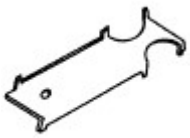
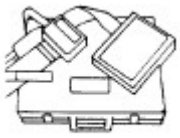
Diagnostics

Special Tool(s)

 ST1633-A	Digital Transmission Range Sensor Alignment Tool 307-351 (T97L-70010-A)
	Digital TRS Sensor Overlay 007-00131 or equivalent
 ST1391-A	EEC-V 104-Pin Breakout Box 418-049 (014-00950) or equivalent
 ST1217-A	New Generation Star (NGS) Tester 418-F048 (007-00500) or equivalent
 ST1137-A	73 Digital Multimeter 105-R0051 or equivalent
 ST1632-A	TRS-E Cable 418-F107 (007-00111) or equivalent
 ST1389-A	Transmission Tester 007-00130 or equivalent

 ST1300-A	12 Volt Master UV Diagnostic Inspection Kit 164-R0756 or equivalent
 ST1392-A	AOD-E Transmission Test Plate 307-246 (T92P-7006-A)
 ST1565-A	Pressure Gauge 307-004 (T57L-77820-A)

Diagnosing an electronically controlled automatic transmission is simplified by using the following procedures. One of the most important things to remember is that there is a definite procedure to follow. DO NOT TAKE SHORT CUTS OR ASSUME THAT CRITICAL CHECKS OR ADJUSTMENTS HAVE ALREADY BEEN MADE. Follow the procedures as written to avoid missing critical components or steps. By following the diagnostic sequence, the technician will be able to diagnose and repair the concern the first time.

On-Board Diagnostics With NGS

NOTE: For detailed instruction and other diagnostic methods using the NGS; refer to the NGS tester manual and the Powertrain Control/Emissions Diagnosis (PC/ED) manual manual. These quick tests should be used to diagnose the powertrain control module and should be performed in order.

- Quick Test 1.0 — Visual Inspection
- Quick Test 2.0 — Set Up
- Quick Test 3.0 — Key On, Engine Off (KOEO)
- Quick Test 4.0 — Continuous Memory Codes
- Quick Test 5.0 — Key On, Engine Running (KOER)
  - Special Test Mode
  - Wiggle Test
- Output Test Mode
- PCM Reset Mode
- Clearing DTCs
- OBD II Drive Cycle
- Other NGS Features

For further information on other diagnostic testing features using the NGS or generic scan tool, refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. Other diagnostic methods include the following:

- Parameter Identification (PID) Access Mode
- Freeze Frame Data Access Mode

- Oxygen Sensor Monitor Mode

Output State Control (OSC) Mode

Output State Control (OSC) allows the technician to take control of certain parameters to function the transmission. For example, OSC allows the technician to shift the transmission only when he/she commands a gear change. If the technician commands 1st gear in OSC, the transmission will remain in 1st gear until the technician commands the next gear. Another example, the technician can command a shift solenoid to turn on or off when performing an electrical circuit check. OSC has two modes of operation for transmission, the BENCH MODE and the DRIVE MODE. Each mode/parameter has a unique set of vehicle operating requirements that the technician is required to meet before being allowed to operate OSC.

NOTE: To operate OSC the digital transmission range (TR) sensor and the vehicle speed sensor (VSS) must be operational. No Diagnostic Trouble Codes (DTCs) related to the digital TR sensor or the VSS sensor can be present.

- The vehicle requirements MUST BE MET when SENDING the OSC value. Refer to individual test modes for vehicle requirements.
- If the vehicle requirements are NOT MET when SENDING the OSC value, and ERROR MESSAGE will appear. When the ERROR MESSAGE is received, OSC is aborted and must be restarted.
- If AFTER SENDING an OSC value, and the vehicle requirements are no longer met, the PCM will cancel the OSC value and NO ERROR message will appear.
- The OSC value [XXX] may be sent anytime to cancel OSC.

Output State Control (OSC) Procedures:

- Perform visual inspection and vehicle preparation as required.
- Select "Vehicle and Engine Selection" menu.
- Select appropriate vehicle and engine.
- Select "Diagnostic Data Link."
- Select "Powertrain Control Module."
- Select "Output Test Mode."
- Select "KOEO On-Demand Self Test and KOER On-Demand Self Tests."
- Perform test and record DTCs.
- Repair all NON-Transmission DTCs.
- Repair all VSS and digital TR Sensor DTCs.
- Ensure that VSS/digital TR Sensors are functional.
- Select "Active Command Modes."
- Select "Trans - Bench Mode or Trans - Drive Mode."

OSC — Transmission Bench Modes

The following Transmission Bench Modes may be used or required during diagnostics.

SSA/SS1, SSB/SS2 and TCC in BENCH MODE:

The BENCH MODE allows the technician to perform electrical circuit checks on the following components:

- SSA/SS1 - Activates SSA/SS1 OFF or ON.
- SSB/SS2 - Activates SSB/SS2 OFF or ON.

- TCC - Activates TCC OFF or ON.

OSC "SSA/SS1, SSB/SS2, TCC" BENCH MODE Operates ONLY when:

- VSS and digital TR sensor are operational.
- no VSS and digital TR sensor DTCs.
- transmission range selector lever in P.
- key ON.
- engine OFF.

OSC Command Values

- [OFF] - turns solenoid OFF.
- [ON] - turns solenoid ON.
- [XXX] - cancels OSC value sent.
- [SEND] - sends the values to PCM.

BENCH MODE Procedure for SSA/SS1, SSB/SS2 and TCC

Follow operating instructions from the NGS menu screen:

- Select "Output State Control."
- Select "Trans - Bench Mode."
- Select "PIDs" to be monitored.
- Monitor all selected PIDs during test.
- Select "Parameters - SSA/SS1, SSB/SS2 or TCC."
- Select "ON" to turn solenoid ON.
- Press "SEND" to send command ON.
- Select "OFF" to turn solenoid OFF.
- Press "SEND" to send command OFF.
- Select "XXX" to cancel at any time.
- Press "SEND."

EPC in BENCH MODE:

The BENCH MODE is also used to test the functionality of the transmission's electronic pressure control. During BENCH MODE, the EPC solenoid can ramp in increments of 15 PSI from zero to 90 PSI and 90 to zero PSI.

The OSC functions for the parameter EPC allows the technician to choose the following options:

- EPC - Activates EPC to selected values.
- [00] - sets EPC pressure to 00 kPa (00 PSI).
- [15] - sets EPC pressure to 103 kPa (15 PSI).
- [30] - sets EPC pressure to 206 kPa (30 PSI).
- [45] - sets EPC pressure to 310 kPa (45 PSI).
- [60] - sets EPC pressure to 411 kPa (60 PSI).
- [75] - sets EPC pressure to 517 kPa (75 PSI).
- [90] - sets EPC pressure to 620 kPa (90 PSI).

OSC "EPC" BENCH MODE Operates ONLY when:

- VSS and digital TR sensor are operational.
- No VSS and digital TR sensor DTCs.
- Transmission range selector lever in P.
- Pressure gauge installed.
- Key ON.
- Engine ON.
- Engine RPM at 1500.

OSC Command Values

- [00] - sets EPC pressure to 00 kPa (00 PSI).
- [15] - sets EPC pressure to 103 kPa (15 PSI).
- [30] - sets EPC pressure to 206 kPa (30 PSI).
- [45] - sets EPC pressure to 310 kPa (45 PSI).
- [60] - sets EPC pressure to 411 kPa (60 PSI).
- [75] - sets EPC pressure to 517 kPa (75 PSI).
- [90] - sets EPC pressure to 620 kPa (90 PSI).
- [OFF] - turns solenoid off.
- [ON] - turns solenoid on.
- [XXX] - cancels OSC value sent.
- [SEND] - sends the values to PCM.

BENCH MODE Procedure for EPC

Following operating instructions from the NGS menu screen.

- Select "Output State Control."
- Select "Trans - Bench Mode."
- Select "PIDs" to be monitored.
- Monitor all selected PIDs during test.
- Select "Parameters - EPC."
- Select Value "0-620 kPa (0-90 psi)."
- Press "SEND" to send command.
- Select "XXX" to cancel at any time.
- Press "SEND."

OSC — Transmission DRIVE MODES

The DRIVE MODE allows control of three transmission parameters. Each mode/parameter has a unique set of vehicle operating requirements that the technician is required to meet before being allowed to operate OSC. The recommended procedure, when using the DRIVE MODE, is to control one parameter at a time.

The DRIVE MODE allows the technician to perform the following functions on the transmission:

- GR_CM - allows upshifts or downshifts.
- TCC - engages or disengages the torque converter clutch.
- EPC - increases/decreases EPC pressure.

GR_CM in DRIVE MODE

This OSC function is used to test the transmission shift functions.

The OSC functions for the GR_CM parameter allows the technician to choose the following options:

- [1] - PCM selects 1st gear.
- [2] - PCM selects 2nd gear.
- [3] - PCM selects 3rd gear.
- [4] - PCM selects 4th gear.
- [5] - PCM selects 5th gear.

OSC "GR_CM" Mode Operates ONLY when:

- VSS and digital TR sensor are operational.
- No VSS and digital TR sensor DTCs.
- Engine "ON."
- TCC "OFF."
- Transmission range selector lever on O/D.
- Vehicle Speed is greater than 2 mph.

OSC Command Values

- [1] - PCM selects 1st gear.
- [2] - PCM selects 2nd gear.
- [3] - PCM selects 3rd gear.
- [4] - PCM selects 4th gear.
- [5] - PCM selects 5th gear.
- [OFF] - turns solenoid off.
- [ON] - turns solenoid on.
- [XXX] - cancels OSC value sent.
- [SEND] - sends the values to PCM.

DRIVE MODE Procedure for GR_CM

Follow operating instructions from the NGS menu screen.

- Select "Output State Control."
- Select "Trans - DRIVE MODE."
- Select "PIDs" to be monitored.
- Monitor all selected PIDs during test.
- Select "Parameters - GR_CM."
- Select Value "1-5."
- Press "SEND" to send command.
- Re-Select Value "1-5."
- Press "SEND" to send command.
- Select "XXX" to cancel at any time.
- Press "SEND."

TCC in DRIVE MODE:

This OSC function is used to test whether the torque converter clutch is engaging and disengaging correctly.

The OSC functions for the TCC parameter allows the technician to choose the following:

- TCC - activates TCC OFF and ON.
- [ON] - turns TCC solenoid ON.
- [OFF] - turns TCC solenoid OFF.

OSC "TCC OFF" DRIVE MODE Operates ONLY when:

- VSS and digital TR sensors are operational.
- No VSS and digital TR sensor DTCs present.
- Engine ON.
- Transmission range selector lever in O/D.
- Vehicle speed is greater than 2 mph.

OSC "TCC ON" DRIVE MODE Operates ONLY when:

- VSS and digital TR sensors are operational.
- No VSS and digital TR sensor DTCs present.
- Engine ON.
- Transmission range selector lever in O/D.
- Vehicle speed is greater than 3.2 km/h (2 mph).
- Transmission in 2nd gear or higher.
- TFT is between 15-135°C (60 and 275°F).
- Brake not applied "OFF" below 32 mph (20 mph).
- (Not an excessive load on engine (engine lugging).

OSC Command Values

- [OFF] - turns TCC OFF.
- [ON] - turns TCC ON.
- [XXX] - cancels OSC value sent.
- [SEND] - sends the values to PCM.

Drive Mode Procedures for TCC

Follow operating instructions from the NGS menu screen.

