






# Chapter 7

## Manual transmission

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Manual transmission oil level check .....	See Chapter 1A or 1B		

### Degrees of difficulty

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

#### General

Type ..... Manual, five forward speeds and reverse. Synchromesh on all forward speeds

#### Designation

<b>Petrol models:</b>	
1.4 litre engines .....	MA5
1.6 litre engines .....	BE4/5
<b>Diesel models:</b>	
1.8 litre engines .....	BE3/5
1.9 litre:	
XUD series engines .....	BE3/5
DW series engines:	
Up to September 2002 .....	BE3/5
September 2002 onward .....	BE4/5
2.0 litre engines:	
Up to September 2002 .....	BE3/5
September 2002 onward .....	BE4/5

#### Lubrication

<b>Capacity:</b>	
MA5 transmission .....	2.0 litres
BE3/5 transmission .....	1.8 litres
BE4/5 transmission .....	1.9 litres

**Torque wrench settings**

	Nm	lbf ft
<b>MA5 transmission</b>		
Clutch release bearing guide sleeve bolts	6	4
Engine-to-transmission fixing bolts	40	30
Gearchange lever mounting nuts	8	6
Left-hand engine/transmission mounting	Refer to Chapter 2A	
Oil drain plug	25	18
Oil filler/level plug	25	18
Rear mounting link	Refer to Chapter 2A	
Reversing light switch	25	18
Roadwheel bolts	90	66
<b>BE3/5 and BE4/5 transmission</b>		
Clutch release bearing guide sleeve bolts	12	9
Engine-to-transmission fixing bolts	50	37
Gearchange lever mounting nuts	8	6
Left-hand engine/transmission mounting	Refer to Chapter 2A, 2B or 2C	
Oil drain plug	30	22
Oil filler/level plug	20	15
Rear mounting link	Refer to Chapter 2A, 2B or 2C	
Reversing light switch	25	18
Roadwheel bolts	90	66
Speedometer drive housing bolts	20	15

**1 General information**

**1** The transmission is contained in a cast-aluminium alloy casing bolted to the engine's left-hand end, and consists of the gearbox and final drive differential – often called a transaxle.

**2** Drive is transmitted from the crankshaft via the clutch to the input shaft, which has a splined extension to accept the clutch friction disc, and rotates in sealed ball-bearings. From the input shaft, drive is transmitted to the output shaft, which rotates in a roller bearing at its right-hand end, and a sealed ball-bearing at its left-hand end. From the output shaft, the drive is transmitted to the differential crownwheel, which rotates with the differential case and planetary gears, thus driving the sun gears and driveshafts. The rotation of the planetary gears on their shaft allows the inner roadwheel to rotate at a slower speed than the outer roadwheel when the car is cornering.

**3** The input and output shafts are arranged side-by-side, parallel to the crankshaft and driveshafts, so that their gear pinion teeth are in constant mesh. In the neutral position, the output shaft gear pinions rotate freely, so that drive cannot be transmitted to the crownwheel.

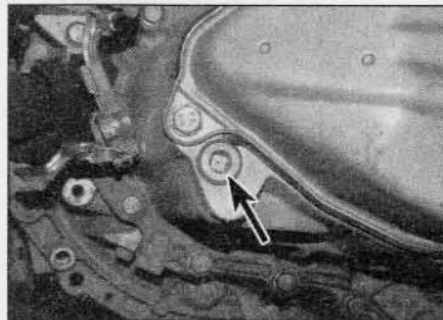
**4** Gear selection is via a floor-mounted lever and selector rod mechanism. The selector rod causes the appropriate selector fork to move its respective synchro-sleeve along the shaft, to lock the gear pinion to the synchro-hub. Since the synchro-hubs are splined to the output shaft, this locks the pinion to the shaft,

so that drive can be transmitted. To ensure that gearchanging can be made quickly and quietly, a synchromesh system is fitted to all forward gears, consisting of baulk rings and spring-loaded fingers, as well as the gear pinions and synchro-hubs. The synchromesh cones are formed on the mating faces of the baulk rings and gear pinions.

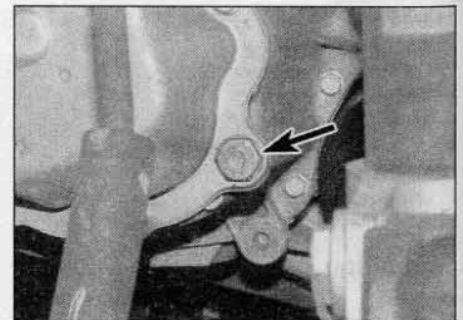
**5** Three different manual transmissions are used on the models covered in this manual, however all are similar in construction and operation. Any differences which affect the procedures covered in this Chapter are described in the Section concerned.

**2 Manual transmission – draining and refilling**

**Note:** A suitable square section wrench may be required to undo the transmission filler/level and drain plugs on some models. These wrenches can be obtained from most motor factors or your Peugeot/Citroën dealer.



**2.4a** Oil filler/level plug (arrowed) – MA5 transmission



**2.4b** Oil filler/level plug (arrowed) – BE3/5 and BE4/5 transmissions

**1** This operation is much quicker and more efficient if the car is first taken on a journey of sufficient length to warm the engine/transmission up to normal operating temperature.

