"Big" Triumph Rear Hub Rebuild Notes

Background

This project commenced as a result of my need to rebuild a rear hub on a 72 TR6. I learned subsequently that the basic principle of a taper shaft and roller bearing assembly was used on all "large" Triumphs from the TR2 though to the 2.0/2.5 saloons. I believe that the following will be of interest to all the above groups when attempting a hub rebuild, but I should stress that the personal references apply only to a 72 TR6. Although that task was far less frightening and difficult than I imagined after having made the Beast – a purpose built tool for removing taper shaft hubs. And so, I hope that you will be just as successful, whatever flavor of Triumph you drive and maintain.

How do you know you've got a problem?

I'm sure that there are many ways of determining that things are not as they should be: in my case, I had 2 very distinct symptoms. The first: I noticed during a routine rear brake check, with the car jacked up, that if I gripped the tire at the front and back, I could move the wheel in-and-out a very small amount (but enough to detect easily). Having ignored the first sign whilst I marshaled my forces to deal with symptom 1, I discovered symptom 2: on acceleration, I could hear a squeak from the problematic rear hub. Noise disappeared on overrun. Took the drum off, and could see that the edge of one of the shoes had been rubbing on the inner wall of the drum – so, the drum was obviously moving in-and-out with the wheel – that indicated that the hub must be able to move side to side.

Parts Needed

To fix the problem, you will need all the parts in group 1 (Halfords, Pep Boys or Napa will not be able to provide all the items!).

Oil seal: outer	138090	Bearing: inner	132066
Oil seal: inner	138089	Bearing: outer	134589
Spacer: collapsible	138272		

Might be needed as well:

Stone-guard	137497	tab washer	139057

I purchased a complete kit containing all seals, bearings and collapsible spacer listed in group 1 from Rimmer Bros (www.rimmerbros.co.uk – ref: GHK1015). Their summer sale, when you can avoid paying postage is worth waiting for!

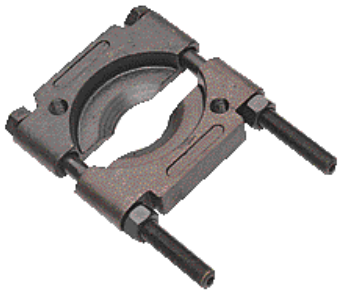
Tools and expertise needed

Have you got a very BIG hammer? Then you are set … only joking (well, partially).

If you currently carry out routine maintenance on your car, you will have the majority of tools needed such as a range of sockets and wrenches/spanners. The only really unusual wrench(s) is the 2.0625 (2 1/16") one is needed to pre-load (plus a second one of the same size to tighten the locknut on the tapered shaft - one is used to hold the main nut, and the other to tighten the locknut against the main nut.). It is a really expensive option to buy one let alone two such wrenches. I had two made (well, cut from 0.25" mild steel) by welding students and they work well.

You will probably need access to someone with a hydraulic press, and bearing separator set. This will enable you to remove the inner races from the outer hub and the drive shaft. If you are also replacing the universal joints, then the same equipment will come in handy there as well. As you will see later, you may end up replacing the outer U/J even if you didn't want to, so the job could be undertaken more easily.

Hydraulic press



Bearing separator

Magnetic Base

Dial Test Indicator

You will also need various drifts and other such implements for applying force to bearing bits. And you will need a dial test indicator (DTI), and stand. I was not convinced that I needed a DTI, imagining that I could "feel" the .002" end float on the outer flange (you'll see later what this means): you can't, well not without a DTI. All the above items can be obtained from Harbor Freight in the US at a reasonable cost (www.harborfreight.com).

Access to a large vise will make life a lot easier since a number of operations need something held securely. An electric or pneumatic grinder/cutter will also come in handy for slicing hardened parts. You'll see how this helps later.

Finally, you will need a purpose built hub puller. The Churchill unit would be great, but if you can't find one, then you can have a copy of the **beast** made. It'll work fine, though you'll need to get your own Oldsmobile (you'll see why later)….

The "Beast" Tool ….

If you look in the factory manual, you'll see the *perfect* tool dismantling the *perfect* hub: let me warn you, you ain't going to have that happen! The Churchill tool, with its hydraulic capsule is rarer than hen's teeth: you ain't going to find one, so you can try a number of options.

