Mk1 or Mk2?

Mk1 tunnel with a pronounced hump on top of the tunnel in a large removable panel round the gear lever: (*MGBs Made in Australia*)

Non-OD on the left with the lever at the front of the oval rim ring, OD on the right with the lever at the rear of the trim ring: (*Clausager*)

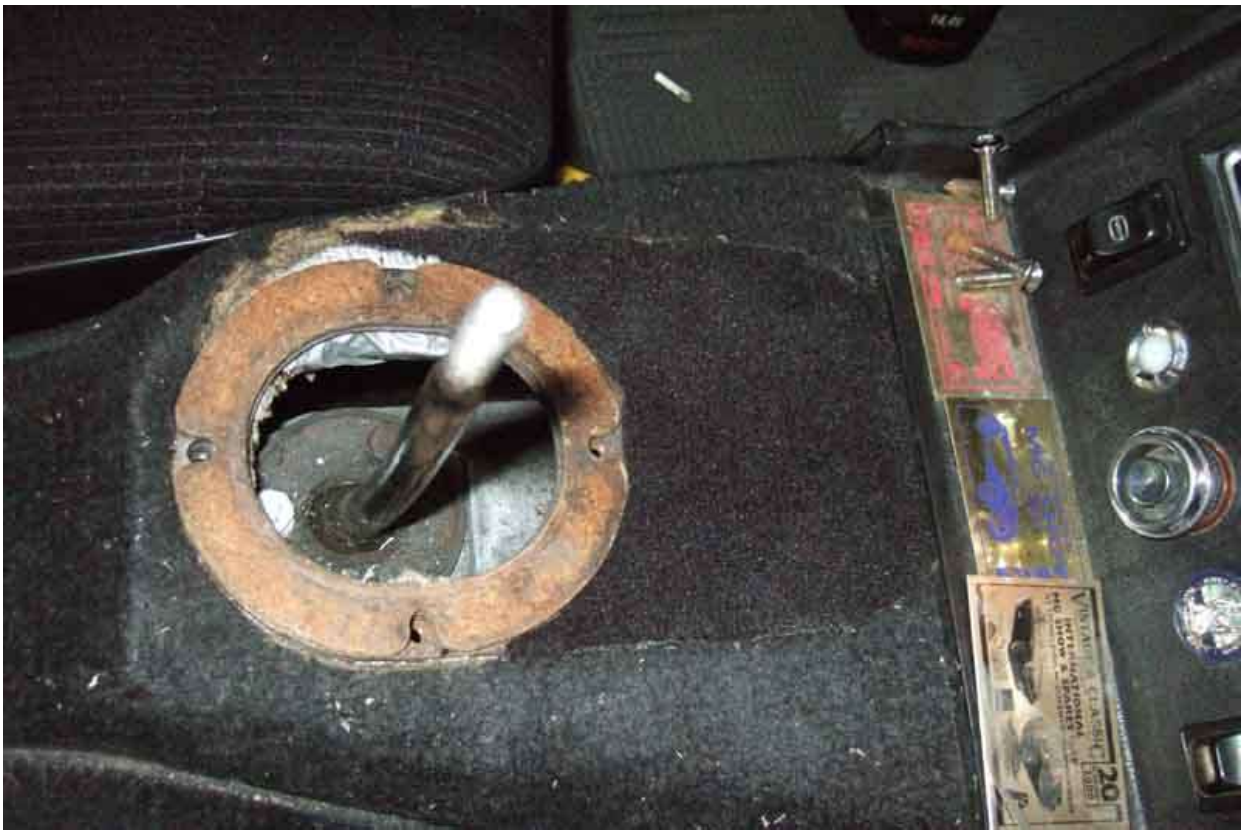
Mk2 tunnel is wider with a flat top, with the lever in the same position on both OD and non-OD. There is a small removable panel HZA1431 screwed to the tunnel:

Removed - suppliers show gasket AHC188 under it and I did find that on a 78 sitting on the metal tunnel but both Bee and Vee have thick insulation there which makes the gasket pointless:

Early Mk2 lever in the same position for both OD and Non-OD: (*Clausager*)

Mk2 with the 72 and later centre console. What the rubber bit at the top of the gaiter is I have no idea, it came with the car - possibly hiding a bit of rattyness at the top of the gaiter, but like steering wheel and the gear knob it seems churlish to replace that part of the car's 'character':

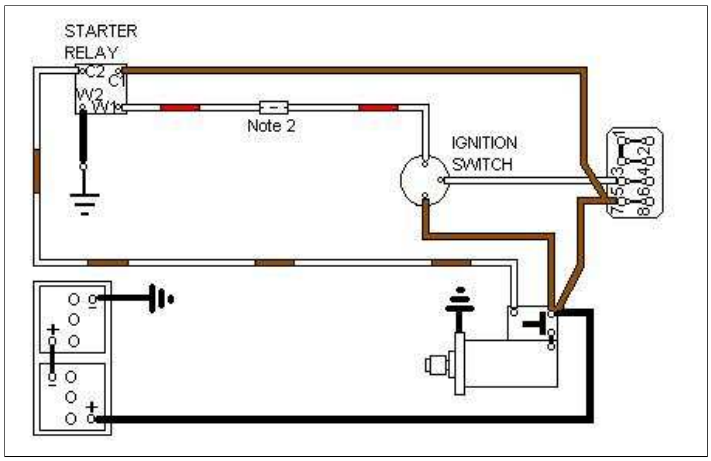
With the 72 and centre centre arm-rest the tunnel carpet can be cut to allow removal of the small access panel without pulling the carpet back, saving a section of carpet to drop back on top for noise insulation:



A 4-synch gearbox can be installed in a Mk1 car but the large removable panel on top of the tunnel needs a section inserted to move the hole back for the 4-synch gear lever, as indicated by the arrows:

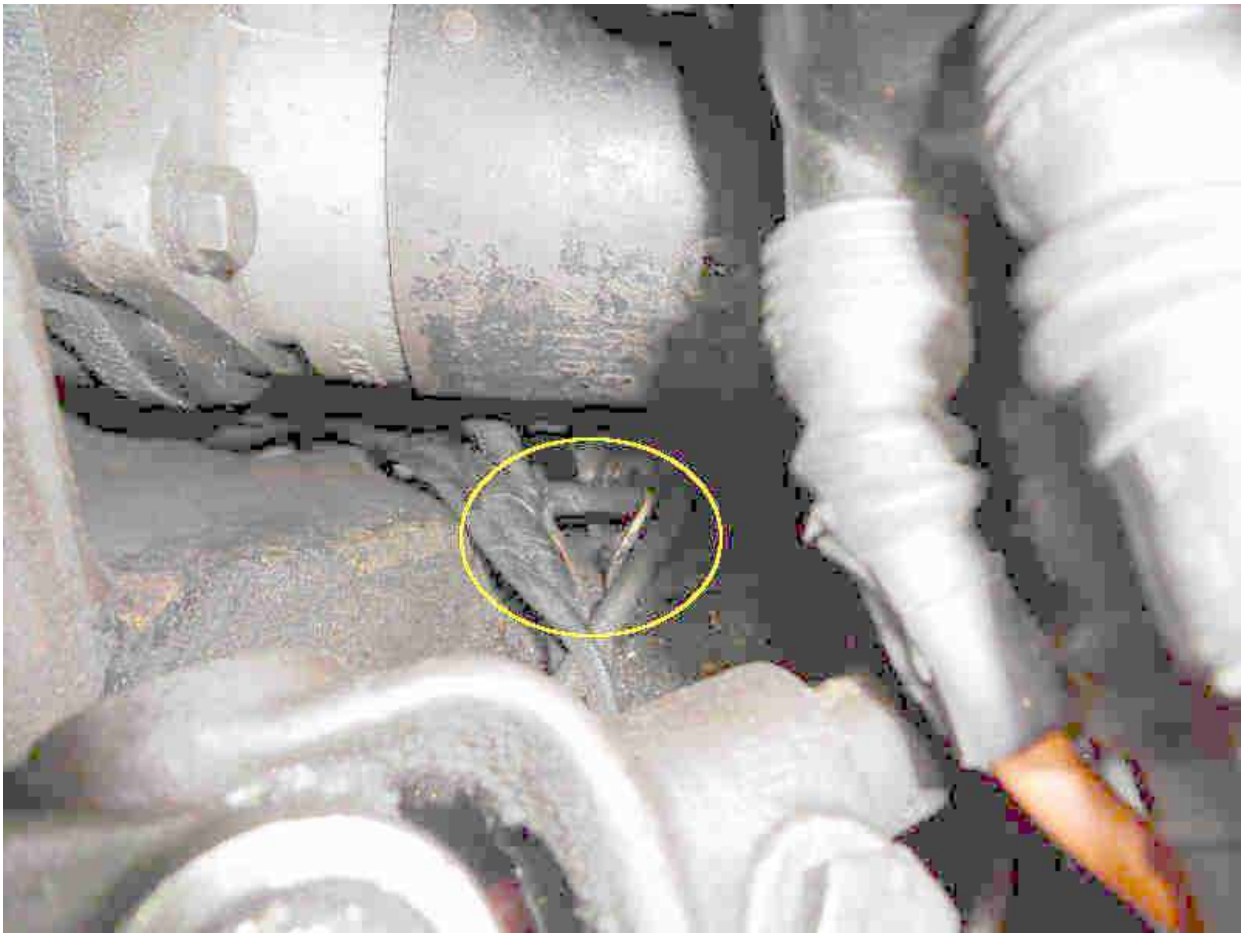
Pre-engaged Starter (attached solenoid), 12v Coil (chrome bumper 68-on, not V8)

Hover over a wire to confirm the colour



Note 1: 1968 and 1969 cars had the pre-engaged starter but no starter relay, the White/Red went direct to the solenoid.

Note 2: There is a bullet connector in the white/red between the ignition switch and the starter solenoid (68 and 69 models) or the relay (70 and later) on **all** Mk2 CB cars, which is where the transmission safety switch/starter inhibitor wires are connected when the automatic gearbox is fitted. Arrowed below, just above the bracket for the clutch pipe and hose, in the tail that leads down to the starter:



See here for more info on the combined inhibitor and reversing light switch.

Note 3: 1973 and 1974 North American cars with the Sequential Seat-belt System (aka 'bum detector') have the white/red connected to pin 1 of the control unit and a Yellow/Pink from pin 3 of the control unit to the starter relay.

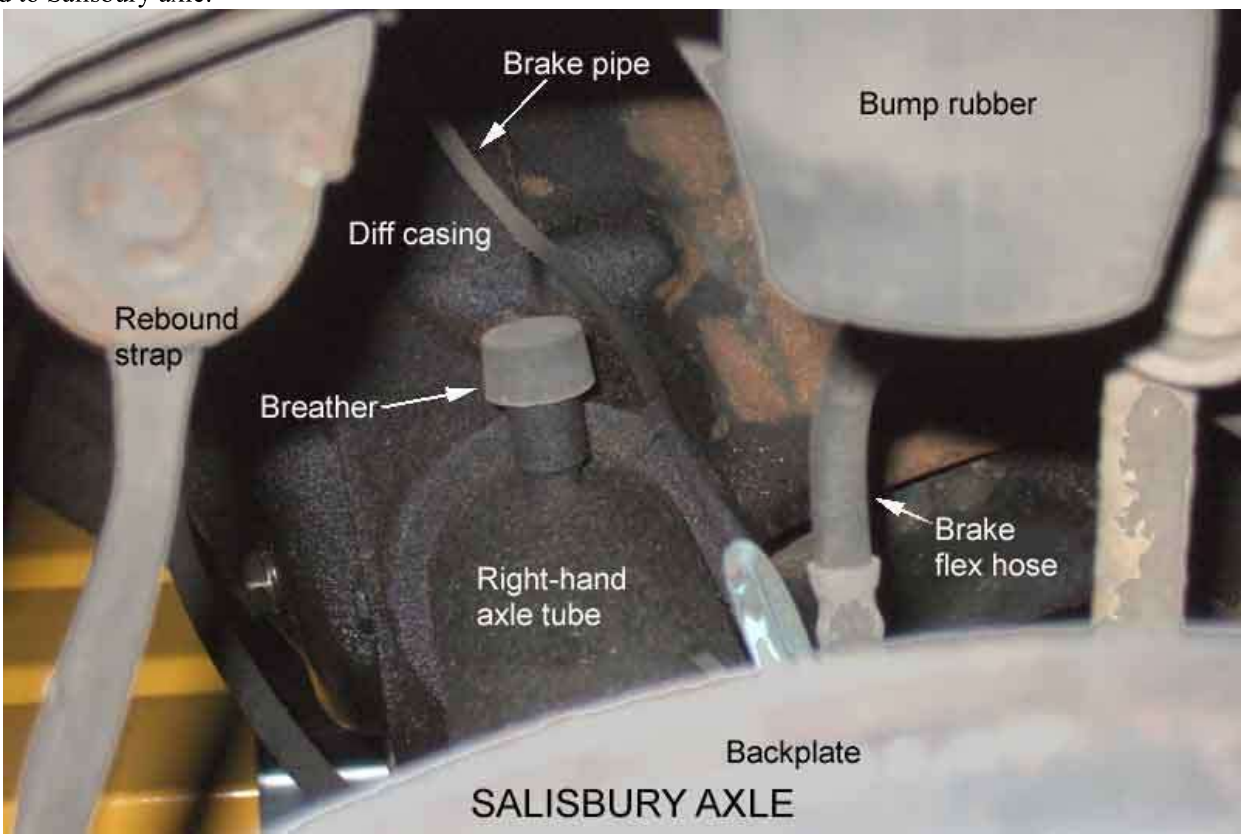
What's that kink in the heater return pipe for?

To give clearance for the kick-down cable on automatics:

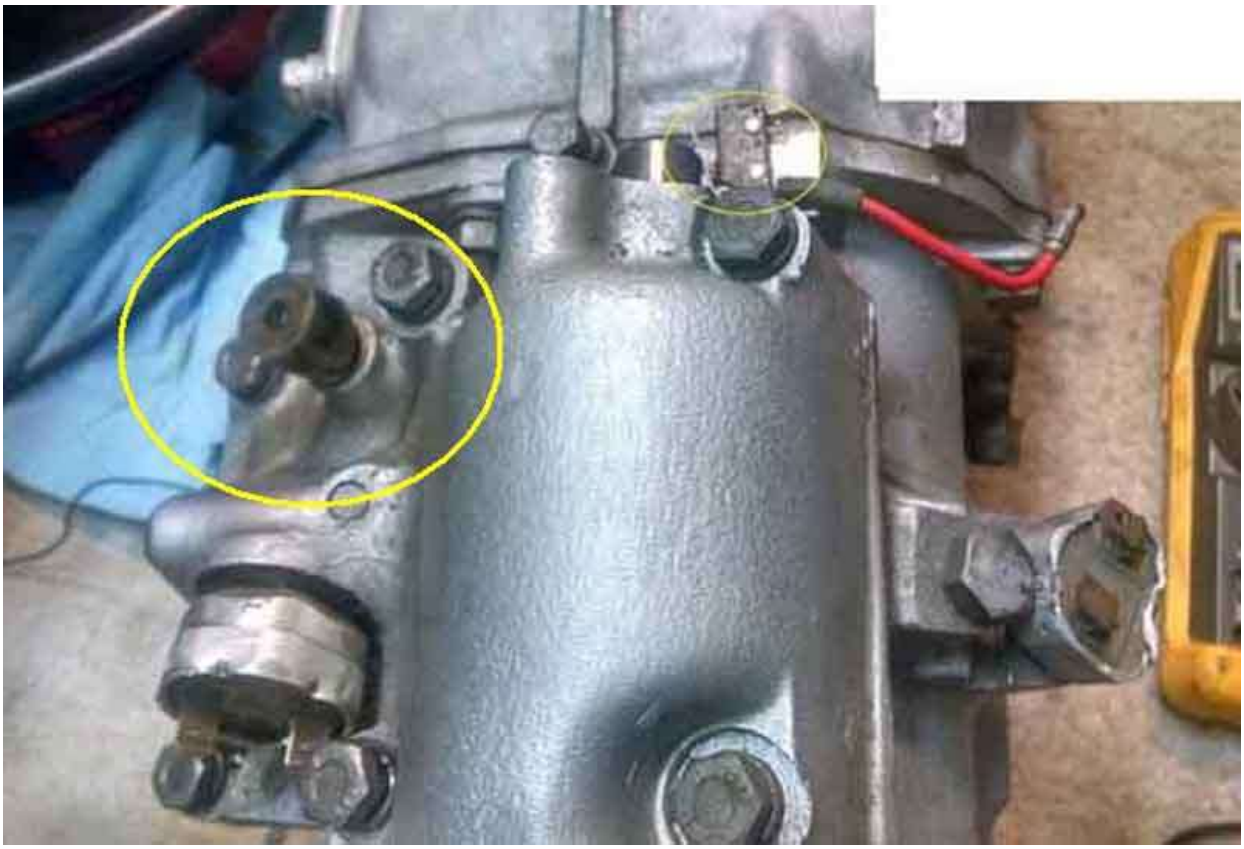
Kick-down cable and starter inhibitor/reversing light switch on a BW35 auto:

Axle/gearbox breather

Installed to Salisbury axle:



4-synch gearbox - OD and non-OD are the same:



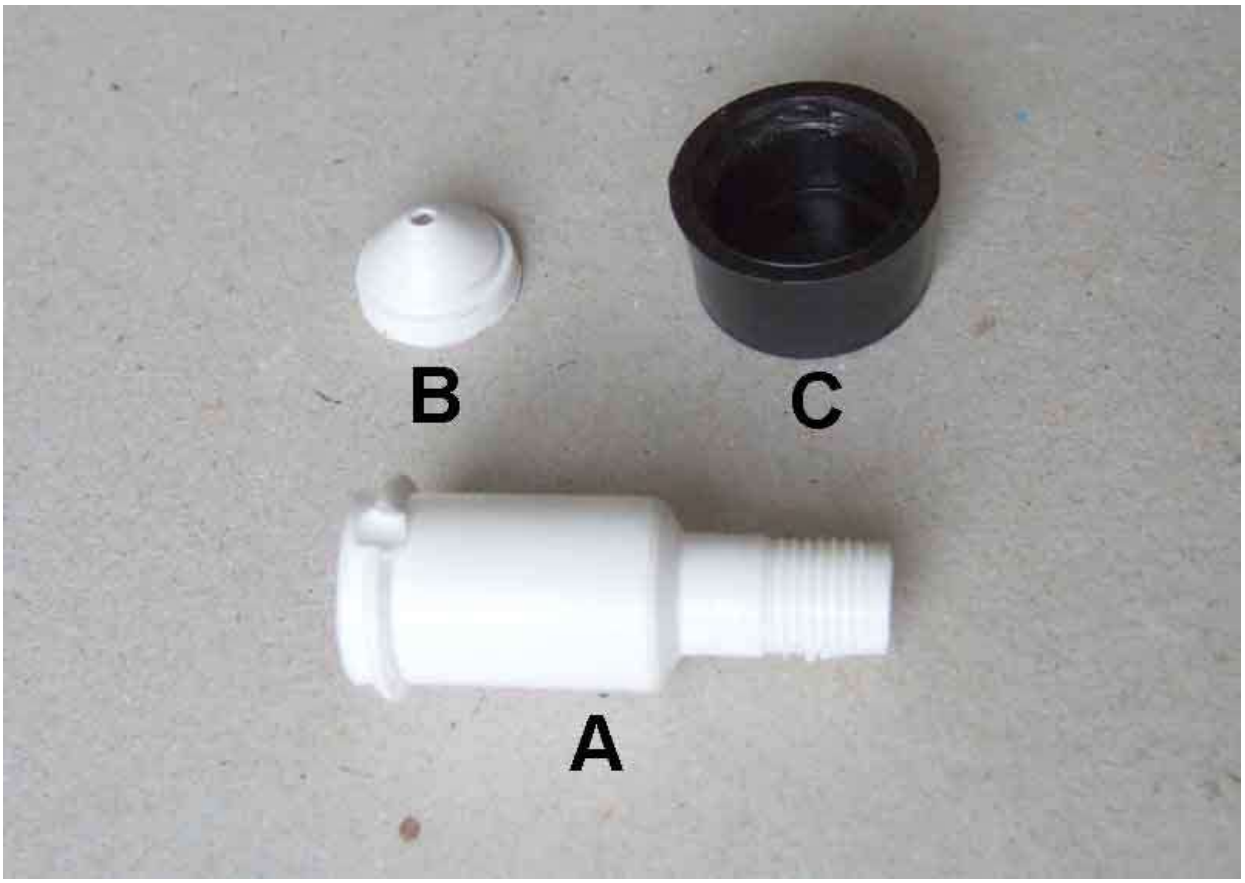
3-synch non-OD: (*Chicagoland MG Club*)

However despite one being listed in the Parts Catalogue there are several indications in the wild that 3-synch OD don't have one, just a hole in the side of the remote change unit:

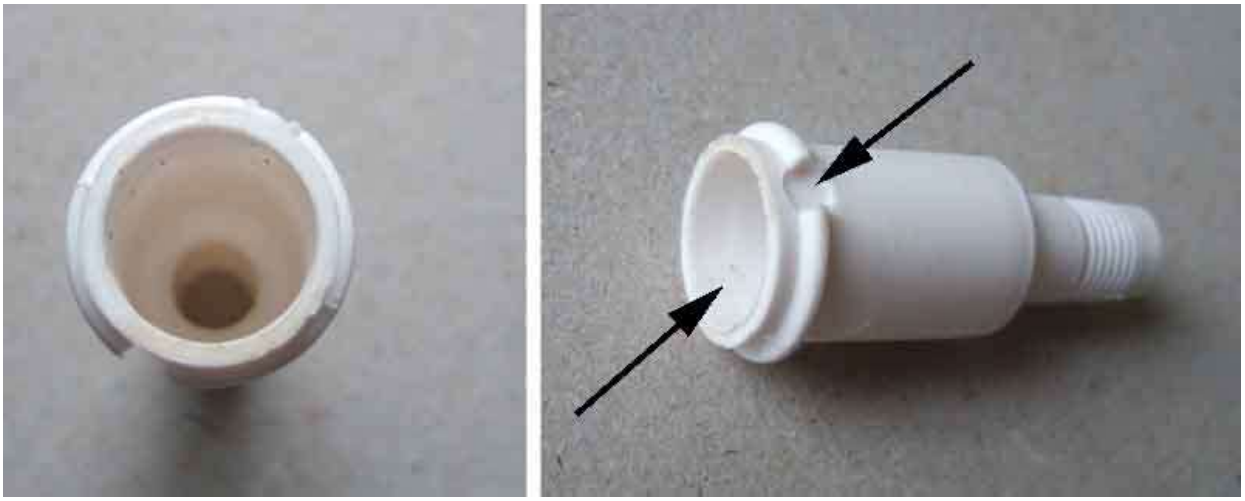
Then again this does seem to have something fitted in that hole (yellow arrow, ignore red circles):

Cap removed. The cap seals the end of the tube, and the holes in the sides (one each side) allow for the breathing. Martin Roberts pointed out that they can be used with a small screwdriver or thin bar through the holes to fit it - or to remove one that hasn't already broken off. The cap should shroud the holes to hopefully prevent flood water going in, but it's a bit hit and miss. (*Dave O'Neil on MG-Cars.net*). I suspect this is the earlier breather as a new 21H6060 in 2017 is quite different:

A new 12H6060/V8 breather, comprising a body (A), insert (B), and cap (C). It can be seen that the main part of the body and hence the cap are significantly bigger than the original items above:



Whilst the body has indentations (arrowed), they are not pierced as in the earlier breather. Together with the cut-outs in the ring around the body (which the cap snaps onto), they allow air to pass between the cap and the body:



The insert. The small hole visible in the first image is actually too small to allow water that might be sitting in the insert to run through to the axle. Of course, if the axle is hot, and has run through water, any sitting there will be sucked in as the axle cools. The slots across the top allow air to pass between the insert and the cap:

The insert fitted to the body ...

... and the cap fitted:

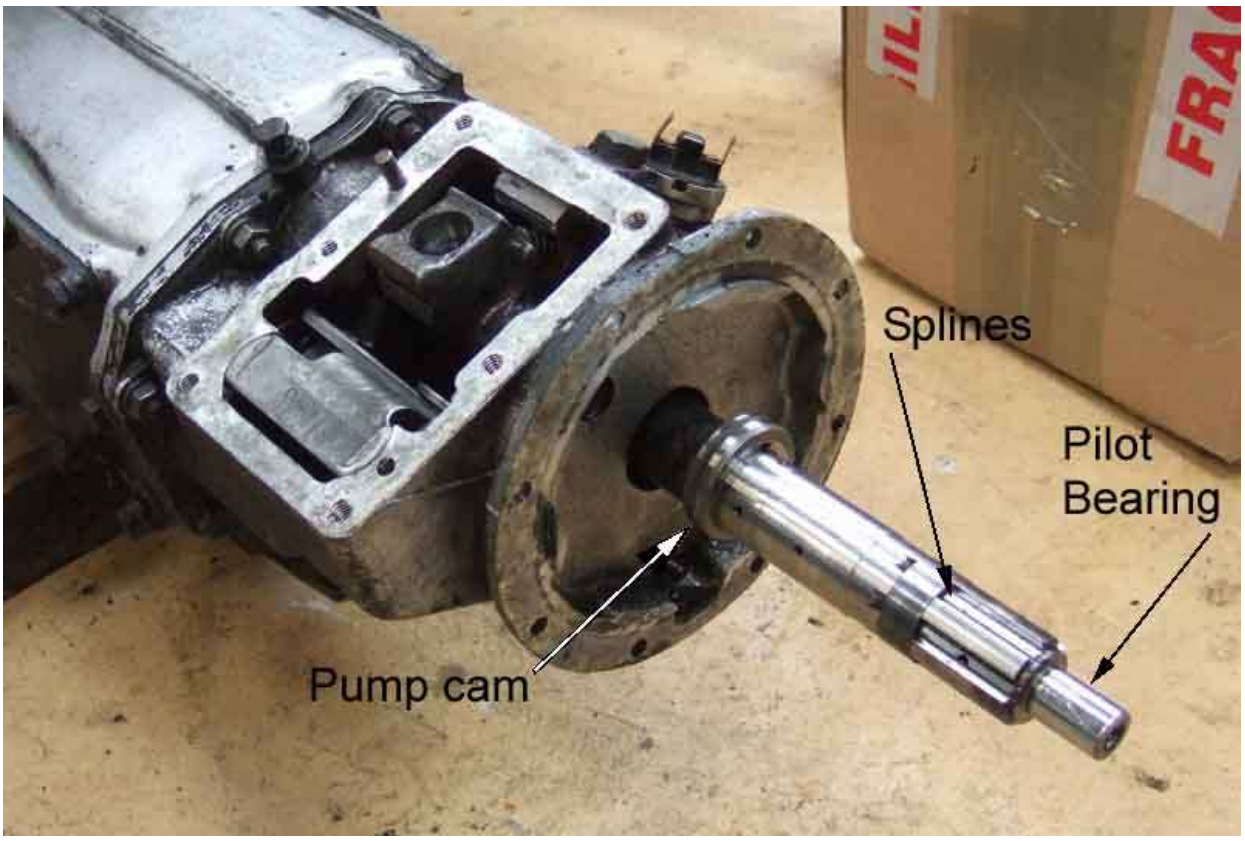
Overdrive Replacement

A lot of worrying crud, probably friction material, on top of the filter, which is what led to the replacement of the OD

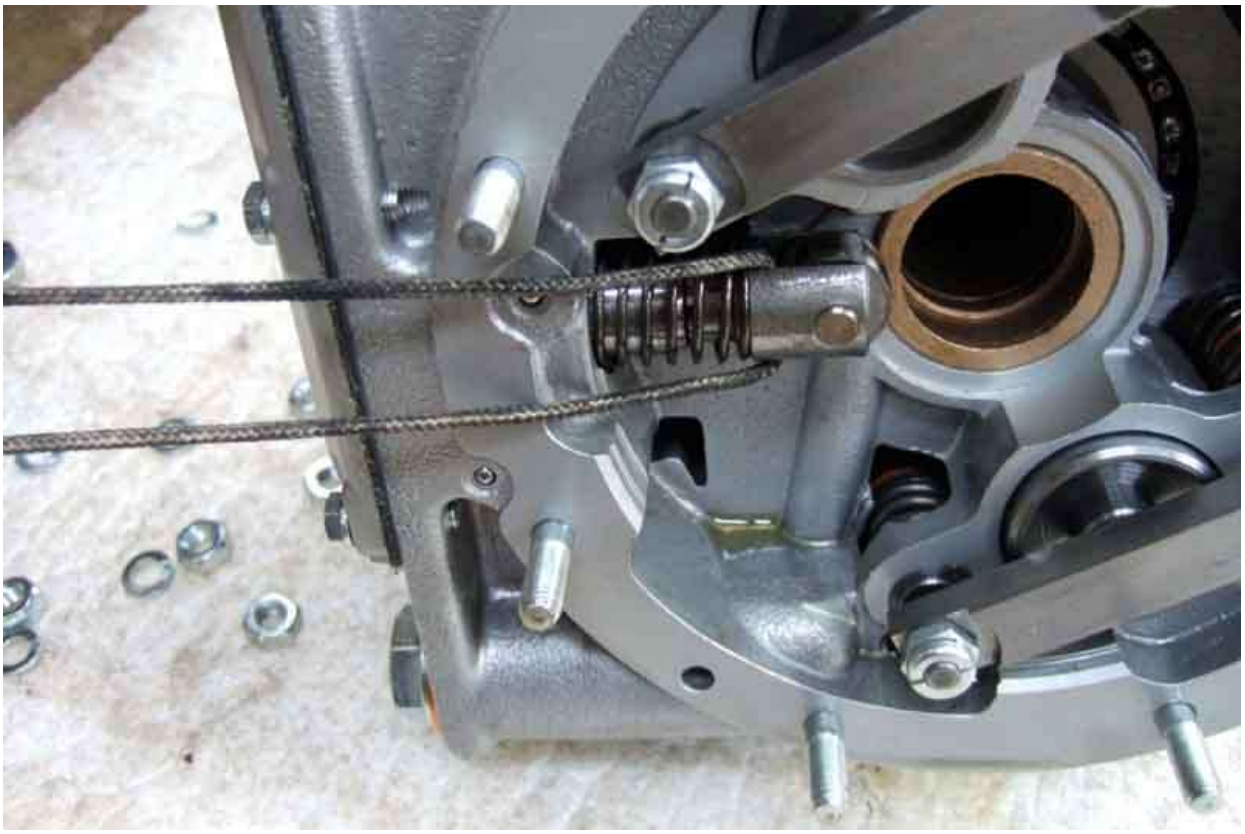
Gearbox separated from engine, bit of wood wedged between ring-gear and starter pinion prior to undoing the clutch cover plate bolts to replace the clutch at the same time.

Gearbox on Workmate preparatory to fitting OD

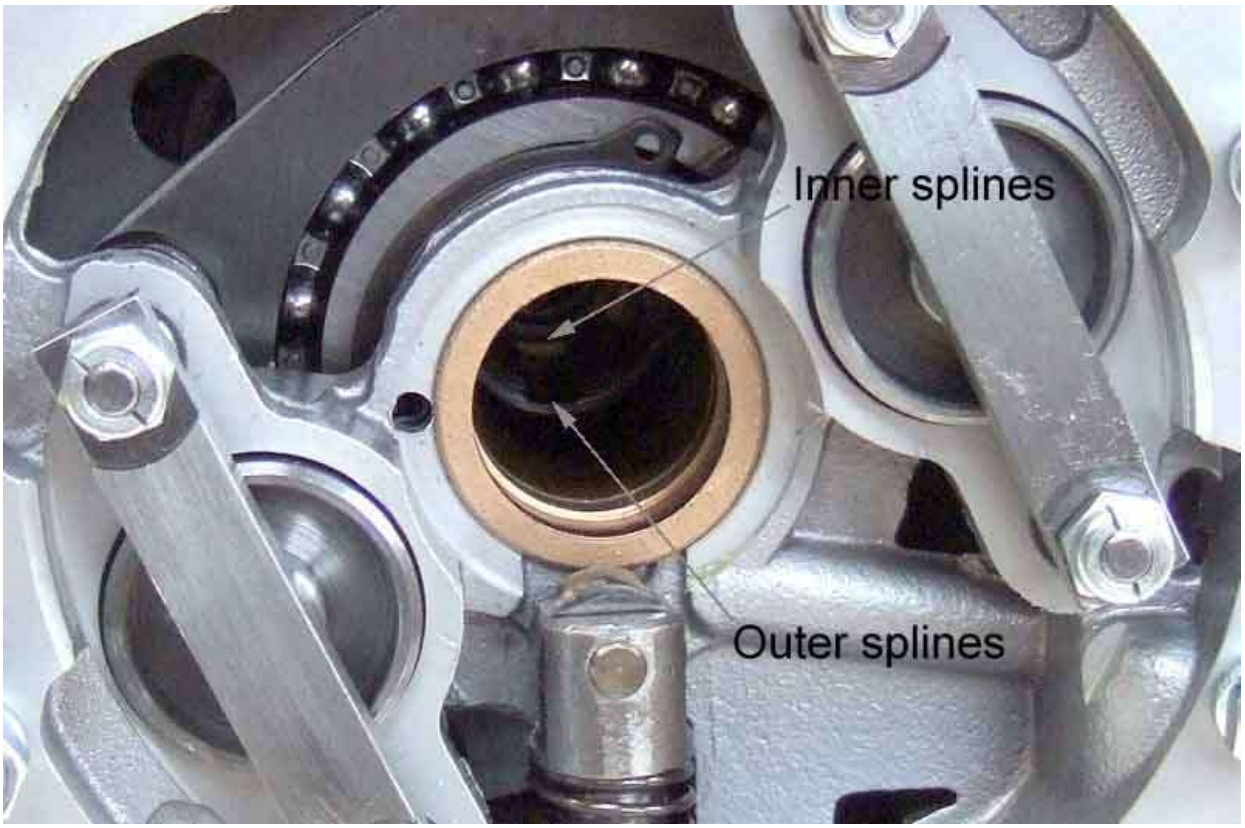
OD pump cam and splines on gearbox output shaft. Just like the gearbox first-motion shaft and crankshaft there is a pilot bearing in the OD for this shaft as well



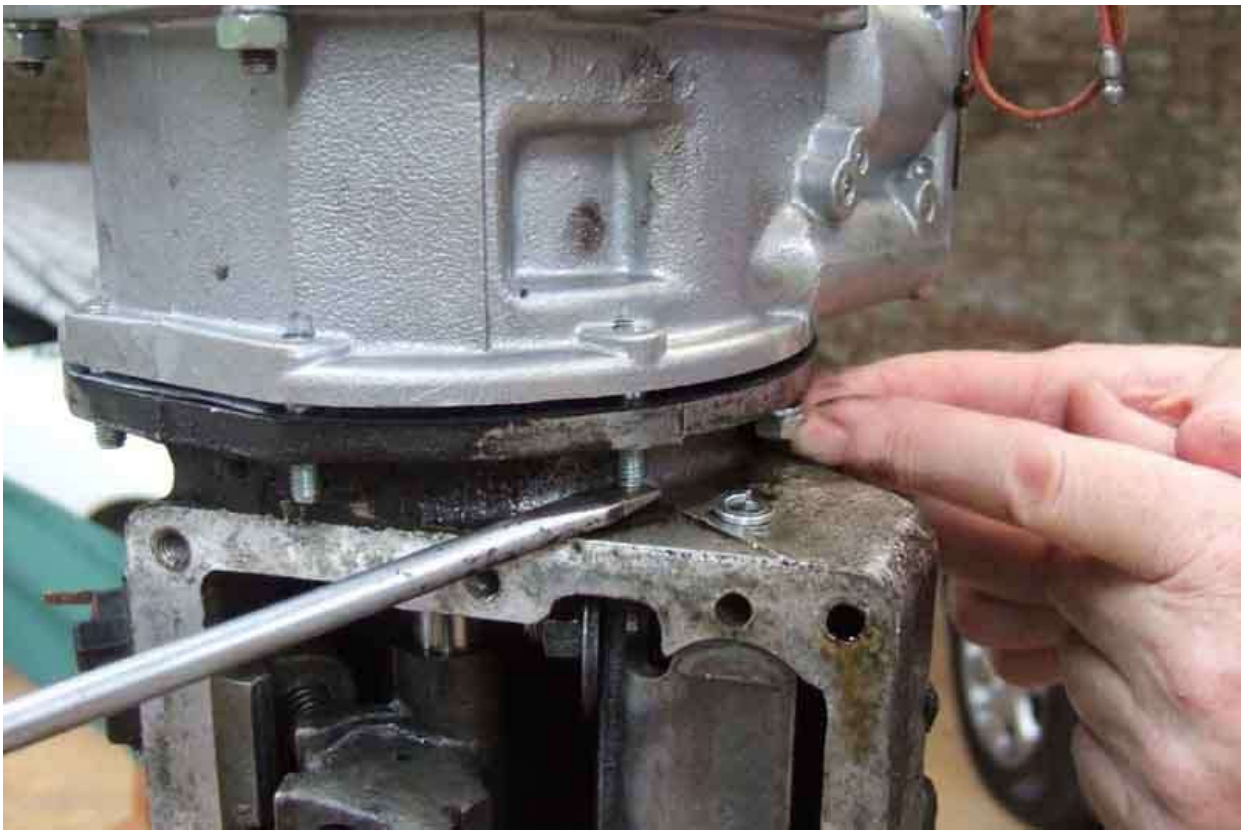
OD pump with cord to pull it back so the roller goes over the cam



Splines just visible inside the OD



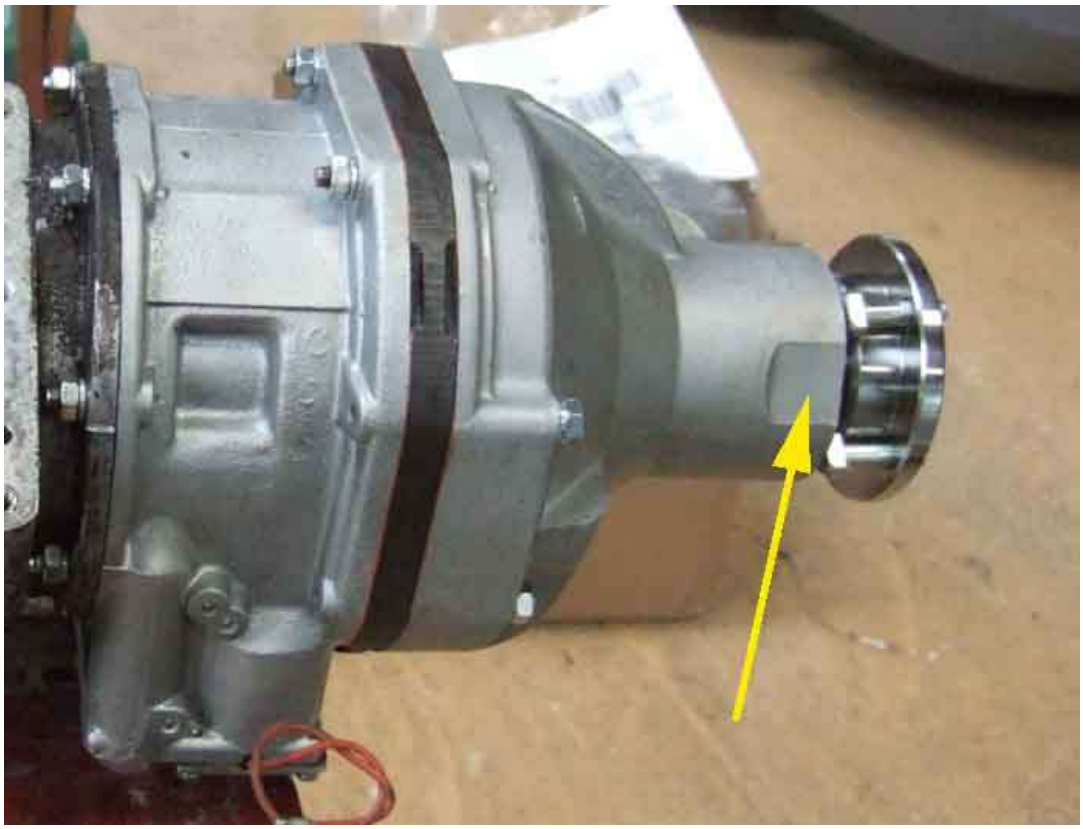
Jacking up the OD to enable fitting washers and nuts to two of the studs



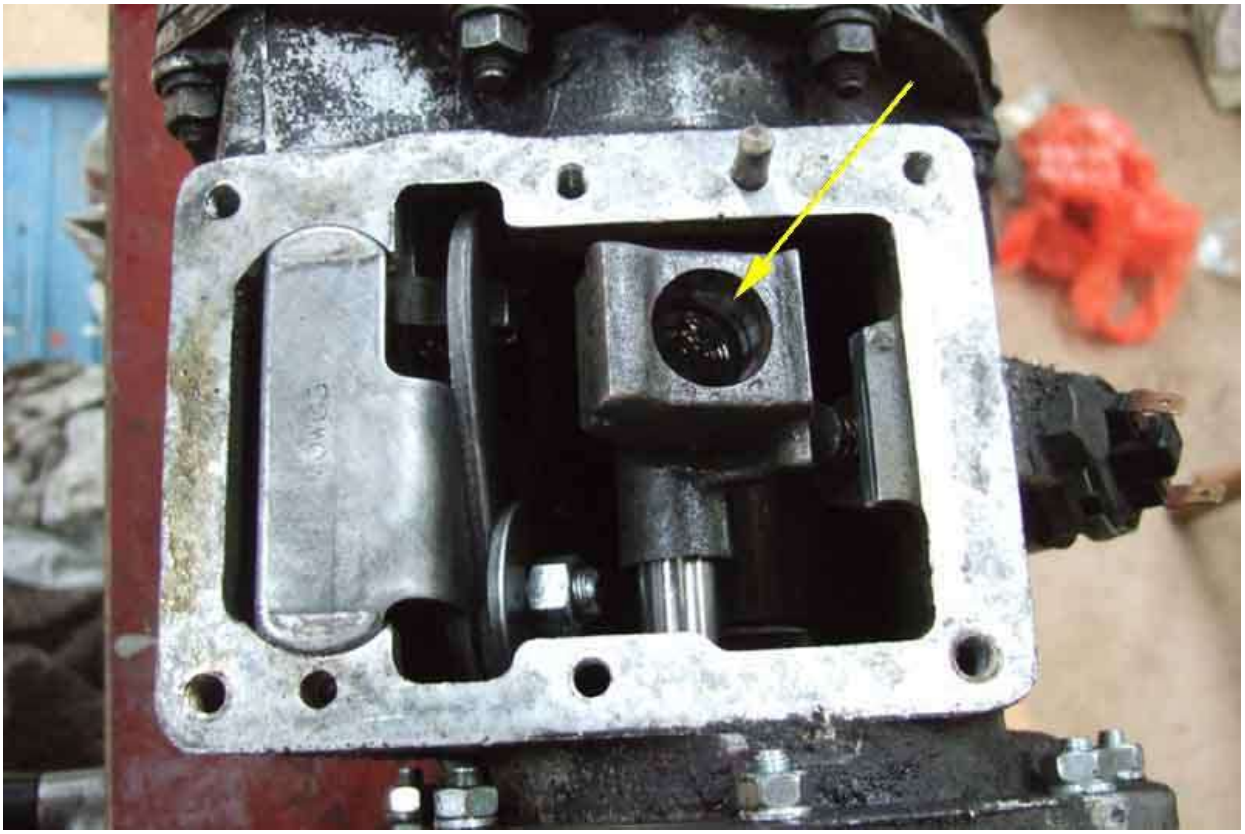
OD fitted, time for a celebratory bacon sarnie!

IMPORTANT! The LH overdrive is attached to the gearbox with the solenoid and the manufactures info plate on the bottom. Unlike the D-type where they are basically on the side.

