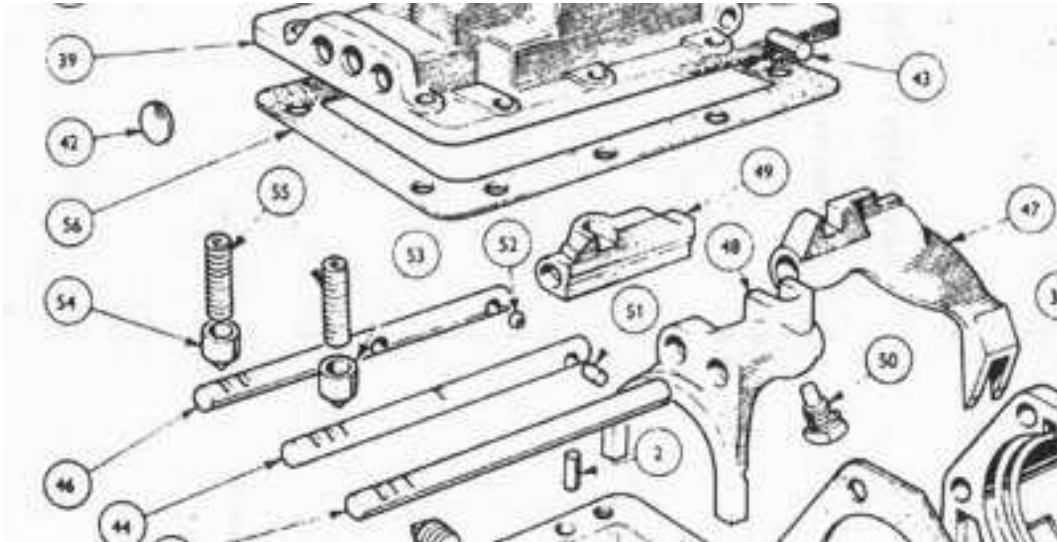


## Fitting a reversing switch to a Herald/Spitfire type gearbox:

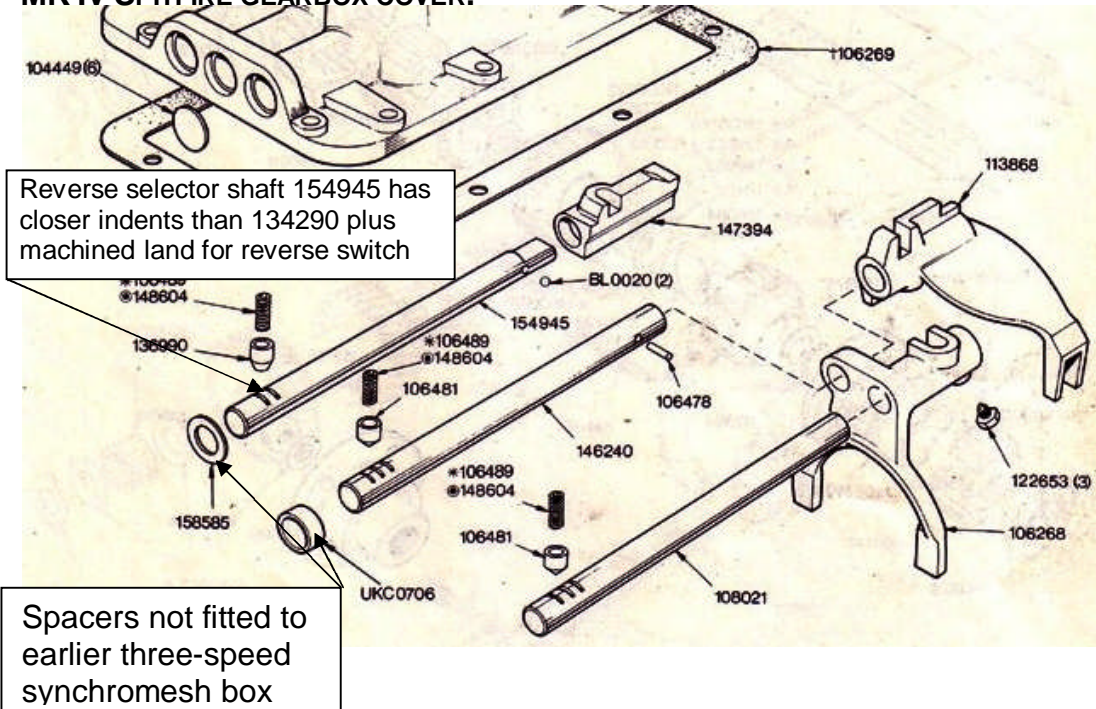
Background:

Working on a Mk III Spitfire that had a Herald ("S" saloon) gearbox fitted. The car, believed to have originally been an Australian car, had reversing lights fitted but no provision for a reversing switch was made to the replacement gearbox. A later gearbox cover with switch, possibly from a Toledo, was fitted but first gear could not be selected. This later cover, from a four speed synchromesh box, had spacers fitted on both the first/second and reverse gear selector shafts. These are shown in the drawings below.

### MK III SPITFIRE GEARBOX COVER.



### MK IV SPITFIRE GEARBOX COVER.



The table and illustrations on the following pages shows various component part numbers used in a range of the gearboxes. As can be seen, there are a lot of components common to boxes across the range.