The earlier threaded-bolt based Churchill tool used for TR3's (and maybe 2's and 4's) will work, but not as serenely as the later hydraulic unit (if the manual is to be believed). A number of Triumph clubs have designed their own pullers using threaded bolts, and these seem to function well. However, I was concerned at the level of force required to get the hub to separate with a UNC or similar threaded system. With the help of a colleague, Robert Espinoza, I designed my own variation on the mechanical or threaded puller using an Acme thread as the basis of transmitting the force (the Acme thread form having been purposely designed for that function). This thread form increased the mechanical advantage greatly, and in one instance, it worked! And having done the calculations, I imagine that it will do so again. The drawings for the "beast" are to be found as a further file attachment.

Or you can also try any variation of 2, 3 or "think of a number" legged-pullers on this problem and you will join a large, but very regretful, group of TR owners who have purchased new outer hubs (the bit the studs fit in) since they were bent by the forces applied at a small number of local points. The Churchill puller (and the above designs) all provide full support of the entire 6" flange, and avoid the problem of high local forces. This same problem faces those who go to their local garage assuming that they can "fix" things … they can, but if they don't have the correct tools, they will try a leg based puller, and some even resort to hydraulic presses as well, so you then have up to 50 tonnes of force being applied to 2 or 3 points on the hub backplate. Guess what happens next!

Tear down

Removing the half shaft is pretty straightforward. Remove the wheel. Then the brake drum (if the drum doesn't want to come off, then you will need to back off the square-headed adjuster found on the lower backplate (the correct spanner/wrench for this task makes this a breeze – GBP3.75/$5.90 from Halfords in the UK – shame that E-commerce hasn't hit them yet). I found I had to undo the brake backplate (rotate the drive shaft for access to the 6 Nyloc nuts) to allow the shaft to be withdrawn through the swinging arm, but you may be fortunate and your shaft will pass through cleanly. Pitch the Nylocs (keep one for a pattern) since they will need to be replaced with new (used Nyloc's don't withstand vibration very well, and can undo). Then with a series of very long extensions, you can get at the Nyloc nuts holding the shaft to the differential output flange (I've got a nice swivel socket that does this really well). You'll need to get a spanner/wrench on the heads of the bolts (between the flange and the diff) to stop them rotating, but it is a pretty straightforward task (we've got a air wrench, so it's a breeze … is that a pun?).

Removing the half shaft requires a bit of squeeze through the swinging arm and brake backplate, but it can be eased through. My shaft doesn't have the inner cups (that keep dust and grime off the inner universal joint) so that makes life a bit easier. If you have the cups fitted, then you'll need to ease them through the aperture. The DPO removed mine: don't be tempted to remove them if they are fitted.

Dismantling the Hub

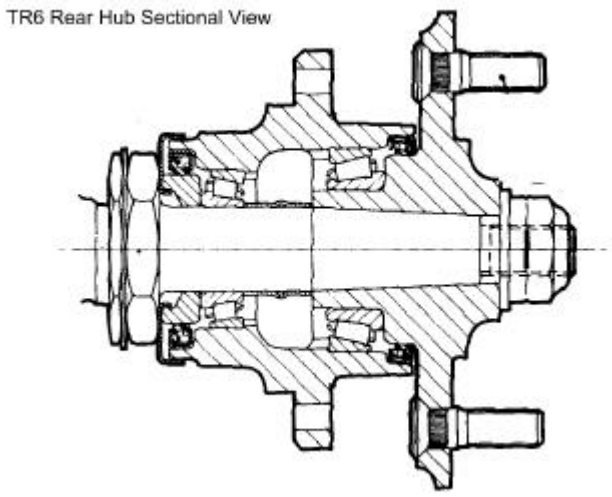
Now you have the part in your hand, you can start dismantling.

Stage 1 – Nut removal

If the shaft is well supported, you'll be able to undo partially the 1.125" Nyloc nut on the shaft (some cars had a split pin fitted, but I think the nut size was the same) from the end of the shaft. This can be done more easily while the shaft is still in the car, but if you're like me, you'll forget.

Stage 2 – Outer Hub Removal

If your hub is in either decrepit condition, or has just come from a NOS box, once the shaft nut is eased, the outer hub plate (the bit with the wheel studs poking out) will pull off the tapered shaft without any effort. And you will be able to gently pull the entire hub and bearing parts from each other with a damp Kleenex. OK, that ain't going to happen, but it's nice to dream.



