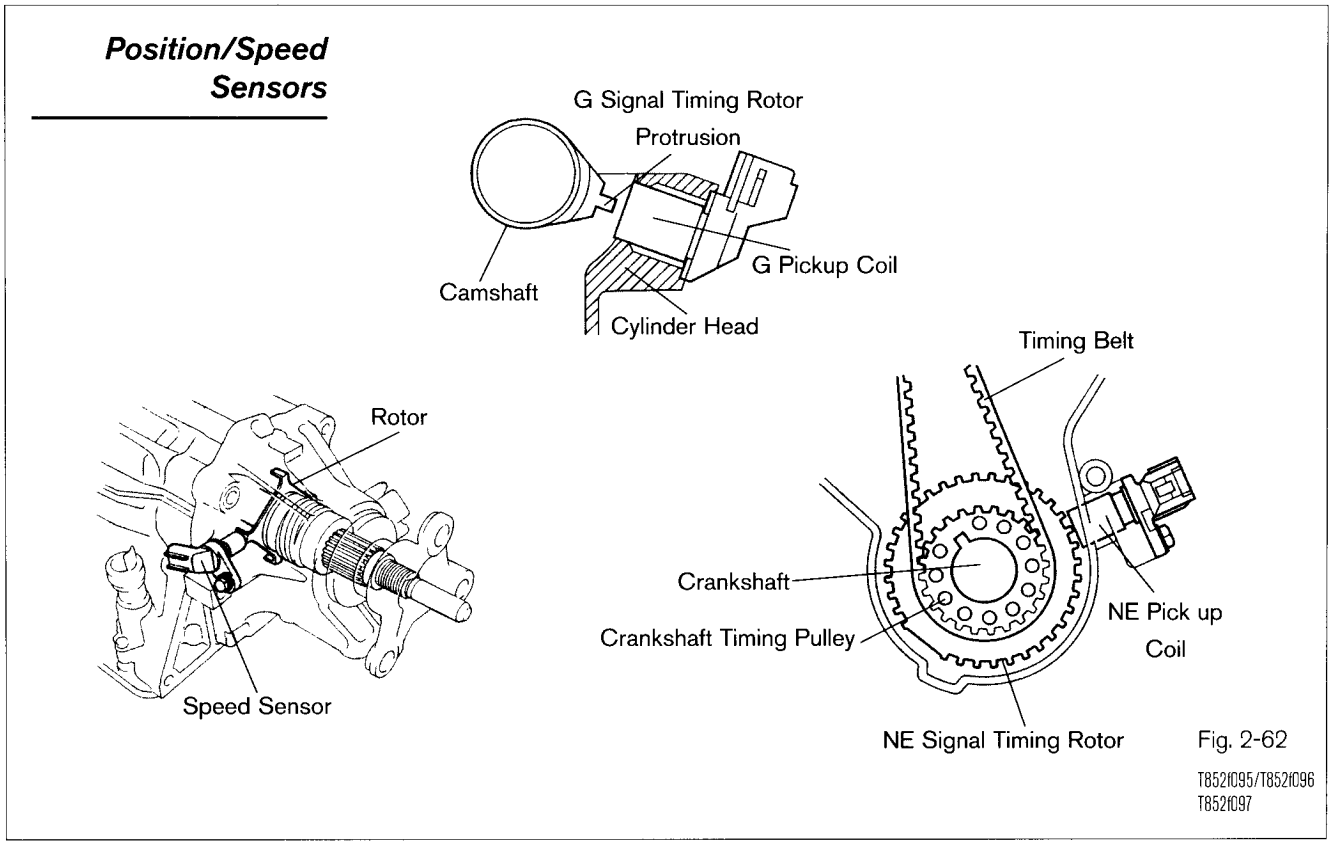
Position / Speed Sensors

Position/speed sensors provide information to the ECM about the position of a component, the speed of a component, and the change in speed of a component. The following sensors provide this data:

- Camshaft Position Sensor (also called G sensor).
- Crankshaft Position Sensor (also called NE sensor).
- Vehicle Speed Sensor.

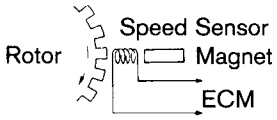


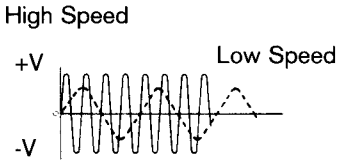
The Camshaft Position Sensor, Crankshaft Position Sensor, and one type of vehicle speed sensor are of the pick-up coil type sensor.

