

**M 45 4-speed**

**M 46 4-speed (M 45 + overdrive)**

**Repairs and Maintenance**

*Section*  
**4**

*Group*  
**43**

**Manual  
Transmissions  
M45 / M46**

**1979—**

**VOLVO**



## Group 43: Manual transmission

M 45 = Standard transmission (introduced on 1979 models)

M 46 = Standard transmission with overdrive unit attached  
(M 45 + overdrive).

Repair instructions for Overdrive are available in separate manual.

### Contents

	<b>Page</b>
<b>Specifications</b> .....	1
<b>Special tools</b> .....	2
— Modifications to fixture 5130 .....	4
<b>Spare parts illustrations</b> .....	5
— Transmission assembly .....	6
— Transmission parts .....	8
— Transmission controls .....	10
— Transmission mounts .....	12
<b>Features, M 45/M 46 1979—</b> .....	14
<b>Service procedures:</b>	
<b>Operation</b>	
— M 45: replacing rear seal in vehicle .....	A1—A8..... 20
— M 45/M 46: replacing back-up light switch in vehicle .....	B1—B13..... 22
— M 45/M 46: repairs to gearshift lever in vehicle .....	C1—C17..... 25
— M 45, removal .....	D1—D17..... 31
— M 45, disassembly .....	E1—E41..... 35
— M 45, assembly .....	F1—F68..... 45
— M 45, installation .....	G1—G15..... 61
— M 46, removal .....	H1—H19..... 61
— M 46, disassembly .....	I1—I38..... 69
— M 46, assembly .....	J1—J69..... 78
— M 46, installation .....	K1—K18..... 94

Indicates changes in text and/or specification in this manual.

**TP 30056/2**

4500.04.84

Printed in U.S.A.



# Specifications

## General

Type .....	M 45	M 46	Late Models
Gear ratios:			
1st gear .....	3.71:1	3.71:1	4.03:1
2nd gear .....	2.16:1	2.16:1	2.16:1
3rd gear .....	1.37:1	1.37:1	1.37:1
4th gear .....	1:1	1:1	1:1
4th gear + overdrive .....	—	0.797:1	0.797:1
Reverse gear .....	3.68:1	3.68:1	3.68:1

## Lubricant

	<i>Metric</i>	<i>US Measurements</i>
Type .....	Automatic Transmission Fluid Type F or G	
Capacity: M 45 .....	0.75 liter	0.8 US qt.
Capacity: M 46 .....	2.3 liters	2.4 US qts.

## Clearances

Clearance between reverse gear and shift fork .....	0.1–1.0 mm	0.004"—0.04"
Axial clearance:		
Input shaft .....	0.01–0.20 mm	0.0004–0.008"
Intermediate shaft .....	0.025–0.10 mm	0.001–0.004"
Main shaft .....	0.01–0.20 mm	0.0004–0.008"

## Aluminum transmission housing:

Pre-tension intermediate shaft to .....	0.03–0.08 mm	0.012–0.0032"
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## Torques

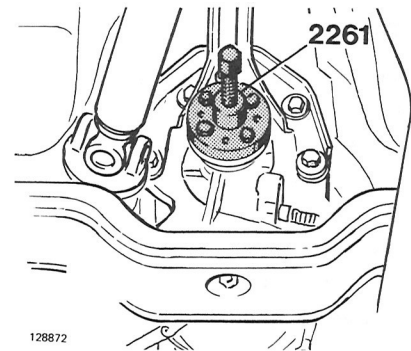
Bell housing bolts .....	35–50 Nm	25–35 ft.lbs.
Output shaft flange nut .....	90–110 Nm	65–80 ft.lbs.
Rear cover (gearshift assembly) .....	35–50 Nm	25–35 ft.lbs.



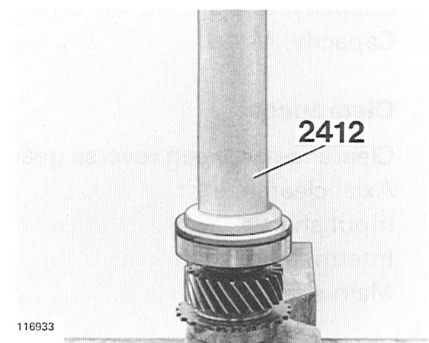
## Special tools, transmission M 45 / M 46

To order, put 999 in front of tool number

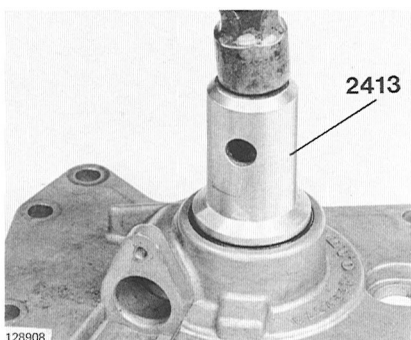
- 1801 Standard handle**
- 2261 Puller**, drive flange
- 2412 Drift**, installing input shaft bearing
- 2413 Drift**, removing/installing rear cover seal
- 2520 Stand**
- 2831 Press tool**, installing main shaft bearing
- 2852 Adapter**, installing gear and synchro ring
- 2853 Adapter**, removing gear and synchro ring
- 2867 Drift**, installing bell housing seal
- 2985 Adapter**, removing main shaft bearing
- 2986 Drift**, installing intermediate shaft bearings
- 5058 Tool**, removing main shaft bearing
- 5064 Drift**, installing rear cover seal
- 5065 Drift**, installing seal on shift selector rail
- 5069 Puller**, removing rear seal
- 5111 Centering drift**, installing clutch
- 5130 Fixture**, attaching transmission to stand 2520
- 5131 Puller**, removing intermediate shaft bearing
- 5147 Tool**, removing main shaft bearing, used with 5058
- 5148 Tool**, removing main shaft bearing on M 46
- 5149 Wrench**, removing/installing flange nut
- 5177 Puller**, intermediate shaft bearing, aluminum housing
- 5180 Drift**, intermediate shaft bearing, aluminum housing
- 5181 Pliers**, removing pin on gearshift lever
- 5972 Fixture**, removing transmission



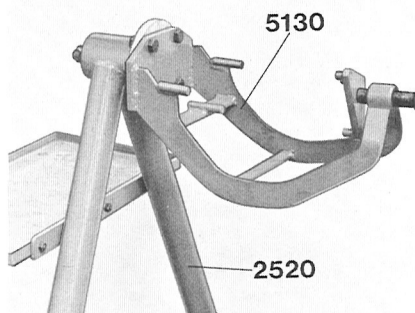
**2261 Puller**  
drive flange



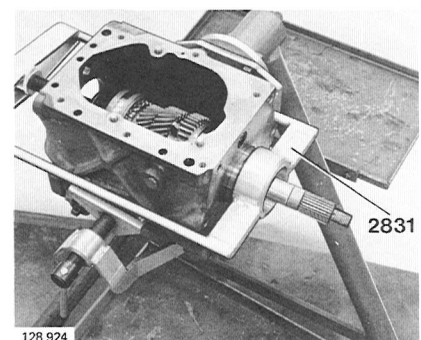
**2412 Drift**  
installing input shaft bearing



**2413 Drift**  
removing/installing rear cover seal

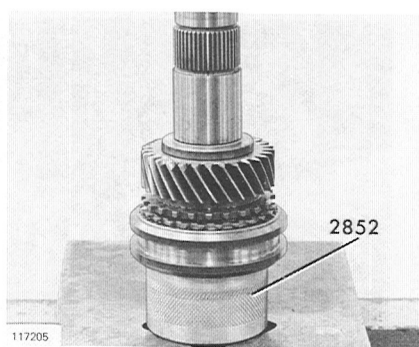


**2520 Stand**  
**5130 Fixture**  
attaching transmission to stand 2520

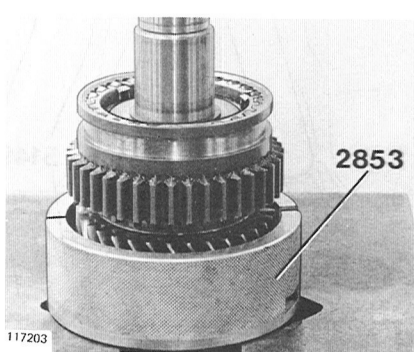


**2831 Press tool**  
installing main shaft bearing

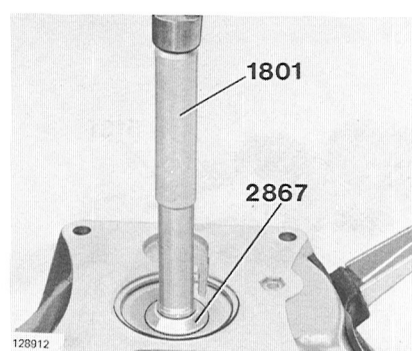




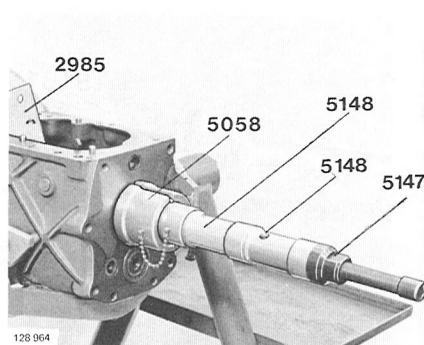
**2852 Adapter**  
installing gear and  
synchro ring



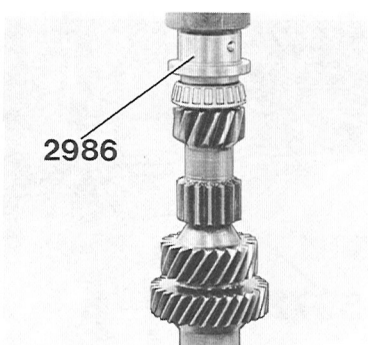
**2853 Adapter**  
removing gear and  
synchro ring



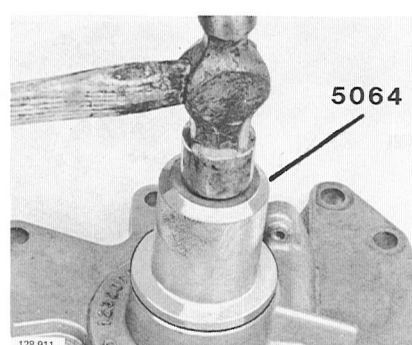
**1801 Standard handle**  
**2867 Drift**  
installing bell housing seal



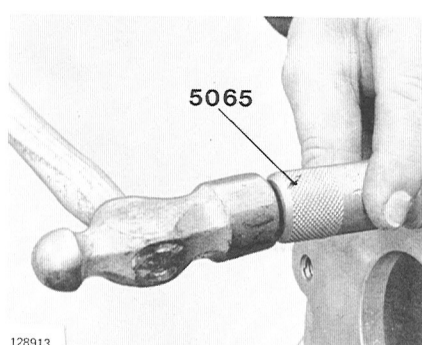
**2985 Adapter**  
removing main shaft  
bearing  
**5058 Tool**  
removing main shaft  
bearing  
**5147 Tool**  
removing main shaft  
bearing  
**5148 Tool**  
removing main shaft  
bearing, M 46



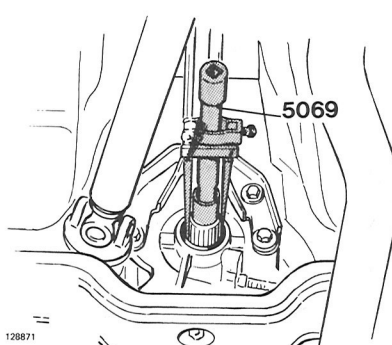
**2986 Drift**  
installing intermediate  
shaft bearings



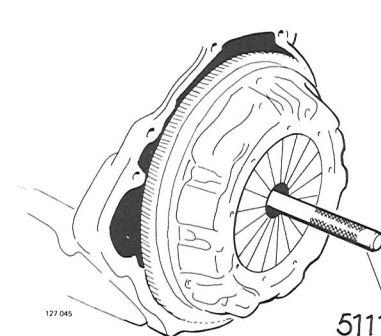
**5064 Drift**  
installing rear cover seal



**5065 Drift**  
installing seal on shift  
selector rail

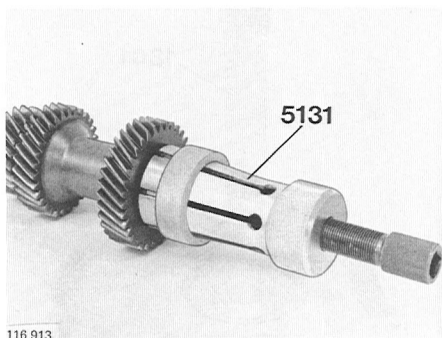


**5069 Puller**  
removing rear seal

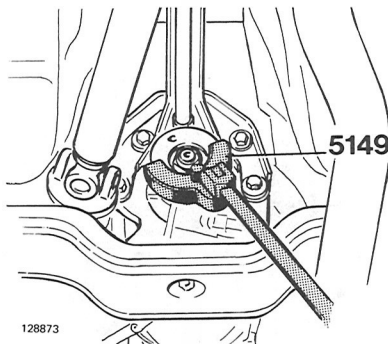


**5111 Centering drift**  
installing clutch

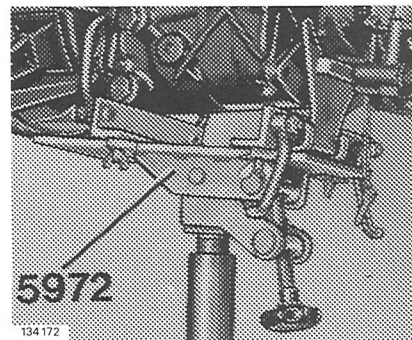




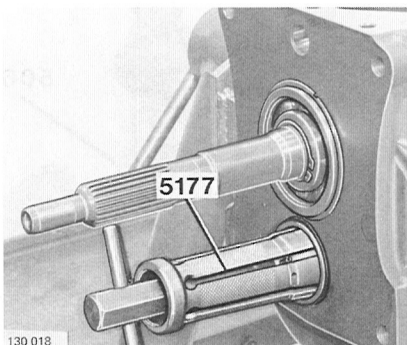
**5131 Puller**  
removing intermediate  
shaft bearing



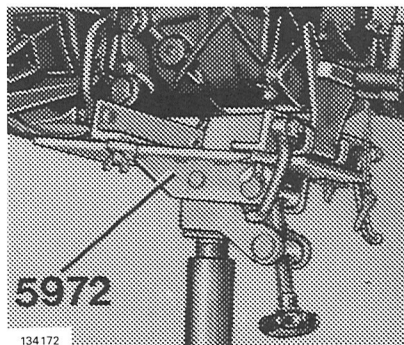
**5149 Wrench**  
removing/installing flange  
nut



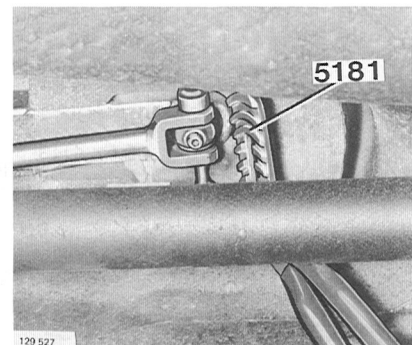
**5972 Fixture**  
removing transmission  
nut



**5177 Puller**  
intermediate shaft bearing,  
aluminum housing



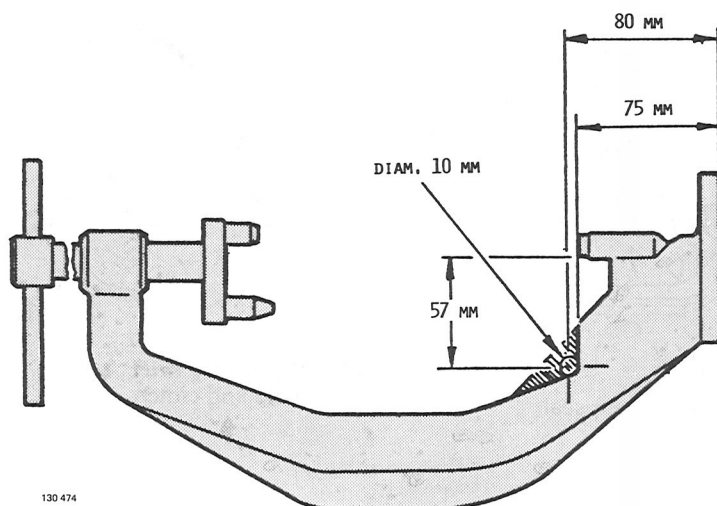
**5180 Drift**  
intermediate shaft bearing,  
aluminum housing



**5181 Pliers**  
removing pin on gearshift  
lever

## Modification of fixture 5130

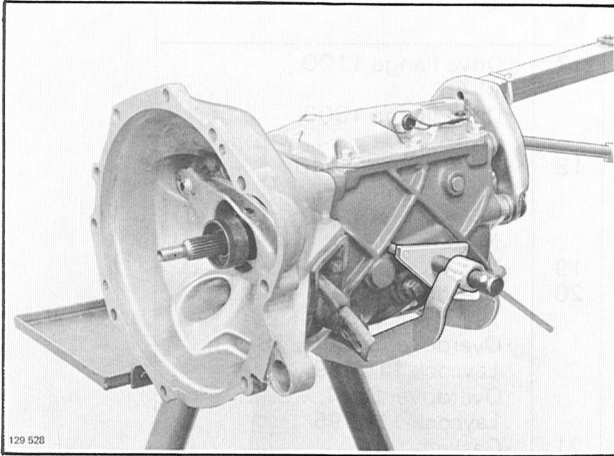
Fixtures delivered prior to introduction of 1979— transmission M 45/M 46 can be modified to fit later model transmissions.



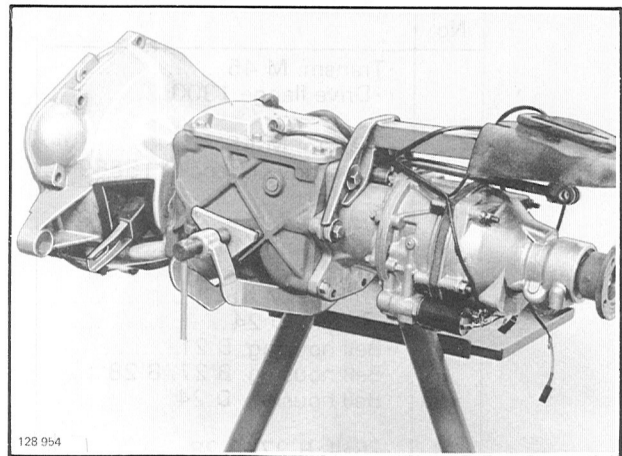
Drill a hole 10 mm = 3/8". Remove  
material stock as shown.



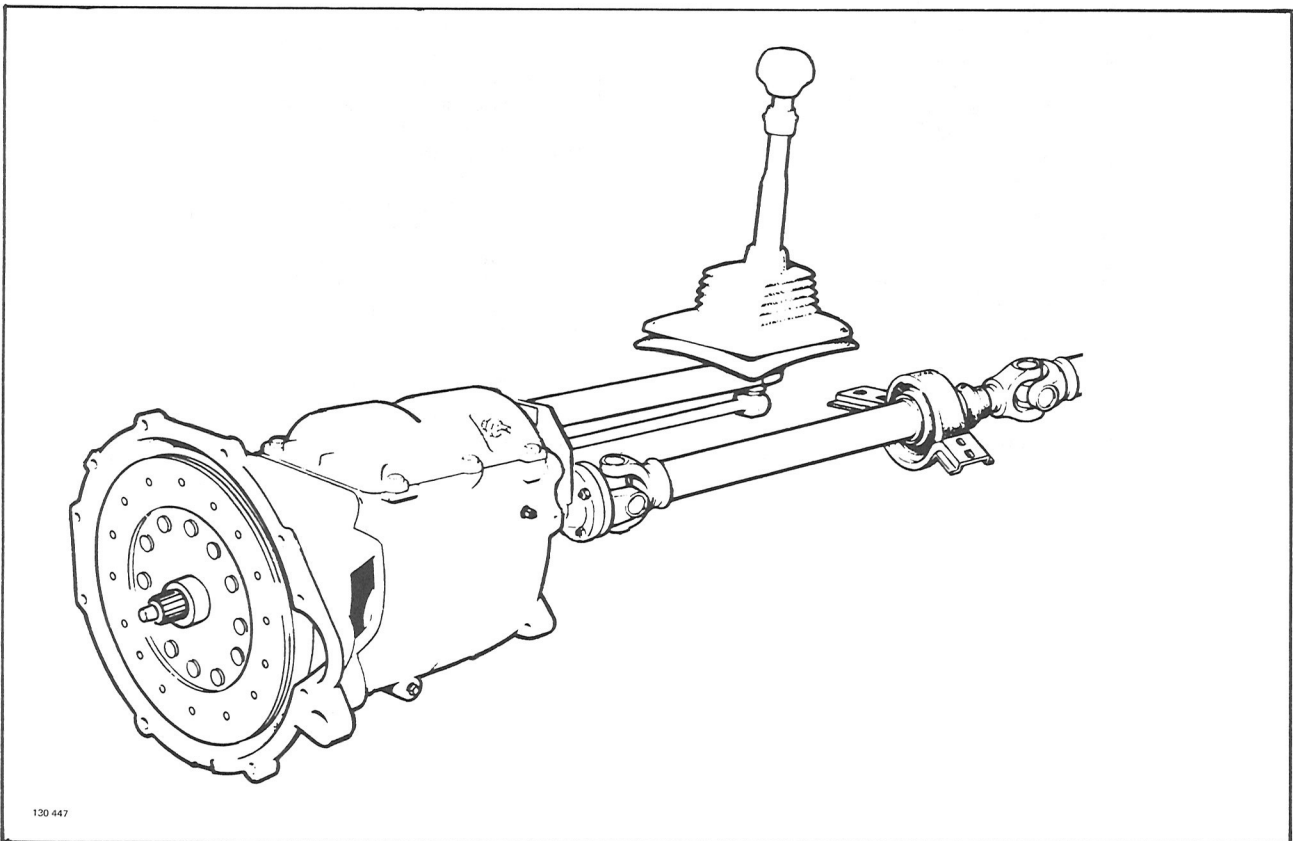
## Spare parts illustrations



**M 45**



**M 46**

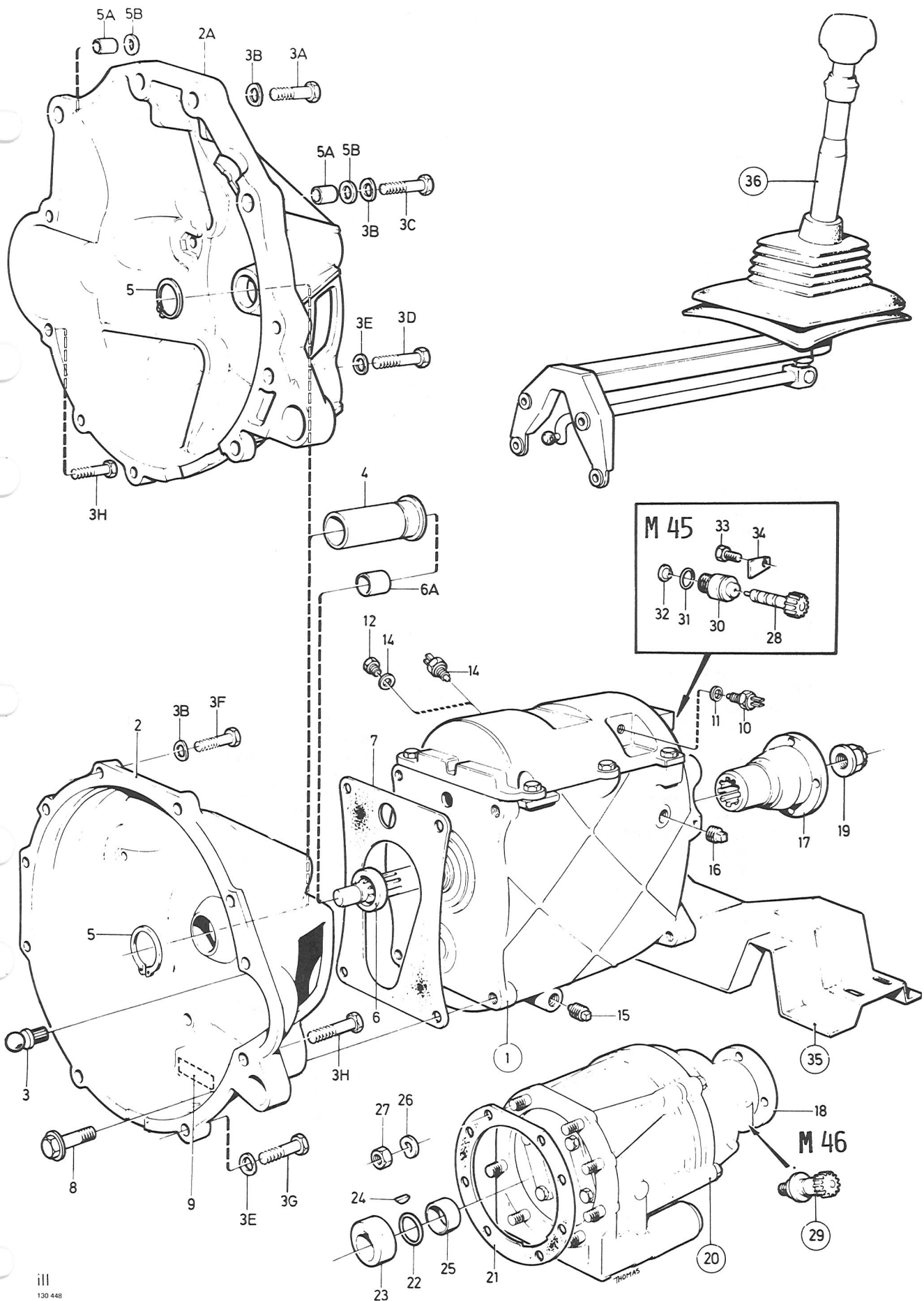


## Transmissions M 45/M 46

III. No.	Description
	• Transm. M 45 .....
	• • Drive flange 1300 .....
	• Transm. M 46 .....
	• • Overdrive laycock 115659 .....
	• Transm. M 45 .....
	• Drive flange 1100 .....
	• Transm. M 46 .....
	• • Engine D 24 .....
2	• Bell housing, B 21 .....
	• Bell housing, B 27/B 28 .....
2a	• Bell housing, D 24 .....
3	• • Ball, B 27/B 28 .....
3a	• Screw .....
3b	• Resilient washer .....
3c	• Screw M 12x100 .....
	• Screw, M 10x70, D 24 .....
3e	• Resilient washer .....
3f	• Screw, M 12x40 .....
3g	• Screw, M 10x40 .....
3h	• Screw .....
4	• Sleeve, B 21, D 24 .....
	• Sleeve, B 27/B 28 .....
5	• Circlip, B 21, D 24 .....
	• Circlip, B 27/B 28 .....
5a	• Guide sleeve, D 24 .....
5b	• Washer, D 24 .....
6	• Seal .....
6a	• Adapter sleeve, D 24 .....
7	• Gasket .....
8	• Flange screw, M 10x40 .....
9	• Plate .....
10	• Switch, back-up light .....
11	• Washer .....
12	• Plug .....
13	• Packing .....
14	• Switch, overdrive .....
15	• Plug .....
16	• Plug .....

III. No.	Description
17	• Drive flange 1100 M 45 .....
	• Drive flange 1300, M 45 .....
18	• Drive flange, 1140 M 46 .....
	• Drive flange 1300 M46 .....
19	• Nut .....
20	• Overdrive, B 21 .....
	Laycock 115660 .....
	• Overdrive, B 27/B 28 .....
	Laycock 115659 .....
	• Overdrive, D 24 .....
	Laycock 115895 .....
21	• Gasket .....
22	• Circlip .....
23	• Cam, oil pump .....
24	• Key .....
25	• Circlip .....
26	• Spring washer .....
27	• Nut .....
28	Speedometer gear, M 45 .....
	18 teeth, rear axle 3.54 .....
	Speedometer drive, M 45 .....
	19 teeth, rear axle 3.73 .....
	Speedometer gear, M 45 .....
	20 teeth, rear axle 3.91 .....
	Speedometer gear, M 46 .....
	20 teeth, rear axle 4.56 .....
29	Speedometer gear, overdrive .....
	19 teeth, rear axle 3.73 .....
	Speedometer gear, overdrive .....
	20 teeth, rear axle 3.91 .....
30	Bearing cage .....
31	O-ring .....
32	Seal .....
33	Screw, drilled for seal .....
34	Lock washer .....
35	Transmission bracket .....
36	Gear shift assembly .....



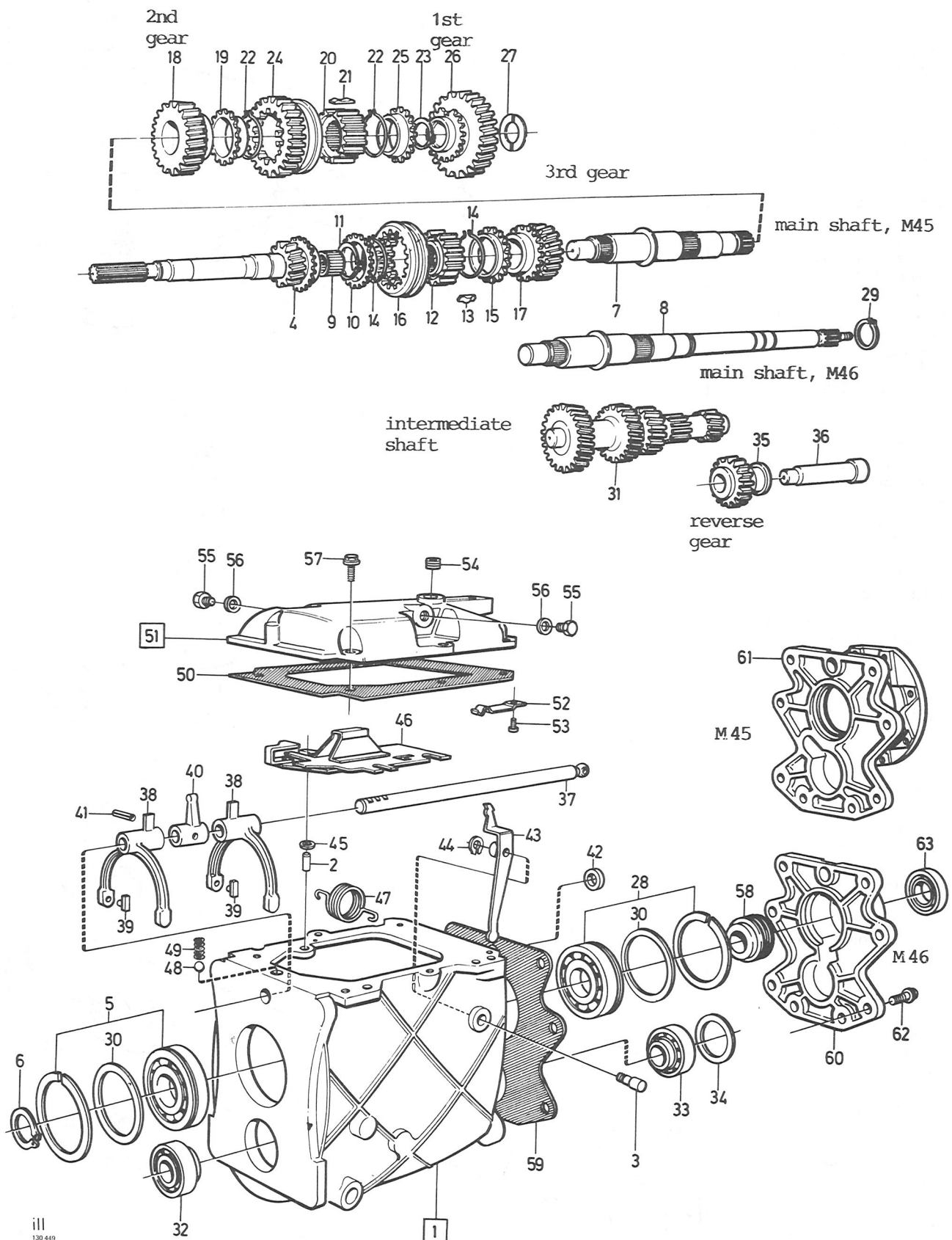


iii  
130 448

## Transmission parts

III. No.	Description
1	• Housing .....
2	• Pin .....
3	• Bearing pin .....
4	• Input shaft .....
5	• Ball bearing .....
6	• Lock ring .....
7	• Main shaft, M 45 .....
8	• Main shaft, M 46 .....
9	• Needle bearing .....
10	• Synchro ring .....
11	• Lock ring .....
12	• Synchro hub .....
13	• Dog .....
14	• Lock ring .....
15	• Synchro ring .....
16	• Sleeve .....
17	• Gear, 3:rd .....
18	• Gear, 2:nd .....
19	• Synchro ring .....
20	• Synchro hub .....
21	• Dog .....
22	• Lock ring .....
23	• Lock ring .....
24	• Sleeve .....
25	• Synchro ring .....
26	• Gear, 1:st, except D 24 ..
	• Gear, 1:st, D 24 .....
27	• Thrust washer .....
28	• Ball bearing .....
29	• Lock ring, M 46 .....
30	• Shim, 0.60 mm .....
	• Shim, 0.75 mm .....
	• Shim, 0.90 mm .....
	• Shim, 1.00 mm .....
31	• Intermediate shaft, except D 24 .....
	• Intermediate shaft, D 24 ..
32	• Roller bearing, except D 24 .....
	• Roller bearing, D 24 .....
33	• Roller bearing .....

III. No.	Description
34	• Shim, 0.05 mm .....
	• Shim, 0.10 mm .....
	• Shim, 0.15 mm .....
	• Shim, 0.35 mm .....
	• Shim, 0.50 mm .....
	• Shim, 0.70 mm .....
	• Shim, 1.00 mm .....
35	• Reverse gear .....
36	• Shaft .....
37	• Selector rail .....
38	• Shift forks .....
39	• Dog .....
40	• Shifter .....
41	• Tubular pin .....
42	• Seal .....
43	• Lever .....
44	• Lock ring .....
45	• Washer .....
46	• Selector plate assy. ....
47	• Spring .....
48	• Detent ball .....
49	• Detent ball spring .....
50	• Gasket .....
51	• Top cover .....
52	• Spring .....
53	• Screw .....
54	• Plug, 1/2"—14 NPTF...
55	• Plug, M 14x12 .....
56	• Packing .....
57	• Screw .....
58	• Speedometer drive gear M 45, B 21 .....
	• Speedometer drive gear, M 46 .....
	Overdrive 115659: to No. 3406 .....
	Overdrive 115660: to No. 24190 .....
	Overdrive 115895: to No. 12 .....
	• Speedometer drive gear, M 46 .....
	Overdrive 115659: from No. 3407 .....
	Overdrive 115660: from No. 24191 .....
	Overdrive 115895: from No. 13 .....
59	• Gasket .....
60	• Cover, rear, M 45 .....
61	• Intermediate housing, M 45 .....
62	• Flange screw .....
63	• Seal .....



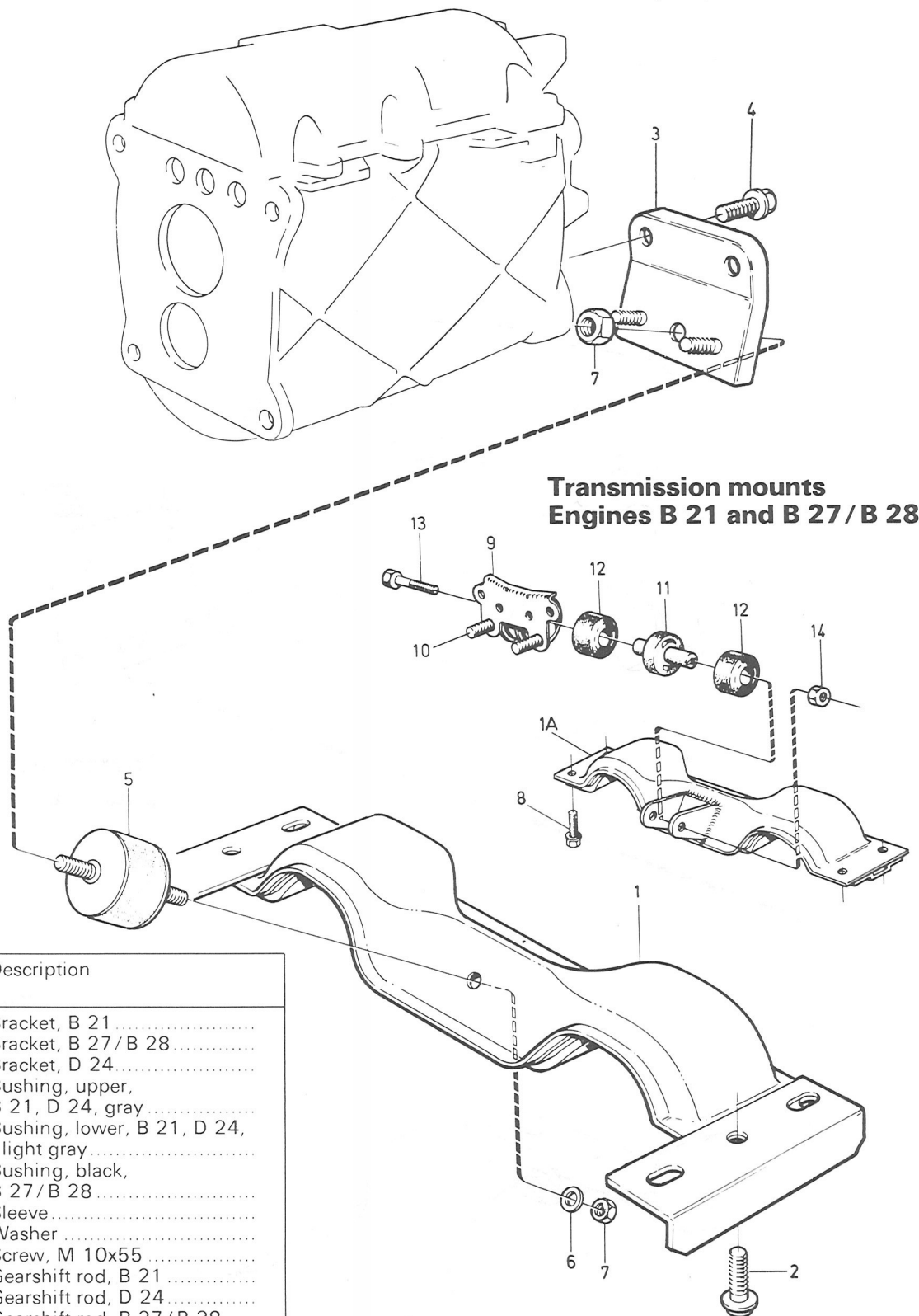


### Transmission controls

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

M 45

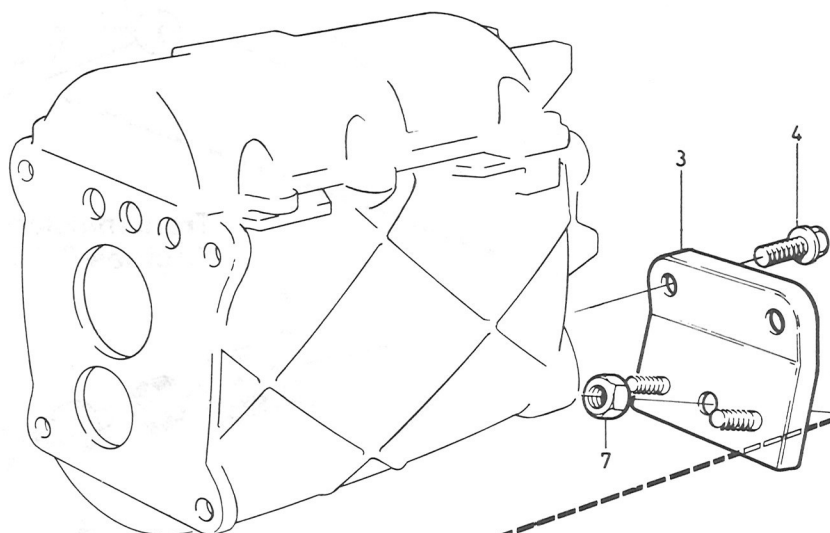
M 46



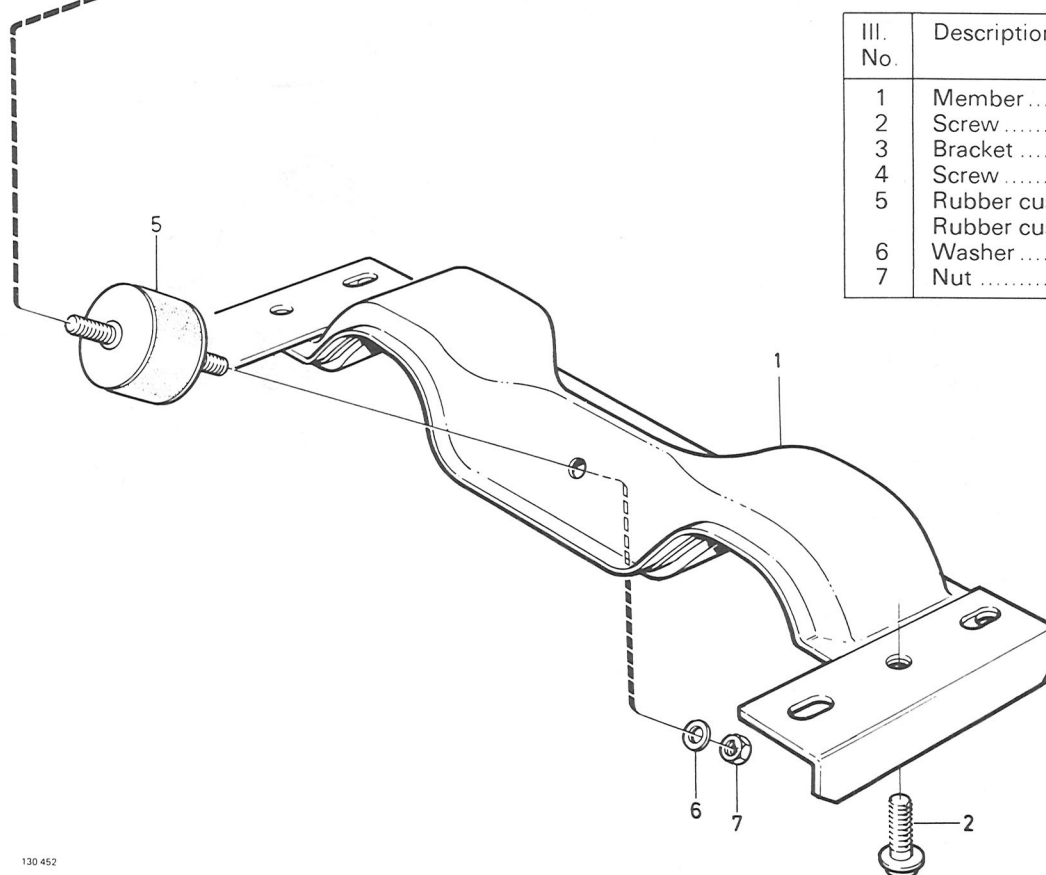
**Transmission mounts  
Engines B 21 and B 27 / B 28**

III. No.	Description
1	Bracket, B 21 Bracket, B 27 / B 28 Bracket, D 24
2	Bushing, upper, B 21, D 24, gray Bushing, lower, B 21, D 24, light gray Bushing, black, B 27 / B 28
3	Sleeve
4	Washer
5	Screw, M 10x55
6	Gearshift rod, B 21 Gearshift rod, D 24 Gearshift rod, B 27 / B 28
7	• Bushing
8	• O-ring
9	Pin
10	Gearshift rod joint
11	O-ring
12	Pin
13	Gearshift lever
14	• Reverse detent knob
15	• Pull rod
16	• Screw, pull rod
17	• Bushing, upper
18	• Bushing, lower
19	• Tubular pin

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**Transmission mount  
Engine D 24**

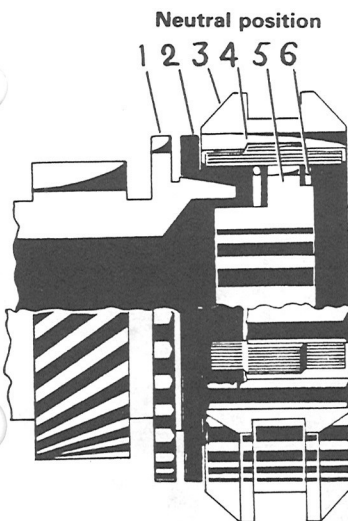


III. No.	Description
1	Member .....
2	Screw .....
3	Bracket .....
4	Screw .....
5	Rubber cushion .....
6	Washer .....
7	Nut .....

