M 45 4-speed

M 46 4-speed (M 45 + overdrive)

Repairs and Maintenance

Section	Group
4	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

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

TP 30056/2
4500.04.84
Printed in U.S.A.

Specifications

General

	M 45	M 46	Late Models
Type			
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

	Metric	*US Measurements*
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"

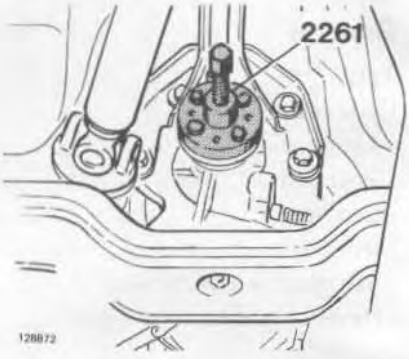
Torques

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.

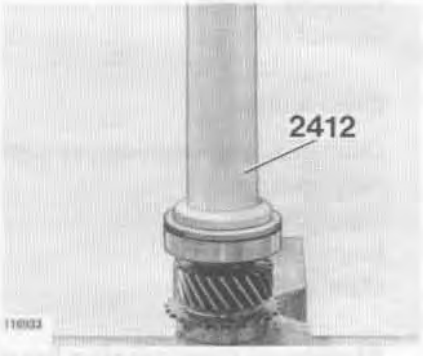
Special tools, transmission M 45/M 46

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

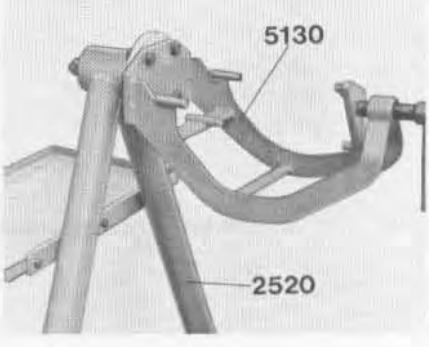


2261 Puller
drive flange

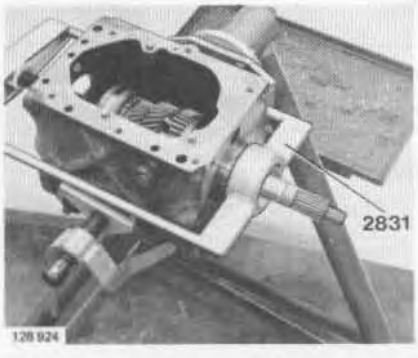


2412 Drift
installing input shaft bearing

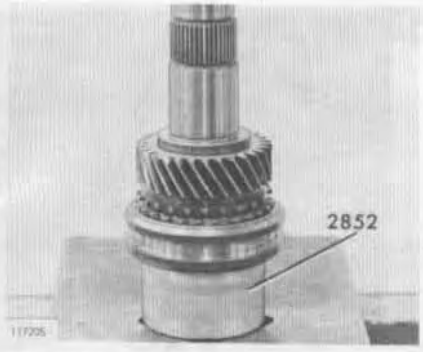
2413 Drift
removing/installing rear cover seal



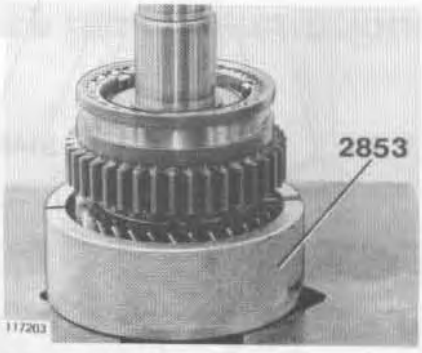
2520 Stand
5130 Fixture
attaching transmission to stand 2520



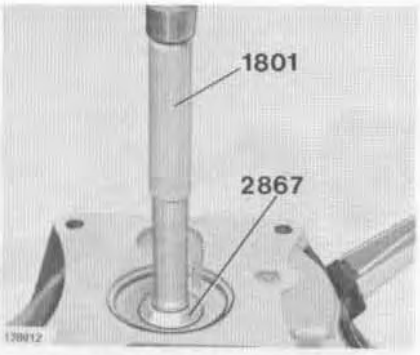
2831 Press tool
installing main shaft bearing



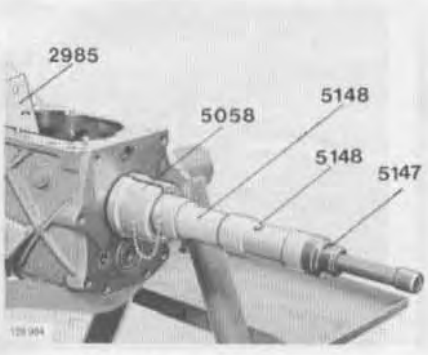
2852 Adapter
installing gear and synchro ring



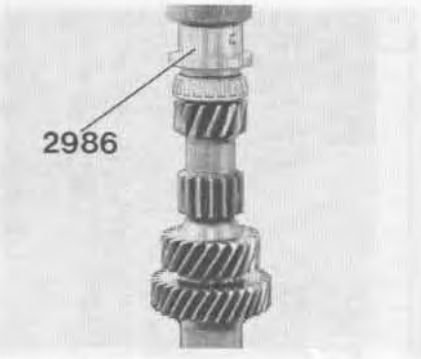
2853 Adapter
removing gear and synchro ring



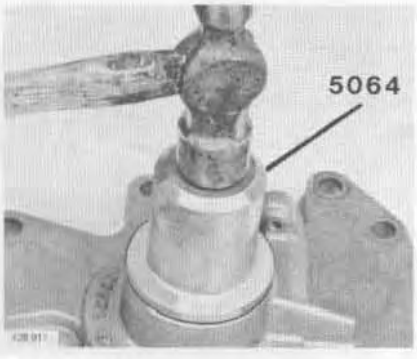
1801 Standard handle
2867 Drift
installing bell housing seal



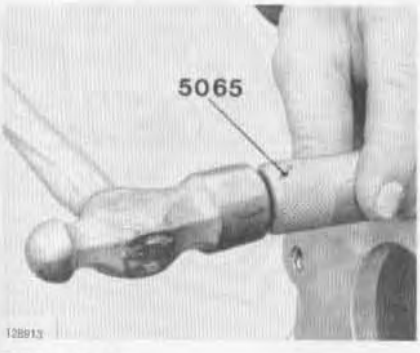
2985 Adapter
removing main shaft bearing
5058 Tool
removing main shaft bearing
5147 Tool
removing main shaft bearing
5148 Tool
removing main shaft bearing, M 46



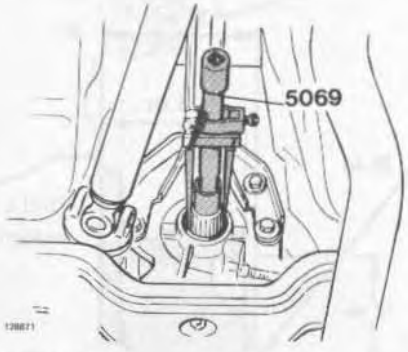
2986 Drift
installing intermediate shaft bearings



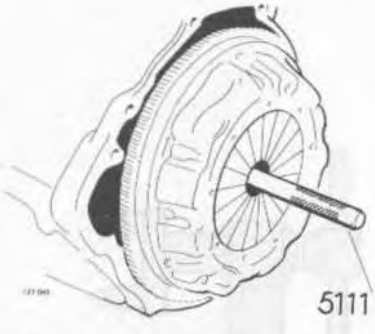
5064 Drift
installing rear cover seal



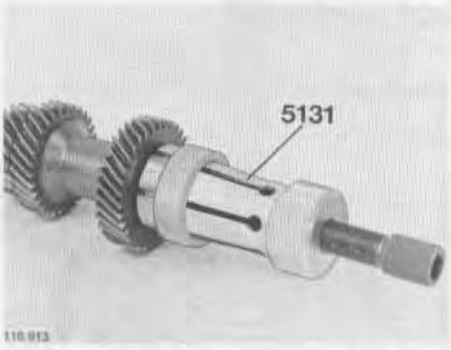
5065 Drift
installing seal on shift selector rail



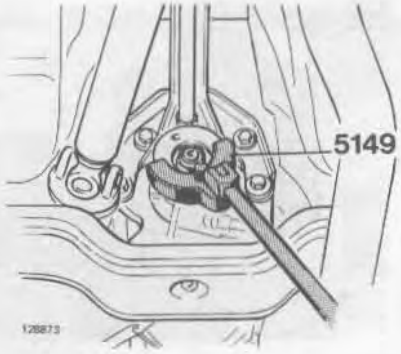
5069 Puller
removing rear seal



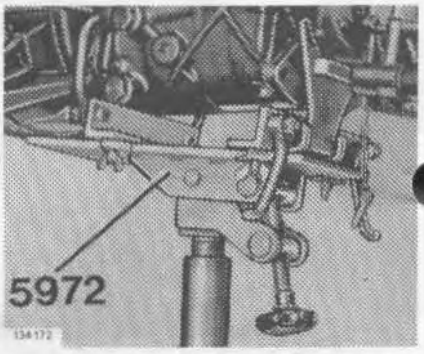
5111 Centering drift
installing clutch



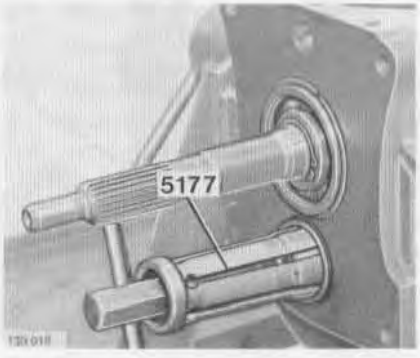
5131 Puller
removing intermediate shaft bearing



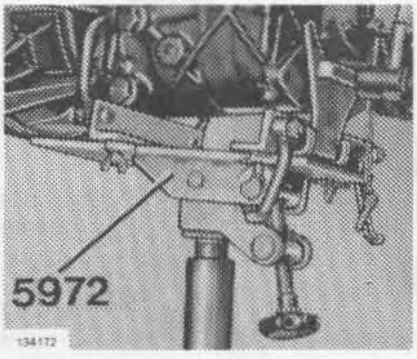
5149 Wrench
removing/installing flange nut



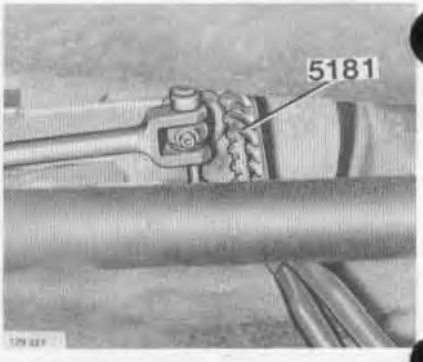
5972 Fixture
removing transmission



5177 Puller
intermediate shaft bearing, aluminum housing



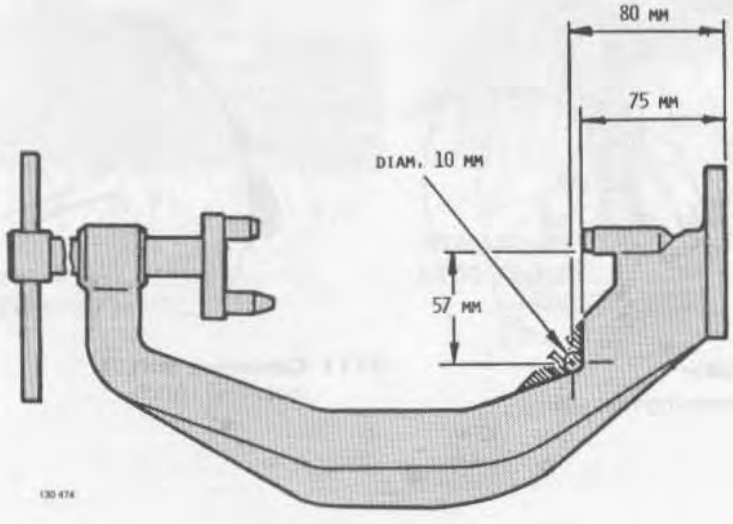
5180 Drift
intermediate shaft bearing, aluminum housing



5181 Pliers
removing pin on gearshift lever

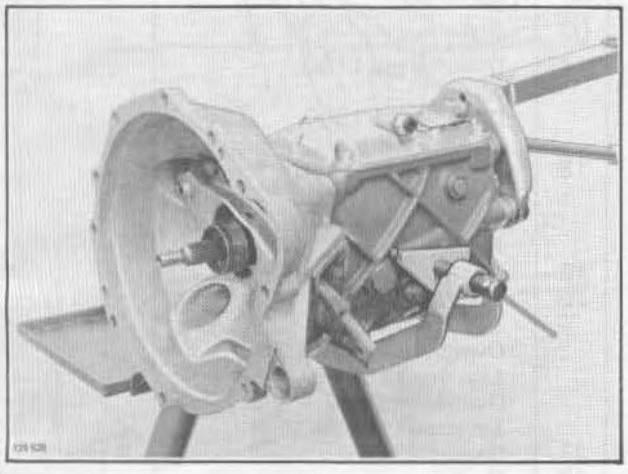
Modification of fixture 5130

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

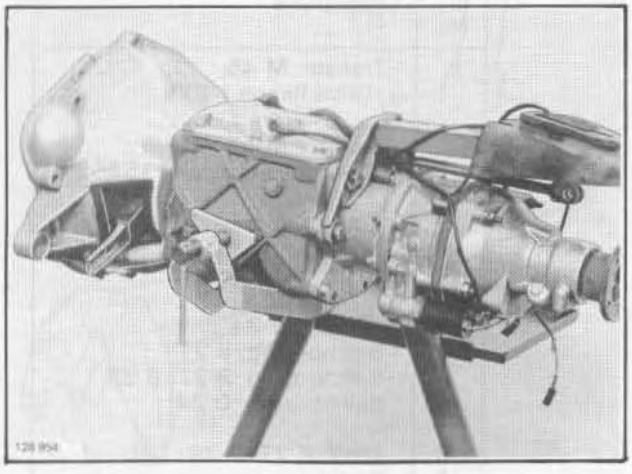


Drill a hole 10 mm = 3/8". Remove material stock as shown.

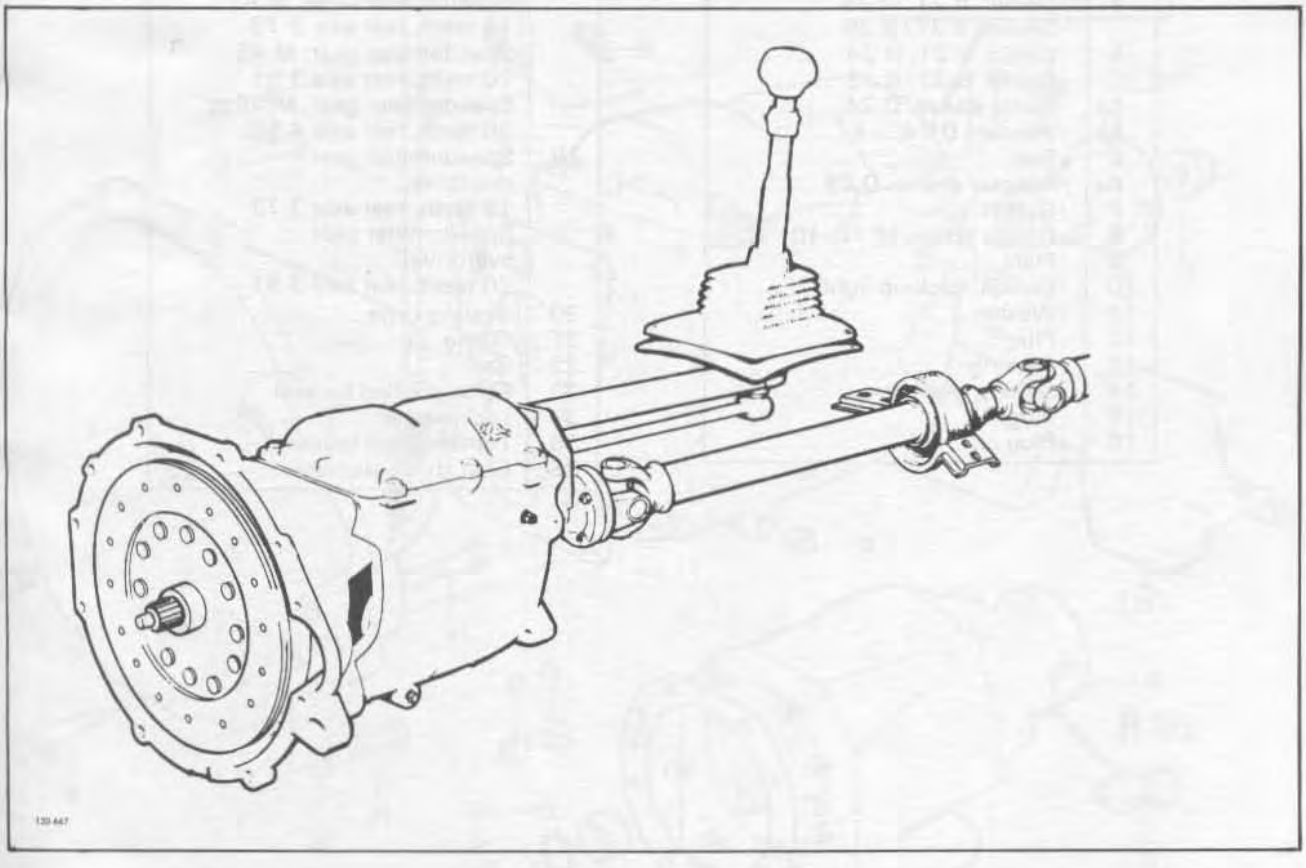
Spare parts illustrations



M 45



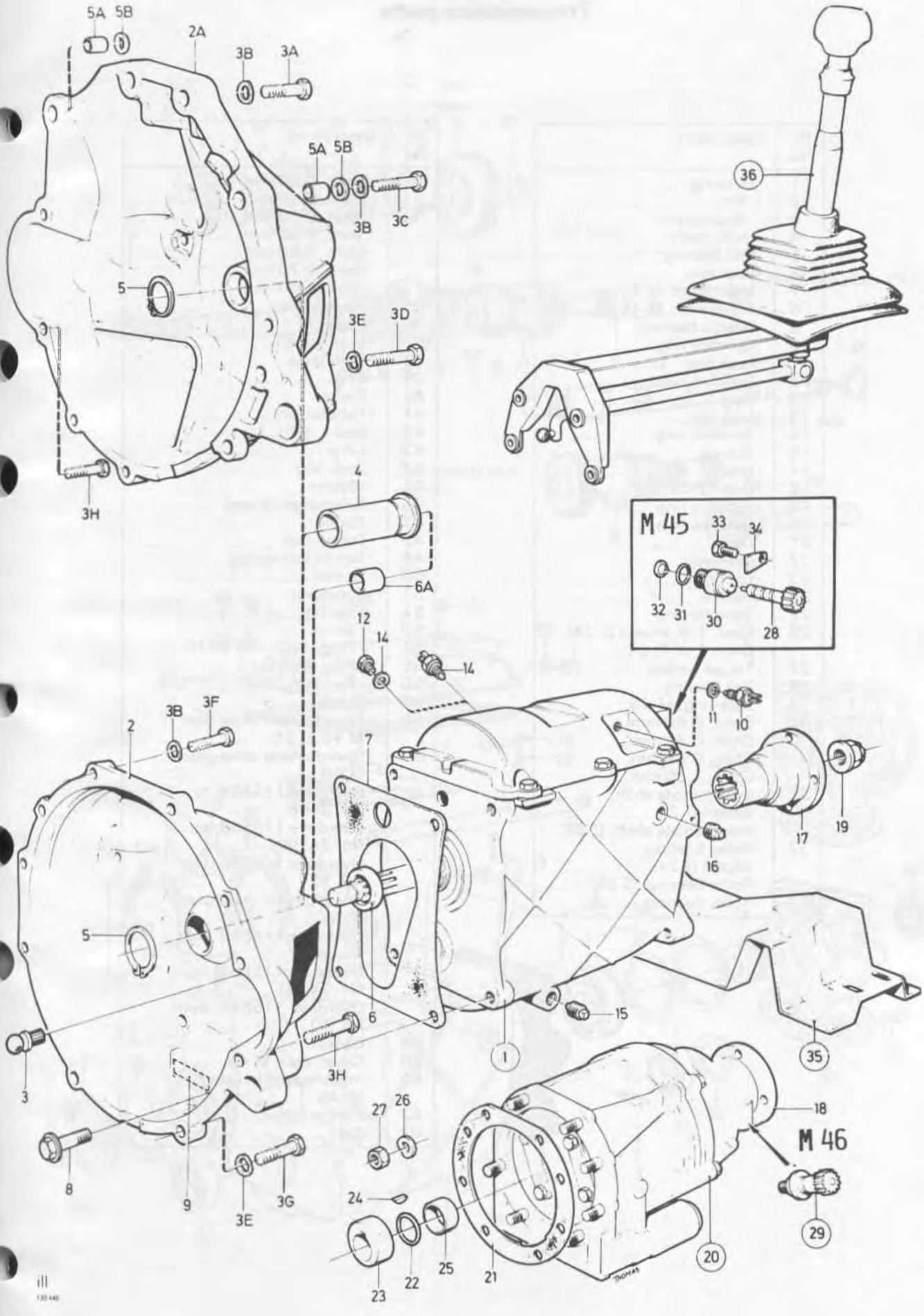
M 46



Transmissions M 45 / M 46

Ill. 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

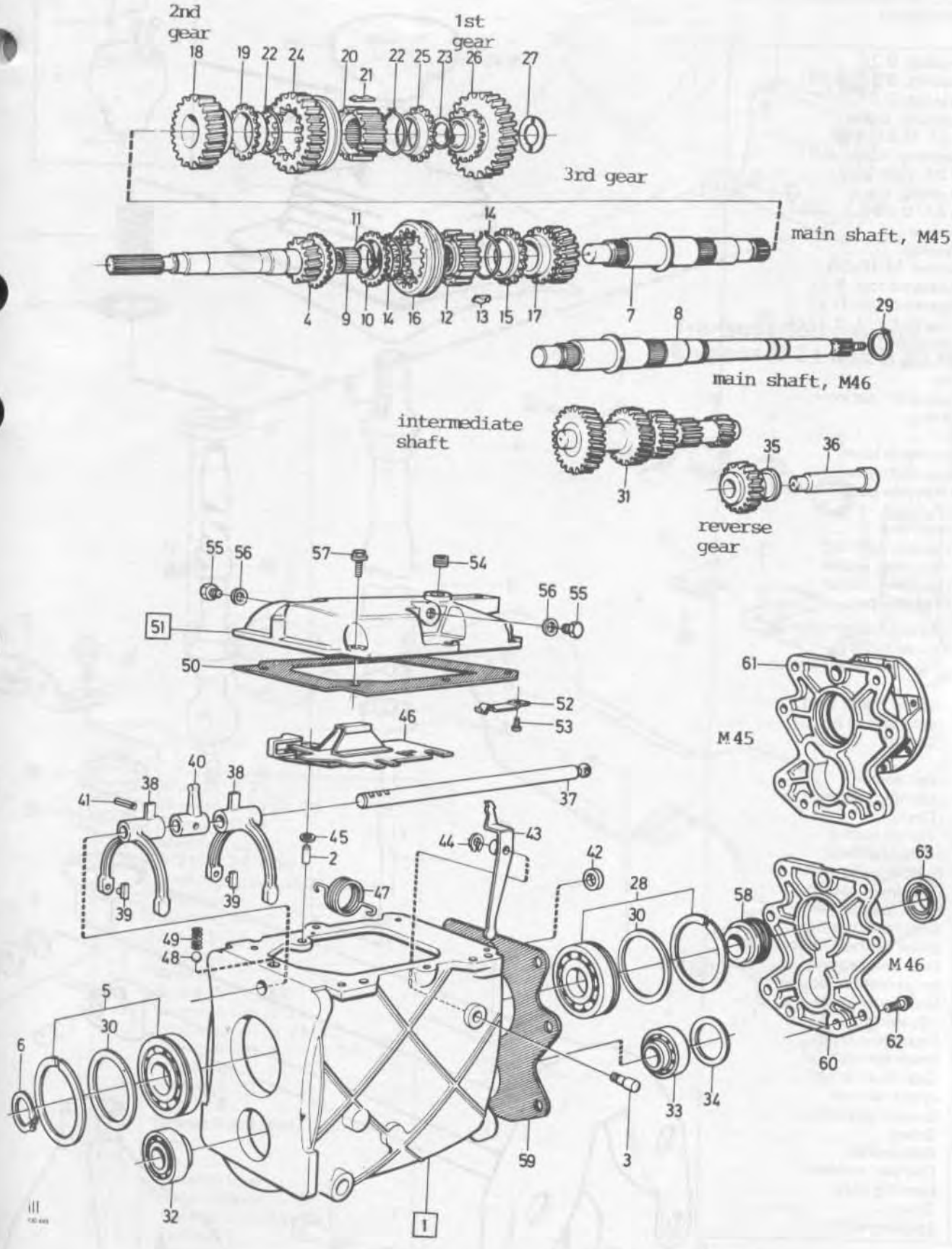
Ill. No.	Description
17	·Drive flange 1100 M 45
	·Drive flange 1300, M 45
18	·Drive flange, 1140 M 46
	·Drive flange 1300 M46
19	·Nut
20	·Overdrive, B 21 Laycock 115660
	·Overdrive, B 27/B 28 Laycock 115659
	·Overdrive, D 24 Laycock 115895
21	·Gasket
22	·Circlip
23	·Cam, oil pump
24	·Key
25	·Circlip
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


5A
5B
2A
3B
3A
5A
5B
3B
3C
5
3E
3D
3H
4
6A
36
M 45
33
34
32
31
30
28
12
14
14
11
10
2
3B
3F
7
17
19
16
5
6
15
3H
1
35
3
27
26
18
M 46
8
9
3E
3G
24
29
25
22
21
20
23

Transmission parts

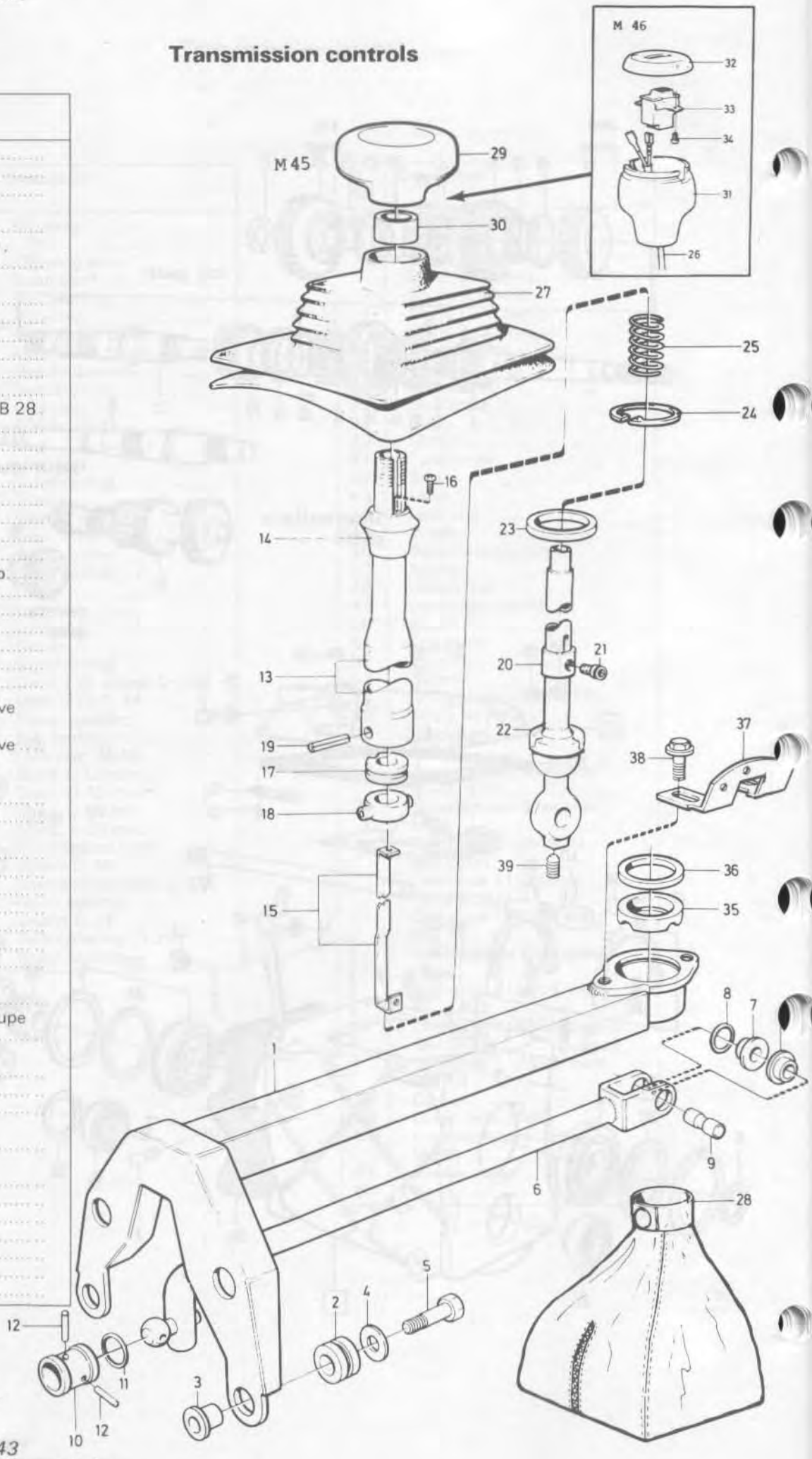
Ill. No.	Description
1	·Housing
2	··Pin
3	··Bearing pin
4	·Input shaft
5	·Ball bearing
6	·Lock ring
7	·Main shaft, M 45
8	·Main shaft, M 46
9	·Needle bearing
10	·Synchro ring
11	·Lock ring
12	·Synchro hub
13	·Dog
14	·Lock ring
15	·Synchro ring
16	·Sleeve
17	·Gear, 3:rd
18	·Gear, 2:nd
19	·Synchro ring
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

Ill. 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

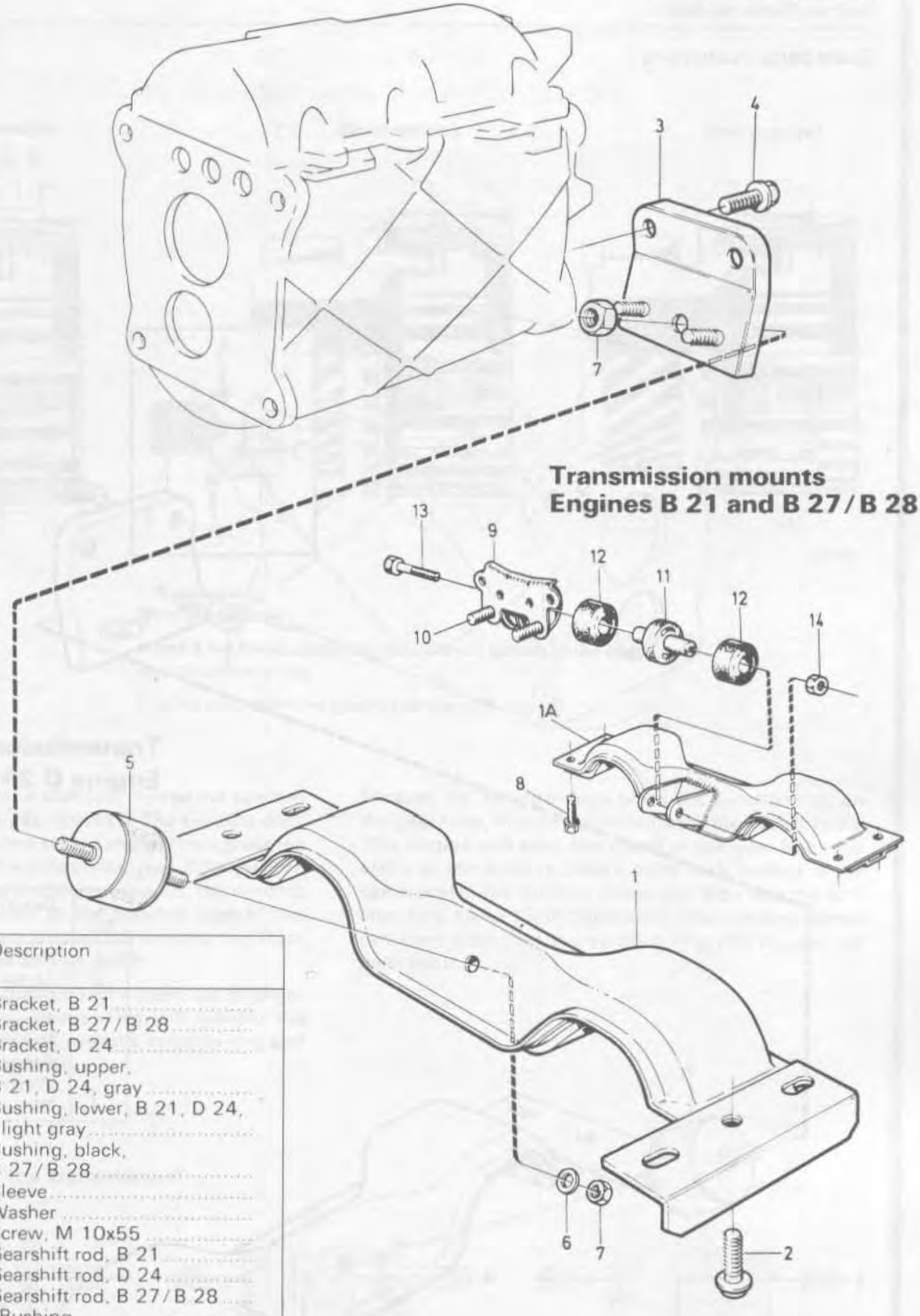

2nd gear
1st gear
18
19
22
24
20
21
22
25
23
26
27
3rd gear
main shaft, M45
11
14
4
9
10
14
16
12
13
15
17
7
8
29
main shaft, M46
intermediate shaft
35
36
31
reverse gear
55
56
57
54
56
55
51
50
52
53
46
61
M45
40
38
38
41
37
45
2
44
43
42
63
47
28
30
58
39
39
49
48
M46
5
30
6
62
60
33
34
59
3
32
1

Transmission controls

Ill No.	Description
1	Bracket, B 21
	Bracket, B 27/B 28
	Bracket, D 24
2	Bushing, upper, B 21, D 24, grey
	Bushing, lower, B 21, D 24, light grey
	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
	Gearshift lever
14	· Reverse detent knob
15	· Pull rod
	· Pull rod
16	· Screw, pull rod
17	· Bushing, upper
18	· Bushing, lower
19	· Tubular pin
20	· Reverse detent sleeve substituted by
	· Reverse detent sleeve
21	· Screw, early type substituted by
	· Screw
22	· Ball socket
23	· Damper, rubber
24	· Circlip
25	· Thrust spring
26	· Cable harness
27	Rubber bellow
28	Gear lever casing, black leather
	Gear lever casing beige leather, not coupe
	Gear lever casing, beige leather, coupe
29	Gear lever knob
30	· Bushing
31	Gear lever knob, lower section
32	Gear lever knob upper section
33	Switch, overdrive
34	Screw
35	Ball socket
36	Damper, rubber
37	Locking plate
38	Screw
39	Locking screw



Transmission mounts
Engines B 21 and B 27/B 28



Ill. 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
	Gearshift lever
14	· Reverse detent knob
15	· Pull rod
	· Pull rod
16	· Screw, pull rod
17	· Bushing, upper
18	· Bushing, lower
19	· Tubular pin

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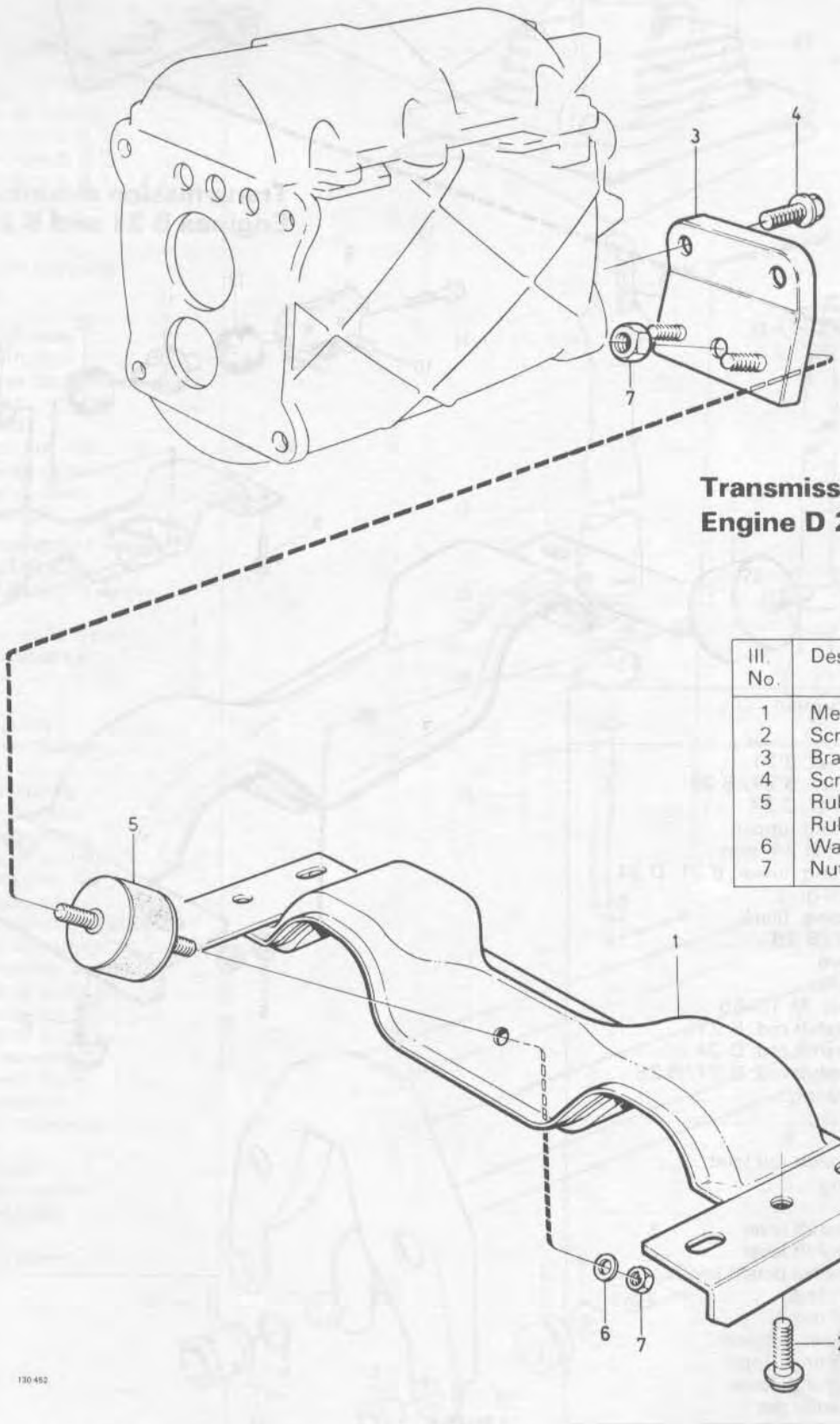
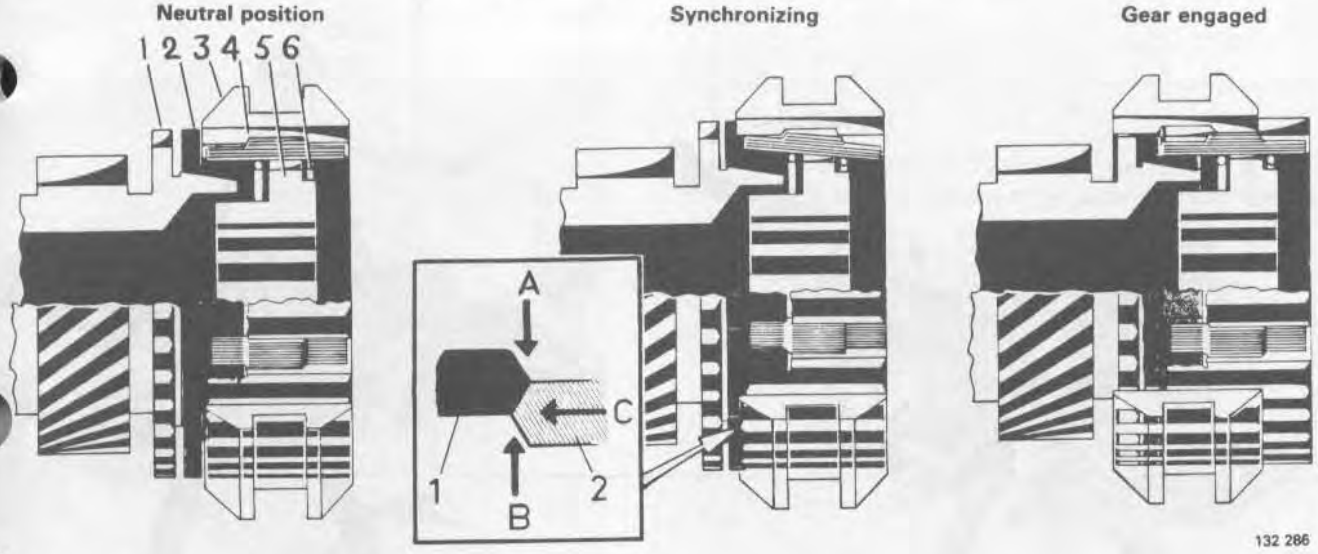
130451



Transmission mount
Engine D 24

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

Synchronization



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

1 Synchro ring
2 Synchro sleeve

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

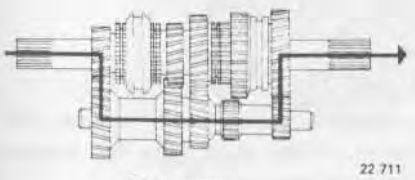
C is the force from the synchro sleeve shift fork.

