PLAYING WITH FIRE

4R70W Interchange

by Jon Rodriguez

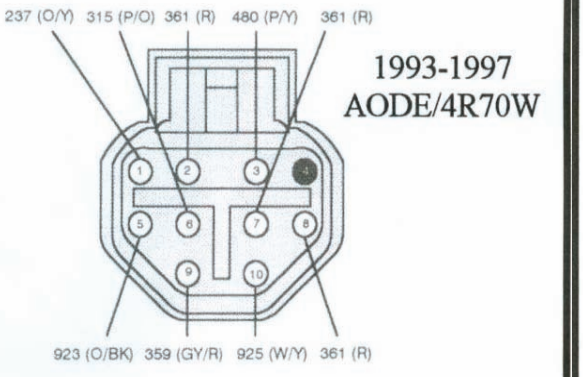
When I first started building, one of the hardest things to overcome wasn't the difficulty of remembering where all the parts go or fumbling with snap rings. Those hurdles were easy to overcome after rebuilding a few units.

The times that make this industry hard are when a unit you rebuilt comes back under warranty. It's worse than getting denied a date when you see your name on top of a transmission in a car that you remember from not too long ago. Was it the parts or technique? Or was it the $%#(@! R&R guy?

Well to make sure it wasn't the parts, I changed everything. And if my new part didn't look exactly like the old one, I crossed my arms and said, "No way, José!"

As time and transmissions stacked up on my resume, I learned that a part doesn't always have to match exactly for it to work. I also learned that sometimes it does, so never assume those extra holes are just to make the part lighter. The approach that makes a rebuilder successful is to look at the part and see what it does. Follow the tracks, count the teeth, measure the heights and widths, etc. Reverse engineer. Figure out interchangeability and your stock as a rebuilder will go up with the guy who signs your paychecks.

Welcome to another edition of *Playing with Fire*. This month's issue is going to cover the interchange do's and don'ts between the 2004-2007 late 4R70E/75E and earlier 1993-2003 4R70W. When covering the interchange, we're going to go in the same order as if we were dismantling the unit, starting with the valve body and working our way down to the last bearing in the case.

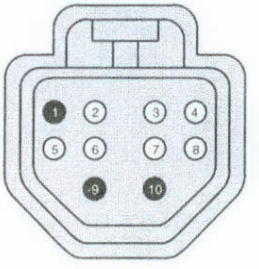


1993-1997 AODE/4R70W

C183 (BLACK)
4R70W TRANSMISSION

PIN	CIRCUIT	CIRCUIT FUNCTION
1	237 (O/Y)	Shift solenoid #1
2	361 (R)	Vehicle Power
3	480 (P/Y)	Torque Converter Clutch Solenoid
4	—	NOT USED
5	923 (O/BK)	Transmission Fluid Temperature (TFT)
6	315 (P/O)	Shift Solenoid #2
7	361 (R)	Vehicle Power
8	361 (R)	Vehicle Power
9	359 (GY/R)	Signal Return
10	925 (W/Y)	Electronic Pressure Control Solenoid

1998-2007 4R70W



C183
4R70W TRANSMISSION

PIN	CIRCUIT	CIRCUIT FUNCTION
1	–	NOT USED
2	359 (GY/RD)	Signal Return
3	480 (VT/YE)	Torque Converter Clutch Solenoid
4	1138 (VT/WH)	Vehicle Power
5	923 (OG/BK)	Transmission Fluid Temperature (TFT)
6	925 (WH/YE)	Electronic Pressure Control Solenoid
7	237 (OG/YE)	Shift Solenoid A (SSA)
8	315 (VT/OG)	Shift Solenoid B (SSB)
9	–	NOT USED
10	–	NOT USED

