Transmission Control Systems: Testing and Inspection
Pinpoint Tests

Pinpoint Test Notes
Pinpoint Tests

NOTE: If equipped, turn the Power Take-Off **(PTO)** unit off for correct test results. On-Board Diagnostic is not accessible when the PTO unit is in operation. SSB is on when the PTO is in operation.

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 a new connector as required.

Before Pinpoint Tests
Before Pinpoint Tests

NOTE: Prior to entering pinpoint tests, cheek the powertrain control module **(PCM)** wiring harness for correct connections, bent or broken pins, corrosion, loose wires, correct routing, correct seals and their condition. Check the PCM, sensors and actuators for damage.

NOTE: If a concern still exists after electrical diagnosis has been carried out, refer to Diagnosis By Symptom. See: Diagnosis By Symptom

If DTCs appear while carrying out the on-board diagnostics, refer to the Diagnostic Trouble Code Chart for the appropriate procedure. Prior to entering pinpoint tests, refer to any TSBs for transmission concerns. See:

Shift Solenoids Pre-Diagnosis
Shift Solenoids Pre-Diagnosis

Use the following shift solenoid operation information when carrying out Pinpoint Test A. See: Test A: Shift Solenoids

Solenoid Operation Chart

Transmission Range Selector Lever Position	PCM Commanded Gear	SSA	SSB	TCC	CCS
P/R/N	1	ON	OFF	a	a
(D)	1	ON	OFF	a	OFF
(D)	2	ON	ON	a	OFF
(D)	3	OFF	ON	a	OFF
(D)	4	OFF	OFF	a	OFF
(D) Cancel	First Through Third Gear Only, SSA, SSB, TCC, Same as OVERDRIVE, CCS Always On.				
MANUAL 2	2	a	a	a	ON
MANUAL 1	2	OFF	OFF	OFF	ON
MANUAL 1	1	ON	OFF	OFF	ON

a Powertrain control module-controlled.

Shift Speed Chart
Shift Speed Application Charts

NOTE: All gasoline applications have new adaptive shift strategies. Whenever the vehicle's battery has been disconnected for any type of service or repairs, the strategy parameters that are stored in the Keep Alive Memory **(KAM)** will be lost. The strategy will start to relearn once the battery is reconnected and the vehicle is driven. This is a temporary condition and will return to normal operating condition once the Powertrain Control Module **(PCM)** relearns all the parameters from the driving conditions. There is no time frame set for this process. If this concern is present during downshifts or converter clutch apply, it is not the shift strategy and will require diagnosis.

The customer needs to be notified that they may experience slightly different upshifts (either soft or firm) and that this condition is temporary and will eventually return to normal operating condition.

Applications Shift Speeds-Approximate* Km/h (MPH) (F-250, F-35O, Excursion with 5.4L Over 8500 GVW Rating)

Throttle Position	Range	Shift	Vehicle Speed [a] Axle Ratio 3.73	Vehicle Speed [a] Axle Ratio 4.10
Closed Throttle	(D) , D	4-3	64-68 (40-42)	58-61 (36-38)
	(D) , D	3-2	26-29 (16-18)	24-27 (15-17)
	(D) , D	2-1	14-18 (9-11)	13-16 (8-10)
Light Throttle	(D) , D	1-2	16-19 (10-12)	14-18 (9-11)
TP Voltage	(D) , D	2-3	27-31 (17-19)	26-29 (9-11)
1.25 Volts	(D) , D	3-4	66-69 (41-43)	60-63 (37-39)
	(D) , D	4-3	64-68 (40-42)	58-61 (36-38)
	(D) , D	3-2	26-29 (16-18)	24-27 (15-17)
	(D) , D	2-1	14-18 (9-11)	13-16 (8-10)
Wide Open Throttle	(D) , D	1-2	69-72 (43-45)	63-66 (39-41)
	(D) , D	2-3	114-117 (71-73)	103-106 (64-66)
	(D) , D	4-3	163-166 (101-103)	148-151 (92-94)
	(D) , D	3-2	105-108 (65-67)	97-100 (60-62)
	(D) , D	2-1	60-63 (37-39)	55-58 (34-36)

a Nominal shift speed at sea level is shown. Actual shift speed will depend on tire brand, size and axle ratio.

Applications Shift Speeds-Approximate* Km/h (MPH) (F-250, F-350, F-450 Excursion, Series Super Duty with 6.8L)

Throttle Position	Range	Shift	Vehicle Speed [a] Axle Ratio 3.73	Vehicle Speed [a] Axle Ratio 4.30	Vehicle Speed [a] Axle Ratio 4.88
Closed Throttle	(D) , D	4-3	53-55 (33-34)	47-48 (29-30)	40-42 (25-26)
	(D) , D	3-2	29-30 (18-19)	26-27 (16-17)	23-24 (14-15)
	(D) , D	2-1	14-16 (9-10)	13-14 (8-9)	11-14 (7-8)
Light Throttle	(D) , D	1-2	21-23 (13-14)	18-19 (11-12)	16-18 (10-11)
TP Voltage	(D) , D	2-3	37-39 (23-24)	31-32 (19-20)	27-29 (17-18)
1.25 Volts	(D) , D	3-4	55-56 (34-35)	48-50 (30-31)	42-43 (26-27)
	(D) , D	4-3	53-55 (33-34)	47-48 (29-30)	40-42 (25-26)
	(D) , D	3-2	29-31 (18-19)	26-27 (16-17)	23-24 (14-15)
	(D) , D	2-1	14-16 (9-10)	13-14 (8-9)	11-13 (7-8)
Wide Open	(D) , D	1-2	64-66 (40-41)	56-58 (35-36)	48-50 (30-31)
Throttle	(D) , D	2-3	126-127 (78-79)	108-109 (67-68)	95-97 (59-60)
	(D) , D	3-4	193-196 (120-122)	169-171 (105-106)	148-150 (92-93)
	(D) , D	4-3	185-187 (115-116)	161-163 (100-101)	142-143 (88-89)
	(D) , D	3-2	108-109 (67-68)	93-95 (58-59)	82-84 (51-52)
	(D) , D	2-1	60-61 (37-38)	51-53 (32-33)	45-47 (28-29)

a Nominal shift speed at sea level is shown. Actual shift speed will depend on tire brand, size and axle ratio.

Applications Shift Speeds-Approximate* Km/h (MPH) (F-250, F-350, F450, F550, Super Duty with 7.3L

Throttle Position	Range	Shift	Vehicle Speed [a] Axle Ratio 3.73	4.10	4.30	4.88
Closed Throttle	(D) , D	4-3	66-72 (41-44)	60-65 (37-40)	51-56 (32-34)	45-49 (28-30)
	(D) , D	3-2	27-29 (17-18)	24-26 (15-16)	22-24 (14-15)	20-21 (12-13)
	(D) , D	2-1	13-14 (8-9)	12-13 (7-8)	11-12 (7-8)	10-11 (6-7)
Light Throttle TP Voltage 1.25 Volts	(D) , D	1-2	25-27 (15-17)	22-24 (14-15)	23-25 (14-16)	21-22 (13-14)
	(D) , D	2-3	44-48 (27-30)	40-43 (25-27)	39-42 (24-26)	35-37 (21-23)
	(D) , D	3-4	75-81 (46-50)	67-73 (42-45)	69-75 (43-46)	61-66 (38-41)
	(D) , D	4-3	66-72 (41-44)	60-65 (37-40)	51-56 (23-34)	45-49 (28-30)
	(D) , D	3-2	27-29 (17-18)	24-26 (15-16)	22-24 (14-15)	20-21 (12-13)
	(D) , D	2-1	13-14 (8-9)	12-13 (7-8)	11-12 (7-8)	10-11 (6-7)
Wide Open Throttle	(D) , D	1-2	45-49 (28-30)	41-44 (25-27)	38-41 (24-26)	34-37 (21-23)
	(D) , D	2-3	80-87 (50-54)	72-78 (45-48)	68-74 (42-46)	60-65 (37-40)
	(D) , D	3-4	123-134 (76-83)	111-120 (69-75)	105-113(65-70)	92-100 (57-62)

Throttle Position	Range	Shift	Vehicle Speed [a] Axle Ratio 3.73	4.10	4.30	4.88
	(D) , D	4-3	114-124 (71-77)	103-111 (64-69)	97-105 (60-65)	86-93 (53-57)
	(D) , D	3-2	74-80 (46-49)	66-72 (41-45)	63-68 (39-42)	55-60 (34-37)
	(D) , D	2-1	34-37 (21-23)	31-33 (19-21)	31-33 (19-21)	27-29 (17-18)

a Nominal shift speed at sea level is shown. Actual shift speed will depend on tire brand. size and axle ratio.

Shift Solenoid Failure Mode Chart "Always Off"

Shift Solenoid Failure Mode Chart Always OFF

Failed OFF due to PCM/vehicle wiring concerns; solenoid electrically or hydraulically stuck off.

SSA Always Off

PCM Gear Commanded	Gear Lever Position (D)	2	1
	Actual Gear Obtained		
1	4	2	1
2	3	2	2
3	3	2	2
4	4	2	2

PCM Gear Commanded	Gear Lever Position (D)	2	1
	Actual Gear Obtained		
1	1	2	1
2	1	2	1
3	4	2	2
4	4	2	2

SSB Always Off*

* PTO will not operate.

Shift Solenoid Failure Mode Chart "Always On"

Shift Solenoid Failure Mode Chart Always ON

Failed ON due to PCM/vehicle wiring concerns; solenoid electrically or hydraulically stuck on.

