C: Reference Voltage (VREF)

C: Introduction

C1 CHECK THE REFERENCE VOLTAGE TO SIGRTN/ETCRTN

Note: Diagnostic trouble codes (DTCs) P0642 and P0643 are set due to VREF circuit concerns only. When diagnosing DTC P0642 or P0643, follow the path for VREF concerns.

- Ignition OFF.
- Disconnect the suspect sensor.
- Ignition ON, engine OFF.
- For ETCREF concerns.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-) Suspect Sensor Connector, Harness Side
ETCREF	ETCRTN
ETCREF2	ETCRTN2
ETCREF3	ETCRTN3

- For VREF concerns.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-) Suspect Sensor Connector, Harness Side
VREF	SIGRTN

Is the voltage between 4.5 - 5.5 V?

Yes	No
GO to C19 .	GO to C2 .

C2 CHECK THE REFERENCE VOLTAGE TO GROUND

- For ETCREF concerns.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-)
ETCREF	Ground
ETCREF2	Ground
ETCREF3	Ground

- For VREF concerns.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-)
VREF	Ground

Is the voltage between 4.5 - 5.5 V?

Yes	No
GO to C18 .	GO to C3 .

C3 CHECK THE REFERENCE VOLTAGE WITH ALL SENSORS DISCONNECTED

Note: Refer to the Sensors Connected To VREF/ETCREF Chart at the beginning of this pinpoint test and the Wiring Diagrams Manual Electronic Engine Controls Cell to identify the sensors connected to VREF/ETCREF.

- Ignition OFF.
- Disconnect all of the sensors connected to the VREF/ETCREF circuit.
- Ignition ON, engine OFF.
- Measure the voltage at the sensor disconnected in C1.
- For ETCREF concerns.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-)
ETCREF	Ground
ETCREF2	Ground
ETCREF3	Ground

- For VREF concerns.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-)
VREF	Ground

Is the voltage between 4.5 - 5.5 V?

Yes	No
For electronic throttle control (ETC) concerns, GO to C8 . For all other VREF concerns, GO to C10 .	GO to C4 .

C4 CHECK THE REFERENCE VOLTAGE CIRCUIT FOR AN OPEN

- Ignition OFF.
- Disconnect the PCM.
- For ETCREF concerns.
- Measure the resistance between:

(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
ETCREF	ETCREF
ETCREF2	ETCREF2
ETCREF3	ETCREF3

- For VREF concerns.
- Measure the resistance between:

(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side

VREF	VREF

Is the resistance less than 5 ohms?

Yes	No
GO to C5 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

C5 CHECK THE REFERENCE VOLTAGE CIRCUIT FOR A SHORT TO GROUND

- For ETCREF concerns.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side
ETCREF	ETCRTN
ETCREF2	ETCRTN2
ETCREF3	ETCRTN3

- Measure the resistance between:

(+) PCM Connector, Harness Side	(-)
ETCREF	Ground
ETCREF2	Ground
ETCREF3	Ground

- For VREF concerns.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side
VREF	SIGRTN

- Measure the resistance between:

(+) PCM Connector, Harness Side	(-)
VREF	Ground

Are the resistances greater than 10K ohms?

Yes	No
GO to C6 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

C6 CHECK THE REFERENCE VOLTAGE CIRCUIT FOR A SHORT TO VPWR

- For ETCREF concerns.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side
ETCREF	VPWR

ETCREF2	VPWR
ETCREF3	VPWR

- For VREF concerns.
- Measure the resistance between:

(+) PCM Connector, Harness Side	(-) PCM Connector, Harness Side
VREF	VPWR

Is the resistance greater than 10K ohms?

Yes	No
GO to C7 .	REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.

C7 CHECK THE REFERENCE VOLTAGE FOR A SHORT TO VOLTAGE

- Ignition ON, engine OFF.
- For ETCREF concerns.
- Measure the voltage between:

(+) PCM Connector, Harness Side	(-)
ETCREF	Ground
ETCREF2	Ground
ETCREF3	Ground

- For VREF concerns.
- Measure the voltage between:

(+) PCM Connector, Harness Side	(-)
VREF	Ground

Is any voltage present?

