



**FORD MOTOR CO.  
4F27E TRANSAXLE**

**INDEX**

<i>IDENTIFICATION TAG LOCATION AND INFORMATION .....</i>	<i>3</i>
<i>GENERAL DESCRIPTION .....</i>	<i>4</i>
<i>TRANSAXLE INTERNAL COMPONENT APPLICATION CHART .....</i>	<i>5</i>
<i>SHIFT SOLENOID APPLICATION CHART AND IDENTIFICATION .....</i>	<i>6</i>
<i>TRANSAXLE INTERNAL COMPONENT RESISTANCE CHART .....</i>	<i>7</i>
<i>ELECTRICAL COMPONENT WIRE SCHEMATIC .....</i>	<i>8</i>
<i>GEAR RATIO IDENTIFICATION .....</i>	<i>9</i>
<i>ELECTRONIC COMPONENT DESCRIPTION .....</i>	<i>9</i>
<i>FAIL-SAFE OPERATION .....</i>	<i>9</i>
<i>PCM LOCATION AND PIN IDENTIFICATION .....</i>	<i>10</i>
<i>TRANSAXLE RANGE SENSOR WIRE SCHEMATIC .....</i>	<i>12</i>
<i>DIAGNOSTIC TROUBLE CODE CHARTS .....</i>	<i>15</i>
<i>LINE PRESSURE TEST .....</i>	<i>16</i>
<i>TRANSAXLE DISASSEMBLY .....</i>	<i>17</i>
<b>COMPONENT REBUILD SECTION</b>	
<i>OIL PUMP ASSEMBLY .....</i>	<i>31</i>
<i>FORWARD CLUTCH HOUSING ASSEMBLY .....</i>	<i>37</i>
<i>REAR END COVER .....</i>	<i>40</i>
<i>DIRECT/REVERSE HOUSING DISASSEMBLE .....</i>	<i>42</i>
<i>DIRECT CLUTCH HOUSING ASSEMBLY .....</i>	<i>43</i>
<i>REVERSE CLUTCH HOUSING ASSEMBLY .....</i>	<i>45</i>
<i>PLANETARY GEAR ASSEMBLIES .....</i>	<i>50</i>
<i>MANUAL CONTROL LINKAGE .....</i>	<i>55</i>
<i>SOLENOID BODY ASSEMBLY .....</i>	<i>58</i>
<i>UPPER AND LOWER VALVE BODY ASSEMBLIES .....</i>	<i>59</i>
<i>BEARING REPLACEMENT AND GEAR SET-UP .....</i>	<i>61</i>
<i>TRANSAXLE ASSEMBLY .....</i>	<i>75</i>
<i>INTERMEDIATE/OVERDRIVE BAND ADJUSTMENT .....</i>	<i>86</i>
<i>BOLT IDENTIFICATION CHART .....</i>	<i>92</i>
<i>TORQUE SPECIFICATIONS AND FLUID REQUIREMENTS .....</i>	<i>93</i>
<i>SPECIAL TOOL REQUIREMENTS AND LIST .....</i>	<i>94</i>
<i>EXPLODED TRANSAXLE VIEWS .....</i>	<i>100</i>
<i>AIR PRESSURE CHECKS .....</i>	<i>111</i>

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# INTRODUCTION

## FORD 4F27E

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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 Mazda designation is FN4A-EL. The new 4F27E transaxle is 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. 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 this manual. 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.

*We wish to thank Ford Motor Company  
for the information and illustrations  
that have made this booklet possible.*

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*The information and part numbers contained in this booklet have  
been carefully compiled from industry sources known for their  
reliability, but ATSG does not guarantee its accuracy.*

