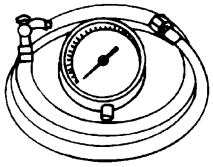
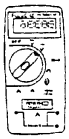
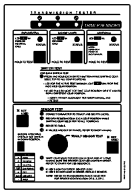
DIAGNOSIS AND TESTING

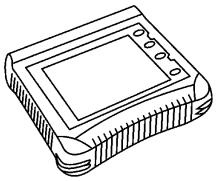
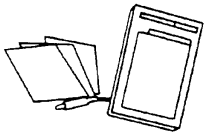
Pinpoint Tests — OSC Equipped Vehicles

Special Tool(s)

 ST1565-A	Transmission Fluid Pressure Gauge 307-004 (T57L-77820-A)
 ST1137-A	73 III Automotive Meter 105-R0057 or equivalent
	Trans Tester TR/MLP Overlay and Manual 007-00131 or equivalent

(Continued)

Special Tool(s)

 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224 New Generation Star (NGS) Tester 418-F205 or equivalent
 ST1632-A	MLP-TR Cable 418-F107 (007-00111) or equivalent
 ST1389-A	Transmission Tester 307-F016 (007-00130) or equivalent

Shift Solenoid Pre-Diagnosis

Any time an electrical connector or solenoid body is disconnected, inspect the connector for terminal condition, corrosion and contamination. Also inspect the connector seal for damage. Clean, repair or install new as necessary.

Use the following shift solenoid operation information when carrying out Pinpoint Test A.

Solenoid Operation Chart

Base Gearshift Selector Position	PCM Commanded Gear	5R55S Solenoid States						
		SSA	SSB	SSC	SSD	PCA	PCB	PCC
P/N	P/N	On	Off	Off	On	L [a]	H/L [b]	L[a]
R	R	On	Off	Off	On	H/L[b]	L[a]	H [c]
D5	1	On	Off	Off	On	H[c]	H/L[b]	L[a]
	2	On	Off	On	On	H/L[b]	H[c]	L[a]
	3	On	On	Off	On	H[c]	H/L[b]	L[a]
	4	Off	Off	Off	On	H[c]	H/L[b]	H[c]
	5	Off	Off	On	On	H[c]	H[c]	H[c]
D4	1	On	Off	Off	On	H[c]	H/L[b]	L[a]
	2	On	Off	On	On	H/L[b]	H[c]	L[a]
	3	On	On	Off	On	H[c]	H/L[b]	L[a]
	4	Off	Off	Off	Off	H/L[b]	H[c]	H[c]
+/-	1	On	Off	Off	On	H[c]	H/L[b]	L[a]

DIAGNOSIS AND TESTING (Continued)

Solenoid Operation Chart (Continued)

Base Gearshift Selector Position	PCM Commanded Gear	5R55S Solenoid States						
		SSA	SSB	SSC	SSD	PCA	PCB	PCC
	2	On	Off	On	On	H/L[b]	H[c]	L[a]
	3	On	On	Off	On	H[c]	H/L[b]	L[a]
	4	Off	Off	Off	On	H[c]	H/L[b]	H[c]
	5	Off	Off	On	On	H[c]	H[c]	H[c]
3	3	On	On	Off	Off	H[c]	L[a]	H/L[b]
2	2	On	Off	On	Off	H[c]	L[a]	H/L[b]
1	1	On	Off	Off	Off	H[c]	L[a]	H/L[b]

a Low line pressure
b High/low pressure — PCM controlled
c High line pressure

Shift Solenoid Failure Mode Chart "Always Off"

Failed OFF due to powertrain control module and/or vehicle wiring concerns, solenoid electrically, mechanically or hydraulically stuck OFF.

SSA Always "OFF":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear	
1	3	3
2	2	2
3	3	3
4	4	4M [a]
5	5	

a Manual

SSB Always "OFF":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	2	2
3	1	1
4	4	4M [a]
5	5	

a Manual

SSC Always "OFF":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	1	1
3	3	3
4	4	4M [a]
5	4	

a Manual

SSD Always "OFF":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1/1M [a]	1/1M[a]
2	2M[a]	2M[a]
3	3/3M[a]	3M[a]
4	4/4M[a]	4M[a]
5	5	

a Manual

Shift Solenoid Failure Mode Chart "Always On"

Failed OFF due to powertrain control module and/or vehicle wiring concerns, solenoid electrically, mechanically or hydraulically stuck ON.

DIAGNOSIS AND TESTING (Continued)

SSA Always "ON":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	2	2
3	3	3
4	1	1M [a]
5	2	

a Manual

SSB Always "ON":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	3	3
2	2	2
3	3	3
4	4	4M [a]
5	5	

a Manual

SSC Always "ON":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1/2	1/2
2	2	2
3	3/Ratio 1.16	3/Ratio 1.16
4	4/5	4/5
5	5	

SSD Always "ON":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	2	2
3	3	3
4	4	4
5	5	

Pressure Control Solenoid Failure Mode Chart "Always Low"

PC A "Low":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	S [a] /1	1
2	2	2
3	S[a]/1	1
4	S[a]/4	4M
5	5	

a Slips

PC B "Low":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	1	1
3	3	3
4	4	4
5	4	

PC C "Low":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	2	2
3	3	3
4	3	3
5	1.1	

DIAGNOSIS AND TESTING (Continued)

Pressure Control Solenoid Failure Mode Chart "Always High"

PC A "High":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	2	2
3	3	3
4	4	4M [a]
5	5	

a Manual

PC B "High":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	2	2
3	3	3
4	4	4M [a]
5	5	

a Manual

PC B "High":	Transmission Range Selector Lever Position	
	D5	D4
2	2	2
3	3	3
4	4	4M [a]
5	5	

a Manual

PC C "High":	Transmission Range Selector Lever Position	
	D5	D4
PCM Gear Commanded	Actual Gear Obtained	
1	1	1
2	2	2
3	3	3
4	4	4M [a]
5	5	

a Manual

Pinpoint Tests

PINPOINT TEST A: SHIFT AND TORQUE CONVERTER CLUTCH SOLENOIDS

NOTE: Refer to the Transmission Vehicle Harness Connector illustration preceding these pinpoint tests.

NOTE: Refer to the Internal Harness Diagram illustration preceding these pinpoint tests.

NOTE: Read and record all DTCs. All Digital TR Sensor and VSS DTCs must be repaired before entering Output State Control (OSC).

Test Step		Result / Action to Take
A1	**ELECTRONIC DIAGNOSTICS**	
	• Key in OFF position. • Select PARK. • Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in connector and in good condition before proceeding. • Connect the diagnostic tool. • Key in ON position. • Enter the following diagnostic mode on the diagnostic tool: Diagnostic Data Link. • Enter the following diagnostic mode on the diagnostic tool: PCM. • Enter the following diagnostic mode on the diagnostic tool: Active Command Modes. • Enter the following diagnostic mode on the diagnostic tool: Output State Control (OSC). • Enter the following diagnostic mode on the diagnostic tool: Trans-Bench Mode. • **Does vehicle enter Trans-Bench Mode?**	**Yes** REMAIN in Trans-Bench Mode. GO to **A2**. **No** REPEAT procedure to enter Trans-Bench Mode. If vehicle did not enter Trans-Bench Mode, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM or NGS.
A2	**WIGGLE TEST**	
	• Remain in Trans-Bench Mode. • Select PIDs to be monitored.	

