
Workshop Manual

911

Carrera 4

The workshop manual is only for the internal use of the Porsche Dealer Organization.

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* No provisions are currently made for repair of the automatic section.

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Diagnosis

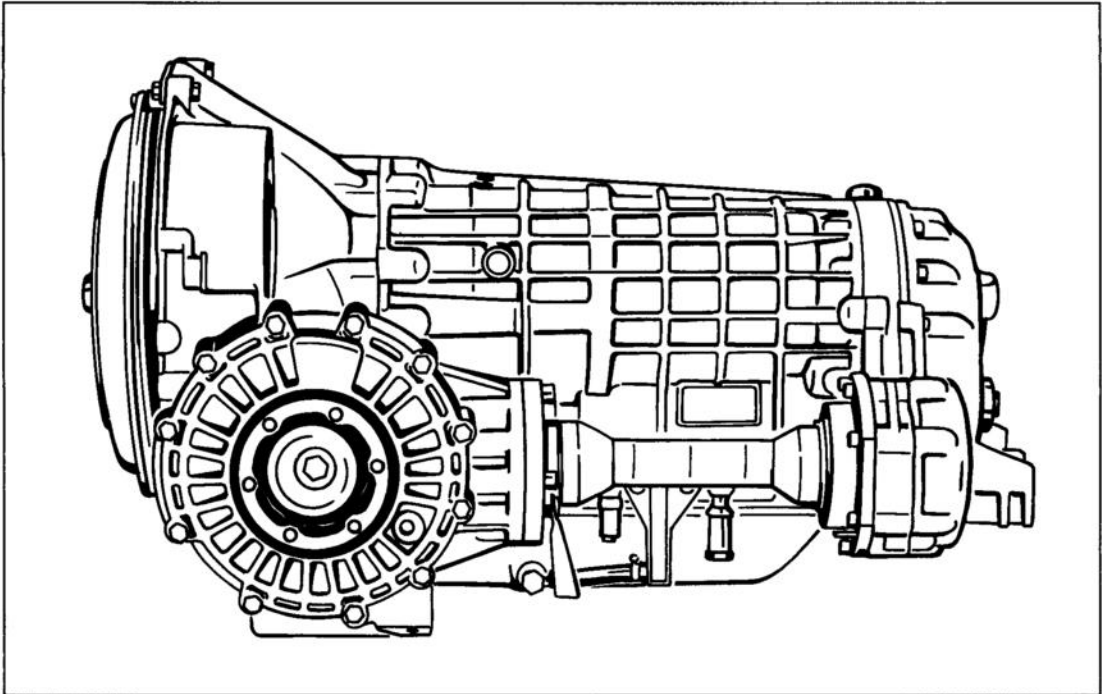
Tiptronic Diagnosis / Troubleshooting

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* No provisions are currently made for repair of the automatic section.

Technical data

4-speed Tiptronic transmission A50

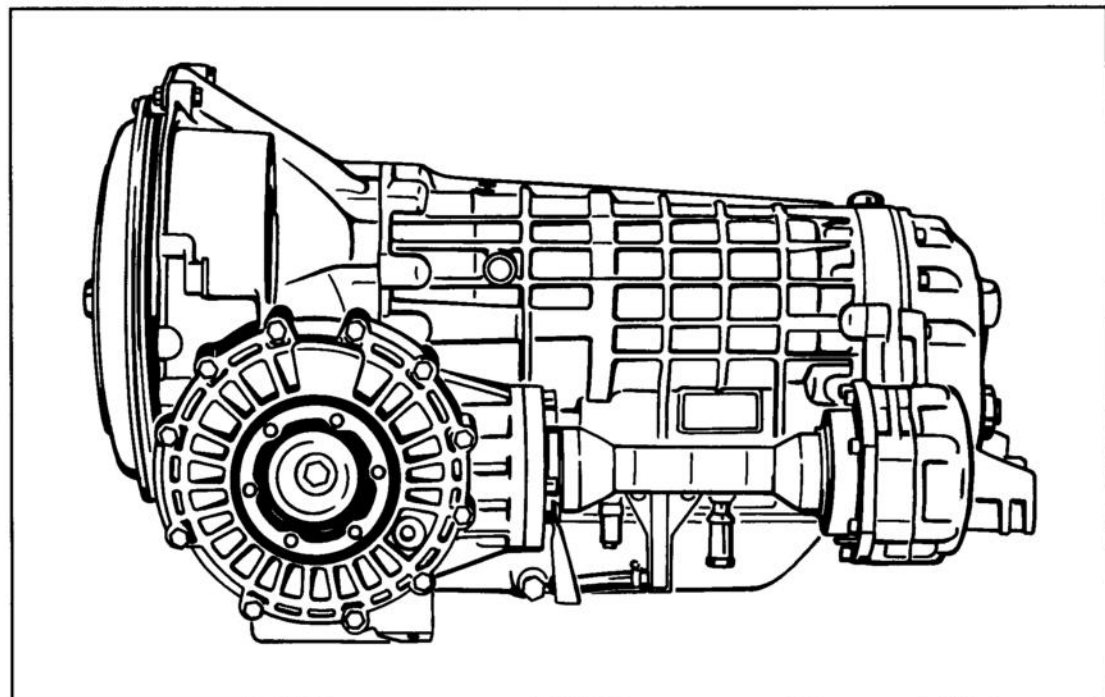


428-37

Type	Identification code	Equipment	Installed in	Model year
A50/01		4-speed	911 Carrera 2 worldwide	90

Technical data

General data	A50/01	
Design	fully-automatic 4-speed planetary transmission (Tiptronic)	
Ratio		
Spur pinion	1.100	
1st gear	2.479	
2nd gear	1.479	
3rd gear	1.000	
4th gear	0.728	
Reverse gear	2.086	
Final drive	Hypoid bevel gear with 15 mm offset	
Final drive ratio	9:33	i = 3.667
Stall speed	2300 $\pm$ 200	
Capacity, rear axle final drive	approx. 0.9 l multi-grade transmission oil 75 W 90 API classification GL5 (MIL-L 2105 B), optionally SAE 90	
Capacity, automatic unit with converter	Total capacity approx. 9.0 l Change quantity approx. 3.0 l ATF-Dexron II D	

Technical data**4-speed Tiptronic transmission A50**

428-37

Type	Identification code	Equipment	Installed in	Model year
A50/01		4-speed	911 Carrera 2 worldwide	90/91
A50/02		4-speed	911 Carrera 2 worldwide (except USA)	92/93/94
A50/03		4-speed	911 Carrera 2 USA	92/93/94

Technical data

General data	A50/01	A50/02	A50/03
Design	fully-automatic 4-speed planetary transmission (Tiptronic)		
Ratio			
Spur pinion	1.100		
1st gear	2.479		
2nd gear	1.479		
3rd gear	1.000		
4th gear	0.728		
Reverse gear	2.086		
Final drive	Hypoid bevel gear with 15 mm offset		
Final drive ratio	9:33	i = 3.667	9 : 32 i = 3,555
Stall speed	2300 – 400		
Capacity, rear axle final drive	approx. 0.9 l multi-grade transmission oil 75 W 90 API classification GL5 (MIL-L 2105 B), optionally SAE 90		
Capacity, automatic unit with converter	Total capacity approx. 9.5 l Change quantity approx. 3.5 l ATF-Dexron II D		

Removing and installing the torque converter

Removing

1. Remove transmission.
2. Remove converter, with transmission in horizontal position.

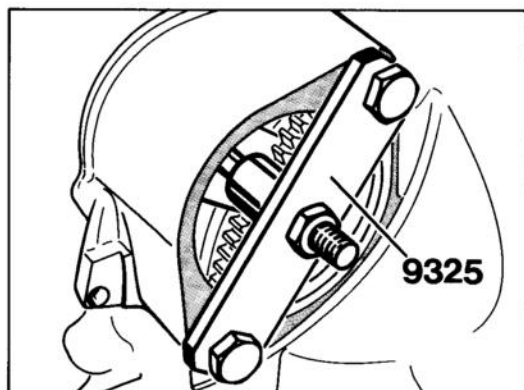
Note

Do not damage converter bearing assembly and rotary shaft seal.

