1995-1996 AUTOMATIC TRANSMISSIONS

4R44E & 4R55E Electronic Controls

INTRODUCTION

NOTE: For 4R44E and 4R55E transmission mechanical testing and repair, see AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E article.

The first step in diagnosing any driveability problem is verifying the customer's complait with a test drive under the conditions the problem reportedly occurred. Before entering self-diagnostics, perform a careful and complete visual inspection. Most transmission control problems result from mechanical breakdowns or poor electrical connections.

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

DESCRIPTION & OPERATION

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

The PCM controls transmission operation through 6 electronic solenoids. Three On/Off solenoids for shifting. One Pulse-Width Modulator (PWM) solenoid for Torque Converter Clutch (TCC) control. One Electronic Pressure Control (EPC) solenoid for line pressure control. One Coast Clutch Solenoid (CCS) to control apply and release of coast clutch. The PCM has built-in self-diagnosis, fail-safe code and warning code display for the main input sensors and solenoid valves.

NOTE: For engine-related DTCs, see appropriate TESTS W/CODES article in 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.

DESCRIPTION & OPERATION

1996 Aerostar

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Explorer

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Explorer

- **TESTS W/CODES - 4.0L** .
- **TESTS W/CODES - 5.0L** .

1995 Ranger

- **TESTS W/CODES - EEC-V (2.3L)** .
- **TESTS W/CODES - EEC-V (3.0L)** .
- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Ranger

- **TESTS W/CODES - 2.3L** .
- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

INPUT SENSORS

Air Conditioning Clutch (ACC)

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

Brake On/Off (BOO) Switch

The PCM receives a signal from the BOO switch when the brake switch is operated. Torque converter clutch is disengaged when brakes are applied. Malfunctioning switch will affect torque converter operation.

Crankshaft Position (CKP) Sensor & Ignition Control Module

(ICM)

The CKP sensor sends crankshaft position information to the ICM, which sends an engine speed signal to the PCM. Signal received by the PCM affects line pressure, shift scheduling and torque converter clutch control. Engine speed signal malfunction may result in harsh engagements, firm shifts, TCC lock-up and/or late WOT shifts.

Engine Coolant Temperature (ECT) Sensor

Engine temperature signal is sent to PCM. Malfunctioning ECT will affect torque converter clutch operation.

Intake Air Temperature (IAT) Sensor

Intake air temperature signal is sent to PCM. Malfunctioning IAT will affect EPC pressure, causing either harsh or soft shifts.

Low Range Switch (4WD)

Switch is mounted on transfer case cover. Switch controls shift scheduling in 4WD. If low range switch fails with open contacts, delayed shifts in 4WD LOW will occur. If low range switch fails with closed contacts, 2WD and 4WD HIGH shift schedule will be early.

Mass Airflow Sensor (MAF)

The MAF signal is used for Electronic Pressure Control (EPC), shift and TCC operation and MAF malfunction will affect these areas.

Power Steering Pressure (PSP) Switch

On some applications, PCM receives signal voltage from PSP switch indication that the power steering pressure exceeded a specific limit. The PCM uses the PSP switch signal to adjust idle speed to compensate for additional engine load. If the PSP switch fails with closed contacts, line pressure will be slightly high, causing firm engagements, firm shifts, and harsh coast down shifts. If the ACC switch fails with open contacts, line pressure will be slightly low during increased power steering load.

Transmission Control Switch (TCS)

Switch is mounted on shift lever handle. Switch controls operation of 4th gear. If TCS fails with open contacts no 4th gear disable or coast braking in 2nd and 3rd gear is possible.

Transmission Fluid Temperature (TFT) Sensor

The TFT sensor is located on the solenoid valve body. The PCM monitors voltage across the TFT thermistor to determine transaxle fluid temperature. Depending on temperature, the PCM controls line pressure, shift scheduling and TCC operation. Malfunction of sensor will cause incorrect line pressure and possible lack of TCC operation.

Throttle Position Sensor (TPS)

The TPS is a potentiometer mounted to the engine throttle body. The PCM receives a signal from the TPS relaying throttle plate position. TPS failure will cause PCM to operate in fail safe mode and raise line pressure to prevent transaxle damage. This condition will result in harsh engagements, firm shift feel, abnormal shift schedule and TCC not engaging or cycling.

Transmission Range (TR) Sensor

The PCM monitors a series of step down resistors in the TR sensor that act as a voltage divider. The voltage signal corresponds with position of the transaxle range selector lever. The TR sensor also contains the neutral/start and backup light circuits. Malfunction of the TR sensor may cause harsh engagements and firm shift feel. Improper shifting or shift selection and no engine cranking may also result.

Transmission Speed Sensor (TSS)

The TSS is a magnetic pickup that sends turbine shaft speed signal to the PCM. Malfunction of sensor may cause increased engine RPM on engagements, harsh shifts or delayed shifts with hard apply.

Vehicle Speed Sensor (VSS)

The VSS is a magnetic pickup that sends output speed signal to the PCM. Malfunction of sensor may cause high EPC pressure, harsh engagements, firm shift feel or abnormal shift schedule. Unexpected down shifts may occur at closed throttle. TCC will not engage.

OUTPUT DEVICES

Solenoid Valve Body Assembly

The solenoid valve body assembly contains EPC solenoid, Shift Solenoid No. 1 (SS1), Shift Solenoid No. 2 (SS2), Shift Solenoid No. 3 (SS3), Coast Clutch Solenoid (CCS) and Torque Converter Clutch (TCC) solenoid. See **SOLENOID OPERATIONS TABLE**.

SOLENOID OPERATIONS

Gear Selector Position	SS1	SS2	SS3	CCS	Engine Braking
"P" Or "N"	On	Off	Off	Off	No
"R"	On	Off	Off	Off	(1) *
"D" (O/D ON)					
1st Gear	On	Off	Off	Off	No
2nd Gear	On	On	Off	Off	No
3rd Gear	Off	Off	Off	Off	No
4th Gear	Off	Off	On	Off	No
"D" (O/D OFF)					
1st Gear	On	Off	Off	On	Yes
2nd Gear	On	On	Off	On	Yes
3rd Gear	Off	Off	Off	On	Yes
"2" (Manual Select)	On	On	Off	On	Yes
"1" (Manual Select)	On	Off	Off	On	Yes
(1) Engine braking with overdrive off.					

Shift Solenoid Assemblies

1. When shift solenoid is always off, failure could be due to the PCM and/or vehicle wiring malfunction, and/or solenoid electrically or mechanically stuck off. For shift symptoms, see **Fig. 1**.
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. For shift symptoms, see **Fig. 2**.
3. 2nd and 4th gear in overdrive can only be obtained with sufficient EPC pressure. Ensure EPC solenoid operates normally.

SS1 Always OFF:	Transmission Range Selector Lever Position		
	OD	2	1
PCM Gear Commanded	Actual Gear Obtained		
1	3	—	2
2	2	2	2[1]
3	3	—	—
4	4	—	—

SS2 Always OFF:	Transmission Range Selector Lever Position		
	OD	2	1
PCM Gear Commanded	Actual Gear Obtained		
1	1	—	1
2	1	2	1
3	3	—	—
4	4	—	—

SS3 Always OFF:	Transmission Range Selector Lever Position		
	OD	2	1
PCM Gear Commanded	Actual Gear Obtained		
1	1	—	1
2	2	2	2[1]
3	3	—	—
4	3	—	—

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

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Fig. 1: Shift Solenoid Failed Off
Courtesy of FORD MOTOR CO.

SS1 Always ON:	Transmission Range Selector Lever Position		
	OD	2	1
PCM Gear Commanded	Actual Gear Obtained		
1	1	—	1
2	2	2	2[1]
3	1	—	—
4	Ratio 1.86	—	—

SS2 Always ON:	Transmission Range Selector Lever Position		
	OD	2	1
PCM Gear Commanded	Actual Gear Obtained		
1	2	—	2
2	2	2	2
3	2	—	—
4	2	—	—

SS3 Always ON:	Transmission Range Selector Lever Position		
	OD	2	1
PCM Gear Commanded	Actual Gear Obtained		
1	Ratio 1.86	—	Ratio 1.86
2	Ratio 1.11	Ratio 1.11	Ratio 1.11[1]
3	4	—	—
4	4	—	—

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

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Fig. 2: Shift Solenoid Failed On
Courtesy of FORD MOTOR CO.

Torque Converter Clutch (TCC) Solenoid

The TCC receives signal from the PCM. The TCC controls application, modulation and release of torque converter clutch. If solenoid fails in ON position, vehicle engine will run rough (shudder) and engine stalls in Drive at low idle speeds (1st, 2nd, 3rd or 4th gear). If solenoid fails in OFF position, torque converter clutch will not engage.

Electronic Pressure Control (EPC) Solenoid

The EPC receives signal from the PCM. The EPC controls transmission line pressure and line modulator pressure. If EPC pressure goes to maximum, shifts and engagements will be harsh. If EPC pressure goes to zero, no 2nd and 4th gear, slips in 1st and 3rd gear with high input torque.

Coast Clutch Solenoid (CCS)

The CCS receives signal from the PCM. The TCC controls application and release of coast clutch. If solenoid fails in ON position, no coast braking occurs (except in 4th gear). Delayed 3-2 shifts occur. If solenoid fails in OFF position, coast braking occurs in 2nd and 3rd gear. Firm or flared 3-2 shifts and harsh 4-3 shifts may occur.

TROUBLE SHOOTING

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 properly routed and are not pinched or cut. Check for non-factory installed equipment wired into transaxle or PCM harness. Ensure shift linkage is properly adjusted. Check PCM, sensors and actuators for physical damage. Check engine coolant level. Check transmission fluid level and condition.

NOTE: In addition to transmission fault codes, engine-related fault codes may be output during QUICK TEST procedure. These fault codes pertain to engine performance and must be repaired first as engine performance will greatly affect transmission operation. For information and testing procedures of engine-related fault codes and components, see appropriate TESTS W/CODES article in ENGINE PERFORMANCE:

1996 Aerostar

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Explorer

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Explorer

- **TESTS W/CODES - 4.0L** .
- **TESTS W/CODES - 5.0L** .

1995 Ranger

- **TESTS W/CODES - EEC-V (2.3L)** .
- **TESTS W/CODES - EEC-V (3.0L)** .
- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Ranger

- **TESTS W/CODES - 2.3L** .
- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

EEC-IV SELF-DIAGNOSTIC SYSTEM

DIAGNOSTIC FORMATS

QUICK TEST, CIRCUIT TESTS and PINPOINT TESTS are diagnostic formats used to test and service EEC-IV system. QUICK TEST allows technician to identify problems and retrieve Diagnostic Trouble Codes (DTCs). CIRCUIT TESTS check engine circuits, sensors and actuators. PINPOINT TESTS check transaxle circuits, sensors and actuators.

Before starting any circuit test, follow all steps under QUICK TEST to find correct circuit or pinpoint test. If vehicle passes QUICK TEST and no driveability symptoms or intermittent faults exist, EEC-IV system is okay.

DIAGNOSTIC TROUBLE CODES (DTC)

During QUICK TEST, 3 types of DTCs are retrieved: Key On Engine Off (KOEO), Key On Engine Running (KOER) and Continuous Memory Codes. See QUICK TEST for self-test procedures. Codes may be cleared from PCM memory after they have been recorded or repaired. See CLEARING CODES.

KOEO & KOER Codes (Hard Faults)

These codes indicate faults are present at time of testing. A hard fault may cause Malfunction Indicator Light (MIL) to glow and remain on until fault is repaired. If KOEO or KOER codes are retrieved during KOEO SELF-TEST or KOER SELF-TEST, find correct testing and repair procedures in the **EEC-IV CODE REFERENCE TABLE**.

Continuous Memory Codes (Soft Faults)

These codes indicate a fault that may or may not be present at time of testing. These codes are used to diagnose intermittent problems. Continuous Memory Codes are retrieved during KOEO SELF-TEST. Some

codes may turn on MIL light. Corresponding soft trouble code will be retained in PCM memory. If fault does not reoccur within 40 warm-up cycles (80 cycles on some models), PCM will automatically clear code. Technician may clear DTCs from memory. See CLEARING CODES. Intermittent faults may be caused by a sensor, connector or wiring-related problems.

CAUTION: Continuous Memory Codes should be recorded when retrieved during KOEO SELF-TEST. These codes may be used to identify intermittent problems that exist after all KOEO and KOER codes have been repaired and a Code 111 (pass code) has been obtained. Failure to follow this procedure may result in unnecessary testing. Some Continuous Memory Codes faults may not be valid after KOEO and KOER codes are repaired.

RETRIEVING CODES

DTCs are retrieved from EEC-IV system through Data Link Connector (DLC). DLC is located below instrument panel, to left of steering column. Various methods and test equipment may be used to access these codes:

- Analog Volt-Ohmmeter (VOM)
- Scan Tool
- In-Dash Malfunction Indicator Light (MIL)
- STAR Series Tester

READING CODES

KOEO & KOER SELF-TEST Codes

PCM outputs codes one digit at a time. Record codes in order received. These codes indicate current faults in system and should be serviced in order of appearance. Use **EEC-IV CODE REFERENCE TABLE** to find correct CIRCUIT TEST and/or PINPOINT TEST.

If using analog VOM, pay careful attention to length of pauses in order to read codes correctly. A 1/2-second pause occurs between number of sweeps in a digit. A 2-second pause occurs between digits in a code. A 4-second pause occurs between each code. KOEO codes are separated from Continuous Memory codes by a 6-second delay, a 1/2-second sweep (separator) and another 6-second delay. See **Fig. 3**. If using MIL light, DTCs are displayed as flashes.

Scan tool, if used, will count pulses and display them as a digital code. STAR Series Tester will add a zero (0) to single-digit Separator Code (10) and Dynamic Response Code (10). Dynamic Response Code is displayed in KOER SELF-TEST. See **Fig. 3**.

Engine Identification (ID) Codes

Engine ID codes are issued at beginning of KOER SELF-TEST. Codes are one-digit numbers represented by number of pulses displayed. See **Fig. 3**. Engine ID code is equal to one-half the number of engine cylinders. For example, 2 pulses would indicate that engine is a 4 cylinder. ID code is used to verify proper PCM is installed and that SELF-TEST has been entered.

Separator Pulse

Single 1/2-second separator pulse is issued 6-9 seconds after last KOEO code. Continuous Memory Codes (soft faults) are then displayed 6-9 seconds after 1/2-second separator pulse. Some digital test equipment may display separator code as "10" instead of "1".

Pass Codes

A Code 111 indicates no DTCs were recorded in that portion of test; system passes that portion of test. If Code 111 is not retrieved in KOEO SELF-TEST, codes retrieved during KOER SELF-TEST may not be valid. Code 111 (pass code) must be obtained in KOEO SELF-TEST. A Code 111-1-111 output during KOEO SELF-TEST indicates no KOEO code or Continuous Memory Code was recorded.

Continuous Memory Codes

These codes result from information stored by PCM during continuous self-test monitoring. Codes are displayed after separator pulse code in KOEO SELF-TEST. Use these codes for diagnosis only when KOEO SELF-TEST and KOER SELF-TEST result in Code 111 (pass code) and all steps under QUICK TEST are successfully completed. (A few codes are exceptions which may be checked after KOEO codes have been repaired). These codes indicate faults recorded within last 40 engine starts (80 engine starts on some models). Fault may or may not be currently present. See **EEC-IV CODE REFERENCE TABLE**.

Fast Codes

At start of KOEO SELF-TEST and after Wide Open Throttle (WOT) request in KOER SELF-TEST, PCM outputs short bursts of information, known as FAST CODES, which were used by manufacturer during assembly. With most equipment, these code bursts are not visible; an entire code sequence lasts less than 1/2 second.

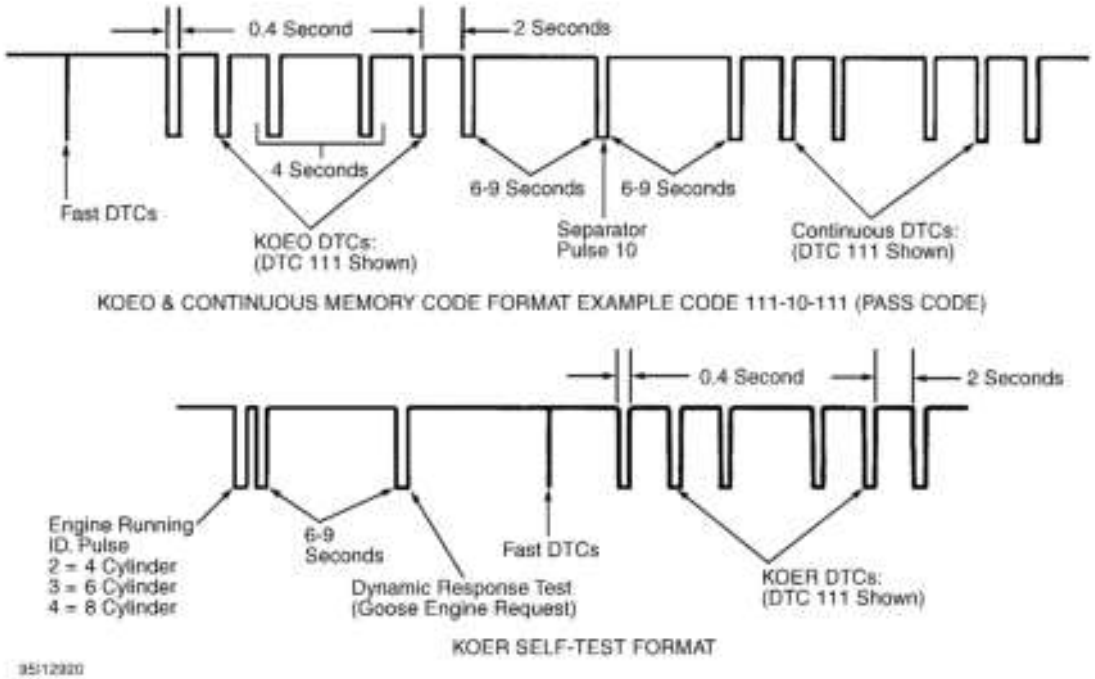

Fig. 3: Reading Diagnostic Trouble Codes (DTCs)
Courtesy of FORD MOTOR CO.

CLEARING CODES

To clear codes from PCM memory, start KOEO SELF-TEST under QUICK TEST. When DTCs appear on test equipment or MIL, disconnect jumper wire from Self-Test Input (STI) connector. If using STAR Series Tester, unlatch center button. This procedure erases Continuous Memory Codes from PCM memory. If problem has not been corrected or fault is still present, hard code will immediately be reset in PCM memory.

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

WARNING: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES in APPLICATIONS & IDENTIFICATION section before disconnecting battery.

SUMMARY

If no codes (or pass code 111-1-111) is present but driveability problem still exists, return to TROUBLE SHOOTING in FORD 4R44E & 4R55E OVERHAUL article.

QUICK TEST

Description

Following procedures are functional tests of EEC-IV system. These following 4 basic test steps must be carefully followed in sequence, otherwise misdiagnosis or replacement of non-faulty components may result:

- Visual Check
- Equipment Hookup.
- KOEO (Key On Engine Off) Self-test.
- KOER (Key On Engine Running) Self-test.

Diagnostic Aids

After each service or repair procedure has been completed, repeat QUICK TEST to ensure all EEC-IV systems work properly and DTCs are no longer present.

Visual Check

Complete all steps in **PRELIMINARY INSPECTION** before proceeding to self-diagnostic tests. Ensure vacuum hoses and EEC-IV wiring harnesses are properly connected.

Equipment Hookup

Apply parking brake, and place shift lever in "P" position. Block drive wheels. Turn off all electrical loads. Connect appropriate test equipment to vehicle as follows:

Analog Volt-Ohmmeter (VOM)

1. Turn ignition switch to OFF position. Set VOM at 0-15V DC range. Connect positive lead of VOM to positive battery terminal.
2. Connect negative VOM lead to Self-Test Output (STO) terminal of self-test connector. See **Fig. 4**. Connect timing light, and go to KOEO SELF-TEST. Activate KOEO SELF-TEST by connecting jumper wire from Self-Test Input (STI) pigtail to signal return terminal of self-test connector with ignition on.

Scan Tool

Follow manufacturer's instructions to hook up equipment and record DTCs.

STAR Series Tester

Turn ignition switch to OFF position. Connect color-coded adapter cable leads to diagnostic tester. Connect 2 service connectors of adapter cable to vehicle self-test connector and STI pigtail connector. Connect timing light. Go to KOEO SELF-TEST.

Malfunction Indicator Light (MIL)

Turn ignition on. Connect a jumper wire between Self-Test Input (STI) pigtail and signal return (SIG RTN) terminal of Data Link Connector (DLC). See **Fig. 4**. Go to KOEO SELF-TEST.

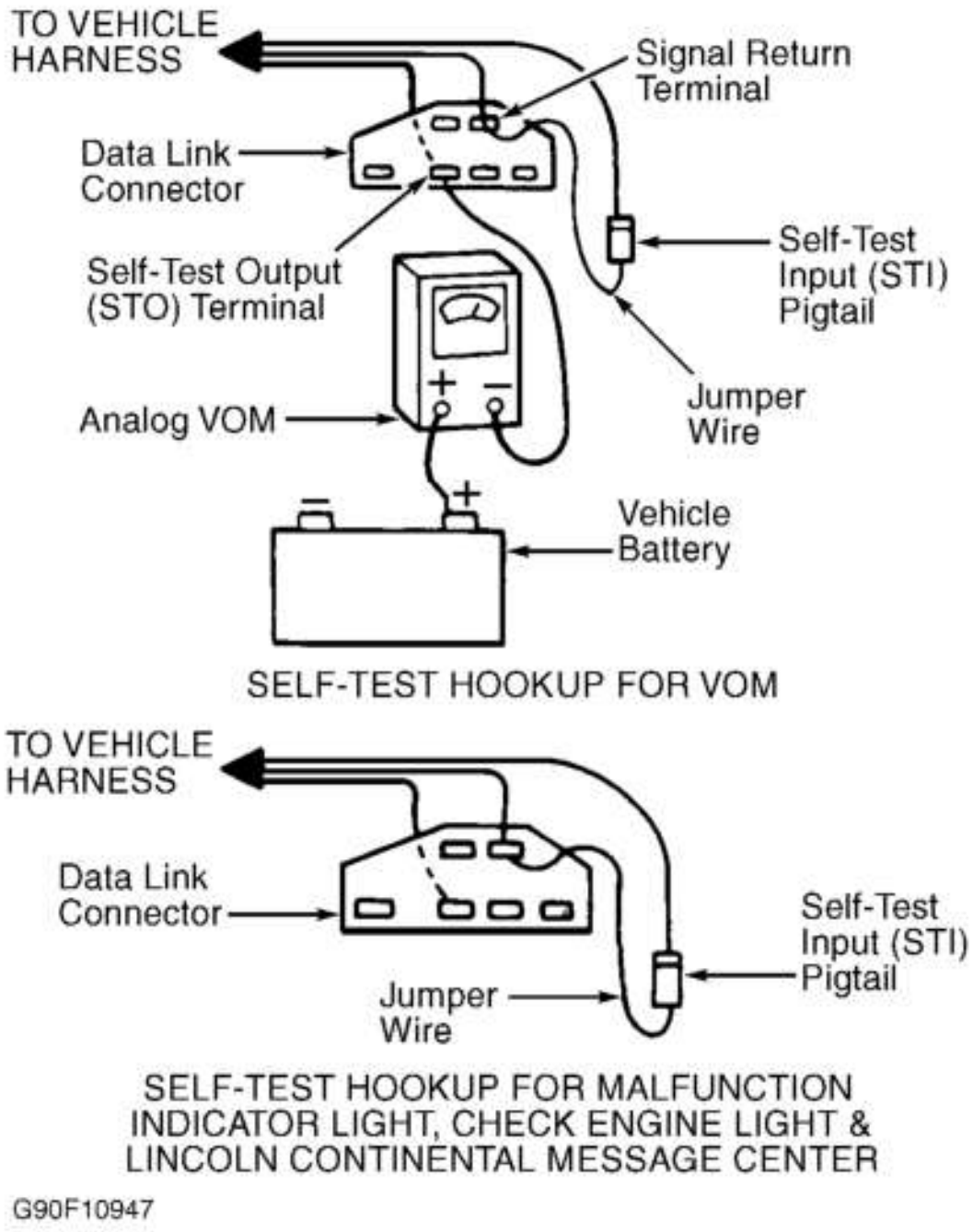

Fig. 4: Connecting Self-Test Diagnostic Equipment
Courtesy of FORD MOTOR CO.

