DTC P0501: VEHICLE SPEED SENSOR RANGE/PERFORMANCE

COMPONENT LOCATION

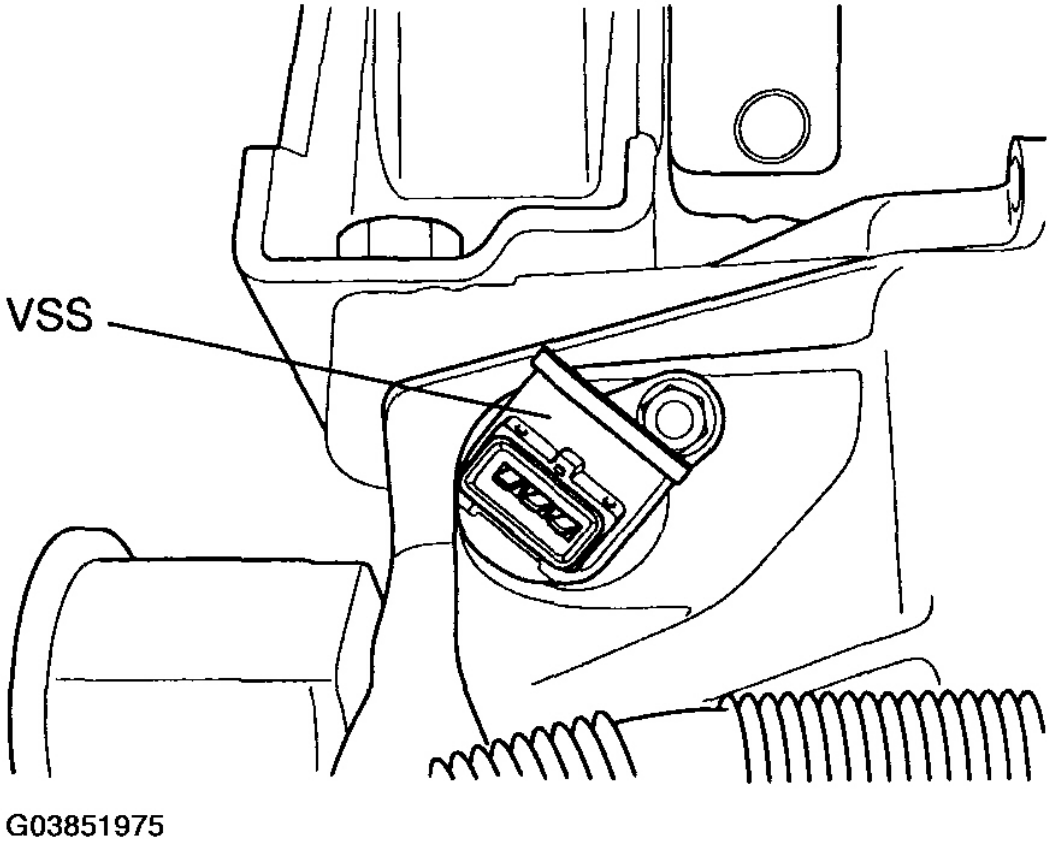

Fig. 401: Identifying VSS Location
Courtesy of HYUNDAI MOTOR CO.

GENERAL DESCRIPTION

The Wheel Speed Sensor (WSS) generates a WAVE FORM with a frequency according to the speed of the vehicle. The signal generated by the WSS informs the PCM not only if the vehicle speed is low or high but also is stopped the vehicle or not. The PCM uses this signal to control the fuel injection, ignition timing, transmission/transaxle shift scheduling and torque converter clutch scheduling. Also the WSS signal is used to detect rough road driving condition.

DTC DESCRIPTION

The PCM evaluates engine speed and mass air flow if there is no vehicle speed signal. This evaluation of both value will detect open circuit or short circuit error on wheel speed sensor. The PCM sets DTC P0501 if there is no vehicle speed signal from wheel speed sensor while both engine speed and mass air flow are higher than

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predetermined threshold during predetermined time. If the same error code is set in the next driving cycle, the ECM illuminates the MIL.