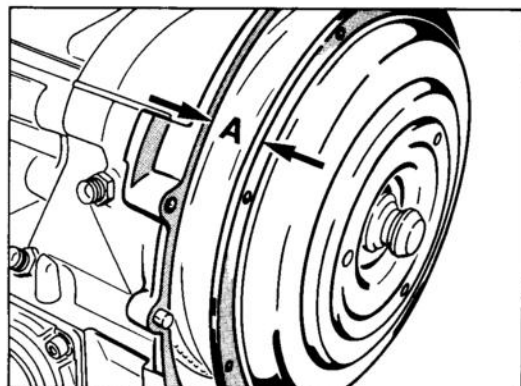
Installing

1. Carefully insert converter, with transmission in horizontal position. Turn the converter to and fro until the gear toothing engages and the installation position is reached.

2. Secure converter against falling out with special tool 9325



413-32



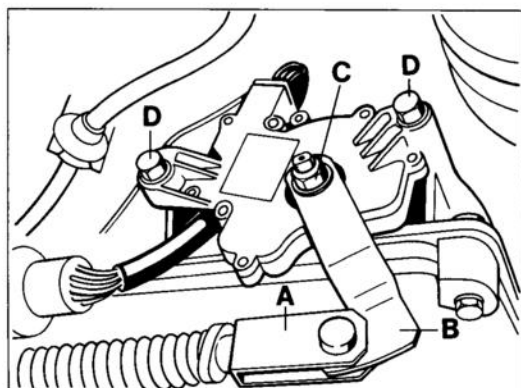
412-32

A = approx. 25 mm

Removing and installing the position switch on transmission

Removing

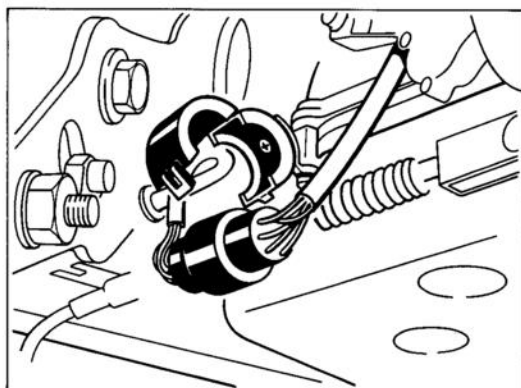
1. Move selector lever to position "N".
2. Remove transmission underbody cladding.
3. Disconnect selector lever cord pull at actuating lever.
4. Remove actuating lever.



381-37a

- A = Selector lever cord pull
 B = Actuating lever
 C = Hexagon nut (M 8 x 1) with washer
 D = Fixing screws

5. Unlock cable holder, remove plug-in connection and disconnect.



397-37

6. Unscrew fixing screws for position switch and remove switch.

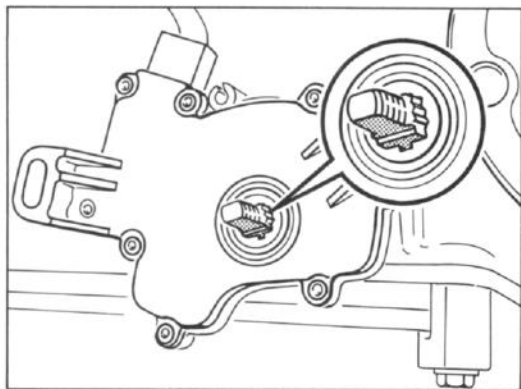
Installing

Installation takes place in reverse order.

Tightening torques:

- Position switch to transmission = 10 Nm
 Actuating lever to switching shaft = 15 Nm

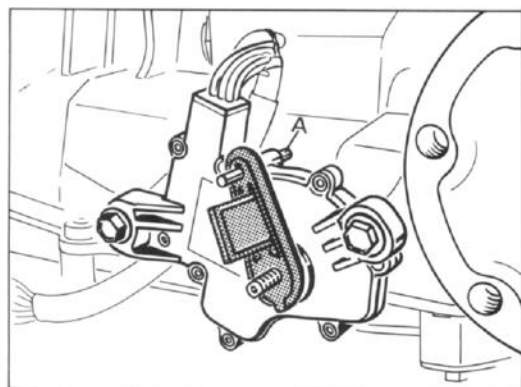
1. Set selector shaft to position "N" (turn shaft anti-clockwise up to the stop and then back two clicks) and place switch in the correct position.
2. Check, and if necessary adjust, setting of selector lever cable.



1884-37

2. Adjusting multifunctional switch.

- Push pointer of special tool **9326** onto the selector shaft and turn the switch until the locating pin can be pushed into the fixing hole of the switch. Tighten the mounting screws to **10 Nm** (7 ftlb.) in this position.