130 452

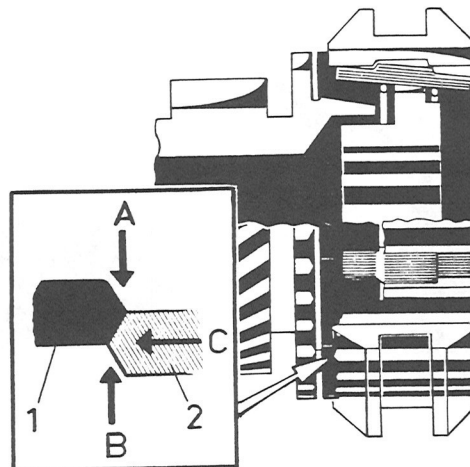


## Synchronization



- 1 Gear teeth
- 2 Synchro ring
- 3 Synchro sleeve
- 4 Dogs (in slots)
- 5 Synchro hub
- 6 Spring

Synchronizing

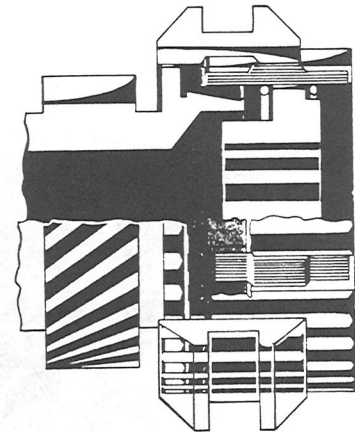


- 1 Synchro ring
- 2 Synchro sleeve

A and B are forces caused by the different speeds of the gear and the synchro ring.

C is the force from the synchro sleeve shift fork.

Gear engaged



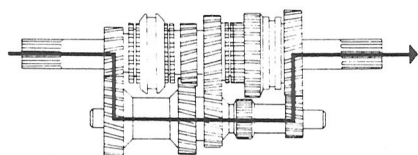
132 286

When engaging a gear, a shift fork moves the synchro sleeve (3) towards the gear teeth (1). The synchro dogs (4) move with the synchro sleeve and will thus press the synchro ring against the cone on the gear. If the synchro sleeve and the gear have different speeds, the synchro ring will turn in relation to the synchro sleeve. The synchro dogs, however, prevent the synchro ring from turning more than half a tooth width.

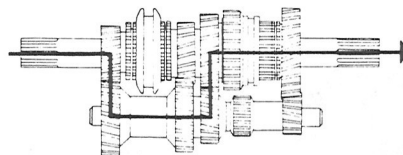
The synchro ring will then be half a tooth out of alignment with the synchro sleeve. This will prevent the synchro sleeve from sliding over the synchro ring and engaging with the gear teeth.

Because the synchro dogs press the synchro ring on the gear cone, friction results between the two surfaces. This friction will slow the speed of the gear to be the same as the synchro sleeve. With both turning at the same speed, the synchro sleeve can then turn the synchro ring half a tooth backwards. The synchro sleeve can then slide over the synchro ring and engage the gear teeth.

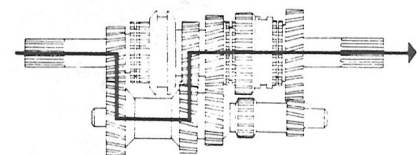
## Power flow through the transmission



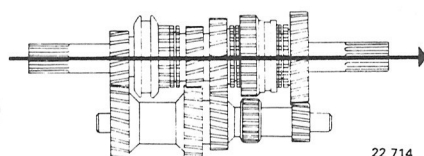
First gear



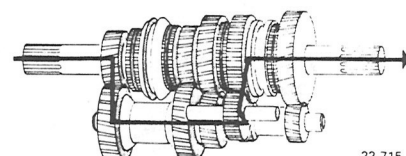
Second gear



Third gear

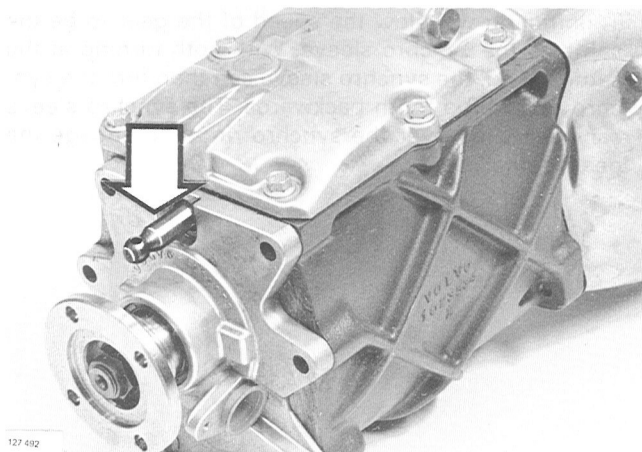
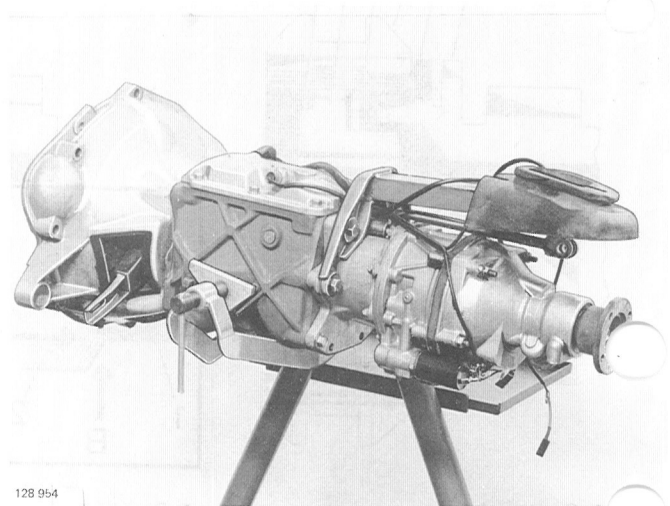
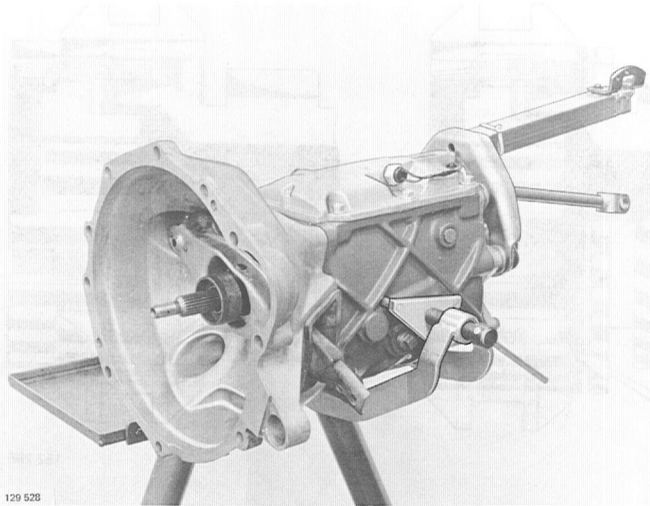


Fourth gear

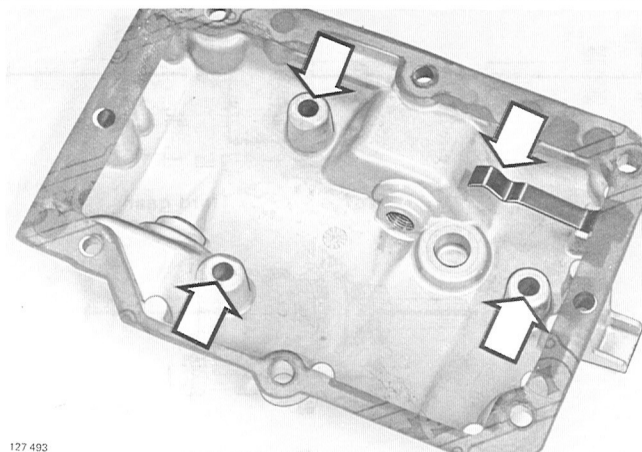


Reverse gear

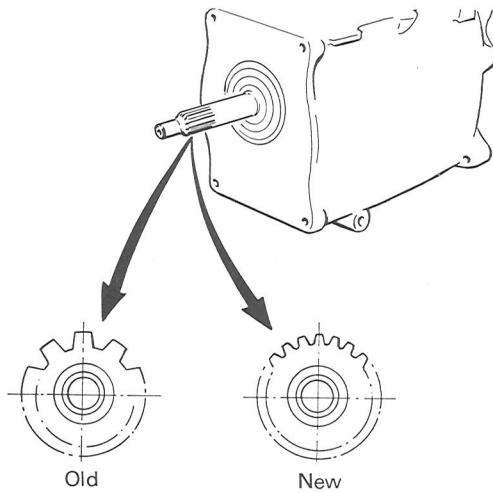
## New features of M 45/M 46 transmission 1979—



Transmission housing contains one shift selector rail (previously 3).



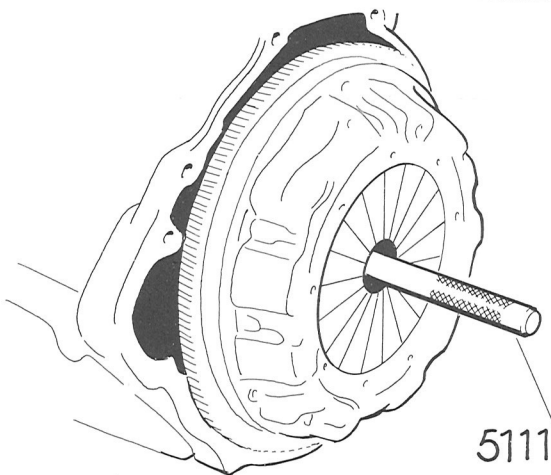
Spring on transmission cover keeps reverse shift selector in position. Three stop lugs for selector plates are also included on cover. Recess for one shift selector rail has been removed, making cover flatter.



127 048

### Input shaft

The input shaft has 22 splines (previously 10).  
Clutch disc is changed to accommodate the new shaft.

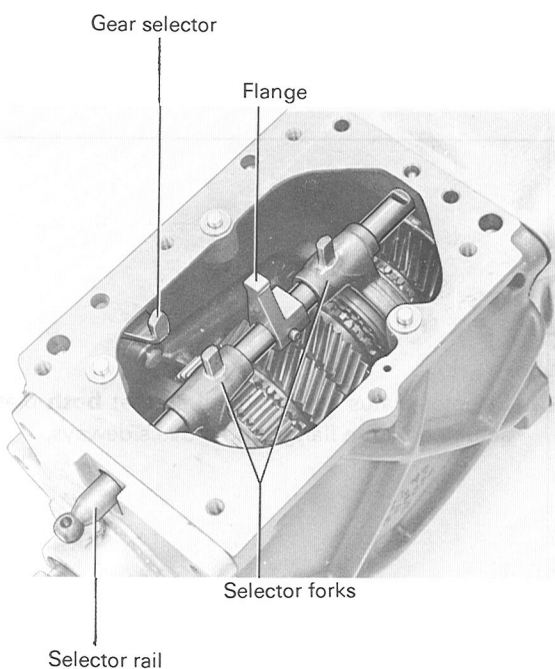


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### 4-cyl and 6-cyl models with manual transmission

#### Centering drift for new clutch plate

Centering drift 999 5111 is required for centering the clutch plate on the new M 45/M 46 transmission.



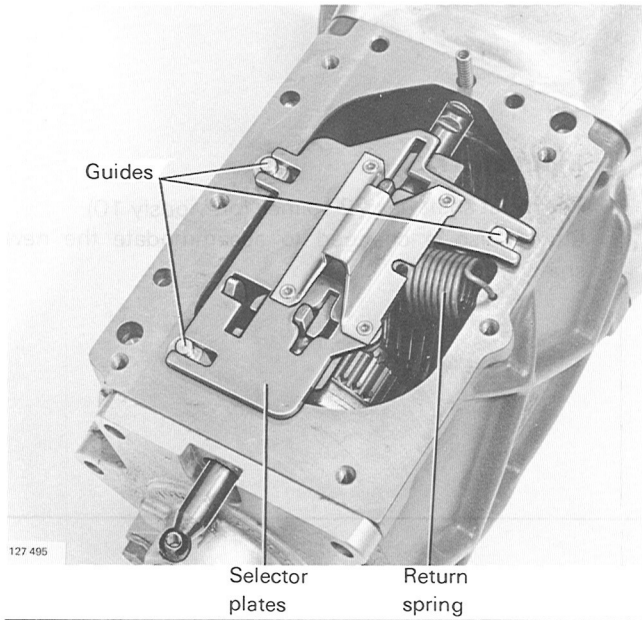
127 494

### Gear-change controls

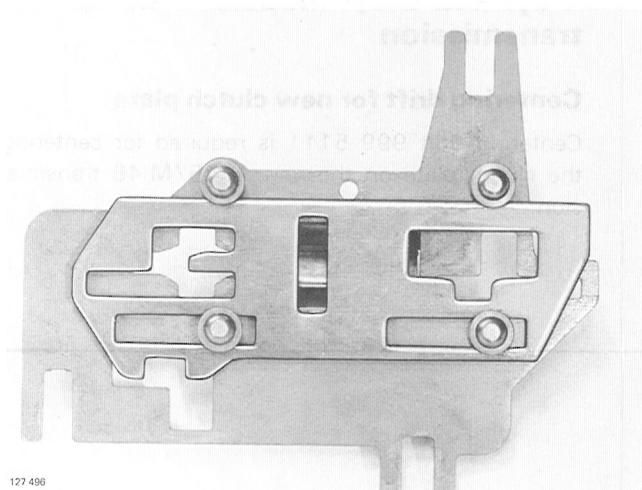
The gear-change controls consist of gear selector rail, gear selector, two (shift) forks, flange and selector plates.

Gear selector rail is located in transmission housing. Shift forks move on gear selector rail. The flange also sits on the gear selector rail but is held in position by a pin.

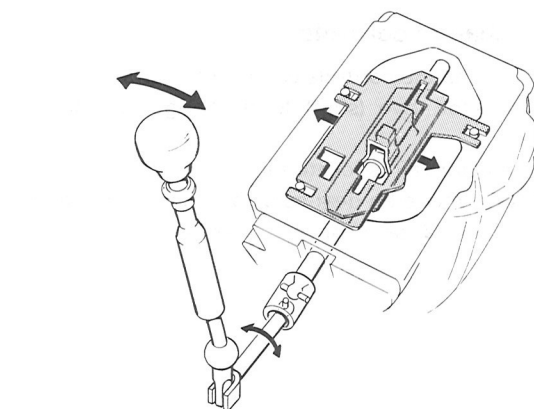




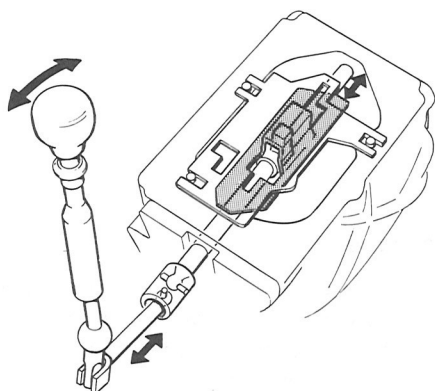
The transmission has two selector plates which are controlled by three guides in the transmission housing. They are held in position by the return spring and transmission cover.



The selector plates contain slots in which the flange, shift forks and reverse gear selector run.

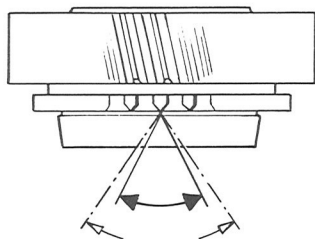


Selector plates are designed so that **both** plates are actuated by the flange and move sideways.



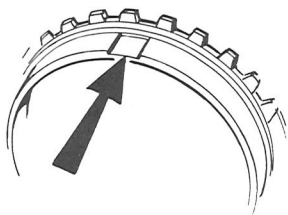
127 498

When the gear lever is moved forward or rearward the flange actuates only the **lower** (small) plate which moves rearward and forward. Gear-changing movement is transmitted (as described above) to the shift fork or gear selector (reverse) which engage the desired gear.



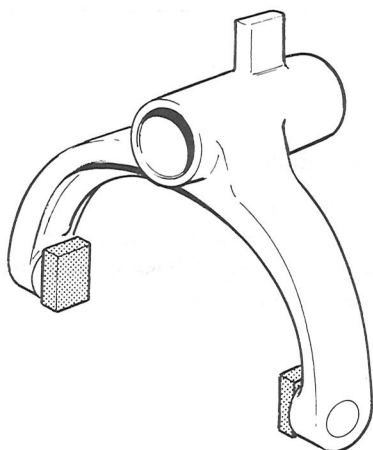
### Synchronizing parts

Sharp points are machined into the teeth on third and fourth gears.



127 499

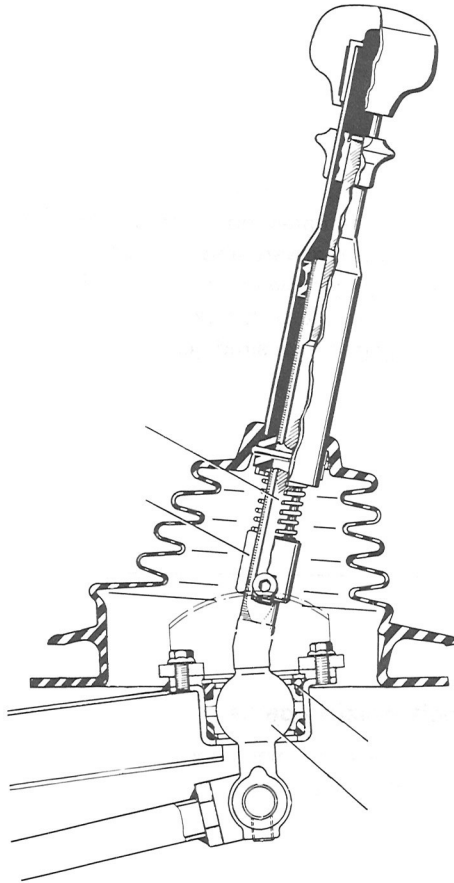
The recesses in the synchronizing rings are narrow to facilitate changing gears.



127 500

### Shift forks

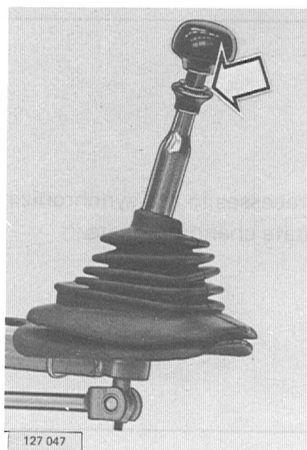
The shift forks are made of steel and have loose brass lugs.



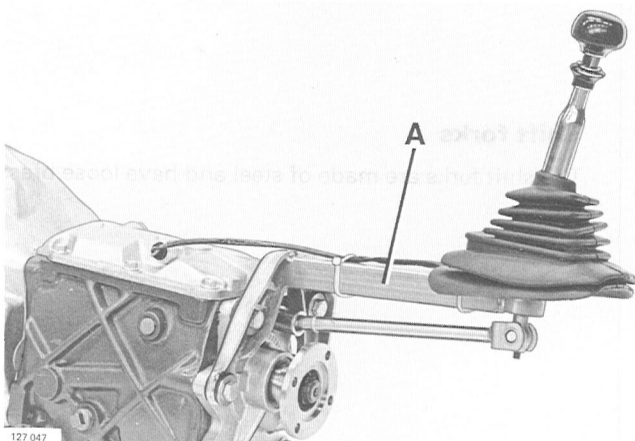
### Gear lever

The bottom section of the gear lever (ball end) is a one piece design. (Previously the parts were welded together.) This change allows the pull rod to operate on the outside (previously inside).

- longer interlock sleeve prevents jamming
- wider diameter ball
- ball locating spring is replaced by two rubber dampers.



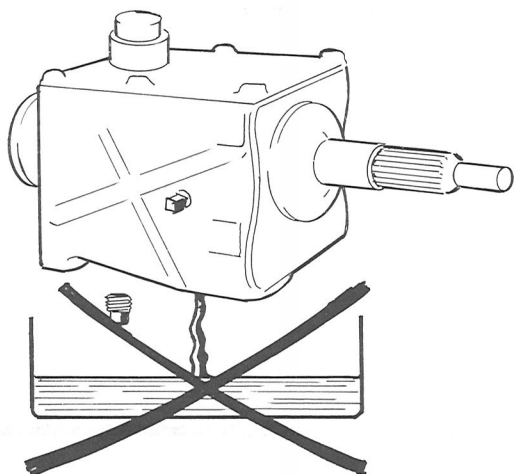
- Reverse slot is on left side of lever instead of the rear.



### Gear lever carrier

The carrier consists of a rectangular tube and bracket welded together. Four bolts secure the carrier to the transmission housing. (These same bolts secure the transmission rear cover.)

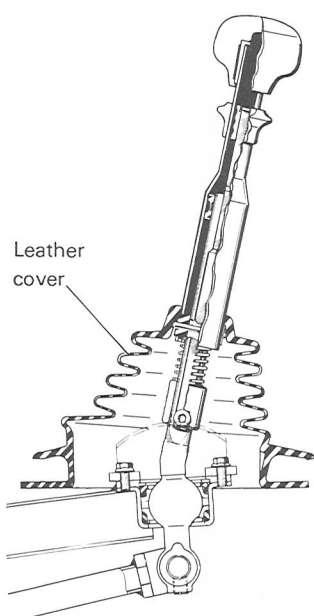




127 049

### Oil change

Another interesting new feature is the exclusion of oil change every 30,000 mi. The oil is changed only in connection with the warranty service. The oil level is subsequently checked at the ordinary servicing.

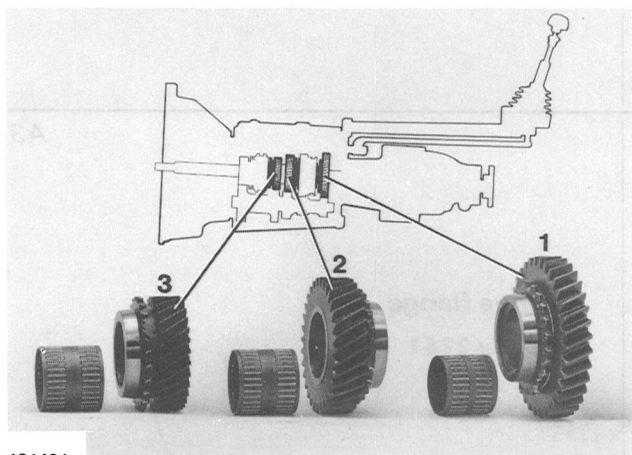


127 503

### 6-cyl gas models

#### Gear lever cover

New gear lever cover in black leather on all 6-cylinder models with manual transmission.



131434

### Manual transmission.

Manual transmissions have been equipped with needle bearings for first, second and third gear. This does not affect the repair methods for manual transmission.

## M 45: replacing rear seal in vehicle

### Special tools:

**2261 Puller**, drive flange

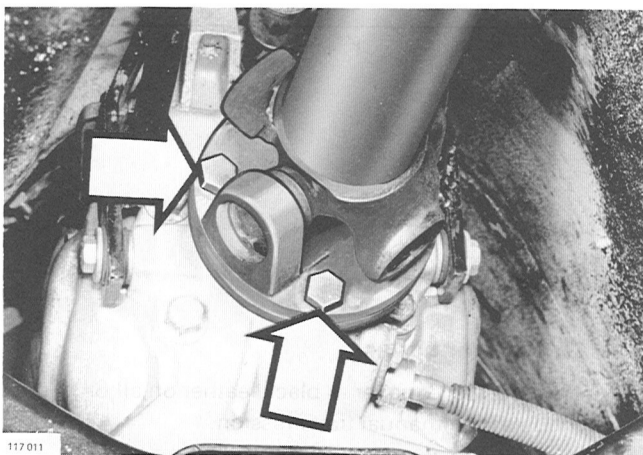
**5064 Drift**, installing rear cover seal

**5069 Puller**, removing rear seal

**5149 Wrench**, removing/installing flange nut

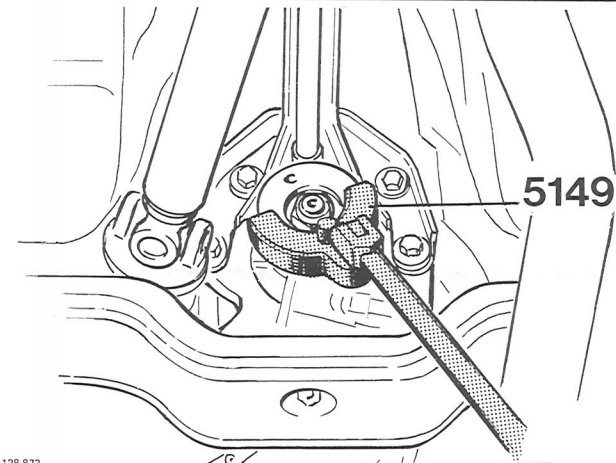
### Removing seal

A1



**Disconnect propeller shaft from transmission.**

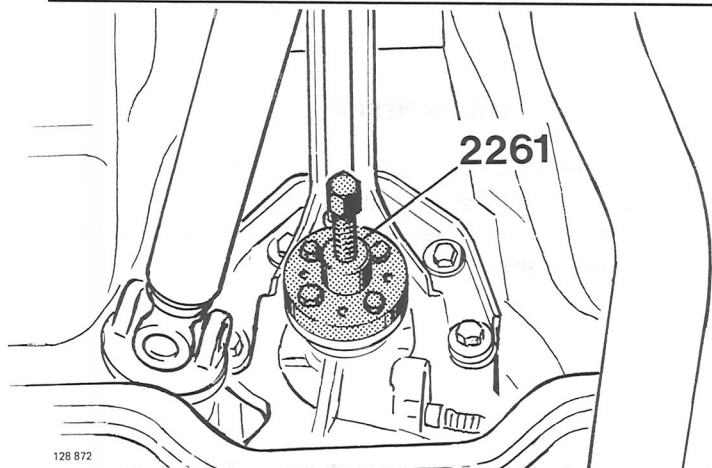
A2



**Remove flange nut.**

Use wrench **5149** and socket **27 mm = 1-1/16"**.

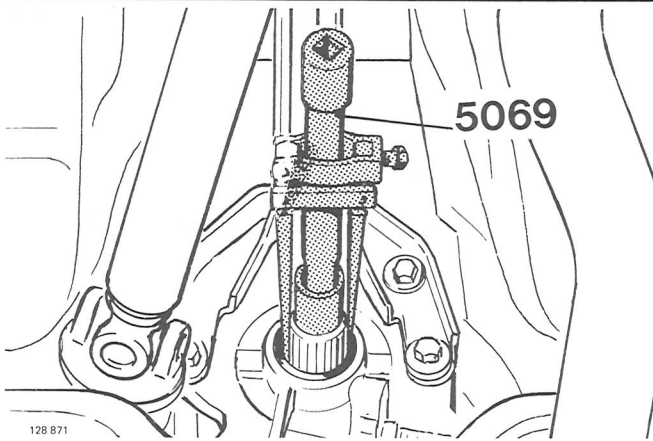
A3



**Remove flange.**

Use puller **2261**.

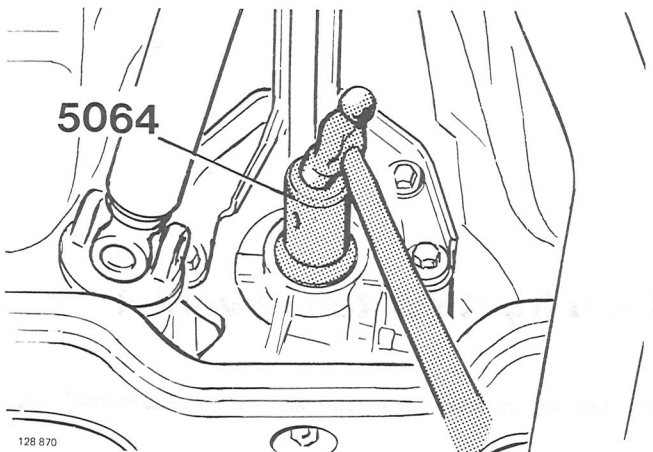
A4



**Remove seal.**  
Use puller **5069**.

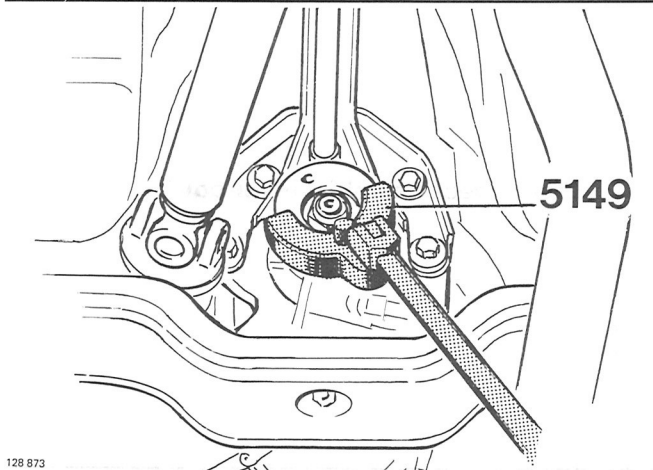
### Installing seal

A5



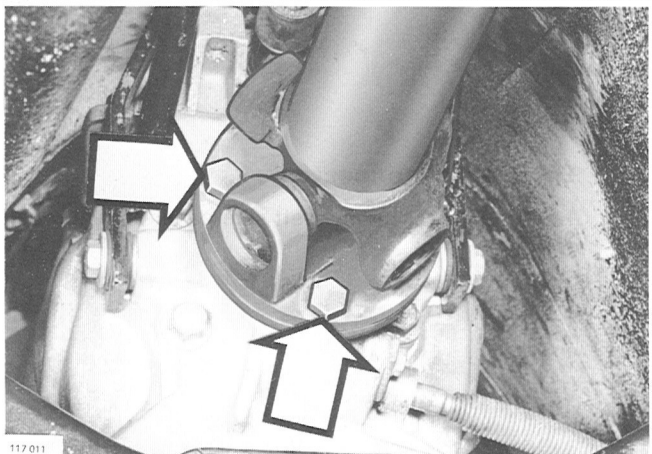
**Install new seal.**  
Use drift **5064**.

A6

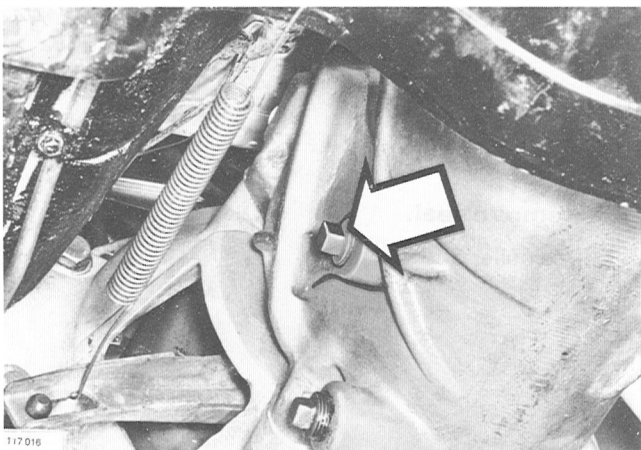


**Install flange.**  
Use wrench **5149** and socket **27 mm = 1-1/16"**.  
Torque to **90-110 Nm = 65-80 ft.lbs.**

A7



**Attach propeller shaft to flange.**

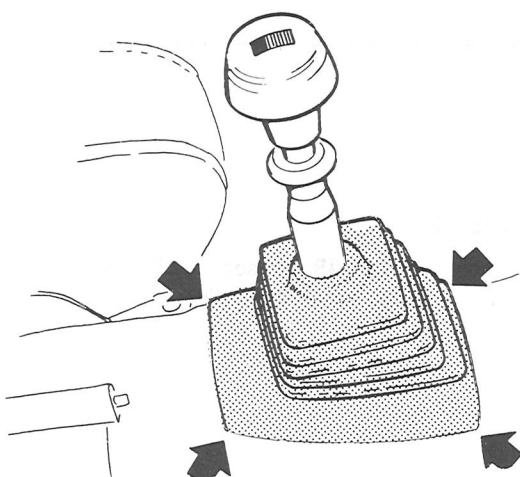


A8

**Check oil level.**

Use Automatic Transmission Fluid type F or G.

## M 45/M 46: replacing back-up light switch in vehicle



B1

**Disconnect gearshift lever cover.**

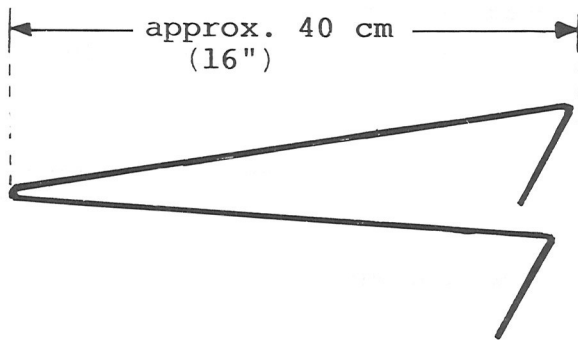


B2

**Disconnect connector.**

To gain access, remove left side panel of center console.

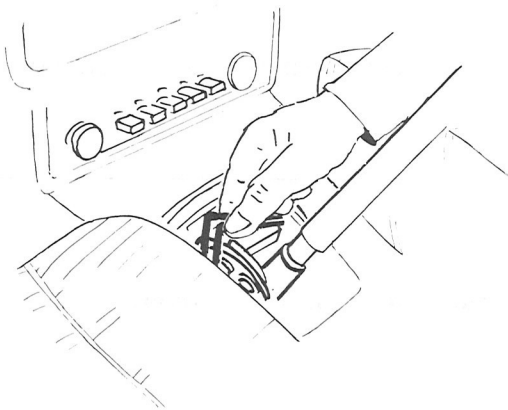
B3



**Bend a steel wire to shape as shown.**  
(early)

130 454

B4

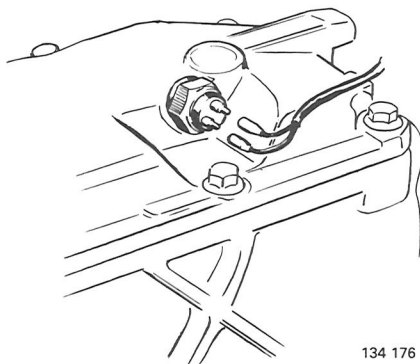


**Position steel wire.**

Insert the bent steel wire between floor insulation and transmission tunnel on right side.

130 056

B5



134 176

**Gain access to back-up light switch.**

Raise vehicle on hoist.  
(early).

B6

**Replace back-up light switch.**

(as applicable)  
Use wrench 22 mm = 7/8" to replace back-up light switch.

B7

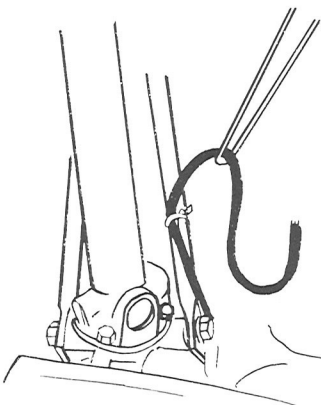
**Re-clamp wire to gearshift carrier rod.**

B8

**Place harness on steel wire as shown.**

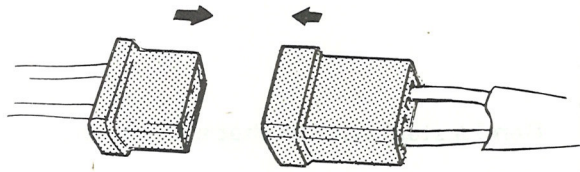
B9

**Install cross member bolts. Lower vehicle.**



130 058





130 455

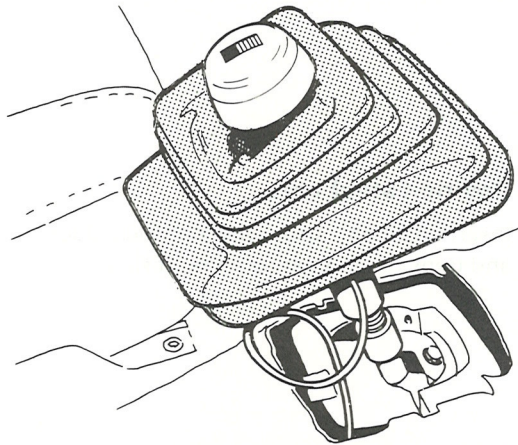
B10

**Inside vehicle:**

Pull wiring harness. Attach connector for back-up light.

B11

**Check operation.**



130 456

B12

**Install left side panel center console.**

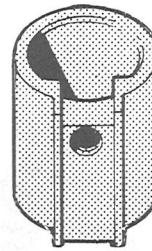
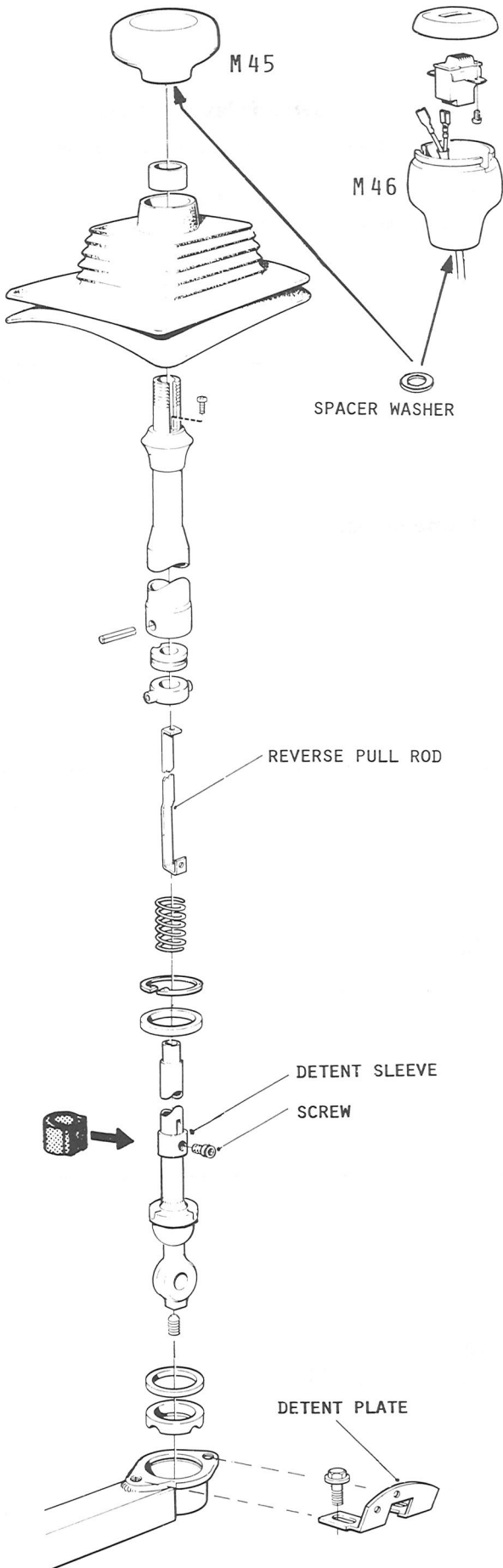
B13

**Install gearshift lever cover.**

## M 45 / M 46: repairs to gearshift lever in vehicle

These repairs refer particularly to replacing reverse detent sleeve and/or reverse pull rod.

From mid-79 there is a new type reverse detent sleeve on the gearshift lever. It has a guide which prevents it from rotating on the gearshift lever and exerting forces on the reverse pull rod. It also has a slot which guides reverse pull rod, preventing it from rubbing the detent plate.



1232687 - 2

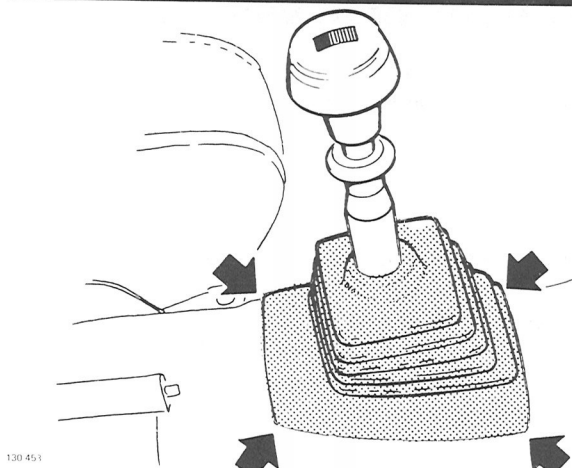
new

130 452

In case the reverse pull rod breaks, the old type reverse detent sleeve should also be replaced. It is 2 mm = 0.08" longer than the old one. Therefore, the gearshift lever knob should be raised accordingly to permit free travel of the reverse detent sleeve. This is done by installing a 2 mm = 0.08" thick spacer washer with diameter 13 mm = approx. 1/2" inside the gearshift lever knob. The retaining screw for the reverse detent sleeve should also be replaced. The new type screw is case hardened. After modification, check gearshift operation.

130 473

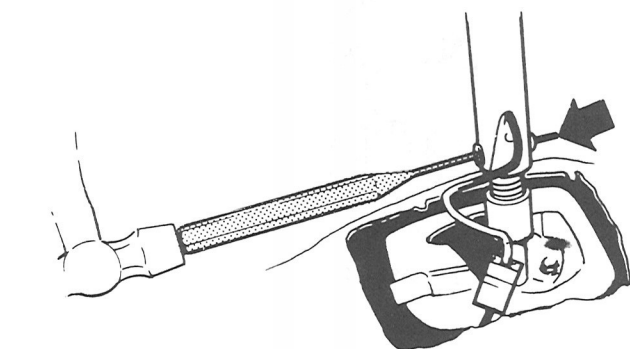
C1



**Disconnect gearshift lever cover.**

Remove four clips retaining cover. Lift up cover along gearshift lever.  
Be careful, not to damage electrical wires. There is no need to disconnect wires.

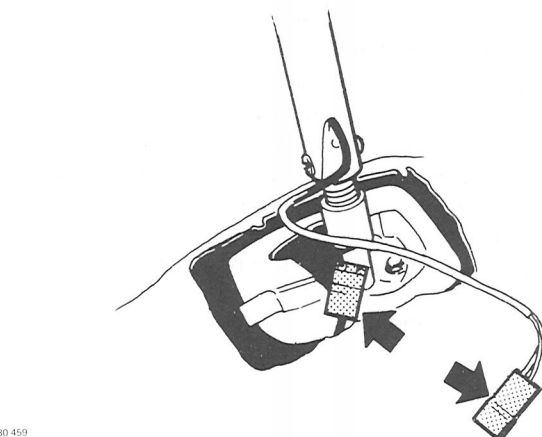
C2



**Remove lock pin.**

Use punch.