SSA Always On

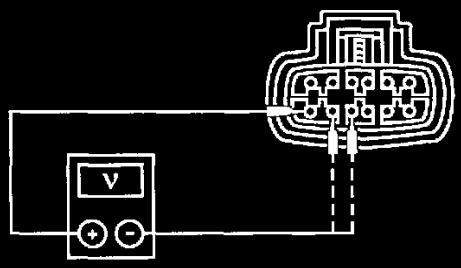
PCM Gear Commanded	Gear Lever Position		
	(D)	2	1
	Actual Gear Obtained		
1	1	2	1
2	2	2	1
3	2	2	1
4	1	2	1

PCM Gear Commanded	Gear Lever Position		
	(D)	2	1
	Actual Gear Obtained		
1	2	2	1
2	2	2	1
3	3	2	2
4	3	2	2

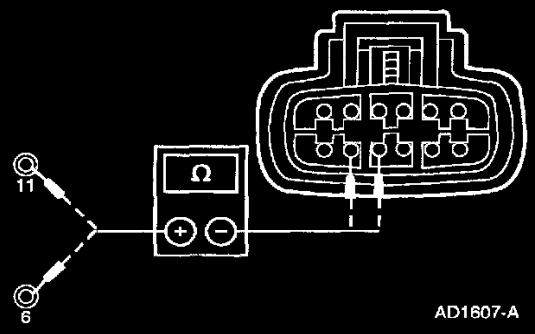
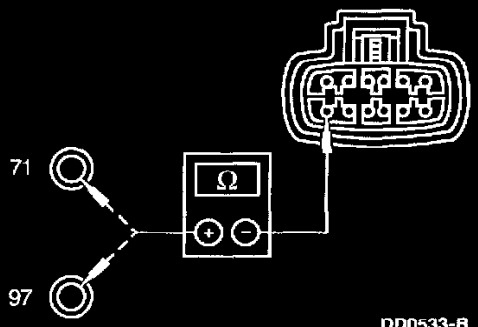
* PTO will always be on.

Test A: Shift Solenoids

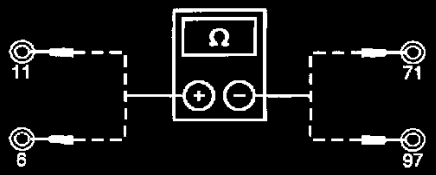
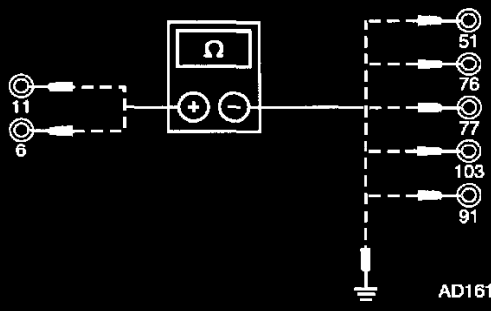
PINPOINT TEST A: SHIFT SOLENOIDS

Test Step		Result / Action to Take
A1	**ELECTRONIC DIAGNOSTICS**	
	• Check to make sure the transmission harness connector is fully seated, terminals are engaged in the connector and in good condition before proceeding. • Connect the diagnostic tool. • Carry out the KOEO Test until continuous DTCs have been displayed. • Enter the Output Test Mode (OTM). • Select the ALL ON mode. Push START to turn outputs on. Push STOP to turn outputs off. • **Does the vehicle enter OTM?**	**Yes** REMAIN in OTM. GO to **A2.** **No** PRESS START. If the vehicle does not enter OTM, REFER to the Powertrain management.
A2	**CHECK THE ELECTRICAL SIGNAL OPERATION**	
	• Disconnect: Transmission Connector. ⚠ **CAUTION: Remove the heat shield, if so equipped, from the transmission before removing the connector. Remove the solenoid body connector by pushing on the center tab and pulling on the harness connector. Do not attempt to pry the tab with a screwdriver. Always reinstall the heat shield when the procedure is completed.** • Use a mirror to inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Measure the voltage between the VPWR pin 1 and the appropriate solenoid signal circuit pins 2 and 3 at the transmission vehicle harness connector.  DD0531-A • Place VOM on the 20-volt scale. • While observing the VOM, press START and STOP to cycle the solenoid output on and off. • **Is the solenoid output voltage changed to approximately battery voltage?**	**Yes** GO to **A5.** **No** GO to **A3.**

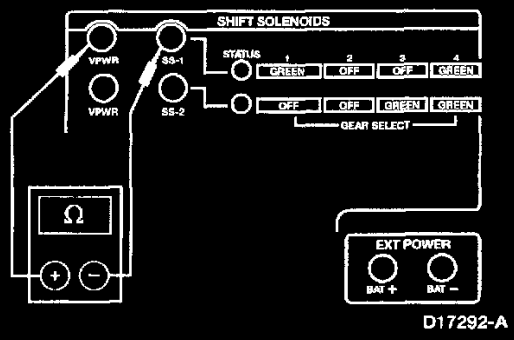
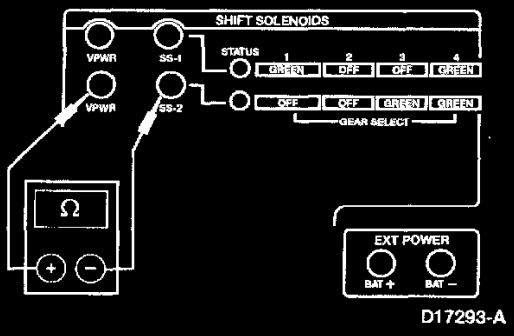
Test A1-A2

Test Step		Result / Action to Take
A3	**CHECK THE CONTINUITY OF THE SOLENOID SIGNAL AND VPWR CIRCUITS** • Key in OFF position. • Disconnect: Powertrain Control Module (PCM). Inspect for damaged or pushed-out pins, corrosion or loose wires. • Install the EEC-V Control System Breakout Box. • Measure the resistance between PCM signal test pins 11 and 6 at the EEC-V Control System Breakout Box and the signal pins 2 and 3 at the transmission harness connector.  AD1607-A • Measure the resistance between the VPWR test pins 71 or 97 at the EEC-V Control System Breakout Box and the VPWR pin 1 at the transmission harness connector.  DD0533-B • **Is each resistance less than 5 ohms?**	**Yes** GO to **A4**. **No** REPAIR the open circuit(s). REMOVE the EEC-V Control System Breakout Box. RECONNECT all of the components. REPEAT the Quick Tests.

Test A3

	Test Step	Result / Action to Take
A4	**CHECK THE SHIFT SOLENOID CIRCUITS FOR SHORTS TO POWER AND GROUND**	
	• Measure the resistance between PCM signal test pins 11 and 6 and the VPWR test pins 71 and 97 at the EEC-V Control System Breakout Box.  AD1609-A • Measure the resistance between PCM signal test pins 11 and 6 and test pins 51, 76, 77, 103 and 91 at the EEC-V Control System Breakout Box and chassis ground.  AD1611-A • **Is each resistance greater than 10,000 ohms?**	**Yes** GO to **A5**. **No** REPAIR the short circuit(s). REMOVE the EEC-V Control System Breakout Box. RECONNECT all of the components. REPEAT the Quick Tests.
A5	**SOLENOID FUNCTIONAL TEST**	
	• Install the Transmission Tester to the transmission connector. • **NOTE:** The LED will turn GREEN when the solenoid activates and turn off when deactivated. The LED will turn RED if an ACTIVATED solenoid is shorted to battery positive. The LED will remain off if an ACTIVATED solenoid is shorted to ground or no continuity (open circuit). Carry out the Solenoid Voltage Test. • **Does the solenoid (LED GREEN) activate?**	**Yes** GO to **A6**. **No** GO to **A7**.
A6	**TRANSMISSION DRIVE TEST**	
	• Connect: Powertrain Control Module (PCM). • Carry out the Dynamic Testing — Engine On. • **Does the vehicle upshift when commanded by the tester?**	**Yes** INSTALL a new PCM. ERASE all codes and CARRY OUT the Transmission Drive Cycle Test. RERUN the Quick Tests. If DTCs are still present, REFER to the Powertrain management **No** GO to **A7**.

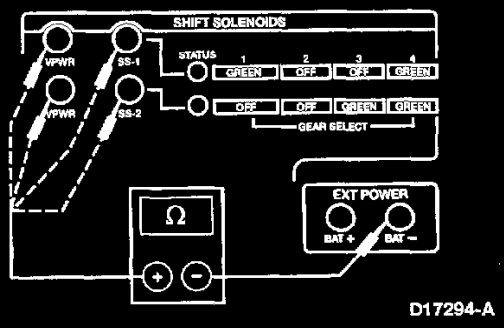
Test A4-A6

Test Step	Result / Action to Take
A7 **CHECK THE RESISTANCE OF THE SOLENOIDS**	
NOTE: Refer to the Transmission Tester for terminal locations. • Place the bench/drive switch to the BENCH mode. • Rotate the gear select switch to the OHMS CHECK position. • Measure the resistance between the SSA/SS-1 jack and the VPWR jack on the transmission tester. This is to test SSA.  D17292-A • Record the resistance. (The resistance should be between 20 and 30 ohms.) • Measure the resistance between the SSB/SS-2 jack and the VPWR jack on the transmission tester. This is to test SSB.  D17293-A • Record the resistance. (The resistance should be between 20 and 30 ohms.) • **Is the resistance for each solenoid between 20 and 30 ohms?**	**Yes** GO to **A8**. **No** INSTALL a new solenoid body assembly. RECORD and ERASE the codes. REPEAT the Quick Tests.
A8 **CHECK THE SOLENOIDS FOR SHORT TO GROUND**	
• Check for continuity between the BAT(-) jack (engine ground) and the appropriate jack with a digital ohmmeter or other low current tester (less than 200 milliamps). Connection should show infinite resistance (no continuity).	**Yes** INSTALL a new solenoid body assembly. RECORD and ERASE the codes. REPEAT the Quick Tests.

