

ZZ: Intermittent

This pinpoint test is intended to diagnose and isolate intermittent concerns for all electronic engine control (EEC) subsystems.

This chart is used to determine which test to run for the suspect circuit. Parameter identifiers (PIDs) corresponding to each circuit are listed. Some circuits do not have an associated PID or the PID may not be available and has to be measured with a digital multimeter (DMM). More specific information on the PID can be found in Section 6, Reference Values.

PCM PIDS/SIGNALS

PCM/PIDS/SIGNALS	Associated Circuit	Test Type
AAT, AAT_V	AAT	Input
BOO1	BPP	Input
BOO2	BPS	Input
CAC_T, CAC_V, CACT_V	CACT	Input
CC_VENTHOSE_V	CRNKCSVT	Input
DPF_INP, DPF_INP_V	DPF12	Input
DPF_V	DPF11	Input
EBP, EBP_V	EBP	Input
ECT, ECT1_V	ECT	Input
ECT2, ECT2_V	ECT2	Input
EGRCBV	EGRCBV	Output
EGRCIT_V, EGRTA	EGRT11	Input
EGRCOT_V, EGRTC	EGRT12	Input
EGRTP_V	TP#2	Output
EGRVP	EGR	Input
EGT11, EGT11_V	EGT11	Input
EGT12, EGT12_V	EGT12	Input
EGT13, EGT13_V	EGT13	Input
EGT14, EGT14_V	EGT14	Input
EOT, EOT_V	EOT	Input
EXHAUST_BRK	EBIS	Input
F_PCV	FPCV	Output
F_VCV	FVCV or FVR	Output
FANSS	FSS	Input
FLI	FLI	Input
FLP	FLP	Input
FP	FPC	Output
FPM	FPM#EFPR	Input
FRP	FRP	Input

PCM/PIDS/SIGNALS	Associated Circuit	Test Type
FRT, FRT_V	FRT	Input
IAT11, IAT11_V	IAT	Input
LP_FUEL_SW	FDPS	Input
MAF, MAF_HZ	MAF	Input
MAP, MAP_V	MAP	Input
NOX11	CAN	Input
OSS_SRC	OSS	Input
PTO_STATUS	PTO	Input
REDUCT_PRES_V	RDP	Input
REDUCT_RV_DC	RDPGC	Output
REDUCT_TNK_LV	RDL1, RDL2, RDL3	Input
REDUCT_TNK_P	RDP	Input
REDUCT_TNK_T	RDT	Input
TCBP_V	TCBP	Input
TURBO_WGATE	TCWRVS	Output
VGT_POS_V	VGTP	Input
Use DMM	VPWR	Input
Use DMM	VREF	Output
WFS, WFS_V	WIF	Input

ZZ1 DIRECTION FOR INTERMITTENT DIAGNOSTIC PATH

Note: Proceed with this step only if the PCM DTCs and the freeze frame data have not been cleared. Record freeze frame data prior to clearing the PCM DTCs. Clearing the DTCs clears any freeze frame data and eliminates FMEM. This helps to recreate the original conditions that set the DTCs or caused the symptom.

- Ignition ON, engine OFF.
- Clear the PCM DTCs.

Are the PCM DTCs cleared?

Yes	GO to ZZ2 .
No	CLEAR the PCM DTCs. REFER to Section 2, Clear The Continuous Diagnostic Trouble Codes (DTCs) And Reset The Emission Monitors Information in The Powertrain Control Module (PCM) . REPEAT the self-test.

ZZ2 SELECT THE PIDS AND/OR SIGNALS RELATED TO THE SYSTEM

- A list of related PIDs and/or signals are needed for use with the scan tool to monitor the suspect areas. Obtain the customer symptom description. Use the Reference Value Symptom chart and proceed to the Reference Value PID/Signal Measurement chart located at the beginning of Section 6, Reference Values.
- Highlight each available PID/signal recommended by the charts under the PID/signal selection menu on the scan tool.

Are all available PIDs/signals related to the symptom selected?

Yes	GO to ZZ3 .
No	REPEAT the test step. GO to ZZ2 .

ZZ3 DECISION TO VERIFY THE SYMPTOM

Note: The path to symptom verification is optional but is recommended for several reasons. For example, the vehicle is back for a repeat repair, or there is no DTC present.

Is a concern or symptom present?

Yes	GO to ZZ10 .
No	GO to ZZ4 .