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: SHIFT AND TORQUE CONVERTER CLUTCH SOLENOIDS (Continued)

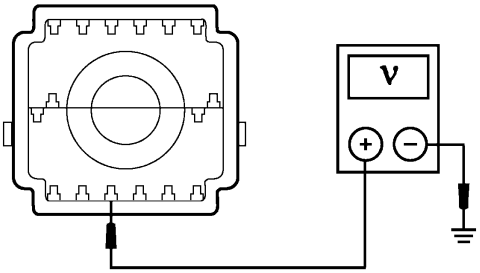
Test Step		Result / Action to Take
A2	**WIGGLE TEST (Continued)**	
		Yes REPAIR the circuit. TEST the system for normal operation. **No** GO to **A3**.

PID Command	PID Actual
SSA	SSA
SSB	SSB
SSC	SSC
SSD	SSD
TCC	TCC

- Select "ON" to turn suspect solenoid on.
- Press "SEND".
- Wiggle all wiring and connectors to the transmission. Monitor the solenoid state for changes.
- Select "OFF" to turn solenoid off.
- Press "SEND".
- **Does the suspect solenoid(s) fault state change?**

A3	**SOLENOID FUNCTIONAL CHECK**	
	• Monitor each solenoid state. • Turn each solenoid ON and OFF. • **Does the solenoid turn ON and OFF when commanded and can solenoid activation be heard?**	**Yes** GO to **A4**. **No** GO to **A5**.
A4	**OSC TRANS-DRIVE MODE (GEAR OR TCC)**	
	• Carry out OSC Trans-Drive Mode. • Select GEAR for shift solenoids or follow procedures for GEAR as listed in this section. • Select TCC for Torque Converter Clutch Solenoid. Follow procedures of TCC in Drive Mode as listed in this section. • **Does the transmission upshift and downshift or torque converter engage/disengage when commanded?**	**Yes** CLEAR all DTCs. ROAD TEST to verify if concern is still present. If concern is still present, REFER to Diagnosis By Symptom to diagnose shift or torque converter concern. **No** GO to **A5**.
A5	**CHECK FOR BATTERY VOLTAGE**	

- Disconnect: Transmission Vehicle Harness Connector.
- Visually inspect all wires and connectors for damage.
- Key in ON position.
- Measure the voltage on pin 3 harness side and ground.



A0005135

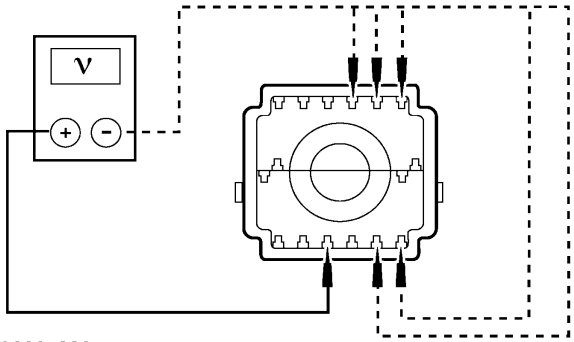
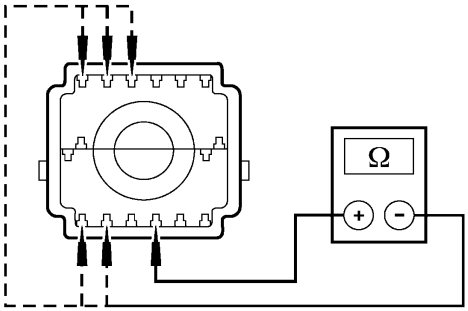
- **Is the voltage greater than 10 volts?**

Yes
GO to **A6**.
No
REPAIR the circuit. TEST for normal operation.

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: SHIFT AND TORQUE CONVERTER CLUTCH SOLENOIDS (Continued)

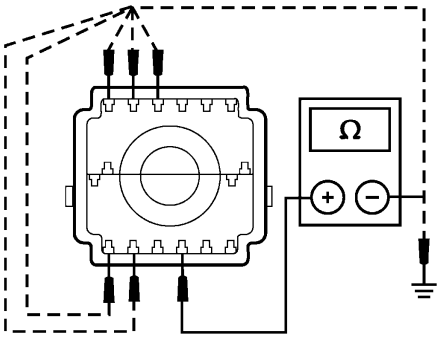
Test Step	Result / Action to Take
A6 ELECTRICAL SIGNAL CHECK • Leave positive lead connected to pin 3 and connect negative lead to pin 5, 6, 14, 15 and 16.  A0037986 • Enter the following diagnostic mode on the diagnostic tool: Trans-Bench Mode. • Select Parameter SSA, SSB, SSC, SSD or TCC. • Select "ON". • Press "SEND". • Measure the voltage while cycling the solenoids ON and OFF. • Select "OFF", press "SEND". • **Does the voltage change?**	**Yes** GO to **A7**. **No** REPAIR the circuit. TEST the system for normal operation.
A7 CHECK SOLENOID RESISTANCE AT SOLENOID • Measure the resistance between pin 3 and pin 5, 6, 14, 15, and 16 solenoid side.  A0039133 • **Is the resistance within specification?**	**Yes** GO to **A8**. **No** INSTALL a new solenoid body assembly. TEST the system for normal operation.

Solenoid	Resistance (ohms)
SSA	16-45
SSB	16-45
SSC	16-45
SSD	16-45
TCC	9-16

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A: SHIFT AND TORQUE CONVERTER CLUTCH SOLENOIDS (Continued)

Test Step		Result / Action to Take
A8	**CHECK SOLENOID FOR SHORT TO GROUND**	
	• Measure the resistance between pin 3 and pin 5, 6, 14, 15, and 16 solenoid side and ground.  A0005137 • **Is the resistance less than 5 ohms?**	**Yes** INSTALL a new solenoid body assembly. **No** REFER to Diagnosis By Symptom in this section for diagnosis of shift or torque converter concerns.

PINPOINT TEST B: TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR

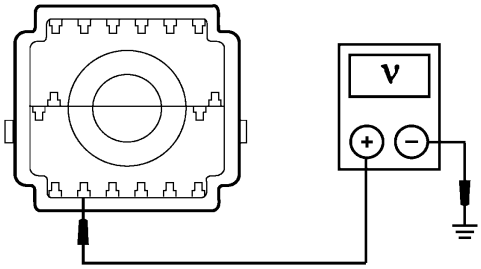
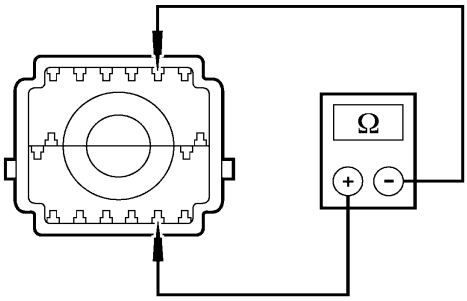
NOTE: Refer to the Transmission Vehicle Harness Connector illustration preceding these pinpoint tests.