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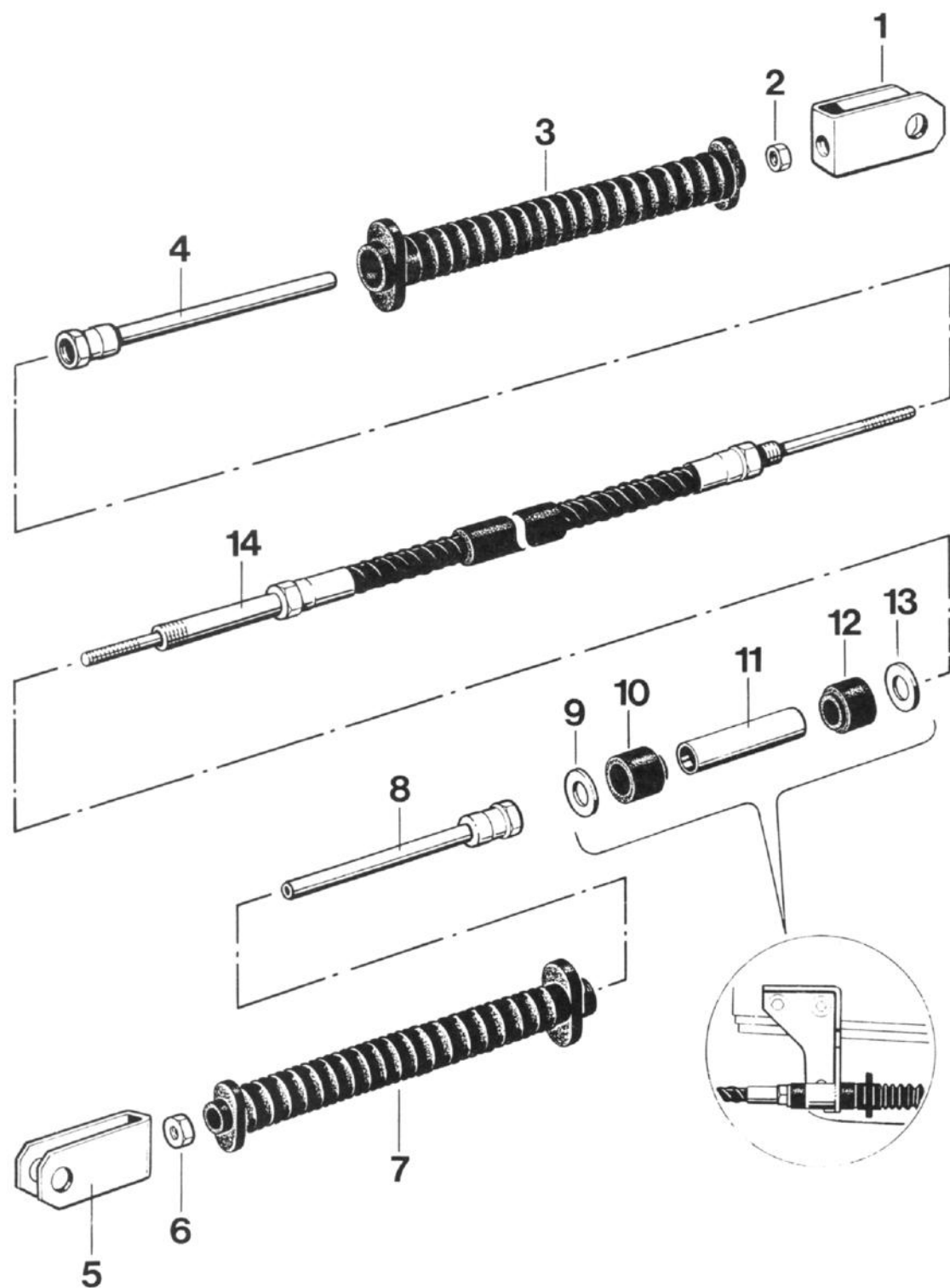
A = locating pin

Adjusting cable for selector device

1. Move selector lever to position "1".
2. Move multi-function switch to position "1" by pushing forward operating lever on switch by maximum amount.
3. Push cable forward and adjust position of fork head until bore holes of fork head and operating lever on gearbox lie exactly one over the other. From this position rotate fork head a further two turns onto thread of cable.
4. Check adjustment by shifting through all the gears and confirming that gear is displayed on speedometer. In addition change gate from "D" to "M". This must be possible with one smooth, straightline movement.

Removing and installing cable for selector mechanism

Removing and installing cable for selector mechanism

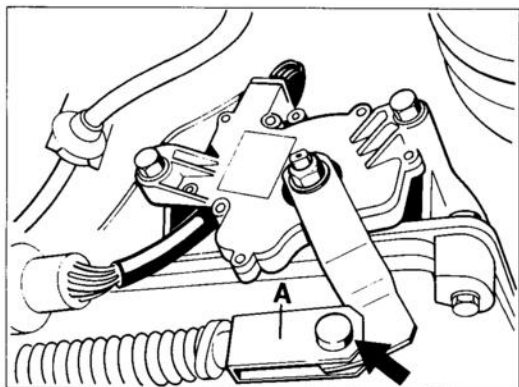


No.	Designation	Qty.	Note:	
			Removal	Installation
1	Fork head	1		Screw on to half length of thread on cable
2	Hexagon nut	1		Tighten to 6 Nm (4.4 ftlb)
3	Gaiter seal	1		
4	Guide tube	1		
5	Fork head	1		
6	Hexagon nut	1		Tighten to 6 Nm (4.4 ftlb)
7	Gaiter seal	1		
8	Guide tube	1		
9	Washer	1		
10	Rubber mount	1		Install in correct position
11	Spacer tube	1		
12	Rubber mount	1		Install in correct position
13	Washer	1		
14	Cable			Readjust

Instructions for removal and installation

Removal

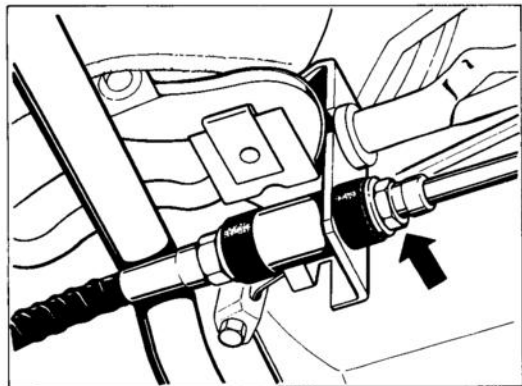
1. Remove underfloor paneling for gearbox and center underfloor paneling.
2. Disconnect cable on operating lever and remove fork head.



381-37

A = Fork head

3. Disconnect guide tube on bracket



494-37

4. Disconnect cable on selector lever casing and disconnect guide tube.

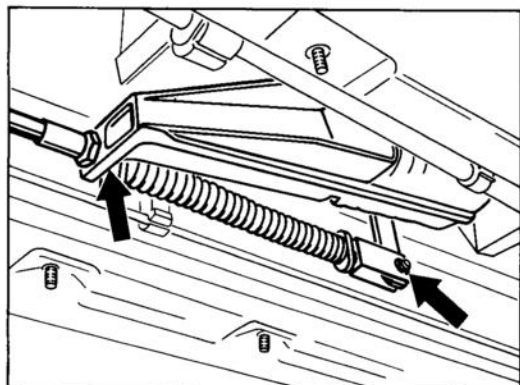
Installation

1. Installation is carried out in reverse order.
2. Adjust cable for selector mechanism (see P. 37 - 102a).

Removing and installing gear selecting system

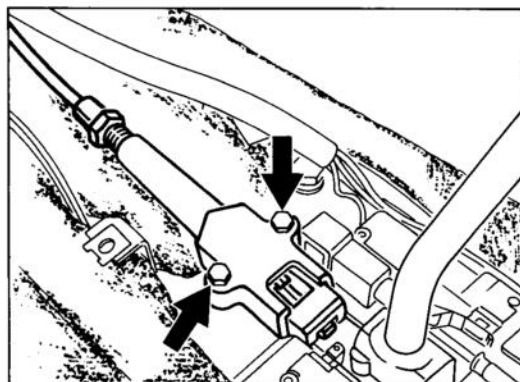
Removal

1. Disconnect battery.
2. Remove center underside panel.
3. Disengage selector lever cable from deflection lever and undo guide tube.



1066-37

4. Unscrew release button and pull off selector knob.
5. Remove center console.
6. Disconnect cable valve body from switch plate (only for keylock models).



1067-37

7. Disconnect connectors for switch plate.
8. Unscrew four mounting screws (M 6) and take out selector lever operator from above.

