






Chapter 7 Part A: Manual gearbox

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Degrees of difficulty

<p>Easy, suitable for novice with little experience</p> 	<p>Fairly easy, suitable for beginner with some experience</p> 	<p>Fairly difficult, suitable for competent DIY mechanic</p> 	<p>Difficult, suitable for experienced DIY mechanic</p> 	<p>Very difficult, suitable for expert DIY or professional</p> 
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Specifications

For engine to model applications refer to Chapter 2

Gearbox

Type	4 or 5 forward speeds and reverse, synchromesh on all forward gears
Designations:	
Type BH3:	
BX	2 BT 52, BT 69, BT 78 (4-speed)
BX 14	2 BT 28, BT 73, BT 84 (5-speed)
Type MA:	
BX 14 (pre Oct 1989)	2 CA 16 (4-speed) or 2 CA 14 (5-speed)
BX 14 (Oct 1989 to Sept 1990)	2 CA 51 (4-speed) or 2 CA 49 (5-speed)
BX 14 (Sept 1990 to Sept 1991)	2 CA 77 (4-speed) or 2 CA 91 (5-speed)
BX 14 (from Sept 1991)	2 CB 35 (4-speed) or 2 CB 48 (5-speed)
Type BE1:	
BX 16	2 BL 03, BL 64, BN 45 (5-speed)
BX 19	BL 61, BL 68, BN 46, BL 62, BL 66, BN 44 (5-speed)
BX 19 GTI	BN10, BN47
BX 19 GTI 16 valve	BN48
Type BE3:	
BX 16 (from April 1989)	BE3 (5-speed)
BX 19 (from April 1989)	BE3 (5-speed)

Torque wrench settings

BX and BX 14 - Type BH3

	Nm	lbf ft
Drain plug	25	18
Sump cover	10	7
Oil pick-up screen	10	7
Detent plugs	12	9
Secondary shaft nut:		
4-speed	25	18
5-speed	95	69
Primary shaft nut	45	33
Speedometer drivegear	30	22
Reverse light switch	25	18
Reverse fork lock plate bolt	10	7
Crownwheel retaining bolts	60	44

BX and BX 14 - Type MA (2 CA)

Gearbox housing to clutch/final drive housing	18	13
Intermediate plate to clutch/final drive housing	51	37
Pressed-steel housing	18	13
Bearing half-rings	18	13
Output shaft nut (2CA 14)	143	103
Drain and filler plugs	26	19
Gearbox to engine	46	33

BX 16 and BX 19

Engine-to-gearbox bolts	40	29
Starter motor bolts	40	29
Gearbox support shaft	35	25
Gearbox support nut	35	25
Gearbox support bolt	18	13
Clutch release bearing guide tube bolts	12	9
Fifth gear end cover bolts*	12	9
Primary and secondary shaft nuts	50	36
Selector rod lock plate bolt	15	11
Secondary shaft bearing retainer bolts	15	11
Reverse idler gear spindle bolt	20	15
Reversing light switch	25	18
Gearbox main casing-to-clutch housing bolts	12	9
Selector shaft spring bracket nut	15	11
Final drive extension bolts	10	7
Final drive half housing bolts:		
10 mm	40	29
7 mm	12	9
Crownwheel securing bolts	60	44
Drain plug:		
Final drive	30	22
Gearbox	10	7

*Apply locking compound to the threads

1 General information and precautions

General information

Type BH3 (2 BT 52 and 2 BT 28)

This gearbox is mounted transversely below and to the rear of the engine. The gearbox and engine share a common lubrication system.

The gearbox casing is constructed in light alloy and incorporates the final drive and differential.

Power from the crankshaft is transmitted through the gearbox output shaft and transfer gears to the primary shaft. Drive to the front roadwheels is transmitted through driveshafts from the differential side gears.

The gearbox is of 4 or 5-speed type, depending upon the vehicle. Both types are similar except for the 5th gear located on the ends of the primary and secondary shafts.

The gearbox is of conventional two shaft, constant-mesh layout. There are four pairs of gears, one for each forward speed. The gears on the primary shaft are fixed to the shaft. The gears on the secondary or pinion shaft float, each being locked to the shaft when engaged by the synchromesh unit. The reverse idler gear is on a third shaft.

On 5-speed units, the 5th speed gears are of fixed type with an extra synchromesh assembly.

The gear selector forks engage in the synchromesh unit. These slide axially along the shaft to engage the appropriate gear. The forks are mounted on selector shafts which are located in the base of the gearbox.

The helical gear on the end of the pinion shaft drives directly onto the crownwheel mounted on the differential unit. The latter differs from normal practice in that it runs in shell bearings and the end thrust is taken up by thrustwashers in a similar manner to the engine crankshaft.

Type MA (2CA)

This gearbox is mounted on the left-hand side of the engine.

The gearbox has either four or five forward gears depending on the model (all with synchromesh) and one reverse gear. All the synchromesh units are located on the output shaft and the differential unit is located in the main gearbox casing.