**2** Park the car on level ground, switch off the ignition and apply the handbrake firmly. For improved access, jack up the front of the car and support it securely on axle stands (see *Jacking and vehicle support*). Note that the car must be level to ensure accuracy when refilling and checking the oil level. Undo the screws and remove the engine undertray (where fitted).

**3** Remove the engine undertray (where fitted) and the left-hand front roadwheel. Remove the plastic wheel arch liner as described in Chapter 11.

**4** Wipe clean the area around the filler/level plug, which is situated on the left-hand end of the transmission, next to the end cover. Unscrew the filler/level plug from the transmission and recover the sealing washer (see illustrations).

**5** Position a suitable container under the

drain plug (situated at the rear of the transmission) and unscrew the plug. On MA5 transmissions, the plug is on the left-hand side of the differential housing; on BE3/5 and BE4/5 transmissions, it is on the base of the differential housing (see illustrations).

6 Allow the oil to drain completely into the container. If the oil is hot, take precautions against scalding. Clean both the filler/level and the drain plugs, being especially careful to wipe any metallic particles off the magnetic inserts. Discard the original sealing washers; they should be renewed whenever they are disturbed.

7 When the oil has finished draining, clean the drain plug threads and those of the transmission casing, fit a new sealing washer and refit the drain plug, tightening it to the specified torque.

8 Refill the transmission slowly, through the filler/level plug orifice, until the oil begins to trickle out of the orifice. Use only good-quality oil of the specified type (refer to *Lubricants and fluids*). To ensure that a correct level is established, wait until the initial trickle has stopped and allow the oil to settle within the transmission. Add a little more oil until a new trickle emerges; the level will be correct when the new flow ceases.

9 When the level is correct, fit a new sealing washer to the filler/level plug, refit the plug and tighten it to the specified torque.

10 Refit the wheel arch liner, engine undertray (where applicable) and roadwheel, then lower the car to the ground. Tighten the roadwheel bolts to the specified torque.

### 3 Gearchange linkage – removal and refitting



**Note:** The gearchange linkage is not adjustable. If difficulty is experienced in gear selection, or if there is excess free play at the gearchange lever, dismantle the linkage and check the condition of the link rod balljoints and pivot bushes as described below.

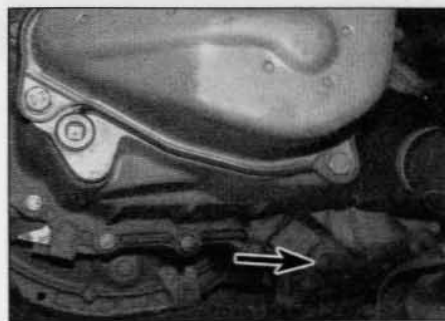
#### Removal

1 Firmly apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Remove the engine undertray (where fitted).

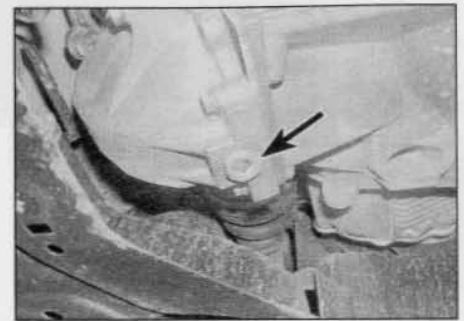
2 Remove the battery, battery tray and mounting plate as described in Chapter 5A. Depending on model and clearance available, remove any remaining air cleaner and air intake duct components as described in the relevant Part of Chapter 4, to gain access to the top of the transmission.

#### MA5 transmission – pre-1998 models

3 Slacken and remove the nut and washer, then withdraw the pivot bolt from each end of the selector rod (see illustration). Disengage the rod from the gearchange lever and selector lever, and remove it from