ZZ4 COLLECT ANY SYMPTOM RELATED DATA TO AID IN VERIFICATION

Note: Only MIL codes trigger freeze frame data. Refer to the scan tool instruction manual to retrieve the freeze frame information.

- Prepare the freeze frame data for use with information from the Section 3, Symptom Charts.
- Check for continuous memory DTCs that should have been recorded from an earlier pinpoint test.
- Access the information from the customer information worksheet and the customer if available. Access any other symptom related data available, such as TSBs and OASIS reports.

Is all available data recorded?

Yes	GO to ZZ5 .
No	GATHER as much data as possible to aid in isolating the intermittent concern area. REPEAT the test step. GO to ZZ4 .

ZZ5 RECREATE THE SYMPTOM USING ALL AVAILABLE DATA

Note: To recreate the original conditions that set the DTC or caused the symptom, the vehicle may require driving.

- With the scan tool, select and monitor the same PIDs as displayed in freeze frame along with any previously selected PIDs/signals from step ZZ2. Using the freeze frame data recorded earlier, recreate the conditions described by each freeze frame PID. Pay special attention to ECT, LOAD, RPM and VSS. Also, use any available data from the customer, TSBs, and other sources to aid in producing the correct conditions for recreating the symptom.
- When the symptom occurs, press the trigger to begin recording. Refer to the scan tool instruction manual for information on the recorder function.

Can the symptom be recreated?

Yes	GO to ZZ10 .
No	GO to ZZ6 .

ZZ6 RECREATE THE SYMPTOM

Note: PIDs for output in the Reference Value Charts represent command values only. Circuit measurements with a DMM indicate the actual output status. Therefore, in the case of a concern, the PID and circuit reading on the vehicle may not correspond with each other. PIDs for PCM circuits with a mismatch in the DMM measurement indicate a possible PCM concern.

- The road test is the last attempt to locate the area of concern before physically disturbing vehicle circuits.
- The Intermittent Road Test Procedure is a set of instructions for monitoring PIDs/signals with a scan tool and circuit measurements with a DMM. This is done under 4 different conditions - ignition ON and engine OFF, hot idle, 48 km/h (30 mph) and 88 km/h (55 mph). Use the typical diagnostic reference values from Section 6, Reference Values to compare with the actual vehicle.
- Locate the correct reference value chart in Section 6, Reference Values.
- Setup the vehicle to measure the circuits with a DMM and a scan tool.
- Connect a scan tool to the DLC.
- Ignition ON, engine OFF.
- With the scan tool, select and monitor PIDs and measure the circuits shown in the reference value chart in Section 6, Reference Values.
- Compare the scan tool PIDs and DMM values to the reference value charts.

Are any values out of range?

Yes	GO to ZZ10 .
No	GO to ZZ7 .

ZZ7 RECREATE THE SYMPTOM USING THE HOT IDLE ROAD TEST

Note: The engine temperature should be at least 87°C (189°F).

- Ignition ON, engine running.
- Continue to monitor the PIDs and circuits as in the previous step.

Are any values out of range?

Yes	GO to ZZ10 .
No	GO to ZZ8 .

ZZ8 RECREATE THE SYMPTOM DURING AN 48 KM/H (30 MPH) ROAD TEST

- Drive the vehicle on a preplanned route.
- Continue to monitor the PIDs and circuits as in the previous step.

Are any values out of range?

Yes	GO to ZZ10 .
No	GO to ZZ9 .

ZZ9 RECREATE THE SYMPTOM DURING AN 88 KM/H (55 MPH) ROAD TEST

- Continue to drive the vehicle on the preplanned route.
- Continue to monitor the PIDs and circuits as in the previous step.

Are any values out of range?

Yes	GO to ZZ10 .
No	It is now necessary to physically disturb the selected vehicle circuits in an attempt to recreate the intermittent concern. GO to ZZ10 .

ZZ10 SELECT THE CIRCUITS FROM THE PCM PIDS/SIGNALS CHART

Note: From the same chart, be sure to select and proceed with the appropriate test type.

Note: The Input Test step should be used on sensing inputs such as temperature or position.

Note: The Output Test step should be used on output devices such as relays or solenoids.

- Remain in the PID/Signal selection menu with the scan tool.
- Highlight only the PIDs/signals from step ZZ2.
- Proceed to the PCM PIDS/SIGNALS chart located at the beginning of this test.
- Match the selected PIDs/signals to the corresponding circuit in the chart. There may be more than one circuit to test. If a PID/signal recording was made with the scan tool, it may be helpful to replay it at this time. Refer to the scan tool instruction manual for additional information.

