

# Section 9

## MANUAL TRANSMISSION AND CLUTCH

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# Manual Transmission and Clutch

## Introduction

The cars covered by this manual are equipped with one of three different five-speed manual transmissions. Most 318i models are equipped with the Getrag 240 transmission. Some early 1984 318i models are equipped with a ZF S5-16 transmission. All 6-cylinder (325) models are equipped with a Getrag 260 transmission.

All three transmissions are fully synchronized in all gears and are housed in lightweight alloy cases. From the transmission, power is transmitted to the drive wheels by the driveshaft and final drive. The transmission can be removed and installed without removing the engine. Service and repair of the driveshaft and final drive are covered in **DRIVESHAFT AND FINAL DRIVE**.

Repairs to the internal parts of the transmission require special tools and knowledge. If you lack the skills and tools, or a suitable workplace for servicing the transmission, we suggest you leave these repairs to an authorized BMW dealer or other qualified shop.

Though you may not have the skills and knowledge for doing actual internal repairs, it may be possible to save some of the expense of professional repair by removing and installing the transmission yourself, using the procedures described in this section. It is important to realize, however, that a partially disassembled transmission may be a problem for a mechanic. We strongly advise against taking the transmission apart to begin any repair that cannot be properly finished.

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## 1. GENERAL DESCRIPTION

This section covers both the clutch and the manual transmission. Fig. 1-1 shows a typical BMW five-speed manual transmission.

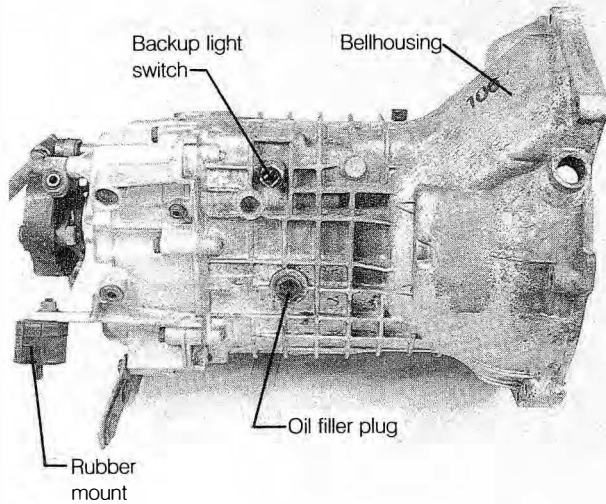


Fig. 1-1. Transmission case of five-speed Getrag 240 manual transmission.

## 1.1 Transmission

The transmission case, which contains the transmission gear train, is a lightweight alloy die casting with an integral bellhousing. The transmission gears are of the constant-mesh type with balk ring synchronizers. Each gear (1st through 5th) is actually a mating pair of gears, and constant-mesh simply means the mating gears are always meshing, as shown in Fig. 1-2.

The 4th gear is mounted on the input shaft and rotates the layshaft at engine speed. The 1st through 3rd and 5th gears are mounted in bearings with their mating gears on the layshaft, and the gears freewheel until engaged. The synchronizers are splined and mounted on the output shaft and always rotate at rear wheel speed.

Gear selection is made using the gearshift lever in the passenger compartment, which is linked to the transmission by the gearshift linkage. When shifting, the synchronizers match the speed of the selected gear to the speed of the output shaft, then lock the selected gear into rotation with the output shaft. This eases shifting, minimizes wear, and helps prevent damage to the gears.

