

TR6 OD Box in a Stag

by Terry Hunt

With the small number of Stag's that came over the pond the overdrive gearbox is a bit of a rarity. However, there were a number of TR6 overdrives that made it so these can still be found and luckily as far as the overdrive parts go they are basically the same. I decided to do a J-type conversion on my Stag 4-speed box. Here's what I found out on the subject.

There are a couple of ways to do this.

1. Use the TR6 OD box to rebuild a 4-speed Stag box. Definitely the best option, especially the post late 1973 TR6 box as they have at least some common parts you can use in case of problems. The parts you add from the TR6 to make it an overdrive are common to both models;
2. Another option if you have a Stag gearbox, buy the parts. Both A-type and J-type Mainshafts and adaptor plates are available, you will also need to get the overdrive and top cover (or convert yours);
3. Use a TR6 OD box complete. Apparently you only need to swap out the input shaft, nose cover and sleeve but neither of the Stag input shafts are available new. However remember you are using weaker components from the TR6, and it may not be strong enough.

Differences between a Stag and TR6 Box

Internally the Stag box from the start was built stronger, especially the layshaft (or countershaft) and its thrusts. The Stag has a layshaft that is thicker at one end, has 3 bearings and uses roller type thrusts, the TR6 has only 2 bearings and solid thrusts. All Stags had steel gear bushings (but there were 2 types for the second gear) whereas the TR6 boxes used bronze bushings until late '73. The TR6 bronze top hat bushing on second gear is infamous for breaking. Whether the TR6 donor has steel or brass bushings is not important, as the mainshaft is essentially the same.

There were only two changes during the Stag's life. There are two types of Stag input shaft, the earliest type (below LD5818) has a different Helix angle on the gear, which needs to be matched to the constant gear on the layshaft. Either pair will work but keep in mind they should

ideally be a matched pair as different wear patterns can cause noise. The other main change came in the second gear bushing, from gearbox LD7888 onwards - more on that later.



Stag layshaft with roller thrusts. The shaft is thicker at one end



Input shafts - the left shaft is an early type Stag input shaft; the right a late TR6. Note the extra length of the Stag shaft

What is needed to convert to Overdrive

- An Overdrive unit
- OD mainshaft
- Adaptor plate
- Top cover with switches



Helix - note the different gear helix angles in these input shafts. Left is the earlier helix angle

- Exhaust down pipe (J-type only)
- Rear gearbox mount (J-type only)
- Overdrive type gear stick (or modify existing)

You may also want to change the speedometer gearing. If the OD itself was not from a Triumph, (e.g. Volvo) you may also need an output flange and you may need to work out the rear gearbox mounting as well.

Getting the right TR6 Donor OD gearbox

The first thing to look for in a donor TR6 OD box is the "imperial" or "metric" mainshaft. This refers to the bearing between the input shaft and mainshaft. The imperial mainshaft/input shaft has a pressed-in bearing while the metric has an open-cage bearing.

All Stags are metric so you must get



Donor TR6 box

a TR6 metric box to provide the overdrive mainshaft as the Stag input shafts you must use are metric. No problem for J-type as they are all metric but for A-type you need to get TR6 gearbox serial# CD20282-CD21768 which is where the metric mainshaft came in.

The next consideration is the bushings, and therefore the "ball bearing" that may be needed in the mainshaft. Before late '73, TR6 boxes had bronze bushings, after that the gears and steel bushings are the same as the late Stag boxes (after LD7889). I have not pinned down a TR6 gearbox number for that change except TR6 Commission# CF12500 and CR5000 or "'74 model year".

The earlier Stag boxes (before LD7889) have a Stag only 2nd gear on the mainshaft with a two-piece steel bush and they use a thinner spacer. After LD7888 the Stag box has the same second gear as the post '73 TR6 box with a steel top hat type bushing and thicker spacer with a groove for a ball bearing that sits in the mainshaft. This ball bearing prevents the spacer from spinning.

The two types of steel 2nd gear bushings are not interchangeable, i.e. they need the matching 2nd gear, but with the correct bushing/gear combination either can be used, as both will fit on the mainshaft, and mesh with the gear on the layshaft.

