D: Manifold Absolute Pressure (MAP) Sensor

D: Introduction

D1 DIAGNOSTIC TROUBLE CODE (DTC) P0236, P1247 AND P1248

- DTC P0236 indicates a turbo boost sensor A circuit performance concern.
- DTCs P1247, P1248 indicate turbo boost pressure was low or not detected.
- Possible causes:
  - damaged MAP hose
  - low turbo boost
  - intake manifold or crossover tube hose leaks
  - damaged MAP sensor
  - damaged PCM
- Inspect MAP sensor hose and manifolds for damage, leaks, restriction and misrouting.

Are manifolds and MAP hose OK and free of damage?

Yes	No
GO to D2 .	REPAIR leak as necessary. CLEAR DTCs and RETEST.

D2 MAP FREQUENCY CHECK

- Disconnect MAP sensor connector.
- Connect the MAP sensor tester between the vehicle harness and the MAP sensor.
- Connect MAP sensor tester to a digital multimeter. Set digital multimeter to frequency scale.
- Key on/engine off.

Is frequency reading between 90 hz and 115 hz?

Yes	No
GO to D3 .	REPLACE MAP sensor. CLEAR DTCs and RETEST.

D3 MAP SENSOR PRESSURE CHECK

- MAP sensor tester still connected.
- Disconnect vacuum hose from MAP sensor.
- Key on/engine off.
- Using Rotunda Pressure Adapter Kit 014-00761 or equivalent (gauge bar), apply 69 kPa (10 psi) of pressure to the MAP sensor.

Is frequency reading 145 hz ± 10 hz?

Yes	No
GO to D4 .	REPLACE MAP sensor. CLEAR DTCs and RETEST.

D4 MAP PERFORMANCE TEST

- Reconnect vacuum hose to MAP sensor.
- Disconnect MAP sensor vacuum hose from intake manifold and install a pressure (boost) gauge.
- Road test vehicle and accelerate vehicle to achieve full boost.

Is engine boost 82 kPa (12 psi) or greater?

Yes	No
CLEAR DTCs and RETEST. If DTC returns, REPLACE ECM.	INSPECT intake manifolds, crossover tubes for leaks. CHECK turbo condition. REFER to the Powertrain/Engine Group in the Service Manual.

D5 KOEO DIAGNOSTIC TROUBLE CODE (DTC) P0237

- DTC P0237 indicates turbo boost sensor A circuit low input.
- Possible causes:
  - MAP signal circuit open, shorted to ground, shorted to B+ , or shorted to VREF
  - open or shorted VREF circuit
  - open or shorted signal return circuit
  - damaged MAP sensor
  - damaged PCM
- Key off.
- Disconnect MAP sensor connector.
- Connect the MAP sensor tester between the vehicle harness connector and the MAP sensor.
- Insert the MAP sensor tester banana plugs into a digital multimeter.

  Note: Green light on tester indicates VREF is OK (4.5-5.5 volts) and signal return is OK. Red light indicates VREF is either too low or too high. No lights indicate VREF or signal return are open or shorted.

- Key on.

Is green light on?

Yes	No
GO to D6 .	Red light "less than 4V" on or no lights, GO to D11 . Red light "greater than 6V" on, GO to D14 .

D6 MAP SIGNAL SHORT TO GROUND CHECK

- Disconnect PCM, inspect for damaged or pushed-out pins, corrosion and loose wires. Service as necessary.
- Install breakout box. Leave PCM disconnected.
- Disconnect MAP sensor harness connector.
- Measure resistance between Pin 34 (49 State except Econoline) or Pin 88 (California and all Econoline) and Pins 25, 51, 76, 77, 91, 103.

Is each resistance greater than 10,000 ohms?

Yes	No
GO to D7 .	REPAIR short to ground or signal return in MAP signal Circuit 358 (LG/BK). CLEAR DTCs and RETEST.

D7 MAP SIGNAL SHORT TO VOLTAGE CHECK

- PCM disconnected.
- MAP sensor connector disconnected.
- Key on/engine off.
- Measure resistance between Pin 34 (49 State except Econoline) or Pin 88 (California and all Econoline) and Pins 55, 71 and 97 at the breakout box.

Is each resistance greater than 10,000 ohms?

Yes	No
GO to D8 .	REPAIR short to power in MAP signal Circuit 358 (LG/BK) and REPLACE MAP sensor. CLEAR DTCs and RETEST.

D8 MAP SIGNAL SHORT TO VREF CHECK

- PCM disconnected.
- MAP sensor connector disconnected.
- Key off.
- Measure resistance between Pin 34 (49 State except Econoline) or Pin 88 (California and all Econoline) and Pin 90 at the breakout box.