Yes	No
REPAIR the short circuit. CLEAR the DTCs. REPEAT the self-test.	GO to C20 .

C8 CHECK THE REFERENCE VOLTAGE WITH THE ELECTRONIC THROTTLE CONTROL CONNECTED

Note: If this sensor was used for the ETCREF measurement in C3, GO to C9 .

- Ignition OFF.
- Connect the electronic throttle body throttle position sensor (ETBTPS).
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-)
ETCREF	Ground

ETCREF2	Ground
ETCREF3	Ground

Are the voltages between 4.5 - 5.5 V?

Yes	No
The concern is intermittent. GO to Pinpoint Test Z .	INSTALL a new ETBTPS. REFER to the Workshop Manual Section 303-04, Fuel Charging and Controls or Section 303-14, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.

C9 CHECK THE REFERENCE VOLTAGE WITH THE APP SENSOR CONNECTED

- Ignition OFF.
- Connect the APP sensor.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-)
ETCREF	Ground
ETCREF2	Ground
ETCREF3	Ground

Are the voltages between 4.5 - 5.5 V?

Yes	No
The concern is intermittent. GO to Pinpoint Test Z .	INSTALL a new APP sensor. REFER to the Workshop Manual Section 310-02, Acceleration Control. CLEAR the DTCs. REPEAT the self-test.

C10 CHECK THE REFERENCE VOLTAGE WITH THE TP SENSOR CONNECTED

Note: If this sensor was used for the VREF measurement in C3, GO to C11 .

- Ignition OFF.
- Connect the TP sensor.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-)
VREF	Ground

Is the voltage between 4.5 - 5.5 V?

Yes	No
For additional sensors disconnected, GO to C11 .	INSTALL a new TP sensor.

For no additional sensors disconnected, GO to Pinpoint Test Z .	REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.

C11 CHECK THE REFERENCE VOLTAGE WITH THE DIFFERENTIAL PRESSURE FEEDBACK EGR SENSOR CONNECTED

Note: If the vehicle is not equipped with a differential pressure feedback EGR sensor or if this sensor was used for the VREF measurement in C3, GO to C12 .

- Ignition OFF.
- Differential Pressure Feedback EGR Sensor connector connected.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-)
VREF	Ground

Is the voltage between 4.5 - 5.5 V?

Yes	No
For additional sensors disconnected, GO to C12 . For no additional sensors disconnected, GO to Pinpoint Test Z .	INSTALL a new Differential Pressure Feedback EGR sensor. REFER to the Workshop Manual Section 303-08, Engine Emission Control. CLEAR the DTCs. REPEAT the self-test.

C12 CHECK THE REFERENCE VOLTAGE WITH THE ESM CONNECTED

Note: If the vehicle is not equipped with an ESM or if this sensor was used for the VREF measurement in C3, GO to C13 .

- Ignition OFF.
- Connect the ESM.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-)
VREF	Ground

Is the voltage between 4.5 - 5.5 V?

Yes	No
For additional sensors disconnected, GO to C13 . For no additional sensors disconnected, GO to Pinpoint Test Z .	INSTALL a new ESM. REFER to the Workshop Manual Section 303-08, Engine Emission Control. CLEAR the DTCs. REPEAT the self-test.

C13 CHECK THE REFERENCE VOLTAGE WITH THE MAP SENSOR CONNECTED

Note: If the vehicle is not equipped with a MAP sensor or if this sensor was used for the VREF measurement in C3, GO to C14 .

- Ignition OFF.
- Connect the MAP sensor.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-)
VREF	Ground

Is the voltage between 4.5 - 5.5 V?

Yes	No
For additional sensors disconnected, GO to C14 . For no additional sensors disconnected, GO to Pinpoint Test Z .	INSTALL a new MAP sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.

C14 CHECK THE REFERENCE VOLTAGE WITH THE FRPT SENSOR CONNECTED

Note: If the vehicle is not equipped with a FRPT sensor or if this sensor was used for the VREF measurement in C3, GO to C15 .

