector 1, pin 14 (YL/BK) for injector 2, pin 2 (YL) for injector 3, and pin 15 (DG/RD) for injector 4 (fig. 57). The Talon uses a sequential fuel injection system in which each injector is fired individually in the firing order, once every two rotations of the crankshaft. The exception is during cranking, when all injectors are fired simultaneously. There also is a rev limiter function, which shuts off all injectors when a predetermined rpm is reached.

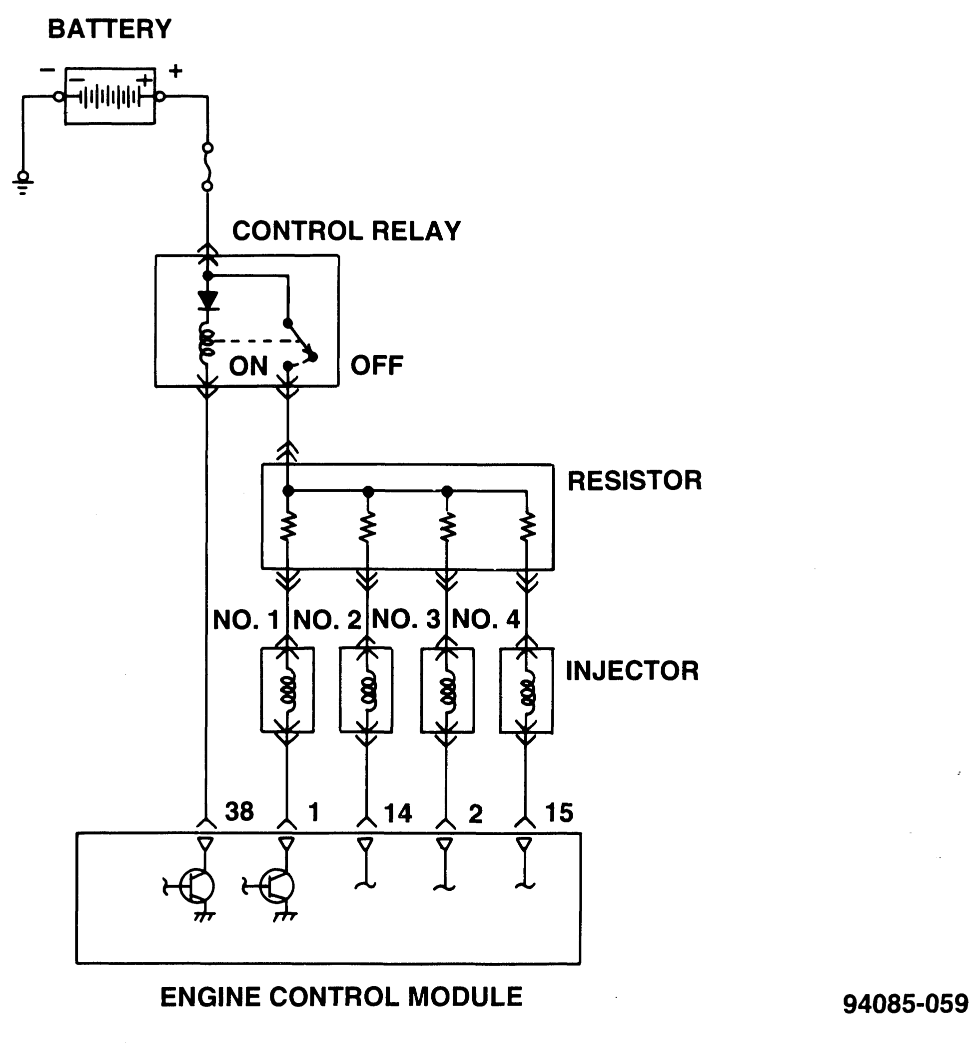


Figure 57 Fuel Injector Circuit

Diagnosis

A DTC 41 (OBD II P 0201 through P 0204, depending upon the injector) is set in memory for an open or short in any one of the fuel injectors whenever the ECT sensor indicates a temperature over 135°F. An engine running actuator test can be performed with the DRB III scan tool to individually turn on and turn off each injector, one at a time. Also, the DRB III scan tool displays injector pulse width in milliseconds.

Idle Air Control Motor (IAC)

The IAC motor consists of a stepper motor and a pintle, and is mounted on the throttle body (fig. 58). The ECM extends or retracts the pintle to control the amount of air that bypasses the throttle blade to control idle speed (fig. 59). A thermal wax pellet (fast-idle air valve) and a basic idle-speed screw also control bypass air (fig. 60).