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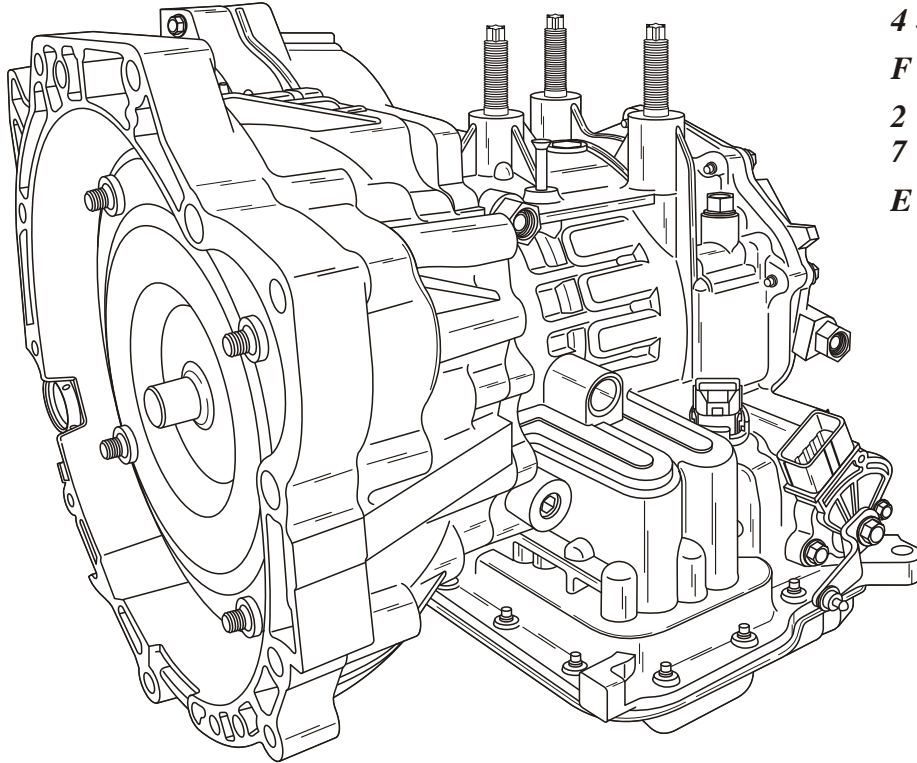
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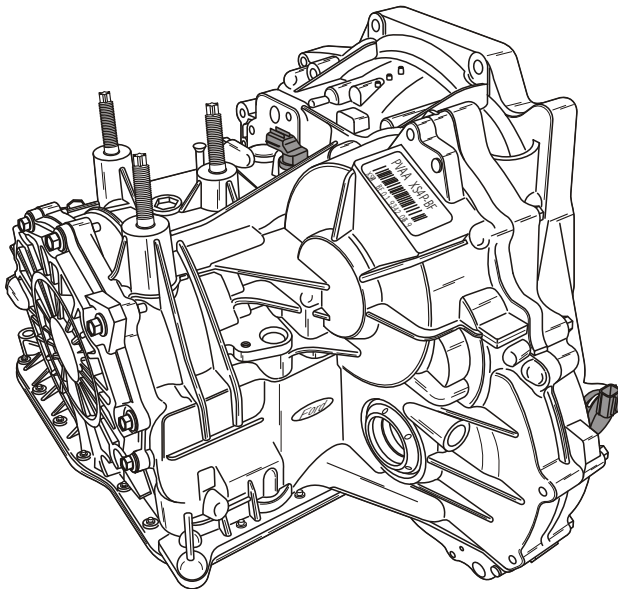
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## FORD 4F27E



*4 = 4 Forward Speeds*  
*F = Front Wheel Drive*  
*2 } = Relative Torque Capacity*  
*7 }*  
*E = Electronic Controlled*

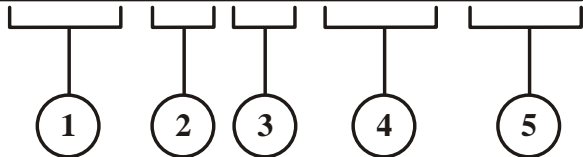
### I.D. TAG INFORMATION FOUND ON RIGHT SIDE OF TRANSMISSION CASE



PVAA XS4P-DA



XS4P DA 01 9342 0769



1. Part Number, Basic = 7000 (Example XS4Z-7000-DA)
2. Transmission Model Code
3. Engineering Level
4. Build Date (Year and Julian Date)
5. Serial Number

	Year	Julian Date
BD-	9	342
Build Date	9=1999	
	0=2000	
	1=2001	
	2=2002	
	3=2003	
	4=2004	

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Figure 1

## GENERAL DESCRIPTION

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, shown in Figure 2, gives the driver a choice of "P", "R", "N", "D", "2", "1", and all ranges are explained in detail below. 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.

**Special Note:** *This transaxle currently shows two different axle ratios and Page 9 also shows how to identify which ratio belongs in the vehicle that you may have. Surely you must know by now that the PCM will recognize 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 and for the location and identification of each solenoid on the valve body.

## MANUAL SELECTOR LEVER OPERATION

**P** In manual selector lever position "P" no gear is selected. The parking pawl is engaged manually by the shift shaft linkage and the engine can be started.