Type BE1 (2 BL 03, BL 61 and BL 62)

This gearbox is mounted transversely in-line with the engine, the drive being taken direct from the crankshaft and not through transfer gears as on smaller engine variants.

The gearbox has five forward gears, all with synchromesh and one reverse. The 5th gear

components are on the far side of an intermediate plate which carries one pair of shaft bearings.

The differential (final drive) unit is contained in its own housing which is bolted to the gearbox casing. The gearbox and differential share the same lubricant.

The gearbox is conventional in operation (as described for the 2 BT 52 and 2 BT 28 types) and has lubrication separate to the engine.

Type BE3

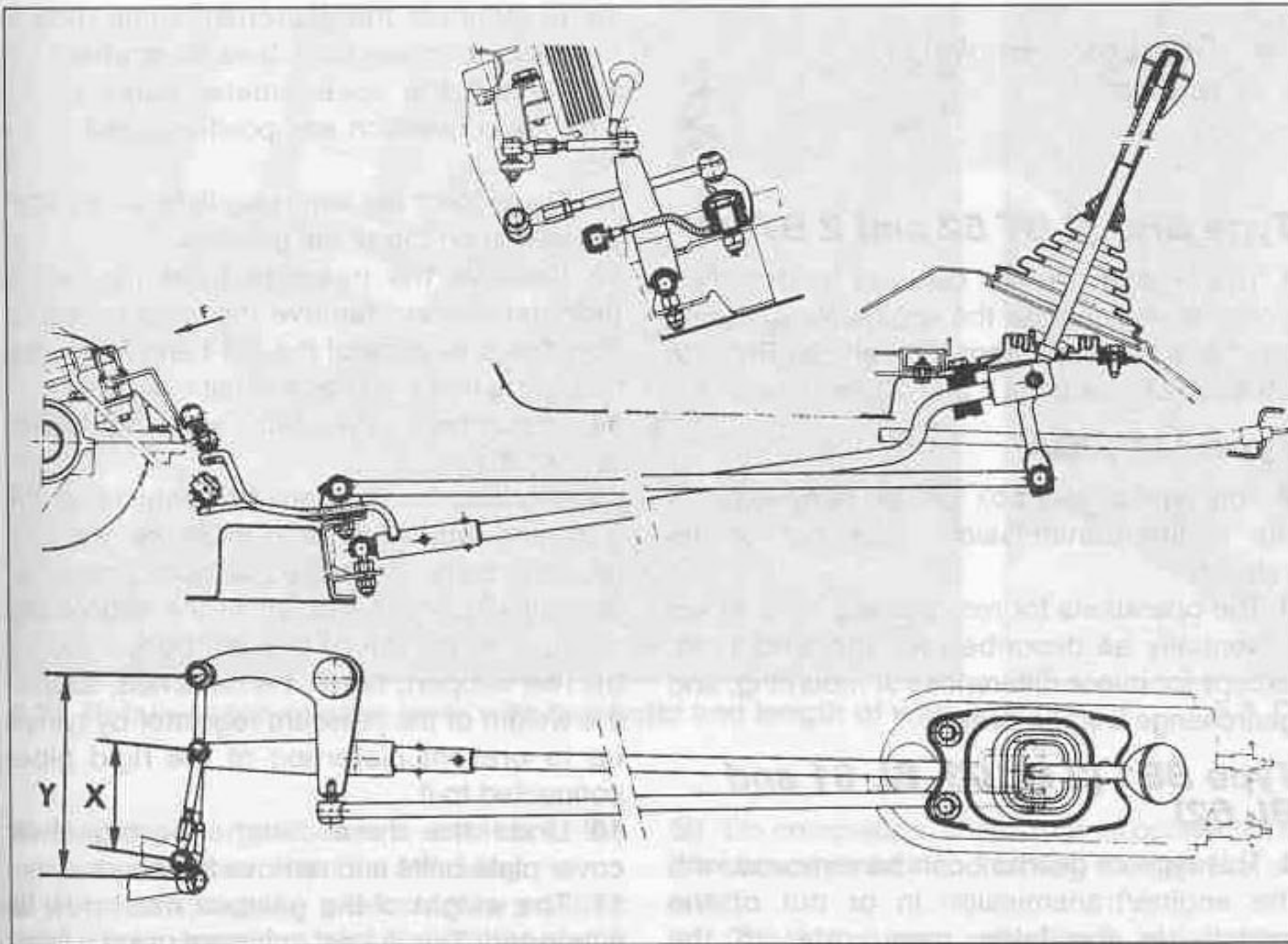
This gearbox is a development of the BE1 5-speed gearbox, being introduced in 1989 to progressively replace its predecessor. It can be identified by the revised gearchange pattern, with reverse positioned opposite (behind) 5th gear.

Most of the procedures described for the BE1 gearbox are applicable to this type, although many of the internal components have been modified.