The only problem here may be when you try to use a top hat type bushing on an older OD mainshaft without a ball bearing in the mainshaft. This would probably only come up if you used a '73 J-type TR6 box. The ball bearing is not shown in the factory part listing. However the factory part

listing does show the part number for the thicker spacer with groove for the ball bearing that is used with the top hat steel bushing. I think in this rare scenario you may be able to get a machine shop to drill the shaft for the ball bearing or a pin that will prevent the spacer from spinning.

In the opposite scenario where you have an older Stag box with the



The "Tophat" steel 2nd gear, its bushing and thicker spacer from the later Stag gearbox



Top hat spacer showing the groove for the ball bearing in the mainshaft



Two types of mainshaft - the one at the top has the ball bearing for the tophat type

two-piece steel bushing you can just pop the ball bearing out, and use the Stag two-piece steel bushings, it should not be a problem.

Doing the Conversion

You will need to disassemble the Stag gearbox, and rebuild it on the shorter OD



Stag gearbox stripped down

Mainshaft. (Note: aside from the input shaft the post-late '73 TR6 gearbox seems to have all the same gears as the later Stags



TR6 gearbox stripped down

and could possibly provide some parts). There are a few resources online that give very detailed accounts on rebuilding TR6 gearboxes that also apply to the Stag. The only difficulty may be releasing the circlip holding the third gear, there is a special tool which I was lucky enough to have access to. There seem to be two types of splined washer here - one has spaces and it may be possible to remove it without the tool but the other type would be difficult.

More Considerations

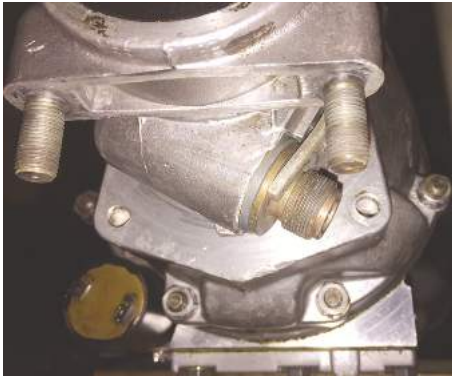
The rear gearbox mounting is the next challenge. The TR6 A-type OD has different (vertical) mounting points so you will probably have to fabricate something. Also the solenoid may point a different way and I am not sure how that would work in the Stag. The exhaust downpipes of the A-type are the same as the BW35 Auto and 4-speed boxes so they should be OK.

The J-type in the Stag has its own type of rear mounting which drops deeper than the standard and uses cotton reel type rubber mounts. This uses horizontal studs on the rear of the OD, rather than the vertical studs used by the TR6. On mine, both were present but it's worth checking that. The exhaust downpipes for the J-type are also different to clear that deeper mounting.

The TR6 J-type has different speedometer drive ratios. The Stag uses a 3:1 ratio running a 1000 tpm speedometer. You will probably need to sort that out. For J-type there are 5, 6, 7, 8 "Start" drives available for the output shaft of the OD which drives 15-20 tooth gears. The "starts" refer to the number of coil



Two-piece steel 2nd gear. The bushing and thinner-type spacer is from an early Stag gearbox



The J-type rear mount showing the vertical studs from TR6 mounting threaded holes for horizontal studs for Stag mount

*Note the number 7 stamped in top left
This shows the no of starts*

starts on the drive. You can actually look down the hole for the speedo gear at them and count them as you do one complete revolution of the output shaft. The ratio is found by dividing the number of teeth on the drive gear by the number of starts. So the standard Stag J-type OD had 15 teeth/5 starts. Both the drives and the gears are available so you can exchange them - e.g., you could use 18 teeth/6 starts. TR6 J-type OD's can have 8 start or the real late ones have 7 start, so would need a 24 or 21 tooth gear, but I have not found those available anywhere.

The way to work out the speedometer gearing is:

$$\text{wheel turns per mile (TPM)} \times \text{diff ratio/speedo gear ratio} = \text{speedo turns per mile}$$

For standard Stag tyres and standard Stag speedo gear:

$$800 \times 3.7/3 = 986 - \text{which gets pretty near the Stag speedo which is } 1,000 \text{ tpm.}$$

In my case the OD had a 7-start and I found a 20 tooth gear, with my planned 195/70 14 inch wheels. it comes out at 1,050 which is quite near. As you can see, the wheel/tyre size will have an effect as well. There are a number of TPM calculators on the internet you can use.

