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!
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

04 January 2018
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 pulley; 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. 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.
Anti-rattle bush, with the slit arrowed
An original bush on the left, with the one on the right having a shallower chamfer to aid insertion into the remote control lever, once the bush has been fitted to the ball-end of the cabin lever.
Locating pins and damper on a 4-synch gear lever with a rearwards kink...

... but no sideways kink...
Orientation of lever seating plate on a 4-synch

Raised portion on the left
Interlock Arm Assembly

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

... and the 4-synch in-situ
Gearbox Dismantle by Michael Beswick

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.

Note orientation of cut out on layshaft. Check for shims either in the cover or stuck to the outer bearing face.
Check for shims in front plate.

What lies inside.
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.

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

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.
Take care not to damage the plastic speedo gear.

The plastic speedo drive. If it shears you have to remove the whole gearbox...
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.

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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 oil for all MGBs showing 'DIFFERENTIAL' and a picture of an axle on the front ...
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.

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Restrainment Rods: Mk1 roadsters had a crossmember with just a single hole for each gearbox mount stud, and 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 cross-member, 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.
Mk 1 GTs don't appear to have the restraint rod, but have the yokes, bushes and pin instead, although these are nowhere as 'positive' at restraining forward movement as the roadster rod. They do 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. 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.

Mk 2 cars have a crossmember with two holes for each gearbox mount stud, and no welded nuts for a restraint bracket (and hence no restraint rod), although the holes are still present. The upper and lower yokes with bushes and pin are now on all cars, but are different in design to the GT originals. 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 cross-member brackets now have two holes for the stud on the rubber mounts, which adds to the possible combinations of assembly.
The V8 only ever had the yokes, bushes and pin as part of the cross-member assembly, never a restraint rod or front mount control bracket.

**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. Note all the shims go between the valve plunger and the spring, increasing overall thickness sharpens/speeds-up engagement, reducing overall thickness softens/slow engagement.

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

I didn't find the valve ball, valve spring or low-pressure valve plug shown in the factory drawings on either car. The
drawing in the Workshop Manual isn't very clear, it is much clearer in the Parts Catalogue although it still doesn't show the coarse screen I found in the roadster. However only the Workshop Manual has the full parts listing, the Parts Catalogue groups all the components together as 'Valve relief and low-pressure'. Below is a composite using the Parts Catalogue drawing and descriptions based on the Workshop Manual.

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
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, pre-77 at least, so the side-fill gearbox can also be filled from the cabin. However 77 and later cars have a different console which may need to be pulled forward to access the bung, not a trivial task.

**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:**

04 January 2018
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. 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 harness joins the main harness, or at the manual switch) AND at point C also where the harness joins the main harness.

This picture shows the yellow wire from the manual switch coming out of the main harness. In this case it is joined to a yellow/red going into the gearbox harness as it is from a 4-synch car, a 3-synch would have another yellow here going to the vacuum switch and relay sub-harness. Insert fuse B 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:**

![Electrical diagram of overdrive system](image)

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-sync, whereas on the 4-sync the rear crossmember and back of the gearbox has to be dropped as well. *Image from Moss Europe* Incidentally the 4-sync removable panel is shown the wrong way round by Moss, the hole for the gear lever is towards the rear, not towards the front as here.

3-sync: The main reason for this picture was to show how the cover is moved backwards when a 4-sync gearbox is fitted to the earlier car, but 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, which has been tack-welded in place.
For information on the 4-synch switch see here.

Reversing Lights

Hover over a wire to confirm the colour

Note 1: Late UK cars seem to have a subdivision of the green circuit with its own in-line 35 amp fuse supplied by the white/brown (ignition relay) circuit feeding things like heated rear window, indicators, heater fan and tach, which leaves the original green circuit fuse (2nd one up in the four-way fuse block) feeding things like reverse lights, stop lights, washers, wipers, and circuits associated with the seat belt warning lamp and time delay buzzer. Note 2: The bullets for the reversing light earths also contain the wired earths for rubber bumper (and 1974 North American with chrome split rear bumper) number plate lights. Note 3: The junction for the two reversing lights is done with a sealed connection (arrowed below) under the off-side light, and not with bullet connectors. This is because the connection to the light units is with a plug and socket instead of with tails as is the case with all the other lights. A bullet connection between three wires all from the
same harness would be pointless.

Location of the reverse light and OD switches on a 3-synch gearbox ...

... and a 4-synch (in this case a UK rubber-bumper 74.5 to 76) gearbox:
Chrome-bumper cars (both 3-synch and 4-synch) have the dipstick for gearbox oil level, rubber-bumper cars have the side level/filler plug. 77 and later models have the same switch arrangement as earlier 4-synch, but different wiring to cater for the gearlever-mounted manual OD switch.

