# 1987–88 D50 Truck Table of Contents

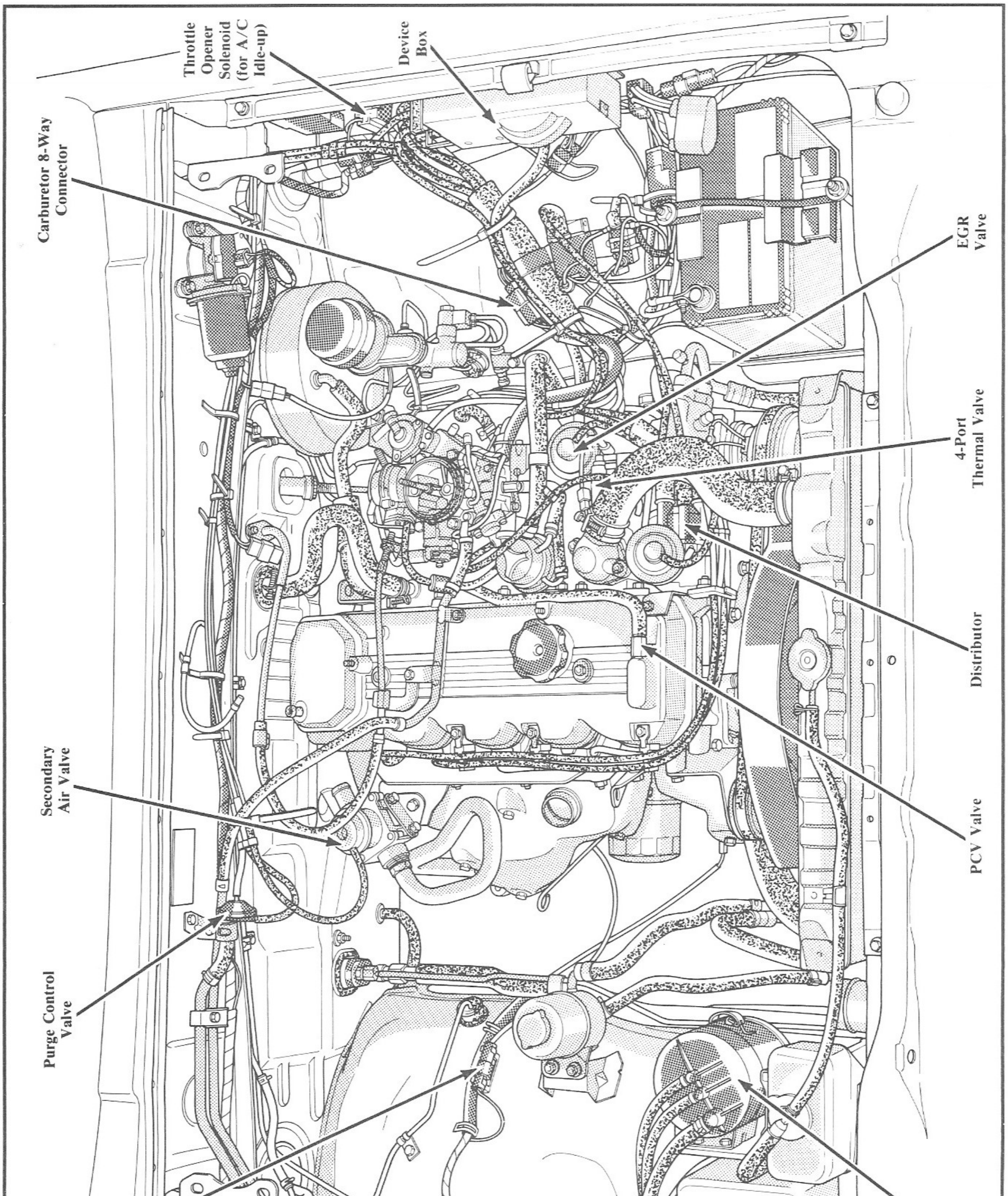


**Fig. 1 Underhood View (2.6L Shown)**

Tab 2

## Decel Solenoid

The Decel Solenoid is held in the Carburetor by a screw and a holder. The Decel Solenoid is mounted below the Throttle Opener. See Fig. 2. The Decel Solenoid gives the ECU control over the Idle Circuit. The Solenoid is spring-loaded closed (no Idle Circuit). Anytime the ignition key is "ON," 12 volts is fed to the Decel Solenoid on the BK/WT Wire which changes to a RD Wire at the Black 8-Way Connector by the Ignition Coil. The ground for the Decel Solenoid is provided by the ECU (pin 53) on the YL/DB Wire which changes to a DB Wire at the 8-Way Connector. Whenever the Solenoid is grounded, the Idle Circuit is opened and air and fuel are allowed to flow through.

The ECU will ground the Decel Solenoid anytime the key is "ON." This allows the engine to start. Once the engine is above 126°F, during decel and above 1800 RPM with the Idle Position Vacuum Switch (IPVS) Closed (0 Volts at ECU pin 5), the ECU ungrounds the Decel Solenoid. This fully shuts off the Idle Circuit. Below 1800 RPM, this system on the 2-Solenoid Carburetor will duty cycle the ground depending on engine RPM **during decel**. For example:

| Engine RPM (While Decelling) | Decel Solenoid Ground Wire (YL/DB) Voltage |
|---|---|
| 1800 or above (IPVS closed Idle off) | 14 volts (no Idle Circuit) |
| 1700 | 12 – 14 volts |
| 1500 | 9 – 12 volts |
| 1400 | 3 – 9 volts |
| 1300 | 0 – 2 volts |
| 1200 or below (IVPS closed Idle on) | Less than 1 volt (complete Idle Circuit) |

This helps to lean out decel emissions.

Anytime the key is turned "OFF," both the 12 volt feed, and the ground from the Solenoid by the ECU are removed. This helps reduce the possibility of engine run-on (dieseling).

### Quick Test

To test the Decel Solenoid, start the engine and let it reach operating temperature. With the engine running at Curb Idle, unplug the 8-Way Connector by the Ignition Coil. When this connector is unplugged, the engine should stall (the Idle Circuit has been shut off).

If the engine stalled, the Solenoid and the passages in the Carburetor are good. If the engine did not stall, this tells you that the Solenoid is probably stuck open and should be removed from the Carburetor and inspected.

It should be noted that the engine will start cold with a Decel Solenoid that is not passing air and fuel. This happens because a cold engine will be on Fast Idle, and an engine on Fast Idle will have fuel and air from the Idle Transfer and from the Primary Main Metering Circuits. As the engine warms up, the Fast Idle Breaker will close the throttle blade at 149°F and the engine will stall with no Idle Circuit.

BK/WT Black/White → RD Red
YL/DB Yellow/Blue → Bl Blue

## Notes

Idle Position Vac Switch won't close (=0volts) if vacuum (aqua hose) <10"Hg

Decrease idle speed (throttle opening) — Idle Too hi

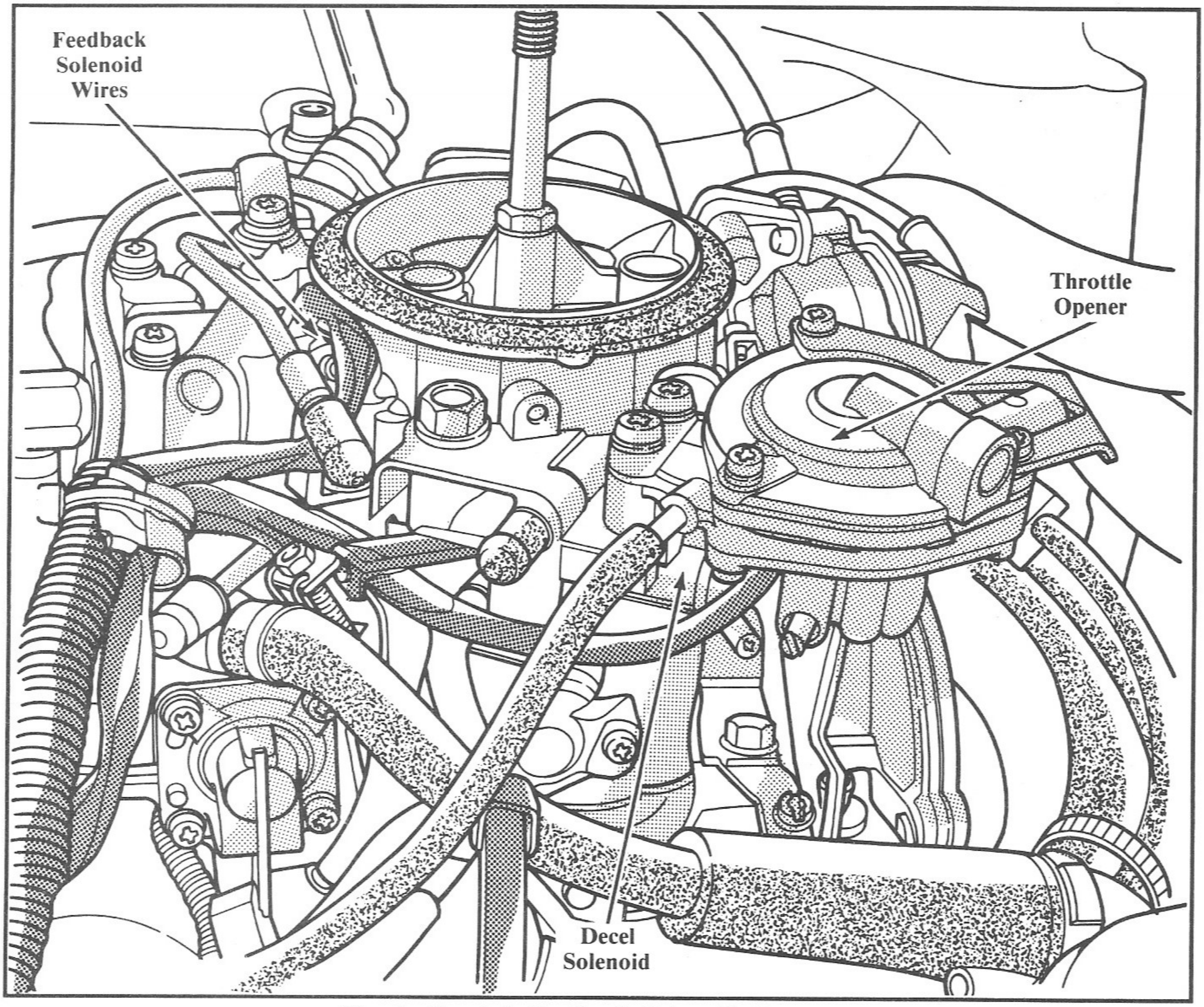


Fig. 2 Decel & Feedback Solenoids Location

## Notes

## Feedback Solenoid (Duty Cycle Solenoid)

The top of the Feedback Solenoid is mounted in the Air Horn, while the bottom of the Solenoid is mounted in the Float Bowl. See Fig. 3. The Feedback Solenoid gives the ECU the ability to do several things. But first, let's describe the differences in this Solenoid from previous MMC Carburetor Solenoids.

First of all, the Feedback Solenoid is similar to a Holley (6520) Duty Cycle Solenoid. That is, this Solenoid is spring-loaded **rich**. All other MMC Carburetor Solenoids are spring-loaded lean. Second, this Solenoid has 2 functions. The top portion of the Solenoid adds or blocks air to the Idle Circuit. The bottom portion of the Solenoid adds or blocks fuel from the Primary Main Metering Circuit. See Fig. 3.

The pintle in the Solenoid will do both things at the same time. The pintle is spring-loaded up, which will block additional air from being added to the Idle Circuit, and allow extra fuel to be added to the Primary Main Metering Circuit. See Fig. 3. In this way, the pintle will make both circuits richer.

When the Feedback Solenoid is grounded, the pintle is pulled down which opens an additional air bleed to the Idle Circuit and closes off the extra fuel to the Primary Main Metering Circuit. Both circuits are now fully leaned out.