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.

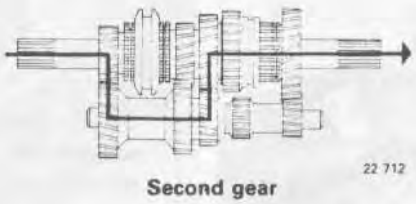
The synchro ring will then be half a tooth out of alignment with the synchro sleeve. This will prevent the synchro sleeve from sliding over the synchro ring and engaging with the gear teeth.

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.

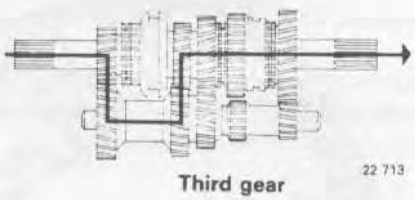
Power flow through the transmission



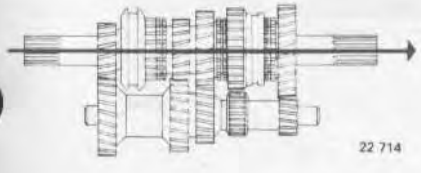
First gear



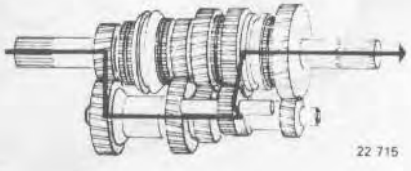
Second gear



Third gear

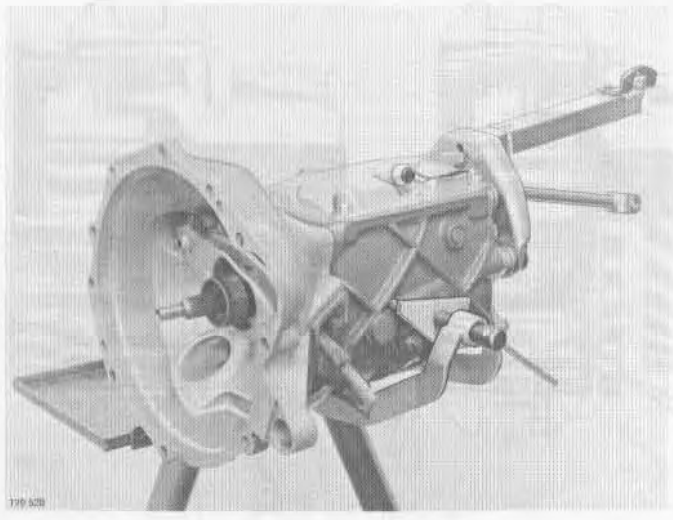


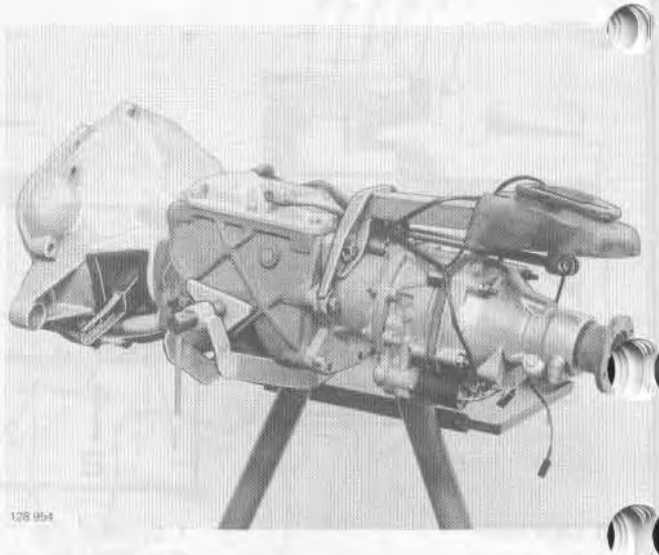
Fourth gear

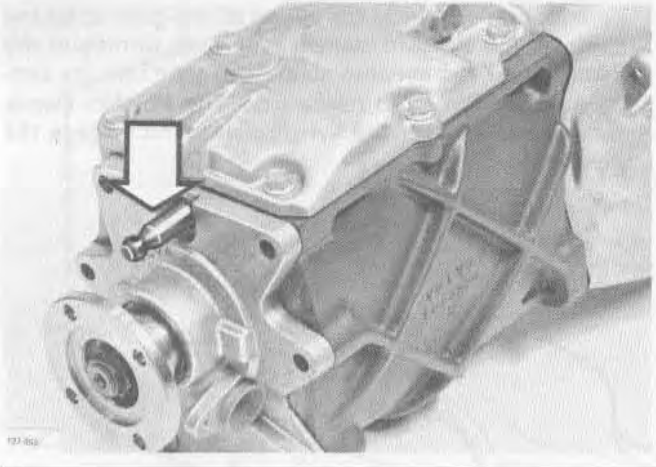


Reverse gear

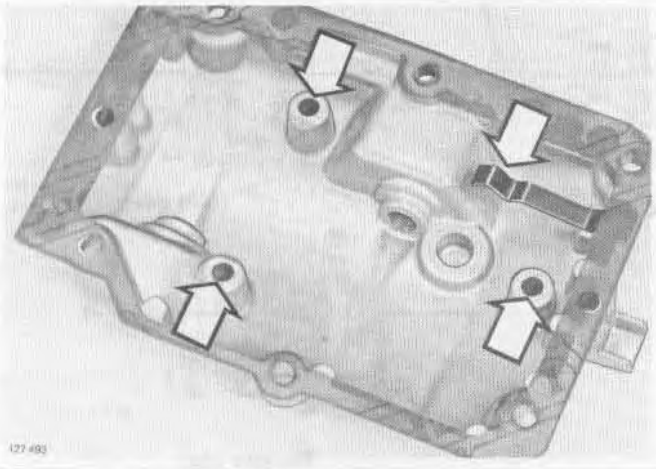
New features of M 45/M 46 transmission 1979–



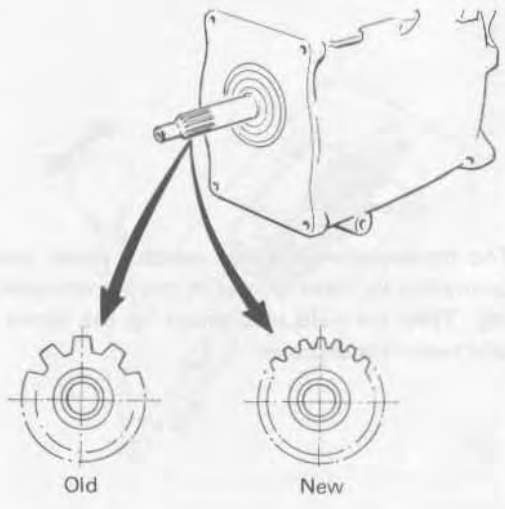




Transmission housing contains one shift selector rail (previously 3).



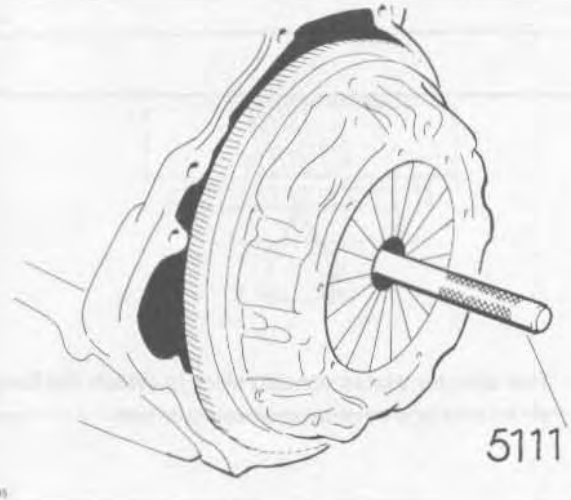
Spring on transmission cover keeps reverse shift selector in position, Three stop lugs for selector plates are also included on cover.
Recess for one shift selector rail has been removed, making cover flatter.



127 048

Input shaft

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

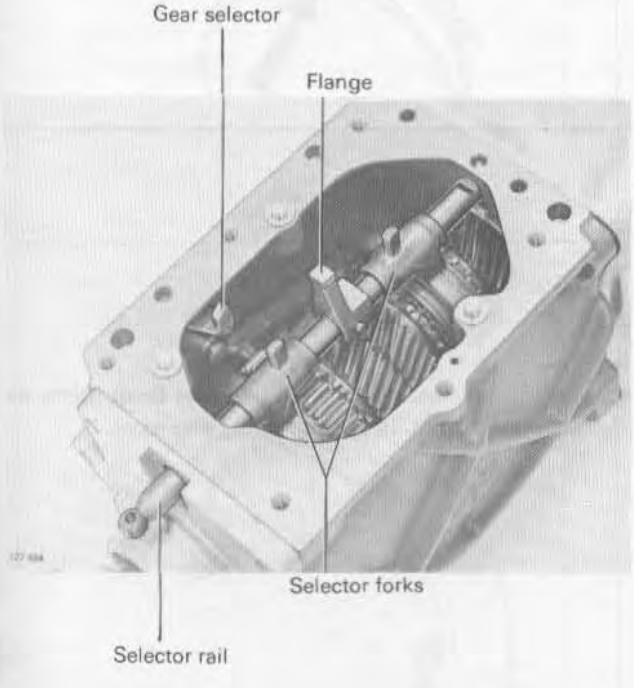


127 045

4-cyl and 6-cyl models with manual transmission

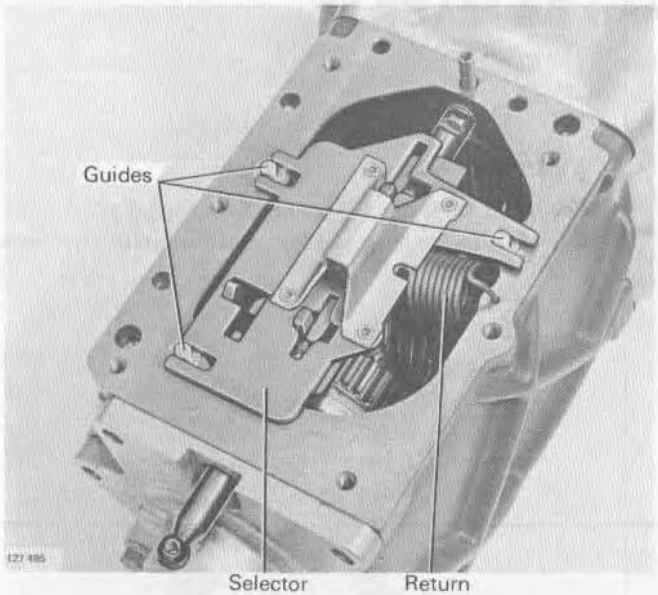
Centering drift for new clutch plate

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

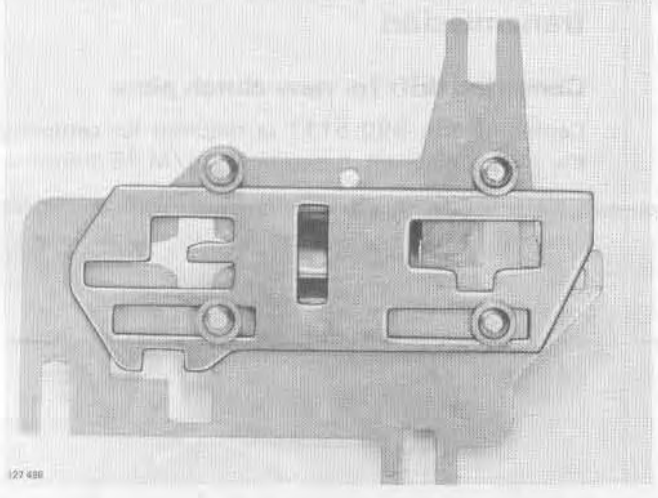


Gear-change controls

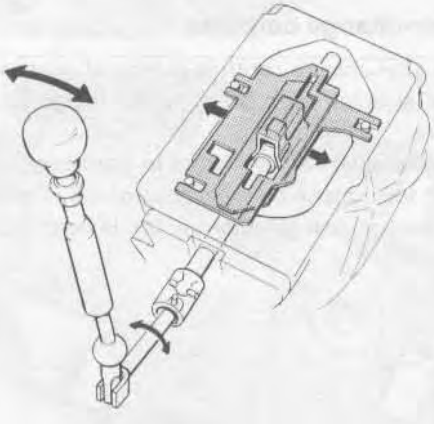
The gear-change controls consist of gear selector rail, gear selector, two (shift) forks, flange and selector plates.
Gear selector rail is located in transmission housing. Shift forks move on gear selector rail. The flange also sits on the gear selector rail but is held in position by a pin.



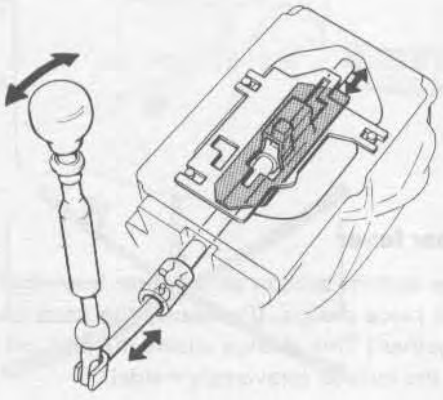
The transmission has two selector plates which are controlled by three guides in the transmission housing. They are held in position by the return spring and transmission cover.



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

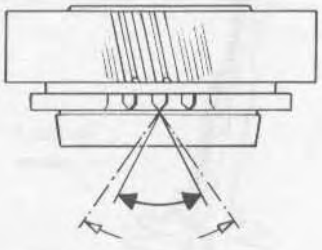


Selector plates are designed so that **both** plates are actuated by the flange and move sideways.



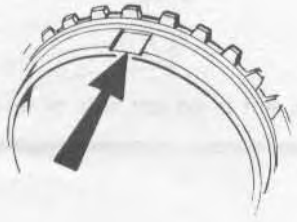
127 498

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.



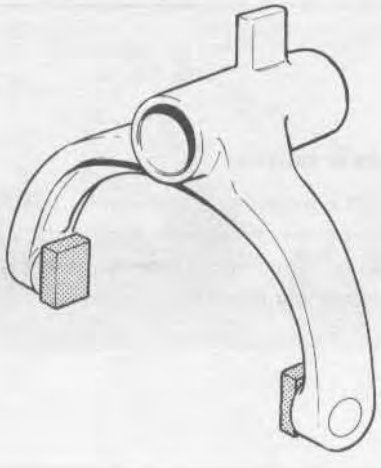
Synchronizing parts

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



127 499

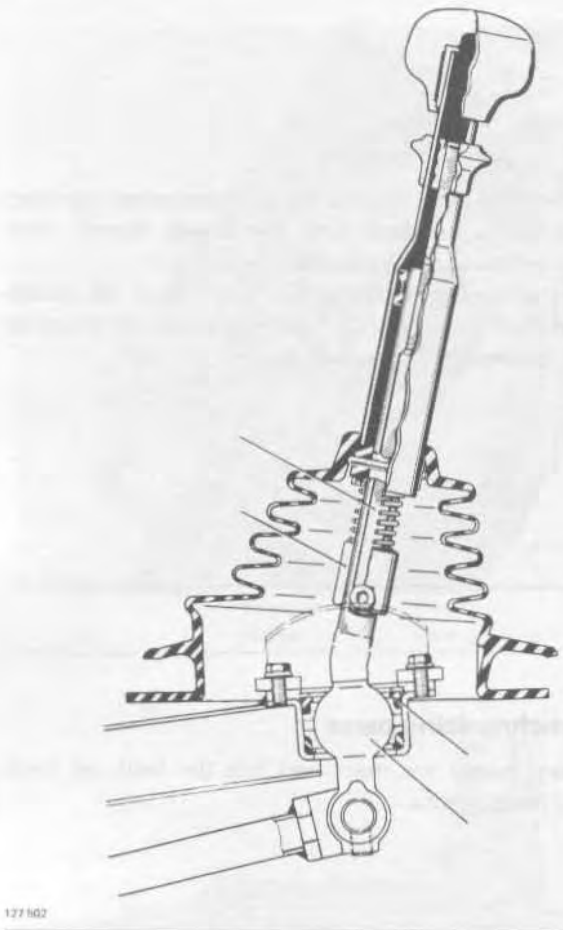
The recesses in the synchronizing rings are narrow to facilitate changing gears.



127 500

Shift forks

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

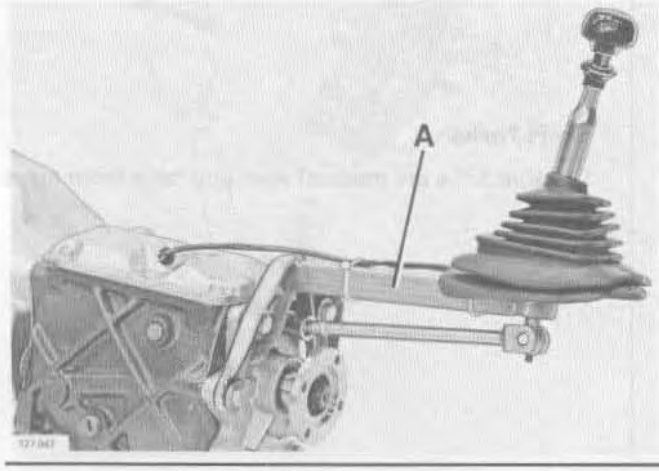


Gear lever

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).

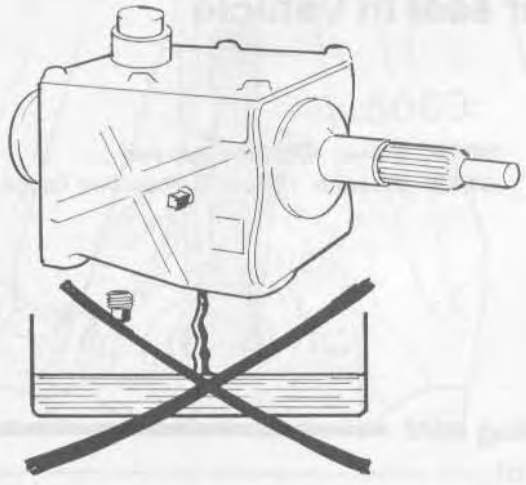
- longer interlock sleeve prevents jamming
- wider diameter ball
- ball locating spring is replaced by two rubber dampers.

- 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

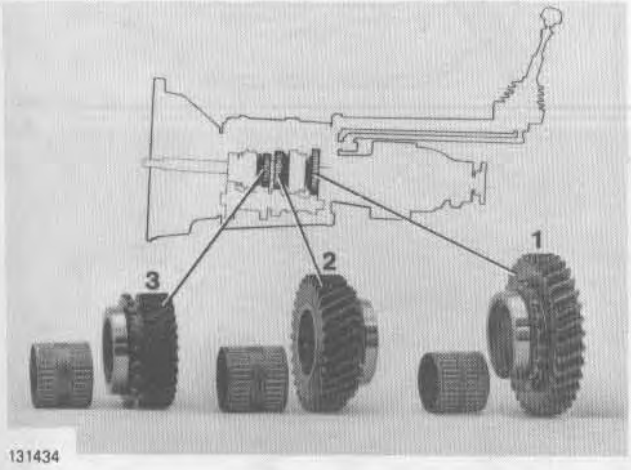
Another interesting new feature is the exclusion of oil change every 30,000 mi. The oil is changed only in connection with the warranty service.
The oil level is subsequently checked at the ordinary servicing.

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.

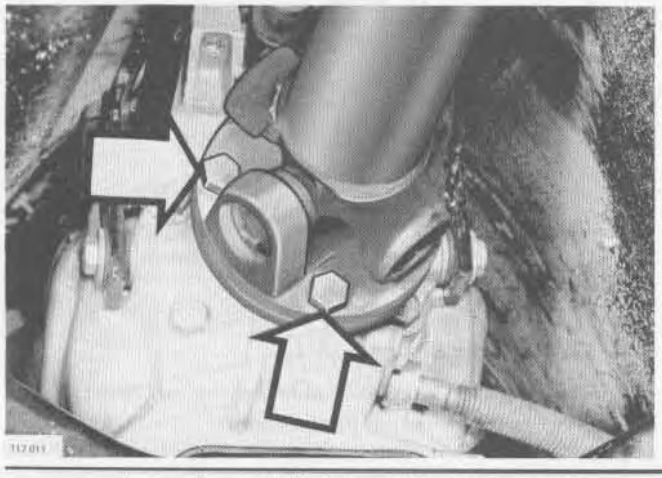
Manual transmissions have been equipped with needle bearings for first, second and third gear.
This does not affect the repair methods for manual transmission.

M 45: replacing rear seal in vehicle

Special tools:

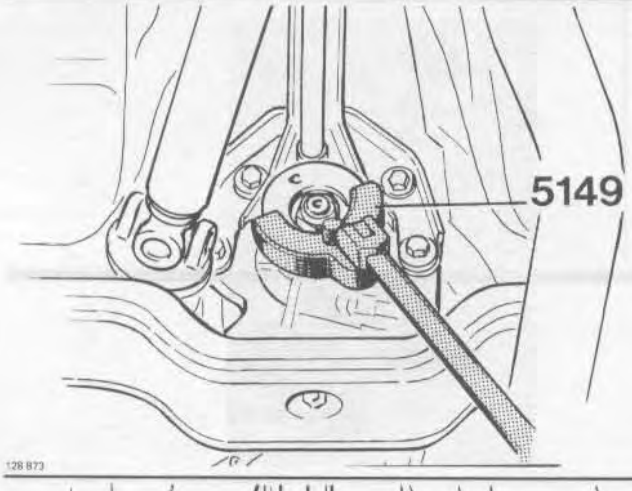
2261 **Puller**, drive flange
5064 **Drift**, installing rear cover seal
5069 **Puller**, removing rear seal
5149 **Wrench**, removing / installing flange nut

Removing seal



A1

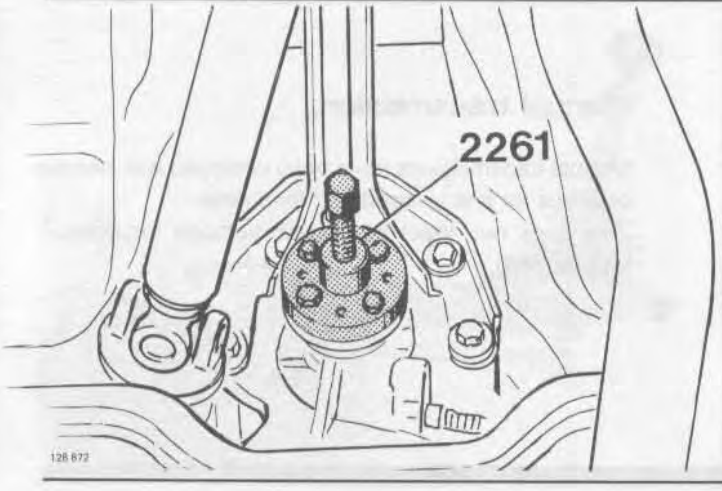
Disconnect propeller shaft from transmission.



A2

Remove flange nut.

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

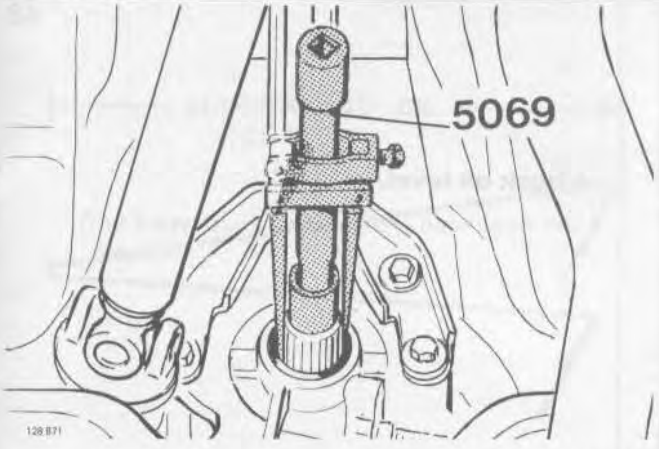


A3

Remove flange.

Use puller **2261**.

A4

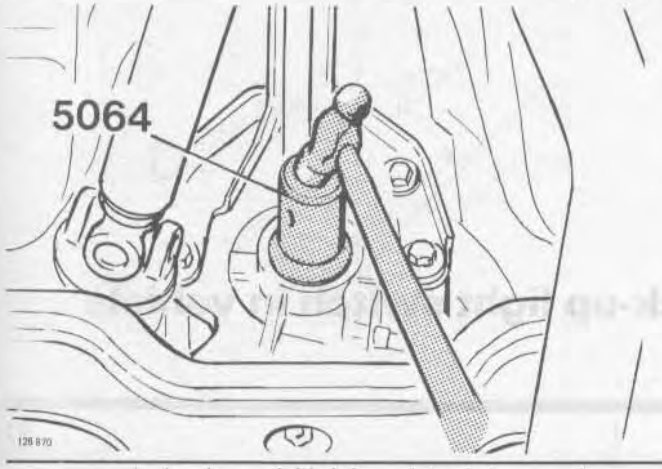


Remove seal.

Use puller **5069**.

Installing seal

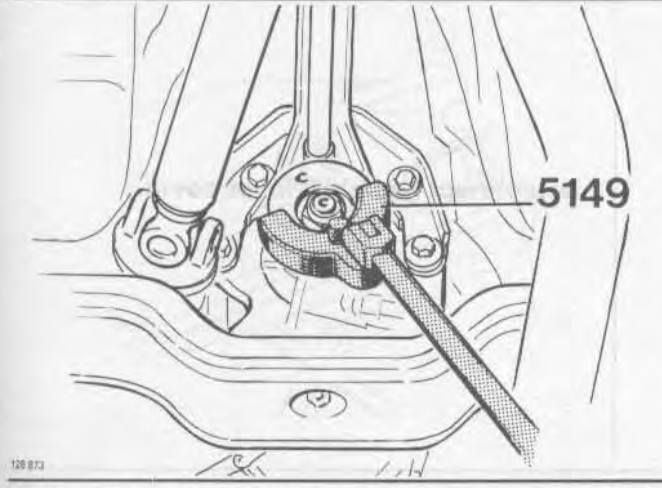
A5



Install new seal.

Use drift **5064.**

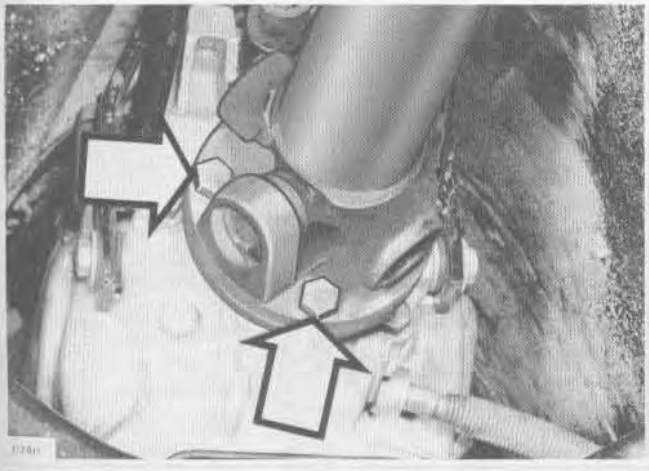
A6



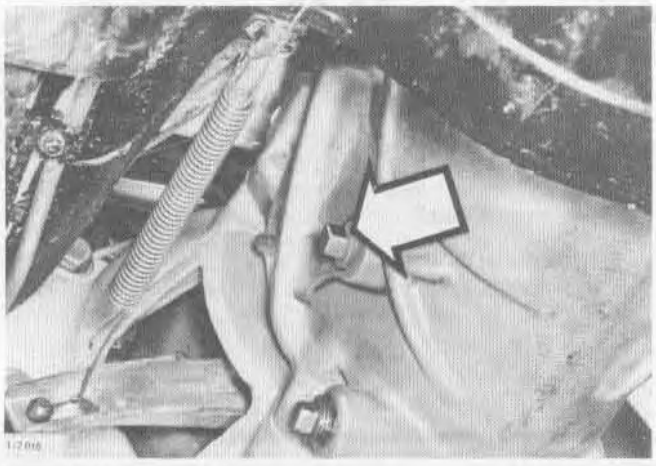
Install flange.

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.

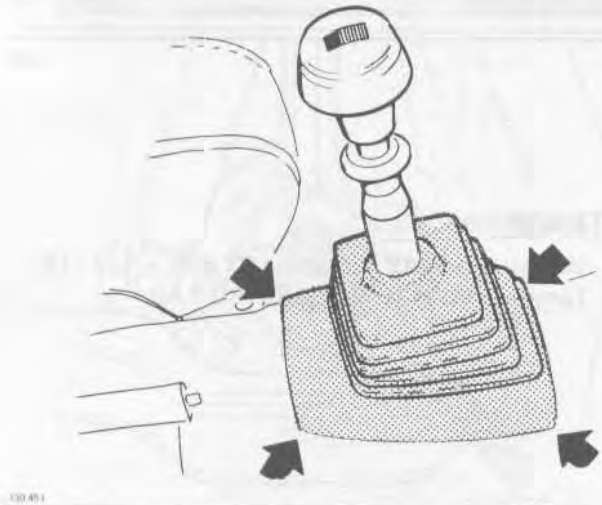


A8

Check oil level.

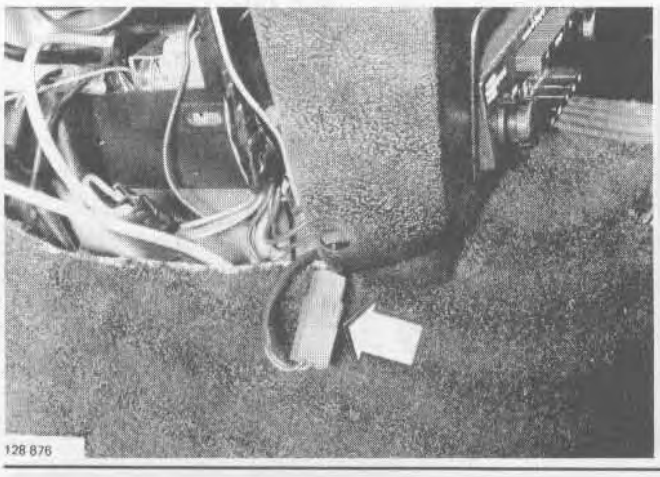
Use Automatic Transmission Fluid type F or G.

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



B1

Disconnect gearshift lever cover.

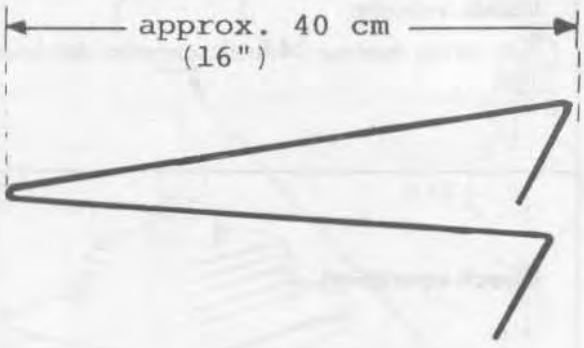


128 876

B2

Disconnect connector.

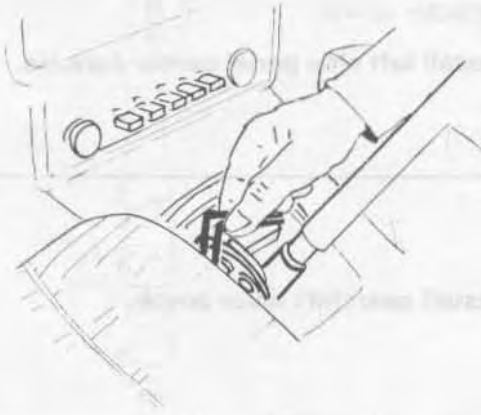
To gain access, remove left side panel of center console.



B3

Bend a steel wire to shape as shown.

(early)



B4

Position steel wire.

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

B5

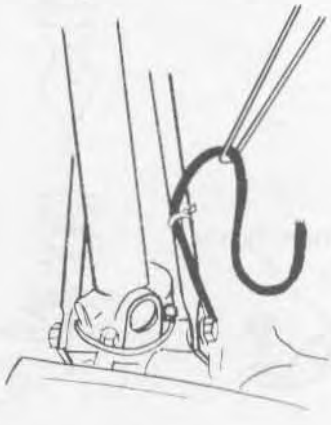
Gain access to back-up light switch.

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

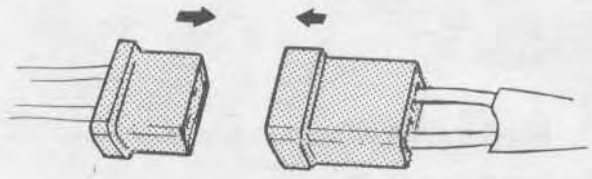
Re-clamp wire to gearshift carrier rod.

B8

Place harness on steel wire as shown.

B9

Install cross member bolts. Lower vehicle.



130 455

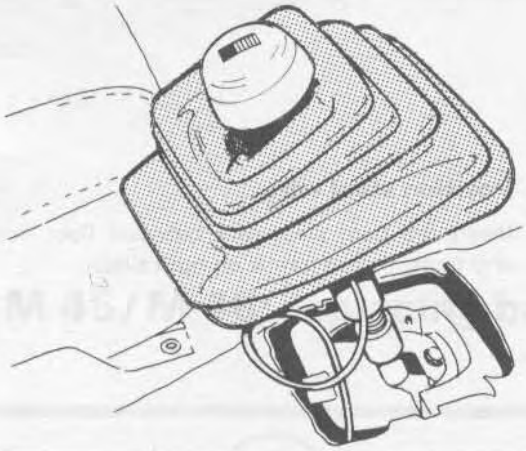
B10

Inside vehicle:

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

B11

Check operation.



130 456

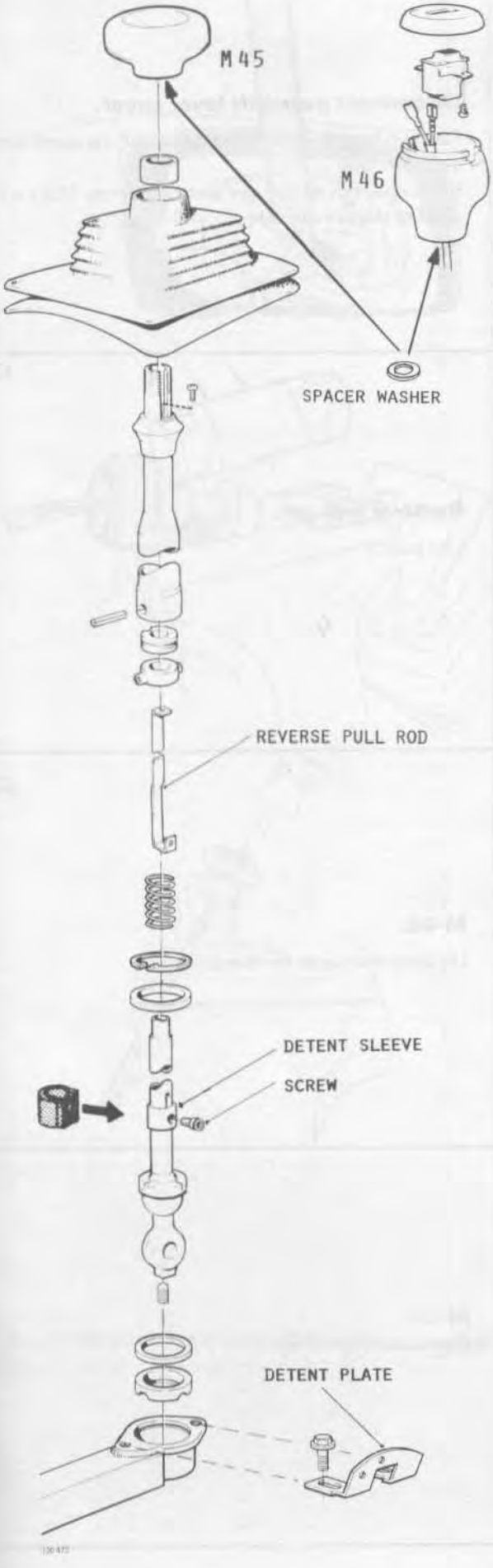
B12

Install left side panel center console.

B13

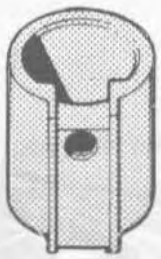
Install gearshift lever cover.

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



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

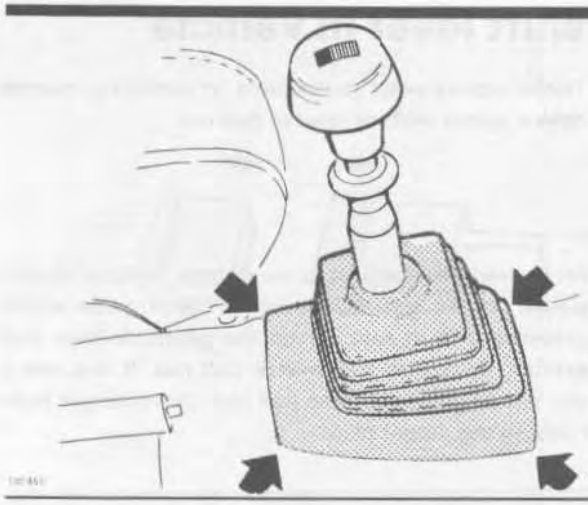
From mid-79 there is a new type reverse detent sleeve on the gearshift lever. It has a guide which prevents it from rotating on the gearshift lever and exerting forces on the reverse pull rod. It also has a slot which guides reverse pull rod, preventing it from rubbing the detent plate.



1232687 - 2

new

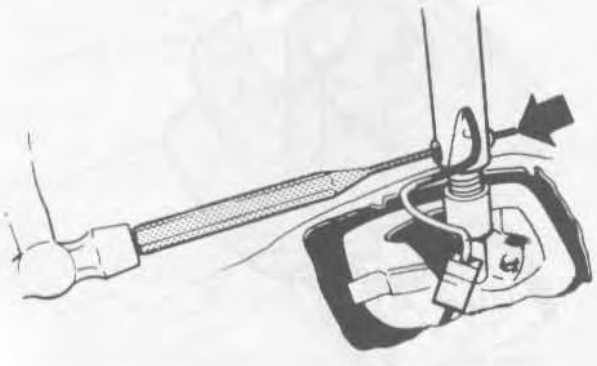
In case the reverse pull rod breaks, the old type reverse detent sleeve should also be replaced. It is 2 mm = 0.08'' longer than the old one. Therefore, the gearshift lever knob should be raised accordingly to permit free travel of the reverse detent sleeve.
This is done by installing a 2 mm = 0.08'' 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.



C1

Disconnect gearshift lever cover.

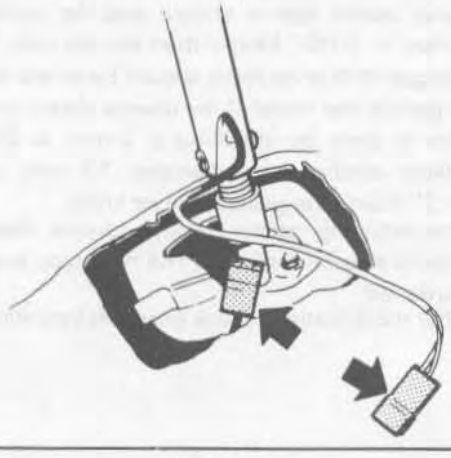
Remove four clips retaining cover. Lift up cover along gearshift lever.
Be careful, not to damage electrical wires. There is no need to disconnect wires.



C2

Remove lock pin.

Use punch.



C3

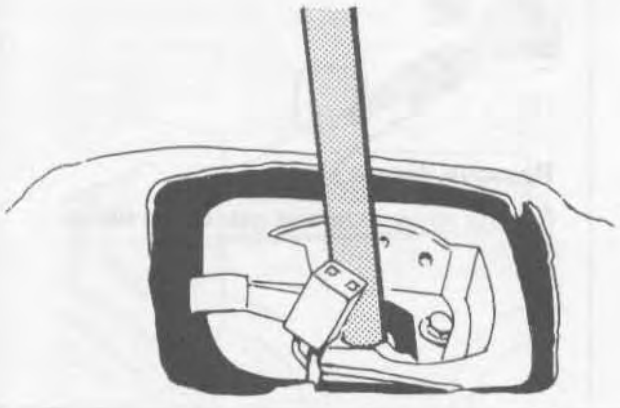
M 46:

Un-plug connector for overdrive wire.

C4

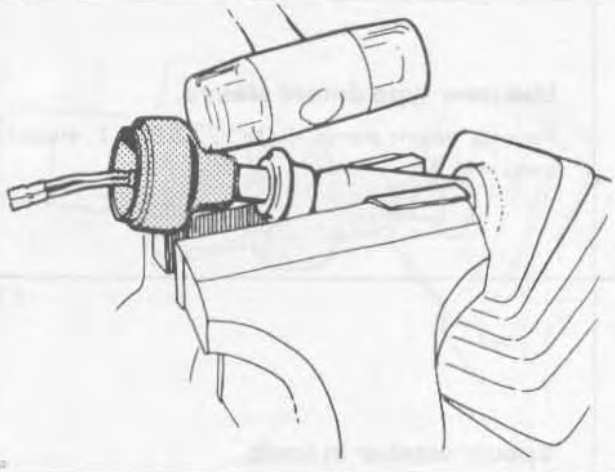
M 46:
Remove top of knob.

C5



Lift up gearshift lever.

