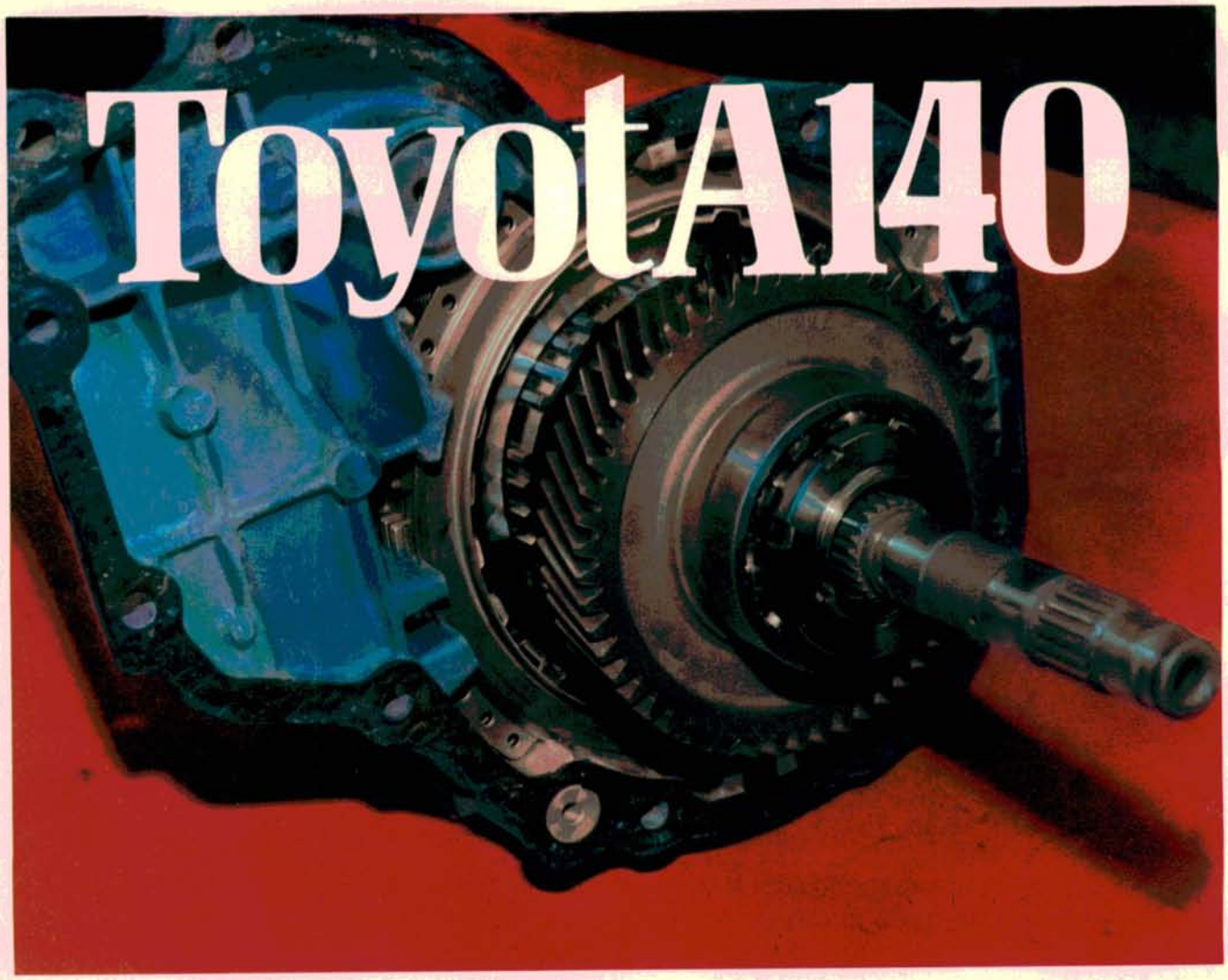
ToyotA140



Back in the May 1988 issue of *Import Service*, we gave you an assortment of overhaul and repair tips for Toyota Corolla front wheel drive transaxles. We promised you then that we would return for a close look at the other units in Toyota's front wheel drive transaxle family. So we're back this month with an overhaul overview of the four-speed automatic transaxles used in Toyota's Camry models.