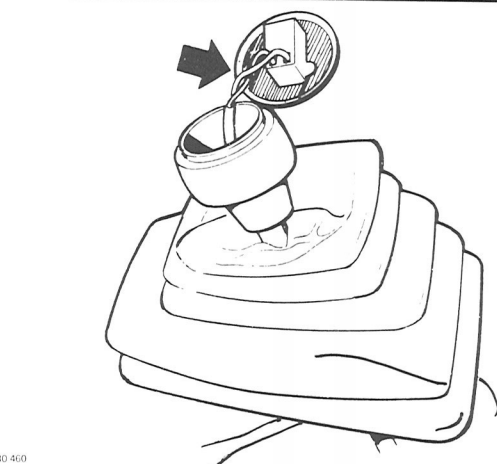
C3



**M 46:**

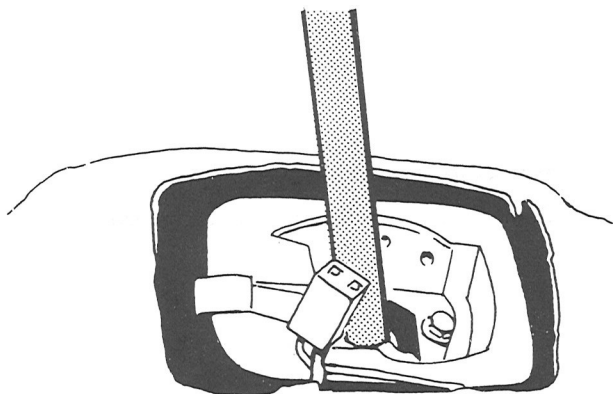
Un-plug connector for overdrive wire.

C4



**M 46:**  
**Remove top of knob.**

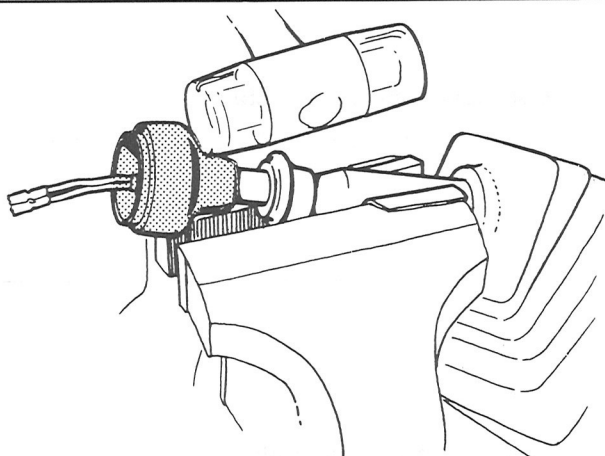
C5



**Lift up gearshift lever.**

130 461

C6

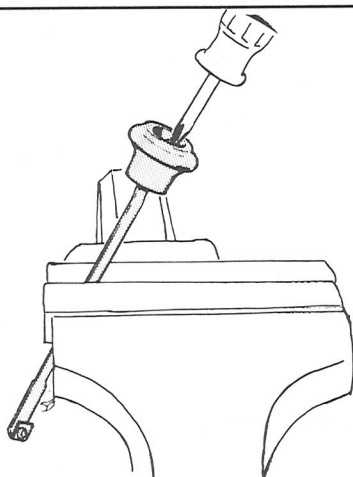


**Remove gearshift lever knob.**

Position gearshift lever in a vise with soft jaws.  
Use plastic mallet to carefully knock off knob.

130 462

C7

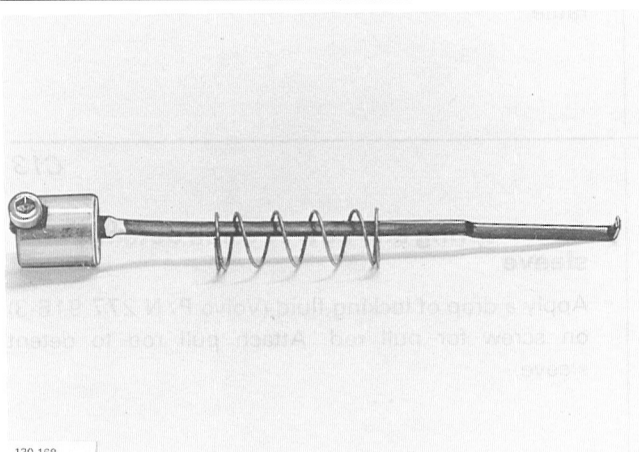


**Remove detent knob.**

Remove screw. Lift off detent knob.

130 463

C8

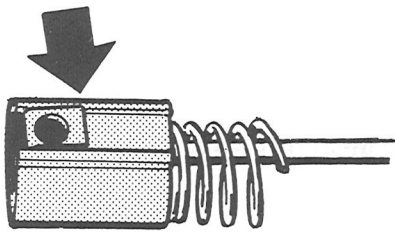


**Remove pull rod.**

Remove pull rod, spring and detent sleeve assembly.

130 168

C9

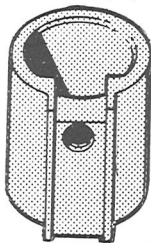


**Remove detent sleeve.**

Remove screw on reverse gear detent sleeve.

130 464

C10

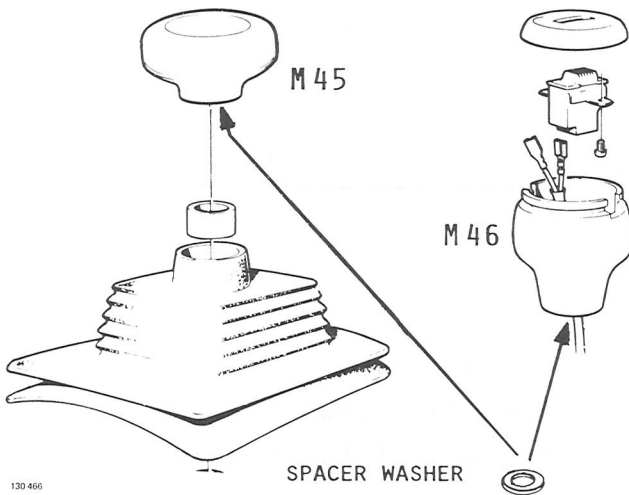


**Use new type detent sleeve.**

Reverse detent sleeve, P/N 1232 687-1, should be used.

130 465

C11



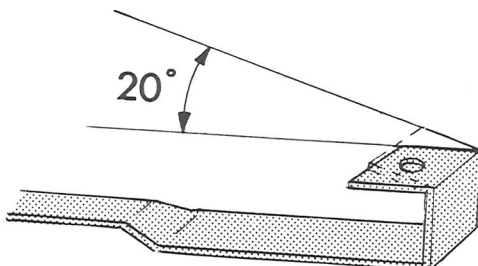
**Spacer washer in knob.**

When substituting new type detent sleeve for older type, gearshift knob must be raised to permit free travel for detent sleeve.

Install 2 mm = 0.08" thick and 13 mm = approx. 1/2" diameter spacer washer in knob.

130 466

C12

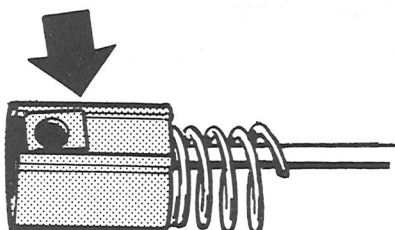


**Bend pull rod end.**

Bend out pull rod end approx. 20°. This will prevent rattle.

130 467

C13



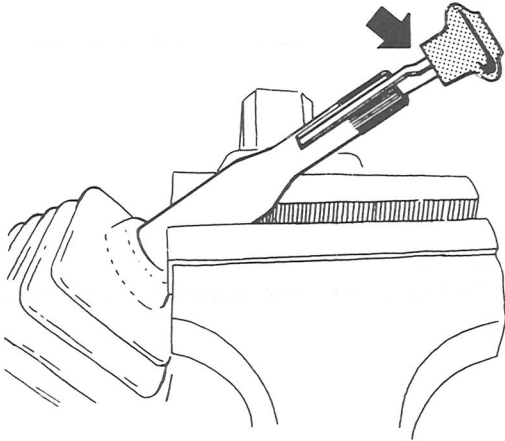
**Install spring and new reverse detent sleeve**

Apply a drop of locking fluid (Volvo P/N 277 916-3) on screw for pull rod. Attach pull rod to detent sleeve.

130 464



C14

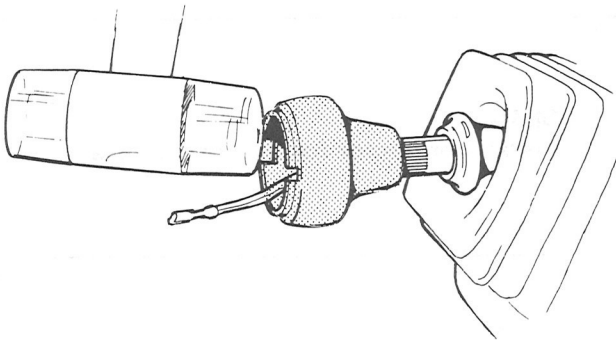


130 468

#### Install detent knob.

Grease new pull rod. Use screw to install detent knob on new pull rod. Install detent knob and pull rod assembly on gearshift lever.

C15

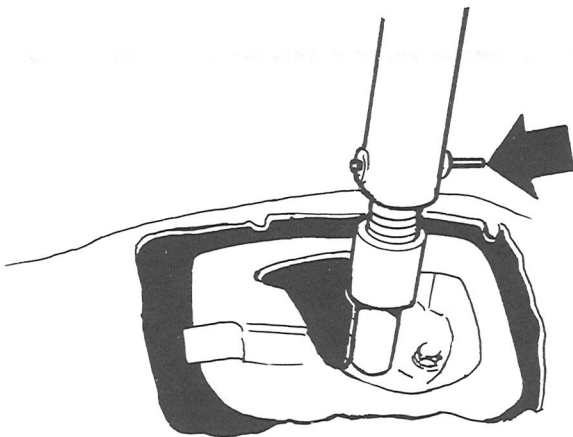


130 469

#### Install gearshift lever knob.

Position gearshift lever in vise with soft jaws. Use plastic mallet to carefully knock knob into position.

C16

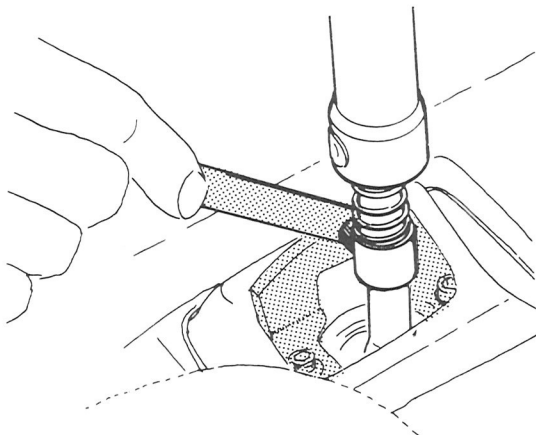


130 470

#### Assemble gearshift lever.

Install upper part of gearshift lever on lower part in vehicle. Install lock pin.

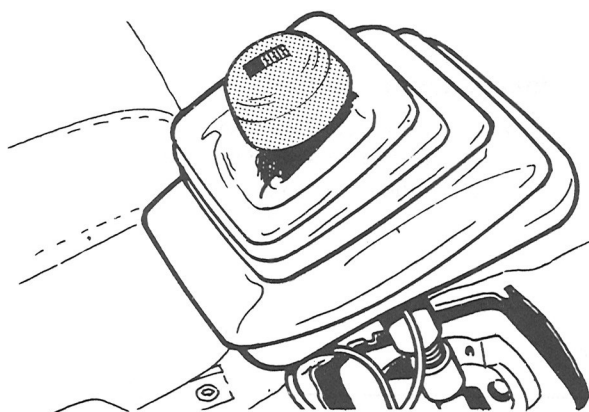
C17



130 471

#### Check reverse detent for correct operation.

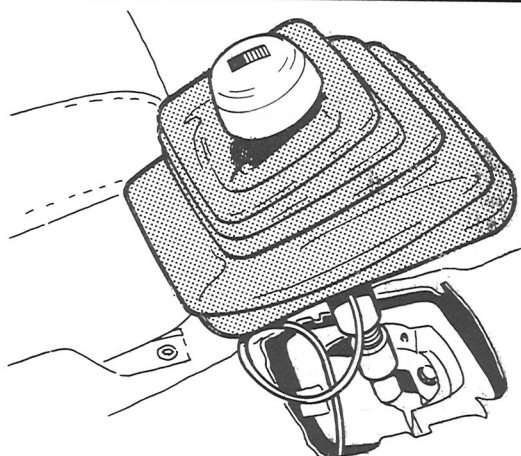
Engage first gear. Distance between detent plate and detent screw should be 0.5–1.5 mm = 0.02–0.06". Adjust by moving detent plate. Also engage second gear and recheck distance.



130 472

C18

**M 46:**  
**Connect wire and install top of knob.**



130 456

C19

**M 46:**  
**Install connector for overdrive wire.**

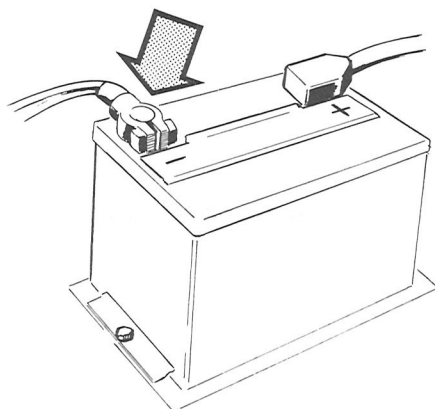
C20

**Install gearshift lever cover.**

## Removing transmission M 45

### Special tools:

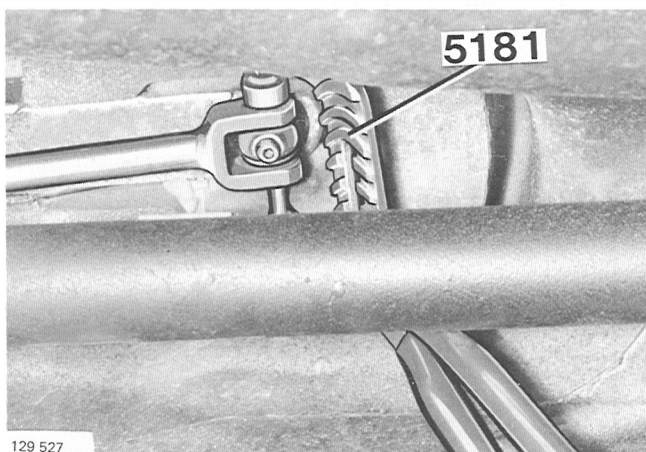
- 5151 Fixture
- 5181 Pliers



130015

D1

**Disconnect battery ground cable.**



129 527

**From under vehicle:**

D2

**Disconnect gearshift lever from gearshift rod.**

Remove lock bolt. Use pliers **5181** to remove pivot pin.

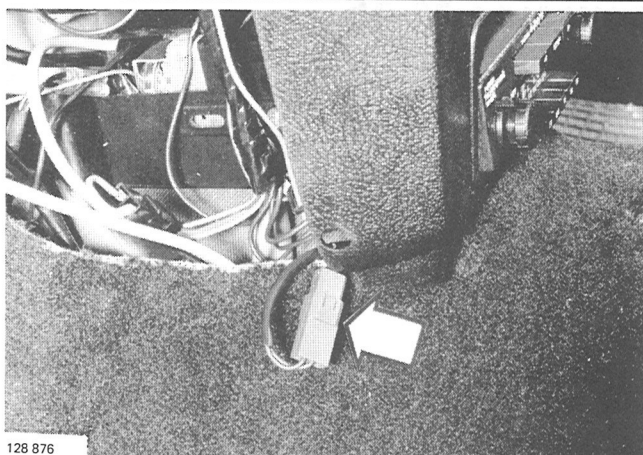


128 875

**Inside vehicle:**

D3

**Disconnect gearshift lever cover from floor.**

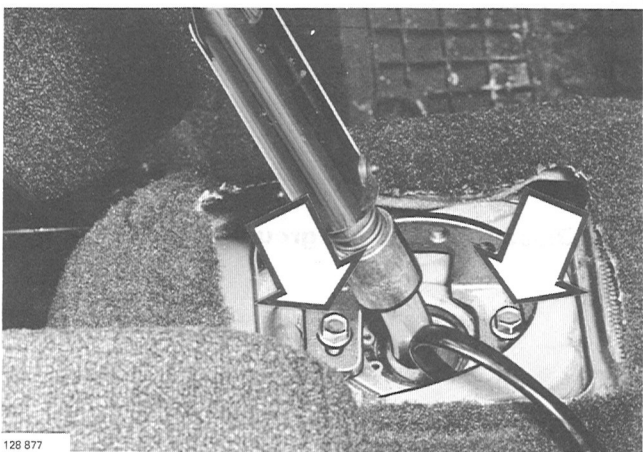


128 876

D4

**Inside vehicle:**

- Remove left side panel of center console.
- Disconnect connector for back-up light.



128 877

D5

**Remove reverse detent plate.**

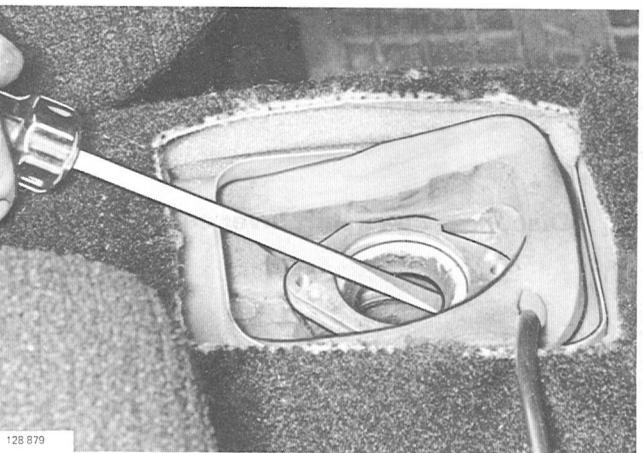


128 878

D6

**Remove gearshift lever.**

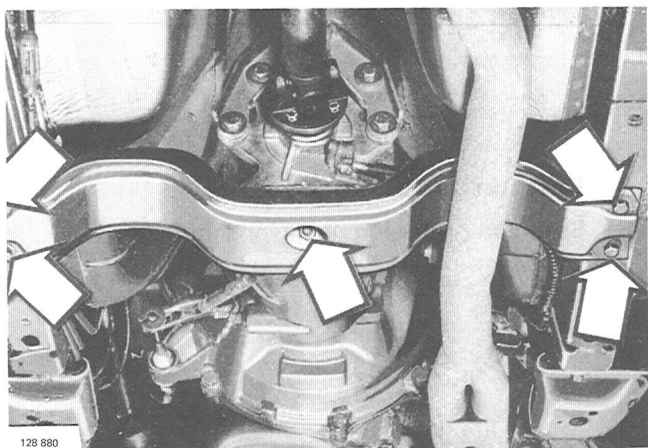
Remove lock ring to remove gearshift lever.



128 879

D7

**Remove plastic bushing and rubber ring.**


**From under vehicle:**

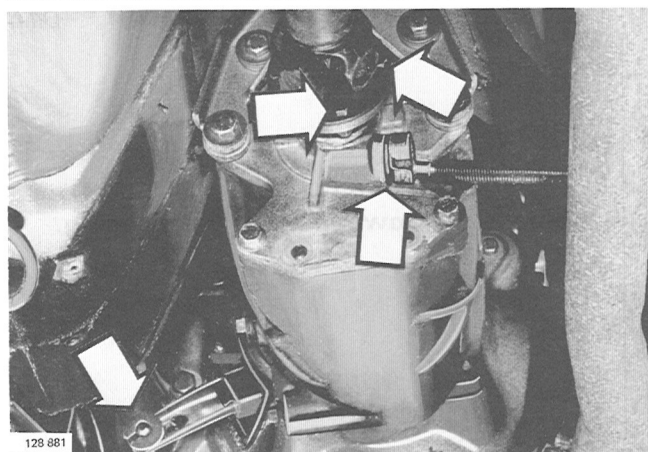
D8

**Unhook clutch fork return spring.**

D9

**Remove cross-member assembly**

Cross-member including rubber cushion and bracket.



D10

**Disconnect:**

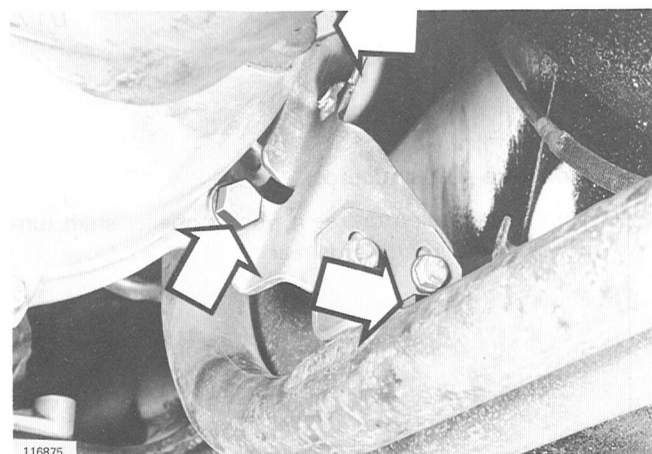
- Speedometer cable from drive gear.
- Propeller shaft from drive flange.
- Clutch cable from fork and bell housing.

D11

**Remove front exhaust pipe attachment.**

Remove bolts at bell housing.  
Remove nut at exhaust pipes.

D12

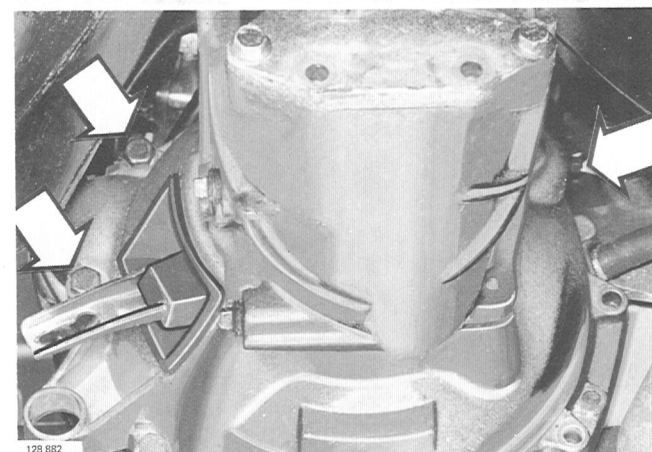
**Unhook rubber supports for front muffler.**


D13

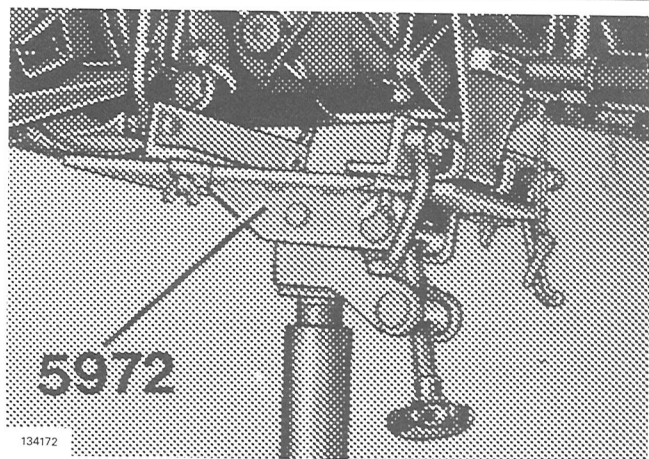
**Begin separating bell housing from engine.**

Remove all bolts except two at bottom.

D14

**Pull out starter motor until free from bell housing.**






D15

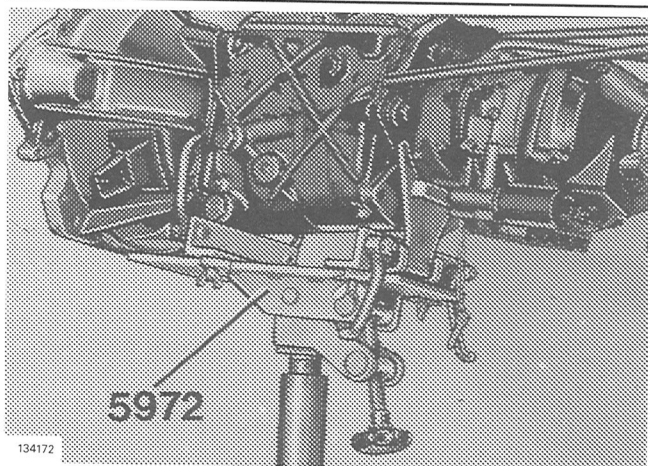
**Position transmission fixture.**

Secure transmission rigidly on fixture.



D16

**Remove two lower bolts at bell housing.**



D17

**Remove transmission.**

Turn transmission to free it from propeller shaft tunnel while pulling towards rear.

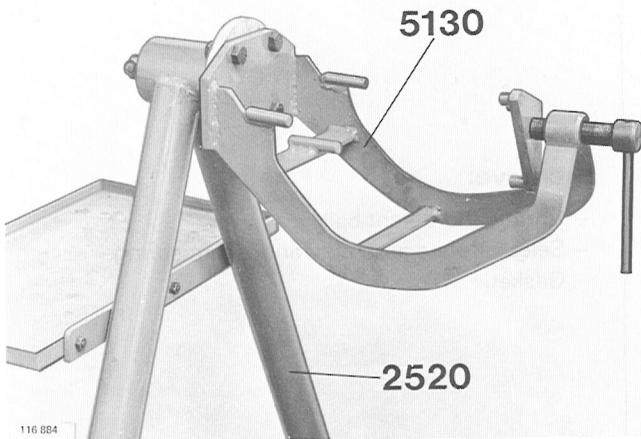
# Disassembling transmission M 45

## Special tools:

- 2261 Puller**, drive flange
- 2413 Drift**, removing/installing rear cover seal
- 2520 Stand**
- 2853 Adapter**, removing gear and synchro ring
- 2985 Adapter**, removing main shaft bearing
- 5058 Tool**, removing main shaft bearing
- 5130 Fixture**, attaching transmission to stand

- 5131 Puller**, removing intermediate shaft bearing
- 5147 Tool**, removing main shaft bearing, used with 5085
- 5149 Wrench**, removing/installing flange nut
- 5177 Puller**, intermediate shaft bearing

E1



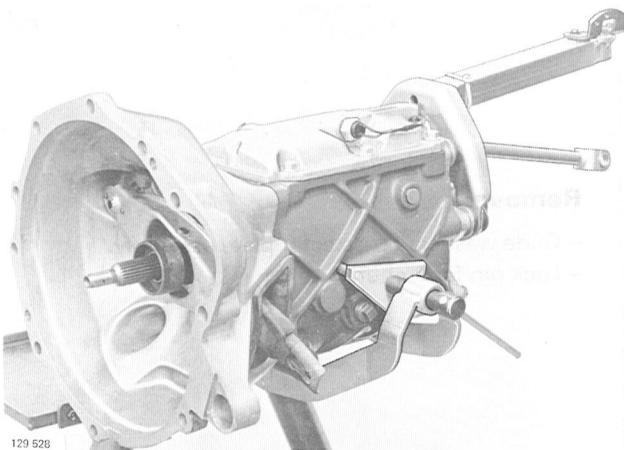
### Attach fixture 5130.

Use four bolts to attach to stand **2520**.

#### NOTE:

Modified type fixture 5130 must be used. See "Modification of fixture 5130" at end of Special Tool section.

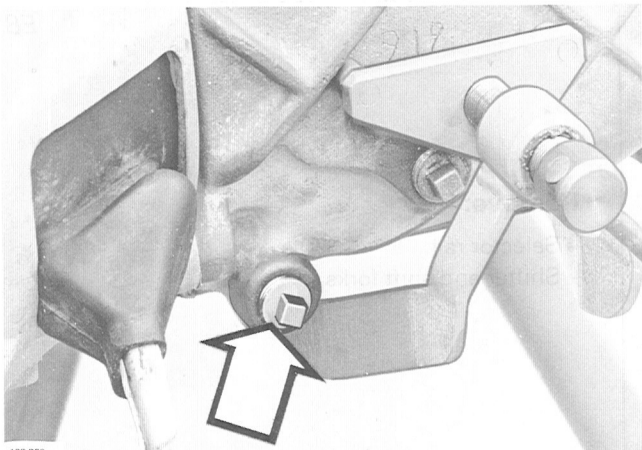
E2



### Install transmission fixture.

Ensure all mating surfaces align when tightening holding bolt.

E3

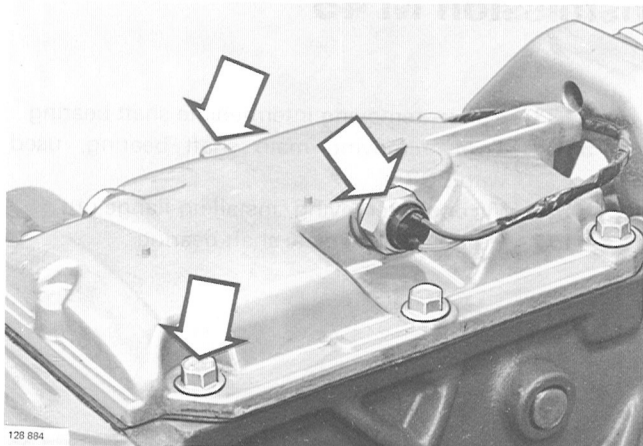


### Remove sound deadening material from gearshift carrier.

E4

### Remove drain plug and drain oil.

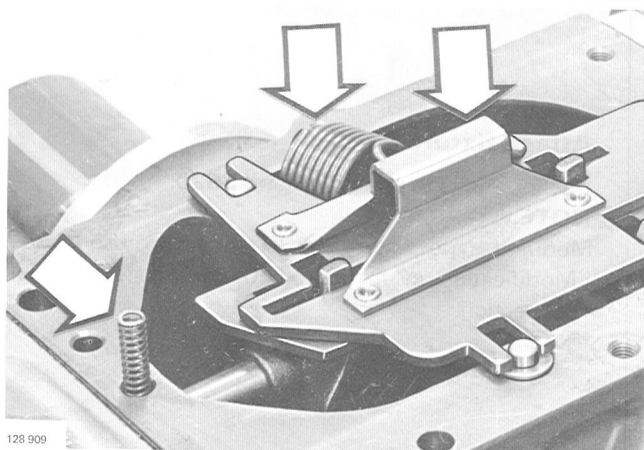
E5



**Remove:**

- Back-up light switch.
- Transmission top cover.

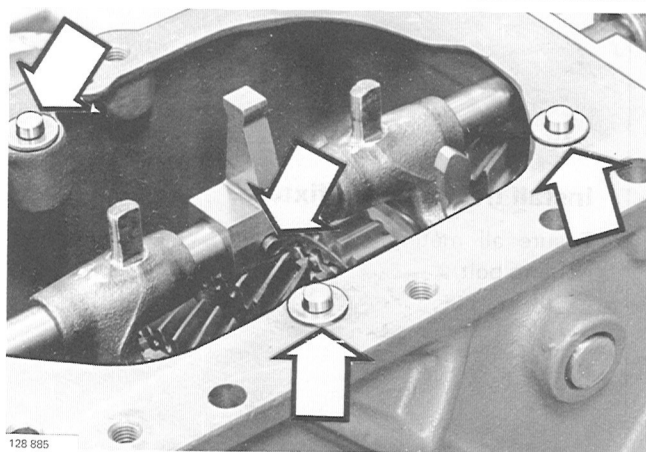
E6



**Remove:**

- Spring and detent ball.
- Selector plate assembly and return spring.
- Gasket.

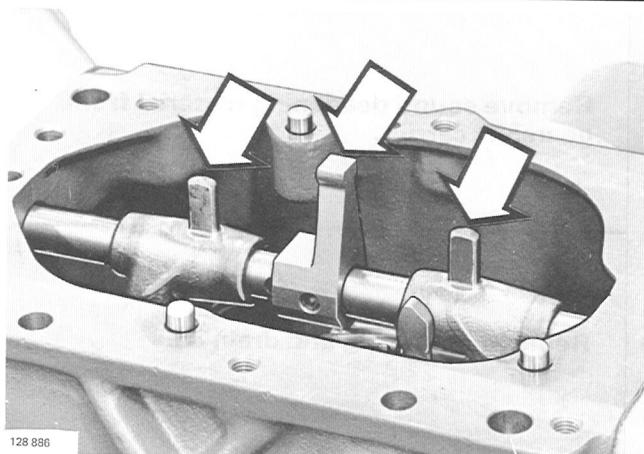
E7



**Remove:**

- Glide washers for selector plate assembly.
- Lock pin for shifter.

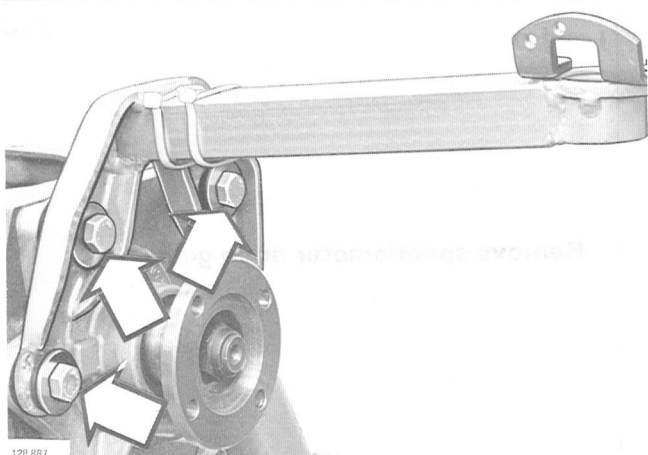
E8



**Remove:**

- Selector rail.
- Shifter and shift forks.

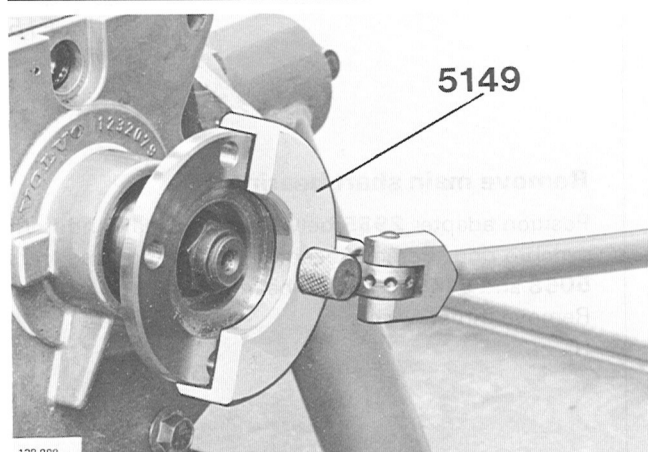
E9



128 887

**Remove gearshift carrier assembly.**

E10

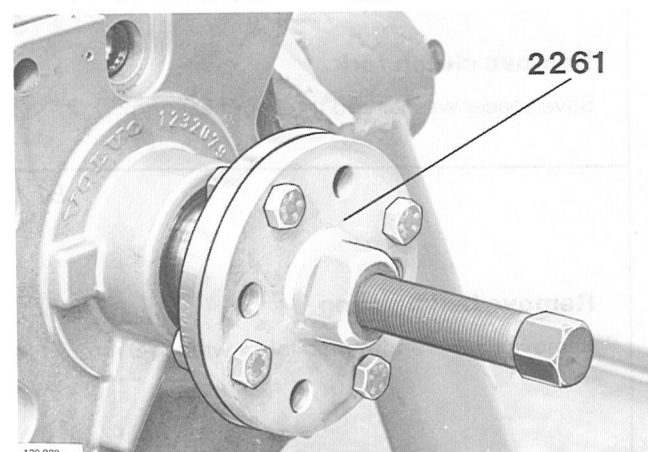


128 888

**Remove drive flange nut.**

Socket **27 mm** = 1-1/16". Use wrench **5149** to hold.

E11

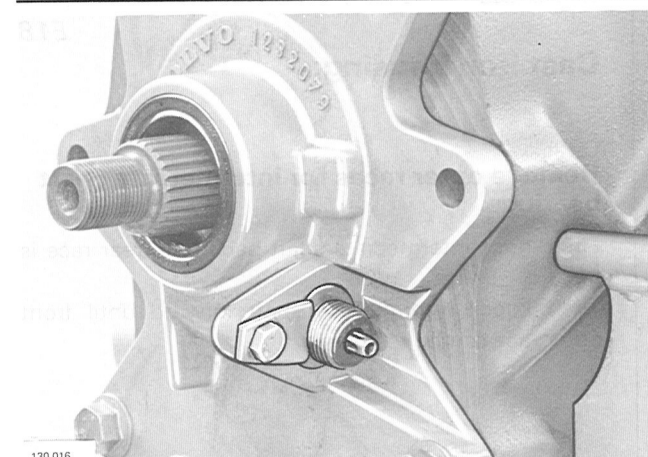


128 889

**Pull off drive flange.**

Puller **2261**.

E12



130 016

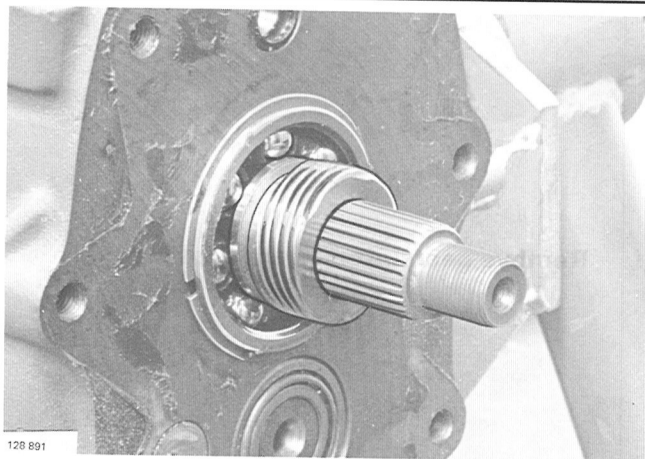
**Remove speedometer driven gear.**

Remove bolt and retainer to pull out gear.

E13

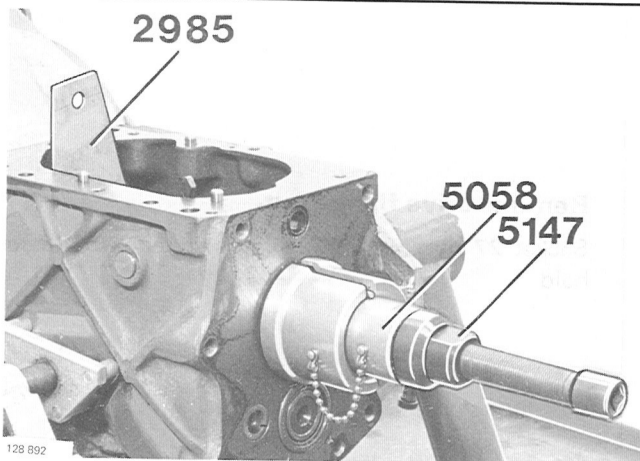
**Remove rear cover.**

Remove gasket and shims.



E14

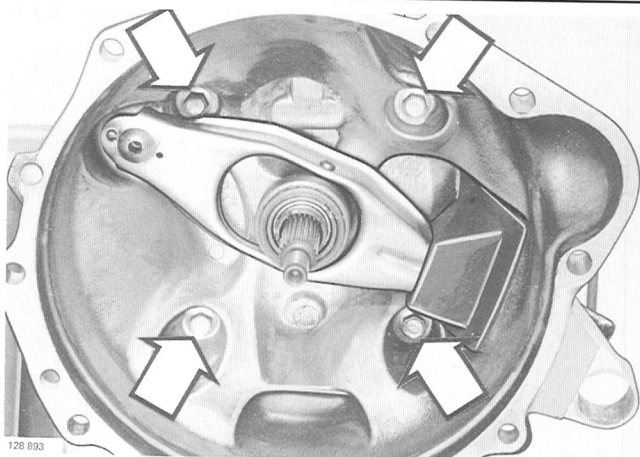
**Remove speedometer drive gear.**



E15

**Remove main shaft bearing.**

Position adapter **2985** between input shaft and front synchro ring. Remove bearing spacer ring. Use tools **5058** and **5147** to pull off bearing. Remove thrust washer.



E16

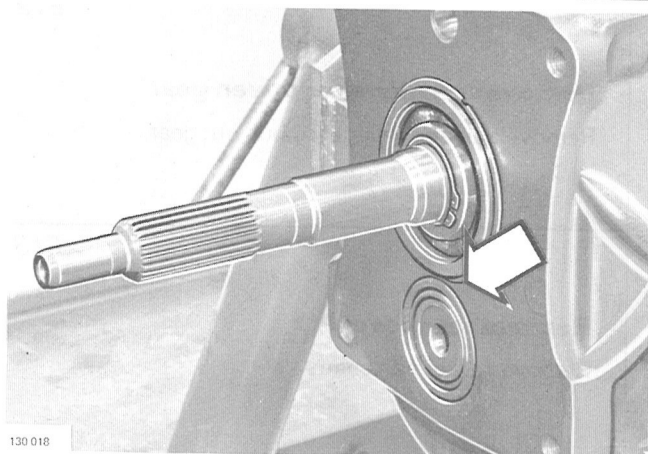
**Remove clutch fork.**

Save spacer washer and throw-out bearing.

E17

**Remove bell housing.**

Remove gasket and shims. Inhex wrench 8 mm.



E18

**Cast iron housing:**

**Remove outer races for intermediate shaft bearings.**

First knock intermediate shaft back until rear race is free.

Then knock intermediate shaft forward until front outer race can be removed.

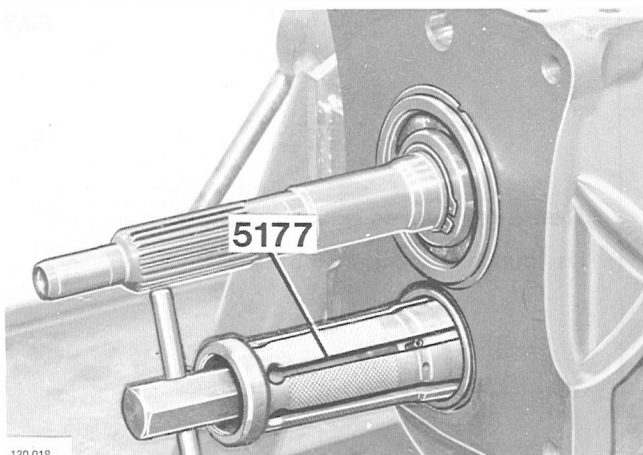


E18

### Aluminum housing:

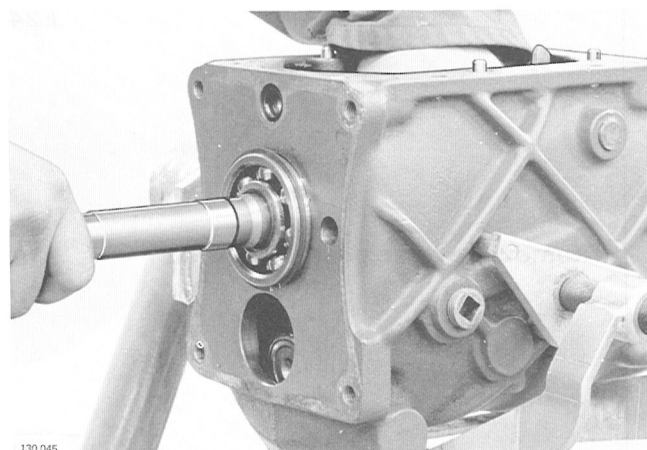
#### Remove outer races for intermediate shaft bearings

Carefully knock intermediate shaft until puller **5177** can grip races.