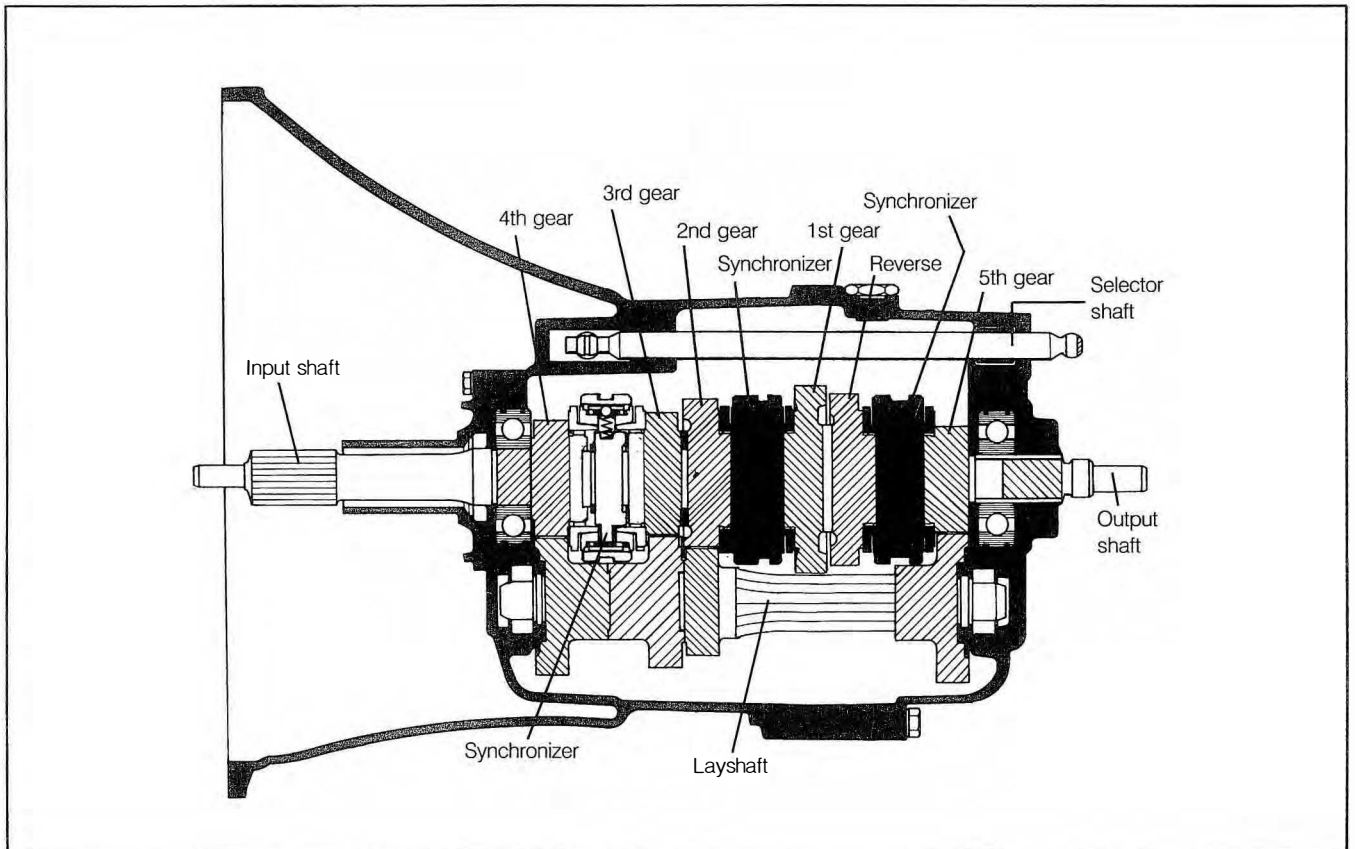


Fig. 1-2. Cross section of manual transmission showing position of gear train.

**1.2 Clutch**

The transmission bellhousing houses the clutch components. The clutch is hydraulically operated. When the clutch pedal is depressed, the clutch master cylinder generates hydraulic pressure to activate the slave cylinder on the transmission. The slave cylinder moves the clutch release lever and release bearing, which are inside the bellhousing, to engage or disengage the clutch.

**1.3 Identification Codes and Specifications.**

Transmissions are identified by manufacturer's stamp and by code numbers and letters. The manufacturer's stamp is on the case, just in front of the mounting for the clutch slave cylinder as shown in Fig. 1-3. The code number and letters are located on the top of the Bellhousing as shown in Fig. 1-4. **Table a** lists manual transmission gear ratios.



**Fig. 1-3.** Manufacturer's stamp for Getrag transmissions. ZF transmissions are similar.



**Fig. 1-4.** Location of transmission identification code (arrow) on five-speed manual transmissions.

**Table a. Manual Transmission Gear Ratios**

Transmission type	Getrag 240	ZF S5-16	Getrag 260
<b>Gear ratios</b>			
1st gear	3.72	3.72	3.83
2nd gear	2.02	2.04	2.20
3rd gear	1.32	1.34	1.40
4th gear	1.00	1.00	1.00
5th gear	0.81	0.80	0.81
Reverse gear	3.45	3.54	3.46

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## 2. MAINTENANCE

BMW specifies the maintenance steps below to be carried out at particular time or mileage intervals for proper maintenance of the clutch and transmission. Information on clutch and transmission maintenance and on the prescribed maintenance intervals can be found in **LUBRICATION AND MAINTENANCE**.

