The Mk 1 Consul, Zephyr and Zodiac Owners Club Technical Manual

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Contents

Bodywork

Initial examination - bolt on parts and sills

Any car will rust if neglected and the Mk1 is no exception. Whether you are looking at a prospective purchase or attempting a repair job, a close examination of the rot prone areas of the Mk1 body is essential.

Figure 1 – Common Bootlid Rust (1)

Rust in the bolt on panels – i.e. wings, doors, bootlid, front panel etc. will usually be obvious, though a previous owner may often have attempted to disguise it with filler. A common giveaway when you examine the exterior of a car is the loss of the piping in the joints between the wings and front and rear panels. If the joint has been filled, it usually covers rot.

People are often ruled by their first reaction to the apparent condition of these outer items. Think carefully before you accept or condemn a car on this basis. Remember that since the wings are bolt on, it is not that difficult to get them repaired by an expert, or yourself if you are competent enough. The same goes for the doors. The front and rear panels usually rot on the flange which joins them to the wings, and this is not too difficult to repair. However, it will all cost money, but it is not as serious as rot in the load bearing areas of the body.

You must now examine the underside of the car, preferably armed with a powerful light, a hammer or a screwdriver and a jack to lift the car up. When examining the underside, remember that undersealing can cause more trouble than it is meant to prevent, as loose areas of sealant can trap moisture and speed up the rusting process – especially over the years. Leaving aside the bolt on parts,

the rest of the Mk1 is of a monocoque construction, virtually every remaining part of the bodyshell being load bearing to some extent. It is especially important that the inner front wings, spring hangers, inner and outer sills, integral chassis members (in fact the last vestiges of separate chassis members) and floor must be sound.

Interestingly, the jacking points are usually the first part to disintegrate, being right behind the front wheels and right in front of the rears. The rust then spreads from the front jacking points into the floor under the driver and front passenger's feet, and from the rear jacking points under the back seat and into the rear of the bottom of the sills. Minor damage to the inner and outer sills can be cut out and new metal welded in. But if the rust has gone too far, or if there are signs of previous bodged repairs, the only long term solution is to replace the affected parts.

The silly part about this is that the jacking points themselves are not important. If you carry a scissor jack or a bottle jack they are not needed at all. Indeed, a car with good floors and sills but without jacking points should pass its MoT (if you want one that is). However, a car with badly rusted jacking points will probably be failed in view of the probable indications for the rest of the car. There has been some inconsistency in the way members' cars have been treated on this issue. The jacking points are especially prone to rust because of their construction – there is no drain hole to let water out of the "V" shape which holds the box section for the car's jack. One should be drilled for new jacking points and then waxoyl or a similar fluid squeezed inside. If floors and sills are not yet badly affected, but you have rusty and broken jacking points, you should take initial steps by having rusty parts cut off and then treat the affected areas with an anti-rust product, even if you can't afford new jacking points.

Look out for:

1. Corrosion of boot floor in spring hanger area
2. Severe corrosion of front and rear jacking points and inner sills
3. Check for corrosion along the length of the front side members

Figure 2 – Severe Rear Floorpan Rot

Door Sill Replacement

A good Mk1 may only need slight repair to the outer and maybe inner sills. If corrosion has really set in, however, full sill replacement on a Mk1 is a far more complicated job than it would first appear. The panel is not flat or even uniformly curved like most other cars. It has many subtle curves. Therefore plenty of time is required if the job is to look just right.

Preparation before you do anything to a car (or in fact almost everything in life) is very important. Ideally you should have a good car to compare with or at least photos of one. Your own car should then be supported on level ground on axle stands so it cannot fall or rock about, and all normal safety precautions must be taken. Additionally, with convertibles, you may need extra supports along the cross-bracing underneath, to ensure that the hood frame pegs always meet up neatly with the screen rail. If you weld when they don't, you're stuck for good!

Before you cut or disturb anything, check the alignment of the doors, particularly at their bottom edge adjacent to the top of the outer sill. If necessary; remove the door trims, slacken the hinge bolts, and adjust the doors to get an even gap all round the door and along its bottom edge. This will provide the necessary reference point for lining up the new sill.

Ideally, front and rear wings should be removed; though it is usually enough to detach the wings at the attachment points in the rear in the case of the front wing, and the front vertical edge of the lower rear wing. The former has 3 bolts holding it, two reachable inside the kick trim beside the front passenger/driver's feet and the third under the wing through an inner wing seam. This is exposed and the bolt is usually rusted into the cage nut at the bottom of the wing and you may need to cut if off and repair the cage. The front edge of the lower rear wing has two bolts, hooked through a keyhole shape to an inner flange. Because of constant treatment from road dirt thrown up by the rear wheels, it is rare that you can do other than cut off and repair the wing afterwards. So, overall, it is better to anticipate the worst and expect to have to take the wings off.

When fitting new sills, cut off the old ones along the top and down each end. Finally, part the outer sill from the inner sill along the bottom seam where it joins the inner sill by drilling out the spot welds and thus avoiding any further uncecessary damage if the inner sill isn't too bad.
An angle grinder is probably the best tool to use for the removal operation; but remember to wear safety goggles and gloves, and don't forget that the sparks produced will ruin any glass in the firing line. They can also set fire to carpets or underfelt if it is not removed or protected, and any stray petrol around can be lethal.

With the bulk of the old sill removed, grind smooth all the edges that remain. The aim is to leave about half an inch at the top vertical face behind the doors which the new panel will then overlap. It is rarely necessary or desirable to replace the complete inner sill too, as normally rust only affects the rear and the lower edges. The part of the inner sill above floor level (the bit with holes in it) usually remains sound. Therefore, it is much easier to cut out any rusted sections and weld in new metal as required – flat section is OK. To replace the complete inner sill involves finding and drilling out all the spot welds along the edge of the floorpan; separating the inner sill from the door pillars and jacking points, which would require much more extensive bracing of the bodyshell to stop it twisting. Possible, but real "A" level stuff.

With the outer sill cut away, you must use that opportunity to repair any rot in the inner sill and check the fit. It will be necessary to mark the new panel and cut a section out at the middle top, where it has to fit around the centre door pillar (B post). If the sill does not sit flush with the doors, it will be necessary to bend the top flange in or out to get things level.

The top of the sill should be secured temporarily with self tappers, with the bottom flange clamped to the bottom on the inner sill with several pairs of mole grips. Before welding anything, check that the curve at the front of the sill matches the curvature at the bottom of the front wing, bending the sill if required.

The bottom edge of the sill on a Mk1 was not straight originally and should have a gentle curve. To ensure this is achieved, a block of wood and a jack may be needed to force the sill in to the correct shape. This is where you may well need to refer to another car if you can. When you are satisfied with the fit of the sill, and it is securely clamped and screwed in position (and don't do anything until you are sure) welding can begin. Start at the top with a few tack welds, and gradually join them up to make a continuous seam. The lower edge of the sill should ideally be spot welded as per the original, but normal gas or electric welding is satisfactory if neatly done.

The front edge of the sill must be welded where it overlaps the A post. Finally, perhaps the most difficult job is at the rear of the sill where it may be necessary to make up a new end closing plate. It is important to seal the rear end of the sill effectively to prevent the ingress of water and road dirt which will start the process all over again. Remove all the self-tappers after welding and fill in the holes. Then grind the welds smooth and apply a good coat of anti-rust primer.

The procedure above is similar for convertibles, but in this case, it is essential to remove the rear wings so that the sills can be properly secured at the top behind the two doors. Finally, don't forget to drill some drain holes in the sill bottoms and after painting it is wise to spray the inside surfaces (through the holes in the inner sills) with a rustproofing compound such as Waxoyl or similar.

Structurally important areas

One of the main areas is the support for the MacPherson strut front suspension given by the inner wings at the front of the car. These and the area around the top of the strut are very durable if compared to other cars. In fact, the strut top should never be a real problem. On highly neglected cars the edge of the inner wing nearest the captive nuts for the outer wing bolts may need attention – simply welding in a new return edge should be enough, but this will be rare.

What you should look for, especially when about to buy a car, is rust on the inner wing where it is welded to the metal tower used as a support for the strut and the spring. If you look under a front wing, behind the wheel, you will see that there is an additional metal tower of fairly thick plate. This is spot welded to the inner wing. On some Mk1s road dirt gets between the tower and the inner wing and begins a rusting process which can damage the inner wing (not usually terminally though). Look for tell-tale signs of rust (mosquito type bulges) along the vertical line to the strut top behind the heater box on one side and battery tray on the other. Inspect this area right down to the front side members under the bonnet.

If there is damage here, the car is devalued and could fail the MoT if it is spotted. To resolve this properly, the battery, heater etc have all got to come out, the rust has to be cut away, which may include drilling out the spot welds, new metal fashioned to fit, welded in and the weld joint ground flat. This is not an impossible job, but it is expensive on time, and thus can be expensive in monetary terms too.

Once you have sorted out the front suspension load-bearing areas, you will need to look at the rear. It is the spring hangers which are most important. These are the strengthened plates which are welded to the chassis side members and which hold the shackles for the rear leaf springs – and hence take the weight of the car and all the shocks from the road. On a saloon, you particularly need to check the rear spring hangers under the rear of the car at the back of the boot floor, either side. When rust is

terminal, the spring hangers will push through the boot floor. The rotting process is accelerated by a damp boot underneath the mat or carpet. Repair here involves jacking the body up carefully and ideally dropping the axle off completely. On a convertible, you also need to look at the front spring hangers which are more hidden by the extra chassis pieces and may suffer as a result.

Once the axle has been removed, you need to cut out all the rotten areas of the boot floor. This will include any spot welds to the chassis side members and between the boot floor and inner wing flange. If it is only the corner area of the boot floor that has rotted, you can repair it with a flat plate of at least 18 gauge. If more has gone you may need to contemplate a whole boot floor (if the car is worth it). Floors and spring hangers can be made by specialist panel makers.

To check for the spot welds, you may need to drill away, use paint stripper and/or a wire brush to get back to bare metal, and trace the round spot weld. Drill these out from the side you are going to replace – if you can get to it. You will probably still need a sharp chisel to separate the parts. This is a time consuming and awkward job but should try to cause the minimum amount of damage. This means allow plenty of time – nearly always more than you estimate.

At the bottom of the inner rear wing and the mudguard inside the boot there should be a flange which is spot welded to the boot floor. If, when you cut the rot out of the floor you find this flange has rotted away, then this must be repaired.

At the same time, you can check the condition of the U shape chassis members underneath the boot floor. These can be repaired if necessary. Then the new spring hangers can be welded in, or repairs made to the present ones. The floor can then be clamped in place and a couple of spot welds made to hold it there – to the flange, the solid part of the remaining floor and to the chassis members. Check everything marries up correctly. Whilst strictly speaking spot welds are right, gas, arc or MIG (the best) will do. You can now complete the welding of the spot welds or seams.

If you haven't decided to scrap the car yet, you can now turn your attention to the main floors in the passenger compartment. Usually you should be able to replace the rotted parts with small plates. This is fairly easy, but it does tend to leave a patchwork effect and may not perpetuate the flutes that were pressed into the original floors.

Cars with leaky windscreens will suffer more from floor rot in the front because there will always be dampness under the carpet or mat. Have you checked your car recently for this? If your front floors are rotten, you almost certainly need new jacking points and either a patch in the floor or a new floor section. The flutes will provide strength to a flat panel and will also help stop booming or drumming when driving along.

If you only have a small patch, you should still try to avoid welding the patch over any remaining rusty metal. All rotten metal should be cut out first. With a complete floor replacement section, you should lay the new section on the old, accurately scribe around it, then cut to leave half an inch overlap all round. You many need to drill out spot welds along edge of the inner sill, and along the front side member of the chassis. Also, cut off the jacking point with a cutter or angle grinder, but make a careful note of its original position.

Clamp the new floor section in place, using the other side of the car as a guide. As for the boot floor, put in a couple of welds to hold it, and check carefully everything is square and looks right compared to the other side. Then seam weld all round the edge on top and underneath to ensure all is watertight. Spot weld or seam weld the chassis back to the floor and weld on a new jacking point.

The rear floor sections can be approached similarly but seem less prone to rot. The place you usually need to repair is under the back seat – which you MUST remove when checking a car over, in the very corner where the floor joins the wheel arch. This can normally be repaired with a carefully bent up triangular plate, though a new jacking point and some making good around the jacking point may be necessary.

During the work described so far, you will have checked the chassis side members or rails and the front cross member joining them. The side members are Top Hat sections with the “brims” welded to the floors and inner wings. Damage to these is easy to repair with flat plates but because of this it is also easy to bodge. The most common area of rot is around the bumper bolts at the front of the car. Strictly, all the rot should be cut out, which would mean dropping the anti-roll bar. This should be done if you respect the vehicle and wish to keep it. For the MoT a flat plate properly welded over the area of rot is sufficient. Even if you do this, it would pay to sand blast or wire brush the rot back to bare metal.

Having repaired the side members, boot floor etc, drill holes through the floors or the plates over the top of the side members at the front of the car and pour in Waxoyl or engine oil or another anti rust solution.

Non-Structural Rot

Doors

Doors will rust along their bottom edges first, and are not too difficult to repair using new lower door skins if you can find them.

Figure 3 – Typical Door Rot and Repairs

To remove the old skin, cut along the door just above the swage line (in line with the bottom of the chrome strip on later cars) and grind away the edges of the skin to release it from the door. The frame can then be cleaned up and repaired if necessary. The skin is fitted to the frame by folding over the edges but great care is needed to avoid damage to the outer surface. The join along the middle of the door is difficult to make without causing distortion and ideally needs to be done by a professional.

This joint could be soldered up as no great strength is required but the metal would need to be spotlessly clean, or you could resort to rivets or self tappers (Yuk!) on later cars where the joint will be hidden by the chrome strip.

Bonnets

Bonnets often suffer from rust in the front corners, particularly on Zephyrs. Repair involves cutting out the damaged parts and welding in new metal, not forgetting to make a template and marking the positions of the badge holes so they can be accurately redrilled after the repair. Bonnets with bad rust along the rear seam or the reinforcing framework are hardly worth repair if a better second hand replacement can be obtained.

Rear Panel

The valance under the rear bumper tends to rust at the ends in line with the rear wheels, the shape forming as an ideal mud collector. Minor damage can be cut out and patched in the usual way, and there is the interesting possibility of using metal cut from the non-rusted part of a scrap boot lid to provide the complicated curves required. If the valance is really bad, then a new section will need to be found. To fit a new valance, you will need to remove the rear bumper complete with its brackets, secured by two bolts each side just above the rear spring hangers. Also, remove the rear stone guard bolted to the rear panel and unbolt (or more usually cut off) the two bolts each side which fix the back of the rear wings to the back panel. Offer up the replacement panel section, and after marking for half an inch overlap, cut off the lower part of the old panel just below the line of captive nuts for holding the stone guard. Screw and clamp the new panel in place, checking that it lines up with the curvature of the rear wings. After making the necessary adjustments, the new panel can be welded on, the joint can be smoothed over afterwards, and in any case, will be neatly covered when the rear stone guard is bolted back on.

Boot Guttering

The drain channel around the boot opening is vulnerable to rusting on the Mk1, particularly when the rubber boot seal deteriorates and acts like a sponge, holding water against the lip of the gutter. The best solution to this problem is to rip off the old rubber seal from the bootlid and fit the type of seal that clips to the gutter as used on modern cars.

The condition of the guttering should be checked carefully, especially in the corners and underneath where the boot hinge supports are welded on. A leaky rear windscreen rubber can aggravate the problems here. All rusted areas will need to be cut out and new sections made up and welded in – a tricky and time consuming process, but essential if you want a dry luggage boot. Check the fit of the bootlid frequently during repairs and all joints thoroughly. When the bootlid is removed don't forget the potential hazard of the energy stored in the boot hinge springs. One of these could easily take your eye out, or worse if it jumps up suddenly. Tie the hinges down with wire or remove them completely when there is no bootlid on the car. The fuel tank should also be removed and stored away from the car during any welding operations.

Boot Lid

If you are lucky enough to have a good boot lid without those tell-tale bubbles along the lower edge, and assuming nobody has got at it with body filler yet, then keep it in good condition with plenty of Waxoyl or other rust proofing fluid injected in the corners and the lower edge. If your boot lid is really bad with the outer and inner skins separated along the lower edge, repair may prove difficult and it may be worth looking for a better one (if you can find one). Removal of the boot plinth can be a long job, usually requiring the drilling out of the four awkwardly placed fitting screws from inside the bootlid, and much patience with the two bolts reachable after the lamps are removed.

Figure 4 – Common Bootlid Rot (2)

Wings

New or good second-hand wings are now hard to find. You might find some good ones imported from the Antipodes, but they will almost certainly require work to make them perfect. In many cases, it may prove more economical to repair your existing wings if they are not too bad. Probably best to consult a professional if you don't have the requisite skills to join curved sections accurately. Certain impossible to get panels, like convertible doors can be restored by professionals and their rear wings can be fabricated by adding an extension panel to normal saloon wings.

Figure 5 – Lower Rear Wing Professional Repair

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Brakes

On our cars, the steering, suspension and brakes are all of vital importance, perhaps more so than a good exterior and interior. Even if you put your car in for one or not, we know that the brakes must be in good condition to obtain a MOT, but there is a world of difference for what is acceptable for the test and the condition of a really good system. If your car has been off the road for some time, or it has just come into your possession I would suggest a full examination and rebuild, starting with the hydraulics.

Various problems can beset the hydraulic system, the most common of which is the absorption of water vapour into the brake fluid. A surprising point is that most of the water vapour is absorbed through the rubber brake hoses where it finds its way to the lowest points of the system – the wheel cylinders. Here it has a field day rusting the pistons and causing the cylinders to seize up with consequent loss of brake action. This problem can be overcome either by regularly changing the brake fluid – something that few people do – or changing to silicone brake fluid which does not absorb water. Although more expensive, this is the best course of action, especially for a car which is not used regularly because this fluid is less likely to allow cylinders to seize up.

So now to the rebuild. First remove all the cylinders for examination – yes, including the master cylinder! Give them all a good external clean with a degreaser and then remove the pistons from the wheel cylinders as in Figures 6 (Front) and 7 (Rear) below.

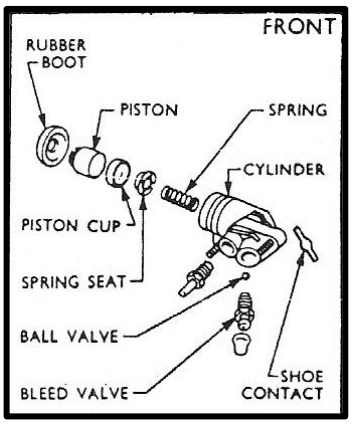

Figure 6 - Front Cylinder

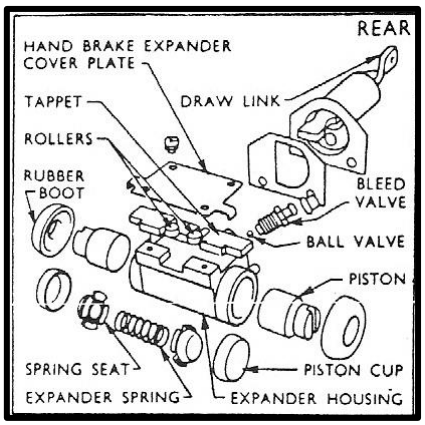

Figure 7 – Rear Cylinder

If any of the cylinders are stuck, a soak overnight in diesel should free them off, and if it doesn't then they are too far gone anyway. Once all the pistons and seals are removed, check the internal surface of the bores for signs of scoring or corrosion and replace if damaged. Also check the rear of the cylinders where the brake pipes fit for corrosion, bad threads and signs of cracking. Assuming the cylinders pass this test, they should be serviceable with new rubber seal kits installed. Give the cylinders a clean with a good brake parts cleaner, then install the new seals with a little rubber grease. Make sure the seal is the right way around, they are

tapered in section and bigger end goes in first. Fit the piston and rubber dust cover and put them somewhere clean and dry.

We now come to the master cylinder which is a little more complicated. After cleaning, the first job is to remove the stop light switch and the cap on the end of the cylinder (Figure 9 on the right).

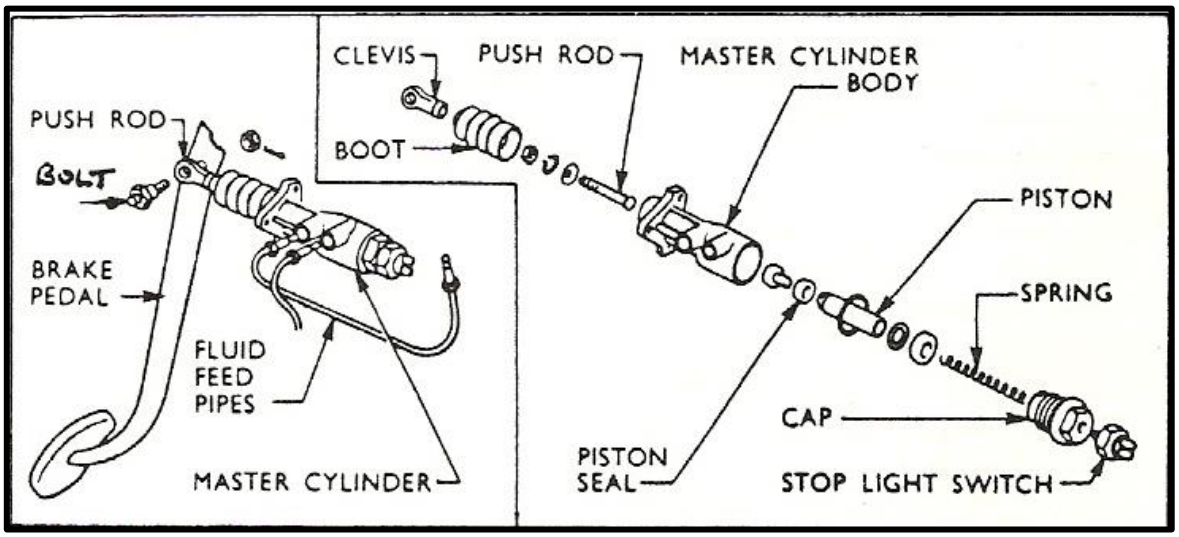

Figure 8 – Pedal and Master Cylinder

Figure 9 – Master Cylinder Exploded

This nut is always very tight and a good vice and well-fitting socket are absolutely essential. If you haven't access to a vice you will still need the socket and it will pay you to slacken the big nut BEFORE you remove the cylinder from the bulkhead. Once it is loose, remove the cap and spring. At the other end now remove the rubber bellows and circlip that holds the pushrod. All the internals should now slide out. Turning to the larger end of the cylinder, remove the main rubber seal with a small screwdriver, and the flat washer that is beneath it. Clean the inside of the cylinder with brake parts cleaner and examine for signs of scoring or corrosion, and replace if damaged (if you can find one!). Assemble the cylinder in reverse order using rubber grease on the seals, which should be fitted with their larger diameter facing the screwed end cap. Before fitting the end cap, pour some brake fluid in as this will make the job of bleeding the brakes that much easier. As mentioned earlier, the end cap must be tight, approximately 70 ft lbs, with a torque wrench or about the same as you would tighten a cylinder head bolt.

It is not all that easy to remove the master cylinder in the first place. Three hexagonal headed bolts hold it to the bulkhead, accessible from under the bonnet, and a special bolt and nut (See Figure 8 above) holds the push rod to the brake pedal – accessible with discomfort and a torch, from inside the car. Note that the bolt has its shaft off centre through the surface on which the pedal pivots. This allows adjustment of the height of the pedal off the floor by twisting the bolt before tightening the nut on it. You may need to adjust this when you replace everything. It is a pig to remove and often needs help with WD40 and a hammer.

Now that the hydraulics are finished, turn your attention to the mechanical side of things. Check that no oil or grease has been leaking from the hub seals and if they are leaking they will need to be replaced. Tell-tale signs are oil on the rear brake shoes or radial black grease marks on the front wheels outside of the hub cap. Replacement of the seals is another story but you may need to do that to avoid contamination of the brakes.

Clean the back plates with degreaser and make sure the brake adjusters are not seized, see Figure 10 below.

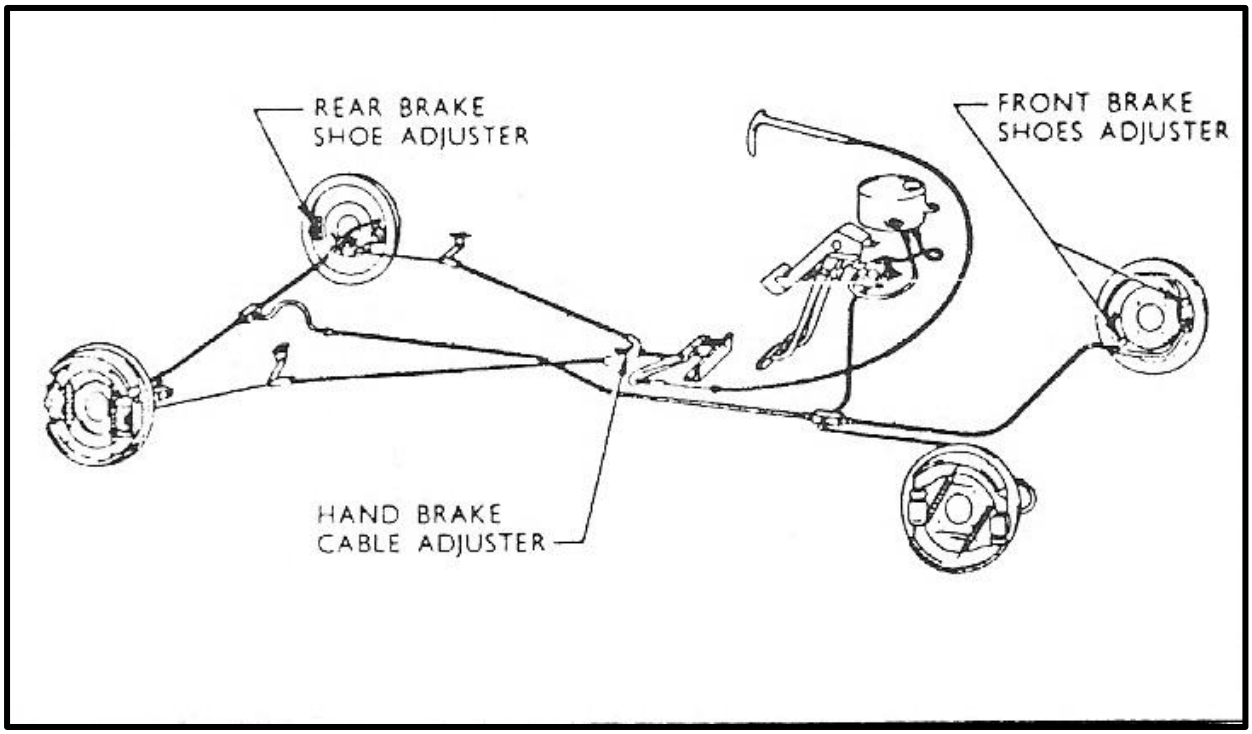

Figure 10 – Brake Adjusters

If they are seized, a little persuasion with a blow lamp should do the trick – but don't overheat any brake fluid around! Screw the rear brake adjusters right out and lubricate with non-seize compound, such as Copaslip.

Now dismantle the handbrake expanders on the rear wheel cylinders and check for wear, the most common faults here are:

1. The two little rollers which get a flat worn on one side and then refuse to roll. If worn, they must be replaced, but spares should present no problem as the same parts are used on the Rover 3.5 Saloon and Coupe models which were made until 1974. You may be able to get used rollers from a spare used rear cylinder off of a Mk1 and sometimes you can find the full handbrake repair kit at an auto jumble, eBay or a Club Swap Meet.

2. The system of rollers and wedges becomes gunged up with brake dust, and the bell-crank operating the lever which moves the wedges and be coated in road dirt and inhibited from moving. This is the part connected to the rearmost end of the rear handbrake cable.

Reassemble the expanders and rollers with Copaslip and now all the cylinders can be refitted. Connect up the system with a new set of brake pipes and rubber hoses and fit a new set of brake shoes as shown in Figures 11 and 12 below. The springs can be awkward to fit.

