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# STEERING

## DESCRIPTION

57.00.00

All cars are fitted with power-assisted rack and pinion steering gear, movement of the rack by the pinion being assisted by hydraulic pressure acting on a piston carried on an extension of the rack.

Hydraulic pressure is provided by a vane-type pump with integral reservoir, belt-driven from the engine crankshaft; steering assistance is, therefore available only while the engine is running. A control valve, located between steering column and pinion, directs hydraulic pressure to the appropriate side of the piston when the steering wheel is turned. Flow through the control valve is continuous, and when the car is travelling straight a low pressure is applied equally to each side of the piston. When the

steering wheel is turned, a small torsion bar at the base of the steering column allows it to rotate a few degrees before turning the pinions, if the pinion is restrained by the rack. This rotation is used to open and close ports in the control valve so that not only is the pressure directed to one side of the pistons but also, as the torsion bar is twisted, the pressure is increased from about 2,8 kgf/cm<sup>2</sup> (40 lbf/in<sup>2</sup>) to a maximum of up to 84,4 kgf/cm<sup>2</sup> (1200 lbf/in<sup>2</sup>), the increase in pressure being proportioned to the twist in the torsion bar, and reducing to a minimum when the load in the torsion bar—from the steering wheel becomes zero.

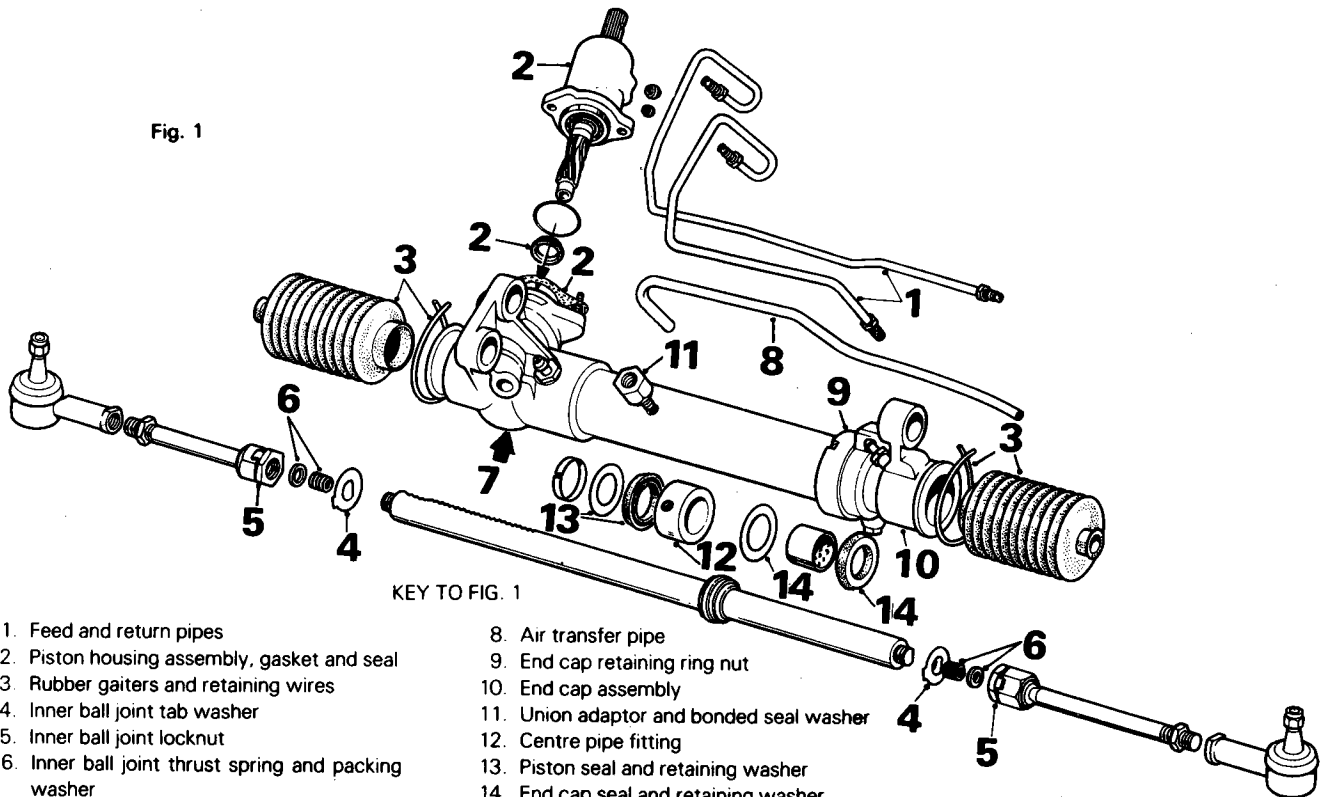
The pressure is prevented from exceeding 84,4 kgf/cm<sup>2</sup> (1200 lbf/in<sup>2</sup>) by a flow control valve in the pump which allows some fluid to

circulate internally when this pressure is reached.

Two rigid pipes connect the control valve to the rack cylinder, and two hoses run from pump to control valve. A third rigid pipe, pressed into each end fitting of the rack, balances air pressure in the two gaiters as the rack operates.

Servicing of the steering gear is confined to grease lubrication of the two outer ball-joints and the rack damper pad, topping-up the reservoir and inspection for fluid leaks, hose condition and belt wear. When checking fluid level take great care to ensure that no dirt or scraps of cloth can enter the reservoir since if they should reach the control valve the operation of the system can become affected.

Fig. 1



KEY TO FIG. 1

- |  |  |
|--|--|
| 1. Feed and return pipes                             | 8. Air transfer pipe                     |
| 2. Piston housing assembly, gasket and seal          | 9. End cap retaining ring nut            |
| 3. Rubber gaiters and retaining wires                | 10. End cap assembly                     |
| 4. Inner ball joint tab washer                       | 11. Union adaptor and bonded seal washer |
| 5. Inner ball joint locknut                          | 12. Centre pipe fitting                  |
| 6. Inner ball joint thrust spring and packing washer | 13. Piston seal and retaining washer     |
| 7. Rack damper pad—location                          | 14. End cap seal and retaining washer    |

J57-024

## DATA

Castor angle: 6 cylinder cars	2½° ± ½° positive
12 cylinder cars	3½° ± ½° positive
Camber angle	½° ± ¼° positive front wheels to be within ¼° of each other
Number of turns of steering wheel, lock to lock	2.75: 6 cylinder models; 3.66: V12 models
Total stroke of rack	156,5 mm (6.16 in)

Axial rack load with feed pressure of 2,11 kgf/cm<sup>2</sup> (30 lbf/in<sup>2</sup>) and pump flow of 9,45 litres/min (2.08 gal/min) at 71°C is to be 18,1 kg (40 lb) max, 13,6 kg (30 lb) min. Rack to traverse at 6 to 10 pinion rev/min in this test.

From 1983 model year all vehicles (VIN 360146)

Castor angle	3½° ± ½° positive
Camber angle	½° ± ¼° negative
Front wheel alignment	0 to 3,18 mm (0 to ¼ in) toe-in

Power assisted steering racks are now oil filled by the supplier with Shell Spirax EP 80 oil. This has replaced the Shell Retinax 'A' grease fill. Racks to this condition were introduced on Jaguar production at the following VIN 426768.

It is important that when investigating power steering fluid leakage, this lubricating oil is not confused with the hydraulic fluid, as under normal operating conditions a small amount of the oil will be present in the steering rack gaiters. If any oil is lost from the gaiters, then an equal amount to that lost should be added to the gaiter prior to the refitment of the gaiter clips.

It is not necessary under normal circumstances to add oil to the rack during Service, unless a complete overhaul of the rack is undertaken. The total oil capacity of the steering rack is 0,19 litres.

**WARNING: It is absolutely essential that the highest standards of cleanliness are maintained in any operations involving access to components in contact with fluid, since steering assistance can be seriously affected by the presence of dirt in the system.**

## SYMPTOM AND DIAGNOSIS CHART

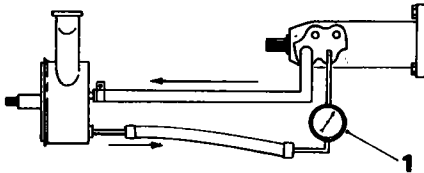
SYMPTOM	CAUSE	CURE
External oil leaks from steering rack unit.	Damaged or worn seals. Loose unions. Damaged union sealing washers.	Replace seals. Tighten unions. Replace sealing washers.
Oil leak at pump shaft.	Damaged shaft seal.	Replace shaft seal.
Oil leak at high pressure outlet union.	Loose or damaged union. Damaged pipe end.	Tighten union. Replace pipe.
Oil leak at low pressure inlet connection.	Loose or damaged hose connection.	Remove and refit or renew hose and clip.
Oil overflowing reservoir cap.	Reservoir overfull. Sticking flow control valve (closed).	Reduce level in reservoir. Remove valve, renew and refit.
Oil leak at reservoir edge.	Damaged 'O' ring.	Replace 'O' ring.
Noise from hydraulic system.	Air in system.	Bleed system, see operation 57.15.02.
Noise from pump.	Slack drive belt (squealing). Internal wear and damage.	Adjust drive belt tension, see operation 57.20.01. Overhaul pump, see operation 57.20.20.
Noise from rack (rattling).	Worn rack and pinion gears, see operation 57.10.13. Worn inner ball joints. Universal joint loose.	Adjust rack damper. Replace inner ball joints, see operation 57.55.03. Tighten clamping bolts.
Steering veering to left or right.	Unbalanced tyre pressures. Incorrect tyres fitted. Incorrect geometry. Steering unit out of trim.	Inflate to correct pressure. Fit tyres of correct specification. Reset geometry to correct specification. Replace valve and pinion assembly, see operation 57.10.19.
Heavy steering when driving.	Low tyre pressures. Tightness in steering column. Tightness in steering joints.	Inflate to correct specification. Grease or replace. Grease or renew joints.
Heavy steering when parking.	Low tyre pressures. Tightness in steering column. Tightness in steering joints. Slack drive belt (squealing). Restricted hose. Sticking flow control valve (open). Internal leaks in steering unit.	Inflate to correct specification. Grease or replace. Grease or renew joints. Adjust drive belt tension, see operation 57.20.01. Replace hose. Remove and renew valve. Replace seals.
Steering effort too light.	Valve torsion bar dowel pins worn. Valve torsion bar broken.	Replace valve assembly. Replace valve assembly.

## STEERING

### TEST PROCEDURES 57.10.20

#### Control valve and pinion test

Faults developing in control valve and pinion assembly as indicated in following test or as shown under 'Symptoms and Diagnosis' will necessitate renewal of control valve and pinion. No adjustment or repair is permissible. Check tyres, tyre pressure and steering geometry before testing.



J57-001

Fig. 2

Fit a 7 kgf/cm<sup>2</sup> (100 lbf/in<sup>2</sup>) pressure gauge (1, Fig. 2) in feed line from p.a.s. pump, start engine and allow to idle. Gauge should register 2.8 kgf/cm<sup>2</sup> (40 lbf/in<sup>2</sup>) approximately. Turn steering wheel slightly to right or left.

**CAUTION:** Do not turn steering excessively, as this will produce high pressure resulting in irreparable damage to gauge.

Pressure should increase by an equal amount irrespective of direction of steering wheel rotation. Any unbalance will be indicated by a slight fall in pressure on either side before rising. Stop and re-start engine and check that steering does not kick to one side.

### SYSTEM TESTING 57.15.01

Service Tools: Tap JD 10-2, power steering test set JD 10, JD 10-3A, adaptor power steering JD 10-4A, adaptor hydraulic pressure test/saginaw pump metric thread.

Faults in systems can be caused by inefficiencies in the hydraulic system, see 'Symptom and Diagnosis Chart'.

The following test may be carried out without removing any components from the car. Before commencing work fluid should be checked for correct level and freedom from froth.

#### Pump blow off pressure

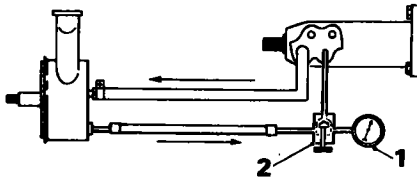
Fit pressure gauge (1, Fig. 3) reading to 100 kgf/cm<sup>2</sup> (1500 lbf/in<sup>2</sup>) in pressure line from pump.

Start engine and allow to run at idling speed. Turn steering to full lock and continue to increase steering effort until pressure recorded on gauge ceases to rise.

Check that recorded pressure lies between 77.5 kgf/cm<sup>2</sup> and 84.4 kgf/cm<sup>2</sup> (1100 and 1200 lbf/in<sup>2</sup>).

**NOTE:** If pressure is below 77.5 kgf/cm<sup>2</sup> (1100 lbf/in<sup>2</sup>) at tickover, but rises to correct figure with increased engine speed the reason is a defective control valve in pump, or excessive internal leakage in rack and pinion unit. Carry out following test to establish location.

Fit tap JD 10-2 (2, Fig. 3) between pump and pressure gauge (1, Fig. 3), arranging connections as shown, so that pressure gauge is at all times connected to pump, but rack unit can be isolated from it.



J57-002

Fig. 3

With tap OPEN, start engine and allow to run at idling speed.

Turn steering to full lock.

Check that gauge reading exceeds 77.5 kgf/cm<sup>2</sup> (1100 lbf/in<sup>2</sup>).

If pressure does not reach this figure, CLOSE TAP AT ONCE, noting gauge reading as tap reaches 'OFF' position.

**CAUTION:** Tap must not remain closed for more than 5 seconds when engine is running.

If reading of pressure gauge increases to at least 77.5 kgf/cm<sup>2</sup> (1100 lbf/in<sup>2</sup>) when tap is turned off, leaks are confined to steering unit, which must be overhauled—see operation 57.10.07.

If pressure reading exceeds 84.4 kgf/cm<sup>2</sup> (1200 lbf/in<sup>2</sup>) remove pump discharge port, withdraw valve assembly located behind it, and inspect a small hemispherical gauze filter carried at its inner extremity, which may be found to be blocked. Clean filter by airline or other means, and replace valve and discharge port.

### POWER STEERING SYSTEM

#### Bleed

7.15.02

Fill the reservoir to the 'full' mark on dipstick, start engine and turn steering wheel from lock to lock a few times to expel any air. Check level and top up if necessary. Use only correct fluid.

### FRONT WHEEL ALIGNMENT

#### Check and adjust 57.65.01

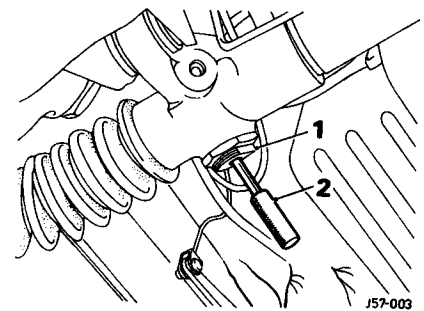
Service Tool: Rack centralising pin 18G 1466.

#### Check

Inflate tyres to correct pressures.

Set front wheels in straight-ahead position.

Remove grease nipple from rack adjuster pad (1, Fig. 4).



J57-003

Fig. 4

Insert centralizing tool (2, Fig. 4) and adjust position of rack until reduced tip of tool enters locating hole in rack.

Check alignment by using light beam equipment or an approved track setting gauge.

**NOTE:** As a front wheel alignment check is called for in the Maintenance Summary, very little variation from specified figures for wheel alignment is to be expected; if, however, a discrepancy of as much as 3 mm (1/8 in) from specified limits of 1.6 mm to 1.2 mm (1/16 in to 1/8 in) toe-in is recorded, accidental damage to a steering lever may have occurred and the following check must be carried out, on both levers.

Remove steering levers.

Accurately check dimensions of each lever against those quoted in illustration (Fig. 5).

Reject for scrap and replace any lever with dimensions outside limits quoted.

**WARNING:** It is absolutely forbidden to attempt to rectify a rejected lever by bending.

If both steering levers are within limits, a discrepancy in alignment figures may be due to distortion of upper or lower wishbones, or end of stub axle carriers (vertical links). Dimensioned drawings of these parts for checking purposes, are given in Group 60.

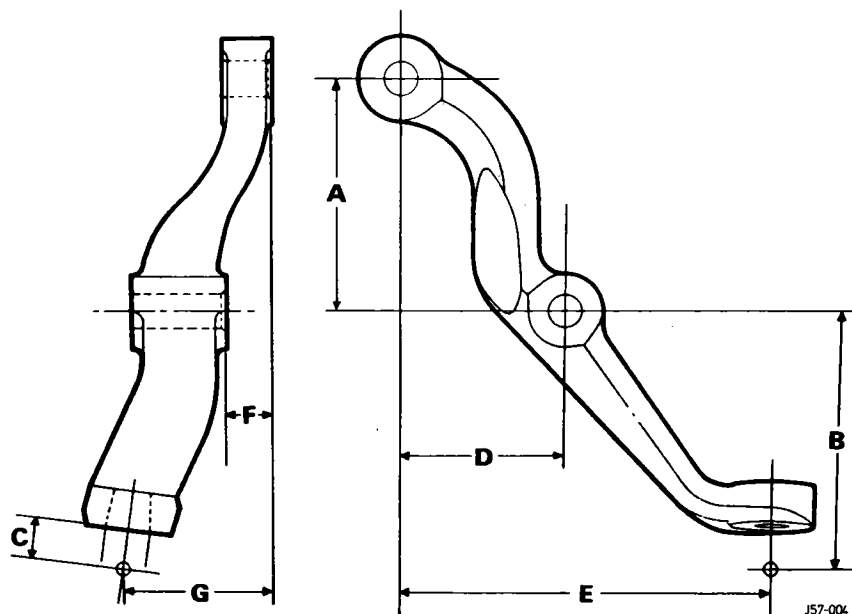


Fig. 5

**DIMENSIONS—STEERING LEVER, Fig. 5**

- 'A' 82,5 mm to 82,6 mm (3.248 in to 3.252 in)
- 'B' 101,85 mm to 102,36 mm (4.01 in to 4.03 in)
- 'C' 22,23 mm (0.875 in)
- 'D' 58,93 mm to 59,44 mm (2.32 in to 2.34 in)
- 'E' 135,38 mm to 135,89 mm (5.33 in to 5.35 in)
- 'F' 17,78 mm to 18,03 mm (0.70 in to 0.71 in)
- 'G' 54,36 mm to 54,86 mm (2.14 in to 2.16 in)

**Adjust**

Slacken locknuts at outer end of each tie-rod. Release clips securing outer ends of gaiters to tie-rods. Turn tie-rods by an equal amount until alignment of wheels is correct. Tighten locknuts to figure quoted while holding track rod end spanner flats. Re-check alignment. Ensure that gaiters are not twisted and re-tighten clips. Remove centralising tool (2, Fig. 3) and refit grease nipple.

**CASTOR ANGLE / CAMBER ANGLE**

**Check and adjust 57.65.05**

**Service Tools:** JD 25B Suspension links. Camber and castor angle checking gauges.

**CAUTION:** Before checking, examine all rubber/steel bushes for deterioration or distortion. Check upper and lower wishbone ball joints for excessive play. Check shock absorbers for leaks and mountings for security.

The two operations require the vehicle to be set up in a mid-laden condition. This can be done as follows:

Ensure that the car is standing on level ground and inflate the tyres to the correct pressure; check that the standing heights are equal on both sides of the car, and the front wheels are in the straight-ahead position.

Make up two front suspension tubes to the dimensions shown (Fig. 6).