Has a test been chosen?

Yes	For the input test step, GO to ZZ11 . For the output test step, GO to ZZ15 .

No	RETURN to Section 3, Symptom Charts for further direction.
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ZZ11 KOEO INPUT TEST PROCEDURE FOR THE PCM SENSORS

⚠ WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. Failure to follow these instructions may result in personal injury.

- Using the circuits chosen from the Section 6, PCM PIDS/SIGNALS Chart, select only the recommended PIDs/signals to monitor with the scan tool. If a PID is not available for the circuit, use a DMM to check the value.
- Proceed to the area of the suspect wiring or component concern.
- Ignition ON, engine OFF.
- If the input is a switch type-component, turn it on manually.
- Monitor while wiggling the sensor harness wire from the component to the PCM/TCM.
- Look for abrupt changes in the values. Compare these actual values to the reference values in Section 6, Reference Values.

Are there abrupt changes in the PID values that do not compare with the typical reference value charts in Section 6, Reference Values?

Yes	REPAIR as necessary. VERIFY the repair. Clear the PCM DTCs. REPEAT the self-test.
No	GO to ZZ12 .

ZZ12 KOER INPUT TEST PROCEDURE FOR THE PCM SENSORS

⚠ WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. Failure to follow these instructions may result in personal injury.

- Ignition ON, engine running.
- Continue to monitor the PIDs and circuits as in the previous step.
- Proceed to the area of the suspect wiring or component concern.
- If the input is a switch type-component, turn it on manually.
- Monitor while wiggling the sensor harness wire from the component to the PCM.
- Look for abrupt changes in the values. Compare these actual values to the reference values in Section 6, Reference Values.

Are any values fluctuating in and out of range?

Yes	REPAIR as necessary. VERIFY the repair. Clear the PCM DTCs. REPEAT the self-test.
No	GO to ZZ13 .

ZZ13 KOEO WATER SOAK TEST PROCEDURE FOR THE PCM SENSORS, EXCLUDING HIGH VOLTAGE CIRCUITS

⚠ WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. Failure to follow these instructions may result in personal injury.

- Ignition ON, engine OFF.
- Continue to monitor the PIDs and circuits as in the previous step.
- Proceed to the area of the suspect wiring or component concern.
- If the input is a switch type-component, turn it on manually.
- Monitor the PID or DMM values while lightly spraying a water mist on the component.
- Monitor while spraying the sensor harness wire from the component to the PCM.
- Look for abrupt changes in the values. Compare these actual values to the Typical Diagnostic Reference Values in Section 6.

Are any values fluctuating in and out of range?

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Yes	REPAIR as necessary. VERIFY the repair. Clear the PCM DTCs. REPEAT the self-test.
No	GO to ZZ14 .

ZZ14 KOER WATER SOAK TEST PROCEDURE FOR THE PCM SENSORS, EXCLUDING HIGH VOLTAGE CIRCUITS

 **WARNING:** When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces.

Failure to follow these instructions may result in personal injury.

- Ignition ON, engine running.
- Continue to monitor the PIDs and circuits as in the previous step.
- Proceed to the area of the suspect wiring or component concern.
- If the input is a switch type-component, turn it on manually.
- Monitor the PID or DMM values while lightly spraying a water mist on the component.
- Monitor while spraying the sensor harness wire from the component to the PCM.
- Look for abrupt changes in the values. Compare these actual values to the Typical Diagnostic Reference Values in Section 6.

Are any values fluctuating in and out of range?

Yes	REPAIR as necessary. VERIFY the repair. Clear the PCM DTCs. REPEAT the self-test.
No	GO to ZZ15 .

ZZ15 KOER WIGGLE TEST PROCEDURE FOR THE PCM SENSORS

 **WARNING:** When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. Failure to follow these instructions may result in personal injury.

Note: Remember that PIDs selected from the PCM PIDS/SIGNALS Chart display commanded values only. A DMM measurement is needed to display the actual values. Be sure to compare them. Look for fluctuations to occur during any part of the following test. The output state test may not control some outputs, such as injectors, and may not be available for all actuators.

- Using the circuits chosen from the PCM PIDS/SIGNALS Chart, select only the recommended PIDs/signals to monitor with the scan tool. If a PID is not available for the circuit, use a DMM to check the value.
- Ignition ON, engine OFF.
- With the scan tool, turn on selected outputs using output state control. Refer to the scan tool instruction manual.
- Proceed to the area of the suspect wiring or component concern.
- Monitor while wiggling the sensor harness wire from the component to the PCM.
- Look for abrupt changes in the values. Compare these actual values to the reference values in Section 6, Reference Values.

