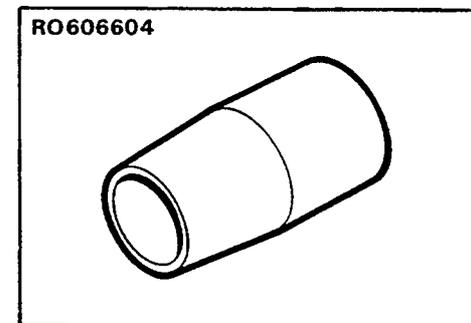
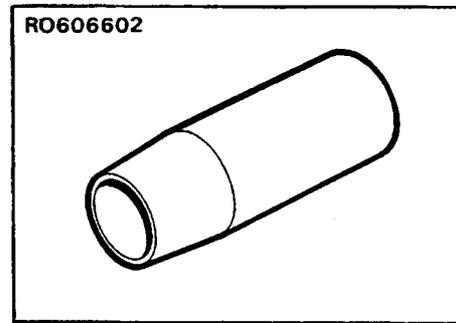
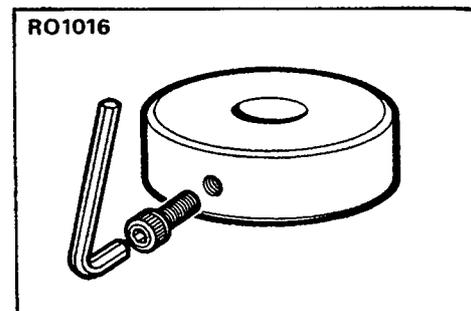
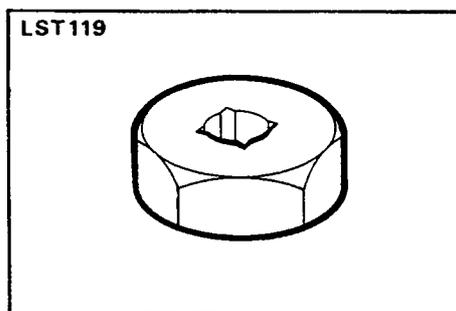
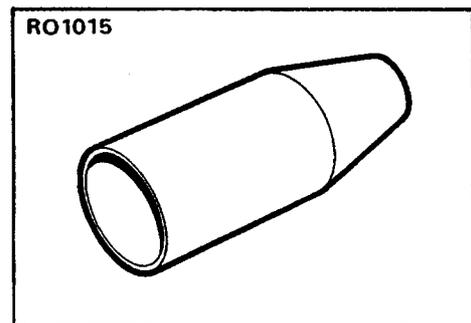
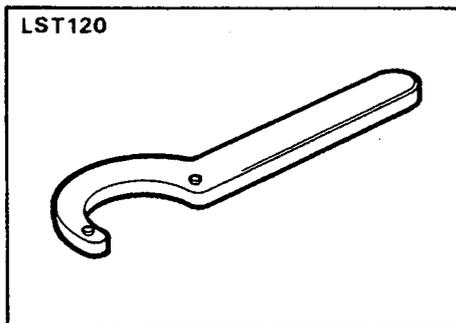
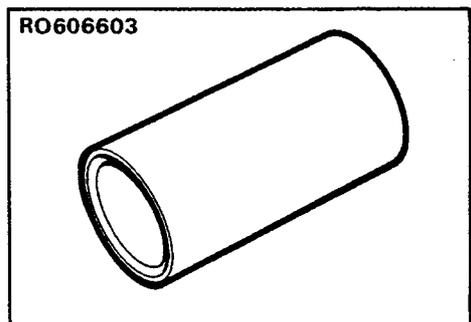
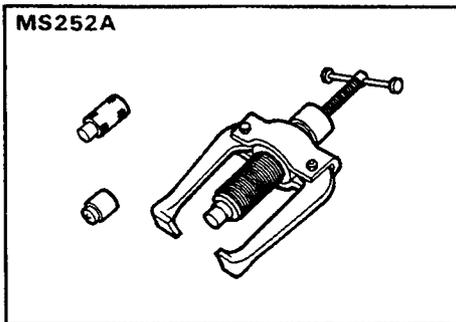


POWER STEERING BOX OVERHAUL.

Special service tools.

Drop arm extractor	MS 252A.
"C" spanner	LST 120.
Worm adjusting socket	LST 119.
Ring expander	RO 606602.
Ring compressor	RO 606603.
Seal saver, valve and worm	RO 1015.
Torque setting tool	RO 1016.
Seal saver, sector shaft	RO 606604.

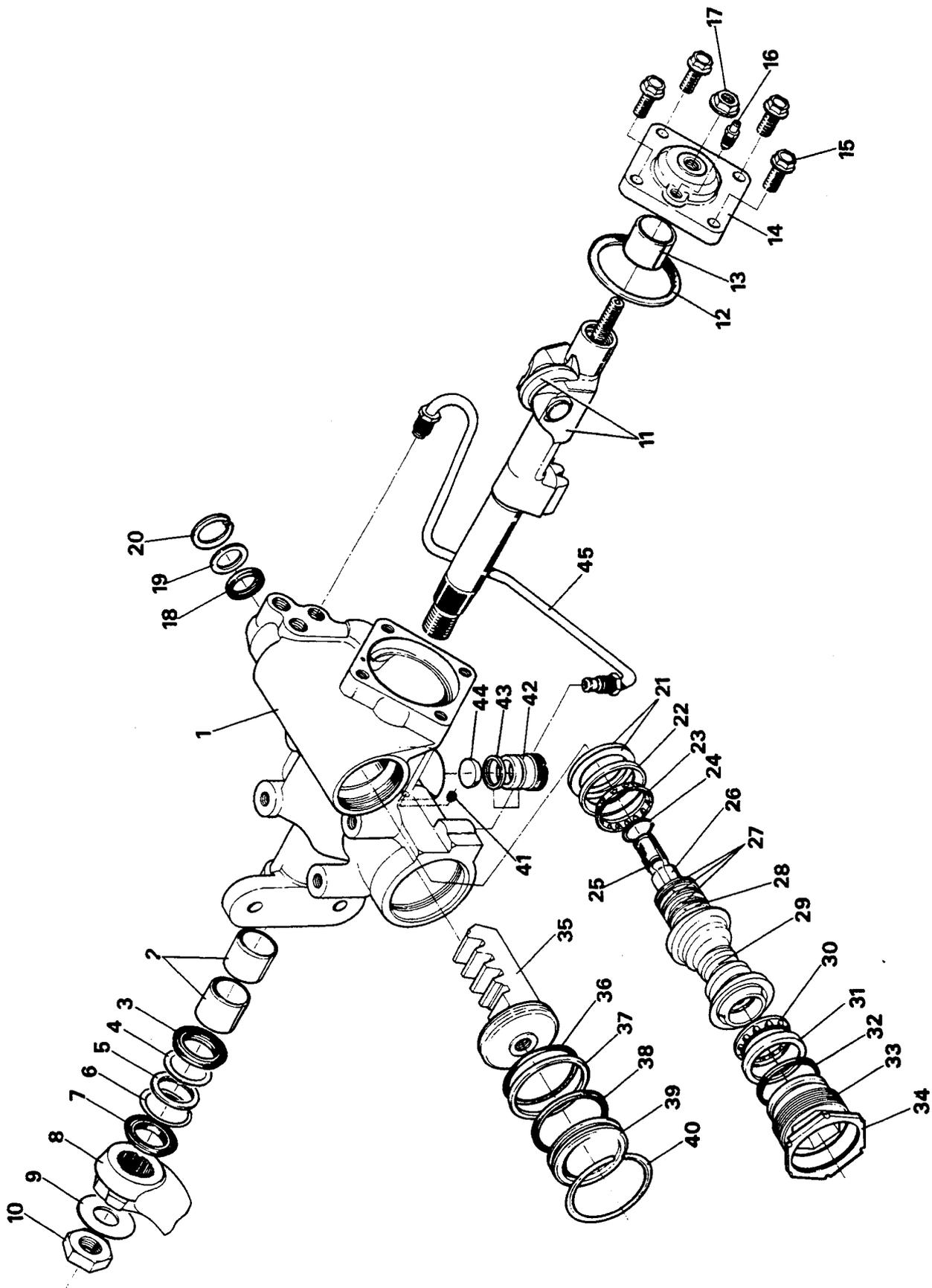


ST2233M

TORQUE FIGURES	Nm	FT16
Drop arm nut	176	130
Steering wheel nut	38	28
Sector shaft cover to steering box	22 - 27	16 - 20

KEY TO ADJUST LIGHTWEIGHT POWER STEERING BOX

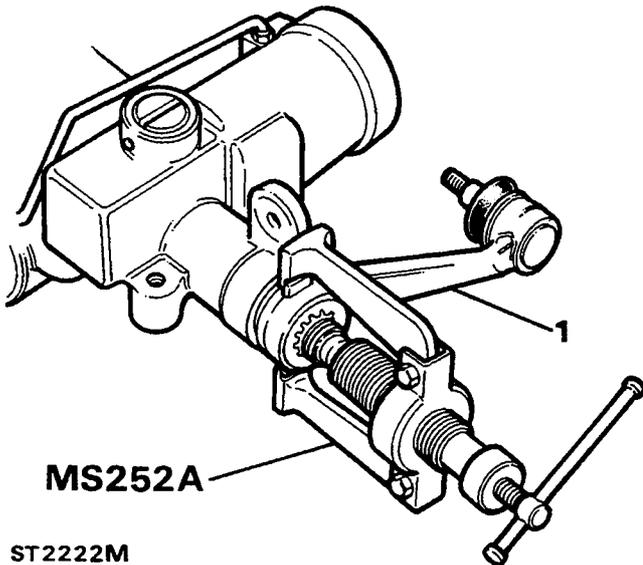
- | | |
|---|--------------------------------|
| 1. Housing. | 24. Circlip. |
| 2. Housing bushes. | 25. Seal torsion bar. |
| 3. Seal. | 26. Rotor. |
| 4. Back-up washer. | 27. Teflon rings - 3 off. |
| 5. Back-up seal. | 28. Stop-off rings. |
| 6. Circlip. | 29. Worm. |
| 7. Dust seal. | 30. Bearing cage and balls. |
| 8. Drop-arm. | 31. Bearing track. |
| 9. Tab washers. | 32. Seal. |
| 10. Sector shaft nut. | 33. Worm adjusting screw. |
| 11. Sector shaft and follower assembly. | 34. Lock nut. |
| 12. Seal. | 35. Piston |
| 13. Bush. | 36. Piston 'O' ring. |
| 14. Cover plate. | 37. Piston Teflon seal. |
| 15. Self locking screws - 4 off. | 38. Cylinder cover seal. |
| 16. Bleed screw. | 39. Cylinder cover. |
| 17. Lock nut. | 40. Cylinder cover retainer. |
| 18. Rotor seal. | 41. Screw. |
| 19. Seal washer. | 42. Rack adjusting screw. |
| 20. Circlip. | 43. Rack adjusting screw seal. |
| 21. Shims. | 44. Rack pad. |
| 22. Bearing track. | 45. Fluid line. |



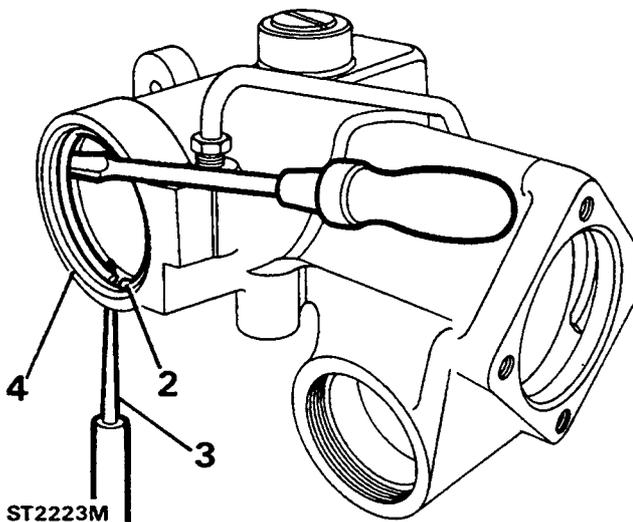
ST1411M

DISMANTLE.

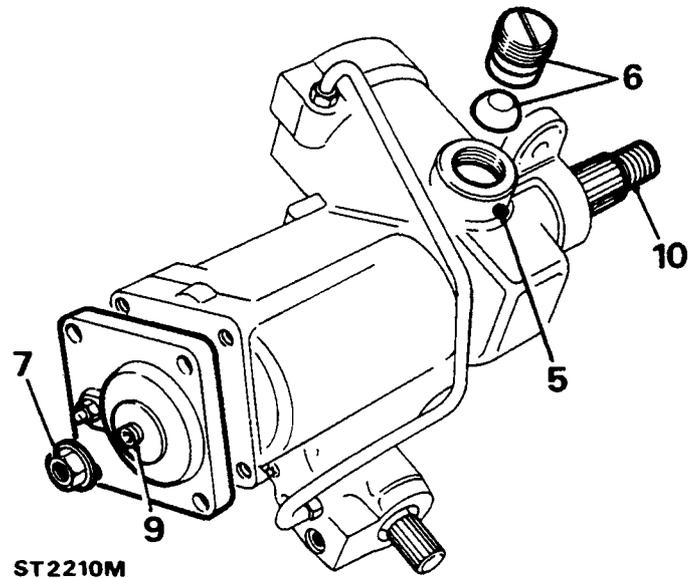
1. To assist assembly, turn the input shaft to bring the steering to the straight ahead position and mark the relationship of the drop arm to the casing. Using special service tool MS 252A withdraw the drop arm and remove the outer dust seal.