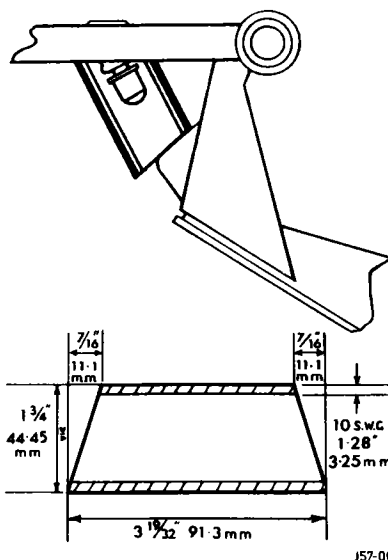


Fig. 6

Compress the front suspension and insert the setting tubes under the upper wishbones, adjacent to the rebound stop rubbers and over the brackets welded to the bottom of the 'turrets'. This locks the front suspension in the mid-laden condition.

Lock the rear suspension in the mid-laden condition using the suspension links, service tools JD 25B.

For each side, compress the suspension, pass the hooked end of service tool JD 25B through the lower hole in the rear mounting and fit the looped end over the rear pivot nut (Fig. 7).

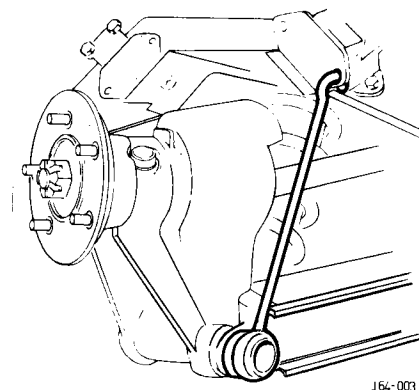


Fig. 7

**Castor angle—check and adjust**

Using the castor angle checking gauge, check the castor angle. Refer to the Data for correct setting.

To adjust, slacken the two bolts on each side securing the upper wishbone members to the upper ball joints.

Transpose shims, which can now be lifted out, from front to rear or vice versa, to reduce or increase the castor angle respectively (Fig. 8).

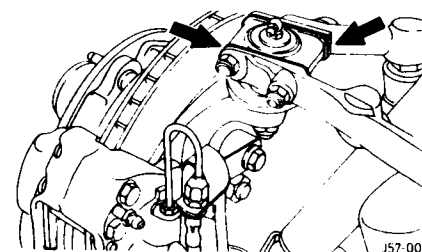


Fig. 8

Transposing one shim 1,6 mm (0.0625 in) thick will alter the castor angle by approximately 1/4°.

After adjusting the castor angle to the correct figure, tighten the bolts to the correct torque. Check the front wheel alignment and adjust if necessary.

# STEERING

## Camber angle—check and adjust

Using the camber angle checking gauge, check the camber angle. Refer to data for the correct settings.

Rotate the road wheels through 180° and re-check

To adjust, slacken the nuts and bolts securing the upper wishbone inner pivots to the cross member turrets.

Add or remove shims between the pivot shafts and cross member turrets to reduce or increase the camber angle (Fig. 9).

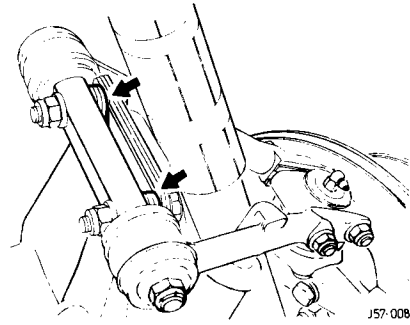


Fig. 9

Shims are available in 0,8 mm ( $\frac{1}{32}$  in), 1,6 mm ( $\frac{1}{16}$  in) and 3,2 mm ( $\frac{1}{8}$  in) thickness. A change of 1,6 mm ( $\frac{1}{16}$  in) in shim thickness will alter the camber angle by approximately  $\frac{1}{4}^\circ$ .

**NOTE:** It is necessary to partly withdraw the bolts to change the shims, so only one bolt of a pair should be shimmed at a time. It is important that an equal thickness of shims should be changed on front and rear bolts, otherwise the castor angle will be affected.

Tighten all the bolts and nuts to the correct torque, and re-check the camber angle.

Check the front wheel alignment and adjust if necessary.

## STEERING PUMP DRIVE BELT

**Adjust** 57.20.01

### 6 cylinder models

The steering pump drive belt also drives the coolant pump, and is tensioned by a screw-type adjuster.

Slacken the pump mounting pivot bolt and adjust pivots; reset the adjuster to tension the belt so that a load of 2,9 kg (6 4 lb), applied to its mid-point between crankshaft and steering pump, deflects the belt 4,3 mm (0.17 in) (Fig. 10).

Re-tighten pivot bolts after correcting belt tension.

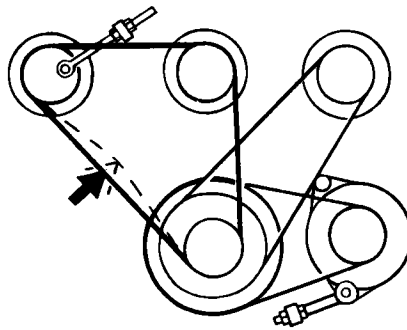


Fig. 10

### 12 cylinder models

Remove the left-hand air cleaner. Slacken the pump mounting pivot bolt (1, Fig. 11).

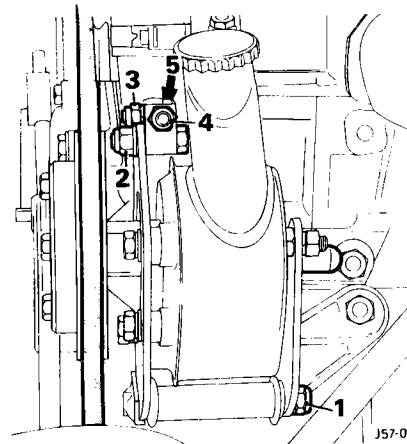


Fig. 11

Slacken the nut securing the adjusting link (2, Fig. 11) and the nut securing the trunnion block (3, Fig. 11).

Unscrew the outer trunnion locknut (4, Fig. 11).

Screw the inner trunnion locknut (5, Fig. 11) outwards to increase the belt tension or inwards, towards the engine, to reduce the tension; correct tension is such that a load of 3 kg (6.4 lb), applied to the belt's mid-point between the crankshaft and the steering pump, deflects the belt 4,0 mm (0.16 in).

Re-tighten all nuts and bolts and re-check the belt tension.

## STEERING PUMP DRIVE BELT

**Remove and refit** 57.20.02

### 6 cylinder models

A damaged belt is most easily removed by cutting it; if it is necessary to remove a complete belt, refer to the fitting instructions below.

### Fitting

Slacken pump and adjuster pivots and turn adjuster nut to bring pump towards the engine;

feed the belt past the fan blades (this can be done without removal of the fan cowl), place it over crankshaft, coolant pumps and steering pump pulleys and adjust.

### 12 cylinder models

Remove the left-hand air cleaner, and fan belt. A damaged belt is most easily removed by cutting it. If it is necessary to remove a complete belt, release and screw back the inner locknut at the pump adjuster trunnion. Slacken the pump pivot bolt, and the nut securing the adjusting link.

Slacken the nut securing the trunnion block, swing the pump towards the engine and remove the belt.

To refit, reverse the above procedure and adjust. Refit the fan belt and left-hand air cleaner.

## STEERING PUMP

**Remove and refit** 57.20.14

Remove cover from front of air cleaner on 6 cylinder models, and remove the left-hand air cleaner on 12 cylinder models, to improve access, detach and plug pipes; slacken pivot and trunnion bolts, then remove adjuster rod bolt to pump.

Press pump towards engine, lift belt off pulley, withdraw pivot bolt and lift pump and bracket away from engine. Detach pump from bracket.

## POWER STEERING RACK

**Adjust pinion clearance** 57.10.13

**Service Tool:** Ball joint separator JD 24

The rack should move smoothly through its full travel, and the maximum clearance between rack and pinion should not exceed 0,25 mm (0.01 in).

Clearance is measured from beneath the car by removing the grease nipple (1, Fig. 12) opposite the pinion, and detaching the nearer tie-rod from its steering arm, using tool JD 24. Insert the stem of a dial gauge through the grease nipple hole to contact the back of the rack, and, grasping the tie-rod, pull rack away from pinion; the dial gauge will then indicate clearance. If this is excessive, release locknut (2, Fig. 12) screw in plug (3, Fig. 12) until firm resistance is felt, back off slightly, re-tighten locknut and re-check clearance.

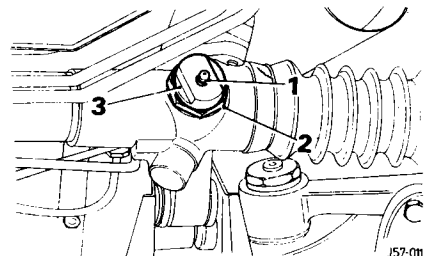


Fig. 12

continued

Move rack through its full travel; if binding occurs at any point, slightly increase clearance and re-check.

When correct minimum clearance is achieved, fully tighten locknut, replace grease nipple, secure tie-rod to steering arm and check wheel alignment.

When greasing the rack damper use **only** Lithium grease N.L.G.I. constituency No. 2.

### PINION SEAL

#### Remove and refit 57.10.23

This seal is accessible from beneath the car; before detaching the internal circlip and retainers which secure it (Fig. 13), thoroughly clean the end of the pinion housing, and detach the lower steering column.

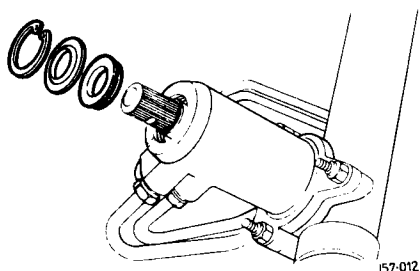


Fig. 13

**CAUTION:** Do not move road wheels or turn steering wheel while joint is disconnected.

### STEERING RACK HOSES

#### Remove and refit 57.15.21 and 22

Before removing these hoses, ensure that suitable plugs are obtained to close the orifices in pump and rack.

Remove the air cleaner, wipe clean the union nuts and the areas around them and, on L.H.D. cars, remove five clips (1, Fig. 14) securing hoses to cross-beam.

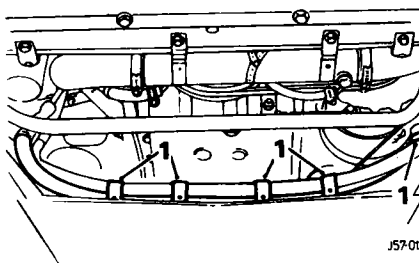


Fig. 14

Detach pipes from pump first, plugging each orifice as the pipe is withdrawn. After refitting pipes, tighten union nuts to figures quoted in Data, top up reservoir and bleed system.

### TIE-ROD BALL JOINTS

#### Remove and refit Outer 57.55.02 Inner 57.55.03

Service Tool: Ball joint separator JD 24

It is necessary to detach and remove the outer ball joint before the inner joint (which is only supplied complete with its tie-rod) can be removed. The front wheel alignment must be checked after refitting either joint, as it is difficult to ensure that the length of the rod between centres is not altered.

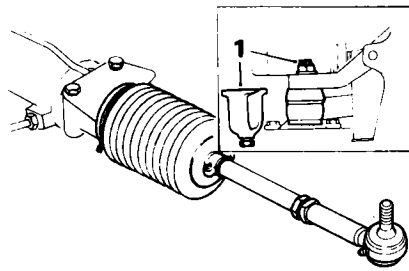


Fig. 15

After separating the outer joint, using tool JD 24 (1, Fig. 15) release the locknut, but do not run it along the thread; unscrew ball-joint from tie-rod and screw on replacement ball-joint up to the locknut; this gives an approximate location before checking wheel alignment.

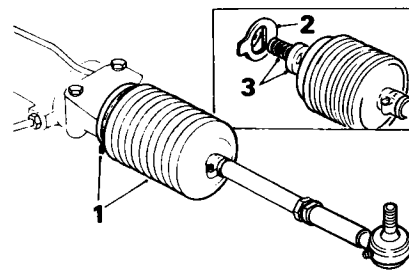


Fig. 16

To remove the inner joint and tie-rod, first detach the gaiter (1, Fig. 16) from the rack housing, knock back tab washers (2, Fig. 16) and unscrew nut securing ball joint to rack bar. Collect washers, spacer and spring (3, Fig. 16); use new tab washers when refitting joint. Coat joint with 60 gm (2 oz) of grease before replacing gaiter.

Check front wheel alignment.

### STEERING LEVERS

#### Remove and refit 57.55.29

Service Tool: Ball-joint separator JD 24

After detaching the ball-joint (1, Fig. 17) by use of tool JD 24, cut the locking wire (2, Fig. 17) and withdraw the two bolts (3, Fig. 17) securing the steering lever to the hub carrier.

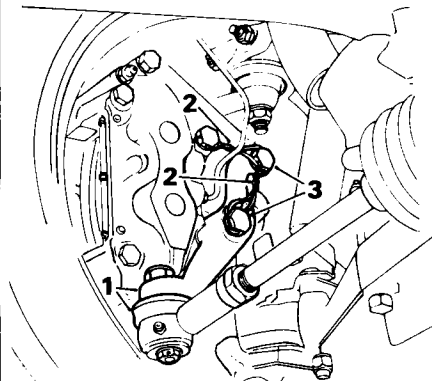


Fig. 17

When withdrawing the lever, inspect carefully for shims which may be fitted between the lever and the lugs on the hub carrier. These shims must be correctly replaced when refitting the lever.

Tighten the set-bolts to the correct torque; renew locking wire and check wheel alignment; adjust if necessary.

### STEERING WHEEL

#### Remove and refit 57.60.01

##### Removing

Centralise front wheels and mark steering wheel to record its position. Do not turn front wheels again.

Remove three screws securing lower switch cover, and detach cover.

Working from below, remove clamp bolt securing collet adaptor to steering column.

Slacken locknut of grub screw in collet adaptor and unscrew grub screw two turns.

Withdraw steering wheel, complete with hand locknut, impact rubber, collet adaptor and shaft.

##### Dismantling

Unscrew two self-tapping screws from lower face of steering wheel boss and lift off padded horn contact.

Unscrew nylon nut from top of steering wheel shaft and remove it carefully. Withdrawing horn contact tube with it.

Remove self-locking nut and plain washer securing steering wheel.

Carefully draw the steering wheel from its splined shaft, collecting both halves of split cone.

*continued*

# STEERING

## Reassembling

Clean thoroughly and remove any burrs with a fine file.  
Lightly lubricate all enclosed metal parts with engine oil.  
Reverse the dismantling procedure operations.

## Refitting

Reverse the removal procedure operations, taking care to replace horn contact tube correctly, (enclosing end of contact rod), and to replace wheel in its straight-ahead position, with front wheels still centralised. Tighten grub screw finger tight, tighten its locknut and tighten clamp bolt to the correct torque.

## POWER STEERING RACK GAITERS

### Remove and refit 57.10.27

It is necessary to remove the outer ball-joint from the tie-rod before a new gaiter can be fitted; when fitting the replacement, clean old grease from the inner joint and smear it with 45 to 55 g (1½ to 2 oz) of recommended grease. Do not omit a check of wheel alignment after replacing the outer ball-joint.

## POWER ASSISTED STEERING (P.A.S.) UNIT

### Remove and refit 57.10.01

**Service Tools:** Ball joint separator JD 24, rack centralising tool 18G 1466, checking fixture JD 36A and plugs for pipe connections.

## Removing

Slacken filler cap of power steering reservoir and remove pinion heat shield (12 cyl. only) with car over pit or raised on ramp, detach both hoses (1, Fig. 18) from pinion housing; collect escaping fluid in a suitable container and blank off ports and hoses.

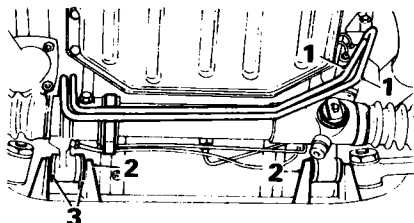


Fig. 18

J57-017

Separate ball-joints from steering arms, using tool JD 24, and release clamp bolt securing joint to pinion shaft; remove three nuts and washers (2, Fig. 18) and withdraw the rack mounting bolts, collecting washers and shims (3, Fig. 18)

Note location of all washers for reassembly, and remove rack downwards.

## Refitting

When refitting rack, ensure that single rack lug is shimmed to be central between cross-beam brackets, fitting shims between metal faces of steel/rubber washers and brackets; check that a gap of 2,5 to 3,0 mm (0.10 to 0.12 in) exists between rubber faces of thrust washers and single lug, locate lower steering column coupling onto rack pinion and insert mounting bolts and ensure the bump stops are fitted to the outer edge but do not yet fully tighten nuts.  
Remove jubilee clips (4, Fig. 18) securing gaiters to rack housing and pull back both gaiters from rack (1, Fig. 19).

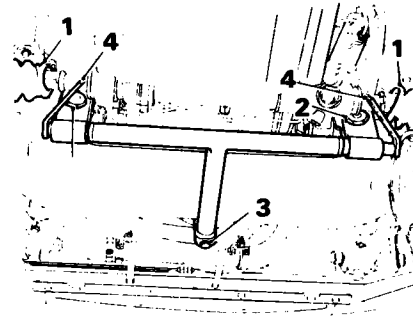


Fig. 19

J57-018

Refit track rod ends.

Locate two attachment brackets of Service tool JD 36A on two large hexagon heads (2, Fig. 19) of lower wishbone fulcrum shafts.

Release locking screw (3, Fig. 19) on forward arm of tool, and move slide until its slot engages with front weld flange of cross-beam. Tighten locking screw.

Lift two couples checking levers (4, Fig. 19) until one or both levers touch rack shaft.

Adjust position of rack, if necessary, to bring both levers into contact.

Tighten nuts of three mounting bolts to secure rack in this position.

Remove checking tool.

Replace gaiters and renew jubilee clips; refit ball joints to steering arms and secure with nyloc nuts. Remove blanking plugs and reconnect both hoses. Refit the pinch bolt and nut to the lower universal joint.

Refit pipe spaces and jubilee clips (12 cyl. only).

Refill system with recommended fluid and bleed, see operation 57.15.02.

Check wheel alignment.

**NOTE:** (a) It is important that distance between rubber faces of thrust washers and adjacent rack lug should in no case be less than 2,5 mm (0.1 in) to allow adequate 'rack compliance' in either direction.

(b) If a replacement rack unit is to be fitted it may be necessary to detach lower column from upper column at universal joint to obtain correct centralization of steering wheel.

## CONTROL VALVE AND PINION

### Remove and refit

57.10.19

It is possible to remove this unit without removing the rack, but extreme care must be taken to prevent contaminants from entering the rack housing while the pinion is removed. The car must be placed over a pit, or raised on a ramp.

Remove the lower steering column and prise off the heatshield fitted to the pinion shaft; then thoroughly clean pinion housing and adjacent rack housing before detaching all four pipes (1, Fig. 20) from the pinion housing. Collect fluid and plug apertures.

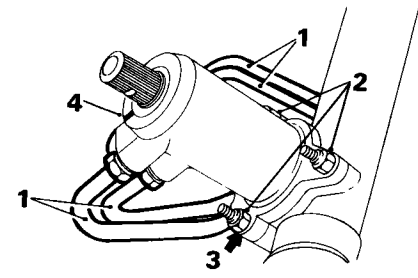


Fig. 20

J57-019

Remove three nuts (2, Fig. 20) attaching pinion housing to rack but before removing housing, release rack adjuster locknut (3, Fig. 20), screw back adjuster one turn and mark position of pinion shaft in relation to housing (4, Fig. 20). Withdraw pinion unit; DO NOT move front wheels, or turn steering column, until unit is replaced.