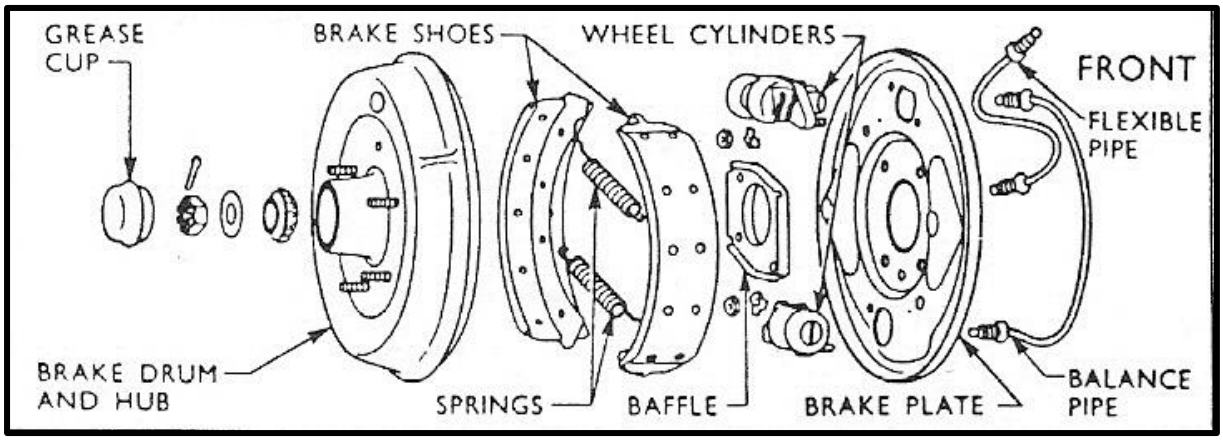

Figure 11 – Front Brake Drums Exploded

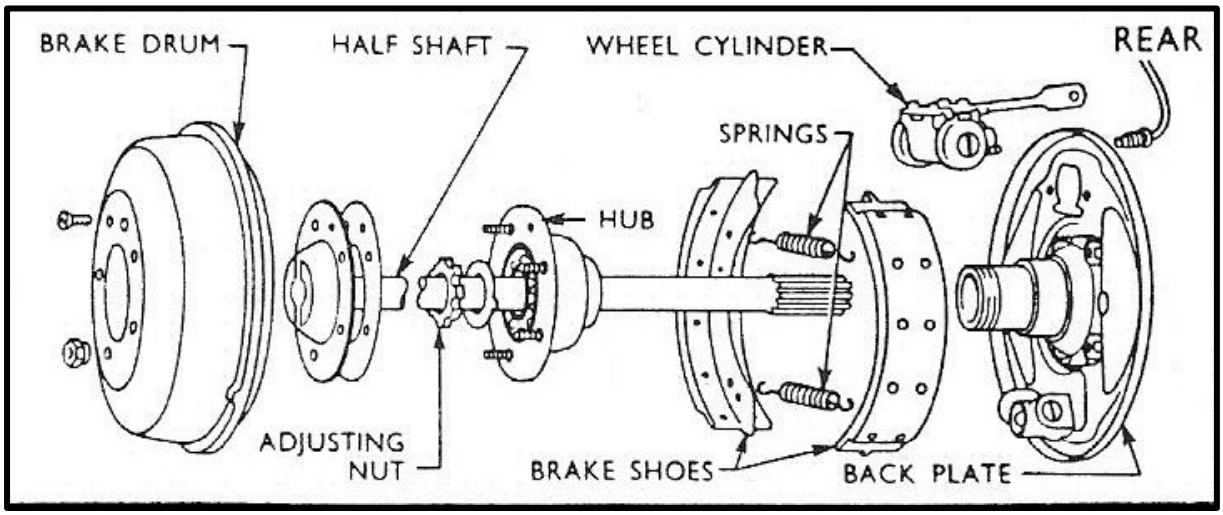

Figure 12 – Rear Brake Drums Exploded

Before refitting the drums, inspect them as they have a smooth inner working surface which the shoes grip on. There should be no scoring or rust. If bad, a drum should be replaced or at least skimmed by a machine shop to restore their surface. Fit the drums and adjust the brakes so that the linings are just binding. You should be able to feel the linings on the shoes dragging as you turn the drums by hand.

The next task is to bleed the brakes. Start by filling the reservoir with clean fluid from a sealed tin. This is most important if you are using conventional fluid, due the way it absorbs water. You will now need an assistant to pump the brake pedal and top up the fluid reservoir while

you attack the bleed nipples. Start bleeding with the longest pipe run, working back to the offside front which is the shortest run. Fit a rubber bleed tube to the nipple and place the other end in a jar to catch the surplus fluid. Open the nipple and ask your assistant to press the brake pedal once. Close the nipple and then ask your assistant to let the pedal go. Continue to do this until no more bubbles come from the pipe. Now move to the other rear wheel and repeat the process. Likewise do the same to the two front wheels.

A word of warning here. At no time reuse the fluid from the jar, even if it looks clear, as minute bubbles of air invisible to the naked eye will still be present. If you have to re-use the fluid, put it back into the tin, tighten down the lid and let it stand for 24 hours.

Back to the bleeding. Now check your brake pedal. If you are lucky it will be fine, with a clear resistance blocking movement beyond a couple of inches. If the pedal allows you to push it to the floor, even slowly, then clamp each hose with a brake hose clamp, in turn, until you find the one that improves the resistance of the pedal, then rebleed at that wheel or wheels. A good safety check once the brakes are bled is to ask your assistant to sit in the car and press the pedal quite hard, while you check all the pipes and connections for leaks.

If you now have the wheels back on you can check that the shoes are being pulled back by their springs and that the adjusters are set so that no wheel is binding. Having pressed the brake pedal a few times, check for binding by jacking it up and ensuring that it turns freely. There are two adjusters on each front brake drum and a single one on the rear. Before you reassemble the drums, take a look at what happens to the shoes when you turn the adjuster behind the brake plate. Once a front drum is on, ensure one adjuster is off sufficiently not to cause the shoe to rub, and adjust the other shoe until it just binds, then slacken off one notch. Do the same for the other adjuster and repeat for the other front wheel.

Ensure that the handbrake cable is slack when the lever is off and that the handbrake does not cause the brakes to bind. Adjust a rear adjuster on one side until the wheel just binds then slacken off just enough to stop the binding. Repeat for the other wheel.

Now make sure the brake pedal is at the right height off the floor, matching the clutch. The distance should be 6 inches from the top of the pedal rubber to the floor.

You can now try a road test. Go somewhere quiet and try the brakes gently a few times. See if there is any pulling to one side. If there is, try driving in low gear with your left foot putting pressure on the brake while you hold the throttle down. This will help to bed the brakes in which is sometimes necessary with shoe material. If the brakes still pull on a hard stop, you need to look at the adjusters again. If the steering pulls to the left on braking, you need to either slacken the left front adjuster or tighten the right front one. Look also for signs of the rear wheels locking. If only one locks, you should try tightening the other side.

The last job is to adjust the handbrake cable. It is most important to have adjusted the rear drums first, and the cable after – and not the other way around otherwise you will never get a good handbrake. First take up any excess slack in the rear cable at the equaliser, see Figure 13, at the back of the gearbox.

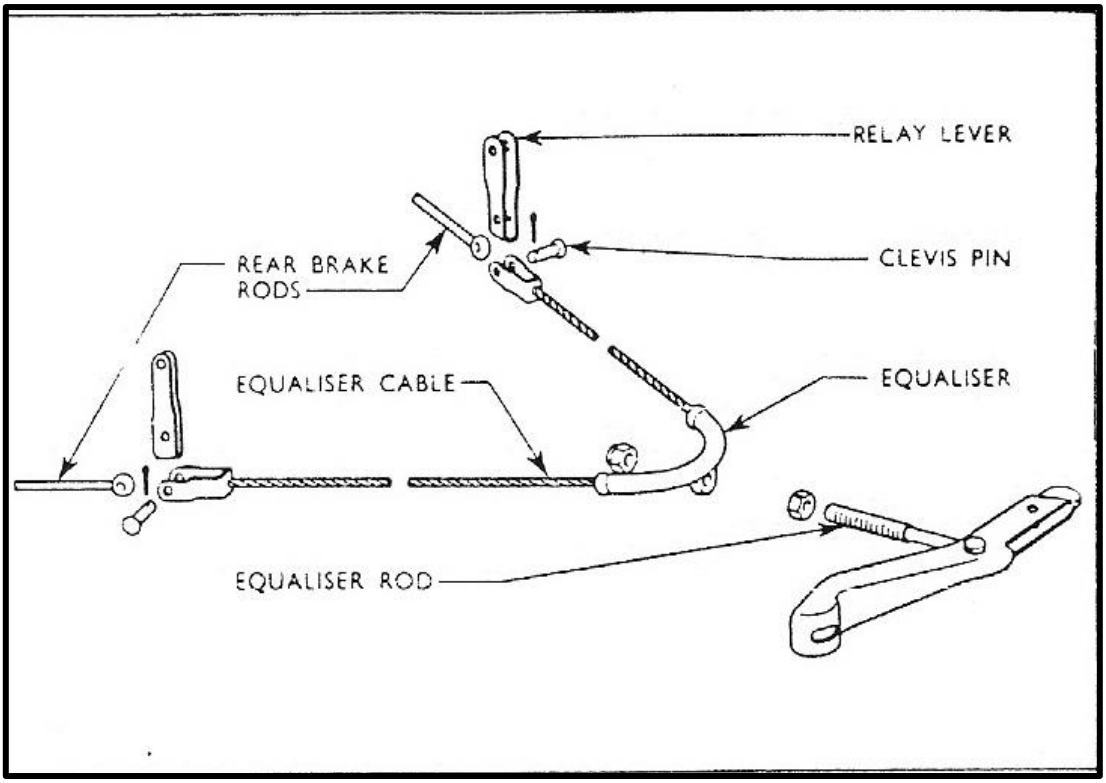

Figure 13 – Handbrake Linkage (Under car)

Then if the handbrake lever in the car still comes up too far, adjust the front cable at the other end of the equaliser lever, see Figure 14 below.

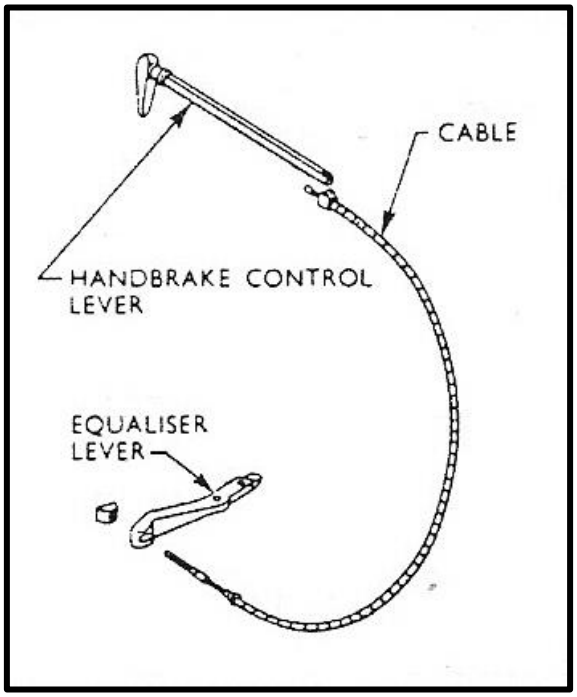

Figure 14 – Handbrake Cable

You should now have a set of brakes which will ensure that your Mk1 keeps its good looks in the event of an emergency stop! But more importantly, you will know that you and your passengers are travelling in a safe vehicle.

If you can't get the brakes to pull straight

Your local MOT tester might have a brake testing device and for a small fee should be able to tell you which parts of the brake system are operating properly and which are not. They may then be able to give you some reasons. If you did not have the drums off, you may have oil or grease on the shoes. Also, the shoes could be of unmatched types and require more bedding in. You may, perhaps not have adjusted things correctly. Finally, if you have a very late model Mk1, the "steady posts" fitted to the rear brake plates may not be operating properly. If you cannot fix things yourself, you must get professional advice. Either try one of the Club suppliers or another member who should be able to help or at least point you in the right direction.

Where to get the parts

There are brake repair kits available, either from one of the club suppliers, or eBay, or perhaps the next Club Swap meeting – you have to be prepared to search! Front and rear wheel cylinders are available, but be careful and wary of parts that might look like they fit, when in fact they don't. Girling part numbers (if you can get hold of them), with casting numbers on the actual cylinders in brackets are front 390320 (303200) & 390321 (303210) and rear 390120 (301200) & 390121 (301210).

Brake Hoses and Bleeding

When changing the brake hoses, you will find you should lose a lot less fluid after disconnecting the hose if you have wedged some clingfilm around the brake fluid reservoir cap to make it airtight and prevent the fluid flowing down the pipes easily. It will help if you have a remanufactured reservoir cap. Another tip if you are changing the front brake hoses is to change one at a time and bleed after each one. A last tip is to pump out a fair amount of the old fluid when bleeding until the fluid looks clean – this will reduce the likelihood of vapour lock.

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Breaking a Mk1 and Saving Useful Parts

Figure 15 – RIP Mk1 Consul Flatdash

Some people might consider it to be sacrilege to break up a Mk1, but the fact remains that to avoid costly remanufacture it is one way of keeping other Mk1s on the road. In many cases, it is now somewhat essential to have a donor car to provide the other one with those hard to get parts, or even non-existent ones. Breaking up a Mk1 is a job that is much more enjoyable with two, and sometimes essential to hold a spanner while you turn the socket, and certainly when it comes to removing an engine (especially a Zephyr or a Zodiac).

It all depends on what facilities you have available, but you should be able to take one apart in a couple of weekends (or one at a push). It is also vital not to cut corners. It is much easier to saw through the shackle pins when you are removing a rear spring, but where are you going to find replacements when you need them? It is probably better to burn the rubbers around the pins until they move - after removing the fuel tank of course. The latter and the straps are another useful part as is the sender unit within the tank. Another typical example of where folks cut corners is when the horn/indicator button wires are cut rather than disconnected. Anybody who has tried rewiring said assembly will understand. It just needs care to push the wires up the column while someone pulls the horn section away from the wheel - again two will find it much easier than one.

Having a few good tools will make life much easier too. It's no good trying to save useful parts armed with a cold chisel, stilsons and a pair of mole grips. Ideally you will need a set of open ended and ring AF spanners with a very minimum of 7/16", ½" and 9/16" amongst these, plus some good flat head and cross headed screwdrivers (not the ones you use as chisels!). Also, you should have to hand an

impact driver with a selection of heads, a set of Allen keys (especially if you want the steering box) and some pliers - long nose type for tricky split pin removal. Socket sets can improve things but are not in fact vital if you are patient and it is not often necessary to resort to nut splitters or ball joint splitters. If all bodywork is truly shot a pair of tin snips can help you cut metal away to get at things easily and even to cut badges out of panels for soaking and gentle removal later. The next problem is what to save?

Obviously if the bodywork is totally rotten there is no point in saving it - but try to bear in mind that it is possible to repair rusty panels with remanufactured parts, which can also be made to look extremely good. As a guide, most doors are not worth saving as fitting skins (if you can find them) to your existing doors is much easier than fitting completely different doors, as the doors to Mk1s can vary a lot in size and shape and it is better to repair the originals if you can. On the other hand, do not reject a really good door or inner door trim and look for good trims around the windows, particularly the Consul non-chromed type. To get these off the front doors you need to remove the quarterlight which has an awkward screw going upwards into the door by the hinge of the quarterlight frame. Remember the interior window trim on one side can be used as the exterior on the other side of the car and interior trims may be reasonable.

Use WD40 and remove by tapping gently with a blunt edge and hammer. Try not to bend the trim. Remember to check the door lock. If there is not much play in the star shaped wheel and the door shuts without play on the catch it is probably worth keeping the lock. You'll need a cross-head screwdriver for the four lock screws visible on the door edge, but long nose pliers and ingenuity to remove the lock crank from the lever connecting it to the inner door handle. Doing this means removing the door trim.

Remember trims can be pressed, dried out and the vinyl repaired and resprayed another colour. Like doors with rotten skins and bottoms, a bootlid that has fallen apart badly at the bottom seam is not worth the trouble of keeping. All the heavy gear - engine, gearbox, suspension, steering - is worth saving since it can all be reconditioned or often reused as it is. Especially important in this line is the steering box, more so if it is a Zephyr you are breaking since this is a common failure point. Be careful in their removal especially if there is pressure on the strong front coil springs, but front struts are also useful as long as their chromed pistons have not rusted.

At the rear, once the wheel and drum is off, half shaft removal is a matter of driving out the wheel studs (save them too) and pulling the shaft out. Save the rear brake shoes and any decent wheel cylinders (although reproductions are now quite plentiful). Brake master and clutch master cylinders can be reconditioned in most cases and should not be left behind despite it being a pig of a job to undo the eccentric bolt where the pushrod from the cylinder meets the pedal.

Other than that it is a case of the smaller items such as all caged nuts where front and rear wings bolt on, the gearshift lever spring and trunnions, the gearbox cross member mounting bolts (on later models inside large round holes in the chassis cross member covered by large round grommets), parcel shelf bolts (very useful size), all decent rubber grommets, chromed screws holding the screen trim, switch knobs, wiring looms, heater units especially the connection in the bottom hose and the radiator and heater valve. Don't neglect the wheels either, five stud wheels of those sizes are not so common now, especially the larger Zephyr ones.

Nowadays, parts for our cars are becoming scarcer, so whatever you decide to save will come in useful, even if you can't use it, there may be someone in the Club who can.

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Clutch and Gearbox

Symptoms and Problems

Clutch

Problems with the clutch are usually pretty noticeable. The main ones are slip, failure to free up (clutch drag), and judder.

Slip is usually due to:

- Wear on the centre plate
- Weak pressure plate springs, even on NOS plates
- Lack of free play on the push-rod, which is adjustable
- Oil on the clutch

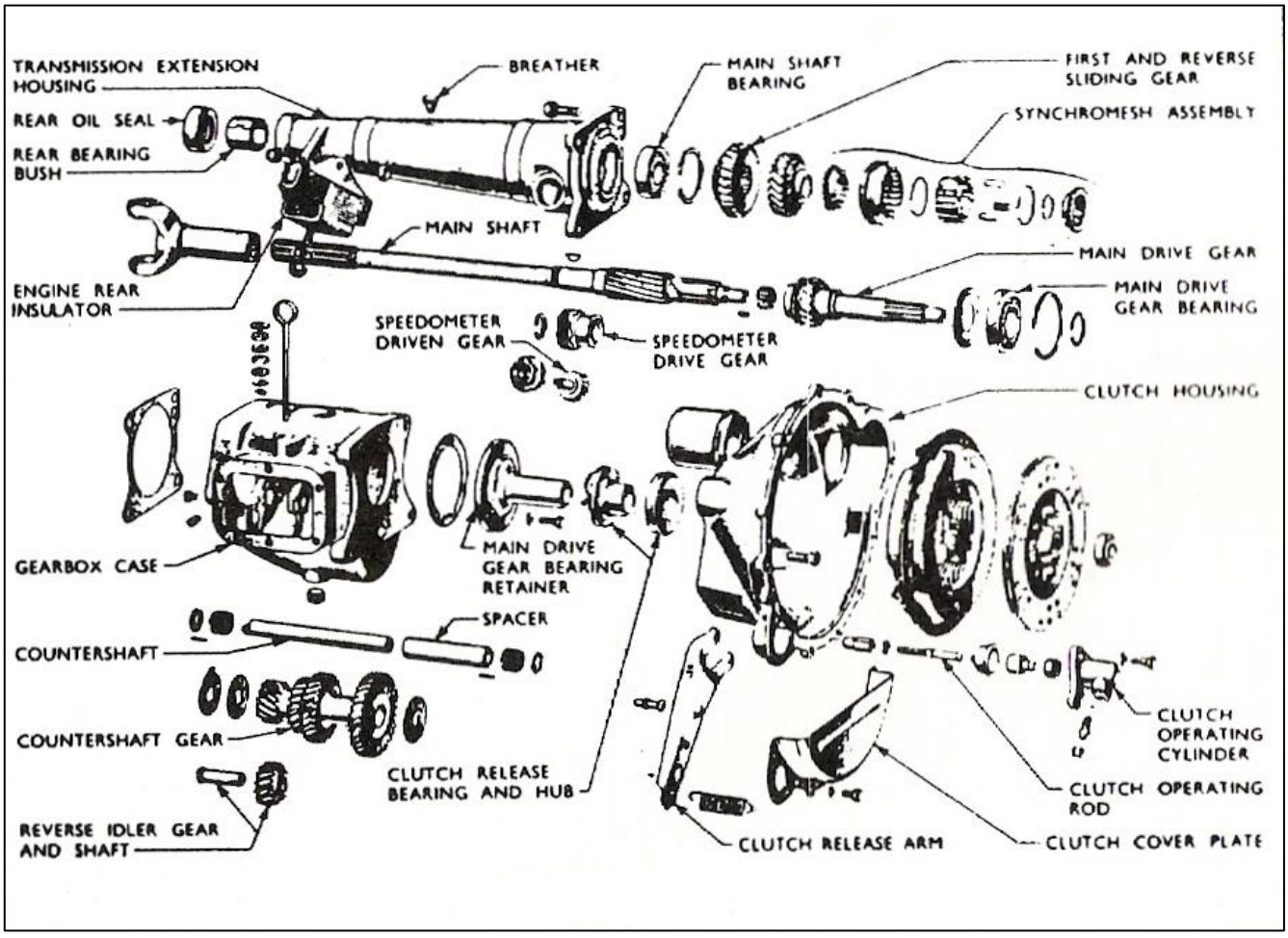

Figure 16 – Clutch and Gearbox Exploded

You can easily check whether the hydraulic mechanism is working by looking underneath the car on the offside, at the pushrod to clutch, as someone operates the pedal. You should be able to feel between an eighth and a sixteenth of an inch. If not, undo the locknut and adjust until there is suitable free play.

If the pushrod is not operating the clutch fully when the pedal is pushed down, then it is likely that you have a hydraulic problem. There could be air in the system due to leaking clutch flexible hose, leaks in the seals of the clutch master and clutch slave cylinders, or loose connections in the system. It is a dead giveaway that you have a hydraulic problem if you are losing clutch fluid from the reservoir. If your car has such a problem, you may notice that if you sit at the lights (or anywhere else) in gear with the clutch down for a long time, then the car may start to move, as the hydraulics fail to hold the clutch springs.

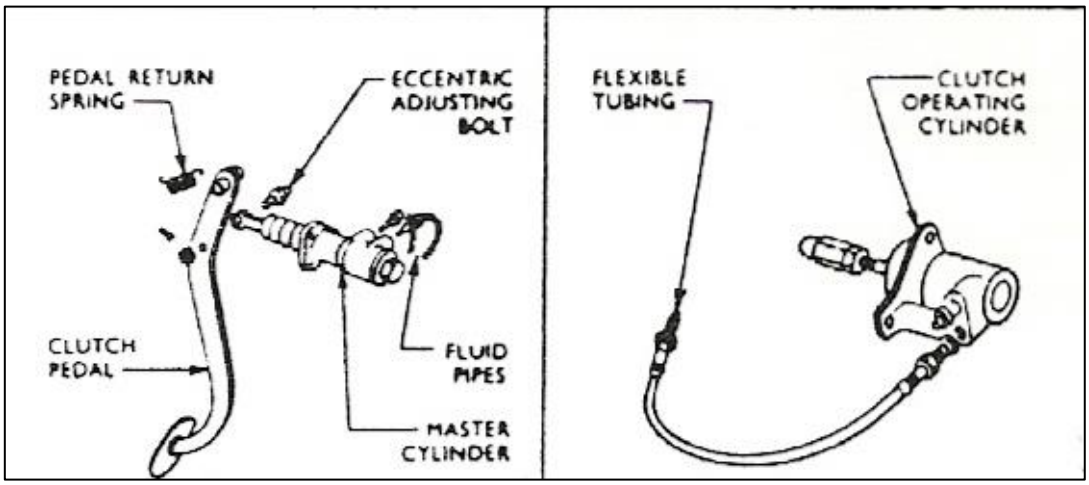

Figure 17 - Pedal, Master and Slave (Operating) Cylinder

Beware of the later 6 cylinder cars (approximately after EOTTA 112432) which have an assister spring on the clutch. If you have serious clutch problems this can take over and push the pedal to the floor by itself so the pedal does not return to normal. Judder is usually caused by a warped clutch plate, uneven spring tension on the pressure plate, or weak engine or gearbox mountings.

The only other clutch problem that can be tackled without removal of the assembly is the plates sticking – typically after the car has been parked for a long time such as over the winter. Start the car in gear with the clutch down and this is usually sufficient to jerk free the plates, and then drive the car hard with the clutch slipping (i.e. with the pedal half way down) to clean up the surfaces.

Figure 12 – Clutch Slave Cylinder Exploded

Clutch drag

An example of clutch drag on a Consul from a few years ago now. Gear changes were fine on the run, but manoeuvring was very difficult as the car would not come out of first and reverse at all easily, and the lever often had to be forced. The problem was worse when the choke was out. All clutch adjustments were checked and normal. The problem was also intermittent. The clutch plate was known to be second hand and was suspected, even though it had seemed fine on installation a couple of years before.

The centre plate was removed and appeared to be true when spun around. But when the offending plate was compared side by side with a new one, it was found to be dished and only then was the distortion apparent. The problem was solved by changing the plate.

When carrying out the changeover and removing the gearbox (a heavy overdrive one), it is much easier to have two trolley jacks to use. One is used to support and raise/lower the gearbox, and the other to raise the front of the engine, though a scissor jack and a block of wood will do for this. The engine needs to be tilted to allow you to slide the gearbox in at a slight angle to the horizontal to give better clearance from the chassis to the gearbox. A simple clutch alignment tool is an old first motion shaft from a gearbox. Even if worn and unusable in the gearbox, it will be most effective.