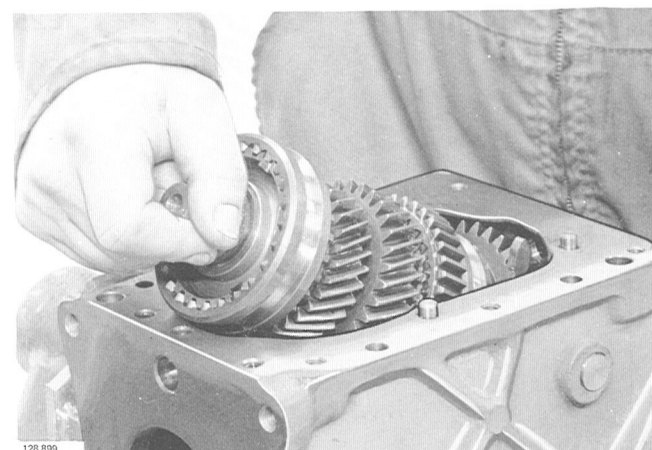
E19

#### Pull out input shaft.



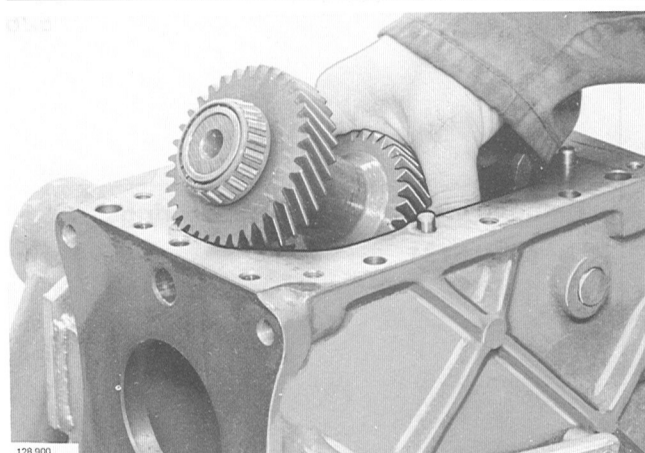
E20

#### Remove 4th gear synchro ring



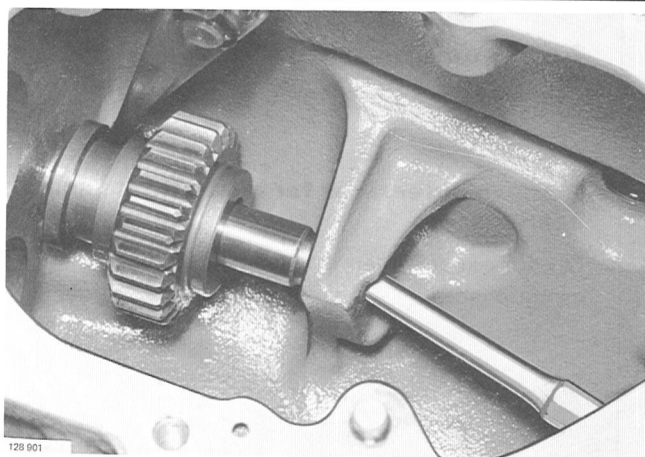
E21

#### Lift out main shaft.



E22

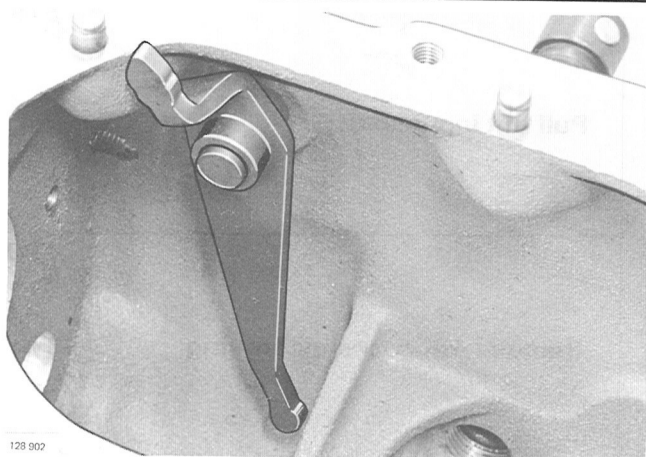
#### Lift out intermediate shaft.



E23

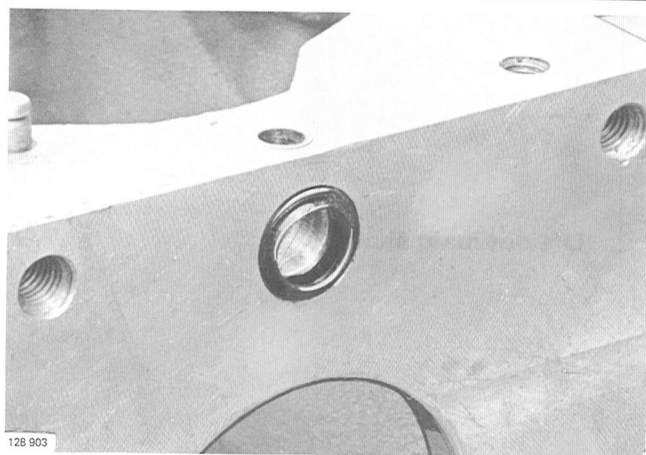
**Remove reverse gear and shaft.**

Use punch to knock shaft back.



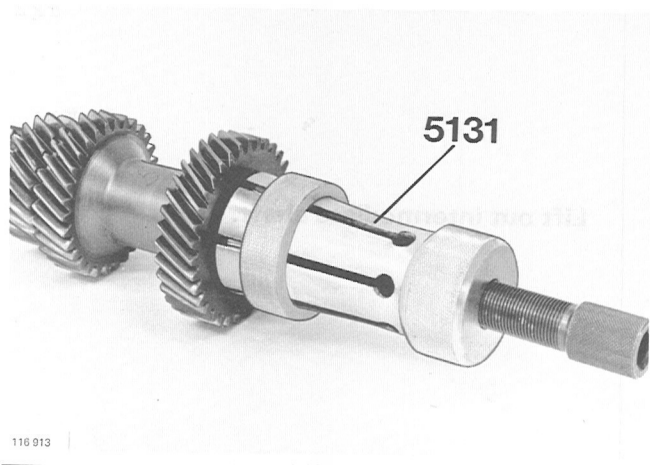
E24

**Remove reverse gear shift fork.**



E25

**Remove seal for selector rail.**

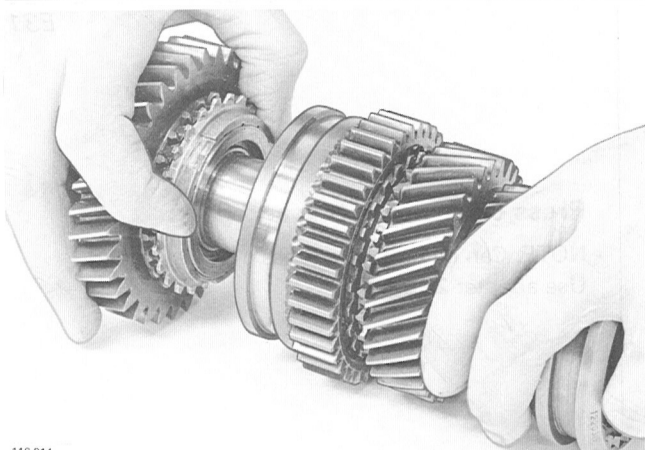


E26

**Remove intermediate shaft bearings.**

Use puller **5131**.

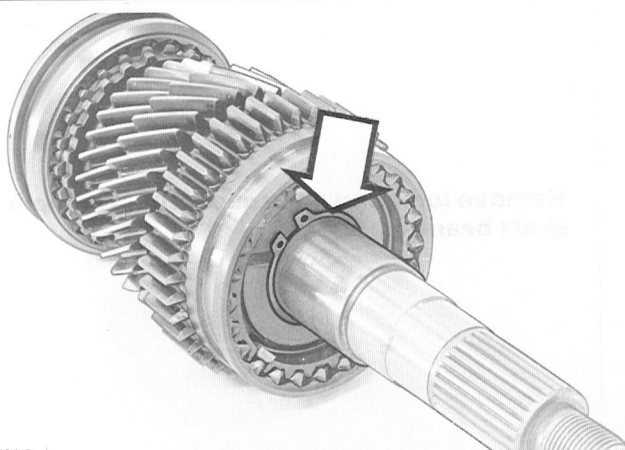
E27



116 914

**Remove 1st gear and synchro ring from main shaft.**

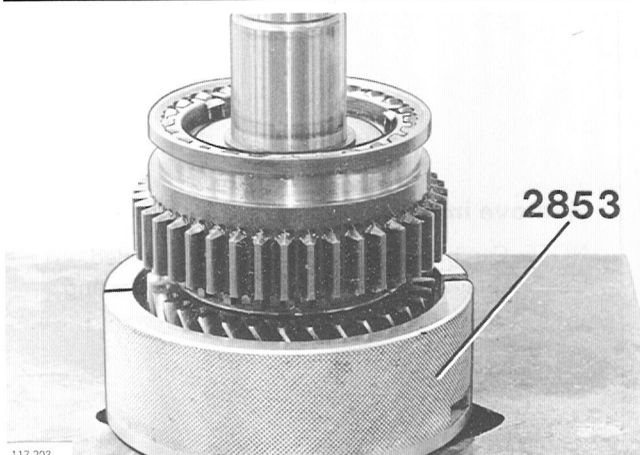
E28



116 915

**Remove lock ring for 1–2 synchro hub.**

E29

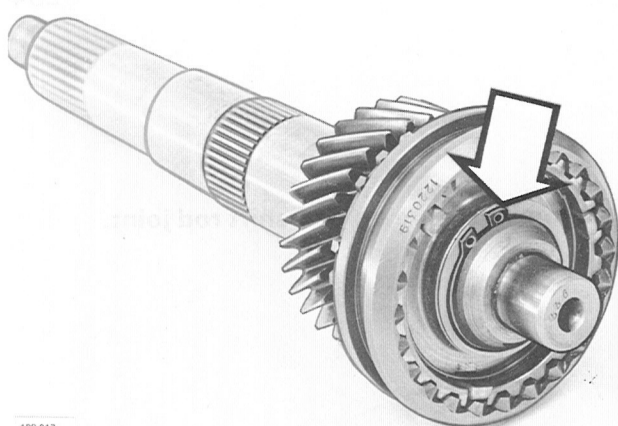


117 203

**Press off synchro hub and gear.**

NOTE: Can be tight so a press may be needed.  
Use adapter **2853**.

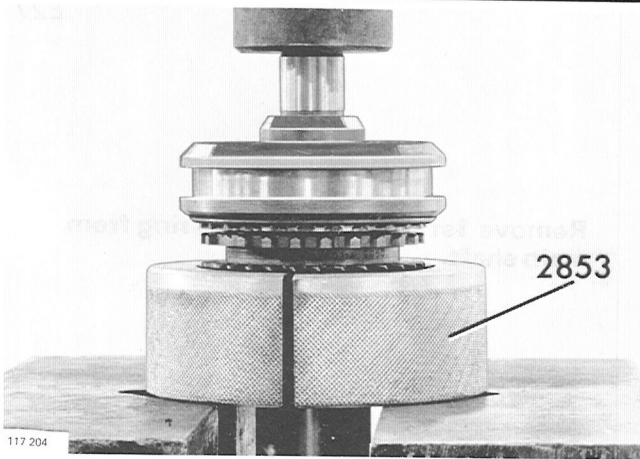
E30



128 917

**Remove lock ring for 3–4 synchro hub.**

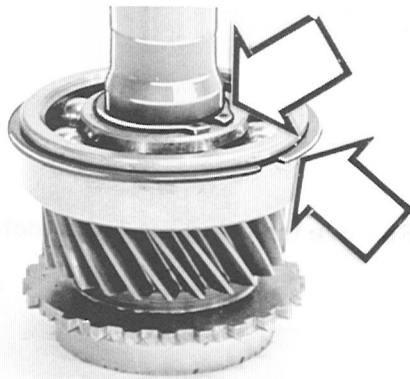
E31



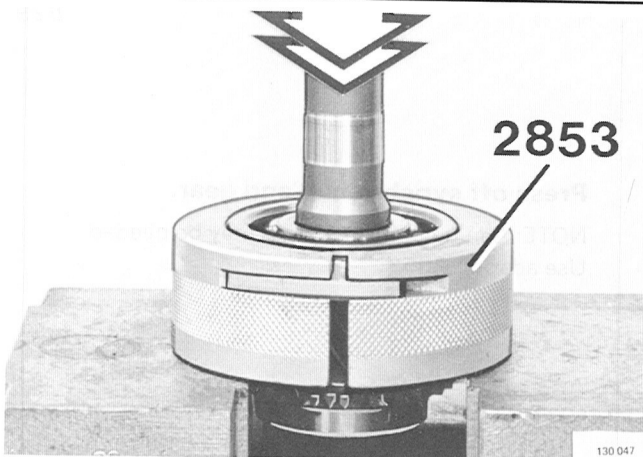
**Press off synchro hub and gear.**

NOTE: Can be tight so a press may be needed.  
Use adapter **2853**.

E32



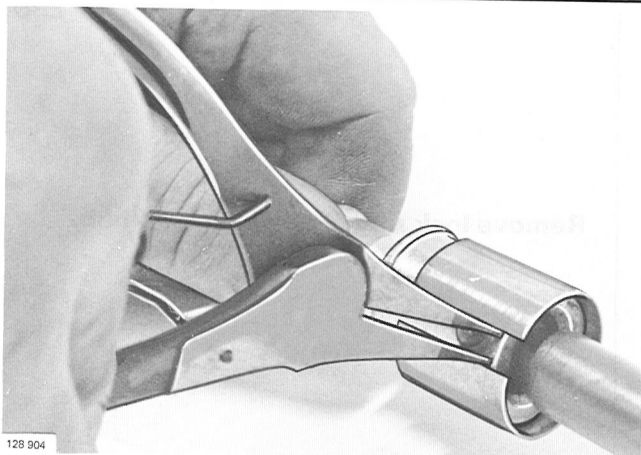
**Remove lock ring and spacer ring for input shaft bearing.**



**Remove input shaft bearing.**

NOTE: Can be tight so a press may be needed.  
Use adapter **2853**, small hole UP under bearing.

E34



**Remove sleeve on gearshift rod joint.**

E35



**Disassemble gear selector rail and gearshift rod.**

Use a 5 mm punch to push out front pin.

E36



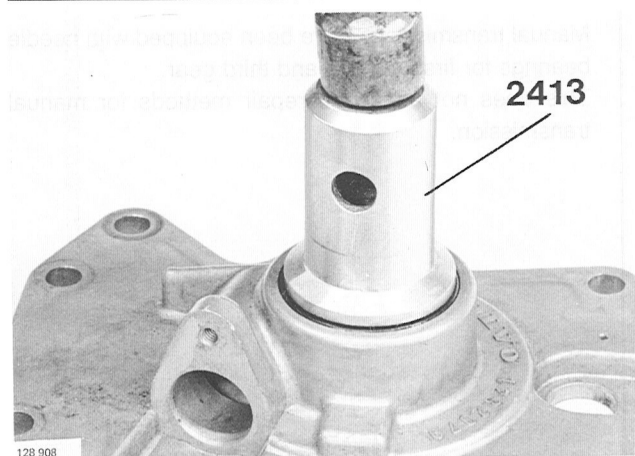
**Remove gearshift rod bushings.**

E37



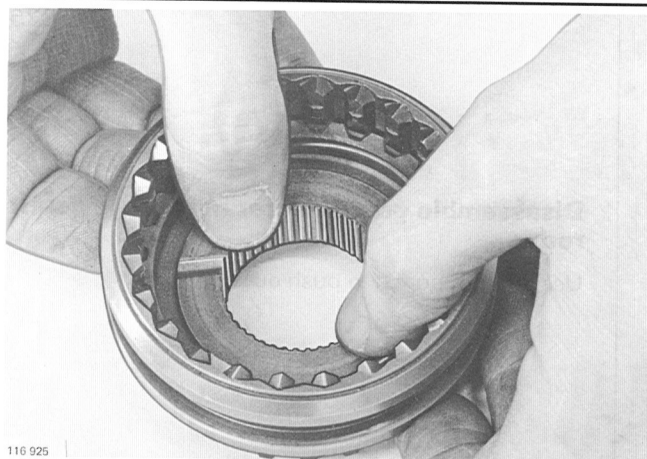
**Remove bell housing seal.**

E38



**Remove rear cover seal.**

Use drift **2413** to knock out seal.



E39

**Disconnect two synchro hubs.**

Push hubs out of sleeves.

E40

**Cleaning.**

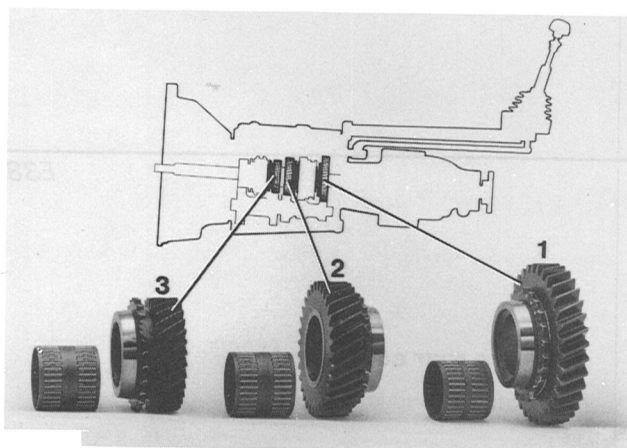
Clean all parts in solvent. Blow clean with compressed air.

E41

**Checking.**

Carefully check all parts. Replace worn or damaged parts. Replace gaskets and seals.

## New features of M 45/M 46 transmission 1979—



131434

**Manual transmission.**

Manual transmissions have been equipped with needle bearings for first, second and third gear. This does not affect the repair methods for manual transmission.



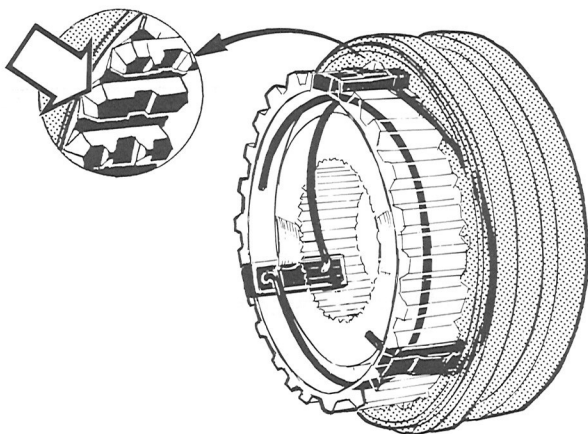
## Assembling transmission M 45

### Special tools:

- 1801 Standard handle**  
**2412 Drift**, installing input shaft bearing  
**2831 Press tool**, installing main shaft bearing  
**2852 Adapter**, installing gear and synchro ring  
**2867 Drift**, installing bell housing seal  
**2986 Drift**, installing intermediate shaft bearings  
**5064 Drift**, installing rear cover seal

- 5065 Drift**, installing seal on shift selector rail  
**5149 Wrench**, removing/installing drive flange nut  
**5177 Puller**, intermediate shaft bearings, aluminum housing  
**5180 Drift**, intermediate shaft bearings, aluminum housing

F1



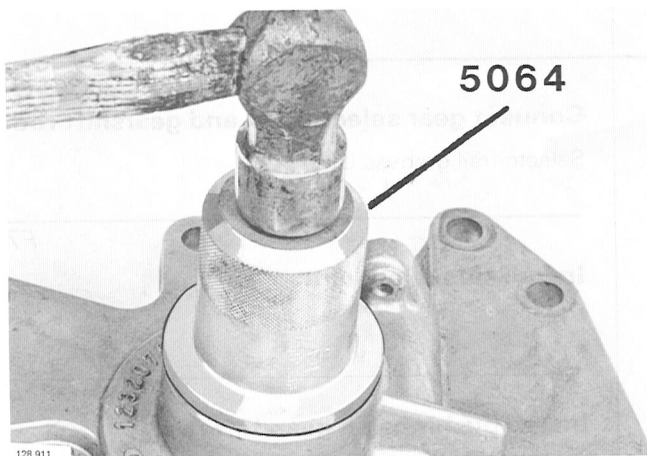
130 017

### Connect 1-2 and 3-4 synchro hubs.

Position hub in sleeve so that hub slots align chamfered teeth in sleeve. Insert dogs (three) and lock them with springs.

NOTE: With curved lock ring, align springs to let free ends press against synchro ring.

F2

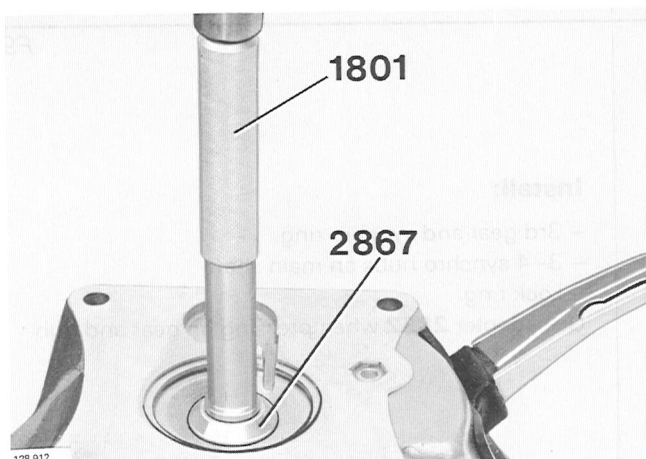


128 911

### Install rear cover seal.

Use drift **5064**.

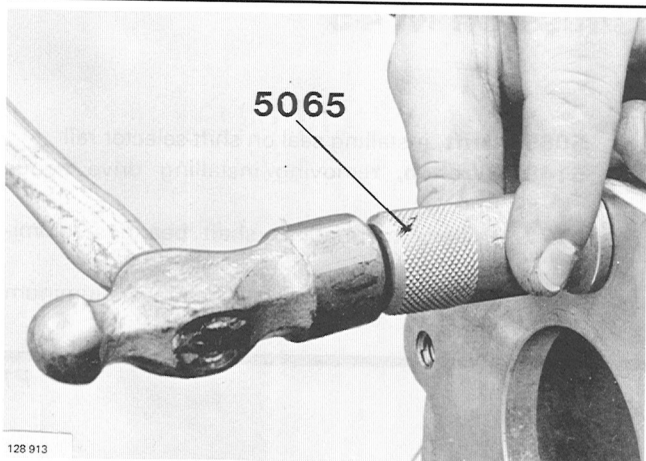
F3



128 912

### Install bell housing seal.

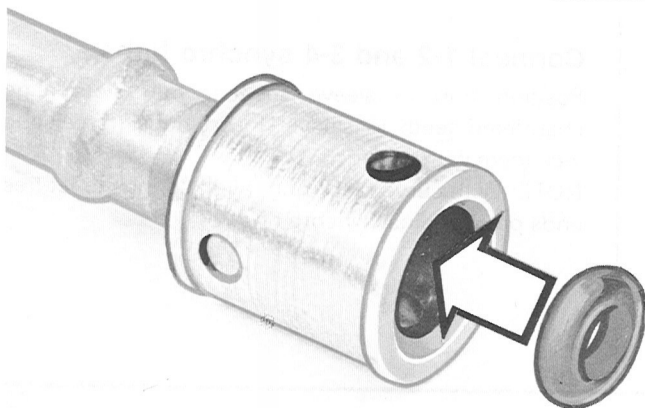
Use drift **2867** and standard handle **1801**.



F4

**Install seal for selector rail.**

Drift **5065**.



F5

**Position rubber ring in joint.**



F6

**Connect gear selector rail and gearshift rod.**

Selector rail grooves UP.

F7

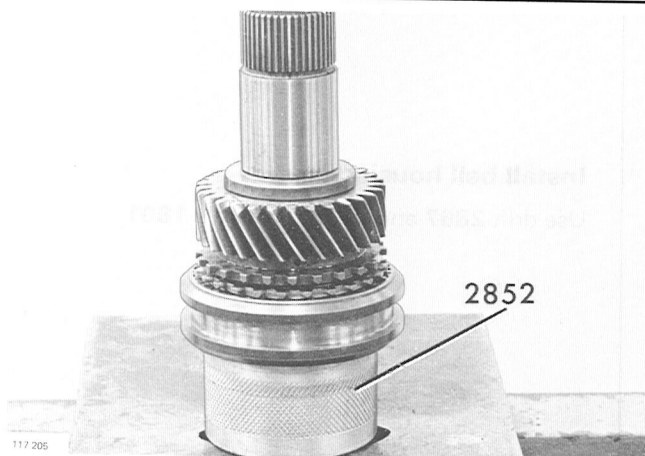
**Install sleeve on joint.**

F8

**Install bushings on gearshift rod.**

Use grease to retain rubber ring on one side.

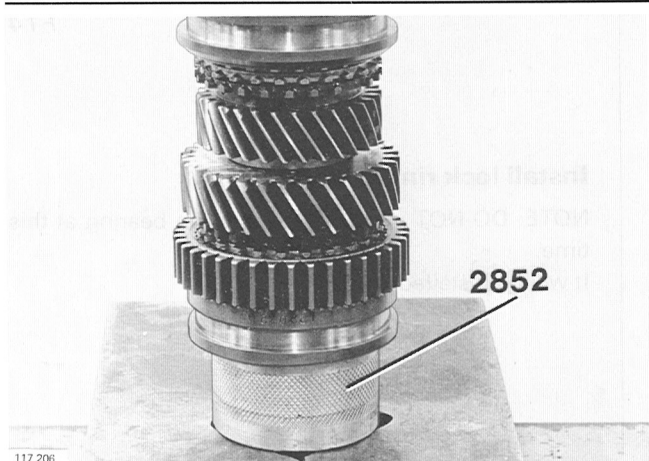
F9



**Install:**

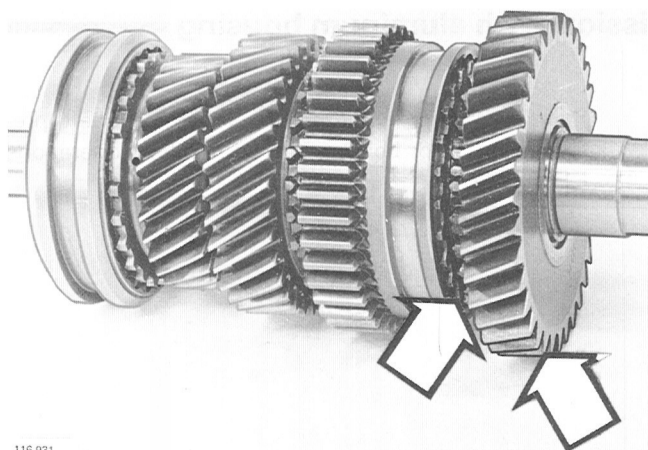
- 3rd gear and synchro ring.
  - 3-4 synchro hubs on main shaft.
  - Lock ring.
- Use adapter **2852** when pressing on gear and hub.

F10

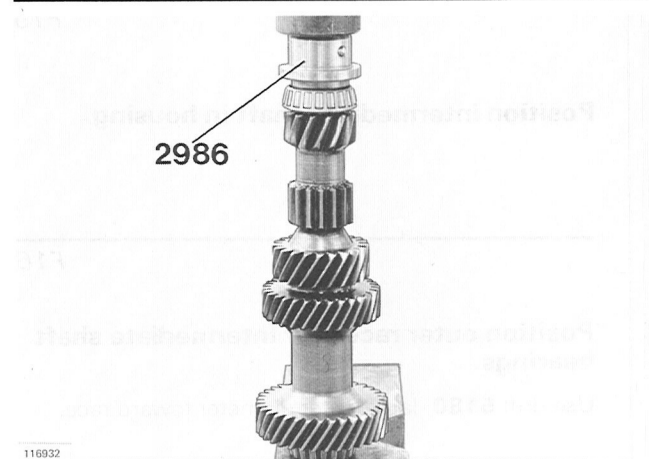
**Install:**

- 2nd gear and synchro hub.
  - 1–2 synchro hub on main shaft.
  - Lock ring.
- Use adapter **2852** when pressing on gear and hub.

F11

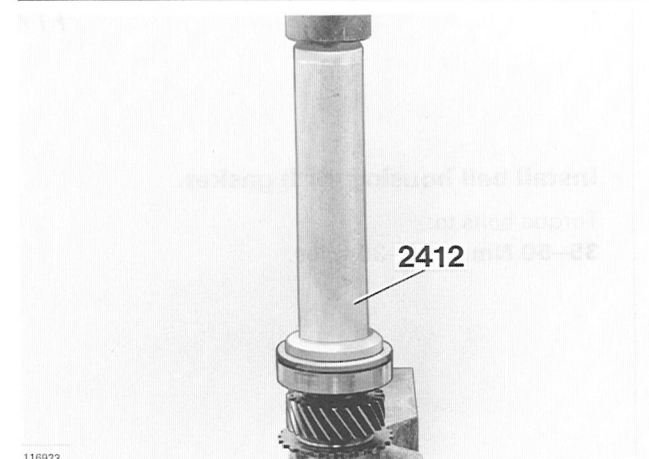
**Install 1st gear and synchro ring on main shaft.**

F12

**Install two intermediate shaft bearings.**

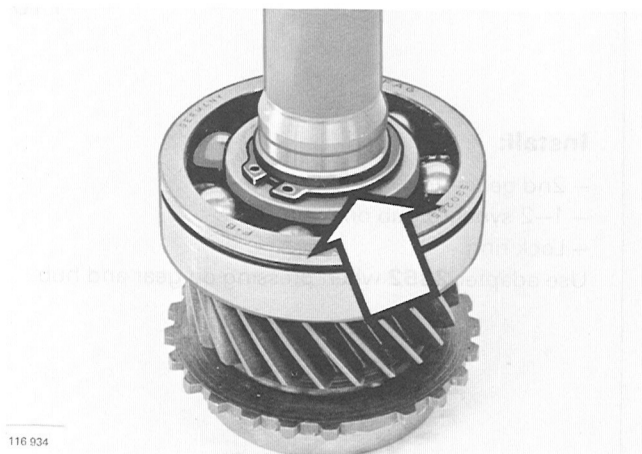
Use drift **2986** to press on bearings.  
 NOTE: Intermediate shaft small end bearing is different for diesel applications.  
 Use correct type bearing.

F13

**Install bearing on input shaft.**

Use drift **2412** to press on bearing.

F14



**Install lock ring on input shaft.**

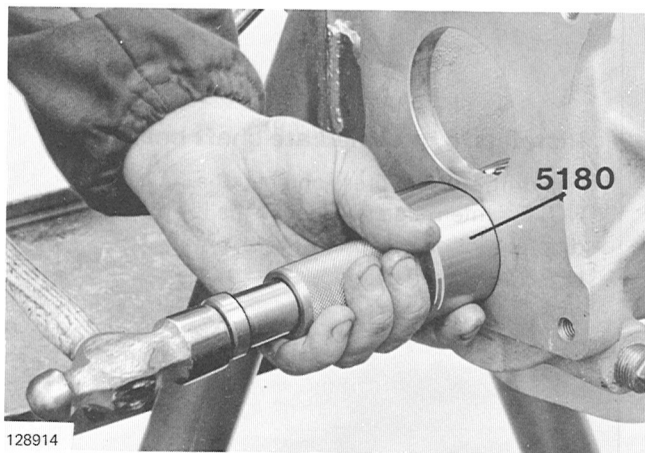
NOTE: DO NOT install spacer ring on bearing at this time.

It will be installed later on.

**Special instructions for transmission with aluminum housing**

Prior to further assembly, intermediate shaft pre-tension should be determined. Follow operations F15–F24.

F15



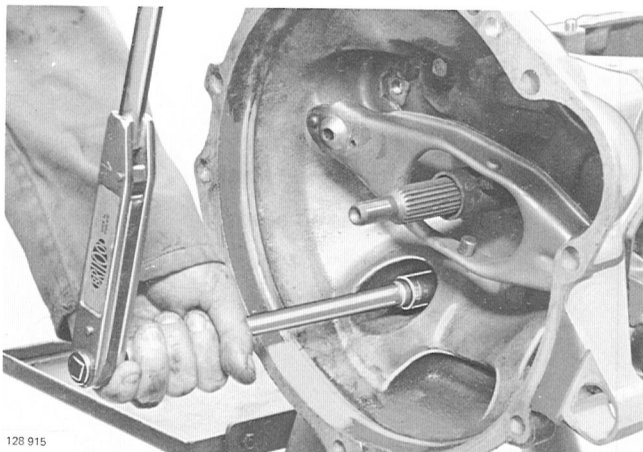
**Position intermediate shaft in housing.**

F16

**Position outer races for intermediate shaft bearings.**

Use drift **5180**, large outer diameter toward race.

F17

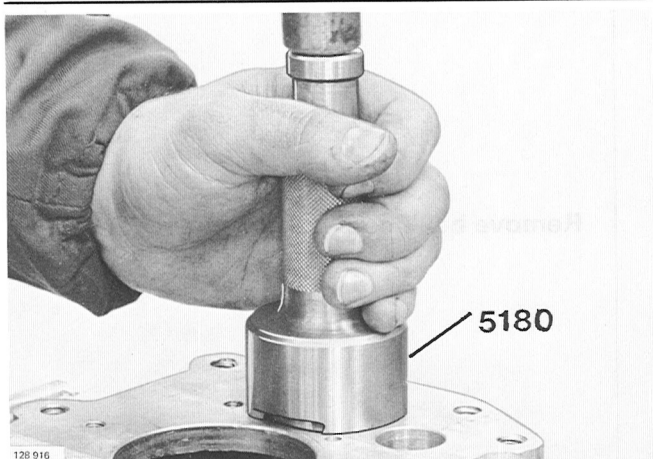


**Install bell housing with gasket.**

Torque bolts to:

**35–50 Nm = 25–35 ft.lbs.**

F18



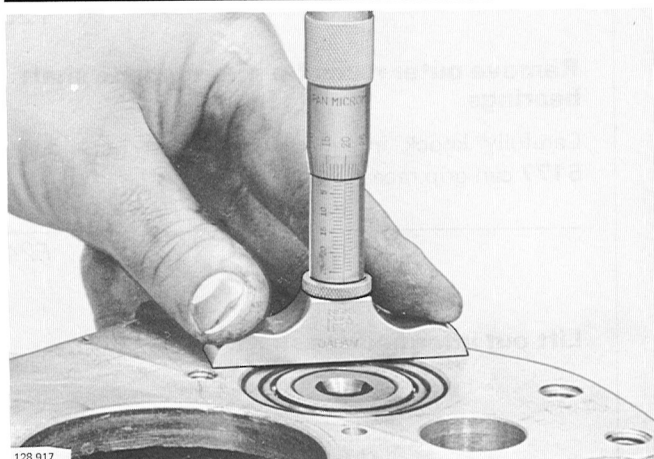
**Turn transmission to vertical position.**

F19

**Eliminate clearance in intermediate shaft bearings.**

Use drift **5180**, small diameter toward rear race. Hold drift rigidly and knock in race with light taps. Repeat while rotating shaft, until all clearance is gone and shaft runs somewhat sluggish.

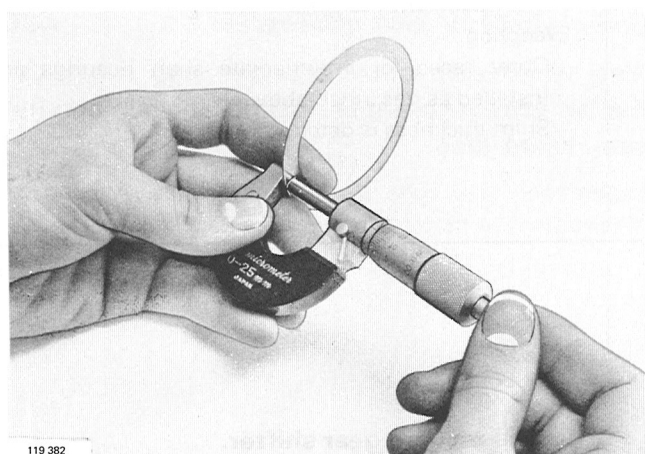
F20



**Measure distance between intermediate shaft bearing outer race and rear surface of housing.**

Use depth gauge and note reading.

F21



**Determine thickness of shims for intermediate shaft.**

Shaft pre-tension should be 0.03–0.08 mm. Gasket thickness 0.25 mm (metric only).

Example:

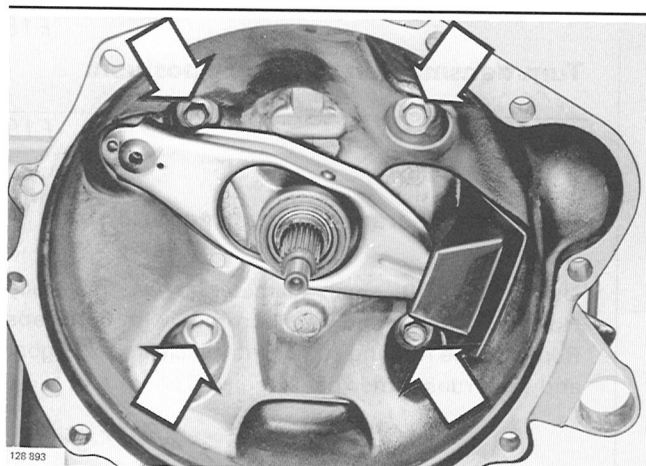
Distance, race—surface	1.51	
Gasket	+0.25	
	<hr/>	
	1.76	1.76
Pre-tension	+0.03 to	+0.08
	<hr/>	
Shim thickness	1.79 to	1.84

Choose **1.80 mm** shim thickness.

Shims available:

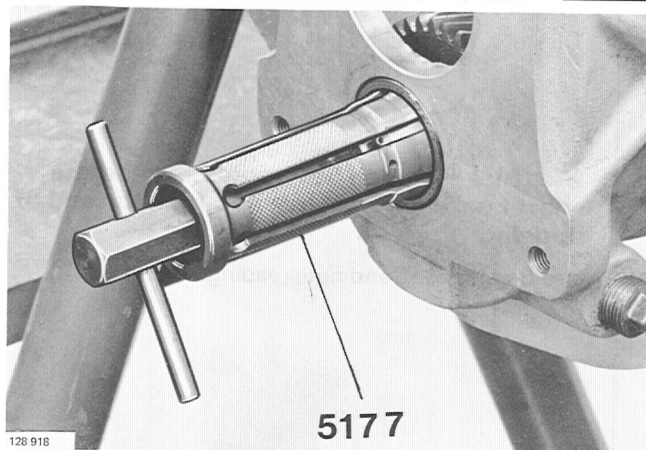
- 0.05 mm
- 0.10 mm
- 0.15 mm
- 0.35 mm
- 0.50 mm
- 0.70 mm
- 1.00 mm





F22

**Remove bell housing and gasket.**



F23

**Remove outer races for intermediate shaft bearings.**

Carefully knock intermediate shaft in until puller **5177** can grip races.

F24

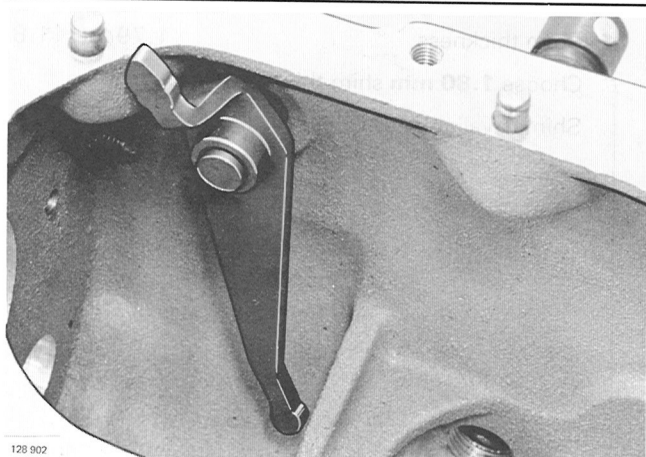
**Lift out intermediate shaft.**

### — End of special instructions for transmissions with aluminum housing —

Continue assembly, using same operations as for transmission with cast iron housing.

Exception:

- Outer races for intermediate shaft bearings are installed as described above.
- Shim thickness is determined.



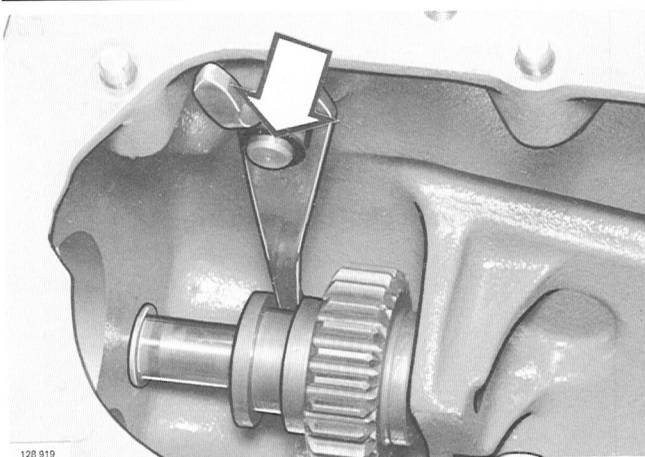
F25

**Install reverse gear shifter.**

Install lock ring.

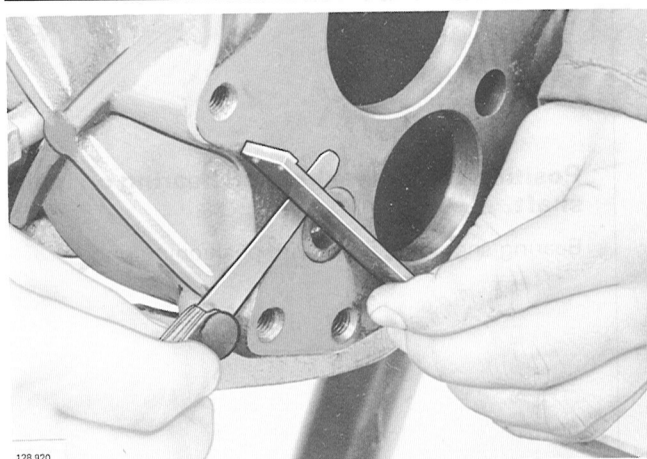


F26



**Install reverse gear and shaft.**

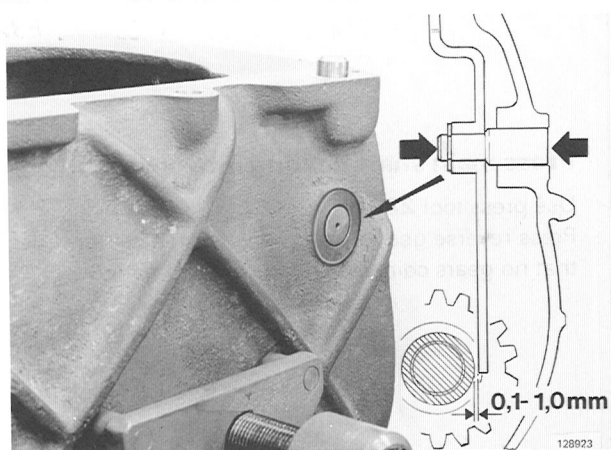
F27



**Check and adjust reverse gear shaft position.**

Shaft end should be minimum 0.05 mm = 0.002'' under housing face.

F28

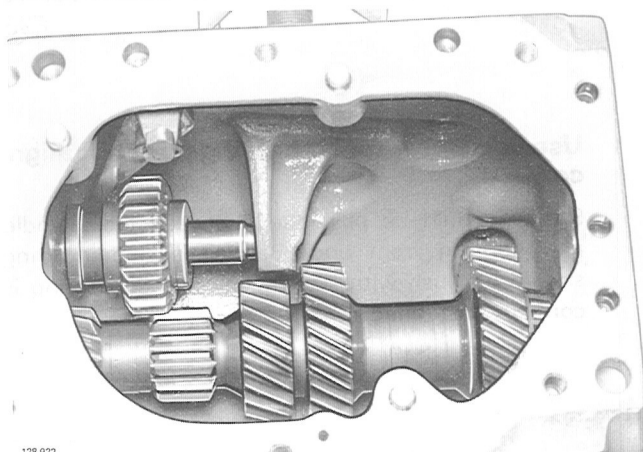


**Important!**

**Adjust clearance between reverse gear and shift fork.**

Correct clearance is 0.1–1.0 mm = 0.004–0.04''. Adjust by knocking shift fork pivot pin axially with a punch.

