

SECTION 7

REAR SUSPENSION - DE DION

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7.1 The De Dion kit as supplied by Caterham Cars includes all the parts necessary to assemble the De Dion axle including differential, hubs and disc brakes.

It is possible to source the differential second hand as it is a Ford Sierra item, and the kit is available without this item if a used item is preferred. The driveshafts and hub assemblies, however, although using Sierra constant velocity joints, are specially manufactured for the Seven. Please note that the Sierra Cosworth differentials will not fit a Seven as they are physically too large.

7.2 Installation of Differential

2.1 Before fitting the differential unit, the locating lug on the top rear of its casing must be removed since this can foul the De Dion tube at the full extent of its travel. Exactly 3/4" should be removed from the lug. If too much metal is cut away there is a danger that the differential casing will be holed.

2.2 Fit the plastic breather pipe to the top of the diff unit ensuring the 'pips' are aligned. This part is a tight fit

2.3 Attach the propshaft to the nose of the differential using four special blue bolts, without washers, which are torqued to 42 lbft using 'loctite' to make absolutely certain they do not come loose in service. Before fitting this however, check that you have been supplied with the correct item, the Vauxhall/Rover propshaft being 26¹/₂" long, the Ford 28" long, and that the other end is a smooth sliding fit into the back of your gearbox. If not call Caterham at once.

2.4 Insert the completed assembly into the transmission tunnel and hang the differential from its upper mounting using the 1/2" x 11" bolt, not securing at this stage.

2.5 The lower, forward mounting is attached to the chassis using two special 12mm x 65mm, 1/2" shank bolts through the metalastic bushes with plain 3/4" diameter washers either side of each bush. The differential has to be located centrally in the

chassis and this can be achieved using further 3/4" diameter washers in equal numbers each side, taking up any clearances. Take care not to force too many washers between the chassis and differential since the small amount of free movement allowed by the rubber bushes will be eliminated, causing excessive noise and vibration to be transmitted into the car. However, all the play should be taken up by the washers. Thinner shim washers are supplied to allow this.

2.6 The 3/4" washers are important because they prevent noise and vibration shorting out between the differential and chassis, bypassing the sound absorbing qualities of the metalastic bushes.

2.7 It is advised that as a double check on the central location of the differential, you measure the distance between the outer edge of the differential and the inner edge of the outer chassis tubes, which should be identical within 2mm. (See figure 7.2)

2.8 Remove the 11" bolt from the upper mounting and centralise with the 3/4" washers in the same way. Tighten this to 40 lb ft.

2.9 Tighten the two lower mounting bolts to 40 lbft.

2.10 The rear lower mounting points on the differential are redundant on the Seven.

7.3 Assembly of De Dion Tube

3.1 The video shows the De Dion tube being partially assembled before installation in the chassis, although these instructions assume that the builder will fit the De Dion tube and driveshafts first, attaching both rear De Dion ears and hub assemblies with the tube in the chassis. Either way, the rear wings should not have been fitted or access becomes difficult.

3.2 Place the De Dion tube into the chassis noting that the outer 'ears' face forward and the diagonal link mounting downward. This is a tight squeeze between the differential and petrol tank.

3.3 Fit both driveshaft assemblies into place inserting their inner (unthreaded) ends into the differential taking care not to damage the seals. These are handed left (nearside for a RHD car) and right (offside).

3.4 Fit the rear taper roller bearings into the hub carriers. These bearings are identical and supplied as matched pairs. The outer housings should be pressed into the hub carriers using either a vice or gently tapped into place using a hammer and suitable drift taking care not to damage the bearing face. If possible this job is better done using a press at your local garage. Note that each bearing outer housing should be fitted with its smaller inner diameter innermost into the hub carrier.

3.5 The inner races and the hub itself should be liberally packed with grease and the races then pushed into place. The seals can now be pressed carefully into position. (see diagram 7.3)

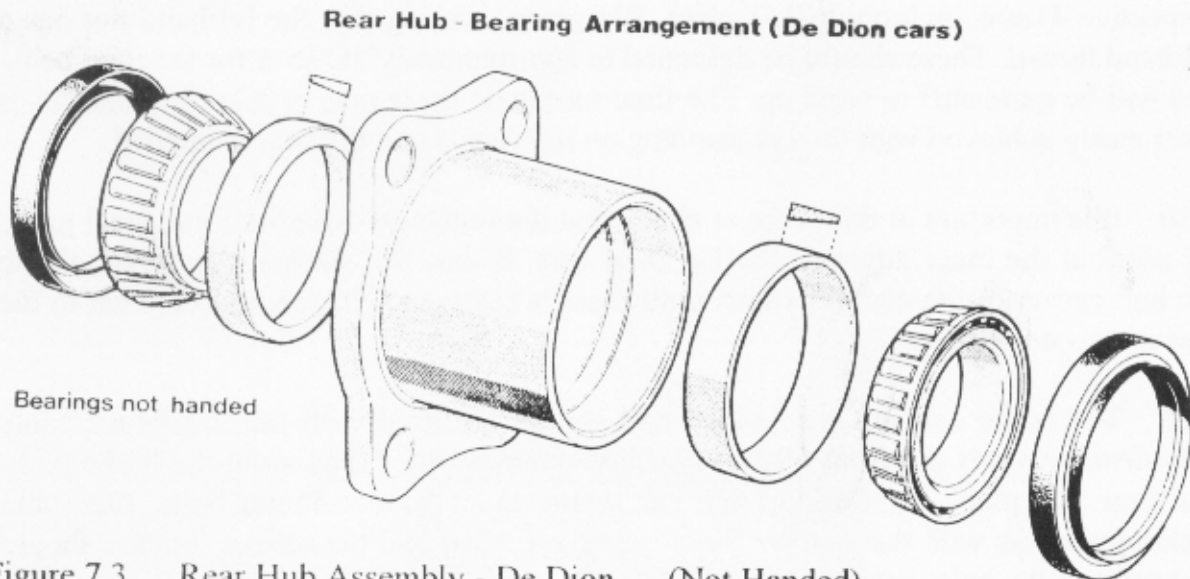


Figure 7.3 Rear Hub Assembly - De Dion (Not Handed)