Precautions

Type BH3 (2 BT 52 and 2 BT 28)

If it is necessary to have the vehicle towed for anything other than short distances, lift the front wheels clear of the ground or the gearbox could seize due to lack of lubrication.



2.1 Gearchange linkage - Type BH3 (2 BT 52 and 2 BT 28) gearboxes

Y = 162 to 172 mm

X = 90 to 100 mm

2 Gearchange linkage - adjustment

Type BH3 (2 BT 52 and 2 BT 28)

1 The gearchange linkage does not normally require adjustment. If new parts have been fitted, set the balljointed link rods so that the distance between the centres of the balljoints is as shown (see illustration).

2 When making a longitudinal adjustment of the control lever, position the gear lever in neutral so that the distance from the centre of the knob to the centre of the heater/fresh air control and radio fascia panel is approximately 235 mm (see illustration).

3 Measure the distance between the centre of the gearchange link rod balljoints (Y in illustration 2.1). The distance should be between 162 and 172 mm. If adjustment is necessary, loosen the link rod balljoint locknut, separate the joint and turn it in the required direction to set it at the required distance. Decreasing the distance will move the gear lever forward and vice versa. With the distance correctly set, reconnect the balljoint and tighten the locknut.

4 Check the lateral adjustment of the control lever by first checking to see if, when in neutral, it is vertical when viewed in line with the vehicle. Now check the distance between the link rod balljoints (X in illustration 2.1). The correct distance requirement is between 90 and 100 mm.

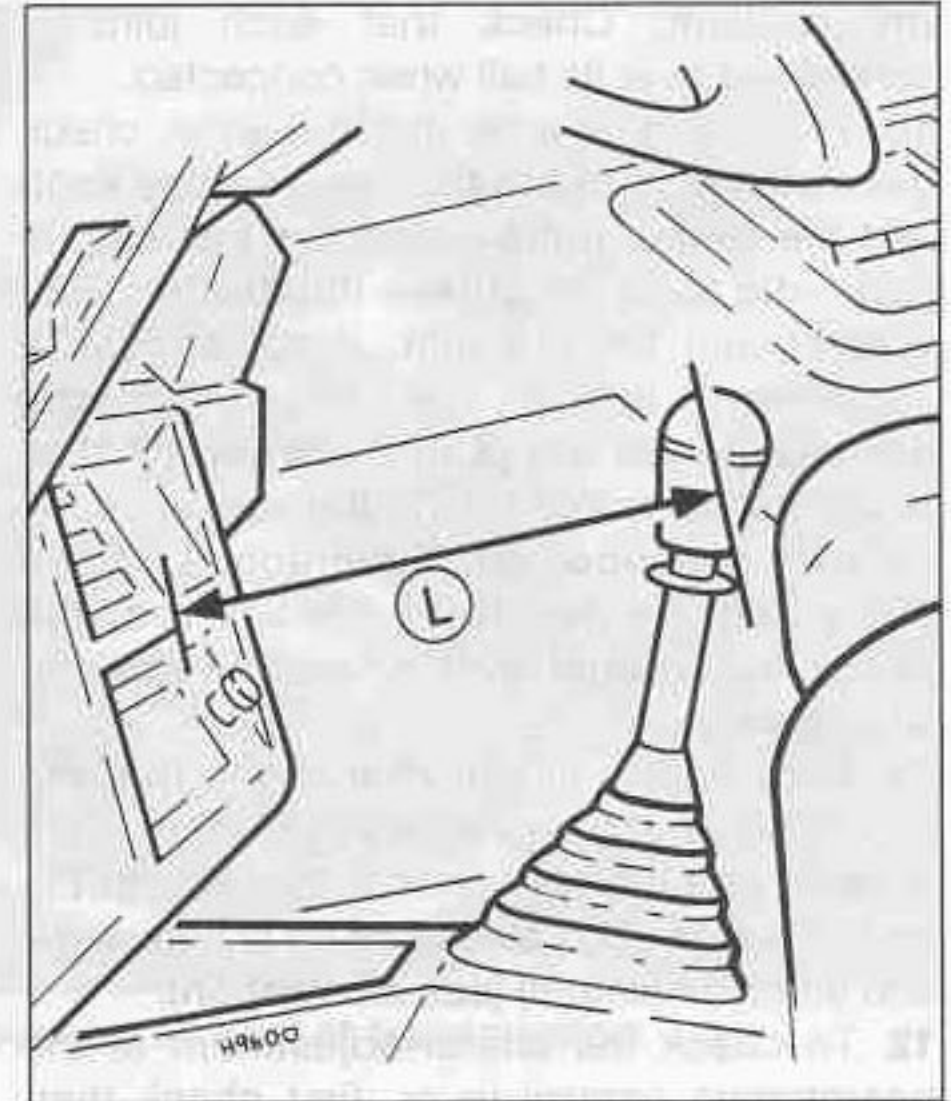
5 If adjustment is necessary, proceed to adjust the link rod X in the same manner as

that described for Y. Note that decreasing the link rod length moves the gear control lever to the left and vice versa (when viewed from the front of the vehicle).

