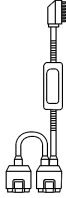
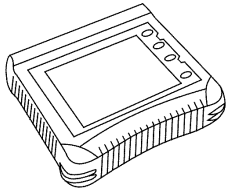

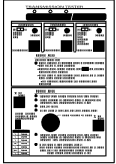
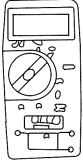
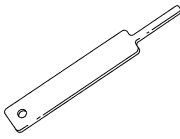


DIAGNOSIS AND TESTING

Pinpoint Tests — OSC Equipped Vehicles

Special Tool(s)

 <p>ST1632-A</p>	<p>MLP-TR Cable 418-F107 (007-00111) or equivalent</p>
 <p>ST2332-A</p>	<p>Worldwide Diagnostic System (WDS) Vehicle Communication Module (VCM) with appropriate adapters, or equivalent diagnostic tool</p>
 <p>ST1389-A</p>	<p>Transmission Tester 007-00130 or equivalent</p>
 <p>ST1761-A</p>	<p>Trans Tester TR/MLP and Manual Overlay 007-00131 or equivalent</p>
 <p>ST1137-A</p>	<p>73 III Automotive Meter 105-R0057 or equivalent</p>
 <p>ST2545-A</p>	<p>Gauge, Transmission Solenoid Connectors 307-426</p>

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

Shift Solenoids Pre-Diagnosis

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

Solenoid Operation Chart

Gear Lever Position	PCM Commanded Gear	Solenoids		
		SSA	SSB	TCC
P/R/N	1	ON	OFF	HD
(D)	1	ON	OFF	HD
(D)	2	OFF	OFF	EC
(D)	3	OFF	ON	EC
(D)	4	ON	ON	EC
(D)				
w/OD OFF				
1	1	ON	OFF	HD
2	2	OFF	OFF	EC
3	3	OFF	ON	EC
Manual 2	2	OFF	OFF	EC
Manual 1	1	ON	OFF	HD
1 ^a	2	OFF	OFF	EC

a When a manual pull-in occurs above a calibrated speed the transmission will downshift from the higher gear until the vehicle speed drops below this calibrated speed.

EC = Electronically controlled.

HD = Hydraulically disabled.

Shift Solenoid Failure Mode Chart “Always Off”

Failed off due to powertrain control module and or vehicle wiring concerns, shift solenoid electrically or hydraulically stuck off.

SSA ALWAYS OFF:	Gear Lever Position		
	(D)	2	1
PCM Gear Commanded	Actual Gear Obtained		
1	2	2	2
2	2	2	2

DIAGNOSIS AND TESTING (Continued)

SSA ALWAYS OFF:	Gear Lever Position		
	(D)	2	1
3	3	2*	2*
4	3	2*	2*

*No engine braking.

SSB ALWAYS OFF:	Gear Lever Position		
	(D)	2	1
PCM Gear Commanded	Actual Gear Obtained		
1	1	1	1
2	2	2	2
3	2	2	2
4	1	1	1

Shift Solenoid Failure Mode Chart “Always On”

Failed on due to powertrain control module and or vehicle wiring concerns, shift solenoid electrically or hydraulically stuck on.

SSA ALWAYS ON:	Gear Lever Position		
	(D)	2	1
PCM Gear Commanded	Actual Gear Obtained		
1	1	1	1

SSA ALWAYS ON:	Gear Lever Position		
	(D)	2	1
2	1	1	1
3	4	2*	2*
4	4	2*	2*

*No engine braking.

SSB ALWAYS ON:	Gear Lever Position		
	(D)	2	1
PCM Gear Commanded	Actual Gear Obtained		
1	4	2*	2*
2	3	2*	2*
3	3	2*	2*
4	4	2*	2*

*No engine braking.

PINPOINT TEST A: SHIFT AND TORQUE CONVERTER CLUTCH SOLENOIDS

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

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

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

Test Step		Result / Action to Take
A1	ELECTRONIC DIAGNOSTICS	
	<ul style="list-style-type: none"> Select PARK. Key in OFF position. Check to make sure the transmission harness connector is fully seated, pins are fully engaged in connector and in good condition before proceeding. Connect the scan tool. Key in ON position. 	

(Continued)

DIAGNOSIS AND TESTING (Continued)

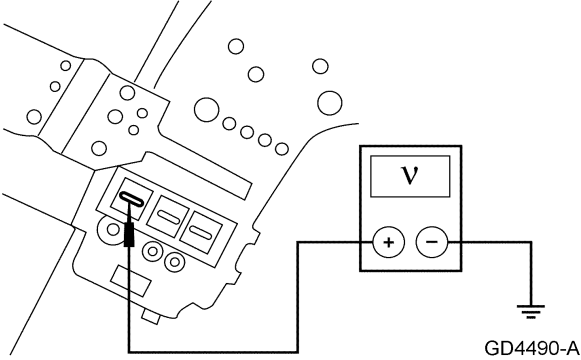
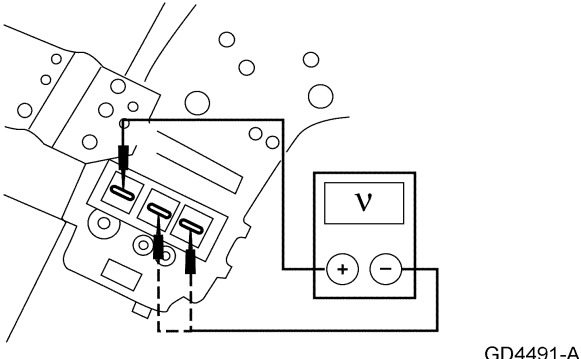
PINPOINT TEST A: SHIFT AND TORQUE CONVERTER CLUTCH SOLENOIDS (Continued)