1. Checking clutch master cylinder fluid level
2. Checking transmission oil level
3. Checking clutch disc for wear
4. Changing transmission oil

### NOTE —

Checking clutch freeplay is not necessary for the BMW cars covered by this manual. The clutch system is hydraulic and is self-adjusting.

## 3. TROUBLESHOOTING

This troubleshooting section applies to problems affecting the transmission—including the gearshift mechanism and the gear train—as well as the clutch.

The source of most problems is apparent from the symptoms. For example, difficulty in engaging a gear or imprecise shifting are transmission problems. Other symptoms, such as loss of performance, vibration or shuddering when releasing the clutch, or noises from the area of the transmission, are less specific.

Poor performance may be evidence of a slipping clutch, but it may also be caused by an engine problem. Vibration suggests a faulty clutch, but might also indicate a driveline problem.

Noises may be the result of a failure in the gear train, or of the driveshaft and final drive. What appears to be a transmission oil leak may be engine oil leaking from a faulty rear crankshaft oil seal, especially if the leak is near the bottom of the transmission bellhousing. See **ENGINE** for information on crankshaft oil seals. See **DRIVESHAFT AND FINAL DRIVE** for information on the driveshaft.

## 3.1 Basic Troubleshooting Principles

Transmission problems fall into two categories: those that can be fixed by external adjustments, and those that require disassembly of the transmission. Problems that at first appear to be caused by internal faults, such as gear shifting difficulty or noisy operation, can often be corrected by external adjustments.

Begin any transmission troubleshooting with a thorough visual inspection, both in the engine compartment and from beneath. Check all parts of the gearshift mechanism for wear that might cause misalignment and shifting difficulty. Look for wet spots that may indicate oil leaks. Low oil level may be the cause of hard shifting or noise. Accurate pinpointing of leaks may require that the suspected area be cleaned and reinspected.

To avoid removing the transmission unnecessarily, check the gearshift mechanism for wear and correct leaks and oil level before acting on suspected internal problems. The gearshift mechanism is covered in **4. Shift Mechanism**. Replacement of oil seals is covered in **7.3 Transmission Oil Seals**. Checking and correcting oil level is covered in **LUBRICATION AND MAINTENANCE**.

As with most other troubleshooting, careful observation of the symptoms is the key to isolating and identifying transmission problems. A road test is an important step. Determining whether the problem is present in all gears, only during acceleration, when the clutch is engaged, or in some other special conditions may help isolate the source of the problem.

**Table b** lists manual transmission and clutch symptoms, their probable causes, and recommended corrective actions. The numbers in bold type in the corrective action column refer to the numbered headings in this section where the suggested repairs are described.

## 3.2 Diagnostic Tests

Most internal transmission problems cannot be accurately diagnosed unless the unit is removed and disassembled. However, a quick test can be used to determine whether the clutch is performing satisfactorily or slipping.

To quick-check clutch performance, start the engine and set the parking brake. Depress the clutch pedal and place the gearshift lever in 3rd or 4th gear, then slightly accelerate the engine and slowly release the clutch pedal. The engine should immediately stall, indicating that the clutch is engaging properly and will not slip enough to allow the engine to continue to run. If the engine stalls slowly, or does not stall at all, the clutch is most likely slipping. See **5. Clutch** for more information.

