

SUB-SUB-SECTION L2

FAULT DIAGNOSIS AND CORRECTIVE ACTION

INTRODUCTION

1. This Sub-sub-section deals with fault diagnosis and corrective action required for the steering system. In Table L2.1 a list of symptoms, the probable cause and the necessary remedies are given. If a fault is suspected, the faults listed in the Table should be consulted. It should be remembered that the Table is not exhaustive and faults may occur which are not listed. Should the Table fail to reveal the fault the suspected component(s) should be removed for a closer inspection and/or overhaul.

TABLE L2.1 - STEERING SYSTEM FAULT DIAGNOSIS CHART

SYMPTOM	POSSIBLE CAUSE	REMEDY
Backlash in steering	Worn or badly adjusted rocker shaft. Worn or loose linkage. Worn swivel hub assembly. Worn or loose front wheel bearings. Steering box loose on chassis.	Replace rocker shaft. Tighten or replace. Overhaul swivel pin housing. Tighten or replace bearings. Tighten box.
Tight steering	Low or unequal tyre pressures. Steering box oil level low. Rocker shaft adjusted too tightly. Inner column binding. Seized ball joint. Relay unit damaged or oil level low.	Check pressures and adjust. Replenish to correct level. Readjust rocker shaft. Clean and lubricate. Replace ball joint. Replenish oil or overhaul relay unit.
Rattle in steering column	Rocker shaft worn or badly adjusted.	Check rocker shaft and replace or readjust.

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SUB-SECTION L3

ADJUSTMENTS

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CHAPTER 1

STEERING BOX ADJUSTMENTS

1. To adjust for steering wheel backlash:

(1) Set the steering in the straight ahead position.

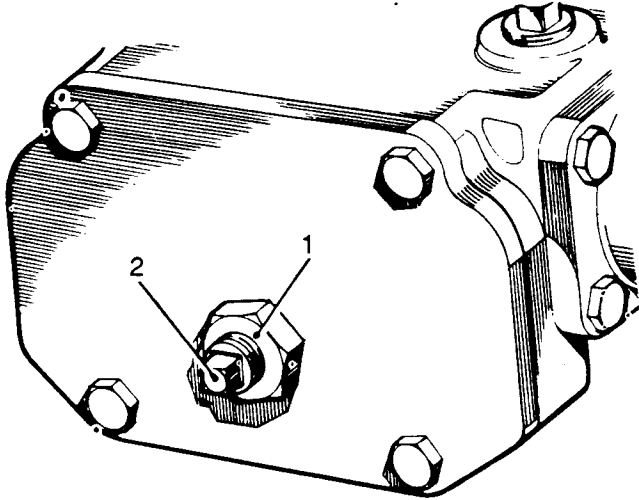


Fig L3.1

(2) Refer to Fig L3.1. Slacken the lock nut (1) and adjuster (2).

(3) Screw in the adjuster (2) until steering wheel backlash is taken up.

(4) Screw in a further one-half flat (maximum) to allow for lock nut (1) tightening.

(5) Tighten the lock nut without disturbing the adjuster (2).

SUB-SECTION L3

CHAPTER 2

STEERING GEOMETRY

1. No adjustment is provided for castor, camber or swivel pin inclination. However, the following applies to the steering system:
 - a. It is essential that there is equal thread engagement of all steering tube ends (ball joints).
 - b. With the road wheel in the straight-ahead position and the steering wheel centralised, the steering column lock (if fitted) should engage within ± 20 degrees.
 - c. Steering box movement exceeds that required to obtain full lock to lock steering movement. This excess movement must be evenly divided between right-hand and left-hand locks and must not be less than 90 degrees steering wheel movement before the stops in the steering box are operative. This adjustment must be made in the drag link only.

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CHAPTER 3

LOCKSTOPS

1. To set the lockstops:

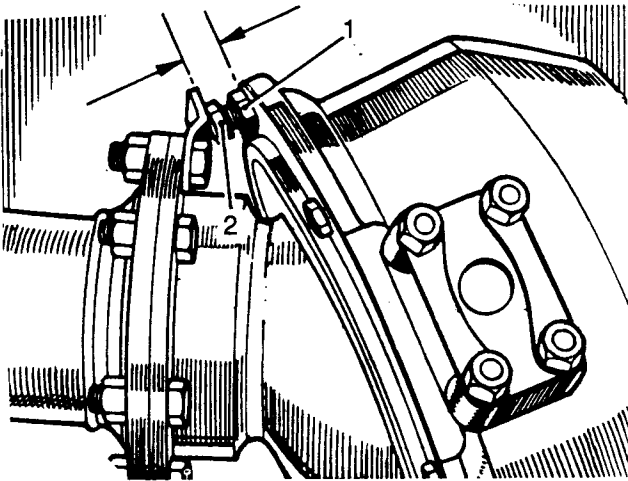


Fig L3.2

(1) Refer to Fig L3.2. Slacken the locknuts (1).

(2) Adjust the stop bolts (2) to obtain 12,5 mm between the bolt head top face and the oil seal retainer face.

(3) Tighten the locknuts (1).

(4) Check the steering at full lock and ensure clearance between the tyres and chassis components.

SUB-SECTION L3

CHAPTER 4

FRONT WHEEL ALIGNMENT

CHECKING TOE-IN

1. To check toe-in:

- (1) Set the vehicle on level ground with the road wheels in the straight-ahead position, and push it forward a short distance.

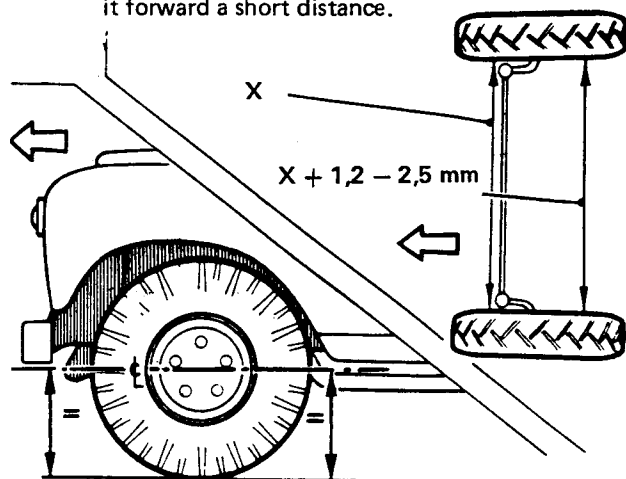


Fig L3.3

- (2) Refer to Fig L3.3. Measure the toe-in, with the aid of a tracking stick or suitable proprietary equipment; it should be 1,2 to 2,5 mm measured at the horizontal centre-line of the road wheels.

- (3) If necessary, adjust the toe-in as detailed below.

ADJUSTMENT

2. To set toe-in:

- (1) Slacken the clamps securing the ball joint at each end of the track rod.
- (2) Turn the track rod to decrease or increase its effective length as necessary, until the toe-in is correct.
- (3) Push the vehicle rearwards turning the steering wheel from side to side to settle the ball joints. Then, with the road wheels in the straight ahead position, push the vehicle forward a short distance. Re-check the toe-in. If necessary carry out further adjustment.

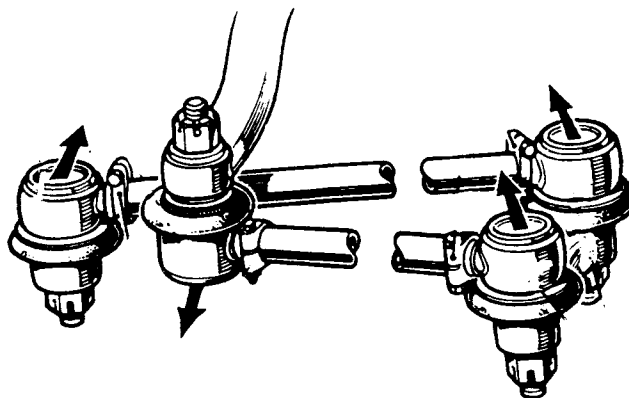


Fig L3.4

- (4) Refer to Fig L3.4. When the toe-in is correct, lightly tap the track rod ball joints in the direction indicated to the maximum of their travel, to ensure full unrestricted movement of the track rod.

- (5) Secure the ball joint clamps. Torque load 11 to 15 N.m.

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SUB-SECTION L4

REMOVAL AND REPLACEMENT PROCEDURES

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SUB-SECTION L4

CHAPTER 1

STEERING COLUMN TOP BEARING - REMOVAL AND REPLACEMENT

REMOVAL

1. Remove the steering column top bearing as follows:
 - (1) Disconnect the battery earth lead.
 - (2) Remove the steering wheel (see Sub-section L4, Chapter 8).
 - (3) Release the combined switch from the steering column (see Sub-section L4, Chapter 2).