- Select "Output State Control."
- Select "Trans - Drive Mode."
- Select "PIDs" to be monitored.
- Monitor all selected PIDs during test.
- Select "Parameters - TCC."
- Select "ON" to turn solenoid ON.
- Press "SEND" to send command ON.
- Select "OFF" to turn solenoid OFF.
- Press "SEND" to send command OFF.
- Select "XXX" to cancel at any time.
- Press "SEND."

EPC in DRIVE MODE

This OSC functions is used to increase the EPC pressure while testing the transmission shift functions. This

OSC functions can only increase the EPC pressure greater than what the PCM normally commands. If an OSC value, such as [75] or [90] PSI is sent, the upshifts and downshifts should exhibit a harsher shift. Harsher shifts would indicate that the EPC pressure control works at higher pressures. The best test for the EPC is to use the BENCH MODE and a hydraulic pressure gauge. Using EPC in the BENCH MODE will confirm that the EPC works at both the higher and lower pressures.

The OSC functions for the parameter EPC allows the technician to choose the following options:

- EPC - Activates EPC to selected
  - [00] - sets EPC pressure to 00 kPa (00 PSI).
  - [15] - sets EPC pressure to 103 kPa (15 PSI).
  - [30] - sets EPC pressure to 206 kPa (30 PSI).
  - [45] - sets EPC pressure to 310 kPa (45 PSI).
  - [60] - sets EPC pressure to 411 kPa (60 PSI).
  - [75] - sets EPC pressure to 517 kPa (75 PSI).
  - [90] - sets EPC pressure to 620 kPa (90 PSI).

OSC "EPC" DRIVE MODE Operates ONLY when:

- VSS and digital TR sensor are operational.
- No VSS and digital TR sensor DTCs.
- Transmission Range Selector Lever in O/D.
- Pressure gauge installed.
- Key ON.
- Engine ON.
- Vehicle speed greater than 2 mph.
- OSC value for EPC must be greater than what the PCM commands (see EPC PID).

OSC Command Values

- [00] - sets EPC pressure to 00 kPa (00 PSI).
- [15] - sets EPC pressure to 103 kPa (15 PSI).
- [30] - sets EPC pressure to 206 kPa (30 PSI).
- [45] - sets EPC pressure to 310 kPa (45 PSI).
- [60] - sets EPC pressure to 411 kPa (60 PSI).
- [75] - sets EPC pressure to 517 kPa (75 PSI).
- [90] - sets EPC pressure to 620 kPa (90 PSI).
- [OFF] -" turns solenoid off.
- [ON] - turns solenoid on.
- [XXX] - cancels OSC value sent.
- [SEND] - sends the values to PCM.

DRIVE MODE Procedure for EPC.

Follow operating instructions from the NGS menu screen.

- Select "Output State Control."
- Select "Trans - Drive Mode."
- Select "PIDs" to be monitored.
- Monitor all selected PIDs during test.
- Select "Parameters - EPC."

- Select Value "0-620 kPa (0-90 psi)."
- Press "SEND" to send command.
- Re-Select Value "0-620 kPa (0-90 psi)."
- Press "SEND" to send command.
- Select "XXX" to cancel at any time.
- Press "SEND."

Using Output State Control (OSC) and Accessing PIDs

To confirm that the OSC value was sent by the NGS and the EEC has accepted the OSC substitution, a corresponding PID for each OSC parameter must be monitored. Additional PIDs should be monitored to help the technician adequately diagnose the transmission.

The following is a list of OSC parameters and their corresponding PID:

OSC PARAMETER CHART

OSC Parameter	PID	Additional PIDs
SSA/SS1	SSA/SS1	SS1F
SSB/SS2	SSB/SS2	SS2F
TCC	TCC	TCCF, TCCMACT (do not use PID TCCMCMD during OSC)
EPC	EPC	—
GR_CM	GEAR	TRANRAT

To confirm that the OSC substitution occurred, SEND the OSC value and monitor the corresponding PID value. If no ERROR MESSAGE was received and the value of the corresponding PID remains the same as the value sent from OSC, then the OSC substitution was successful.

Transmission Drive Cycle Test

NOTE: Always drive the vehicle in a safe manner according to driving conditions and obey all traffic laws.

NOTE: The Transmission Drive Cycle Test must be followed exactly. Malfunctions must occur four times consecutively for shift error DTC code to be set, and five times consecutively for continuous torque converter clutch code to set.

NOTE: When performing the Transmission Drive Cycle Test, refer to the Solenoid Application Chart for proper solenoid operation.

After performing the Quick Test, use the Transmission Drive Cycle Test for checking continuous codes.

1. Record and then erase Quick Test codes.
2. Warm engine to normal operating temperature.
3. Make sure transmission fluid level is correct.
4. With transmission in Overdrive, moderately accelerate from stop to 80 km/h (50 mph). This allows the

transmission to shift into fourth gear. Hold speed and throttle open steady for a minimum of 15 seconds.

5. With transmission in Overdrive, press TCS (TCIL should illuminate) and moderately accelerate from stop to 64 km/h (40 mph). This allows the transmission to shift into third gear. Hold speed and throttle open steady for a minimum of 15 seconds (30 seconds above 4000 ft altitude).

6. Press TCS (TCIL should turn off) and accelerate from 64 km/h (40 mph) to 80 km/h (50 mph). This allows transmission to shift into fourth gear. Hold speed and throttle position steady for a minimum of 15 seconds.

7. With transmission in fourth gear and maintaining steady speed and throttle opening, lightly apply and release brake to operate stoplamps. Then hold speed and throttle steady for a minimum of five seconds.

8. Brake to a stop and remain stopped for a minimum of 20 seconds.

9. Repeat steps 4 through 8 at least five times.

10. Perform Quick Test and record continuous DTCs.

After On-Board Diagnostic

NOTE: The vehicle wiring harness, powertrain control module (PCM) (12A650) and non-transmission sensors may affect transmission operations. Repair these concerns first.

After the on-board diagnostic procedures are completed, repair all DTCs.

Begin with non-transmission related DTCs, then repair any transmission related DTCs. Refer to the Diagnostic Trouble Code Chart for information on condition and symptoms. This chart will be helpful in referring to the proper manual(s) and aids in diagnosing internal transmission concerns and external non-transmission inputs. The pinpoint tests are used in diagnosing transmission electrical concerns. Make sure that the vehicle wiring harness and the PCM are diagnosed as well. The Powertrain Control/Emissions Diagnosis (PC/ED) manual will aid in diagnosing non-transmission electronic components.

Before Pinpoint Tests

NOTE: Prior to entering pinpoint tests, check the powertrain control module (PCM) wiring harness for proper connections, bent or broken pins, corrosion, loose wires, proper routing, proper seals and their condition. Check the PCM, sensors and actuators for damage. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

NOTE: If a concern still exists after electrical diagnosis has been performed, refer to Diagnosis by Symptom in this section.

If DTCs appear while performing the on-board diagnostics, refer to the Diagnostic Trouble Code Chart for the appropriate repair procedure. Prior to entering pinpoint tests, refer to any TSBs and OASIS messages for transmission concerns.

Diagnostic Trouble Code Chart

Four Digit DTC	Component	Description	Condition	Symptom	Action
P0102 P0103 P1100 P1101	MAF	MAF concerns	MAF system has a malfunction which may cause a transmission concern.	High or low EPC pressure, incorrect shift schedule. Incorrect torque converter clutch engagement scheduling. Symptoms similar to a TP failure.	Refer to PC/ED
P0112	IAT	IAT indicates 125° C (257°F) (grounded)	Voltage drop across IAT exceeds scale set for temperature 125°C (257°F).	Incorrect EPC pressure, either high or low, results in harsh or soft shifts.	Refer to PC/ED
P0113	IAT	IAT indicates -40° C (-40°F) (open circuit)	Voltage drop across IAT exceeds scale set for temperature -40°C (-40°F).	Incorrect EPC pressure, either high or low, results in harsh or soft shifts.	Refer to PC/ED
P0114	IAT	IAT out of on-board diagnostic range	IAT temperature higher or lower than expected during KOEO and KOER.	Rerun on-board diagnostic at normal operating temperature.	Refer to PC/ED
P0117	ECT	ECT indicates 125°C (257°F)	Voltage drop across ECT exceeds scale set for temperature 125°C (257°F) (grounded).	Torque converter clutch will always be off, resulting in reduced fuel economy.	Refer to PC/ED
P0118	ECT	ECT indicates -40° C (-40°F)	Voltage drop across ECT exceeds scale set for temperature -40°C (-40°F) (open circuit).	Torque converter clutch will always be off, resulting in reduced fuel economy.	Refer to PC/ED
P0122 P0123 P1120	TP	TP concern	PCM has detected an error that may cause a transmission concern.	Harsh engagements, firm shift feel, abnormal shift schedule, torque converter clutch does not engage, torque converter clutch cycling.	Refer to PC/ED
P0300- P0308 P0320 P0340 P1351- P1364	EI	EI systems concerns	EI system has a malfunction which may cause a transmission concern.	Harsh engagements and shifts, late WOT shifts, no torque converter clutch engagement.	Refer to PC/ED
P0501 P0503 P0500 P1500 P1501	VSS	Insufficient VSS input	PCM detected a loss of vehicle speed signal during operation.	Torque converter clutch engages, shift engagement or disengagement (hunting) on grades.	Refer to PC/ED
P0705	Digital TR	Digital TR sensor	Digital TR sensor,	Increase in EPC	Refer to

	Sensor	malfunction	circuit or PCM indicates short.	pressure.	Pinpoint Test D .
P0707	Digital TR Sensor, Wiring, PCM	Digital TR sensor circuit below minimum voltage	Digital TR sensor, circuit or PCM shorted or grounded.	Increase in EPC pressure.	Refer to Pinpoint Test D .
P0708	Digital TR Sensor, Wiring, PCM	Digital TR sensor circuit above maximum voltage	Digital TR sensor, circuit or PCM indicates open.	Increase in EPC pressure.	Refer to Pinpoint Test D .
P0712	TFT, Wiring, PCM	157°C (315°F) indicated TFT sensor circuit grounded	Voltage drop across TFT sensor exceeds scale set for temperature of 157° C (315°F).	Firm shift feel.	Refer to Pinpoint Test B .
P0713	TFT, Wiring, PCM	-40°C (-40°F) indicated TFT sensor circuit open	Voltage drop across TFT sensor exceeds scale set for temperature -40°C (-40°F).	Firm shift feel.	Refer to Pinpoint Test B .
P0720	OSS	Insufficient input from output shaft speed sensor	PCM detected a loss of OSS signal during operation.	Harsh shifts, abnormal shift schedule, no torque converter clutch activation.	Refer to Pinpoint Test F .
P0721	OSS	Output shaft speed sensor signal noisy	PCM has detected an erratic OSS signal.	Harsh shifts, abnormal shift schedule, no torque converter clutch engagement.	Refer to Pinpoint Test F .
P0741 **	TCC, Internal Components	TCC slippage detected	The PCM picked up an excessive amount of slippage during normal vehicle operation.	TCC slippage/erratic or no torque converter clutch operation. Flashing TCIL.	Refer to Diagnosis by Symptom Index.
P0743 *	TCC, Wiring, PCM	TCC solenoid circuit failure during on-board diagnostic	TCC solenoid circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	Short circuit: engine stalls in second (OD, 2 range) at low idle speeds with brake applied. Open circuit: torque converter clutch never engages.	Refer to Pinpoint Test A .
P0750 *	SSA/SS1, Wiring, PCM	SSA/SS1 solenoid circuit failure	SSA/SS1 circuit failed to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	Improper gear selection depending on condition mode and manual lever position. See Solenoid On/Off chart.	Refer to Pinpoint Test A .
P0751	SSA/SS1, Wiring, PCM	Shift solenoid A (1) functional failure	Mechanical or hydraulic failure of the shift solenoid.	Improper gear selection depending on failure mode manual lever position.	Refer to Solenoid On/Off chart. Refer to Pinpoint Test A .