Figure 1

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5R55E	O/D Planet 95-02
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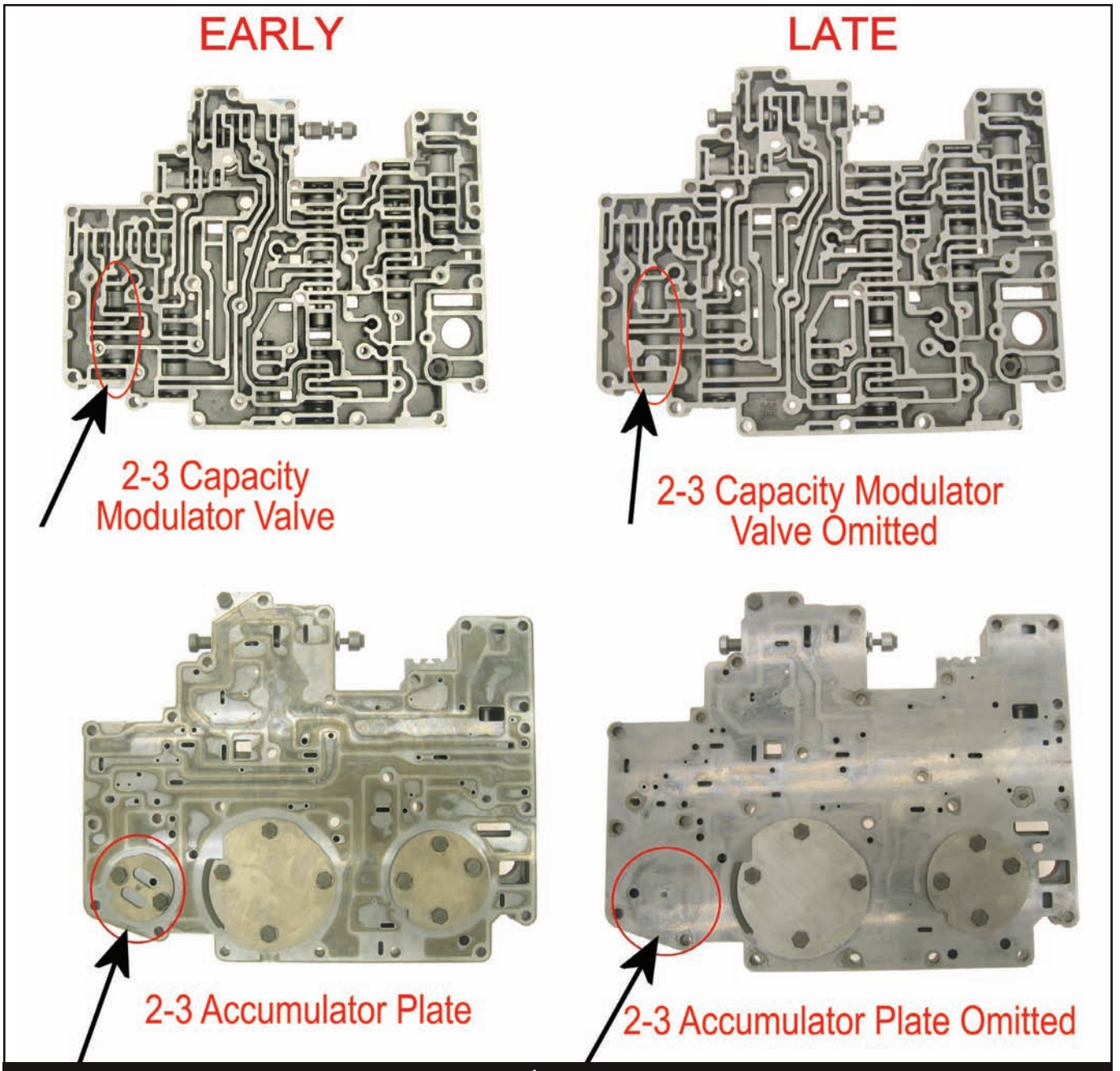

Figure 2

Electronics

Use the diagrams (figure 1) to make sure you have the correct connector for your application. The shift solenoids, TCC solenoid, and wiring harness are the same from 1998-on, and if they plug into the harness, they're the correct ones.

The most important change is the EPC solenoid. The EPC solenoid from 1998-2004 (XL3Z-7G383 AB) and the solenoid from 2005-07 (5C2Z-7G383 AB) have the exact same resistance (2.48-5.66 ohms) and connection. The difference is the internal design that was changed to accommodate the different frequency that the PCM uses to signal the solenoid.

