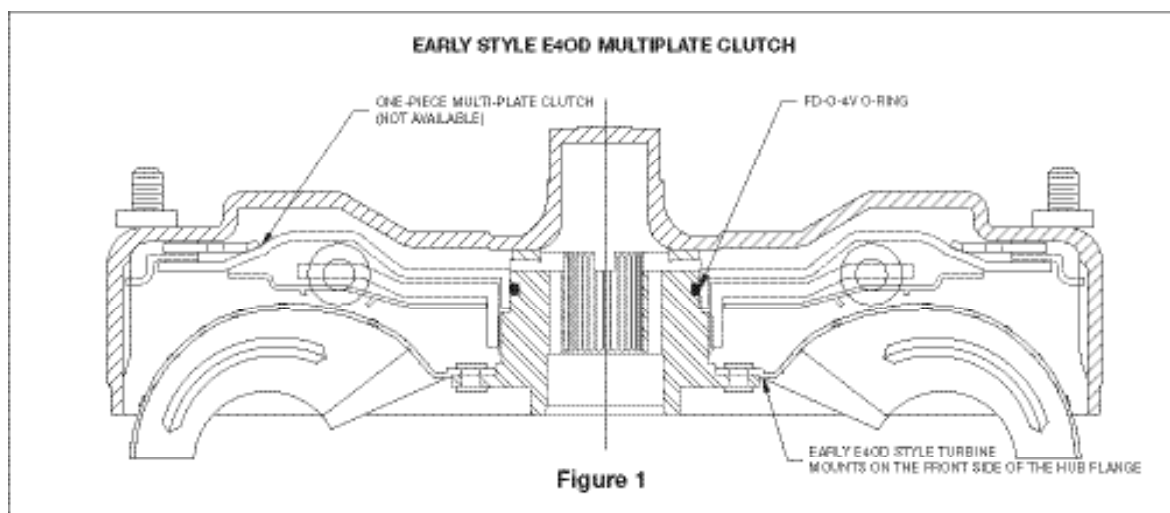


# New options for rebuilding the E4OD/4R100/5R110W Converters

by Mike Morin

**W**e often talk about E4OD and 4R100 converters as if they're the same thing. When our article on E4OD converters appeared in our last catalog, the options were limited in rebuilding the E4OD multi-plate or grob converter. Ford redesigned the E4OD converter piston, damper clutch, turbine and turbine hub when it switched to the 4R100 transmission design, but left the rest of the parts in the converter the same. The old E4OD multi-plate clutch is difficult to repair because it is a one-piece design that must be disassembled to replace the friction rings (*see Figure 1*).



This multi-plate clutch is not available and, to make matters worse, the E4OD turbine isn't compatible with the new turbine hub and 4R100 multi-plate clutch. The only rebuild option was to change this converter to the single friction piston damper with stiffer springs (*see Figure 2*). However, this is not always the preferred method because clutch torque capacity is reduced by using only a single friction clutch.

There are now two new ways to repair this converter. First, the Sonnax FD-HT-40HSK kit will adapt the E4OD turbine to the later 4R100 multi-plate clutch design by means of a special turbine hub, reinforcement ring and associated rivets. This kit is used with the 4R100 multi-plate clutch assembly, FD-DA-13 (*see Figure 3*).

The second method is to replace the E4OD turbine with the Sonnax 4R100 turbine FD-TA-1. This requires using the Sonnax turbine hub FD-HT-33HS along with the multi-plate clutch assembly FD-DA-13 (*see Figure 4*). This upgrade will make your E4OD converter identical to the late 4R100 design.

## 4R100 multi-plate upgrades

Sonnax has offered heavy-duty forged billet front covers since 1999. These covers were designed for the single friction clutch only and could not be used with the multi-plate clutch. Since the high torque diesel and gas engines use the OEM multi-plate clutch, a splined version of this converter cover was needed. The new Sonnax billet cover FD-CC-17S offers both the spline feature for the multi-plate clutch and thicker walls for extra strength. The shaped spline on this cover is taller and provides more engagement than the OEM cover grob spline, and that extra spline engagement reduces wear on the cover spline and splined ring. The Sonnax cover is designed to take the abuse from the extra torque produced in a chipped or modified engine. A billet cover should also be considered for vehicles towing heavy loads (*see Figure 5*). Sonnax also offers a four-long-stud spline cover, FD-CC-17L4.

