



[PREVIOUS  
MENU](#)

## **INDEX FORD 4R100**

### [GO TO PAGE](#)

<b>Description and Operation</b>	<b>3</b>
<b>Power Take-Off Operation</b>	<b>5</b>
<b>Pressure Testing</b>	<b>16</b>
<b>Air Checks</b>	<b>17</b>
<b>Electronic Control Components</b>	<b>21</b>
<b>Diagnostic Trouble Codes</b>	<b>26</b>
<b>solenoid Checks</b>	<b>30</b>
<b>Electronic and Hydraulic Trouble Shooting</b>	<b>33</b>
<b>Teardown of Transmission</b>	<b>63</b>
<b>Component Teardown and Assembly</b>	<b>71</b>
<b>Transmission Assembly</b>	<b>103</b>
<b>Specifications</b>	<b>115</b>
<b>Transmission Radiator Coolers</b>	<b>119</b>

**AUTOMATIC TRANSMISSION SERVICE GROUP**



## TECHNICAL SERVICE INFORMATION

### INTRODUCTION FORD 4R100

The 4R100 was introduced for the 1999 model year in F250, F350, F450 and F550 Super Duty Trucks equipped with the 5.4L, 6.8L and 7.3L engines. The 4R100 is a revised version of the E4OD transmission with a Power-Take-Off (PTO) window on the left side of the case. The revisions have created many changes in this transmission that have affected many internal and external parts that will effect servicing these units.

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.  
Copyright ATSG 1999

**DALE ENGLAND**  
FIELD SERVICE CONSULTANT

**JIM DIAL**  
TECHNICAL CONSULTANT

**JERRY GOTT**  
TECHNICAL CONSULTANT

**DAVID CHALKER**  
TECHNICAL CONSULTANT

**ED KRUSE**  
TECHNICAL CONSULTANT

**GERALD CAMPBELL**  
TECHNICAL CONSULTANT

**ROBERT D. CHERRNAY**  
TECHNICAL DIRECTOR

**WAYNE COLONNA**  
TECHNICAL SUPERVISOR

**PETE LUBAN**  
TECHNICAL CONSULTANT

**ARSENIO RIVERA**  
TECHNICAL CONSULTANT

**GREGORY LIPNICK**  
TECHNICAL CONSULTANT

**AUTOMATIC TRANSMISSION SERVICE GROUP**  
9200 South Dadeland Blvd. Suite 720  
Miami, Florida 33156  
(305) 670-4161



## Technical Service Information Ford 4R100

### DESCRIPTION and OPERATION

#### Automatic Transmission—4R100

The 4R100 features include:

- four speeds.
- fully automatic.
- electronically controlled.
- optional power take-off.

The main operating components include:

- Torque converter clutch.
- Six multiple-disc friction clutches.
- One band.
- One sprag one-way clutch.
- Two roller one-way clutches that provide for the desired function of three planetary gearsets.

#### Identification Tags

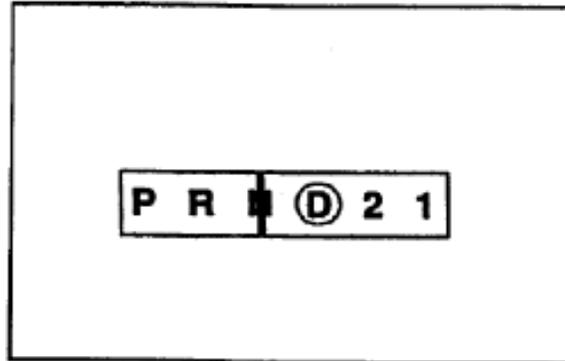
An identification tag is located on the left side of the transmission case (7005), rearward of the digital transmission range (TR) sensor.



Item	Description
1	Assembly Part Number Prefix and Suffix
2	Transmission Model
3	Serial
4	Build Date (Year, Month and Day).

#### Range Selection

The transmission has six range positions: P, R, N, , 2 and 1.



#### Park

In the Park position:

- There is no powerflow through the transmission.
- The parking pawl locks the output shaft to the case.
- The engine may be started.
- The ignition key may be removed.

#### Reverse

In the Reverse position:

- The vehicle may be operated in a rearward direction, at a reduced gear ratio.

