J Type Overdrive (TR6), Part II - Disassembly

Before we start: The OD units are very rugged and not prone to internal failure. This is the second J type I've had apart and other than the problem caused by my stupidly not dealing with loud noises from the gearbox, I've found no problems. I've heard of several problems from folks on the email lists that are mentioned at the end of Part IV.

On a unit that has been working or has not suffered a major failure (the typical situation) I feel a partial disassembly and thorough cleaning is sufficient. I don't do a bearing replacement unless they are found to be rough. The only other wear component is the clutch sliding member. I understand that the clutch material does wear after several 100K miles or, more likely, the OD has been slipping for an extended period. Since this unit was associated with a major gearbox failure, I decided to pull apart everything and do a thorough inspection. Unless I find a bad component, I plan to only replace the rear seal and O Rings. The only other required materials are the gaskets.

Special Tools: Several special tools are required to disassemble, assemble and test the OD. These tools are easily constructed from material readily available at the hardware store. Pullers of various sizes and a hydraulic press came in handy.

Cleaning: The OD and gearbox are removed from the car as one unit. Most Gearboxes and OD are covered with oil and grease. Either the engine or the gearbox is leaking oil (most likely both) that has covered the gearbox & OD and then dirt mixes with the oil making a black gooey mess. The whole unit should be cleaned thoroughly before it is opened. The spray degreasers stocked at the discount auto stores work pretty well. I spray the stuff on, let it set for 15 minutes or so and then use a stiff brush to loosen the difficult parts and then hose it off. In most cases some areas have to be degreased again and maybe a third time. (A couple cans of degreaser are usually required.) After all the grease is off I scrub the outside with hot water and dish detergent to get the film from the degreaser off. It might be wise to haul the gearbox/OD it to a self serve car wash to clean it up. After everything is clean, the oil is drained from both the gearbox and OD. The oil flows between the gearbox and the OD unit but it is necessary to stand the unit on the front for a period to get the oil to flow from the OD to the gearbox so it can be drained. Even with doing this there will still be considerable oil in the OD that will make a big mess when the OD is separated from the gearbox.

Gearbox Stand: I use a gearbox stand made from scrap pieces of 2X4, 2X2 and a short piece of steel angle as seen in the photos below. The gearbox bolts to the angle at the front. The 2X2 near the rear of the main gearbox casting has a shim tacked to the top to adjust the gearbox so that it is horizontal. The stand took about 30 minutes to make and proved its worth in about 15 minutes of use.

Separating the castings

We're now ready to open up the gearbox. I took the unit apart on the bench and everything went fine. However, I much prefer to split the rear casting from the main casting while the unit is still on the gearbox and mounted on the gearbox stand. It was too late for that here.

The manuals tell you that before removing the gearbox you should drive the vehicle and engage OD and then disengage with the clutch depressed. This will release the spline loading between the planet carrier and unidirectional clutch, which can make removal difficult. What this means is that the unidirectional clutch and the sliding clutch can be positioned in a way that there is large rotational forces in opposite directions on the splines of the rear of the mainshaft. The forces can be so great that the mainshaft can't be slid out of the OD unit. Once you have it on the bench, you aren't going to

put it back in the car and run it in OD, no way. Apparently this doesn't happen in the A Type, or if it does, the forces are less. I've never encounter this problem but I know others who have had the problem; it is real. The spline loading can be relieved by moving the sliding clutch away from the annulus (the direct drive position). The manuals suggest the following procedure if the mainshaft is hung up: operate the solenoid, remove the plug in front of the solenoid and force oil into the chamber around the operating valve at the front of the solenoid. (The adaptor hose normally used to connect a pressure gauge can be used to connect to a grease gun filled with oil.) This should shift the unit out of direct drive thus relieving the spline loading.