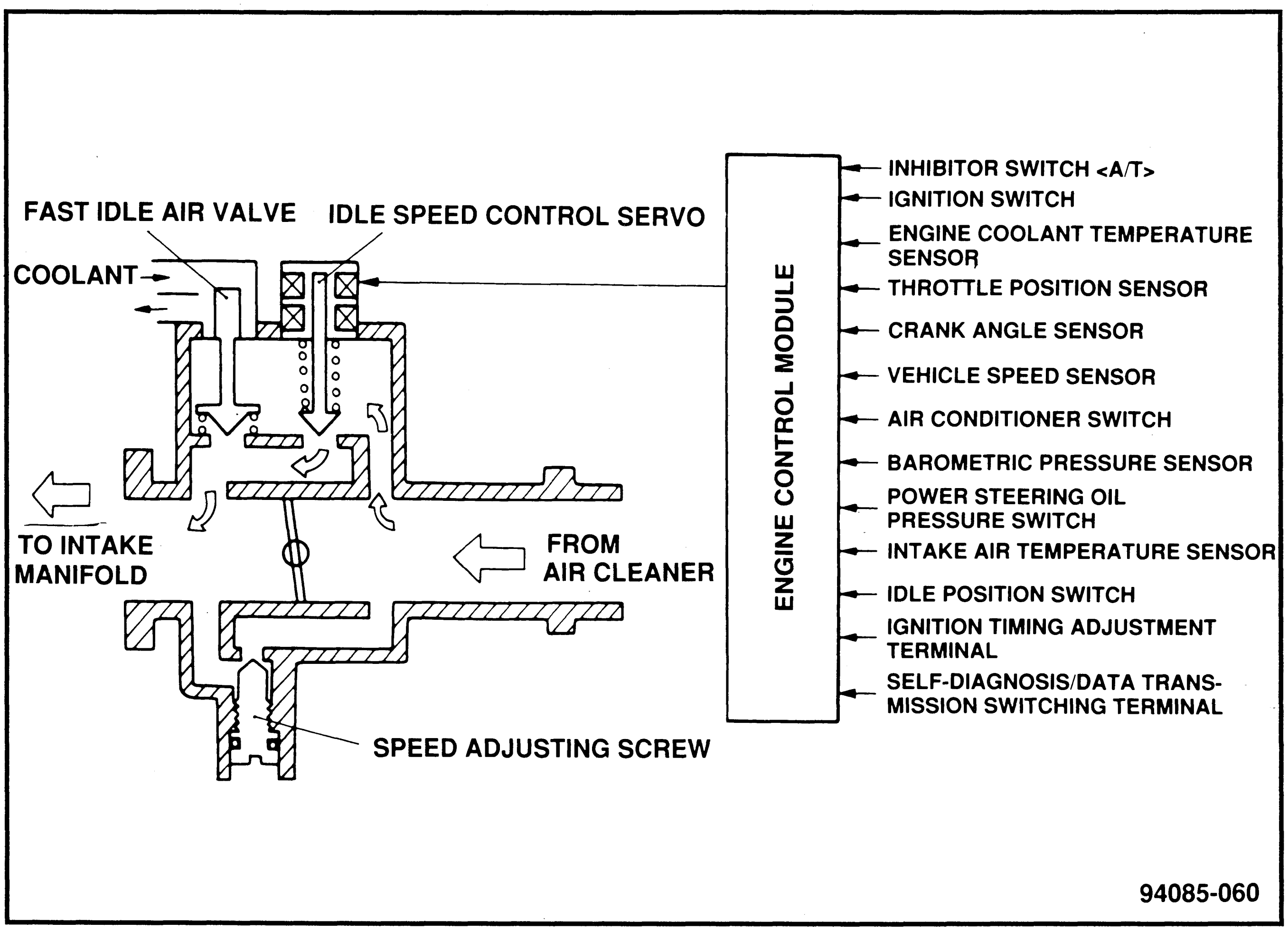


Figure 58 Idle Control

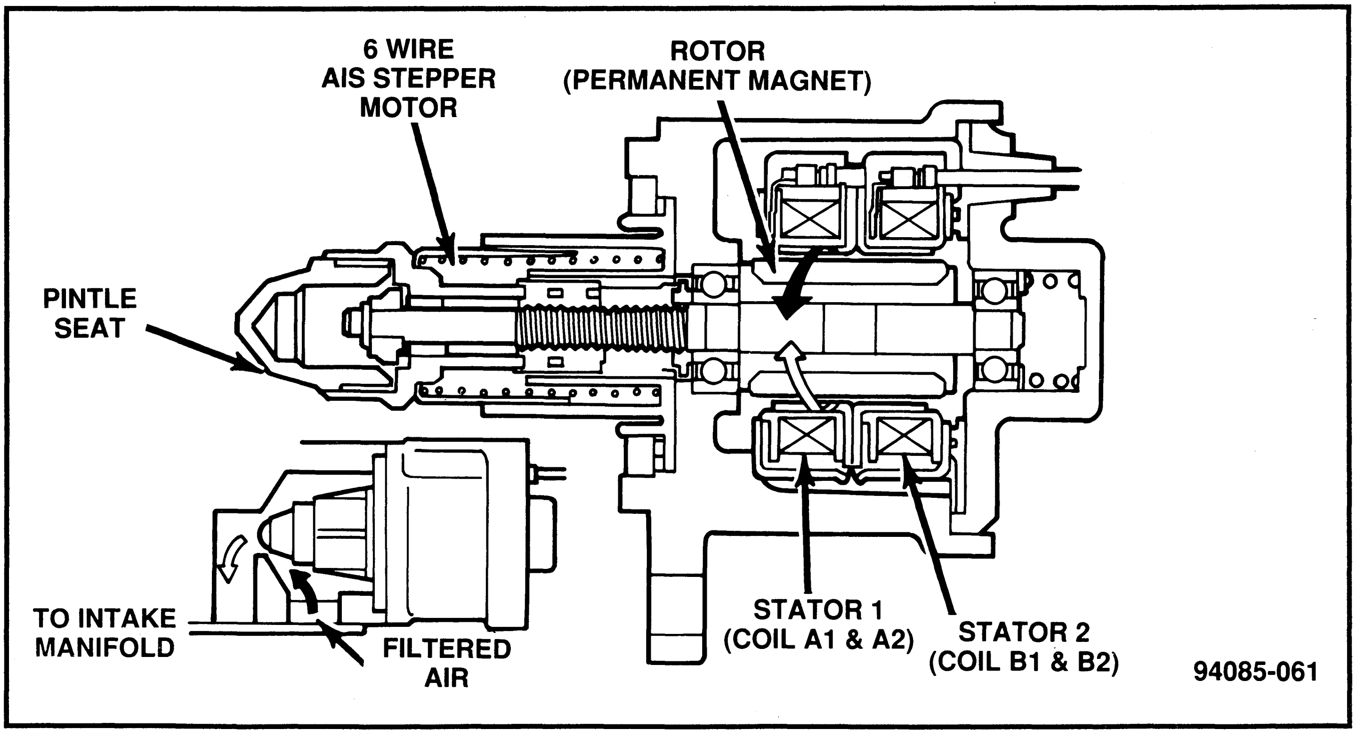


Figure 59 Idle Air Control Stepper Motor

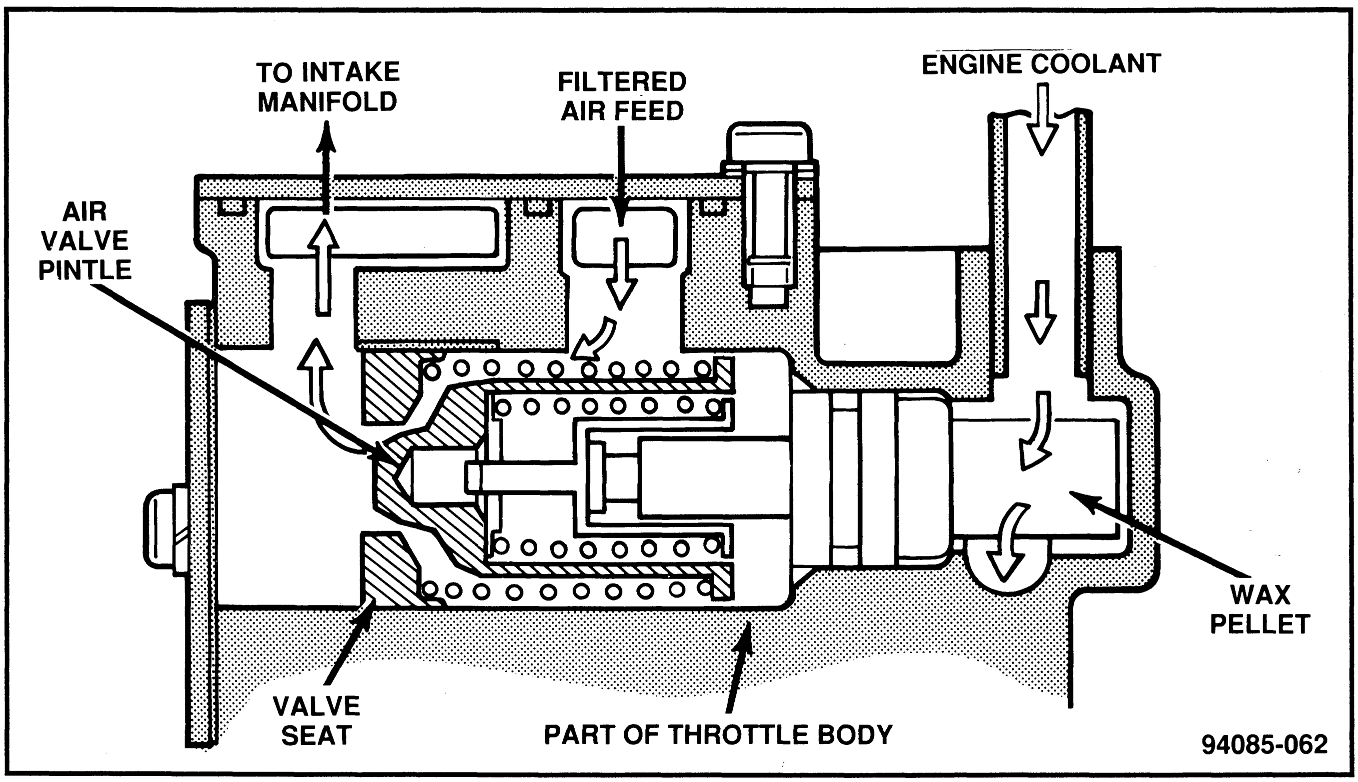


Figure 60 Fast-Idle Air Valve

The IAC motor is fed battery voltage from the MFI relay, and the ECM controls the ground circuits at pin 4 (DG/RD), pin 5 (GR/BL), pin 17 (DG/BK), and pin 18 (DG/YL). There are two coils in the IAC motor that the ECM controls that turn the motor to extend or retract the pintle (fig. 61).

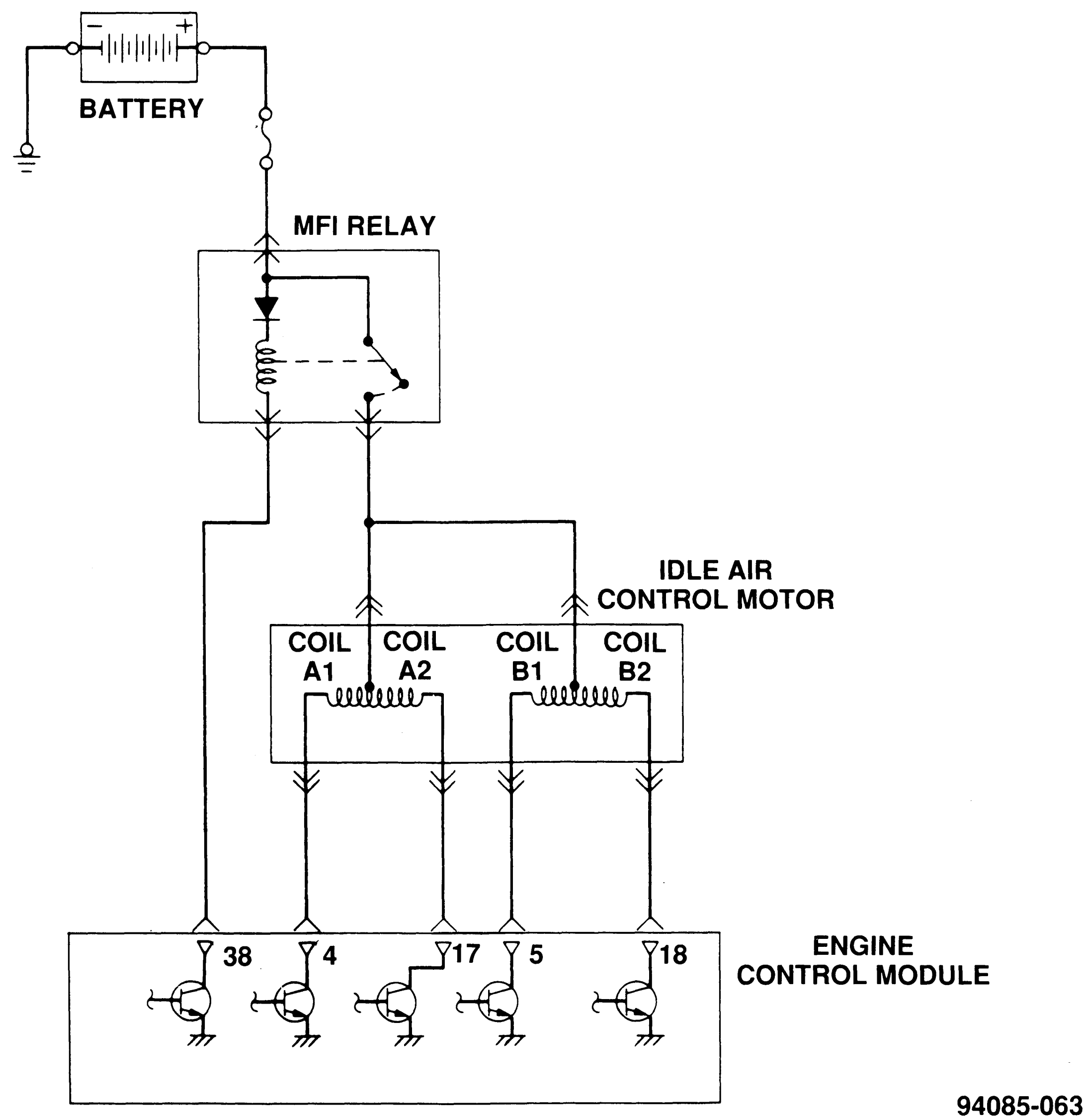


Figure 61 Idle Air Control Motor Circuit

The thermal wax pellet (fast-idle air valve) is coolant-controlled to control fast idle. The thermal wax pellet should be fully closed when engine coolant temperature reaches 122°F. The basic idle-speed screw is used to control minimum air flow through the throttle valve, and is adjustable. (See Adjustment Section.)