P0755 *	SSB/SS2, Wiring, PCM	SSB/SS2 solenoid circuit failure	SSB/SS2 circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during on-board diagnostic.	Improper gear selection depending on condition mode and manual lever position. See Solenoid On/Off chart.	Refer to Pinpoint Test A .
—	TCIL	TCIL circuit failure	TCIL circuit open or shorted.	Failed on, OD cancel mode on. No flashing TCIL for EPC failure or sensor. Failed off, OD cancel mode never indicated. No flashing TCIL for EPC sensor failure.	Refer to PC/ED
P0756	SSB/SS2	Shift solenoid B (2) functional failure	Mechanical or hydraulic failure of the shift solenoid.	Improper gear selection depending on failure mode and manual lever position.	Refer to Solenoid On/Off chart. Refer to Pinpoint Test A .
P0781 **	SSA/SS1 or internal parts	1-2 shift error	Engine rpm drop not detected when 1-2 shift was commanded by PCM.	Improper gear selection depending on failure or mode and manual lever position. Shift errors may also be due to other internal transmission concerns (stuck valves, damaged friction material).	Refer to Solenoid On/Off Charts. Refer to Pinpoint Test A .
P0782 **	SSA/SS1, SSB/SS2 or internal parts	2-3 shift error	Engine rpm drop not detected when 2-3 shift was commanded by PCM.	Improper gear selection depending on failure or mode and manual lever position. Shift errors may also be due to other internal transmission concerns (stuck valves, damaged friction material).	Refer to Solenoid On/Off Charts. Refer to Pinpoint Test A .
P0783 **	SSA/SS1, SSB/SS2 or internal parts	3-4 shift error	Engine rpm drop not detected when 3-4 shift was commanded by PCM.	Improper gear selection depending on failure or mode and manual lever position. Shift errors may also be due to other internal transmission concerns (stuck valves, damaged friction material).	Refer to Solenoid On/Off Charts. Refer to Pinpoint Test A .
P1116	ECT	ECT out of on-board diagnostic range	ECT temperature higher or lower than expected during KOEO and KOER.	Rerun on-board diagnostic at normal operating temperature.	Refer to PC/ED
P1124	TP	TP voltage high/low for on-	TP was not in the correct position for	Rerun at appropriate throttle position per	Refer to PC/ED

		board diagnostic	on-board diagnostic.	application.	
P1460	A/C	A/C clutch cycling pressure switch error	A/C or defrost on condition may result from A/C clutch being on during on-board diagnostic.	DTC set during on-board diagnostic, rerun with A/C off. Failed on, EPC pressure slightly low with A/C OFF.	Refer to PC/ED
P1703	BPP	BPP switch circuit failed.	Brake ON/OFF circuit failure.	Failed ON or not connected — torque converter clutch will not engage at less than 1/3 throttle. Failed OFF or not connected — torque converter clutch will not disengage when brake is applied.	Refer to PC/ED
P1703	BPP	Brake not actuated during on-board diagnostic	Brake not cycled during KOER.	Failed OFF or not connected — torque converter clutch will not engage at less than 1/3 throttle. Failed OFF or not connected — torque converter clutch will not disengage when brake is applied.	Refer to PC/ED
P1705	Digital TR Sensor	Digital TR sensor not indicating Park during KOEO	On-board diagnostic not run in Park.	Rerun on-board diagnostic in Park.	Refer to Pinpoint Test D .
P1710	TFT	TFT sensor in range malfunction	PCM detected TFT not changing.	Firm shift, TCIL flashing, increase in EPC.	Refer to Pinpoint Test B .
P1711	TFT	TFT out of on-board diagnostic range	Transmission not at operating temperature during on-board diagnostic.	Warm vehicle to normal operating temperature.	Refer to Pinpoint Test B .
P1714	SSA/SS1, Internal Components	SSA/SS1 malfunction	Mechanical failure of the solenoid detected.	Improper gear selection depending on condition, mode and manual lever position. See Solenoid Operation Chart.	Refer to Pinpoint Test H .
P1715	SSB/SS2	SSB/SS2 malfunction	Mechanical failure of the solenoid detected.	Improper gear selection depending on condition, mode and manual lever position. See Solenoid Operation Chart.	Refer to Pinpoint Test H .
P1728	Trans	Trans slip error	The PCM has detected an excessive amount of slippage during normal operation.	Transmission slippage/erratic or no torque clutch operation.	Refer to Diagnosis by Symptom Index.
P1740	TCC	TCC malfunction	Mechanical failure of the solenoid detected.	Failed ON — Engine stalls in 2nd (O/D, Manual 2 ranges) at low idle speeds with brake applied. Failed OFF —	Refer to Pinpoint Test H .

				Torque Converter never applies.	
P1741 **	TCC, Internal Components	Excessive torque converter clutch engagement error	Excessive variations in slip (engine speed surge) across the torque converter clutch.	Engine rpm oscillation is present in 3rd gear.	Refer to Pinpoint Test A .
P1742	TCC, Internal Components	TCC solenoid failed ON	TCC solenoid has failed on by electric, mechanical or hydraulic concern.	Harsh shifts.	Refer to Pinpoint Test A .
P1743	TCC, Internal Components	TCC solenoid failed ON	TCC solenoid has failed on by electric, mechanical or hydraulic concern.	Harsh shifts.	Refer to Pinpoint Test A .
P1744	TCC	TCC	The PCM picked up an excessive amount of TCC slippage during normal vehicle operation.	TCC slippage/erratic or no torque converter clutch operation.	Refer to Diagnosis by Symptom Index.
P1746 *	EPC, Wiring, PCM	Shorted PCM output driver	Voltage through EPC solenoid is checked. An error will be noted if tolerance is exceeded.	Open circuit causes maximum EPC pressure, harsh engagements and shifts.	Refer to Pinpoint Test E .
P1747 *	EPC, Wiring, PCM	EPC solenoid circuit failure, shorted circuit or output driver	Voltage through EPC solenoid is checked. An error will be noted if tolerance is exceeded.	Short circuit causes minimum EPC pressure (minimum capacity) and limits engine torque (alternate firm).	Refer to Pinpoint Test E .
P1751 **	SSA/SS1	Shift solenoid A (1) functional failure	Mechanical or hydraulic failure of the shift solenoid.	Improper gear selection depending on failure mode and manual lever position.	Refer to Solenoid On/Off chart. Refer to Pinpoint Test A .
P1756 **	SSB/SS2	Shift solenoid B (2) functional failure	Mechanical or hydraulic failure of the shift solenoid.	Improper gear selection depending on failure mode and manual lever position.	Refer to Solenoid On/Off chart. Refer to Pinpoint Test A .
P1767	TCC	TCC solenoid circuit failure during OBD Test	TCC solenoid circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM Driver failure during OBD Test.	Short Circuit: engine stalls in second (O/D, 2 range) at low idle speeds with brake applied. Open Circuit: Torque Converter never engages.	Refer to Pinpoint Test A .
P1780	TCS	TCS not changing states	TCS not cycled during self-test. TCS	Rerun on-board diagnostic and cycle	Refer to PC/ED

			circuit open or shorted.	switch. No OD cancel when switch is cycled.	
P1783	TFT	Transmission overtemperature condition indicated	Transmission fluid temperature exceeded 127°C (270°F).	Increase in EPC pressure.	Refer to Pinpoint Test B .

* Output circuit check, generated only by electrical symptoms.
** May also be generated by some other non-electric transmission hardware system.

PC/ED = Powertrain Control/Emissions Diagnosis (PC/ED) manual

Rotunda Transmission Tester

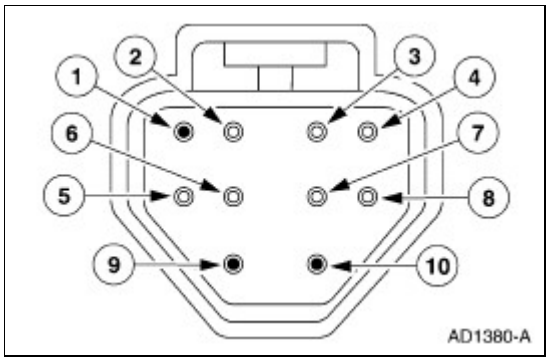
NOTE: Use the AODE transmission tester overlay to diagnose the 4R70W transmission.

The Rotunda Transmission Tester is used to diagnosis electronically controlled transmission and is used in conjunction with the pinpoint tests. The tests should be performed in order. Installing the Rotunda Transmission Tester allows separation of the vehicle electronics from transmission electronics; refer to the Rotunda Transmission Tester manual for these tests.

- Bench Testing - Engine Off
- Resistance/Continuity Test
- Solenoid Voltage Test
- Dynamic Testing - Engine On
- EPC Solenoid
- Transmission Engagements
- Upshifts/Downshifts
- Torque Converter Clutch (TCC) Engagement
- Output Shaft Speed (OSS) Sensor
- Digital Transmission Range (TR) Sensor Testing
- Resistance/Continuity Test
- Voltage Test - Park/Neutral, Backup Lamp, and Optional Circuits

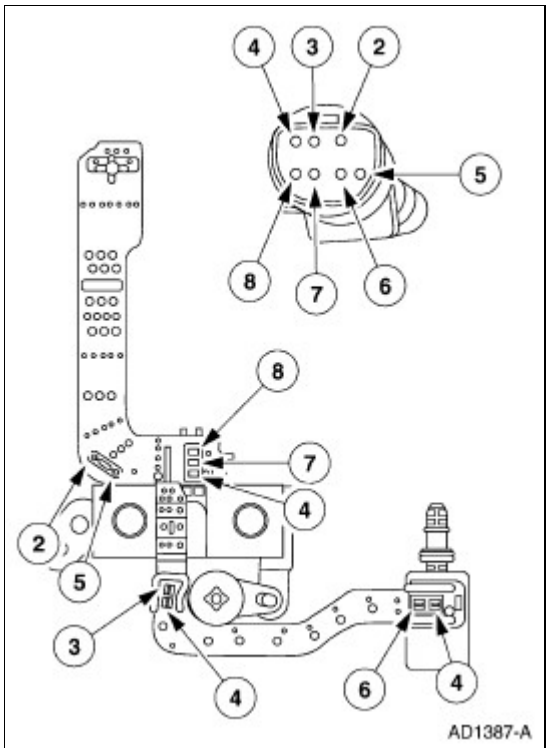
Transmission Connector Layouts

Transmission Vehicle Harness Connector



Pin Number	Circuit	Circuit Function
1	—	NOT USED
2	359 (GY/R)	Signal Return
3	473 (R/LB)	Torque Converter Clutch (TCC) Solenoid
4	361 (R)	Vehicle Power
5	923 (O/BK)	Transmission Fluid Temperature (TFT) Input
6	925 (W/Y)	Electronic Pressure Control (EPC) Solenoid
7	237 (O/Y)	Shift Solenoid 1
8	315 (P/O)	Shift Solenoid 2
9	—	NOT USED
10	—	NOT USED