DTC DETECTING CONDITION

1.5 SOHC

1.5 SOHC DETECTING CONDITION

Item		Detecting Condition	Possible cause
Monitoring Strategy		• Rationality check	• Open in signal circuit • Open in battery and ground circuit • Short to ground in signal circuit • Short to battery in signal circuit • Faulty VSS • Faulty PCM
Case1	Threshold value	• No vehicle speed signal (during injection): < 3.75kph (2.330142 mile)	
	Enable Conditions	• Engine speed > 3000 RPM • Engine load > 50% • Coolant temperature > 65°C(149°F)	
Case2	Threshold value	• No vehicle speed signal (during fuel cut-off) < 5 kph (3.106856 mile)	
	Enable Conditions	• Engine speed 1520-4000 RPM • Coolant temperature > 65°C(149°F)	
Diagnostic Time		• 20 sec	
Fail Safe		• None	

1.6 DOHC

1.6 DOHC DETECTING CONDITION

Item		Detecting Condition	Possible cause
Monitoring Strategy		• Rationality check	• Open in signal circuit • Open in battery and
Case1	Threshold value	• No vehicle speed signal (during injection): < 3.75kph (2.330142 mile)	
	Enable Conditions	• Engine speed > 3000 RPM • Engine load > 50%	

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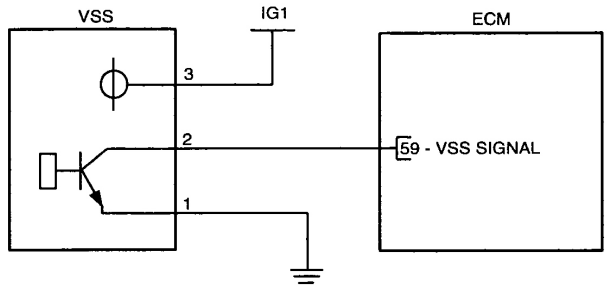
		• Coolant temperature > 65°C(149°F)	ground circuit • Short to ground in signal circuit • Short to battery in signal circuit • Faulty VSS • Faulty PCM
Case2	Threshold value	• No vehicle speed signal (during fuel cut-off) < 5 kph (3.106856 mile)	
	Enable Conditions	• Engine speed 1520-4000 RPM • Coolant temperature > 65°C(149°F)	
Diagnostic Time		• 20 sec	
Fail Safe		• None	

SCHEMATIC DIAGRAM

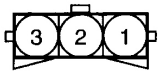
[CIRCUIT DIAGRAM]



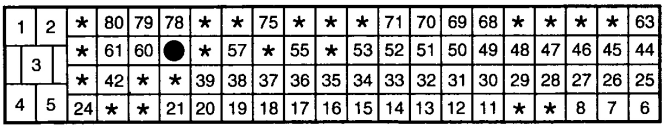
[CONNECTION INFORMATION]

Terminal	Connected to	Function
2	ECM terminal 59	Sensor Ground
1	Chassis Ground	VSS Signal
3	IG 1	Battery Voltage

[HARNESS CONNECTORS]



VSS



ECM

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Fig. 402: Vehicle Speed Sensor Schematic Diagram
Courtesy of HYUNDAI MOTOR CO.

SIGNAL WAVE FORM & DATA

This is the wave form of vehicle sensor when it drives 40Km/h.