The A-type's speedometer drive gear is part of the output shaft and unlike the J-type is not replaceable. There are a few different speedometer gears for the A-type, so some investigation would be required.

The top cover needs switches to enable the overdrive. 3/4th gear only for J-type, 2nd and 3/4th for A-type. Early TR6s had the switches on the circular castings you see on top of all top covers, later ones had the 3/4th gear switch in the center of the cover just in front of the gear stick.

Either will work. If there is one with your donor box you are set; if not then you can drill and tap a 4-speed cover to mount the switch.

Electrical circuit

Finally the electrical circuit for the overdrive. The original overdrive had a special gear stick that held the switch and had a hole to take the wires down to the solenoid circuitry. if you cannot source one of these, then some fabrication would be required. Power comes from the main fuse box 23/24 via a yellow wire to a connector near the bulkhead located around the area of the starter motor. This should be present even if overdrive was not originally fitted. The starter motor wire is also looped back here should be a mating plug already there. You can obtain extra pins, and a plug if required from Autosparks in the UK (<https://www.autosparks.co.uk>). The pins to ask for are type "3mm for RISTE housings."

The circuit is pretty simple; the power passes through the inhibitor switch(es) (only if you are in the correct gears) and then the overdrive switch (only if it switched ON) to the solenoid.



3mm pin for RISTE housing

Resources

Here are some good places to look for further information:

Buckeye Triumphs' website is a great place to start. There are some good resources for the overdrives and gearboxes (<http://www.buckeyetriumphs.org>):

- Buckeye Triumphs J-type info
- Buckeye Triumphs A-type info
- Buckeye Triumphs gearbox rebuild
- Buckeye Triumphs cover modifications for OD switches

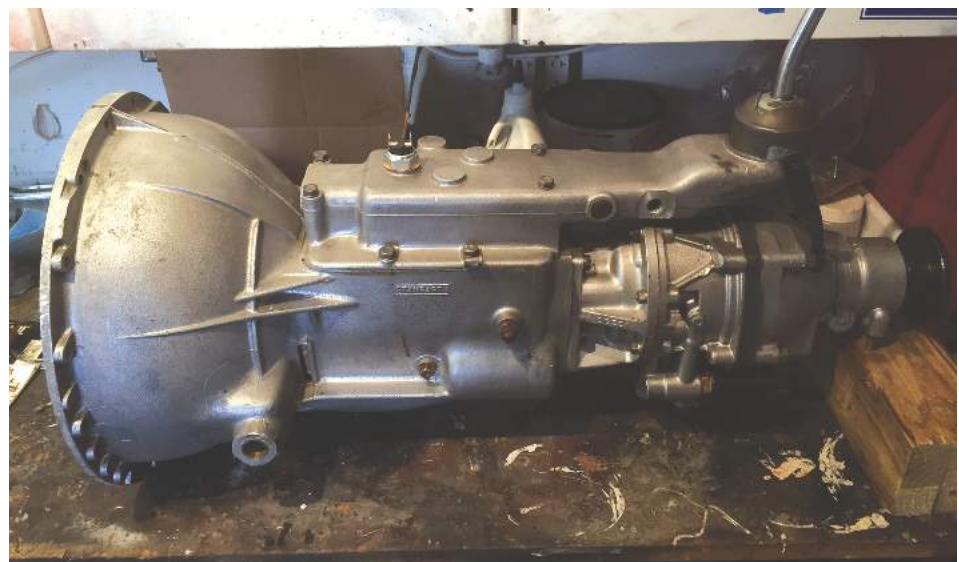
Rimmer Bros

- Factory parts manual

Overdrive Repair Services Ltd.

- for many overdrive parts that you might need. Located in Sheffield, UK (<https://www.overdrive-repairs.co.uk>)

[Terry came to the USA for his work from England in 1988 and now resides in Wilmington, DE. When he hit his mid-life crisis it was a non-running TR250 which he restored and kept for a number of years. He really enjoyed working on these old cars so only having a single garage, he had to sell that to make way for a Mini project, which arrived with 30 odd bhp and left with 130 bhp via a turbocharger! Terry had his eye on a Stag for a retirement project but it was so far away that a '67 MGB somehow got restored while he searched for one. This year having semi-retired, Terry has the Stag and restoration is staring in earnest. He has pretty much managed to do everything himself, bodywork and painting included - Ed.] SN



The final result, a Stag Overdrive Gearbox!