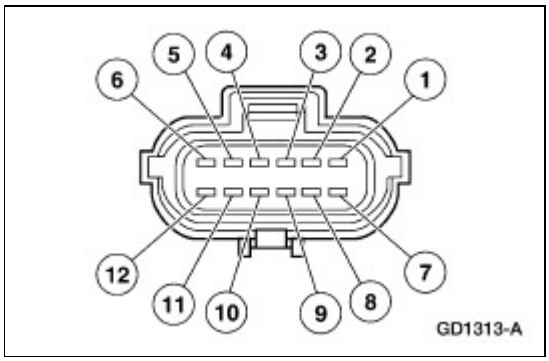
Transmission Internal Harness



Item	Part Number	Description

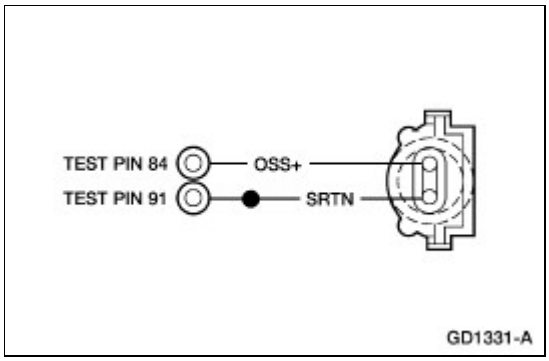
1	—	Not Used
2	—	Signal Return-Transmission Fluid Temperature (TFT)
3	—	Torque Converter Clutch (TCC)
4	—	Vehicle Power-Shift Solenoid
5	—	Transmission Fluid Temperature (TFT)
6	—	Electronic Pressure Control (EPC)
7	—	SSA/SS1
8	—	SSB/SS2
9	—	Not Used
10	—	Not Used

Digital Transmission Range (TR) Sensor Connector



Pin Number	Circuit	EEC-V Pin Number	Circuit Function
1	—	—	NOT USED
2	359 (GY/R)	91	Signal Return
3	199 (LB/Y)	64	TR3A
4	1144 (Y/BK)	3	TR1
5	1145 (LB/BK)	49	TR2
6	1143 (W/BK)	50	TR4
7	—	—	NOT USED
8	—	—	NOT USED
9	1040 (R/BK)	—	Fused Power Feed
10	32 (R/LB)	—	Starter Control
11	140 (BK/PK)	—	Back Up
12	33 (W/PK)	—	Starter to Starter Interrupt Relay

Output Shaft Speed Sensor (OSS) Harness Connector



Pinpoint Tests

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 replace as required.

Shift Solenoids Pre-Diagnosis

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

Solenoid Operation Chart

Gear Lever Position	PCM Commanded Gear	Solenoids		
		SSA/ SS1	SSB/ SS2	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
[a] 1	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 (7G484) electrically or hydraulically stuck off.

	Gear Lever Position		
SSA/SS1 ALWAYS OFF:	**(D)**	**2**	**1**
PCM Gear Commanded	**Actual Gear Obtained**		
1	2	2	2
2	2	2	2
3	3	2*	2*
4	3	2*	2*

*No engine braking.

	Gear Lever Position		
SSB/SS2 ALWAYS OFF:	**(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.

	Gear Lever Position		
SSA/SS1 ALWAYS ON:	**(D)**	**2**	**1**
PCM Gear Commanded	**Actual Gear Obtained**		
1	1	1	1
2	1	1	1
3	4	2*	2*
4	4	2*	2*

*No engine braking.

SSB/SS2 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 (TCC) CLUTCH SOLENOIDS

CONDITIONS	DETAILS/RESULTS/ACTIONS
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.	
A1 ELECTRONIC DIAGNOSTICS	
1  2  P R N D 2 1 4  New Generation STAR (NGS) Tester 5  6	3 Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in connector and in good condition before proceeding.

Diagnostic Data Link

7

PCM

8

Active Command Modes

9

Output State Control (OSC)

10

Trans-Bench Mode

- **Does vehicle enter Trans-Bench Mode?**

→ **Yes**
REMAIN in Trans-Bench Mode. GO to A2 .

→ **No**
REPEAT procedure to enter Trans-Bench Mode. If vehicle did not enter Trans-Bench Mode, REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM or NGS.

A2 WIGGLE TEST

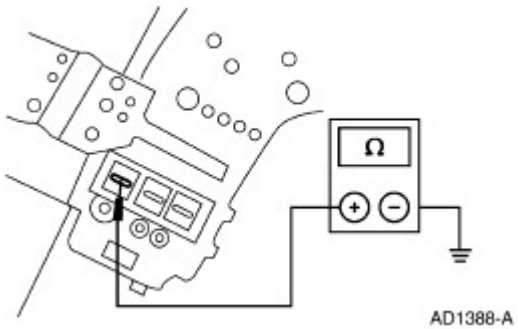
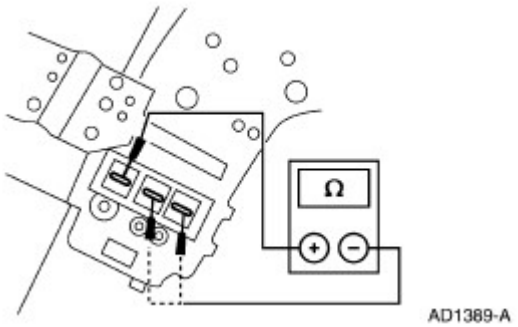
1 Remain on Trans-Bench Mode.

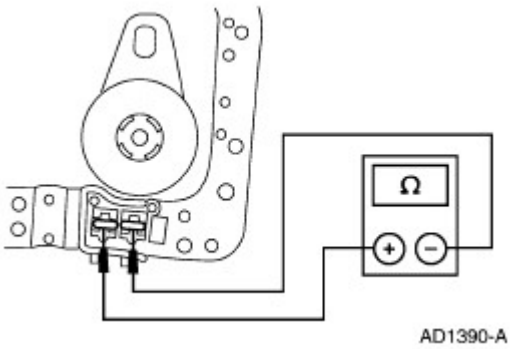
2 Select PIDs to be monitored.

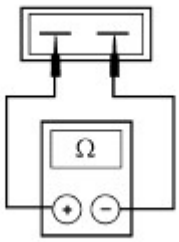
PID Command	PID Actual
SSA	SS1F
SSB	SS2F
TCC	TCCF

3 Select "ON" to turn suspect solenoid on.

	4 Press "SEND". 5 Wiggle all wiring and connectors to the transmission. Monitor the Solenoid State for changes. 6 Select "OFF" to turn solenoid off. 7 Press "SEND". • **Does the suspect solenoid(s) fault state change?** → **Yes** REPAIR open or short in the vehicle harness or connector. → **No** GO to A3.
A3 SOLENOID FUNCTIONAL CHECK	
	1 Monitor each solenoid state. 2 Turn each solenoid ON and OFF. • **Does the solenoid turn ON and OFF when commanded and can solenoid activation be heard?** → **Yes** GO to A4. → **No** GO to A5.
A4 OSC TRANS-DRIVE MODE (GR_CM OR TCC)	
	1 Perform OSC Trans-Drive Mode. 2 Select GR_CM for Shift Solenoids or follow procedures for GR_CM as listed in this section. 3 Select TCC for Torque Converter Clutch Solenoid. Follow procedures of TCC in Drive Mode as listed in this section. • **Does the transmission upshift and downshift or torque converter engage/disengage when commanded?** → **Yes** CLEAR all DTCs. Road test to verify if concern is still present. If concern is still present, REFER to Diagnosis by Symptom to diagnose shift or torque converter concern.

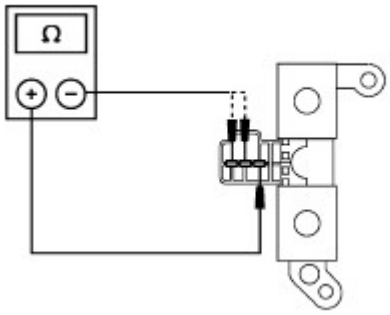
	→ **No** GO to A5.
A5 CHECK FOR BATTERY VOLTAGE	
3  4  AD1388-A	1 Remove transmission fluid pan. 2 Visually inspect the lead frame and connectors for damage. 4 Connect DVOM positive lead to VPWR solenoid terminal and negative lead to a good ground. • **Is the battery voltage present?** → **Yes** GO to A6. → **No** CHECK for open or short circuit in harness, or solenoid.
A6 ELECTRICAL SIGNAL CHECK	
1  AD1389-A 2  Trans-Bench Mode	1 Leave positive lead connected to VPWR solenoid terminal and connect negative lead to the signal terminal of the appropriate solenoid.

	3 Select Parameter SSA/SS1, SSB/SS2 or TCC. 4 Select "ON". 5 Press "SEND". 6 Turn the solenoids ON and OFF, while monitoring the voltage reading on the DVOM, solenoid state on the NGS (ON and OFF), listen for the solenoid to activate (click).
7 	7 Connect the positive lead to VPWR terminal and the negative lead to the TCC terminal.
8 	8 Select Parameter TCC. 9 Select "ON". 10 Press "SEND". 11 Turn the solenoid ON and OFF, while monitoring the voltage reading on the DVOM, solenoid state on the NGS (ON and OFF). Listen for the solenoid to activate (click). 12 Select "OFF", press "SEND". • **Does the voltage and solenoid state change?** → **Yes** GO to A7 . → **No** CHECK for open or short circuit in harness, solenoid or a PCM concern.
A7 CHECK SOLENOID RESISTANCE AT SOLENOID	
2	1 Disconnect the appropriate solenoid from the lead frame. 2 Check solenoid resistance by connecting an ohmmeter at the terminals of the solenoid.



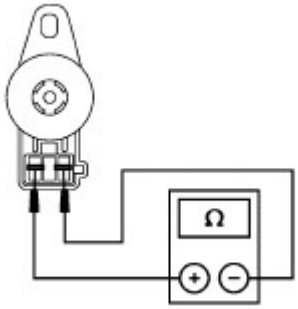
GD3386-A

3



AD1391-A

4



AD1392-A

5 Measure and record the resistance for each solenoid (SSA/SS1, SSB/SS2 or TCC).

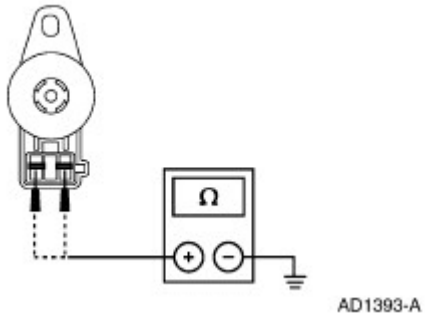
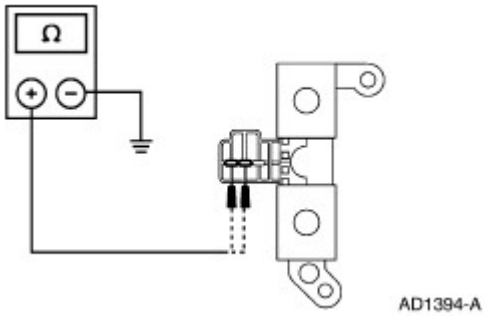
Solenoid	Resistance (ohms)
SSA/SS1	20-30
SSB/SS2	20-30
TCC	10-16

- **Is the resistance within specification?**

→ **Yes**
GO to A8 .

→ **No**
REPLACE the solenoid.

A8 CHECK SOLENOID FOR SHORT TO GROUND

1  AD1393-A 2  AD1394-A	1 Check for continuity between engine ground and appropriate solenoid terminal with ohmmeter or other low current tester (less than 200 milliamps). Connection should show infinite resistance (no continuity). **Solenoid** / **Terminal** SSA/SS1 +/- SSB/SS2 +/- TCC +/- • **Is there continuity?** → **Yes** REPLACE the solenoid. → **No** REFER to Diagnosis by Symptom for diagnosis of shift or torque converter concerns.