Test Step		Result / Action to Take
B1	**ELECTRONIC DIAGNOSTICS**	
	• Key in OFF position. • Select PARK. • Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in connector and in good condition before proceeding. • Connect the diagnostic tool. • Key in ON position. • Select Diagnostic Data Link. • Select PCM. • Select PID/Data Monitor and Record. • Enter the following diagnostic mode on the diagnostic tool: PIDs; TFT, TFTV. • **Does the vehicle enter PID/Data Monitor and Record?**	**Yes** REMAIN in PID/Data Control. GO to **B2**. **No** REPEAT procedure to enter PID. If vehicle did not enter PID, REFER to thePowertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM and NGS.
B2	**WARM-UP/COOL-DOWN CYCLE**	
	• While monitoring the TFT PIDs, carry out the following test: If transmission is cold, run transmission to warm it up. If transmission is warm, allow transmission to cool down. • **Do the TFT PIDs increase as the transmission is warmed up or decrease as the transmission is cooled or does the TFT or TFTV drop in and out of range?**	**Yes** If the TFT PIDs increase as the transmission is warmed or decrease as the transmission is cooled, CLEAR all DTCs. ROAD TEST to verify if concern is still present. If concern is still present, REFER to Diagnosis By Symptom in this section to diagnose transmission overheating. If the TFT or TFTV drop in and out of range, INSPECT for intermittent concern in the internal/external harness, sensor or connector. **No** GO to **B3**.
B3	**ELECTRICAL SIGNAL CHECK**	
	• Disconnect: Transmission Harness Connector. • Visually inspect all wires and connectors for damage.	

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B: TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR (Continued)

Test Step	Result / Action to Take
B3 ELECTRICAL SIGNAL CHECK (Continued) • Measure the voltage between pin 2 harness side and ground.  A0005138 • **Is the voltage between 4.5 and 5.0 volts?**	**Yes** GO to **B4**. **No** REPAIR the circuit. TEST the system for normal operation.
B4 CHECK RESISTANCE OF TFT SENSOR • Measure the resistance between pin 2 and 12 at the solenoid body connector.  A0061762 • Record the resistance. • Resistance should be approximately in the following ranges: **Transmission Fluid Temperature** • **Is the resistance in the range?**	**Yes** REFER to Diagnosis By Symptom in this section to diagnose an overheating concern. **No** INSTALL a new solenoid body assembly.

°C	°F	Resistance (Ohms)
-40 to -20	-40 to -4	967K - 284K
-19 to -1	-3 - 31	284K - 100K
0 - 20	32 - 68	100K - 37K
21 - 40	69 - 104	37K - 16K
41 - 70	105 - 158	16K - 5K
71 - 90	159 - 194	5K - 2.7K
91 - 110	195 - 230	2.7K - 1.5K
111 - 130	231 - 266	1.5K - 0.8K
131 - 150	267 - 302	0.8K - 0.54K

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR

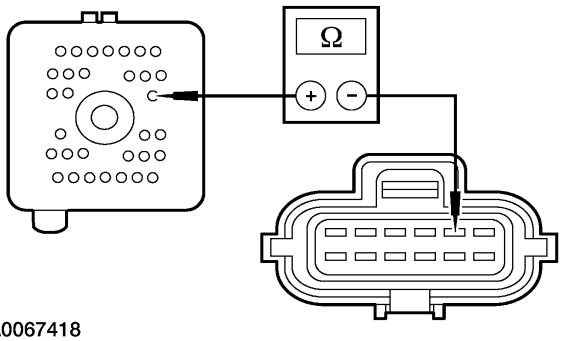
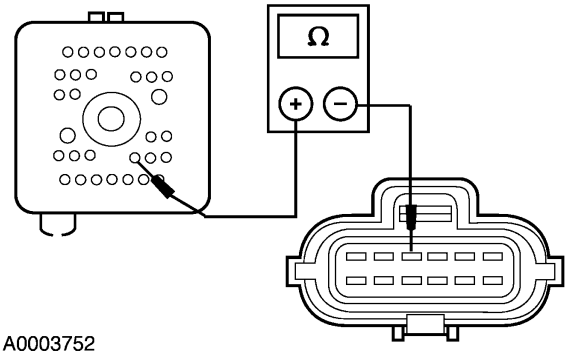
NOTE: Refer to the Digital Transmission Range (TR) Sensor Connector illustration and Digital Transmission Range TR) Sensor Diagnosis Chart preceding these pinpoint tests.

Test Step		Result / Action to Take
C1	**VERIFY DIAGNOSTIC TROUBLE CODES**	
	• Key in OFF position. • Select PARK. • Carry out on-board diagnostic test. • **Are only DTC codes P0705, P0708 present?**	**Yes** GO to **C4**. **No** GO to **C2**.
C2	**VERIFY DIGITAL TRANSMISSION RANGE SENSOR ALIGNMENT**	
	• Key in OFF position. • Select PARK. • Check to make sure the digital TR sensor harness connector is fully seated, terminals are fully engaged in connector and in good condition before proceeding. • Apply the parking brake. • Select NEUTRAL. • Disconnect the shift cable/linkage from the manual lever. • Verify that the TR Sensor Alignment Gauge fits in the appropriate slots. • **Is the digital TR sensor correctly adjusted?**	**Yes** GO to **C3**. **No** ADJUST the digital TR sensor; REFER toDigital Transmission Range (TR) Sensor in this section. PLACE transmission range selector lever into PARK and CLEAR DTCs. RERUN OBD Tests. GO to **C3**.
C3	**VERIFY SHIFT CABLE/LINKAGE ADJUSTMENT**	
	• Place range selector lever in D5. • Connect the shift cable/linkage. • Verify that the shift cable/linkage is correctly adjusted. Refer toSelector Lever Cable Adjustment in this section. • **Is the shift cable/linkage is correctly adjusted?**	**Yes** GO to **C4**. **No** ADJUST the shift cable/linkage. REFER toSelector Lever Cable Adjustment in this section. GO to **C4**.
C4	**CHECK ELECTRICAL SIGNAL OPERATION**	
	• Select PARK. • Disconnect: Digital TR Sensor. ⚠ **CAUTION: Do not pry on connector. This will damage the connector and result in a transmission concern.** Press button and pull out on the digital TR harness connector. • Inspect both ends of the connector for damage or pushed out pins, corrosion, loose wires and missing or damaged seals. • **Is there damage to the connector, pins or harness?**	**Yes** REPAIR as necessary. CLEAR DTCs and RERUN OBD Tests. **No** If diagnosing a DTC, GO to **C5**. If diagnosing a starting concern or a backup lamp concern, GO to **C10**.
C5	**CHECK ELECTRICAL SYSTEM OPERATION (DIGITAL TR AND PCM)**	
	• Key in OFF position. • Connect the diagnostic tool. • Connect: Digital TR Sensor. • Key in ON position. • Enter the following diagnostic mode on the diagnostic tool: TR PIDS TR__D, TR__V. • Move transmission range selector lever into each gear and stop. • Observe the PIDs, TR__D, and TR__V (vehicle-dependent) while wiggling harness, tapping on sensor, or driving the vehicle. Use PIDs TR__D for DTCs P0705, P1704, and P1705. Use PIDs TR__V for DTC P0708. • Compare the PIDs to the Digital Transmission Range (TR) Sensor Diagnosis Chart. • **Do the PIDs TR__D and TR__V match the Digital Transmission Range (TR) Sensor Diagnosis chart, and does the TR__D PID remain steady when the harness is wiggled, the sensor is tapped on, or the vehicle driven?**	**Yes** The problem is not in the digital TR sensor system. REFER to Diagnosis By Symptom in this section for further diagnosis. **No** If TR__D changes when wiggling harness, tapping on the sensor or driving the vehicle, the problem may be intermittent. GO to **C6**.