When refitting, use a new gasket and ensure that relation between pinion shaft and housing is correct before connecting steering column joint.

Reset adjuster plug and bleed system.

## UPPER STEERING COLUMN

### Remove and refit

57.40.02

## Removing

Before removing the column, it is necessary to disconnect the battery and remove steering wheel, speedometer, tachometer and the trim panel below the upper column.

Detach the horn feed from its contact and separate three connections to disconnect switchgear.

Completely withdraw bolt securing universal joint to lower column and slacken the two setscrews screwing the lower end of the column to its mounting strut.

Release upper mountings by working through open adjustment apertures and, supporting column by hand, remove lower setscrews and withdraw column. Collect any packing and record its position. Do not use excessive force in separating joint from lower column.

*continued*



**Refitting**

No repair or adjustment of any description is permitted on upper steering columns. If damage is suspected, remove adjusting clamp, mark its position, remove universal joint and measure overall length of inner column, which must be between 547,74 and 551,04 mm (21.565 and 21.695 in.) Any column outside these limits must be renewed; renew also in all cases of doubt. If column is to be renewed, refer to electrical section 86 for details of removal and refitting of electrical equipment. In refitting column, check that an axial clearance of 10 mm (0.375 in) exists at lower universal joint; if less, move upper joint along column to correct it.

Check that direction indicates self-cancel correctly; if not, proceed as follows:

Detach lower switch cover by removing three screws.

Check that lower dogs on fixed portion of switch engage correctly with cutaways on outer (fixed) column, and that a dog on collet adaptor enters slot in movable section of switch.

Turn steering wheel to bring clamp bolt of column adaptor to horizontal, below axis of column; self-cancelling switch will then function correctly.

Remove steering wheel, rotate it to straight ahead position and refit to splined column with minimum of rotation. Refer to Steering Wheel remove and refit, operation 57.60.01.

Refit lower switch cover.

**LOWER STEERING COLUMN**

**Remove and refit 57.40.05**

**Removing**

Place car on ramp and raise ramp.

Remove pinch bolt securing lower universal joint to pinion shaft. Collect heat shield fitted to pinion shaft.

Lower ramp.

Detach lower parcel shelf.

Remove both pinch bolts securing upper universal joint to upper and lower columns.

Release two lower mounting screws of upper column.

Release lower column from upper universal joint.

Raise ramp.

Remove lower universal joint from pinion shaft and withdraw lower column.

Lower ramp.

**Refitting**

No repairs are permissible. Faulty or damaged columns must be renewed. Reverse above procedure.

Check that upper column and road wheels are centralized before reconnecting splines, and tighten pinch bolt nuts to correct torque. Ensure that a gap of 10 mm (0.375 in) exists between sections of lower universal joint.

**CAUTION:** Excessive force, which may damage nylon shear plugs, must not be used when withdrawing and refitting columns. Burrs on splines should be removed with a fine file.

**STEERING COLUMN ADJUSTING CLAMP**

**Remove and refit 57.40.07**

**Removing**

Remove steering wheel, see operation 57.60.01.

Remove impact rubber (1, Fig. 21) from steering wheel shaft.

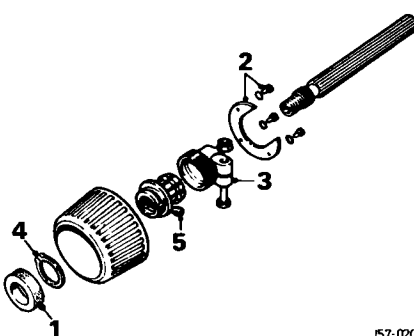


Fig. 21

J57-020

Remove three small cheese head screws from beneath hand locknut, and collect retaining plate (2, Fig. 21).

Unscrew collet adaptor (3, Fig. 21) completely and remove from shaft.

Remove collet circlip (4, Fig. 21) from within upper side of hand locknut.

Withdraw hand locknut, collecting stop button (5, Fig. 21).

Slide split collet off shaft.

**Refitting**

Clean thoroughly and inspect all parts; remove any small burrs with a fine file.

Lightly lubricate all enclosed metal parts with engine oil.

Reverse operations for removal.

**STEERING COLUMN UNIVERSAL JOINT**

**Remove and refit 57.40.25**

**Removing**

Detach lower parcel shelf.

Remove both pinch bolts (1, Fig. 22) securing upper universal joint to upper and lower columns.

Remove two lower mounting screws (2, Fig. 22) of upper column.

Remove upper universal joint from upper column, then from lower column.

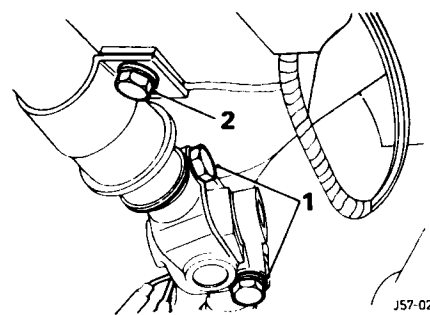


Fig. 22

J57-021

**Refitting**

Reverse operations above. Ensure that the two universal joints are correctly aligned with each other, and tighten pinch bolt nuts to correct torque.

**NOTE:** Lower universal joint is integral with lower steering column and removed with it.

**STEERING COLUMN—LOWER—SEAL**

**Remove and refit 57.40.15**

**Removing**

Remove upper steering column, see operation 57.40.02.

Slacken hose clip (1, Fig. 23) attaching upper sealing sleeve to lower column; remove clip and sleeve.

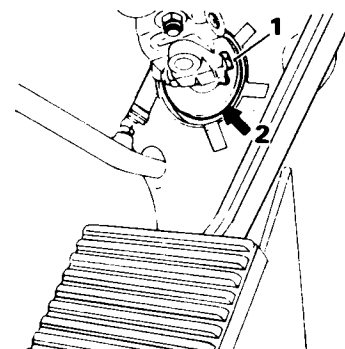


Fig. 23

J57-022

Remove three setscrews (2, Fig. 23) securing gaiter retainer to bulkhead; slide gaiter, retainer and sealing sleeve up and off lower column.

**Refitting**

Fit assembly of sealing sleeve, gaiter and retainer over end of lower column, taking care not to damage gaiter or flanged face of sleeve. Insert and tighten three setscrews securing retainer to bulkhead.

Carefully slide second sealing sleeve, flanged end first, over lower column as far as sealing sleeve; replace its hose clip but do not tighten. Move second sealing sleeve approximately 6 mm (0.25 in) towards bulkhead, to pre-load it against first sleeve; secure it with its hose clip in this position.

Refit upper steering column.

# STEERING

## STEERING COLUMN LOCK

### Remove and refit 57.40.28

#### Removing

Remove the steering column lower shroud.

Adjust the steering wheel to maximum travel, disconnect the fibre optic strand and remove the ignition switch shroud. Remove the shear bolts securing the lock assembly and displace the assembly from its mounting position.

Remove the screw securing the lock assembly to the switch, displace the plastic cover and remove the steering column lock.

To fit the new lock reverse the removal procedure.

**NOTE:** If lock is to be returned to manufacturer under warranty, include key number on material return label.

## POWER STEERING RACK

### Overhaul

Service Tools: Ball joint separator JD 24 + 2 in long 1/2 in UNF socket headed (grub) screw. Rack checking fixture JD 36A. Plugs for pipe connections. End housing 'C' nut remover S355. Pinion ring expansion sleeve 606602. Pinion ring compression sleeve 606603 (JD 33). Pinion housing seal saver 18G 1259. Rack centralising tool, Jaguar Part No. 12297.

### Steering Rack Remove

Slacken the power steering fluid reservoir filler cap. Raise the car and support; detach both the hoses from the pinion housing. Collect the escaping fluid in a suitable container. Blank off all ports and hoses.

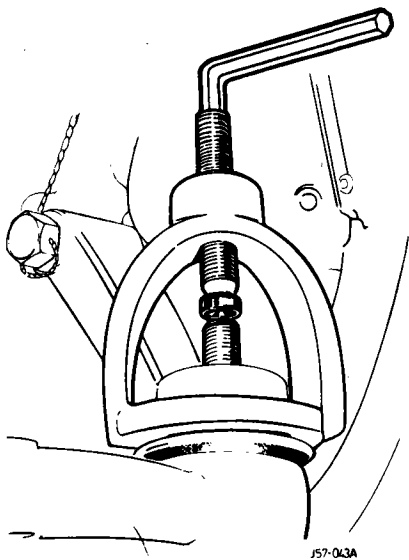


Fig 25

Separate the ball joints from the steering arms, using Service Tool JD 24 (Fig 25).

**NOTE:** It may be necessary to substitute a 2 in long 1/2 in UNF socket headed (grub) screw, for the existing bolt of JD 24.

Remove the pinch bolt (1, Fig 26) securing the lower steering column universal joint, to the rack pinion.

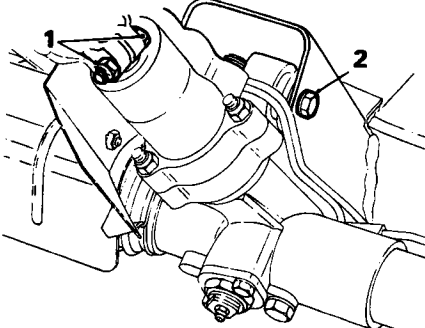


Fig 26

Remove the bolt, washer and self-locking nut, securing the steering rack top mounting (pinion side of rack assembly) (2, Fig 26), to the crossmember.

Remember both the rack bottom mounting bolts, washers and nuts, securing the steering rack to the crossmember.

**CAUTION:** Make a careful record of the number and position of the packing washers for refitting.

Release the steering rack from the crossmember and retrieve the packing washers.

### Steering Rack Dismantle

Thoroughly clean the exterior of the steering rack.

Remove the blanking plugs from the pinion housing ports and purge any remaining fluid by turning the pinion gently from lock to lock. Centre the pinion gear and note the location of the pinchbolt groove. Remove the rack mounting rubbers and sleeves. Release the nuts securing the feed pipes to the pinion valve housing and the rack body; remove the pipes from the rack assembly.

Remove the sealing washer from the port in the pinion end rack housing.

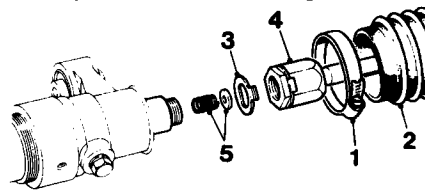


Fig 27

Make a note of their position and release the two large clips (1, Fig 27) securing the tie rod gaiters to the pinion and end housings. Pull back the gaiters (2, Fig 27) to allow access to the inner ball joint assemblies.

**NOTE:** Do not disturb the outer ball joints, unless replacement is necessary.

If the outer ball joints are to be renewed, measure accurately and record the total length of each tie rod, before releasing the locknuts. This will assist when re-tracking the car.

Knock back the tab washers (3, Fig 27) securing the inner ball joint assembly locknuts to the rack.

**CAUTION:** Do not disturb the tab washers between the locknuts and the ball pin housings.

Hold one inner ball joint assembly (4, Fig 27) with a suitable spanner and release the opposite one.

Protect the rack teeth and back of the rack; clamp the rack to enable the other inner ball joint to be released.

Unscrew the tie rod assemblies from the rack. Collect the springs and packing pieces (5, Fig 27).

Release the locknut securing the rack damper; remove the nut, threaded plug, spring and rack damper pad.

**NOTE:** If the rack damper adjustment is satisfactory and the rack damper assembly does not require overhauling then remove the two bolts and lift off the plate; remove the 'O' ring, spring and rack damper pad (Fig 28).



Fig 28

### Pinion Valve and Housing

Remove the three self locking nuts securing the pinion and valve assembly to the pinion end rack housing. Note the relationship of the ports to the rack and remove the complete pinion and valve assembly (1, Fig 29).

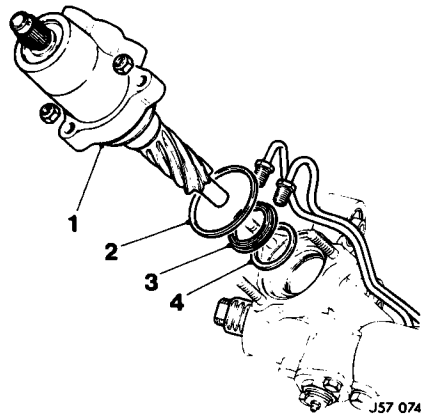


Fig 29

Remove the sealing ring (2, Fig 29) the pinion seal (3, Fig 29) and the backing washer (4, Fig 29).

Using a suitable mallet gently tap the pinion valve from the pinion valve housing.

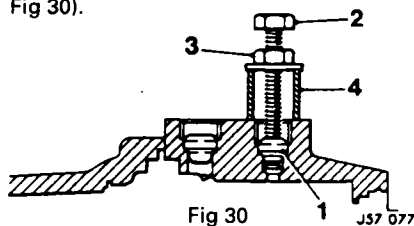
Remove the circlip washer and ball bearing race, from the valve assembly, if a replacement is necessary.

**NOTE:** The pinion valve cannot be dismantled further. This item must be replaced as a complete assembly.

**Port Inserts Renew**

Tap a suitable thread in the bore of the insert (1, Fig 30).

Insert a setscrew (2, Fig 30) with attached nut (3, Fig 30) and distance piece (4, Fig 30).



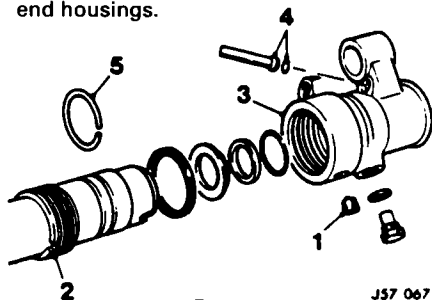
Tighten the nut and withdraw the insert. Ensure that all swarf and metal particles are completely removed. Fit a new insert into each port and tap home squarely using a soft mandrel.

**End Housing**

Release the small hexagon socket grub screw (1, Fig 31) in the end housing.

Using Service Tool S355, unscrew the ring nut from the end housing (2, Fig 31). Remove the end housing (3, Fig 31) from the rack tube.

Remove the air transfer pipe and sealing rings (4, Fig 31), from both the pinion and end housings.



**Rack and Inner Sleeve**

Remove the hexagon socket grub screw (1, Fig 32) from the pinion end rack housing and collect the sealing washer (2, Fig 29).

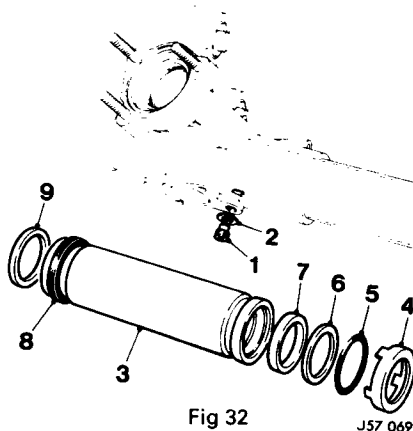
Remove the rack complete with the inner sleeve (3, Fig 32) from the bore of the rack tube.

**NOTE:** Removal of the inner sleeve over the rack teeth will destroy the seal (6, Fig 32).

Bend up the retaining tabs on the seal cap (4, Fig 32) and remove the cap from the inner sleeve.

Remove the seal 'O' ring (5, Fig 32), seal (6, Fig 32) and split bearing (7, Fig 32).

Remove the rubber 'O' ring (8, Fig 32) and nylon washer (9, Fig 32) from the bottom of the rack tube.



The piston cannot be removed from the rack but the piston ring (1, Fig 33) and the backing ring (2, Fig 33) can be renewed..

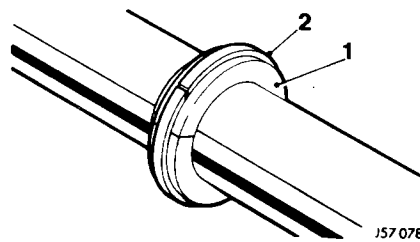


Fig 33

The rack tube cannot be removed from the plain (pinion end) rack housing, but the ring nut (2, Fig 31) and circlip (5, Fig 31) can be renewed.

Exercise caution, when removing and replacing the circlip over the ground sealing outer diameter of the rack tube.

**Renewing Seals**

Discard all the old seals, and the inner sleeve seal retaining cap.

Thoroughly clean and inspect each item for surface damage and wear.

For efficient sealing it is essential that all seal surfaces, lead chambers etc., are smooth, with no scratches or score marks.

**Re-assembling - Inner Sleeve and Rack Bar**

Fit a new backing ring and piston ring to the piston, and ensure that it moves freely in its groove.

Place a new seal retaining cap over the rack teeth, with the three tabs facing away from the piston.

Fit a new split bearing in the recess in the inner sleeve, ensure that it is seated correctly.

To protect the new inner sleeve seal from being damaged by the rack teeth; cover the rack teeth with a piece of suitable plastic adhesive tape, placed lengthways over the teeth.

Carefully slide the seal, with the recessed face towards the piston, over the tape and onto the rack bar.

Remove the tape.

Fit a new 'O' ring in its recess in the inner sleeve, ensure that it seats correctly.

Ensure that the ends of the split bearing are on the opposite side of the rack bar to the teeth and push the inner sleeve along the rack bar. Carefully push the seal up against the retaining cap and in turn, against the piston.

Ensure that the inner sleeve is square to the piston; continue pushing until the seal is fully home.

Maintain the pressure against the piston and neatly bend the three tangs into the groove on the outside of the inner sleeve, securing the retaining cap.

Apply a smear of silicone to the bore of the new square section sealing ring. Fit the nylon backing washer (9, Fig 32) and sealing ring (8, Fig 32) into the bore of the rack tube; slide them all the way down until they contact the pinion end main housing.

Assemble the rack bar, with the inner sleeve still against the piston, into the rack tube bore. Continue sliding the rack and inner sleeve assembly into the rack tube bore, until the inner sleeve enters the sealing ring and seats firmly against the pinion end rack housing.

Look into the hexagon socket screw hole and ensure that the retaining shoulder has passed the hole. Fit the sealing washer and socket grub screw (1 & 2, Fig 32). After tightening, it should fit flush to slightly proud, stake in position.

**End Housing**

Remove the seal (1, Fig 34) and 'O' ring (2, Fig 34) using a suitable sharp instrument. With a suitable soft metal drift, carefully remove the steel retaining washer (3, Fig 34).

Fit a new 'O' ring in the recess, pushing a new seal with the groove uppermost, on to the top of the 'O' ring; replace the steel retaining washer with the spigot towards the seal and press home.

Fit a new square section sealing ring (4, Fig 34) into the end housing; smear the sealing ring bore, with a silicone lubricant, to aid assembly.

Fit new air transfer pipe sealing rings (5, Fig 34) to the pinion and end housings. Fit the air transfer pipe to the pinion rack housing.

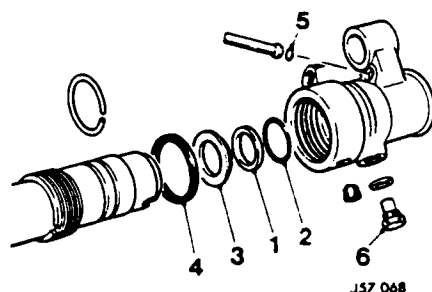


Fig 34

## STEERING

### Pinion Valve and Housing

To remove the seals from the pinion, use a sharp knife and cut diagonally, taking care not to damage the groove ends.