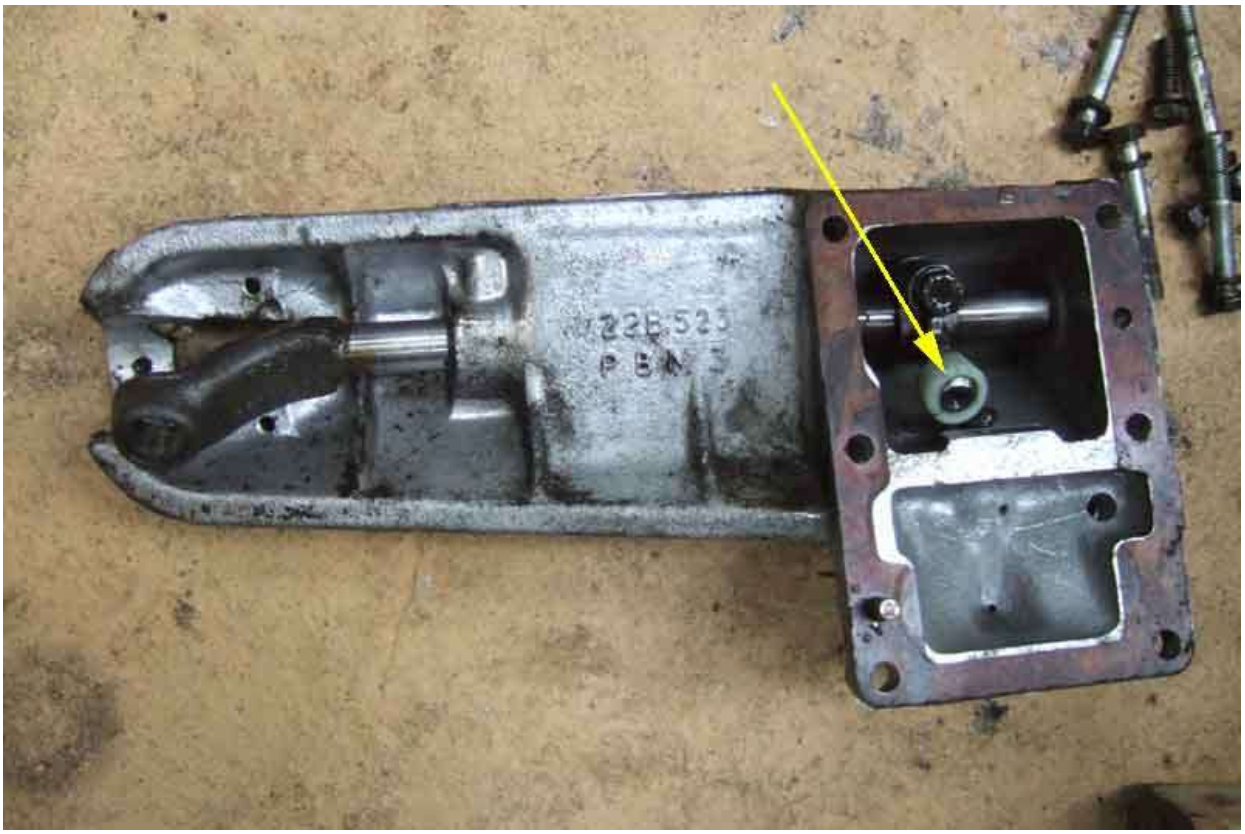
Arrowed is the flat on the casing that allows the removal of the V8 propshaft bolts while the flange is still fitted to the output shaft. Not possible with this 4-cylinder flange, which is smaller.



The socket in the gearbox for the remote change ...

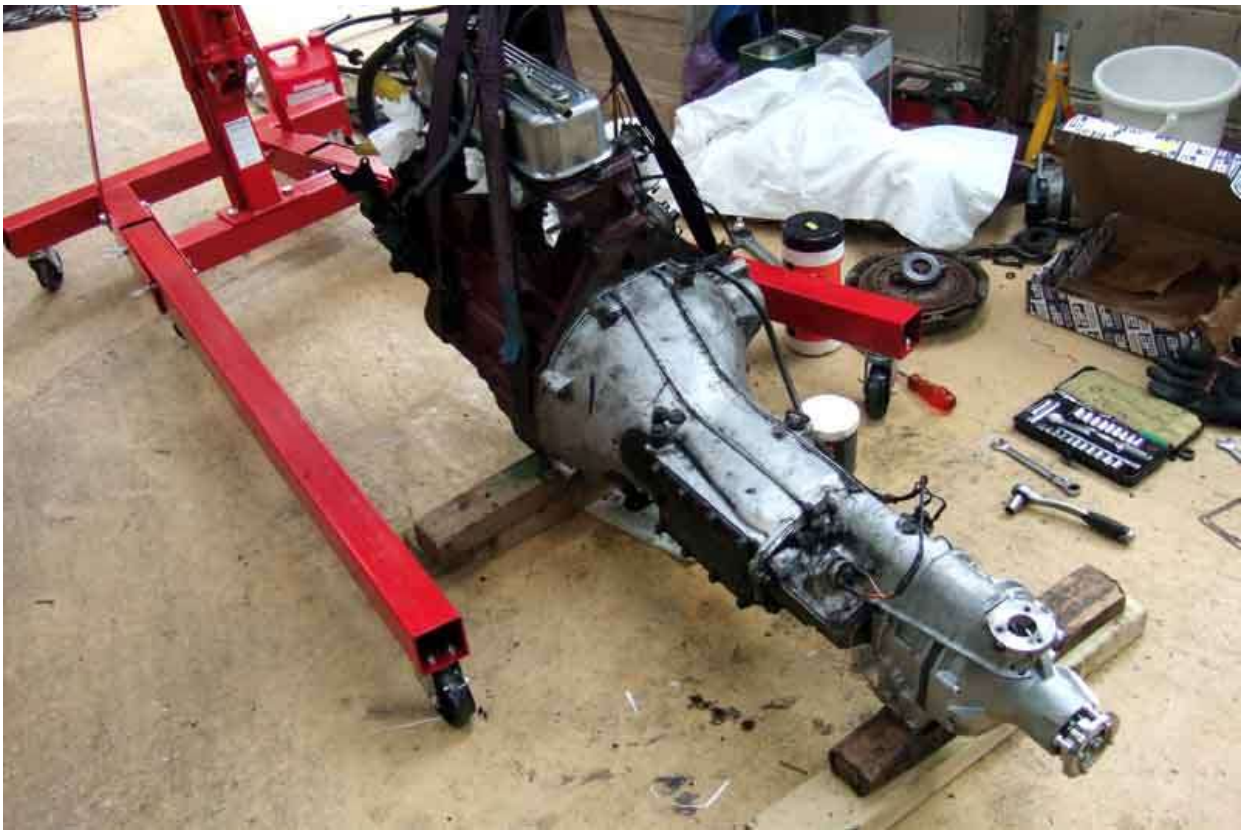


... and the split bush on the ball in the tower, which is identical to the bush on the bottom of the gear lever



The disposition of the bottom two bell-housing bolts and exhaust mounting bracket

Back together, gearbox harness fitted, ready for reinstallation. Incidentally I believe now that the gearbox harness should go under the remote control extension, not above it.



Rear Seal Replacement

New flange and seal, together with a wooden ring originally intended to be used to drift the new seal into position but not used

The seal fitted over the flange

The 'tool' used to hold the drive flange steady while the central nut was undone - a piece of 2 ½" angle iron, with a curved section cut out and 2 holes. The flange nut is 1 1/8" AF, same as the front hub nuts.

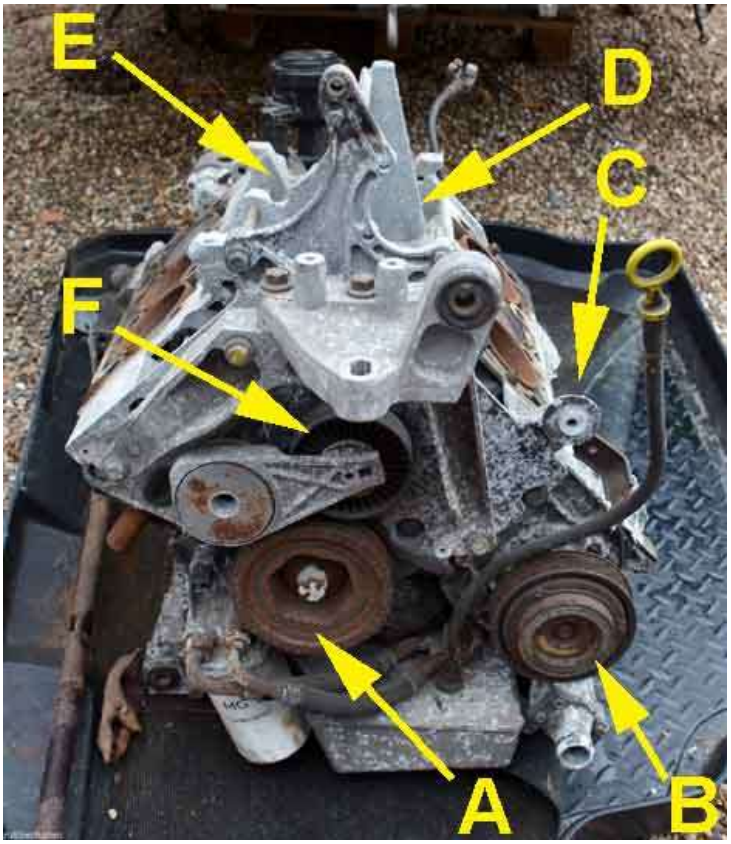
Prop-shaft removed

Flange removed

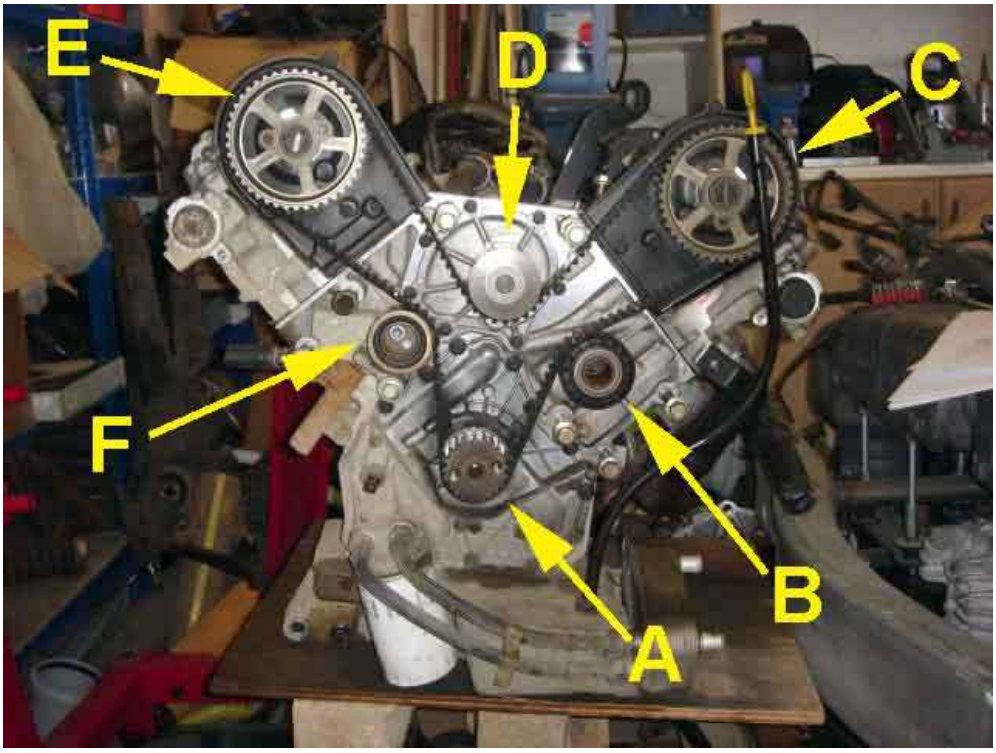
The 'ice pick', and the large socket that was used to drift the new seal into position

ZS180 Cambelt Change

The components around which the auxiliary belt travels: A - crankshaft pulley; B - air-con pump; C - location of idler pulley; D - location of power steering pup; E - location of alternator; F - auxiliary belt tensioner. Sundry engine mount components have to be removed before you can remove the auxiliary belt, then crank pulley, idler pulley, air-con pump, tensioner and dipstick tube before you can remove the front cover to access the primary belt. *RubberFusion Engineering*



The primary belt: A - crank pulley; B - idler pulley; C - front bank inlet camshaft; D - water pump; E - rear bank inlet camshaft; F - tensioner. *XPowerForums.com*



The forked tool. About 8" cut off the flat strip and a set of 10mm (shank) bolts and nuts for the pivot and 'pegs' to engage with the slots in the sprocket. After the other pieces had been cut off the tool ended up being about 2 ft long overall.

Flywheel locking pin cut down from a 10mm (shank) bolt. I put the threaded end in a drill chuck, then used that as a kind of lathe to 'turn down' 36mm from the head to 9.7mm, then a further 12mm to 7.4mm, then cut off after that. That was before I butchered it trying to get it into the wrong hole!

Note the bolts are screwed into the fixed and pivoting arms by different amounts so they engage the cut-outs in the sprocket equally.

The curious sump washer with the rubber insert (now known to be a 'Dowty' washer). Looking in Halfords for solid aluminium ones I noticed this type specified for Ford (yuk).

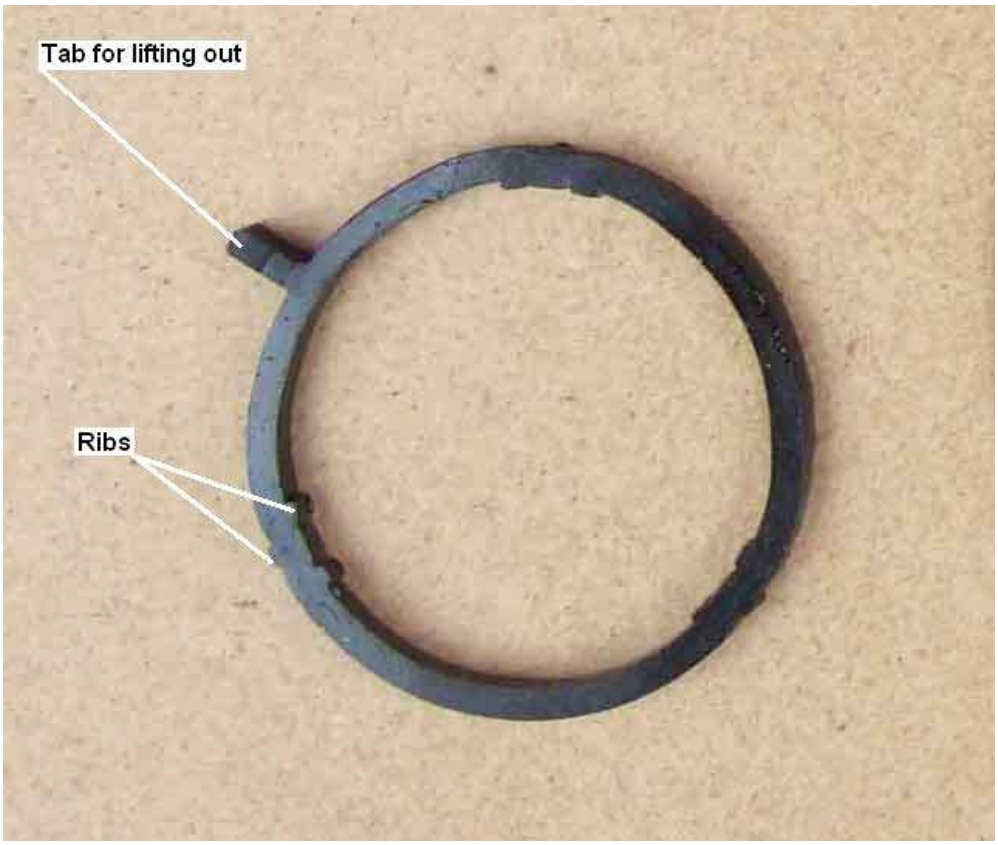
Orientation of the tension rubber cover. This is held beside the position it fits in the lower rear part of the front cover.

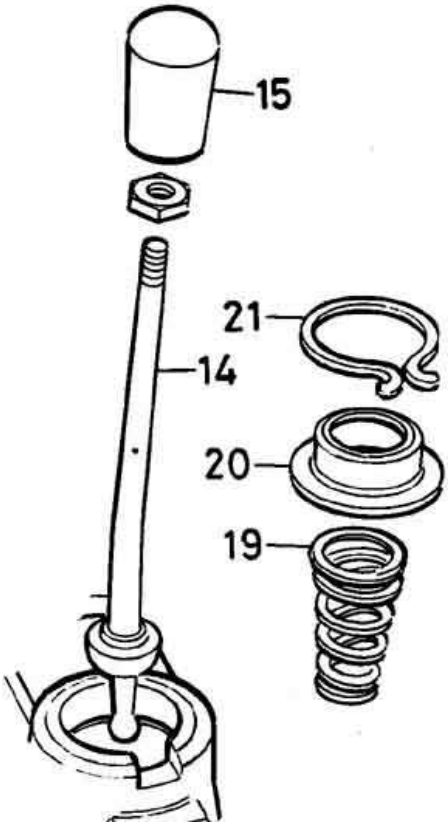
One of two unnecessary tools. Haynes calls for a tapered pin to help locate the sprocket over the hole to enable insertion of the bolt. This seems to be based on the two tapered pins used in the pukka MG Rover kit when **both** sprockets are removed and slid back on as an assembly with the belt. I couldn't see how that would help with the Haynes method, so made this pin which is actually eccentric rather than tapered, so that as the bolt was turned it would move the sprocket outwards and so locate it over its keyway. Not required, the bolt fitted right in, then turning it pulled the exhaust sprocket back into alignment and tightening the inlet bolt simply pulled it onto its keyway.

The other unnecessary 'flat bar tool' made from a few inches of offcut from a 1 metre length of 20mm x 4mm flat bar, with another 48mm length welded crosswise. In the event it wasn't needed, it kept slipping out of the shallow notches in the end of the sprocket. It might have been of more use if the crosswise piece were T-shaped to fit inside the sprocket as well as engage the slots.

Homemade degree-wheel. What more could anyone want for a one-off job?

One of the three front inlet manifold sealing rings, showing the tab that can be lifted up by a finger nail to remove the old one, and the ribs that have to be compressed slightly with the back of a finger-nail to insert the new.

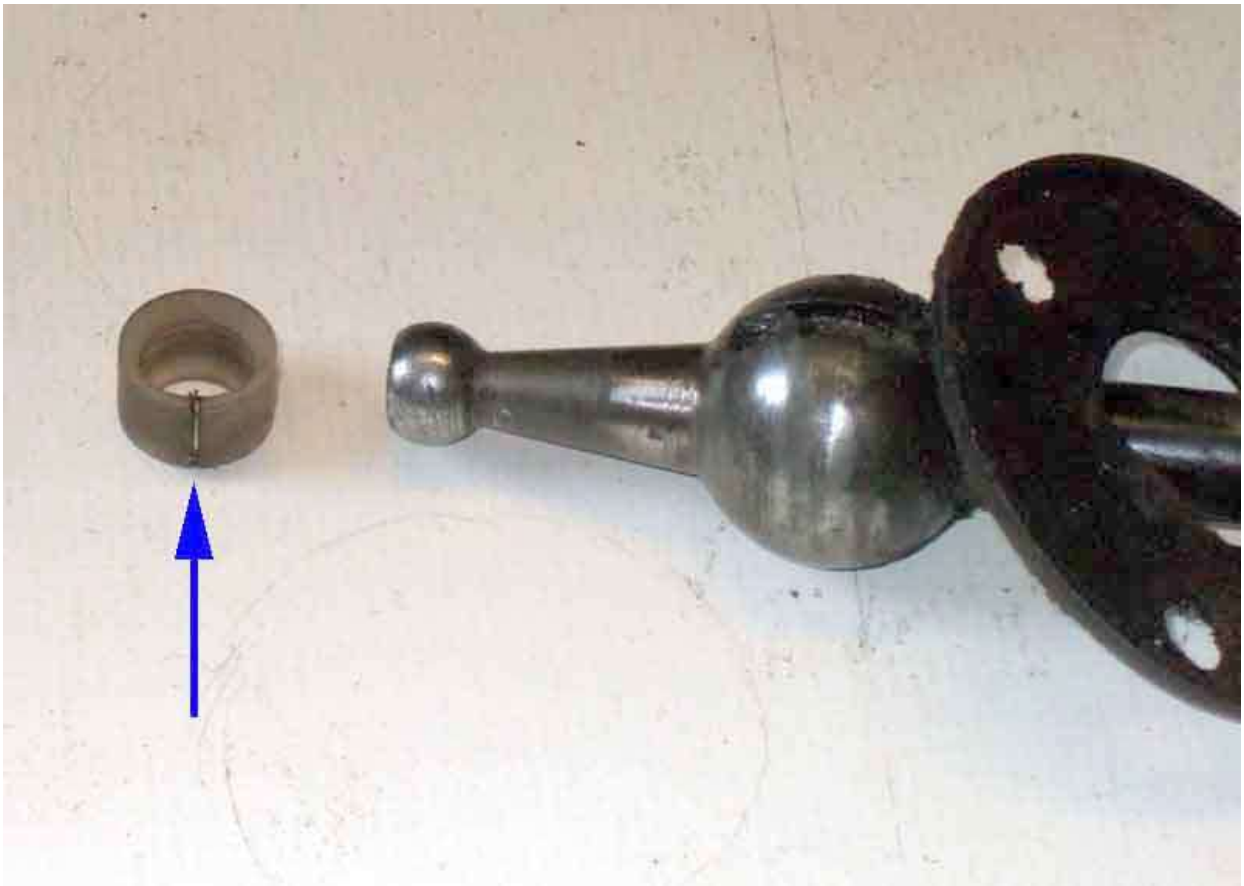

Tab for lifting out
Ribs



4-synch gearbox - the retaining plate is secured with three special bolts and Thackery washers into the remote control housing:

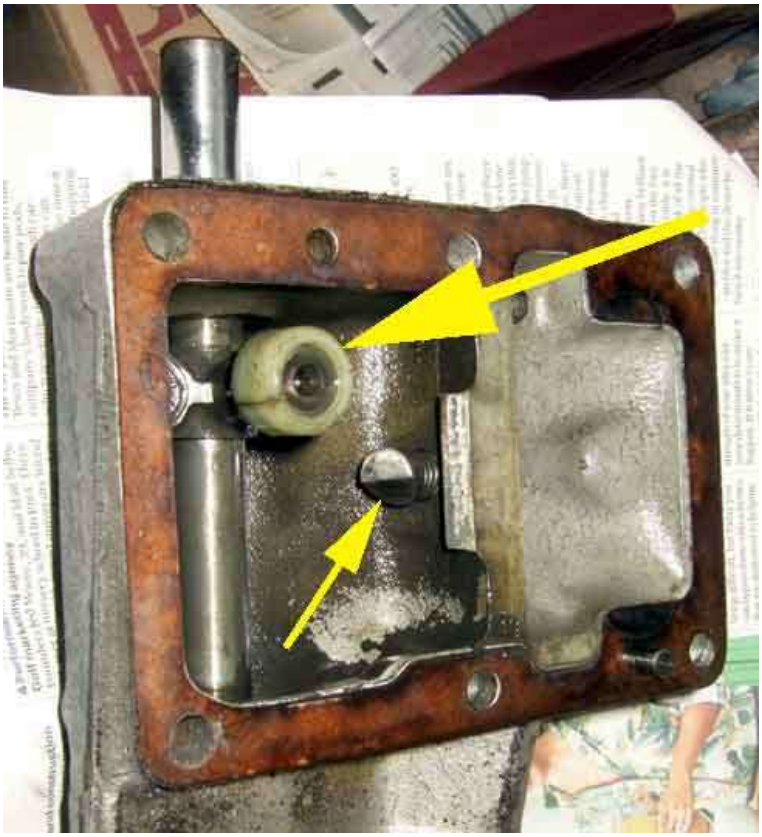
Shouldered bolt and Thackery washer. The bolt tightens through the retaining pate and washer onto the gearbox casing, compressing the spring of the washer, which presses the retaining plate down onto the large ball of the gear-lever, pressing it into the socket in the casing:

Anti-rattle bush, with the slit arrowed:

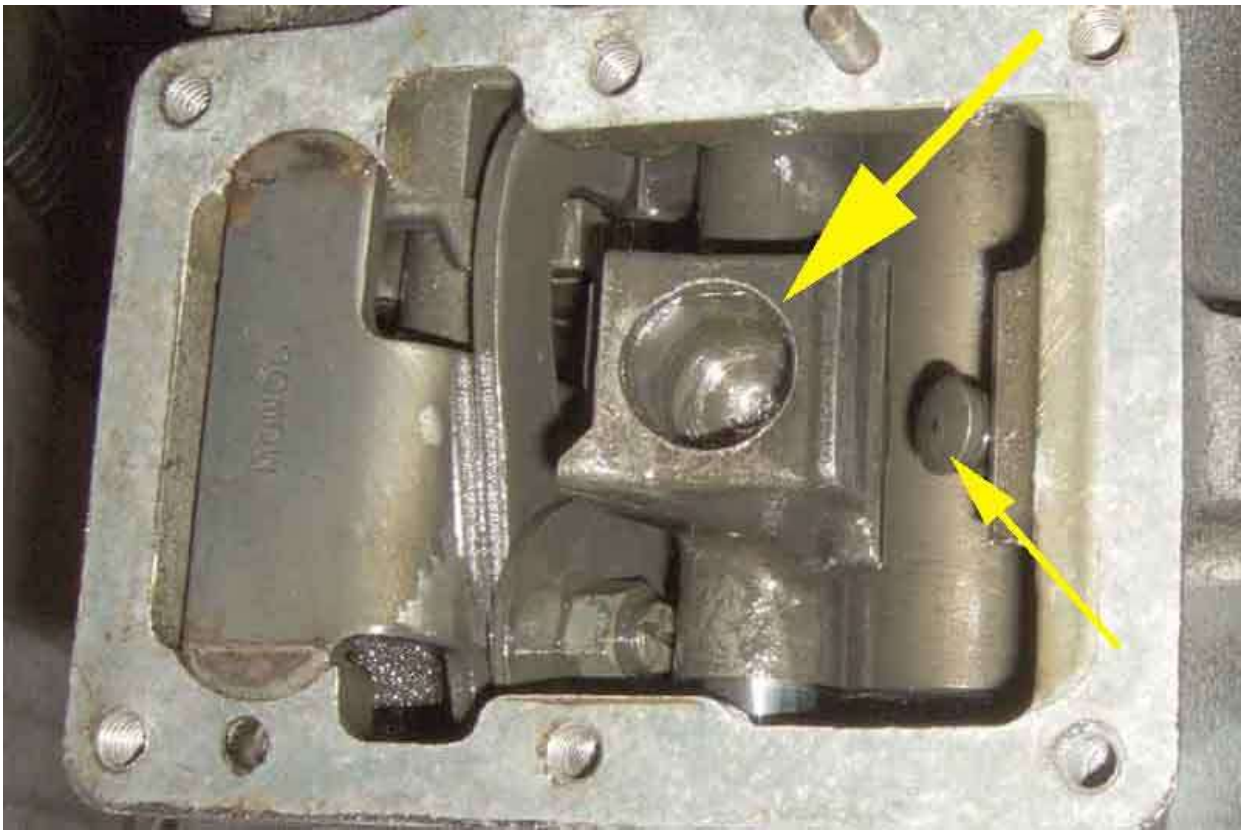


An original bush on the left with a significant chamfer to aid insertion into the gearbox shaft socket, once the bush has been fitted to the ball-end of the cabin lever. The bush on the right is a replacement with virtually no chamfer and was impossible to fit, until I cut more of a chamfer. I tried fitting this to the gearbox first but when fitting the lever it just pushed it straight out, fortunately to fall on the floor and be retrieved. However Bill Etter was able to fit the bush to the gearbox before fitting the lever:

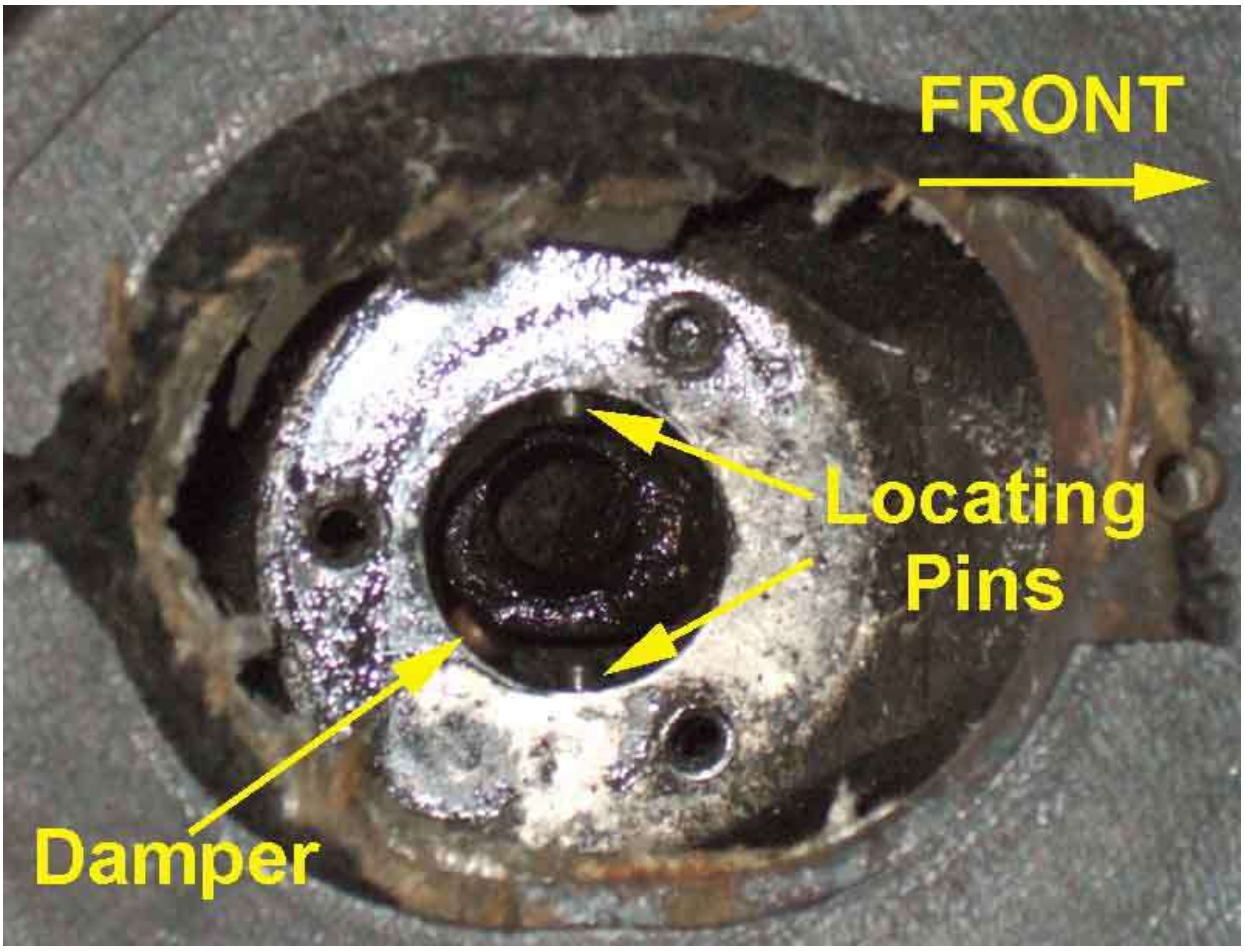
There is an identical bush on the other end of that gearbox shaft (large arrow). Also shown is the overdrive switch plunger (small arrow), with a chamfered head where there is OD on 4th only i.e. this V8, also later North American spec 4-cylinder:



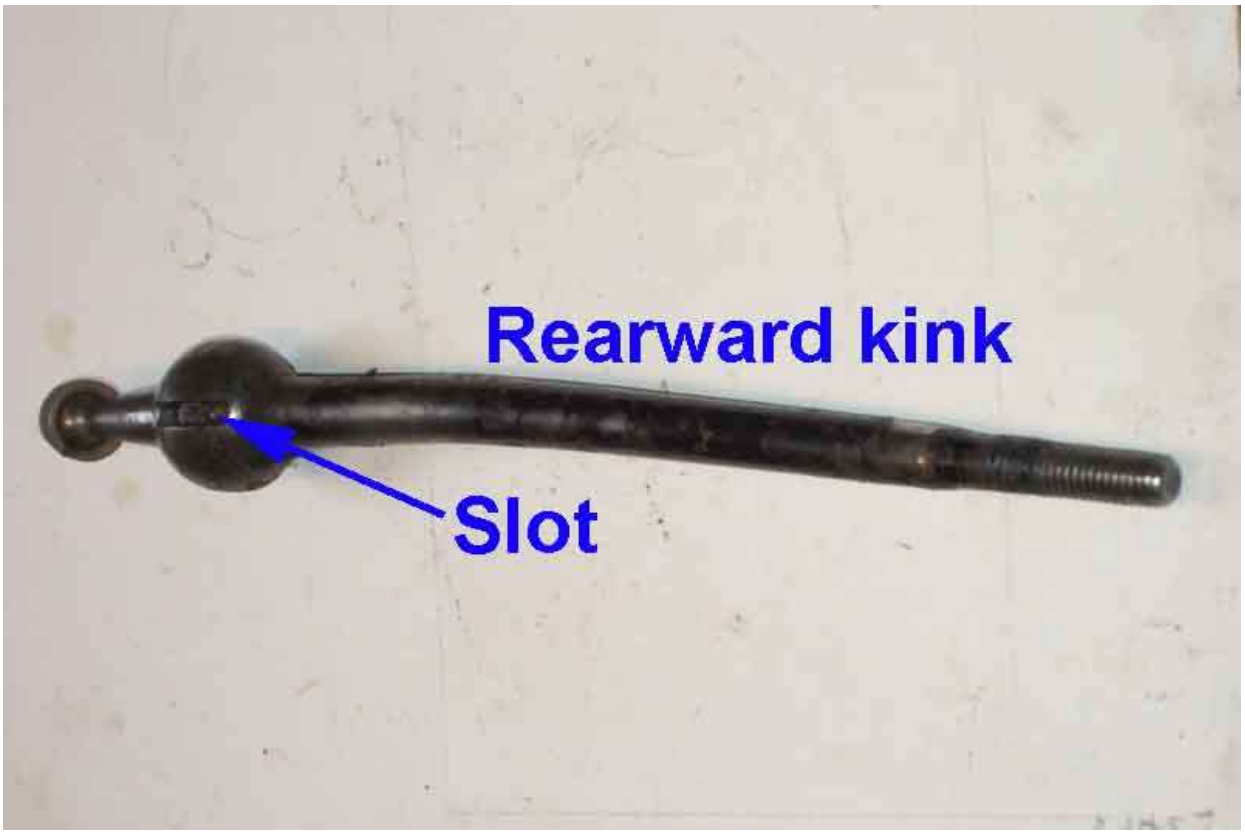
The socket for the bush in the gearbox selector shaft (large arrow). Also shown is the reverse light switch plunger (small arrow):



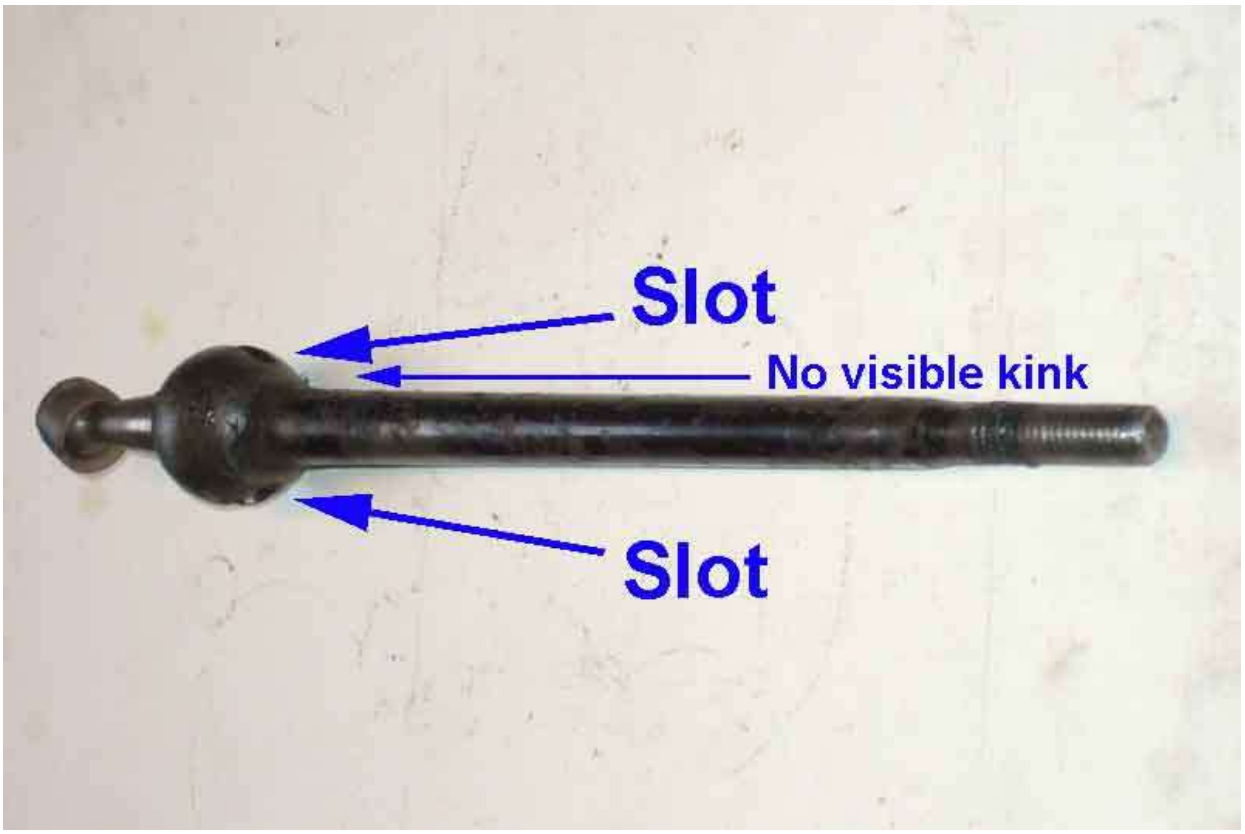
Two locating pins and damper on a pre-77 4-synch, 77 and later only have one slot in the ball and hence only one locating pin:



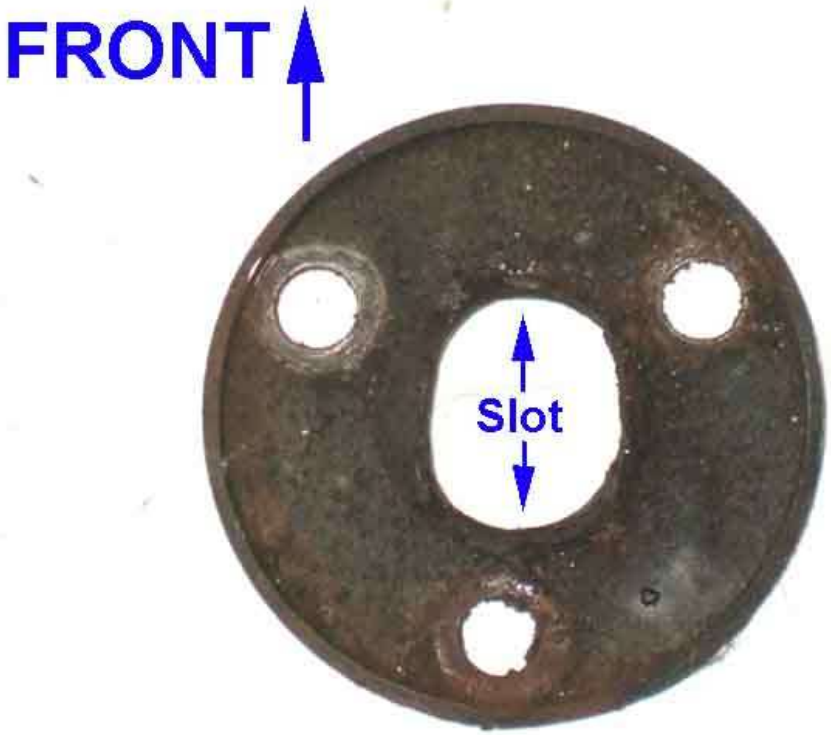
4-synch gear lever with a rearwards kink ...