KOEO Self-Test

Ensure engine is at normal operating temperature. If engine does not start (or stalls after starting), continue KOEO SELF-TEST. **DO NOT** depress throttle. Turn ignition off. Wait 10 seconds. Ensure test equipment is properly attached. Turn ignition on (engine off). Record all KOEO and Continuous Memory Codes.

If a Code 111 (pass code) is not retrieved in KOEO portion of test, service KOEO codes at this time. Service

any engine codes recorded before servicing transmission codes (codes No. 566 and 629). If PCM will not output codes, see appropriate TESTS W/CODES article in ENGINE PERFORMANCE:

1996 Aerostar

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Explorer

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Explorer

- **TESTS W/CODES - 4.0L** .
- **TESTS W/CODES - 5.0L** .

1995 Ranger

- **TESTS W/CODES - EEC-V (2.3L)** .
- **TESTS W/CODES - EEC-V (3.0L)** .
- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Ranger

- **TESTS W/CODES - 2.3L** .
- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

If DTCs are retrieved, observe the following procedures:

- If Malfunction Indicator Light (MIL) is on, service DTCs in order retrieved.
- If vehicle has a no-start condition, go to CIRCUIT TEST AA, AB or AC in appropriate TESTS W/CODES article in ENGINE PERFORMANCE.

KOER Self-Test

DO NOT enter this test sequence until a Code 111 (pass code) has been retrieved in KOEO SELF-TEST. If system has not passed KOEO SELF-TEST, codes recorded in KOER SELF-TEST may not be valid.

Deactivate self-test by removing and reconnecting jumper wire or by procedure specified by test equipment in use. Start engine, and run it for 2 minutes at 2000 RPM to warm Heated Exhaust Gas Oxygen (HEGO)

sensor. Turn engine off, and wait 10 seconds. Activate KOER SELF-TEST using a jumper wire or appropriate procedure for test equipment used. Start engine. Record all DTCs displayed. Check following items:

- If engine starts and stalls (or stalls during self-test), go to CIRCUIT TESTS. See appropriate TESTS W/CODES article in ENGINE PERFORMANCE.
- If vehicle is equipped with a Brake On-Off (BOO) switch, brake pedal must be depressed and released after ID code portion of test.
- If Dynamic Response Code appears, perform a brief Wide Open Throttle (WOT). **DO NOT** perform WOT unless requested.
- If a Code 111 (pass code) is retrieved during KOER SELF-TEST, service Continuous Memory Codes retrieved in KOEO SELF-TEST. See appropriate TESTS W/CODES - EEC-IV article in ENGINE PERFORMANCE.
- If a Code 111 (pass code) is retrieved during Continuous Memory Code portion of KOEO SELF-TEST (Code 111-1-111) and no driveability problem exists, EEC-IV testing is complete. If driveability problems are still present, go to TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article.
- If KOER codes are present, see **EEC-IV CODE REFERENCE TABLE**. If system will not output codes, go to CIRCUIT TEST QA. See appropriate TESTS W/CODES article in ENGINE PERFORMANCE:

1996 Aerostar

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Explorer

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Explorer

- **TESTS W/CODES - 4.0L** .
- **TESTS W/CODES - 5.0L** .

1995 Ranger

- **TESTS W/CODES - EEC-V (2.3L)** .
- **TESTS W/CODES - EEC-V (3.0L)** .
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1996 Ranger

- **TESTS W/CODES - 2.3L** .
- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

Continuous Monitor Mode (Wiggle Test)

Continuous Monitor Mode allows technician to attempt to recreate an intermittent fault while monitoring system. This mode, also called "wiggle" test, may be used in both KOEO SELF-TEST and KOER SELF-TEST. CIRCUIT TESTS and PINPOINT TESTS specify use of this procedure to identify intermittent faults in specific circuits or components.

KOEO Wiggle Test Procedure

Connect test equipment. See **Fig. 4**. Turn ignition on, and activate self-test using jumper lead or diagnostic tester. Wait 10 seconds, and then deactivate and reactivate self-test. Wiggle test mode is now activated. Tap, move and wiggle suspect sensor and/or harness area. If a fault is detected, a DTC may be stored in memory and indicated at diagnostic tester or scan tester. Retrieve code, and perform appropriate test. See **EEC-IV CODE REFERENCE TABLE**.

KOER Wiggle Test Procedure

Connect test equipment. See **Fig. 4**. Turn ignition off, and wait 10 seconds. Start engine. Activate self-test using jumper lead or diagnostic tester. Wait 10 seconds, and then deactivate and reactivate self-test. **DO NOT** turn engine off. KOER wiggle test mode is now activated. Tap, move and wiggle suspect sensor and/or harness area. If a fault is detected, a DTC may be stored in memory and indicated at diagnostic tester or scan tester. Retrieve code, and perform appropriate test. See **EEC-IV CODE REFERENCE TABLE**.

ADDITIONAL SYSTEM FUNCTIONS

Additional diagnostic system features are available to help diagnose driveability problems and service EEC-IV systems.

Malfunction Indicator Light (MIL)

MIL is intended to alert driver of certain malfunctions in EEC-IV system.

Light may also be used to retrieve DTCs stored in PCM. When hooked up for KOEO SELF-TEST or KOER SELF-TEST, light will display all codes which turn on light during vehicle operation, not just Continuous Memory Codes.

If light comes on during vehicle operation, vehicle should be inspected as soon as possible. Immediately turning off engine is not necessary; vehicle can be driven with light on.

If light comes on and then goes off during vehicle operation, code causing light to glow will be stored in PCM memory as a Continuous Memory Code.

Light should come on when ignition is turned on and go out when engine is started. If hard fault codes are not present, PCM turns out light when it receives a Profile Ignition Pick-Up (PIP) signal. If light does not come on, see SYMPTOMS in appropriate TESTS W/O CODES article in ENGINE PERFORMANCE.

Output State Check

Output State Check is used as an aid in servicing output actuators associated with EEC-IV system. It allows technicians to energize and de-energize most system output actuators on command. This mode is entered from KOEO SELF-TEST after all codes have been retrieved. Leave SELF-TEST activated, and depress throttle to initiate test sequence. Each time throttle is depressed and released, output actuators will change state (from on to off or off to on).

Failure Mode Effects Management (FMEM)

FMEM mode allows system operation when sensors fail or transmit signals that are out of normal operating range. During FMEM mode, PCM substitutes a mid-range signal for defective sensor while continuing to monitor sensor. If faulty sensor's signals return to normal operating range, PCM will use those signals. A KOER Code 998 will be displayed when FMEM mode is in effect.

Hardware Limited Operational Strategy (HLOS)

If a number of system or sensor failures are present and PCM is not receiving enough information to operate, PCM will switch to HLOS mode. PCM will output fixed values to allow operation of vehicle. Driveability concerns will be present. PCM will not output self-test DTCs in this mode.

TRANSMISSION DRIVE CYCLE TEST

NOTE: The transmission drive cycle test must be followed exactly. Malfunctions have to occur 4 times consecutively for codes 645, 646, 647 and 648 to be set and 5 times consecutively for continuous code 628.

1. After repairing any engine performance trouble codes, erase remaining transmission codes. Warm engine to normal operating temperature. Ensure transmission fluid level is correct. Shift transmission to drive "D". Press TCS on shifter handle. O/D OFF light should illuminate.
2. Accelerate from stop to 40 mph. Hold speed for at least 15 seconds (30 seconds above 4000 ft.). Press TCS and accelerate to 50 mph. Hold speed for at least 15 seconds (30 seconds above 4000 ft.). Hold speed and throttle position steady for at least 15 seconds. While maintaining speed with transaxle in 4th gear, lightly depress brake pedal and release (to operate stoplights). Hold speed for at least an additional 5 seconds. Bring vehicle to stop for at least 20 seconds with transmission in drive "D". Repeat steps 1) and 2) at least 5 times. Perform Quick Test and record continuous codes.

TORQUE CONVERTOR ENGAGEMENT TEST

Connect tachometer. Warm engine to normal operating temperature. Ensure transmission fluid level is correct. Maintain approximately 50 mph. Release throttle for about 2 seconds, then reapply to previous setting. Engine RPM should increase when throttle is released and decrease in about 5 seconds after throttle is reapplied. If torque converter clutch operation is not as specified, see TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** overhaul article.

SUMMARY

If no codes (or pass code 111-1-111) is present but driveability problem still exists, return to TROUBLE SHOOTING in FORD 4R44E & 4R55E overhaul article.

EEC-IV CODE REFERENCE TABLE

NOTE: In addition to transmission fault codes, engine-related fault codes may be output during QUICK TEST procedure. These fault codes pertain to engine performance and must be repaired first as engine performance will greatly affect transmission operation. For information and testing procedures of engine-related fault codes and components, see appropriate TESTS W/CODES article in ENGINE PERFORMANCE:

1996 Aerostar

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Explorer

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Explorer

- **TESTS W/CODES - 4.0L** .
- **TESTS W/CODES - 5.0L** .

1995 Ranger

- **TESTS W/CODES - EEC-V (2.3L)** .
- **TESTS W/CODES - EEC-V (3.0L)** .
- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Ranger

- **TESTS W/CODES - 2.3L** .
- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

EEC-IV CODE REFERENCE

Fault Code (1)	Circuit/Pinpoint Test & Step	Code Definition
No Code/Code Not Listed	(2)	N/A
111	N/A	Pass Code
112	(2)	IAT Indicates 254° F (125° C)

113	(2)	IAT Indicates -40° F (-40° C)
114	(2)	IAT Out Of Range
116	(2)	ECT Out Of Range
117	(2)	ECT Indicates 254° F (125° C)
118	(2)	ECT Indicates -40° F (-40° C)
121	(2)	TPS Voltage High/Low
122	(2)	TPS Malfunction
123	(2)	TPS Malfunction
124	(2)	TPS Malfunction
125	(2)	TPS Malfunction
157	(2)	MAF Sensor Malfunction
158	(2)	MAF Sensor Malfunction
159	(2)	MAF Sensor Malfunction
167	(2)	TPS Malfunction
184	(2)	MAF Sensor Malfunction
185	(2)	MAF Sensor Malfunction
211	(2)	EI System Malfunction
212	(2)	EI System Malfunction
219	(2)	EI System Malfunction
221	(2)	EI System Malfunction
217	(2)	EI System Malfunction
224	(2)	EI System Malfunction
225	(2)	EI System Malfunction
232	(2)	EI System Malfunction
239	(2)	EI System Malfunction
241	(2)	EI System Malfunction
243	(2)	EI System Malfunction
452	(2)	Insufficient VSS Input
522	D1	TR Not In Park
519	(2)	PSP Circuit Failure
521	(2)	PSP Not Changing State
536	(3) FD1/(4) FD90	BOO Switch Malfunction
539	KM40	A/C Switch Error
621	A1	SS1 Solenoid Circuit Failure
622	A1	SS2 Solenoid Circuit Failure
624	E1	EPC Solenoid Circuit Failure
625	E1	Shorted PCM Output Driver
628	(4) TG90	TCC Engagement Error

631	(2)	TCIL Circuit Failure
632	(2)	TCS Malfunction
633	(2)	4WD Low Switch Failure
636	B1	TFT Out Of Range
637	B1	TFT Indicates -40° F (-40° C)
638	B1	TFT Indicates 315° F (157° C)
639	F1	Insufficient Input From TSS
641	A1	SS3 Solenoid Circuit Failure
643	G1	CCS Solenoid Circuit Failure
645	A1	No 1st Gear
646	A1	No 2nd Gear
647	A1	No 3rd Gear
648	A1	No 4th Gear
652	C1	TCC Circuit Failure
657	B1	Transmission Overtemp
667	D1	TR Sensor Voltage Low
668	D1	TR Sensor Voltage High
691	(2)	4WD Low Circuit Failure

(1) Only engine performance fault codes that may affect transmission operation are listed. For complete list of engine performance fault codes, see appropriate TESTS W/CODES article in ENGINE PERFORMANCE.

(2) See appropriate TESTS W/CODES article in ENGINE PERFORMANCE.

(3) KOER fault code.

(4) Continuous memory code.

EEC-V SELF-DIAGNOSTIC SYSTEM

DIAGNOSTIC FORMATS

QUICK TEST, CIRCUIT TESTS and PINPOINT TESTS are diagnostic formats used to test and service EEC-V system. QUICK TEST allows technician to identify problems and retrieve Diagnostic Trouble Codes (DTCs). CIRCUIT and PINPOINT TESTS check circuits, sensors and actuators.

Before starting any CIRCUIT or PINPOINT TEST, follow all steps under QUICK TEST to find correct CIRCUIT and/or PINPOINT TEST. If vehicle passes QUICK TEST and no driveability symptoms or intermittent faults exist, EEC-V system is okay.

DIAGNOSTIC TROUBLE CODES (DTCS)

During QUICK TEST, 3 types of diagnostic trouble codes are retrieved: KOEO, KOER and Continuous Memory codes. See QUICK TEST for self-test procedures. Codes may be cleared from PCM memory after they have been recorded or repaired. See CLEARING CODES.

KOEO & KOER Codes (Hard Faults)

These codes indicate faults are present at time of testing. A hard fault may cause CHECK ENGINE or Malfunction Indicator Light (MIL) to go on and remain on until fault is repaired. If KOEO or KOER codes are retrieved during KOEO SELF-TEST or KOER SELF-TEST, use **EEC-V CODE REFERENCE TABLE** to find correct testing and repair procedures.

Continuous Memory Codes (Intermittent Faults)

These codes are used to diagnose intermittent problems. Continuous Memory Codes are retrieved after KOEO SELF-TEST. These codes indicate a fault that may or may not be present at time of testing.

After noting and/or repairing fault, clear codes from memory. See CLEARING CODES. Intermittent faults may be caused by a sensor, connector or wiring-related problem.

CAUTION: Continuous Memory Codes should be recorded when retrieved. These codes may be used to identify intermittent problems that exist after all KOEO and KOER codes have been repaired. Some Continuous Memory Code faults may not be valid after KOEO and KOER codes are serviced.

RETRIEVING CODES

Fault codes are retrieved from EEC-V system through Data Link Connector (DLC). DLC is located below instrument panel, to left of steering column. Self-diagnostic test procedures are for use with New Generation Star (NGS) scan tester. If a generic scan tool is used, ensure tool is certified OBD-II standard and refer to scan tool manufacturer's operating procedures.

READING CODES

NOTE: For engine-related DTCs, see appropriate TESTS W/CODES article in 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.

1996 Aerostar

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Explorer

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Explorer

- **TESTS W/CODES - 4.0L** .
- **TESTS W/CODES - 5.0L** .

1995 Ranger

- **TESTS W/CODES - EEC-V (2.3L)** .
- **TESTS W/CODES - EEC-V (3.0L)** .

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Ranger

- **TESTS W/CODES - 2.3L** .
- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

KOEO & KOER Self-Test Codes

Record codes in order received. These codes indicate current faults in system and should be serviced in order of appearance. Use **EEC-V CODE REFERENCE TABLE** to identify correct CIRCUIT TEST and/or PINPOINT TEST to perform.

NOTE: If self-test will not activate or TOOL COMMUNICATION ERROR is received, see appropriate TESTS W/CODES article in ENGINE PERFORMANCE section:

1996 Aerostar

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Explorer

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Explorer

- **TESTS W/CODES - 4.0L** .
- **TESTS W/CODES - 5.0L** .

1995 Ranger

- **TESTS W/CODES - EEC-V (2.3L)** .
- **TESTS W/CODES - EEC-V (3.0L)** .
- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Ranger

- **TESTS W/CODES - 2.3L** .

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

Pass Codes

SYSTEM PASS indicates no diagnostic trouble codes were recorded in that portion of test. If SYSTEM PASS is not retrieved in KOEO SELF-TEST, codes retrieved during KOER SELF-TEST may not be valid.

Continuous Memory Codes

These codes result from information stored by PCM during continuous self-test monitoring. Use these codes for diagnosis only when KOEO SELF-TEST and KOER SELF-TEST result in SYSTEM PASS and all steps under QUICK TEST are successfully completed. These codes indicate faults previously recorded. Fault may or may not be currently present. See **EEC-V CODE REFERENCE TABLE**.

CLEARING CODES

PCM Reset

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

- All DTCs cleared from PCM memory.
- All freeze frame data cleared from PCM memory.
- All oxygen sensor test data cleared from PCM memory.
- OBD II system monitor status is reset.
- DTC P1000 set in PCM memory.

To perform PCM reset using NGS scan tester, ensure connectors are properly connected. Program scan tester using the following steps:

- Select vehicle and engine selection menu (optional). See **Fig. 6**.
- Select year, engine, model and any additional information requested by scan tester (optional).
- Follow operating instructions from scan tester menu.
- Select GENERIC OBD II FUNCTIONS. Press CONT button if monitors are not complete.
- Turn ignition on.
- Select CLEAR DIAGNOSTIC CODES.

All codes 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.

CAUTION: DO NOT disconnect vehicle battery to clear codes. This will erase operating information from Keep-Alive Memory (KAM). To clear KAM, disconnect negative battery terminal for at least 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 the GENERAL INFORMATION before disconnecting battery.

QUICK TEST

Description

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

- Visual Check
- Equipment Hookup
- KOEO (Key On Engine Off) Self-Test
- KOER (Key On Engine Running) Self-Test
- Computed Timing Check
- Continuous Memory Self-Test

After each service or repair procedure has been completed, repeat QUICK TEST to ensure all EEC-V systems work properly and diagnostic trouble codes are no longer present.

Visual Check

Complete all steps in **PRELIMINARY INSPECTION** before proceeding to self-diagnostic tests. Ensure vacuum hoses and EEC-V wiring harnesses are properly connected.

Equipment Hookup

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

Generic Scan Tool

Ensure scan tool meets or exceeds OBD-II standard. Follow manufacturer's instructions to hook up equipment and record diagnostic trouble codes.

New Generation STAR (NGS) Tester

Turn ignition switch to OFF position. Connect adapter cable lead to diagnostic tester. See **Fig. 5**. Connect service connectors of adapter cable to vehicle Data Link Connector (DLC). Go to KOEO SELF-TEST.

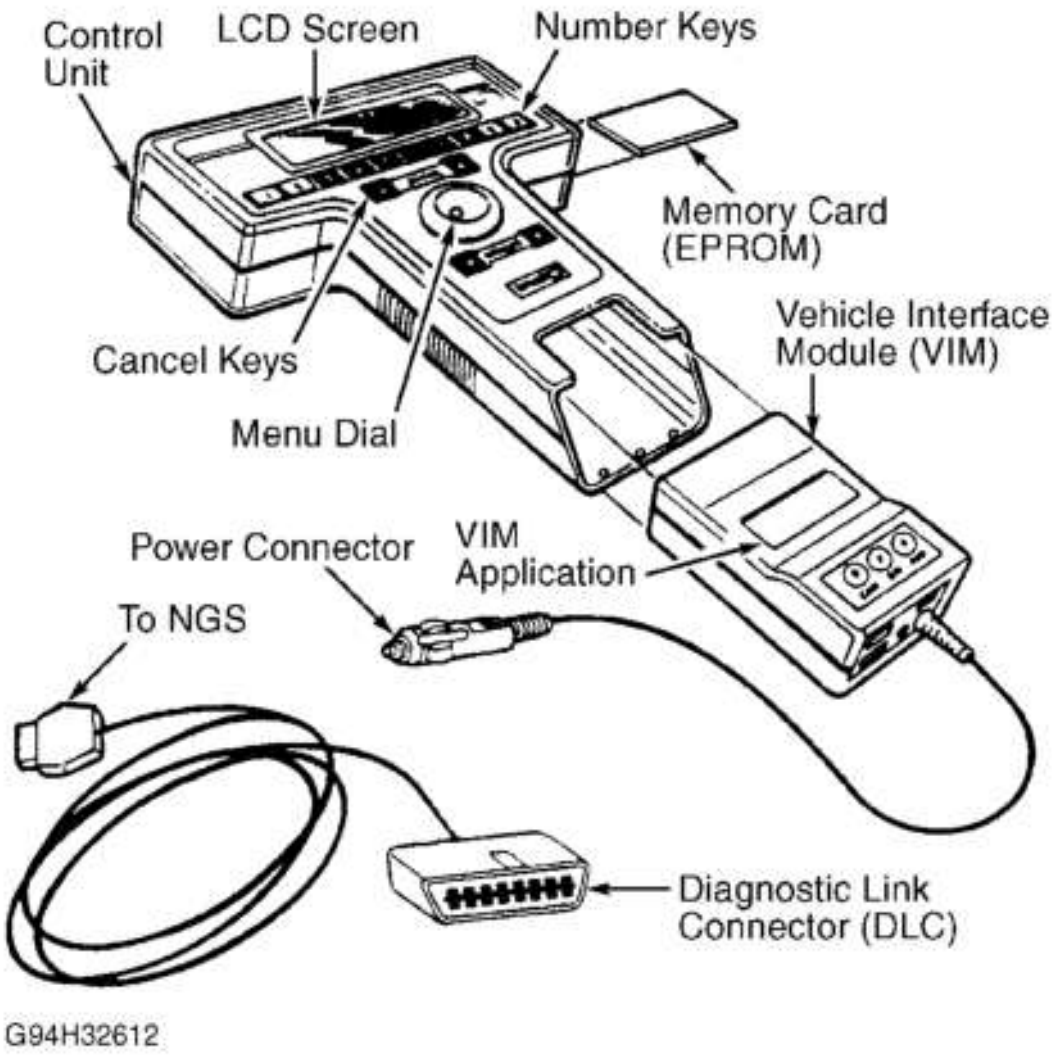

Fig. 5: Identifying New Generation Star (NGS) Scan Tester
Courtesy of FORD MOTOR CO.

KOEO Self-Test

Ensure engine is warmed to 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 scan tester using the following steps:

- Select vehicle and engine selection menu. See **Fig. 6**.
- Select year, engine, model and any additional information requested by scan tester.
- Select DIAGNOSTIC DATA LINK.
- Select PCM - POWERTRAIN CTRL MODULE.
- Select DIAGNOSTIC TEST MODE.
- Select KOEO ON-DEMAND SELF-TEST.
- Turn ignition on.

- Follow operating instructions from scan tester menu.

KOER Self-Test

Ensure engine is warmed to normal operating temperature. Turn ignition switch to OFF position. Ensure test equipment is properly attached. Program scan tester using the following steps:

- Select vehicle and engine selection menu. See **Fig. 6**.
- Select year, engine, model and any additional information requested by scan tester.
- Select DIAGNOSTIC DATA LINK.
- Select PCM - POWERTRAIN CTRL MODULE.
- Select DIAGNOSTIC TEST MODE.
- Select KOER ON-DEMAND SELF-TEST.
- Start engine and allow to idle.
- Follow operating instructions from scan tester menu.
- Perform BOO and TCS cycling (if equipped).

Computed Timing Check

Ensure all accessories are off and engine is at normal operating temperature. Disconnect SPOUT connector. Connect timing light. Using ignition switch, start engine. Ignition timing should be approximately 10 degrees BTDC (base timing). Reconnect SPOUT connector. Timing should advance from base timing. If timing is not as specified, check for causes of incorrect timing such as damaged Crankshaft Position (CKP) sensor. For additional procedure, see appropriate TESTS W/CODES article in ENGINE PERFORMANCE:

1996 Aerostar

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Explorer

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Explorer

- **TESTS W/CODES - 4.0L** .
- **TESTS W/CODES - 5.0L** .