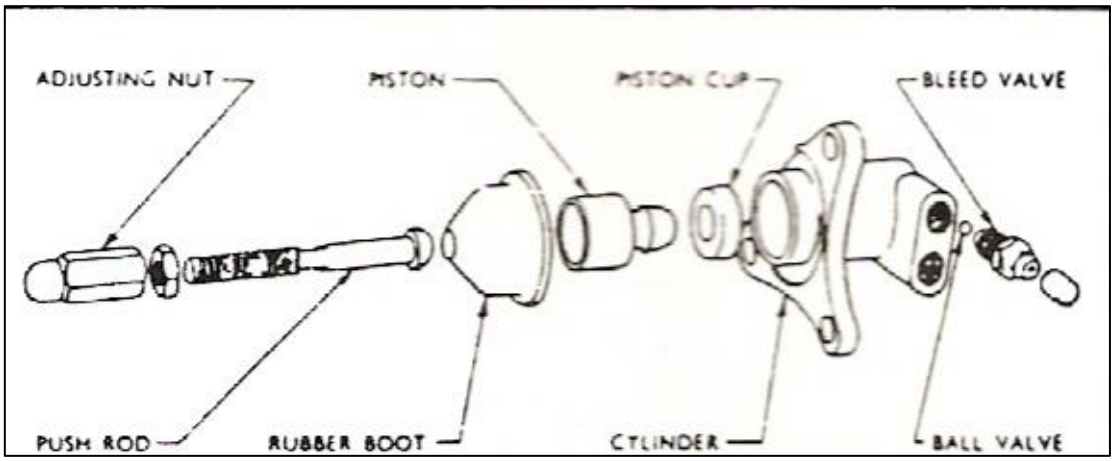

Figure 18 – Slave Cylinder Exploded

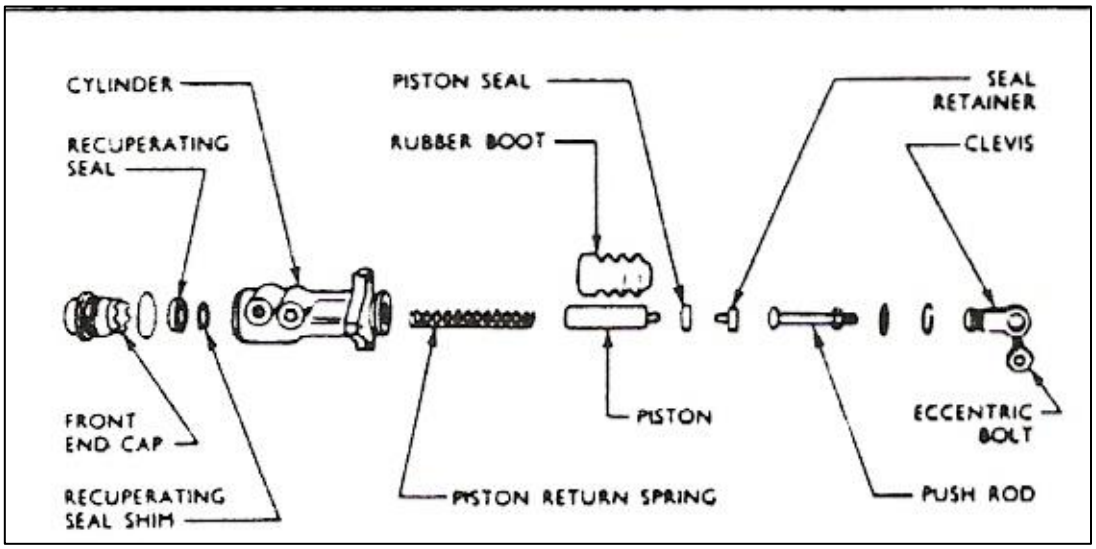

Figure 19 – Master Cylinder Exploded

Gearbox

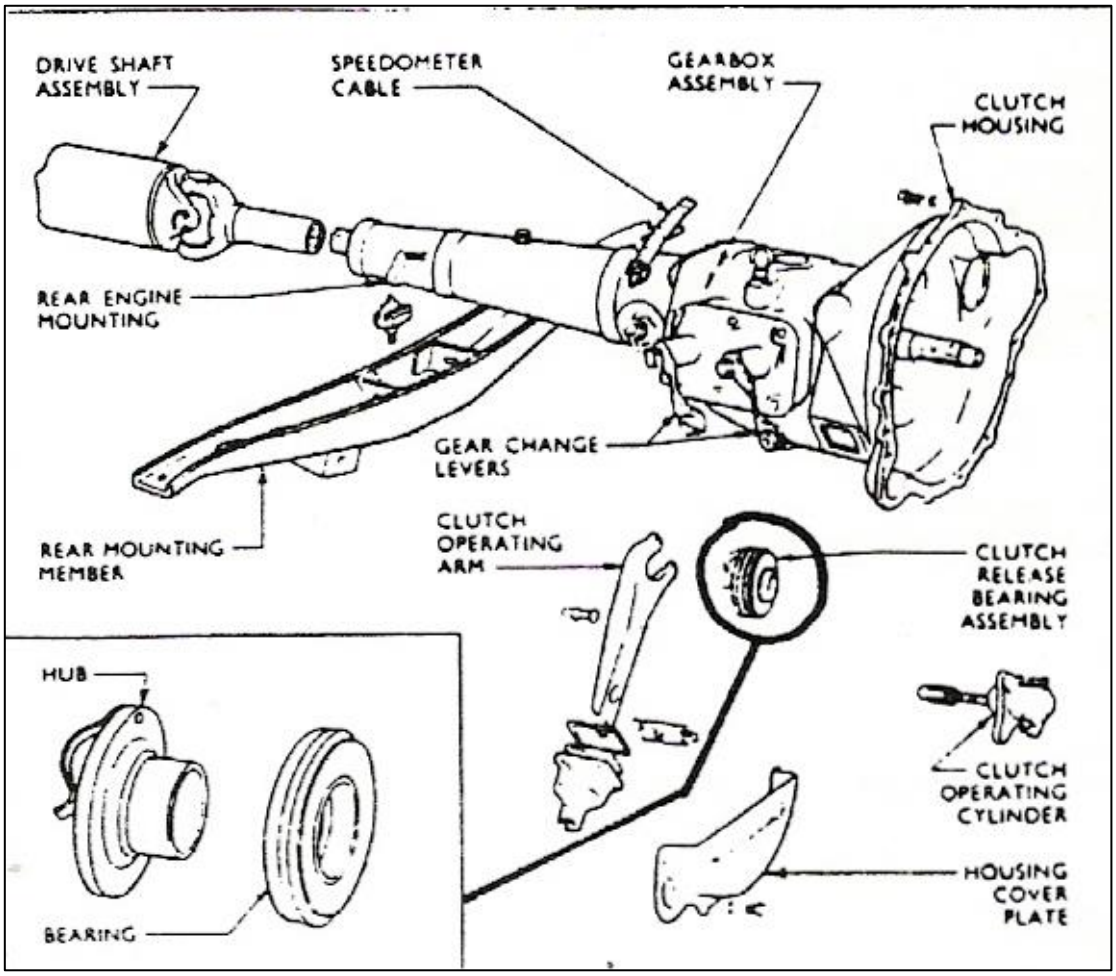

Figure 20 – Gearbox and Cross Member (Later model Cars)

The obvious problems are weak synchromesh, especially when cold, jumping out of gear on the overrun, whining in certain gears, and a regular knocking varying with speed. There is also occasional lockup of the linkage which may be due to the clutch dragging or to wrong adjustment of the gear linkage.

Apparently weak synchromesh, e.g. crunching when changing up or down, may be alleviated by changing the gearbox oil to the correct EP80 grade, as many boxes are filled with EP90 which is a lot thicker and affects the operation of the box, especially if cold.

If you cannot obtain a gear (other than when you have the choke out) then this may be due to clutch drag (see above) or incorrect adjustment of the linkage. You might just get linkage problems if the engine or gearbox mountings are worn or broken so check this first. Secondly, if you are actually driving the car when it happens, get out and forcibly move the gearchange cranks at the bottom of the steering column until they are both horizontal. It is likely that your gearchange was trying to get into two gears at once due to incorrect changing out of the first gear before moving into the next.

In rare cases this might simply be due to wrong adjustment of the gearchange rod lengths, e.g. if you have just fitted the box or changed the mountings.

You will need your manual to show how to adjust the lengths though it can be done at the roadside. Basically, you ensure the cranks on the side of the gearbox are in mid neutral position. The levers should then be adjusted to the required lengths for this position to be obtained. At the same time, check that there is no play in the bushes through which the ends of the rods pass.

More likely in the case of failure to select a gear, then you have a selector problem in the gearbox as well. If there is nothing else wrong with the box, then the minimum problem is with the spring plunger between the selector shafts.

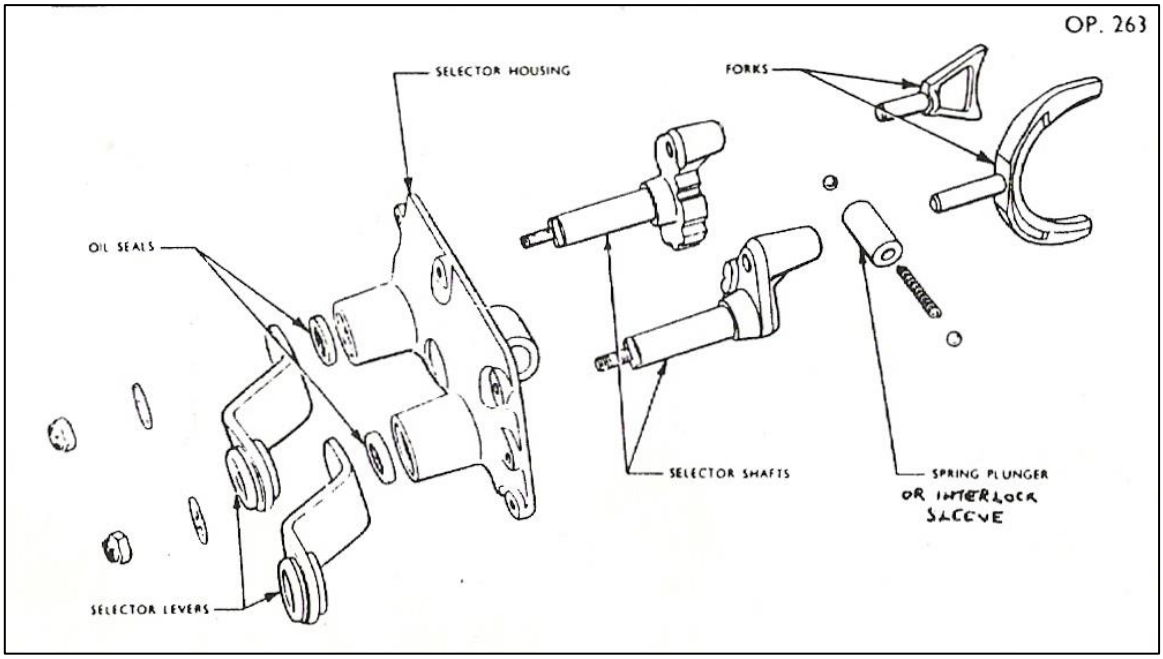

Figure 21 – Spring Plunger and Selector Shafts

These plungers actually come in different sizes. It is possible to remove the selector housing (6 bolts) from the gearbox without taking the box off the car although getting the forks back can test your patience.

Before you worry about all this, if you can't get top gear, then this is due to a broken snap ring on the main shaft and the box must come out (See Figure 16 – the ring is at the far right of the synchromesh assembly.)

Removal of the gearbox

If none of the above helps, then you will have to remove the gearbox. Ideally you need a pit or a pair of ramps/axle stands as some bolts will be awkward to get at. Most importantly, you will need a large can etc to drain the gearbox oil into, and this should be carried out before you start dismantling.

Getting things out of the way

The next thing is moving the gearbox and bell housing parts which can stay on the car but, must not get in the way. First, after draining the oil, remove the speedo cable. Then take the split pins out and remove the gearchange rods at the gearbox end and try not to lose the

spring washers as you remove them. Remove the two bolts holding the clutch slave cylinder and let it hang away or tape/strap it to the car to prevent the piston falling out.

If you have an overdrive of any type, check for a separate drain plug for the oil, and remove any electrical and control cables.

Beginning the dismantling

Remove the four bolts holding the rear UJ flange on the propshaft. These are often very tight (as they should be) and you will need two 9/16th AF ring/open ended spanners with thin walls as access is difficult. Check you have the kit to do this before starting. Pull the prop shaft free of the gearbox and wipe clean of spare oil at the front end.

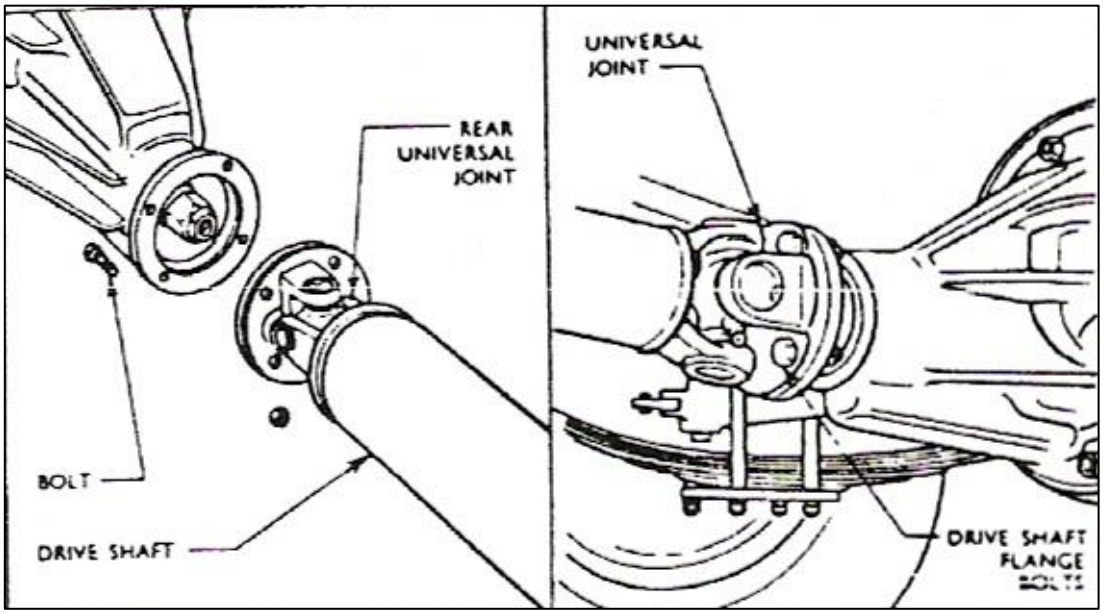

Figure 17 – Universal Joints

Removal of the gearbox cross member

You really do need the correct sockets and spanners for this. The cross member is held by two castellated nuts with split pins (11/16th AF) on bolts (the heads of which will inevitably spin round) which you should grip by an appropriate cranked ring spanner or socket – it is just possible to fit a socket in there. To get at the top of the bolt it is necessary to remove the large round grommets on the rear facing side of the chassis box cross member above the gearbox. You must check that you have the correct size sockets and spanners for this job as well.

Before you loosen the cross member, be sure that you are not going to cause problems under the bonnet as the engine and gearbox tilt with the lack of rear end support – this will finish off any dodgy mountings. It is best to turn the fan blades to horizontal, to avoid contact with the radiator and to loosen the radiator top hose at the radiator end to prevent strain and, on a Zephyr, to check the throttle linkage will not foul the bulkhead.

Remove the split pins and the nuts leaving the gearbox cross member free. You will now need to provide a jack to hold the rear of the gearbox as you loosen the bolts at the front.

Removing the bolts around the bell housing

These are 9/16th and ½ inch AF so have the spanners and sockets ready. If you can reach them it is best to take the top three bolts out first – it may help to look at the diagrams which show the three holes at the top of the "clutch" or bell housing. The starter motor is held on by two long 9/16th bolts and these should be removed and normally the starter will stay hanging on its cable. Then remove the other bolts around the circumference of the bell housing and note that one of the bolts on the driver's side holds the earth strap which MUST be replaced with the new/reconditioned gearbox on reassembly.

Removing the handbrake front cable

You now have a choice. Either remove the cross member from the two gearbox mountings (or one mounting for early cars) – held by 9/16th AF nuts, or remove the front cable of the handbrake by undoing the lock nut and then winding off the half-moon nut which fits in the equaliser lever.

Removal of the gearbox itself

Wriggle the extension housing until you feel the gearbox moving rearwards – you may help with a screwdriver between the bell housing and the block. Be careful since the gearbox is heavy, especially if it has overdrive fitted!

Removal of the clutch

The pressure plate is held to the flywheel by six half inch AF bolts. Remove these and you can pull away the pressure plate and centre plate. N.B. Don't remove this unless you have a clutch alignment tool to get it back correctly. Note which side of the centre plate faces the engine and mark it. Check the surface of the flywheel for damage, and at the same time you may as well look at the starter ring gear (especially on a Consul) and the spigot bearing.

This is the time to change flywheels if you have a problem (if you can find one!). Beware of early and late flywheels which are different and not interchangeable. Alternatively, if the ring gear is poorish but saveable, you will improve matters by removing it and rotating it on the flywheel so that the areas currently worn are replaced by unworn teeth. Mark the ring gear and the flywheel very carefully and use a blowlamp to heat the ring to remove it and a blow lamp or a gas ring to heat the same or a new ring prior to hammering on to the flywheel.

You probably do not need to worry about the spigot bearing unless you are getting a shriek form the clutch on the first press on a cold day. If you are, you should change the spigot bearing or the flywheel and bearing together (again, if you can find any).

Repair and Replacement of Parts

Clutch

Inspect the clutch centre plate – if the lining is all worn replace the plate. Look for loose cushion springs, if you find them, replace the plate. These are still available here and there.

Next look at the pressure plate. If the ring is not square with the housing then it needs reconditioning and resettling. Also check how easy it is to squeeze the springs. It should be all you can do to squeeze them. If it is easy to do, then the springs are tired and need replacement, or else they will not hold the centrepiece against the flywheel tightly. Spares

nowadays are still possible, although getting harder to find. If you are really lucky you might be able to find a heavy-duty plate with the wider lining.

Gearbox

All the information you need is in the official Ford service manual and it is therefore possible for you to carry out a restoration, if you feel mechanically competent enough to do so. But to be honest, you are best advised to get a specialist to carry out the work for you instead, they will have all the requisite parts and have the experience to do the work correctly.

Replacement of the gearbox and clutch

While most of this is the reversal of the removal, there are certain things where special preparation is required. The most important is the lining up the clutch plates correctly. Ideally you will need an old primary shaft, or if not, use a proprietary clutch alignment tool.

Offer up the clutch centre plate the correct way around to the flywheel. Some are marked “flywheel side” but in any case, the long part of the centre boss must go to the rear. Then bolt up the pressure plate, leaving the bolts hand tight so you can then use the alignment tool to centralise the centre plate, and align the splines with those in the flywheel. Tighten the bolts 12 to 15 lbs ft or you will snap them.

Preferably with somebody’s help, offer up the gearbox. Just before you do this, smear a little high melting-point grease on the splines of the primary shaft to allow the centre plate to slide easily. Also move one of the selector cranks to engage a gear and help prevent the primary shaft from turning while you are aligning things. If the box does not slide on at once, try realigning the clutch again. The rest of the procedure is the reversal of the removal.

Remember to fill the gearbox with oil through the dipstick hole in the floor of the car and lubricate the smooth circumference of the propshaft with gear oil before sliding in the box. Remember to check clutch clearance and gearchange rod lengths.

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Cooling System

Overheating and Cooling Problems

Modern water cooled cars tend to have quite small radiators and water capacities together with an electric fan. By comparison, the Mk1, especially the 6 cylinder models, has a massive (almost 3 gallons) water capacity, huge radiator and noisy fixed fan rotating according to engine speed. You would never think there would be cooling problems. In fact, if everything is healthy, there will not be any. Some modified Mk1s are even known to run with a standard rad and no fan at all!

A good checklist of things that can cause overheating is as follows: -

1. Stuck thermostat
2. Fan belt loose
3. Clogged radiator
4. Leaking radiator
5. Head gasket
6. Collapsed or leaking hoses
7. Ignition too far advanced
8. Cracks in block or head
9. Badly fitting or wrong radiator cap
10. Brakes binding

Let's examine those in a little more detail:

Stuck Thermostat

Mk1 thermostats seem to vary between 80 degrees centigrade and 88 degrees. What exactly is best for each car depends slightly on the car itself, the weather conditions and the type of driving – hilly, long distance, hot country etc. 86 degrees is usually a good compromise for engine temperature and some sort of response from the heater too. The original type thermostat was a failsafe in that it was a "bellows" type that used to fail in the open position. Intermittent overheating can be due to a sticking thermostat.

If you doubt yours, remove it and check it by putting it in a saucepan of hot water and bring it to the boil. See if the thermostat opens and shuts. You can check it with a thermometer (cooking type) or another thermostat. All you need to do to get at the thermostat is to remove the top radiator hose and the two bolts holding the thermostat housing on the engine head. Gently tap around the stat and ease it out. It is only held in by gunge – nothing else. Don't do all this unless you have water resistant gasket sealer available to help you put everything back together again without leaks. New thermostats can be found all over the internet, especially eBay or at your favourite auto jumble.

Fan Belt Loose

Easy to forget, and it doesn't do much for the charging system either. It can even happen with a new belt as these stretch slightly after a little use. Preferably for your own safety, with a cold engine, loosen the two bolts holding the dynamo (if you use one) underneath and then the bolts holding the slotted strip which adjusts the dynamo position. Get someone to use a crowbar or similar to pull the dynamo to tension the belt, then tighten up. There should be no more than half an inch of play at the loosest part of the belt in between the pulleys. New belts are readily obtainable through Club spares specialists. Later cars can use Mini fanbelts.

Clogged Radiator

So… you can see no leaks, all seems to be running well, and still the car overheats. Often forgotten is that whilst the radiator may look OK it may not be doing its job. Just like the central heating pipes can clog up, so can a radiator. Some members might be surprised at how light a new radiator is, this is because the new cores don't have all the gunge of the old one. If your car radiator is really heavy, and you have a cooling problem, and nothing seems to help, this could be your answer. Again, the Club spares specialists can get radiators recored, or you can find these sorts of services on t'interweb nowadays.

Leaking Radiator

This is much more obvious than a clogged radiator. But the leak may be tiny and not obvious. You may need to get the engine really dry, then get it hot and look with a strong light very carefully around the radiator and other parts of the cooling system for any tiny little jets of steam or water. Even a tiny jet can lose a lot of water over a period of time. If this is what you have, a temporary repair might be possible using a radiator repair remedy currently available at most garages and motor accessory places. These use surface tension phenomena to get into the holes and seal them, again basically with gunge. If this doesn't work, you'll have to get the radiator recored.

Head Gasket

To make the engine run, very high pressures are generated in the cylinders. A few pounds above atmospheric is also generated in the cooling system. The role of the head gasket is to keep the joints in the passages belonging to these systems sealed, and independent of each other. A leak from a water passage to the outside would result in probably a slight loss of water and a wet area on the block below the joint to the head. But if there is a leak from the cylinders across the head gasket, those great pressures in the cylinders will be allowed either into the open air with loss of power, or into the cooling system. In the latter case the pressure will simply lift the spring on the radiator cap and push water gradually out of the system. Typical symptoms are uneven engine compressions; bubbles in the cooling system (visible if you warm the engine up with the radiator cap off, couple with a "fountain" as the thermostat opens). Swollen hoses or other signs of excess pressure in the cooling system are also possible. Head gaskets are available if you look hard enough!

Remember to think why your head gasket may have failed. If it was quite new, there may be evidence of a warped head, in which case you should really try to replace it with a good second hand one, and perhaps even have it skimmed slightly.

Collapsed or Leaking Hoses

Hose leaks have got to be looked for in the same way as fine radiator leaks. There was a Consul once that kept misfiring and the cause was a tiny, fine jet of water from a pinhole in the bottom hose around the jubilee clip which was being directed onto the distributor cap. Leaks may simply be due to untightened (or even overtightened) clips. Whilst the old original wire clips for the hoses are correct, later jubilee clips are better sealers and do less damage to the hoses. Tighten clips before condemning hoses.

Look at all your hoses at the beginning of the season especially around where the clips go, and look for fatigue in the heater hoses where they bend. Look also for loss of strength in the hose where lose shape or seem very spongy. In all cases, they should be changed. If possible carry a spare set, spare 1 inch heater hose and some spare clips too.

Ignition too far Advanced

This causes the engine to run too hot. It would probably have to be a long way out to cause real trouble. Other symptoms would be “pinking”, running on when you switch off, and white plugs due to overheating. It is unlikely that this would be a sole cause of overheating, but retarding the ignition is a simple remedy, and a cheap one even if you go to a garage.

Cracks or Leaks in the Block

There are a few examples of cars which for some reason have developed cracks in the block. A common cause is freezing of the cooling system over the winter. Mk1 blocks are extremely strong but will crack sometimes if the coolant freezes. Symptoms of coolant loss will usually be accompanied by tell-tale signs of rust streaks on the block in the area of the crack. If you suspect this, clean the block thoroughly, then let it get hot and inspect very carefully. Occasionally hairline cracks can be repaired using Holts or similar Block weld preparations. Yet again, these use surface tension effects to fill the crack with (you’ve guessed it) gunge.

If you really have a cracked block problem, there are only two solutions. The easiest is probably to junk the block and find a reconditioned or second hand one. The other is to find a specialist block welder to identify the crack by specialist techniques and then to weld it up. That is, if you can find someone to do it.

Badly Fitting or Wrong Radiator Cap

This is often overlooked as a cause of loss of coolant. The correct Mk1 cap has a long spring which seals at 4lb pressure. A poor fit or wrong spring rate will not keep the correct pressure, and thus cause different heating and boiling effects within the system. In any case, a poor fit will cause escape of the coolant through the overflow, which you may not notice while driving along. If you are mystified by loss of coolant, always change the radiator cap in order to eliminate it as a possible cause.

Brakes Binding

This simply causes the engine to work harder than it should for a given speed. It can happen due to a seized handbrake, or wrongly adjusted shoes, especially new ones. It may occur after the first run after a long period of lay-up when the brake shoes may not return to the correct “off” position. Diagnose by trying to push the car. You should just be able to move a Mk1 with brakes off on level ground. If it won’t shift at all, jack up each wheel in turn, and by getting someone to try the brakes, check the wheels continue to turn freely with the brakes off.

★★★★★

Electrics

The ignition warning light

If you haven't already experienced that dreaded moment when the ignition warning light shines suddenly and brightly in the middle of a journey, then you probably will do one day. No doubt it will be during a rainstorm and probably at night too! But whilst this is probably one of the most common symptoms of electrical faults, it needn't be a disaster. Often the fault will be easier to trace if it occurs in this way rather than if it is already a fault on a car you buy on which someone has already messed up the wiring.

If the light does come on, the first thing to do is to check that your fan belt is rotating properly and driving the water pump and dynamo pulleys – otherwise your engine could seize in clouds of steam.

If the fan belt is slipping you obviously loosen the dynamo bolts and retighten with greater tension on the belt. Remember to carry sticking plaster for resulting bared knuckles! At the same time, you would check that your fan belt is not fraying and about to give up the ghost. You should always carry a spare fan belt if you can.

If the belt is giving up or if it has gone already, and you haven't a spare, then fit a Mini fan belt (or ask the breakdown guy to fit one). They seem to fit nicely – for the 1953 – 1956 cars with small groove fan pulleys. It may be possible to drive a short distance at about 25mph without the fan belt, and this has been done, although it is not advisable. If you have tools, but no fan belt, you could remove the thermostat and maybe limp to a local garage.

If you do end up driving the car some distance with the ignition warning light on, apart from overheating beware that you do not cause the electrical control box points to "weld shut". This will cause the dynamo to rotate the wrong way when the engine and ignition are switched off. The only answer is to disconnect the battery earth lead to stop all the activity, and then take off the cover of the Lucas control box on the engine side of the bulkhead and very carefully prize the points apart.

If you have an operative fan belt, and the warning light is still on, check that your battery terminals are tight. Then if they are not the cause, try turning off all your electrical equipment, item by item. You may find that one particular unit has developed a fault or a short. The heater motor can sometimes cause the light to glimmer. If this is all it is, don't use that item of equipment, until you can have it looked at. Don't forget that it is normal for the warning light to glow or glimmer at tick over, but not above 1000rpm.

Another thing you should ensure is that there is no corrosion within the fuse box. Check that the fuses are OK. You could be driving along with a blown fuse, warning light on and NO BRAKE LIGHTS!! Check also the terminals of the box and the ends of the fuses are bright metal and make good contact. Use a nail file or sandpaper to improve things – remember to disconnect the battery or you may have miniature sparklers. Owners of very early cars have a different type of fuse box which seems prone to Verdigris and rubbish around the contacts. Check also that there is a good earth to earth white/black lead to terminal E on the Lucas control box.

If all this fails and you are out on the road, you may still be able to get home. Unless your battery is already flat, you can manage to go a few miles even if your charging circuit is not working. A healthy battery could get you a 100 plus miles in daylight if you switch off the blower, radio and any other electrical accessories, and don't turn off the engine, otherwise you won't get restarted.

If it is dark, the headlights and all other accessories taking a hefty current should be switched off wherever possible.

1. If your ammeter shows no positive charge, then the likelihood is that either your dynamo or Lucas control box or both have packed up. Replacement dynamos are reasonably cheap and there are plenty of modern reproductions available.

2. One unusual cause of lighting the ignition warning light could be the severing of the wire joining the dynamo field coils. This can happen on a new dynamo especially if the wire is chafing. To repair this involves dismantling the dynamo and resoldering – the latter a 2-minute job, the former, probably an hour or two.

3. If your dynamo and control box are OK, and your ammeter shows some positive charge but the warning light stays on when all electrical devices are switched off, then a possible cause is corrosion in the ignition switch.

4. If you still have a warning light on, then the problem is likely to be a shorting lead or bad earth somewhere.

Ignition Switch

This is about the last place people expect to find a fault. It is possible, though, for you to get all your lights to light up, and get the engine running, via a very corroded switch. It must be the resulting higher resistance across the ignition switch that leads to the warning light staying on, it's a possibility at least?

If you do have the warning light glowing (rather than shining brilliantly) then it is worth checking the ignition switch if you suspect nothing else. Unscrew the chrome bezel on the outside of the switch on the instrument panel (except Flatdash models) and pull the switch into the open above the parcel shelf by catching the wires attached to it. These are normally yellow/black and red/yellow. The back of the switch unclips in much the same way as a push and twist light bulb. Hold the switch key-side down as you unscrew it and observe the position of the contact plate inside as you open the switch so that you can put it back together again. You'll usually find a fair amount of Verdigris so clean up the plate and the terminals with fine grade sandpaper or Duraglit etc and replace.