2.5a Oil drain plug (arrowed) – MA5 transmission



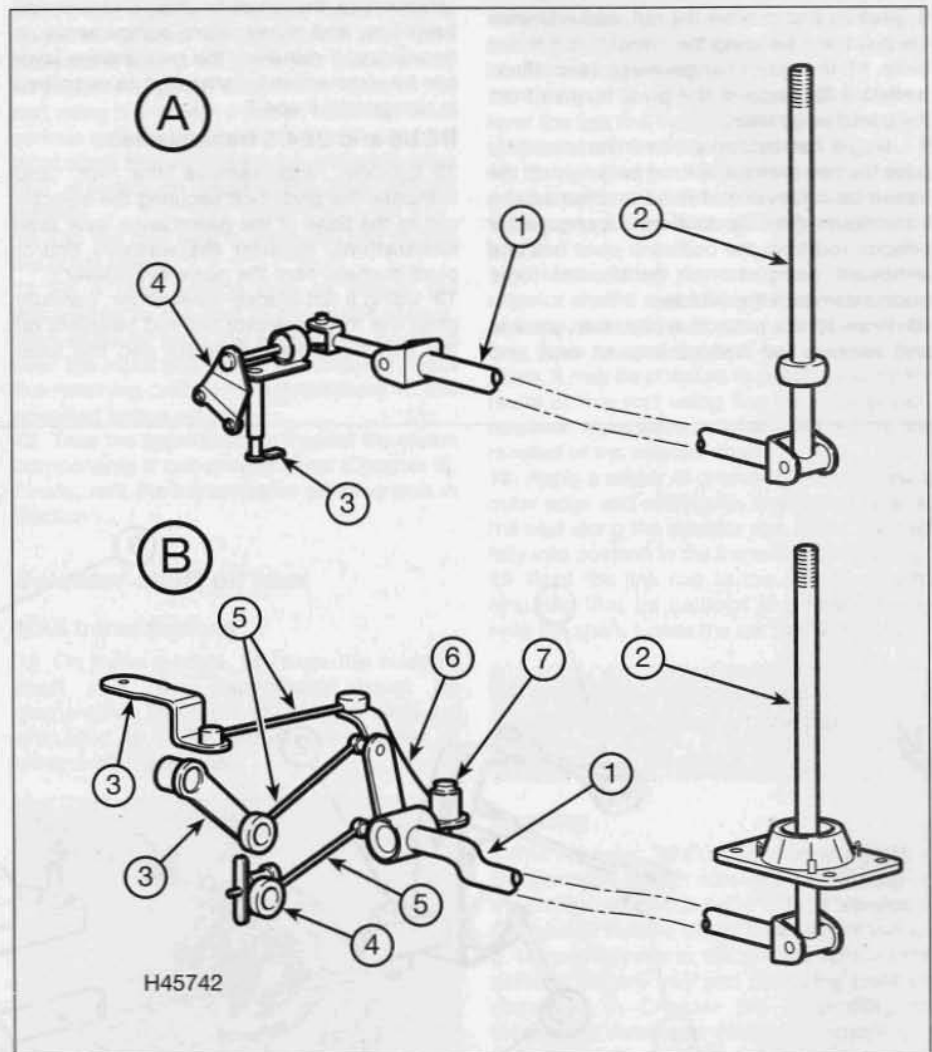
2.5b Oil drain plug (arrowed) – BE3/5 and BE4/5 transmissions

underneath the vehicle. Recover the spacers and pivot bushes from the gearchange lever and transmission selector lever.

4 Undo the two nuts securing the selector

lever mounting bracket to the transmission housing, then remove the bracket and lever assembly from the transmission.

5 Inspect all the linkage components for



3.3 Gearchange linkage arrangement on the MA5 transmission

- |                      |                               |                        |
|----------------------|-------------------------------|------------------------|
| A Pre-1998 models    | 3 Transmission selector lever | 5 Link rods            |
| B 1998 models onward | 4 Fixed mounting bracket      | 6 Bellcrank            |
| 1 Selector rod       |                               | 7 Bellcrank pivot bolt |
| 2 Gearchange lever   |                               |                        |



signs of wear or damage, paying particular attention to the pivot bushes, and renew worn components as necessary.

**6** To remove the gearchange lever, remove the centre console as described in Chapter 11, then undo the four retaining nuts and lower the gearchange lever out from underneath the vehicle.

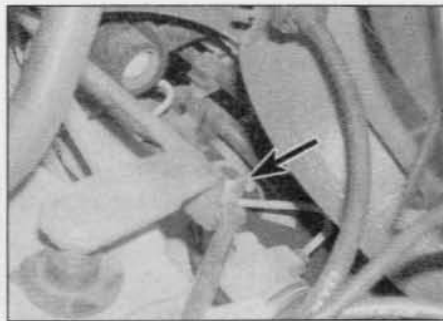
**7** Peel back the lower gaiter from the base of the gearchange lever, then disengage the lever mounting plate. Slide the upper gaiter up the lever to gain access to the gearchange lever pivot ball. Examine the lever components for signs of wear or damage, paying particular attention to the rubber gaiters, and renew components as necessary. The lever can be separated from its baseplate after the retaining ring has been unclipped.

#### MA5 transmission – 1998 models onward

**8** Slacken and remove the nut, and withdraw the pivot bolt securing the selector rod to the base of the gearchange lever (see illustration 3.3). Recover the pivot bushes from the gearchange lever.

**9** Using a flat-bladed screwdriver, carefully prise the two selector link rod balljoints off the transmission lever and fixed bracket on the transmission (see illustration). Disengage the selector rod from the bellcrank pivot ball and remove it, complete with the two link rods, from underneath the vehicle.

**10** Prise off the protective cap, then slacken and remove the bellcrank pivot bolt and



**3.9** Carefully lever the link rods off their balljoints on the transmission unit

washer. Carefully prise the bellcrank link rod balljoint off the transmission lever and remove the bellcrank and link rod assembly.

**11** Inspect all the linkage components for signs of wear or damage, paying particular attention to the pivot bushes and link rod balljoints, and renew worn components as necessary. If required, the gearchange lever can be removed and dismantled as described in paragraphs 6 and 7.

#### BE3/5 and BE4/5 transmissions

**12** Slacken and remove the nut, and withdraw the pivot bolt securing the selector rod to the base of the gearchange lever (see illustration). Recover the washers and/or pivot bush(es) from the gearchange lever.