Toyota was one of the first companies to offer a four-speed front wheel drive transaxle. Instead of adding a fourth gear to an existing three-speed transaxle, Toyota started out by designing a new four-speed automatic for the introduction of the Camry. Then they worked backward to build a three-speed version for the Corolla based on the four-speed model.

Before we go any further, we should do our best to explain Toyota's transaxle identification system. That way you'll know which transaxles we're talking about and what cars you're likely to find them in. Our earlier article covered the A130L and A131L three-speed lockup units that were used in the Toyota Corolla and Chevy Nova.

This article will pick up with the A140E (electronically controlled shifting) and A140L (hydraulically controlled shifting) four-speed automatic transaxles. Both transaxles also have locking torque converters. These transaxles have been installed in Camrys since their introduction and are also used in later front wheel drive Celica models.

Originally, the A140L transaxle was only installed in diesel-engined Camrys. Since the 1987 model year, standard model Camrys have also used this transaxle. Deluxe model Camrys still use the electronically shifted A140E.

A very similar transaxle, called the A141E, is installed in the mid-engine, rear wheel drive MR-2. And a beefed up version of the A140E, called the A540E, has been installed in all Camry models with V6 engines built since February 1988.

Don't be confused by all of these numbers. All of these transaxles belong to the same basic family. While internal parts for each will differ slightly, the repair information included in this article should apply to all of them.

We aren't going to take you through every step in the overhaul procedure. You'll need a service manual or lots of previous experience for that. Our purpose here is to point out the tricks and traps that can make the difference between a successful overhaul and a very long afternoon.

Keep Your Eyes Open

Probably the most important thing to find out when you're overhauling a transaxle is why it failed in the first place. The sooner you find out the cause of the problem, the less time you'll have to spend worrying about whether your overhaul is going to last.

To help you out in this area, we spoke with several transmission specialists. They told us the areas they give special attention to during an A140 overhaul. To call these problem areas wouldn't be fair to Toyota's design engineers, since many of the specialists' tips apply only to early versions of this transaxle. Several improvements have been made and all of our sources agree that they see far fewer problems with later versions of the A140.

We've included the following tips in the introduction because they wouldn't fit our photo caption format. Keep your eyes and ears open for these symptoms both before and during an A140 overhaul.

Locking Torque Converter Operation

The locking torque converter engagement on early (1983-84) transaxles seemed harsh to some customers. The converter begins locking up as early as second gear under certain conditions. It must unlock before each following upshift or during changes in engine load.

This makes for a very busy transmission that may seem like it's shifting all the time. Later electronic transmission controls are more finely tuned. The converter doesn't lock up quite so soon, and engages more smoothly when it does.

1-2 Shift Quality

The 1-2 shift seemed too harsh to some 1987 Camry owners, especially when the engine was cold. The harshness should diminish as the transmission warms up. Some techs tried to adjust (loosen) the transmission's throttle cable to compensate. This caused the transmission to shift a little softer and reduced the 1-2 harshness, but ran the risk of burning the clutch plates due to slippage.

Consult a manual for the proper throttle cable adjustment procedure. The cable should be checked and adjusted at the wide open throttle position. If you do try to loosen the cable adjustment slightly to reduce shift harshness, make sure you move the cable adjusting lock nuts 1 mm or less. Any more than that and you're risking other problems.

Bushing Wear

As we'll describe in our photo captions, worn bushings are responsible for many early A140 problems. If you're lucky, your customer will bring you his car before bushing wear has completely disabled his transaxle. If he does, the transaxle may have any of the following symptoms:

- **Chatter on takeoff.**
- **Sluggish takeoff in forward or reverse gears.**
- **Slow engagement of reverse gear, especially when the transaxle is cold.**
- **Slipping shift into third.**
- **Slipping in high gear.**

You will save your customer's money if you can convince him that now is the time to repair a transaxle with these symptoms.