The Feedback Solenoid will maintain the air/fuel ratio based on the Oxygen Sensor's voltage (except when in Open Loop). This Solenoid is MMC's Duty Cycle Solenoid.

Anytime the key is "ON," the Solenoid is fed 12 volts on the BK/WT Wire which changes to a RD Wire at the 8-Way Connector by the Ignition Coil. The ground for the Feedback Solenoid is provided by the ECU (pin 59) on the YL/DG Wire which changes to a YL Wire at the 8-Way Connector.

Since this Solenoid is spring-loaded rich, it must be **ungrounded** to be rich. This means that if you hook up a voltmeter to the ground wire of the Feedback Solenoid (YL/DG Wire) and see a high voltage (14 volts) on your voltmeter, that indicates that the ECU is "driving" the Solenoid full rich. And a low voltage (0–1 volt), indicates that the ECU is driving the Solenoid full lean. Remember that the ECU will vary the ground (duty cycle) of this Solenoid when it is operated. This will be seen as a pulsating or varying needle on your voltmeter.

### Quick Test

Hook up the positive lead of your analog (needle type) voltmeter to the YL/DG Wire at the 8-Way Connector (See Fig. 5) by the Ignition Coil, and ground the negative lead. Hook up the positive lead of a digital voltmeter (10 mega ohm minimum impedance) to the Oxygen Sensor WT Wire (See Fig. 6) and ground the negative lead. Start the engine. If the engine is cold or has just been restarted, the ECU is in Open Loop, and the Oxygen Sensor voltage is being ignored. You will see your voltmeter pulsate some voltage (14 volts at first, then down to about 4 volts). Once the engine warms up (126°F or .85-1.2 volts on the Coolant Sensor Wire) or the restart timer times out (about 1 minute and 10 seconds), the ECU will drive the Feedback Solenoid based on the Oxygen Sensor and TPS voltage.

With the engine running at Curb Idle, (in Closed Loop), ground the YL/DG Wire of the 8-Way Connector. This will make the Feedback Solenoid go full lean. At Curb Idle, this should lower your RPM by 50–100 RPM. By grounding the Feedback Solenoid, you have added extra air to the Idle Circuit, which resulted in the 50–100 RPM drop. This only tests the top portion of the Feedback Solenoid.

To test the bottom portion of the Feedback Solenoid, raise the RPM to 3,000. While holding the RPM steady at 3,000, ground the YL/DG Wire of the 8-Way Connector. You should see a 100–300 RPM drop. At 3,000 RPM, the Idle Circuit is only adding a small portion of the fuel and air being used. So the leaning out of the Idle Circuit alone at 3,000 RPM, will not result in a 100–300 RPM drop. At 3,000 RPM the Primary Main Metering Circuit is providing most of the fuel and air being used. Fully grounding the Feedback Solenoid will shut off the "extra" fuel supplied to the Primary Main Metering Circuit which will result in the 100–300 RPM drop.

If the engine is warm and running (more than 1 minute and 10 seconds), and you snap the throttle open, you should see the voltage on the YL/DG Wire go higher (richer). This is the ECU's response to the higher TPS voltage and the higher RPM.

BK/WT Black/white → RD Red
YL/DG Yellow/Green → YL Yellow
ungrounded = de-energized

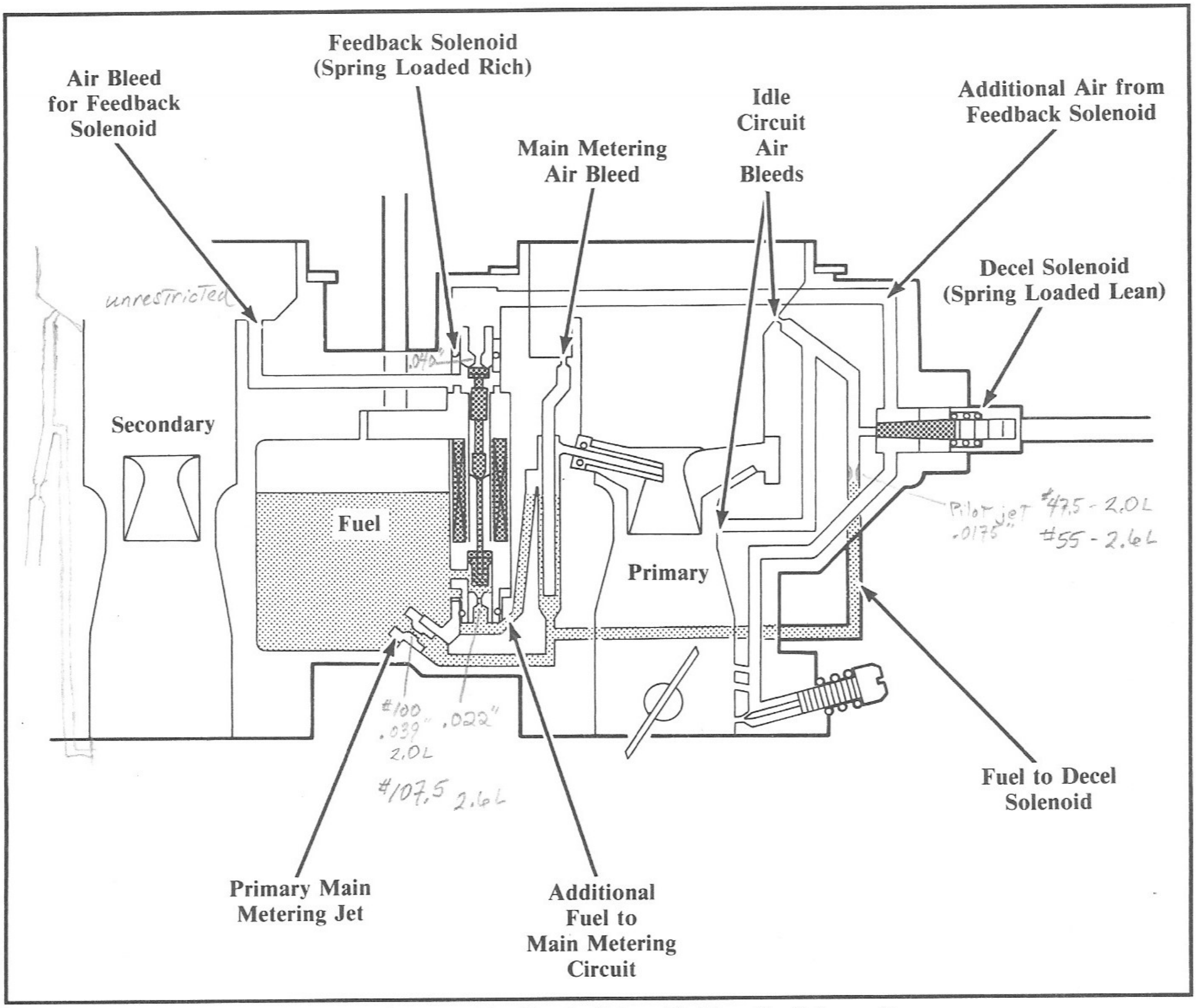


Fig. 3 Decel & Feedback Solenoid Circuits Schematic

## Notes

Low voltage = solenoid grounded = ECU driving lean = rich mixture

High voltage = solenoid ungrounded = ECU driving rich = lean mixture

Main Metering Air Bleed .0235 Main Idle Circuit Air Bleed .026

Secondary Metering Air Bleed .034" Secondary Circuit Air Bleed .037"

## Feedback Solenoid
### Quick Test Continued . . .

The following is a list of what the ECU's response is to an increase in TPS voltage at different RPMs:

| Steady Engine RPM | Artificial TPS Voltage Increase to 5 volts, and the Effect on the Feedback Solenoid voltage |
|---|---|
| 1100 RPM | 2 volts, then after TPS increase, 7 volts |
| 1200 RPM | 2 volts, then after TPS increase, 9 volts |
| 1500 RPM | 4 volts, then after TPS increase, 12 volts |
| 2000 RPM | 4 volts, then after TPS increase, 9 volts |
| 3000 RPM | 4 volts, then after TPS increase, 6 volts |
| 4000 RPM | 4 volts, then after TPS increase, 14 volts |

The previous chart shows you that "snapping the throttle open" (increasing the TPS voltage), will richen up the mixture, but how much richer the mixture gets is dependent on engine RPM.

With the engine warmed up and running (Closed Loop), if the Oxygen Sensor voltage is high (above .45 volts), this indicates the mixture that was just burned was rich. In response to the rich mixture, the ECU will increase the ground time of the Feedback Solenoid which will lean out the mixture (this will be seen as a lower voltage on the Feedback Solenoid ground wire).

If the Oxygen Sensor voltage is low (below .45 volts) this indicates a lean mixture and the ECU will richen up the mixture by decreasing the ground time (this will be seen as an increase in voltage on the Feedback Solenoid ground wire).

Once you're in Closed Loop (above 126 °F and/or restart timer timed out), to test the ECU and its control over the Feedback Solenoid just open the throttle (about 2,000 RPM) and put your hand over the top of the Carburetor, restricting the air flow till the Oxygen Sensor voltage goes above .45 volts. If the system is working OK, the Feedback Solenoid voltage on the YL/DG Wire will go down to 0–1 volt. You have richened up the mixture and the Oxygen Sensor voltage has gone above .45 volts. The ECU will now lean out the mixture till the Oxygen Sensor voltage comes down below .45 volts. You will see this leaning out as a decreasing voltage on the Feedback Solenoid ground wire, down to full lean (0–1 volt).

Now, take your hand off the Carburetor and the voltage should go back to 7 or 8 volts. While you're still holding the engine at about 2,000 RPM, pull the vacuum hose off the PCV Valve. This creates a large vacuum leak which leans out the engine and lowers the Oxygen Sensor voltage below .45 volts. Being in Closed Loop, the ECU will try to raise the Oxygen Sensor voltage above .45 volts. The ECU will do this by ungrounding the Feedback Solenoid more and more until it goes up to full rich (14 volts). Put the PCV Valve hose back on and the voltage should come back up to 6 or 7 volts.

If your system reacts like this, then it's OK. But, if your system doesn't react like this, then you'll have to do some more testing to find out where the trouble may be.

If your system isn't OK, the next thing you'll want to do is check the Oxygen Sensor voltage. With the engine running in **Closed Loop** (above 126 °F and/or restart timer timed out), open the throttle to about 2,000 RPM and put your hand over the Carburetor. Your Oxygen Sensor voltage should be way above .45 volts (close to 1 volt). If the Oxygen Sensor voltage isn't above .45 volts, it is bad and needs to be replaced.

If the Oxygen Sensor voltage is above .45 volts and the Feedback Solenoid voltage did not go full lean (0–1 volt), check the voltage on the Coolant Sensor by back probing the YL/DG Wire of the Coolant Sensor's 2-Way Connector. The voltage for a warmed up engine should be about ½ a volt. Any voltage above about 1.0 volt, will prevent the ECU from going into Closed Loop. If your engine is at operating temperature and your Coolant Sensor voltage is above 1.0 volt, the Coolant Sensor is bad and needs to be replaced.

If the Coolant Sensor voltage is OK (about ½ a volt or less), the TPS voltage can put the system into Open Loop. So the next thing you want to do is check the TPS voltage with a digital voltmeter by back probing the YL/RD Wire of the 8-Way Connector by the Ignition Coil. At Curb Idle, the TPS voltage should be between .4–.7 volts. The TPS voltage has to be above about 2.8 volts before the ECU will ignore the Oxygen Sensor and go into Open Loop. If the TPS voltage is high enough to cause Open Loop, try adjusting the TPS per the procedure in this manual or the procedure in the Service Manual. If the TPS cannot be adjusted down, make sure the voltage feed for the TPS is 5 volts on the DG Wire. If it is 5 volts, then the TPS is bad and must be replaced.