Installation

Tightening torques:

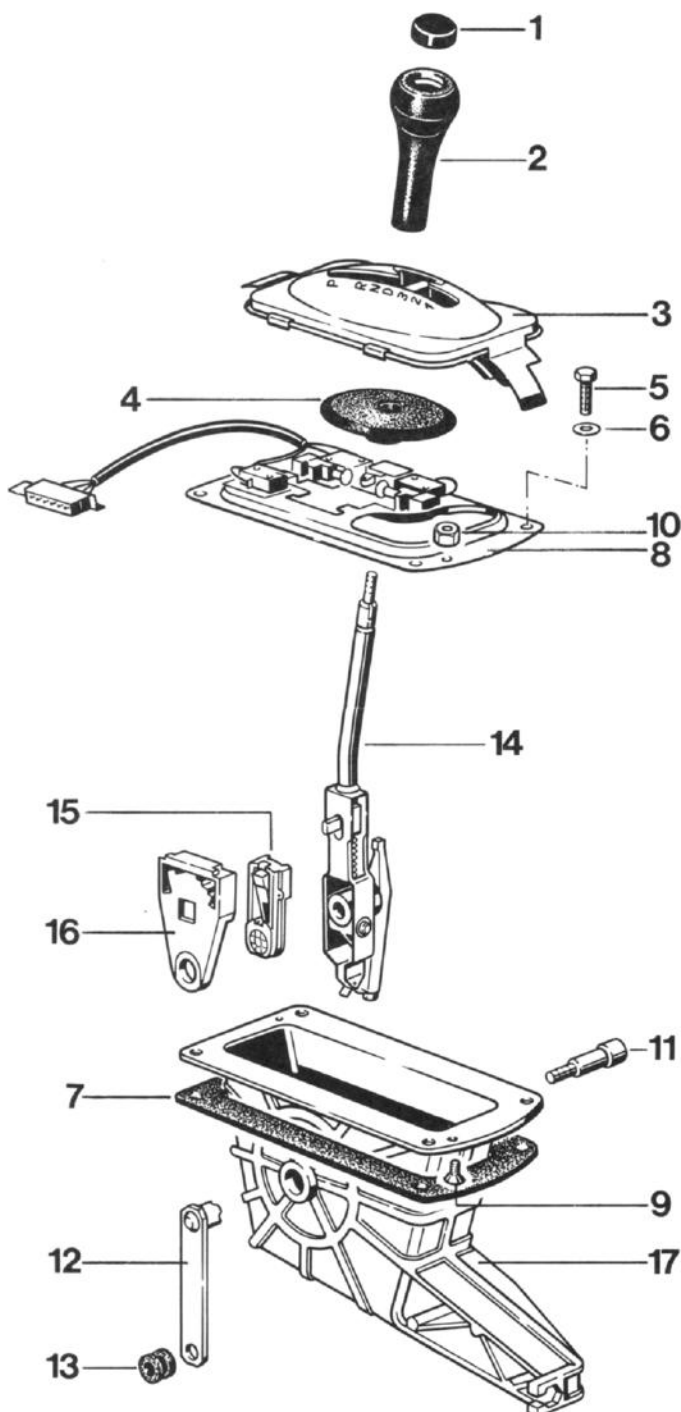
Gear selecting system to body = 10 Nm (7 ftlb)

Cable valve body to switch plate = 2,5 Nm (2 ftlb)

1. Install in reverse order.
2. Press selector knob manually until it is up against the stop, making sure the twist lock engages in the cutout in the selector lever.
3. Check release button for smooth operation. It must return into the home position by itself.
4. Check selector lever cable adjustment and readjust if required.
5. Check operation of keylock and shiftlock (if fitted).

Dismantling and assembling selector mechanism

Dismantling and assembling selector mechanism

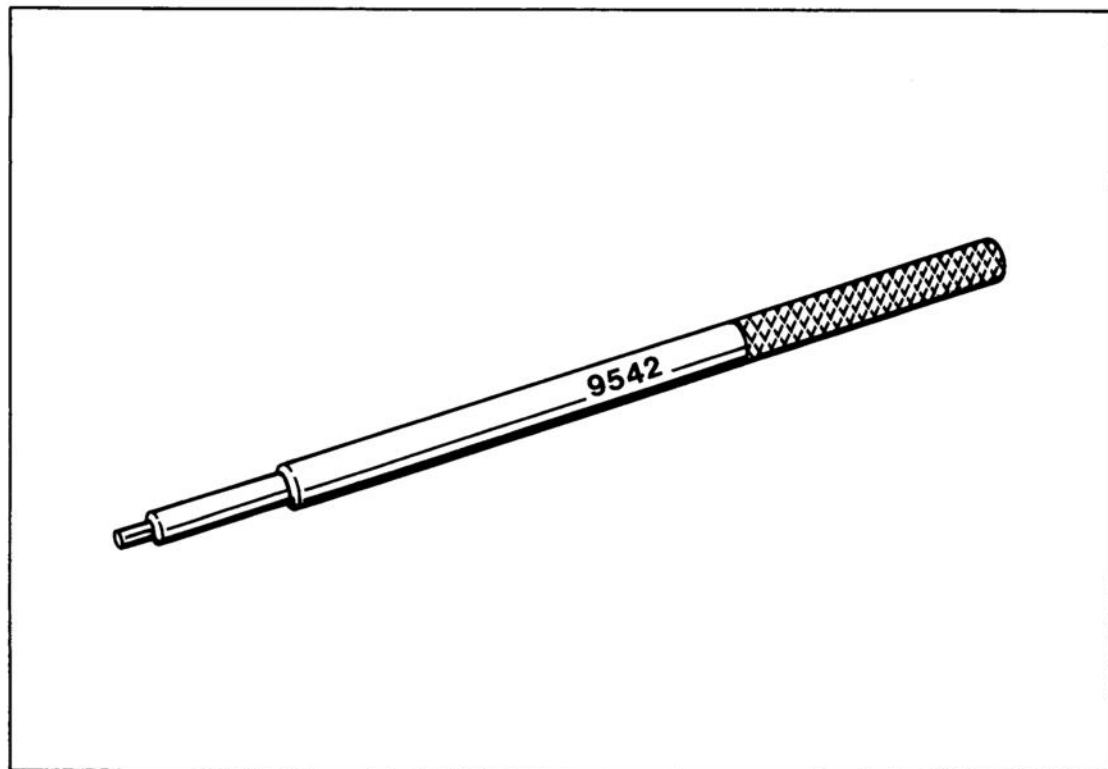


492-37

No.	Designation	Qty.	Note:	
			Removal	Installation
1	Unlocking button	1	Unscrew by hand	Must return automatically to original position after operation
2	Selector lever handle	1	Pull off by hand	Press on in correct position until properly in contact. Twisting lock must engage with lock on shift lever.
3	Cover panel	1	Can only be taken out from below and with center console removed	
4	Cover	1		
5	Hexagon screw	4		Tighten to 10 Nm (7.3 ftlb)
6	Washer	4		
7	Seal	1		
8	Hexagon nut	2		Tighten to 2 Nm (1.4 ftlb)
9	Flat-head screw	2		
10	Control plate	1		
11	Clamping screw	1		Tighten to 23 Nm (16.9 ftlb)
12	Reversing shaft	1		
13	Rubber mount	1		
14	Selector lever (complete)	1		
15	Lock	1		
16	Gate	1		Must engage in recess in control plate
17	Selector lever casing	1		