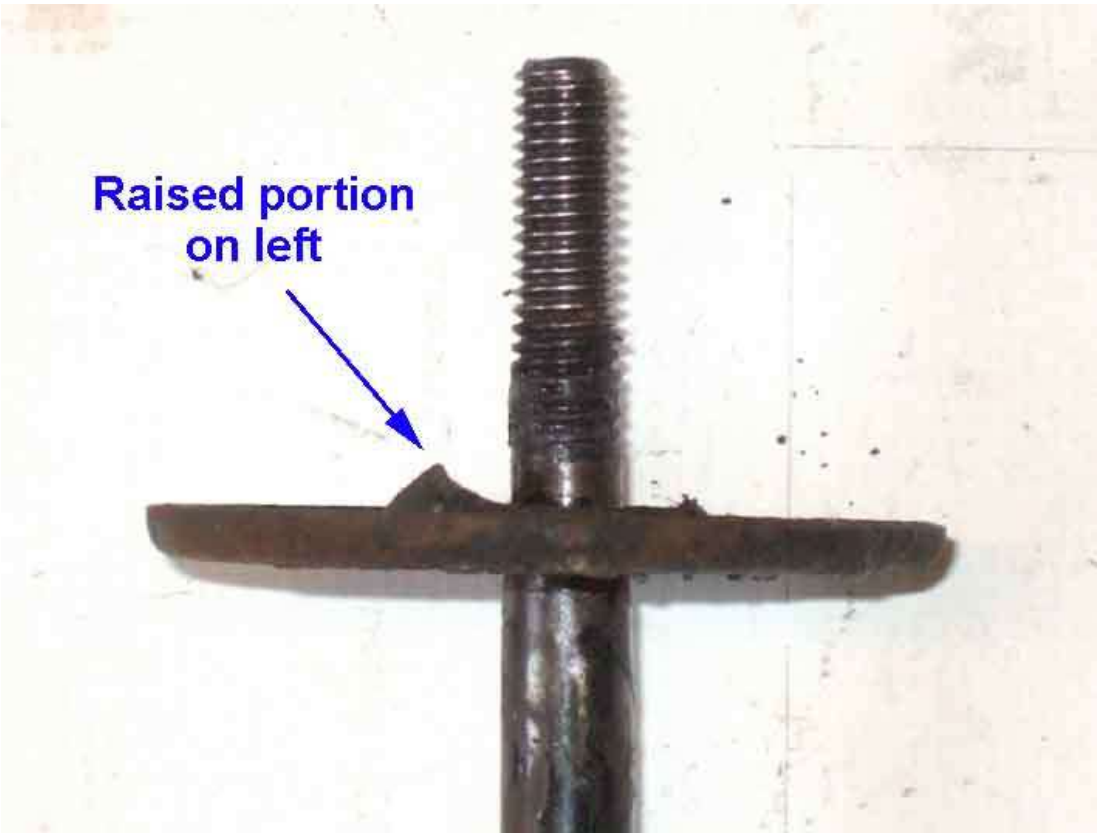
... but no sideways kink, and two guide slots ... which means the gear lever could be installed the wrong way round:



Orientation of lever seating plate 22B524 on a 4-synch



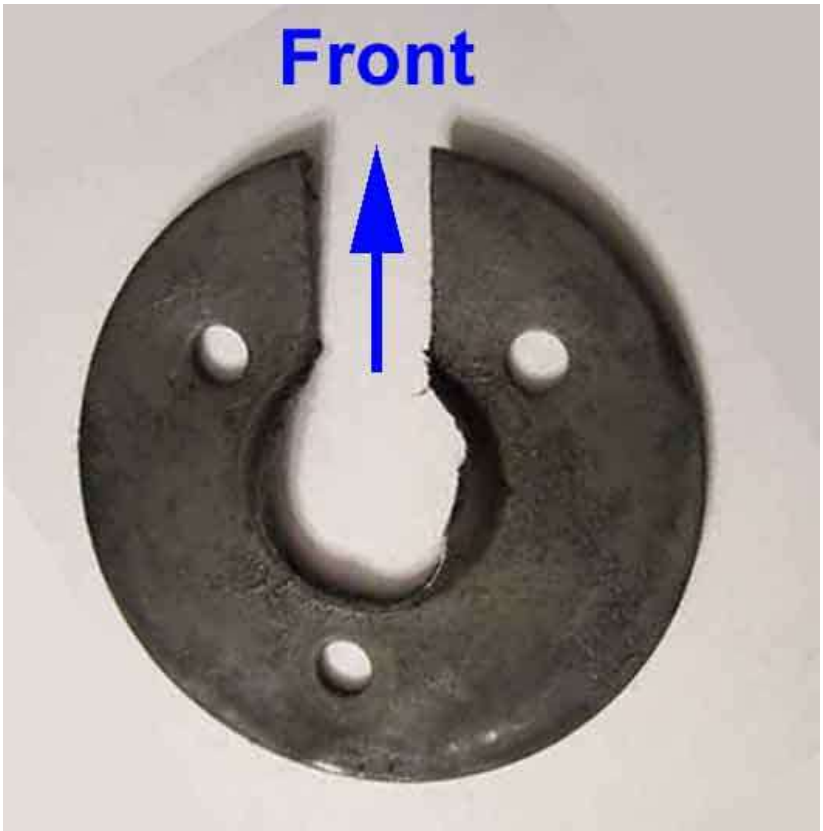
Raised portion on the left:



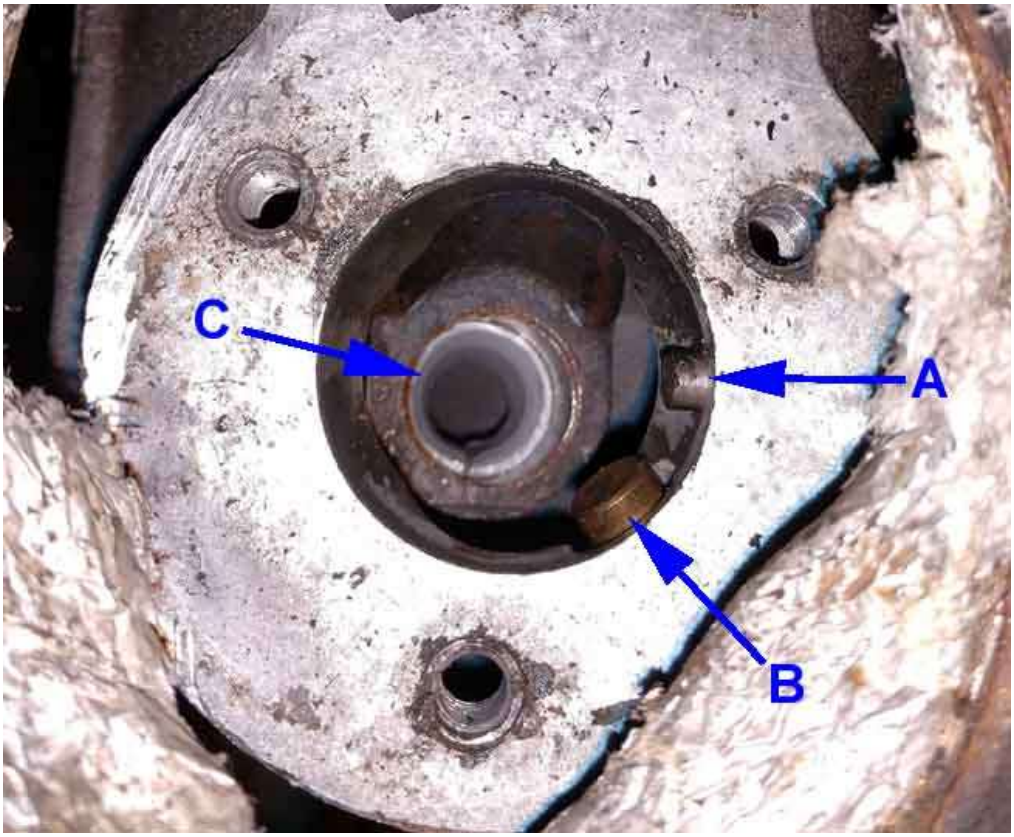
1977 and later manual switch on the gear knob: (*Upgrades4MGs* *and* *WorthPoint*)

Lever with thickened section, said to be a harmonic damper, but there are still complaints that this knob buzzes. Guide pin slot on one side only (not visible here) so the lever can only installed in the correct position. It may be that this is a 'steel-rubber-steel' sandwich so there may be the risk of twisting the upper part of the lever relative to the lower part if you apply too much force to the knob nuts:

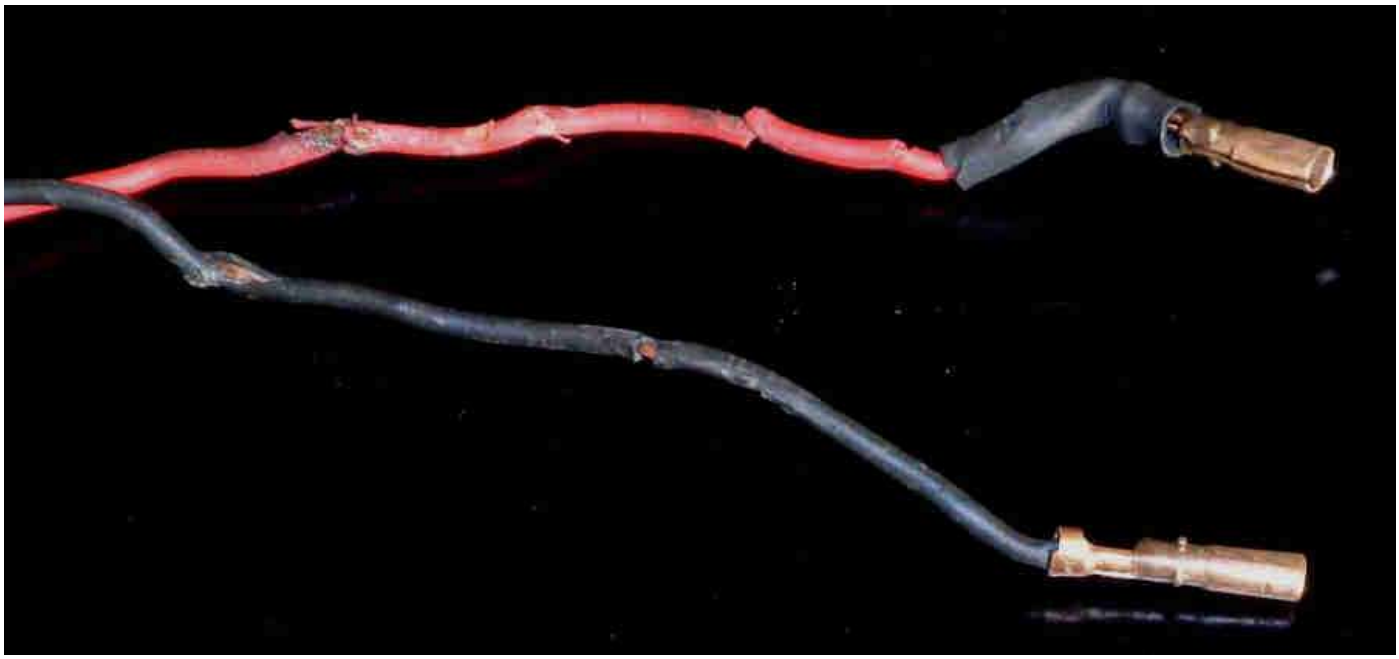
The retaining plate DAM2576 for the above lever:



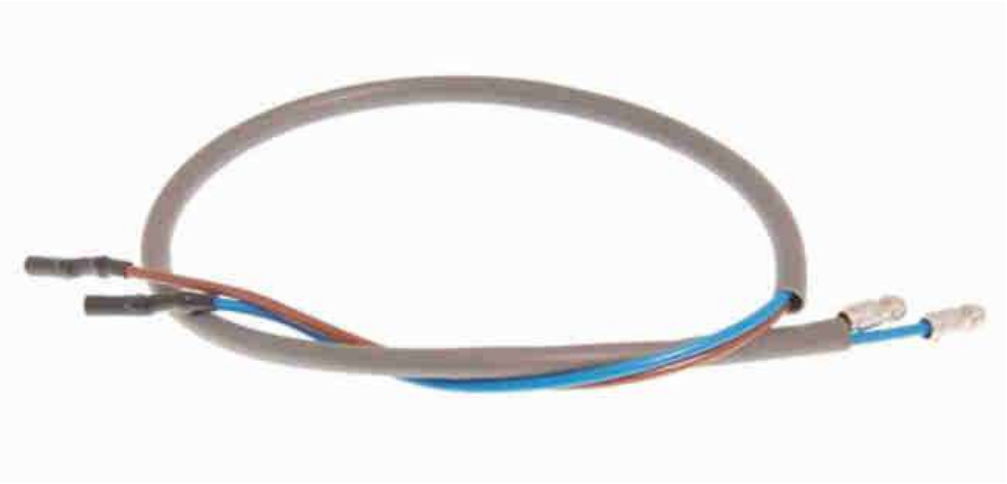
77 and later housing with single locating pin (A) which together with only one slot in the ball of the lever ensures the lever can only fit in the gearbox one way round, unlike earlier. Also showing the damper (B) and bush (C). In this case the gear lever could be fitted and removed with the bush already in the gearbox shaft: (*Bill Etter*)



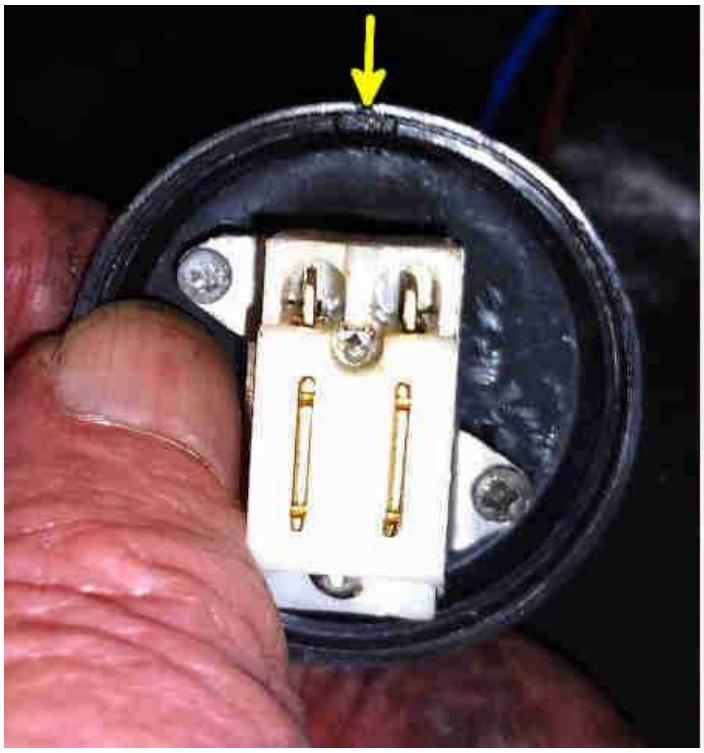
A good indication of why the OD circuit especially for this manual switch should be fused - single-insulated wires passing through the earthed gear lever:



Gear-lever sub-harness 153726 with bullets to connect to the gearbox sub-harness and 'sleeve' connections to the switch. Get one like this with a 'loose' sleeve' that can be slid towards the switch connections so protecting the wires where they are in the slot in the gear-lever, not one with a tight sleeve (like 2-wire lighting cable):



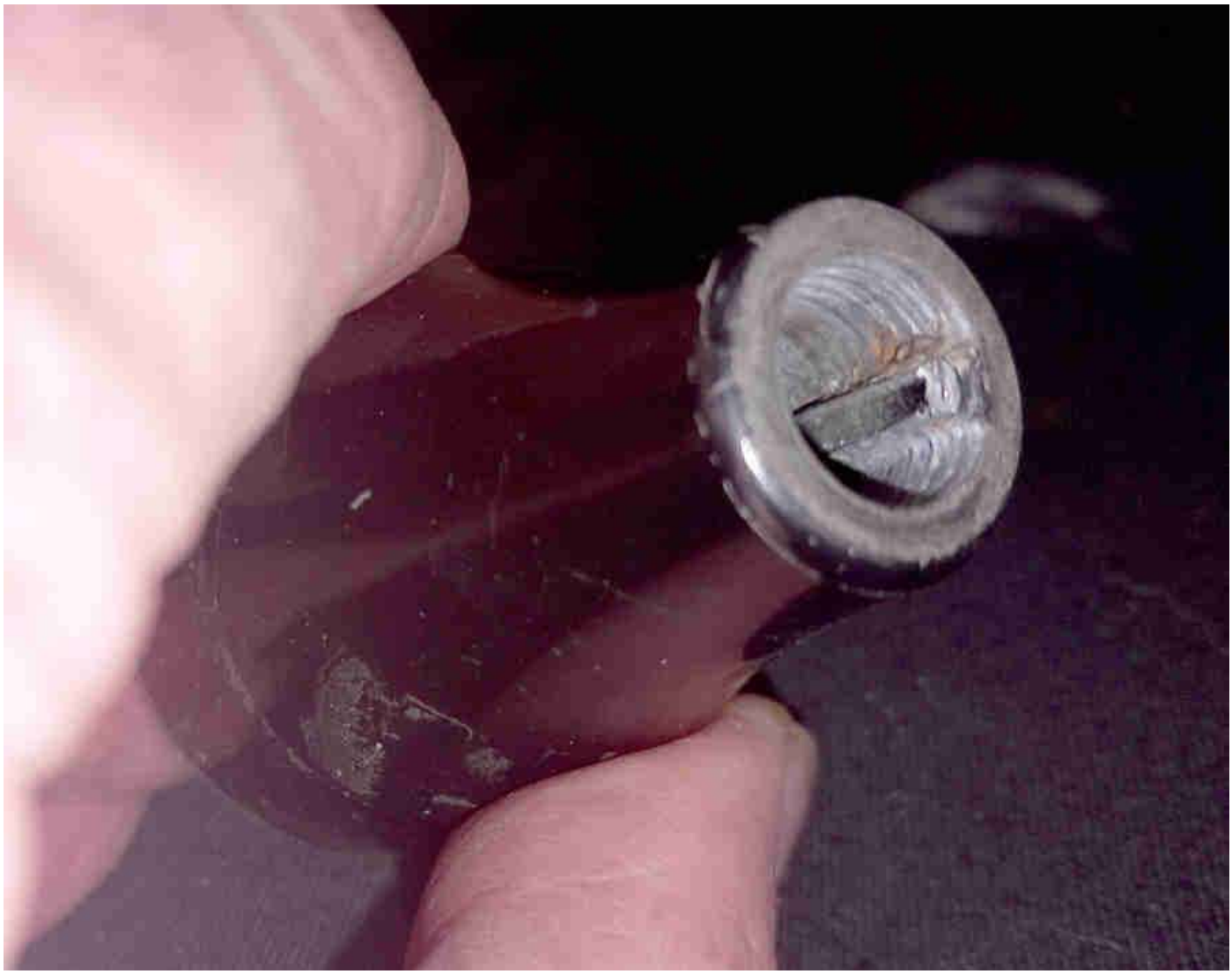
The sub-harness connections to the switch are cylindrical but the switch (520999a) terminals themselves are not pins but flat blades. The cylinders are slit lengthwise and this slit slides over the blades on the switch. If loose pinch them up **carefully** to close up the slit, don't flatten them. Note the location tab on the cap arrowed:



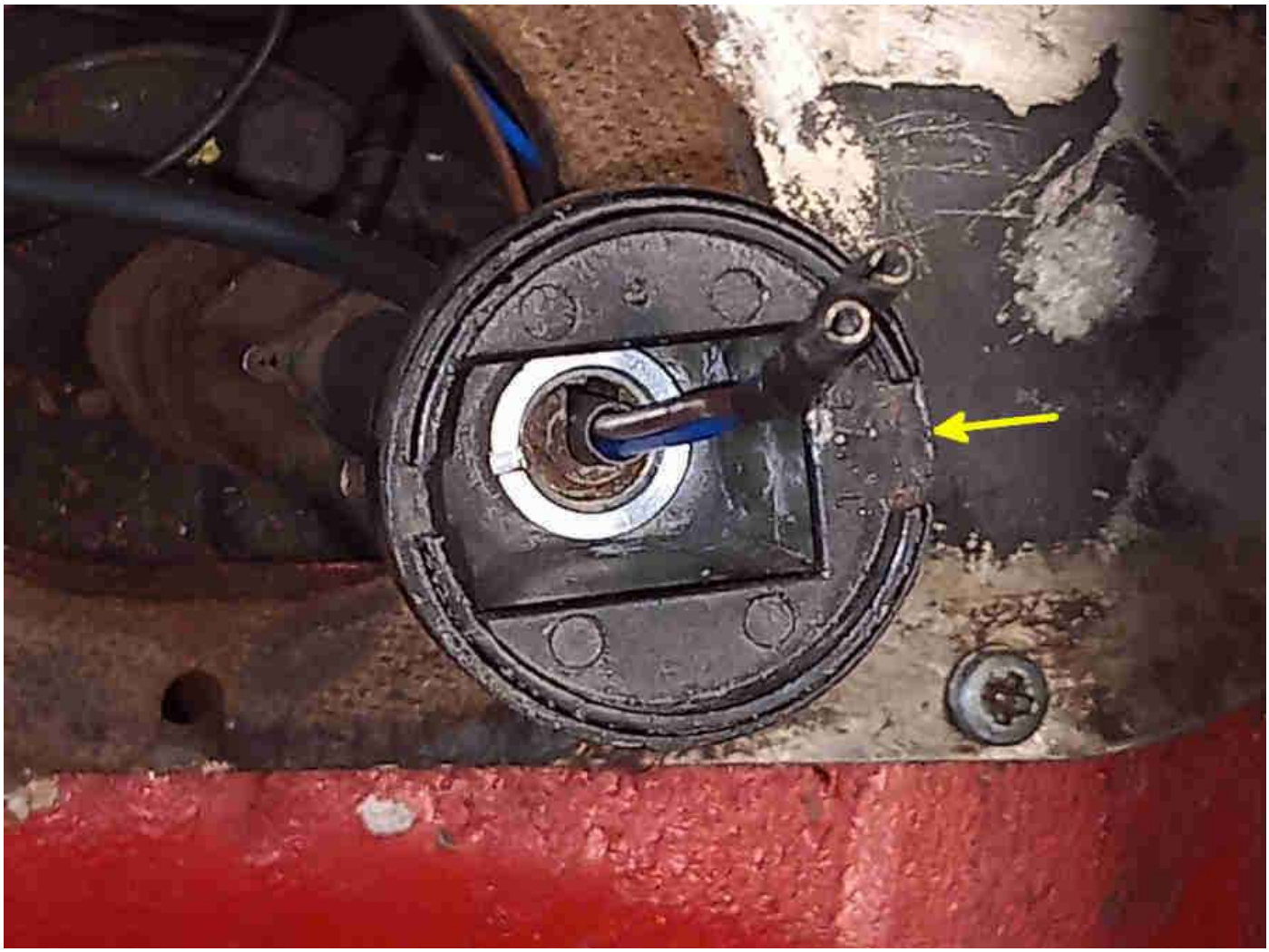
Ring-nut C30623 goes inside the knob and chrome nut C30505A goes under the knob to secure it. The ring-nut can be lightly screwed on with a suitable implement then the chrome nut tightened with a 5/8" spanner (it has flats) from below to secure the knob: (*Moss Europe*)

Gear lever with chrome nut screwed on and sub-harness passing up the slot, sleeving extending up above the slot:

The knob has a 'key' that fits in the lever slot so the knob can only fit in one orientation and not twist round:



Knob fitted, slotted nut inside, cap locating tab slot arrowed:

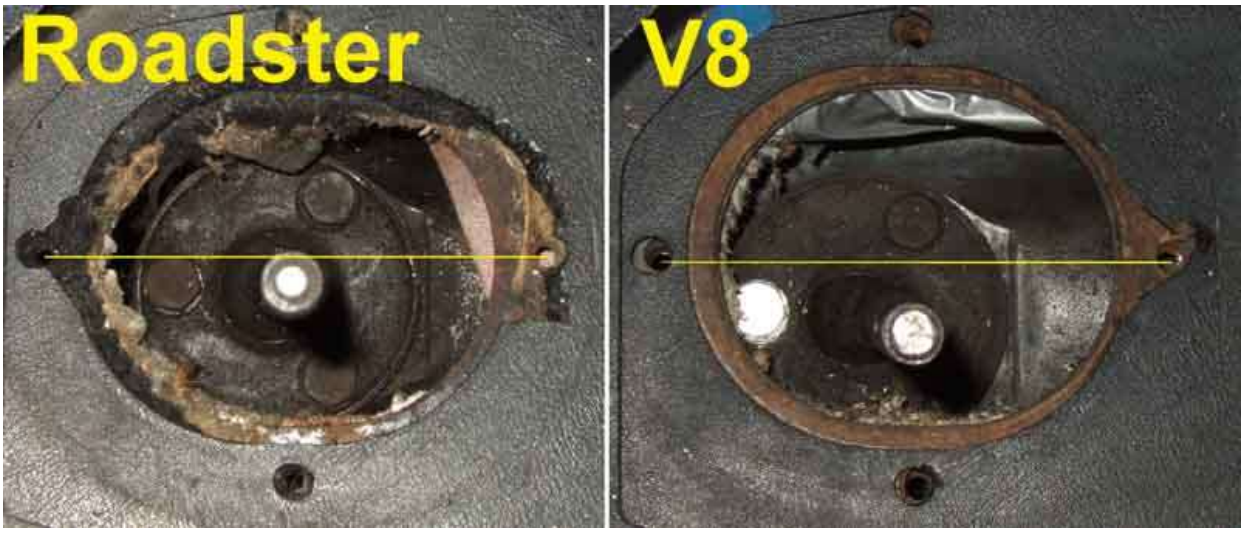


Oddly the knob has a wide slot for a locating tab on the cap and a narrower slot at the rear whereas the cap only has a narrow tab at the front (see above). The result is that the narrow cab tab in the wide knob slot allows the cap to swivel a bit, and it's not a tight fit. The knob can only go on the lever in one orientation because of the slot in the lever and the 'key' in the knob, and the lever can only go in the gearbox in one orientation because of the single locating pin in the gearbox ('A' above).

Gear Lever Gaiter

Showing how much the gaiter has to slide down the shaft in 4th compared to neutral in the 1/2 plane:

Showing the additional offset towards the driver of Vee's gearbox compared to Bee, which exacerbates the problem with the gaiter:



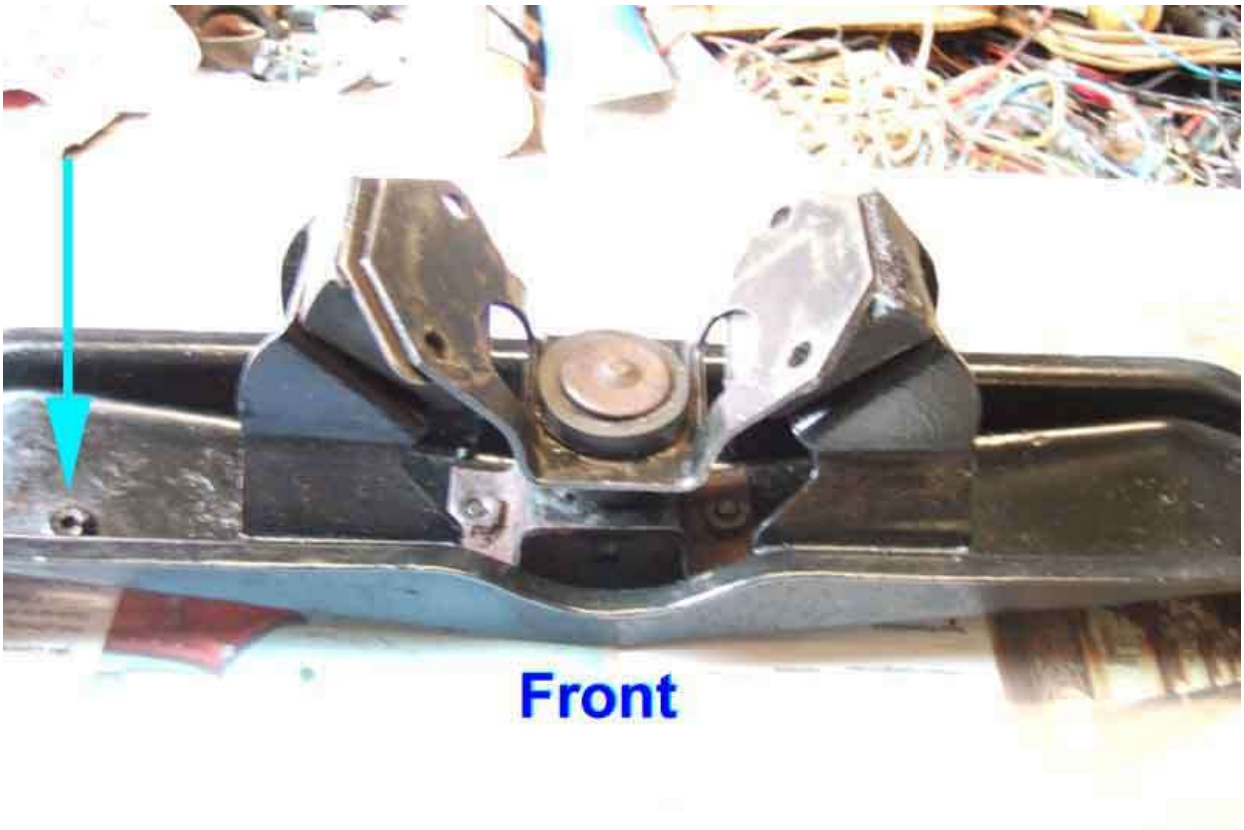
Rubber gaiter inverted, before re-stapling the leather gaiter. The driver's side edge sticks up a bit as with the gearbox offset to that side a bit there is less space for the corrugations:

Fitted, different but not unattractive:

Gearbox crossmember Detail

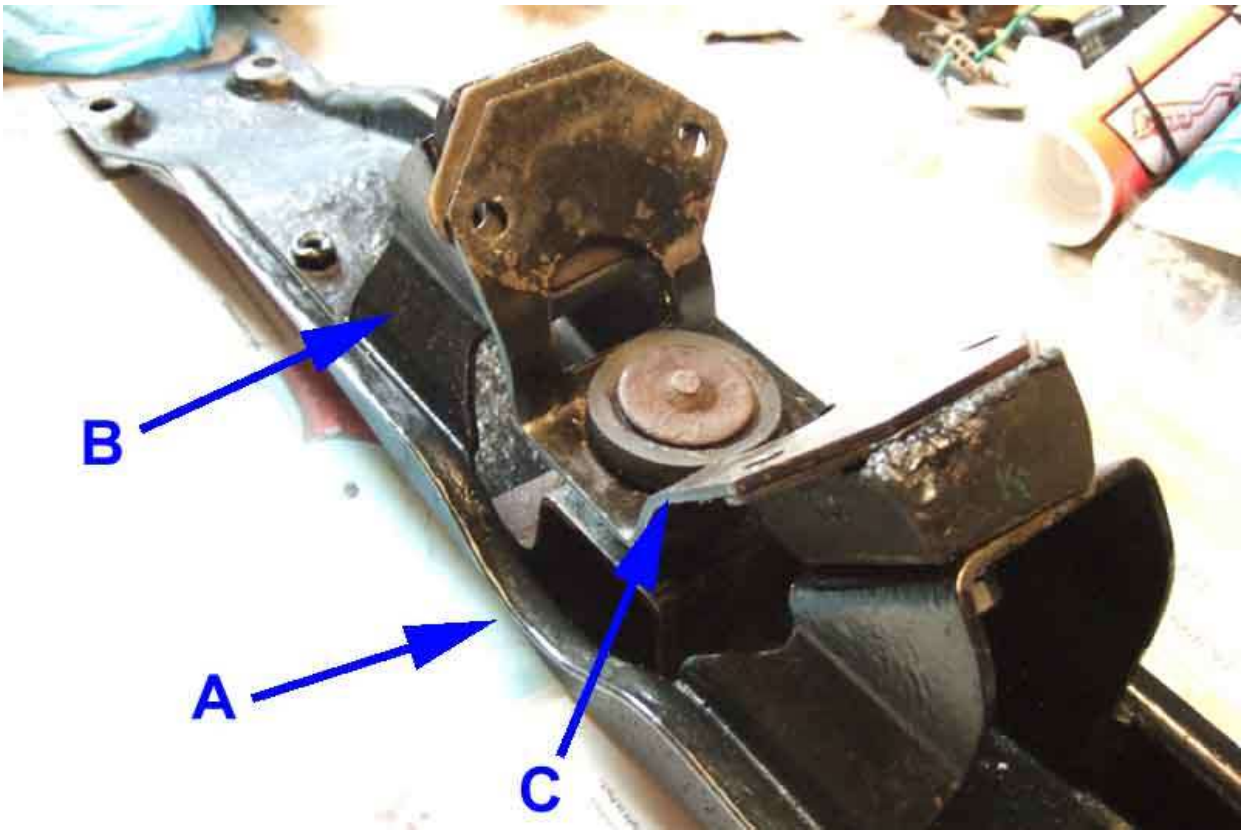
Restraint Pin
Restraint Rods

The front face has a dip, and the rear face is straight with various holes, both of which accommodate one of the two restraint rods that were used at various times. The welded nut arrowed is for the speedo cable clip when OD is fitted, and is on the right-hand side when facing forwards:

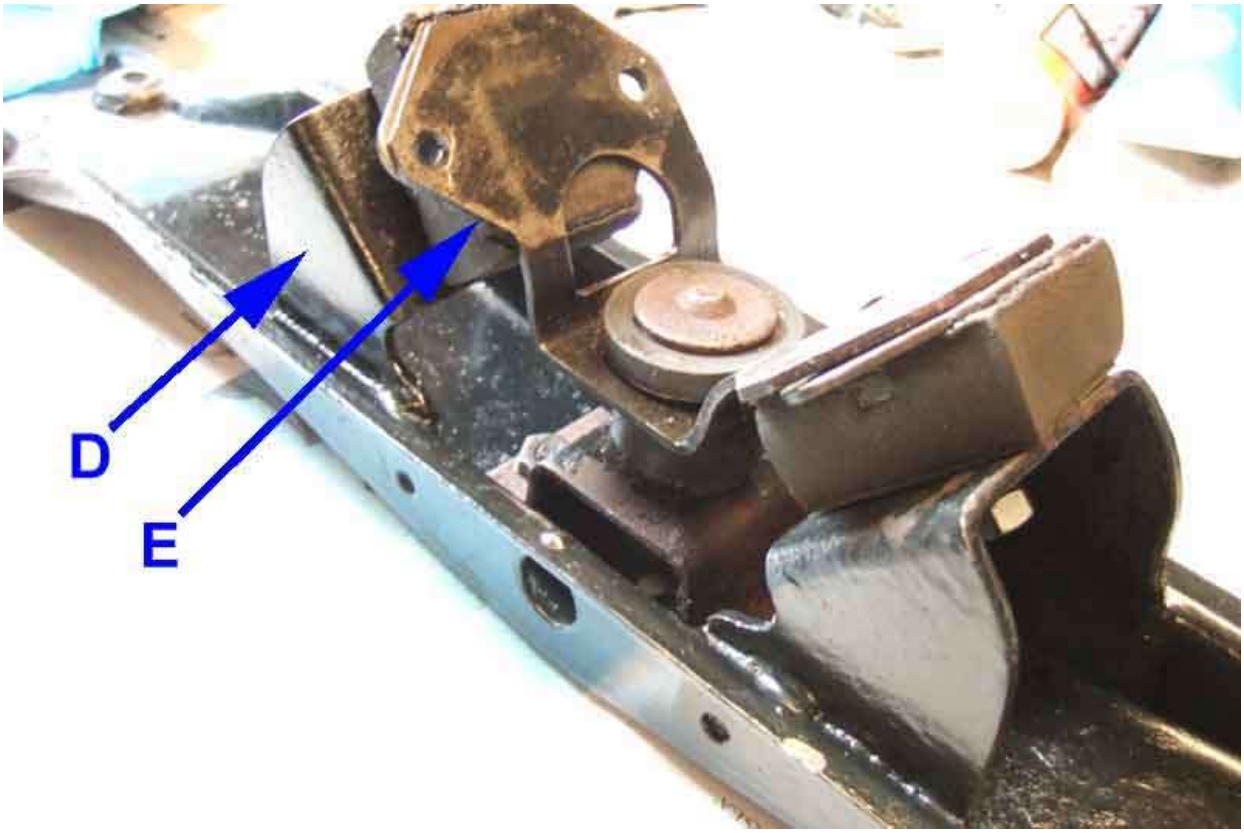


Note that the gearbox earth strap (rubber bumper cars) is fitted to the left-hand side here, the manuals show it fitted to the right-hand side i.e. the same side as the speedo cable clamp welded nut:

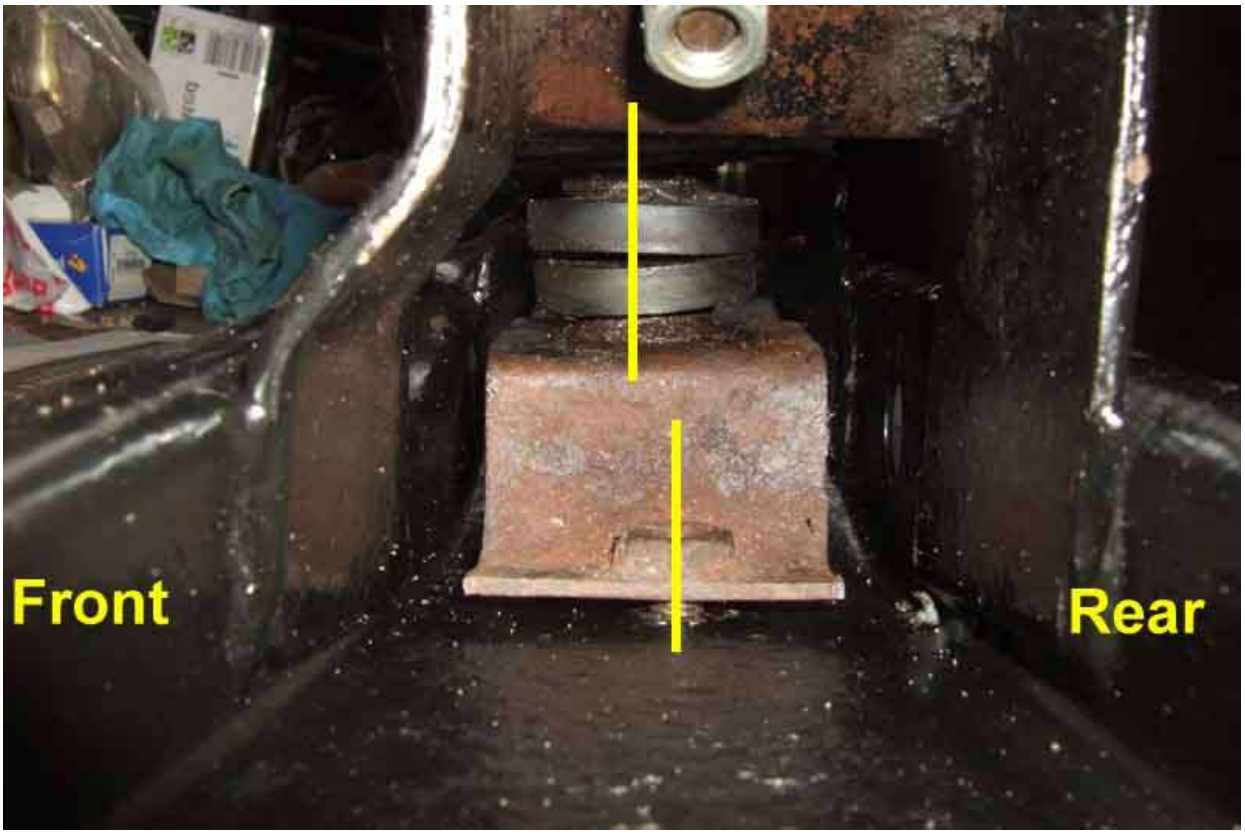
On the side with the dip 'A' the face of the welded brackets 'B' is angled back, and the front edge of the upper yoke 'C' is flat:



Conversely the rear face of the welded brackets 'D' is vertical and the rear edge of the upper yoke 'E' is stepped, which with OD apparently gives more space to access the bolts that go into the gearbox:



The lower restraint-pin yoke is orientated such that the welded nuts are behind the centre-line of the pin, i.e. vertically below the mount studs:

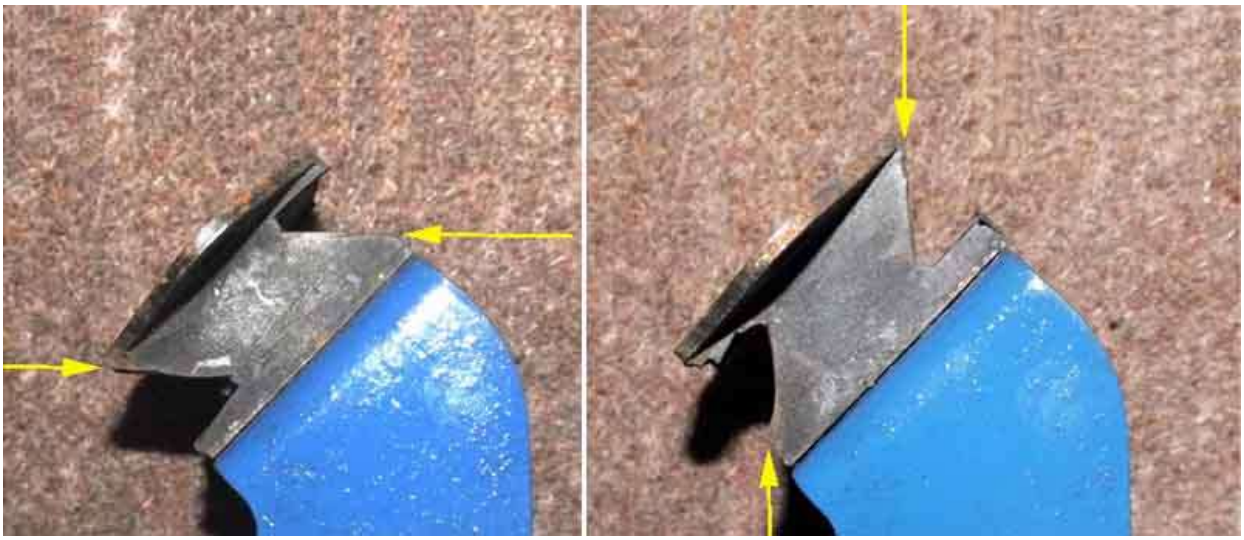


The mount stud goes though the front-most of the two holes in the bracket:

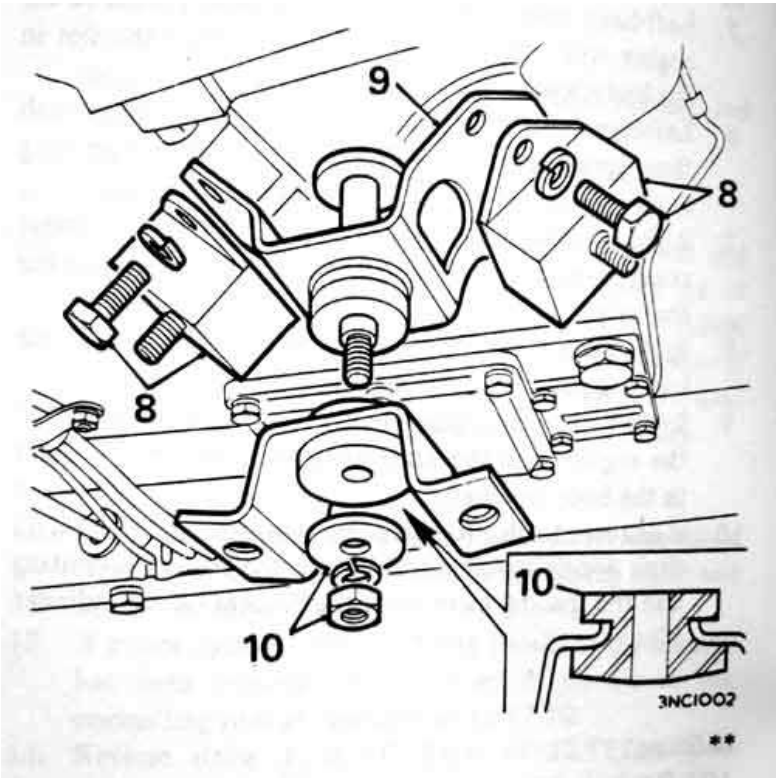
The upshot is that the rubbers are positioned centrally across the crossmember, and the lower yoke welded nuts line up with the holes in the crossmember:

Perished mount rubbers:

If there weren't already enough options for assembly some suppliers now have the rectangular rubber mounts with cut-outs, meaning that whereas before they could be fitted either way round, now there is a difference in the shape of the rubber and the forces acting upon it, making them 'handed'. In the orientation as shown on the left the unsupported faces are horizontal, but as fitted on the right they are vertical. Logic dictates that vertical is correct, as the main weight of the gearbox acts vertically so the rubber will be in compression. If fitted horizontally the rubber would experience a significant shear load. It's true that when in use the forces could be in any direction, including fore and aft, but as with very few exceptions cars spend more time sitting than running, it seems that fitted as shown on the right is preferable: (*Graham Barker*)

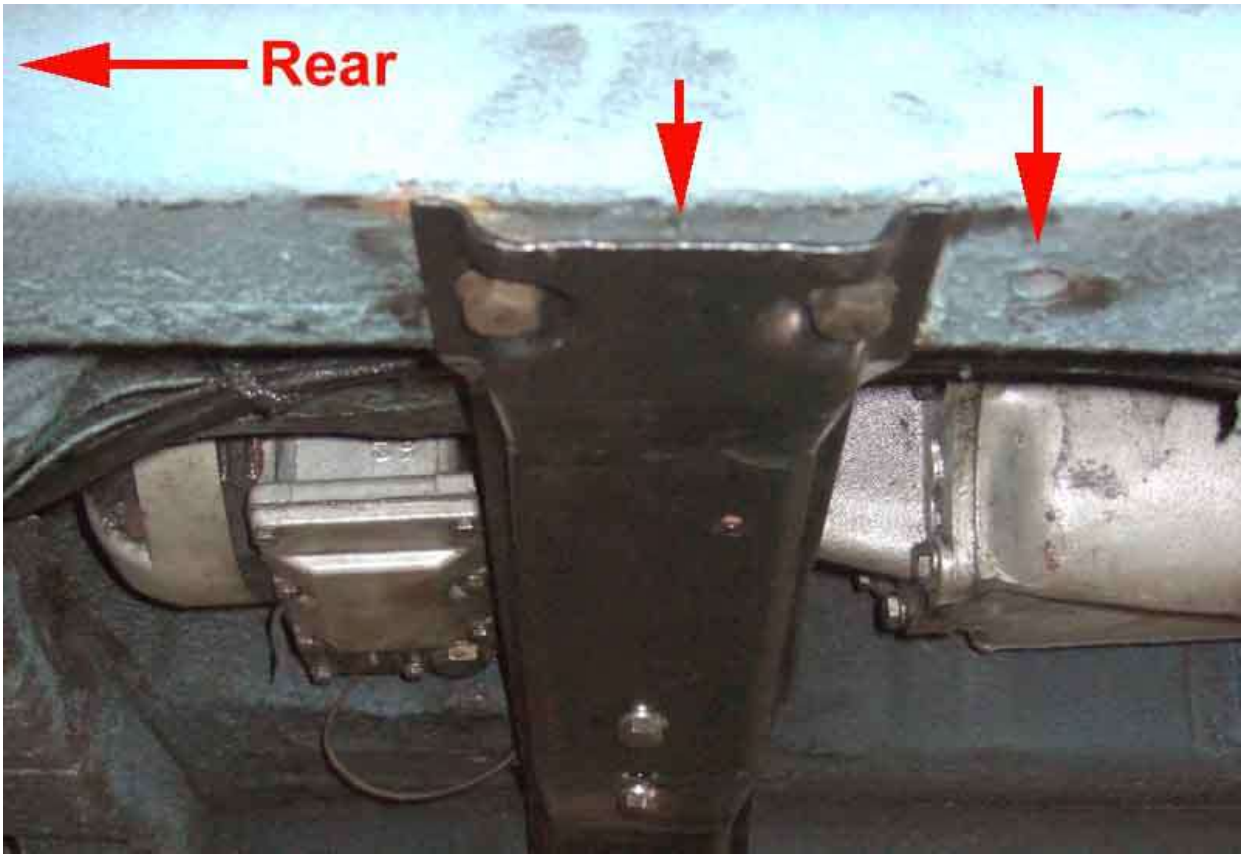


Showing the assembly of all the central restraint pin (once the crossmember has been removed!). The flat edge of the upper yoke faces forwards (9). Inset '10' shows the insertion of a bush into a yoke, in this case the lower yoke with the wider diameter inside the yoke. Invert the image for the upper yoke: (*Leyland V8 supplement*)

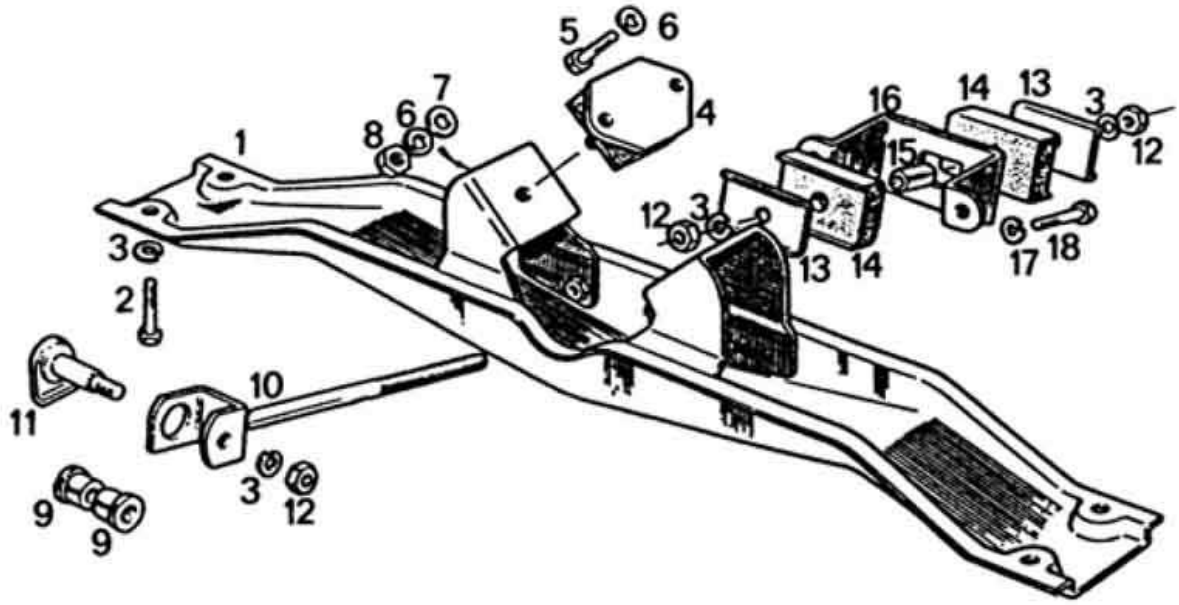


Showing the earthing strap (8) on rubber bumper cars and V8s, one end under the head of a bolt securing the mount to the gearbox casing, the other under the nut on the mount stud. Shown on the left-hand side front here (as I found it), the manuals show it fitted to the right-hand side front:

4-sync crossmembers use the rear-most mounting position, unused holes indicated. 3-sync non-OD use the same holes, the extra set were there before the auto option was available so not for that, maybe for the 3-synch OD box:

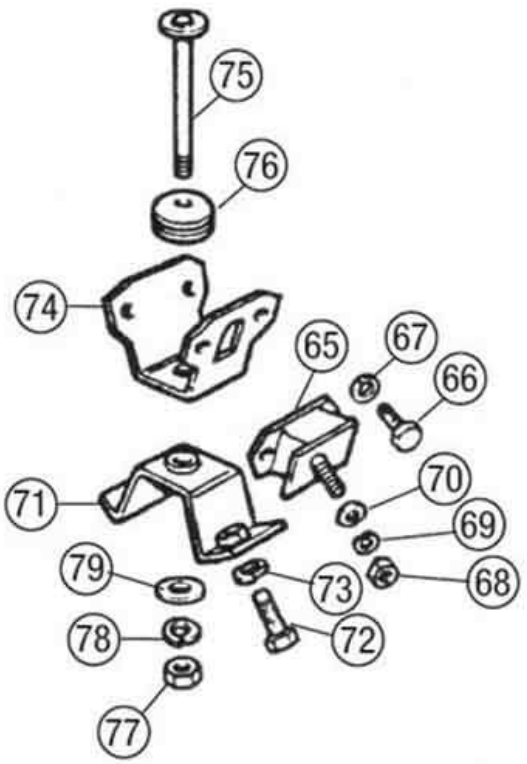


Restraint Rods: Mk 1/3-synch cars had a crossmember with just a single hole for each gearbox mount stud. Roadsters had welded nuts on the rear face for a restraint rod bracket. A short rod passed through the crossmember and bracket and was retained by a nut. The front of the rod has a 'U'-bracket that goes around a protrusion on the bottom of the gearbox casting close to the crossmember, and a special pin goes through the bracket and protrusion with rubber bushes between them. They don't appear to have the yokes, bushes and pin at this stage: (*MG Centre Wrexham*)



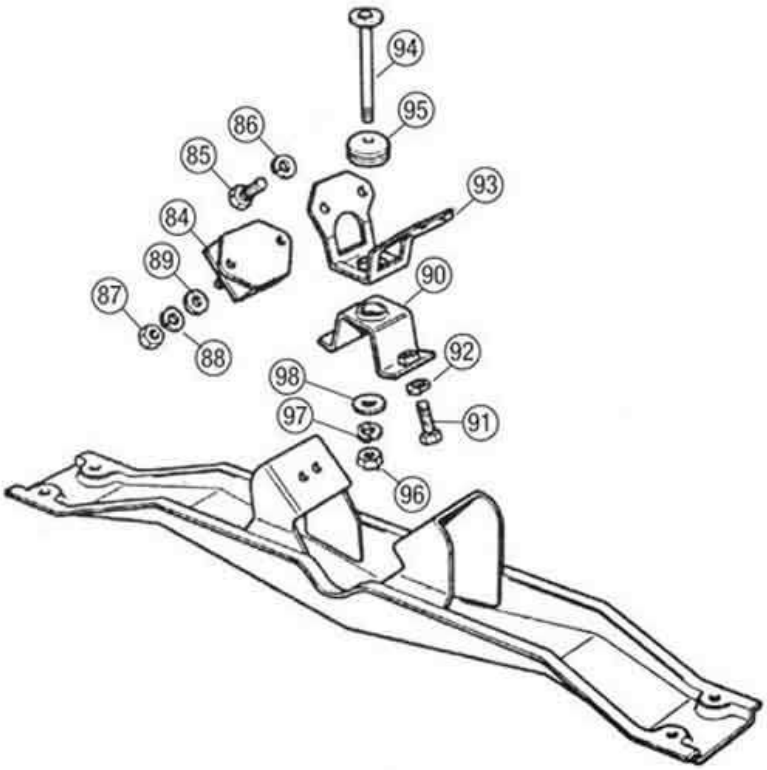
(Moss Europe)

Mk 1 GTs don't appear to have the restraint rod, but have yokes, bushes and pin instead. This upper yoke (item 74) in the Parts Catalogue and Rimmers is shown as symmetrical so either way round makes no difference, the lower (71) is probably the same. Although these are not as 'positive' at restraining forward movement as the roadster rod they will limit it. They also prevent any untoward lifting of the gearbox tail should the rubber mounts part which could tip the fan into the radiator, and almost certainly would prevent them parting in the first place: (*Rimmers*)

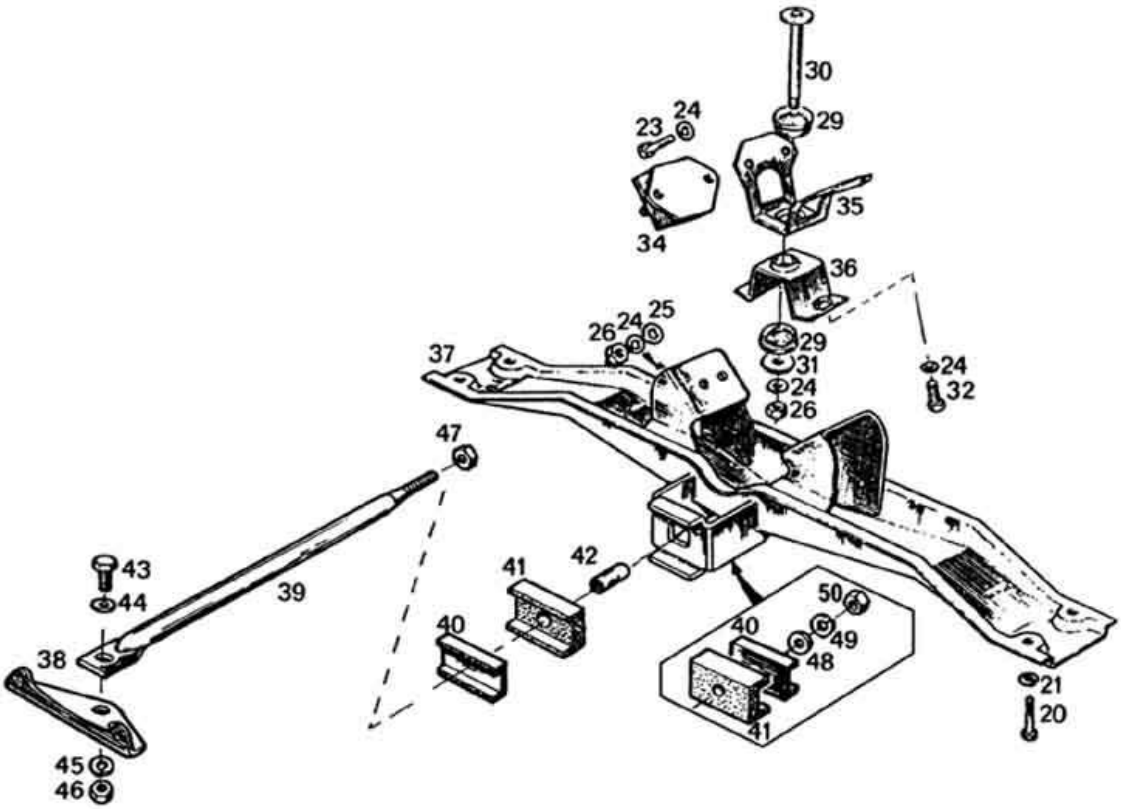


Mk1 GTs also have control brackets as part of each engine mount that restricts how far the engine can move forward. Perhaps not quite so positive as a restraint rod, but just as effective as keeping the fan away from the radiator. Unfortunately if these front control brackets are left out during an engine removal and refitting the engine has no **positive** restraint, just the floppy (in the fore and aft direction) yokes, bushes and pin. Very few seem to exist in the wild going by past comments (although Michael's has them), but they are available from the usual suspects, part AHH7890 variously described as 'Bracket control', 'Bracket - Engine Surge', 'Recoil bracket', and 'Restraint Bracket'. The mounts that bolt to the gearbox are different to those on the roadster.

All Mk 2/4-synch cars have a crossmember with two holes for each gearbox mount stud so two more options for assembly, and no welded nuts for a restraint bracket (and hence no restraint rod), although the holes are still present. The upper (93) and lower (90) yokes with bushes and pin are different to the Mk1 GT, both asymmetric which makes a difference according to which way round they are fitted. All GT and roadster parts are now common. The quantity of the front control brackets was reduced from 2 to 1 (penny-pinchers again), for markets other than North America, for the 1972 model year. These cars would definitely benefit from retro-fitting the front control brackets if they are missing.



In Feb 74 (still chrome bumper) a new restraint rod was added to North American cars. This used a welded bracket on the front face of the crossmember, and a longer rod going all the way to a bracket that attaches to the two bottom bolts that secure the bell-housing to the engine. Other markets got this arrangement at the start of rubber bumpers, but despite this very positive restraint being used again, and the yokes, pin and bushes, the front mount control brackets were also apparently still provided (making no less than three restraint systems!), 2 for North America, 1 elsewhere as before, until the engine mounts changed from rectangular to round at the start of rubber bumper production in September 1974, which prevented the use of the front control brackets. The crossmember brackets again have two holes for the stud on the rubber mounts.



(Moss Europe)

The V8 only ever had the Mk2 yokes, bushes and pin as part of the crossmember assembly, never a restraint rod or front mount control bracket.

Removable Rear Crossmember

Quite a neat installation: (*The MG Experience*)

I do wonder how it affects speedo cable routing though:

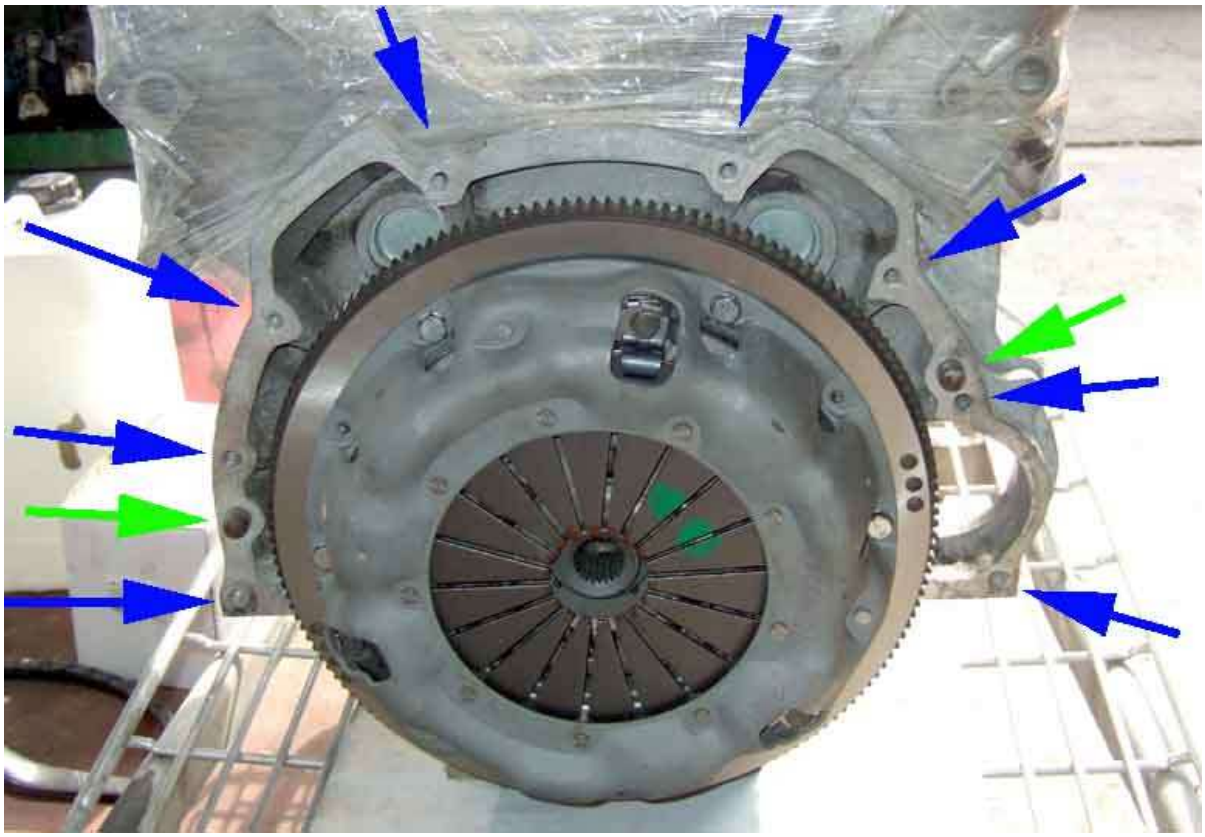
V8 Gearbox Removal

Reinstallation

December 2019: Vee's gearbox started whining about a year after it was out for an engine rebuild and repaint - very annoying, as both have to come out again. It's usually said that the two have to come out together, which is simply not possible at home with a folding hoist, and I really really don't want to send her away again after the last time. With a double-length garage and Bee out of the way there is the length to work on the car and just shut the door on it at night. That would mean leaving Bee out for several days in winter weather, but fortunately pal Dave is in the process of remodelling a property so it's not occupied, and I can put her in that garage. The first dry day for weeks as I don't want to put her away wet sees Bee round there, and next day I can start. Also the start of a spell of cold weather with morning frosts, but there we are, just a matter of 'the right clothing'.

So my preferred method is to remove the engine first, then the gearbox, which would be my choice on the 4-cylinder as well. Not a trivial task in any event, but there are several aspects of the V8 which make it trickier:

- The bell-housing bolts sit further back on the V8 than they do on the 4-cylinder and are in the tunnel.
- But more significantly they are bolts that screw into the V8 block, instead of bolts through the 4-cylinder engine back-plate with nuts that are effectively in the engine bay, so you have no option but to undo the bolts. With the 4-cylinder you undo the nuts just holding the bolts still, so they don't need any 'swing' space for a spanner.
- With the 4-cylinder the bell-housing bolts are distributed fairly evenly around it, with the two lowest ones right at the bottom so easy to access. These are the last ones you undo (and the first to refit), as when the engine is hanging on the hoist and the tail of the gearbox is on one of the cross-members, the top of the back-plate and bell-housing are being pushed together, and the bottom is trying to pull apart. Once all the others have been taken out with the engine lowered, it is lifted until the gearbox is at the top of the tunnel. Then the gearbox is supported taking equal weight, the final two nuts - right at the bottom - are removed and the engine pulled forwards. That's the 4-cylinder! On the V8 all of them are round the upper half of the bell-housing and inside the tunnel (blue arrows below taken prior to reuniting engine and gearbox on the workshop floor after the engine rebuild), so the lowest two are up inside the tunnel even with the engine fully lowered, even higher when the engine and gearbox have been lifted to the top of the tunnel. The top two are right on top and not visible from underneath, and only just visible from above, at an angle inside the tunnel, with no space to fit even an angled ring spanner let along swing it.
- Whereas with the 4-cylinder several bolts are left in the bell-housing to act as guide pins when pulling the engine forwards and refitting, but on the V8 as soon as the threads are disengaged there are just a couple of short dowels (green arrows) for location, so you have to be sure the gearbox and engine are supported equally as those dowels disengage, so you don't stress the first-motion shaft. As it is, I'll have to partially unscrew the two lowest ones, ease the engine forwards to disengage the dowels, and the bolts will still be keeping the two more or less in line. If those have now become stiff to turn, I'll know the engine and gearbox are not supported equally, so can make small adjustments to one or the other until the bolts turn freely - that's the theory at any rate!



However looking ahead to getting the gearbox looked at, one of my contacts came up with a local chap, and he said it **is** possible to get the V8 engine out on its own. You have to remove the engine mounts and mounting plates, and exhaust manifolds, and that allows the engine to sit a good 2" or more lower in the chassis. Then with the carb assembly off and heater hoses and heat valve out of the way you have more access to the top two bell-housing bolts. To get the off-side exhaust manifold off the rack needs to be removed, and removing the manifolds gives more access to the engine mounts, so quite a bit of work needs to be done to get to the point where you know you will be able to access all the bell-housing bolts. The engine has to be lifted right up so the mount studs are clear of the chassis slots so they and the mounting plates can be removed, so prior to that I disconnected the oil cooler and gauge hoses to avoid stressing them, removed the distributor cap and leads and fitted an old cap to protect the distributor innards. As I can only borrow the hoist for the final extraction I'm having to raise the engine by jacking under the sump with a wood block, and squeezing in and out between that and the wheel ramps first one side then the other is hard work. With the mounts and plate off and the engine lowered onto the chassis rails, and the carb assembly removed, there is a lot more access to the top two bolts as shown below, even though in this picture the engine is sitting on thin wood blocks in place of the mounts and is not quite as low as it can go.

However as there is so much work involved to get this far it would be advisable to check you can move the six lower bell-housing bolts first - slackening each then nipping back up. If you can't then there seems little point proceeding, and if you intend driving the car elsewhere to get the job done make sure any you **have** been able to move are retightened fully. If you can't get a socket on any of the bolts with a 3/8" drive, multiple extensions, U/J and socket try dropping the rear cross-member which will allow you to swing the tail of the gearbox an inch or so either way, which may give just enough clearance to the tunnel. Even then there is no guarantee that you will be able to move the top two.

Having got access, the next question is will they undo! Joined together with both units on the workshop floor two years ago, and tightened with a 1/2" drive socket wrench, no torque I'm aware of. Even with the extra space it's not enough to get even my 3/8" drive socket wrench in there, let alone with a U/J, and especially not my 1/2" drive, a swivel head type might. I did lay in a 1/2" and 9/16" swivel-ended socket spanner, which did just go on, but is very close to the tunnel. My angled ring spanner went on easily, with the handle pointing out at a convenient angle. But it's shorter than the swivel ended let alone the socket wrench, and I couldn't get enough force on it to shift the nut. So get one of my oil cooler hose spanners, put the ring on that over the appropriate half of the open-ended jaw to get more than double the force ... the spanner was bending ... there was a 'crack' ... and the bolt was free. Ditto the second top bolt - phew! That took about four hours and enough for one day.

The big question for the second half-day was, would the remaining six come undone! Underneath it looks like there is enough space to do one side but not the other, which is right up against the tunnel wall. Nevertheless I get my 1/2" drive socket with long and medium extensions and a U/J, and by leaning the wrench head against convenient chassis rail and cross-member they do come undone with the same 'crack'. I don't intend to disconnect the gearbox cross-member from the chassis rails until the last minute, which is giving a degree of stability to the engine as it's going up and down and only supported under the sump. The only way I can get access to the other side is by jacking up the engine and putting a chunk of wood where the engine mount goes on the side I want to access, so when I jack it down the engine is forced across to the other side ... and those three come free just the same. So that's all eight loosened now, and I have good chance of being able to complete the job. It's only now that I start thinking about everything else that has to come off - drain coolant, remove radiator hoses, remove fan guard, radiator, cooling fans (the fan comes off the motor replaced many years ago but I have to remove the other motor complete with fan), alternator, temp gauge sender, servo hose, coil to distributor wire, and anything else round the top of the engine, and enough for another half-day.

The next half-day was removal of centre cubby and armrest, gear lever, starter, clutch slave from bell-housing left hanging on hose, prop-shaft, speedo cable, and anything else round the gearbox such as disconnecting the gearbox sub-harness from the main harness at the heater shelf. I'd been pondering lowering the gearbox cross-member to give better access to the bell-housing bolts and more tilt on the engine, but didn't want to leave it completely disconnected. I found some long bolts that fitted the chassis rails, and used one each side in place of the four short originals. I had to remove Bee's chrome bumper when getting her engine out with this hoist, so felt I'd have to do the same with the rubber bumper. I didn't want to wait until I got the hoist as I want to crack straight on getting the engine out, so decided to take it off anyway, which meant removal of the mesh grille so I could disconnect the indicator wires from the main harness. I may have to remove the front valance as it is the ST 'scoop' type and projects forward slightly rather than simply curving back, but that can wait as I'll still have the morning before we tackle the extraction in the afternoon. That really is about all I can do, the bonnet has to come off but will wait until Dave comes round to help with the final extraction. In the meantime I can remove the rear hinge-to-bonnet bolts and slacken the front ones with plenty of padding under the rear corners and the front (as recommended by John Maguire) and disconnect the prop, so all that needs to be done is remove the front hinge-to-bonnet bolts and lift it off.

I left the gearbox draining over night into a clean bucket, nothing in there next day, but some metal fragments in the hollow in the drain plug. Otherwise a day of rest, apart from constructing a support for the rear of the engine as that will have to go back minus the gearbox, which will then allow the car to be pushed back onto the full-length ramps so I can get Bee back from her temporary home. Hoist arrives that night.

Should be the big day, but Dave isn't available until 2pm which gives me the morning to ponder attaching the hoist and thinking through all the steps needed. I decide to remove the valance rather than risk damaging it, and it gives an extra inch clearance between car and hoist as well as giving me more room to slide under and back out, should have done that at the outset.

Restricted for height in the garage, especially as the car is on wheel ramps, so I set up the hoist and leveller chains for minimum length. Not ideal as the leveller is shorter than the distance between the V8 lifting eyes, which means the chains will

be at an angle and tending to pull the eyes towards each other, and towards the rocker covers. Last time putting engine and gearbox in together we used a strap through the eyes to the hook on the hoist, no leveller, and both eyes did end up bent, but how much of that was new and how much old I don't know. The strap was left longish, maybe about the same angle as the chains will be, so we'll see. That leaves the leveller quite close to the long carb plenum studs sticking up from the inlet manifold, so they come out. The rear attachment point is very close to the heater motor, to that comes out with its fan, and I dig out a couple of stout bolts with nuts, and big washers, to attach the leveller chains to the V8 lifting brackets. The heads of the bolts are very close to the rocker covers, so I remove the screws but leave them sitting there as a loose cover.

Then I have to think about getting underneath to remove the remaining bell-housing bolts with the hoist in position, and really I don't think I'll be able to lie across the hoist legs while getting underneath, and especially getting out again. When I did Bee's clutch I got in from the sides behind the front wheels. But the wheel ramps are only a few inches away from the end of the full-length ramps and not enough room. So I jack the one wheel up off the ramp and turn the ramp round, and take off the mud-flap, but still not enough room. Nothing for it but to jack the front wheels down to the floor and roll it forward a foot or so ... which needs the rack to be refitted loosely, but it would need to be anyway to roll the car back onto the full-length ramps after engine and gearbox are out, so no big deal. Then jack back up and slide the wheel ramps under, facing the 'wrong' way as before to give me the maximum space from the sides. Finally I have plenty of room to get in from the side, but with the trolley jack in place as it will be to support the gearbox I can't reach across to the other side. So the mud-flap comes off that side as well. Really the front of the exhaust pipe is in the way as well, so round the back and completely remove the rear mount (only slackened before along with the centre mount), and I can pull the exhaust system back until the centre box reaches the centre mount. As well as being largely out of the way now, it also allows me to pivot it round so the front end is by the sill and not the tunnel.

Next morning I hook up the hoist with leveller, but I'm still concerned about being able to lift the engine high enough to clear the slam panel before the end of the jib hits the ceiling, especially as the body will rise a couple of inches as the weight is taken off! With the engine pulled forwards clear of the gearbox I may need to lower the gearbox trolley jack, then jack the body to replace the wheel ramps with axle stands ... which needs two jacks ... and fortunately Dave has one as well. If we slide the gearbox out from under the car the body may have to go back on the wheel ramps again, plus be raised a bit more, as from measurements the space between the front cross-member to the floor for the height of the bell-housing is also going to be close, even though the body will be a couple of inches higher without the engine. Alternatively we could lift the gearbox out after the engine. Dave arrives in the afternoon so I start removing the side bolts between the bell-housing and the engine, leaving just the bottom two in place. Three come out no problem with fingers after a turn or two with the ratchet handle, but the fourth needs ratcheting all the way and comes out so far and no more. I **think** it is clear of the thread in the engine, so wedge a long screwdriver behind the head while I ratchet some more, which gets it out another half inch so must be clear. Then start jacking to raise the top of the bell-housing to the top of the tunnel ready to support the gearbox and remove the final two bolts ... and the hoist starts sinking! There is a small Mole wrench on the release valve instead of using the slot in the end of the jack handle, which is suspicious as it allows the valve to be tightened much more than it normally would be. Tighten it a bit more, and it seems OK, but then starts sinking again. So I try jacking as it is sinking but it gets to the point where is sinking as fast I can jack. Fluid? We dribble in hydraulic jack oil from a nozzle bottle, which involves lying the hoist on its back each

time, but despite doing that repeatedly, when we stand it up again it still hasn't reached the bottom of the filler hole. Thinking if lack of fluid was the problem, having added a significant amount it must have made a difference. But no, once it starts sinking it does so until the engine is right back on the chassis mounts. Also before hooking it up to the engine I jacked the jib right up to the ceiling to check the clearance for the engine to the slam panel, and it didn't sink then. No way we can risk it, if it suddenly drops half way out it would all be over. Bugger bugger bugger.

Dave leaves to call on a couple of places that might have a hoist and hits pay-dirt at the first - same type as this one so we know it will fit between the ramps. Next morning he brings it round, and the other chap collects the first hoist saying when he asked the person who had it before about it sinking he said "Oh yes, I just keep cranking ...".

The first job is to clear as much space at the front of the car as possible which we should have done the previous day really. Hook up the new hoist with Dave suggesting we use the shackles through the lifting eyes on the engine instead of the lifting plates with bolts i.e. fit the chains the other way up, and that gives loads more clearance to both the rocker covers and the heater motor had it still been there - the power of lateral thinking. Raise the engine and gearbox ... and hoorah, no sinking! But the bolt that is stuck in the bell-housing is jamming on the side of the tunnel, so ponder a bit, can see it from above with them lowered, so get a long screwdriver in as a drift behind the head, tap it with a hammer, and out it pops. Now the engine can be raised until the gearbox is at the top of the tunnel, and I can see the sump will clear the cross-member with a straight pull forwards, unlike the CB 4-cylinder where it has to be angled once the first-motion shaft is clear of the clutch splines before it can be pulled forwards any more. Now with a trolley jack under the front of the bell-housing I can start slackening the two lowest bell-housing bolts.

One mistake was using the minimum length of chain being concerned about the headroom to get the engine over the slam panel, and we found the we couldn't turn the leveller handle as it was too close to the engine. But I'd set that before hooking it up testing the 'twang' on each chain by tapping them with a spanner and got the same sound so I was confident the engine would be at the right angle when it started to come free, and not stress the first-motion shaft or anything else. I undo the bottom two bell-housing bolts bit by bit, but can't get any separation top or bottom. So with a bit of wood against the bulkhead I put a breaker bar behind the top of the engine and the gap opens up a couple of mm. Underneath and no movement, so raise the engine a little, then Dave waggles the front of the engine from side to side - and Bingo movement at the bottom as well. So now it is a case of slackening the bolts bit by bit, pulling and waggling, checking that the gap opens up evenly all round. Then when they are about an inch apart there is a joggle and they are free! Now it's just a case of pulling the engine forwards so it is fully clear of the 1st motion shaft, and raising it to clear the slam panel. Part way up I measure the height from the top of the jib to the bottom of the sump, and compare that with the distance between the ceiling and the slam panel, and we have about 30cm spare, so that's one problem avoided and no need to lower the car, and I could have used another couple of links on the chains and been able to swing the leveller handle - must remember to do that for the refit. Hoist it the rest of the way up, pull it completely forwards, and swing it round to park it on a Workmate.

Then the first thing I did was test-fit the MGB GT V8 crankshaft pilot bush MGB549911 that I'd bought to the gearbox shaft to make sure it fitted, as I was going to use that bush to check the rebuilt gearbox had the correct shaft when I went to collect it.

Now for the gearbox - hoist chains attached to the bell-housing in preparation for the initial pull forwards to bring the OD clear of the fixed cross-member before lowering it, as with the rear cross-member disconnected I didn't want to risk it toppling off the trolley jack.

I'm deliberately leaving the gearbox cross-member on the gearbox to stop it rolling. Took the weight of the bell-housing on the hoist, got a trolley jack under the removable cross-member to lift the OD off the fixed cross-member and remove the temporary bolts though to the chassis rails ... but all that happened was that the bell-housing rose up in the air! All the weight is at the back of the gearbox, so that trolley jack has to go under the end of the OD, and I can remove the chassis rail bolts. Pull the gearbox towards the front cross-member clear of the fixed cross-member, and lower both the hoist and the trolley jack onto a plank so we can drag it forwards on that rather than the painted concrete floor. We are couple of inches short for clearance under the front cross-member, but jacking under one of the spring pans raises the car enough to pull it out ... and it's free! After the engine, this bit was really easy.

Stand the gearbox on wood blocks to keep the first-motion shaft clear of the floor, ready to remove the cross-member and mounts, sub-harness, reverse light switch. I decide to remove the tower as well to investigate the OD switch actuation mechanism further, with a view to converting it to 3rd and 4th to overcome the coming out of OD on the over-run. Drain the

gearbox first while in-situ, then after standing like this for a while lay it level and drain it again, and about another pint comes out:

I remove the nuts from the mount studs going through the cross-member which is much easier without there being a car above it in the way, but without the gearbox being held firmly in the body it makes it harder to pull the cross-member off the studs - not helped by forgetting to remove the two bolts that go up into the central bracket! So I opt to remove the bolts that go into the gearbox itself from one of the rubber mounts, then it can be lifted off the other mount stud. Note this shows the gearbox earth strap on the left-hand side front, the manuals show it fitted to the right-hand side front:

When dismantling bear in mind that there are up to 32 different ways the crossmember components can be installed!

I'd been advised not to replace the mount rubbers unless absolutely necessary as new ones are so much harder, but these are definitely perished even having gone shiny and 'melted' in one area, so I will replace them. The central bracket circular rubbers can stay as there is no sign of damage and they only restrain the gearbox against excessive forward movement in the event of a severe frontal impact:

The gearbox harness (on the V8) has a clip on the upper right bell-housing bolt, and another on one of the gearbox to bell-housing bolts by the reverse light switch. The harness is really hard and inflexible, with the wrapping tape damaged in several places, but more importantly the insulation is cracked on a couple of the wires near the terminations, so that will have to be replaced. The 4-synch OD and reverse light gearbox harness AHC258 in the Parts Catalogue specifically states 'Not V8' but there is not another one shown. The V8 harness can be shorter as it only has to reach as far as the shelf under the heater motor, as the three wires involved are part of the tail leading to the heater motor and screen washer. The 4-cylinder version is longer as it has to reach the mass of connectors in the main and rear harnesses, but I suppose I'll have to use that one. MGOC and Leacy use part number AHC258, but Brown & Gammons uses '684', and Moss 'BL654'. Another purchase will be the release arm gaiter 22B450 as when removing the arm and cleaning it up the gaiter was virtually in three pieces:

The pivot pin is also showing wear but even though the hydraulics compensate for all mechanical wear at that end of the system it gets replaced, the push-rod will be fine:

The release bearing is interesting. Although it is a bearing-type and the face that contacts the cover-plate rotates with it, there is a noticeable flat worn on that face (left), whereas the new one on the right is rounded and matt:

In the fullness of time after the gearbox has gone to the workshop (on 10th December) we will put the engine back in the car, with a support for the rear, push it back all the way onto the full-length ramps, so Bee can come back home. But in the meantime I extend the heat insulation on the inner wings. The original sections were working perfectly well, but as the manifolds extended back further it didn't look right.

January 2020: I wasn't really expecting the gearbox to come back very soon with Christmas and New Year in the way, the other garage with Bee is available until towards the end of January so we were in no rush to get her back, which means putting the engine back in, supporting the rear somehow, then rolling her back to her normal parking position, which would need some method of extending the full-length ramps to lower the wheel down onto when they came off the wheel ramps.

The workshop (Geartech (Midlands) Ltd, very happy with their work) phone a week into January saying the mainshaft was shot so had to be replaced with new gearsets and sundry other stuff, and quoting £775 plus VAT for the job - overdrive extra as that is farmed-out elsewhere. Not surprised at the price, I was quoted £400 at one place and £980 at another, plus VAT and OD, so gave the go-ahead. Didn't bother asking about timescales as it is unlikely to be in two weeks, by which time Bee has to vacate her temporary home, so gird my loins.

As I'm not going to be working under the car I decide to lower the front before I put the engine in, but they will have to rest on something else of the same height as the full-length ramps, so I can push her all the way back to make room for Bee. I have a collection of bricks out the back, and several boards, and with the bricks resting on their sides and a board on top is only about 1/2" low - I reckon I can push her up that with a bit of momentum. With the bricks spaced out with gaps a bit thicker than the bricks and boards on top I reckon it's safe enough for rolling Vee back. With the steering rack loosely refitted, the wheel ramps removed she is lowered onto the bricks and boards.

Getting the engine back in is easy, and to support the rear I come up with a steel bar slid through holes in two pieces of planking, sitting edge-wise in the rain channels of the wings, on cloths to protect the paint. First I have to support the engine under the sump so I can get the hoist out of the way, and with the two top bell-housing bolts replaced I wrap several turns of nylon rope under the bolts and round the bar and tie it off. Tentatively lower the jack, the suspension sinks as expected, but it all seems secure. With everything out of the way from behind where the bumper, air dam, and sundry mechanical parts have been stored up to now I chock a rear wheel to stop it rolling forwards, lower the jack under the sump all the way, and roll her back. I'm not leaving the engine supported solely on the steel bar so fiddle about under the full-length ramps to get the jack back in, and taking some of the load. From time to time I'll check the jack to make sure it isn't sagging.

With that done I temporarily refit the air-dam and bumper as that is the easiest place to store those two large items. All the rest fit in or under the car, the bonnet resting on thick cloths on the rear support for the engine and the slam panel. The hoist folds up and slots into a space against the garage wall where the wheel ramps usually go, they are stored under the front of Vee.

So Bee comes back home, now the wait for the return of the gearbox.

January 29th - the gearbox returns, and reinstallation commences.

First job is to get the tower off and test my modified OD plunger to see if it operates the switch any earlier, and so resists coming out if the gear lever should ease forwards on the over-run as it had been doing. One would hope it wouldn't with a rebuilt box, but one never knows. But that came to naught, the plunger needs to move further, which means welding some metal to the chamfered end, which seems a lot of work. I searched high and low for a 4-cylinder plunger to give it OD in 3rd and 4th, but that needs the 4-cylinder selector as well. They are available, but not the plungers, so I've left it with the original plunger...

... and carried on fitting the crossmember. New rubber mounts as the old ones were perished. Tried bolting it up to the gearbox loosely assembled but in the cramped space with both cars in the garage getting the 2nd, 3rd and 4th bolts started in the gearbox was a challenge. So I loosely bolted just the mounts and the upper yoke to the gearbox, then slotted the crossmember onto the mount studs. With new rubbers the studs are miles away from the holes and don't want to lean that far even with the gearbox bolts only just started. So I removed one of the forward mount bolts (easier to get at then the rears, hooked the crossmember onto the other stud and could twist the other mount and the crossmember to get the stud in, then refitted the fourth gearbox bolt, with the earth cable, and the stud washers and nuts.

Fitted the switches checking the shimming and correct operation, the harness - replacement as the old one had lost all its flexibility and had damaged wrapping and insulation, and checked continuity through that for reverse and to the gearbox casing for the OD solenoid. Ordering the harness caused some head-scratching as there isn't one listed anywhere for the V8, and the Parts Catalogue doesn't say the one that **is** there is for both. It's electrically the same as the 4-cylinder with OD from 67 to 76 of course, but only goes as far as the heater shelf on the V8 whereas it goes to the inner wing on 4-cylinder cars, but at least that means the 4-cylinder one should be more than long enough for the V8. Another puzzle was the description. Ordering a few parts only Brown & Gammons had all of them and I didn't want to split the order and incur double P&P. All the usual suppliers only list one harness for all years, whereas one would expect cloth braided for early cars and plastic wrapped for later, as Vee's original. The original is AHC258 which Leacy shows as plastic wrapped, but B&G have that as superseded by '684 ... MGB & MGC 67/76 O/D G/B REV SWITC PL/BRAIDED'. The picture shows it's braided, so what is the 'PL' bit which sounds like it ought to be 'plastic', Surely they don't mean the plastic insulation on the wires! But when it arrives it has a plastic sheath over part of the braiding, which can be seen in the right-hand image below. It is just long enough to reach to both the gearbox clip by the reverse switch and the bellhousing bolt, but that puts all the slack at the heater shelf end which may get in the way. So I've cut the plastic sheath in half so both clips are over the plastic sheath instead of the braiding, and the slack is between the two. It does mean it is better than the Leacy item without the additional sheath, only an Australian supplier shows that over the plastic harness wrap. Incidentally one UK supplier shows the 77 to 80 harness with the extra wires and terminals as being suitable for all years - plastic wrapped with no reinforcing.

That's about all I can do until it's dry enough to get Bee outside, and roll Vee forwards to get the engine out, and the gearbox and engine back in.

And that's Saturday. Roll Bee out, extend the ramps with bricks and boards as before, roll Vee forwards, and replace the bricks and boards with wheel ramps. Engine out, and slide the gearbox under on boards. Raising the gearbox high enough for the output to go over the fixed crossmember is tricky as it's unstable on jacks, so I opt to support the bellhousing on my jury-rig that I'd used to support the rear of the engine, several turns round bolts in the top holes, and a piece of wood twisting those to raise it bit by bit. I build up layers of timber under the ends of the gearbox crossmember while jacking under that, and eventually I get it high enough to slide back, and get my long bolts through the gearbox crossmember into the chassis rails temporarily. Fitted the release arm and bearing - which needs care as unlike the 4-cylinder it's not immediately obvious which way round the arm has to go. It's kinked, and in one position the release bearing goes right to the back of the guide tube, which is the right way round. Lubricate the release arm pivot, release bearing pivots, splines and spigot with special spline grease from Sachs and we are ready to go.

That took all morning. With a helper in the cabin it would have been easier to raise the back in one go with a rope through the tunnel hole. He offered, but I was so grateful for his help in getting it all out and taking it and me to the repairer and back, I didn't want to take the mick.

After lunch with the front of the bell-housing on a jack raised to the top of the tunnel, I removed the mounts from the engine, and wheeled it into the engine bay. With the nose of the first-motion shaft in the hole in the clutch cover plate, and bit of fine adjustment to height and angle and the engine slides straight onto the splines. In five cases of fitting engine to gearbox, 4-cylinder and V8, I've never had the problem that some describe. I always leave the gearbox out of gear (if not disconnected from the propshaft) and the first motion shaft always seems to rotate the clutch splines. Where people have the problem I think they must have the gearbox in gear, propshaft connected and wheels locked, and have to turn the crank while the engine is dangling on the hoist. Fit the bottom bellhousing bolts (short), and it's taken all of 20 minutes! At this point it would be wise to check the clutch slave against the release arm to make sure the arm and bearing are correctly fitted. Even without fluid the

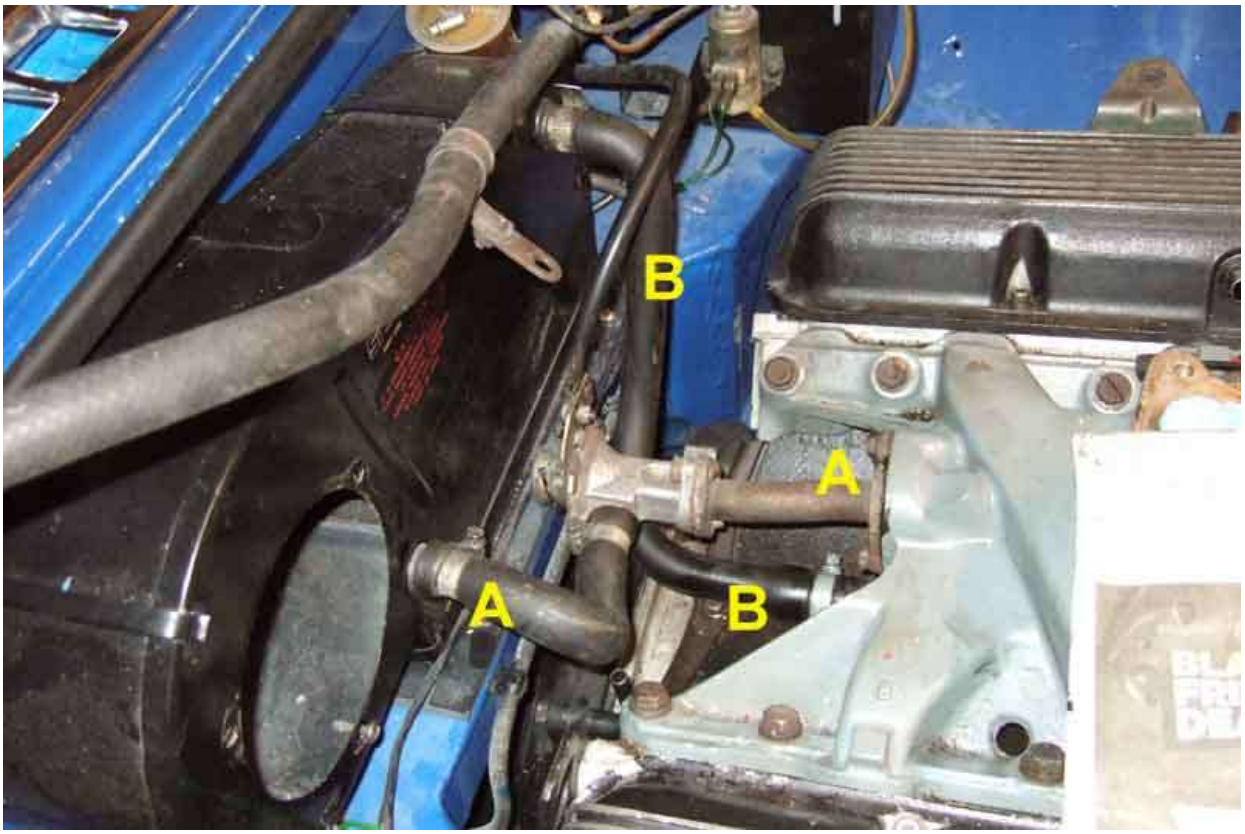
internal spring should be pushing the piston to the end of the cylinder, so when fitted the pushrod should be pushing the piston back into the cylinder by a minimum of 1/2" as the cylinder is slid back to get the bolt holes lined up. That done the engine is lowered onto the chassis rails, the top two bellhousing bolts (short) are fitted and I tighten them with the swivel-ended spanner with 1/2" and 9/16" sockets which being longer than my standard 9/16" ring spanner is easier than using a big spanner as a lever. Then the four side bellhousing bolts (long) not forgetting the gearbox harness clip which goes on the upper right-hand one. Still pretty early in the afternoon so raise the engine and gearbox to the top of the tunnel again and fit the engine mounting plates to the block then the mounts to the plates and they are the fiddliest part so far. Make sure you get the plates on the right sides - the mount is offset relative to the plate and needs to be in the forward of the two possible positions, to position the engine in the rearmost of the two possible positions, and make sure the mounts are fitted to the plates with the studs in the lower of the two possible positions. Lower the engine again wiggle it about to get the mount studs in the chassis bracket slots. Ideally the stud won't quite be at the bottom so the mount rubbers are in compression and not shear, if it is it needs packing. There should be at least one oval packing plate each side between the rubber mount and the mounting plate. I have an extra one on one side, plus a circular spacer between the mount and the chassis bracket. Originally this was to prevent the exhaust manifold hitting the steering column, which is a known problem. With the Clive Wheatley 'rock' steady bar this isn't needed but I still fit them all. As a final measure I use a hammer and drift on the metal plate on the mount where it sits against the chassis bracket to make sure it is fully down, and they both move a sixteenth or so. More fiddling getting the location plates, washers and nuts onto the studs. The location plates fit with the hole in the lower of the two possible positions to make sure the stud is close to the bottom of the slot. Very restricted both sides, the rack needs to be removed again as it passes through the mount bracket and makes accessing that nut almost impossible. A couple of finger-tips to get the washer on and the nuts started, with your fingers in there you can't see when the nut is square to the stud. Even then if your ring-spanner is too long you can only turn the nut half a flat at a time, a shorter one will pass over the top of the crossmember and allow you to do a whole flat at a time - whoopy-do. Not enough space to get a ratchet ring on the nut, let alone a socket. With it all in it's obvious that the gearbox harness is at least a foot longer than it needs to be, I shall have to lose that somewhere,

Only about 3pm but that's enough for one day. Apart from lifting the engine out and back in, the top two bellhousing bolts, and attaching the mounting plates to the block everything has been under the car, and continually getting up and down and crawling under and out with restricted space both sides is hard work ... at my age. I've got to pack everything away and replace wheel ramps with the bricks and boards and refit the rack again so I can roll Vee back, then pack the bricks and boards away, and put Bee back in the garage, which takes another half-hour, and I'm pretty whacked. Fortunately the weather looks equally good next week as I will have to do the rolling forwards bit at least once more to reattach propshaft, speedo cable, flywheel cover, clutch slave and exhaust. But the last needs the manifolds to be on, which I can do without the bricks and boards business, so I'll probably do that first, instead of messing with the bricks and boards twice.

Sunday is a day of rest so Monday afternoon sees me tacking the exhaust manifolds, which have been a pain ever since I've had the car. Tubulars fitted by a PO, started cracking and after a couple of sessions welding-up I replaced them with mild steel. As well as the cracking I had found that once I had got them off (for welding) I couldn't get all the bolts back in as the outer two ports had turned in towards each other. Struts welded between the flanges solved that, but I still had a problem with the outer pair stepping back from being in-line with the others, so when the bolts were tightened the outer flanges went to the

head faces at an angle, and sealing was poor. Checking them with a straight-edge the outer pair were set back about 20 thou. New gaskets are 44 thou clamping down to about 12 thou once used, so this time I've used new gaskets on all the ports (of course) plus previously used but sound ones on the outer ports, in hope that all four ports will clamp down and seal evenly all the way round. I also used Holts exhaust paste on all the faces, including gasket to gasket. Previous paste I have tried seemed to go off very quickly, but this stuff is much thinner than expected - almost runny, and only dries very slowly, giving me time to get a manifold with six gaskets and eight bolts onto the head before it goes hard. A fiddle fitting them as the rack has to come out to get the off-side manifold in, I have to put the four top bolts in to hold the gaskets in place (studs in the head is sooooo much easier) and get each of them started without pushing any of the other back allowing the gaskets to slide off. Get to the end ... and find I'm a bolt and washer short! How that happened I don't know as I was sure I had counted them way back when I took them off and put them all in a small tub. Temporarily used one of the engine lifting eye bolts which is shorter, but will do until I can get replacements.