PINPOINT TEST B: TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: Refer to the Transmission Internal Harness Illustration preceding these pinpoint tests.	
B1 ELECTRONIC DIAGNOSTICS	
2  New Generation STAR (NGS) Tester 3	1 Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in connector and in good condition before proceeding.

4 Select Diagnostic Data Link.

5 Select PCM.

6 Select PID/Data Monitor and Record.

7

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 Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM and NGS.

B2 WARM-UP/COOL-DOWN CYCLE

1 While monitoring the TFT PIDs, perform the following test: If transmission is cold, run transmission to warm it up. If transmission is warm, allow transmission to cool down.

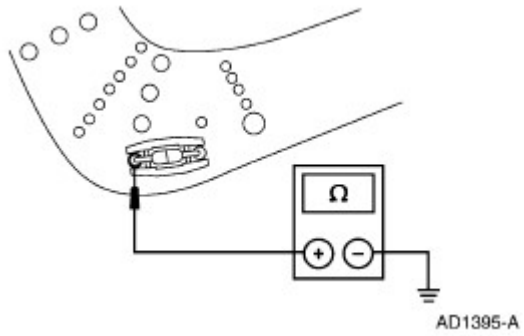
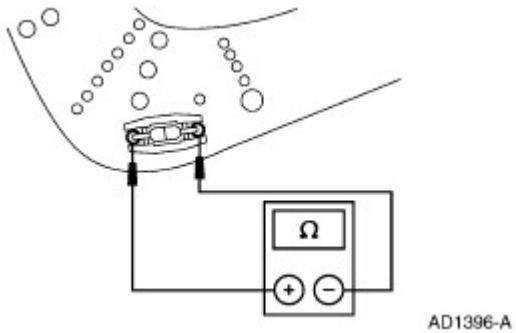
- **Do the TFT PIDs increase as the transmission is warmed up or decrease as the transmission is cooled or does the TFT or TFTV drop in and out of range?**

→ **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 ELECTRICAL SIGNAL CHECK

3  AD1395-A	1 Remove transmission fluid pan. 2 Visually inspect the lead frame and connectors for damage. 3 Connect DVOM positive lead to +TFT at sensor terminal and negative lead to a good ground. • **Is the voltage present?** → **Yes** GO to B4 . → **No** CHECK for open or short circuit in vehicle harness, internal harness or a PCM concern.
B4 CHECK RESISTANCE OF TFT SENSOR	
1  Transmission Harness 2  AD1396-A	2 Connect DVOM across +TFT and -TFT terminals at transmission connector. 3 Record the resistance. 4 Resistance should be approximately in the following ranges: **Transmission Fluid Temperature** **°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

- **Is the resistance in the range?**

→ **Yes**
REFER to Diagnosis by Symptom Index to diagnose an overheating concern.

→ **No**
REPLACE internal harness (sensor is part of harness).

Pinpoint Test C

Does not apply.

PINPOINT TEST D: DIGITAL TRANSMISSION RANGE (TR) SENSOR

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: Refer to the Digital Transmission Range (TR) Sensor Connector Illustration preceding these pinpoint tests.	
D1 VERIFY DIGITAL TRANSMISSION RANGE SENSOR ALIGNMENT	
1  2  5	3 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. 4 Apply the parking brake.

6 Verify the shift linkage is adjusted in the OVERDRIVE (O/D) position.

7

8 Verify that the digital TR Sensor Alignment Tool fits in the appropriate slots.

- **Is the digital TR sensor properly adjusted?**

→ **Yes**
GO to D2 .

→ **No**
ADJUST the digital TR sensor; refer to Digital Transmission Range (TR) Sensor—Adjustment in this section.

D2 CHECK ELECTRICAL SIGNAL OPERATION

1

2

Digital TR Sensor

2 **CAUTION: Do not pry on connector. This will damage the connector and result in a transmission concern.**

Press button and pull out on the digital TR harness connector.

3 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?**

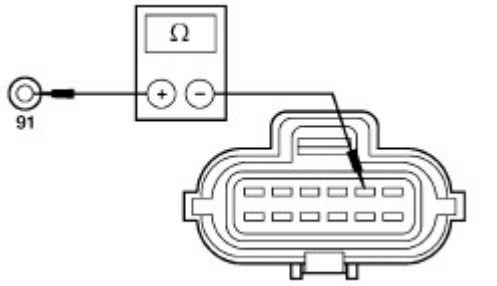
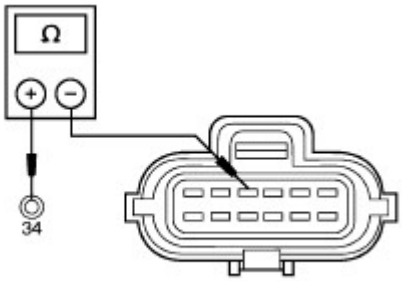
→ **Yes**
REPAIR as required. CLEAR DTCs and RERUN OBD Tests.

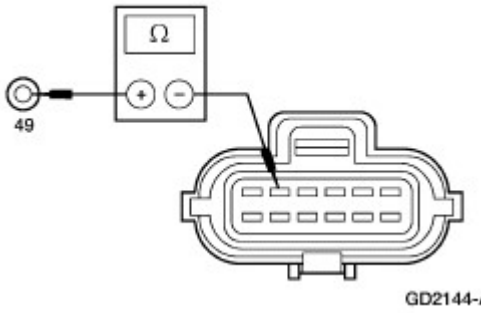
→ **No**
If diagnosing a DTC, GO to D3 .

If diagnosing a starting concern, a backup lamp

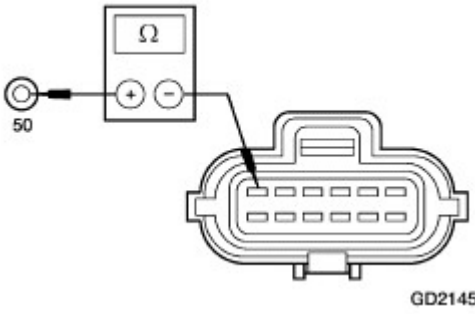
	concern, GO to D8 .
D3 CHECK ELECTRICAL SYSTEM OPERATION (TR AND PCM)	
1  2  New Generation Star (NGS) Tester 3  Digital TR Sensor 4  5  TR PIDS TR, TR_D	6 Move transmission range selector lever into each gear and stop. 7 Observe the PIDs, TR and TR_D, while wiggling harness and tapping on sensor. 8 Compare the PIDs to the chart below: **Selector Position / TR / TR_D** Park / P/N / 0000 Reverse / REV / 1100 Neutral / NTRL / 0110 Drive / O/D * / 1111 Man 2 / MAN2 / 1001 Man 1 / MAN1 / 0011 * Will read "DRIVE" if O/D cancel switch is "ON." • **Do the PIDs TR and TR_D match the above chart, and does the TR_D PID remain steady when the harness is**

	wiggled or when the sensor is tapped upon? → **Yes** The problem is not in the digital TR sensor system. REFER to Diagnosis by Symptom for further diagnosis. → **No** If TR_D changes when wiggling harness or tapping on the sensor, problem may be intermittent. GO to D4 .
D4 CHECK DIGITAL TRANSMISSION RANGE SENSOR OPERATION	
1  Digital TR Sensor 2  TR-E Cable to Transmission Tester 3  TR-E Cable to Digital TR Sensor	4 Place the DIGITAL TR Overlay onto Transmission Tester. 5 Perform SENSOR Test as instructed on the digital TR Overlay. • **Does the status lamp on the tester TRS-E cable match the selected gear positions?** → **Yes** Concern is not in the digital TR sensor, GO to D5 . → **No** REPLACE the digital TR sensor and ADJUST; refer to Digital Transmission Range (TR) Sensor—Adjustment in this section. CLEAR DTCs and RERUN OBD Tests.
D5 CHECK PCM HARNESS CIRCUITS FOR OPENS	

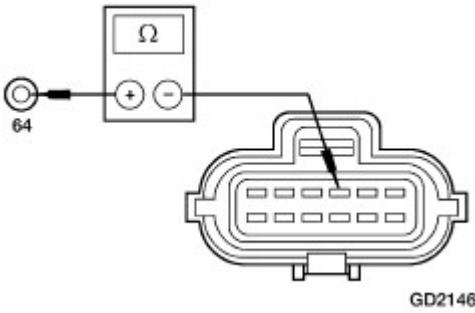
1 	
2  Powertrain Control Module (PCM)	2 Inspect for damaged or pushed out pins, corrosion or loose wires.
3  Digital TR Sensor	3 **CAUTION: Do not pry the connector. This will damage the connector and result in a transmission concern.** Disconnect the digital TR sensor connector.
4  104-Pin Breakout Box	
5  GD2142-A	5 Measure the resistance between the PCM test pin 91 at the 104-Pin Breakout Box and signal return circuit pin at vehicle harness connector pin 2.
6  AD1665-A	6 Measure the resistance between the PCM test pin 34 at the 104-Pin Breakout Box and TR1 circuit pin at vehicle harness connector pin 4.
7	7 Measure the resistance between the PCM test pin 49 at the 104-Pin Breakout Box and TR2 circuit pin at vehicle harness connector pin 5.



8 Measure the resistance between the PCM test pin 50 at the 104-Pin Breakout Box and TR4 circuit pin at vehicle harness connector pin 6.



9 Measure the resistance between the PCM test pin 64 at the 104-Pin Breakout Box and TR3A circuit pin at vehicle harness connector pin 3.



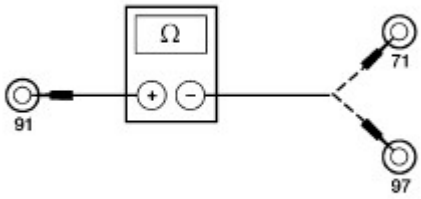
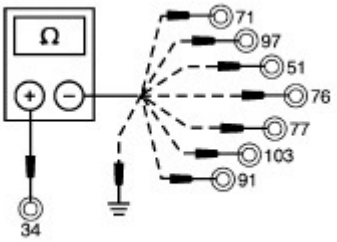
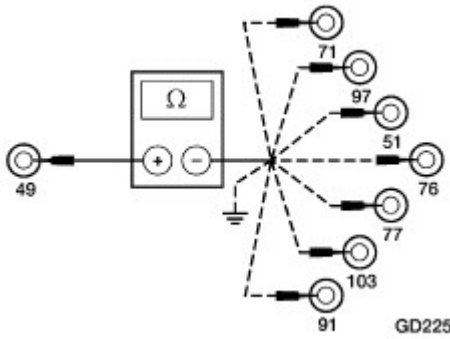
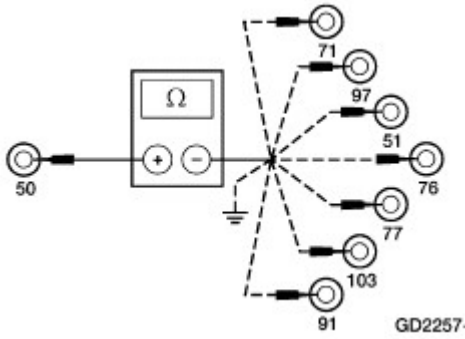
- **Are all resistances less than 5 ohms?**

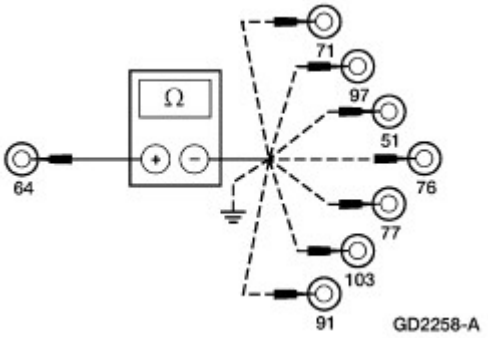
→ **Yes**
GO to D6 .

