# FORD 4F27E
## PRELIMINARY INFORMATION

Ford Motor Company in a joint venture with Mazda in Japan have developed a new design transaxle designed specifically for use in the Ford Focus, with the designation 4F27E, and is shown in Figure 1. The new 4F27E transaxle is actually produced by Ford Motor Company in Sterling Heights, Michigan.

This is a four speed, Front Wheel Drive, with fully electronic controls for the upshifts and downshifts, with 4th gear being overdrive. The individual gear ratios are achieved through two planetary gear sets connected one behind the other. The components of the planetary gear sets are driven or locked by means of four multiple plate clutches, one brake band and a one-way roller clutch, and are illustrated in Figure 3 along with the component application chart for each gear. To minimize fuel consumption, the torque converter clutch is applied by the PCM in 3rd and 4th gears, depending on throttle position and vehicle speed. This unit is designed to use Mercon® V automatic transmission fluid.

The manual selector lever gives the driver a choice of "P", "R", "N", "D", "2", "1", and all ranges are explained in detail in Figure 2. It is also possible to operate an O/D cancel switch, located on the selector lever, to prevent the transaxle from shifting into 4th gear or to shift down to 3rd gear as shown in Figure 2.

***Special Note: This transaxle currently shows two different axle ratios and Figure 2 also shows how to identify which ratio belongs in the vehicle that you may have. Refer to Figure 5 to show you location of the transaxle identification tag, and how to identify ratio in the transaxle. Surely you must know by now that the PCM will regonize almost instantly if you install the wrong axle ratio.***

The 4F27E transaxle is equipped with six different solenoids to shift the transaxle through the various gears and to control line pressure. Shift Solenoids "A" and "B" are On-Off solenoids and control shift valves in the valve body. Shift Solenoids "C", "D" and "E" are Pulse Width Modulated (PWM) solenoids and control the pressures to the various apply components. The sixth solenoid is the Electronic Pressure Control (EPC) solenoid. Refer to Figure 4 for the solenoid application chart for each gear. Refer to Figure 6 for the location and identification of each solenoid on the valve body and the resistance chart for the internal components.

Refer to Figure 7 for the location of the Turbine Speed Sensor (TSS) and the Output Speed Sensor (OSS) and the resistance chart to check these two sensors. Figure 8 gives you the location of the PCM and pin identification for the PCM.

Refer to Figure 9 for the pin identification for the transaxle case connector and the vehicle harness connector. We have also provided you with the internal wire schematic and the PCM pin numbers for all of the internal transaxle electrical components, as shown in Figure 9. Notice also in Figure 9 that we have labeled the internal harness connectors for each solenoid. It is mandatory that the internal harness connectors be installed as shown in Figure 9. The harness connector color letters are also cast into the valve body, and can be seen in Figure 6.

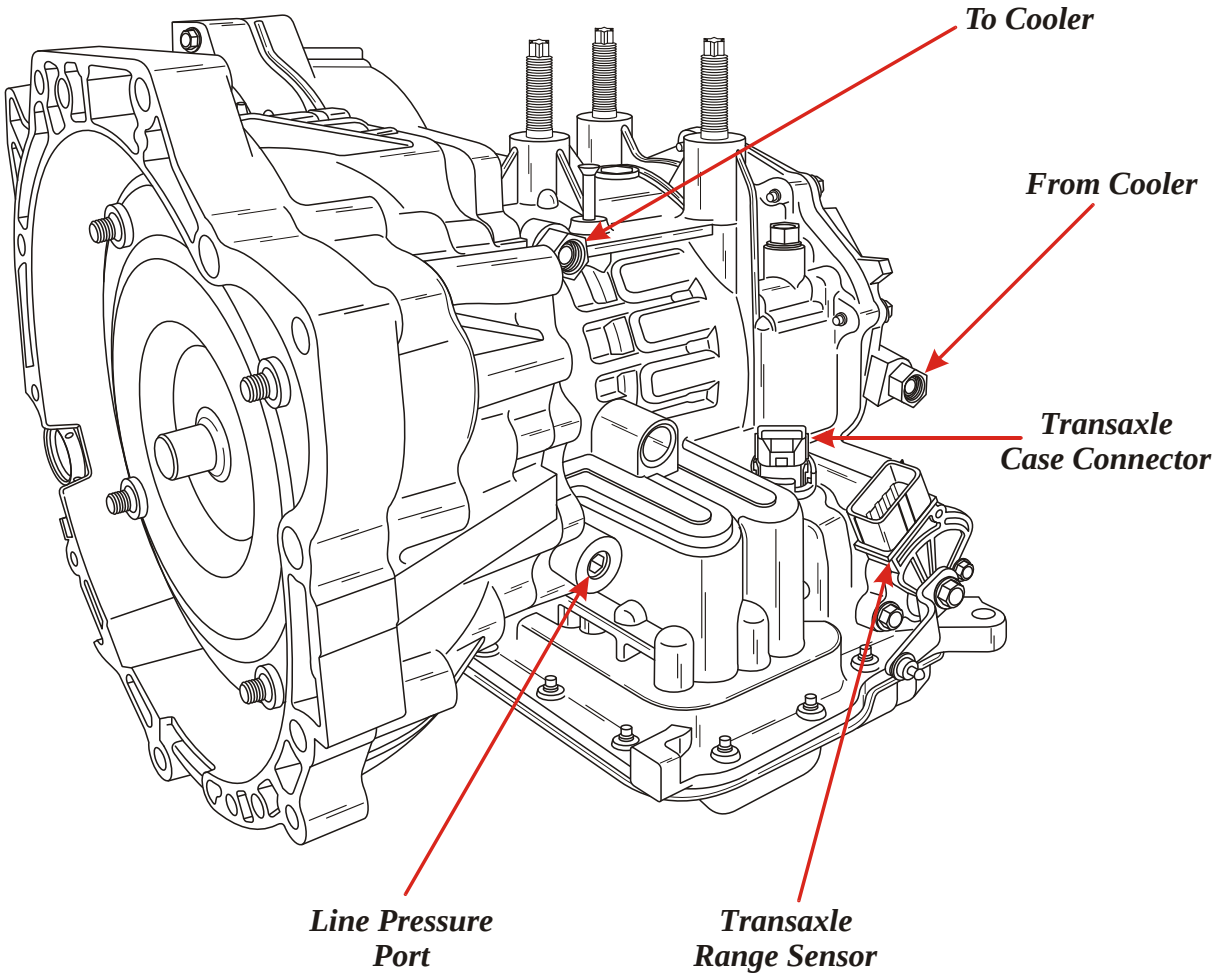
Refer to Figure 10 for the pin identification for the Transaxle Range Sensor (TRS) connector and the vehicle harness connector. We have also provided you with the external wire schematic and the PCM pin numbers, as shown in Figure 10. Refer to Figure 11 for the transaxle line pressure specifications and stall speed specifications.

Refer to Figure 12 for the location of the "Powertrain Warning Indicator" which will illuminate when there is a Diagnostic Trouble Code stored, not the traditional O/D cancel light flashing. Refer to Figure 13 for the description of the Diagnostic Trouble Codes.