Test Step		Result / Action to Take								
A1	ELECTRONIC DIAGNOSTICS (Continued)	<p>Yes GO to A2.</p> <p>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.</p>								
	<ul style="list-style-type: none"> Enter the following diagnostic mode on the scan tool: Diagnostic Data Link. Enter the following diagnostic mode on the scan tool: PCM. Enter the following diagnostic mode on the scan tool: Active Command Modes. Enter the following diagnostic mode on the scan tool: Output State Control (OSC). Enter the following diagnostic mode on the scan tool: Trans-Bench Mode. Does vehicle enter Trans-Bench Mode? 									
A2	WIGGLE TEST									
	<ul style="list-style-type: none"> Select PIDs to be monitored. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">PID Command</th> <th style="width: 50%;">PID Actual</th> </tr> </thead> <tbody> <tr> <td>SSA</td> <td>SS1F</td> </tr> <tr> <td>SSB</td> <td>SS2F</td> </tr> <tr> <td>TCC</td> <td>TCCF</td> </tr> </tbody> </table> <ul style="list-style-type: none"> 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? 		PID Command	PID Actual	SSA	SS1F	SSB	SS2F	TCC	TCCF
PID Command	PID Actual									
SSA	SS1F									
SSB	SS2F									
TCC	TCCF									
	<ul style="list-style-type: none"> 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? <p>Yes REPAIR open or short in the vehicle harness or connector.</p> <p>No GO to A3.</p>									
A3	SOLENOID FUNCTIONAL CHECK	<p>Yes GO to A4.</p> <p>No GO to A5.</p>								
	<ul style="list-style-type: none"> 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? 									
A4	OSC TRANS-DRIVE MODE (GR_CM OR TCC)	<p>Yes 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 shift or torque converter concern.</p> <p>No GO to A5.</p>								
	<ul style="list-style-type: none"> Carry out OSC Trans-Drive Mode. Select GR_CM for Shift Solenoids or follow procedures for GR_CM as listed. Select TCC for Torque Converter Clutch Solenoid. Follow procedures of TCC in Drive Mode as listed. Does the transmission upshift and downshift or torque converter engage/disengage when commanded? 									
A5	CHECK FOR BATTERY VOLTAGE									
	<ul style="list-style-type: none"> Remove transmission fluid pan. Visually inspect the lead frame and connectors for damage. Key in ON position. 									

(Continued)

DIAGNOSIS AND TESTING (Continued)

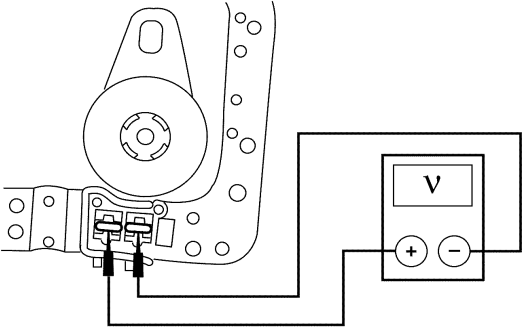
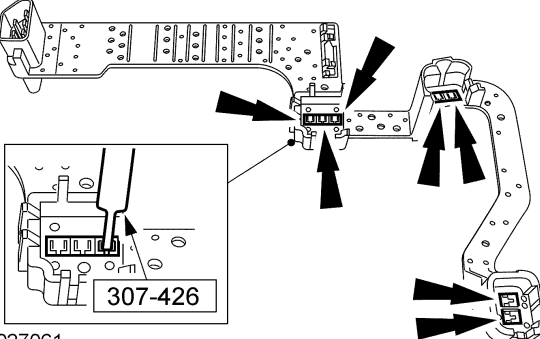
PINPOINT TEST A: SHIFT AND TORQUE CONVERTER CLUTCH SOLENOIDS (Continued)

	Test Step	Result / Action to Take
A5	CHECK FOR BATTERY VOLTAGE (Continued)	
	<ul style="list-style-type: none"> Measure the voltage with the positive lead to VPWR solenoid pin and negative lead to a good ground.  <p style="text-align: right;">GD4490-A</p> <ul style="list-style-type: none"> Is the voltage greater than 10 volts? 	<p>Yes GO to A6.</p> <p>No CHECK for open or short circuit in harness or solenoid.</p>
A6	ELECTRICAL SIGNAL CHECK	
	<ul style="list-style-type: none"> Measure the voltage with the positive lead connected to VPWR solenoid pin and the negative lead to the signal pin of the appropriate solenoid.  <p style="text-align: right;">GD4491-A</p> <ul style="list-style-type: none"> Enter the following diagnostic mode on the scan tool: Trans-Bench Mode. Select Parameter SSA, SSB or TCC. Select "ON". Press "SEND". Turn the solenoids ON and OFF, while monitoring the voltage, solenoid state on the diagnostic tool (ON and OFF) and listen for the solenoid to activate (click). 	

(Continued)

DIAGNOSIS AND TESTING (Continued)

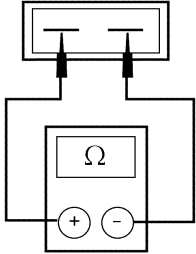
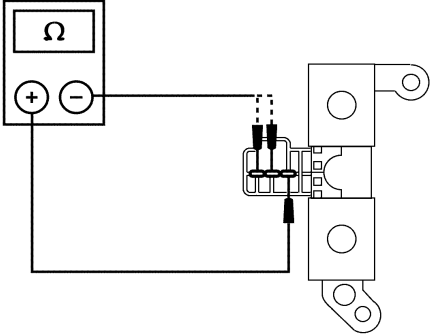
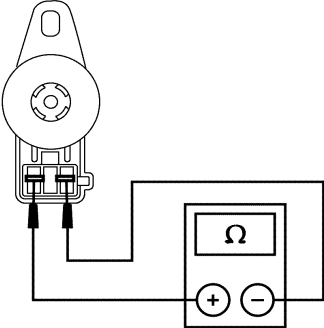
PINPOINT TEST A: SHIFT AND TORQUE CONVERTER CLUTCH SOLENOIDS (Continued)

	Test Step	Result / Action to Take
A6	ELECTRICAL SIGNAL CHECK (Continued)	
	<ul style="list-style-type: none"> Measure the voltage with the positive lead to VPWR pin and the negative lead to the TCC pin.  <p style="text-align: center;">GD4492-A</p> <ul style="list-style-type: none"> Enter the following diagnostic mode on the scan tool: Select Parameter TCC. Select "ON". Press "SEND". Turn the solenoid ON and OFF, while monitoring the voltage, solenoid state on the diagnostic tool (ON and OFF) and listen for the solenoid to activate (click). Select "OFF", press "SEND". Does the voltage and solenoid state change? 	<p>Yes GO to A7.</p> <p>No CHECK for open or short circuit in harness, solenoid or a PCM concern.</p>
A7	CHECK THE MOLDED LEAD FRAME CONNECTIONS	
	<ul style="list-style-type: none"> Key in OFF position. Disconnect: Molded Lead Frame. Inspect for damaged or pushed out pins, corrosion, etc. Using special tool, check each of the molded lead frame connector pins.  <p style="text-align: center;">A0027061</p> <ul style="list-style-type: none"> Does the special tool go through the molded lead frame connector pins? 	<p>Yes INSTALL a new molded lead frame. GO to A8.</p> <p>No GO to A8.</p>

(Continued)

DIAGNOSIS AND TESTING (Continued)