#### Neutral

In the Neutral position:

- There is no powerflow through the transmission.
- The output shaft is not held and is free to turn.
- The engine may be started.

#### Overdrive

Overdrive is the normal position for most forward driving.

The Overdrive position provides:

- Automatic shifts.
- Apply and release of the torque converter clutch.
- Maximum fuel economy during normal operation.



## Technical Service Information Ford 4R100

### DESCRIPTION and OPERATION

#### Second Position—2nd Gear

This position provides:

- Second gear start and hold.
- The torque converter clutch may apply and release.
- Improved traction and engine braking on slippery roads.

#### First Position

If this position is selected at normal road speeds, the transmission will shift into second gear, then into first when the vehicle reaches a speed within 1st gear range.

This position provides:

- First gear operation only.
- Engine braking for descending steep grades.

#### Shift Patterns

##### Upshifts

Transmission upshifting is controlled by the powertrain control module (PCM). The PCM receives inputs from various engine or vehicle sensors and driver demands to control shift scheduling, shift feel and torque converter clutch (TCC) operation.

##### Downshifts

Under certain conditions the transmission will downshift automatically to a lower gear range (without moving the transmission range selector lever). There are three categories of automatic downshifts; Coastdown, Torque Demand and Forced or Kickdown shifts.

##### Coastdown

The coastdown downshift occurs when the vehicle is coasting down to a stop.

##### Torque Demand

The torque demand downshift occurs (automatically) during part throttle acceleration when the demand for torque is greater than the engine can provide at that gear ratio.

##### Kickdown

For maximum acceleration, the driver can force a downshift by pressing the accelerator pedal to the floor. A forced downshift into a lower gear is possible below calibrated speeds. Specifications for downshift speeds are subject to variations due to tire size, engine and transmission calibration requirements.



DESCRIPTION and OPERATION

POWER TAKE-OFF

Beginning at the start of production for 1999 models, Ford Motor Company introduced a new 4R100 transmission in some F250, F350, F450 and F550 Super Duty Trucks, equipped with the 5.4L, 6.8L and 7.3L engines. Basically the new 4R100 is a revised version of the previous E4OD transmission with a Power-Take-Off (PTO) window on the left side of the transmission case, right behind the front pump. Refer to Figure 1. The revisions that have occurred have created many major engineering changes that have affected many internal and external parts that will create service concerns and diagnostic concerns.

**PTO REQUIREMENTS:**

- (1) Obviously the case must be PTO capable with the cast-in window in the transmission where the PTO unit mounts to the transmission, as shown in Figure 1.
- (2) Designed for use during Mobile (Some Models) or Stationary conditions.
- (3) PTO is available as an option *only* on 8500 GVW or above, Super Duty F-Series trucks with 6.8L Gasoline and 7.3L Diesel engines. Ford 4R100 transmissions on other models *are not* PTO capable.
- (4) Battery voltage *must* be supplied to the Electronic Engine Control (EEC) input pin 4 on gasoline models, or pin 66 on diesel models, *when PTO is engaged*. The processor uses this information to raise EPC pressure to approximately 55 PSI so that you do not smoke the coast clutch. *This voltage must be provided by the PTO installer.*

**CONDITIONS FOR PTO OPERATION (General):**

- (1) The vehicle is not in the crank or start mode.
- (2) The transmission range selector *must* be in P, R, O.D, 2 or 1 position. The PTO will not operate when selector is in the neutral position.
- (3) PTO operation is inhibited when in cranking mode, neutral, or 4th gear.
- (4) Transmission only operates 1st through 3rd gears. Computer strategy does not allow 4th gear to engage, even if selected.
- (5) Transmission Fluid Temperature Sensor reading is up to operating temperature.



## Technical Service Information Ford 4R100

### DESCRIPTION and OPERATION

## FORD 4R100 PRELIMINARY INFORMATION

**CHANGE:** Beginning at the start of production for 1999 models, Ford Motor Company introduced a new transmission in some F250, F350, F450 and F550 Super Duty Trucks, equipped with the 5.4L, 6.8L and 7.3L engines. Basically the new 4R100 is a revised version of the previous E4OD transmission with a Power-Take-Off (PTO) window on the side of the case (See Figure 1). The revisions that have occurred however, have created many major engineering changes that have affected many internal and external parts that will affect service.

