

A-PDF Page Crop DEMO: Purchase from www.A-PDF.com to remove the watermark



Clutch

Last updated 01-Jan-2012

[Bleeding](#) [Bore Sizes](#) [Clevis Pin Wear](#) [Clutch Change](#) [Flex-Hose](#) [Fluid](#) [Master Cylinder](#) [Pedal Return Spring](#)
[Release Bearing](#) [Slave Cylinder](#) [Links](#)

NEW NEW NEW [The sectioned MGB at the Heritage Motor Centre Museum, Gaydon](#) NEW NEW NEW

Bleeding

Recently changed all the V8 clutch hydraulics. Only the m/c was bad (leaking back) but decided to change the hose and slave while the system was down. So many people have complained that the clutch is a pig to bleed - worse than the brakes (and they are bad enough) that I wondered if there was a better way. What about reverse bleeding it some how so the air was pushed in its natural direction rather than straight down? In fact, what about **filling** the system from the slave?

My Gunsons EeziBleed came with two pipes for draining the slaves into jam-jars - a narrow bore that fits the rears and a wider bore that fits the calipers and the clutch. I discovered the larger bore tube is also a snug fit on the bit of pipe that protrudes through the cap that screws on the m/c during normal bleeding, so used it to connect the cap to the clutch slave, which was dangling down on its flex pipe. I connected the Gunsons bottle to a spare with just 10 lbs in it, checked that fluid wasn't spurting out everywhere, then opened the slave bleed nipple. Stand by the clutch m/c, which has the cap off, looking and listening. After a few seconds I hear some gurgling then see clear golden liquid slowly rise up the sides of the m/c. When it reached about half-way I got back under the car to close the bleed nipple and disconnected the air and the Gunsons tubing. Got my faithful assistant to pump the clutch while I measured the travel and compared it with the measurement I had taken before I started. It was spot-on, or possibly a fraction more - looking good. Gingerly try the clutch with the engine running, and the biting point is just where it should be.

What's the bleeding time (as the surgeon said to his pupil)? About five minutes.

Bear in mind that if you use this method without replacing the slave you could push any debris that is lurking in it up to the m/c. However you may be able to get away with it if you flush the system through with clean fluid by pumping the pedal, then drain it again before refilling with fresh fluid from the slave as described above. I haven't tried it, though.

Update August 2004: This simpler method using the same principle of reverse bleeding is based on a posting on the [MG Enthusiasts](#) MGA Bulletin Board by Ian Pearl in Ireland which came to me via Dave Dubois:

Connect a bleed tube from the clutch slave to the front right brake bleed nipple. Make sure the brake master is fully topped up and the clutch master has room for more fluid, removing some if necessary. Loosen both brake and clutch bleed nipples (you may find that the bleed nipple on the clutch slave only needs the slightest turn as it can be quite loose fitting). Pump the brake pedal twice. Check the brake master fluid level and top up, check the clutch master is not close to overflowing. Pump the brake pedal three more times and tighten up the nipples. This is a reverse bleed and can be done single handed. Check your clutch operation after this and repeat if necessary. Finally correct the level of both masters.

Note that it is probably advisable to close one of the nipples before each up-stroke of the pedal to avoid drawing air from the tube into the brake system. It would also be preferable

that this was the brake nipple, to avoid drawing air past the threads as well. Remember that if you have pushed fluid out on the pedal down-stroke, that needs to be replaced by fluid from the reservoir during the up-stroke, but the by-pass hole is only uncovered when the master piston has fully returned. Therefore the fluid has to be sucked past the master pressure seal, which can only happen by developing a negative pressure in the line, hence the risk of pulling air back into the line at the slave bleed nipple.

Updated October 2006 and November 2009:



I've seen several comments that if you push the slave piston all the way back into the cylinder, and clamp it there while you are bleeding normally with the pedal or Gunsons on the master cylinder you don't get the problem of trapped air. A nice idea as the piston is normally not at the bottom of the cylinder bore and so there is fluid and the potential for trapped air behind it.

But it shouldn't be necessary for conventional bleeding because if you look inside the cylinder you will see that the bleed hole is drilled along the join of the cylinder and back walls at the top edge, cutting away an arc about 3/8" wide, rather than just being a small hole like the fluid entrance has, and the cylinder is also tipped up slightly in that direction (unless the car has a marked nose-down attitude). In theory this ought to be required for reverse bleeding as you are trying to push air out of the inlet port which is halfway down the side of the cylinder. But practical experience shows that it's much easier to bleed the clutch using reverse bleeding than conventional, **without** pushing the piston back. This treatment can be useful though, to push air that has gathered in the loop of pipe at the top of the engine compartment back through the master and into the reservoir. You do have to be careful **after** pushing it in though, if you simply let it go the spring in the cylinder will tend to push the piston back out again, which can pull air in again past the seal, the seal only being effective in one direction. With the piston pushed in you (or someone else) should operate the clutch pedal to push the piston back out i.e. while you are still attempting to restrain it by hand.