Diagnosis

An idle speed control OBD II DTC P 0505 is set in memory if the actual idle speed is greater than 300 RPM above the target idle RPM for 10 seconds, or if the target idle RPM is less than 120 RPM below the target idle rpm for 10 seconds. Any of the three items listed above that control idle speed, a misadjusted accelerator cable, or a vacuum leak could cause the DTC. The IAC steps can be checked with the DRB III scan tool. The range of steps is from 0 to about 120 steps. Remember that this display is only a software counter. The ECM resets the IAC motor counter whenever the battery feed to the ECM is disconnected. After a battery disconnect, conduct a quick test by turning the key on and listening for a ratcheting sound from the IAC when it is reset.

Test the four ground wires for the IAC motor at the ECM with a voltmeter by watching to see that the voltage cycles between 0 and 12 volts with the engine running. The resistance of the IAC motor stepper coils can be checked by disconnecting the ECM, and measuring between ECM terminal 12 and terminals 4, 5, 17, and 18. The resistance values should range between 28-33 ohms.

Turbocharger Operation

Engine performance is limited to the amount of air an engine can consume. The turbocharger is designed to increase the volume of air flowing into the engine. Garrett Air Research manufactures the turbocharger for MMC. The turbine and compressor are designed to provide a large amount of air movement in a relatively short period. The maximum amount of air volume is controlled by a pressure regulation device called a "wastegate".

Manifold pressure is applied to the wastegate actuator, which is spring-loaded closed. The wastegate actuator opens (allowing exhaust gasses to bypass the turbine) when the boost pressure overcomes the spring pressure. The wastegate actuator opens at 6-11 psi with a manual transaxle, and 5-10 psi with an automatic transaxle.

Teed into the pressure hose that goes to the wastegate actuator is the wastegate solenoid (fig. 62). The wastegate solenoid is located in the right front area of the engine compartment, below the air cleaner. The function of the wastegate solenoid is to bleed off some of the pressure going to the wastegate actuator in order to allow the boost pressure to go higher than the wastegate actuator setting.

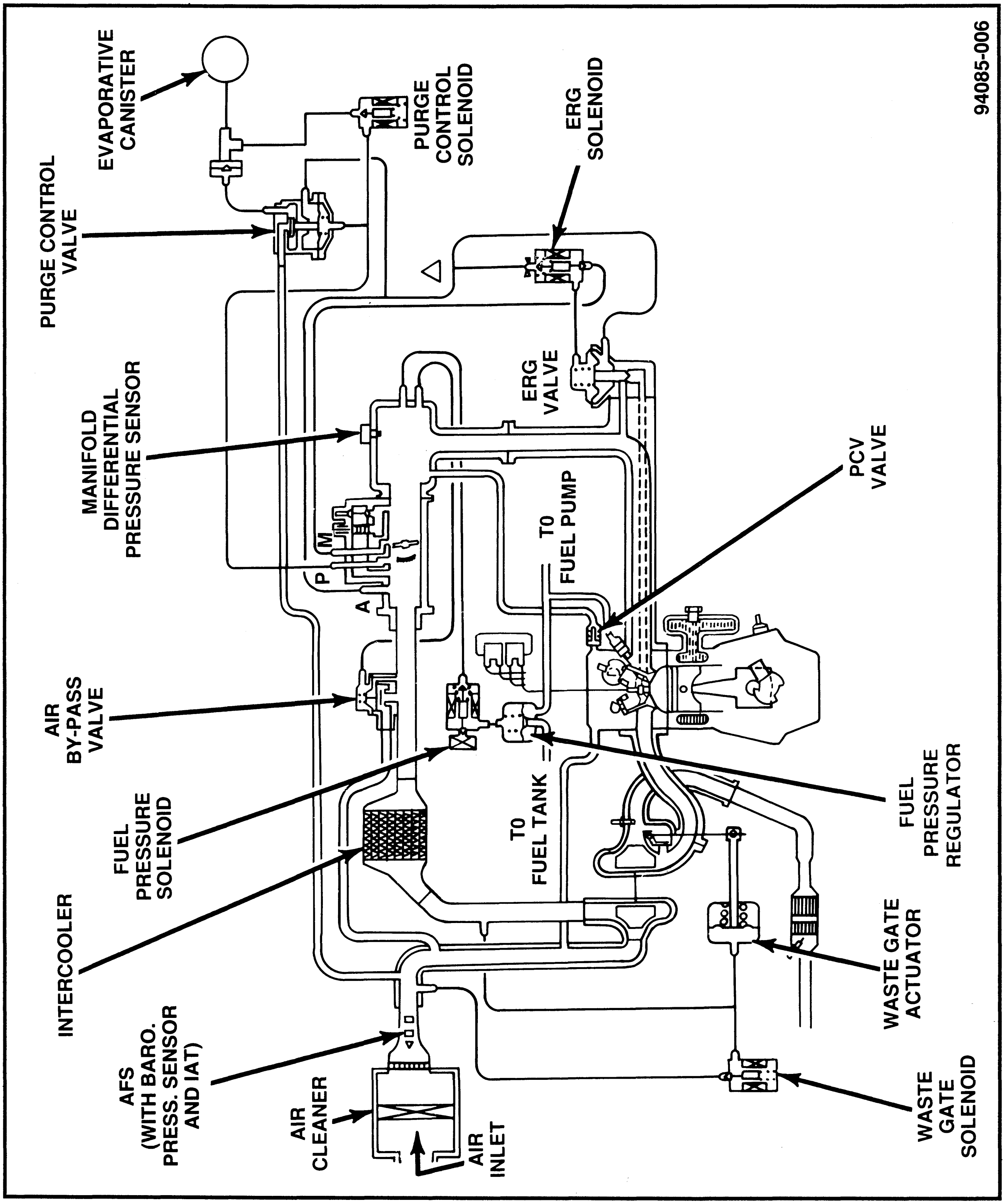


Figure 62 Turbocharger Hose Routing

The wastegate solenoid is spring-loaded closed, which means that if the solenoid is not energized, the maximum boost pressure that can be achieved is the same as the wastegate actuator setting. If the solenoid is energized, some of the boost pressure going to the wastegate actuator will be bled off into the air cleaner, allowing the engine to achieve higher boost pressure than the wastegate actuator setting. The wastegate solenoid can bleed off about 2-3 psi of pressure.

An intercooler is placed between the turbocharger compressor and the throttle body. the function of the intercooler is to cool the compressed air, causing the air to become more dense. Engine performance improves as the input air becomes more dense.

An air bypass valve is positioned between the intercooler and the throttle body. the air bypass valve, when open, causes the boost pressure to bypass the throttle body and dump into the turbocharger inlet hose. The valve is used to prevent pressure build-up behind the throttle blade in the event that the turbocharger is providing a large flow of air when the throttle valve is closed (quick deceleration from a WOT cruise) (fig, 63).

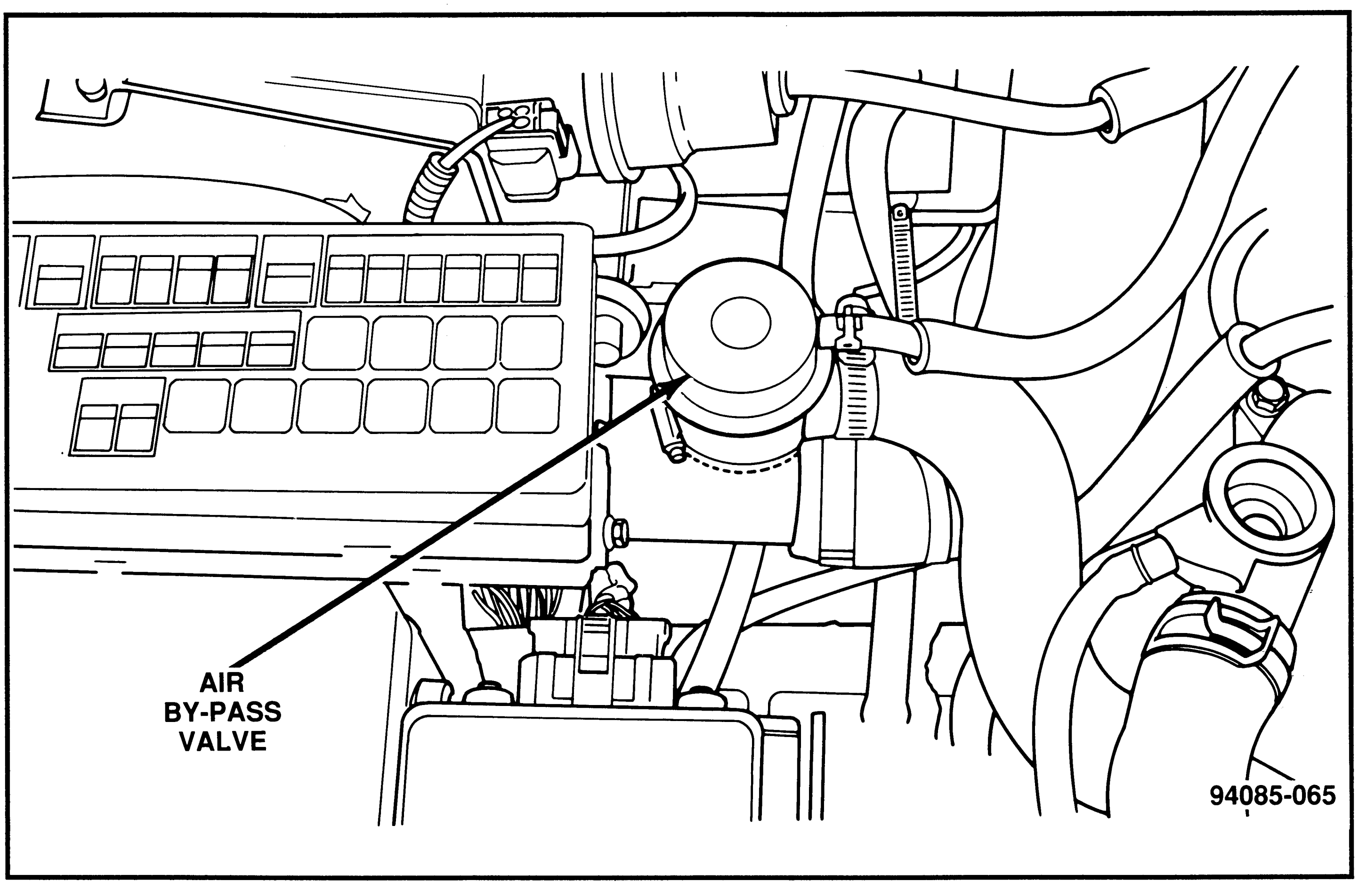


Figure 63 Air Bypass Valve

Battery voltage is fed to the wastegate solenoid from the MFI relay and the ECM supplies the ground at ECM pin 11 (RD/YL) (fig. 64). The ECM duty cycles the wastegate solenoid to achieve the desired boost pressure. The ECM de-energizes the wastegate solenoid if there is a VAF sensor failure, a Knock Sensor failure, or if the ECM detects detonation from the Knock Sensor. Premium unleaded fuel should always be used with this engine.

