



by Larry Frash

## Familiar Failures and Faithful Fixes for the Mazda FN4A-EL and Ford 4F27E

The FN4A-EL/4F27E was first introduced in the 1999 Mazda Protégé. These transmissions are used in a variety of Mazdas, and in the Ford Focus. Overall, this has been a fairly dependable unit, and is reasonably easy to rebuild when it does wear out. But ever since the first one rolled off the assembly line, these transmissions have continued to experience a few common problems. In this edition of *Transmission Therapy* we'll cover three of the most common wear problems known to cause major failures in these transmissions.

### Stator Support Bushing Wear

The stator support bushings support the turbine shaft (figures 1 and 2), but they also separate the TCC apply and release pressures. With lockup released, converter charge pressure is delivered between the converter clutch and the apply surface (the front converter cover). This hydraulic pressure is called *converter release pressure*, and that pressure is what keeps the converter clutch from applying.

When conditions are right for lockup to apply, the converter release pressure is exhausted. Converter clutch apply pressure is always applied to the back of the torque converter clutch; the only thing that keeps it from applying is the release pressure. Once the release pressure exhausts, converter clutch apply pressure is able to apply the converter clutch.

When the stator support bushings are worn, they can allow converter apply pressure to leak into the release side of the converter. When this occurs,

Always check this bushing for wear



Worn stator support bushings allow converter apply pressure to cross leak into the release circuit causing lockup slippage

Figure 1

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Figure 2



Figure 3



Figure 4

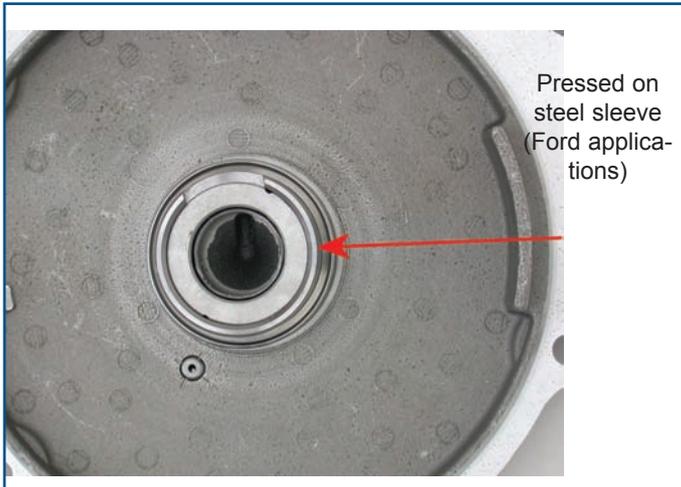


Figure 5

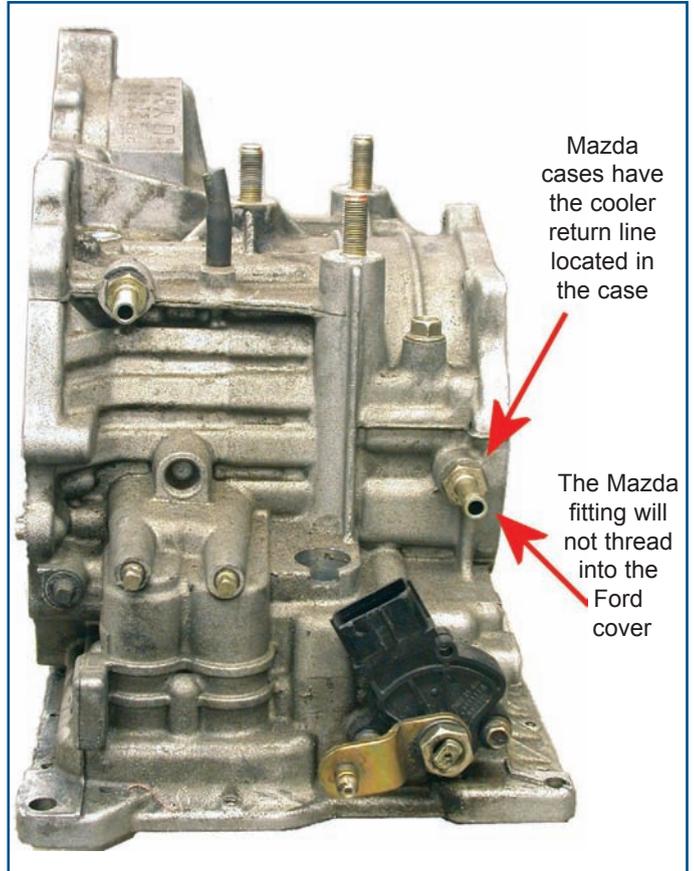


Figure 6

converter release pressure can't exhaust fast enough, so it keeps pressure on the release side of the converter clutch. This prevents the converter clutch from fully applying, which causes the converter clutch to slip.

