2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### 2002 AUTOMATIC TRANSMISSIONS

#### **5R55W/S Diagnosis**

# **APPLICATION**

WARNING: Vehicles are equipped with Supplemental Inflatable Restraint (SIR) system. When servicing vehicle, use care to avoid accidental air bag deployment. SIR system-related components are located in various locations throughout interior and exterior of vehicle, depending on application. Do not use electrical test equipment on or near these circuits. If necessary, deactivate SIR system before servicing components. See AIR BAG DEACTIVATION PROCEDURES article in GENERAL INFORMATION.

#### **TRANSMISSION APPLICATION**

Application	Transmission Model
Ford Explorer (4.0L & 4.6L)	5R55W/S
Mercury Mountaineer (4.0L & 4.6L)	5R55W/S

# IDENTIFICATION

The 5R55W/S 5-speed automatic transmission can be identified by the vehicle certification label, located on driver's door post. This label contains the transmission letter code under space marked TR (next to space marked AXLE). Letter code for 5R55S transmission is "V". Letter code for 5R55W transmission is "R". Transmission can also be identified by service identification tag attached to transmission case. See <u>Fig. 1</u> and <u>Fig. 2</u>.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis



#### Fig. 1: Identifying 5R55W/S Transmission & Component Locations Courtesy of FORD MOTOR CO.





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#### **Fig. 2: Identifying Service Identification Tag Information** Courtesy of FORD MOTOR CO.

# **DESCRIPTION & OPERATION**

## INTRODUCTION

The 5R55W/S is an electronically controlled 5-speed automatic transmission. Transmission has the following features: a 4-element torque converter with Torque Converter Clutch (TCC), 3 compound planetary gear sets, 3 bands, 3 multi-plate clutches and 2 one-way clutches. The letter "S" within transmission code describes a synchronous shift transmission. The letter "W" within transmission code describes a wide ratio transmission.

Powertrain Control Module (PCM) controls transmission operation through 4 On/Off solenoids for shifting, one Pulse-Width Modulated (PWM) solenoid for Torque Converter Clutch (TCC) control and 3 Pressure Control (PC) solenoids (PC-A, PC-B and PC-C) for line pressure control, band and clutch application pressure. PCM has built-in self-diagnosis, fail-safe operations mode, and warning code display for the main input sensors and solenoid valves.

Input signals from sensors are sent to PCM. PCM can determine when the time and conditions are right for a shift or converter clutch application.

### ELECTRONIC CONTROL SYSTEM

### NOTE: For engine-related DTCs, see appropriate SELF-DIAGNOSTICS article in

Sunday, September 10, 2017 11:43:09 AM	Page 3	© 2005
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#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

# **ENGINE PERFORMANCE.** These DTCs pertain to engine performance and must be repaired first, as engine performance and related component signals will affect transmission operation and diagnosis.

#### **Diagnostic Formats**

Diagnostic Trouble Codes (DTCs) are retrieved using QUICK TEST. Three types of DTCs are stored: Key On Engine Off (KOEO), Key On Engine Running (KOER) and continuous memory codes. See **<u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. During QUICK TEST, PCM performs 3 self-tests to retrieve DTCs. See <b><u>RETRIEVING DTCS</u>**. DTCs may be cleared from PCM memory after they have been recorded or repaired. See <u>**CLEARING DIAGNOSTIC TROUBLE**</u> **<u>CODES</u>** under SELF-DIAGNOSTIC SYSTEM.

#### **Retrieving DTCs**

DTCs are retrieved from EEC-V system through 16-pin Data Link Connector (DLC). DLC is located below center of instrument panel. Self-diagnostic test procedures are for use with New Generation Star (NGS) tester. If a generic scan tool is used, ensure scan tool is OBD-II certified. Refer to scan tool manufacturer's operating procedures. Once DTCs are recorded, diagnostic tests are used to locate and repair problem. See **DIAGNOSTIC TESTS**.

#### Key On, Engine Off (KOEO) Self-Test

KOEO self-test is a functional test of PCM performed with ignition switch turned to ON position, engine off. This test checks if PCM input and output devices are functioning electronically without any faults. KOEO selftest displays on-demand hard DTCs. These DTCs usually are electrical open and/or short circuits and must be serviced first, before any other type of DTCs. A fault must be present at time of testing for KOEO self-test to detect a fault.

#### Key On, Engine Running (KOER) Self-Test

# NOTE: PCM will not perform KOER self-test if any KOEO DTCs are present and not repaired.

KOER self-test is a functional test of PCM performed with ignition key on, engine running. A check of certain input and output devices is made during operating conditions and normal operating temperature. The Brake Pedal Position (BPP) switch, Power Steering Pressure (PSP) switch and Transmission Control Switch (TCS) tests are part of KOER self-test and must be performed during this operation (if applicable). See <u>BPP</u> <u>SWITCH, PSP SWITCH & TCS TEST PROCEDURES</u>. A fault must be present at time of testing for KOER on-demand self-test to detect a fault.

#### BPP Switch, PSP Switch & TCS Test Procedures

This test ensures EEC-V system is able to detect a change of state in BPP switch, PSP switch and TCS. During KOER self-test, the brake pedal must be applied and then released, TCS must be cycled, and steering wheel must be turned at least 1/4 of a revolution.

#### **Continuous Memory Self-Test**

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### **NOTE:** Continuous memory self-test may also be known as memory test.

Continuous memory self-test is a functional test of PCM performed under any condition (engine running or engine off) with ignition switch turned to ON position. Unlike KOEO and KOER self-tests which can only be activated on demand, continuous memory is always active in monitoring the system. When a fault is detected, DTC will be stored in memory. This makes it possible to diagnose intermittent faults. Memory codes should be serviced last, after all other DTCs.

There are 2 types of continuous memory DTCs. Emission related DTCs will illuminate the Malfunction Indicator Light (MIL) on instrument cluster. Non-emission DTCs will never illuminate MIL. On emissionrelated MIL DTCs, PCM will store DTC in continuous memory at first detection of problem. The MIL will not be illuminated, but DTC is considered by PCM to be a pending DTC. If same problem is detected in next drive cycle, MIL will illuminate. MIL will go out if fault is not present after 3 consecutive drive cycles, or PCM has been reset. An emission-related pending DTC or non-emission DTC will be erased after 40-80 warm-up cycles or PCM reset.

#### **INPUT DEVICES**

#### Air Conditioning Clutch Switch

On factory installed A/C system, PCM receives signal voltage from Air Conditioning Clutch (ACC) switch indicating that the air conditioning compressor clutch is engaged. PCM uses the ACC switch signal to adjust line pressure to compensate for additional engine load. If ACC switch fails with closed contacts, line pressure will be slightly lower with air conditioning off. If ACC switch fails with open contacts, line pressure will be slightly higher with air conditioning on.

#### **Brake Pedal Position Switch**

PCM receives a signal from the Brake Pedal Position (BPP) switch when the brake switch is operated. Torque converter clutch is disengaged when brakes are applied. Malfunctioning switch will affect torque converter operation.

#### **Digital Transmission Range Sensor**

The Digital Transmission Range (DTR) sensor is located on outside of transmission at manual lever. See <u>Fig.</u> <u>1</u>. The DTR sensor opens or closes a set of 4 switches that are monitored by the PCM. The internal switch signal corresponds with position of the gearshift lever. DTR sensor completes the neutral/start and back-up lights circuits. Malfunction of the DTR sensor may cause harsh engagements and firm shift feel. Improper shifting or shift selection, no back-up lights, and/or no engine cranking may also result.

#### Engine Coolant Temperature Sensor

Engine coolant temperature signal is sent to PCM. Malfunctioning Engine Coolant Temperature (ECT) sensor will affect torque converter clutch operation.

#### Intake Air Temperature Sensor

Intake air temperature signal is sent to PCM. Malfunctioning Intake Air Temperature (IAT) sensor will affect

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

control pressure, causing either harsh or soft shifts.

#### **Mass Airflow Sensor**

A Mass Airflow (MAF) sensor malfunction will affect transmission performance. MAF signal is used for control pressure, shift and TCC scheduling.

#### **Output Shaft Speed Sensor**

The Output Shaft Speed (OSS) sensor is a magnetic pickup located on outside of transmission case at output shaft ring gear. See <u>Fig. 1</u>. OSS sensor sends output shaft speed signal to PCM. OSS sensor is used for Torque Converter Clutch (TCC) control, shift scheduling and to determine control pressure. Malfunctioning OSS sensor may cause harsh engagements, firm shift feel or abnormal shift schedule. Unexpected downshifts may occur at closed throttle. TCC may not engage.

#### Profile Ignition Pick-Up Signal

The Crankshaft Position (CKP) sensor sends crankshaft position information to the Ignition Control Module (ICM), which generates a Profile Ignition Pick-Up (PIP) (engine RPM) signal and sends it to PCM. The PIP signal helps PCM determine transmission strategy, Wide Open Throttle (WOT) shift control, TCC control and control pressure.

#### Throttle Position Sensor

The Throttle Position (TP) sensor is a potentiometer mounted to the engine throttle body. PCM receives a signal from the TP sensor relaying throttle plate position. TP sensor is used for shift scheduling, control pressure and TCC control. TP sensor failure will cause PCM to operate in fail safe mode, and PCM will raise line pressure to prevent transmission damage. This condition will result in harsh engagements, firm shift feel, abnormal shift schedule, and TCC not engaging or cycling.

#### **Transmission Control Indicator Light**

Transmission Control Indicator Light (TCIL) is located in instrument panel and is labeled O/D OFF. It is illuminated in conjunction with Transmission Control Switch (TCS). See <u>TRANSMISSION CONTROL</u> <u>SWITCH</u>. TCIL will flash if PC solenoid is open, shorted to voltage or grounded, or if fault has been detected in monitored sensor used for transmission operation.

#### **Transmission Control Switch**

Transmission Control Switch (TCS) is a momentary contact switch that allows driver to cancel operation of 5th gear (Overdrive). TCS is located on gearshift lever handle. When driver presses TCS, a signal is sent to PCM. PCM uses shift solenoids to disengage or disable 5th gear operation and activate coast clutch. PCM also illuminates TCIL to notify driver that 5th gear is canceled. When TCS is pressed again, 5th gear operation is enabled, coast clutch is released and TCIL is turned off. When ignition switch is cycled (vehicle shut off and then started again), TCS is turned off and 5th gear will be enabled.

#### Transmission Fluid Temperature Sensor

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

The Transmission Fluid Temperature (TFT) sensor is located on the solenoid valve body. PCM monitors voltage across the TFT sensor thermistor to determine transmission fluid temperature. Depending on temperature, PCM regulates control pressure, shift scheduling and TCC operation. Malfunction of sensor will cause incorrect line pressure and possible lack of TCC operation.

#### **Turbine Shaft Speed Sensor**

The Turbine Shaft Speed (TSS) sensor is a magnetic pick-up that sends turbine shaft speed signal to PCM. TSS sensor is located on transmission case. See <u>Fig. 1</u>. Malfunction of sensor may cause increased engine RPM on engagements, harsh shifts or delayed shifts with hard apply.

#### **Intermediate Shaft Speed Sensor**

The Intermediate Shaft Speed (ISS) sensor is a magnetic pick-up that sends planetary sun gear speed information to PCM. The ISS sensor is mounted externally on center of transmission case. See <u>Fig. 1</u>. PCM uses ISS sensor information to aid in determining pressure requirements.

#### **OUTPUT DEVICES**

#### Pressure Control (PC-A, PC-B & PC-C) Solenoids

- 1. PC solenoids are variable-force type solenoids. Variable-force type solenoid is an electrohydraulic actuator combining a solenoid and regulating valve. Line pressure tap is used to verify output pressure from PC-A or PC-B solenoid by turning either one off while verifying output from other solenoid.
- 2. Pressure control tap is used to verify output pressure from PC-C solenoid. There are 3 PC solenoids (PC-A, PC-B or PC-C) located in solenoid valve body assembly. PC solenoids are used to control line pressure, and band and clutch application pressure within transmission by using PCM to vary current to appropriate PC solenoid.
- 3. When a pressure control solenoid (PC-A, PC-B or PC-C) pressure is always low, failure could be due to PCM and/or vehicle wiring malfunction, and/or solenoid electrically or mechanically stuck open or closed. Check pressure control solenoid operations. See Fig. 3 and Fig. 4.
- 4. When a pressure control solenoid (PC-A, PC-B or PC-C) pressure is always high, failure could be due to PCM and/or vehicle wiring malfunction, and/or solenoid electrically or mechanically stuck open or closed. Check pressure control solenoid operations. See Fig. 3 and Fig. 4.

2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

	Actual Gear					
O/D Posi- tion	PC A		PC B		PCC	
Gear	L	н	L	Н	L	Н
1	1/S	1	1	1	1	1
2	2	2	1	2	2	2
3	1/ <b>S</b>	3	3	3	3	3
4	4	4	4	4	1	4
5	5	5	4	5	2	5
R	R/S	R	R/S	R	R	R
O/D Canceled Position						
Gear						
1M	1	<b>M</b> 1	1	M1	<b>M</b> 1	<b>M</b> 1
2M	M2	M2	1	M2	M2	M2
3M	1	M3	3	M3	M3	M3
4M	M4	M4	4	M4	1	M4

H = High S = Slip due to low line pressure

L = Low M = Manual

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#### **Fig. 3: Checking PC Solenoid Operation Courtesy of FORD MOTOR CO.**

#### Solenoid Valve Body Assembly

The solenoid valve body assembly contains 3 PC solenoids (PC-A, PC-B and PC-C), 4 Shift Solenoids (SSA, SSB, SSC and SSD), and a TCC solenoid. For shift solenoid operation, see <u>Fig. 4</u>.

	Sunday, September 10, 2017 11:43:09 AM	Page 8	© 2005 Mitchell Repair Information Company, LLC.
1			

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### Shift Solenoids (SSA, SSB, SSC & SSD)

Transmission uses 4 on/off shift solenoids which allow PCM to control shift scheduling. Shift solenoids are normally open 3-way solenoids. Shift solenoids (SSA, SSB, SSC and SSD) provide gear selection by directing control pressure to appropriate elements. See <u>Fig. 4</u>.

#### Shift Solenoid Assembly Failure

- 1. When shift solenoid is always off, failure could be due to PCM and/or vehicle wiring malfunction, and/or solenoid electrically or mechanically stuck off. Check shift solenoid operations. See <u>Fig. 5</u>.
- 2. When shift solenoid is always on, failure could be due to the PCM and/or vehicle wiring malfunction, and/or solenoid electrically or mechanically stuck on. Check shift solenoid operations. See <u>Fig. 5</u>.

#### **Torque Converter Clutch Solenoid**

Torque Converter Clutch (TCC) receives a signal from PCM. TCC solenoid controls application, modulation and release of TCC. If solenoid fails in ON position, vehicle engine will run rough (shudder) and engine may stall in Drive at low idle speeds. If solenoid fails in OFF position, TCC will not engage.

Gearshift Lever Position	PCM Commanded Gear	SSA	SSB	SSC	SSD	РСА	РСВ	PCC
R	R	On	Off	Off	Off	L/H 1	H 2	H <sup>2</sup>
Ø	1	On	Off	Off	On	H <sup>2</sup>	L/H <sup>1</sup>	L/H <sup>1</sup>
Overdrive	2	On	Off	On	On	L/H <sup>1</sup>	H <sup>2</sup>	L/H <sup>1</sup>
	3	On	On	Off	On	$H^2$	L/H <sup>1</sup>	L/H <sup>1</sup>
	4	Off	Off	Off	On	L/H <sup>1</sup>	L/H <sup>1</sup>	H <sup>2</sup>
	5	Off	Off	On	On	L/H <sup>1</sup>	H <sup>2</sup>	H <sup>2</sup>
Drive	1 <b>M</b>	On	Off	Off	Off	H <sup>2</sup>	H <sup>2</sup>	L/H <sup>1</sup>
	2M	On	Off	On	Off	H <sup>2</sup>	H <sup>2</sup>	L/H <sup>1</sup>
	3M	On	On	Off	Off	$H^2$	$H^2$	L/H <sup>1</sup>
	4 <b>M</b>	Off	Off	Off	Off	L/H <sup>1</sup>	H²	$H^2$

1 Low/High line pressure

2 High line pressure

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#### **Fig. 4: Checking Solenoid Operation Courtesy of FORD MOTOR CO.**

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

	Actual Gear					
O/D Po- sition	S	SA	SSB			
Gear	ON	OFF	ON	OFF		
1	1	3	3	1		
2	2	1.1	1.1	2		
3	3	3	3	1		
4	1	4	4	4		
5	2	5	5	5		
R	R	R	N	R		
O/D Cance	led Positio	n				
Gear						
1M	M1	M3	M3	M1		
2M	M2	1.1	1.1	M2		
3M	M3	M3	M3	M1		
4M	M1	M4	M4	M4		

	Actual Gear				
O/D Po- sition	S	SC	S	SD	
Gear	ON	OFF	ON	OFF	
1	1/2	1	1	1/M1	
2	2	1	2	M2	
3	3/1.1	3	3	3/M3	
4	4/5	4	4	4/M4	
5	5	4	5	5	
R	R	R	R	R	
O/D Canceled Position					
Gear					
1 <b>M</b>	M2	M1	1	M1	
2M	M2	M1	2	M2	
3M	1.1	M3	3	M3	
4M	5	M4	4	M4	

1.1 = Actual ratio with Forward Clutch, Intermediate Clutch and O/D Band applied. G00072528 1.1 = Actual ratio with Forward Clutch, Intermediate Clutch and O/D Band applied.

