# MAZDA/FORD F4AEL/F4EAT

## SHIFTS 1-3 IN "D"

**COMPLAINT:** The vehicle exhibits a 1-3 upshift, or a slipping condition in 2nd and 4th gear, when driving with the selector lever in the "D" position.

**CAUSE:** The cause may be, ***any one of the following:***

**A. Hydraulic/Mechanical**

1. A "Clogged" 1-2 shift solenoid.
2. A stuck 1-2 shift valve in the valve body.
3. A mis-located checkball in the premain section of the valve body.
4. The 1-2 shift solenoid wire connected to the lock-up solenoid.
5. A "Clogged" 2-4 servo feed orifice, located in the case.
6. A worn 2-4 servo cover and/or servo piston.
7. A defective or burnt band.

**B. Electrical**

1. A 1-2 shift solenoid circuit error (Trouble Code 60), preventing band application, or a 3-4 shift solenoid circuit error (Trouble Code 62), which may electronically prevent the 1-2 shift solenoid to activate.

**QUALIFICATION:**

Install a pressure gage on the 2-4 servo apply port and the line pressure port, as shown in Figure 1. "Back-Probe" into the 1-2 solenoid wire, as shown in Figure 2, with the ***positive*** lead of your volt meter. Place the ***negative*** lead of your volt meter to the case or a know good body ground. Run the vehicle on the lift up to approximately 45 mph, while watching the volt meter and the 2-4 pressure gage. If the volt meter rises from 0 to 12 volts at the time the 1-2 or 3-4 shift should occur, and the pressure gage stays at 0 psi, or does not match line pressure (Within 10 PSI), refer to Correction A, Hydraulic/Mechanical which are the most likely posibilitys.
If the volt meter and the 2-4 pressure gage both stay at 0 psi at all times, then refer to Correction B, Electrical which are the most likely possibilitys. If the volt meter rises to 12 volts and the 2-4 pressure gage matches line pressure, replace the band.

**CORRECTION "A", HYDRAULIC/MECHANICAL**

**1.** Refer to Figure 3 to identify, and check the 1-2 shift solenoid for the proper resistance value and mechanical operation. All of the solenoids are "Normally Closed". When 12 volts is applied to the solenoids, they should open to exhaust.
***Note:*** It may be necessary to compare the amount of air exhausting while you have the 12 volts applied, to the amount of air you are using as input, to ensure that you do not have a solenoid that is partially clogged.

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**CORRECTION A, HYDRAULIC/MECHANICAL (Continued)**

2. Inspect the 1-2 shift valve, shown in Figure 4, for freedom of movement in the bore. After the valve body is reassembled, air check the 1-2 shift valve from the 1-2 shift solenoid bore and listen for the shift valve snapping back and forth in its bore when the air pressure is turned on and off.
3. Ensure that there are only two checkballs in the "Main" valve body, and that they are in their proper locations, as shown in Figure 5.
4. Ensure that he solenoids are in their proper locations and the internal wire color to the solenoids using the chart in Figure 3.
5. Air check the servo through the 2-4 servo apply passage, as shown in Figure 6. If the servo cannot be applied, or is slow to apply, remove the 2-4 servo orifice assembly from the case, using a 10mm "Hex" socket, thoroughly clean and reassemble. (See Figure 6).
6. Inspect the 2-4 servo piston, seals, and the servo cap bore where the piston rides for damage and/or scoring. Replace parts as necessary.
7. Replace the 2-4 band assembly, and inspect the surface of the Sun Gear Drum where the band rides, for any damage or wear. Replace as necessary.

**CORRECTION B, ELECTRICAL:**

**Troubleshooting a 1-2 or 3-4 Shift Solenoid circuit error:**

1. While checking for trouble codes, give extra attention to the length of the needle sweep if you are using a volt meter, or the length of the flash if you are watching the "Hold" light. Trouble Code "6", vehicle speed sensor, can be easily confused with Trouble Code "60", 1-2 shift solenoid circuit error. Refer to Figure 7 for trouble code identification.
2. Disconnect and clean both the 12 pin and 6 pin connectors that are shown in Figure 2.
3. Disconnect the battery for 30 seconds to clear the computers memory, and retest for any trouble codes that may be present.
4. If trouble code re-appears, disconnect the 12 pin female harness connector, shown in Figure 2, and check for 13-27 ohms resistance between terminal 5 and ground (for 1-2 shift solenoid), or terminal 6 and ground (for 3-4 shift solenoid). If 13-27 ohms resistance is seen, go to step 6. If 13-27 ohms resistance is not seen, go to step 5.
5. Disconnect the 6 pin connector and check for 13-27 ohms resistance between terminal 3, of the case (Male) connector and ground (for 1-2 shift solenoid), or terminal 5, of the case (Male) connector and ground (for 3-4 shift solenoid). Refer to Figure 2. If 13-27 ohms resistance is not seen, remove the pan and check connections and the wiring to the solenoid and the solenoid location itself (See Figure 3). If 13-27 ohms resistance is seen, the wiring or connections between the 6 pin and the 12 pin connector may be faulty.