Using an early solenoid in a late application will cause low line pressure rise at light to medium throttle, and excessive line pressure at heavy throttle. Using a late solenoid in an early application will create high line pressure at light to medium throttle and low pressure at heavy throttle. The best way to be sure you have the correct solenoid is to check the part number.

Valve Body

For the sake of interchange, we're going to make this easy. As long as the valve body, separator plate, and gaskets match, all valve bodies from 1996-2007 will interchange. In 2000, Ford eliminated the 2-3 capacity modulator valve lineup and the 2-3 accumulator plate (figure 2).

Using an earlier, *complete* valve body on a late application won't affect performance or durability. In some cases, where the 2-3 accumulator spring cover damages the unprotected plate on the 2000-and-up valve bodies, you can improve durability by using a 1996-1999 valve body with the accumulator plate, to help protect the separator plate.

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Figure 3

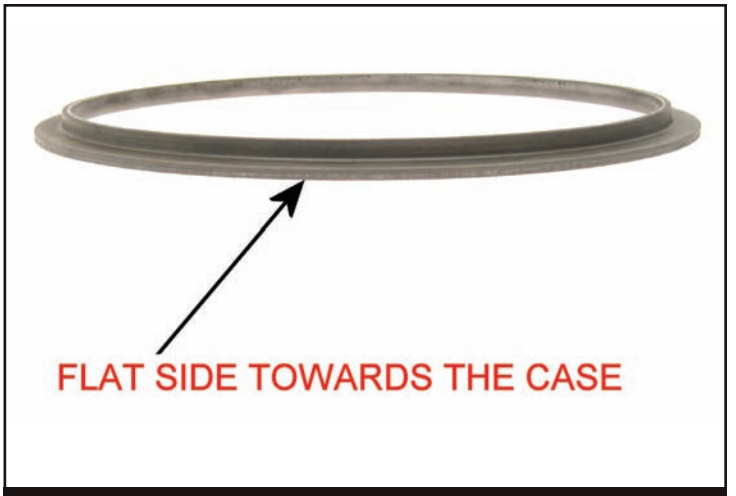

Figure 4

The 1993-1995 valve bodies aren't interchangeable with the later versions because the alignment pins are a different size. But there are aftermarket adapters available to make late valve bodies fit earlier cases. Ask your local parts supplier about availability.

Pump Body

Pump bodies are identical except for the intermediate piston design. The 4R70E/75E uses a bonded rubber piston and wave-style piston return spring (figure 3). The wave-style spring requires a seat that sits in the case so the wave spring doesn't eat into the aluminum. Use figure 4 to reference proper installation.

The two different designs can be interchanged as a complete set without causing any problems. Never attempt to interchange intermediate pistons or springs. If you use a 4R75E pump in an early 4R70W, always install the wave spring retainer into the early case or it'll damage the case.

Stator Support

The stator supports are identical in hydraulic design, but there's an important difference in the forward sealing ring lands. The 4R70E/75E uses a plastic ring that's much thinner than the 4R70W cast iron design (figure 5). The outer dimensions of the two rings are identical, so as long as you use the correct rings for the stator support, you can interchange them freely. Figure 6 shows the differences in the ring lands.

The other difference is the forward clutch apply hole: Ford changed the machining process for the forward