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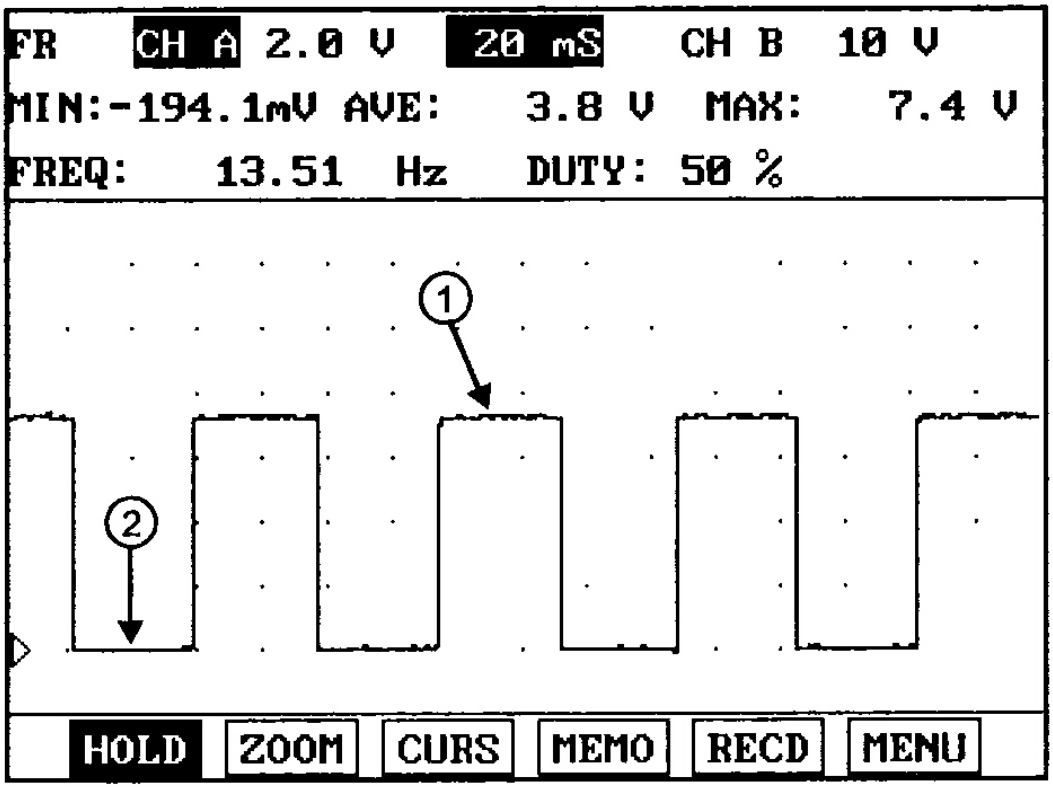

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Fig. 403: Vehicle Sensor Wave Form
Courtesy of HYUNDAI MOTOR CO.

- The voltage at point (1) should be below 0.8V and at point (2) should be above 7V.
- The frequency of vehicle sensor must increase as the RPM increases

MONITOR DTC STATUS

This is the inspection procedure to determine whether it is present DTC or memoried one by monitoring the current signal or by using the function of oscilloscope with Hi-scan pro.

1. Connect scan tool to Data Link Connector (DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "VSS signal" parameter on the scan tool.

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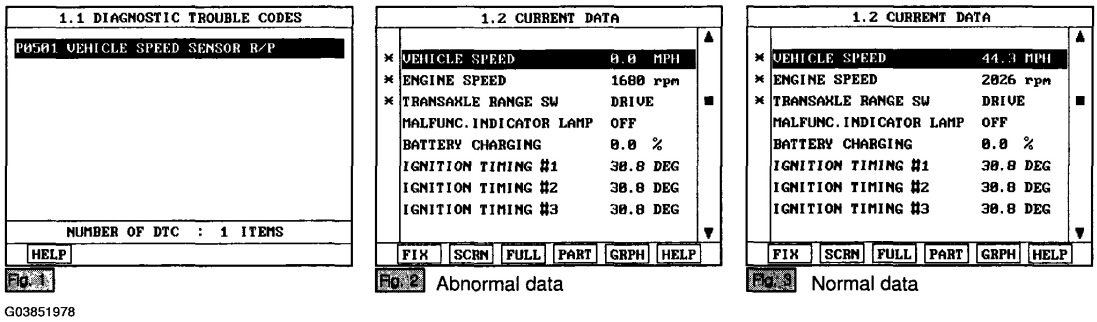

Fig. 404: Monitoring "VSS Signal" Parameter On Scan Tool
Courtesy of HYUNDAI MOTOR CO.

Service standard

Approximately 40 Km/h

NOTE: The data shown above is only for reference and there may be a little difference actually.

4. Is parameter displayed within specifications?

YES

- Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "**VERIFICATION OF VEHICLE REPAIR**" procedures.

NO

- Go to "**W/HARNESS INSPECTION**" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

- Repair as necessary and go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

NO

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- Go to "**POWER CIRCUIT INSPECTION**" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect VSS sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 3 of sensor harness connector and chassis ground.