6 When making adjustment to the link rods, the balljoints must be centralised when tightening the locknut.

Type BE1 (2 BL 03, BL 61 and BL 62)

7 The gearchange linkage does not normally require adjustment. If new parts have been



2.2 Gear control lever set for longitudinal adjustment

L = 235 mm (2 BT 52 and 2 BT 28)

L = 215 mm (2 BL 03 and BL 61)

fitted, set the gearchange control lever to the neutral position.

8 First check the adjustment of the selector control. Check that the selector control lever is in the upright position (see illustration). The reaction link rod length between the balljoint centres should be between 70 and 80 mm.

9 If necessary, adjust the length of the reaction link rod by detaching at the balljoints, loosening the locknut and turning the balljoint in the required direction to the specified length. Retighten the locknut and reconnect

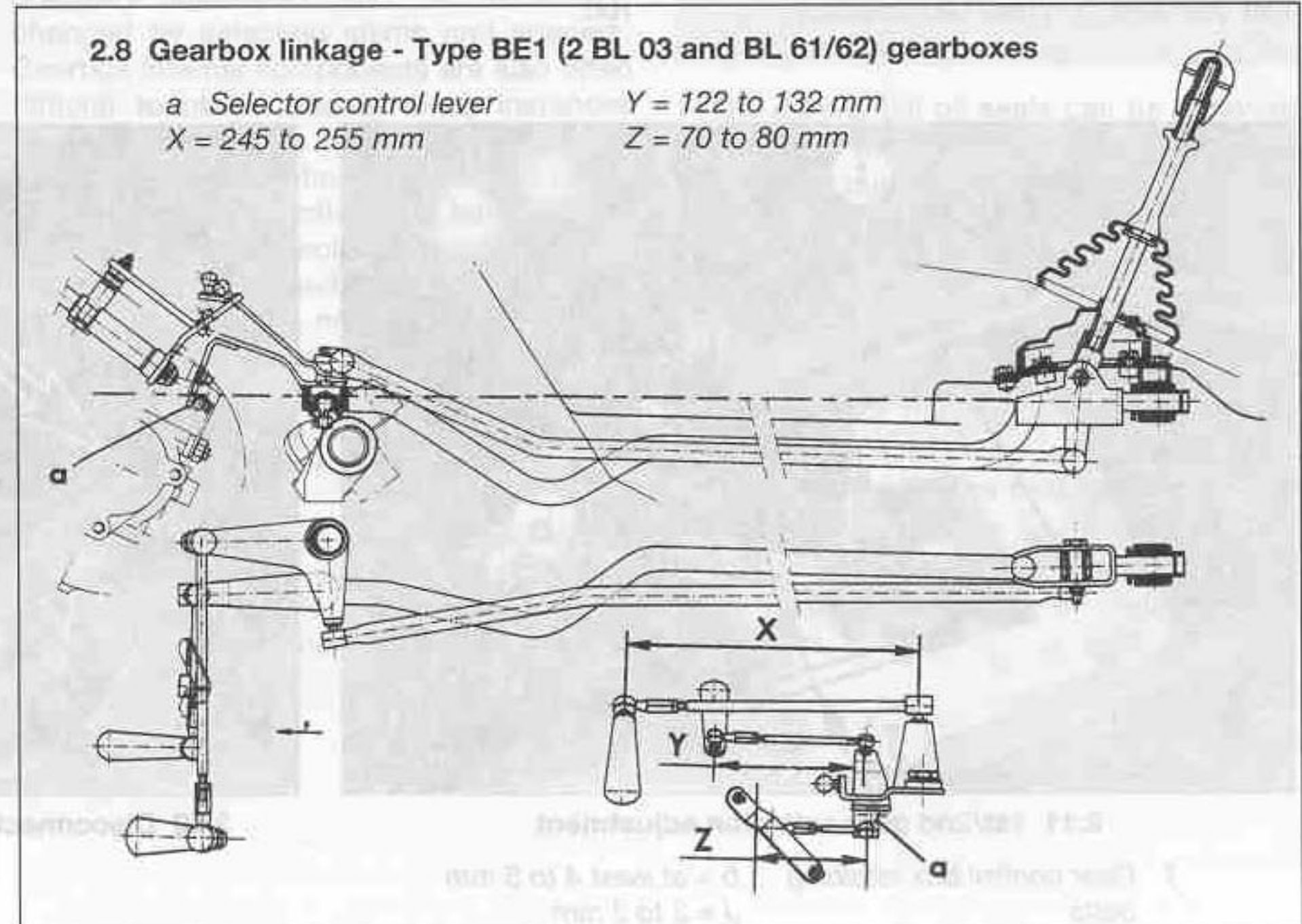
2.8 Gearbox linkage - Type BE1 (2 BL 03 and BL 61/62) gearboxes

a Selector control lever

Y = 122 to 132 mm

X = 245 to 255 mm

Z = 70 to 80 mm



the balljoint. Check that each joint is centralised over its ball when connected.