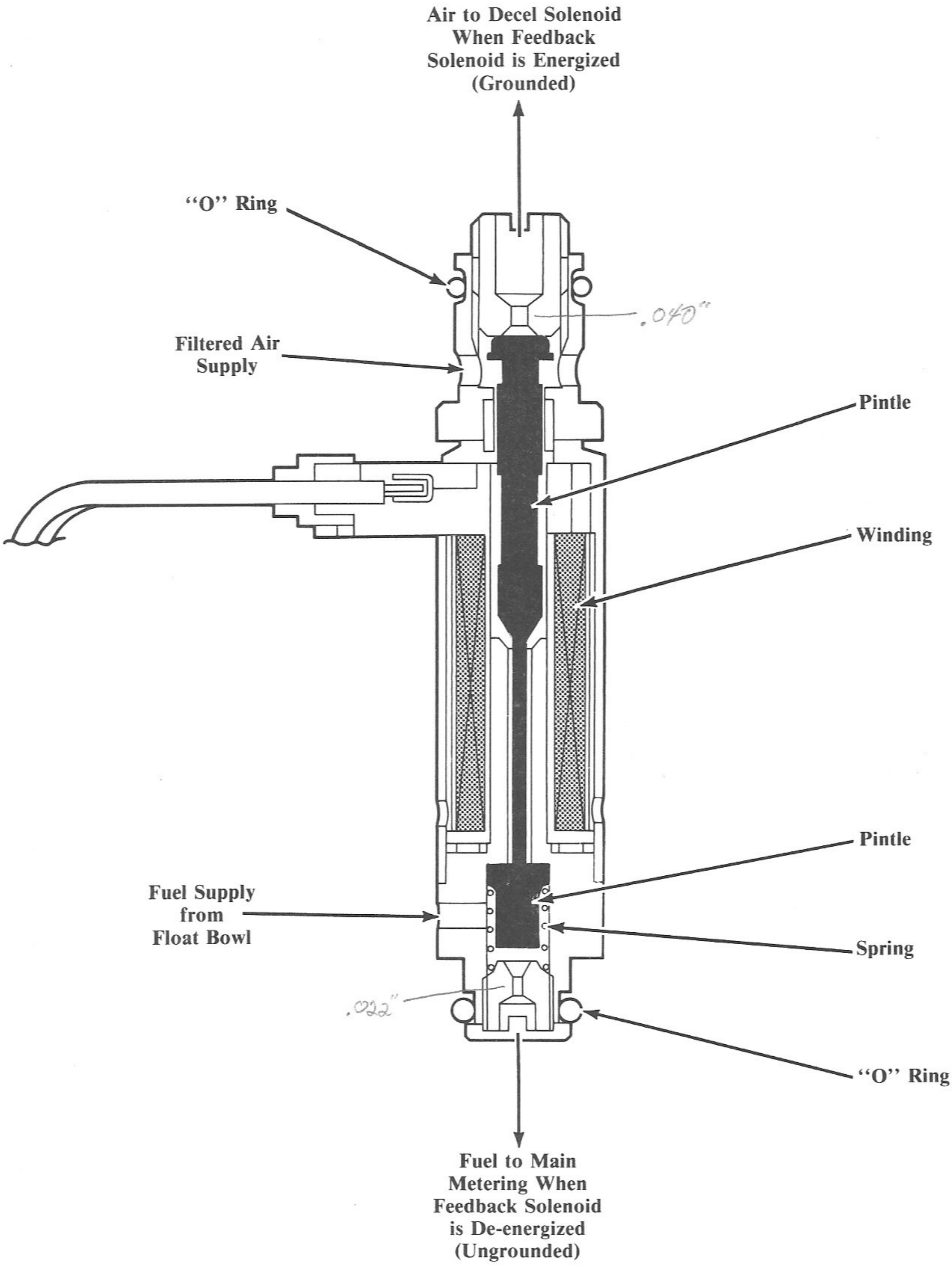


Fig. 4 Feedback Solenoid

## Feedback Solenoid
### Quick Test Continued . . .

If the TPS voltage is OK, then the only thing left that could be bad is the ECU and it must be replaced.

**Note:** If the Coolant Sensor Signal is lost (4.7 volts on the Coolant Sensor Wire), the Feedback Solenoid will default to about a 6–8 volt idle. If the throttle is snapped open, the ECU will go full rich (14 volts). During decel, the ECU will go to a 3 volt decel until the Curb Idle RPM is reached. At a slowly increasing RPM, the ECU will keep the Feedback Solenoid between 6–8 volts. Once above 1.85 TPS voltage, the ECU will drive the Feedback Solenoid full rich (14 volts). What this means is that if the Coolant Sensor signal is lost, the ECU will drive the Feedback Solenoid based on TPS voltage and engine RPM.

**A good rule of thumb:** If you've just restarted a warm engine, the system is in Open Loop. Now, look at the voltage on the Feedback Solenoid, it should be at about 9 volts. Once the restart timer (1 minute and 10 seconds) times out, the Feedback Solenoid voltage should be ½ Charging System voltage, or about 7 volts. **This is only true if there are no vacuum leaks and the Idle Mixture (MAS) is set correctly.**

Lower Feedback Solenoid voltage means the Carburetor and/or mixture is richer. Higher Feedback Solenoid voltage means the Carburetor and/or mixture is leaner (only true in Closed Loop).

If the Carburetor has a vacuum leak (manifold vacuum hose fell off), once you're in Closed Loop, the ECU "sees" the low Oxygen Sensor voltage. If the RPM is raised above Curb Idle and then the throttle is allowed to close, the ECU will now try to richen up the mixture. You would see this by the voltage slowly going higher and higher up to full rich (12–14 volts). Once at full rich, then the voltage will instantly go down to about 6 volts. If the mixture is too rich, the ECU will spend most of its time leaning out the mixture and this will be seen as a lower voltage (2 volts for example). Again, the richer the mixture, the more the ECU will try and lean it out and the lower the Feedback Solenoid voltage will be.

So the ECU will allow the system to idle lean, but will try to lean out a rich idle condition.