Update June 2007: An acquaintance has just bought a non-runner, one of the problems being the clutch went to the floor with no resistance. The master was full, but when opening the slave bleed nipple just a gurgling and a few drops of liquid came from it when the pedal was pumped. So first I tried the October 2006 tip of wedging the slave piston all the way into the cylinder but nothing changed. So then we siphoned the fluid out of the master (to prevent it overflowing) and connected the bleed nipple to the right-hand caliper to try the August 2004 tip. They are the same size so this was easy. Gentle operation of the brake pedal (do it too quickly and you will blow the pipe off one or other of the nipples) got fluid flowing, and we kept pumping until the clutch master was full again. This was a 1978 with the large plastic brake master reservoir so there was no risk of lowering the level too much and then having to bleed the brakes. Did up both nipples, the clutch pedal now had normal pressure, and the slave push-rod was moving the normal 1/2" or so. Started it up, selected reverse with no grinding, and the biting point was about mid-way i.e. where it should be. So eminently successful, and easier than using the Gunsons to reverse fill/bleed, the only thing to remember is to remove some fluid from the clutch master to begin with.

Bore Sizes

MGB and V8 master and slave bore sizes differ as follows:

MGB M/C: 19mm
 MGB slave: 32mm
 i.e. a ratio of 0.594:1.
 V8 M/C: 17.8mm

V8 slave: 25.4mm

i.e. a ratio of 0.701:1, i.e. more slave movement for a given pedal movement, which seems a little odd as the V8 clutch should be heavier than the 4-cylinder. Ironically the V8 uses the same master and slave as some Midgets.

Clevis Pin Wear



Bee's clutch has always engaged near the floor in my ownership. Looking at the pedal, m/c push-rod holes and the clevis pin there was obvious wear (see pics). I swapped the clevis pin with the brake as a short-term measure, which showed negligible wear, and it improved things a little. Since then I have often pondered what to do about the pedal (the other two items are easily replaceable). Fully welding and re-drilling? - Maybe tricky without a pillar-drill. Over-drilling and using a bigger clevis pin? - I'd have to over-drill the push-rod, and any replacements, as well. Over-drilling and inserting a sleeve? - Where to get the sleeve? Or filling the worn part with weld and filing it out? - Would roughness cause accelerated wear in a new clevis-pin? Eventually the replaced clevis pin wore as well and again engagement was closer to the floor than I would like.

I decided on the last option - if I have to replace the clevis pin from time-to-time then so be it. But first I measured the wear on all three items. Using a good push-rod I reckoned the diameter of the holes in pedal and push-rod should be 0.316" - mine were 0.368" in both. The diameter of the clevis pin at the split-pin end was 0.309" but where it contacted the push-rod it was 0.299" and at the pedal was 0.292". That wear added up to a total of 0.13". Considering that the pedal has a leverage of some 4:1, that means about 0.5" of extra travel at the pedal pad.

I MIG-welded up the worn side of the hole gradually, filing it out from time-to-time while I could still get a small file in what was left of the hole, which also let me fill in any cavities between 'lumps' of weld.

It only took a couple of hours to dismantle, get a reasonably smooth and complete hole, and reinstall. And even though I still need to get and fit new clevis pins (replacing the worn one in the brake as well) clutch engagement is noticeably higher than before - close to that of the V8 which doesn't seem to have any visible wear. Well worth it.

Updated August 2008: Note that any mechanical wear at the slave end i.e. push-rod, clevis-pin, clutch arm etc. is compensated for by the design of the hydraulic system. It is, after all, designed to take account of wear in the release bearing which can be at least half an inch, any wear in the other components is miniscule by comparison.

Clutch Change *June 2008*

About a year ago a friend bought a 'barn find' (actually garaged for four years) 78 GT for a song which only took pump points cleaning and clutch bleeding to get going, even passed its MOT. However the clutch seemed to be slipping a bit although only in 4th and had a high biting-point, so that was obviously on the way out. 12 months on it is much worse, slipping in all gears now, and I was game for the challenge. Bought a B&B clutch kit, checking that the release bearing was of the bonded type and not the pinned ([see below](#)).

Dismantling was straight-forward enough - until it came to the nuts holding the rubber mounts to the chassis rails! I left the carbs and alternator on the engine but removed the air-cleaners and put paper bungs in the cab throats. I removed the distributor which enabled me

to remove the starter from above (although possibly only the top bolt into the bell-housing needs to be removed, the bottom bolt could be left in and the motor left attached to the engine). Note these two bolts have different threads, one coarse as it screws into alloy and the other fine as it screws into steel. Whilst removing the solenoid operate connector the spade broke off the solenoid - repair number one. And when removing the servo hose (which needed replacing) I had to cut through its servo hose clamp as it had seized solid. The oil-cooler pipes were a pain - why is it that it is the adapter that always comes loose from the block first and not the pipe union? It means you have to get another big spanner or something (I wedged a screwdriver between the flats and the back-plate for the rear pipe) to undo the pipe union. Taped up the block fitting to stop debris falling in. Wrap some paper round the oil filter and head to stop oil dripping out, and prop the ends of the hoses up high for the same reason. I left the oil-cooler in-situ (and hence that end of the pipes) as it was underslung like a V8, also the diaphragm, but removed the radiator. This isn't strictly necessary with a late model with the forward-mounted radiator as there is more than enough room to get the engine forward to clear the first-motion shaft, and if you are worried about hitting it you can put a board in front of it. But it had been fitted on the wrong side of the diaphragm and I wanted to correct that, and in the event I would have had to remove it anyway as will become clear. Only one of the studs on the exhaust manifold sheared, but I had bought a full set as a precaution. Decided to pull the rack as it was going to be hard enough to get at the engine mounting bolt that side anyway. Easy-peasy with the track-rod end taper cracking scissors, although the clamp bolt in the UJ and the rack shaft needed a bit of persuasion.