This type of sensor consists of a permanent magnet, yoke, and coil. This sensor is mounted close to a toothed gear. As each tooth moves by the sensor, an AC voltage pulse is induced in the coil. Each tooth produces a pulse. As the gear rotates faster there more pulses are produced. The ECM determines the speed the component is revolving based on the number of pulses. The number of pulses in one second is the signal frequency.

Pick-up Coil (Variable Reluctance) Sensor

Rotor speed determines the signal frequency. The faster the rotor revolves the higher the frequency.





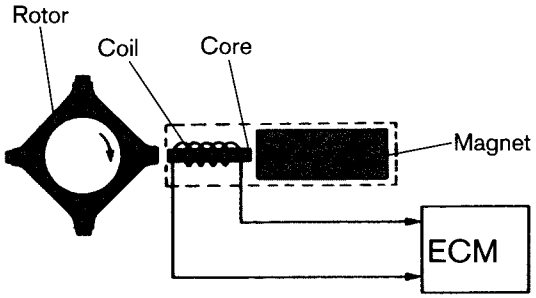


Fig. 2-63
T8521098/T8521099

Pick-Up Coil (Variable Reluctance) Type Sensors
The distance between the rotor and pickup coil is critical. The further apart they are, the weaker the signal.

Not all rotors use teeth. Sometimes the rotor is notched, which will produce the same effect.

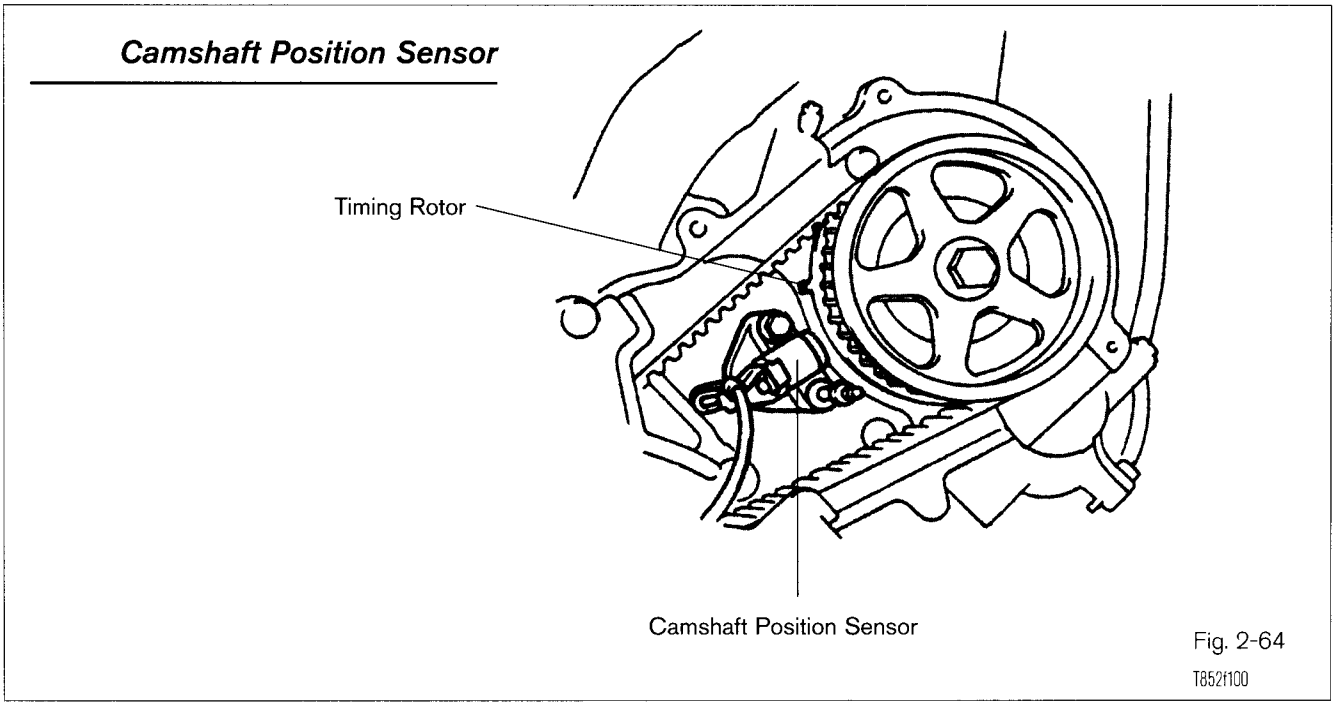
These sensors generate AC voltage, and do not need an external power supply. Another common characteristic is that they have two wires to carry the AC voltage.