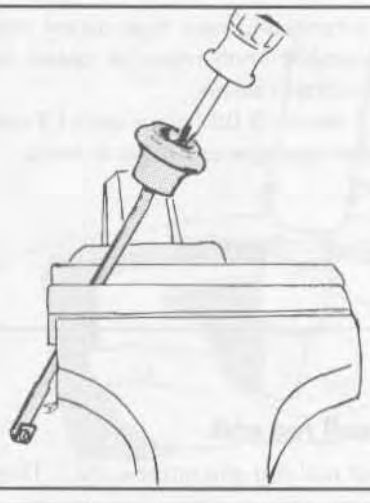
C6



Remove gearshift lever knob.

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

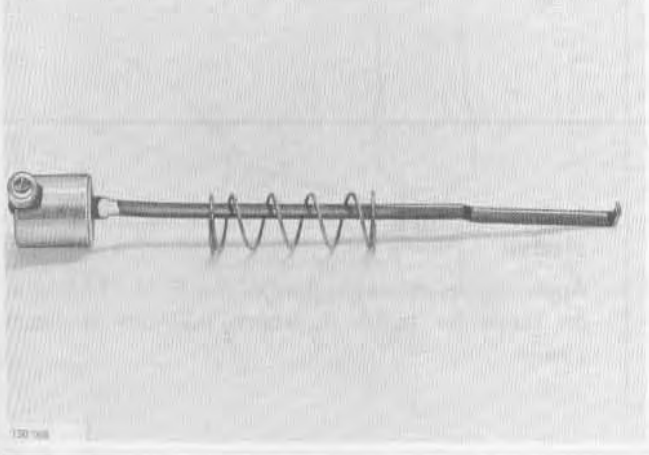
C7



Remove detent knob.

Remove screw. Lift off detent knob.

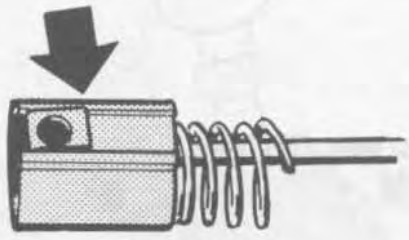
C8



Remove pull rod.

Remove pull rod, spring and detent sleeve assembly.

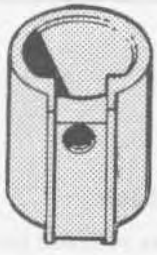
C9



Remove detent sleeve.

Remove screw on reverse gear detent sleeve.

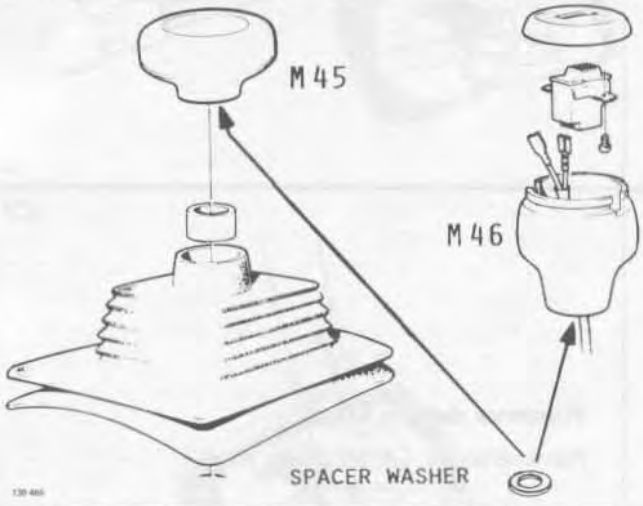
C10



Use new type detent sleeve.

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

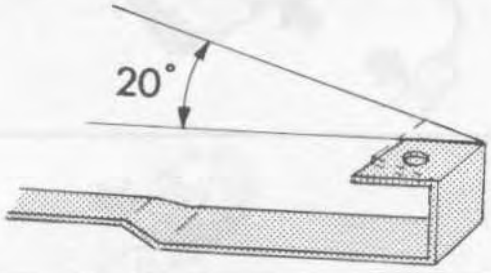
C11



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.

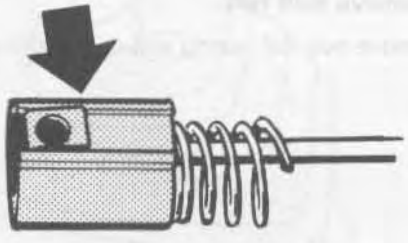
C12



Bend pull rod end.

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

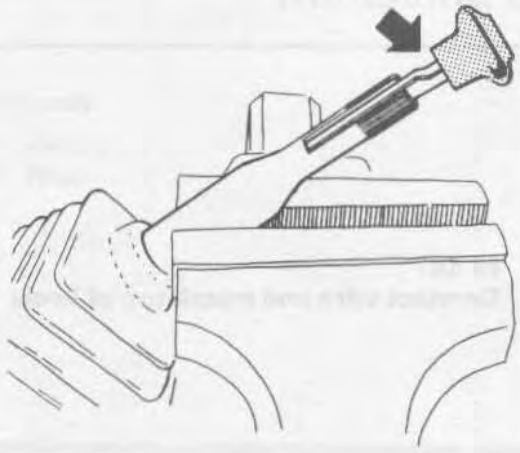
C13



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.

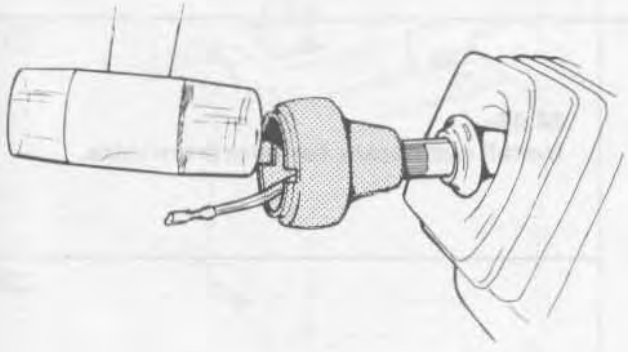
C14



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.

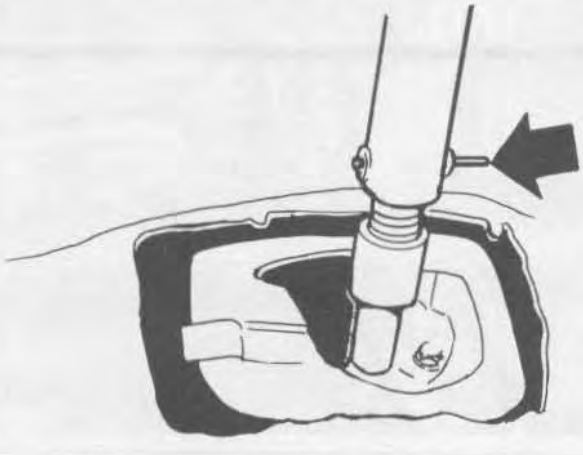
C15



Install gearshift lever knob.

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

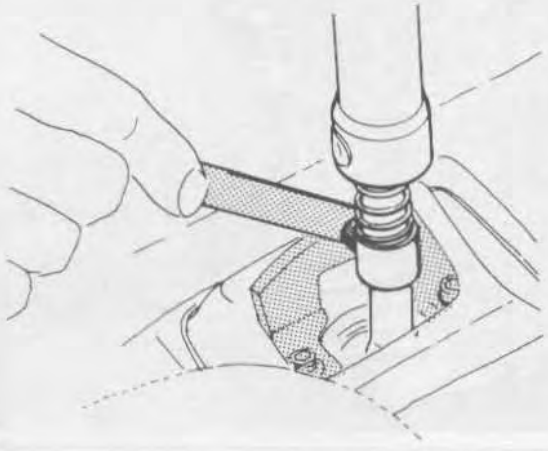
C16



Assemble gearshift lever.

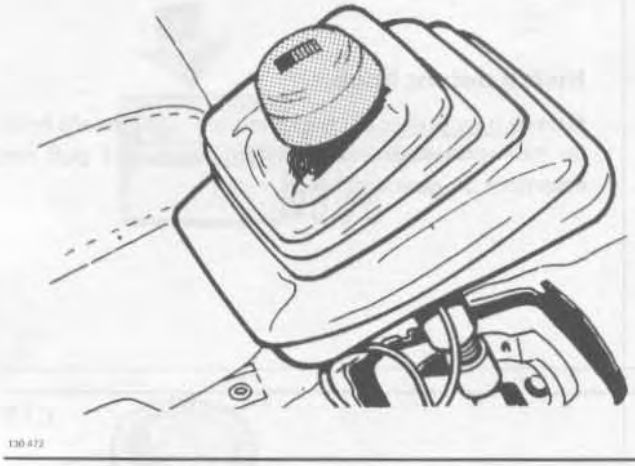
Install upper part of gearshift lever on lower part in vehicle.
Install lock pin.

C17



Check reverse detent for correct operation.

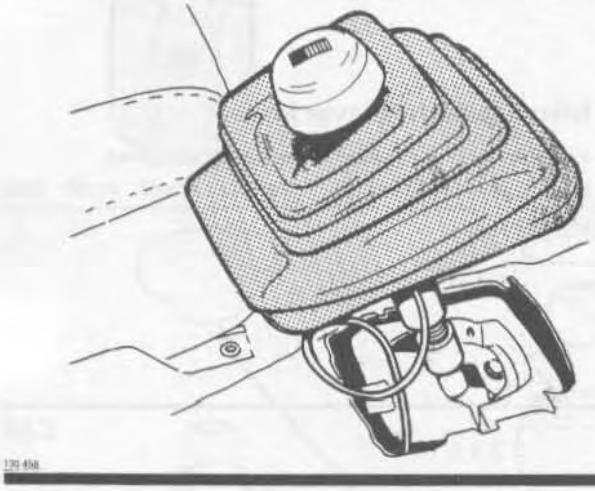
Engage first gear. Distance between detent plate and detent screw should be 0.5–1.5 mm = 0.02–0.06". Adjust by moving detent plate.
Also engage second gear and recheck distance.



130 472

C18

M 46:
Connect wire and install top of knob.



130 458

C19

M 46:
Install connector for overdrive wire.

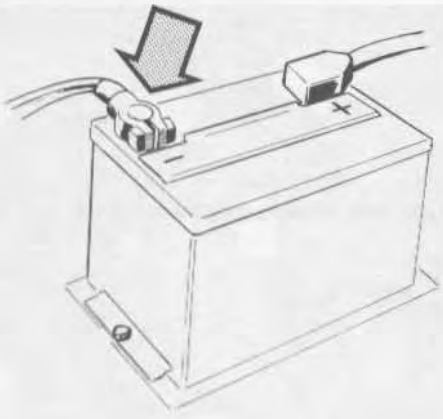
C20

Install gearshift lever cover.

Removing transmission M 45

Special tools:

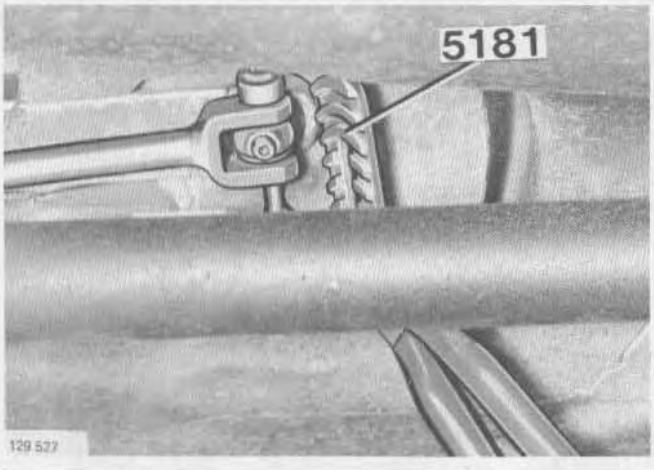
5151 Fixture
5181 Pliers



130015

D1

Disconnect battery ground cable.



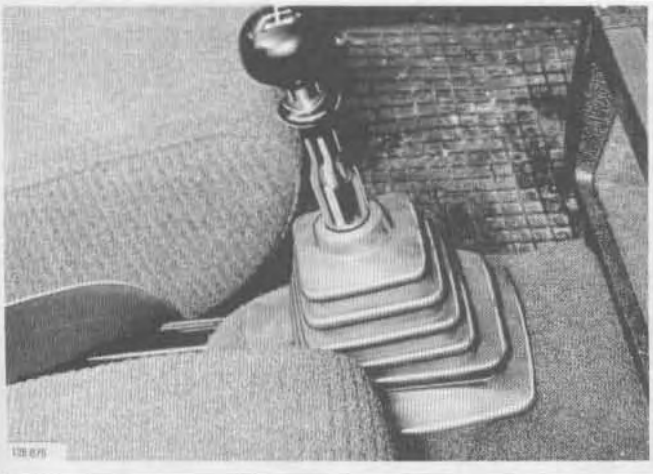
129 527

From under vehicle:

D2

Disconnect gearshift lever from gearshift rod.

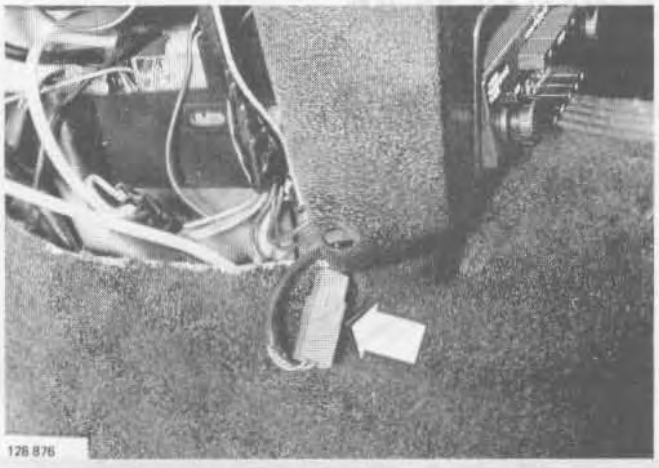
Remove lock bolt. Use pliers **5181** to remove pivot pin.



Inside vehicle:

D3

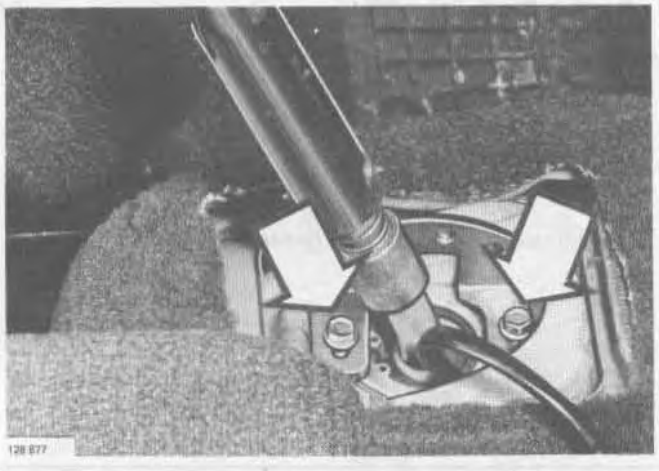
Disconnect gearshift lever cover from floor.



D4

Inside vehicle:

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



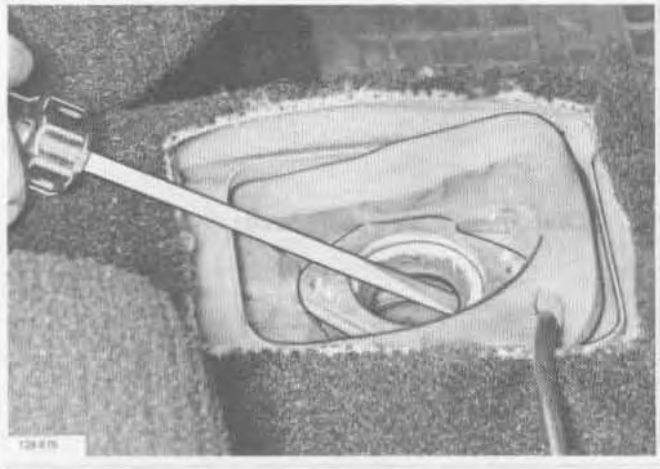
D5

Remove reverse detent plate.

D6

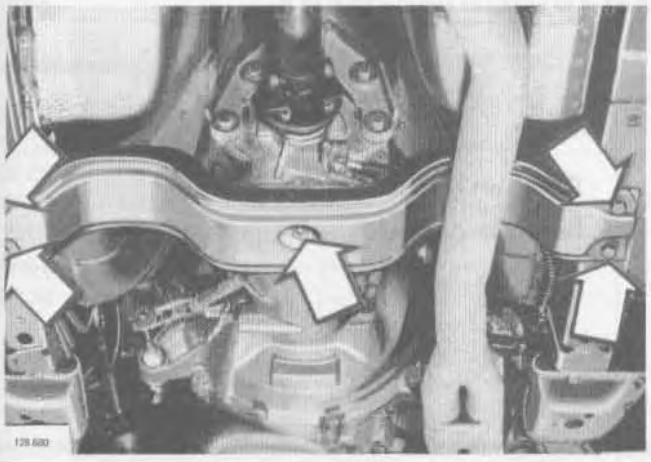
Remove gearshift lever.

Remove lock ring to remove gearshift lever.



D7

Remove plastic bushing and rubber ring.



D8

From under vehicle:

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.

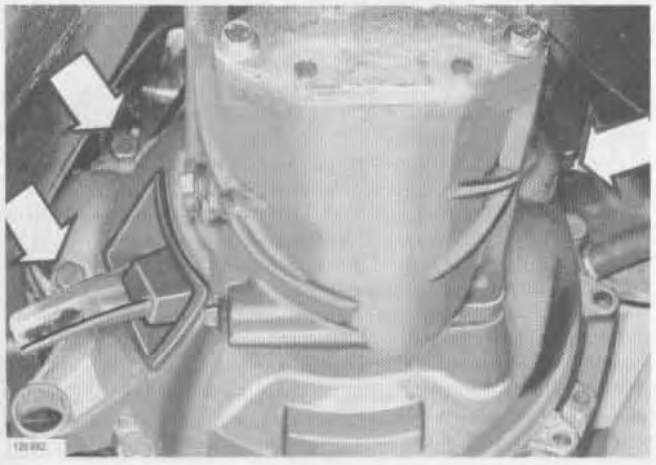
D11

Remove front exhaust pipe attachment.

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

D12

Unhook rubber supports for front muffler.



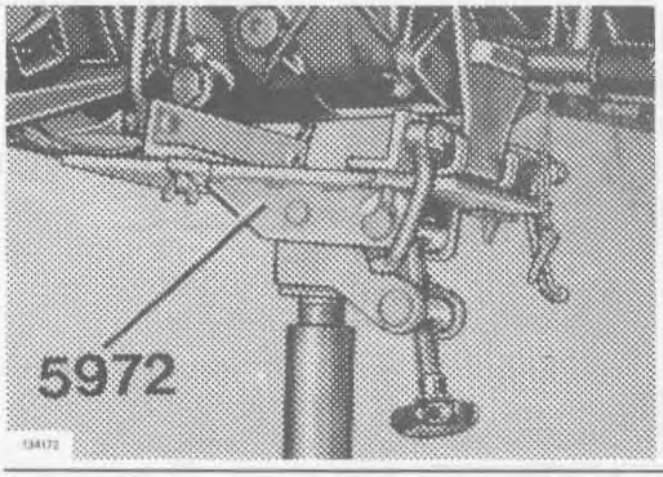
D13

Begin separating bell housing from engine.

Remove all bolts except two at bottom.

D14

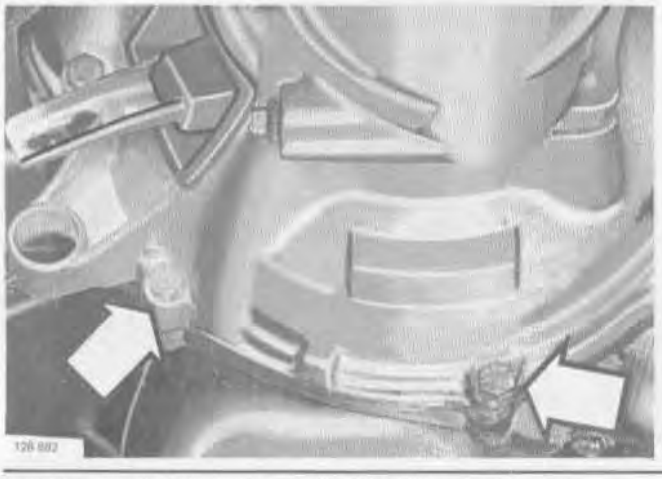
Pull out starter motor until free from bell housing.



D15

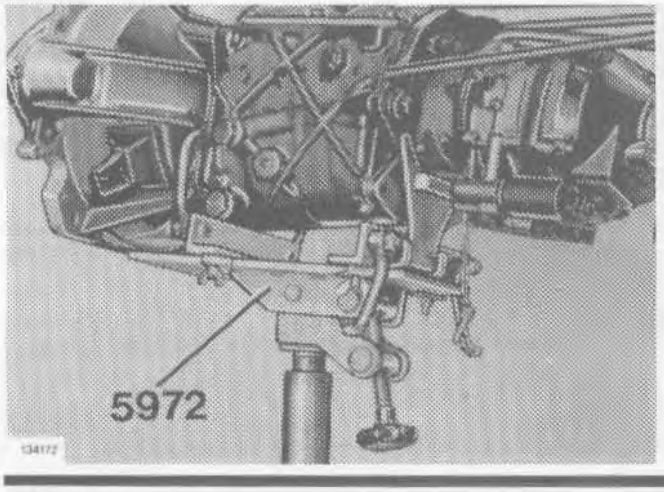
Position transmission fixture.

Secure transmission rigidly on fixture.



D16

Remove two lower bolts at bell housing.



D17

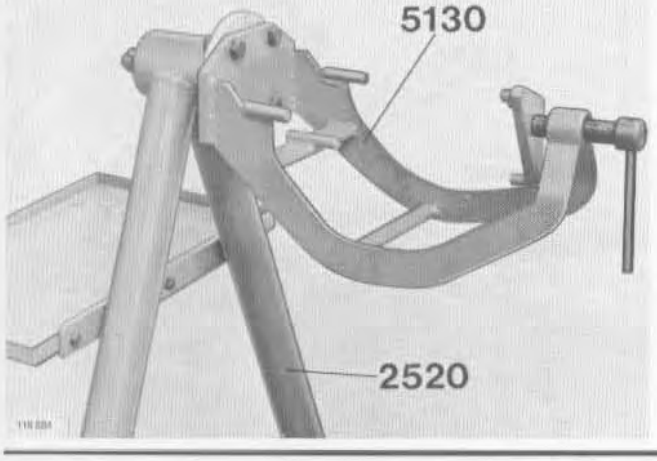
Remove transmission.

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 2520
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

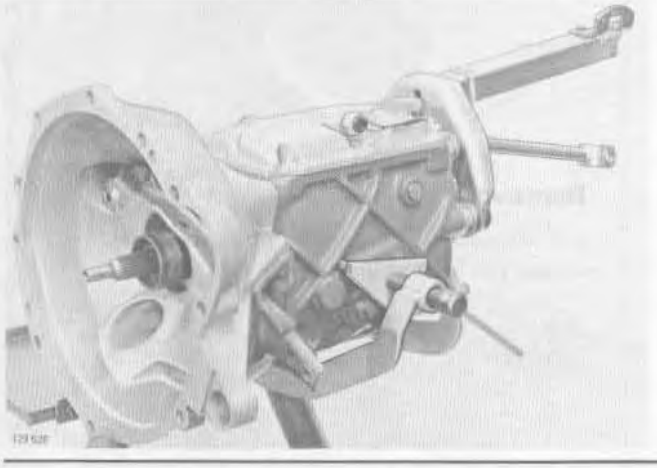


E1

Attach fixture 5130.

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

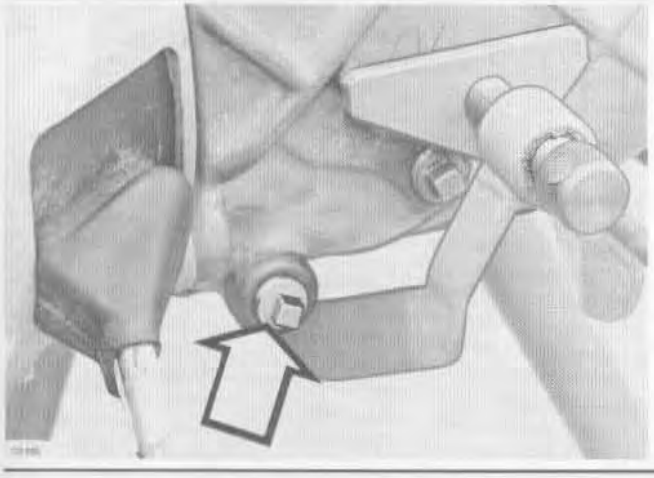
NOTE:
Modified type fixture 5130 must be used. See "Modification of fixture 5130" at end of Special Tool section.



E2

Install transmission fixture.

Ensure all mating surfaces align when tightening holding bolt.

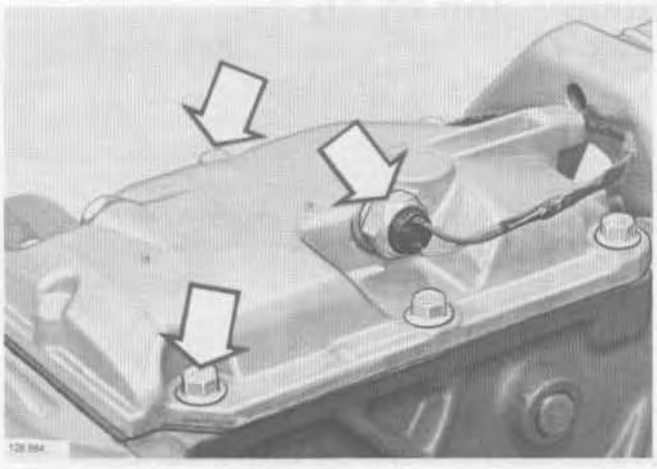


E3

Remove sound deadening material from gearshift carrier.

E4

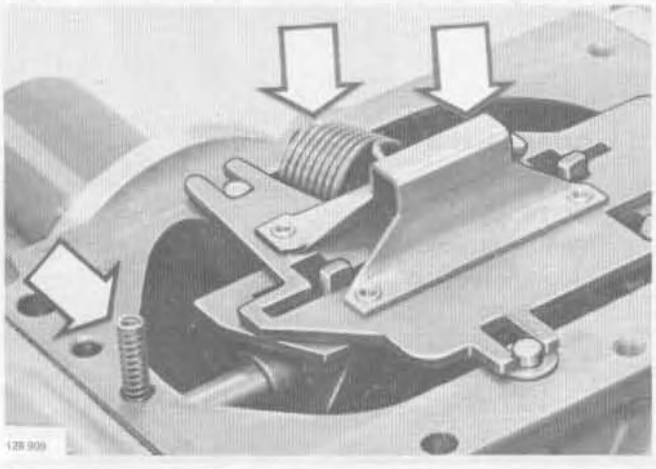
Remove drain plug and drain oil.



E5

Remove:

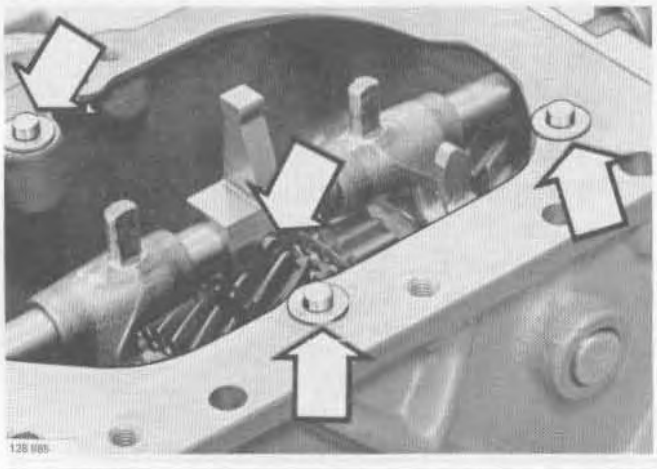
– Back-up light switch.
– Transmission top cover.



E6

Remove:

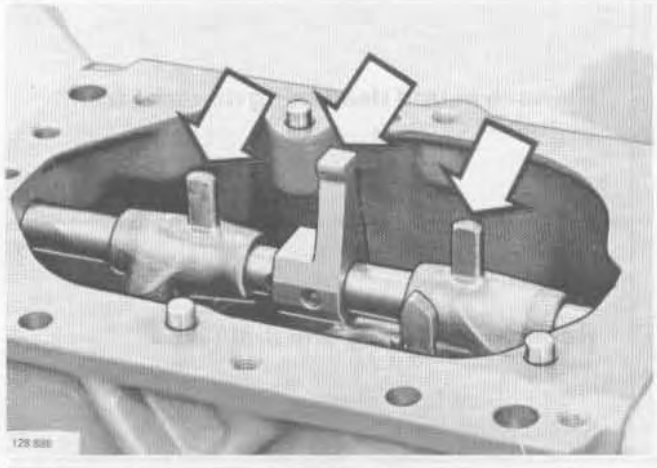
– Spring and detent ball.
– Selector plate assembly and return spring.
– Gasket.



E7

Remove:

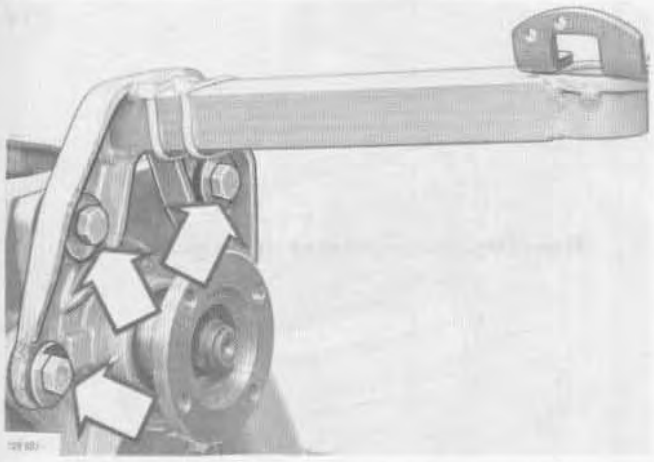
– Glide washers for selector plate assembly.
– Lock pin for shifter.



E8

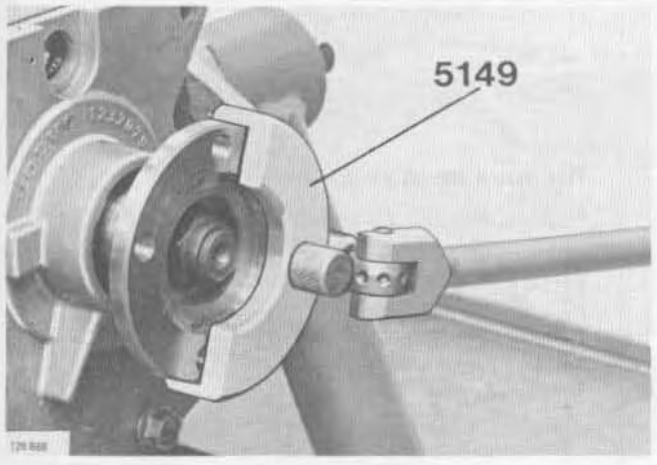
Remove:

– Selector rail.
– Shifter and shift forks.



E9

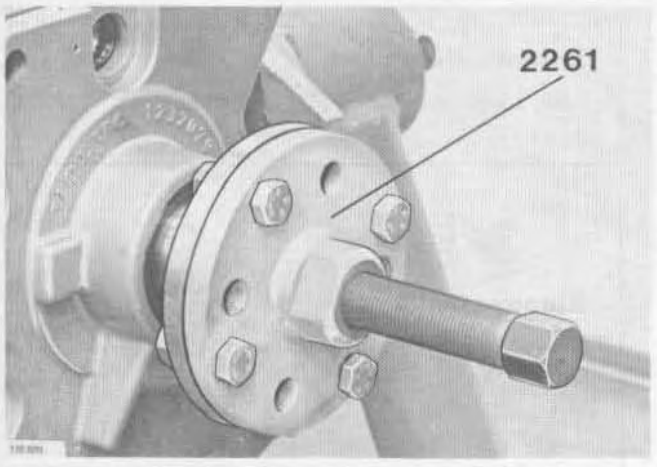
Remove gearshift carrier assembly.



E10

Remove drive flange nut.

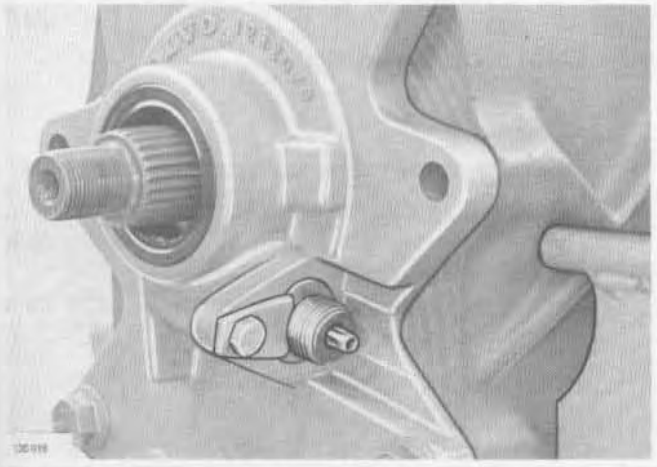
Socket **27 mm** = 1–1/16". Use wrench **5149** to hold.



E11

Pull off drive flange.

Puller **2261**.



E12

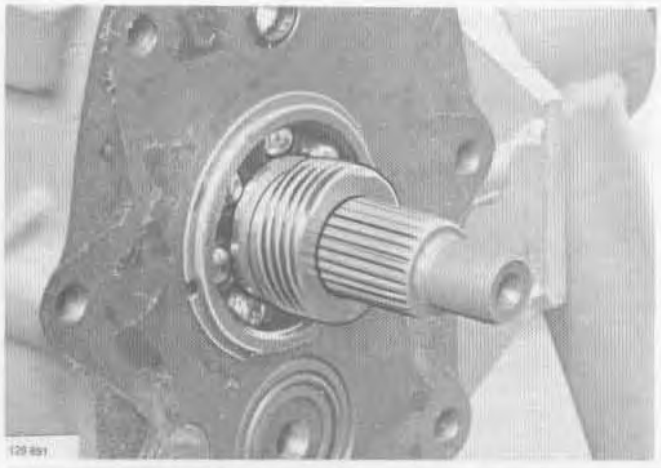
Remove speedometer driven gear.

Remove bolt and retainer to pull out gear.

E13

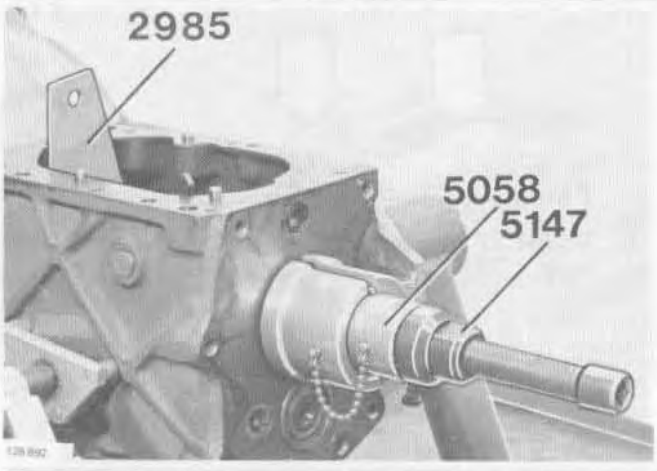
Remove rear cover.

Remove gasket and shims.



E14

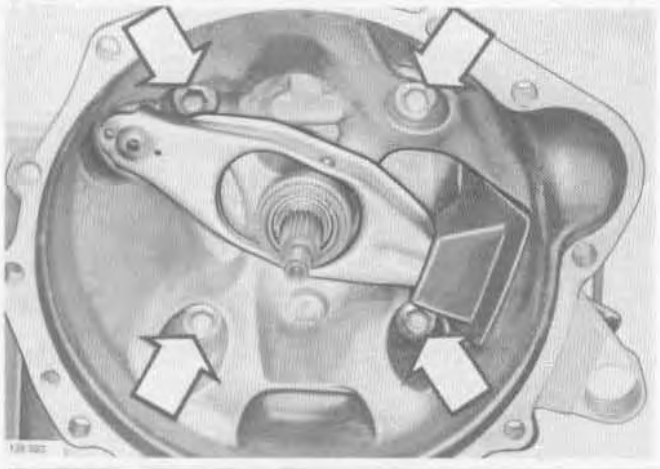
Remove speedometer drive gear.



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

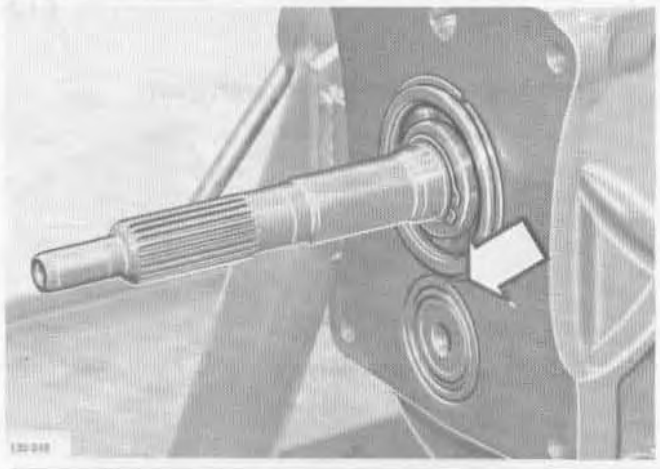
Remove clutch fork.

Save spacer washer and throw-out bearing.

E17

Remove bell housing.

Remove gasket and shims. Inhex wrench 8 mm.

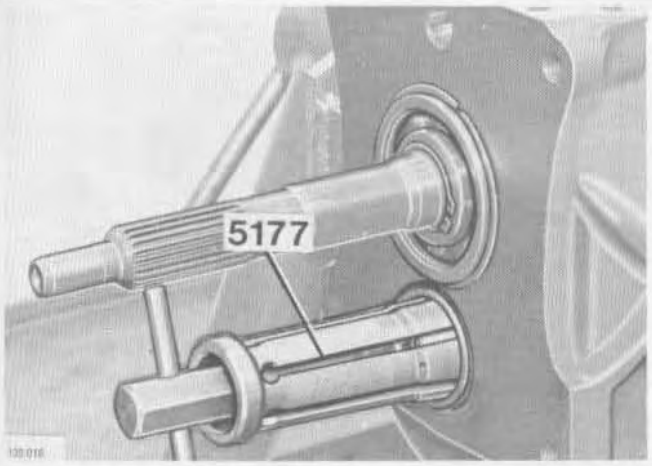


E18

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.

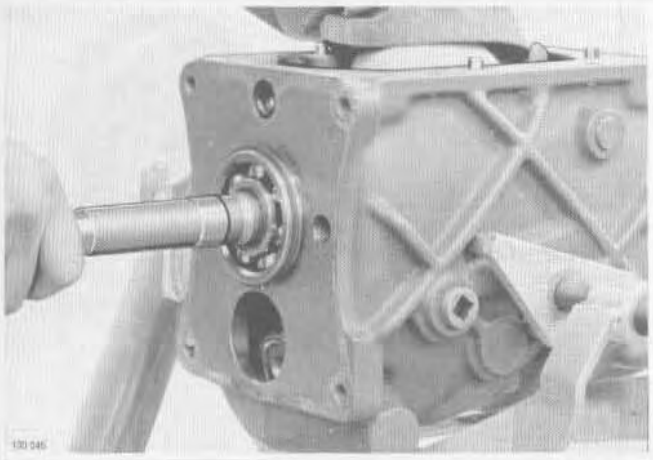


E18

Aluminum housing:

Remove outer races for intermediate shaft bearings

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

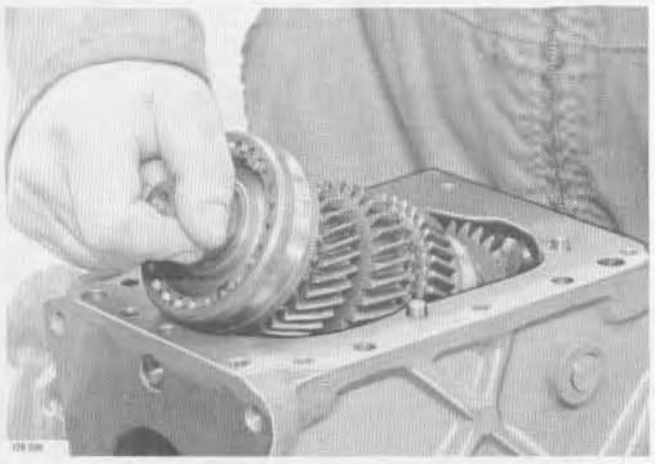


E19

Pull out input shaft.

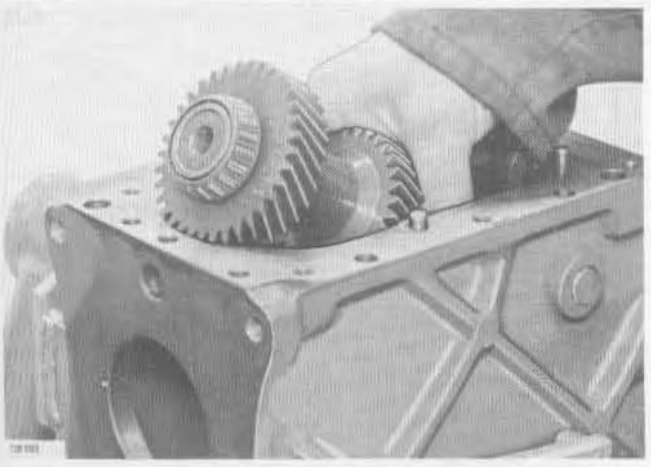
E20

Remove 4th gear synchro ring



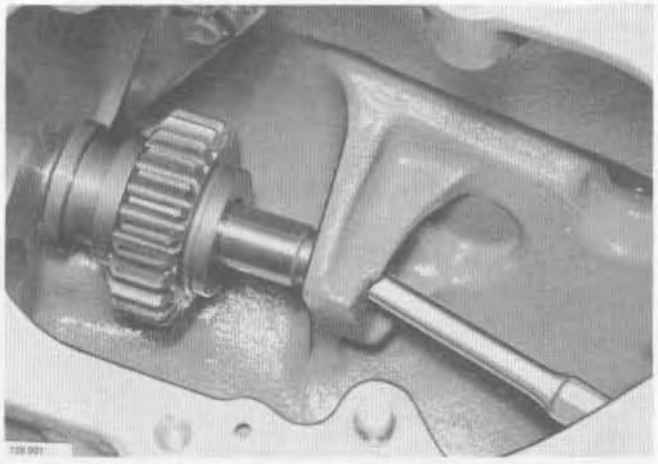
E21

Lift out main shaft.