**13** Using a flat-bladed screwdriver, carefully prise the three selector link rod balljoints off the two transmission levers and the fixed

bracket. Disengage the selector rod from the bellcrank pivot ball and remove it, with the two link rods, from underneath the vehicle.

**14** Where fitted, carefully prise the plastic cap off the pivot bolt securing the gearchange linkage bellcrank to the subframe.

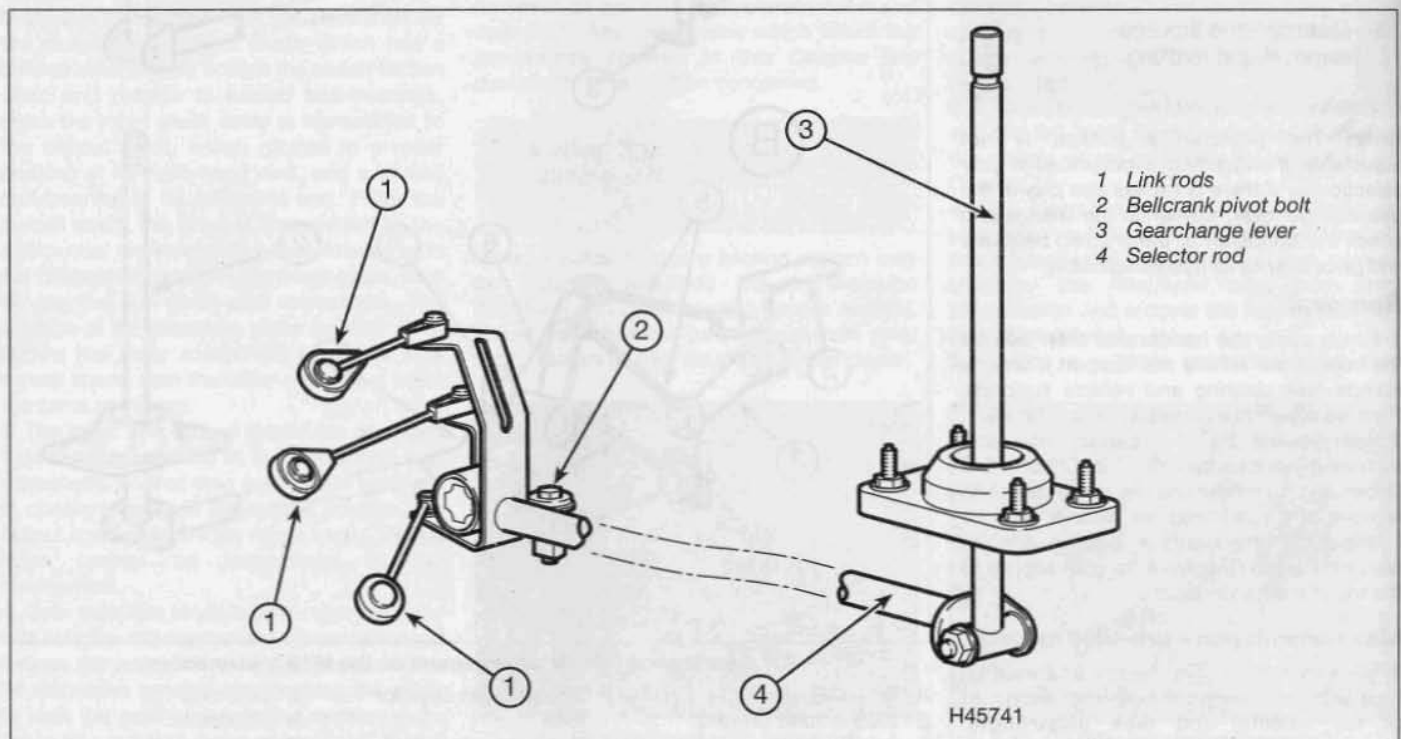
**15** Slacken and remove the bellcrank pivot bolt and washer, or the nut and washer from the bellcrank shaft, then manoeuvre the bellcrank and the remaining link rod out from under the vehicle. Where applicable, recover the spacer and pivot bushes from the centre of the bellcrank.

**16** Inspect all the linkage components for signs of wear or damage, paying particular attention to the pivot bushes and link rod balljoints, and renew worn components as necessary. If required, the gearchange lever can be removed and dismantled as described above in paragraphs 6 and 7.

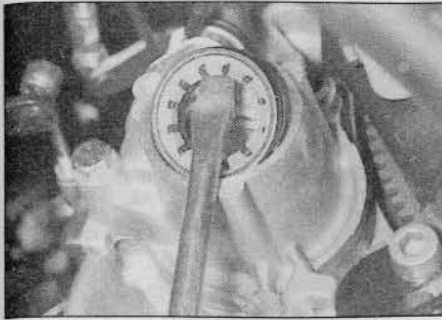
#### Refitting

**17** Refitting is a reversal of the removal procedure, noting the following points:

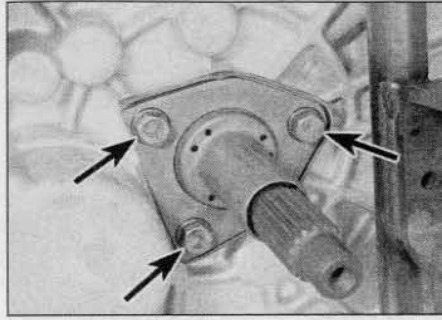
- Apply a smear of multi-purpose grease to the bellcrank pivot ball. Do not grease the link rod balljoints or the pivot bushes.
- Ensure that all link rods are securely pressed onto their balljoints.
- Where applicable, refit the air cleaner components (Chapter 4A, 4B or 4C), the mounting plate, battery tray and battery (Chapter 5A) and the centre console (Chapter 11).