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**CORRECTION B, ELECTRICAL: (Continued)**

**6.** Locate the computer connector pin for the 1-2 and/or 3-4 shift solenoid and check for 13-27 ohms resistance between that pin and ground. If 13-27 ohms resistance is seen, the problem may exist in the solenoid driver inside the computer.
***Before*** replacing the computer, lets go one step further for some "Cheap Insurance". Apply 12 volts to the solenoid, using a jumper wire with a 5 amp fuse from the vehicle fuse panel (See Figure 8). Using a DVOM, set to mA/A, measure the amperage draw of the solenoid in question (See Figure 8). We know that the solenoids on this transmission operate with a 12 volt signal, and we know that the resistance of the solenoid we are testing is 16 ohms. With a simple math equation we can know what the amperage draw of the solenoid ***should*** be.
***Example: 12 volts ÷ 16 ohms = .75 amps.*** This simple test can also be done from the 12 pin or 6 pin connectors if necessary. If the 5 amp fuse blows or the amperage draw did not work, the wiring or connectors may be at fault. If necessary run a new wire and retest.
If the amperage draw is correct, replace the computer.

**SERVICE INFORMATION:** ***(Mazda Part Numbers)***

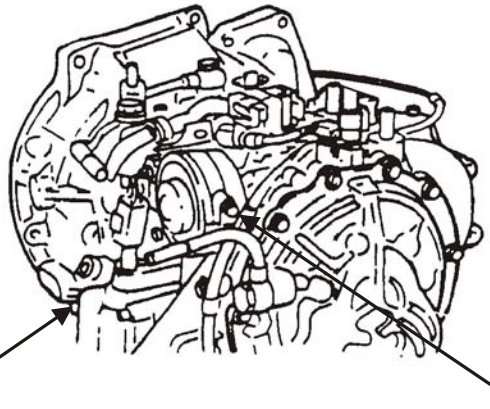
| | |
|---|---|
| 1-2 Shift Solenoid (Type 1) | FU62-21-285 |
| 1-2 Shift Solenoid (Type 2) | FU61-21-285B |
| 2-3 & 3-4 Shift Solenoid (Sold as Set Type 3) | FU62-21-280A |
| 2-3 & 3-4 Shift Solenoid (Sold as Set Type 3) | FU61-21-280C |
| Lock-Up Solenoid | FU01-21-243C |

***SPECIAL NOTE:***

***There are three different manufacturers for these solenoids as listed below.***
***Type 1 = Manufactured by Mitsubishi***
***Type 2 = Manufactured by NOK***
***Type 3 = Manufactured by Fujikoshi***

***The case of the solenoid will reflect the manufacturer. Even though there are different manufacturers which carry different part numbers, they will interchange with no problems, within the solenoid group you are ordering.***