Test A7-A8

Test Step		Result / Action to Take
A8	CHECK THE SOLENOIDS FOR SHORT TO GROUND (Continued)	

Solenoid	Tester Jack
SSA/SS1	SSA/SS1/VPWR
SSB/SS2	SSB/SS2/VPWR



- Does the connection show continuity?

No
REFER to Diagnosis By Symptom

Test A8

NOTE: Refer to the Transmission Vehicle Harness Connector illustration.

Test B: Transmission Fluid Temperature (TFT) Sensor

PINPOINT TEST B: TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR

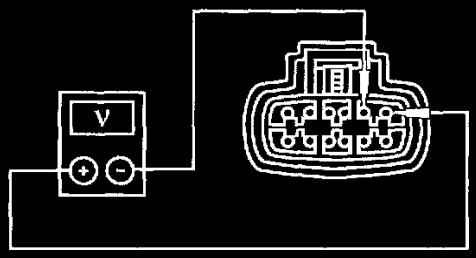
Test Step		Result / Action to Take
B1	ELECTRONIC DIAGNOSTICS	

- Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in the 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?**

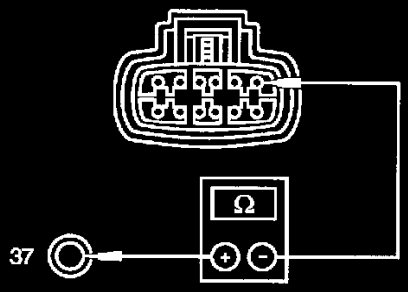
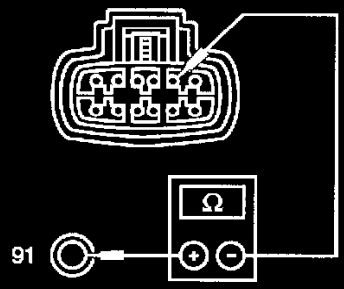
Yes
REMAIN in PID/Data Control. GO to **B2**.

No
REPEAT procedure to enter PID. If vehicle did not enter PID, REFER to the diagnosis of PCM.

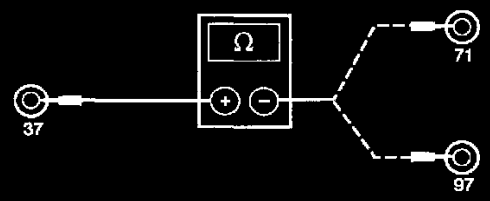
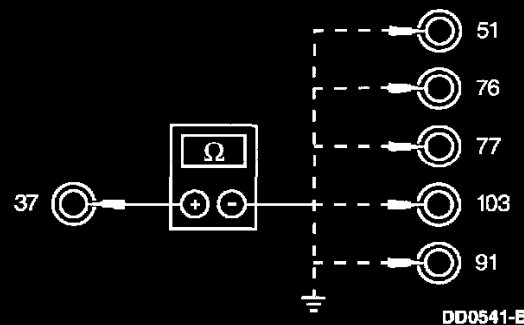
Test B1

Test Step	Result / Action to Take
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 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 CHECK THE ELECTRICAL SIGNAL OPERATION • Key in OFF position. • Disconnect: Transmission Connector. **⚠ CAUTION: Remove the heat shield, if so equipped, from transmission before removing the connector. Remove the solenoid body connector by pushing on the center tab and pulling on the harness connector. Do not attempt to pry the tab with a screwdriver. Always reinstall the heat shield when the procedure is completed.** • Use a mirror to inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Measure the voltage between TFT signal circuit pin 7 and the SIG RTN circuit pin 8 at the transmission harness connector.  DD0537-A • Place the VOM on the 20-volt scale. • Key in ON position. • **Is the voltage between 4.75 and 5.25 volts?**	**Yes** GO to **B7**. **No** GO to **B4**.

Test B2-B3

Test Step		Result / Action to Take
B4	**CHECK THE CONTINUITY OF THE TFT SIGNAL AND SIG RTN CIRCUITS**	
	• Key in OFF position. • Disconnect: Powertrain Control Module (PCM). Inspect for damaged or pushed-out pins, corrosion or loose wires. • Install the EEC-V Control System Breakout Box. • Measure the resistance between the PCM signal test pin 37 at the EEC-V Control System Breakout Box and the signal pin 7 at the transmission harness connector.  DD0538-B • Measure the resistance between the PCM SIG RTN test pin 91 at the EEC-V Control System Breakout Box and the SIG RTN pin 8 at the transmission harness connector.  DD0539-B • **Is each resistance less than 5 ohms?**	**Yes** GO to **B5**. **No** REPAIR the open circuits. REMOVE the EEC-V Control System Breakout Box. RECONNECT all of the components. REPEAT the Quick Tests.

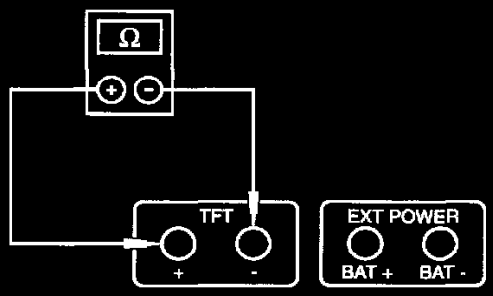
Test B4

	Test Step	Result / Action to Take
B5	**CHECK THE TFT SIGNAL CIRCUIT FOR SHORT TO VPWR AND GROUND**	
	• Measure the resistance between the PCM signal test pin 37 and VPWR test pins 71 and 97 at the EEC-V Control System Breakout Box.  D17682-A • Measure the resistance between the PCM signal test pin 37 and test pins 51, 76, 77, 103, 91 at the EEC-V Control System Breakout Box and chassis ground.  DD0541-B • **Is each resistance greater than 10,000 ohms?**	**Yes** GO to **B6**. **No** REPAIR the short circuit(s). REMOVE the EEC-V Control System Breakout Box. RECONNECT all of the components. REPEAT the Quick Tests.
B6	**CHECK THE RESISTANCE OF THE TFT SENSOR**	
	• Install the Transmission Tester to the transmission connector. • Set the bench/drive switch to the BENCH mode.	**Yes** GO to **B7**.

Test B5-B6

Test Step		Result / Action to Take
B6	CHECK THE RESISTANCE OF THE TFT SENSOR (Continued)	

- Rotate the gear select switch to the OHMS CHECK position.
- **NOTE:** While carrying out Tests 1 and 2 below, observe resistance. DTC P0713 is set if the resistance value exceeds 1,062 ohms (open circuit). DTC P0712 is set if the resistance value falls below 597 ohms (short circuit).
  Measure the resistance between the TFT- jack and the TFT+ jack on the tester.



DD0542-A

- **TEST 1**
- Record the resistance. Resistance should be approximately in the following ranges:

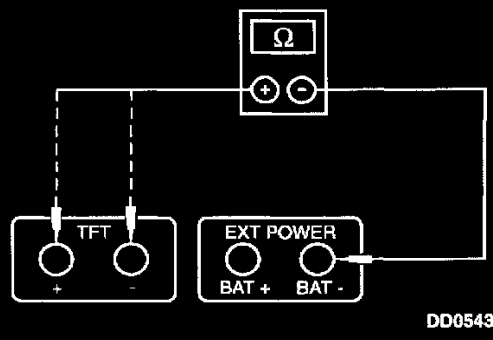
Transmission Fluid Temperature

°C	°F	Resistance (Ohms)
-40 to -20	-40 to -4	1,062 k-284 k
-19 to -1	-3-31	284 k-100 k
0-20	32-68	100 k-37 k
21-40	69-104	37 k-16 k
41-70	105-158	16 k-5 k
71-90	159-194	5 k-2.7 k
91-110	195-230	2.7 k-1.5 k
111-130	231-266	1.5 k-0.8 k
131-150	267-302	0.8 k-0.54 k

- **TEST 2**
- Check for an intermittent short or open.
- If the resistance was between 0.8 k and 100 k ohms, carry out the following test. If the transmission is cold, start and run the engine until transmission reaches its normal operating temperature. If the transmission is warm, allow the transmission to cool. Check the TFT sensor resistance again. Compare the resistance with the initial resistance. The resistance should decrease if the transmission was warmed and should increase if the transmission was allowed to cool. If the correct change in resistance occurs, repeat the Quick Test.
- **Is the resistance in the specified range?**

No
INSTALL a new solenoid assembly.
RECORD and ERASE the codes.
REPEAT the Quick Tests.

Test B6

Test Step		Result / Action to Take
B7	CHECK THE TFT SENSOR FOR SHORT TO GROUND	
• Check for continuity between the BAT(-) jack (engine ground) and the appropriate jack (-TFT or +TFT) with a digital ohmmeter or other low current tester (less than 200 milliamps). Connection should show infinite resistance (no continuity).  DD0543-A • **Does the connection show continuity?**		**Yes** INSTALL a new solenoid assembly. REPEAT the Quick Tests. **No** INSTALL a new PCM. REPEAT the Quick Tests. If the DTC is still present and overtemp condition exists, CHECK the fluid condition. CHECK the overheat condition. REFER to Diagnosis By Symptom . REPAIR as required. REPEAT the Quick Tests.

Test B7

NOTE: Refer to the Transmission Vehicle Harness Connector illustration.