#### **Fig. 5: Identifying Shift Solenoid On/Off Operation** Courtesy of FORD MOTOR CO.

#### SHIFT INTERLOCK SYSTEM

NOTE: For system description and repair information, see appropriate SHIFT INTERLOCK SYSTEMS article.

# **COMPONENT LOCATIONS**

#### NOTE: For transmission component locations, see Fig. 1.

#### **COMPONENT LOCATIONS**

Component	Location
Air Conditioning Clutch Switch	Right Rear Of Engine Compartment, Near Blower Motor
Brake Pedal Position Switch	On Top Of Brake Support
Digital Transmission Position Sensor	On Throttle Body
Intake Air Temperature Sensor	On Air Cleaner Outlet Tube
Mass Airflow Sensor	On Air Intake Assembly
Powertrain Control Module	At Right Rear Corner Of Engine Compartment, On Firewall

## PROGRAMMING

# NOTE: Before performing PCM programming procedure, check for any applicable Technical Service Bulletins (TSBs) that may apply to vehicle application.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### DESCRIPTION

Flash Electronically Erasable Programmable Read Only Memory (EEPROM) is contained in an Integrated Circuit (IC) inside of Powertrain Control Module (PCM). The EEPROM contains the vehicle strategy and any calibration information specific to vehicle. The IC is reprogrammable, and at times it may become necessary to reprogram or reflash the entire contents. This is usually due to an after production strategy change or the Flash Vehicle Identification (VID) Block has been previously reprogrammed and has reached its limit. The VID block can be tailored to accommodate various hardware changes made since vehicle production. This procedure can only be performed using Ford's Service Bay Technical System (SBTS) or equivalent.

A replacement PCM will have a label stating PROGRAMMING REQUIRED. This indicates that it is necessary to retrieve VID data from the original PCM before removing PCM from vehicle. This procedure can be performed using New Generation Star (007-00500) (NGS tester) or equivalent. See <u>FLASH VEHICLE</u> <u>IDENTIFICATION BLOCK PROCEDURE</u>. If original PCM is damaged, nonfunctional or incapable of communicating, it will be necessary to manually reprogram VID block. This procedure can only be performed by contacting the "AS BUILT" data center for programming information.

#### FLASH VEHICLE IDENTIFICATION BLOCK PROCEDURE

# NOTE: If using a generic scan tool, follow scan tool manufacturer's instructions to perform this procedure.

- 1. To perform this procedure, NGS tester, Ford Service Function (FSF) card and NGS Flash Cable (007-00531) must be used. Plug flash cable into NGS tester. Plug other end of flash cable into Data Link Connector (DLC). From the NGS tester main menu, select SERVICE BAY FUNCTIONS, POWERTRAIN CONTROL MODULE and then PROGRAMMABLE MODULE INSTALLATION.
- 2. NGS tester display should show 2 selections. The first selection is for old PCM information to be retrieved and stored. The second selection is for restoring new PCM with information that has been retrieved from the old PCM. Follow NGS tester display instructions or refer to instruction sheet included with FSF card. If Flash Vehicle Identification (VID) Block has been reprogrammed previously, NGS tester will display a message indicating the need to reflash entire Integrated Circuit (IC). This procedure can only be performed using Ford's Worldwide Diagnostic System (WDS).

# **TROUBLE SHOOTING**

#### INTRODUCTION

- NOTE: Prior to symptom diagnosis, record any stored DTCs. See <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. If DTCs are present, diagnose and repair as instructed. If no DTCs are present, see <u>SYMPTOM DIAGNOSIS (ELECTRONIC)</u> or <u>SYMPTOM DIAGNOSIS</u> (MECHANICAL).
- NOTE: Any diagnosis should begin with confirming the customer's complaint. If possible, road test vehicle first, and note transmission performance for future reference during diagnosis.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### PRELIMINARY INSPECTION

Visually inspect all electrical wiring, looking for chafed, stretched, cut or pinched wiring. Ensure electrical connectors fit tightly and are not corroded. Inspect air induction system for possible leaks. Ensure vacuum hoses are correctly routed, and are not pinched or cut. Check for non-factory installed equipment wired into transmission or PCM harness. Ensure shift linkage is correctly adjusted. Check PCM, sensors and actuators for physical damage. Check engine coolant level. Check transmission fluid level and condition.

#### SYMPTOM DIAGNOSIS (ELECTRONIC)

- **NOTE:** Perform PRELIMINARY INSPECTION prior to diagnosing by symptom.
- NOTE: Use the following symptoms to aid in preliminary diagnosis. If a listed symptom matches the customer's concern, check the applicable items for possible cause.
- NOTE: Prior to symptom diagnosis, check for and record stored DTCs. See <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. If DTCs are present, diagnose as directed. If no DTCs are present, begin symptom diagnosis.
- NOTE: For additional symptom diagnostic information related to mechanical components, see <u>SYMPTOM DIAGNOSIS (MECHANICAL)</u>. Road test vehicle to verify symptom(s). See <u>ROAD TEST</u> under PERFORMANCE TESTS.

#### No Forward Gears In "D"

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK</u> <u>TEST</u>). Ensure DTCs are not present.

#### No Forward Gears In Any Position

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK</u> <u>TEST</u>). Ensure DTCs are not present.

#### No Reverse Engagement

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u> and <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

Sunday, September 10, 2017 11:43:09 AM

Page 12 © 2005 Mitchell Repair Information Company, LLC.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### Harsh Reverse Engagement

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK</u> <u>TEST</u>). Ensure DTCs are not present.

#### Harsh Forward Engagement

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (OUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (OUICK</u> <u>TEST</u>). Ensure DTCs are not present.

#### Harsh Manual 1st Gear Engagement

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> and <u>TEST E: ISS, OSS & TSS SPEED SENSORS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### **Delayed/Soft Reverse Engagement**

Perform <u>**RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u></u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u><b>TEST D: PC-A, PC-B & PC-C SOLENOIDS**</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>**TRANSMISSION DRIVE CYCLE TEST**</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>**RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK**</u> <u>**TEST**</u>). Ensure DTCs are not present.</u>

#### **Delayed/Soft Forward Engagement**

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK</u> <u>TEST</u>). Ensure DTCs are not present.

#### No Forward & No Reverse Engagement

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK</u> <u>TEST</u>). Ensure DTCs are not present.

#### Harsh Forward & Reverse Engagement

Sunday, September 10, 2017 11:43:09 AM Page 13 © 2005 Mitchell Repair Information Company, LLC.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR</u> and <u>TEST C: TRANSMISSION RANGE SENSOR</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### Delayed/Soft Forward & Reverse Gears

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE</u> <u>TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES</u> (QUICK TEST). Ensure DTCs are not present.

#### Shifts Missing (Some Or All)

Road test vehicle. See <u>ROAD TEST</u> under PERFORMANCE TESTS. Perform <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u>, <u>TEST C:</u> <u>TRANSMISSION RANGE SENSOR</u>, <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> and <u>TEST E: ISS</u>, <u>OSS & TSS SPEED SENSORS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

Early Or Late Shifts (Some Or All)

Road test vehicle. See <u>ROAD TEST</u> under PERFORMANCE TESTS. Perform <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST E: ISS, OSS & TSS SPEED SENSORS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### Erratic Or Hunting Shifts (Some Or All)

Road test vehicle. See <u>ROAD TEST</u> under PERFORMANCE TESTS. Perform <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST E: ISS, OSS & TSS SPEED SENSORS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### Soft Or Slipping Shifts (Some Or All)

Road test vehicle. See **ROAD TEST** under PERFORMANCE TESTS. Perform **TCC ENGAGEMENT TEST** under SELF-DIAGNOSTIC SYSTEM. Perform **RETRIEVING DIAGNOSTIC TROUBLE CODES** (QUICK TEST) under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform **TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS**, **TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR**, **TEST D: PC-A, PC-B & PC-C SOLENOIDS** and **TEST E: ISS, OSS & TSS SPEED SENSORS** under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

TRANSMISSION DRIVE CYCLE TEST under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING</u> DIAGNOSTIC TROUBLE CODES (QUICK TEST). Ensure DTCs are not present.

Harsh Shifts (Some Or All)

Perform **<u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u>, <u><b>TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR**</u>, <u>**TEST D: PC-A, PC-B & PC-C**</u> <u>**SOLENOIDS** and <u>**TEST E: ISS, OSS & TSS SPEED SENSORS**</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>**TRANSMISSION DRIVE CYCLE TEST**</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>**RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)**</u>. Ensure DTCs are not present.</u>

No 1st & 2nd Gear In Drive, Engages In Higher Gear

Road test vehicle. See **ROAD TEST** under PERFORMANCE TESTS. Perform **TCC ENGAGEMENT TEST** under SELF-DIAGNOSTIC SYSTEM. Perform **RETRIEVING DIAGNOSTIC TROUBLE CODES** (QUICK TEST) under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform **TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS** and **TEST C: TRANSMISSION RANGE SENSOR** under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform **TRANSMISSION DRIVE CYCLE TEST** under SELF-DIAGNOSTIC SYSTEM. Repeat **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)**. Ensure DTCs are not present.

No Manual 1st Gear

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u> and <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

No Manual 2nd Gear

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u> and <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

No TCC Application

Perform <u>TCC ENGAGEMENT TEST</u> under SELF-DIAGNOSTIC SYSTEM. Perform <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u> and <u>TEST B:</u> <u>TRANSMISSION FLUID TEMPERATURE SENSOR</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### TCC Always Applied (Stalls Vehicle)

Check engine idle speed. See appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE. Perform <u>TCC ENGAGEMENT TEST</u> under SELF-DIAGNOSTIC SYSTEM. Perform <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK</u> <u>TEST</u>). Ensure DTCs are not present.

#### TCC Cycling, Chattering Or Shuddering

Perform <u>TCC ENGAGEMENT TEST</u> under SELF-DIAGNOSTIC SYSTEM. Perform <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK</u> <u>TEST</u>). Ensure DTCs are not present.

#### Gearshift Lever Effort Is High

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST C: TRANSMISSION RANGE SENSOR</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK</u> <u>TEST</u>). Ensure DTCs are not present.

#### Poor Vehicle Performance

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u>, <u>TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR</u>, <u>TEST C: TRANSMISSION RANGE</u> <u>SENSOR</u>, <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> and <u>TEST E: ISS, OSS & TSS SPEED</u> <u>SENSORS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION</u> <u>DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC</u> <u>TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### Noise Or Vibration In Forward Or Reverse Gears

Perform <u>TCC ENGAGEMENT TEST</u> under SELF-DIAGNOSTIC SYSTEM. Perform <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u> and <u>TEST D: PC-A, PC-B</u> <u>& PC-C SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### Engine Will Not Crank

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST C: TRANSMISSION RANGE SENSOR</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK</u> <u>TEST</u>). Ensure DTCs are not present.

#### **Transmission Overheating**

Perform <u>TCC ENGAGEMENT TEST</u> under SELF-DIAGNOSTIC SYSTEM. Perform <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u>, <u>TEST B:</u> <u>TRANSMISSION FLUID TEMPERATURE SENSOR</u> and <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE</u> <u>CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE</u> <u>CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### No Engine Braking In Manual "3" & Manual 4th Position

Road test vehicle. See **<u>ROAD TEST</u>** under PERFORMANCE TESTS. Perform <u>**RETRIEVING**</u> <u>**DIAGNOSTIC TROUBLE CODES (QUICK TEST)**</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>**TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS**</u> and <u>**TEST D: PC-A, PC-B**</u> <u>**& PC-C SOLENOIDS**</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>**TRANSMISSION DRIVE CYCLE TEST**</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>**RETRIEVING**</u> <u>**DIAGNOSTIC TROUBLE CODES (QUICK TEST)**</u>. Ensure DTCs are not present. Check for no engine braking in 1st or 2nd gear.

#### No Engine Braking In Manual "2" Position

Road test vehicle. See **ROAD TEST** under PERFORMANCE TESTS. Perform **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)** under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform **TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS** and **TEST D: PC-A, PC-B & PC-C SOLENOIDS** under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform **TRANSMISSION DRIVE CYCLE TEST** under SELF-DIAGNOSTIC SYSTEM. Repeat **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)**. Ensure DTCs are not present. Check for no engine braking in 1st or 2nd gear.

#### No Engine Braking In Manual "1" Position

Road test vehicle. See **ROAD TEST** under PERFORMANCE TESTS. Perform **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)** under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform **TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS** and **TEST D: PC-A, PC-B & PC-C SOLENOIDS** under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform **TRANSMISSION DRIVE CYCLE TEST** under SELF-DIAGNOSTIC SYSTEM. Repeat **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)**. Ensure DTCs are not present. Check for no engine braking in 1st or 2nd gear.

#### Slips & Chatters In Manual "1", "2" Or "3" Position

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK</u> <u>TEST</u>). Ensure DTCs are not present.

#### **Engine Braking In All Gears**

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE</u> <u>CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE</u> <u>CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### No 2nd & 5th Gears

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK</u> <u>TEST</u>). Ensure DTCs are not present.

#### No 3rd, 4th & 5th Gears

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK</u> <u>TEST</u>). Ensure DTCs are not present.

#### Harsh 1-2 Shift

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u>, <u>TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR</u>, <u>TEST C: TRANSMISSION RANGE</u> <u>SENSOR</u>, <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> and <u>TEST E: ISS, OSS & TSS SPEED</u> <u>SENSORS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION</u> <u>DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC</u> <u>TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### Harsh 2-3 Shift

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u>, <u>TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR</u>, <u>TEST C: TRANSMISSION RANGE</u> <u>SENSOR</u>, <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> and <u>TEST E: ISS, OSS & TSS SPEED</u> <u>SENSORS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION</u> <u>DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC</u>

Sunday, September 10, 2017 11:43:09 AM Page 18 © 2005 Mitchell Repair Information Company, LLC.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### TROUBLE CODES (QUICK TEST) . Ensure DTCs are not present.

#### Harsh 3-4 Shift

Perform **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)** under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform **TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS**, **TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR**, **TEST C: TRANSMISSION RANGE SENSOR** and **TEST D: PC-A, PC-B & PC-C SOLENOIDS** under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform **TRANSMISSION DRIVE CYCLE TEST** under SELF-DIAGNOSTIC SYSTEM. Repeat **RETRIEVING DIAGNOSTIC TROUBLE CODES (OUICK TEST)**. Ensure DTCs are not present.

#### Harsh 4-5 Shift

Perform **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)** under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform **TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS**, **TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR**, **TEST C: TRANSMISSION RANGE SENSOR**, **TEST D: PC-A, PC-B & PC-C SOLENOIDS** and **TEST E: ISS, OSS & TSS SPEED SENSORS** under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform **TRANSMISSION DRIVE CYCLE TEST** under SELF-DIAGNOSTIC SYSTEM. Repeat **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)**. Ensure DTCs are not present.

#### Harsh 5-4, 4-3, 3-2 Or 2-1 Shift

Road test vehicle. See **ROAD TEST** under PERFORMANCE TESTS. Perform **TCC ENGAGEMENT TEST** under SELF-DIAGNOSTIC SYSTEM. Perform **RETRIEVING DIAGNOSTIC TROUBLE CODES** (**QUICK TEST**) under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform **TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS**, **TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR**, **TEST C: TRANSMISSION RANGE SENSOR**, **TEST D: PC-A, PC-B & PC-C SOLENOIDS** and **TEST E: ISS, OSS & TSS SPEED SENSORS** under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform **TRANSMISSION DRIVE CYCLE TEST** under SELF-DIAGNOSTIC SYSTEM. Repeat **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)**. Ensure DTCs are not present.