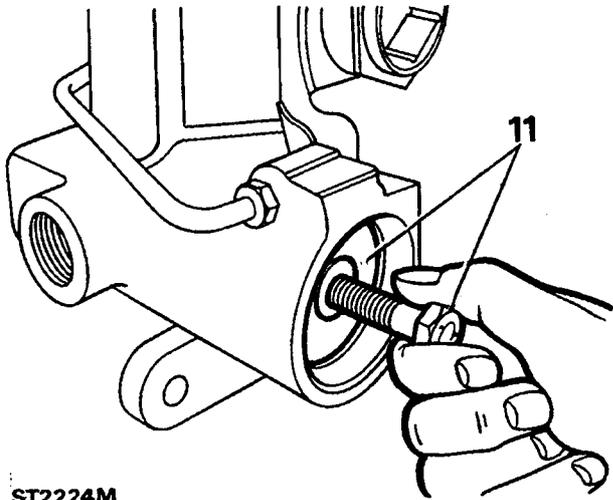
2. Rotate the piston cover retaining ring until one end is about 12mm (0.500ins.) from the extractor hole in the side of the cylinder housing.
3. Lever the retaining ring from its locating groove by inserting a suitable pointed drift through the extractor hole. Complete the removal of the ring using a screw driver.



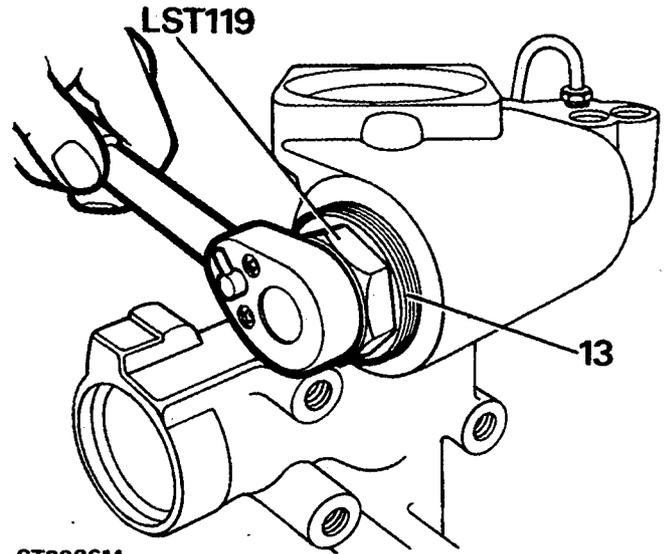
4. To remove the cover, turn the input shaft, in the appropriate direction, until the piston pushes out the cover. For a left-hand steering box, position the sector shaft on the left hand lock and for a right-hand box on the right-hand lock.
5. Slacken the grub screw locking the rack pad adjuster.
6. Remove the rack pad adjuster clockwise and withdraw the pad.
7. Remove the sector shaft lock nut. The nut, which has a seal moulded inside it, also acts as a fluid seal. The nut should therefore be discarded and a replacement new nut obtained for reassembly.
8. Remove the sector shaft cover bolts.
9. Turn the sector shaft adjuster clockwise with a 6mm Allen key whilst holding the cover, to prevent it turning, until the cover is removed.
10. The sector shaft can now be removed from the casing.



11. To remove the piston, screw a suitable bolt into the piston crown and use it to pull the piston from the casing.

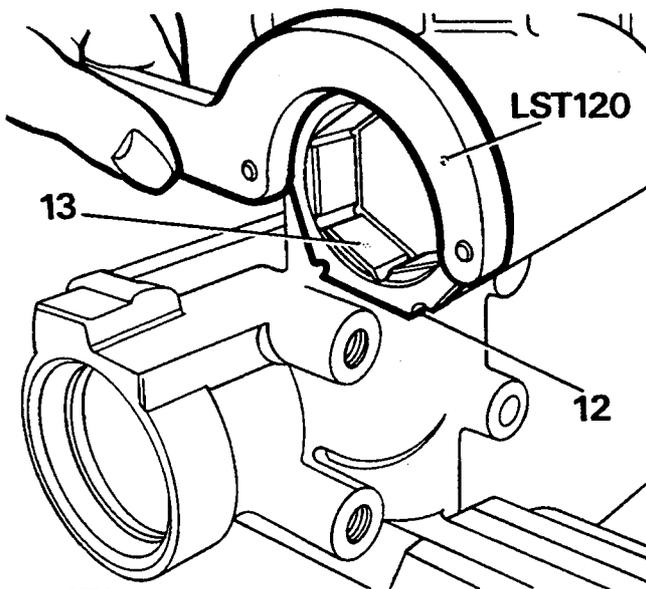


ST2224M

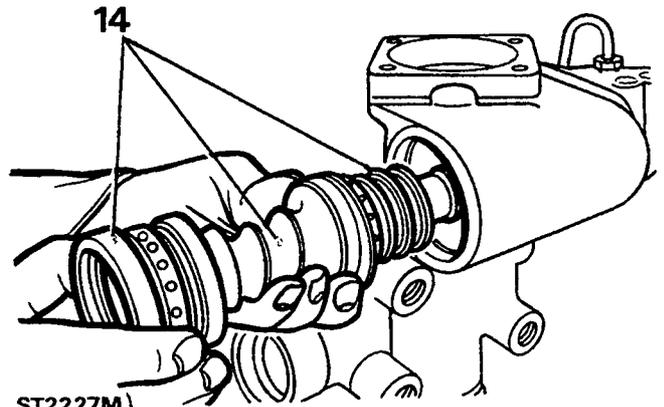


ST2226M

12. Remove the worm shaft adjuster lock nut using special service tool LST 120.



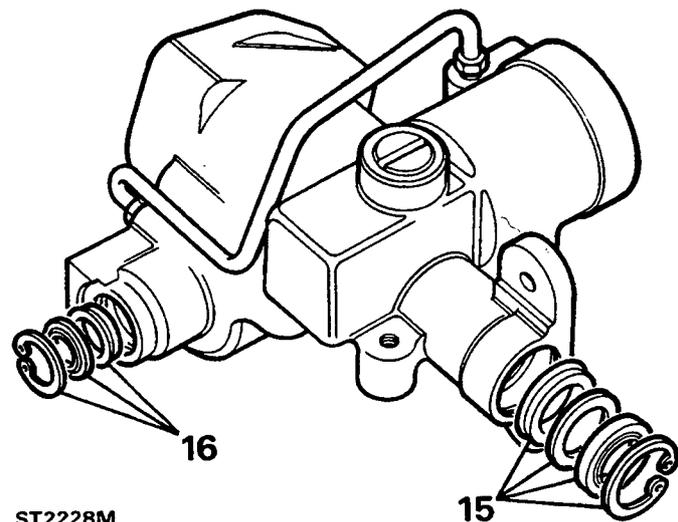
ST2225M



ST2227M

13. Using service tool LST 119 remove the worm shaft adjuster.
14. To withdraw the shaft and bearings tap the splined end of the shaft and lift-out the assembly.

15. Remove the circlip from the sector shaft bore to enable the seal assembly to be withdrawn.
16. Similarly, remove the circlip from the input shaft (worm shaft) bore and remove and discard the seals.



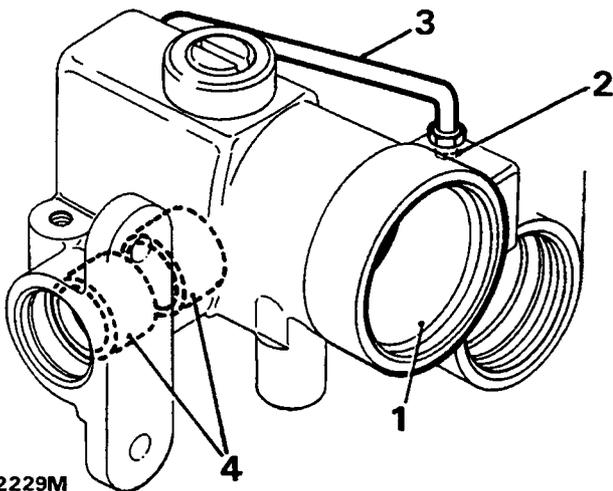
ST2228M

NOTE: the steering box has now been dismantled except for the sector shaft bushes, shown dotted. Since replacement bushes are not available, they should not be removed. The input shaft inner bearing cup and shims may also still be in position if jaring of the box has not already dislodged them and instructions for removing these appear later.

INSPECTION

Steering box casing.

1. Examine the piston bore for wear, scores and pitting.
2. Examine the inlet pipe thread in the side of the cylinder tube for damage and if necessary repair using a suitable tap.
3. Check the feed pipe for damage especially for cracks and dents and renew if in any way faulty.
4. Since it is very unusual for the sector shaft bushes to wear they are not available as replacements. However, they should nevertheless be checked for damage.



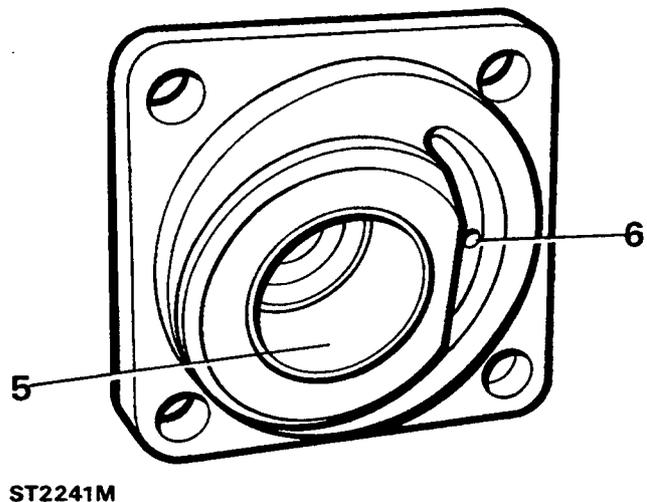
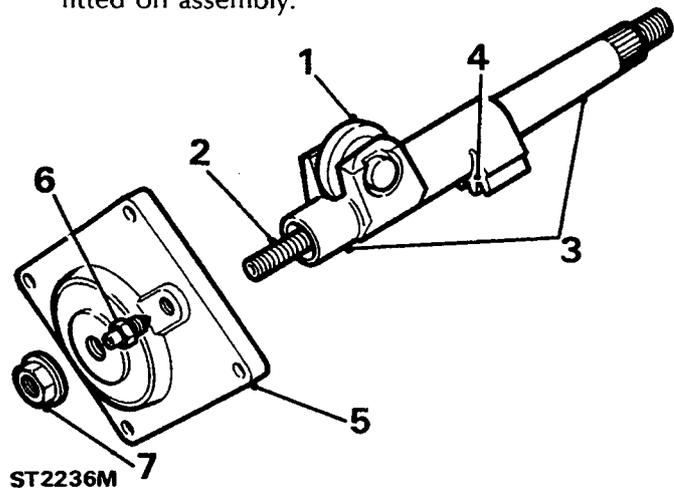
Sector shaft and cover assembly.

1. Check that there is no side play on the roller. If excessive play does exist the sector shaft should be renewed likewise if any of the following checks are unsatisfactory.

2. Check the condition of the adjuster thread and that there is no excessive vertical play. A movement of 2mm is acceptable. Side play, however, is of no significance.
3. Examine the bearing surfaces of the shaft for wear, scores and pitting.
4. Check the gear teeth for excessive or uneven wear, scores and pitting.
5. Examine the cover for damage and burrs. Remove and discard the seal. Check the bush for wear and scores. Also check the adjuster thread for damage.
6. Check the bleed nipple and threads and that the bleed hole in the inside of the cover is clear.

NOTE: for replacement purposes, the cover, bush and seal are supplied as a complete assembly.

7. The locknut, which should be discarded, also acts as a fluid seal and a new one should be fitted on assembly.

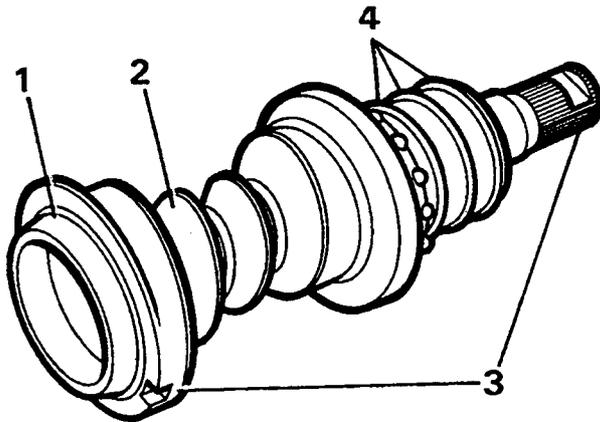


Valve and worm assembly.

1. Examine the bearing areas for wear. The surfaces must be smooth and free from indentations, scores and pitting.
2. Examine the worm for wear which must also be smooth and free of scores and indentations.
3. Check for any wear on the torsion bar assembly pins. Grip the splined end of the input shaft in a soft jawed vice and by hand twist the worm end. No free movement should exist between the input shaft and worm.