**Table b. Manual Transmission Troubleshooting**

Symptom	Probable cause	Corrective action
1. Difficult or noisy shifting	<ul style="list-style-type: none"> <li>a. Clutch not fully releasing</li> <li>b. Clutch disc binding on transmission input shaft</li> <li>c. Worn gearshift linkage, or loose shift console</li> <li>d. Low gear oil level</li> <li>e. Incorrect gear oil for ambient temperature</li> <li>f. Worn or damaged internal gear train components</li> <li>g. Not waiting long enough before shifting (Reverse)</li> </ul>	<ul style="list-style-type: none"> <li>a. Air in clutch hydraulic system. Bleed system. <b>5.1</b> Incorrect pedal adjustment. Check and correct pedal adjustment. <b>5.2</b></li> <li>b. Remove transmission and inspect splines of clutch disc and input shaft. If necessary, replace clutch disc. <b>5.3</b></li> <li>c. Check shift mechanism and tighten shift console. If necessary, replace worn parts. <b>4.1</b></li> <li>d. Check for transmission oil leaks. Check and correct oil level if needed. See <b>LUBRICATION AND MAINTENANCE</b></li> <li>e. Drain oil and replace with oil of correct viscosity. See <b>LUBRICATION AND MAINTENANCE</b></li> <li>f. Inspect internal transmission components and replace faulty parts. <b>7</b></li> <li>g. Wait at least 3-4 seconds after depressing clutch pedal before shifting into reverse</li> </ul>
2. Transmission noisy	<ul style="list-style-type: none"> <li>a. Insufficient gear oil</li> <li>b. Worn or damaged internal gear train components</li> <li>c. Clutch dampening springs broken</li> </ul>	<ul style="list-style-type: none"> <li>a. Check for transmission oil leaks. Check and correct oil level if needed. See <b>LUBRICATION AND MAINTENANCE</b></li> <li>b. Inspect internal transmission components and replace faulty parts. <b>7</b></li> <li>c. Inspect clutch components and replace faulty parts. <b>5.3</b></li> </ul>
3. Grinding noise when shifting (1st or Reverse gears)	<ul style="list-style-type: none"> <li>a. Idle speed too high</li> <li>b. Not waiting long enough before shifting (Reverse)</li> <li>c. Worn or damaged internal gear train components</li> </ul>	<ul style="list-style-type: none"> <li>a. Adjust idle speed. See <b>FUEL SYSTEM</b></li> <li>b. Wait at least 3-4 seconds after depressing clutch pedal before shifting into reverse</li> <li>c. Inspect internal transmission components and replace faulty parts. <b>7</b></li> </ul>
4. Transmission fails to engage a gear or jumps out of gear	<ul style="list-style-type: none"> <li>a. Worn gearshift linkage or loose shift console</li> <li>b. Transmission output flange loose</li> <li>c. Worn or damaged internal gear train components</li> </ul>	<ul style="list-style-type: none"> <li>a. Check shift mechanism and tighten shift console. If necessary, replace worn parts. <b>4.1</b></li> <li>b. Check output flange. See <b>DRIVESHAFT AND FINAL DRIVE</b></li> <li>c. Inspect internal transmission components and replace faulty parts. <b>7</b></li> </ul>
5. Poor acceleration, clutch slipping on hills when accelerating	<ul style="list-style-type: none"> <li>a. Clutch friction surfaces worn or burnt</li> <li>b. Clutch not fully engaging</li> <li>c. Clutch disc, pressure plate, or flywheel oil soaked</li> </ul>	<ul style="list-style-type: none"> <li>a. Inspect clutch components and replace faulty parts. <b>5.3</b></li> <li>b. Inspect clutch disc for binding on input shaft. Check condition of bearing on input shaft. Check condition of release bearing and release lever. Replace faulty parts. <b>5.3</b>. Check for binding in clutch hydraulic system at slave cylinder and master cylinder pushrods. <b>5.2</b></li> <li>c. Inspect clutch components and engine and transmission oil seals. If necessary, clean pressure plate and flywheel. Replace clutch disc and faulty oil seals. <b>5.3, 7.3</b></li> </ul>
6. Clutch grabs or chatters when the pedal is released	<ul style="list-style-type: none"> <li>a. Faulty clutch release system</li> <li>b. Clutch disc binding on transmission input shaft</li> <li>c. Contaminated or glazed (overheated) clutch disc</li> <li>d. Faulty engine/transmission mounting</li> </ul>	<ul style="list-style-type: none"> <li>a. Check condition of release bearing and release lever. Replace faulty parts. <b>5.3</b>. Check for binding in clutch hydraulic system. <b>5.2</b></li> <li>b. Remove transmission and inspect splines of clutch disc and input shaft. If necessary, replace clutch disc. <b>5.3</b></li> <li>c. Inspect clutch disc and replace faulty parts. <b>5.3</b></li> <li>d. Check engine and transmission mounts for oil contamination. Replace if necessary. See <b>ENGINE</b></li> </ul>

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## 4. SHIFT MECHANISM

The basic shift mechanism on the cars covered by this manual is a shift lever and shift rod connected to the transmission selector shaft. See Fig. 4-1. The shift lever swivels in a ball-and-socket mounted in the shift console. The shift rod

is carried in bushings at either end to dampen transmission vibration.