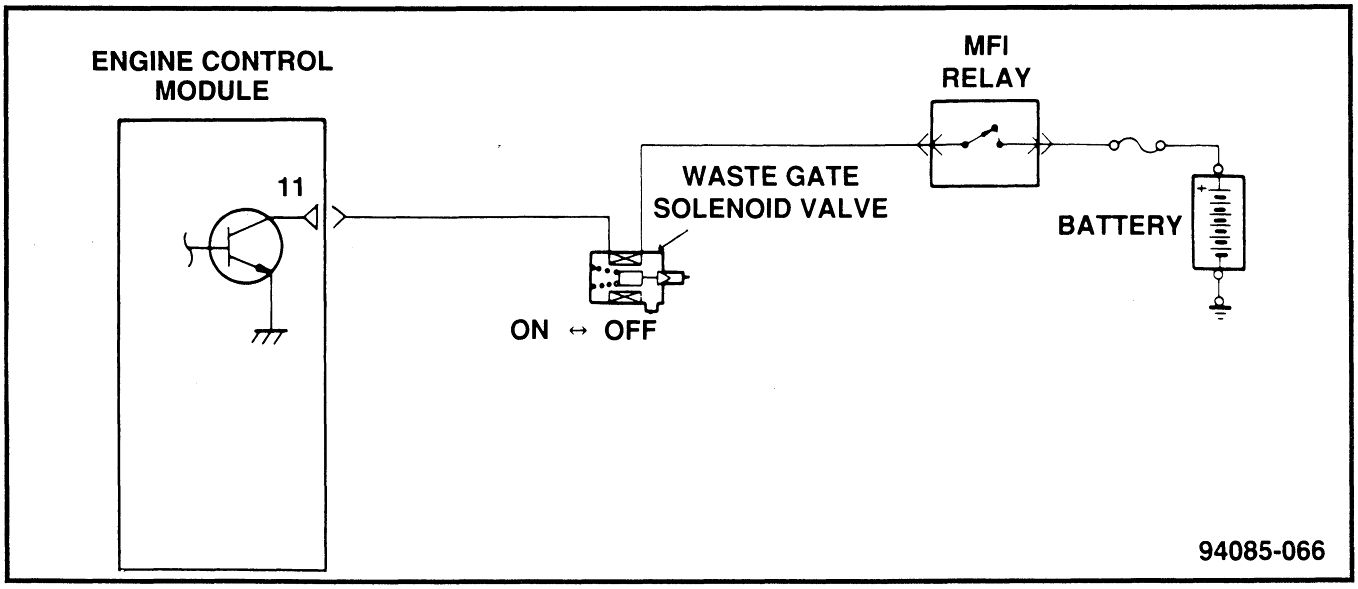


Figure 64 Wastegate Solenoid Circuit

Diagnosis

An actuator test can be performed using the DRBIII scan tool. The ECM energizes and de-energizes the wastegate solenoid every 6 seconds, for up to 5 minutes. If the solenoid clicks, you can assume the electrical portion of the circuit is good. If it does not click, check the voltage at ECM pin 11; it should be close to battery voltage with the key on. Grounding this terminal should cause the solenoid to click. The solenoid resistance value should be 36-44 ohms.

When performing the actuator test, connect a hand vacuum pump to the wastegate solenoid port that goes to the wastegate actuator. It should hold vacuum with the solenoid off, and bleed vacuum with the solenoid on. This checks the mechanical portion of the solenoid.

EGR System

The EGR system consists of an EGR valve and an EGR solenoid. The EGR solenoid is located on the bulkhead, behind the engine (fig. 65). The EGR valve is attached to the bottom of the intake manifold.

The valve that is used on the turbocharged engine is a two-port valve. One port opens the valve when a vacuum is applied to the diaphragm; the other keeps the valve closed when boost pressure is applied to the diaphragm.

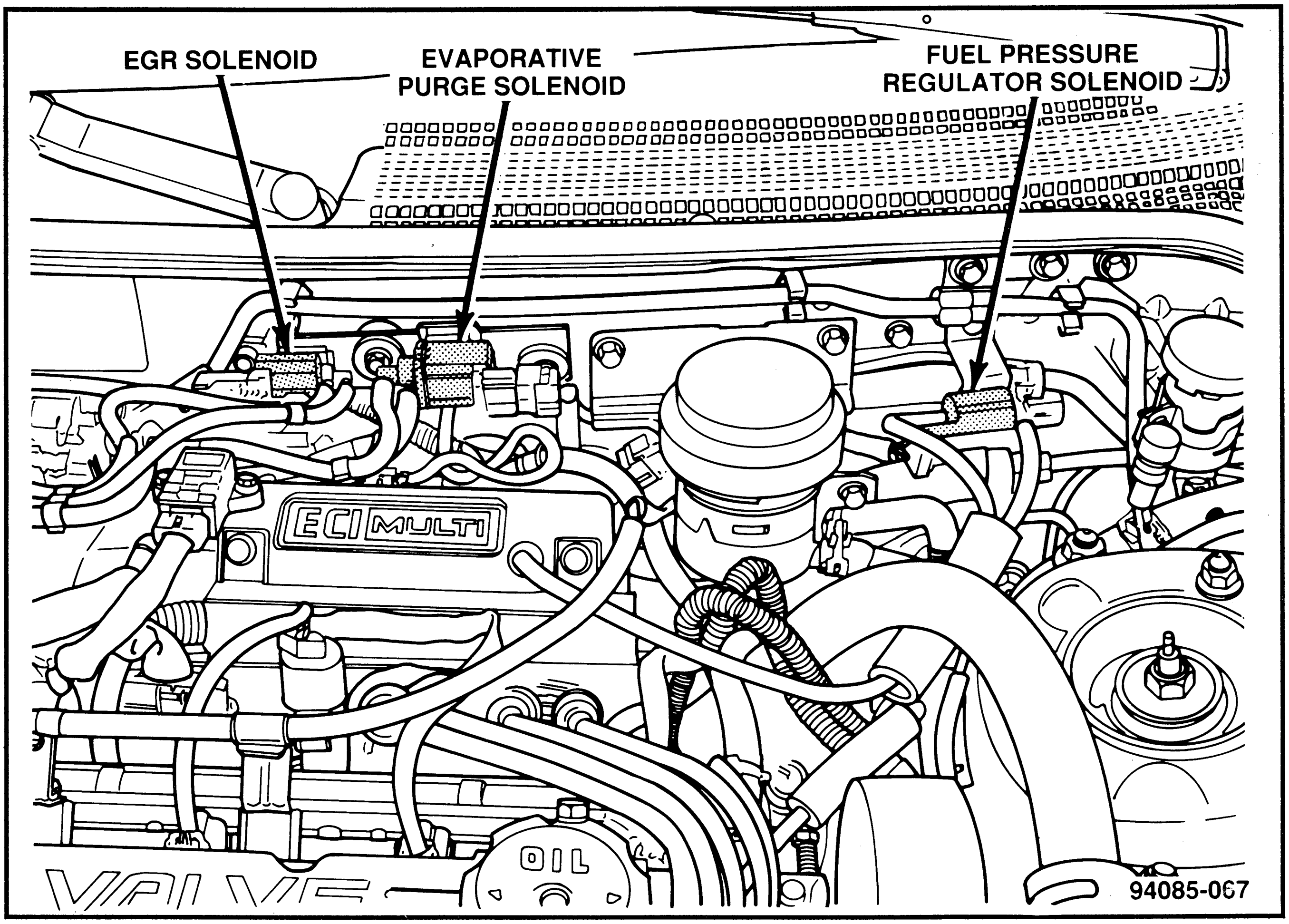
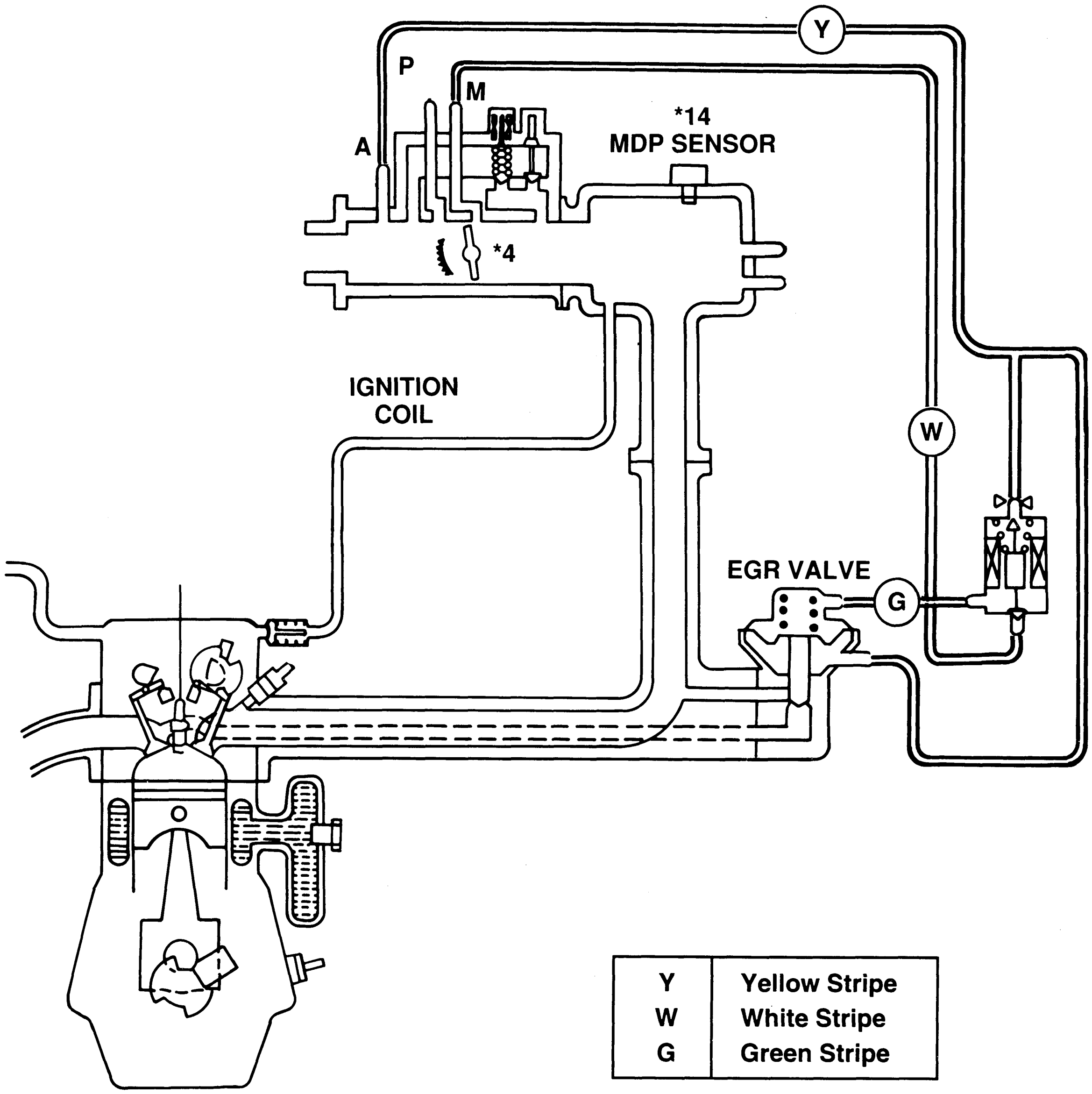