   Specification: approximately B+

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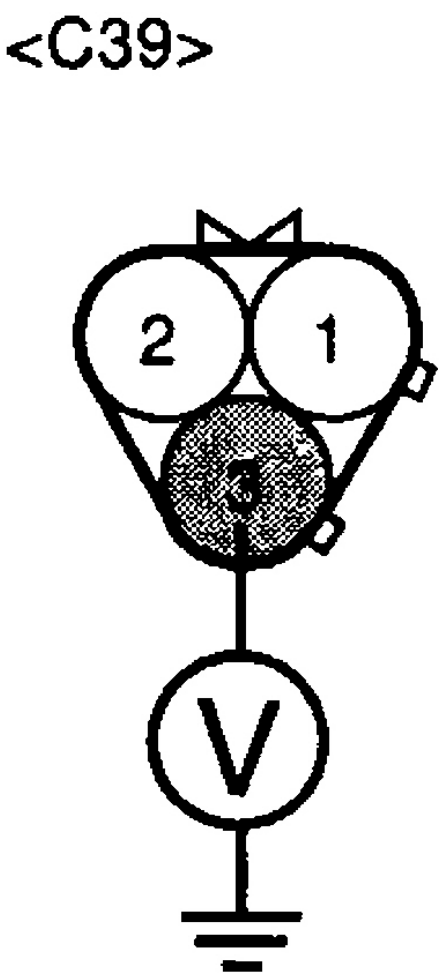

1. Ground
2. Vss Signal
3. Battery Power(12V)

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Fig. 405: Measuring Voltage Between Terminal 3 Of Sensor Harness Connector And Chassis Ground
Courtesy of HYUNDAI MOTOR CO.

5. Is measure voltage within Specification?

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YES

- Go to "**SIGNAL CIRCUIT INSPECTION**" procedure.

NO

- Open circuit or short circuit to chassis ground between VSS harness connector and battery power circuit.
- Repair as necessary and then go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

NOTE: In case, when the connector of VSS is disconnected, the voltage of terminal 3 is 1V.

- **Possible cause: Open circuit or short circuit after I/P-J/BOX fuse (10A)**

SIGNAL CIRCUIT INSPECTION

1. Check for open in harness
    1. Ignition "OFF"
    2. Disconnect VSS sensor connector.
    3. Ignition "ON" & Engine "OFF"
    4. Measure voltage between terminal 2 of sensor harness connector and chassis ground.

       Specification: approximately 5V

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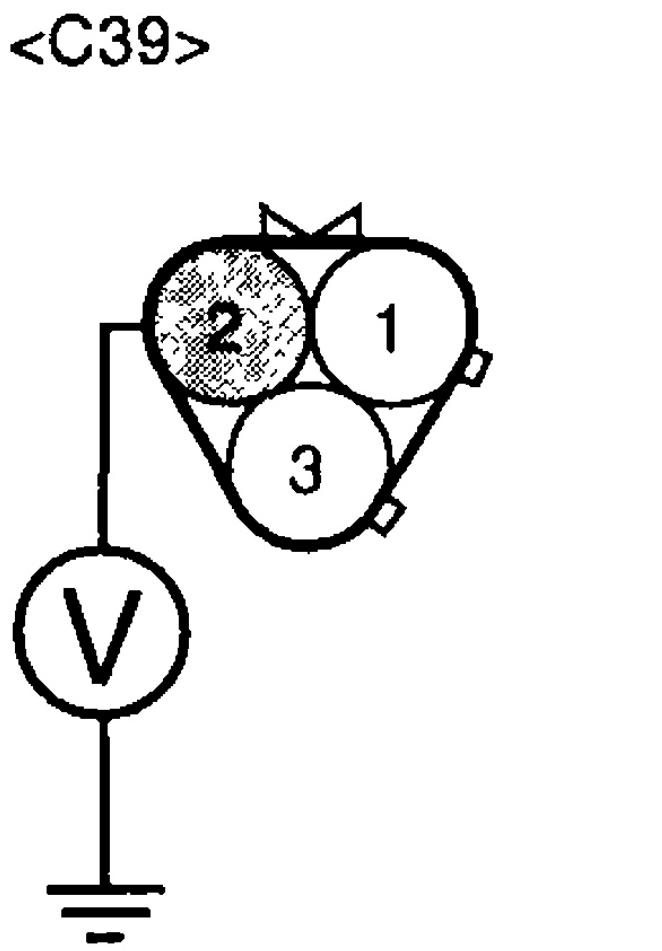

Fig. 406: Measuring Voltage Between Terminal 2 Of Sensor Harness Connector And Chassis Ground
Courtesy of HYUNDAI MOTOR CO.

