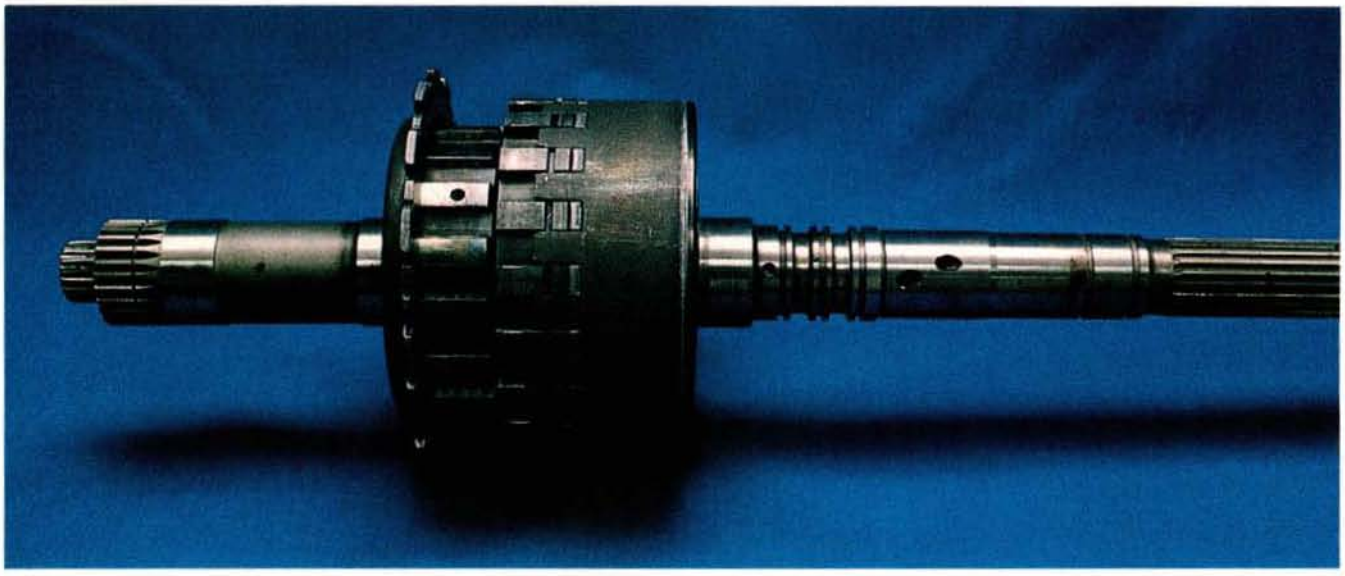
Toyota A-40 Series Automatic Transmissions



The Toyota A40 transmission family began as part of a joint manufacturing venture between Aisin Seiki of Japan and Borg-Warner of the United States. This partnership produced the first A40 transmission in Japan in July 1972.

Nearly all rear wheel drive Toyota automatic transmissions produced since then can trace their heritage back to the A40. It's really the granddaddy of them all. As improved transmissions with new features such as overdrive and lock-up converters were added, they were still based on the original A40 design.

A distant cousin of the A40 family was produced in England by Borg-Warner for use in Volvos. While this transmission looks very similar to the A40, parts should not be interchanged.

The A40 is an all-clutch transmission; there are no bands. Two of the clutch packs are used to hold various parts of the planetary gearset, and the other three hold or release one-way sprag clutches and brakes. All five clutch packs use o-ring type piston seals. There are no lip-type seals.

Because of the many transmission models produced over the years and the number of different cars that they were installed in, it's very important to determine exactly which one you're working on. Use the

tag on the side of the transmission or check the vehicle I.D. plate on the firewall for positive identification.

For a listing of the Aisin Seiki I.D. numbers and their equivalent transmission numbers, refer to the chart on page 7 of the June 1988 issue of *Import Service*.