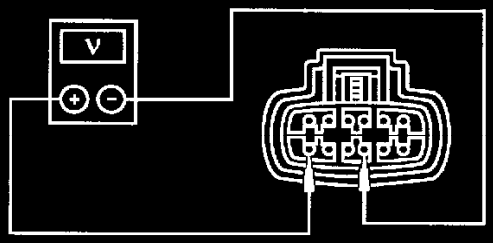
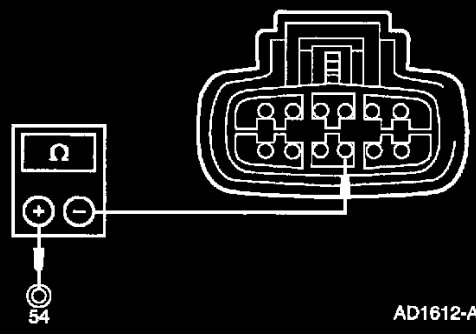
NOTE: This vehicle is equipped with a transmission fluid temperature gauge in the dash. The transmission fluid temperature gauge may be used as a quick reference to the operating temperature. It should not be used as a diagnostic tool to tell the temperature of the transmission. The WDS, NGS or transmission tester should be used to obtain the actual temperature of the transmission.

Test C: Torque Converter Clutch (TCC) Solenoid

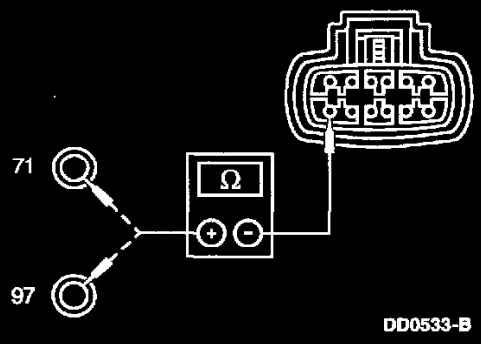
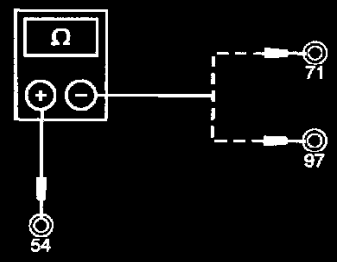
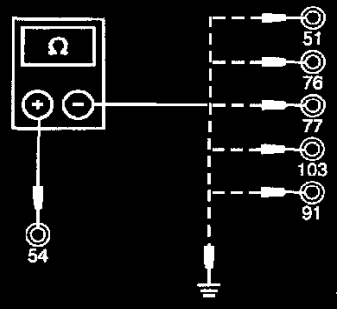
PINPOINT TEST C: TORQUE CONVERTER CLUTCH (TCC) SOLENOID

Test Step		Result / Action to Take
C1	ELECTRONIC DIAGNOSTICS	
• Check to make sure the transmission harness connector is fully seated, terminals are engaged in the connector and in good condition before proceeding. • Connect the diagnostic tool. • Carry out KOEO Test until continuous DTCs have been displayed. • Enter Output Test Mode (OTM). • Select the ALL ON mode. Push START to turn the outputs on. Push STOP to turn the outputs off. • **Does the vehicle enter OTM?**		**Yes** REMAIN in OTM. GO to **C2**. **No** PRESS START. If vehicle does not enter OTM, REFER to the Powertrain management.
C2	CHECK THE ELECTRICAL SIGNAL OPERATION	
• Disconnect: Transmission Connector. ⚠ **CAUTION: Remove the heat shield, if so equipped, from the transmission before removing the connector. Remove the solenoid body connector by pushing on the center tab and pulling on the harness connector. Do not attempt to pry the tab with a screwdriver. Always reinstall the heat shield when the procedure is completed.** • Use a mirror to inspect both ends of the connector for damaged or pushed-out pins, corrosion, loose wires and missing or damaged seals.		**Yes** GO to **C6**. **No** GO to **C3**.

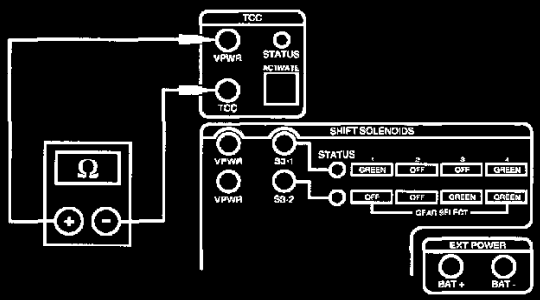
Test C1-C2

Test Step		Result / Action to Take
C2	**CHECK THE ELECTRICAL SIGNAL OPERATION (Continued)**	
	• Measure the voltage between the VPWR circuit pin 1 and the TCC signal circuit pin 4 at the transmission vehicle harness connector.  DD0545-A • Place the VOM on the 20-volt scale. • While observing the VOM, press START and STOP to cycle the solenoid output on and off. • **Is the solenoid output voltage changed to approximately battery voltage?**	
C3	**CHECK THE CONTINUITY OF THE TCC SIGNAL AND VPWR CIRCUITS**	
	• Key in OFF position. • Disconnect: Powertrain Control Module (PCM). Inspect for damaged or pushed-out pins, corrosion or loose wires. • Install the EEC-V Control System Breakout Box. • Measure the resistance between the PCM signal test pin 54 at the EEC-V Control System Breakout Box and the signal pin 4 at the transmission harness connector.  AD1612-A	**Yes** GO to **C4**. **No** REPAIR the open circuits. REMOVE the EEC-V Control System Breakout Box. RECONNECT all of the components. REPEAT the Quick Tests.

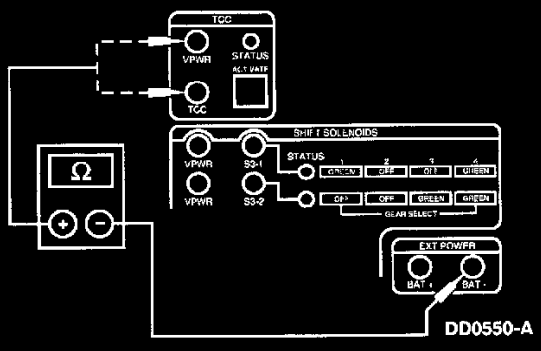
Test C2-C3

Test Step		Result / Action to Take
C3	**CHECK THE CONTINUITY OF THE TCC SIGNAL AND VPWR CIRCUITS (Continued)**	
	• Measure the resistance between the VPWR test pin 71 or 97 at the EEC-V Control System Breakout Box and the VPWR pin 1 at the transmission harness connector.  DD0533-B • **Is each resistance less than 5 ohms?**	
C4	**CHECK THE TCC CIRCUIT FOR SHORT TO POWER**	
	• Measure the resistance between the PCM signal test pin 54 and VPWR test pins 71 and 97 at the EEC-V Control System Breakout Box.  AD1614-A • **Is each resistance greater than 10,000 ohms?**	**Yes** GO to **C5**. **No** REPAIR the open circuits. REMOVE the EEC-V Control System Breakout Box. RECONNECT all of the components. REPEAT the Quick Tests.
C5	**CHECK THE TCC CIRCUIT FOR SHORT TO GROUND**	
	• Measure the resistance between the PCM signal test pin 54 and test pins 51, 76, 77, 103 and 91 at the EEC-V Control System Breakout Box and chassis ground.  AD1616-A • **Is each resistance greater than 10,000 ohms?**	**Yes** GO to **C6**. **No** REPAIR the short circuit(s). REMOVE the EEC-V Control System Breakout Box . RECONNECT all of the components. REPEAT the Quick Tests.

Test C3-C5

Test Step	Result / Action to Take
C6 SOLENOID FUNCTIONAL TEST	
• Install the Transmission Tester to the transmission connector. • **NOTE:** The LED will turn GREEN when the TCC solenoid activates and turn off when deactivated. The LED will turn RED if an ACTIVATED solenoid is shorted to battery positive. The LED will remain off if an ACTIVATED solenoid is shorted to ground or no continuity (open circuit). Carry out the Solenoid Voltage Test. • **Does the solenoid (LED GREEN) activate when tester switch is pressed?**	**Yes** GO to **C7**. **No** GO to **C8**.
C7 TRANSMISSION DRIVE TEST	
• Connect: Powertrain Control Module (PCM). • Carry out the Dynamic Testing — Engine On. • **Does the torque converter clutch solenoid activate (LED GREEN) and does the engine rpm drop?**	**Yes** INSTALL a new PCM. ERASE all DTCs. CARRY OUT the Transmission Drive Cycle Test. REPEAT the Quick Tests. If the symptoms are still present, REFER to Diagnosis By Symptom — Torque Converter Clutch Operation Concerns **No** GO to **C8**.
C8 CHECK THE RESISTANCE OF THE SOLENOID	
NOTE: Refer to the Transmission Tester for terminal locations. • Place the bench/drive switch to the BENCH mode. • Rotate the gear select switch to the OHMS CHECK position. • Measure the resistance between the TCC jack and the VPWR jack on the transmission tester.  DD0549-A • Record the resistance. The resistance should be between 13 and 20 ohms. • **Is the resistance between 13 and 20 ohms?**	**Yes** GO to **C9**. **No** INSTALL a new solenoid body assembly.

Test C6-C8

Test Step	Result / Action to Take
C9 CHECK THE SOLENOID FOR SHORT TO GROUND	
• Check for continuity between the BAT(-) jack (engine ground) and the appropriate jack with a digital ohmmeter or other low current tester (less than 200 milliamps). Connection should show infinite resistance (no continuity).  DD0550-A • **Does the connection show continuity?**	**Yes** INSTALL a new solenoid body assembly. **No** REFER to the Diagnosis By Symptom — Torque Converter Clutch Operation Concerns

Test C9

NOTE: Refer to the Transmission Vehicle Harness Connector illustration.