The wires are twisted and shielded to prevent electrical interference from disrupting the signal. The EWD will indicate if the wires are shielded.

By knowing the position of the camshaft, the ECM can determine when cylinder No. I is on the compression stroke. The ECM uses this information for fuel injection timing, for direct ignition systems and for variable valve timing systems.

This sensor is located near one of the camshafts. With variable timing V-type engines, there is one sensor for each cylinder bank. On distributor ignition systems, it is often called the G sensor and is located in the distributor.

An AC signal is generated that is directly proportional to camshaft speed. That is, as the camshaft revolves faster the frequency increases.



Camshaft Position Sensor (G Sensor)
The terminal on the ECM is designated with a letter G, and on some models a G and a number, such as G22 is used.

Variable Valve Position Sensor
Some variable valve timing systems call the Camshaft Position Sensor the Variable Valve Position Sensor. See section on variable valve timing systems for more information.

Crankshaft Position Sensor (NE Sensor)

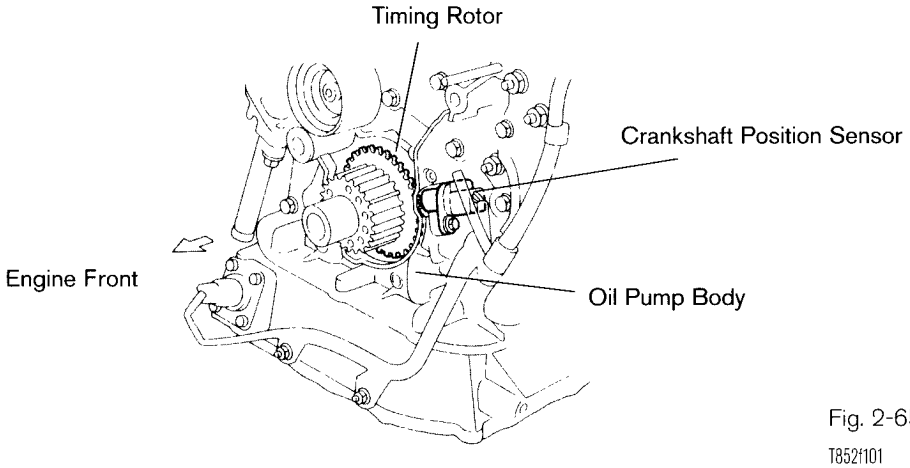


Fig. 2-65
T852f1101

Crankshaft Position Sensor (NE Sensor)

The ECM uses crankshaft position signal to determine engine RPM, crankshaft position, and engine misfire. This signal is referred to as the NE signal. The NE signal combined with the G signal indicates the cylinder that is on compression and the ECM can determine from its programming the engine firing order. See Section 3 on ignition systems for more information.

NE and G Signals

The periodic gap in the NE signal is because there is a tooth missing in the timing rotor. The gap is used by the ECM as reference to crankshaft position. When combined with the G signal, the ECM can determine cylinder position and stroke.

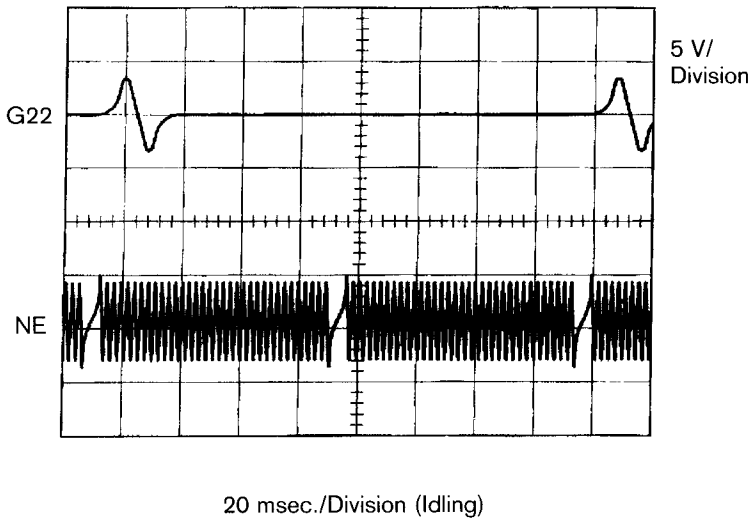


Fig. 2-66
T852f1102

Vehicle Speed Sensor Signal Circuit Combinations

There are different configurations by which the vehicle speed sensor signal reaches the ECM.