Then think about refitting the heater fan and motor, but realise it is better to start at the bottom without things in the way, so refit the heater valve and matrix hoses to the inlet manifold instead. The heater fan and motor will have to go back in next as otherwise the carb assembly will probably be in the way.



Decide to call it a day so refit the rack so I can roll the car back, and out again tomorrow ... and spot the missing exhaust manifold bolt and washer at the end of the chassis rail under the steering column UJ! So that replaces the temporary one, which can go back in the lifting eye.

Next day a lot of 'underneath' work reconnecting the propshaft (put the screws in the drive flange first as it's easier) with a rear wheel just off the 'ground' so it can be turned to tighten each in turn. Speedo cable (patience needed to get it started), (new) clutch lever gaiter, pushrod, clevis pin, washer and split-pin, and slave. Starter was the usual struggle underneath lifting it up while trying to line up the holes. In the end I used a cross-head screwdriver - in heaven all bolts where you can't see the holes are in line will be pointy ended. When I came to do the top bolt from above I realised I should have fitted the starter before the exhaust manifold that side. Not that it can't be done, after all I've had three starters on and off in the past. Feed the bolt in a 3/8" U/J on a long and a medium extension through between the middle two ports and it goes in easy enough. Back underneath to attach the cable/wires and fit the heat-shield. Then flywheel cover and exhaust system - only now discovering the clamps I bought from Clive Wheatley back in June when one broke and another looked like it wasn't far away, are too big. Stainless strap types I haven't used before so I'll have to see what can be done about those. Fortunately I bought two standard U-clamp types when the one broke so can use the second one of those to replace the weak one. The standard strap type need the pipes to be parted to fit, but the stainless like the U-clamps can be fitted without doing that, so relatively easy to sort out later.

Final refit of the rack, and hopefully that's all underneath with the rest on top which should be easier. Fit the oil filter and housing and connect up the two hoses plus the gauge hose. Prime the system with my drive shaft in a drill as usual, but as I now have a low oil-pressure switch in the engine bay it's easy to connect an ohmmeter to that to watch for pressure, and a first check for leaks. In the past I'm never quick enough running round from the front to look at the gauge and have had to rig up a

mirror or camera for a video. That needs the distributor to come out, and refitting is nothing like as easy as the 4-cylinder. The distributor has a spiral gear to the camshaft, then a key on the end of the distributor shaft engages in a slot on the oil pump drive. There is no way to turn the oil pump, so you have to look at the angle of the key on the distributor shaft, then turn the pump shaft to hopefully the right angle. The problem is that when you remove and insert the distributor the shaft turns because of the cam gears, so you have to guess how the angle will change as it is inserted! Not easy, and if it doesn't engage after a few attempts you have to turn the crankshaft a bit at a time - lifting up the distributor a fraction so simple friction doesn't move the pump shaft, and try refitting it. If that wasn't enough the distributor can engage with the cam in as many positions as there are teeth, but only one is right for the position of the leads in the cap of course, so you have to turn the crank to TDC, and set the distributor so the rotor is pointing at the correct contact. Eventually it goes in, but with two TDCs you have a 50% chance of getting the wrong one - unless you slacken No.1 plug to determine from hissing when that is rising on it's compression stroke. I'll take a punt on it being right, and turn the crank 360 degrees with the distributor pulled up again if not. I'm planning on running it dry initially so without radiator and cooling fans fitted access to the crank pulley is much easier.

Then refit the carb, plenum and air-filter assembly which conveniently comes off as one unit on the V8. Connect the fuel supply hose, power up, ignition on, pump chatters away then slows and stops. Check the connection to the carb and that is dry ... but then notice a drip from the filter! It was only then I remembered that I had started removing the hose from the top of the filter to get it out of the way, but it didn't want to come off the plastic filter spigot so I left it rather than risk breaking the filter ... but didn't retighten that clamp! Soon fixed, and that'll do for today. Last time (hopefully) replacing the wheel ramps with bricks and blocks and rolling it back to get Bee in the garage. With everything else (again hopefully) on top I should be able to finish now with Vee in her parked position and Bee just rolled forwards a few feet. Another annoyance when I've finished for the day is that I realise I haven't refitted the heater fan and motor and I'm not sure if it will go in with the air-box on the carbs, even though yesterday I realised I would have to do them in that order. I won't remove the carbs again, but I can remove the airbox.

Next day first thing is to remove the air-box and fit the heater fan and motor. The screws would have been easier to get at if I had done it before fitting the carbs, but there we are. Connect up the accelerator cable and choke, overflow hoses, PCV filter behind the air-box, PCV hoses and flame-traps between rocker covers and carbs, servo hose, temp gauge sensor. That's enough for a dry test, battery a bit weak after standing for pretty-well two months so connect my lithium battery pack. Power on, pump clicks a few times, no leaks. Crank several times ... and nothing. I wonder if I have got the distributor 180 degrees out so have the idea that if I use my air compressor and modified spark plug in No.1 with the engine at TDC and there is pressure it's at the correct TDC, and if no pressure it's at the wrong TDC. I get pressure, but looking at the rotor it's 180 degrees out. So distributor carefully lifted out of engagement with the cam drive, rotor turned 180 degrees, and reinsert. This time slots into the pump drive straight away. So crank again ... and there is an almighty bang! What the hell was that? Disconnect the ignition and try cranking and it turns over OK, so nothing mechanical, probably just fuel in the exhaust. Connect the ignition and crank again, and this time it fires up, but with the off-side exhaust blowing something awful on No.2 cylinder. I'm thinking the bang was that gasket blowing, which is one of the double-thickness ones. So peer closely at it and I can see it sticking out one side as if it has never been lined up properly with the bottom bolt hole. I took loads of care lining them up - or so I thought, but now what? It's the one that needs to rack to be removed to extract from the engine compartment, as well as disconnected from

the exhaust system. Maybe I can just pull it back far enough to line up the errant gasket with that one bolt removed and all the others slackened, and so it proves. Tighten all the bolts back up again, try another run, and no blowing, which is a relief. Subsequently it struck me that I could fit all the bolts and gaskets, then use thin wire above and below each bolt working along, and that would hold everything in place while I got each bolt started, then remove the wire. Oh well, next time.

Refit the bottom hose before the alternator as it's easier, and the alt was another pain. The belt squealed when she came to me, so I checked with a straight-edge and the pulley was set back from the water pump pulley, so I added several spacer washers to the lower front mount. These have to be fitted over the bolt in the alt lug, then pushed through the engine bracket with a nut on the back, with another bolt going through the rear mount and it was a fiddle getting everything lined up. Then refit the cooling fans, radiator, and top hose. For some reason the clamps are really too small for this hose and need to be bigger, but I can't remember struggling as much as this previously. Finally the gearbox harness and fan connections, and a bit of head-scratching and testing as I have a relay operated by the reverse light switch to disconnect the OD feed as belt and braces as I have the OD switch on the minimum spacer to try and stop the dropping-out on the overrun. Finally bolt down the gear-lever - to find it jammed as I have the plate 120 degrees out!

Next day it's time to put the gearbox oil in - until I discover the bottom hose connection has been dripping all night. Can tighten that some more which seems to stop it. Then I discover another hose clip in the back where I have been storing clean removed parts. That's bigger than the two I have fitted to the top hose and would have been much easier but where on earth has the under-sized one come from? We may never know. Filling/topping up the gearbox is bad enough on the CB with the cabin access and dip-stick but even worse with the RB side/fill. People use a long tube down from the engine compartment, but you still have to get underneath to fit that, it would take a long time to drain down, and still leave a significant amount in the tube to make a mess. With the rear wheels on the full-length ramps and the fronts on axle stands I have plenty of access underneath and can just get a 1 Litre bottle with it's filler tube up the side of the gearbox sideways on, but trickling in is very slow, even though the containers have been standing in hot water on this frosty morning. The new bottles are pretty stiff and squeezing while it gets some in will leave a lot behind, but I have a Castrol bottle from when I last drained and refilled some time ago and that is much squeezier, I can practically roll that up. Still leaves about 1/3rd litre behind, but I decant each of the new bottles into the Castrol bottle one by one. On the fourth litre it starts trickling out of the level hole, but from experience I know that isn't enough for OD to operate properly as it has yet to circulate throughout the OD and gearbox. So with one rear wheel safely chocked I raise the other just off the ground so I can run the engine (no traumas this time) and carefully select each gear and ease the clutch out, and switch OD in and out a few times. As expected, the OD is not functioning. Back underneath and squeeze more in, probably just short of the 4.3 litres in the book but foam is trickling out now. Don't remember that last time, so I'll probably have to let it stand overnight and check it again. But enough in for a test drive round our local road. I fit the valance and bumper with number-plate but don't bother with the bonnet. A quick circuit selecting all gears, and OD in 4th. Can't go too quickly but it is just fast enough to tell OD is engaging. So back home and after lunch the Navigator helps me with the bonnet using John Maguire's method, which is much easier on the Navigator than how we did Bee's some years ago. Basically she just helps me lift it onto thick padding at the front and rear corners, then I can reach under to loosely fit the front hinge bolts, then she lifts the front high enough to fit the hinge rear bolts, and the stay. Then once I have the twist drills through the hinges and bonnet brackets to get the basic alignment its a matter of fine-tuning the position. That

done, time for a longer trip of a couple of miles, and all seems well. Back home for final fitting of the centre arm-rest, fan guard and mesh grille, and a longer run of a dozen miles or so. Without the manifolds blowing which has been the case for years and the exhaust buzzing at idle more recently the engine sounds really good.

On our return the cooling fans cut in but don't sound right. Then they stop but the light is still showing on the override switch to show they are still powered. Round the front to find the near-side stalled because my bonnet emergency release cord has got wrapped round the fan blade - which is exactly what happened after getting everything back together after the engine rebuild. Also repeated is the melting of the fuse holder from the additional current from the stalled fan, which cut the power. So another new fuse-holder needed but it connects with spades each end so no problem. I'll also have to do something like put a cable-tie round the fan motor bracket to hold the emergency bonnet release cord back, when the fan is running it's being sucked against the blades even when it doesn't get wrapped round. Also evident is some hissing from the expansion tank hose where it connects to the radiator (probably from the inadequate fan cooling). Clip is tight, but waggling the hose causes it to spurt so it must be damaged. I'll try cutting the end off when it's all cooled down.

Next day recheck the gearbox oil level with the car level instead of raised slightly as before, and it starts trickling out, so there is plenty. Miffed to discover some droplets under the solenoid and sump! More running to ascertain the source. Also annoyed to discover the bonnet isn't quite far enough forwards on the drivers side and is rubbing on the panel at the base of the screen as it is opened and closed, so that has to be tweaked. Expansion tank hose removed from the radiator and cut back an inch, and refitted. New cooling fan fuse-holder with spade connectors made up, fitted and tested. Cable-tie fitted round the motor bracket and emergency bonnet release cord to stop it getting sucked into the fan and stalling it. Pretty cold wind today, so that's enough, just the front mud-flaps to refit.

Fortunate to get a really good week for all the reinstallation as Bee would have to be outside, then the weather changed with Storm Ciara. Good enough to fit the mud-flaps but that's all, until the following week when a couple of good enough days give me an hour out - shortly before Storm Dennis! All good including the cooling fans, except it felt like it was flat-spotting when accelerating in 4th, until I pulled the choke. Back home sprayed some carb-cleaner round where the intake plenum is bolted to the intake manifold and towards the rear near-side it had an effect on the idle. Need to do a bit more testing to confirm that it is that joint, and not something else in the vicinity like the carb gasket, for another day.

Interestingly WD40 doesn't make any difference when sprayed at the plenum/intake manifold, only carb cleaner. Tested with a 3 thou feeler gauge and I could slide it in between the two castings in one area (!), so carb assembly has to come off. The non-setting sealant I used in that area has obviously been dissolved by the carb cleaner. Clean it all off and put a straight edge across the inlet manifold in various places and I can get a feeler gauge under it in that area, but nothing I can do about that now. After the repaint I had obviously used a silicone sealant, which I don't normally, and I don't know why I did. I'll have to use it again with a thicker (but not great gobs) bead than the non-setting stuff I'd used this time. Back together I leave it to set, then the weather is pretty rubbish so no chance to test.

Having to top-up the coolant more than I'd like, but no signs of leakage when hot. So fit my Schrader valve tee into the expansion tank hose and pump it with a foot pump. A drip from the bottom hose, which was difficult to seal when I first

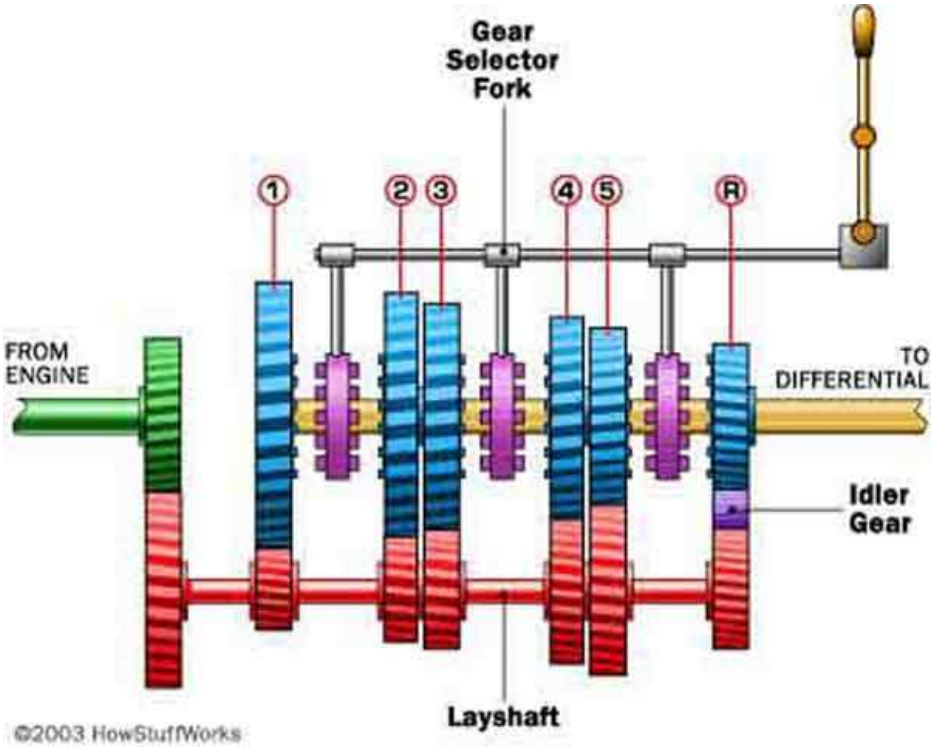
replaced the hose. A wire clamp which I prefer, but with a screwdriver slot so not as easy to get tight as more modern ones with hex heads. In my running spares I have a couple of large Jubilee-type clips with hex-head clamp screws, and can open one of those right out to fit it over the hose without having to remove the hose and drain the system. Remove the old clip the same way. Pump up the system again and that needs a little more tightening, and while underneath am aware of an occasional drip from the front cover. That turns out to be the water pump hose to the pipe what runs under the inlet manifold which wasn't touched as part of the gearbox job, so had probably been seeping very slightly since the repaint. Another wire clip with a screwdriver-slot head, I'm always careful to orientate the many hose clips so that they can be accessed with minimal if any removal of other parts and can get a bit more tension on that, which seems to do the trick. I'll have to invest in a set of wire clamps with hex heads for future use. Subsequently I spot a bit of dampness under the other small hose between pump and inlet manifold - another one not removed this time, hex head on that, so easy to tighten a bit more.

Reverse Idler Gear

To engage each gear the gear selector fork moves one of the pink dog-clutches into engagement with one of the blue output gears, to lock it to the output shaft and provide drive through to the prop-shaft.

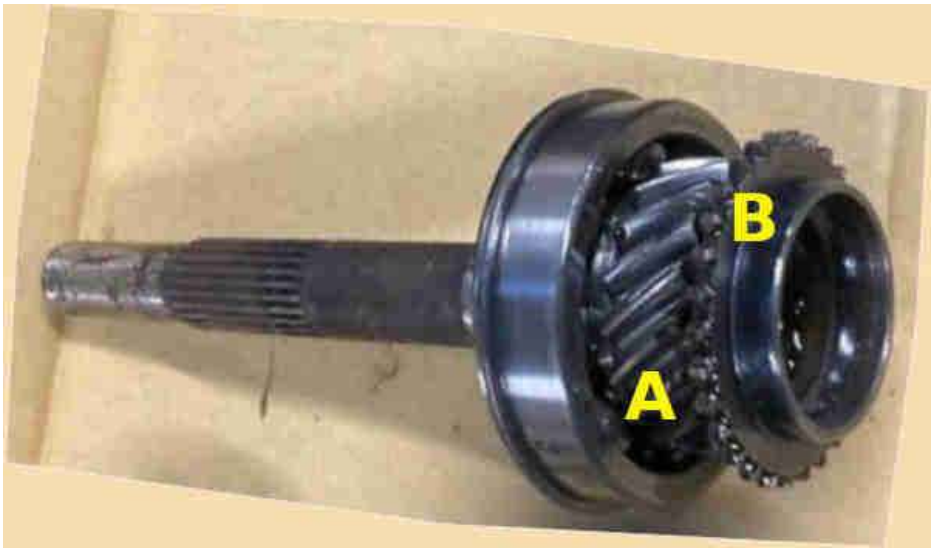
The additional purple idler gear between the red laygear and the blue reverse output gear reverses the direction of rotation of the output shaft when in reverse.

An oddity with this drawing is that despite each successive forward gear being larger on the laygear and smaller on the output shaft as one would expect, the laygear reverse gear is somewhere between 3rd and 4th and would give. In practice reverse is to first as indicated by the similar sizes of the 1st and reverse gears on the MGB mainshaft further down:



In the MGB gearbox the laygear is not used for fourth, the 4th gear selector engages directly with the drive dog teeth on the 1st-motion shaft to give a 1:1 ratio. For that reason the order of gears is the other way round to the drawing above i.e. the 3rd gear wheel is on the left of the mainshaft with the 4/3 selector between it and the 1st-motion shaft gear, 2nd gear to its right, then the 2nd/1st gear selector, then 1st gear, then reverse.

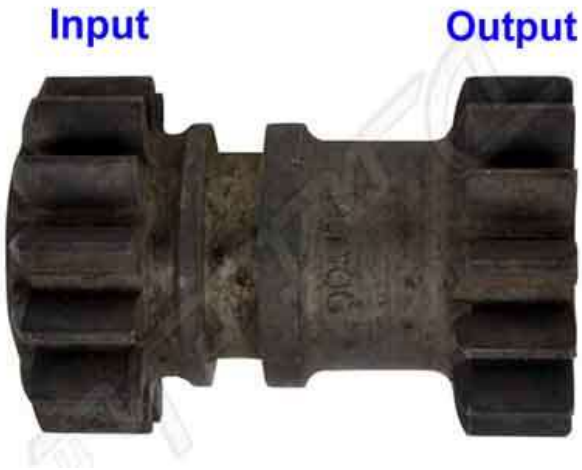
1st-motion shaft containing the gear 'A' to drive the laygear and dog teeth 'B' that the 4th gear synchroniser assembly engages with to select 4th gear:



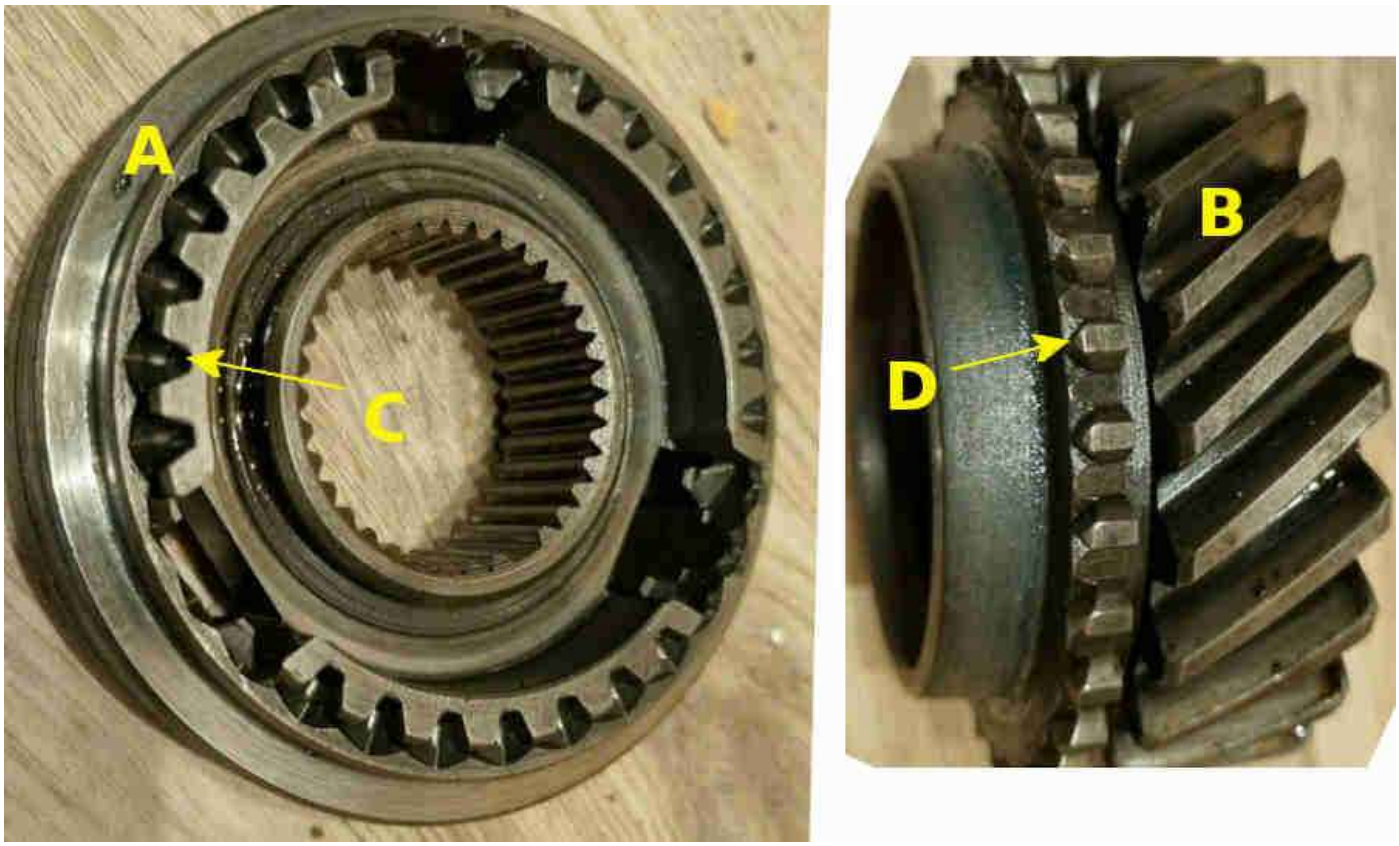
Output/mainshaft with the '4/3' synchro assembly moving left for 4th and right for 3rd, ditto the '2/1' assembly, and near-equal 1st and reverse gears. 'A' is the needle roller that engages in the end of the 1st-motion shaft to support that end of the mainshaft, 'B' is the worm gear for the speedo drive:

The laygear has 1st and reverse about the same size on the laygear - this is the 4-synch where 1st is 3.44:1 and reverse is 3.095:1 i.e. reverse has a lower ratio/higher gear than 1st. The 3-synch has 1st at 3.64:1 and reverse at 4.76:1 i.e. the other way round with reverse being a higher ratio/lower gear than 1st. This fits in with old-school advice when a very steep hill defeats 1st, which is to try reverse:

The reverse idler gear having similar input and output gears:



Gear selection: The selector forks move the synchroniser assembly 'A' (keyed to the mainshaft with splines) towards the gear 'B' (being driven by the laygear and spinning freely on the mainshaft). Cut-outs 'C' engage with teeth 'D' to lock the gear to the mainshaft:

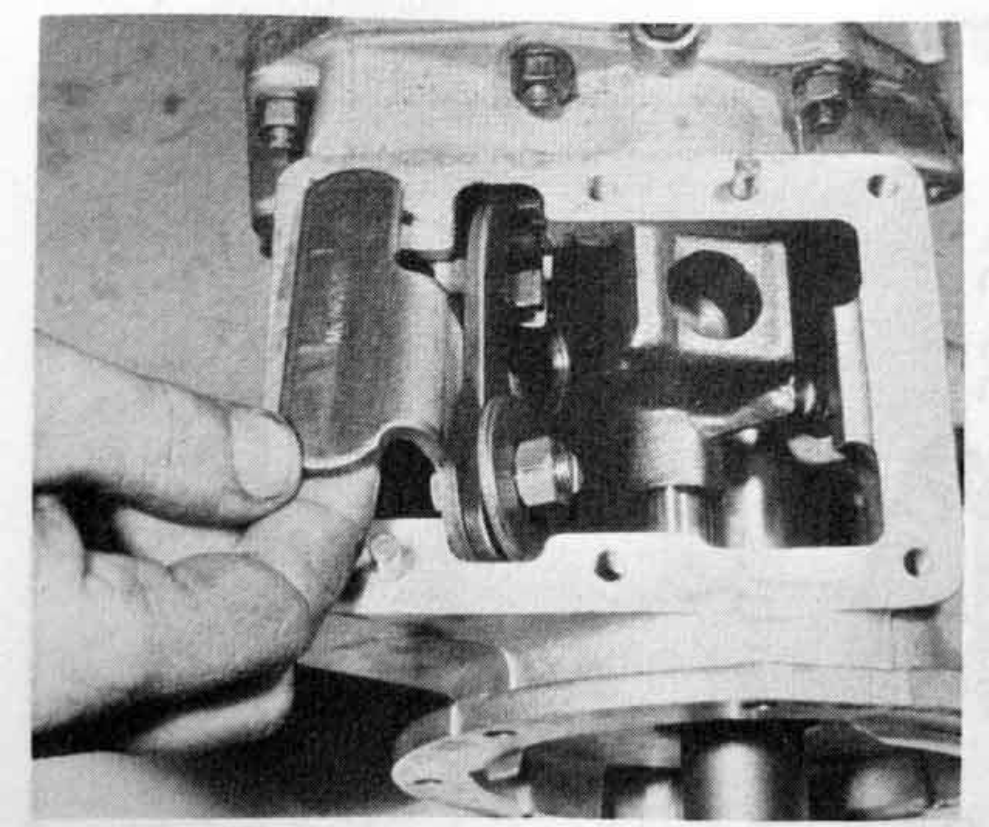


In context: The large gear on the laygear is engaged with the gear on the 1st-motion shaft. The reverse idler gear shown in its engaged position, with its driven gear meshed with the laygear and its driving gear meshed with the mainshaft. When disengaged the reverse idler moves to the right with the driven gear in the space between the laygear reverse and 1st gears and the driving gear in the cut-out in the main bearing cover on the right:


1st-motion shaft
2nd
Reverse
3rd
1st
4/3
2/1

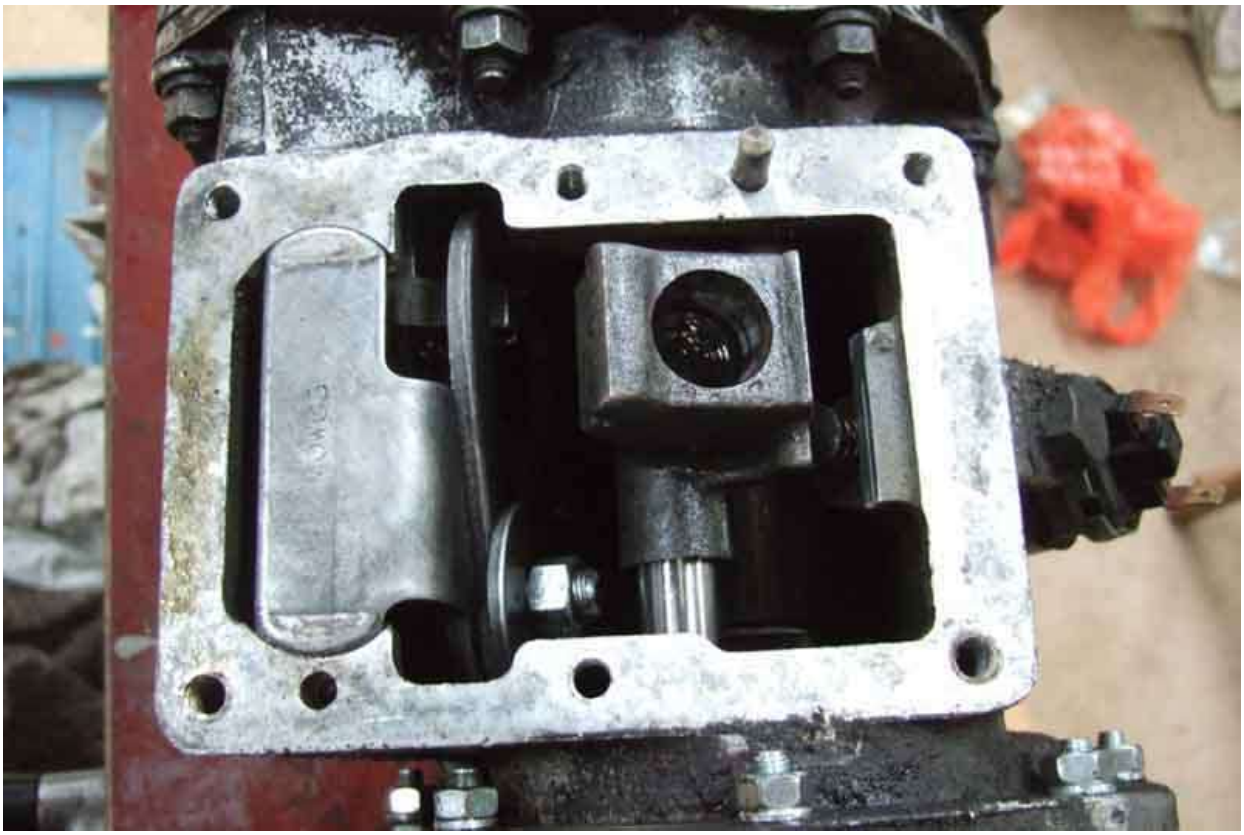
Interlock Arm Assembly

The 3-sync assembly being removed (Haynes) ...



4.17c Remove the interlock arm assembly

... and the 4-synch in-situ



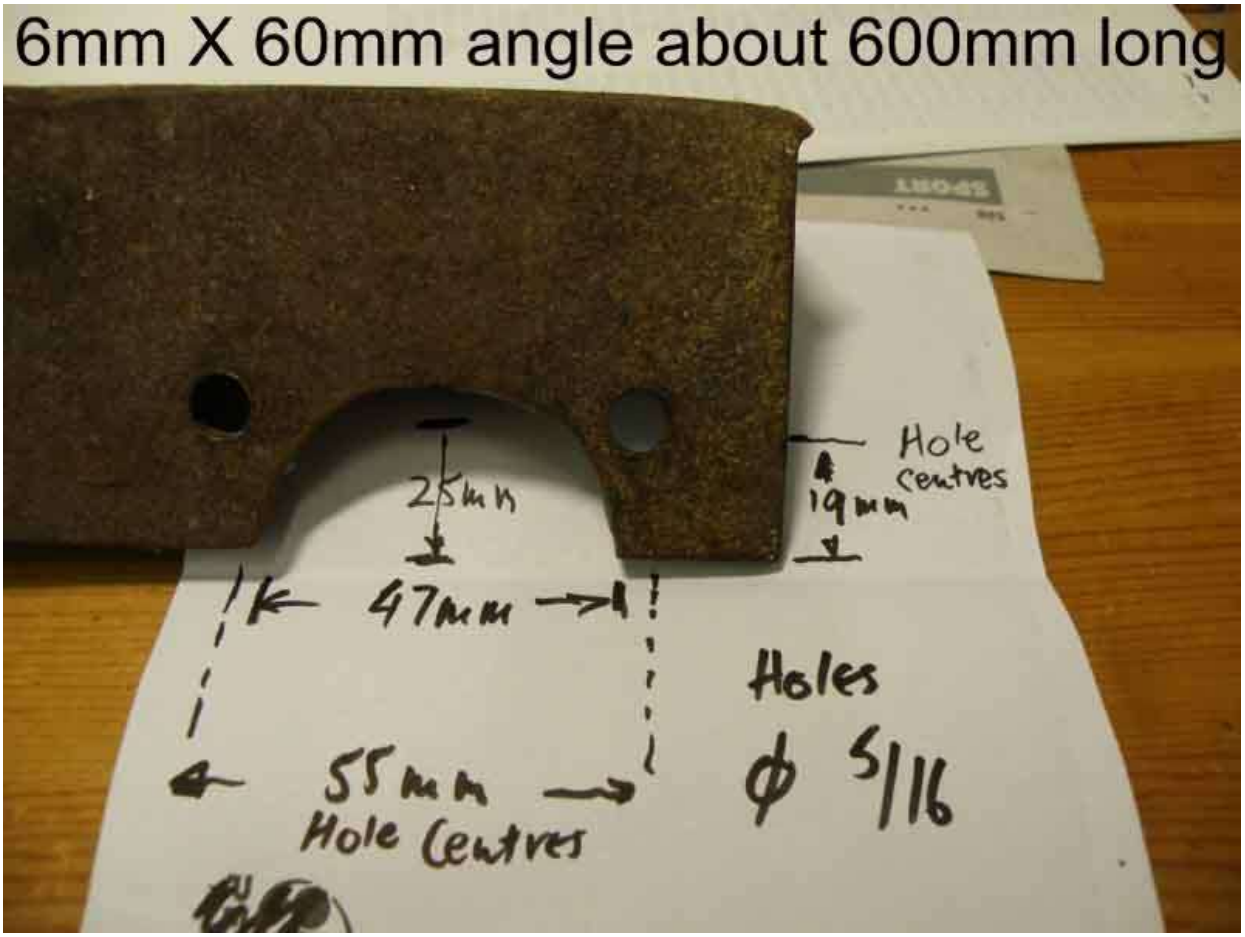
Gearbox Dismantle by Michael Beswick with additions

Having acquired a 4 speed non o/d gearbox, I was able to dismantle it. It was purely for interest and to "see how it works". It turned out to be in excellent condition, so I did not remove the various components from the shafts.. The key difference between this and an o/d box is the mainshaft, plus a few bits and pieces. O/D mainshafts are NLA (as are some parts) so it may prove more economical to source a recon box.

The workshop manual and Haynes are fairly good, but the following may help also. The "books" also give information as to clearances and checking for wear.

You will need to remove the "big nut" at the end on the mainshaft. It is probably worth doing this right at the start.

You need a piece of 6mm angle iron, about 2 foot long, with a suitable sized "bite" out of one end and two holes. The bite is large enough to fit the 1 5/16" AF socket and the holes line up with 2 adjacent bolts on the flange. I was lucky in that when bolted up, the angle iron rested against the leg of the bench, so I tied it to the leg and used a 2 ft breaker bar to undo the nut. It might be easier to leave the gearbox on the floor to allow it's own weight to help with undoing the nut.



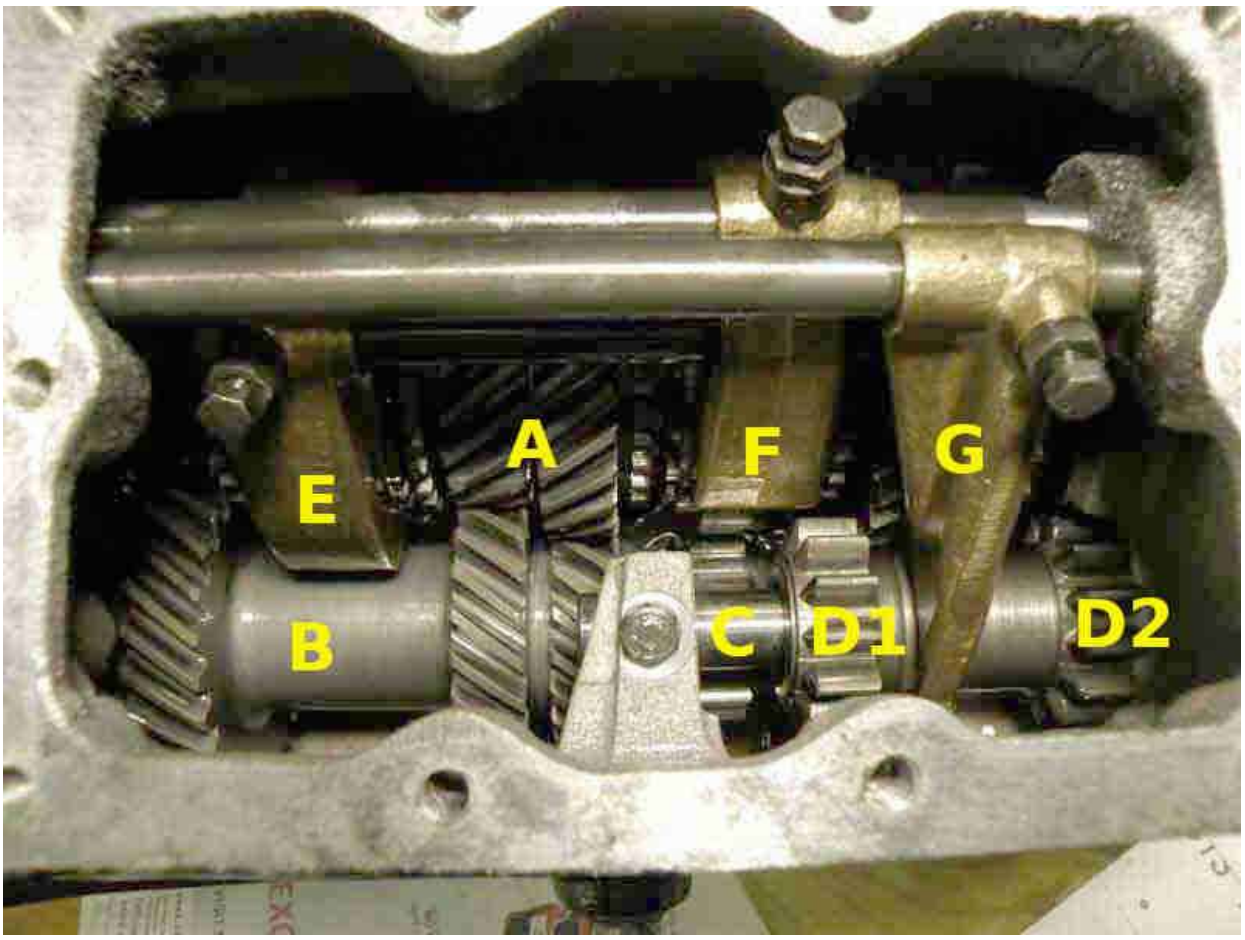
(See also this 'universal' tool made from B&Q flat steel strip).

Gearbox input shaft - release bearing inadvertently rotated through 180 degrees.

Front plate removed.

Check for shims in front plate.

What lies inside: 'A' 3rd (left) and 2nd (right) gears on mainshaft; 'B' Laygear; 'C' reverse idler gear shaft; 'D1' driven gear on reverse idler; 'D2' driving gear on reverse idler; 'E' 4/3 gear selector fork; 'F' 2/1 gear selector fork; 'G' reverse gear selector fork:

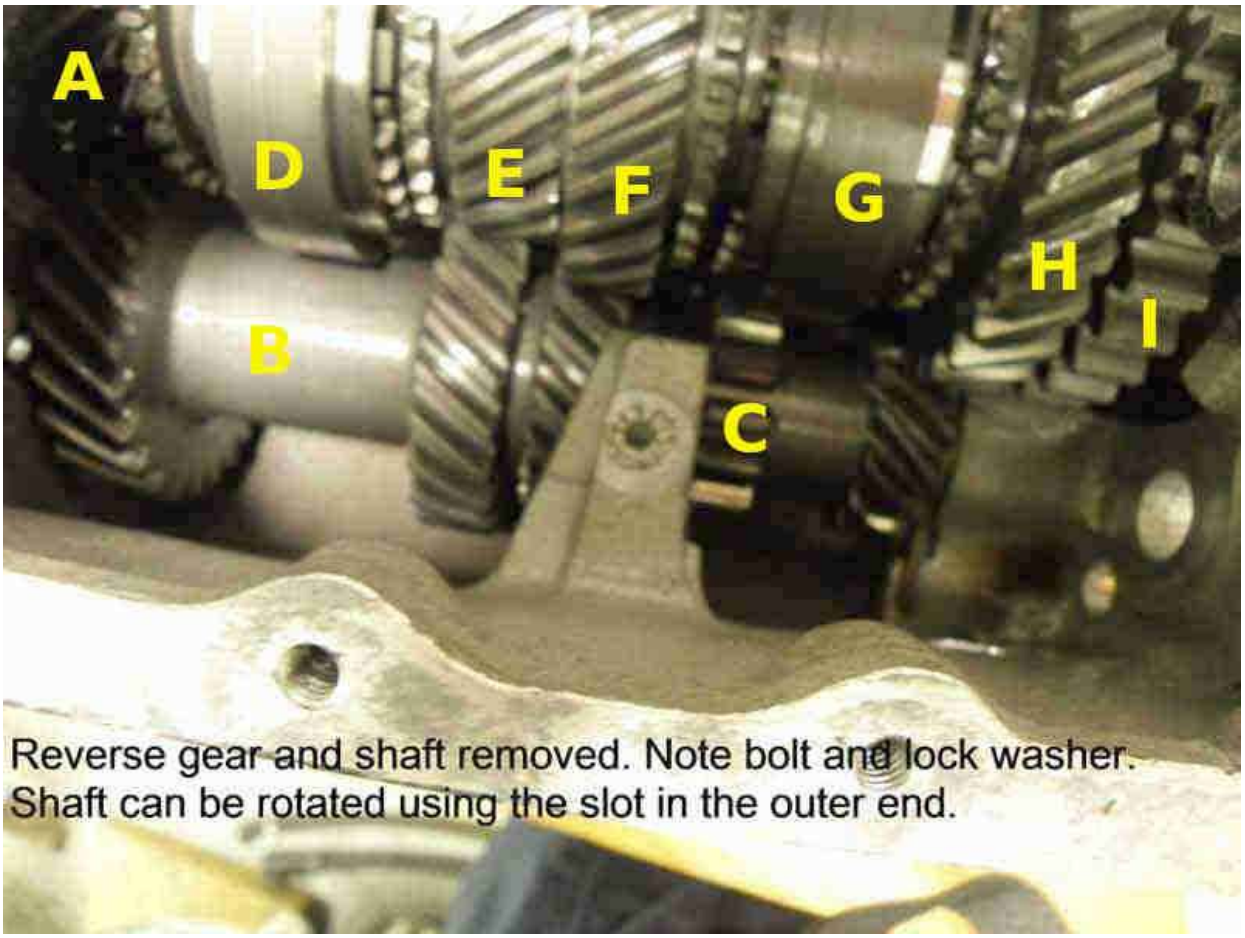


I found removing the interlock plate impossible until I moved the gear selector lever out of the way by selecting third (I think) gear.

It's a fiddle and perseverance is needed! I used a socket on the end of an extension as a makeshift gear stick located in the hole. The plastic grommet had remained in place on the remote control shaft.

You now have the gearbox in a more manageable state-without the remote cover and the tail-just the mainshaft sticking out. Remove the selector rods and forks as described in Haynes. Check the clearances for the laygears.