3.6 Position one of the cast aluminium De Dion ears (these are not handed but the flange to which the brake calipers fit must be at the top) over one of the driveshafts and attach to the De Dion tube, noting that thin aluminium plates are fitted over the hollow ends of the tube. The holes in these plates are not symmetrical so ensure they align correctly. Bolt the ear into place using the 10mm x 40mm bolts with plain and spring washers into the tapped holes which are rearmost on the De Dion tube ear. It is possible that these bolts will not go fully home due to the depth of thread available. Should this be the case, add an additional plain washer in order to space out the bolt. Do not fully tighten at this stage, but when you DO, use Loctite to ensure these bolts do not work loose in service. (see Figures 7.3.8A & B).

Note that the countersunk small diameter holes in the ears are redundant and are for manufacturing purposes only.

3.7 Position the rear hub carrier the correct way up and slide this over the end of the driveshaft taking care not to damage the bearing seals. Bolt the hub onto the De Dion ear using 10mm x 55mm bolts, plain washers and nylocs at the front and 10mm x 65mm bolts and nylocs to the centre. The plain washers should be positioned against the alloy ear, but are not needed on the steel De Dion tube. All these bolts, including those fitted in 3.6 above, are tightened to 35 lb ft.

3.8 The rear hubs are specially manufactured items with their drive flanges machined to fit brake discs identical to those fitted at the front. The discs are bolted to the flanges using 4 3/8" x 7/8" UNF thin head bolts each side using Loctite and torqued to 30 lb ft. Ensure that mating surfaces are thoroughly cleaned as any dirt present can cause disc run-out.

3.9 Slide each of the rear hubs complete with brake discs onto the splined end of the driveshaft and ease into position through the seals into the hub carrier. Place a thick 22mm x 45mm diameter washer over the remaining thread and secure with the respective 41mm nyloc nut (LH plain, RH green), noting that the lefthand nut has a lefthand thread. These should be tightened to approximately 30 lb ft for the time being and will be quite stiff to wind up. The final torque on these nuts is 200 lbft and this is most easily achieved with the car standing on its wheels and the brakes applied.

3.10 It is important at this stage to check that the outboard driveshaft universal joints do not foul the inner edges of the De Dion ears. If they do, slacken the bolts holding the hub carrier to the ear and adjust until there is sufficient clearance. Retighten to the correct torque settings.

3.11 The brake calipers are handed and should be fitted with the handbrake cable abutments towards the front of the car. Slide over the disc, separating the brake pads, and bolt into place on the De Dion ears using the 10mm x 55mm bolts, plain and locking washers with the spacers fitted between the ear and the caliper. Loctite should be used and the bolts tightened to 35 lbft.

7.4 Assembly of Rear Suspension

4.1 Fit the radius or "Z" arms to the chassis with the offset inwards to provide maximum clearance to the brake calipers when fitted, noting that they are not exactly parallel to the chassis tubes. These are fitted using a 3/8" x 2" bolt into a threaded bush in the chassis with a large diameter plain washer under the head of the bolt.

4.2 There are two alternative positions for these arms, a higher location which will provide a slightly better ride and a lower location biased in favour of handling. In the lower position it may be necessary to trim the wing flange to gain adequate clearance around the radius arm front mounting. The lower mounting position is not threaded.

4.3 Attach the rear end of the radius arms to the brackets on top of the De Dion tube using the special 1/2" x 2 1/2" bolts and nylocs passed inward to the centre of the car, do not fully tighten yet. These bolts have threaded heads to which the lower ball joint of the anti-roll bar drop link will be attached.

4.4 It is imperative to check the clearance between the De Dion tube and the rear of the differential casing throughout its full arc of travel, particularly if the rear radius arms are fitted in the upper position. Relieve with a coarse file if necessary.

4.5 If it is intended that an FIA approved competition roll-over bar is to be fitted considerable time will be saved if it is installed now since once the spring/damper units are fitted it will not be possible to reach the roll bar fixings.

4.6 The rear spring/damper units are suspended from their mountings under the top of the spaceframe using 1/2" x 2 1/2" caphead bolts inserted through the access holes provided in the seat back panel. A light application of Loctite should be made and the bolts tightened to 40 lbft once the damper has been attached to the De Dion tube.

4.7 Slide a copa-slipped 1/2" x 5" bolt through the De Dion tube from the rear and secure the damper to the tube using a plain washer either side of the bush with a thin nyloc nut, checking that there is clearance between the protruding thread on the bolt and the rubber boot on the driveshaft.

4.8 The De Dion tube is located laterally using an "A" frame, which has bushes fitted to its forward ends and must be fitted the correct way up, which is with the frame itself below the centreline of the outer bushes. The De Dion tube has an "everymans" bush fitted where it attaches to the A frame.

