FRONT AND REAR ENGINE AND GEARBOX MOUNTINGS RENEWING

R-R Silver Dawn, Silver Wraith, Bentley Mark VI, R type

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OBJECTIVE AND BACKGROUND

In the past the importance of ensuring that the rear gearbox mounting is kept in good condition and the symptoms that may be experienced with poor mountings was described in the article “The rear gearbox mounting”.

A number of owners have found it difficult to understand some of the relationships between the actual parts, and also the fitting and adjustment. The individual owners are not helped because the parts come under a number of headings and are in different locations in the parts manuals. A list of parts has been complied and included here to show those who wish to look just where they are listed.

In no place in the manuals will all the components that make up the front and rear mounting assemblies be found illustrated together in an understandable fashion. For the benefit of the owner mechanic this situation has been rectified and the separate front and rear assemblies will be found illustrated within the body of this article under Fig 5 and Fig 13.

It is intended that this article will assist in replacing both front and rear mounting assemblies, including tie rods and buffers, and also may encompass other useful data for the owner mechanic.

ENGINE AND GEARBOX GENERAL MOUNTING DESIGN AND FITTINGS

The main front mounting is positioned high up, under the water pump, directly on the front of the timing case. In comparison the main rear mounting is positioned within a channel shaped cross bearer, position to the rear and below the gearbox. The mountings themselves and distances between their centres are identical on both the manual and automatic transmissions, on all EPW cars prior to the Silver Cloud I / Bentley S1 range, except for some, but not all, 4.9 litre Silver Wraith engines.

These two main mountings take all the circa 800 lbs. weight of the engine and transmission, but provide little resistance to any torque, or fore and aft movement. The high front and low rear positions allow a roll centre, or a line drawn through each of the mounting centres to approximately intersect the centre of the engine flywheel. This design is not unique to R-R and was used on US produced cars before WW2. It does however have the advantage of the coupling line passing through one of the heaviest rotating masses at the flywheel and results in the rotating mass being very insulated from the driver.

A disadvantage is that the engine movement, or roll, tends to react around the flywheel centre. To provide a reaction to power and overrun torque, or twisting, a cross member is attached to the gearbox centre line and terminates higher up on each side above the chassis line. This connection takes the form of just compressing rubber blocks or buffers between the gearbox cross member and a chassis bracket on each side. That is without directly coupling the mountings in the normal way. A common name for this gearbox torque reaction cross member is the “cows horn” cross member and this is a reflection of its shape.

This main mounting arrangement and the extreme rear highly mounted torque reaction arrangement also has another major disadvantage, as well as advantages. This position can be seen clearly in an image of a chassis in Fig 14. Under certain circumstances of power demand the engine and transmission move in a corkscrew or yaw path. A path that is quickly reversed when the brakes are used and overrun torque is transmitted in the opposite direction through the mounting. In normal circumstances this undesirable

movement is restricted but when the rear main mounting in particular has decayed, usually through contact with chassis lubrication oil, the degree of movement increases. At that point running problems become apparent to the driver, brakes poor, exhaust fouling the chassis, clutch action erratic, a non-compliant gear change and sometimes erratic throttle action. This action also overloads the tie rod arrangement, discussed below, when the engine corkscrew path can cause bending and breakage of the tie rod itself encouraged by a side to side movement on the rear mounting.

All main fore and aft forces are controlled through a longitudinal small bar, or tie rod, that is mounted between the rear of the gearbox and chassis cruciform. At each end of the tie rod a limited flexible connection is formed by the compression of four circular rubber blocks. The rod arrangement is designed to retain the engine and transmission in its rested or neutral position even under circumstances when high fore and aft loads are applied. The adjustment of the tie rod takes the form of threaded ends and nuts that in turn clamp circular heavy washers and the rubbers to the attachment points.

PART NUMBERS AND LOCATION

The following list shows the parts book section location and the part numbers.

Section G4.

Rear cows horn bearer and Rear mounting shims part number GB 5266, normally three (3) per chassis. Manual suggests 4 are required.

Section G10.

Tie rod components and RG 3428 rubber spacers, four (4) needed per assembly.

Section U2. Part 9

Gearbox rear cross member shown as part number RF 5222. In fact this is an assembly number for welding 2 x RE 3624 threaded strip to the actual RF 5336 Gearbox cross bearer. Not normally needed.

Section U2. Part 10

Torque reaction chassis bracket, part FB4865, two (2) per car. Not normally needed.

Section U7. Part 3

Front Engine mounting arrangement with RF 727 rubbers, two (2) needed per assembly.

Section U7. Part 5

Main gearbox rear mounting part number FW 1970, one (1) per car, see note about threads.

Section U7. Part 6

Torque reaction rubber buffers part number RE 9001, two (2) per car.

Section U7. Part 6

Buffer holders and threaded adjuster part number FB4537, two (2) per car.

POINTS TO OBSERVE WHEN FITTING REPLACEMENT MOUNTINGS

There are a number of different ways of attacking these jobs but if the front mounting is being changed it is much better to complete that change before attempting the rear mounts. In the case of the rear mounting no attempt is made here to change the mounting with the cross bearer in the chassis.

Also the description follows the path of changing the mountings with the absolute minimum of component disconnection, for example the exhaust is left untouched. This means that any alteration of the engine and gearbox positions, by jacking up or down, needs doing slowly and carefully, but the job is well within the range of the owner mechanic.

Whenever jacking takes place, which can be on the rear of the engine oil sump, the rear part of the main manual gearbox case, or sump pan of the automatic, a degree of care needs exercising. It is necessary to pack or support under the component being lifted, so that given any slip that the drop or lift of the part is kept very limited, and less than 0.50 inch. To protect the alloy engine sump or automatic transmission pan two thick flat pieces of ply board about 0.50 inch thick, placed between any jack and the jacking point, and spreads the weight. Between the actual contact areas it will be found that very thick cardboard provides a useful buffer. Whatever method is selected the importance of inserting packing to keep pace with the jacking cannot be over emphasised. I find it preferable to lift the rear end by jacking under the gearbox and then safety packing at the rear of the engine oil sump.

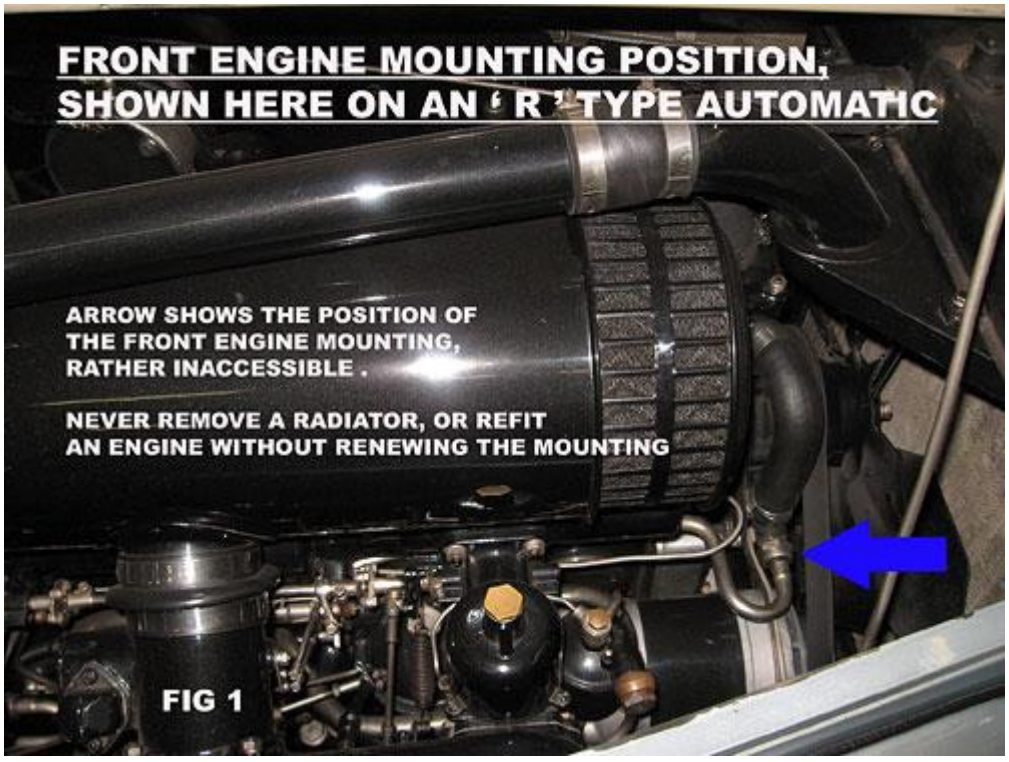
FRONT ENGINE MOUNTING ACCESS

Fig 1 The position of the front engine mounting, below the fan, on the timing case

Fig 2 Showing a typical in situ view taken blindly by a camera

If you happen to be looking to renew the front engine mounting, examine Fig 1 noting where the blue arrow points. This arrow shows roughly the direction to look for the mount, under the water pump and mounted off the timing case. Accessibility, well it is enough to give you a bad day!