#### No 1-2 Or 2-3 Upshift In Drive

Road test vehicle. See **ROAD TEST** under PERFORMANCE TESTS. Perform **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)** under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform **TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS**, **TEST C: TRANSMISSION RANGE SENSOR**, **TEST D: PC-A, PC-B & PC-C SOLENOIDS** and **TEST E: ISS**, **OSS & TSS SPEED SENSORS** under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform **TRANSMISSION DRIVE CYCLE TEST** under SELF-DIAGNOSTIC SYSTEM. Repeat **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)**. Ensure DTCs are not present.

#### No 3-4 Or 4-5 Upshift In Drive

Road test vehicle. See <u>**ROAD TEST</u>** under PERFORMANCE TESTS. Perform <u>**RETRIEVING**</u> <u>**DIAGNOSTIC TROUBLE CODES (QUICK TEST)**</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs.</u>

Sunday, September 10, 2017 11:43:09 AM	Page 19	© 2005 Mitchell Repair Information Company, LL

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u>, <u>TEST C:</u> <u>TRANSMISSION RANGE SENSOR</u>, <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u>, <u>TEST E: ISS, OSS</u> <u>& TSS SPEED SENSORS</u> and <u>TEST G: TRANSMISSION CONTROL SWITCH INOPERATIVE</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE</u> <u>TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES</u> (<u>QUICK TEST</u>). Ensure DTCs are not present.

#### No 5-4 Or 4-3 Downshift (Manual)

Road test vehicle. See <u>ROAD TEST</u> under PERFORMANCE TESTS. Perform <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u>, <u>TEST C:</u> <u>TRANSMISSION RANGE SENSOR</u>, <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u>, <u>TEST E: ISS, OSS</u> <u>& TSS SPEED SENSORS</u> and <u>TEST G: TRANSMISSION CONTROL SWITCH INOPERATIVE</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE</u> <u>TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES</u> (<u>OUICK TEST</u>). Ensure DTCs are not present.

#### No 3-2 Or 2-1 Downshift (Manual)

Road test vehicle. See <u>ROAD TEST</u> under PERFORMANCE TESTS. Perform <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u>, <u>TEST C:</u> <u>TRANSMISSION RANGE SENSOR</u>, <u>TEST D: PC-A, PC-B & PC-C SOLENOIDS</u> and <u>TEST E: ISS</u>, <u>OSS & TSS SPEED SENSORS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### Soft Or Slipping 1-2 Shift

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u>, <u>TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR</u> and <u>TEST D: PC-A, PC-B & PC-C</u> <u>SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION</u> <u>DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC</u> <u>TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### Soft Or Slipping 2-3 Shift

Perform **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)** under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform **TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS**, **TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR**, **TEST D: PC-A, PC-B & PC-C SOLENOIDS** and **TEST E: ISS, OSS & TSS SPEED SENSORS** under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform **TRANSMISSION DRIVE CYCLE TEST** under SELF-DIAGNOSTIC SYSTEM. Repeat **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)**. Ensure DTCs are not present.

#### Soft Or Slipping 3-4 Or 4-5 Shift

Sunday, September 10, 2017 11:43:09 AM	Page 20	© 2005 Mitchell Repair Information Company, LLC.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u>, <u>TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR</u> and <u>TEST D: PC-A, PC-B & PC-C</u> <u>SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION</u> <u>DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC</u> <u>TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### Soft Or Slipping 5-4, 4-3 Or 2-1 Shift

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u>, <u>TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR</u> and <u>TEST D: PC-A, PC-B & PC-C</u> <u>SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION</u> <u>DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC</u> <u>TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### Soft Or Slipping 3-2 Shift

Perform **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)** under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform **TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS**, **TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR**, **TEST D: PC-A, PC-B & PC-C SOLENOIDS** and **TEST E: ISS, OSS & TSS SPEED SENSORS** under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform **TRANSMISSION DRIVE CYCLE TEST** under SELF-DIAGNOSTIC SYSTEM. Repeat **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)**. Ensure DTCs are not present.

#### Soft Or Slipping 2-1 Shift

Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Record DTCs. Perform <u>TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS</u>, <u>TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR</u> and <u>TEST D: PC-A, PC-B & PC-C</u> <u>SOLENOIDS</u> under DIAGNOSTIC TESTS. Repair as necessary. Clear DTCs and perform <u>TRANSMISSION</u> <u>DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC</u> <u>TROUBLE CODES (QUICK TEST)</u>. Ensure DTCs are not present.

#### SYMPTOM DIAGNOSIS (MECHANICAL)

#### No Forward Gears In Any Position

Check the following: fluid level and condition, forward clutch assembly, overdrive servo, overdrive band and/or transmission case for damage.

#### No Forward Gears In "D" Position

Check the following: valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), center support assembly, forward clutch assembly, forward planetary assembly and/or low one-way clutch assembly for damage.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### No Reverse Gears

Check the following: valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), direct clutch assembly, reverse band and servo and/or reverse drum assembly for damage.

#### Harsh Reverse Engagement

Check the following: incorrect (high) line pressure, valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), direct clutch assembly, forward clutch assembly, reverse band and servo and/or reverse drum assembly for damage.

#### Harsh Forward Engagement

Check the following: incorrect (high) line pressure, valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), overdrive servo, overdrive band, center support and forward clutch assembly for damage.

#### **Delayed/Soft Reverse Engagement**

Check the following: low line pressure, valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), direct clutch assembly and/or reverse band and servo for damage.

#### **Delayed/Soft Forward Engagement**

Check the following: low line pressure, valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), overdrive servo, overdrive band, center support and/or forward clutch assembly for damage.

#### No Forward & No Reverse Gears

Check the following: fluid level and condition, shift linkage (misadjusted cable), digital TR sensor, valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), input shaft, oil pump assembly, overdrive planetary assembly, center shaft assembly, forward clutch assembly, forward planetary assembly, reverse planetary assembly, output shaft, torque converter and/or direct one-way clutch for damage.

#### Harsh Forward & Reverse Gears

Check the following: fluid level and condition, high line pressure, valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks) and forward clutch assembly for damage.

#### Delayed/Soft Forward & Reverse Gears

Check the following: fluid level and condition, low or high control pressure, filter assembly (plugged), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks) and/or oil pump assembly for damage.

#### Some Or All Shifts Missing

Check the following: fluid level and condition, shift linkage (misadjusted cable), digital TR sensor, incorrect

Sunday, September 10, 2017 11:43:09 AM	Page 22	© 2005 Mitchell Repair Information Company, LLC.
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#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

line pressure (high or low), valve body (SSA, SSB, SSC, SSD, PC-A, PC-B, PC-C) solenoids, incorrectly tightened valve body bolts (cross-leaks), oil pump assembly, overdrive planetary assembly, center support and direct clutch assembly for damage.

#### Early Or Late Shift Speeds

Check the following: fluid level and condition, valve body (SSA, SSB, SSC, SSD, PC-A, PC-B, PC-C) solenoids, valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), oil pump assembly, overdrive servo and/or overdrive band for damage.

#### Erratic Or Hunting Shifts (Some Or All)

Check the following: fluid level and condition, filter assembly (plugged), valve body (SSA, SSB, SSC, SSD, PC-A, PC-B, PC-C) solenoids, valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks).

#### Soft Or Slipping Shifts (Some Or All)

Check the following: fluid level and condition, filter assembly (plugged), incorrect line pressure (high or low), valve body (SSA, SSB, SSC, SSD, PC-A, PC-B, PC-C) solenoids, valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), oil pump assembly, coast clutch assembly, center support, intermediate band and servo, direct clutch assembly, forward clutch assembly, reverse band and servo and/or transmission case for damage.

#### Soft Or Slipping 1-2 Shift

Check the following: fluid level and condition, incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks) and/or overdrive band and servo for damage.

#### Soft Or Slipping 2-3 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), intermediate band and servo, and/or direct one-way clutch for damage.

#### Soft Or Slipping 3-4 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), center support, intermediate servo and/or direct clutch assembly for damage.

#### Soft Or Slipping 4-5 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks) and/or overdrive band and servo for damage.

#### Soft Or Slipping 5-4 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), direct clutch assembly and/or direct one-way clutch for damage.

	Sunday, September 10, 2017 11:43:09 AM	Page 23	© 2005 Mitchell Repair Information Company, LLC.
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#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### Soft Or Slipping 4-3 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks) and/or intermediate band and servo for damage.

#### Soft Or Slipping 3-2 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), overdrive band and servo, and/or direct one-way clutch for damage.

#### Soft Or Slipping 2-1 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves) and/or incorrectly tightened valve body bolts (cross-leaks).

#### Harsh Shifts (Some Or All)

Check the following: fluid level, incorrect line pressure (high or low), valve body (PC-A, PC-B, PC-C) solenoids, valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), input shaft, overdrive servo, overdrive band, center shaft assembly, intermediate band and servo, forward clutch assembly, reverse band and servo, output shaft and/or transmission case for damage.

#### Harsh 1-2 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), overdrive band and servo, and direct clutch assembly for damage.

#### Harsh 2-3 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), direct clutch assembly, intermediate band and servo, overdrive band and servo, and/or direct one-way clutch assembly for damage.

#### Harsh 3-4 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), center support and direct clutch assembly for damage.

#### Harsh 4-5 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks) and/or overdrive band and servo for damage.

#### Harsh 5-4 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), direct clutch assembly and/or direct one-way clutch for damage.

#### Harsh 4-3 Shift

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), direct clutch assembly and/or intermediate servo and band for damage.

#### Harsh 3-2 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), overdrive band and servo, direct clutch assembly, and/or intermediate band and servo for damage.

#### Harsh 2-1 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), overdrive band and servo, and/or direct one-way clutch for damage.

#### No 1-2 Shift

Check the following: fluid level, incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), overdrive band and servo and overdrive planetary assembly for damage.

#### No 2-3 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), forward clutch assembly and intermediate band and servo for damage.

#### No 3-4 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), center support, direct clutch assembly, forward clutch assembly and/or intermediate servo for damage.

#### No 4-5 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks) and/or overdrive band and servo for damage.

#### No 5-4 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks) and/or direct clutch assembly for damage.

#### No 4-3 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), forward clutch assembly and/or intermediate band and servo for damage.

#### No 3-2 Shift

Sunday, September 10, 2017 11:43:09 AM	Page 25	© 2005 Mitchell Repair Information Company, LLC.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), overdrive band and servo, and forward clutch assembly for damage.

#### No 2-1 Shift

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), forward clutch assembly and/or overdrive band and servo for damage.

#### No 1st & 2nd Gear In Drive, Engages In Higher Gear

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), intermediate band and servo, overdrive band and servo, direct one-way clutch and/or low one-way clutch for damage.

#### No Manual 1st Gear

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), overdrive planetary assembly, direct one-way clutch and/or low one-way clutch for damage.

#### No Manual 2nd Gear

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), overdrive band and servo, direct one-way clutch and/or low one-way clutch for damage.

#### No Torque Converter Clutch Application

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), oil pump assembly and/or torque converter for damage.

#### **Torque Converter Clutch Always Applied**

Check the following: incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), torque converter and/or low one-way clutch assembly for damage.

#### Torque Converter Clutch Cycling, Chattering Or Shuddering

Check the following: fluid contamination, valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), torque converter for damage.

#### **Gearshift Lever Efforts High**

Check the following: shift linkage (misadjusted cable), digital TR sensor misaligned, valve body (sticking valves), incorrectly tightened valve body bolts and/or transmission case for damage.

#### Noise Or Vibration In Forward Or Reverse Gears

Sunday, September 10, 2017 11.43.09 AM Page 20 Sub Milcheir Repair mormation Compan	Sunday, September 10, 2017 11:43:09 AM	Page 26	© 2005 Mitchell Repair Information Company, LL
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#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

Check the following: oil pump assembly, low one-way clutch, and/or flexplate or adapter plate for damage.

#### **Engine Will Not Crank**

Check the following: shift linkage (misadjusted cable), digital TR sensor misaligned, oil pump assembly seized, and/or flexplate or adapter plate for damage.

#### Transmission Will Not Go Into Park

Check the following: shift linkage (misadjusted cable), digital TR sensor misaligned, transmission case and/or parking system component (parking pawl, gear, guide, etc.) for damage.

#### **Transmission Overheating**

Check the following: fluid level, incorrect line pressure (high or low), valve body (sticking valves), oil pump assembly, transmission case, torque converter (seized one-way clutch) and/or cooler line restriction.

#### No Engine Braking In Manual "1" Position

Check the following: fluid level, incorrect line pressure (high or low), oil pump assembly, coast clutch assembly, and/or reverse band and servo for damage.

#### No Engine Braking In Manual "2" Position

Check the following: fluid level, incorrect line pressure (high or low) and/or reverse band and servo for damage.

#### No Engine Braking In Manual "3" Position

Check the following: fluid level, incorrect line pressure (high or low), valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), oil pump assembly, coast clutch assembly, center support assembly, intermediate band and servo, and/or low one-way clutch assembly for damage.

#### No Engine Braking In Manual "D4" Position

Check the following: fluid level, valve body (sticking valves), incorrectly tightened valve body bolts (cross-leaks), oil pump assembly and coast clutch assembly for damage.

#### **Transmission Fluid Foaming Or Venting**

Check the following: fluid level and condition, oil pump assembly, intermediate band and servo, transmission case and/or transmission overheating.

#### Vehicle Movement With Gearshift Lever In "N" Position

Check the following: fluid level, shift linkage (adjustment), transmission case damage, and/or incorrect line pressure (high or low).

#### Slips & Chatters In Manual 1st Gear

Sunday, September 10, 2017 11:43:09 AM	Page 27	© 2005 Mitchell Repair Information Company, LLC.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

Check the following: fluid level and condition, incorrect line pressure (high or low), valve body (sticking valves), oil pump assembly, forward clutch assembly, reverse band and servo, direct one-way clutch and/or low one-way clutch for damage.

#### Slips & Chatters In Manual 2nd Gear

Check the following: fluid level and condition, incorrect line pressure (high or low), oil pump assembly, overdrive band and servo, overdrive planetary assembly, forward clutch assembly, reverse band and servo, and/or low one-way clutch for damage.

#### Slips Or Chatters In Manual 3rd Gear

Check the following: fluid level and condition, incorrect line pressure (high or low), oil pump assembly, overdrive band and servo, intermediate band and servo, forward clutch assembly, direct one-way clutch and/or low one-way clutch for damage.

#### No 3rd, 4th & 5th Gears

Check the following: oil pump assembly, overdrive band and servo and/or overdrive planetary assembly for damage.

#### **CLUTCH & BAND APPLICATIONS**

Gearshift Lever Position	Elements In Use
"R" (Reverse)	Reverse Band, Coast Clutch, Direct Clutch & <sup>(1)(2)</sup> Direct One-Way Clutch
"OD" (Overdrive)	
1st Gear	Forward Clutch, <sup>(1)(2)</sup> Direct One-Way Clutch & <sup>(1)(2)</sup> Low One-Way Clutch
2nd Gear	Forward Clutch, Overdrive Band, <sup>(1)</sup> Direct One-Way Clutch & <sup>(1)(2)</sup> Low One-Way Clutch
3rd Gear	Forward Clutch, Intermediate Band, <sup>(1)(2)</sup> Direct One-Way Clutch & <sup>(2)</sup> Low One-Way Clutch
4th Gear	Forward Clutch, Direct Clutch, <sup>(1)(2)</sup> Direct One-Way Clutch & <sup>(1)</sup> Low One- Way Clutch
5th Gear	Forward Clutch, Overdrive Band, Direct Clutch, <sup>(1)</sup> Direct One-Way Clutch & <sup>(1)</sup> Low One-Way Clutch
"D" (Drive) <sup>(3)</sup>	
1st Gear	Forward Clutch, Coast Clutch, Reverse Band, <sup>(1)(2)</sup> Direct One-Way Clutch & <sup>(1)(2)</sup> Low One-Way Clutch
2nd Gear	Forward Clutch, Overdrive Band, Reverse Band, <sup>(1)</sup> Direct One-Way Clutch & <sup>(1)</sup> (2) Low One-Way Clutch
3rd Gear	Forward Clutch, Coast Clutch, Intermediate Band, <sup>(1)(2)</sup> Direct One-Way

#### **CLUTCH & BAND APPLICATIONS**

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

	Clutch & <sup>(1)</sup> Low One-Way Clutch	
4th Gear	Forward Clutch, Direct Clutch, Coast Clutch, <sup>(1)(2)</sup> Direct One-Way Clutch &	
	<sup>(1)</sup> Low One-Way Clutch	
"3" (Manual 3rd)	Forward Clutch, Intermediate Band, Coast Clutch, <sup>(1)(2)</sup> Direct One-Way Clutch	
	& <sup>(1)</sup> Low One-Way Clutch	
"2" (Manual 2nd)	Forward Clutch, Overdrive Band, Reverse Band, <sup>(1)</sup> Direct One-Way Clutch &	
<sup>(1)(2)</sup> Low One-Way Clutc		
"1" (Manual First)	Forward Clutch, Reverse Band, Coast Clutch, $^{(1)(2)}$ Direct One-Way Clutch & $^{(1)}$	
	<sup>(2)</sup> Low One-Way Clutch	
(1) One-way clutch overruns during coasting operation.		
(2) One-way clutch holding in drive.		
(3) Transmission Control Switch (TCS) on, overdrive cancelled.		