(Continued)

DIAGNOSIS AND TESTING (Continued)

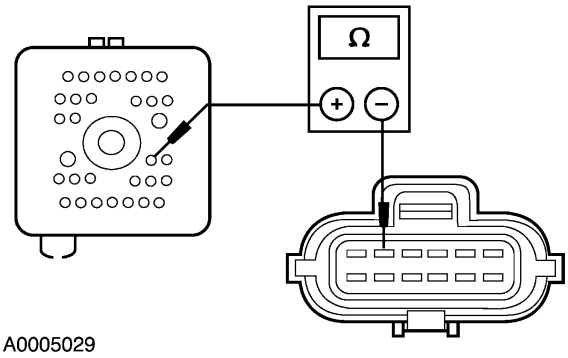
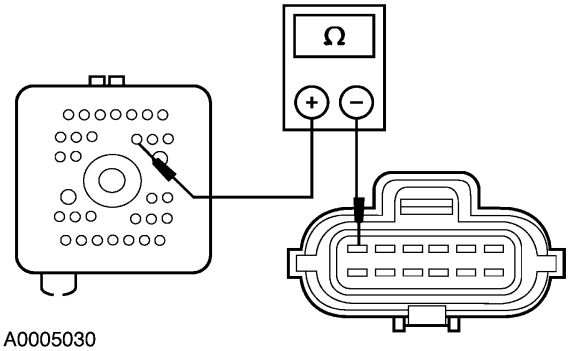
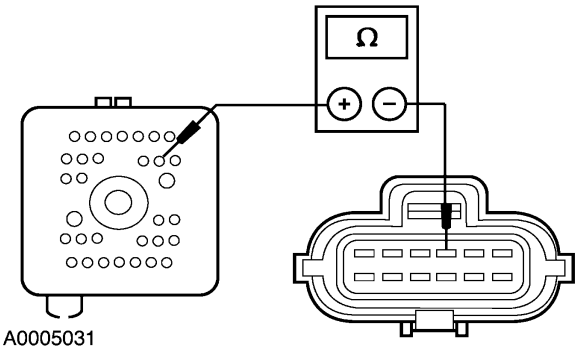
PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR (Continued)

Test Step		Result / Action to Take
C6	**CHECK DIGITAL TRANSMISSION RANGE SENSOR OPERATION**	
	• Disconnect: Digital TR Sensor. • Connect: TR-E Cable to Transmission Tester. • Connect: TR-E Cable to Digital TR Sensor. • Place the DIGITAL TR Overlay onto Transmission Tester. • Carry out SENSOR Test as instructed on the digital TR Overlay. • **Does the status lamp on the tester TRS-E cable match the selected gear positions?**	**Yes** Concern is not in the digital TR sensor. GO to **C7**. **No** INSTALL a new digital TR sensor and ADJUST. REFER toDigital Transmission Range (TR) Sensor in this section. CLEAR DTCs and RERUN OBD Tests.
C7	**CHECK PCM HARNESS CIRCUITS FOR OPENS**	
	• Key in OFF position. • Disconnect: 150 Pin PTEC Module Connector ‘‘B’’. Inspect for damaged or pushed out pins, corrosion or loose wires. • Disconnect: Digital TR Sensor. ⚠ **CAUTION: Do not pry the connector. This will damage the connector and result in a transmission concern.** Disconnect the digital TR sensor connector. • Measure the resistance between TR pin 2 harness side and signal return PCM pin 14 harness side.  A0067418 • Measure the resistance between PCM pin 22 and TR pin 4 harness side.  A0003752	

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR (Continued)

Test Step		Result / Action to Take
C7	**CHECK PCM HARNESS CIRCUITS FOR OPENS (Continued)**	
• Measure the resistance between PCM pin 18 and TR pin 5 harness side.  A0005029 • Measure the resistance between PCM pin 10 and TR pin 6 harness side.  A0005030 • Measure the resistance between PCM pin 9 and TR pin 3 harness side.  A0005031 • **Are the resistances less than 5 ohms?**		**Yes** GO to **C8**. **No** REPAIR the circuits. TEST the system for normal operation.

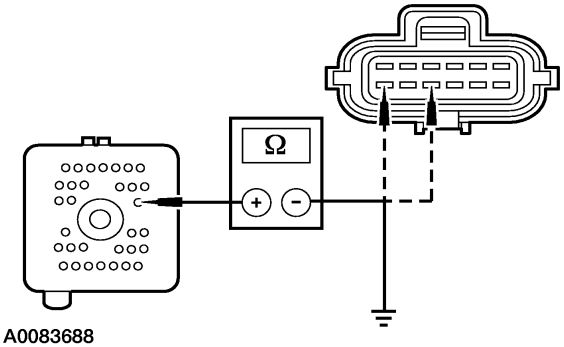
(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR (Continued)

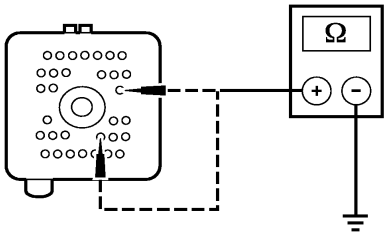
Test Step		Result / Action to Take
C8	CHECK PCM HARNESS CIRCUITS FOR SHORT TO GROUND OR POWER	

- Measure the resistance between PCM pin 14 and TR pin 10 and 12 harness side and ground.



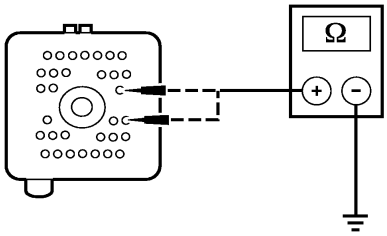
A0083688

- Measure the resistance between pin 22 harness side and ground; and pin 14 harness side and ground.



A0083701

- Measure the resistance between pin 18 harness side and ground; and pin 14 harness side and ground.

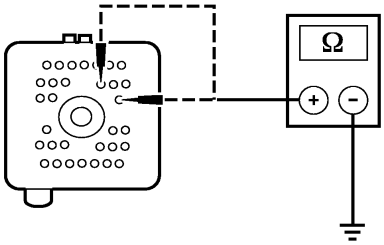
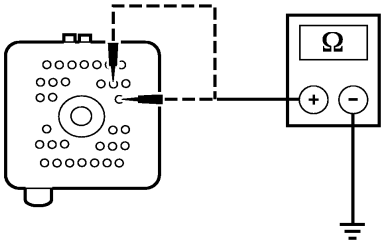
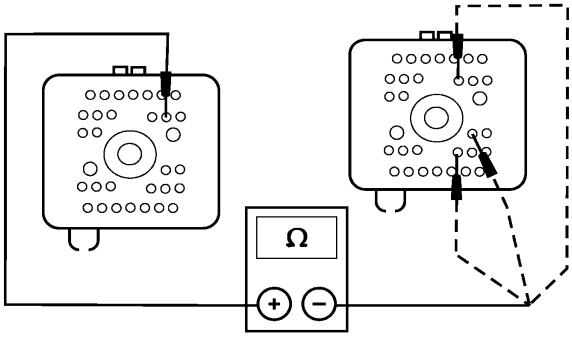


A0083702

(Continued)

DIAGNOSIS AND TESTING (Continued)