## PRESSURE PORT LOCATIONS



**LINE PRESSURE PORT**
**"L" STAMPED IN CASE**

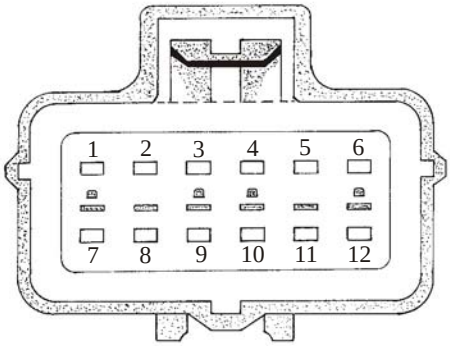
**2-4 SERVO APPLY PORT**

***NOTE: LINE PRESSURE IS NORMALLY 60PSI. AT IDLE AND 150 PSI. AT STALL***

Figure 1

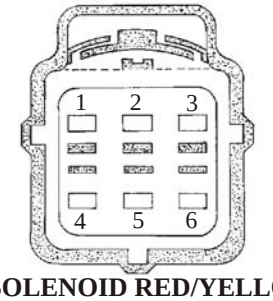
## CONNECTORS

**12 PIN (FEMALE)**



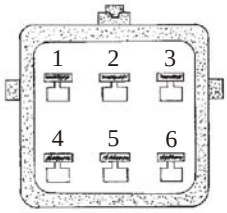

**PIN 5 = 1-2 SOLENOID RED/YELLOW STRIPE**
**PIN 6 = 3-4 SOLENOID BLUE/RED STRIPE**

**6 