## Notes

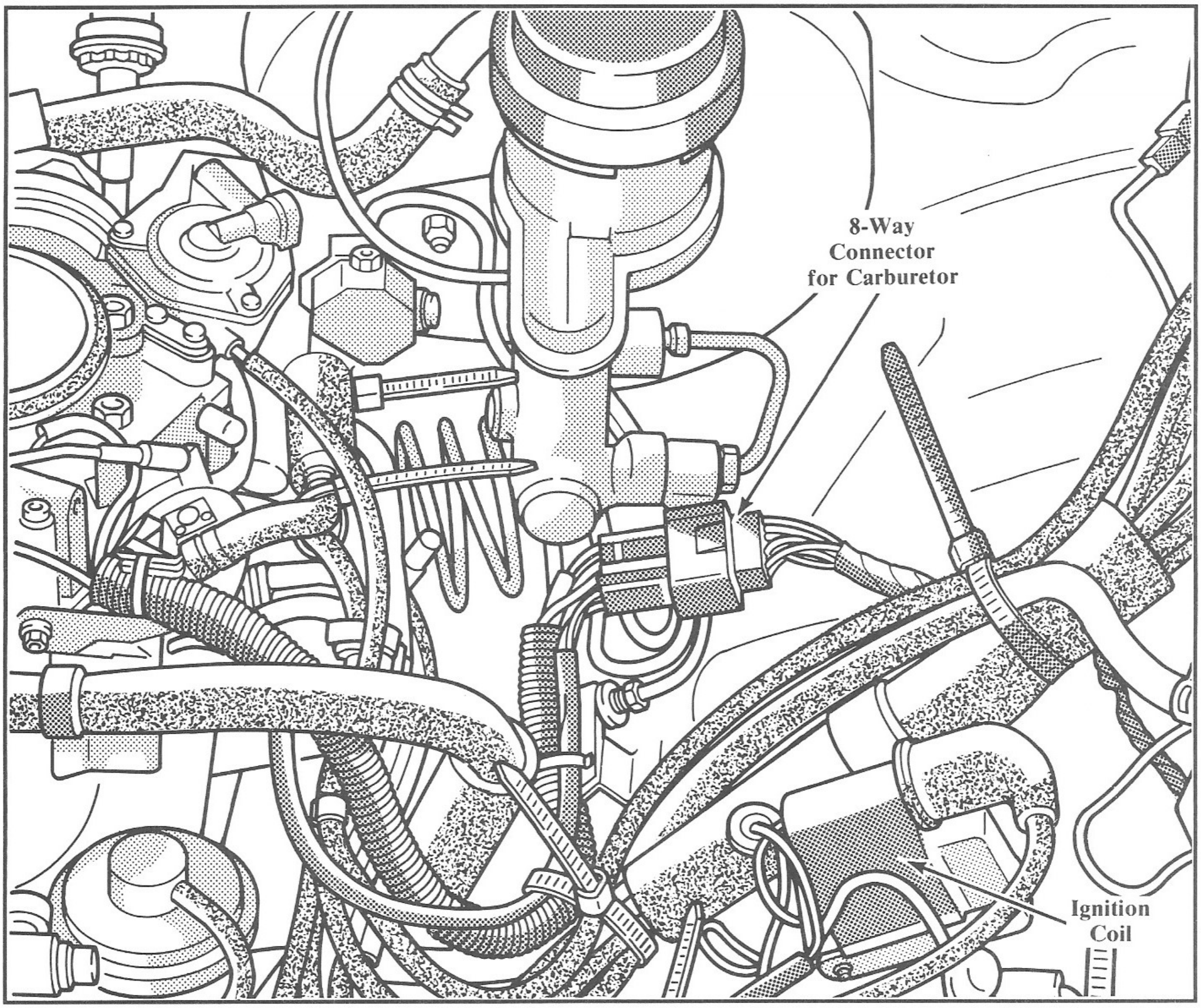


Fig. 5 8-Way Connector Location

## Notes

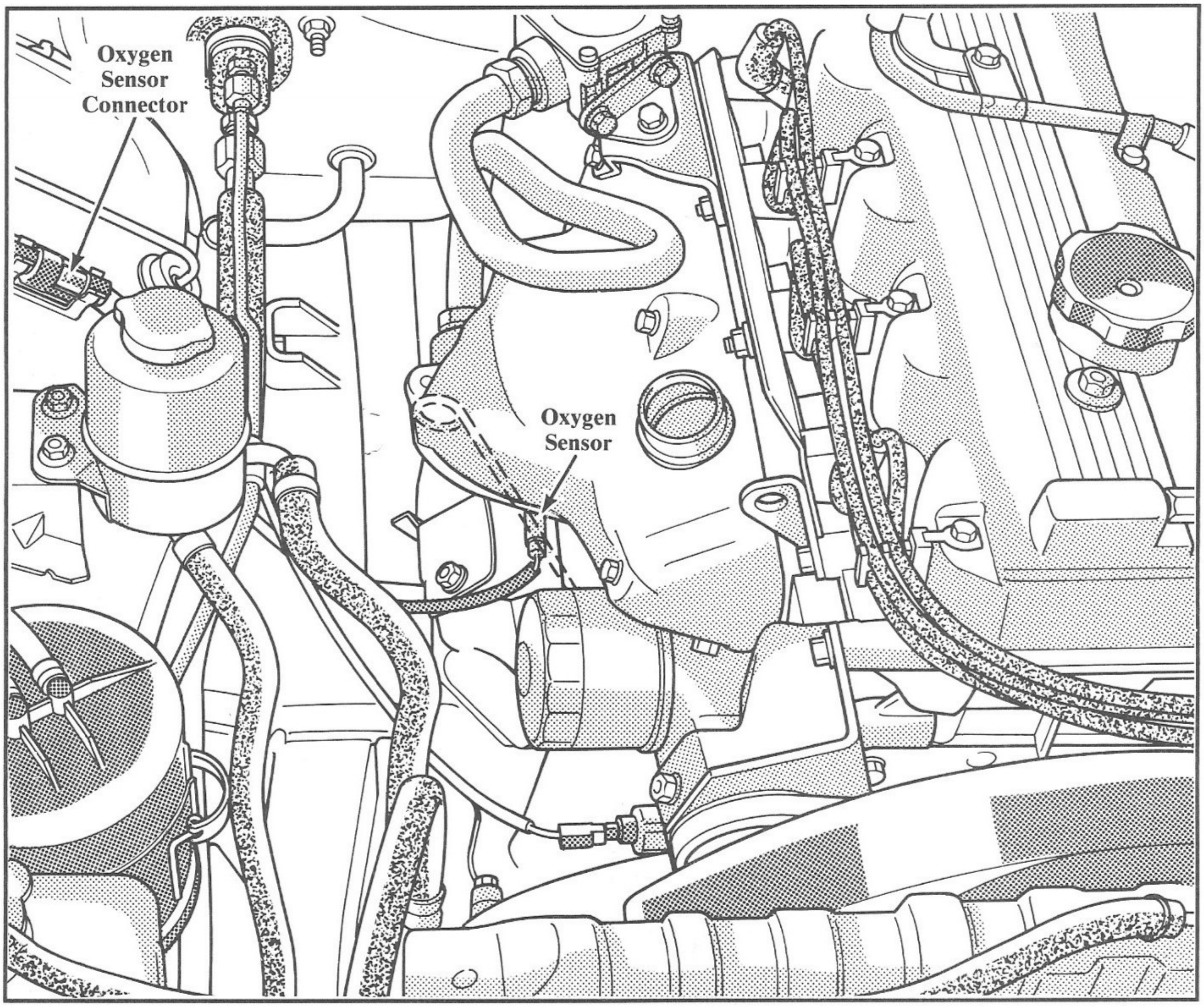


Fig. 6 Oxygen Sensor & Connector Location

## Notes

## Bowl Vent Valve

The Float Bowl has a vent which allows fuel vapors to leave the Carburetor and go to the Purge Canister, when the engine is off (external vent). See Fig. 7. This is done to prevent hot hard starts which would happen if the fuel vapors were not routed outside the Carburetor. If the external vent is not working or is plugged, the fuel vapors would go down the "throat" of the Carburetor and would flood the engine (in hot ambient temperatures).

Once the engine is started and air begins to flow through the air cleaner, there is a "normal" pressure drop across the air cleaner, even if the air filter is new. We know that the engine doesn't suck the fuel in. Rather, when the piston goes down in the cylinder, a low pressure is created (less than atmospheric). Pressure always travels from high to low. So the higher atmospheric pressure pushes into the engine to equalize the lower pressure. When the air passes through the Venturi of the Carburetor it picks up speed and a pressure drop results. This pressure drop at the Venturi causes the fuel to be pushed out of the Float Bowl into the Idle and Main Metering Circuits.

When the engine is off, we want the fuel vapors to go to the Purge Canister. If the fuel in the Float Bowl is always exposed to atmospheric pressure when the engine is running, it will cause too much to be pushed into the engine, resulting in an over-rich mixture. This happens because the engine doesn't "see" atmospheric pressure due to the "normal" pressure drop across the air cleaner. What the engine does "see" is something less (a pound or two) than atmospheric pressure. We need to have this "slightly less than atmospheric pressure" pushing on the fuel in the Float Bowl to prevent an over-rich mixture. This is done by putting an internal vent in the Carburetor. An internal vent is nothing more than a passage from the Float Bowl to the Air Horn.

Switching from external to internal vent is done by the Bowl Vent Valve. This Bowl Vent Valve is a dual diaphragm type with no electromagnet. When the engine is started, manifold vacuum is applied to the rear vacuum chamber. See Fig. 7. Manifold vacuum in this rear chamber will start to overcome spring tension, and then compress the spring and the rear diaphragm will seal off the small bleed between the front and the rear vacuum chambers. The manifold vacuum will now unseat the red one-way check valve and allow manifold vacuum to be applied to the front diaphragm. Manifold vacuum applying on the front diaphragm will overcome spring tension and switch the Bowl Vent Valve from external to internal vent.

During heavy acceleration, manifold vacuum will drop. This will lower vacuum that is applied to the rear vacuum chamber, and the rear diaphragm will unseat. However, the Bowl Vent Valve will not switch back to external vent yet. If prolonged heavy acceleration is experienced, all the vacuum in the front vacuum chamber will have to bleed off through the small bleed between the two chambers. This system is calibrated to run richer during prolonged heavy acceleration by using the External Bowl Vent (atmospheric pressure).

### Quick Test

Remove the black hose from the Purge Canister marked "TO CARB." Lightly blow into the hose. As you blow into the hose you will force gasoline out of the Float Bowl and into the intake manifold (Internal Vent). If this happens, the valve is OK. If you cannot blow through the hose, the valve is stuck or plugged.

Now start the engine. Once the engine is running, try to blow into the hose. You should not be able to blow into the hose. If you cannot blow into the hose, the Bowl Vent Valve is OK. If you can blow into the hose with the engine running, either the manifold vacuum passage is plugged or the diaphragm has a leak.

## Notes

Additional internal vent at end of diaphragm shaft to secondary venturi

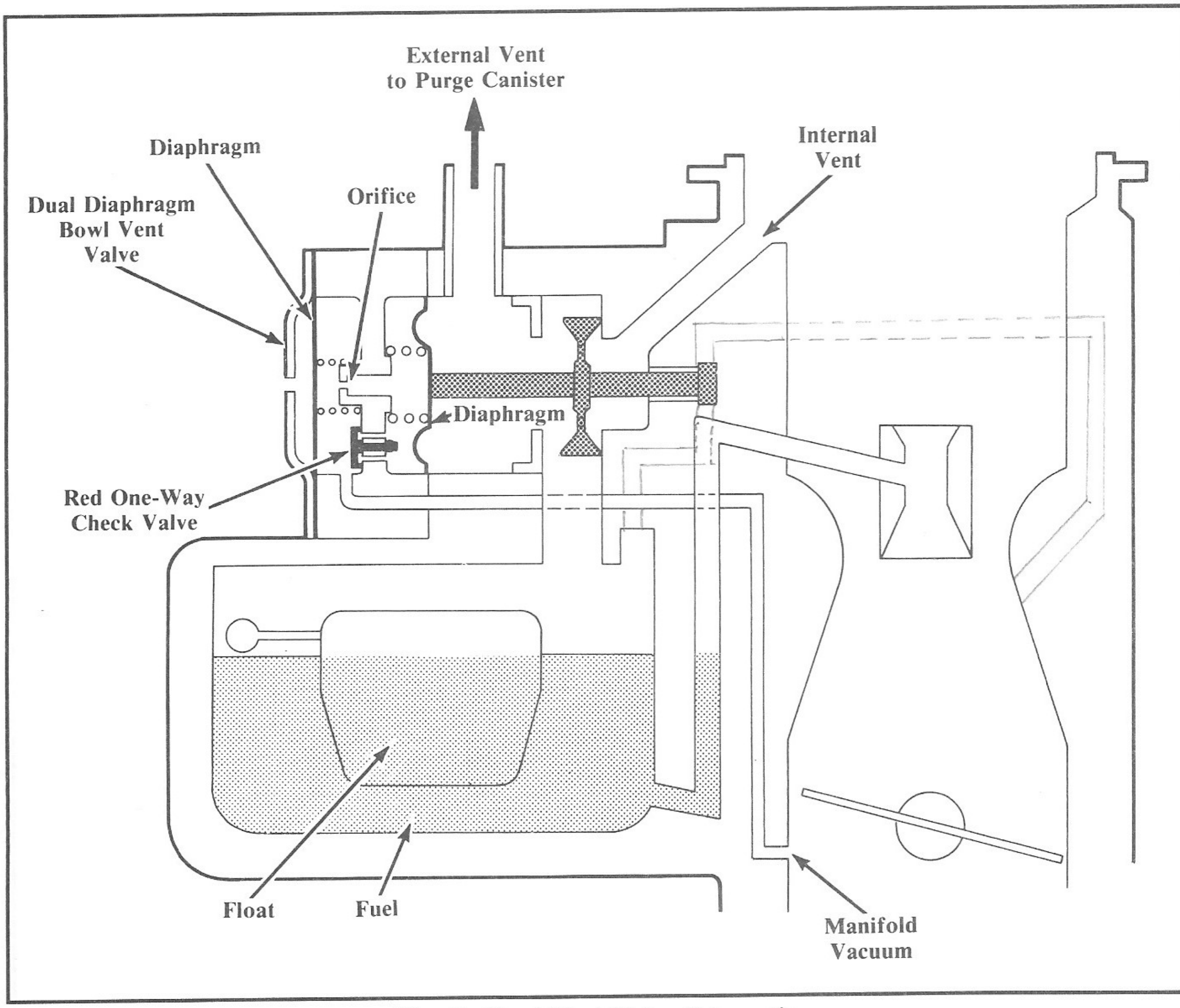


Fig. 7 Bowl Vent Valve Schematic

## Notes

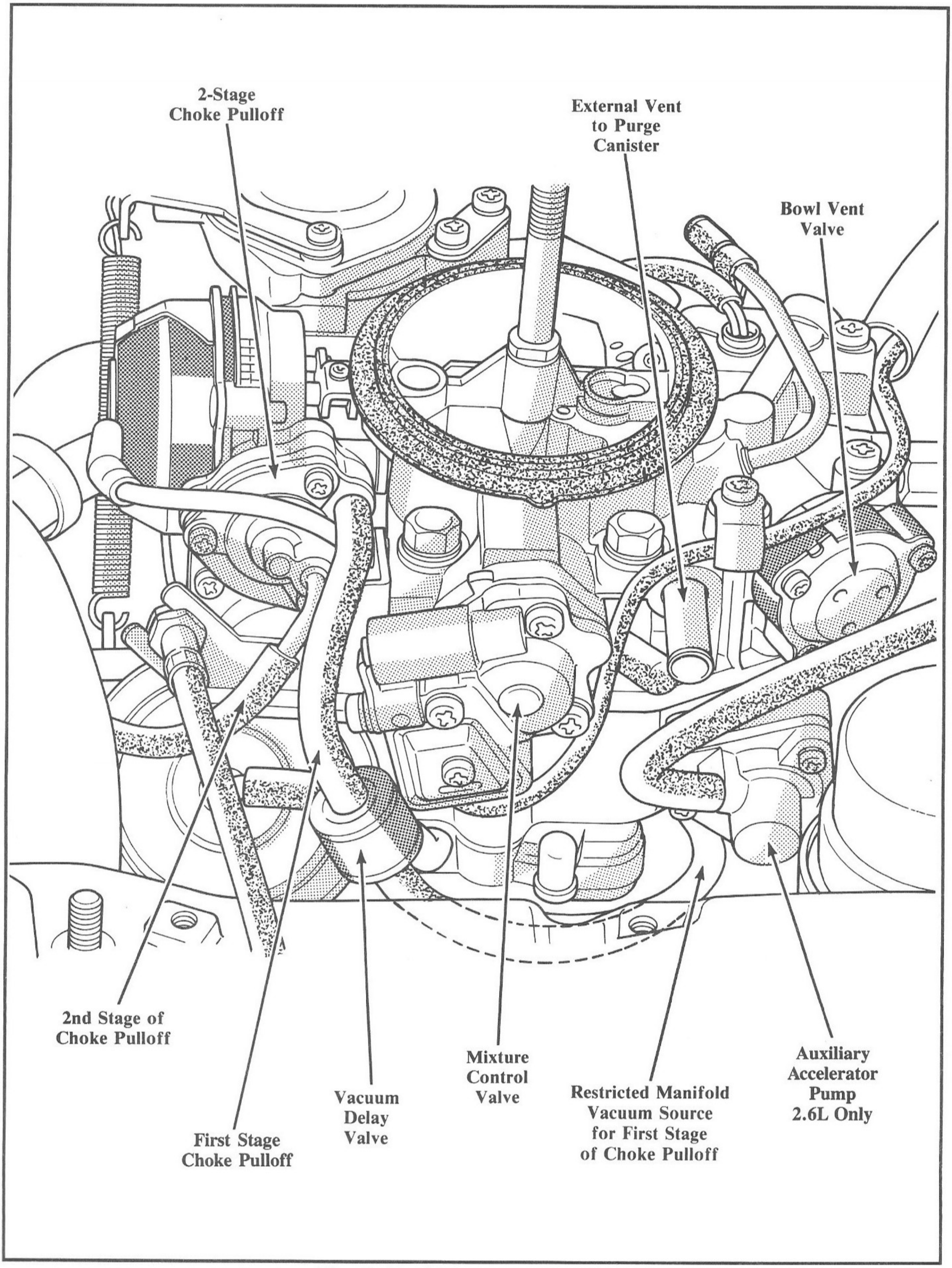


Fig. 8 Bowl Vent Valve Location

## Mixture Control Valve System

The Mixture Control Valve is a vacuum operated valve on the passenger's side of the Carburetor. See Fig. 10. The purpose of the valve is to lean out decel emissions by opening and allowing extra air below the Secondary Throttle Blade.