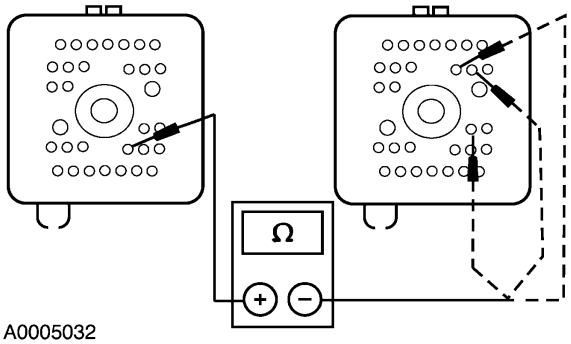
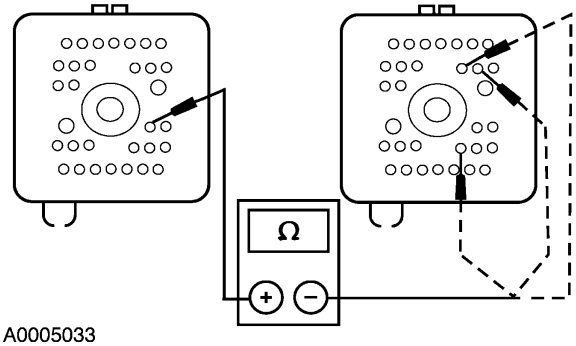
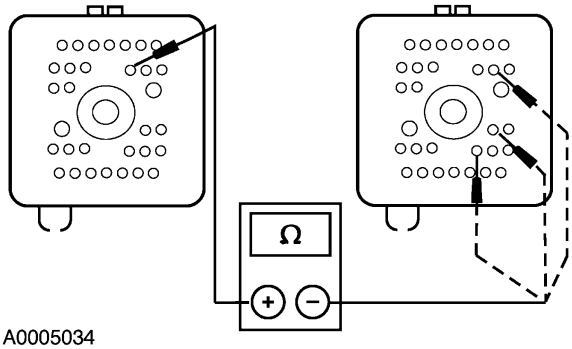
PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR (Continued)

Test Step		Result / Action to Take
C8	**CHECK PCM HARNESS CIRCUITS FOR SHORT TO GROUND OR POWER (Continued)**	
• Measure the resistance between pin 10 harness side and ground; and pin 14 harness side and ground.  A0083703 • Measure the resistance between pin 9 harness side and ground; and pin 14 harness side and ground.  A0083704 • **Are the resistances greater than 10,000 ohms?**		**Yes** GO to **C9**. **No** REPAIR the circuits. TEST the system for normal operation. CLEAR DTCs. RERUN OBD Tests.
C9	**CHECK FOR SHORT BETWEEN TR/PCM INPUT SIGNAL CIRCUITS**	
• Measure the resistance between pin 9 harness side and pin 22; pin 18; pin 10 harness side.  A0036188		

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR (Continued)

Test Step		Result / Action to Take
C9	**CHECK FOR SHORT BETWEEN TR/PCM INPUT SIGNAL CIRCUITS (Continued)**	
• Measure the resistance between pin 22 harness side and pin 9; pin 18; pin 10 harness side.  A0005032 • Measure the resistance between pin 18 harness side and pin 22; pin 9; pin 10 harness side.  A0005033 • Measure the resistance between pin 10 harness side and pin 22; pin 18; pin 9 harness side.  A0005034 • **Are the resistances greater than 10,000 ohms?**		**Yes** INSTALL a new PCM. TEST the system for normal operation. **No** REPAIR the circuit. TEST the system for normal operation.

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR (Continued)

Test Step		Result / Action to Take
C10	**CHECK THE NON-PCM INTERNAL CIRCUITS OF SENSOR**	
	• Connect: TRS-E Cable to Transmission. • Connect: TRS-E Cable to Digital TR Sensor. • Place the Digital TR Overlay onto Transmission Tester. • Carry out Switch Test as instructed on the digital TR Overlay. • **Does the status lamp on the tester indicate RED for the correct gear position?**	**Yes** Concern is not in the digital TR sensor. For start system concerns, REFER toSection 303-04 or Section 303-04. For backup lamp concerns, REFER toSection 417-01. **No** INSTALL a new digital TR sensor and ADJUST; REFER toDigital Transmission Range (TR) Sensor in this section. CLEAR DTCs and RERUN OBD Tests.

PINPOINT TEST D: PRESSURE CONTROL (PC) SOLENOIDS (PCA, PCB, PCC)

NOTE: Refer to the Transmission Vehicle Harness Connector illustration preceding these pinpoint tests.

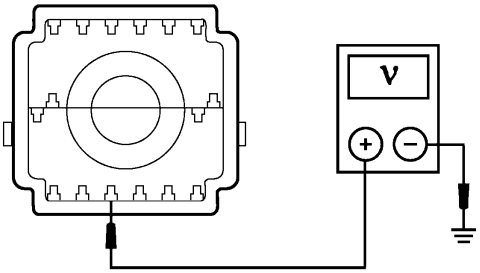
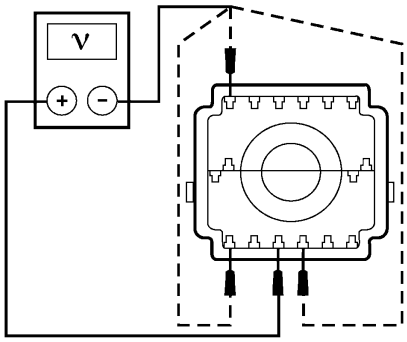
NOTE: Read and record all DTCs. All digital TR Sensor and VSS DTCs must be repaired before entering Output State Control (OSC).

Test Step		Result / Action to Take
D1	**ELECTRONIC DIAGNOSTICS**	
	• Key in OFF position. • Select PARK. • Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in the connector and in good condition before proceeding. • Install 300 psi pressure gauges into Line and PC C tap. • Connect the diagnostic tool. • Key in ON position. • Enter the following diagnostic mode on the diagnostic tool: Diagnostic Data Link. • Enter the following diagnostic mode on the diagnostic tool: PCM. • Enter the following diagnostic mode on the diagnostic tool: Active Command Modes. • Enter the following diagnostic mode on the diagnostic tool: Output State Control (OSC). • Enter the following diagnostic mode on the diagnostic tool: Trans-Bench Mode. • **Does the vehicle enter the Trans-Bench Mode?**	**Yes** REMAIN in Trans-Bench Mode. GO to **D2**. **No** REPEAT procedure to enter Trans-Bench Mode. If vehicle did not enter OSC, REFER toPowertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM or NGS.
D2	**SOLENOID FUNCTIONAL TEST**	
	• Monitor pressure gauges. • Enter the following diagnostic mode on the diagnostic tool: Parameter; PCx. • **NOTE:** Make sure that the solenoids not being tested are off or at zero. Select PC A, PC B, or PC C. • Select value - 15, 30, 45, 60, 70 or 90 psi. • Press "SEND". • Select another value "0-90 psi". • Press "SEND". • Enter the following diagnostic mode on the diagnostic tool: XXX. • Press "SEND". • **For PC A and PC B: Does the pressure reading for A or B follow the commanded pressure, (actual A and B pressures will be higher than the commanded pressure)? For PC C: Does the pressure reading match the commanded pressure?"**	**Yes** CLEAR DTCs. **No** GO to **D3**.
D3	**CHECK FOR BATTERY VOLTAGE**	
	• Disconnect: Transmission Harness Connector. • Visually inspect all wires and connectors for damage. • Key in ON position.	