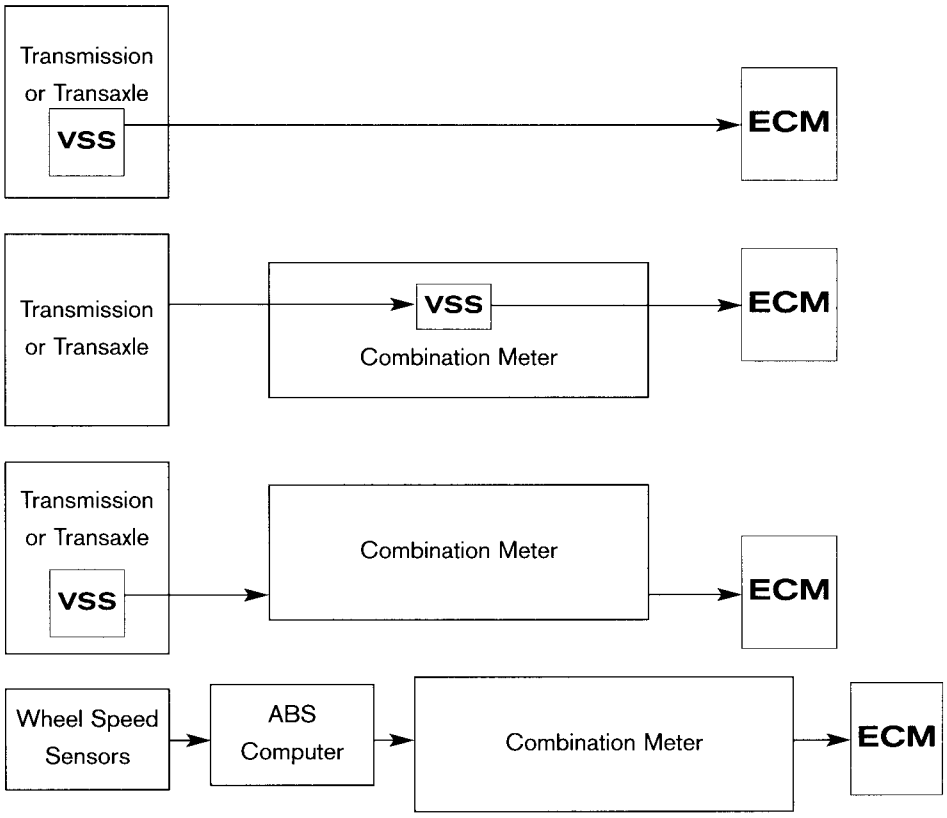


Fig. 2-67

Vehicle Speed Sensor (VSS)

The ECM uses the Vehicle Speed Sensor (VSS) signal to modify engine functions and initiate diagnostic routines. The VSS signal originates from a sensor measuring transmission/ transaxle output speed or wheel speed. Different types of sensors have been used depending on models and applications.

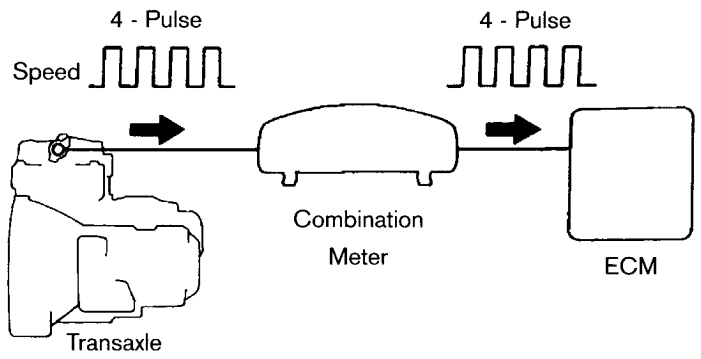
On some vehicles, the vehicle speed sensor signal is processed in the combination meter and then sent to the ECM.

On some anti-lock brake system (ABS) equipped vehicles, the ABS computer processes the wheel speed sensor signals and sends a speed sensor signal to the combination meter and then to the ECM. You will need to consult the EWD to confirm the type of system you are working on.

Pick-Up Coil (Variable Reluctance) Type

This type of VSS operates on the variable reluctance principle discussed earlier and it is used to measure transmission/ transaxle output speed or wheel speed depending on type of system.