A camera pointed in the right direction may provide some light relief and it could produce the result shown in Fig 2. This clearly shows the mounting rubber in good shape. Provided this mounting has been replaced at engine rebuild time or whenever the radiator has been removed, all should be well. It suffers much less than rear mountings, which get contaminated with oil.



In extreme cases, on early cars with single central steering idlers, it becomes impossible to remove the engine oil sump without disturbing the steering idler because the engine has dropped so much on the mount. On later cars with twin idlers it is not so noticeable unless work needs completing on the lubrication pipes on top of the idlers.

To gain access to the front mounting it is necessary to remove the shell, shutters and radiator. In turn by implication this requires removal of the front bumper, spot lamps, horns, bonnet and of course draining the cooling system at the very least. It is assumed for our purpose that access has been gained because removal of these items will differ slightly on each model.

However a few notes may be useful.

EARTH BONDING

The insulated earth return systems for the dynamo was incorporated to deter cooling system silting, there are two main types and these can be identified as shown below. All the earlier type non-insulated return dynamos should have also been modified and the earth strap system should be identical to the later type.

In the early type the dynamo is insulated from its mounting bracket by rubber bobbin ferrules. Although the earth strap connects on the dynamo to a non-insulated terminal the earth strap should be insulated or covered along its length.

In the later insulated system both the output and earth wires egress from the dynamo rear end from insulted terminals and also the earth strap is fully sheathed or insulated. The dynamo earth strap connects to the bottom lower right hand corner of the radiator yoke frame, before finally terminating at a chassis connection adjacent to the right front brake hose. That is your left hand side if you are working on the car at the front end.

It is probable that some previous knife and fork mechanic has altered the connections to the detriment of the cooling system, because they could not gain easy access to the lower right hand earth cable radiator coupling bolt. Owners may find that the earth cable incorrectly couples directly between the dynamo and the chassis, or in some cases no connection exists. In the latter case, even on a basis that it does not hurt, it is preferable to drill a 0.250 inch hole in the lower right corner of the radiator frame and form an earthing point.

When the radiator is out, take advantage to correct the situation by cleaning up the area around the radiator earth attachment point and fit a long bolt into this hole onto which are positioned copper washers. Tighten the bolt with the nut facing to the front of the car, the copper washers trapped against each side of the radiator frame with at least 1.25 inch (30mm) of thread protruding through the nut. When the time comes

to refit the radiator, pass a length of string through the loose end of the earth wire and tie the string off at a forward point near the anti-roll bar mounting.

Refit the radiator; pull the end of the earth wire forward between the radiator and side panel with the aid of the string. Fit a copper washer to the protruding bolt thread, position the earth wire on the bolt, and place on another copper washer followed by a plain washer then spring washer and finally a nut. Tightening the nut will be easy because the bolt will already be held firmly with the initial nut from turning, in short the job can be done with one hand. . This arrangement will aid the removal and fitting of the earth and through copper washers provide first class earth bonding to the radiator. When the job is done, smear grease on the end of any protruding bolt thread.

RADIATOR FLUSHING AND HEATER SYSTEM BLEEDING

As the radiator must be removed to change the front engine mounting rubbers it is the ideal opportunity to comprehensively flush the cooling system. On no account be tempted to replace the thermostat with a different type, or leave it out of this engine.

The radiator should be reversed flushed to clear water passages at a minimum, taking particular attention to ensure the bottom tank adjacent to the bottom hose outlet is clear of debris. Cooling system silt will gravitate to this point by water pump suction.

Attention to the coolant flow system will show that coolant both enters and exits the heater matrix at the bottom, any air naturally rising to the matrix top. Once the coolant system is refilled it is sensible to bleed out this air to prevent an air lock by running the engine with the return heater hose to the water pump inlet detached. The engine should be run at a fast idle of about 1200 rpm until a full flow of coolant flows from the heater return pipe. Beware of the revolving fan blades, especially if you are using a fluorescent hand lamp.

It is suggested that on no account should the engine operated with either the heater taps, if fitted, turned off, or the heater detached. The coolant flow through the heater matrix provides a very helpful flow through the rear of the engine and cylinder head, and helps prevent the normal situation whereby the coolant flow is stagnant at the rear end.

BONNET (HOOD) STORAGE

Fig 3 Bonnet Buck to aid storage of the bonnet (hood) without damage

The bonnet (hood) will need handling with care, it can “gull wing” suddenly with no warning and cause a lot of damage, it is better removed with two strong people, making sure thick protection is placed on the top of the radiator shell. To aid storage of the bonnet without damage it is possible to construct two

plywood bucks, which are each cut in a half moon shape, see Fig 3. One panel with a large radius to suit the rear of the bonnet radius and one small radius to suit the front end radius. These two panels are flat on their base to represent a line rough below the bonnet line and they are joined together by two length of timber.

An explanation of how the bonnet rests will answer outstanding questions. The bonnet is rested over the two radius panels in exactly the same way as it would rest in the closed position on the car. In essence one could say it rests on the two bucks like a saddle on a horse. The edge of the bucks can be taped to prevent under bonnet scratching. This arrangement was used on production to store bonnets once the two individual bonnet panels had been assembled.

SHUTTER POSITIONS

Fig 4. Front shutters opened out on an R Type

All Bentley EPW cars went through a series of front shutter grille changes. Three major shutter arrangements were used, 10 shutters in each half to approx. B 163 DZ, some 9 shutters in each half up to R type B 210 TN, and thereafter 9 shutters in each half with a centre bar. In between these major changes a few minor changes took place.

All these changes were not completed for the styling exercise but to improve cooling. Further to these changes a system of modifying the earlier and intermediate shutters took place to assist cooling. These changes need applying to all shutters whenever the shell unit has been removed from a car.

The modification on each shutter set comprises of drilling out one of the two rivets at each end of individual shutter rails. The vertical rail is then turned or pivoted on the existing rivet, towards the open position as far as is feasible to admit more cooling air commensurate with a good frontal appearance. Common sense should dictate which shutter rivet to drill out to obtain the desired pivoting action, and a rivet in the same alignment needs drilling out at the opposite end.

Once the new position of the shutter rails has been chosen the lower end of each shutter can be drilled through the old vacant rivet hole and the shell bottom bearer, and a new rivet inserted. In the earlier modifications the company suggested soldering the rail in the new position. This means applying some form of heat and it is also difficult to clean up the individual faces of the shutter and the shell bearers, and re-riveting appears to be a better choice to secure the rails.

Anyone attempting this modification will find that the centre bearer that clips into each shutter rail half way up the shell varies in design depending on which shutter set is fitted. This centre bearer design will in practice limit the increased angle through which the shutter can be pivoted, before the rail and bearer clip arrangement foul each other. It is possible on the two earlier shutter designs to grind out each see- saw clip to allow a greater rail pivot angle to be achieved. The ground out position causes no distress to the frontal appearance, as it cannot be seen, and because the rails are brass no corrosion takes place. The rails will stand some amount of tensioning towards the more open position and certainly admit more air.