Figure 65 EGR Solenoid

The solenoid has three ports. One port is connected to manifold vacuum; one is connected to the top of the EGR valve; and the third is connected to a port in the intake manifold, above the throttle blade (fig. 66). This port is also "teed" into the lower port of the EGR valve.

The EGR solenoid is duty cycled, based on information provided by the ECT sensor and engine load. The EGR solenoid is duty cycled to control the amount of manifold vacuum reaching the EGR valve. When in boost, equal pressure is applied to both ports of the EGR valve, keeping it closed.



Y	Yellow Stripe
W	White Stripe
G	Green Stripe

Figure 66 EGR System

With the solenoid de-energized, the ports are connected, bleeding off the manifold vacuum. When the solenoid is energized, the ports are "blocked," allowing manifold vacuum to open the EGR valve.

The MFI relay supplies battery voltage to the EGR solenoid, and the ground is supplied through the ECM on pin 6 (LG/RD) (fig. 67).

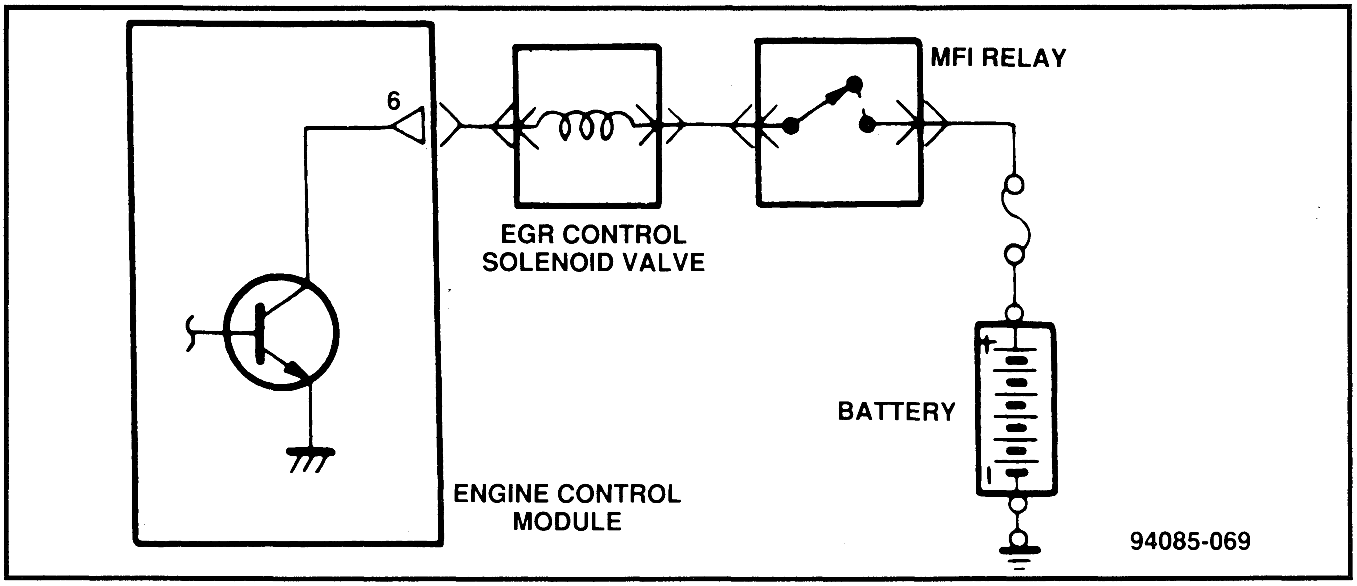


Figure 67 EGR Solenoid Circuit

Diagnosis

An actuator test can be performed with the DRB III scan tool. The ECM energizes and de-energizes the solenoid every 6 seconds, for a maximum of 5 minutes. A hand vacuum pump can be used to test the mechanical operation of the valve. The EGR solenoid resistance value should be 36-44 ohms.

EGR System Monitor (EGR Flow Malfunction)

The MDP sensor is monitored to detect a malfunction in the EGR system, as required by OBD II, during the following conditions:

- ECT sensor must be indicating a temperature greater than 180°F
- Calculated engine load must be less than 15%
- Engine speed must be 1,000-2,000 rpm
- The CTP switch must be ON (closed throttle)

When the above conditions are met, the EGR solenoid is energized for 1 second, and the ECM will look for a minimum of about 0.5 in. of vacuum change. This test must fail two consecutive "trips" for a DTC to occur. (The conditions must be met and the test performed twice, and it must fail two consecutive times for DTC 43 (OBD II P 0400) to be stored.)

Radiator/Condenser Fan Relays

The radiator and condenser fan relays are located in the centralized junction in the engine compartment. The 2.0L with a manual transaxle uses an 120W dual speed radiator fan motor, where as the automatic transaxle versions use a two speed 160W motor. The ECM operates the relays based on inputs from the engine coolant temperature sensor, vehicle speed sensor, and A/C system.

The ECM supplies the ground circuit for both the high speed radiator fan and condenser fan relays electromagnet through pin 20. The low speed radiator fan relay is controlled through pin 21 and the low speed condenser fan relay is controlled by the A/C sense circuit (fig. 68 and 69).

The Talon's two speed radiator fan motor is equipped with four fan motor brushes, two of which are fed battery voltage. One brush is fed battery voltage from the LO speed fan relay and the other brush is fed battery voltage from the HI speed fan relay. The two remanding brushes are connected directly to a chassis ground if the vehicle is equipped with a manual transaxle. If the vehicle is equipped with an automatic transaxle, one brush is connected directly to a chassis ground while the other is connected to an additional HI speed fan relay.

To be able to achieve two separate fan speeds, the ECM energizes either the LOW speed relay to provide LOW speed or both relays to provide HIGH speed (all three if equipped with an automatic transaxle). The ECM supplies the ground circuit for the LOW speed fan relay's electromagnet through pin 21 and the HIGH speed fan relay(s) electromagnet through pin 21 (fig. 68 and 69).

Battery voltage is provided to both of the fan relay's contacts through a fuse located in the centralized junction. When the ECM energizes the LO fan speed relay, current flows through the contacts of the relay to the fan motor's LO speed brush providing a LO speed operation of the fan motor. HIGH speed is accomplished by the ECM energizing both the LOW speed and the HIGH speed relays (all three if equipped with an automatic transaxle). When this occurs, current flows to both LOW speed and HIGH speed fan motor brushes.

When operating in the LO fan speed mode, current flows through one positive brush and two negative brushes if equipped with a manual transaxle. In reality, this provides a medium speed. On vehicles equipped with automatic transaxles, energizing the LO fan speed relay allows current to flow through one positive brush and only one negative brush which provides only one path to ground and gives a true "LO" speed. During HI speed mode, both positive brushes and negative brushes are providing current flow in both the automatic and manual transaxle vehicles. Table 5 provides radiator and condenser fan operating speeds and conditions.

The condenser fan motor operates very similar to the radiator fan motor. Talons equipped with A/C use a two speed condenser fan motor. The condenser fan motor is controlled by two relays, a LOW speed relay and a HIGH speed relay. Both relays are located in the centralized junction.

The LO speed relay's electromagnet is provided battery voltage by the A/C switch and is grounded continuously. The HI speed fan motor relay's electromagnet is fed battery voltage through a fuse and the ground side is controlled by the ECM through pin 20 which is the same pin as the HI speed radiator fan motor relay's circuit (fig. 68 and 69).