The Battery

This seems to be more often a source of high charge rate than of a glowing warning light. +10 amp on your ammeter for prolonged periods usually means a battery problem. This can be because the battery is old or discharged or because of a bad earth. Once batteries get both old and run down no amount of trickle charging seems to help. You are probably better off buying a new one. Before you buy, do remember to check the battery terminals, earth strap, and the earth wire connected to terminal E of the control box are all clean and making contact. It is much easier to do this and to trace other bad earth faults if you have a 12-volt circuit tester and a circuit tester with a built-in battery. These are available all over nowadays.

The more powerful battery the better, and especially so in the case of a Zephyr or a Zodiac that has been off the road all winter, when you come to start her up for the Summer season.

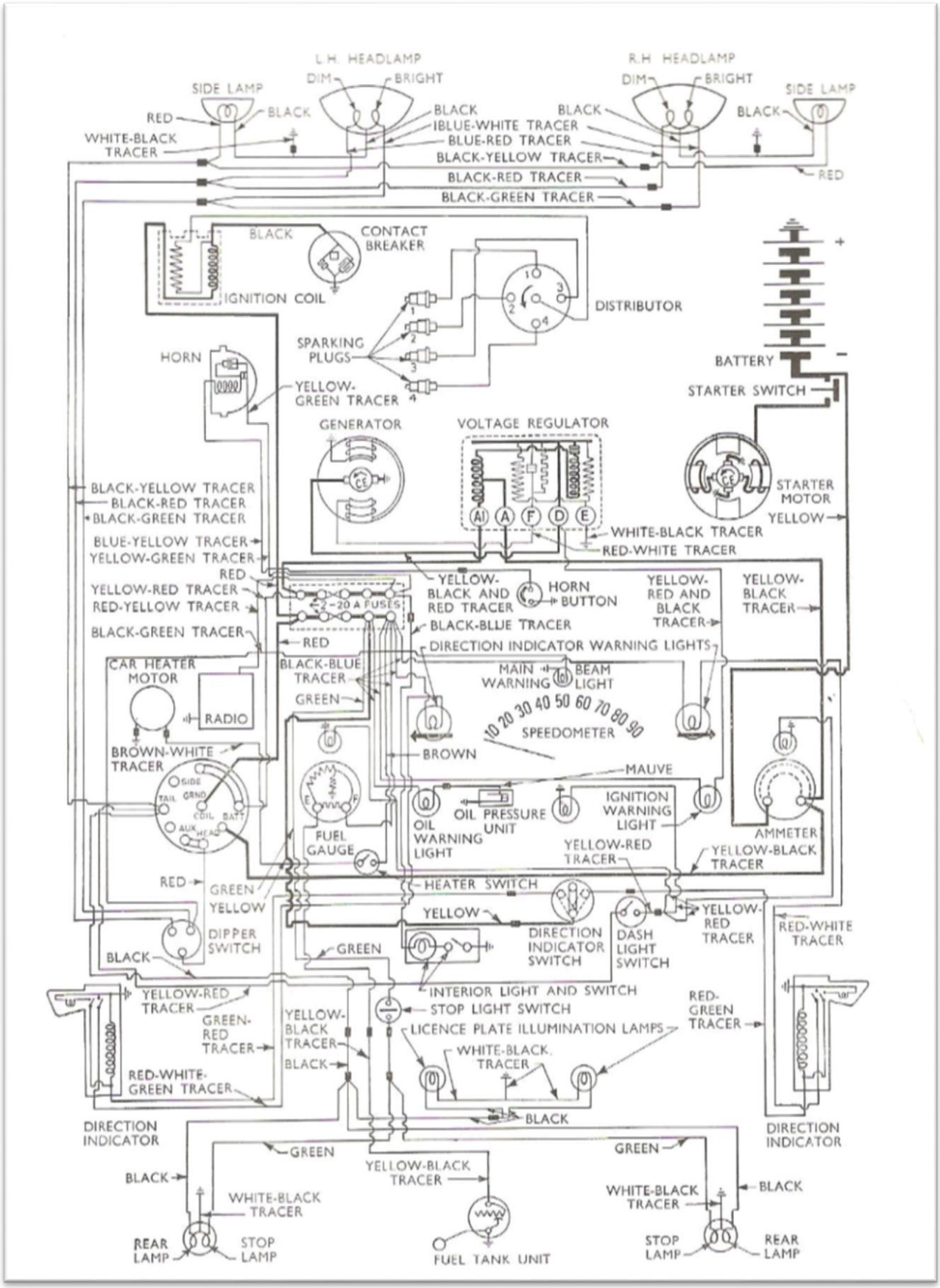

Figure 18 – Mk1 Consul Wiring Diagram Prior to September 1952

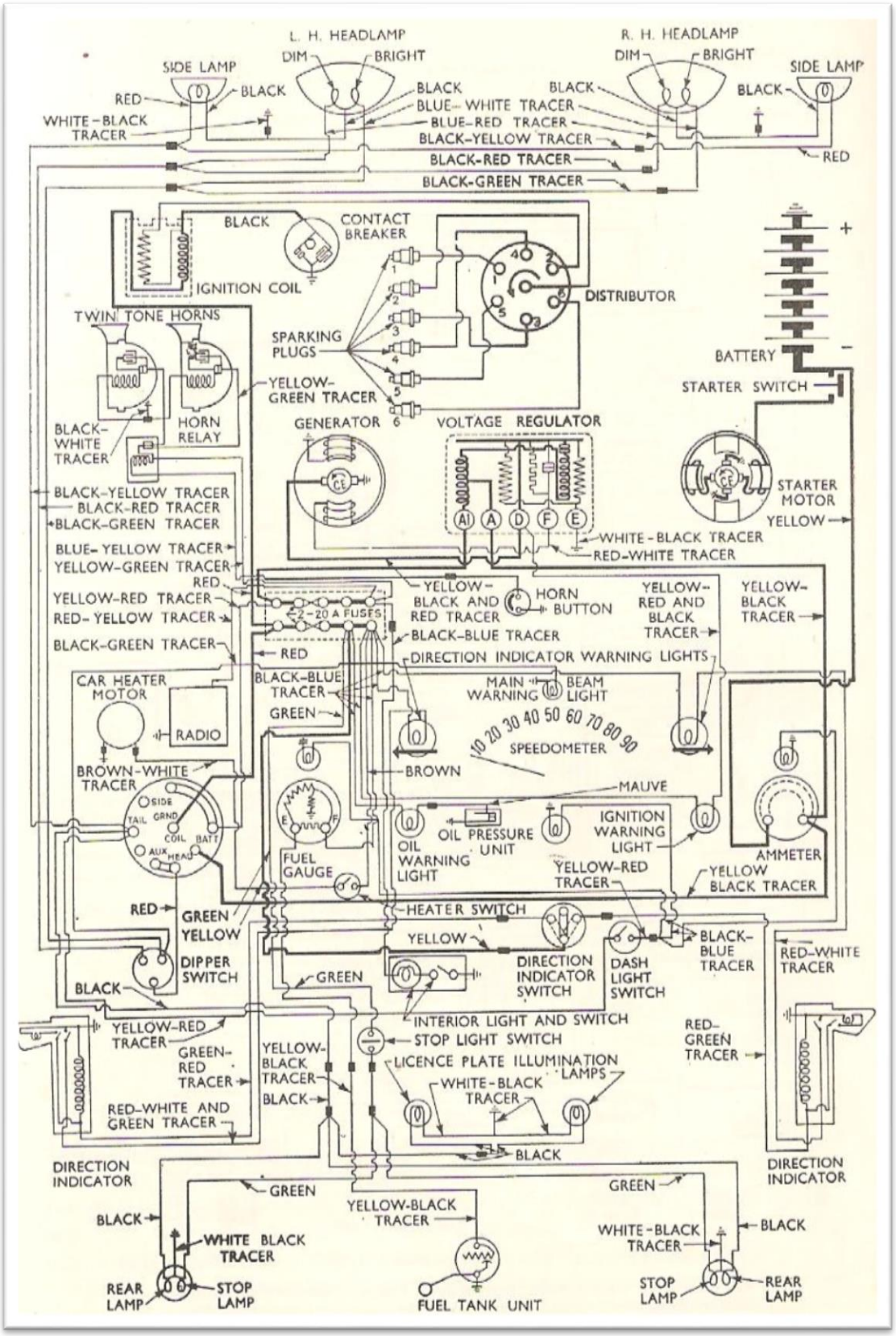

Figure 18 – Mk1 Zephyr Wiring Diagram Prior to September 1952

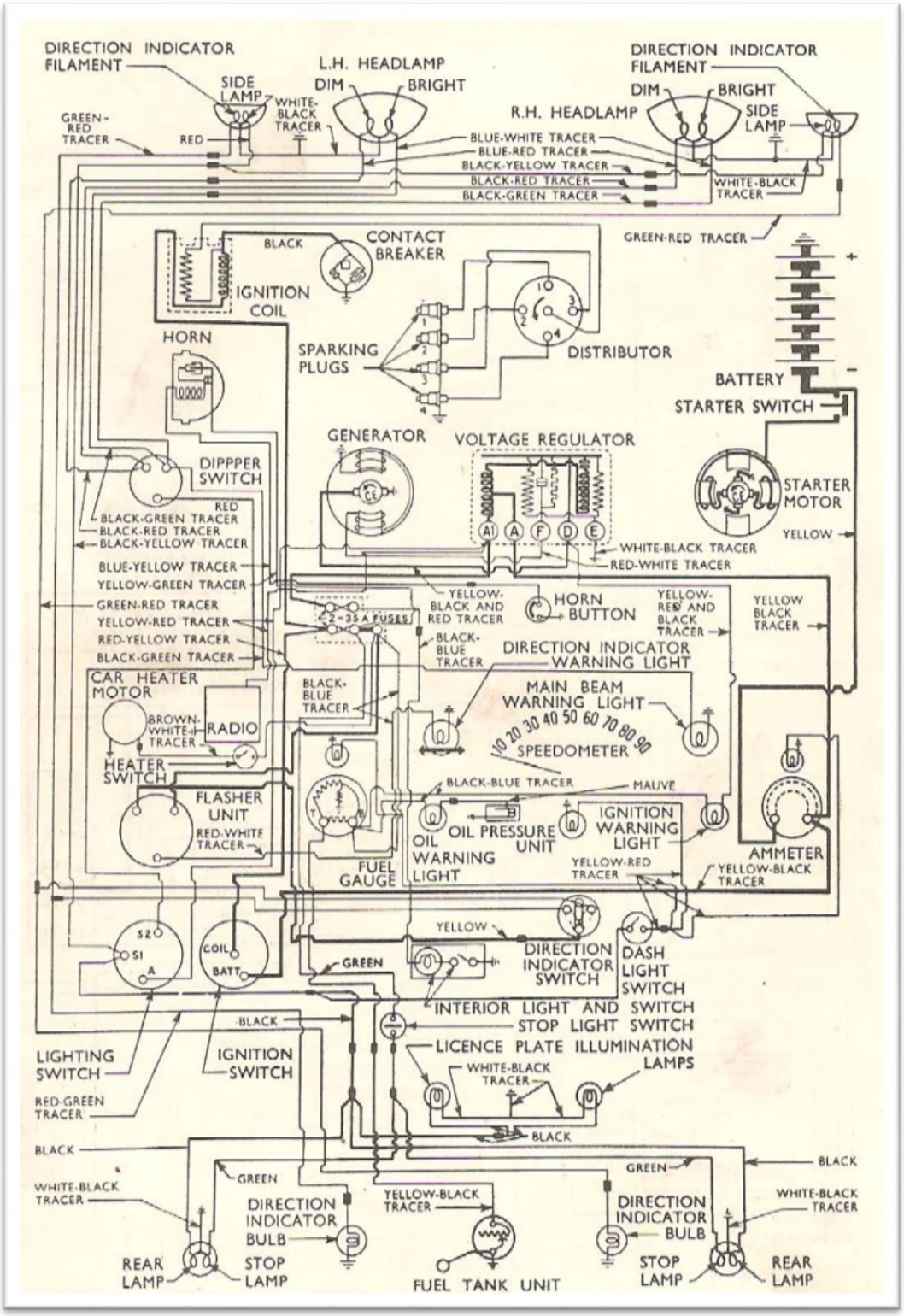

Figure 19 – Mk1 Consul Wiring Diagram (After October 1953)

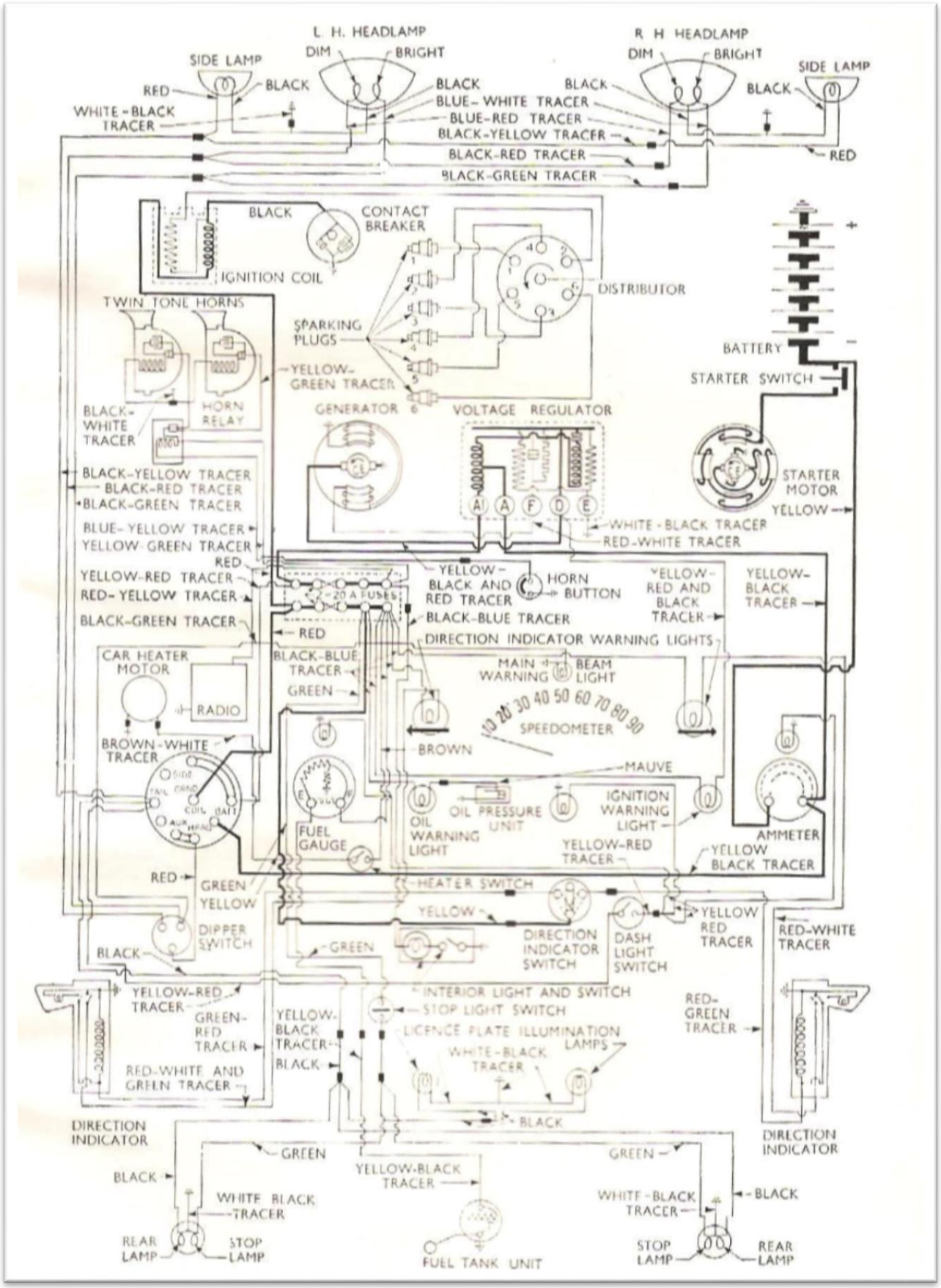

Figure 20 – Mk1 Zephyr (later models) Wiring Diagram

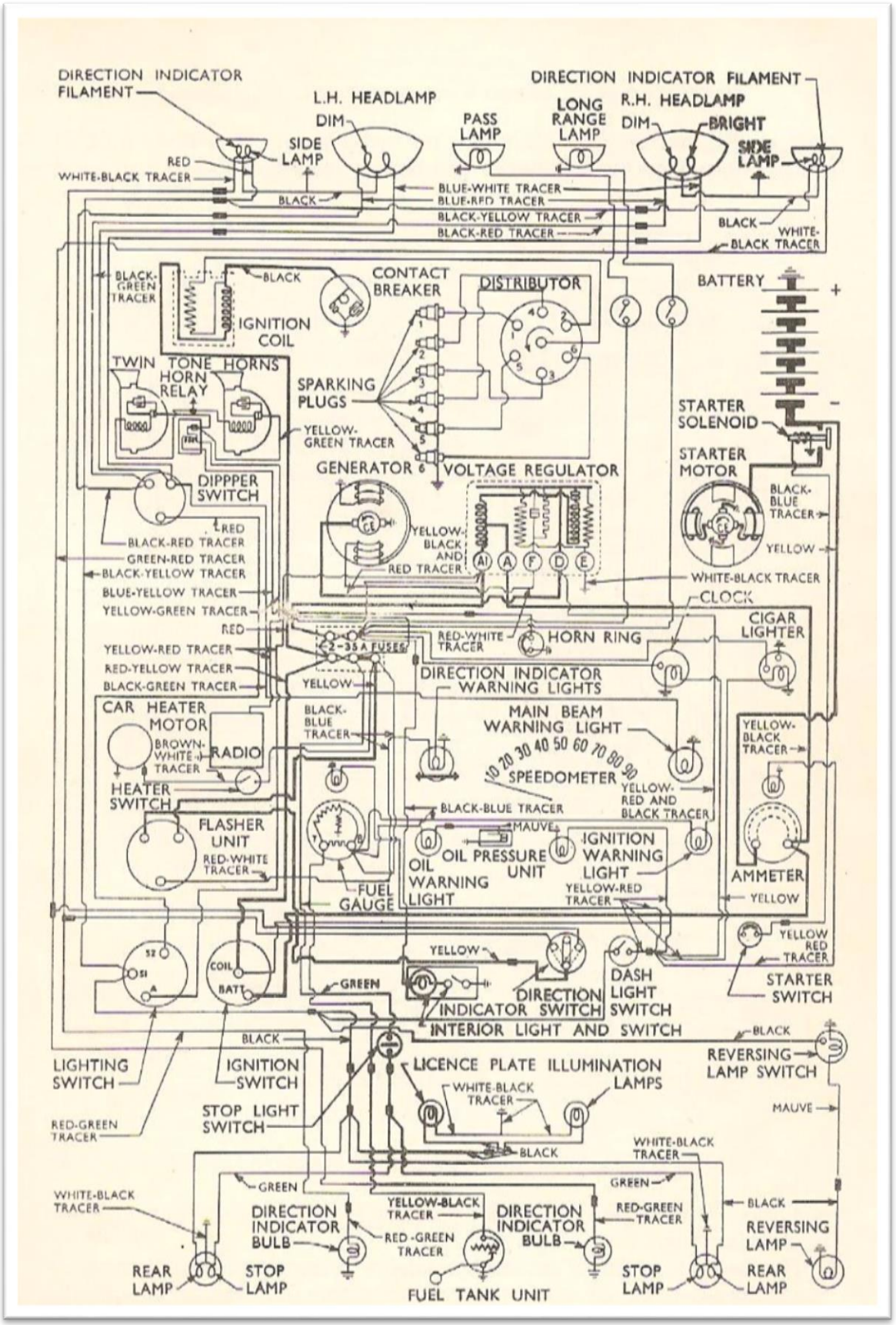

Figure 21 – Mk1 Zodiac Wiring Diagram

Dynamo and Control Box

You can easily test your dynamo by putting it across your car battery – one wire to the big central terminal (Field Terminal) of the dynamo from battery negative and one wire from battery positive (earth) held against the dynamo casing – watch out for sparks. If the dynamo runs freely and sweetly, the chances are it is OK, and the problem is the control box.

Dynamos are available all over the internet etc, or you may even find one locally. Make sure you compare any new purchase with your old one, as it can be easy to mistake for a longer one which might fit the later models.

The 5 terminal Lucas control box has to be checked with special equipment. New boxes are not hard to find nowadays at all specialist suppliers and on t'interweb. Remember to get a screw terminal and NOT a Lucas type.

It is easier to remove the dynamo if you first remove the metal anti-splash plates fitted between side member and sump (if you have them!). Then when you remove the control box, held by only two screws on the engine side of the bulkhead below the windscreen on passenger side of the car, remember to label all the wires with the letters of the terminals to which they are attached – A1, A, F, D and E (for earth).

Some people say that an old dynamo and new control box, or vice versa, do not mix, if you renew one, you need to renew the other. This may or may not be true, but it wouldn't hurt any.

Bad Earths and other wiring faults

These are a major source of nuisance outside of ignition warning light problems.

If your Mk1 has been on the road during the winter, it is likely that the salt and other chemicals from the road and air will have played at least one or two unkind tricks to your electrics. The usual result will be a dim or non-functioning light, or wonky trafficators (if you have them). Even if the car has been kept off the road, it is quite likely that one of these little faults will show up when the laid-up car returns to the road. The cause is almost always those little gremlins who cause poor earthing to the chassis and bad connections at joins in the wiring loom.

The other sort of problem is when you buy a car with an electrical fault and things like the dynamo and control box etc all seem OK, but a certain part of the electrics won't work. This usually means someone has tampered with the wiring and means you have got to return the wiring to standard, maybe "spring clean" it at the same time and also add extras in the correct way if you want to.

Joins in the Loom

Joins in the wiring loom are clustered under both the inner wing support spars (the offside one holds the brake/clutch fluid reservoir), under the dash by the offside A post, and in the boot on the offside in the space between the inner and the outer wings. This applies to both saloons and convertibles.

The joins under the bonnet are kept in a tidy state by the most cantankerous circular clips which hold the loom wires in place. They are real nail breakers. Also, if you use a screwdriver or pliers to remove them you risk these tools slipping and scratching the paint. However, you must remove the clips to have any hope of reaching the wires effectively.

The joins by the offside A post will be tucked behind a small piece of cardboard trim on the right hand side of the driver's small parcel shelf (non Flatdash models). In saloons, the joins are from the main loom to the bulkhead to the subsidiary loom for the rear lights and courtesy light to the instrument panel lights.

In saloons, the subsidiary loom goes up the A post and under the headlining. In convertibles, the loom goes down and along inside of the sill. Never remove it without attaching a draw cord with which to pull the old or the new loom back into the sill. At the end of the subsidiary loom is another set of joins easily reached inside the boot on the right.

There are various other important joins within the system. The main ones are:

- Connection of the 4-core loom in the steering column to the main loom, for horn and indicators. You can find these by tracing the wires from the bottom end of the steering column. They must always be undone before you remove the horn ring from the car.

- Connection of indicator sender unit to main loom usually via a triple connecting piece like the one on the right.

- Remember now the separate two-core loom from the dynamo to the control box on the bulkhead with a thick yellow (plus odd colour stripes) and a thin red/white cable.

Bullet Connectors

Look up your wiring diagram and the colours of the wires feeding the bulb or unit that is not working properly. Pull the relevant wires out of the black bullet connector which makes the join in the loom and clean up the bullet on the end of each wire with sandpaper. You are almost bound to find some verdigris and corrosion. Ease a small piece of sandpaper through the connector itself and try to ensure that you clean it enough to be sure of a good, bright metal surface on the inside. Alternatively, and far more preferable, fit a new connector.

There are single double and treble connectors used on a Mk1. Tracing which connector is at fault is not especially easy for some circuits have at least two connectors between battery and unit – the reversing light has three. Another example is the nearside front lighting which is fed from a double connector on the offside under the wing support carrying the brake/clutch fluid reservoir. This connector has one feed from the fuse box and two exit wires, one going round the loom to the nearside, the other going to the offside lights.

Construction of the Loom

Most people's blood turns cold when you mention rewiring. Believe it or not, the Mk1 electrical setup is in fact quite simple. In all of the glove box instruction manuals you will find a wiring diagram for reference (some are included above).

Why fit a new Loom?

The main reasons for replacing a Loom are:

1. The old one burned out (and possibly took your car with it!), or there is an untraceable dead short.

2. The insulation has completely rotted, split, melted or some electrical connections are faulty.

3. The wiring looks tatty or unsightly.

4. You have rebuilt your car.

If you are unlucky enough to have had numbers 1 or 2 happen to you, you have to replace the loom. In the more regular case of 3, it is probably the wiring you see under the bonnet that is tatty and the bullet connectors will be suffering from verdigris. You don't need to dismantle all those main loom connections to put this right. All you need is a couple of rolls of sticky insulation tape and stretchy black loom tape; a selection of single, double and one triple bullet connectors, sandpaper and if the wiring from the front lights is really tatty – you'll need a soldering iron.

To make a good repair this is what to do:

- Disconnect the battery
- Undo all under bonnet and boot wiring clips (watch out for the paint and your nails)
- Separate bullet connector joints – some need a strong pull and are aided by easing fluids
- Re solder any bullets that need it
- Sand all the bullets on the ends of the wires
- Tape up any tatty areas of the loom
- Sand verdigris off old connectors or use new ones and rejoin wires
- Check all connections with a circuit tester
- Reconnect the battery

If the wires leading from the under bonnet to the side and headlights are really tatty, you have two choices. It is most unlikely that the insulation (which is double thickness on the original) is ineffective even if it is unlovely. Therefore, you can improve everything by getting new wires from jumbles or advertisers on t'interweb or in classic car magazines.

You can even make things look much better by taping around the wires from a couple of inches behind the lights up to a couple of inches from the bullet connectors. Tape them tightly since the hole through the inner wing and associated black plastic sleeve that the wires go through is none too big.

If you seek perfection, then you will need new light units and new wires. Often the new units or new wires have modern spade connector fittings and so you have to find old connections, unsolder them, clean them up and solder on to the new wires, especially the round push/twist fittings at the rear of the original headlights.

You can sometimes get connectors which bridge from one type of terminal end to the other. Look in all those electrical counters at autojumbles. In most cases, cleaning up the bullets and replacement of the bullet connectors and removal of nonstandard wiring will solve the remaining problems. On the other hand, if you are a real glutton for punishment, you can undo all the instrument panel, dismantle it and remove the main loom. As we've seen it is unlikely this is your problem, and even then, you will have to deal with all the joins described here, which will be the most likely cause of dim lights etc.

Indicator Switch

Getting the indicators to cancel

The early and late type indicator switches, both Consul and Zephyr, have the same type of cancel mechanism. It is clear from looking at and testing some Mk1s that the indicators are not set to cancel properly. You should be able to set the indicators to a right turn, and having turned the steering wheel less than half a turn to the right, turn it back and have the indicator switch spring back to the central position. Similarly, for a left turn.

If this does not happen, something is set wrong. This may be due to a loose indicator/horn unit or incorrectly refitted stator tube in the steering column – probably quite common after a refit of a steering box.

To check for what is wrong if your indicators are not cancelling properly, loosen the three grub screws around the rear of the steering wheel. Since the steering wheel is fixed on splines to the steering shaft, tightening of the grub screws actually grips on to the metal ring which is part of indicator/horn switch assembly and makes this part of the assembly turn with the steering wheel.

Check that the wires are clean and free to move at the base of the steering column under the bonnet, then, having loosened the grub screws, gently pull the indicator/horn (Consul) or indicator/horn ring (Zephyr) assembly away from the steering wheel, until you can clearly see the steering wheel nut.

The nut holds the steering wheel in place and tightens round the steering shaft, inside which is the stator tube. The four round horn/indicator wires pass down this tube inside the column. Look for this tube and you should see there is a cut-out in the circumference. This cut-out goes for about three inches down the tube, and is about one eighth of an inch wide. If you now look at the horn assembly, you will see there is a short length of shaft protruding from the base with four dimples with the wires protruding from it. These dimples make certain that the short shaft or tube on the base of the indicator/horn switch assembly slides over the stator tube but only in one position, where the dimples align with the cut-out.