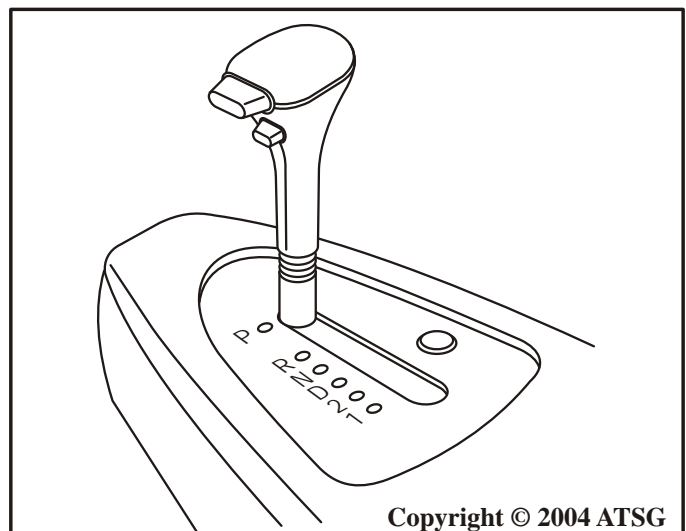
**R** In manual selector lever position "R" reverse gear is selected. Reverse allows the vehicle to be operated in a rearward direction, at a reduced gear ratio.

**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.

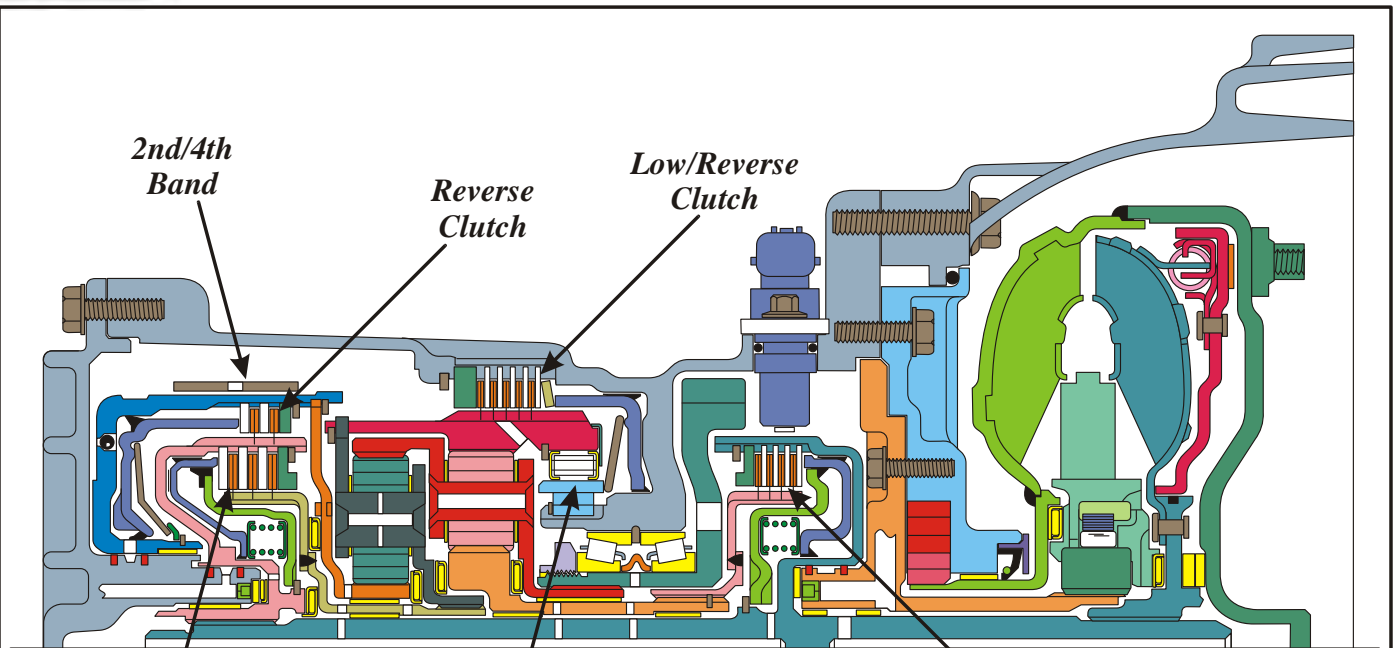
**2** In manual selector lever position "2" **only** 2nd gear is available. The transmission controls will not allow a shift into first gear. If the manual selector lever is moved to position "2" at an excessive vehicle speed for 2nd gear, the computer only allows the shift to take place when a safe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

**1** In manual selector lever position "1" **only** first is available.. 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 down shift to take place when a safe vehicle speed has been reached.