Refer to Figures 14 and 15 for the exploded view of the valve body and solenoids.

# FORD 4F27E TRANSAXLE

*(Found In 2000 Focus)*




**4** — ***FOUR FORWARD SPEEDS***

**F** — ***FRONT WHEEL DRIVE***

**27** — ***RELATIVE TORQUE CARRYING CAPACITY***

**E** — ***FULLY ELECTRONIC CONTROLLED***



Figure 1

## MANUAL SELECTOR LEVER

P In manual selector lever position "P" no gear is selected. The parking pawl is engaged manually by the shift shaft linkage.

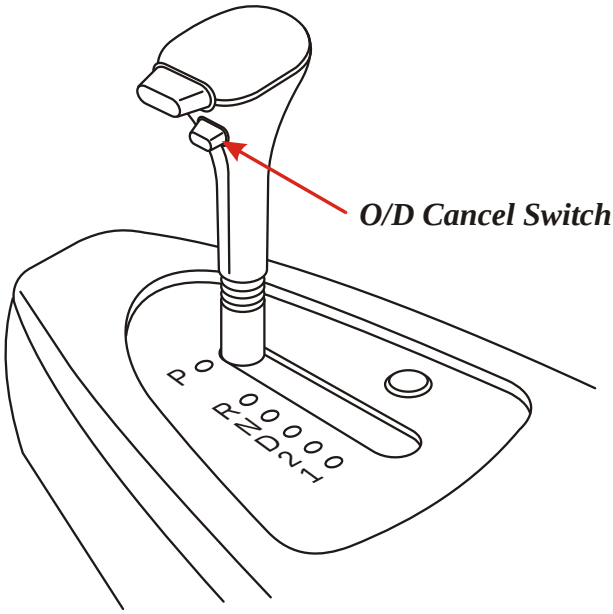
R In manual selector lever position "R" reverse gear is selected. Reverse allows the vehicle to be operated in a rearward direction, at a reduced gear ratio.

N In manual selector lever position "N" no gear is selected. The driveline is not locked, so the wheels are free to rotate. The engine may be started in Neutral.

D In manual selector lever position "D" the transmission control system allows upshifts first through fourth gears automatically. When the O/D cancel switch is pressed, shifting into 4th gear is prevented, or if it is already in 4th gear, the transmission shifts down to 3rd gear.

2 In manual selector lever position "2" ***only*** 2nd gear is selected. The transmission controls will not allow a shift into first gear.
If the manual selector lever is moved to position "2" at an excessive vehicle speed for 2nd gear, the computer only allows the shift to take place when a safe vehicle speed has been reached.

1 In manual selector lever position "1" ***only*** first is selected. The transmission control system applies the Low/Reverse clutch to provide engine braking effect.
If the manual selector lever is moved to position "1" at an excessive vehicle speed for 1st gear, the computer only allows the shift to take place when a safe vehicle speed has been reached.



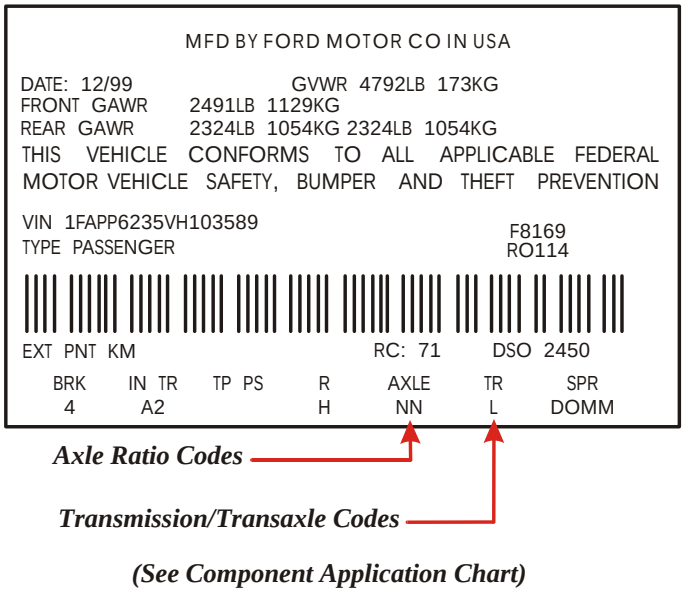
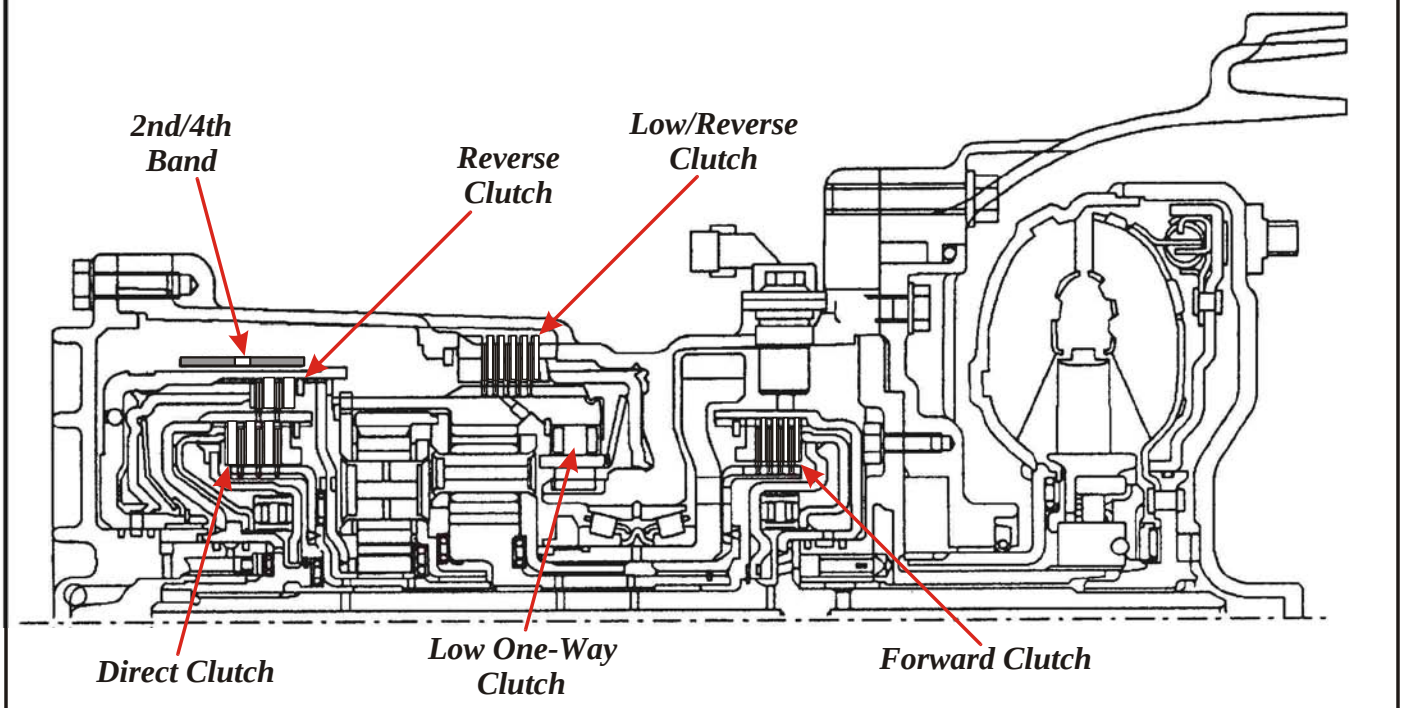