To avoid this problem, always check for wear between the stator support bushings and turbine shaft, whenever you're rebuilding one of these transmissions. If you find more than 0.0015" clearance, replace the bushings. These bushings are made by Omega Machine & Tool, Inc. and are available from a number of sources in the aftermarket.

Once you've replaced the bushings, slide the stator shaft into place and recheck the clearance between the shaft and the bushings; while not particularly common, it is possible for the shaft itself to wear and need replacement.

## End Cover Wear

It's not uncommon to see wear in the end cover, around the top direct

clutch ring land area (figure 3). On Mazda applications, the end cover is aluminum and is hard coat anodized around the ring land area (figure 4). This hard coating is designed to prevent the rings from wearing into the soft aluminum. Once the thin anodized coating wears through, the ring wears into the bare aluminum, destroying the cover.

The end cover used in Ford applications is also made out of aluminum, but this cover has a pressed steel sleeve for the ring land area (figure 5). And, since the direct clutch rings ride against the steel surface, ring land wear isn't a problem on Fords.

So, to avoid wear in the end cover, you should always use the Ford cover. Whenever you rebuild an FN4A-

EL/4F27E transmission, check the end cover carefully to see which one is being used. Never reuse the hard coat anodized cover, even if there's no sign of wear in the ring area. Always replace the Mazda-style end cover with a Ford cover, part# XS4Z-7222-BA. This cover will work on all models, with a few minor modifications:

The Mazda version of the FN4A-EL/4F27E transmission has the cooler return line located in the case (figure 6). From there it's routed through a passage to the end cover to provide

