Triumph Spitfire Diff Ratio Change

Most of you know, to varying degrees of amusement or astonishment, that I have recently changed my Spitfire diff ratio from 4.11:1 to 3.89:1. The reason was that the crown wheel and pinion were worn, and I thought slightly longer legs would be a good idea.

The final result is wonderful. Through the gears the car is not noticeably sluggish. The legs are only 5.4% longer, but what a difference! The diff is so quiet that I now realise how noisy the gearbox is.

So what's the bottom line? Here it is: You can't do it unless you have a diff housing suitable for the 3.89:1 ratio. Full Stop.

Read on if you want the Ts and Cs. Firstly some technical terms:

Diff numbers starting:

FC = Mk 1, 2 and early 3 up to GA housing. 4.11:1 ratio.
FH = Mk 4 and other 1500cc cars, perhaps more. 3.89:1 ratio
FR = 3.63:1 ratio and, I was told by reliable sources that parts are interchangeable with 3.89:1 diffs.
But 4.11:1 and 3.27:1 diffs are not interchangeable with others
FM = American Mk4 might be ok. 3.89:1 ratio

Here's why you can't put 3.89:1 (FH) parts into a 4.11:1 (FC) diff housing:

1 The front housings are machined differently so that the pinion meets the crown wheel at a slightly different angle. This is the show stopper, there are no shims or spacers to fix this.

2 The FH front housing diff carrier bearing mounts are closer together and smaller OD to suit smaller carrier bearings. Both carrier bearings have the same ID.

3 The front housing and diff carrier must be used together and cannot be interchanged. The FH flange to which the crown wheel is bolted, is thinner - to allow for the thicker crown wheel.

Note that you probably could use an FC diff carrier if you are prepared to machine the crown wheel flange by almost 1mm. Then the modified FC carrier might be used in the FH housing. In that case the FC rear housing and side output shafts might be used. Personally I think it is risky to machine original parts into something non-standard. But if needs must....

The FH crown wheel bolt heads are flatter, to give clearance inside the housing.

4 The FH diff carrier (sun gear) output shaft splines are bigger

5 The FH side output shafts and splines are thicker, bearings are bigger, drive flanges are bigger. The side output shafts and half shaft flanges are centred by a large diameter boss and recess which is the same for both FC and FH diffs. Thus the flange bolt holes can be slotted to match. This is what I did.

6 Front and rear housings are interchangeable w.r.t. casing joint and alignment of the output shafts. But FH output shaft bearings are bigger, thus front and rear housings should go together.

7 The FH pinion front bearing and seal is bigger

8 The FH pinion input flange is bigger and the splined length is longer. I had had my FC input flange splines slotted to fit the FH pinion while I was thinking that the FC housing would work. Thus my old input flange fitted the new pinion.

Slotting the input flange was done by wire EDM cutting. Grindex Engineering in PE do this. It is very accurate and costs a good deal less than conventional slotting. Worth knowing.

9 Note: The pinion supplied by Rimmer was, in my opinion, incorrectly manufactured. The pinion is assembled with a collapsible spacer which fits between a shoulder on the pinion shaft and the toe bearing. As manufactured, the spacer would have needed to collapse by about 7.5mm - far more than its design allowed. I resolved this by making and fitting a 6mm spacer behind the toe bearing cone. The added advantage of this, I found out later, was that my FC input flange (now slotted to fit the FH pinion) was about 5.5mm shorter than the FH input flange. The spacer thus corrected the input flange position on the pinion splines - a gap is necessary between the pinion splines and the washer / nut which holds the assembly together.

Many thanks to: **Beyers Vermaak** tried very hard to find a FH diff for me and put me onto Jaco and advertised for me in Sabrina. **Jaco Van Vuuren** in Centurion makes his living by restoring and fixing Triumphs. He confirmed exactly what I had to look for, and he finally found a diff for me. **Frank Dreher** in Cape Town also fixes Triumphs, confirmed what I needed and could have sold me a 4.11:1 diff. The guys at **ITAC** issued an import permit to me efficiently and free of charge, just in case I got really desperate. The technical guys at **Rimmer UK** who also confirmed what I needed. **Jeff Nagel** at RDG PE was a mine of technical info and physical help and finally set up my diff professionally. And many more who I spoke to along the way.

Best of luck it you should ever have such "clever" ideas!