Figure 2




| 4F27E TRANSAXLE COMPONENT APPLICATION CHART | | | | | | | |
|---|---|---|---|---|---|---|---|
| RANGE | Forward Clutch | 2nd-4th Band | Direct Clutch | Reverse Clutch | Low/Rev Clutch | Low One-Way Clutch | Gear Ratio |
| PARK | | | | | | | |
| REVERSE | | | | ON | ON | | 2.649 |
| NEUTRAL | | | | | | | |
| DRIVE-1st | ON | | | | | HOLD | 2.816 |
| DRIVE-2nd | ON | ON | | | | | 1.498 |
| DRIVE-3rd | ON | | ON | | | | 1.000 |
| DRIVE-4th | | ON | ON | | | | 0.726 |
| MANUAL-2nd | ON | ON | | | | | 1.498 |
| MANUAL-1st | ON | | | | ON | | 2.816 |
| NOTE: Failsafe on this unit is 3rd gear in all forward ranges | | | | | | | |

*NOTE: There are two different axle ratios listed for this transaxle;*
*NN = 3.693 Automatic*
*WW = 3.904 Automatic*

***REFER TO DOOR TAG INFORMATION IN FIGURE 2***
***TO DETERMINE GEAR RATIO FOR YOUR VEHICLE.***

***REFER TO DOOR TAG INFORMATION IN FIGURE 5***
***TO DETERMINE GEAR RATIO IN YOUR TRANSAXLE.***



Figure 3

| SHIFT SOLENOID APPLY CHART | | | | | | |
|---|---|---|---|---|---|---|
| *Range* | *Shift "A" (On-Off)* | *Shift "B" (On-Off)* | *Shift "C" (PWM)* | *Shift "D" (PWM)* | *Shift "E" (PWM)* | *EPC Solenoid* |
| *Park* | *ON* | *OFF* | *Not Fed* | *Not Fed* | *Not Fed* | *** |
| *Reverse* | *ON* | *ON* | *Not Fed* | *OFF* | *Not Fed* | *** |
| *Neutral* | *ON* | *OFF* | *Not Fed* | *Not Fed* | *Not Fed* | *** |
| *Drive-1st* | *OFF* | *OFF* | *OFF* | *ON* | *ON* | *** |
| *Drive-2nd* | *OFF* | *OFF* | *OFF* | *OFF* | *ON* | *** |
| *Drive-3rd* | *OFF* | *OFF* ** | *OFF* ** | *OFF* | *OFF* | *** |
| *Drive-4th* | *ON* | *OFF* ** | *ON* | *OFF* | *OFF* | *** |
| *Manual-1st* | *ON* | *ON* | *OFF* | *OFF* | *ON* | *** |

*** EPC Control dependent on throttle position and vehicle speed.*
*** TCC control dependent on throttle position, vehicle speed, brake switch.*

| 4F27E TRANSAXLE COMPONENT APPLICATION CHART | | | | | | | |
|---|---|---|---|---|---|---|---|
| RANGE | *Forward Clutch* | *2nd-4th Band* | *Direct Clutch* | *Reverse Clutch* | *Low/Rev Clutch* | *Low One-Way Clutch* | *Gear Ratio* |
| *PARK* | | | | | | | |
| *REVERSE* | | | | *ON* | *ON* | | *2.649* |
| *NEUTRAL* | | | | | | | |
| *DRIVE-1st* | *ON* | | | | | *HOLD* | *2.816* |
| *DRIVE-2nd* | *ON* | *ON* | | | | | *1.498* |
| *DRIVE-3rd* | *ON* | | *ON* | | | | *1.000* |
| *DRIVE-4th* | | *ON* | *ON* | | | | *0.726* |
| *MANUAL-2nd* | *ON* | *ON* | | | | | *1.498* |
| *MANUAL-1st* | *ON* | | | | *ON* | | *2.816* |

*NOTE: Failsafe on this unit is 3rd gear in all forward ranges*

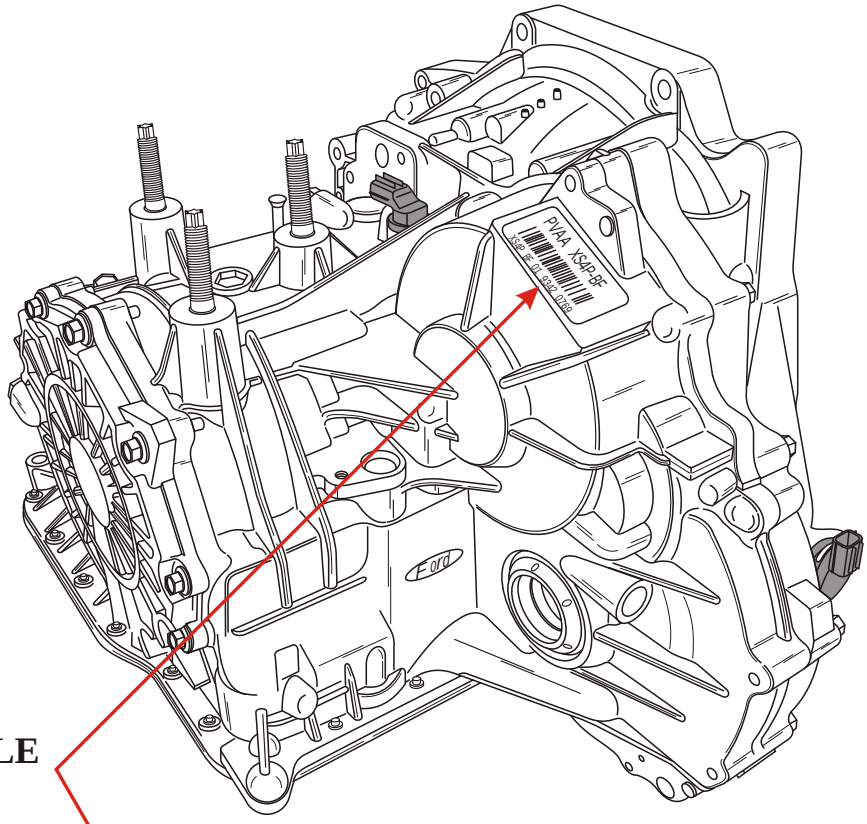
*NOTE: There are two different axle ratios listed for this transaxle;*
*NN = 3.693 Automatic*
*WW = 3.904 Automatic*