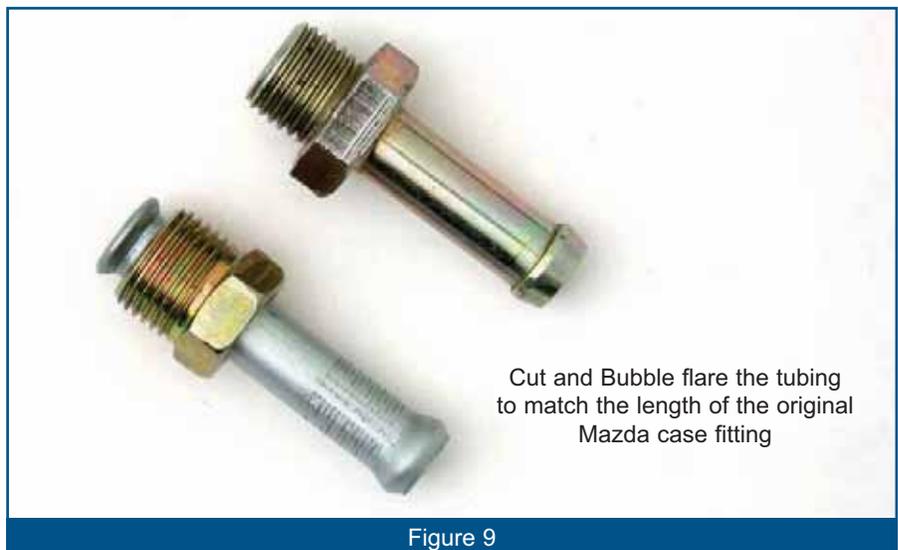
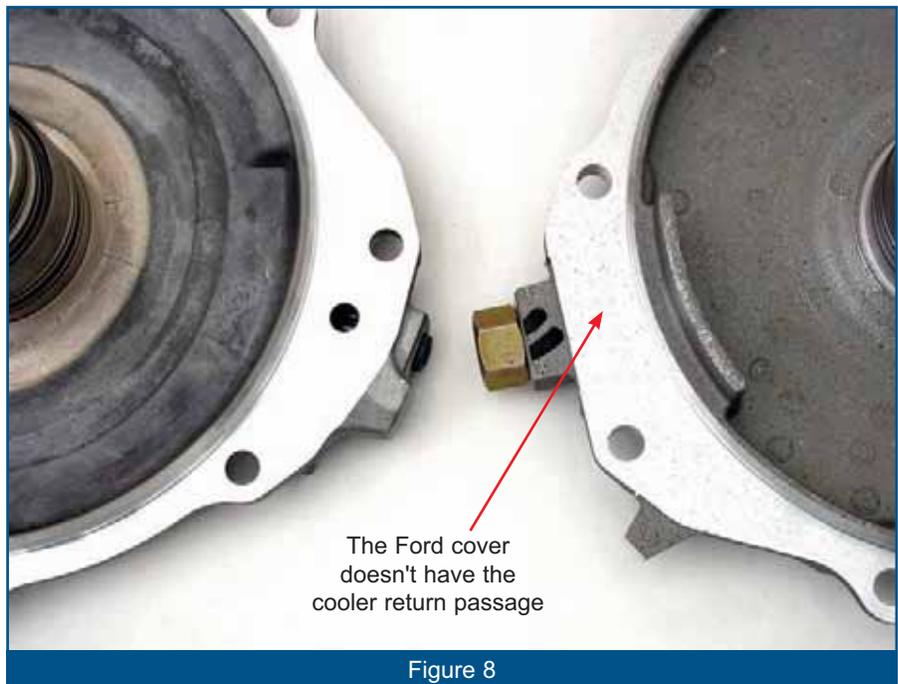
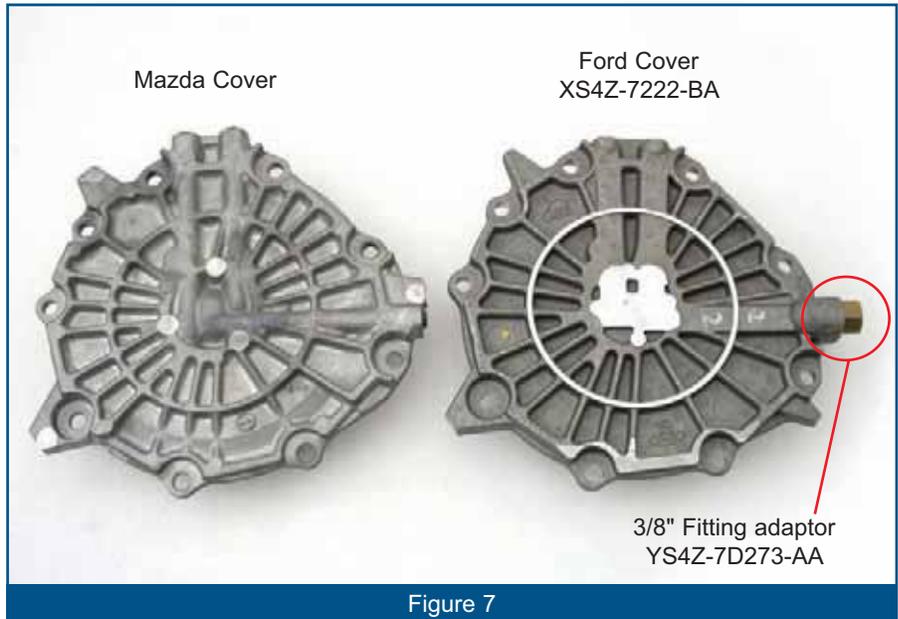
**To adapt the Ford cover for use with a Mazda transmission, you must reroute the cooler return circuit.**