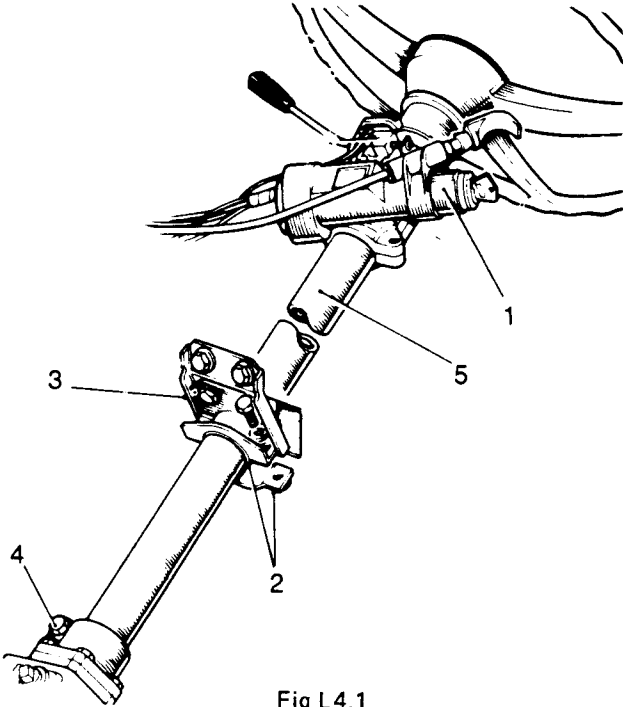


Fig L4.1

- (4) Refer to Fig L4.1. On vehicles without a steering column lock, unscrew the lock ring (1) and move aside the ignition/starter switch from the mounting bracket.
- (5) Remove the column clamp bracket and seal (2).
- (6) Remove the column support bracket (3).
- (7) Slacken the pinch bolt (4) outer column to steering box.
- (8) Withdraw the outer column (5) from the inner column and steering box.

NOTE

On vehicles fitted with a steering column lock disconnect the cold start control in the engine compartment and disconnect the leads from the ignition/starter switch (see Sub-section L4, Chapter 2), turn the ignition/starter key to unlock steering.

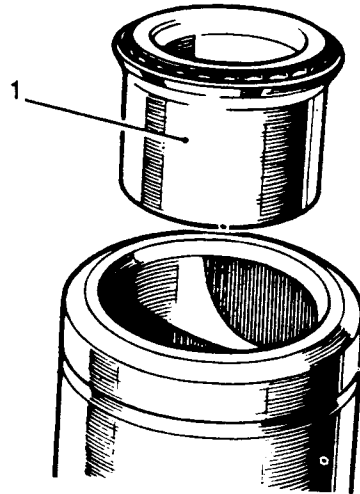


Fig L4.2

- (9) Refer to Fig L4.2. Remove the column top bearing (1).

REPLACEMENT

2. To replace the steering column top bearing:

- (1) Refit the top bearing (1) to the steering column.

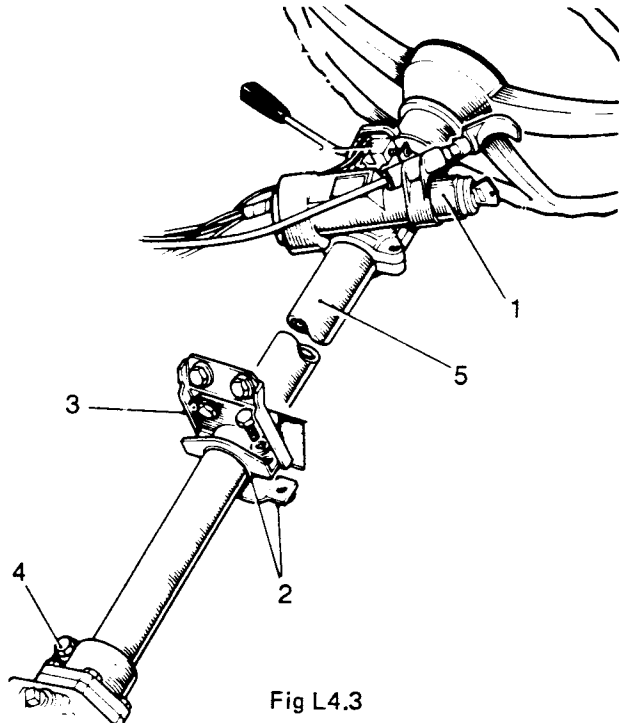


Fig L4.3

- (2) Refer to Fig L4.3. Replace the outer column (5) over the inner column.
- (3) Tighten the pinch bolt (4), outer column to steering box.

- (4) Refit the column support bracket (3).
- (5) Replace the column clamp bracket and seal (2).
- (6) Replace the ignition/starter switch on the mounting bracket and screw the locking ring (1) tight.
- (7) Replace the combined switch onto the steering column (see Sub-section L4, Chapter 2).
- (8) Replace the steering wheel (see Sub-section L4, Chapter 8).
- (9) Refit the battery negative lead.

SUB-SECTION L4

CHAPTER 2

STEERING COLUMN LOCK AND IGNITION/STARTER SWITCH - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the lock and switch:

- (1) Disconnect the battery earth lead.
- (2) Disconnect the cold start control in the engine compartment.

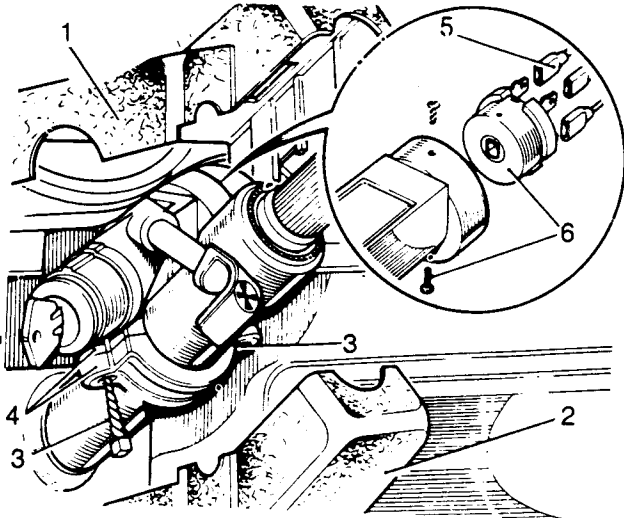


Fig L4.4

- (3) Refer to Fig L4.4. Remove the fixings and withdraw the steering column upper shroud (1).
- (4) Remove the fixings and move aside the lower shroud (2).
- (5) Centre punch and drill a hole in each sheared bolt to accept an extractor (3).
- (6) Remove the sheared bolts using a suitable 'Easy-out' extractor.
- (7) Withdraw the steering column lock and retainer saddle (4).
- (8) Disconnect the electrical leads (5) at the ignition/starter switch.
- (9) If required, remove the fixing screws (6) and withdraw the switch and the cold start control.

REPLACEMENT

2. Replace the lock and switch as detailed below:

- (1) If the switch has been withdrawn, replace it and tighten the fixing screws.

LEAD COLOUR CODE:

N—Brown
R—Red
W—White
O—Orange

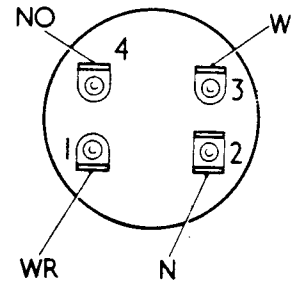


Fig L4.5

- (2) Refer to Fig L4.5. Reconnect the electrical leads to the ignition/starter switch.

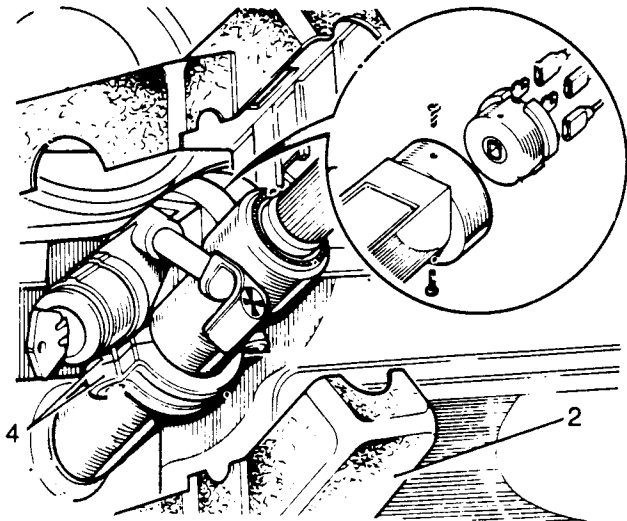


Fig L4.6

- (3) Refer to Fig L4.6. Replace the steering column lock and retainer saddle (4) and secure with new bolts.
- (4) Replace the lower shroud (2).
- (5) Replace the upper shroud (1).
- (6) Reconnect the cold start control in the engine compartment.
- (7) Refit the battery negative lead.

SUB-SECTION L4

CHAPTER 3

STEERING COLUMN AND BOX ASSEMBLY - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the column and box:

- (1) Remove the bonnet (see Sub-section M3, Chapter 1).
- (2) Disconnect the battery earth lead.
- (3) Remove the air cleaner (see Sub-section G3).
- (4) Remove the steering wheel (see Sub-section L4, Chapter 8).
- (5) Remove the lock and starter switch (see Sub-section L4, Chapter 2).

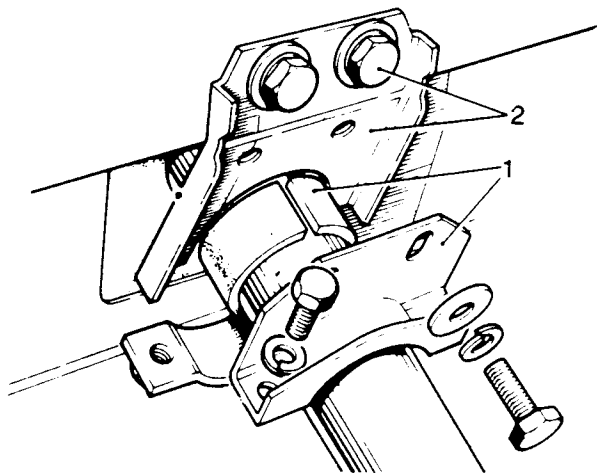


Fig L4.7

- (6) Refer to Fig L4.7. Remove the lower clamp bracket and rubber sleeve (1) from the outer column.
- (7) Remove the upper clamp bracket and support bracket (2) from the bulkhead.