1995 Ranger

- **TESTS W/CODES - EEC-V (2.3L)** .
- **TESTS W/CODES - EEC-V (3.0L)** .
- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Ranger

- **TESTS W/CODES - 2.3L** .

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

Continuous Memory Self-Test (Emission Related)

Turn ignition switch to OFF position. Ensure test equipment is properly attached. Program scan tester using the following steps:

- Select vehicle and engine selection menu (optional). See **Fig. 6**.
- Select year, engine, model and any additional information requested by scan tester (optional).
- Select GENERIC OBD-II OPTIONS. Press CONT button if all OBD II monitors are not complete.
- Select DIAGNOSTIC TROUBLE CODES.
- Turn ignition on.
- Follow operating instructions from scan tester menu.

Continuous Memory Self-Test (Enhanced Mode)

Turn ignition switch to OFF position. Ensure test equipment is properly attached. Program scan tester using the following steps:

- Select vehicle and engine selection menu. See **Fig. 6**.
- Select year, engine, model and any additional information requested by scan tester.
- Select DIAGNOSTIC DATA LINK.
- Select PCM - POWERTRAIN CTRL MODULE.
- Select DIAGNOSTIC TEST MODES.
- Select RETRIEVE/CLEAR CONTINUOUS DTCs.
- Turn ignition on.
- Follow operating instructions from scan tester menu.

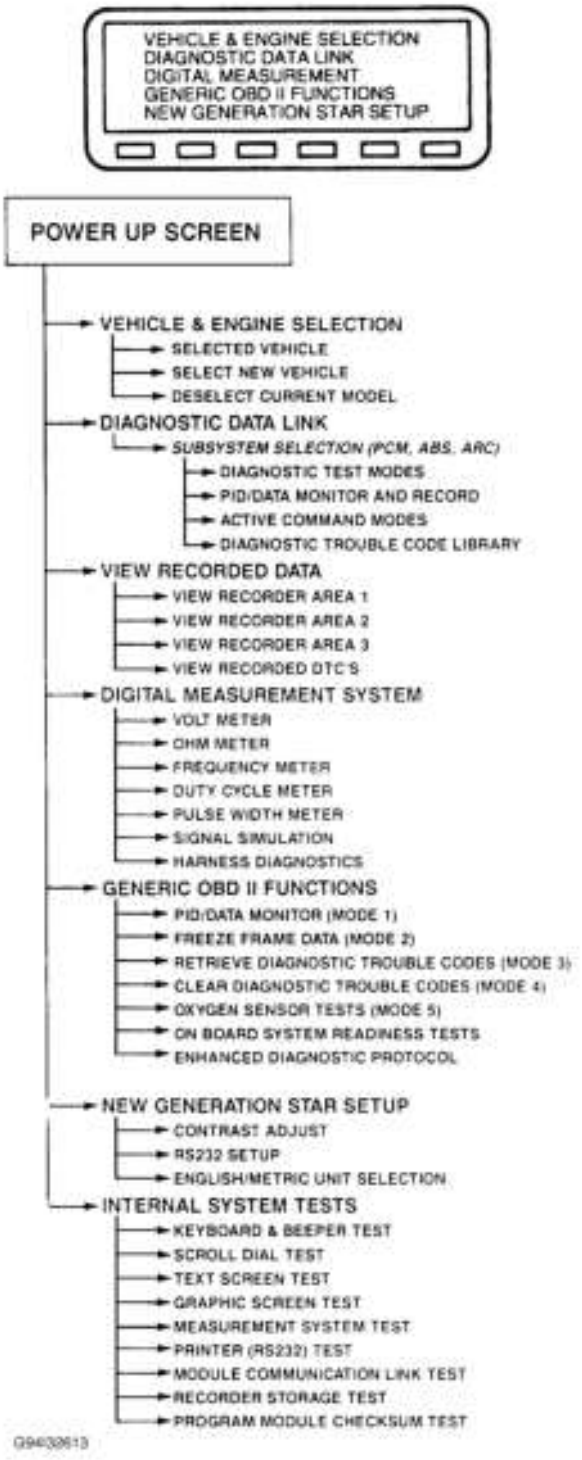

Fig. 6: Identifying New Generation Star (NGS) Tester Main Menu & Mode Paths
Courtesy of FORD MOTOR CO.

ADDITIONAL SYSTEM FUNCTIONS

NOTE: **Additional diagnostic system features are available to help diagnose driveability problems and service EEC-V systems.**

Generic OBD-II Parameter Identification (PID)

Turn ignition switch to OFF position. Ensure test equipment is properly attached. Program scan tester using the following steps:

- Select vehicle and engine selection menu (optional). See **Fig. 6**.
- Select year, engine, model and any additional information requested by scan tester (optional).
- Select GENERIC OBD-II OPTIONS. Press CONT button if monitors are not complete.
- Select PID/DATA MONITOR.
- Turn ignition on or start engine and allow to idle.
- Follow operating instructions from scan tester menu.
- Select PIDs and press START.

Non-Generic OBD-II Parameter Identification (PID)

Turn ignition switch to OFF position. Ensure test equipment is properly attached. Program scan tester using the following steps:

- Select vehicle and engine selection menu. See **Fig. 6**.
- Select year, engine, model and any additional information requested by scan tester.
- Select GENERIC OBD-II OPTIONS. Press CONT button if monitors are not complete.
- Select DIAGNOSTIC DATA LINK.
- Select PCM - POWERTRAIN CTRL MODULE.
- Select DIAGNOSTIC TEST MODES.
- Select PID DATA MONITOR AND RECORD.
- Turn ignition on or start engine and allow to idle.
- Follow operating instructions from scan tester menu.
- Select PIDs and press START.

On-Board System Readiness (OSR) Test Mode

All OBD-II scan testers must display OSR test. The OSR will display monitors on the vehicle and status of all monitors; complete or not complete. If not complete, the scan tester will display which monitor has not completed.

To enter OSR, turn ignition switch to OFF position. Ensure test equipment is properly attached. Program scan tester using the following steps:

- Select vehicle and engine selection menu (optional). See **Fig. 6**.
- Select year, engine, model and any additional information requested by scan tester.
- Follow operating instructions from scan tester menu.
- Select GENERIC OBD-II FUNCTIONS. Press TEST button if all OBD II monitors are not complete.
- Start engine and allow to idle.
- Select ON-BOARD SYSTEM READINESS.

Freeze Frame Data Mode

This mode allows access to emission related data values from some generic PIDs. These values are immediately stored in continuous memory when an emission related fault occurs. This provides a snapshot of the conditions that were present when the fault occurred. Freeze frame will be stored until PCM memory is erased. To access FREEZE FRAME DATA MODE, turn ignition switch to OFF position. Ensure test equipment is properly attached. Program scan tester using the following steps:

- Select vehicle and engine selection menu (optional). See **Fig. 6**.
- Select year, engine, model and any additional information requested by scan tester (optional).
- Follow operating instructions from scan tester menu.
- Select GENERIC OBD II FUNCTIONS. Press CONT button if OBD II monitors are not complete.
- Turn ignition on.
- Select FREEZE FRAME PID TESTS.

Oxygen Sensor Test Mode

This mode allows access to on-board sensor fault limits and actual values during test cycle. The test cycle has specific engine operating conditions that must be met for completion. This information is used to determine the efficiency of the catalytic converter. To access OXYGEN SENSOR TEST mode, turn ignition switch to OFF position. Ensure test equipment is properly attached. Program scan tester using the following steps:

- Select vehicle and engine selection menu (optional). See **Fig. 6**.
- Select year, engine, model and any additional information requested by scan tester (optional).
- Follow operating instructions from scan tester menu.
- Select GENERIC OBD II FUNCTIONS.
- Select OXYGEN SENSOR TESTS.
- Select appropriate oxygen sensor test and follow menu instructions.

Output Test Mode

This mode allows a technician to energize and de-energize most of the system output actuators on command. After accessing OUTPUT TEST MODE, outputs and cooling fans can be turned on and off separately. To access OUTPUT TEST MODE, turn ignition switch to OFF position. Ensure test equipment is properly attached. Program scan tester using the following steps:

- Select vehicle and engine selection menu. See **Fig. 6**.
- Select year, engine, model and any additional information requested by scan tester.
- Follow operating instructions from scan tester menu.
- Select DIAGNOSTIC DATA LINK.
- Select PCM - POWERTRAIN CTRL MODULE.
- Select DIAGNOSTIC TEST MODE.
- Select ACTIVE COMMAND MODE.
- Select OUTPUT TEST MODE.
- Turn ignition on.
- Follow operating instructions from scan tester menu.
- Select either LOW SPEED FAN, HIGH SPEED FAN or ALL ON mode.

- Select START to turn outputs on. This step may cause link-up to PIDs.
- Select STOP to turn outputs off.

Failure Mode Effects Management (FMEM)

FMEM mode allows system operation when sensors fail or transmit signals that are out of normal operating range. During FMEM mode, PCM substitutes a mid-range signal for defective sensor while continuing to monitor sensor. If faulty sensor signals return to normal operating range, PCM will use those signals. Depending on specific failure, a fault code may be set in PCM memory.

Hardware Limited Operational Strategy (HLOS)

If a number of system or sensor failures are present and PCM is not receiving enough information to operate, PCM will switch to HLOS mode. PCM will output fixed values to allow operation of vehicle. Driveability concerns will be present. PCM will not output diagnostic trouble codes in this mode.

TORQUE CONVERTOR ENGAGEMENT TEST

Connect tachometer. Warm engine to normal operating temperature. Ensure transmission fluid level is correct. Maintain approximately 50 mph. Release throttle for about 2 seconds, then reapply to previous setting. Engine RPM should increase when throttle is released and decrease in about 5 seconds after throttle is reapplied. If torque converter clutch operation is not as specified, see TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** overhaul article.

TRANSMISSION DRIVE CYCLE TEST

NOTE: The transmission drive cycle test must be followed exactly. Malfunctions have to occur 4 times consecutively for codes P0731, P0732, P0733 and P0734 to be set and 5 times consecutively for continuous codes P0741 and P1741.

1. After repairing any engine performance related DTCs, erase remaining transmission codes. Warm engine to normal operating temperature. Ensure transmission fluid level is correct. Shift transmission to drive "D". Press TCS on shifter handle. O/D OFF light should illuminate.
2. Accelerate from stop to 40 mph. Hold speed for at least 15 seconds (30 seconds above 4000 ft.). Press TCS and accelerate to 50 mph. Hold speed for at least 15 seconds (30 seconds above 4000 ft.). Hold speed and throttle position steady for at least 15 seconds. While maintaining speed with transaxle in 4th gear, lightly depress brake pedal and release (to operate stoplights). Hold speed for at least an additional 5 seconds. Bring vehicle to stop for at least 20 seconds with transmission in drive "D". Repeat steps 1) and 2) at least 5 times. Perform Quick Test and record continuous codes.

TRANSMISSION SOLENOID CYCLING & DRIVE TEST (DYNAMIC TEST)

Preliminary Set Up

Connect transmission tester. Install pressure gauge to line pressure tap. See **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article. Set Bench/Drive switch to DRIVE mode. Set tester to Gear Select switch to "1". Ensure vehicle is in park "P". Start vehicle.

CAUTION: Transaxle damage will occur if stall test is conducted with EPC switch

depressed.

EPC Solenoid

Record line pressure. Line pressure should go to maximum pressure. If line pressure is not within specification, see TESTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article or PINPOINT TEST E. Depress EPC switch. Line pressure should drop to minimum pressure. If line pressure is not within specification, see TESTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article or PINPOINT TEST E.

Engagements

Ensure Bench/Drive switch is in DRIVE mode. Set tester to Gear Select switch to "1". Shift transaxle from park to reverse. Reverse should engage. Depress EPC switch. Line pressure should drop to idle pressure. While depressing EPC switch, shift vehicle from park to drive. Vehicle should shift into drive with smooth engagement. Release EPC switch. Line pressure should rise to maximum pressure. Repeat previous step. Vehicle shift engagement should be firm with EPC switch released.

NOTE: Upshifts and downshifts will be firm during this procedure. LEDs will turn Green when solenoids are activated and turn off when deactivated.

Upshift/Downshift

Remove line pressure gauge. Set Gear Select switch to "1". Shift transmission to overdrive and accelerate to 15 mph. Rotate Gear Select switch to "2". Vehicle should shift into 2nd gear. Accelerate to 25 mph and select "3". Vehicle should shift into 3rd gear. Accelerate to 35-45 mph and select "4". Vehicle should shift into 4th gear. Downshift in reverse order. Vehicle should downshift through each gear. Ensure appropriate shift solenoid LED activates/deactivates.

CAUTION: DO NOT depress TCC switch with transmission in gear and vehicle at a stop. Damage to TCC may result.

Torque Converter Engagement

Accelerate and upshift vehicle into 3rd gear. Maintain constant speed and depress TCC switch. Torque converter clutch should engage, engine RPM should decrease, and LED should activate Green.

Coast Clutch Engagement

Accelerate and upshift vehicle into 3rd gear. Release throttle and depress CCS switch. Coast clutch should engage and LED should activate Green. Release CCS switch, solenoid should deactivate.

NOTE: This test may be performed on hoist.

Transmission Speed Sensor Function Check

Set voltmeter to 20 volts A/C. Connect voltmeter leads to appropriate TSS jacks. Slowly accelerate vehicle and monitor voltmeter reading. Voltage should increase with vehicle speed.

Transmission Tester Removal & Clearing Trouble Codes

Disconnect Transmission Tester from transaxle connector. Install vehicle wiring harness to transaxle connector. Install all heat shields that were removed. Disconnect tester power lead from vehicle. See CLEARING CODES to erase any DTCs that were set. Run QUICK TEST to determine if any DTCs are present.

SUMMARY

If no Diagnostic Trouble Code (DTC) is present but driveability problem still exists, return to TROUBLE SHOOTING in FORD 4R44E & 4R55E OVERHAUL article for symptom diagnosis procedures.

NOTE: CIRCUIT TESTS and PINPOINT TESTS are diagnostic formats used to test and service EEC-V system. QUICK TEST allows technician to identify problems and retrieve service codes. CIRCUIT TESTS check engine circuits, sensors and actuators. PINPOINT TESTS check transaxle circuits, sensors and actuators.

EEC-V CODE REFERENCE TABLE

NOTE: For transmission fault codes perform appropriate circuit or pinpoint test. See EEC-V CODE REFERENCE TABLE. For engine-related fault codes output during QUICK TEST procedure, see appropriate TESTS W/CODES article in ENGINE PERFORMANCE section:

1996 Aerostar

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Explorer

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Explorer

- **TESTS W/CODES - 4.0L** .
- **TESTS W/CODES - 5.0L** .

1995 Ranger

- **TESTS W/CODES - EEC-V (2.3L)** .
- **TESTS W/CODES - EEC-V (3.0L)** .
- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Ranger

- **TESTS W/CODES - 2.3L** .
- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

These fault codes pertain to engine performance and must be repaired first as engine performance will greatly affect transmission operation.

EEC-V CODE REFERENCE

Fault Code (1)	Circuit/Pinpoint Test & Step	Code Definition
P1111	N/A	System Pass Code
P0102	(2)	MAF Sensor Malfunction
P0103	(2)	MAF Sensor Malfunction
P0112	(2)	IAT Indicates 254° F (125° C)
P0113	(2)	IAT Indicates -40° F (-40° C)
P0114	(2)	IAT Out Of Range
P0117	(2)	ECT Indicates 254° F (125° C)
P0118	(2)	ECT Indicates -40° F (-40° C)
P0121	(2)	TPS Malfunction
P0122	(2)	TPS Malfunction
P0123	(2)	TPS Malfunction
P0300	(2)	EI System Malfunction
P0301	(2)	EI System Malfunction
P0302	(2)	EI System Malfunction
P0303	(2)	EI System Malfunction
P0304	(2)	EI System Malfunction
P0305	(2)	EI System Malfunction
P0306	(2)	EI System Malfunction
P0307	(2)	EI System Malfunction
P0308	(2)	EI System Malfunction
P0320	(2)	EI System Malfunction
P0340	(2)	EI System Malfunction
P0500	(2)	Insufficient VSS Input
P0703	(3) **FD1**	BOO Switch Malfunction
P0707	**D1**	TR Sensor Voltage Low
P0708	**D1**	TR Sensor Voltage High

P0712	**B1**	TFT Indicates 315° F (157° C)
P0713	**B1**	TFT Indicates -40° F (-40° C)
P0715	**F1**	Insufficient Input From TSS
P0731	**A1**	No 1st Gear
P0732	**A1**	No 2nd Gear
P0733	**A1**	No 3rd Gear
P0734	**A1**	No 4th Gear
P0741	**C1**	TCC Engagement Error
P0743	**C1**	TCC Solenoid Circuit Failure
P0750	**A1**	SS1 Solenoid Electrical Circuit Failure
P0751	**A1**	SS1 Solenoid Mechanical/Hydraulic Failure
P0755	**A1**	SS2 Solenoid Electrical Circuit Failure
P0756	**A1**	SS2 Solenoid Mechanical/Hydraulic Failure
P0760	**A1**	SS3 Solenoid Electrical Circuit Failure
P0761	**A1**	SS3 Solenoid Mechanical/Hydraulic Failure
P1100	(2)	MAF Sensor Malfunction
P1101	(2)	MAF Sensor Malfunction
P1116	(2)	ECT Out Of Range
P1120	(2)	TPS Malfunction
P1121	(2)	TPS Malfunction
P1124	(2)	TP Voltage High/Low
P1125	(2)	TPS Malfunction
P1351	(2)	EI System Malfunction
P1352	(2)	EI System Malfunction
P1353	(2)	EI System Malfunction
P1354	(2)	EI System Malfunction
P1355	(2)	EI System Malfunction
P1359	(2)	EI System Malfunction
P1364	(2)	EI System Malfunction
P1460	(4) (2)/(5) (2)	A/C Switch Error
P1500	(2)	Intermittent VSS Input
P1650	(2)	PSP Circuit Failure
P1651	(2)	PSP Not Changing State
P1701	(3) **D1**	Reverse Engagement Error
P1703	(4) **FD2**	BOO Switch Malfunction
P1705	**D1**	TR Not In Park

P1711	**B1**	TFT Out Of Range
P1729	(2)	4WD Low Circuit Failure
P1743	**C1**	TCC Solenoid Failed On
P1746	**E1**	EPC Solenoid Circuit Failure
P1751	**A1**	SS1 Solenoid Mechanical/Hydraulic Failure
P1754	**G1**	CS Solenoid Circuit Failure
P1756	**A1**	SS2 Solenoid Mechanical/Hydraulic Failure
P1761	**A1**	SS3 Solenoid Failure
P1780	(6) (2)	TCS Malfunction
P1781	(2)	4WD Low Switch Failure
P1783	**B1**	Transmission Overtemp

(1) Only engine performance fault codes that may affect transmission operation are listed. For complete list of engine performance fault codes, see appropriate TESTS W/CODES article in ENGINE PERFORMANCE.

(2) See appropriate TESTS W/CODES article in ENGINE PERFORMANCE.

(3) KOER or continuous memory code.

(4) KOEO or KOER fault code.

(5) Continuous memory code.

(6) KOER fault code.

EEC-IV & EEC-V CIRCUIT TEST & PINPOINT TEST PROCEDURES

NOTE: Procedures in CIRCUIT TESTS and PINPOINT TESTS are written for the use of the following Ford Motor Co. test equipment:

- **Super Star II Tester (007-0041B) or New Generation Star (NGS) Tester (007-00500)**
- **60-Pin Breakout Box (007-00033) or 104-Pin Breakout Box (014-00950)**
- **Transmission Tester (007-0085C or 007-0085D)**

Terminal pin references are based on this equipment and appropriate overlays. All references to "test pins", "test terminals" or "jacks" refer to TEST EQUIPMENT.

When after market test equipment is used, always follow test equipment manufacturer's procedures.

HOW TO USE CIRCUIT TEST & PINPOINT TESTS

1. Ensure all non-EEC related faults found while performing TROUBLE SHOOTING steps in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** overhaul article have been corrected. DO NOT perform any CIRCUIT TEST or PINPOINT TEST unless specifically instructed by a QUICK TEST procedure. Follow each test step in order until fault is found. DO NOT replace any part unless directed to do so. When more than one code is retrieved, start with first code displayed.

2. CIRCUIT TESTS and PINPOINT 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 CIRCUIT TESTS and PINPOINT TESTS.
3. DO NOT measure voltage or resistance at PCM. **DO NOT** connect any test light unless specified in testing procedure. All measurements are made by probing rear of connector. Isolate both ends of a circuit and turn ignition off 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 QUICK TEST.
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 it 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 CIRCUIT TEST and/or PINPOINT TEST.

Diagnostic Aids

Fuel-contaminated engine oil may set some codes and effect engine performance. If oil is suspect, remove PCV valve from valve cover and repeat QUICK TEST. If problem is corrected, change engine oil.

EEC-IV & EEC-V PINPOINT TESTS

NOTE: PINPOINT TESTS are diagnostic formats used to test and service EEC-IV & EEC-V system. PINPOINT TESTS check transmission circuits, sensors and actuators. Procedures in PINPOINT TESTS are written for the use of the following Ford Motor Co. test equipment:

- **Super Star II Tester (007-0041B) or New Generation Star (NGS) Tester (007-00500)**
- **60-Pin Breakout Box (007-00033) or 104-Pin Breakout Box (014-00950)**
- **Transmission Tester (007-0085C or 007-0085D)**

Terminal pin references are based on this equipment and appropriate overlays. All references to "test pins", "test terminals" or "jacks" refer to test equipment.

When after market test equipment is used, always follow test equipment manufacturer's procedures.

PINPOINT TEST A - SHIFT SOLENOID ELECTRICAL CIRCUIT

1) 4R44E & 4R55E Electronic Diagnostics Ensure transmission harness connector is in acceptable condition. Repair as necessary. Perform KOEO test until Continuous Memory DTCs have been displayed. See QUICK TEST. Depress throttle to WOT and release. If vehicle enters Output State, go to next step. If vehicle will not enter Output State, see appropriate TESTS W/CODES article in ENGINE PERFORMANCE:

1996 Aerostar

- **TESTS W/CODES - 3.0L** .

- **TESTS W/CODES - 4.0L** .

1995 Explorer

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Explorer

- **TESTS W/CODES - 4.0L** .
- **TESTS W/CODES - 5.0L** .

1995 Ranger

- **TESTS W/CODES - EEC-V (2.3L)** .
- **TESTS W/CODES - EEC-V (3.0L)** .
- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Ranger

- **TESTS W/CODES - 2.3L** .
- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

2) Check Electrical Signal Operation Disconnect transmission harness connector. Inspect condition of connector and repair as needed. Using DVOM (20-volt scale), connect positive lead to transmission vehicle harness connector terminal No. 10 (VPWR). See **Fig. 7**. Connect negative lead to appropriate solenoid circuit. Depress and release throttle to cycle solenoid output. If voltage changes at least .5 volts, go to step 5). If voltage is unaffected, go to next step.

