Computers and Control Systems: Pinpoint Tests
Test Z: Intermittent
PINPOINT TEST Z: INTERMITTENT

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This pinpoint test is intended to diagnose and isolate intermittent concerns for the following:

- All electronic engine control (EEC) subsystems.

This chart is used to determine which test to run for the suspect circuit. PIDs corresponding to each circuit are listed. Some circuits do not have an associated PID or the PID may not be available and will have to be measured with a digital multimeter (DMM). More specific information on the PID can be found in Reference Values. If the vehicle has a coil pack system with a no start condition, carry out the ignition test.

PCM PIDS/SIGNALS

PCM/TCM PIDS/SIGNALS	Associated Circuit	Test Type
4X4	4X4	input
ACCS	A/CCS	input
ACCR (WAC)	ACCR	output
ACET	ACET	input
ACP, ACP V	ACPSW	input
APP1	APPS	input
APP2	APPS	input
APP3	APPS	input
BPS/BOO	BPS	input
CCS	CCS	output
Use Digital Multimeter	CD-A (primary)	output
Use Digital Multimeter	CD-B (primary)	output
Use Digital multimeter	CD-C (primary)	output
Use Digital Multimeter	CD-D (primary)	output
CHT, CHT V	CHT	input
CKP	CKP	input
CMP	CMP	input
CPP	CPP	input
CTO	CTO	output
DPFEGR	DPFE	input
ECT, ECT V	ECT	input
EGRMC1	EGRMC1	output
EGRMC2	EGRMC2	output
EGRMC3	EGRMC3	output
EGRMC4	EGRMC4	output
EGRMDSD	EGRMC	output
EGRVR	EGRVR	output
EOT, EOT V	EOT	input
EPC, EPC V	EPC	output
EVAPC V	CV	output

(Continued)

Note And Chart

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PCM PIDS/SIGNALS

PCM/TCM PIDS/SIGNALS	Associated Circuit	Test Type
EVAPPDC	VMV	output
EVAPPF	VMV	output
EVAPPF	VMV	output
FLI, FLI V	FLI	input
FP	FP	output
FPM	FPM	input
FP M	FPM	input
FRP, FRP V	FRP	input
FRT	FRT	input
FTP, FTP V	FTP	input
GEN RC	GENRC	output
GENLI	GENLI	input
HFC	HFC	output
HOS11	HEGO	input
HOS12	HEGO	input
HOS13	HEGO	input
HTR11	HEGO	output
HTR12	HEGO	output
HTR13	HEGO	output
IAC	IAC	output
IAT, IAT V	IAT	input
IAT2, IAT2 V	IAT 2	input
IMRC	IMRC	output
IMRCM	IMRCM	input
IMTV1	IMTV1	output
IMTV2	IMTV2	output
KS1	KS1	input
KS2	KS2	input
LFC	LFC	output
MAF, MAF V	MAF	input
MAP V	MAP/TMAP	input
OSS	OSS	input
PSP, PSPV	PSP	input
PSPT	PSP	input
PTO	PTO	input
SAIR	SAIR	output
SAIRM	SAIRM	input
SS1	SS1	output
SS2	SS2	output

(Continued)

Chart

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PCM PIDS/SIGNALS

PCM/TCM PIDS/SIGNALS	Associated Circuit	Test Type
SS3	SS3	output
SS4	SS4	output
TACM (+)	TACM (+)	output
TACM (-)	TACM (-)	output
TP1	TP1	input
TP2	TP2	input
TCC	TCC	output
TCIL	TCIL	output
TCS	TCS	input
TFT, TFT V	TFT	input
TP, TPV	TP	input
TSS/ISS	TSS	input
VCT1	VCT1	output
VCT2	VCT2	output
VPWR	VPWR	input
Use Digital Multimeter	VREF	output
Use Digital Multimeter	VSO	output
VSS	VSS+	input
WAC	WAC	output

	Test Step	Results / Action to Take
Z1	**DIRECTION FOR INTERMITTENT DIAGNOSTIC PATH**	
	Note: Proceed with this step only if the powertrain control module (PCM) was not previously cleared. Record freeze frame data prior to clearing the PCM DTCs. Clearing the DTCs will clear any freeze frame data and eliminate FMEM. This will help to recreate the original conditions that set the DTCs or caused the symptom. • Connect a diagnostic tool to the data link connector (DLC). • Key in ON position. • Clear the PCM DTCs. • **Are the PCM DTCs cleared?**	**Yes** GO to **Z2**. **No** RESET the keep alive memory (KAM). REFER to Diagnostic Methods, Resetting The Keep Alive Memory (KAM).