Is there a mismatch between command and actual, or are any values fluctuating in and out of range, when compared to the reference value charts in Section 6, Reference Values?

Yes	REPAIR as necessary. VERIFY the repair. Clear the PCM DTCs. REPEAT the self-test.
No	GO to ZZ16 .

ZZ16 KOER OUTPUT TEST PROCEDURE FOR THE PCM ACTUATORS

 **WARNING:** When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. Failure to follow these instructions may result in personal injury.

Note: Remember that PIDs selected from the PCM PIDS/SIGNALS Chart display commanded values only. A DMM measurement is needed to display the actual values. Be sure to compare them. Look for fluctuations to occur during any

part of the following test. The output state test may not control some outputs, such as injectors, and may not be available for all actuators.

- Ignition ON, engine running.
- Proceed to the area of the suspect wiring or component concern.
- Monitor while wiggling the sensor harness wire from the component to the PCM.
- Look for abrupt changes in the values. Compare these actual values to the reference values in Section 6, Reference Values.

Is there a scan tool to DMM value mismatch or an idle fluctuation?

Yes	REPAIR as necessary. VERIFY the repair. Clear the PCM DTCs. REPEAT the self-test.
No	GO to ZZ17 .

ZZ17 KOEO WATER SOAK TEST PROCEDURE FOR THE PCM ACTUATORS, EXCLUDING HIGH VOLTAGE CIRCUITS

 **WARNING:** When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. Failure to follow these instructions may result in personal injury.

Note: Remember that PIDs selected from the PCM PIDS/SIGNALS Chart display commanded values only. A DMM measurement is needed to display the actual values. Be sure to compare them. Look for fluctuations to occur during any part of the following test. The output state test may not control some outputs, such as injectors, and may not be available for all actuators.

- Ignition ON, engine OFF.
- With the scan tool, turn on selected outputs using output state control. Refer to the scan tool instruction manual.
- Proceed to the area of the suspect wiring or component concern.
- Monitor the PID or DMM values while lightly spraying a water mist on the component.
- Look for abrupt changes in the values. Compare these actual values to the reference values in Section 6, Reference Values.

Is there a mismatch between command and actual, or are any values fluctuating in and out of range, when compared to the reference value charts in Section 6, Reference Values?

Yes	REPAIR as necessary. VERIFY the repair. Clear the PCM DTCs. REPEAT the self-test.
No	GO to ZZ18 .

ZZ18 KOER WATER SOAK TEST PROCEDURE FOR THE PCM ACTUATORS

 **WARNING:** When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces.

Failure to follow these instructions may result in personal injury.

- Ignition ON, engine running.
- Using the circuits chosen from the PCM PIDS/SIGNALS Chart, select only the recommended PIDs/signals to monitor with the scan tool. If a PID is not available for the circuit, use a DMM to check the value.
- Proceed to the area of the suspect wiring or component concern.
- Monitor the PID or DMM values while lightly spraying a water mist on the component.
- Monitor while spraying the sensor harness wire from the component to the PCM/TCM.
- Look for abrupt changes in the values. Compare these actual values to the Section 6, Typical Diagnostic Reference Values.

Is there a mismatch between command and actual, or are any values fluctuating in and out of range, when compared to the reference value charts in Section 6, Reference Values?

Yes	REPAIR as necessary. VERIFY the repair. Clear the PCM DTCs. REPEAT the self-test.
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No	GO to ZZ19 .
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ZZ19 INSPECT FOR INTERMITTENT MECHANICAL CONCERNS

Note: *It is possible for an intermittent mechanical concern to cause a good PCM system to react abnormally.*

- An inspection of DTC related mechanical systems should have been carried out in an earlier section. If not, visually inspect at this time.
- Look for possible vacuum lines, wires, cables, linkage or hoses that may become kinked, shorted or restricted during normal engine operation.
- This may include engine/transmission gear changes, acceleration and deceleration, rough roads and various engine RPM and torque related conditions.

Is a mechanical concern detected?

Yes	REPAIR as necessary. VERIFY the repair. Clear the PCM DTCs. REPEAT the self-test.
No	It is necessary to seek additional help. REFER to the Service Repair And Technical Assistance Process. A vehicle data recorder (VDR) or similar recorder may also be useful.

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