# PERFORMANCE TESTS

#### **ROAD TEST**

- Ensure engine and transmission are at normal operating temperature. Road test vehicle in "D" position (overdrive on). Apply minimum throttle and observe speeds at which upshifts occur and Torque Converter Clutch (TCC) applies. For vehicle shift speed specifications, see appropriate table under <u>SHIFT SPEED SPECIFICATIONS</u>.
- 2. Stop vehicle. Press TCS switch. The O/D OFF light will illuminate. Repeat step 1 . Transmission will make all upshifts except 4-5 and TCC should apply above 29 MPH.
- 3. Press accelerator pedal to floor (WOT). Transmission should downshift from 3rd to 2nd or 3rd to 1st gear (depending on vehicle speed) and TCC should release.
- 4. With vehicle speed at about 30 MPH in "D" position, manually shift transmission into "1" position (manual low) and release accelerator pedal. Transmission should shift into 3rd gear. When vehicle speed drops below 20 MPH, transmission should downshift into 1st gear.
- 5. If transmission fails to upshift/downshift or TCC does not apply/release, see appropriate SYMPTOM DIAGNOSIS under **TROUBLE SHOOTING**.

#### SHIFT SPEED SPECIFICATIONS

#### SHIFT SPEEDS (EXPLORER/MOUNTAINEER 4.0L - WITH 5R55S)

Operating Condition	<sup>(1)</sup> Shift Speed MPH
Minimum Throttle (TP Voltage = 1.25 Volts)	
1-2	11-14
2-3	14-17
3-4	21-25
4-5	36-41

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

WOT		
1-2	3	37-41
2-3	5	53-58
3-4	8	34-89
Coast <sup>(2)</sup>		
5-4	3	31-34
4-3	1	6-20
3-1		8-10
(1) All speeds are approximate.		
<sup>(2)</sup> Closed throttle, coasting condition.		

#### SHIFT SPEEDS (EXPLORER/MOUNTAINEER 4.0L - WITH 5R55W)

Operating Condition	<sup>(1)</sup> Shift Speed MPH
Minimum Throttle (TP Voltage = 1.25 Volts)	
1-2	12-14
2-3	17-19
3-4	24-28
4-5	36-40
WOT	
1-2	33-37
2-3	49-54
3-4	77-83
Coast <sup>(2)</sup>	
5-4	30-34
4-3	20-22
3-1	7-9
(1) All speeds are approximate.	
<sup>(2)</sup> Closed throttle, coasting condition.	

#### SHIFT SPEEDS (EXPLORER/MOUNTAINEER 4.6L - WITH 5R55S)

Operating Condition	<sup>(1)</sup> Shift Speed MPH
Minimum Throttle (TP Voltage = 1.25 Volts)	
1-2	10-12
2-3	14-18
3-4	18-22
4-5	40-44
WOT	
1-2	36-42
2-3	52-58

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

3-4	80-8
Coast <sup>(2)</sup>	
5-4	28-3
4-3	15-1
3-1	8-1
(1) All speeds are approximate.	
(2) Closed throttle, coasting condition.	

#### SHIFT SPEEDS (EXPLORER/MOUNTAINEER 4.6L - WITH 5R55W)

Operating Condition	<sup>(1)</sup> Shift Speed MPH
Minimum Throttle (TP Voltage = 1.25 Volts)	
1-2	9-11
2-3	16-20
3-4	21-25
4-5	37-42
WOT	
1-2	33-37
2-3	49-54
3-4	77-83
Coast <sup>(2)</sup>	
5-4	25-29
4-3	15-18
3-1	6-8
(1) All speeds are approximate.	
(2) Closed throttle, coasting condition.	

#### **HYDRAULIC PRESSURE TESTS**

# CAUTION: Perform line pressure test prior to performing <u>STALL SPEED TEST</u>. If line pressure is low at stall speed, further transmission damage will occur. DO NOT maintain WOT in any gear for more than 5 seconds.

#### Line Pressure Test Procedure

- Connect scan tool to vehicle to monitor engine RPM. Remove line pressure tap. Connect pressure gauge to line pressure test port. See <u>Fig. 6</u>. Apply service and parking brakes. Start engine and check line pressure in all gears. See <u>LINE PRESSURE SPECIFICATIONS</u> table.
- If line pressure is not within specification, disconnect line pressure gauge and reinstall tap. Remove pressure control tap. See <u>Fig. 7</u>. Connect pressure gauge to pressure control test port. Apply service and parking brakes. Start engine and check pressure in all gears. See <u>PRESSURE CONTROL</u> <u>SPECIFICATIONS</u> table.

Sunday, September 10, 2017 11:43:09 AM

#### Page 31 © 2005 Mitchell Repair Information Company, LLC.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

 If control pressure or line pressure is not within specification, perform <u>TEST D: PC-A, PC-B & PC-C</u> <u>SOLENOIDS</u> under DIAGNOSTIC TESTS. If control pressure is okay, see <u>LINE PRESSURE TEST</u> <u>RESULTS</u>.



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#### **Fig. 6: Identifying Line Pressure Test Port Courtesy of FORD MOTOR CO.**

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis



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#### **Fig. 7: Identifying Pressure Control Tap Courtesy of FORD MOTOR CO.**

#### LINE PRESSURE SPECIFICATIONS

<b>Gearshift Lever Position</b>	At Idle RPM - psi (kg/cm <sup>2</sup> )	At WOT Stall RPM - psi (kg/cm <sup>2</sup> )
Explorer/Mountaineer 4.0L		
"P" & "N"	75-120 (5.3-8.4)	N/A
"R"	145-190 (10.2-13.4)	282-350 (19.8-24.6)
"D", "3", "2" & "1"	80-110 (5.6-7.7)	228-263 (16.0-18.5)
Explorer/Mountaineer 4.6L		
"P" & "N"	75-120 (5.3-8.4)	N/A
"R"	175-215 (12.3-15.1)	282-350 (19.8-24.6)
"D", "3", "2" & "1"	100-135 (7.0-9.5)	228-263 (16.0-18.5)

#### PRESSURE CONTROL SPECIFICATIONS

<b>Gearshift Lever Position</b>	At Idle RPM - psi (kg/cm <sup>2</sup> )

At WOT Stall RPM - psi (kg/cm<sup>2</sup>)

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

Explorer/Mountaineer 4.0L		
"P" & "N"	20-40 (1.4-2.8)	N/A
"R"	40-50 (2.8-3.5)	112-134 (7.9-9.4)
"D", "3" "2" & "1"	25-35 (1.8-2.5)	112-134 (7.9-9.4)
Explorer/Mountaineer 4.6L		
"P" & "N"	20-40 (1.4-2.8)	N/A
"R"	55-65 (3.9-4.6)	112-134 (7.9-9.4)
"D", "3", "2" & "1"	40-50 (2.8-3.5)	112-134 (7.9-9.4)

#### LINE PRESSURE TEST RESULTS

Compare recorded pressures to pressures listed in table. See <u>LINE PRESSURE SPECIFICATIONS</u> table under HYDRAULIC PRESSURE TESTS. If control pressures are outside of specified ranges, use following symptoms to determine cause of trouble.

#### High At Idle In All Ranges

Wiring harness, boost valve, PC solenoid, or main regulator valve.

#### Low At Idle In All Ranges

Low fluid level, faulty intake screen/filter or filter seal, loose valve body bolts, pump or pump gasket leakage, case leakage, faulty valve body or separator plate.

#### Low In All Forward Ranges

Forward clutch, valve body, overdrive servo or intermediate servo.

Low In "P" Only

Valve body.

#### Low In "R" Only

Separator plate, rear servo cover or piston leakage, reverse clutch, overdrive servo, intermediate servo, valve body or forward clutch.

#### Low In "N" Only

Valve body, overdrive servo or intermediate servo.

#### Low In "O/D" Only

Forward clutch, overdrive servo, intermediate servo or valve body.

#### Low In "O/D" (O/D Cancelled)

	Sunday, September 10, 2017 11:43:09 AM	Page 34	© 2005 Mitchell Repair Information Company 11 C
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#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

Forward clutch, overdrive servo, intermediate servo or valve body.

Low In Manual "1"

Forward clutch or valve body.

Low In Manual "2" Or Manual "3"

Intermediate servo, overdrive servo or forward clutch.

#### STALL SPEED TEST

# NOTE: DO NOT depress accelerator to WOT for more than 5 seconds, or damage to transmission may occur from overheating.

#### Stall Speed Test Precautions

- 1. Engine coolant and transmission fluid must be at normal operating temperatures. Linkages must be adjusted properly. Hold accelerator down just long enough to get a stable tachometer reading.
- 2. DO NOT exceed maximum specified RPM for vehicle. Before shifting into each gearshift lever position, run engine in Neutral at 1000 RPM for 15 seconds to cool transmission. If engine speed exceeds specification, release accelerator immediately, as this is an indication of clutch or band slippage.

#### Stall Speed Test Procedure

#### NOTE: Performing stall speed test procedure for an extended period of time may set Diagnostic Trouble Code (DTC) P0712 or P1783. Always clear DTC after performing stall speed test. See <u>CLEARING DIAGNOSTIC TROUBLE CODES</u> under SELF-DIAGNOSTIC SYSTEM.

Connect tachometer to engine. Apply parking and service brakes firmly. Place gearshift lever in each gear. Press accelerator completely to floor and record tachometer RPM reading in each gear. DO NOT exceed 5 second limit. Engine speed should be within specifications. See <u>STALL SPEED SPECIFICATIONS</u> table. If engine speed is not within specifications, diagnose and repair. See <u>STALL SPEED TEST RESULTS</u>.

#### STALL SPEED SPECIFICATIONS

Application	Stall Speed RPM
Explorer/Mountaineer (4.0L)	2557-3036
Explorer/Mountaineer (4.6L)	2687-3150

#### STALL SPEED TEST RESULTS

#### Low In All Ranges

Poor engine performance. Faulty torque converter stator one-way clutch.

Sunday, September 10, 2017 11:43:09 AM	Page 35	© 2005 Mitchell Repair Information Company, LLC.
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#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### High In "OD", "D" & "1"

Direct one-way clutch or low one-way clutch faulty.

#### High In "D", "2" & "1"

Forward clutch or direct one-way clutch faulty.

#### High In "OD" Only

Forward clutch or direct one-way clutch faulty.

#### High In All Ranges

General transmission problems are indicated. Forward clutch or direct one-way clutch. Perform <u>HYDRAULIC</u> <u>PRESSURE TESTS</u>.

#### High In "R" Only

Reverse clutch or reverse band or servo faulty.

High In "2" Only

Intermediate band or servo faulty.

#### High In "1" Only

Reverse band or servo faulty.

#### AIR PRESSURE TESTS

A "No Drive" condition can exist, even with correct transmission fluid pressure, due to inoperative clutches or bands. Inoperative components can be located through a series of checks by substituting air pressure for fluid pressure to determine location of malfunction. To check component, drain transmission fluid. Remove oil pan, gasket and control valve body. See REMOVAL & INSTALLATION in appropriate AUTOMATIC article in TRANSMISSION SERVICING. Install Transmission Test Plate (307-433-01) and Test Plate Gasket (307-433-03).

# NOTE: Cover vent in test plate with shop towel to prevent fluid spray. Do not plug or apply air pressure to test plate vent.

Using compressed air at 40 psi  $(2.8 \text{ kg/cm}^2)$  maximum, apply air to appropriate points. See **Fig. 8**. A dull thud can be heard or movement felt when clutch or band is applied. If clutch seals or check balls are leaking, a hissing sound may be heard. If air pressure applied to a clutch passage fails to operate clutch or operates clutches simultaneously, disassemble and check fluid passages in center support and clutches to detect obstructions.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis



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#### **Fig. 8: Identifying Air Pressure Test Points Courtesy of FORD MOTOR CO.**

#### TRANSMISSION FLUID COOLER

- CAUTION: Whenever a transmission has been disassembled to install new parts, the installation of a new transmission fluid cooler must be installed and the transmission fluid cooler tubes must be cleaned and backflushed.
- NOTE: Cleaning and backflushing the transmission fluid cooling system along with normal cleaning and inspection procedures, as outlined in 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. These contaminants are a major cause of recurring transmission troubles and must be removed from the system before the transmission is put back in use.

Sunday, September 10, 2017 11:43:09 AM	Page 37	© 2005 Mitchell Repair Information Company, LLC.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### **Transmission Fluid Cooler Flow Test**

- NOTE: The engine idle, transmission linkage/cable adjustment, fluid level and line pressure must be within specification before carrying out this test. For additional information on transmission linkage/cable adjustment, see <u>SHIFT</u> <u>CABLE</u> for adjustments. For additional information on engine idle diagnosis, see <u>SELF-DIAGNOSTICS - EEC-V - GASOLINE & NGV</u>. For additional information on fluid level check, see <u>CHECKING FLUID LEVEL</u>. For additional information on line pressure, see <u>LINE PRESSURE TEST RESULTS</u>.
  - 1. Place the transmission range selector lever into PARK.
  - 2. Raise the vehicle on a hoist and place suitable safety stands under the vehicle.
  - 3. Prior to carrying out the Transmission Fluid Cooler Flow Test check to see if the vehicle is equipped with a in-line fluid filter. If the vehicle is equipped with an filter, remove and discard the in-line fluid filter prior to carrying out the Transmission Fluid Cooler Flow Test and system flushing.
  - 4. Using a 3/16 inch Allen key, hold the large drain plug with a wrench and remove the small (center) fluid level indicating plug.
  - 5. Install the Fluid Level and Fill Plug Adapter (307-437) into the pan.
  - 6. Remove the cooler return line (upper line) from the fitting on the transmission case.
  - 7. Connect one end of a clear hose to the cooler return line and route the other end of the hose to the fluid level and fill plug adapter in the pan.
  - 8. Remove the safety stands and lower the vehicle.
  - 9. Start the engine and run it at idle.
- 10. With the engine running, raise the vehicle on a hoist and place suitable safety stands under the vehicle.
- 11. Once a steady flow of fluid (without air bubbles) is observed, remove the hose from the fluid level and fill plug adapter and place the hose in a measuring container for 15 seconds. After 15 seconds, place the hose back onto the fluid level and fill plug adapter. Lower the vehicle and turn the engine off. Measure the amount of fluid in the container. If adequate flow is observed, approximately 8 oz (237 ml) will be in the measuring container. The test is now complete. Reconnect the cooler line and install the fluid fill plug.

# NOTE: If the vehicle was not equipped with a fluid filter, install a fluid filter kit and follow the instructions supplied in the kit. If the vehicle was equipped with a fluid filter install a new filter.

- 12. Once an adequate flow has been established, install a new in-line transmission fluid filter kit or filter.
- 13. Once the fluid filter has been installed, check that fluid will flow out of the filter.
- 14. If the flow is not liberal, disconnect the hose from the cooler return line and connect the hose to the cooler inlet (lower fitting) on the transmission case. Reconnect the cooler return line to the case (upper fitting).
- 15. Repeat Steps 8-10. If the flow is now approximately 8 oz (237 ml) in 15 seconds, the cooler lines and auxiliary cooler must be cleaned. For additional information, see <u>BACKFLUSHING AND CLEANING</u> <u>TRANSMISSION FLUID</u>. Carry out this entire test after carrying out the backflushing and cleaning procedure. If the flow is still not adequate after carrying out the backflushing and cleaning procedure, install new cooler lines and/or an auxiliary cooler. If the flow from the case is still not adequate after the installation of new cooler lines and/or an auxiliary cooler (8 oz [237 ml] in 15 seconds) the pump and/or

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

torque converter may be at fault. Carry out the appropriate procedures for diagnosis and repair.