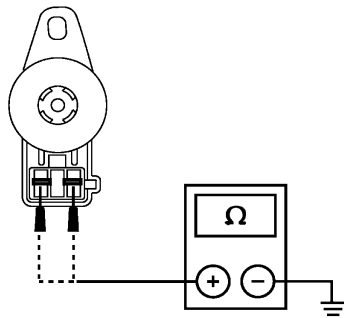
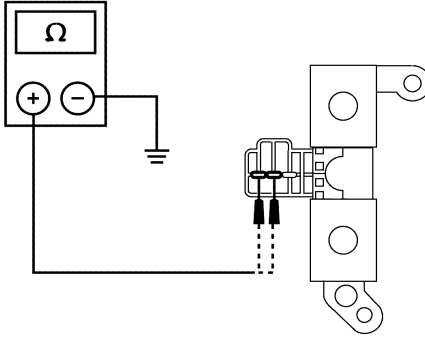
PINPOINT TEST A: SHIFT AND TORQUE CONVERTER CLUTCH SOLENOIDS (Continued)

	Test Step	Result / Action to Take								
A8	<p>CHECK THE SOLENOID RESISTANCE AT THE SOLENOID</p> <ul style="list-style-type: none"> Measure the resistance between the pins of the solenoid. 									
	 <p style="text-align: right;">GD3386-A</p>									
	<ul style="list-style-type: none">  <p style="text-align: right;">AD1391-A</p> 									
	<ul style="list-style-type: none">  <p style="text-align: right;">AD1392-A</p> 									
	<ul style="list-style-type: none"> Measure the resistance for each solenoid (SSA, SSB or TCC) as follows: 									
	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="width: 30%;">Solenoid</th> <th style="width: 70%;">Resistance (ohms)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">SSA</td> <td style="text-align: center;">20-30</td> </tr> <tr> <td style="text-align: center;">SSB</td> <td style="text-align: center;">20-30</td> </tr> <tr> <td style="text-align: center;">TCC</td> <td style="text-align: center;">10-16</td> </tr> </tbody> </table>	Solenoid	Resistance (ohms)	SSA	20-30	SSB	20-30	TCC	10-16	
Solenoid	Resistance (ohms)									
SSA	20-30									
SSB	20-30									
TCC	10-16									
	<ul style="list-style-type: none"> Are the resistances correct? 	<p>Yes GO to A9.</p> <p>No INSTALL a new solenoid.</p>								

(Continued)

DIAGNOSIS AND TESTING (Continued)

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

Test Step		Result / Action to Take								
A9	CHECK THE SOLENOID FOR A SHORT TO GROUND									
<ul style="list-style-type: none"> Check for continuity between the engine ground and the appropriate solenoid pin with an ohmmeter or other low current tester (less than 200 milliamps). Connection should show infinite resistance (no continuity). 										
<table border="1"> <thead> <tr> <th>Solenoid</th> <th>Terminal</th> </tr> </thead> <tbody> <tr> <td>SSA</td> <td>+/-</td> </tr> <tr> <td>SSB</td> <td>+/-</td> </tr> <tr> <td>TCC</td> <td>+/-</td> </tr> </tbody> </table>		Solenoid	Terminal	SSA	+/-	SSB	+/-	TCC	+/-	
Solenoid	Terminal									
SSA	+/-									
SSB	+/-									
TCC	+/-									
 <p>AD1393-A</p>										
<ul style="list-style-type: none"> Is there continuity? 										
 <p>AD1394-A</p>										
		<p>Yes INSTALL a new solenoid.</p> <p>No REFER to Diagnosis By Symptom in this section for diagnosis of shift or torque converter concerns.</p>								

PINPOINT TEST B: TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR

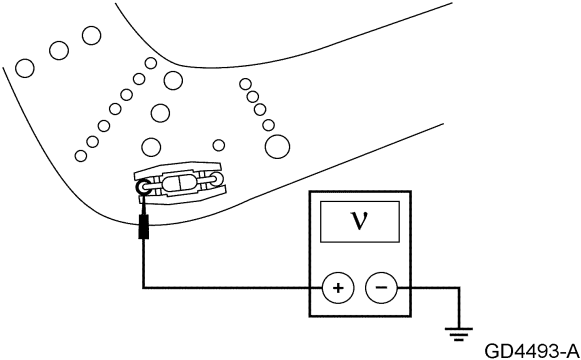
NOTE: Refer to the Transmission Connector Layouts preceding these pinpoint tests.

Test Step		Result / Action to Take
B1	ELECTRONIC DIAGNOSTICS	
<ul style="list-style-type: none"> Check to make sure the transmission harness connector is fully seated, pins are fully engaged in connector and in good condition before proceeding. Connect the scan tool. Key in ON position. Select Diagnostic Data Link. Select PCM. Select PID/Data Monitor and Record. Enter the following diagnostic mode on the scan tool: PIDs; TFT, TFTV. Does the vehicle enter PID/Data Monitor and Record? 		<p>Yes GO to B2.</p> <p>No REPEAT procedure to enter PID. If vehicle did not enter PID, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM.</p>

(Continued)

DIAGNOSIS AND TESTING (Continued)

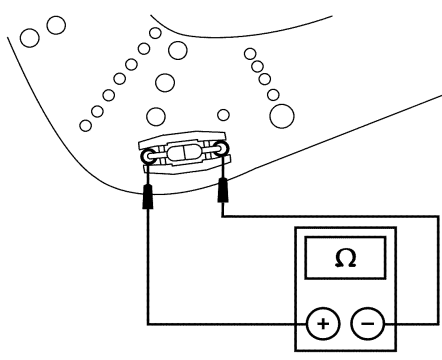
PINPOINT TEST B: TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR (Continued)