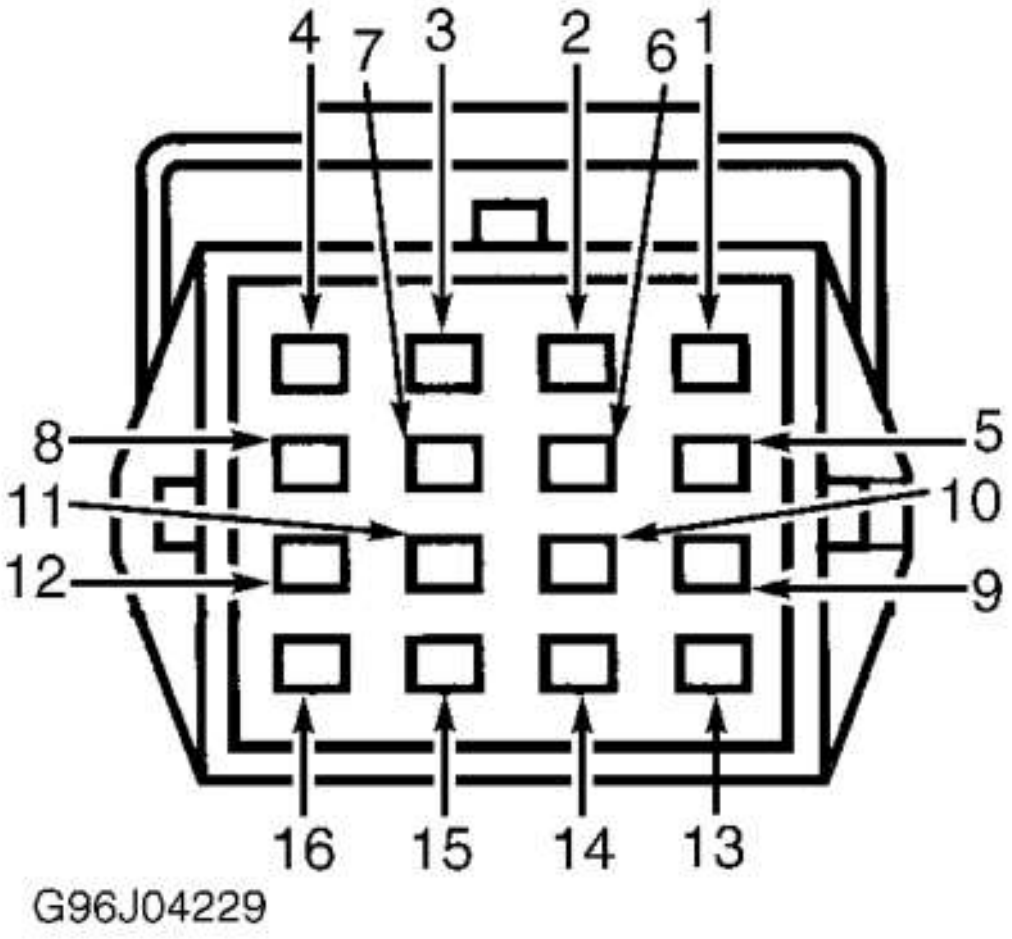

Fig. 7: Identifying Transmission Harness Connector

WIRE COLOR IDENTIFICATION

Terminal No.	Wire Color	Circuit
1	Red	TCC Power
2	Green/White	TSS Signal (+)
3	Gray/Red	TSS Signal Return (-)
4	Orange/Black	TFT Sensor Signal (+)
5	Pink/Yellow	TCC Solenoid
7	Pink/Black	Shift Solenoid No. 3
8	Green/Red	TFT Sensor Signal Return (-)
9	Brown/Orange	Coast Clutch Solenoid
10	Red	Shift Solenoid Power
11	Red	EPC Solenoid Power

12	White/Yellow	EPC Solenoid
14	Pink/Orange	Shift Solenoid No. 2
16	Orange/Yellow	Shift Solenoid No. 1

3) Check Continuity Of Solenoid Signal & VPWR Harness Circuits Ensure ignition is off. Disconnect PCM connector, and inspect it for damaged pins, corrosion and loose wires. Repair as necessary. Install breakout box, leaving PCM disconnected. On 1995 Explorer, measure and record resistance between breakout box test pin No. 51, 52 or 55 and corresponding solenoid signal pin at transmission harness connector. Measure and record resistance between test pins No. 37 and 57 and transmission harness connector terminal No. 10 (VPWR). On all other models, measure and record resistance between breakout box test pins No. 1, 27 or 53 and corresponding solenoid signal pin at transmission harness connector. See **Fig. 7**. Measure and record resistance between test pins No. 71 and 97 and transmission harness connector terminal No. 10 (VPWR). If any resistance is greater than 5 ohms, repair open circuit. Connect all components. Disconnect breakout box and repeat QUICK TEST. If each resistance is 5 ohms or less, go to next step.

4) Check Solenoid Harness For Shorts To Power & Ground On 1995 Explorer, measure and record resistance between breakout box test pins No. 51, 52, and 55 test pins No. 37 and 57. Measure and record resistance between test pins No. 40, 46 and 60, and ground. On all other models, measure and record resistance between breakout box test pins No. 1, 27, and 53 and test pins No. 71 and 97. Measure and record resistance between test pins No. 77, 91 and 103, and ground. If any resistance is less than 10 k/ohms, repair short circuit. Connect all components. Disconnect breakout box and repeat QUICK TEST. If each resistance is 10 k/ohms or more, go to step 6).

5) Solenoid Functional Test Connect transmission tester. Perform solenoid functional test. See tester instructions. If LED turns Green when solenoid activates and turns off when solenoid deactivates, go to next step. If LED turns Red or remains off when solenoid activates, go to step 7).

6) Transmission Drive Test Perform tester drive test. See tester instructions. If vehicle upshifts when operated with tester, replace PCM. Erase all trouble codes. See CLEARING CODES. Perform TRANSMISSION DRIVE CYCLE TEST. Repeat QUICK TEST. If codes are still present, go to TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article. If vehicle does not upshift when operated by tester, go to next step.

7) Check Resistance Of Solenoid Set tester Bench/Drive switch to Bench mode. Set Gear Selector switch to OHMS CHECK. Connect ohmmeter positive lead to VPWR jack on tester and negative lead in turn to SS1, SS2, and SS3 jacks. Measure and record resistance. Resistance for each solenoid should be 22-48 ohms. If resistance is within specification, go to next step. If resistance is not within specification, go to step 9).

8) Check Solenoid For Short To Ground Check continuity between BAT (-) terminal and between SS1, SS2, and SS3 jacks. Check continuity between BAT (-) terminal and VPWR terminal. If continuity exists for any circuit, go to next step. Erase all codes. See CLEARING CODES. Repeat QUICK TEST. If continuity does not exist, go to TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article.

9) Internal Electronic Diagnostics Drain transmission fluid. See TRANSMISSION SERVICING section. Remove transmission fluid pan. See VALVE BODY under ON-VEHICLE SERVICE in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article. Inspect all internal wiring and harness connectors. Ensure all connectors are fully connected and not damaged. Repair as needed. Install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. If wiring and connectors are okay, go to next step.

10) Check Internal Harness Continuity Disconnect internal harness from solenoid assemblies. Connect positive lead of ohmmeter in turn to tester SS1, SS2, and SS3 jack and negative lead to corresponding shift solenoid signal wire. Measure and record resistance. To test SS1, SS2, and SS3 VPWR circuits, connect positive lead of ohmmeter to selected solenoid White wire. Connect negative lead to corresponding VPWR tester terminal. Measure and record resistance. If each resistance is .5 ohms or less, go to next step. If any resistance measured is more than .5 ohms, replace internal harness. Go to step 12).

SHIFT SOLENOID WIRE COLOR IDENTIFICATION

Application	Signal	Power
SS1	Gray	White
SS2	Brown	White
SS3	Yellow	White

11) Check Internal Harness For Shorts To Ground Using transmission tester, check continuity between each solenoid lead and BAT (-) terminal of tester. If continuity does not exist in any circuit, go to next step. If continuity exists in any circuit, replace internal harness. Go to next step.

12) Check Resistance Of Solenoid Using ohmmeter, check resistance between terminals of each solenoid. Resistance should be 22-48 ohms. If resistance is within specification, go to next step. If resistance measured for any solenoid is not within specification, replace shift solenoid. Install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST.

13) Check Solenoid For Short To Ground Using ohmmeter, check continuity between each solenoid terminal and ground. If continuity exists, replace faulty shift solenoid. If continuity does not exist, go to TROUBLE SHOOTING in FORD 4R44E & 4R55E article. Install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST.

PINPOINT TEST B - TFT ELECTRICAL CIRCUIT

1) 4R44E & 4R55E Electronic Diagnostics Check transmission harness connector. Inspect connector for damaged pins, corrosion and loose wires. Ensure transmission connector is fully seated. Repair as necessary. Go to next step.

2) Check Electrical Signal Operation Ensure ignition is off. Disconnect transmission connector. Using DVOM, connect positive lead to transmission harness connector terminal No. 4 and negative lead to terminal No. 8. See **Fig. 7**. Turn ignition on. If voltage is 4.75-5.25 volts, go to step 5). If voltage is not within specification, go to next step.

3) Check Continuity Of TFT Signal Return (SIG RTN) Circuits Turn ignition off. Disconnect PCM connector, and inspect it for damaged pins, corrosion and loose wires. Repair as necessary. Install breakout box, leaving PCM disconnected. On 1995 Explorer models, measure and record resistance between breakout box test pin No. 49 and transmission harness connector terminal No. 4. Measure and record resistance between test pin No. 46 and transmission harness connector terminal No. 8. On all other models, measure and record resistance between breakout box test pin No. 37 and transmission harness connector terminal No. 4. See **Fig. 7**. Measure and record resistance between test pin No. 91 and transmission harness connector terminal No. 8. If each resistance is less than 5 ohms, go to next step. If any resistance is more than 5 ohms, repair open circuit. Connect all components. Disconnect breakout box. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST.

4) Check TFT Circuit For Short To VPWR & Ground Ensure ignition is off. Disconnect PCM

connector, and inspect it for damaged pins, corrosion and loose wires. Repair as necessary. Install breakout box, leaving PCM disconnected. On 1995 Explorer models, measure and record resistance between breakout box test pin No. 49 and test pins No. 37 and 57. On all other models, measure and record resistance between breakout box test pin No. 37 and test pins No. 71 and 97. If any resistance is less than 10 k/ohms, repair short circuit. Disconnect breakout box and repeat QUICK TEST. If resistance is 10 k/ohms or more, go to next step.

NOTE: DTC 637 or P0713 is set if resistance is above 869 k/ohms (open circuit). DTC 638 or P0712 is set if resistance is below 597 ohms (short circuit).

5) Check Resistance Of TFT Sensor Install transmission tester. Set tester Bench/Drive switch to BENCH position. Set Solenoid Selector switch to OHMS CHECK. Connect ohmmeter leads to appropriate TFT jacks. Measure and record resistance. Resistance should be within specification. See **TFT TEMPERATURE/RESISTANCE TABLE**. If resistance is within specification for specific temperature, either warm up transmission or allow transmission to cool to check resistance at different temperatures. If resistances measured remain within specification, go to next step. If resistances measured are not within specification, replace internal harness. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST.

TFT TEMPERATURE/RESISTANCE

Temperature °F (°C)	Resistance (k/Ohms)
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

6) Check TFT Sensor/Harness For Short To Ground Check continuity between BAT (-) tester jack and TFT jacks. If continuity exists, go to next step. If continuity does not exist, replace PCM. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST.

7) Internal Electronic Diagnostics Drain transmission fluid. See TRANSMISSION SERVICING section. Remove transmission fluid pan. See VALVE BODY under ON-VEHICLE SERVICE in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article. Inspect TFT internal wiring and harness connector. Ensure connector is fully connected and not damaged. Repair or replace as needed. Install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. If wiring and connectors are okay, replace internal harness.

PINPOINT TEST C - TCC ELECTRICAL CIRCUIT

1) 4R44E & 4R55E Electronic Diagnostics Ensure transmission harness connector is in acceptable condition. Repair as necessary. Perform KOEO test until Continuous Memory trouble code(s) have been displayed. See QUICK TEST. Depress throttle to WOT and release. If vehicle enters Output State, go to next step. If vehicle will not enter Output State, see appropriate TESTS W/CODES article in ENGINE PERFORMANCE:

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Explorer

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Explorer

- **TESTS W/CODES - 4.0L** .
- **TESTS W/CODES - 5.0L** .

1995 Ranger

- **TESTS W/CODES - EEC-V (2.3L)** .
- **TESTS W/CODES - EEC-V (3.0L)** .
- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Ranger

- **TESTS W/CODES - 2.3L** .
- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

2) Check Electrical Signal Operation Disconnect transmission harness connector. Inspect condition of connector and repair as needed. Using DVOM (20-volt scale), connect positive lead to transmission harness connector terminal No. 1 (VPWR). See **Fig. 7**. Connect negative lead to terminal No. 5 (TCC). Depress and release throttle to cycle solenoid output. If voltage changes at least .5 volts, go to step 5). If voltage is unaffected, go to next step.

3) Check Continuity Of Solenoid Signal & VPWR Harness Circuits Ensure ignition is off. Disconnect PCM connector, and inspect it for damaged pins, corrosion and loose wires. Repair as necessary. Install breakout box, leaving PCM disconnected. On 1995 Explorer models, measure and record resistance between test pins No. 37 and 57 and transmission harness connector terminal No. 1 (VPWR). Measure and record resistance between breakout box test pin No. 53 and transmission harness connector terminal No. 5 (TCC). See **Fig. 7**. On all other models, measure and record resistance between test pins No. 71 and 97 and transmission harness connector terminal No. 1 (VPWR). Measure and record resistance between breakout box test pin No. 54 and transmission harness connector terminal No. 5 (TCC). If any resistance is greater than 5 ohms, repair open circuit. Connect all components. Disconnect breakout box and repeat QUICK TEST. If each resistance is 5 ohms or less, go to next step.

4) Check Solenoid/Harness For Shorts To Power & Ground On 1995 Explorer models, measure and record resistance between test pin No. 53 and test pins No. 37 and 57. Measure and

record resistance between test pins No. 40, 46 and 60, and ground. On all other models, measure and record resistance between breakout box test pin No. 54 and test pins No. 71 and 97. Measure and record resistance between test pins No. 77, 91 and 103, and ground. If any resistance is less than 10 k/ohms, repair short circuit. Connect all components. Disconnect breakout box and repeat QUICK TEST. If each resistance is 10 k/ohms or more, go to next step.

5) Solenoid Functional Test Connect transmission tester. Perform TCC solenoid functional test. See tester instructions. If LED turns Green when solenoid activates and turns off when solenoid deactivates, go to next step. If LED turns Red or remains off when solenoid activates, go to step 7).

6) Transmission Drive Test Perform tester drive test. See tester instructions. While in 3rd, gear press tester TCC switch. If LED turns Green and engine RPM decreases, replace PCM. Erase all trouble codes. See CLEARING CODES. Perform TRANSMISSION DRIVE CYCLE TEST and TORQUE CONVERTOR ENGAGEMENT TEST. Repeat QUICK TEST. If codes are still present, go to TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article. If engine RPM does not decrease when operated by tester, go to next step.

7) Check Resistance Of Solenoid/Harness Set tester Bench/Drive switch to BENCH mode. Set Gear Selector switch to OHMS CHECK. Connect ohmmeter negative lead to TCC jack and positive lead to VPWR jack on tester. Measure resistance. Resistance should be 8.9-16 ohms. If resistance is within specification, go to next step. If resistance is not within specification, go to step 9).

8) Check Solenoid/Harness For Short To Ground Check continuity between BAT (-) tester terminal and TCC connector terminals. If continuity exists, go to next step. Erase all trouble codes and road test vehicle. Repeat QUICK TEST. If continuity does not exist, see TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article for non-electronic symptom diagnostics.

9) 4R44E & 4R55E Internal Electronic Diagnostics Drain transmission fluid. See TRANSMISSION SERVICING section. Remove transmission fluid pan. See VALVE BODY under ON-VEHICLE SERVICE in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article. Inspect TCC internal harness connector. Ensure connector is fully connected and not damaged. Repair as needed. Install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. If all connectors are okay, go to next step.

10) Check Internal Harness Continuity Disconnect internal harness from TCC solenoid. Connect positive lead of ohmmeter to tester TCC jack and negative lead to TCC connector Purple wire. Measure and record resistance. Connect positive lead of ohmmeter to tester VPWR jack and negative lead to TCC connector Black wire. If each resistance is .5 ohms or less, go to next step. If any resistance is more than .5 ohms, replace internal harness. Go to step 12).

11) Check Internal Harness For Shorts To Ground Using transmission tester, check continuity between each TCC solenoid connector terminal and BAT (-) terminal of tester. If continuity does not exist in either circuit, go to next step. If continuity exists in any circuit, replace internal harness. Go to next step.

12) Check Solenoid Resistance Using ohmmeter, check resistance between TCC solenoid terminals. If resistance is 8.9-16 ohms, go to next step. If resistance measured is not within specification, replace TCC solenoid. Install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST.

13) Check Solenoid For Short To Ground Using ohmmeter, check continuity between each TCC solenoid terminal and ground. If continuity exists, replace faulty TCC solenoid. Install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble

codes. See CLEARING CODES. Repeat QUICK TEST. If continuity does not exist, install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. See TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article for non-electronic symptom diagnostics.

PINPOINT TEST D - TRANSMISSION RANGE (TR) SENSOR

1) 4R44E & 4R55E Electronic Diagnostics Ensure TR sensor harness connector is fully seated and in acceptable condition. Repair as necessary. Ensure TR sensor is correctly adjusted. See **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article. After adjustment, place transmission in park and clear trouble codes. See CLEARING CODES. Repeat QUICK TEST. If sensor is correctly adjusted, go to next step.

2) Check Electrical Signal Operation Ensure ignition is off. Disconnect TR sensor connector, and inspect it for damaged pins, corrosion and loose wires. Repair as necessary. Turn ignition on. Measure voltage between harness connector terminals No. 6 and 7. See **Fig. 8**. If voltage is 4.75-5.25 volts, go to step 5). If voltage is not within specification, go to next step.

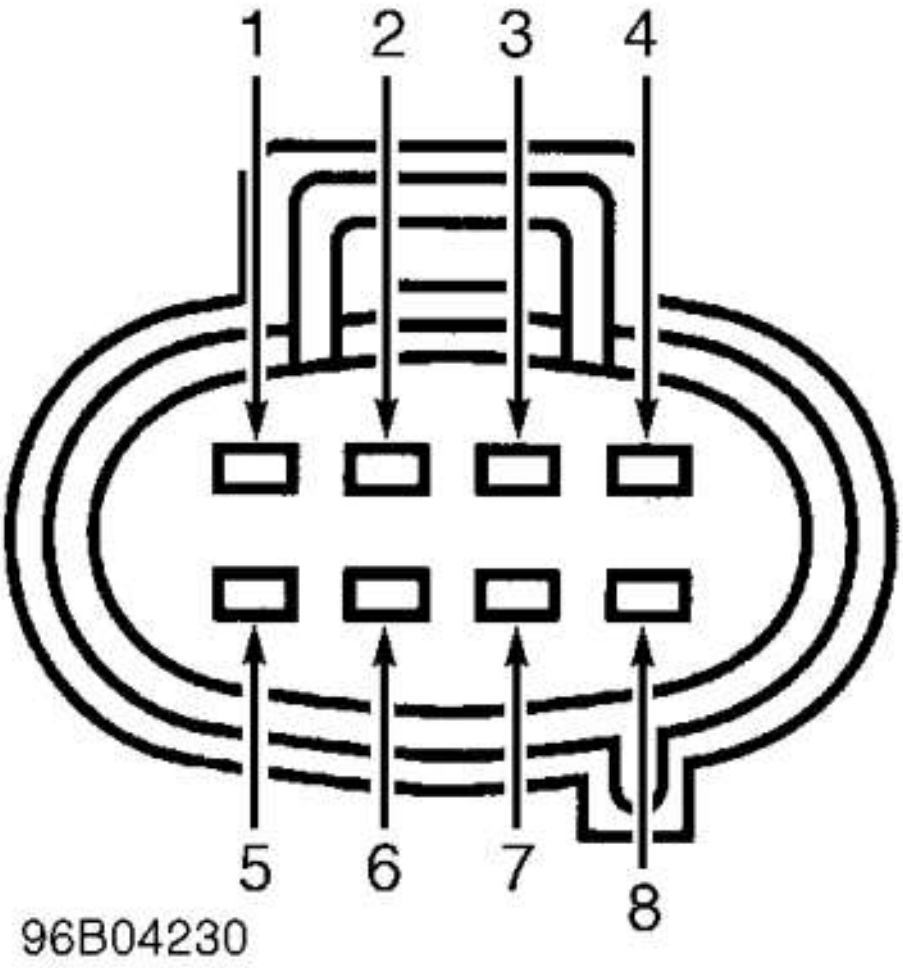

Fig. 8: Identifying TR Sensor Harness Connector

TR SENSOR WIRE COLOR IDENTIFICATION

Terminal No.	Wire Color
6	Light Blue/Yellow
7	Gray/Red

3) Check Continuity Of TR Sensor Harness Circuits Turn ignition off. Disconnect PCM connector, and inspect it for damaged pins, corrosion and loose wires. Repair as necessary. Install breakout box, leaving PCM disconnected. On 1995 Explorer models, measure and record resistance between breakout box test pin terminal No. 30 and TR sensor harness connector terminal No. 7. Measure and record resistance between breakout box test pin terminal No. 46 and TR sensor harness connector terminal No. 6. See **Fig. 8**. On all other models, measure and record resistance between breakout box test pin terminal No. 64 and TR sensor harness connector terminal No. 7. Measure and record resistance between breakout box test pin terminal No. 91 and TR sensor harness connector terminal No. 6. If each resistance is less than 5 ohms, go to next step. If any resistance is more than 5 ohms,

repair open circuit. Remove breakout box and connect all components. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST.

4) Check TR Circuit For Shorts To Power & Ground On 1995 Explorer models, measure resistance between breakout box test pin No. 30 and test pins No. 37, 40, 46, 57 and 60. Measure resistance between breakout box test pin No. 30 and ground. On all other models, measure resistance between breakout box test pin No. 64 and test pins No. 71, 77, 91, 97 and 103. Measure resistance between breakout box test pin No. 64 and ground. If each resistance is more than 10 k/ohms, go to next step. If any resistance is less than 10 k/ohms, repair short circuit. Remove breakout box and connect all components. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST.

5) Check TR Sensor Resistance Install TR overlay on transmission tester. Connect tester to TR sensor. Ensure sensor functions in all positions. See tester instructions. Check continuity and resistances in all positions. See **Fig. 9**. If TR sensor does not operate within specification, replace sensor. Connect all components. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. If sensor operates within specification, replace PCM. Go to next step.

Gearshift Selector Lever Position	Resistance (ohms)		Voltage
	min	max	range
P	3770	4607	3.97-4.85
R	1304	1593	3.24-3.46
N	660	807	2.55-3.11
D	361	442	1.88-2.30
2	190	232	1.23-1.51
1	78	95	0.61-0.75

G94F36728

Fig. 9: TR Resistance Specification Chart

6) Check TR Sensor Park/Neutral Circuit Check park/neutral circuit in all gear positions. See tester instructions. Connect ohmmeter between terminals No. 1 and 4. See **Fig. 8**. Check resistances in all positions. Resistance should be less than 5 ohms in park/neutral and 100 k/ohms or more in all other positions. If TR sensor does not operate within specification, replace sensor. Connect all components. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. If sensor operates within specification, go to next step.

7) Check TR Sensor Reverse/Backup Light Circuit Check reverse/backup light circuit in all gear positions. See tester instructions. Connect ohmmeter between terminals No. 2 and 3. See **Fig. 8**. Check resistances in all positions. Resistance should be less than 5 ohms in reverse and 100 k/ohms or more in all other positions. If TR sensor does not operate within specification, replace sensor. Connect all components. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. If sensor operates within specification, go to next step.

8) Check TR Sensor 4WD Low/Neutral Sense Circuit Check 4WD low/neutral sense circuit in all

gear positions. See tester instructions. Connect ohmmeter between terminals No. 5 and 8. See **Fig. 8**. Check resistances in all positions. Resistance should be less than 5 ohms in neutral and 100 k/ohms or more in all other positions. If TR sensor does not operate within specification, replace sensor. Connect all components. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. If sensor operates within specification, see TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article for non-electronic symptom diagnostics.