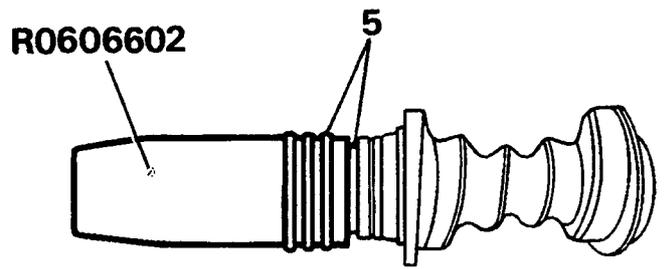
NOTE: If any wear does appear in the above areas it is essential that a new valve and worm assembly is fitted.

4. Examine the valve rings which must be free from cuts, scratches and grooves. The valve rings must be a loose fit in the valve grooves. If any one of the rings is faulty, all the rings must be renewed. Take care not to damage the ring grooves when removing the rings.



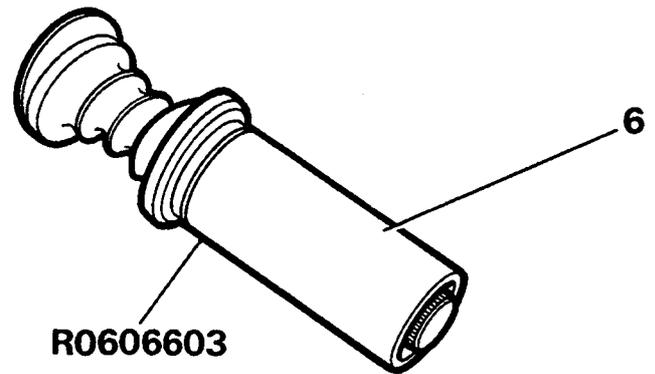
ST2219M

5. Fit replacement rings using expander tool RO 606602. Expand the rings by immersing them in hot water until pliable then carefully slide the rings over the tool, from the chamfered end. Place the tool over the the ring grooves and slide the first ring into the groove nearest to the worm and so on until the third ring is in place. It is important to fit the rings in this sequence since the tool will not pass over the rings.



ST2220M

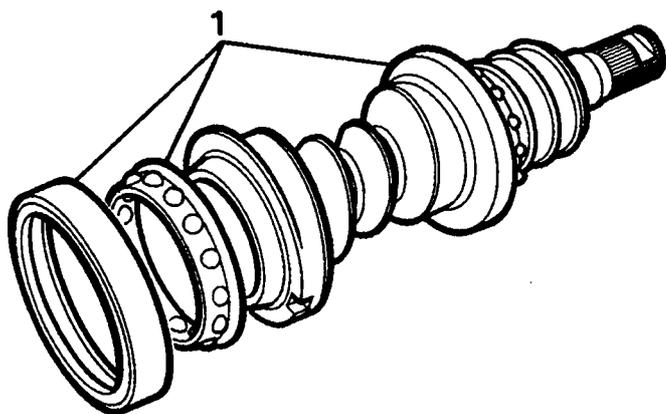
6. Remove the expander tool and slide the compressor tool RO 606603 over the rings, internal chamfered end leading and leave until cool.



ST2217M

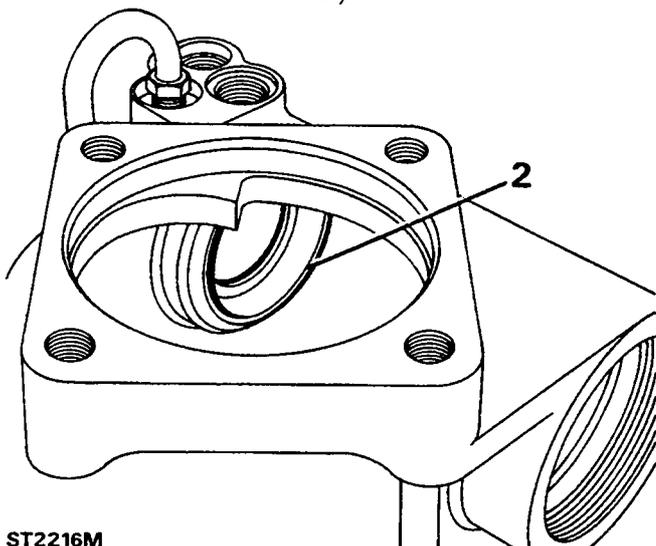
Ball bearing and cage assemblies.

1. Examine the valve and worm inner and outer ball races and cups and if either is worn, pitted or damaged in any way, both the cups and the ball races must be renewed.



ST2230M

2. To remove the inner bearing cup and shims jar the casing on the work bench or use a suitable extractor. Alternatively, if difficulty is being experienced, warm the casing universally in an oven or in boiling water. Do not, however, attempt to apply local heat since distortion of the casing may result. Whilst the casing is being heated, cool a suitable mandrel or round bar to fit inside the bearing cup. Insert the cooled bar in the heated casing to retract the cup to enable it to be withdrawn together with the shims which must be retained for reassembly.

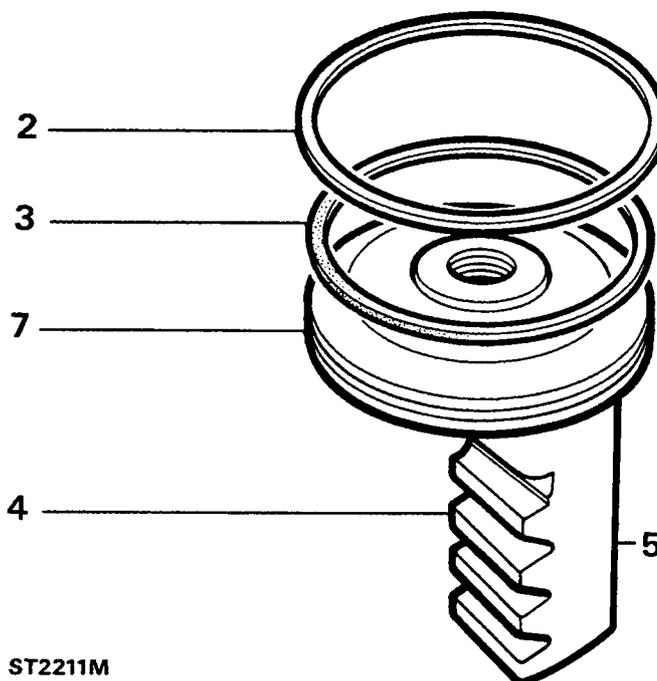


ST2216M

Rack and piston.

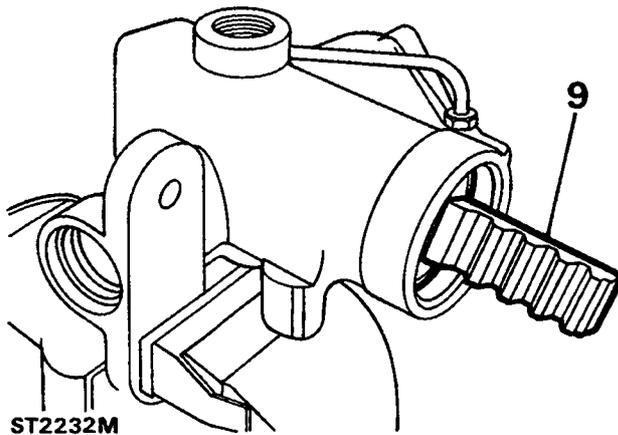
NOTE: That beneath the visible white Nylon ring in the piston groove, there is a rubber seal.

1. Examine the outer seal and if worn or damaged in any way it must be renewed along with the rubber ring.
2. Taking care not to damage the piston outer diameter remove the plastic seal.
3. Likewise, carefully remove the rubber ring.
4. Examine the rack teeth for wear and damage.
5. Check that the thrust pad bearing surface is free from wear and scores.
7. Check the piston outer diameters for burrs and damage and repair as necessary using a fine file and emery cloth.
8. Ensure that the bottom of the groove and the inside walls are not damaged or burred. Repair where necessary in the same way as above.



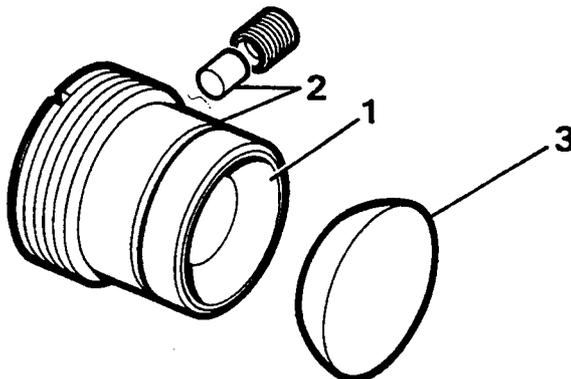
ST2211M

- Fit a new rubber ring to the piston groove. Warm a new white Nylon seal in hot water and fit to the piston. Immediately, whilst still warm, carefully insert the piston squarely into the casing bore with the rack outwards, as illustrated, and leave until cool.



Rack thrust pad and adjuster.

- Examine the rack pad adjuster for general condition particularly the pad bearing surface.
- Renew the seal and if necessary the nylon thrust pad behind the grub screw.
- Check the thrust pad for wear in particular the flat side which slides on the reverse side of the piston rack.

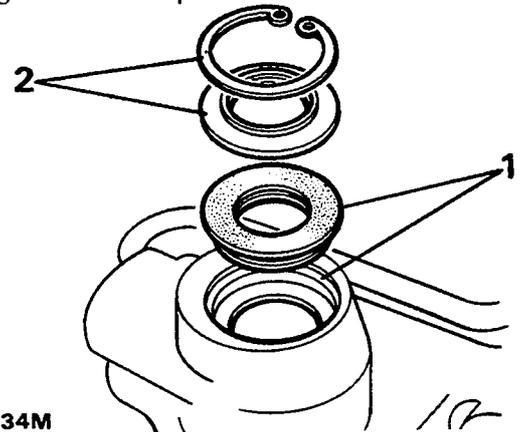


ASSEMBLE

NOTE: When fitting replacement oil seals, these must be lubricated, before fitting, with the recommended steering box fluid. Also ensure that absolute cleanliness is observed throughout the following assembly instructions.

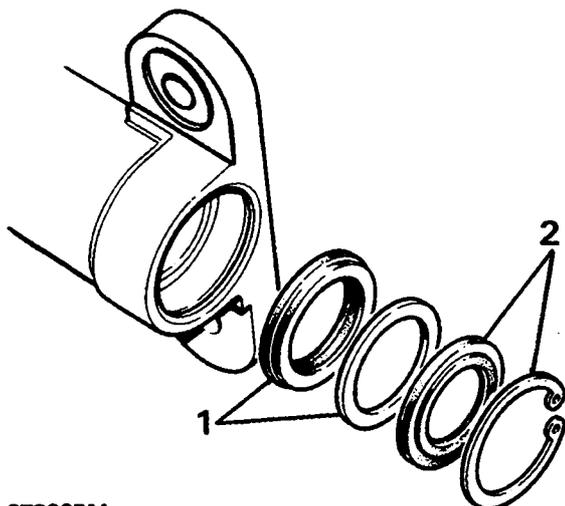
Fitting input shaft oil seal.

- Fit a new seal, lipped side first, into the housing noting that when correctly fitted the seal backing will seat on the first shoulder in the bore.
- Insert the extrusion washer with the flat side downwards facing the seal. Secure the the assembly with the circlip and to ensure that it is properly located, tap the circlip into the groove with a punch.



Fitting sector shaft seal.

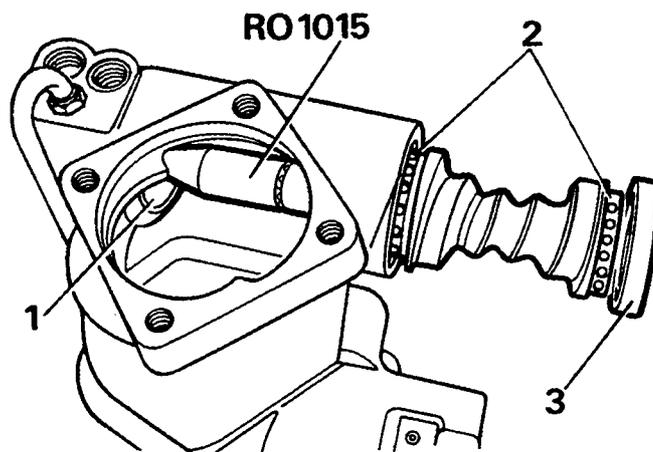
1. With the lipped side leading, fit the oil seal to the casing followed by a plain fibre washer.
2. Fit the steel backed dust seal, flat side downwards towards the oil seal. Secure with the circlip ensuring that it is properly located in the groove.