*REFER TO DOOR TAG INFORMATION IN FIGURE 2*
*TO DETERMINE GEAR RATIO FOR YOUR VEHICLE.*

*REFER TO DOOR TAG INFORMATION IN FIGURE 5*
*TO DETERMINE GEAR RATIO IN YOUR TRANSAXLE.*

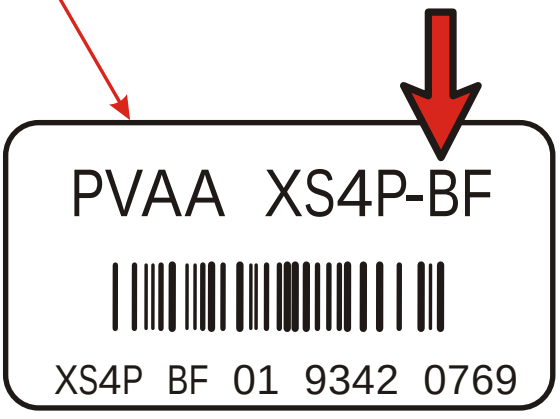


Figure 4




**TRANSAXLE I.D. TAG**

***Refer To The 1st Digit Of The Suffix For Transaxle Ratio Identification***

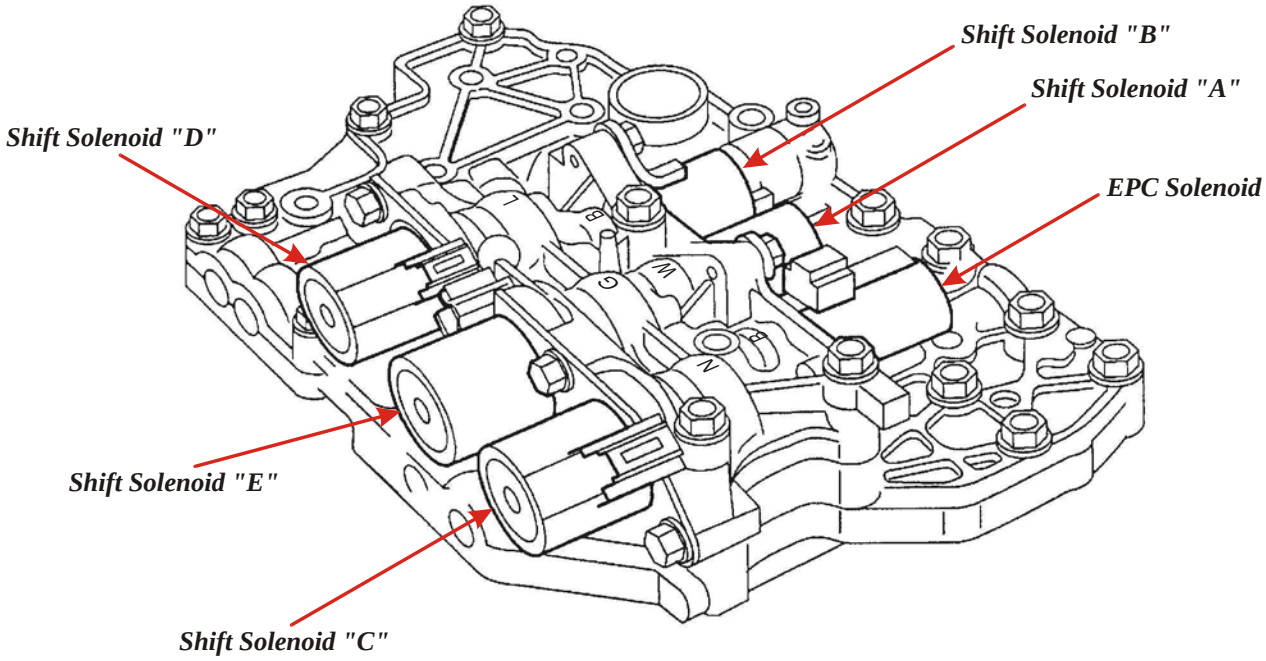



**B = Sigma Engine, 4.15 Ratio (European Only)**
**C = 2.0L SPI Engine, 3.69 Ratio**
**D = 2.0L Z-Tec Eng, 3.90 Ratio**



Figure 5

## SOLENOID IDENTIFICATION AND RESISTANCE CHART



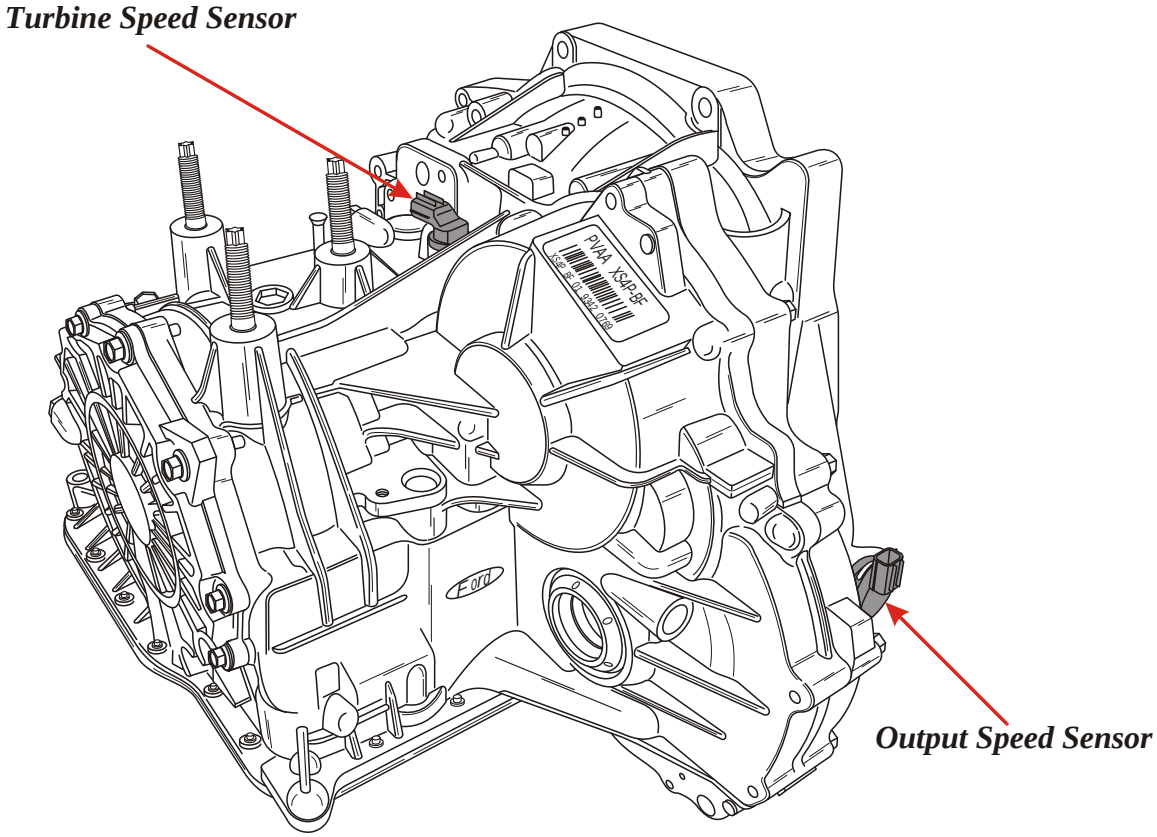

| INTERNAL TRANSAXLE COMPONENTS RESISTANCE CHART | |
|---|---|
| *Transaxle Component* | *Ohms Resistance At 20°C (70°F)* |
| *Shift Solenoid "A" (On-Off)* | *10.9 - 26.2* |
| *Shift Solenoid "B" (On-Off)* | *10.9 - 26.2* |
| *Shift Solenoid "C" (PWM)* | *1.0 - 4.2* |
| *Shift Solenoid "D" (PWM)* | *1.0 - 4.2* |
| *Shift Solenoid "E" (PWM)* | *1.0 - 4.2* |
| *EPC Solenoid (PWM)* | *2.4 - 7.3* |