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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
<b>PARK</b>							
<b>REVERSE</b>				ON	ON		2.65
<b>NEUTRAL</b>							
<b>DRIVE-1st</b>	ON					HOLD	2.82
<b>DRIVE-2nd</b>	ON	ON					1.50
<b>DRIVE-3rd</b>	ON		ON				1.00
<b>DRIVE-4th</b>		ON	ON				0.73
<b>MANUAL-2nd</b>	ON	ON					1.50
<b>MANUAL-1st</b>	ON				ON		2.82

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

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

**REFER TO DOOR TAG INFORMATION ON PAGE 9 TO DETERMINE GEAR RATIO FOR YOUR VEHICLE.**

Figure 3

## SHIFT SOLENOID APPLY CHART

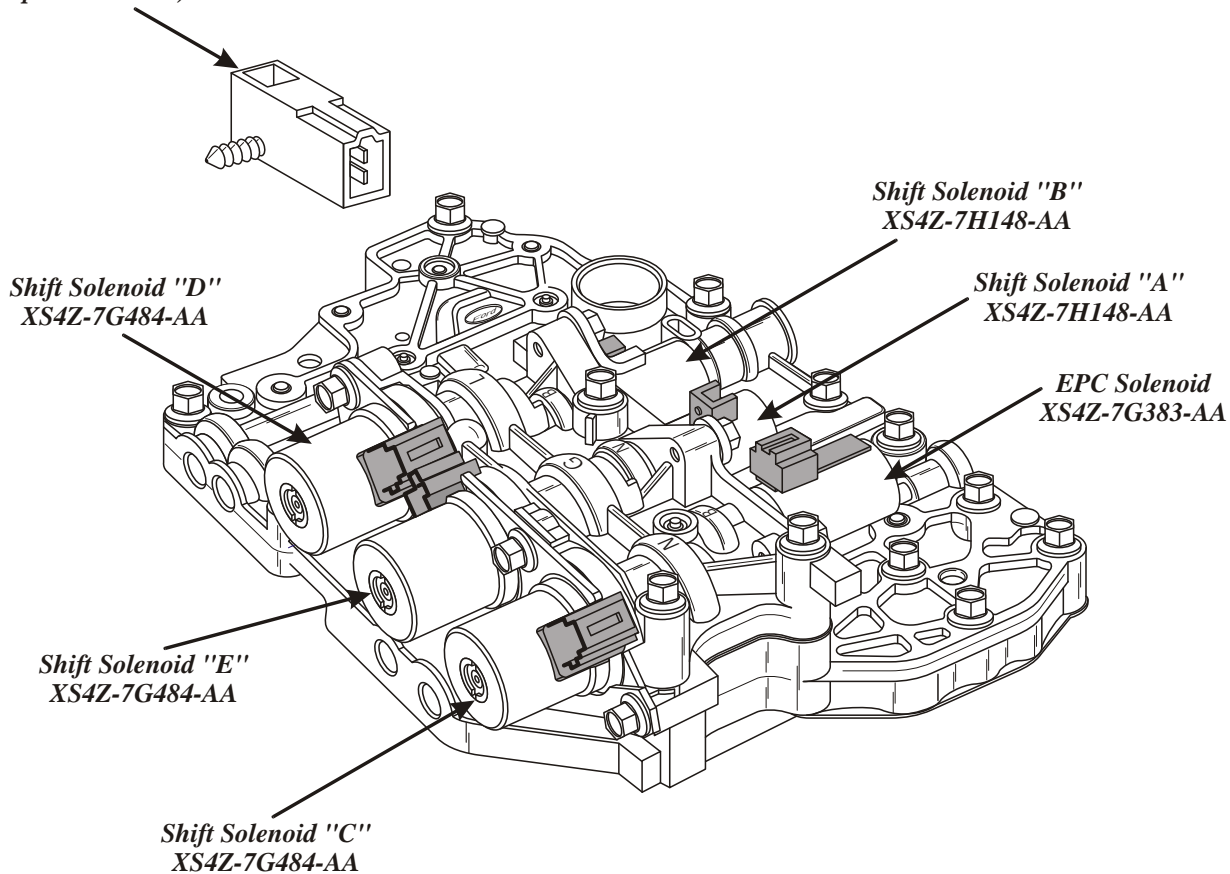
Range	Shift "A" (On-Off)	Shift "B" (On-Off)	Shift "C" (PWM)	Shift "D" (PWM)	Shift "E" (PWM)	EPC Solenoid
Park	ON	OFF	Not Fed	Not Fed	Not Fed	***
Reverse	ON	ON	Not Fed	OFF	Not Fed	***
Neutral	ON	OFF	Not Fed	Not Fed	Not Fed	***
Drive-1st	OFF	OFF	OFF	ON	ON	***
Drive-2nd	OFF	OFF	OFF	OFF	ON	***
Drive-3rd	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.