So in the real world: removal of the outer hub is something of a bear. The tapered shaft and outer hub have been in very close company for many years, and have been heated and cooled repeatedly (thanks to the weather and the brakes, etc), and have flexed in every direction as the car was driven, for good measure. This joint is more like a marriage than a loose fit. To get them apart you will need a purpose built tool. The Beast (and the Churchill tool) fit over the wheel studs and are fixed down with wheel nuts (check that the wheel nuts will travel far enough down the studs to secure the puller to the hub). I'm not keen on this option (I paid a lot of money for my shiny, chromed, wheel nuts, and I can get regular nuts from Home Depot/Smiths Do-It-All for a couple of $/p). In any case, the puller needs to be fitted very snugly against the hub with all 4 nuts tightened securely.

The force required to separate the hub is considerable. So holding the shaft while you apply very high turning forces via the hub puller is a problem. The Triumph manual shows a holding frame or bracket that fits into a large vise. You won't find the bracket, and even if you did, I don't think there is a vice outside of a shipyard that is sufficiently strong to hold the bracket and the withstand the forces you will apply, so it may be easier to go another way.

In my case, I knew that I couldn't find a way of holding the shaft to enable me to apply sufficient torque to remove the hub. So I removed the outboard universal joint (U/J) leaving me with a hub assembly, and a nice yoke into which I was able to put a 1" diameter, 3ft long (25mm by 1M) long mild steel bar (a large crowbar would have worked, I'm sure). The bar was then laid on the ground on our drive, and I drove our boat-towing Oldsmobile Delta 88 (which weighs close to 5000lb) over the bar trapping it very securely.

The Nyloc nut was then backed off so the outer surface was level with the end of the threaded part of tapered shaft (see the drawing above). The puller was then fixed down firmly to the outer hub with 4 nuts. A very large wrench/spanner (1.5" A/F – about 24"/.60cm long – was used to apply force to the 1" Acme-fine threaded bolt, and tightened. After each tightening sequence, it is suggested that you remove the wrench and hit the center of the bolt with a

large hammer to “shock” the hub. Repeat this process of tighten and hit, etc. It may be necessary to use your body weight on the wrench to get apply force – I certainly did.

In my case, after 10 minutes, and without me becoming frightened from bouncing off the wrench (though it did flex a bit): BANG! a loose hub! The backplate is true, and is fine (so is the rear tire of the Olds). This was a single-handed job, just like the guy in the manual!

The end of the puller bolt will be somewhat mushroomed by this process. This is intention, since the object of the exercise is to remove the outer hub without damage to the tapered shaft. It does mean, however, that the end of the bolt will need dressing or re-turning to get it back to the original diameter before use again.

Assuming that everything came loose, move onto stage 3.

Stage 3 – record the details

Well, stage 3 for me – sketch (or video) the disassembly sequence, so you know where it all went when you put it back together.

Stage 4 – tear down

Start the tear down: the first item that will come off is the outer hub flange (the part the wheel studs attach to). This will still have the inner race for the outer bearing attached (complete with the rollers and cage attached). Put this to one side.

When the flange is removed, you will see the tapered shaft. This has a keyway, with a key fitted, that transmits the drive to the hub flange. Carefully remove the key, and put it somewhere safe (where it will be found again).

The hub unit will be the next part you can remove (this is the large cylinder with the 6 holes in it). Put that to one side, and you will now see the tapered shaft and yoke unit.

Stage 5 - shaft

Remove the compressible sleeve from the shaft (this will be an alloy collar that slips off the shaft – dispose of the sleeve – you can’t use it again).

You will now be able to tackle the rear inner roller race fitted to the shaft. On my car this pulled off without a great deal of effort. This had failed and was the cause of my problems; you may not be so lucky!

Bearing races are designed to be a tight fit on the shaft, and they are supposed to be removed and fitted with tools that apply pressure to do the job.

If the race doesn't pull off with the use of non-damaging persuading tools (such as big vise grips, etc), then STOP before you move onto the bigger guns like the grinder, or oxy-acetylene torch. If you do resort to this level of "tactical nuclear weapon", then you are on your way to a new shaft, or worse. For info on the race removal see the next section.