ST2235M

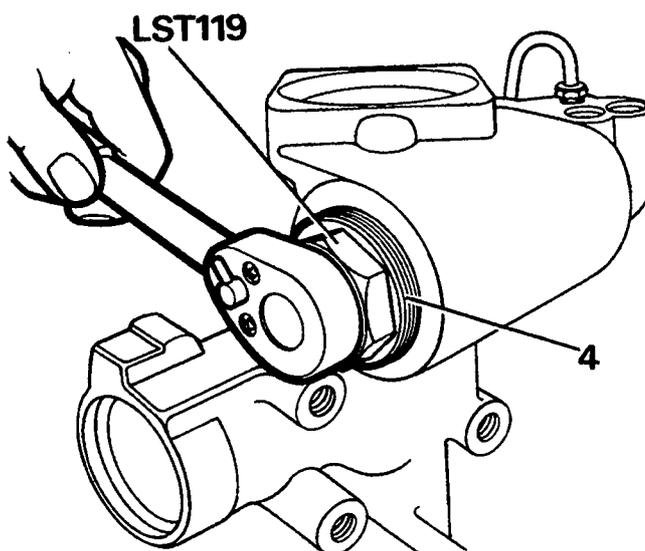
Fitting valve and worm assembly.

1. Fit the inner bearing cup and the original shims to the casing. Use a suitable bar approximately 57mm (2.2in.) diameter to tap the cup squarely into position. If the original shims are not available fit shims to the value of 0,76mm (0.030ins.) to provide a nominal thickness.
2. Fit the inner and outer bearing cages to the worm using petroleum jelly only to hold the cages in position. Do not use grease for this purpose since it does not dissolve in the steering box lubricating fluid and could block the fluid passages in the valve assembly.
3. Cover the input shaft splined area with seal saver RO 1015 and carefully insert the shaft into the casing followed by the outer bearing cup.



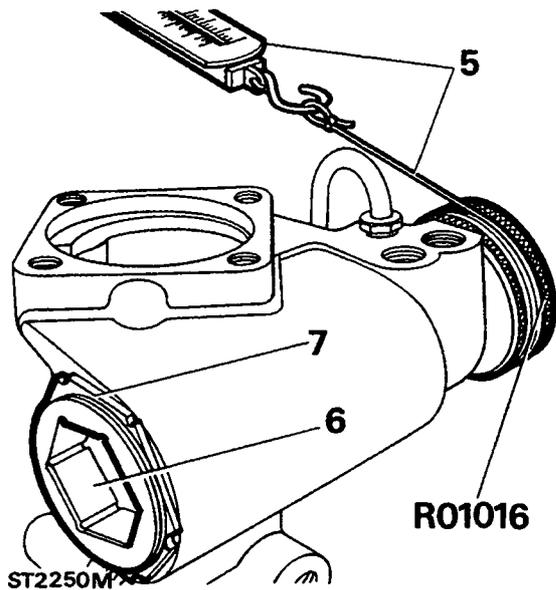
ST2218M

4. Fit a new sealing ring to the worm adjuster screw and turn the adjuster clockwise into the housing using special tool LST 119 until the end float in the input shaft is almost eliminated. Fit the lock-nut but do not tighten until the following instructions for setting the input shaft preload are completed.

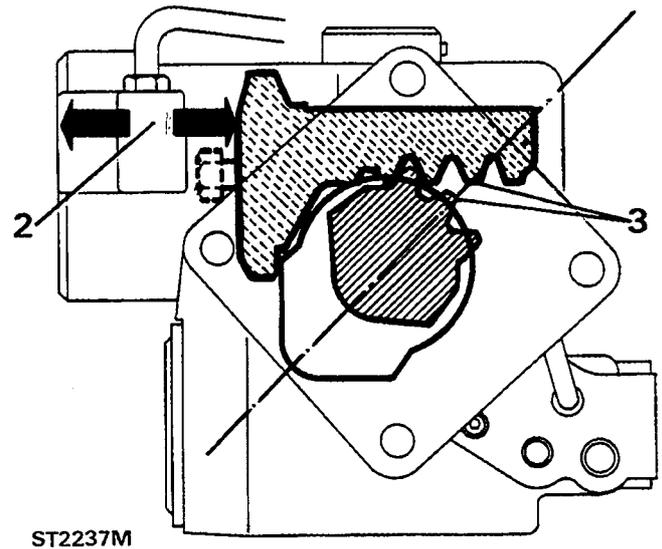


ST2248M

5. Fit the torque setting tool RO 1016 to the input shaft and secure with the grub screw. Coil a length of cord round the tool and attach a spring balance to the free end. Measure and record the rolling resistance of the shaft as the spring balance is pulled.



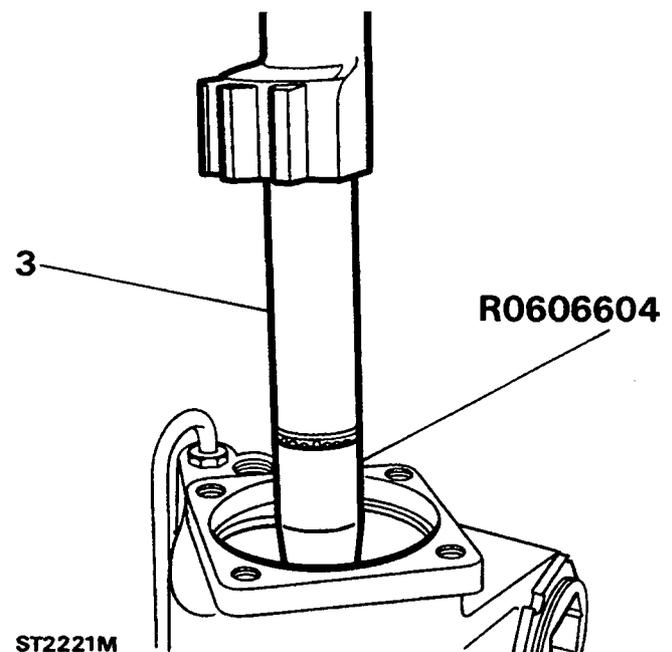
3. Fit seal saver RO 606604 over the thread and splines of the sector shaft and carefully insert the shaft into the casing. Align the centre gear pitch on the rack with the centre gear tooth on the sector shaft and at the same time rotate the input shaft about a small arc to allow the sector roller to engage the worm.



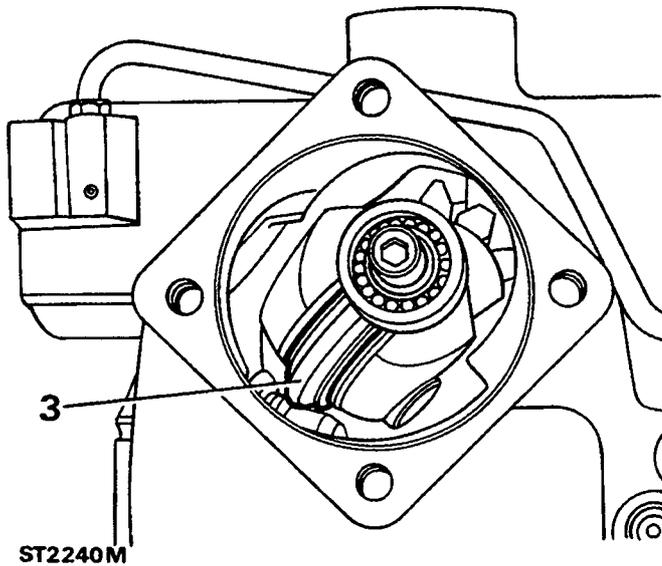
6. To settle the bearings, turn the worm adjuster again, clockwise, to increase the resistance over that recorded in the previous instruction by 1.8 to 2.2 kg (4 to 5 lb.) (at a radius of 31,7mm (1.250in.) which is determined by the the setting tool).
7. Now, back-off the worm adjuster anti-clockwise so that the rolling resistance recorded in instruction 5 is only 0.9 to 1.3 kg (2 to 3 lb.). Tighten the locknut using special tool LST 119. Check the rolling resistance again in case tightening the lock-nut has altered the setting.

Fitting rack, piston and sector shaft.

1. Screw a suitable bolt into the piston crown to assist the fitting and positioning of the piston as was recommended for removing the piston.
2. Insert the piston, rack end first, into the casing so that the piston crown is approximately 63,5mm (2.5in.) from the outer end of the bore.

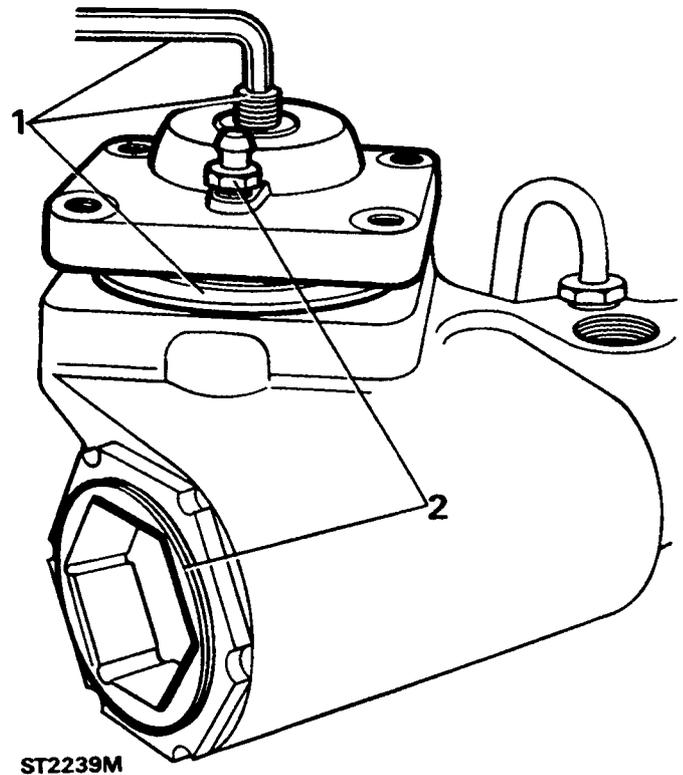


4. The illustration below shows the position in which the sector shaft and roller should be in relation to the casing aperture when the shaft is being inserted.



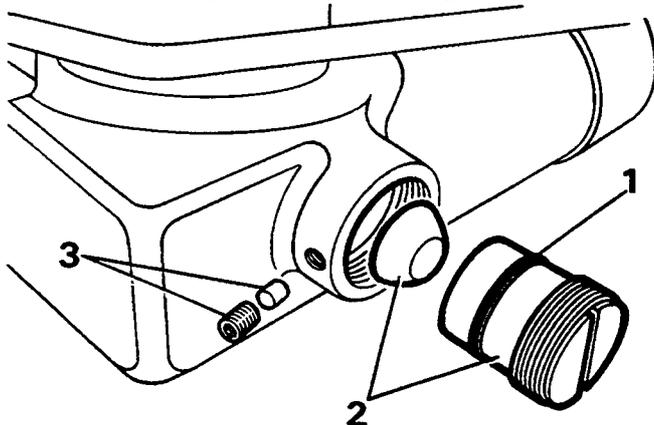
Fitting sector shaft cover.

1. Fit and lubricate a new sealing ring to the inside of the cover and screw the cover fully on to the sector shaft adjuster screw. If necessary, use an Allen key to hold the screw to prevent it turning.
2. Locate the cover on the casing noting that it can only be fitted one way, that is, with the bleed nipple towards the worm adjuster. Tap the cover into place and if necessary, back off the adjuster screw a few turns to allow the cover to seat properly on the casing. Fit the cover retaining screws but do not tighten.
3. Using the torque setting tool RO 1016 for convenience, rotate the input shaft through a small arc, in both directions, to ensure that the sector roller is free to move in the worm. Tighten the four screws evenly to the correct torque.



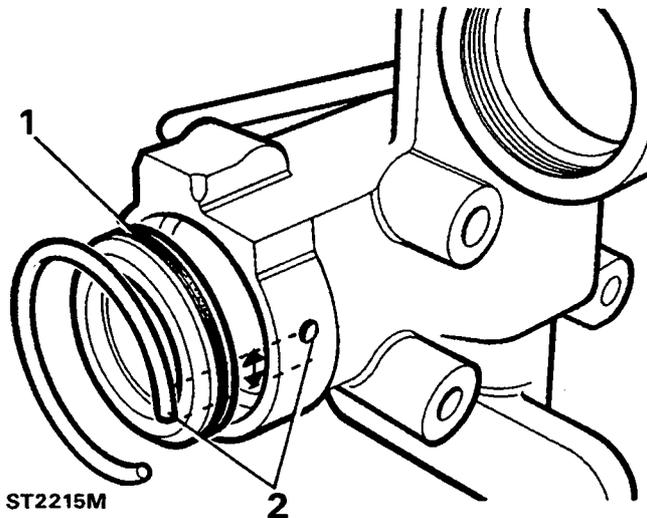
Fitting rack adjuster

1. Fit a new sealing ring to the rack adjuster.
2. Fit the adjuster pad with the flat side towards the rack and screw in the adjuster until solid contact is made with the rack. Now back-off the adjuster half a turn.
3. Insert the Nylon locking pad and fit the grub screw, leaving it slack at this stage.