There are two versions of the shift mechanism. One has a sheet metal shift console and one has an aluminum shift console. The version with sheet-metal shift console is installed

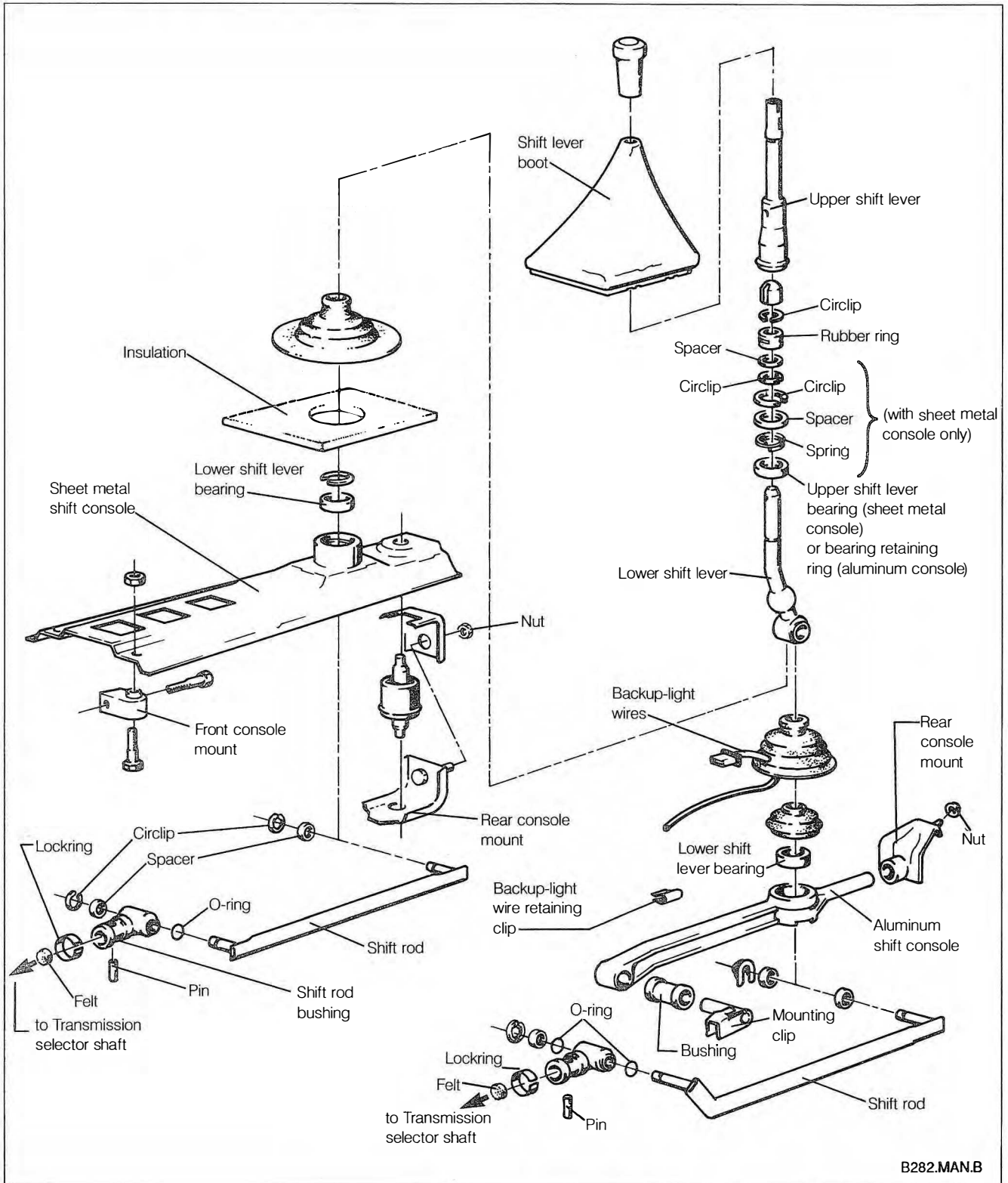


Fig. 4-1. Exploded view of shift mechanism.

B282.MAN.B



on most models through 1986. On sheet-metal consoles, the shift lever is mounted in a two-piece plastic bearing secured by a circlip. At the front, the console is bolted to the transmission case.