→ **No**
REPAIR open circuit(s). RECONNECT all components. CLEAR DTCs. RERUN OBD Tests.

D6 CHECK PCM HARNESS CIRCUITS FOR SHORT TO GROUND OR POWER

1 Measure the resistance between PCM test pin 91 and test pins 71 and 97 at the 104-Pin Breakout Box.

 GD2254-A	
2  AD1664-A	2 Measure the resistance between PCM test pin 3 and test pins 71, 97, 51, 76, 77, 103, and 91 at the 104-Pin Breakout Box and ground.
3  GD2256-A	3 Measure the resistance between PCM test pin 49 and test pins 71, 97, 51, 76, 77, 103, and 91 at the 104-Pin Breakout Box and ground.
4  GD2257-A	4 Measure the resistance between PCM test pin 50 and test pins 71, 97, 51, 76, 77, 103, and 91 at the 104-Pin Breakout Box and ground.
5	5 Measure the resistance between PCM test pin 64 and test pins 71, 97, 51, 76, 77, 103, and 91 at the 104-Pin Breakout Box and ground.



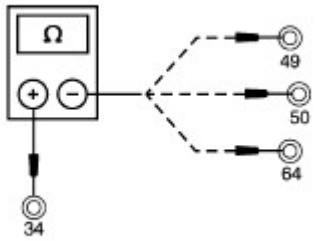
- **Are all resistances greater than 10,000 ohms?**

→ **Yes**
GO to D7 .

→ **No**
REPAIR short circuit(s). RECONNECT all components. CLEAR DTCs. RERUN OBD Tests.

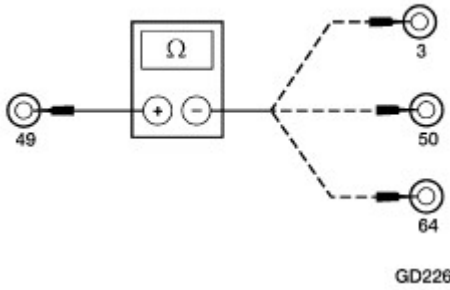
D7 CHECK FOR SHORT BETWEEN TR/PCM INPUT SIGNAL CIRCUITS

1



1 Measure the resistance between test pin 34 and pins 49, 50, and 64 at the 104-Pin Breakout Box.

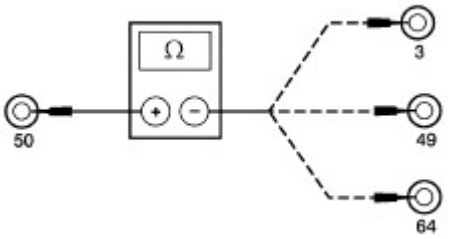
2



2 Measure the resistance between test pin 49 and pins 3, 50, and 64 at the 104-Pin Breakout Box.

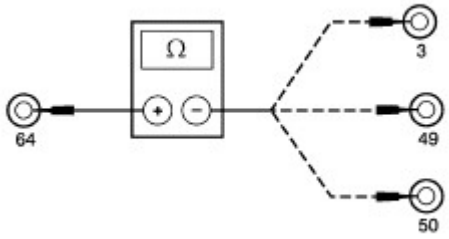
3

3 Measure the resistance between test pin 50 and pins 3, 49, and 64 at the 104-Pin Breakout Box.



GD2261-A

4



GD2262-A

4 Measure the resistance between test pin 64 and pins 3, 49, and 50 at the 104-Pin Breakout Box.

- **Are all the resistances greater than 10,000 ohms?**

→ **Yes**
REPLACE the PCM. RECONNECT all components. CLEAR DTCs and RERUN OBD Tests.

→ **No**
REPAIR shorts on circuits having less than 10,000 ohms between other TR/PCM input signal circuits. RECONNECT all components. CLEAR DTCs and RERUN OBD Tests.

D8 CHECK THE NON-PCM INTERNAL CIRCUITS OF SENSOR

1

TRS-E Cable to Transmission

2

TRS-E Cable to Digital TR Sensor

3 Place the DIGITAL TR Overlay onto Transmission Tester.

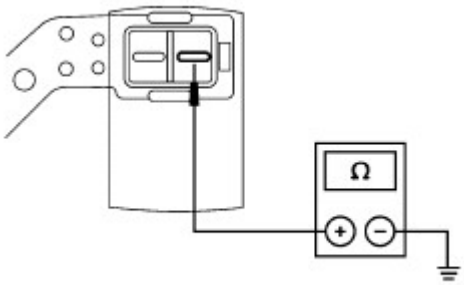
4 Perform SWITCH Test as instructed on the

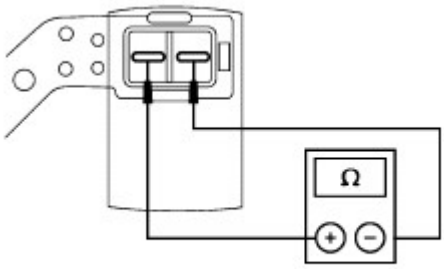
	digital TR Overlay. • **Does the status lamp on the tester indicate RED for the correct gear position?** → **Yes** Concern is not in the digital TR sensor. For Start System concerns, REFER to Section 303-06 . For Backup Lamp concerns, GO to Section 417-01 . For Optional Circuits; REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis. → **No** REPLACE the digital TR sensor and ADJUST; refer to Digital Transmission Range (TR) Sensor—Adjustment in this section. Clear DTCs and RERUN OBD Tests.

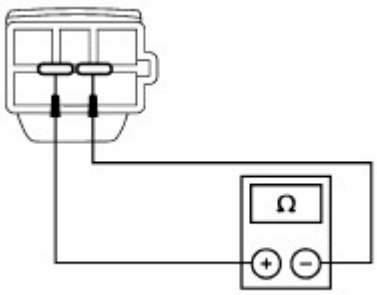
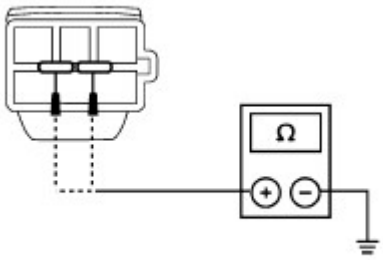
PINPOINT TEST E: ELECTRICAL PRESSURE CONTROL (EPC) SOLENOID

CONDITIONS	DETAILS/RESULTS/ACTIONS
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).	
E1 ELECTRONIC DIAGNOSTICS	
1  2  4  New Generation STAR (NGS) Tester 5 	3 Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in the connector and in good condition before proceeding.

6  Diagnostic Data Link 7  PCM 8  Active Command Modes 9  Output State Control (OSC) 10  Trans-Bench Mode	• **Does the vehicle enter the Trans-Bench Mode?** → **Yes** REMAIN in Trans-Bench Mode. GO to E2 . → **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 or NGS.
E2 SOLENOID FUNCTIONAL TEST	
3  Parameter; EPC	1 Install 300 psi pressure gauge into EPC tap. 2 Monitor pressure gauge. 4 Select value - 15, 30, 45, 60, 70 or 90 PSI.

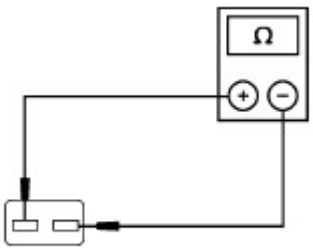
8  XXX	5 Press "SEND". 6 Select another value "0-90 psi". 7 Press "SEND". 9 Press "SEND". • **Does the pressure reading match the commanded pressure?** → **Yes** CLEAR DTCs. → **No** GO to E3 .
E3 CHECK FOR BATTERY VOLTAGE	
3  4  AD1397-A	1 Remove transmission fluid pan. 2 Visually inspect the lead frame connectors for damage. 4 Connect DVOM positive lead to VPWR solenoid terminal and negative lead to a good ground. • **Is the battery voltage present?** → **Yes** GO to E4 . → **No** CHECK for open or short circuit in harness.
E4 ELECTRICAL SIGNAL CHECK	

1  AD1398-A	1 Leave positive lead connected to VPWR solenoid terminal and connect negative lead to the signal terminal of the EPC solenoid.
	2 Turn the solenoids ON and OFF, while monitoring the voltage reading on the DVOM, solenoid state on the NGS (ON and OFF), listen for the solenoid to activate (click).
3  Trans-Bench Mode	
4  Parameter; EPC	
	5 Select a value "0-90 psi". 6 Press "SEND". 7 Select another value "0-90 psi". 8 Press "SEND".
9  XXX	
	10 Press "SEND". • **Does the voltage and solenoid state change?** → **Yes** GO to E5 . → **No** CHECK for open or short circuit in harness or PCM.
E5 CHECK SOLENOID RESISTANCE AT SOLENOID	

1  Transmission Harness 2  AD1399-A	2 Check solenoid resistance by connecting an ohmmeter at the terminals of the solenoid. 3 Measure and record the resistance of the EPC solenoid. Resistance should be between 2.48-5.66 ohms. • **Is the resistance within specifications?** → **Yes** GO to E6 . → **No** REPLACE the solenoid.
E6 CHECK SOLENOID FOR SHORT TO GROUND	
1  AD1400-A	1 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). **Solenoid** / **Terminal** EPC / +/- • **Is there continuity?** → **Yes** REPLACE the solenoid. → **No** REFER to Diagnosis by Symptom Index in this section for diagnosis of pressure concerns.

PINPOINT TEST F: OUTPUT SHAFT SPEED (OSS) SENSORS

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: Refer to the Output Shaft Speed Sensor (OSS) Harness Connector Illustration preceding these pinpoint tests.	
F1 ELECTRONIC DIAGNOSTICS	
2  New Generation STAR (NGS) Tester 3  4  Diagnostic Data Link 5  PCM	1 Check to make sure the transmission harness connector is fully seated, terminals are fully engaged in connector and in good condition before proceeding. 6 Select PID/Data Monitor and Record. 7 Select the following PID: 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 the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM or NGS.
F2 DRIVE CYCLE TEST	
	1 While monitoring the appropriate sensor 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 or is the sensor signal erratic (drop to zero or near zero and return to normal operation)?** → **Yes** If the 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 Index. If the sensor signal is erratic, INSPECT for intermittent concern in the internal/external harness, sensor, or connector. → **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. If the sensor signal is steady, GO to F3.
F3 CHECK RESISTANCE OF OSS SENSOR	
2  AD1084-B	1 Disconnect the appropriate vehicle harness connector from the OSS sensor. 2 Connect ohmmeter negative lead to one pin of the sensor and the positive lead to the other pin on the sensor. 3 Record the resistance. Resistance should be as follows: **Sensor** / **Resistance (ohms)** OSS / 450-750 • **Is the resistance within specification for the appropriate sensor?** → **Yes** REFER to Diagnosis by Symptom Index for

	concern diagnosis. → **No** REPLACE OSS sensor.

Pinpoint Test G

Does not apply.

PINPOINT TEST H: SOLENOID MECHANICAL FAILURE

CONDITIONS	DETAILS/RESULTS/ACTIONS
NOTE: Repair all other DTCs before repairing the following DTCs: P1714, P1715, P1740.	
H1 ELECTRONIC DIAGNOSIS	
1  New Generation STAR (NGS) Tester	2 Perform KOEO test until continuous DTCs have been displayed. 3 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 PERFORM transmission Drive Cycle Test. RERUN Quick Test. → **No** REPLACE the appropriate solenoid and/or body; REFER to the Diagnostic Trouble Code Chart for code description. GO to H2.
H2 TRANSMISSION DRIVE CYCLE TEST	
	1 Perform transmission drive cycle test. 2 Perform 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.