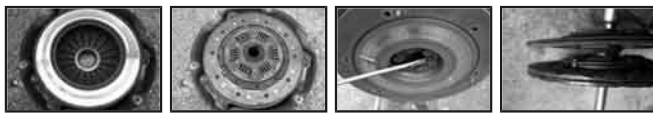
But those mounting nuts! They fought us every inch of the way, despite releasing fluid, WD40, undoing them a bit then working them back and fore and so on. Space is **very** restricted, you can only turn them half a flat at a time. Fortunately I had a slim ring-spanner that I could get on, an open-ended would never have done it. They were so tight I was having to bash the other end of the spanner with a lump hammer to get them to move at all, which lying on my back under the car and working above me was extremely hard work. Keith (the owner) could only be there occasionally due to work commitments, but fortunately one of his free periods coincided with this so he was able to help by pulling on a rope running under the car (forwards for the one side, rearwards for the other) tied to the free end of the spanner while I lay underneath moving the spanner half a flat at a time. We got the first one off but the 2nd was even harder! It was so stiff after a while the rubber part of the mount was twisting, which meant the nut didn't undo so much, sprung back when he released the rope, and I couldn't get the spanner on the next half-flat. Eventually I drilled a small hole through the edge of the bottom metal plate of the mount and the chassis bracket with the intention of putting a pin in the hole to stop the mount twisting, but in the event the drill snapped as it broke through and did the job anyway. After that it was relatively straight-forward (but still a lot of pulling on the rope) to get the nut the rest of the way off. I did loosen the two front nuts and bolts that hold the mount bracket to the engine front plate, but there is another bolt underneath that and there is no way of getting to that until you remove the mount from the bracket, which I didn't think I could do with the engine in the car (unlike the V8). The only other way I could see of releasing the engine was to lift the engine to 'stretch' the mounts, then cut through the rubber or chisel it off the plates to release the engine, then grind the bottom plate of the mount off the chassis brackets. Fortunately we didn't have to go that far, as it would have meant another trip to Leacy for new mounts (but see below). Just to get that far took half a day, and as it was getting on for tea-time we decided to leave it there, with the engine ready to do a 'Playtex' i.e. lift and separate next day.



Next morning I was on my own again. Assembled the hoist, wheeled it up to the front of the car, only to find that even with the arm at it's fullest

extent it didn't even reach the front of the engine! I didn't think removing the front bumper would have given me enough movement even though the rubber bumpers are pretty thick, so I had to push the hoist in from the side, and even then it only just reached over the rocker cover with about an inch to spare (thick cloths over the wing to prevent damage from the pump which was also in the way!). Slung a tow-rope through the eye in the hoist, down between the alternator and the block behind the front mount brackets and in front of the sump, up and through the eye again, then down the back of the engine and under the back behind the sump, and tie off. Started jacking up and tested the 'twang' of the front and rear parts of the rope - it's important to lift the engine so that it will be as square as possible to the bell-housing as they are parted to avoid damage to the first-motion shaft, and it seemed fine. Before jacking up any more I removed the top two bell-housing bolts while I still had the space, there was another one a bit lower down on the left, but a space below that where it seemed like there should have been another, and another space on the right below the starter. These were undone using a combination ring/open-ended spanner, the ring is at a slight angle, and I fitted it to the bolts the 'wrong' way round so the arm of the spanner was angled forwards instead of backwards. That left just the two bottom bolts which I had checked were free but retightened, so that as I jacked the engine up to clear the mounts from the chassis rails it lifted the gearbox with it and they remained together, the bottom bolts holding the bottom of the joint together, and the forces pressing the top of the joint together even though the bolts were out. You need to jack it until the bell-housing reaches the tunnel, or nearly so, which is why the top bolts are best undone first. Once up far enough a trolley jack under the forward part of the bell-housing jacked up a little bit more just so as it is taking the weight of the gearbox, then you can undo the bottom bolts. A bit of a pull and the joint parted, staying nice and square so confirming the engine was correctly balanced.

Now came another tricky bit - because the hoist was in from the side, and the front wheels at least only go back and fore and don't pivot, I couldn't easily pull the engine clear of the first motion shaft. I had to tie a rope to the engine and pull it back (i.e. towards the front of the car) as far as I could, tie it off on to the bonnet slam-panel (hence removal of the radiator required anyway), then get under the car and drag the wheels of the hoist sideways a bit, then pull on the rope a bit more, drag the wheels a bit more and so-on until the clutch cover-plate was free of the first motion shaft, then I could jack the engine the rest of the way up to clear the top of the wing, and pull it backwards away from the side of the car. Once clear of the car I lowered it onto a saw-bench for some stability but still left the hoist taking most of the weight. Phew! Not bad going, but still took a couple of hours to get that far.



Undid the cover-plate bolts, but it stayed where it was, the diaphragm spring pressure

should have pushed it off at least part of the way, but I had to lever it off the dowels. It wasn't jammed, it was just that it was so badly worn there was virtually no spring pressure left on the friction plate! The cover plate was badly scored, the friction plate being down to the rivets that side, but fortunately not quite as worn the other side although the raised pads had vanished from that side as well. No blueing or cracking from excessive heat from slipping, a very slight but even wear mark the full width of the flywheel, and even though at first sight there did seem to be a ring where the rivets had been it was only a polish mark and not a groove. Some good news, at least.