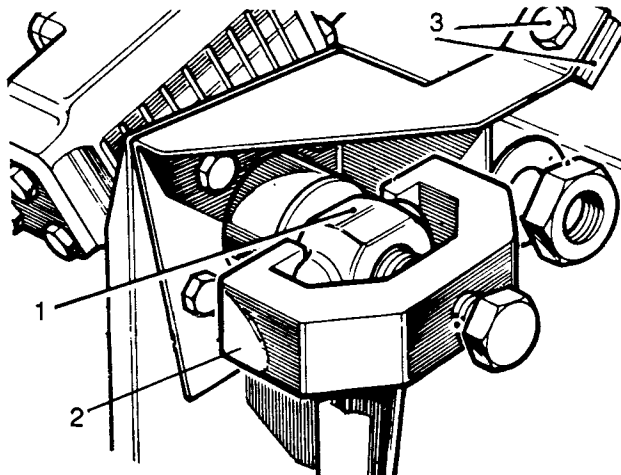


Fig L4.8

- (8) Refer to Fig L4.8. Disconnect the steering drop arm and the attached longitudinal steering tube (1) from the steering box, using special tool 600000 (2).
- (9) Remove the fixings steering box stiffener bracket (3) to the box.
- (10) Raise the front of the vehicle and support on stands.
- (11) Remove the driver's side front road wheel.

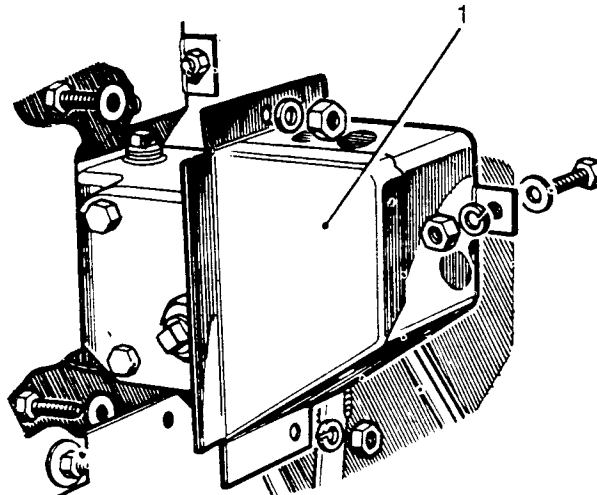


Fig L4.9

- (12) Refer to Fig L4.9. Remove the steering unit box (1) from the wheel arch.

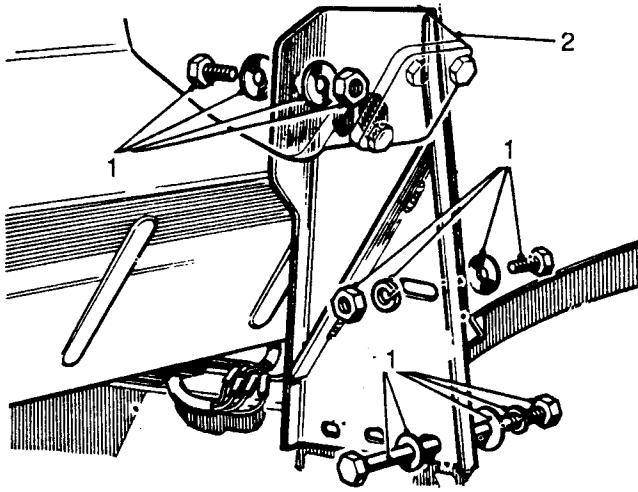


Fig L4.10

(13) Refer to Fig L4.10. Remove the fixings (1), steering box support bracket to toe box, wing valance and chassis.

(14) Withdraw the steering column and box assembly (2) complete with attached brackets from beneath the front wing.

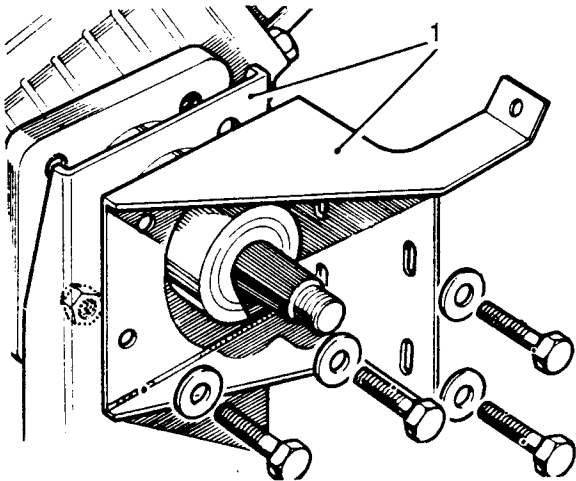


Fig L4.11

(15) Refer to Fig L4.11. If required, remove the stiffener bracket and support bracket (1) from the steering box.

NOTE

The steering box can be overhauled without removing the brackets.

REPLACEMENT

2. Replace the column and box as follows:

(1) If removed, fit the support bracket and stiffener brackets to the steering box. Torque 70 to 85 N.m.

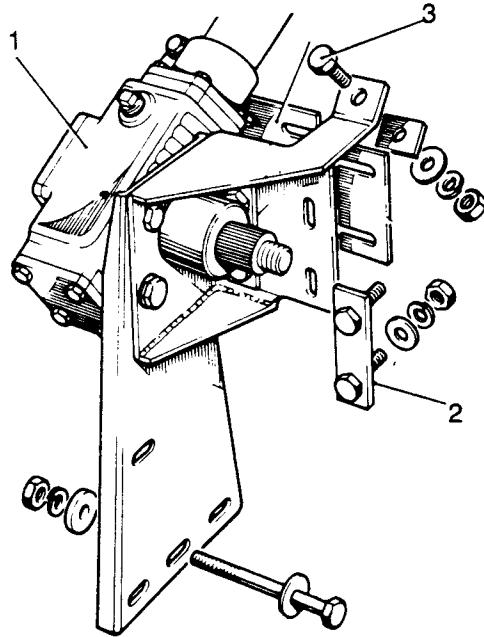


Fig L4.12

(2) Refer to Fig L4.12. Locate the steering box and bracket assembly (1) less drop arm, in position on the vehicle.

(3) Retain the support bracket to the chassis, wing valance and toe box, but do not fully tighten the fixings (2) at this stage.

(4) Retain the steering box stiffener bracket (3) to the toe box, but do not fully tighten the fixings at this stage. If necessary, fit shim washers between the stiffener bracket and the toe box to prevent distorting the toe box or bracket.

CAUTION

During the next steps, do not strain the steering column. If necessary, adjust the steering box position, using the slotted fixing holes in the support and stiffener brackets, to obtain a snug fit between the clamp upper half and the steering column, before securing the clamp halves.

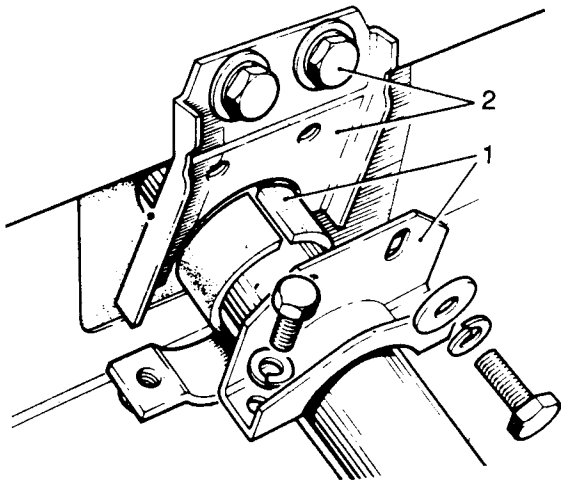


Fig L4.13

- (5) Refer to Fig L4.13. Refit the upper clamp bracket and support bracket (2) to the bulkhead.
- (6) Fit the rubber sleeve and lower clamp bracket (1) to the outer column.
- (7) Insert slotted packing pieces as required to take up clearance between the support bracket, stiffener bracket and toe box.
- (8) Secure the support bracket and stiffener bracket fixings. Torque load for support bracket to chassis fixings is 20 N.m.
- (9) Lower the front of the vehicle to the ground.