When the engine is started, manifold vacuum is applied to the front side of the diaphragm. See Fig. 9. This will momentarily (about a second) open the valve on start up. The manifold vacuum will bleed through an orifice to the back side of the diaphragm equalizing the "vacuums" which will allow the spring to close the valve.

During a fast throttle closing, manifold vacuum applies to the front of the diaphragm first, which opens the valve. Eventually, the manifold vacuum gets through the orifice and to the back side of the diaphragm, closing the valve.

There is a check valve in the diaphragm of the Mixture Control Valve. This check valve allows the valve to close quickly if the throttle is opened during a decel. If the check valve was not there, the valve could stay open when the throttle is opened. This would cause a lean condition and would result in a hesitation on acceleration.

### Quick Test

Start the engine and quickly open and close the throttle. As the throttle is closed, you should see and hear the valve open (air cleaner removed). If not, either the manifold vacuum passage is plugged or the diaphragm has a hole in it. If the valve always stays open (engine won't idle), the orifice in the Brass Piece is plugged.

## Notes

Delayed closing; cause of lean transition of small to lrg throttle opening at 1500-3500 RPM (from closed to open loop)

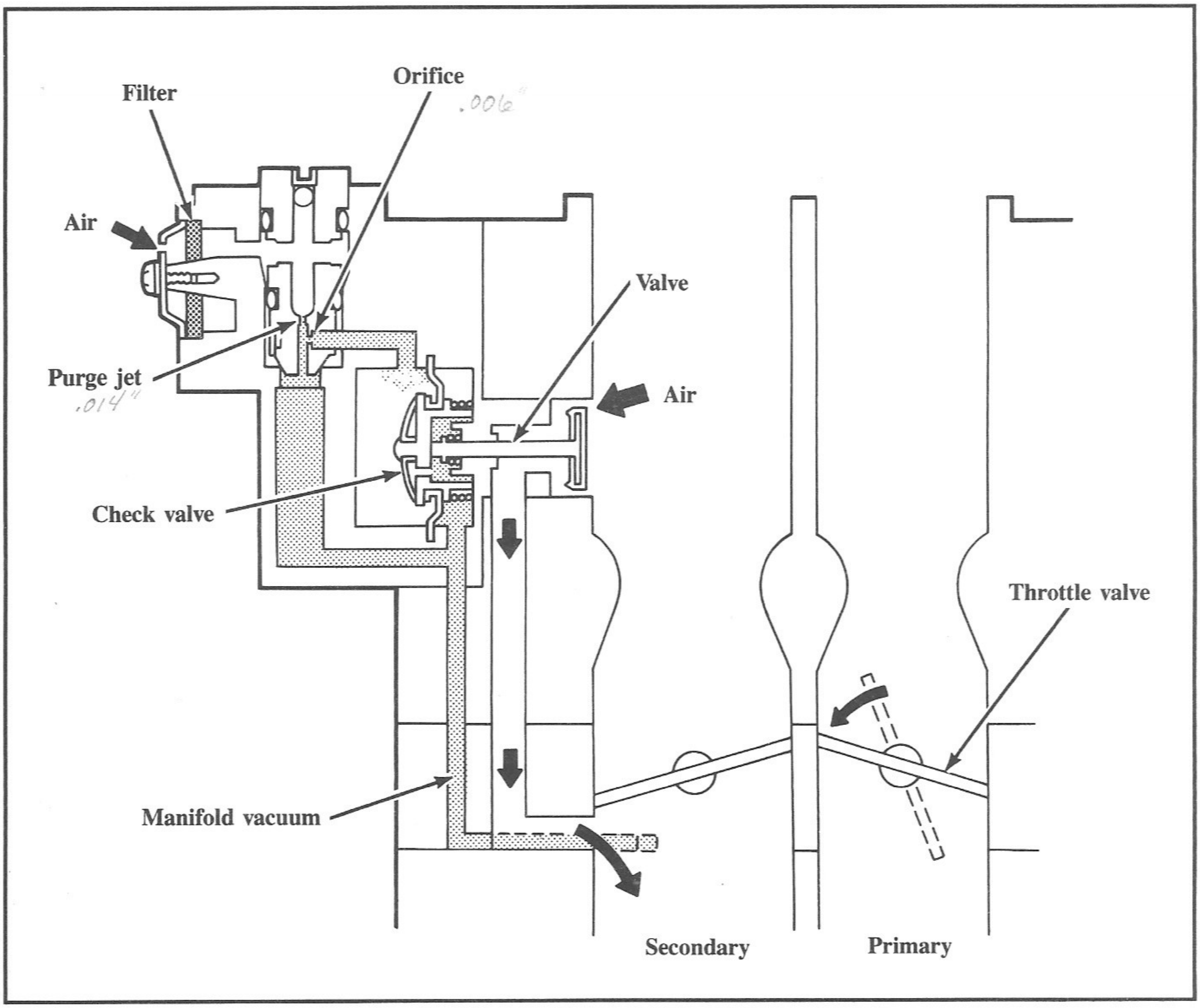


Fig. 9 Mixture Control Valve Schematic

## Notes

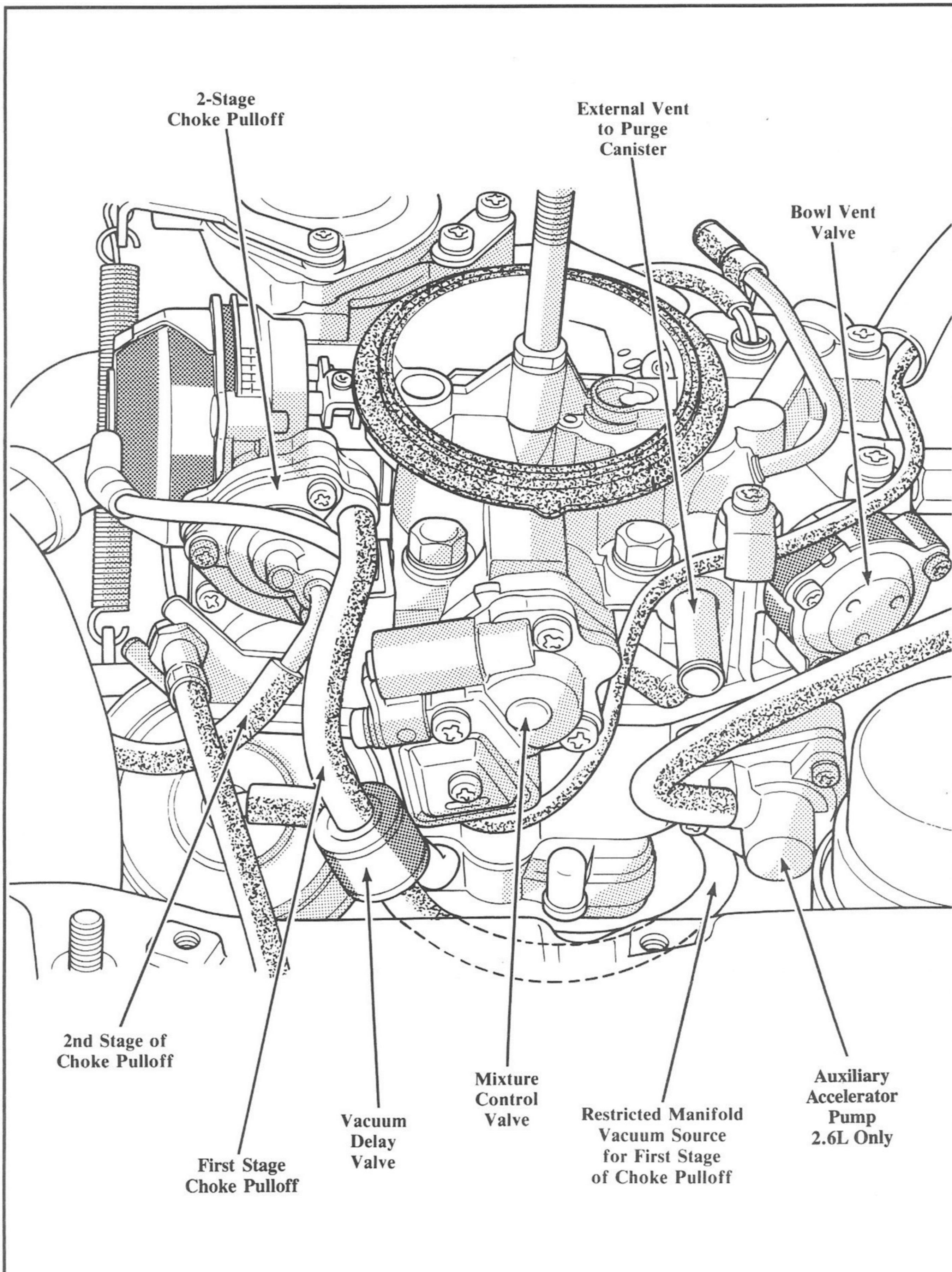


**Fig. 10 Mixture Control Valve Location**

## Mechanical Enrichment Valve

The Mechanical Enrichment Valve will provide additional fuel to the Primary Main Metering Circuit during low vacuum (high load) conditions. During high vacuum conditions, manifold vacuum will pull on the Diaphragm compressing the Rear Spring. See Fig. 11. With the Diaphragm pulled back, this allows the Front Spring to seat the Check Ball. With the Check Ball seated, this blocks all additional fuel from the Primary Main Metering Circuit.

During a hard accel, the manifold vacuum will drop. This will allow the Rear Spring to push the Diaphragm. With the Rear Spring pushing on the Diaphragm, this will unseat the Check Ball and compress the Front Spring. With the Check Ball unseated, this will allow fuel to feed the Primary Main Metering Circuit, along with the Primary Main Metering Jet and the Feedback Solenoid.