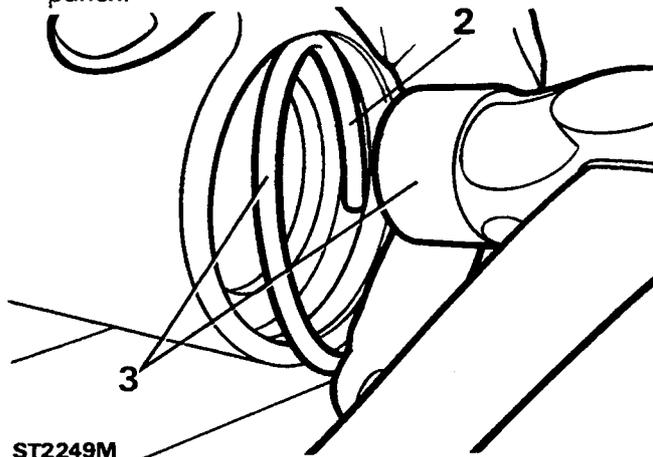


Fitting Cylinder cover.

1. Fit and lubricate a new seal to the cylinder cover and press the cover squarely into the cylinder just far enough to clear the retaining ring groove.
2. Secure the cover with the retaining ring by inserting one end of the ring into the cylinder groove so that it is positioned 12mm (0.5in.) beyond the ring extractor hole in the side of the cylinder.

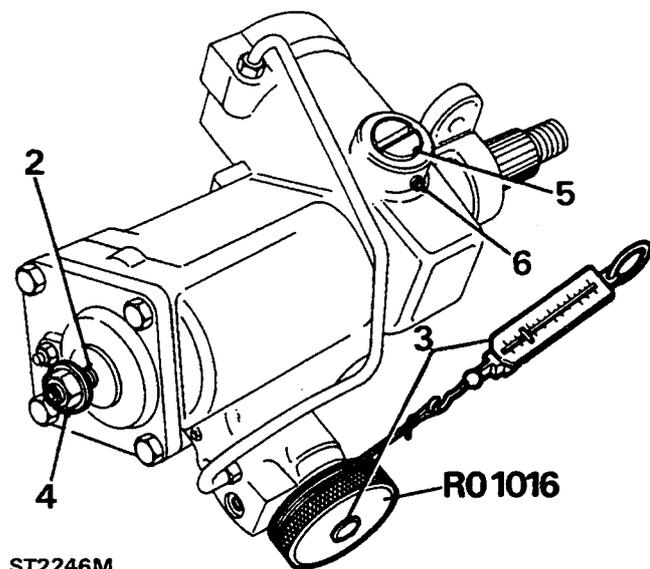


3. Now, compress the ring, by hand, whilst feeding it into the groove by striking it with a hammer until the ring finally springs into position in the groove. Ensure that the ring is fully seated by tapping it round with a punch.



Setting the sector shaft and rack adjuster pre-loads.

1. Turn the input shaft to set the sector shaft roller at the mid point of its travel between the left and right hand locks.
2. Using a 6mm Allen key, turn the sector shaft adjusting screw anti-clockwise to obtain backlash between the input shaft and sector shaft. Now, turn the adjusting screw clockwise until the backlash is just eliminated.
3. Using the tool RO 1016 and spring balance, measure and record the maximum rolling resistance at the input shaft.
4. Fit a new locknut to the adjuster screw but do not tighten. Continue to rotate the input shaft, with the spring balance, whilst turning the adjuster screw until the figure recorded in instruction 3 is increased by 0.9 to 1.3 kg (2 to 3 lb). Tighten the locknut and check the above figures again.
5. Turn the rack adjuster clockwise to impart pressure upon the rack and back-off half a turn. Again, using special tool RO 1016 and the spring balance, rotate the the input shaft whilst turning the rack adjuster until the figure recorded in instruction 4 is increased by a further 0.9 to 1.3 kg (2 to 3 lb.). Note that the final rolling resistance figure, recorded on the spring balance, must not exceed 7.25 kg.(16 lb.).



6. When satisfied that the pre-load figures are satisfactory, lock the rack adjuster in position with the grub screw.

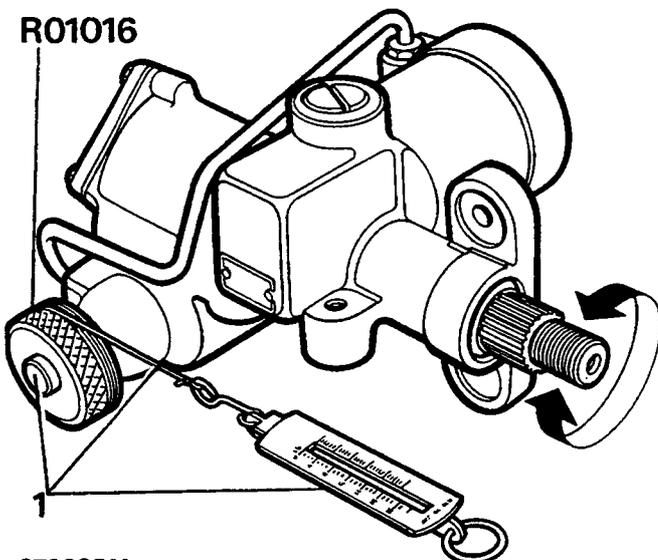
Torque peak check.

The purpose of this check is to determine the point at which the rolling resistance is the greatest when the steering is turned from lock to lock. This resistance, which must be equally distributed, should be when the sector shaft roller is positioned along the centre portion of the worm approximately two revolutions of the input shaft from either the left or right hand lock.

The correct position of the resistance depends upon the amount of shimming behind the input shaft inner bearing cup. Provided that the original shim pack has been refitted, the torque peak position should be correct unless major components have been renewed. The procedure for checking and adjusting the torque peak is contained in the following instructions.

1. Attach the Torque setting tool RO 1016 to the input shaft and turn it fully anti-clockwise. Wind cord round the tool and fasten a spring balance to the free end as before. Turn the input shaft by pulling the spring balance and note the position where the highest figure is obtained. If the highest figures are not recorded along the middle portion of the travel as explained above adjustment is necessary.
2. Adjustment involves the dismantling of the steering box and removal of the input shaft inner bearing cup and shims. If the torque peak (highest figure) occurred before the centre position, add shims to the pack. Remove shims if the torque peak occurs after the centre position.

R01016

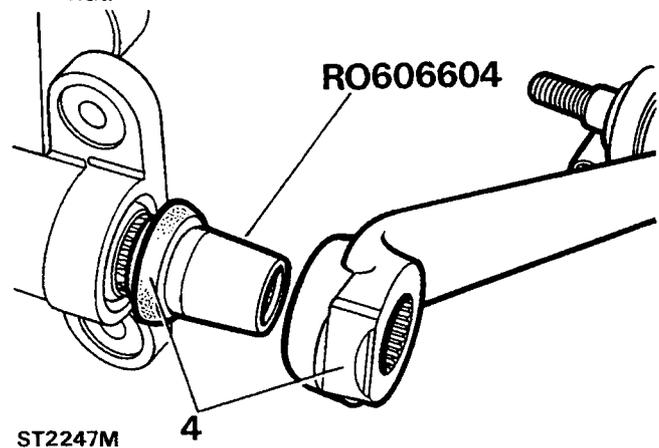


ST2238M

NOTE: That the addition or subtraction of a 0.07mm (0.003in.) shim will move the torque peak area by approximately one quarter of a turn of the input shaft.

Shim washers are available from Land Rover Parts and Equipment in the following sizes: 0,03mm 0,07mm 0,12mm and 0,24mm (0.0015in. 0.003in. 0.005in. and 0.010in.).

3. Having added or subtracted shims as necessary, reassemble the steering box and check that the Torque peak position is now correct.
4. Using seal saver RO 606604, fit a new outer dust seal over the sector shaft. Fit the drop arm to the sector shaft and a new lock washer. Fit and tighten the retaining nut to the correct torque and bend the lock tab over a flat of the nut.



ST2247M

Fitting steering box to vehicle and testing.

1. Fit the steering box to the vehicle and replenish the system with the correct make and grade of fluid. For this information refer to "Recommended Lubricants and Fluids" and bleed the power steering system.
2. To test the effectiveness of the steering box overhaul and the system for leaks, run the engine and hold the steering hard on full lock in both directions whilst a second person checks for fluid leaks.

CAUTION : Do not hold the steering on full lock for more than thirty seconds in any one minute to avoid overheating the fluid and possibly damaging the seals.

3. Finally road test the vehicle

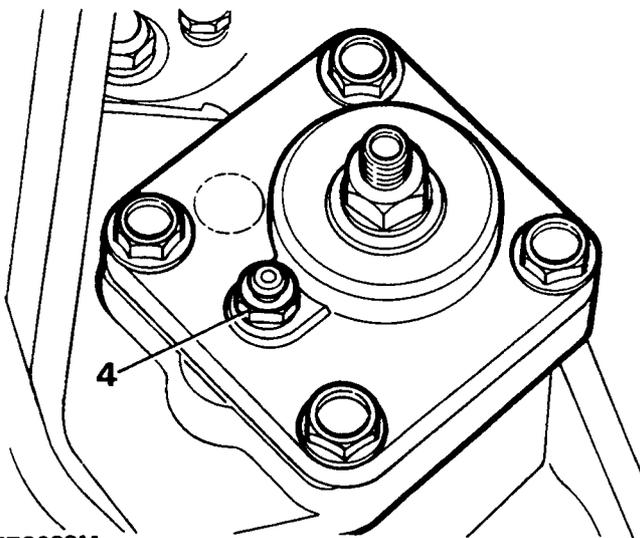
POWER STEERING SYSTEM

Bleed

1. Fill the steering fluid reservoir to the appropriate level marking on the dipstick with one of the recommended fluids.
2. Start and run the engine until it attains normal operating temperature.
3. Check and correct the reservoir fluid level.

NOTE: During the carrying out of items 4, 5 and 6, ensure that the steering reservoir is kept full. Do not increase the engine speed or move the steering wheel.

4. Run the engine at idle speed, loosen the bleed screw. When fluid seepage past the bleed screw is observed, retighten the screw.



ST2693M

5. Ensure that the fluid level is in alignment with the mark on the dipstick.
6. Wipe off all fluid lost during bleeding.
7. Check all hose connections, pump and steering box for fluid leaks under pressure by holding the steering hard on full lock in both directions.

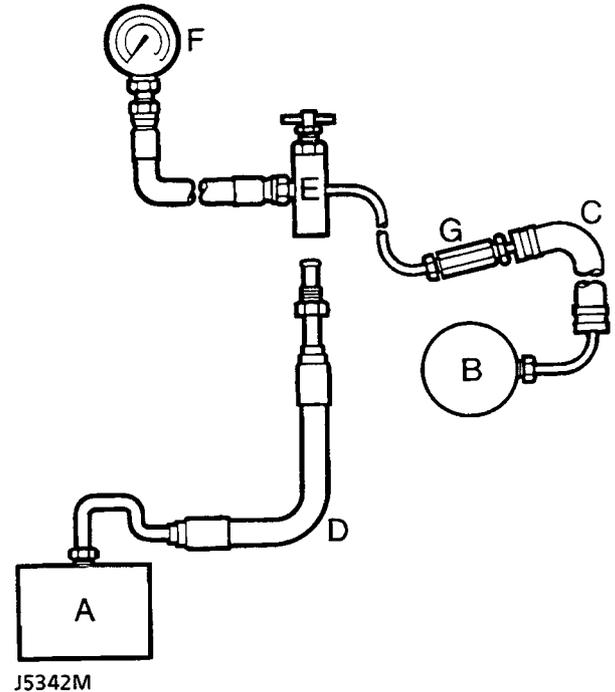
CAUTION: Do not maintain this pressure for more than 30 seconds in any one minute, to avoid causing the oil to overheat and possible damage to the seals. The steering should be smooth lock-to-lock in both directions, that is, no heavy or light spots when changing direction when the vehicle is stationary.

8. Carry out a short road test. If necessary, repeat the complete foregoing procedure.

POWER STEERING SYSTEM

Test

If there is a lack of power assistance for the steering the pressure of the hydraulic pump should be checked first before fitting new components to the system. The fault diagnosis chart should also be used to assist in tracing faults in the power steering system.



- A. Steering box.
- B. Steering pump.
- C. Existing hose, steering box to pump.
- D. Test adaptor LRT-57-030.
- E. Test adaptor JD10-2.
- F. Pressure gauge HY23.
- G. Thread adaptor LRT-57-030.

Procedure

1. The hydraulic pressure gauge in conjunction with the test adaptor is used for testing the power steering system. This gauge is calibrated to read up to 140 kgf/cm² (2000 p.s.i.) and the normal pressure which may be expected in the power steering system is 77 kgf/cm² (1100 p.s.i.).

2. Under certain fault conditions of the hydraulic pump it is possible to obtain pressures up to 105 kgf/cm² (1500 p.s.i.). Therefore, it is important to realise that the pressure upon the gauge is in direct proportion to the pressure being exerted upon the steering wheel. When testing, apply pressure to the steering wheel very gradually while carefully observing the pressure gauge.
3. Check, and if necessary replenish, the fluid reservoir.
4. Examine the power steering units and connections for leaks. All leaks must be rectified before attempting to test the system.
5. Check the steering pump drive belt for condition and tension, rectify as necessary.
6. Assemble the test equipment and fit to the vehicle, as shown in the diagram.
7. Open the tap in the adaptor.
8. Bleed the system but exercise extreme care when carrying out this operation so as not to overload the pressure gauge.
9. With the system in good condition, the pressures should be as follows:

(a) Steering wheel held hard on full lock and engine running at 1,000 rev/min, the pressure should be 70 to 77 kgf/cm² (1000 to 1100 p.s.i.).