Battery voltage is provided to both of the relay contacts through a fuse located in the centralized junction. When all of the appropriate inputs to the automatic A/C control module indicate that the A/C compressor should be functioning, battery voltage is supplied to the condenser fan motor's LO speed relay. When the relay is energized, current flows through the relay contacts to the condenser fan motor's LO speed brush. If HI speed is desired by the ECM, the ECM energizes both the HI speed and LO speed fan relays. When this occurs, current flows to both the LO speed and HI speed brushes.

Diagnosis

Two separate actuator tests can be performed with the DRB III scan tool. The ECM energizes and de-energizes the fan motor relay high or low speed circuit every 6 seconds for a maximum of 5 minutes. If the fan motor relays do not click and the fans do not come on, check for battery voltage at ECM pins 20 for high speed or 21 for low speed, the relay should click and the fans should operate at the appropriate speed.

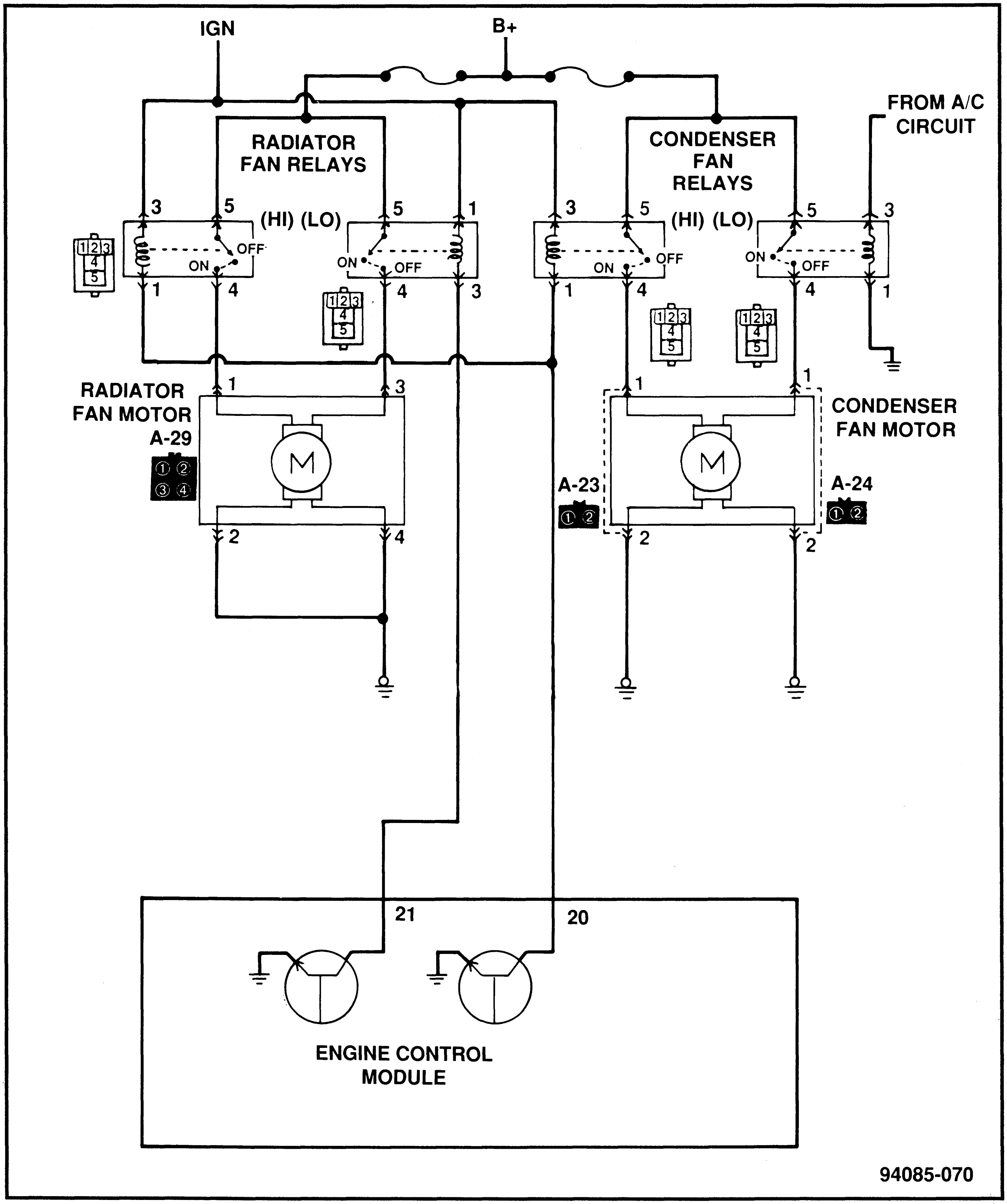


Figure 68 Manual Transaxle Radiator Fan Relay Circuits

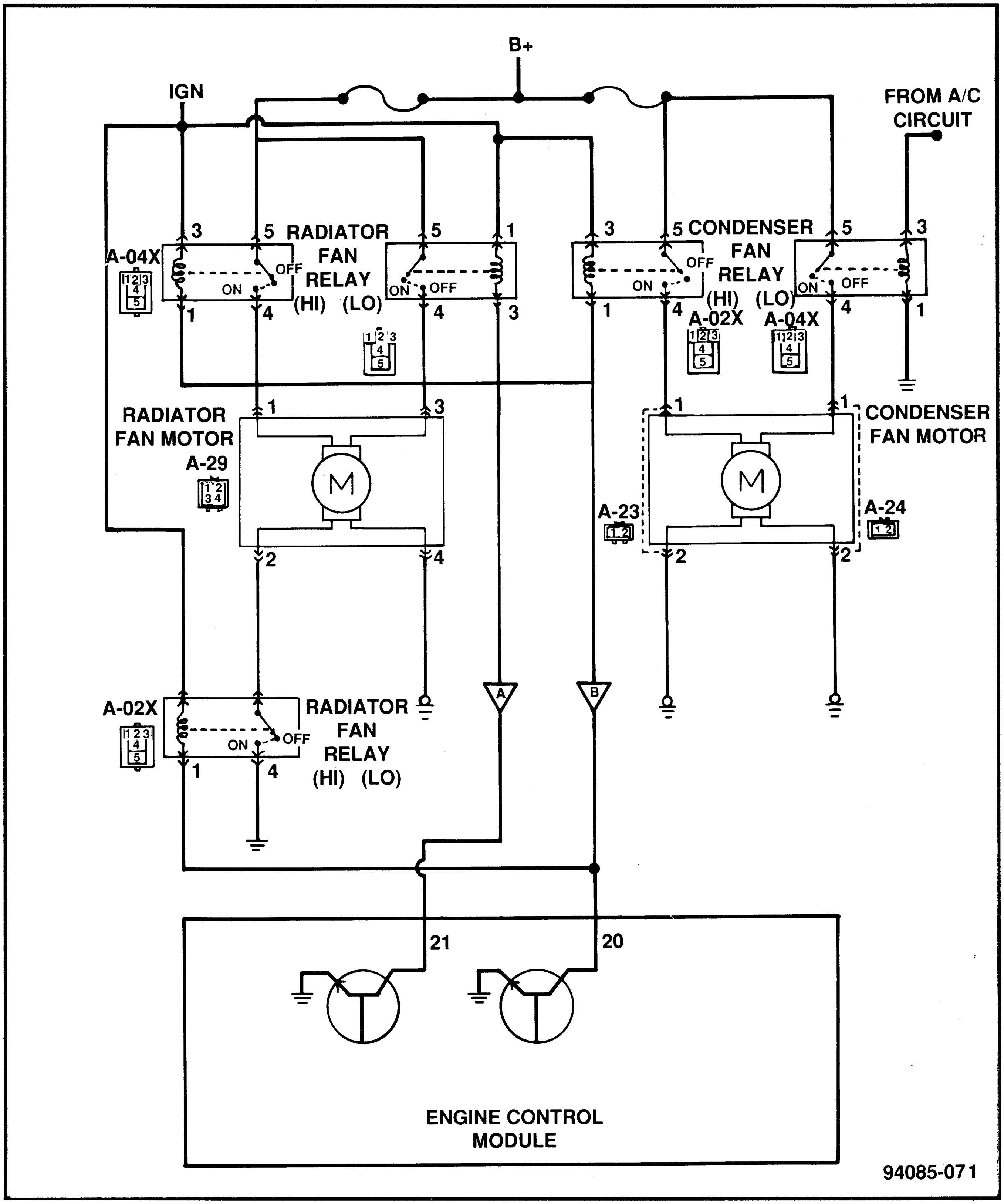


Figure 69 Automatic Transaxle Radiator Fan Relay Circuits

Table 5. Radiator and Condenser Fan Operation

A/C SWITCH POSITION	VEHICLE SPEED	ENGINE COOL. TEMP	LOW FAN RELAY	HI FAN RELAY	A/C COMP.	RAD. FAN SPEED	COND. FAN SPEED
OFF	0-28 mph	Under 203°F	OFF	OFF	OFF	OFF	OFF
		203°F to 212°F	ON	OFF	OFF	LOW	OFF
		Over 212°F	ON	ON	OFF	HI	LOW
	28-50 mph	Under 203°F	OFF	OFF	OFF	OFF	OFF
		203°F to 212°F	ON	OFF	OFF	LOW	OFF
		Over 212°F	ON	ON	OFF	HI	LOW
	Over 50 mph	Under 212°F	OFF	OFF	OFF	OFF	OFF
		Over 212°F	ON	ON	OFF	HI	LOW
ON	0-12 mph	Under 212°F	ON	OFF	ON	LOW	LOW
		212°F to 239°F	ON	ON	ON	HI	HI
		Over 239°F	ON	ON	CUT	HI	HI
ON	12-28 mph	Under 212°F	ON	OFF	ON	LOW	LOW
		212°F to 239°F	ON	ON	ON	HI	HI
		Over 239°F	ON	ON	CUT	HI	HI
	Over 50 mph	Under 212°F	OFF	OFF	ON	OFF	LOW
		212°F to 239°F	ON	ON	ON	HI	HI
		Over 239°F	ON	ON	CUT	HI	HI