PINPOINT TEST E - EPC SOLENOID

1) 4R44E & 4R55E Electronic Diagnostics Ensure transmission harness connector is in acceptable condition. Repair as necessary. Perform KOEO test until Continuous Memory DTCs have been displayed. See QUICK TEST. Depress throttle to WOT and release. If vehicle enters Output State, go to next step. If vehicle will not enter Output State, see appropriate TESTS W/CODES article in ENGINE PERFORMANCE:

1996 Aerostar

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Explorer

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Explorer

- **TESTS W/CODES - 4.0L** .
- **TESTS W/CODES - 5.0L** .

1995 Ranger

- **TESTS W/CODES - EEC-V (2.3L)** .
- **TESTS W/CODES - EEC-V (3.0L)** .
- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Ranger

- **TESTS W/CODES - 2.3L** .
- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

2) Check Electrical Signal Operation Disconnect transmission harness connector. Inspect condition of connector and repair as needed. Using DVOM (20-volt scale), connect positive

lead to transmission vehicle harness connector terminal No. 11 (VPWR). See **Fig. 7**. Connect negative lead to terminal No. 12 (EPC). Depress and release throttle to cycle solenoid output. If voltage changes at least .5 volts, go to step 5). If voltage is unaffected, go to next step.

3) Check Continuity Of Solenoid Signal & VPWR Harness Circuits Ensure ignition is off. Disconnect PCM connector, and inspect it for damaged pins, corrosion and loose wires. Repair as necessary. Install breakout box, leaving PCM disconnected. On 1995 Explorer models, measure and record resistance between test pins No. 37 and 57 and transmission harness connector terminal No. 11 (VPWR). Measure and record resistance between breakout box test pin No. 38 and transmission harness connector terminal No. 12 (EPC). See **Fig. 7**. On all other models, measure and record resistance between test pins No. 71 and 97 and transmission harness connector terminal No. 11 (VPWR). Measure and record resistance between breakout box test pin No. 81 and transmission harness connector terminal No. 12 (EPC). If any resistance is greater than 5 ohms, repair open circuit. Connect all components. Disconnect breakout box and repeat QUICK TEST. If each resistance is 5 ohms or less, go to next step.

4) Check Solenoid/Harness For Shorts To Power & Ground On 1995 Explorer models, measure and record resistance between test pin No. 38 and test pins No. 37 and 57. Measure and record resistance between test pin No. 38 and test pins No. 40, 46 and 60. On all other models, measure and record resistance between breakout box test pin No. 81 and test pins No. 71 and 97. Measure and record resistance between test pin No. 81 and test pins No. 77, 91 and 103. If any resistance is less than 10 k/ohms, repair short circuit. Connect all components. Disconnect breakout box and repeat QUICK TEST. If each resistance is 10 k/ohms or more, go to next step.

5) Solenoid Functional Test Connect transmission tester. Connect line pressure gauge. See **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article. Perform EPC solenoid functional test. See tester instructions. Observe line pressure on gauge while depressing EPC switch with KOER. EPC solenoid should activate (Green LED) and line pressure should drop when EPC switch is depressed. If solenoid operates correctly, replace PCM. Check power relay for damage or corrosion. Repair as necessary. Connect all components. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. If solenoid is not operating, go to next step.

6) Check Resistance Of Solenoid/Harness Set tester Bench/Drive switch to BENCH mode. Set Gear Selector switch to OHMS CHECK. Connect ohmmeter negative lead to EPC jack and positive lead to VPWR jack on tester. Measure resistance. Resistance should be 3.1-5.7 ohms. If resistance is within specification, go to next step. If resistance is not within specification, go to step 8).

7) Check Solenoid/Harness For Short To Ground Check continuity between BAT (-) tester terminal and EPC terminals. If continuity exists, go to next step. Erase all trouble codes and road test vehicle. Repeat QUICK TEST. If continuity does not exist, see TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article for non-electronic symptom diagnostics.

8) Internal Electronic Diagnostics Drain transmission fluid. See TRANSMISSION SERVICING section. Remove transmission fluid pan. See VALVE BODY under ON-VEHICLE SERVICE in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article. Inspect EPC internal harness connector. Ensure connector is fully connected and not damaged. Repair as needed. Install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. If all connectors are okay, go to next step.

9) Check Internal Harness Continuity Disconnect internal harness from EPC solenoid. Connect positive lead of ohmmeter to tester EPC jack and negative lead to EPC connector Blue wire. Measure and record resistance. Connect positive lead of ohmmeter to tester VPWR jack and negative lead to EPC connector Green wire. If each resistance is .5 ohms or less, go to next step. If any resistance is more than .5 ohms, replace internal harness.

10) Check Internal Harness For Shorts To Ground Using transmission tester, check continuity between each EPC solenoid connector terminal and BAT (-) terminal of tester. If continuity does not exist in either circuit, go to next step. If continuity exists in any circuit, replace internal harness. Go to next step.

11) Check Solenoid Resistance Using ohmmeter, check resistance between EPC solenoid terminals. If resistance is 3.1-5.7 ohms, go to next step. If resistance measured is not within specification, replace EPC solenoid. Install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST.

12) Check Solenoid For Short To Ground Using ohmmeter, check continuity between each EPC solenoid terminal and ground. If continuity exists, replace faulty EPC solenoid. Install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. If continuity does not exist, go to next step.

13) Check Solenoid For Short To Power Using ohmmeter, check continuity between each EPC solenoid terminal and BAT (+) terminal of tester. If continuity exists, replace faulty EPC solenoid. Install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. If continuity does not exist, install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. See TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article for non-electronic symptom diagnostics.

PINPOINT TEST F - TRANSMISSION SPEED SENSOR (TSS)

1) 4R44E & 4R55E Electronic Diagnostics Ensure transmission harness connector is in acceptable condition. Repair as necessary. Go to next step.

2) Check Continuity Of TSS Harness Circuit Ensure ignition is off. Disconnect PCM connector, and inspect it for damaged pins, corrosion and loose wires. Repair as necessary. Install breakout box, leaving PCM disconnected. On 1995 Explorer models, disconnect TSS harness connector. Measure and record resistance between breakout box test pin No. 5 and TSS (+) terminal. Measure and record resistance between breakout box test pin No. 46 and TSS (-) terminal. On all other models, measure and record resistance between breakout box test pin No. 84 and transmission harness connector terminal No. 2. See **Fig. 7**. Measure and record resistance between breakout box test pin No. 91 and transmission harness connector terminal No 3. If each resistance is 5 ohms or less, go to next step. If any resistance is more than 5 ohms, repair open circuit. Connect all components. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST.

3) Check TSS Circuit For Short To Power & Ground On 1995 Explorer models, measure and record resistance between test pins No. 5 and 46, and test pins No. 37 and 57. Measure and record resistance between test pins No. 5, 37, 46, and 57, and test pins No. 40 and 60. On all other models, measure and record resistance between test pins No. 84 and 91, and test pins No. 71 and 97. Measure and record resistance between test pins No. 71, 84, 91, and 97, and test pins No. 77 and 103. If any resistance measured is less than 10 k/ohms, repair short circuit. Connect all components. Disconnect breakout box and repeat QUICK TEST. If each resistance is 10 k/ohms or more, go to next step.

4) TSS Functional Test Connect PCM connector. Connect transmission tester. Connect voltmeter leads to appropriate tester jacks. Set voltmeter to 20 volt AC scale. Perform drive cycle test. See TRANSMISSION DRIVE CYCLE TESTS. If voltage increases with vehicle speed, replace PCM. Connect all components. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. If voltage does not increase with speed, go to next step.

5) Check Solenoid/Harness Resistance Set Gear Selector switch to OFF. Connect ohmmeter leads to

appropriate tester jacks. If resistance is 64-120 ohms, connect all components. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. See TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article for non-electronic symptom diagnostics. If resistance is not within specification, go to next step.

6) Check Solenoid/Harness For Short To Ground Check for continuity between each TSS jack and tester BAT (-) jack. If continuity does not exist, connect all components. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. See TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article for non-electronic symptom diagnostics. If continuity exists, replace TSS. See TRANSMISSION DISASSEMBLY in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article.

PINPOINT TEST G - COAST CLUTCH (CCS) SOLENOID

1) 4R44E & 4R55E Electronic Diagnostics Ensure transmission harness connector is in acceptable condition. Repair as necessary. Perform KOEO test until Continuous Memory DTCs have been displayed. See QUICK TEST. Depress throttle to WOT and release. If vehicle enters Output State, go to next step. If vehicle will not enter Output State, see appropriate TESTS W/CODES article in ENGINE PERFORMANCE:

1996 Aerostar

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Explorer

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Explorer

- **TESTS W/CODES - 4.0L** .
- **TESTS W/CODES - 5.0L** .

1995 Ranger

- **TESTS W/CODES - EEC-V (2.3L)** .
- **TESTS W/CODES - EEC-V (3.0L)** .
- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Ranger

- **TESTS W/CODES - 2.3L** .
- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

2) Check Electrical Signal Operation Disconnect transmission harness connector. Inspect condition of connector and repair as needed. Using DVOM (20-volt scale), connect positive lead to transmission vehicle harness connector terminal No. 10 (VPWR). See **Fig. 7**. Connect negative lead to terminal No. 4 (CCS). Depress and release throttle to cycle solenoid output. If voltage changes at least .5 volts, go to step 5). If voltage is unaffected, go to next step.

3) Check Continuity Of Solenoid Signal & VPWR Harness Circuits Ensure ignition is off. Disconnect PCM connector, and inspect it for damaged pins, corrosion and loose wires. Repair as necessary. Install breakout box, leaving PCM disconnected. On 1995 Explorer models, measure and record resistance between test pins No. 37 and 57 and transmission harness connector terminal No. 10 (VPWR). Measure and record resistance between breakout box test pin No. 32 and transmission harness connector terminal No. 4 (TCC). See **Fig. 7**. On all other models, measure and record resistance between test pins No. 71 and 97 and transmission harness connector terminal No. 10 (VPWR). Measure and record resistance between breakout box test pin No. 28 and transmission harness connector terminal No. 4 (TCC). If any resistance is greater than 5 ohms, repair open circuit. Connect all components. Disconnect breakout box and repeat QUICK TEST. If each resistance is 5 ohms or less, go to next step.

4) Check Solenoid/Harness For Shorts To Power & Ground On 1995 Explorer models, measure and record resistance between test pin No. 32 and test pins No. 37 and 57. Measure and record resistance between test pins No. 40, 46 and 60, and ground. On all other models, measure and record resistance between breakout box test pin No. 28 and test pins No. 71 and 97. Measure and record resistance between test pin No. 28 and test pins No. 77 and 103. If any resistance is less than 10 k/ohms, repair short circuit. Connect all components. Disconnect breakout box and repeat QUICK TEST. If each resistance is 10 k/ohms or more, go to next step.

5) Solenoid Functional Test Connect transmission tester. Perform TCC solenoid functional test. See tester instructions. If LED turns Green when solenoid activates and turns off when solenoid deactivates, go to next step. If LED turns Red or remains off when solenoid activates, go to step 7).

6) Transmission Drive Test Perform tester drive test. See tester instructions. Press tester CCS switch. If LED turns Green and engine braking occurs, replace PCM. Erase all trouble codes. See CLEARING CODES. Perform TRANSMISSION DRIVE CYCLE TEST. Repeat QUICK TEST. If codes are still present, go to TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article. If coast clutch does not engage when operated by tester, go to next step.

7) Check Resistance Of Solenoid/Harness Set tester Bench/Drive switch to BENCH mode. Set Gear Selector switch to OHMS CHECK. Connect ohmmeter negative lead to CCS jack and positive lead to VPWR jack on tester. Measure resistance. Resistance should be 22-48 ohms. If resistance is within specification, go to next step. If resistance is not within specification, go to step 9).

8) Check Solenoid/Harness For Short To Ground Check continuity between BAT (-) tester terminal and CCS terminals. If continuity exists, go to next step. If continuity does not exist, see TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article

for non-electronic symptom diagnostics.

9) 4R44E & 4R55E Internal Electronic Diagnostics Drain transmission fluid. See TRANSMISSION SERVICING section. Remove transmission fluid pan. See VALVE BODY under ON-VEHICLE SERVICE in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article. Inspect CCS internal harness connector. Ensure connector is fully connected and not damaged. Repair as needed. Install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. If all connectors are okay, go to next step.

10) Check Internal Harness Continuity Disconnect internal harness from CCS solenoid. Connect positive lead of ohmmeter to tester CCS jack and negative lead to CCS connector Orange wire. Measure and record resistance. Connect positive lead of ohmmeter to tester VPWR jack and negative lead to CCS connector White wire. If each resistance is .5 ohms or less, go to next step. If any resistance is more than .5 ohms, replace internal harness. Go to step 12).

11) Check Internal Harness For Shorts To Ground Using transmission tester, check continuity between each CCS solenoid connector terminal and BAT (-) terminal of tester. If continuity does not exist in either circuit, go to next step. If continuity exists in any circuit, replace internal harness.

12) Check Solenoid Resistance Using ohmmeter, check resistance between TCC solenoid terminals. If resistance is 22-48 ohms, go to next step. If resistance is not within specification, replace CCS solenoid. Install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST.

13) Check Solenoid For Short To Ground Using ohmmeter, check continuity between each CCS solenoid terminal and ground. If continuity exists, replace faulty CCS solenoid. Install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. If continuity does not exist, install all components in reverse order of disassembly. Fill transmission with fluid. Erase all trouble codes. See CLEARING CODES. Repeat QUICK TEST. See TROUBLE SHOOTING in **AUTO TRANS OVERHAUL - FORD 4R44E & 4R55E** article for non-electronic symptom diagnostics.

EEC-IV CIRCUIT TESTS

NOTE: CIRCUIT TESTS are diagnostic formats used to test and service EEC-IV system. CIRCUIT TESTS check engine circuits, sensors and actuators. Procedures in CIRCUIT TESTS are written for the use of the following Ford Motor Co. test equipment:

- **Super Star II Tester (007-0041B)**
- **60-Pin Breakout Box (007-00033)**
- **Transmission Tester (007-0085C)**

Terminal pin references are based on this equipment and appropriate overlays. All references to "test pins", "test terminals" or "jacks" refer to TEST EQUIPMENT.

When after market test equipment is used, always follow test equipment manufacturer's procedures.

CIRCUIT TEST FD - BRAKE ON-OFF (BOO) SWITCH

Diagnostic Aids

Perform this test when directed by QUICK TEST. This test is intended to diagnose a faulty BOO switch circuit or PCM. To prevent replacement of good components, be aware following non-EEC related areas may be at fault:

- Brake light bulb.
- Brake light switch or brake light fuse.

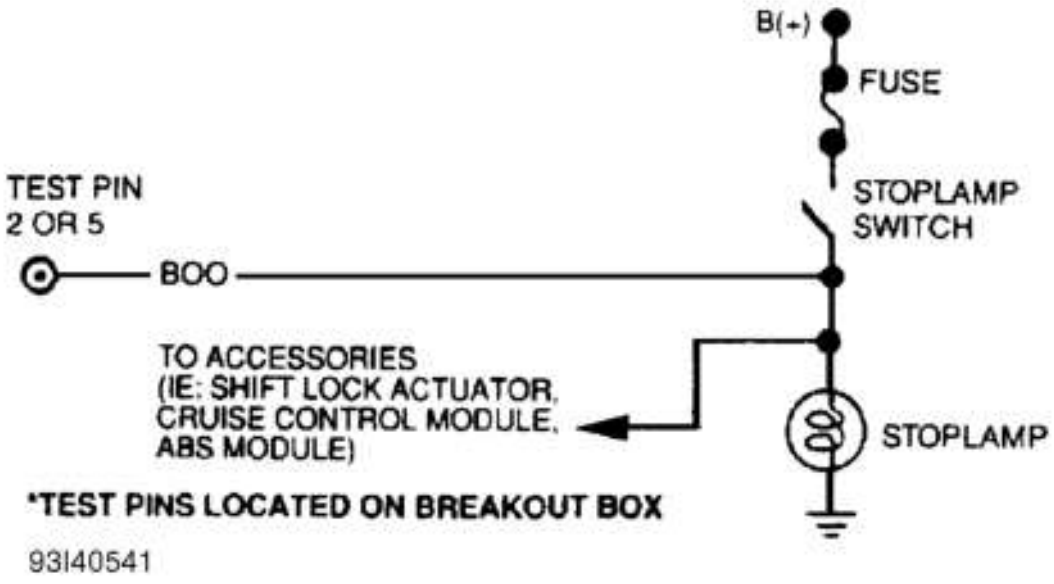

Fig. 10: BOO Switch Circuit

TEST PIN WIRE COLOR IDENTIFICATION

Application	Wire Color
No. 2 (BOO)	Light Green

1) DTC 536: Verify Brake Pedal Was Depressed DTC 536 indicates that when brake pedal is applied during KOER SELF-TEST, BOO signal did not cycle high and low. Possible causes for this fault are:

- Brake pedal not applied during self-test.
- Brake pedal applied during entire self-test.
- Open brake light circuit.
- Short to ground or power.
- Faulty brake light switch.
- Faulty Powertrain Control Module (PCM).

If brake was not applied during KOER SELF-TEST, repeat test. Depress and release brake pedal only once during test. If pedal was depressed, go to next step.

2) Check Operation Of Brake Lights With ignition on, check operation of brake lights. If brake lights operate normally, go to next step. If brake lights do not operate, go to step 4). If brake lights are always on,go to step 5).

3) Check For BOO Switch Circuit Cycling Turn ignition off. Wait 10 seconds. Disconnect PCM 60-pin connector. Inspect terminals, and repair if damaged. Install breakout box, leaving PCM disconnected. Measure voltage between BOO test pin (No. 2) and test pin No. 40 while applying and releasing brake. If voltage cycles, replace PCM. Remove breakout box and repeat QUICK TEST. If voltage does not cycle, repair open circuit in BOO switch circuit between PCM and BOO switch connection to brake light circuit. Repeat QUICK TEST.

4) Check For Power To Brake Switch Ensure related fuses and brake light bulbs are in good condition. Turn ignition off. Disconnect brake light switch (located on brake pedal). Measure voltage between BAT (+) input to brake light switch and ground. If voltage is greater than 10 volts, check condition of brake light switch. If brake light switch is okay, repair open circuit between brake light switch and brake light ground. Repeat QUICK TEST. If voltage is less than 10 volts, repair open BAT (+) circuit to brake light switch and repeat QUICK TEST.

5) Verify Brake Switch Is Not Always Closed Turn ignition off. Disconnect brake light switch (located on brake pedal). Turn ignition on. If brake lights are still on, go to next step. If brake lights are not on, verify correct installation of brake light switch. If installation is okay, replace brake light switch and repeat QUICK TEST.

6) Check For Short To Power In PCM Turn ignition off. Disconnect PCM. Turn ignition on. Check brake lights. If brake lights are on, go to next step. If brake lights are not on, replace PCM and repeat QUICK TEST.

7) Check For Short To Power In Shift Lock Actuator Turn ignition off. Ensure PCM and brake light switch are disconnected. Disconnect shift lock actuator, cruise control module and ABS module (if equipped). Turn ignition on. If brake lights are still on, repair short to power in BOO or stoplight circuit and repeat QUICK TEST. If brake lights are not on, repair short circuit in shift lock actuator circuit, cruise control system circuit or ABS circuit. Repeat QUICK TEST.

NOTE: A break in step numbering sequence occurs at this point. Procedure skips from step 7) to step 90). No test procedures have been omitted.

90) DTC 536: Check For Proper Brake Light Switch Installation Continuous memory DTC 536 indicates a BOO circuit failure. If BOO input does not cycle after a predetermined number of transitions from 0 mph to a specific speed, the BOO input is assumed to be damaged and continuous memory DTC 536 is set. Possible causes of failure are:

- Incorrect brake light switch installation.
- Open brake light/BOO circuit.
- Brake Light/BOO circuit short.
- Damaged switch or ground circuit.

If switch is correctly installed and in good condition, go to next step. If switch or harness is damaged, service as needed, clear continuous memory repeat QUICK TEST.

91) Inspect Brake Light Ground Inspect brake light ground connection and harness connector. Repair as needed, clear continuous memory and repeat QUICK TEST. If connections are okay, go to next step.

92) Inspect Brake Light/BOO Circuits For Shorts With KOEO and brake pedal released, perform wiggle test of brake light/BOO circuit harness and connectors while observing brake lights. If brake

lights illuminate, inspect and repair circuits as needed, clear continuous memory and repeat QUICK TEST. If brake lights do not illuminate, go to next step.

93) Inspect Brake Light Circuit Continuity With ignition off, depress brake pedal and hold. Perform wiggle test of brake light circuits while observing brake lights. Lightly tap brake light switch while observing brake lights. If brake lights intermittently go out, inspect and repair circuits as needed, clear continuous memory and repeat QUICK TEST. If brake lights remain illuminated, go to next step.

94) Inspect BOO Circuit Continuity With ignition off, ensure brake pedal is released. Disconnect PCM 60-pin connector. Inspect terminals, and repair if damaged. Install breakout box, leaving PCM disconnected. Measure resistance between BOO test pin No. 2 and brake light circuit at switch while performing wiggle test on harness and connector. If resistance intermittently increases above 5 ohms, inspect and repair open circuit. Repeat QUICK TEST. If resistance is within specification, go to next step for further diagnosis.

NOTE: A break in step numbering sequence occurs at this point. Procedure skips from step 94) to step 99). No test procedures have been omitted.

99) Road Test Vehicle Purpose of this test is to identify faults by monitoring certain controlled parameters while trying to recreate a drive-ability or MIL symptom. To prepare for road test, complete the following:

- Install fuel pressure gauge and if available, a MAP/BARO tester.
- Disconnect PCM 60-pin connector, install breakout box and reconnect PCM to breakout box.
- Connect "T" vacuum gauge into manifold vacuum line.
- Have DVOM, writing materials and appropriate schematics and pin voltage charts available.

With ignition on and negative lead of DVOM connected to negative battery terminal, ensure following signals are correct:

- POWER: KAPWR (pin No. 1) is greater than 10.5 volts, VPWR (pins No. 37 and 57) is greater than 10.5 volts and VREF (pin No. 26) is 4-6 volts.
- GROUNDS: PWR GND (pins No. 40 and 60), SIG RTN (pin No. 46) and IGN GND (pin No. 16) are 0.0-0.5 volt.
- OPTIONAL GROUNDS: HO2S GND (pin No. 49), CSE GND (pin No. 20) and MAF RTN (pin No. 9 or 15) are 0.0-0.5 volt.

Diagnostic Aids

Test lights and DVOM are useful during diagnosis. For example: a test light could be connected at brake light switch between battery and ground and another test light between switch bulb circuit and ground. Test Light to battery circuit should always be illuminated and other test light should only illuminate when brake light is depressed.

With DVOM connected between test pins No. 2 and 40 at breakout box, check voltage. If voltage is 6-7 volts with brake pedal released, possible open circuit between PCM and brake light ground could exist.

CIRCUIT TEST KM - A/C DEMAND SWITCH

Diagnostic Aids

Perform this test when diagnosing a symptom. To prevent replacing good components, check the following

non-EEC components and systems:

- Refrigerant charge.
- Low ambient temperature (less than 45°F (7°C).