Shift Solenoid Operation

On A140E (electronic shift) transaxles, it may be hard to determine whether some shifting problems are caused by electronic or internal transaxle problems. For a quick check, disconnect the transmission control unit connector. The transmission should now take off in high gear. The ECT control unit is located in the dash, below the right hand speaker.

Two shift solenoids mounted on the valve body are actuated by the ECT control unit to control the A140E's forward shifting. In Drive range (overdrive switch on), the ECT control unit actuates the shift solenoids in the following order to select the forward gears:

- **In first gear, the number 1 solenoid is on and the number 2 solenoid is off.**
- **In second gear, the number 1 solenoid is on and the number 2 solenoid is on.**
- **In third gear, the number 1 solenoid is off and the number 2 solenoid is on.**
- **In fourth gear, the number 1 solenoid is off and the number 2 solenoid is off.**

Using a wiring diagram, it's possible to actuate each of the shift solenoids in the proper sequence to shift the transaxle through the gears without using the ECT control unit. If you can't get all of the gears using this method, you know that the problem is inside the transaxle, not the ECT control unit.

Shift solenoids can fail intermittently, causing unusual shifting characteristics. The transmission may shift normally under a light load, but slip under heavier acceleration. This may be caused by a solenoid that's not opening and closing cleanly. Solenoids open to vent pressure when actuated, allowing the valve body's shift valves to function.

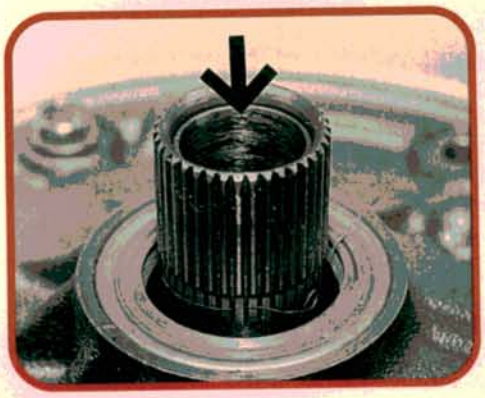
Properly operating shift solenoids should make a solid clunking noise when they are actuated. You can hear it right through the pan. A solenoid that makes a dull clunking noise is probably on its last legs.

Thanks to John Wozniak at Freudenberg-NOK for his technical assistance on this article.

—By Karl Seyfert

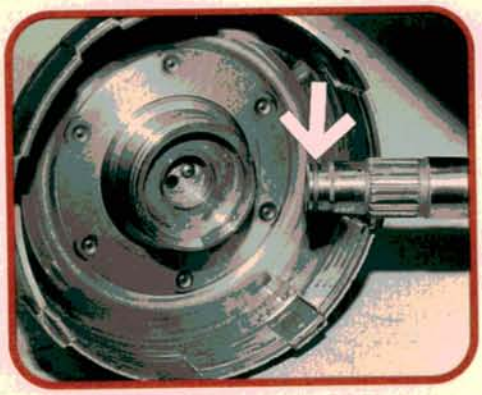
1

Early A140s used babbit-style bushings in the clutch drums and oil pump bushings. Worn babbit bushings are one of the main reasons early A140 transaxles fail. Later A140s have longer wearing bronze bushings. Aftermarket bronze replacement bushings are available to repair early A140s.



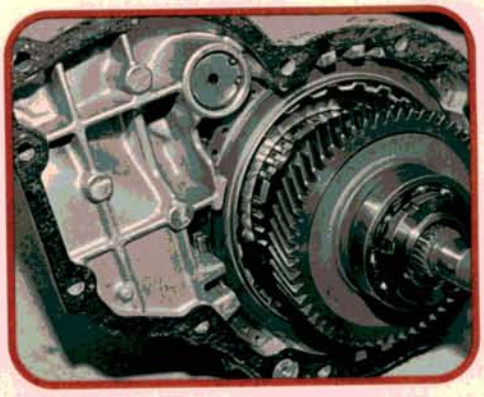
2

Worn internal oil pump bushings will let the internal transmission parts wobble as they rotate. This causes wear and fluid leakage in other parts of the transaxle further down the line. Worn pump bushings can cause the overdrive unit at the other end of the transaxle to fail, as we'll describe next.