Is resistance greater than 10,000 ohms?

Yes	No
GO to D9 .	REPAIR short to VREF in MAP signal Circuit 358 (LG/BK). CLEAR DTCs and RETEST.

D9 MAP SIGNAL CONTINUITY CHECK

- PCM disconnected.
- MAP sensor connector disconnected.
- Measure resistance between Pin 34 (49 State except Econoline) or Pin 88 (California and all Econoline) at breakout box and Circuit 358 (LG/BK) at the MAP harness connector.

Is resistance less than 5 ohms?

Yes	No
GO to D10 .	REPAIR open MAP signal Circuit 358 (LG/BK). CLEAR DTCs and RETEST.

D10 PCM CHECK

- Connect PCM to breakout box.
- MAP sensor connector disconnected.
- Key on.
- Measure voltage on MAP signal Circuit 358 (LG/BK) at MAP harness connector.

Is voltage reading 5 volts ± 0.5v?

Yes	No
REPLACE MAP sensor. CLEAR DTCs and RETEST.	REPLACE PCM. CLEAR DTCs and RETEST.

D11 VREF VOLTAGE CHECK

- Disconnect MAP sensor tester connector from MAP sensor, leaving it connected to vehicle harness.
- Key on/engine off.

Is green light on tester now on?

Yes	No
REPLACE MAP sensor. CLEAR DTCs and RETEST.	GO to D12 .

D12 VREF CONTINUITY CHECK

- Key off.
- Disconnect PCM, inspect for damaged or pushed-out pins, corrosion and loose wires. Service as necessary.
- Install breakout box. Leave PCM disconnected.
- Disconnect MAP sensor tester from vehicle harness.
- Measure resistance between Pin 90 at breakout box and VREF Circuit 351 (BR/W) at MAP sensor connector.

Is resistance less than 5 ohms?

Yes	No
GO to D13 .	REPAIR open in VREF Circuit 351 (BR/W) between PCM and MAP sensor.

D13 SIGNAL RETURN CONTINUITY CHECK

- PCM disconnected.
- Measure resistance between Pin 34 (49 State except Econoline) or Pin 88 (California and all Econoline) on breakout box and signal return Circuit 359 (GY/R) at MAP sensor connector.

Is resistance less than 5 ohms?

Yes	No
REPLACE PCM. CLEAR DTCs and RETEST.	REPAIR open in signal return Circuit 359 (GY/R).

D14 VREF SHORT TO B+ CHECK

- Disconnect PCM, inspect for damaged or pushed-out pins, corrosion and loose wires. Service as necessary.
- Install breakout box. Leave PCM disconnected.
- Key on.
- Measure voltage between Pin 90 and ground.

Is voltage reading less than 0.25v?

Yes	No
REPLACE PCM. CLEAR DTCs and RETEST.	REPAIR short to B+ in VREF circuit. CLEAR DTCs and RETEST.

D15 KOEO DIAGNOSTIC TROUBLE CODE (DTC) P0238

- DTC P0238 indicates turbo boost sensor A circuit high input.
- Possible causes:
  - damaged MAP sensor
  - damaged PCM
- Disconnect MAP sensor connector.
- Connect the MAP sensor tester between the vehicle harness connector and the MAP sensor.
- Insert the MAP sensor tester banana plug into a digital multimeter. Set digital multimeter to frequency scale.
- Key on/engine off.

Is frequency reading above 125 hz?

Yes	No
REPLACE MAP sensor. CLEAR DTCs and RETEST.	REPLACE PCM. CLEAR DTCs and RETEST.

D16 CONTINUOUS DIAGNOSTIC TROUBLE CODE (DTC) P0237 OR P0235

Note: MAP connector has no letter identification. Refer to diagram at beginning of this pinpoint test for proper pin location.

- DTC P0237 indicates turbo boost sensor A circuit low input. The code was set during normal driving conditions.
- Possible causes:
  - MAP signal circuit open, shorted to ground, shorted to VREF
  - open in VREF circuit
  - open in signal return circuit
  - damaged MAP sensor
  - damaged PCM
- Disconnect MAP sensor harness connector, and inspect pins for damage.
- Connect MAP sensor tester between the vehicle harness connector and MAP sensor.
- Insert MAP sensor tester banana plug into a digital multimeter.
- Set digital multimeter to frequency scale.
- Key on, engine off.

Is frequency reading 110 hz ± 5 hz?

Yes	No
GO to D17 .	REPLACE MAP sensor.

D17 MAP SENSOR CHECK

- Lightly tap on MAP sensor while monitoring frequency reading.

Does reading fluctuate?

Yes	No
REPLACE MAP sensor. CLEAR DTCs and RETEST.	GO to D18 .