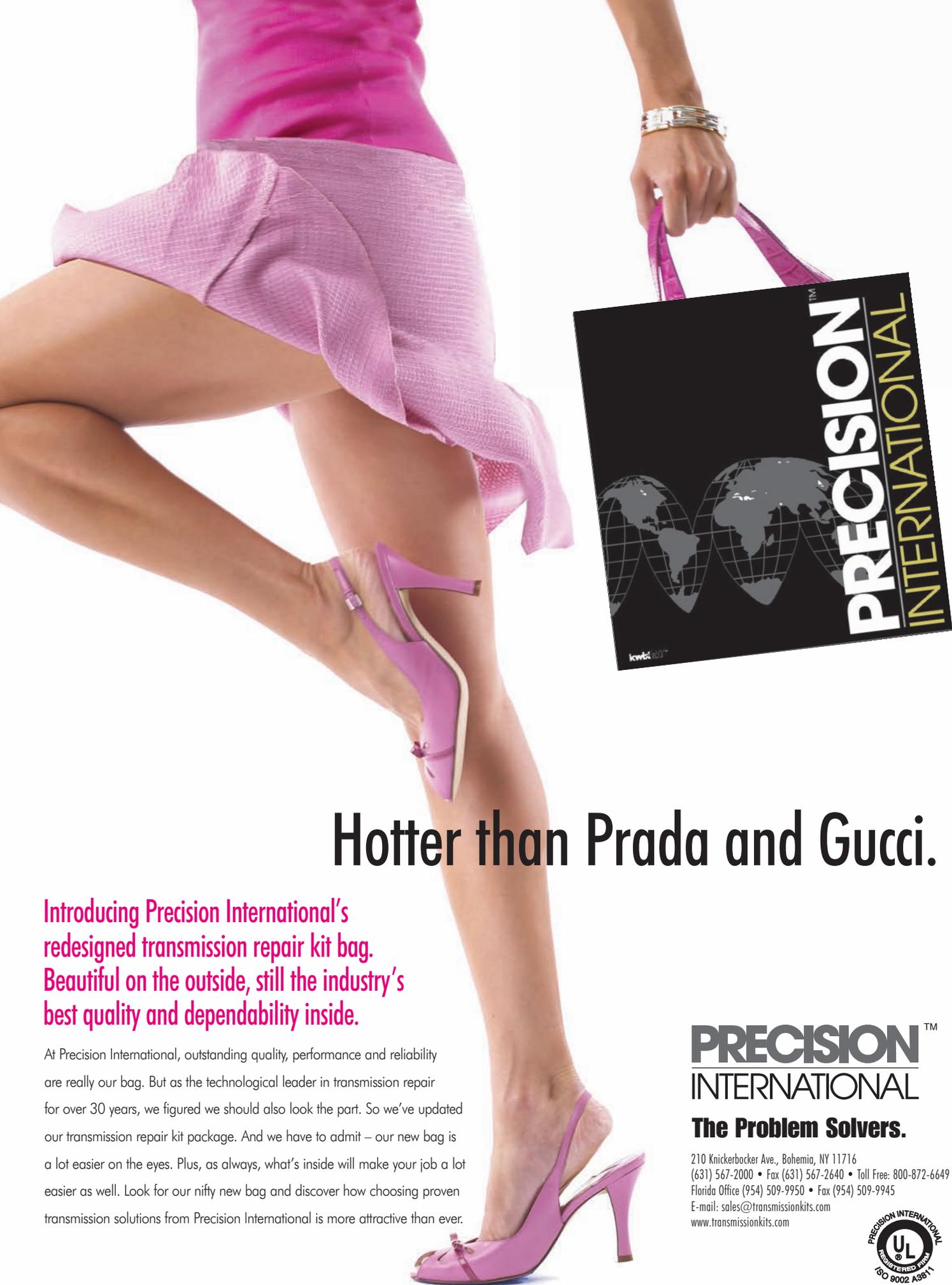
lube oil to the transmission. The Ford version of this transmission has the cooler return line threaded directly into the end cover. Because of this, the Ford end cover doesn't have the cooler return passage from the case that the Mazda cover has (figure 7 and 8).

To adapt the Ford cover for use with a Mazda transmission, you must reroute the cooler return circuit. Here's how:

Remove the original cooler line fitting from the Mazda case to use it as a template to make a new fitting. The threads are different and won't fit the Ford end cover. When you order the Ford end cover, also order a 3/8" fitting adaptor from Ford, part# YS4Z-7D273-AA. Install it into the Ford end cover.

Using a piece of 3/8" cooler line, cut and bubble flare the tubing to match the length or the original Mazda case fitting (figure 9). As you can see, a bubble flare isn't a full flare. It's only flared enough to hold the rubber hose onto the line when it's handling pressurized fluid. Pay attention to this when flaring the replacement line: If you flare the tubing too much, the flared portion of the tube will be too sharp and will eventually cut through the rubber hose.





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Figure 10



Figure 11



Figure 12

Because the Ford end cover ring lands are made of steel, always use the Ford rings. The part number for the reverse clutch rings is YS4Z-7D020-AA (figure 10). The part number for the direct clutch rings is YA4Z-7D019-AA (figure 11).

endplay for this transmission is 0.010" to 0.019". Corrective shims for adjusting endplay are available from Ford, and range from 0.062" to 0.098" (figure 12).

When you bolt the end cover to the transmission, the Ford cover will block



Figure 13

Any time you change hard parts in a transmission, always check the endplay. Proper

the original cooler return passage in the case. This leaves you with two options: You can either plug the case passage or leave it open; it really doesn't matter, since there's no oil there anyway. But always leave the original fitting out of the case, so the customer or the next technician who works on the car doesn't think you left a hose off the transmission.

When you install the transmission into the vehicle, connect the cooler

**But the most common symptoms caused by a loose servo pin are a slip in 4<sup>th</sup> gear and 4<sup>th</sup> gear ratio codes.**

return hose to the fitting you made for the end cover, and you're finished: The new end cover should work fine, and you shouldn't have any more wear problems in the ring area.