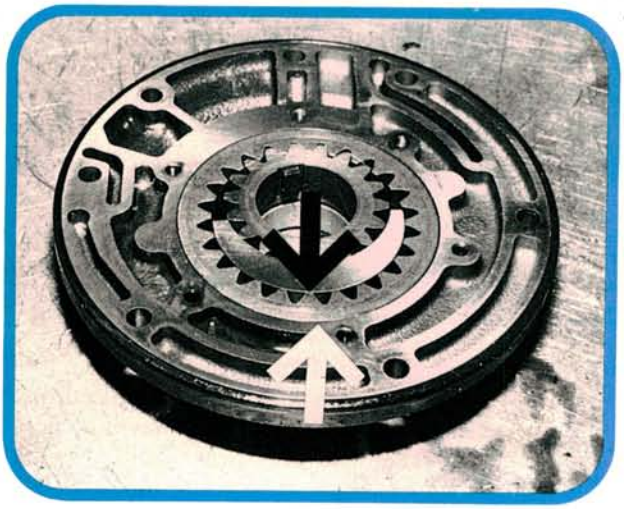
It can be pretty embarrassing to order parts for an A40 and then find out later that you're working on an A41. Parts may look the same but may have been changed enough to cause some serious problems. If you are using an overhaul kit that includes enough o-rings and sealing rings to do more than one transmission version, carefully compare all of the new parts to the old ones.

Transmission specialists tell us that the A40 family of transmissions is really pretty sturdy. If there is a weakness, it would be the o-ring seals used in each of the clutch packs. Outer o-ring seals on both the forward and direct clutches on the A40 were known to roll out of their grooves, causing fluid pressure leakage. Toyota corrected this problem by increasing the cross sectional dimension of the o-rings on the A41. This was done in August 1981.

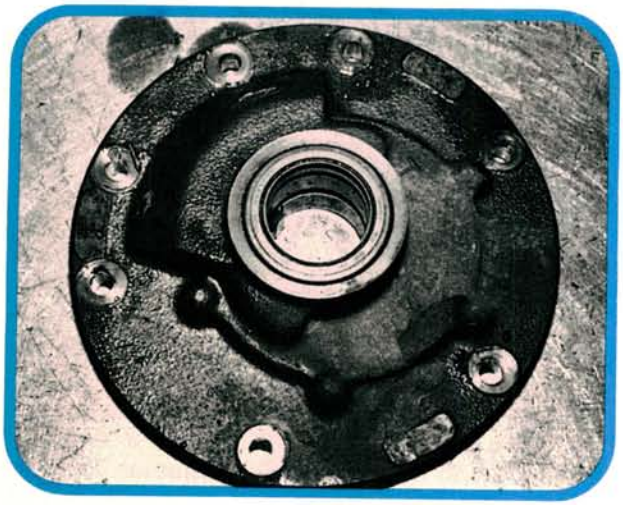
Failure of an A40-series transmission will more likely result from wear than from anything else. Carefully inspect all parts for wear during an overhaul.

We're going to concentrate on the three-speed A40, A41, and A43 transmissions in this article. As we go along, we'll point out the differences between them and any problems that are peculiar to each. The photographs of an A40 that follow outline the important areas to look at on all three transmissions during the course of an overhaul.

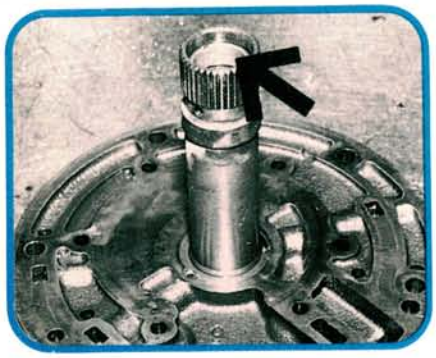
—By Karl Seyfert



1 Inspect the oil pump torque converter bushing. Engine-to-transmission misalignment or excessive flexplate runout will cause increased bushing wear. Inspect the mating surface of the torque converter for seal or bushing wear. New bushing inside diameter is 38.113 to 38.138 mm. Wear limit is 38.188 mm.