PIN (FEMALE)**




**PIN 1 = 1-2 SOLENOID RED/YELLOW STRIPE**
**PIN 5 = 3-4 SOLENOID BLUE/RED STRIPE**

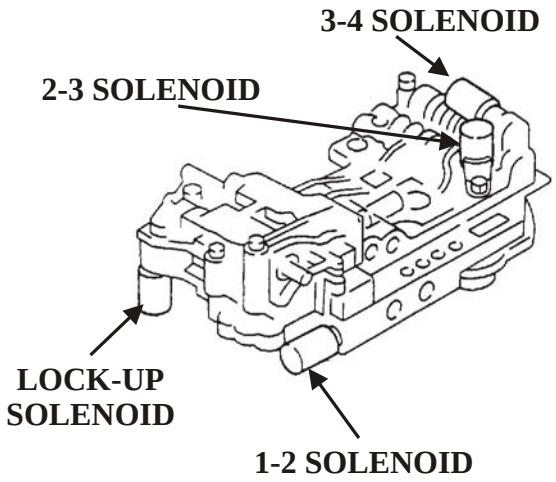
**6 PIN CASE (MALE)**




**PIN 3 = 1-2 SOLENOID GREEN (INTERNAL)**
**PIN 5 = 3-4 SOLENOID YELLOW (INTERNAL)**

Figure 2

## 1-2 SOLENOID LOCATION AND OPERATION

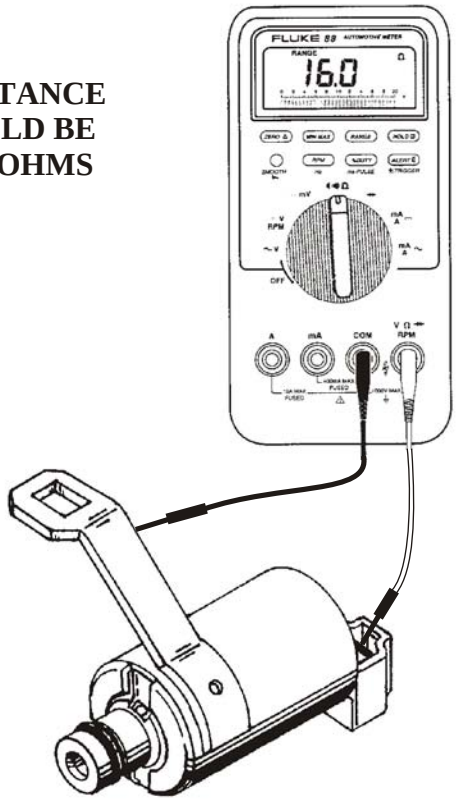



| SOLENOID | INTERNAL WIRE COLOR |
|---|---|
| 1-2 | GREEN |
| 2-3 | BLUE |
| 3-4 | YELLOW |