4.9 Attach the "A" frame using a 1/2"x 2 1/2" bolt and a half nyloc nut with a 3/4" diameter plain washer on either side of the everymans bush. Secure the forward outer ends of the "A" frame to the mountings provided on the chassis using 1/2" x 4 1/2" bolts, large diameter plain washers and nylocs passing the bolts inward. A large diameter washer should be placed on either side of the A frame bush. Do not fully tighten these mountings yet. If competition use is envisaged, nylon race washers should be fitted as per figure 7.4-3.

4.10 To check that the De Dion tube is centralised in the chassis measure the gaps between the De Dion ears and the outer edge of the chassis tubes which should be identical to within 2mm. If not insert spacing washers between the chassis and forward ends of the "A" frame until an acceptable tolerance is achieved.

7.5 Rear Anti-roll Bar Attachment

5.1 The rear anti-roll bar is suspended above the differential from "U" bolt mountings immediately below the inertia reel seatbelt boxes with its blades facing rearward to pick up onto the De Dion tube through a vertical link.

5.2 The anti-roll bar is attached to the 5/16" "U" bolts pointing downwards under the inertia reel housings using split aluminium blocks similar to those holding the steering rack, with the thicker half of the block above the anti-roll bar. The bar is mounted using rubber cotton reel bushes sandwiched by these blocks and secured using plain washers and nyloc nuts. The Cotton reel bushes can be slid over the anti-roll bar with the help of a little rubberlube. Do NOT force these with a screwdriver, or they will stretch, hand pressure should be adequate.

5.3 The anti-roll bar is positioned horizontally in the car and its blades are connected to the radius arm brackets on the De Dion tube using two drop links. Attach the lower ends of each drop link to the De Dion tube by screwing them into the

threaded ends of the special bolts attaching the rear radius arms. The upper ends attach to the outer edge of the anti-roll bar blade and are secured with an 8mm nyloc nut.

5.4 The droplinks are installed at an angle - this is normal. The links should be adjusted to be as short as possible, whilst being equal in length, side to side.

5.5 The handling characteristics of the car can be altered by re-positioning the drop links into alternative holes in the anti-roll bar blades. The rearmost hole is recommended for road use maximizing safe understeer, while the foremost hole increases the effect of the bar to bring in more oversteer.

7.6 Final Assembly

6.1 Fit the brass brake pipe union to the threaded stud protruding from the De Dion tube, input uppermost, and attach using a 1/4" UNF nyloc nut.

6.2 Bend the steel brake pipes to fit as tightly as possible to the De Dion tube and attach to both the union and respective brake caliper, tightening to 5-7 lb ft. This tubing is readily bent by hand, but take care to avoid any sharp kinks or bends of less than 1" radius since this can lead to weakening and possible brake failure. Due to the design of the calipers a small amount of movement needs to be taken up as the pads wear and therefore the brake pipes where they enter the caliper should not be bent tighter than a 3 to 4 inch radius. The use of flexible brake hoses here is not considered necessary.

6.3 Secure the brake pipes to the De Dion tube using the long ty-wraps provided and check carefully that the pipes do not foul any part of the suspension or chassis. **The pipe must run along the top of the tube, not the front.**

6.4 The handbrake cable can now be fitted. This is double ended and is designed to be attached to both rear calipers and to be pulled from the centre by the separate forward cable attached to the handbrake lever itself. (see Miscellaneous section). Feed the centre of the cable (inner only) up through the transmission tunnel and note that location points are provided for the cable outers at the differential end of the tunnel.

6.5 Unscrew the knurled nylon adjusters on the cable to ensure plenty of slack. Fit each end of the cable into the respective brake caliper, noting that the cables are above both 'A' frame and the lower chassis rail. The inner ends of the cable are fed through the abutments in the caliper and hooked over the brake levers. The cable outer is secured by the caliper body.

6.6 The rubber grommets which have been fed over both ends of the cable should be attached to the chassis diagonal tubes using Ty-wraps. This prevents the cables from contacting the driveshafts or the chassis tubes as the suspension moves.

6.7 Finally attach each half of the cable to the unused lower mont of the differential with the rubber lined 'P' clips supplied. Undersized bolts should be passed through the large threads to secure the 'P' clips.

6.8 In order to avoid any incorrect preloading of the rubber bushes in the suspension, the securing bolts should be tightened with either the wheels on the ground or the car's weight taken by the De Dion tube. Axle stands are ideal for this purpose.

6.9 Tighten all the bolts through rubber bushes securing the rear suspension as follows. The 1/2" bolts should be torqued to 60 lb ft and the radius arm bolts to 35 lbft. The radius arm bolts should have an application of loctite immediately before being torqued up and the weight of the car should be on the suspension also.

6.10 Finally, with the wheels on the ground and the brakes on, torque the rear hub nuts to 200 lb ft. Since most domestic torque wrenches do not reach this figure, it may be necessary to visit your local garage for assistance. Alternatively these nuts can be attended to at Caterham Cars if your car is brought in to us for its post build check. On no account must the car be driven until these nuts are correctly tightened.

6.11 41mm sockets are available from Caterham under Part No. 79067 and since this is a 3/4" drive socket, appropriate adaptors to 1/2" are also available.