Test D: Digital Transmission Range (TR) Sensor

PINPOINT TEST D: DIGITAL TRANSMISSION RANGE (TR) SENSOR

Test Step		Result / Action to Take
D1	**VERIFY DIAGNOSTIC TROUBLE CODES**	
	• Key in OFF position. • Select PARK. • Carry out on-board diagnostic test. DTC codes P0705 and P0708 cannot be set by an incorrectly adjusted digital TR sensor. • **Are only DTC codes P0705, P0708 present?**	**Yes** GO to **D4.** **No** GO to **D2.**
D2	**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 **D3.** **No** ADJUST the digital TR sensor. PLACE transmission range selector lever into PARK and CLEAR DTCs. RERUN OBD Tests.GO to **D3.**
D3	**VERIFY SHIFT CABLE/LINKAGE ADJUSTMENT**	
	• Place the manual lever in the OVERDRIVE position. • Select DRIVE. • Reconnect the shift cable/linkage. • Verify that the shift cable/linkage is correctly adjusted. • **Is the shift cable/linkage correctly adjusted?**	**Yes** GO to **D4.** **No** ADJUST the shift cable/linkage. GO to **D4.**

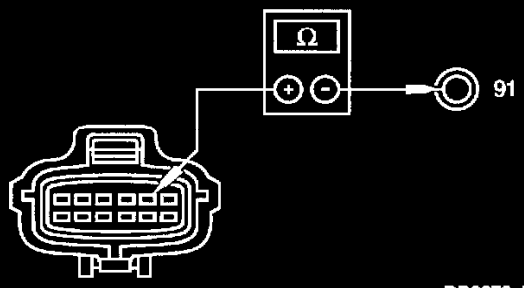
Test D1-D3

Test Step		Result / Action to Take
D4	**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 the 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 required. CLEAR DTCs and RERUN OBD Tests. **No** If diagnosing a DTC, GO to **D5**. If diagnosing a starting concern or a backup lamp concern, GO to **D10**.
D5	**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, 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, and/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?**	**Yes** The problem is not in the digital TR sensor system. **No** If TR_D changes when wiggling harness, tapping on the sensor, or driving the vehicle, the problem may be intermittent. GO to **D6**.
D6	**CHECK THE DIGITAL TRANSMISSION RANGE SENSOR OPERATION**	
	• Disconnect: Digital TR Sensor. ⚠ **CAUTION: Do not pry on the connector. This will damage the connector and result in a transmission concern. Press the button and pull out on the harness connector.** • Connect the tester cable E to the Transmission Tester. Connect the tester cable E black connector marked DIGITAL to the digital TR sensor. • Place the Digital TR Overlay onto the Transmission Tester. • Carry out the sensor test as instructed on the Digital TR Overlay. • **Do the status lamps on the tester TR-E cable match the selected gear positions?**	**Yes** The concern is not in the digital TR sensor. GO to **D7**. **No** INSTALL and ADJUST a new digital TR sensor. CLEAR the DTCs. REPEAT the Quick Tests.
D7	**CHECK THE PCM HARNESS CIRCUITS FOR OPENS**	
	• Key in OFF position. • Disconnect: Powertrain Control Module. Inspect for damaged or pushed-out pins, corrosion or loose wires. • Disconnect: Digital TR Sensor. ⚠ **CAUTION: Do not pry on the connector. This will damage the connector and result in a transmission concern. Press the button and pull out on the digital TR sensor harness connector.** Disconnect digital TR sensor connector. • Install the EEC-V Control System Breakout Box.	**Yes** GO to **D8**. **No** REPAIR the open circuit(s). RECONNECT all of the components. CLEAR the DTCs. REPEAT the Quick Tests.

Test D4-D7

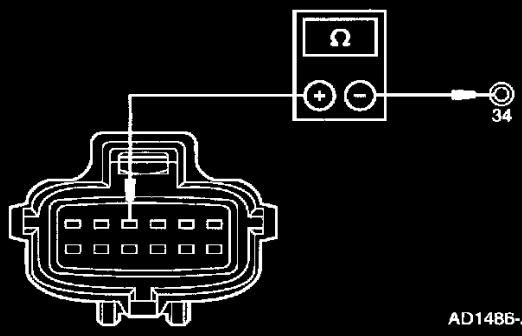
Test Step		Result / Action to Take
D7	**CHECK THE PCM HARNESS CIRCUITS FOR OPENS (Continued)**	

- Measure the resistance between PCM test pin 91 at the EEC-V Control System Breakout Box and the signal return circuit pin 2 at the vehicle harness connector.



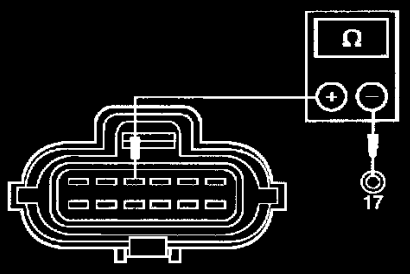
DD0670-A

- Vehicles equipped with 7.3L (Cal.) DI diesel, and all gasoline engines, measure the resistance between PCM test pin 34 at the EEC-V Control System Breakout Box, and TR1 circuit pin 4 at the vehicle harness connector.



AD1486-A

- Vehicles equipped with 7.3L (49-state) DI diesel engine, measure the resistance between PCM test pin 17 at the EEC-V Control System Breakout Box, and TR1 circuit pin 4 at the vehicle harness connector.

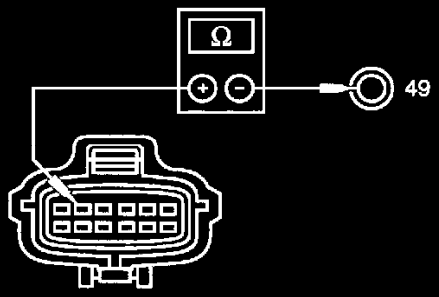


AD1618-A

Test D7

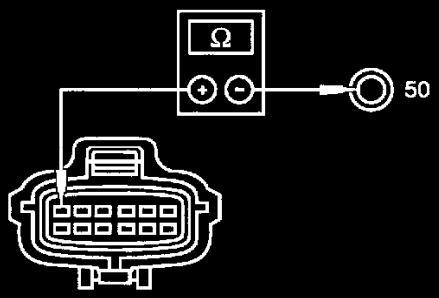
Test Step		Result / Action to Take
D7	**CHECK THE PCM HARNESS CIRCUITS FOR OPENS (Continued)**	

- Measure the resistance between PCM test pin 49 at the EEC-V Control System Breakout Box and TR2 circuit pin 5 at the vehicle harness connector.



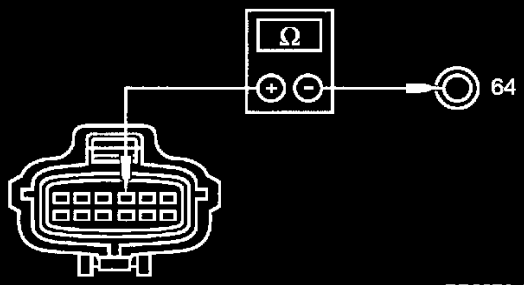
DD0672-A

- Measure the resistance between PCM test pin 50 at the EEC-V Control System Breakout Box and TR4 circuit pin 6 at the vehicle harness connector.



DD0673-A

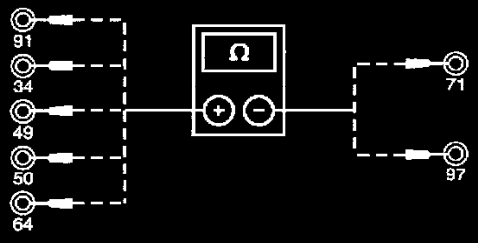
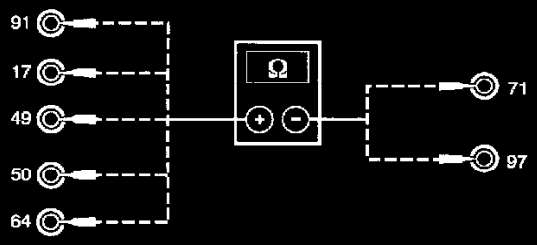
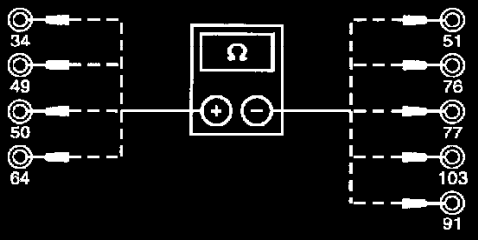
- Measure the resistance between PCM test pin 64 at the EEC-V Control System Breakout Box and TR3A circuit pin 3 at the vehicle harness connector.