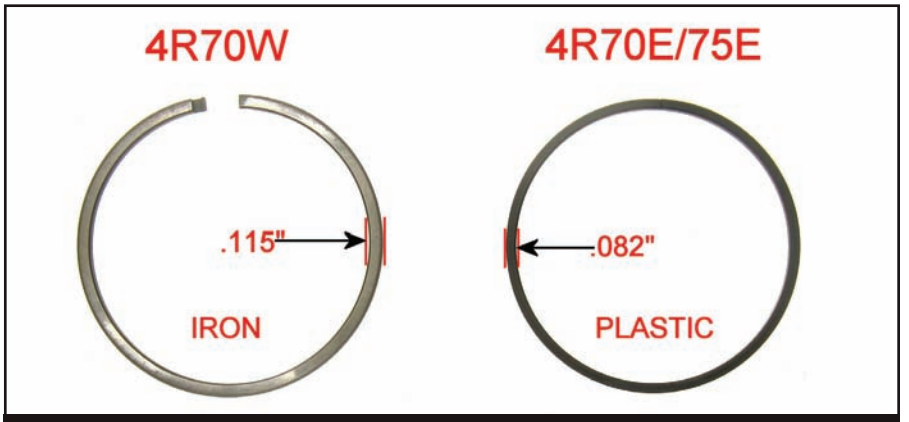

Figure 5

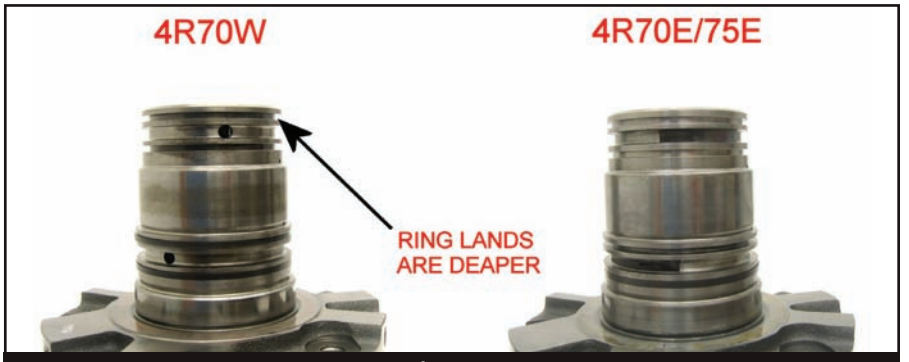

Figure 6

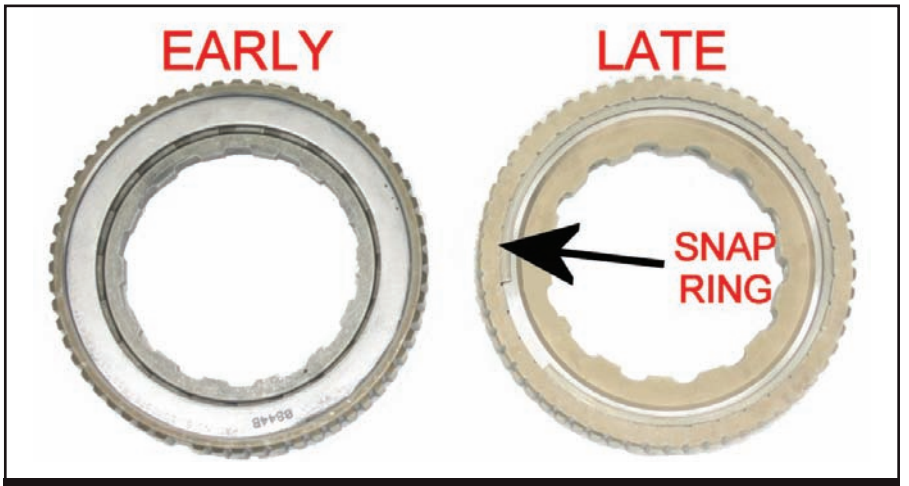

Figure 7

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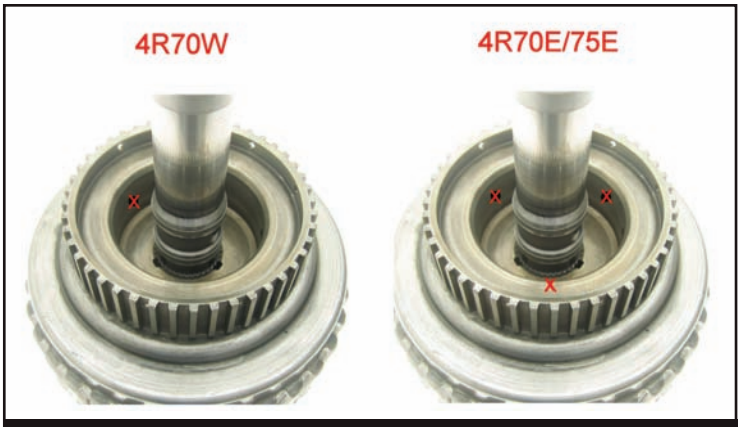

Figure 8

clutch apply hole and turned it into a slot instead of a round hole. This is strictly cosmetic and will have no effect on forward clutch apply.