Bolt Size	Usage	Torque
1/2"UNF x 11"	Upper diff bolt	40 lbft
M12 x 65mm	Lower diff bolts	40 lbft
M10 x 40mm	De Dion ears	35 lbft
M10 x 55mm	Hub carrier - front	35 lbft
M10 x 65mm	Hub carrier - rear	35 lbft
3/8"UNF x 7/8"	Disc to drive flange	30 lbft
41mm A/F	rear hub nut	200 lbft
M10 x 55	Calipers to ears	35 lbft
3/8"UNF x 2"	Radius arm front	35 lbft
1/2"UNF x 2 1/2"	Upper damper mount	60 lbft
1/2"UNF x 2 1/2"	Radius arm to De Dion tube	60 lbft
1/2"UNF x 5"	Lower damper mount	60 lbft
1/2"UNF x 2 1/2"	A frame to De Dion tube	60 lbft
1/2"UNF x 4 1/2"	A frame to chassis	60 lbft
5/16" nyloc	Anti-roll bar clamps	7-10 lbft

Table 7.1 De Dion Rear Suspension - Torque Settings

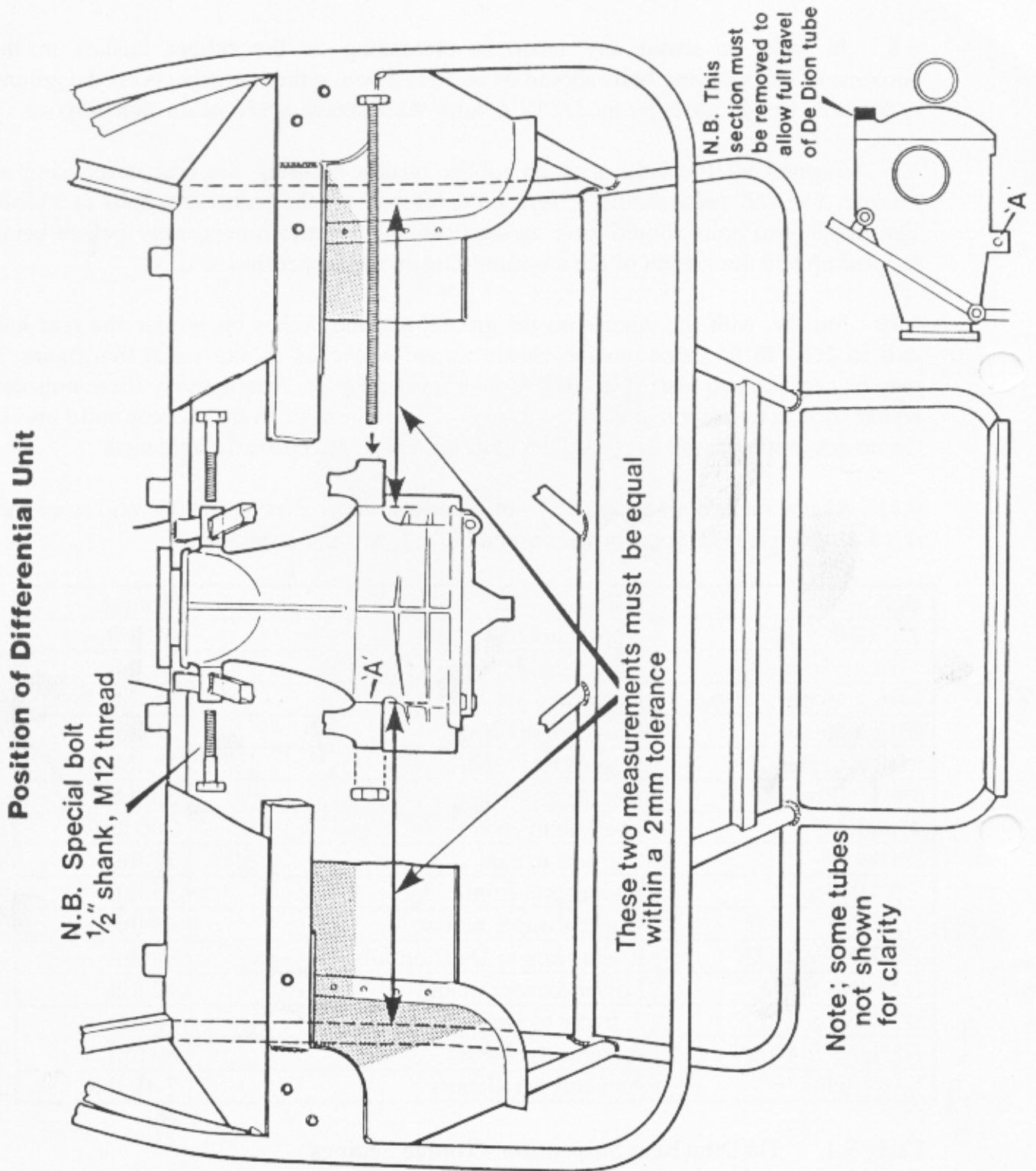


Figure 7.2.1 Position Of Differential Unit

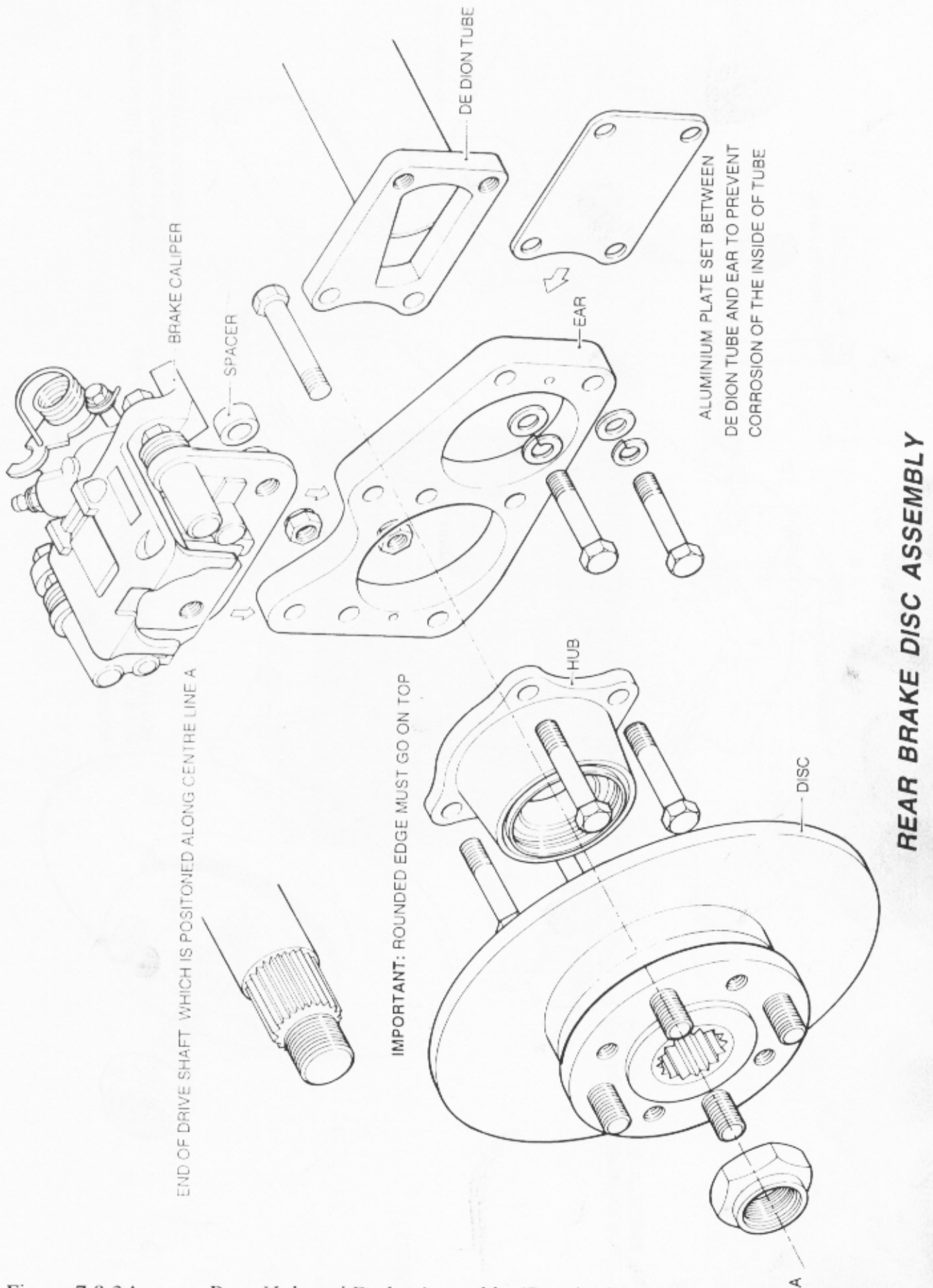
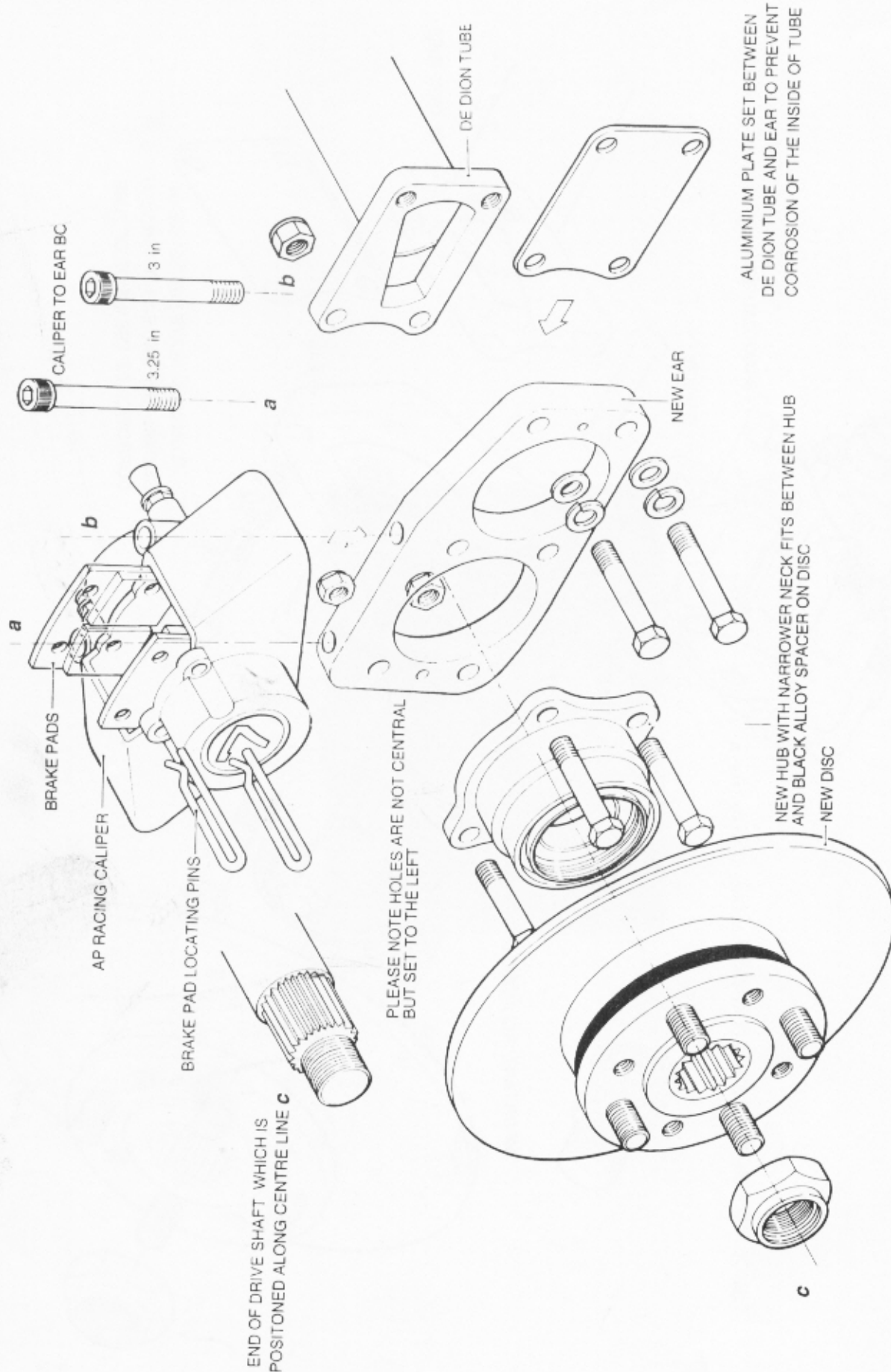