Removing the solenoid: The solenoid with operating valve should be removed before breaking apart the castings. This requires a thin 1 inch open end wrench. I had neither a thin nor a 1-inch wrench. I did however have a 22 mm wrench with no know application. A little work on the grinder and the 22 mm became a 1- inch opening and after a little more work, it was the exact thickness to just slide into position. The photo on right shows the wrench in action.

Adaptor Casting: The adaptor casting that goes between the OD and the gearbox had been removed when I brought the parts home -- the adaptor is on the left in the photo below.

Splitting the castings: The next step was to spilt the rear and main casting. The 8 nuts were removed from the studs. A wood block was then placed against the lower part of the main casting and tapped with a hammer to loosen the seal. The black colored brake ring between the castings must come off with the main casting because it won't slide over the sliding clutch. In this case, the brake ring wanted to stay attached to the rear casting. There are little notches in the brake ring casting in the same area as the solenoid (already removed) that a punch can be positioned against. A couple taps with a hammer on a punch freed the brake ring from the rear casting.

The photo above shows the separated castings. The planet carrier with planet gears came off with the main casting and sun gear. It was held there by friction between the sun gear and planet gear teeth. It some cases it might stay in the annulus. Care should be taken that it not fall off the bench

and break a few (gear) teeth or a few toes (on your foot). The photo on the right shows removing the planet carrier from the sun gear. The sun gear is retained in the sliding clutch with a circlip. The clutch is held to the thrust ring by the thrust bearing. The thrust ring is held to the main casting by the bridge pieces. Both the main casting and planet carrier were set aside for later attention.

Dismantling the Rear Casting

The level of disassembly of the rear casting will depend on which components are being replaced. The rear flange must be removed to replace the rear seal. The speedometer driven gear bushing must be removed to replace the speedometer gear seal and O-Ring. Both the rear flange and speedometer driven gear must be removed before the annulus can be removed to get at the annulus bearings.

Before taking the rear casting apart I did a couple tests on the bearings. First, I checked the end float using the same technique used on the A type OD where the end float must be adjusted using various size washers. End float adjustment is not required here because the parts (especially the rear casting) are machined to closer tolerances. The end float test in this case was to see if the bearings were worn and loose. The photo on the right shows the setup to test annulus end float on an A type OD; the setup for the J type is the same. The dial indicator rests on the lips of the rear casting with the point near the center of the annulus. The case is then grasped on each side with the hands and lifting while using thumbs to pushing down on the annulus. In this case an end float of 0.006" was measured. I don't have specs for the end float but guess that 0.005" to 0.010" specified for the A type is OK here. Less end float indicates that there is something wrong with the bearing position and shims may be required. See the A OD notes Part III for more information on adjusting this end float. An end float greater than 0.010" indicates bearing slop and the bearings should be replaced.

I tested the bearings carefully and found everything seemed smooth and no unusual sounds were heard. This together with the good end float measurement indicated to me that the annulus bearings were good.

Since the bearings were good, I normally wouldn't remove the annulus. However, I wanted to verify that none of the debris from the gearbox made it back there. Besides, the bright red speedometer drive gear makes for a nice photo.

Speedometer gear: After the screw securing the speedometer cable connector was removed, the connector, bushing and driven gear were removed as shown in the following photos. As parts were removed they were thoroughly cleaned and inspected. To keep track of the parts, associated groups of parts were placed in small zip lock plastic bags.



Rear Flange: The instructions say use a RG 421 tool to retain the flange. Looked in the toolbox and couldn't find anything labeled RG 421. I did however have a long flat steel bar with a 5/16 hole drilled in the end ---- just the ticket. After the nut was removed, the flange slid right off.

Unidirectional Clutch: The circlip retaining the unidirectional clutch was lifted out with a screwdriver. The unidirectional clutch parts are shown in the right photo. The small brass washer in the middle is a thrust washer that fits behind the unidirectional clutch. There is a small mainshaft support bushing pressed into the hole in the annulus behind the unidirectional clutch. The bushing was in good shape so it wasn't removed.