A useful set of instructions with the

clutch describing things to check (like same size etc. as the old parts), clean (like the greasy film off the rubbing surface of the cover plate), and most importantly that the new friction plate fits over the splines of the first-motion shaft! Cleaned all the old friction material dust off the flywheel, slotted the friction plate onto location tool, and the plate and tool to the flywheel. Offered up the new cover plate and fitted the bolts, this time there was probably about 1/4" gap left to the flywheel when the bolts started taking up spring pressure. Mindful of people having fitted the friction plate the wrong way round (the flywheel side should be marked as such) I took the cover-plate off again and doubled checked. I wasn't able to fully torque them up (25-30 ft lb) as I needed to stop the flywheel turning and decided it would be easier to wait until Keith came by again than rig up something myself (rope fed through a plug hole to stop the piston reaching TDC is one method I have read of). Unhooked the spring clips holding the release-bearing to the fork, carbon still visible above the edge of casting so still plenty of life left, but certainly not worth leaving. There was quite a bit of really thick black grease/oil at the bottom of the bell-housing, but with the bearing off I could see there wasn't a leak from the oil-seal, so just checked the bolts on the plate the seal sits in for tightness. The clutch kit includes a little tube of grease so smear some on the pins of the release bearing and fit that to the fork and refit the springs.

Time to get the carbs and exhaust manifold off to drill and retap for a new stud. Used a small drill first to check it was in the centre of the old stud at both ends - a little bit of side drilling required to square it up, then through with the correct size, taper tap, plug tap, screw in stud with double nuts and job done. When I came to refit it with a new gasket I found the same thing had happened as to the tubular V8 manifolds in that it had warped, and the outer holes on the manifold were closer together than the holes in the head. I fitted one, then tapped a screwdriver down between the centre branch and its adjacent stud to spring that a little bit, then between the outer branch and its stud to spring that as well, and got the other outer bolt in. Smears of Hermetite red on one face of each joint for the intake (there are no less than eight joints!) and bolt them up. The HIF are convenient in that the link pipe that feeds fuel from the front carb to the rear helps to keep them together and all the linkages in place. Cleaned up the studs on the mounts as best I could and worked a nut up and down each one with copper grease until they turned relatively easily.

Keith arrived again, just in time to hold the flywheel while I finished torquing up the cover-plate bolts. More clutch grease on the nose and splines of the first-motion shaft and the splines of the friction plate, then hoist the engine to clear the wing, push it over the engine compartment following the tracks made in the drive when pulling it out, and lowered it to be in line with the first-motion shaft. Tied off the engine again while we kicked the legs of the hoist sideways, then gradually released the rope and fiddled with the height to line it up. One very useful tip is just before the end of the shaft enters the hole in the cover plate feel with a finger to check the clearance is the same all round, and when you start moving the engine onto the shaft check the teeth on the flywheel are square with the bell-housing when viewed diagonally downwards from each side. Get the same alignment of flywheel to bell-housing all the way round and the engine **has** to be square to it as well as at the correct height and sideways alignment. I don't know whether we were particularly lucky, but just turning the crank pulley nut while pushing the engine forward, then giving it another push, and it went right on! I did see a recommendation that if you jack one rear wheel, put it in gear, you can use the rear wheel to turn the first-motion shaft into alignment. Personally I think it is easier to turn the crank pulley - put it in gear as before but this time make sure the rear wheels aren't going to turn i.e. lock the first-motion shaft in place, while you turn the crankshaft into alignment. We didn't put it in gear i.e. the shaft was free to turn, maybe we were just lucky, or maybe the grease on the nose and splines of the shaft helped. Bolted up the bottom of the bell-housing, lowered the jack, and lowered the hoist to get the mounting

studs into the slots. This was a bit tricky as they were about 1/2" too far back. I probably should have disconnected or slackened the engine restraint tube on these models, but with a bit of pulling and levering we got them in. Fitted the locating plates, washers and nuts under the chassis mounting brackets - another fiddle as you can only get a couple of fingers up from below and one in from the side, and they did up a lot easier than they undid. Then it was a matter of refitting things that needed two pairs of hands while Keith was still around like the exhaust (new sealing rings, metal side down as that was how they came off), I had to disconnect the front restraint strap as it was holding the exhaust in the wrong place. The rack needed a bit of persuasion again to get the splines inserted, check the notch in the shaft is aligned correctly with the split in the UJ i.e. there are the same number of splines each side. We chocked the back of the UJ against the firewall while tapping the rack casing with a hammer and block of wood, and it went in easier than it came out. With the starter I tried soldering another spade to the stub of the broken one but the rest of it broke away as well, what it is made of goodness knows. Fortunately the ends of the solenoid wire were sticking up a bit so I was able to wrap a short piece of wire round that with a male spade soldered to the end. Refitted the starter with me underneath supporting it while Keith got the top bolt in, then the bottom. End of day 2.

Then it was a matter of fitting oil cooler and gauge pipes, wiring and plugs to starter and alternator, carb throttle and choke cables and fuel pipe, heater tap control cable, and hoses. Both the bottom hose clips would only tighten up so far 'before jumping a tooth', as it were, no spares to hand, so they would need replacement. Cut the new servo hose to length and fitted that, with a spare clip that I **did** happen to have to hand to replace the broken one. Refitted the distributor, removed No.1 plug and turned the engine with my thumb over the hole to find TDC of the compression stroke, and see where the rotor was pointing. It was in the correct place (about 2 o'clock) so on went the cap and leads. Reconnected the battery and tried cranking, OK so the starter repair is good for the time being at least. Tried starting it and it was trying to go, but wouldn't catch. Wandered round to the front of the engine to ponder why and I noticed I had left the paper bungs in the throat carbs! Removed those and it fired up nicely, ran it for just a few seconds as I hadn't put any water in yet because of the hose clips.