Using Service Tool 606602, to expand the seals, fit one in the groove nearest to the ball bearing race. Repeat the procedure for the other three seals.

The rings can then be compressed to their original size by fitting a sleeve over them. Use 606603. If this tool is not available, then recovery will take place naturally if left for about 3 hour.

Fit the washer and 'U' section seal, into the pinion main housing, ensure that the grooves in the seal face upwards and that the seal flange fits snugly in the groove.

### Valve Housing

Using suitable circlip pliers remove the circlip (1, Fig. 35). Remove the seal retainer (2, Fig. 35) and the seal (3, Fig. 35).

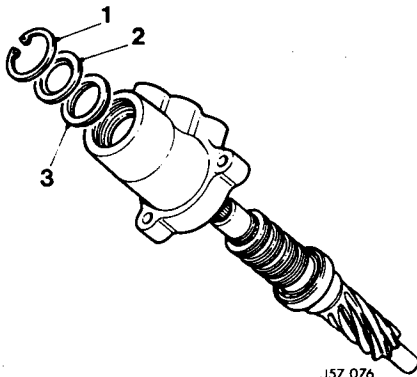


Fig. 35

Fit a new seal, grooved face downwards. Ensure that the flange sits snugly in the recess. Fit the seal retainer, with the rubber side and lip outermost. Fit the circlip, ensure that it is seated fully in the groove.

Smear the seals with a little clean power steering fluid. Fit the taper seal saver 18G 1259 over the serrations on the pinion valve, and enter the pinion valve into the pinion valve housing. Press the ball bearing race fully home.

Refit the rack damper assembly. Ensure that the threaded plug is slack. Remove the grease nipple from the plug, and centralise the rack using Service Tool 18G 1466 (Fig. 36).

Refit the pinion valve assembly to the pinion rack housing, ensure that the coupling groove in the pinion is in the correct position. Fit and tighten the three self-locking nuts.

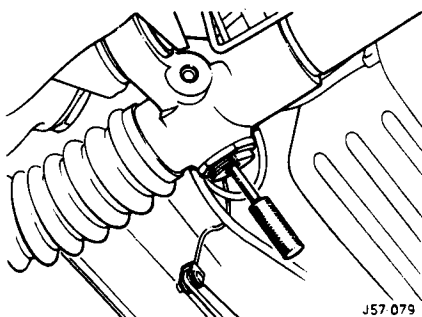


Fig. 36

Adjust the rack damper pad assembly to obtain the correct end float. Tighten the locknut and refit the grease nipple.

Fit a new sealing washer to the port in the pinion end rack housing. Fit and tighten the feed pipes to the pinion valve housing and rack body. Do not overtighten the pipe nuts as irreversible damage could be caused to the pipes.

### Tie Rods

Refit the new tab washers to the rack, dished face outermost. Screw on the tie rods. Holding one ball joint and tighten the opposite ball joint (one joint should react against the other). Do not restrain the rack assembly. Secure the tab washers in four places against the spanner flats. Regrease the ball joint areas and replace any lost from the gaiters. Each gaiter should contain 57 gms (2 oz) of grease.

Fit the gaiters and secure with the clips, ensuring that the clips are in their correct position.

### Refitting the Steering Rack

Ensure that the steering wheel is set to the straight ahead position and refit the rack.

Fit the lower coupling to the pinion. Ensure that the single rack mounting lug is shimmed so that it is central between the cross-beam brackets. This is achieved by fitting shims between the faces of the steel/rubber washers and the bracket. Check that a gap of 2,5 to 3,0 mm (0.10 to 0.12 in) exists between the face of the rubber thrust washers and the single lug of the rack.

Insert the mounting bolts, fit but do not fully tighten the nuts.

Slacken the clips securing the rubber gaiters to the rack housing, pull the gaiters (1, Fig. 37) clear of the inner ball joint assemblies.

Locate the two attachment brackets of Service Tool JD 36A on the heads of the lower wishbone fulcrum shaft bolts (2, Fig. 37).

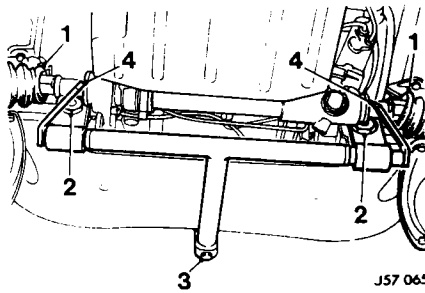


Fig. 37

Release the locking screw (3, Fig. 37) on the forward arm of the tool and position the slide so that the slot engages with the front welded flange of the cross beam. Tighten the lock screw. Rotate the alignment legs (4, Fig. 37) of the tool until one or both rest on the rack shaft.

Adjust the position of the rack if necessary, until both legs are in contact with the rack shaft.

Tighten the nuts of the mounting bolts to secure the rack in this position. Remove Service Tool JD 36A.

Refit the rubber gaiters and secure with the clips. Refit the ball joints to the steering arms and secure with the nyloc nuts.

Remove the blanking plugs and connect both fluid hoses to the pinion housing.

Refit the pinch bolt and nut to the lower universal coupling.

Refill the system with the recommended fluid and carry out the bleed procedure. Check the front wheel alignment.

### NOTE:

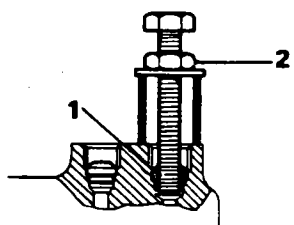
- (A) It is important that the distance between the rubber faces of the thrust washers and the adjacent rack lug should in no case be less than 2,5 mm (0.1 in). This is to allow adequate 'rack' compliance in either direction.
- (B) If a replacement rack unit is to be fitted it may be necessary to detach the lower column from the upper column at the universal joint, to obtain correct centralisation.

**PORT INSERTS**

**Remove and refit 57.10.24**

**Removing**

Tap a suitable thread in bore of seat (1, Fig 38), and insert a setscrew with attached nut, washer and distance piece.



J57-026

Fig 38

Tighten nut (2, Fig 38) and withdraw seat.

**Refitting**

Insert seat, and tap home squarely with a soft mandrel.

**STEERING PUMP**

**Overhaul 57.20.20**

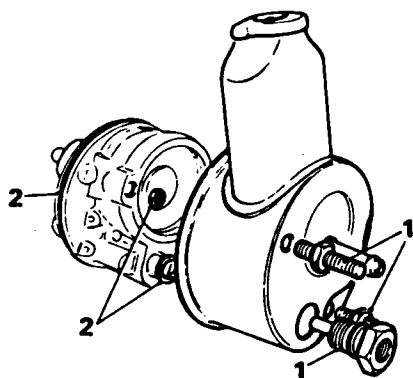
Steering tool: Pulley carrier remover/replacer 18G 326.

**Dismantling**

Absolute cleanliness and extreme care are essential to pump overhaul, which should not be entrusted to inexperienced mechanics; if any doubt exists on the necessity for the replacement of partly worn items they should be replaced, as pump overhaul is not specified in routine maintenance.

After removing pump, detach plugs, drain and discard fluid. Remove three screws and detach pulley, clean out tapped hole in pump shaft and fit reaction screw for Saginaw-approved removal tool, 18G 1326, screwing it fully into shaft. Engage body of extractor with recessed diameter of carrier and remove carrier by tightening extractor screw.

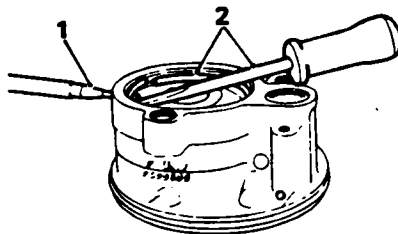
Remove reaction screw before continuing. Detach pump from mounting bracket, remove adjuster link, thoroughly clear externally, detach outlet union and three studs (1, Fig 39) and withdraw reservoirs from body. Collect and discard 'O' rings (2, Fig 39).



J57-027

Fig 39

Insert a suitable punch (1, Fig 40) in hole in rear of pump body and dislodge spring ring. Extract ring with screwdriver (2, Fig 40) as shown.



J57-028

Fig 40

If end-plate (1, Fig 41) is not ejected by spring (2, Fig 41), a light tap on the casing will free it. Extract 'O' ring (3, Fig 41) and discard; unscrew flow control valve (4, Fig 41) and tap shaft (5, Fig 41) lightly through body, carrying rotor assembly with it. Extract second 'O' ring (6, Fig 41) and discard it, then carefully separate motor components.

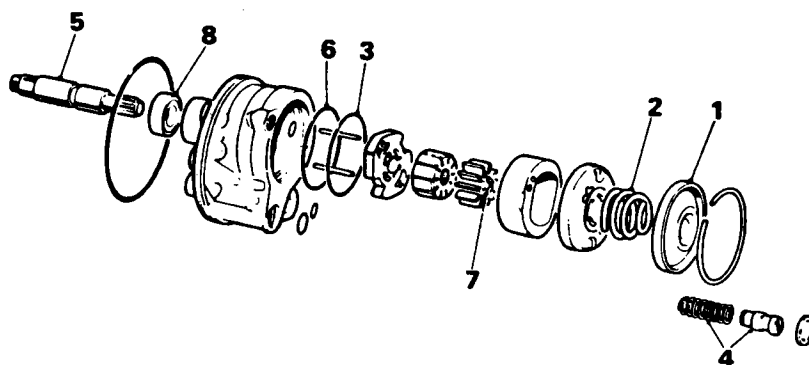


Fig 41

J57-029

Remove circlip (7, Fig 41) and withdraw rotor and thrust plate from shaft; finally, extract drive shaft oil seal (8, Fig 41).

**Inspection**

Clean all metal parts in solvent; do NOT immerse the new seals. Carefully inspect for wear and damage.

If necessary, light scoring may be removed from thrust and pressure plates by lapping. Reject pump ring and vanes if chatter marks or grooves are present; scuff marks and light uniform wear are acceptable. Check control valve for free movement; remove any burrs and renew valve if at all faulty. Check shaft in bush and measure external diameter of shaft at pulley carrier; finally carrier internal diameter MUST provide an interference of 0,025 to 0,066 mm (0.001 to 0.0026 in) with shaft diameter.

*continued*

# STEERING

## Reassembly

Fit the shaft seal into the casing, smear with petroleum jelly and insert shaft, splined end first. Replace dowel pins (1,

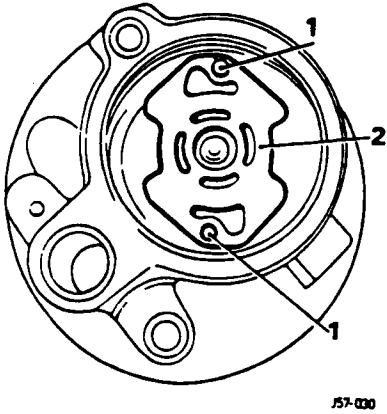


Fig 42

Fig 42) (if withdrawn from body) and fit thrust plate (2, Fig 42) over them, with ports visible. Place counterbored face of

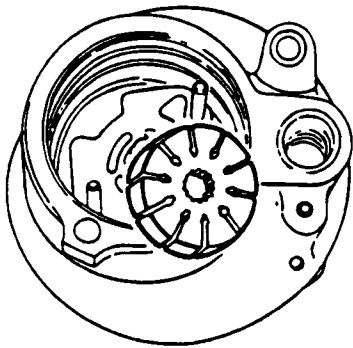


Fig 43

rotor (Fig 43) over splines, press down and fit circlip (7, Fig 41). Slide pump ring

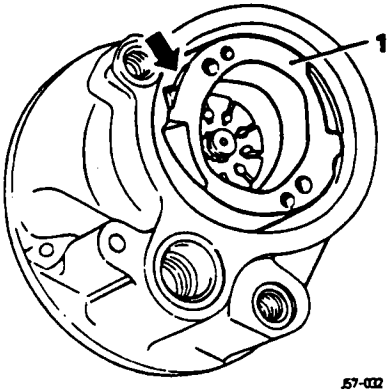


Fig 44

(1, Fig 44) over dowel pins with rotating arrow visible (arrowed Fig 44), and place vanes in rotor slots with their radiused edges outmost (Fig 45).

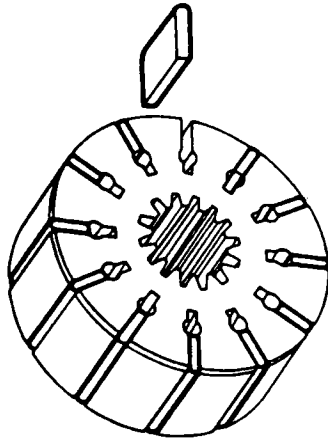


Fig 45

Smear new 'O' ring for pressure plate with petroleum jelly and insert into inner groove in casing; insert pressure plate (1, Fig 46) with its spring recess outwards;

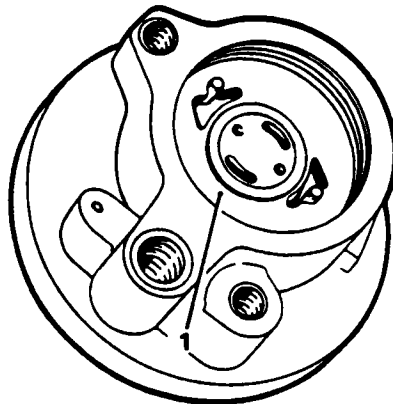


Fig 46

press firmly into 'O' ring (do not tap) fit second greased 'O' ring into outer groove, insert spring and place end plate in position with its spring ring on top. Position gap on ring away from extractor hole. Place assembly under a press and depress end plate until spring ring can be sprung into groove (Fig 47).

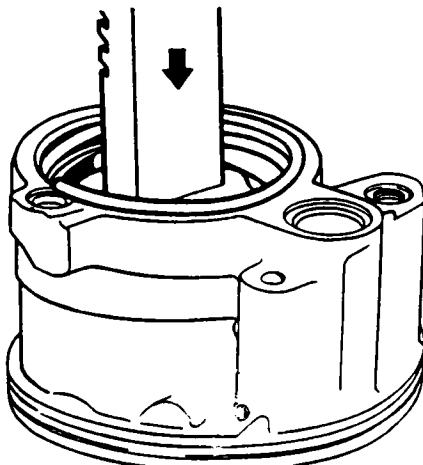


Fig 47

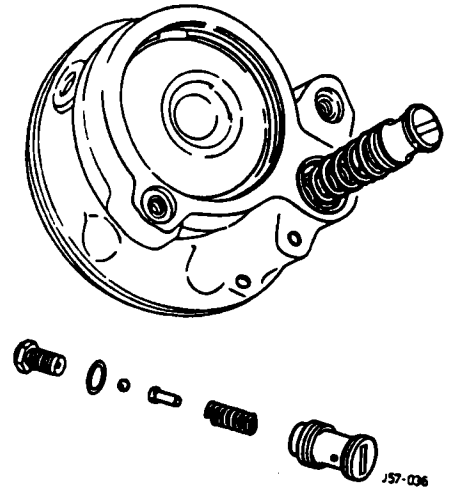


Fig 48

Reassemble control valve details and refit (Fig 48), replace reservoirs, using new 'O' rings.

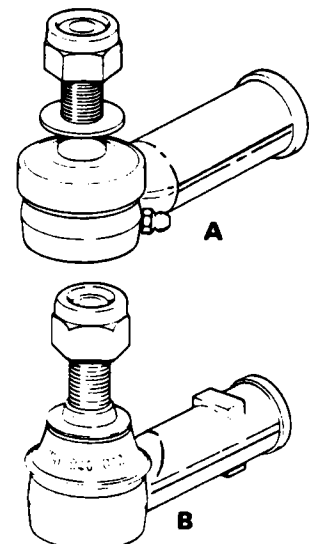
Refit pulley carrier to shaft, using tool 18G 1326. Place carrier on tool with its flange adjacent to 3/8 in UNC thread of tool. Screw this threaded stud into tapped hole in pump shaft until it bottoms then, still holding spindle of tool with spanner, screw body of installer down spindle until face of carrier is flush with end of pump shaft. Unscrew tool from pump shaft; (the tapped hole in pump shaft is provided solely to suit installation and removal tools).

After replacing pump test system.

## Steering Tie Rod Ends (Track Rod Ends)

Commencing at the Vehicle Identification Numbers listed below, an alternative design of tie rod was introduced. It should be noted that the new tie rod ends are sealed and require no lubrication. A feature of the new tie rod is that there is NO SPRING LOADED FREE MOVEMENT. To avoid any confusion over the identification of these tie rod ends, the old and new types are illustrated below.

Vehicle Identification Number  
345390



JS1 157A

**STEERING RACK MOUNTING BUSHES**

**Remove and refit 57.10.30**

Service Tools: Rack mounting bush replacement tool JD 165, rack centralising pin 18G 1466.

**Removing**

Raise and support the front of the vehicle. Turn the ignition key to prevent steering lock engagement.

Position adhesive tape along the top edge of the steering column upper cowl and along the steering wheel boss.

Apply and shape a small amount of plastercine to the shoulder of the steering rack centralising pin 18G 1466. This will prevent oil loss when fitted.

Remove the centralising pin access plug from the steering rack and insert the pin. With help from another person rotate the steering wheel until the pin is fully engaged (Fig 36).

Mark the position of the steering wheel on the adhesive tape.

Remove the pin and refit the access plug. Remove the securing nut and bolt from the steering column lower universal joint. On catalyst vehicles space is extremely confined.

Release the joint from the steering rack. Undo and remove the rack to crossbeam lower and upper securing nuts and bolts. Displace and remove rack heatshields as necessary.

Remove the non pinion side mounting bush to crossbeam shims and lower the rack assembly.

Remove and discard the rubber faced thrust washers of the lower mounting bushes.

Position tool body item JD 165/3 to the inside face of the mounting bush housing. Insert the draw bolt through tool body and mounting bush.

Fit tool item JD 165/1, washer and pillar nut to the outer face of the mounting bush. Operate tool drawing the mounting bush into the tool body (Fig 49).

Repeat procedure for the remaining bushes.

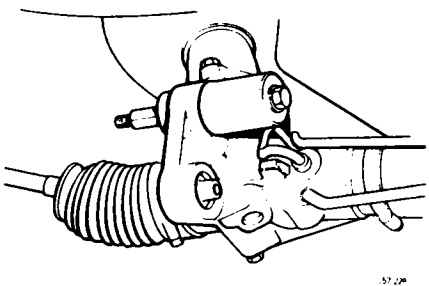


Fig 49

**Refitting**

Clean mounting bush housings and cross-beam mounting locations.

Position tool item JD 165/2 to the inside face of the bush housing.

Position and align mounting bush to the outside face of the bush housing.

Fit tool item JD 165/1, pass draw bolt through assembly and fit pillar nut.

Tighten draw bolt to fully seat bush into housing (Fig 50).

Repeat procedure for the remaining bushes.

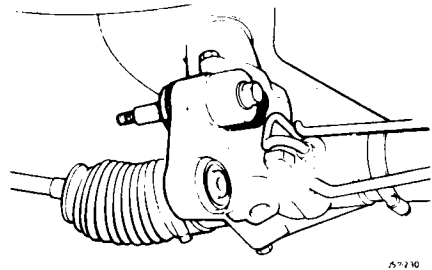


Fig 50

Fit new rubber faced thrust washers to the outer faces of the lower bushes.

