The Greasy Hands Garage Guide to Rebuilding the Triumph TR Transmission Part 1 – Disassembly

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Some of the disassembly steps do not have to be in the exact order given below, but this is the order we like to use.

Step 1 – Drain the oil and remove the top cover

Before starting, drain the oil out of the transmission. Then remove the transmission top cover by removing the eight bolts.

Step 2 – Check the Synchros

Wear on the synchro rings should be checked before disassembly. Remove the slack by pushing the synchro hub toward the ring and then measure the clearance with a feeler gauge. The Service Instruction Manual states that the clearance should be 0.035 to 0.040 for new rings and they should be replaced if the clearance is less than 0.030. Some of the new synchro rings are of dubious quality, so we normally reuse the synchro rings if they meet this criterion.

Step 3 – Remove the Rear Flange

If you have an impact wrench, you can usually just hold the flange with your hand while you remove the nut. If you use an ordinary wrench, you'll probably need some sort of flange holding tool. Sam had this nice tool made, but you could also make one by drilling two holes in a piece of angle iron. Once the nut and washer are removed, you can tap the flange off with a small

hammer or use a puller if it's stubborn. The photos show flange removal for an overdrive, which could be done as a later step.

Step 4 – Remove the speedometer drive

When there is no overdrive, the speedometer drive must be removed before the rear housing, otherwise you will destroy it (guess how we know this). If you have an overdrive, be sure to remove the speedometer drive before dismantling the rear housing. First remove the set screw. Early drives with the brass housing can be removed with a pair of pliers or a thin wrench. The later drives don't stick out from the case, so they can be removed by prying up on the end of an old speedometer cable.

Step 5 – Remove the rear housing or overdrive

Next, remove the rear housing or if an overdrive is installed, remove it (see Overdrive Disassembly). Remove the bolts that attach the rear housing to the back of the transmission. The housing has a lip near the end that can be grabbed by a bearing separator and pulled using an assembly like that in the right photo. This is my poboy puller, since all items in the assembly are from a discount tool house, except for the angle iron plate, which was easy to make.

Step 6 – Remove clutch shaft and fork

If you have an early transmission with set screws that hold the clutch shaft in position, remove them. The clutch fork is held on the shaft by a pin which is frequently broken. They usually break where the pin enters the shaft, so you can't get the fork off until you get the remains of the pin out. The orientation of the pin makes it difficult to remove the remains of a broken pin. The trick is to drill through the back side of the fork and knock the pin out with a punch. You must drill at an angle so that the drill bit will intersect the remains of the pin, which goes all the way through the shaft. It is difficult to get the right angle because the ends of the clutch fork interfere with the drill.

Our TR4 project transmission had a broken pin. We first drilled with a 3/16" bit, but only caught the edge of the pin, so we tried again with a 1/4" bit. The second attempt intersected the pin. We've done this successfully in the past, but had trouble this time. Obviously, you can't really see what's going on until you do a post mortem investigation. In this case the fork was loose enough on the shaft that we had difficulty aligning the fork and the shaft so that we could knock the pin

out. We finally gave up and cut the shaft. Once we had it out, it was easy to get things lined up and knock the pin out. The photo shows the broken pin next to a new one.

Step 7 – Remove the front and countershaft covers

Remove the four bolts holding the input shaft front cover and the two bolts holding the counter shaft cover and remove both covers

Step 8 – Remove the countershaft

First, free the countershaft from its retaining mechanism. Early countershafts are retained by a long set screw that holds both the reverse shaft and the countershaft. Later models used a large phillips head screw that holds a retaining plate, which is often broken. This screw is sometimes difficult to remove. If you can't get it loose with a screw driver, you might try using a socket wrench or an impact screwdriver (see photos).

The countershaft can now be pushed out the back of the transmission with a rod. Once it is removed the countershaft gear cluster will fall to the bottom of the case.

The early transmissions used loose needle bearings on the countershaft. In order to retain the needle bearings, cut a 3/4” OD rod or pipe to a length of about 6 1/4”. Push the countershaft out with the rod and leave it inside the counter shaft gear cluster.

The photos show some countershafts removed from various transmissions. Most of the wear is at the rear bearing under first gear. The early transmissions with needle bearings usually show less wear than the later transmissions. The shaft on the right came out of our TR6 project transmission. This transmission had fewer than 10,000 miles on a rebuild that used a new countershaft and new shell type bearings. The rear bearing had failed completely - only crumbs remained. The silvery sludge was scooped from the bottom of the rear housing.