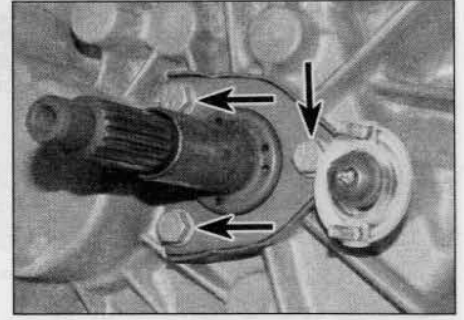
**3.12** Gearchange linkage arrangement on the BE3/5 and BE4/5 transmissions



4.2 Using a large flat-bladed screwdriver to lever the right-hand oil seal out of position – BE3/5 transmission shown



4.7a Clutch release bearing guide sleeve retaining bolts (arrowed) on the MA5 and BE3/5 transmissions . . .



4.7b . . . and on the BE4/5 transmission

#### 4 Oil seals – renewal

##### Driveshaft oil seals

1 Remove the appropriate driveshaft as described in Chapter 8.

2 Carefully prise the oil seal out of the transmission, using a large flat-bladed screwdriver (see illustration).

3 Remove all traces of dirt from the area around the oil seal aperture, then apply a smear of grease to the outer lip of the new oil seal. Fit the new seal into its aperture, and drive it squarely into position using a suitable tubular drift (such as a socket) which bears only on the hard outer edge of the seal, until it abuts its locating shoulder.

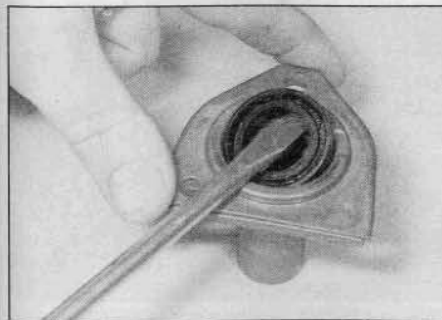
4 Apply a thin film of grease to the oil seal lip.

5 Refit the driveshaft as described in Chapter 8.

##### Input shaft oil seal

6 Remove the transmission as described in Section 7, and the clutch release mechanism as described in Chapter 6.

7 Undo the three bolts securing the clutch release bearing guide sleeve in position, and slide the guide off the input shaft, along with its sealing ring or gasket (as applicable) (see illustrations). Recover any shims or thrustwashers which have stuck to the rear of the guide sleeve, and refit them to the input shaft.



4.8 Carefully lever the oil seal out of the guide sleeve, noting which way round it is fitted

8 Carefully lever the oil seal out of the guide sleeve using a suitable flat-bladed screwdriver (see illustration).

9 Before fitting a new seal, check the input shaft's seal rubbing surface for signs of burrs, scratches or other damage, which may have caused the seal to fail in the first place. It may be possible to polish away minor faults of this sort using fine abrasive paper; however, more serious defects will require the renewal of the input shaft. Ensure that the input shaft is clean and greased, to protect the seal lips on refitting.

10 Dip the new seal in clean oil, and fit it to the guide sleeve.

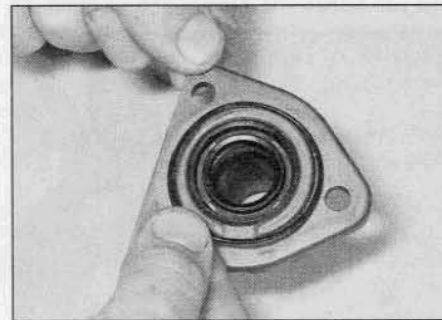
11 Fit a new sealing ring or gasket (as applicable) to the rear of the guide sleeve, then carefully slide the sleeve into position over the input shaft (see illustration). Refit the retaining bolts and tighten them to the specified torque setting.

12 Take the opportunity to inspect the clutch components if not already done (Chapter 6). Finally, refit the transmission as described in Section 7.

##### Selector shaft oil seal

###### MA5 transmissions

13 On these models, to renew the selector shaft seal, the transmission must be dismantled. This task should therefore be entrusted to a Peugeot/Citroën dealer or transmission specialist.



4.11 Fit a new sealing ring or gasket (as applicable) to the rear of the guide sleeve

##### BE3/5 and BE4/5 transmissions

14 Park the car on level ground, apply the handbrake, slacken the left-hand front roadwheel bolts, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Remove the left-hand front roadwheel.

15 Using a large flat-bladed screwdriver, lever the link rod balljoint off the transmission selector shaft, and disconnect the link rod.