Along with these new covers Sonnax now offers three new low stall OEM impeller assemblies: the FD-IM-1 low stall (105K) with hub base slots for use with a wear plate and plas-

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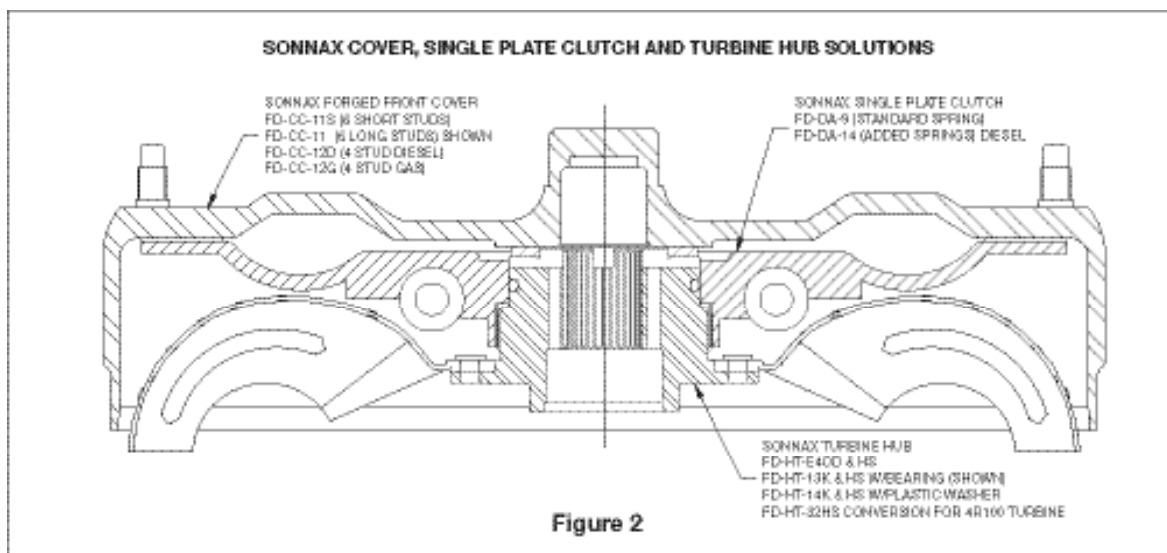


Figure 2

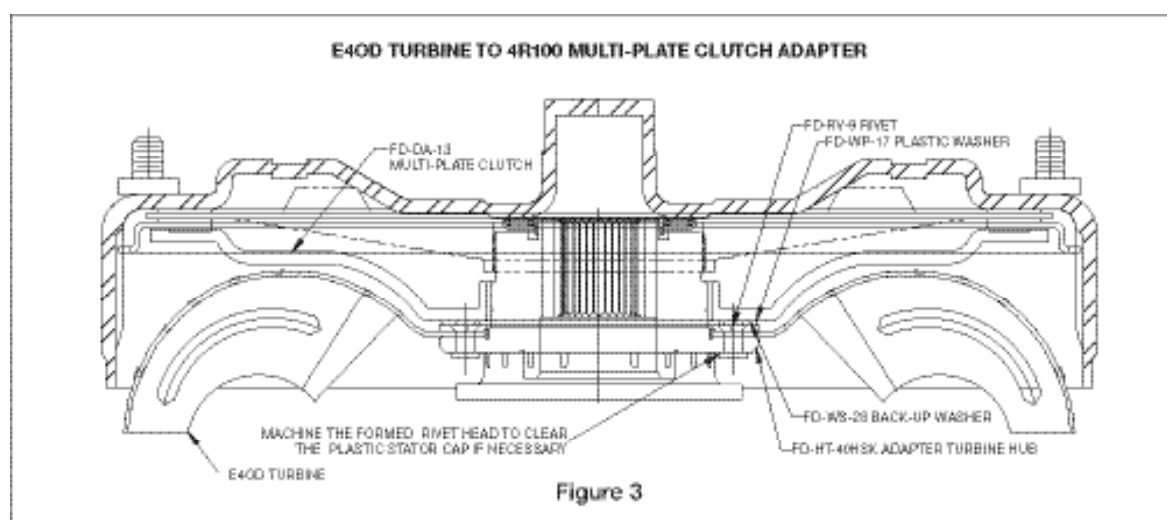


Figure 3

tic stator cap; and FD-IM-1L low stall (105K) without hub base slots for use with a bearing and steel stator cap. If you are building a converter for a modified engine that produces at least 560 ft.-lbs., you should consider using the Sonnax FD-IM-5 extra low stall (95K). This is the same impeller used in the 5R110W converter (see Figure 6). These impellers come complete with impeller hubs.