Test Step		Result / Action to Take																														
B2	<p>WARM-UP/COOL-DOWN CYCLE</p> <ul style="list-style-type: none"> 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? 	<p>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.</p> <p>If the TFT or TFTV drop in and out of range, INSPECT for intermittent concern in the internal/external harness, sensor or connector.</p> <p>No GO to B3.</p>																														
B3	<p>ELECTRICAL SIGNAL CHECK</p> <ul style="list-style-type: none"> Key in ON position. Remove transmission fluid pan. Visually inspect the molded lead frame and connectors for damage. Measure the voltage with the positive lead to the positive TFT at the sensor pin and the negative lead to a good ground.  <p>GD4493-A</p> <ul style="list-style-type: none"> Is the voltage present? 		<p>Yes GO to B4.</p> <p>No CHECK for open or short circuit in vehicle harness, internal harness or a PCM concern.</p>																													
B4	<p>CHECK RESISTANCE OF TFT SENSOR</p> <ul style="list-style-type: none"> Disconnect: Transmission Harness. Measure the resistance between the positive TFT and negative TFT pins at the transmission connector, using the following: <p>Transmission Fluid Temperature</p> <table border="1"> <thead> <tr> <th>°C</th> <th>°F</th> <th>Resistance (Ohms)</th> </tr> </thead> <tbody> <tr> <td>-40 to -20</td> <td>-40 to -4</td> <td>967K - 284K</td> </tr> <tr> <td>-19 to -1</td> <td>-3 - 31</td> <td>284K - 100K</td> </tr> <tr> <td>0 - 20</td> <td>32 - 68</td> <td>100K - 37K</td> </tr> <tr> <td>21 - 40</td> <td>69 - 104</td> <td>37K - 16K</td> </tr> <tr> <td>41 - 70</td> <td>105 - 158</td> <td>16K - 5K</td> </tr> <tr> <td>71 - 90</td> <td>159 - 194</td> <td>5K - 2.7K</td> </tr> <tr> <td>91 - 110</td> <td>195 - 230</td> <td>2.7K - 1.5K</td> </tr> <tr> <td>111 - 130</td> <td>231 - 266</td> <td>1.5K - 0.8K</td> </tr> <tr> <td>131 - 150</td> <td>267 - 302</td> <td>0.8K - 0.54K</td> </tr> </tbody> </table>	°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
°C	°F	Resistance (Ohms)																														
-40 to -20	-40 to -4	967K - 284K																														
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41 - 70	105 - 158	16K - 5K																														
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DIAGNOSIS AND TESTING (Continued)


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

Test Step		Result / Action to Take
B4	CHECK RESISTANCE OF TFT SENSOR (Continued)	
 <p>AD1396-A</p> <ul style="list-style-type: none"> • Is the resistance correct? 		<p>Yes REFER to Diagnosis By Symptom in this section to diagnose an overheating concern.</p> <p>No INSTALL a new internal harness (sensor is part of harness).</p>

PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR

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

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

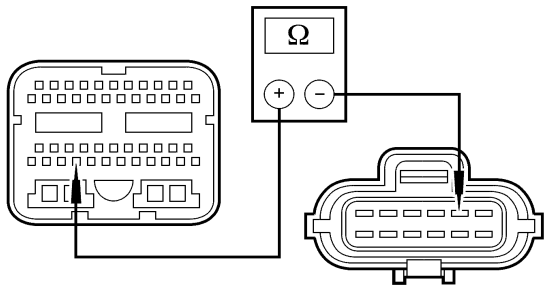
Test Step		Result / Action to Take
C1	VERIFY DIAGNOSTIC TROUBLE CODES	
<ul style="list-style-type: none"> • Select PARK. • Key in OFF position. • NOTE: DTC codes P0705 and P0708 cannot be set by an incorrectly adjusted digital TR sensor. • Carry out on-board diagnostic test. • Are only DTC codes P0705, P0708 present? 		<p>Yes GO to C4.</p> <p>No GO to C2.</p>
C2	VERIFY DIGITAL TRANSMISSION RANGE SENSOR ALIGNMENT	
<ul style="list-style-type: none"> • Check to make sure the digital TR sensor harness connector is fully seated, pins 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 adjustment OK? 		<p>Yes GO to C3.</p> <p>No ADJUST the digital TR sensor. PLACE transmission range selector lever in P and CLEAR DTCs. REPEAT OBD Tests. GO to C3.</p>
C3	VERIFY SHIFT CABLE/LINKAGE ADJUSTMENT	
<ul style="list-style-type: none"> • Place the manual lever in the OVERDRIVE position. • Select DRIVE. • Reconnect the shift cable/linkage. • Verify that the shift cable/linkage is adjusted OK. • Is the shift cable/linkage adjusted OK? 		<p>Yes GO to C4.</p> <p>No ADJUST the shift cable/linkage. Refer to Selector Lever Cable Adjustment in this section.</p>
C4	CHECK ELECTRICAL SIGNAL OPERATION	
<ul style="list-style-type: none"> • Select PARK. • Disconnect: Digital TR Sensor. <p> CAUTION: Do not pry on connector. This will damage the connector and result in a transmission concern. Press the button and pull out on the digital TR harness connector.</p> <ul style="list-style-type: none"> • Inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Are the connector, pins and harness damaged? 		<p>Yes REPAIR as required. CLEAR DTCs and REPEAT OBD Tests.</p> <p>No If diagnosing a DTC, GO to C5. If diagnosing a starting concern or a reversing lamp concern, GO to C10.</p>

(Continued)

DIAGNOSIS AND TESTING (Continued)

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

Test Step		Result / Action to Take
C5	<p>CHECK ELECTRICAL SYSTEM OPERATION (DIGITAL TR AND PCM)</p> <ul style="list-style-type: none"> • Key in OFF position. • Connect the scan tool. • Connect: Digital TR Sensor. • Key in ON position. • Enter the following diagnostic mode on the scan tool: TR PIDS TR, TR_D, TR_V. • Move transmission range selector lever into each gear and stop. • Observe any of the following PIDs, TR and TR_D, TR_V (vehicle dependent) while wiggling harness, tapping on sensor or driving the vehicle. Use PIDs TR and TR_D for DTCs P0705, P1704 and P1705. Use PIDs TR and TR_V for DTC P0708. • Compare the PIDs to the Digital Transmission Range (TR) Sensor Diagnosis Chart. • Do the PIDs TR, 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 or the vehicle driven? 	<p>Yes The problem is not in the digital TR sensor system. REFER to Diagnosis By Symptom in this section for further diagnosis.</p> <p>No If TR_D changes when wiggling harness, tapping on the sensor or driving the vehicle, the problem may be intermittent. GO to C6.</p>
C6	<ul style="list-style-type: none"> • Disconnect: Digital TR Sensor. <p>⚠ CAUTION: Do not pry on the connector. This will damage the connector and result in a transmission concern.</p> <ul style="list-style-type: none"> • 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? 	<p>Yes Concern is not in the digital TR sensor, GO to C7.</p> <p>No INSTALL a new digital TR sensor. CLEAR DTCs and REPEAT OBD Tests.</p>
C7	<p>CHECK THE PCM HARNESS CIRCUITS FOR OPENS</p> <ul style="list-style-type: none"> • Key in OFF position. • Disconnect: Powertrain Control Module (PCM). • Inspect for damaged or pushed-out pins, corrosion or loose wires. • Disconnect: Digital TR Sensor. <p>⚠ CAUTION: Do not pry on the connector. This will damage the connector and result in a transmission concern.</p> <p>Disconnect the digital TR sensor connector.</p> <ul style="list-style-type: none"> • Measure the resistance between PCM test pin 43 and signal return circuit pin 2 at digital TR sensor connector harness side. 	