Now this cut-out should be at the top of the stator tube. If it isn't, loosen the clamp nut at the bottom of the steering box around the hole where the wires come out. This holds the tube tight. Get someone to use a screwdriver etc. inside the car to hold the tube in the right place, level with the top of the column (or the indicator/horn switch unit will not push in properly) and with the cut-out to the vertical and retighten the nut.

Having made sure that this is OK, now grasp the stubby shaft or tube on the base of the horn/indicator switch assembly just as if it was held in the stator tube. With a Zephyr unit, you will find you can rotate the chrome surround of the horn/indicator switch assembly around this shaft. This is what normally happens when the steering wheel is turned with those grub screws tightened. With a Consul unit, you need to rotate the round plate normally held by the grub screws, whilst grasping the short shaft. Notice that the indicator switch itself does not move while you are doing this.

Normally, when the dimples of the shaft are held uppermost, the indicator switch should also be uppermost at the 12 o'clock position. You should now find that if you set the indicator, you can feel the click of the return mechanism after you turn the assembly about a quarter of a turn and the indicator switch clicks back as you twist the unit back to the zero position. If not, keep trying positions of the indicator switch until this works. It is remotely possible someone refitted a Zephyr indicator switch in the wrong position. Usually, if everything is right, when the indicator switch is at 12 o'clock, and the dimples also uppermost, you will see a "V" shape pointing downwards under the assembly – on both Zephyr and Consul units. On a Zephyr, this "V" will be engaging one of the three radial supports of the horn ring which hold it to the very plate which is in turn gripped by the steering wheel grub screws. It is possible that someone may have reassembled your indicator/horn unit with the wrong radial support in the "V", in which case you will never get the cancelling right as the switch will only cancel properly when it centres well away from where it should be. This is not possible with the Consul unit which has no horn ring and can only be fitted one way.

If you check all these items above, you should find that your indicator switch will now cancel properly. It is merely a question of getting the mechanical positioning right and has, of course, nothing to do with the electrics of the indicators – flashers or semaphores. The dismantling of the switches is a very fiddly operation and if there is an electrical contact problem in the switch it is recommended to find a

second hand one if you can. Even then, you will need to check during fitting that you have done what is suggested above.

Ignition Warning Light

If you have a dimly glowing ignition warning light (especially with headlights and heater blower on or other accessories on) but an ammeter that indicates a healthy charge rate, check that the fuse box and/or fuses do not show corrosion at the terminals, and use sandpaper to clean all the contact surfaces. If all this fails, it may be that the ignition switch needs cleaning inside.

Fitting New Ignition Points

Remember that new points may be coated with a preservative which should be wiped off or removed with fine grade emery paper before they are fitted. (Alternatively, you could always fit electronic ignition and do away with points altogether).

Distributors

When carrying out an overhaul or if you think uneven running might be caused by timing, remove and check the distributor. Wear in the distributor can occur at the bottom drive dog and in the bush on the bearing plate which holds the points mechanism. If there is appreciable wear in either place, you will not be able to adjust the timing accurately. You should then fit a new/overhauled or good second hand dizzy.

★★★★★

Engine

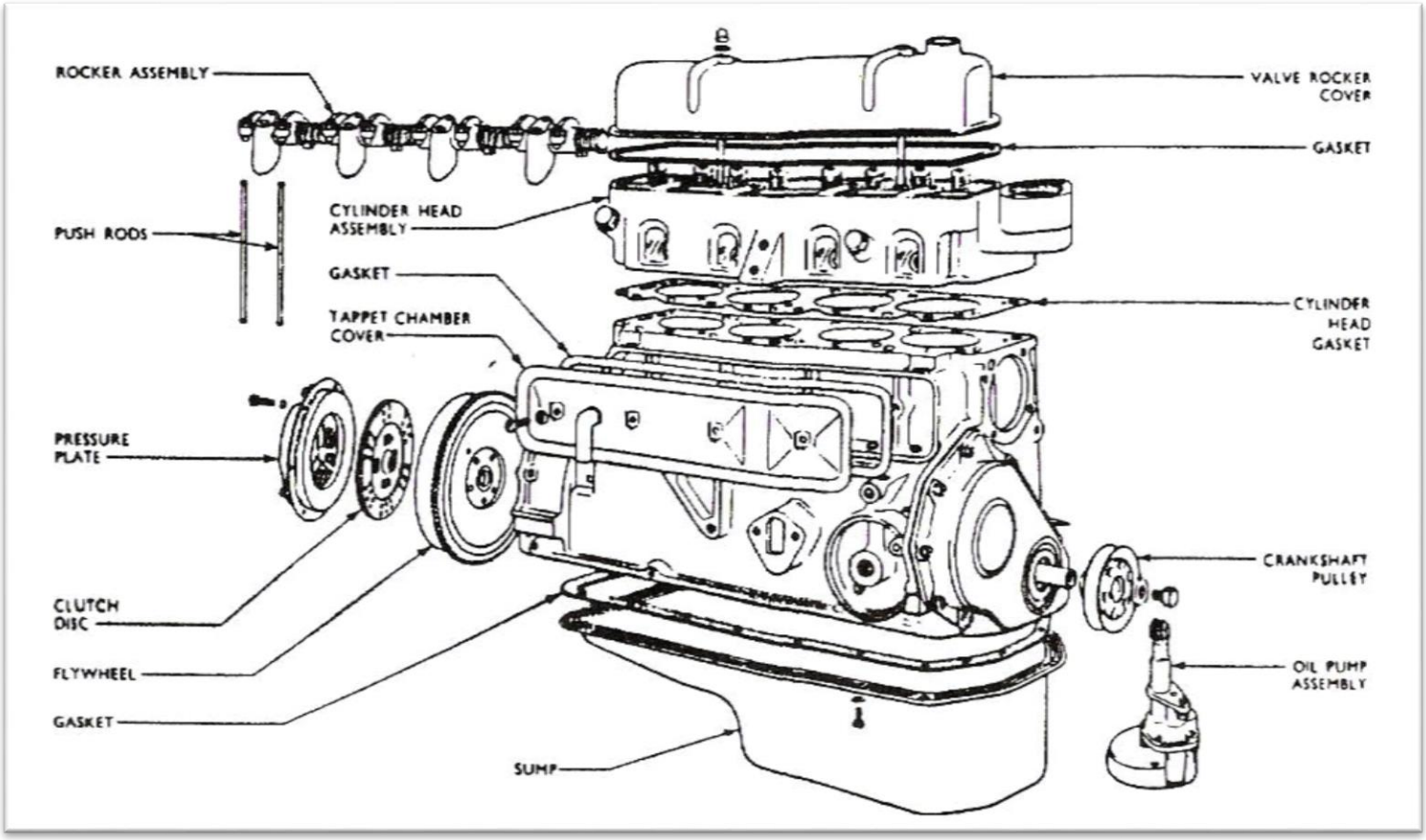

Figure 22 – Mk1 Consul Engine

Problems with Starting

A number of members have written in over the years to ask for help with starting problems on their Mk1s. Now, however annoying it may be to hear this if your Mk1 is giving you problems, it is true that a car that is set up correctly is a very good starter and under all normal conditions, it should fire first go and quickly at that. So, if your Mk1 is a poor starter then you will need to investigate the following areas one by one until you narrow down the fault or faults – often bad starting is a build-up of several faults over a period of time.

1. First check that the battery has enough "oomph" in it. The Mk1 battery tray is so big you can swap just about any other battery into it and give a known healthy battery a try. (Don't forget to confirm if your car is positive or negative earth). Check that the positive earth and negative feed terminals are a good, clean and tight fit and check the tightness of the thick feed lead from the battery to starter at both terminal ends. If the battery is in doubt – replace it.

2. Check the plugs. There may be a duff plug or the plugs may be old which can be the cause of problematic starting simply through age. They might also be wrongly gapped or “coked up”. It is best to fit a new set, Champion N8 or N9Y will fit, or the confirmed equivalent from other makers.

3. Before you can check the points inside the distributor you have to remove the cap, so clean that as well and inspect it for any hairline cracks. These can lead to bad starting, occasional misfire under load and to dampness in the distributor – which itself can cause poor starting. If you want to remove the cap altogether from the engine bay, remember to mark the plug leads before you pull them off the plugs so you are sure which is which. Mark the cap if you remove the leads from it as it only goes back one way round.

4. Change (preferable) or file/regap the points in the distributor to 15 thou or thereabouts. Leave the cap off and have someone turn the engine over while you check to see if the points are giving a spark. Check that the advance/retard vacuum mechanism is free and working.

5. Whilst this is being tried, undo the main fuel feed line to the carburettor and check fuel comes through when the engine is turned over (no need to have the ignition on, just use the starter solenoid button on a Zephyr or pull the starter on a Consul) – it should come shooting out of the loose pipe. If it does, then you should not have a fuel pump problem, although you may still have a carburettor problem. Retighten the feed for a moment and go back to the distributor.

6. Before you put the distributor cap back, change the condenser. This is a standard Lucas part. Usually its failure will lead you to total failure of the car’s ignition system, but even if things seem OK it is probably worth replacing anyway as they are so cheap.

7. Change the coil – new 12V ones with screw terminals should be available at any specialist supplier or eBay etc. It is rare for the coil to be the problem, but it is possible. Watch that you connect the terminals the correct way around – check the original before removing it. Check for looseness and breaks in the wire from the fuse box to the coil.

8. Check for water or condensation problems. When the pressure builds up in the cooling system you may find a tiny water spray aimed at the distributor or some other vital part which gets a soaking and then is too damp to allow an easy restart. Look for condensation droplets inside the distributor cap and clean them off and then coat with water repellent WD40. Try using an ignition system spray and sealer as well.

9. Check the timing or have the timing checked. It is quite possible for your car to perform well but be a bad starter. It may be that the timing is too far advanced which can give good performance but good starting usually requires a retarded timing.

10. Check or have the fuel system checked. Remove the carburettor float chamber and clean out the jets. Rinse in clean petrol to remove any muck. If there is a lot of muck then suspect the fuel tank and you may need to take that off and rinse out with clean petrol. Then you should use a “slosh” tank sealant if you can. The tank straps are held on by two bolts at the forward end of the tank – but getting access to them can be a little tricky, as you have to get right under the car.

11. If all seems well with the fuel system it is still worth having a look at the flexible hose joining the fuel pipe from the tank to the fuel pump at the front of the car. This can become porous and allow air bubbles to be sucked in, causing occasional fuel starvation.

12. Check the engine compressions. Bad compression leads to bad starting. You may have a burnt out valve or two, or a broken piston ring even if there are no other obvious symptoms. Regrind the valves if necessary. Compressions should be consistent and not more than about 10psi out between each other. Levels should be about 110 to 120psi for a Consul or a Zephyr and 130 to 140psi for a Zodiac.

13. It is always possible that the starter motor is not performing properly – or that it has a bad earth, or is not engaging properly on the flywheel ring gear. This does get worn, especially on Consuls. But usually you know this because of the horrible grinding noises that you will hear when operating the starter – or alternatively if it jams.

14. Finally, it is worth considering (if you are not a total purist) that you might fit electronic ignition and an electric fuel pump. These can be carefully hidden from view and can work wonders with starting the car first time, every time.

If you go through all the points above, you should have a reasonable chance of finding and overcoming all starting problems. If you trace the problem to the condition of the engine itself, you will need to continue on to the next section.

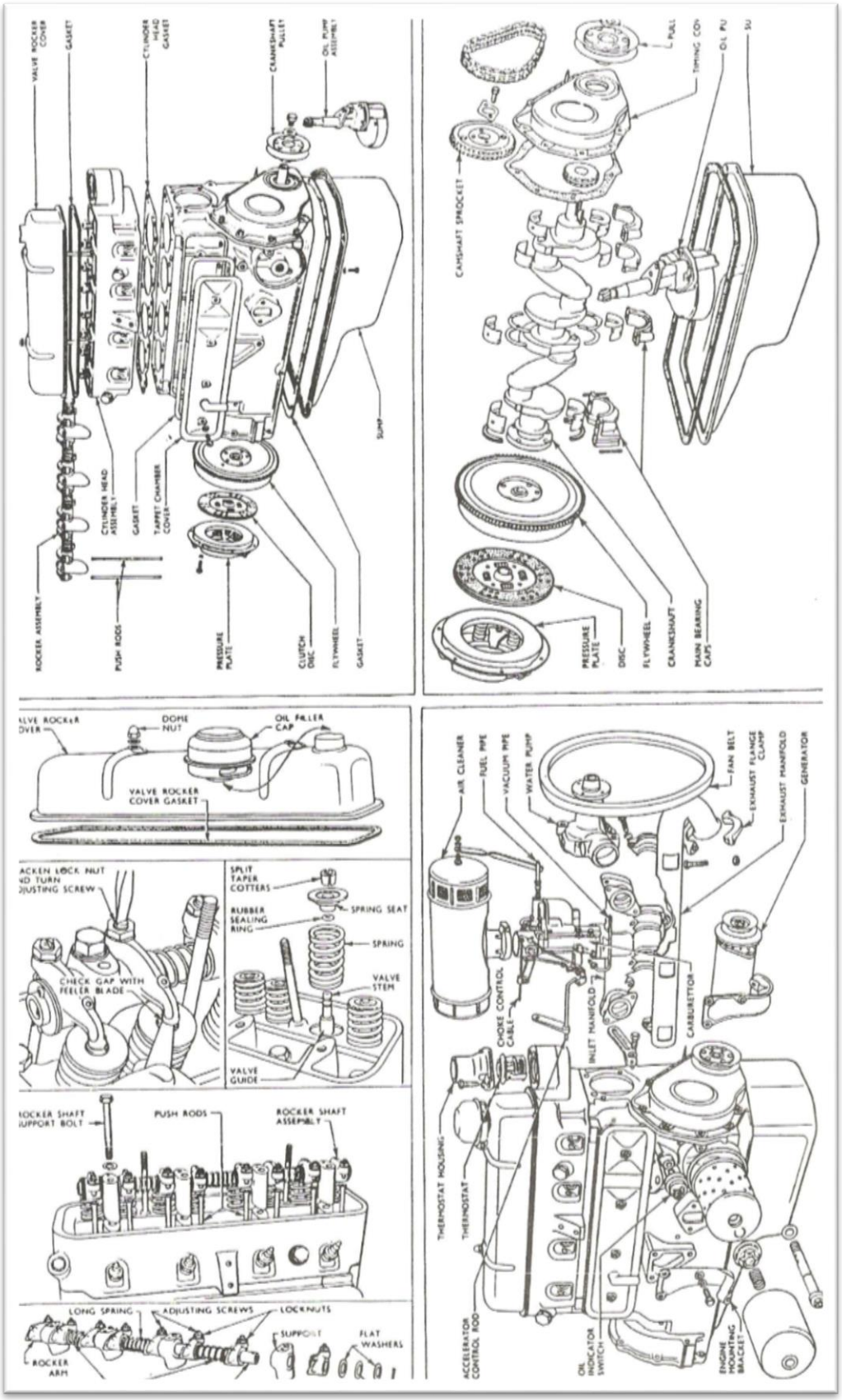

Figure 22 – Engine Exploded, Various

Engine Repair

The Mk1 Unit

Mk1 Engines are generally long lived units and can last up to about 100 – 120, 000 miles before needing major repair if maintained regularly. However, lack of performance and increased oil consumption due to wear in the bores do eventually become an expensive nuisance and there is then little alternative other than to rebuild the engine.

Thinking beforehand is essential.

If you are not used to these things, you really must take technical advice from another Club member or a professional before beginning anything like an engine overhaul. You really should read this article several times and study the workshop manual as well before attempting a rebuild. If you are in any doubt, and not particularly confident, seek professional assistance, or have the work done for you.

If you are going to renew things, it is essential that you have used a checklist to be sure you have all the parts you are going to need, and the right ones at that. There is no point putting in some new parts in and leaving a lot of worn pieces. Advice can come from the Club or any of the other advertisers in the magazine and website. Second hand engines are sometimes available, if you do go down this route, try to ensure that they come from a known, good runner. It is much simpler to swap engines over than to carry out a full rebuild. Either way, this article should help.

Finally, please also take advice from any Club experts, or advertise in the magazine or online for assistance. If you do get professional help, ensure they know what they are doing and have similar experience, as the Club has seen an awful mess made (even of the simplest engine rebuilds) by dumbo garages who really should know better. Take technical advice from Club specialists whenever possible.

Preparing

You should not even start to remove an engine unless you have a number of essential tools and other items. These include a proper engine hoist, valve spring compressor, torque wrench, clutch alignment tool (or an old Mk1 gearbox primary shaft), feeler gauges, old cans/boxes and marker pens so you can save bolts, pistons etc in named boxes to keep things in the right order, plus trays or empty oil cans to collect all the old engine oil, and loads of kitchen roll to mop up! You will also need old blankets and a bowl, the latter for the coolant. In addition, you will need all the spare parts and gasket sets that you will have discussed with your favourite expert.

Removal of the Engine

This is a fairly simple process providing you have access to some kind of lifting crane or hoist. If you don’t have one, you ought to hire one to reduce the chance of damaging things while removing and replacing the engine. (What follows assumes that you are doing this on a roadworthy vehicle, if you are breaking one or building one up from scratch, common sense should prevail, depending on your requirements).

To give yourself space and to avoid damage to the car, first get some old blankets or rags and drape them over the front wings. Then remove the bonnet – it is only four bolts. Remember to undo the horn connections on a 6-cylinder car.

Then it is probably easiest to start at the top and work down, having first disconnected and removed the battery, drained the sump and radiator, using your old can and bowl respectively. You need to remove the radiator and hoses, air cleaners, starter motor, dynamo, fan blades and pulley and then disconnect the exhaust pipe at the manifold clamp, vacuum pipe to the wiper motor and the petrol pump supply type. Although not strictly necessary, it makes life easier (and prevents damage) if the distributor cap and leads, coil, water pump and inlet manifold complete with carburettor are removed too.

Now, beneath the car, undo the clutch slave cylinder and it out of harm's way along with the clutch return spring and operating rod. Also remove the flywheel cover bolts and all the gearbox bell housing bolts you can reach. Note one of these bolts clamps the earth strap.

Next position a jack under the gearbox to support it and attach ropes or chains to the engine itself. From experience a rope tied around the rocker shaft is fine as long as the rope is secure. So, you may need to remove the rocker cover now. Take the weight of the engine with the hoist and remove the top three bell housing bolts which can be a bit of a fiddle. An open-ended spanner is best. Now undo the two engine mountings ensuring that the weight of the engine is taken by the hoist and pull the engine forward to disengage the splines of the gearbox first motion shaft. You may need to wiggle things or force an implement between the bell housing and the block to free things.

Now raise the engine, twisting around the obstructions and lifting it high to clear the front panel. On a Zephyr, you will find it essential to remove the heater unit before removing the engine, as well as the battery tray). It must be stressed that safety is very important – ensure the hoist you are using is up to the job and keep yourself as far away as possible from the engine when it is supported by the hoist.

Dismantling

Assuming your engine is now out you can begin dismantling it. Start by cleaning it with Jizer or Gunk – it is much more pleasant working on a cleaner engine and there is less chance of dirt finding its way into the engine internals.

Have your kitchen roll, tins boxes and marker pen ready as you start to dismantle as it is essential that pushrods, cam followers, connecting rods etc are kept in the right order by piston number. Next remove the distributor, fuel pump and oil filter bowl and then the rocker shaft and pushrods. If you plan to reuse the pushrods and the original cam followers keep them in their original order so that they can be mated up to each other again on reassembly. Next, remove the cylinder head bolts in the correct sequence as per below and then remove the head and discard the gasket.

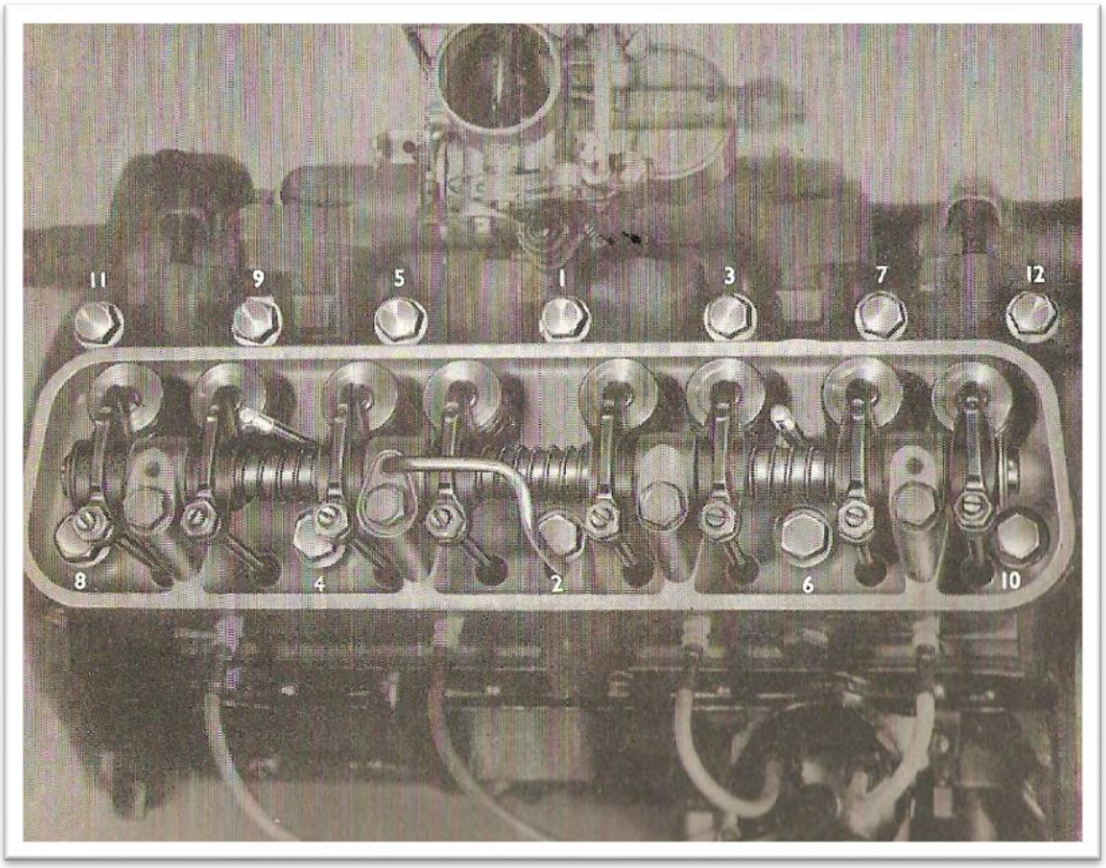

Figure 22 – Four Cylinder Engine Sequence

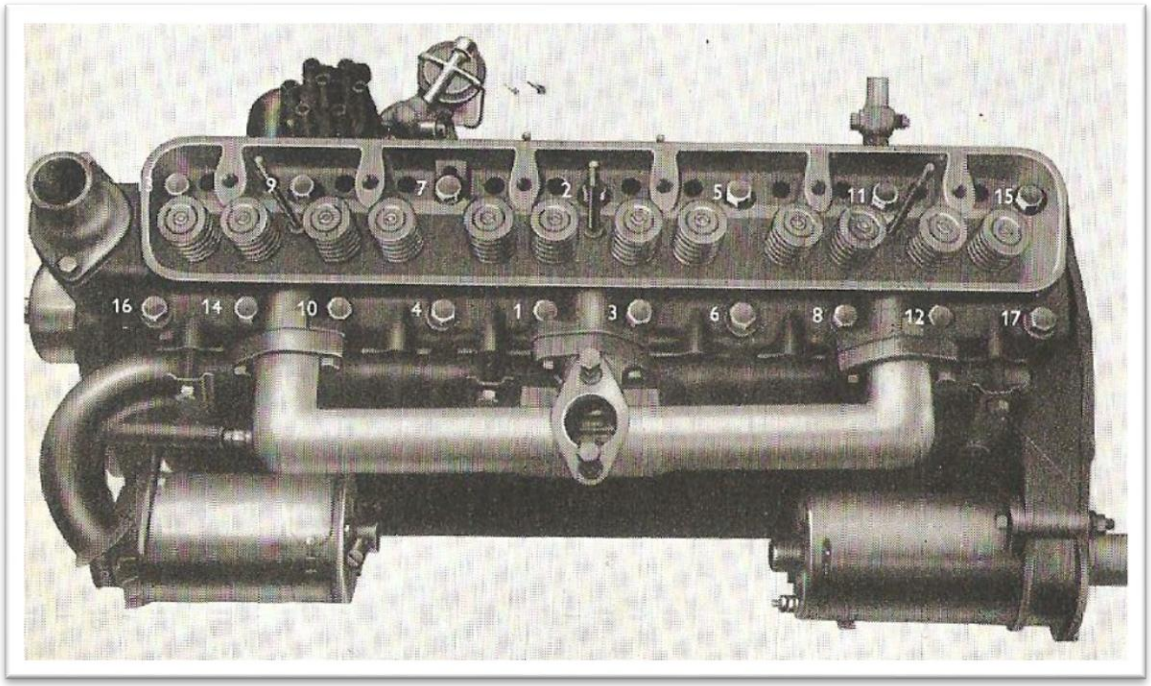

Figure 23 – Six Cylinder Engine Sequence

Now, watching for more oil spillage, invert the engine and remove the myriad of sump bolts, a little at a time to avoid distortion of the sump itself, and remove the sump. Now remove the oil pump (two bolts). Tilt the engine onto its side and undo the big end clamp nuts and locking washers and remove the lower part of the clamp on the big end. These should be numbered, but again ensure that they are kept in the correct order for reassembly. You can now carefully push the piston up through its bore with the connecting rod still attached avoiding damaging the bore or the crankshaft journal.

To remove the con rod from the piston, heat it in warm water (or use an old hair dryer to heat it), undo the clamp bolt and slide the gudgeon pin from the piston. Again, keep each rod with its original piston although they should be marked with a number.

Now undo the crankshaft pulley nut and pull the pulley from the shaft, taking care not to lose the Woodruff key which locates the pulley on the shaft, then undo the chain sprocket, undo the bolts and pull off the chain and sprocket. Next remove the clutch cover and plate from the flywheel, bend back the locking tabs, undo the four bolts and remove the flywheel itself. To remove the crankshaft, undo the bearing retaining clamps and lift it out. The camshaft is removed by undoing the thrust plate at the front of the engine and sliding it through the front aperture, ensuring that the cam followers are pushed well clear of it. Finally, you can remove the cam followers themselves.

To dismantle the head, compress each valve in turn with a valve spring compressor and remove the collets which hold it all together. Now release the compressor and remove the spring, valve and top plate. The rocker shaft can be dismantled by removing the split pin from the end and sliding the components off of the shaft, keeping them in their correct sequence for reassembly.

Inspection of the Engine Parts

Common sense and monetary considerations will dictate the actual amount of rebuilding to carry out. If the crankshaft shows any signs of scoring it will need to be reground at an engineering workshop and oversized bearing shells fitted on reassembly.

Bearing shells really should be replaced as a matter of course, even if the crankshaft journals are perfect. (As long as you can find them, try all our usual suppliers, advertise in the magazine/website or look on good old eBay as well.) Camshafts and cam followers rarely need attention and can normally be reused after a thorough clean.

If the piston bores have a ridge at the top of the stroke (you can feel this with your fingernail) or are scored in any way you will need to have the block bored out and fit oversize pistons and rings. Again, this is an engineering shop job. If there is very little bore wear, you may get away with fitting new piston rings to the original pistons provided that the ring grooves are thoroughly cleaned and all carbon deposits removed – a broken piece of piston ring is a good tool for this. It is best to take expert advice on the look of the engine if you are unsure. In many cases, you will know there is a lot of wear so the decision is taken for you! Remember if the engine has been rebored before - there is a limit to the amount of further reboring that you can do, +60 thou being that limit.

Oil pumps are not prone to wear on the Mk1 engine, but remove the filter screen and give the whole lot a good clean to remove any sludge deposits. Timing chains are also a good replacement idea, if you

can find them. A good idea is to refit a Mk2 timing chain cover which includes a tensioner device but otherwise looks the same.

Otherwise it is a case of removing traces of old gasket material and cleaning all oil sludge from the engine components. It is important that absolutely no dirt or swarf finds its way into the engine on reassembly or all your hard work could be in vain.

If the valves are well worn, these will need replacing. Check that the valves do not rock laterally in their guides, if they do - the guides need replacing. This is a case of driving out the old guides with a suitable drift and driving in the new. Thoroughly remove all carbon deposits from the head and valves. Valve springs do not wear often, but can break in very high mileage engines. If the rocker arms and shaft are badly ridged they will need replacing, but this is unusual.