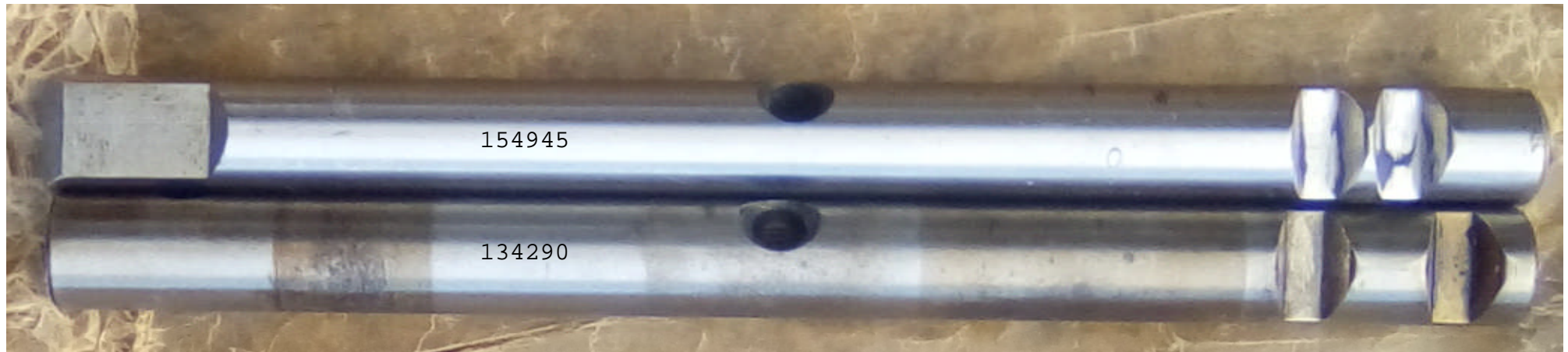
The table below shows the part numbers across most of the range of these gearboxes. Colours show common parts.