**REASON:** Provided a PTO option for Ford Motor Company.

#### PARTS AFFECTED:

- (1) **TRANSMISSION CASE** - Now has a PTO window added to the left side of the case directly behind the front pump area, and a Turbine Speed Sensor has been added at the top of the case and triggered by a revised coast clutch drum (See Figure 2). Another change to the rear of the case is the addition of a Lube Orifice Plug to the Rear of the case, as shown in Figure 4, which also changes the extension housings.
- (2) **TURBINE SPEED SENSOR** - Added to the top front of the case on some models, as shown in Figure 2. We have also provided you with the resistance readings and OEM part numbers on both Turbine Speed Sensors, as the PTO and Non-PTO models use different sensors. Refer to Figure 2 for turbine speed sensor information.
- (3) **OUTPUT SHAFT SENSOR** - Output Shaft Speed sensor was added to the top of the extension housing on some models, as shown in Figure 2. OSS is triggered by an added rotor pressed onto the output shaft, which requires a new tool to position the speed rotor properly *if* it is removed during overhaul, as shown in Figure 3. The park gear is also now pressed onto the output shaft, and the number 13 thrust washer has been changed to a thrust bearing as shown in Figure 3. We have provided you with the resistance reading and the OEM part number for the output shaft speed sensor. Refer to Figure 2 for output shaft speed sensor information.
- (4) **LUBE ORIFICE PLUG** - Added to the rear of the case in the lube circuit to provide added lubrication to the extension housing bushing on 2WD models. To retain common cases the 4WD models will also have the lube orifice plug installed, as well as E4OD cases produced after July 24, 1997. Lube Orifice Plug is available under OEM part number F81Z-7E380-AA, and should be replaced on rebuild. Refer to Figure 4.
- (5) **EXTENSION HOUSING** - Has an added boss or shoulder to retain the lube orifice plug in position in the transmission case, as shown in Figure 5. Notice that the 6.8L and 7.3L, 2 wheel drive extension housing has added a new passage to the extension housing bushing, much like the 4L80-E. All 4R100 and E4OD transmissions equipped with the lube orifice plug *must* use an extension housing with the shoulder or boss. Failure to do so could blow the lube orifice plug out and exhaust all lube oil, which would be catastrophic. Refer to Figure 5.



## Technical Service Information Ford 4R100

### DESCRIPTION and OPERATION

#### PARTS AFFECTED:

- (6) **MANUAL SHIFT LEVER** - There are two different external shift levers for this unit, one for Non-PTO transmissions and one for transmissions with the PTO option, as shown in Figure 6. We have provided you with the "Stamping" number as well as the OEM part number for both, as shown in Figure 6.
- (7) **COOLER BYPASS VALVE** - Similar to the Cooler Bypass Valve on the E4OD that provides lubrication to the transmission in case of blocked or partially blocked coolers. We have given you OEM part numbers for both and both bypass valves are illustrated in Figure 7.
- (8) **TRANSMISSION COOLERS** - Most F-Series vehicles over 8500 GVW equipped with the 4R100 transmission have an external "Oil-To-Air" cooler *only*. Due to the internal design of the "Oil-To-Air" cooler, it cannot be adequately flushed to remove contaminants, and requires replacement during transmission rebuild. The only exception is that F-Series vehicles over 8500 GVW equipped with the 5.4L engine also uses a radiator "In-Tank" cooler in addition to the "Oil-To-Air" cooler.
- (9) **FRONT PUMP COVER** - The pump cover is basically the same as the E4OD, but has a different valve line-up in the Converter Clutch Control Valve bore. The gasoline applications all have an "On-Off" lock-up solenoid and the 7.3L diesel applications all have a Pulse Width Modulated (PWM) lock-up solenoid. This changes the Converter Clutch Control Valve line-ups in the pump cover.
- (10) **FRONT PUMP STATOR SHAFT** - With the addition of the PTO gear on the front of the coast clutch drum, it was necessary to move the coast clutch sealing ring grooves up on the pump stator shaft to accommodate the coast clutch drum moving. There are currently three different Pump Stator Shafts used in production. One is the current E4OD shaft which is used with the "Cast Iron" coast clutch drum with the 5.4L and 6.8L engines without the PTO option. Two is the shaft with the relocated sealing rings and a bushing in the pump tower, which is used with the "Stamped Steel" coast clutch drum with the 5.4L, 6.8L and the 7.3L engines with the PTO option. Third is the shaft with the relocated sealing rings and "caged Needle Bearing to accommodate the new "Stamped Steel Drum" with the PTO ring gear and the overdrive roller clutch inner cam mode on the drum and the overdrive sun gear pressed into the new design drum, which changes the assembly process of the overdrive roller clutch.
- (11) **COAST CLUTCH DRUM AND STEEL PLATES** - There is now a revised "Stamped Steel" coast clutch drum introduced with the 4R100 transmission. There are currently three different coast clutch drums used in production. One is the current E4OD coast clutch drum which is "cast iron" and uses the current steel plates. The others are the "stamped steel" coast clutch drum, one with a ring gear for the PTO and the other without the PTO ring gear. The PTO gear is pressed onto this coast clutch drum. The drum uses the new coast clutch steel and lined clutch plates. The drum has the overdrive roller clutch inner race made on the drum and the overdrive sun gear is pressed into the new design drum, which changes the assembly process of the overdrive roller clutch.
- (12) **COAST CLUTCH PISTON** - The coast clutch piston in the new design coast clutch drum is now stamped steel, molded rubber seals assembly. The new design piston assembly requires a new seal protector tool, Rotunda No 307-387, to install the piston and seal assembly into the new design stamped steel clutch drum.