Manual transaxle radiator fan operation - LOW = MEDIUM

A/C Clutch Relay

Like the radiator fan relays, the A/C clutch relay is located in the centralized junction under the hood. The ECM will supply a ground for the A/C relay on pin 22 (DG) (fig. 70). Relay operation is based upon inputs that the ECM receives from the air conditioning request circuit. The ECM energizes the A/C relay under the following conditions:

- Battery voltage is present on ECM pin 45 (A/C request ON from A/C compressor control module)
- Engine speed is above 450-500 rpm
- Once the A/C request input is seen from the A/C compressor control module, the A/C clutch is delayed about 1 second to allow the IAC motor to open
- TPS voltage is less than 4 volts

Diagnosis

The ECM must see the A/C request input. (See A/C Components Section.) The DRB III scan tool displays the A/C request (switch) input and the status of the A/C clutch as either ON or OFF. Key on - engine off check for battery voltage at ECM pins 45 and 22 with the A/C switch on. With the engine running, the voltage on ECM pin 22 should drop from battery voltage to 0-1 volt with the A/C clutch engaged. (See Group 24 of the Service Manual for additional diagnostics for the A/C clutch relay circuit.)

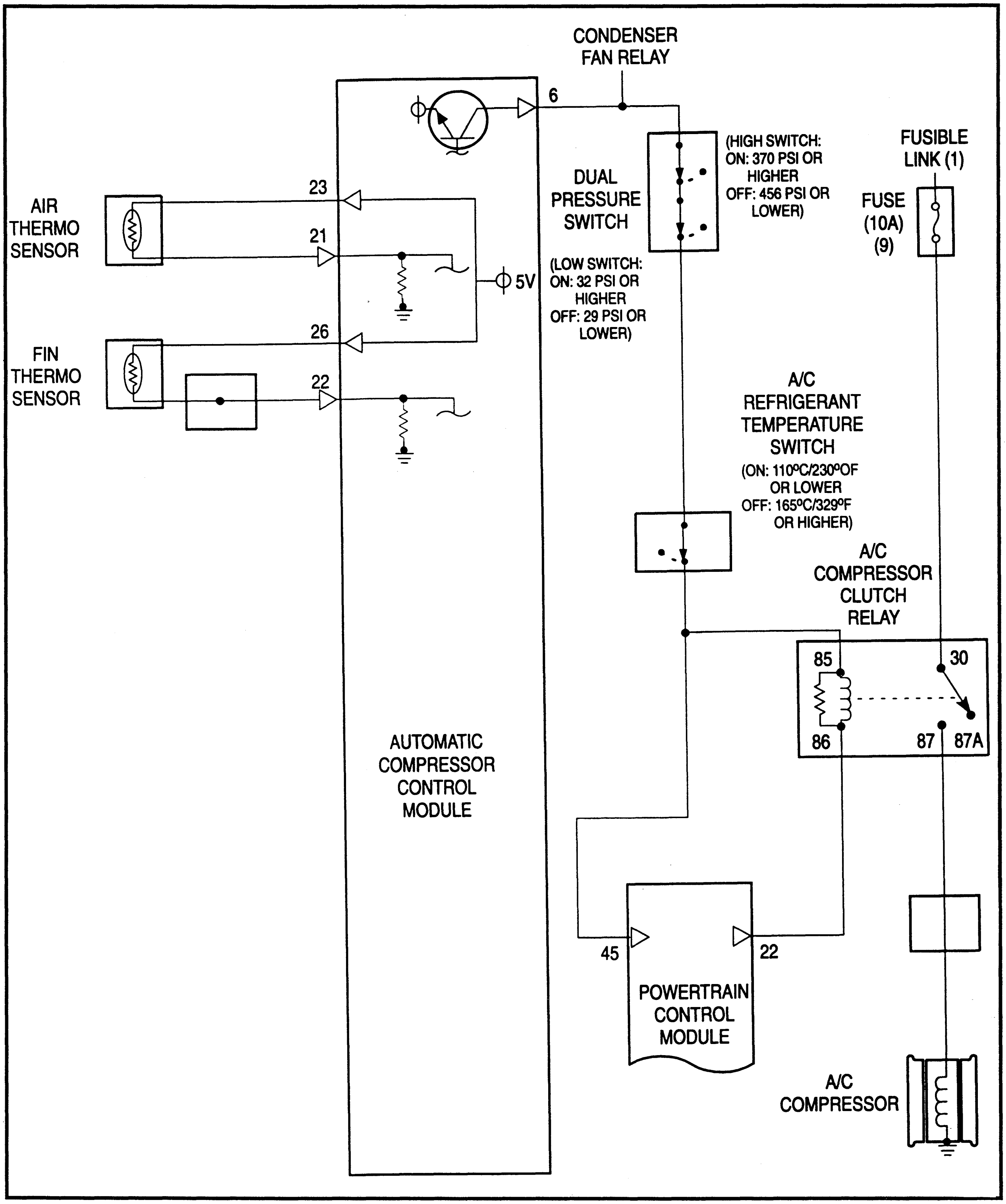


Figure 70 A/C Clutch Circuit

Boost Meter

The boost meter on the dash is controlled by the ECM through pin 16 (RD/BK) (fig. 71). The boost meter is fed battery voltage from fuse 8 (10 amp) in the fuse box, and the ECM controls the ground side of the boost meter. The boost meter is a positive/negative pressure meter (not a vacuum/boost gauge). It reads high negative pressure with high engine vacuum, and high positive pressure with high boost pressure. The boost meter is controlled by the ECM, based upon the VAF sensor input.

Diagnosis

The ECM acts like a sending unit for the boost meter by controlling the ground circuit. With high engine vacuum, the voltage at ECM pin 16 is high, and with high boost pressure, the voltage is low. Momentarily grounding ECM pin 16 should cause the boost meter to read maximum positive pressure.

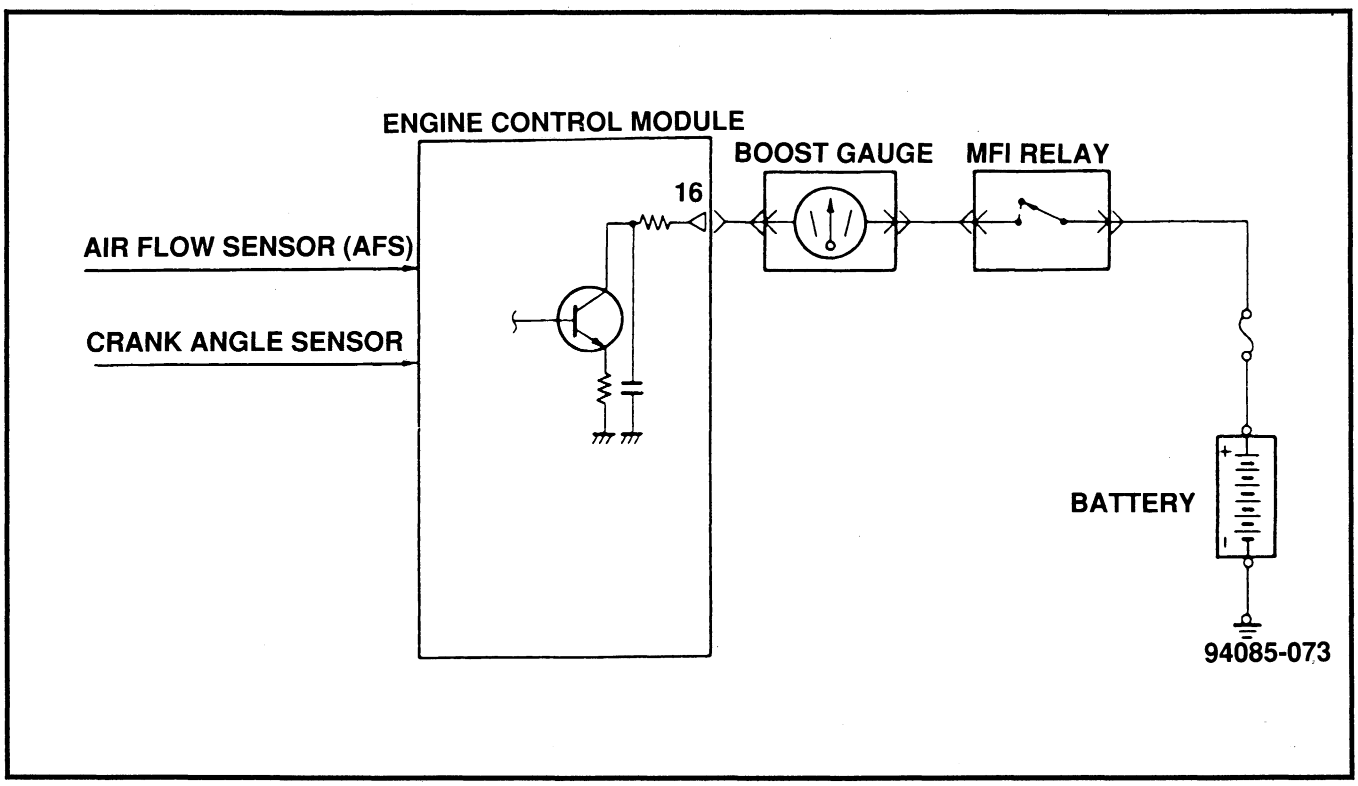


Figure 71 Boost Meter Circuit

Generator G Terminal

This circuit connects the G terminal of the generator to ECM pin 33 (WT) (fig. 72). The ECM can regulate the charging system voltage between 12.3 and 14.4 volts. The purpose of this circuit is to prevent a sharp drop in idle speed due to a sudden high electrical load.