Figure 7.8.3A Rear Hub and Brake Assembly (Standard Brakes)



REAR BRAKE DISC ASSEMBLY (UPDATED)

Figure 7.3.8B

Rear Hub and Brake Assembly (Up-rated Brakes)

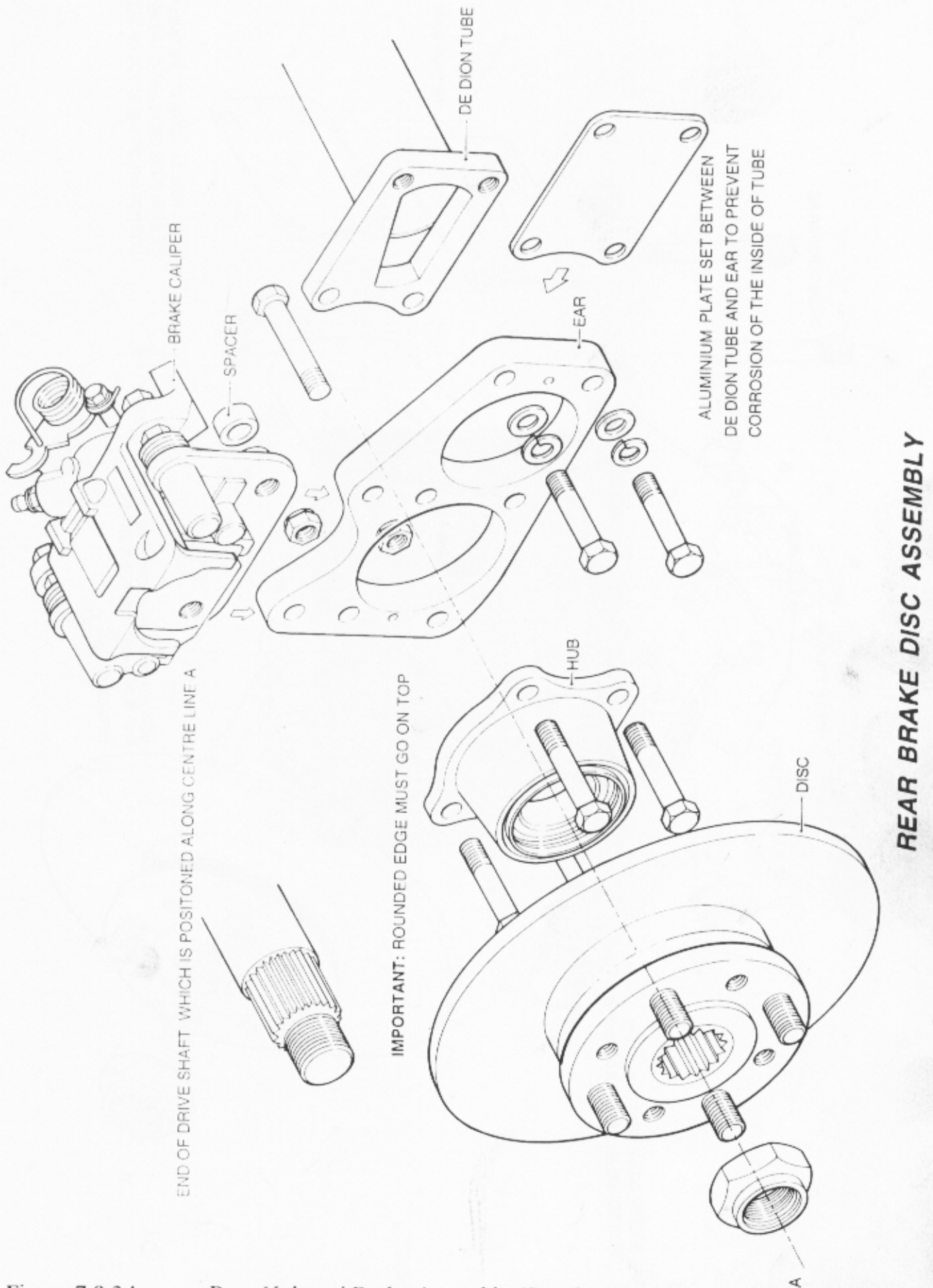


Figure 7.8.3A Rear Hub and Brake Assembly (Standard Brakes)