## Technical Service Information Ford 4R100

### DESCRIPTION and OPERATION

#### PARTS AFFECTED:

- (13) **OVERDRIVE ROLLER CLUTCH** - The overdrive roller clutch inner cam is now made onto the new design coast clutch drum, instead of being splined like the previous models were. The new design overdrive roller clutch assembly is now assembled onto the inner cam on the new design drum. The overdrive roller clutch outer race is still located in the overdrive ring gear next to the overdrive carrier and the number 13 thrust washer between the two is now plastic, but the cage and roller assembly are now assembled over the inner race on the ew design coast clutch drum.
- (14) **OVERDRIVE LINED PLATES** - Now have wider teeth to accomodate the new design stamped steel coast clutch drum assembly when used.
- (15) **VALVE BODY CHECKBALL LOCATIONS** - Valve body checkball locations now has two 1/4" checkballs and two 5/16" check balls. This of course changes the lower valve body spacer plate. The new design spacer plate has only one hole over the bathtub where the check ball was removed. The case checkball location remains the same as the 1996 - Up configuration.
- (16) **VALVE LINE-UPS IN VALVE BODY** - Have changed from previous models and are shown and listed in the valve body section of the manual.
- (17) **SOLENOID BODY** - There are now TWO different Solenoid Bodies, depending on whether you have a gasoline or diesel engine model. Since the diesel models have a pulse width Modulated (PWM) converter clutch application, the resistance on the converter clutch solenoid in the Solenoid Body is going to be different. We have included the OEM part numbers for both of the solenoid bodies and the resistance charts for all the solenoids along with the solenoid application and pin function charts.
- (18) **TROUBLE CODES** - Abbreviations are listed with the OBD II Trouble Codes, which are listed in numerical order.

#### INTERCHANGEABILITY:

All of the parts listed above are model sensitive, and some of the parts listed above cannot be intermixed with E4OD parts. With this unit you will have to be very carefull if replacement of the various components becomes necessary.

#### SERVICE INFORMATION:

Turbine Shaft Speed Sensor (PTO Models Only) .....	F81Z-7M101-BA
Turbine Shaft Speed Sensor (Non-PTO Models Only) .....	F81Z-7M101-AA
Output Shaft Speed Sensor (All Models) .....	F81Z-7M101-AA
Lube Orifice Plug (Plastic) .....	F81Z-7E380-AA
External Manual Shift Lever (With PTO Option) .....	F81Z-7A256-AA
External Manual Shift Lever (Without PTO Option) .....	F7UZ-7A256-BB
Cooler Bypass Valve Assembly .....	F81Z-7H322-AA
Coast Clutch Piston (New Design) .....	F81Z-7A262-AA
Solenoid Body Assembly (Gasoline Engine Only) .....	F81Z-7G391-BA
Solenoid Body Assembly (Diesel Engine Only) .....	F81Z-7G391-AB
Overdrive Roller Clutch And Cage Assembly .....	F81Z-7A089-AB