10 With the gear lever still in neutral, check the distance between the centre of the knob and the centre of the heater/fresh air control and radio fascia panel (see illustration 2.2). This should be 215 mm. If adjustment is necessary, adjust the length of the gearchange link rod (X in illustration 2.1) to between 245 to 255 mm in the same manner as that described in paragraph 9. When decreasing the length of the link rod, the gearchange control lever moves forwards and vice versa.

11 Engage 2nd or 4th gear, prise free the rubber gaiter of the gear lever from the centre console and then check that the lever to the rear part of the box clearance (b) is between 4 and 5 mm (minimum) (see illustration).

12 To check the lateral adjustment of the gearchange control lever, first check that, when in neutral, the lever is upright when viewed in line with the vehicle. If it is not, change the length of link rod Y (as described in paragraph 9) so that the length between the centre of the balljoints is between 122 and 132 mm. Decreasing the link rod length moves the control lever towards the left and vice versa.

13 Adjustment to 1st and 2nd gear selection is possible by loosening the gearchange control box retaining bolts then setting the gear lever into the 2nd gear position. Move the box to give a free play movement of 2 to 3 mm between the box and the lever guide block (J). Retighten the box retaining bolts.

14 Move the gear selector through all forward gears and the reverse gear position to check for satisfactory engagement. Also check the gears for satisfactory selection on a road test. Further minor adjustment of 1st and 2nd gear selection may be necessary.

3 Gearbox - removal and refitting

Type BH3 (2 BT 52 and 2 BT 28)

1 This type of gearbox can only be detached from the engine after the engine/transmission has been removed from the vehicle. Refer to Chapter 2A, Sections 7 and 10 for details.

Type MA (2CA)

2 This type of gearbox can be removed with the engine/transmission in or out of the vehicle.

3 The operations for removal and refitting are essentially as described for the BH3 type, except for minor differences in mounting, and gearchange linkage design.

Type BE1 (2 BL 03, BL 61 and BL 62)

4 This type of gearbox can be removed with the engine/transmission in or out of the vehicle. In the latter case, refer to the appropriate part of Chapter 2 for details. With the engine/transmission in the vehicle, proceed as follows.

5 Raise and support the vehicle so that the front and rear roadwheels are clear of the ground. When raised, the vehicle must be level and securely supported (see "Jacking and vehicle support").

6 Disconnect and remove the battery.

7 Disconnect and remove the air filter unit and its support.

8 Unbolt and disconnect the battery earth lead from the top of the gearbox.

9 Disconnect the clutch cable from the operating lever and retrieve the connecting rod.

10 Disconnect the gearchange link rods at the balljoint connections (see illustration).

11 Detach the speedometer cable at the gearbox connection and position it out of the way.

12 Disconnect the reversing light wiring from the switch on top of the gearbox.

13 Remove the nearside front roadwheel then detach and remove the wing protector from the underside of the left-hand front wing by prising free the plastic retaining clips.

14 Disconnect the left and right-hand driveshafts.

15 Working underneath the vehicle at the front end, undo the three pressure regulator retaining bolts. There are two bolts positioned vertically in line to the left of the sphere and one bolt to the left of the unit body securing the rear support. When it is detached, support the weight of the pressure regulator by tying it up to prevent distortion of the rigid pipes connected to it.