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Test Step		Results / Action to Take
Z2	**SELECT THE PIDS AND/OR SIGNALS RELATED TO THE SYSTEM**	
	• A list of related PIDs and/or signals are needed for use with the diagnostic 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 Reference Values. • Highlight each available PID/signal recommended by the charts under the PID/signal selection menu on the diagnostic tool. • **Have all available PIDs/signals related to the symptom been selected?**	**Yes** GO to **Z3**. **No** REPEAT the test step. GO to **Z2**.
Z3	**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. • **Has a fault symptom been detected?**	**Yes** GO to **Z10**. **No** GO to **Z4**.
Z4	**COLLECT ANY SYMPTOM RELATED DATA TO AID IN VERIFICATION**	
	Note: Only MIL codes trigger freeze frame data. Refer to the diagnostic tool instruction manual to retrieve the freeze frame information. • Prepare the freeze frame data for use with information from the 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. • **Has all available data been recorded?**	**Yes** GO to **Z5**. **No** GATHER as much data as possible to aid in isolating the intermittent fault area. REPEAT the test step. GO to **Z4**.
Z5	**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 diagnostic tool, select and monitor the same PIDs as displayed in freeze frame along with any previously selected PIDs/signals from step Z2. 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 diagnostic tool instruction manual for information on the recorder function. • **Could the symptom be recreated?**	**Yes** GO to **Z10**. **No** GO to **Z6**.

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Test Step		Results / Action to Take
Z6	**RECREATE THE SYMPTOM USING THE KOEO AND ROAD TEST PROCEDURE**	
	• The road test is the last attempt to locate the area of concern before physically disturbing vehicle circuits. **Note:** PIDs for output in the Reference Value Charts represent command values only. Circuit measurements with a digital multimeter indicate the actual output status. Therefore, in the case of a fault, the PID and circuit reading on the vehicle may not correspond with each other. PIDs for PCM/TCM circuits with a mismatch in the digital multimeter measurement indicate a possible PCM/TCM concern. • The Intermittent Road Test Procedure is a set of instructions for monitoring PIDs/signals with a diagnostic tool and circuit measurements with a digital multimeter. This is done under 4 different conditions - key on/engine off, hot idle, 48 km/h (30 mph) and 88 km/h (55 mph). Use the typical diagnostic reference values from Reference Values to compare with the actual vehicle. • Locate the correct Reference Value Chart. • Set the vehicle up to measure the circuits with a digital multimeter and a diagnostic tool. • Connect a diagnostic tool to the DLC. • Key in ON position. • With the diagnostic tool, select and monitor PIDs and measure circuits shown in the Reference Value Chart in Reference Values. • Compare the diagnostic tool PIDs and digital multimeter values to the Reference Value Charts. • **Are any values out of range?**	**Yes** GO to **Z10**. **No** GO to **Z7**.
Z7	**RECREATE THE SYMPTOM USING THE HOT IDLE ROAD TEST PROCEDURE**	
	• The engine temperature should be at least 87°C (195°F). • Key on engine running. • Continue to monitor the PIDs and circuits as in the previous step. • **Are any values out of range?**	**Yes** GO to **Z10**. **No** GO to **Z8**.
Z8	**RECREATE THE SYMPTOM USING THE 48 KM/H (30 MPH) SLOW CRUISE ROAD TEST PROCEDURE**	
	• 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 **Z10**. **No** GO to **Z9**.

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Test Step		Results / Action to Take
Z9	**RECREATE THE SYMPTOM USING 88 KM/H (55 MPH) HIGH CRUISE ROAD TEST PROCEDURE**	
	• 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 **Z10**. **No** It is now necessary to physically disturb the selected vehicle circuits in an attempt to recreate the intermittent concern. GO to **Z10**.
Z10	**SELECT THE CIRCUITS FROM THE INTERMITTENT TEST CHART**	
	• Remain in the PID/Signal selection menu with the diagnostic tool. • If the intermittent road test was used to verify the symptom, highlight the PIDs/signals that were displayed as a mismatch to the Reference Values. Otherwise, highlight only the PIDs/signals from step Z2. • Proceed to the Intermittent Test 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 diagnostic tool, it may be helpful to replay it at this time. Refer to the diagnostic tool instruction manual for recorder function information. **Note:** From the same chart, be sure to select and proceed with the appropriate test type. • Input Test - used on sensing inputs such as temperature, position or oxygen. • Output Test - used on output devices such as relays, coils or solenoids. • **Has a test been chosen?**	**Yes** For Input Test: GO to **Z11**. For Output Test: GO to **Z15**. **No** To diagnose other driveability symptoms, REFER to Symptom Charts.

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Test Step		Results / Action to Take
Z11	**KOEO INPUT TEST PROCEDURE FOR THE PCM/TCM SENSORS**	
	⚠ WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. • Using the circuits chosen from the Intermittent Test Chart, select only the recommended PIDs/signals to monitor with the diagnostic tool. If a PID is not available for the circuit, use a digital multimeter to check the value. • Proceed to the area of the suspect wiring or component fault. • Key in ON position. • If the input is a switch type-component, turn it on manually. • Monitor the PID or digital multimeter while tapping on the component. • 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 Typical Diagnostic Reference Values in Reference Values. • **Are there abrupt changes in the PID values that do not compare with the** Reference Values?	**Yes** REPAIR as necessary. VERIFY the repair. **No** GO to **Z12**.
Z12	**KOER INPUT TEST PROCEDURE FOR THE PCM/TCM SENSORS**	
	⚠ WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. • Key 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 fault. • If the input is a switch type-component, turn it on manually. • Monitor the PID or digital multimeter while tapping on the component. • 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 Typical Diagnostic Reference Values in Reference Values. • **Are any values fluctuating in and out of range?**	**Yes** REPAIR as necessary. VERIFY the repair. **No** GO to **Z13**.