Step 9 – Remove the input shaft

Now, with the countershaft gears at the bottom of the case, the input shaft and bearing can be driven out with a brass punch.


Step 10 – Remove the center bearing

The center bearing can now be removed. Remove the clip and washer (left photo). Drive the main shaft back about ¼ to ½ inch with a block of wood so a bearing separator can be positioned under the clip on the bearing. Use a puller to remove the bearing from the main shaft (right photo below).

Step 11 – Remove the output shaft and countershaft gears

The transmission main shaft and gears can now be withdrawn from the case (left photo below). The countershaft gear cluster can then be removed (right photo below).

Step 12 – Remove Countershaft Bearings

The following photo shows the three types of countershaft bearings: (1) 24 loose needle bearings, (2) shell bearing with 18 needles and (3) cage with 15 needles. The loose needles were used in early 3 synchro boxes. The shell type bearings were used in early 4 synchro boxes, while the open cage bearings were used in late TR6 boxes. We find that countershafts are almost always galled in late TR6 boxes and are usually in good condition with the loose bearings. The larger number of needles seems to create less wear on the countershaft. Shell bearings seem to be better than open cage bearings and may be used in place of the open cage bearing.

The loose bearings and open cage bearings are easy to remove, but the shell type bearings can be a problem. The shell bearings can be removed with a hammer and cold chisel. Profanity and gnashing of teeth may also be required. A crankshaft pilot bushing puller can also be used. The photo at right shows a SnapOn puller borrowed from our engine builder, Chad Hodges. We've also used a similar tool found at MSC Industrial (catalog no. 00084731) for about $85. We did have to do a bit of grinding on the tool, but it works just fine as long as the bearings are not pressed in too far.

Step 13 – Remove input shaft bearing

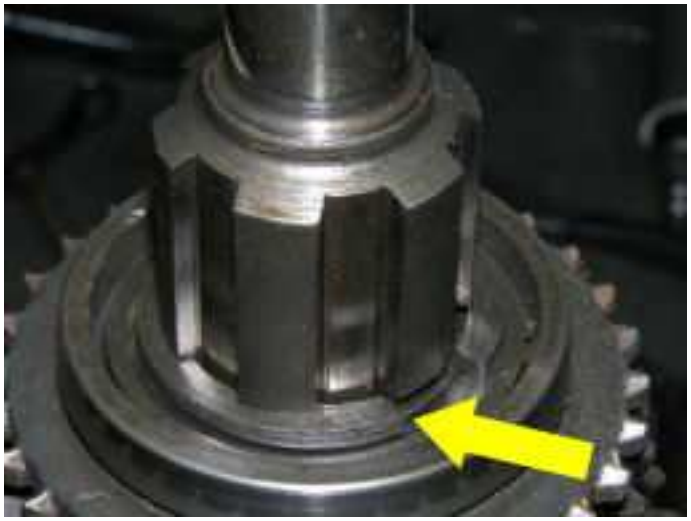
The large bearing on the input shaft can now be removed. Remove the snap ring and press or drive the bearing off the shaft (right photo).

Step 14 – Input shaft pilot bearing

Three types of input shaft pilot bearings were used. Early 3 synchro boxes used a bronze bushing. Early 4 synchro boxes used a shell type bearing and late TR6 boxes used an open cage bearing. The OD and ID of the shell bearing are 1.125 and 0.875 in, respectively. The ID of the bronze bushing is the same, so I believe the later bearing could be directly substituted for the bushing. The OD and ID for the cage bearing is 1.209 and 0.833, so it requires a different main shaft and cannot be directly substituted. Close ratio gearsets are designed for the cage type bearing, but come with a sleeve to adapt it for use with a shell type bearing and earlier main shaft.

These bearings do not turn when the transmission is in 4th gear, so are less important than some of the other bearings. You may wish to reuse the old bearing if it is in good condition. The open cage bearings are easy to remove and replace. The other two types require a blind puller like the pilot bearing puller used to remove countershaft needle bearings.

Step 15 – Remove mainshaft gears



Removal of 2nd and 3rd gears from the mainshaft requires removal of the circlip indicated by the arrow in the photo. This clip can be removed with a couple of screwdrivers and several sets of hands. You might be able to notch the ends with a Dremel tool and then use expanding snap ring pliers. I've also seen the suggestion to use a small cutoff wheel with a Dremel tool to cut the circlip.

However, if you have a Churchill removal tool the job is much easier. The photo below shows the removal tool on the left and the clip installation tool on the right. The other photos show use of the tool to remove the clip.

Once the clip is removed, the two gears, two washers and two bushings can be removed from the shaft.