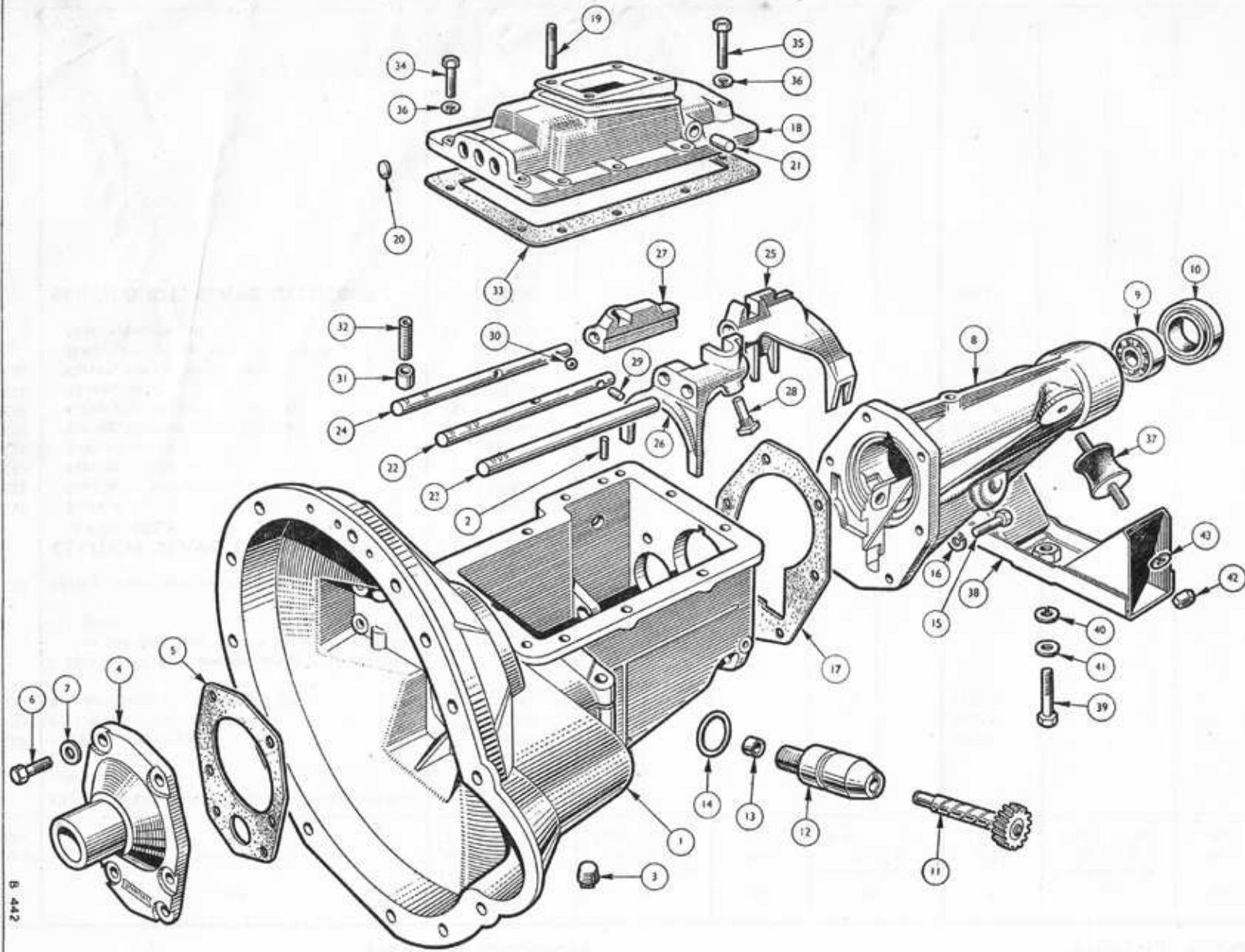
Plate #	Description	948	1200	13/60	Spitfire I, II	Spitfire III	Spitfire IV	GT6 Mk I	Vitesse 1600	Vitesse 2 Litre	Toledo (1973)	Dolomite	New Number
L18	Gearbox cover	120304	511489	134761	120304	134697/ 141775	158493	134761	134761	134761/ 147775	158493	158493	
L22	Shaft - 1st/2nd selector	108020	108020	108020	108020	108020	146290	108020	108020	146240	146240	146240	
L23	Shaft - 3rd/4th selector	108021	108021	108021	108021	108021	108021	108021	108021	108021	108021	108021	
L24	Shaft - reverse actuator	108022	108022	134290	134290	134290	154945	134290	134290	147395	154945	154945	
L25	Fork - 1st/2nd	113868	113868	113868	113868	113868	113868	113868	113868	113868	113868	113868	
L26	Fork - 3rd/4th	106268	106268	106268	106268	106268	106268	106268	106268	106268	106268	106268	
L27	Actuator - reverse gear	114781	114781	114781	114781	114781	147394	114781	114781	147394	147394	147394	
M1	Top cover extension	303283/ 306152	306152	306152	306152	306152	306152	306152	304570	304570	306152	306152	
M2	Reverse baulk plate	120307	120307	120307	120307	120307	120307	120307	120307	120307	120307	120307	
M3	Gear lever	121487	129121	129121	134814	134814	134814	146906	129121	149136	152957	152957	
M4	Spherical bush	120570/ 138685	138685	120570/ 138685	120570/ 138685	138685	138685	138685	120570/ 138685	138685	138685	138685	
M5	Spring - reverse baulk	119252	119252	119252	119252	119252	119252	119252	119252	119252	119252	119252	
M6	Circlip	119263	119263	119263	119263	119263	119263	119263	119263	119263	119263	119263	
M7	Spring - cap retainer	119251	119251	119251	119251	119251	119251	119251	119251	119251	119251	119251	
M8	Dished washer inner	128373	128373	128373	128373	128373	128373	128373	128373	128373	128373	128373	
M9	Dished washer outer	119573	119573	119573	119573	119573	119573	119573	119573	119573	119573	119573	
M10	Cap	120306	126607	126607	126607	126607	126607	126607	126607	126607	126607	126607	
M11	Operating shaft	119260	129952	129952	129952	129952	129120	129952	129952	129952	129120	129120	
M12	Operating shaft bush	119262	155799+ 155800	119262	119262	119262	119262	155799+ 155800	119262	119262	155801 x 2	155799+ 155800	
M13	Handlever bush (2 off)	-	156910	129118/ 138686	129118/ 138686	138686	156910	156910	129118/ 138686	138686	156910	156910	
M14	Sleeve	-	129119	129119	129119	129119	129119	129119	129119	129119	129119	129119	
M17	Screw - reverse stop	118054		118054	118054	118054	118054	118054	118054	118054	118054	118054	
M19	Coupling	119264/ 127741	127741	127741	127741	127741	127741	127741	127741	127741	127741	127741	
M20	Gear lever shaft	127740	127740	127740	118041	118041	127740	127740	127740	127740	127740	127740	
M21	Selector arm	118040	118040	118040	118040	118040	118040	118040	118040	118040	118040	118040	
M23	Setscrew (Wedgelok)	105749 (lock wire)	122653	122653	122653	122653	122653	122653	122653	122653	122653	122653	
	Reverse switch	-	-	127380	-	-	147471	-	-	127380/ 147471	147471	UKC1908	BAU1074A

Despite the different part numbers, it appears that all 3-rail covers, with the possible exception of part # 120304 fitted to the earliest Heralds and Spitfires, use the same 303250 casting.

Reverse selector shaft 154945 has closer indents than 134290 and machined land for reverse switch

Comparison of 134290 and 154945 reverse selector shafts. The later 154945 shaft is about  $\frac{1}{8}$ " longer than the earlier shaft, the difference being the length of the bevel at the switch land. The difference in indent positions is obvious!







Selectors, shafts, stud and pins were removed from the cover. Welch plugs and locating pins were driven out with a 3mm diameter punch. Picture below, from Herald 1200 factory repair manual, shows how this is done. Make sure all selectors/shafts are in the “neutral” position before removing these plugs. A similar method is used to remove the locating pins for the gearbox extension assembly if needed.

Removing selector shaft Welch plugs.

Use 3mm or  $\frac{1}{8}$ " diameter punch.



It should be possible to make up a support for the cover that would permit the required machining to be done without stripping the cover. This may be a better bet but the reverse actuator, shaft and Welch plugs must be removed. There is a steel ball, L30 - part of the selector interlock mechanism, that should be removed to prevent loss. Ditto for L31 & L32 - the detent plunger and spring.