## Notes

If no vacuum to rear spring chamber, always extra fuel. = poor mpg

Jet size: #65, 2.6L; #55, 2.0L

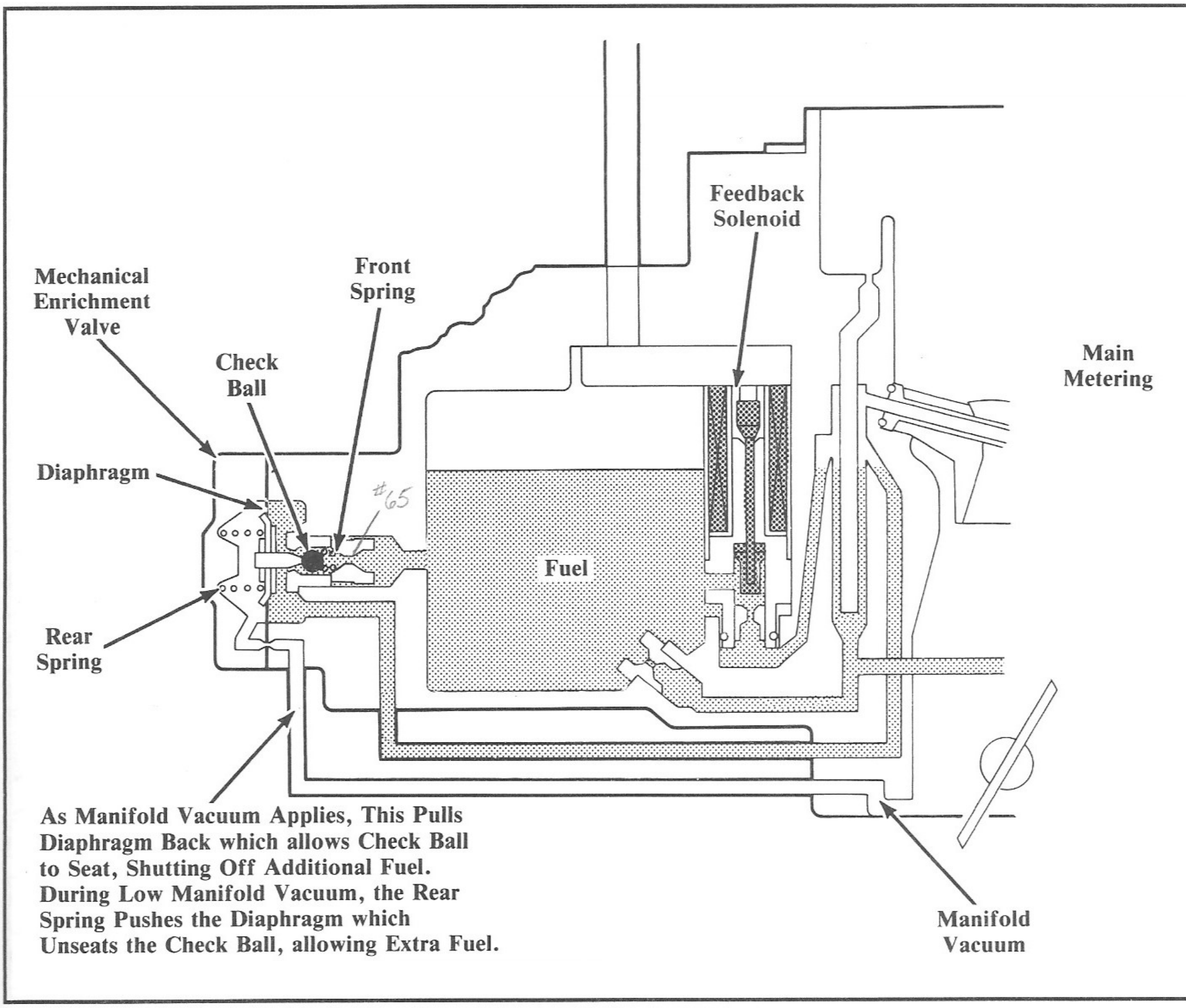


Fig. 11 Mechanical Enrichment Valve Schematic

# Notes

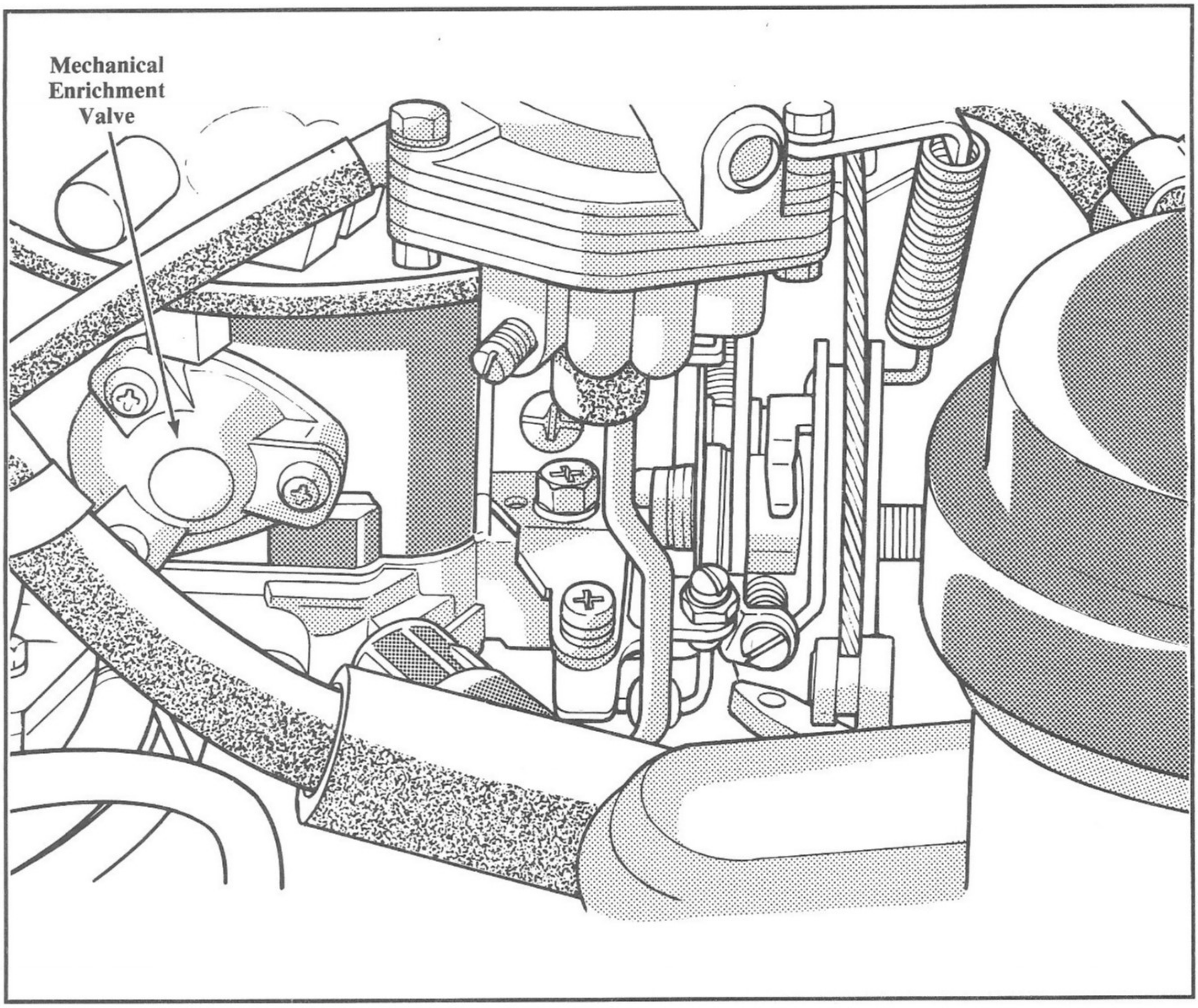


Fig. 12 Mechanical Enrichment Valve Location

## Notes

## Throttle Opener System (only for A/C Idle-up)

The Throttle Opener System consists of:

- Fuse #9,
- Blower Switch,
- A/C Switch,
- Thermal "Relay" (Solid-State),
- Fuse #8,
- Evaporator Temperature Sensor,
- 280 Ohm Resistor,
- A/C Clutch Relay,
- Low Pressure Cutout Switch,
- A/C Clutch Relay Coolant Switch (Manual Trans. Only),
- ECU pin 57 (Auto Trans. Only),
- Throttle Opener,
- Throttle Opener Solenoid, and the ECU pin 54.

In this section we will give you a schematic and art showing the locations of all these components, along with a description of how the circuit works.

The circuit starts at Fuse #9 which is fed 12 volts key "ON." With the key "ON" and Fuse #9 good, 12 volts is sent to the Blower Switch. See Fig. 13. With the Blower Switch in any position except "OFF," 12 volts is sent to the A/C Switch on the WT/BK Wire.

If the A/C Button is pushed, 12 volts is sent to the Thermal "Relay" on the DB/BK Wire. See Fig. 13. The Thermal "Relay" isn't a Relay at all. It's a solid-state device that acts like a Relay. The Thermal "Relay" is provided a voltage source on the DB/BK Wire. When the YL Wire is grounded, the Thermal "Relay" will output 12 volts on the DB Wire.

The Thermal "Relay" will output about 7 volts on the YL Wire. This voltage then goes through the Evaporator Temperature Sensor (thermistor) and then through a 280 ohm Resistor and then to ground. See Fig. 13. As the Evaporator cools down the resistance of the Evaporator Temperature Sensor goes up. Any resistance above about 9,550 ohms, will cause the Thermal "Relay" to stop sending 12 volts on the DB Wire to the A/C Clutch Relay Coil.

The Thermal "Relay" together with the Evaporator Temperature Sensor act as an A/C cycling switch. Whenever the Evaporator fin temperature gets low enough, the Thermal "Relay" will remove the 12 volt feed for the A/C Clutch Relay Coil, which will open the Relay and shut off the A/C Compressor. As the Evaporator fin temperature goes up, the Thermal "Relay" will start sending 12 volts out on the DB Wire again. In this way, these two parts act as the A/C cycling switch.

Whenever the Evaporator fin temperature is above 38 °F, the Evaporator Temperature Sensor's resistance is low enough to ground the 7 volts on the YL Wire. This allows the Thermal "Relay" to send 12 volts out on the DB Wire to the A/C Clutch Relay Coil. See Fig. 13. If the A/C system loses enough refrigerant (below 30 PSI High-Side pressure), the contacts in the Low Pressure Cutout Switch will open, removing the ground from the A/C Clutch Relay Coil opening the Relay and shutting off the Compressor. Above 30 PSI High-Side pressure, the Low Pressure contacts will be closed. This will allow the 12 volts on the BK/YL Wire to go to the A/C Clutch Relay Coolant Switch (Manual Trans. Only) or to the ECU pin 57 (Auto Trans. Only). On a Manual Trans., below 235 °F, the Coolant Switch will be closed providing the ground for the A/C Clutch Relay Coil. On an Auto Trans., the ECU will provide a ground at pin 57, if the TPS voltage doesn't indicate W.O.T. condition.

With a ground for the A/C Clutch Relay, 12 volts is fed to the A/C Clutch on the BK/WT Wire and it has its own constant ground. Spliced into the BK/WT Wire is the 12 volt feed for the Throttle Opener. The Throttle Opener is provided a ground on the BK/WT Wire by the ECU pin 54 below 1300 RPM. Above 1400 RPM, A/C Idle-up is not needed so the ECU will unground the Throttle Opener Solenoid.