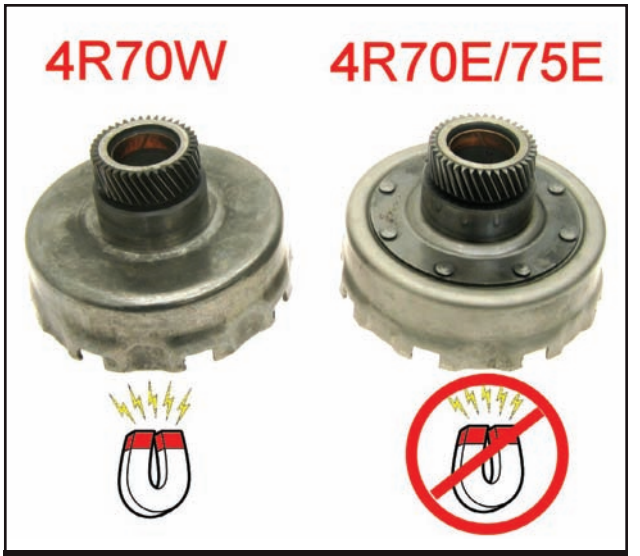

Figure 9

Intermediate Mechanical Diode

In 2007, Ford introduced a new design mechanical diode: They increased the number of ratchet teeth in the diode and changed the assembly process. The new diode has a snap ring that holds the element retainer in place instead of the earlier pressed design (figure 7).

The height dimensions have changed slightly where the snap ring rides on the reverse input drum. The new design diode supersedes the previous design, and when used on any diode-style drum, will increase the clearance between the inner race and the snap ring by about 0.020". We recommend using an aftermarket-designed spiral snap ring in place of the stock snap ring to prevent snap ring failure.

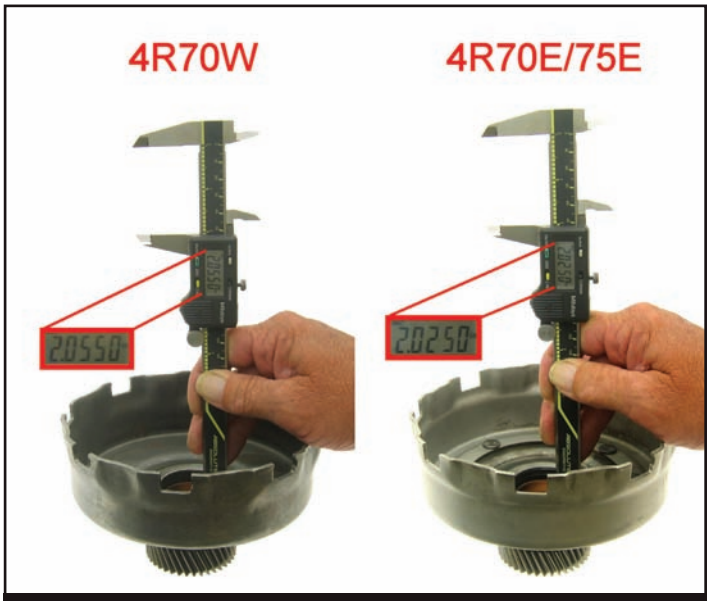

Figure 10

Reverse Input/OD Drum

No changes made; these drums are fully interchangeable.

Forward Drum

The 2004-and-up forward drum has three apply holes, 120º apart, verses the earlier version having only one (figure 8). This design change is cosmetic and won't affect forward

Figure 11

Figure 12

clutch apply if interchanged.

Forward Clutch Hub

No changes made; these hubs are fully interchangeable.

Sun Shell

There have been some big changes to the sun shell (figure 9). First, they designed it to be a lot stronger; the metal is thicker and the new design is riveted. Thanks to these changes, there shouldn't be any more problems with the sun shells breaking.