Annulus: The annulus is easily pressed out using a hydraulic press (left photo). The center photo shows the speedometer drive gear. The plastic gear is fastened to the steel sleeve that also serves as a spacer between the inner races of the two annulus bearings. The front annulus bearing was removed using a bearing separator (~$15 @ Harbor Freight) and part of a puller fabricated to remove the gearbox rear casting --- see gearbox overhaul notes.



Rear Seal: I don't know an easy way to pull the rear oil seal. The best way I've found is to use a hammer and chisel to deform the seal enough so that it can be pried out with a screwdriver as shown on the right. The rear annulus bearing left in the casting when the annulus was pressed out can be removed after the rear seal is out. I tapped the bearing out from the inside of the case using a long pin punch on the outer race.

This completed the disassembly of the rear casting.

Dismantling the Main Casting

Bridges, Thrust Ring with Clutch & Brake Ring: The four nuts retaining the bridge pieces were removed (left photo below) and then bridge pieces were pulled off. The sliding clutch with thrust ring and release springs was then drawn out the rear of the casting. I put the bridge pieces and nuts back on the thrust ring so that the parts aren't separated (center photo). The brake ring was then pulled off the back of the main casting.

Springs: I has some really bad experiences with damaged and worn out springs in an A type OD (see Part IV of A type OD notes). Ever since then I've taken pains to learn all I can about the springs. I haven't found specifications on the minimum usable spring free length for these clutch release springs. The dimensions of the springs from this OD are listed below. Note there is a position in the table for the dimensions of new springs. If any one has new springs, please send the dimensions so I can fill in the table.

Clutch Release Spring Properties (all dimensions in inches)

Spring	Free length	OD	ID	Wire Diameter	Turns
Used (from this OD)	2.070 - 2.095	0.586	0.35	0.117	12.5
New					

Separating Clutch from Thrust Ring: The sliding clutch should be removed from the thrust ring only if the thrust bearing and/or sliding clutch is being replaced. I tested the bearing before taking it apart. The bearing was first tested for looseness; no problem, the bearing turned smooth and no slack was detected. I decided to take the bearing out anyway so that I could show how it is done.

The sliding clutch is pressed into the thrust bearing and retained by a circlip. The circlip was removed first (left photo). Next, the clutch must be must be separated from the thrust bearing. I tried the large bearing separator used on the annulus bearing earlier. It is about 20% too small and I didn't have ready access to a larger one. I then supported the bridge pieces with 1/2-inch rods on 2X4 blocks in the hydraulic press and used it to press out the clutch. This worked --- see center photo. The separated parts are shown in the right photo.

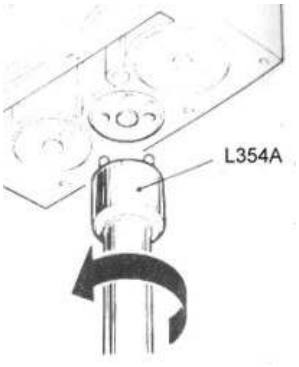


Removing Thrust Bearing: The thrust bearing is removed from the thrust ring only if it is to be replaced. The first task is to remove the circlip retaining the bearing. First attempts at this task drew a few choice words. The end of the clip is beveled so that one can slip a screwdriver under the point of the bevel and pry the clip out. Unfortunately, when just enough force is applied to lift the end of the circlip, it slides around the groove and off the end if the screwdriver. A third hand was needed. Considered asking the wife, but she'd expect me to reciprocate with a small job for her, like shoveling the snow off the driveway. (Should have asked for her help; had to clean the driveway anyway.) The solution was to secure the ring with a small machinist clamp; it was then easy to lift one end of the clip and slide a small screwdriver under the clip (left photo below). The next task was to remove the bearing from the thrust ring. I set the outer edge of the thrust ring on two 2X4 scraps that were positioned on edge and then used a pin punch against the outer race to drive out the bearing (center photo). The separated parts are shown in right photo. These parts were cleaned up and set aside.