#### 4R100 single clutch upgrades

Sonnax also offers the impeller assembly FD-IM-4 for the high stall (140K) converter. This impeller can be used with the 4.9, 5.0, 5.4 and 5.8 liter Ford gas engines.

#### 5R110W torque converter

With the new 6-liter Power Stroke diesel and 5R110W transmission out since mid-2003, demand is starting to grow for rebuilt converters. This converter is yet another version of the 4R100 converter with minor improvements and a lower stall impeller (95K). The layout of the Ford 5R110W converter can be seen on page 58 of this catalog.

The most significant external change between the 4R100 and the 5R110W converters is the shorter cover pilot. The 5R110W converter should not be used in 4R100 applica-

tions. The 5R110W cover is thicker than the 4R100 and has a 6mm stamp on the back side. Sonnax offers the OEM stamped cover as part number FD-CC-18. Sonnax also has a forged billet cover, FD-CC-21S, for this application. This cover offers the same benefits of taller spline teeth and thicker walls as the 4R100 forged billet cover. Again, a billet cover is recommended for chipped or modified engines and for engines towing heavy loads.

If the impeller assembly is damaged, Sonnax offers FD-IM-5, the 5R110W impeller designed to work with the torque produced by Power Stroke 6-liter diesel engines. The 4R100 impeller will NOT work in this converter, as the stall speed will be too high.

The slots on the impeller hub are no longer needed and have been removed. Internally, Ford has replaced the plastic stator cap and wear plate on the impeller side with a steel stator cap and enclosed needle bearing. Sonnax part numbers FD-WS-27 and FD-N-9.

#### Past designs and rebuild options

In 1997 Ford introduced the grob front cover with the multi-plate clutch damper design. This design has three friction rings in a single piece assembly. This converter retained

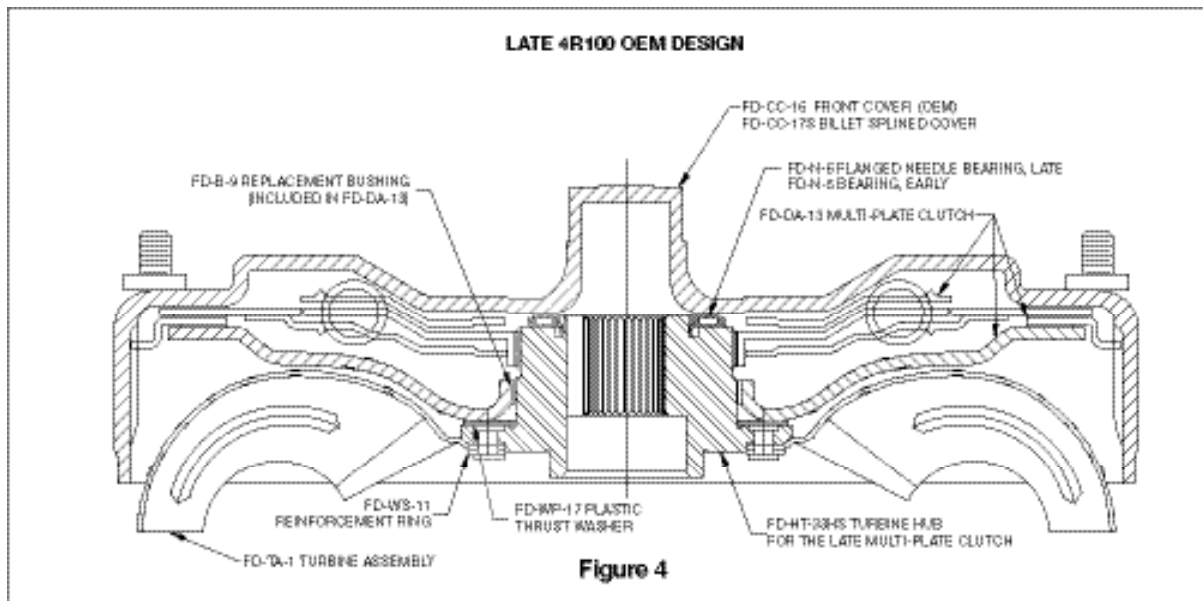


Figure 4



Figure 5

the original E4OD turbine and turbine hub design with the o-ring seal (see Figure 1). As noted earlier, it is difficult to replace the friction rings on this design because the damper assembly must be disassembled. Many rebuilders still convert this design to the heavy-duty single clutch by using a Sonnax forged cover (see Figure 2).