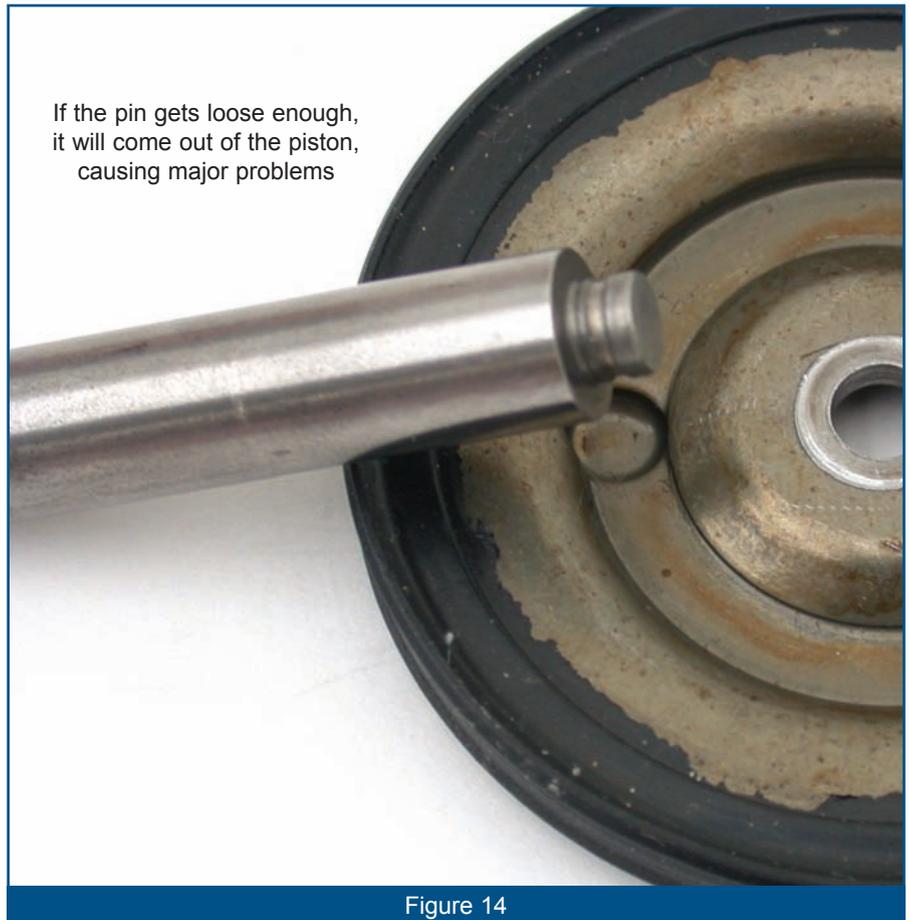
### Intermediate/Overdrive Band Servo

The intermediate/overdrive band servo is a molded rubber piston with a pressed-in pin (figure 13). Problems occur when the pin becomes loose in the piston and causes leaks between the apply side and the release side of the servo. Symptoms of a loose pin can include:

- Ratio errors
- 2<sup>nd</sup> gear slip
- 2-3 flare
- 3<sup>rd</sup> gear slip

But the most common symptoms caused by a loose servo pin are a slip in 4<sup>th</sup> gear and 4<sup>th</sup> gear ratio codes. If the pin gets loose enough, it will come completely out of the piston, causing major problems (figure 14). To avoid problems from this servo, always replace the servo with a new one during every rebuild.

Other than these few problem areas, the FN4A-EL/4F27E is a fairly bulletproof transmission. Just follow the normal rebuild procedures, and pay particular attention to the areas we've covered here, and you shouldn't have any problem with these units.



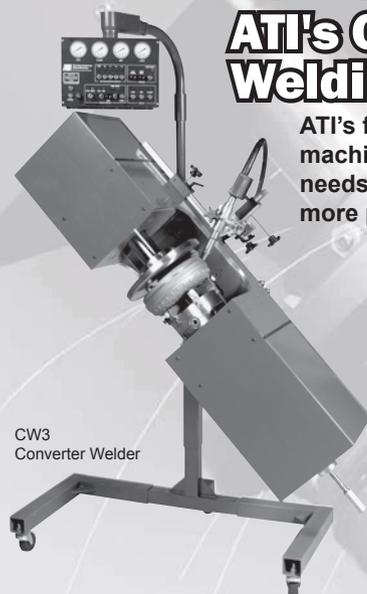
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Figure 14

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