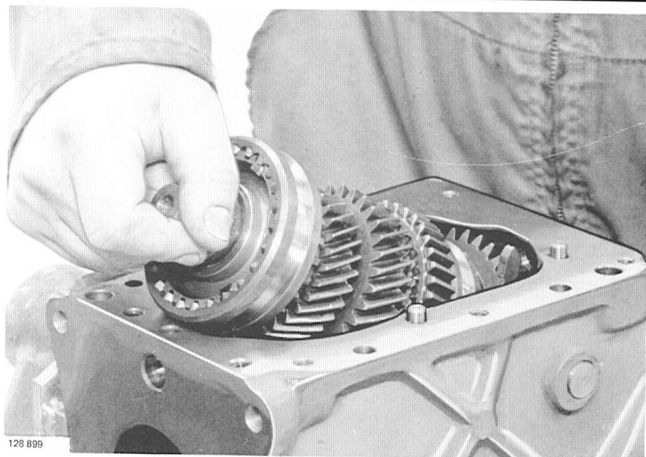
F29



**Position intermediate shaft in housing.**

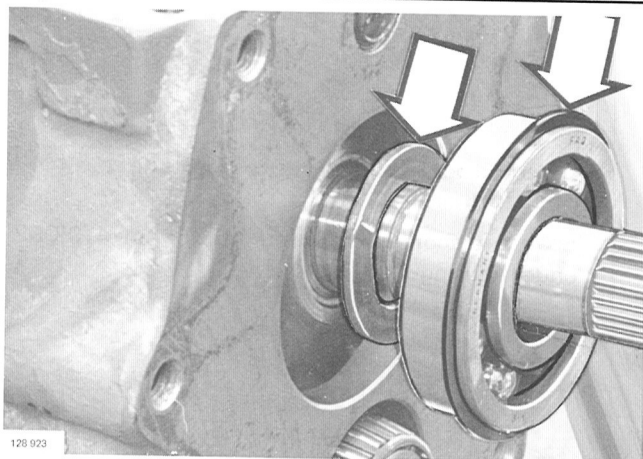
Position on bottom of housing.

F30



**Position main shaft in housing.**

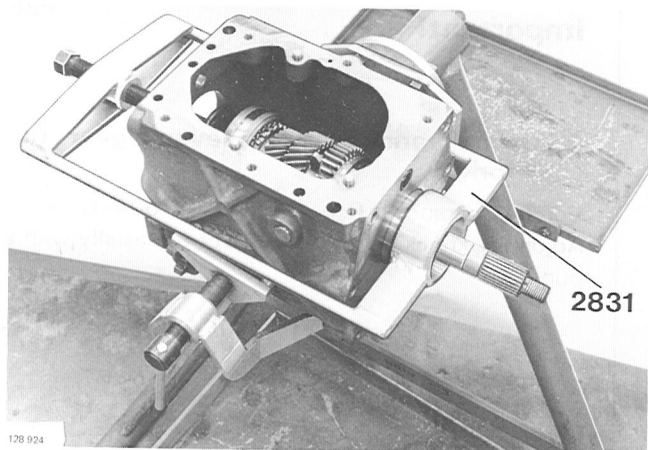
F31



**Position thrust washer and bearing on main shaft.**

Bearing should be fitted with positioning ring.

F32

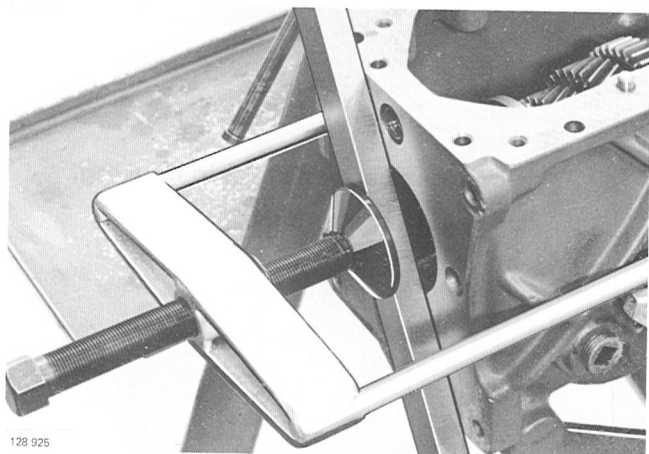


**Press main shaft bearing into position.**

Use press tool **2831**.

Press reverse gear toward transmission center. Check that no gears coincide and become damaged.

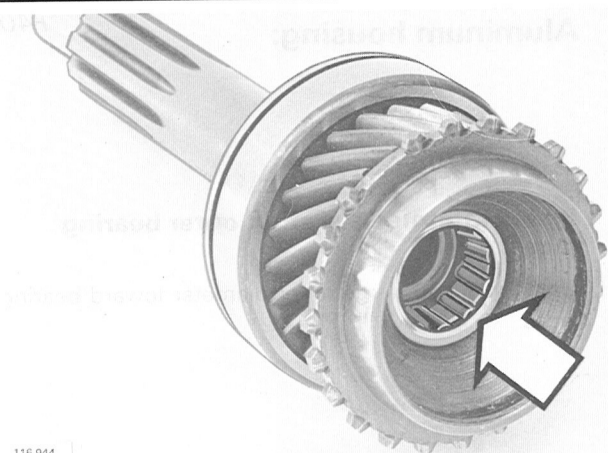
F33



**Use spacer for tool if bearing does not align correctly.**

Spacer should be positioned between tool spindle and housing front end. Bearing positioning ring should be flush with housing face when bearing is correctly positioned.

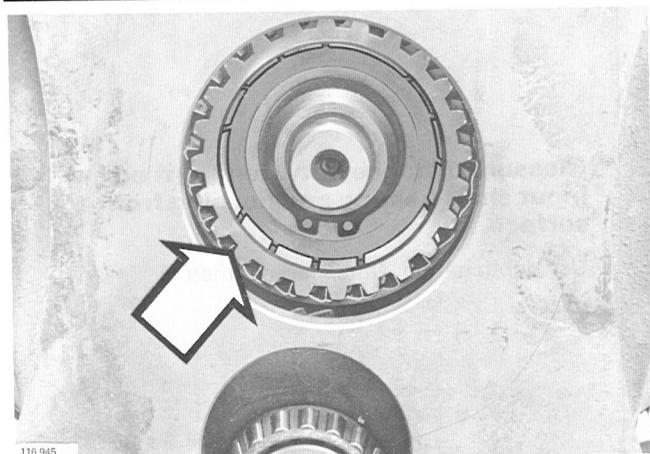
F34



116 944

**Grease and install input shaft roller bearing.**

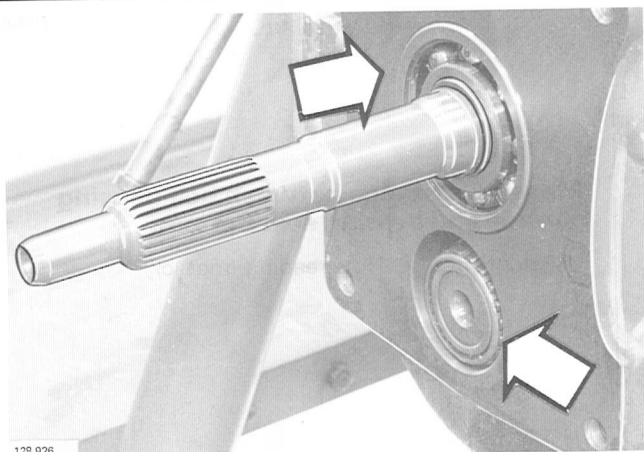
F35



116 945

**Position 4th gear synchro ring in synchro hub.**

F36



128 926

**Attach input shaft to main shaft.**

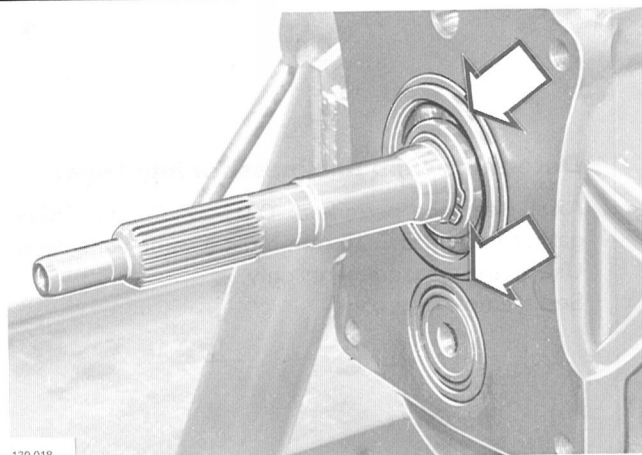
Push shaft in all the way.

F37

**Lift up intermediate shaft.**

Position shaft so bearings are correctly positioned in housing.

F38



130 018

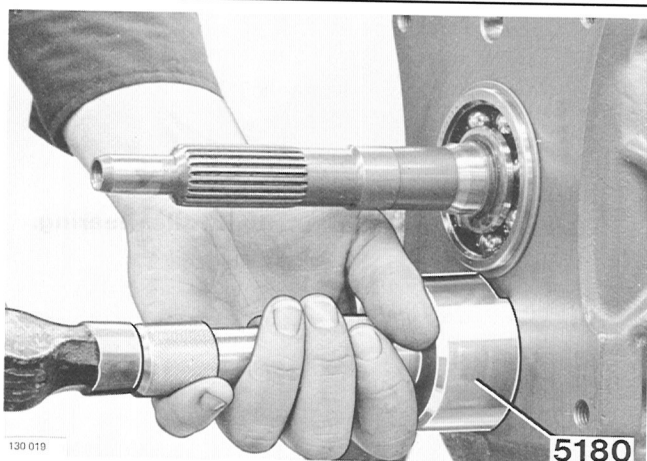
**Pull out input shaft so that spacer ring can be positioned on bearing.**

Then push in shaft again. Spacer ring should lie against housing.

F39

**Cast iron housing:**

**Install intermediate shaft outer bearing races.**

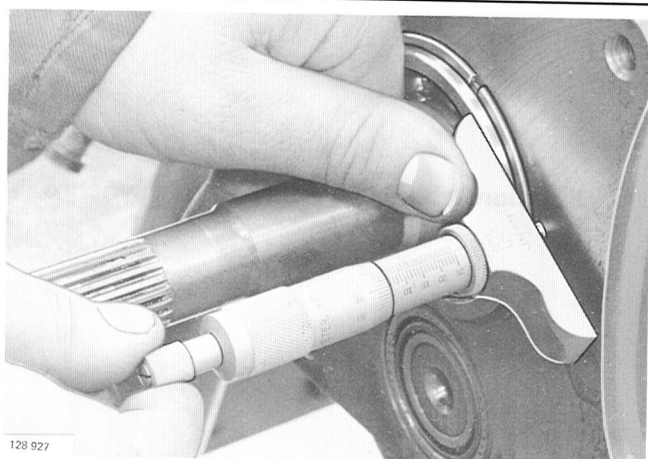


## Aluminum housing:

F40

### Install intermediate shaft outer bearing races.

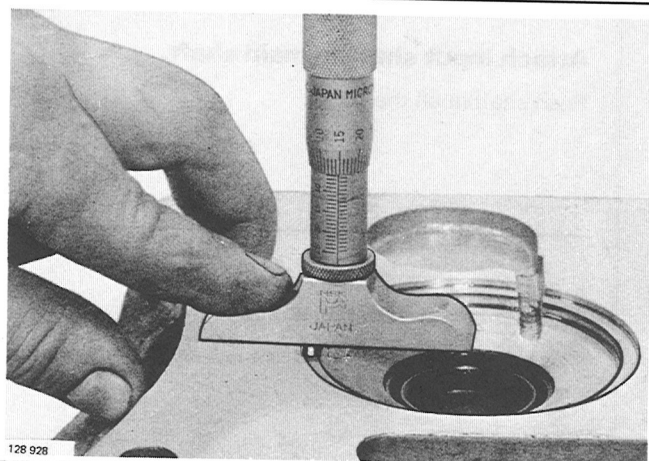
Use drift **5180**, large outer diameter toward bearing races.



F41

### Measure distance between front end of input shaft bearing and housing front surface.

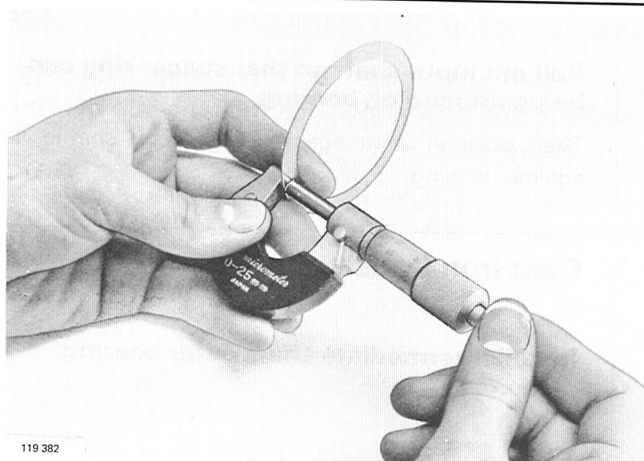
Use depth gauge. Note reading (metric).



F42

### Measure distance between bell housing surface and bearing seat bottom.

Use depth gauge. Note reading (metric).

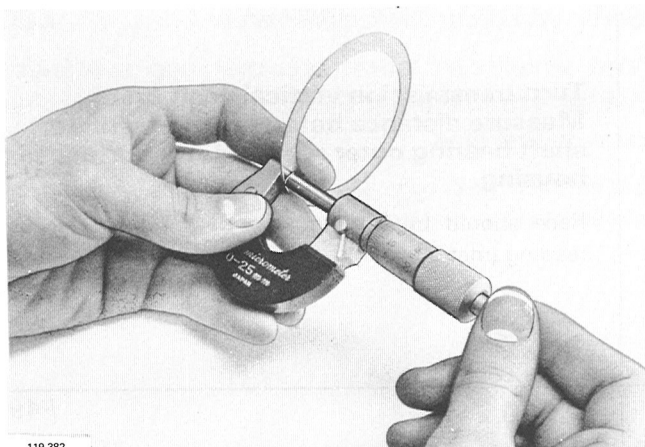


F43

### Determine shim thickness for input shaft.

Axial clearance permitted: 0.01–0.20 mm. NOTE: gasket thickness 0.25 mm must also be considered. Use metric measurements only. See example next page.





119 382

Example:

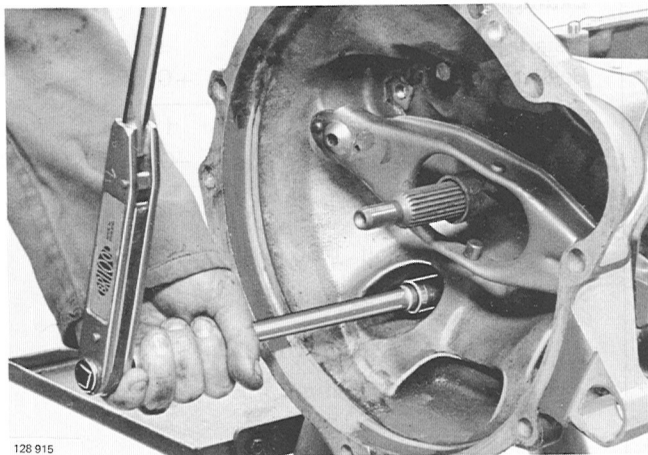
Distance, flywheel housing to bearing bottom	5.60	
Gasket thickness	+0.25	
	<hr/> 5.75	
Distance, bearing to housing	-4.71	
	<hr/> 1.04	1.04
Clearance permitted	-0.01 to	-0.15
	<hr/> 1.03 to	0.89
Shim thickness, mm		
Choose shim 0.90 mm.		
Shims available:	0.60 mm	
	0.75 mm	
	0.90 mm	
	1.00 mm	

F44

**Attach bell housing.**

Use grease on gasket and shim to keep in place.  
Torque: **35–50 Nm** = 25–35 ft.lbs.

F45



128 915

**Aluminum housing:****Install clutch fork.**

Including spacer.

F46

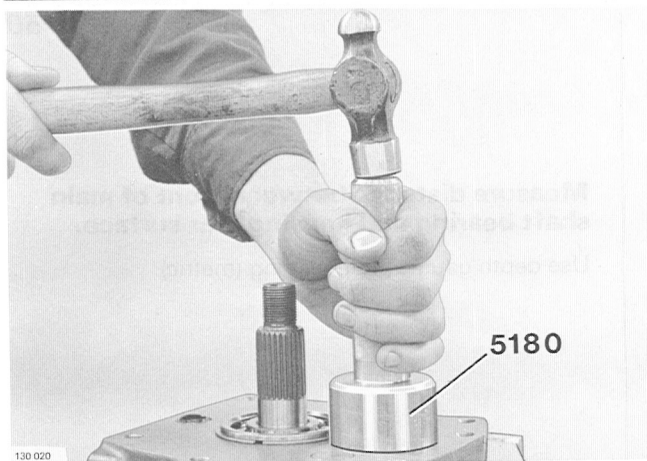
**Install throw-out bearing.**

F47

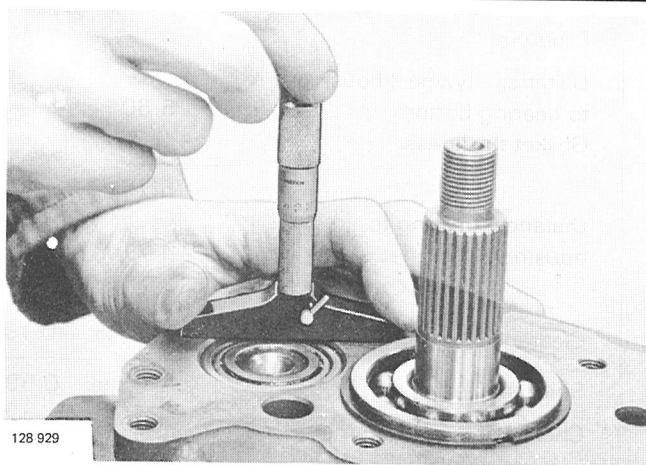
**Aluminum housing:**

**Turn transmission to vertical position.**  
**Make sure intermediate shaft bearings have no clearance.**

Use drift **5180** with small diameter toward rear bearing race. Hold tool rigidly and knock on race with light knocks. Repeat while rotating shaft until all clearance is gone and shaft runs somewhat sluggish.



130 020



### Cast iron housing:

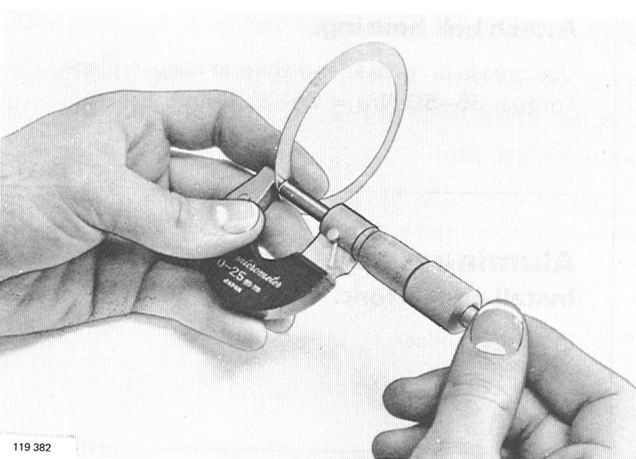
F48

**Turn transmission vertical position. Measure distance between intermediate shaft bearing outer race and rear surface of housing.**

Race should butt rollers. Use depth gauge. Note reading (metric).

128 929

F49



### Determine thickness of shims for intermediate shaft.

Axial clearance permitted: 0.025–0.10 mm. Gasket thickness: 0.25. Metric only.

#### Example:

Distance, race to surface	1.43
Gasket	+0.25
	<hr/>
	1.680
Clearance permitted	–0.025 to 0.100
	<hr/>
Shim thickness	1.655 to 1.580

Choose 1.65 mm (alt. 1.60 mm).

Shims available: 0.05 mm  
0.10 mm  
0.15 mm  
0.35 mm  
0.50 mm  
0.70 mm  
1.00 mm

119 382

F50



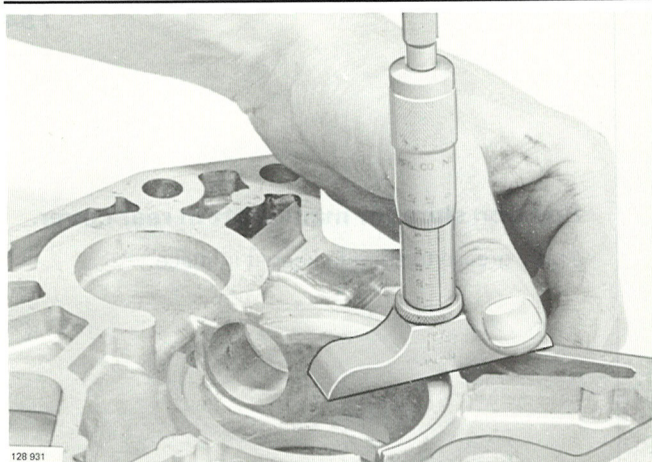
### Measure distance between front of main shaft bearing and housing rear surface.

Use depth gauge. Note reading (metric).

128 930



F51

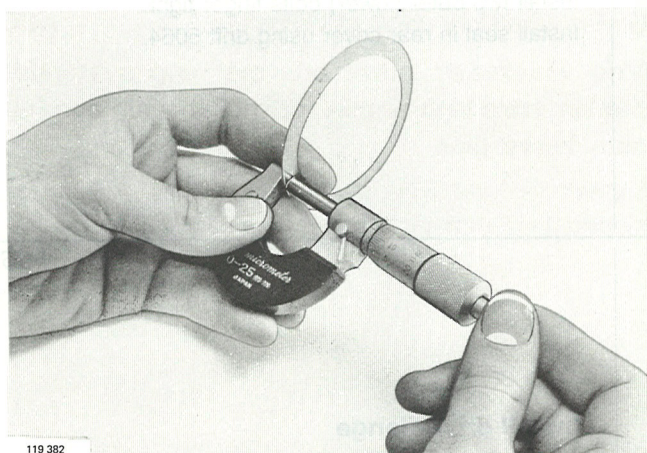


128 931

### Measure distance between rear cover surface and bearing seat bottom.

Use depth gauge. Note reading (metric).

F52



119 382

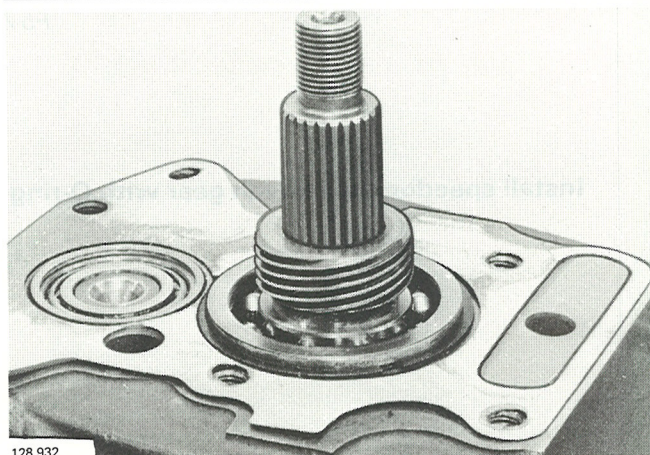
### Determine shim thickness for main shaft.

Axial clearance permitted: 0.01–0.20 mm. Gasket thickness: 0.25 mm.

#### Example:

Distance, cover to bearing bottom	5.50
Gasket	+0.25
	<hr/>
Distance, bearing to housing	–4.71
	<hr/>
	1.04
Clearance permitted	–0.01 to –0.20
	<hr/>
Shim thickness	1.03 to 0.84
Choose shim 0.90 mm	
Shims available:	0.60 mm
	0.75 mm
	0.90 mm
	1.00 mm

F53



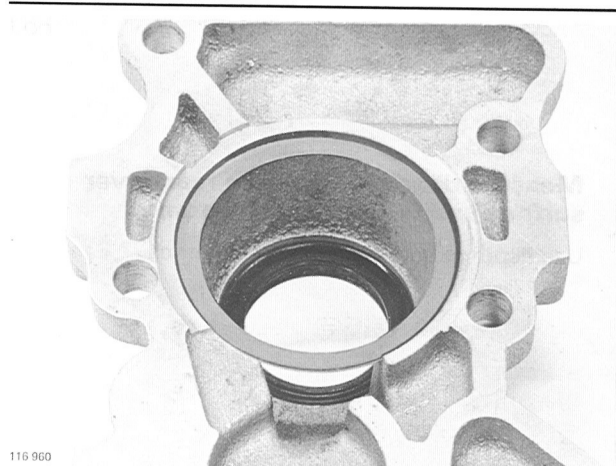
128 932

### Install speedometer drive gear, gasket and shim pack for intermediate shaft.

Speedometer gear flange toward bearing.

Shim pack determined:

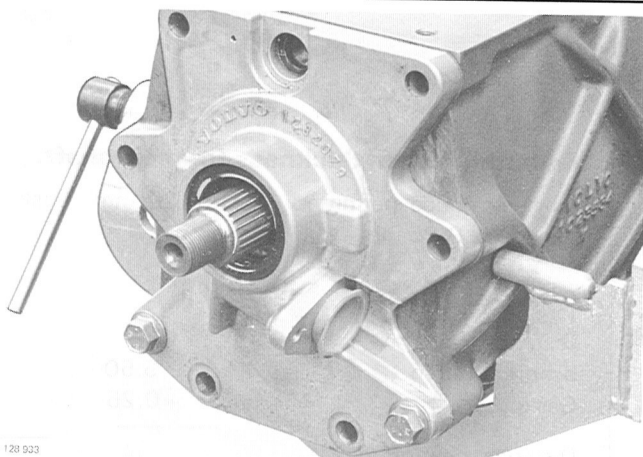
- Op. F15–F24 for transmissions with aluminum housing.
- Op. F48–F49 for transmissions with cast iron housing.



F54

**Position shim for main shaft in rear cover.**

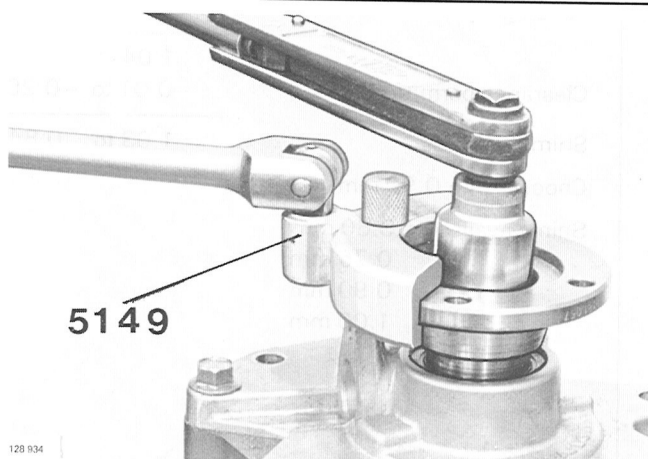
Apply grease to shim to keep it in place.



F55

**Install rear cover.**

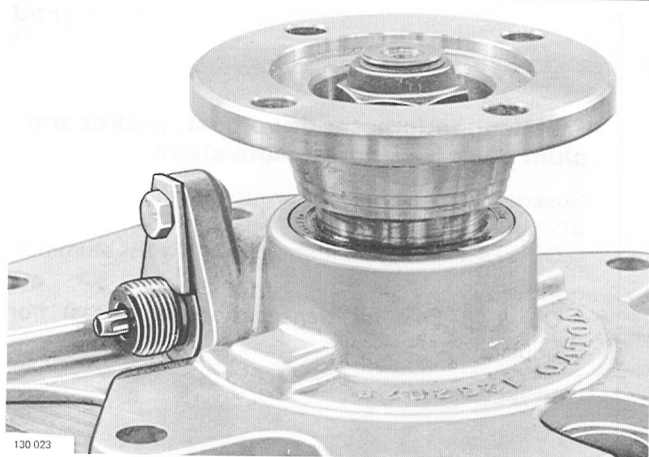
Install two outer (lower) bolts finger tight.  
Install seal in rear cover using drift 5064.



F56

**Install drive flange**

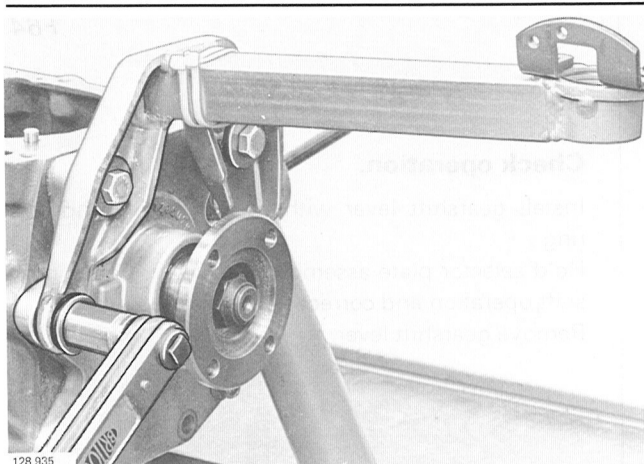
Use wrench **5149** to hold.  
Torque nut to: **90–110 Nm** = 65–80 ft.lbs.



F57

**Install speedometer driven gear with O-ring**

F58



### Install gearshift carrier.

Note sequence: bolt — washer — spacer — washer.

Torque bolts to:

**35–50 Nm = 25–35 ft.lbs.**

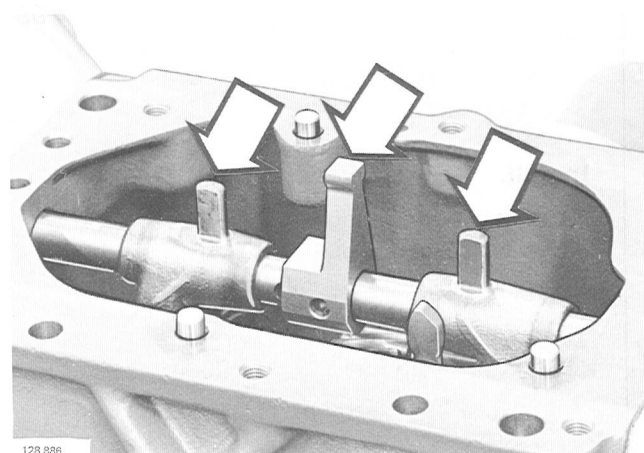
F59

### Install two inner (lower) bolts for rear cover.

Torque four lower bolts to:

**35–50 Nm = 25–35 ft.lbs.**

F60



### Install shift forks.

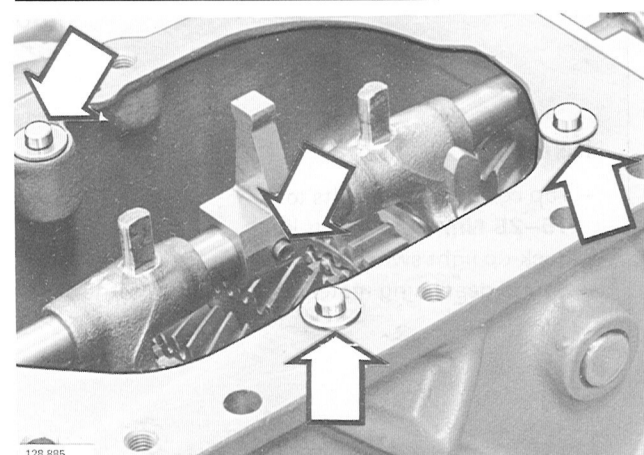
Make sure lugs position correctly.

F61

### Install shifter and gear selector rail.

Shifter boss forward.

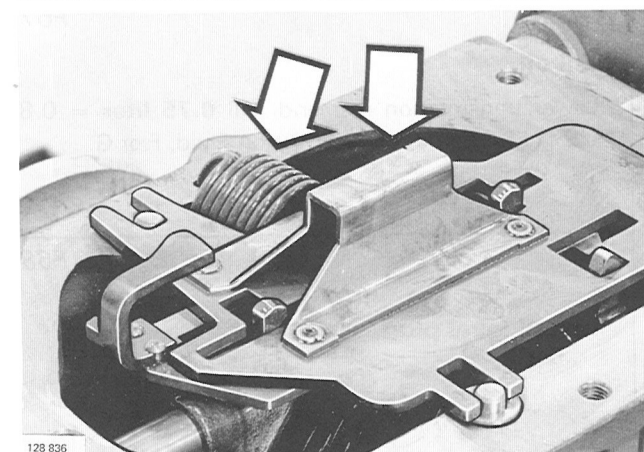
F62



### Install:

- Lock pin for shifter.
- Glide washers for selector plate assembly.

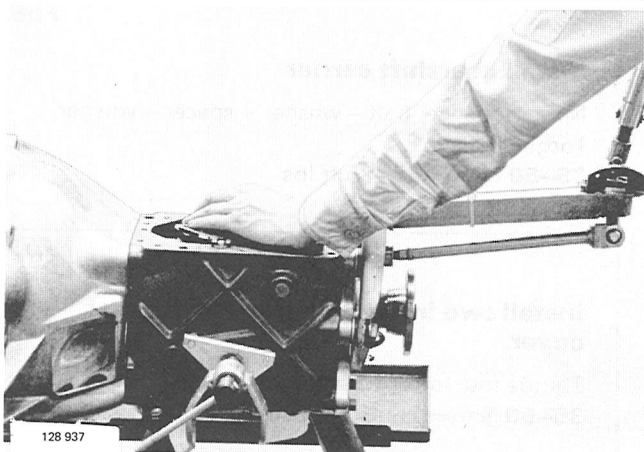
F63



### Install selector plate assembly and return spring.



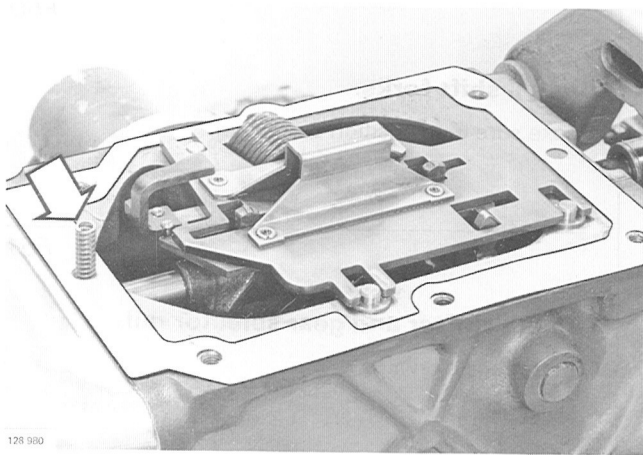
F64



### Check operation.

Install gearshift lever without lock screw and lock ring.  
Hold selector plate assembly with palm. Check gearshift operation and correct as necessary.  
Remove gearshift lever.

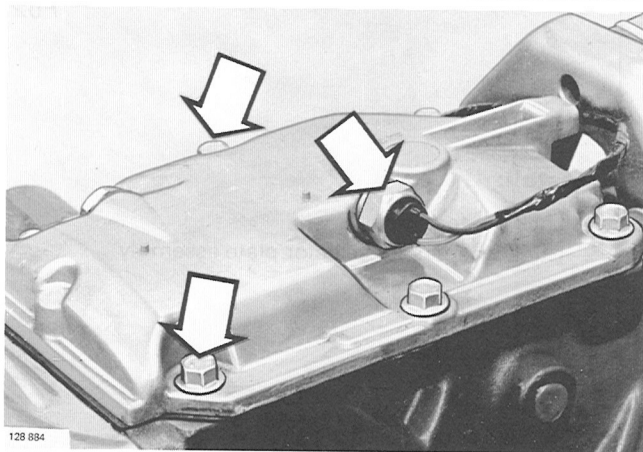
F65



### Install:

- Detent ball and spring.
- New top cover gasket.

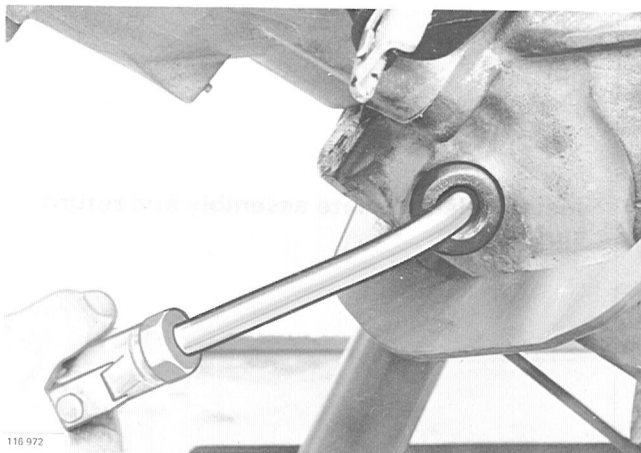
F66



### Install:

- Top cover. Torque bolts to:  
**15–25 Nm = 11–18 ft.lbs.**
- Back-up light switch.
- Sound deadening material on gearshift carrier.

F67



### Fill oil.

Lower transmission rear end. Fill **0.75 liter** = 0.8 US qt of Automatic Transmission Fluid, F or G.

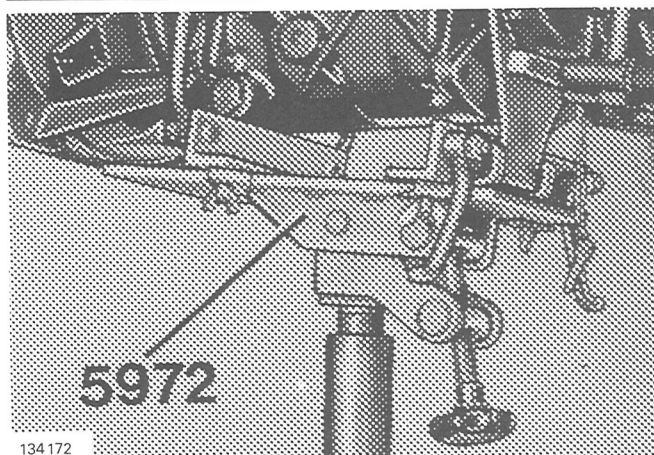
F68

### Install level plug.

## Installing transmission M 45

### Special tools:

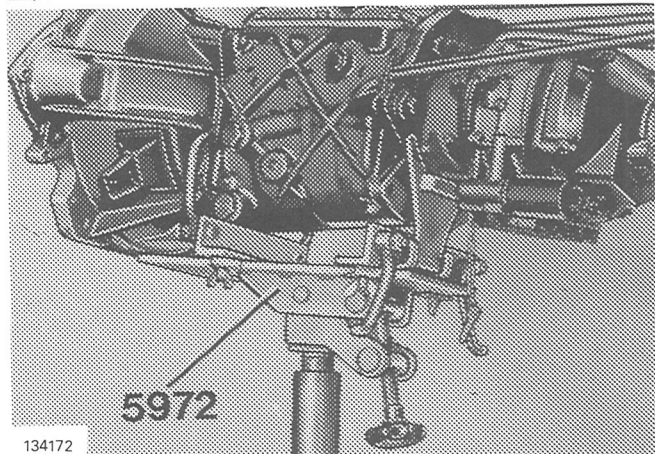
5972 Fixture



G1

### Position transmission and fixture 5972 assembly on lifting device.

Fixture in front position to secure transmission rigidly on fixture.



G2

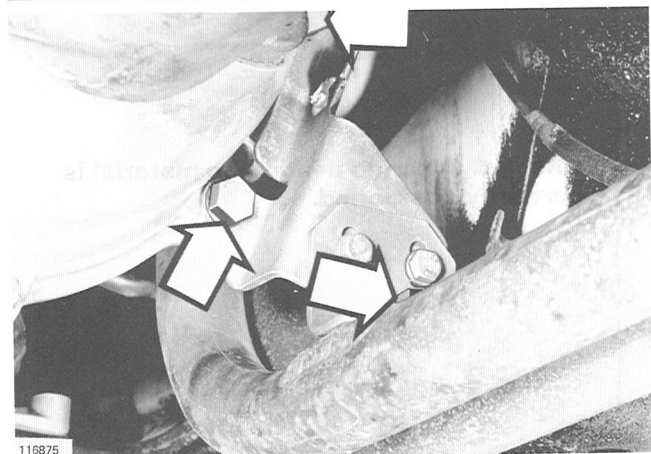
### Install transmission.

Check that throw-out bearing is correctly positioned in fork.

Raise transmission. Turn transmission to free it from propeller shaft tunnel when pushing it in from rear.

Install two lower bolts at bell housing.

Remove fixture and lifting device.



G3

### Install:

- Starter motor and tighten retaining bolts.
- Front exhaust pipe bracket. Two bolts at bell housing, one nut at exhaust pipe.
- Remaining bolts for bell housing.
- Rubber rings for front muffler.

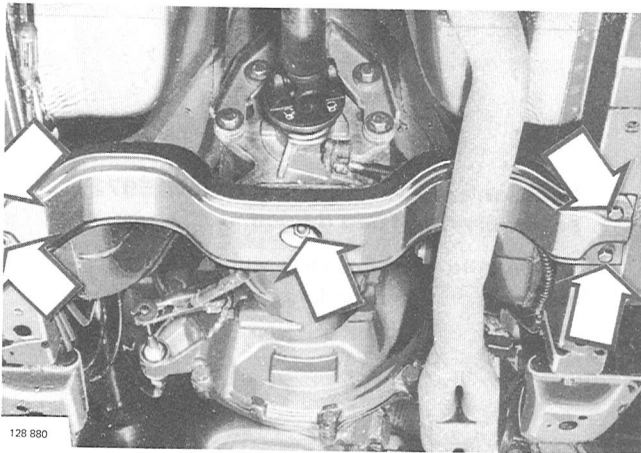




G4

**Install:**

- Clutch cable to bell housing and clutch fork.
- Propeller shaft to transmission drive flange.
- Speedometer cable.



G5

**Install:**

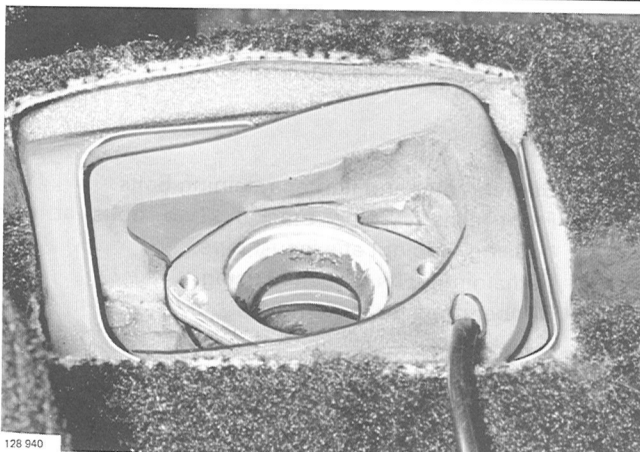
- Cross-member with rubber cushion and bracket.
- Clutch fork return spring.