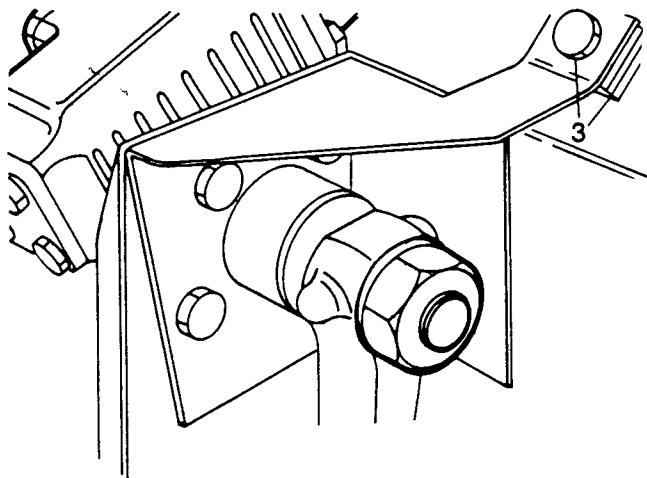
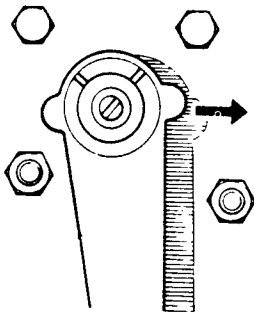


Fig L4.14

- (10) Refer to Fig L4.14. Replace the fixings (3), steering box stiffener bracket to the box.

- (11) Fit the drop arm to the steering box, aligning the mark on the steering rocker arm with the forward mark of the two on the drop arm.

NOTE

Where a replacement steering box and drop arm complete is being fitted, remove and discard the original drop arm from the longitudinal steering tube, using special tool 601763 (see Fig L4.15), and fit the new drop arm. Torque load for ball joint fixings is 40 N.m.

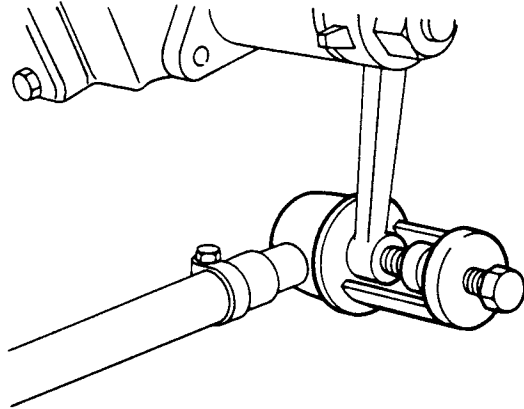


Fig L4.15

- (12) Tighten the drop arm fixing to 85 to 110 N.m.
- (13) Replace the lock and starter switch (see Sub-section L4, Chapter 2).
- (14) Replace the steering wheel (see Sub-section L4, Chapter 8).
- (15) Replace the air cleaner (see Sub-section G3).
- (16) Reconnect the battery earth lead.
- (17) Refit the bonnet (see Sub-section M3, Chapter 1).

SUB-SECTION L4

CHAPTER 4

STEERING RELAY - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the steering relay:

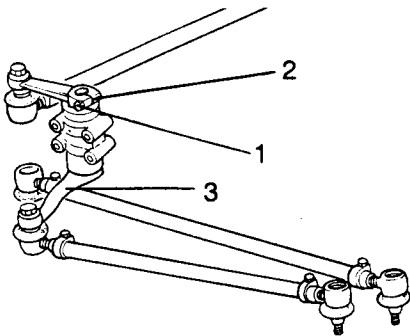


Fig L4.16

- (1) Refer to Fig L4.16. From under the bonnet, remove the pinch bolt (1) and withdraw the upper lever (2) from the relay shaft.
- (2) Remove the two upper nuts and bolts securing the relay to the chassis.
- (3) From under the vehicle, remove the pinch bolt and withdraw the lower lever (3) from the relay shaft.
- (4) Support the relay and remove the two lower nuts and bolts securing the relay to the chassis.
- (5) Withdraw the steering relay.

REPLACEMENT

2. Replace the steering relay as follows:
 - (1) Ensure that the relay unit is filled with the correct oil.
 - (2) Locate the relay in position on the chassis and secure the assembly with the four nuts and bolts.
 - (3) Fit the upper and lower relay levers and their respective securing bolts and nuts.

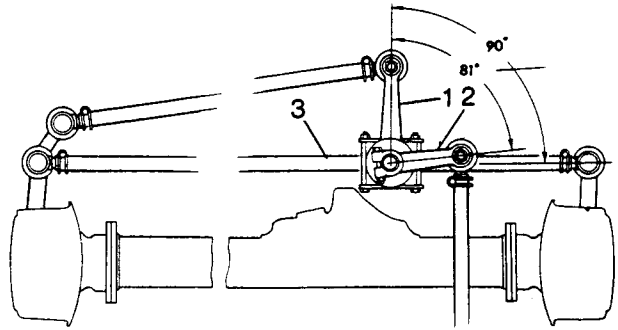


Fig L4.17

- (4) Refer to Fig L4.17. The angular relationship of the upper and lower relay levers should be 81 degrees. Check by setting the road wheels in the straight ahead position, at which point the relay lower lever (1) should be at 90 degrees to the track rod. The relay upper lever (2) should be inclined forward of the track rod, 9 degrees out of alignment with the track rod (3).
3. Refit the ball joints to the track rod as follows:
 - (1) Screw the ball joints equally until the overall dimension between the ball joint centres is 1157 to 1160 mm (dimension A on Fig L4.19).
 - (2) Position the ball joint clamps 1,6 to 3,2 mm from the track rod ends (dimension B). Do not tighten the clamp bolts at this stage.
 4. Refit the track rod:
 - (1) Fit the ball joints into their housings and secure with the washer and castellated nut. Torque to 40 N.m. Fit new split pins.
 - (2) Replace the front road wheels.
 - (3) Lower the front end of the vehicle to the ground.
 - (4) Check and if necessary adjust wheel alignment leaving the clamp fixings slackened.
 - (5) Tighten the ball joint clamps. Torque to 11 to 15 N.m.

SUB-SECTION L4

CHAPTER 5

TRACK ROD BALL AND JOINTS - REMOVAL AND REPLACEMENT

REMOVAL

1. First remove the track rod:
 - (1) Jack up the vehicle front end and support on stands.
 - (2) Remove the front road wheels.

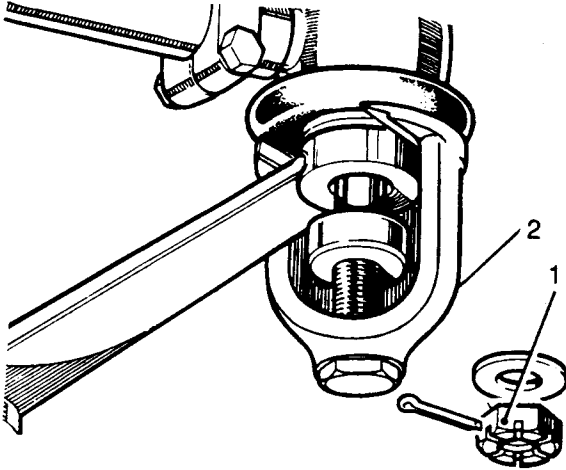


Fig L4.18

- (3) Refer to Fig L4.18. Remove the fixings (1) from both ball joints.
 - (4) Extract the ball joint, using special tool 601763 (2).
 - (5) Withdraw the track rod and ball joints.
2. Now remove the ball joints from the track rod:

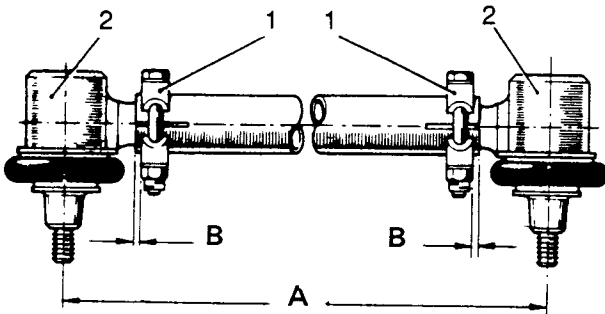


Fig L4.19

- (1) Refer to Fig L4.19. Slacken the ball joints clamp fixings (1).
- (2) Unscrew the ball joints (2) (LH and RH thread).

REPLACEMENT

3. Refit the ball joints to the track rods as follows:
 - (1) Screw on the ball joints equally until the overall dimension between the ball joint centres is 1157 to 1160 mm (dimension A on Fig L4.19).
 - (2) Position the ball joint clamps 1,6 to 3,2 mm from the track rod ends (dimension B). Do not tighten the clamp bolts at this stage.
4. Refit the track rod:
 - (1) Fit the ball joints into their housings and secure with the washer and castellated nut. Torque to 40 N.m. Fit new split pins.
 - (2) Replace the front road wheels.
 - (3) Lower the front end of the vehicle to the ground.
 - (4) Check, and if necessary adjust, wheel alignment, leaving the clamp fixings slackened.
 - (5) Tighten the ball joint clamps. Torque to 11 to 15 N.m.

SUB-SECTION L4

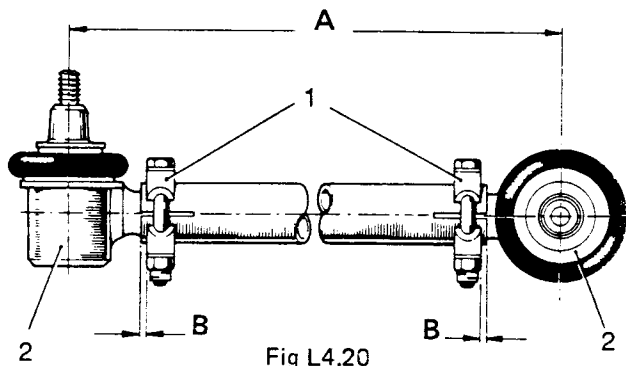
CHAPTER 6

LONGITUDINAL STEERING TUBE AND BALL JOINTS - REMOVAL AND REPLACEMENT

REMOVAL

1. First remove the longitudinal steering tube as detailed below:
 - (1) Prop open the bonnet.
 - (2) Remove the fixings (split pin, castellated nut and washer) from the ball joint connecting the longitudinal tube to the steering box drop arm.
 - (3) Using special tool 601763 extract the ball joint from the steering box drop arm (see Fig L4.18 for use of special tool).
 - (4) Remove the fixings from the ball joint connecting the longitudinal tube to the relay lever.
 - (5) Using special tool 601763 (see Fig L4.18) extract the ball joint from the relay lever and withdraw the longitudinal steering tube from the vehicle.