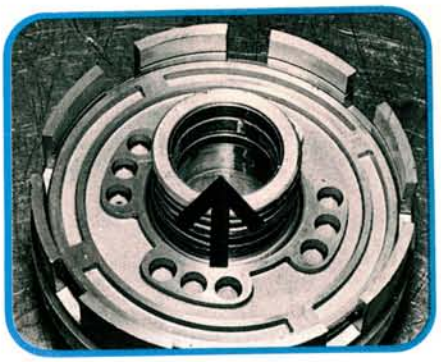


2 Inspect the pump clearances. The driven gear-to-body (white arrow) and driven gear-to-crescent (black arrow) wear limits are both 0.30 mm. The clearance limit from the face of the gears to the cover is 0.10 mm. Match-mark the gear faces with a penny before removing them from the pump housing.



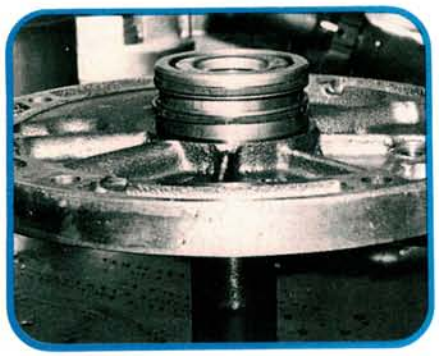
3

Check the bushings (arrow) inside the oil pump stator support. The bushings support the input shaft which is attached to the forward clutch. The maximum wear limit is 21.577 mm. Excessive bushing wear may cause stator support breakage. Inspect the pump body for scoring caused by the pump gears.



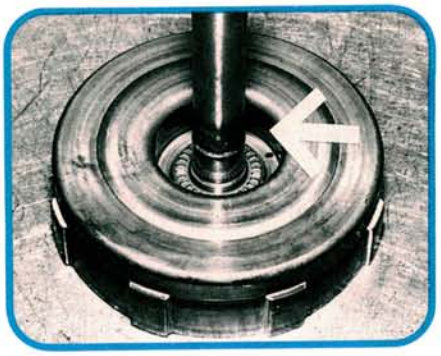
4

The bushings on the inside of the center support (arrow) are the most prone to wear. The bushings support the end of the sun gear shaft and handle the input torque from the forward and direct clutch units. Wear limit for the bushings is 36.461 mm. Inspect the sun gear mating surface also.



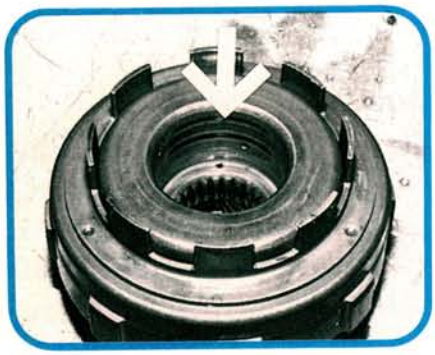
5

Check the rings and ring lands at the rear of the oil pump which seal the oil passages to the forward clutch. When replacing these rings on an A40, avoid confusing them with the three sealing rings on the center support. They have different wall dimensions. All rings have the same dimensions after August 1981.



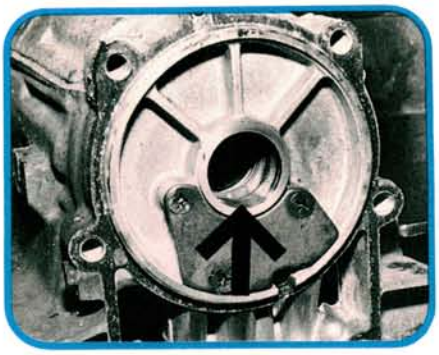
6

Inspect the mating surface of the forward clutch in this area (arrow) for seal ring wear. While most oil pumps used steel sealing rings, you may find a few that used Teflon rings. Leakage in this area would cause transmission slippage during acceleration.



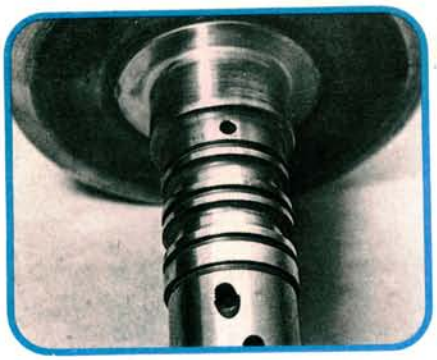
7

Check the sealing surface of the direct clutch (arrow) for wear. The center support uses three steel sealing rings because of the double piston setup on the direct clutch. One piston is applied in third gear drive range. Both pistons are applied in reverse for increased holding ability.