(b) With the engine idling and the steering wheel held hard on full lock, the pressure should be 28 kgf/cm² (400 p.s.i.) minimum.

These checks should be carried out first on one lock, then on the other.

CAUTION: Under no circumstances must the steering wheel be held on full lock for more than 30 seconds in any one minute, otherwise there will be a tendency for the oil to overheat and possible damage to the seals may result.

10. Release the steering wheel and allow the engine to idle. The pressure should be below 7 kgf/cm² (100 p.s.i.).
11. If the pressures recorded during the foregoing tests are outside the specified range, or pressure imbalance is recorded, a fault exist in the system. To determine if the fault is in the steering box or the pump, close the adaptor tap for a period not exceeding five seconds.
12. If the gauge fails to register the specified pressure, the pump is at fault and a new unit must be fitted.
13. Repeat the foregoing test after fitting a new pump and bleeding the system. If pump delivery is satisfactory but low pressure or a substantial imbalance exists, the fault must be in the steering box valve and worm assembly.

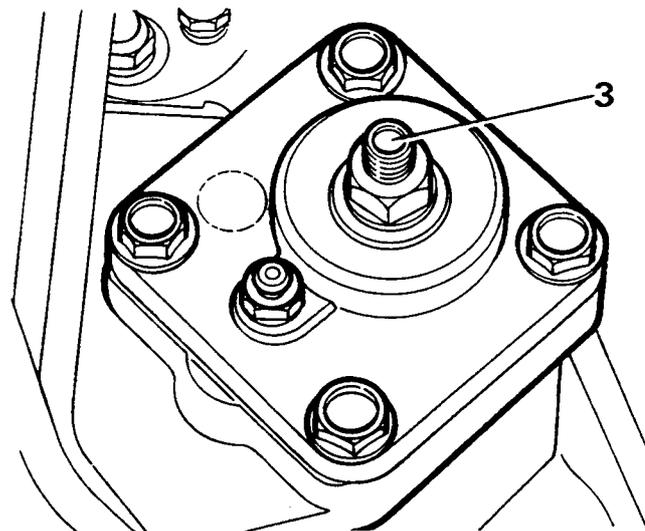
ADJUST POWER STEERING BOX

NOTE: The condition of adjustment which must be checked is one of minimum backlash without overtightness when the wheels are in the straight-ahead position.

1. Jack up the front of the vehicle until the wheels are clear of the ground and support the chassis with axle stands.

WARNING: It is essential that the wheels are chocked, the parking brake applied, and low range selected with differential lock engaged.

2. Gently rock the steering wheel about the straight-ahead position to obtain the 'feel' of the backlash present. This backlash must not be more than 9.5mm (0.375 in).
3. Continue the rocking action while an assistant slowly tightens the steering box adjuster screw after loosening the locknut until the steering wheel movement is reduced to 9.5mm (0.375 in) maximum.



ST2694M

4. Tighten the locknut, then turn the steering wheel from lock to lock and check that no excessive tightness exists at any point.
5. Lower the vehicle to ground level and remove the wheel chocks.
6. Road test the vehicle.

POWER STEERING

FAULT DIAGNOSIS

SYMPTOM	CAUSE	TEST ACTION	CURE
INSUFFICIENT POWER ASSISTANCE WHEN PARKING	(1) Lack of fluid	Check hydraulic fluid tank level	If low, fill and bleed the system
	(2) Driving belt	Check belt tension	Adjust the driving belt
	(3) Defective hydraulic pump	(a) Fit pressure gauge between high pressure hose and steering pump with steering held hard on full lock, see Note 1 and 'Power Steering System Test' (b) Release steering wheel and allow engine to idle. See 'Power Steering System Test'	If pressure is outside limits (high or low) after checking items 1 and 2, see Note 2 If pressure is greater, check box for freedom and self-centering action
POOR HANDLING WHEN VEHICLE IS IN MOTION	Lack of castor action (wheels will not return to centre)	This is caused by over-tightening the rocker shaft backlash adjusting screw on top of the steering box	It is most important that this screw is correctly adjusted. See instructions governing adjustment
HYDRAULIC FLUID LEAKS	Damaged pipework, loose connecting unions etc.	Check by visual inspection; leaks from the high pressure lines are best found while holding the steering on full lock with engine running at fast idle speed (See Note 1)	Tighten or renew as necessary
		Check 'O' rings on pipework	Renew as necessary
NOTE: Leaks from the steering box tend to show up under low pressure conditions, that is, engine idling and no pressure on steering wheel			

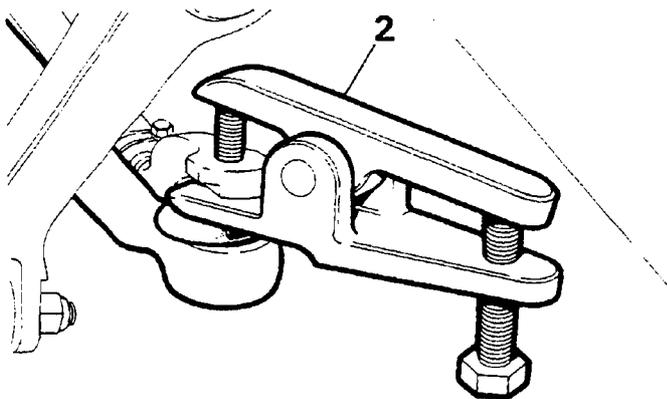
SYMPTOM	CAUSE	TEST ACTION	CURE
EXCESSIVE NOISE	(1) If the high pressure hose is allowed to come into contact with the body shell, or any component not insulated by the body mounting, noise will be transmitted to the car interior	Check the loose runs of the hoses	Alter hose route or insulate as necessary
	(2) Noise from hydraulic pump	Check oil level and bleed system	If no cure, change hydraulic pump
<p>Note 1. Never hold the steering wheel on full lock for more than 30 seconds in any one minute, to avoid causing the oil to overheat and possible damage to the seals.</p> <p>Note 2. High pressure- In general it may be assumed that excessive pressure is due to a fault in the hydraulic pump. Low pressure- Insufficient pressure may be caused by one of the following:</p> <ol style="list-style-type: none"> 1. Low fluid level in reservoir) Most usual cause of 2. Pump belt slip) insufficient pressure 3. Leaks in the power steering system 4. Hydraulic pump not delivering correct pressure 5. Fault in steering box valve and worm assembly 6. Leak at piston sealing in steering box 7. Worn components in either steering box or hydraulic pump 			

Steering pump

Make/type	Hobourn-Eaton series 200
Operating pressure - straight ahead position - at idle	7 kgf/cm ² (100 p.s.i.) maximum
Full lock (left or right) at idle	28 kgf/cm ² (400 p.s.i.) minimum
Full lock (left or right) 1000 rev/min	70-77 kgf/cm ² (1000-1100 p.s.i.)

DROP ARM**Remove and refit****Service tools:****MS252A Drop arm extractor****Removing**

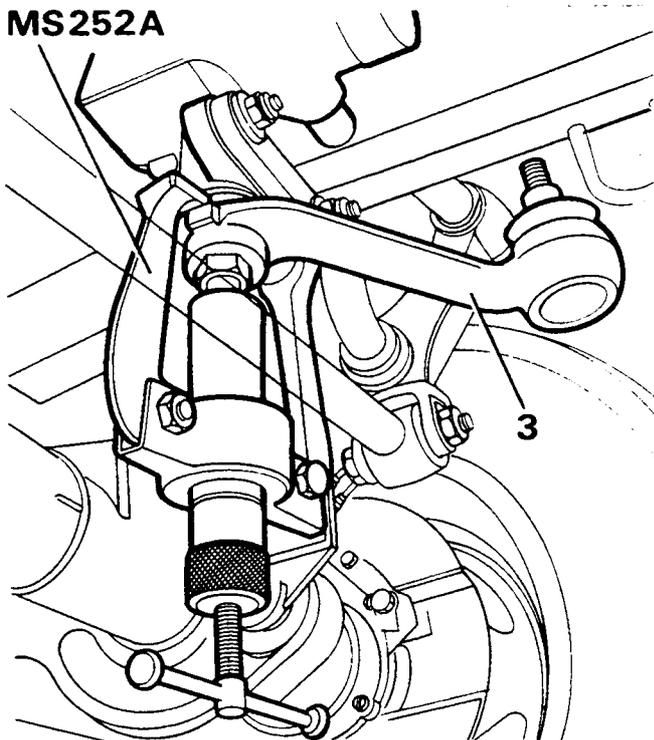
1. Place the vehicle on a suitable hydraulic hoist, alternatively raise the front of the vehicle using a hydraulic floor jack and install axle stands under the front axle, remove the floor jack.
2. Disconnect the drag link from the drop arm ball joint, using a suitable extractor.



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3. Remove the drop arm from the steering box rocker shaft, using extractor MS252A.

NOTE: The drop arm ball joint is integral with the drop arm.

MS252A

J5142M

Refitting

4. Set the steering box in the midway lock-to-lock position.
5. Fit the drop arm in position, aligning the master splines.
6. Fit the drop arm fixings and tighten to the correct torque (see section 06-Torque values).
7. Fit the drag link and tighten to the correct torque (see section 06-Torque values).

DROP ARM BALL JOINT**Overhaul**

The drop arm ball joint can be overhauled with a repair kit available which consists of the the following items:

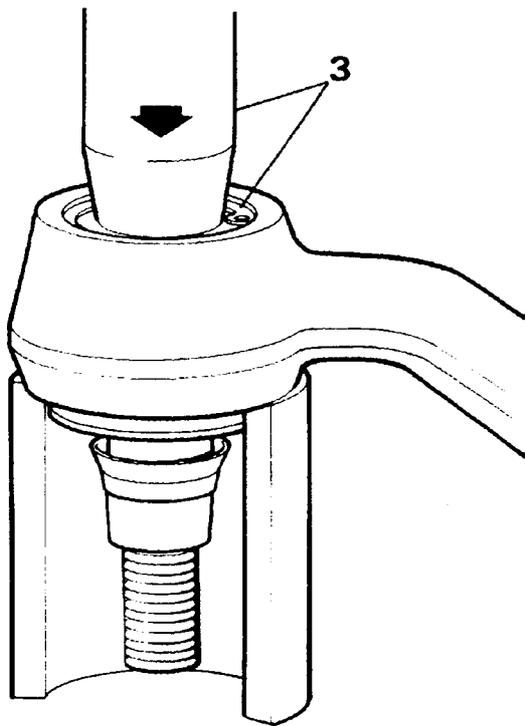
**Ball pin
Retainer
Spring rings
Dust cover
Ball top socket**

**Ball lower socket
Spring
'O' ring
Cover-plate
Circlip**

Dismantle

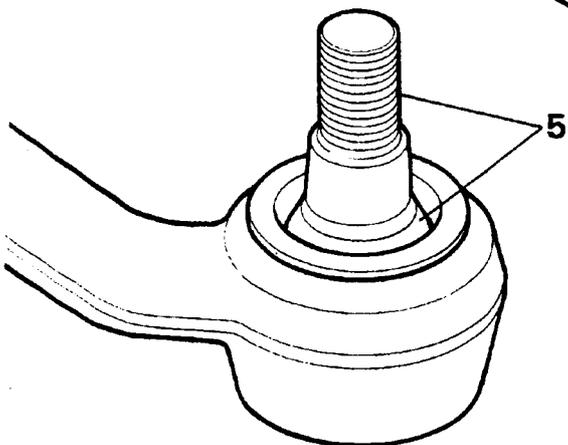
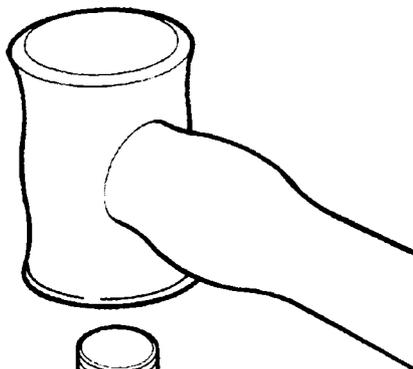
1. Remove the drop arm from the vehicle and clean the exterior.
2. Remove the spring rings and prise off the dust cover.
3. In the interests of safety, position the ball joint under a press to relieve the spring tension and support the housing both sides of the ball pin, as illustrated. Apply pressure to the cover plate and remove the circlip and slowly release the pressure.

WARNING: Personal injury could result if the circlip is removed without pressure being applied and maintained to the cover plate.