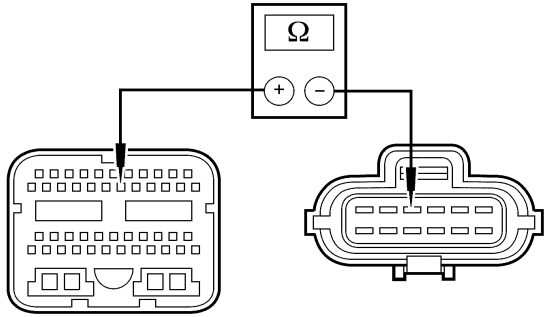
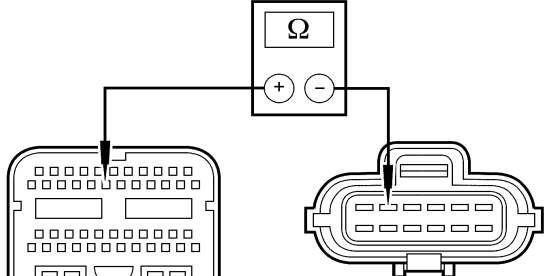
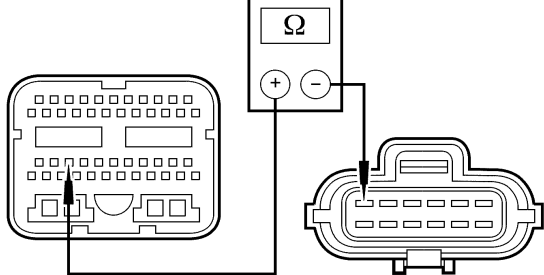


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DIAGNOSIS AND TESTING (Continued)

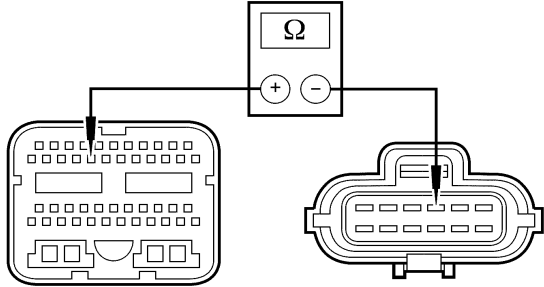
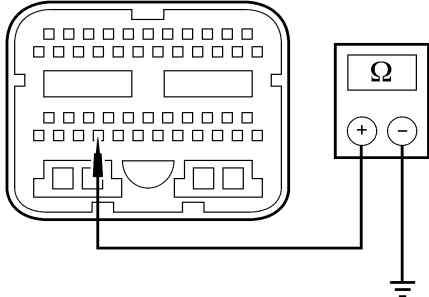
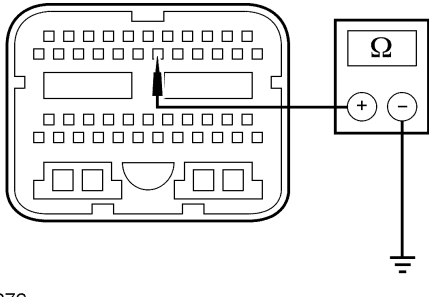
PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR (Continued)

	Test Step	Result / Action to Take
<p>C7</p>	<p>CHECK THE PCM HARNESS CIRCUITS FOR OPENS (Continued)</p>	
	<ul style="list-style-type: none"> Measure the resistance between PCM test pin 17 and TR1 circuit pin 4 at digital TR sensor connector harness side.  <p>A0089871</p>	
	<ul style="list-style-type: none"> Measure the resistance between PCM test pin 18 and TR2 circuit pin 5 at digital TR sensor connector harness side.  <p>A0089872</p>	
	<ul style="list-style-type: none"> Measure the resistance between PCM test pin 32 and TR4 circuit pin 6 at digital TR sensor connector harness side.  <p>A0089873</p>	

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DIAGNOSIS AND TESTING (Continued)

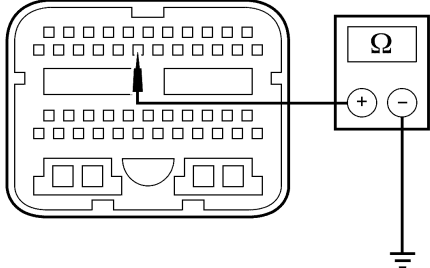
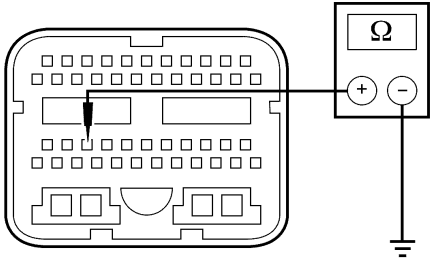
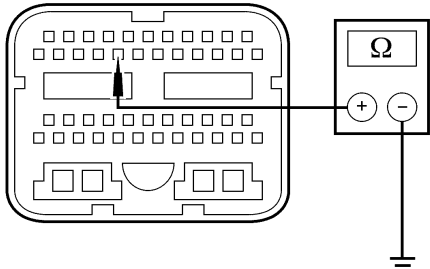
PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR (Continued)

	Test Step	Result / Action to Take
<p>C7</p>	<p>CHECK THE PCM HARNESS CIRCUITS FOR OPENS (Continued)</p>	
	<ul style="list-style-type: none"> Measure the resistance between PCM test pin 19 and TR3A circuit pin 3 at digital TR sensor connector harness side.  <p>A0089874</p> <ul style="list-style-type: none"> Are all resistances less than 5 ohms? 	<p>Yes GO to C8.</p> <p>No REPAIR open circuit(s). RECONNECT all components. CLEAR DTCs. REPEAT OBD Tests.</p>
<p>C8</p>	<p>CHECK THE PCM HARNESS CIRCUITS FOR A SHORT TO GROUND OR POWER</p>	
	<ul style="list-style-type: none"> Measure the resistance between PCM test pin 43 and chassis ground.  <p>A0089875</p> <ul style="list-style-type: none"> Measure the resistance between PCM test pin 17 and chassis ground.  <p>A0089876</p>	

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DIAGNOSIS AND TESTING (Continued)