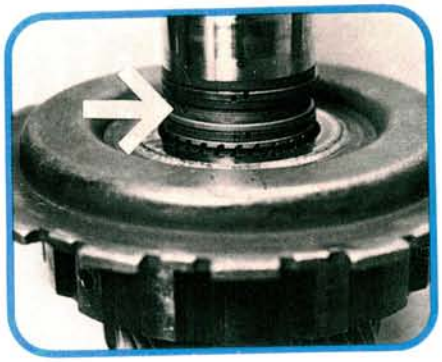
8

The rear of the case contains the oil passages (arrow) for the governor circuit. The metal sealing rings on the output shaft can groove the bushing. The output shaft bushing has the same inside diameter as the converter bushing in the oil pump. Maximum diameter wear limit is 38.188 mm.



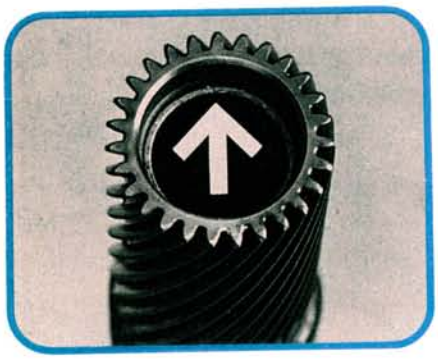
9

Inspect the area around the governor seal lands for bushing wear. The governor passages must be clean and free of any debris. The governor clips to the output shaft and covers the two large passages. Disassemble and clean the governor; they've been known to stick.



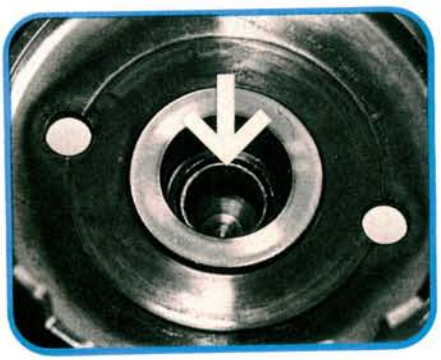
10

The hollow sun gear shaft is backed out so that you can see where the seal rings fit. Oil passes through this opening (arrow) to lubricate the rear one-way clutch. Check the inside surface of the one-way clutch assembly for wear. The A43 uses larger diameter sealing rings.



11

The bushings inside the sun gear shaft often wear. This bushing (arrow) and its mate at the other end of the sun gear support the intermediate shaft which is splined to the rear internal ring gear of the planetary gear set. New bushing inside diameter is 21.501-21.527 mm. The wear limit is 21.577 mm.

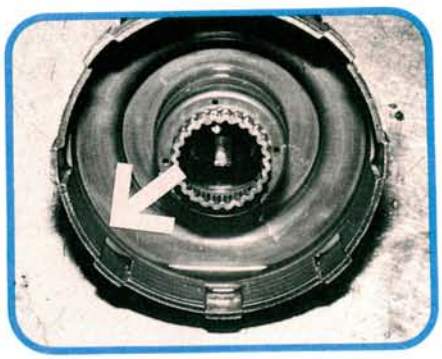


12

This bushing (arrow) in the output shaft centers the end of the internal ring gear on the rear half of the compound planetary gearset. It's a small bushing with a big job to do. New bushing dimensions are between 18.001 and 18.025 mm. The maximum wear limit is 18.076 mm.

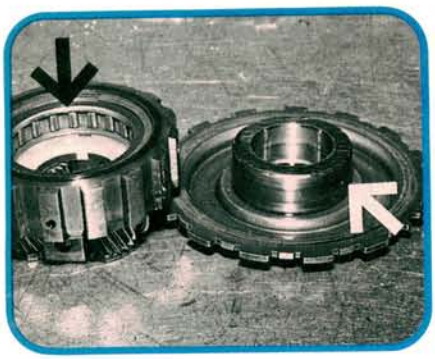
13

An out of balance or damaged driveshaft may have caused excessive extension housing bushing wear. Inspect the driveshaft yolk for roughness or seal grooving. Maximum bushing wear limit is 38.075 mm. Replace the extension housing seal and polish minor abrasions on the driveshaft before reinstallation.