16 Undo the three clutch housing lower cover plate bolts and remove the cover.

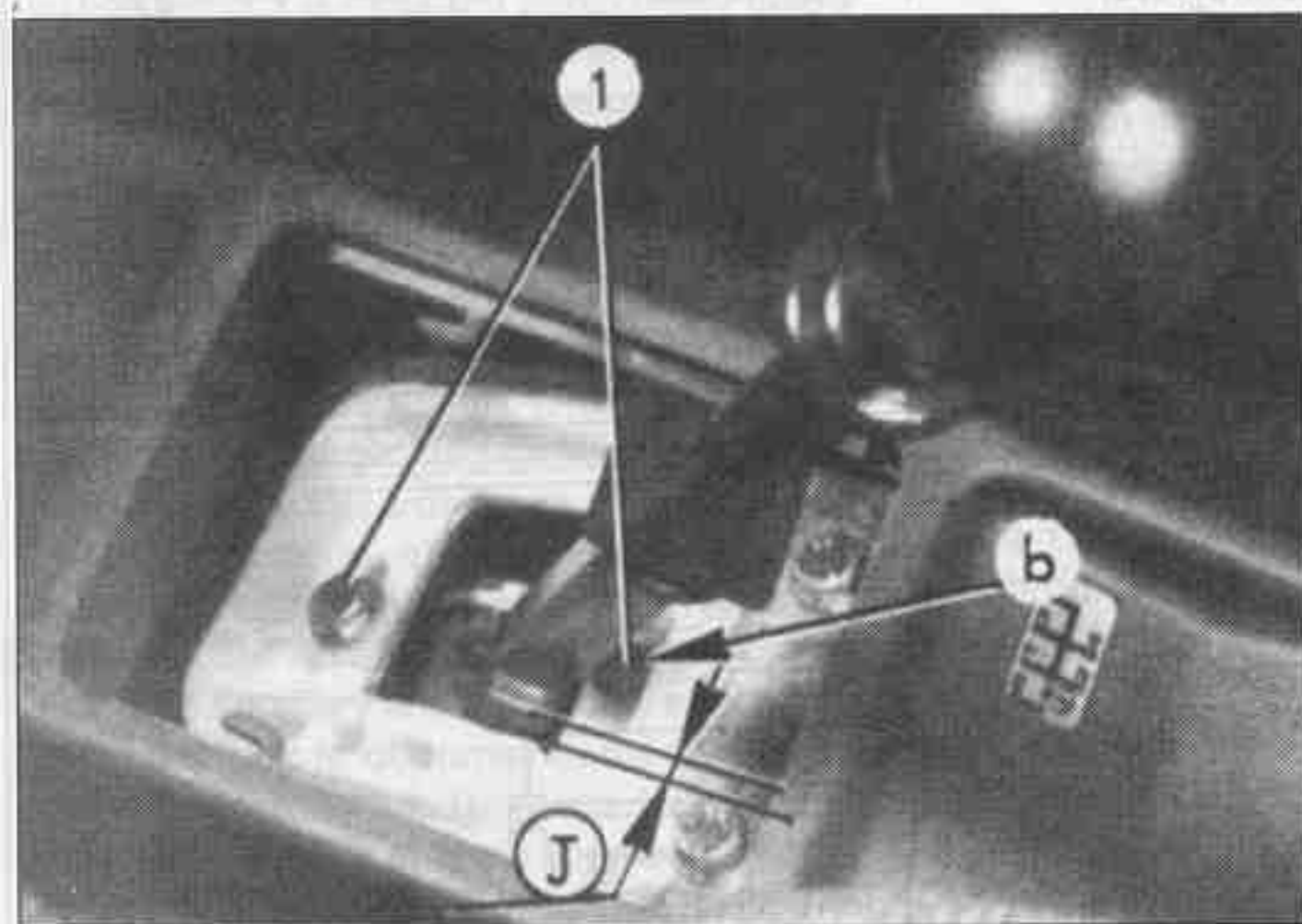
17 The weight of the gearbox must now be supported. This is best achieved using a lifting sling and hoist and supporting it from above. Failing this, it may be possible to support it from underneath using