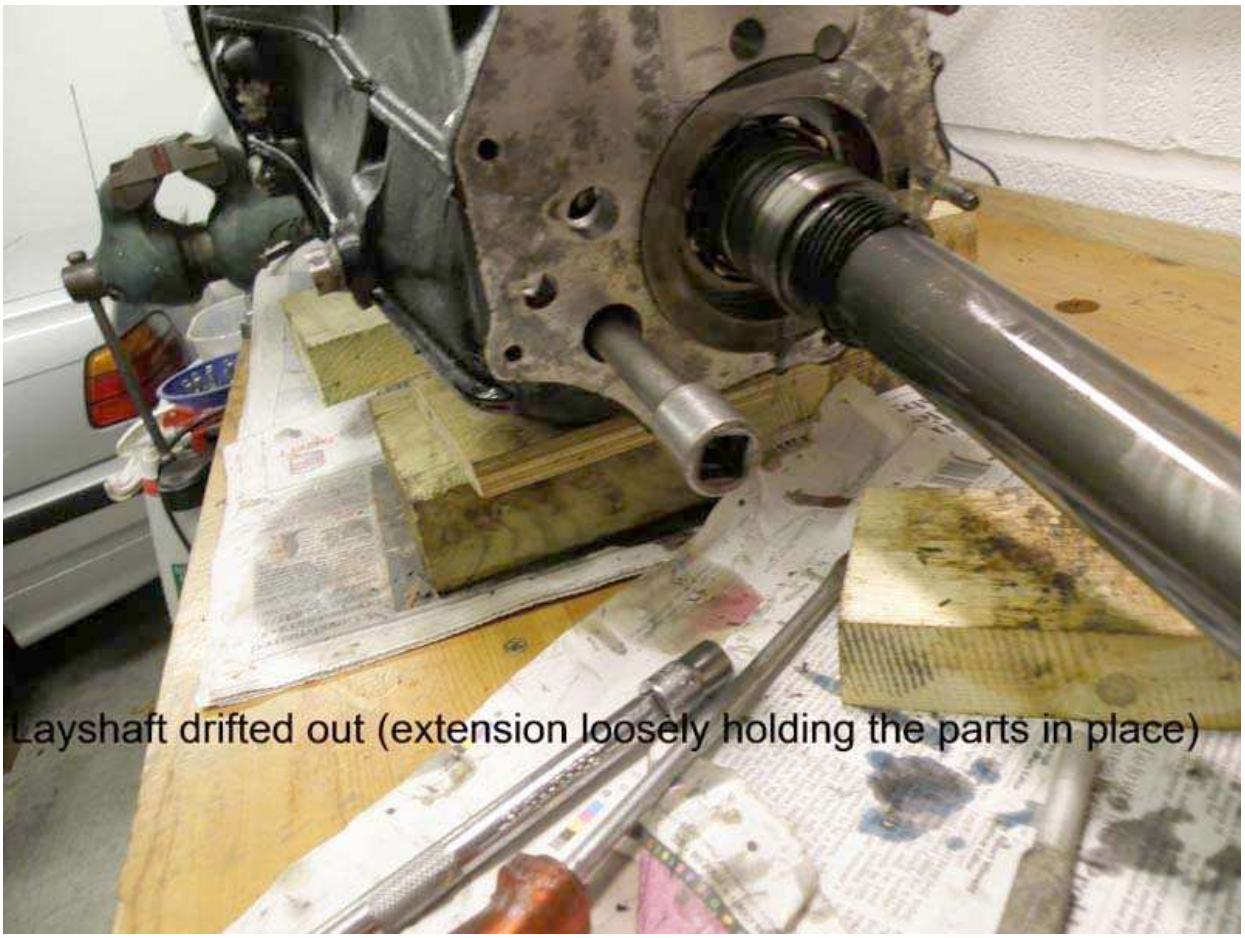
'A' mainshaft gear driving the laygear and dog-clutch for 4th gear; 'B' laygear; 'C' laygear teeth to drive the reverse idler gear (reverse gear and shaft removed); 'D' 4/3 synchroniser and selector; 'E' 3rd gear on mainshaft; 'F' 2nd gear on mainshaft; 'G' 2/1 synchroniser and selector; 'H' 1st gear on mainshaft; 'I' reverse gear on mainshaft:



Reverse gear and shaft removed. Note bolt and lock washer. Shaft can be rotated using the slot in the outer end.

Reverse gear and shaft

Next to drift the layshaft out. You need a long drift and a piece of coat-hanger wire. As you drift out the shaft push the wire (not shown) down the centre to keep the thrust washers roughly in place. Allow/assist the laygears to move to the bottom of the casing.



I managed to remove the mainshaft whilst the box was horizontal-it slid out easily- note the cut-out in the bearing housing. It might be necessary to put the box bellhousing on the floor (on blocks) and tap the rear of the casing to free the mainshaft. In this case ensure the laygears are out of the way, as being vertical, they can move across and jam the mainshaft. Inspect the mainshaft clearances.

Output/mainshaft with the '4/3' synchro assembly moving left for 4th and right for 3rd, ditto the '2/1' assembly, and near-equal 1st and reverse gears. 'A' is the needle roller that engages in the end of the 1st-motion shaft to support that end of the mainshaft, 'B' is the worm gear for the speedo drive:

Take care not to damage the plastic speedo gear.

More shims on the mainshaft.

To remove the input shaft you need to use a (softish) drift on the outer bearing face from inside the box. It takes time and patience as the angle is not easy!

It's now apart!

To re-assemble.....I put the box on blocks on the floor to drift the input shaft assembly back in. Again a softish drift is called for but as it refused to go in, I finally resorted to a 4 ft long steel bar and the wheel spinner hammer, but keep it on the outer bearing casing. Just tap round and round till it goes in! Check the needle roller bearing is either on the mainshaft or the inner end of the input shaft-doubtful! Rest the bell-housing end on blocks on the floor and ease the mainshaft in (note cut-out in bearing housing). It will need jiggling as 2 sets of splines must engage. An assistant is useful in ensuring the laygears are kept out of the way. Once the mainshaft is in, move the laygear assembly till in "engages", find a piece of 20mm electrical conduit or similar, and insert this over the coat-hanger wire to reposition the laygears and thrust washers more centrally. Replace on the bench. Clean the layshaft and check for any burrs or damage. Attach a bungee cord or rubber bands to the end of the electrical conduit at the tail, sufficient for it to be taut enough to keep the end of the conduit against the end of the shaft as it is drifted in. Alternatively an assistant can keep pressure on the tube. Drift the layshaft in from the bell-housing end taking care that the orientation of the cut-out matches that of the front cover (you can use mole grips to rotate it once it is inserted).

Squirt some oil on to the cogs and up the oilway on the ends of the layshaft, and twiddle the input shaft.

Slide the selector rods in through the forks. Note that the rods have holes in which the bolts bolt into. A delicate touch whilst finger tightening these bolts and moving the rod very slightly will ensure the bolts are in the right place. I got it wrong and caused the "fingers" (that protrude out of the tail) to jam.

Once I rotated the shaft a tad the bolt in the fork engaged properly and the "fingers" slid past each other. Now slide the tail on having first replaced the gasket, and bolt up. Engage 3rd (I think) gear to allow the interlock to be inserted. Feed it in rounded end (not the finger end)first as far as possible in a diagonal direction. Then rotate it and move it slightly left to allow the flat plate to sit in the recesses. Again a fiddle-at first it seems impossible and when it finally slips in, you wonder how you did it! Bolt the remote casing back on, squirt some oil on the cogs, bearings, and replace the side, and front covers. I was storing mine so just used enough to keep moisture at bay. If replacing in the car I would add more to allow for initial lubrication.

Gearbox and Rear Axle Oils

Castrol V8 gearbox oil showing 'MANUAL' and a picture of a gear lever on the front ...

... and 'MANUAL' and 'GL4' on the back.

Castrol rear axle (and steering rack) oil for all MGBs showing 'DIFFERENTIAL' and a picture of an axle on the front ...

... and 'DIFFERENTIAL' and 'GL5' on the back.

Replacing gear box mounts-by removing the Cross-member

by Michael Beswick

Removing the gear box cross-member is reckoned to be one of the most tiresome jobs on a B! But there again there are lots of most tiresome jobs!

At first glance it may seem that the 4 bolts holding the mounts to the gearbox could be removed. Subsequent removal of the 4 cross member bolts would allow the cross-member to be lowered (supporting the gear box) complete with the "yoke" fittings. However at least 2 bolts through the mounts into the gearbox are inaccessible and all may suffer from the rubber mounting pad expanding and covering the bolt heads.

According to John Twist's video there are 16 different ways for the assembly to be fitted! (*November 2014:* Now doubled to 32!) Whether due to incorrect fitting or not, most people have difficulty removing the cross-member! This is my experience /suggestions! Take particular care to mark which way round the bits go.....

Mine is a 4 synchro box with overdrive on a 69/70 chassis.

To start, it is worth printing off the Moss parts diagram as it illustrates the all bits and some of the angles of fitment. The Leyland 4-cylinder and Haynes Manuals and the Parts Catalogues drawings are variously incomplete and/or misleading in respect of what parts are present, the order and the orientation. However the Leyland V8 Supplement also has a good drawing showing the assembly, additionally with the detail of the bush location in the yokes.

First, try to loosen the 4 main (9/16 AF) bolts that hold the cross-member to the chassis, and the 2 central ones (1/2" AF) that hold the lower yoke to the cross-member. If your gearbox is anything like mine, it leaks, so all the adjacent nuts and bolts are unlikely to be rusty. Cross-member mounting bolts are another story and are mounted to captive nuts (or maybe a threaded plate) in the chassis rail. If it is a plate, this may move, so avoid raising or lowering the car if possible –or loosely fit a bolt in each side.

Assuming the bolts move, mark the position of the cross-member on the chassis rails and nip them up again.

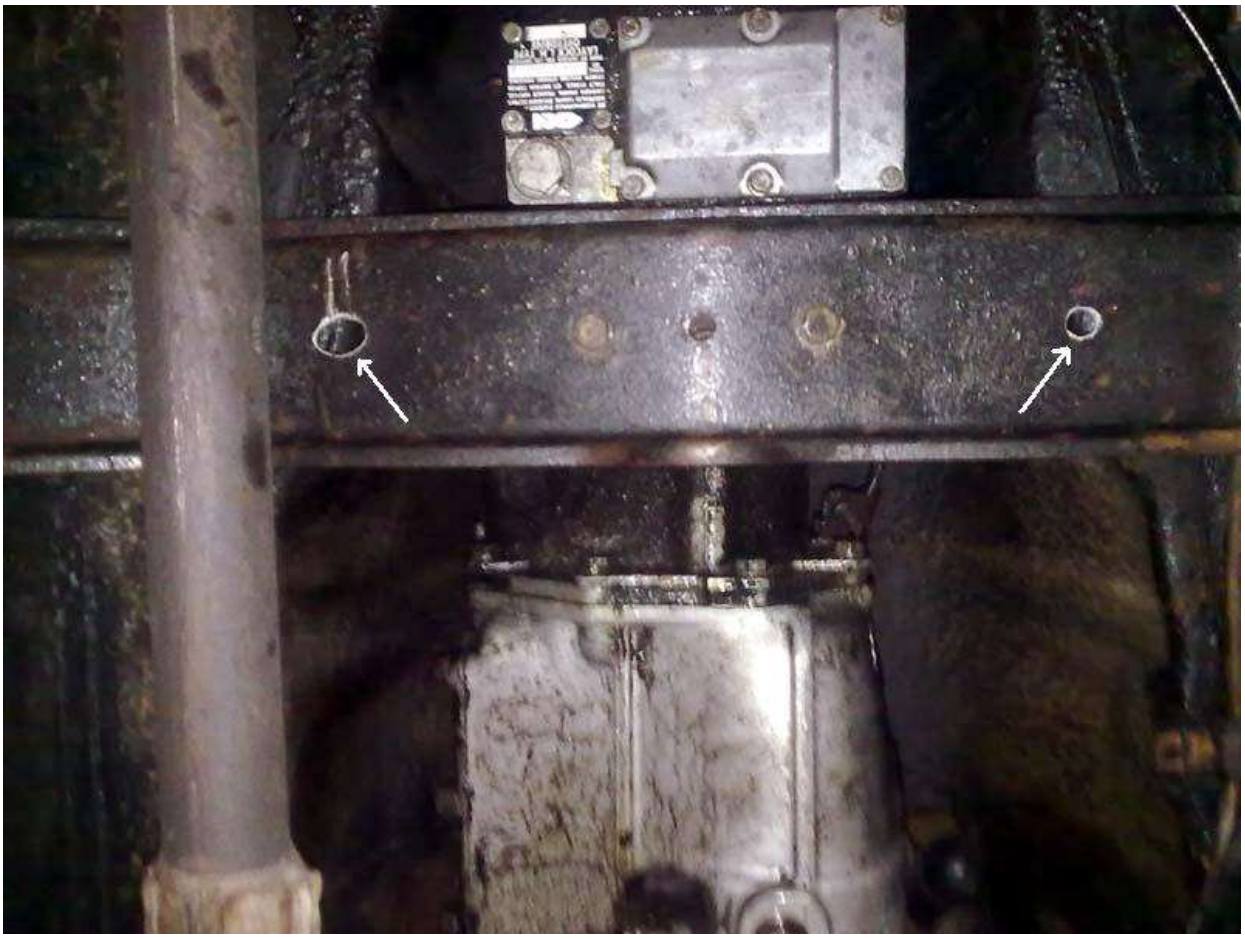
Looking at the parts diagram, note the angled brackets that take the mounts can have 2 holes in them. As the cross-member comes away leaving the mounts (and yokes) attached to the gear box, note which hole the mount was fitted to. Witness marks should show this. For which years had which parts see here. It is worth bearing in mind that after 40 years (more or less) any car could have any combination of gearbox, cross-member and mounting parts, and there could be more than one combination that lines up depending on which way each part is orientated. For example John Twist states that standard gearboxes use the front hole and overdrive the rear, but this assembly was found with an overdrive gearbox using the front holes. The bottom line is that the datum must be the engine attached to its mounts, then the cross-member parts orientated to put minimum stress on the gearbox rubbers when bolted up.

Measure and mark a point 100mm from the centre of the bolts that hold the yoke to the cross-member outwards. Drill respective pilot holes. The exhaust starts to get in the way on the left-hand side.

On the right-hand side enlarge the hole to 10mm, and then elongate it to about 18mm. The 18mm dimension is “across” the car, the 10mm front to back of the car.

Repeat for the left-hand side but enlarge to about 22mm “across” and 18mm front to back. This is not critical-the cross-

member is strong, so you could just make bigger round holes. I used a Dremel to enlarge them.



It should be possible using a 250mm ¼” extension and a ½” socket to reach the nut on the rubber mount on the right-hand side. Fit the socket after you have fed the extension bar through the hole. Note that rubber bumper cars and all V8s should have an earthing strap round the right-hand mount.

If the nut won't shift or you only have a 3/8” drive set-make the hole bigger. For the left-hand side, the socket fits on to a

75mm extension, then a universal joint, then a 150mm extension. This allows you to work inboard of the exhaust pipe. The whole lot does move about a bit, as the U/J is turning in the hole that you drilled.

Alternatively remove the exhaust, so it becomes a repeat of the right-hand side.

And all this for two ½” nuts.....(Note washer and spring washer each side) Have a break-you've earned it!

Support the gear box back end. If O/D style, blocks of wood allow you to rest the tail of the O/D on the fixed cross-member. I lifted the tail slightly to compensate for the collapsed mounts. Remember that the whole engine is now tilting slightly, so for c/b cars the clearance between front crankshaft pulley and steering rack could (but shouldn't) become an issue. (Mine is 10mm clearance)

Remove the 2 bolts that hold the yokes to the cross-member. Remove the 4 bolts holding the cross-member to the chassis. It should now move, though probably will not drop away, as the studs on the rubber mounts are still through the angled shoulders of the cross-member. Look at the parts diagram: as this hole is not elongated the cross-member cannot be freed. You will need to lever one side or the other to free the bolt one side. There should be some “play” as the rubber mounts are almost

certainly squishy! Now it will come away. Note which way round the lower yoke is mounted (it rotates fairly easily) to aid re-assembly. The captive nuts in this lower yoke are mounted off centre...

You should now have the cross-member free and the rubber mounts, upper and lower yokes bolted to the gearbox. The rubber mounts almost certainly have “spread” preventing easy access to the bolt heads. Cut away the excess rubber! Remove the two bolts on either side and remove the upper and lower yokes (bolted together) and the two rubber mounts.

Note which way round everything goes-again!

To dismantle the yokes, use a mole grip on the top “disc” to allow removal of the nut and washer at the bottom. With so much apart it is pointless not to renew the rubber “bobbins” that are a feature of the two yokes. These are a pig! I reduced the diameter of the smaller of the two “discs” from 32mm to 28 mm using a belt sander whilst rotating the bobbin. The technique is to heat the bobbins, and use Vaseline on both it, and the metal yoke. Put the yoke in a vice, and put a loop of nylon cord around the waist of the bobbin (check which way up they go –see parts diagram) with the ends passed through the hole in the

metal yoke. Pull downwards so the lower edge of the smaller diameter “disc” of the bobbin goes through the hole and use a blunt pusher (6mm punch) to push the rest in – working round the disc. Note that it makes sense for the narrower diameter of each bush to be pushed through from the side that **doesn't** have the lip round the edge of the hole.

I managed to snap two across the middle-perhaps they were faulty.....

Clean up the captive nuts in the bottom yoke and the threads on the bolts (or replace) use Coppaslip! John Twist mentions squeezing (or stretching) the lower yoke in a vice so the bolt holes in the cross-member line up with the welded nuts on the yoke. It's a good time to check and adjust this alignment now.

Having re-assembled the 2 yokes with new bobbins I was unimpressed with the amount of “slop” in the whole arrangement (see here for comments on the various engine/gearbox restraint methods over the years), especially when viewed against the effort of getting the bobbins in. However it allows more “wiggle room” during re-assembly.

Now back to the cross member. The new rubber mounts are likely to have far less give in them, so it will be more difficult to lever the cross-member on than removing it-and it has to be in the right place! Elongate the fitting holes to about 15-18mm-upwards. This should allow the cross-member to be lifted and located easily(!) on the protruding studs of first one and then the other mount. Clean the cross-member mounting bolts –or replace- and put Coppaslip on these. I also slightly enlarged the holes in the cross-member through which the bolts go to hold the lower yoke, to aid reassembly. Note John Twists's video (and also this very wordy alternative) shows one of these holes elongated so neatly that it seems 'factory', however this cross-member didn't have that.

Note the bolts holding the yokes and rubbers to the gearbox are UNC. Clean the threads. The corresponding drillings in the box casing are probably clean, but worth running a new bolt (or a tap) to check. Again I Coppaslipped the lot!

Generally the fitting holes in the shoulder on the cross-member are front for non-o/d and back for o/d. Mine were front for o/d....The upper yoke always has the flat face pointing forward. The cross-member always has the cut out (for the earliest gear box steady bar) pointing forwards. Check the alignment of the lower yoke captive nuts and the holes in the cross-member.

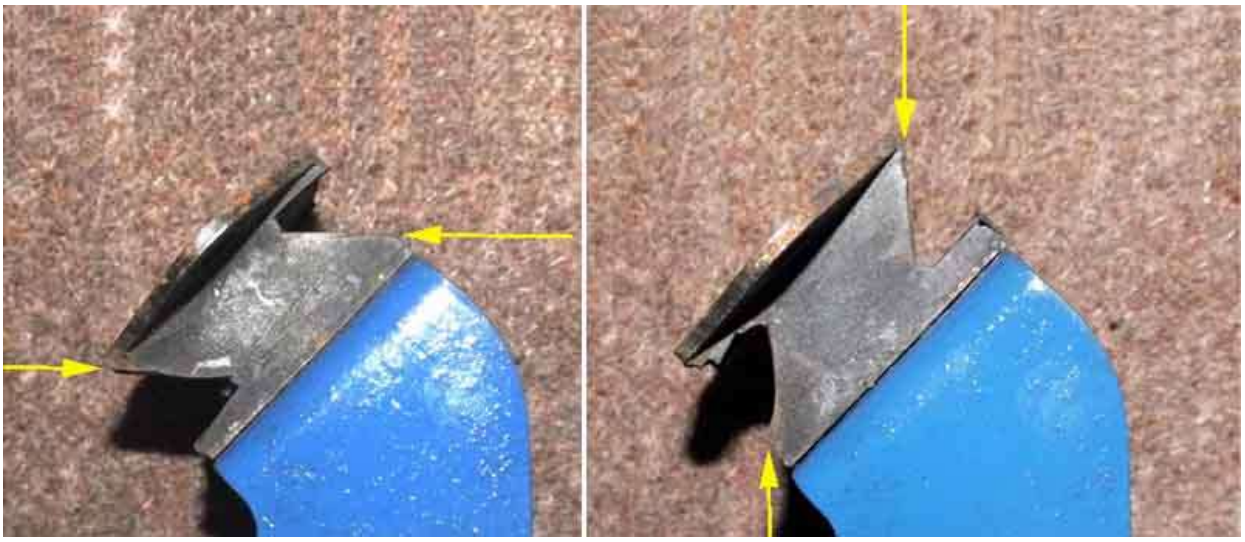
Using longer bolts with a filed point to aid location would be easier than refitting the short original ones, and allows for some wiggle room on re-assembly. Once the assembly was tightened (but before bolting up the cross member) I removed these long bolts one at a time and replaced with short ones. You could leave the long ones in, but the protruding thread will corrode make disassembly more difficult next time!

Re-assembly: Now is a good time for examining faults with either the reversing light switch or the overdrive switch, and for treating the inside of the chassis box sections with Waxoyl or Dinitrol.

Re-assemble the two yokes with the pin through the two bobbins. Mount this and the rubber mounts on to the gear box. The top yoke will be firm, the lower one able to move.

November 2014: If there wasn't already enough options for assembly some suppliers now have the rectangular rubber mounts with cut-outs, meaning that whereas before they could be fitted either way round, now there is a difference in the shape of the rubber and the forces acting upon it, making them 'handed'. In the orientation as shown on the left the unsupported faces are horizontal, but as fitted on the right they are vertical. Logic dictates that vertical is correct, as the main weight of the gearbox acts vertically so the rubber will be in compression. If fitted horizontally the rubber would experience a significant shear load.

It's true that when in use the forces could be in any direction, including fore and aft, but as with very few exceptions cars spend more time sitting than running, it seems that fitted as shown on the right is preferable. (*Images from Graham Barker*)



Wiggle the cross-member roughly into position resting up against the yoke assembly. Use the longer bolts mentioned above to lift the cross-member and take its weight. Starting on the left-hand side, waggle the cross-member on to the stud of the rubber mount. With a little squeezing lift the other side on to its corresponding stud. Tighten the bolts that hold the cross-member to the yokes just enough to prevent the cross-member dropping away-no more.

Jack up the gearbox enough to remove the packing supporting it on the fixed cross member. I left an 18mm thick block, which still allowed access for the next operation.

The angle of the studs (protruding through the supports) is downwards, making fitting washers and nuts difficult. Start with the more difficult left-hand side. Coppaslip the stud to assist with stiction. I opted for a single spring washer, and used one of those spring tools with 4 claws (operated by your thumb on a plunger) to hold the washer. There is a convenient slot through which you can offer the washer and gently press it over the stud with a finger on your other hand! Put the nut in the socket, and place the socket above the elongated hole in the cross member. Fit the short extension bar through the cross-member on to the socket and allow to hang (vertically). Fit the U/J and the longer extension bar. Use two fingers to locate the short extension/socket/nut on to the stud, whilst maintaining a little upward pressure on the long extension as you twist it. Repeat for the right-hand side where the long extension is all that is needed. Remember to refit the earthing strap on rubber bumper cars and V8s!

Snug the long bolts through the cross-member into the lower yoke. Remove one and replace with one of the correct length. Tighten this and repeat for the other long bolt. This isn't because the standard bolts don't fit until the bushes have been compressed, but because it is a juggling act holding the cross-member up, keeping the lower yoke at the right angle, and lining up the cross-member hole with the yoke captive nut so you can start the bolt, the longer bolts make this easier.

Jack up the gear box (not the cross-member as you may need to waggle it to fit) until the cross-member is correctly located, and refit the 4 bolts.

Speedo Cables

Speedo Fitting Replacement Routing Right-angle Drives EGR Service Indicator

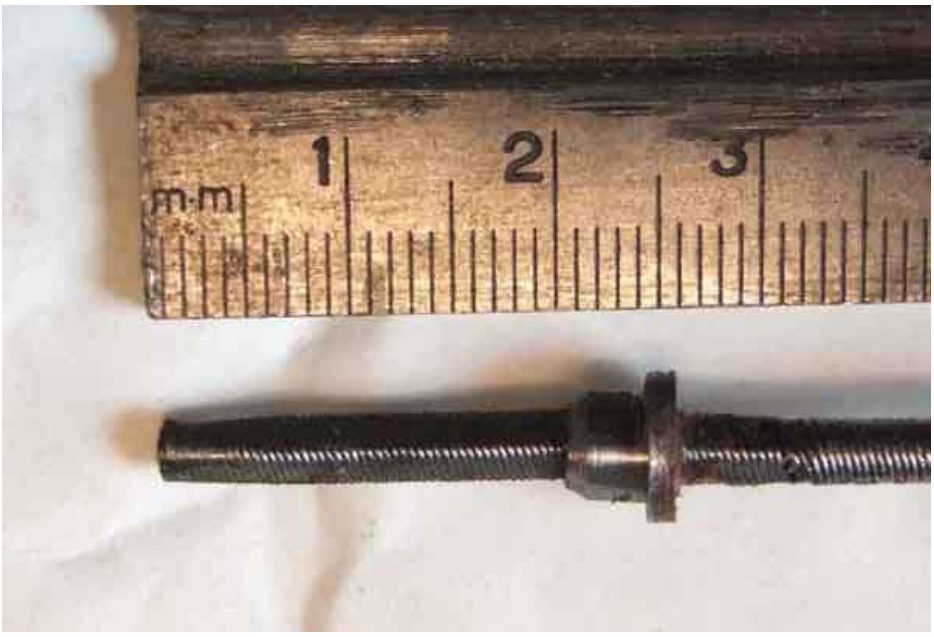
Gearbox cable drive

Speedo Fitting: *May 2021*

The inner at the speedo end has a ferrule pressed onto the inner that prevents the inner dropping out of the other end of the cable, should that become detached from the gearbox. The amount of inner that protrudes from the ferrule - and hence the end of the outer - varies and if incorrect may have a bearing on speedo operation.

Prior to the 77 model year the inner projects about 10mm and the ferrule sits against the end of the outer flange:

Whereas for 77 although the ferrule is 20mm along the inner it also sits inside the outer by about 10mm, so projects by about the same 10mm:



If the inner goes to the end of the square hole in the pinion gear at the gearbox end then it may project further from the outer at the speedo end.

Using the longer 77 and later inner as a 'depth gauge' in a pre-77 speedo you can see that there is about 13mm of depth available inside the speedo fitting. If the inner projects further than that - for example using a 77 and latter inner on an earlier speedo, the inner would be pushing the input shaft into the speedo with some force as the knurled nut on the outer

was tightened, which would almost certainly affect speedo operation. That would be an extreme case, but if slackening the knurled nut cures the problem it would be worth checking the amount of engagement:

Incidentally leaving the knurled nut loose is not a good idea as the outer will not be square to the speedo, the inner will enter the input shaft at an angle and may eventually break.

Another potential problem concerns the ferrule in the end of the inner. In the pre-77 cable it projects past the flange on the outer by less than 1mm, and that has to be accommodated inside the speedo fitting or the ferrule will be pushing against the input shaft when the knurled nut is tightened, even though there may be enough clearance for the inner itself. On the corresponding speedo the input shaft is recessed by about 2.5mm, so more than enough:

On the 77 and later cable the ferrule sits down inside the outer so that is not an issue. On a pre-77 speedo the square hole in the shaft is recessed by about 3-5mm, meaning there is about 5-7mm of inner engaged with the square hole in the speedo shaft. That should be more than enough as long as the nut at the speedo end of the cable is screwed fully on and the outer is held firmly.

Replacement: *March 2020*

Vee breaks her cable and as well as the turmoil created by Corona virus and companies trying to keep going with people working from home, the part numbers and lengths are very variable between suppliers, which leads to some head-scratching prior to ordering. I do wonder if the thump I can hear and feel engaging OD with throttle and this speedo cable failure are connected. I'd already checked to see if the gearbox was securely held and it was, but I replaced the mount rubbers this time and I'm wondering if they aren't thick enough, and the OD is hitting the fixed crossmember as well as crushing the speedo cable. But although Vee's cable is significantly kinked it is **towards** the body, not away, so hopefully just one of those things. Vee's on the left, Bee's on the right and a smoother turn:

I get the speedo out of the dash in about five minutes (only one clamp but I've never been aware of it not fitting the dash correctly) and can pull it forwards far enough to unscrew the cable from the speedo, and remove the illumination bulb. The trip odometer reset is a long cable that fits unto a bracket behind the dash, so that has to be undone as well. I can twiddle the inner while fully inserted so it's definitely a problem 'down there' and not with the speedo. I can pull 68" or 1730mm of inner out, minus the square drive that should be at the end, so definitely the cable and it must have broken pretty near the gearbox. As the gearbox has been out and back in December and January, it's possible those disturbances have caused the problem. The Parts Catalogue quotes GSD 116 for the V8 at 56" or 1422mm, i.e. way shorter than what I have pulled out! What I have is probably a 72" cable for LHD, for some reason. Googling GSD116 does not come up with any hits, even though it is listed for several years and markets in the Parts Catalogue.

Browsing various suppliers shows GSD117 at 60"/1542mm seems to be the one, and Leacy (despite showing it as out of stock) say they do have it and several pounds cheaper than anyone else. However their web site says that cable is for Mk1 OD cars, which agrees with the Parts Catalogue, which says that cable was for various other years and markets as well. Leacy say that GSD115 (which isn't shown in the Parts Catalogue) is the right one for the V8, but some sources show that as 57". I don't want to go any shorter than I have to as that may mean the speedo has to be back in the dash to reattach the cable from behind, or fit that end first then the gearbox end. However Leacy assure me that is 60", as do a couple of other supplier web sites, so I go for that.

I've seen a complaint that the end of replacement cables is too big to fit through the hole in the bulkhead and they had chosen to cut the fitting down a bit in preference to increasing the size of the hole slightly. The gearbox end **is** larger than the speedo end so the cable has to be pushed up from below into the cabin, not down from inside the cabin. I wondered if that was the problem, but he never replied. On a trial removal of my cable even with the grommet removed (of course) the speedo end looks like it will only just fit through the hole - and has to be dead square to it, so with the replacement cable I'll see if the speedo end will fit **down** the hole first, as that will be easier from inside the cabin that struggling from underneath, especially if I have to enlarge the hole.

The cable arrived, it was 60", but the speedo fitting was way too big for the speedo! Good job I did a test-fit on the bench before installing it, which was probably only because it was raining and I didn't want to get the cars out to start work. So as well as different suppliers giving different part numbers and lengths for the same model years, it looks like there are two sizes of speedo fitting as well. The poly bag this came in had no labels, so could be for a completely

different car. I wondered if it is the difference between 4" and 80mm instruments, but I've found a supplier that gives the internal sizes of the speedo and gearbox ferrules. They give different listings for 62-63 OD, 67-76 OD, LHD Auto and V8 but they all have the same manufacturers part number - GSD115. There is another listing for 62-63 non-OD (GSD103) but all of them have the same ferrule sizes, which tends to rule out a difference between 4" and 80" - prior to 77 at least. For 77-on the Parts Catalogue quotes GSD315, but I can't find that listed on the same site, and no matter what vehicle I look at the same ferrule sizes are given for all of them! The vendor isn't accepting messages, so that's a dead-end. Enquire with Leacy and next day they come back and say that checking their stock things were in the wrong bins, and based on what I had been able to tell them about dimensions they were able to sort that out, and are sending me another cable.

While waiting for that I get the old cable out - I thought I was going to have problems as there is no access from above in the engine compartment, and pulling and pushing from the footwell and from underneath didn't move it very much. The cable was wrapped round the carb overflow tube, but with that lifted out of the way the cable sprung down to hang straight down from the hole in the bulkhead which was now clearly visible from underneath, so was relatively easy to get out except that the ferrule has to be square to the hole. The gearbox end was also a bit of a fiddle, despite only recently being fitted, as access is very restricted over the fixed crossmember. But the same pair of grips I used to finally tighten it got it started, and I moved it most of the rest of the way with fingers. A couple of times it jammed and I resorted to the grips again, but that turned the cable with it, and releasing the grips the ferrule just sprung back. I had to turn the ferrule with the grips, then wiggle the cable about until just that sprung back, and repeat, until I could go back to fingers. It's cable-tied to the services either side of the removable crossmember, and passing above that instead of below, making the exit from the gearbox slightly tighter than would be under the crossmember and clipped to it as it should be, so I looked out the parts necessary to fit it as originally instead. The old cable has a 92 date code, so not that long before my taking over Vee. With the cable removed and a clear view of the kink by the gearbox shows daylight between the turns of the steel spiral, so that is what caused the inner to break. The remains fall out of the gearbox fitting:

The replacement cable arrives, and one thing I had noticed with the first replacement was that the gearbox end was flattened instead of the square-section I was expecting, and is how all three speedo ends and both broken and 2nd replacement cables are. Left and centre pictures are of the flattened end of the first replacement, the right picture of the 2nd replacement. However I did try the flattened end in the speedo on the bench as a test, the speedo did operate, so probably would have been OK in a gearbox drive:

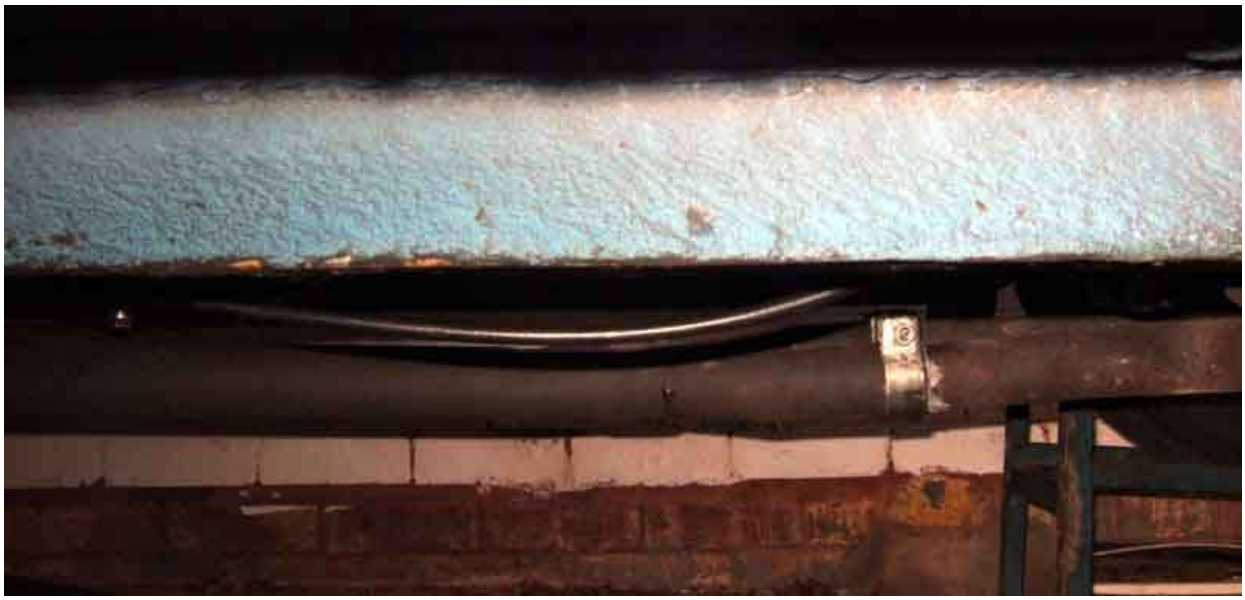
The 'nuts' can vary from cable to cable - finely or coarsely fluted, or knurled, at either or both ends. Someone on the MGOC forum posted that on his new GSD117 cable the inner was too long and when fitted to the gearbox the ferrule in the inner at the speedo end protruded and the nut wouldn't reach the speedo, so he chose to cut the excess off the gearbox end, which left it frayed, hardly ideal. His photo also showed the flange at the speedo end as turned over rather than cast, and only just at that looking like it wouldn't take much for it to come out of the nut, unlike the very definite cast stepped flanges on three I have:

I measured the speedo ferrules of the original and second replacement cables, to find the new one smaller than the original, which was something of a surprise - original on the left, new one on the right. Maybe the 'original', with its 92 date code, was over-size and the hole had been filed out for that to fit. Nevertheless I trial-fitted it from above first and it went in easily:

After someone had said it was impossible to get the ferrule up the bulkhead hole while fitting the cable, and he had to push it up with a stick afterwards, I wrapped some tape round the cable to hold the ferrule near the top, and it went through straight away:

I probably should have done the same thing at the gearbox end to stop the ferrule sliding down more than anything else, but it went on easier than the old one came off, or went on when I refitted the gearbox. The trick is to not let the cable take up a natural angle, which will not position it in the right place or at the right angle, but to hold it square and central to the end of the gearbox drive, which allows you to get the ferrule started. Care is needed here not to cross-thread and jam it. Push the cable up to the gearbox drive all the time, and you should be able to tighten the ferrule all the way - subject to the size of your hands!

Next job was to clip it to the underside of the removable cross-member, with parts I had to hand. That allowed the forward end of the cable to hang down below the chassis rail:

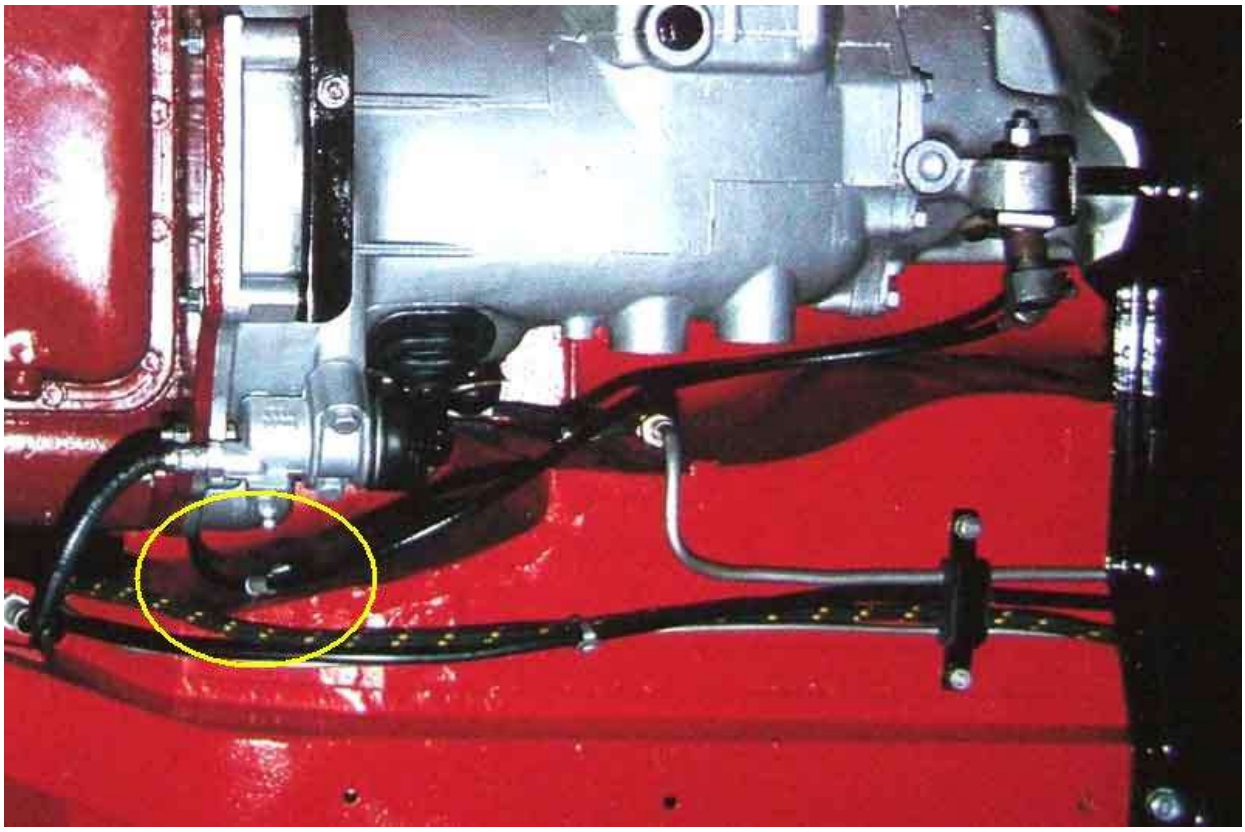


So I used a cable-tie to hold it up out of the way. The cable now makes a smoother exit from the gearbox then previously. Note this shows the gearbox earth strap in the 'correct' position as shown in the manuals - right-hand side front:

I wasn't aware there was a pukka fitting for this originally so hadn't ordered one with the cable, but it is clip PCR809 with split ferrule ACH8529. Even that isn't straightforward as the Parts Catalogue specifies PCR809 for RHD where overdrive is not fitted, and AHH7178 for RHD with overdrive, but not V8. I've not found a picture of this to compare. Later on it says LHD from May 72 and all V8s use PCR809. Clausager says North America got modified speedos and cables from that date, implying V8s had the same and later cable, but the Parts Catalogue shows the V8 cable GSD116 being used for RHD OD cars from the beginning of production. All very confusing.

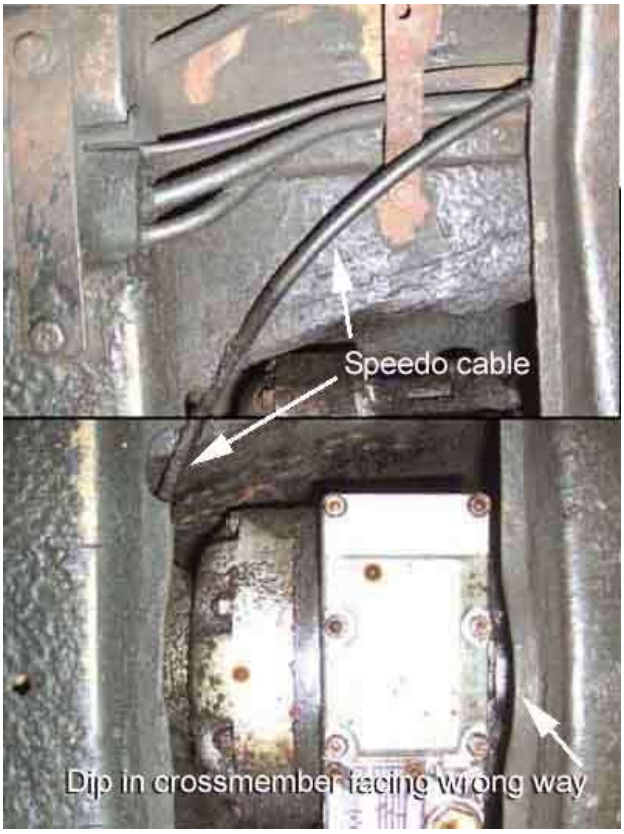
I've only seen one supplier selling these as single part, but the usual suspects have the two components:

Looks like the same support is used on the side of the tunnel as the cable comes up to enter the cabin:



I'll add the makings to my next order to combine the postage rather than getting them now, along with replacement bulkhead grommets RFN305 as the one I took out is hard and misshapen. The above supplier shows cables with the grommet already fitted, which would be preferable, but at more than double the price I paid. The one I took out had been cut to retro-fit, I have no problems doing the same. A new one may stretch over the speedo ferrule (unlikely, having obtained one I didn't even try), but I'm not taking the speedo out again just for that!

Routing:

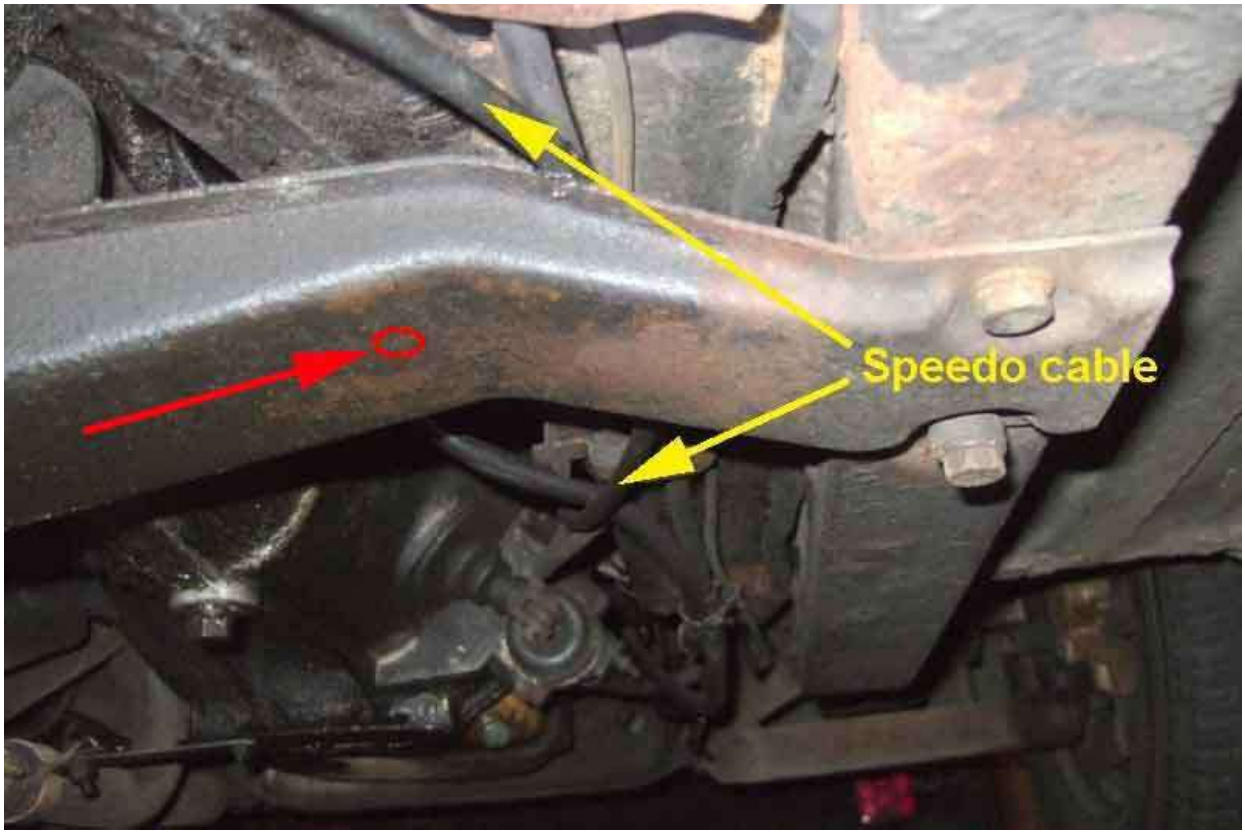


On my 73 roadster the cable (arrowed) comes off the output of the OD conveniently (not!) above the fixed crossmember then turns forwards and under the floor to meet the pipes and cables running the length of the floor, and over the removable cross-member. The notch in the fixed crossmember shows that the cable is designed to exit at right-angles to the gearbox, and then turn forwards. The 1964 3-synch non-OD car pictured in Clausager (p76) does not have this notch.