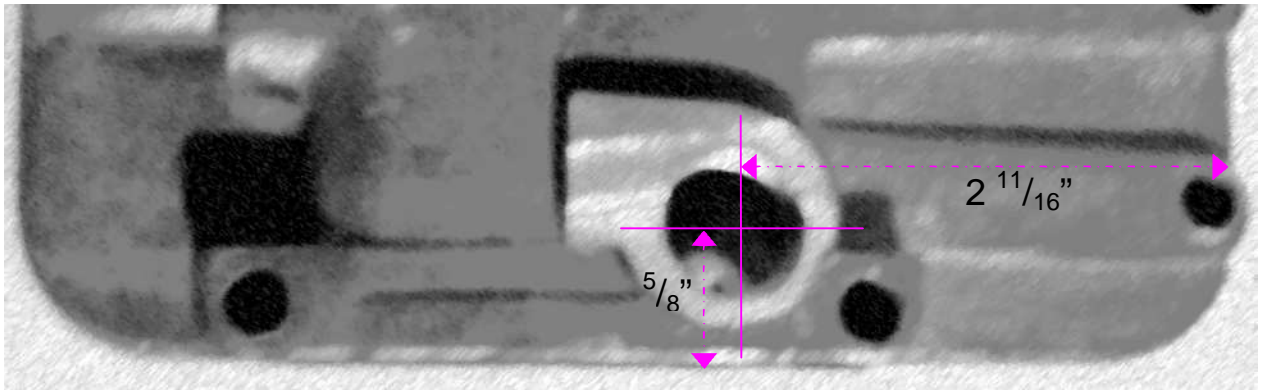
Removing the selector actuator retaining taper bolt(s) is the most difficult part of the job. This requires a closed  $\frac{5}{16}$ " square spanner such as used on some older cars to adjust the brake shoes. Failing that an 8-point  $\frac{5}{16}$ " socket also works well if you can find one. Chances are good that the taper bolt will shear off on earlier covers. The bolt will thus have to be drilled out. The taper bolts have a  $\frac{5}{16}$ " x 24 tpi, (UNF) thread. Replacements taper bolts are available from Rimmers (part # 122653 @ £4.85 each!) at time of writing.

Once ready to machine, the cover was clamped to the saddle of a combined lathe/mill and the surface of the cover casting was dressed flat using several passes with an end mill bit. Several “tee” nuts were made up to allow the cover to be secured to the saddle by  $\frac{1}{4}$ " bolts through the cover mounting holes. Depending on the depth of cut with the end mill – I took several light cuts – the lateral forces on the cover are fairly minimal. Location of hole is not absolutely critical – the center of the cast land is near enough. Actual measurements used, from measurement of a later style cover fitted with a reversing light switch, are shown on next page.

A pilot hole – c1/4", was drilled and then the hole was drilled to its final size of 14mm in preparation for tapping. The hole must be drilled to its full width in the actuator shaft bore. The mill was set to its lowest speed, the tap (a “plug” or “bottoming” tap) replaced the mill bit and with firm pressure applied the start of the thread was cut. Once the thread was started, square to the cover, the chuck was opened, raised and the milling head was swung clear of the work area. A tap wrench was used to finish cutting the thread continuing until the tap “bottomed out”.

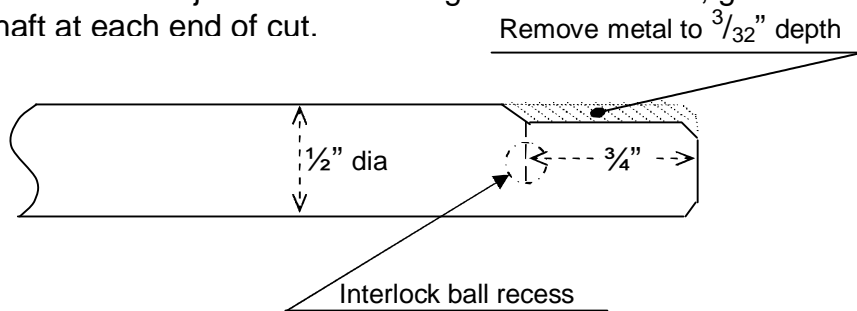
The thread of the Lucas switch is 16mm x 2mm.

Location of reverse switch drilling on cover. All measurements taken from edge of cover. Depth of drilling to about  $\frac{5}{8}$ " below machined land, the exact depth will depend on how much metal is removed to form a flat surface.



The next job is to grind a flat on the reverse actuator shaft. Dimensions for this part of the job are provided below. There is a bit of 'come and go' on this part of the work. The final vertical position of the reverse switch is set by fibre washers between the switch and the cover.

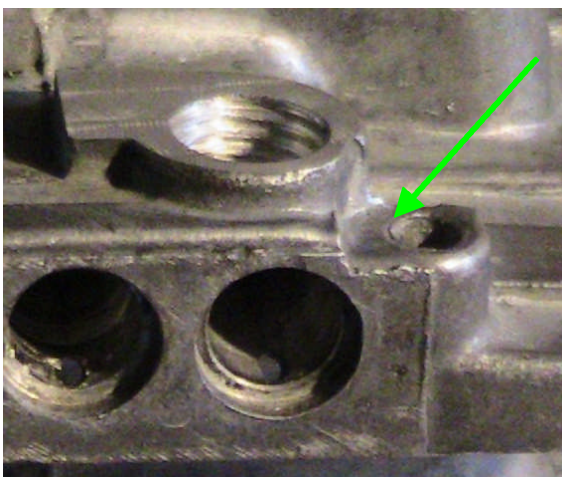
Sketch showing modification requirement of reverse actuator shaft. Shaft is (case) hardened so metal will need to be removed by grinding. With care, an angle grinder will do the job. After removing metal from shaft, grind 45 degree bevel on shaft at each end of cut.