Raise the rack assembly and align cross-beam mountings. Fit suitable pegs to mounting positions to hold the rack in place.

Remove peg from passengers side, fit shims as necessary between rack lower mounting bush and crossbeam. Fit but do not tighten rack mounting bolt and nut.

Remove peg from pinion side, fit but do not tighten rack mounting bolt and nut.

Fit and align rack heatshields as necessary. Fit but do not tighten upper rack mounting bolt and nut.

Align rack assembly with crossbeam base and finally tighten securing bolts.

Reposition the steering column and steering rack centrally using the centralising pin as detailed above and engage and fully seat lower universal joint to rack spline.

Fit and tighten pinch bolt and nut.

Lower vehicle.

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# FRONT SUSPENSION

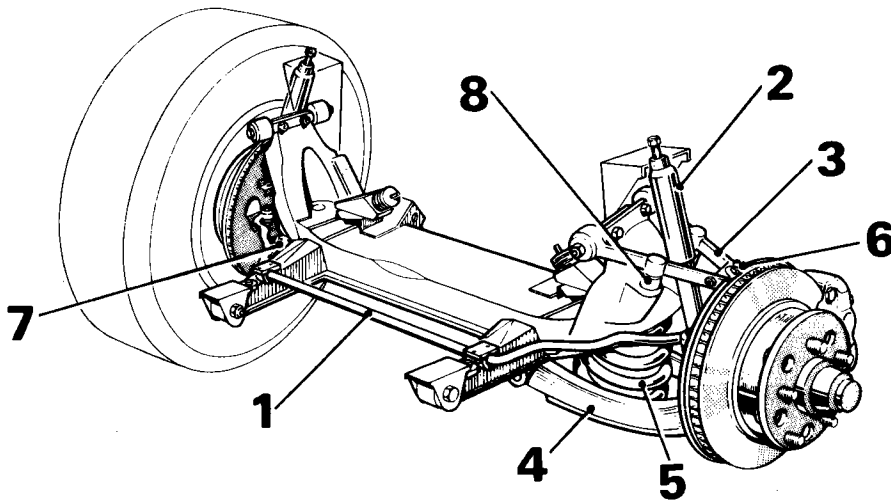


Fig. 1

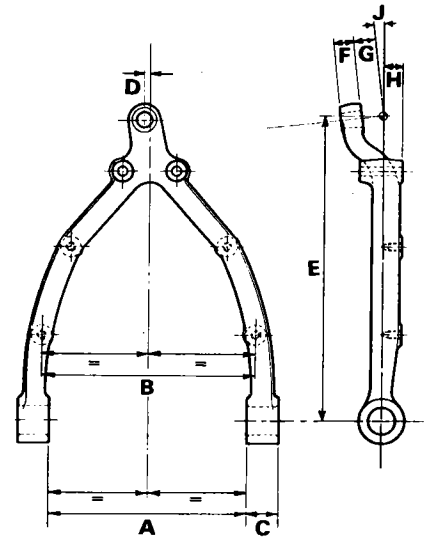
J60-028

### Key to Fig. 1

1. Anti-roll bar
2. Damper
3. Upper wishbone
4. Lower wishbone
5. Road spring
6. Upper ball joint
7. Lower ball joint
8. Rebound stops

### Dimension—Lower Wishbone Arm—Fig. 3

- A. 225,30 to 225,81 mm (8.87 to 8.89 in)
- B. 244,35 to 244,60 mm (9.62 to 9.63 in)
- C. 34,67 to 35,18 mm (1.365 to 1.385 in)
- D. 5,84 to 6,35 mm (0.23 to 0.25 in)
- E. 353,82 to 354,33 mm (13.93 to 13.95 in)
- F. 22,86 to 23,37 mm (0.90 to 0.92 in)
- G. 26,67 to 27,18 mm (1.05 to 1.07 in)
- H. 21,08 to 21,59 mm (0.83 to 0.85 in)

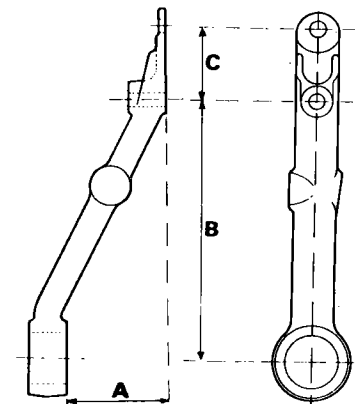


J60-003

Fig. 3

### Dimension—Upper Wishbone Arm—Fig. 4

- A. 53 mm (2.10 in)
- B. 160 mm (6.30 in)
- C. 445 mm (1.75 in)



J60-004

Fig. 4

## DESCRIPTION

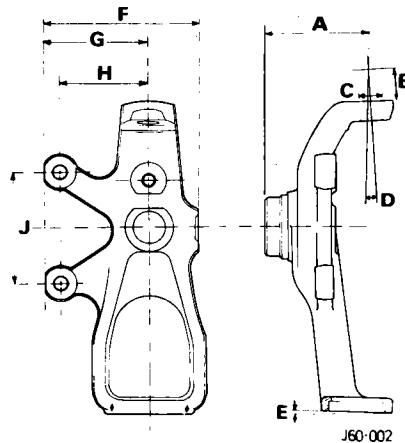
The front suspension is fitted to the car as a complete unit, assembled with anti-roll bar, springs, dampers and steering gear to a fabricated sheet-steel cross-beam which also carries the front engine mountings. The cross-beam is rubber mounted to the body/chassis structure at four points but its removal is not required for most of the operations carried out on the front suspension.

Suspension units are of the coil spring and unequal double wishbone type, the forged steel wishbones being pivoted on inclined inner axes to reduce nose-dip in braking; rubber bushes are used for these inner pivots, the outer ones being formed by the steering ball-joints which are connected by forged steel stub axle carriers, on which the disc brake calipers are mounted. The upper ball joints are sealed units which must be replaced if wear is apparent. Slight wear on the lower joints can be compensated for by the removal of shims. Lubrication nipples are provided on all the ball joints, and it is strongly recommended that grease should only be injected into them with the car's weight removed from its front wheels.

If the front of the car should be accidentally damaged it is most important that castor and camber angles are checked and wheel alignment and ride height measured. If these readings are not to specification the wishbones, hub carriers and steering arms must be removed and dimensionally checked; if any item is not to design dimensions it must be replaced and scrapped.

## DIMENSIONAL DATA

The following dimensional drawings are provided to assist in assessing accidental damage. A component suspected of being damaged should be removed from the car, cleaned off and the dimensions checked and compared with those given in the appropriate illustration. Components found to be dimensionally inaccurate, or damaged in any way MUST be replaced, and NO ATTEMPT made to straighten and re-use.



J60-002

Fig. 2

### Dimension—Stub Axle Carrier—Fig. 2

- A. 81,7 mm (3.21 in)
- B. 25,4 mm (1.0 in)
- C. 19,05 mm (0.75 in)
- D. 5 degrees
- E. 2 degrees
- F. 113,9 mm (4.48 in) nominal
- G. 51 mm (2.80 in)
- H. 59,2 mm (2.33 in) nominal
- J. 88,9 mm (3.5 in) nominal

TORQUE WRENCH SETTINGS

ITEM	DESCRIPTION	TIGHTENING TORQUE		
		Nm	kgf m	lbf ft
Stub axle to carrier .....	$\frac{3}{8}$ in U.N.F. nut	108 to 122	11,1 to 12,4	80 to 90
Brake disc to hub .....	$\frac{1}{2}$ in U.N.F. bolt	40,7 to 54,2	4,2 to 5,54	30 to 40
Lower ball-joint to stub axle carrier .....	$\frac{1}{2}$ in U.N.F. bolt	20,3 to 27,1	2,08 to 2,76	15 to 20
Brake caliper to stub axle carrier .....	M12 Bolt	67,8 to 81,3	6,91 to 8,29	50 to 60
Steering arm to stub axle carrier .....	M12 Bolt	67,8 to 74,5	6,91 to 7,60	50 to 55
Lower ball-joint to lower wishbone .....	$\frac{1}{2}$ in U.N.F. bolt	74,5	7,60	55
Upper ball-joint to stub axle carrier .....	$\frac{1}{2}$ in U.N.F. nut	47,0 to 67,8	4,84 to 6,91	35 to 50
Fulcrum shaft upper .....	$\frac{1}{2}$ in U.N.F. nut	67,8 to 74,5	6,23 to 7,60	45 to 55
Fulcrum shaft lower .....	$\frac{1}{2}$ in U.N.F. slotted nut	43,4 to 67,8	4,43 to 6,91	32 to 50
Upper ball-joint to wishbone .....	$\frac{3}{8}$ in U.N.F. nut	35,2 to 43,4	3,60 to 4,42	26 to 32
Upper fulcrum shaft to spring turret .....	$\frac{1}{2}$ in U.N.F. nut	66,4 to 74,5	6,78 to 7,60	49 to 55
Clamp and shield to stub axle carrier .....	$\frac{1}{2}$ in U.N.F. nut	6,1 to 7,5	0,62 to 0,76	4,5 to 5,5
Spring pan to lower wishbone .....	$\frac{3}{8}$ in U.N.F. bolt	36,7 to 43,4	3,74 to 4,42	27 to 32
Damper mounting bracket to wishbone .....	$\frac{3}{8}$ in U.N.F. nut	36,7 to 43,4	3,74 to 4,42	27 to 32
Damper upper mounting .....	$\frac{3}{8}$ in U.N.F. nut	36,7 to 43,4	3,74 to 4,42	27 to 32
Damper lower mounting .....	$\frac{1}{2}$ in U.N.F. nut	54,2 to 74,5	5,54 to 6,23	40 to 45
Bump stop to spring pan .....	$\frac{1}{2}$ in U.N.F. nut	10,8 to 13,6	1,10 to 1,38	8 to 10
Rebound stops to upper wishbone .....	$\frac{1}{2}$ in U.N.F. setscrew	10,8 to 13,6	1,10 to 1,38	8 to 10
Anti-roll bar bracket to body .....	$\frac{3}{8}$ in U.N.F. nut	36,7 to 43,4	3,74 to 4,42	27 to 32
Anti-roll bar to link .....	$\frac{3}{8}$ in U.N.F. nut	19,0 to 24,4	1,94 to 2,48	14 to 18
Anti-roll bar link to lower wishbone .....	$\frac{3}{8}$ in U.N.F. nut	19,0 to 24,4	1,94 to 2,48	14 to 18
Clamp, cross beam front mounting .....	$\frac{1}{2}$ in U.N.F. nut	33,9 to 40,7	3,46 to 4,14	25 to 30
Front mounting bolt .....	$\frac{3}{4}$ in U.N.F. nut	129 to 156	13,14 to 15,91	95 to 115
Rear mounting to body .....	$\frac{3}{8}$ in U.N.F. bolt	29,8 to 35,2	3,05 to 3,59	22 to 26
Rear mounting to beam .....	$\frac{3}{8}$ in U.N.F. nut	19,0 to 24,4	1,94 to 2,48	14 to 18
Wheel nuts .....	Special nuts	88,0 to 101	8,98 to 10,4	65 to 75

FRONT SUSPENSION RIDING HEIGHT

Check and adjust 60.10.18

Check that car is full of petrol, oil and water, and that tyre pressures are correctly adjusted. Position car with front wheels on slip plates.

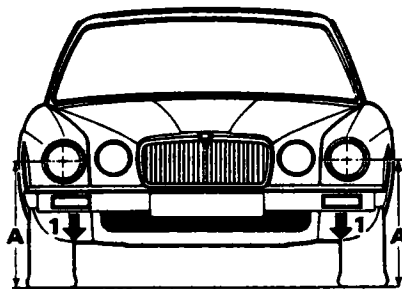


Fig. 5

Press downwards on front bumper as indicated at arrows (1, Fig. 5) to depress car and slowly release. Lift front bumper and slowly release. Measure distance between centre of outer headlight and ground at both sides of car area. Obtain values for dimension 'A', right and left hand. Correct height is 611 mm (24 $\frac{1}{2}$  in) minimum. If necessary, fit or remove packing rings beneath springs to achieve this dimension; see operation 60.20.01. Packing rings are 3,18 mm ( $\frac{1}{8}$  in) thick, and vary the riding height by 7,93 mm ( $\frac{3}{8}$  in).

BALL JOINT—LOWER

Adjust 60.15.04

Service tool: Steering joint taper separator JD 24

Jack up front of car and place on stands. Remove front wheel/s. Place jack beneath front spring seat pan and raise sufficient to relieve stub axle carrier of spring pressure. Remove self-locking nut and washer (1, Fig. 6) securing steering tie rod ball-joint.

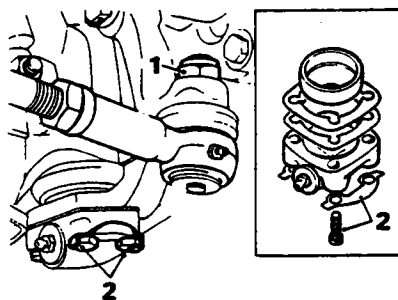


Fig. 6

Separate tie-rod from steering arm using service tool JD 24. Lift hub and stub axle carrier assembly to reveal any free play in lower ball-joint. Bend back tab washers, remove four screws (2, Fig. 6) securing ball pin cap to stub axle carrier. Detach ball pin cap, shims and socket from stub axle carrier. Clean and examine all parts for wear.

**CAUTION:** In order to obtain correct adjustment of ball joint it is necessary to shim to correct clearance. Excessive wear on ball pin and sockets must not be adjusted by shims. Worn parts must be renewed.

Remove shims one by one until ball pin is tight in its socket with screws fully tightened.

**NOTE:** shims are available in 0,05 mm (0.002 in) and 0,10 mm (0.004 in) thicknesses.

Remove screws, ball pin cap, shims and socket.

Add shims to the value of 0,10 mm to 0,15 mm (0.004 in to 0.006 in).

Lightly grease ball pin and socket. Refit socket ball pin cap and new tab washers. Refit and tighten screws (2, Fig.6) to correct torque figure.

When correctly adjusted, hub and stub axle carrier can be pivoted with a very slight drag. Turn up tab washers and charge joint with correct grease.

Replace nut and washer (1, Fig. 6) refit wheel(s) and lower car.

**NOTE:** The bolts securing the lower ball pin cap to the stub axle carrier may on some vehicles be in a mixed condition, i.e. the head of the bolts are of different thicknesses 7,94 mm (0.3125 in) and 4,76 mm (0.1875 in).

The bolts with a head thickness of 7,94 mm (0.3125 in) are fitted on production to the inboard holes of the lower ball pin cap.

It is important that if any of these bolts are removed during service, they should be replaced in the correct position.

1. Inboard bolts — head thickness 7,94 mm (0.3125 in)
2. Outboard bolts — head thickness 4,76 mm (0.1875 in)

## FRONT SUSPENSION

### BALL JOINT—UPPER

**Remove and refit** 60.15.02

**Service tool:** Steering joint taper separator JD 24

The upper wishbone ball joint cannot be dismantled and if worn, the complete assembly must be replaced.

#### Removing

Jack up car beneath lower wishbone. Remove road wheel. Tie stub axle carrier to cross member turret to prevent strain on front brake caliper hose. Remove two nuts, bolts (1, Fig. 7) and plain washers securing ball joint to upper wishbone levers.

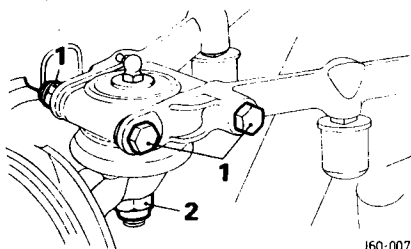


Fig. 7

**NOTE:** Take careful note of fitted positions of bolts and also positions of packing piece and shims; these control castor angle.

Remove self locking nut (2, Fig. 7) and plain washer securing ball joint to stub axle carrier. Use taper separator tool JD 24 to extract ball-joint from stub axle carrier.

#### Refitting

**CAUTION:** Bolts securing upper ball-joints in upper wishbone must be fitted from front of car towards rear.

Reverse above operations, ensuring that packing piece and shims are positioned as noted. Fit ball-joint to stub axle carrier before securing to wishbone. Check castor angle, camber angle and front wheel alignment.

### ANTI-ROLL BAR RUBBERS

**Remove and refit** 60.10.04

#### Removing—see Fig. 8

Car may be placed on ramp or over pit, but do not jack up front of car. Remove nuts and setscrews securing anti-roll bar brackets to chassis members; remove keeper plates and remove rubbers from around anti-roll bar.

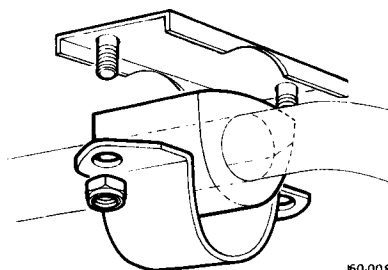


Fig. 8

#### Refitting

**NOTE:** Fitting of bushes will be greatly facilitated if a proprietary rubber lubricant or a solution of 12 parts water to one part of liquid soap is used.

Reverse above operations ensuring that each rubber protrudes an equal amount each side of its respective keeper plate; the split in rubbers must face to rear of car.

**CAUTION:** All nuts and setscrews must be tightened with full weight of car on the suspension; premature failure of rubber bushes may occur if this precaution is not taken.

### ANTI-ROLL BAR LINK AND BUSHES

**Remove and refit** 60.10.02/60.10.03

#### Removing

Jack up front of car and rest on stands. Remove self locking nut (1, Fig. 9) special washer and rubber pad securing end of anti-roll bar to anti-roll bar link.

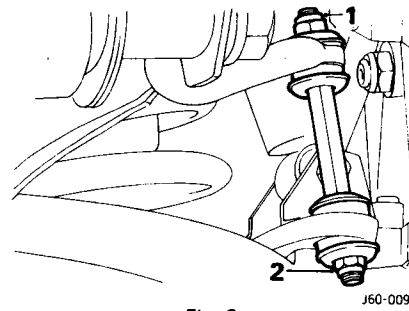


Fig. 9

Remove self-locking nuts (2, Fig. 9) special washer and rubber pad securing anti-roll bar link to anti-roll bar support bracket. Release upper nut on link at opposite end of anti-roll bar. Lift link clear and recover two spacer tubes, two rubber pads and special washers.

#### Refitting

Check conditions of rubber pads, renew if damaged in any way. Reverse removal operations, but do not fully tighten nuts. Lower car on to wheels. Fully tighten self-locking nuts at top and bottom of link, to the correct torque.

### ANTI-ROLL BAR

**Remove and refit** 60.10.01

#### Removing

Jack up front of car, rest on stands and remove both front wheels. Remove self locking nut (1, Fig. 10) special washer and rubber pad securing each end of anti-roll bar to anti-roll bar links.

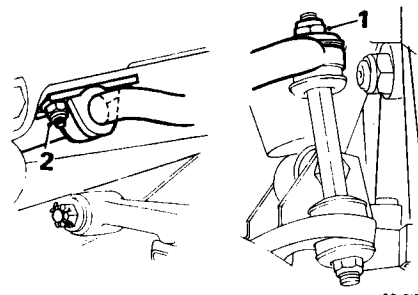


Fig. 10

Remove four self-locking nuts (2, Fig. 10) and setscrews securing keeper plates to sub-frame members.

Detach anti-roll bar and recover split bushes. Remove nut and release one steering tie-rod ball-joint. Manoeuvre anti-roll bar clear of car.