# SELF-DIAGNOSTIC SYSTEM

#### **DIAGNOSTIC PROCEDURE**

- NOTE: Perform preliminary inspection before starting diagnostic procedure. See <u>PRELIMINARY INSPECTION</u> under TROUBLE SHOOTING.
- NOTE: In addition to transmission DTCs, engine-related DTCs may also be present. These DTCs must be repaired first, as engine performance will greatly affect transmission operation. For information and testing procedures of enginerelated DTCs and components, see appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.
  - Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. If any engine-related DTCs are set, repair them first. See appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE. Record and repair all KOEO and KOER DTCs. See <u>DIAGNOSTIC TROUBLE</u> <u>CODE DEFINITIONS</u>. Once DTCs are repaired, go to next step. If no KOEO and KOER DTCs are set, go to step 4.
  - Check for continuous memory DTCs. If any continuous memory DTCs were set, clear all DTCs. See <u>CLEARING DIAGNOSTIC TROUBLE CODES</u>. Perform <u>TRANSMISSION DRIVE CYCLE</u> <u>TEST</u>. If continuous memory DTCs are set during drive cycle, go to next step. If continuous memory DTCs are not set during drive cycle, go to step 4.
  - 3. Perform diagnostic test corresponding to DTC set. See <u>DIAGNOSTIC TROUBLE CODE</u> <u>DEFINITIONS</u>. If problem is not corrected, go to next step. If problem is corrected, go to step 7.
  - Diagnose problem by symptom. See <u>SYMPTOM DIAGNOSIS (ELECTRONIC)</u> under TROUBLE SHOOTING. If electronic trouble symptoms exist, perform <u>OUTPUT STATE CONTROL MODES</u>, then go to next step. If no electronic trouble symptoms exist, go to step 6.
  - 5. Follow diagnostic tests corresponding to electronic trouble symptom. Perform static and drive tests. Use manufacturer provided transmission tester overlay to perform static tests. Follow tester manufacturer's instructions. If drive tests do not correct problem, go to next step. If drive tests correct problem, then the PCM, vehicle wiring harness and/or external inputs (sensors, switches, etc.) could be cause of problem. Diagnosis possible intermittent problem using appropriate scan tool and transmission tester. See TEST Z: INTERMITTENT in appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.
  - Diagnose problem by mechanical symptom. See <u>SYMPTOM DIAGNOSIS (MECHANICAL)</u> under TROUBLE SHOOTING. Perform any recommended overhaul procedures. Perform <u>TRANSMISSION</u> <u>DRIVE CYCLE TEST</u>.
  - 7. Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> and ensure no DTCs and no mechanical problems exist. If any DTCs exist, return to step 1. If no DTCs exist, clear memory code. See <u>CLEARING DIAGNOSTIC TROUBLE CODES</u>.

#### **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)**

#### NOTE: If self-test will not activate or TOOL COMMUNICATION ERROR is received, see

Sunday, September 10, 2017 11:43:09 AM Page 39 © 2005 Mitchell Repair Information Company, LLC.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### SCAN TOOL UNABLE TO COMMUNICATE .

#### Description

Quick test checks the integrity and function of the Electronic System, and outputs the test results when requested by a scan tool. Quick test also provides a quick end check of powertrain control system, and is usually performed at the start of each diagnostic procedure with all accessories off. Quick test is also performed at the end of diagnostic tests for verification of repair and to ensure no other faults were incurred while repairing a previous fault. A system pass will be displayed when no DTCs are output and a scan tool communication error does not exist. System pass means that hardware monitored by the PCM is functioning within normal operating limits. Only a system pass, DTC or an incomplete OBD-II drive cycle (P1000) will be displayed.

The following procedures are functional tests of EEC-V system. These basic test steps must be followed in sequence to avoid misdiagnosis:

- Perform visual check. See VISUAL CHECK .
- Connect appropriate scan tool to DLC. See<u>VEHICLE PREPARATION & EQUIPMENT HOOKUP</u>. Use DVOM and transmission tester as instructed.
- Perform KOEO self-test. See <u>KEY ON ENGINE OFF (KOEO) SELF-TEST</u>. Record and repair DTCs. Repeat KOEO self-test until no hard DTCs are present.
- Perform KOER self-test. See <u>KEY ON ENGINE RUNNING (KOER) SELF-TEST</u>. Record and repair DTCs. Repeat KOER self-test until no hard DTCs are present.
- Clear DTCs. See <u>CLEARING DIAGNOSTIC TROUBLE CODES</u>. Test drive vehicle. Record and repair memory codes. See <u>CONTINUOUS MEMORY SELF-TEST</u>. Continue to clear DTCs, test drive vehicle and check for memory DTCs until no memory DTCs are present.

#### Visual Check

Perform preliminary inspection before proceeding. Complete all procedures in <u>PRELIMINARY</u> <u>INSPECTION</u> under TROUBLE SHOOTING. Ensure vacuum hoses and EEC-V wiring harnesses are properly routed and connected.

#### Vehicle Preparation & Equipment Hookup

Apply parking brake, and place gearshift lever in "P" position. Block drive wheels. Turn off all electrical accessories. Connect appropriate test equipment to vehicle.

#### Generic Scan Tool

Ensure scan tool meets or exceeds OBD-II standard. Follow manufacturer's instructions to hook up equipment. Record DTCs.

#### New Generation STAR Tester

Turn ignition switch to OFF position. Connect adapter cable lead to NGS tester. Connect service connectors of adapter cable to vehicle DLC. Perform <u>KEY ON ENGINE OFF (KOEO) SELF-TEST</u>.

Sunday, September 10, 2017 11:43:09 AM	Page 40	© 2005 Mitchell Repair Information Company, LLC.
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#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### Digital Volt-Ohm Multimeter (DVOM)

Use appropriate DVOM to perform voltage and/or resistance measurements across appropriate circuits.

#### Transmission Tester

The Rotunda(R) Transmission Tester is used to diagnose electronically controlled transmissions, and is used in conjunction with the diagnostic tests. The tests should be carried out in order. Installing the transmission tester allows separation of the vehicle electronics from transmission electronics. For additional information, refer to the transmission tester manual for these following tests:

- Bench Testing (Engine OFF)
- Resistance/Continuity Tests
- Solenoid Voltage Test
- Dynamic Testing (Engine ON)
- PC Solenoids
- Transmission Engagements
- Upshifts/Downshifts
- Torque Converter Clutch (TCC) Engagement
- Intermediate Shaft Speed (ISS) Sensor
- Output Shaft Speed (OSS) Sensor
- Turbine Shaft Speed (TSS) Sensor
- Digital Transmission Range (TR) Sensor Testing
- Resistance/Continuity Test
- Sensor Tests
- Switch Tests (DTR Sensor, Backup Lamp, and Optional Circuits)

#### Key On Engine Off (KOEO) Self-Test

These DTCs indicate faults are present at time of testing. A hard fault may cause CHECK ENGINE or MIL to illuminate and remain illuminated until fault is repaired. If KOEO DTCs are retrieved during a KOEO SELF-TEST, identify DTCs and perform appropriate diagnostic test. See <u>DIAGNOSTIC TROUBLE CODE</u> <u>DEFINITIONS</u>.

SYSTEM PASS codes indicates no DTCs were recorded in that portion of test. If SYSTEM PASS is not retrieved in KOEO SELF-TEST, DTCs retrieved during KOER SELF-TEST may not be valid. Ensure engine is at normal operating temperature. If engine does not start (or stalls after starting), continue KOEO SELF-TEST. Turn ignition switch to OFF position. Ensure test equipment is properly attached. Program NGS tester following manufacturer's instructions. Follow operating instructions from NGS tester menu.

#### Key On Engine Running (KOER) Self-Test

These DTCs indicate faults are present at time of testing. A hard fault may cause CHECK ENGINE or MIL to illuminate and remain illuminated until fault is repaired. If KOER DTCs are retrieved during a KOER SELF-

	Sunday, September 10, 2017 11:43:09 AM	Page 41	© 2005 Mitchell Repair Information Company, LLC.
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#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### TEST, identify DTCs and perform appropriate diagnostic test. See **<u>DIAGNOSTIC TROUBLE CODE</u> <u>DEFINITIONS</u>.**

Ensure engine is at normal operating temperature. Turn ignition switch to OFF position. Ensure test equipment is properly attached. Program NGS tester following manufacturer's instructions. Follow operating instructions from NGS tester menu. Perform BPP switch, PSP switch and TCS cycling when instructed.

#### CAUTION: Continuous memory DTCs should be recorded when retrieved. These DTCs may be used to identify intermittent faults that exist after all KOEO and KOER DTCs have been repaired. Some continuous memory DTCs may not be valid after KOEO and KOER DTCs are serviced.

#### **Continuous Memory Self-Test**

These DTCs result from information stored by PCM during continuous memory self-test monitoring. Use these DTCs for diagnosis only when KOEO SELF-TEST and KOER SELF-TEST result in SYSTEM PASS and all steps in QUICK TEST are successfully completed. These DTCs indicate faults previously recorded. Fault may or may not be currently present. See **<u>DIAGNOSTIC TROUBLE CODE DEFINITIONS</u>**. After noting and/or repairing concern, clear codes from memory. See <u>**CLEARING DIAGNOSTIC TROUBLE CODES**</u>. Intermittent faults may be caused by a sensor, connector or wiring-related concern.

Turn ignition switch to OFF position. Ensure test equipment is properly attached. Program NGS tester following manufacturer's instructions. Follow operating instructions from NGS tester menu.

#### **DIAGNOSTIC TROUBLE CODE DEFINITIONS**

#### **DIAGNOSTIC TROUBLE CODE DEFINITIONS**

<b>DTC</b> <sup>(1)</sup>	Diagnostic Test	Definition	Transmission Symptom
P0102 &	(2)	MAF Sensor Malfunction	High Or Low PC Pressure, Incorrect Torque
P0103			Converter Clutch Engagement
P0112	(2)	IAT Sensor Indicates 254°F (125°C) - Short To Ground	High Or Low PC Pressure
P0113	(2)	IAT Sensor Indicates -40°F (- 40°C) - Open Circuit	High Or Low PC Pressure
P0114	(2)	IAT Sensor Out Of On-Board Diagnostic Range	Re-Run On-Board Diagnostics At Normal Operating Temperature
P0117	(2)	ECT Sensor Indicates 254°F (125°C) - Short To Ground	TCC Will Always Be Off Or Poor Fuel Economy
P0118	(2)	ECT Sensor Indicates -40°F (- 40°C) - Open Circuit	TCC Will Always Be Off Or Poor Fuel Economy
P0121- P0123	(2)	TP Sensor Malfunction	Harsh Shifts, Abnormal Shift Patterns, TCC Does Not Engage, TCC Cycling
P0300- P0308, P0320,	(2)	Electronic Ignition (EI) System Malfunction	Harsh Engagements & Shifts, Late WOT Shifts, No TCC Engagement

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

P0340			
P0705	<u>C</u>	Digital TR Sensor Circuit Short To Ground Or Open	Increase In Control Pressure (Harsh Shifts)
P0708	<u>C</u>	Digital TR Sensor Circuit TR3A Open Circuit	Increase In Control Pressure (Defaults To "OD" Position In All Ranges)
P0712	<u>B</u>	TFT Sensor Indicates 315°F (157°C) - Short To Ground	Firm Shift Feel
P0713	<u>B</u>	TFT Sensor Indicates -40°F (- 40°C) - Open Circuit	Firm Shift Feel
P0715	<u>E</u>	Insufficient Input From TSS Sensor	Harsh Shifts, Harsh TCC Activation & Engagement
P0717	<u>E</u>	Insufficient Input From TSS Sensor	Harsh Shifts, Harsh TCC Activation & Engagement
P0718	<u>E</u>	Erratic Or Noisy Signal From TSS Sensor	Harsh Shifts, Possible Abnormal Shift Schedule
P0720	<u>E</u>	Insufficient Input From OSS Sensor	Harsh Shifts, Possible Abnormal Shift Schedule
P0721	<u>E</u>	Erratic Or Noisy Signal From OSS Sensor	Harsh Shifts, Abnormal Shift Schedule
P0722	<u>E</u>	Intermittent Signal From OSS Sensor	Harsh Shifts, Abnormal Shift Schedule
P0731 <sup>(3)</sup>	<u>A</u> <sup>(4)</sup>	No 1st Gear	Improper Gear Selection, Shift Errors & RPM Higher Or Lower Than Expected
P0732 <sup>(3)</sup>	<u>A</u> <sup>(4)</sup>	No 2nd Gear	Improper Gear Selection, Shift Errors & RPM Higher Or Lower Than Expected
P0733 <sup>(3)</sup>	<u>A</u> <sup>(4)</sup>	No 3rd Gear	Improper Gear Selection, Shift Errors & RPM Higher Or Lower Than Expected
P0734 <sup>(3)</sup>	<u>A</u> <sup>(4)</sup>	No 4th Gear	Improper Gear Selection, Shift Errors & RPM Higher Or Lower Than Expected
P0735 <sup>(3)</sup>	<u>A</u> <sup>(4)</sup>	No 5th Gear	Improper Gear Selection, Shift Errors & RPM Higher Or Lower Than Expected
P0740 & P0743 <sup>(6)</sup>	<u>A</u>	TCC Solenoid Circuit Failure	If Short Circuit, Engine Stalls At Low Idle; If Open Circuit, TCC Does Not Engage
<u>P0741</u> (3)	(5)	TCC Engagement Error	No TCC Operation Or TCC Slips
<u>P0745</u> & P1746 <sup>(3)</sup>	D	PC-A Solenoid Circuit Or Mechanical Failure	If Open Circuit, Causes High PC-A Pressure, Harsh Engagement, Slips In Gear & 3rd Gear Incorrect
P0750 & P0753 <sup>(6)</sup>	<u>A</u>	SSA Solenoid Circuit/Hydraulic Failure	If Shorted, No 4th Or 5th Gear; If Open, No 1st Gear
P0755 & P0758 <sup>(6)</sup>	<u>A</u>	SSB Solenoid Circuit/Hydraulic Failure	If Shorted, No 1st Gear; If Open, No 3rd Gear
P0760 & P0763 <sup>(6)</sup>	<u>A</u> <sup>(4)</sup>	SSC Solenoid Circuit/Hydraulic Failure	Incorrect Gear Selection Depending On Condition Mode & Manual Lever Position

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

P0765 & P0768	<u>A</u>	SSD Solenoid Circuit Failure	No Engine Braking In Manual Gears
P0775 & P1789 <sup>(3)</sup>	D	PC-B Solenoid Circuit Failure	If Short Circuit, Causes Low PC-B Pressure, Limits Engine Torque, Zero PC-B, No 2nd & 5th Gear
P0779	<u>D</u>	PC-B Solenoid Circuit Intermittent Short To Ground	If Short Circuit, Causes Low PC-B Pressure, Limits Engine Torque, No 2nd & 5th Gear
P0791	<u>E</u>	Insufficient Input From ISS Sensor	Harsh 2-3 Shift
P0794	<u>E</u>	Intermittent Signal From ISS Sensor	Harsh 2-3 Shift
P0795 & P0797 <sup>(3)</sup>	<u>D</u>	PC-C Solenoid Circuit Failure	Incorrect Gear Ratio In 4th & 5th Gears
P0796 <sup>(3)</sup>	D	PC-C Solenoid Circuit Open	If Open Circuit, Causes Maximum PC-C Pressure, Harsh Engagements & Shifts
P0799	<u>D</u>	PC-C Solenoid Circuit Intermittent Short To Ground	If Short Circuit, Causes Low PC-C Pressure, Limits Engine Torque, Incorrect Gear Ratio In 4th & 5th Gears
P1000	N/A	Incomplete OBD-II Testing	N/A
P1111	N/A	System Pass Code	N/A
P1100 & P1101	(2)	MAF Sensor Malfunction	High Or Low PC Pressure, Incorrect Torque Converter Clutch Engagement
P1116	(2)	ECT Sensor Temperature Low Or High	Re-Run On-Board Diagnostics With Vehicle At Normal Operating Temperature
P1120, P1121, P1124 & P1125	(2)	TP Sensor Malfunction	Harsh Shifts, Firm Shift Feel, Abnormal Shift Patterns, TCC Does Not Engage, TCC Cycling
P1351- P1364	(2)	Electronic Ignition (EI) System Malfunction	Harsh Engagements & Shifts, Late WOT Shifts, No TCC Engagement
P1460	(2)	ACC Switch Error	Re-Run On-Board Diagnostics With A/C Off; If Stuck On, PC Pressure Will Be Low
P1636	(7)	PCM Detects Error In ISIG Chip	Replace PCM
P1700	(5)	Internal Component Failure, Direct One-Way Clutch Failure	Failed A Neutral Condition: FMEM Is Active; No 1st, 3rd Or 4th Gear In Automatic Mode, Other DTCs May Set
P1702	<u>C</u>	Digital TR Sensor Signal Intermittent	DTCs P0705 & P0708 May Also Set; Refer To DTCs P0705 & P0708
P1572 & P1703	(2)	BPP Switch Malfunction	(8)
P1704	<u>C</u>	Digital TR Sensor Malfunction, Or Not In "P" Or "N" Position During KOEO/KOER	Incorrect Commanded PC Pressure, DTR Sensor Reading Incorrect Gear Position