Fig 4 shows the shell and shutter appearance on a late R type when the shutters have been opened out to maximum. Close up, the radiator matrix can just be seen from a direct head on view, but in 20 years even specialists have admitted they have never noticed the modification. An examination of other cars will usually show that the radiator matrix cannot be seen, and even the company admitted that on the earlier cars the centre 8 inch of the matrix is starved of cooling air.

MOUNTING ARCH TO CHASSIS BOLTS, BOLTS, WASHERS, NUTS AND SPLIT PINS

Few people pay attention to split pins and yet there is always a chorus of complaint when split pins have to be removed. It is suggested that the following system is used when the split pins are inserted in the mounting bolts. This will ensure the pins are tight and yet easy to fit and remove.

Choose a split pin that can be inserted into the bolt hole without having to apply any undo force. Cut the pin ends to length, and if a grind stone is available grind a radius on the cut ends generally towards a pointed shape. Open out each pin around 0.375 inches by spreading the legs and then close the legs again. This will create a 'set' in the legs of the pins that will keep them free from vibration fretting and leave them easier to withdraw.

Enter the arch bearer square headed bolts into position and set the pin hole in a compass position that will best aid both fitting and withdrawal of the split pins. Place a spot of grease on each split pin and in each pin hole, and fit the plain washers and castel nuts. Tighten the nuts and enter the spit pins, turn the nuts slightly to grip the pins, and finally spread the legs of the pin.

FRONT ENGINE MOUNTING RENEWAL

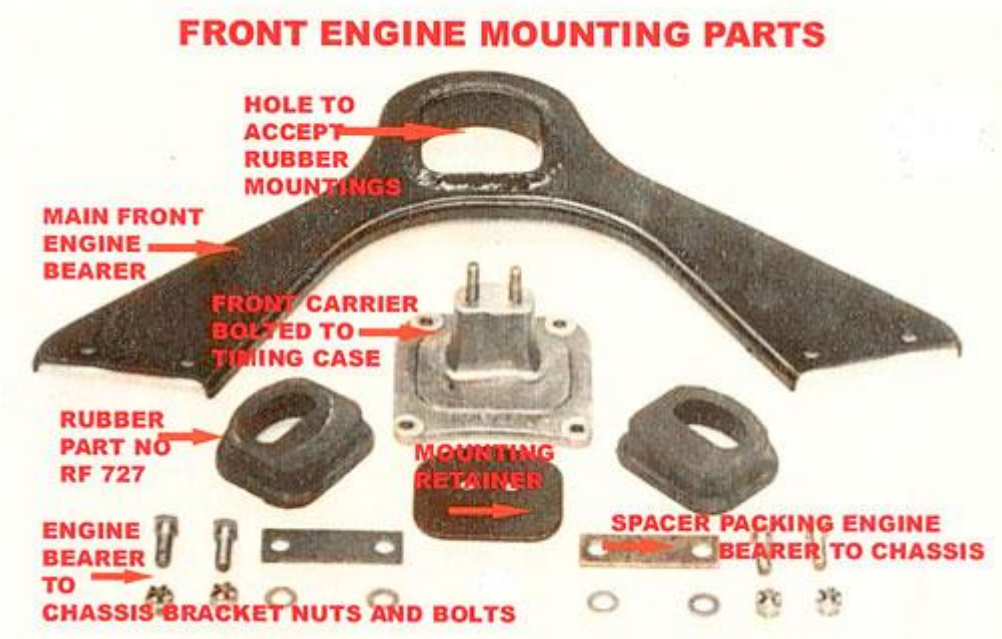


Fig 5. The various component parts that make up the front mounting

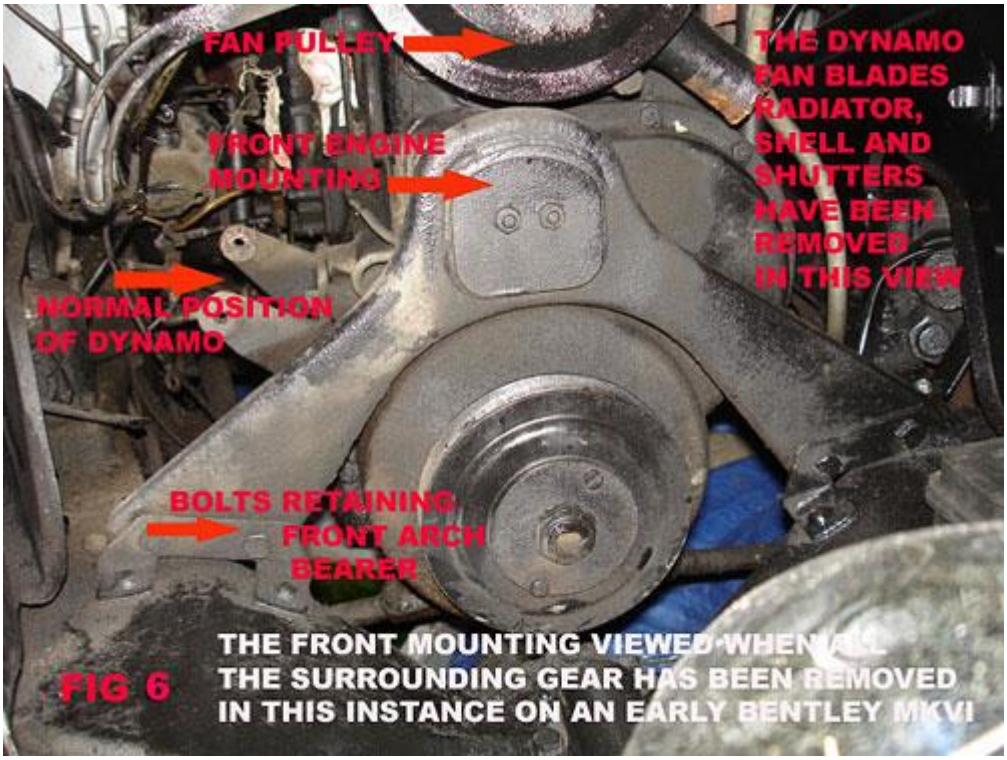


Fig 6. The view, once the front end is stripped off the car

The production parts that originally made up the front mounting are shown at Fig 5. Once the radiator assembly has been removed, the fan and belt, and preferably the dynamo can be removed to improve access. At that point the front of the engine will look similar to Fig 6. Note in this view the arch bearer to chassis bracket four retaining bolts have previously been fitted back to front; their nuts should face to the front of the car.

Prior to raising the engine to take weight off the mounting, ensure that both gearbox rear side buffer adjusters are slackened off fully so that in no way do they exert vertical forces as the engine is raised. Failure to do so is likely to result in cracking or breaking off of the threaded adjuster sections from the rubber buffer cup holders. These buffer adjusters are shown in a later section of this article covering the rear mounting arrangements.

Extract the four split pins from the front cross bearer arch to chassis attachment bolts, remove the castel nuts from the bolts, but leave the bolts in place. Take note that the bolts are a very close fit and packing pieces, Fig 5, are inserted between the arch bearer and chassis brackets.

Take the weight of the engine assembly off the mounting by jacking up on the alloy sump near the front end. Place adequate protection packing or support between the jack and sump, and also block or pack independent of the jack for safety. Only raise the assembly enough to remove and replace the rubber mountings.

Undo and remove the two nuts and spring washers holding the rubber mounting retaining plate, remove the front RF 727 rubber by prising it out of position. Gently tap out the four chassis mounting bolts (they have already had their nuts and washers removed). Make sure that the arch bearer is not under load so that the bolt threads are not damaged. Finally remove the arched engine mounting bearer and the rear RF 727 rubber. Collect the spacers positioned between the chassis brackets and arch bearer.