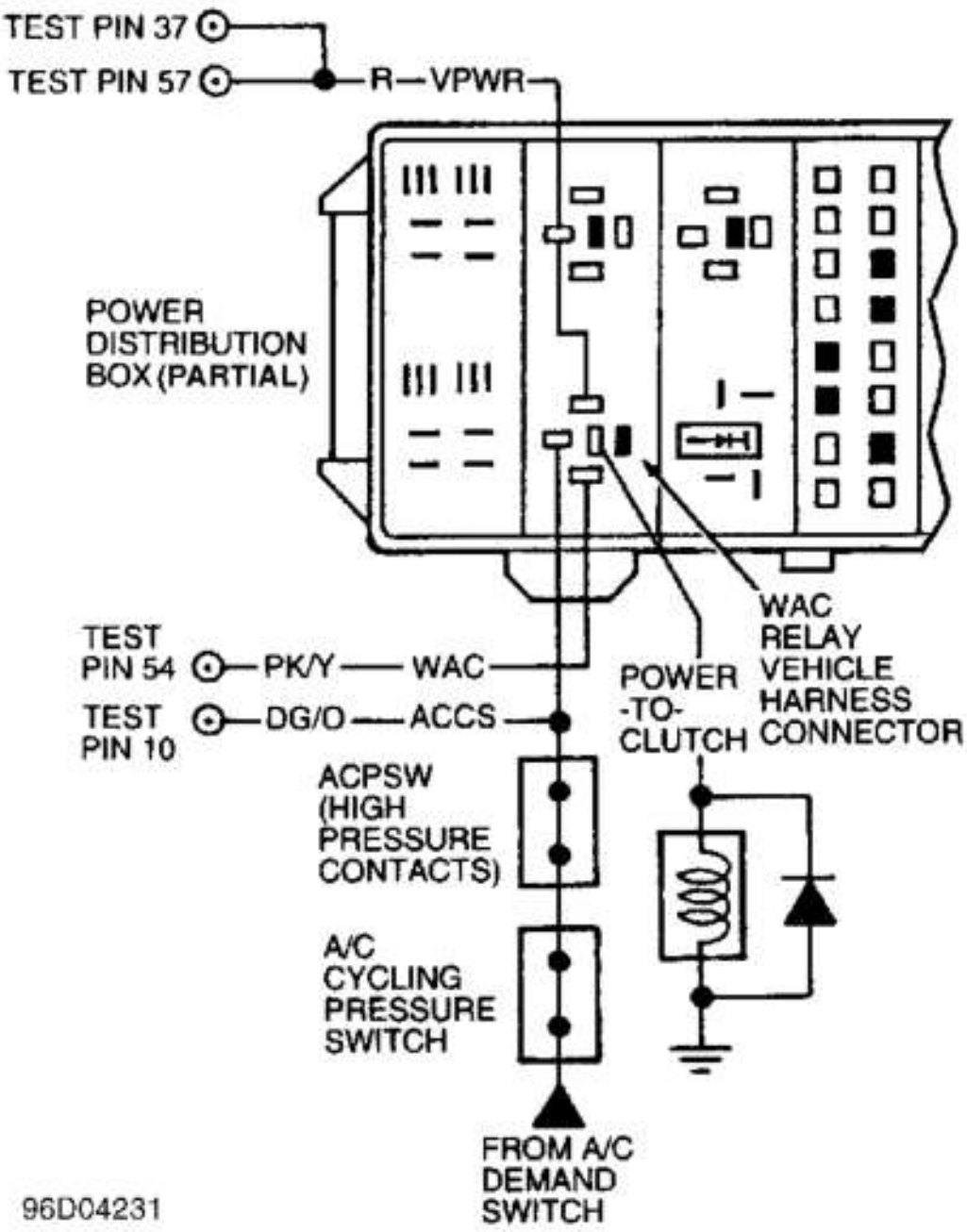

Fig. 11: WOT A/C Cut-Out Circuit (Explorer)

NOTE: This procedure starts with step 40). No test procedures have been omitted.

Before performing this test, ensure A/C switch is off. If A/C switch was on, turn A/C off and repeat QUICK TEST.

40) DTC 539: Check A/C Input DTC 539 indicates ACCS input to PCM was high during KOEO/KOER SELF-TEST. Turn ignition off. Disconnect 60-pin PCM connector. Inspect terminals, and repair if damaged. Install breakout box, leaving PCM disconnected. Turn ignition on. Measure voltage between test pin No. 10 at breakout box and chassis ground. If voltage is 1.0 volt or more, verify operation of A/C demand switch. If A/C demand switch is okay, repair short to power in A/C circuit and repeat QUICK TEST. If voltage is less than 1.0 volt, replace PCM. Remove breakout box and repeat QUICK TEST.

CIRCUIT TEST TG - TORQUE CONVERTOR CLUTCH (TCC) EXCESSIVE SLIP INDICATED

Diagnostic Aids

Perform this test when instructed during QUICK TEST or if directed by other test procedures. This test is used to diagnose the following:

- Wiring harness circuits (TCC).
- Faulty Powertrain Control Module (PCM).

NOTE: This procedure starts with step 90). No test procedures have been omitted.

90) Perform Drive Cycle Test Warm engine to normal operating temperature. Ensure transmission fluid level is correct. Shift transmission to drive "D". Press TCS on shifter handle. O/D OFF light should illuminate. Accelerate from stop to 40 mph. Hold speed for at least 15 seconds (30 seconds above 4000 ft.). Press TCS and accelerate to 50 mph. Hold speed for at least 15 seconds (30 seconds above 4000 ft.). Hold speed and throttle position steady for at least 15 seconds. While maintaining speed with transmission in 4th gear, lightly depress brake pedal and release (to operate stoplights). Hold speed for at least an additional 5 seconds. Bring vehicle to stop for at least 20 seconds with transmission in drive "D". Repeat drive cycle test at least 5 times. Perform Quick Test and record continuous memory codes. If continuous memory DTC 628 is present, go to next step. If no codes are present and driveability symptoms still exist, see **PINPOINT TEST** C for further diagnosis of TCC solenoid.

NOTE: A break in step numbering sequence occurs at this point. Procedure skips from step 90) to step 92). No test procedures have been omitted.

92) Check Harness Circuits Connect scan tool to DLC. Access KOEO continuous monitor mode. Perform wiggle test of PCM and TCC circuit harness and connectors. If no faults are indicated, go to TROUBLE SHOOTING in FORD 4R44E & 4R55E article. If fault is indicated, inspect and repair circuits or replace components as needed. Clear continuous memory and repeat QUICK TEST.

EEC-V CIRCUIT TESTS

NOTE: CIRCUIT TESTS are diagnostic formats used to test and service EEC system. CIRCUIT TESTS check engine circuits, sensors and actuators. Procedures in CIRCUIT TESTS are written for the use of the following Ford Motor Co. test equipment:

- **New Generation Star (NGS) Tester (007-00500)**
- **104-Pin Breakout Box (014-00950)**
- **Transmission Tester (007-0085D)**

Terminal pin references are based on this equipment and appropriate overlays. All references to "test pins", "test terminals" or "jacks" refer to test equipment. When after market test equipment is used, always follow test equipment manufacturer's procedures.

CIRCUIT TEST FD - BRAKE ON-OFF (BOO) SWITCH

Diagnostic Aids

Perform this test when directed by QUICK TEST. This test is intended to diagnose a faulty BOO switch circuit or PCM. To prevent replacement of good components, ensure following non-EEC related areas are not at fault:

- Brake light bulb.
- Brake light switch or brake light fuse.

1) DTC P1703: (KOER) Verify Brake Pedal Was Depressed DTC P1703 indicates that when brake pedal is applied during KOER SELF-TEST, BOO signal did not cycle high and low. Possible causes for this fault are:

- Brake pedal not applied during self-test.
- Brake pedal applied during entire self-test.
- Open brake light circuit.
- Short to ground or power.
- Faulty brake light switch.
- Faulty Powertrain Control Module (PCM).

If brake was not applied during KOER SELF-TEST, repeat test. Depress and release brake pedal only once during test. If pedal was depressed, go to step 3).

- **2) DTC P1703: (KOEO)** DTC P1703 indicates that during KOEO SELF-TEST, voltage was seen on BOO test pin at PCM. Possible causes for this fault are:
  - Brake pedal applied during self-test.
  - Short to power.
  - Faulty brake light switch.

  If brake was applied during KOER SELF-TEST, repeat test. **DO NOT** depress brake pedal during test. If pedal was not depressed, go to next step.

- **3) DTC P0703 & P1703: Check Operation Of Brake Lights** With ignition on, check operation of brake lights. If brake lights operate normally, go to next step. If brake lights do not operate, go to step 5). If brake lights are always on, go to step 7).
- **4) Check For BOO Circuit Cycling** Turn ignition off. Wait 10 seconds. Disconnect PCM 104-pin connector. Inspect terminals, and repair if damaged. Install breakout box, leaving PCM disconnected. Measure voltage between BOO test pin No. 92 and test pins No. 76 and 77 while

applying and releasing brake. If voltage cycles, replace PCM. Remove breakout box and repeat QUICK TEST. If voltage does not cycle, repair open circuit in BOO switch circuit between PCM and BOO switch connection to brake light circuit. Repeat QUICK TEST.

- **5) Check For Power To Brake Switch** Ensure related fuses and brake light bulbs are in good condition. Turn ignition off. Disconnect brake light switch (located on brake pedal). Measure voltage between BAT (+) input to brake light switch and ground. If voltage is greater than 10 volts, go to next step. If voltage is less than 10 volts, repair open BAT (+) circuit to brake light switch and repeat QUICK TEST.
- **6) Verify Integrity Of Brake Switch** Disconnect brake light switch connector. Measure resistance between brake light switch terminals while depressing brake pedal. If resistance is less than 5 ohms, repair open circuit between brake light switch and brake light ground. Repeat QUICK TEST. If resistance is more than 5 ohms, replace brake light switch and repeat QUICK TEST.
- **7) Verify Brake Switch Is Not Always Closed** Turn ignition off. Disconnect brake light switch (located on brake pedal). Turn ignition on. If brake lights are still on, go to next step. If brake lights are not on, verify correct installation of brake light switch. If installation is okay, replace brake light switch and repeat QUICK TEST.
- **8) Check For Short To Power In PCM** Turn ignition off. Disconnect PCM. Turn ignition on. Check brake lights. If brake lights are on, go to next step. If brake lights are not on, replace PCM and repeat QUICK TEST.
- **9) Check For Short To Power In Shift Lock Actuator** Turn ignition off. Ensure PCM and brake light switch are disconnected. Disconnect shift lock actuator, cruise control module, ABS module, and General Electronic Module (GEM) (if equipped). Turn ignition on. If brake lights are still on, repair short to power in BOO or stoplight circuit and repeat QUICK TEST. If brake lights are not on, repair short circuit in shift lock actuator circuit, cruise control system circuit, ABS circuit or general electronic module circuit. Repeat QUICK TEST.

CIRCUIT TEST KM - WOT A/C CUT-OFF (WAC)

NOTE: If vehicle is not equipped with A/C, DTC P1460 can be ignored.

Diagnostic Aids

Perform this test when directed by QUICK TEST. To prevent replacing good components, check the following non-EEC components and systems

- Refrigerant charge.
- Low ambient temperature (less than 45°F (7°C).

:

1) DTC P1460: (KOEO/KOER) Check ACCS PID Is Off DTC P1460 indicates A/C was on during SELF-TEST or a WAC fault. Possible causes for this fault are:

- A/C on during self-test.
- Open or shorted circuit.
- Faulty WAC relay.
- Faulty PCM.

If A/C or defrost was on during KOEO/KOER SELF-TEST, turn A/C off and repeat QUICK TEST. If

A/C was not on, start engine. Using scan tool access ACCS PID. If ACCS PID is off, go to next step. If ACCS PID is on, go to step 20).

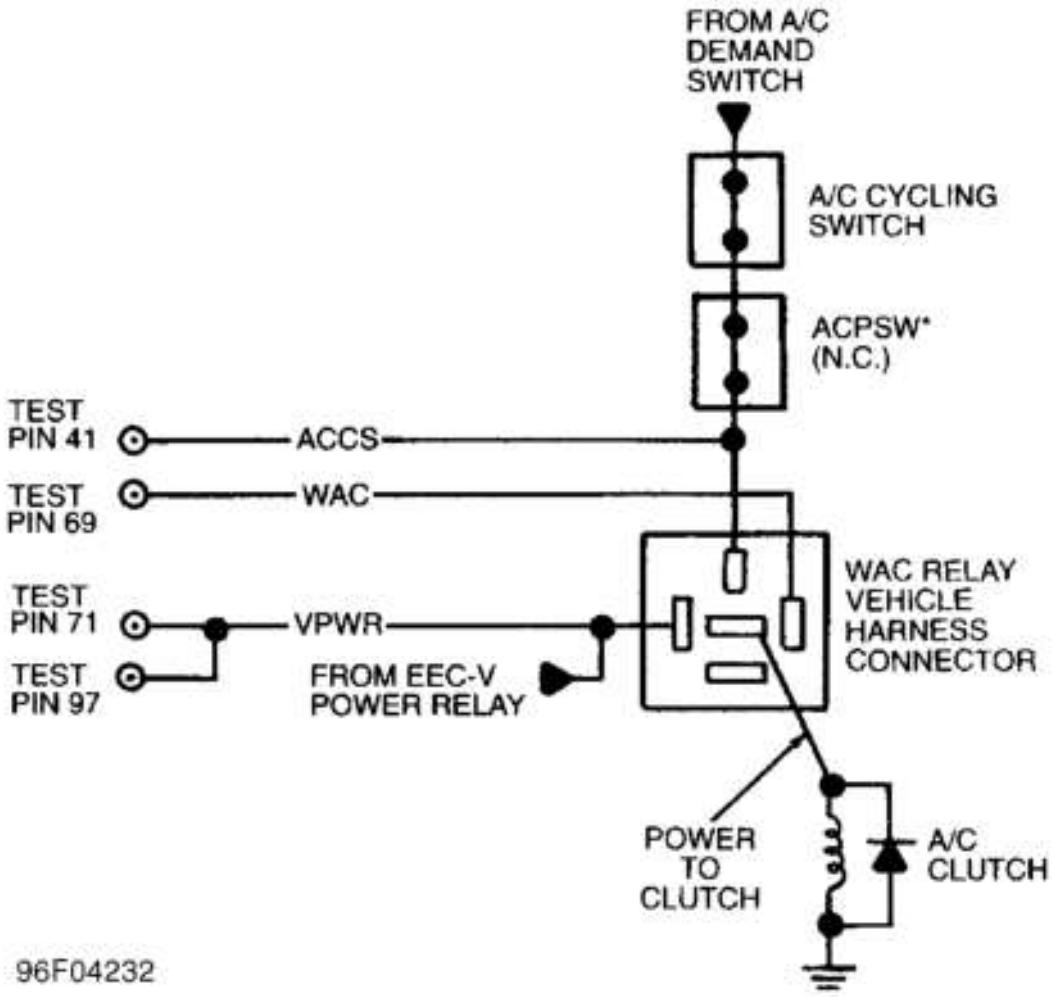

Fig. 12: WOT A/C Cut-Out Circuit (Aerostar)

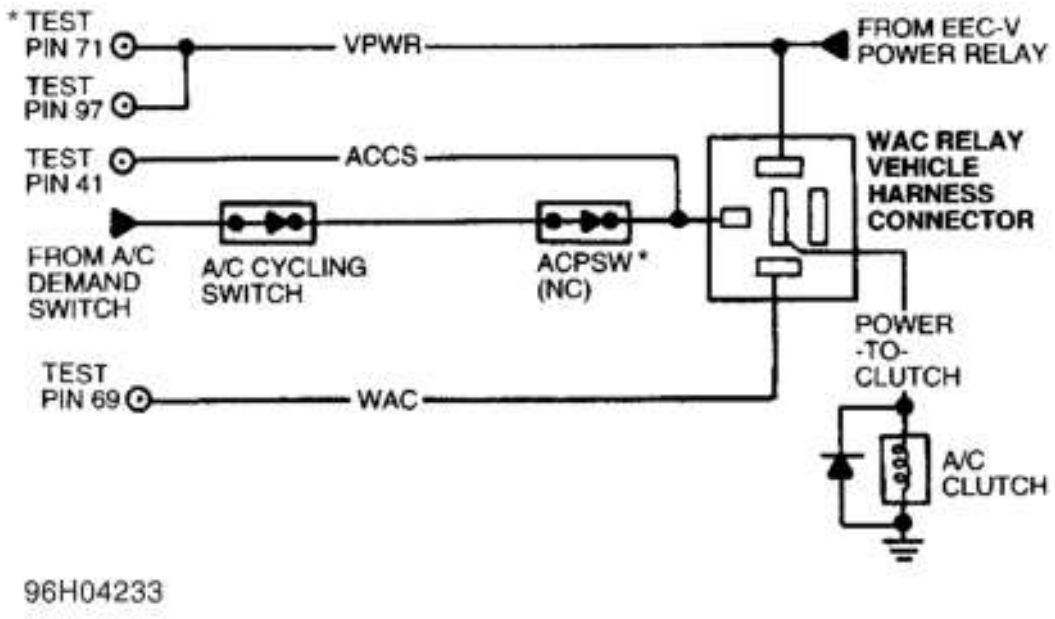

Fig. 13: WOT A/C Cut-Out Circuit (Explorer & Ranger)

2) Check For VPWR To WAC Relay Turn ignition off. Remove WAC relay. Turn ignition on. Measure voltage between VPWR relay connector terminal and chassis ground. If voltage is more than 10.5 volts, go to next step. If voltage is less than 10.5 volts, repair open VPWR circuit. Install WAC relay and repeat QUICK TEST.

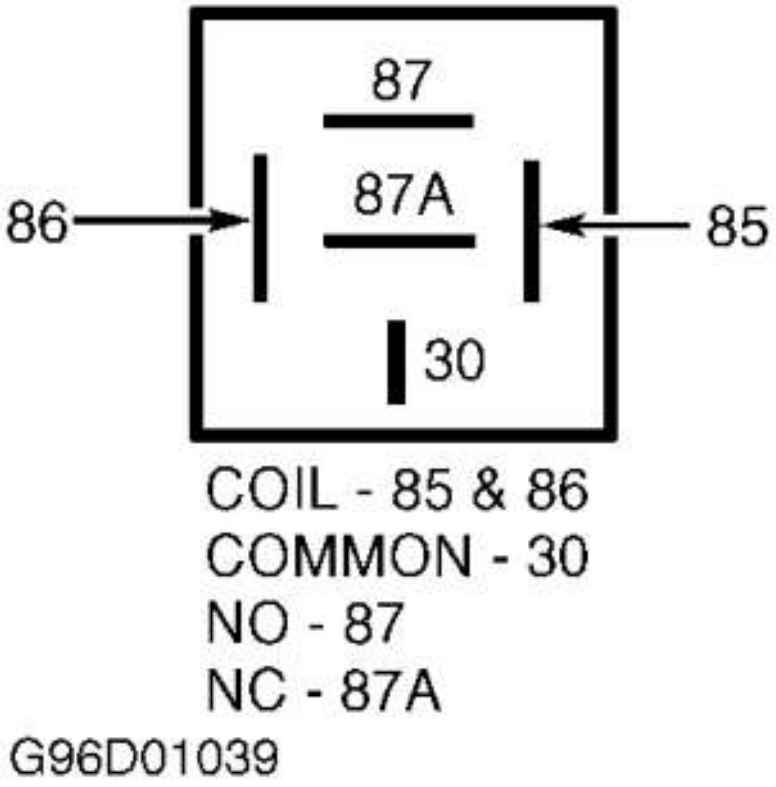

Fig. 14: WAC Relay Connector Terminals

3) Check WAC Relay Turn ignition off. Remove WAC relay. Measure resistance between relay terminal No. 85 and 86. Resistance should be 40-85 ohms. Measure resistance between terminal No. 85 and terminals No. 30, 87 and 87A. Resistance should be 10 k/ohms or more. If resistance is as specified, go to next step. If resistance is not as specified, replace WAC relay. Repeat QUICK TEST.

4) Check WAC Circuit For Short To Power Ensure ignition is off and WAC relay is removed. Disconnect 104-pin PCM connector. Inspect terminals, and repair if damaged. Install breakout box, leaving PCM disconnected. Turn ignition on. Measure voltage between test pin No. 69 and chassis ground. If voltage is less than one volt, go to next step. If voltage is more than one volt, repair short to power in WAC circuit. Connect all components and repeat QUICK TEST.

5) Check WAC Circuit For Short To Ground Ensure ignition is off. Disconnect scan tool from DLC. Measure resistance between test pin No. 69 and test pins No. 51, 91, and 103. If each resistance is 10 k/ohms or more, go to next step. If any resistance is less than 10 k/ohms, repair short to ground in WAC circuit. Connect all components and repeat QUICK TEST.

6) Check WAC Circuit Continuity Ensure ignition is off. Measure resistance between WAC circuit relay connector terminal and test pin No. 69. If resistance is more than 5 ohms, repair open circuit. Connect all components and repeat QUICK TEST. If resistance is less than 5 ohms, replace PCM. Connect all components and repeat QUICK TEST.

NOTE: A break in step numbering sequence occurs at this point. Procedure skips from step 6) to step 20). No test procedures have been omitted.

20) ACCS PID On: Disconnect ACPSW & Check ACCS PID Is Off Turn ignition off. Disconnect A/C pressure switch. Turn ignition on. Using scan tool access ACCS PID. If ACCS PID is on, go to next step. If ACCS PID is off, turn ignition off. Check operation of A/C demand switch or EATC module. If switch is okay, repair short to power in A/C demand circuit to A/C pressure switch.

21) Check A/C Clutch Circuit For Short To Power Turn ignition off. Remove WAC relay. Turn ignition on. Measure voltage between power-to-clutch terminal of relay harness connector and chassis ground. If voltage is less than one volt, go to next step. If voltage is more than one volt, repair short to power. Connect all components and repeat QUICK TEST.

22) Check ACCS Circuit For Short To Power Ensure ignition is off and WAC relay is removed. Disconnect A/C pressure switch. Disconnect 104-pin PCM connector. Inspect terminals, and repair if damaged. Install breakout box, leaving PCM disconnected. Turn ignition on. Measure voltage between test pin No. 41 (ACCS) and test pins No. 51 and 103. If voltage is less than one volt, go to next step. If voltage is more than one volt, repair short to power in ACCS circuit. Remove breakout box, connect all components and repeat QUICK TEST.

23) Check ACCS Circuit Voltage To PCM Turn ignition off. Install WAC relay. Turn ignition on. Measure voltage between test pin No. 41 (ACCS) and test pins No. 51 and 103. If voltage is less than one volt, replace PCM. Remove breakout box, connect all components and repeat QUICK TEST. If voltage is more than one volt, replace WAC relay. Remove breakout box, connect all components and repeat QUICK TEST.

NOTE: A break in step numbering sequence occurs at this point. Procedure skips from step 23) to step 30). No test procedures have been omitted.

30) DTC P1460: (Continuous Memory) Check WAC Circuit DTC P01460 indicates WAC circuit failure. Possible causes for this fault are:

- Open or shorted WAC circuit.
- Open coil in WAC relay.
- Open VPWR to WAC relay.

NOTE: If scan tool will not access PIDs in Output Test Mode, disconnect PCM connector. Install breakout box, reconnect PCM. Connect DVOM to test pin No. 69 (WAC) and test pin No. 71 (VPWR).

Using scan tool, access Output Test Mode. Access WAC PID and WACA PID (Aerostar and Explorer) or WACF PID (Ranger). Turn WAC and WACF outputs off (DVOM voltage will be above 10 volts). Check for indication of fault while wiggling and bending WAC circuit wiring between relay and PCM. Fault will be indicated by WAC or WACA/WACF PID turning on. If using DVOM, fault will be indicated by voltage drop on DVOM. Wiggle and bend WAC circuit wiring between PCM (terminal No. 69) and relay. Wiggle and bend VPWR circuit wiring between EEC-V power relay and WAC relay. Lightly tap on WAC relay. Check connectors for clean tight connection. If any faults are found, isolate and repair as necessary. Repeat QUICK TEST. If no faults are found, go to next step.

31) Check WAC Circuit For Intermittents Exit Output Test Mode. Access WACA PID (Aerostar and Explorer) or WACF PID (Ranger). Disconnect WAC relay. WACA PID should be on, or WACF should be off. Check for indication of fault while wiggling and bending WAC circuit wiring between PCM (terminal No. 69) and WAC or A/C relay. Fault will be indicated by WACA PID turning off or

WACF PID turning on. Check connectors for clean tight connection. If any faults are found, isolate and repair as necessary. Repeat QUICK TEST. If no faults are found, fault cannot be duplicated at this time. Go to CIRCUIT TEST Z. See appropriate TESTS W/CODES article in ENGINE PERFORMANCE:

1996 Aerostar

- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Explorer

- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Explorer

- **TESTS W/CODES - 4.0L** .
- **TESTS W/CODES - 5.0L** .