G6

**Inside vehicle:**

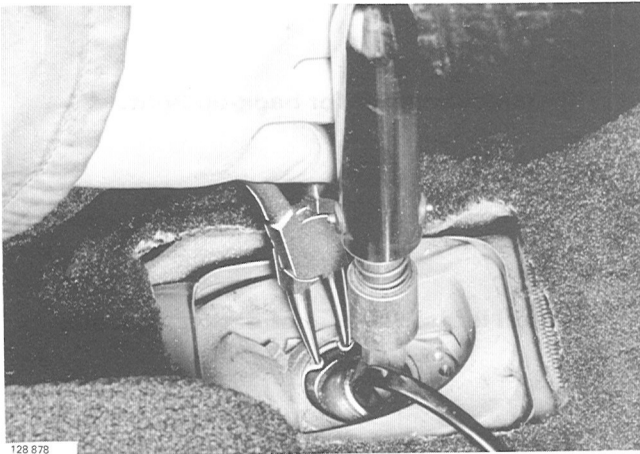
**Install rubber ring and plastic bushing.**



G7

**Check that sound deadening material is correctly positioned.**

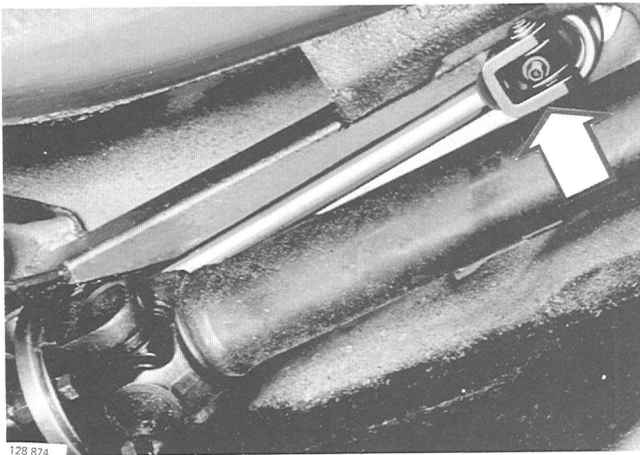
G8



**Install gearshift lever.**

Install retaining ring.

G9

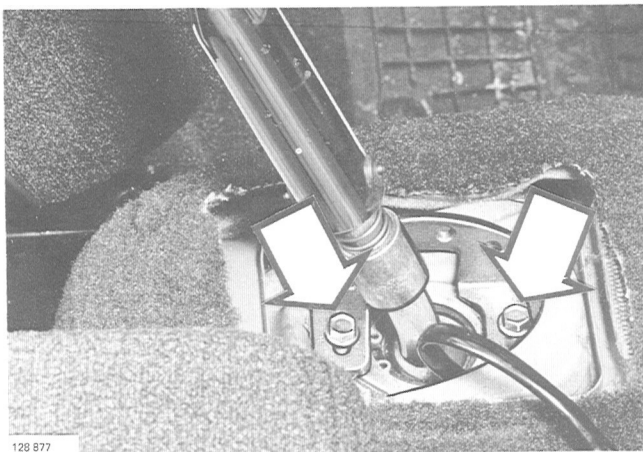


**From under vehicle:**

**Attach gearshift rod to gearshift lever.**

Push pivot pin onto position and install locking screw.

G10



**Install reverse detent plate.**

G11

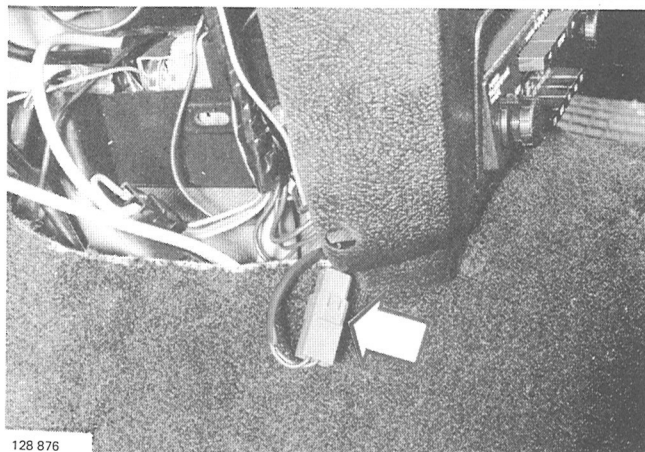


**Adjust clearance for reverse gear detent.**

Engage 1st gear and adjust clearance between detent plate and gear shift lever.

Correct clearance: **0.5–1.5 mm = 0.020–0.060"**.

Engage 2nd gear and recheck clearance.



G12

**Install connector for back-up light.**

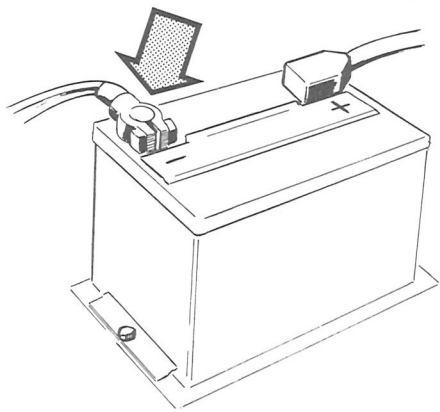
G13

**Install left side panel of center console.**



G14

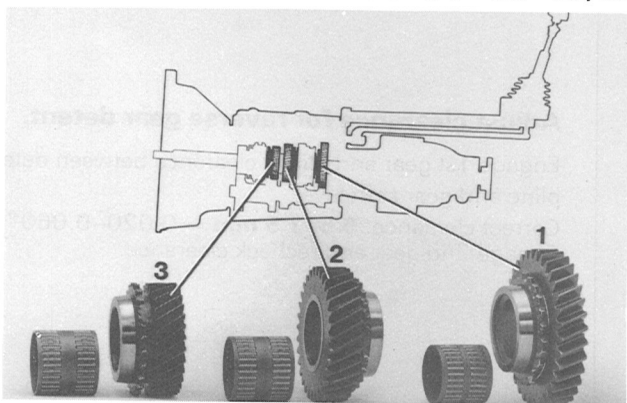
**Install gearshift lever cover.**



G15

**Reconnect battery ground cable.**

## New features of M 45/M 46 transmission 1979—



### Manual transmission.

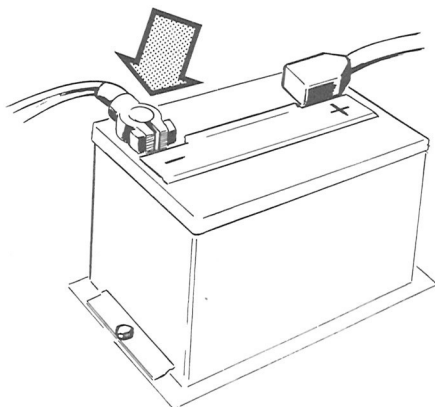
Manual transmissions have been equipped with needle bearings for first, second and third gear. This does not affect the repair methods for manual transmission.

## Removing transmission M 46

### Special tools:

**5972 Fixture**, removing transmission

**5181 Pliers**, removing pin on gearshift lever



### Important!

H1

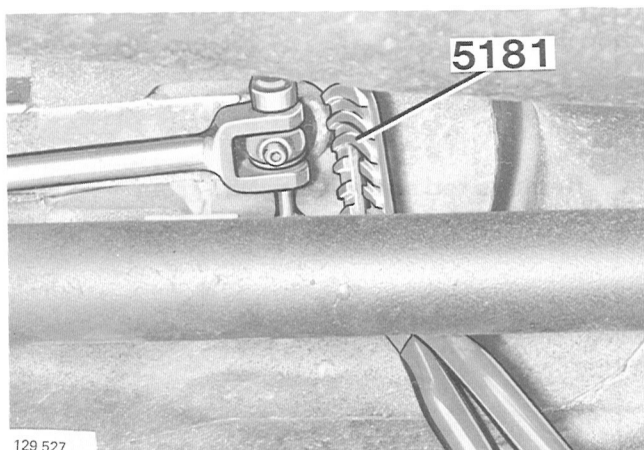
#### Release overdrive.

- Raise rear wheels from ground.
- Start engine and engage 4th gear.
- Engage overdrive.
- Depress clutch pedal and stop engine.

H2

**Disconnect battery ground cable.**

130015



129 527

### From under vehicle:

H3

#### Disconnect gearshift lever from gearshift rod.

Remove lock bolt. Use pliers **5181** to remove pivot pin.



128 843

### Inside vehicle:

H4

**Disconnect gearshift lever cover from floor.**

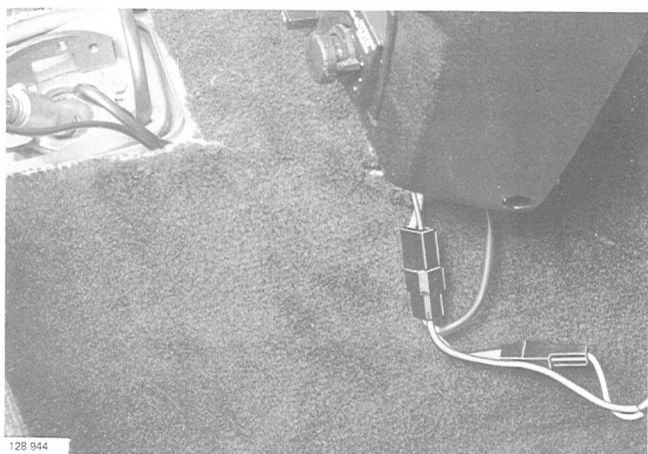




H5

**Inside vehicle:**

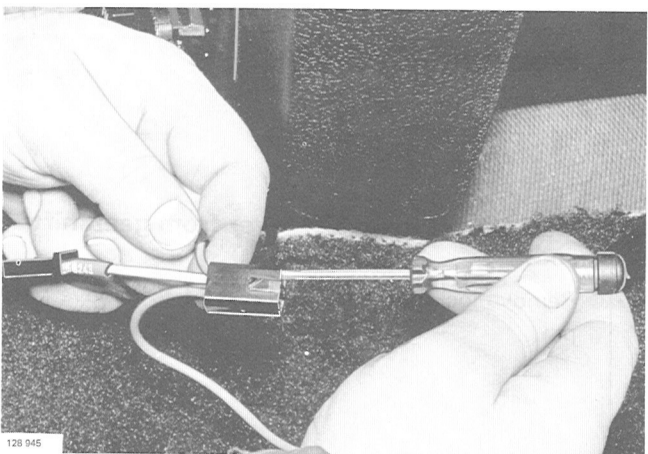
- Remove left side panel at center console.
- Separate connector.



H6

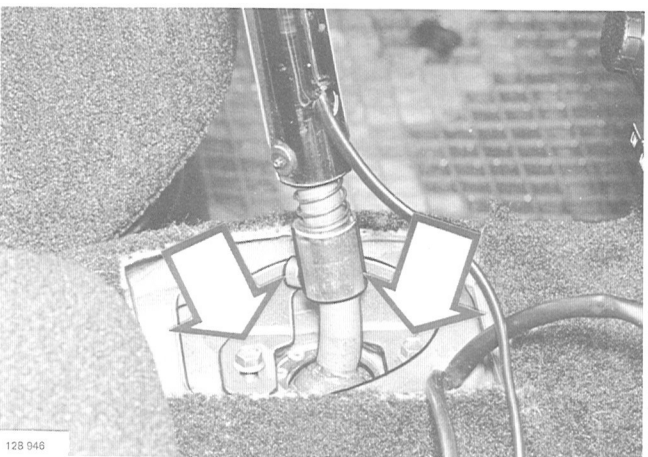
**Separate connector for overdrive.**

- Remove right side panel at center console.
- Separate both connectors.



H7

**Remove red and yellow wire from connector.**

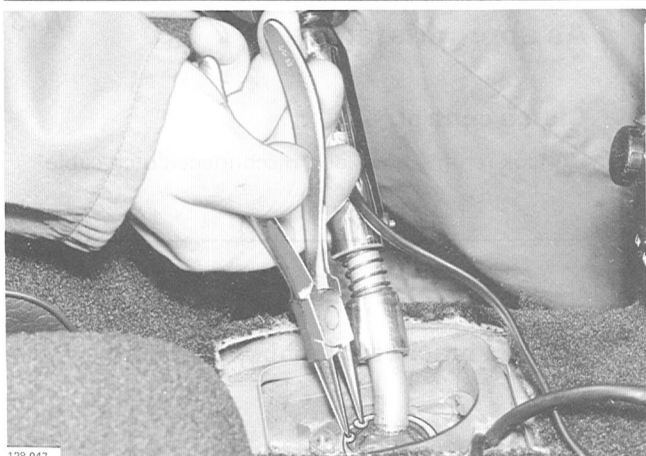


H8

**Remove reverse detent plate.**



H9

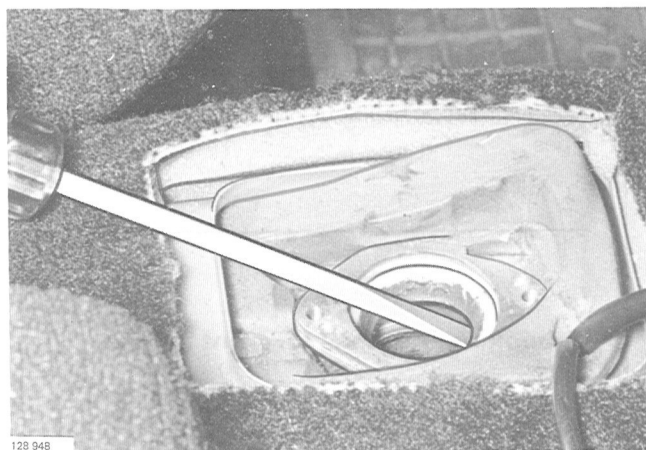


128 947

### Remove gearshift lever.

Remove lock ring to free gearshift lever.

H10



128 948

### Remove plastic bushing and rubber ring.

H11

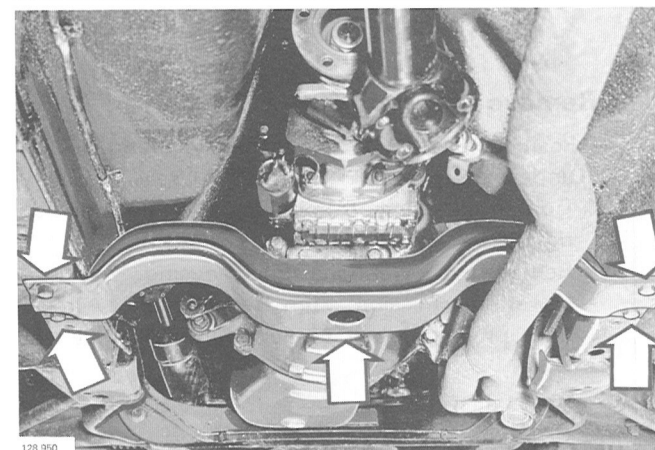


128 949

### From under vehicle:

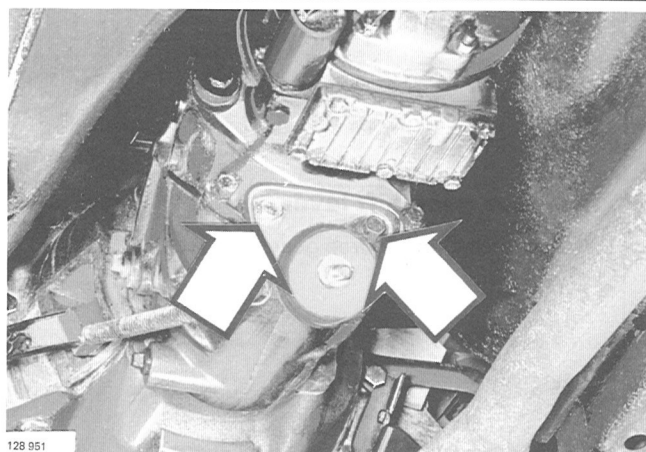
- Disconnect speedometer cable from drive gear.
- Disconnect propeller shaft from drive flange.

H12



128 950

### Remove cross-member assembly.



**As appropriate:**

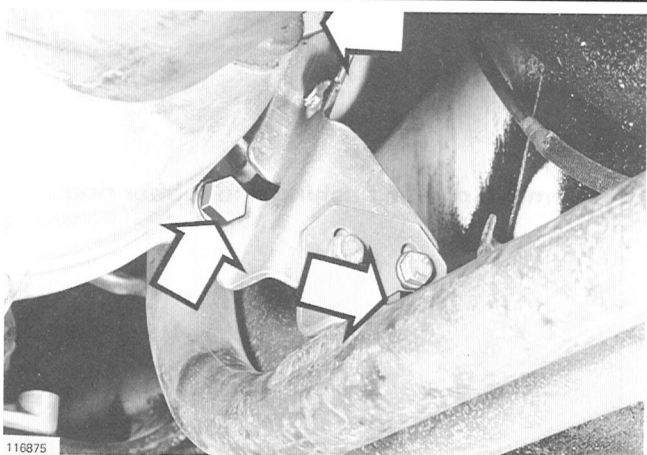
H13

**Clutch control.**

Unhook return spring and disconnect clutch cable.

H14

**Remove bracket for rubber cushion.**



H15

**Remove front exhaust pipe attachment.**

Remove bolts at bell housing. Remove nut at exhaust pipes.

H16

**Unhook rubber rings for front muffler.**



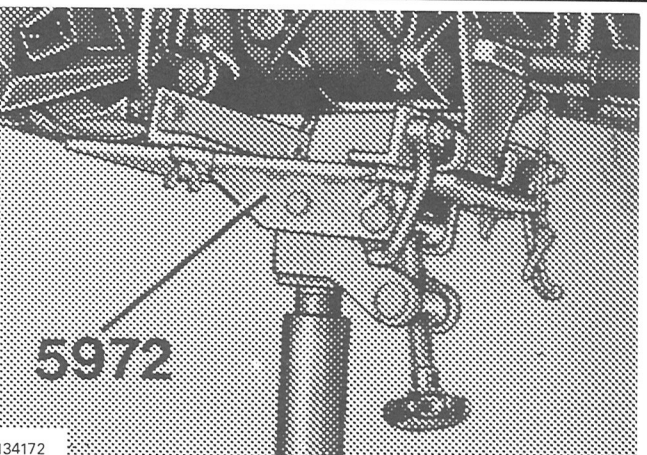
H17

**Begin separating bell housing from engine.**

H18

**Pull out starter motor until free from bell housing.**

H19



**Remove transmission.**

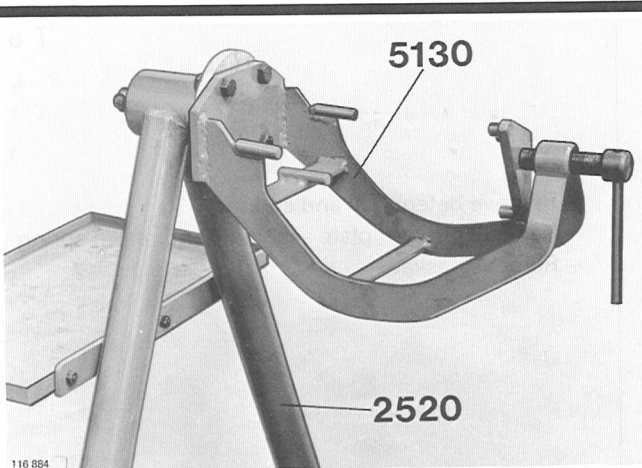
- Position fixture **5972**, attached to lifting device, under transmission. Fixture in rear position. Tighten attachment bolts to hold transmission rigidly.
- Remove two lower bolts at bell housing.
- Lower transmission. Turn transmission to free it from propeller shaft tunnel while pulling it rearward.

## Disassembling transmission M 46

### Special tools:

**2520** Stand  
**2853** Adapter, removing gear and synchro ring  
**2985** Adapter, removing main shaft bearing  
**5058** Tool, removing main shaft bearing  
**5130** Fixture, for transmission

**5131** Puller, removing intermediate shaft bearing  
**5147** Tool, removing main shaft bearing  
**5148** Tool, removing main shaft bearing  
**5177** Puller, intermediate shaft bearings, aluminum housing



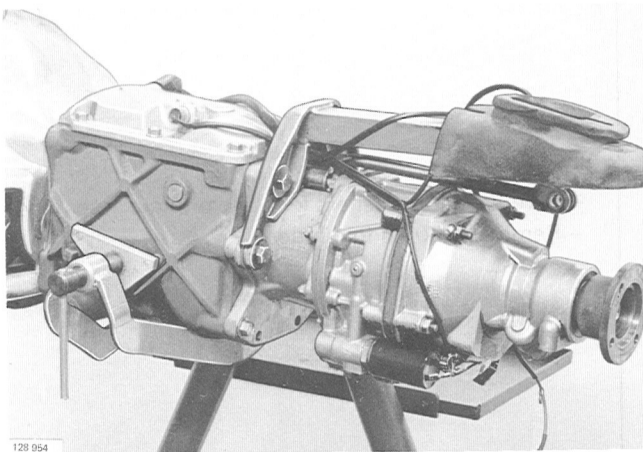
I 1

### Attach fixture 5130.

Use four bolts to attach to stand 2520.

#### NOTE:

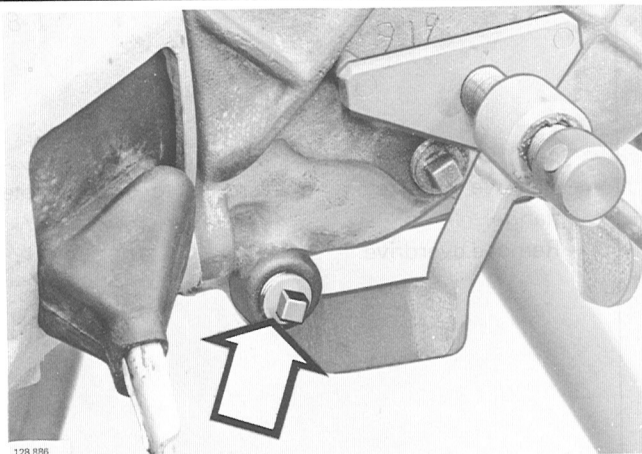
Modified type fixture 5130, must be used. See "Modification of fixture 5130" at end of Special Tool section.



I 2

### Install transmission to fixture.

Make sure all mating surfaces align when tightening holding bolt.



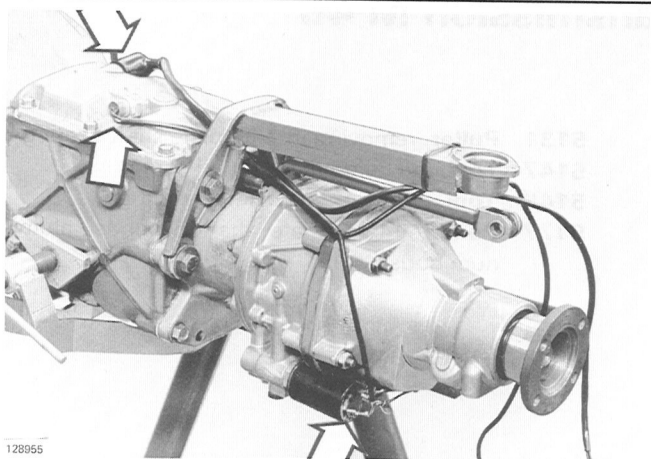
I 3

### Remove sound deadening material from gearshift carrier.

I 4

### Remove drain plug and drain oil.

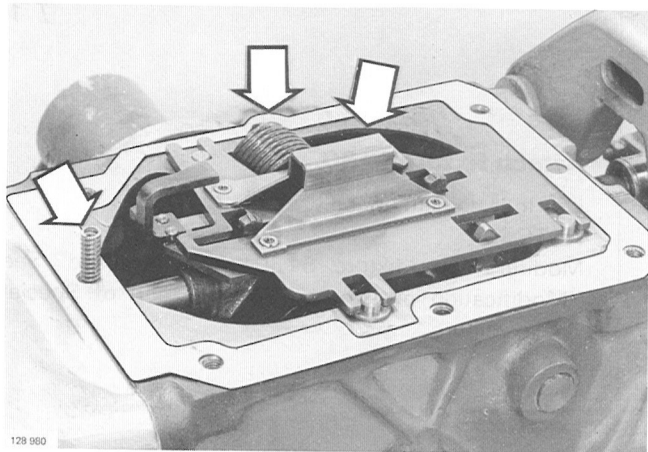
I 5



128 955

- Disconnect wires at overdrive solenoid.
- Remove back-up light switch.
- Remove overdrive switch.
- Remove transmission top cover.

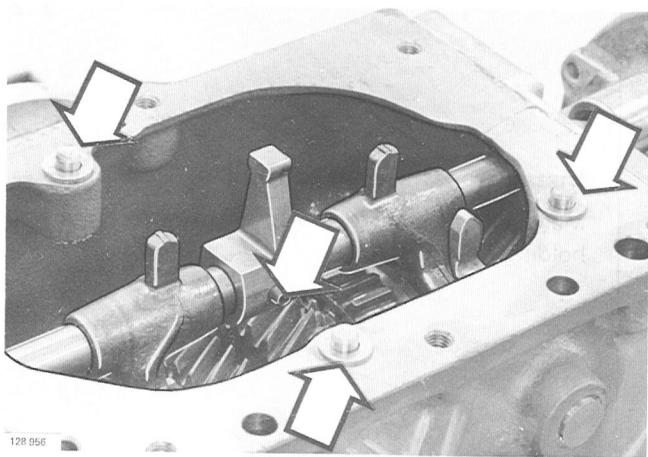
I 6



128 960

- Remove detent ball and spring.
- Remove selector plate assembly and return spring.
- Remove gasket.

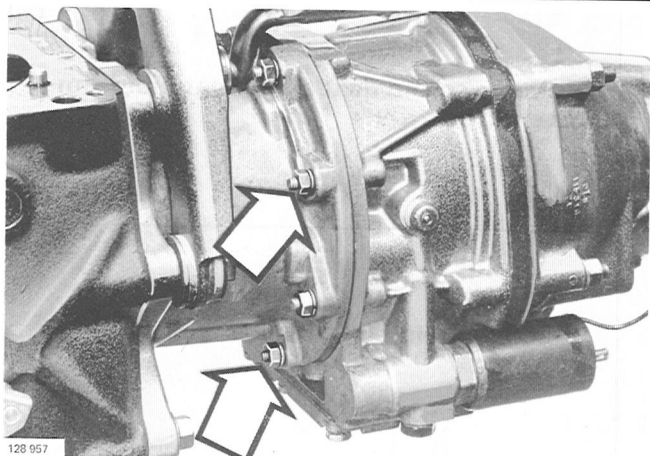
I 7



128 956

- Remove glide washers for selector plate assembly.
- Remove lock pin for shifter.

I 8

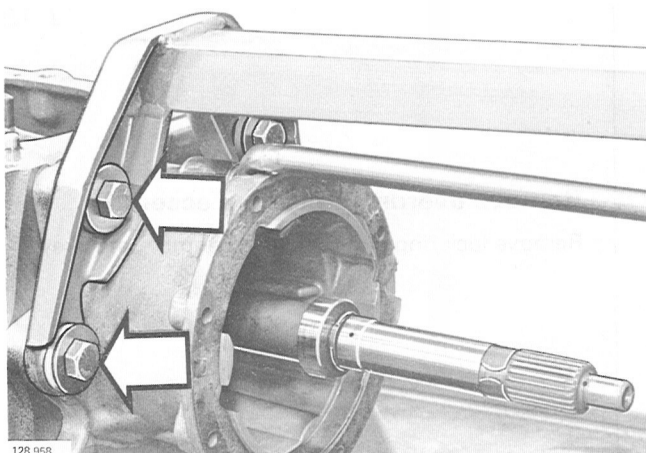


128 957

- Remove nuts retaining overdrive to intermediate flange.
- Remove overdrive.



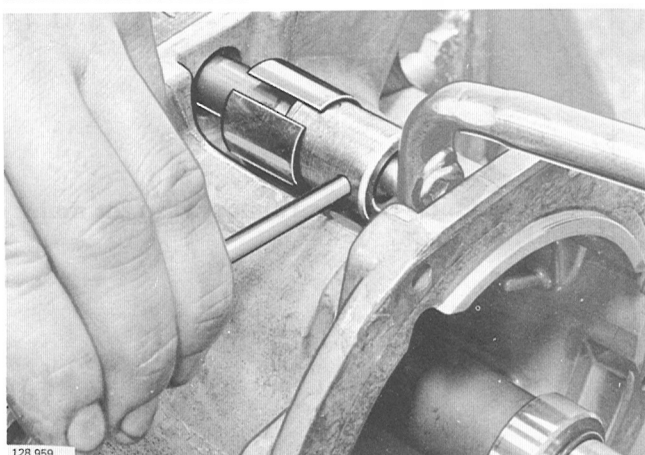
I 9



128 958

**Remove gearshift carrier assembly.**

I 10

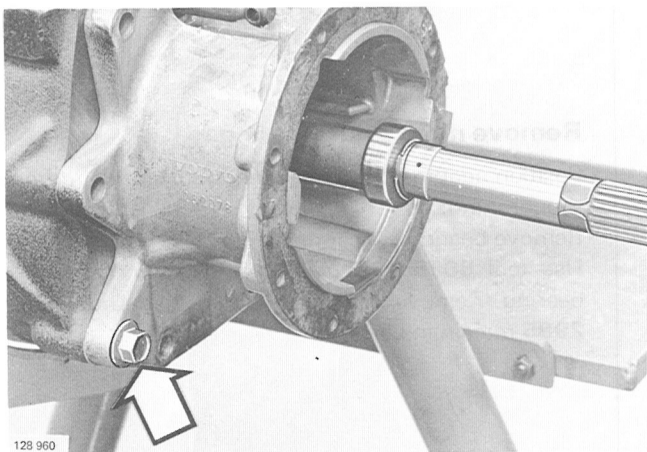


128 959

**Remove.**

- Remove sleeve for gearshift rod joint.
- Remove gearshift rod.  
First knock out rear pin. Then turn rod and knock out front pin.

I 11

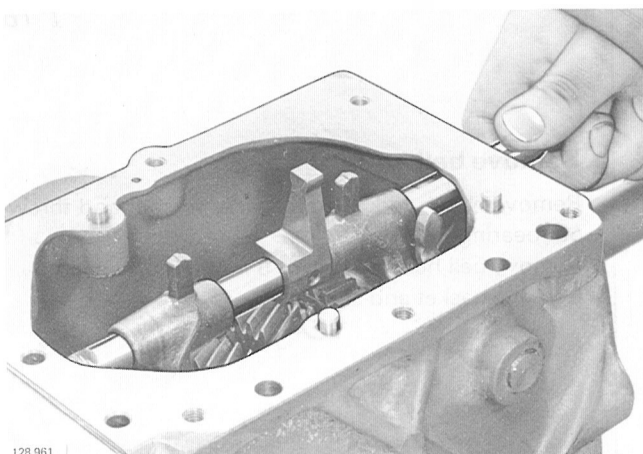


128 960

**Remove intermediate housing.**

Remove gasket and shims.

I 12

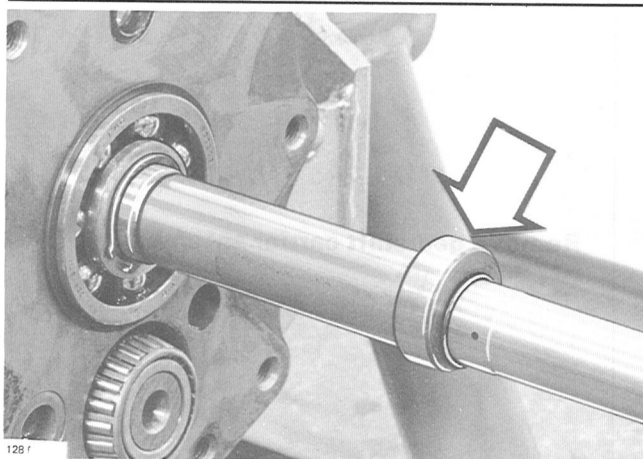


128 961

- Remove gear selector rail.
- Remove shifter and shift forks.



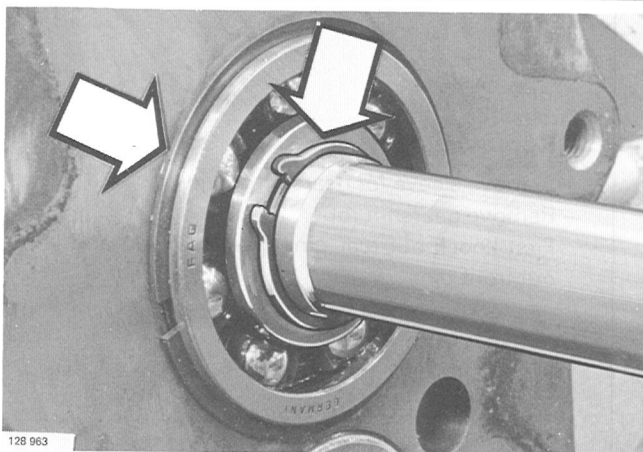
I 13



**Remove overdrive oil pump eccentric.**

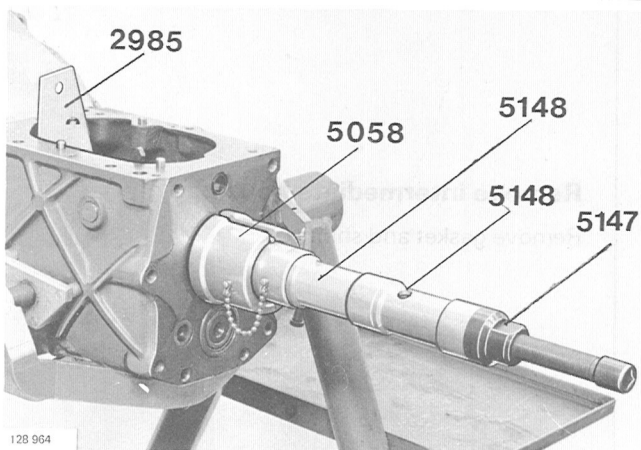
Remove lock ring and pull off eccentric. Catch key.

I 14



**Remove lock ring and spacer ring for main shaft bearing.**

I 15



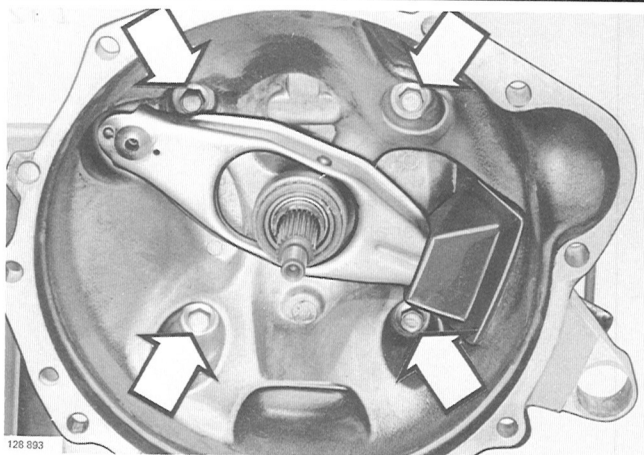
**Remove main shaft bearing.**

Position adapter **2985** between input shaft and front synchro ring.

Remove bearing spacer ring.

Use tool **5085** + **5148** (2) and **5147** to remove bearing. Remove bearing thrust washer. Let adapter **2985** remain in place.

I 16

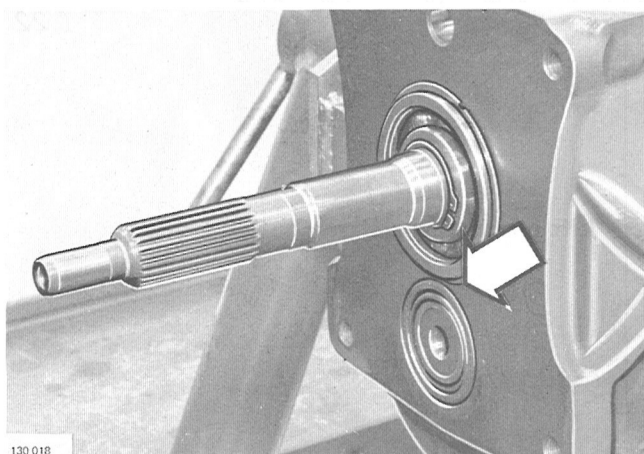


**Remove bell housing.**

Remove clutch fork. Catch spacer washer and throw-out bearing.

Remove bell housing, using 8 mm inhex wrench.

Remove gasket and shims.



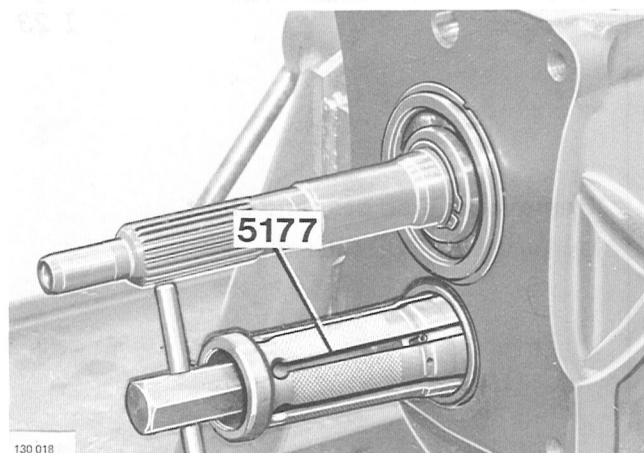
130 018

**Cast iron housing:**

I 17

**Remove outer races for intermediate shaft bearings.**

First knock intermediate shaft back until rear outer race comes free. Then knock shaft forward until front outer race can be removed.



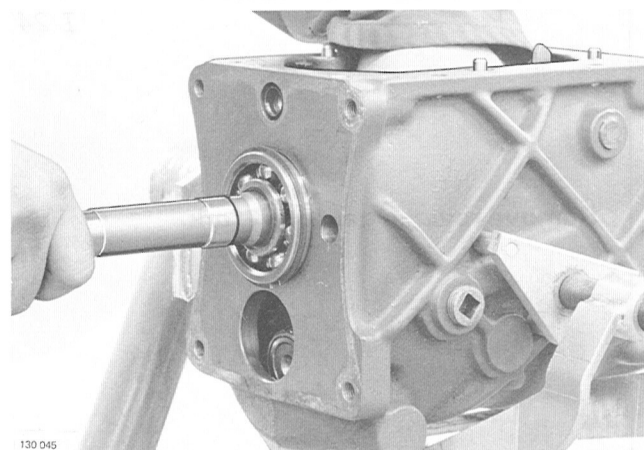
130 018

**Aluminum housing:**

I 18

**Remove outer races for intermediate shaft bearings.**

Carefully knock intermediate shaft until puller **5177** can grip races.

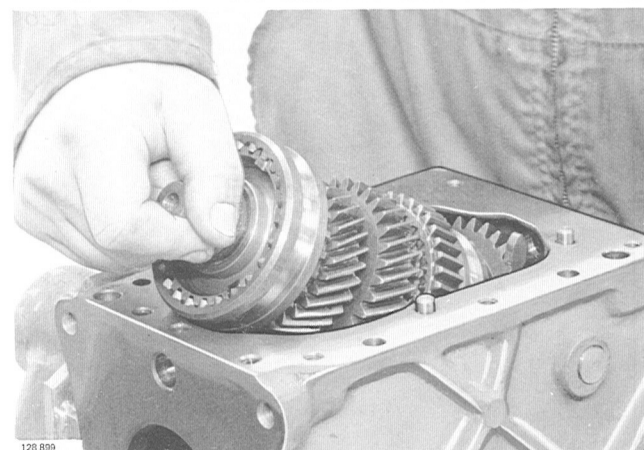


130 045

**Pull out input shaft.**

I 19

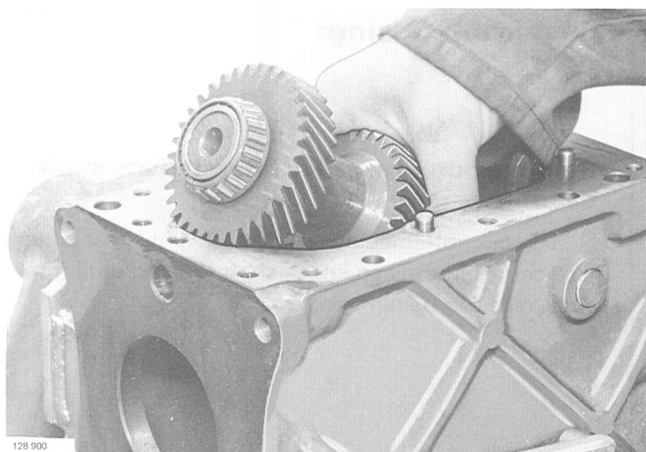
I 20

**Remove 4th gear synchro ring.**

128 899

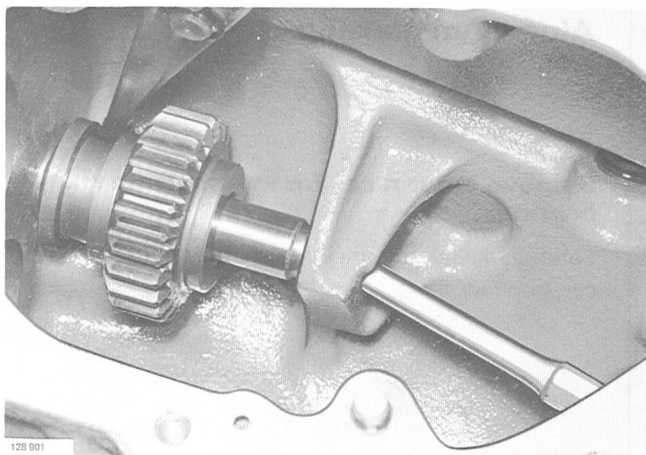
**Lift out main shaft**

I 21



I 22

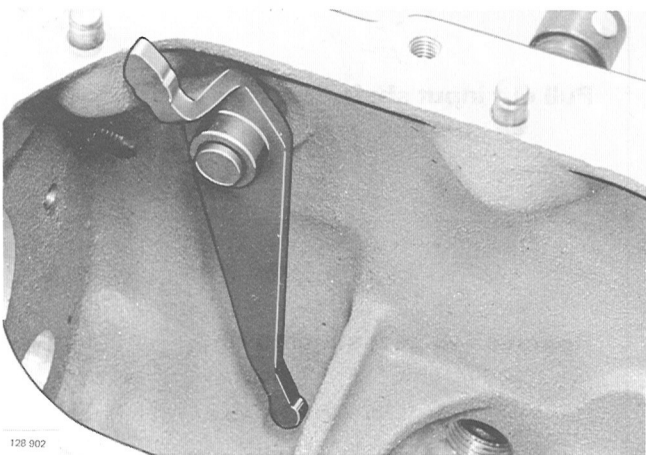
**Lift out intermediate shaft.**



I 23

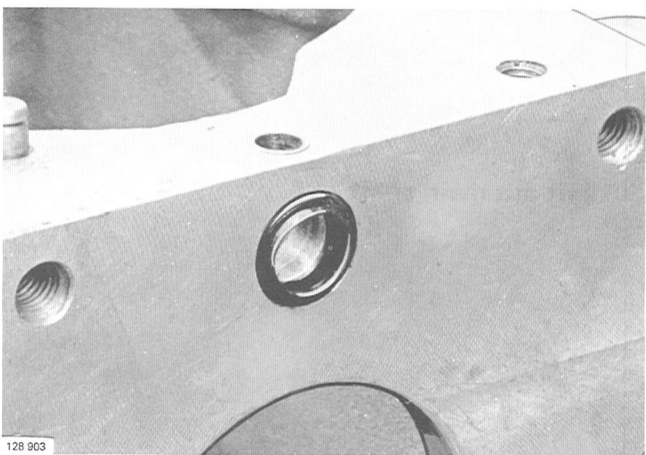
**Remove reverse gear and shaft.**

Use punch to knock shaft back.