Once the required machining has been completed, clean the cover and shaft ensuring all swarf and grinding dust has been removed and refit previously removed parts to the cover.

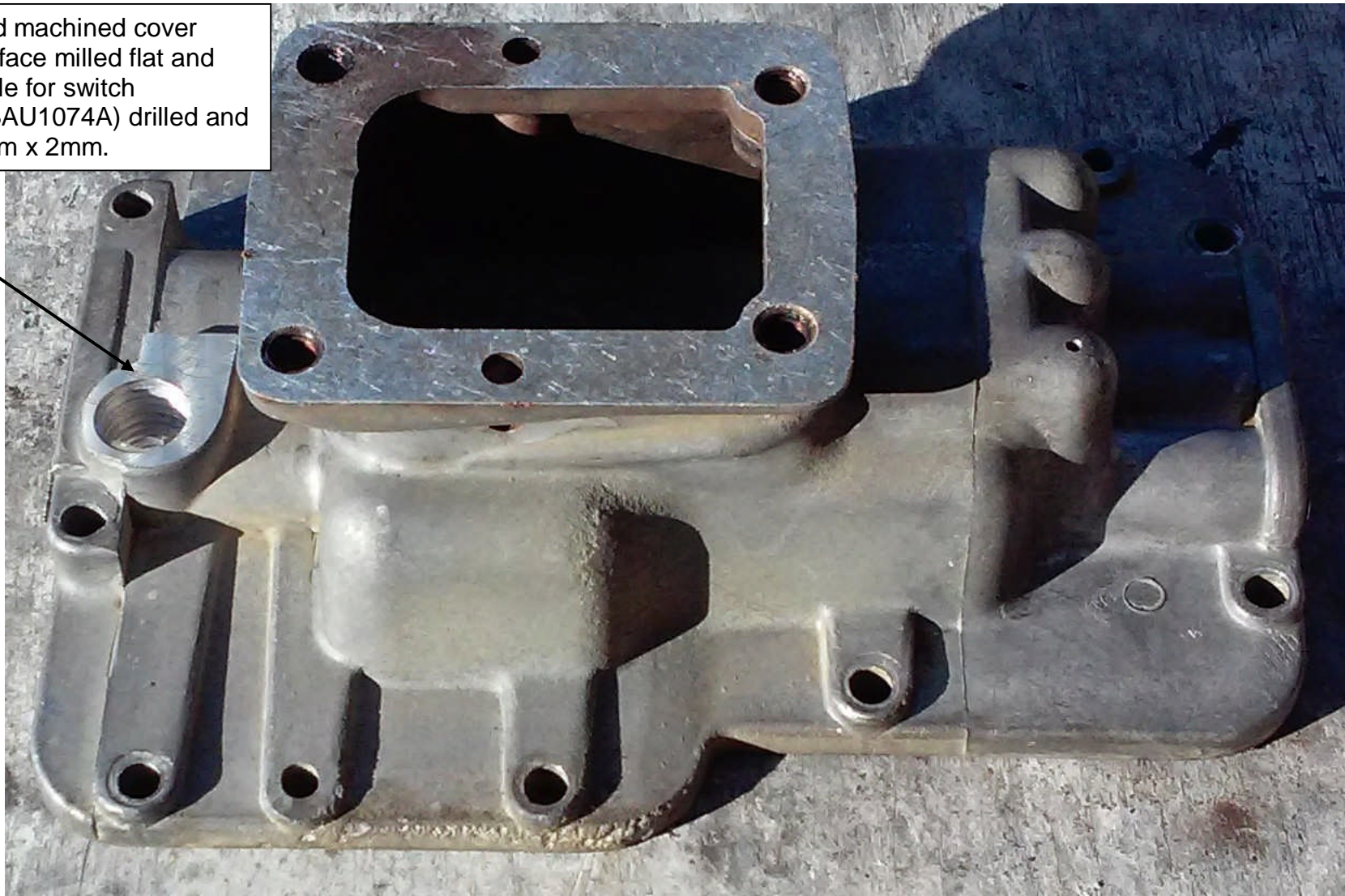
Welch plugs are  $\frac{5}{8}$ " diameter. These may be available locally but Rimmer's can supply these (part # 51K3424). Place some sealant around the edge of the recess that receives the Welch plug before fitting. Hylomar Blue or similar is good for this job.

When fitting the reverse switch, install fibre washers between the switch and cover as required to ensure correct operation.