## SOLENOID AND FLUID TEMPERATURE SENSOR LOCATIONS

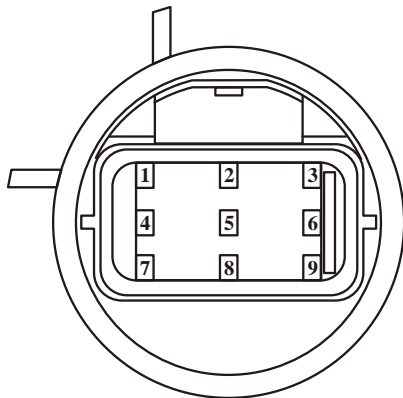
Transmission Fluid  
Temp Sensor  
(Snaps Onto Filter)



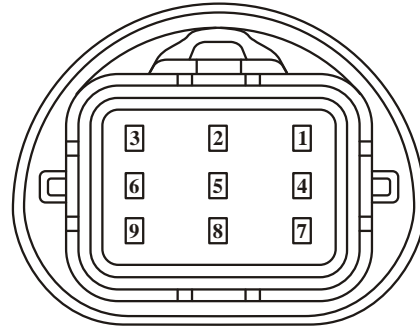
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Figure 4

## SOLENOID AND TRANSAXLE FLUID TEMP RESISTANCE CHART



*Transaxle Case Connector  
(Face View)*



*Vehicle Harness Connector  
(Face View)*

### INTERNAL TRANSAXLE COMPONENTS RESISTANCE CHART

<i>Terminals</i>	<i>Transaxle Component</i>	<i>Ohms Resistance At 20°C (70°F)</i>
<i>6 and Gnd.</i>	<i>Shift Solenoid "A" (On-Off)</i>	<i>10.9 - 26.2</i>
<i>8 and Gnd.</i>	<i>Shift Solenoid "B" (On-Off)</i>	<i>10.9 - 26.2</i>
<i>3 and Gnd.</i>	<i>Shift Solenoid "C" (PWM)</i>	<i>1.0 - 4.2</i>
<i>9 and Gnd.</i>	<i>Shift Solenoid "D" (PWM)</i>	<i>1.0 - 4.2</i>
<i>1 and Gnd.</i>	<i>Shift Solenoid "E" (PWM)</i>	<i>1.0 - 4.2</i>
<i>2 and 7</i>	<i>EPC Solenoid (PWM)</i>	<i>2.4 - 7.3</i>

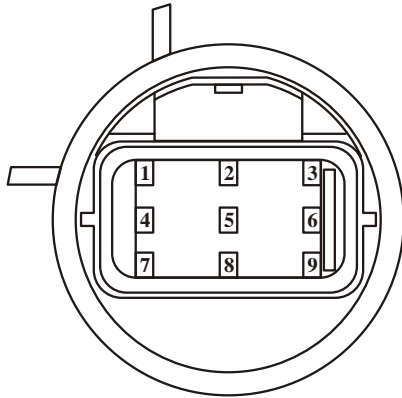
**NOTE:** *Gnd.* = Ground Ohm Meter to the Case