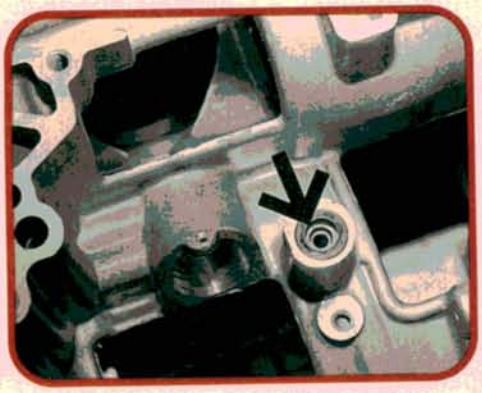
3

The inner pump bushings support the forward clutch shaft. A wobbling forward clutch will wipe out this seal (arrow) at the tip of the overdrive unit's intermediate shaft. The leaking seal keeps lube oil from passing through the forward clutch to the overdrive unit. Lack of lubrication will cause overdrive melt down.



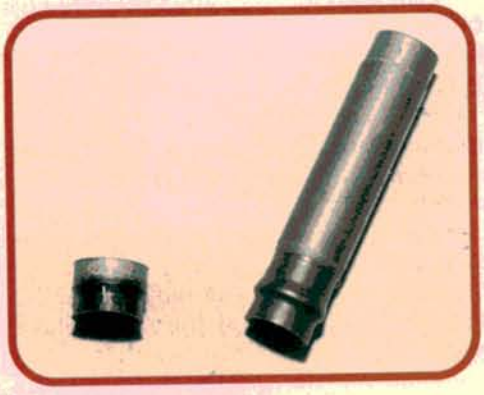
4

If the overdrive unit fails, there probably won't be any useable parts left when you get the transaxle apart. The heat often welds everything into a solid mass. All internal parts are available separately, or can be purchased in kit form from aftermarket suppliers.



5

A backed out intermediate brake (B2) cup seal can cause second gear slippage on early A140s. The B2 cup seal is driven into the case to prevent pressure loss between the valve body and the intermediate brake. Don't forget to install this second seal (arrow) between the passage and the valve body.

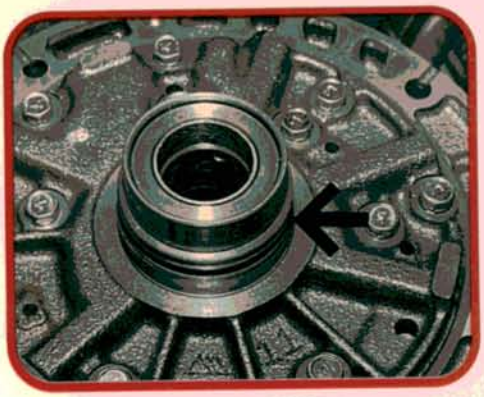


6

Later B2 seals (right) have an extension which reaches almost to the bottom of the valve body and prevents the seal from backing out. Some techs had problems with the early seal (left) because they installed it either too deep or too shallow. Both mistakes will cause pressure loss to the B2 circuit.

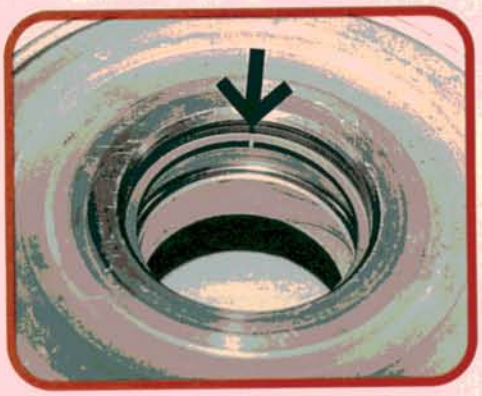
7

Check each clutch drum for wear in the area where the sealing rings ride (arrow). Dirty fluid combined with the Teflon sealing rings can wear grooves in the drum's sealing surface. High mileage transaxles may also show this wear, even with clean fluid. Clutch drum replacement is the only fix.