Clean the parts ready for assembly, make sure the split pin holes are clean in each bearer bolt and prepare the split pins as previously described. Apply a very thin layer of rubber grease, if available, to the protruding inside and outside section of the new RF 727 mountings.

Commence to place the new rear rubber mounting into the arch bearer aperture and at the same time position the bearer so it will both fit over the inner timing case carrier, and its outer legs will fit behind the chassis mounting brackets. Some force and positioning will be required and some repairers prefer to enter the rubber initially onto the carrier instead of inside the arch bearer. Once the arch bearer is approximately in position fit the front rubber mounting, the retaining plate and the spring washers and nuts. It may be found that it is necessary to fit the nuts initially without spring washers to gain thread access and pull up the mounting into position. However position the spacing packers between the arch mounting and chassis brackets, before tightening the two retaining plate nuts as follows.

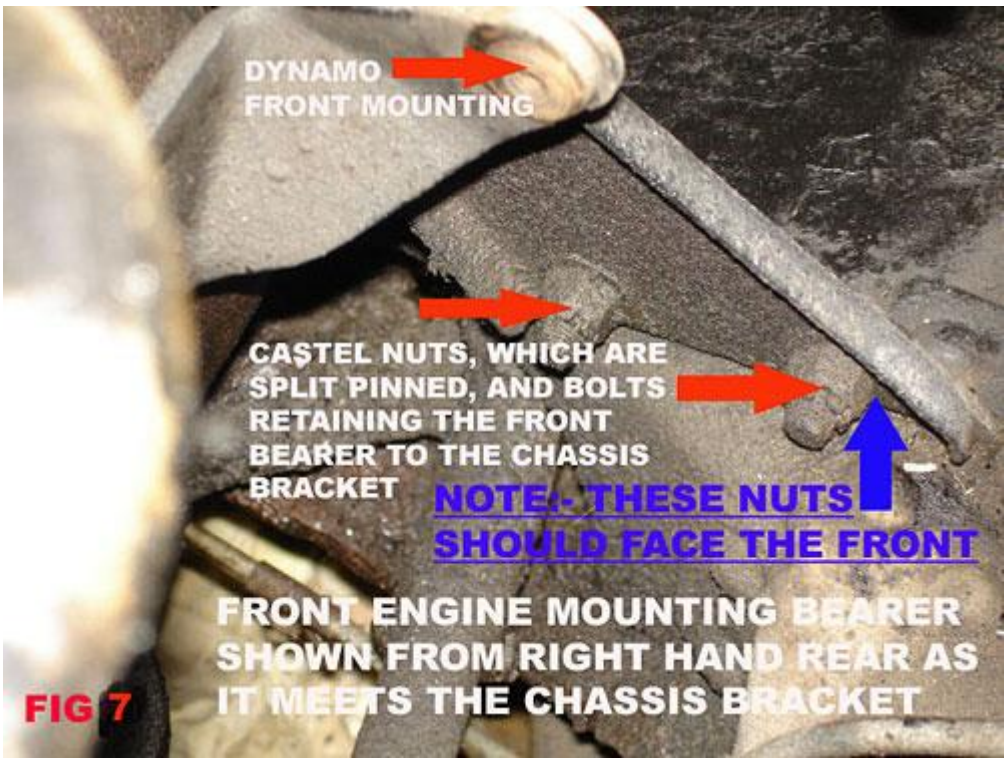


Fig 7. Front arch to chassis, make sure to fit split pins and the bolts go in from the rear!

Position the spacer plates, if necessary prise and flex the arch cross bearer against the new rubber mounts, so that one end of the spacer is in alignment with one hole. Use a taper punch if needed to line up the components. Once aligned enter one of the square headed bolts from the rear, (note these are NOT correct in Fig 7), through the arch, spacer and chassis bracket and fit the plain washer and castel nut. Push the other end of the spacer into alignment with the other hole and repeat the procedure. Treat the other side of the arch attachment in the same way. Tighten the two main rubber mounting retaining plate nuts making certain that the spring washers are fitted under these nuts. Finally tighten the arch bearer to chassis four castel nuts and spit pin as previously described.

Let the full engine weight onto the front mounting and then reset the gearbox rear rubber buffers. Refit the front end parts and refill the cooling system.

REAR MOUNTING CONSIDERATIONS

The introduction of the R type model, the higher compression engine, automatic transmission and the replacement of the riveted chassis frame with a welded frame caused a few problems to the later R type chassis webbed design tie rod attachment. In fact all chassis affected, and already in owner's hands were intended to be retrofitted, and production types reverted to the earlier MKVI tie rod. A bulletin BB 180 was issued to cover cars already in owner's hands.

Fig 8. Bulletin BB180 page 1

SERVICE Bulletin No. BB-180

MODEL BENTLEY MARK VI

FOR CATEGORY 2 ACTION

MODIFICATION

Gearbox Tie-Rod Bracket.

1. GENERAL

It has been found necessary to modify the transverse mounting bracket for the rear end of the gearbox tie-rod fitted to the Bentley 'R' Type and to the Bentley Continental from B series onwards.

On the earlier rivetted frame the tie-rod bracket is to be strengthened by the addition of a stiffener and a backing plate. The aluminium seating for the tie-rod rubbers is to be replaced by a steel seating.

On the later welded frame the tie-rod bracket is to be cut away and replaced with the Mark VI type bracket.

Details of both modifications are set out in this Bulletin and Retailers are asked to incorporate them on a Category 2 basis, dealing with cars as they come in for service.

The original Mark VI type bracket is now being fitted on production. Both modifications apply equally to cars fitted with either automatic or synchromesh gearbox.

2. RIVETTED FRAMES MODIFICATION

(a) Chassis Nos. Affected:

Bentley 'R' Type

B-2-RT to B-159-SP (inclusive)
B-163-SP to B-21-TO (inclusive)
B-25-TO to B-55-TO (inclusive)
B-59-TO to B-117-TO (inclusive)
B-121-TO
B-125-TO to B-347-TO (inclusive)
B-387-TP, B-401-LTO.

Bentley Continental

BC-1-LB to BC-20-C (inclusive)

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Fig 9. Bulletin BB180 page 2

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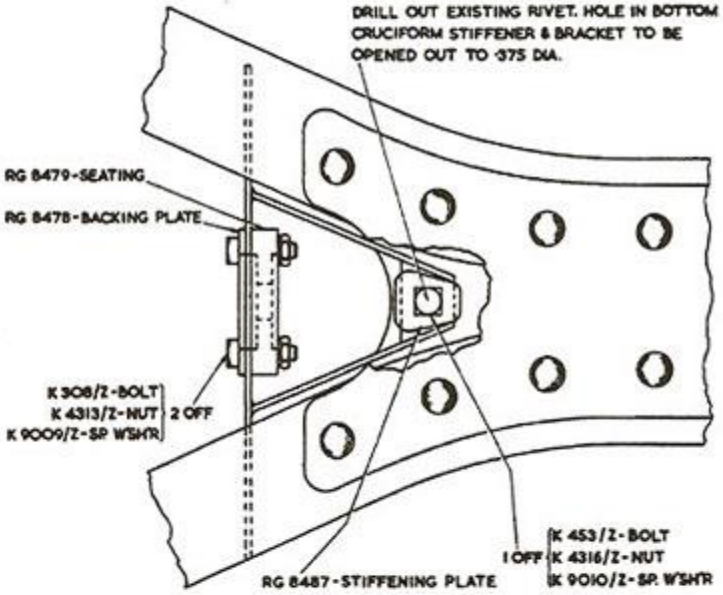
(b) Material Required:

RG.8479	Seating - Rubber	1 off
K.308/Z	Bolt .312" Tie-Rod Seating	2 off
K.4313/Z	Nut .312" Tie-Rod Seating	2 off
K.9009/Z	Washer Tie-Rod Seating	2 off
RG.8478	Backing Plate - Tie-Rod Bracket	1 off
RG.8487	Stiffener Plate - Tie-Rod Bracket	1 off
K.453/Z	Bolt .375"dia. - Tie-Rod Bracket	1 off
K.4316/Z	Nut .375"dia. - Tie-Rod Bracket	1 off
K.9010/Z	P.S. Washer - Tie-Rod Bracket	1 off

This material is available from the London Service Station.