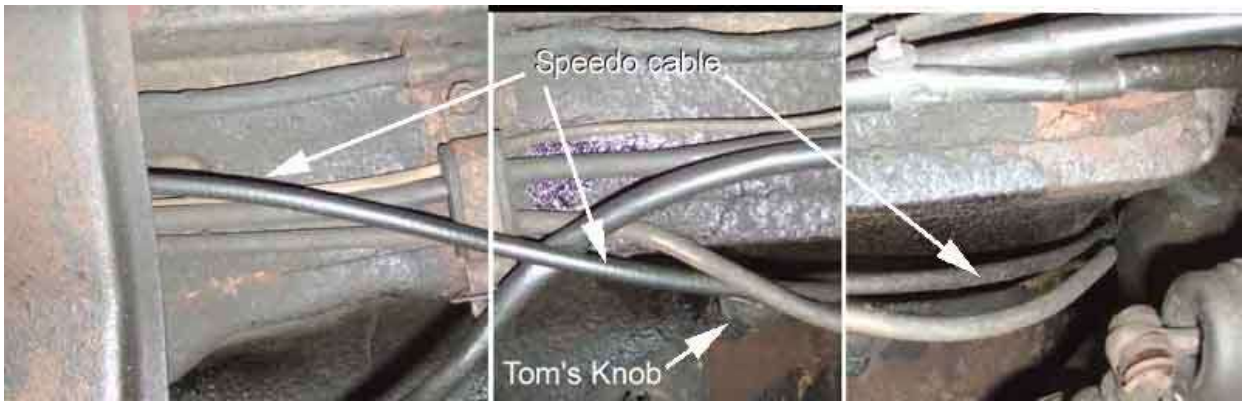
It also appears to show that my removable crossmember is the wrong way round! The downward dip for the earlier restraint rod is supposed to face forwards, and the hole for the restraint rod should face rearwards. Neither is the lower bracket for the restraint pin bolted to the crossmember, so that may be the wrong way round so the holes don't line up.

The speedo cable should pass below the crossmember and be supported with a P-clip and split ferrule in a tapped hole:

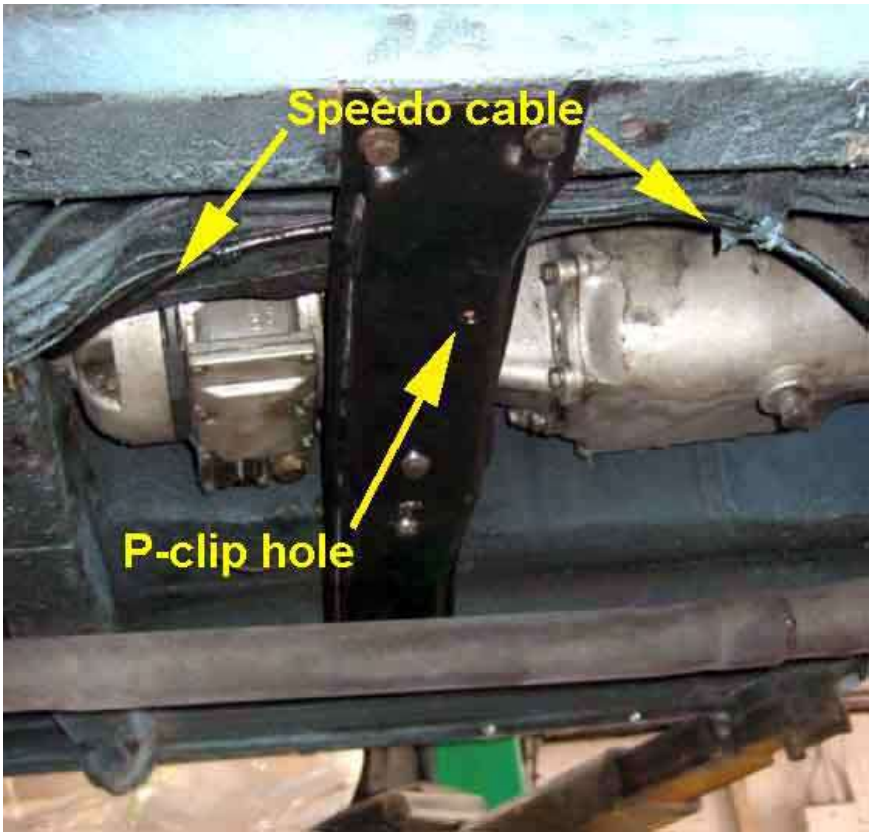
But as Bee's crossmember is the wrong way round it passes with the pipes and cables above it ...



... and goes forwards in a bit of a tangle with everything else:

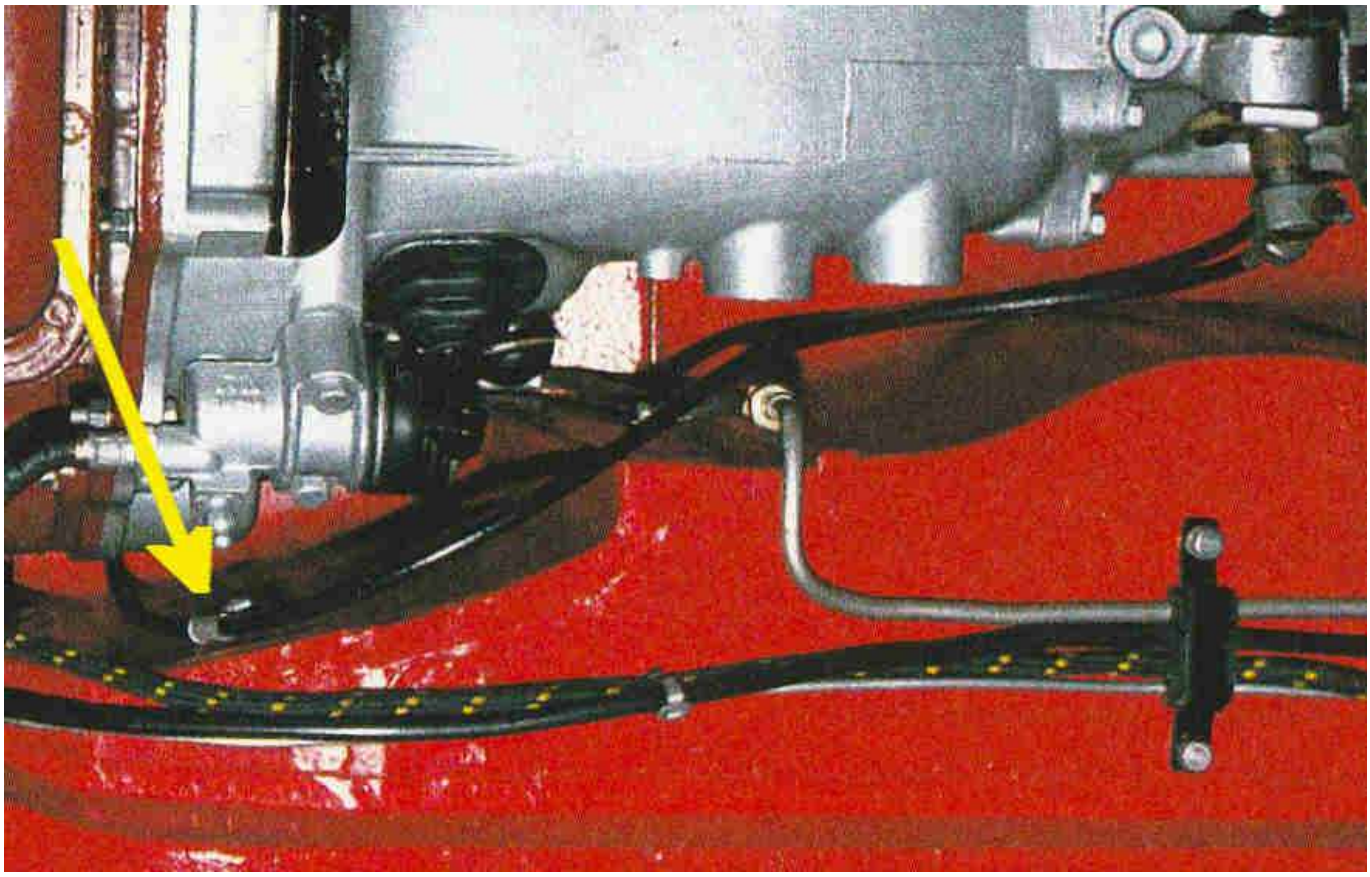


Vee's crossmember being the right way round has the tapped hole for the P-clip that would support the cable under the crossmember tucked up into the recess, but was also routed above. In the correct position the cable takes a slightly shorter, straighter route, albeit more exposed. But as both cables have always been cable-tied above the crossmember with the other cables and pipes in my ownership and haven't exhibited any problems with routing, I've left them there for the better protection.

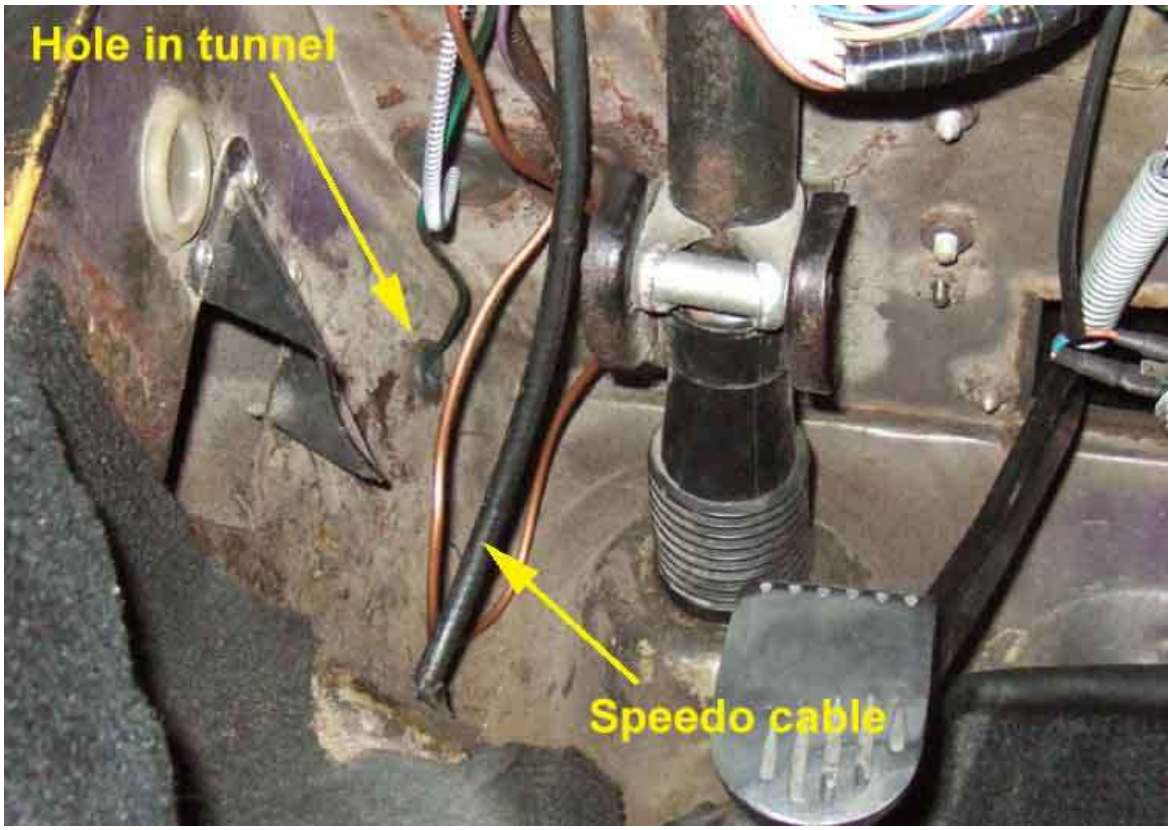


That is, until Vee's cable broke not long after, so I routed the new one correctly.

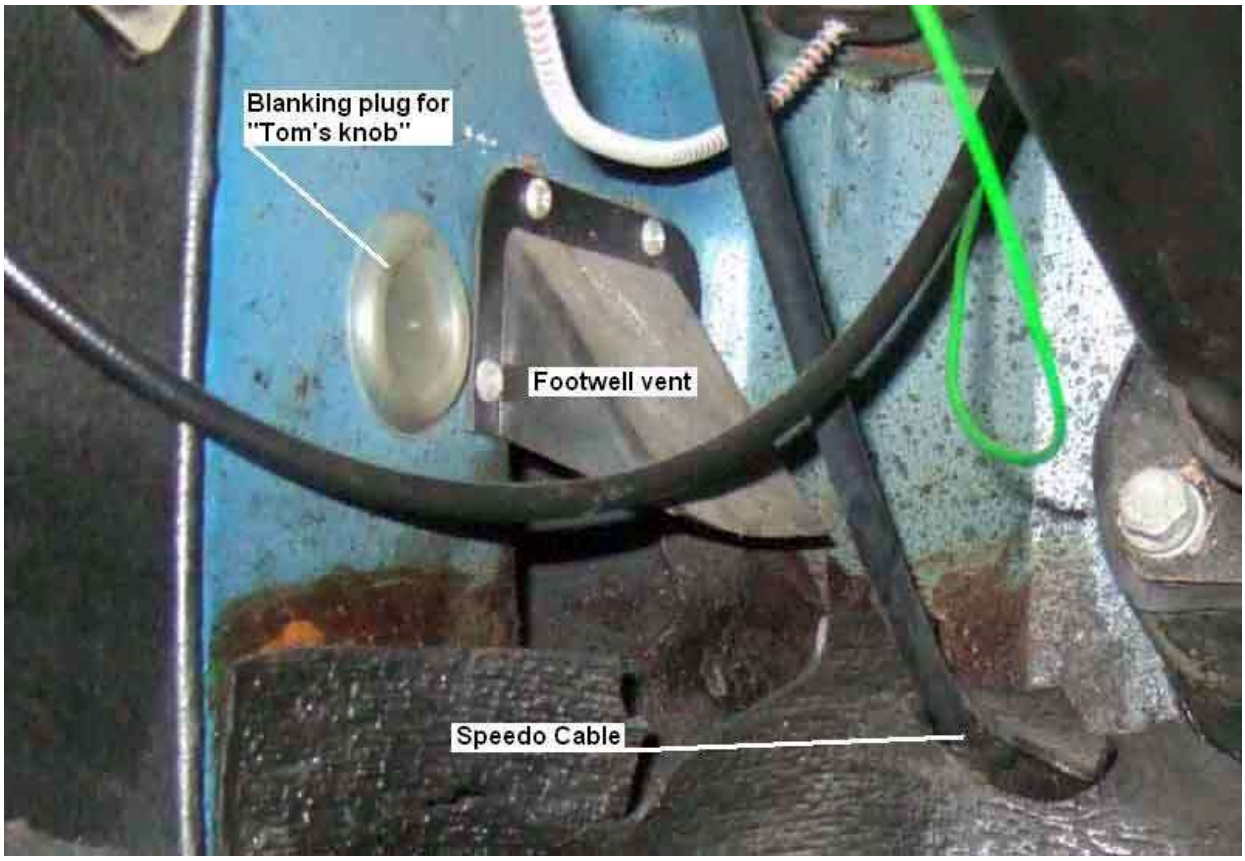
Clausager shows this Mk1 with another P-clip on the side of the tunnel:



Speedo cable entry in the footwell of a 1973 RHD with the cable coming from the top of the 'foot rest', and an originally unused hole in the side of the tunnel at the top which I'm using for an extra wire.



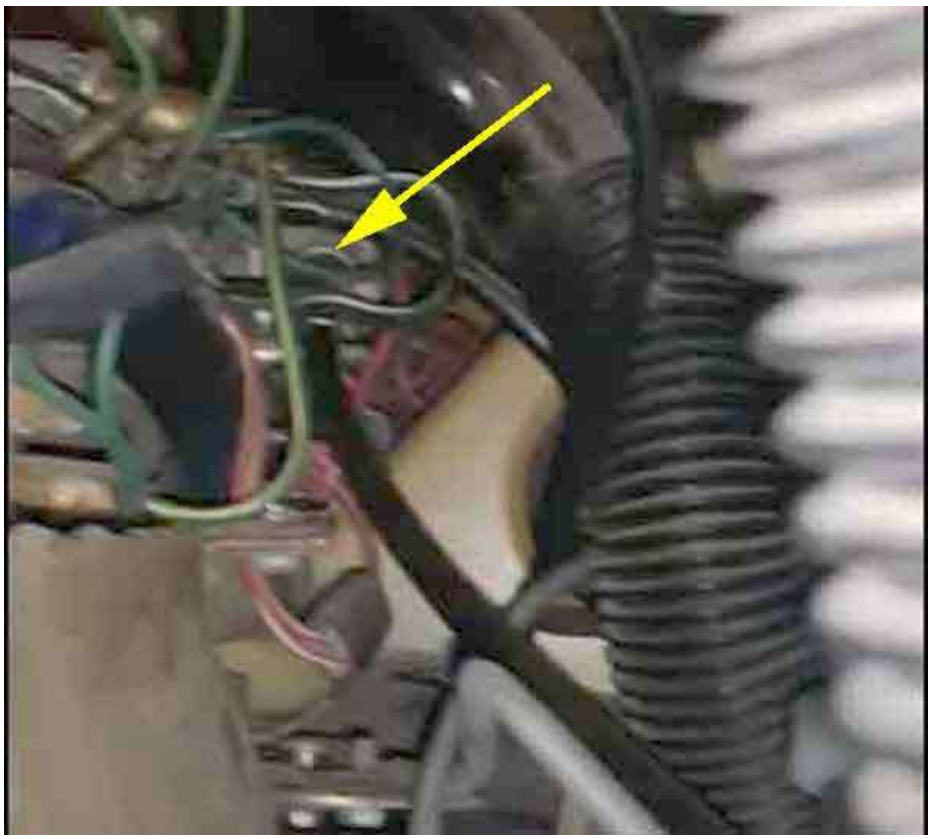
A 1975 V8 with the cable entering in the same position, but no hole in the side of the tunnel.



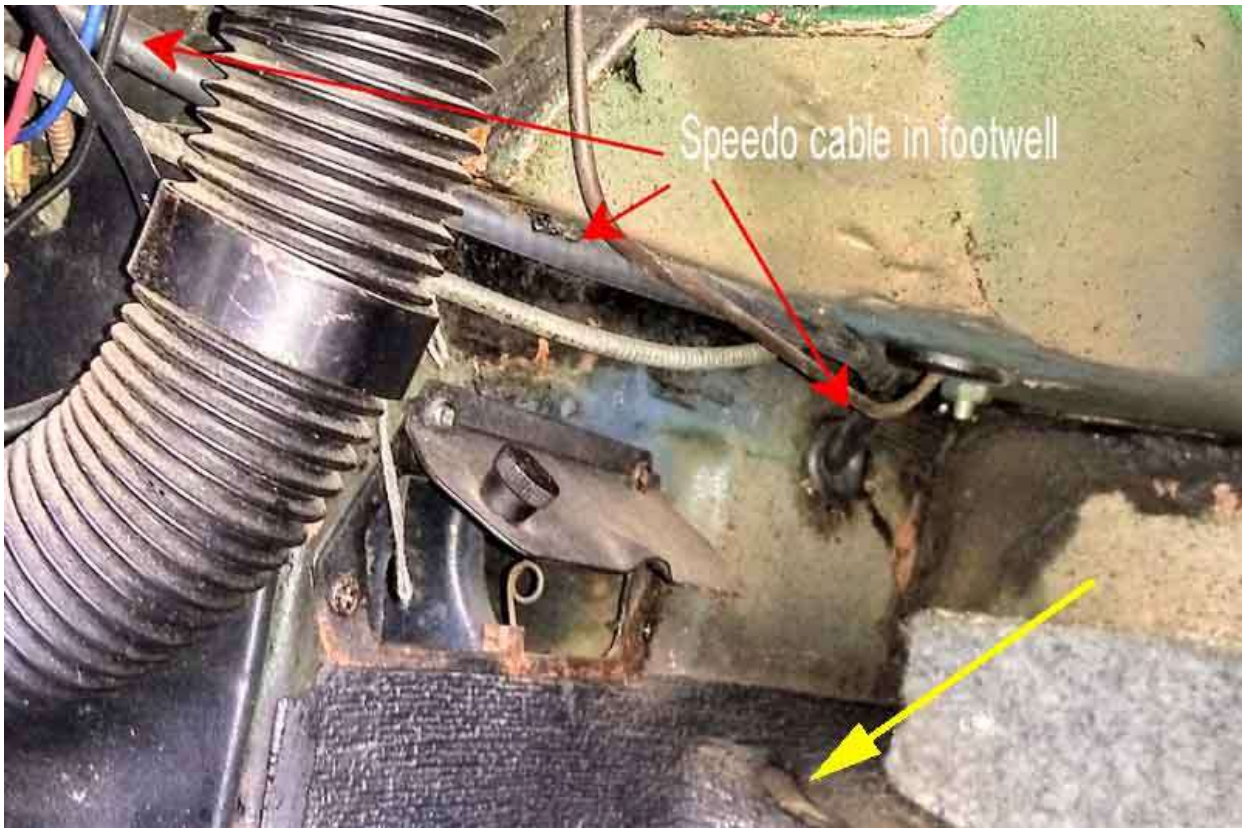
On a 1970 LHD the cable enters the cabin via the hole on the side of the tunnel ... (*Bill Etter*)

... proceeds behind the dash ... (*Bill Etter*)

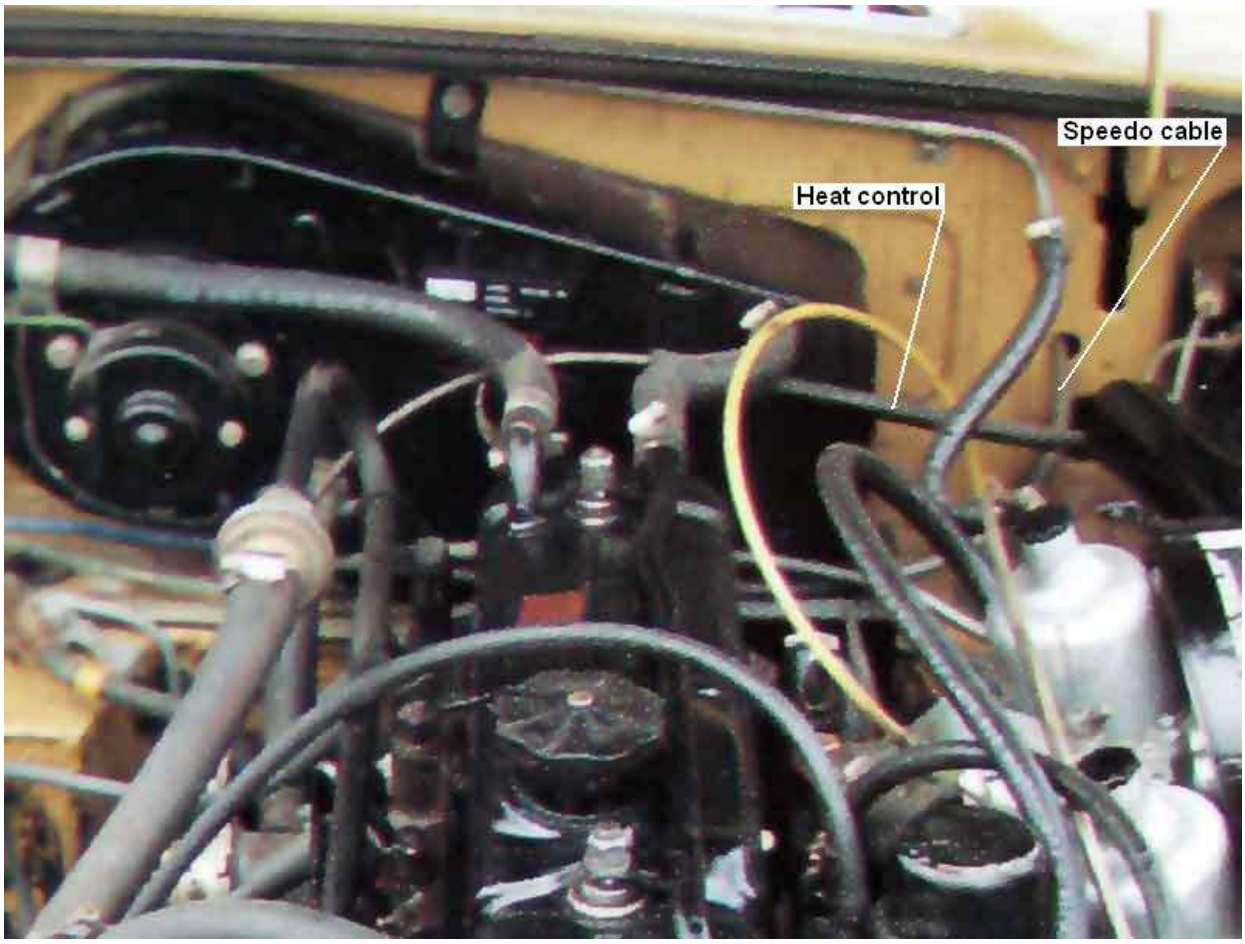
... to end at a right-angle drive unit on the back of the speedo: (*Bill Etter*)



This 1968 has a hole in the rubber mat at the top of the RHD clutch foot rest but it's not clear if there is a hole on the panel (bunged) on not. But I have seen a picture of the cable coming in at the top of the footrest on an LHD, and going back out again through the side hole in the tunnel. My initial thought was that this was very odd, but if it didn't do that it would need some other support in that area in the engine compartment while it continued across to a hole in the bulkhead in front of an LHD driver.



1974 LHD car from Clausager, showing (probably) how the speedo cable and heat control cable pass through the bulkhead in front of the driver. With this arrangement a right-angle drive is not needed as the cable goes straight onto the back of the speedo, and Clausager says these were deleted from May 1972. I've seen a variation on this where the cable enters the cabin in the RHD position, but then goes out again through the hole in the side of the tunnel under the heater, which is used for the entry in the picture above:



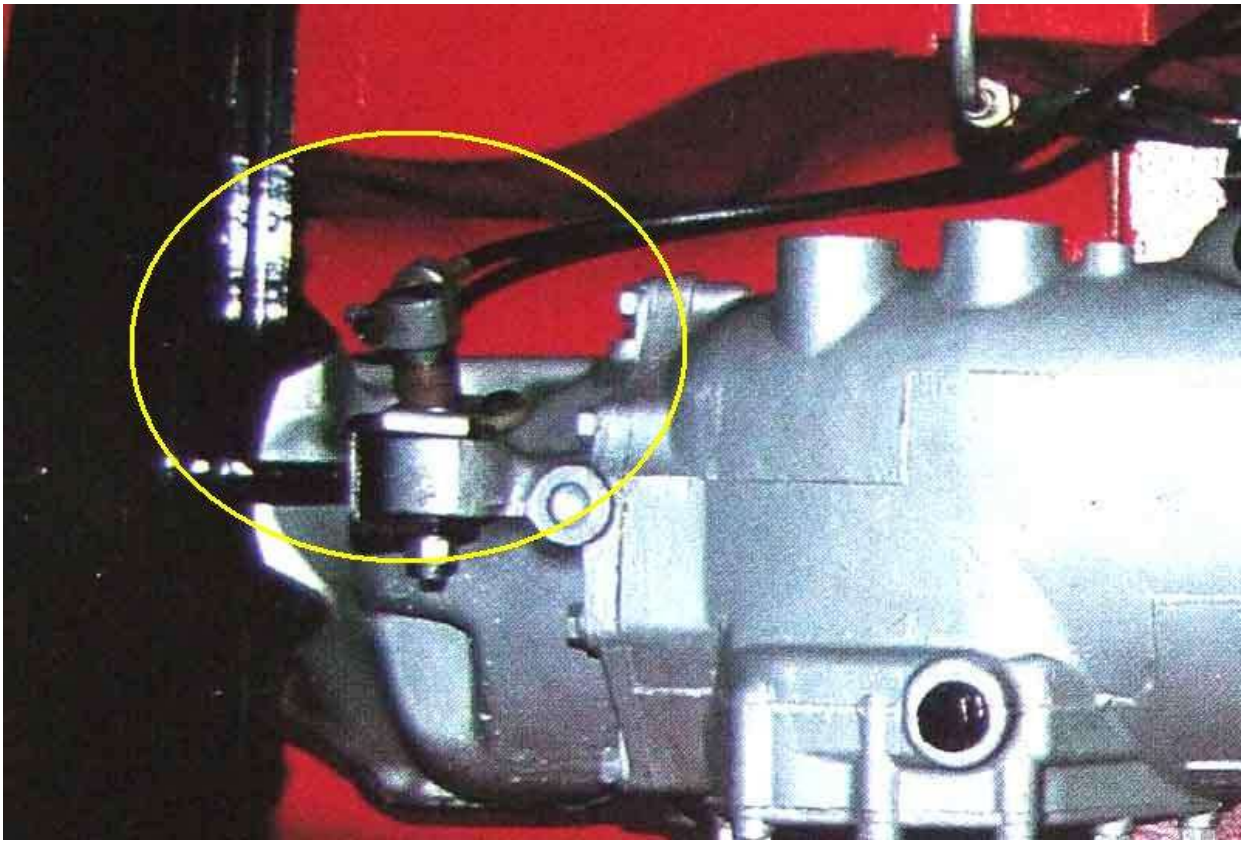
1976 with EGR service counter (arrowed). Note the bracket attaching the cable to the top of the heater casing, my 75 V8 has that stud and I always wondered what it was for: (*Bill Etter*)

Right-angle Drives:

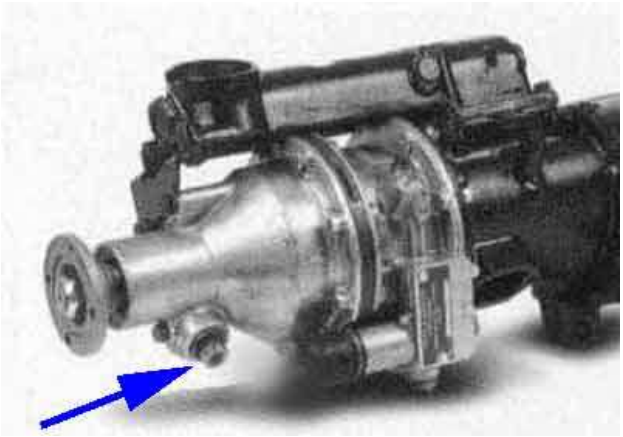
Speedo end - this has a bracket for mounting to the back of the speedo, and a knurled wheel to screw it on. Clausager says this was deleted in May 72, when the cable was run across the bulkhead behind the engine (*Moss Europe*)

Gearbox end: (eBay)

This 1963 non-OD car has the cable connected in front of the removable cross-member with a right-angle drive. This part of the non-OD gearbox is much narrower than the OD, and as the spigot points backwards slightly the cable without a right-angle drive would have to turn through more than 90 degrees to go forwards: (*Clausager*)

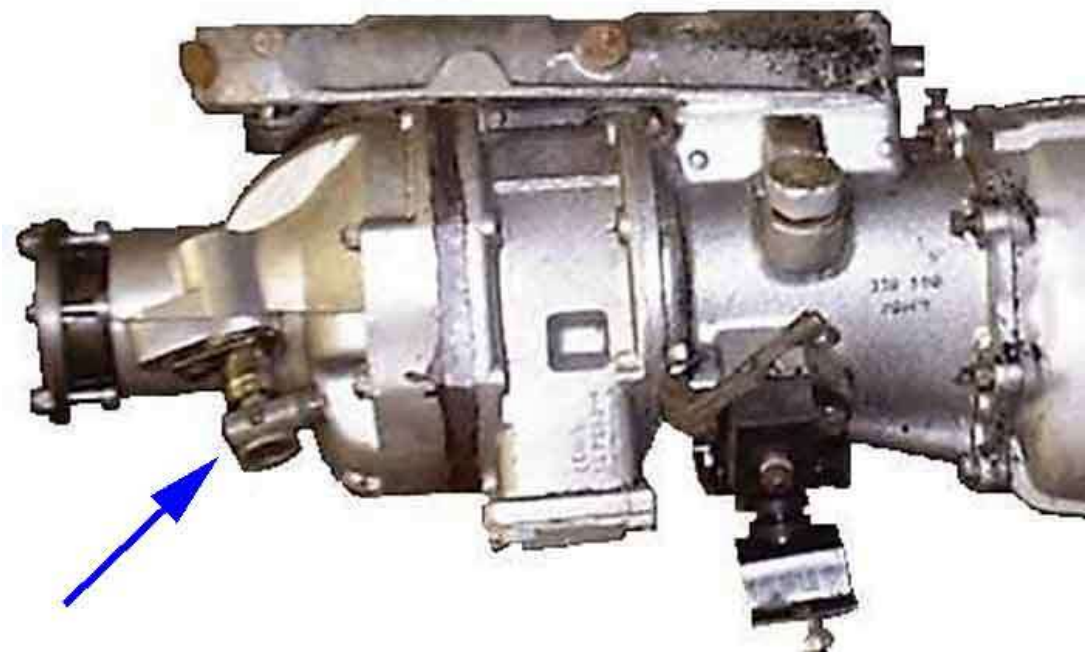


Three-synch OD: The speedo take-off is spaced back from the bulge of the OD a little, at a right-angle, and the bulge is less and tapered. This creates room for a right-angle drive, without which the cable would have to turn through 90 degrees: (*Chicagoland MG Club*)



Four-synch non-OD: Close to the wider part of the main gearbox casing and bellhousing, also angled forwards, which means a right-angle drive can only be fitted if the cable leaves it virtually straight up or straight down. Without the right-angle drive the cable will already be pointing forwards by a significant amount, the remainder of the curve forwards can be accomplished under the floor ahead of the removable crossmember to meet the other pipes and cables: (*Chicagoland MG Club*)

Rubber-bumper four-synch OD: Someone has fitted a right-angle drive to this, but because the take-off is angled forwards, and is very close to the wider part of the OD, the cable can only be attached to it if the right-angle drive points upwards (or downwards to the wrong side) which is counter-productive ...: (*Chicagoland MG Club*)



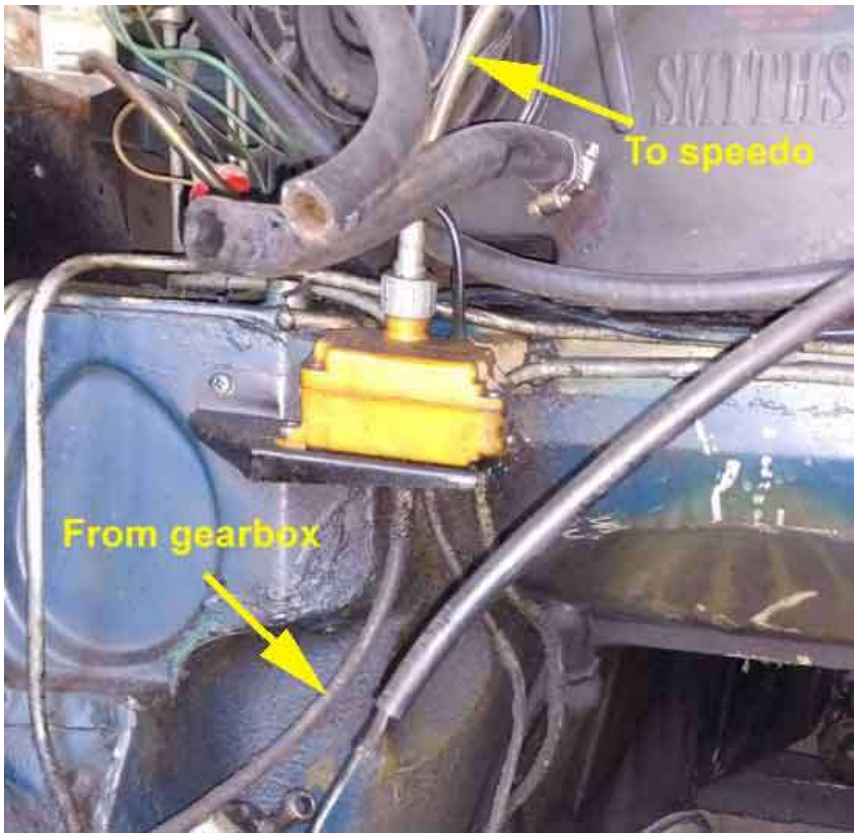
... and there is a notch in the fixed cross-member to allow the cable to come down and forwards without (note this was before I replaced the clip on the removable cross-member with the pukka item):

Automatic: Exits at right-angles so would benefit from the right-angle drive as per the 3-synch boxes:

The copper washer 3H550 is shown in this image from Brown & Gammons. It also shows a 'silver' washer but doesn't discuss it, although mentioned elsewhere are one or two O-ring oil seals that also fit into the angle-drive:

The EGR valve service indicator counter: (*Bill Etter*)

Mounted on a bracket screwed to the lower firewall. The engine has been removed for a clutch change which is why the gearbox cable appears to go forwards, and not down and back to the gearbox: (*Bill Etter*)



From the EGR counter the cable goes across the bulkhead and through in front of the speedo, so a right-angle drive is not required: (*Bill Etter*)

Gearbox/OD Oil Change

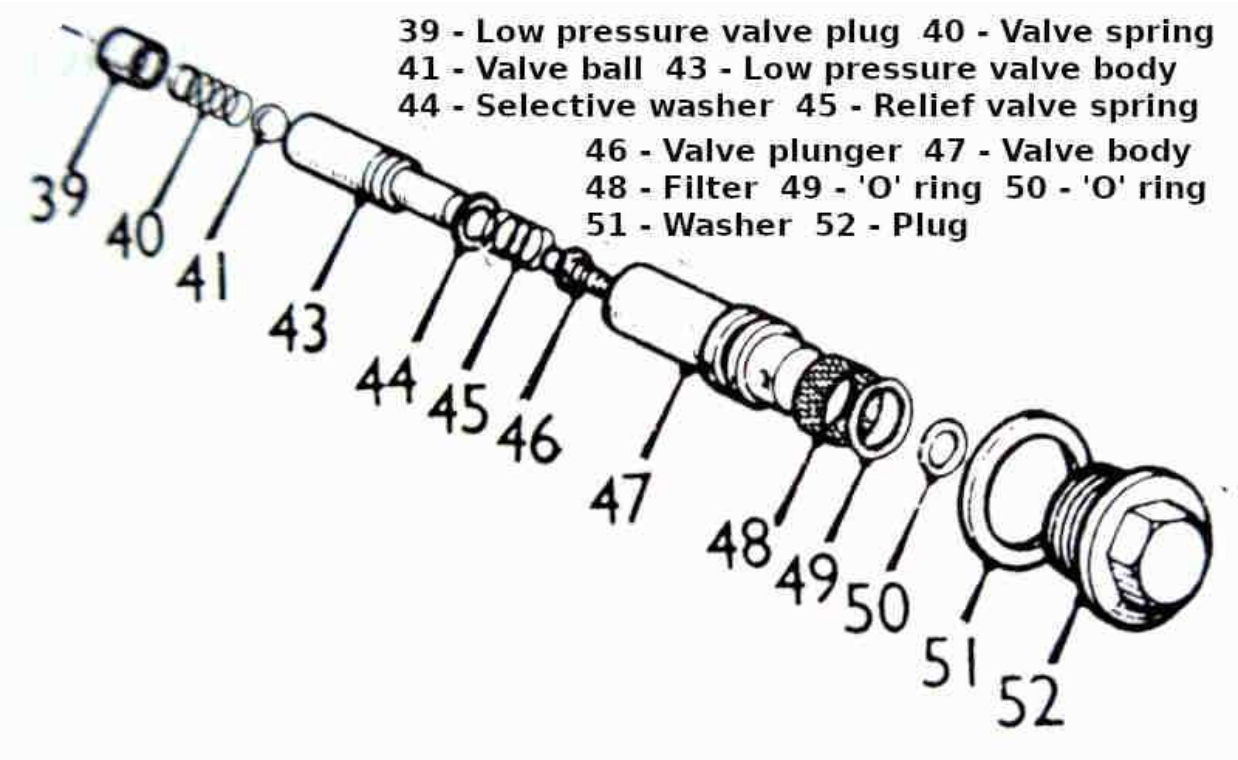
The hollow drain plug from the roadster and some metal debris. As I recall the V8 drain plug was flat:

Roadster sump and gasket/filter, no damage to this on removal unlike the V8:

Sump and all the relief valve and filter components from the roadster. The V8 didn't have the coarse screen shown here, may have been left inside. I found all the shims between the valve plunger and the spring, increasing overall thickness

sharpens/speeds-up engagement, reducing overall thickness softens/slows engagement. It's vital to get the valve plunger the right way round or OD will not engage:

From the original Leyland and Laycock Workshop Manuals. However whilst the 'low-pressure valve plug', 'valve spring' and 'valve ball' at the upper left are shown in both those and the Parts Catalogue and Haynes I didn't find them in either of my cars. Note that the selective shims are shown at the upper end of the spring, not the lower end as I found in both mine, but it makes no difference:



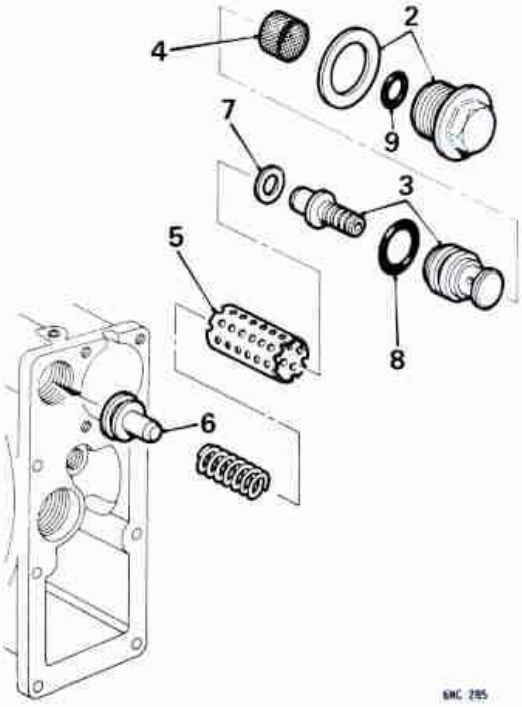
From the 77 and 78 Leyland manuals, without the 'low-pressure valve plug', 'valve spring' and 'valve ball', and with the shims below the spring. Also showing the coarse screen I found:

RELIEF AND LOW PRESSURE VALVE

Remove and refit **40.16.05**

Removing

1 Drain the gearbox and overdrive unit.
2 Clean the relief valve plug and its immediate surroundings, unscrew the plug and remove the sealing washer.
3 Withdraw the relief valve assembly.
4 Remove the relief valve filter.
5 Withdraw the spacer tube from the assembly, collect the spring.
6 Remove the low pressure valve.
7 If fitted, remove the shims from the relief valve plunger.
8 Remove the 'O' ring seal from the relief valve body.
9 Remove the 'O' ring seal from the relief valve plug.

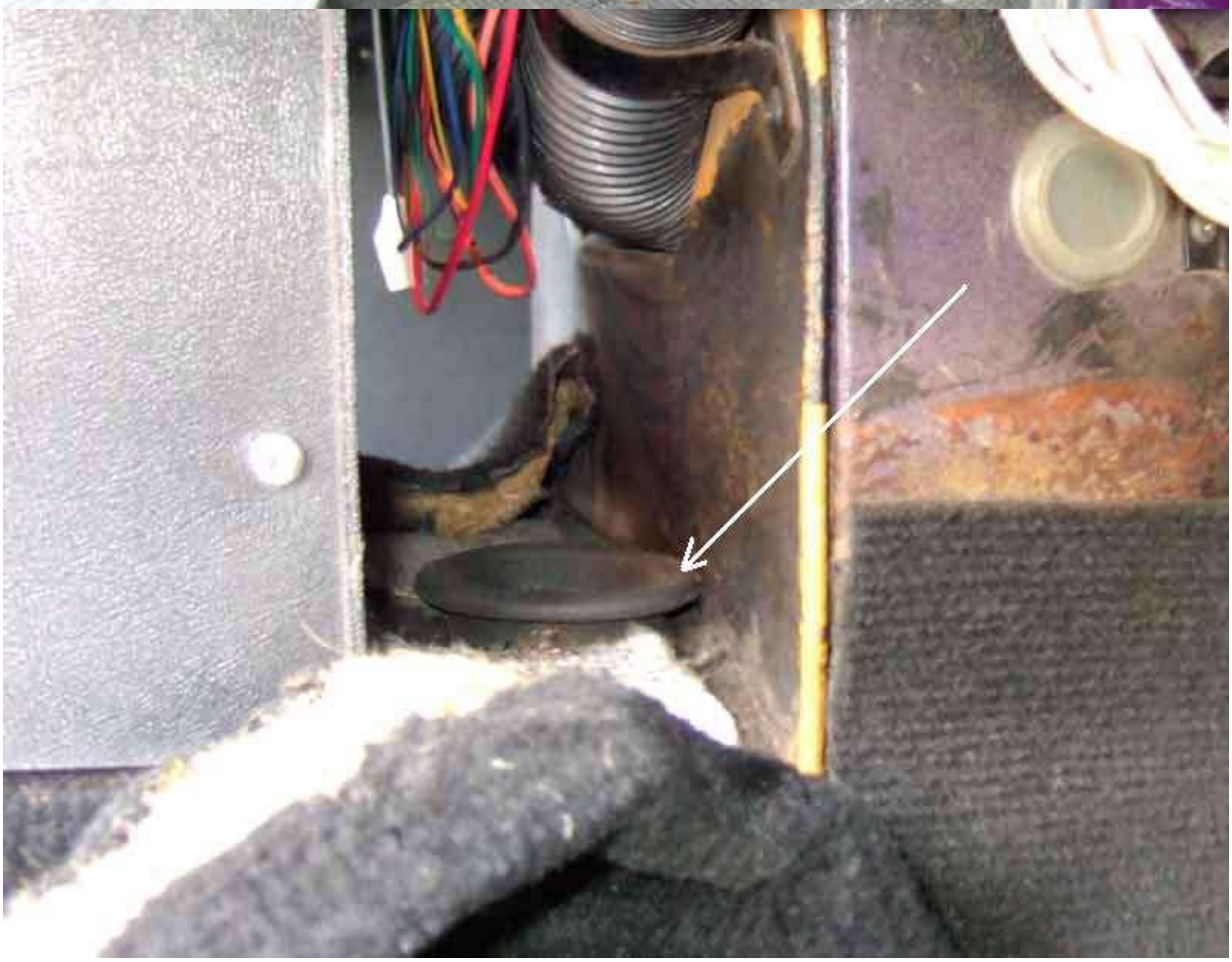


Subsequently information from Overdrive Repair Services in Sheffield is that the plug, spring and ball are pressed into the low-pressure valve body so would not normally be separately visible in routine servicing.