2. The ball joints may now be removed as follows:



- (1) Refer to Fig L4.20. Slacken the ball joint clamp fixings (1).
- (2) Unscrew the ball joints (2) (LH and RH thread).

REPLACEMENT

3. To replace the ball joints onto the longitudinal steering tube:
 - (1) Screw in the ball joint equally until the overall dimension between ball joint centres is 621,4 to 624,6 mm (dimension A). Position the clamps 1,58 to 3,17 mm from the longitudinal tube ends (dimension B). Do not tighten the clamp fixings at this stage.
4. To refit the longitudinal steering tube:
 - (1) Insert the ball joint ends into their housings on the steering relay lever and the steering box arm.

- (2) Secure the ball joints with washers and castellated nuts. Torque the ball joint fixings to 40 N.m and fit new split pins.

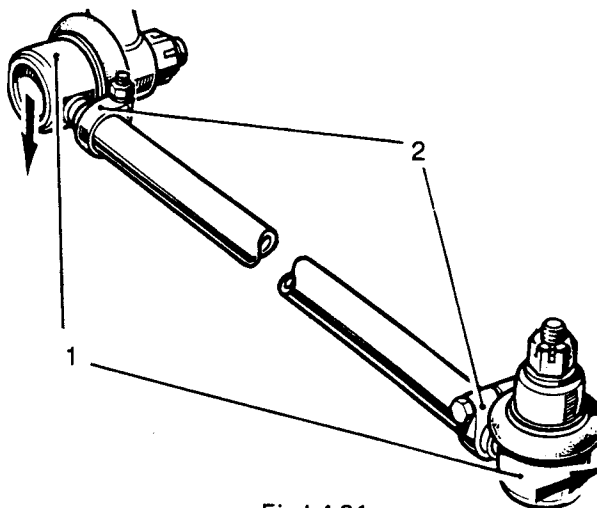


Fig L4.21

- (3) Refer to Fig L4.21. Using a mallet, lightly tap the ball joint cups (1) in the direction indicated to the maximum of their travel, to ensure full unrestricted movement of the longitudinal arm.
- (4) Tighten both ball joint clamps (2) to 11 to 15 N.m.
- (5) Check the steering lockstops setting (see Sub-section L3, Chapter 3).
- (6) Check the steering, lock to lock, for correct functioning. If necessary, adjust the overall length of the longitudinal arm by slackening the ball joint clamps and screwing the arm in or out, as required, then resecure the clamps.

SUB-SECTION L4

CHAPTER 7

DRAG LINK AND BALL JOINTS - REMOVAL AND REPLACEMENT

REMOVAL

1. Remove the drag link first as detailed below:
 - (1) Jack up the vehicle front end.
 - (2) Remove the front road wheel from the side where the drag link is connected to the swivel pin steering lever.

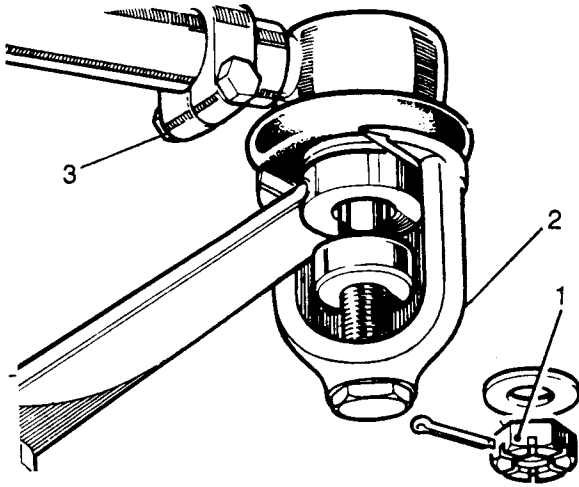


Fig L4.22

- (3) Refer to Fig L4.22. Remove both ball joint fixings (1).
 - (4) Extract the ball joints, using special tool 601763 (2).
 - (5) Withdraw the drag link.
2. Now remove the ball joints:
 - (1) Slacken the clamp fixings (3) on Fig L4.2 .
 - (2) Unscrew the ball joints, LH and RH thread.

REPLACEMENT

3. Replace the ball joints as follows:

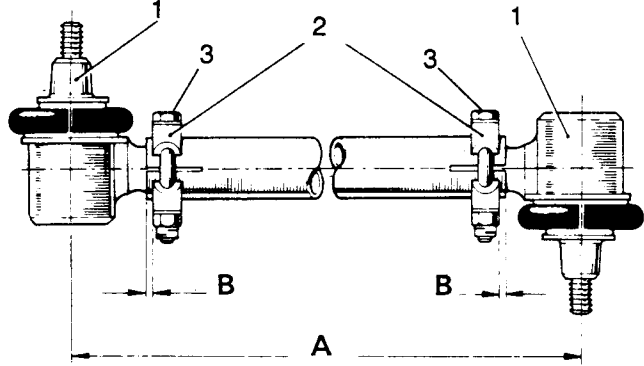


Fig L4.23

- (1) Refer to Fig L4.23. Screw in the ball joints (1) equally until the overall dimension between ball joint centres is 782,62 to 785,79 mm (dimension A).
 - (2) Position the clamps (2) 1,58 to 3,17 mm from the drag link ends (dimension B) with the clamp jaws situated over the slot in the tube; the relay lever ball joint is in the pendant position when fitted. Do not tighten the clamp fixings (3) at this stage.
4. Now refit the drag link:
 - (1) Fit the drag link ball joints into their housings and secure with a washer and castellated nut. Tighten the nuts to 40 N.m. Fit new split pins.

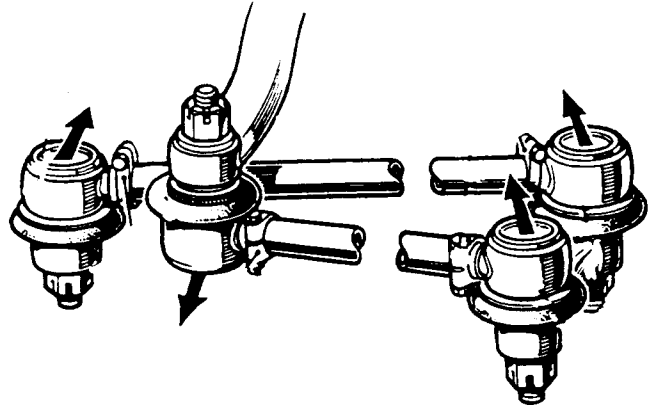


Fig L4.24

- (2) Refer to Fig L4.24. If the clamps were previously slackened, lightly tap the ball joint cups with a mallet in the direction indicated to the maximum of their travel, to ensure full unrestricted movement of the drag link.

(3) Tighten the ball joint clamps to 11 to 15 N.m.

(5) Lower the vehicle front end to the ground.

(4) Replace the front road wheel.

SUB-SECTION L4

CHAPTER 8

STEERING WHEEL - REMOVAL AND REPLACEMENT

REMOVAL

1. To remove the steering wheel:

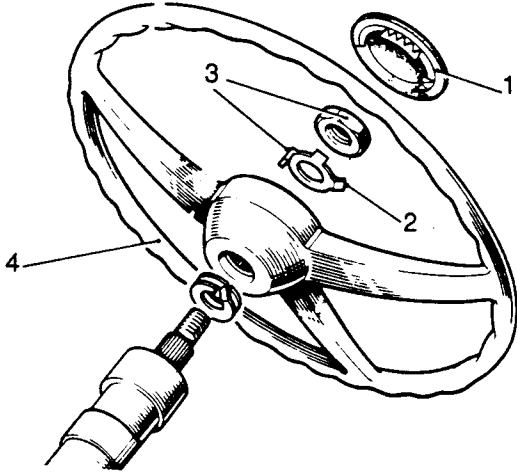


Fig L4.25

- (1) Refer to Fig L4.25. Prise off the wheel centre cover (1).
- (2) Release the locking tab (2).
- (3) Remove the tab washer and fixing nut (3).
- (4) Withdraw the steering wheel (4). Take care not to lose the spring washer below the wheel.

REPLACEMENT

2. To replace the steering wheel:

- (1) Position the road wheels in the straight ahead position.
- (2) Fit the steering wheel with the centre spoke pointing downwards.
- (3) Fit the tab washer and fixing nut. Torque the nut to 54 N.m.
- (4) Tap the locking tab into position against the nut.
- (5) Refit the wheel centre cover.

SUB-SECTION CONTENTS LIST

SUB-SECTION L5

OVERHAUL AND CLEANING PROCEDURES

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2	STEERING RELAY - OVERHAUL	L5.7
3	STEERING BALL JOINTS - CLEANING AND REGREASING	L5.10

SUB-SECTION L6

MAINTENANCE

INTRODUCTION

1. The steering system is relatively trouble free and requires little regular maintenance other than periodic cleaning and checking the connecting links for wear and damage.
2. The ball joints should be examined periodically to see that the rubber covers are undamaged. If cuts or abrasions are noted the covers should be replaced immediately.