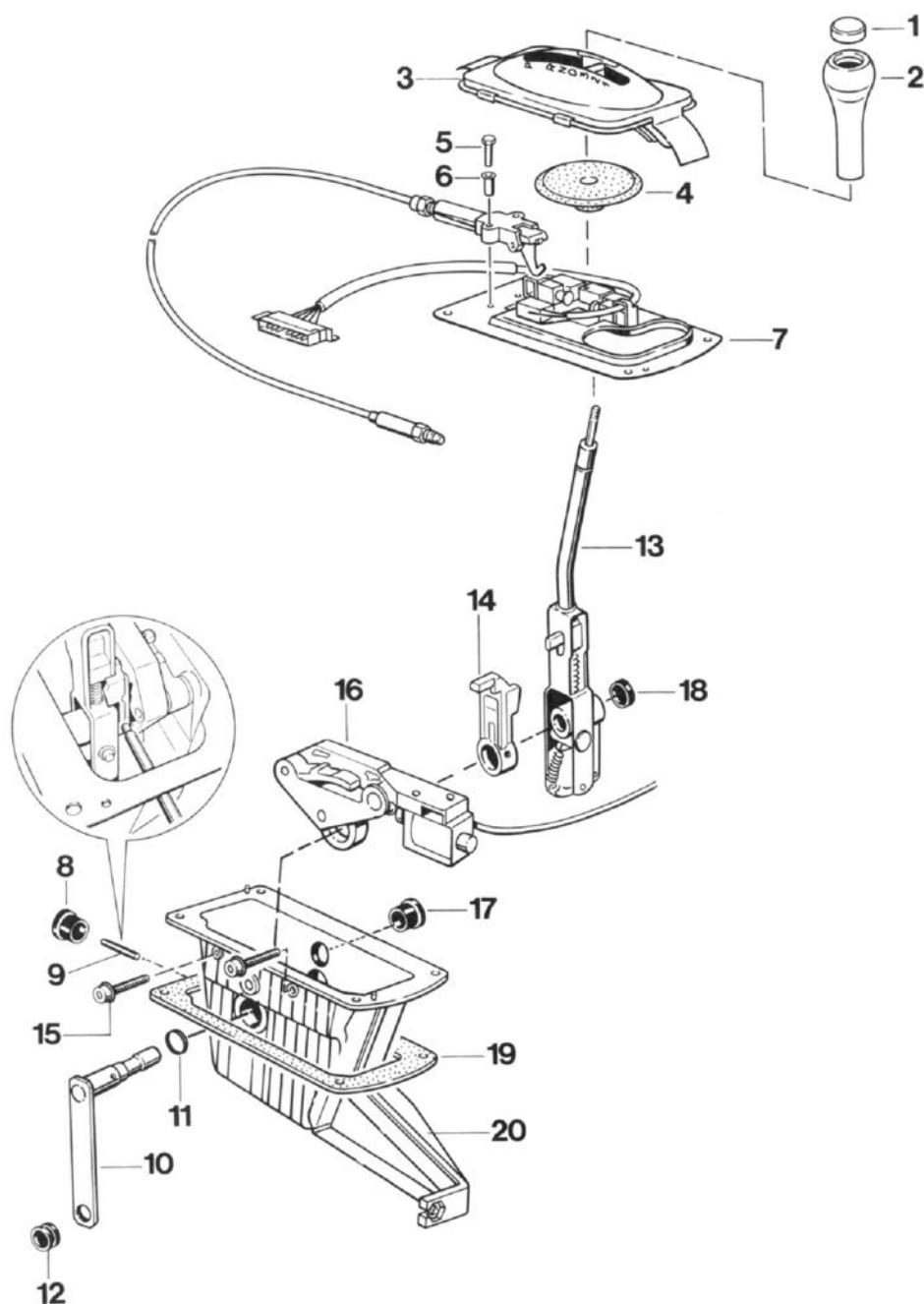
Note

Coat all sliding surfaces in low-temperature grease (e.g. Shell S 6508)

Dismantling and assembling gear selecting system with keylock and shiftlock**Tools**

No.	Designation	Special tool	Order number	Explanation
	Assembly mandrel	9542	000.721.954.20	

Dismantling and assembling gear selecting system with keylock and shiftlock



No.	Designation	Qty.	Note:	
			Removal	Installation
1	Release button	1	Screw off manually	Must return to home position automatically after it has been actuated
2	Selector knob	1	Pull off manually	Push up to stop in correct position. Twist lock must engage in cutout in selector lever
3	Shroud	1	Can only be removed from below with the center console removed	
4	Cover	1		
5	Hexagon head screw	2		Tighten to 2.5 Nm (2 ftlb)
6	Sleeve	2		
7	Switch plate	1		
8	Plug	1		
9	Tensioning sleeve	1	Drive out using Special Tool 9542	Bore of driver and relay shaft must match
10	Deflection lever	1		
11	Seal	1		
12	Rubber mount	1		
13	Selector lever	1	Shift into manual speed selection gate	
14	Driver	1		
15	Hex socket head bolt	2		Tighten to 6.5 Nm
16	Shift-Lock	1		
17	Plug	1		
18	Cover	1		
19	Gasket	1		
20	Housing	1		

Note

Coat all sliding surfaces with low-temperature grease (e.g. Shell S 6508)

Removing and installing lift solenoid for shiftlock

Note

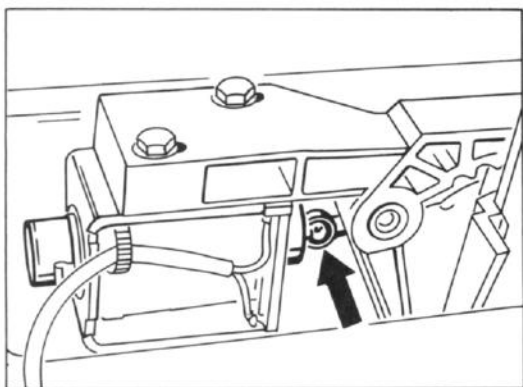
When checking the lift solenoid electrically, be sure to observe correct polarity

Terminal 1 = Positive

Terminal 2 = Negative

Removal

1. Remove center console and gear selecting system.
2. Remove switch plate.
3. Using a suitable tool, press connecting rod carefully off the lift solenoid.



1085-37

4. Screw out mounting screws and take off lift solenoid.

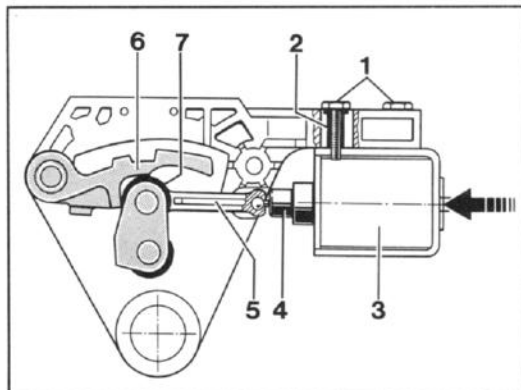
Installation

1. Set selector lever to "1" position.
2. Grease ball and ball socket with low-temperature grease.
3. Clip connecting rod to lift solenoid, retaining the connecting rod in correct position using a suitable wire hook or marking tool and pushing the free lift solenoid carefully into the ball socket.