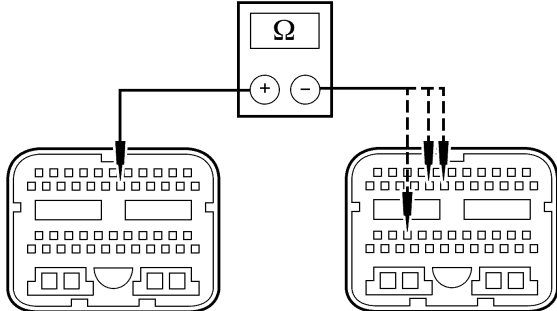
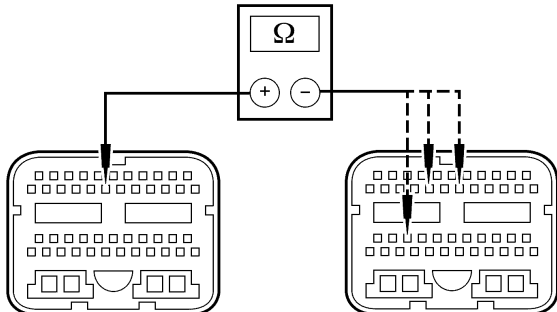
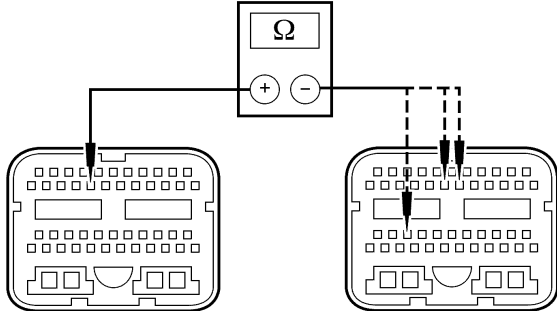
PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR (Continued)

	Test Step	Result / Action to Take
<p>C8</p>	<p>CHECK THE PCM HARNESS CIRCUITS FOR A SHORT TO GROUND OR POWER (Continued)</p>	
	<ul style="list-style-type: none"> Measure the resistance between PCM test pin 18 and chassis ground.  <p>A0089877</p>	
	<ul style="list-style-type: none"> Measure the resistance between PCM test pin 32 and chassis ground.  <p>A0089878</p>	
	<ul style="list-style-type: none"> Measure the resistance between PCM test pin 19 and chassis ground.  <p>A0089879</p>	
	<ul style="list-style-type: none"> Are all resistances greater than 10,000 ohms? 	<p>Yes GO to C9.</p> <p>No REPAIR short circuit(s). RECONNECT all components. CLEAR DTCs. REPEAT OBD Tests.</p>

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DIAGNOSIS AND TESTING (Continued)

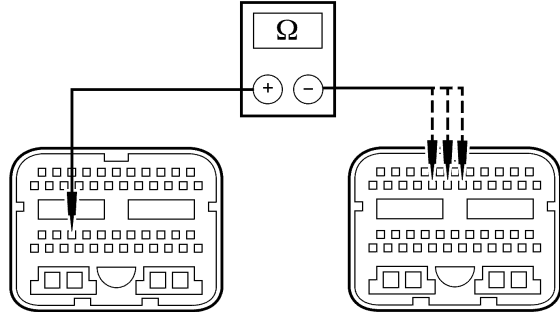
PINPOINT TEST C: DIGITAL TRANSMISSION RANGE (TR) SENSOR (Continued)

	Test Step	Result / Action to Take
C9	<p>CHECK FOR A SHORT BETWEEN THE TR/PCM INPUT SIGNAL CIRCUITS</p>	
	<ul style="list-style-type: none"> Measure the resistance between PCM test pin 17 and PCM test pins 18, 19 and 32.  <p>A0089880</p>	
	<ul style="list-style-type: none"> Measure the resistance between PCM test pin 18 and PCM test pins 17, 19 and 32.  <p>A0089881</p>	
	<ul style="list-style-type: none"> Measure the resistance between PCM test pin 19 and PCM test pins 17, 18 and 32.  <p>A0089883</p>	

(Continued)

DIAGNOSIS AND TESTING (Continued)

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

Test Step		Result / Action to Take
C9	CHECK FOR A SHORT BETWEEN THE TR/PCM INPUT SIGNAL CIRCUITS (Continued)	
<ul style="list-style-type: none"> Measure the resistance between PCM test pin 32 and PCM test pins 17, 18 and 19.  <p>A0089882</p> <ul style="list-style-type: none"> Are all the resistances greater than 10,000 ohms? 		<p>Yes INSTALL a new PCM. REFER to Section 303-00. RECONNECT all components. CLEAR DTCs. REPEAT OBD Tests.</p> <p>No REPAIR shorts on circuits having less than 10,000 ohms between other TR/PCM input signal circuits. RECONNECT all components. CLEAR DTCs. REPEAT OBD Tests.</p>
C10	CHECK THE NON-PCM INTERNAL CIRCUITS OF SENSOR	
<ul style="list-style-type: none"> Connect: TRS-E Cable to Transmission Tester. 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? 		<p>Yes Concern is not in the digital TR sensor. For starting system concerns, REFER to Section 303-00. For reversing lamp concerns, REFER to Section 417-01. For optional circuits, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis.</p> <p>No INSTALL a new digital TR sensor. CLEAR DTCs. REPEAT OBD Tests.</p>

PINPOINT TEST D: ELECTRICAL PRESSURE CONTROL (EPC) SOLENOID

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

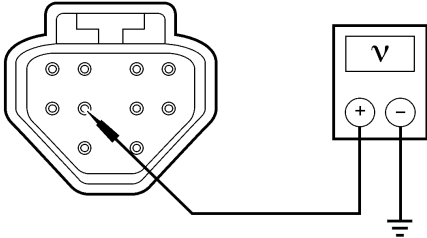
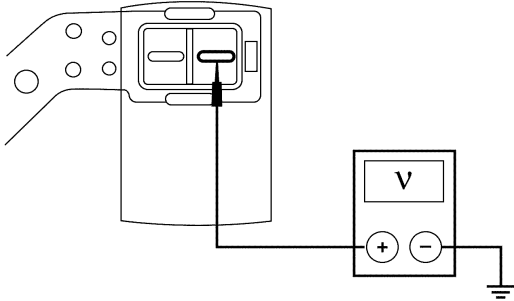
NOTE: Read and record all DTCs. All Digital TR Sensor and VSS DTCs must be repaired before entering Output State Control (OSC).

Test Step		Result / Action to Take
D1	ELECTRONIC DIAGNOSTICS	
<ul style="list-style-type: none"> Key in OFF position. Select PARK. Check to make sure the transmission harness connector is fully seated, pins are fully engaged in the connector and in good condition before proceeding. Connect the scan tool. Key in ON position. Enter the following diagnostic mode on the scan tool: Diagnostic Data Link. Enter the following diagnostic mode on the scan tool: PCM. Enter the following diagnostic mode on the scan tool: Active Command Modes. Enter the following diagnostic mode on the scan tool: Output State Control (OSC). Enter the following diagnostic mode on the scan tool: Trans-Bench Mode. Does the vehicle enter the Trans-Bench Mode? 		<p>Yes GO to D2.</p> <p>No REPEAT procedure to ENTER Trans-Bench Mode. If vehicle did not enter OSC, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM.</p>
D2	SOLENOID FUNCTIONAL TEST	
<ul style="list-style-type: none"> Install 2,060 kPa (300 psi) pressure gauge into EPC tap. Monitor pressure gauge. Enter the following diagnostic mode on the scan tool: Parameter; EPC. Select value - 15, 30, 45, 60, 70 or 90 psi. 		