5. Is measure voltage within Specification?

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YES

- Go to "Check for short to ground in harness" below.

NO

- Open or short circuit between VSS harness connector and PCM harness connector.
- Faulty PCM
- Repair as necessary and then go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

NOTE:

1. **In case, when the connector of VSS is disconnected, the voltage of terminal 2 is 0V.**
   - **Possible cause: If the terminal 2 voltage of VSS is 0V, the possible cause is likely to be open or bad PC-M.**
2. **The voltage of terminal 2 is about 6.5~7.5V when the VSS connector is disconnected.**

2. Check for short to ground in harness

   When the voltage of VSS terminal 2 is 0V, the inspection of short circuit is recommended to find open or short circuit of signal line.

   1. Ignition "OFF"
   2. Disconnect VSS sensor connector and PCM connector.
   3. Ignition "ON" & Engine "OFF"
   4. Measure resistance between terminal 1 and 2 of sensor harness connector.

      Specification: infinite

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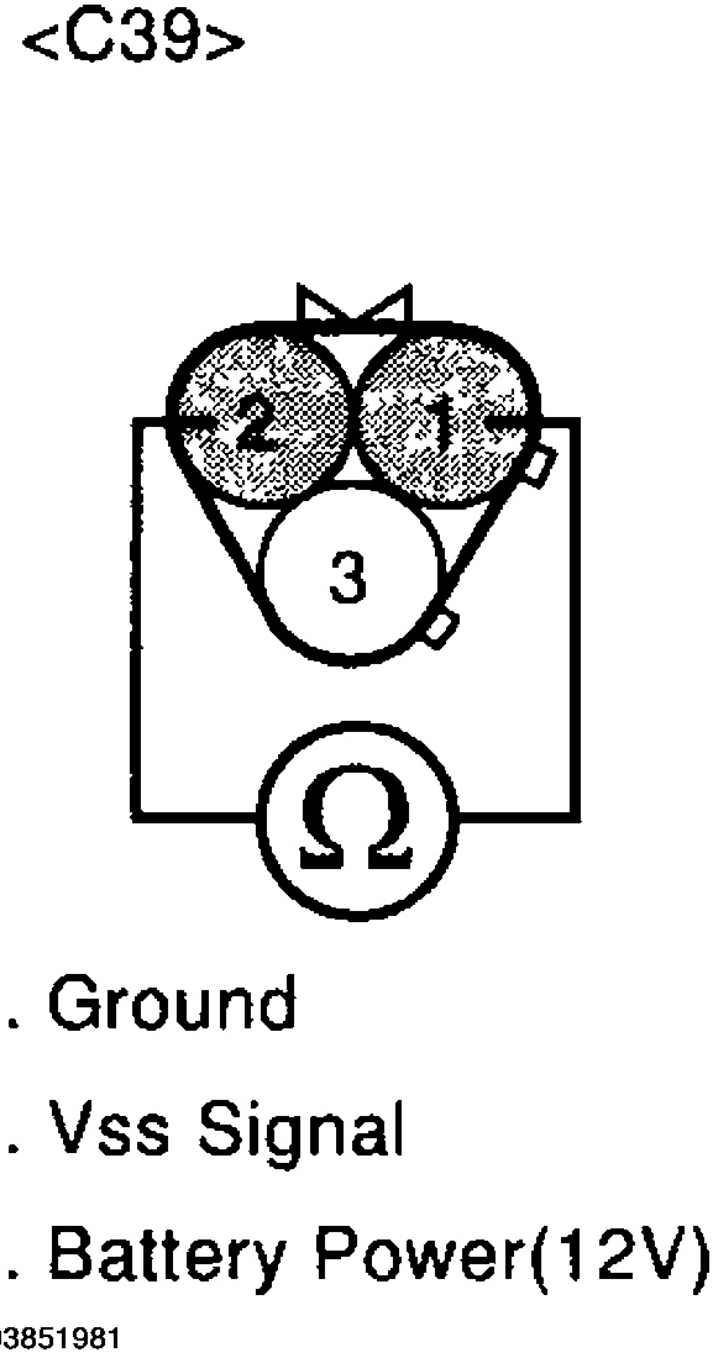

Fig. 407: Measuring Resistance Between Terminal 1 And 2 Of Sensor Harness Connector
Courtesy of HYUNDAI MOTOR CO.