(Continued)

DIAGNOSIS AND TESTING (Continued)

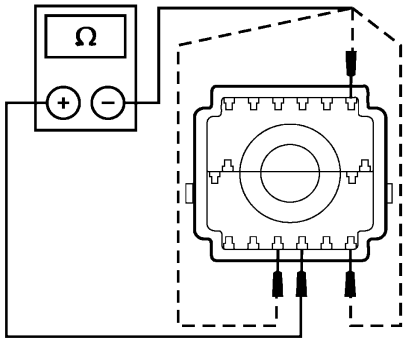
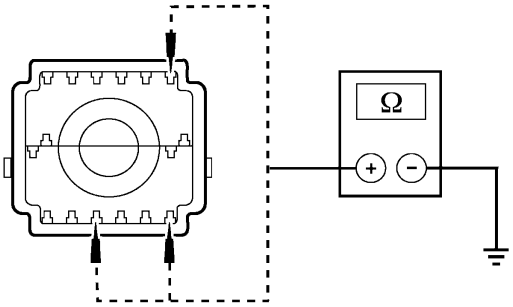
PINPOINT TEST D: PRESSURE CONTROL (PC) SOLENOIDS (PCA, PCB, PCC) (Continued)

Test Step		Result / Action to Take
D3	**CHECK FOR BATTERY VOLTAGE (Continued)**	
• Measure the voltage between pin 3 harness side and ground.  A0005135 • **Is the voltage greater than 10 volts?**		**Yes** GO to **D4**. **No** REPAIR the circuit. TEST the system for normal operation.
D4	**ELECTRICAL SIGNAL CHECK**	
• Leave positive lead connected pin 3 and connect negative lead to pins 1, 4 and 11 harness side.  A0035164 • Activate solenoids (ON and OFF) while monitoring the voltage reading. • Enter the following diagnostic mode on the diagnostic tool: Trans-Bench Mode. • Enter the following diagnostic mode on the diagnostic tool: Parameter; PCx. • Select a value ''0-90 psi''. • Press ''SEND''. • Select another value ''0-90 psi''. • Press ''SEND''. • Enter the following diagnostic mode on the diagnostic tool: XXX. • Press ''SEND''. • **Does the voltage and solenoid state change?**		**Yes** GO to **D5**. **No** CHECK for open or short circuit in harness or PCM.

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST D: PRESSURE CONTROL (PC) SOLENOIDS (PCA, PCB, PCC) (Continued)

Test Step		Result / Action to Take
D5	**CHECK SOLENOID RESISTANCE AT SOLENOID**	
	• Measure and record the resistance between PC solenoid pin 3 and pins 1, 4, and 11. Resistance should be between 3.3 and 7.5 ohms.  A0005068 • **Is the resistance within specifications?**	**Yes** GO to **D6**. **No** INSTALL a new solenoid body assembly.
D6	**CHECK SOLENOID FOR SHORT TO GROUND**	
	• Measure and record the resistance between the PC solenoid pins 1, 4, 11, and ground solenoid side.  A0037992 • **Is the resistance less than 10,000 ohms?**	**Yes** INSTALL a new solenoid body assembly. TEST the system for normal operation. **No** REFER to Diagnosis By Symptom in this section for diagnosis of pressure concerns. TEST the system for normal operation.

PINPOINT TEST E: TURBINE SHAFT SPEED (TSS), INTERMEDIATE SHAFT SPEED (ISS), AND OUTPUT SHAFT SPEED (OSS) SENSORS

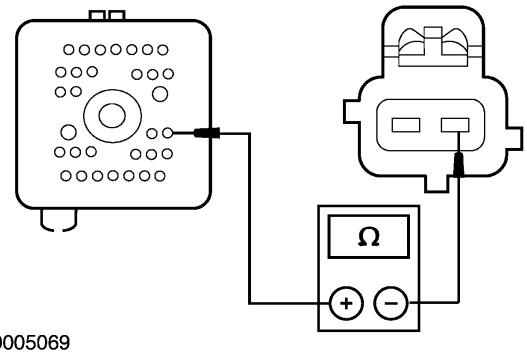
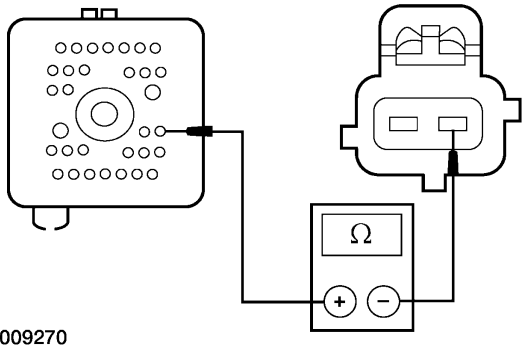
NOTE: Refer to the turbine shaft speed (TSS), intermediate shaft speed (ISS), and output shaft speed (OSS) sensor connector illustrations preceding these pinpoint tests.

Test Step		Result / Action to Take
E1	**ELECTRONIC DIAGNOSTICS**	
	• Check to make sure the transmission harness connectors are fully seated, terminals are fully engaged in connector and in good condition before proceeding. • Connect the diagnostic tool. • Key in ON position. • Enter the following diagnostic mode on the diagnostic tool: Diagnostic Data Link. • Enter the following diagnostic mode on the diagnostic tool: PCM. • Select PID/Data Monitor and Record. • Select the following PIDs: TSS, ISS, or OSS. • **Does vehicle enter PID/Data Monitor and Record?**	**Yes** REMAIN in PID/Data. GO to **E2**. **No** REPEAT procedure to ENTER PID. If vehicle did not enter PID, REFER to thePowertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM or NGS.

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E: TURBINE SHAFT SPEED (TSS), INTERMEDIATE SHAFT SPEED (ISS), AND OUTPUT SHAFT SPEED (OSS) SENSORS (Continued)

Test Step		Result / Action to Take
E2	**DRIVE CYCLE TEST**	
	• While monitoring the appropriate sensor PID, drive the vehicle so that the transmission upshifts and downshifts through all gears. • **Does the TSS, ISS, or OSS Speed PID increase and decrease with engine and vehicle speed?**	**Yes** GO to **E3**. **No** If the TSS, ISS, or OSS Speed PID does not increase and decrease with engine and vehicle speed, INSPECT for open or short in vehicle harness, sensor, a PCM concern, or internal hardware concern. GO to **E4**.
E3	**DRIVE CYCLE TEST ERRATIC**	
	• While monitoring the appropriate sensor PID, drive the vehicle so that the transmission upshifts and downshifts through all gears. • **Is the TSS, ISS, or OSS Speed PID signal erratic (drop to zero or near zero and return to normal operation)?**	**Yes** If the sensor signal is erratic, INSPECT for intermittent concern in the harness, sensor, or connector. GO to **E4**. **No** CLEAR all DTCs. Rerun OBD.
E4	**CHECK PCM HARNESS CIRCUITS FOR OPENS**	
	• Key in OFF position. • Disconnect: 150 Pin PTEC Module Connector ''B''. Inspect for damaged or pushed out pins, corrosion or loose wires. • For OSS, measure the resistance between pin 17 and the appropriate sensor connector pin 2 harness side.  A0005069 • For ISS, measure the resistance between pin 17 and the appropriate sensor connector pin 2 harness side.  A0009270	