1995 Ranger

- **TESTS W/CODES - EEC-V (2.3L)** .
- **TESTS W/CODES - EEC-V (3.0L)** .
- **TESTS W/CODES - EEC-V (4.0L)** .

1996 Ranger

- **TESTS W/CODES - 2.3L** .
- **TESTS W/CODES - 3.0L** .
- **TESTS W/CODES - 4.0L** .

1995 Mazda B-Series

- TESTS W/CODES - 1995

1996 Mazda B-Series

- TESTS W/CODES - 1996

CIRCUIT TEST TB - TRANS. CONTROL SWITCH (TCS) & TRANS. CONTROL INDICATOR LAMP (TCIL)

Diagnostic Aids

Perform this test when instructed during QUICK TEST or if directed by other test procedures. This test is used to diagnose the following:

- Wiring harness circuits (TCIL and TCS).
- Faulty Powertrain Control Module (PCM).

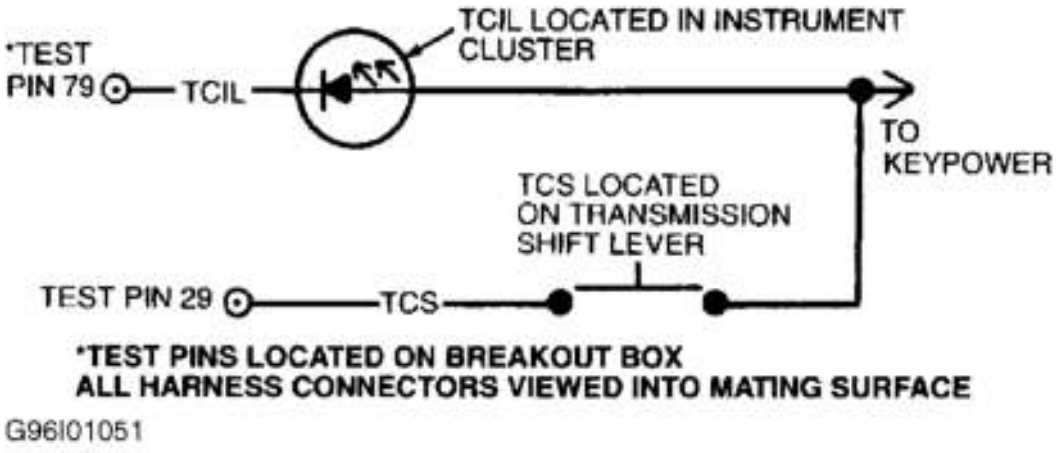

Fig. 15: TCIL & TCS Circuit Schematic

1) Check Test Validity DTC P1780 indicates that TCS was not cycled during KOER self-test. Possible causes are as follows:

- TCS not cycled during KOER self-test.
- TCS circuit faulty.
- Faulty TCS.
- Faulty Powertrain Control Module (PCM).
-

Repeat KOER self-test if TCS was not cycled in original test. If TCS was cycled during KOER self-test, go to next step.

2) Check TCS Circuit Voltage Turn ignition off. Disconnect PCM connector. Inspect pins for damage. Install breakout box, leaving PCM disconnected. Turn ignition on. Measure voltage between test pin No. 29 (TCS) and test pins No. 24 and 77 (PWR GND) at breakout box while cycling TCS. If voltmeter reading does not cycle when TCS is cycled, go to next step. If voltmeter reading cycles when TCS is cycled, replace PCM. Remove breakout box and repeat QUICK TEST.

3) Check TCS Circuit For Short To Ground Turn ignition off. Disconnect TCS. Inspect pins for damage and repair if necessary. Measure resistance between test pin No. 29 (TCS) and test pins No. 24 and 77 (PWR GND). If resistance is 10 k/ohms or more, go to next step. If resistance is less than 10 k/ohms, repair short circuit. Remove breakout box and repeat QUICK TEST.

4) Check TCS Circuit Continuity Leave ignition off. Connect ohmmeter positive lead to TCS keypower at the fuse panel. Connect negative lead to power terminal of TCS wiring harness connector. If resistance is less than 5 ohms, go to next step. If resistance is 5 ohms or more, repair open circuit. Remove breakout box and repeat QUICK TEST.

5) Check TCS Circuit For Short To Power Leave ignition off. Measure resistance between test pin No. 29 (TCS) and test pins No. 71 and 97 (VPWR). If resistance is 10 k/ohms or more, replace TCS switch. Remove breakout box and repeat QUICK TEST. If resistance is less than 10 k/ohms, repair short circuit. Remove breakout box and repeat QUICK TEST.

6) TCIL Always On Turn ignition on. Cycle TCS. If TCIL does not cycle on and off, go to next step. If TCIL cycles on and off, fault may be intermittent. Connect scan tool to DLC. Access TCS PID.

Perform wiggle test of TCS/TCIL circuit harness and connectors while observing scan tool. If TCS PID changes abruptly, inspect and repair circuits or replace components as needed. Clear continuous memory and repeat QUICK TEST.

7) Check TCIL Circuit For Short To Ground Turn ignition off. Disconnect PCM connector. Inspect pins for damage and repair if necessary. Turn ignition on. If TCIL is off, replace PCM. If TCIL remains on, repair TCIL circuit short to ground.

8) TCIL Will Not Turn On Perform KOER self-test. If DTC 1780 is not present, go to next step. If DTC 1780 is present, go to step 1).

9) Check Circuit For Continuity Disconnect PCM connector. Inspect pins for damage and repair if necessary. Turn ignition on. Measure voltage between test pin No. 79 (TCIL) and test pins No. 24 and 76 (PWR GND) at breakout box. If voltage is 2 volts or more, replace PCM. If voltage is less than 2 volts, check indicator bulb and fuse. If bulb and fuse are okay, repair open circuit between test pin No. 79 and ignition switch.