D18 MAP SENSOR PSI CHECK

- Apply 69 kPa (10 psi) of pressure with vacuum/pressure pump from Rotunda Pressure Adapter Kit 014-00761 or equivalent.
- Tap on sensor while monitoring frequency reading.

Does reading fluctuate?

Yes	No
REPLACE MAP sensor. CLEAR DTCs and RETEST.	GO to D19 .

D19 SIGNAL RETURN HARNESS CHECK

- MAP sensor connector disconnected.
- Measure resistance between Pin A on harness connector and ground.
- Observe the resistance value while performing the following:
  - Grasp the vehicle harness close to the sensor connector. Wiggle, shake vehicle harness while working towards the PCM.

Does resistance reading fluctuate?

Yes	No
REPAIR intermittent open in Circuit 359 (GY/R) as required. CLEAR DTCs and RETEST.	GO to D20 .

D20 VREF CIRCUIT CHECK

- Key on.
- Measure voltage between Pin B on harness connector and ground.
- Observe VREF voltage (5v ± 0.5) while performing the following:
  - Grasp the harness close to the sensor connector.
  - Wiggle and shake vehicle harness while working toward the PCM.

Does voltage value fluctuate?

Yes	No
REPAIR intermittent open in Circuit 351 (BR/W) as required. CLEAR DTCs and RETEST.	GO to D21 .

D21 MAP SIGNAL WIRE CONTINUITY CHECK

- Disconnect PCM, inspect for damaged, pushed-out pins, corrosion and loose wires. Service as necessary.
- Install breakout box. Leave PCM disconnected.
- MAP sensor connector disconnected.

- Measure resistance between Pin 34 (49 State except Econoline) or Pin 88 (California and all Econoline) and Circuit 358 (LG/BK) at MAP on harness connector.
- Observe resistance value while performing the following:
  - Grasp harness close to the sensor connector.
  - Wiggle and shake vehicle harness while working toward the PCM.

Does resistance stay below 5 ohms?

Yes	No
GO to D22 .	REPAIR intermittent open in Circuit 358 (LG/BK). CLEAR DTCs and RETEST.

D22 MAP SIGNAL WIRE SHORT TO GND

- Measure resistance between Pin 34 (49 State except Econoline) or Pin 88 (California and all Econoline) and Pins 25, 51, 76, 77, 103 on breakout box.
- Perform harness shake test.

Does resistance value drop below 10,000 ohms?

Yes	No
REPAIR intermittent short to ground in Circuit 358 (LG/BK). CLEAR DTCs and RETEST.	GO to D23 .

D23 MAP SIGNAL WIRE SHORT TO PWR

- Key on.
- Measure voltage between Pin 34 (49 State except Econoline) or Pin 88 (California and all Econoline) and ground.
- Perform harness shake test.

Does voltage reading go above 0v?

Yes	No
REPAIR intermittent short to PWR in circuit 358 (LG/BK). CLEAR DTCs and RETEST.	Intermittent failure. Unable to VERIFY. CLEAR DTCs.

D24 CONTINUOUS DIAGNOSTIC TROUBLE CODE (DTC) P0238

- DTC P0238 indicates turbo boost sensor A circuit high input. This code was set under normal driving conditions.
- Possible causes:
  - damaged MAP sensor
  - damaged circuit
- Disconnect MAP sensor connector.
- Connect MAP sensor tester between the vehicle harness connector and MAP sensor.
- Insert MAP sensor tester banana plug into a digital multimeter.
- Set digital multimeter to frequency scale.
- Key on, engine off.
- Observe frequency reading while tapping on sensor.

Does frequency reading go above 125 hz?

Yes	No
REPLACE MAP sensor. CLEAR DTCs and RETEST.	GO to D25 .

D25 CHECK MAP SENSOR

- Apply 69 kPa (10 psi) of pressure with vacuum/pressure pump from Rotunda Pressure Adapter Kit 014-00761 or equivalent.
- Observe frequency reading while tapping on sensor.

Does frequency reading go above 300 hz?

Yes	No
REPLACE MAP sensor. CLEAR DTCs and RETEST.	GO to D26 .

D26 MAP HARNESS CHECK

- Using a vacuum pump from Rotunda Pressure Adapter Kit 014-00761 or equivalent, apply 33 kPa (10 in-Hg) of vacuum.
- Observe frequency reading while performing the following:
  - Grasp the vehicle harness close to the sensor connector.
  - Wiggle and shake the vehicle while working toward the PCM.

Does frequency reading go above 300 hz?

Yes	No
REPAIR intermittent circuit failure. CLEAR DTCs and RETEST.	FAILURE is intermittent. Unable to duplicate at this time. CLEAR DTCs.