Stage 6 – shaft: bearing inner race removal

The removal process starts with levering off the pressed steel roller cage and rollers, leaving just the inner race. Remember this cannot be re-used so this apparently brutal process is really OK.

Attach to the inner race a two-piece bearing separating collar (see the tool notes above for an example). This item is not a wedge device as imagined by some, but a tool that clamps to the race beneath the upper lip, that then can be supported in some way in a press whilst the shaft is pressed through the inner race using an hydraulic press (again see above).

If you don't have a 5-ton press handy, it is likely that you'll need to visit a garage or a machine shop for help on this bit (and if you can't deal with this one, you'll need help on the outer race as well … I was charged $5 for removal of both). Incidentally, removal of these bearing races is the only part that the average home mechanic is not likely to be able to accomplish, so don't feel bad if you need help on this one. And whatever you do, do NOT try to cut, heat, chisel, levitate, or exorcise the parts off the shaft/hub! It won't work!

Make sure you get the inner races back – you will need them later in the reassembly process.

Stage 7 – hub unit

The outer housings of both roller bearings will be found firmly fixed to the hub unit. Once you have removed the lashings of Castrol LM grease applied by some poor soul on the assembly line in Canley, you will see that there are 4 cut-outs in the cast inner walls of the bearing surfaces (well, that's what my 72 look like). This allows you to use a drift to drive the seals (both inner and outer) and the old races out of the hub relatively easily. Do **NOT** throw the races away!

Stage 8 – outer hub

The outer hub (the part with the wheel studs attached) will have the large dia inner race still attached. This needs to be removed as per the instructions given in stage 6. This is another case of a need of a bearing separator and a hydraulic press.

Stage 9 – other bits

Once all the above has been removed, you will be able to ease the lock washer fitted between the two big 2.0625" nuts on the tapered shaft. In my case, the lock washer was in good

condition, and the tabs could be easily moved and preserved. You may find that it is necessary to get a spare to replace the old one!

Stage 10 – lock nuts

The two 2.0625 nuts on the inner part of the tapered shaft are used to pre-load the bearing assembly. They are not subjected to a large amount of torque, but you will need some large wrenches/spanners to release them. You can buy some regular 2 1/16" wrenches, but you'll never need that kind of length/capacity unless you run a locomotive! Shop bought wrenches this size will be about 30" long and cost a small fortune, so I had some 12" long wrenches/spanners made from 1020/EN1B (aka, ordinary) steel by the welding students at our skills center ($4.00 each!). Ease the lock nut away, and then undo the large nut. Back them off as far as possible.

If you can't access purpose made wrenches, you can try a large plumbers' pipe wrench, or slip joint pliers. The only problem with this route is that it is very difficult to get two adjustable wrenches in to the same space to allow you to jamb the locknut onto the main nut: the large jaws just get in the way!

Step 11 – clean up

Clean all parts with brake cleaner, dry with rags or an airline, and lightly lubricate with clean oil.

Step 12 – Installation: Taper shaft Inner Race

The inner race (the smaller of the 2 inner races) needs to be installed on the taper shaft. The rollers are attached to the inner race part. This needs to be installed so the taper is facing *into* the hub assembly.

The biggest problem with this unit is the fact that it needs to be persuaded to move almost 2" down the shaft to its final position. This cannot be done by hitting the collar from alternate sides, or any other such clever scheme. You will need to find a piece of 1 7/8 (1.875)"/47mm pipe (about 3mm wall thickness will work well) that is about 12" long, that you can then hit with a hammer to gently drift/drive the bearing housing into place.

To add additional security to this operation, I cut through the old inner housing with my 4" grinder thus making a ring with one vertical cut. I placed this over the new bearing, and used this as the surface against which I placed the pipe that I was hitting with a hammer.

This sounds more complicated than it is. It was easy.

Step 13 – Installation: Outer hub flange Inner Race

I mentioned above that I had cut through the old bearing races to provide protection as the race was fitted. With the outer bearing, the problem was one of finding a piece of pipe large enough to use as a drift. I couldn't find one, so I used the old outer race as a means of drifting the new bearing into place. Not ideal – but without access to a piece of 2.25", 0.125" wall, pipe, I was stuck..

I would recommend using the pipe, but if all else fails, you can use the old inner race, with a vertical slit cut in it to stop it becoming firmly attached once more to the outer race.