### *Transaxle Temperature Sensor Resistance Chart Terminals 4 and 5*

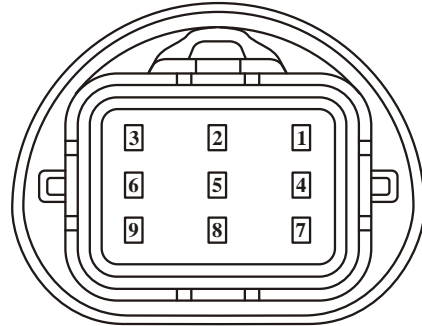
<i>0°C (32°F) = 83.2k - 107k Ohms</i>
<i>20°C (70°F) = 33.5k - 41.2k Ohms</i>
<i>40°C (104°F) = 14.6k - 17.6k Ohms</i>
<i>60°C (140°F) = 7.08k - 8.01k Ohms</i>
<i>80°C (176°F) = 3.61k - 4.06k Ohms</i>
<i>100°C (212°F) = 1.96k - 2.20k Ohms</i>
<i>120°C (248°F) = 1.13k - 1.25k Ohms</i>
<i>130°C (266°F) = 0.87k - 0.96k Ohms</i>

Figure 5

## TRANSAXLE ELECTRICAL COMPONENT WIRE SCHEMATIC



*Transaxle Case Connector  
(Face View)*



*Vehicle Harness Connector  
(Face View)*

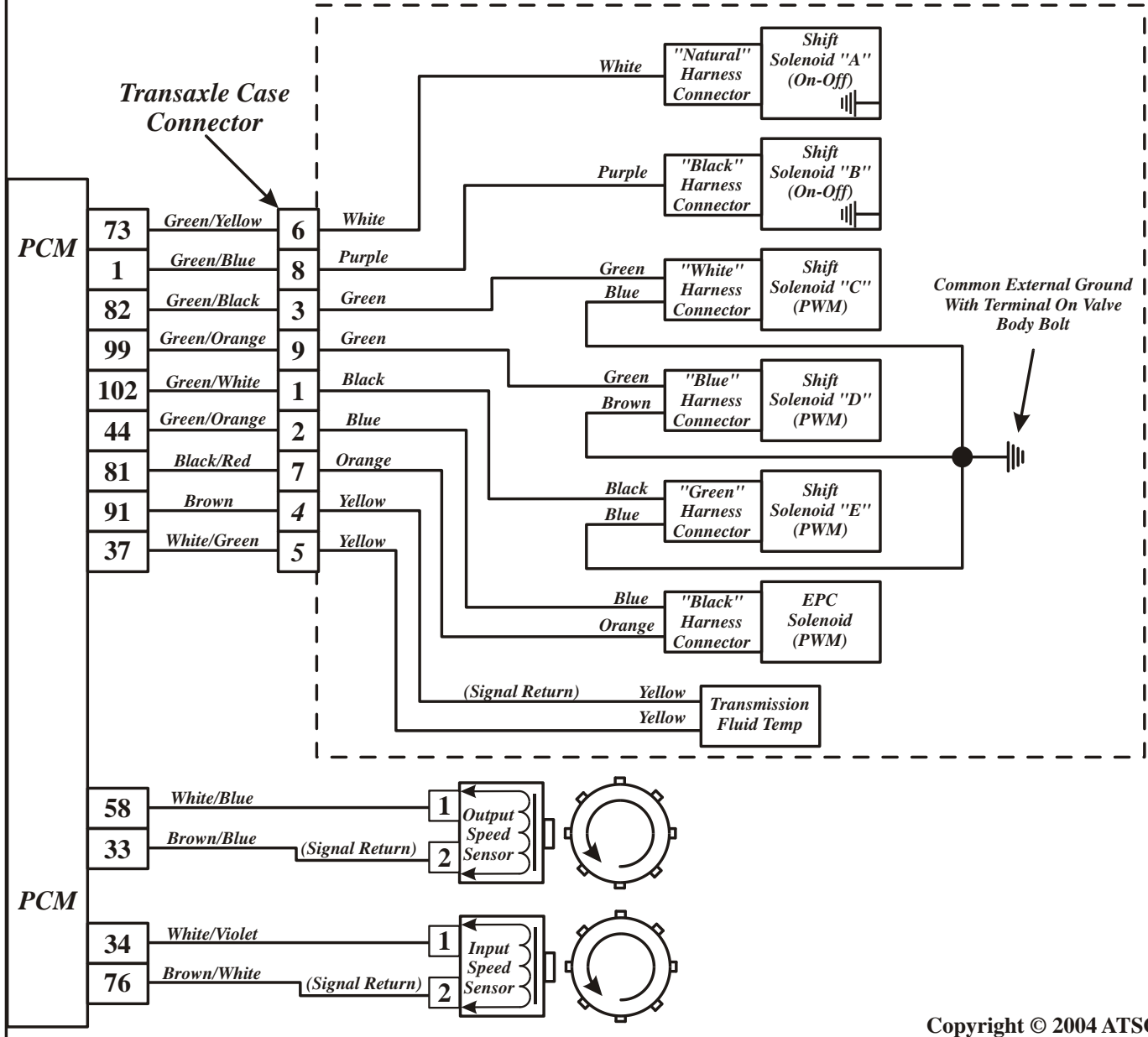


Figure 6





# Technical Service Information

## Typical Door I.D. Tag

MFD BY FORD MOTOR CO IN USA

DATE: 12/99                      GVWR 4792LB 173KG  
 FRONT GAWR    2491LB 1129KG  
 REAR GAWR    2324LB 1054KG 2324LB 1054KG

THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY, BUMPER AND THEFT PREVENTION

VIN 1FAPP6235VH103589                      F8169  
 TYPE PASSENGER    RO114

EXT PNT KM    RC: 71                      DSO 2450

BRK	IN TR	TP PS	R	AXLE	TR	SPR
4	A2		H	NN	L	DOMM

Axle Ratio Codes

**NOTE: There are two different axle ratios listed for this transaxle used in the U.S.**

**NN = 3.693 Automatic**  
**WW = 3.904 Automatic**

Typical Transaxle I.D. Tag

1st Digit Of Suffix Also Identifies Ratio And Original Engine

PVAA XS4P-DA

XS4P DA 01 9342 0769

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

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Figure 7