Nothing for it now but to bite the bullet and test the clutch! So light it obviously wasn't doing anything, but as I was on my own I couldn't operate it and look at the slave push-rod at the same time. I'd had the slave off at one time while I removed the starter, and even though I put it back once the engine was out the spring inside the master would have pushed the piston out quite a way moving the release arm with it. Couldn't see why it would need bleeding as I hadn't opened the hydraulics, but nothing else to be done. Tried from the top down first of all using a Gunson's EeziBleed on the master - no change. Next I tried reverse bleeding with the Gunsons connected to the slave (having first removed some fluid from the master to prevent overflow) - again no go. Then I tried removing the slave and reverse bleeding it while hanging off the hose i.e. air at the highest point by the hose connection but again no-go. Then I tried manually pushing and releasing the piston. Lots of gurgling from the master so I thought 'Ah-ha' but it did it every time I pushed the piston back, so I guessed it must be sucking in air past the seals as the spring pushed the piston back out rather than drawing it down from the master. Then the slave started dripping fluid, so that was it another trip to Leacy's and more of Keith's money spent, also got a new flex hose. On my return I couldn't shift either the nut holding the pipe on the chassis end of the old flex hose, nor shift the hose or its locking nut on the chassis bracket. Keith said to leave it and we would deal with it when we had to. The problem is that the hose ports were tapped differently old to new (and yes I did move the bleed nipple from its shipping place to the correct place) so when the hose was tightened the only way the slave would sit on the bell-housing was by twisting the flex hose. Fortunately by fiddling about with various

copper washers I was able to line it up. Tried reverse bleeding with a pipe connected between it's nipple and the right-hand caliper nipple while Keith pumped but there still didn't seem to be any pressure on the pedal. Next took the slave off the bell-housing and tried again this time with it hanging on the pipe. This time when I pushed the piston back I could feel the pressure from the fluid as I forced it back into the master, but again once attached Keith said he still couldn't feel any back-pressure. However when he pumped it I could see the push-rod moving, but only by about 3/8" and not the 1/2" or so I have seen before. So I tried, and it was indeed very light, but I thought I could feel some back pressure. Nothing for it to start the engine and tentatively try selecting reverse - and it went in as quiet as a mouse! Not only that the biting point was where I would expect it, so it seemed to be working properly (thank goodness!), just very light!

After that it was just a matter of finishing off the hoses, fill with water, retime, and take it for a test drive - perfect, very light and as smooth as silk. The top hose seemed to be dripping by the thermostat housing, so we removed it, spotted what looked like a pin-hole just on the hose side of the clip, so cut that bit off and refitted as there is room to do that with that hose. One of the heater hoses was also leaking at the heater even though the clip was tight (I'd put some Waxoyl on the worm 'threads' which usually helps old clips but not in this case), I had a new clip that size so replaced it and solved that. 15 minutes to replace the clutch, 2 1/2 days dismantling and reassembly!

Flex Hose

Came across an interesting snippet in the July issue of Enjoying MG. Someone touring Iceland had a persistent starting problem that was diagnosed as a 'lazy starter'. Subsequently the clutch flex hose split, which was of the braided steel type. It was only after replacing that with a conventional hose, when the starting problem got much worse, that they realised the gearbox earth strap hadn't been reconnected after clutch work and the starter had been earthing via the clutch hose! This caused lots of heat which eventual caused the rubber inner to fail.

Now quite apart from the fact that steel braided brake hoses are one thing (the pressures in the clutch hydraulics simply shouldn't need it the same kind of resistance to ballooning) if the person doing the initial starting problem diagnosis had done a proper volt-drop test on the starter it should have been immediately obvious there was an engine/gearbox earth strap problem.

There is also a point of view that says steel braided brake hoses are dangerous unless changed on a routine basis irrespective of mileage and condition. The normal reason for replacement of non-braided types is fine cracks developing in the outer covering, which occurs well before the hose becomes dangerous. With steel braid covering you can't see the condition of the rubber, hence the need for routine replacement regardless of condition.

As I relate above to remove the flex hose from the slave you must undo the pipe nut that connects the end of the steel pipe to the top of the hose, then undo the large nut securing the hose to the bracket, both of which are well concealed above the bracket with poor access when the engine is in. Although they are standard sizes you really need the special spanner for the pipe nut that is like a ring spanner with a slot cut in it for the pipe to pass through as it will grip much better than a standard open-ended. Only when the hose is at the very least loose in both places will you then be able to remove the hose from the slave cylinder. The alternative, which is much easier if all you need is access to the slave, is to disconnect the clevis pin on the slave push-rod, **slacken** the hose in the slave, remove the slave mounting bolts, then unscrew the slave from the hose. Refitting is the reverse of removal, but be

aware that the start for the hose thread in a **different** slave will almost certainly be in a different place in the slave casting, which means the hose is almost certainly bound to be twisted when fully tightened and the slave remounted - which isn't acceptable. You **may** be able to get away with extra copper washers to pad it out, but maybe not.

Fluid

No reason not to use the same fluid as in the brakes, so [see here](#).

