

NO: 21-11-98

SUBJECT: Transmission Simulator Diagnostic Tool

DATE: Dec. 11, 1998

NOTE: THIS INFORMATION APPLIES TO VEHICLES EQUIPPED WITH A 45RFE TRANSMISSION.

DISCUSSION:

A new transmission simulator (Miller Special Tool 8333) will soon be distributed to dealers. This new tool will help technicians make a more thorough, accurate, and timely diagnosis by distinguishing between electronic hardware failures and TCM/wiring harness failures.

Included in your CMMS mailing is 2 copies of the simulator manual for 45RFE transmissions. In addition to diagnosing the 45RFE, the simulator will be capable of making similar diagnostics for the 41TE and 42LE transaxles. Adapters and Instructions for Front Wheel Drive applications will become available in the first quarter of 1999.

POLICY: Information Only

INTRODUCTION

The following information covers the installation and use of the Miller Special Tools 8333, Transmission Simulator ([FIGURE 1](#)). The Transmission Simulator facilitates testing the transmission circuits and the transmission control module (TCM) under operating conditions. Proper use of the Simulator will result in quicker and more accurate diagnosis of transmission symptoms. Distinguishing between transmission electronic hardware failure and TCM/wiring harness failures can be made easily and accurately. The WJ Transmission Diagnostic Procedures can then be used to repair the identified wiring circuit or component. The Transmission Simulator uses the vehicle wiring harness to supply all power and ground requirements necessary to generate the signals sent to the TCM. By receiving power from the vehicle harness, the Simulator allows testing of all the transmission circuits under actual circuit loads.

NOTE: The vehicle starter will not crank or start with Special Tool 8333 installed.

PRELIMINARY DIAGNOSIS

The following steps and procedures must be performed prior to beginning any diagnosis of the 45RFE transmission system. It must be confirmed that the DRB III[®] scan tool is functioning properly and that the vehicle's communication bus is operational before any meaningful diagnosis of the transmission system can begin.

1. Place the vehicle gear selector lever in the **PARK** position.
2. Connect the DRB III[®] scan tool to the vehicle data link connector.
3. Turn the ignition to the **ON** position.
4. Note the scan tool display.
 - If the DRB III[®] scan tool display is blank or displays an internal error message, refer to any Diagnostic manual for corrective procedures.
 - Otherwise, proceed to the next step.
5. Did the DRB III[®] scan tool show the message "BUS OPERATIONAL?"
 - If not, refer to the WJ Body Diagnostic Procedures for corrective procedures.
 - Otherwise, proceed to the next step.
6. Using the DRB III[®] scan tool, check for any diagnostic trouble codes (DTCs) or one-trip failures stored in the powertrain control module (PCM).
 - If any DTCs are present, refer to the WJ Powertrain Diagnostic Procedures for the correct procedures to check and repair any PCM DTCs.

- If no DTCs are present, proceed to the next step.
- 7. Select the **TRANSMISSION** system from the DRB III[®] menu.
- 8. Does the DRB III[®] scan tool show "NO RESPONSE?"
 - If so, refer to the WJ Transmission Diagnostic Procedures for corrective procedures.
 - Otherwise, proceed to **SYMPTOM VERIFICATION**.

SYMPTOM VERIFICATION

1. Perform the **SHIFT LEVER POSITION TEST** using the DRB III[®] scan tool.
 - If the test did not pass, refer to the WJ Transmission Diagnostic Procedures to interpret the failure code. Record the information for future reference.
 - Then, proceed to the next step.
2. Check the TCM for DTCs. Be sure to check for one-trip failures, also. Record all DTCs and one-trip failures for future reference.
3. Erase all DTCs using the DRB III[®] scan tool.
4. Refer to the WJ Transmission Diagnostic Procedures for information regarding the conditions required to set each DTC or one-trip failure.
5. Perform the applicable instructions and attempt to reset each recorded DTC or one-trip failure.
6. Any DTC or one-trip failure which can be repeated is considered a **HARD CODE**.
7. Any DTC or one-trip failure which cannot be repeated is considered an **INTERMITTENT CODE**.

*Once the **Preliminary Diagnosis and Symptom Verification** procedures are complete, you know that the DRB III[®] scan tool and the TCM are communicating over an operational vehicle communication bus. You also know whether the DTCs or one-trip failures, which have been stored in the TCM, are hard or intermittent codes. The Transmission Simulator can now be installed.*

TRANSMISSION SIMULATOR INSTALLATION

1. Ensure that the vehicle ignition is in the **OFF** position.

NOTE: If the transmission solenoid/TRS assembly connector is removed while the ignition is in the **ON** or **RUN** position, a DTC will be set indicating that the TCM has seen an invalid TRS state. If this DTC is set, it must be erased prior to any further testing.