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DIAGNOSIS AND TESTING (Continued)

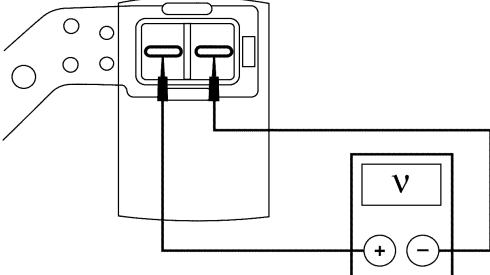
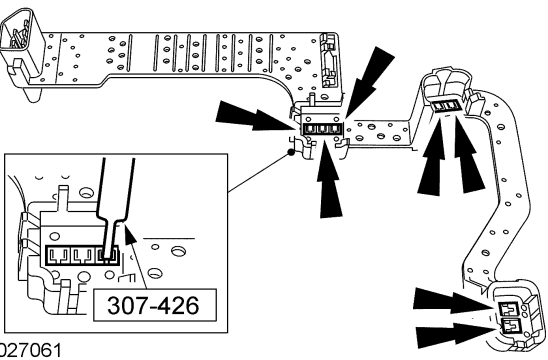
PINPOINT TEST D: ELECTRICAL PRESSURE CONTROL (EPC) SOLENOID (Continued)

Test Step		Result / Action to Take
D2	<p>SOLENOID FUNCTIONAL TEST (Continued)</p> <ul style="list-style-type: none"> • Press "SEND". • Select another value "0-90 psi". • Press "SEND". • Enter the following diagnostic mode on the scan tool: XXX. • Press "SEND". • Does the pressure reading match the commanded pressure? 	<p>Yes CLEAR DTCs. REPEAT OBD Tests.</p> <p>No GO to D3.</p>
D3	<p>CHECK FOR VOLTAGE</p> <ul style="list-style-type: none"> • Disconnect: Transmission Harness Connector. • Key in ON position. • Measure the voltage on pin 6 at the transmission harness connector to chassis ground.  <p>A0089885</p> <ul style="list-style-type: none"> • Is the voltage less than 5 volts? 	<p>Yes GO to D4.</p> <p>No REPAIR the circuit.</p>
D4	<p>CHECK FOR BATTERY VOLTAGE</p> <ul style="list-style-type: none"> • Remove transmission fluid pan. • Visually inspect the lead frame connectors for damage. • Key in ON position. • Measure the voltage with positive lead to VPWR solenoid pin and negative lead to a good ground.  <p>GD4494-A</p> <ul style="list-style-type: none"> • Is voltage greater than 10 volts? 	<p>Yes GO to D5.</p> <p>No REPAIR the circuit. CLEAR the DTCs. REPEAT the OBD Tests.</p>

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DIAGNOSIS AND TESTING (Continued)

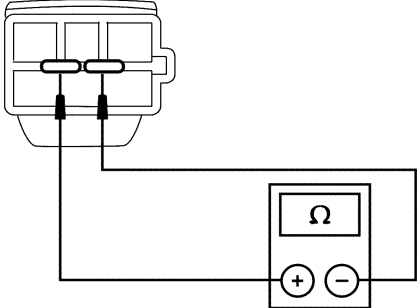
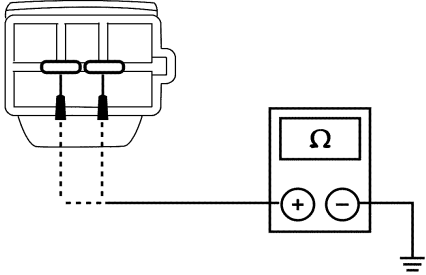
PINPOINT TEST D: ELECTRICAL PRESSURE CONTROL (EPC) SOLENOID (Continued)

Test Step		Result / Action to Take
D5	<p>ELECTRICAL SIGNAL CHECK</p> <ul style="list-style-type: none"> Measure the voltage with positive lead connected to VPWR solenoid pin and connect negative lead to the signal pin of the EPC solenoid.  <p style="text-align: center;">GD4495-A</p> <ul style="list-style-type: none"> Turn the solenoids ON and OFF, while monitoring the voltage reading, solenoid state on the diagnostic tool (ON and OFF), listen for the solenoid to activate (click). Enter the following diagnostic mode on the scan tool: Trans-Bench Mode. Enter the following diagnostic mode on the scan tool: Parameter EPC. Select a value "0-90 psi". Press "SEND". Select another value "0-90 psi". Press "SEND". Enter the following diagnostic mode on the scan tool: XXX. Press "SEND". Does the voltage and solenoid state change? 	<p>Yes GO to D6.</p> <p>No CHECK for open or short circuit in harness or PCM.</p>
D6	<p>CHECK LEAD FRAME SOLENOID CONNECTIONS</p> <ul style="list-style-type: none"> Key in OFF position. Disconnect: Caption Lead Frame. Inspect the lead frame for damage, pushed out pins, corrosion, etc. Using the special tool, check each of the lead frame connector pins.  <p style="text-align: center;">A0027061</p> <ul style="list-style-type: none"> Does the special tool go through the lead frame connector pins? 	<p>Yes INSTALL a new lead frame. GO to D7.</p> <p>No GO to D7.</p>

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST D: ELECTRICAL PRESSURE CONTROL (EPC) SOLENOID (Continued)

Test Step		Result / Action to Take
D7	<p>CHECK SOLENOID RESISTANCE AT SOLENOID</p> <ul style="list-style-type: none"> Measure the resistance of the EPC solenoid.  <p style="text-align: right;">AD1399-A</p> <ul style="list-style-type: none"> Is the resistance between 2.48 and 5.66 ohms? 	<p>Yes GO to D8.</p> <p>No INSTALL a new solenoid. CLEAR the DTCs. REPEAT the OBD Tests.</p>
D8	<p>CHECK SOLENOID FOR SHORT TO GROUND</p> <ul style="list-style-type: none"> Check for continuity between engine ground and the EPC solenoid terminals with ohmmeter or other low current tester (less than 200 milliamps). Connection should show infinite resistance (no continuity).  <p style="text-align: right;">AD1400-A</p> <ul style="list-style-type: none"> Is there continuity? 	<p>Yes INSTALL a new solenoid. CLEAR the DTCs. REPEAT the OBD Tests.</p> <p>No REFER to Diagnosis By Symptom in this section for diagnosis of pressure concerns.</p>

PINPOINT TEST E: OUTPUT SHAFT SPEED (OSS) SENSORS

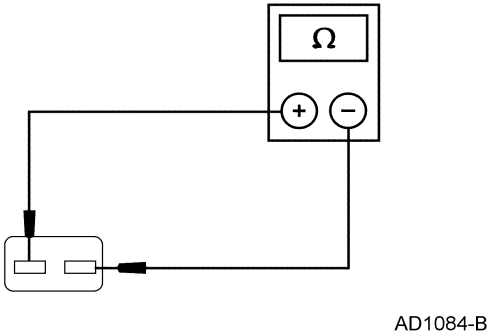
NOTE: Refer to the Output Shaft Speed (OSS) Sensor Harness Connector illustration preceding these pinpoint tests.