E22

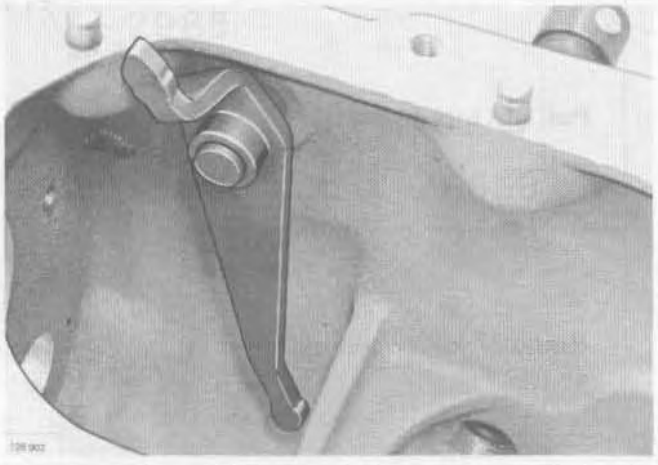
Lift out intermediate shaft.



E23

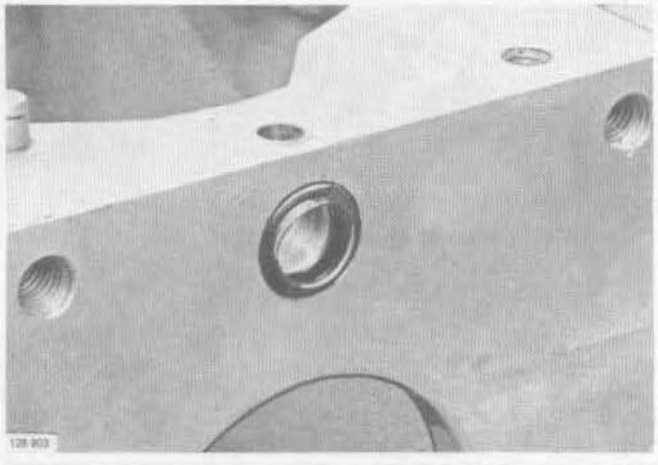
Remove reverse gear and shaft.

Use punch to knock shaft back.



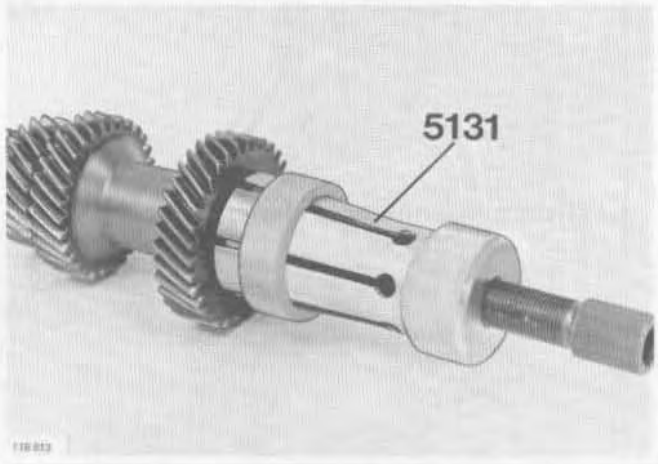
E24

Remove reverse gear shift fork.



E25

Remove seal for selector rail.

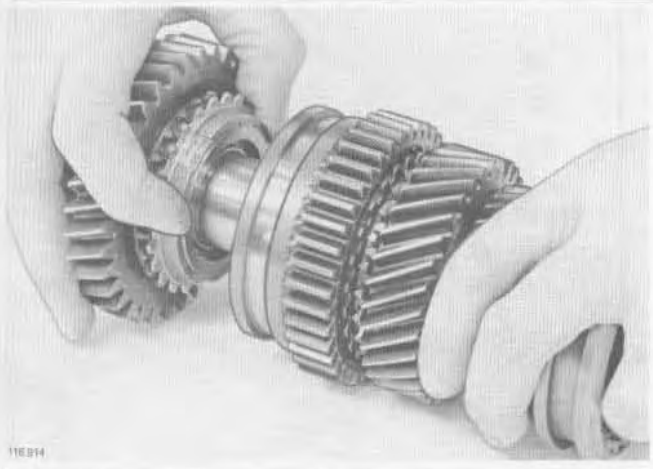


E26

Remove intermediate shaft bearings.

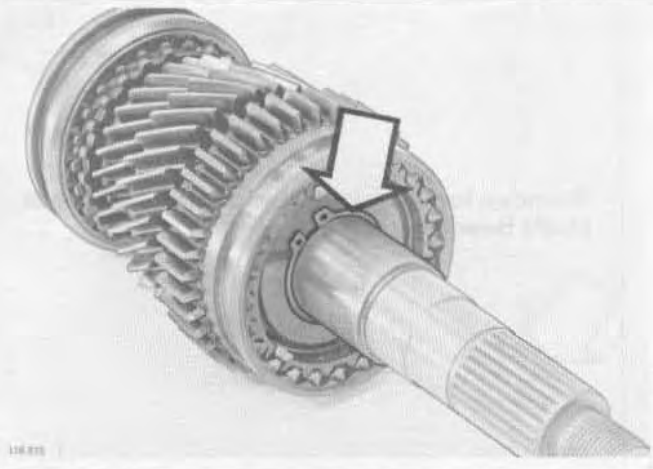
Use puller **5131**.

E27



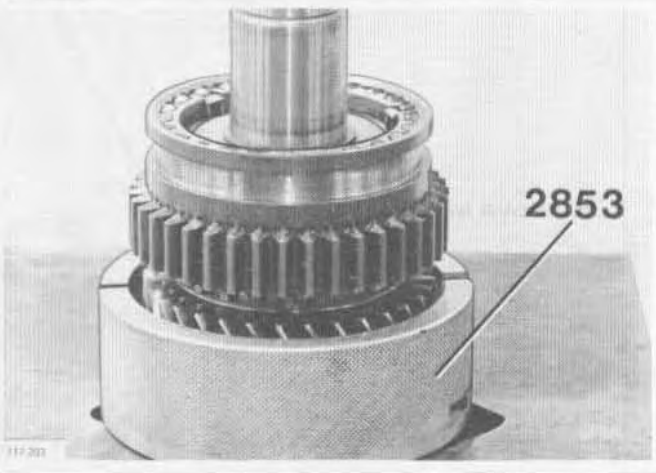
Remove 1st gear and synchro ring from main shaft.

E28



Remove lock ring for 1–2 synchro hub.

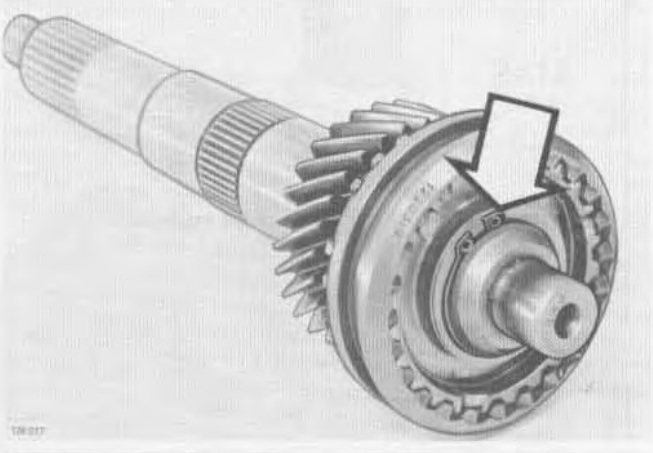
E29



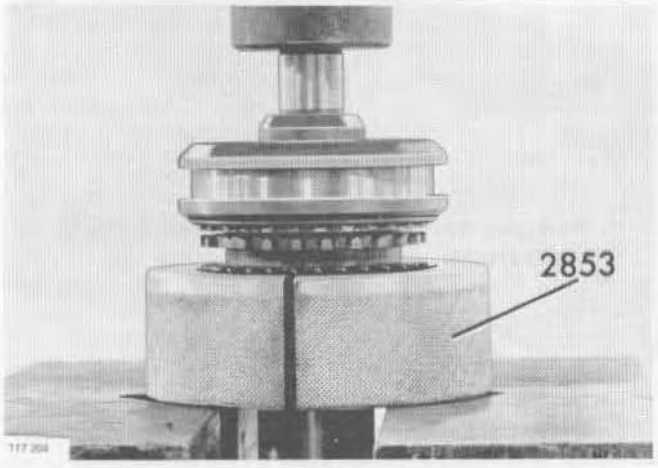
Press off synchro hub and gear.

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

E30



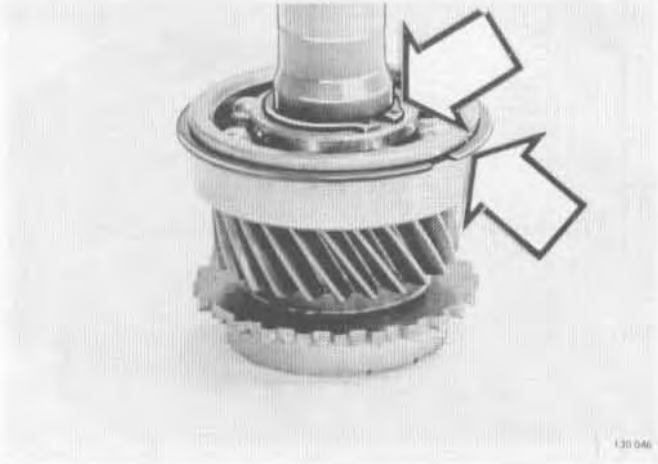
Remove lock ring for 3–4 synchro hub.



E31

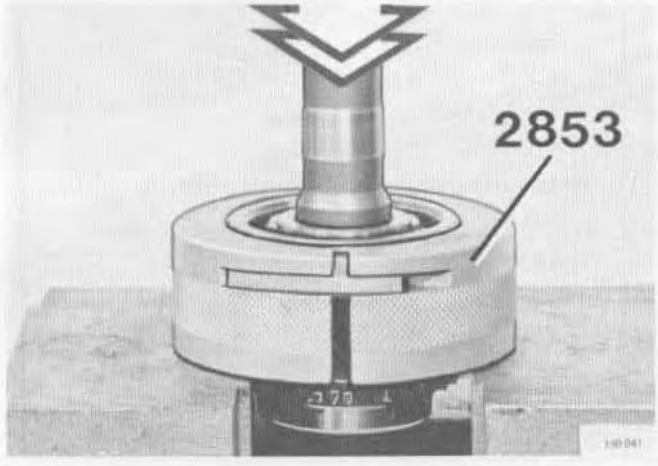
Press off synchro hub and gear.

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



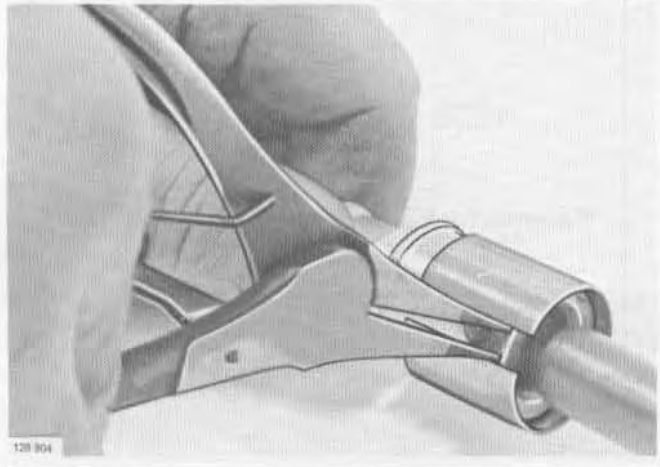
E32

Remove lock ring and spacer ring for input shaft bearing.



Remove input shaft bearing.

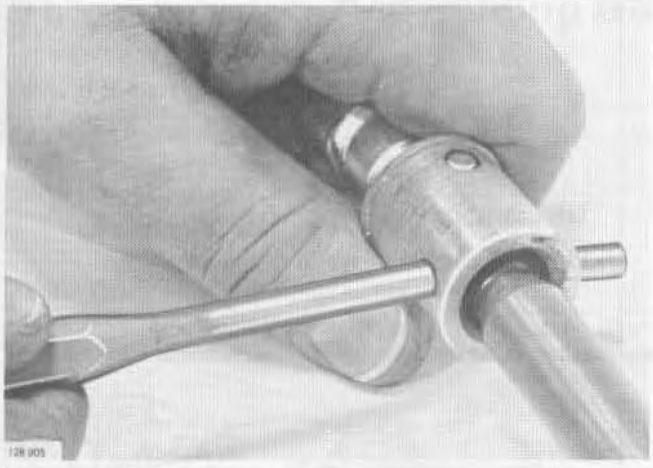
NOTE: Can be tight so a press may be needed.
Use adapter **2853,** small hole UP under bearing.



E34

Remove sleeve on gearshift rod joint.

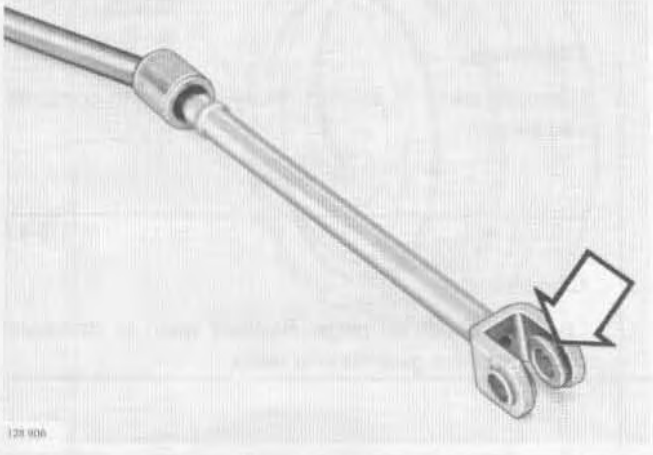
E35



Disassemble gear selector rail and gearshift rod.

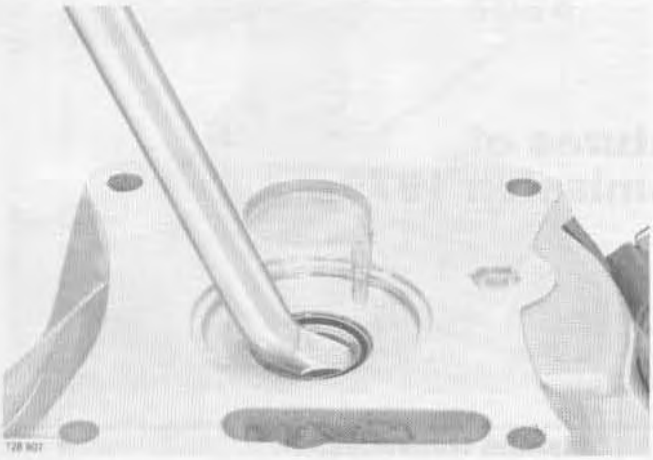
Use a 5 mm punch to push out front pin.

E36



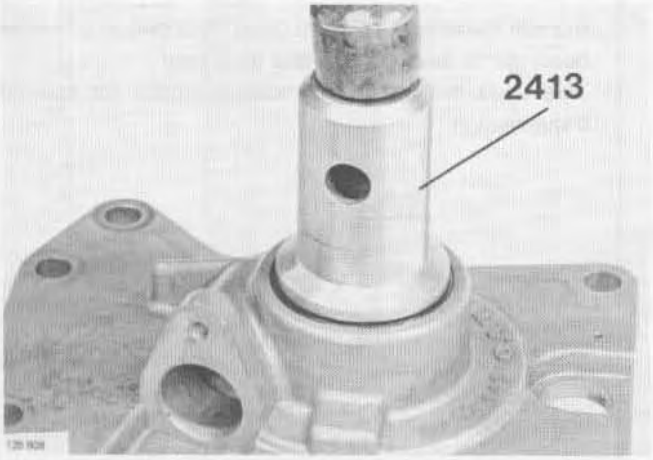
Remove gearshift rod bushings.

E37



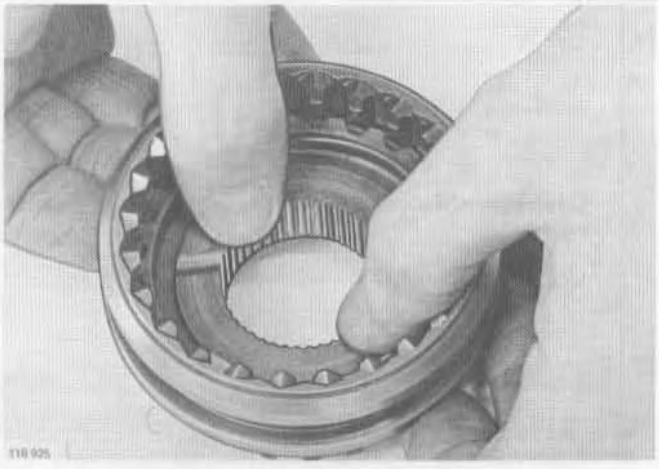
Remove bell housing seal.

E38



Remove rear cover seal.

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



E39

Disconnect two synchro hubs.

Push hubs out of sleeves.

E40

Cleaning.

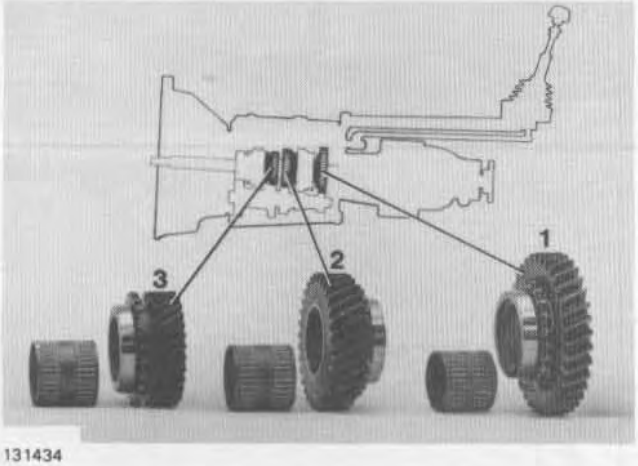
Clean all parts in solvent. Blow clean with compressed air.

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.

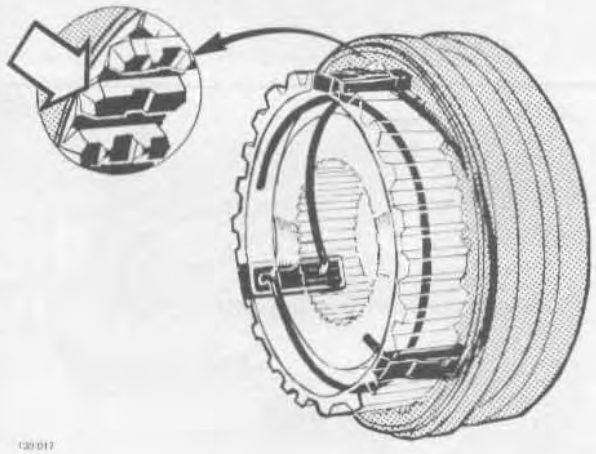
Manual transmissions have been equipped with needle bearings for first, second and third gear.
This does not affect the repair methods for manual transmission.

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

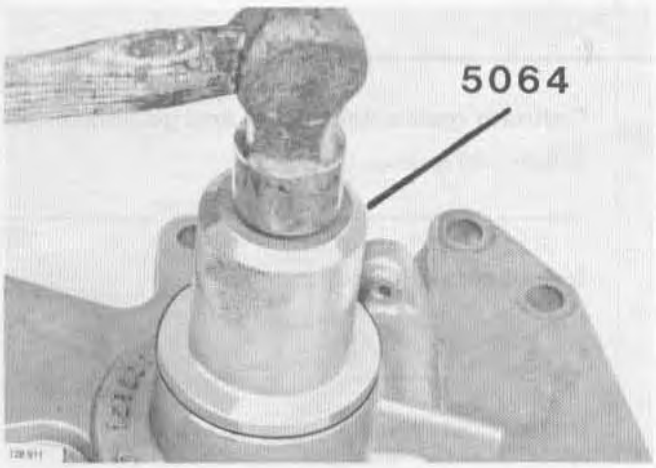


Connect 1-2 and 3-4 synchro hubs.

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.

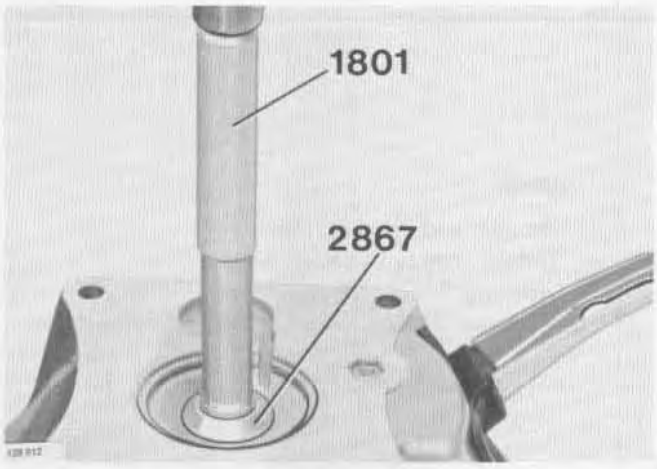
F2



Install rear cover seal.

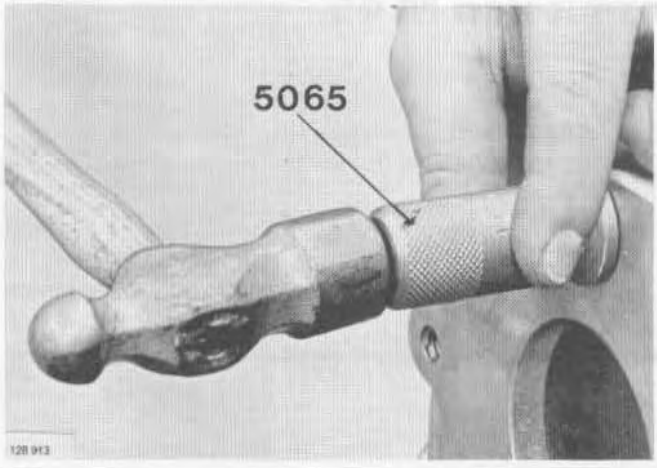
Use drift **5064**.

F3



Install bell housing seal.

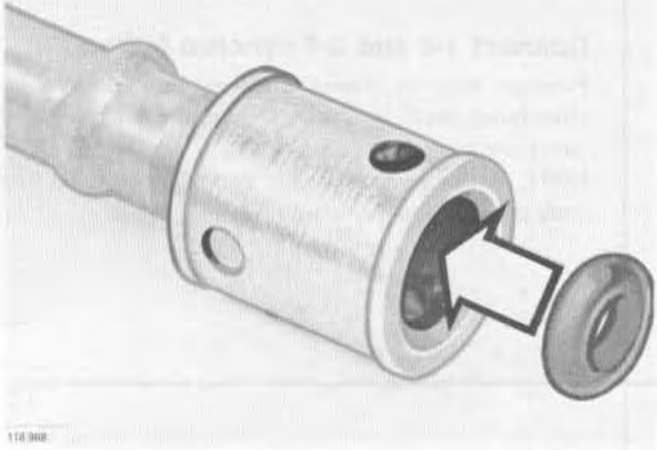
Use drift **2867** and standard handle **1801**.



F4

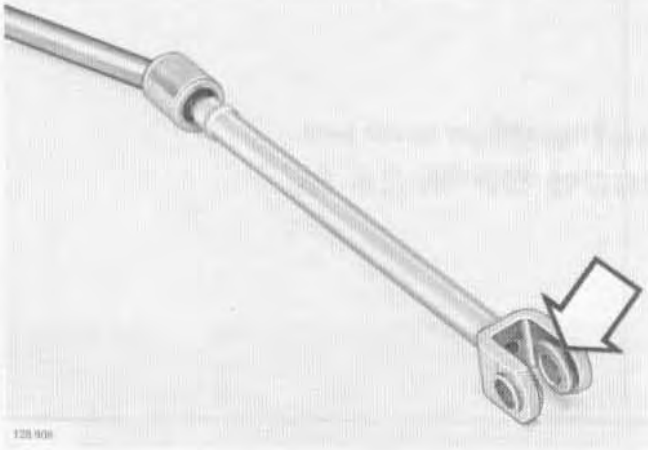
Install seal for selector rail.

Drift **5065**.



F5

Position rubber ring in joint.



F6

Connect gear selector rail and gearshift rod.

Selector rail grooves UP.

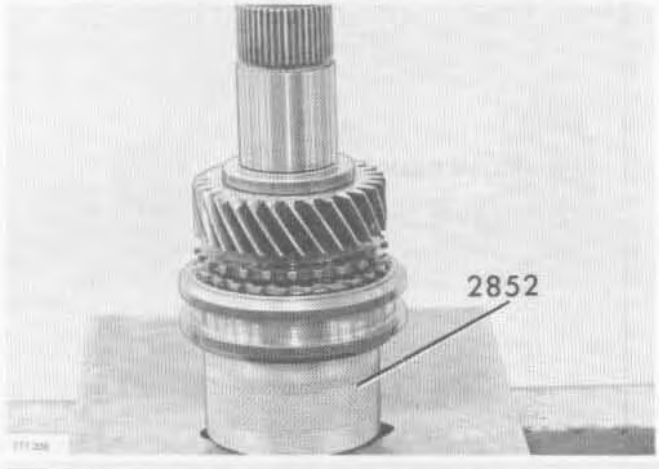
F7

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.

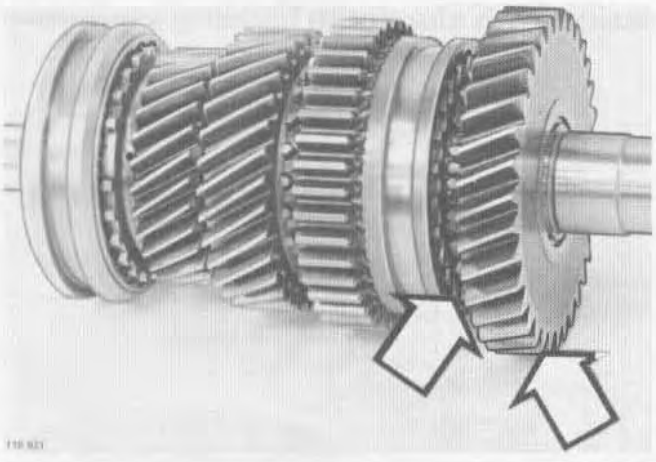
F10

Install:

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

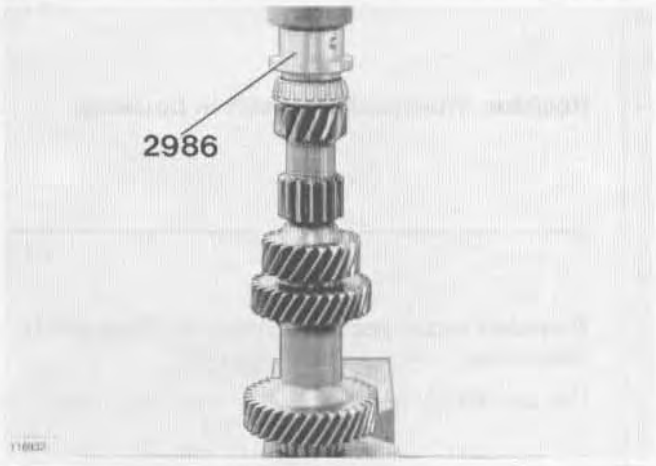
Use adapter **2852** when pressing on gear and hub.

F11



Install 1st gear and synchro ring on main shaft.

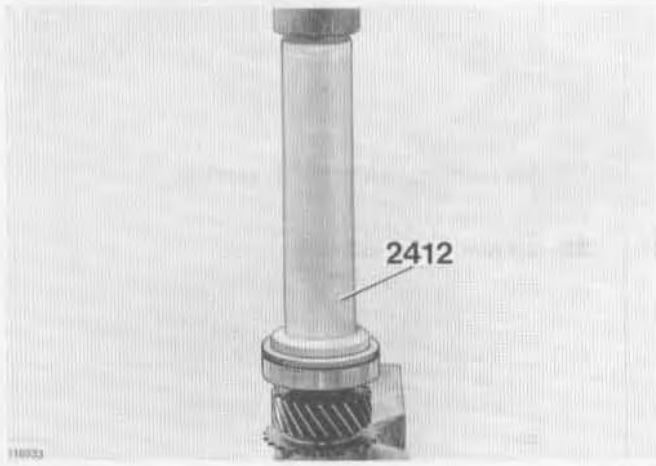
F12



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.

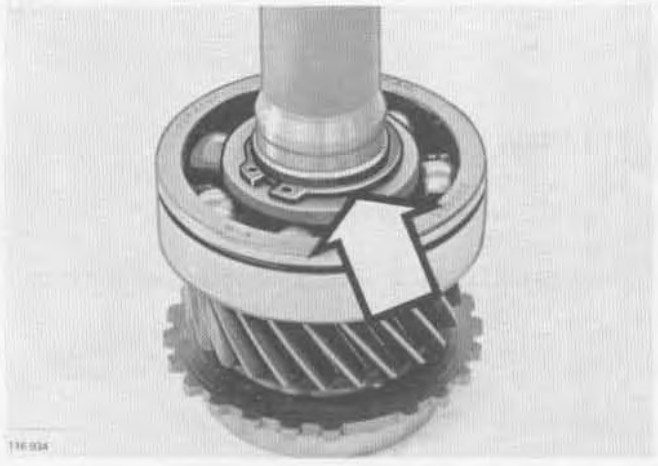
F13



Install bearing on input shaft.

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

F14



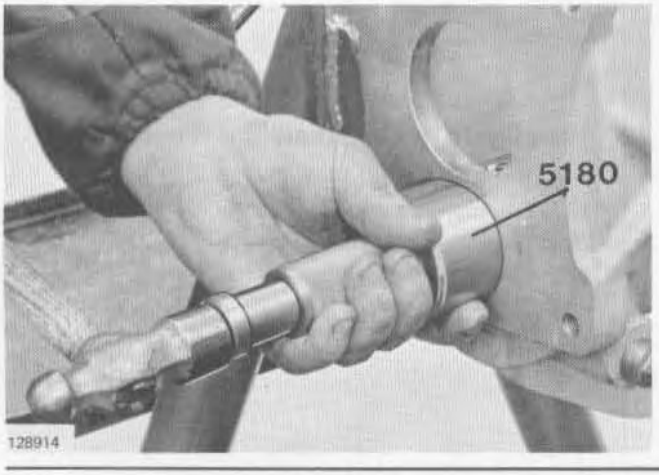
Install lock ring on input shaft.

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



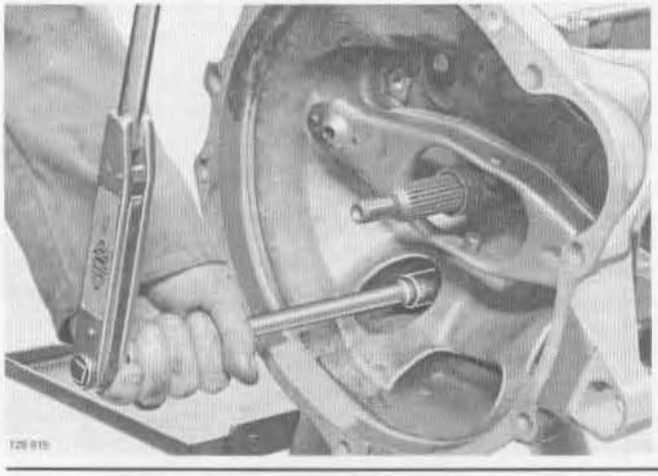
Position intermediate shaft in housing.

F16

Position outer races for intermediate shaft bearings.

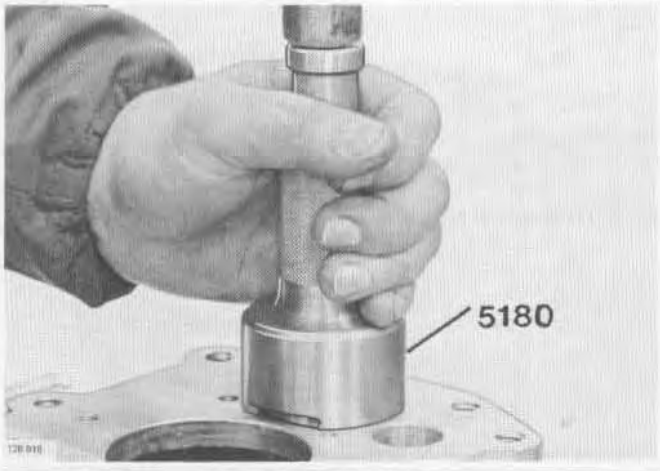
Use drift **5180**, large outer diameter toward race.

F17



Install bell housing with gasket.

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



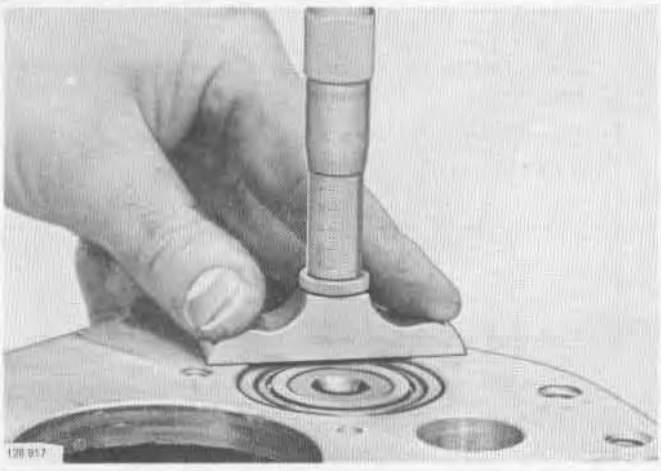
F18

Turn transmission to vertical position.

F19

Eliminate clearance in intermediate shaft bearings.

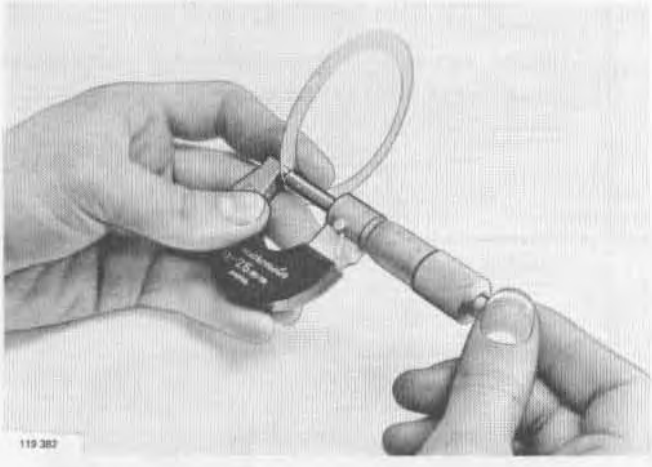
Use drift **5180**, small diameter toward rear race. Hold drift rigidly and knock in race with light taps. Repeat while rotating shaft, until all clearance is gone and shaft runs somewhat sluggish.



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.

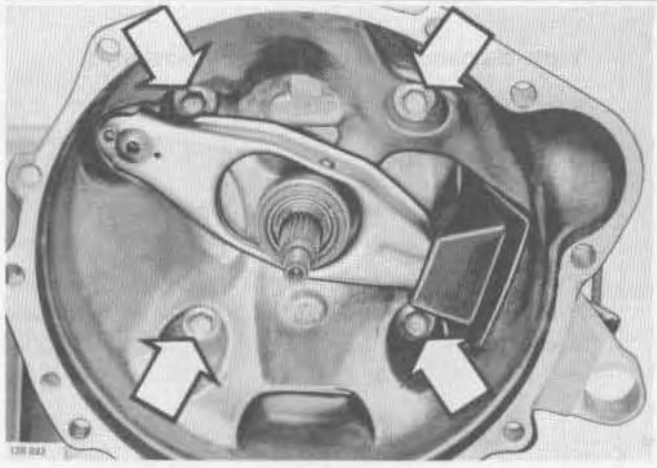
Shaft pre-tension should be 0.03–0.08 mm. Gasket thickness 0.25 mm (metric only).

Example:

Distance, race–surface	1.51	
Gasket	+0.25	
	1.76	1.76
Pre-tension	+0.03 to	+0.08
Shim thickness	1.79 to	1.84

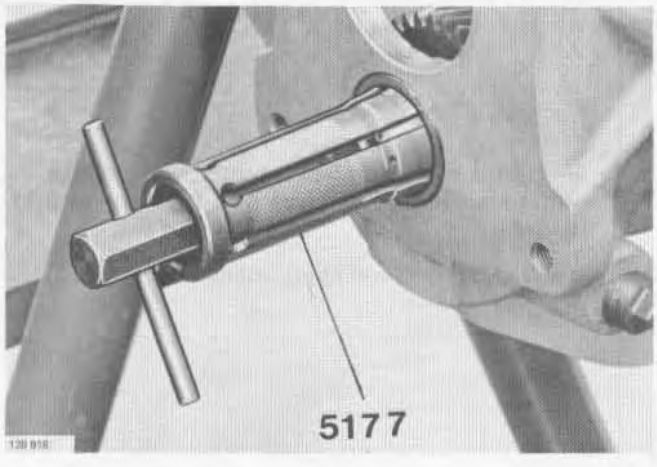
Choose **1.80 mm** shim thickness.

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.

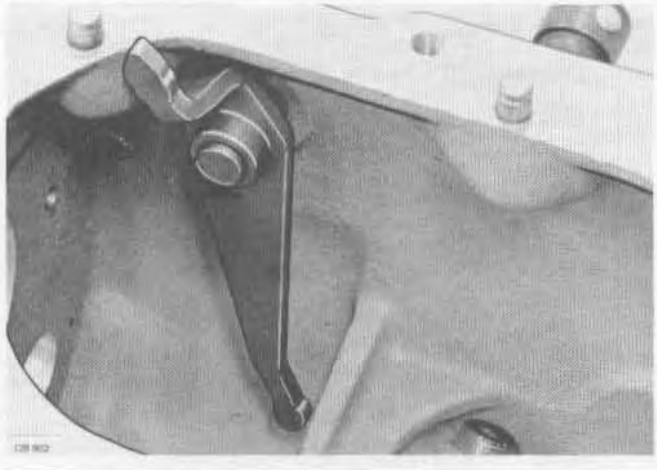
Carefully knock intermediate shaft in until puller **5177** can grip races.

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.

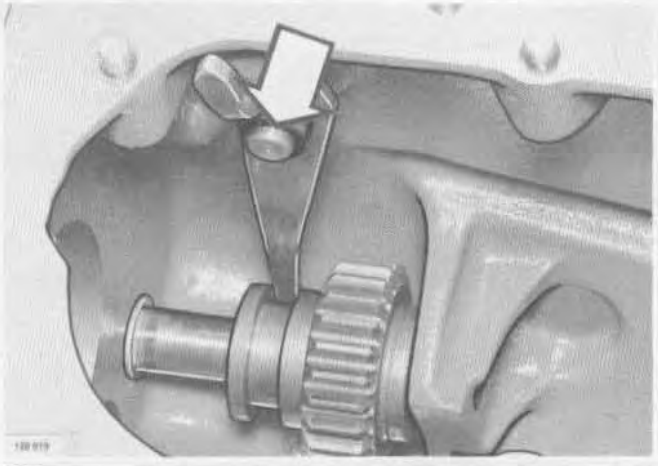


F25

Install reverse gear shifter.

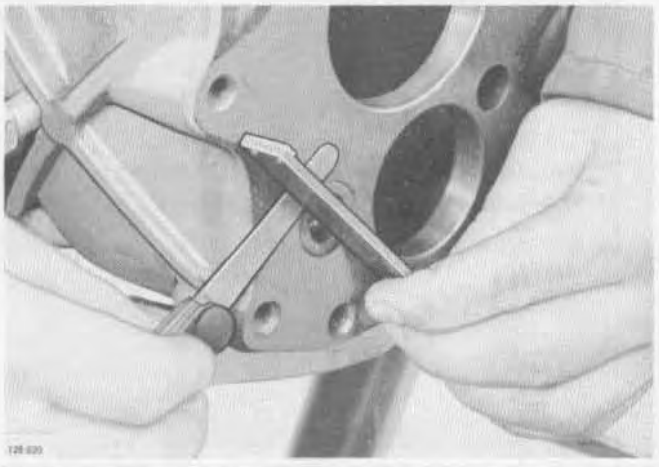
Install lock ring.

F26



Install reverse gear and shaft.

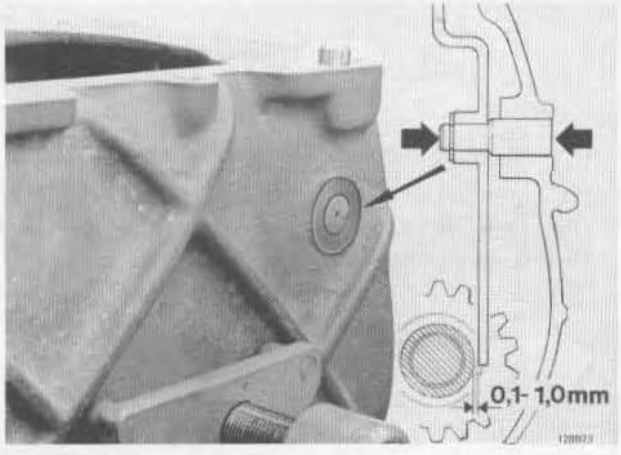
F27



Check and adjust reverse gear shaft position.