16 Using a large flat-bladed screwdriver, carefully prise the selector shaft seal out of the housing, and slide it off the end of the shaft.

17 Before fitting a new seal, check the selector shaft's seal rubbing surface for signs of burrs, scratches or other damage, which may have caused the seal to fail in the first place. It may be possible to polish away minor faults of this sort using fine abrasive paper; however, more serious defects will require the renewal of the selector shaft.

18 Apply a smear of grease to the new seal's outer edge and sealing lip, then carefully slide the seal along the selector rod. Press the seal fully into position in the transmission housing.

19 Refit the link rod to the selector shaft, ensuring that its balljoint is pressed firmly onto the shaft. Lower the car to the ground.

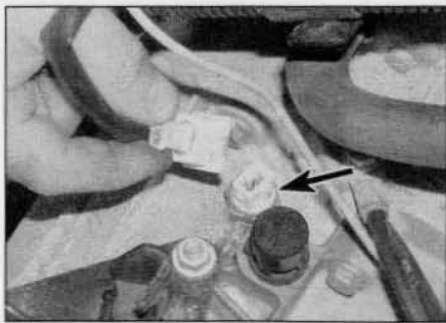
#### 5 Reversing light switch – testing, removal and refitting

##### Testing

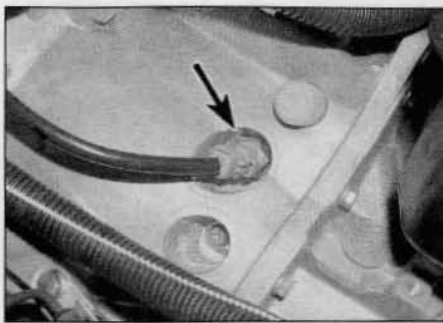
1 The reversing light circuit is controlled by a plunger-type switch screwed into the top of the transmission casing. If a fault develops, first ensure that the circuit fuse has not blown.

2 To gain access to the switch, remove the battery, battery tray and mounting plate as described in Chapter 5A. Depending on model and clearance available, remove any remaining air cleaner and air intake duct components as described in the relevant Part of Chapter 4.

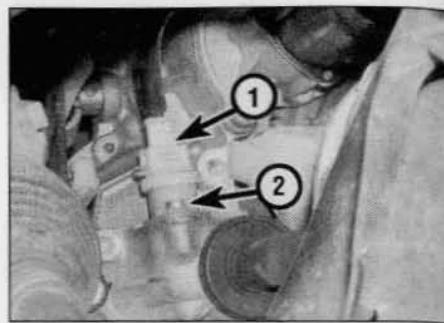
3 To test the switch, disconnect the wiring connector, and use a multimeter (set to the resistance function) or a battery-and-bulb test



5.5a Reversing light switch location (arrowed) on the MA5 transmission . . .



5.5b . . . and on the BE4/5 transmission



6.2 Speedometer drive wiring connector (1) and retaining bolt (2)

circuit to check that there is continuity between the switch terminals only when reverse gear is selected. If this is not the case, and there are no obvious breaks or other damage to the wires, the switch is faulty, and must be renewed.

### Removal

4 To gain access to the switch, remove the battery, battery tray and mounting plate as described in Chapter 5A. Depending on model and clearance available, remove any remaining air cleaner and air intake duct components as described in the relevant Part of Chapter 4.

5 Disconnect the wiring connector, then unscrew the switch from the transmission casing along with its sealing washer (see illustrations).

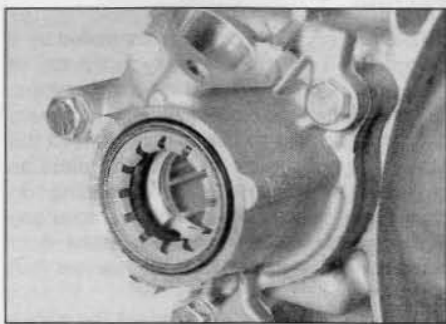
### Refitting

6 Fit a new sealing washer to the switch, then screw it back into position in the top of the transmission housing and tighten it to the specified torque setting. Refit the wiring plug, and test the operation of the circuit. Refit the components removed for access.

## 6 Speedometer drive – removal and refitting

### Removal

1 Chock the rear wheels, firmly apply the



6.7a On BE3/5 and BE4/5 transmissions, unscrew the housing retaining bolts . . .



6.7b . . . and remove the housing, sealing ring and drive pinion from the transmission

handbrake, then jack up the front of the car and support it on axle stands (see *Jacking and vehicle support*). The speedometer drive is on the rear of the transmission housing, next to the inner end of the right-hand driveshaft. Undo the screws and remove the engine undertray (where fitted).

2 Disconnect the wiring connector from the speedometer drive (see illustration).

3 Slacken and remove the retaining bolt and remove the heat shield (where fitted). Withdraw the speedometer drive and driven pinion assembly from the transmission housing, along with its sealing ring.

4 If necessary, the pinion can be slid out of the housing, and the oil seal removed from the top of the housing. Examine the pinion for signs of damage, and renew if necessary. Renew the housing sealing ring as a matter of course.