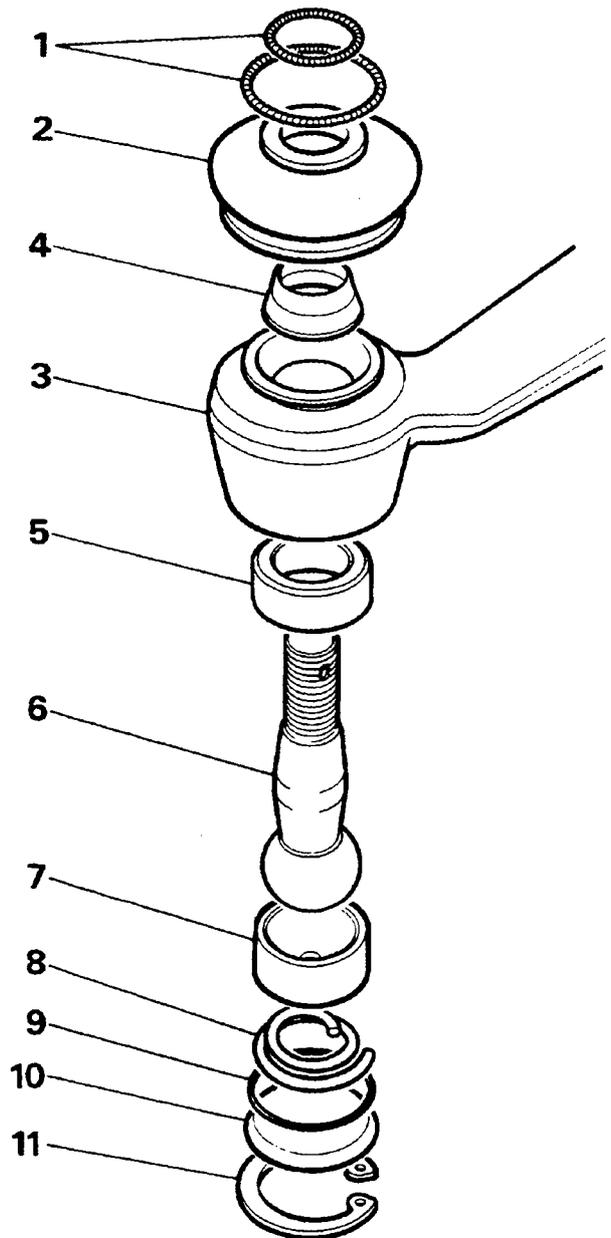


ST1382M

4. Remove the spring, top socket and 'O' ring.
5. Since the ball pin cannot be removed with the retainer in position, tap the threaded end of the ball pin to release the retainer and to remove the pin from the housing.



ST1383M

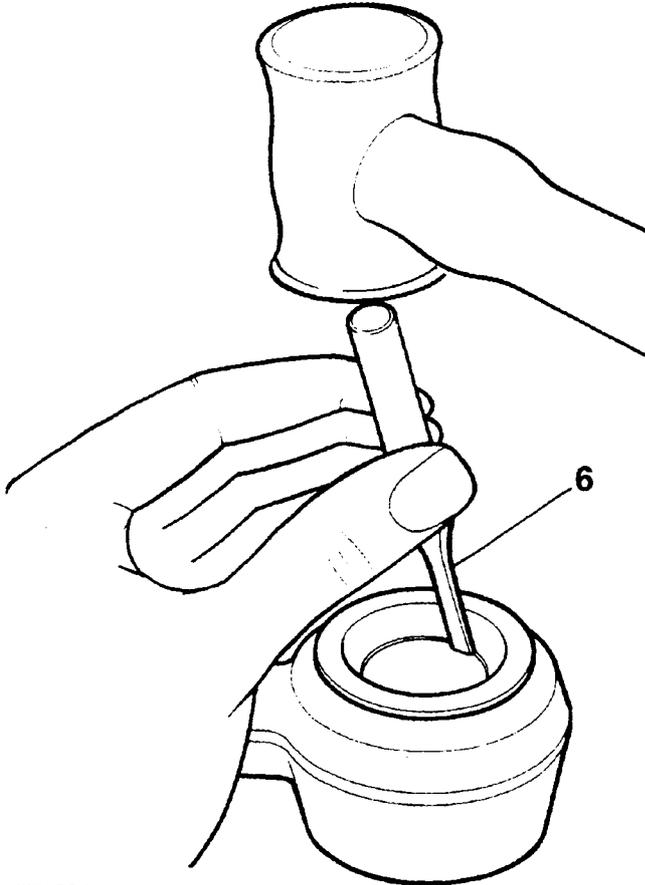


ST1381M

KEY TO BALL JOINT

1. Spring rings
2. Dust cover
3. Ball housing
4. Retainer
5. Bottom socket
6. Ball pin
7. Top socket
8. Spring
9. 'O' ring
10. Cover-plate
11. Circlip

6. Using a sharp-edged punch or chisel, drive the ball lower socket from the housing.
7. Clean the housing and remove any burrs.

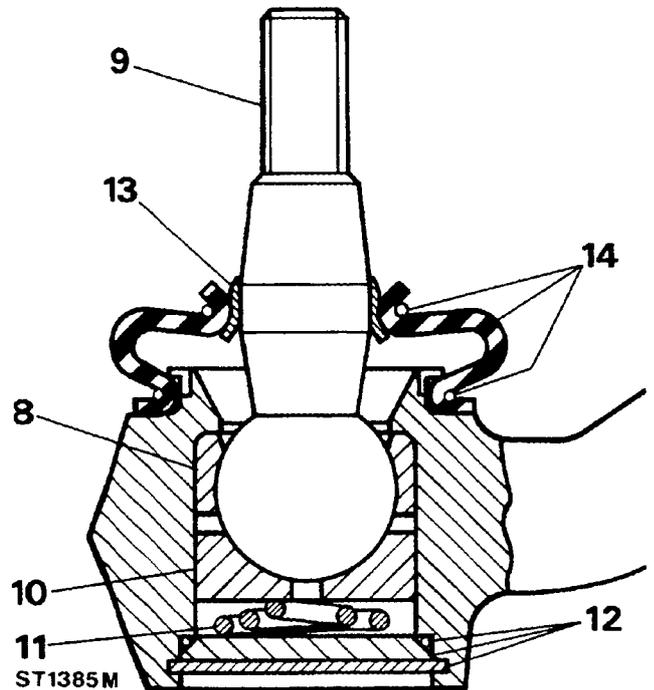


ST1384M

Assemble

8. Press in the lower socket squarely up to the shoulder.
9. Dip the ball in Duckhams LB10 grease, or equivalent and fit to the housing and pack with grease.
10. Fit the top socket.
11. Fit the spring, small diameter towards the ball.
12. Fit the 'O' ring and using the same method as for removing the circlip, compress the cover plate and secure with the circlip. Ensure that the circlip is fully seated in the machined groove

13. Press the retainer onto the ball pin so that the top edge is level with the edge of the taper.



14. Fit the dust cover and retain with the two spring rings.
15. Fit the drop arm to the steering box using a new lock washer. Tighten the retaining nut to the correct torque (see section 06-Torque values) and bend over the lock washer.
16. Assemble the ball pin to the drag link, see instructions for fitting drag link and track rod, tighten the castle nut to the correct torque (see section 06-Torque values) and secure with a new cotter pin.

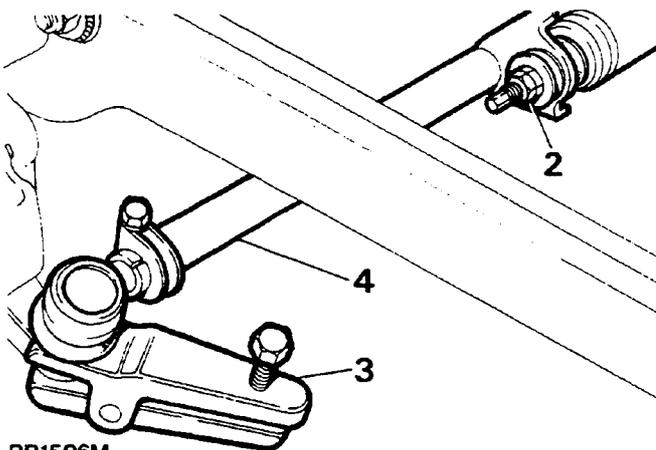
TRACK ROD AND LINKAGE

Remove and refit

TRACK ROD

Removing

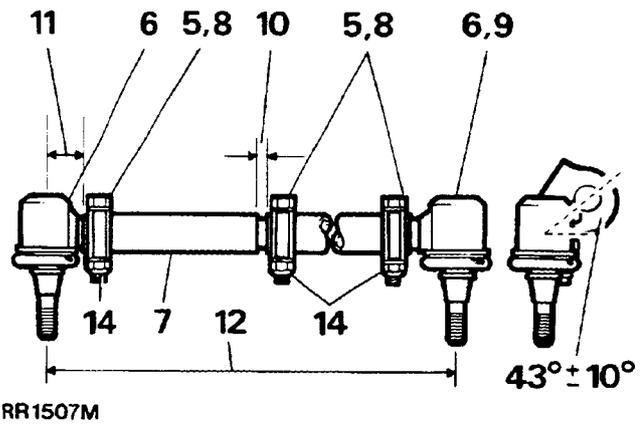
1. Place the vehicle on a suitable hydraulic hoist, alternatively raise the front of the vehicle using a hydraulic floor jack and install axle stands under the front axle, remove the floor jack.
2. Disconnect the steering damper at the track rod.
3. Disconnect the track rod at the ball joints, using a suitable extractor.
4. Withdraw the complete track rod.



LINKAGE

Removing

5. Loosen the clamp bolts.
6. Unscrew the ball joints.
7. Unscrew the track rod adjuster, left hand thread.



Refitting

8. Fit the replacement parts. Do not tighten the clamp pinch bolts at this stage.
9. Screw in a ball joint to the full extent of the threads.
10. Set the adjuster dimensionally to the track rod as illustrated, to 8.9mm (0.350 in).
11. Set the adjuster end ball joint dimensionally, as illustrated to 28.57mm (1.125 in).
12. The track rod effective length of 1230.0mm (48.4 in) is subject to adjustment during the subsequent wheel alignment check.

TRACK ROD

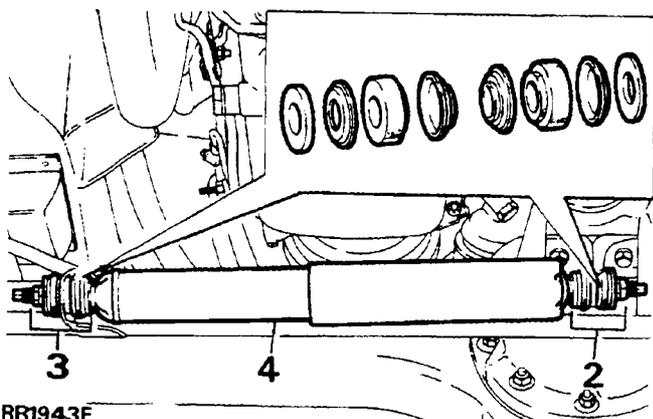
Refitting

13. Fit the track rod and tighten the ball joint nuts to the correct torque (see section 06-Torque values).
14. Check the front wheel alignment.
15. Reverse 1 and 2.

CAUTION: A new track rod must be fitted if the existing track rod is damaged or bent. No attempt should be made to repair or straighten it.

STEERING DAMPER**Remove and refit****Removing**

1. Place the vehicle on a suitable hydraulic hoist, alternatively raise the front of the vehicle using a hydraulic floor jack and place axle stands under the front axle, remove the floor jack.
2. Remove the fixings at the differential case bracket.
3. Remove the fixings at the track rod bracket.
4. Withdraw the steering damper.



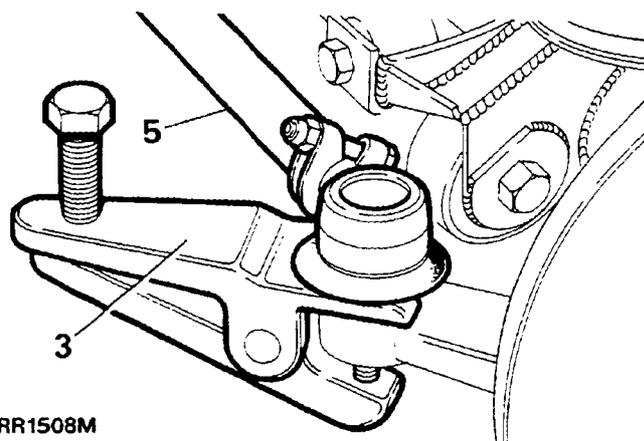
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Refitting

5. Reverse 1 to 4.

DRAG LINK AND DRAG LINK ENDS**Remove and refit****Removing**

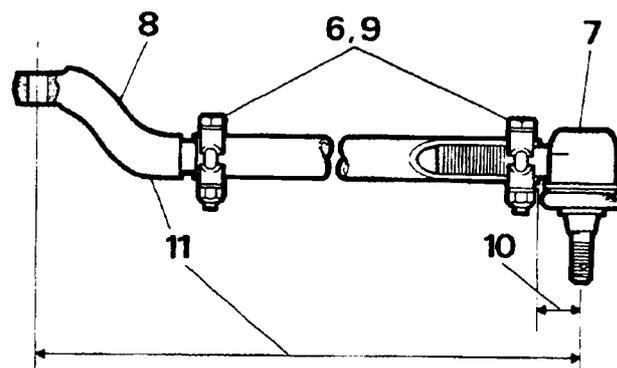
1. Place the vehicle on a suitable hydraulic hoist, alternatively raise the front of the vehicle using a hydraulic floor jack and place axle stands under the front axle-remove the floor jack.
2. Remove the right hand front road wheel.
3. Disconnect the drag link ball joint at the swivel housing arm, using a suitable extractor.
4. Disconnect the drag link end at the drop arm ball joint, using a suitable extractor.
5. Withdraw the drag link.