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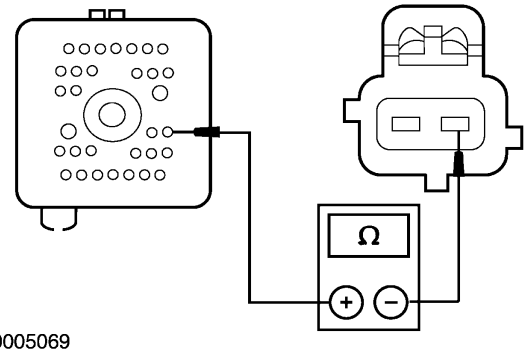
DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E: TURBINE SHAFT SPEED (TSS), INTERMEDIATE SHAFT SPEED (ISS), AND OUTPUT SHAFT SPEED (OSS) SENSORS (Continued)

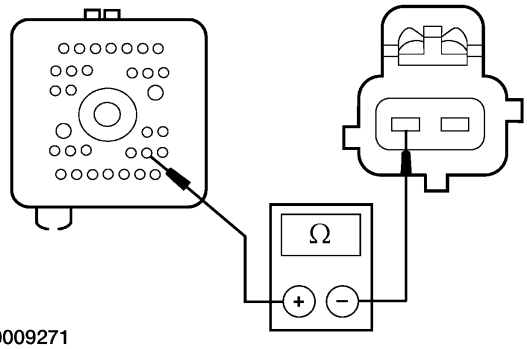
Test Step		Result / Action to Take
E4	**CHECK PCM HARNESS CIRCUITS FOR OPENS (Continued)**	

- For TSS, measure the resistance between pin 17 and the appropriate sensor connector pin 2 harness side.



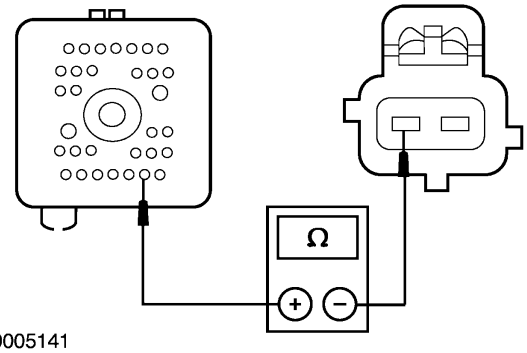
A0005069

- For ISS, measure the resistance between pin 21 and the appropriate sensor connector pin 1 harness side.



A0009271

- For TSS, measure the resistance between pin 27 and the appropriate sensor connector pin 1 harness side.



A0005141

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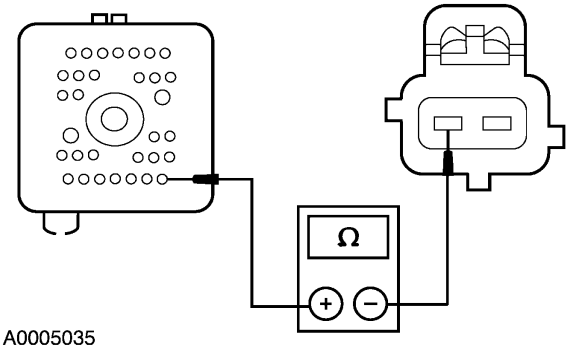
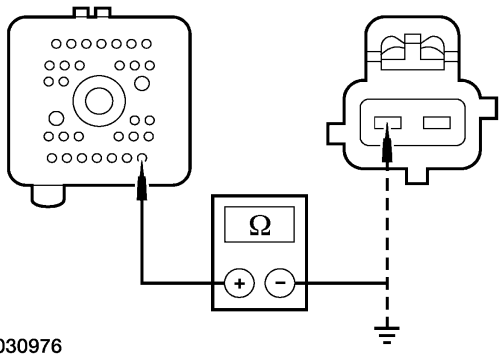
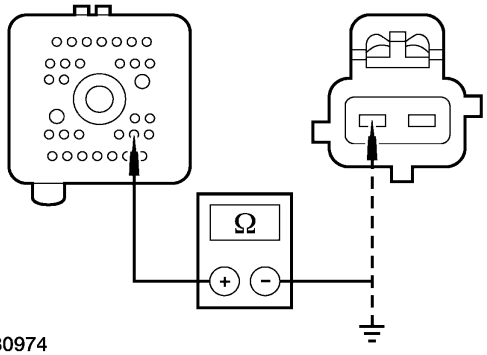
DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E: TURBINE SHAFT SPEED (TSS), INTERMEDIATE SHAFT SPEED (ISS), AND OUTPUT SHAFT SPEED (OSS) SENSORS (Continued)

Test Step		Result / Action to Take
E4	**CHECK PCM HARNESS CIRCUITS FOR OPENS (Continued)**	
• For OSS, measure the resistance between pin 26 and the appropriate sensor connector pin 1 harness side.  A0005035 • **Are all resistances less than 5 ohms?**		**Yes** GO to **E5**. **No** REPAIR the circuit. TEST the system for normal operation.
E5	**CHECK PCM HARNESS CIRCUITS FOR SHORT TO GROUND**	
• For OSS, measure the resistance between pin 26 and sensor connector pin 1 harness side and ground.  A0030976 • For ISS, measure the resistance between PCM pin 21 and sensor connector pin 1 harness side and ground.  A0030974		

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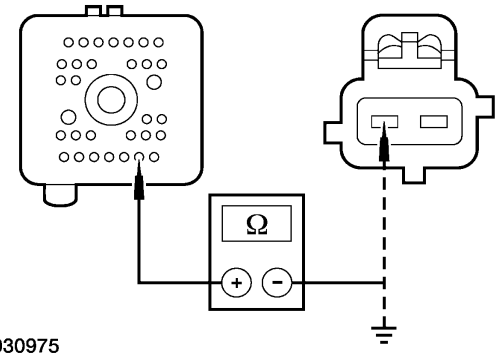
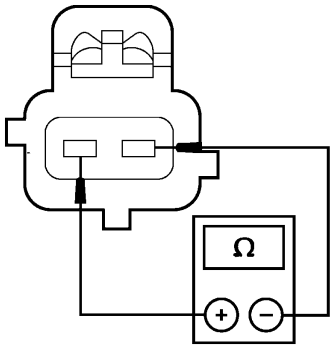
DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E: TURBINE SHAFT SPEED (TSS), INTERMEDIATE SHAFT SPEED (ISS), AND OUTPUT SHAFT SPEED (OSS) SENSORS (Continued)

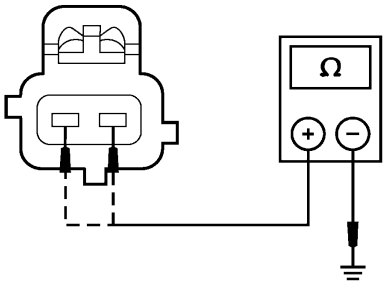
Test Step		Result / Action to Take
E5	**CHECK PCM HARNESS CIRCUITS FOR SHORT TO GROUND (Continued)**	
• For TSS, measure the resistance between PCM pin 27 and sensor connector pin 1 harness side and ground.  A0030975 • **Are the resistances greater than 10,000 ohms?**		**Yes** GO to **E6**. **No** REPAIR the circuits. TEST the system for normal operation. CLEAR DTCs. RERUN OBD Tests.
E6	**CHECK RESISTANCE OF TSS, ISS or OSS SENSOR**	
• Disconnect the appropriate vehicle harness connector from the TSS, ISS or OSS sensor. • Connect ohmmeter negative lead to one pin of the sensor and the positive lead to the other pin on the sensor.  A0005211 • Record the resistance. Resistance should be as follows: • **Is the resistance within specification for the appropriate sensor?**		**Yes** GO to **E7**. **No** INSTALL a new sensor.