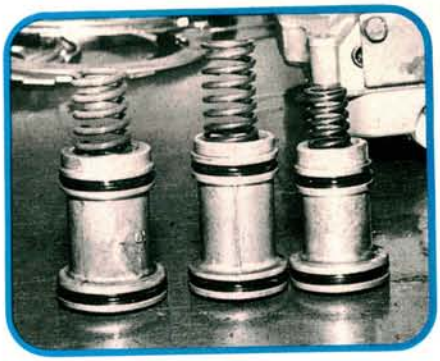
14

The direct clutch is splined to the end of the sun gear shaft. Check the internal splines for wear. Also check the internal sealing area (arrow) of the clutch drum for roughness. O-ring seal failure was a problem on A40s. O-ring dimensions on the A41 and A43 were changed to correct this problem.



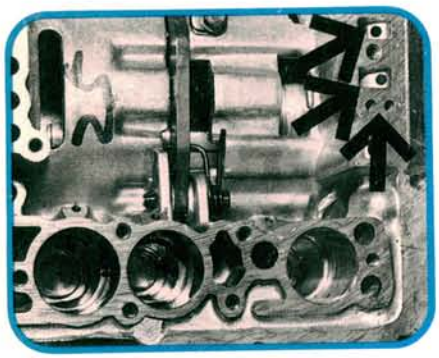
15

Inspect the inner surface (right arrow) of both one way clutches carefully. As this surface and the sprags that grip it become worn, the one way clutch may not hold properly. When dismantling the sprag assembly (left arrow), note the proper direction of the sprags for reinstallation.



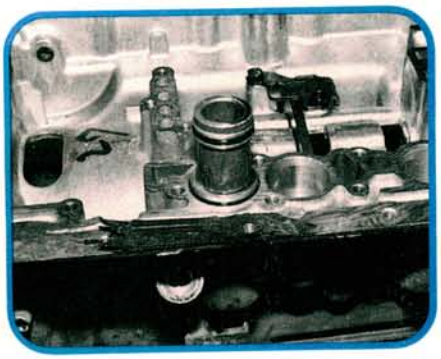
16

Use low pressure compressed air to remove the three accumulator pistons. The pistons and springs are very similar in size and shape and are easily confused. Match-mark the accumulator pistons and their bores and then put them aside in a safe place with their springs.



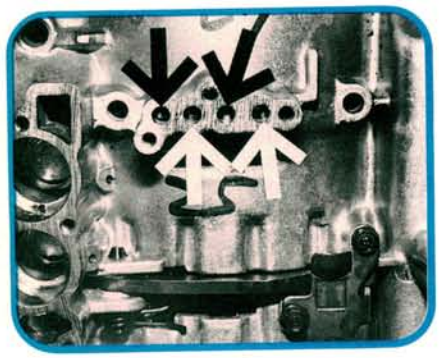
17

Inspect the accumulator bores for any signs of wear. Use these passages (arrows) in the case for air-checking before installing the valve body. Starting at the top are: the discharge passage for the governor, governor supply passage, and low-reverse inner and outer piston supply passages (right and left).



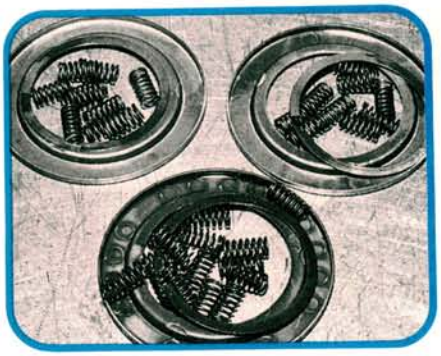
18

Check each accumulator piston's fit in its bore. Turn it upside down to check the fit of the larger diameter seal first. Two of the three pistons are very close in o.d. size. Make sure that you install the correct new o-ring on each piston. Lubricate the o-rings with transmission fluid to prevent damage.