2. Raise the vehicle on a suitable hoist.
3. Inspect all transmission connectors and wiring for visible damage or corrosion. Repair and retest as necessary.
4. Disconnect the input and output speed sensor connectors from the input and output speed sensors ([FIGURE 2](#)).
5. Inspect the speed sensor connectors and the speed sensors for terminal damage, deformation, or corrosion. Repair and retest as necessary.
6. Disconnect the line pressure sensor connector from the line pressure sensor ([FIGURE 3](#)).
7. Inspect the line pressure sensor connector and the line pressure sensor for terminal damage, deformation, or corrosion. Repair and retest as necessary.
8. Disconnect the transmission solenoid/TRS assembly connector from the transmission solenoid/TRS assembly ([FIGURE 4](#)).

WARNING: The latch mechanism on the transmission solenoid/TRS assembly connector can often be difficult to release. If not released correctly, the connector locking mechanism will be damaged and the entire connector body will need to be replaced. The correct method to release the connector latch is to press the black locking mechanism bar, located between the gray clamp/swing arm and the main connector body, toward the connector centerline ([FIGURE 5](#)).

9. Inspect the transmission solenoid/TRS assembly connector and the transmission solenoid/TRS assembly for terminal damage, deformation, or corrosion. Repair and retest as necessary.
10. Connect the Transmission Simulator, Special Tool 8333, to the vehicle wiring harness. Refer to the connection

instructions on the interior of the Simulator lid ([FIGURE 6](#)).

11. Connect the Transmission Simulator ground cable to a suitable vehicle ground.

NOTE: Ensure that the Simulator ground clamp is secure. The Simulator will power down and a DTC will be set if the ground clamp loses contact with the vehicle ground once the ignition is moved to the **ON** or **RUN** position.

12. Lower the vehicle.
13. Move the ignition to the **RUN** position.
14. If the transmission relay does not power on, the Transmission Simulator will not be powered on. This is indicated by no red LED illuminated in the **PARK** position of the TRS portion on the Simulator control panel.
15. If the Transmission Simulator is not powered on, the source of the DTC is still present. Diagnose the TCM\wiring using the WJ Transmission Diagnostics Procedures.
16. If the transmission relay powers on, the Transmission Simulator will be powered on with a single red LED illuminated, indicating the **PARK** position in the TRS portion of the Simulator control panel.

*With the Transmission Simulator correctly installed and ready for use, you can evaluate the possible causes of the DTC retrieved from the TCM. Perform **ONLY** the following tests which are necessary to implicate or exonerate the suspect component/circuit. Refer to the chart at the rear of this document to determine which tests are necessary for a particular DTC. Use the Test Checklist at the end of this document to record the results of any tests performed.*

SHIFT LEVER POSITION TEST

1. Choose the **SHIFT LEVER POSITION TEST** from the DRB III[®] scan tool menu.
2. Use the Step Up/Step Down momentary contact toggle switch on the Transmission Simulator control panel to step through the shift lever positions per the DRB III[®] scan tool test directions.
3. When directed to depress the **O/D** off button, locate and depress the **O/D** off button, located inside the vehicle.
4. Did the **SHIFT LEVER POSITION TEST** pass?
 - If the test did not pass, proceed to the Transmission Range Sensor Test.
 - If the test passed with the Simulator connected but did not pass with the 45RFE transmission connected, proceed to the Test Interpretation section at the end of this document.
 - If the test passed with the Simulator connected and with the 45RFE transmission connected, proceed with any other necessary tests.

TRANSMISSION RANGE SENSOR TEST

1. Display the TRS signal line states on the DRB III[®] scan tool screen. The signal lines are displayed C1, C2, etc..
2. Use the Step Up/Step Down momentary contact toggle switch on the Transmission Simulator control panel to select each shift lever position. Using the TRS switch state tables provided below, compare the switch states displayed on the DRB III[®] scan tool to the states in the table.

GEAR	C1	C2	C3	C4	C5
PARK	CL	CL	OP	OP	CL
TEMP 1	OP	CL	OP	OP	CL
REVERSE	OP	CL	OP	OP	OP
TEMP 2	OP	CL	CL	OP	OP
NEUTRAL 1	CL	CL	CL	OP	OP
NEUTRAL 2	CL	CL	CL	CL	OP
TEMP 3	OP	CL	CL	CL	OP
DRIVE	OP	OP	CL	CL	OP
TEMP 4	OP	OP	OP	CL	OP
MANUAL 2	OP	OP	OP	CL	CL

TEMP 5	OP	OP	OP	OP	CL
MANUAL 1	OP	OP	CL	OP	CL

- Record the values displayed by the DRB III[®] for each signal line on the checklist. Note whether or not a particular signal line never switches states.
- Proceed to the Test Interpretation section at the end of this document.