5. Is measure resistance within Specification?

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YES

- Go to "**GROUND CIRCUIT INSPECTION**" procedure.

NO

- Short circuit to chassis ground between VSS harness connector and PCM harness connector.
- Short circuit between VSS signal circuit and ground circuit.
- Repair as necessary and then go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

GROUND CIRCUIT INSPECTION

The purpose of checking terminal 2 after disconnecting VSS connector is to check open or short circuit of ground.

1. Ignition "OFF"
2. Disconnect VSS sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 1 of sensor harness connector and chassis ground.

   Specification: below 0.5V or below 1ohms

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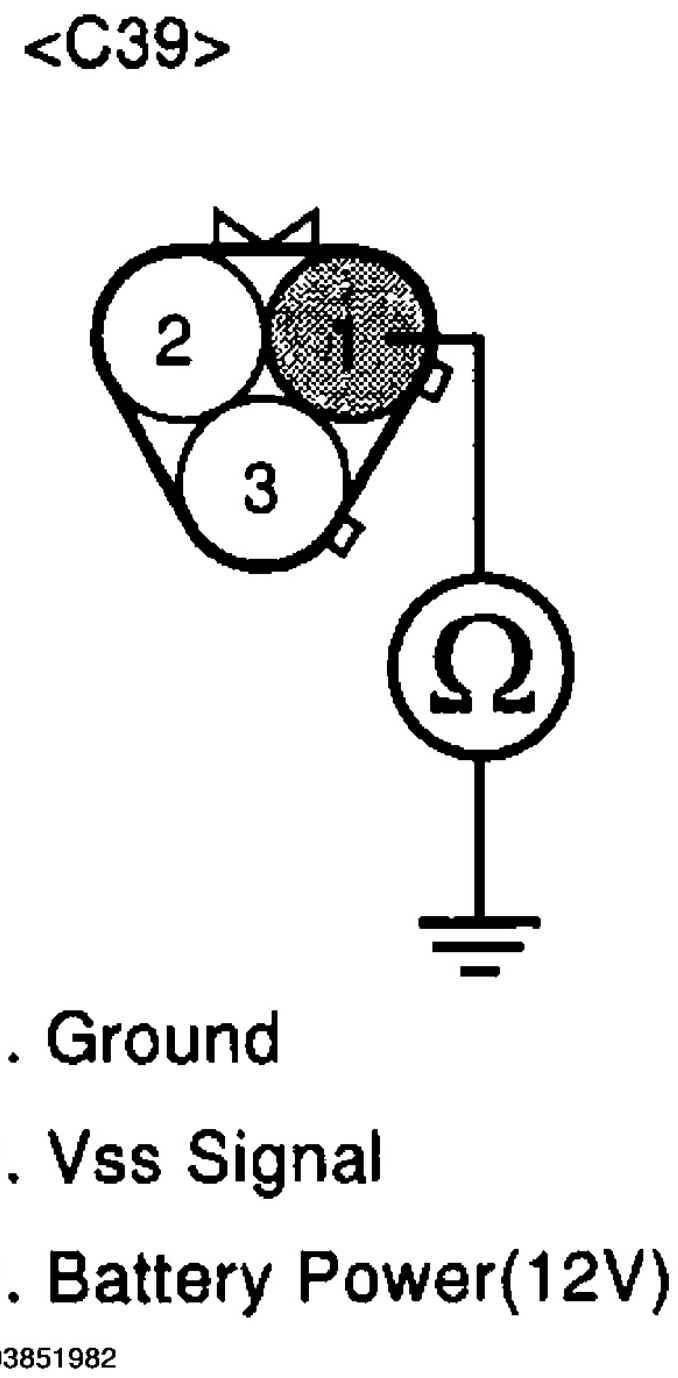

Fig. 408: Measuring Resistance Between Terminal 1 Of Sensor Harness Connector And Chassis Ground
Courtesy of HYUNDAI MOTOR CO.