Master Cylinder

Types

Description

NEW Types Added January 2010



Originally part number AHH 6553 with a metal cap on 3-synch cars, it was changed to BHA 4667 on Mk2 cars. This had the reservoir canted over slightly to give better clearance to the North American dual brake master but was fitted to all cars. Probably got the plastic cap about this time. The V8 master BHA 5217 has the same appearance as the Mk2 4-cylinder item but a smaller bore.



There was a third variant AAU7152 for 77 model year cars which has two concentric rings on the cylinder part nearest the mounting flange, or another (unspecified) identifying mark on the other side of the reservoir, but which is otherwise externally identical and is fully interchangeable with the previous type, it is the internals that differ

which is important when buying a repair kit.



AHH6553 still seems to be available from the usual suspects, but the latter two and the V8 item are not. GMC 1007 seems to be the recommended replacements for the 4-cylinder, which has a cylindrical plastic reservoir and what looks like a standard cap.



The V8 replacement item seems to be GMC 1011, which has a square plastic reservoir but what looks to be a different cap. However there have been reports that GMC1011 is too tall to fit into the space available, or if it **does** fit you can't get the cap off! These reports date from 2006, but several MG suppliers do currently (2011) specify this master, so maybe the problem has been resolved. Hans Duinhoven has recently installed one of these and space doesn't seem to be an issue, even on an LHD where the clutch master is closer to the 'corner' of the engine bay than on RHD.

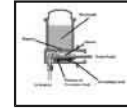


However some suppliers seem to have a reproduction version with a large black cap which fouls the brake master - with the American early i.e. unboosted dual brake masters at any rate. Moss Europe has three types - the correct early type, specifying GMC1007 for the Mk2 version as well as a cheaper repro. Moss America uses it's own part numbers so you can't tell what you're getting, but they also have three types so I'm guessing they are the same as Moss Europe and their 180-695 is the GMC 1007 (even though it only says 'plastic cap'). The repro from both sources could be the one with the large black cap. Victoria British are showing part number 7-512 for Mark II cars with a plastic

reservoir and a large plastic cap, which almost certainly is the one causing the problem. However the large cap seems OK with the later boosted dual masters which give more clearance.

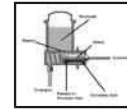
Description

Typical problems can be a low biting point, baulking when selecting a forward gear, grinding when selecting reverse, the car creeping forward with ever more urgency while the pedal is held fully down, fluid leaking down the pedal, or a slipping clutch. The first three can be caused by [wear in the pedal to master cylinder linkages](#), too short a master pushrod or [air in the hydraulics](#). The fourth by a faulty primary or pressure seal on the piston, the fifth by a faulty secondary seal, and the sixth by too long a master push-rod as well as a [worn out clutch](#). A couple of diagrams may help to explain these:



Initial movement of the piston by the pedal pushes fluid up into the reservoir via the bypass hole and doesn't disengage the clutch. As soon as the primary seal covers the bypass hole further movement of the piston pressurises the fluid in the lines and starts disengaging the clutch. As the primary seal continues moving forward and clears the

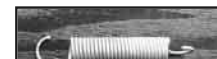
bypass hole fluid is free to run into the space behind it from the reservoir, the secondary seal prevents fluid leaking out the back of the master and down the pedal. If the primary seal is faulty pressurised fluid can leak back past it into the space between the two seals and back into the reservoir, which causes the clutch to progressively re-engage even though the pedal is fully down. A ripped seal may not pressurise the fluid to release the clutch at all, the pedal will be very light in this instance (which can also be caused by [air in the hydraulics](#)). If the secondary seal is faulty, fluid, even though it is not under pressure, will leak back towards the pedal linkage and run down the pedal.



The final problem happens when something prevents the piston coming back far enough for the primary seal to clear the bypass hole. Releasing the pedal should release the pressure, and any expansion or contraction of the fluid in the slave or pipes from heating or cooling while the clutch pedal is released flows via the master cylinder and the bypass

hole to or from the reservoir as appropriate. The problem comes when the piston hasn't come back far enough for the primary seal to clear the bypass hole. If the fluid should heat up and expand in this instance it can't flow into the reservoir as it should, so the fluid pressurises which tends to release the clutch which can cause slipping at high loads in 4th. This can be caused if a master push-rod that is too long has been used, or some other problem is preventing the pedal coming all the way back. A similar thing can happen if the slave hose starts delaminating and acting as a one-way valve. The correct length push-rod, together with the master piston and pedal returning all the way, should put the holes in the end of the push-rod and the pedal in line so that the clevis pin can be slid in, and there should still be a little free play at the joint. If the pedal has to be pushed forwards to line up either the master piston isn't coming back far enough or the push-rod is too short. If the piston has to be pushed into the cylinder form them to line up either the pedal isn't coming back far enough or the push-rod is too long.

NEW Pedal Return Spring Added May 2010



Towards the end of the Wye Valley run this month there was a loud twang and something hit my foot, and looking down I could see

one of the pedal return springs had broken. It's for the clutch (much more likely than the brake since the pedal goes down much further stretching the spring more, and may well be used more often anyway). This has happened before (albeit many years ago) and has happened exactly as before, which is near the bottom of one of the loops. As this is well away from where the spring contacts either the pedal or bracket I can only assume it is being twisted or bent back some how, rather than pivoting freely, so I'll have to look closely at how the replacement operates. Interestingly this time I couldn't tell from the pedals which one had broken as both were at or very near their fully returned positions. Last time was before I had taken the wear out of the pedal to master linkage and that was a good inch or more down without the spring. I opened out the last turn of the spring to make a new loop, but it was stretched quite a bit when fitted, so I opened out the spring bit by bit until it just returned the pedal all the way. It can go through the body tag in one of two ways, and attached the 'easy' way (hooked in from the more open tunnel side) it did seem to be bending the wire as the pedal was operated whereas inserted from the other side it moved smoothly in the hole, so that was the way I left it.

