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

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⚠ WARNING: This vehicle is equipped with high voltage cables, components, and wiring. The high voltage warning labels containing the high voltage symbol are located on each high voltage component. High voltage cables, and wiring are orange in color. Certified rubber insulating gloves and a face shield must be worn when working with the high voltage cables, components, or wiring. The ignition key must be cycled to the OFF position for a minimum of 5 minutes, and the high voltage traction battery service disconnect plug placed in the servicing/shipping position before disconnecting the high voltage cables. Failure to follow these instructions may result in personal injury or death.

Do not disconnect, disable, or touch the high voltage cables, components, or wiring during the module reprogramming procedure because high voltage is present. The high voltage warning labels containing the high voltage symbol are located on each high voltage component. High voltage cables, and wiring are orange in color. Failure to follow these instructions may result in personal injury or death.

Important Safety Notice

Appropriate repair methods and procedures are essential for the safe, reliable operation of all motor vehicles, as well as the personal safety of the individual doing the work. This manual provides general directions for repairing vehicles with tested, effective techniques. Following them will help ensure reliability. There are numerous variations in procedures, techniques, tools, and parts for repairing vehicles, as well as in the skill of the individual doing the work. This manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in this manual must first establish that they compromise neither their personal safety nor the vehicle integrity by their choice of methods, tools, or parts.

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

- All electronic engine control (EEC) subsystems.
- Transaxle assembly (7000).

This chart is used to determine which test to run for the suspect circuit. Corresponding PIDs 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. More specific PIDs can be found in Reference Values.

Warning And Important Safety Notice

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PCM/TCM PIDS/SIGNALS

PCM/TCM* PIDS/SIGNALS	Associated Circuit	Test Type
ACCR	A/CCR	output
ACCS	A/CCS	input
AC_ET	ACET	input
ACFDS_P	A/CFDS	input
Use Digital Multimeter	A/CLPCS	input
ACP	A/CPSW	input
ACRDV	A/CRDV	output
ACRSW	A/CRSW	input
AMC	AMC	output
APP1	APPS1	input
APP2	APPS2	input
APP3	APPS3	input
ARPMDES*, ENG_CTO*	CTO	input
BPO, BPO_HZ	BPO	input
BPP/BOO	BPP	input
Use Digital Multimeter	BPS	input
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
Use Digital Multimeter	CKP(+)	input
Use Digital Multimeter	CMP	input
Use Digital Multimeter	CTO	output
DCE, DCE_F	DCE	output
Use Digital Multimeter	DCF	input
EGRMC1	EGRMC1	output
EGRMC2	EGRMC2	output
EGRMC3	EGRMC3	output
EGRMC4	EGRMC4	output
EVAPCV	CANV	output
EVAPPDC	VMV	output
FP	FP	output
FPM	FPM	input
FRP, FRP_V	FRP	input
FRT, FRT_V	FRT	input

(Continued)

Table

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PCM/TCM PIDS/SIGNALS

PCM/TCM* PIDS/SIGNALS	Associated Circuit	Test Type
FTIV	FTIV	output
FTP, FTP_V	FTP	input
G_SDN, Use Digital Multimeter	GSDN	output
G_SDN_A*, G_SDN_C*	GSDN	input
GTQ_CMD	TGAC	input
GTQ_CMD*	TGAC	output
HFC	FC3	output
HPUMP	HPCR	output
HTR11	HTR11	output
HTR12	HTR12	output
IAT, IAT_V	IAT	input
IGN_R	ISP-R	input
IGN_R/S	ISP-RS	input
IMRC	IMRC	output
IMRCM	IMRCM	input
INJ1	INJ1	output
INJ2	INJ2	output
INJ3	INJ3	output
INJ4	INJ4	output
ISDN1*	ISDN1	input
ISDN2*	ISDN2	input
Use Digital Multimeter	KAPWR	input
KS1	KS(+)	input
LFC	FC1	output
MAF, MAF_V	MAF	input
MAP	MAP	input
MECP	MECP	output
Use Digital Multimeter	MECT	input
MFC	FC2	output
M_SDN, Use Digital Multimeter	MSDN	output
MTQ_OUT	TMAC	input
MTQ_OUT*	TMAC	output
O2S11SV	HO2S11	input
O2S12SV	HO2S12	input
PSR	PSR	output
TACM (+)	TACM (+)	output
TACM (-)	TACM (-)	output

(Continued)

Table

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PCM/TCM PIDS/SIGNALS

PCM/TCM* PIDS/SIGNALS	Associated Circuit	Test Type
TP1	TP1	input
TP2	TP2	input
TR-A1	TR-A1	input
TR-A2	TR-A2	input
TR-A3	TR-A3	input
VPWR	VPWR	input
Use Digital Multimeter	VREF	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) or transaxle control module (TCM) DTCs were 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. • Key ON, engine OFF. • Clear PCM DTCs first and then TCM DTCs. • **Have the DTCs been cleared?**	**Yes** GO to **Z2.** **No** CLEAR the DTCs. GO to **Z2.**
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 to obtain the required information.
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 in for a repeat repair. • No DTC is present. • Customer has difficulty describing the symptom. • **Has a fault symptom been detected?**	**Yes** GO to **Z10.** **No** GO to **Z4.**

Table And Z1-Z3

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Test Step		Results / Action to Take
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 the continuous memory DTCs that should have been recorded from an earlier pinpoint test. • Access information from the customer information worksheet and the customer if available. Access any other symptom related data available, such as TSBs and CQIS 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 to obtain the required information.
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 previously selected PIDs/signals from Step Z2. Using 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**	
	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 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 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. For actual road test at speeds, a planned route or test track and passenger is required. • Locate the correct Reference Value Chart in Reference Values. • Set the vehicle up to measure the circuits with a digital multimeter and a diagnostic tool. • Connect the diagnostic tool to the data link connector (DLC). • Key ON, *engine* OFF. • 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 (189°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** Attempt to recreate the intermittent concern. GO to **Z10.**
Z10	**SELECT 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 from Reference Values. Otherwise, highlight only the PIDs/signals from step Z2. • Proceed to the Intermittent Test chart located at the beginning of this pinpoint 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. • 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 the input test, GO to **Z11.** For the output test, GO to **Z16.** **No** REFER to Symptom Charts to diagnose other driveability symptoms.

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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 ON, engine OFF. • 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 Reference Values readings?**	**Yes** REPAIR as necessary. TEST the system for normal operation. **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. TEST the system for normal operation. **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 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 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 to PCM/TCM. • 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. TEST the system for normal operation. **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 to PCM/TCM. • 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. TEST the system for normal operation. **No** GO to **Z15**.

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Test Step		Results / Action to Take
Z15	**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. **⚠ CAUTION: The cooling fans or the fuel pump may turn on during the next steps.** **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. • 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. • Key ON, engine OFF. • 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. TEST the system for normal operation. **No** GO to **Z16**.

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Test Step		Results / Action to Take
Z16	**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. Make 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 the PIDs 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. TEST the system for normal operation. **No** GO to **Z17**.

Intermittent — Z

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 the water soak test on electrical components and/or harnesses, avoid contact with the PCM, TCM, GEM, and other modules if possible. **⚠ 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 OFF. • 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 to 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. TEST the system for normal operation. **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 the water soak test on electrical components and/or harnesses, avoid contact with the PCM, TCM, GEM, and other modules if possible. **⚠ 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 to PCM/TCM. • 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. TEST the system for normal operation. **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 performed 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. TEST the system for normal operation. **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.