- Ignition OFF.
- Connect the FRPT sensor.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-)
VREF	Ground

Is the voltage between 4.5 - 5.5 V?

Yes	No
For additional sensors disconnected, GO to C15 . For no additional sensors disconnected, GO to Pinpoint Test Z .	INSTALL a new FRPT sensor. REFER to the Workshop Manual Section 303-14, Electronic Engine Controls. CLEAR the DTCs. REPEAT the self-test.

C15 CHECK THE REFERENCE VOLTAGE WITH THE FTP SENSOR CONNECTED

Note: If the vehicle is not equipped with a FTP sensor or if this sensor was used for the VREF measurement in C3, GO to C16 .

- Ignition OFF.
- Connect the FTP sensor.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-)

VREF	Ground

Is the voltage between 4.5 - 5.5 V?

Yes	No
For additional sensors disconnected, GO to C16 . For no additional sensors disconnected, GO to Pinpoint Test Z .	INSTALL a new FTP sensor. REFER to the Workshop Manual Section 303-13, Evaporative Emissions. CLEAR the DTCs. REPEAT the self-test.

C16 CHECK THE REFERENCE VOLTAGE WITH THE ACP TRANSDUCER SENSOR CONNECTED

Note: If the vehicle is not equipped with an ACP transducer sensor or if this sensor was used for the VREF measurement in C3, GO to C17 .

- Ignition OFF.
- Connect the ACP transducer sensor.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-)
VREF	Ground

Is the voltage between 4.5 - 5.5 V?

Yes	No
For additional sensors disconnected, GO to C17 . For no additional sensors disconnected, GO to Pinpoint Test Z .	INSTALL a new Air Conditioning Pressure (ACP) Transducer Sensor. CLEAR the DTCs. REPEAT the self-test.

C17 CHECK THE REFERENCE VOLTAGE WITH THE PSP SENSOR CONNECTED

- Ignition OFF.
- Connect the PSP sensor.
- Ignition ON, engine OFF.
- Measure the voltage between:

(+) Suspect Sensor Connector, Harness Side	(-)
VREF	Ground

Is the voltage between 4.5 - 5.5 V?

Yes	No
The concern is intermittent. GO to Pinpoint Test Z .	INSTALL a new PSP sensor. CLEAR the DTCs. REPEAT the self-test.

C18 CHECK THE SIGRTN OR ETCRTN CIRCUIT(S) FOR AN OPEN

Note: Refer to the Wiring Diagrams Manual Electronic Engine Controls Cell for specific vehicle application and pin locations.

- Ignition OFF.
- Disconnect the PCM.
- For ETCRTN concerns.
- Measure the resistance between:

(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
ETCRTN	ETCRTN

- For SIGRTN concerns.
- Measure the resistance between:

(+) Suspect Sensor Connector, Harness Side	(-) PCM Connector, Harness Side
SIGRTN	SIGRTN

Is the resistance less than 5 ohms?

Yes	No
GO to C20 .	REPAIR the open circuit. CLEAR the DTCs. REPEAT the self-test.

C19 CHECK THE SUSPECT SENSOR FOR AN INTERNAL SHORT

- Clear the KOEO, KOER, and continuous DTCs.
- Ignition OFF.
- Connect the suspect sensor.
- Ignition ON, engine OFF.
- Carry out the PCM self-test.

Is the concern still present?

Yes	No
INSTALL a new sensor for the sensor in question. CLEAR the DTCs. REPEAT the self-test.	The concern is intermittent. GO to Pinpoint Test Z .

C20 CHECK FOR CORRECT PCM OPERATION

- Disconnect all the PCM connectors.
- Visually inspect for:
  - pushed out pins
  - corrosion
- Connect all the PCM connectors and make sure they seat correctly.
- Carry out the PCM self-test and verify the concern is still present.

Is the concern still present?

Yes	No
INSTALL a new PCM.	The system is operating correctly at this time. The

REFER to Section 2, Flash Electrically Erasable Programmable Read Only Memory (EEPROM) , Programming the VID Block for a Replacement PCM.	concern may have been caused by a loose or corroded connector.