OD/reverse light switch and spacer. It's always been said they are fibre and there are two per switch. However Vee's OD switch spacer (here) is copper and there is only one. Most suppliers show it as fibre, and only one (as does the Parts catalogue) but Brown & Gammons shows the reverse light switch spacer as fibre and the OD spacer as copper, the same part as the master cylinder banjo washer.
Vee's reverse light switch and spacer. One fibre, thinner than the copper OD spacer above, smooth all over so not squashed down by the switch.

4-cylinder OD switch and spacers. Two, different sizes and thicknesses, one the same as Vees copper spacer the other slightly thinner.

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 for access to the OD switch at least. These images
are from Moss Europe but contain a couple of errors. The plate and trim ring above the 4-synch are not correct - the 4-synch has a small cover plate that goes to the front of the hole in the tunnel, putting the gear lever towards the rear of the slot, and the trim ring is circular. The lozenge-shaped trim ring is used on the 3-synch box, with a similar shaped base on the gaiter. The gear lever does come up towards the front of the slot in the removable panel on the 3-synch.

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, but 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, which has been tack-welded in place.

4-synch: The much smaller removable panel, with the hole for the gear lever positioned to the rear, and not how Moss show it in their drawing above. You can just get to the switch wiring with long-nose pliers with this panel removed, unbolting the removable crossmember so that the tail of the OD rests on the fixed cross-member gives a little more room. However whether this is enough for OD switch replacement I don't know. The reverse light switch should be easier to get at from below with channel-lock pliers, as it is lower down and faces sideways.
Gearbox Switches

OD/reverse light switch and spacer. It's always been said they are fibre and there are two per switch. However Vee's OD switch spacer (here) is copper and there is only one. Most suppliers show it as fibre, and only one (as does the Parts catalogue) but Brown & Gammons shows the reverse light switch spacer as fibre and the OD spacer as copper, the same part as the master cylinder banjo washer.
Vee's reverse light switch and spacer. One fibre, thinner than the copper OD spacer above, smooth all over so not squashed down by the switch.

4-cylinder OD switch and spacers. Two, different sizes and thicknesses, one the same as Vees copper spacer the other slightly thinner.
Switch actuation: 4-cylinder - round shaft, notch under the switch in the reverse and 1/2 plane, with a smooth transition at it moves to the left to activate the switch in the 3/4 plane. This gearbox uses selector lever 22B 386 and isolation switch plunger 22B406.

V8 with OD on 4th gear only - the same notch under the switch in the reverse and 1/2 planes, rising quite sharply as the shaft moves to the left and the 3/4 plane. It also appears to be flat on the upper side, which is the 3rd gear side, to release the switch if that gear is selected. Not visible but it has to be rounded on the lower side i.e. for 4th gear to keep the switch operated. This gearbox uses selector lever 22B 726 and isolation switch plunger 22B 727.
**Overdrive - LH-Type**

**LH type without ignition relay (68-76 and V8):**

On cars with the dash-mounted manual switch to protect the most wiring insert the fuse in the white wire at A where it connects to the back of the switch. On cars with the column switch - to avoid cutting wires - insert it at B where the gearbox harness joins the main harness below the pedal box.

**LH type with ignition relay - UK (77-on):**
On cars with the gear-lever mounted switch to protect the most wiring a fuse can only be inserted at A where the gearbox harness joins the main harness.

**LH type with ignition relay - North America (77-on):**

A fuse inserted at A will protect both the OD and the TCSA circuits, this is probably where the gearbox harness joins the main harness. However there is also position B: In the wire from the inertia switch a single fuse will protect the OD, TCSA and fuel pump. But a fault in the OD or TCSA wiring will also cut off the fuel pump, so it is better to use two fuses - one in each of the wires coming from the 4-way bullet connector at B.

This picture shows the yellow wire from the manual switch coming out of the main harness, joined to a yellow/red going into the gearbox harness. Insert the fuse here. *(Image by David Farrar on the MGOC Forum)*
Note: For a few months from late 76 to Feb 77 the original gearbox Overdrive switch operating in 3rd and 4th was used plus an additional TCSA (Transmission Controlled Spark Advance) microswitch operating in 2nd and 4th. Wiring these two switches in series allowed the TCSA i.e. vacuum advance to be enabled in 4th gear only whilst Overdrive was still available in both 3rd and 4th. In Feb 77, possibly due to unreliability or cost considerations, the microswitch was deleted and the Overdrive switch arrangements changed to operate in 4th gear only, feeding both the TCSA and Overdrive. With this arrangement the output of the gearbox switch fed both the Overdrive manual switch and the TCSA solenoid directly, so OD was only available in 4th gear.