REVERSE LIGHT SWITCH TEST

- Depress the reverse light switch test button on the Simulator control panel.
- Check to see if the vehicle reverse lights illuminate while the switch is depressed.
- Proceed to the Test Interpretation section at the end of this document.

PRESSURE SWITCH TESTS

- Display the transmission pressure switch states on the DRB III[®] scan tool screen.
- Select the pressure switch to be tested with the Pressure Switch rotary knob on the Simulator control panel.
- Depress and hold the Pressure Switch Test button on the Simulator control panel.
- View the selected pressure switch state on the DRB III[®] scan tool and note if the pressure switch state display switches to **CLOSED** when the test button is depressed and held.

NOTE: Due to the DRB III[®] update rate, it may take a moment for the DRB III[®] display to toggle states after the switch is depressed.

- Select each of the remaining pressure switches with the Pressure Switch rotary knob and repeat steps 3 and 4 until all switches have been tested. Record the results of each pressure switch test on the checklist.
- Proceed to the Test Interpretation section at the end of this document.

SENSOR TESTS

- Verify that the Input/Output sensor switch on the Simulator control panel is in the **ON** position.

NOTE: With the switch in the **OFF** position, the DRB III[®] will display zero output speed and the input speed selected by the rotary knob position.

- Rotate the Sensor Value rotary knob on the Simulator control panel to the top position.
- Use the DRB III[®] scan tool to view the input and output speed sensor, line pressure sensor, and transmission temperature thermistor voltage readings.
- Compare the DRB III[®] readings to the values on the Simulator control panel. Record the sensor values displayed by the DRB III[®] on the checklist.

NOTE: It is normal for the input and output speed sensor readings to vary from the Simulator panel by a few RPM. It is also normal for the line pressure sensor reading to vary by 1-3 psi from the panel value.

- Switch to each of the remaining sensor value positions on the Simulator and repeat steps 3 and 4.
- Proceed to the Test Interpretation section at the end of this document.

SHIFT SOLENOID ACTUATOR TESTS

- Choose the **ACTUATORS** selection from the DRB III[®] scan tool menus.
- Verify that the Input/Output sensor switch on the Simulator control panel is in the **OFF** position.

NOTE: The TCM will not permit the actuator tests to run if the TCM "sees" an output speed signal greater than zero rpm.

3. Select the solenoid to be tested from the DRB III[®] scan tool menu and begin actuation.
4. The green LED on the Simulator control panel next to the selected solenoid will begin to flash if the vehicle is capable of supplying the current and voltage to turn on a correctly functioning 45RFE transmission shift solenoid.

NOTE: To prevent the possibility of having three clutch elements applied at once when this test is performed with the 45RFE transmission connected and the engine running, the TCM turns on the normally applied transmission solenoids, OD and MS. This means that three LEDs (OD, MS, and the selected solenoid) may be illuminated at the same time.

5. Note if any solenoid does not respond to the actuation command from the DRB III[®] scan tool or if any LED repeatedly flashes differently from the other LEDs. Record the results of the tests on the checklist.
6. Proceed to the Test Interpretation section at the end of this document.

TEST INTERPRETATION

1. If the DTC was a **HARD** code and the above diagnostics showed no discrepancies between the expected reading/response from the Simulator and the displayed reading/response of the DRB III[®] scan tool.
 - o The source of the DTC is the transmission component associated with the DTC.
2. If the DTC was a **HARD** code and the above diagnostics showed discrepancies between the expected reading/response from the Simulator and the displayed reading/response of the DRB III[®] scan tool.
 - o The source of the DTC is the vehicle wiring/TCM.
 - o Analyze the test where the discrepancy was noted to isolate the source of the DTC to an individual circuit or the TCM.
 - o Refer to the WJ Transmission Diagnostics for corrective procedures.
3. If the DTC was an **INTERMITTENT** code and the above diagnostics showed discrepancies between the expected reading/response from the Simulator and the displayed reading/response of the DRB III[®] scan tool.
 - o The source of the DTC is the vehicle wiring/TCM.
 - o Analyze the test where the discrepancy was noted to isolate the source of the DTC to an individual circuit or the TCM.
 - o Refer to the WJ Transmission Diagnostics for corrective procedures.
4. If the DTC was an **INTERMITTENT** code and the above diagnostics showed no discrepancies between the expected reading/response from the Simulator and the displayed reading/response of the DRB III[®] scan tool.
 - o The source of the DTC cannot yet be determined.
 - o Continue testing until the DTC can be duplicated.
 - o The Transmission Simulator can be used to create an operating load in a circuit to facilitate further testing, such as harness wiggle and connector movement tests.