The version with aluminum shift console is installed on most models from 1987 on. On aluminum consoles, the shift lever and its bearing are held in the frame by a plastic retaining ring that snaps into place. The front of the console is mounted to the transmission case by a clip.

The shift mechanism is not adjustable. For any shifting problems, the gearshift bearing and shift-rod bushings should be inspected for wear or for a lack of lubrication that might affect smooth or accurate shifting. The shift console should also be checked for secure mounting and bushing wear. All bearings and bushings are available as replacement parts.

## 4.1 Disassembling and Assembling Shift Mechanism

The shift mechanism itself is easily removed and installed, but in most models complete access to the mechanism requires removing the exhaust system, the exhaust heat shield, and the driveshaft. See **EXHAUST SYSTEM AND EMISSION CONTROLS** and **DRIVESHAFT AND FINAL DRIVE** for more information.

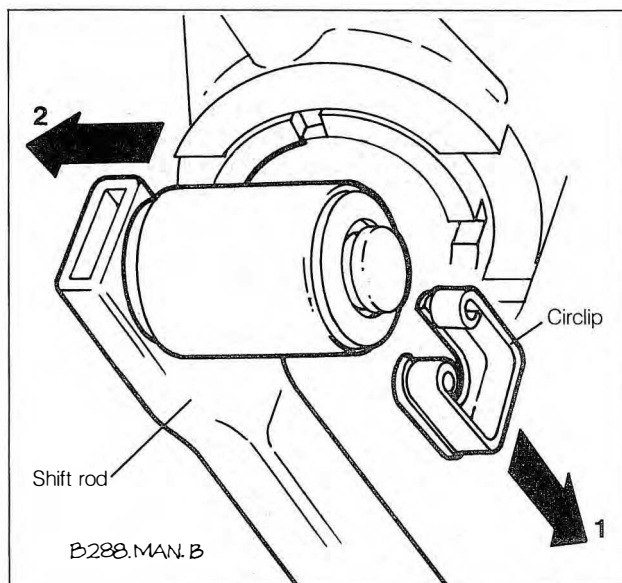
On models with the aluminum shift console, removal of the shift lever may require the use of a special tabbed tool to unlock the plastic retaining ring.

On models with the sheet-metal console, special bolts coated with a locking compound are used to hold the console to the transmission. This prevents the bolts from loosening and being stripped by the shifting action.

When assembling the shift rod or shift lever bearing, lubricate all joints and pivot points with molybdenum disulfide grease (Molykote Longterm 2 or equivalent).

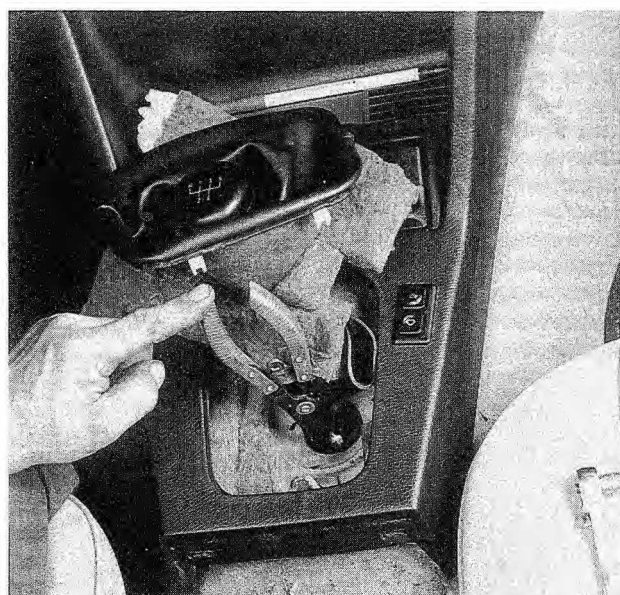
### To remove and install shift lever and shift rod:

1. Put the transmission in reverse.
2. Pull the shift knob up and off of the shift lever. Remove the shift boot and the sound insulating felt underneath it.
3. Remove the rubber dust cover. On models with aluminum shift console, it is necessary to first disconnect the plug for the backup light switch.
4. Working underneath the car, disconnect the shift lever from the shift rod by removing the circlip as shown in Fig. 4-2.