RR1508M

DRAG LINK ENDS**Removing**

6. Loosen the clamp bolts.
7. Unscrew the ball joint.
8. Unscrew the offset end.



RR1509M

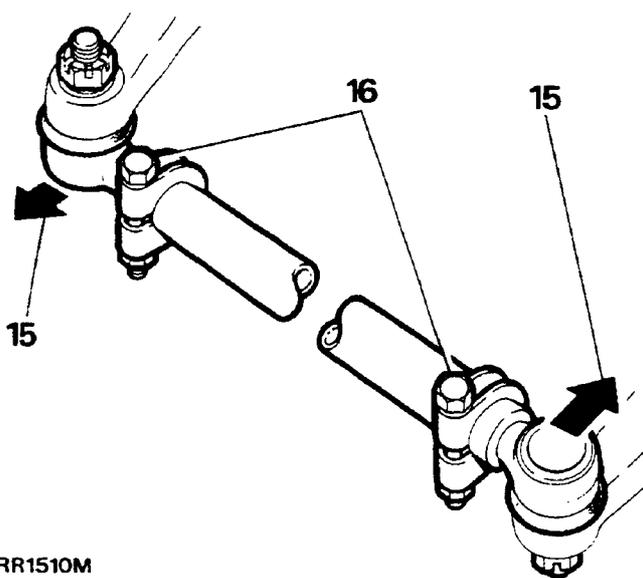
Refitting

9. Fit the replacement ends. Do not tighten the clamp bolts at this stage.
10. Set the ball joint dimensionally to the drag link, as illustrated, to 28.57mm (1.125 in).
11. Adjust the offset end to obtain the nominal overall length of 919.0mm (36.2 in). The final length is adjusted during refitting.

DRAG LINK

Refitting

12. Fit the drag link. Tighten the ball-joint nuts to the correct torque (see section 06-Torque values).
13. Check, and if necessary, set the steering lock stops.
14. Turn the steering and ensure that full travel is obtained between the lock stops. Adjust the drag link length to suit.
15. Using a mallet, tap the ball joints in the direction indicated so that both ball pins are in the same angular plane.
16. Tighten the clamp bolts to the correct torque (see section 06-Torque values).



RR1510M

17. Reverse 1 and 2.

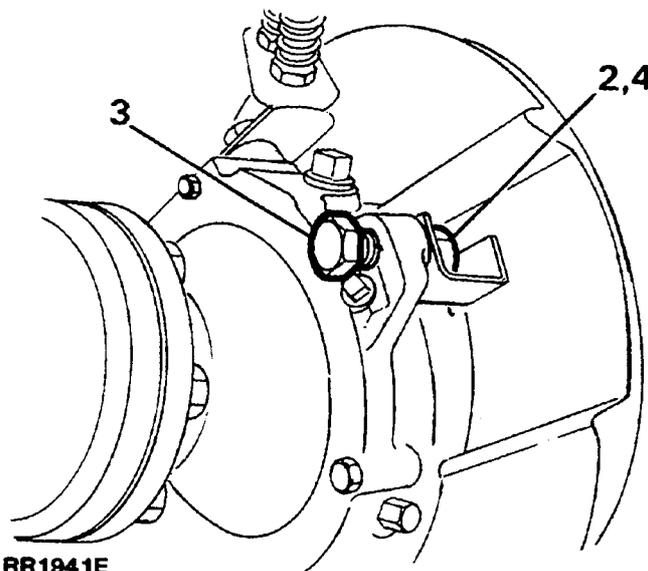
CAUTION: A new drag link must be fitted if the existing drag link is damaged or bent. No attempt should be made to repair or straighten it.

STEERING LOCK STOPS

Check and adjust

Checking

1. Measure the clearance between tyre wall and radius arm at full lock. This must be 20 mm (0.787 in).



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Adjusting

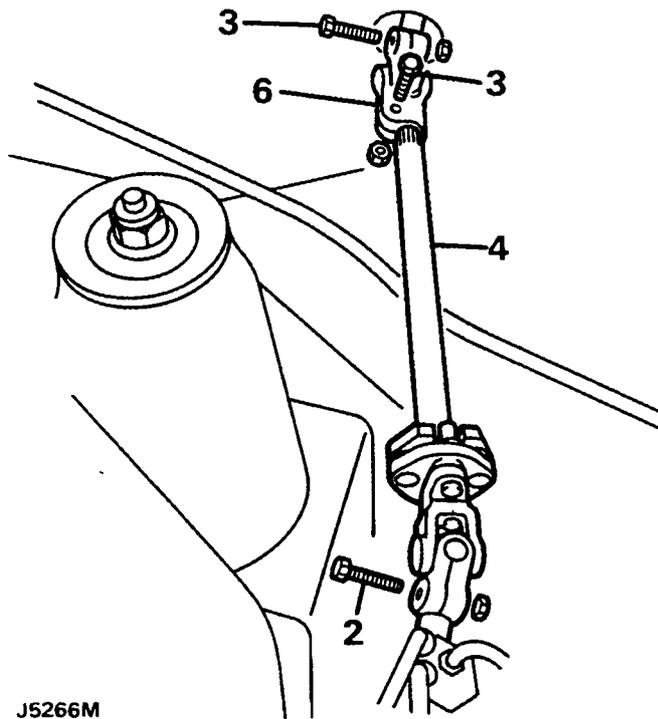
2. Loosen the stop bolt locknut.
3. Turn the stop bolt in or out as required.
4. Tighten the locknut.
5. Check the clearance between tyre wall and radius arm on each lock.

STEERING COLUMN

Removal

NOTE: The steering column is of the safety type and incorporates shear pins. Therefore do not impart shock loads to the steering column.

1. Disconnect battery negative lead.
2. Remove steering wheel (Section 76).
3. Remove access panel from below steering column.
4. Remove footwell fascia closing panel, if fitted.
5. Remove steering column shroud (Section 76).
6. Remove steering column switches (Section 86).
7. Remove column switches mounting bracket from steering column.
8. Disconnect ignition switch at multi-plug.
9. Remove top pinch bolt, universal joint to steering column.
10. Remove fixings securing column to bulkhead.
11. Remove fixings securing column to fascia bracket.
12. Withdraw steering column complete with gasket.



J5266M

Refitting

13. Position gasket on end of steering column.
14. Feed splined end of column through bulkhead and engage splines with universal joint.
15. Fit column upper fixings, do not fully tighten at this stage.
16. Fit column lower fixings and tighten to a torque of 27 Nm (20 lbf ft)
17. Fit pinch bolt to universal joint and tighten to a torque of 35 Nm (26 lbf ft).
18. Tighten the upper fixings to a torque of 27 Nm (20 lbf ft).
19. Fit remaining components reversing operations 1 to 8.

LOWER STEERING SHAFT AND UNIVERSAL JOINTS

NOTE: Early models were fitted with lower steering shaft assemblies having a thicker rubber coupling which was fitted at the steering column end of the shaft.

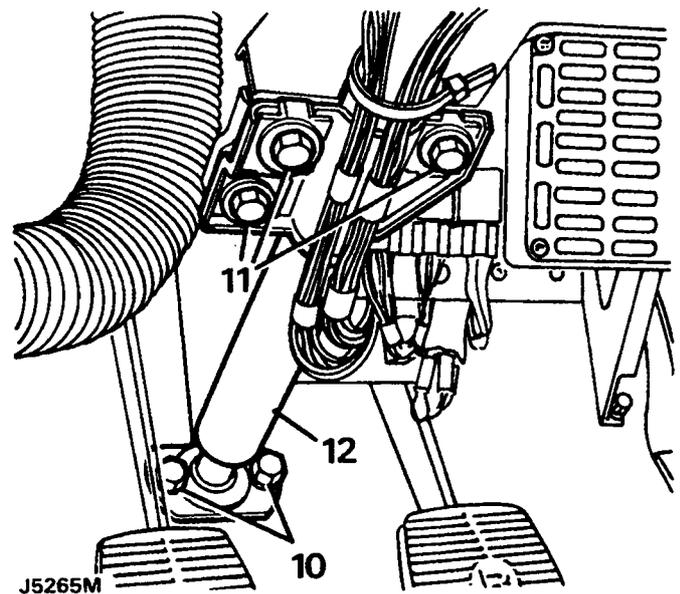
Removal

1. Ensure road wheels are in the straight ahead position.
2. Remove pinch bolt securing lower universal joint to steering box.
3. Remove two pinch bolts securing upper universal joint to shaft and steering column.
4. Slide shaft assembly upwards to release lower joint steering box.

5. Detach shaft assembly from upper spline and withdraw it from vehicle.
6. Withdraw upper universal joint from shaft.

NOTE: Do not dismantle or remove lower coupling from shaft. Steering shaft, rubber coupling and lower universal joint are only available as an assembly.

7. Inspect both universal joints for wear and excessive play, fit new components as necessary.
8. Check condition of rubber coupling, renew as necessary.



J5265M

Refitting

NOTE: When refitting universal joints ensure pinch bolt holes align with their respective grooves.

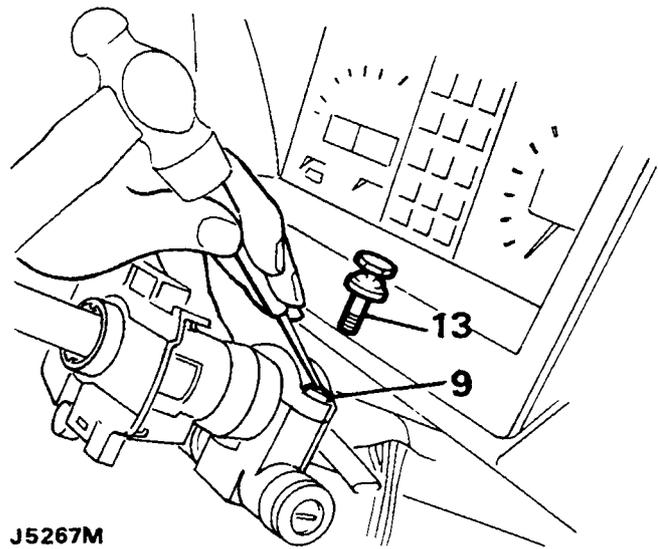
9. Position upper universal joint on shaft.
10. Locate shaft assembly with splined end of steering column and slide upper universal joint fully onto spline.
11. Engage lower universal joint with spline on steering box and slide shaft assembly down.
12. Locate bolt holes in universal joint with their respective grooves in steering column, shaft and steering box splines.
13. Fit pinch bolts and tighten to a torque of 35 Nm (26 lbf ft).

STEERING COLUMN LOCK ASSEMBLY

Removal

NOTE: The steering column is of the safety type and incorporates shear pins. Therefore do not impart shock loads to the steering column.

1. Disconnect battery negative lead.
2. Remove steering wheel (Section 76).
3. Remove access panel from below steering column.
4. Remove steering column shroud (Section 76).
5. Remove steering column switches (Section 86).
6. Remove column switches mounting bracket from steering column.
7. Disconnect ignition/start switch from steering lock.
8. Using a sharp punch and a hammer, lightly tap head of shear pins in a counter-clockwise direction to release from column lock housing.
9. Remove sheared bolts detach clamp and withdraw lock assembly.



J5267M

Refitting

10. Position clamp on outer column, locating spigot in hole provided.
11. Locate lock assembly with column and clamp.
12. Fit new shear bolts to retain clamp and lock, tightening bolts sufficient to shear heads.
13. Refit remaining components reversing operation 1 to 8

FRONT WHEEL ALIGNMENT

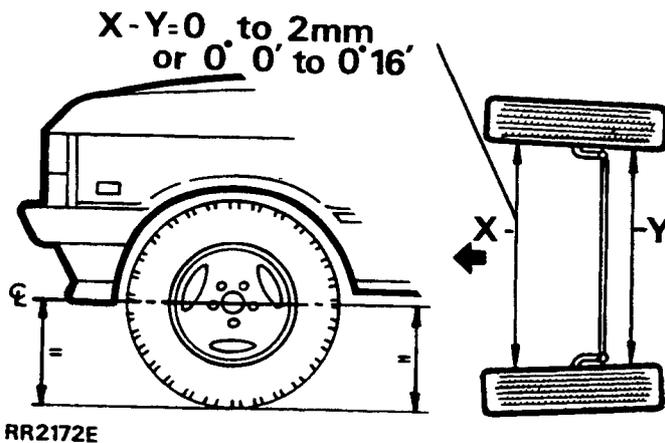
Check and adjust

Checking

Toe-out dimensions

NOTE: No adjustment is provided for castor, camber or swivel pin inclinations.

1. Set the vehicle on level ground with the road wheels in the straight-ahead position.
2. Push the vehicle back then forwards for a short distance to settle the linkage.
3. Measure the toe-out at the horizontal centre-line of the wheels.
4. Toe-out must be 0 to 2mm. Toe-out included angle $0^{\circ} 0'$ to $0^{\circ} 16'$.
5. Check tightness of the clamp bolt fixings for the correct torque **14 Nm**.



Adjusting

1. Loosen the adjuster sleeve clamp bolts.
2. Rotate the adjuster to lengthen or shorten the track rod.
3. Check the toe-out setting as in instructions 1 to 4. When the toe-out is correct, lightly tap the steering linkage ball joints, in the directions illustrated, to the maximum of their travel to ensure full unrestricted working travel.
4. Finally, tighten the clamp bolts to the correct torque (see section 06-Torque values).