19

The passages between the valve body and the center support can also be used for air-checking. From left to right they are: the passage to the number one brake piston, the passage to the rear clutch inner piston, the passage to brake number two piston, and the passage to the rear clutch outer piston.



20

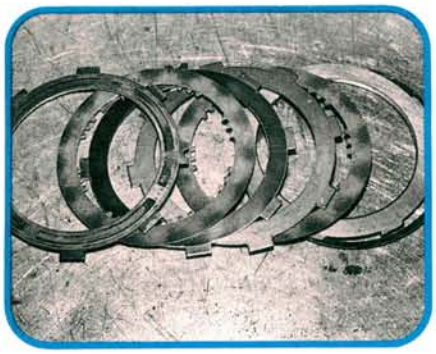
You can see the similarity between the return spring parts for the three brake pistons. They may look the same, but each set of springs is slightly different in length and spring tension. Save yourself trouble later by keeping all of these parts separate to avoid possible confusion.

21

The direct clutch is a two piston design. During third gear operation, torque demands are low and only one piston receives hydraulic pressure. When reverse gear is engaged, a sequencer valve in the valve body applies both pistons for increased holding power in this high-torque situation.

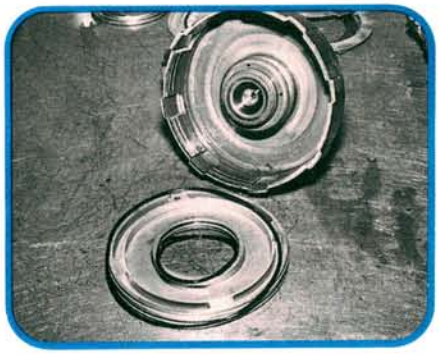
22

The low-reverse brake also has dual pistons. A sequencer valve in the valve body applies the two pistons one after the other, reducing shift shock when engaging reverse gear. The reverse brake outer piston is also applied in park. Assemble all three piston parts before reinstalling them in the case.



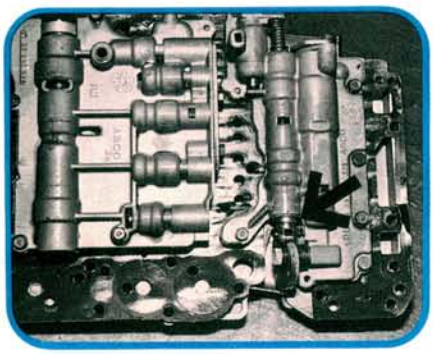
23

Different models of this transmission use different numbers and combinations of steel and lined clutch plates. Note the use of two back-to-back steel plates in the middle of this set of low-reverse clutch plates. Different thicknesses of steel plates were also used to obtain proper clearances.



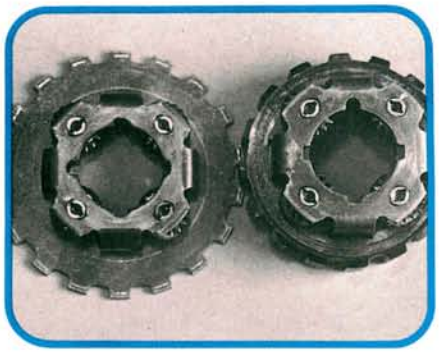
24

The outer o-ring seal cross section, clutch piston groove diameter, and clutch piston groove width on both the forward (shown) and direct clutches were changed in August 1981. The earlier, smaller o-rings will not seal properly on the later A41. Later, wider o-rings will bind the clutch piston if used on an A40.



25

Different spacer plate gaskets were used for different models. Always compare the new gaskets to the old ones. Steel check balls may wear the separator plate openings. A leaking second gear ball will cause a hard shift to second. The lack of vacuum modulator makes throttle valve (arrow) adjustment very important.



26

The A40 had some planetary gear failures, especially when it was installed in trucks. The A43 was developed to correct this problem. It featured an enlarged planetary set to handle the increased load and was used only in truck models from August 1981 until they went to four-speed automatics in 1984.