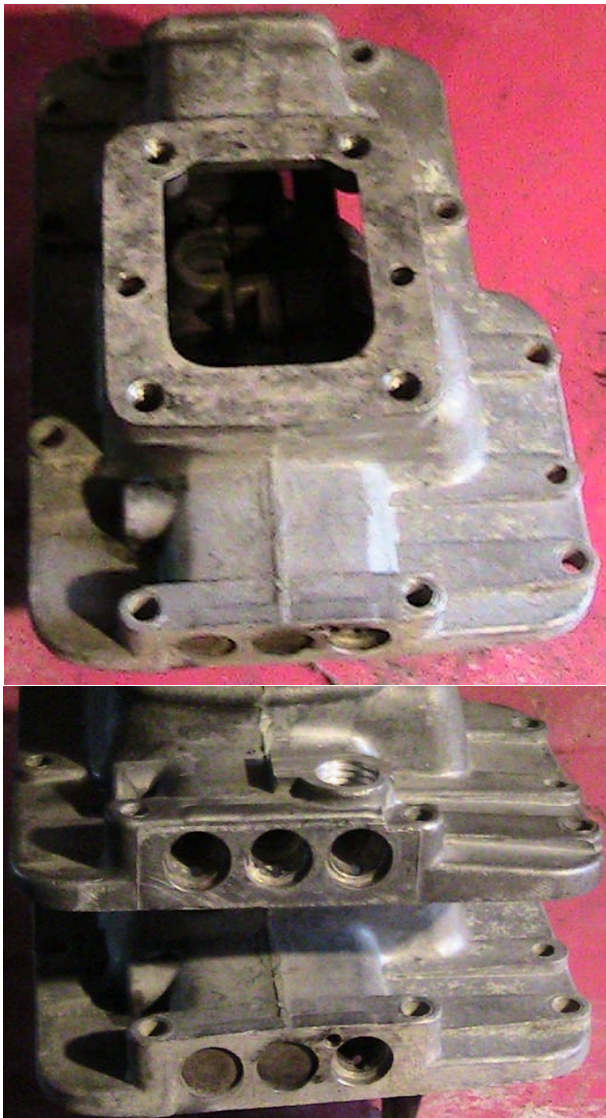
Close-up of reversing switch area on 303250 pattern cover showing finished switch mounting hole. Note the recessed land for this cover securing bolt (arrow). This provides clearance for the bolt-head, lock and spring washers below the switch itself. The switch has to be removed before this bolt can be accessed with a socket or removed from cover. This recessed land is not present on the earliest cover(s).

Stripped and machined cover showing surface milled flat and threaded hole for switch (Rimmer's BAU1074A) drilled and tapped 16mm x 2mm.





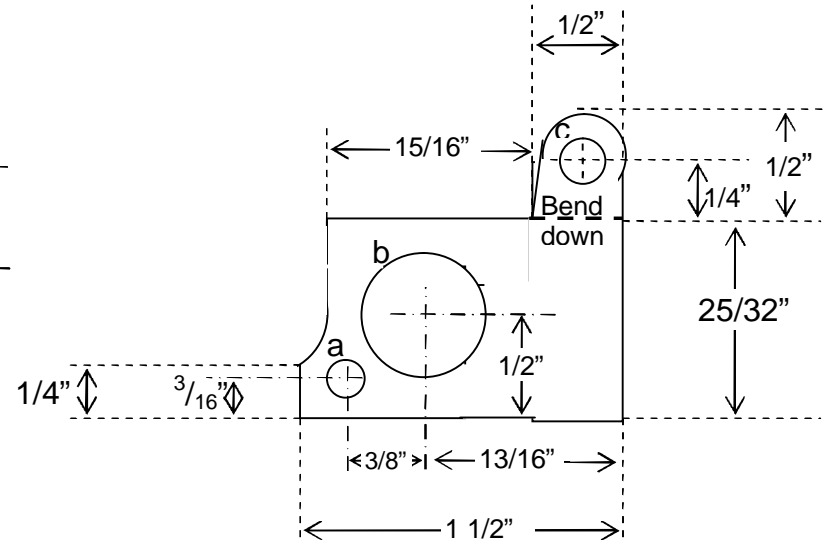
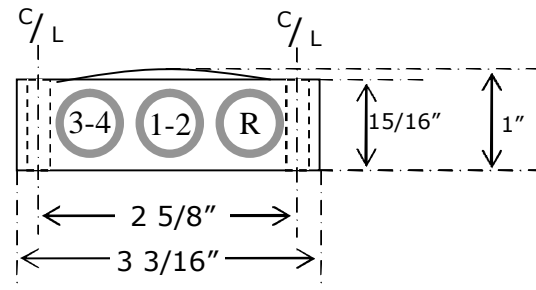
The procedure described in the previous pages replicates the reversing switch mounting as used in later Triumph 3-rail gearboxes. It may also be possible to make up a bracket to fit a switch from another car, or manufacturer, such that it operates on the end of the reverse actuator shaft. This method entails removing the relevant Welch plug from the cover and the drilling of one hole in the cover with no further disassembly required.



Top photo shows rear of early cover. The bottom photo shows the rear views of a late (upper) and early cover (lower).

The difference in the castings in this area can be readily seen. The early cover has no provision for fitting a reversing switch as the later cover does. The later cover was not always drilled for the reversing switch but could be machined as set out earlier if a switch was desired to be retro-fitted.

Part rear end of early cover dimensions.



Support plate dimensions:

Material: 1/16"/16swg/1.6mm (2mm) galvanised or stainless steel sheet. Cut-away portion on left to follow casting shape - could be left as a straight edge.

Hole a: clearance for 3/16" UNC screw.

Hole c: 17/64" dia (1/4" screw clearance). Mark, after bending, with a 1/4" drill through hole in cover. Then drill to final size.