## Notes

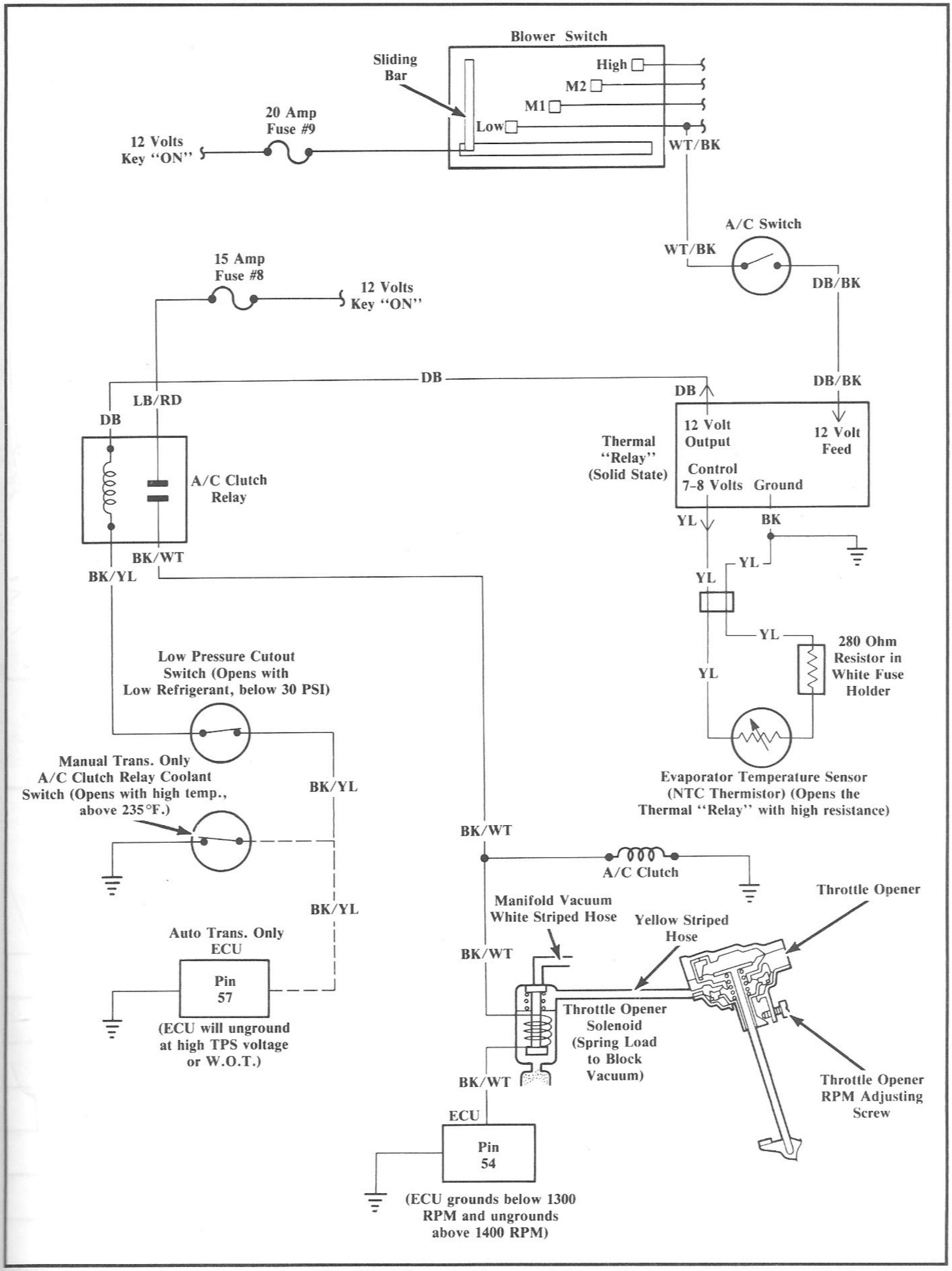


Fig. 13 Throttle Opener Schematic

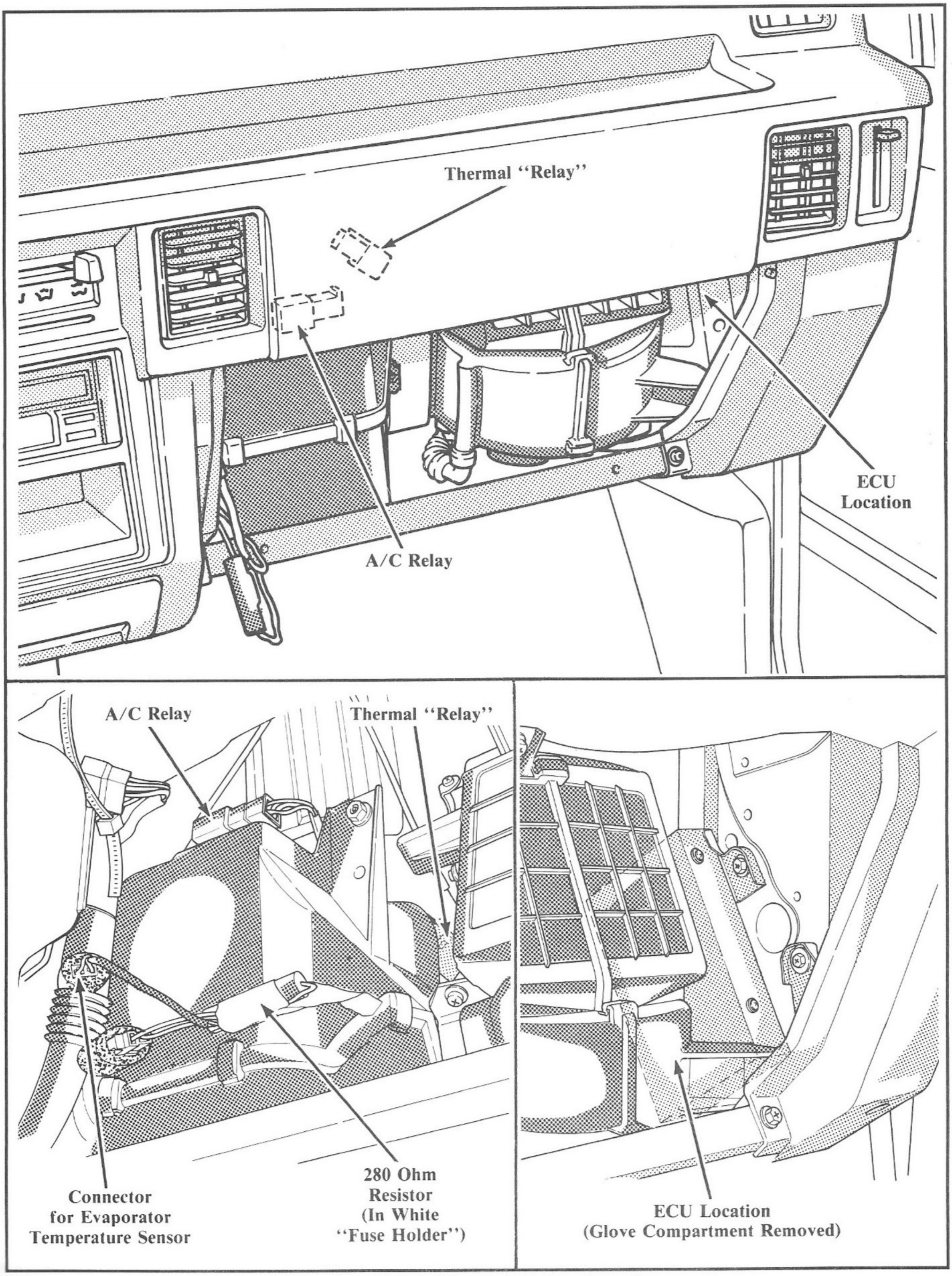


Fig. 14 A/C & Thermal Relays Location

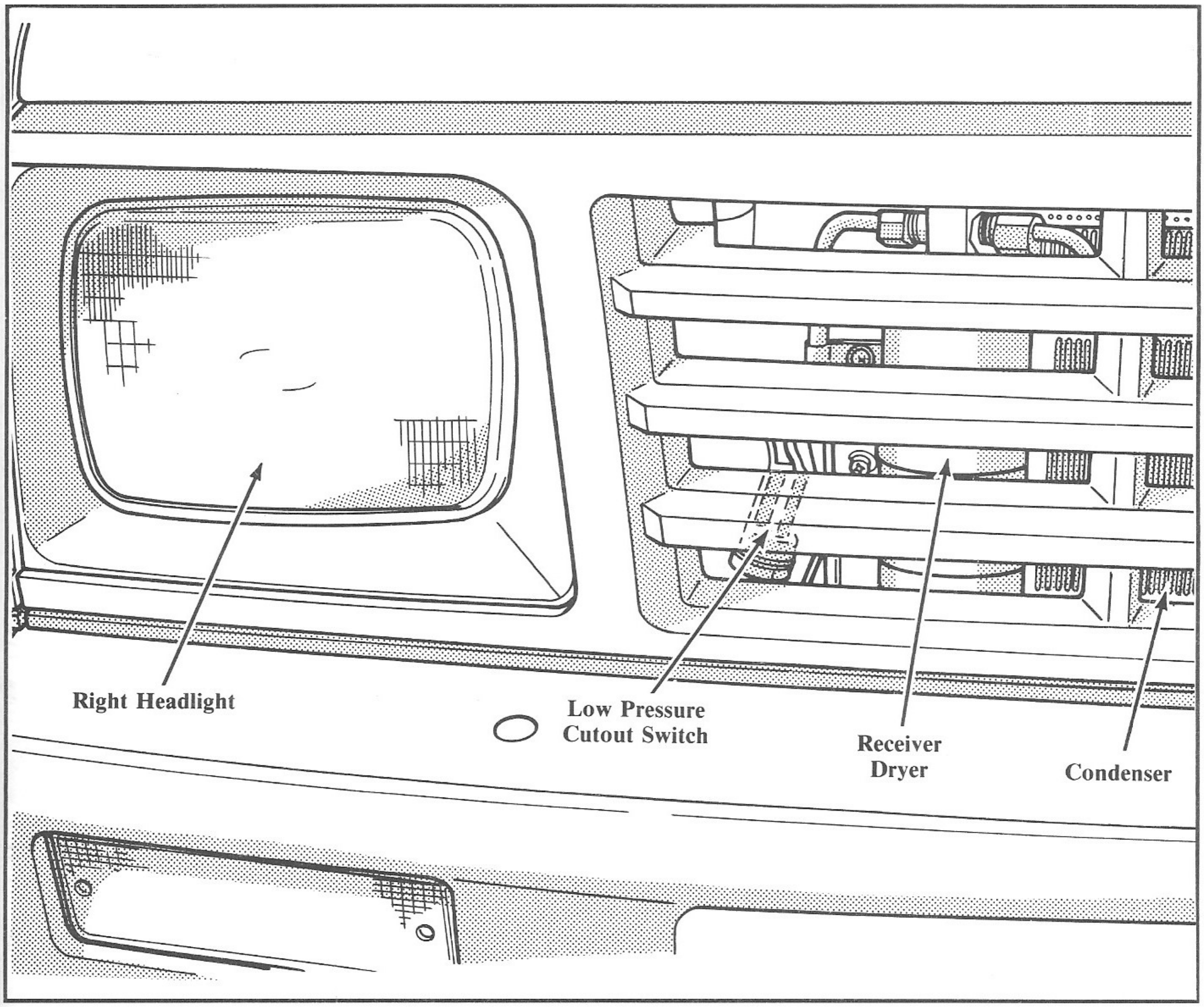


Fig. 15 Low Pressure Cutout Switch Location

## Notes

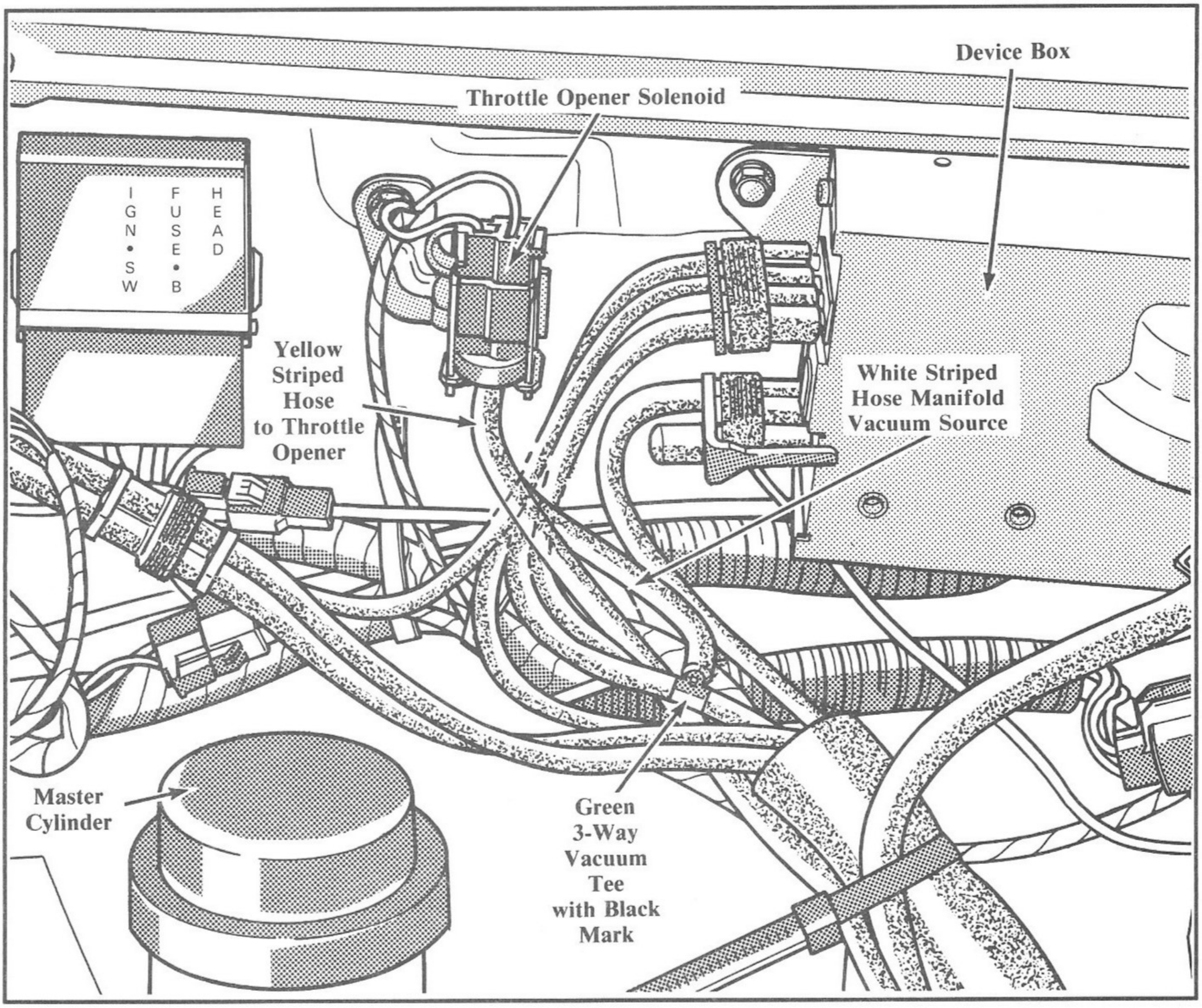


Fig. 16 Throttle Opener Solenoid Location

## Notes

## Secondary Air System

The Secondary Air System consists of: the Secondary Air Solenoid, Secondary Air Valve, the Idle Position Vacuum Switch, and the ECU pins 5 and 55.

Secondary Air simply means upstream air. When the Secondary Air Valve is open (See Fig. 17), filtered air from the Air Cleaner is allowed to be drawn into the exhaust manifold in front of the Catalytic Converter.

The Secondary Air Solenoid (located in the Device Box, See Fig. 18) is fed 12 volts key "ON" on the BK/WT Wire. This BK/WT Wire changes to a DB Wire at the 4-Way Connector and the ground is provided on the RD/WT Wire which also changes to DB Wire at the 4-Way Connector by the Device Box. The ECU provides the ground to the RD/WT Wire at pin 55.

The ECU will ground the Solenoid at the following times: cold engine (65°F–125°F), warm restart (for 1 minute and 10 seconds), and during decel. The cold engine Secondary Air feature comes from the ECU and the Coolant Sensor. The warm restart Secondary Air comes from a key "ON" timer that will shut off Secondary Air after the timer times out. The decel Secondary Air comes from two