Release Bearing

4-cylinder V8

NEW *September 2009:* **Tip:** I've just read about a problem whereby someone was about to remove the engine to have a look at what almost certainly looked like a release bearing problem, but decided to try bleeding it instead, and seems to have solved it! He had just replaced the clutch but not the release bearing (and was roundly criticised for not doing so). For 20 miles it was OK, then started getting noise and vibration from the pedal when the clutch was pressed, and the biting point was very low. The opinion from several was that the release bearing was breaking up, which sounded like the cause of the noise and vibration to me as well having BT, DT. But I pointed out that if the clutch was otherwise still working that wouldn't account for the low biting point as the clutch is self-adjusting for any wear at the clutch end, and air in the hydraulics or possibly a problem in the mechanical linkages at the pedal end is the likely cause of that. I'd like to think it was that comment that led him to try bleeding first, and so far at least it seems to have been successful. Thinking about it afterwards the resistance to the flow of hydraulic fluid in the clutch system is quite marked, and a spring inside the slave piston is continually pushing the linkages that end together taking out any free play, being back-filled by fluid from the reservoir, so tending to resist any light movements of piston, release arm and release bearing. But get some air in the slave, say, and there is nothing to stop them rattling back and fore, so generating noise and vibration, just like air in a hydraulic suspension damper allows rapid movements of the wheel/axle instead of damped.

4-cylinder: The carbon release bearing has a ring of carbon in a steel housing. The carbon ring when new is 5/8" thick, and in theory all this is available to wear down before replacement is required (see [Update April 2008](#)). But that is only if the release bearing is co-axial with the cover plate, as all but about 1/4" of the carbon is recessed into the housing. If the two are offset or the release arm is loose on its pivot the housing of the bearing will start rubbing on the cover plate, and that will wear down, probably accompanied by noise and vibration when the pedal is down, eventually to break up completely, which is what happened to Bee's in 1994 and also [here](#).

I fitted a roller release bearing when I changed Bee's clutch in 1994 as it seemed a good idea at the time. Then I started reading about premature failure because the bearing is constantly spinning, unless a pull-off spring kit is fitted at the same time. Spoke to my

supplier who said they had never heard of such a problem (well, they would say that, wouldn't they?). In fact the slave cylinder contains a spring that is continually pushing on the clutch arm to take up any mechanical play that may develop between clutch operations and so is pressing the release bearing against the cover plate. Presumably the pull-off spring is designed to be stronger than this, which will introduce a little play, and so also has a stop to control just how much play there is. Unfortunately this has the side effect of lowering the biting point, which may already be low to begin with if the [pedal to master linkage is worn](#).

As time went by I realised how foolish I had been. Did I seriously think that I would leave an old bearing, roller or not, in the clutch the next time I changed it? Of course not. Do carbon throw-out bearings regularly and repeatedly fail before the clutch needs changing anyway? Not if you don't ride the clutch they don't.

Fast forward a couple of years, and I now have a wittering that sounds just like a dry bearing as the clutch pedal takes up the free play. Doesn't do it when the clutch is fully up or in the process of disengaging.

Would I fit another one? Would I 'eckerslike (i.e. NO!).

See also [this article](#) from [British Automotive](#).

10 years later my own release bearing is still wittering, no worse, no better, so it looks like just one of those things. Despite my comment above about not using a roller bearing again I subsequently discovered the V8 uses them as standard, and so I believe does the Sherpa van and Midget 1500, so they can't be all bad. And the V8 at least doesn't use a pull-off spring. I have a [clutch replacement](#) coming up soon on someone else's car and given the reports about the carbon bearings I **was** considering using a roller bearing again. However given that the after-market roller for the 4-cylinder doesn't seem to be available any more (and neither is the standard item for the V8 at the moment) and indications that the carbon is OK again, then I probably will stick with carbon.

Update April 2008



I've recently read about problems

with carbon release bearings where the carbon ring disintegrates after only a short usage. The problem is said to have been caused by a change in manufacture from having the carbon ring bonded into the housing, to having it pinned. Relative movement between the two causes the carbon to crack around the pin and fall out. This seems to be what has happened to a fellow owner this week after only 8000 miles of use. However there were no pieces of carbon left in the housing or in the bell-housing, just a fine dust spread all around, indicating extreme wear rather than breaking up. There is a roll-pin in one side of the housing, is this the culprit? The good news is that a contact at the MGOC has confirmed that there **was** a problem, caused by pinning, but that current stock shows no sign of a roll-pin and seem to be OK in use. However these are Quinton-Hazell and not the Borg&Beck that failed here, who may still be using the roll-pin, so beware when buying either type. *June 2008* Bought a B&B clutch kit which included a bonded bearing, so B&B are OK too. However when I rang the supplier beforehand he said they had both types and I could have whichever I wanted. The one I got came boxed in a kit, so maybe it is the separate ones they have that are both pinned and bonded. I said to the counter person I wanted a bonded, and he said "you certainly wouldn't want a pinned" so he at least seemed to be aware of the

problem.