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

F28

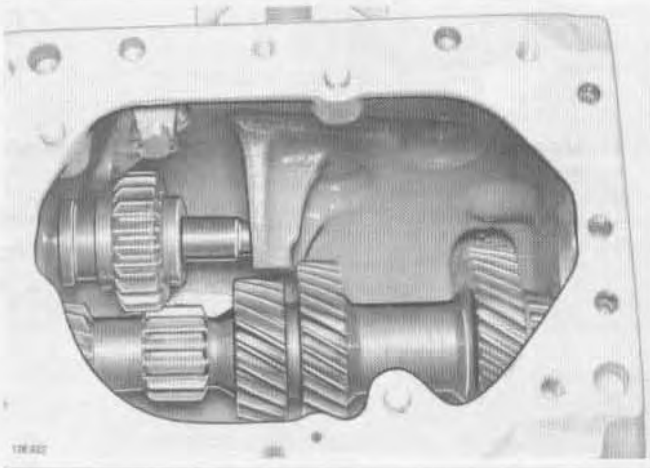


Important!

Adjust clearance between reverse gear and shift fork.

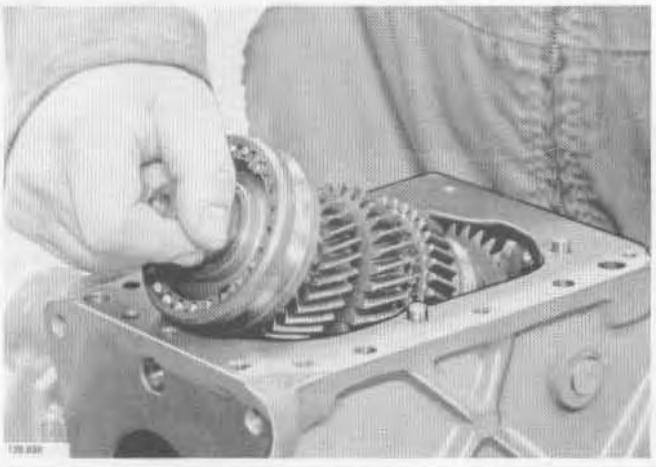
Correct clearance is 0.1–1.0 mm = 0.004–0.04''. Adjust by knocking shift fork pivot pin axially with a punch.

F29



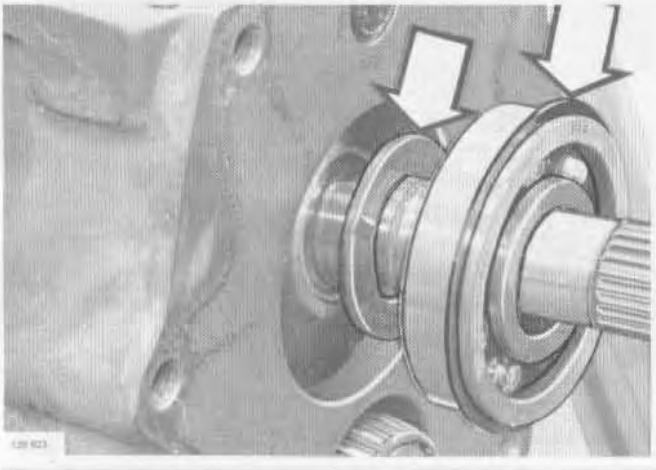
Position intermediate shaft in housing.

Position on bottom of housing.



F30

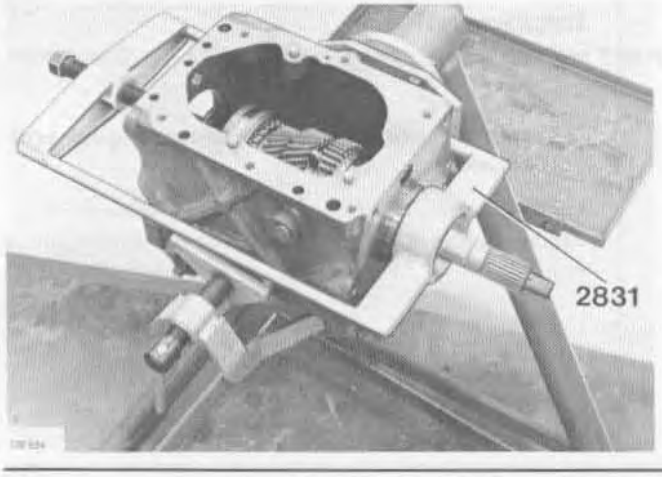
Position main shaft in housing.



F31

Position thrust washer and bearing on main shaft.

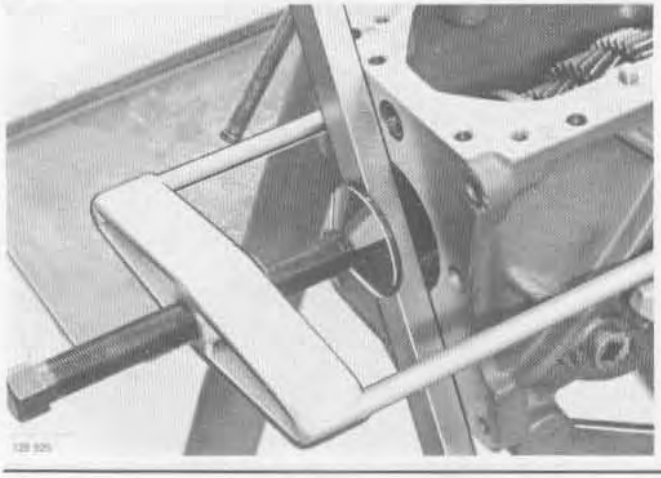
Bearing should be fitted with positioning ring.



F32

Press main shaft bearing into position.

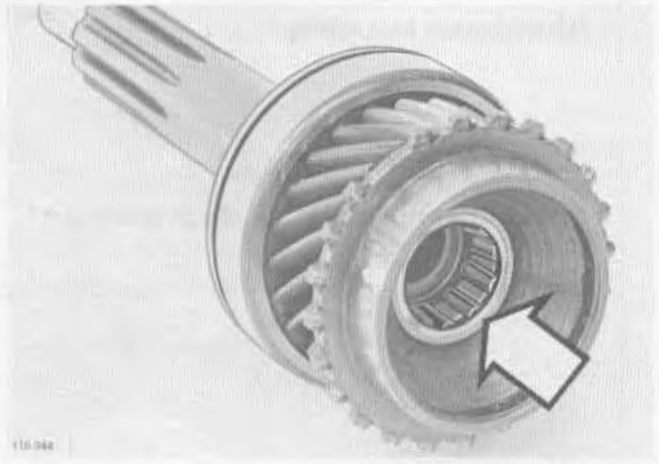
Use press tool **2831**.
Press reverse gear toward transmission center. Check that no gears coincide and become damaged.



F33

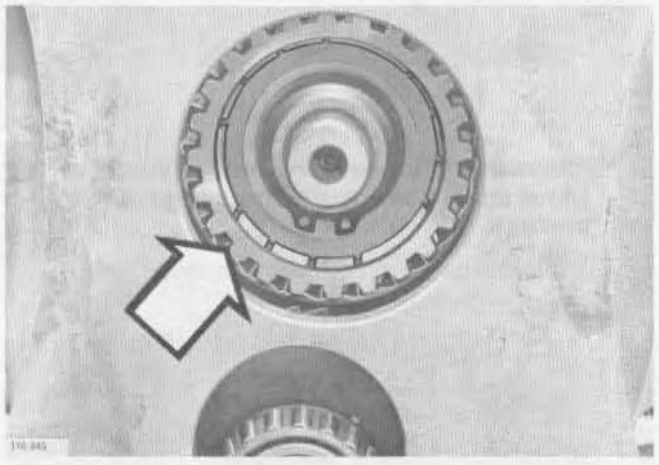
Use spacer for tool if bearing does not align correctly.

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.



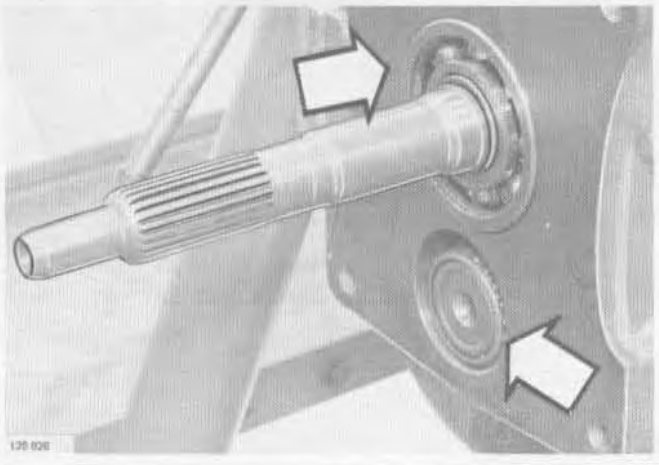
F34

Grease and install input shaft roller bearing.



F35

Position 4th gear synchro ring in synchro hub.



F36

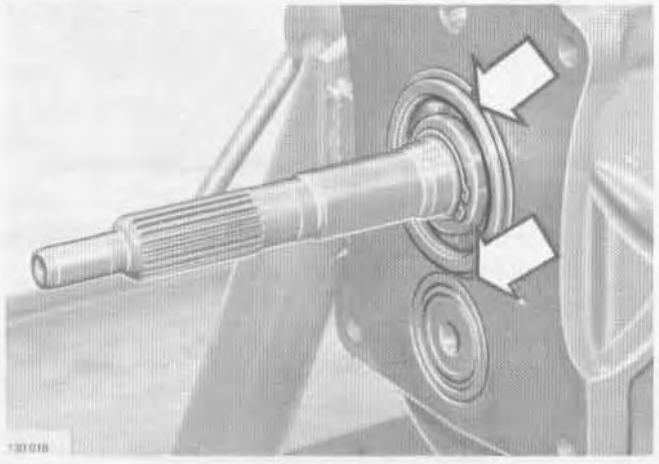
Attach input shaft to main shaft.

Push shaft in all the way.

F37

Lift up intermediate shaft.

Position shaft so bearings are correctly positioned in housing.



F38

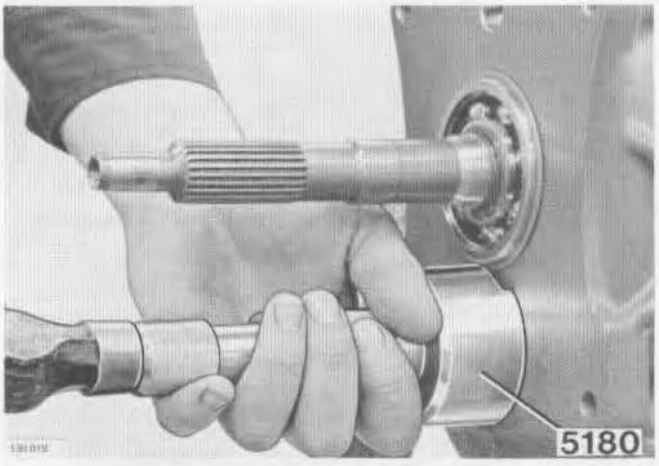
Pull out input shaft so that spacer ring can be positioned on bearing.

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

F39

Cast iron housing:

Install intermediate shaft outer bearing races.

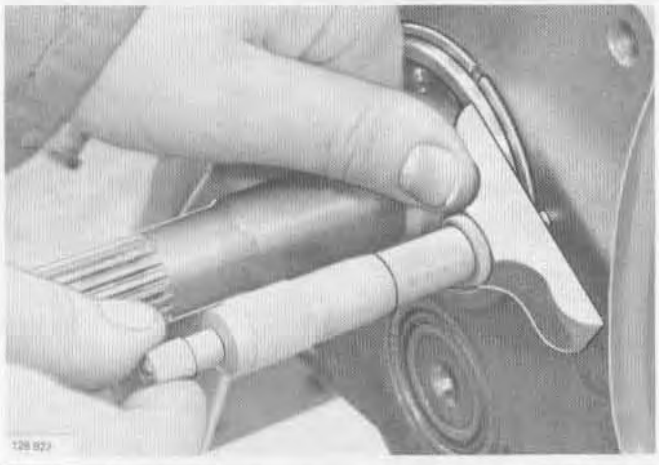


F40

Aluminum housing:

Install intermediate shaft outer bearing races.

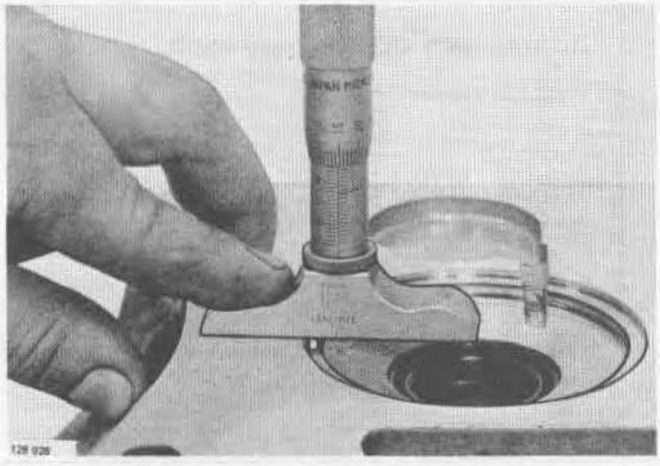
Use drift **5180**, large outer diameter toward bearing races.



F41

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

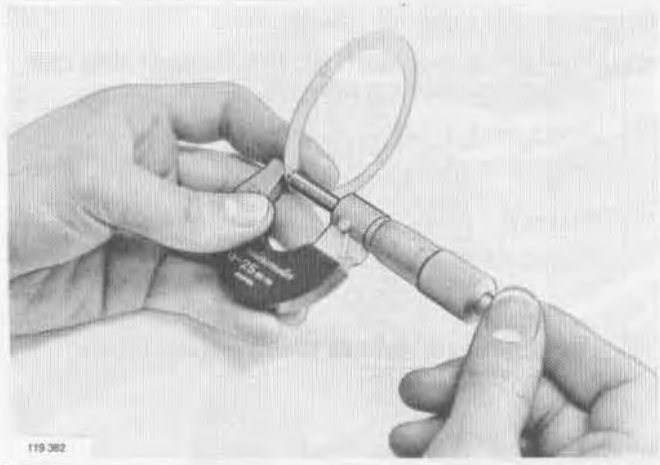
Use depth gauge. Note reading (metric).



F42

Measure distance between bell housing surface and bearing seat bottom.

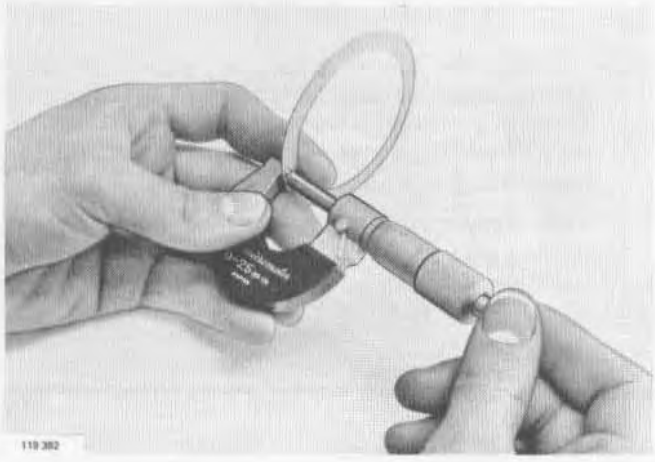
Use depth gauge. Note reading (metric).



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.



Example:

Distance, flywheel housing to bearing bottom	5.60	
Gasket thickness	+0.25	
	5.75	
Distance, bearing to housing	–4.71	
	1.04	1.04
Clearance permitted	–0.01 to	–0.15
Shim thickness, mm	1.03 to	0.89

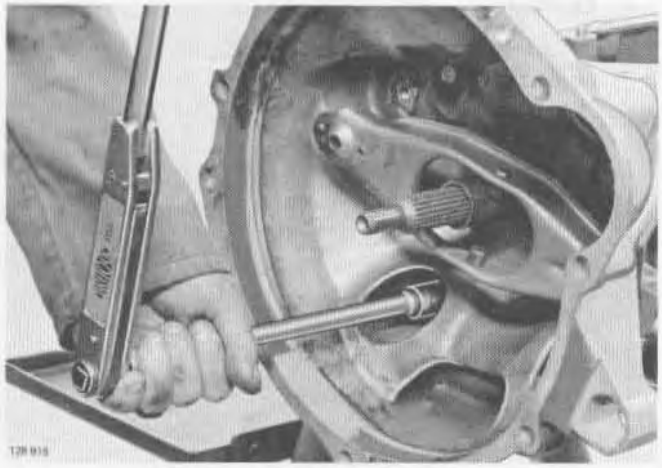
Choose shim 0.90 mm.

Shims available: 0.60 mm
0.75 mm
0.90 mm
1.00 mm

F44

Attach bell housing.

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



F45

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.

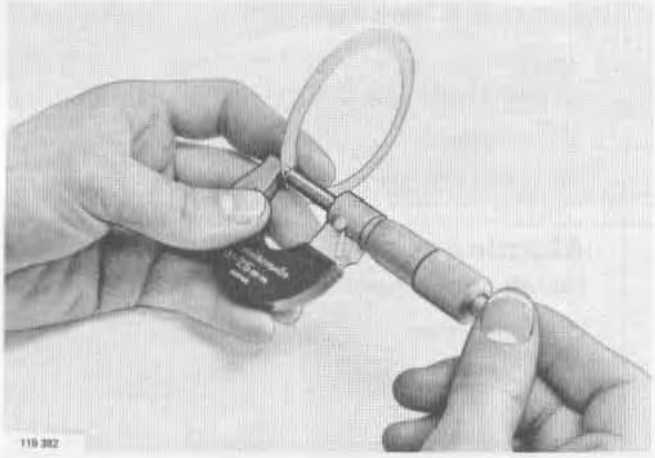
F48

Cast iron housing:

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).

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	
	1.680	1.680
Clearance permitted	–0.025	to 0.100
Shim thickness	1.655	to 1.580

Choose 1.65 mm (alt. 1.60 mm).

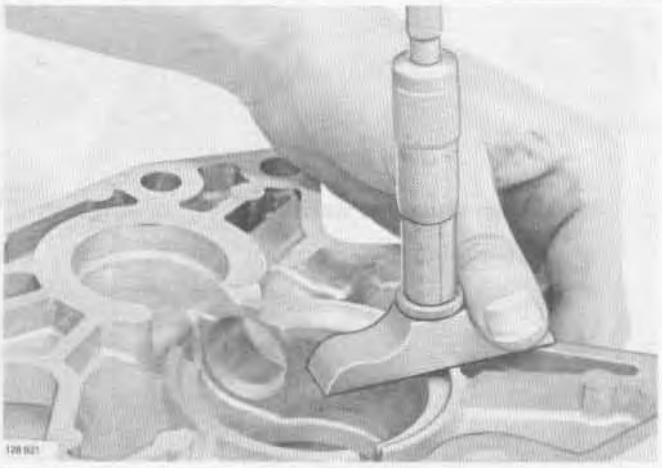
Shims available: 0.05 mm
0.10 mm
0.15 mm
0.35 mm
0.50 mm
0.70 mm
1.00 mm

F50

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

Use depth gauge. Note reading (metric).

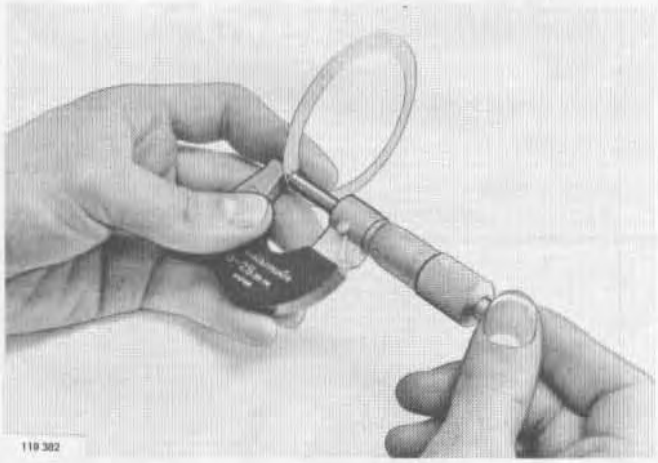
F51



Measure distance between rear cover surface and bearing seat bottom.

Use depth gauge. Note reading (metric).

F52



Determine shim thickness for main shaft.

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

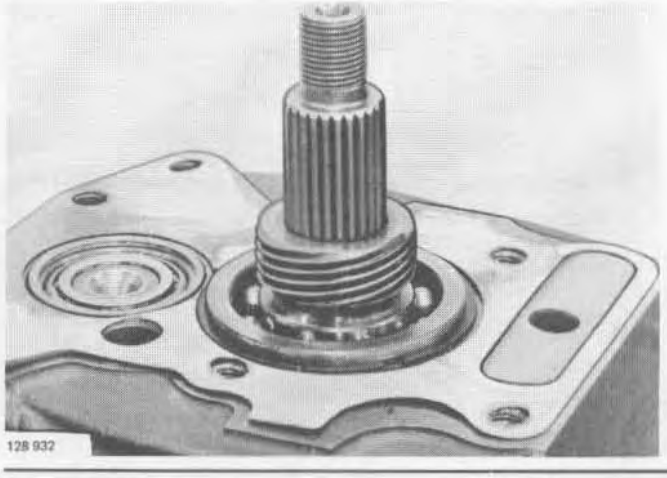
Example:

Distance, cover to bearing bottom	5.50	
Gasket	+0.25	
Distance, bearing to housing	−4.71	
	1.04	
Clearance permitted	−0.01	to −0.20
Shim thickness	1.03	to 0.84

Choose shim 0.90 mm

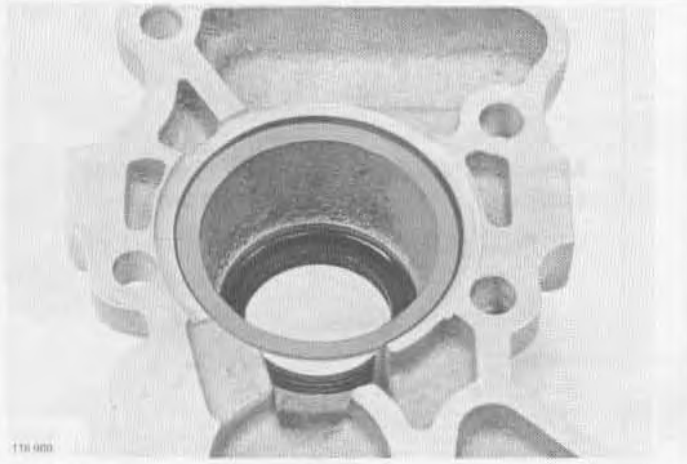
Shims available: 0.60 mm
0.75 mm
0.90 mm
1.00 mm

F53



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

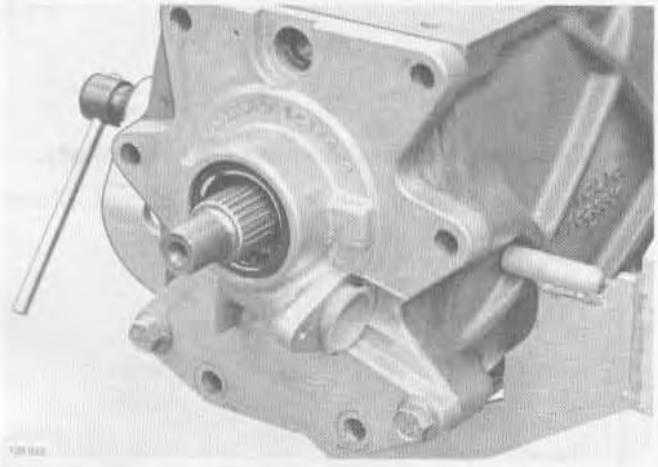
Speedometer gear flange toward bearing.
Shim pack determined:
- Op. F15–F24 for transmissios with aluminum housing.
- Op. F48–F49 for transmissions with cast iron housing.



F54

Position shim for main shaft in rear cover.

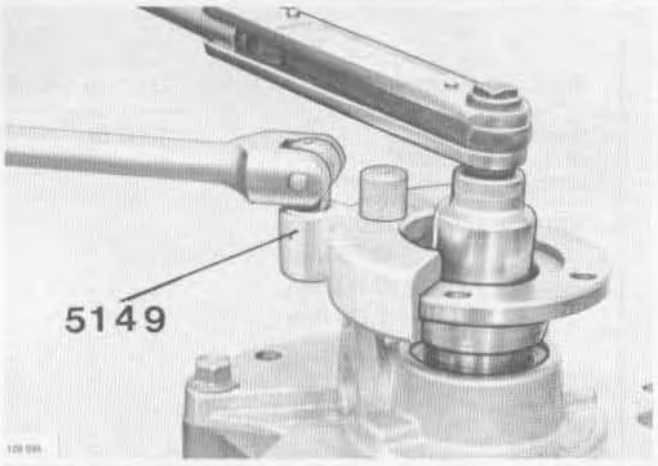
Apply grease to shim to keep it in place.



F55

Install rear cover.

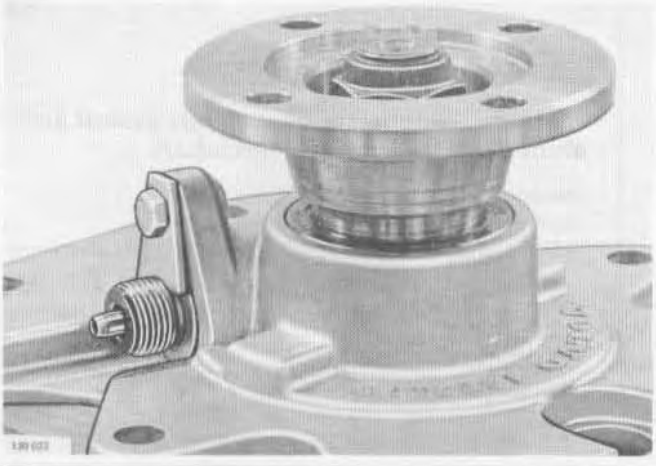
Install two outer (lower) bolts finger tight.
Install seal in rear cover using drift 5064.



F56

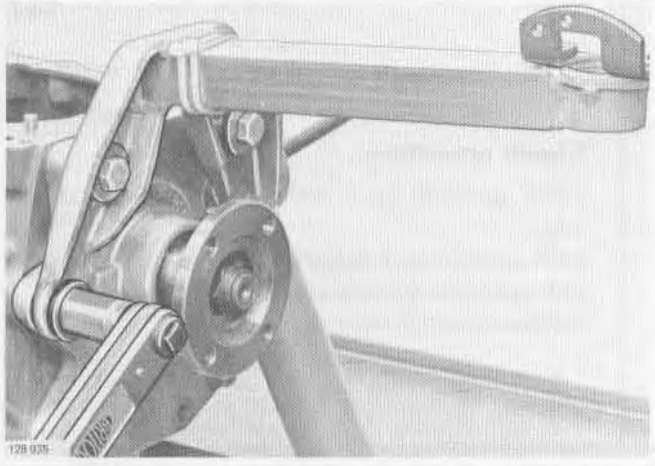
Install drive flange

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



F57

Install speedometer driven gear with O-ring



F58

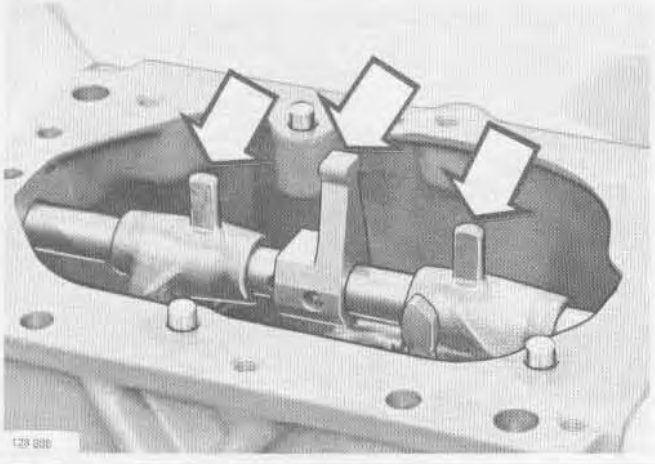
Install gearshift carrier.

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

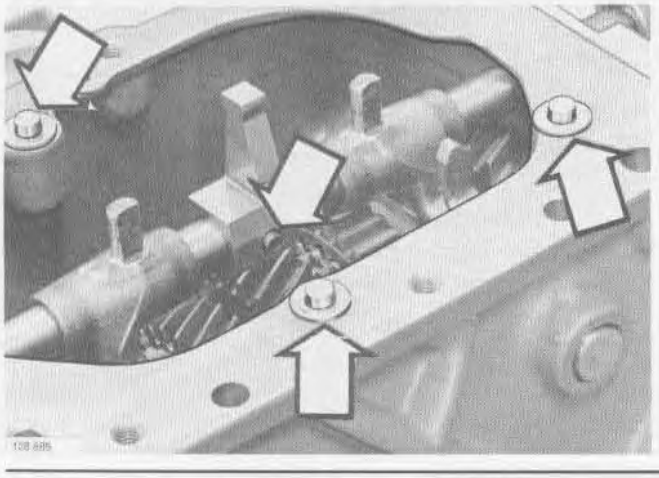
Install shift forks.

Make sure lugs position correctly.

F61

Install shifter and gear selector rail.

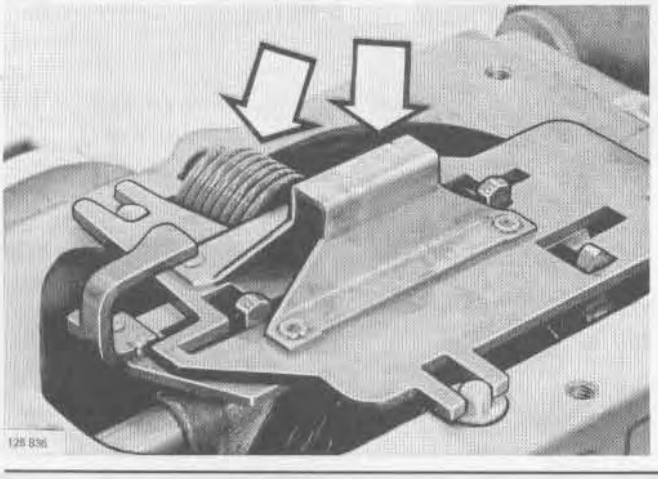
Shifter boss forward.



F62

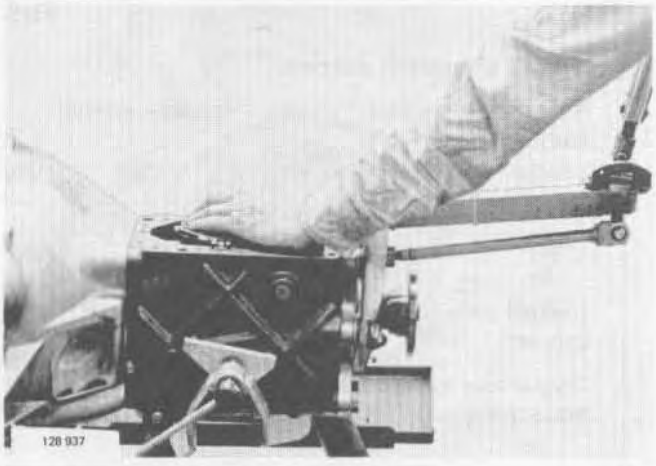
Install:

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



F63

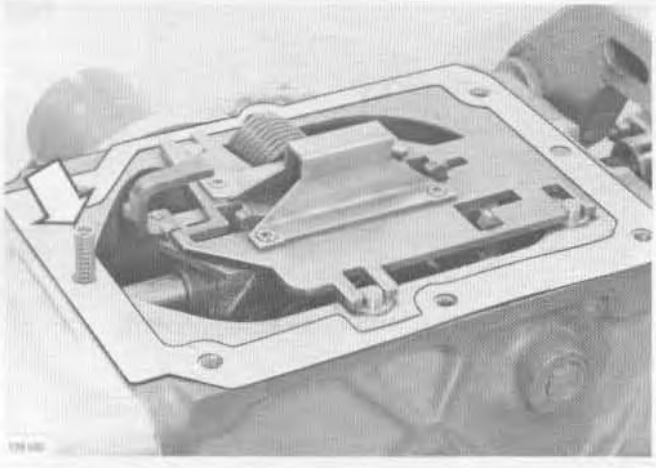
Install selector plate assembly and return spring.



F64

Check operation.

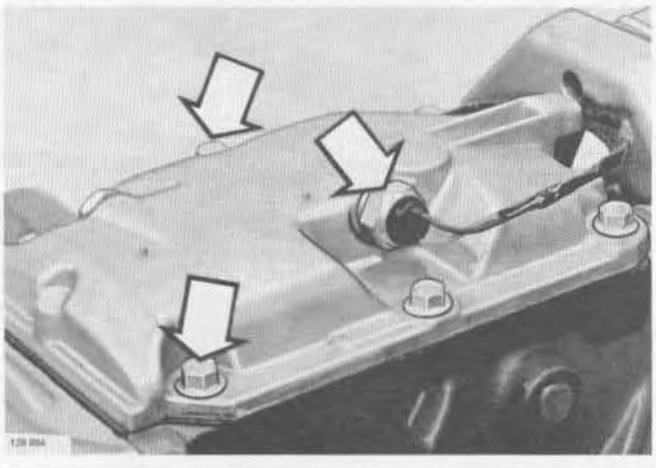
Install gearshift lever without lock screw and lock ring.
Hold selector plate assembly with palm. Check gearshift operation and correct as necessary.
Remove gearshift lever.



F65

Install:

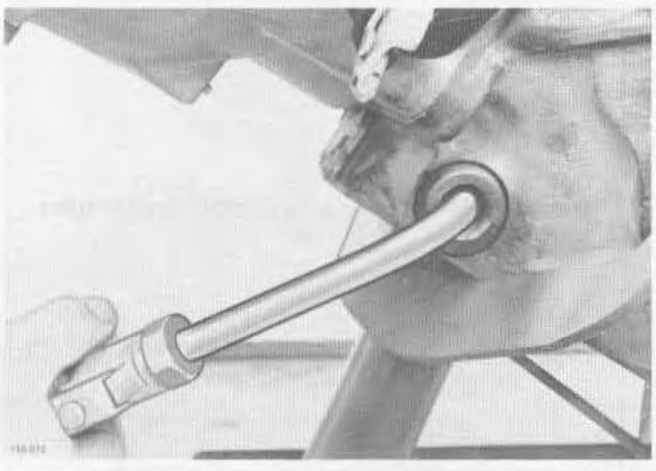
– Detent ball and spring.
– New top cover gasket.



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.

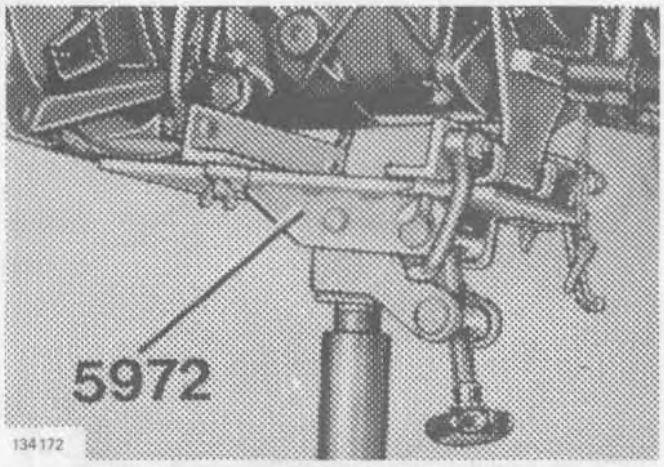
F68

Install level plug.

Installing transmission M 45

Special tools:

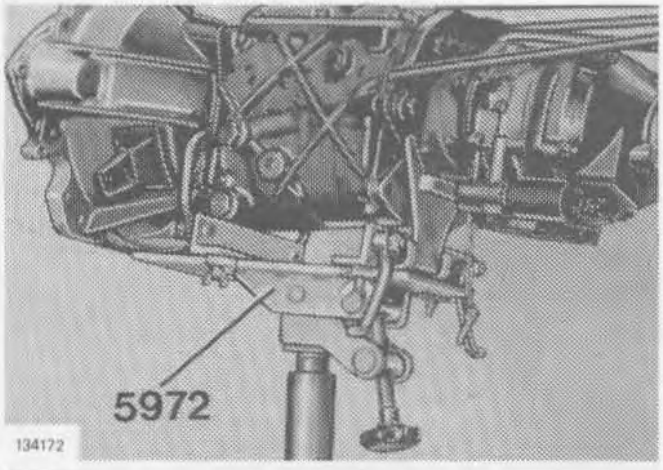
5972 Fixture



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:

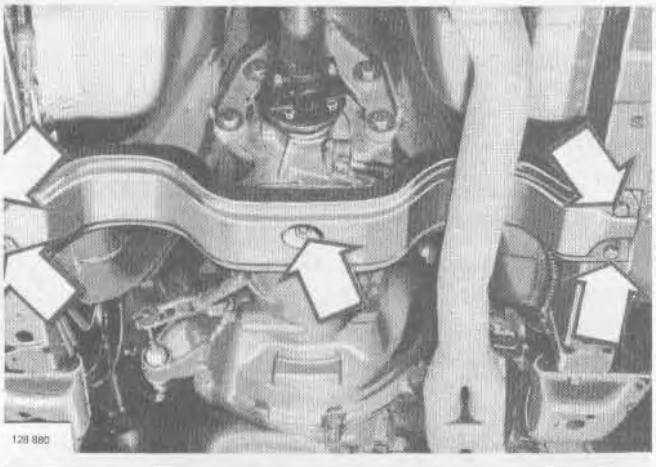
- Starter motor and tighten retaining bolts.
- Front exhaust pipe bracket. Two bolts at bell housing, one nut at exhaust pipe.
- Remaining bolts for bell housing.
- Rubber rings for front muffler.

G4

Install:

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

G5



Install:

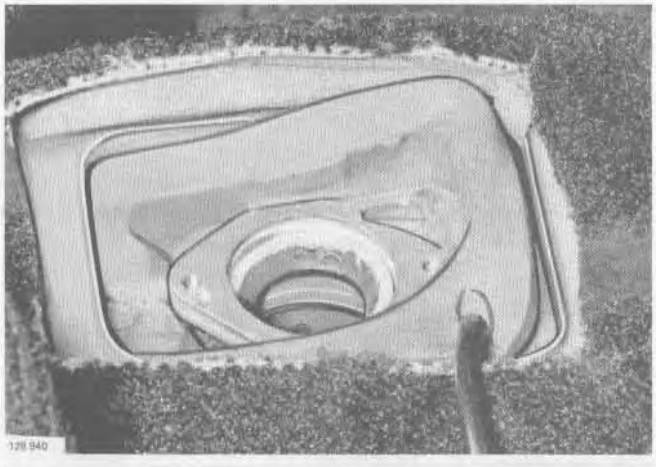
– Cross-member with rubber cushion and bracket.
– Clutch fork return spring.

G6

Inside vehicle:

Install rubber ring and plastic bushing.

G7



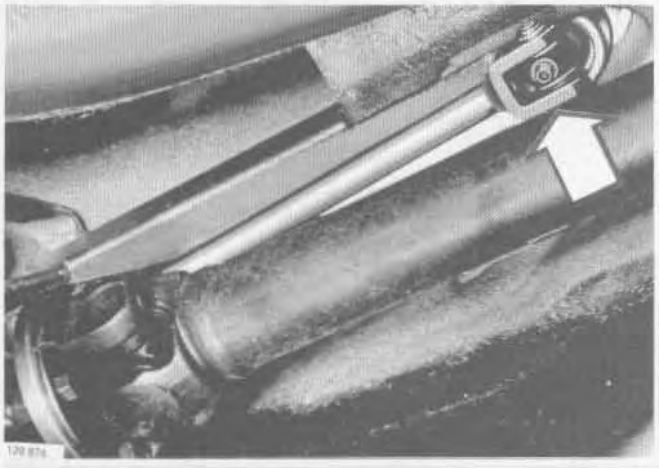
Check that sound deadening material is correctly positioned.

G8

Install gearshift lever.

Install retaining ring.

G9

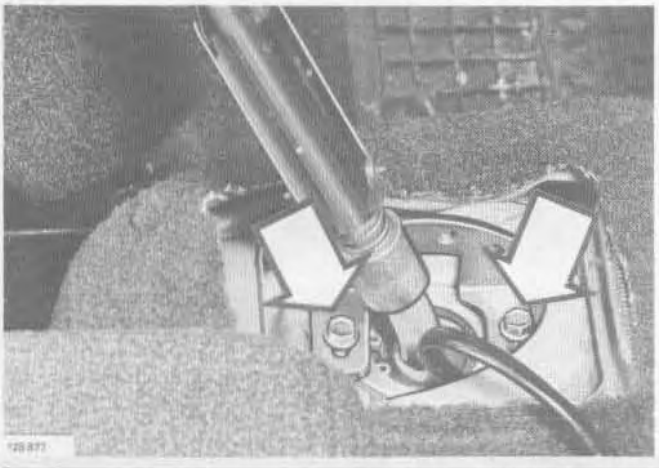


From under vehicle:

Attach gearshift rod to gearshift lever.