Resistance (ohms)	Temperature C° (F°)
266-390	-20° (4°)
325-485	21° (70°)
492-738	150° (302°)

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E: TURBINE SHAFT SPEED (TSS), INTERMEDIATE SHAFT SPEED (ISS), AND OUTPUT SHAFT SPEED (OSS) SENSORS (Continued)

Test Step		Result / Action to Take
E7	**CHECK SENSORS FOR SHORT TO GROUND**	
	• Measure the resistance between pin 1 and 2 of each sensor and ground.  A0005501 • **Is the resistance less than 10,000 ohms?**	**Yes** INSTALL a new sensor. **No** REFER to Diagnosis By Symptom for diagnosis of shift or torque converter concerns in this section.

PINPOINT TEST F: SOLENOID MECHANICAL FAILURE

NOTE: Repair all other DTCs before repairing the following DTCs: P1714, P1715, P1716, P1717, P1740.

Test Step		Result / Action to Take
F1	**ELECTRONIC DIAGNOSIS**	
	• Connect the diagnostic tool. • Select PARK. • Key in ON position. • Carry out KOEO test until continuous DTCs have been displayed. • If any of the following DTCs are present, continue with this test: P1714, P1715, P1716, P1717, P1740. • **Are other DTCs present for TFT or shift solenoids?**	**Yes** REPAIR the DTCs for TFT or shift solenoids first. CLEAR DTCs and CARRY OUT transmission Drive Cycle test. RERUN Quick Test. **No** INSTALL a new solenoid and/or body. REFER to the Diagnostic Trouble Code Charts for code description. GO to **F2**.
F2	**TRANSMISSION DRIVE CYCLE TEST**	
	• Carry out transmission drive cycle test. Refer to Transmission Drive Cycle Test in this section. • **Does the vehicle upshift and downshift OK?**	**Yes** GO to **F3**. **No** REFER to Diagnosis By Symptom in this section to diagnose shift concerns.
F3	**RETRIEVE DTCS**	
	• Connect the diagnostic tool. • Select PARK. • Key in ON position. • Carry out KOEO test until continuous DTCs have been displayed. • **Are DTCs P1714, P1715, P1716, P1717, P1740 still present?**	**Yes** INSTALL a new PCM. ROAD TEST and RERUN Quick Test. **No** Testing completed. If a concern still exists, REFER to Diagnosis By Symptom in this section for concern diagnosis.

PINPOINT TEST G: REVERSE PRESSURE SWITCH

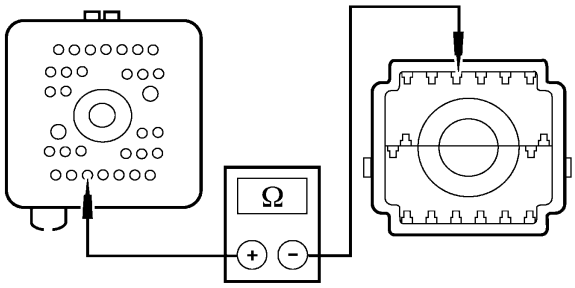
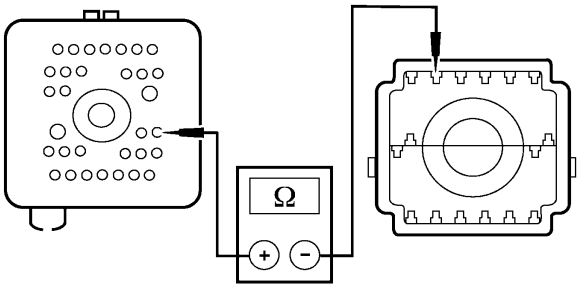
NOTE: Refer to the Reverse Pressure (RP) Switch Diagnosis Chart preceding these pinpoint tests.

Test Step		Result / Action to Take
G1	**ELECTRONIC DIAGNOSIS**	
	• Key in OFF position. • Select PARK.	

(Continued)

DIAGNOSIS AND TESTING (Continued)

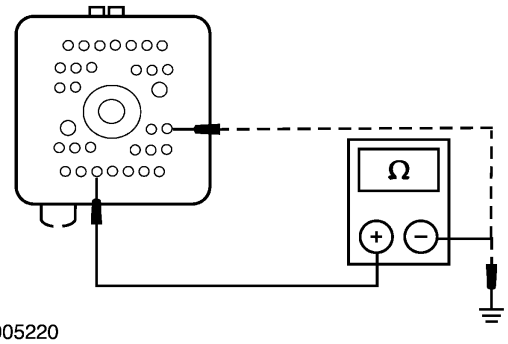
PINPOINT TEST G: REVERSE PRESSURE SWITCH (Continued)

Test Step		Result / Action to Take
G1	**ELECTRONIC DIAGNOSIS (Continued)**	
	• Check to make sure that the transmission harnesses is fully seated, the terminals are fully engaged in the connector, and the terminals are in good condition. • Connect the diagnostic tool. • Key in ON position. • Select Diagnostic Data Link. • Select PCM. • Select PID DATA Monitor and record. • Enter the following diagnostic mode on the diagnostic tool: PIDs: RPS, FFG RPS. • **Does the vehicle enter PID/DATA Monitor and record?**	**Yes** REMAIN in PID/DATA control. GO to **G2**. **No** REPEAT the procedure. If vehicle did not enter PID, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for PCM and NGS.
G2	**ELECTRICAL SIGNAL CHECK**	
	• Carry out Transmission Drive Cycle Test and monitor line pressure and PIDs: RPS, FFG RPS. • **Do the PIDs: RPS, FFG RPS match the chart for a given gear?**	**Yes** RP switch is OK. REFER to Diagnosis By Symptom in this section. **No** GO to **G3**.
G3	**CHECK HARNESS FOR OPENS**	
	• Key in OFF position. • Disconnect: 150 Pin PTEC Module Connector ”B“. • Disconnect: Transmission Connector. • Measure the resistance between PCM pin 30 and pin 13 harness side.  A0037855 • Measure the resistance between PCM pin 17 and pin 12 harness side.  A0037854 • **Are the resistances less than 5 ohms?**	**Yes** GO to **G4**. **No** REPAIR the circuit. CLEAR DTCs. RERUN OBD tests.

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST G: REVERSE PRESSURE SWITCH (Continued)

Test Step		Result / Action to Take
G4	**CHECK CIRCUIT FOR SHORT TO GROUND OR POWER**	
• Measure the resistance between PCM pin 30 and pin 17 harness side and ground.  A0005220 • **Is the resistance less than 10,000 ohms?**		**Yes** INSTALL a new reverse pressure switch. TEST the system for normal operation. **No** REPAIR the circuit. CLEAR the DTCs. RERUN OBD test. TEST the system for normal operation.