## GEAR RATIO IDENTIFICATION

There are currently two different final drive axle ratios listed for this transaxle, in vehicles that are sold in the United States. The two different axle ratios are tied to the engine size in the vehicle. The easiest means of identification is on the door tag of the vehicle, as shown in Figure 7, and look for the two digit code under the word "AXLE".

Another means of identification is the first digit of the Suffix in the part number that is located on the transaxle identification tag, and is also shown in Figure 7. This will be the only means of identification if someone brings you a transaxle core to purchase. We have also shown you the European ratio, as we have already seen some of these cores in the U.S., and **will not** interchange into U.S. vehicles.

## ELECTRONIC COMPONENT DESCRIPTION

### POWERTRAIN CONTROL MODULE (PCM)

The Powertrain Control Module (PCM) controls engine functions and provides total control of the 4F27E transaxle. The PCM monitors various input signals from several sensors and switches, as shown in Figure 8, and will then respond by operating solenoids for control of the line pressure, the shift scheduling and apply and release of the Torque Converter Clutch (TCC).

The PCM may also store Diagnostic Trouble Codes (DTC's) related to detected transaxle faults. If faults are detected, it will alert the driver by turning ON the Malfunction Indicator Lamp (MIL) located in the instrument cluster, as shown in Figure 8.