Wear in the clutch drive plate is obvious, as the rivets will be close or level with the wearing surface, but check for weak springs in the cover. These should usually just yield to really firm hand pressure – if they move easily then exchange the cover for a reconditioned unit with stronger springs. A weak clutch pressure plate is often related to a very “soft” lightweight clutch pedal pressure on a Mk1.

Reassembly of the Block

Having ensured that you have sufficient gaskets and everything has been scrupulously cleaned with all traces of old gaskets removed you can now start to reassemble the engine.

Firstly, look at the core plugs in the outer surface of the block – if these look rusty drive them out with an old screwdriver and tap in new ones if you can find them. Now you will start to have to put parts back in the correct places from which they came.

Lubricate the cam followers with clean engine oil and then replace them into their respective bores and then lubricate the camshaft and carefully slide and then tap it into its bearings, securing the locking plate with the two bolts you should have put into a marked tin. Next lubricate and refit the crankshaft and its bearings, tightening the clamps up to the correct torque. You must have a torque wrench for this – hire one or borrow one if you don’t own one.

Next, fit the connecting rod to the piston, warming the piston first in warm water and sliding the gudgeon pin into position and clamping it with the locking bolt. Then slide the new rings onto each piston with the oil control ring at the bottom, ordinary ring in the middle and chrome ring at the top. If you are reusing your original pistons and there is a slight ridge at the top of the bore, it may well be worth fitting “ridge dodger” rings which are stepped to avoid the ridge. Take proper advice as recommended earlier if you are not sure **DON’T** go ahead and do something wrong and then ask for advice when it’s too late.

Use feeler gauges to fit the rings to the pistons, easing them carefully into position. Clamp the rings with a ring compressor or large jubilee clip and slide and tap them into their respective bores. Fit new big end clamp bearing shells and loosely clamp the big ends with their bolts. Ensure that you have lubricated the shells well before finally tightening to the correct torque and refitting the locking cap. Now check that the crankshaft will turn – if it is too tight, something is wrong – probably the big end clamps are too tight. It is very important that the correct torque is adhered to. (In rare cases the size of the outer radius of the shells may be larger to allow for reaming of the shell mounting.)

Next, refit the timing chain making sure that the timing marks on the sprockets line up, refit the bolts and bend back the locking tables. Fit a new oil seal to the front cover and using a new gasket replace the cover and then the crankshaft pulley. Now refit the oil pump checking that the large D on the cog (seen through the distributor aperture) is facing the front of the engine. It is trial and error to get this

right, but it is worth taking some time over. Fit a new gasket to the sump and replace it, tightening up the nuts progressively to avoid distortion of the sump, or it will leak.

Reassembly of the Head

Now turn the engine the right way up and turn your attention to the head. The valves must be refitted to the head in turn, lapping each valve to its seat with grinding paste. If you are re-using the old valves, make sure you replace them in the seats they came from. Use a valve grinding tool for this which utilises a rubber sucker which attaches itself to the valve whilst you grind the valve to its seat using a rotary action. Once you have a smooth matt grey finish to the valve and seat, remove ALL traces of the grinding paste and with the compressor, reassemble the spring, plate and new valve seal, and collet to the valve. Using a new gasket refit the head and progressively tighten down each bolt in the correct sequence and to the correct torque. Refit the pushrods.

Reassemble the rocker shaft, locate it on the head and rocker arms and tighten down to the correct torque. Now set the valve clearance to .015 using the correct order. With the corresponding valves open check the clearance by inserting a feeler gauge between the valve head and the rocker arm – it should be a firm but sliding fit. To adjust, slacken the locknut and turn the adjuster with a screwdriver until the desired clearance is reached. Repeat this performance until all the valve clearances have been checked. Fit a new oil filter and sealing ring to the engine block (much easier with the engine out).

Refit the flywheel and the clutch, aligning the plate with an old gearbox first motion shaft or a clutch alignment tool, and progressively tightening the clutch cover bolts to the correct torque.

Refitting

You are now ready to refit the engine which is pretty much reverse of taking it out. It is easier to refit the distributor with the engine out of the car. It is probably best not to fit the rocker cover so you can make adjustments after starting the car. You may wish to use a rope round the shaft for refitting too.

To set the initial timing, turn the crankshaft pulley until the timing marks align and rotate the distributor until the points are just opening with the rotor arm pointing to No. 1 plug segment in the distributor cap. This will enable you to start the engine and fine adjustments with a strobe light and the Vernier scale can be made with the engine running.

The most difficult part of the engine refitting is aligning the clutch with the gearbox first motion shaft which can involve much jiggling around (and swearing). If the clutch plate is not properly aligned in the first place it will be impossible to mate the engine to the gearbox.

Before starting up refill the engine with clean 20/50 oil and check that everything has been reconnected. Starting may be difficult. If the battery is strong enough, use the under bonnet solenoid to turn the engine over with the ignition off to check for nasty sounds. With a Consul just use the starter with the ignition off. This will circulate the oil. If all sounds good, turn on the ignition and start the engine, leaving at fast idle for 10 minutes – ½ an hour (watch for overheating) to let the engine bed in.

With a very tight new engine you may need a hefty battery to start it. Occasionally with Mk1s, it is necessary to tow-start the car for the first time.

With the engine running check for leaks and unwanted noises. There will be some fumes as oil burns off the engine exterior if you have spilled any, but this is normal. Once the engine has warmed up retighten the head bolts and check the valve clearances again. It is advisable to do this again after the

first 500 miles. If you have fitted new pistons and bearings it would be advisable to change the oil and filter at 500 miles too.

Obviously, some engine repairs, such as head renovation (or unleaded conversion) can be easily carried out with the engine still in the car – indeed it is possible to drop the sump and remove the pistons with the engine in situ, but if you want a long lasting unit it does pay to "give it the works".

General Tips on the Engine

Leaks around the tappet inspection cover

This is a favourite area of oil leaks under the bonnet and can cause a thin spray of oil and consequent mess everywhere under the bonnet. If you have an oil leak through the tappet inspection cover gasket, check that the cover plate is being clamped evenly all the way round, and if not, add washer to the screws holding the plate. Occasionally, you may find a replacement gasket is thinner than the original. Use blue Hermetite (or similar) to stick the gasket to the cover before refitting to ensure the gasket stays in the correct place and does not distort (or fall off) as you refit the cover.

Cylinder Head Replacement

When replacing the head, you should have ready some old head bolts with the hexagonal nuts cut off, and a slot cut into the shank so you can use a screwdriver on them. Use two of these, one at each corner of the block, to line things up by sliding the head down onto them, and it must then slide down into the correct position. This is an especially useful technique if you are on your own for this awkward and heavy job.

Inlet Manifold Gaskets

These are steel pressed gaskets at the join of the inlet manifold to the head. If these are not sealing properly, you will get uneven running at idle with a Zephyr, as if it was running on four cylinders, but this is less apparent as soon as the engine is revved. This may be due to a small leak at the inlet join. If possible, use new steel gaskets (usually supplied with a head set), when overhauling, or carefully coat old gaskets with blue Hermetite or similar.

Oil Pump

It was noticed that a newly reconditioned oil pump supplied had a hairline crack in the drive gear where the pin holds the cog to the oil pump shaft. This had to be changed for another cog before the recon pump could be used. If fitting a reconditioned pump, check yours. The pin had probably been too tight (it was very difficult to remove) was forced in, and cracked the cog.

The pump was to go in an early Zephyr. These early cars typically suffer from slow build-up of oil pressure when starting, and oil pressure which disappears on sharp bends or braking. The reason is believed to be that the early pumps were not self priming and so it pays to fit a later Mk1 pump when overhauling. Mk2 and Mk3 pumps fit the Mk1 if you can find one.

It is also wise to fit an oil supply extension tube to those early cars which don't have them. This is a small bent piece of pipe which is a push fit in a hold behind the oil filter mounting in the block. It would appear to stop the filter draining and causing temporary loss of oil pressure under conditions such as sharp cornering or braking.

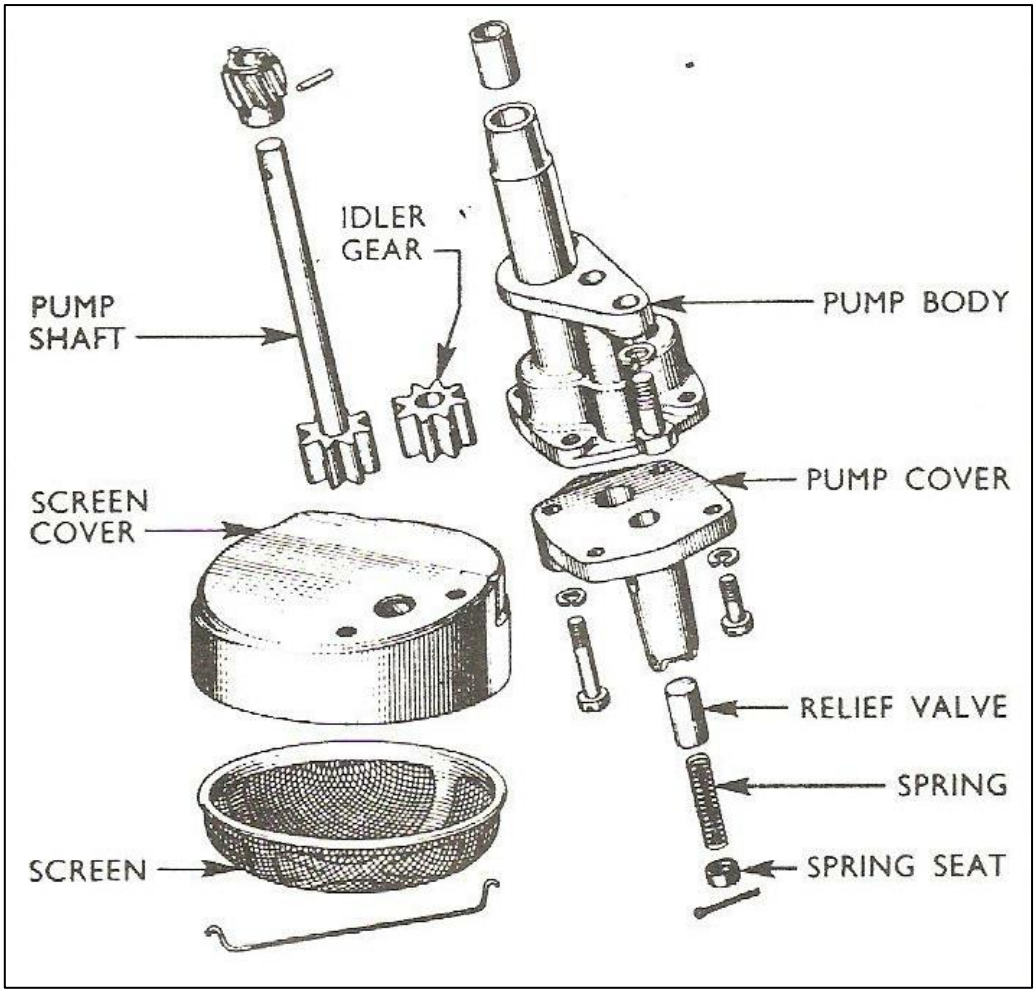

Figure 24 – Oil Pump Exploded

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Fuel Starvation

High Speed Misfire

It can start with this. At anything over around 50mph you get an intermittent misfire. It could be electrical. It could be a fuel problem – something simple as a little dirt in the fuel and as soon as it clears you are away again. But if the misfire doesn't go away you will have to do something. If you get this sort of symptom only at high speed it is probably best to start by checking the electrics.

Some guidance on starting problems was given way back in the March 1988 issue of Five Stars. We assume the car will go but only shows the symptoms under stress at higher speeds.

Electrical items to check

1. Plugs and Points – it is always worth replacing these before spending any more time looking for misfiring faults. When replacing the points, if you have a misfire, replace the condenser in the distributor as well. If this doesn't cure the misfire, then…

2. Change the HT leads and the coil, if you still have a misfire, then…

3. You must check whether your engine is healthy or not. An engine with weak compression or a shot head gasket can show misfiring under load. If your engine is healthy, then you need to start looking at the fuel system as a cause of the misfire, which may actually be a cut out due to fuel starvation.

An Example:

In one of the worst cases we have known, the symptoms got so bad that the car could only be driven a few yards before the engine would stall. Checks made were as follows:

- Carburettor – dismantling it and reconditioning it, adding a new needle valve since the choke chamber was not filling up with petrol.

- Fuel pump – reconditioned it.

- Dismantle the fuel supply and blow through it on a pressure line (a lot of muck shot out). This of course means that the muck was coming from somewhere so…

- Remove the fuel tank and clean it out, using a piece of stiff wire to clean out the pick-up pipe in the tank. Experience shows that you would then use a "Slosh" tank sealant to prevent more debris loosening.

- In this case, there was a misfire on two cylinders, so replace the plugs.

- Renew the HT leads to the plugs, which were this time the source of the trouble as on inspection two of the plug push on connectors were damaged.

- The job might have been easier (as we now suggest to our membership) to check these items first.

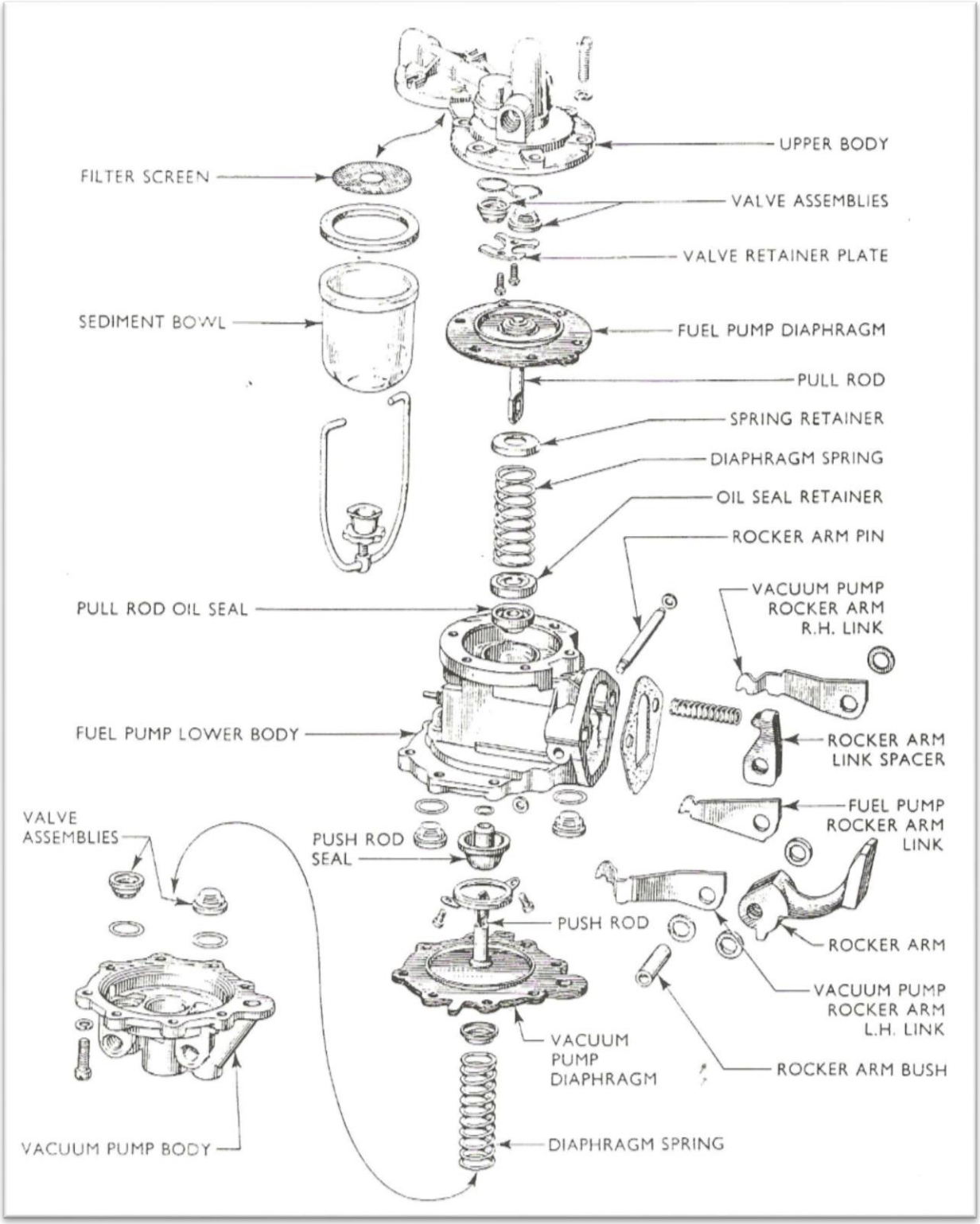

Figure 25 – Fuel Pump Exploded

Sorting Fuel Problems

Mk1 Owners have reported that any attempt to get the car to go over 60mph results in some shuddering and misfires, although if the car is kept below 50mph there was no problem. It is difficult to tell whether problems like this are electrical or due to fuel starvation. Elimination was called for. The plugs were changed, together with the points. Then the condenser in the distributor was changed. But there was no difference, the coil and the HT leads were also changed. There seemed to be some slight improvement, but then the problem started up again at any speeds over 30mph.

Moving away from the electrics, attention was turned to the fuel system with a new pump (lucky if you can find one now). But this was no help. The fuel pipe was cleared out and there was a slight improvement, but it didn't last. The float chamber came off of the carburettor and it was almost dry, so it appeared to be fuel starvation. The fuel pipe was blown through with a compressor, but still the problem occurred. It was discovered that a previous owner had used sealant on the fuel sender unit which softens in petrol and that had deposited globules into the tank and caused the blockage. The tank had to be thoroughly cleaned, but it was only when another second-hand tank was fitted that the problem went away.

Moral of the story – never use a standard gasket sealant. However, this is not the only source of problems relating to fuel starvation, sometimes you have to go down a lot of avenues to get to the root cause.

Removal of the Tank

The fuel tank is held in place by two metal straps held on at the rear by being slotted into a hole in a plate and at the front by two bolts whose locked heads protrude into the boot under the mat just rear of the rise over the axle. By now, all Mk1 tanks are quite old and may have little bits of paint flaking off or small areas of rust flaking inside. These should not be a long-term problem causing you to junk the tank. But if you have a real impurity in there, you may need to change the tank. All other measures may fail.

You should preferably not have much fuel in the tank. Get the car jacked up nice and high and get someone to help you. With a well-fitting spanner or mole grips see if you can loosen the drain plug underneath the tank. If so (and this is rare), drain the tank into a suitable can. Then using the spanner or mole grips release the nut holding the fuel pump supply pipe connection into the tank, and pull it free. Undo the clamp screws holding the filler pipe hose in the boot. Then, while one of you holds the tank in place, the other can get on with the socket set and remove the nuts from the two bolts holding the tank. The straps will then hang down. You should then gently ease the tank out, saving the tapes placed between the straps and tank, and the packing pieces between tank and boot floor.

If you have a brake master cylinder spare anywhere with the little screw in protective caps, the larger of these will act as a screw in stopper for the tank (being the same thread as the supply pipe clamp nut).

Fuel Starvation Summary Checklist

1. Check plugs and leads
2. Check points and condenser
3. Check the coil
4. Check the carburettor and float chamber
5. Check the fuel pump and flexible fuel pipe (this can become porous)
6. Clean the fuel lines
7. Clean or replace the tank

Loss of Power by Mick Johnson

If this is your general problem, not attributable to other sources, then take a closer look at the engine itself, especially if it has not been touched from new (quite possibly very rare nowadays). On two examples, similar problems were experienced – i.e. a lack of performance on low mileage engines 33,000 and 40,000. Although running smoothly, in both cases the piston rings had stuck and broken, causing a lack of compression. Additionally, the valve seats in the head were in poor condition, and several exhaust valves were burnt. Despite all this the engines seemed to be running well at tickover and started without problem, but they had no power.

Once new standard piston rings were located and fitted and the cylinder head was overhauled, full performance was restored quite quickly and cheaply. A number of engines out there may require similar attention, and a check of the compression in each cylinder would confirm the trouble.

The distributor should also be examined, perhaps even replaced? Serious wear would probably not occur until a very high mileage has been covered, but the operation of the advance unit should be checked. This can be done by using a timing light to check that the pulley timing marks move apart when the engine is revved.

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Steering

The steering system on your Mk1 needs regular checking and maintenance for continued driving pleasure, plus legal and safety requirements and, of course (if you decide to have it done) the annual MOT test. As the years and mileage of the car build up, wear develops at some or all of the several joints and pivot joints in the steering linkage. This wearing process is accelerated by neglect. At the heart of the system is the steering box, although when handling deficiencies are apparent it is important not to jump to conclusions and blame this major and reasonably expensive component before making a thorough check of other parts in the steering setup. Defects in these tend to feed their effects back to the driver via the steering wheel though may not involve the steering box itself.

Tyres and Wheelbearings

When tracing faults, start with the basics. Correct tyre pressures are important as soft tyres give the impression of vague (even more so if you are on cross plies), or heavy (probably more on radials) steering. Unevenly worn or mismatched tyres may tend to cause the car to pull to one side when the hands are taken off of the steering wheel. Swapping wheels around will probably confirm this fault. When changing the tyres or when the car is jacked up, check the front wheel bearings for excessive play. Hold the top and bottom of the wheel and try to move the top in and the bottom out and vice versa. If you can feel “give” (i.e. more than just perceptible play) then the bearing needs tightening. Here we have an advantage of the Mk1 as the bearings are adjustable and even when not serviceable, it should be possible to find replacements or fit serviceable used ones (try eBay for new ones if you can). Adjust by removing the grease cap, remove the split pin from the big hub nut, and check the roller bearing and race for grooves and uneven wear. Grease the bearing surfaces and tighten the big nut a small amount at a time until you can no longer feel the in/out play but just a perceptible amount as you try to wiggle the road wheel. Don’t forget to check that the wheel runs smoothly and doesn’t grab, and also that it runs “true” and has no kinks in it. Also, don’t forget to replace the split pins in the nut, pack with grease and replace the grease cap.

You could also take this as an opportunity to replace the outer grease seal if need be. Streaks of grease outside the hub cap on the road wheel paint surface, especially after a hard drive, are a tell-tale sign of this. Another source of worn tyres is the adjustment of the front tracking – the distance between the front edges of the front road wheels as maladjustment here is all too common, as folks replace parts of the steering without adjusting the track.

Steering Linkage and Joints

Moving on to the steering linkage, get a friend to rock the steering wheel back and forth while you watch each joint in turn – or get a mechanic or mechanically aware friend to do this. Note any play that may be found in each joint – see the illustrations to check part names etc. A worn joint often betrays itself with a knocking noise and a badly worn idler assembly (the opposite side of the steering linkage to the steering box) will tend to move up and down in addition to its normal sideways movement as the steering wheel is turned.

Carefully check the condition of the rubber bushes at the inner ends of the Track Control Arms and on the anti-roll bar mounting points. Check that the U bolts holding the anti-roll bar are tight and correctly located in their grooves.

A favourite wear point is the swivel joint on each side of the car at the outer end of the Track Control Arms. These are best checked with the car on its wheels by placing a suitable lever between the Track Control Arm and the spindle support bracket and putting a strain on the joint to look for any give – serious wear in these joints often goes unnoticed even by some MOT inspectors – so beware. Parts should still be available.

Strut Top Bearings

Next, inspect the often-forgotten thrust bearings at the top of the suspension legs. Although not strictly part of the steering linkage itself, partial or total seizure of these bearings can give similar effects to a worn or badly adjusted steering box. Jack up the front of the car and check that the top spring seats turn freely as the steering wheel is swung from lock to lock. Any stiffness or jerkiness here means that the bearing needs replacement. You should be able to see the bottom of the coil spring turn and the top stay still if the bearing is seized. Seized top-mount bearings are usually caused by water entering the bearing at the top due to defective rubber caps which are visible at the top of the inner wings when the bonnet is open. Quite often if they are seized a “twanging” sound will be heard as the car is driven around corners due to the spring winding up because of the lack of free rotation. While you are checking this, if you have the right size wrench or socket, check the top nut on the strut under the rubber cap is tight – if not, you may hear the odd rattling sound from the strut area as you go over a bump.

Steering Box – Movement on the chassis

Assuming everything else is checked and OK, remaining problems with steering can probably be traced to the box. There are a number of things to look for in connection with the box itself. First, check that the long bolts holding the steering box to the car are tight. Also inspect the bracket holding the bottom of the box to the car. This L shaped bracket is prone to cracking. This was often the cause of defeat in the Demolition Derbies of the late Sixties and early Seventies at which the Mk1s were good, strong performers. Cracking of the bottom of the mounting of the steering box causes excessive movement of the box in relation to the chassis. Get someone to rock the steering wheel and look for more than just slight movement of the box on the chassis. If there is more than an amount which is only just perceptible, then you have a problem. At its worst this might be caused not by loose bolts or weakness in the bracket, but by thinning of the mounting on the chassis.

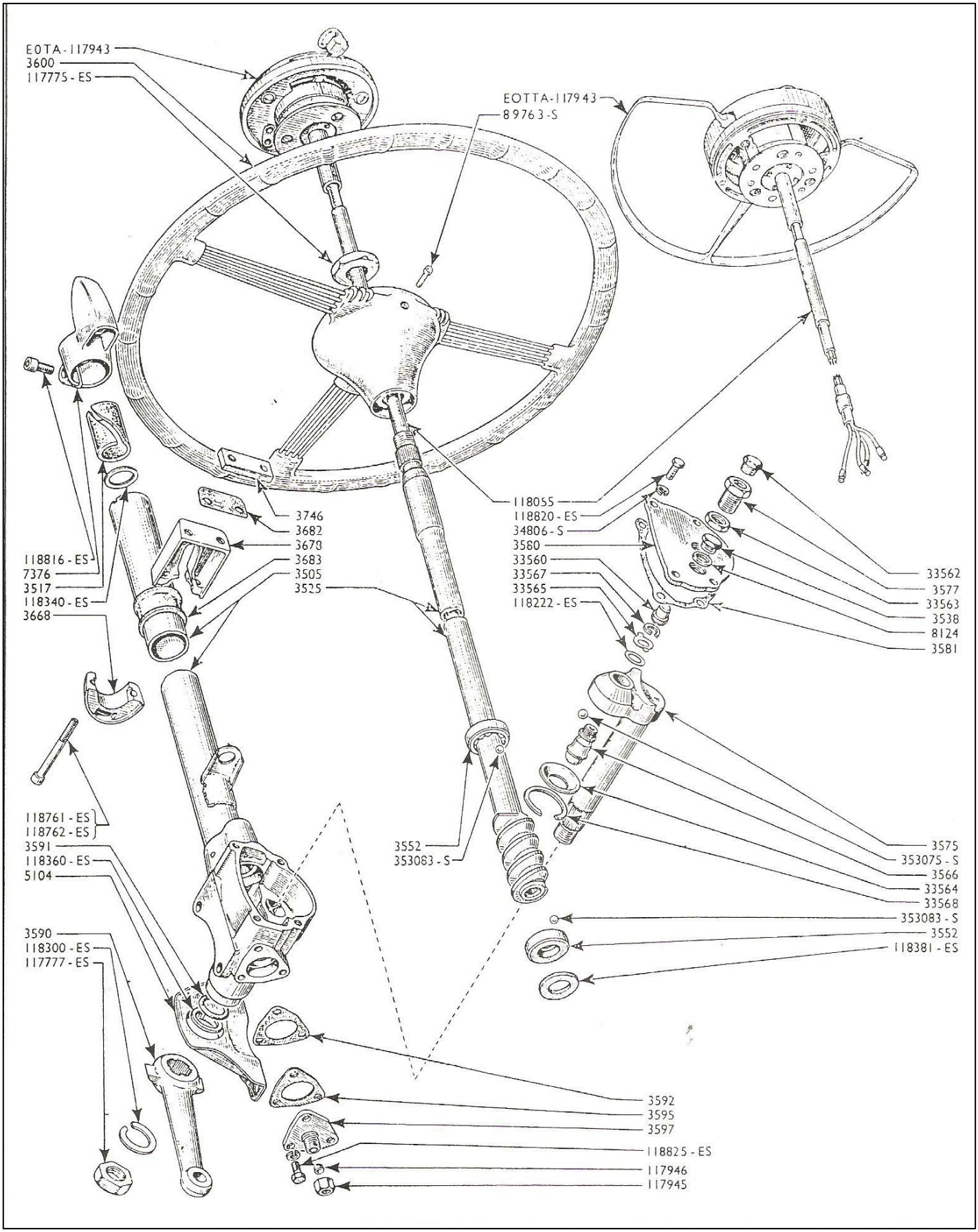

Figure 18 – Steering Wheel and Shaft Exploded

Steering Box – Checking and Adjusting

Get someone to rock the steering wheel and look for any up and down movement of the drop arm before the rest of the linkage starts to move (see illustrations for location of the drop arm). Up and down movement indicates at the least that adjustment is required. The correct procedure for adjustment is to disconnect the drag-link (see illustrations) top drop-arm ball joint thus leaving the steering box free of any load. Then, after slackening the locknut on the adjustment bolt on top of the steering box, gently turn down the adjuster nut until a very light resistance is felt in the straight ahead position as the steering wheel is turned from lock to lock. Note that some early boxes have a button screw and spring at the top of the adjuster nut and these have got to be removed before adjustment is carried out.