I 24

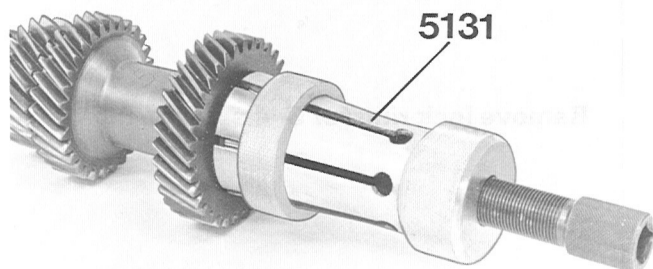
**Remove reverse gear shift fork.**



I 25

**Remove seal for selector rail.**

I 26

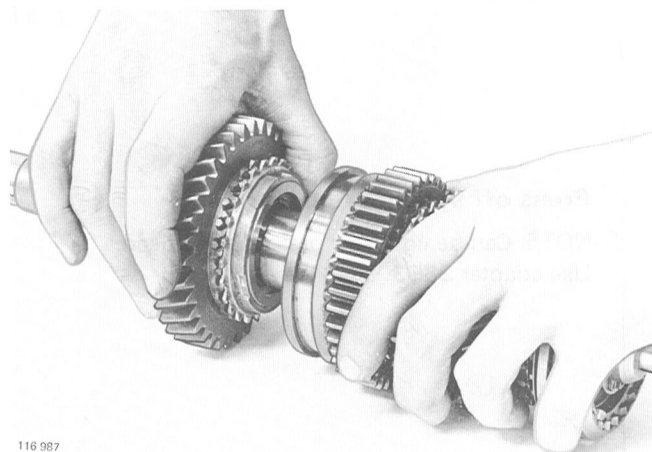


116 013

**Remove intermediate shaft bearings.**

Use puller **5131**.

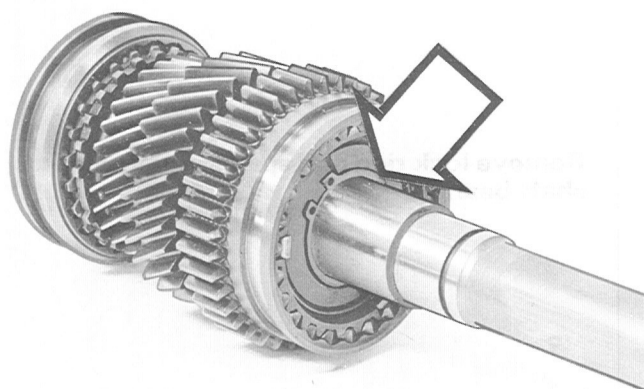
I 27



116 987

**Remove 1st gear and synchro ring from main shaft.**

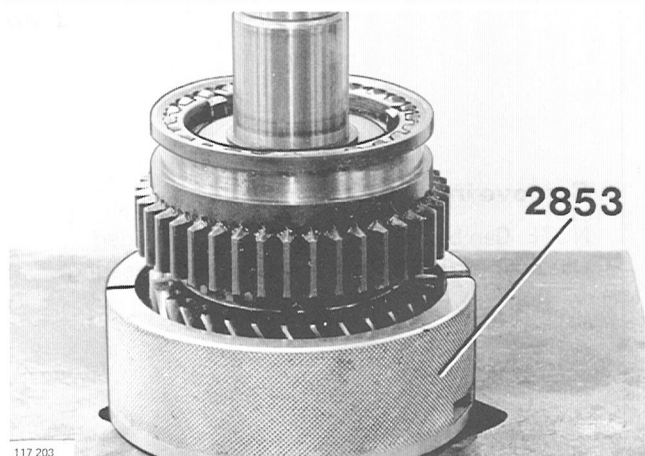
I 28



116 988

**Remove lock ring for 1–2 synchro hub.**

I 29

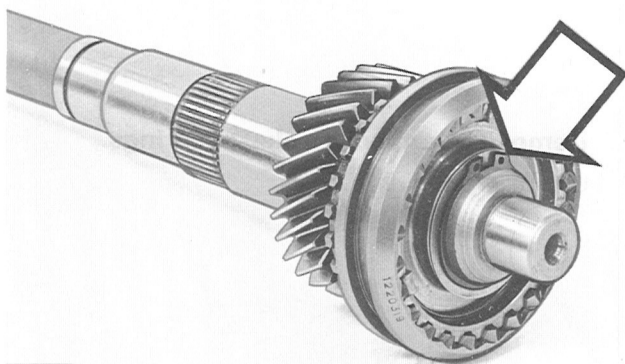


117 203

**Press off synchro hub and gear.**

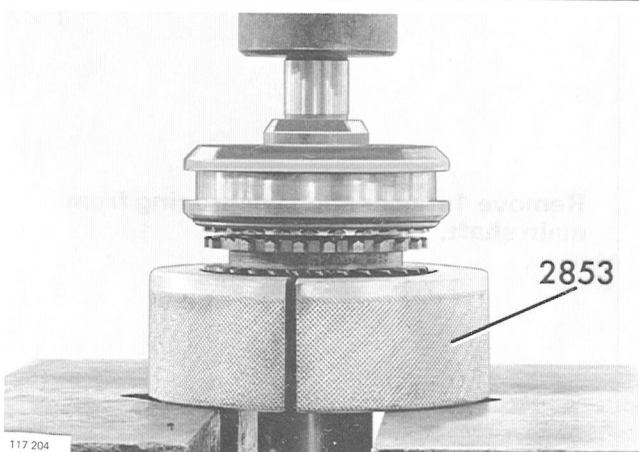
NOTE: Can be tight so a press may be needed.  
Use adapter **2853**.

I 30



**Remove lock ring for 3-4 synchro hub.**

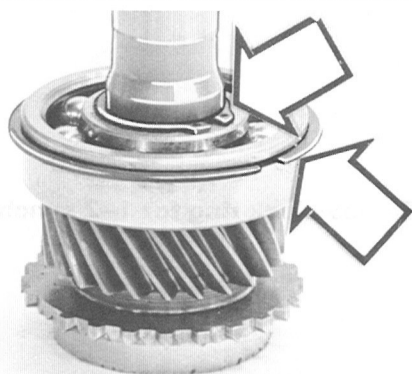
I 31



**Press off synchro hub and gear.**

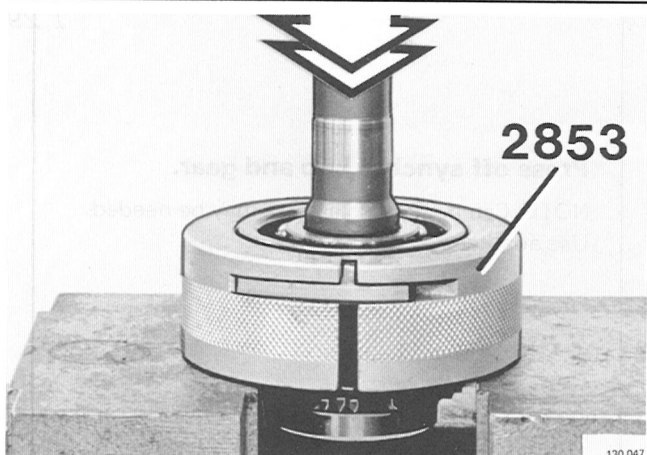
NOTE: Can be tight so a press may be used.  
Use adapter **2853**.

I 32



**Remove lock ring and spacer ring for input shaft bearing.**

I 33

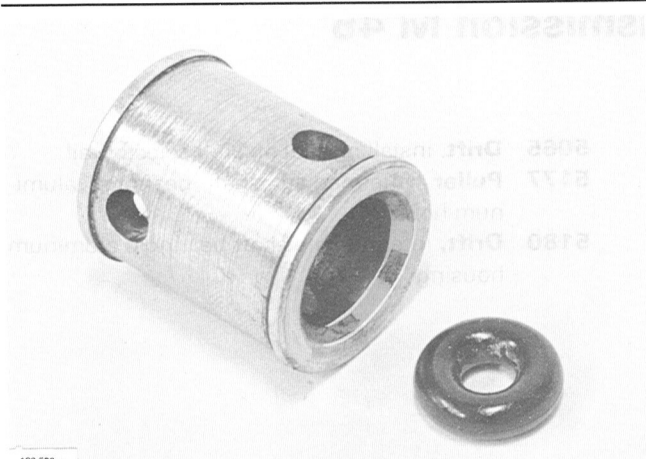


**Remove input shaft bearing.**

NOTE: Can be tight so a press may be needed.  
Use adapter **2853**, small hole UP under bearing.



I 34



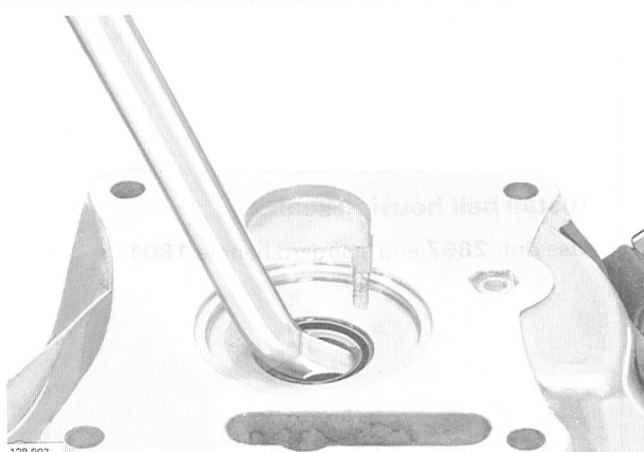
**Remove rubber ring from gearshift rod joint.**

I 35



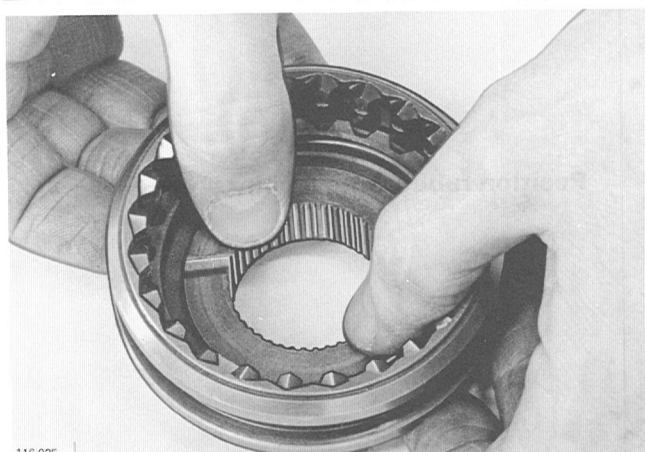
**Remove gearshift rod bushings.**

I 36



**Remove bell housing seal.**

I 37



**Disconnect two synchro hubs.**

Push hubs out of sleeves.

I 38

**Cleaning – checking.**

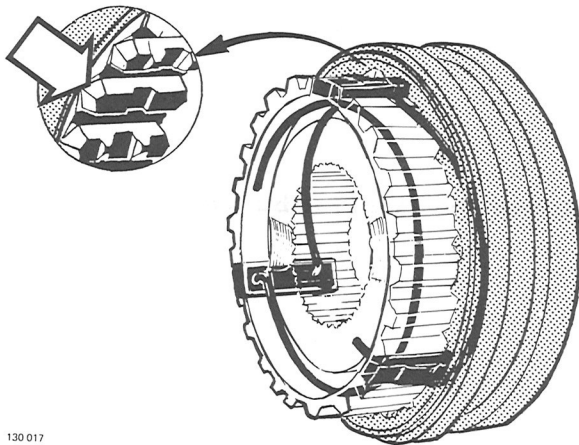
Clean all parts in solvent. Blow clean with compressed air.

Carefully check all parts. Replace worn or damaged parts. Replace gaskets and seals.

## Assembling transmission M 46

### Special tools:

- 1801 Standard handle**
- 2412 Drift**, installing input shaft bearing
- 2831 Press tool**, installing main shaft bearing
- 2852 Adapter**, installing gear and synchro ring
- 2867 Drift**, installing bell housing seal
- 2986 Drift**, installing intermediate shaft bearings
- 5065 Drift**, installing seal on shift selector rail
- 5177 Puller**, intermediate shaft bearings, aluminum housing
- 5180 Drift**, intermediate shaft bearings, aluminum housing

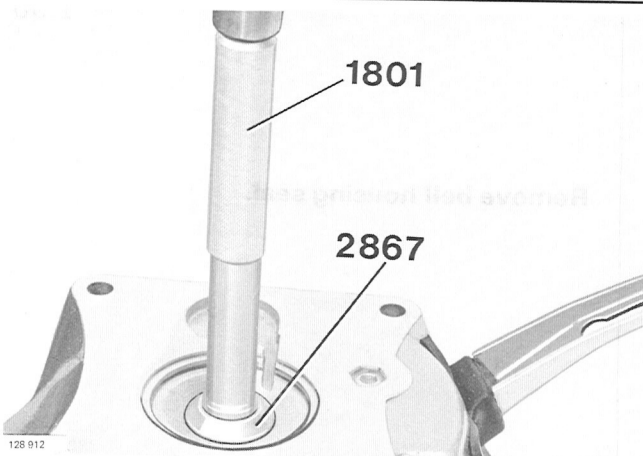


J1

### Connect 1-2 and 3-4 synchro hubs.

Position hub in sleeve so that hub slots align chamfered teeth in sleeve. Insert dogs (three) and lock them with springs.

NOTE: With curved lock ring, align springs to let free ends press against synchro ring.



J2

### Install bell housing seal.

Use drift **2867** and standard handle **1801**.



J3

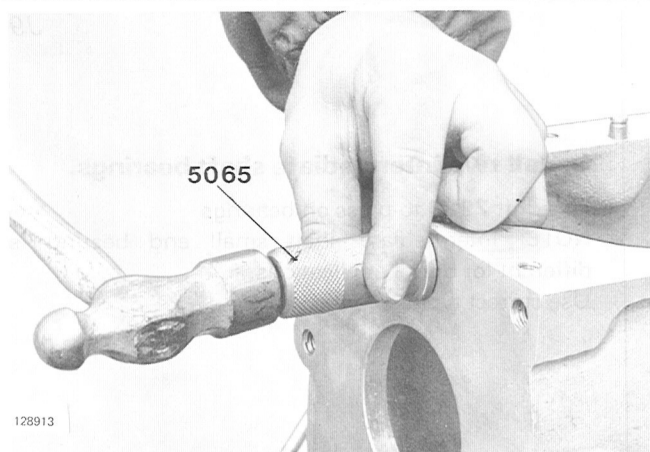
### Position rubber ring in joint.

J4

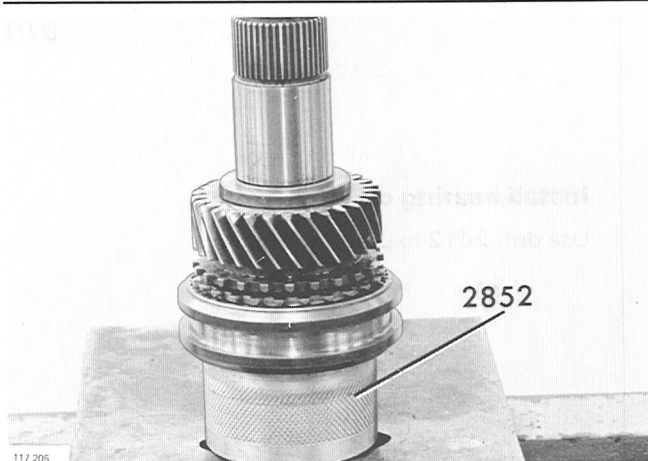
**Install bushings on gearshift rod.**

Use grease to retain rubber ring on right side.

J5

**Install seal for selector rail.****Drift 5065.**

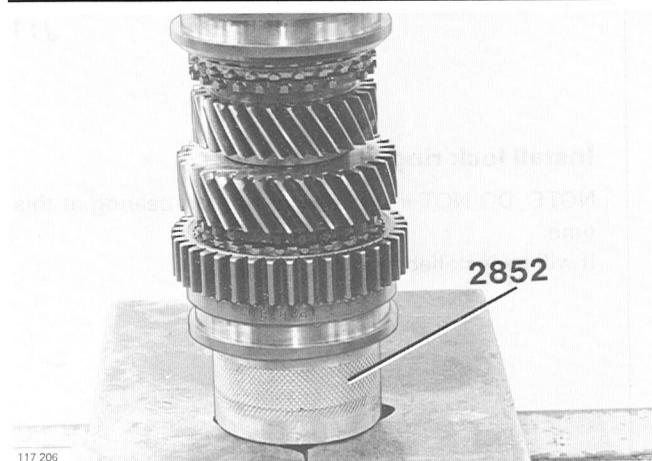
J6

**Install:**

- 3rd gear and syncro ring.
- 3–4 synchro hubs on main shaft.
- Lock ring.

Use adapter **2852** when pressing on gear and hub.

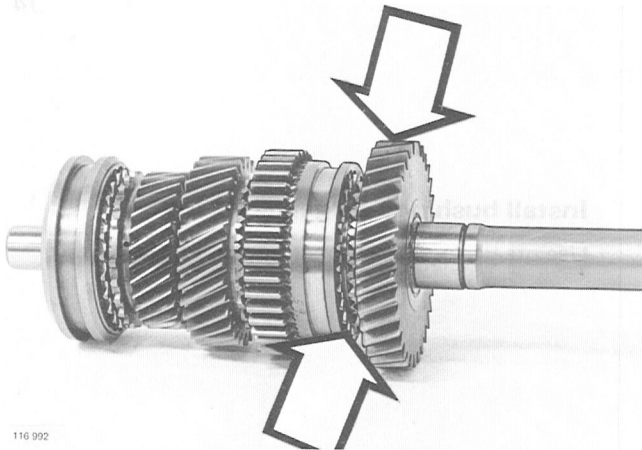
J7

**Install:**

- 2nd gear and synchro hub.
- 1–2 synchro hub on main shaft.
- Lock ring.

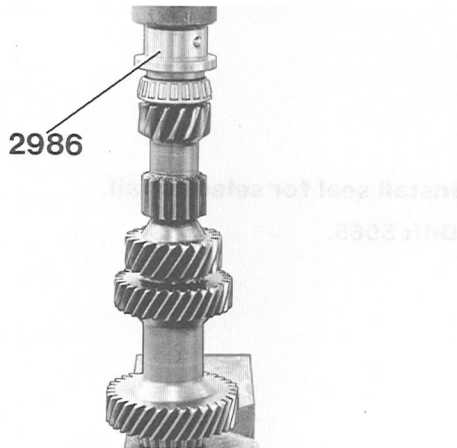
Use adapter **2852** when pressing on gear and hub.

J8



**Install 1st gear and synchro ring on main shaft.**

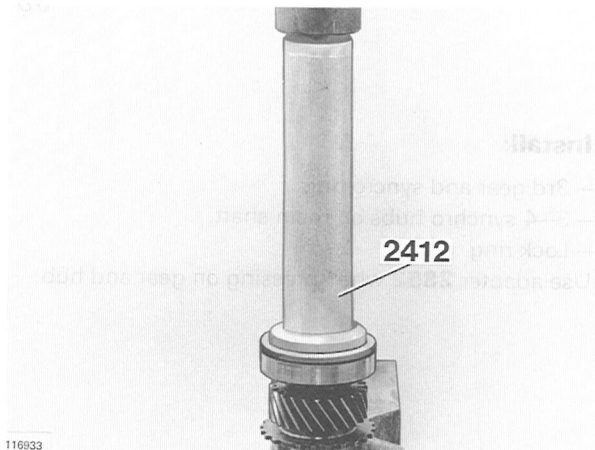
J9



**Install two intermediate shaft bearings.**

Use drift **2986** to press on bearings.  
NOTE: Intermediate shaft small end bearing is different for diesel applications.  
Use correct type bearings.

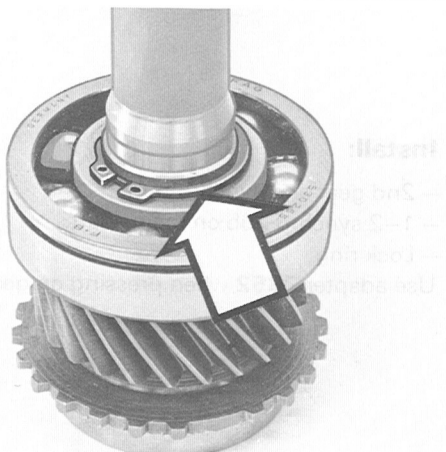
J10



**Install bearing on input shaft.**

Use drift 2412 to press on bearing.

J11



**Install lock ring on input shaft.**

NOTE: DO NOT install spacer ring on bearing at this time.  
It will be installed later on.

## Special instructions for transmissions with aluminum housing

Prior to further assembly, intermediate shaft pre-tension should be determined. Follow operations J12–J21.

J12

**Position intermediate shaft in housing.**

J13

**Position outer races for intermediate shaft bearings.**

Use drift **5180**, large outer diameter toward race.

J14

**Install bell housing with gasket.**

Torque bolts to:  
**35–50 Nm = 25–35 ft.lbs.**

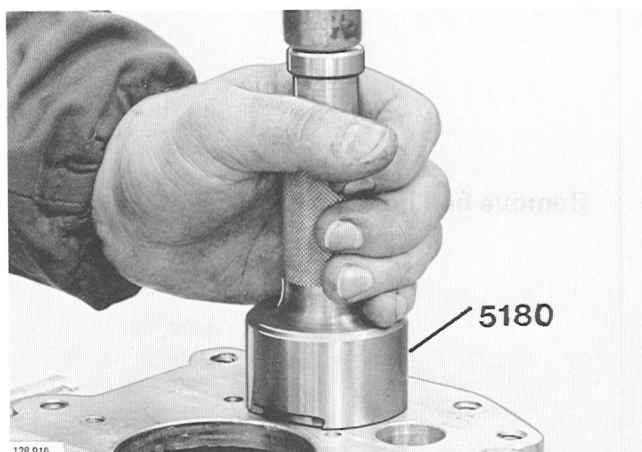
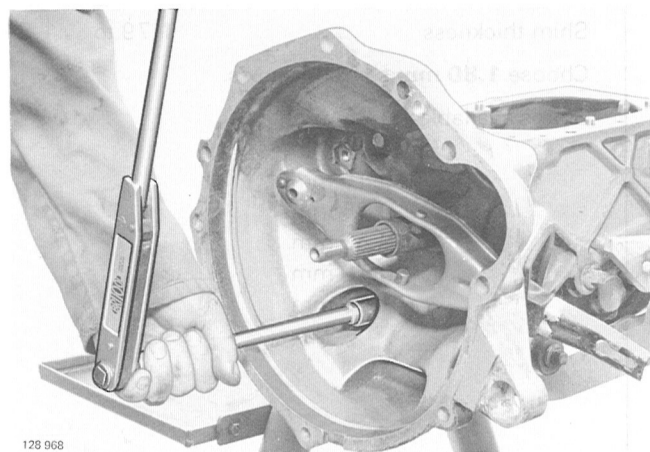
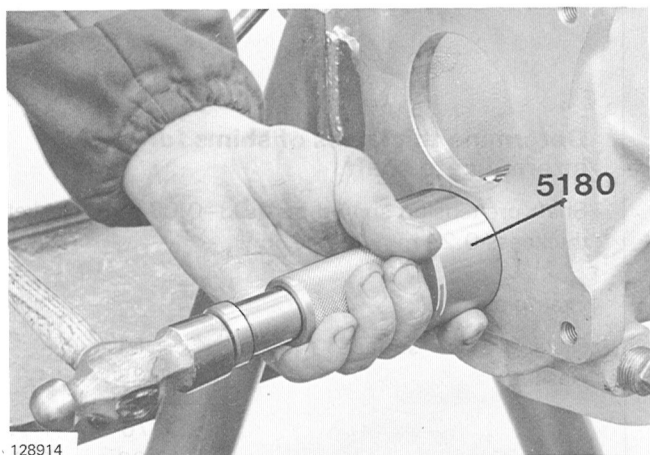
J15

**Turn transmission to vertical position.**

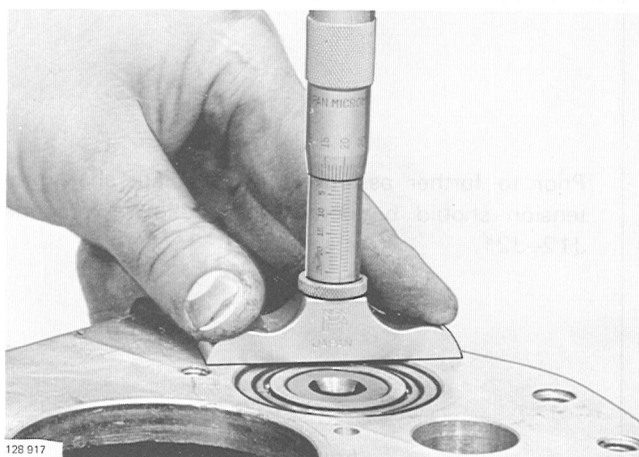
J16

**Eliminate clearance in intermediate shaft bearings.**

Use drift **5180**, small diameter toward rear race. Hold drift rigidly and knock race with light taps. Repeat while rotating shaft, until all clearance is gone and shaft runs somewhat sluggish.







J17

**Measure distance between intermediate shaft bearing outer race and rear surface of housing.**

Use depth gauge and note reading.

J18

**Determine thickness of shims for intermediate shaft.**

Shaft pre-tension should be 0.03–0.08 mm. Gasket thickness 0.25 mm (metric only).

Example:

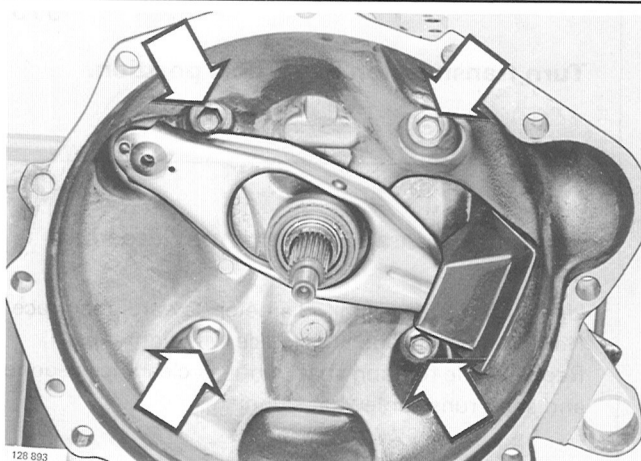
Distance, race—surface	1.51	
Gasket	+0.25	
	<hr/>	
	1.76	1.76
Pre-tension	+0.03 to	+0.08
	<hr/>	
Shim thickness	1.79 to	1.84

Choose **1.80 mm** shim thickness.

Shims available:

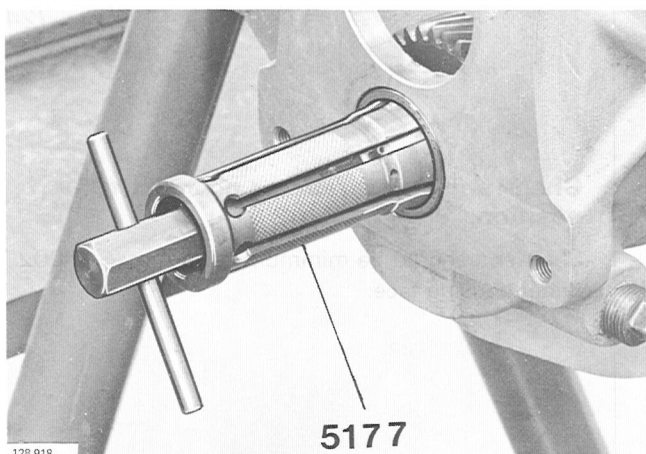
- 0.05 mm
- 0.10 mm
- 0.15 mm
- 0.35 mm
- 0.50 mm
- 0.70 mm
- 1.00 mm

J19



**Remove bell housing and gasket.**

J20



**Remove outer races for intermediate shaft bearings.**

Carefully knock intermediate shaft until puller **5177** can grip races.

J21

**Lift out intermediate shaft.**

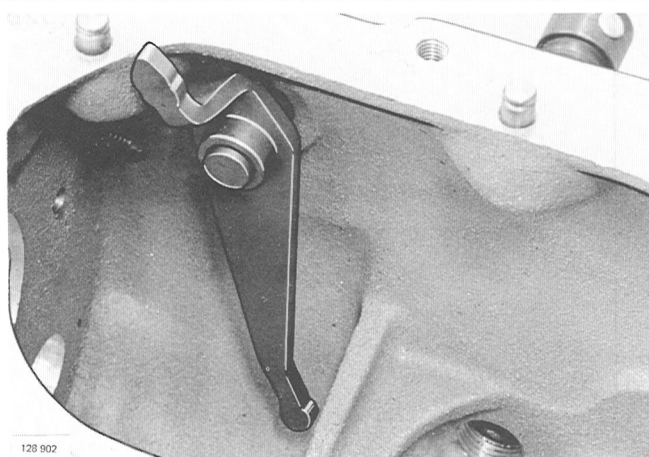
**End of special instructions for transmissions with aluminum housing**

Proceed with assembly, using same operations as for transmission with cast iron housing.

Exception:

- Outer races for intermediate shaft bearings are installed as described above.
- Shim thickness is determined.

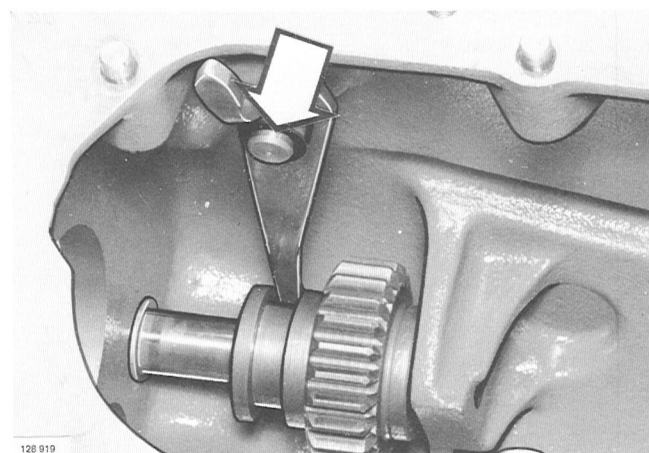
J22



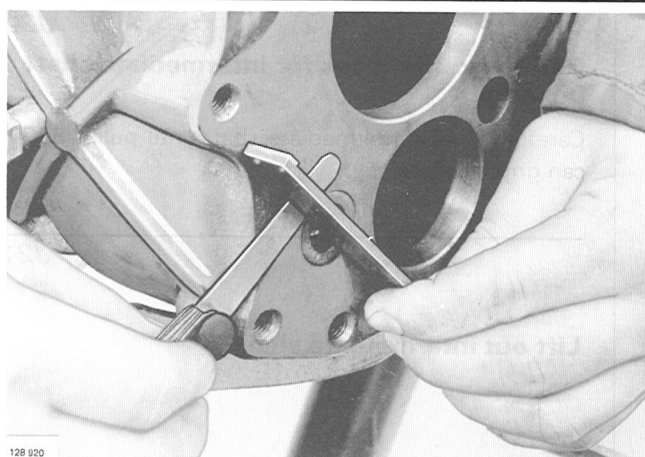
**Install reverse gear shifter.**

Install lock ring.

J23



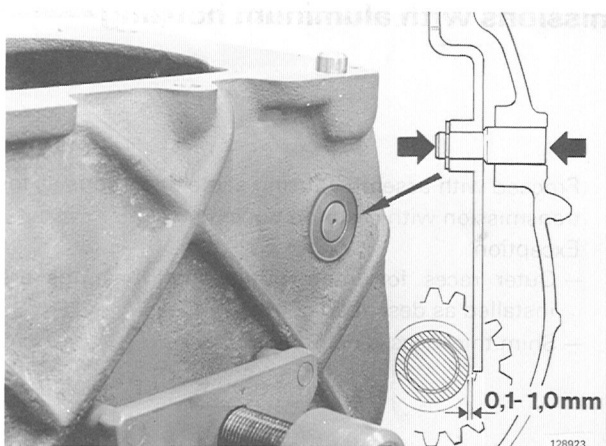
**Install reverse gear and shaft.**



J24

**Check and adjust reverse gear shaft position.**

Shaft end should be minimum 0.05 mm = 0.002" under housing face.

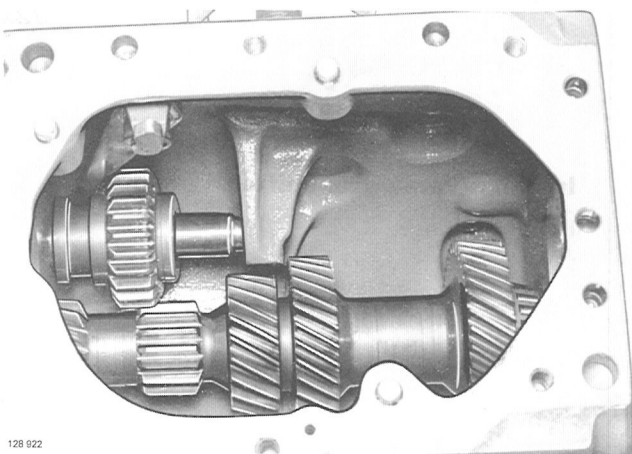


J25

**Important!**

**Adjust clearance between reverse gear and shift fork.**

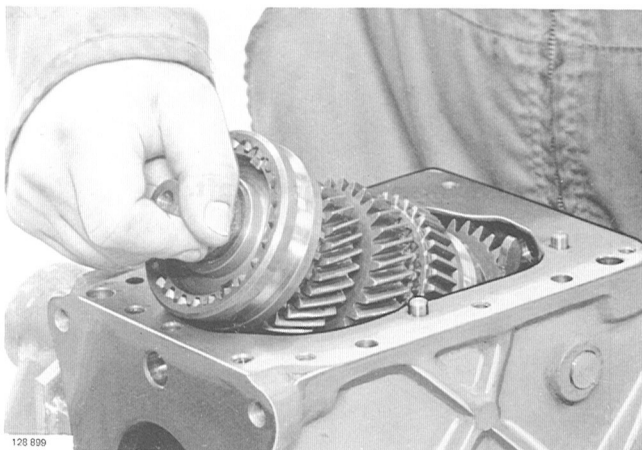
Correct clearance is 0.1–1.0 mm = 0.004–0.04". Adjust by knocking shift fork pivot pin axially with a punch.



J26

**Position intermediate shaft in housing.**

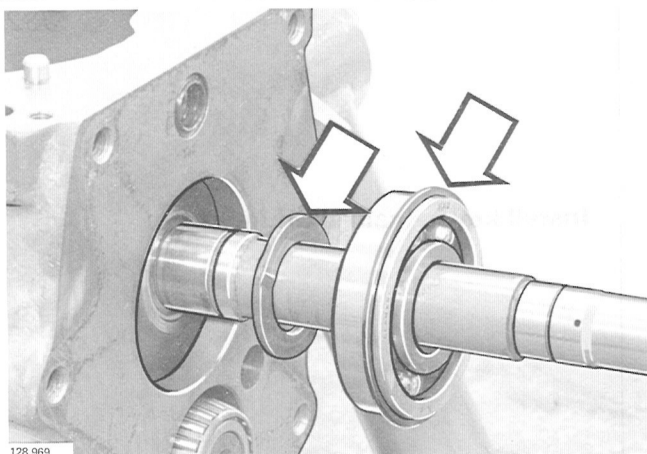
Position on bottom of housing.



J27

**Position main shaft in housing.**

J28

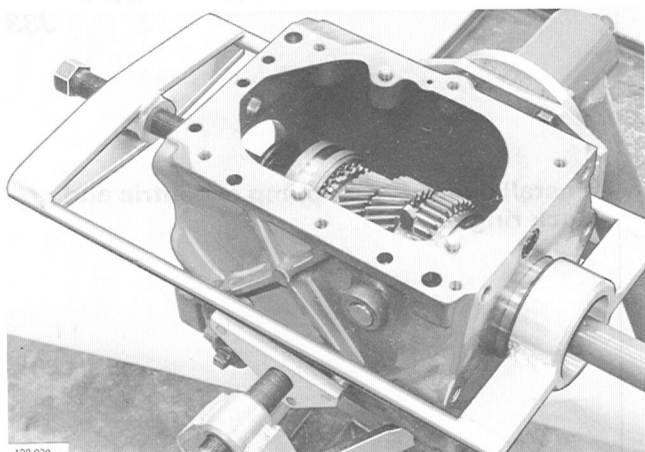


128 969

**Position thrust washer and bearing on main shaft.**

Bearing should be fitted with positioning ring.

J29



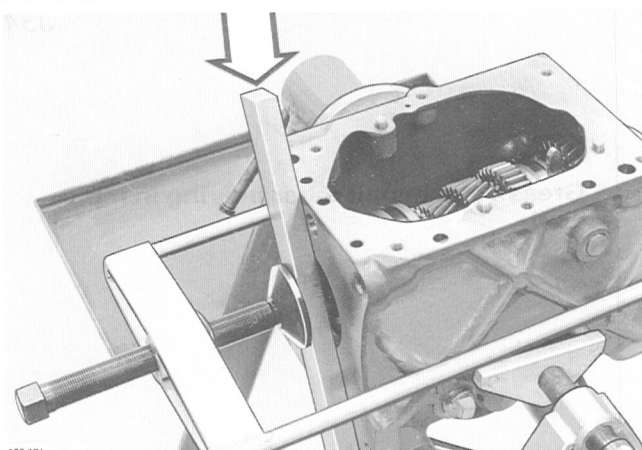
128 970

**Press main shaft bearing into position.**

Use press tool **2831**.

Press reverse gear toward transmission center. Check that no gears coincide and become damaged.

J30

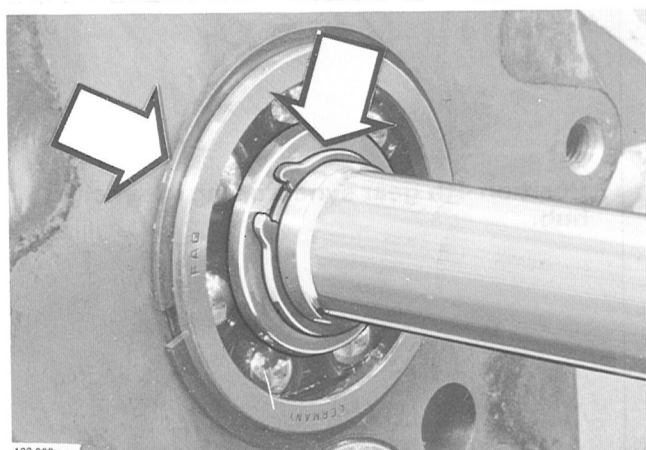


128 971

**Use spacer for tool if bearing does not align correctly.**

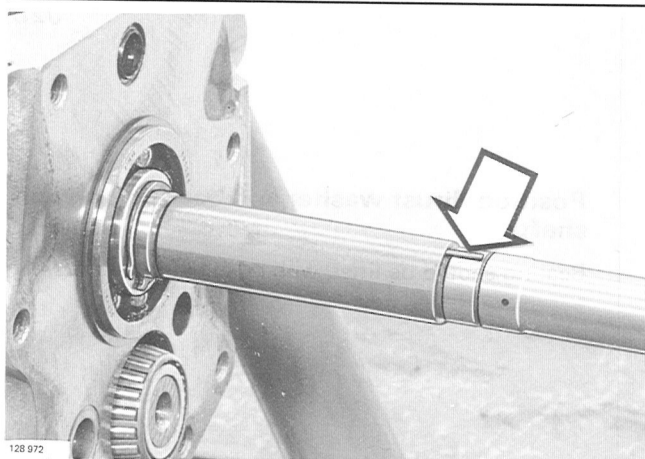
Spacer should be positioned between tool spindle and housing front end. Bearing positioning ring should be flush with housing face when bearing is correctly positioned.

J31



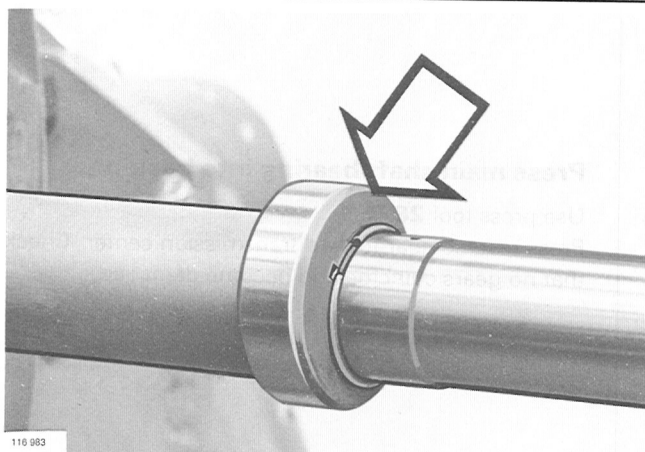
128 963

**Install lock ring for main shaft bearing.**



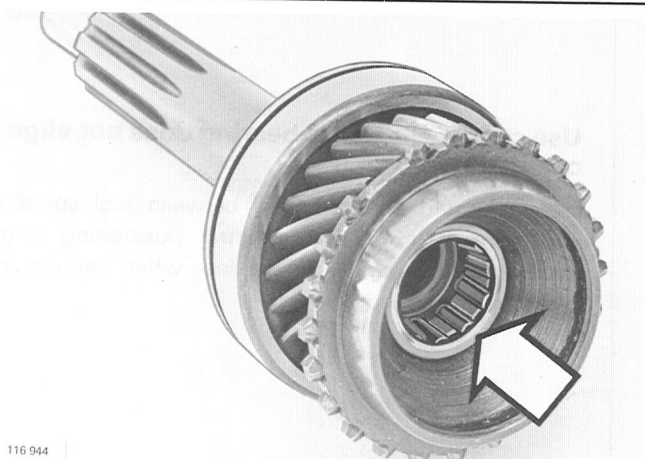
J32

**Install key in main shaft keyway.**



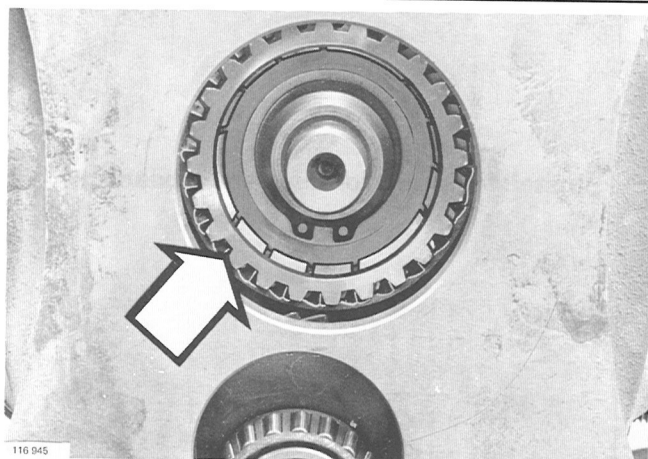
J33

**Install overdrive oil pump eccentric and lock ring.**



J34

**Grease and install roller bearing in input shaft.**

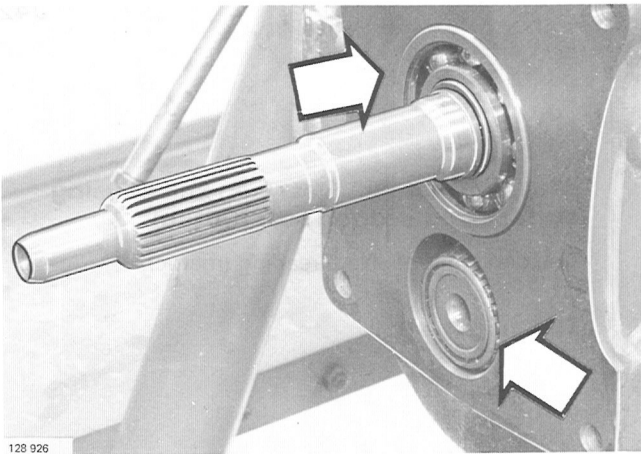


J35

**Position 4th gear synchro ring in synchro hub.**



J36



128 926

**Attach input shaft to main shaft.**

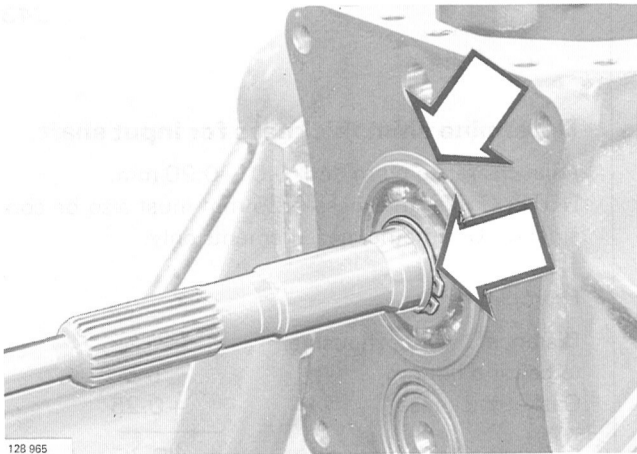
Push in shaft all the way.