| *Transaxle Temperature Sensor Resistance Chart* |
|---|
| *0°C (32°F) = 83.2k - 107k Ohms* |
| *20°C (70°F) = 33.5k - 41.2k Ohms* |
| *40°C (104°F) = 14.6k - 17.6k Ohms* |
| *60°C (140°F) = 7.08k - 8.01k Ohms* |
| *80°C (176°F) = 3.61k - 4.06k Ohms* |
| *100°C (212°F) = 1.96k - 2.20k Ohms* |
| *120°C (248°F) = 1.13k - 1.25k Ohms* |
| *130°C (266°F) = 0.87k - 0.96k Ohms* |



Figure 6

**TURBINE AND OUTPUT SPEED SENSORS**

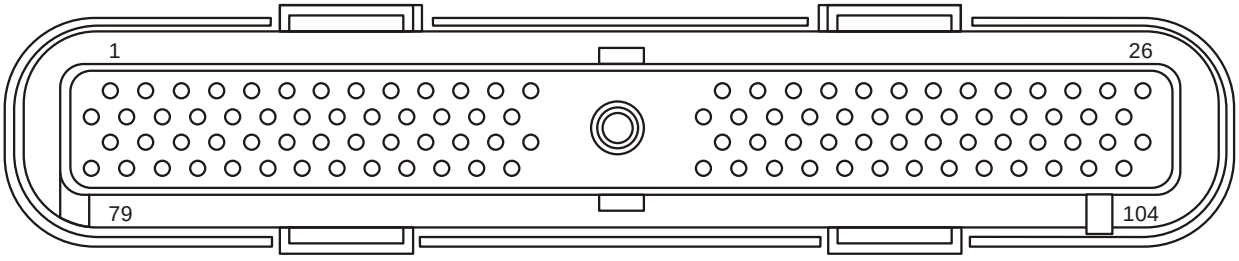



| TRANSAXLE SPEED SENSOR RESISTANCE CHART | |
|---|---|
| *Transaxle Component* | *Ohms Resistance At 20°C (70°F)* |
| *Turbine Speed Sensor (TSS)* | *330 - 390 Ohms* |
| *Output Speed Sensor (OSS)* | *720 - 800 Ohms* |



Figure 7

**PCM PIN IDENTIFICATION**




***PCM IS LOCATED BEHIND THE RIGHT HAND KICK PANEL***



Figure 8

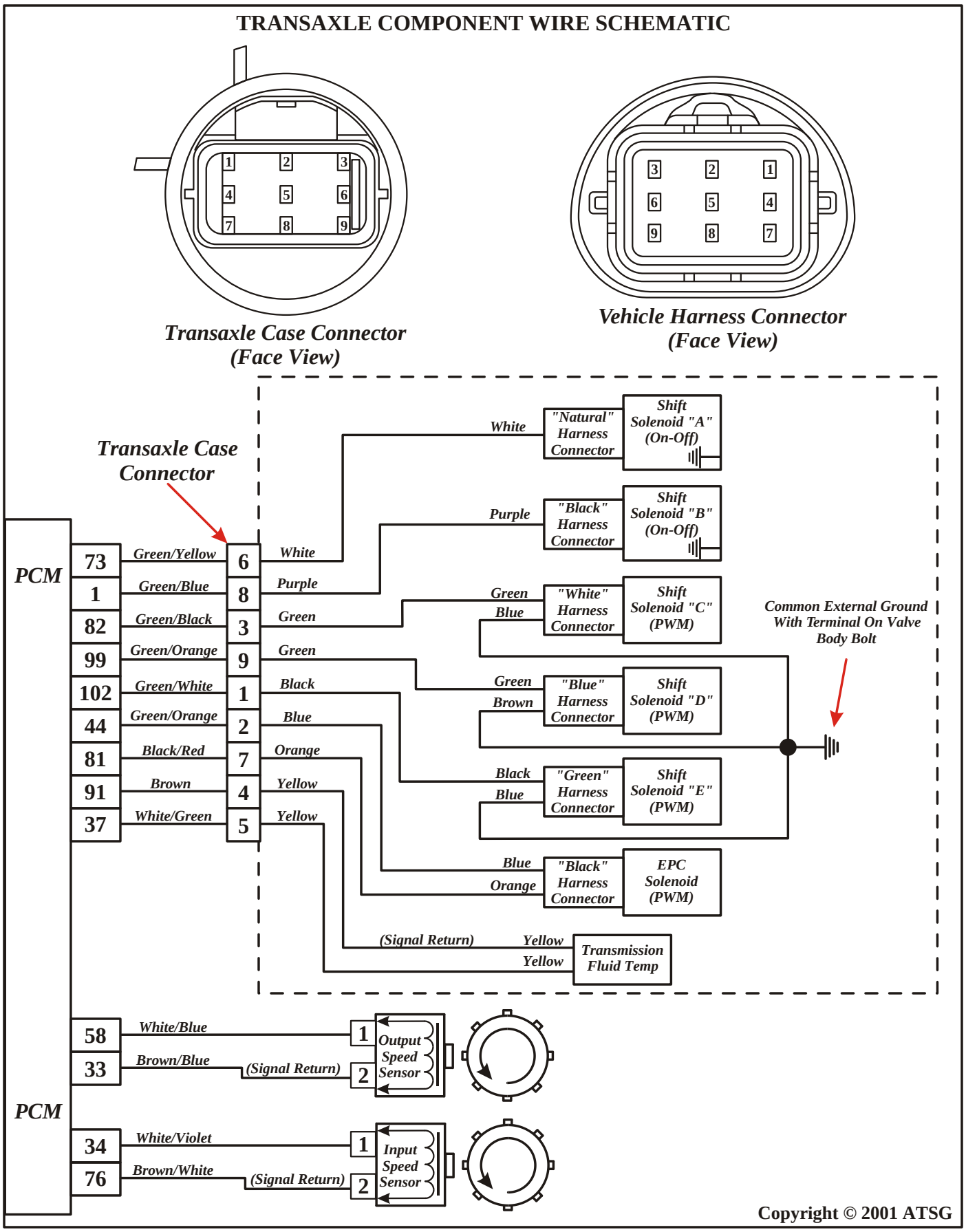
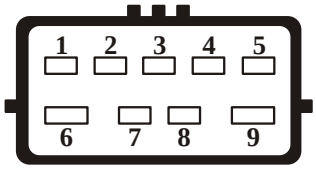
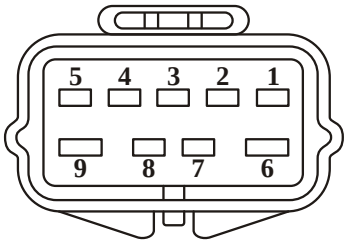