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

P1705	<u>C</u>	Digital TR Sensor Malfunction, Or Not In "P" Or "N" Position During KOEO/KOER	DTC Is Set, Re-Run On-Board Diagnostics With Manual Lever In "P" Or "N" Position
P1711	B	TFT Sensor Not At Operating Temperature During On-Board Diagnostics	Vehicle Cold Or Overheated
P1713	B	PCM Detects No TFT Sensor Change At Low Range During Operation	Increased PC Pressure, Incorrect TCC Engagement Scheduling, Harsh TCC Engagement, Harsh Shifts
P1714	<u>F</u>	SSA Solenoid Failure	If Shorted, No 4th Or 5th Gear; If Open, No 1st gear, SSA Solenoid Mechanical Failure
P1715	<u>F</u>	SSB Solenoid Failure	If Shorted, No 1st Gear; If Open, No 3rd Gear, SSB Solenoid Mechanical Failure
P1716	<u><b>F</b></u> <sup>(4)</sup>	SSC Solenoid Failure	Incorrect Gear Selection Depending On Condition; Mode & Manual Lever Position
P1717	<u><b>F</b></u> <sup>(4)</sup>	SSD Solenoid Failure	Incorrect Gear Selection Depending On Condition, Mode & Manual Lever Position
P1718	B	No Change In TFT Sensor High Range	Increased PC Pressure, Incorrect TCC Engagement Schedule, Harsh Engagements & Shifts
P1740 <sup>(3)</sup>	<u>A &amp; D</u>	Mechanical Failure Of TCC Solenoid Detected	If Stuck On, Engine Stalls At Low Idle; If Stuck Off, No TCC Engagement
P1746 <sup>(3)</sup>	D	PC-A Solenoid Circuit Open	Maximum PC-A Pressure, Harsh Engagements & Shifts
P1747 <sup>(3)</sup>	<u>D</u>	PC-A Solenoid Circuit Short To Ground	If Short Circuit, Causes Low PC Pressure, Limits Engine Torque, Slips In Gear & 3rd Gear Incorrect
P1760	D	PC-A Solenoid Circuit Intermittent Short To Ground Or Power	Short To Ground: Minimum PC-A Pressure, Limits Engine Torque, Slips In Gear, 3rd Incorrect. Short To Power: Maximum PC-A Pressure, Harsh Shifts & Engagements
P1780	<u>G</u>	TCS Not Changing States - Open Or Shorted	No Overdrive Cancel When Switch Is Cycled During KOER
P1783	B	Transmission Overheating Condition - 270°F (127°C)	Increase In PC Pressure
P1788 <sup>(3)</sup>	<u>D</u>	PC-B Solenoid Circuit Open	Maximum PC-B Pressure, Harsh Engagements & Shifts

(1) Only engine performance-related DTCs that may affect transmission operation are listed. For complete list of engine performance-related DTCs, see appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

(2) See appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

(3) DTC can be set by other non-electronic-related transmission hardware condition.

Refer to illustrations to check solenoid on/off operation. See Fig. 3 and Fig. 4.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

(4)

- (5) Diagnose DTC by symptom. See SYMPTOM DIAGNOSIS (ELECTRONIC) under <u>TROUBLE</u> <u>SHOOTING</u>.
- (6) Output circuit check, generated ONLY by electrical conditions.
- (7) SSx ISIG communication error. Replace PCM.
- (8) If stuck on or not connected, TCC will not engage at 1/3 or less throttle. If stuck off or not connected, TCC will not disengage when brake is applied.

#### **CLEARING DIAGNOSTIC TROUBLE CODES**

# CAUTION: DO NOT disconnect vehicle battery to clear DTCs. This will erase operating information from Keep-Alive Memory (KAM). To clear KAM, disconnect negative battery terminal for 5 minutes.

#### CAUTION: When battery is disconnected, vehicle computer may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

#### PCM Reset

After a PCM reset procedure, following conditions will be met:

- All DTCs will be cleared from PCM memory.
- All freeze frame data will be cleared from PCM memory.
- Diagnostic monitoring results will be cleared from PCM memory.
- OBD-II system monitor status will reset.
- DTC P1000 will be set in PCM memory.

To perform PCM reset using scan tool, ensure connectors are correctly connected. Program scan tool following manufacturer's instructions. Follow operating instructions from scan tool menu.

All DTCs should now be cleared from PCM memory. If problem has not been corrected or fault is still present, hard code will immediately be reset in PCM memory.

#### SCAN TOOL UNABLE TO COMMUNICATE

#### NOTE: See TEST QA: UNABLE TO ACTIVATE SELF-TEST/SCP COMMUNICATION ERROR/DTC NOT LISTED in appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

#### OUTPUT STATE CONTROL MODES

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

# NOTE: DTR sensor and VSS must be operational to enter OSC modes. No DTCs may be present for TR and VSS sensors before entering OSC modes.

OSC modes allow control of some parameters for specific operation. OSC has 2 modes of operation: Bench Mode and Drive Mode. Each mode has a unique set of vehicle operation requirements that must be met before OSC operation will be allowed. If vehicle requirements are not met, an error message will be displayed and OSC mode will be aborted. Follow OSC PRELIMINARY PROCEDURES before entering into OSC modes.

#### **OSC Preliminary Procedures**

Perform the following procedures in order before entering into OSC modes:

- Select vehicle and engine selection menu.
- Select appropriate vehicle and engine.
- Select DIAGNOSTIC DATA LINK.
- Select POWERTRAIN CONTROL MODULE.
- Select DIAGNOSTIC TEST MODE.
- Select KOEO ON-DEMAND SELF TEST and KOER ON-DEMAND SELF TESTS.
- Perform test and record DTCs.
- Repair all non-transmission related DTCs.
- Repair all VSS and DTR sensor DTCs.
- Ensure VSS and DTR sensors are functional.
- Select ACTIVE COMMAND MODES.
- Select OUTPUT STATE CONTROL.
- Select TRANS-BENCH MODE or TRANS-DRIVE MODE.

#### SSA, SSB, SSC, SSD & TCC Solenoids (Bench Mode)

This procedure ensures TCC and shift solenoids may be turned on or off. Ensure parking brake is set, gearshift lever is in "P" position, and ignition switch is in ON position (engine off). Follow the procedure in order to test appropriate solenoid.

- Select OUTPUT STATE CONTROL.
- Select TRANS-BENCH MODE.
- Select PIDs to be monitored (SSA, SSB, SSC, SSD or TCC).
- Monitor all selected PIDs during test.
- Select Parameters SSA, SSB, SSC, SSD or TCC.
- Select ON, then press SEND to turn solenoid on.
- Select OFF, then press SEND to turn solenoid off.
- Select "XXX", then press SEND at any time to cancel any command sent.

#### PC-A, PC-B & PC-C Solenoids (Bench Mode)

Sunday, September 10, 2017 11:43:10 AM	Page 47	© 2005 Mitchell Repair Information Company, LLC.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

PC solenoid pressure may be set from 0-90 psi (0-6.3 kg/cm<sup>2</sup>) in increments of 15 psi (1.1 kg/cm<sup>2</sup>). Set parking brake. With gearshift lever in "P" position, install pressure gauge in pressure control test port. See <u>Fig.</u> 7. Start engine and run to 1500 RPM. Follow the procedure in order to test appropriate solenoid.

- Select OUTPUT STATE CONTROL.
- Select TRANS-BENCH MODE.
- Select PIDs to be monitored (PC-A, PC-B or PC-C).
- Monitor selected PID during test.
- Select "Parameter PCx".
- Select value 0-90, then press SEND. 00 sets PCx pressure to zero psi, 15 sets PCx pressure to 15 psi (1.1 kg/cm<sup>2</sup>), 30 sets PCx pressure to 30 psi (2.1 kg/cm<sup>2</sup>), 45 sets PCx pressure to 45 psi (3.2 kg/cm<sup>2</sup>), 60 sets PCx pressure to 60 psi (4.2 kg/cm<sup>2</sup>), 75 sets PCx pressure to 75 psi (5.3 kg/cm<sup>2</sup>), 90 sets PCx pressure to 90 psi (6.3 kg/cm<sup>2</sup>).
- Select "XXX", then press SEND at any time to cancel any command sent.

#### **Trans-Drive Mode**

DRIVE MODE allows control of 3 transmission modes. Each mode has a unique set of vehicle operating requirements that must be met before being allowed to operate in OUTPUT STATE CONTROL. When performing DRIVE MODE, control one parameter at a time. DRIVE MODE allows the following modes to be entered and tested on transmission:

#### GEAR MODE

Allows upshifts or downshifts.

#### TCC MODE

Engages or disengages TCC.

#### FIRM\_SFT MODE

Commands a higher or lower control pressure.

PC solenoids are not directly controlled during DRIVE MODE testing. Pressures may be raised during an upshift in FIRM\_SFT GEAR mode to test transmission shift operation. In DRIVE MODE, transmission can be commanded into any forward gear. Engine must be running and transmission gearshift lever in "D" position. Vehicle speed must be more than 2 MPH and TCC solenoid must be OFF.

#### Gear Mode (Drive Mode)

Gear mode is used to test transmission shift functions. The OSC COMMAND VALUES allow for the following options:

(1) PCM selects 1st gear.

(2)

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

PCM selects 2nd gear.

(3) PCM selects 3rd gear.

(4) PCM selects 4th gear.

(5) PCM selects 5th gear.

Perform the following procedure for GEAR MODE:

- Select OUTPUT STATE CONTROL.
- Select TRANS-DRIVE MODE.
- Select PIDs to be monitored.
- Monitor all selected PIDs during test.
- Select "Parameters GEAR".
- Select OSC COMMAND VALUE 1-5, then press SEND.
- Re-select OSC value 1-5, then press SEND.
- Select "XXX", then press SEND at any time to cancel any command sent.

#### TCC Mode (Drive Mode)

This mode is used to test TCC engagement and disengagement. OSC "TCC on or off" DRIVE MODE operates only when VSS and digital TR sensor are okay, no VSS or digital TR sensor DTCs are present, engine is running, gearshift lever is in "OD" position and vehicle speed is more than 2 MPH.

In addition, OSC "TCC On" DRIVE MODE operates only when vehicle speed is more than 2 MPH, transmission is in 2nd gear or higher, TFT sensor is 60-275°F (33-153°C), brakes are not applied at 20 MPH or less, and vehicle is maintaining a steady speed. Perform the following procedure for TCC MODE:

- Select OUTPUT STATE CONTROL.
- Select TRANS-DRIVE Mode.
- Select PIDs to be monitored.
- Monitor all selected PIDs during test.
- Select "Parameters TCC".
- Select ON, then press SEND to turn TCC solenoid on.
- Select OFF, then press SEND to turn TCC solenoid off.
- Select "XXX", then press SEND at any time to cancel any command sent.

#### FIRM\_SFT Mode (Drive Mode)

This OSC mode is used to raise pressure during an upshift to determine whether pressure control system is

Sunday, September 10, 2017 11:43:10 AM Page 49 © 2005 Mitchell Repair Information Company, LLC.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

functioning correctly. Harsher shifts indicate that pressure control system works at higher pressure. The best test for isolating pressure control system problems is to perform PC-A, PC-B or PC-C tests in BENCH MODE, using a hydraulic pressure gauge. See <u>PC-A, PC-B & PC-C SOLENOIDS (BENCH MODE)</u>.

OSC COMMAND VALUES allow for following options:

• (ON)

Sets control pressure higher for all upshifts.

• (OFF)

Sets control pressure to normal for all upshifts.

• (XXX) Cancels FIRM\_SFT MODE.

OSC FIRM\_SFT DRIVE MODE operates ONLY when VSS and digital TR sensor is okay, no VSS or digital TR sensor DTCs are present, engine is running, gearshift lever is in "D" position, vehicle speed is more than 2 MPH and when TCC is off (disengaged). Perform following procedure for FIRM\_SFT MODE:

- Select OUTPUT STATE CONTROL.
- Select TRANS-DRIVE MODE.
- Select PIDs to be monitored.
- Monitor all selected PIDs during test.
- Select "Parameters FIRM\_SFT.
- Select OSC COMMAND VALUE (On or Off), then press SEND.
- Select "XXX", then press SEND at any time to cancel any command sent.

#### ADDITIONAL SYSTEM FUNCTIONS

NOTE: These additional diagnostic system features are available to help diagnose driveability problems and service EEC-V systems. For additional information, see appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

- GENERIC OBD-II PARAMETER IDENTIFICATION (PID)
- NON-GENERIC OBD-II PARAMETER IDENTIFICATION (PID)
- ON-BOARD SYSTEM READINESS (OSR) TEST MODE
- FREEZE FRAME DATA MODE
- FAILURE MODE EFFECTS MANAGEMENT (FMEM)
- ENGINE RPM/VEHICLE SPEED LIMITER
- HARDWARE LIMITED OPERATIONAL STRATEGY (HLOS)

#### TCC ENGAGEMENT TEST

Connect tachometer to engine. Ensure engine and transmission are at normal operating temperature. Drive

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

vehicle at about 50 MPH in "D" position (overdrive on). After normal operating temperature has been reached, maintain a constant speed of about 50 MPH and tap brake pedal lightly. Engine RPM should increase when brake pedal is tapped (TCC disengages). Engine RPM should decrease in about 5 seconds (TCC engages). Slow to a stop. If TCC does not engage during road test or is engaged continuously (causing engine to stall at stops), see appropriate symptom in SYMPTOM DIAGNOSIS under **TROUBLE SHOOTING**.

#### TRANSMISSION DRIVE CYCLE TEST

- NOTE: The transmission drive cycle test must be followed exactly. Malfunctions have to occur 4 times consecutively for continuous memory codes P0731, P0732, P0733 and P0734 to be set, and 5 times consecutively for continuous memory codes P0741 and P1740 to set.
  - 1. After repairing any engine-performance related DTCs, erase remaining transmission DTCs. Warm engine to normal operating temperature. Ensure transmission fluid level is correct.
  - 2. With gearshift lever in "D" position, accelerate from stop to 50 MPH. This allows transmission to shift into 5th gear. Hold speed for at least 15 seconds.
  - 3. While maintaining speed with transmission in 5th gear, lightly depress brake pedal and release (to operate brakelights). Hold speed for at least an additional 5 seconds. Bring vehicle to a stop for at least 20 seconds with gearshift lever in "D" position.
  - 4. Repeat steps 1 -3 at least 5 times. Perform <u>RETRIEVING DIAGNOSTIC TROUBLE CODES</u> (QUICK TEST) and record any continuous memory codes.

# **DIAGNOSTIC TESTS**

- NOTE: To diagnose all other input and output devices not included in the following diagnostic tests, see appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.
- NOTE: Diagnostic tests are diagnostic procedures used to test and service EEC-V system. For engine-related DTCs, see appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE. <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK</u> <u>TEST)</u> allows technician to identify problems and retrieve service DTCs. Diagnostic tests check transmission circuits, sensors and actuators.

# NOTE: Perform all voltage tests with a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance, unless stated otherwise in test procedure.

Procedures in diagnostic tests are written for use with following Ford Motor Co. test equipment:

- Worldwide Diagnostic System (WDS) Scan Tool (418-F224) or New Generation Star (NGS) tester (418-F052) or equivalent.
- Transmission Tester (007-00130)

#### HOW TO USE DIAGNOSTIC TESTS

Sunday, September 10, 2017 11:43:10 AM Page 51 © 2005 Mitchell Repair Information Company, LLC.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

- Ensure all non-EEC-V related faults found while performing <u>TROUBLE SHOOTING</u> have been corrected. DO NOT perform any DIAGNOSTIC TESTS unless specifically instructed by a <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> procedure. Follow each test step in order until fault is found. DO NOT replace any part unless directed here to do so. When more than one code is retrieved, start with first DTC displayed.
- Diagnostic tests ensure electrical circuits are okay before sensors or other components are replaced. Always test circuits for continuity between sensor and PCM. Test all circuits for short to power, opens or short to ground. Voltage Reference (VREF) and Voltage Power (VPWR) circuits should be tested with KOEO or as specified in DIAGNOSTIC TESTS.
- 3. If measuring voltage or resistance at PCM, always backprobe PCM harness connectors. DO NOT connect any test light unless specified in testing procedure. All measurements are made by probing rear of connector (wiring harness side). Isolate both ends of a circuit and turn ignition switch to OFF position when checking for shorts or continuity, unless instructed otherwise.
- 4. Disconnect solenoids and switches from harness before measuring continuity and resistance or applying voltage. After each repair, check all component connections and repeat <u>RETRIEVING DIAGNOSTIC</u> <u>TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM.
- 5. An open circuit is defined as a resistance reading of greater than 5 ohms. This specification tolerance may be too high for some items in EEC-V system. If resistance approaches 5 ohms, always clean suspect connector and coat with protective dielectric silicone grease. A short is defined as a resistance reading of less than 10 k/ohms to ground, unless stated otherwise in DIAGNOSTIC TESTS.
- 6. If instructed to replace Powertrain Control Module (PCM) after performing a diagnostic test, new PCM must be programmed. See <u>PROGRAMMING</u>.