J37

**Lift up intermediate shaft.**

Position shaft so that bearings are correctly positioned in housing.

J38



128 965

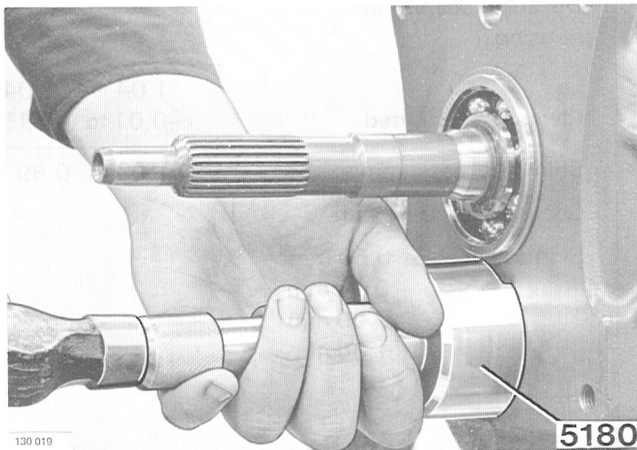
**Pull out input shaft so that spacer ring can be positioned on bearing.**

Then push in shaft again. Spacer ring should lie against housing.

J39

**Cast iron housing:****Install outer races for intermediate shaft bearings.**

J40



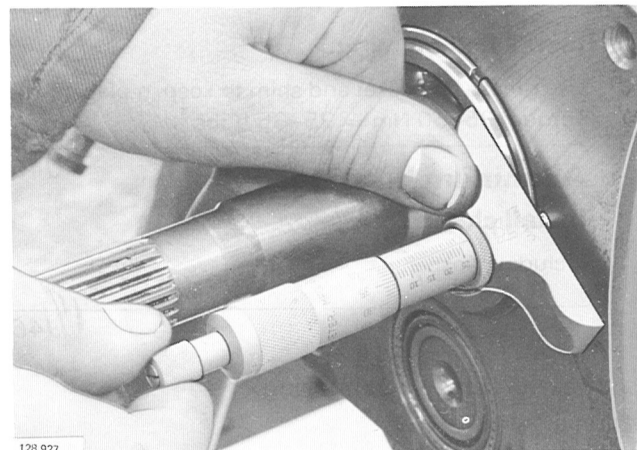
130 019

5180

**Aluminum housing:****Install intermediate shaft outer bearing races.**

Use drift **5180**, large outer diameter toward bearing races.

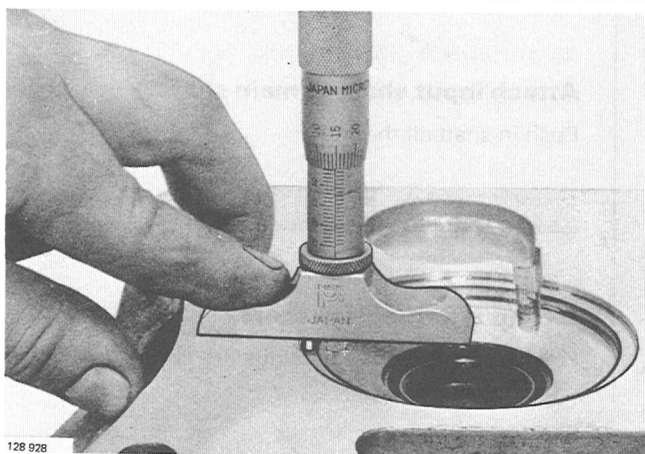
J41



128 927

**Measure distance between front end of input shaft bearing and housing front surface.**

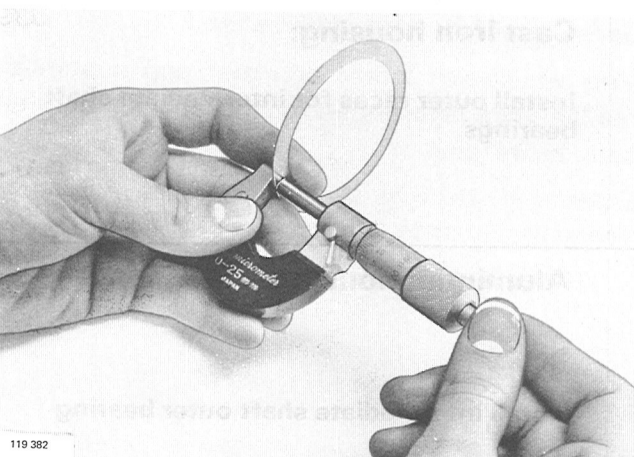
Use depth gauge. Note reading (metric).



J42

### Measure distance between bell housing surface and bearing seat bottom.

Use depth gauge. Note reading (metric).



J43

### Determine shim thickness for input shaft.

Axial clearance permitted: 0.01–0.20 mm.

NOTE: Gasket thickness 0.25 mm must also be considered. Use metric measurements only.

Example:

Distance, flywheel housing  
to bearing bottom  
Gasket thickness

5.60  
+0.25

5.75

Distance, bearing to  
housing

–4.71

Clearance permitted

1.04      1.04  
–0.01 to –0.15

Shim thickness, mm

1.03 to 0.89

Choose shim 0.90 mm.

Shims available: 0.60 mm  
0.75 mm  
0.90 mm  
1.00 mm

J44

### Install bell housing.

Use grease on gasket and shim to keep in place.  
Torque: 35–50 Nm = 25–35 ft.lbs.

J45

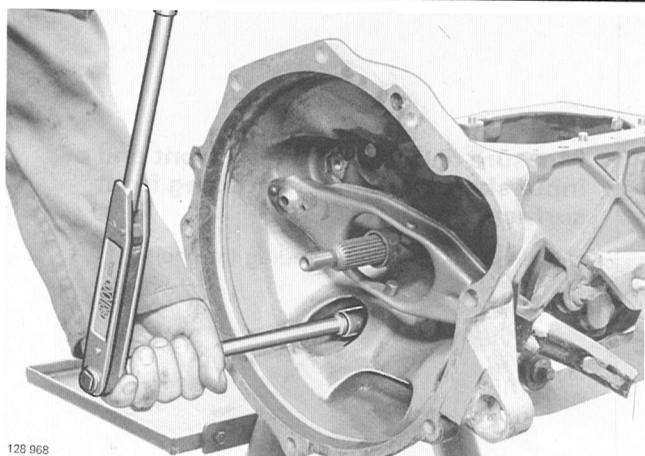
### Aluminum housing:

#### Install clutch fork.

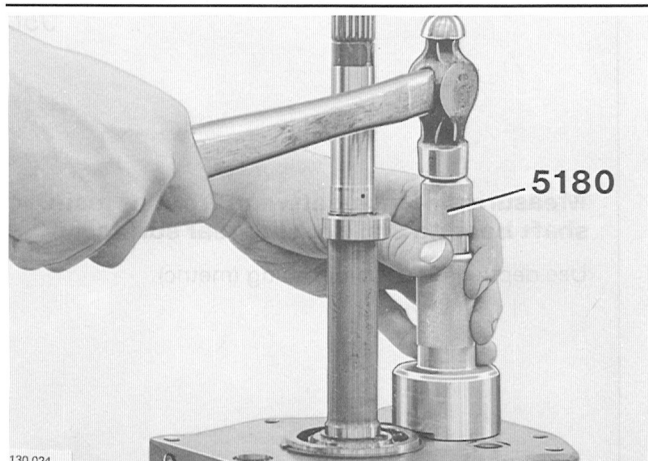
Including spacer.

J46

### Install throw-out bearing.



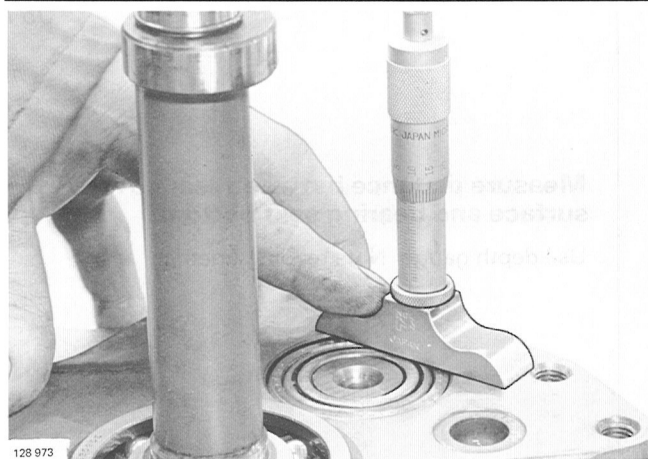
J47

**Aluminum housing:**

**Turn transmission to vertical position. Make sure intermediate shaft bearings have no clearance.**

Use drift **5180** with small diameter toward rear bearing race. Hold tool rigidly and knock on race with light taps. Repeat while rotating shaft until all clearance is gone and shaft runs somewhat sluggish.

J48

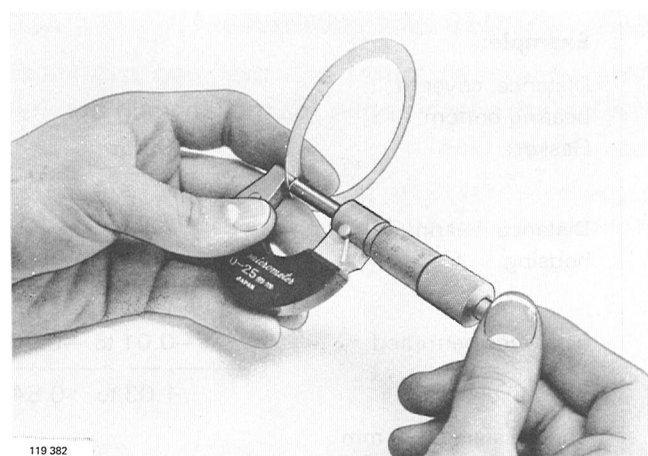
**Cast iron housing:**

**Turn transmission to vertical position.**

**Measure distance between intermediate shaft bearing outer race and rear surface of housing.**

Race should butt rollers. Use depth gauge. Note reading (metric).

J49

**Determine thickness of shims for intermediate shaft.**

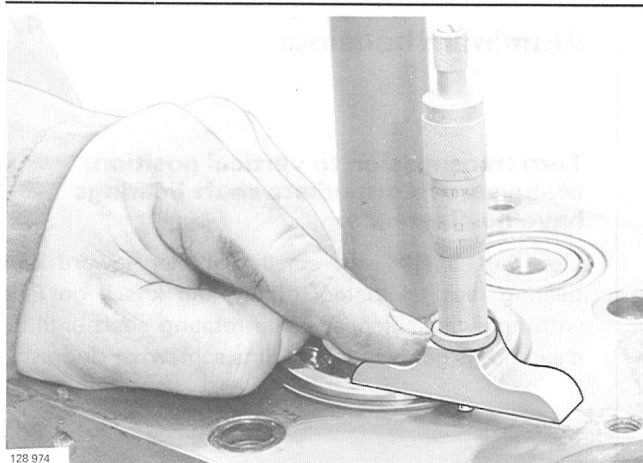
Axial clearance permitted: 0.025–0.10 mm. Gasket thickness: 0.25 mm. Metric only.

**Example:**

Distance, race to surface	1.43	
Gasket	+0.25	
	<hr/>	
	1.680	1.680
Clearance permitted	–0.025	0.100
	<hr/>	
Shim thickness		1.655 to 1.580

Choose 1.65 mm (alt. 1.60 mm).

Shims available: 0.05 mm  
0.10 mm  
0.15 mm  
0.35 mm  
0.50 mm  
0.70 mm  
1.00 mm

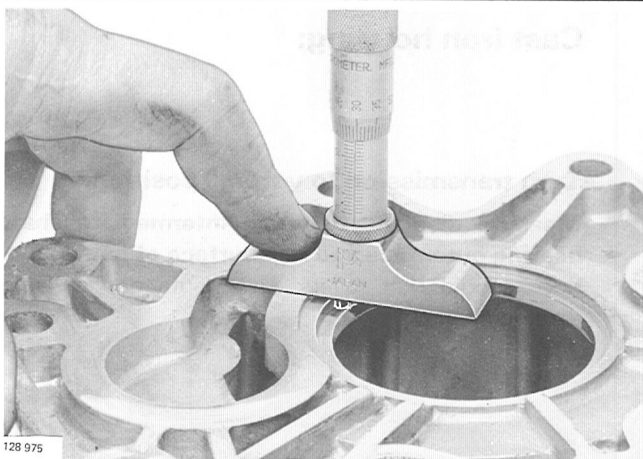


128 974

J50

### Measure distance between front of main shaft bearing and housing rear surface.

Use depth gauge. Note reading (metric).

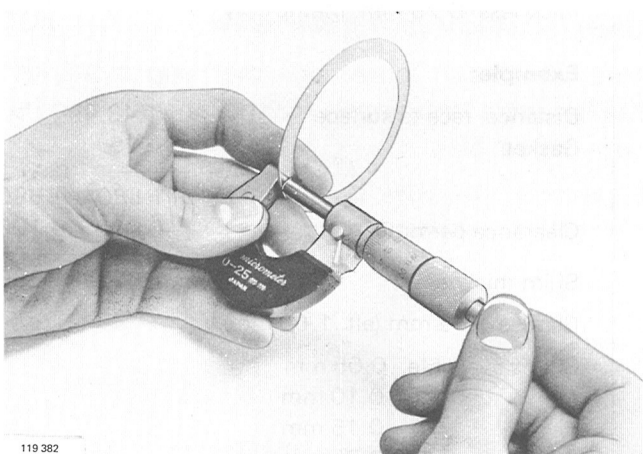


128 975

J51

### Measure distance between rear cover surface and bearing seat bottom.

Use depth gauge. Note reading (metric).



119 382

J52

### Determine shim thickness for main shaft.

Axial clearance permitted: 0.01–0.20 mm. Gasket thickness: 0.25 mm.

#### Example:

Distance, cover to  
bearing bottom  
Gasket

5.50  
+0.25

5.75

Distance, bearing to  
housing

–4.71

Clearance permitted

1.04      1.04  
–0.01 to –0.20

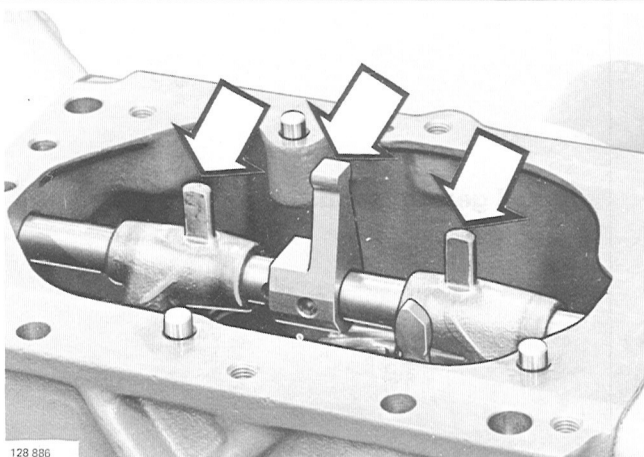
Shim thickness

1.03 to    0.84

Choose shim 0.90 mm

Shims available: 0.60 mm  
0.75 mm  
0.90 mm  
1.00 mm

J53



128 886

**Install shift forks.**

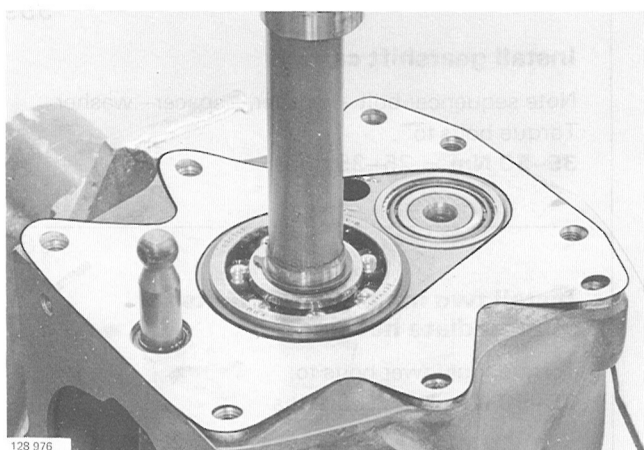
Make sure lugs position correctly.

J54

**Install shifter and gear selector rail.**

Shifter boss forward.

J55



128 976

**Position gasket and shim pack for intermediate shaft.**

J56

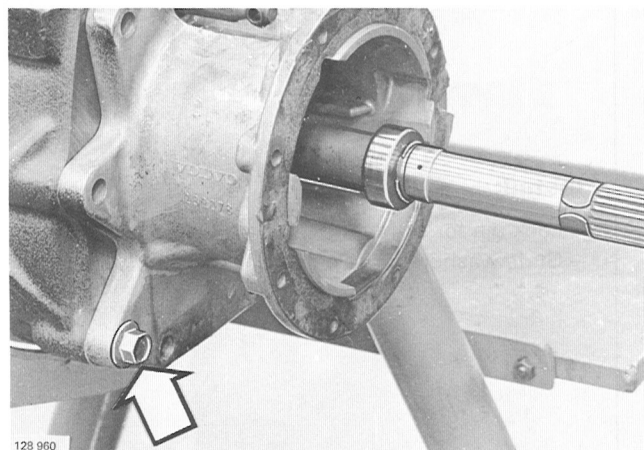


128 977

**Position main shaft shim pack in intermediate housing.**

Apply grease to shim to keep in place.

J57

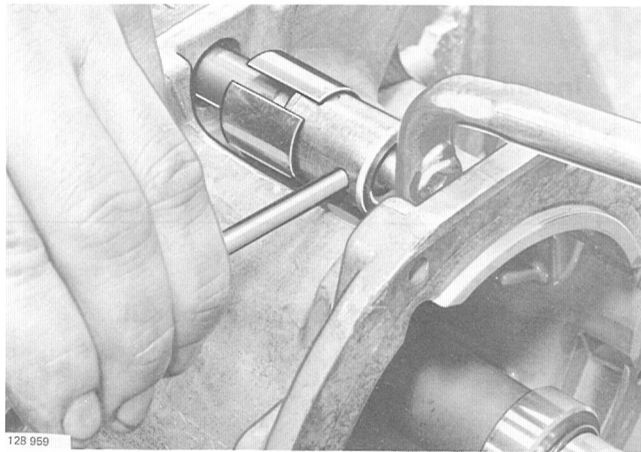


128 960

**Install intermediate housing.**

Install two outer (lower) bolts finger tight.

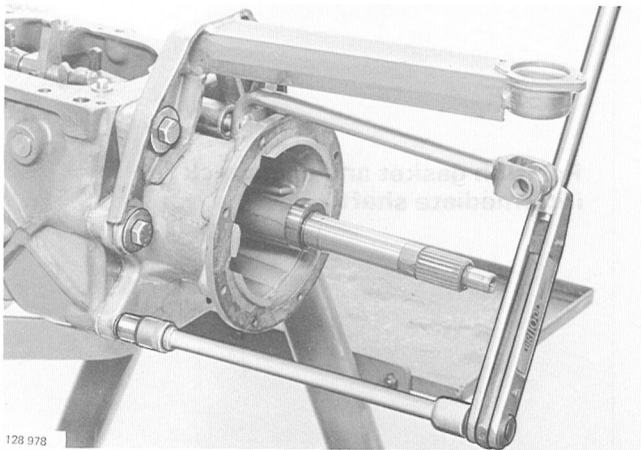




J58

**Install gearshift rod.**

Install sleeve on joint.



J59

**Install gearshift carrier.**

Note sequence: bolt – washer – spacer – washer

Torque bolts to:

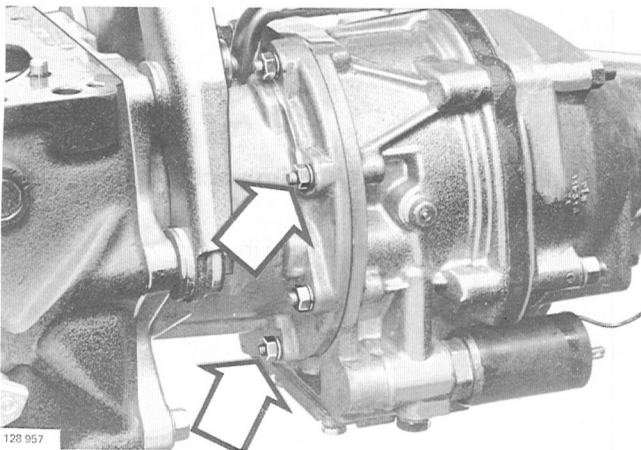
**35–50 Nm = 25–35 ft.lbs.**

J60

**Install two inner (lower) bolts for intermediate housing.**

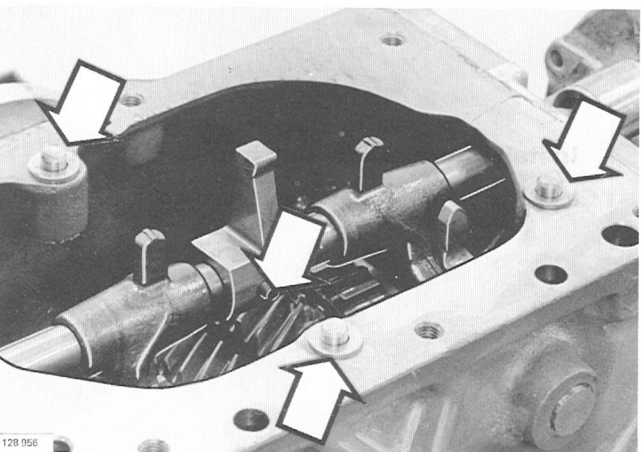
Torque four lower bolts to:

**35–50 Nm = 25–35 ft.lbs.**



J61

**Install overdrive.**

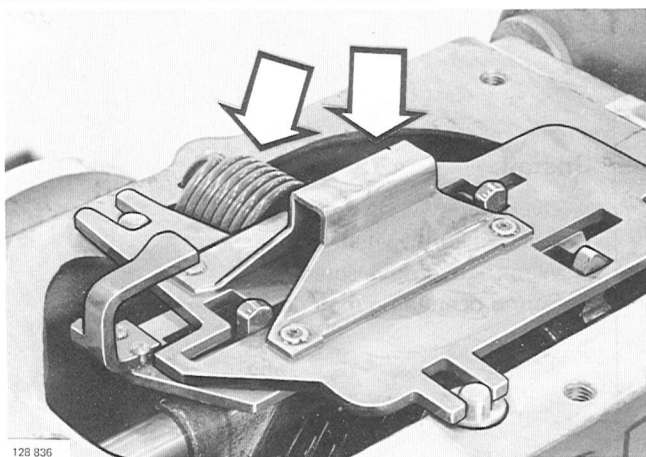


J62

**Install:**

- Lock pin for shifter.
- Glide washers for selector plate assembly.

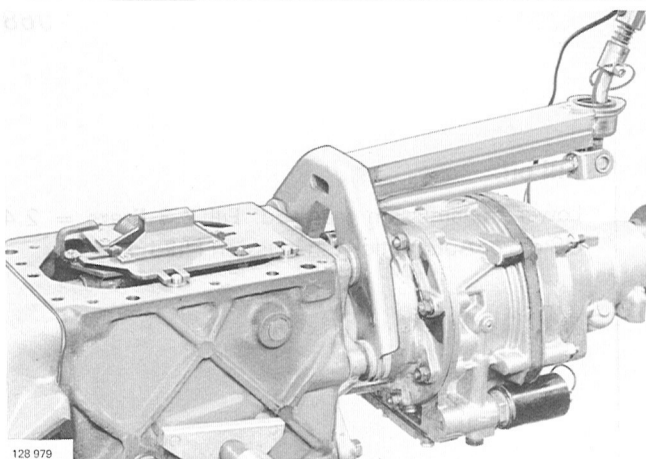
J63



128 836

**Install selector plate assembly and return spring.**

J64



128 979

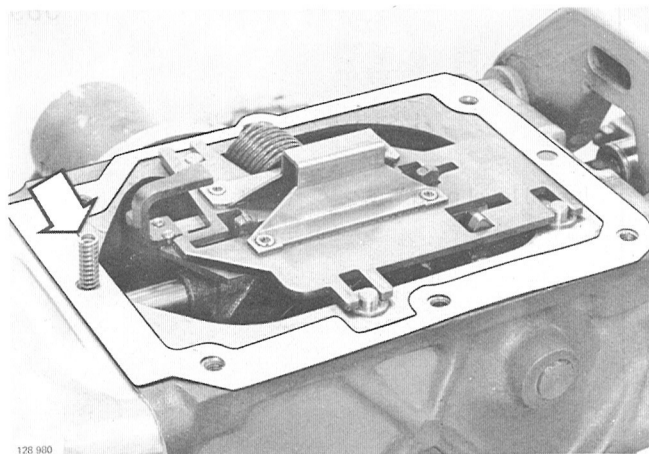
**Check operation.**

Install gearshift lever without lock screw and lock ring.

Hold selector plate assembly with palm. Check gearshift operation, correct as necessary.

Remove gearshift lever.

J65

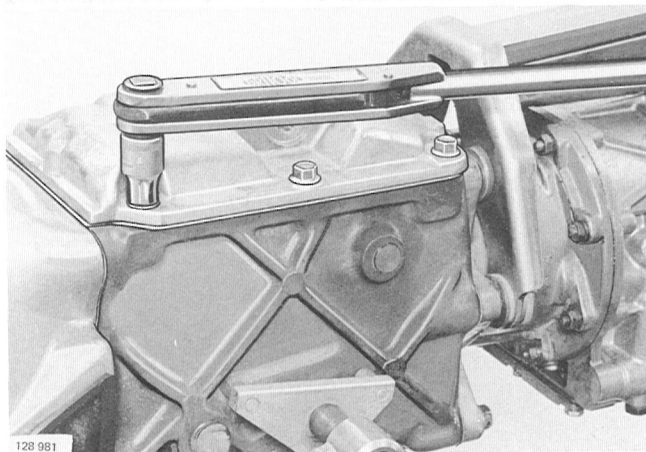


128 990

**Install:**

- Detent ball and spring.
- New top cover gasket.

J66

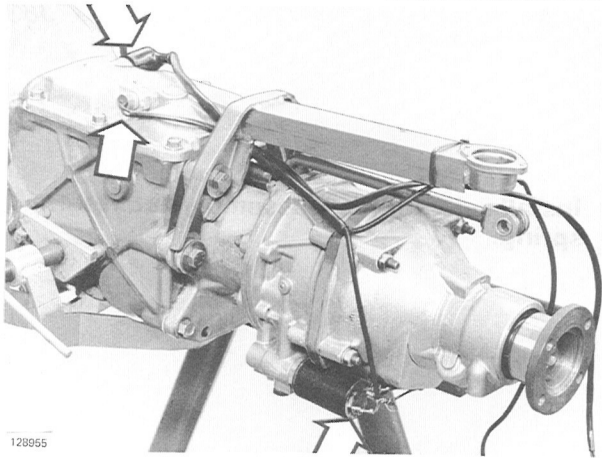


128 981

**Install top cover.**

Torque bolts to:

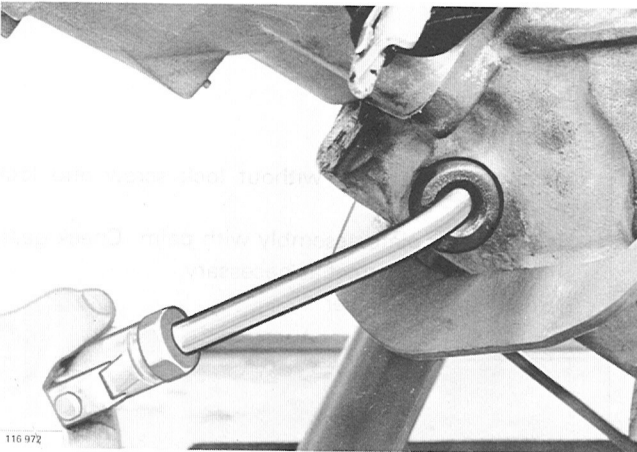
15–25 Nm = 11–18 ft.lbs.



J67

**Install:**

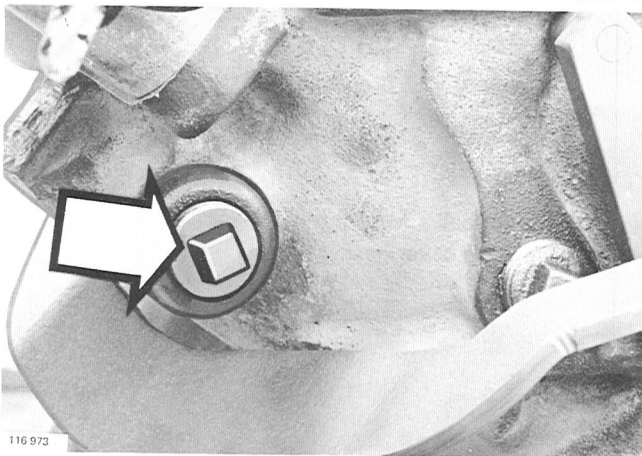
- Overdrive switch.
- Back-up light switch.
- Wires at overdrive solenoid.
- Sound deadening material on gearshift carrier.



J68

**Fill oil.**

Lower transmission rear and. Fill **2.3 liters** = 2.4 US qts of Automatic Transmission Fluid, F or G.



J69

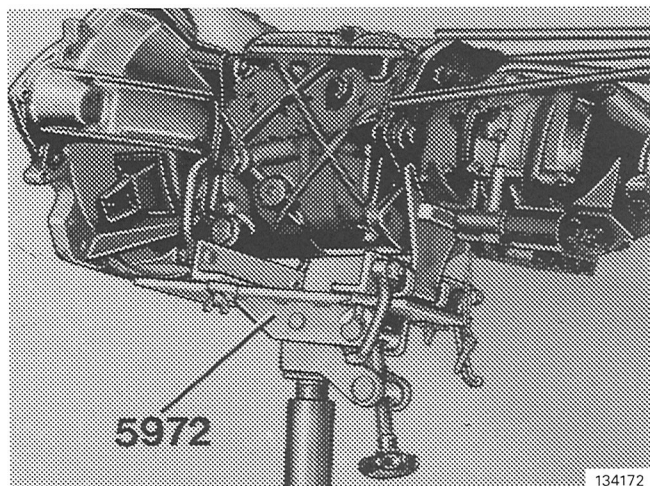
Install level plug.

## Installing transmission M 46

### Special tools:

5972 Fixture

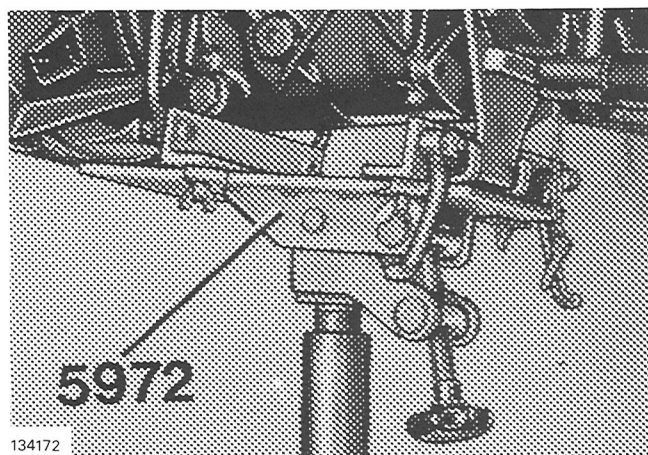
K1



### Position transmission and fixture 5972 assembly on lifting device.

Fixture in rear position to secure transmission rigidly on fixture.

K2



### Install transmission.

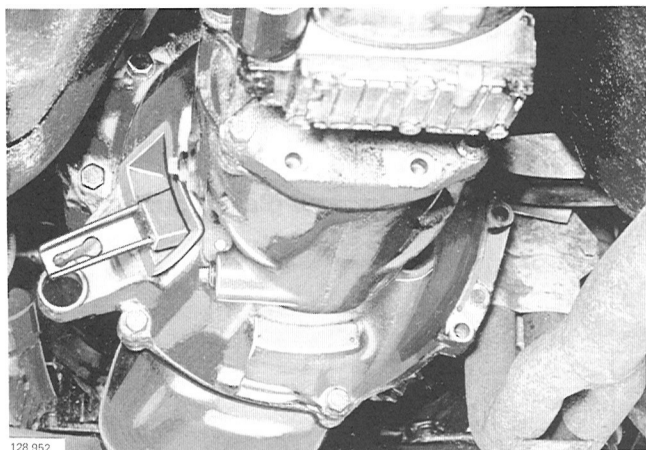
Check that throw-out bearing is correctly positioned in fork.

Raise transmission. Turn transmission to be free from propeller shaft when pushing it in from rear.

Install two lower bolts at bell housing.

Remove fixture and lifting device.

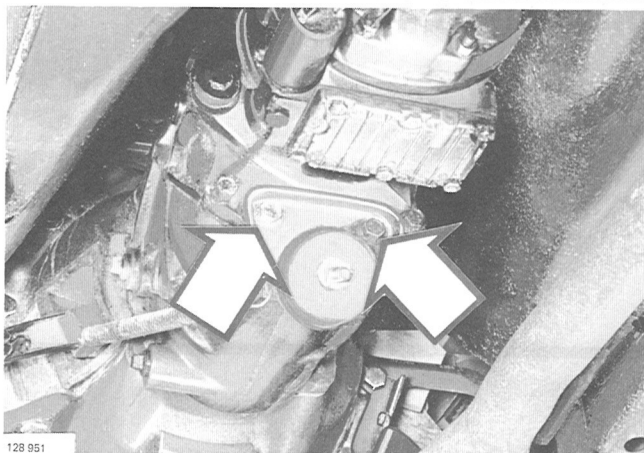
K3



### Install:

- Starter motor and tighten retaining bolts.
- Front exhaust pipe bracket. Two bolts at bell housing, one nut at exhaust pipe.
- Remaining bolts for bell housing.
- Rubber rings for front muffler.





**As appropriate:**

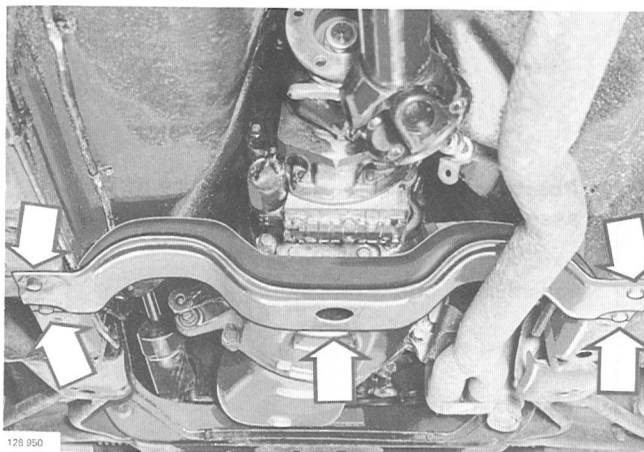
K4

**Attach clutch cable.**

Hook on return spring.

K5

**Install bracket for rubber cushion.**



K6

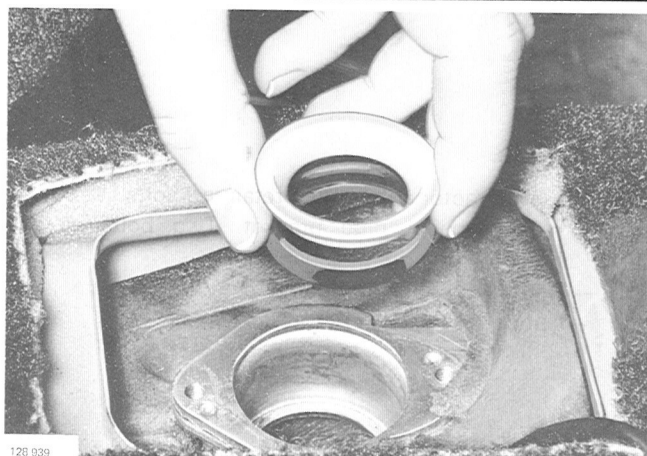
**Install cross-member assembly.**



K7

**Install:**

- Propeller shaft to transmission drive flange.
- Speedometer cable.



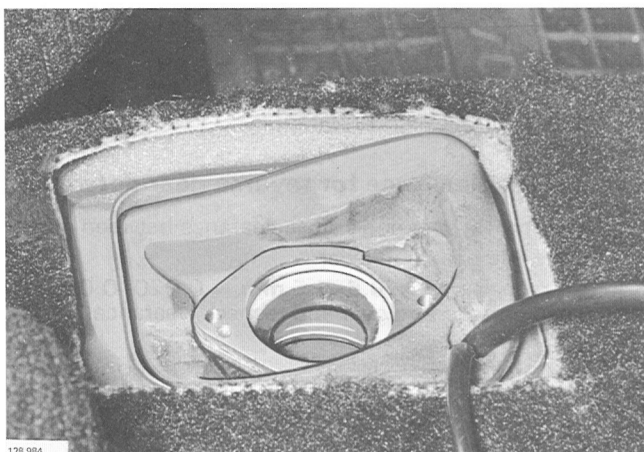
K8

**Inside vehicle:**

**Install rubber ring and plastic bushing.**

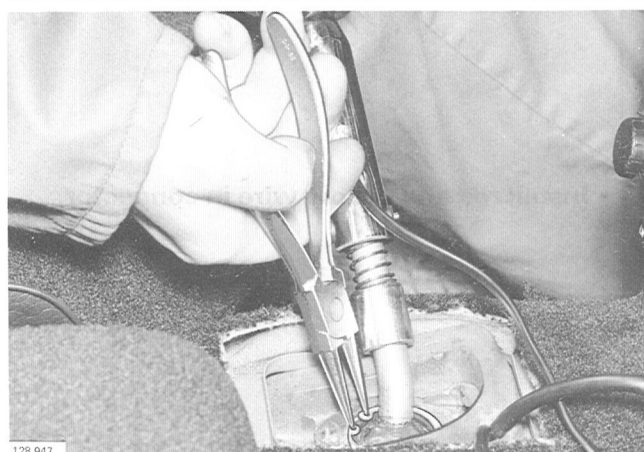


K9



**Check that sound deadening material is correctly positioned.**

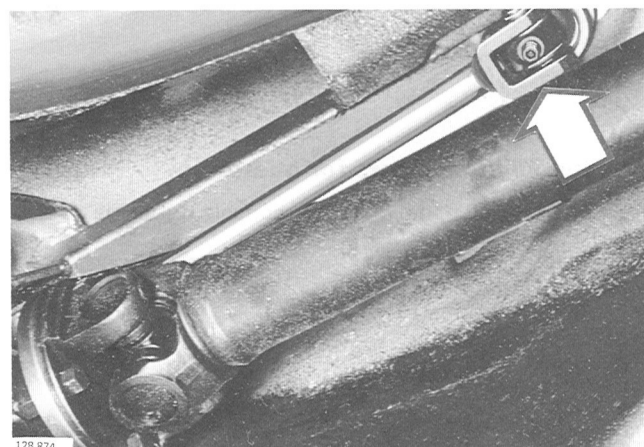
K10



**Install gearshift lever.**

Install retaining ring.

K11

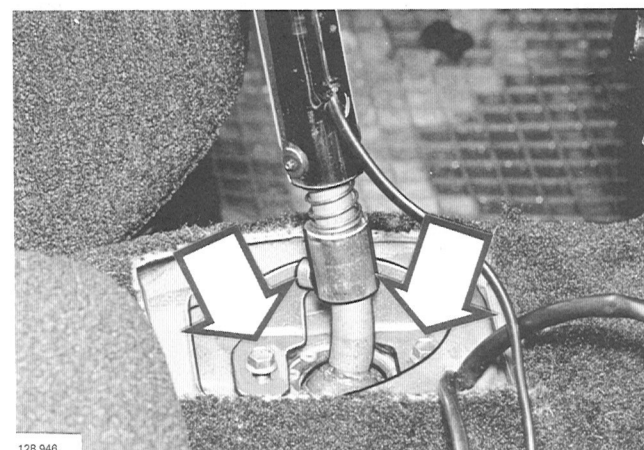


**From under vehicle:**

**Attach gearshift rod to gearshift lever.**

Push pivot pin into position and install locking screw.

K12



**Install reverse detent plate.**



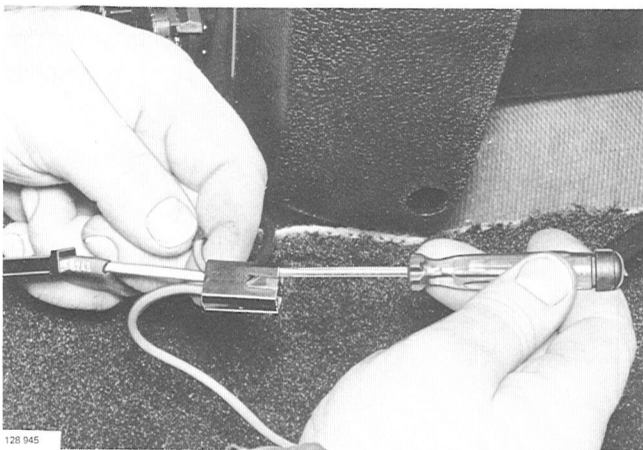
128 985

K13

**Adjust clearance for reverse gear detent.**

Engage 1st gear and adjust clearance between detent plate and gear shift lever.

Correct clearance: **0.5–1.5 mm** = 0.020–0.060".  
Then engage 2nd gear and recheck clearance.



128 945

K14

**Install red and yellow wire in connector.**

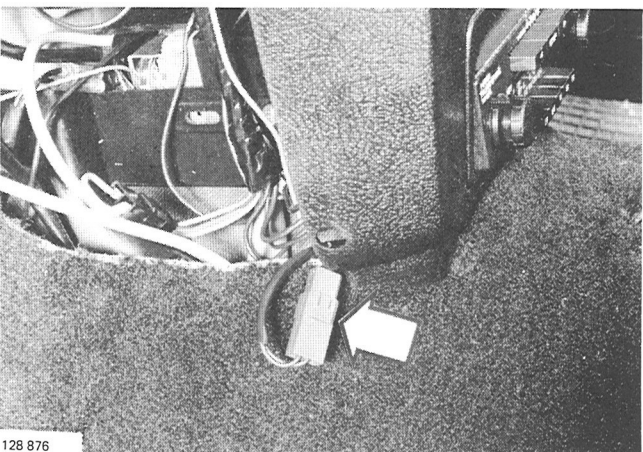


128 944

K15

**Install connectors for overdrive.**

Then install panel on center console right side.



128 876

K16

**Install connector for back-up light.**

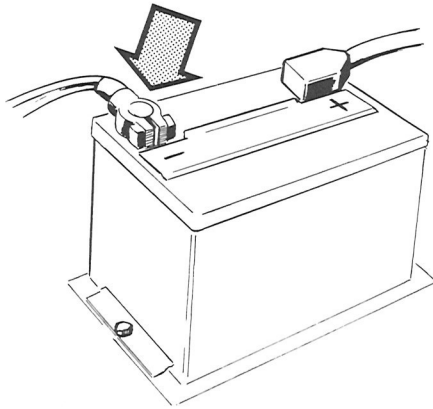
Then install panel on center console left side.

K17



**Install gearshift lever cover.**

K18



**Connect battery ground cable.**

130015





**VOLVO SUPPORTS VOLUNTARY  
MECHANIC CERTIFICATION  
BY THE N.I.A.S.E.**

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