### Splined piston with seal ring and two friction rings (design problem)

Around 1998-99 the piston was designed with splines on the O.D. and a seal ring on the I.D. This design didn't work well because the piston was allowed to move around too much in the converter. This eventually caused severe wear on the splined O.D. of the piston, which caused it to rattle. Ford sent out a tech bulletin to replace these converters because of the excessive clearance. This is a two-piece multi-plate assembly. (See Figure 7).

This assembly can be fixed in two ways: Use the late OEM multi-plate clutch design with Sonnax turbine hub FD-HT-33HS (see Figure 4) or if the clutch assembly is damaged, the FD-HT-32HS turbine hub can be used to convert to a single clutch unit (see Figure 2).

### Splined friction disk with bushing in piston

Around 1999 the splines on the O.D. of the piston were removed and the seal ring was replaced with a bushing on the I.D. A third friction disk was added to a splined ring, making the assembly three pieces (see Figure 3). The tight fit between the piston bushing and the turbine hub greatly reduces excessive movement of the piston and provides a seal. This design is currently used on late 4R100 and current 5R110W converters.

A flanged bearing was added to provide extra engagement on the turbine hub. Under hard engine braking conditions the distance between the front cover and turbine can increase too much, allowing the needle bearing to fall off the turbine hub. This allows the bearing to get pinched and crushed between the cover and turbine hub, a major converter disaster. Ford's solution was to add a flange to the

### E4OD/4R100/5R110W IMPELLER IDENTIFICATION

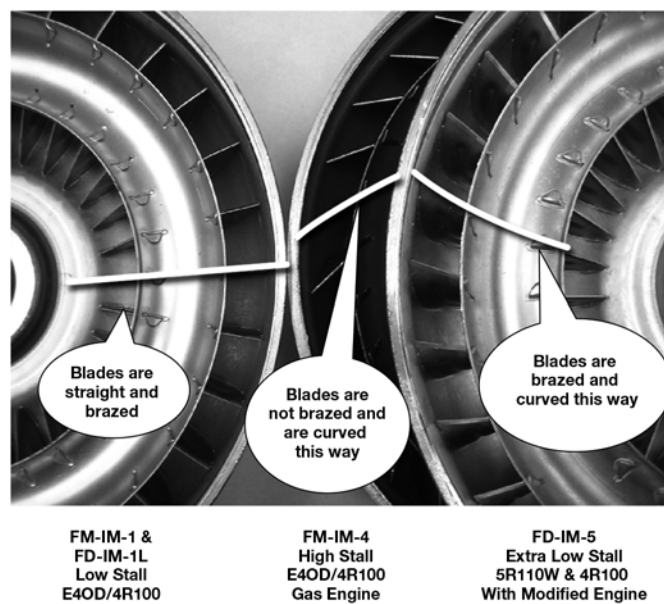
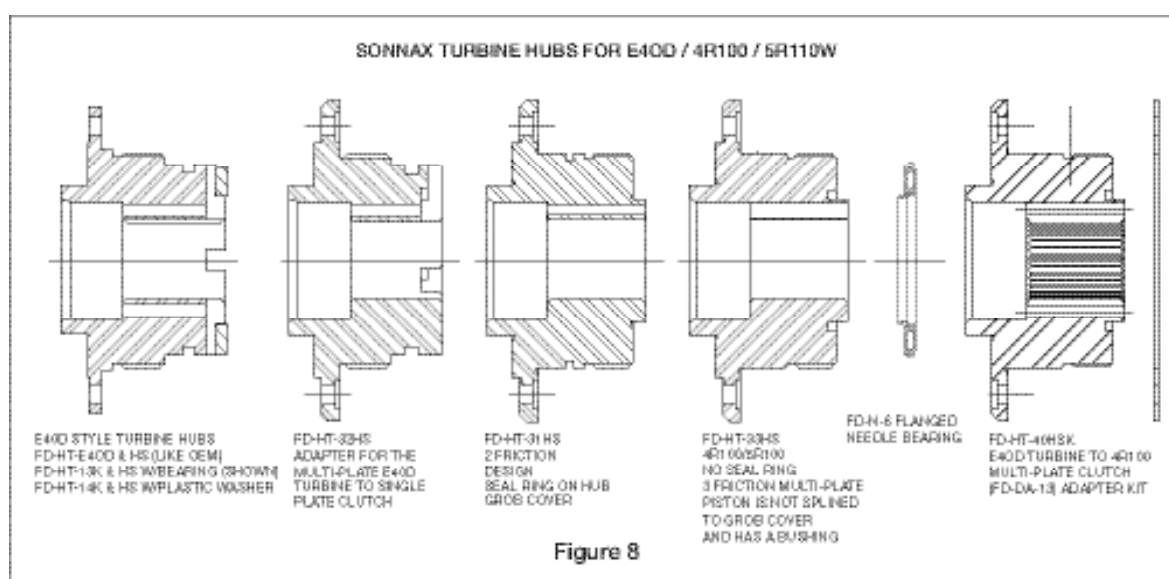
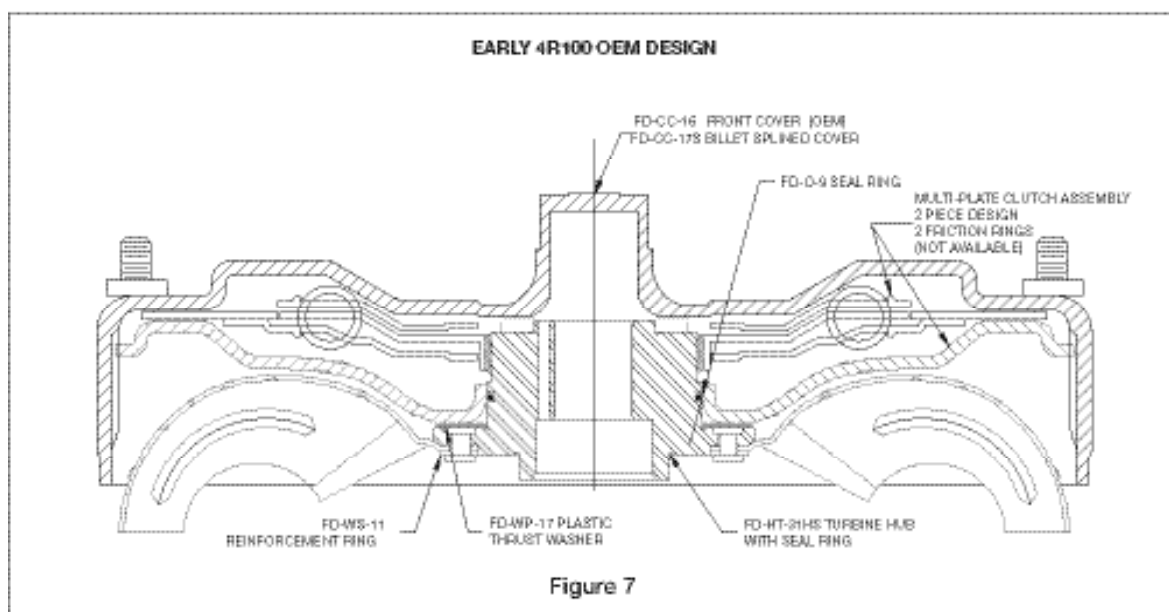