#### **Diagnostic Aids**

Fuel-contaminated engine oil may set some DTCs and affect engine performance. If oil is suspect, remove PCV valve from valve cover and repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. If problem is corrected, change engine oil.

#### **TEST A: SHIFT & TORQUE CONVERTER CLUTCH SOLENOIDS**

- NOTE: After each service or repair procedure has been completed, reconnect all components. Clear DTCs and repeat QUICK TEST. See <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Ensure all EEC-V systems are working properly and DTCs are no longer present.
  - Ensure ignition switch is in OFF position. Place gearshift lever in "P" position. Ensure transmission harness connector is fully seated, terminals are fully engaged in connector and in good condition. Connect NGS tester to DLC. Enter TRANS-BENCH MODE. See SSA, SSB, SSC, SSD & TCC SOLENOIDS (BENCH MODE) in <u>OUTPUT STATE CONTROL MODES</u> under SELF-DIAGNOSTIC SYSTEM.
  - If vehicle enters TRANS-BENCH MODE, remain in TRANS-BENCH MODE and go to next step. If vehicle does not enter TRANS-BENCH MODE, repeat procedure. If vehicle still does not enter TRANS-BENCH MODE, see <u>SCAN TOOL UNABLE TO COMMUNICATE</u> under SELF-DIAGNOSTIC SYSTEM.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

- Perform SSA, SSB, SSC, SSD & TCC SOLENOIDS (BENCH MODE) tests. See <u>OUTPUT STATE</u> <u>CONTROL MODES</u> under SELF-DIAGNOSTIC SYSTEM. Select suspect PIDs (SSA, SSB, SSC, SSD or TCC) to be monitored. Select suspect solenoid ON and press SEND. Monitor PIDs for change of state while wiggling wiring and connectors to transmission. If suspect solenoid PID changes from ON to OFF state, repair affected circuit and retest system. If suspect solenoid PIDs do not change from ON to OFF state, go to next step.
- 4. Remain in TRANS-BENCH MODE. Monitor each solenoid PID while changing solenoid state from ON to OFF. If all solenoids turn on and off when commanded and an audible click can be heard, go to next step. If any solenoid does not turn on and off when commanded and an audible click cannot be heard, go to step 6.
- 5. Perform GEAR and TCC mode tests in <u>TRANS-DRIVE MODE</u> under OUTPUT STATE CONTROL MODES. If transmission does not upshift or downshift, or TCC does not engage or disengage when commanded, go to next step. If transmission upshifts and downshifts and TCC engages and disengages when commanded, clear DTCs. See <u>CLEARING DIAGNOSTIC TROUBLE CODES</u> under SELF-DIAGNOSTIC SYSTEM. Road test vehicle. Retest system. If concern still exists, see appropriate symptom in appropriate SYMPTOM DIAGNOSIS under <u>TROUBLE SHOOTING</u>.
- Ensure ignition switch is turned to OFF position. Disconnect transmission 16-pin harness connector. Turn ignition switch to ON position. Using DVOM, measure voltage between chassis ground and transmission 16-pin harness connector terminal No. 3. See <u>Fig. 13</u>. If voltage is more than 10 volts, go to next step. If voltage is 10 volts or less, repair open circuit. See <u>WIRING DIAGRAMS</u>. Retest system.
- 7. Using DVOM, measure voltage between transmission 16-pin harness connector terminal No. 3 and appropriate solenoid terminal. See <u>SOLENOID VOLTAGE CHECK</u> table. With NGS tester connected, select appropriate PID (SSA, SSB, SSC, SSD or TCC). Select ON and press SEND. Select OFF and press SEND. Measure voltage while cycling solenoid on and off. Ensure audible click can be heard from solenoid being activated. If voltage changes, go to next step. If voltage does not change, repair open in affected circuit between PCM and transmission 16-pin harness connector. See <u>WIRING DIAGRAMS</u>. Retest system.
- With transmission 16-pin harness connector disconnected, measure resistance between transmission 16-pin harness connector terminal No. 3 and appropriate solenoid terminals. See <u>TRANSMISSION</u> <u>SOLENOID RESISTANCE</u> table. See <u>WIRING DIAGRAMS</u>. If resistance is within specification, go to next step. If resistance is not within specification, replace solenoid body assembly. Retest system.
- Measure resistance between chassis ground and transmission 16-pin harness connector terminals No. 3, 5, 6, 14, 15 and 16. If resistance is less than 5 ohms, replace solenoid body assembly. Retest system. If resistance is 5 ohms or more, see appropriate shift or TCC symptom in appropriate SYMPTOM DIAGNOSIS under <u>TROUBLE SHOOTING</u>.

Solenoid	Transmission Harness Connector Terminal No.
SSA	16
SSB	15
SSC	6
SSD	5
TCC	14
(1) See <b>Fig. 13</b> for transmission	16-pin harness connector terminal identification

#### SOLENOID VOLTAGE CHECK<sup>(1)</sup>

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

TRANSMISSION SOLENOID RESISTANCE		
Solenoid	Ohms	
SSA, SSB, SSC Or SSD	16-45	
TCC	9-16	

#### **TEST B: TRANSMISSION FLUID TEMPERATURE SENSOR**

- NOTE: After each service or repair procedure has been completed, reconnect all components. Clear DTCs and repeat QUICK TEST. See <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Ensure all EEC-V systems are working properly and DTCs are no longer present.
  - Turn ignition switch to OFF position. Place gearshift lever in "P" position. Ensure transmission harness connector is fully seated, terminals are fully engaged in connector and in good condition. Connect NGS tester to DLC. Turn ignition switch to ON position. Select DIAGNOSTIC DATA LINK on NGS tester. Select PCM. Select PID/DATA MONITOR and RECORD. Select PIDs TFT and TFTV. If vehicle enters PID/DATA MONITOR and RECORD, remain in PID/DATA MONITOR and RECORD and go to next step. If vehicle does not enter PID/DATA MONITOR and RECORD, see <u>SCAN TOOL UNABLE TO</u> <u>COMMUNICATE</u> under SELF-DIAGNOSTIC SYSTEM.

#### NOTE: While monitoring TFT and TFTV PIDs, perform following test.

- 2. If transmission is cold, run engine to warm. If transmission is warm, allow transmission to cool down. If TFT and TFTV PIDs increase as transmission warms up or decrease as transmission is cooled, erase all DTCs. See <u>CLEARING DIAGNOSTIC TROUBLE CODES</u> under SELF-DIAGNOSTIC SYSTEM. Perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM to verify condition is still present. If condition is still present, see TRANSMISSION OVERHEATING in appropriate SYMPTOM DIAGNOSIS under <u>TROUBLE SHOOTING</u>. If TFT or TFTV drop in and out of range, inspect for intermittent condition in internal or external harness, sensor or connector. If TFT PIDs do not increase as transmission warms up or decrease as transmission is cooled, go to next step.
- 3. Ensure ignition switch is turned to OFF position. Disconnect transmission 16-pin harness connector. Inspect condition of connector. Repair as necessary. Using DVOM, measure voltage between chassis ground and transmission 16-pin harness connector terminal No. 2. See <u>Fig. 13</u>. Turn ignition switch to ON position. If voltage is 4.5-5.5 volts, go to next step. If voltage is not 4.5-5.5 volts, repair open circuit between transmission 16-pin harness connector and PCM. See <u>WIRING DIAGRAMS</u>. Retest system.
- 4. Measure and record resistance between transmission 16-pin harness connector terminals No. 2 and 12. Resistance should be within specification. See <u>TFT SENSOR TEMPERATURE/RESISTANCE</u> table. If resistance is within specification for specific temperature, see TRANSMISSION OVERHEATING in appropriate SYMPTOM DIAGNOSIS under <u>TROUBLE SHOOTING</u>. If resistance is not within specification, replace solenoid body assembly. Retest system.

#### TFT SENSOR TEMPERATURE/RESISTANCE

Temperature °F (°C)	k/Ohms
-40 To -4 (-40 To -20)	284-967

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

-3-31 (-19 To -1)	100-284
32-68 (0-20)	37-100
69-104 (21-40)	16-37
105-158 (41-70)	5-16
159-194 (71-90)	2.7-5
195-230 (91-110)	1.5-2.7
231-266 (111-130)	.8-1.5
267-302 (131-150)	.58

#### **TEST C: TRANSMISSION RANGE SENSOR**

NOTE: After each service or repair procedure has been completed, reconnect all components. Clear DTCs and repeat QUICK TEST. See RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST) under SELF-DIAGNOSTIC SYSTEM. Ensure all EEC-V systems are working properly and DTCs are no longer present.

#### NOTE: DTCs P0705 and P0708 cannot be set by an incorrectly adjusted digital TR sensor.

- 1. Turn ignition switch to OFF position. Place gearshift lever in "P" position. Perform **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)** under SELF-DIAGNOSTIC SYSTEM. If only DTCs P0705 and P0708 are present, go to step 4. If any other DTCs, or no DTCs are present, go to next step.
- 2. With ignition switch in OFF position and gearshift lever in "P" position, ensure DTR sensor harness connector is fully seated and in good condition. Repair as necessary. Apply parking brake. Place gearshift lever in "N" position. Disconnect shift cable/linkage from transmission manual lever. Install DTR sensor alignment tool and ensure sensor is aligned correctly. DTR sensor alignment tool will not seat fully if sensor is not aligned. If DTR sensor is aligned correctly, go to next step. If DTR sensor is not adjusted correctly, adjust DTR sensor and clear DTCs. See CLEARING DIAGNOSTIC TROUBLE CODES under SELF-DIAGNOSTIC SYSTEM. Place gearshift lever in "P" position and repeat **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST).**
- 3. Place gearshift lever in "D" position. Reconnect shift cable/linkage to manual lever on transmission. Ensure shift cable/linkage is correctly adjusted. See appropriate AUTOMATIC article in TRANSMISSION SERVICING. Go to next step. If adjustment is okay, go to next step.
- 4. Place gearshift lever in "P" position. Disconnect DTR sensor connector. Inspect both ends of connector for damage or pushed out terminals, corrosion, loose wires, and missing or damaged seals. If connector is okay and you are directed here to diagnose a DTC, go to next step. If diagnosing a starting problem or back-up lights concern, go to step 11. If connector needs repair, repair as necessary and clear DTCs. See CLEARING DIAGNOSTIC TROUBLE CODES under SELF-DIAGNOSTIC SYSTEM. Repeat **RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)** under SELF-DIAGNOSTIC SYSTEM

#### NOTE: Use PID TR D for DTCs P0705, P1704 and P1705. Use PID TR V for DTC P0708.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

		PID: TR_D (C)			PID: TR_V (volts) (A)(D)	
Selector Position	PID: TR	TR4	TR3A	TR2	TR1	TR3A (PCM pin 64 to sigrtn)
PARK (E)	P/N	0	0	0	0	0.0 Volts
In Between(B)	REV	0	1	0	0	1.3 - 1.8 Volts
REVERSE	REV	1	1	0	0	1.3 - 1.8 Volts
In Between(B)	REV	0	1	0	0	1.3 - 1.8 Volts
NEUTRAL	NTRL	0	1	1	0	1.3 - 1.8 Volts
In Between(B)	O/D1	1	1	1	0	1.3 - 1.8 Volts
OVERDRIVE(F)	O/D1	1	1	1	1	1.3 - 1.8 Volts
In Between(B)	Man 2	1	0	1	1	0.0Volts
Manual 2	Man 2	1	0	0	1	0.0Volts
In Between(B)	Man 2	1	0	1	1	0.0Volts
Manual 1	Man 1	0	0	1	1	0.0Volts

#### Digital Transmission Range (TR) Sensor Diagnosis Chart

<sup>1</sup> Will read "Drive" if O/D is canceled

#### TR Sensor Diagnosis Chart:

- TR\_V is the voltage at PCM terminal No. 64 (TR3A circuit) to signal return.
- R "In Between" reading could be caused by a shift cable or digital TR sensor mis-aligned or a digital TR sensor failure of TR1, TR2, TR3A or TR4.
- C. TR\_D: 1= Open digital TR sensor, 0= Closed digital TR sensor.
  - Breakout Box readings taken from PCM signal terminals for TR1, TR2, TR3A and TR4 to signal return:
    - Voltages For TR1, TR2 & TR4:
    - 0 = 0.0 Volts (circuit shorted to ground).
    - 1 = 9.0-14.0 Volts (open circuit).
    - Voltages For TR3A:
    - 0 = 0.0 Volts (circuit shorted to around).
    - 1 = 1.3-1.8 Volts (open circuit).
  - 1.8-5.0 Volts = Invalid reading (open in wires or bad resistor in digital TR sensor).
- Wiggle Test Information For Open Of Shorts:

   E.
   TR1, TR2, TR3A and TR4 are all closed in "P" position (shorted to signal return), so "P" position is a good place to
  check for intermittent open circuits (with scan tool monitoring TR\_D). TR1, TR2, TR3A and TR4 are all open in OVERDRIVE position, so OVERDRIVE is a good position to check for shorts
- F to ground. To determine shorted components while observing TR\_D, unplug TR sensor and check if short goes away. If short is still present, unplug transmission harness and check if short goes away. If short is still present, short is in PCM or vehicle wiring harness. Remove suspect circuit wire terminal from PCM connector. If short is still present, then PCM has an internal failure; otherwise failure is in vehicle wiring harness.

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#### Fig. 9: Digital TR Sensor PID Output Specifications **Courtesy of FORD MOTOR CO.**

- 5. Ensure ignition switch is turned to OFF position. Connect NGS tester to DLC. Reconnect DTR sensor. Turn ignition switch to ON position. Select TR PIDs TR D and TR V on NGS tester. While observing NGS tester display, move gearshift lever to each gear position, hold gearshift lever still, wiggle DTR sensor wiring harness connector and tap on DTR sensor lightly. Compare TR PID values to TR PID specifications in illustration. See Fig. 9. If PID values are within specification and do not change during wiggle or tap tests, DTR sensor is okay. Diagnose DTR sensor concern by appropriate symptom. See appropriate SYMPTOM DIAGNOSIS under TROUBLE SHOOTING. If PID values are not within specification or change during wiggle or tap tests, go to next step.
- 6. Disconnect DTR sensor connector. Connect TR-"E" cable and transmission tester to DTR sensor. Place digital TR sensor Overlay (007-00131) onto transmission tester. See Fig. 10. Perform DTR sensor test as instructed on digital TR sensor overlay. If TR-"E" cable status lights match each selected gear position, DTR sensor is okay. Go to next step. If TR-"E" cable status lights do not match each selected gear

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

position, replace and adjust DTR sensor. Clear DTCs. See <u>CLEARING DIAGNOSTIC TROUBLE</u> <u>CODES</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE</u> <u>CODES (QUICK TEST)</u>.



#### Fig. 10: Identifying DTR Sensor "E" Cable & Transmission Tester Digital TR Sensor Overlay

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

#### **Courtesy of FORD MOTOR CO.**

7. Turn ignition switch to OFF position. Ensure DTR sensor is disconnected. Disconnect 32-pin PCM harness connector C175b. See <u>Fig. 12</u>. Inspect connector for damaged terminals, corrosion and loose wires. Repair as necessary. Measure and record resistance between specified PCM harness connector C175b terminal and appropriate DTR sensor harness connector terminal. See <u>DTR SENSOR/PCM</u> <u>OPEN CIRCUIT CHECK</u> table. See <u>Fig. 11</u>. If each resistance reading is less than 5 ohms, go to next step. If any resistance reading is 5 ohms or more, repair open in affected circuit. Clear DTCs. See <u>CLEARING DIAGNOSTIC TROUBLE CODES</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM.

#### DTR SENSOR/PCM OPEN CIRCUIT CHECK<sup>(1)</sup>

DTR Sensor Connector Terminal No.	PCM Connector C175 Terminal No.
2	17
3	9
4	22
5	18
6	10
(1) Refer to appropriate illustration for TR and PCM	sensor connector terminal identification See Fig

Refer to appropriate illustration for TR and PCM sensor connector terminal identification. See <u>Fig.</u>
 <u>11</u> and <u>Fig. 12</u>.