### "FAIL-SAFE" OPERATION

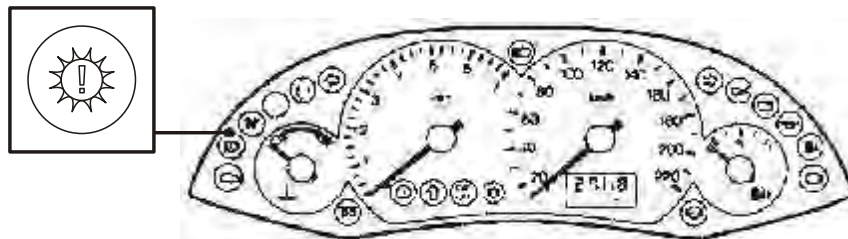
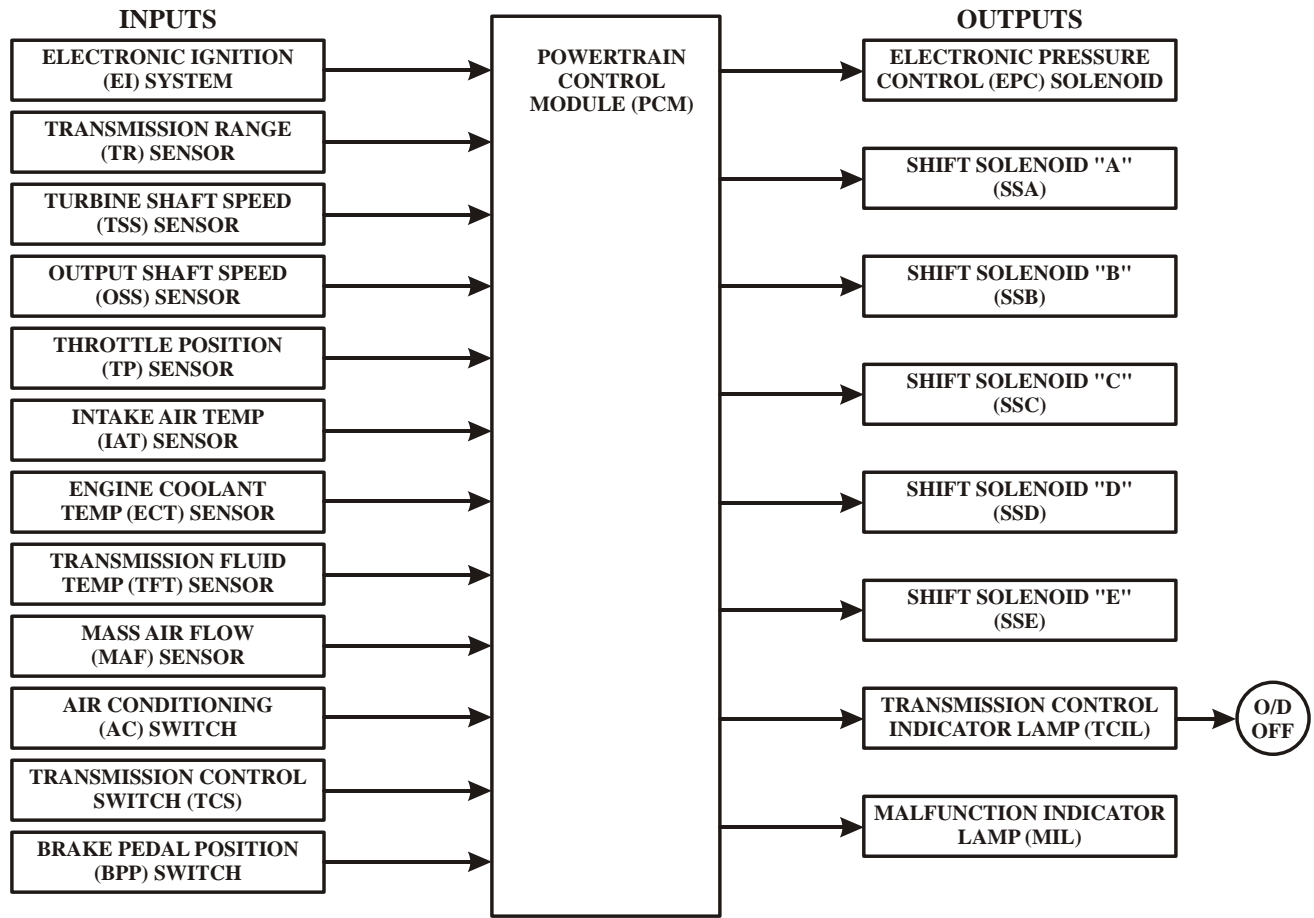
If the transaxle loses electronic control, as in blown fuse, it will operate in a fail-safe mode with the following features:

- Maximum line pressure in all positions.
- Fully functional P, R and N positions.
- Operation in 3rd gear only with coast braking, when selector is in **any** forward range.
- TCC released in all positions.

Continued on Page 11



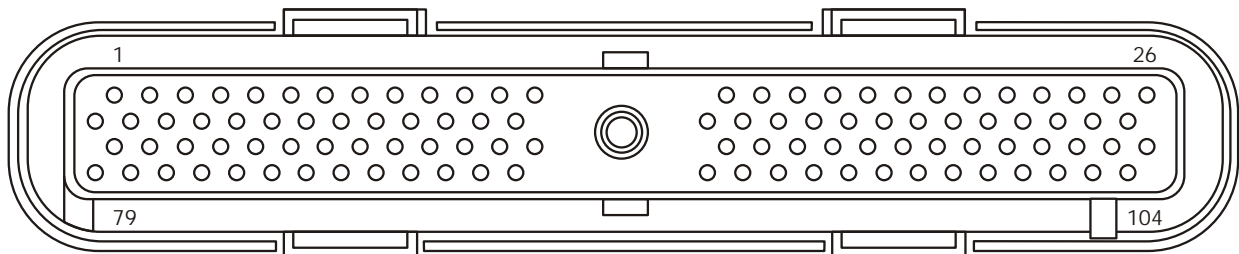
# Technical Service Information



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

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

### PCM PIN IDENTIFICATION



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Figure 8