| LOCK-UP | WHITE |

***NOTE: REMOVE SOLENOID FROM HOLE IN VALVEBODY TO AIR CHECK SHIFT VALVE***

### OHM TEST

**RESISTANCE SHOULD BE 13-27 OHMS**




### MECHANICAL OPERATION

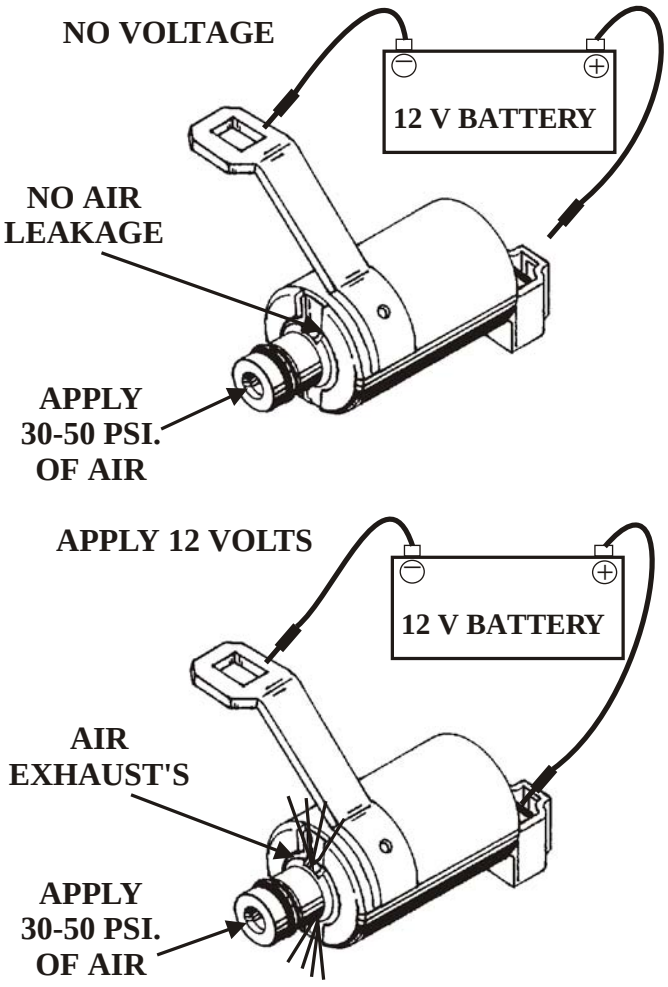



Figure 3

## LOWER VALVE BODY

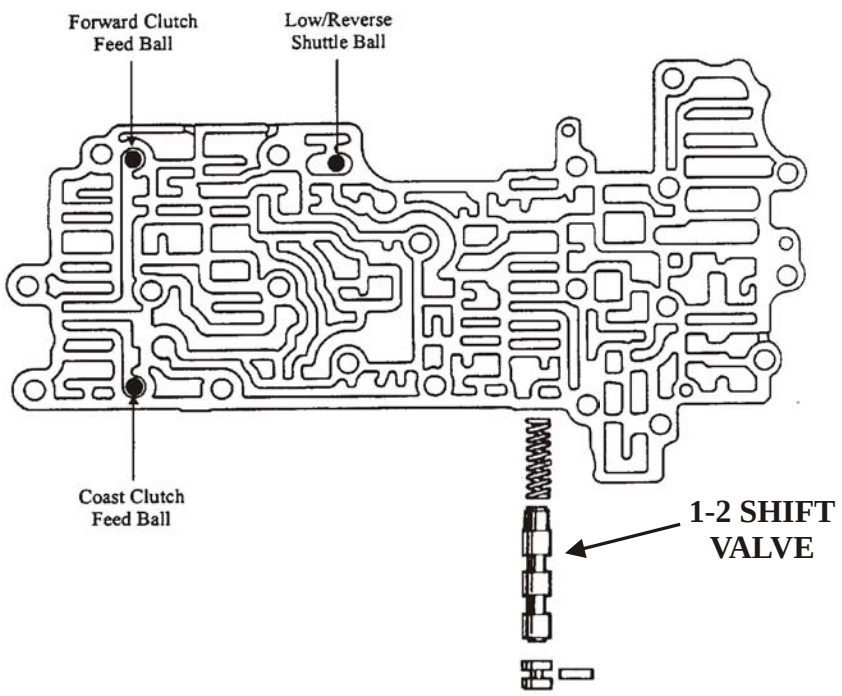



Figure 4

## MAIN VALVE BODY CHECK BALL LOCATIONS

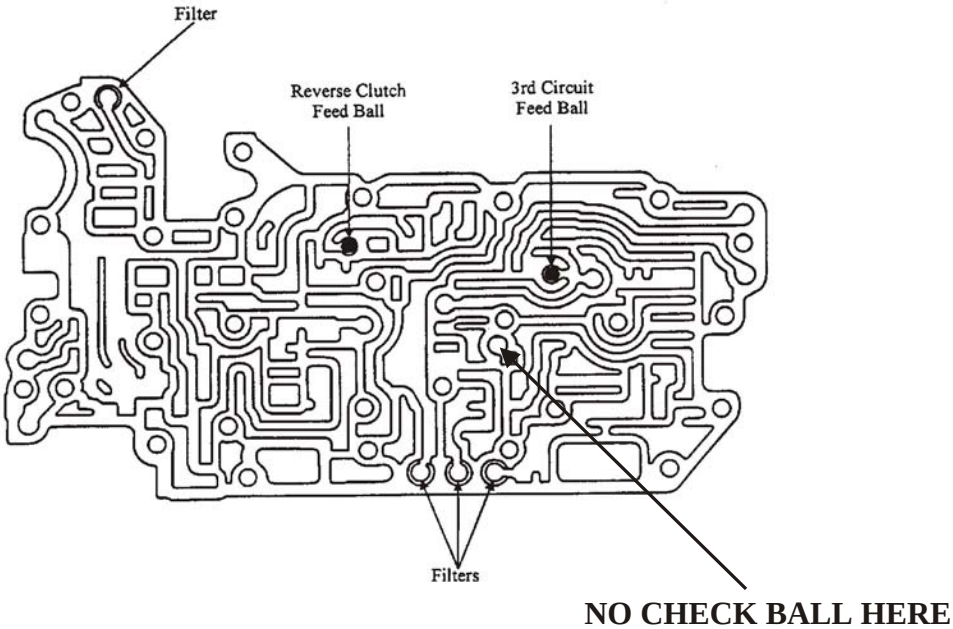
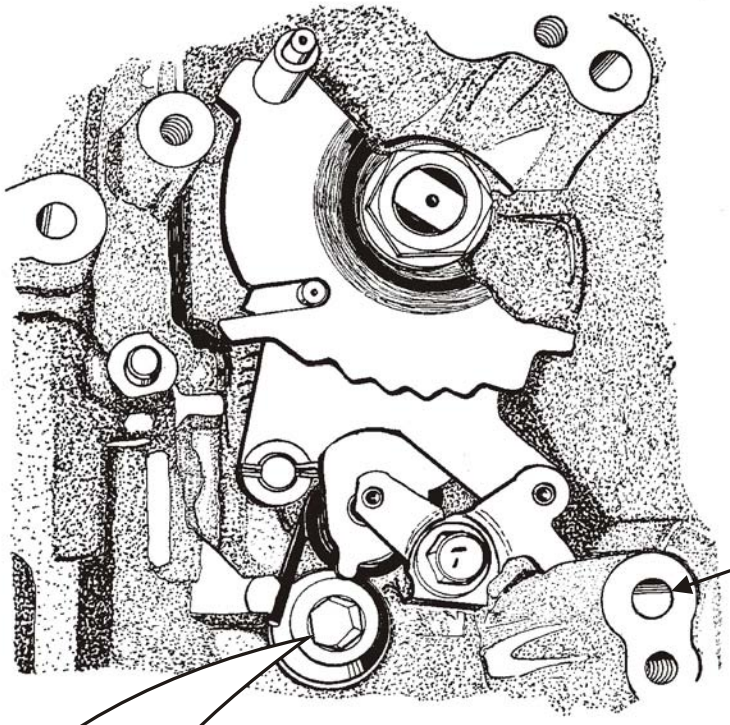