Figure 6



bearing, lengthening the engagement and avoiding the problem. The Sonnax turbine hub has added the undercut necessary to use this needle bearing. The Sonnax part for this late-style bearing is FD-N-6.

The seal ring style 4R100 turbine hub cannot be used with the new bushing style piston. Too much clearance between the turbine hub and bushing inside diameter will leak too much fluid. The leak will prevent the converter piston from applying and releasing completely. The seal ring groove in the middle of the turbine hub will also wear into the soft bi-metal bushing and prevent the piston from moving freely. Sonnax turbine hub FD-HT-33HS is designed to function properly with the bushing style piston.

#### 4R100 Piston Release Flow Problems

The Ford 4R100 multiplate clutch converter does not have piston release oil flow passages to the outside diameter of the turbine hub, like the single clutch converter. Ford has intentionally allowed extra clearance between the front

cover and the needle bearing to allow the piston release oil to flow between the two and thus apply pressure on the whole diameter of the piston. The Sonnax billet cover is also designed with this extra clearance for oil flow. This clearance must be maintained; otherwise the flow is reduced and the lockup piston is released too slowly, *See Figure 4*.

It has come to our attention that some converter rebuilders reduce this clearance by machining the reaction surface on the cover to improve needle bearing life. This is not a good practice as it significantly reduces piston release flow. Reduced flow can cause the clutch to drag on the cover too long. Symptoms are converter overheating, lock-up cover surface turning blue and premature clutch failure. This may cause a 1728 scanner code. Ford has designed the 5R110W turbine hub so that the piston release oil exits on the outside of the needle bearing, thus not requiring the extra clearance. Because they lack the cross-drilled oil holes, 4R100 turbine hubs cannot be used in 5R110W units.