45RFE TEST CHECKLIST

TRS TEST						
GEAR	C1	C2	C3	C4	C5	PASSED?
PARK	CLOSED	CLOSED	OPEN	OPEN	CLOSED	
TEMP 1	OPEN	CLOSED	OPEN	OPEN	CLOSED	
REVERSE	OPEN	CLOSED	OPEN	OPEN	OPEN	
TEMP 2	OPEN	CLOSED	CLOSED	OPEN	OPEN	
NEUTRAL 1	CLOSED	CLOSED	CLOSED	OPEN	OPEN	
NEUTRAL 2	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	
TEMP 3	OPEN	CLOSED	CLOSED	CLOSED	OPEN	

DRIVE	OPEN	OPEN	CLOSED	CLOSED	OPEN
TEMP 4	OPEN	OPEN	OPEN	CLOSED	OPEN
MANUAL 2	OPEN	OPEN	OPEN	CLOSED	CLOSED
TEMP 5	OPEN	OPEN	OPEN	OPEN	CLOSED
MANUAL 1	OPEN	OPEN	CLOSED	OPEN	CLOSED

REVERSE LIGHT TEST	
PASSED?	

PRESSURE SWITCH TEST	
SWITCH	PASSED?
L/R	
OD	
UD	
4C	
2C	
MS	

SPEED SENSOR TEST	
DESIRED	DISPLAYED
200/600	
1000/3000	
2000/6000	

LINE PRESSURE SENSOR TEST	
DESIRED	DISPLAYED
230	
76	
35	

TEMPERATURE THERMISTOR TEST	
DESIRED	DISPLAYED
4.8V	
1.8V	
0.4V	

SOLENOID TEST						
SOLENOID	L/R	OD	UD	4C	2C	MS
PASSED?						

TEST DETERMINATION TABLE

TEST DETERMINATION			
CODE	P-CODE	NAME OF CODE	RECOMMENDED

			TEST
28	P0705	CHECK SHIFTER SIGNAL	TRS
35	P1791	LOSS OF PRIME	PRESSURE SWITCH
50	P0736	GEAR RATIO ERROR IN REVERSE	SENSOR OR SOLENOID
51	P0731	GEAR RATIO ERROR IN 1ST	SENSOR OR SOLENOID
52	P0732	GEAR RATIO ERROR IN 2ND	SENSOR OR SOLENOID
53	P0733	GEAR RATIO ERROR IN 3RD	SENSOR OR SOLENOID
54	P0734	GEAR RATIO ERROR IN 4TH	SENSOR OR SOLENOID
55	P1736	GEAR RATIO ERROR IN 2ND PRIME	SENSOR OR SOLENOID
56	P0715	INPUT SPEED SENSOR ERROR	SENSOR
57	P0720	OUTPUT SPEED SENSOR ERROR	SENSOR
58	P1794	SPEED SENSOR GROUND ERROR	SENSOR
74	P1799	TEMPERATURE SENSOR	SENSOR
81	P1784	L/R PRESSURE SWITCH SENSE	PRESSURE SWITCH
82	P1734	2C PRESSURE SWITCH SENSE	PRESSURE SWITCH
84	P1781	OD PRESSURE SWITCH SENSE	PRESSURE SWITCH
88	P1733	4C PRESSURE SWITCH SENSE	PRESSURE SWITCH
90	P1732	UD PRESSURE SWITCH SENSE	PRESSURE SWITCH
A1	P1729	L/R HYDRAULIC PRESSURE SWITCH CIRCUIT	PRESSURE SWITCH
A2	P1728	2C HYDRAULIC PRESSURE SWITCH CIRCUIT	PRESSURE SWITCH
A4	P1787	OD HYDRAULIC PRESSURE SWITCH CIRCUIT	PRESSURE SWITCH
A8	P1727	4C HYDRAULIC PRESSURE SWITCH CIRCUIT	PRESSURE SWITCH
B0	P1726	UD HYDRAULIC	PRESSURE

		PRESSURE SWITCH CIRCUIT	SWITCH
C1	P0750	L/R SOLENOID CIRCUIT	SOLENOID
C2	P0755	2C SOLENOID CIRCUIT	SOLENOID
C3	P0760	OD SOLENOID CIRCUIT	SOLENOID
C4	P0770	4C SOLENOID CIRCUIT	SOLENOID
C5	P0765	UD SOLENOID CIRCUIT	SOLENOID
C6	P1737	MS SOLENOID CIRCUIT	SOLENOID
C8	P1720	LINE PRESSURE FAULT	SENSOR
C9	P1722	LINE PRESSURE LOW	SENSOR
CA	P1721	LINE PRESSURE SENSOR FAULT	SENSOR
CB	P1724	LINE PRESSURE HIGH	SENSOR