CHECKING OIL LEVEL IN THE STEERING RELAY

3. At the specified intervals, check the oil level as follows:

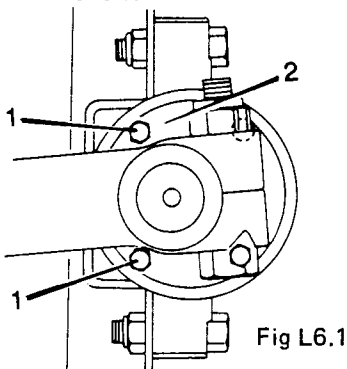


Fig L6.1

- (1) Refer to Fig L6.1. Remove two of the bolts (1) securing the relay top cover (2).

- (2) Check that the oil level is up to the bottom of the holes.
- (3) If it is not, pour oil into one of the holes (the other acts as a breather) until the oil is at the correct level.

NOTE

1. While filling, it is probable that oil will eject from the breather hole. If this occurs do not assume that the relay unit is full. Allow time for the oil to find its way to the main chamber. Wait a few moments until the breather hole is clear of oil, then continue pouring.
 2. As the unit fills up, air is forced out of the breather hole in the form of an air bubble again giving the impression that the unit is full. Wait until the bubble subsides and then continue filling until the oil is clearly visible at the base of the filler and breather holes.
- (4) Replace the two top cover bolts.

SUB-SECTION L5

CHAPTER 1

STEERING COLUMN AND BOX ASSEMBLY - OVERHAUL

DISMANTLING

1. To dismantle the assembly:

(1) Remove the steering column and box assembly (see Sub-section L4, Chapter 3).

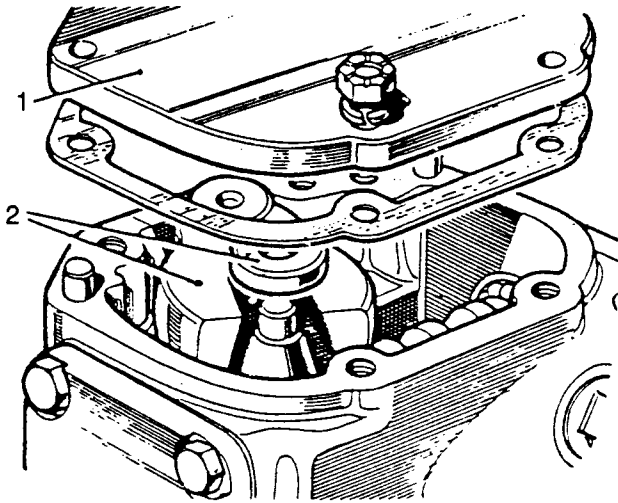


Fig L5.1

(2) Refer to Fig L5.1. Remove the side cover (1) and drain the oil from the steering box.

(3) Lift out the roller for the main nut and withdraw the rocker shaft (2).

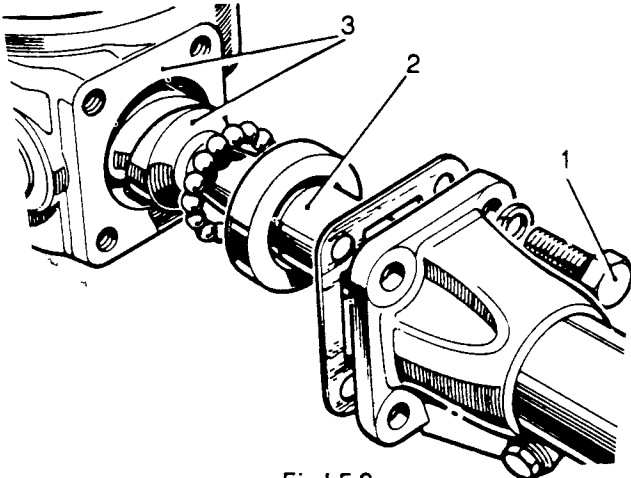


Fig L5.2

(4) Refer to Fig L5.2. Hold the outer column in a vice and remove the fixings (1) securing the steering box.

(5) Using a mallet, tap the inner column (2) at the steering wheel end to partially remove the box.

(6) Withdraw the box and inner column (3) complete. Take care not to lose any of the steel balls from the steering box bearings.

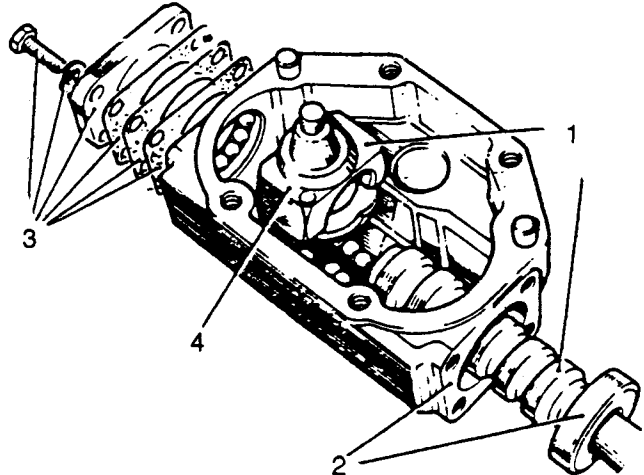


Fig L5.3

(7) Refer to Fig L5.3. Rotate the inner column to locate the main nut in the mid-way position on the worm shaft (1).

(8) Using a mallet, gently tap the box away from the inner column sufficient to remove the upper ball race (2). Take care not to lose the steel balls which will be released from the bearings.

(9) Wind the worm shaft through the main nut and remove the shaft, main nut and any loose steel balls.

(10) Remove the end cover, shims and lower ball race (3).

(11) Dislodge and remove the twelve 9,52 mm diameter ball bearings from the main nut and recirculating tube (4).

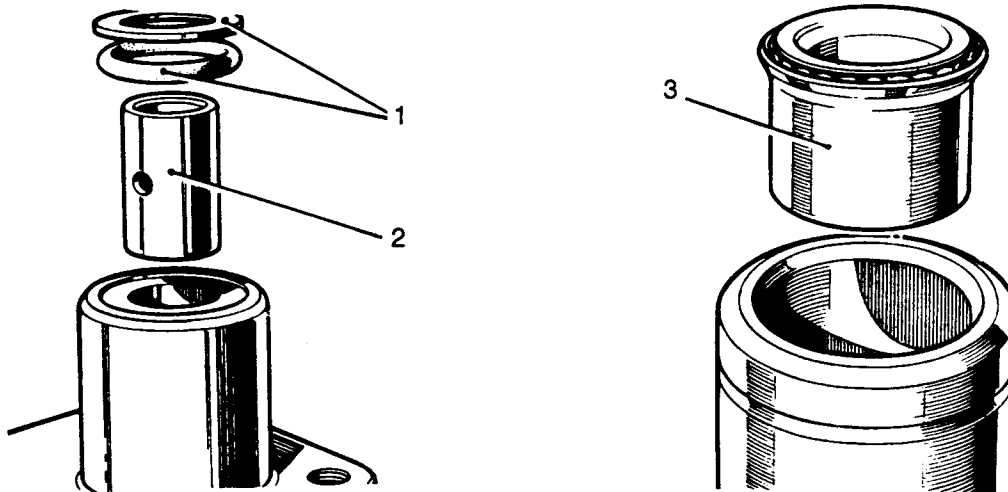


Fig L5.4

- (12) Refer to Fig L5.4. Remove the retaining washer and oil seal (1).
- (13) If required, press out the rocker shaft bush (2).
- (14) If required, remove the outer column top bearing (3).

- (3) Examine the main nut ball bearing track for evidence of indentations or scaling.
- (4) Examine the worm shaft for similar markings. Slight indentations at the extreme end of the shaft can be disregarded as this is a normal wear condition, but if indentations have spread to the middle of the shaft, a replacement must be fitted.

INSPECTING

- 2. Carry out the following inspection:
 - (1) Clean all components in a grease solvent and dry out.
 - (2) Examine all components for obvious signs of wear or damage.

REASSEMBLING

3. Reassemble the steering box and column as follows:

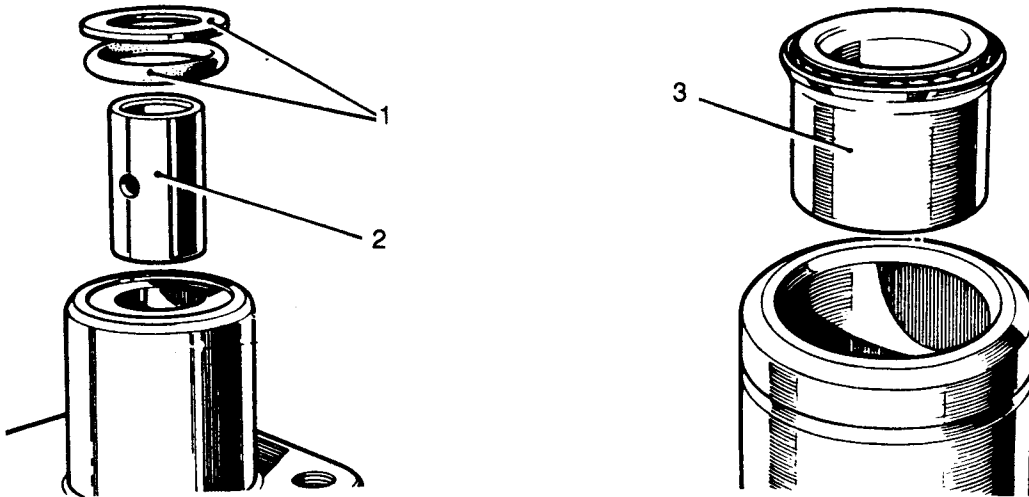


Fig L5.5

- (1) Refer to Fig L5.5. If it has been removed, replace the outer column top bearing (3).
- (2) If necessary, refit the rocker shaft bush (2). Use a press if required.
- (3) Replace the retaining washer and oil seal (1).