The height from the bottom of the sun gear to the bearing surface has been reduced by 0.030" to make room for the thicker, two-piece bearing (figure 10). You'll need to replace the sun shell, bearing and forward sun gear as a set when updating to the newer parts in a 4R70W, to keep the endplay correct. Ford sells this complete service kit under part number 4L3Z-7D234-AA.


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The single most important change with the 4R70E/75E sun shell is something you can't see, but will prevent the transmission from leaving your shop: The 4R70E/75E sun shell is non-magnetic. For the input speed sensor used in today's 4R70E/75E transmissions to work, the sun shell must be non-magnetic. This allows the sensor to create the signal from the stamping on the forward drum. Using a magnetic sun shell in later units will cause harsh or no shifts, with possible ratio and input speed sensor codes.

Sun Gear

Ford shortened the length of the sun gear by 0.010" to make room for the thicker, two-piece bearing. 0.010" may not seem like a big difference, but it's enough to affect your endplay. The easiest way to identify the late gear is the ID groove at the splined part of the gear (figure 11). Just like the sun shell, you can only use the newer sun gear in early units as a set that includes the sun shell, bearing and sun gear. Ford sells this complete service kit under part number 4L3Z-7D234-AA.

Center Support

To make room for the input speed sensor, the 4R70E/75E center support has an extra notch cut out (figure 12). If you install a 4R70W support in a 4R70E/75E case, the input speed sensor won't fit all the way into the case.

If you're in a pinch, you can grind a notch into a 4R70W support to make room for the sensor.

Anti-Rattle Spring

Finally, Ford has come up with a better design anti-rattle spring. The updated spring is a V-shaped strip of spring steel that won't eat into the case or center support (figure 13). This spring will retrofit all the way to the AOD and is a great way to save severely worn cases. The part number for the updated spring is 2L3Z-7F277-AA.

Low Roller Clutch

The low roller clutch is the proven design that Ford has used since the AOD. No changes were made and the roller is still the same as the one used in a Turbo 400 low roller clutch.