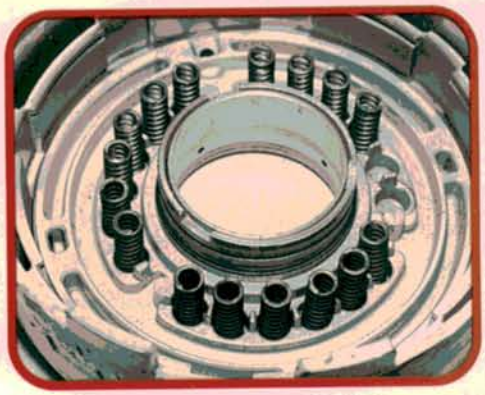
8

Also check all sealing ring lands for wear. Worn bushings or fluid contamination can round off or damage the ring lands' sharp edges. Sloppy ring lands can make for loose fitting Teflon sealing rings. Damaged ring lands can also keep the sealing rings from turning or sealing properly.



9

Measure the new sealing ring end gap before installation. Stretch the new seals by hand first, then place them inside the clutch drum in their installed position. Measure the seal's end gap the same way you measure piston ring end gap. Maximum allowable seal end gap is 1 mm (0.040 in).

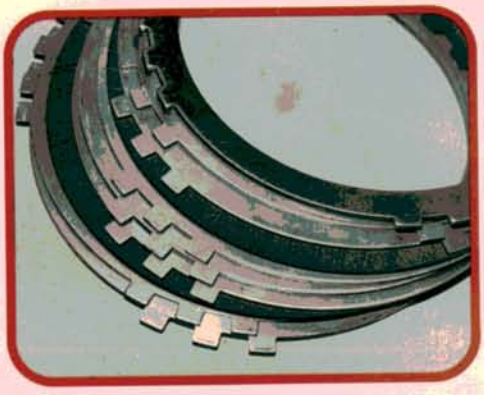


10

Keep a close eye on the number and location of the clutch drum release springs (we've already removed two here). Different length springs are used in each of the clutch drums. Either disassemble your clutch drums one at a time, or make sure you keep each set of release springs in a separate place.

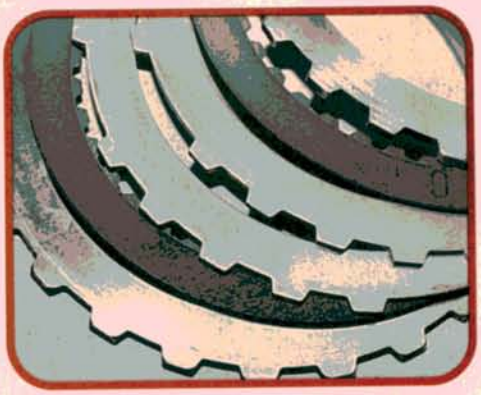
11

The steel plates used for the intermediate brake (B2) and low/reverse brake (B3) look very similar. Side by side measurement of the teeth will prevent confusion. Low/reverse plates have wider teeth, and intermediate plates have thinner teeth. Some plates are notched, some aren't. Don't use these markings as a guide.



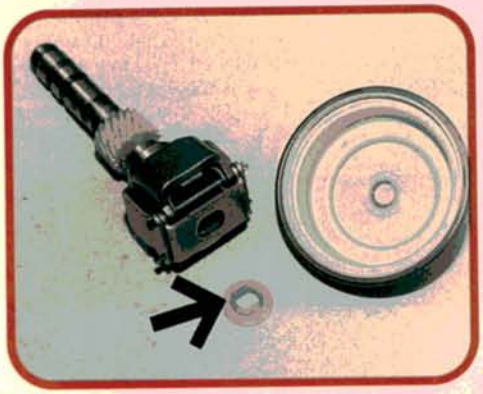
12

Different versions of this transaxle may have back-to-back steel clutch plates (sometimes as many as three back-to-back) in different brake and clutch packs. The steel plates are used to help dissipate heat. Both overdrive clutch packs use extra steels to handle the extra heat in this area.