5 If the driven pinion is worn or damaged, also examine the drive pinion in the transmission housing for similar signs.

6 To renew the drive pinion on MA5 transmissions, the transmission must be dismantled and the differential gear removed. This task should therefore be entrusted to a Peugeot/Citroën dealer or a transmission specialist.

7 To remove the drive pinion on BE3/5 and BE4/5 transmissions, first remove the right-hand driveshaft as described in Chapter 8. Undo the three retaining bolts and remove the speedometer drive housing from the

transmission, along with its sealing ring. Remove the drive pinion from the differential gear, and recover any adjustment shims from the gear (see illustrations).

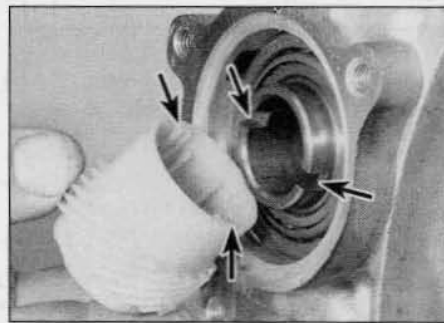
### Refitting

8 On BE3/5 and BE4/5 transmissions, where the drive pinion has been removed, refit the adjustment shims to the differential gear, then locate the speedometer drive on the gear, ensuring it is correctly engaged in the gear slots (see illustration). Fit a new sealing ring to the rear of the speedometer drive housing, then refit the housing to the transmission and tighten its retaining bolts to the specified torque. Inspect the driveshaft oil seal for signs of wear, and renew if necessary. Refit the driveshaft as described in Chapter 8.

9 On all transmissions, apply a smear of grease to the lips of the seal and to the driven pinion shaft, and slide the pinion into position in the speedometer drive.

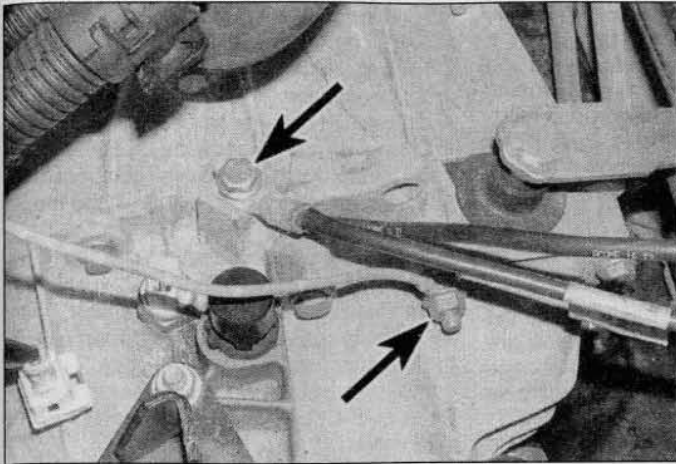
10 Fit a new sealing ring to the speedometer drive and refit it to the transmission, ensuring that the drive and driven pinions are correctly engaged. Refit the drive retaining bolt, complete with heat shield (where fitted), and tighten securely.

11 Reconnect the wiring connector to the speedometer drive, refit the engine undertray (where applicable), then lower the vehicle to the ground.

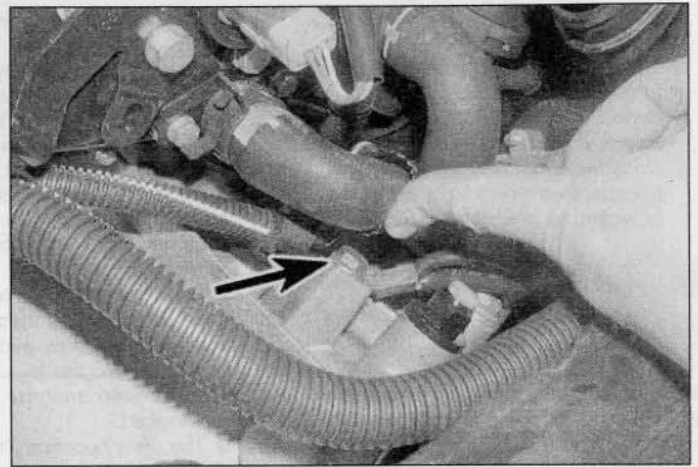


6.8 On BE3/5 and BE4/5 transmissions, ensure the drive pinion dogs are correctly engaged with the gear slots (arrowed) when refitting