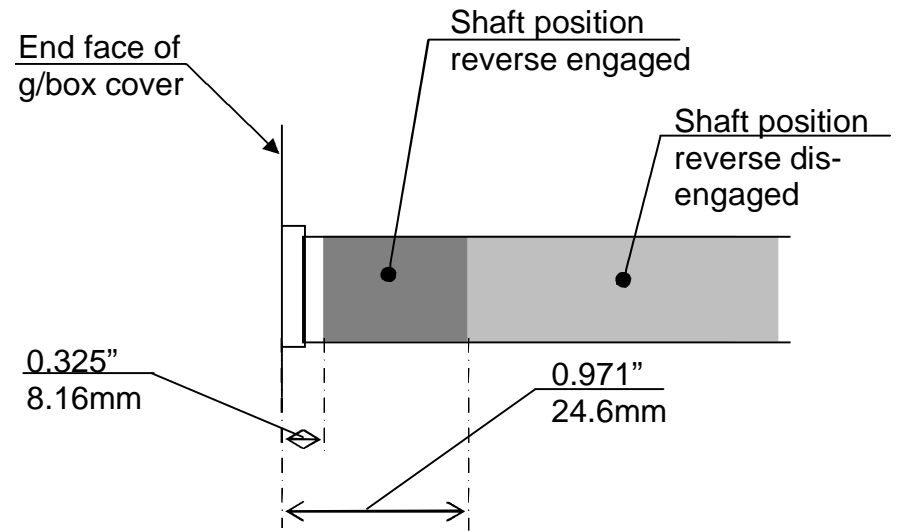
Hole b: as required. This has options: A nut could be welded to the plate to suit the switch chosen rather than machining a boss to accept the switch. If this style of fitting was used, a suitable O-ring should be clamped beneath the plate to seal the cover.

Measured position of shaft in (early) cover casting. To fit a switch to this cover will need a support plate and some means of sealing the cover.

The aluminium cover is fairly soft and although a 14mm thread could be formed at the end of the shaft drilling, the amount of purchase (2 or 3 threads maximum) may not hold over time, so this option has been discounted.

Use a custom made boss to support a switch if you have the capability to make one. The option of welding an appropriately sized nut to the plate can be done without recourse to a lathe, requiring only a drill press and means of shaping the plate. This could be done in most home workshops.

*This method could also be used with the later covers if the facilities to machine the cover to take the "correct" switch are not available.*

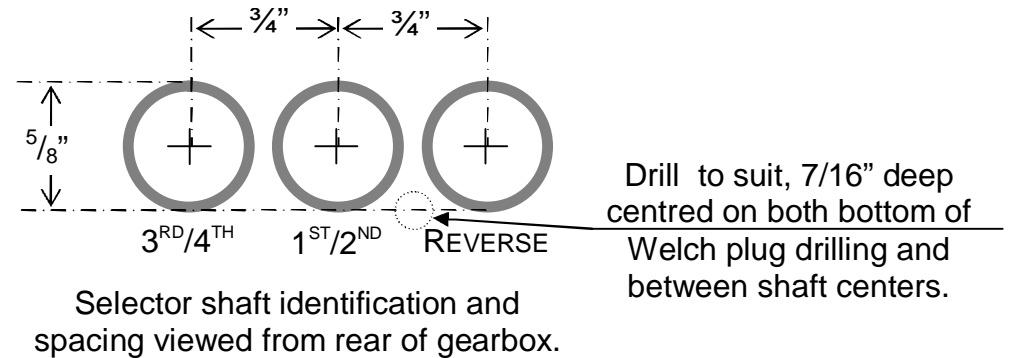


Dimensions of cover drilling for selector shafts showing position of plate retaining screw hole. This to be tapped 3/16 Whitworth or #10 UNC for retaining screw.