TRANSAXLE COMPONENT WIRE SCHEMATIC
Transaxle Case Connector (Face View)
Vehicle Harness Connector (Face View)
Transaxle Case Connector
PCM
73 Green/Yellow 6 White
1 Green/Blue 8 Purple
82 Green/Black 3 Green
99 Green/Orange 9 Green
102 Green/White 1 Black
44 Green/Orange 2 Blue
81 Black/Red 7 Orange
91 Brown 4 Yellow
37 White/Green 5 Yellow
White "Natural" Harness Connector Shift Solenoid "A" (On-Off)
Purple "Black" Harness Connector Shift Solenoid "B" (On-Off)
Green Blue "White" Harness Connector Shift Solenoid "C" (PWM)
Green Brown "Blue" Harness Connector Shift Solenoid "D" (PWM)
Black Blue "Green" Harness Connector Shift Solenoid "E" (PWM)
Blue Orange "Black" Harness Connector EPC Solenoid (PWM)
(Signal Return) Yellow Yellow Transmission Fluid Temp
Common External Ground With Terminal On Valve Body Bolt
PCM
58 White/Blue 1 Output Speed Sensor
33 Brown/Blue (Signal Return) 2
34 White/Violet 1 Input Speed Sensor
76 Brown/White (Signal Return) 2
Copyright © 2001 ATSG