Sump Cover & Suction Filter: Next, the eight bolts retaining the sump cover to the main casting were removed and the sump cover pried off. The suction filter was then slipped out of the pump input channel. The filter and magnetic strip affixed to the bottom of the sump cover were inspected for signs of metal. There were just some small particles, not the chips I found in my OD that had been driven for many miles after the rear countershaft bearing in the gearbox had failed. The gasket material was cleaned off the cover and both the cover and filter were cleaned thoroughly. There was quite a bit of thick sludge on the magnetic strip. These parts were then set aside.


L354ATool: The next step was to remove the hydraulic components from the bottom of the main casting that are secured with plugs. The plugs have two holes that mate with two prongs on tool L354A. The plugs are unscrewed by rotating the L354A as shown in the left photo below. I didn't happen to have a L354A so I made the substitute shown in the middle photo below. I used roll pins for the prongs. The extra holes were an error --- forgot to measure twice and drill once so I measured once and drilled once, then measured again and drilled again. Didn't have any drills that made square holes, no broaches either, so it was round hole and file. The hole mates with a 3/8" drive ratchet as shown in the right photo.




Pump: The right photo above shows removing the pump plug. This plug was much tighter than the other two plugs. The casting had to be held securely to break the plug loose. The piston and cam combination was removed after the plug was removed (it can be removed before too). I pushed the pump body out from the top with a finger as shown on the left below.

High Pressure Filter: The high pressure filter with washer drop out after the large plug is removed -- right photo below.





Relief Valve: The dashpot piston slides out easily after the valve plug as been removed, left photo above. The center photos above show removing the residual spring with a hooked wire and the valve with pliers. The dashpot sleeve is removed by slipping the hook at the end of the wire through the little hole.

Tool L401 is designed to remove the valve body at the very bottom of the valve chamber. I didn't have a L401 so I made an extracting tool using a piece of 1/4' OD brass tube and 3/32" stiff wire, both available from hobby stores, center photo below. The wire is the same one used to remove the residual spring and sleeve above. The valve bode slides out rather easily as long it as is straight. If it tilts it binds and can't be withdrawn. The brass tube slides into the hole in the valve body to keep it straight. The hook at the end of the wire goes over the top lip of the valve body. Care must be taken to keep the hook from scratching the inside of the valve body. After the tool was in position, I grasped the end of the tube with one hand and pushed the end of the wire toward the casting. That forced the hooked end to the side of the tube and securely hooked it over the valve body lip. The tube was then withdraw, bringing the valve body with it as shown in right photo below.

Pistons: The pistons were pulled out easily using pliers as shown on the right.

O-Rings: This past December I exchanged a couple emails with Jay Holenkamp in Illinois dealing with an adaptor to connect to an A Type OD to measure the hydraulic pressure. I mentioned to Jay that I was about to purchase another J type OD. He later sent me a copy of a note by Erik Quackenbush about troubleshooting a no-shift problem in a J type OD from the December issue of the Illinois Sports Owners Association Newsletter. What intrigued me was that Erik listed the sizes of O-Rings needed to repair a solenoid, including the O-rings on the inside of the valve that are not in any catalog I have. He said O-Rings should be in Buna-N and listed the sizes in the National O-Ring sizes. I thought that was neat. Later when I tried to purchase O-Rings from TRF I found they only had about half them in stock. I then noticed that Victoria British had an O-Ring kit so I bought one. As expected, I received a Ziploc bag with a dozen O-Rings and no instructions as to which when where. Also, the little O-Rings for inside the operating valve mentioned by Erik were not included. Since I had to mess around with which O-Ring went where, I decided to document the size of each O-Ring so that I could get replacements locally. I used the sizing cart at the Marco Rubber website http://www.marcorubber.com/ to determine the National O-Ring size from the O-Ring measurements. They also have a nice description of the common O-Ring materials including Buna-N. The 007 and 010 O-Rings not included in the set from Victoria British were purchased from the local bearing supplier.