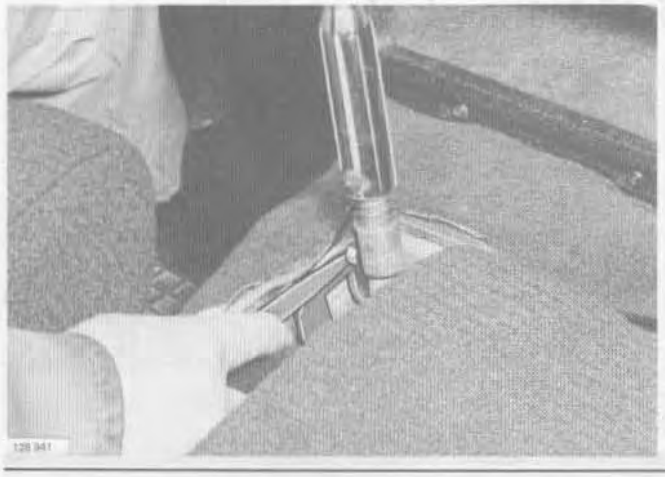
Push pivot pin onto position and install locking screw.

G10



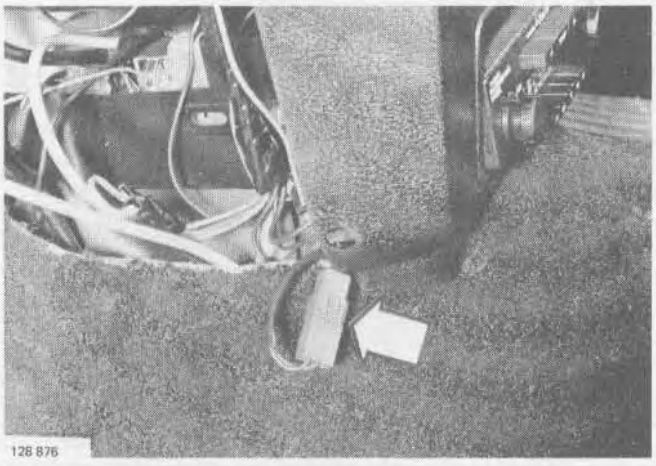
Install reverse detent plate.

G11



Adjust clearance for reverse gear detent.

Engage 1st gear and adjust clearance between detent plate and gear shift lever.
Correct cleraance: **0.5–1.5 mm** = 0.020–0.060".
Engage 2nd gear and recheck clearance.

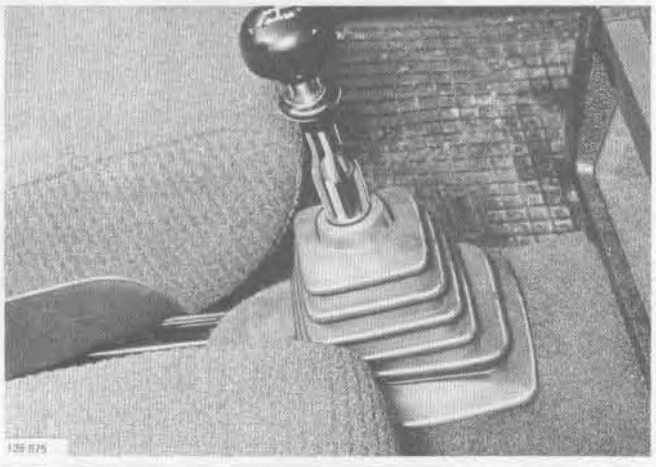

128 876

G12

Install connector for back-up light.

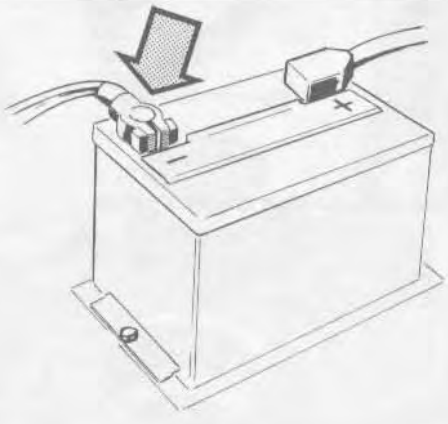
G13

Install left side panel of center console.


128 875

G14

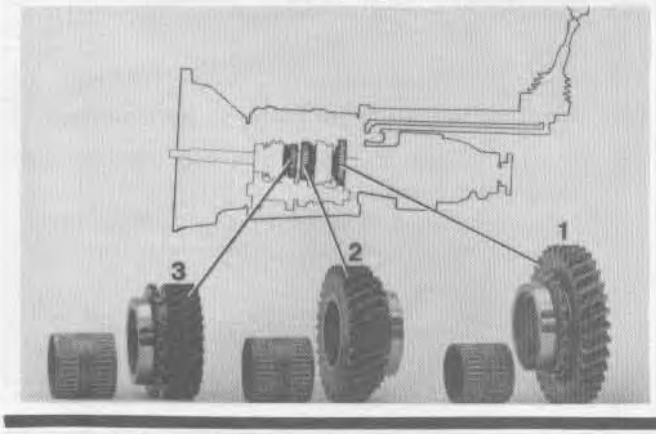
Install gearshift lever cover.


130015

G15

Reconnect battery ground cable.

New features of M 45/M 46 transmission 1979—



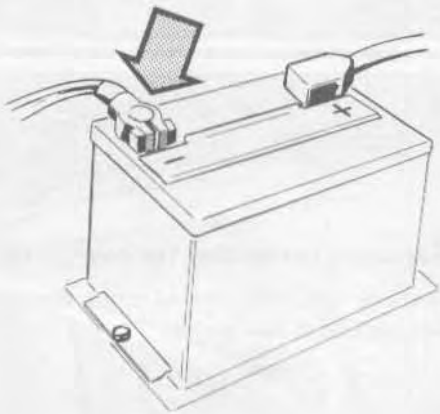
Manual transmission.

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



130015

H1

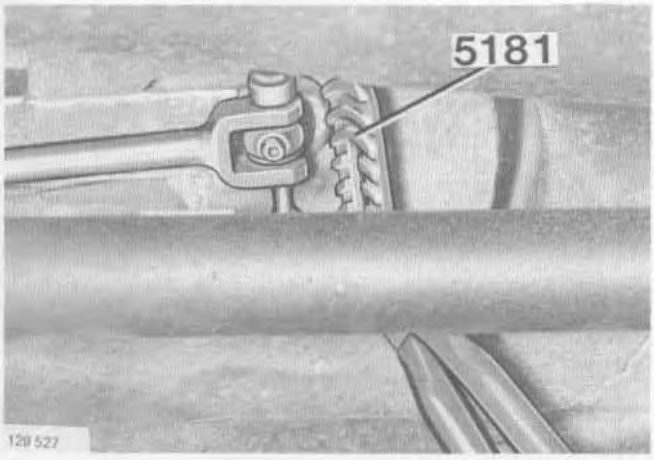
Important!

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.



129 527

H3

From under vehicle:

Disconnect gearshift lever from gearshift rod.

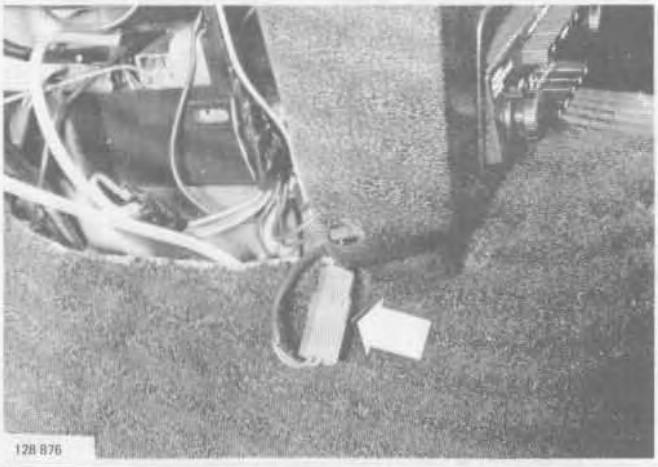
Remove lock bolt. Use pliers **5181** to remove pivot pin.

128 843

H4

Inside vehicle:

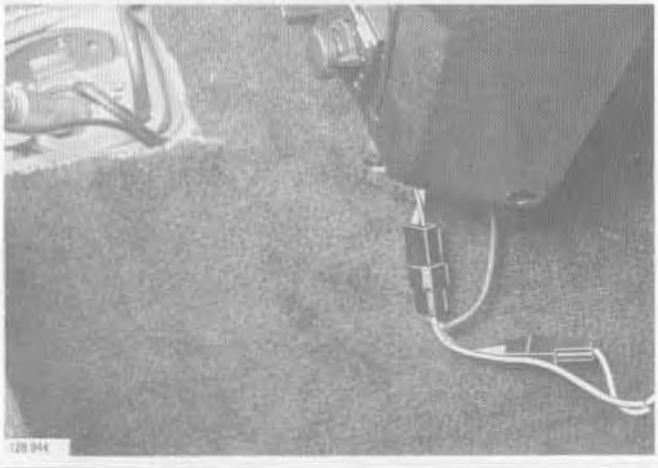
Disconnect gearshift lever cover from floor.



H5

Inside vehicle:

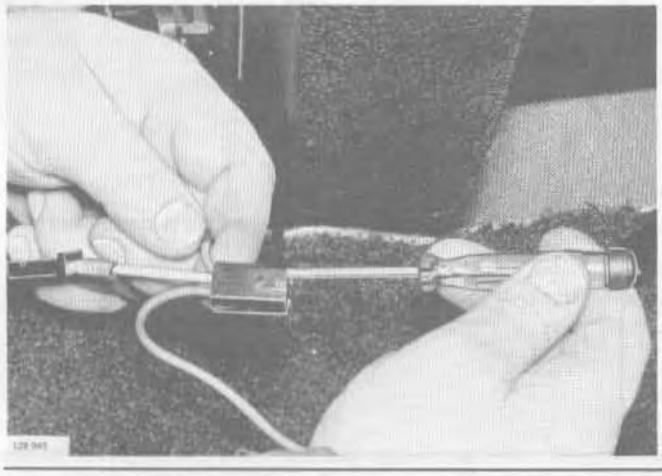
– Remove left side panel at center console.
– Separate connector.



H6

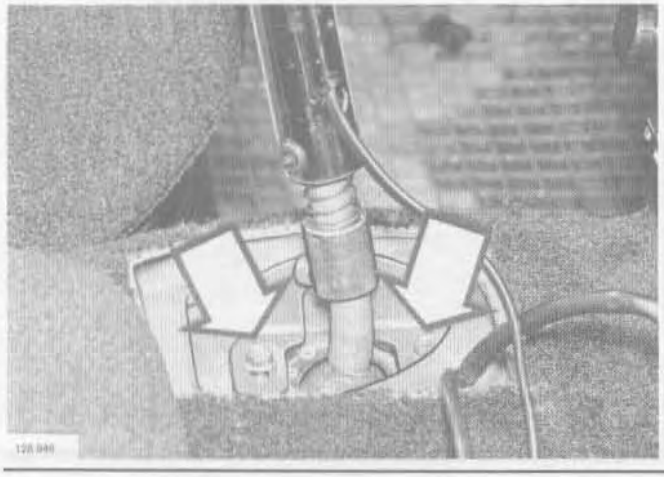
Separate connector for overdrive.

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



H7

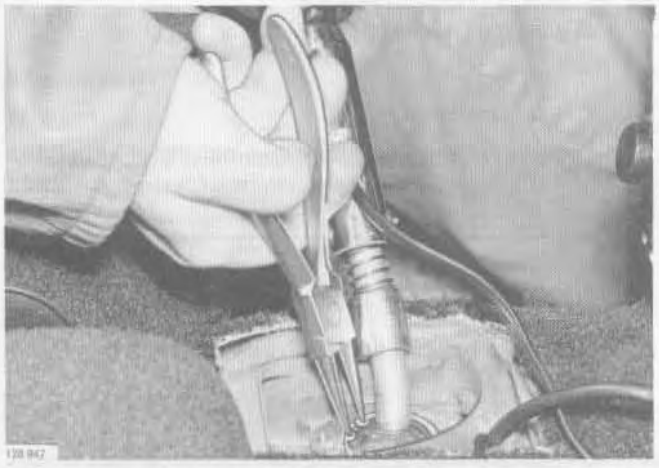
Remove red and yellow wire from connector.



H8

Remove reverse detent plate.

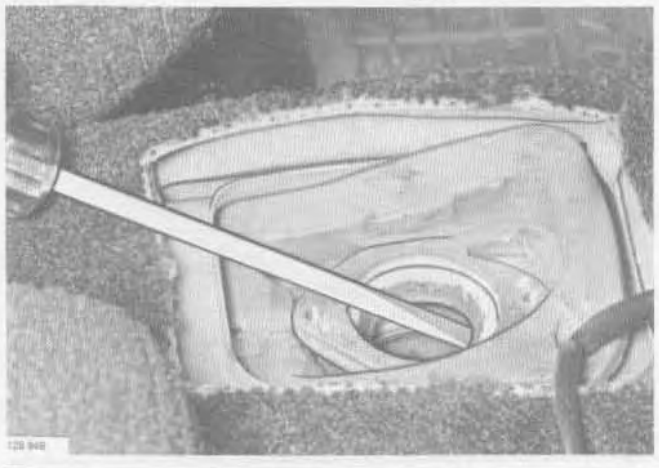
H9



Remove gearshift lever.

Remove lock ring to free gearshift lever.

H10



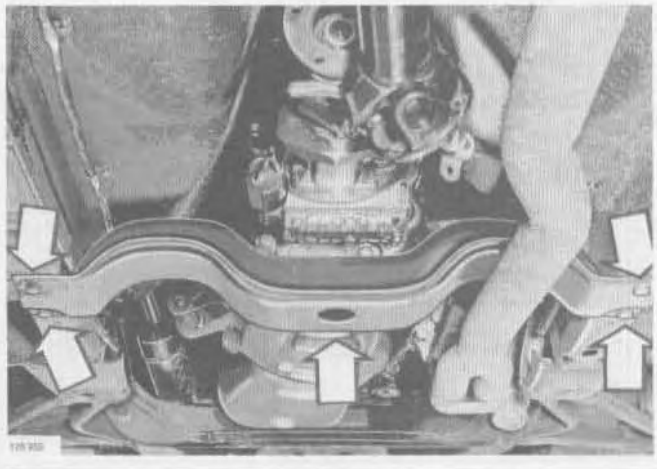
Remove plastic bushing and rubber ring.

H11

From under vehicle:

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

H12



Remove cross-member assembly.

H13

As appropriate:

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

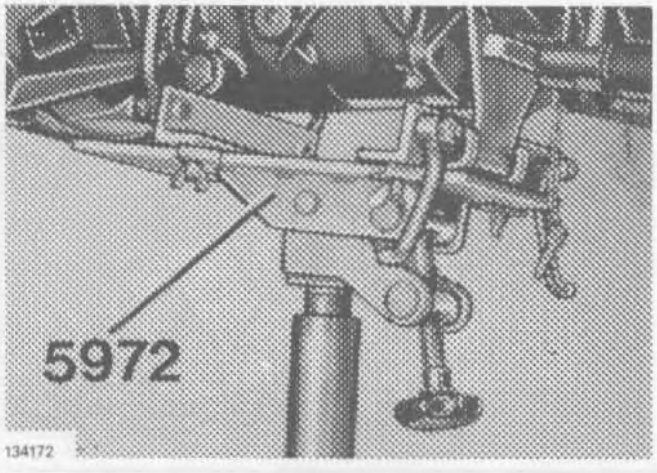
Unhook rubber rings for front muffler.

H17

Begin separating bell housing from engine.

H18

Pull out starter motor until free from bell housing.



H19

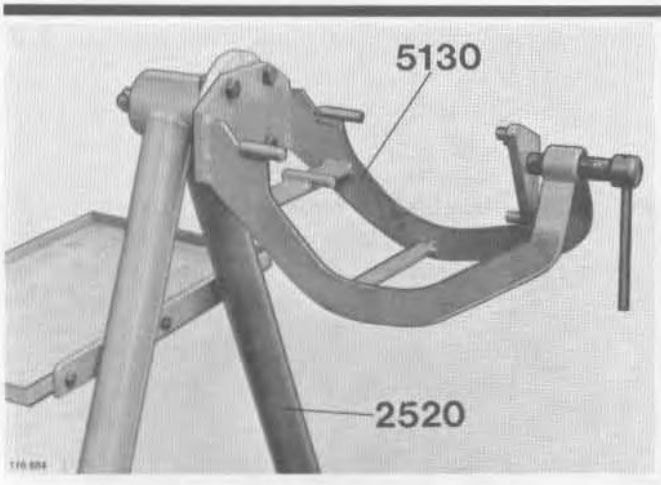
Remove transmission.

- 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:

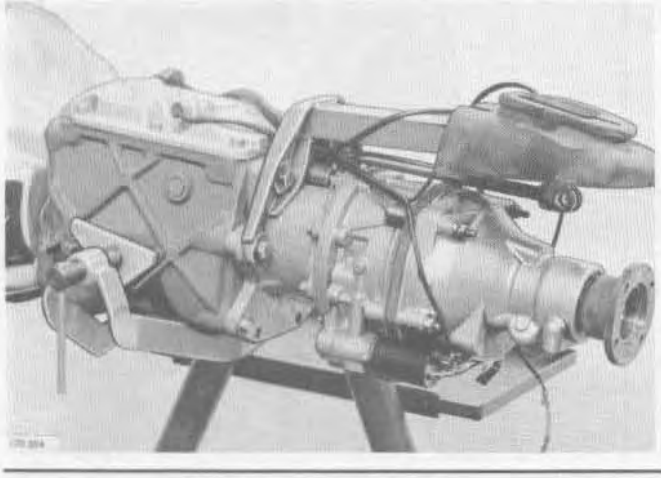
2520 **Stand**
2853 **Adapter**, removing gear and synchro ring
2985 **Adapter**, removing main shaft bearing
5058 **Tool**, removing main shaft bearing
5130 **Fixture**, for transmission
5131 **Puller**, removing intermediate shaft bearing
5147 **Tool**, removing main shaft bearing
5148 **Tool,** removing main shaft bearing
5177 **Puller**, intermediate shaft bearings, aluminum housing



I 1

Attach fixture 5130.

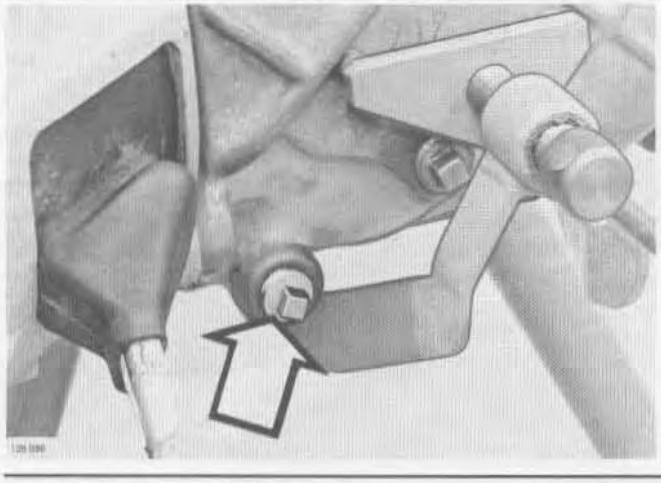
Use four bolts to attach to stand 2520.
NOTE:
Modified type fixture 5130 must be used. See "Modification of fixture 5130 at end of Special Tool section.



I 2

Install transmission to fixutre.

Make sure all mating surfaces align when tightening holding bolt.



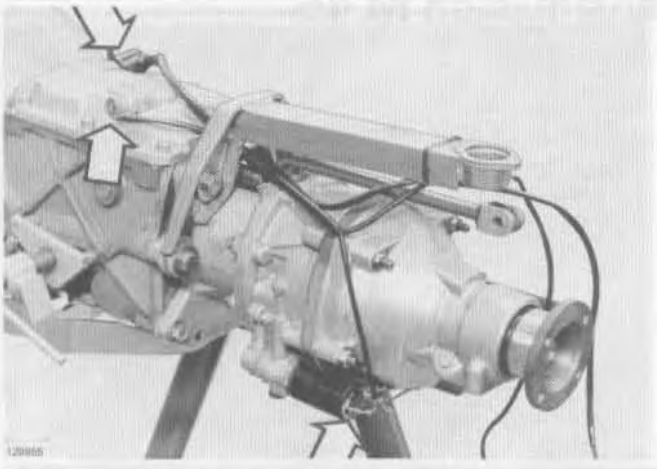
I 3

Remove sound deadening material from gearshift carrier.

I 4

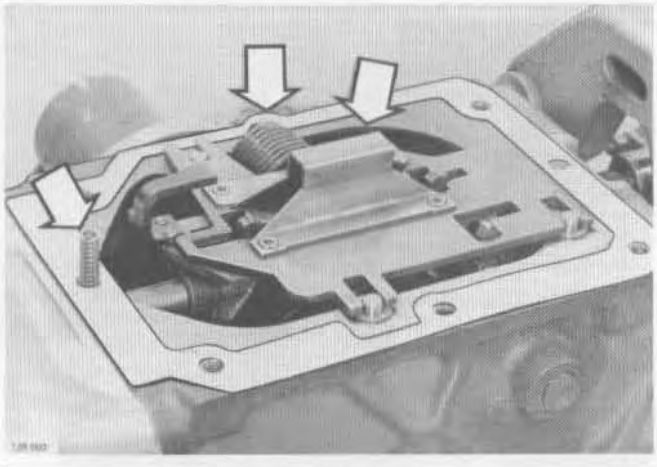
Remove drain plug and drain oil.

I 5



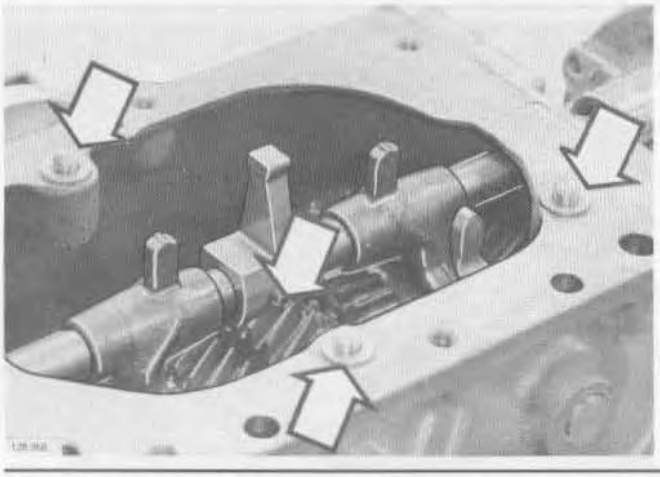
– Disconnect wires at overdrive solenoid.
– Remove back-up light switch.
– Remove overdrive switch.
– Remove transmission top cover.

I 6



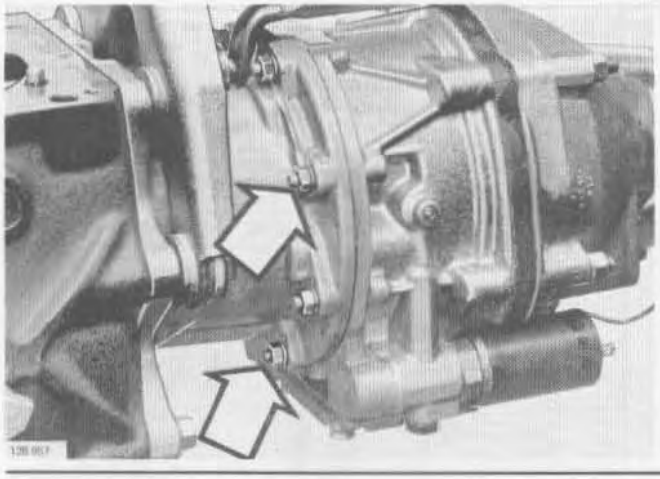
– Remove detent ball and spring.
– Remove selector plate assembly and return spring.
– Remove gasket.

I 7



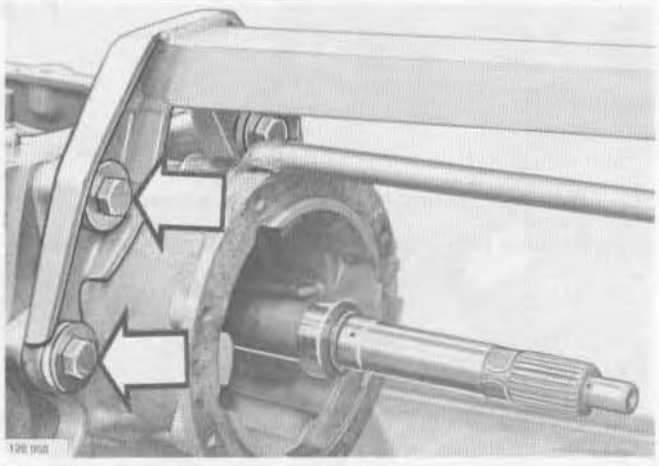
– Remove glide washers for selector plate assembly.
– Remove lock pin for shifter.

I 8



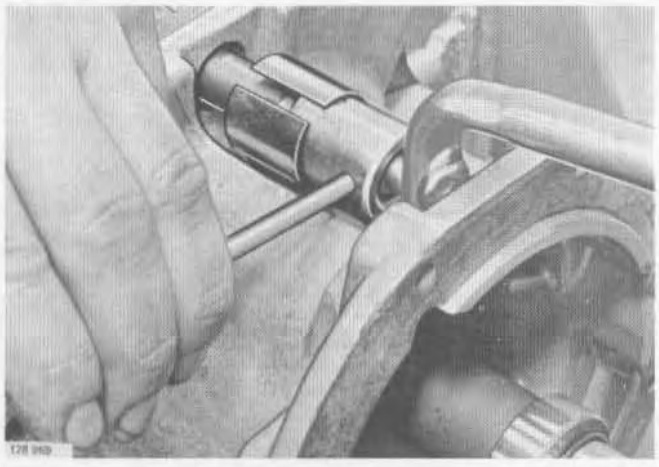
– Remove nuts retaining overdrive to intermediate flange.
– Remove overdrive.

I 9



Remove gearshift carrier assembly.

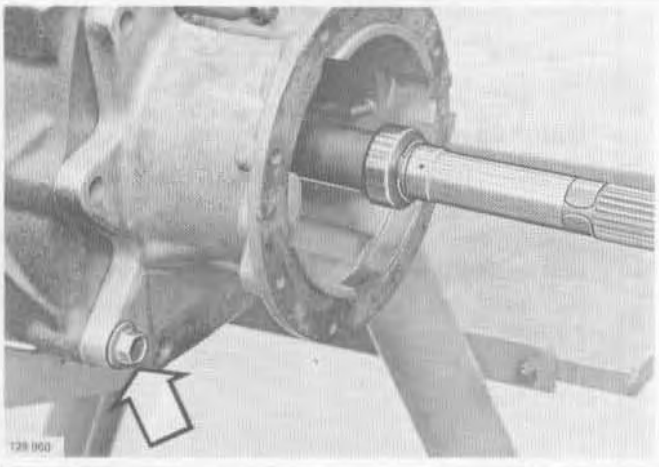
I 10



Remove.

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

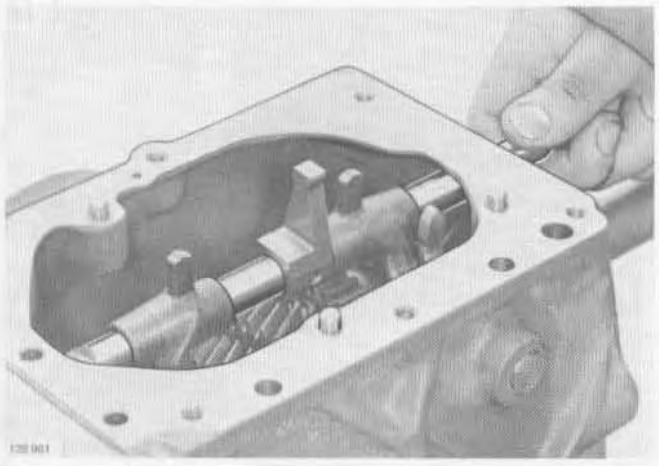
I 11



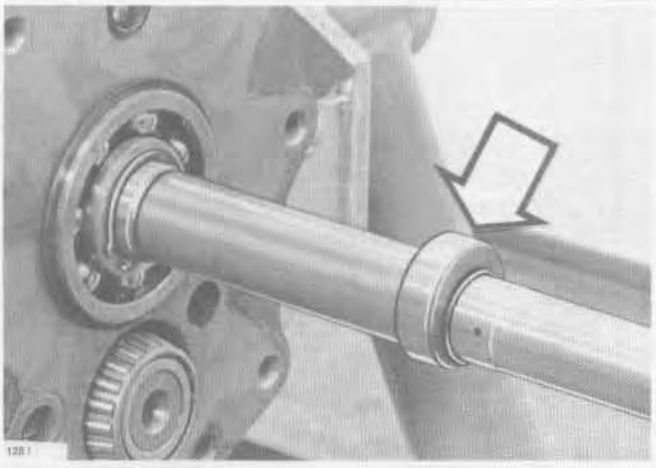
Remove intermediate housing.

Remove gasket and shims.

I 12



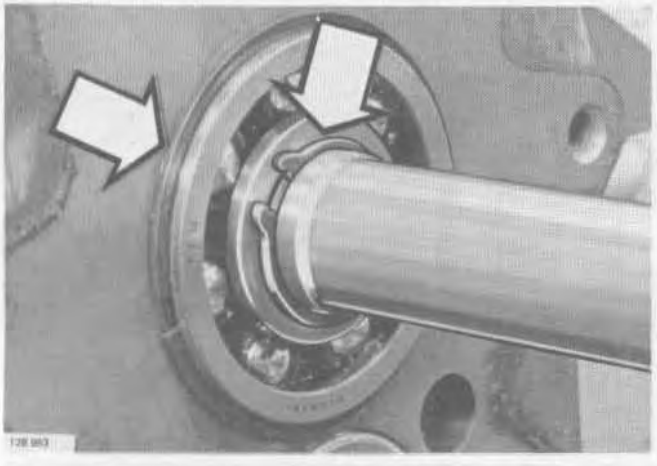
– Remove gear selector rail.
– Remove shifter and shift forks.



I 13

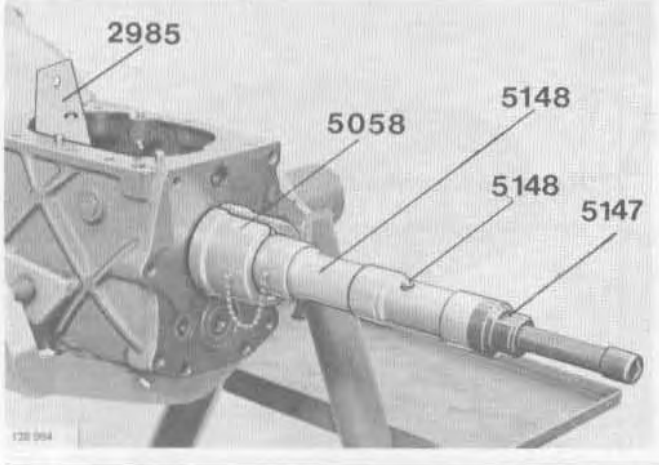
Remove overdrive oil pump eccentric.

Remove lock ring and pull off eccentric. Catch key.



I 14

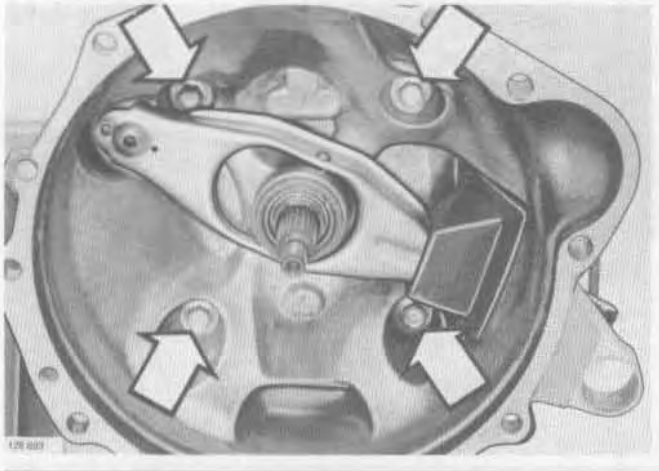
Remove lock ring and spacer ring for main shaft bearing.



I 15

Remove main shaft bearing.

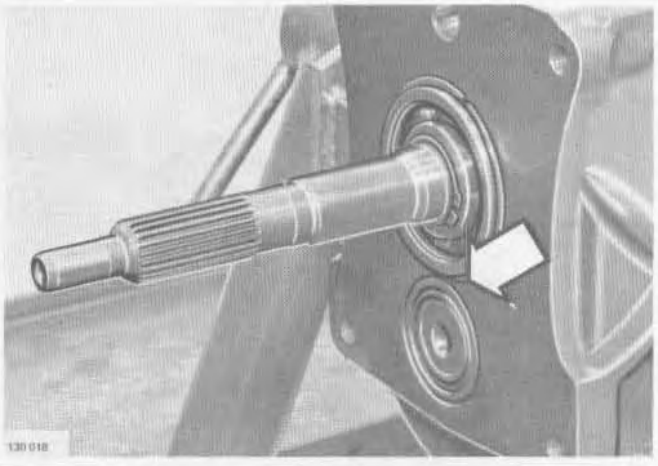
Position adapter **2985** between input shaft and front synchro ring.
Remove bearing spacer ring.
Use tool **5085** + **5148** (2) and **5147** to remove bearing. Remove bearing thrust washer. Let adapter **2985** remain in place.



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.

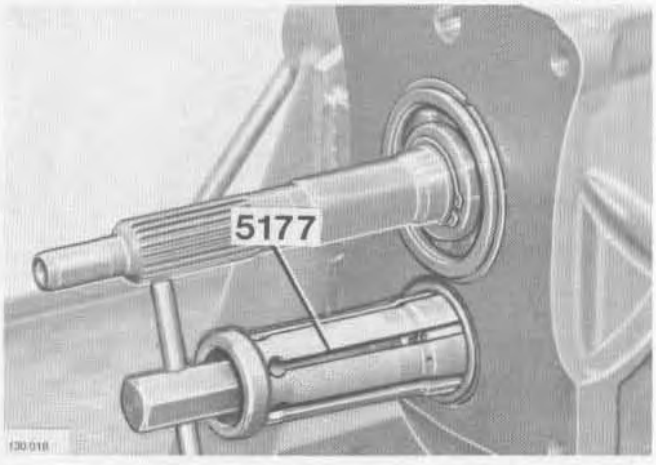


I 17

Cast iron housing:

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.

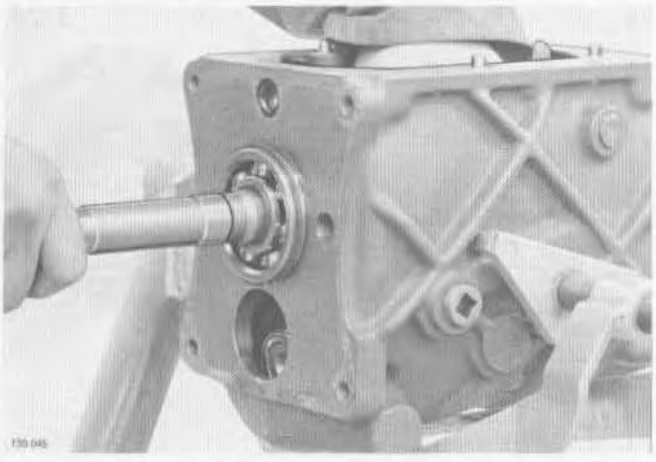


I 18

Aluminum housing:

Remove outer races for intermediate shaft bearings.

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

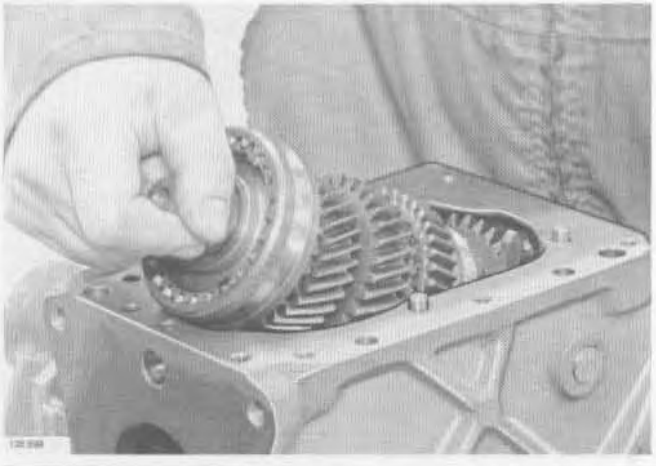


I 19

Pull out input shaft.

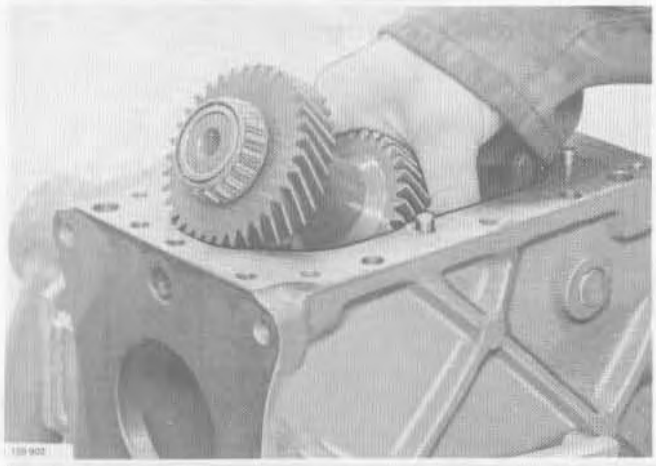
I 20

Remove 4th gear synchro ring.



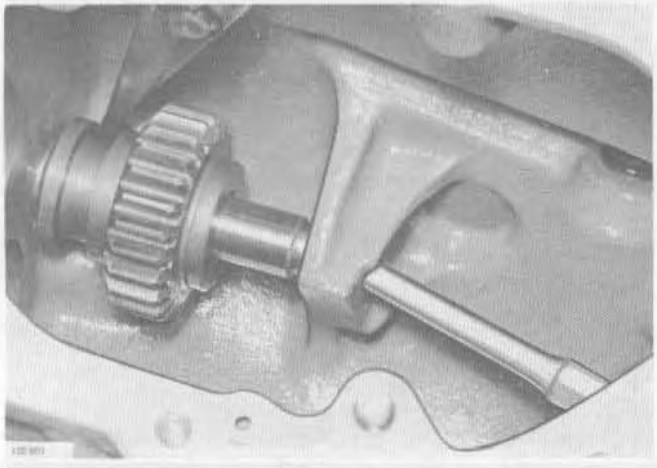
I 21

Lift out main shaft



I 22

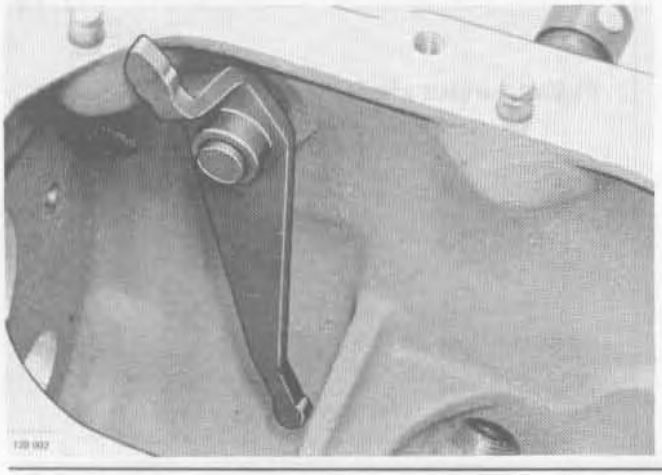
Lift out intermediate shaft.



I 23

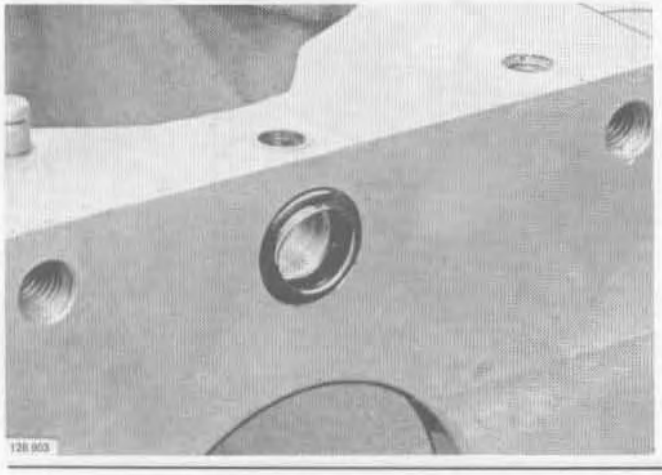
Remove reverse gear and shaft.

Use punch to knock shaft back.



I 24

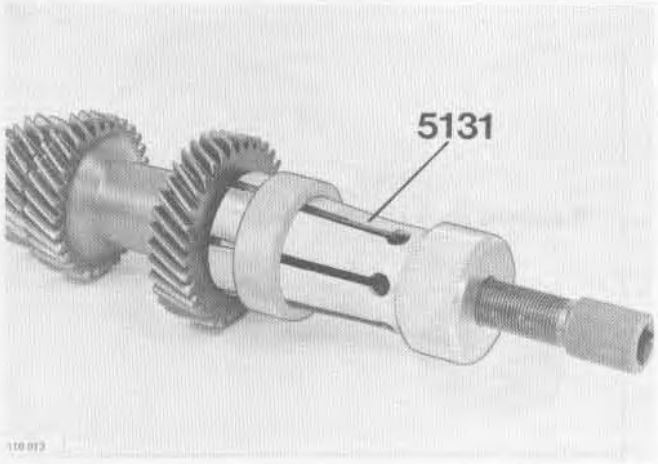
Remove reverse gear shift fork.



I 25

Remove seal for selector rail.