(c) Procedure



VIEW LOOKING ON TOP OF FRAME SHOWING NEW RUBBER SEATING & BRACKET STIFFENERS FITTED

FIG. 1

(i) Place the car on a ramp or over a pit.

(ii) Remove the gearbox tie-rod by removing the two nuts and spring washers retaining the rubber seating to the gearbox at the front end and to the mounting bracket at the rear end.

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Fig 10. Bulletin BB180 page 3

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MODEL: BENTLEY MARK VI

(iii) Drill out the existing rivet securing the bracket to the lower cruciform stiffening plate (Fig.1). Enlarge the hole to .375" (9.52 mm) dia. Fit the bolt and stiffening plate. The stiffening plate fits between the bolt head and upper face of the bracket.

(iv) Fit the new rubber seating and backing plate (Fig.1).

(v) Discard the old rubber seating and refit the tie-rod.

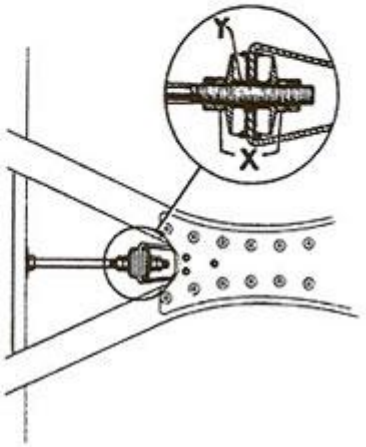

FIG. 2 ADJUSTING THE TIE-ROD LENGTH.

(vi) To adjust the length of the rod, screw up the adjusting nuts (X Fig.2) finger tight and then tighten them an equal amount until the distance piece Y is clamped. Tighten the locknuts. The adjustment should impose no fore and aft deflection on the gearbox rear rubber mounting block.

(d) Charges

A time of 2 hours is allowed and charges should be submitted on a Guarantee Form in the usual way.

3. WELDED FRAMES MODIFICATION

(a) Chassis Nos. Affected

Bentley 'R' Type

B-161-SP, B-23-TO, B-57-TO,
B-119-TO, B-123-TO.
B-349-LTO to B-385-LTO (inclusive)
B-389-LTO to B-399-TO (inclusive)
B-2-TN to B-8-UM (inclusive)
B-12-UM to B-160-UM (inclusive)
B-164-UM to B-176-UM (inclusive)
B-180-UM to B-184-UM (inclusive)
B-202-UM to B-210-UM (inclusive)

Bentley Continental

BC-21-LC to BC-49-LC (inclusive)

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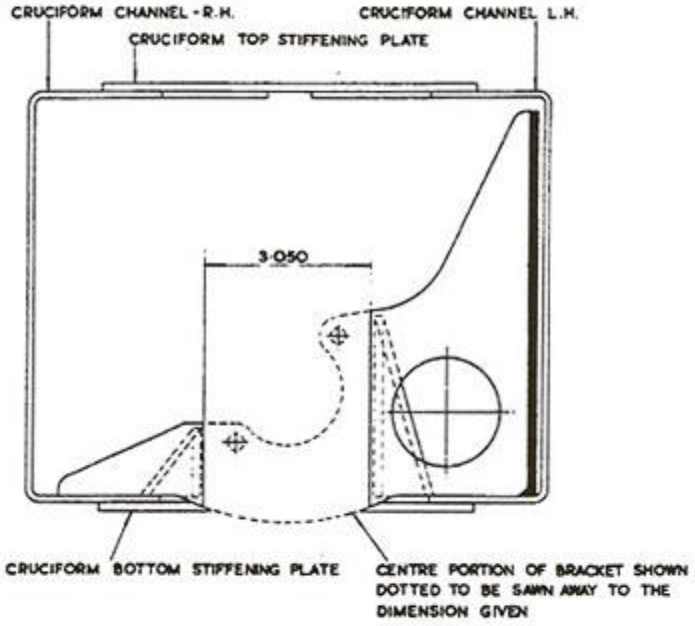
(b) Material Required

RG.8482	Assembly Tie-Rod Bracket	1 off
RG.3434	Packing Plate, Tie-Rod Bracket	1 off
K.345/Z	Bolt 5/16" Tie-Rod Bracket	1 off
K.4313/Z	Nut 5/16" Tie-Rod Bracket	1 off
K.9009/Z	Spring Washer, Tie-Rod Bracket	1 off
K.243/Z	Bolt ¼" Tie-Rod Bracket	2 off
K.4310/Z	Nut ¼" Tie-Rod Bracket	2 off
K.9008/Z	Spring Washer, Tie-Rod Bracket	2 off

This material is available from the London Service Station.

(c) Procedure



VIEW LOOKING FROM FRONT OF CAR SHOWING MODIFICATION TO EXISTING TIE ROD BRACKET

FIG. 3

(i) Place the car on a ramp or over a pit.

(ii) Remove the gearbox tie-rod by removing the two nuts and spring washers retaining the rubber seatings to the gearbox at the front end and to the mounting bracket at the rear end.

(iii) Cut out the centre portion of the transverse mounting bracket with a hacksaw as shown in Fig.3. Clean up and paint the cut edges.

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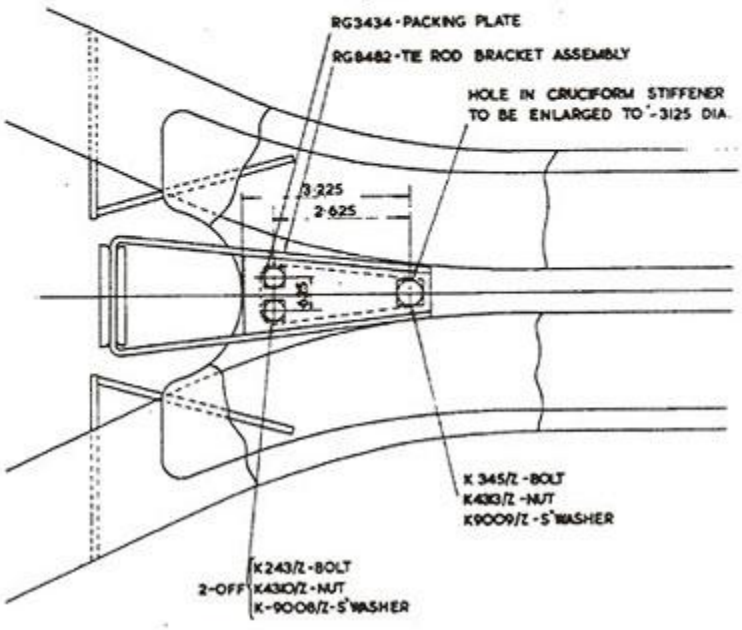


VIEW LOOKING ON TOP OF FRAME SHOWING NEW TIE ROD BRACKET FITTED IN POSITION

FIG. 4

(iv) Increase the diameter of the rear centre hole in the cruciform bottom stiffener plate from ¼" (6.35 mm) to 5/16" (7.93 mm) (Fig.4). On some frames the three holes in the stiffening plate may not already exist and should be drilled in accordance with the dimensions given in Fig.2.

(v) Fit the new bracket and packing piece to the top of the stiffening plate securing with the three bolts, spring washers and nuts.

(vi) Remove the old rubber seating from the rear end of the tie-rod and refit the rod to the gearbox and bracket.

(vii) Set the length of the rod as in para 2 sub.para (vi) above.

(d) Charges

A time of 2 hours is allowed and charges should be submitted on a Guarantee Form in the usual way.