Figure 5

## 2-4 SERVO ORIFICE LOCATION



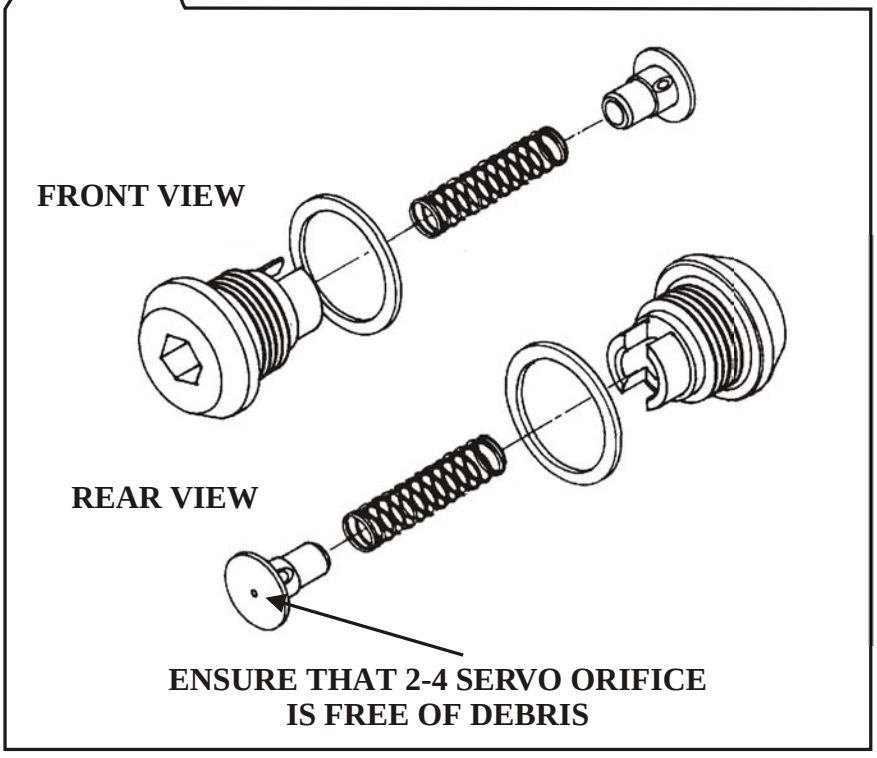




Figure 6

## CODE IDENTIFICATION

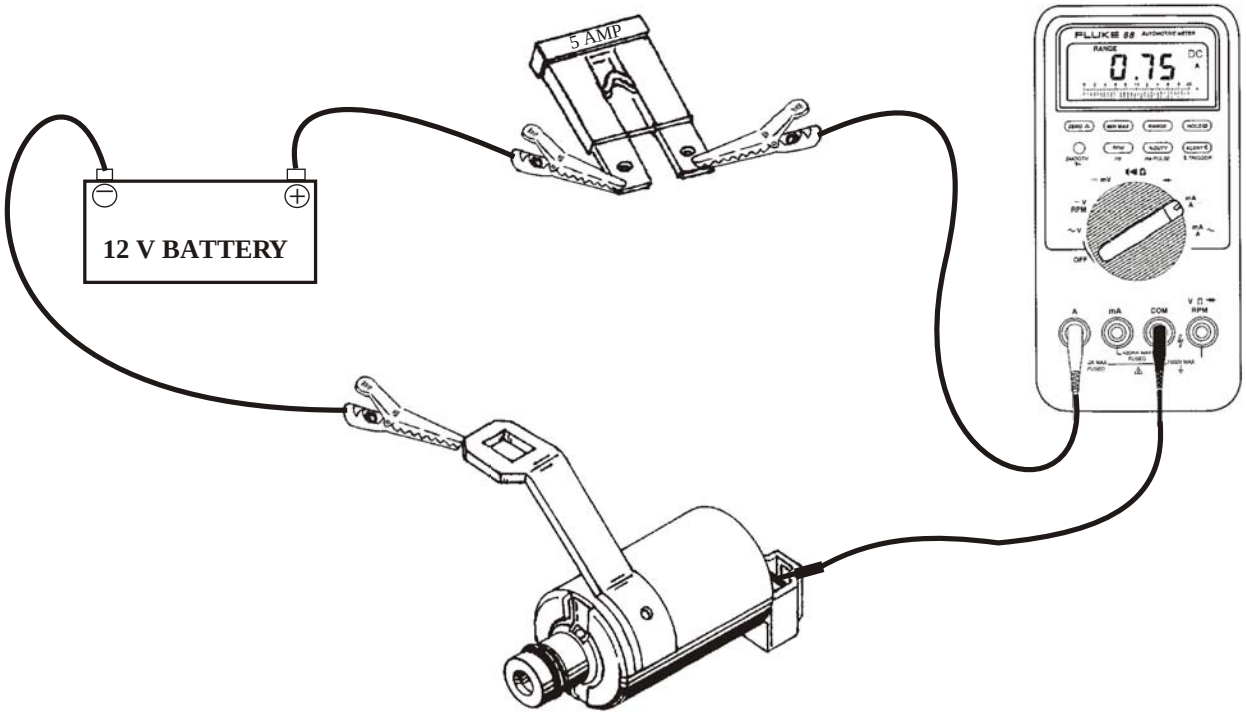
**CODE 6**
**VEHICLE SPEED SENSOR**


**CODE 60**
**1-2 SHIFT SOLENOID**


***6 SHORT FLASHES OR SWEEPS OF THE VOLT METER = CODE 6***
***6 LONG FLASHES OR SWEEPS OF THE VOLT METER = CODE 60***

Figure 7

## LOAD TESTING THE CIRCUIT




**12 volts ÷ 16 ohms = .75 amps**

Figure 8