#### Refitting

**NOTE:** Fitting of bushes will be greatly facilitated if a proprietary rubber lubricant or a solution of 12 parts water to one part of a liquid soap is used.

Manoeuvre anti-roll bar into position across car.

Lubricate bushes and position them on anti-roll bar adjacent to keeper plate locations, split towards rear of car.

Fit keeper plates and loosely secure to sub-frame using four setscrews—from top—and four self-locking nuts.

**CAUTION:** All nuts and setscrews must be tightened with full weight of car on suspension; premature failure of rubber bushes may occur if this precaution is not taken.

Ensure spacer tube fitted on anti-roll bar link and locate anti-roll bar on link at both sides of car.

Fit rubber pads, special washers and self-locking nuts to anti-roll bar links.

Refit tie-rod ball-joint.

Fit wheels and lower car.

With weight of car on road wheels fully tighten all fastenings.

**FRONT SPRING**

**Remove and refit 60.20.01**

Service tools: Spring compressor tool JD 6F, or JD 6D and adaptor JD 6D-1 with spring locating pegs JD 6E-6.

**Removing**

Jack up front of car, place on stand and remove road wheel.

Fit spring compressor tool JD 6D with adaptor JD 6D-1 and compress spring sufficiently to relieve load on seat pan fastening.

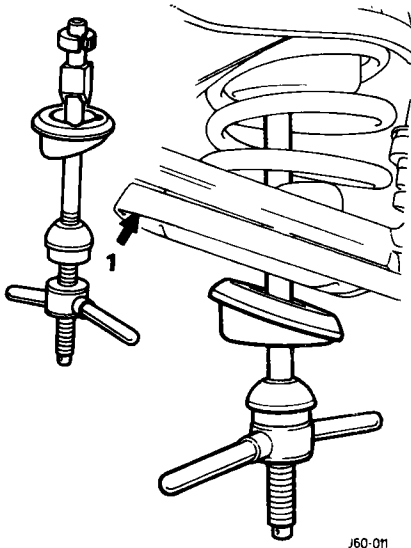


Fig. 11

Remove four setscrews and washers and two nuts, bolts and washers securing spring seat pan to lower wishbone.

Slacken spring compressor tool and remove, together with seat pan, spring and spacers.

**NOTE:** Record position of packers to assist during replacement.

**Refitting**

Remove handle nut and adaptors from spring compressor and offer threaded bar up through spring turret.

Secure at top end.

Assemble spring, packing and seat pan as noted in their removal, and lift up into spring turret, retain with handle nut and adaptors of spring compressor.

Fit pilot bolts (1, Fig. 11) to holes nearest centre line of car on forward and rear limbs of wishbone or insert locating pegs JD 6E-6 into tapped holes.

**NOTE:** A jack may be used beneath lower ball joint to assist with location of spring pan on pilot bolts. Compress spring, locating seat pan on pilot bolts, and tighten until setscrews and nuts, bolts and washers can be fitted in outer location.

Remove pilot bolts and fit two setscrews and washers.

Remove spring compressor.

Fit road wheel and remove stands. Check front suspension riding height.

**WARNING: A maximum of three packers may be fitted in the spring pan and two packers on the cross member.**

**BUMP STOP**

**Remove and refit 60.30.10**

**Removing**

Jack up front of car and place on stands.

Remove road wheel.

Remove two plain nuts (1, Fig. 12) and spring washers securing bump stop.

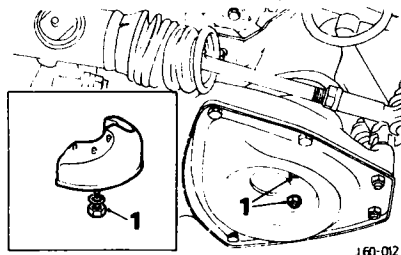


Fig. 12

Manoeuvre bump stop clear through coils of spring, prising coils carefully apart with bar if necessary.

**Refitting**

Reverse operations for removal. Tighten nuts to correct torque.

**REBOUND STOPS**

**Remove and refit 60.30.14**

**NOTE:** Rebound stops must only be replaced as a pair; uneven loads will be placed on upper wishbone if this is not done.

**Removing**

Jack up front of car and place stand beneath spring seat pan.

Lower car on to stand.

Remove road wheel.

Unscrew rebound stops (1, Fig. 13) from upper wishbone.

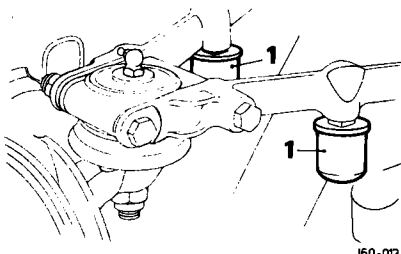


Fig. 13

**Refitting**

Reverse above operations, tightening stops to correct torque.

**FRONT HUB ASSEMBLY**

**Remove and refit 60.25.01**

**Removing**

Remove road wheel.

Through aperture in disc shield remove five bolts (1, Fig. 14) and washers holding hub assembly to brake disc.

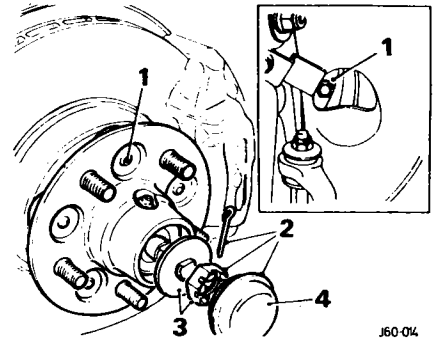


Fig. 14

Remove hub grease cap, extract split pin, and remove nut and washer from stub axle (2, Fig. 14); withdraw hub by hand.

**Refitting**

Pack hub with specified grease and refit to stub axle.

Fit bearing, nut and washer (3, Fig. 14) to stub axle and tighten nut to give end-float of 0.05 mm to 0.15 mm (0.002 in to 0.006 in).

**NOTE:** End-float is measured by fitting a dial test indicator with the button against the hub. Fit new split pin.

Refit grease cap (4, Fig. 14). Ensure that vent hole is clear.

Replace road wheel.

**FRONT HUB BEARINGS AND GREASE SEAL**

**Remove and refit 60.25.14**

**Removing**

Remove front hub assembly as detailed above. Extract grease seal (1, Fig. 15).

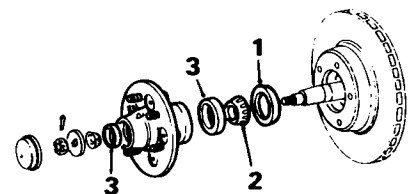


Fig. 15

Withdraw inner bearing race (2, Fig. 15) if necessary.

Drift bearing cups (3, Fig. 15) from hub; grooves are provided in the abutment shoulders for this purpose.

continued

## FRONT SUSPENSION

### Refitting

Tap replacement cups into position, ensuring that they are seated square to abutments, if bearings have been removed.

Lubricate large bearing race and fit to cup.

Fit new grease seal, using suitable 'bell-piece' and tapping seal squarely into position.

Replace front hub assembly and road wheel.

## FRONT HUB STUB AXLE

### Remove and refit

60.25.22

Service tool: Steering joint taper separator JD 24

### Removing

Jack up front of car and place stand beneath spring seat pan. Lower car to firmly locate on stand and remove road wheel. Remove self-locking nut and washer securing steering tie-rod ball joint (1, Fig. 16).

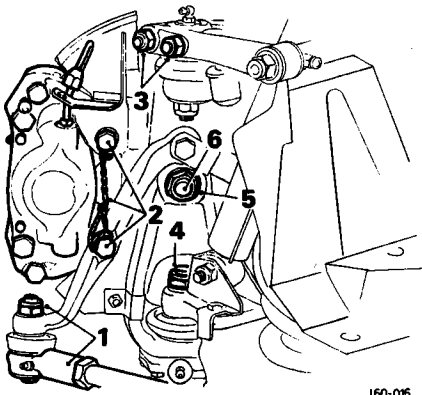


Fig. 16

Separate rod from steering arm using tool JD 24.

Suspend brake caliper by wires or strong cord from damper top mounting to prevent damage to hoses when ball-joints are disconnected.

Break locking wire and remove two bolts and spring washers (2, Fig. 16) securing steering arm and brake caliper to stub axle carrier. Swing caliper aside.

**NOTE:** Record number of shims fitted between steering arm and brake caliper. Recover large plain washer from between disc shield and caliper.

Remove two nuts, bolts and plain washers (3, Fig. 16) securing upper ball joint to upper wishbone levers.

**NOTE:** Take careful note of fitted position of bolts and also position of packing piece and shims; these control castor angle.

Remove self-locking nut and washer (4, Fig. 16) and separate lower ball-joint from wishbone; draw assembly from car.

Remove grease cap, split pin and castellated nut securing hub assembly to stub axle; draw assembly clear.

Remove nyloc nut and plain washer (5, Fig. 16) securing stub axle to stub axle carrier.

Support stub axle carrier and drift out stub axle (6, Fig. 16).

### Refitting

**CAUTION:** Bolts securing upper ball joint in upper wishbone must be fitted from front of car towards rear.

Reverse removal operations, ensuring that all shims are correctly replaced.

Tighten bolts and nuts to correct torque figures, wire lock caliper bolts and check wheel alignment, castor and camber angles.

## FRONT HUB STUB CARRIER

### Remove and refit

60.25.23

Service tool: Steering joint taper separator JD 24

### Removing

Remove front hub stub axle, see operation 60.25.22.

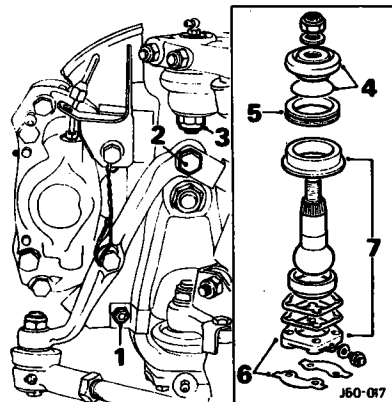


Fig. 17

Remove two nyloc nuts (1, Fig. 17) securing clamps at bottom of disc shields, remove attachment plate and rear disc shield.

Remove bolt (2, Fig. 17) spring and plain washer securing steering arm and forward disc shield to carrier.

Remove self-locking nut and washer (3, Fig. 17) and separate upper ball-joint from stub axle carrier, using separator JD 24.

Remove retaining ring and withdraw rubber gaiter (4, Fig. 17).

Withdraw retainer (5, Fig. 17) from top of ball pin.

Tap back tab washers and unscrew four setscrews securing ball pin cap (6, Fig. 17) to stub axle carrier.

Remove cap, shims, lower ball pin socket, ball pin and spigot (7, Fig. 17).

### Refitting

**CAUTION:** In order to obtain correct adjustment of the ball joint it is necessary to shim to the correct clearance. Excessive wear on ball pin and socket must not be adjusted by shims. Worn parts must be renewed.

Fit spigot, ball pin, socket, shims, ball pin cap and screws. Remove shims one by one until the ball pin is tight in its socket with screws fully tightened.

Remove screws, ball pin cap, shims and socket. Add shims to the value of 0,10 mm to 0,15 mm (0.004 in to 0.006 in).

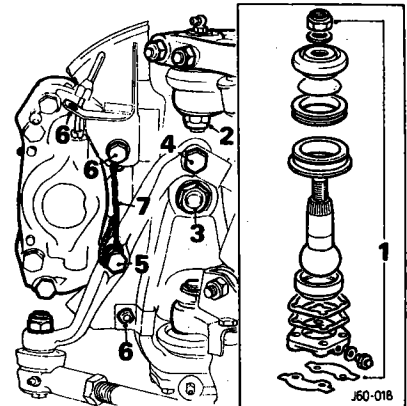


Fig. 18

Lightly grease ball pin and socket (1, Fig. 18). Refit socket, ball pin cap and new tab washers. Refit and tighten screws. Ball pin should now be slightly stiff in socket.

Fit upper ball joint to stub axle carrier and secure using one nyloc nut and washer (2, Fig. 18).

Fit stub axle and secure using new nyloc nut and plain washer (3, Fig. 18).

Assemble forward end of steering arm to its location and loosely secure using one bolt, plain and spring washer (4, Fig. 18).

Fit hub to stub axle.

Locate brake caliper on stub axle to carrier, and secure with long bolt (5, Fig. 18) and spring washer through steering arm. Fit shims removed in dismantling operations between steering arm and caliper.

Locate disc shields and secure using clamps, nyloc nuts (6, Fig. 18) and upper caliper bolt. Fit large plain washer between disc shield and caliper.

Tighten bolts to correct torque.

Fit stub axle carrier to wishbones and steering tie rod, disconnecting wire or cord supporting caliper.

Wire lock brake caliper bolts (7, Fig. 18), and check wheel alignment, castor and camber angles.

**FRONT DAMPER**

**Remove and refit 60.30.02**

**Removing**

Beneath bonnet, remove locknut, nut, outer washer, buffer and inner washer from damper front mounting (1, Fig. 19).

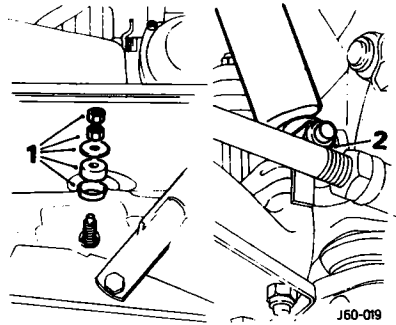


Fig. 19

Jack up front of car and place on stands. Remove road wheel. Remove self-locking nut and bolt from bottom mounting (2, Fig. 19). Withdraw damper from car. Collect shaped washer, micron buffer and plain washer from damper stem.

**Refitting**

Ensure that lower washers and buffer are in place on damper stem and insert stem through hole in wheel arch. Replace nuts and bolt; tighten to correct torque.

**WISHBONE UPPER**

**Remove and refit 60.35.01**

**Removing**

Jack up front of car and place stand beneath spring seat pan. Remove wheel.

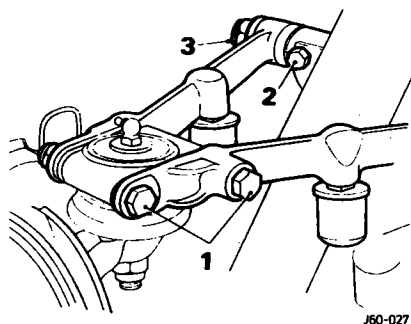


Fig. 20

Remove two nuts, bolts (1, Fig. 20) and plain washers securing upper ball-joint to upper wishbone levers.

**NOTE:** Take careful note of fitted position of bolts and also position of packing piece and shims, these control castor angle.

Tie stub axle carrier to road spring turret to prevent damage to brake flexible hose. Remove two bolts (2, Fig. 20), special washers and nyloc nuts securing upper wishbone fulcrum shaft to road spring turret.

**NOTE:** Take careful note of position of shims as these control camber angle. Manoeuvre wishbone assembly clear of damper unit.

**Refitting**

Ensure that fulcrum shaft nuts are loose, and not clamping bushes before refitting bolts (2, Fig. 20). Check replacement of shims. Replace bolts and nuts (1, Fig. 20) with castor shims. Tighten bolts to specified torques, then replace wheel and lower car BEFORE tightening fulcrum shaft nuts (3, Fig. 20). Check wheel alignment, castor and camber angles and adjust if necessary.

**SUSPENSION UNIT MOUNTING BUSH**

**Remove and refit 60.35.06**

**NOTE:** A worn or damaged bush infers that undue strain has been thrown upon the apparently satisfactory opposite number. Bushes must therefore be changed as a pair.

**Removing**

Raise front of car by using trolley jack under suspension cross-beam; place stands (1, Fig. 21) under jacking points and lower jack to release load from bushes. Remove self-locking nut (2, Fig. 21) securing one mounting bolt and drift bolt clear of bush.

**NOTE:** Record position of plain and special washers, and securing bracket if fitted.

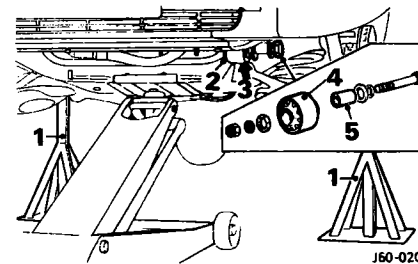


Fig. 21

Slacken clamping nut (3, Fig. 21) and bolt securing relevant mounting bush eye. Lower jack SLIGHTLY to improve access to bush and tap mounting bush (4, Fig. 21) clear of eye.

Remove sleeve (5, Fig. 21) from mounting bush. Repeat the removal operations for opposite bush.

**Refitting**

Reverse the removal operations, tightening nuts to correct torque figures.

**SUSPENSION UNIT MOUNTING —REAR**

**Remove and refit 60.35.07**

**NOTE:** A worn or damaged mounting infers that undue strain has been thrown on the apparently satisfactory opposite number. Mountings must therefore be changed as a pair.

**Removing**

Remove front exhaust pipe, see operation 30.10.09. Slacken self-locking nuts securing mounting bolts. Raise front of car and support body on stands (1, Fig. 22). Remove both front wheels. Locate trolley jack to support front suspension unit cross-beam.

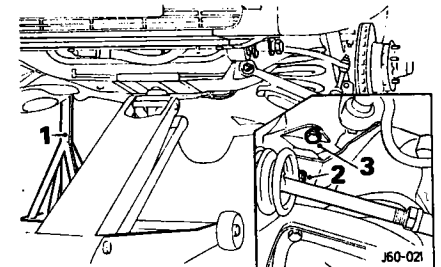


Fig. 22

Remove self-locking nuts and washers (2, Fig. 22) securing suspension unit to mountings. Carefully lower rear of suspension unit just sufficient to remove two special setscrews and lock washers securing each mounting to body sub-frame (3, Fig. 22).

**Refitting**

**NOTE:** Mountings are offset. Position mountings and secure to body sub-frame using special setscrews and lock washers. Tighten to correct torque figure. Raise rear of suspension unit and secure to mountings using two self locking nuts and plain washers. Tighten to correct torque figure. Replace exhaust pipe and front wheels.

## FRONT SUSPENSION

### FRONT SUSPENSION

#### Remove and refit

60.35.05

Service tools: Engine support bracket MS.53A; rack centralising tool 18G 1466.

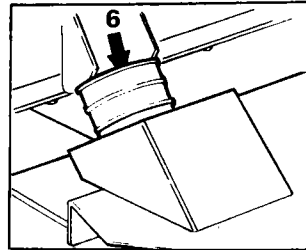
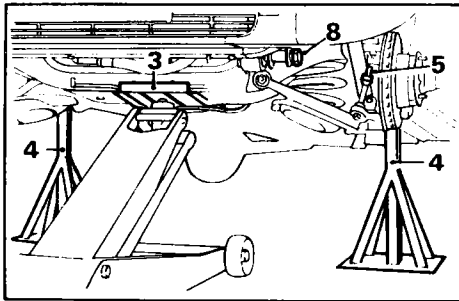
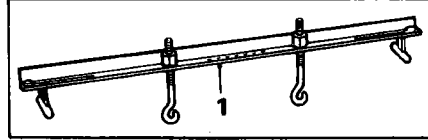
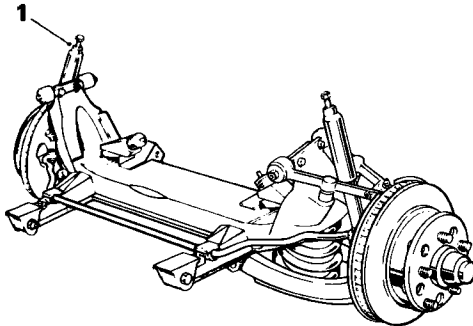
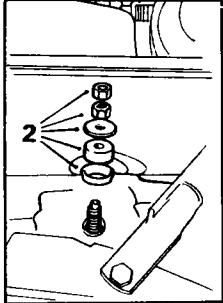


Fig. 23

J60-072

#### Removing

Disconnect battery earth lead and remove air cleaner.