O-Rings for J Type Overdrive

Application	Quantity	Triumph Part #	Nat'l O-Ring Size	Nominal size in inches		
				ID	CS	OD
Operating Piston	2	NKC99	214	1	1/8	1 1/4
Speedometer Bearing	1	NKC106	210	3/4	1/8	1
Pump Plug	1	NKC101	021	15/16	1/16	1 1/16
Pump Body	1	NKC100	023	11/16	1/16	13/16
Dashpot Plug	1	NKC91	024	1 1/8	1/16	1 1/4
Dashpot Sleeve	1	NKC92	022	1	1/1/6	1 1/8
Relief Valve Body (large)	1	NKC92	022	1	1/1/6	1 1/8
Relief Valve Body (small)	1	NKC102	028	1 3/8	1/16	1 1/2
Solenoid-Operating valve-outside valve	2	NKC107	014	1/2	1/16	5/8
Solenoid-Operating valve-valve end	1		010	1/4	1/16	3/8
Solenoid-Operating valve- valve stem	2		007	5/32	1/16	9/32

Parts List: After everything was taken apart and inspected it was determined that no parts were damaged. This is one of the later units that has no noticeable wear. I decided to replace all the O-Rings and seals, based on the age of the unit. The rough question was, should I replace the bearings? There have been many reports recently of poor quality and early failure of new bearings. Several folks

have rebuilt gearboxes with new bearings, suffered a bearings failure in a few K miles, disassembled the gearbox, put the old bearings back in and had no problem since. (I've jokingly offered to sell old gearbox bearings at twice the price of new. It is of course no joke if you have to spend a weekend pulling the gearbox to replace a new bearing that has failed.) So the question is, does one reinstall the lightly used but thoroughly tested original bearings or risk failure with a new untested bearing? I checked each bearing and as described earlier and found each to be good. I decided to go with the known good bearings rather than replace them. The other area of concern is the springs. As mentioned earlier, I don't have specifications on the clutch release springs. Based on length of use and age, I'm guessing the ones in this unit are OK. If one measures free lengths much shorter than the length of the springs in this unit as recorded earlier, the springs should probably be replaced.

The following lists the parts one might consider for various levels of maintenance.

For inspection and cleanup I suggest the following parts:

- Gasket, adapter to gearbox
- Gasket, adaptor to OD
- Gasket, brake ring to main casting
- Gasket, rear casting to main casting
- Rear shaft seal
- Speedometer gear seal
- 2 operating piston O-Rings (I replace these because OD must be removed from the gearbox to get at the case).
- Tube of Hylomar HPF Gasket & Flange Sealer by Permatex, available from local auto pasts store.
- 2 quarts of gear oil (see separate note on Gearbox Lubricants)

For a major overhaul the following parts in addition to those listed above are suggested:

- Bearing, annulus head
- Bearing, annulus tail
- Bearing, thrust (between clutch sliding member and thrust ring)
- Unidirectional clutch roller set
- All O-Rings
- Non-return valve ball & spring

I usually buy parts from The Roadster Factory (TRF) because of a long relationship and good service. Unfortunately, as mentioned above, they didn't have all the gaskets and only a few of the O rings so I purchased the gaskets TRF didn't have and an O-Rring kit from Victoria British.

Other sources of Overdrive parts are:

Moss of UK, 011 44 208 867 2020

Overdrive Repair Services (UK), 011 44 114 248 2632

Brian Schlorff of Power British Performance Parts Incorporated, 610-270-0505

John Esposito of Quantum Mechanics, 800-274-1920

This completes the Part II - Disassembly. Subsequent parts discuss reassembly, adjustment and troubleshooting.