VSS Mounted in Transaxle



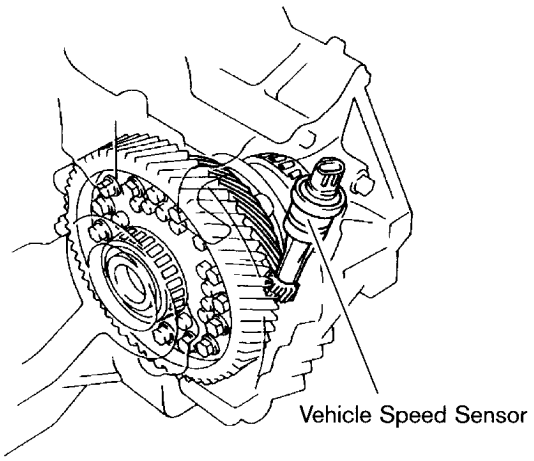
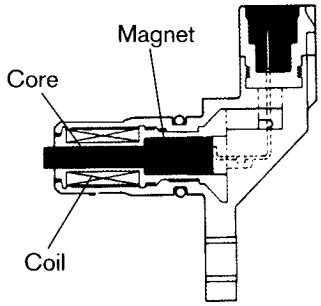


Fig. 2-68
T852f103/T852f104

VSS Mounted in Transmission



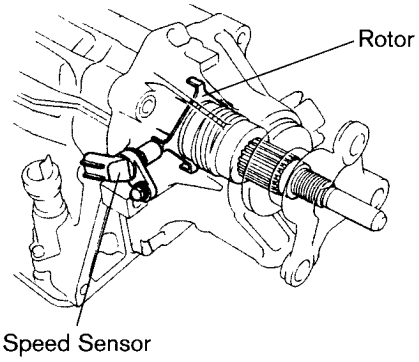
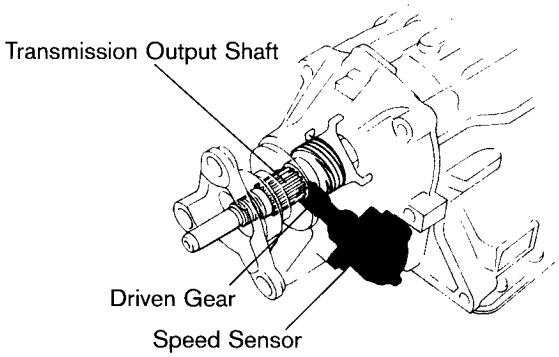