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Test Step		Results / Action to Take
Z13	**KOEO WATER SOAK TEST PROCEDURE FOR THE PCM/TCM 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.** • Key in ON position. • Continue to monitor the PIDs and circuits as in the previous step. • Proceed to the area of the suspect wiring or component fault. • If the input is a switch type-component, turn it on manually. • Monitor the PID or digital multimeter 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 Typical Diagnostic Reference Values in Reference Values. • **Are any values fluctuating in and out of range?**	**Yes** REPAIR as necessary. VERIFY the repair. **No** GO to **Z14**.
Z14	**KOER WATER SOAK TEST PROCEDURE FOR THE PCM/TCM 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.** • Key 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 fault. • If the input is a switch type-component, turn it on manually. • Monitor the PID or digital multimeter 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 Typical Diagnostic Reference Values in Reference Values. • **Are any values fluctuating in and out of range?**	**Yes** REPAIR as necessary. VERIFY the repair. **No** GO to **Z15**.

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Test Step		Results / Action to Take
Z15	**KOER WATER SOAK 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. • Using the circuits chosen from the Intermittent Test Chart, select only the recommended PIDs/signals to monitor with the diagnostic tool. If a PID is not available for the circuit, use a digital multimeter to check the value. **Note:** Remember that PIDs selected from the Intermittent Test Chart display commanded values only. A digital multimeter 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 ignition coils and may not be available for all actuators. **⚠ CAUTION: The cooling fans or the fuel pump may turn on during the next steps.** • Key in ON position. • With the diagnostic tool, turn on selected outputs using Output State Control. Refer to the diagnostic tool instruction manual. • Proceed to the area of the suspect wiring or component fault. • Monitor the PID or digital multimeter while tapping on the component. • 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 Typical Diagnostic Reference Values in 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 Reference Values?**	**Yes** REPAIR as necessary. VERIFY the repair. **No** GO to **Z16**.

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Test Step		Results / Action to Take
Z16	**KOER OUTPUT TEST PROCEDURE FOR THE PCM/TCM ACTUATORS**	
	⚠ WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces. **Note:** Remember that PIDs selected from the Intermittent Test Chart display commanded values only. A digital multimeter 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 ignition coils and may not be available for all actuators. • To test these output types, GO to **Z18**. • Key on engine running. • Proceed to the area of the suspect wiring or component fault. • Monitor the PIDs with the diagnostic tool and note the values. Compare the diagnostic tool values with values from a digital multimeter with the engine at idle. While tapping on the suspect component look for fluctuations in the values. • If a coil for a coil on plug application is suspect, turn off the key. Gain access to the coil and measure continuity from the spark plug terminal to the signal terminal while tapping the coil. A large fluctuation in resistance indicates an intermittent open or short. • 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 Typical Diagnostic Reference Values in Reference Values. • **Is there a diagnostic tool to digital multimeter value mismatch or an idle fluctuation?**	**Yes** REPAIR as necessary. VERIFY the repair. **No** GO to **Z17**.

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Test Step		Results / Action to Take
Z17	**KOEO WATER SOAK TEST PROCEDURE FOR THE PCM/TCM 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. **Note:** Remember that PIDs selected from the Intermittent Test Chart display commanded values only. A digital multimeter 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 ignition coils and may not be available for all actuators. • To test these output types, GO to **Z18**. • Key in ON position. • With the diagnostic tool, turn on selected outputs using Output State Control. Refer to the diagnostic tool instruction manual. • Proceed to the area of the suspect wiring or component fault. • Monitor the PID or digital multimeter values while lightly spraying a water mist on the component. • Look for abrupt changes in the values. Compare these actual values to the Typical Diagnostic Reference Values in 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 Reference Values?**	**Yes** REPAIR as necessary. VERIFY the repair. **No** GO to **Z18**.

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Test Step		Results / Action to Take
Z18	**KOER WATER SOAK TEST PROCEDURE FOR THE PCM/TCM ACTUATORS**	
	⚠ **WARNING: When carrying out any test steps, always be aware of hands, clothing or tools near cooling fans, belts or hot surfaces.** • Key on engine running. • Using the circuits chosen from the Intermittent Test Chart, select only the recommended PIDs/signals to monitor with the diagnostic tool. If a PID is not available for the circuit, use a digital multimeter to check the value. • Proceed to the area of the suspect wiring or component fault. • Monitor the PID or digital multimeter 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 Typical Diagnostic Reference Values in 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 Reference Values?**	**Yes** REPAIR as necessary. VERIFY the repair. **No** GO to **Z19**.
Z19	**INSPECT FOR INTERMITTENT MECHANICAL CONCERNS**	
	Note: It is possible for an intermittent mechanical concern to cause a good PCM/TCM 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. **No** It is necessary to seek additional help. REFER to the Professional Technician Society (PTS) web site, the OASIS system or the Technical Hotline. A vehicle data recorder (VDR) or similar recorder may also be useful.