ALL COMMUNICATIONS SHOULD BE ADDRESSED TO
BENTLEY MOTORS (1931) LTD., SERVICE STATION, HYTHE ROAD, WILLESDEN, LONDON, N.W.10

SB/VK/CL 1JN.....24.2.54. SECTION G

PRINTED IN ENGLAND

This bulletin has been reproduced in full in Fig 8 to Fig 12. Not only will it explain to some owners of early R types why their chassis tie rod arrangement may be different, but also how to modify it to current standards. In addition it explains how to remove, refit and adjust the tie rod correctly, which may save a little repetition here.

NOTES ON THE REAR MOUNTING FW 1760

It is usually the failure of the main gearbox rear mounting that grabs the attention of the owner, when the brakes, clutch or the gear change show some signs of being out of adjustment. A new mounting is exactly 1 inch thick, including both steel faces. Initial collapse of the mounting can be seen when it bulges outwards and partially obscures the view of the upper nuts on the mounting to gearbox studs, when they are viewed through the cross member access holes.

Owners should be aware that although the two studs that are an integral part of the rear mounting were originally BSF threaded, this was changed in 1979 when this mounting was redrawn and 0.312 inch 24 tpi UNF – 2A studs and nuts to were incorporated. It is not unknown for pattern mountings to have even Metric threads. The importance of this is felt because the mounting is normally supplied without nuts or washers and the owner may not have the correct ones at hand during the job…. Moral; ensure you have nuts that will fit the mounting before taking the job on board.

GEARBOX REAR END SUPPORT ARRANGEMENTS

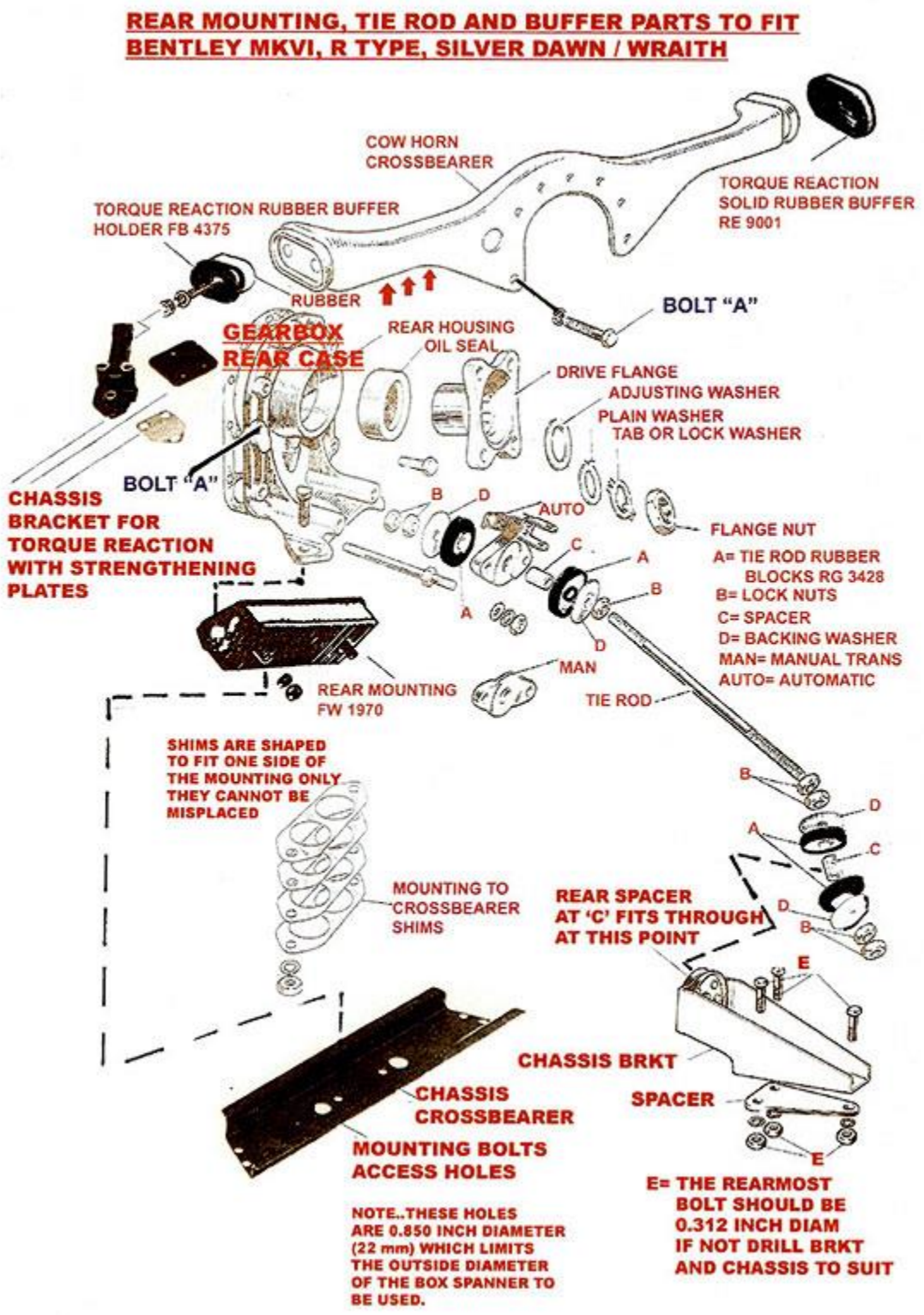


Fig 13. Rear Mounting Layout

Both manual and automatic gearbox arrangements are basically identical, although owners may come across slightly different versions that have been used over the years. Fig 13 shows a layout of all the component parts that is not available elsewhere. It can generally be presumed that current practice identically covers both welded and riveted chassis frames. A triangular spacer with three holes to accept through bolts is positioned under the rear tie rod bracket. This spacer allows the tie rod bracket to be raised above the chassis flanged lip in the centre cruciform. The spacer is circa 0.125 inch thick and often has been

misplaced during a previous renewal of the tie rod rubbers. If this spacer is missing look further rearwards into hollow section of the cruciform where it may well be laying in the grime and dirt.

The main differences that owners may find are, referring to the tie rod chassis bracket shown in the bottom right hand corner Fig 13. The rear bolt of the three marked 'E' may be 0.250 inch, 0.312 inch or 0.375 inch diameter. All have been used over time, but this bolt must be at least 0.312 inch diameter on a welded chassis frame and 0.375 inch diameter on a riveted chassis. Also under the head of the 0.375 inch bolt on the welded frame should be a stiffening plate part number RG 8487, this is not shown in Fig 13. In essence this is a large thick washer, slightly tapered in shape and approximately 0.0625 inch thick. All welded chassis frames were continuously embodied on R type production from chassis B349 TO or circa June 1953 production on other R-R products.

Note also in Fig 13, the access hole for the gearbox to main mounting nuts is limited to 0.875 inch (22 mm) diameter. This means either using a very slim socket or a box spanner to reach the nuts. Keep in mind that whatever method is used that it will also be need to accomplish the feat of positioning the spring washer and nut onto the thread of the bolt when a new mounting is fitted.