Copyright © 1998 ATSG



# Technical Service Information Ford 4R100

## DESCRIPTION and OPERATION

*Turbine Shaft Speed Sensor*  
*PTO Models Only=496-1244 Ohms*

*Part Number F81Z-7M101-BA*

*Non PTO Models Only - 781-1979 Ohms*

*Part Number F81Z-7M101-AA*

*Output Shaft Speed Sensor*

*All Models = 781-1979 Ohms*

*Part Number F81Z-7M101-AA*

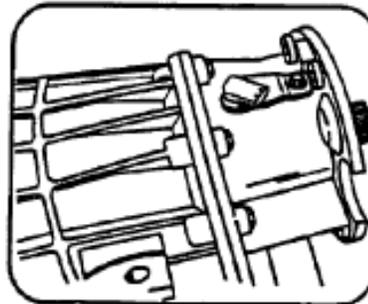
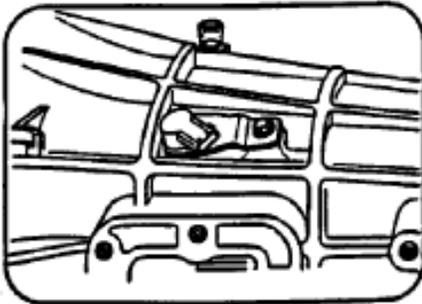
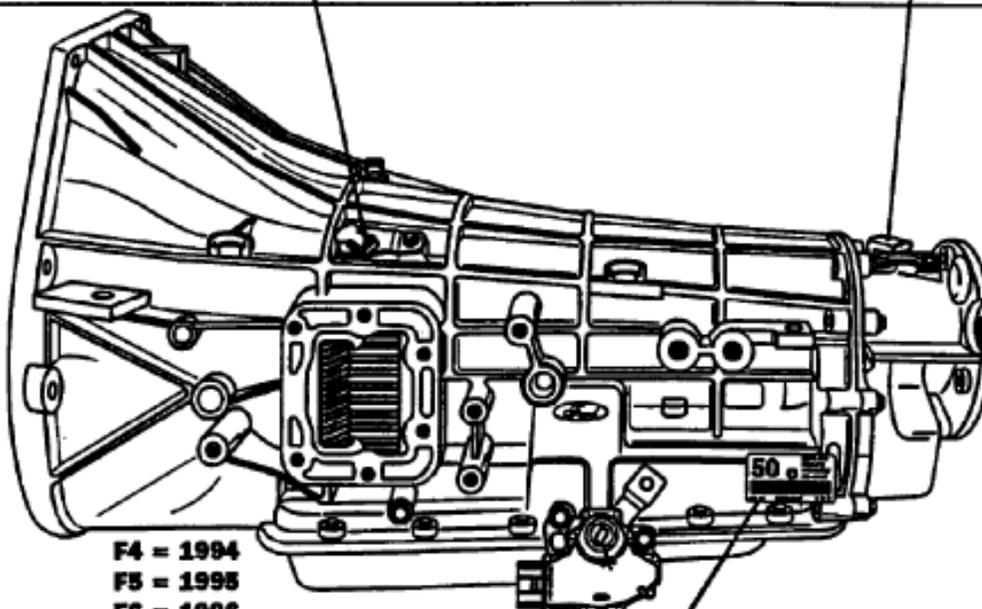


Figure 2



- F4 = 1994
- F5 = 1995
- F6 = 1996
- F7 = 1997
- F8 = 1998
- F9 = 1999



- Assembly Part Number (Prefix and Suffix)
- Transmission Model
- Serial Number
- Build Date - (Year, Month, Day)

- |         |         |
|---------|---------|
| A = JAN | G = JUL |
| B = FEB | H = AUG |
| C = MAR | J = SEP |
| D = APR | K = OCT |
| E = MAY | L = NOV |
| F = JUN | M = DEC |