Update November 2008



Another entrant for the chamber of horrors from Bob Muenchhausen, although in this case it had done 75k over 17 years.

Update November 2009: I've recently noticed that it has stopped 'withering', how long for I don't know (see 'The dog that didn't bark' by Sherlock Holmes). Changes not being good, I hope it isn't an indication of impending complete failure. The roller bearings didn't seem to be available from the MGOC for many years, but they have recently started advertising them again. That, and experience of a number of people of the rapid break-up of carbon bearings does now leave me in a bit of a quandry - what to do next time, and if I decide to stay with a roller with my old one or a new?

V8: The V8 uses a roller bearing as standard, which on the face of it has been NLA for many years. However it consists of a carrier plus a bearing, and it is this assembly - GRB224 - that is NLA. As long as you still have the carrier and it is sound the Midget bearing GRB207 will fit the original carrier.

Slave Cylinder *Added January 2009*



This is the very mucky 4-cylinder slave cylinder replaced as part of the clutch change above. Not only was the outer boot filled with fluid, but also black gunge and some crystalline substance as well. The outer boot with its clamping ring can be levered off the end of the cylinder, to reveal the outer end of the piston. As well as the large clamping ring on the outside of the

boot which seals that from external dirt and moisture, there is a smaller square-section ring around the narrow internal tube of the boot which seals to the push-rod as well. The outward face of the piston has a conical depression to correctly position the push-rod. Although the central tube of the outer boot will locate the push-rod approximately centrally as it is inserted, if there were no other method of positioning the push-rod it would move about and probably slide to one side of the piston as any pressure is applied to it to operate the clutch. Not only would this distort the rubber boot and cause premature splitting and ingress of water and dirt, but it would cause rapid wear between the piston and cylinder wall, causing the piston to get 'cocked' in the bore more and more. This would also mean the hydraulic seal was no longer square to the bore, which would also reduce its effectiveness. The depression in the face of the piston means that as soon as any pressure is applied to the push-rod by the piston the push-rod is automatically positioned in the centre of the piston for best alignment and minimal wear.

Holding the cylinder upside down and tapping the edge of the cylinder at an angle should move the piston out of the bore until it can be gripped and pulled out the rest of the way. Behind the piston is the inner hydraulic seal - flat side facing outwards, cupped side towards the fluid, and behind that a locating disc on a spring. If gentle tapping fails to move the piston a thin steel rod could be inserted through the hose port and used to push the piston out. However if the piston is stuck the end of the rod will be bearing on the plastic disc that locates the hydraulic seal, so hitting or pressing on this too hard could distort the disc and so affect the seal in future. In the plastic disc there are three small holes to allow fluid through so that fluid pressure is applied to the seal itself to spread it and press the edges against the cylinder walls for a good seal.

The hydraulic seal is 'loose' in the cylinder (unlike rear brake slave seals which fit over the end of the piston and into a groove) and so are a doddle to remove and replace. The plastic disc and spring keep the seal pressed up against the back of the piston and so keeps it 'square' to the bore to give a seal. The spring also has the effect of pushing the piston out, which pushes on the push-rod, clevis pin, release arm, release bearing and clutch cover-plate to take out any mechanical wear in any of these components. Contrary to popular opinion physical wear in these components does **not** contribute to a low biting point or grinding in reverse like similar wear at the master cylinder end does (see '[Clevis Pin Wear](#)' above). Also any crankshaft end-float movement towards the back of the engine will act on the release bearing, arm and so on to push the piston back into the bore, which without this spring will mean that the first bit of pedal movement might be required to take up the free play created if the crankshaft has subsequently moved back towards the front of the engine, which again will give a low biting point but more importantly an inconsistent one which will lead to stalling and over-revving.

With all components out examine the bore. I'm pretty sure both piston and cylinder are all-alloy. This cylinder had corroded quite badly causing cavities towards the open end, but also had visible corrosion further down. Only the bottom inch or so felt smooth and looked clean. If you are desperate to keep the original component then you could have it bored out and sleeved, possibly. In this case honing wouldn't have got rid of the cavities, and any more aggressive treatment would increase the clearance between piston and bore, affecting the alignment of the piston and hence the hydraulic seal without sleeving. Unless the car is off the road long-term for comprehensive restoration a new slave is really the only sensible way to go, and guaranteed, one way or the other.

Reassembly is the reverse of removal. Make sure all components are scrupulously clean, the three holes in the plastic disc clear, and the spring fitted to the plastic disc. Drop the spring and plastic disc in the cylinder disc upwards, then the hydraulic seal on top of that flat face upwards. Then insert the piston with its conical depression facing upwards, and fit the external boot over the lip of the cylinder. If you have removed both hose and bleed nipple, make sure the hose is refitted to the port that faces towards the front of the car when installed, and the bleed nipple faces across the car and is uppermost. Note that new slave cylinders come with the bleed nipple in the 'wrong' port. Originally I wondered whether that is where it is needed for its original application if it is used on vehicles other than the MGB, or whether it is just to save a groat or two on packaging. However looking in the cylinder you will see the hose port is in the back wall, whereas the bleed port occupies an arc at the angle where the back wall joins the side walls. This latter port will definitely be more effective in getting all air bubbles out of the cylinder than the other one, so I guess it is just down to packaging.

<http://www.mgb-stuff.org.uk/>

© Copyright 1999 to 2011 LT. Answers Ltd.