Fig. 2-69
T852f105/T852f095

MRE Type VSS



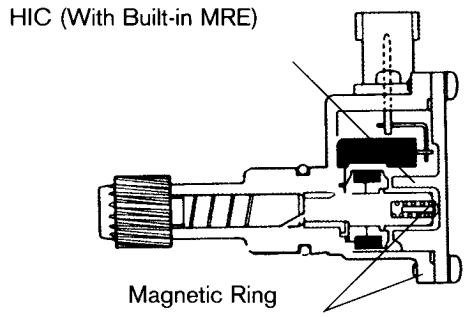
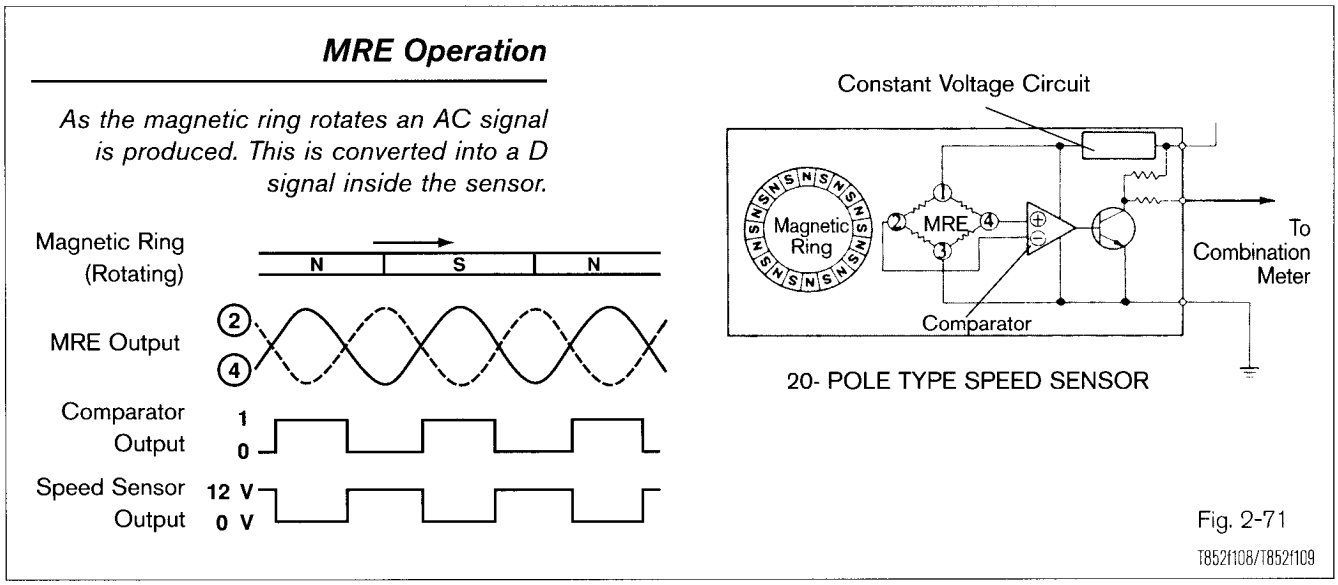
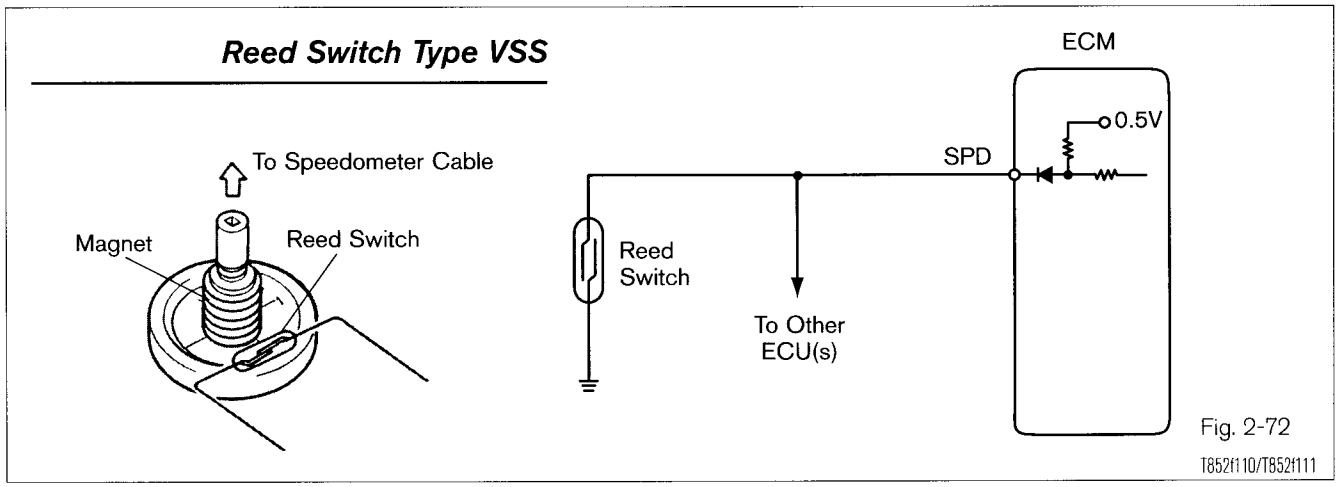


Fig. 2-70
T852f106/T852f107



Magnetic Resistance Element (MRE) Type

The MIRE is driven by the output shaft on a transmission or output gear on a transaxle. This sensor uses a magnetic ring that revolves when the output shaft is turning. The MIRE senses the changing magnetic field. This signal is conditioned inside the VSS to a digital wave. This digital wave signal is received by the Combination meter, and then sent to the ECM. The MIRE requires an external power supply to operate.



Reed Switch Type

The reed switch type is driven by the speedometer cable. The main components are a magnet, reed switch, and the speedometer cable. As the magnet revolves the reed switch contacts open and close four times per revolution. This action produces 4 pulses per revolution. From the number of pulses put out by the VSS, the combination meter/ECM is able to determine vehicle speed.

ASSIGNMENT **NAME:** _____

1. What are the “G” and “NE” sensors?

2. Explain in detail how an magnetic pick up coil type Cam or Crank sensor works.

3. Explain how the PCM (ECM) uses the Crankshaft position sensor signal.

4. Draw the scope pattern of both a Cam sensor and Crank sensor.

5. What is the function of a vehicle speed sensor (VVS) and list the three types.

6. Explain how a Pick UP Coil (Variable Reluctance) type VSS works?

7. Explain how a Magnetic Resistance Element (MRE) type VSS works?

8. Explain how a Reed Switch type VSS works?