Fit engine support bracket MS.53A (1, Fig. 23) to engine front lifting eyes. Adjust links until engine is just supported.

Remove locknut, nut, plain washer, rubber and cup (2, Fig. 23) securing upper end of each damper.

Jack up front of car (3, Fig. 23) place on stands (4, Fig. 23) and remove front wheels.

Remove self-locking nut (5, Fig. 23) securing each anti-roll bar link to anti-roll bar, withdraw cup washers and rubbers.

Turn steering to full lock and cut locking wire at caliper bolts now accessible. Remove bolts securing caliper and steering lever; remove caliper from disc and suspend by wire or cord to avoid damage to hose. Collect shims.

Turn steering to opposite lock and repeat above operation.

Remove nuts securing engine mountings to mounting brackets (6, Fig. 23).

Remove nuts securing cross-beam rear mountings (7, Fig. 23)

Remove steering rack mounting bolts and tie up both ends of rack under engine. Collect packing and rubbers from mountings.

Place trolley jack under centre of cross-beam and raise to take weight of beam.

Remove cross-beam mounting bolts (8, Fig. 23); collect packing washers and towing brackets

Lower jack and remove cross-beam and suspension units. Transfer to work bench, using adequate lifting tackle.

#### Refitting

Reverse removal procedure, fitting front cross-beam mountings first, then jacking up beam to align rear mountings.

Check that towing brackets are in position and all spacers fitted before lowering engine.

Ensure that washers and rubbers are correctly in position on damper stems, and fit upper washers, rubbers and nuts as shown in removal instructions. Connect anti-roll bar links, and replace steering rack; check correct centralization of single lug.

Refit calipers and steering arms with correct shims.

Tighten all bolts and nuts to correct torque figures.

Replace wheels.

Check rack setting, using tool no. 18G 1466, and adjust as necessary. See steering, section 57.

Check wheel alignment, castor and camber angles.

### WISHBONE—LOWER

#### Remove and refit

60.35.02

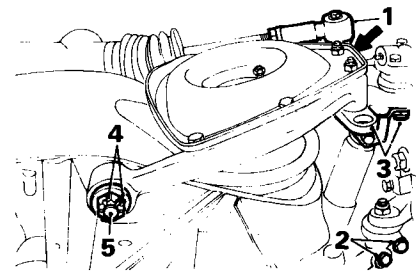
Service tools. Steering joint taper separator JD 24. Spring compressor JD 6D and adaptor JD 6D-1. Spring plate locating pegs JD 6E-6.

#### Removing

Remove front suspension unit, see operation 60.35.05 (XJ12 only). Invert unit.

Remove self-locking nut and washer (1, Fig. 24) securing steering tie-rod ball joint. Separate rod from steering arm using tool JD 24.

Remove three bolts, nuts and washers securing steering rack to front suspension cross-member. Remove front spring.



J60-073

Fig. 24

Remove two nuts, bolts and plain washers (2, Fig. 24) securing upper ball-joint to upper wishbone levers.

**NOTE:** Take careful note of fitted position of bolts and also position of packing piece and shims; these control castor angle.

Remove self-locking nut and washer (3, Fig. 24), and separate lower ball-joint from wishbone. Recover anti-roll bar support bracket and damper unit mounting.

Remove split pin at fulcrum shaft nut (4, Fig. 24) and remove nut and plain washer.

Drift fulcrum shaft (5, Fig. 24) from cross-member and recover two washers.

#### Refitting

Reverse above operations.

**CAUTION:** Do not fully tighten fulcrum shaft nut until full weight of car is on suspension.

Fully tighten fulcrum shaft nut to correct torque and fit new split pin.

Check front wheel alignment.

Check castor angle and camber angle.

**WISHBONE—LOWER**

**Overhaul 60.35.09**

Remove lower wishbone, as detailed in operation 60.35.02.

**Dismantling**

Using a press and suitable mandrel, remove bushes from wishbone arms.

**Reassembling**

Using a press and suitable mandrel fit new bushes to wishbone arms, ensure each bush is central in arm.

**CAUTION:** New bushes must be coated with Esso Process Oil 'L' before they are pressed in to wishbone arms.

Refit lower wishbone.

**FRONT HUB STUDS**

**Remove and refit 60.25.29**

**Removing**

Remove front hub, see operation 60.25.01. Using power press and suitable mandrel, press stud/s (1, Fig. 25) from hub.

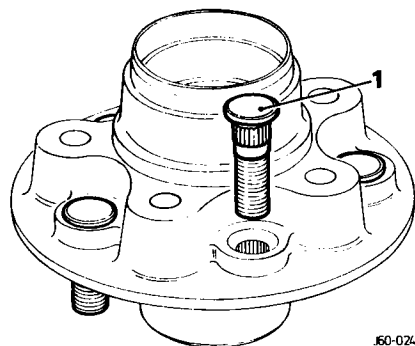


Fig. 25

**Refitting**

Use power press and suitable mandrel to press stud/s into hub. Refit front hub

**WISHBONE—UPPER**

**Overhaul 60.35.08**

Remove upper wishbone, see operation 60.35.01

**Dismantling**

Remove self-locking nut (1, Fig. 26) at each end of fulcrum shaft and recover plain washers and bushes.

Using a press and suitable mandrel, remove bushes (2, Fig. 26) from wishbone arms.

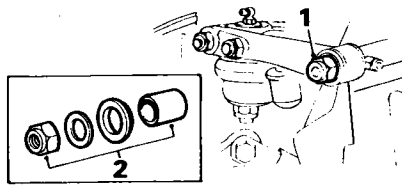


Fig. 26

**Reassembling**

Using a press and suitable mandrel, fit new bushes to wishbone arms. Ensure each bush is central in arm.

**CAUTION:** New bushes must be coated with Esso Process Oil 'L' before they are pressed into wishbone arms.

Assemble wishbone arms to fulcrum shaft, using new bushes, and retain with plain washers and self-locking nuts.

**CAUTION:** Do not fully tighten at this stage.

Fit upper wishbone. Tighten to correct torque.

**BALL-JOINT—LOWER**

**Overhaul 60.15.13**

Service tool: Steering joint taper separator JD 24.

**Removing**

Jack up front of car and place stand beneath spring seat pan. Lower car to firmly locate on stand. Remove road wheel. Remove self-locking nut and washer securing steering tie-rod ball joint (1, Fig. 27).

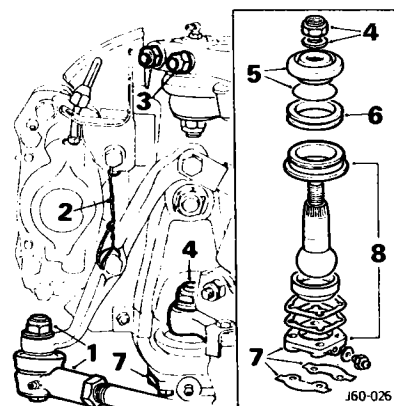


Fig. 27

Separate rod from steering arm using service tool JD 24. Cut locking wire (2, Fig. 27), withdraw two set bolts and suspend caliper to prevent damage to hose. Remove two nuts (3, Fig. 27) bolts and plain washers securing upper ball joint to upper wishbone levers

**NOTE:** Take careful note of fitted position of bolts and also position of packing piece and shims; these control castor angle.

Support hub and stub axle carrier assembly and separate upper ball joint from upper wishbone. Remove self-locking nut (4, Fig. 27) and washer and using service tool JD 24 separate lower ball joint from wishbone, withdraw assembly from car.

Remove retaining ring and withdraw rubber gaiter (5, Fig. 27).

Withdraw retainer (6, Fig. 27) from top of ball pin.

Tap back tab washers (7, Fig. 27) and unscrew four setscrews securing ball pin cap to stub axle carrier.

Remove cap, shims, lower ball pin socket, ball pin and spigot (8, Fig. 27).

**Overhaul**

Clean and inspect all components.

**CAUTION:** In order to obtain correct adjustment of ball joint it is necessary to shim to correct clearance. Excessive wear on ball pin and sockets must not be adjusted by shims. Worn parts must be renewed.

Fit spigot, ball pin, socket, shims, ball pin cap and screws. Remove shims one by one until the ball pin is tight in its socket with screws fully tightened.

Remove screws, ball pin cap, shims and socket. Add shims to the value of 0,10 mm to 0,15 mm (0.004 in to 0.006 in).

**NOTE:** The correct adjustment of the ball pin is achieved by limiting the vertical lift of the ball pin, without lubrication, to 0,025 — 0,203 mm (0.001 — 0.008 in). When grease is added the torque required to move the ball pin must not exceed 1 Nm (9 lbf.in).

Lightly grease ball pin and socket. Refit socket, ball pin cap and new tab washers. Refit and tighten screws. Ball pin should now be slightly stiff in socket.

**Refitting**

**CAUTION:** Bolts securing upper ball joint in upper wishbone must be fitted from front of car towards rear.

Reverse removal operations, fitting upper ball joint to stub axle carrier before securing it to the wishbone.

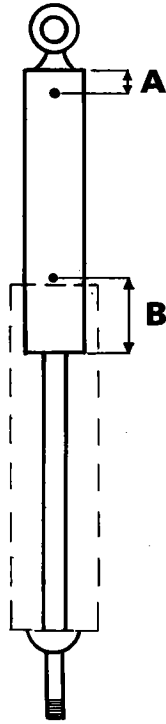
Tighten all nuts and bolts to correct torque.

Check front wheel alignment, castor and camber angle.



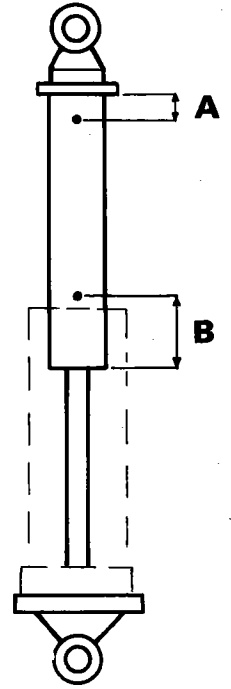
**FRONT SUSPENSION**

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A = 20 mm (0.8 in)

B = 50 mm (2.0 in)



JSI.268

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# REAR SUSPENSION

## DESCRIPTION

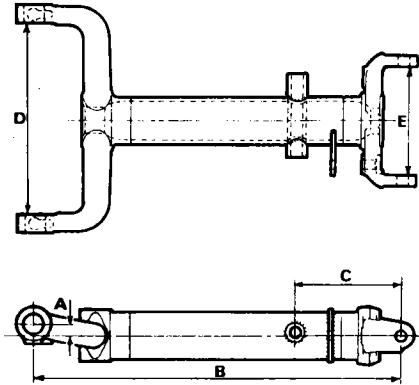
The complete independent rear suspension system is mounted on a fabricated sheet metal cross-beam (1, Fig. 1) which also carries the final drive unit (2, Fig. 1) and is rubber mounted to the body/chassis structure. Although geometrically similar to a double wishbone system, the upper members are replaced by the drive shafts (3, Fig. 1) and the lower members, (4, Fig. 1) with their inner ends pivoted on the final drive unit, are made torsionally strong to resist drive and braking loads which are partially transmitted by radius rods to the body structure.

The wheel hubs (5, Fig. 1) are carried in aluminium alloy castings (6, Fig. 1) which are pivoted to the outer ends of the lower members; brakes are carried inboard, on the final drive unit, and two coil spring and damper units (7, Fig. 1) are fitted on each side of the drive shafts. The lower rear pick-up points of the dampers are connected by plates with the hub carrier pivots; these plates provide the down points for use in transportation of the car.

**WARNING: If car is fitted with a Powr-Lok differential, under no circumstance must engine be run with car in gear and one rear wheel off the ground. If it is found necessary to turn transmission with car in gear, both wheels must be raised.**

## DIMENSIONAL DATA

The dimensional drawing is provided to assist in assessing accidental damage. A component suspected of being damaged should be removed from the car and cleaned off, the dimensions should then be checked and compared with those given in Fig. 2.

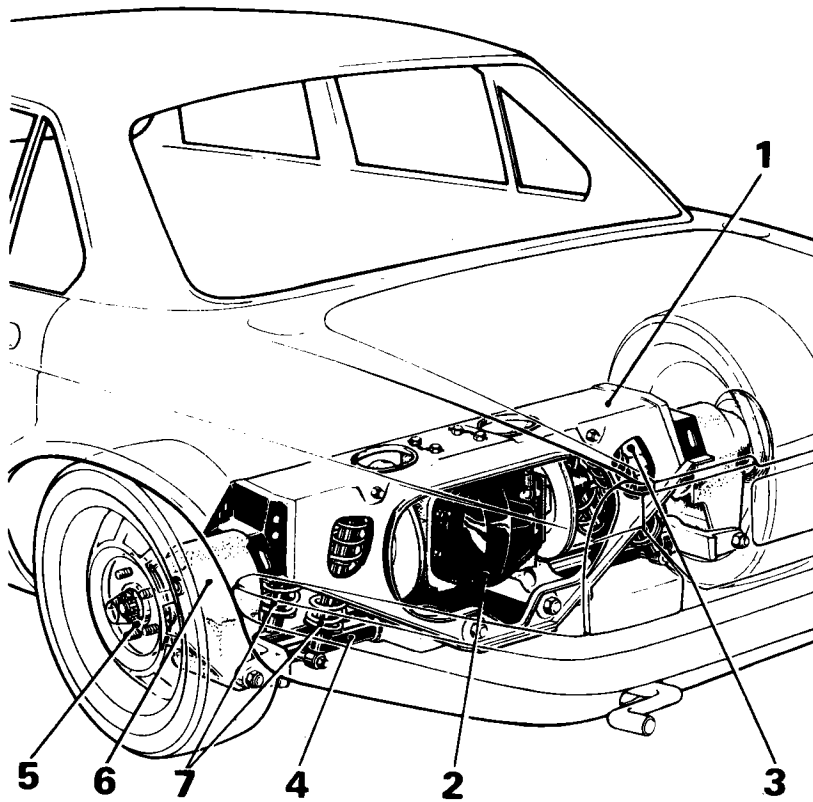


J64-001

Fig. 2

### Dimension

- A. 15,75 to 16,26 mm (0.62 to 0.64 in)
- B. 519,43 to 519,94 mm (20.45 to 20.47 in)
- C. 150,62 to 151,13 mm (5.93 to 5.95 in)
- D. 270,05 to 270,31 mm (10.632 to 10.642 in)
- E. 155,45 to 155,70 mm (6.12 to 6.13 in)



J64-034

Fig. 1

## TORQUE WRENCH SETTINGS

ITEM	DESCRIPTION	TIGHTENING TORQUE		
		Nm	kgf m	lbf ft
Clip, exhaust pipe	$\frac{5}{16}$ in U.N.F. nut	14,9 to 17,6	1,53 to 1,79	11 to 13
Bottom tie plate	$\frac{5}{16}$ in U.N.F. nuts and bolts	19,0 to 24,4	1,94 to 2,48	14 to 18
Inner fulcrum bracket attachment	$\frac{7}{16}$ in U.N.C. bolts	81,3 to 88,0	8,30 to 8,98	60 to 65
Inner fulcrum shaft nuts	$\frac{1}{2}$ in U.N.F. nuts	61,0 to 67,8	6,23 to 6,91	45 to 50
Outer fulcrum shaft nuts	$\frac{9}{16}$ in U.N.F. nuts	131 to 145	13,4 to 14,8	97 to 107
Drive shafts to hub carriers	$\frac{3}{4}$ in U.N.F. nut	136 to 163	13,83 to 16,6	100 to 120
Radius arms to wishbones	$\frac{1}{2}$ in U.N.F. bolt	81,3 to 94,4	8,30 to 9,68	60 to 70
Safety straps and radius arms to body	$\frac{7}{16}$ in U.N.F. bolt	54,2 to 61,0	5,54 to 6,22	40 to 45
Safety straps to floor panel	$\frac{3}{8}$ in U.N.F. bolt	37,6 to 43,4	3,74 to 4,42	27 to 32
Damper attachments	$\frac{7}{16}$ in U.N.F. nut	43,4 to 48,8	4,43 to 4,97	32 to 36
Mounting brackets to body	$\frac{3}{8}$ in U.N.F. nut	37,6 to 43,3	3,74 to 4,42	27 to 32
Mounting brackets to beam	$\frac{5}{16}$ in U.N.F. nut	19,0 to 24,4	1,94 to 2,48	14 to 18
Bump stops to body	$\frac{5}{16}$ in U.N.F. nut	10,8 to 13,6	1,10 to 1,38	8 to 10
Wheel nuts	Special nuts	61,0 to 88,0	6,23 to 8,98	45 to 65

**REAR SUSPENSION HEIGHT**

**Check 64.25.12**

Ensure radiator is topped up with coolant. Ensure engine sump is filled to correct level with specified lubricant. Ensure tyre pressures are correct.

Note contents of fuel tanks by switching on ignition and switching from one tank to another.

**NOTE:** Fuel tanks hold a total of 20 Imperial gallons (24 U.S. gallons or 9.1 litres). Calculate ballast weights required to represent difference between weight of fuel tank contents and weight of full tanks. Full fuel tanks total approximately 73 kg (160 lb).

Place ballast weights required in centre of luggage compartment floor. Roll car forward three lengths on perfectly level surface.

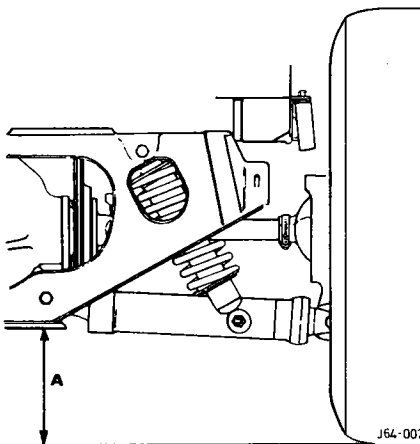


Fig. 3

Measure distance between lower surface of rear cross member and ground at both sides of car. (Dimension A in Fig. 3 must be 189 mm  $\pm$  6.4 mm (7.45  $\pm$  0.25 in).

If dimension is not correct, check all bushes and bearing points of rear suspension. If the cause is not discovered, rear road springs must be changed. Remove all four springs and change as complete set.

**REAR SUSPENSION CAMBER ANGLE**

**Check and adjust 64.25.18**

**Service tool:** Setting links JD 25B.

**Checking**

Set car on level surface. Ensure tyre pressures correct. Hook one end of setting link tool (1, Fig. 4) JD 25B, in lower hole of rear mounting, depress body until other end of setting link can be slid over outer wishbone fulcrum nut. Repeat on other side of car.

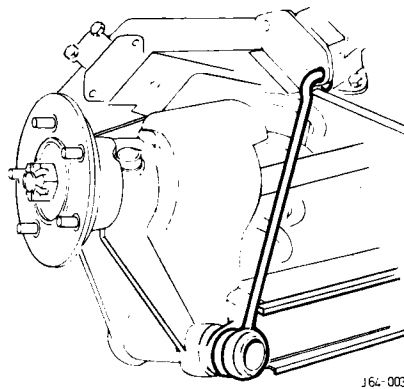


Fig. 4

Set camber gauge (1, Fig. 5) against each rear tyre and read off camber angle. The correct reading should be  $\frac{3}{4}^{\circ} \pm \frac{1}{4}^{\circ}$  negative. If these limits are not met, note deviation and adjust camber angle.