Never be tempted to overtighten the adjuster as stiff steering and possible damage to the box will result. Worse, if your box was very worn, tightening at the central position; where the box is most worn (since you drive more or less straight most of the time), will mean that the box will be very tight as you reach full lock which would be very dangerous. Strictly speaking, you should therefore only get mechanically qualified people to do this job. Make sure you recheck the steering is not stiff at any point after you have retightened the lock nut. If it is – and you disconnected the drag link – then you definitely have a problem in the steering box. If you did not check the rest of the steering, it is possible that you have a fault elsewhere, and that is why you should check in the order stated above. Do also check the oil level in the steering box. Use EP90 or EP140 gear only.

Steering Box – other checks

There are a number of other faults to check for. A slightly loose feel of the steering wheel as you rotate it at the driving seat – with possibly a knocking noise as the wheel is rotated – could be due to the central fixing nut being loose causing movement of the steering wheel on the splines. You can also get movement forward and back of the rim of the steering wheel – towards you and away from you if the nut is not tight. It is surprising how often it is slightly loose. To cure this, slacken the three grubscrews on the steering wheel hub and gently pull off the horn/indicator assembly. If it resists, also slacken the gland nut at the bottom of the steering column on the radiator side of the steering box where the wires come out (in the centre of the nut itself). The gland nut holds the stator tube down which the wires go in the hollow steering shaft itself. Withdraw the horn/indicator assembly on the few inches of free cable usually available so you can get at the nut holding the steering wheel. You'll need a big wrench to tighten it as the wires prevent you getting a socket on, unless you want to do a total removal of the indicator/horn electrical wires! Make sure the wheel is pulled right up tight on the column. Replace the horn/indicator assembly ensuring you push the wires back down the hollow column, and retighten the grub screws and gland nut.

Ensure you replace the indicator unit with the switch central and the upturned V of the cancel unit facing downwards – or the indicators will not cancel properly. It they do not already, that may be why. If the wheel is not central with the two side spokes horizontal as you go straight, make a note of how much you need to turn it by seeing how far off centre it is when driving straight. Ensure the road wheels are in straight ahead position when adjusting, remove the

nut completely, replace the steering wheel after turning it the required amount, and retighten.

Now the wheel is tight, look for in or out movement, towards you and away from you as you sit in the driver's seat. This is caused by excessive end float of the steering shaft on which the steering wheel is mounted. This can be adjusted by removing shims (basically thin metal spacers) you should find between the end plate of the steering box and the box itself. The cover plate (see the illustrations) is held on by three bolts to the bottom of the box and the bolts go through the shims. Removal of a shim should take up the wear that has occurred on the shaft causing it to have a tiny amount of forward and back play.

Next, having made sure that the steering wheel is tightly on the shaft, try to move it vertically up and down. Excessive up and down movement, usually with a slight clonk, is caused by play in the steering column top bush.

If now, when you have tried all else, you turn the steering wheel and there is a gravelly grinding or rough feel as you rotate the wheel, this is likely to be due to wear or damage of the worm and peg surfaces where they meet. The worm is part of the shaft and is in fact welded to it, and cannot be replaced without removal and rebuild of the box. The peg engages in the worm and is moved along as the worm turns, pulling a crank attached to the rocker shaft thus turning it and hence turning the drop arm on the bottom of the shaft – which is the arm underneath the steering box.

To inspect the worm and peg, remove the top cover plate from the steering box. It is held on by 4 bolts. You can now try to remove the drop arm from the rocker shaft as you can't pull the shaft out of the box without removing the arm. On some cars, the arm proves very difficult to remove. After the arm has been removed the ball peg and its bearings can be inspected and replaced if you are lucky enough to find them nowadays – but matched used ones can usually be satisfactory. The ball bearings might be available. If there is any visible or suspected serious wear on the worm, the whole box will have to come out for repair by a specialist.

Even if the peg is replaced, there may still be some play. The problem is that the steering shaft is journalled in the metal of the steering box itself and this leads to wear where the shaft rotates, gradually enlarging the diameter of the hole in which the shaft twists, leading to play.

Checking the track after fitting the parts

Once all the worn parts are replaced it is important to ensure that the front wheel alignment is correctly adjusted. During adjustment, BOTH of the adjustable track rod parts must be turned (usually equal amounts or equal number of turns) and, after alignment, both track rods must end up the same length if the steering is to work correctly. A quick check is that the wheel should turn exactly the same amount from the central position to either left or right lock. If the number of turns and fractions of turns is unequal then probably the track rods as adjusted are not the same length even if the track itself is the correct distance.

If you do this job yourself with a DIY tracking tool, you can ensure that the track rods are the same length as you can measure them with a ruler. The track rods consist of the inner and outer track rod ends each of which has a ball joint on them and so these may be parts that

you will replace. The inner and outer ends are joined by a hollow rod into which they are screwed and held by locknuts. The amount they are screwed in determines the length of the rods. Remember, if you do adjust these, you may end up with the steering wheel off centre and you will have to adjust it in the way described earlier, especially if things have been wrongly set up in the past.

Obtaining the parts

Parts are now pretty scarce, but you should always check with one of the club suppliers or specialists to see if they can assist.

Removing and Understanding the Steering Box

Removal of the Box

If after your recent examination of the steering system you find you need to remove the steering box, then you may be able to save yourself some money by doing this job yourself, though the overhaul of the box itself should be left to experts (which will become clear later).

First, ensure that you have the following tools to hand:

- Small screwdriver for grub screws round the steering wheel
- Screwdriver for floorplate around the bottom of the column
- Small Philips screwdriver for shroud around gearchange
- Large wrench or socket to fit steering wheel nut
- Spanners/sockets for steering box bolts and gland nut
- Allen keys for steering column to instrument panel clamp
- Pliers for split pins
- Heavy-duty joint splitter and hammer for drag link to drop arm ball joint

Please note that the removal of the gearchange can be fiddly and is easier with two people. Allow two to three hours for removal if you haven't done it before.

Removal of Floorplate

Before you start the main job, lift the carpet or mats and look for the large rubber weather pad which slips over the column and gearchange tube and seals where they meet the floor (if it still exists!). Slide this up the column and inspect the floor to see what sort of plate is attached to the floor around the bottom of the column. You should normally be able to unscrew this but later models may have a welded plate in which case it becomes a great deal fiddlier to remove the box from the car once it is unbolted. You may feel you can drill out the spot welds if your plate is welded and if so this is probably worthwhile as it is easier than messing about with all the other things that you will have to remove.

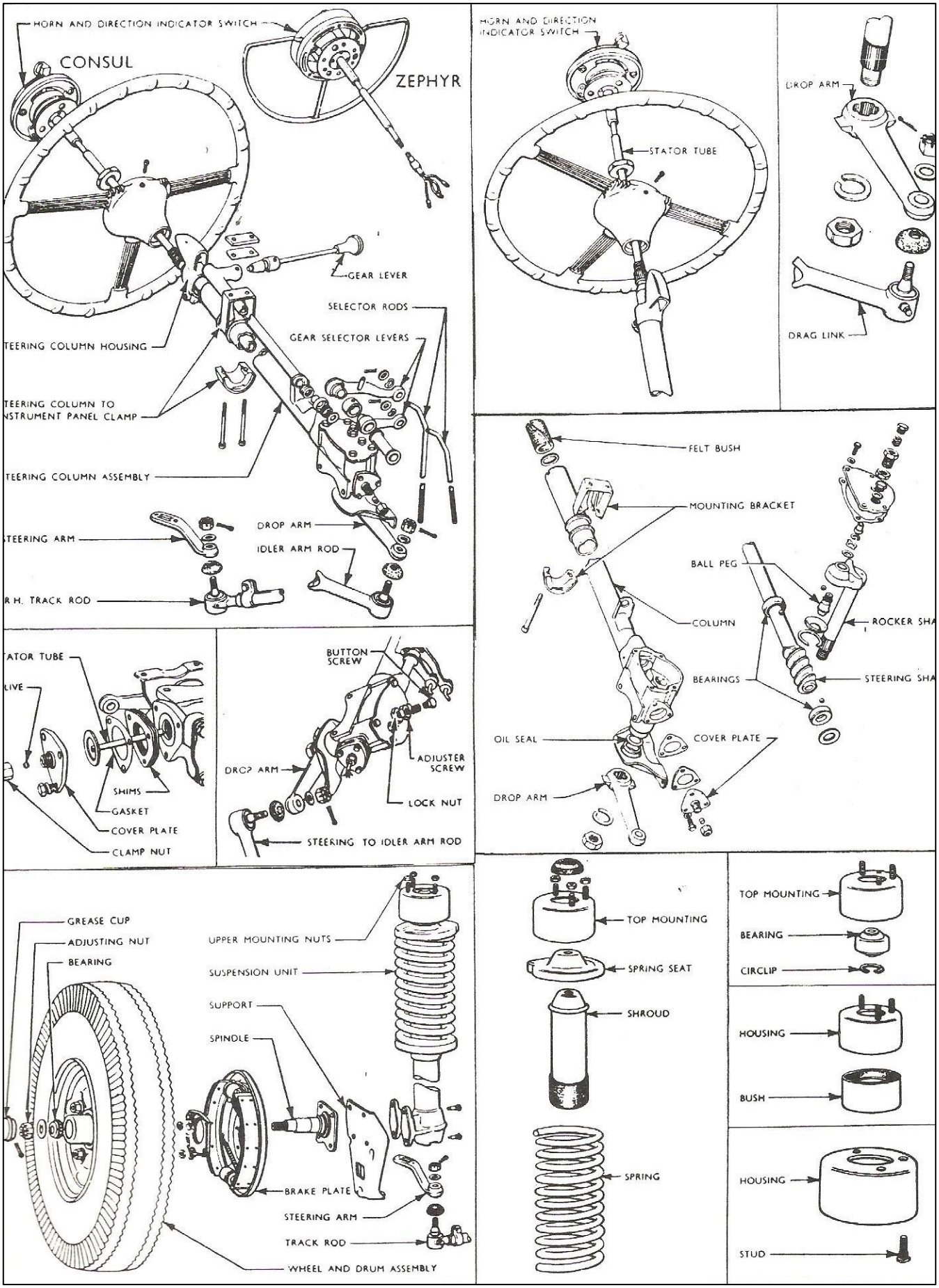

Figure 19 – Steering, Column, Front Suspension

Removal of the Shroud and Indicator Assembly

First of all, it is wise to disconnect the earth lead of the battery as you will be undoing some electrical connections. To get at the things you need to dismantle, remove the four small Philips screws holding the upper and lower halves of the shroud around the steering column. This is not fitted on Flatdashes. Then remove the other four screws and washers holding the lower part of the shroud and remove the two halves carefully without scratching the paint. On a Zodiac and other cars fitted with extras you will find the screen wash pipe and the auxiliaries attached to the lower half. You may be able to fold these out of the way, if not, you will have to remove them.

Now you need to remove the indicator/horn press assembly. First, the wires need disconnecting at the bottom of the steering column. Loosen the gland nut (also called the clamp nut) which holds the stator tube which runs down inside the steering column. This nut is likely to be fairly grotty. Next trace the wiring loom where it comes out of the bottom of the stator tube and pull the wires and bullets out of the bullet connectors. Don't cut the wires and don't leave the connectors on. You should be left with four wires all with bullets, but of slightly different lengths so the bullets do not overlap when they are pulled up the stator tube. Now the grub screws around the steering wheel can be loosened and the horn/indicator assembly eased away from the wheel preferably while a second person feeds the wires from the under bonnet end up the stator tube.

Now use your socket or wrench to remove the steering wheel. The wheel may be a tight fit. The trick is to loosen the nut but leave it on by a few threads then you can hit the wheel as hard as necessary towards you – without it coming off and hitting you! By the time it has moved a millimetre or two it usually loosens up nicely.

Removal of Gear lever

You will see at the base of the gear lever a rubber collar and just where this enters the gearchange socket there are, on the top and the bottom and opposite each other, two little circular holes. Inside these are two spring loaded trunnions and you must depress the upper and lower ones at the same time (occasionally they need a tap to loosen them if they are rusty) whilst pulling the gear lever and taking care they do not spring out as the gear lever comes free. Store in a safe place ready for reassembly.

Steering Column Cap

Out come your Allen keys to undo the two screws holding together the two parts of the clamp to the underside of the speedo binnacle assembly. Note that there may be packing pieces held in place by the screws – don't lose these or the tapped plate (roughly two inches by half an inch) into which they are tightened.

Undoing connections under the bonnet

The fiddliest are the gearchange rod connections. The two cranks at the bottom of the gearchange tube are held on each of the gearchange rods by a flat washer, a spring washer and a split pin. Remove the split pins by bending their arms until they will slide through the small hole in the end of the rod. Store the washers carefully for reuse.

Now for some force. Jack up the front of the car so you can get at the joint between the drop arm and the drag link (may be called idler arm rod or centre track rod). First remove the split pin in the large nut which keeps the joint tight, and then undo and remove the nut. Now the fun begins. Try to support the joint by jamming a block of wood behind it. If you have a forked joint splitter, insert this in between the drag link and drop arm and give it some welly whilst trying not to damage the rubber boot. Alternatively use a screw type joint splitter which forces the joint open as you screw down on its nut. This is less violent.

There remain the four bolts which hold the steering box and its bracket to the chassis. These usually need a 9/16 spanner one end and a socket on the other as they always turn without undoing if you only have one spanner.

Removal of the box from the car

All may not yet be over though the box should now be loose. If you have the screw-fitting floor plate there should be enough play for you to remove the box/column/gearchange tube assembly though you may need to jack the car higher to give clearance to pull the item clear. If the plate on the floor is welded you have much less clearance and the manuals say you will need to pull the steering box and column assembly over the front suspension cross-tube. To have room for this you need to remove the offside splash guard (if you still have one fitted!!).

You may need to remove the fuel pump. It is only held by two nuts to the block but lots of other pipes need to be removed before you can take the pump away. Unless you have a small socket set, you may have to remove the oil filter (messy) to get at the front nut on a fuel pump on a Consul. Also on a Consul it may be necessary to remove the fulcrum pin housing from the top of the column – to give better clearance as you remove everything. You will need Allen keys again for this and a different size too. The best plan is to try to withdraw the box and column and remove things as they get in the way. It may even be preferable to drill out the spot welds holding the floorplate and remove this, using self-tappers to replace it. As we said at the start, it may be better to have a new plate cut and filed to shape ready so you can get rough with the welded one if necessary.

Putting everything back is the reverse of the process detailed above. The wires for the horn etc should be eased gently back into the stator tube by keeping the bullets in “single file”. You should not normally need a draw-wire if you spray WD40 down the tube to start with, though a piece of stiff wire wrapped around the lead bullet can be pulled from below. Remember to check the steering wheel position before tightening it. Only then should you push the horn/indicator assembly and its wires right home and fasten the grub screws. Check the upturned V-Shape points downwards when the wheel is at the straight ahead position.

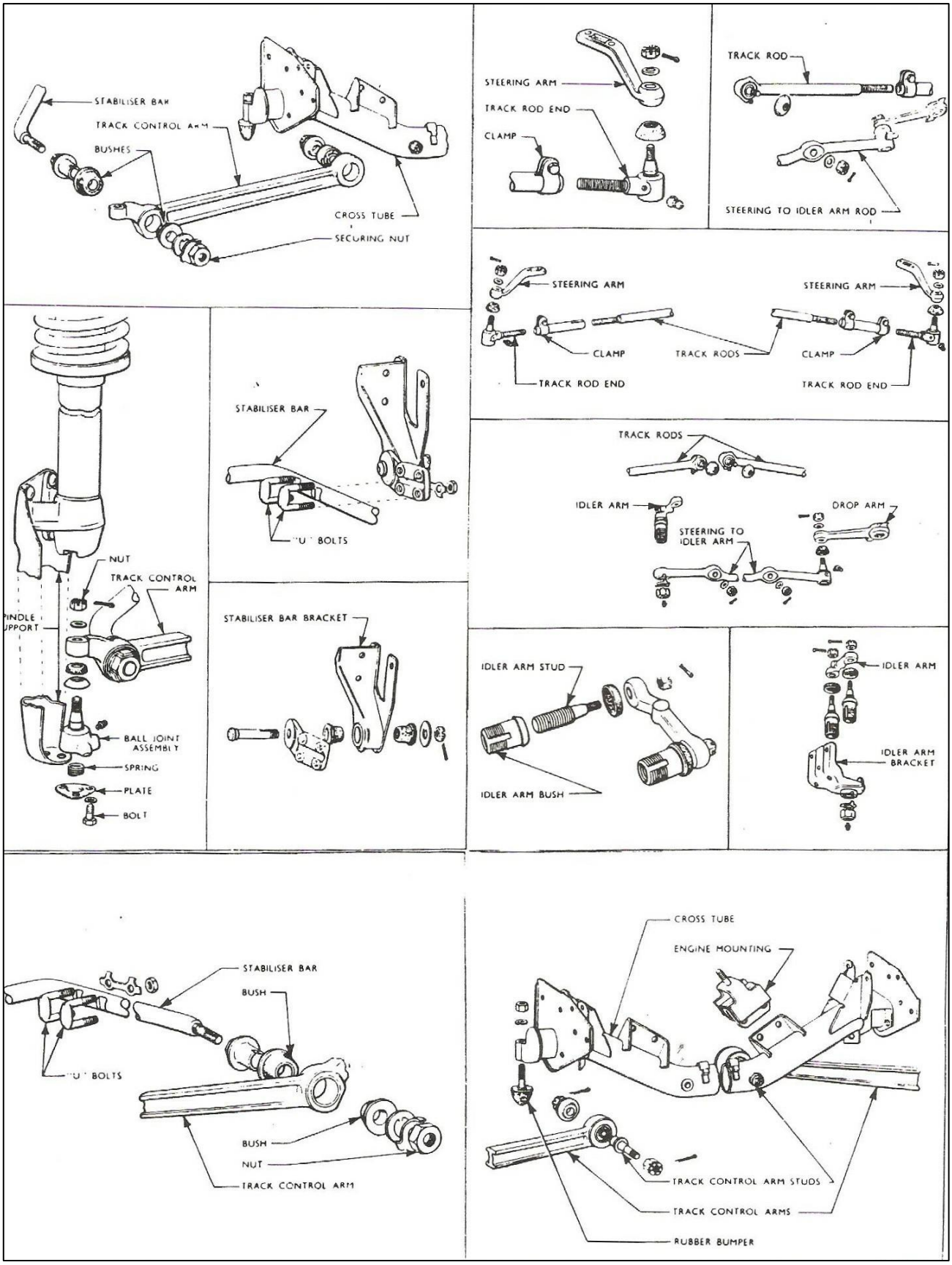

Figure 20 – Steering, Front (Exploded View)

Heavy Steering

Many people complain now and have complained in the past about the heavy steering on a Mk1. The fact is that the steering may well be heavier than most modern cars, but is should not feel heavier than normal, except when doing a three point turn on radials. If it does feel heavier, then it is quite likely something is wrong. Tyre pressures being too low are the most obvious possibility, and a seized joint or tight steering box are others. But an often overlooked cause, which will nowadays turn out to be the real source of the problem, is a seized strut top bearing.

MacPherson Struts

The Mk1 was the first production car to have MacPherson strut front suspension, which was basically a way of mounting the spring and shock absorber concentrically in one unit. However, the steering is such that while you would expect the top of the strut with spring and shock absorber to pivot about a single point, there needs to be some play to allow for the angles and steering geometry. This is done by mounting the top of the strut in a roller bearing, it is held by a thick rubber casing. The rubber is moulded in a cup held by the three studs you see on each inner wing under the bonnet.

Seized Strut Top Bearings

When the bearing at the top of the strut seizes, the strut cannot take up the angle it prefers and the whole unit tends to twist slightly, thus making the steering quite heavy if one bearing has seized and very heavy if both have gone. It is quite likely that an infrequently used Mk1, or one back on the road after a long layup, will have seized strut top bearings if there is a heavy steering symptom.

Getting ready to change the bearings

One thing that is not realised is that it need not prove difficult to change the strut top bearings and lighten the steering again. The bearings themselves are quite hard to obtain now, but do appear now and then. They are held in place by a circlip in the rubbers, and assuming you are lucky enough to have some exchange units, you will need a trolley jack, a 9/16ths A/F socket and a ¾" Whitworth socket for the large nut on the strut top and a pair of well-engineered road spring clamps which are easy to tighten with the springs still on the car.

Procedure

Start work by removing the rubber caps over the strut tops on the inner wings under the bonnet. Use WD40 to lubricate the threads of the studs on the rubber mountings, and the threads around the big nut you can see on the strut top, under where the cap was. While the weight of the car is still on the strut you should now try to loosen this nut. Use the ¾" Whitworth socket and socket driver. If the nut is very tight, slip the trolley jack handle over the socket driver to get more leverage. Once you have freed the nut, which can be VERY tight, loosen the nuts on the three studs, but don't remove yet.

Now jack up the car under the front axle beam slightly. You do not need to remove the wheels. Fix the spring clamps onto one of the road springs and tighten down considerably. Jack the car right up and on one side take off the three stud nuts and the strut assembly should free itself from the inner wing. It may need a tap around the studs with a hammer if it has been in

place a long time. With the car still jacked up high, reach up under the wing and pull the rubber moulding/mounting and strut top bearing assembly off the top of the strut.

Ensuring first that the inside part that slides over the strut is clean, take the replacement unit (if you have one!) and do the reverse, sliding it over the strut top. Then let the jack down very slowly (easier with two people) while guiding the top of the strut assembly into the top of the turret. At the point where the studs are just about to touch the top of the inner wing, use a screwdriver to ensure they are aligned with their three holes, then let the jack down very gently again until the studs poke through. Loosely fit the three stud nuts and hand-tighten the strut nut. You may need to jack up the car a little again to loosen off the spring clamps and the strut will take up its proper position – you may notice the position of the nut on top of the strut alter slightly so it is easier to get the socket on it as you do this. Tighten all the stud nuts and really tighten the strut top nut. You may need to finish the latter with the full weight of the car on the strut. Ensure the ends of the coil spring have not come out of their slots in the strut assembly.

Now you can do the other side in a similar way. You should now find that the steering is rather lighter and be confident that the struts are operating as they are meant to.

Repair of Strut Top Unit

What we have not covered so far is the repair of the rubber moulding/mounting in which the bearing is held by a circlip. This is the procedure for removing the bearing from its rubber mounting and replacing it – without having to use specialist tools. If you can get hold of new/replacement mouldings with the bearing already replaced, so much the better. If not, it is still a good idea to get hold of an old pair of rubber tops and, as long as the rubber is still in good condition, (as per an engine mounting needs to be) you can work on these spares before you start work on the car itself.

Taking the rubber unit complete, first prise out the large circlip from its groove at the bottom of the mounting. This can be awkward but patience and a couple of sharp screwdrivers will do the trick. Next, clean the area below the bearing thoroughly to remove any rust or burrs. The bearing can then be pressed out of the unit from the top downwards. It is possible to do this in a large vice using various sockets as spacers to apply the pressure to the centre of the bearing. This is hard work and it is in fact better to seek the help of someone with a press to remove and replace the bearings for you!

Prior to fitting, the inner surface of the mounting and the outer part of the new bearing must be clean and free from burrs. The new bearing must be pressed in squarely as far as it will go, so the circlip can be re-located in its groove. Ideally the outside of the complete top-mount unit should be cleaned of surface rust which affects the casing round the rubber and painted for protection. A new gasket should be made up for the top of the unit – or you could use silicon gasket sealant when fitting the unit to the top of the inner wing of the car. This will help prevent the ingress of water which will shorten the life of the bearing and give you stiff steering again. Finally, if you can find a pair, fit a new pair of strut top caps which will round off the job perfectly.

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Sorting the Windscreen Wipers and Fuel Pump

This is a funny combination, but you will soon see why. Mk1 wipers are another common problem, even if in fact their slow operation can be quite simple to solve. Most people know that the Mk1 windscreen wipers are operated by vacuum. The source of this is two-fold – from the inlet manifold and from the bottom part of the fuel pump.

Vacuum wipers operate by suction, the vacuum effectively causing the wipers to follow the motion of a paddle in the wiper motor which is sucked from side to side by vacuum and connected by a simple linkage to the wipers. Vacuum, or reduction in pressure in the inlet manifold varies with the throttle opening, so when you put your foot down, vacuum is reduced and the wipers slow down.

Ford thought they had got around this with their design of the fuel pump. This pump is driven off the engine and has two diaphragms. One forms a pump sucking the fuel through to the carburettor. This is the upper one. The lower diaphragm forms a vacuum pump to provide constant vacuum for the wipers – and original washers (if fitted) – in addition to that from the inlet manifold. In theory therefore, the wipers should always be kept going by the action of the vacuum pump, if it is working properly and if the pipes carrying the low pressure are not porous.

The first thing to do therefore is to cut a small sample of the pipe leading from the fuel pump to your wipers. It is a force fit over an elbow at the rear of the pump and goes close to steering column and through a hole in the bulkhead on the wing side of the steering column. You should be able to obtain plastic or other synthetic tubing of the right diameter from either online or a motor factor. It doesn't matter if the new tubing is a very tight fit as you can heat it in boiling water to make it supple and stretchy. Try this first before anything else if your wipers are dodgy.

If you want to repair the fuel pump, you will still have to remove it as if you were replacing it. What you need to do first of all is use an old rag to clean around the old pump and then make a drawing of all the different outlets and which pipes, either metal or rubber, they are connected to. It is quite difficult to remember which way round things go if you are tackling this for the first time.

Only then remove the fittings connecting the pipes, taking care with the brass connectors, and finally, probably using an open-ended spanner in the enclosed space plus a small socket set, remove the two nuts on the studs holding the pump to the block. If you have a new pump, you can now swap the brass connectors correctly onto the new pump. You may also need to swap the glass filter bowl, then fit the new pump. Connect up and try your wipers out and all should be well.

Repair of the pump is much easier, but fiddly. Experience seems to show that the top end which deals with the fuel is very long lasting. Repair requires and AC "D54" repair kit if you can find one. It comes with a new diaphragm and a set of non-return valves which are clamped in the inside of the upper body of the pump. You unscrew the screws holding the upper body and CAREFULLY prize apart the upper body from the rest of the pump REMEMBERING there is a spring inside waiting to do a jack in the box and a disappearing act on you.

GENTLY open up and note carefully the positioning of everything especially which way up the non-return valves are, preferably having someone to help you note it down while you hold the pump. You will have to mess about with the pump operating lever and the centre of the diaphragm to get the pull-rod to slip off the hooks on the rocker arm. Fit the new non-return valves and try to fit the new diaphragm, picking up the same rocker arm hook with the new diaphragm's pull-rod. If you can't do this, you could try taking the pump to a small old fashioned garage who might be able to do this for you?

The vacuum pump or bottom end of the fuel pump has a slightly larger diaphragm. The repair kit for the vast majority of Mk1's is the AC "BD8" which, like the AC "D54" costs a few quid. Again, it is a matter of removing the numerous screws around the circumference of the bottom end of the pump, then easing it gently away from the pump body REMEMBERING to allow for the spring doing its trick.

There are lots of non-return valves too and you have to note again their position and which way up they are before they fall out of place. Again, you will have the fiddly job of removing the diaphragm pull-rod from its rocker arm hook and replacing the new one – check the old fashioned garage if in trouble!