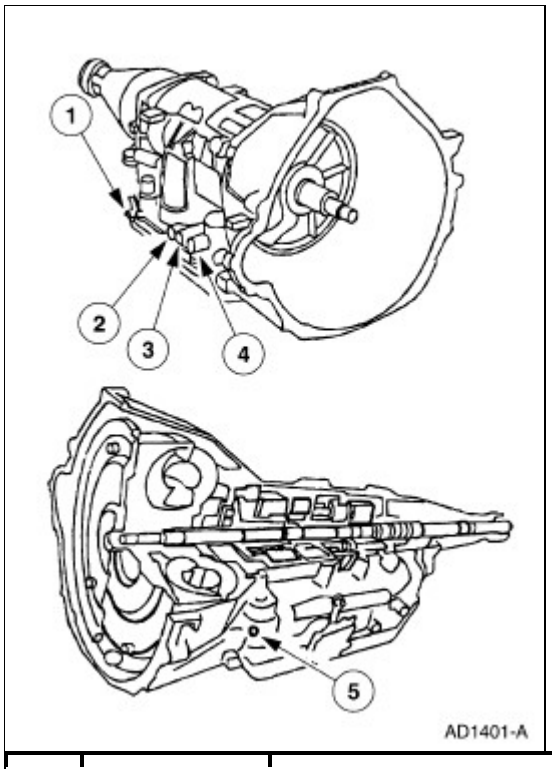
H3 RETRIEVE DTCS	
1  New Generation STAR (NGS) Tester	2 Perform KOEO test until continuous DTCs have been displayed. • **Are DTCs P1714, P1715, P1740 still present?** → **Yes** REPLACE PCM. Road test and RERUN Quick Test. → **No** Testing completed. If a concern still exists, REFER to the Diagnosis by Symptom Index for concern diagnosis.

Special Testing Procedures

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

Engine Idle Speed Check

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the engine idle speed.



Item	Part Number	Description
1	—	Direct Clutch Pressure Tap
2	—	Forward Clutch Pressure Tap
3	—	Electronic Pressure Control (EPC) Pressure Tap
4	—	Intermediate Clutch Pressure Tap
5	—	Line Pressure Tap

Line Pressure Test

CAUTION: Perform the line pressure test prior to performing the stall speed test. If the line pressure is low at stall, do not perform stall speed test or further transmission damage will occur. Do not maintain WOT in any transmission range for more than five seconds.

This test verifies that the line pressure is within specification.

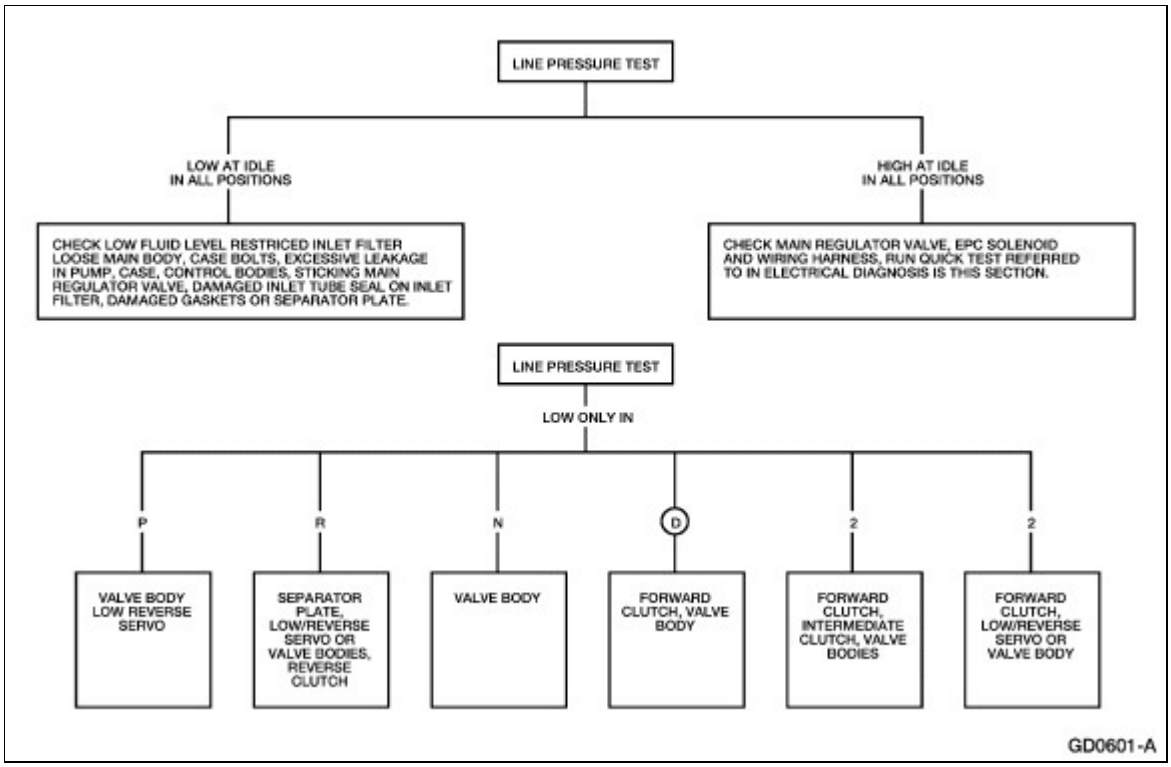
1. Connect pressure gauge to line pressure tap.
2. Start engine and check line pressures. Refer to the Line Pressure Chart to determine if line pressure is within specification.

Line Pressure Chart

Range	Idle		WOT Stall	
	EPC	Line Pressure	EPC	Line Pressure
P, N, OD, 2, 1	103-172 kPa (15-25 psi)	379-648 kPa (55-94 psi)	572-641 kPa (83-93 psi)	1103-1448 kPa (160-210 psi)
R	0-62 kPa (0-7 psi)	372-662 kPa (54-92 psi)	572-641 kPa (83-93 psi)	1427-1841 kPa (207-267 psi)

3. If line pressure is not within specification, check EPC pressure.
4. Connect pressure gauge to EPC pressure tap.
5. Restart engine and check EPC pressure. Refer to the Line Pressure Chart for specifications.
6. If EPC pressure is not within specification, perform Pinpoint Test E to diagnose EPC operation. If EPC operation is OK, refer to Line Pressure Diagnosis Chart for line pressure concern causes.

Line Pressure Diagnosis Chart



Stall Speed Test

WARNING: Apply the parking brake firmly while performing each stall test.

CAUTION: Perform Line Pressure Test prior to performing Stall Test. If the line pressure is low at stall, do not perform Stall Test or further transmission damage will occur.

The stall speed test checks:

- torque converter clutch operation and installation.
- holding ability of the forward clutch.
- reverse clutch (the low-reverse bands).
- planetary one-way clutch.
- engine performance.

Conduct this test with the engine coolant and transmission fluid at proper levels and at normal operating temperature.

Apply the parking brake firmly for each stall speed test.

1. Find the specified stall rpm for the vehicle; refer to Stall Speed Diagnosis Chart. Use a grease pencil to mark the rpm on the dial of a tachometer.

Stall Speed Chart

Stall Speed RPM
2116-2471

2. Connect a tachometer to the engine.

3. **NOTE:** If the rpm recorded by the tachometer exceeds the maximum limits, release the accelerator pedal immediately because clutch or band slippage is indicated.

   In each of the following ranges (D), 2, 1, R, press the accelerator pedal to the floor and hold it just long enough to let the engine get to wide open throttle (WOT). While making this test, do not hold the throttle open for more than 5 seconds at a time.

4. Note the results in each range.

5. After each range, move the shift control selector lever to Neutral and run the engine at 1000 rpm for about 15 seconds to cool the torque converter (7902) before making the next test.

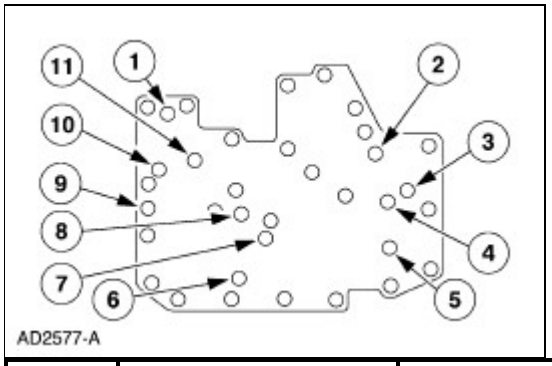
6. Refer to the stall speed diagnosis chart for corrective actions.

Stall Speed Diagnosis Chart

Selector Position	Stall Speeds High	Stall Speeds Low
(D)	Planetary One-Way Clutch	
(D), 2 and 1	Forward Clutch or Intermediate Clutch	
(D), 2, 1 and R	Perform Pressure Test	Torque Converter Stator One-Way Clutch or Engine Performance
R	Reverse Clutch or Low Reverse Band or Servo	

Air Pressure Tests

Transmission Air Test Plate



Item	Part Number	Description
1	—	Converter Bypass
2	—	Direct Clutch

3	—	Forward Clutch
4	—	2-3 Accumulator Top
5	—	2-3 Accumulator Bottom
6	—	Overdrive Servo Apply
7	—	Reverse Servo
8	—	Overdrive Servo Release
9	—	Intermediate Clutch
10	—	Reverse Clutch
11	—	1-2 Accumulator Apply

A no-drive condition can exist even with correct transmission fluid pressure because of inoperative clutches or bands. An erratic shift can be located through a series of checks by substituting air pressure for fluid pressure to determine the location of the malfunction.

Follow the procedure to determine the location of the inoperative clutch or band by introducing air pressure into the various test plate passages.

NOTE: Use only dry, regulated (276 kPa [40 psi] maximum) air pressure.

Apply air to the appropriate passage(s). A dull thud should be felt or heard or movement could be observed when the clutch component applies. There should be no hissing sound when the component is applied.

Cover the vent hole in the test plate with a clean, lint-free shop towel to prevent spray when the air is applied. Plugging the vent hole during testing will result in inaccurate results.

7. Drain transmission fluid and remove the transmission fluid pan.

8. Remove the main control valve body.

9. Install Transmission Test Plate and gasket. Tighten bolts to 9-11 Nm (87-90 lb/in).

10. **NOTE:** Do not apply air to the test plate vent hole.

    Apply air to the appropriate clutch port (refer to the Transmission Air Test Plate illustration). A dull thud may be heard or movement felt when the component is applied or released. If clutch seals or check balls are leaking a hissing sound may be heard.

If the servos do not operate, disassemble, clean and inspect them to locate the source of the concern.

If air pressure applied to the clutch passages fails to operate a clutch, or operates clutches simultaneously, inspect the fluid passages in the case.

If air pressure applied to the accumulator fails to operate an accumulator, remove and inspect case passages and piston.

Direct Clutch Pressure Test

The direct clutch pressure test will diagnose a low-pressure condition or leakage in the direct clutch circuit. A difference of 103 kPa (15 psi) or more between direct clutch pressure and line pressure (read at the forward clutch pressure tap) will prevent a normal 3-4 shift.