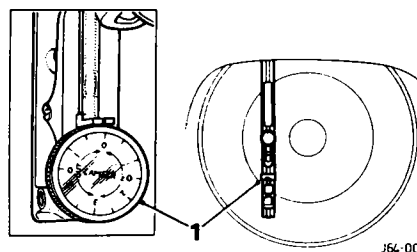


Fig. 5

If result satisfactory remove setting links.

To adjust the camber angle

Remove setting links.

Jack up rear of car, place stands to support body and remove road wheel.

Remove lower wishbone outer fulcrum grease nipple.

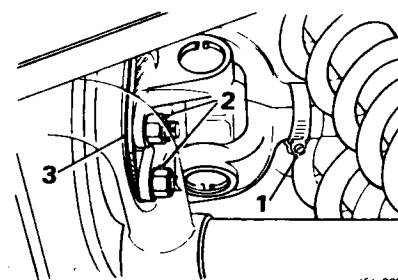


Fig. 6

Release clip (1, Fig. 6) securing inner universal joint cover. Slide cover clear of joint. Remove four steel locknuts (2, Fig. 6) securing drive shaft flange (3, Fig. 6) to brake disc.

Separate drive shaft from disc to enable shims to be fitted.

**NOTE:** Addition of one shim, 0.5 mm (0.020 in) will alter camber position  $\frac{1}{4}^{\circ}$ .

Add or remove shims as required.

Replace drive shaft, cover, nipple and wheel. Remove car from stands and re-check camber angle.

**REAR HUB BEARING END-FLOAT**

**Check and adjust 64.15.13**

**Service tools:** Hub remover JD 1D. Thread protector JD 1C-7. Backlash gauge JD 13.

**NOTE:** End-float is controlled by a spacer located next to the universal joint on the hub shaft. Spacers are available in thickness from 2.77 mm (0.109 in) to 3.84 mm (0.151 in) in 0.076 mm (0.003 in) steps.

End-float is normally 0.026 to 0.076 mm (0.001 to 0.003 in) and **MUST** be rectified if it exceeds 0.127 mm (0.005 in) by changing the spacer for a thicker one.

**Checking**

Raise car and place on stands.

Remove rear road wheel and tap hub towards car.

Clamp tool JD 13A (1, Fig. 7) to hub carrier web, as shown, so that stylus of dial gauge contacts hub flange.

Note reading of dial gauge (2, Fig. 7).

Using two levers (3, Fig. 7) between hub and hub carrier boss, press hub outwards. Take care not to damage water thrower.

Note altered reading on dial gauge.

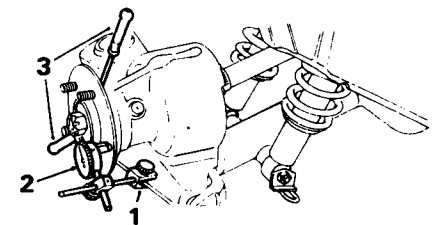


Fig. 7

**NOTE:** The difference between dial gauge readings represents end-float of hub bearings. If this exceeds 0.127 mm (0.005 in) refer to 'Adjusting' procedure.

Otherwise, remove tool and gauge and refit road wheel.

**Adjusting**

Remove split pin, nut and washer from end of drive shaft.

Remove fulcrum shaft grease nipple from hub carrier.

Place thread protector on end of drive shaft.

Fit hub puller JD 1D to rear hub and secure. Withdraw hub and carrier from drive shaft and remove hub puller and thread protector.

Remove spacer from drive shaft and measure thickness with micrometer.

**NOTE:** A simple calculation will give the thickness of spacer required to reduce end-float to specified 0.026 to 0.076 mm (0.001 to 0.003 in) i.e. If end-float measured above was 0.203 mm (0.007 in) a replacement spacer will need to be 0.127 mm (0.005 in) thicker than that removed to reduce end-float to 0.051 mm (0.002 in).

*continued*

**Refitting**

Position fulcrum bracket against final drive unit and locate loosely with two setscrews. Replace shims (3, Fig. 23) between bracket and final drive unit. Tighten mounting setscrews to correct torque and wire lock. Replace spacer tube between lugs of fulcrum bracket. Clean, inspect and grease wishbone bearings, thrust washer etc. Refit with new oil seals. Offer up wishbone to fulcrum bracket lugs and locate with dummy shafts (1, Fig. 24) tool number JD 14. Take great care not to displace any components during this operation.

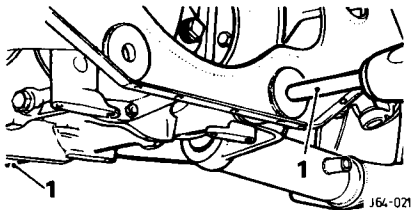


Fig. 24

Drift dummy shafts from fulcrum bracket with fulcrum shaft. Restrain dummy shafts to prevent spacers or thrust washers dropping out of position. Tighten fulcrum shaft nut to correct torque. Remove wire suspending hub assembly from cross-beam. Replace damper lower mounting shaft, refitting spacer and tie-down bracket. Tighten nuts to correct torque. Clean spigot on body, raise radius arm and replace bolt. Tighten to correct torque and wire-lock bolt. Bolt anti-roll bar link to radius arm and tighten. Replace bottom tie-plate and tighten bolts and setscrews to correct torque. Replace road wheel. Remove car from stands.

**RADIUS ARM**

**Remove and refit 64.35.28**

**Removing**

Jack up rear of car and support on stands forward of radius arm anchor points. Remove rear road wheel. Remove special bolt and spring washer (1, Fig. 25) securing safety strap to body.

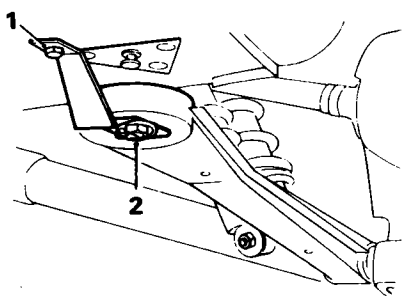


Fig. 25

Remove locking wire and bolt (2, Fig. 25) securing radius arm to body; remove safety strap. Remove self-locking nut and flat washer (1, Fig. 26) securing forward damper assembly lower mounting pin.

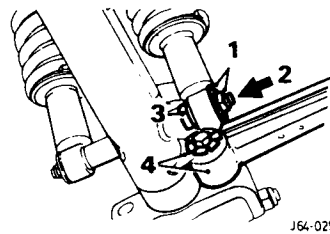


Fig. 26

Drift mounting pin to rear of wishbone clearing damper assembly mounting boss and spacer (2, Fig. 26). Recover spacer (3, Fig. 26) and swing damper assembly to centre line of car. Turn down tab washer and remove bolt (4, Fig. 26) securing radius arm to wishbone; remove radius arm. Examine radius arm bushes and replace as necessary.

**Refitting**

**NOTE:** Prior to fitting radius arm to body spigot, wire brush spigot and smear with waterproof grease. Reverse removal operations, tightening bolts and nuts to correct torque figures. Renew locking wire and tab washer.

**RADIUS ARM BUSHES**

**Remove and refit 64.35.29**

Service tool: Mandrel JD 21

**Removing** — See Fig. 27

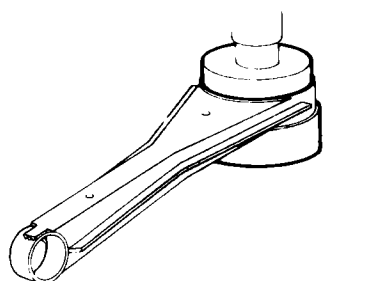


Fig. 27

Remove radius arm. Use mandrel tool JD 21 and press front bush from housing. Use mandrel tool JD 21 and press rear bush from housing.

**Refitting**

Press new bush into rear bush housing so that bush is central in radius arm. Use mandrel and press new bush into front bush housing so that holes in bush rubber are in line with centre line of radius arm. Press bush into radius arm until bush ring is flush with bush housing. When pressing bush, have small hole in bush core upwards. Refit radius arm.

**REAR HUB WHEEL STUDS**

**Remove and refit 64.15.26**

**Removing**

Remove rear hub and carrier assembly. Support hub carrier and press out hub using hand press (1, Fig. 28) and suitable mandrel.

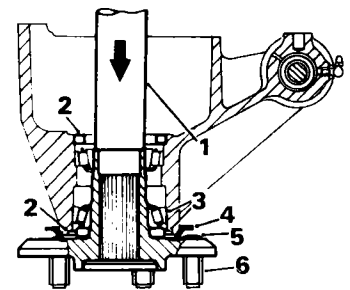


Fig. 28

Prise old oil seal (2, Fig. 28) from hub. Draw outer bearing and oil seal track (3, Fig. 28) from hub. Using a narrow, sharp cold chisel, open peening securing water thrower. Remove thrower (4, Fig. 28). Support hub, and file or grind staking from faulty stud/s (5, Fig. 28). Unscrew stud/s (6, Fig. 28/1, Fig. 29) from hub flange.

**Refitting**

Screw new stud/s into hub and stake in four places to back of flange (2, Fig. 29).

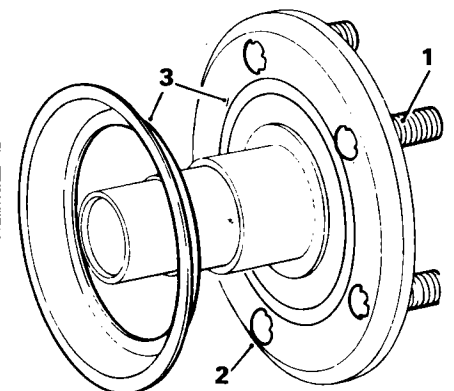


Fig. 29

continued

## REAR SUSPENSION

Fit water thrower to hub and use blunt cold chisel to peen over flange in three or four places (3, Fig. 29).

Press oil seal track and outer bearing race on to hub.

Press new outer and inner oil seals into hub.

Fit hub into hub carrier and pack with suitable grease.

Locate inner bearing over hub and press into position.

Refit rear hub and carrier assembly.

## REAR SUSPENSION UNIT

### Overhaul 64.25.06

The rear suspension unit is an assembly comprising individual units, the removal, refitting and overhaul of each being covered elsewhere in this Manual.

For this reason, an overhaul procedure is not given for the rear suspension unit assembly, although it is advisable to check all bushes, fulcrum bearings and oil seals for damage or leakage whenever the unit is removed from the car.

## REAR HUB AND CARRIER ASSEMBLY

### Overhaul 64.15.07

**Including WISHBONE OUTER FULCRUM BEARINGS—Remove and refit 64.35.16 and REAR HUB OIL SEALS—Remove and refit 64.15.15.**

Service tools: Master spacer JD 15. Dummy shaft JD 14. Press tool JD 16C. Hand press 47. Press tool JD 20A. Tool JD 20A-1. Adaptor JD 16C-1.

### Dismantling

Remove rear hub and carrier assembly.

Prise out oil seal retainers (1, Fig. 30) from fulcrum shaft housing and remove seals, dummy shaft, bearings, distance tubes and shims (2, Fig. 30).

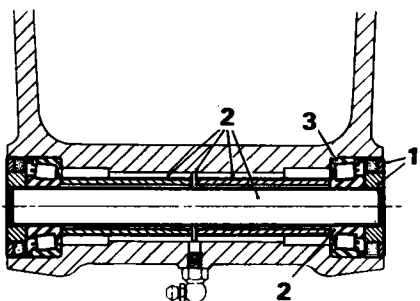


Fig. 30

Mount hub carrier in vice and drift out bearing cups (3, Fig. 30) from fulcrum shaft housing.

Transfer hub carrier to press and remove hub assembly from carrier.

Drift out inner hub bearing cup, with seal and bearing, from hub carrier.

Drift out outer bearing cup.

Fit hand press 47 with adaptors JD 16C-1 to hub and pull outer bearing from hub.

Remove oil seal track from hub shaft and clean and inspect all parts.

**NOTE:** When inspecting components, pay particular attention to oil seal tracks; a minute score can considerably shorten oil seal life. For further details on inspection of seals and bearings refer to 'General Fitting Instructions'.

### Reassembling

Replace outer oil seal track (1, Fig. 31) on hub shaft.

Press outer bearing cone (2, Fig. 31) into position on hub shaft and grease bearing with 70 cc of Retinax 'A'.

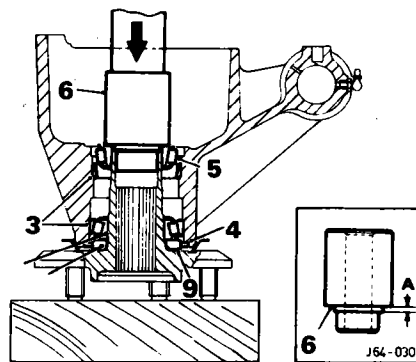


Fig. 31

Press outer and inner cups of bearings (3, Fig. 31) into hub carrier, using tool JD 20A with adaptor JD 20A-1.

Drift new outer oil seal (4, Fig. 31) into position in hub carrier and lower carrier on to hub shaft and outer bearing.

Place inner bearing (5, Fig. 31) into position for fitting.

Place master spacer JD 15 (6, Fig. 31) in position as shown and press bearing on to hub shaft.

Transfer hub and carrier assembly to vice, set up dial gauge (1, Fig. 32) and spacer (2, Fig. 32) JD 15 as shown and measure end-float, lifting carrier by using two screwdrivers (3, Fig. 32) as levers.

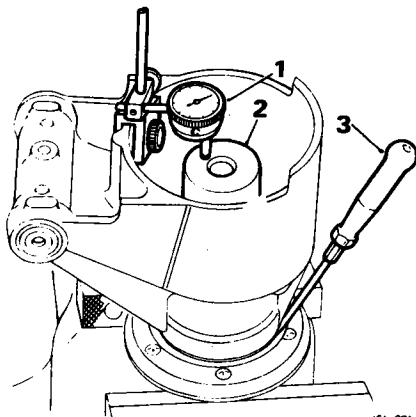


Fig. 32

Select spacer to be fitted on drive shaft.

**NOTE:** Master spacer has a diameter of length 'A' equivalent to a spacer of 3,81 mm (0.15 in). Calculate the spacer required to give end-float of 0,025 to 0,076 mm (0.001 to 0.003 in).

Spacers are supplied in thicknesses of 2,77 to 3,84 mm (0.109 to 0.151 in) in steps of 0,076 mm (0.003 in) and are lettered A to R (less letters I, N and O).

SPACER LETTER	mm	THICKNESS inches
A	2,77	0.109
B	2,85	0.112
C	2,92	0.115
D	3,00	0.118
E	3,07	0.121
F	3,15	0.124
G	3,23	0.127
H	3,30	0.130
J	3,38	0.133
K	3,45	0.136
L	3,53	0.139
M	3,61	0.142
P	3,68	0.145
Q	3,76	0.148
R	3,84	0.151

For example, assume end-float to be 0,66 mm (0.026 in). Subtract required nominal end-float of 0,050 mm (0.002 in) from measured end-float giving 0,61 mm (0.024 in). Since special collar is 3,81 mm (0.150 in) thick, the thickness of the spacer to be fitted will be 3,8 mm - 0,61 mm, i.e. 3,20 mm (0.126 in). The nearest spacer is 3,23 mm (0.127 in) so letter G spacer should be fitted in place of special collar.

Remove adaptor and fit new inner bearing oil seal to hub carrier.

Fit fulcrum shaft bearing cups to hub carrier and insert one bearing.

Secure fulcrum shaft vertically in suitably protected jaws of vice and slide bearing in hub carrier over shaft.

Replace distance tubes and shims as removed in dismantling, adding 0,25 mm (0.010 in) extra shims. (One extra 0,076 mm (0.003 in) shim and one extra 0,178 mm (0.007 in) shim.

Fit second bearing over fulcrum shaft, remove hub assembly from vice and replace oil seal tracks outside bearings.

Place a large washer (1, Fig. 33) (e.g. inner fork thrust washer) next to one oil seal track.

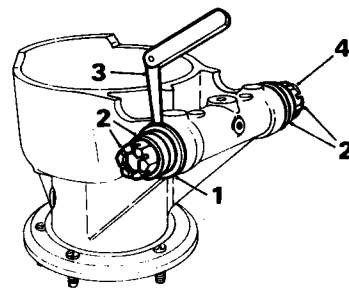


Fig. 33

Cover exposed plain length of fulcrum shaft with suitable temporary spacers, (2, Fig. 33) fit nuts and tighten to correct torque.

Apply pressure to fulcrum shaft at large washer end, turning it to settle taper rollers and using feeler gauge (3, Fig. 33) measure minimum distance between large washer and hub carrier.

Apply pressure to opposite end of fulcrum shaft (4, Fig. 33) and measure maximum distance between washer and hub carrier.

**NOTE:** End play of fulcrum shaft in hub carrier is now obtained by subtracting the minimum measurement from the maximum measurement.

This end play must be replaced by a pre-load of 0,05 mm (0.002 in) by removing shims, to a total thickness of 0,05 mm (0.002 in) more than the end play, from between spacer tubes: For example:

Assume end play found to be 0,25 mm (0.010 in).

Therefore shims to the value of  $0,25 + 0,05$  mm = 0,30 mm ( $0.010 + 0.002$  in = 0.012 in) must be removed to give correct pre-load.

Release nut from large washer end of fulcrum shaft and detach spacers, washer, oil seal track and bearing.

Remove one spacer tube and extract shims to thickness established to give pre-load. Replace spacer tube, pack fulcrum shaft housing with grease and replace bearing and oil seal track.

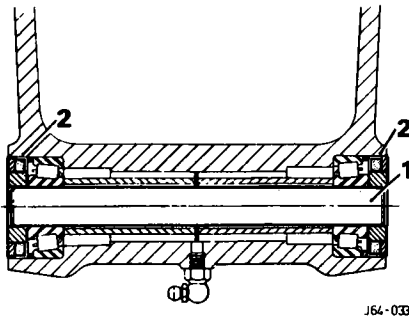


Fig. 34

Push out fulcrum shaft by inserting dummy shaft (1, Fig. 34) and detach temporary spacers from fulcrum shaft. Check that oil seal tracks are in position.

Press new oil seals (2, Fig. 34) into fulcrum shaft housings and secure with oil seal retainers.

Replace rear hub and carrier assembly, see operation 64.15.01.

**REAR SUSPENSION MOUNTINGS**

**Inspect 64.25.00**

Drive the vehicle on to a ramp and position a ramp jack under the jacking point, in front of the rear radius arm body mounting.

Raise the ramp sufficiently to allow either the rear wheel to clear the ramp, or until the distance between the lower edge of the rear quarter valance and the ramp is 34 cm (13.5 in). **DO NOT** exceed this distance.

Visually inspect the condition of the rubber, and the rubber/metal bonding.

If the rubber shows signs of cracking, or there is unbonding of the rubber to a depth greater than 3,175 mm (0.125 in), then the mounting must be replaced.

If a visual inspection is not conclusive, insert a lever between the two 'V's of the mounting and apply pressure.

Check the rubber for cracking and the rubber/metal bonding.

Repeat the procedure for the other side.

**DAMPER SAFETY 64.30.00**

See page 60—10.