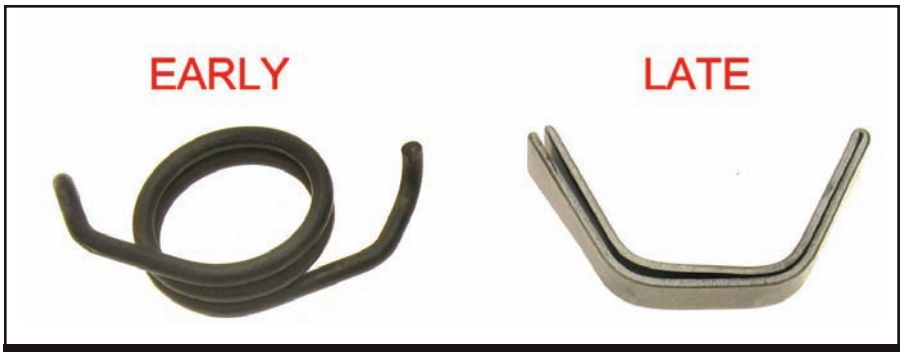

Figure 13

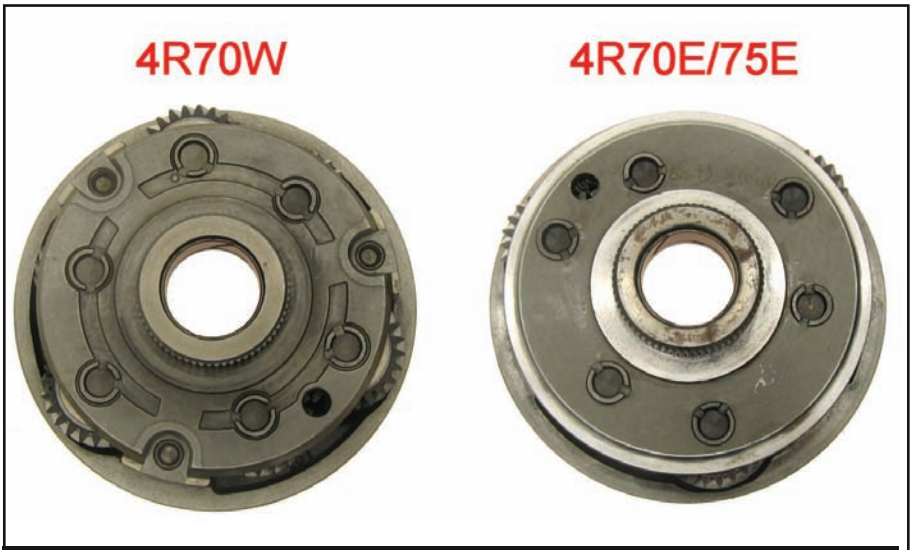

Figure 14

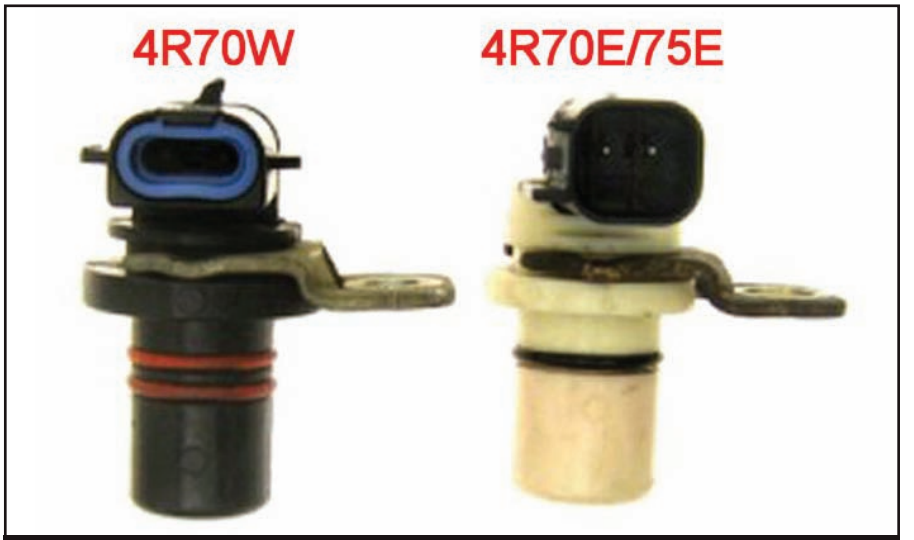

Figure 15

Planetary

The planetary gear sets in both units have the same ratio and dimensions. The only difference is how the rear cover is attached: The 4R70E/75E uses a welded design; older versions use rivets to connect the bottom cover to the top of the gear set (figure 14). That area never had any real issue; the change is strictly to make manufacturing easier. Interchange between years won't pose a problem.

Direct Drum and Hub

No changes made; the direct drum and hub are fully interchangeable.

Ring Gear

A new design output speed sensor was incorporated for the 2004 model

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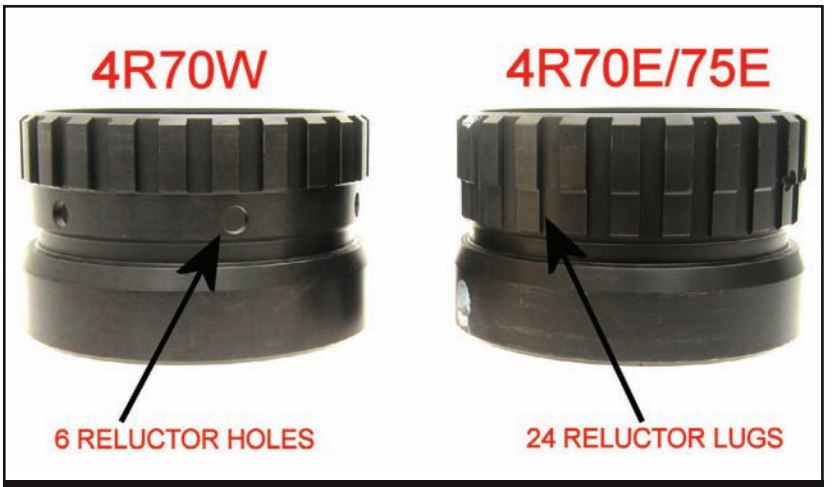

Figure 16

year (figure 15). The new sensor uses the 24 extended parking pawl lugs for the exciter ring; the old sensor used the six holes machined around the ring gear (figure 16).