1. **CAUTION: Pressure gauges affect the shift quality of the transmission. Care should be taken not to accelerate or decelerate rapidly. Possible transmission failure could result.**

   Attach 0-2000 kPa (0-300 psi) pressure gauges to the forward clutch pressure tap and to the direct clutch pressure tap. Gauges must be accurate enough to distinguish a 103 kPa (15 psi) difference. (If this test is done in conjunction with a control pressure test, pressure gauges will be attached to all pressure taps.) Have sufficient flexible hose available to read the gauges in the vehicle.

2. Drive the vehicle. When pressure is applied to the direct clutch, note the difference between the pressure read at the forward clutch pressure tap and the direct clutch pressure.

3. If the difference in pressures is less than 103 kPa (15 psi), the direct clutch circuit is OK.

4. If the difference is greater than 103 kPa (15 psi), there could be a leak in the direct clutch pressure circuit. If the difference does not exceed 103 kPa (15 psi), the gauges on the line pressure and direct clutch pressure can be switched to confirm that gauge calibration differences is not the cause.

Leakage Inspection

CAUTION: Do not try to stop the fluid leak by increasing the torque beyond specifications. This may cause damage to the case threads.

Check the vehicle speed sensor (VSS) and the speedometer cable connection at the transmission. Replace rubber seal if necessary.

Leakage at the transmission fluid pan to case gasket often can be stopped by tightening the attaching bolts to 13-15 Nm (115-132 lb/in). If necessary, replace the oil pan case gasket.

Check the fluid filler tube connection at the transmission case. If leakage is found here, install a new grommet.

Check fluid lines and fittings between the transmission and the cooler in the radiator tank for looseness, wear, or damage. If leakage cannot be stopped by tightening a fluid tube nut, replace the damaged parts. When fluid is found leaking between the case and cooler line fitting, check for missing or damaged O-ring, then tighten the fitting to maximum specification.

If the leak continues, replace cooler line fitting and tighten to specification. The same procedure should be followed for fluid leaks between the radiator cooler and the cooler line fittings in this section; refer to Section 307-02 .

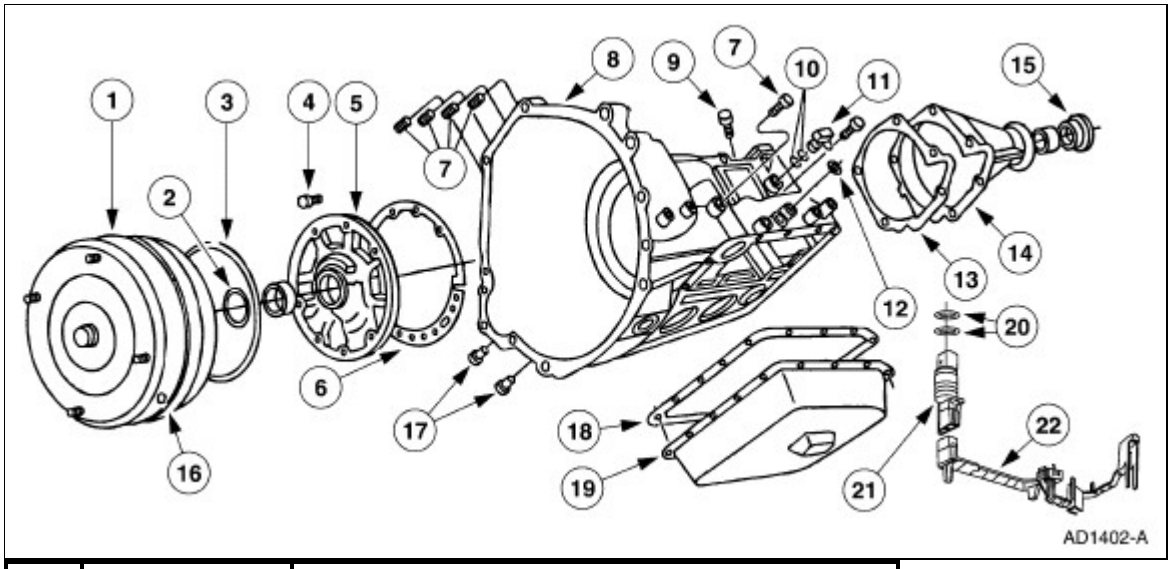
Check the engine coolant in the radiator. If transmission fluid is present in the coolant, the cooler in the radiator is probably leaking.

The cooler can be further checked for leaks by disconnecting the lines for the cooler fittings and applying no more than 345 kPa (50 psi) air pressure to the fittings. Remove the radiator cap to relieve the pressure buildup at the exterior of the oil cooler tank. If the cooler is leaking and/or will not hold pressure, replace the cooler.

If leakage is found at the transmission range selector lever, replace the seal.

If leakage is found at the transmission internal harness connector, replace O-ring.

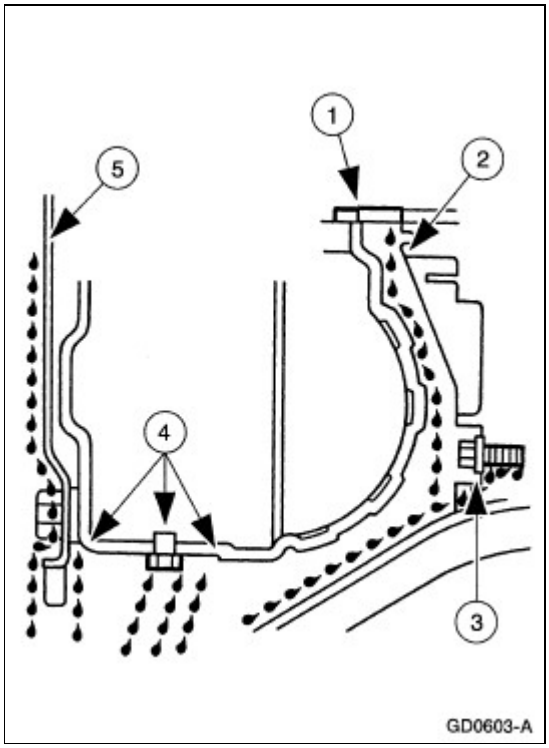
4R70W External Sealing



Item	Part Number	Description
1	7902	Torque Converter
2	7A248	Front Pump Seal
3	7A248	Front Pump Seal
4	N605789-S100	Bolt
5	7A106	Front Pump Body Assembly
6	7A136	Pump Gasket
7	390318-S100	Pipe Plug — 1/8 — 27 Dryseal Tapered
8	7005	Case
9	7034	Vent
10	7Z101	Turbine Speed Sensor Seal
11	7H103	Output Shaft Speed (OSS) Sensor
12	7B498	Manual Control Lever Seal Assembly
13	7086	Extension Housing Gasket
14	7A039	Extension Housing
15	7052	Oil Seal
16	87650-S2	Plug — Converter Drain — 1/8 — 27 Dryseal
17	7D273	Oil Tube Connector
18	7A191	Pan to Case Gasket (Reuseable)
19	7A194	Transmission Fluid Pan
20	7Z276	O-Ring Seal
21	7G276	Bulkhead Assembly Wiring Connector
22	7G276	Bulkhead Assembly Wiring Connector, Molded

Fluid Leakage in Torque Converter Area

In diagnosing and correcting fluid leaks in the front pump support and gear (7A103) and torque converter area, use the following procedures to locate the exact cause of the leakage. Leakage at the front of transmission, as evidenced by fluid around the torque converter housing, may have several sources. By careful observation it is possible, in many instances, to pinpoint the source of leak before removing the transmission from the vehicle. The paths which the fluid takes to reach the bottom of the torque converter housing are shown in the illustration. The five steps following correspond with the numbers in the illustration.



1. Fluid leaking by the front pump seal lip will tend to move along the impeller hub and onto the back of the impeller housing. Except in the case of a total seal failure, fluid leakage by the lip of the seal will be deposited on the inside of the torque converter housing only, near the outside diameter of the housing.

2. Fluid leakage by the outside diameter of the front pump seal and front pump body will follow the same path that leaks by the inside diameter of the front pump seal follow.

3. Fluid that leaks by a front pump to case bolt or pump gasket will be deposited on the inside of the torque converter housing only. Fluid will not be deposited on the back of the torque converter.

4. Fluid leakage from the converter drain plug, (model dependent) converter seal weld or stud weld will appear at the outside diameter of the torque converter, on the back face of the flexplate, and in the converter housing only near the flexplate. Fluid leaks from the torque converter will leave a ring of fluid around the inside of the torque converter housing.

5. **NOTE:** White facial tissue paper may aid in determining the color (red is transmission fluid) and source of the leaking fluid.

   Engine oil leaks are sometimes improperly diagnosed as transmission pump gasket leaks. The following areas of possible leakage should also be checked to determine if engine oil leakage is causing the concern.

a. Leakage at the valve cover gasket (6584) may allow oil to flow over the torque converter housing or seep down between the torque converter housing and cylinder block (6010) causing oil to be present

in or at the bottom of the torque converter housing.
b. Oil galley plug leaks will allow oil to flow down the rear face of the cylinder block to the bottom of the torque converter housing.
c. Leakage at the crankshaft rear oil seal (6701) will work back to the flexplate, and then into the torque converter housing.
d. Leakage at oil pressure sensor (9278).

Leak Check Test

1. Remove the fluid level indicator (7A020) and note the color of the fluid. Original factory fill fluid is dyed red to aid in determining if leakage is from the engine or transmission. Unless a considerable amount of makeup fluid has been added or the fluid has been changed, the red color should assist in pinpointing the leak.

2. Remove the torque converter housing cover. Clean off any fluid from the top and bottom of the torque converter housing, front of the case (7005) and rear face of the engine and oil pan (6675). Clean the torque converter area by washing with a suitable nonflammable solvent and blow dry with compressed air.

3. Wash out the torque converter housing, the front of the flexplate and the converter drain plugs. The torque converter housing may be washed out using cleaning solvent and a squirt-type oil can. Blow all washed areas dry with compressed air.

4. Start and run the engine until the transmission reaches its normal operating temperature. Observe the back of the cylinder block and top of the torque converter housing for evidence of fluid leakage. Raise the vehicle on a hoist; refer to Section 100-02 and run the engine at fast idle, then at engine idle, occasionally shifting to the Overdrive and Reverse ranges to increase pressure within the transmission. Observe the front of the flexplate , back of the cylinder block (in as far as possible), and inside the torque converter housing and front of the case. Run the engine until fluid leakage is evident and the probable source of leakage can be determined.

Leak Check Test With Black Light Used With 12 Volt Master UV Diagnostic Inspection Kit

Oil soluble aniline or fluorescent dyes premixed at the rate of 2.5ml (1/2 teaspoon) of dye powder to 0.235L (1/2 pint) of transmission fluid have proved helpful in locating the source of fluid leakage. Such dyes may be used to determine whether an engine oil or transmission fluid leak is present, or if the fluid in the fluid cooler leaks into the engine cooling system. A black light must be used with the fluorescent dye solution.

Transmission Fluid Cooler—Oil to Air

CAUTION: Whenever a transmission has been disassembled to replace worn or damaged parts the cooler bypass valve (CBV), all transmission fluid coolers (in tank and auxiliary) and transmission fluid cooler lines must be cleaned and backflushed. Use the torque converter/oil cooler cleaner.

NOTE: Cleaning and backflushing the transmission fluid cooling system along with the following all the normal cleaning and inspection procedures as outlined in this section during disassembly and reassembly will keep contamination from reentering the transmission and causing a repeat repair.

When internal wear or damage has occurred in the transmission, metal particles, clutch plate material, or band material may have been carried into the torque converter and transmission fluid cooler (7A095). These contaminants are a major cause of recurring transmission troubles and must be removed from the system before the transmission is put back into use.

Transmission Fluid Cooler or Tube Replacement

Refer to Section 307-02 .