GEARBOX REAR MOUNTING, TIE ROD AND BUFFERS

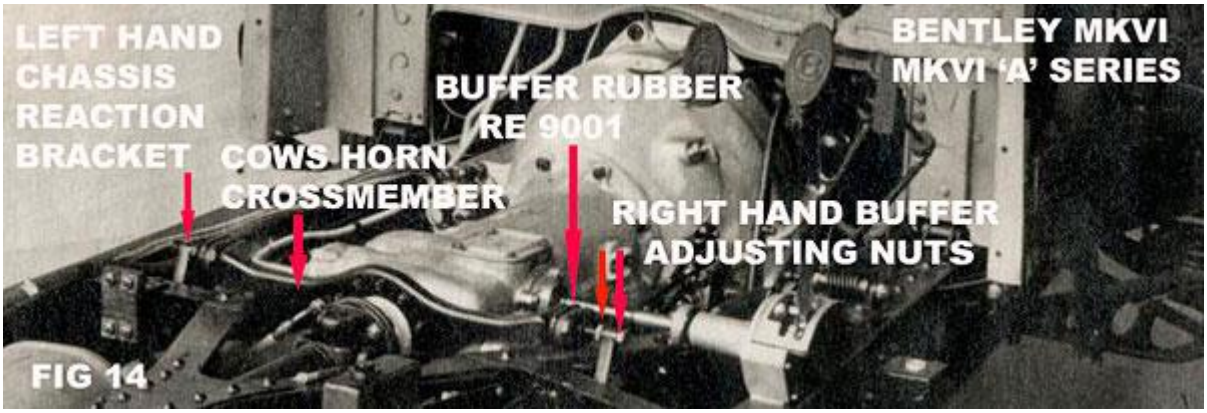
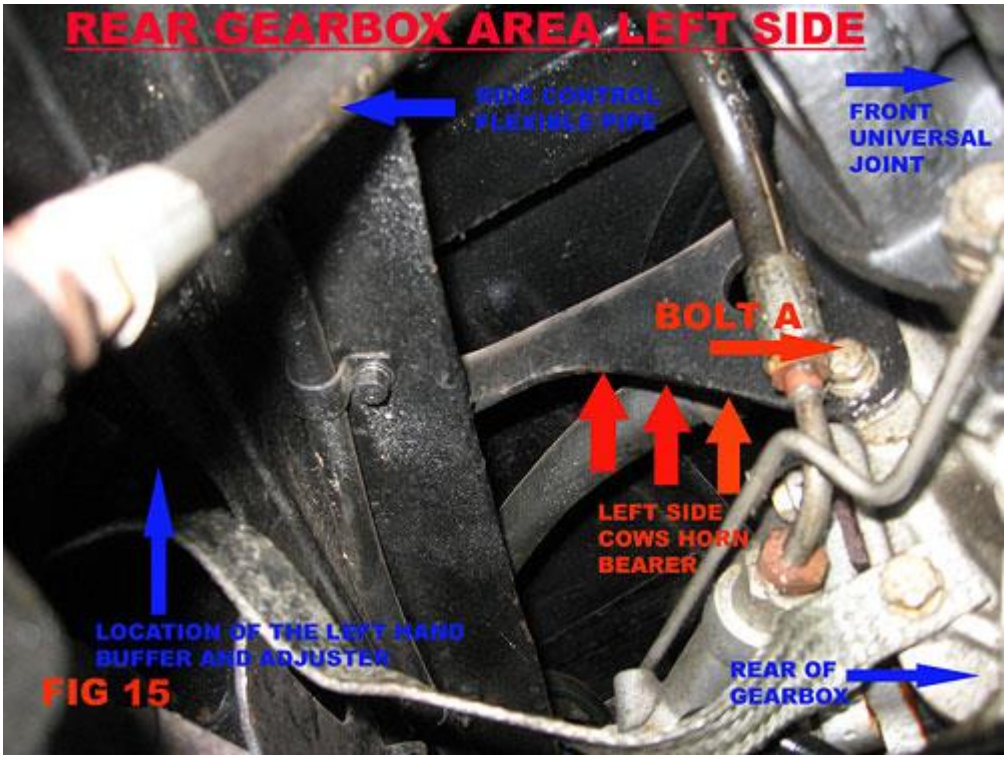


Fig 14. The high position of the buffers above chassis level can be seen here



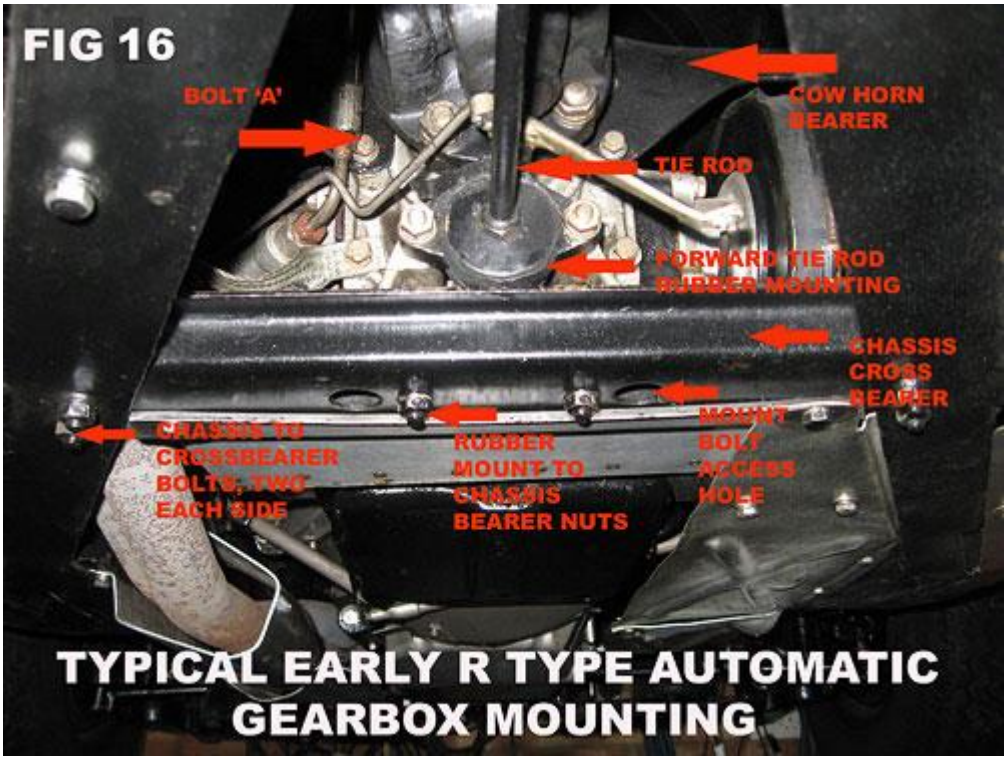


Fig 15. Gearbox Rear left hand side

Fig 16. Rear end arrangement in an R type Automatic, with an unlisted component on view

It is usually the rear mounting, tie rod and buffers that often require attention and this job is now discussed. Raise the car to an acceptable working height and block or fit axle stands under the substance of the chassis or axles. The worst problem is really accessing the rear rubber side buffers on each end of the cow's horn bearer, so called due to its shape. Examining this area will provide some idea of the working height needed. The position of the buffers in relationship to the chassis is shown in Fig 14.

If reference is made to Fig 13, Fig 15 and Fig 16 the orientation of the position of parts can be judged by locating the position of "Bolt A" on each image.

In extreme cases the rear mounting will have collapsed and hardly be supporting the weight of the transmission, and if the side buffers are removed initially some severe gearbox rocking can occur when the tie rod is undone. In these cases the side buffers will in any case be taking some weight, a job they were not designed to do, and some jacking may eventually be needed to extract the buffer blocks that have displaced downwards.

Fig 17. A Torque reaction bracket and adjuster

We must therefore first remove the tie rod assembly. This is accomplished by referring to Fig 13 and removing nuts, washers and bolts marked ‘E’ from the tie rod chassis bracket, and the nuts

on the long studs that secure the front seating on the tie rod to the gearbox rear cover. This will detach the assembled unit from both the chassis and gearbox and will enable the nuts marked ‘B’ at the front end of the tie rod to be accessed and removed, when the partially assembled unit can be withdrawn. Due to room constrains it is may be necessary on some chassis to undo or remove nuts marked’ B’ at the rear end of the tie rod before it can be fully withdrawn.

Take care not to loosen the two tube spacers shown at ‘C’ and strip down the assembly and fit the new rubbers ready for refitting the unit to the chassis. When refitting is due, take care to assemble the parts correctly and note that only one nut is positioned at the rear side of the front tie rod mounting; refer to Fig 13, Fig 16 and Fig 18 as required.