a suitable trolley jack, but ensure that it is securely located.

18 Unbolt and remove the gearbox support and the support spindle.

19 Position a jack or blocks under the engine to support it.

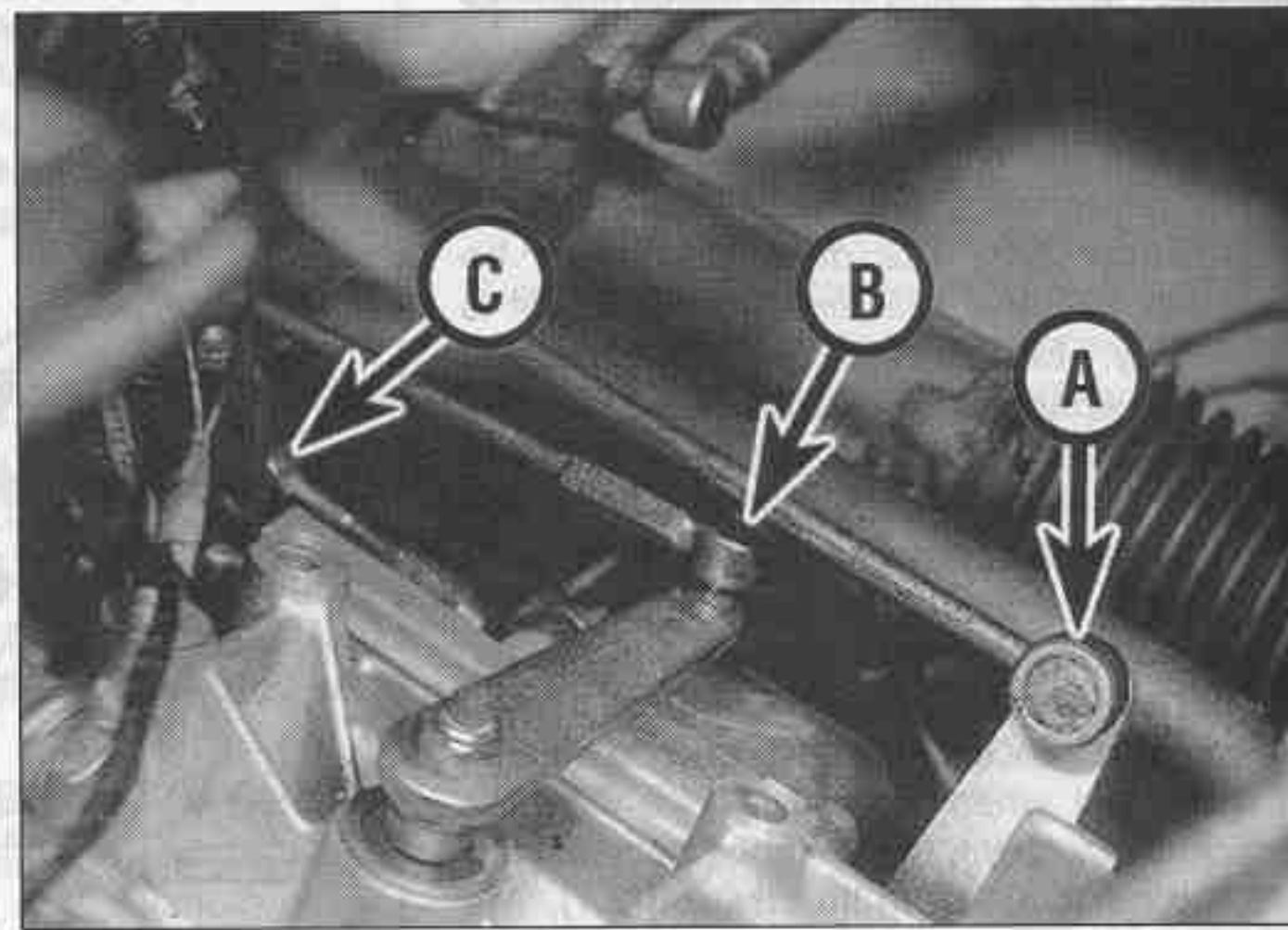
20 Unbolt and remove the engine-to-gearbox coupling bolts and the starter motor bolts.