4. Using sleeves and hexagon head bolts, fit lift solenoid to gate in such a manner that it remains free to slide in an axial direction.

5. Adjusting the lift solenoid:

- Set selector lever to position „P“.
- Slide lift solenoid all the way back in the slots of the gate.
- Push iron core from the lift solenoid towards the pawl until it contacts the stop and locate it in this position.
- Slide the actuated lift solenoid axially until the idler contacts the stop of the pawl.
- Tighten hexagon head bolt to 2.5 Nm (2 ftlb) in this position.



1086-37

- | | |
|-----------------------|---------------|
| 1 - Hexagon head bolt | 2 - Sleeve |
| 3 - Lift solenoid | 4 - Iron core |
| 5 - Connecting rod | 6 - Pawl |
| 7 - Idler | |

6. Check operation of shiftlock.

Removing and installing keylock bowden cable

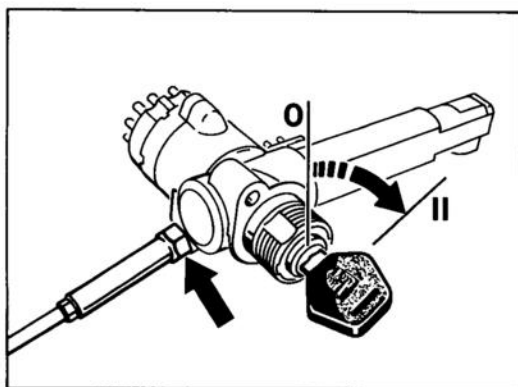
Removal

1. Disconnect battery.
2. Remove complete center console, knee guard and side nozzle.
3. Undo Central Information System and leave it suspended on the wiring.
4. Turn ignition lock to position „2" (Ignition on).

Note

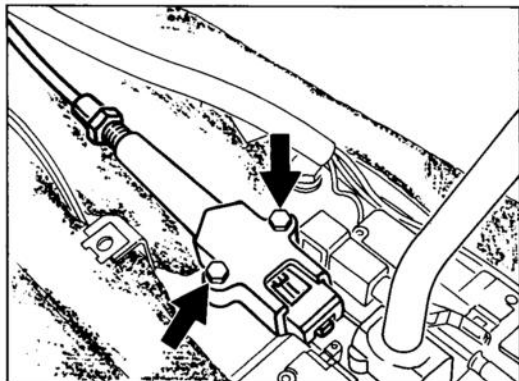
The ignition lock must be in position „2". If it is left in any other position, both the lock and the bowden cable may be damaged.

5. Unbolt bowden cable from ignition lock.



1068-3/

6. Undo mounting screws of valve body.



1067-37

7. Disengage bowden cable from pedal floor-board and from bracket for center console.

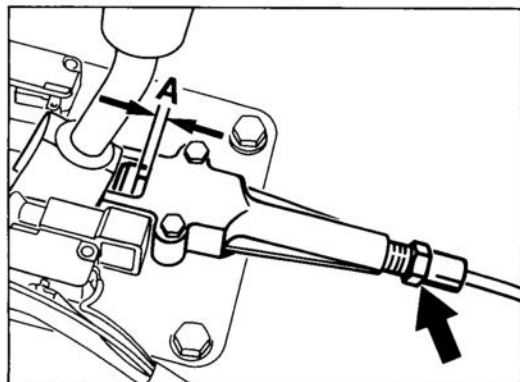
Installation

1. Assemble in reverse order, observing the following points.
2. Turn ignition lock to position „2" (Ignition on) and fit bowden cable to ignition lock. Tightening torque: 2.5 Nm (2 ftlb)
3. Fit bowden cable valve body using sleeves and hexagon head bolts. Tightening torque: 2.5 Nm (2 ftlb)
4. Set selector lever to position „P" and turn ignition lock to position „0".

Note

If the ignition lock cannot be turned to the 0 position, the bowden cable must be re-adjusted.

5. Adjust bowden cable, turning the cable sleeve on the valve body until the lock slide reaches a setting of 2 ± 0.5 mm (refer to Fig.).



1081-37

$$A = 2 \pm 0.5 \text{ mm}$$

6. Check operation of keylock and shiftlock.

Checking keylock and shiftlock

Checking the keylock (ignition key lock)

Selector lever position	Position of release button	Keylock operation	Ignition key
P	not actuated	no	rotary, may be pulled off
P	actuated	yes	cannot be turned to pulloff position
R-N-D-3-2-1	not actuated actuated	yes	cannot be turned to pulloff position

Checking the keylock (selector lever lock)

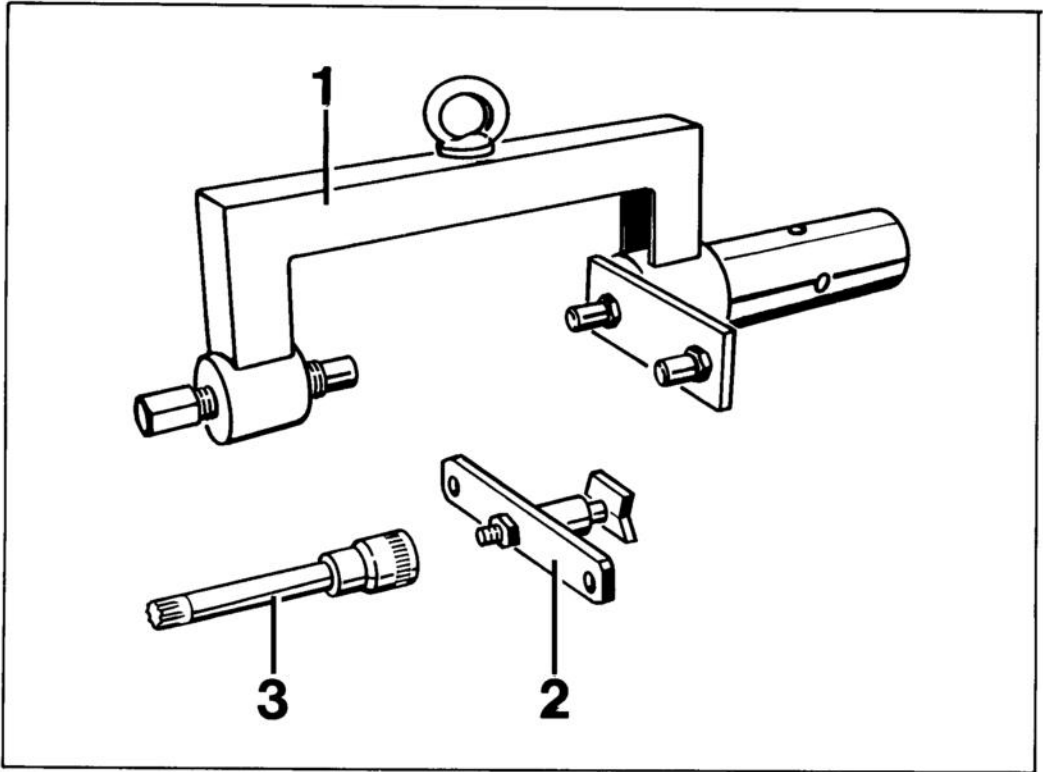
Ignition key position	Release button status	Keylock operation	Selector lever
Pulled off or pulled position	locked	yes	locked
Position 1 or 2	not locked	no	not locked