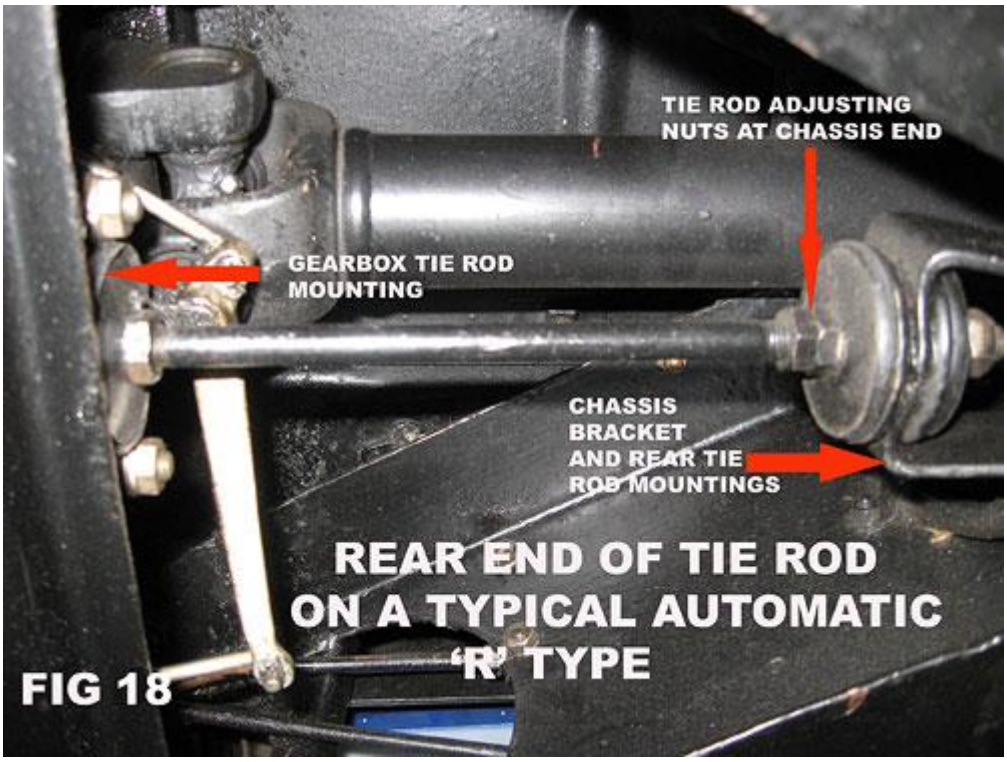


Fig 18. The rear end of the tie rod, showing the adjustment nuts at the chassis end

Examine the tie rod for being straight, if is visibly bent, do not straighten but renew the rod. If a genuine example is not available make one from EN24 or EN 19 round bar and thread to suit. When these tie rods are bent it is usually not from just an isolated instance but is the result of continual bending and torque reversals. This weakens the rod in particular immediately to the rear of the single nut at the forward end. Once bent there is no method of knowing how many reversals have taken place or when the rod may break. When the rod breaks there is no restraint of the engine or gearbox assembly either for or aft and upon the next hard brake application the gearbox is likely to move forward under the force of the braking load to the servo. Tie rods do break and under hard braking conditions severe damage should be expected to the engine and transmission couplings, in addition to the radiator.

With the tie rod assembly still detached, remove the right hand side servo under sheet and right hand rear under sheet on RHD cars. In addition on LHD cars remove the left hand rear under sheet. Refer to Fig 14 and Fig 17 and slacken the two adjusting nuts on both torque reaction buffer holders, slide back the holders and remove the old rubber buffer blocks. If the old rubber buffers stick and refuse to move, tap the rubber buffer at the joint with the cows horn cross bearer cup, a piece of large timber dowel is ideal for the task.

The rubber buffers are merely trapped into place by the clamping effect of the adjuster against the rubber holding cups. Examine the buffer cups at the point where they are welded to the threaded adjuster, if any cracks or detachment is apparent renew the cups and adjusters on both left and right hand sides. Clean and lubricate the adjuster thread and nuts.

Refit the buffer holders and insert new rubber buffers, recessed ends outermost. Adjust both buffers to just touch the cow's horn cross bearer end cups. Check that they are providing some side support to stop the gearbox moving sideways when the main mounting is removed, but not so as to come under strain when the gearbox is raised.

Refer to Fig 16 and jack up the rear of the gearbox and block. Raise it just sufficiently to take the weight off the main mounting and to leave as clear access as possible through the chassis cross bearer access holes. Using a box spanner or socket with an outside diameter less than 0.875 inch (22 mm) undo and remove the two nuts securing the mounting to the gearbox, leave the studs in place. Undo and remove the nuts securing the mounting to the rear chassis cross bearer.

Undo and remove the four bolts, nuts and washers, which secure the bearer to the chassis, these are shown at each side of the cross bearer in Fig 16. Displace the bolts holding the main mounting to the gearbox rear cover by tapping them lightly upwards. Recover the bolts.

Continue to raise the gearbox by jacking, following up at every opportunity with packing blocks, until the rear mounting can be worked out of the depth of the cross member. It may be necessary to rotate the cross member to assist. Total maximum lift at a guess is around 1.5 inches. Recover the shims adjacent to the mounting and remove the cross member by rotating in each direction until it becomes detached. If the inside flanges of the chassis are heavy with dirt this must be cleared away to allow the ends of the cross bearer to rotate. Clean the parts, and refit the cross bearer using a new rubber mounting and ensuring the shims are in place.

Locate all the bolts and nuts (ensure the gearbox studs pass cleanly through the shim holes) including the four cross bearer to chassis ones, and let the full weight of the transmission onto the mounting before tightening any nuts. Tighten the chassis to bearer nuts fully followed by the nuts holding the mounting to the cross bearer and gearbox, do not omit any spring washers.

Refit the tie rod assembly and adjust as described in Fig 8 to Fig 12, notice that the front tie rod adjustment is fully tightened and all adjustment takes place at the rear end, see Fig 18 for detail. The tie rod should restrain the power train in a neutral position with no fore or aft bias.

Check that the buffer rubbers are still squarely in their holders, see Fig 14 and Fig 17, carry out the adjustment, feeling around each holder frequently during adjustment to ensure that the rubbers seat into position. The manual specifies very little pre-loading exertion force on the rubbers but it will be found that at least with new rubbers some 3 to 4 full turns of the adjuster will be required after initial finger tightening contact. For the record the official method suggests, full slackening both nuts, tightening up the inner one finger tight, then holding the cup holders square, tighten two more complete turns. Then tighten up the outer nuts. In service it will be found that the outer nut comes roughly level with the end of the adjuster.

Check all nuts are tight. Check the action of the gear change, manual or automatic. In the case of the latter detach the gear change linkage set the neutral detent at the auto gearbox end in the bottom of the neutral engaged position, this ensures the gearbox is in neutral. At that point ensure that the column change lever is in the uppermost neutral position, then adjust the linkage to fit without strain. Check the gear change for selection positions. It is possible on automatics that the (TV) Throttle valve rod will need readjusting to attain the correct gear change timing. All cars may need slight throttle rod adjustment. Manual transmission cars will need a clutch adjustment check.

On each occasion when the rear mountings have been changed it is imperative that the brake linkages should be checked and reset, as it is almost certain they will have attained a new position.

Once all the checks and adjustments have been made the under sheets can be refitted.

OIL CONTAMINATION OF THE REAR MOUNTING AND AVOIDANCE

By this point the observant owner mechanic will have noticed that Fig 16 contains an extra component not listed in the parts book. This is an oil deflector shield that is attached to the original but vacant tapped holes on each side of the gearbox rear chassis cross member. It is made of alloy with a rubber strip attached to seal closely to the gearbox and it completely prevents oil contamination of the rear gearbox mounting. From an end on or side view it is a double 'Z' shape.

ACKNOWLEDGEMENTS

I am grateful to Mr Don Elliot of Washington State, USA for proof reading and Dr Charles K. Nash of Virginia Beach, USA for his assistance on preparing this article and permission to use images Fig. 6 and Fig 7.