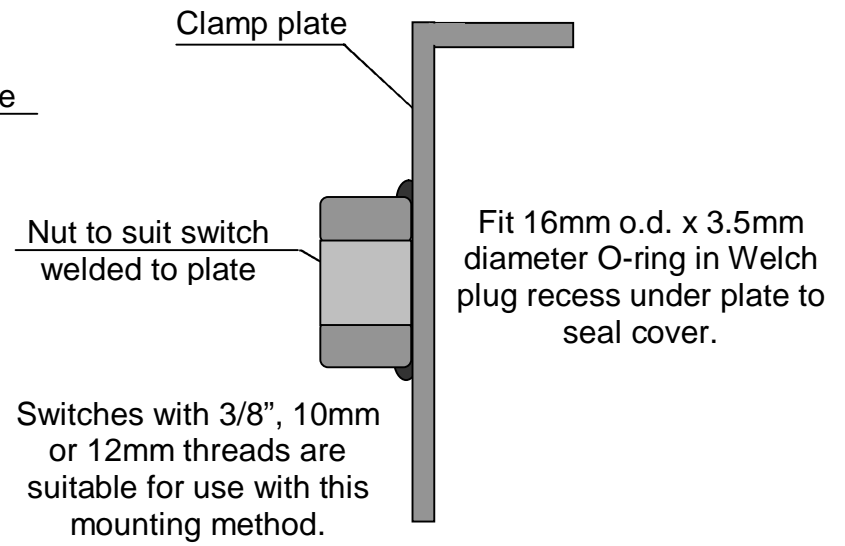
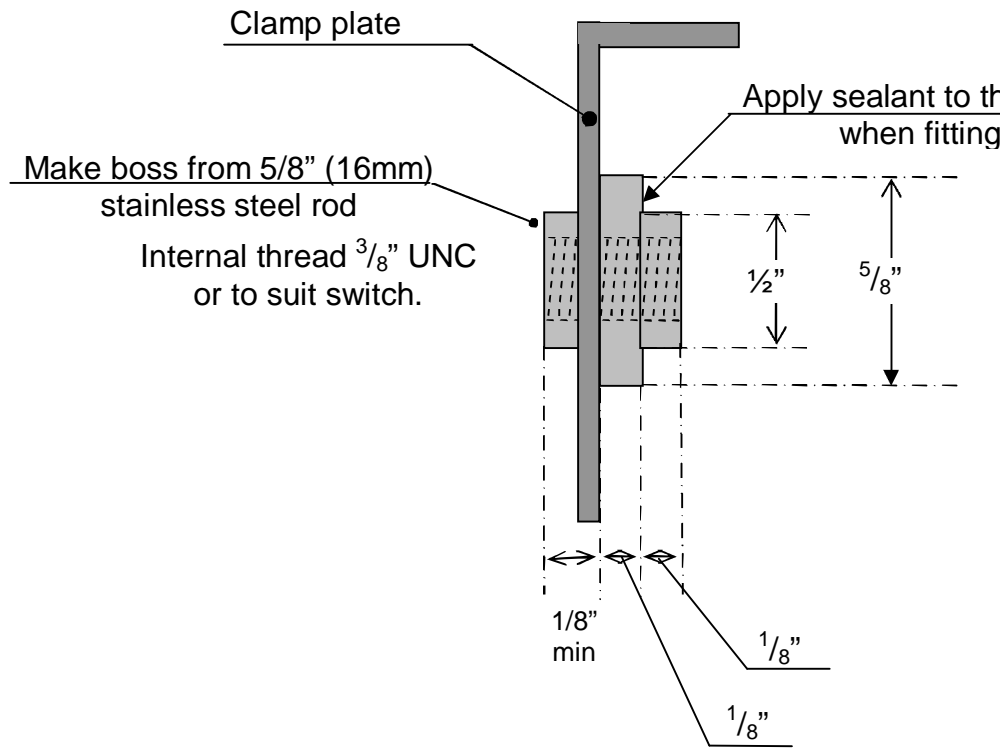
Limiting depth of the retaining screw hole to c7/16" will avoid penetrating cover. Otherwise, use thread sealant on retaining screw. Use thread locker and/or lock washer to secure this screw.

There is little clearance so a cap screw (socket head) screw is preferred. Possible alternative fixings are a self-tapping screw, blind (Pop) rivet or a drive screw. Either of these latter options may cause problems should complete dismantling of the gearbox cover be required at a later date.

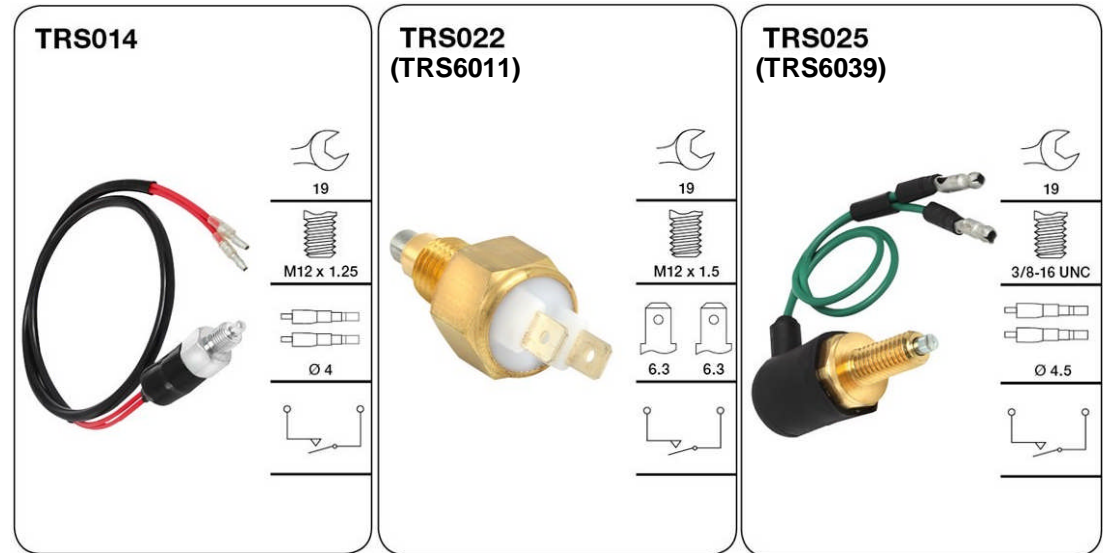
In retrospect, a self-tapping or drive screw may be the best option here.



Switch mounting plate dimensions showing both mounting boss and welded nut forms.



Pictures at right show several Tridon (Australia) switches that are readily available and may be used here. Other manufacturers will have similar products. Numbers in brackets are New Zealand part numbers.  
 A TRS025/TRS6039 switch was used in a early modified cover.



TRIUMPH OWNERS' CLUB  
 CHRISTCHURCH  
 NEW ZEALAND  
[www.triumphclub.co.nz](http://www.triumphclub.co.nz)