Checking the shiftlock

Selector lever position	Ignition	Shiftlock operation	Brakes	Selector lever
P-R-N-D-3-2-1	off	no	actuated not actuated	not locked
P and N	on	yes	not actuated	locked
P and N	on	yes	actuated	not locked

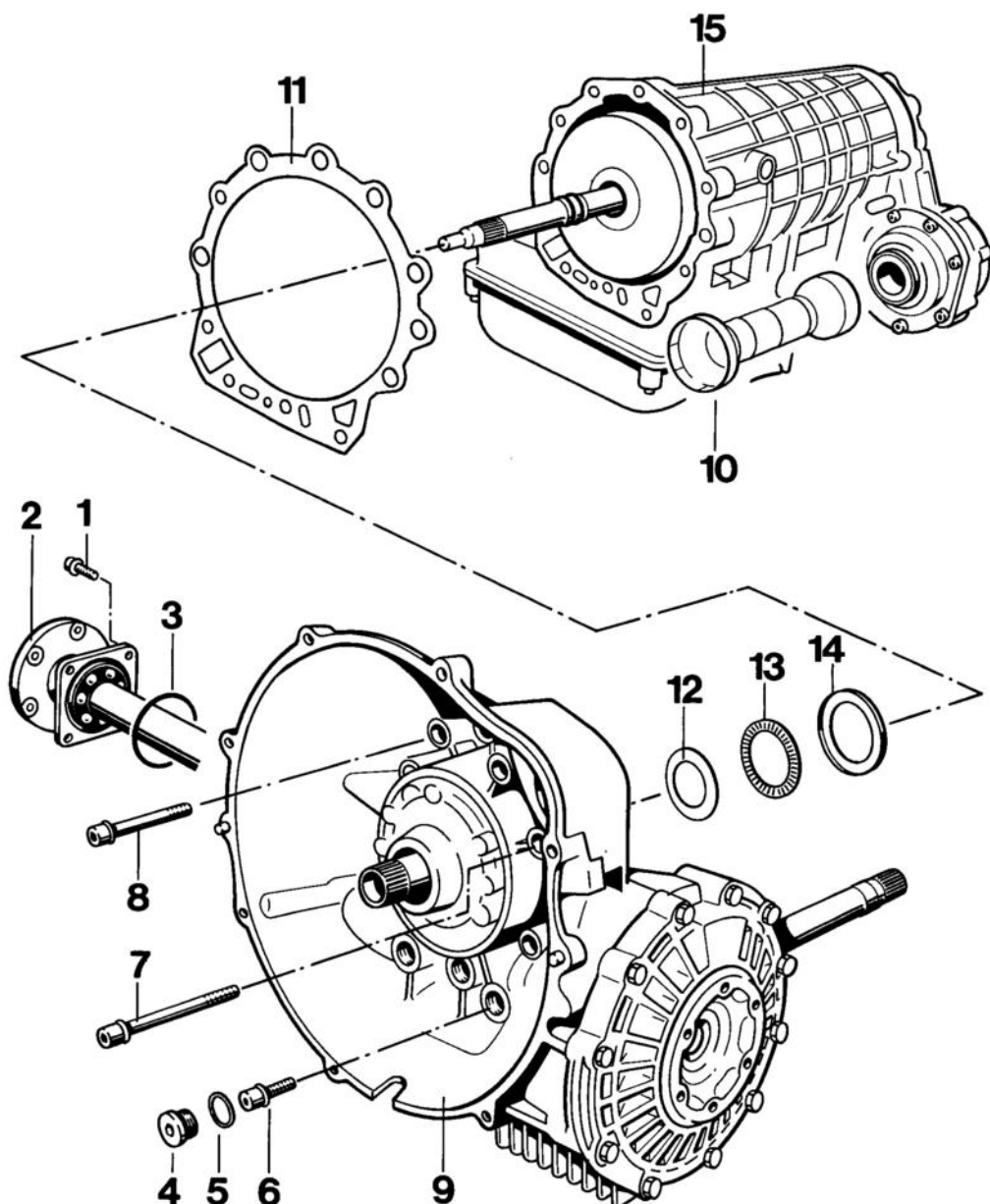
Removing and installing rear transmission case

Tools



No.	Designation	Special tool	Order number	Explanation
1	Transmission holder	9324	000.721.932.40	
2	Holding device	9325	000.721.932.50	
3	socket key insert	9330	000.721.933.00	

Removing and installing rear transmission case



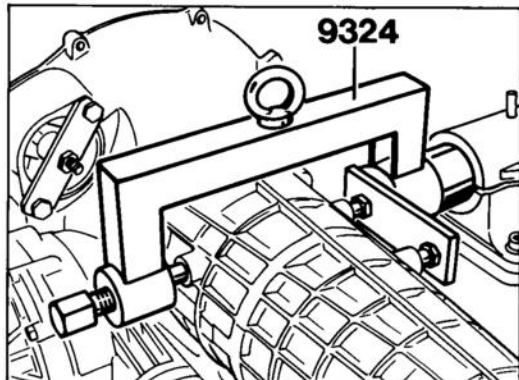
No.	Designation	Qty.	Note:	
			Removal	Installation (= ftlb)
1	Fillister head screw	4	Use Special Tool 9330 to remove	Tighten with 23 Nm (17)
2	Joint flange	1		
3	O-ring	1		Replace, oil slightly
4	Screw plug	3		Tighten with 50 Nm (36)
5	Sealing ring	3		Replace
6	Fillister head screw	3	Remove with Torx insert T50	Tighten with 46 Nm (34)
7	Fillister head screw	3	Remove with Torx insert T50	Tighten with 46 Nm (34)
8	Fillister head screw	6	Remove with Torx insert T50	Tighten with 46 Nm (34)
9	Rear transmission case	1		
10	Protective tube	1		Large diameter to final drive
11	Seal	1		Replace, glue to case with a small quantity of grease (vaseline)
12	Shim	X	Note thickness for re-installation	Redetermine thickness if required (refer to page 38 - 171)
13	Needle cage	1		
14	Angle ring	1		Fit in correct position
15	Automatic transmission	1		Pay attention to installation position of clutch A. Make sure that the square drive shaft rings are correctly fitted. Coat the drive shaft with a small quantity of grease in the area of the square rings.

* Must be checked and, if required, corrected after each transmission installation.

Assembly instructions for removal and installation

Removal

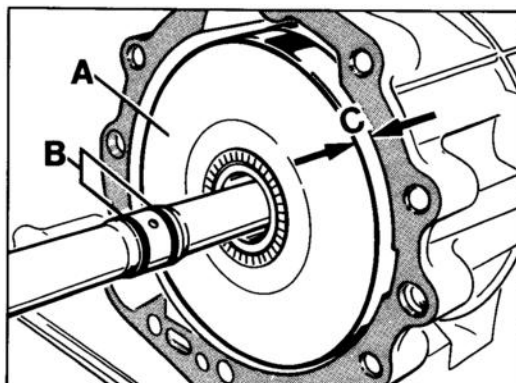
1. Remove the transmission and torque converter.
2. Secure transmission on assembly block with holding device 9324.