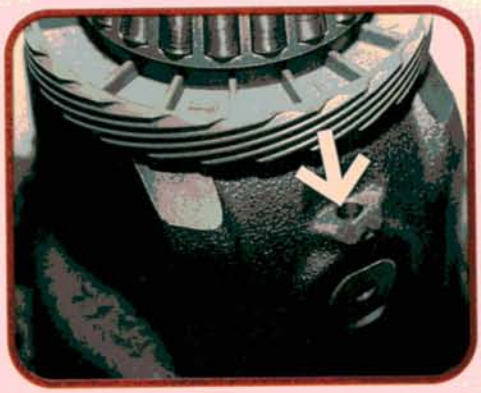
13

If the fiber faced plates in clutch packs or brakes are burnt and you also find clutch material in the pan, suspect the torque converter clutch. Friction material from the clutch may flake off and clog the transaxle's pressure regulator. The stuck regulator lowers line pressure, causing the clutches to burn.



14

This nylon thrust bushing sits on top of the governor to keep the governor located in the case on A140L transaxles. If the bushing wears out or is lost during an overhaul, the governor will walk out of the case, gouging the governor cover and causing a loss of governor circuit pressure.



15

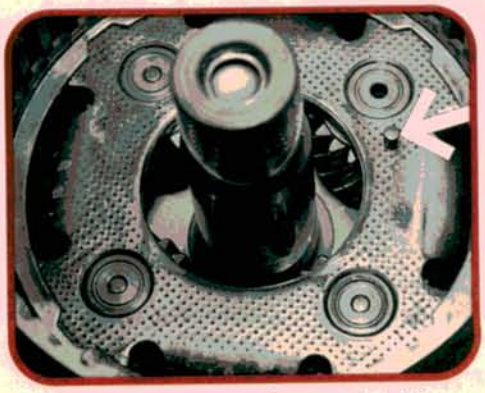
It's a good idea to remove and replace the differential spider gear shaft roll pin (arrow) during an overhaul. These pins have been known to break, which lets the spider gear shaft slide out of the spinning differential housing. A loose spider gear shaft will really do a number on the inside of the transaxle case.

16

While you have the roll pin out, carefully inspect the spider gear shaft. Early, gray colored shafts may become worn in the area where the spider gears ride. Later models have a gold colored shaft which seems to hold up better. Gold shafts may be installed on early transaxles.

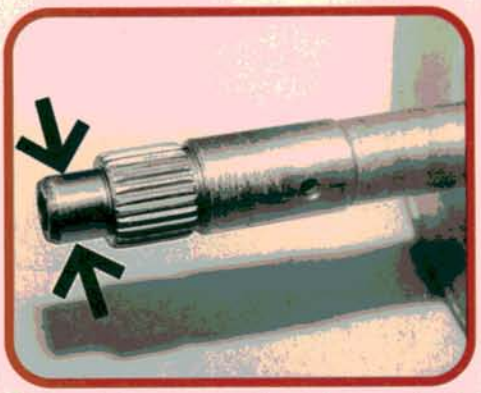
17

Pay careful attention to the intermediate sprag's installation direction. The sprag should turn freely in a clockwise direction when it's installed correctly. The whole transaxle will lock up when it tries to shift to third gear if the sprag is installed backward.



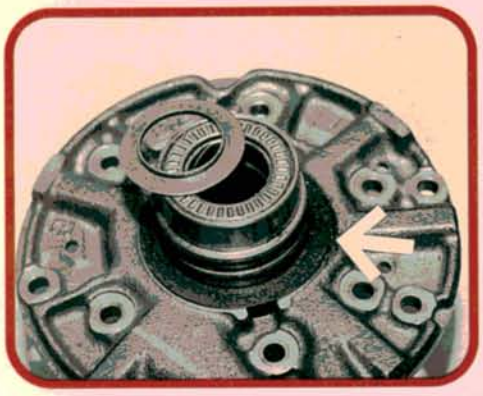
18

Small pins (arrow) at the center of the overdrive unit's planet pinions direct the flow of lubricating oil toward the pinions. If one of the pins falls out during an overhaul, the oil will leak through the open hole. No lube oil gets to the pinion and bearing, causing a planetary failure.