**7.8a** Unscrew the nut and bolt and detach the earth leads (arrowed) from the transmission – MA5 transmission



**7.8b** Unscrew the bolt (arrowed) and disconnect the earth lead from the transmission – BE3/5 and BE4/5 transmissions

## 7 Manual transmission – removal and refitting



### Removal

- 1 Firmly apply the handbrake, then jack up the front of the car and support it securely on axle stands (see *Jacking and vehicle support*).
- 2 Drain the transmission oil as described in Section 2, then refit the drain and filler plugs, tightening them to the specified torque.
- 3 Remove the air cleaner and air intake duct(s) as described in the relevant Part of Chapter 4. On D9B diesel engines, also remove the air distribution housing as described in Chapter 4B.
- 4 Remove the battery, battery tray and mounting plate as described in Chapter 5A.
- 5 Remove both driveshafts as described in Chapter 8.
- 6 Remove the starter motor as described in Chapter 5A.
- 7 Refer to Chapter 6 and release the clutch inner cable end fitting from the release fork/lever. Depress the retaining tabs and release the outer cable from the transmission bracket.
- 8 Disconnect the wiring connector from the reversing light switch, TDC sensor and speedometer drive. Undo the retaining nuts/bolts, and disconnect the earth straps from the transmission housing (**see illustrations**). Disconnect the wiring from any additional switches/sensors as necessary, free the wiring loom from the retaining clips, and position it clear of the transmission.
- 9 On the MA5 transmission, undo the bolt securing the exhaust front pipe to its transmission mounting bracket.
- 10 On pre-1998 MA5 transmissions, slacken and remove the nut and washer, then withdraw the pivot bolt securing the selector rod to the transmission selector lever. Disengage the rod from the selector lever. On

all other transmissions, using a flat-bladed screwdriver, carefully prise the gearchange mechanism link rod balljoints off their respective levers on the transmission. Position the rods clear of the transmission.

11 On models with power steering, undo the retaining nuts and bolts and release the power steering pipe support brackets from the transmission. Position the pipe clear of the unit so that it will not be damaged during the removal procedure.

12 Undo the retaining bolt(s), and remove the flywheel lower cover plate (where fitted) from the transmission.

13 On the BE3/5 and BE4/5 transmissions, remove the speedometer drive housing from the transmission as described in Section 6.

14 Place a jack with a block of wood beneath the engine, to take the weight of the engine. Alternatively, attach a couple of lifting eyes to the engine, and fit a hoist or support bar to take the engine weight.

15 Place a jack and block of wood beneath the transmission, and raise the jack to take the weight of the transmission.

16 Undo the nut and bolt securing the engine/transmission rear mounting connecting link to the bracket on the subframe.

17 Slacken and remove the centre nut and washer from the left-hand engine/transmission mounting. Undo the two bolts/nuts securing the mounting to the support bracket, and remove the rubber mounting.

18 On the MA5 transmission, undo the three retaining nuts and remove the mounting plate from the top of the transmission.

19 On the BE3/5 and BE4/5 transmission, remove the washer and spacer from the mounting stud, then unscrew the stud from the top of the transmission housing. Collect the large spacer plate from the mounting stud.

20 With the jack positioned beneath the transmission taking the weight, slacken and remove the remaining bolts securing the

transmission housing to the engine. Note the correct fitted positions of each bolt, and the necessary brackets, as they are removed to use as a reference on refitting. Make a final check that all components have been disconnected, and are positioned clear of the transmission so that they will not hinder the removal procedure.

21 With the bolts removed, move the trolley jack and transmission to the left, to free it from its locating dowels then pivot the differential end of the transmission upwards (to disengage it from the subframe).

**Caution: Take great care not to place any excess strain on the exhaust system, or damage the radiator if the engine is moved. On models equipped with air conditioning, care must also be taken to ensure the auxiliary drivebelt pulleys do not damage the air conditioning pipes on the right-hand side of the engine compartment.**

22 Once the transmission is free, lower the jack and manoeuvre the unit out from under the car. Remove the locating dowels from the transmission or engine if they are loose, and keep them in a safe place.

### Refitting

23 The transmission is refitted by a reversal of the removal procedure, bearing in mind the following points:

- a) Apply a little high melting-point grease (Peugeot/Citroën recommend the use of Molykote BR2 plus – available from your dealer) to the splines of the transmission input shaft. Do not apply too much, otherwise there is a possibility of the grease contaminating the clutch friction disc.
- b) Ensure that the locating dowels are correctly positioned prior to installation.
- c) On the BE3/5 and BE4/5 transmissions, apply thread-locking fluid to the left-hand engine/transmission mounting stud threads, prior to refitting it to the

transmission. Tighten the stud to the specified torque.

- d) Tighten all nuts and bolts to the specified torque (where given).
- e) Renew the driveshaft oil seals (Section 5), then refit the driveshafts (see Chapter 8).
- f) On completion, refill the transmission with the specified type and quantity of lubricant, as described in Section 2.

## 8 Manual transmission overhaul – general information

**1** Overhauling a manual transmission 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. Internal transmission components are also often difficult to obtain, and in many instances, extremely expensive. Because of this, if the transmission develops a fault or becomes noisy, the best course of action is to have the unit overhauled by a specialist repairer, or to obtain an exchange reconditioned unit.

**2** Nevertheless, it is not impossible for the more experienced mechanic to overhaul the transmission, provided 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 an overhaul include

internal and external circlip pliers, bearing pullers, a slide hammer, a set of pin punches, a dial test indicator, and possibly a hydraulic press. In addition, a large, sturdy workbench and a vice will be required.

**4** During dismantling of the transmission, make careful notes of how each component is fitted, to make reassembly easier and more accurate.

**5** Before dismantling the transmission, it will help if you have some idea what area is malfunctioning. Certain problems can be closely related to specific areas in the transmission, which can make component examination and renewal easier. Refer to the *Fault finding* Section for more information.