The ECM varies the duty cycle on ECM pin 33 to control the power transistor in the internal voltage regulator of the generator. When the ECM turns off ECM pin 33, the power transistor will be on (full-fielded). The maximum authority the ECM has over charging system voltage is 14.4 volts. If the charging system voltage exceeds 14.4 volts, the internal voltage regulator turns the power transistor off. In addition, if the charging system voltage falls below 12.3 volts, the internal voltage regulator turns on the power transistor. The ECM simply "slows down," or suppresses, the full-fielding of the generator during high electrical load conditions to allow it to compensate with the IAC motor to prevent a drop in idle speed. The generator G terminal control is not used when the ECT sensor indicates a temperature below 122°F.

Diagnosis

Based upon the input from the Generator FR terminal, the ECM duty cycles the voltage on the G terminal between 0 and 2.5 volts. Grounding ECM pin 33 should cause the charging system voltage to drop to about 12.3 volts. If there is an open circuit on ECM pin 33, the charging system voltage increases to about 14.4 volts.

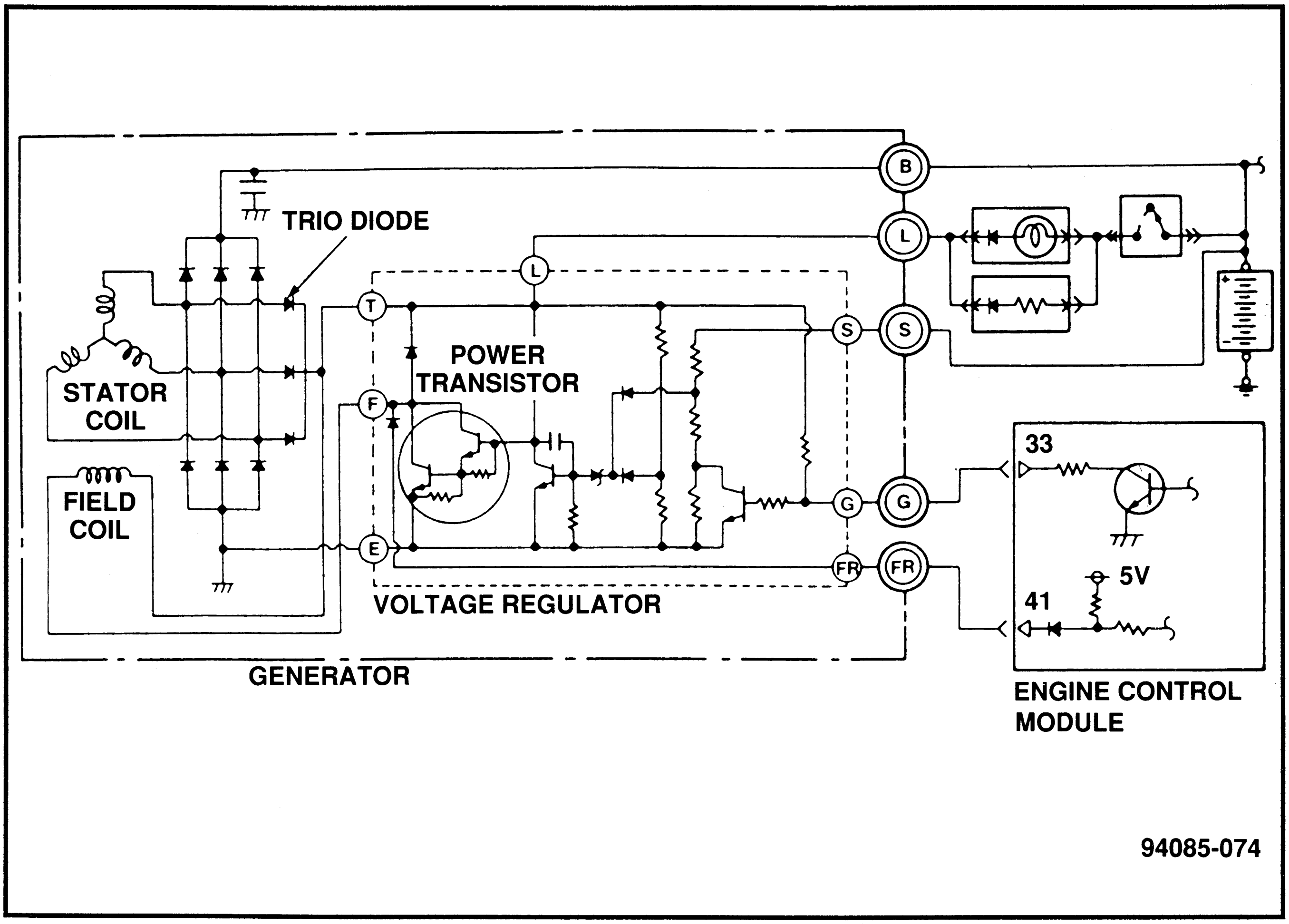


Figure 72 Generator Circuit

ADJUSTMENTS

***Note:** The following adjustments should be performed in the order listed, as some of the adjustments may affect the next adjustment.*

Fixed SAS and Accelerator Cable

The fixed Speed Adjusting Screw (SAS) is the screw on the throttle body with a locknut holding it in position. The main purpose of the screw is to prevent the throttle blade from closing completely and possibly binding in the throttle bore. This screw should not need adjustment during normal service procedures, but it is the basis for all of the other adjustments, and if it is turned, it will affect the other adjustments.

1. Ensure that the accelerator cable has some slack in it, and is not keeping the throttle from closing completely.

2. Loosen the locknut on the fixed SAS.

3. Loosen the fixed SAS by turning it counterclockwise until the throttle blade is completely closed. (There should be clearance between the fixed SAS screw and the throttle lever.)

4. Tighten the fixed SAS by turning it clockwise until it just touches the throttle lever; then turn the fixed SAS screw in an additional 1 turns.

5. Hold the fixed SAS screw in position to prevent it from turning, and tighten the locknut securely.

6. Adjust the accelerator cable so that there is 0.040-0.080 in. of play (manual transaxle) or 0.120-0.200 in. of play (automatic transaxle) in the cable by loosening the adjusting screws and sliding the plate until the specified amount of play is achieved. Then tighten the adjusting screws.

Closed Throttle Position Switch (CTP)/Throttle Position Sensor (TPS)

This system uses a four-wire throttle position sensor with the CTP switch incorporated into the TPS. The TPS voltage is not adjustable, but should be checked after adjusting the CTP switch. The CTP switch can be adjusted with the DRB III scan tool or with an ohmmeter. The procedure discussed here will be with the DRB III scan tool. (See the Service Manual Group 14 for the ohmmeter procedure.)

1. Insert a 0.025 in. feeler gauge between the fixed SAS screw and the throttle lever.

2. Loosen the TPS mounting screws, and turn the TPS fully, counterclockwise.

3. Connect the DRB III scan tool to the DLC, and turn the key on. View the CTP switch. The display should be "closed" at this time.

4. Slowly turn the TPS until the display on the DRB III scan tool reads "open."

5. Tighten the TPS mounting screws securely.

6. View the TPS voltage with the DRB III scan tool. The TPS voltage should be 0.40-1.0 volt.

7. Remove the feeler gauge, and turn the key off.

Ignition Timing

Note: *The scan tool must be disconnected from the 16-way DLC connector when checking ignition timing. With the scan tool connected to the DLC and the ignition timing adjustment grounded, the ECM sets the engine at the basic idle speed setting* ***NOT*** *basic timing.*

1. ECT sensor should be indicating a temperature between 176-205°F.

2. All accessories must be off.

3. Automatic transaxle vehicles should be in Park.

4. Connect a timing light and a tachometer. (Do NOT use the DRB for a tach.)

5. Curb idle speed should be 750 rpm +/- 100 rpm.

6. Turn the key off, and connect a jumper wire to the ignition timing adjustment terminal and to ground. This terminal is located behind the engine, against the bulkhead. It is a BK/DG wire in a single-wire, brown connector with a cap protecting the terminal. Grounding this terminal sets the engine to basic timing. The MIL (Check Engine light) should illuminate when the engine is started.

7. Start the engine, and check ignition timing with a timing light. Basic timing should be 5° BTDC +/- 3°.

8. Basic timing on this engine is not adjustable. If the timing is not within specs, check the CKP sensor and the flux screening plate (shudder blades).

9. Disconnect the jumper wire, and reinstall the cap. With the ignition timing terminal ungrounded, the timing should advance.

Basic Idle Speed (Minimum Air Flow)

1. ECT sensor must indicate a temperature between 176-205°F.

2. All accessories must be off.

3. Automatic transaxle vehicles should be in Park.

4. Connect the DRB III scan tool to the 16-way DLC located under the instrument panel, below the steering column. View IAC motor steps and engine rpm.

5. Ground the ignition timing adjustment terminal with a jumper wire. (See basic timing adjustment for location.)

   Note: *With the DRB III scan tool connected to the DLC AND the ignition timing adjustment terminal grounded, the ECM sets the engine at the basic idle speed setting.*

6. Start the engine, and ensure that the IAC motor steps go to step 9.

7 Check engine speed with the DRB III scan tool. Basic idle speed should be 750 rpm +/- 50 rpm.

8. If the engine speed is not within specs, remove the rubber plug from the throttle body and adjust the basic idle speed screw. This is an air bypass screw, so turning it in closes off the bypass (decreases rpm), and backing it out will open the bypass (increases rpm).

9. If the correct idle speed cannot be achieved, ensure that the fixed SAS is set correctly, and the fast idle air valve is not open.

10. Reinstall the rubber plug, and disconnect the jumper wire from the timing terminal. Reinstall the cap to the timing adjustment terminal.

2.0L DOHC Turbo Fuel and Ignition

2.0L DOHC Turbo Fuel and Ignition

2.0L DOHC Turbo Fuel and Ignition

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