5. Is measure voltage or resistance within Specification?

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YES

- Go to "**COMPONENT INSPECTION**" procedure.

NO

- Open circuit between VSS harness connector and Chassis ground.
- Repair as necessary and then go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

1. Check PCM

   The purpose of checking ECM is to determine whether there is any malfunction of PCM

   1. Ignition "OFF"
   2. Connect scan tool and Engine "ON "
   3. Select simulation function on scan tool.

      Specification: If the vehicle speed changes as simulation change, it is OK

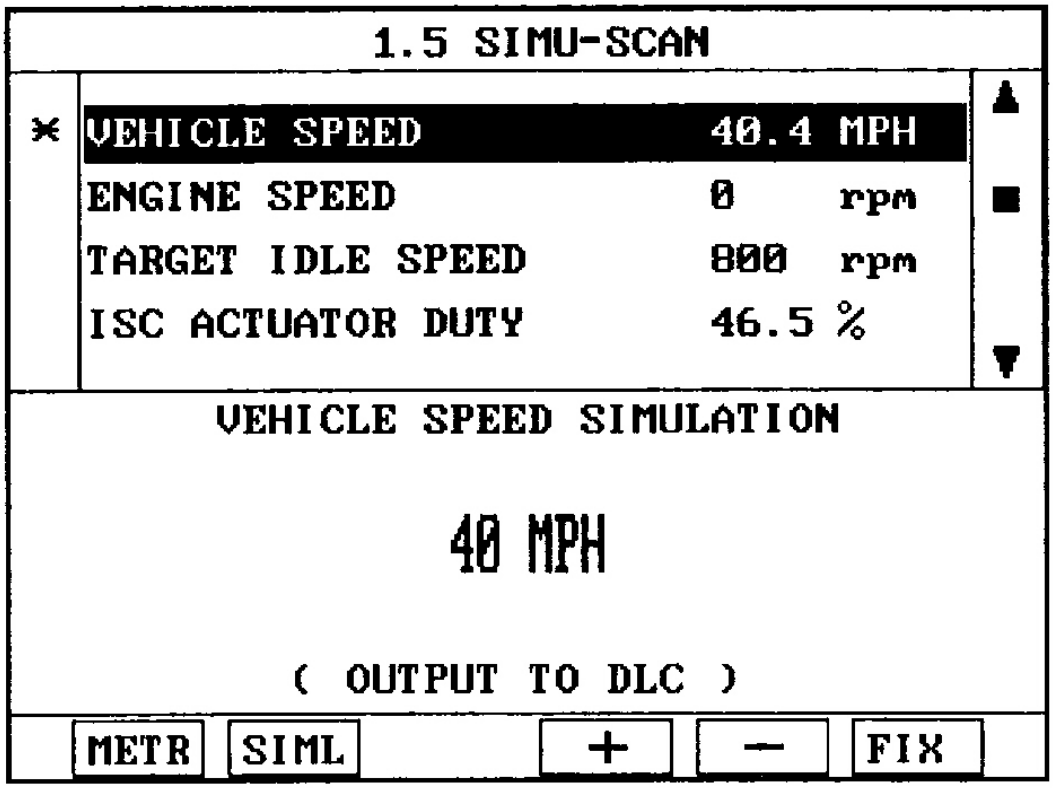

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Fig. 409: Scan Tool Display Vehicle Speed Simulation
Courtesy of HYUNDAI MOTOR CO.

4. Is VSS sensor signal value changed according to simulation voltage ?

   YES

   - Check VSS for contamination, deterioration, or damage. Clean VSS with suitable cleaner as necessary and let air dry before reinstalling. If problem still exists, Substitute with a known-good VSS and check for proper operation.

     If the problem is corrected, replace VSS and then go to "**VERIFICATION OF VEHICLE REPAIR**" procedure

   NO

   - Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "**VERIFICATION OF VEHICLE REPAIR**" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a scan tool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all readiness test have been verified as "Complete"
5. Are any DTCs present ?

   YES

   - Go to the **APPLICABLE TROUBLESHOOTING PROCEDURE**.

   NO

   - System is performing to specification at this time.

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