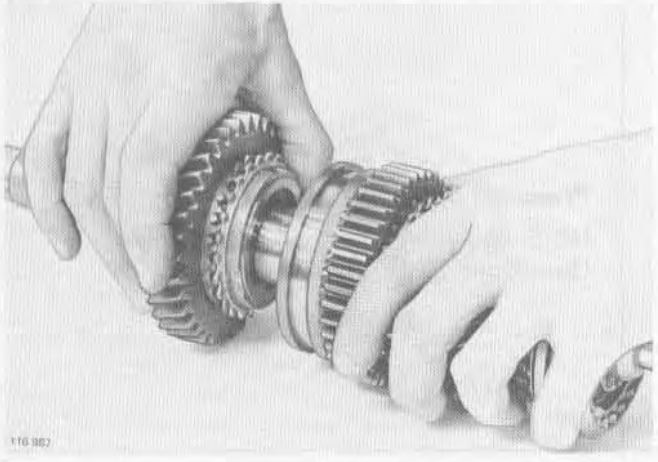
I 26



Remove intermediate shaft bearings.

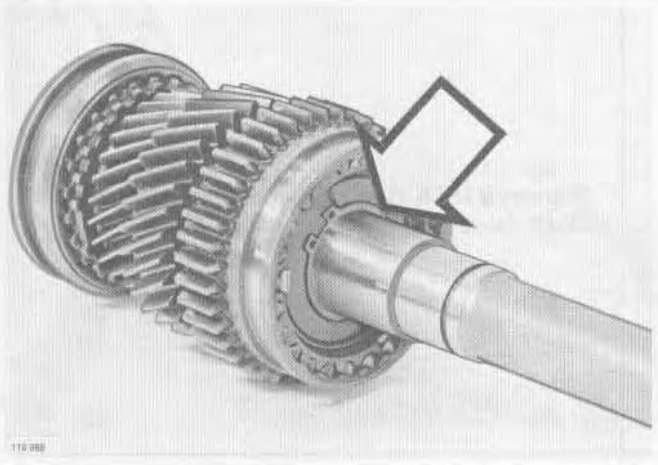
Use puller **5131**.

I 27



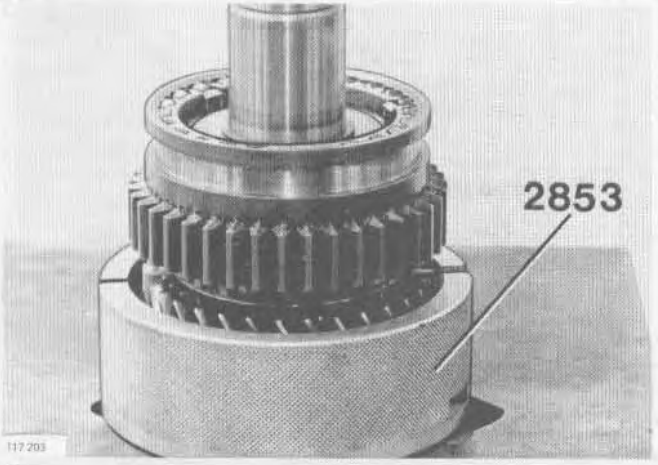
Remove 1st gear and synchro ring from main shaft.

I 28



Remove lock ring for 1–2 synchro hub.

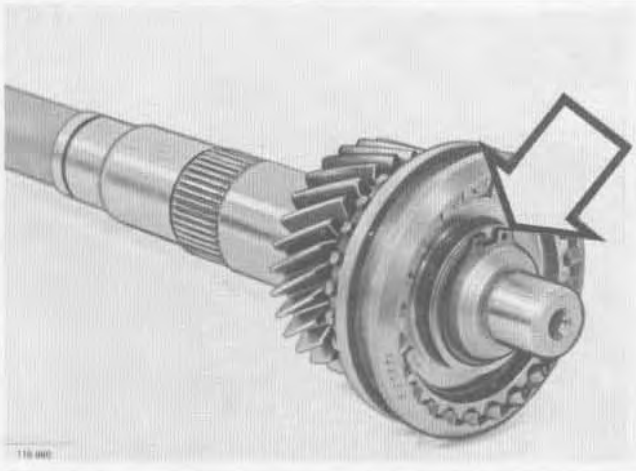
I 29



Press off synchro hub and gear.

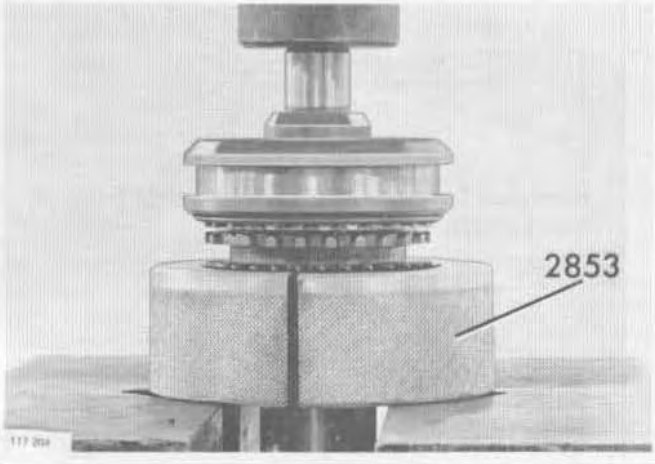
NOTE: Can be tight so a press may be needed.
Use adapter **2853**.

I 30



Remove lock ring for 3–4 synchro hub.

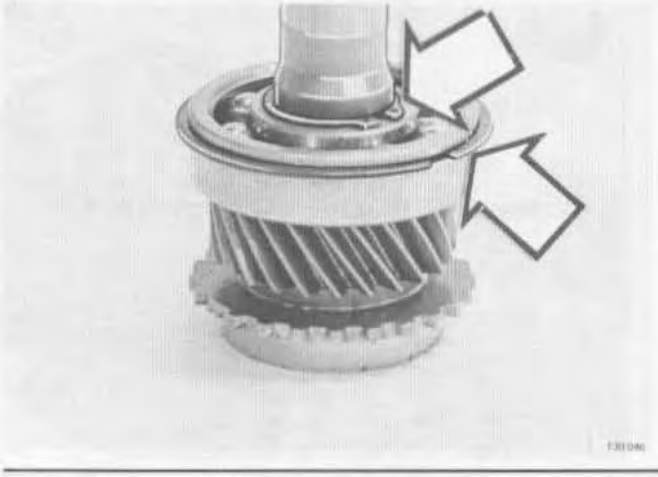
I 31



Press off synchro hub and gear.

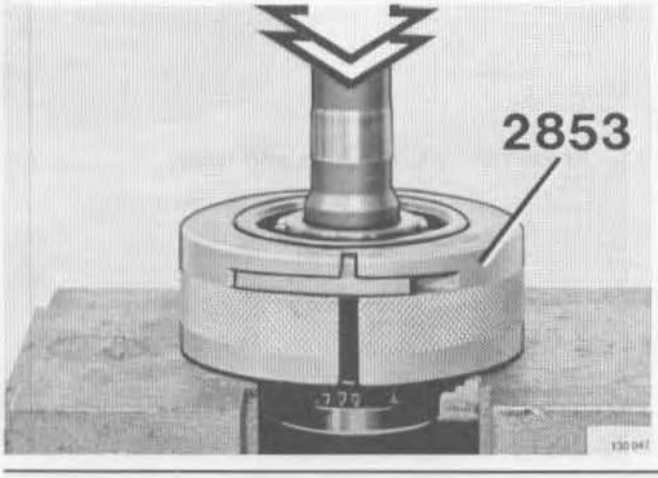
NOTE: Can be tight so a press may be used.
Use adapter **2853**.

I 32



Remove lock ring and spacer ring for input shaft bearing.

I 33



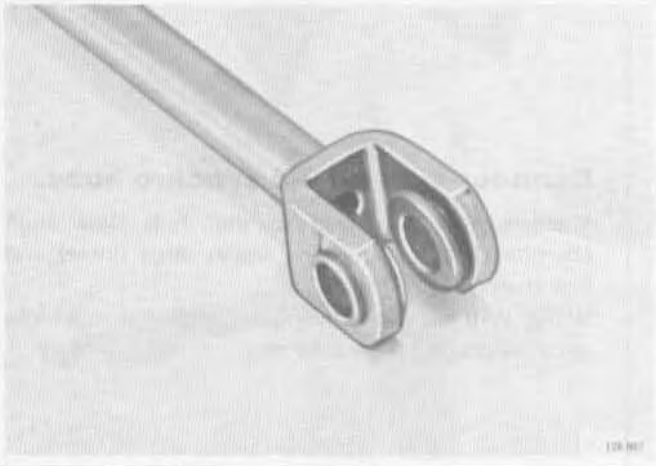
Remove input shaft bearing.

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

I 34

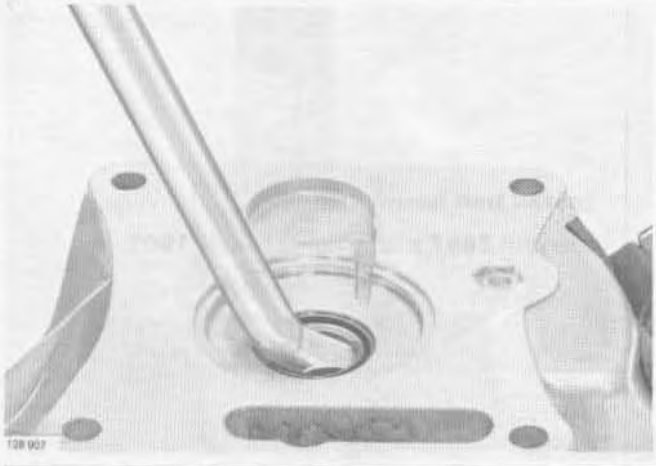
Remove rubber ring from gearshift rod joint.

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.

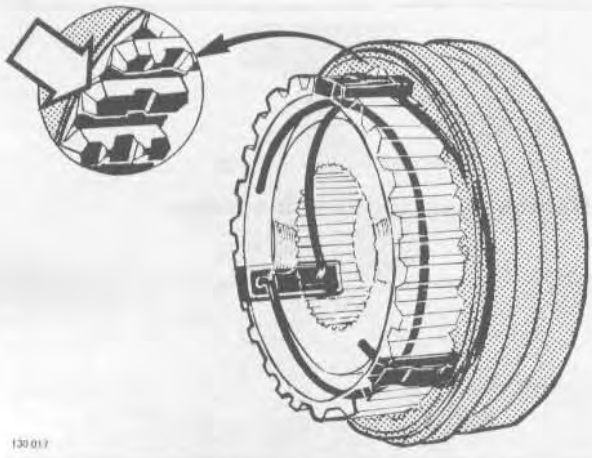
Clean all parts in solvent. Blow clean with compressed air.

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

Assembling transmission M 46

Special tools:

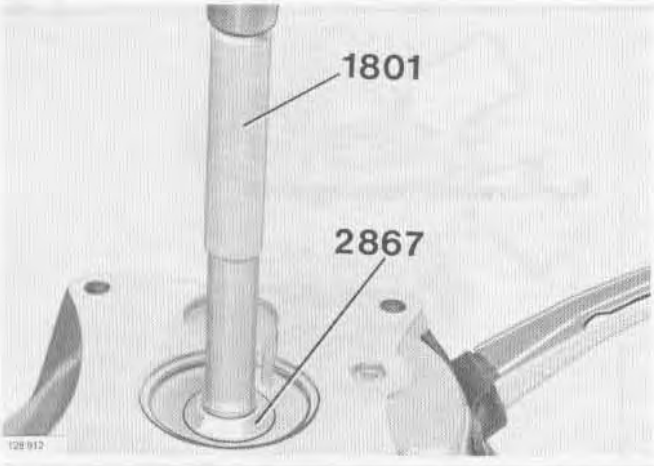
1801 **Standard handle**
2412 **Drift**, installing input shaft bearing
2831 **Press tool**, installing main shaft bearing
2852 **Adapter**, installing gear and synchro ring
2867 **Drift**, installing bell housing seal
2986 **Drift**, installing intermediate shaft bearings
5065 **Drift**, installing 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

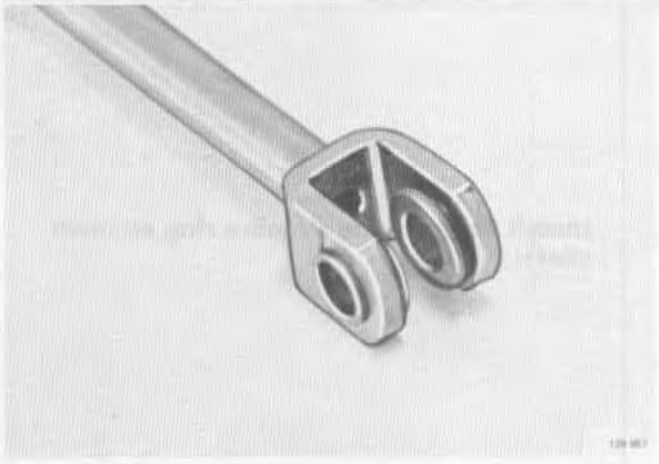
Install bell housing seal.

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

J3

Position rubber ring in joint.

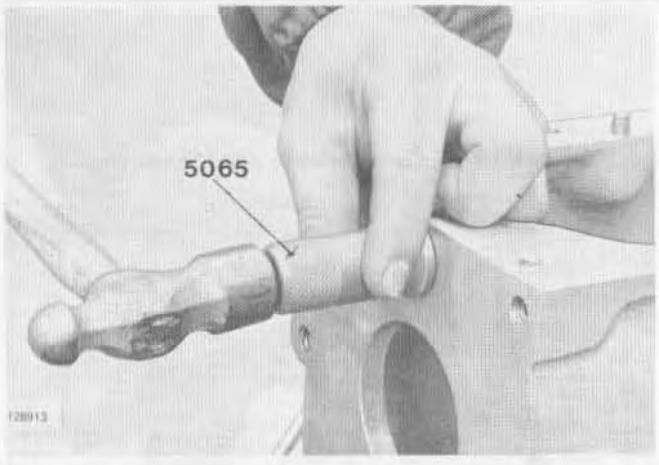
J4



Install bushings on gearshift rod.

Use grease to retain rubber ring on right side.

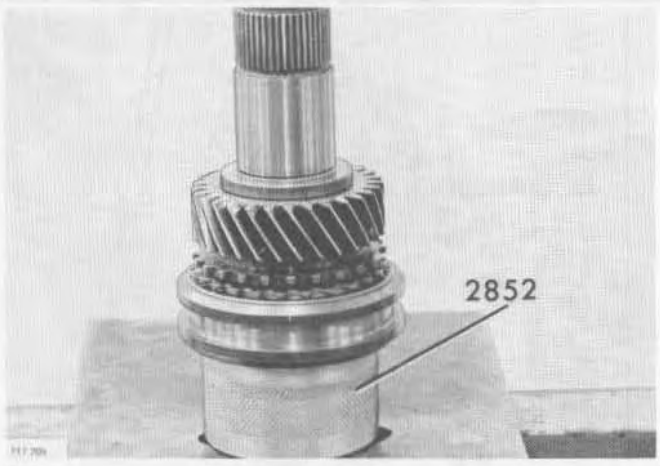
J5



Install seal for selector rail.

Drift 5065.

J6

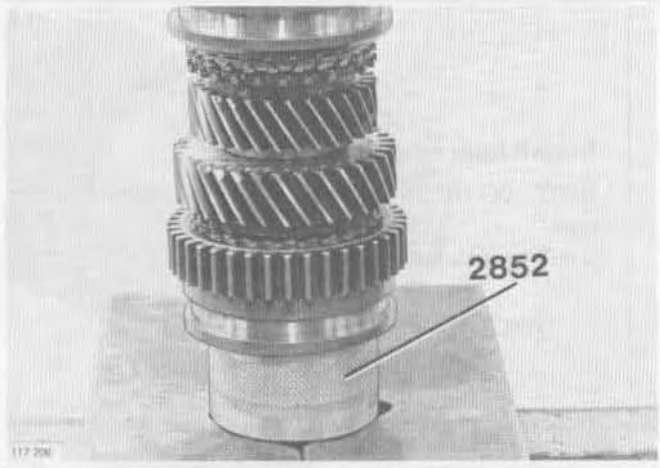


Install:

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

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

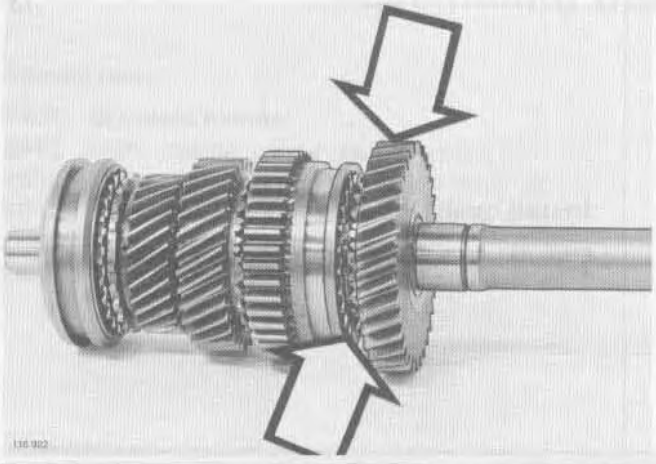
J7



Install:

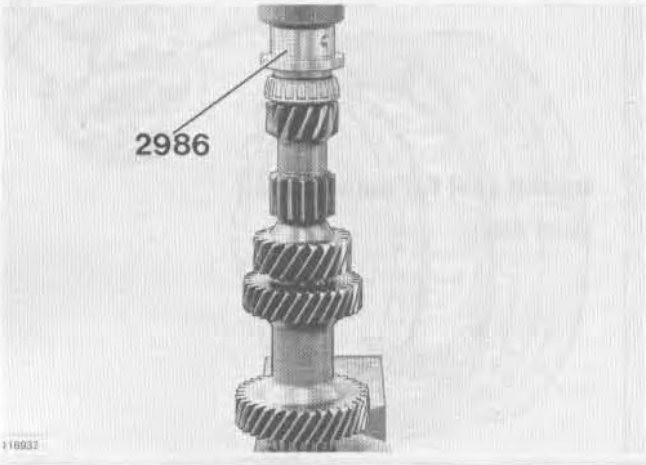
– 2nd gear and synchro hub.
– 1–2 synchro hub on main shaft.
– Lock ring.

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



J8

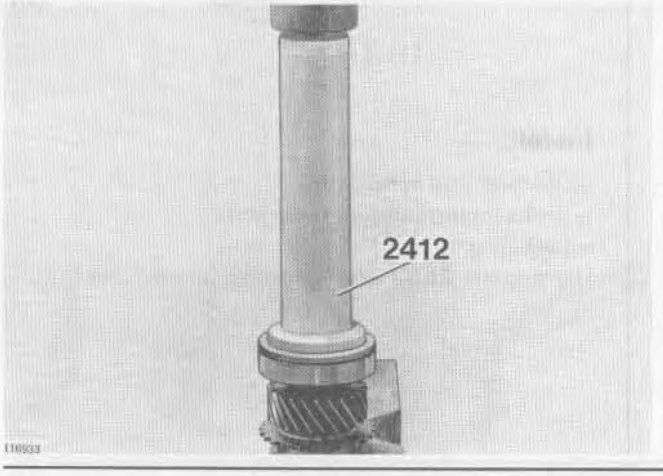
Install 1st gear and synchro ring on main shaft.



J9

Install two intermediate shaft bearings.

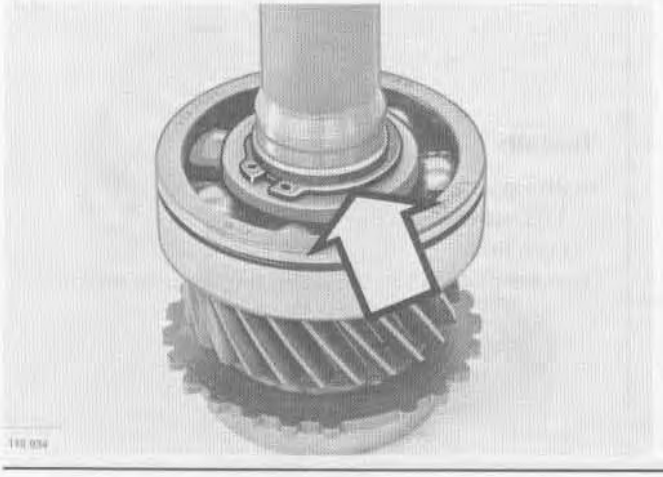
Use drift **2986** to press on bearings.
NOTE: Intermediate shaft small end bearing is different for diesel applications.
Use correct type bearings.



J10

Install bearing on input shaft.

Use drift 2412 to press on bearing.



J11

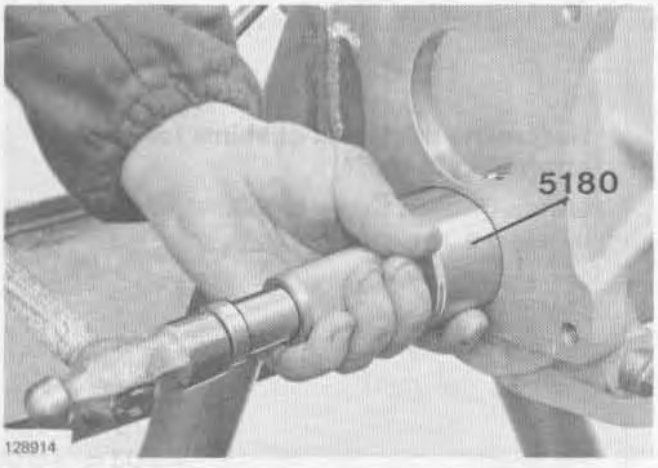
Install lock ring on input shaft.

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



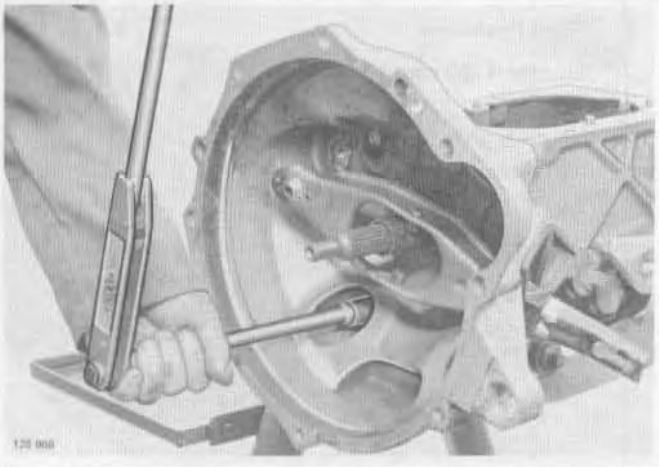
Position intermediate shaft in housing.

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.

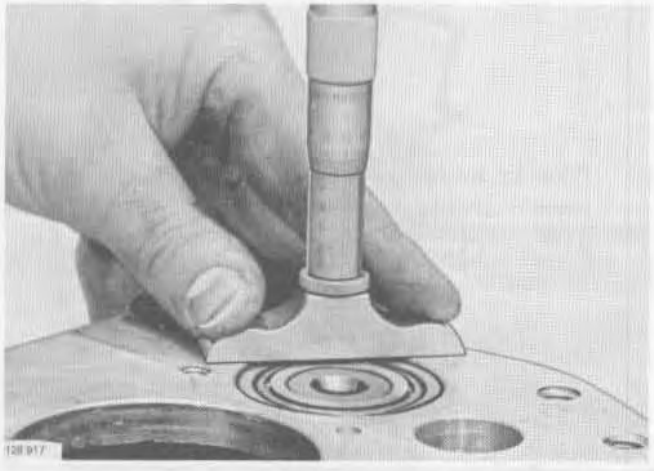
J15

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

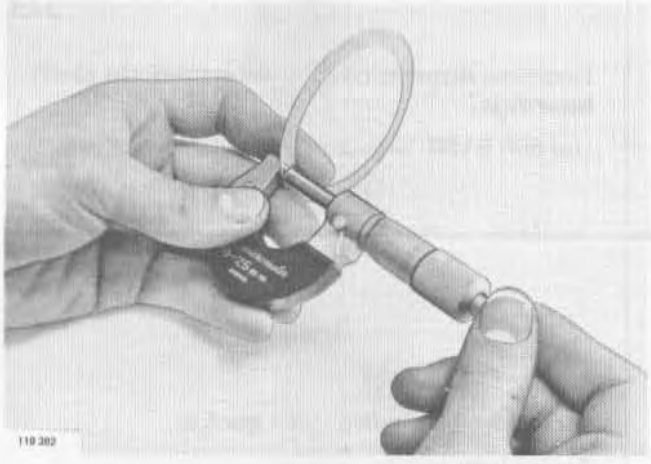
Measure distance between intermediate shaft bearing outer race and rear surface of housing.

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).

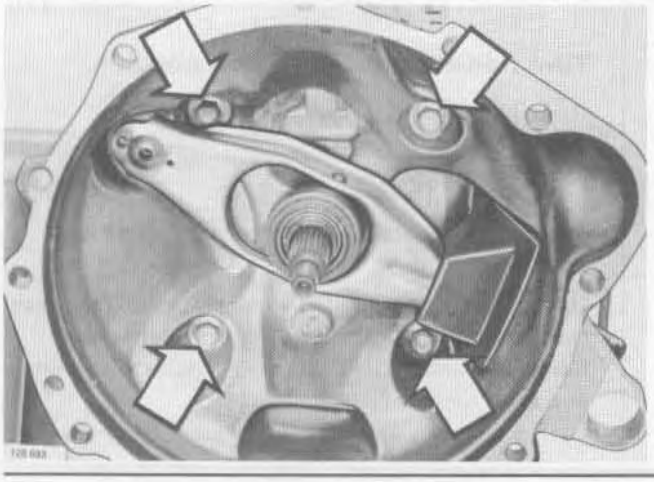


Example:

Distance, race–surface	1.51	
Gasket	+0.25	
	1.76	1.76
Pre-tension	+0.03 to	+0.08
Shim thickness	1.79 to	1.84

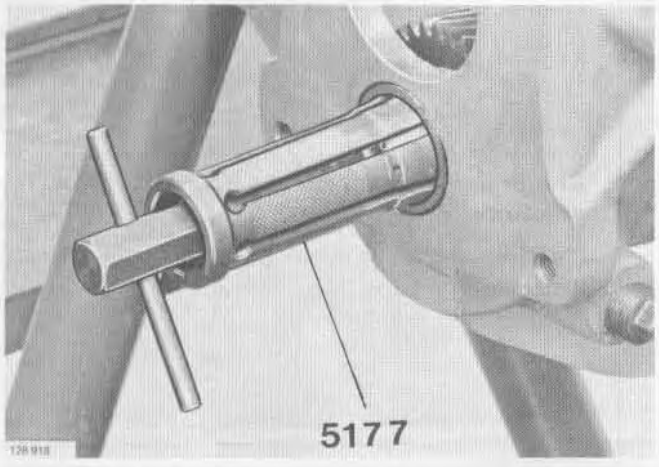
Choose **1.80 mm** shim thickness.

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.

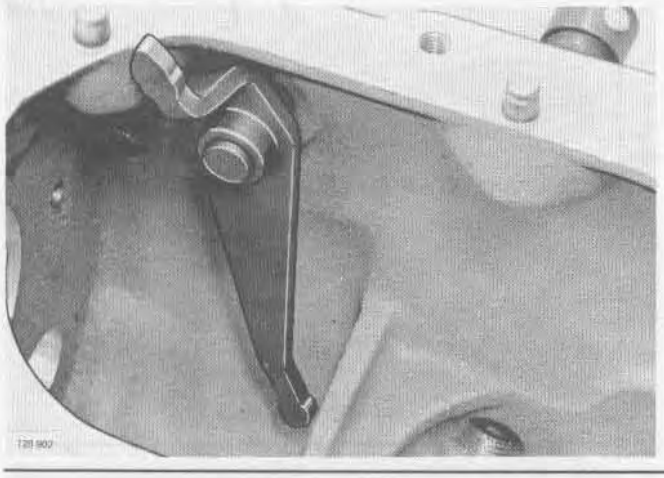
Carefully knock intermediate shaft until puller **5177** can grip races.

J21

Lift out intermediate shaft.

End of special instructions for transmissions with aluminum housing

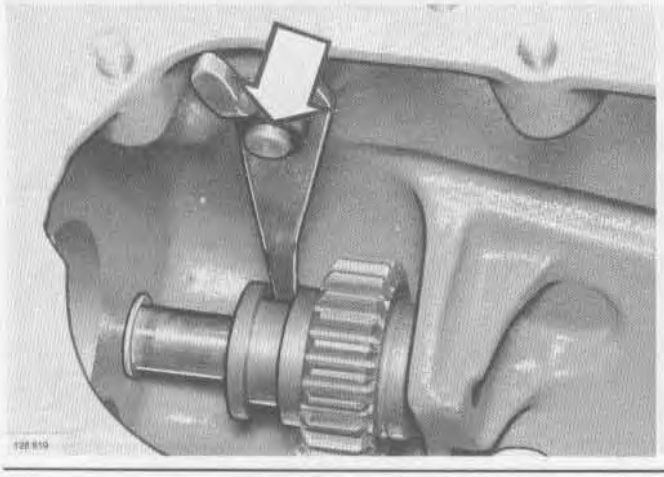
Proceed with assembly, using same operations as for transmission with cast iron housing.
Exception:
- Outer races for intermediate shaft bearings are installed as described above.
- Shim thickness is determined.



J22

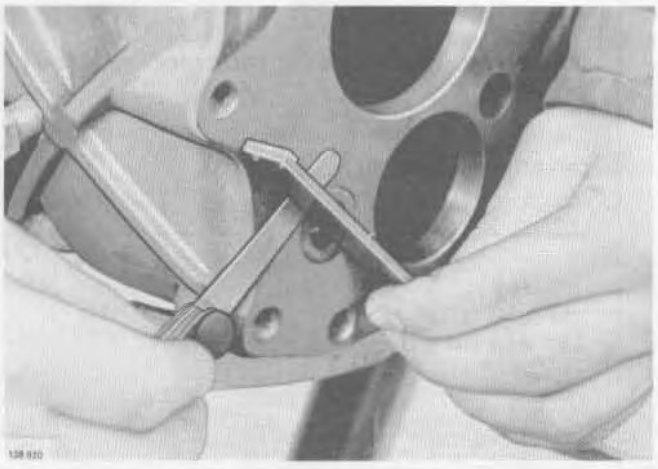
Install reverse gear shifter.

Install lock ring.



J23

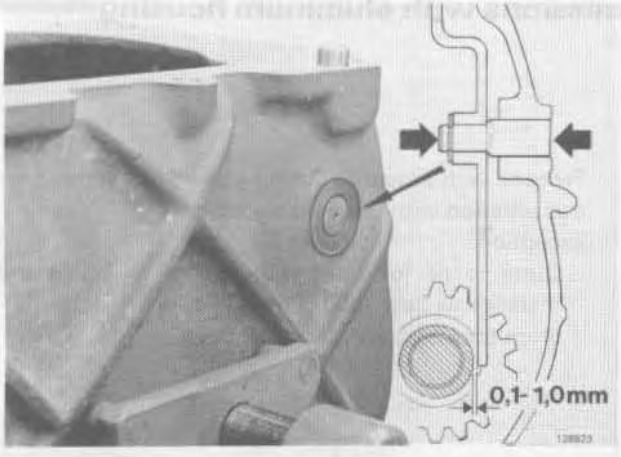
Install reverse gear and shaft.



J24

Check and adjust reverse gear shaft position.

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

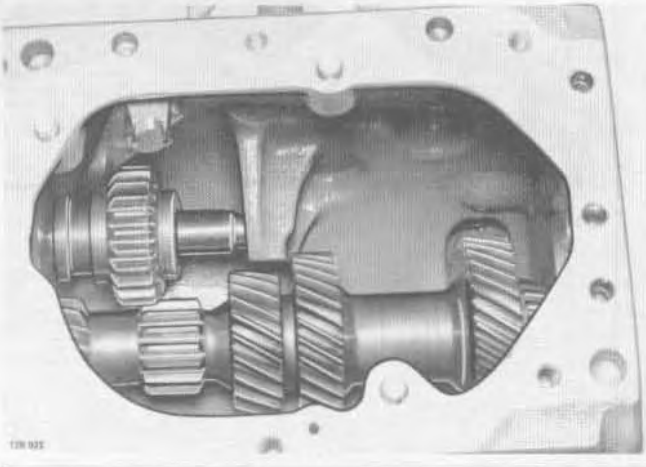


J25

Important!

Adjust clearance between reverse gear and shift fork.

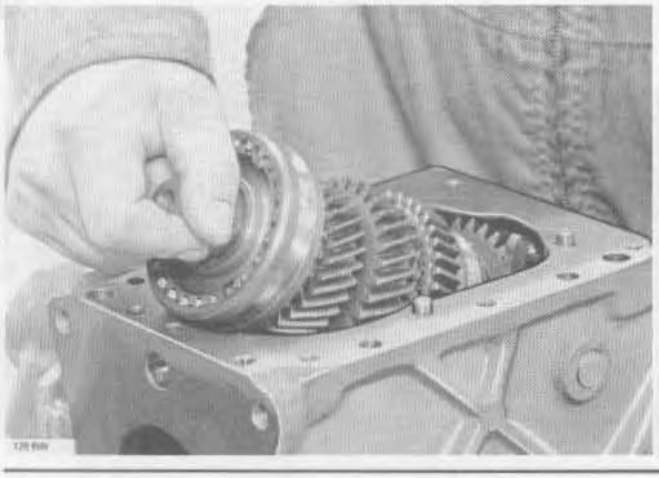
Correct clearance is 0.1–1.0 mm = 0.004–0.04''. Adjust by knocking shift fork pivot pin axially with a punch.



J26

Position intermediate shaft in housing.

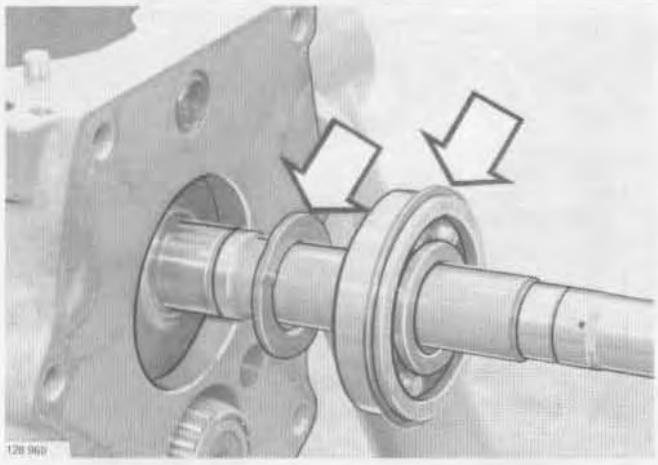
Position on bottom of housing.



J27

Position main shaft in housing.

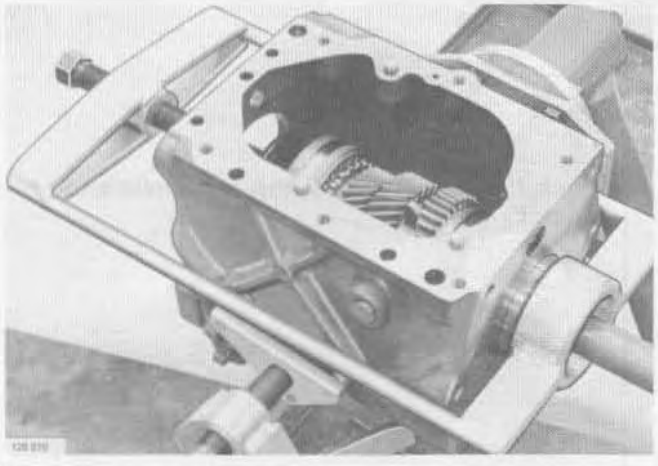
J28



Position thrust washer and bearing on main shaft.

Bearing should be fitted with positioning ring.

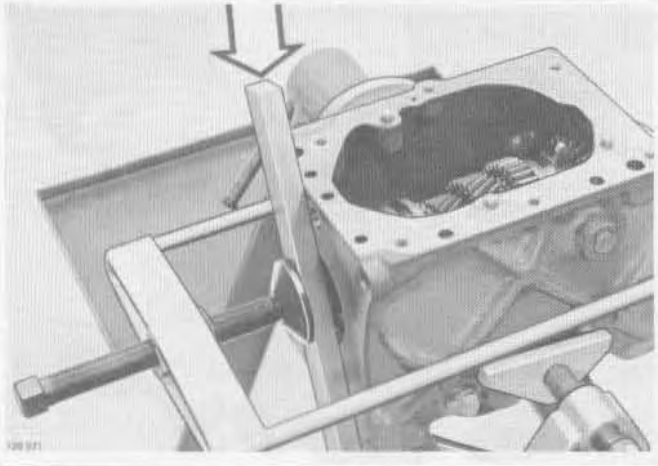
J29



Press main shaft bearing into position.

Use press tool **2831**.
Press reverse gear toward transmission center. Check that no gears coincide and become damaged.

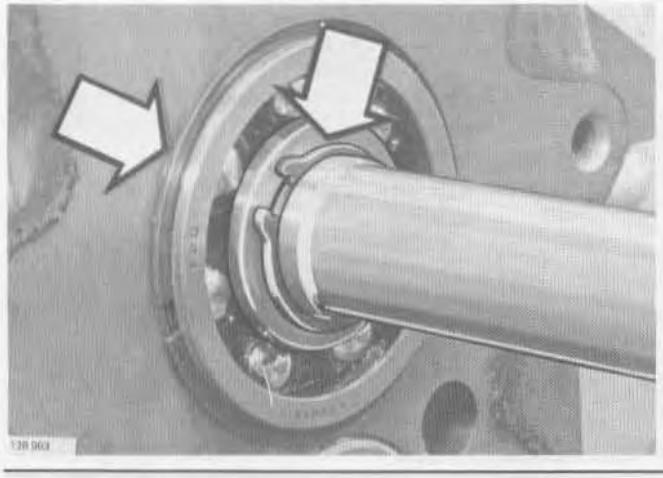
J30



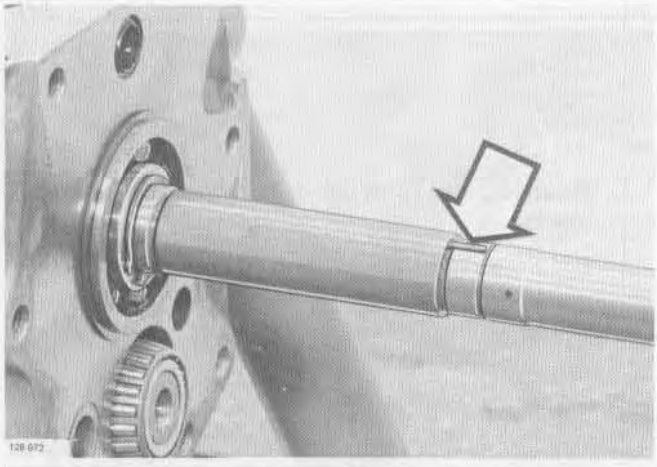
Use spacer for tool if bearing does not align correctly.

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

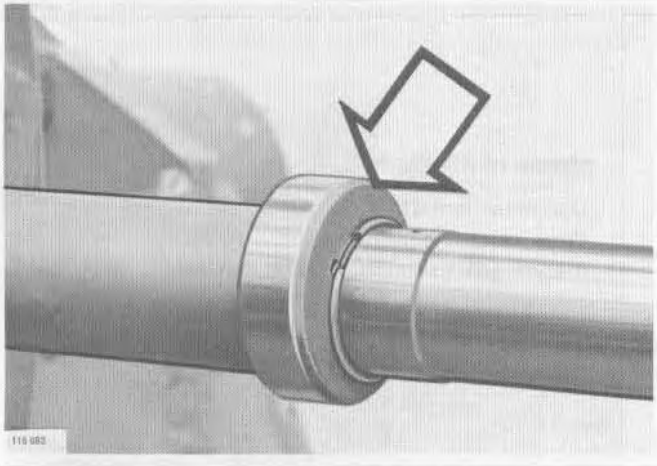


Install lock ring for main shaft bearing.



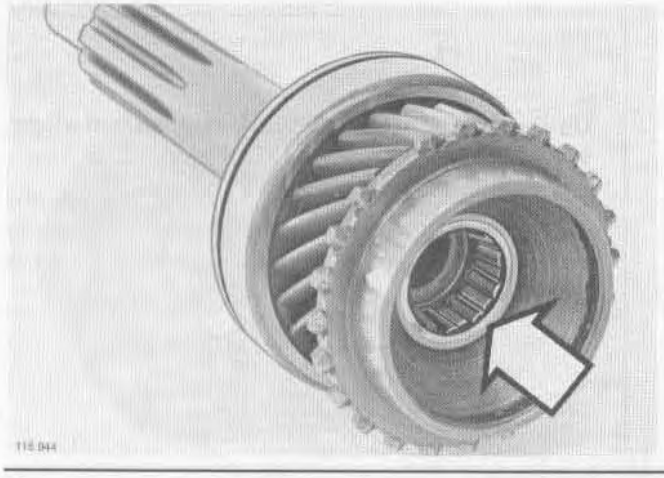
J32

Install key in main shaft keyway.



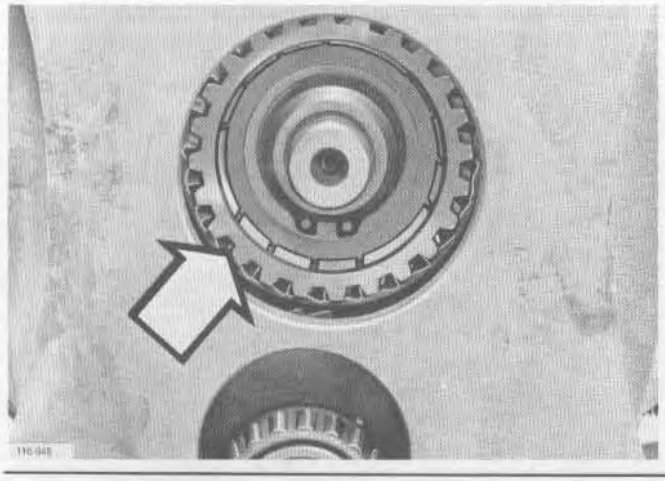
J33

Install overdrive oil pump eccentric and lock ring.