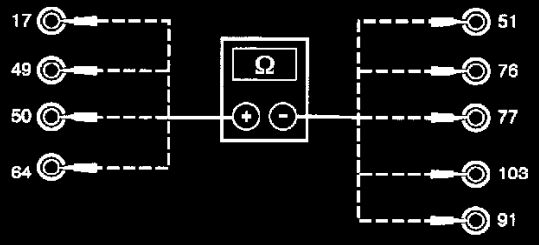
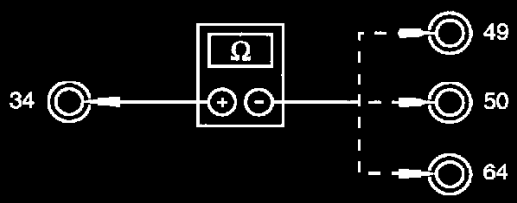
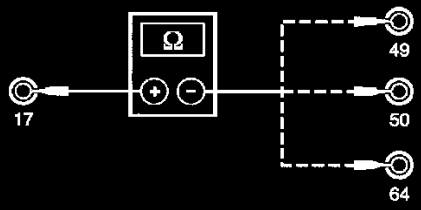
DD0674-A

- **Is each resistance less than 5 ohms?**

Test D7

Test Step		Result / Action to Take
D8	**CHECK THE PCM HARNESS CIRCUITS FOR A SHORT TO GROUND OR TO POWER**	
	• Vehicles equipped with 7.3L (Cal.) DI diesel, and all gasoline engines, measure the resistance between PCM test pins 91, 34, 49, 50 and 64, and VPWR test pins 71 and 97 at the EEC-V Control System Breakout Box.  AD1487-A • Vehicles equipped with 7.3L (49-state) DI diesel engine, measure the resistance between PCM test pins 91, 17, 49, 50 and 64, and VPWR test pins 71 and 97 at the EEC-V Control System Breakout Box.  A0011874 • Vehicles equipped with 7.3L (Cal.) DI diesel, and all gasoline engines, measure the resistance between PCM test pins 34, 49, 50 and 64, and test pins 51, 76, 77, 103 and 91 at the EEC-V Control System Breakout Box.  AD1488-A	**Yes** GO to **D9**. **No** REPAIR the short circuit(s). RECONNECT all of the components. CLEAR the DTCs. REPEAT the Quick Tests.

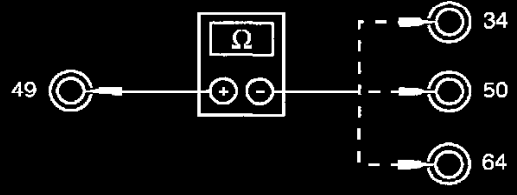
Test D8

Test Step		Result / Action to Take
D8	**CHECK THE PCM HARNESS CIRCUITS FOR A SHORT TO GROUND OR TO POWER (Continued)**	
	• Vehicles equipped with 7.3L (49-state) DI diesel engine, measure the resistance between PCM test pins 17, 49, 50 and 64, and test pins 51, 76, 77, 103 and 91 at the EEC-V Control System Breakout Box.  A0011875 • **Is each resistance greater than 10,000 ohms?**	
D9	**CHECK FOR A SHORT BETWEEN THE TR/PCM INPUT SIGNAL CIRCUITS**	
	• Vehicles equipped with 7.3L (Cal.) DI diesel, and all gasoline engines, measure the resistance between test pin 34 and test pins 49, 50 and 64 at the EEC-V Control System Breakout Box.  DD0677-A • Vehicles equipped with 7.3L (49-state) DI diesel engine, measure the resistance between test pin 17 and test pins 49, 50 and 64 at the EEC-V Control System Breakout Box.  A0011876	**Yes** INSTALL a new PCM. RECONNECT all of the components. CLEAR the DTCs. RERUN the Quick Tests. **No** REPAIR shorts on the circuits having less than 10,000 ohms resistance between other TR/PCM input signal circuits. RECONNECT all of the components. CLEAR the DTCs. REPEAT the Quick Tests.

Test D8-D9

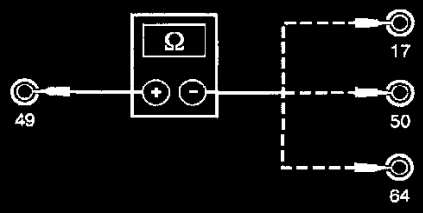
Test Step		Result / Action to Take
D9	CHECK FOR A SHORT BETWEEN THE TR/PCM INPUT SIGNAL CIRCUITS (Continued)	

- Vehicles equipped with 7.3L (Cal.) DI diesel, and all gasoline engines, measure the resistance between test pin 49 and test pins 34, 50 and 64 at the EEC-V Control System Breakout Box.



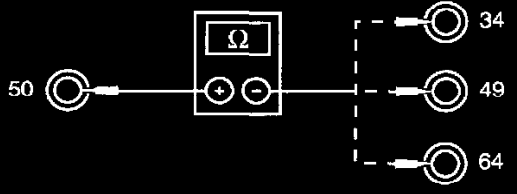
DD0678-A

- Vehicles equipped with 7.3L (49-state) DI diesel engine, measure the resistance between test pin 49 and test pins 17, 50 and 64 at the EEC-V Control System Breakout Box.



A0011879

- Vehicles equipped with 7.3L (Cal.) DI diesel, and all gasoline engines, measure the resistance between test pin 50 and test pins 34, 49 and 64 at the EEC-V Control System Breakout Box.

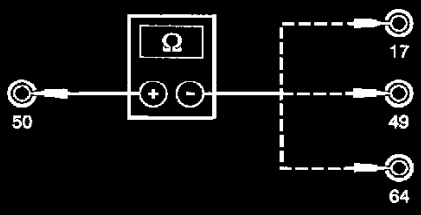


DD0679-A

Test D9

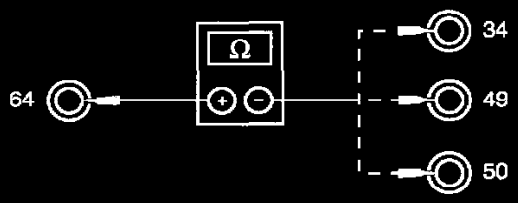
Test Step		Result / Action to Take
D9	CHECK FOR A SHORT BETWEEN THE TR/PCM INPUT SIGNAL CIRCUITS (Continued)	

- Vehicles equipped with 7.3L (49-state) DI diesel engine, measure the resistance between test pin 50 and test pins 17, 49 and 64 at the EEC-V Control System Breakout Box.



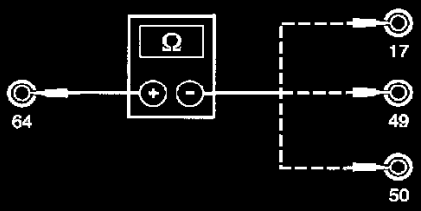
A0011877

- Vehicles equipped with 7.3L (Cal.) DI diesel, and all gasoline engines, measure the resistance between test pin 64 and test pins 34, 49 and 50 at the EEC-V Control System Breakout Box.



DD0680-A

- Vehicles equipped with 7.3L (49-state) DI diesel engine, measure the resistance between test pin 64 and test pins 17, 49 and 50 at the EEC-V Control System Breakout Box.



A0011878

- **Is each resistance greater than 10,000 ohms?**

Test D9

Test Step		Result / Action to Take
D10	CHECK THE NON-PCM INTERNAL CIRCUITS OF SENSOR	
• Connect the tester cable E to the Transmission Tester. • Connect the cable E connector marked DIGITAL to the digital TR sensor. • Place the Digital TR Overlay onto the Transmission Tester. • Carry out the switch test as Instructed on the Digital TR Overlay. • **Does the status lamp on the tester indicate RED for the correct gear position?**		**Yes** The concern is not in the digital TR sensor. For starter system concerns, REFER to starting and charging For backup lamp concerns, REFER to lighting and horns. **No** INSTALL and ADJUST a new digital TR sensor. REFER to Digital Transmission Range (TR) Sensor. CLEAR the DTCs. REPEAT the Quick Tests.

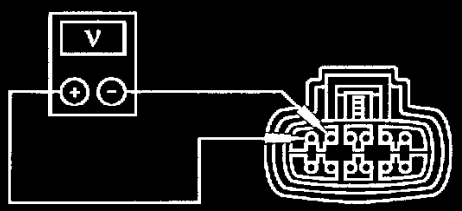
Test D10

NOTE: Refer to the Digital Transmission Range **(TR)** Sensor Connector illustration.

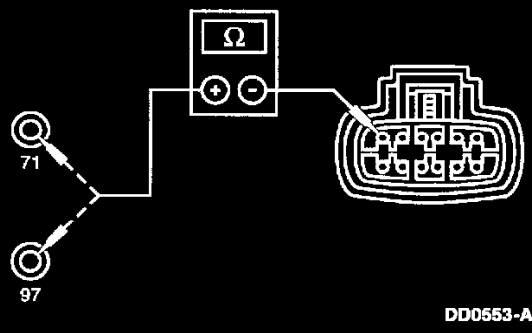
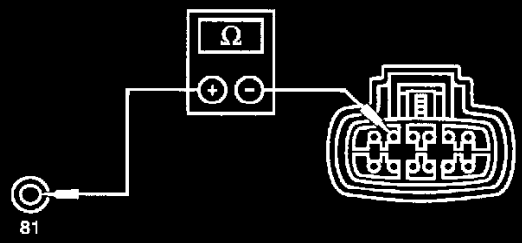
NOTE: Refer to the Digital Transmission Range **(TR)** Sensor Diagnosis Chart.