21 Check that gearbox associated fittings are detached and positioned out of the way, then withdraw the gearbox sideways from the engine. When the gearbox input shaft is clear of the clutch unit, carefully lower the gearbox and remove it from underneath the vehicle.

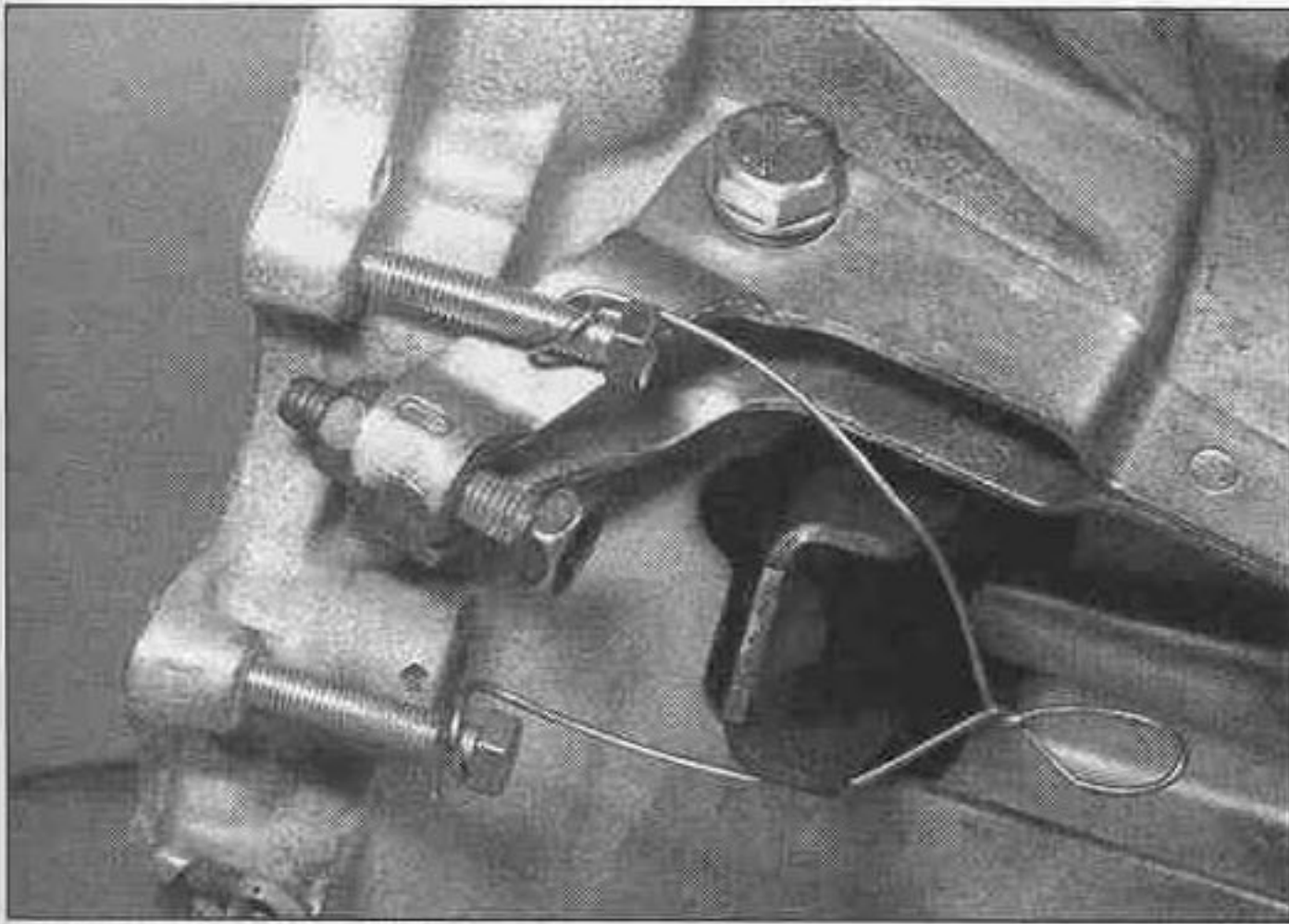


2.11 1st/2nd gear selection adjustment

- 1 Gear control box retaining bolts b = at least 4 to 5 mm
J = 2 to 3 mm



3.10 Disconnect gearchange link rods at joints indicated (A, B and C)



3.23 Retain clutch release lever with two bolts and length of wire



5.3 Driveshaft oil seal at transmission

22 Refitting the gearbox is a reversal of the removal procedure. Note the following.

23 Prior to lifting the gearbox into position make a temporary provision to hold the clutch thrust bearing in position against the guide. This can be achieved by fitting two bolts into the clutch housing/engine bolt holes adjacent to the clutch release lever. Wind wire around the bolt heads and then twist the wire round the release lever to keep the thrust bearing against the guide (see illustration).

24 Apply a small amount of grease to the thrust bearing guide and the control shaft.

25 When fitting the gearbox to the engine, check that the two alignment dowels are in position on the engine flange face (one each side). Centring rods of suitable diameter fitted inside the dowels will assist in aligning the two assemblies as they are joined. Turn the flywheel to align the splines of the clutch friction plate with the gearbox input shaft.

26 When the gearbox is fitted flush to the engine, insert the retaining bolts and tighten them evenly to the specified torque setting. If used, remove the alignment centring rods and remove the wire holding the clutch release lever in position.

27 When refitting the gearbox support shaft, apply a locking sealant to the threads. Tighten the shaft, and the support nut and bolt to the specified torque settings.

28 When refitting the right-hand drive-shaft to the final drive unit, an oil seal protector must be used to protect the oil seal as the shaft splines pass through it.

29 When reconnecting the steering and suspension connections, use new nuts on the balljoints.

30 On completion, check that all connections are securely made and top-up the gearbox oil level.

31 Check that gear selection is satisfactory and if necessary, adjust the linkage.

4 Gearbox - overhaul

Note: *If a gearbox develops a fault or becomes noisy, the best course of action is to have the unit overhauled by a specialist or to obtain an exchange reconditioned unit*

1 Overhauling a gearbox is a difficult and involved job for the DIY home mechanic. In addition to dismantling and reassembling many small parts, clearances must be precisely measured and, if necessary, changed by selecting shims and spacers. Gearbox internal components are also often difficult to obtain and in many instances extremely expensive. Because of this, if the gearbox develops a fault or becomes noisy, the best course of action is to have the unit overhauled by a specialist or to obtain an exchange reconditioned unit.

2 Nevertheless, it is not impossible for the more experienced mechanic to overhaul a gearbox provided that the special tools are available and the job is done in a deliberate step-by-step manner so that nothing is overlooked.

3 The tools necessary for a typical overhaul include internal and external circlip pliers, bearing pullers, a slide-hammer, a set of pin punches, a dial test indicator and possibly an

hydraulic press. In addition, a large sturdy workbench and a vice will be required.

4 All work should be done in conditions of extreme cleanliness. When dismantling, make careful notes of how each component is fitted. This will facilitate accurate and straightforward reassembly.

5 Before dismantling the gearbox, it will help to have some idea of which component is malfunctioning. Certain problems can be related to specific areas in the gearbox which can in turn make component examination and replacement more straightforward. Refer to *Fault diagnosis* in the Reference section of this Manual for more information.

5 Differential/driveshaft oil seals - renewal

1 The differential oil seals can be removed and refitted with the engine/transmission in the vehicle, but the driveshafts will obviously have to be removed.

2 With the driveshafts withdrawn, the old oil seals can be extracted from the differential housing using a suitable screwdriver.

3 Clean out the seating before fitting a new seal. Lubricate the seal to assist assembly and drift it carefully into position with its lip facing inwards. Fill the seal lips with grease (see illustration).

4 Always take care not to damage the oil seals when removing or refitting the driveshafts.