Figure 9

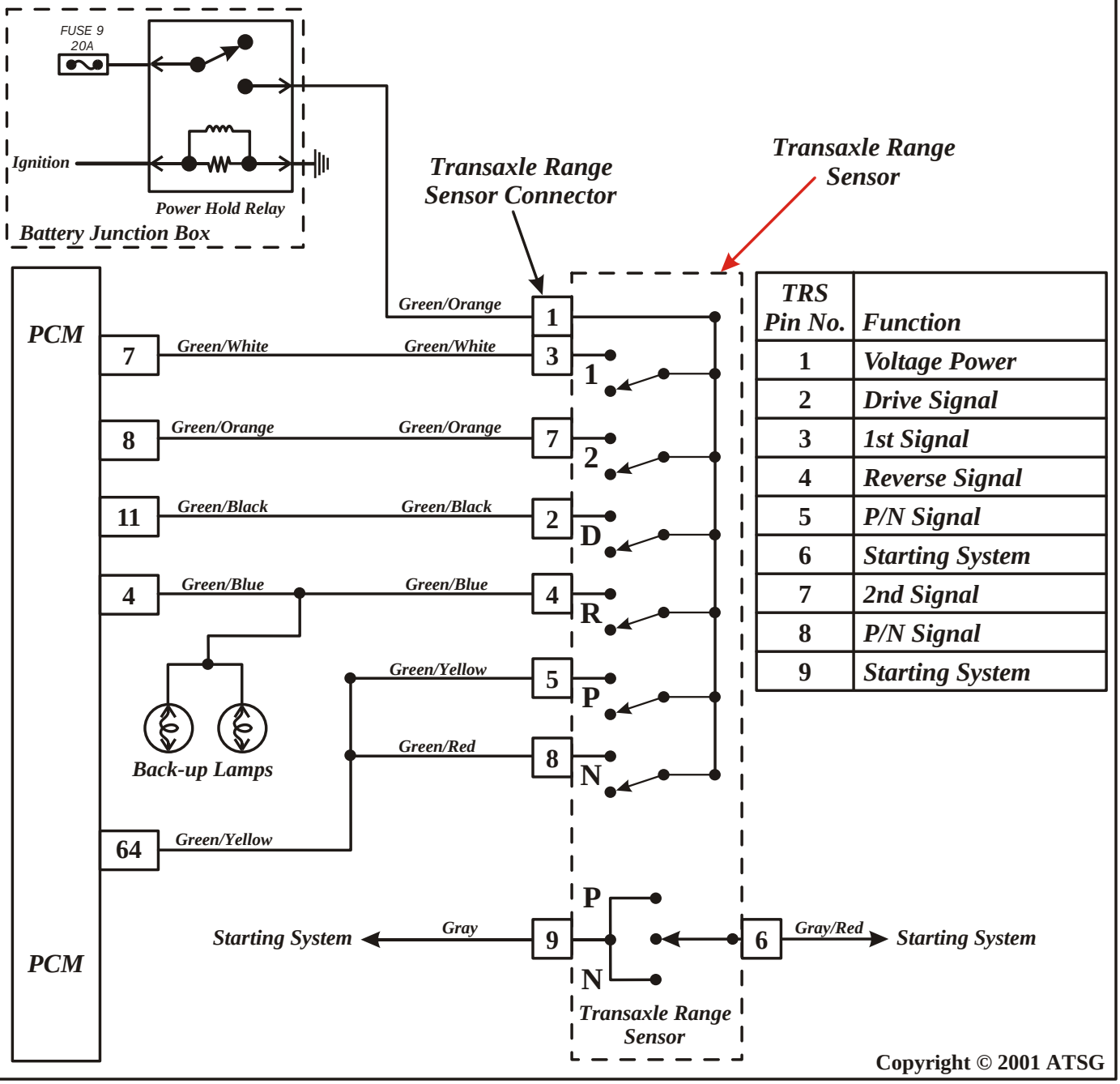
## TRANSAXLE RANGE SENSOR WIRE SCHEMATIC




*Transaxle Case Connector (Face View)*




*Vehicle Harness Connector (Face View)*

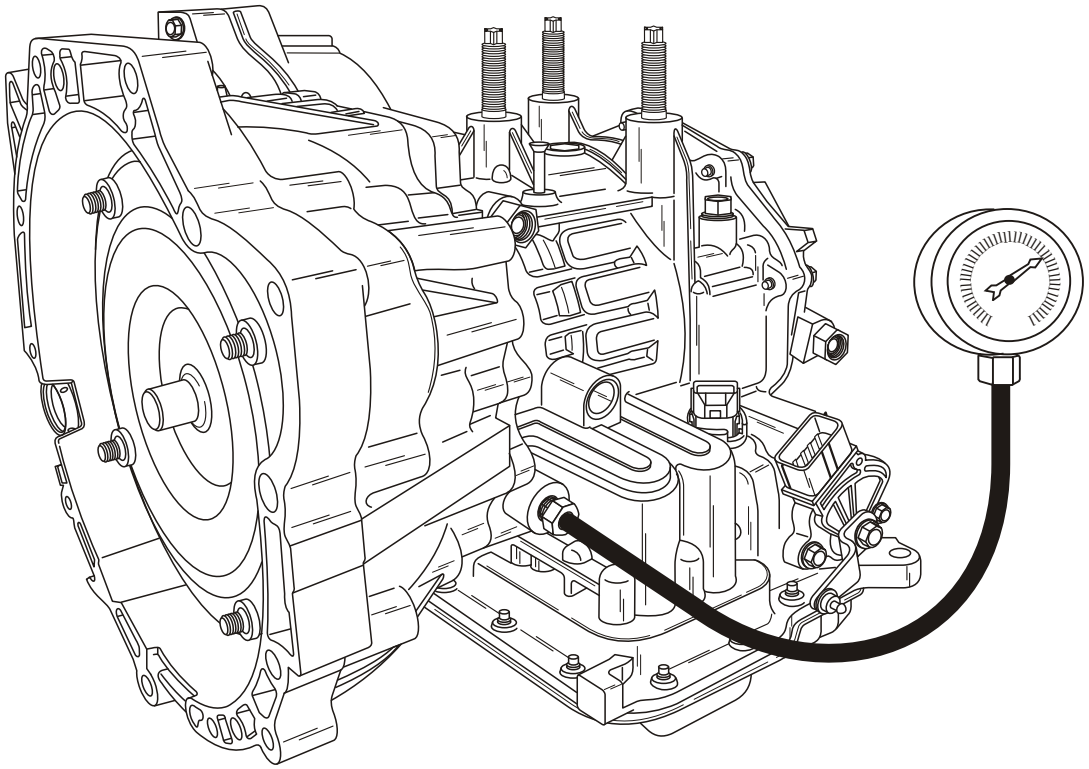



| TRS Pin No. | Function |
|---|---|
| 1 | Voltage Power |
| 2 | Drive Signal |
| 3 | 1st Signal |
| 4 | Reverse Signal |
| 5 | P/N Signal |
| 6 | Starting System |
| 7 | 2nd Signal |
| 8 | P/N Signal |
| 9 | Starting System |



Figure 10

## 4F27E TRANSAXLE LINE PRESSURE TEST



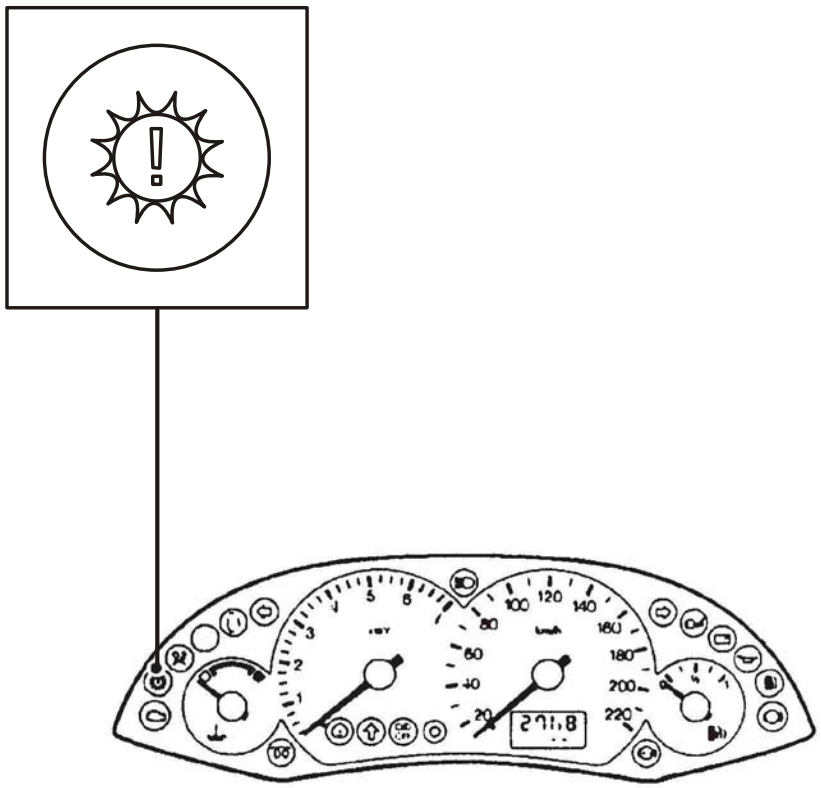
| 4F27E TRANSAXLE LINE PRESSURE TEST | | |
|---|---|---|
| **RANGE** | **IDLE** | **STALL** |
| **Park/Neutral** | **50-65 PSI (345-450 KPA)** | |
| **Reverse** | **65-85 PSI (450-585 KPA)** | **280-335 PSI (1930-2310 KPA)** |
| **D, 2, 1** | **50-65 PSI (345-450 KPA)** | **180-210 PSI (1240-1450 KPA)** |

| STALL SPEED CHART | |
|---|---|
| **ENGINE** | **RPM** |
| ***2.0L SPI (Split Port Induction)*** | ***2330-2740*** |
| ***2.0L "Zetec"-E*** | ***2300-2800*** |



Figure 11

**POWERTRAIN WARNING INDICATOR**



***The "Powertrain Warning Indicator" is located on the left side of the instrument cluster as shown above and is Orange in color.***

***The "Powertrain Warning Indicator" illuminates to inform the driver that the transaxle has been put into "Failsafe", which is 3rd gear, and that a DTC has been stored into memory. This is contrary to Ford tradition with the O/D cancel light flashing to inform the driver of problems.***



Figure 12

| DIAGNOSTIC TROUBLE CODE CHARTS | |
|---|---|
| **DTC** | **DESCRIPTION** |
| **P0705** | ***Transmission Range Sensor Circuit Failure*** |
| **P0712** | ***Transmission Fluid Temperature Sensor Circuit Grounded, 315°F Indicated*** |
| **P0713** | ***Transmission Fluid Temperature Sensor Circuit Open, -40°F Indicated*** |
| **P0715** | ***Turbine Shaft Speed Sensor, Insufficient Input*** |
| **P0717** | ***Turbine Shaft Speed Sensor, Intermittent Signal*** |
| **P0718** | ***Turbine Shaft Speed Sensor Erratic*** |
| **P0720** | ***Output Shaft Speed Sensor, Insufficient Input*** |
| **P0721** | ***Output Shaft Speed Sensor Erratic*** |
| **P0722** | ***Output Shaft Speed Sensor, Intermittent Signal*** |
| **P0731** | ***1st Gear Error - Shift Solenoid "A", "B", "C", Or Internal Parts*** |
| **P0732** | ***2nd Gear Error - Shift Solenoid "A", "B", "C", Or Internal Parts*** |
| **P0733** | ***3rd Gear Error - Shift Solenoid "A", "B", "C", Or Internal Parts*** |
| **P0734** | ***4th Gear Error - Shift Solenoid "A", "B", "C", Or Internal Parts*** |
| **P0741** | ***Torque Converter Clutch Slippage Detected*** |
| **P0745** | ***EPC Solenoid Circuit Failure, Circuit Shorted*** |
| **P0750** | ***Shift Solenoid "A" Circuit Failure*** |
| **P0751** | ***Shift Solenoid "A", Mechanical Or Hydraulic Failure*** |
| **P0755** | ***Shift Solenoid "B" Circuit Failure*** |
| **P0756** | ***Shift Solenoid "B", Mechanical Or Hydraulic Failure*** |
| **P0760** | ***Shift Solenoid "C" Circuit Failure*** |
| **P0761** | ***Shift Solenoid "C", Mechanical Or Hydraulic Failure*** |
| **P0765** | ***Shift Solenoid "D" Circuit Failure*** |
| **P0766** | ***Shift Solenoid "D", Mechanical Or Hydraulic Failure*** |
| **P0770** | ***Shift Solenoid "E" Circuit Failure*** |
| **P0771** | ***Shift Solenoid "E", Mechanical Or Hydraulic Failure*** |
| **P1700** | ***Internal Transaxle Mechanical Failure*** |
| **P1705** | ***Transmission Range Sensor, Not In Park Or Neutral During KOEO/KOER*** |
| **P1711** | ***Transmission Fluid Temperature Sensor, Out Of On-Board Diagnostic Range*** |
| **P1713** | ***Transmission Fluid Temperature Sensor, No Change In Low Range*** |
| **P1718** | ***Transmission Fluid Temperature Sensor, No Change In High Range*** |
| **P1746** | ***EPC Solenoid Circuit Failure, Circuit Open*** |
| **P1747** | ***EPC Solenoid Circuit Failure, Circuit Shorted*** |
| **P1760** | ***EPC Solenoid Circuit, Intermittent Short To Ground*** |
| **P1780** | ***Transaxle Control Switch, Input Incorrect For Selected Position*** |
| **P1783** | ***Transaxle Overtemp Condition Indicated*** |