Test E: Electronic Pressure Control (EPC) Solenoid

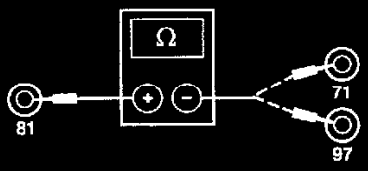
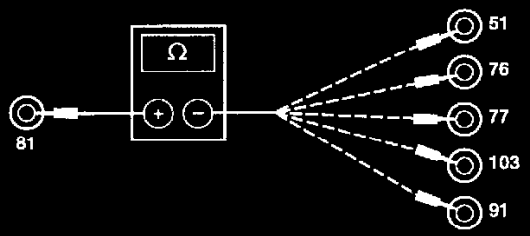
PINPOINT TEST E: ELECTRONIC PRESSURE CONTROL (EPC) SOLENOID

Test Step		Result / Action to Take
E1	**ELECTRONIC DIAGNOSTICS**	
	• Check to make sure the transmission harness connector is fully seated, terminals are engaged in the connector and in good condition before proceeding. • Connect the diagnostic tool. • Carry out KOEO Test until continuous DTCs have been displayed. • ENTER Output Test Mode (OTM). • Select the ALL ON mode. Push START to turn the outputs on. Push STOP to turn the outputs off. • **Does the vehicle enter OTM?**	**Yes** REMAIN in OTM. GO to **E2.** **No** PRESS START. If the vehicle does not enter OTM, REFER to the Powertrain management.
E2	**CHECK THE ELECTRICAL SIGNAL OPERATION**	
	• Disconnect: Transmission Connector. ⚠ **CAUTION: Remove the heat shield, if so equipped, from the transmission before removing the connector. Remove the solenoid body connector by pushing on the center tab and pulling on the harness connector. Do not attempt to pry the tab with a screwdriver. Always reinstall the heat shield when the procedure is completed.** • Use a mirror to inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Measure the voltage between EPC PWR pin 12 and EPC signal circuit pin 11 at the transmission vehicle harness connector.  DD0552-B • Place the VOM on the 20-volt scale. • While observing the VOM, press START and STOP to cycle the solenoid output on and off. • **Is the solenoid output voltage changed to approximately battery voltage?**	**Yes** GO to **E5.** **No** GO to **E3.**

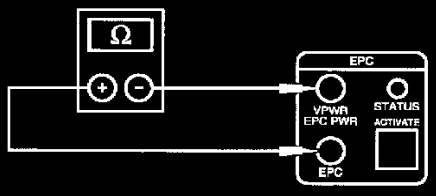
Test E1-E2

Test Step		Result / Action to Take
E3	**CHECK THE CONTINUITY OF THE SOLENOID SIGNAL AND VPWR CIRCUITS** • Key in OFF position. • Disconnect: Powertrain Control Module (PCM). Inspect for damaged or pushed-out pins, corrosion or loose wires. • Install the EEC-V Control System Breakout Box. • Measure the resistance between the VPWR test pins 71 and 97 at the EEC-V Control System Breakout Box and the EPC PWR circuit pin 12 at the transmission harness connector.  DD0553-A • Measure the resistance between the PCM signal test pin 81 at the EEC-V Control System Breakout Box and the EPC signal pin 11 at the transmission harness connector.  DD0554-A • **Is each resistance less than 5 ohms?**	**Yes** GO to **E4**. **No** REPAIR the open circuit(s). REMOVE the EEC-V Control System Breakout Box. RECONNECT all of the components. ERASE the codes. REPEAT the Quick Tests.

Test E3

Test Step		Result / Action to Take
E4	**CHECK THE HARNESS FOR SHORTS TO POWER AND GROUND**	
	• Measure the resistance between the PCM signal test pin 81 and VPWR test pins 71 and 97 at the EEC-V Control System Breakout Box.  D17329-A • Measure the resistance between the PCM signal test pin 81 and test pins 51, 76, 77, 103 and 91 at the EEC-V Control System Breakout Box.  D17330-A • **Is each resistance greater than 10,000 ohms?**	**Yes** GO to **E5**. **No** REPAIR the short circuit(s). REMOVE the EEC-V Control System Breakout Box. RECONNECT all of the components. ERASE the codes. REPEAT the Quick Tests.
E5	**TRANSMISSION FUNCTIONAL TEST**	
	• Connect: Powertrain Control Module (PCM). • Install a Line Pressure Gauge at the line tap on the case. • Install the Transmission Tester to transmission connector. • Set the bench/drive switch to the DRIVE mode. • Rotate the gear select switch to the first gear position. • **NOTE:** The LED will turn GREEN when the EPC solenoid activates and turn off when deactivated. The LED will turn RED if an ACTIVATED solenoid is shorted to battery positive. The LED will remain off if an ACTIVATED solenoid is shorted to ground or no continuity (open circuit). Carry out the EPC Solenoid Functional Test. • Observe line pressure on the gauge while pressing the EPC switch (engine must be running). • **Does the EPC (GREEN LED) activate and line pressure drop when the EPC switch is pressed?**	**Yes** INSTALL a new PCM. REPEAT the Quick Tests. **No** GO to **E6**.

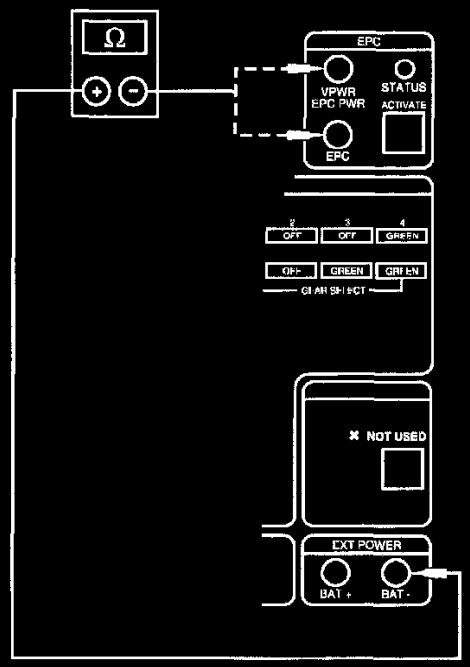
Test E4-E5

Test Step		Result / Action to Take
E6	**CHECK THE RESISTANCE OF THE SOLENOID**	
	NOTE: Refer to the Transmission Tester for terminal locations. • Set the bench/drive switch to the BENCH mode. • Rotate the gear select switch to the OHMS CHECK position. • ⚠ **CAUTION: Make sure the tester power is off or damage to the ohmmeter can result.** Measure the resistance between the VPWR jack and the EPC jack on the transmission tester.  DD0557-A • Record the resistance. (The resistance should be between 3.0 and 5.0 ohms.) • **Is the resistance between 3.0 and 5.0 ohms?**	**Yes** GO to **E7**. **No** INSTALL a new solenoid body assembly. RECORD and ERASE all codes. REPEAT the Quick Tests.
E7	**CHECK THE SOLENOID FOR SHORT TO GROUND**	
	• Check for continuity between the BAT(-) jack (engine ground) and the appropriate jack with a digital ohmmeter or other low current tester (less than 200 milliamps). The connection should show infinite resistance (no continuity).	**Yes** INSTALL a new solenoid body assembly. RECORD and ERASE codes. REPEAT the Quick Tests.

Test E6-E7

Test Step		Result / Action to Take
E7	CHECK THE SOLENOID FOR SHORT TO GROUND (Continued)	

Solenoid	Tester Jack
EPC	VPWR EPC PWR



DD0558-A

- Does the connection show continuity?

No
REFER to Diagnosis By Symptom

Test E7

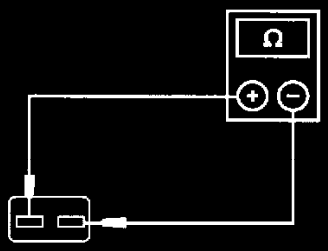
NOTE: Refer to the Transmission Vehicle Harness Connector illustration.

Test F: Turbine Shaft Speed (TSS) & Output Shaft Speed (OSS) Sensor

PINPOINT TEST F: TURBINE SHAFT SPEED (TSS) AND OUTPUT SHAFT SPEED (OSS) SENSORS

Test Step		Result / Action to Take
F1	ELECTRONIC DIAGNOSTICS	
	• 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. • Select PID/Data Monitor and Record. • Select the following PIDs: TSS, OSS. • **Does vehicle enter PID/Data Monitor and Record?**	**Yes** REMAIN in PID/Data. GO to **F2**. **No** REPEAT procedure to ENTER PID. If vehicle did not enter PID, REFER to diagnosis of PCM.

Test F1

Test Step		Result / Action to Take
F2	**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, or OSS Speed PID increase and decrease with engine and vehicle speed or is the sensor signal erratic (drop to zero or near zero and return to normal operation)?**	**Yes** If the TSS or OSS Speed PID increase and decrease with engine and vehicle speed, CLEAR all DTCs. ROAD TEST to verify if concern is still present. If concern is still present, REFER to Diagnosis By Symptom for diagnosis. If the sensor signal is erratic, INSPECT for intermittent concern in the internal/external harness, sensor or connector. **No** If the TSS, 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. If the sensor signal is steady, GO to **F3**.
F3	**CHECK RESISTANCE OF TSS OR OSS SENSOR** • Disconnect the appropriate vehicle harness connector from the TSS and or OSS sensor. • For TSS or OSS: Measure the resistance between pin 1 and pin 2 at the sensor.  AD1084-B • Record the resistance. Resistance should be as follows: • **Is the resistance within specification for the appropriate sensor?**	**Yes** REFER to Diagnosis By Symptom for concern diagnosis. **No** For TSS and OSS, INSTALL a new sensor.