IDENTIFICATION TAG LOCATION AND INFORMATION

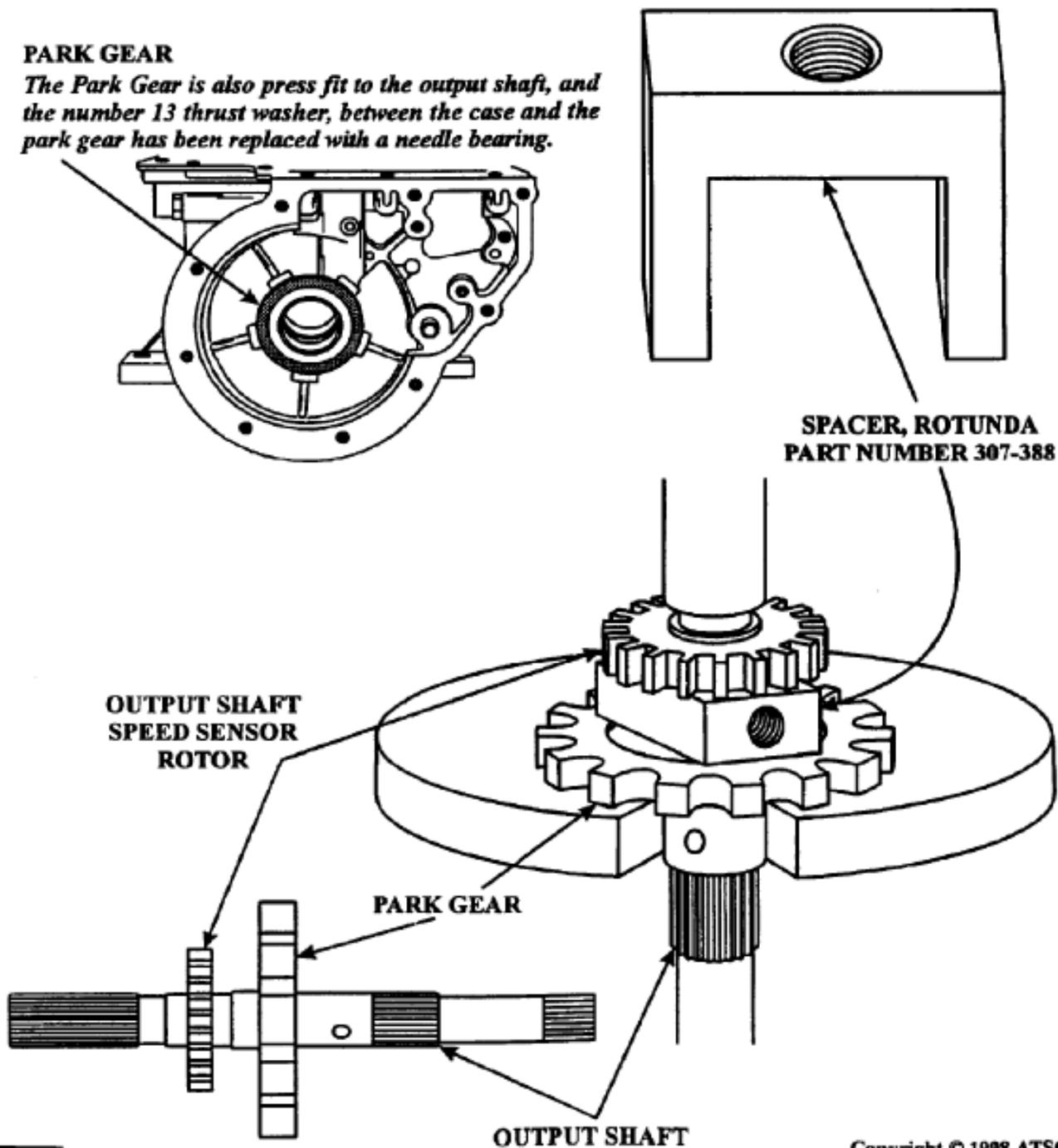
Figure 1

**FORD 4R100  
OUTPUT SHAFT SPEED SENSOR ROTOR**

*Output Shaft Speed Sensor Rotor is press fit to the output shaft and requires new Spacer Tool, Rotunda No. 307-388 for spacing the speed sensor rotor the proper distance from the park gear, if it was removed from the output shaft during service.*

**PARK GEAR**

*The Park Gear is also press fit to the output shaft, and the number 13 thrust washer, between the case and the park gear has been replaced with a needle bearing.*



Copyright © 1998 ATSG