Place the inner race in place, and then slip the "old" cut inner race on to the shaft. Then gently tap the new race into place. This took a little time, as you need to ensure that the bearing seats completely, and is not "high" on any side.

Step 14 – Installation: both Outer Races

The outer races of both taper bearings are seated in the hub unit. If you have kept the old races, they can be cut as described above. Then you can use the old races to drift the new ones into position in the hub.

This part is pretty straightforward, but you do need to make sure that the bearings go in evenly on all sides – I had one that kept wanting to pop up on one side when being started, but once started, it was fine.

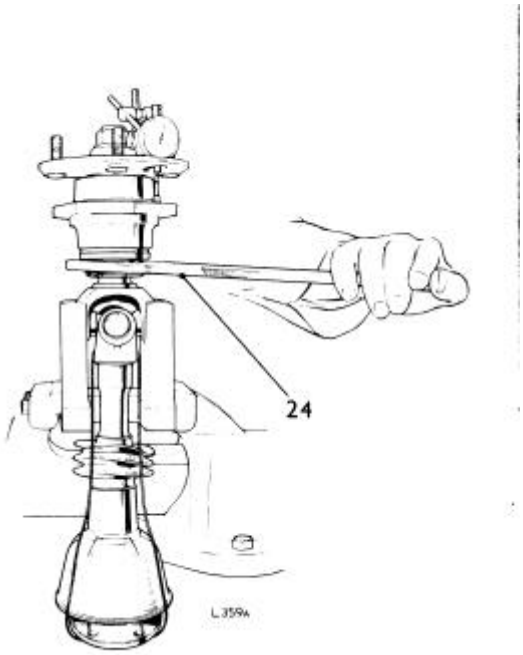
Both oil seals are fitted in the hub unit as well at this time. The old races are useful for helping with this task as well.

Step 15 – Assembly

You now have all the pieces ready to be assembled. I secured the outer U/J yoke in the vise, and applied liberal quantities of moly-based grease to the inner bearing race, I pushed it into the cage with my fingers. The hub unit can now be fitted on to the shaft. Put large quantities of grease into the inner portion of hub casting (remember what it looked like when you removed it!) before assembly.

Now apply grease to the outer flange roller race cage – again, push the grease into the cage. Fit the drive key to the shaft, and fit the flange to the shaft. Fit the large washer over the end of the threaded part of the shaft, and fit a new 1 1/8" Nyloc nut. Tighten the nut to the required torque of 120ft/lb (16.6kg/m) as per the manual. Remember, this nut does not act on the compressible washer, so it will **NOT** have any effect on the in-out play that you will feel when pulling the outer hub flange unit in and out.

The innermost of the 2 large nuts (the 2 1/16” ones on the back of the hub) needs to be tightened against the hub unit until snug. Then a dial test indicator needs to be fitted as per the manual. See below for a scanned image of the procedure.



You will need to tighten the large nut until the end float (the amount the hub will move upwards when pulled vigorously) is 0.002” – without a DTI, you will not be able to detect this small a movement! However, with a DTI, it is a very straightforward operation.