When you have replaced the diaphragm, or diaphragms you can refit the pump and the wipers should be OK again. If not, then it may well be that you have a very sick engine that is hardly creating any vacuum to help the pump – so turn to the section on the Engine in this manual. If this is clearly not the case, only now should you try to get a second-hand wiper motor (or NOS if available).

While we are on the subject of fuel pumps, they are occasionally the cause of another fault – mysterious but substantial loss of oil. If you have a good engine, no visible bad oil leaks, yet use loads of oil, then your problem could be the vacuum pump part of the fuel pump. If the diaphragm is punctured or porous, then it is possible that the general local suction effect can suck oil out of the engine. The fuel pump is of course connected to the engine so its arm can operate off the cam-shaft. Thus, oil then can travel up the pipe into the inlet manifold and lead to blue smoke and oily plugs, poor running etc as well as oil loss. If you have unaccountable oil loss and poor wiper operation, then a porous diaphragm in the vacuum pump may well be the reason. Far from a serious engine problem, it's just a cheap diaphragm replacement.

Finally, there will be a very small number of Mk1s which have the early fuel pump which has a different bottom end and needs an AC "BD7" kit to repair it. These pumps will probably only be found on Flatdash cars, which will in any case accept the later fuel pump, though some careful rebending of the fuel and vacuum pipes will be required.

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Getting Ready for the MOT

To improve your chances of passing the MOT (should you decide to put the car through one) you should bear the following in mind.

Lighting Equipment

a) Front Lamps

You must check that all the front lamps are working, the two headlights, main and dip beam, the two sidelights and the two indicators, except for cars with semaphore arm indicators. Ensure that when the indicators are working that the sidelamp bulb does not go dim due to poor earthing. Cars with semaphore arms must have working arms which must light up and cancel properly.

Also, even if all the filaments are working, you must check the aim for dipped and main beam. In no case should the headlights point to the right of the direction of travel, dipped or main beam, and should not be aimed too high.

A very common cause of dim or non-functioning lights in a Mk1, especially for the nearside is poor conduct of the bullet connector supports on non Flatdash models. On Flatdashes the loom runs across the radiator bulkhead, with the connectors accessible either side. Follow the wiring diagram in a handbook or this manual and you will see that both sidelights and headlights are fed from a bullet connector join on the driver's side. Both sidelights and headlights need a good earth (black lead). They are linked to a small plate that accepts two bullets, the plate being held underneath the support by a nut and a screw. You may need to clean up the plate and ensure that there is a good bare metal connection at this bolt and at each bullet connection.

b) Rear Lamps

The feed to the rear lamps comes from a bullet connector on the driver's side beside the small parcel shelf on a curved dash car, through the headlining over the doors (down via the sill on a convertible) to the space between the inner and upper rear wing on the offside of the boot. This feed provides the supply to both the rear red tail lamps (black wire) and the number plate lamps. Check all bullet connectors and clean or replace if necessary. Then the next problem, assuming you have checked the bulbs, is the connection between the bulb and the spring terminal in each lamp unit – effectively the bulb holder. These become rusted over the years in both the tail lamp units and the number plate lamp units. Dowsing in oil, penetrating oil or WD40 does not help as it softens and breaks up the fibre plate which holds the springs and terminals in place and which acts as an insulator for them. It is a sure sign that there is a problem here if the bulb will not push in and out and twist easily. You should check for proper function of the spring terminals if you buy replacement light units at a jumble for example, or at least before you try fitting them. Watch for different types of unit with different drillings and methods of fitting.

The earth for the tail lamps, brake lights, and rear indicators (black/white tracer wire) is made by self tappers easily visible in the boot, and for the number plate lamps by a nut and bolt through the offside rear inner wing.

Remember to check the stop lamps when the ignition is on. If there is no power from the supply line (green colour) check that the brake pressure switch is working by undoing the two green wires from the front of the brake master cylinder under the bonnet and joining them temporarily, and see if this produces power to the brake lights.

You must have a set of red rear reflectors as a legal requirement. Later type light fittings may have a reflector which has faded to orange and this is not liked by some MOT testers. Look for red ones at

autojumbles and online if you can. Some of the oldest cars were not fitted with reflectors of the type required, and you will need to fit a pair.

Steering and Suspension

The first thing to check is that there is not too much play in the front wheel bearings. Jack up the car and check play by holding the wheel at the top and the bottom and trying to wriggle it inwards and outwards. You should just be able to detect play but not be able to measure anything. Play can be taken up by adjusting the wheel bearings. Grasp the wheel at 9 o'clock and 3 o'clock and wriggle it inwards and outwards. There should not be substantial play before the steering linkage and the other front wheel should replicate your movements if all is well.

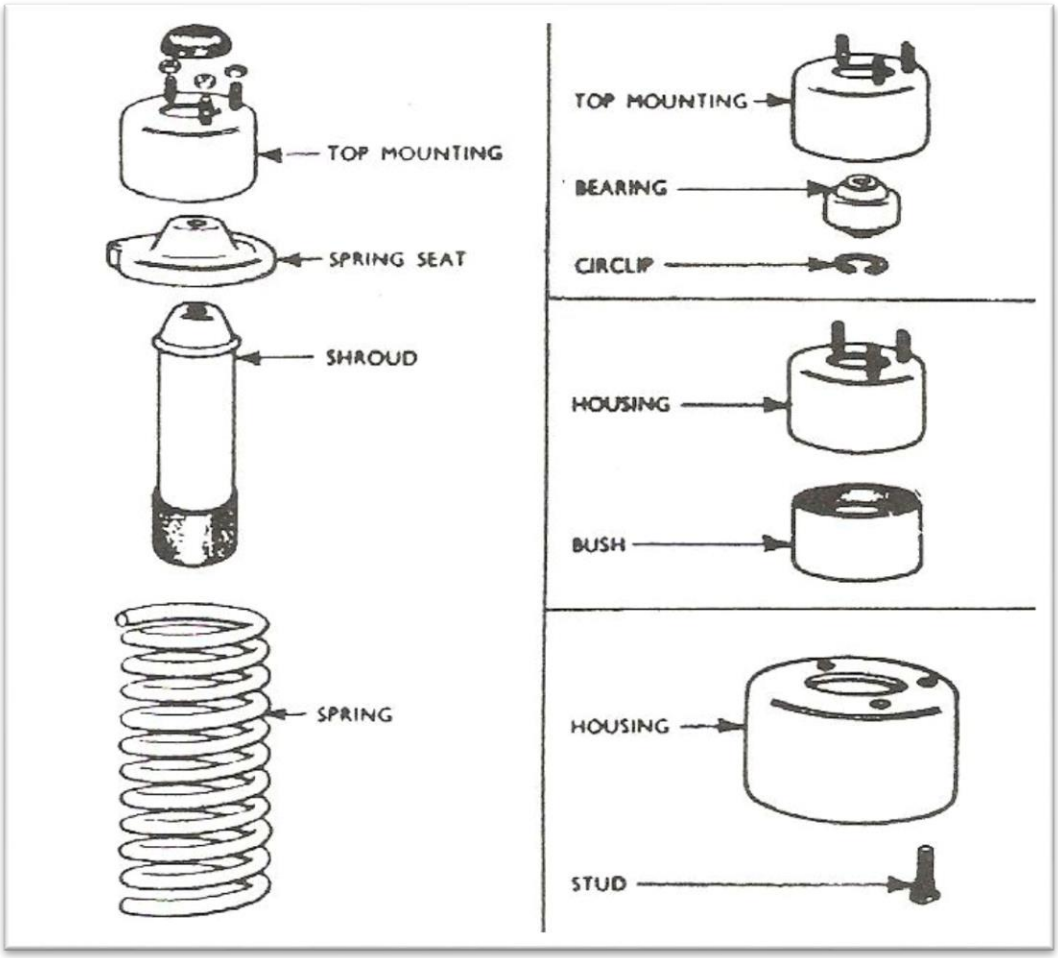

Figure 21 – Suspension, Front top (Exploded View)

Whilst the car is still jacked up, check for resistance to movement that may be caused by seized top mount bearings at the top of the struts. Check the top of the strut and spring swivel as you turn the steering wheel. If they don't swivel, you will find you are turning against the tension of the coil of the spring – and the top mount bearing will then usually be seized. Testers may not notice this, although you should fit new bearings (if you can find some).

With the car standing on the ground, get someone to wriggle the steering wheel. Look for joints taking up the movement and hence causing play when movement of the steering wheel should be transmitted right through to the road wheel with no slack. You are quite likely to see play at the idler

arm, making the nearside wheel move less than the offside. If excessive idler play is detected, the tester will fail the car.

There may be play within the steering box, causing the steering arm movement to be delayed relative to the movement of the steering wheel. You can adjust this with the steering wheel adjuster nut on the steering box, but only if this does not cause the steering to go tight on full lock. That is an indicator of wear in the box. In that case, you should try to get the steering box reconditioned if you can. Check for feathering of the tyres (uneven wear at the edges) which may indicate incorrect alignment of the steering, or possibly wrong tyre pressures – remember to check those too.

Whilst inspecting the steering and front suspension, check for loose U-bolts on the anti-roll bar and for perished bushes anywhere as this can lead to failure. There should be no visible fluid leaks from the front struts or the rear shockers, and the front and rear bump stops should be present and in good condition. Try to bounce the front of the car. After you let go it should bounce once, then return to normal and stop. Slow setting means weak damping.

Brakes

You need to check for leaks and condition of all of the brake pipes and hoses. The flexible hoses – two by the front wheels and one over the rear axle – must be in good condition. Bend them to look for cracks. Hoses over five years old are almost certain to need replacement. Clean off any oil as this does the hoses no good at all.

However, this oil is good for the metal brake pipes (unless you have copper ones) and you need to check their soundness for their whole length underneath the car. A weakness in hoses or rusty pipes should cause a fail.

There should be no sponginess or excessive travel in the brake pedal. Brakes must pull up evenly, so you should check the brake adjustment while your car is jacked up and set the brakes such that they avoid binding. At the rear, you need to do this with the handbrake cable adjuster loosened. Check that the brakes pull you up straight via a road test. If not, check the wheel cylinders are free or also for oil contamination on the inefficient side. Failure of your half-shaft oil seal will soak the shoes in oil.

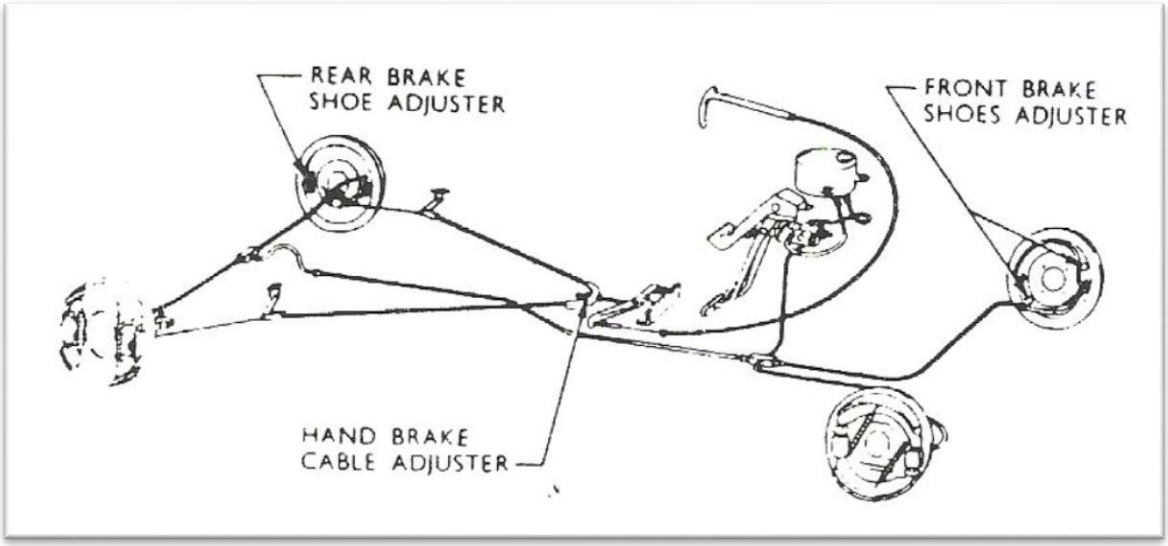

Figure 21 – Brake Adjusters

Ensure the handbrake linkage behind the brake drum is clear of mud and well greased and free to run. The handbrake is often a problem due to seizing up and not freeing off properly. The handbrake should pull up the car square if used alone. When adjusted properly, Mk1 brakes should be quite good although pedal pressures are fairly high.

Tyres

You must not have the wrong mix of cross ply and radial tyres and you must have legal tread on all tyres including the spare (if carried). Remember that although you may have enough tread, there must be no cracks or perishing of the sidewalls – a common problem with older tyres for example.

Seatbelts (if fitted)

These must function correctly and be undamaged, with secure mountings.

Windscreen Wipers and Washers

The wipers must clear the screen efficiently and the blades must be in good condition and in firm contact with the screen. The windscreen washer must function and provide spray efficiently to clear the screen to give a good, clear view for the driver.

Horn

This must work! Non-functioning horns in a Mk1 are seldom due to the horn itself, but nearly always a bad earth, either at a bullet connector (or the relay on the Zephyr) or, if you are unlucky, at the horn switch. Check the bullet connector about 6 inches from the bottom of the steering column where the cables come out and near the horns under the bonnet on a Zephyr.

Exhaust System

This must be leak free, and properly mounted, and give effective silencing. Beware of a poor seal between the hockey stick manifold and the head, as if this is bad it will fail the car.

Vehicle Structure

All suspension points must be sound. Check the chassis side members where the rear springs are attached at all four points. Check the front suspension towers inside the bonnet, where corrosion begins at the bottom of the inner wing, and can be more of an ongoing problem as cars reach a lofty old age. Check the chassis side members at the front and rear of the car for soundness. If you can poke a screwdriver through at any point, the car is likely to fail. In general, the inner and outer sills must be sound, though small patches of corrosion might be acceptable. Wings should be secure though they may be rusty as they are not load bearing, but there should be no jagged edges. Front seat mountings in the front floor must be sound, and anything more than tiny holes in the floor may cause a fail.

The steering box as well as the front suspension must be attached to sound metal. Check the steering box bracket for cracking as well as the chassis in its vicinity for rust. In theory, the car needs no jacking points to pass. Decrepit jacking points are usually a sign of a corroded floor and may tempt testers to fail a car. Again, in theory, if the floor above the jacking point is sound, this should not lead to a fail. Bodged repairs with rivets, and occasionally brazing, tend to be frowned upon by testers!

After the Test

Remember that the MoT represents the minimum standard acceptable at the time of the test, and is not a guarantee of roadworthiness. You need to continue to look after your Mk1, checking the sort of items described. If you have gone through these fairly carefully, your car should have a good chance of passing without unforeseen problems occurring.

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Various Hints and Tips

Choke Cable

A cheap way to renew your Mk1 choke cables. You might need this if you have an Aquaplane conversion for example. Looking at the original cable, it might seem to be very similar to a push bike brake cable. Buy the longest you can, remove the rounded end with a sharp tool or the cable will start to fray.

Next step is to remove the old cable from the knob, which look like they are soldered on – you might need some help in doing this from a friendly local garage or mechanic. Once fitted to the car you can get the end exactly right to make a perfect fit.

Quieter B Posts

Early Mk1s with semaphore indicators usually have much more wind noise than later models, the source being the cut out in the B post for the semaphore which lets in draughts and noise from the wind. To quieten things down, remove the upper interior B post trim. Clean the surface of the post round the cut out with some thinners. Then use some strong tape or similar to seal over the cut out in the post. Smooth down the edges and make sure the tape has adhered. Now you can drive around without all that wind noise around your ears.

Tyres

For Mk1s crossply or radial tyres can be used – although, better handling probably can be obtained when using radials. Zephyrs and Zodiacs use 4.5J wheel size, whilst the Consul uses 4J. The crossply recommendation for a Zephyr and Zodiac is 640 x 13 tyres and 590 x 13 for the Consul. There is some discussion around what wheel size to use with what tyre etc, it might even be possible to fit a 590 x 13 on a Zephyr wheel, but probably best to stick with recommendations.

Road holding, tyre life and wet road behaviour can be achieved if using radials. The correct size for a Consul is 165 x 13. Zephyr and Zodiac users are not quite so well served as there is no exact radial match for the 640 x 13 tyre. The correct diameter is offered almost exactly by 185 x 13 tyres, which should be relatively easy to locate. Whilst they are the same diameter as the cross plies, they are fatter than them and can sometimes be difficult to fit due to clearance problems with the back wings. They may also rub on the front suspension leg and hence require thin spacers at the front. These could be machined up from old brake drums by using the cut-out centre.

On the other hand, 175 x 13 tyres fit easily and are probably easier to get. They are a fraction smaller in diameter and can cause the speedo to overread a little. However, the gain outweighs the problems.

If you are fussy about originality you can stick to cross plies but there is no doubt that the behaviour on today's roads is detectably inferior. Cross plies on a Mk1 can often cause "tramlining" and are also prone to uneven wear, especially at the front unless the tracking is spot on. Cross ply tyres need to be swapped around regularly to even the wear. Full whitewall tyres are available in 640 x 13, so that may be a reason for sticking to cross plies for some, although they are not cheap!

Vacuum Washers

If wipers and washers are poor, then the vacuum in the fuel pump might be sub optimal due to a weak lower end of the fuel pump or ineffective compression in the engine. If you can find a repair kit for the fuel pump this usually fixes things. But if the wipers work, but not the washers then this must relate to the vacuum. Causes can vary from the switch unit, porous pipes or loose joints, a puncture in the diaphragm in the unit over the washer bottle, or a lot of gunge in the water pipes. It might even be as

simple as blocked jets. Make sure everything is scrupulously clean before you condemn the system though.

Correct position of Radio Aerial

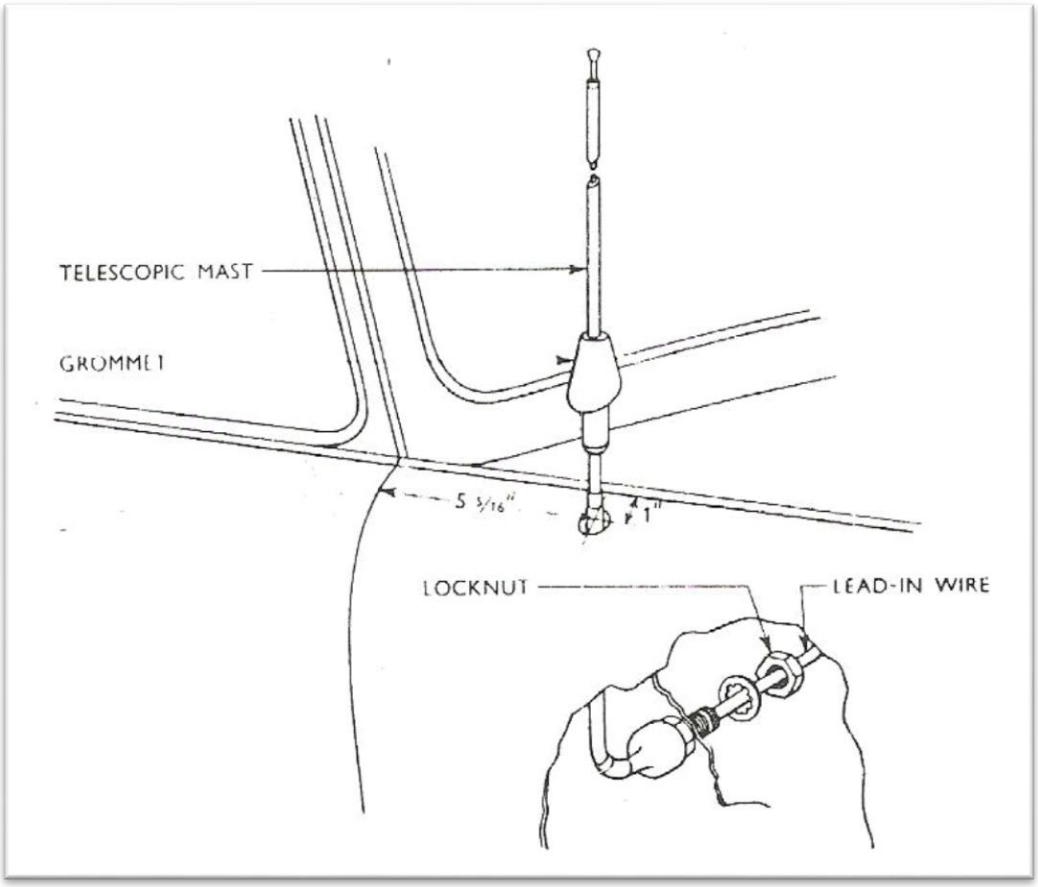

Figure 22 – Correct position of Aerial

Water Leaks

Some of us spend ages attending to sealing round the bootlid and to the drain channels running around the inside edge of the boot – yet we still end up with water in the boot. Why? One check that you can carry out is to remove the boot mat (if you have one) along with all the material from inside the boot. Then, with the bootlid open, pour water down into the drain channel, and observe very carefully what happens. You may well find that the water runs down, with no leaks, until it hits the light units, then it pours behind the light rubbers (especially the older type) and flows into the boot. If this is your problem, then don't waste time with the boot sealing, make sure the water doesn't penetrate through the light units. If it does, remove the lights, and use a decent mastic sealer and spread it behind the light unit to make a watertight join. When you have done this, check also that water does not run into the light unit and fill it up.

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Additional Tips – Heater Valve Replacement

This useful tip is from Allan Sim in New Zealand and very helpful if you have a rusty heater valve unit that you want to replace the body on and get operational again. You can find suitable alternatives on the internet and eBay – try searching for Triumph Spitfire MkIII and 1500 Heater Control Valve, and then use Allan's tips to modify it to work with a Mk1. (You might also be able to locate a Mk2 Heater Valve repair kit if you are lucky.)

Figure 23 – Heater Valve (1)

1. Carefully cut the flange off from the corroded valve body (see 4 below for reason)

Figure 24 – Heater Valve (2)

Thus:

Figure 25 – Heater Valve (3)

Figure 26 – Heater Valve (4)

Figure 27 – Heater Valve (5)

2. Flange removed

Figure 28 – Heater Valve (6)

3. ¾ inch section needs to be removed (this will act as a one-piece nut which sandwiches the original top cam and the new base, along with the new rubber seal. This will allow the piece to fully butt up against each other using the four original screws, and tighten properly.

Figure 29 – Heater Valve (7)

Figure 30 – Heater Valve (8)

Figure 31 – Heater Valve (9)

Figure 32 – Heater Valve (9)

Figure 33 – Heater Valve (10)

Figure 34 – Heater Valve (11)

4. Trial Fitting

Figure 35 – Heater Valve (11)

Figure 36 – Heater Valve (12)

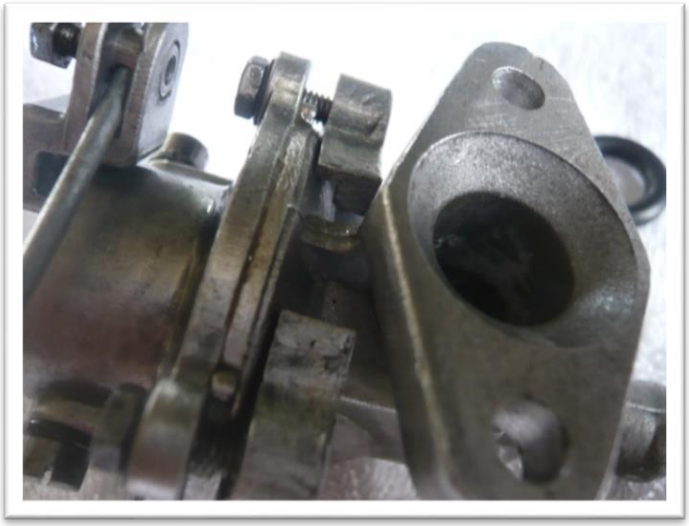

Figure 37 – Heater Valve (13)

Figure 38 – Heater Valve (14)

5. Using original screws to hold together, with new seal sandwiched between top and bottom

Figure 39 – Heater Valve (15)

6. Job Done!

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Additional Tips (Various)

- To make cork gaskets fit, soak them in water for a day or two.

- An oil additive may be used in a Mk1 gearbox fitted with a Borg Warner overdrive but NOT with a Laycock.

- The differential carrier assembly gasket from an early type Transit van will also fit a Mk1.

- Do not overtighten the brake cables as this may cause the brakes to bind when your Mk1 is loaded. Eight clicks on the handbrake should suffice.

- If your Mk1 is using excessive amounts of oil, check that the vacuum pump is not at fault. If it is, oil is sucked up the vacuum pipe and burnt in the cylinders. Remove the spark plugs and check that the front two (on a Consul) are the same colour as the back two. If the front two are darker, oil is being burnt and the pump diaphragm is probably faulty.

- To stop timing chain rattle on the Consul engine, remove the tensioner from the base of the cover (not fitted to early Mk1s or 6 cylinder engines), wrap a cloth around it to avoid losing the parts, then stretch the spring and replace it. Alternatively put two or three washers under it.

- Fitting a Mk2/3 engine to a Mk1, the following may help… Fitting such an engine and using the original Mk1 gearbox is very easy - provided you fit a late type Mk1 flywheel and Mk1 clutch to the Mk2/3 engine. All the Mk1 components will bolt straight on with the exception of the water pump, see later. With a bit of “enginuity” you could use the Mk2/3 manifold and carb, but you will have to play around with the throttle linkage. It is possible to fit a Mk2/3 head to a Mk1 engine, but you will have to use the Mk2/3 water pump as these heads have a bypass hose which the Mk1 head does not. You could of course weld up the bypass hose aperture in the Mk2/3 head, but using the Mk2/3 water pump means you can do away with the heater connection in the bottom hose (the heater take off for the Mk2/3 comes direct from the pump.) If you use the Mk2 gearbox you run into problems with the gearbox mountings and the propshaft, but these too can be overcome with judicious welding.

- To find out if you have a late type flywheel fitted to your engine check the bottom clutch cover. If it is alloy with two bolts holding it to the crankcase behind the sump it is a late type. Early engines used a tin cover. The alloy type was also used with Mk2/3 engines.

- Maintaining a gas tight seal between the exhaust manifold (better known as the hockey stick) and the engine cylinder head - top tip. The design of the manifold is to say the least simple and not very efficient in performance terms, however, this aside, the design lasted in production for Mk1 up to and including Mk3 cars. The basic problem seems to be associated with the rigidity of the pipe, which unlike most standard manifolds is not manufactured of cast material and thus is relatively fragile. Slight overtightening of the fixings can produce an oval distortion; with the familiar non-sealing consequences, also as engine mounts tire, the exhaust system including the manifold tend to act as an engine stabiliser with its associated stresses.

Following thorough cleaning of the surfaces to be united, a liberal coat of silicone sealant as used for sealing baths, sinks, washbasins etc. can be applied, the fixing bolts are then tightened and the joint is left to cure, without heat.

- It is very rare to find a Mk1 with a quiet rear axle. Tightening the pinion nut can sometimes help, the torque setting being 100-125 lb ft. If the pinion flange is loose it can also cause transmission vibration.

- With every service or removal of a wheel, give a shot of WD40 down the centre of each brake bleed nipple to prevent seizure.

- To prevent grating first gear, push the gear lever against second gear synchromesh. This will stop the gears rotating and then select first for a smoother change.

- If you want your clutch to last up to 100,000 miles remember the golden rule. 'The only time your foot should be on the clutch is when you change gear'.

- With the hotter running fuels now in use it is a good idea to increase your Mk1 exhaust valve clearance by 2 thou. This should prolong the life of the valves.

- The voltage regulator boxes on Mk1s may require resetting. This is a five-minute job and is made easier with two persons. The battery should be in reasonable condition and fully charged. Start the engine and run it fast enough for the dynamo to charge. After a short time, the ammeter should read zero. Now switch the headlights on full beam, also the panel lights. Keep the engine running for a couple of minutes and the ammeter should again return to zero. If not, remove the regulator cover and note the two screws passing through springs on the back plate. The lower screw is the one to adjust. If the ammeter shows a discharge, turn the screw a fraction at a time clockwise to bring the needle to zero. Likewise, if the ammeter shows a charge turn the screw anti-clockwise to bring it back to zero.

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