Figure 13

**VALVE BODY EXPLODED VIEW**

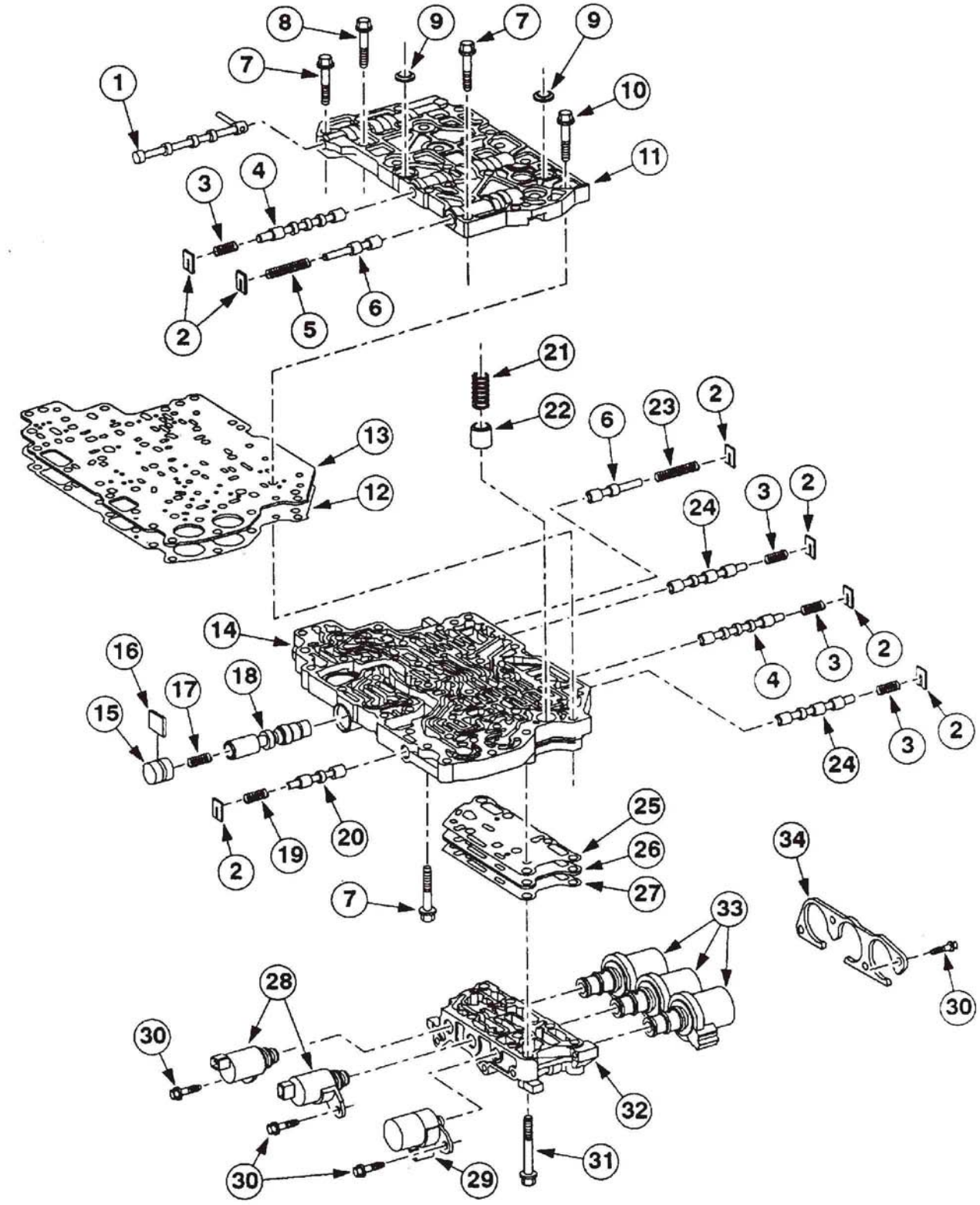





Figure 14

1. MANUAL VALVE.
2. VALVE BODY SPRING RETAINERS (7 REQUIRED).
3. BYPASS CLUTCH CONTROL VALVE SPRING.
4. BYPASS CLUTCH CONTROL VALVE (2 REQUIRED).
5. LINE PRESSURE MODUL ATION VALVE SPRING.
6. LINE PRESSURE MODUL ATION VALVE.
7. VALVE BODY BOLT M6X40 (3 REQUIRED).
8. VALVE BODY BOLT M6X30 (5 REQUIRED).
9. VALVE BODY TO CASE SEALS (2 REQUIRED).
10. VALVE BODY BOLT M6X30 (5 REQUIRED).
11. UPPER VALVE BODY.
12. MAIN VALVE BODY GASKETS, BONDED TO SPACER PLATE.
13. MAIN VALVE BODY SPACER PLATE, WITH BONDED GASKETS.
14. LOWER CONTROL VALVE BODY.
15. MAIN PRESSURE REGUL ATOR VALVE BORE PLUG.
16. MAIN PRESSURE REGUL ATOR VALVE RETAINER.
17. MAIN PRESSURE REGUL ATOR VALVE SPRING.
18. MAIN PRESSURE REGUL ATOR VALVE.
19. SOLENOID REGUL ATOR VALVE SPRING.
20. SOLENOID REGUL ATOR VALVE.
21. INTERMEDIATE SERVO ACCUMULATOR SPRING.
22. INTERMEDIATE SERVO ACCUMULATOR PISTON.
23. CONVERTER REGUL ATOR VALVE SPRING.
24. CONVERTER REGUL ATOR VALVE.
25. SOLENOID BODY GASKET.
26. SOLENOID BODY SPACER PLATE.
27. SOLENOID BODY GASKET/SCREEN.
28. SHIFT SOLENOIDS "A" AND "B" (ON- OFF).
29. EPC SOLENOID.
30. SOLENOID RETAINING BOLTS, M6X20 (7 REQUIRED).
31. VALVE BODY BOLT M6X72.
32. SOLENOID BODY.
33. SHIFT SOLENOIDS "C", "D", AND "E" (PWM).
34. SHIFT SOLENOID RETAINING BRACKET.

Figure 15