NOTE

In the following procedures use a general purpose grease to retain ball bearings and to coat all joint washers while assembling.

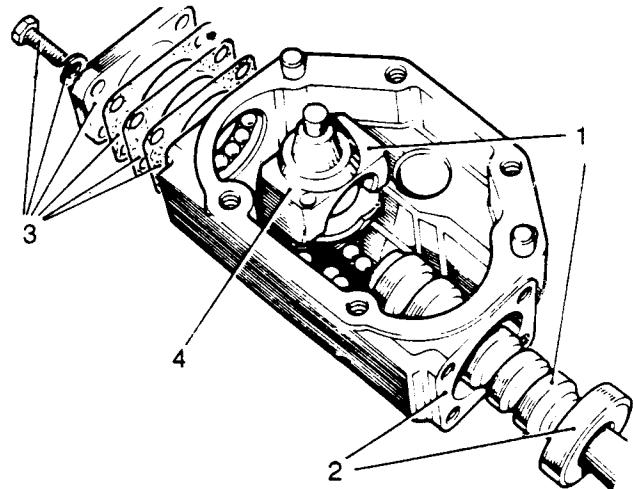


Fig L5.6

- (4) Refer to Fig L5.6. Fit the twelve 9,52 mm diameter ball bearings to the main nut and re-circulating tube (4).
- (5) Replace the lower ball race, shims and end cover (3).
- (6) Wind the worm shaft through the main nut.

(7) Refit the upper ball race and fit the box to the inner column (2).

(8) Rotate the inner column to locate the main nut in the midway position on the worm shaft (1).

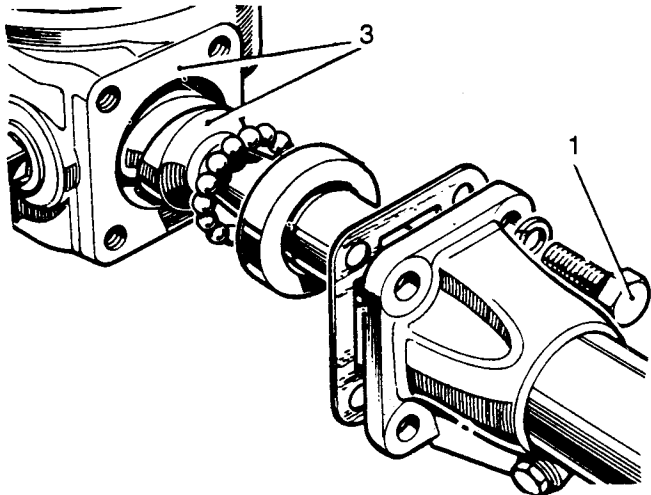


Fig L5.7

(9) Refer to Fig L5.7. Refit the box and inner column (3) complete to the outer column.

(10) With the outer column held in a vice, replace the fixings (1) securing the steering box.

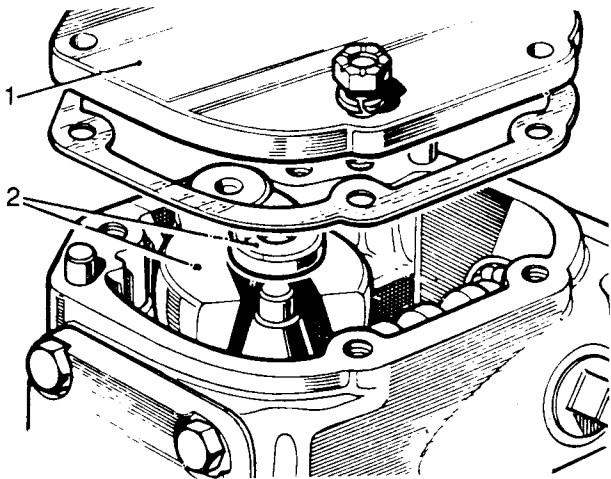


Fig L5.8

(11) Refer to Fig L5.8. Replace the rocker shaft (2) and refit the roller for the main nut.

(12) Replace the side cover (1). Coat all cover plate fixing nuts with 'Wellseal' or suitable equivalent sealing compound and tighten to 23 to 28 N.m.

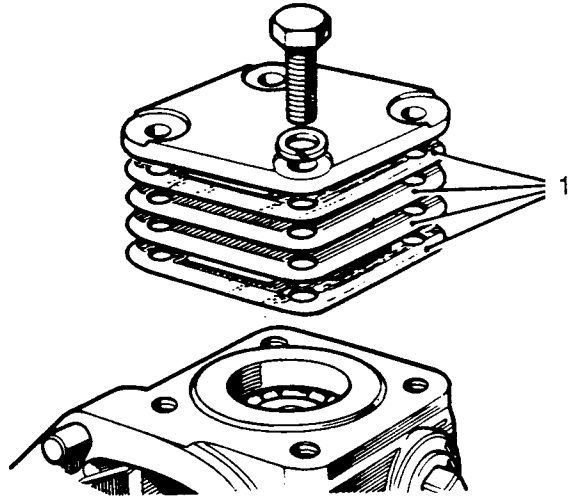


Fig L5.9

(13) Refer to Fig L5.9. Check for end-float on the steering column. Adjust the shim washer (1) thickness between the end cover and the steering box to obtain a 'free to rotate but no end-float' condition on the inner column.

(14) Set the steering in the straight ahead position (midway lock to lock).

(15) Screw the steering box adjuster by hand until there is no end-float between the adjuster and the rocker shaft. Screw in a further one half flat (maximum) to allow for locknut tightening.

(16) Tighten the adjuster locknut ensuring that the adjuster does not move.

(17) Fill the steering box with the correct grade of lubricating oil.

(18) Replace the steering column and box assembly (see Sub-section L4, Chapter 3).

SUB-SECTION L5

CHAPTER 2

STEERING RELAY - OVERHAUL

DISMANTLING

1. Dismantling the relay assembly as follows:

(1) Remove the relay assembly (see Sub-section L4, Chapter 4).

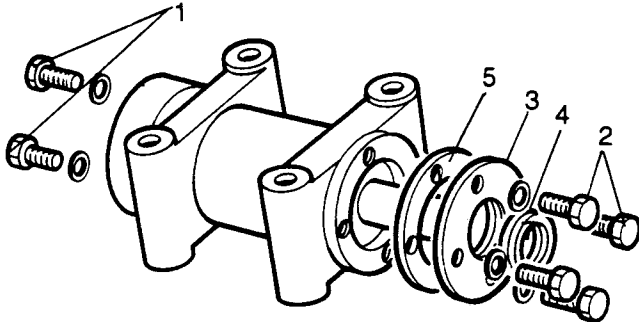


Fig L5.10

- (2) Refer to Fig L5.10. Remove the two of the securing bolts (1) from the relay top cover. Invert the relay and allow the oil to drain.
- (3) Locate the relay assembly horizontally in a vice.
- (4) Remove the four bolts (2) securing the relay lower cover (3).
- (5) Remove the lower cover complete with oil seal (4) gasket (5) and thrust washer. Discard the gasket.

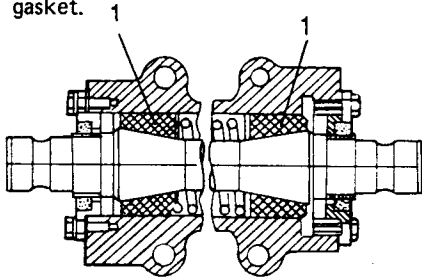


Fig L5.11

- (6) Refer to Fig L5.11. The relay shaft now has to be drifted through the lower end of the relay housing. In the sectioned illustration of the relay assembly, note that items (1) are split bushes with internal tapered faces, against which they are held by a compression spring.

WARNING

The relay split bushes and spring will fly apart when released from the housing. Protection must be provided to prevent injury.

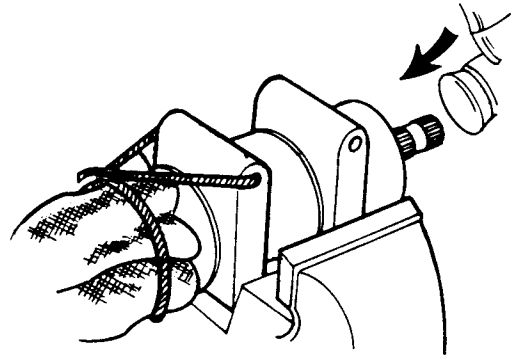


Fig L5.12

- (7) Refer to Fig L5.12. Enclose the lower end of the relay assembly with stout material, leaving within the material sufficient space to accommodate the relay shaft. Secure the material to the relay housing to form a safety sheath.
- (8) Gently tap the relay shaft into the safety sheath.
- (9) Remove the safety sheath and collect the relay shaft, split bushes, spring and washers.
- (10) Remove the bolts securing the relay upper cover and remove the upper cover complete with oil seal, gasket and thrust washer. Discard the gasket, remove the oil seal.
- (11) Remove the oil seal from the relay lower cover.