The location of the gearbox Overdrive and reverse light switches. This is a UK rubber bumper 74.5 to 76, but the switches are the same on all four-synch gearboxes:
Showing the much smaller removable panel on top of the 4-synch tunnel (right) compared to the 3-synch, so you will probably have to lower the rear crossmember and back of the gearbox as well. *Image from Moss Europe*

Incidentally the smaller removable panel is shown the wrong way round by Moss, the hole for the gear lever is towards the rear, not towards the front as 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, but 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, which has been tack-welded in place, with a filler-strip.
4-synch: The much smaller removable panel, with the hole for the gear lever positioned to the rear, and not how Moss show it in their drawing above. You can just get to the switch wiring with long-nose pliers with this panel removed, unbolting the removable crossmember so that the tail of the OD rests on the fixed cross-member gives a little more room. However whether this is enough for OD switch replacement I don’t know. The reverse light switch should be easier to get at from below with channel-lock pliers, as it is lower down and faces sideways.
With the panel removed you can just get at the switch wires (arrowed) with long-nosed pliers. You need to remove these wires from the switch to be able to pull the solenoid bullet connector up far enough to part or reconnect.
The spacer lifts the coil up, so the plunger is pulled upwards when the coil is energised. Without it the plunger is as likely to be pulled downwards as upwards. However without any of the case fitted, there is almost no magnetic force on the plunger when the coil is energised and it doesn't move at all. With the outer case and bottom cap fitted the plunger moves up slightly as shown. But when the top cap is fitted there is a very strong attraction upwards. You can pull the plunger most of the way out of the bottom, and powering the coil will pull it all the way in and against the top cap with a real smack. It has to resist 400-420 psi of oil pressure in the 4-cylinder OD, and 510-530psi in the V8.
Plunger and ball, small O-ring arrowed, which prevents oil escaping down the inside of the solenoid, and leaking from the cover. The slot in the plunger prevents air-pressure or leaked oil pressure resisting the movement of the plunger. When the plunger presses the ball against its seat oil cannot flow from the inlet to the outlet of the top cap, the pressure rises at the inlet, and OD is engaged.
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 ball when on its seat, which would result in pressure loss. The large O-ring prevents oil escaping down the side of the solenoid, which will leak past the cover.
In the released position the ball and plunger should be pushed back so releasing oil pressure. With a sound small O-ring the plunger is unlikely to fall back under its own weight, which is why - apart from possibly the first time the coil is powered after the car has been driven - you won't hear any noise from it, unlike the 3-synch solenoid. If the plunger 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) and you get a distinctive 'pulsing' sensation. However under normal circumstances the plunger comes back at least 2mm when the solenoid is released, giving a clear path through the valve, as can be seen here.

O-ring set (MS&C)

Solenoid coil, with earthing spring. Flat on Bee's removed coil on the left, whereas opposite sides should be bent up to form a spring, as with the new one on the right.
Fuel Pump and Overdrive Fusing

Damage to the V8 rear harness inside the boot. The fact damage is visible here shows the short must have occurred either in the pump or closer to it than this point. Damage runs all the way back through the rear harness and into the main harness, through that back to the ignition switch, and from there on the brown down to the solenoid. This has happened to both my roadster and V8 before my ownership. The roadster is still using the original wire so presumably wasn't damaged too badly, the V8 has had a new wire run in (brown, the blue is a wire I added for the rear fog lights). It also shows why fuses must be as near to the supply as possible. If there had been a fuse near the pump then it would have prevented the damage from this short in the pump, but if the short had happened in the rear harness under the car the fuse wouldn't have blown and the same damage would have occurred in the rest of the wiring.

The bullet connector near the RHD pedal cover where the two white wires from the main harness join the white wire to the rear harness and the pump. Note the heat damage to the pump wire on the right of the connector, insert the pump fuse here. On 77 and later the white wires from the main harness are white/brown, also there is a fourth wire - also white/brown - which goes into the gearbox harness for the overdrive circuit. You can take both the output wires into a new 4-way bullet connector and insert a fuse between the two 4-ways, but if one circuit blows the fuse it will stop the other working. Better to use one fuse for each. North American spec cars are wired
differently as they have an inertia switch in the pump circuit, and the OD wiring is different, see the main text. (Image by David Farrar on the MGOC Forum)

V8 Pump and Overdrive fuses: They should be installed as close as possible to the supply where a unique wire can be accessed. I've inserted them at existing spade and bullet connections which avoids cutting into wiring. It is also reversible - should anyone want to! I had to put the V8 overdrive fuse in the engine compartment as that was the first place I could use existing connectors as it has the manual switch on the column stalk with a multi-way plug connecting to the main harness. On the roadster with the manual switch on the dash I have put the fuse on the back of the switch using spade connectors instead of bullets. When I had a major overflow from one of the V8 carbs the close proximity of the two allowed me to cross-connect them so I could use the overdrive switch to turn the fuel pump on and off!
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 Leacy Classics)

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 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

![Overdrive Sequencer Relay Schematic](image)

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

![6RA Relay with Electronics and Fuses](image)
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.