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WIRING DIAGRAMS

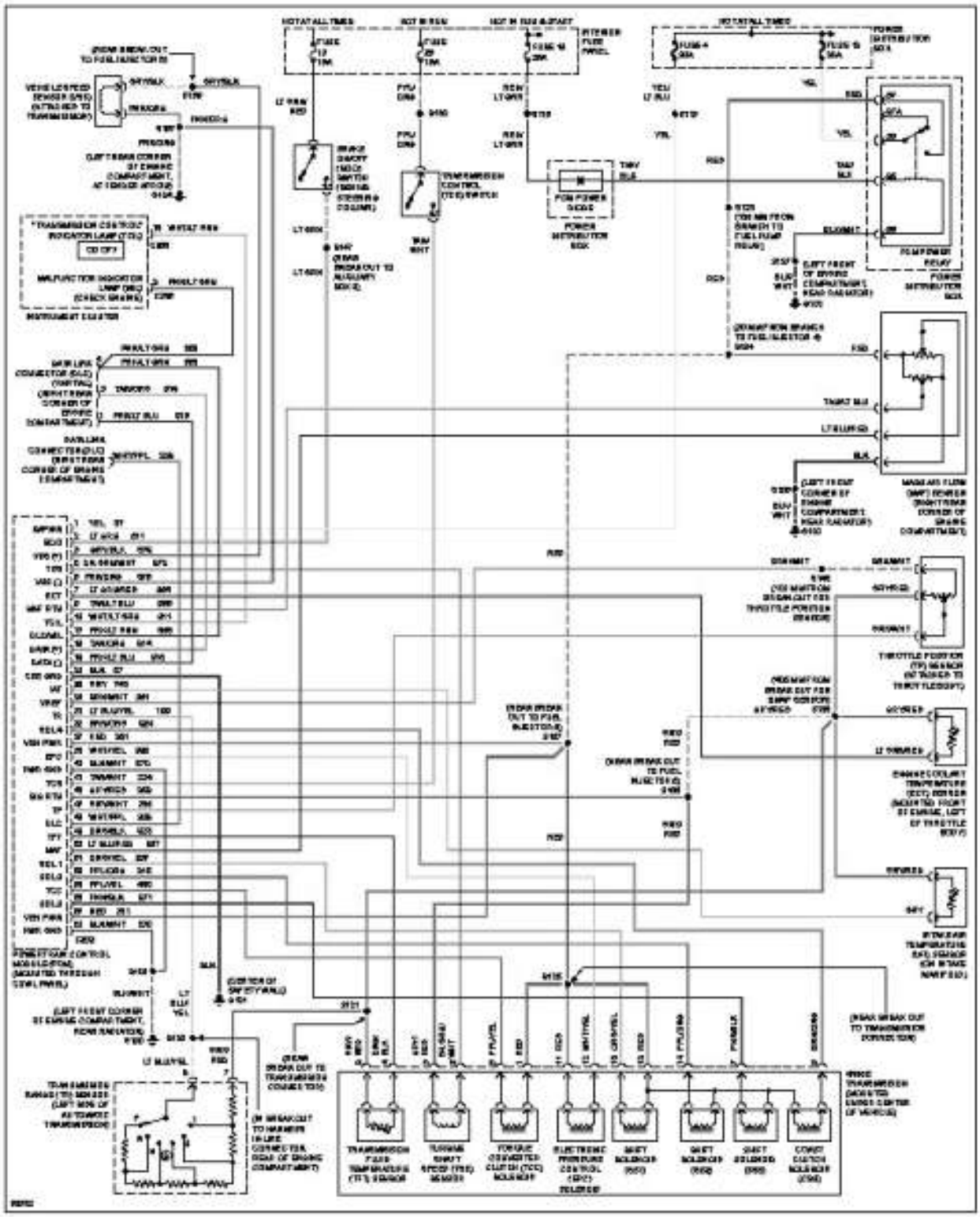

Fig. 16: 1995 Explorer Transmission Wiring Diagram

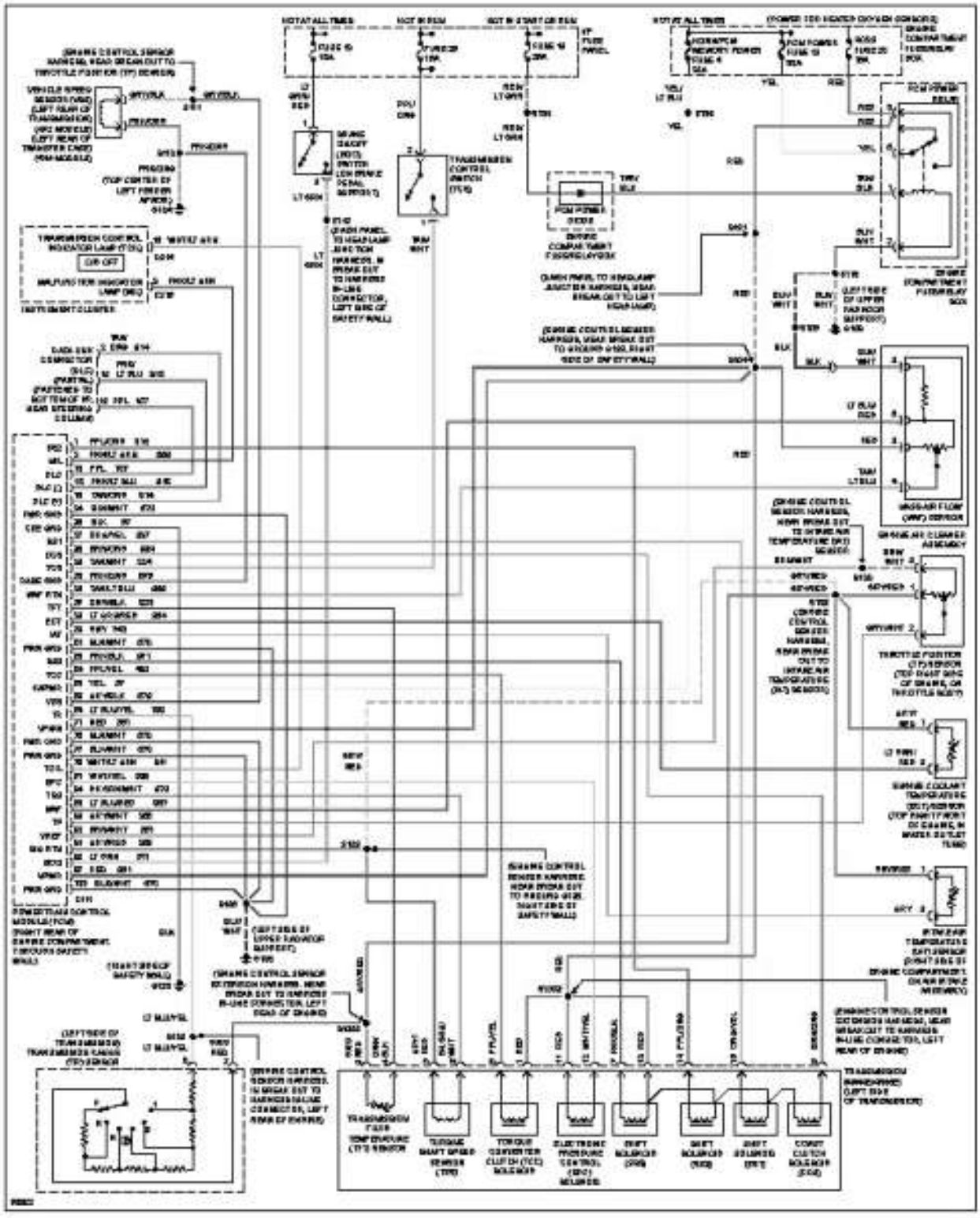

Fig. 17: 1995 Ranger (2.3L) Transmission Wiring Diagram

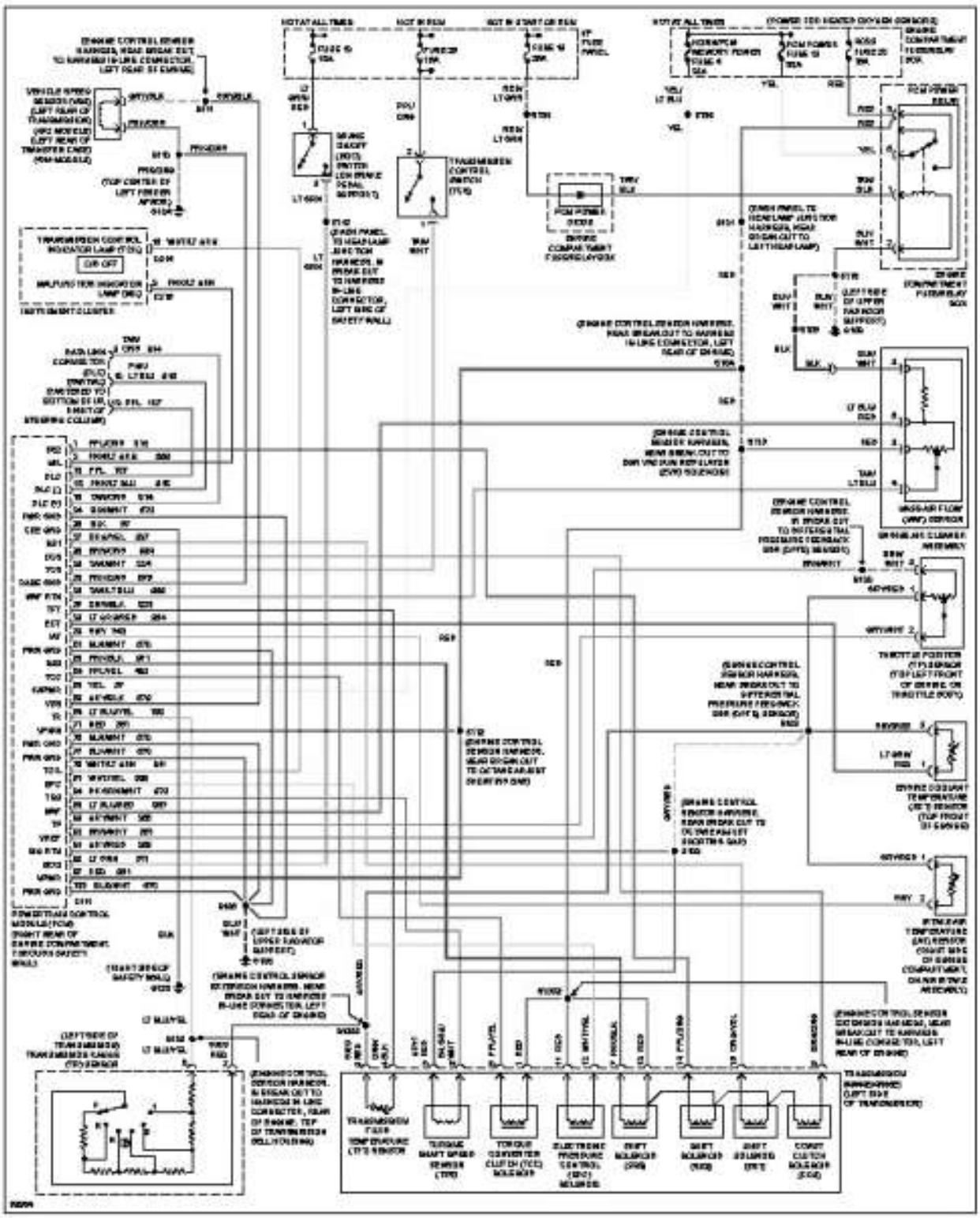

Fig. 18: 1995 Ranger (3.0L) Transmission Wiring Diagram

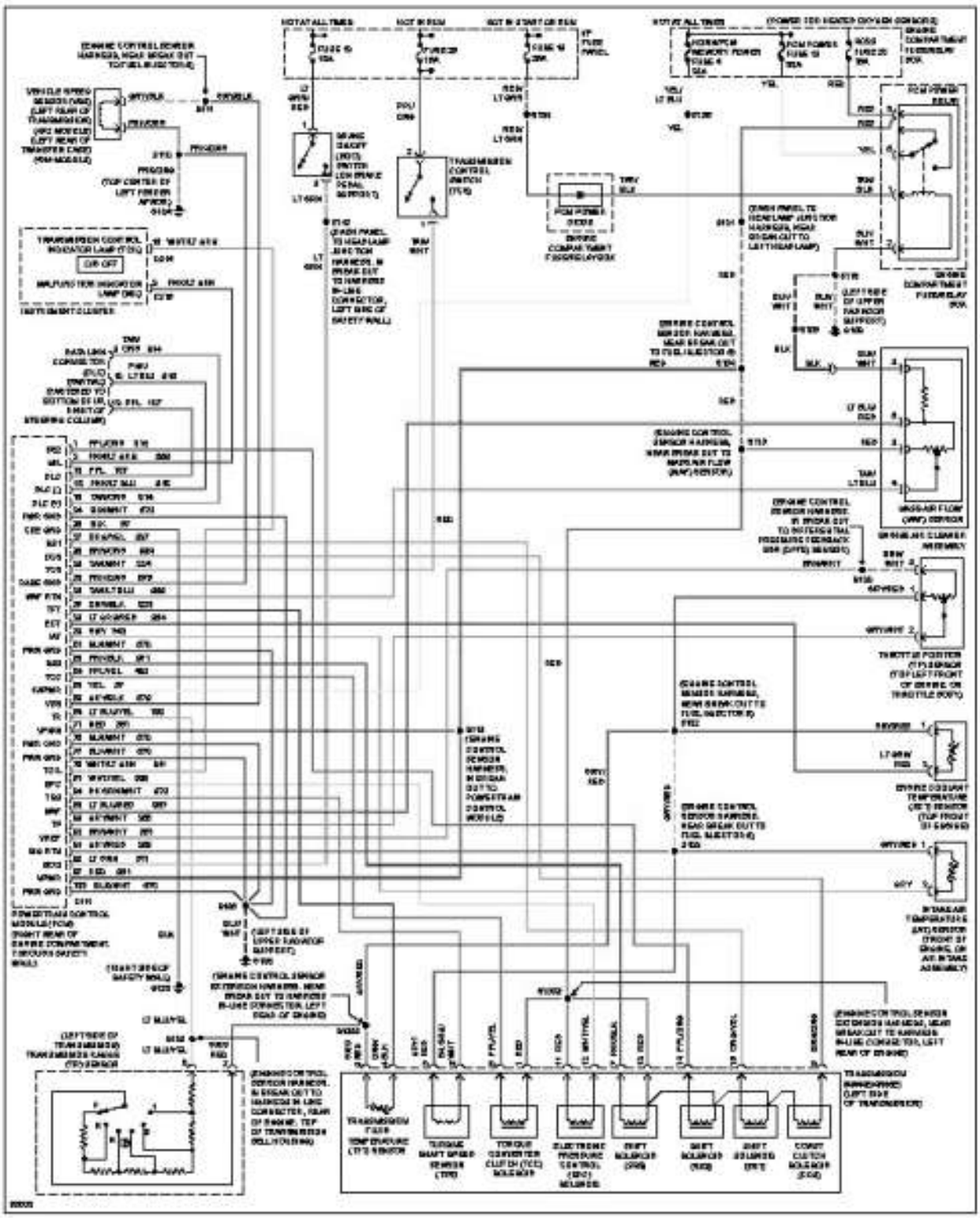

Fig. 19: 1995 Ranger (4.0L) Transmission Wiring Diagram

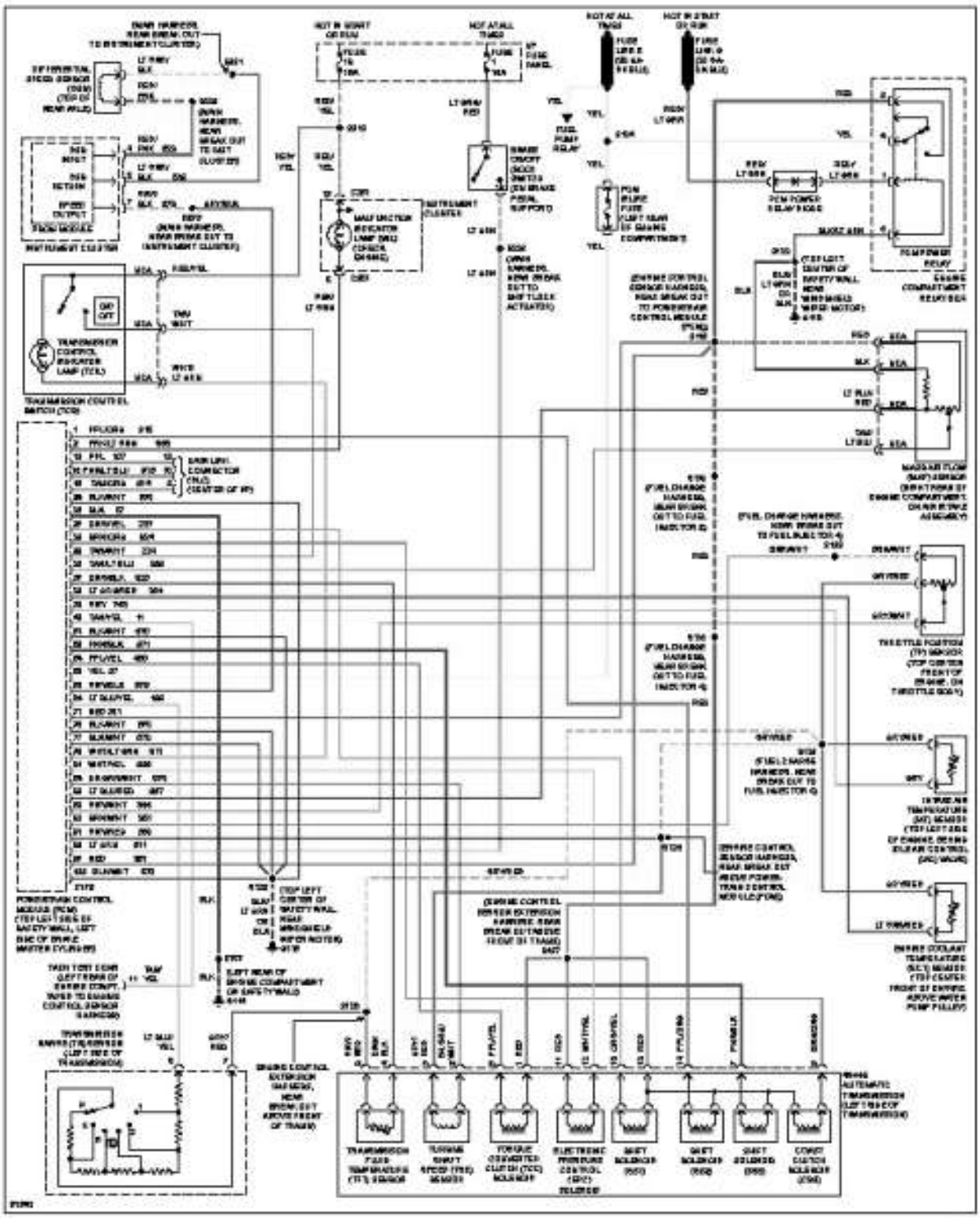

Fig. 20: 1996 Aerostar (3.0L) Transmission Wiring Diagram

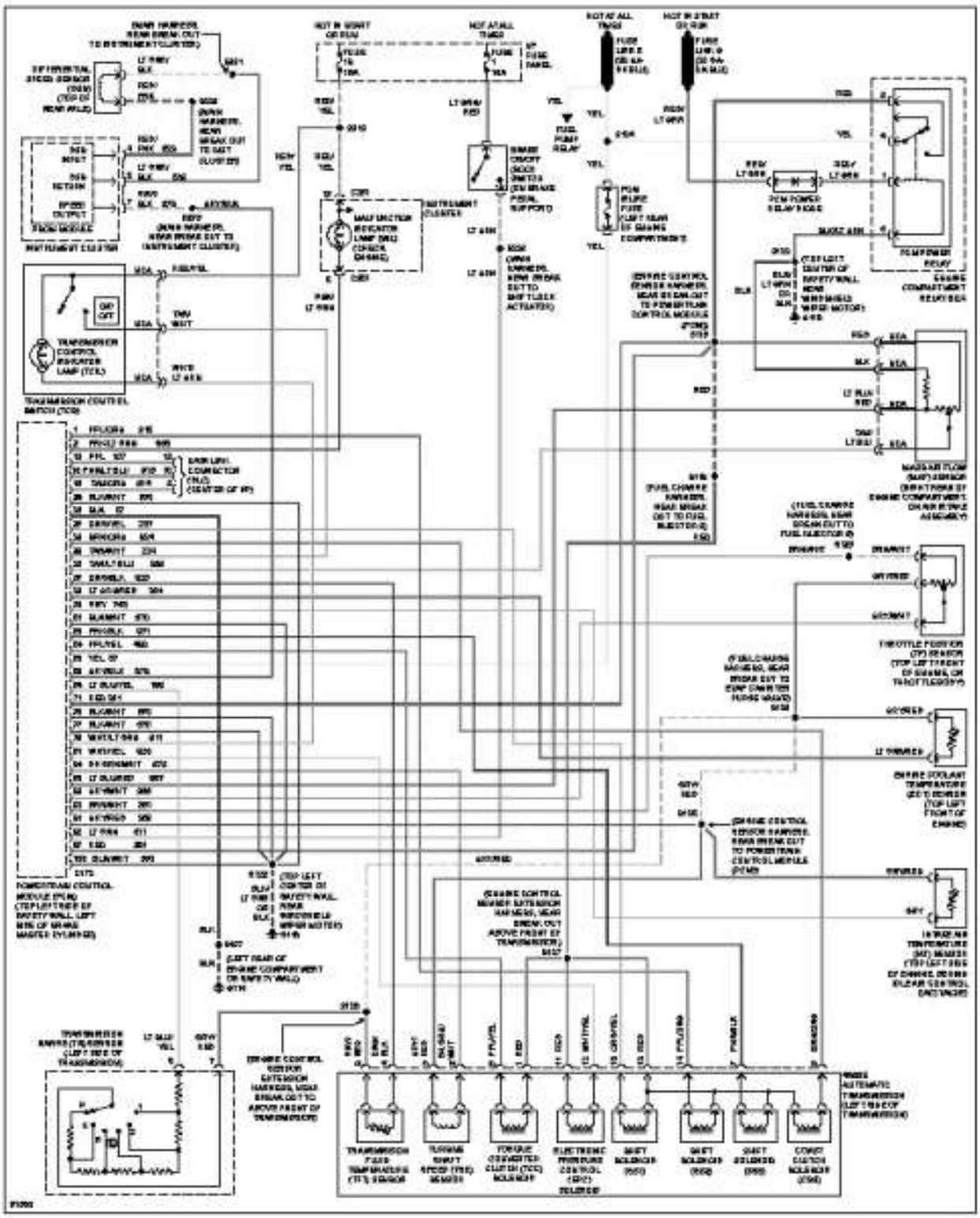

Fig. 21: 1996 Aerostar (4.0L) Transmission Wiring Diagram

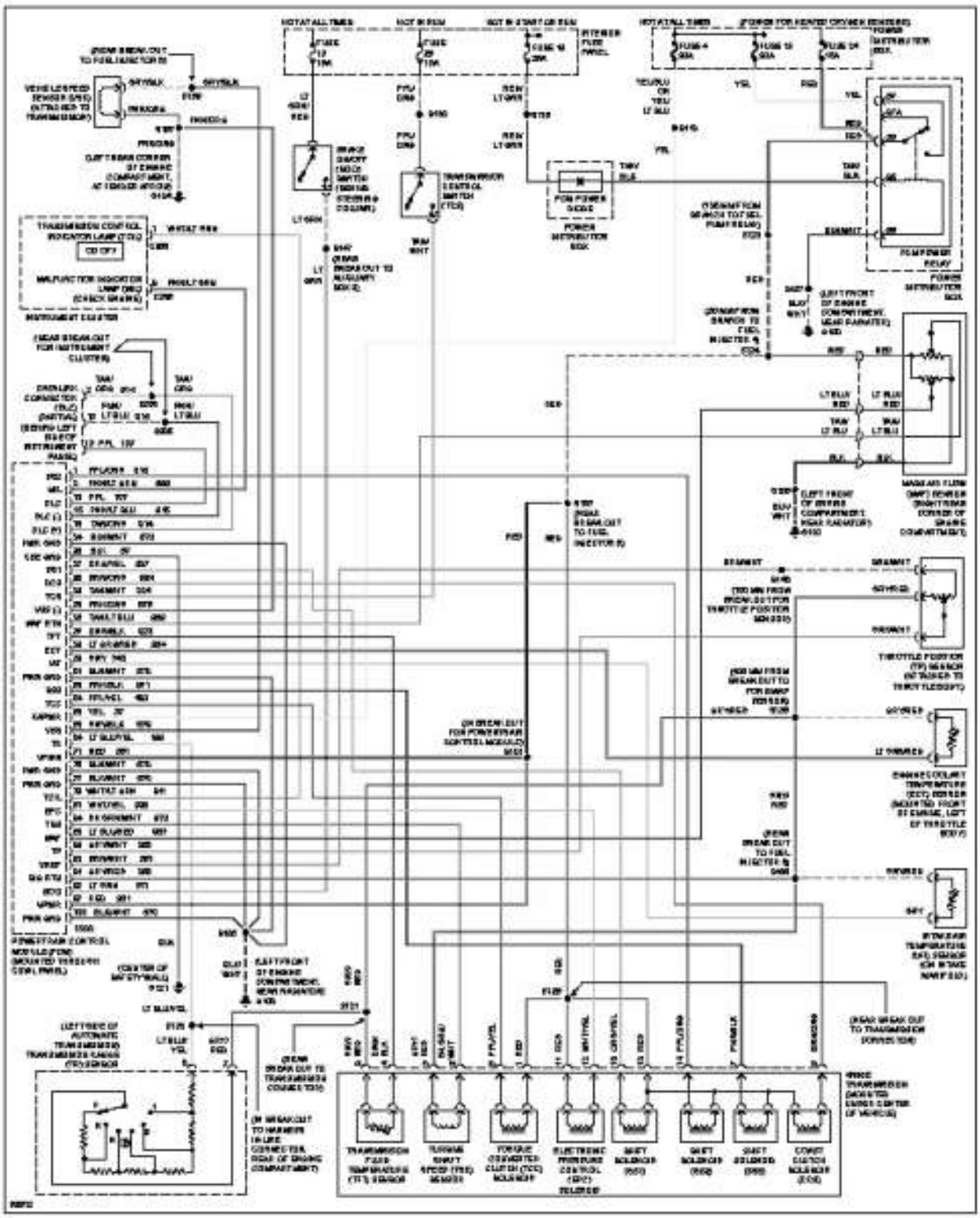

Fig. 22: 1996 Explorer (4.0L) Transmission Wiring Diagram

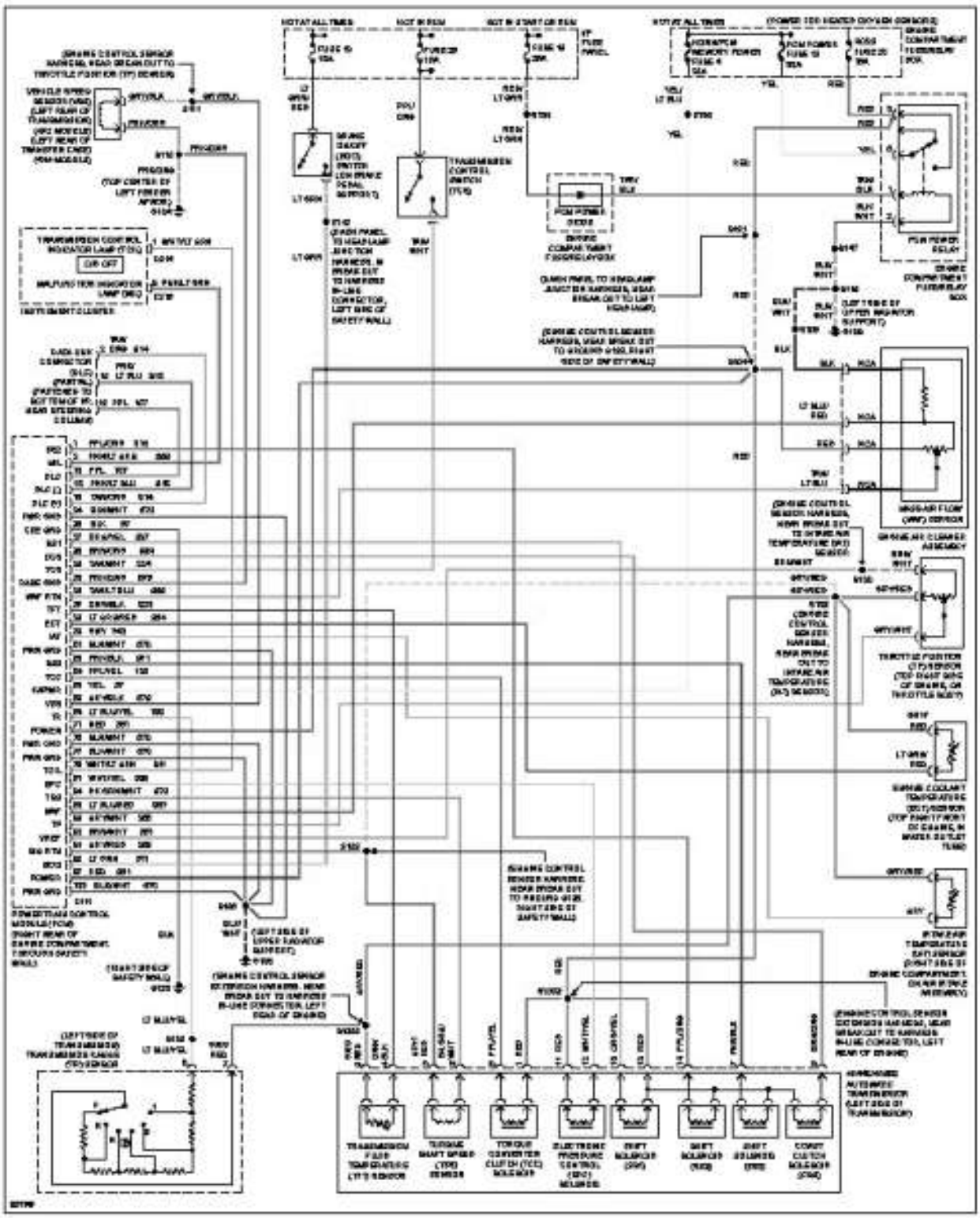

Fig. 23: 1996 Ranger (2.3L) Transmission Wiring Diagram

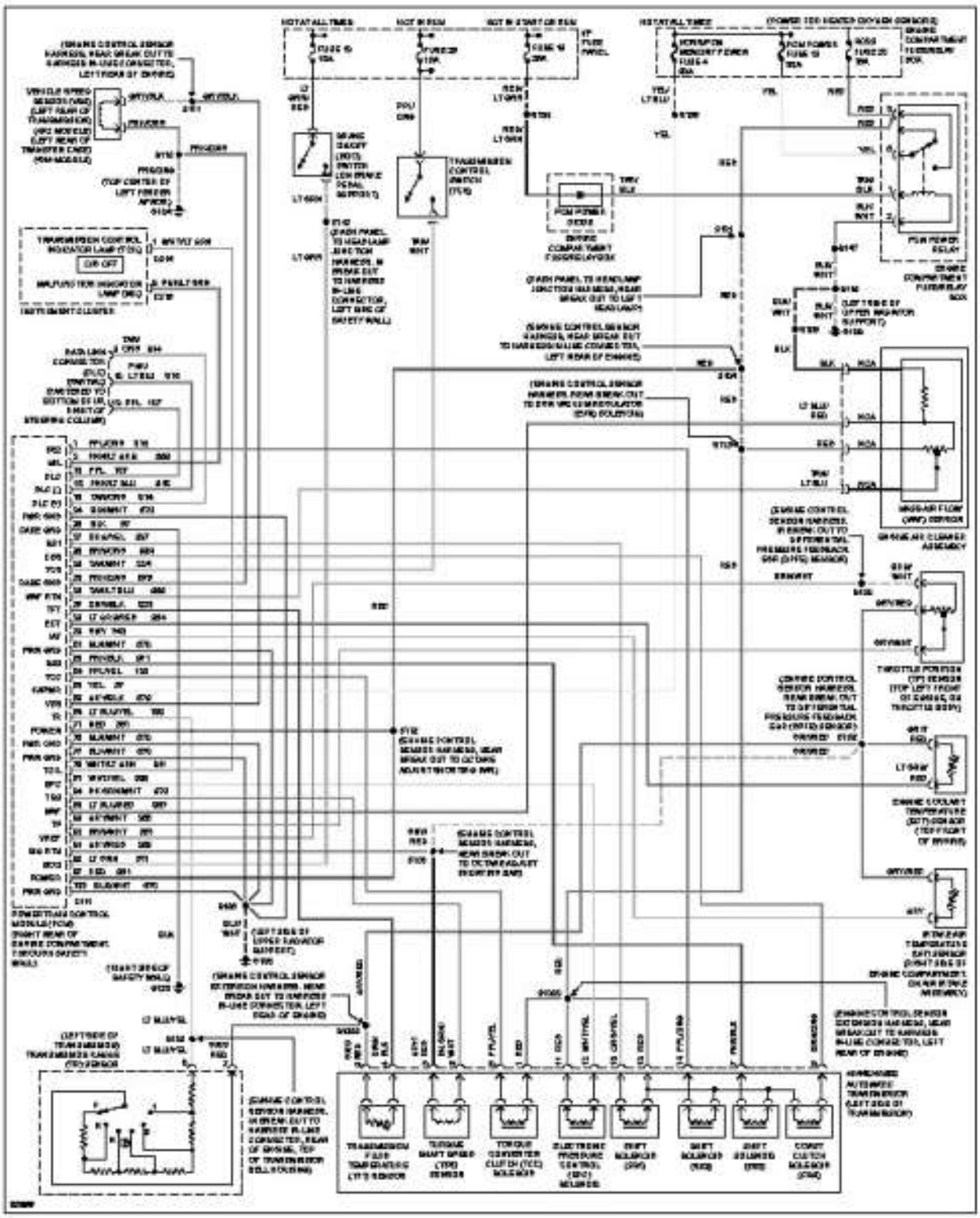

Fig. 24: 1996 Ranger (3.0L) Transmission Wiring Diagram

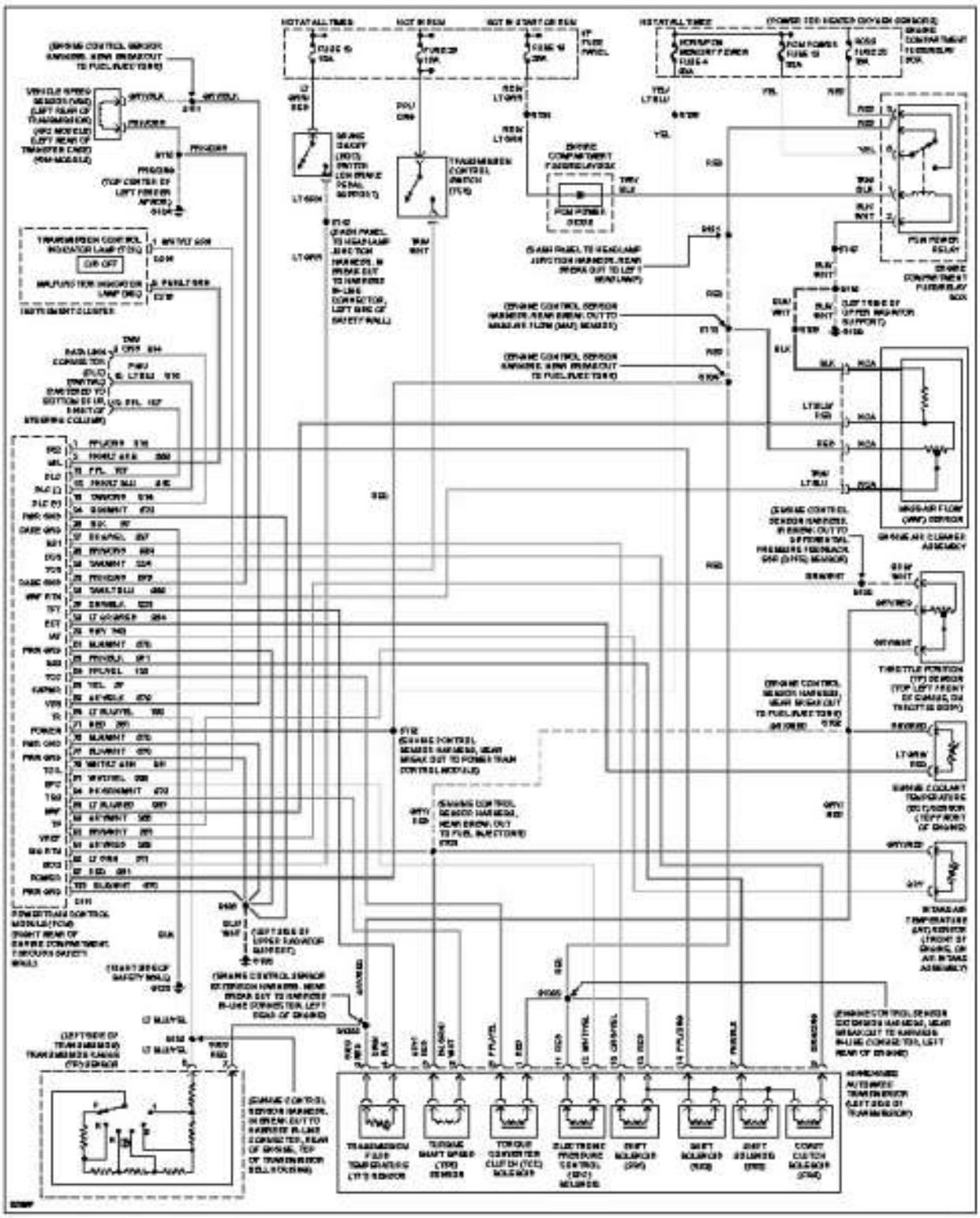

Fig. 25: 1996 Ranger (4.0L) Transmission Wiring Diagram

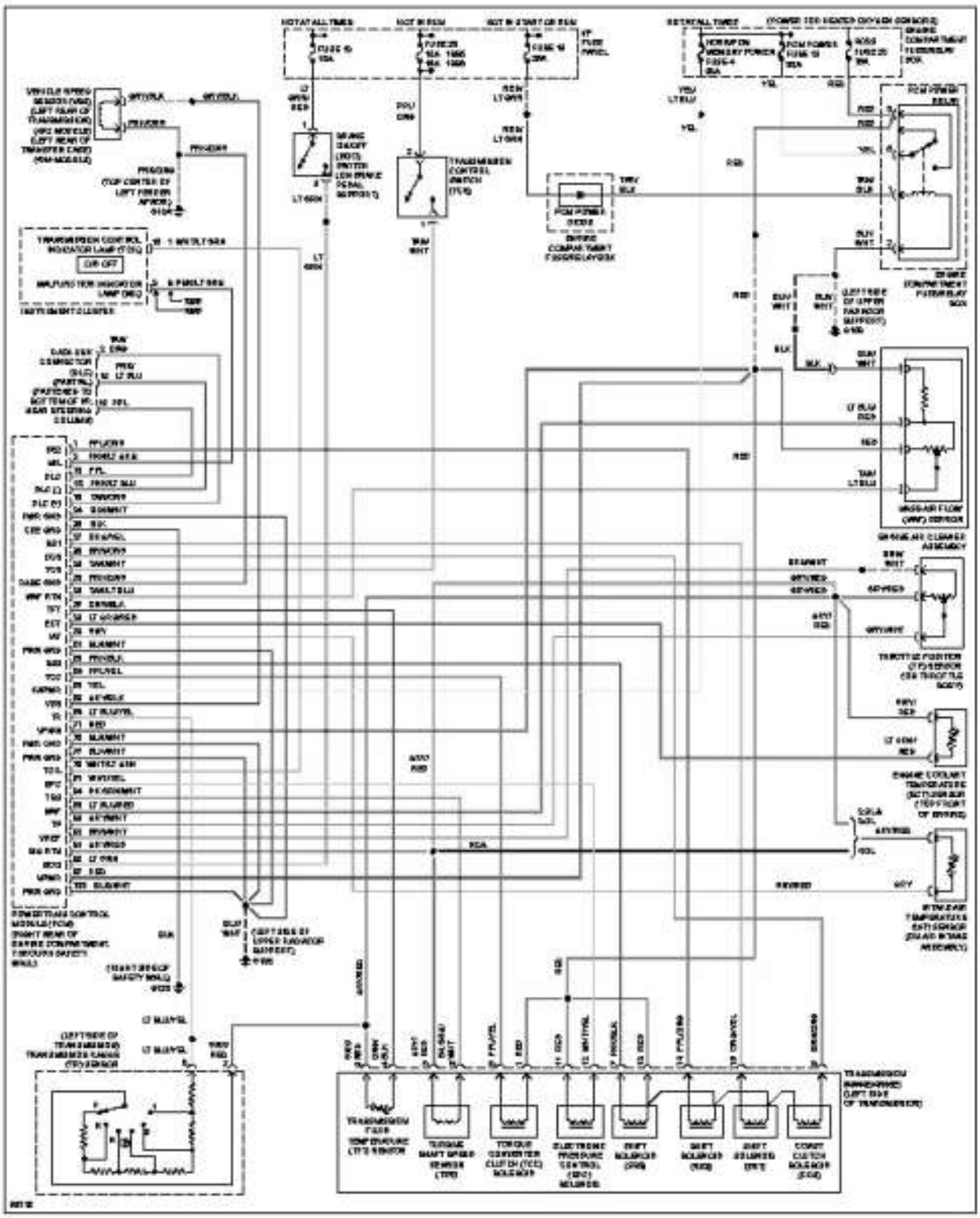

Fig. 26: Mazda B-Series Transmission Wiring Diagram