Mismatching an early ring gear in a late transmission will reduce the output speed sensor signal by 75%, so the transmission won't shift out of first gear. Using a late ring gear in an early transmission will produce an output speed signal 400% faster, so the transmission will shift into fourth gear by the time you hit 10 MPH. No interchange possible.

Rear Hub and Shaft

The output shafts and rear hubs are fully interchangeable. The only difference is the speedometer drive gear that's machined into the shaft. A late shaft without a gear won't work in early applications with a vehicle speed sensor.

Bearings

The new case-to-rear hub and front hub-to-sun shell bearings are wider (figure 17), but height has remained the same. The sun gear-to-sun shell bearing has changed from one piece to a two pieces (figure 18), and the combined thickness of both pieces has increased by 0.040". If you want to use the later bearing in earlier models, you'll also have to use the late-style sun shell and sun gear. Ford sells a complete service kit under part number 4L3Z-7D234-AA. All other bearings and the pump washer have remained the same.

That about covers it: I hope this edition of *Playing with Fire* covered any questions you may have had on interchanges between these units. If there's anything else you'd like to know, drop us a line and we'll be happy to answer your questions.

Until then, remember: Pay attention to the design of the part in question when working with interchanges, and chances are good you won't get burned when *Playing with Fire!*

A special thanks to Roger Rodriguez at Payless Transmissions in Fresno for his help with this article.

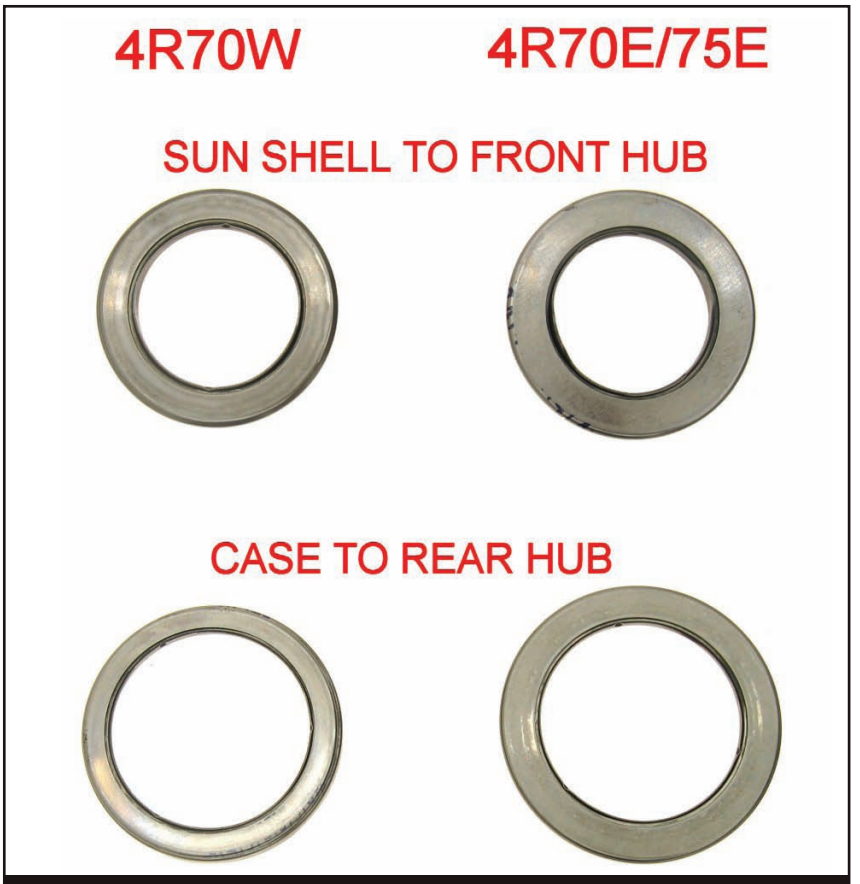

Figure 17

Figure 18