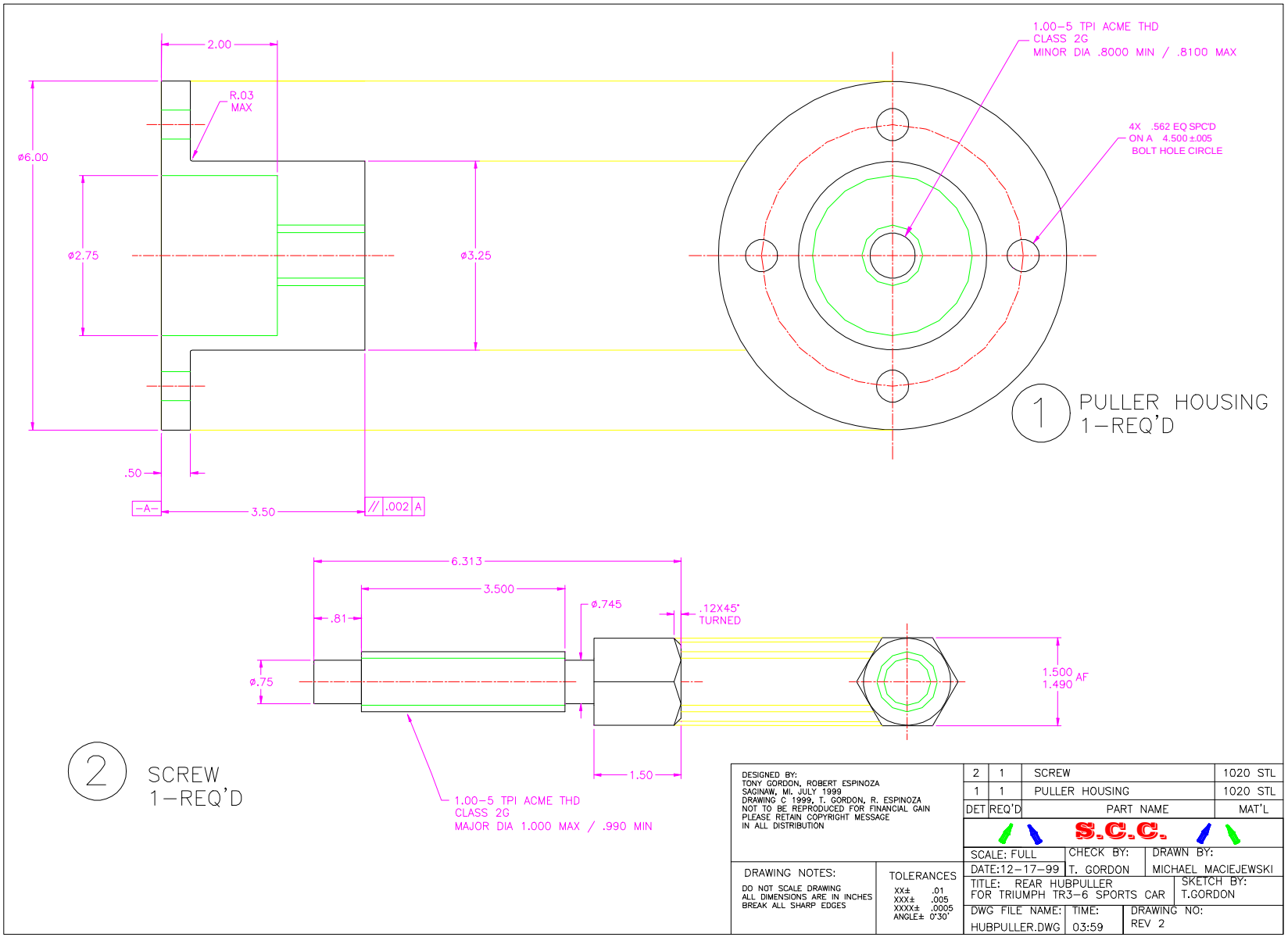
Once the end float is set to 2 thou, then tighten the locknut against the main nut – do not inadvertently tighten the main nut as you tighten the locknut against it, otherwise it all has to come apart and a new compressible washer be inserted! Then tap down the tab washer onto both sides of the unit, and you’re done.

You have now finished the rebuild. The hub unit should turn smoothly, albeit it a little stiffly, when the shaft is held.

Refitting is a reverse of the tear-down from now on in …I hope your rebuild goes as smoothly as mine! And I hope that the above notes, and the drawing of the hub puller are a help!

Tony Gordon
Midland, Michigan, USA

(ps – I would be pleased to learn of your experiences, if and when you get into a hub rebuild – email me on tgordon@saginaw-city.k12.mi.us)



DESIGNED BY:
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SAGINAW, MI. JULY 1999

DRAWING NOTES:
DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN INCHES
BREAK ALL SHARP EDGES

TOLERANCES
XX± .01
XXX± .005
XXXX± .0005
ANGLE± 0°30'

DET	REQ'D	PART NAME	MAT'L
2	1	SCREW	1020 STL
1	1	PULLER HOUSING	1020 STL

S.C.C.

SCALE: FULL	CHECK BY:	DRAWN BY:
DATE:12-17-99	T. GORDON	MICHAEL MACIEJEWSKI
TITLE: REAR HUBPULLER FOR TRIUMPH TR3-6 SPORTS CAR		SKETCH BY: T.GORDON
DWG FILE NAME: HUBPULLER.DWG	TIME: 03:59	DRAWING NO: REV 2