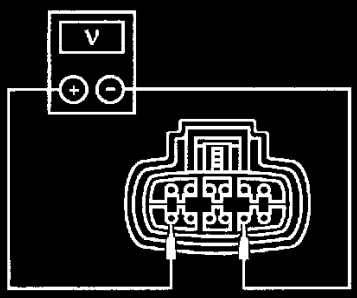
Sensor	Resistance (ohms)
TSS — PTO Only Applications	496-1,244
TSS — Non-PTO Applications	781-1,979
OSS — All Applications	781-1,979

Test F2-F3

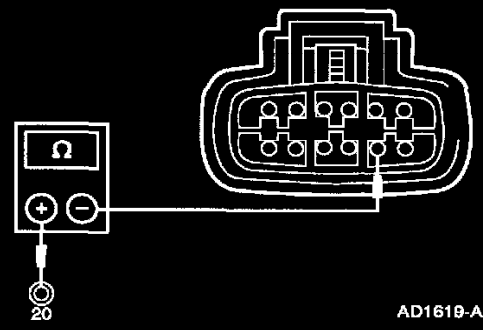
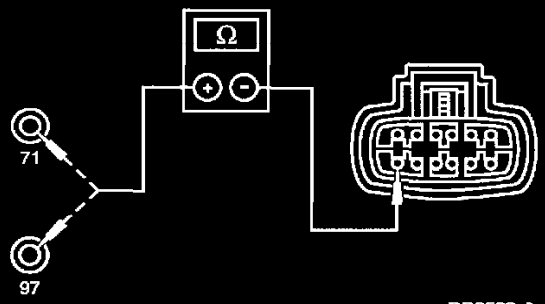
NOTE: Refer to the Output Shaft Speed **(OSS)** Sensor Connector illustration

Test G: Coast Clutch Solenoid (CCS)

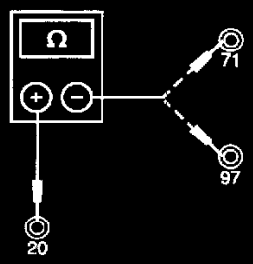
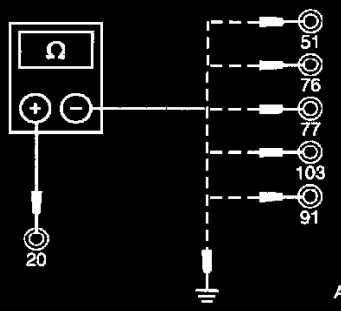
PINPOINT TEST G: COAST CLUTCH SOLENOID (CCS)

Test Step		Result / Action to Take
G1	**ELECTRONIC DIAGNOSTICS**	
	• **NOTE:** PTO must be turned off. For a description of PTO operation, refer to Transmission Electronic Control System Check to make sure the transmission harness connector is fully seated, terminals are engaged in the connector and in good condition before proceeding. • Connect the diagnostic tool. • Carry out the KOEO Test until continuous DTCs have been displayed. • Enter the Output Test Mode (OTM). • Select the ALL ON mode. Push START to turn the outputs on. Push STOP to turn the outputs off. • **Does the vehicle enter OTM?**	**Yes** REMAIN in OTM. GO to **G2**. **No** PRESS START. If the vehicle does not enter OTM, REFER to the Powertrain management.
G2	**CHECK THE ELECTRICAL SIGNAL OPERATION**	
	• Disconnect: Transmission Connector. ⚠ **CAUTION: Remove the heat shield, if so equipped, from the transmission before removing the connector. Remove the solenoid body connector by pushing on the center tab and pulling on the harness connector. Do not attempt to pry the tab with a screwdriver. Always reinstall the heat shield when the procedure is completed.** • Use a mirror to inspect both ends of the connector for damage or pushed-out pins, corrosion, loose wires and missing or damaged seals. • Measure the voltage between VPWR circuit pin 1 and CCS signal circuit pin 5 of the transmission vehicle harness connector.  DD0560-A • Place the VOM on the 20-volt scale. • While observing the VOM, press START and STOP to cycle the solenoid output on and off. • **Is the solenoid output voltage changed to approximately battery voltage?**	**Yes** GO to **G5**. **No** GO to **G3**.

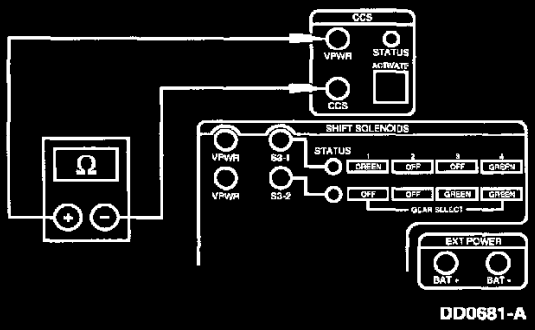
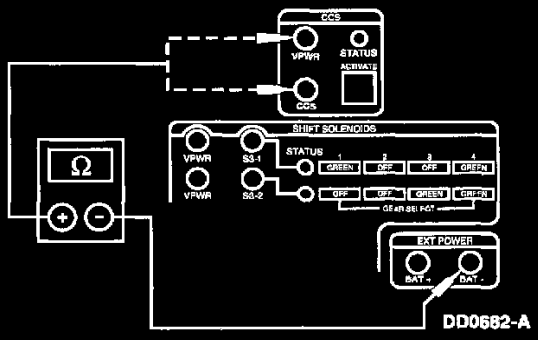
Test G1-G2

Test Step		Result / Action to Take
G3	**CHECK THE CONTINUITY OF THE CCS SIGNAL AND VPWR CIRCUITS**	
	• Key in OFF position. • Disconnect: Powertrain Control Module (PCM). Inspect for damaged or pushed-out pins, corrosion or loose wires. • Install the EEC-V Control System Breakout Box. • Measure the resistance between the PCM signal test pin 20 at the EEC-V Control System Breakout Box and the signal pin 5 at the transmission harness connector.  AD1619-A • Measure the resistance between the VPWR test pin 71 or 97 at the EEC-V Control System Breakout Box and the VPWR pin 1 at the transmission harness connector.  DD0562-A • **Is each resistance less than 5 ohms?**	**Yes** GO to **G4**. **No** REPAIR the open circuits. REMOVE the EEC-V Control System Breakout Box. RECONNECT all of the components. REPEAT the Quick Tests.

Test G3

Test Step		Result / Action to Take
G4	**CHECK THE CCS CIRCUIT FOR SHORTS TO POWER AND GROUND**	
	• Measure the resistance between the PCM signal test pin 20 and VPWR test pins 71 and 97 at the EEC-V Control System Breakout Box.  AD1621-A • Measure the resistance between the PCM signal test pin 20 and test pins 51, 76, 77, 103 and 91 at the EEC-V Control System Breakout Box and chassis ground.  AD1623-A • **Is each resistance greater than 10,000 ohms?**	**Yes** GO to **G5**. **No** REPAIR the short circuit(s). REMOVE the EEC-V Control System Breakout Box. RECONNECT all of the components. REPEAT the Quick Tests.
G5	**SOLENOID FUNCTIONAL TEST**	
	• Connect: Powertrain Control Module (PCM). • Install the Transmission Tester to the transmission connector. • **NOTE:** The LED will turn GREEN when the CCS activates and turn off when deactivated. The LED will turn RED if an ACTIVATED solenoid is shorted to battery positive. The LED will remain off if an ACTIVATED solenoid is shorted to ground or no continuity (open circuit). Carry out the Solenoid Voltage Test. • **Does the solenoid (LED GREEN) activate when the tester switch is pressed?**	**Yes** GO to **G6**. **No** GO to **G7**.
G6	**TRANSMISSION DRIVE TEST**	
	• Carry out the Dynamic Testing. • **Does the CCS activate (LED GREEN) and engine braking occur?**	**Yes** INSTALL a new PCM. ERASE all DTCs. CARRY OUT the Transmission Drive Cycle Test. REPEAT the Quick Tests. If symptoms are still present, REFER to Diagnosis By Symptom. **No** GO to **G7**.

Test G4-G6

Test Step		Result / Action to Take
G7	CHECK THE RESISTANCE OF THE SOLENOID	
	NOTE: Refer to the Transmission Tester for terminal locations. • Place the bench/drive switch to the BENCH mode. • Rotate the Gear Select switch to the OHMS CHECK position. • Measure the resistance between the CCS jack and the VPWR jack on the transmission tester.  DD0681-A • Record the resistance. (The resistance should be between 20 and 30 ohms). • **Is the resistance between 20 and 30 ohms?**	**Yes** GO to **G8**. **No** INSTALL a new solenoid body assembly.
G8	CHECK THE SOLENOID FOR SHORT TO GROUND	
	• Check for continuity between the BAT(-) jack (engine ground) and the appropriate jack with a digital ohmmeter or other low current tester (less than 200 milliamps). Connection should show infinite resistance (no continuity).  DD0682-A • **Does the connection show continuity?**	**Yes** INSTALL a new solenoid body assembly. **No** REFER to Diagnosis By Symptom

Test G7-G8

NOTE: Refer to the Transmission Vehicle Harness Connector illustration.

Test H: Solenoid Mechanical Failure

PINPOINT TEST H: SOLENOID MECHANICAL FAILURE

NOTE: Repair all other DTCs before repairing the following DTCs P174. P1715, P1740.

Test Step		Result / Action to Take
H1	ELECTRONIC DIAGNOSIS	
	• Connect the diagnostic tool. • Carry out the KOEO Test until continuous DTCs have been displayed. • If any of the following DTCs are present, continue with this test: P1714, P1715, 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 appropriate solenoid and/or body. GO to **H2**.

Test H1

Test Step		Result / Action to Take
H2	TRANSMISSION DRIVE CYCLE TEST	
	• Carry out Transmission Drive Cycle Test. • Carry out the On-Board Diagnostic Test. • **Does the vehicle upshift and downshift OK?**	**Yes** GO to **H3**. **No** REFER to Diagnosis By Symptom to diagnose shift concerns.
H3	RETRIEVE DTCS	
	• Connect the diagnostic tool. • Carry out KOEO Test until continuous DTCs have been displayed. • **Are DTCs P1714, P1715, 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 for concern diagnosis.

Test H2-H3

Special Testing Procedures

The special tests are designed to aid the technician in diagnosing the hydraulic and mechanical portions of the transmission.