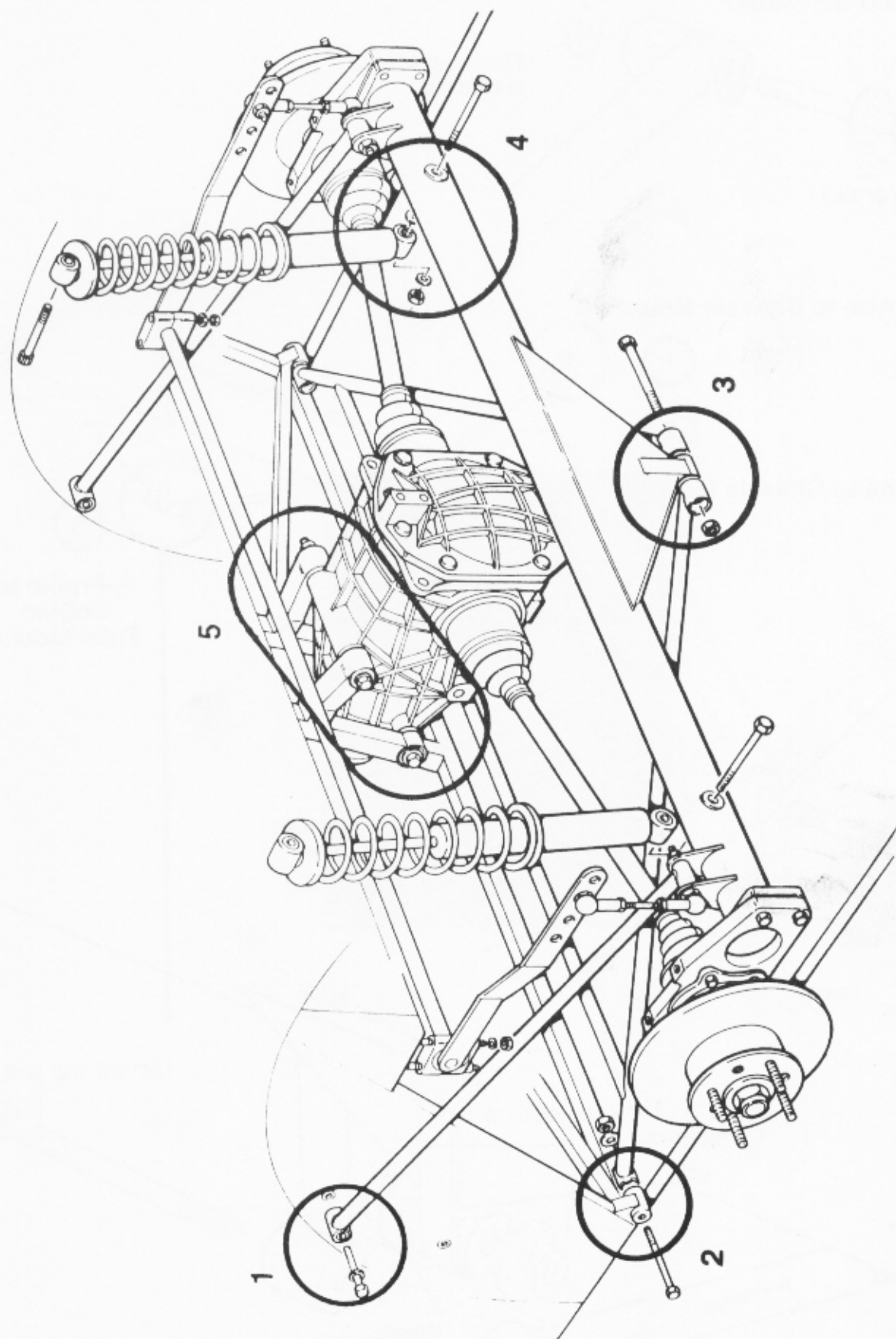
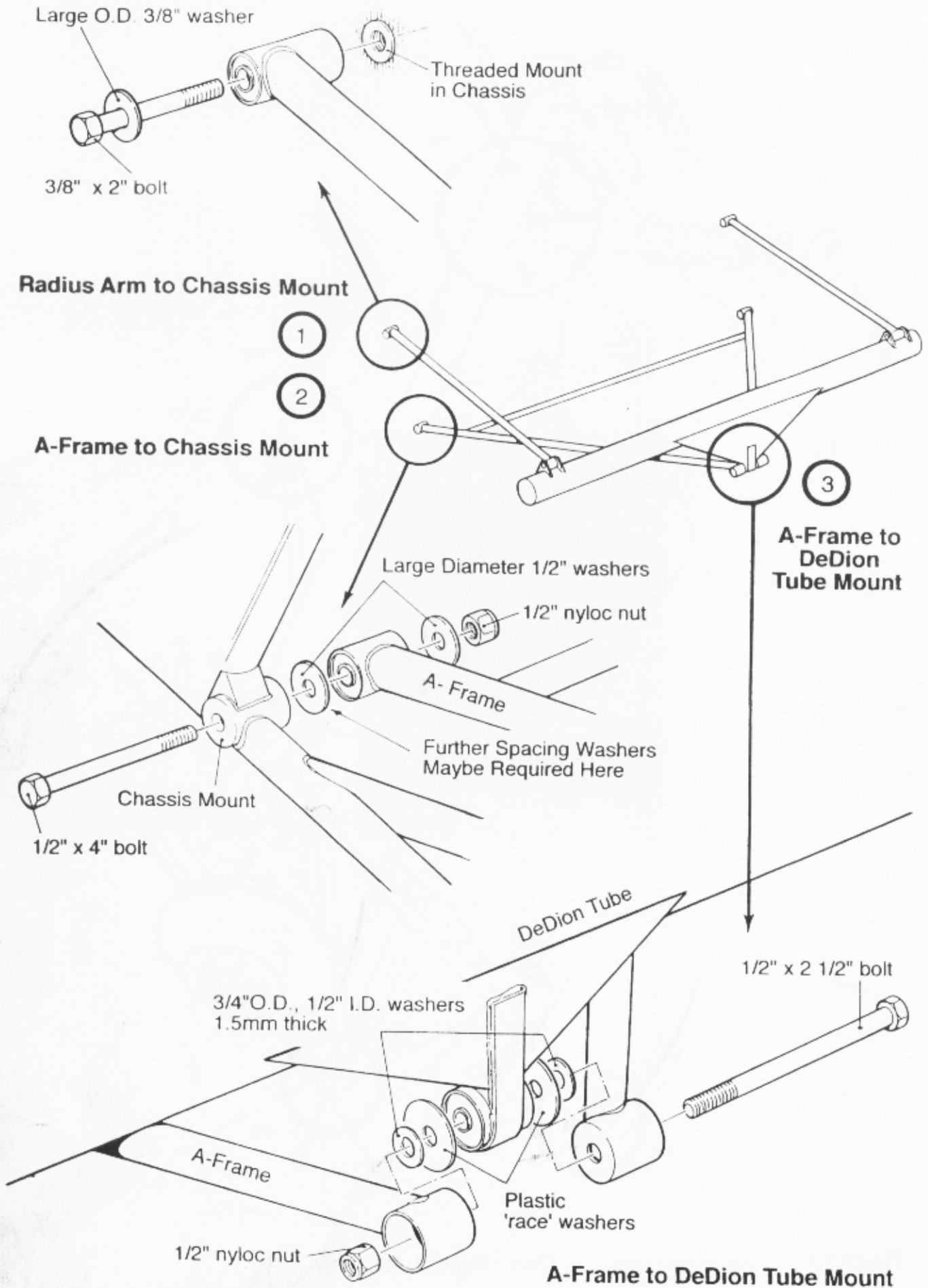
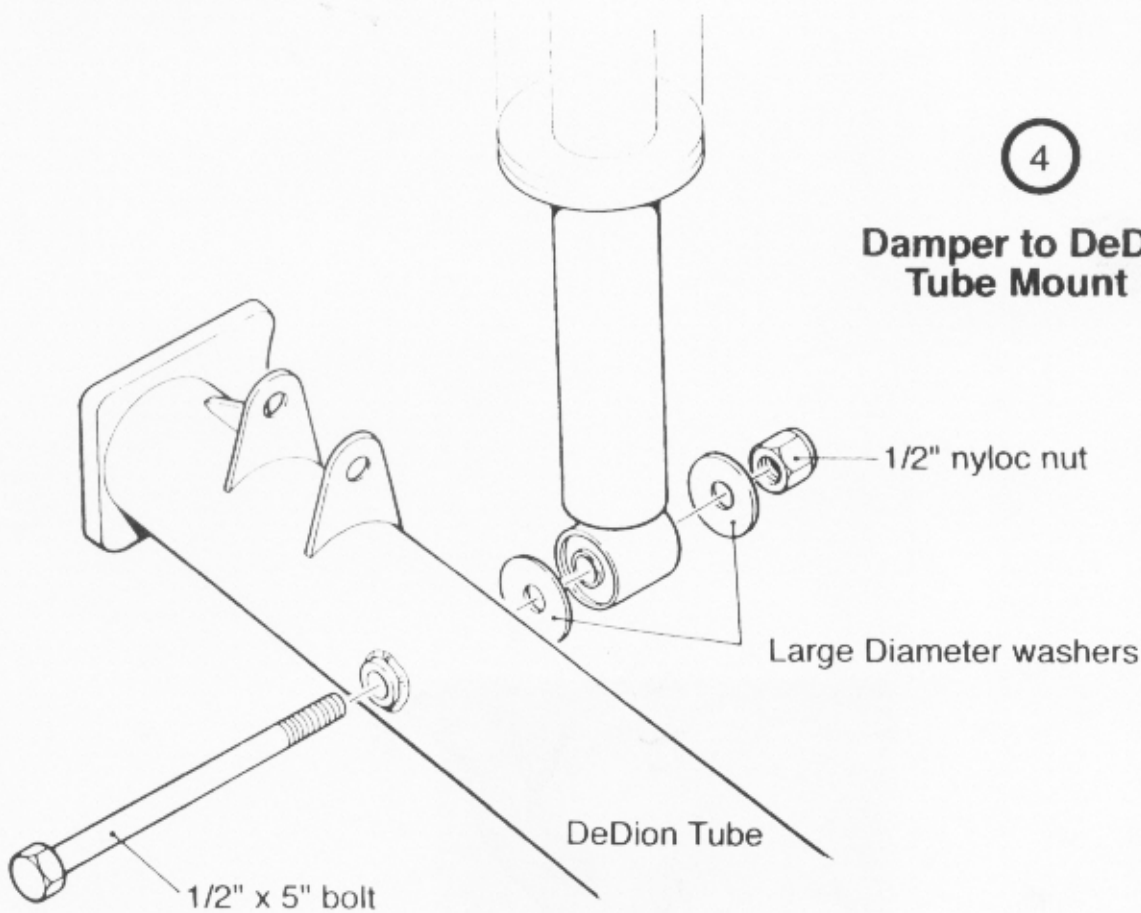


Figure 7.4 Rear Suspension - De Dion - General Assembly



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**Damper to DeDion
Tube Mount**



**Differential Mounting
in Chassis**

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