**Fig. 4-2.** Lower shift lever being disconnected from shift rod. Pull off circlip in direction of arrow (1) and then disengage shift rod from bushing (2).

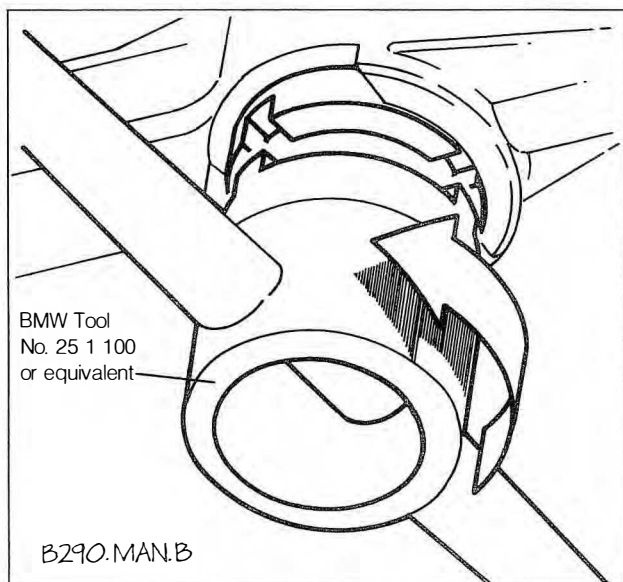
5. On models with sheet-metal shift console, remove the circlip from the top of shift lever bearing shown in Fig. 4-3 and lift out the shift lever.



**Fig. 4-3.** Circlip being removed on models with sheet-metal shift console.

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- On models with aluminum shift console, work underneath the car and use the special tool (BMW Part No. 25 1 100) or a screwdriver to engage the locking tabs of the bearing retaining ring from below the lower shift lever bearing. Turn the ring 90° (¼ turn) counterclockwise, as shown in Fig. 4-4 to unlock it, and lift out the shift lever.



**Fig. 4-4.** Removing shift lever retaining ring on models with aluminum shift console.

- Remove the shift rod from the transmission selector shaft. This is done by pulling off the bushing lockring, then using a suitable drift to drive out the pin. See Fig. 4-5.



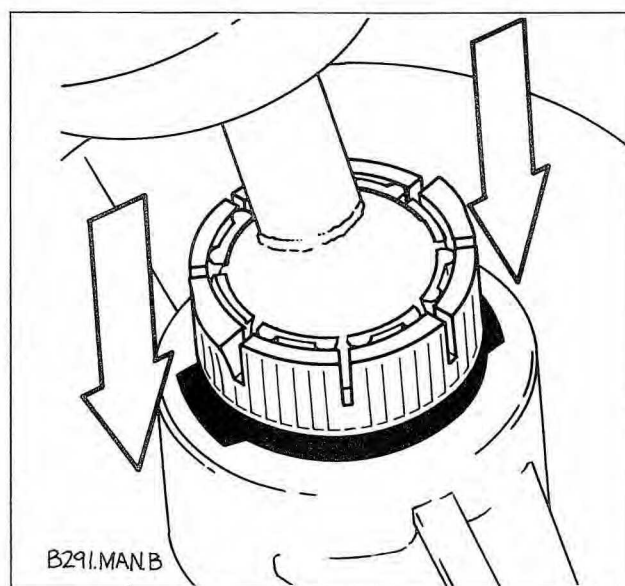
**Fig. 4-5.** Shift rod bushing lockring (arrow), and pin (A). Transmission shown removed. With transmission installed, drive pin out from below.

### NOTE

- Note the installed orientation of the shift rod so that it can be reinstalled the same way. Depending on the transmission, the shift rod may be on the right or left side of the bushing.
- On models with sheet-metal shift console, it may be easier to drive the pin out with the selector shaft in 3rd or 5th gear.

Installation is the reverse of removal. Check the condition of the felt in the shift rod bushing, and replace it if it is torn or damaged. Drive the bushing pin in from the bottom. Remove any old grease from the shift lever bearing and lubricate it with molybdenum disulfide grease (Molykote Longterm 2 or equivalent).

On models with sheet-metal shift console, the shift lever bearing should be lubricated with the same grease. On models with aluminum shift console, align the tabs on the plastic retaining ring with the openings in the shift console, as shown in Fig. 4-6, and press in the retaining ring until it clicks twice.



**Fig. 4-6.** Shift lever being installed.