Yet another variation, a cylinder with cut-outs at one end, in place of my roadster coarse screen. Note that John Twist shows this type with the cut-out facing the hex plug, and not as here. It *could* make a difference if the oil has to flow back up the tube to escape from the slots rather than exiting directly, and is maybe why it was changed to the coarse screen I found which can be fitted either way up: *Photo: Corky*

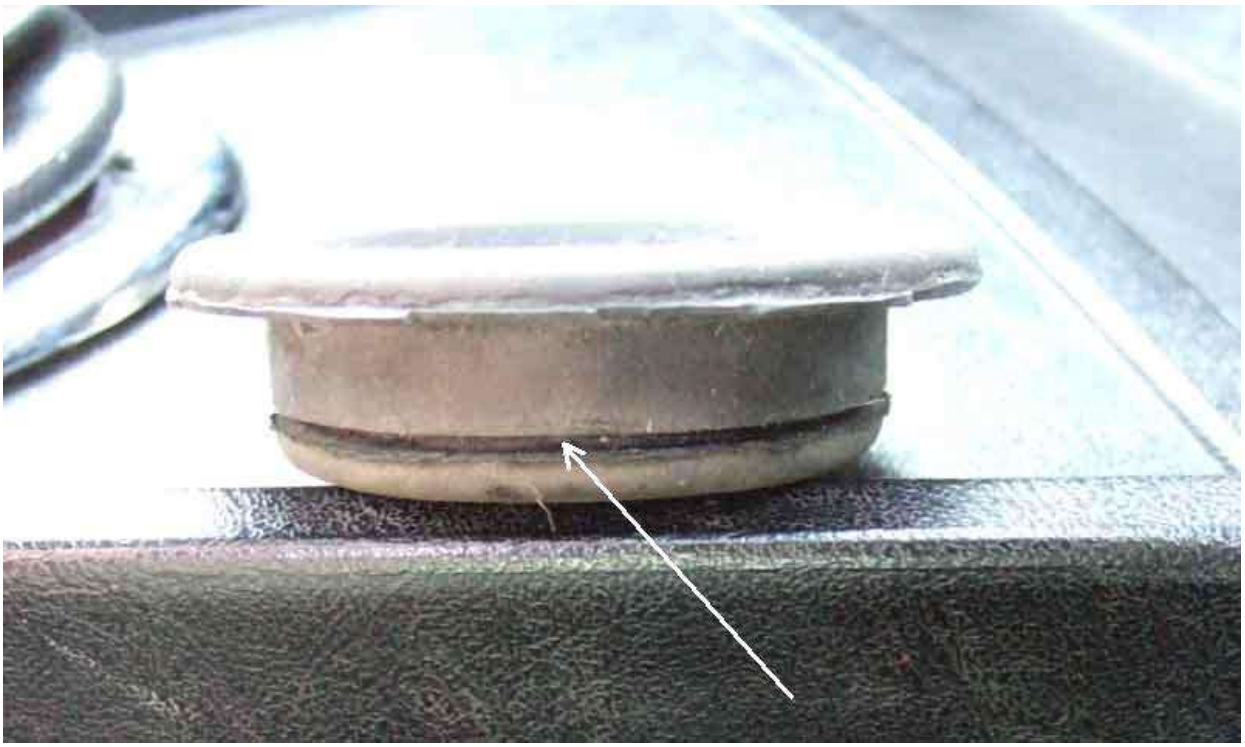
Plastic squeezy bottle for gear and diff oil, with a flexible spout that just fits in the length of tubing, and the tubing just fits in the filler hole on both side and top fill gearboxes. The snug fit between spout and tubing means that even though the 'join' is horizontal when filling in the footwell no oil leaks out from it. But put plenty of cloths and paper down over your carpets just in case, I still spilt a little. This tubing is probably longer than it needs to be even for the side-fill gearbox:

Location of the access hole and bung AHH6507:



Loop of cord on the dipstick to aid removal:

The bung isn't pushed all the way in, just until the body panel slots into the groove (arrowed):



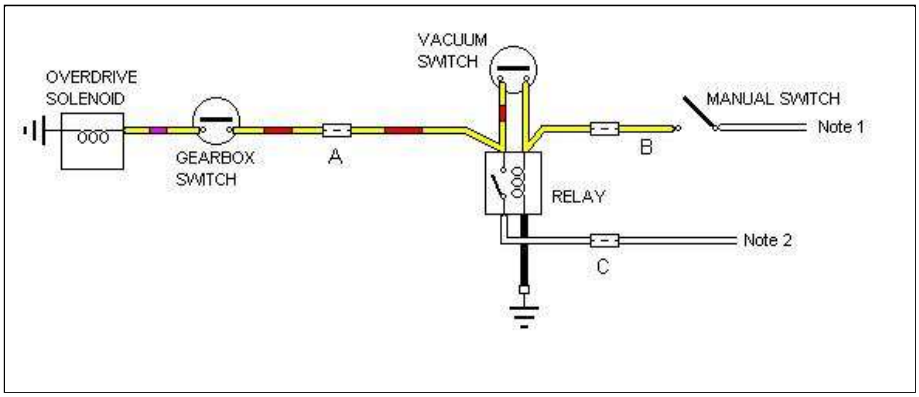
Note that the bung is still present on rubber bumper cars with the side-fill gearbox and some have said they use that hole to feed a tube through to the side fill for filling/topping-up. Others have said either that theirs doesn't have it, or the console is different and you can't access it, but not going by this 78:

Overdrive - D-Type (to 67)

Overdrive relay location, with vacuum switch below, image from Ste Brown, West Yorkshire, UK:

A description of the vacuum switch, its component parts and its calibration can be found here.

Hover over a wire to confirm the colour
Schematic:



Note 1: On 62-64 cars the manual switch is wired back to the ignition switch. On 65 to 67 cars it is wired to terminal 3 of the fusebox.
Note 2: On 62-64 cars the relay contact is wired back to terminal 3 of the fusebox. On 65-67 cars it is wired to a 6-way bullet connector in the mass where the main, rear, gearbox and OD harness all join together near the bulkhead.

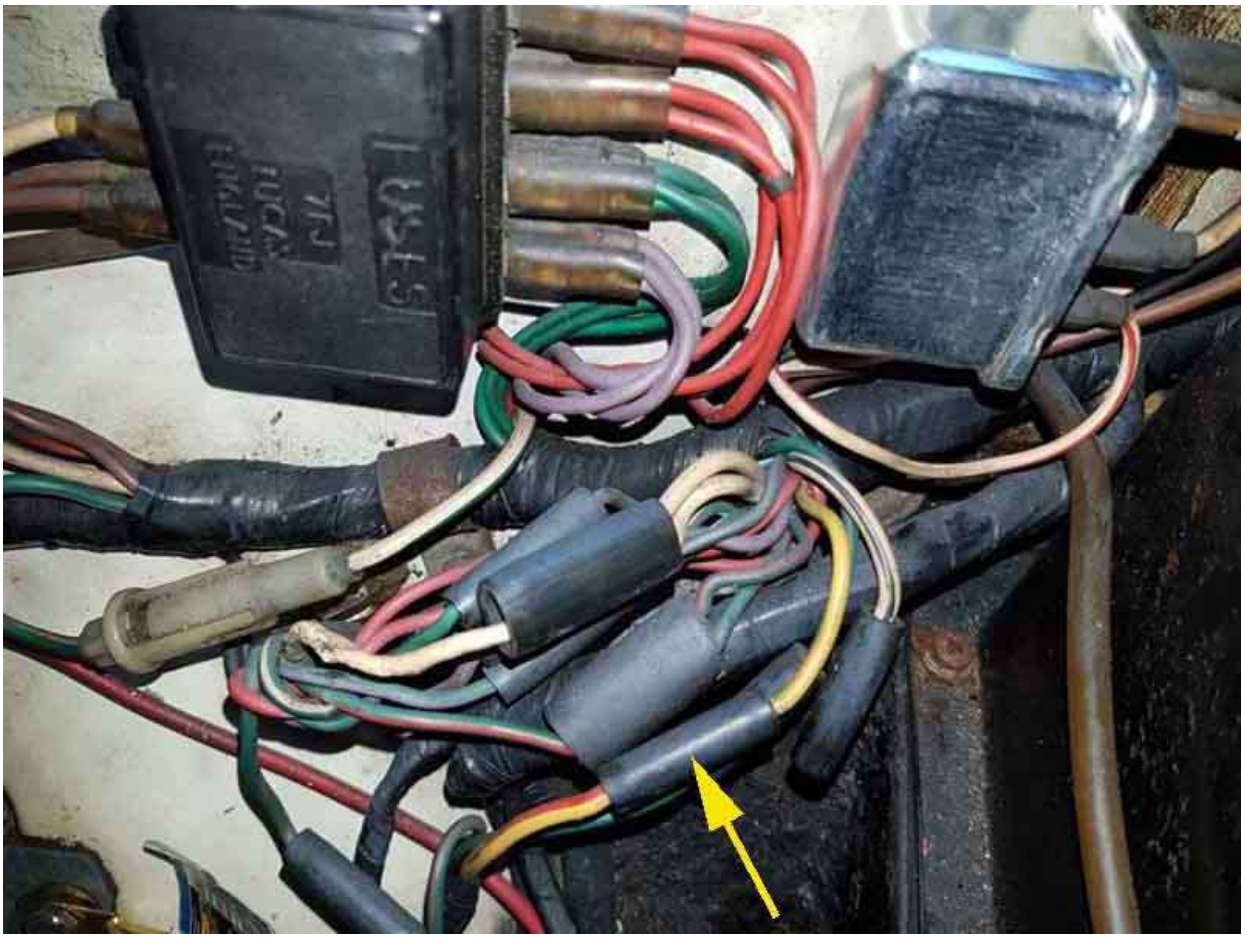
When the manual switch is closed the relay is operated, and the relay contact energises the solenoid via the gearbox switch if closed, and overdrive is engaged. At this point the condition of the vacuum switch - open or closed - is immaterial.

Assume now that with overdrive engaged the engine is doing high rpms but the throttle is closed i.e. it is on the overrun. This will create a high vacuum in the inlet manifold which will close the vacuum switch. If the driver now opens the manual switch, the vacuum switch being closed will continue to maintain a 12v supply to the relay winding from the relay contact, independently of the manual switch, so the relay remains operated, the overdrive remains engaged, regardless of the fact that the manual switch has been turned off.

Imagine now that either the speed of the car has slowed so that the engine revs are closer to idle, or the clutch is dipped so allowing the revs to fall to idle, or the throttle is opened again. In all cases the vacuum in the inlet manifold will reduce, allowing the vacuum switch to open. This causes the relay to release (the manual switch is already open) and its contact disconnects 12v from the overdrive solenoid so disengaging overdrive.

Fusing: A single fuse could be inserted at point A where the relay and vacuum switch harness joins the gearbox harness with two yellow/reds. But to protect the gearbox and vacuum switch harness as well one would need to be inserted at point B (either at the bullet connector where the main harness joins the relay and vacuum-switch sub-harness with two yellows, or at the manual switch) AND at point C leading to the white in the relay and vacuum-switch sub-harness.

This picture shows a yellow wire from the manual switch coming out of the main harness joined to a yellow/red going into the gearbox harness as it would be on a 4-synch car. For the 3-synch with relay and vacuum-switch the yellow from the main harness will go to another yellow in the relay and vacuum-switch sub-harness. Insert fuse B here. Above it are three whites, on the 3-synch there will be a fourth white going to the relay and vacuum-switch sub-harness, insert fuse C here.(*Image by David Farrar on the MGOC Forum*)



Update January 2008 I was under the impression that the vacuum switch was to prevent OD being disengaged under conditions of "high manifold vacuum" (Leyland Workshop Manual) i.e. to prevent high reverse torque from damaging the OD. But info from Bruce Cunha indicates that the vacuum switch only opens at manifold depressions lower than 7 in. Hg., and so OD could only be switched out if accelerating significantly, i.e. a bit like a kick-down on an auto box. But the Workshop Manual talks in terms of it delaying the change "until the engine takes up the drive", which implies light acceleration with the inlet manifold depression significantly above 7 in. Hg. Subsequent discussion with the designer of the transmission system for the MGB confirmed that the vacuum switch was indeed intended to prevent disengagement unless the car was accelerating, but to give a smoother disengagement rather than to prevent damage. However they found the vacuum switches were unreliable and so deleted them opting for 'driver education' instead. However my 73 Drivers handbook says it (the LH-type) can be engaged and disengaged accelerating or decelerating, just **not** to depress the clutch while doing either.

Of course, if the gearbox should be taken out of an overdrive gear the gearbox switch will ensure that overdrive is disengaged instantly, regardless of the position of the manual or vacuum switches. 'Normal' gear changes, say from 3rd to 2nd, will usually allow the overdrive to disengage safely and not encounter the mechanical stresses that the vacuum switch and relay are designed to avoid.

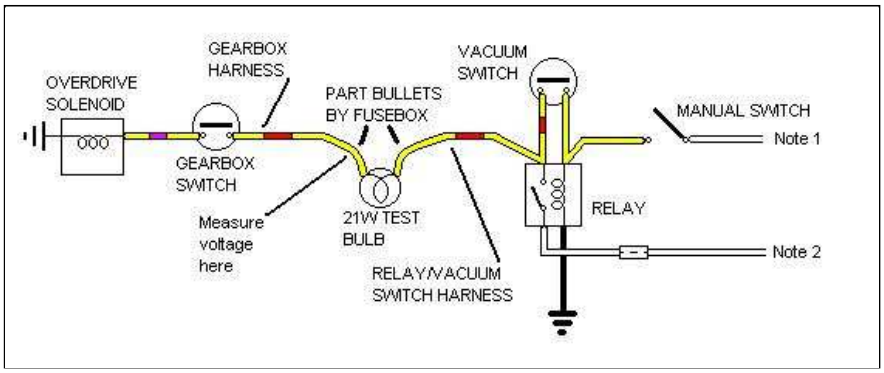
The vacuum switch on its own cannot operate the relay and so cause overdrive to be engaged, the manual switch must be closed first.

The other thing to be aware of is that the manual switch will operate the relay, and the vacuum switch will keep the relay operated under conditions of high manifold vacuum even if the manual switch is turned off, when the gearbox is **not** in an overdrive gear. All this means is that when an overdrive gear is selected the solenoid will be energised and overdrive engaged as normal.

The later LH-type overdrive does not have this vacuum switch and relay, presumably the designers feel it is strong enough to take disengagement under conditions of high manifold vacuum without damage. Also the current taken by the LH solenoid is much less, so the relay is not required for that reason either.

February 2014: It should also be noted that on some makes and models with this overdrive unit the relay was provided even when the vacuum switch wasn't. This is because the initial current from the solenoid - the 'pull-in' current - is several amps, which is more than the rating of the manual switch. Once the solenoid has operated the pull-in coil is disconnected leaving just the 'hold-in' winding, which only takes from 1 to 2 amps. Whilst the standard overdrive manual switch will operate the solenoid without either relay or vacuum switch, the high initial current can result in premature switch failure, and some have reported this if they haven't bothered to fit the relay because they couldn't obtain a vacuum switch. However if you engage the manual switch with a closed throttle, i.e. vacuum switch contact closed, in an OD gear, it is initially the manual switch that powers both the relay and the solenoid, which initially takes a high 17 amps of current. It is only when the relay has operated that its contact takes over the load of the solenoid. It's said that the manual switch isn't up to the job of powering the solenoid, and I'm aware of at least one person who has had a couple of manual switch failures when using the circuit without the relay and solenoid. Some applications of this OD still had the relay when they didn't have the vacuum switch, which tends to support that. Ideally the vacuum switch would have a series diode, so current could only flow back from the contact, through the vacuum switch, to the relay winding to keep it operated, and not allow current to flow the other way i.e. from the manual switch, through the closed vacuum switch, to the solenoid, but I doubt suitable semiconductor diodes were commonly available at that time. Another option would be a dual-make or 'split-charge' relay, with the solenoid on one output contact and the vacuum switch on the other, as with the relay released the two output contacts are isolated from each other so current couldn't flow from the vacuum switch to the solenoid. But again these weren't available at the time, only subsequently with 'cube' relays i.e. Lucas SRB630 or the Bosch with 87 and 87b contacts. The LH solenoid doesn't have this two-stage operation, only takes 1 amp, and so the manual switch doesn't need a relay.

Electrically testing the circuit:

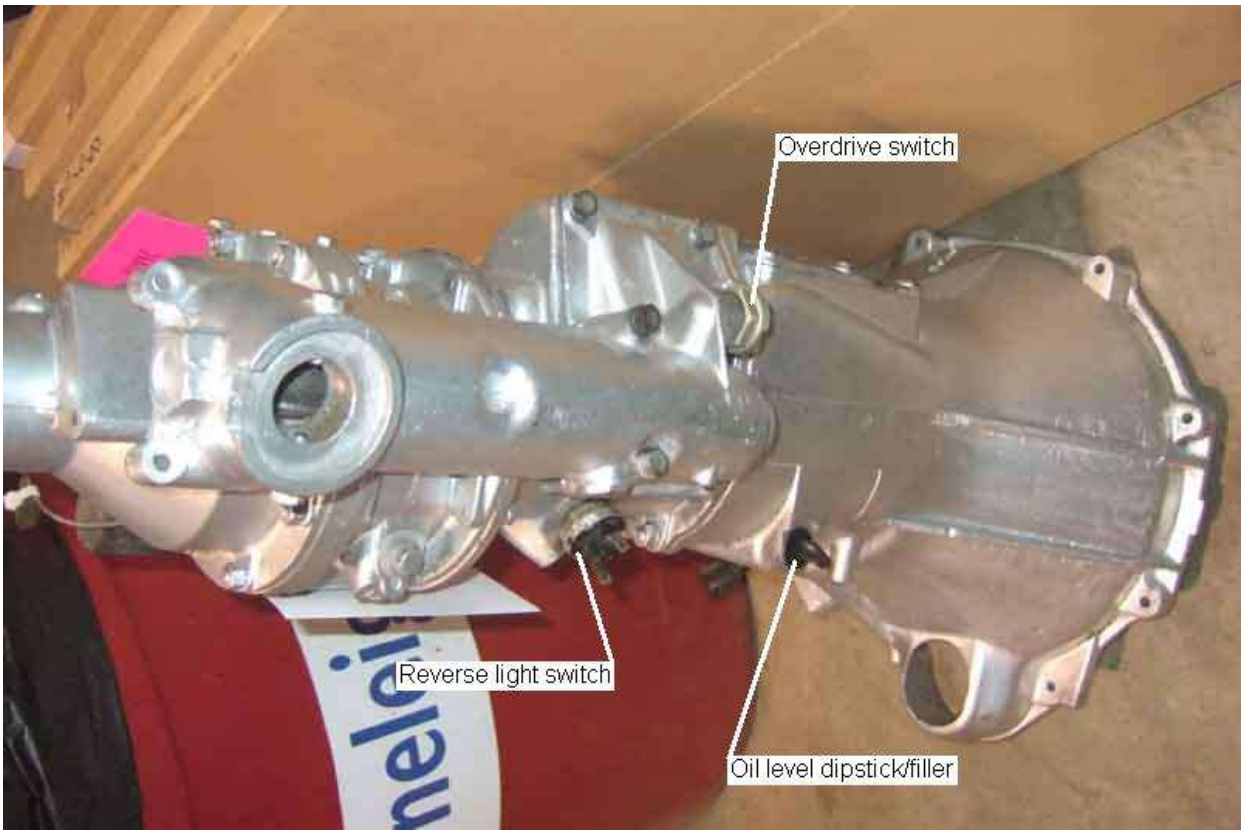


Note 1: On 62-64 cars the manual switch is wired back to the ignition switch. On 65 to 67 cars it is wired to terminal 3 of the fusebox.
Note 2: On 62-64 cars the relay contact is wired back to terminal 3 of the fusebox. On 65-67 cars it is wired to a 6-way bullet connector in the mass where the main, rear, gearbox and OD harness all join together near the bulkhead.

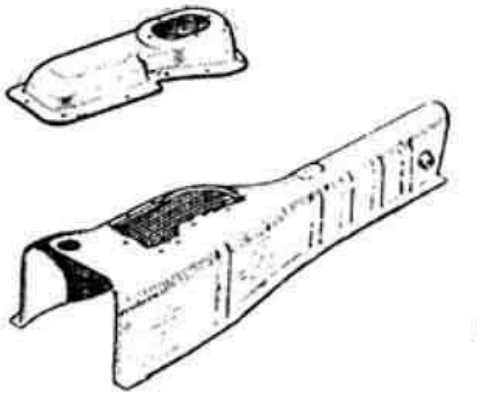
Locate the 2-way bullet connector where the yellow/red from the relay/vacuum switch sub-harness joins the gearbox harness. Part the connector, and insert a 21w indicator bulb in series with the two wires. With the ignition on, an overdrive gear selected, and the manual switch turned on the bulb should glow at near full brilliance, showing the low-resistance pull-in winding is in circuit. If it only glows at half brilliance the implication is that the pull-in winding or its normally closed switch are open-circuit, and only the higher resistance hold-in winding is in circuit. If the bulb doesn't glow at all the circuit is completely open, i.e. it could be a problem in the wiring or the gearbox switch as well as the solenoid. Even if the electrical tests are good, the solenoid plunger could still be jammed. Note that the plunger will not operate with the test bulb in series, this is just an electrical continuity test, not a functional test of the overdrive unit as a whole.

It should be noted that if you intend to fuse the overdrive circuit to protect the wiring, both the white feeds from the fusebox to the manual switch and the relay should be fused.

The location of the overdrive and reverse light switches:



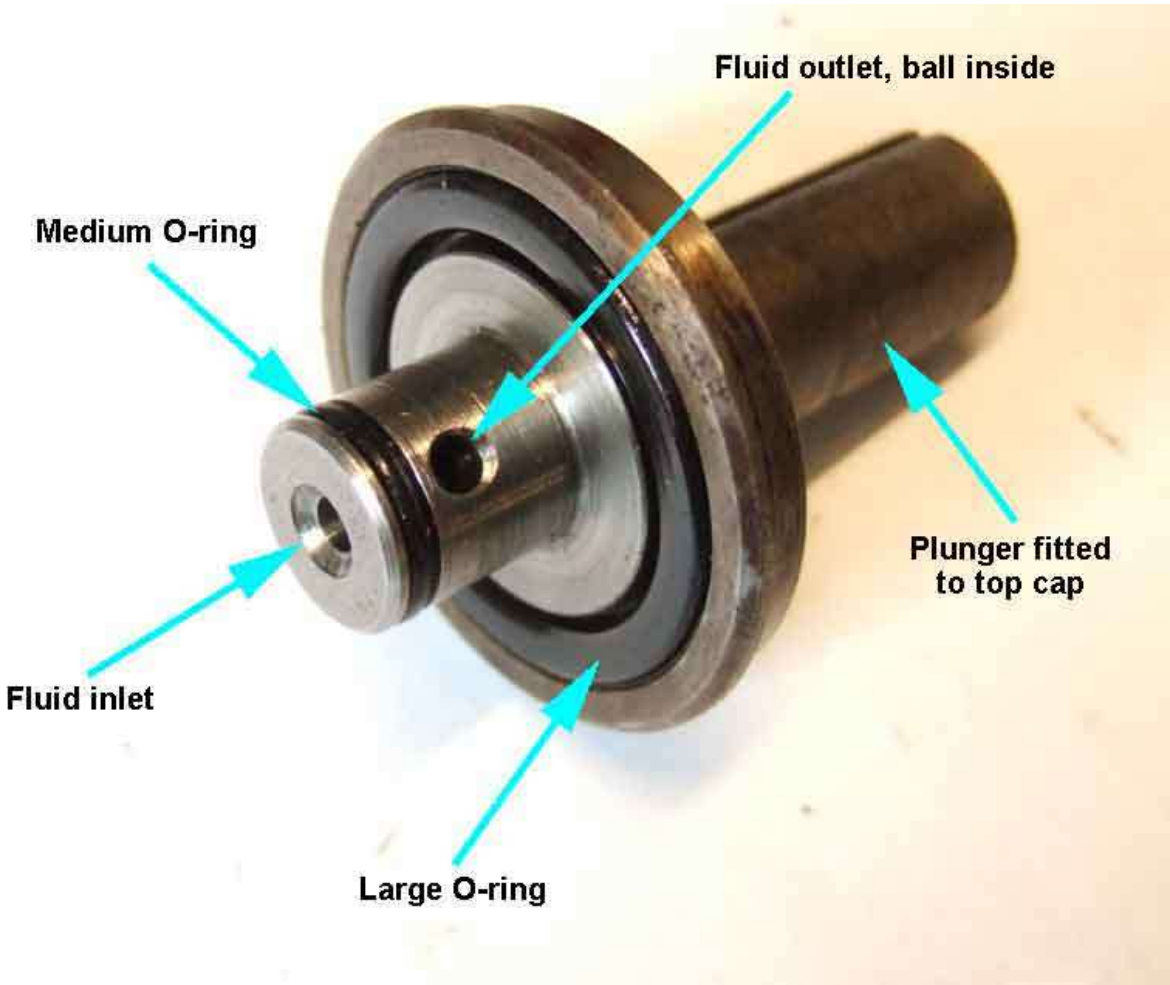
Showing the large access panel on top of the 3-sync tunnel (left), as opposed to the small one on the 4-sync. This should be enough to get at both the OD and reverse light switches on the 3-synch, whereas on the 4-synch the rear crossmember and back of the gearbox has to be dropped as well. *Image from* [Moss Europe] Incidentally the 4-synch removable panel is shown the wrong way round by Moss with the hole for the gear lever at the front, it is towards the rear as shown here.



3-synch: The main reason for this picture was to show how the cover is moved backwards when a 4-synch gearbox is fitted to the earlier car. You can see the screws in the forward section, and the holes in the rear section which were for the remainder of the screws originally, but has been tack-welded in place.

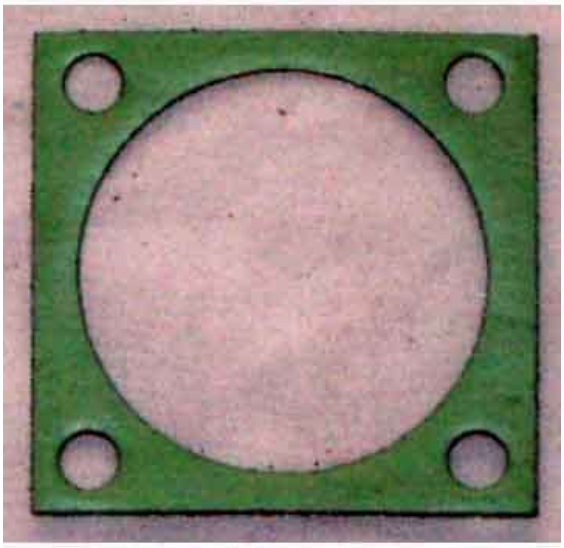
For information on the 4-synch switch see here.

Top cap. When OD is engaged and oil is not flowing from the inlet to the outlet, the medium O-ring prevents oil escaping past the outside of the solenoid, which would cause pressure loss. The large O-ring prevents oil escaping down the side of the solenoid, which leaks past the cover.



In the released position the ball and plunger should be pushed back so releasing oil pressure. If it doesn't move back far enough there may be enough residual pressure to prevent the operating pistons and clutch sliding member moving fully back from the annulus to the outer casing so it can't fully engage direct drive. While the clutch sliding member is between the two there is no engine braking (you still have drive as until OD is fully engaged the one-way clutch is bypassing the slipping clutch). However the plunger comes back at least 2mm when the solenoid is released, giving a clear path through the valve, as can be seen here.

The standard solenoid gasket. If a thicker or second one of these is fitted both the solenoid body and the plunger will move out from the overdrive casing by the extra thickness. But as the seat of the valve is part of the solenoid assembly, that will move out as well, so the plunger and the valve seat will have the same relationship and travel as before. Also by allowing the whole solenoid assembly to move back you will take the pressure off the large sealing O-ring, and oil will travel down to the cover and gasket, and almost certainly leak out. (*Image from Motaclan/Leacy*)



If a second gasket were to be fitted between the existing gasket and the cover plate, with a hole large enough to allow the plunger to move back as far as the cover plate, but not large enough to allow the solenoid body to move back, this may well allow the plunger to move back far enough to solve the problem. However that will possibly cause another problem, by the secondary gasket insulating the solenoid assembly from the cover plate, and hence from the OD body, and earth. The spring on the solenoid coil is compressed when the solenoid is clamped between the bottom cover and the O-ring, and is how it makes its earth connection to the solenoid body. The solenoid assembly is then clamped between it's large O-ring and the bottom cover to make an earth connection with the outside world. Although the whole of the solenoid body can be used to

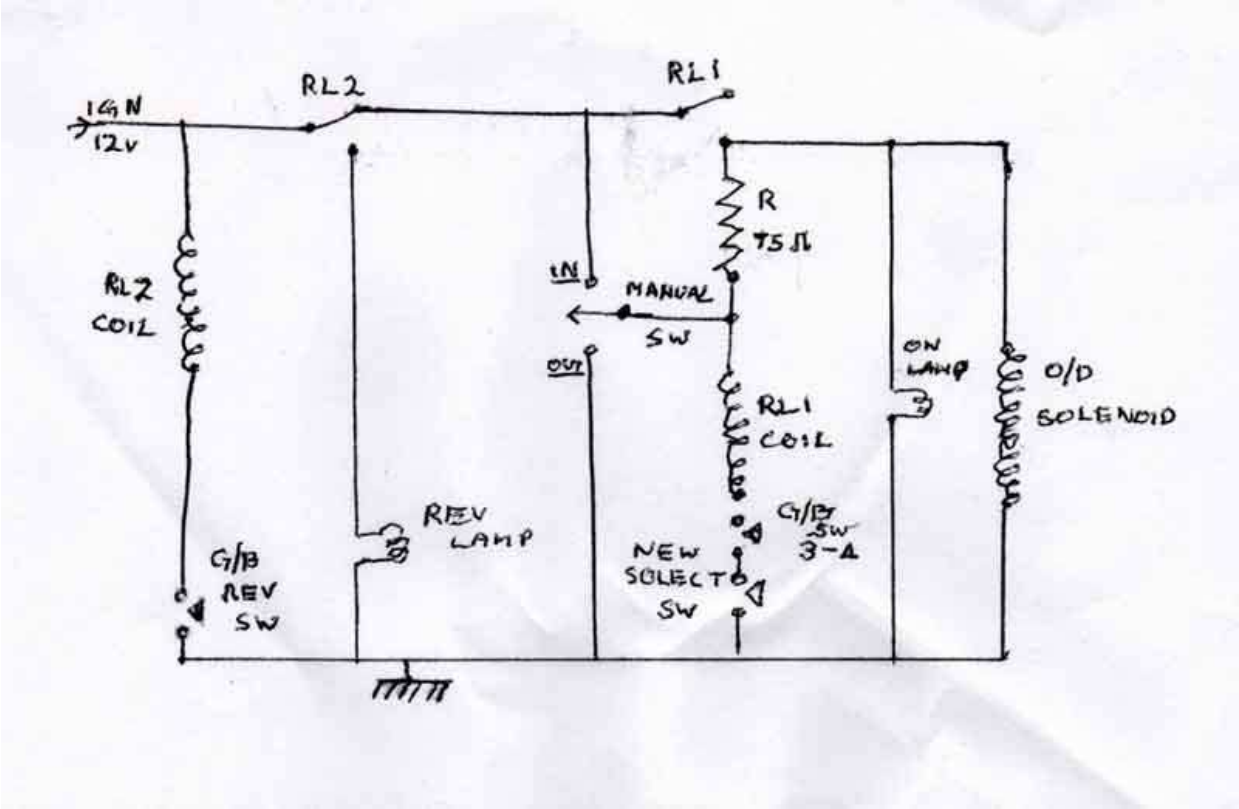
provide an earth, and the sides of the body are in contact with the OD casing, it is not a pressure contact, so the earthing, and hence OD operation, may become unreliable. The question also has to be asked - why isn't the plunger coming back far enough? If something is physically preventing it from coming back as far as it should, then allowing more space isn't going to help - unless the obstruction is directly under the plunger. And if it is coming back as far as it should be, then something else must be keeping the pressure higher than it should be. This could be an obstruction in the solenoid top cap, or possibly the relief valve assembly.

Modified Overdrive Circuitry

by Graham White

Graham writes:

Having recently visited your site and looked at your O/D sequencer circuit, particularly the caution about the danger of mixing overdrive and reverse at the same time I realised that my circuit offers (I hope) several safeguards against this happening, plus some additional benefits.



My circuit uses one relay RL1 to control the over drive, with a second relay to power the reverse lights. This second relay RL2 is a single pole changeover that removes power to the over drive when reverse is selected. Now, with no power to RL1 any damage, shorts or stuck points, the over drive can not be engaged. RL2 also powers my 25 watt reverse light enabling the gear box switch to only pass a few milliamps, so extending its life.

The over drive dash switch is a three position non latching, centre off switch with a long stalk. Moved briefly up to engage, briefly down to cancel. As you follow the circuit you will see that after initially passing full coil current to turn on RL1 it remains held on with about half the engaging current via R1 so the coil will not overheat. Switch "3-4" is the original over drive switch. The "SELECTOR SWITCH" is an extra switch, normally closed that briefly goes o/c as the gear lever is moved between third and forth or forth and third. This automatically disengages the over drive when moving from over drive top down to third when maximum acceleration is required. If not always req'd a dash mounted switch can be added to over ride its action.

In your picture of the gear box switch positions the anti rattle plunger holder can be seen mid way along the gear lever extension casting (arrowed below). The plunger, now with a ball bearing in the end & pressing on the selector shaft, trips a micro switch (mounted on the plunger holder) when passing a very small depression cut in the shaft.

For added safety all the gearbox mounted switches are wired to the negative, chassis side of the circuit, so no fire or burnt wiring!

Graham subsequently emailed:

"I now realize that I have left out one important component in the circuit I sent you. I omitted to draw a blocking diode in series with the 75 ohm resistor. Its purpose is to ensure that if the O/D switch is held ON, in first or second the solenoid will not be powered by current flowing from the switch through the resistor."

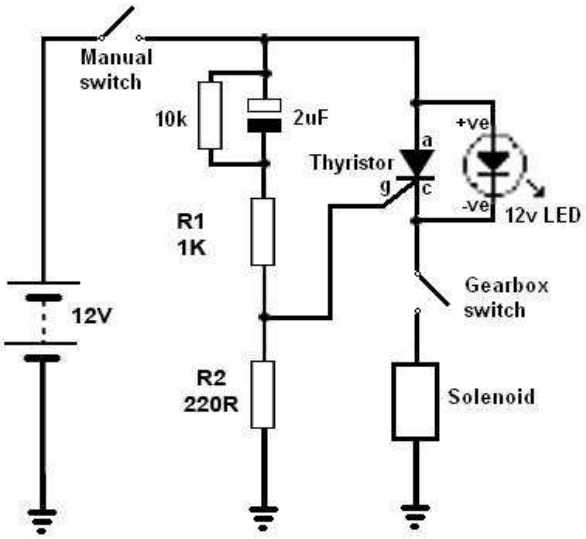
Note that the diode needs to be connected appropriately depending on whether your car is positive earth or negative earth. However in my tests with the LH overdrive the solenoid would not reliably operate with 25 ohms in series, and would not operate at all with 35 ohms in series. The earlier D-type overdrive requires significantly more current to operate so is even less likely to operate without a diode. So being powered with Graham's 75 ohm resistor is series should not cause any problems, but then neither will putting in a diode to be sure.

I also strongly recommend fusing the ignition supply to the circuit, as I do to all overdrives (and fuel pumps). Graham tells me uses fused relays, but as far as I can see these are only available in the basic 'on-off' flavour i.e. RL1 and not with the 'changeover' type RL2, which does leave some components and wiring unfused.

Overdrive Sequencer - all-electronic

This circuit works in exactly the same way as my original circuit - i.e. the existing manual switch is used to 'reset' the circuit once automatically locked out as well as engage or disengage OD manually. The LED shows when OD has been locked-out i.e. whenever the manual switch is closed but the gearbox switch is open.

This circuit has been bench-tested, but needs to be tested on-car to check for any unwanted operations. Cars of our era are very 'noisy' electrically with many spikes and random pulses as things are turned on and off, as I have found with purely electronic circuits in the past, and a commercial version of this suffers from this problem so I've been told. It's not something I've ever encountered with my original circuit, quite possibly the brief (in our timescales) time that a relay needs to operate and release is able to ignore microscopic (in time and voltage) hiccups in the signal from the electronics.



The characteristics of a thyristor are such that once a signal has been connected to the gate 'g' and turned the thyristor 'on', which allows current to pass from the anode 'a' to the cathode 'c', the gate signal can be removed and the thyristor will continue to conduct until something else interrupts the current. This can be the manual switch (to turn OD off manually), or the gearbox switch opening when changing out of an OD gear, or turning the ignition off.

The capacitor enables this to be achieved solely with the original manual switch, and not need two other push-buttons that have to be mounted somewhere, as other systems need. The capacitor supplies a brief pulse of +ve voltage to the gate as it charges up when the manual switch is turned on, and this is enough to turn the thyristor on. The 10k resistor in parallel with the capacitor ensures that the capacitor can discharge when the manual switch is turned off, as if the capacitor is still charged when turning the manual switch on again it will not generate a pulse to turn the thyristor back on again. Note that opening and closing of the gearbox switch will not re-engage OD as this does not generate a pulse to the gate, only turning the manual switch on (or off and back on) will do that.

R1 and R2 form a potential divider to give a reduced voltage to the gate - in the order of 2v or so - as required by the specification of the device. This is despite the thyristor itself being rated at 650V and 13A, which is deliberately way over-kill for the 12V and 1A of the OD.

The LED will glow when OD is locked out i.e. the manual switch is on, the gearbox is in an OD gear and that switch is closed, but the thyristor is not triggered. The LED 'sees' 12v from the manual switch, and an earth via the gearbox switch and solenoid, and as the solenoid resistance is only 15 ohms that is more than enough for the LED.

The LED can be changed to act as an 'OD engaged' indicator by moving its +ve connection to the thyristor cathode and its -ve connection to earth.

Overdrive Sequencer and North American 1977-on Cars

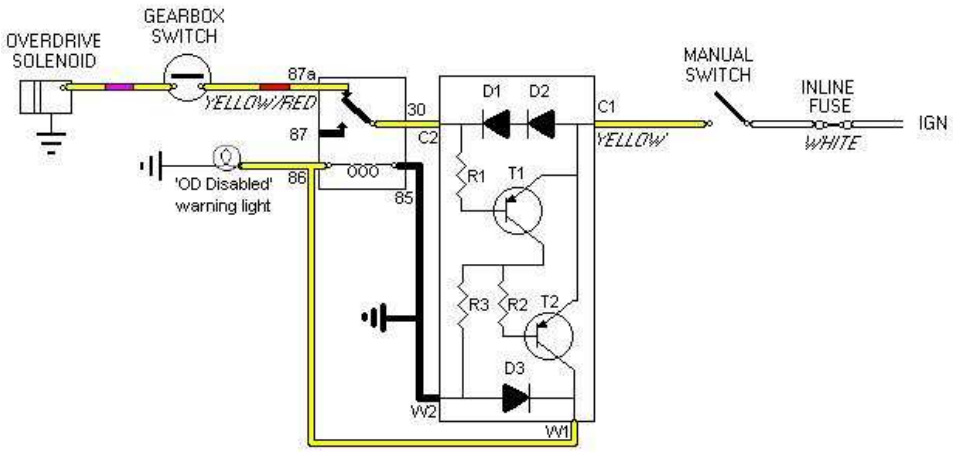
Adding the overdrive sequencer circuit to North America is complicated by the order of the driver's and gearbox switches in the circuit being reversed, as the overdrive circuit was linked with the Transmission Controlled Spark Advance system that was added shortly after the driver's switch moved to the gear lever. Clausager indicates that the gear lever switch was added at car number 410001 in June 76, and TCSA started to be provided at car number 411635 in July 76, finally fitted to all cars by 429084 by Feb 77. With TCSA 12v is connected to the gearbox switch first, then the output of the gearbox switch controls both the OD and the TCSA. The output is split into two, one branch going to the TCSA system, the other branch going to the driver's switch and then to the OD solenoid.

If you don't have or don't need TCSA, then you can rearrange the wiring such that the 12v supply on the white/brown and yellow/purple goes to the gear lever switch first, then from there to the gearbox switch, and from there to the solenoid i.e. the original order of components. Then you can simply (accessibility aside) insert the sequencer circuit between the manual and gearbox switches and it will function as intended.

If you have TCSA but don't need it for emissions inspections then with the wiring rearranged as above the driver's switch will be controlling TCSA instead of the gearbox switch. To prevent that the simplest thing is to remove the TCSA solenoid from the distributor vacuum pipe, and join the two halves of the pipe together. This will give you vacuum advance in all gears instead of just 4th gear. Clausager says the TCSA system was provided to prevent 'surging' in the lower gears by restricting vacuum advance to 4th gear only, so if you make this change you will have to see if it gives you that problem. I'd recommend making this change before doing anything about the sequencer circuit, so if you do have 'surging' problems and decide you still need TCSA, you will have to think again about adding the sequencer. It is technically possible to add the sequencer, or different circuitry to achieve the same effect, with the gearbox and driver's switches in this order, but they involve adding circuitry and components to the solenoid side of the gearbox switch. And if any fault should develop that allows 12v to continue to be extended to the solenoid when the gearbox switch has opened, you could find yourself reversing with overdrive engaged and destroy the unit. Because of that I'm not prepared to suggest any of these other options.

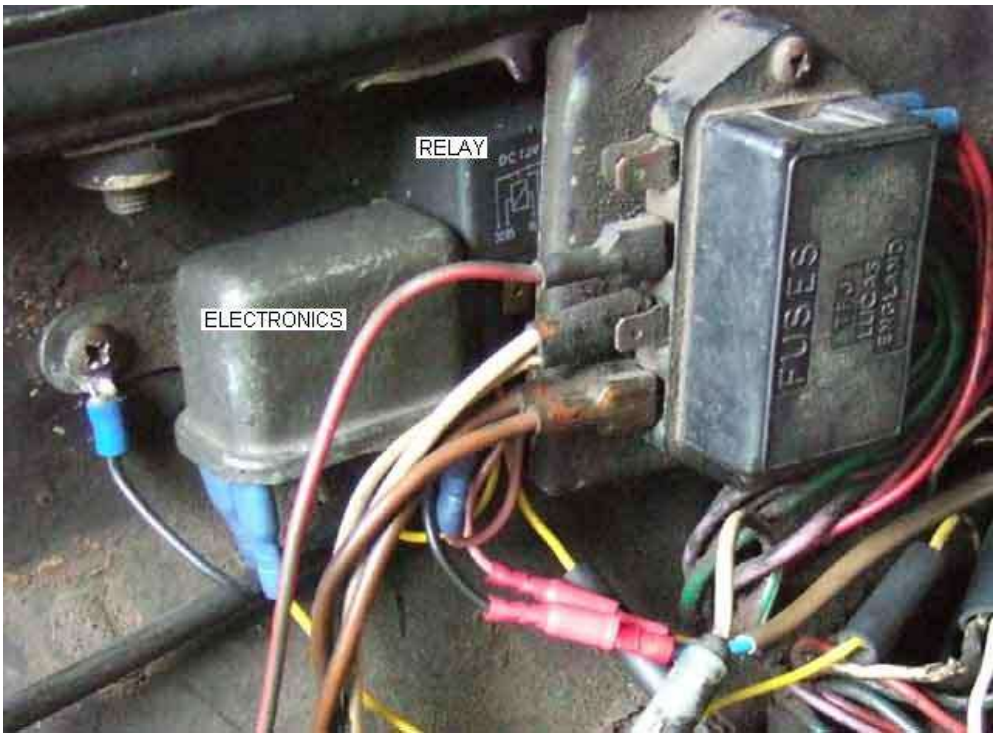
Overdrive Sequencer Relay

Schematic



NEGATIVE EARTH CARS EXCEPT THOSE FOR NORTH AMERICA FROM FEBRUARY 1977

6RA relay can containing the electronics, and a modern single-pole, double-throw relay



Warning light fitted in a convenient space between steering column and dash

The revised position, a small bracket with a hole for the LED below a smaller hole for the fixing screw for the door seal end-cap sees it neatly positioned at the end of the dashboard crash-pad, and pleasingly close to the manual switch.


RPM
FUEL


FUEL
NORMAL