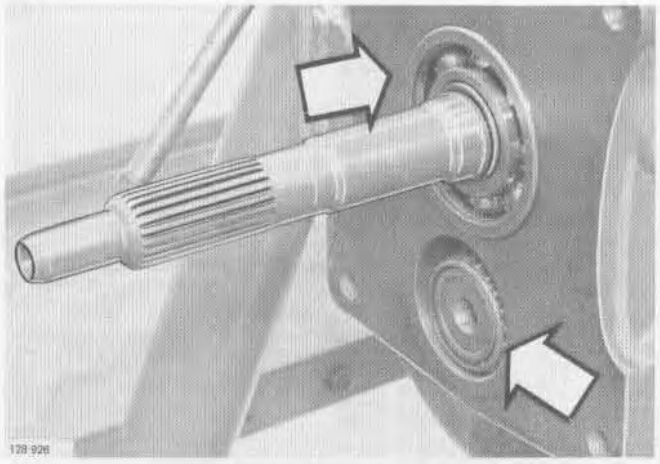
J34

Grease and install roller bearing in input shaft.



J35

Position 4th gear synchro ring in synchro hub.



J36

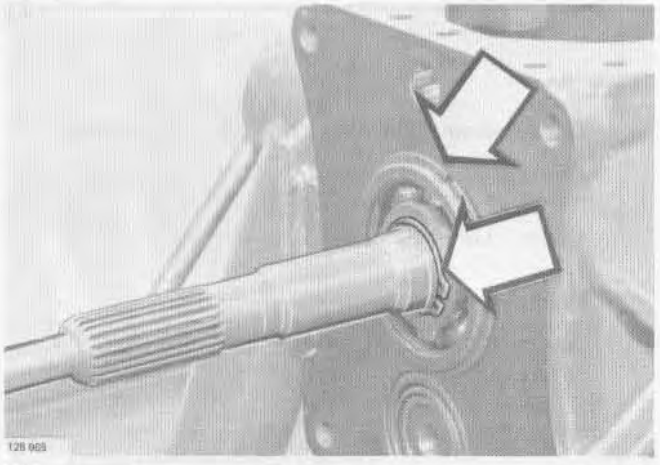
Attach input shaft to main shaft.

Push in shaft all the way.

J37

Lift up intermediate shaft.

Position shaft so that bearings are correctly positioned in housing.



J38

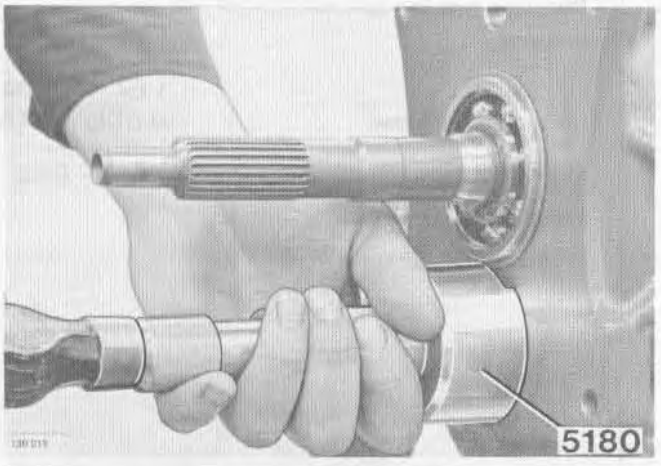
Pull out input shaft so that spacer ring can be positioned on bearing.

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

Cast iron housing:

J39

Install outer races for intermediate shaft bearings.

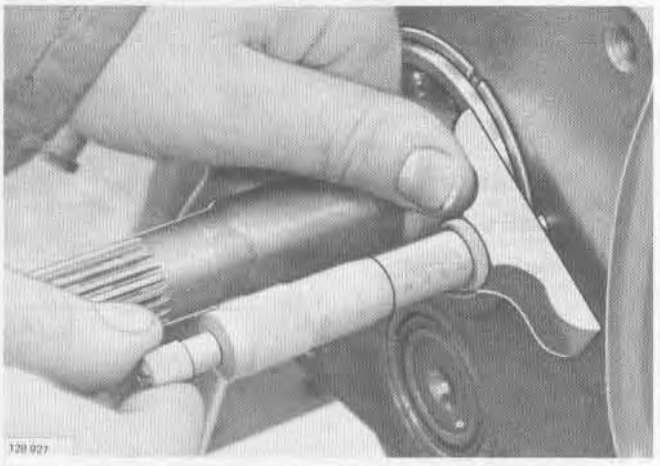


Aluminum housing:

J40

Install intermediate shaft outer bearing races.

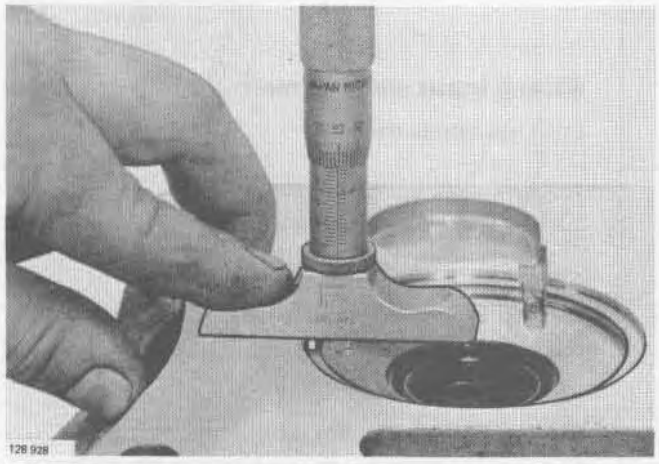
Use drift **5180**, large outer diameter toward bearing races.



J41

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

Use depth gauge. Note reading (metric).

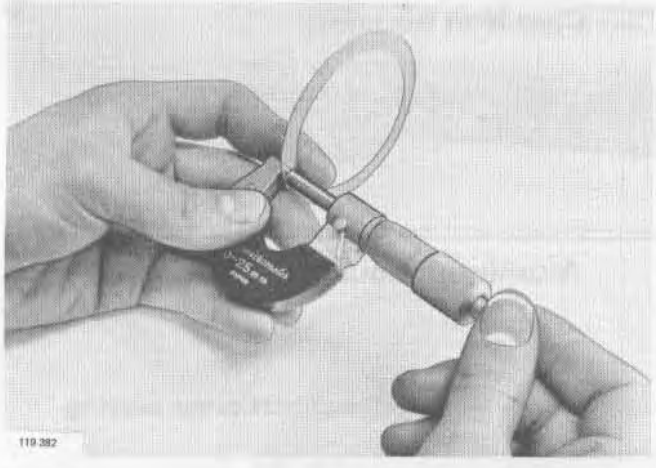


J42

Measure distance between bell housing surface and bearing seat bottom.

Use depth gauge. Note reading (metric).

J43



Determine shim thickness for input shaft.

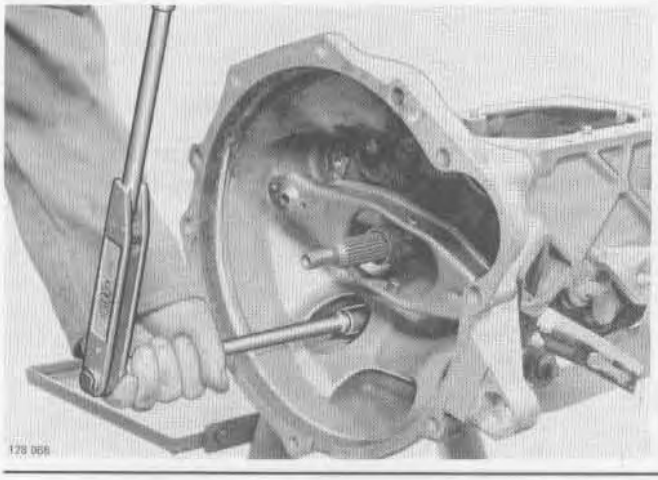
Axial clearance permitted: 0.01–0.20 mm.
NOTE: Gasket thickness 0.25 mm must also be considered. Use metric measurements only.

Example:

Distance, flywheel housing to bearing bottom	5.60	
Gasket thickness	+0.25	
	5.75	
Distance, bearing to housing	–4.71	
	1.04	1.04
Clearance permitted	–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

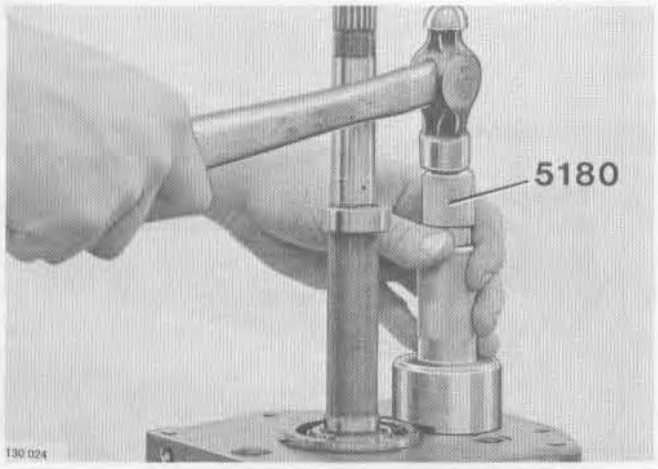
Aluminum housing:

Install clutch fork.

Including spacer.

J46

Install throw-out bearing.

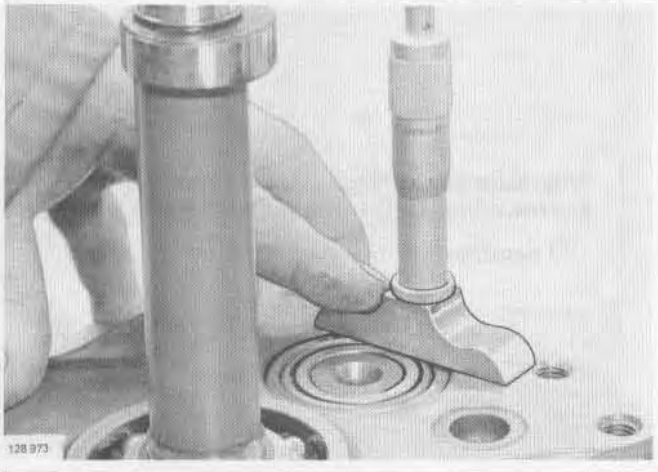


J47

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.



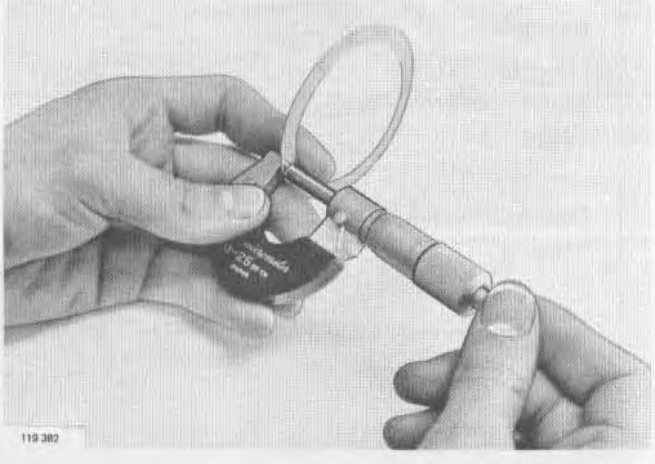
J48

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.

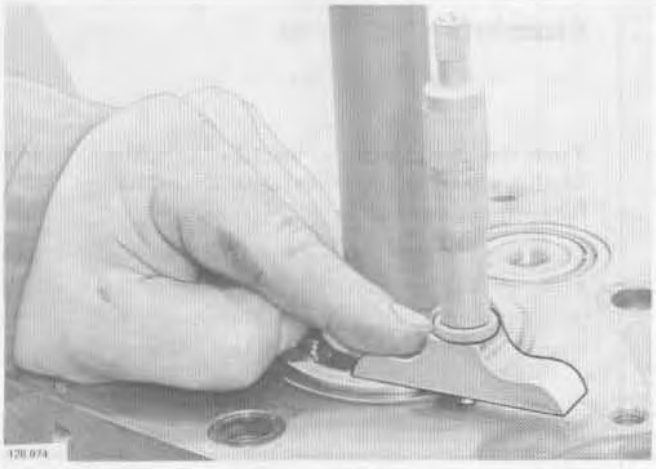
Axial clearance permitted: 0.025–0.10 mm. Gasket thickness: 0.25 mm. Metric only.

Example:

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

Choose 1.65 mm (alt. 1.60 mm).

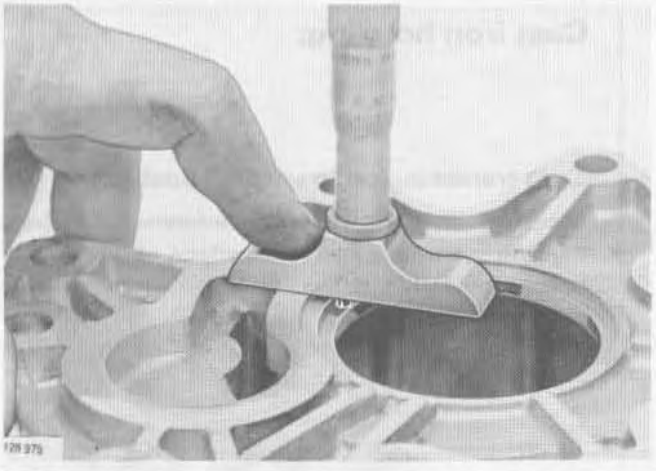
Shims available: 0.05 mm
0.10 mm
0.15 mm
0.35 mm
0.50 mm
0.70 mm
1.00 mm



J50

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

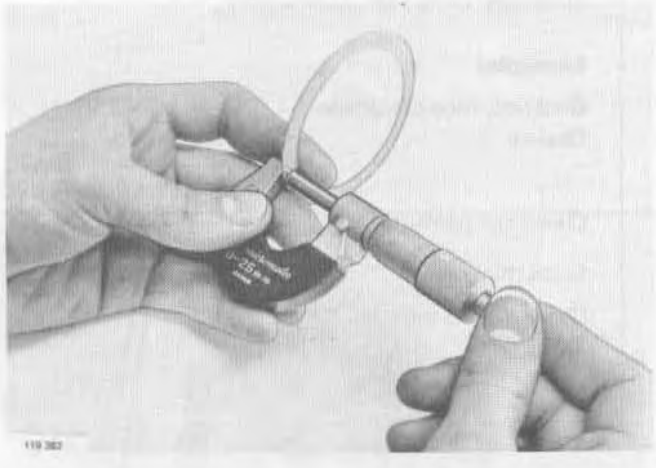
Use depth gauge. Note reading (metric).



J51

Measure distance between rear cover surface and bearing seat bottom.

Use depth gauge. Note reading (metric).



J52

Determine shim thickness for main shaft.

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

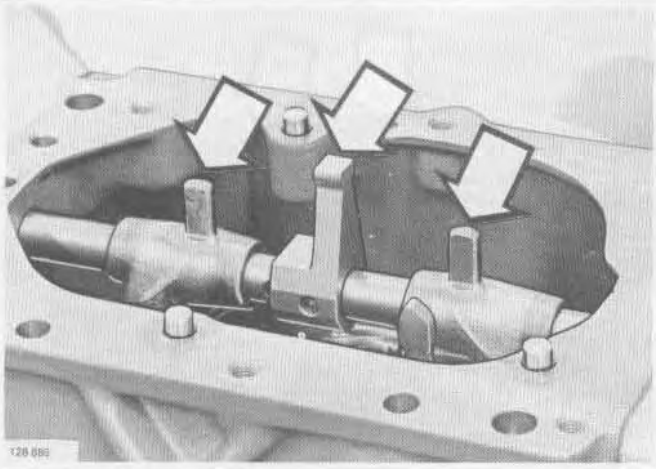
Example:

Distance, cover to bearing bottom	5.50	
Gasket	+0.25	
	5.75	
Distance, bearing to housing	–4.71	
	1.04	1.04
Clearance permitted	–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



Install shift forks.

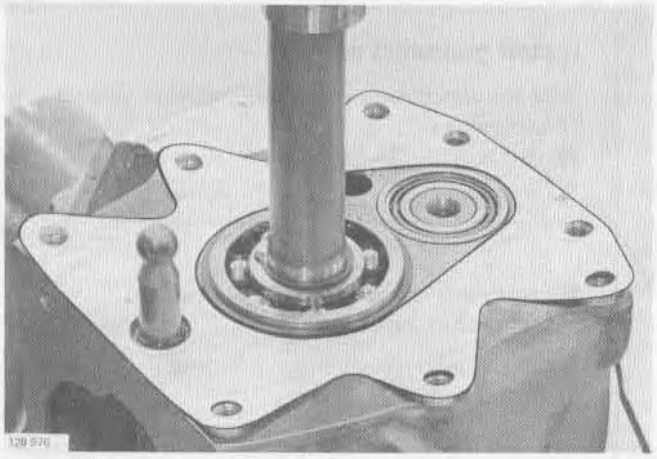
Make sure lugs position correctly.

J54

Install shifter and gear selector rail.

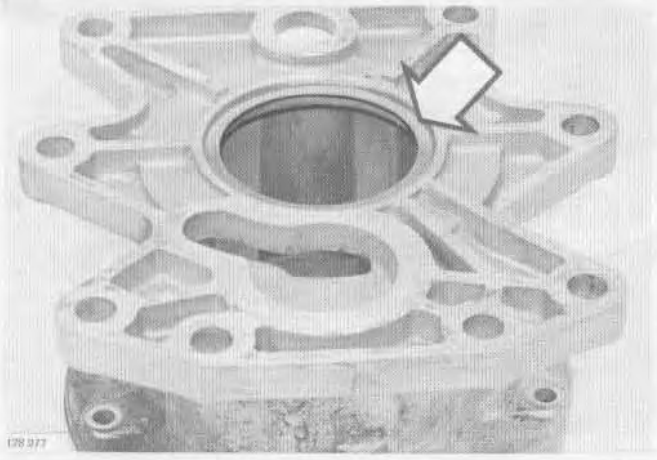
Shifter boss forward.

J55



Position gasket and shim pack for intermediate shaft.

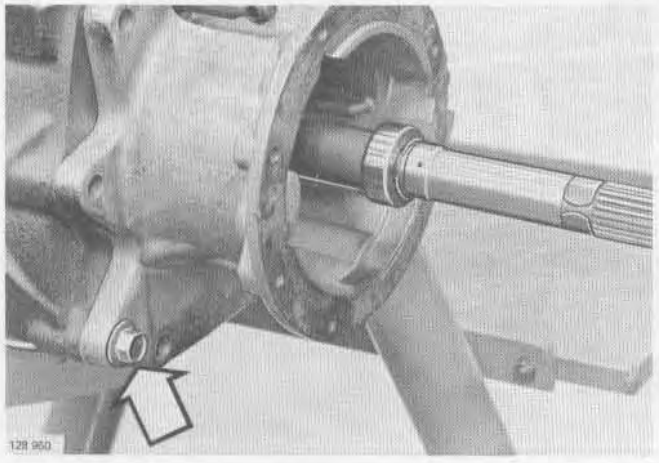
J56



Position main shaft shim pack in intermediate housing.

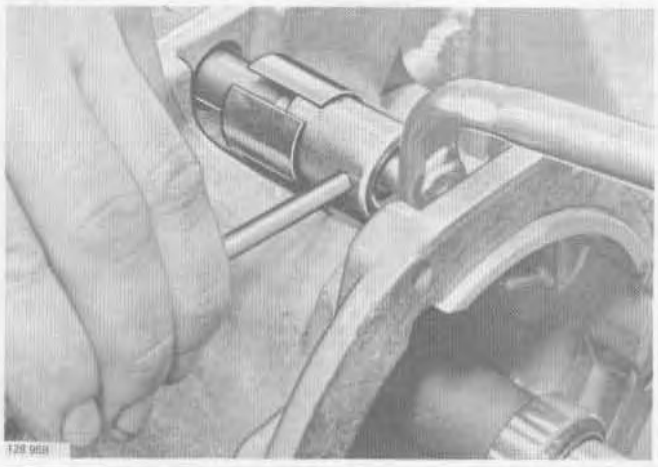
Apply grease to shim to keep in place.

J57



Install intermediate housing.

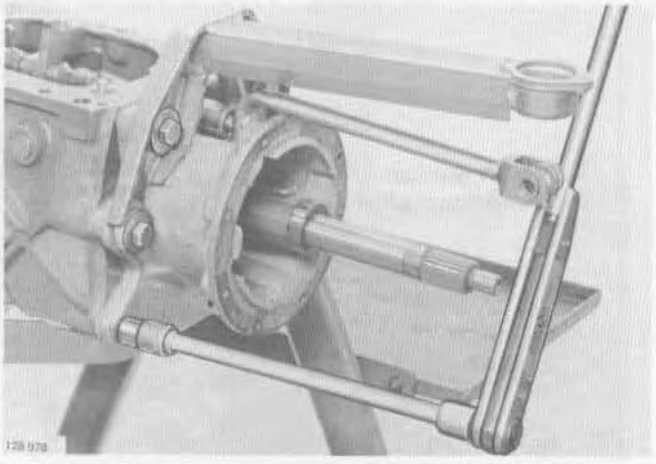
Install two outer (lower) bolts finger tight.



J58

Install gearshift rod.

Install sleeve on joint.



J59

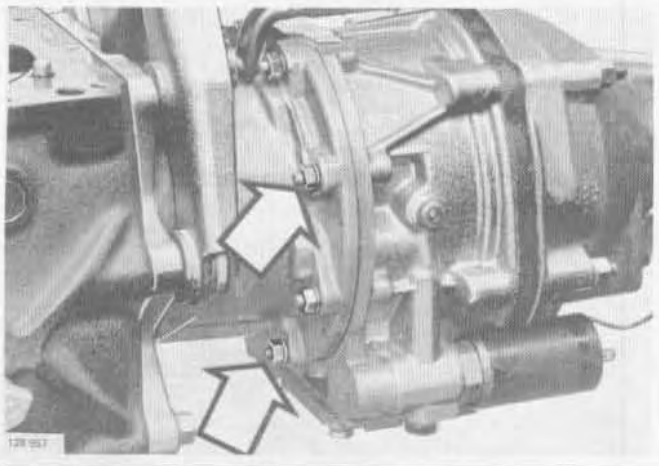
Install gearshift carrier.

Note sequence: bolt – washer – spacer– washer
Torque bolts to:
35–50 Nm = 25–35 ft.lbs.

J60

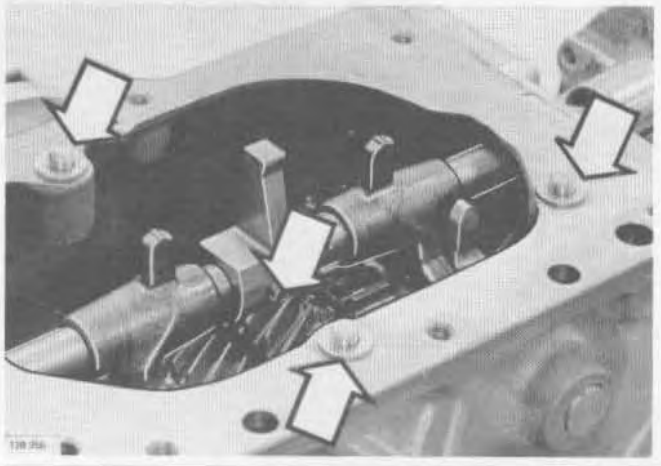
Install two inner (lower) bolts for intermediate housing.

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



J61

Install overdrive.

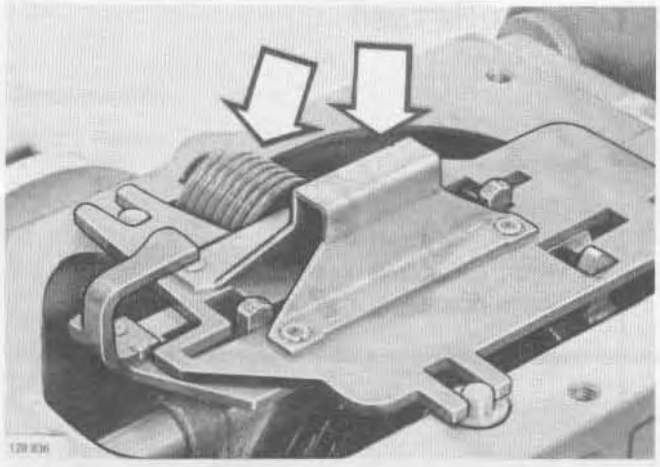


J62

Install:

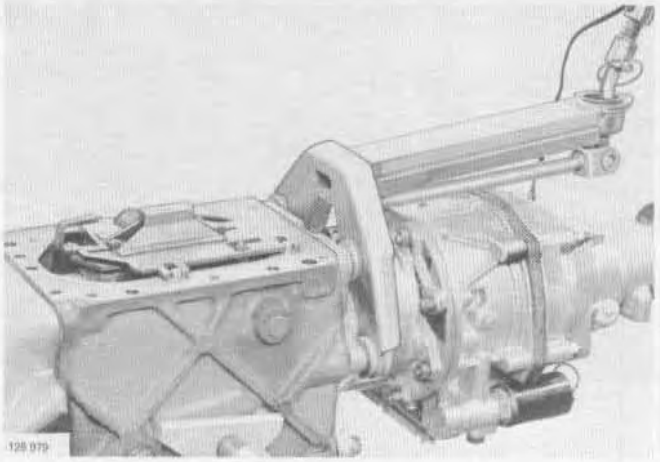
– Lock pin for shifter.
– Glide washers for selector plate assembly.

J63



Install selector plate assembly and return spring.

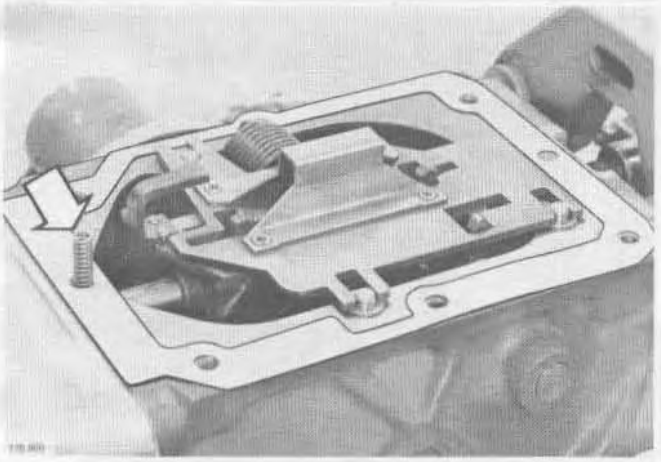
J64



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.

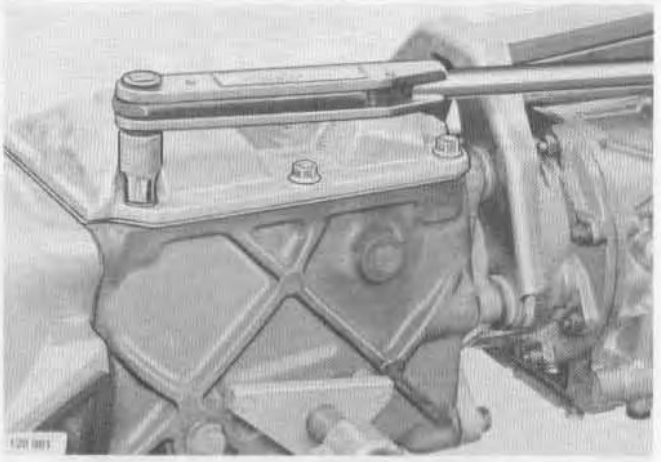
J65



Install:

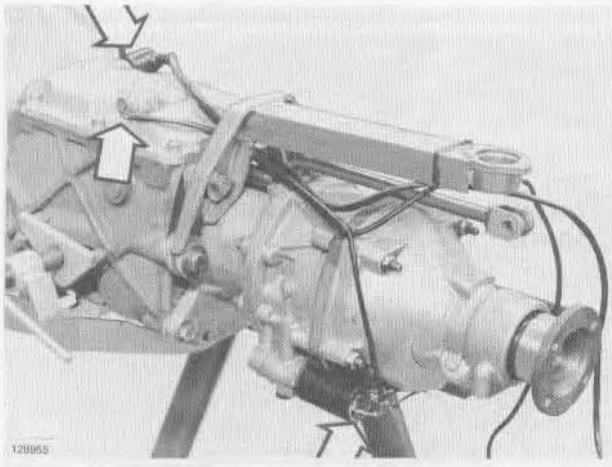
– Detent ball and spring.
– New top cover gasket.

J66



Install top cover.

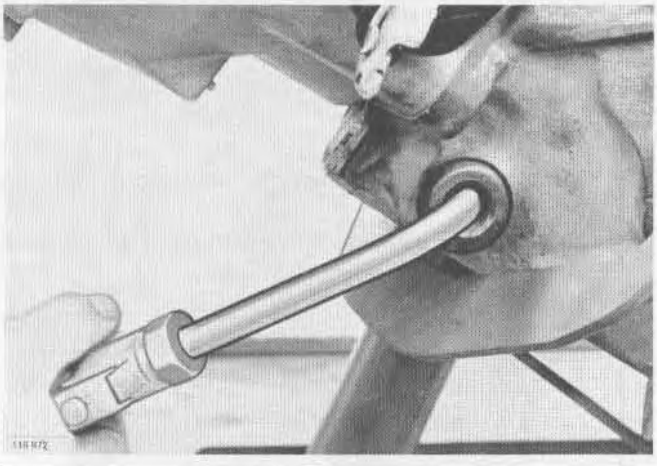
Torque bolts to:
15–25 Nm = 11–18 ft.lbs.



J67

Install:

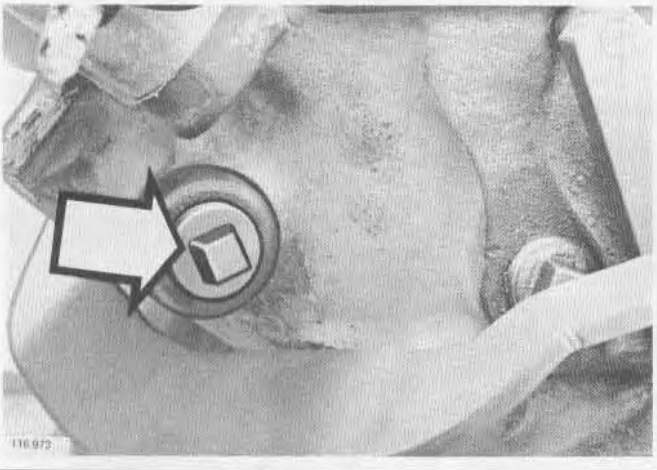
– Overdrive switch.
– Back-up light switch.
– Wires at overdrive solenoid.
– Sound deadening material on gearshift carrier.



J68

Fill oil.

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



J69

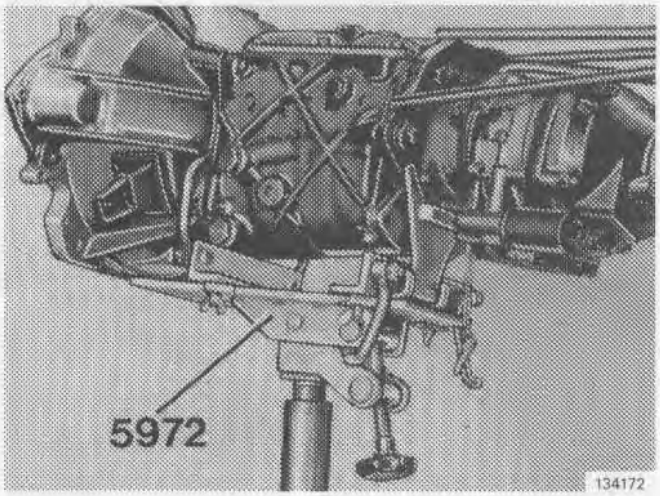
Install level plug.

Installing transmission M 46

Special tools:

5972 Fixture

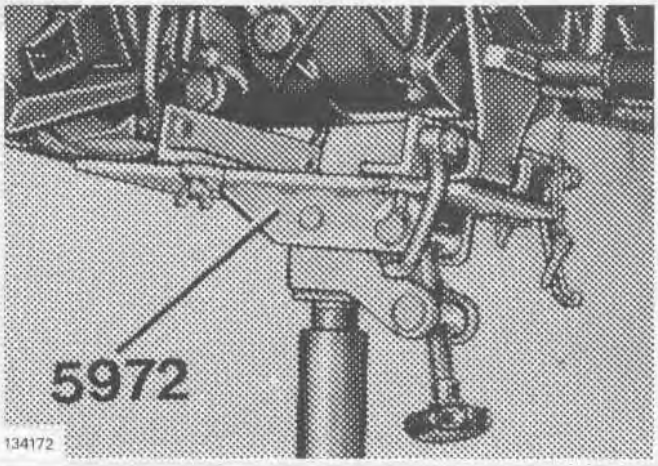
K1



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.

K4

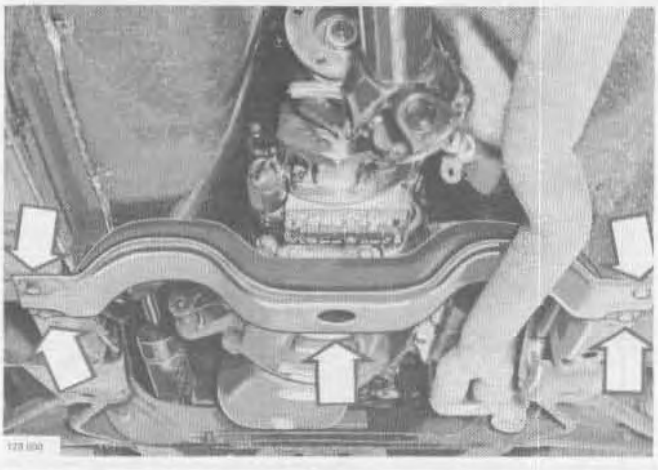
As appropriate:

Attach clutch cable.

Hook on return spring.

K5

Install bracket for rubber cushion.



K6

Install cross-member assembly.

K7

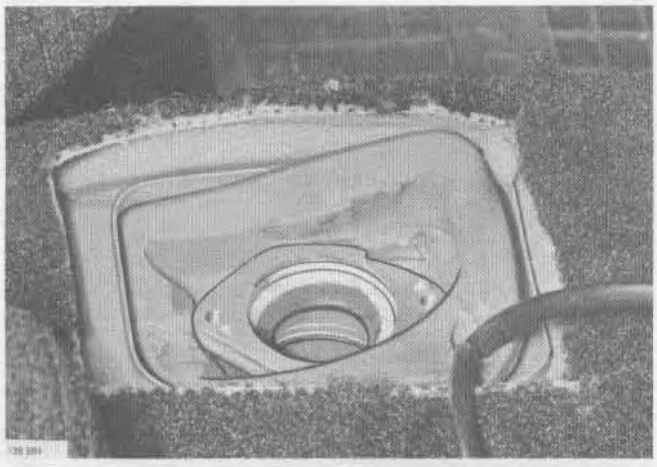
Install:

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

K8

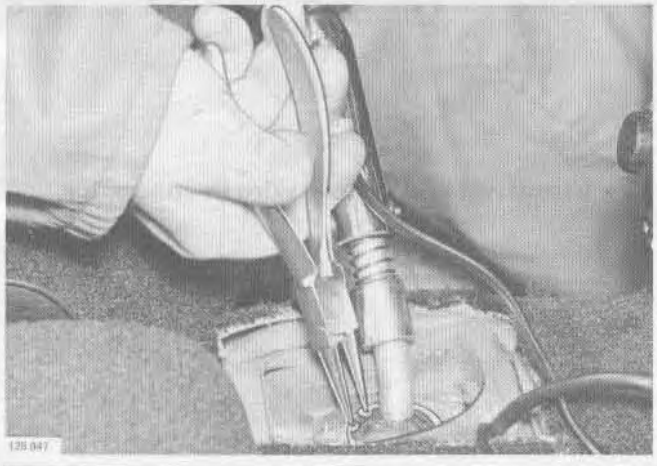
Inside vehicle:

Install rubber ring and plastic bushing.



K9

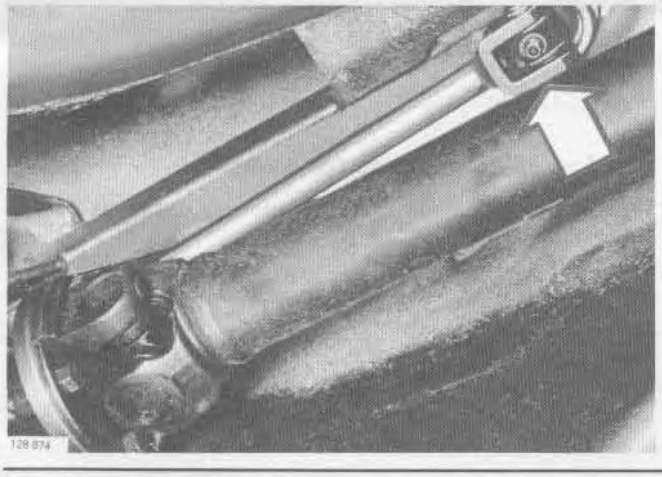
Check that sound deadening material is correctly positioned.



K10

Install gearshift lever.

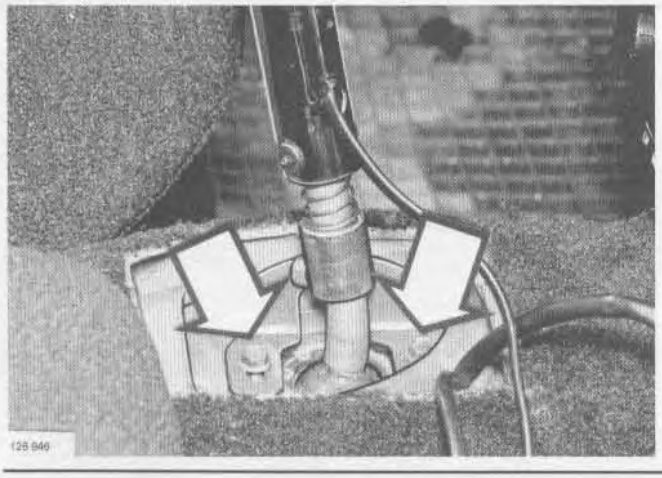
Install retaining ring.



From under vehicle: K11

Attach gearshift rod to gearshift lever.

Push pivot pin into position and install locking screw.



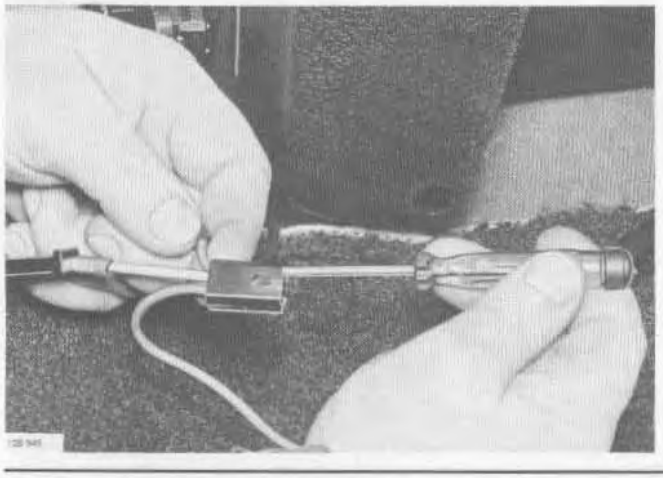
K12

Install reverse detent plate.

K13

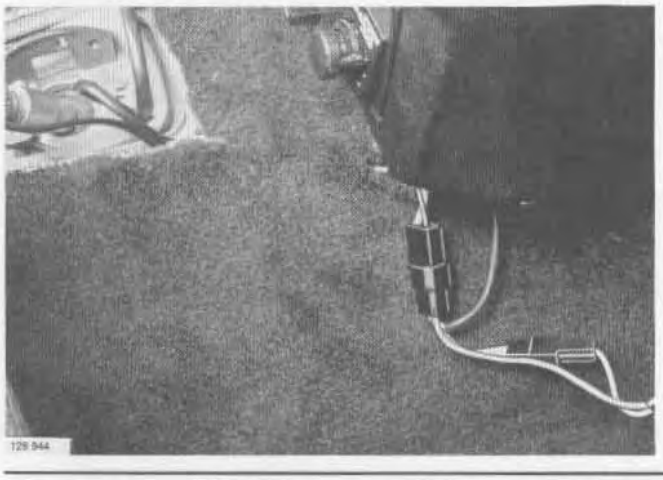
Adjust clearance for reverse gear detent.

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.



K14

Install red and yellow wire in connector.



K15

Install connectors for overdrive.

Then install panel on center console right side.

K16

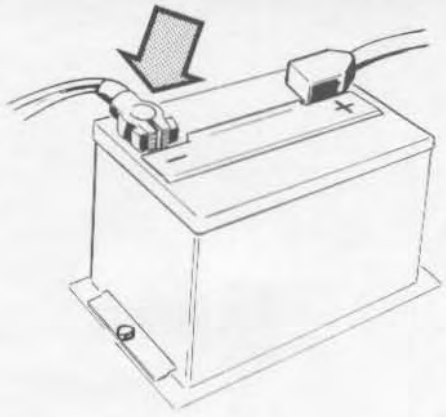
Install connector for back-up light.

Then install panel on center console left side.

K17

Install gearshift lever cover.

K18



Connect battery ground cable.

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