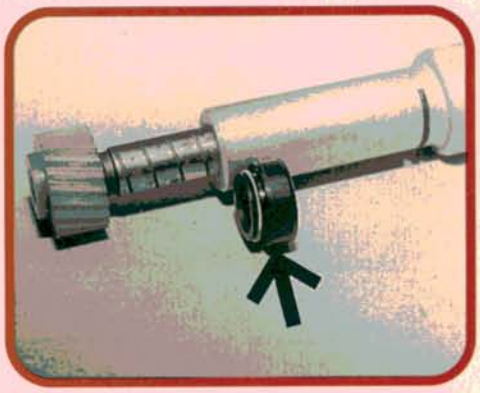
19

Many of the parts in the A140 are similar to parts used in other Toyota transmissions. Look for an extension at the tip of the forward clutch shaft (arrow) to identify locking torque converter versions. There's no o-ring seal, so any wear can cause fluid pressure loss and locking torque converter problems.



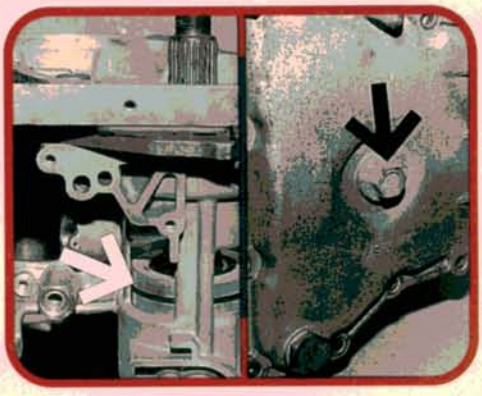
20

This plastic thrust washer at the back of the oil pump (arrow) controls overall transaxle end play. Only two shim sizes are available. So if you get the transaxle back together and the end play is wrong, you've probably got something assembled wrong. Check for proper installation of the thrust bearings and races.



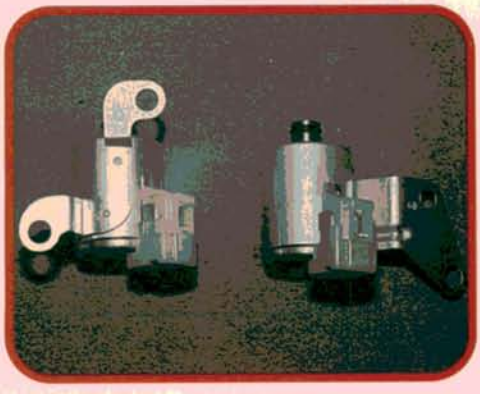
21

The transaxle case has separate fluid reservoirs for the transmission and differential. A leak at the speedometer gear seal (arrow) can drain the fluid out of the differential section and into the transmission. The transaxle will shift normally right up until the differential fails from lack of lubrication.



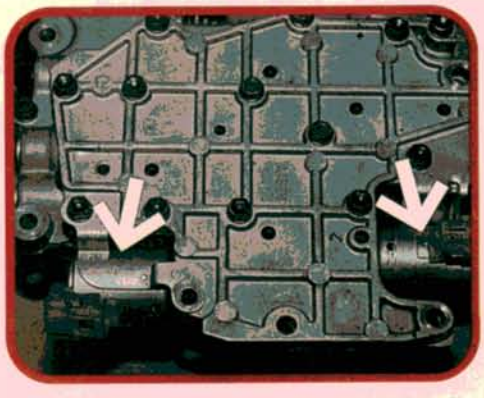
22

Fluid can also pass between the two halves of the transaxle at the drive pinion seals. Two large seals, an aluminum collar, and an o-ring surround the pinion to keep the fluid where it belongs (left photo). Don't forget to fill the differential reservoir with ATF after your overhaul (right photo).



23

Intermittent operation of the electronic shift solenoids on A140E transaxles can cause strange shifting complaints. The solenoid electromagnets can also attract stray metal or may simply die of old age. When activated, the solenoids dump pressure, allowing the valve body shift valves to move.



24

Two shift solenoids control all four gears on the A140E. The ECT computer selects each gear by a different combination of "on" or "off" signals to the shift solenoids. For a memory aid, remember the number 1 solenoid (right) has one mounting bracket, the number 2 solenoid (left) has two brackets.