different things. First, the engine RPM must be above about 1450 RPMs, and the voltage on the Idle Position Vacuum Switch to the ECU (pin 5) DG/BK Wire should be 0-1 volt. As the throttle is opened, manifold vacuum to the Idle Position Switch is quickly lost. The manifold vacuum source for the Idle Position Switch comes from a special port just below the Primary Throttle Blade. Soon after the throttle blade is opened, the port is uncovered and the vacuum is no longer applied.

The ECU will send out 12 volts (through a resistor) from pin 5 (DG/BK Wire) to the Idle Position Vacuum Switch. The Switch is open when there is less than 10″ of vacuum applied to its nipple, and closes when there is more than 10″ of vacuum applied. So at idle the ECU "sees" 0-1 volt, which indicates an idle condition. When the throttle blade is slightly opened, the vacuum is no longer applied to the Switch and the ECU "sees" 12 volts.

Anytime there is 12 volts on the Idle Position Vacuum Switch wire to the ECU, this will cancel all Decel Secondary Air, regardless of engine RPM. Also, if the Coolant Sensor Signal is lost (4.7 volts on the wire), this will cancel all 3 Secondary Air times (cold, warm restart, and decel).

If you have Secondary Air during "normal" driving, this will cause the engine to run rough.

# Notes

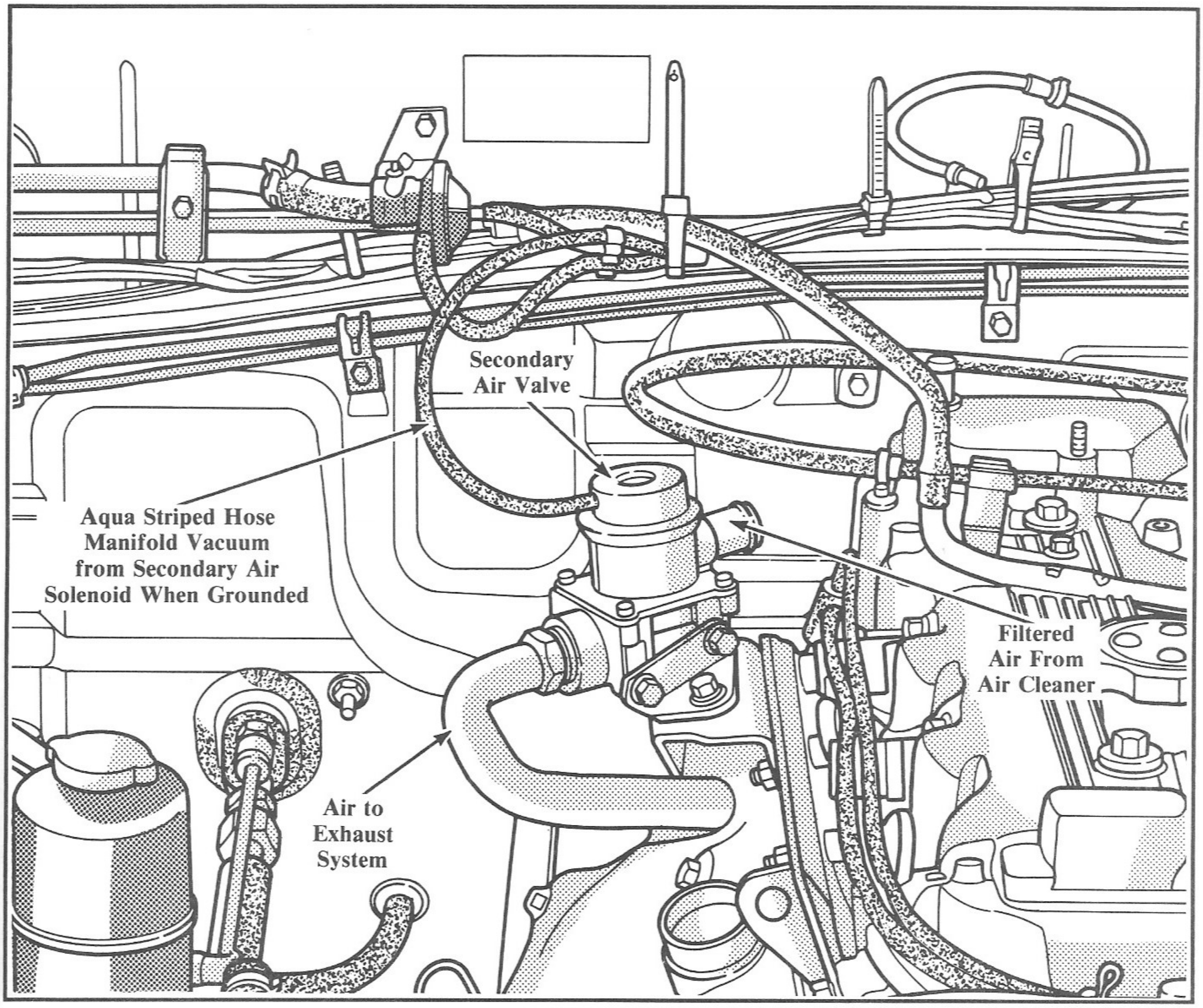


Fig. 17 Secondary Air Valve Location

## Notes

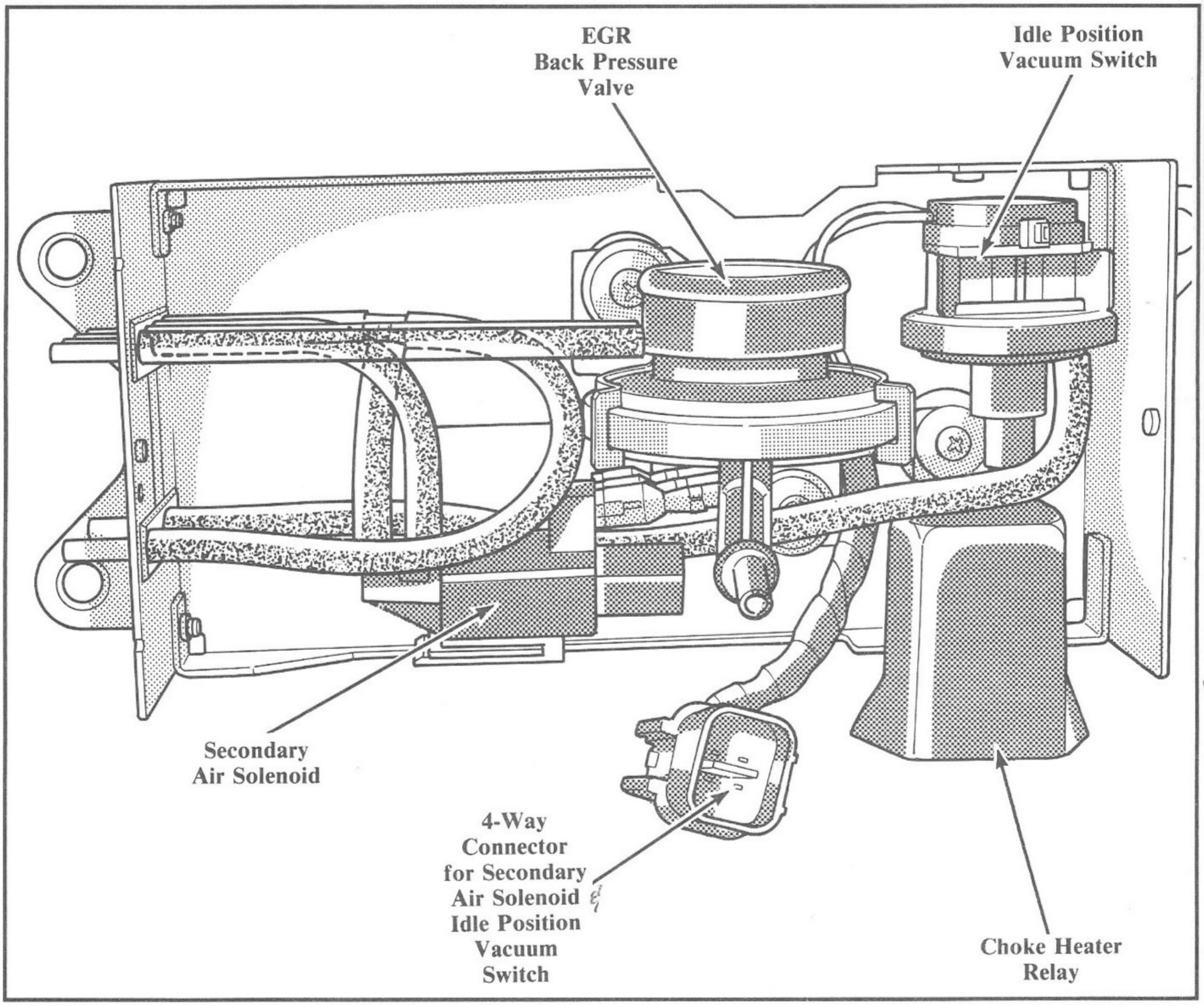


Fig. 18 Device Box Components

# Notes