Test Step		Result / Action to Take
E1	<p>ELECTRONIC DIAGNOSTICS</p> <ul style="list-style-type: none"> Check to make sure the transmission harness connector is fully seated, pins are fully engaged in connector and in good condition before proceeding. Connect the scan tool. Key in ON position. Enter the following diagnostic mode on the scan tool: Diagnostic Data Link. Enter the following diagnostic mode on the scan tool: PCM. Select PID/Data Monitor and Record. Select the PID OSS. Does vehicle enter PID/Data Monitor and Record? 	<p>Yes GO to E2.</p> <p>No REPEAT procedure to ENTER PID. If vehicle did not enter PID, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM.</p>

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST E: OUTPUT SHAFT SPEED (OSS) SENSORS (Continued)

Test Step		Result / Action to Take
E2	DRIVE CYCLE TEST	<p>Yes 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.</p> <p>No If the 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.</p> <p>If the sensor signal is erratic, INSPECT for intermittent concern in the internal/external harness, sensor or connector.</p> <p>If the sensor signal is steady, GO to E3.</p>
	<ul style="list-style-type: none"> While monitoring the OSS Speed PID, drive the vehicle so that the transmission upshifts and downshifts through all gears. Does the OSS Speed PID increase and decrease with engine and vehicle speed? 	
E3	CHECK THE RESISTANCE OF THE OSS SENSOR	<p>Yes REFER to Diagnosis By Symptom in this section for concern diagnosis.</p> <p>No INSTALL a new OSS sensor.</p>
	<ul style="list-style-type: none"> Disconnect the vehicle harness connector from the OSS sensor. Measure the resistance between the OSS sensor pins. <div style="text-align: center;">  <p>AD1084-B</p> </div> <ul style="list-style-type: none"> Record the resistance. Is the resistance within 400-500 ohms at 77°F (25°C)? 	

PINPOINT TEST F: TURBINE SHAFT SPEED (TSS) SENSORS

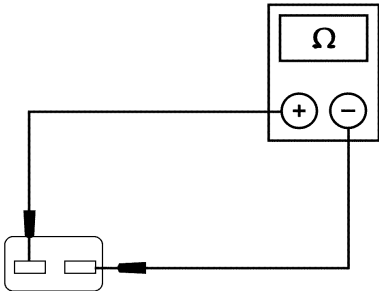
NOTE: Refer to the Turbine Shaft Speed (TSS) Sensor Harness Connector illustration preceding these pinpoint tests.

Test Step		Result / Action to Take
F1	ELECTRONIC DIAGNOSTICS	<p>Yes GO to F2.</p> <p>No REPEAT procedure to ENTER PID. If vehicle did not enter PID, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM.</p>
	<ul style="list-style-type: none"> Check to make sure the transmission harness connector is fully seated, pins are fully engaged in connector and in good condition before proceeding. Connect the scan tool. Key in ON position. Enter the following diagnostic mode on the scan tool: Diagnostic Data Link. Enter the following diagnostic mode on the scan tool: PCM. Select PID/Data Monitor and Record. Select the PID TSS. Does vehicle enter PID/Data Monitor and Record? 	

(Continued)

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST F: TURBINE SHAFT SPEED (TSS) SENSORS (Continued)

Test Step		Result / Action to Take
F2	DRIVE CYCLE TEST	<p>Yes 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.</p> <p>No If the TSS 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.</p> <p>If the sensor signal is erratic, INSPECT for intermittent concern in the internal/external harness, sensor or connector.</p> <p>If the sensor signal is steady, GO to F3.</p>
	<ul style="list-style-type: none"> While monitoring the TSS Speed PID, drive the vehicle so that the transmission upshifts and downshifts through all gears. Does the TSS Speed PID increase and decrease with engine and vehicle speed? 	
F3	CHECK THE RESISTANCE OF THE TSS SENSOR	<p>Yes REFER to Diagnosis By Symptom in this section for concern diagnosis.</p> <p>No INSTALL a new TSS sensor.</p>
	<ul style="list-style-type: none"> Disconnect the vehicle harness connector from the TSS sensor. Measure the resistance between the TSS sensor pins. <div style="text-align: center;">  <p>AD1084-B</p> </div> <ul style="list-style-type: none"> Record the resistance. Is the resistance within 480-590 ohms? 	

PINPOINT TEST G: SOLENOID MECHANICAL FAILURE

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

Test Step		Result / Action to Take
G1	ELECTRONIC DIAGNOSIS	<p>Yes REPAIR the other DTCs first. CLEAR DTCs and CARRY OUT Transmission Drive Cycle Test. REPEAT Quick Test.</p> <p>No INSTALL a new solenoid and or body. REFER to the Diagnostic Trouble Code Charts in this section for code description. GO to G2.</p>
	<ul style="list-style-type: none"> Connect the scan tool. Carry out KOEO Test. If any of the following DTCs are present, continue with this test: P1714, P1715, P1740. Are other DTCs present for TFT or shift solenoids? 	
G2	TRANSMISSION DRIVE CYCLE TEST	<p>Yes GO to G3.</p> <p>No REFER to Diagnosis By Symptom in this section to diagnose shift concerns.</p>
	<ul style="list-style-type: none"> Carry out transmission drive cycle test. Carry out on-board diagnostic test. Does the vehicle upshift and downshift OK? 	

(Continued)

DIAGNOSIS AND TESTING (Continued)**PINPOINT TEST G: SOLENOID MECHANICAL FAILURE (Continued)**

Test Step		Result / Action to Take
G3	RETRIEVE DTCs	
	<ul style="list-style-type: none"> • Connect the scan tool. • Carry out KOEO Test until continuous DTCs have been displayed. • Are DTCs P1714, P1715, P1740 still present? 	<p>Yes INSTALL a new PCM. REFER to Section 303-00. ROAD TEST and REPEAT Quick Test.</p> <p>No Testing completed. If a concern still exists, REFER to Diagnosis By Symptom in this section for concern diagnosis.</p>