- 8. Ensure DTR sensor harness connector and PCM 32-pin harness connector C175b are disconnected. Perform following checks: Measure resistance between chassis ground and PCM 32-pin harness connector C175b terminals No. 9, 10, 17, 18 and 22. Measure resistance between PCM 32-pin harness connector C175b terminal No. 17 and terminals No. 9, 10, 18 and 22. Measure resistance between PCM 32-pin harness connector C175b terminal No. 17 and DTR sensor harness connector terminals No. 10 and 12. Measure resistance between chassis ground and DTR sensor harness connector terminals No. 10 and 12. If each resistance reading is more than 10 k/ohms, go to next step. If any resistance reading is 10 k/ohms or less, repair short circuit(s). Clear DTCs. See <u>CLEARING DIAGNOSTIC TROUBLE</u> <u>CODES</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE</u> <u>CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM.
- 9. Ensure DTR sensor harness connector and PCM 32-pin harness connector C175b are disconnected. Perform following checks: Measure resistance between PCM 32-pin harness connector C175b terminal No. 9 and terminals No. 10, 18 and 22. Measure resistance between PCM 32-pin harness connector C175b terminal No. 10 and terminals No. 9, 18 and 22. Measure resistance between PCM 32-pin harness connector C175b terminal No. 18 and terminals No. 9, 10 and 22. Measure resistance between PCM 32-pin harness pin harness connector C175b terminal No. 22 and terminals No. 9, 10 and 18. Go to next step.
- If each measurement in previous step is more than 10 k/ohms, replace PCM. Clear DTCs. See <u>CLEARING DIAGNOSTIC TROUBLE CODES</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. If any measurement is 10 k/ohms or less, repair short circuit(s). Clear DTCs. See <u>CLEARING DIAGNOSTIC TROUBLE</u> <u>CODES</u>. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>.
- 11. Connect TR "E" cable marked DIGITAL and transmission tester to digital TR sensor. See **Fig. 10**. Install digital TR sensor overlay onto transmission tester. Perform switch test as instructed on digital TR sensor

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

overlay. If transmission tester status light does not turn Red for appropriate gear position, replace and adjust DTR sensor. Clear DTCs. See <u>CLEARING DIAGNOSTIC TROUBLE CODES</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK</u> <u>TEST)</u> under SELF-DIAGNOSTIC SYSTEM. If transmission tester light turns Red for appropriate gear position, DTR sensor is okay. For back-up lights concerns, see BACK-UP LIGHTS article in ACCESSORIES & EQUIPMENT. For starting concerns, see appropriate STARTERS article in STARTING & CHARGING SYSTEMS.

#### TEST D: PC-A, PC-B & PC-C SOLENOIDS

NOTE: After each service or repair procedure has been completed, reconnect all components. Clear DTCs and repeat QUICK TEST. See <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Ensure all EEC-V systems are working properly and DTCs are no longer present.

# NOTE: All digital TR sensor and VSS DTCs must be repaired before entering Output State Control (OSC) mode.

- Turn ignition switch to OFF position. Place gearshift lever in "P" position. Ensure transmission harness connector is fully seated, terminals are fully engaged in connectors and in good condition. Install 300 psi (22.6 kg/cm<sup>2</sup>) pressure gauges to line pressure and pressure control taps on transmission case. See <u>Fig. 6</u> and <u>Fig. 7</u>. Connect NGS tester to DLC. Turn ignition switch to ON position. Select DIAGNOSTIC DATA LINK on NGS tester. Select PCM. Select ACTIVE COMMAND MODES. Select OUTPUT STATE CONTROL (OSC). Select TRANS-BENCH MODE. If vehicle enters TRANS-BENCH MODE, remain in TRANS-BENCH MODE and go to next step. If vehicle does not enter TRANS-BENCH MODE, repeat procedure to enter OSC. If vehicle still does not enter OSC, see <u>SCAN TOOL UNABLE TO COMMUNICATE</u> under SELF-DIAGNOSTIC SYSTEM.
- Perform <u>PC-A, PC-B & PC-C SOLENOIDS (BENCH MODE)</u> under OUTPUT STATE CONTROL MODES. Select value 15, 30, 45, 60, 70 or 90 psi and press SEND. Monitor and record pressures. Select another value 0-90 psi and press SEND. Monitor and record pressures. Select "XXX" and press SEND to cancel command. If pressure readings matched commanded pressures, clear DTCs. See <u>CLEARING</u> <u>DIAGNOSTIC TROUBLE CODES</u> under SELF-DIAGNOSTIC SYSTEM. If pressure readings did not match commanded pressures, go to next step.
- 3. Turn ignition switch to OFF position. Disconnect transmission 16-pin harness connector. Ensure all wires and connector terminals are in good condition. Turn ignition switch to ON position. Measure voltage between chassis ground and transmission 16-pin harness connector terminal No. 3. If voltage is more than 10 volts, go to next step. If voltage is 10 volts or less, repair open circuit between transmission and 15-amp fuse in junction box. See <u>WIRING DIAGRAMS</u>.
- 4. Cycle PC solenoids on and off in TRANS-BENCH MODE, while measuring voltage between transmission 16-pin harness connector terminal No. 3 and appropriate PC solenoid terminal. See <u>PRESSURE CONTROL SOLENOID OPERATION CHECK</u> table. If voltage changes when solenoid states change, go to next step. If voltage does not change when solenoid state changes, check for open or short circuit in wiring harness. If wiring harness is okay, check for open or short in PCM.

#### PRESSURE CONTROL SOLENOID OPERATION CHECK

Sunday, September 10, 2017 11:43:10 AM	Page 59	© 2005 Mitchell Repair Information Company 11 C
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#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

Solenoid	Transmission Harness Connector Terminal No.
PC-A	11
PC-B	1
PC-C	4

- Measure resistance between transmission 16-pin harness connector terminal No. 3 and appropriate PC solenoid terminal. See <u>PRESSURE CONTROL SOLENOID OPERATION CHECK</u> table. PC solenoid resistance should be 3.3-7.5 ohms. If all solenoid resistance readings are within specification, go to next step. If any solenoid resistance reading is not within specification, replace solenoid body assembly. Retest system.
- 6. Measure resistance between chassis ground and transmission 16-pin harness connector terminals No. 1, 4 and 11. If resistance readings are 10 k/ohms or less, replace solenoid body assembly. Clear DTCs. See <u>CLEARING DIAGNOSTIC TROUBLE CODES</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. If resistance readings are more than 10 k/ohms, see appropriate SYMPTOM DIAGNOSIS under <u>TROUBLE SHOOTING</u>. Retest system.

#### **TEST E: ISS, OSS & TSS SENSORS**

- NOTE: After each service or repair procedure has been completed, reconnect all components. Clear DTCs and repeat QUICK TEST. See <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Ensure all EEC-V systems are working properly and DTCs are no longer present.
  - Ensure ignition switch is in OFF position and gearshift lever is in "P" position. Ensure transmission harness connector is fully seated, terminals are fully engaged in connector and in good condition. Repair as necessary. Connect NGS tester to DLC. Turn ignition switch to ON position. Select DIAGNOSTIC DATA LINK on NGS tester. Select PCM. Select PID/DATA MONITOR AND RECORD. Select PIDs ISS, OSS and TSS. If vehicle enters PID/DATA MONITOR AND RECORD, remain in PID/DATA MONITOR AND RECORD and go to next step. If vehicle does not enter PID/DATA MONITOR AND RECORD, see <u>SCAN TOOL UNABLE TO COMMUNICATE</u> under SELF-DIAGNOSTIC SYSTEM.
  - 2. Road test vehicle while monitoring appropriate sensor PID. Ensure transmission upshifts and downshifts through all gears. If ISS, OSS and TSS sensor speed increases and decreases with engine and vehicle speed, go to next step. If ISS, OSS and TSS sensor speed does not increase and decrease with engine and vehicle speed, check for open or short circuit in wiring harness or sensor, or check for PCM concern or internal hardware concern. Go to step 4.
  - 3. While road testing vehicle, monitor appropriate ISS, OSS or TSS sensor PID. Ensure transmission upshifts and downshifts through all gears. If ISS, OSS or TSS sensor PID signal is erratic (drops to zero or near zero and returns to normal), check for intermittent concern in wiring harness, sensor or connectors, then go to next step. If ISS, OSS or TSS sensor PID signal is okay, clear DTCs. See <u>CLEARING DIAGNOSTIC TROUBLE CODES</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES</u> (QUICK TEST) under SELF-DIAGNOSTIC SYSTEM.
  - 4. Turn ignition switch to OFF position. Disconnect PCM 32-pin harness connector C175b. Inspect both ends of connector for damage or pushed out terminals, corrosion, loose wires, and missing or damaged

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

seals. Disconnect suspect sensor 2-pin harness connector. Measure between specified PCM harness connector C175b terminal and suspect ISS, OSS or TSS sensor harness connector terminals. See <u>PCM</u> <u>HARNESS OPEN CIRCUIT CHECK</u> table. See <u>Fig. 12</u>. See <u>WIRING DIAGRAMS</u>. If all resistance readings are less than 5 ohms, go to next step. If any resistance reading is 5 ohms or more, repair open in affected circuit. See <u>WIRING DIAGRAMS</u>.

#### PCM HARNESS OPEN CIRCUIT CHECK<sup>(1)</sup>

Sensor Harness Connector Terminal No.	PCM Harness Connector Terminal No.
ISS	
1	21
2	17
OSS	
1	26
2	17
TSS	
1	27
2	17
(1) Refer to appropriate illustration for PCM or ISS, identification See Fig. 12. See WIRING DIAG	OSS or TSS sensor harness connector terminal

- 5. Ensure suspect sensor harness connector and PCM 32-pin harness connector C175b are disconnected. Perform appropriate test for suspect sensor in the following steps.
- 6. For OSS sensor, measure resistance between PCM 32-pin harness connector C175b terminal No. 26 and OSS sensor harness connector terminal No. 1. Measure resistance between chassis ground and PCM 32-pin harness connector terminal No. 26.
- For ISS sensor, measure resistance between PCM 32-pin harness connector C175b terminal No. 21 and ISS sensor harness connector terminal No. 1. Measure resistance between chassis ground and PCM 32pin harness connector terminal No. 21.
- 8. For TSS sensor, measure resistance between PCM 32-pin harness connector C175b terminal No. 27 and TSS sensor harness connector terminal No. 1. Measure resistance between chassis ground and PCM 32-pin harness connector terminal No. 27.
- If all resistance readings in previous steps are more than 10 k/ohms, go to next step. If any resistance reading is 10 k/ohms or less, repair short to ground in affected circuit. See <u>WIRING DIAGRAMS</u>. Retest system. Clear DTCs. See <u>CLEARING DIAGNOSTIC TROUBLE CODES</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM.
- Disconnect suspect ISS, OSS or TSS sensor 2-pin connector. Measure and record resistance between suspect sensor connector (component side) terminals No. 1 and 2. Sensor resistance should be 266-390 ohms at 4°F (-20°C), 325-485 ohms at 70°F (21°C) and 492-738 ohms at 302°F (150°C). If resistance reading is not within specification, replace affected sensor. If resistance reading is within specification, go to next step.
- Measure and record resistance between chassis ground and sensor connector terminals No. 1 and 2. If either resistance reading is 10 k/ohms or less, replace affected sensor. Clear DTCs. See <u>CLEARING</u> <u>DIAGNOSTIC TROUBLE CODES</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING</u>

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

**<u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>** under SELF-DIAGNOSTIC SYSTEM. If both resistance readings are more than 10 k/ohms, see appropriate transmission shifting or TCC symptom in appropriate SYMPTOM DIAGNOSIS under **TROUBLE SHOOTING**. Retest system.

#### **TEST F: SOLENOID MECHANICAL FAILURE**

- NOTE: All other DTCs must be repaired and cleared, prior to repairing DTCs P1714, P1715, P1716, P1717 or P1740.
- NOTE: After each service or repair procedure has been completed, reconnect all components. Clear DTCs and repeat QUICK TEST. See <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Ensure all EEC-V systems are working properly and DTCs are no longer present.
  - Ensure ignition switch is in OFF position and gearshift lever is in "P" position. Connect NGS tester to DLC. Turn ignition switch to ON position. Perform <u>KEY ON ENGINE OFF (KOEO) SELF-TEST</u> under RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST), until continuous memory codes are retrieved. If DTCs for TFT sensor and shift solenoids are present, repair those DTCs first. Clear DTCs. See <u>CLEARING DIAGNOSTIC TROUBLE CODES</u> under SELF-DIAGNOSTIC SYSTEM. Perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. If only DTCs P1714, P1715, P1716, P1717 or P1740 are set, replace suspect solenoid body assembly and go to next step.
  - Disconnect NGS tester. Perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. If transmission upshifts and downshifts correctly, go to next step. If transmission does not upshift and/or downshift correctly, see appropriate symptom in appropriate SYMPTOM DIAGNOSIS under <u>TROUBLE SHOOTING</u>.
  - 3. Turn ignition switch to OFF position. Place gearshift lever is in "P" position. Connect NGS tester to DLC. Turn ignition switch to ON position. Perform <u>KEY ON ENGINE OFF (KOEO) SELF-TEST</u> under RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST) again until continuous memory codes are retrieved. If DTCs P1714, P1715, P1716, P1717 or P1740 are still present, replace PCM and perform <u>TRANSMISSION DRIVE CYCLE TEST</u> under SELF-DIAGNOSTIC SYSTEM. Repeat <u>RETRIEVING DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u>. If DTCs P1714, P1715, P1716, P1717 or P1740 are not set, testing is complete. If shifting problems still exist, see appropriate symptom in appropriate SYMPTOM DIAGNOSIS under <u>TROUBLE SHOOTING</u>.

#### **TEST G: TRANSMISSION CONTROL SWITCH INOPERATIVE**

- NOTE: O/D cancel switch is also referred to as Transmission Control Switch (TCS).
- NOTE: After each service or repair procedure has been completed, reconnect all components. Clear DTCs and repeat QUICK TEST. See <u>RETRIEVING</u> <u>DIAGNOSTIC TROUBLE CODES (QUICK TEST)</u> under SELF-DIAGNOSTIC SYSTEM. Ensure all EEC-IV systems are working properly and DTCs are no longer present.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

- Turn ignition switch to OFF position. Disconnect PCM 58-pin harness connector C175a. See <u>Fig. 12</u>. Turn ignition switch to ON position. Measure voltage between chassis ground and PCM 58-pin harness connector C175a terminal No. 41. If voltage is more than 10 volts, check for stuck closed O/D cancel switch or short to ground in circuit. If voltage is 10 volts or less, go to next step.
- Ensure ignition switch is turned to ON position. Measure voltage between chassis ground and central junction box fuse No. 13. If voltage is more than 10 volts, go to next step. If voltage is 10 volts or less, repair open in affected circuit. See <u>WIRING DIAGRAMS</u>. Retest system.

## **REMOVAL & INSTALLATION**

#### **POWERTRAIN CONTROL MODULE**

#### CAUTION: When battery is disconnected, vehicle computer may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

#### **Removal & Installation**

Disconnect negative battery cable. Locate PCM. See <u>COMPONENT LOCATIONS</u>. Loosen nuts and disconnect PCM harness connectors. Remove 2 PCM nuts. Remove glove box door. Remove PCM. To install, reverse removal procedure. Tighten nuts to specification. See TORQUE SPECIFICATIONS. Connect negative battery cable. Program PCM. See <u>PROGRAMMING</u>.

## TORQUE SPECIFICATIONS

#### **TORQUE SPECIFICATIONS**

Application	INCH Lbs. (N.m)
PCM Connector Nut	7 (62)
PCM Nut	8 (71)

## **CONNECTOR IDENTIFICATION**

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis



**Fig. 11: Identifying DTR Sensor Harness Connector Terminals** Courtesy of FORD MOTOR CO.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis



**<sup>&</sup>lt;u>Fig. 12: Identifying Powertrain Control Module Harness Connectors</u> Courtesy of FORD MOTOR CO.** 

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis



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**Fig. 13: Identifying Transmission 16-Pin Harness Connector Terminals** Courtesy of FORD MOTOR CO.

# WIRING DIAGRAMS

2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

# Fig. 14: Transmission Electronic Control System Wiring Diagram (2002 Ford Explorer & Mercury

Sunday, September 10, 2017 11:43:10 AM	Page 67	© 2005 Mitchell Repair Information Company, LLC.
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#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

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2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

# Fig. 15: Transmission Electronic Control System Wiring Diagram (2002 Ford Explorer & Mercury

Sunday, September 10, 2017 11:43:10 AM	Page 69	© 2005 Mitchell Repair Information Company, LLC.

#### 2002 AUTOMATIC TRANSMISSIONS' '5R55W/S Diagnosis

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