INSPECTING

2. Thoroughly clean all components and examine for wear and damage. Renew components as necessary.

REASSEMBLY

3. To reassemble the relay:

- (1) Apply jointing compound to the outer periphery of the new oil seals. Fit the oil seals to the relay upper and lower covers (seal lips towards the relay housing).

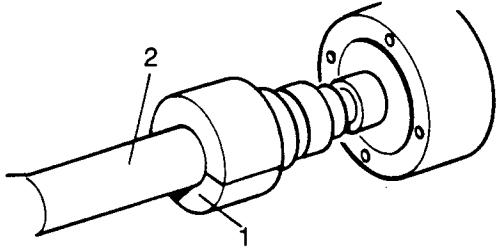


Fig L5.13

- (2) Refer to Fig L5.13. Locate the two halves of the split bush (1) on the top cone of the shaft (2).
- (3) Insert the assembly of shaft and bush into the housing from the bottom.

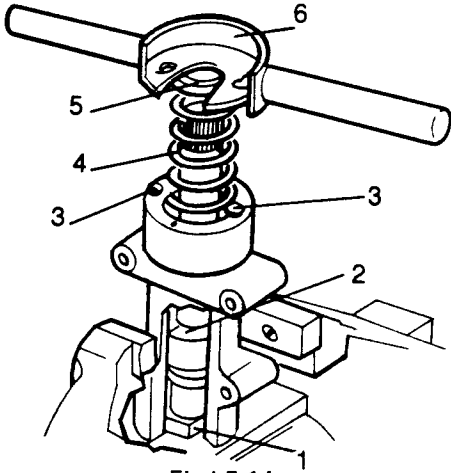


Fig L5.14

- (4) Refer to Fig L5.14. Secure the housing and shaft assembly, bottom end uppermost, in a vice with a 19 mm support block (1) under the bottom end of the shaft.
- (5) Insert the washer (2) for the spring into the housing and fit two of the oil seal retainer fixing bolts (3) into the housing diametrically opposite each other.
- (6) Fit the spring (4) and washer (5).
- (7) Using special tool 600536 (6) carefully compress the spring.
- (8) Turn the tool to lock in position with the key-hole slots under the heads of the bolts.

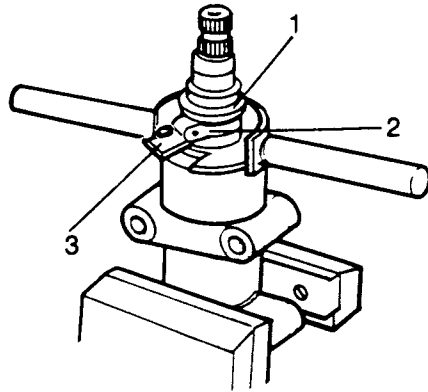


Fig L5.15

- (9) Refer to Fig L5.15. Locate the other split bush (1) in position on the bottom cone of the shaft and secure with a 50 mm hose clip (2).
- (10) Remove the special tool and the seal retainer fixing bolts (3).
- (11) Remove the assembly from the vice and gently tap the shaft into position until the split bush has entered the housing for at least half its length.
- (12) Remove the hose clip and continue to tap the shaft into the housing until the bushes are correctly located in the housing.

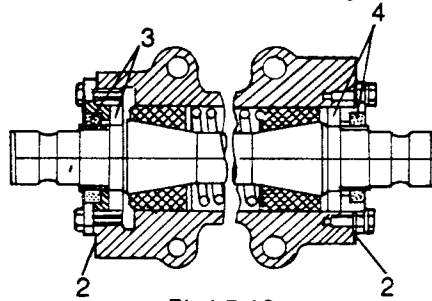


Fig L5.16

- (13) Refer to Fig L5.16. Smear general purpose grease on both sides of the joint washers (2) and fit one to each end of the housing.
- (14) Fit the thrust washer and end cover (3) complete with seal to the bottom end of the housing only. Use 'Wellseal' or a suitable equivalent sealing compound on the threads of the bolt fitted to the breather hole.
- (15) Fill the housing with the correct grade of oil.
- (16) Fit the thrust washer and end cover (4), complete with seal to the top of the housing, using sealing compound on the threads of the four securing bolts.

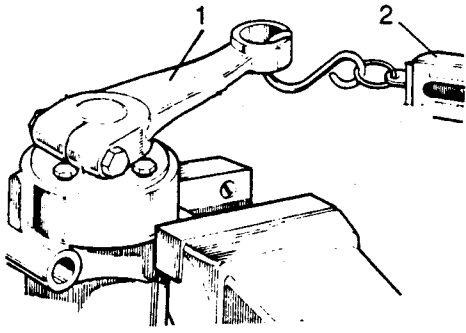


Fig L5.17

(17) Refer to Fig L5.17. Hold the relay in a vice.

(18) Temporarily attach the upper relay lever (1) and use a suitable spring balance (2) to check resistance to rotation of the relay shaft. The resistance, measured on the spring balance, must not be less than 5,4 kg and should not exceed 7,3 kg.

(19) If the resistance is less than 5,4 kg, fit a new spring.

(20) If the resistance is excessive, remove the oil seal retainers and thrust washers, then use a suitable piece of tube to push each split bush in turn clear of its cone and inject lubricating oil. Reassemble and recheck.

(21) Fit the assembly to the vehicle (see Sub-section L4, Chapter 4).

SUB-SECTION L5

CHAPTER 3

STEERING BALL JOINTS - CLEANING AND REGREASING

GENERAL

1. The steering ball joints have been designed in such a way as to retain the initial filling of grease for the normal life of the ball joint; however, this applies only if the rubber boot remains in position on the joint. The rubber boots should be checked at the maintenance intervals to ensure that they have not become dislodged or the joint damaged. Should any of the rubber boots be dislodged, proceed as follows:

DISMANTLING

2. To dismantle a ball joint:

- (1) Remove the ball joint from the longitudinal arm, track rod or drag link (see Sub-section L4, Chapter 5, 6 or 7).

NOTE

If only one ball joint requires attention, it is only necessary to disconnect the applicable end of the steering arm.

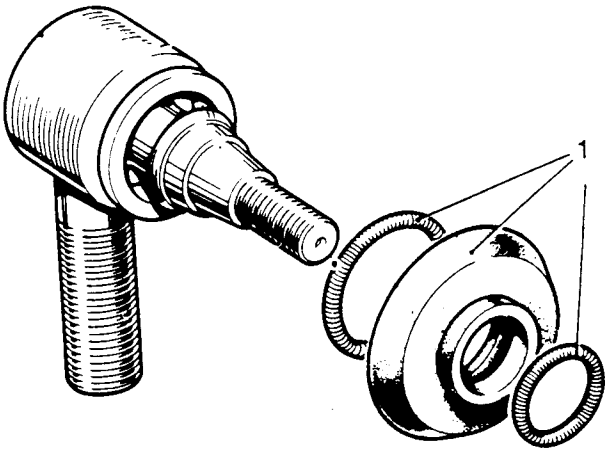


Fig L5.18

- (2) Refer to Fig L5.18. Remove the rubber cover and spring rings (1).

(3) Thoroughly clean all parts.

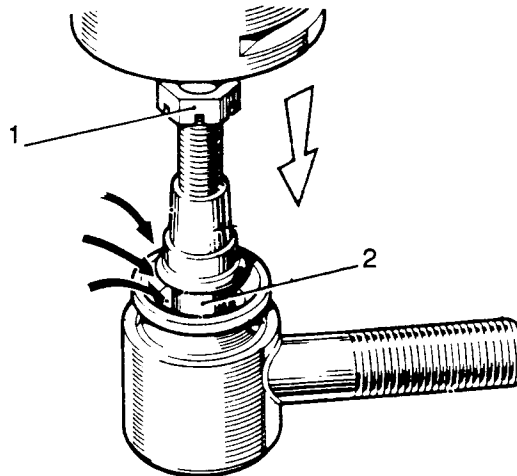


Fig L5.19

- (4) Refer to Fig L5.19. Place the castle nut (1) upside down on the pin and screw on a few threads.

(5) Place the ball joint under a press or between the jaws of a vice and carefully force the pin and ball down against the spring. In this position the interior of the ball joint can be cleaned and lubricated.

- (6) Apply grease around the taper (2) and fill the replacement rubber boot.

REASSEMBLY

3. Reassemble the ball joint:

- (1) Discard the spring rings and fit new rings.

(2) Take off the castle nut.

- (3) Replace the ball joint onto the longitudinal arm, track rod or drag link (see Sub-section L4, Chapter 5, 6 or 7).

SUB-SECTION M1

DESCRIPTION OF THE BODY

1. The Land Rover bodywork, with the exception of a steel radiator grille and tailboard frames is made from 'Birmabright' alloy. This is a magnesium-aluminium alloy which will not rust or corrode under normal circumstances. It is work hardening and so becomes brittle when hammered. It is, however, easily annealed.
2. Birmabright has the property of forming a hard oxide skin when exposed to air so care and special preparation is necessary when painting is undertaken.