415-37

Installation

1. Check the installation position of clutch A.
The installation depth has been reached when the distance "C" is approx. 8.5 mm.

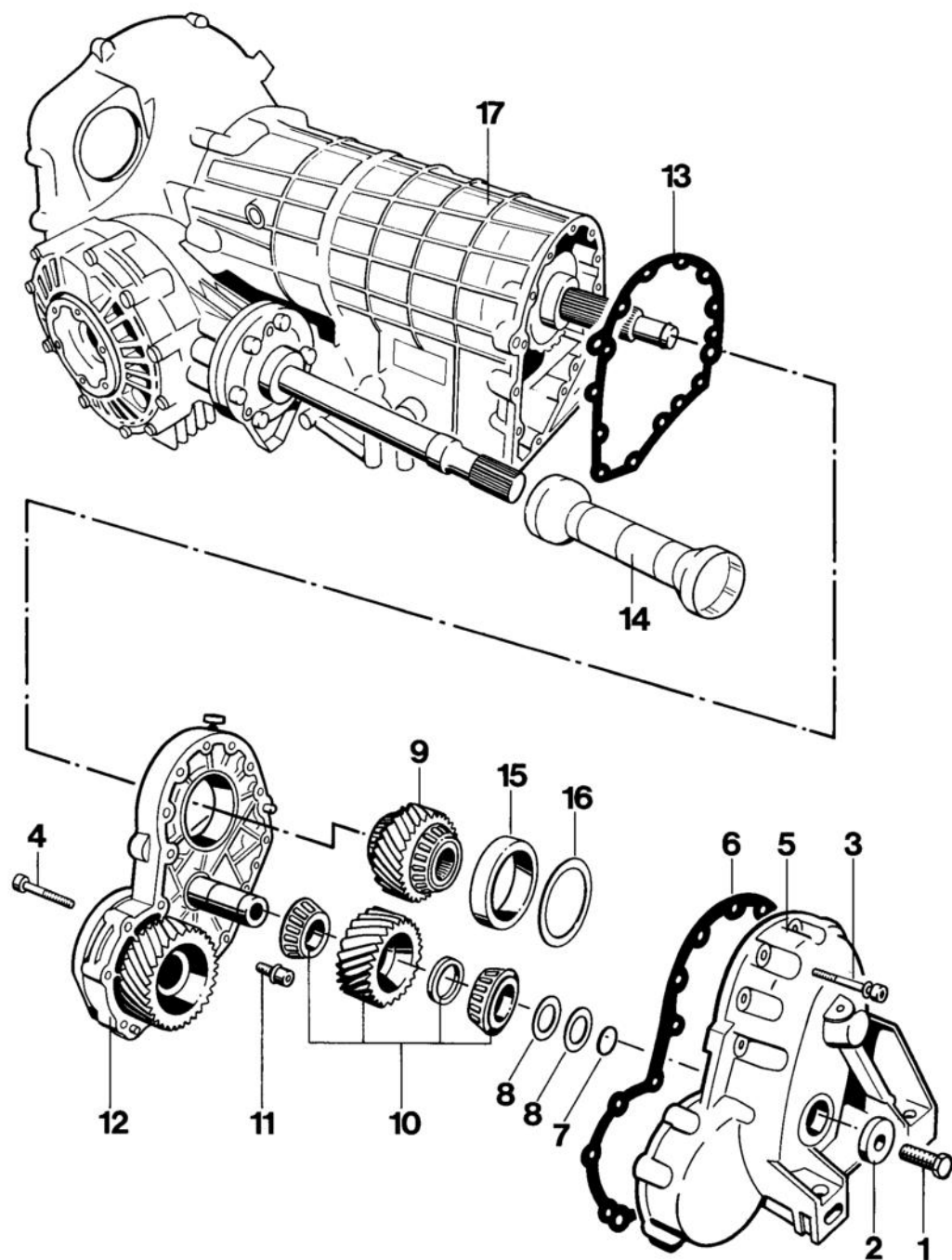


416-37

- A = Clutch A
B = Square rings
C = Installation depths

Removing and installing the intermediate plate

Removing and installing the intermediate plate



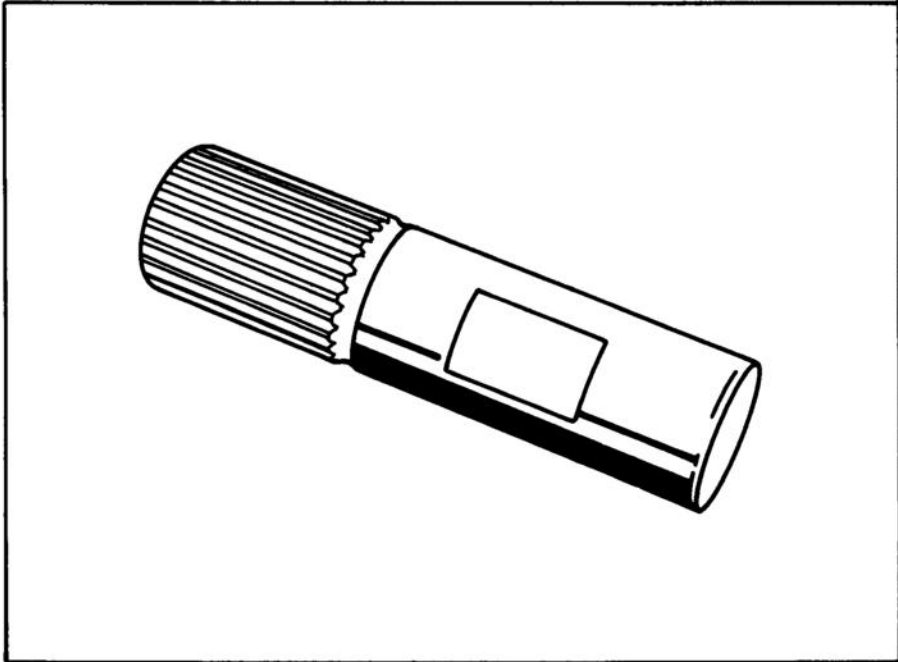
No.	Designation	Qty.	Note:	
			Removal	Installation
1	Hexagon screws	1		Tighten with 46 Nm
2	Washer	1		
3	Fillister head screw	11		Tighten with 23 Nm
4	Fillister head screw	6		Tighten with 23 Nm
5	Front transmission cover*	1		
6	Seal	1		Replace
7	O-Ring	1		Replace, oil with ATF
8	Shim	X	Note thickness for reinstallation	
9	Gear wheel with tapered-roller bearings*	1	Note correct position for reinstallation	Adjust preload if required
10	Gear wheel with bearing assembly*	1	Note correct position for reinstallation	Set by the manufacturer.
11	Fillister head screw	2		Tighten with 23 Nm
12	Intermediate plate*	1		
13	Seal	1		Replace
14	Protective tube	1		Large diameter to final drive
15	Tapper roller bearing outer race	1	Remove with internal pulley (e.g. Schrem 60 - 70)	Heat transmission cover to approx. 120 deg. C and press in to stop
16	Adjusting shim	X	Record thickness for reinstallation	Redetermine thickness if required
17	Automatic transmission with final drive	1		

Note

The spur gear drive is only available as a complete set (intermediate plate, transmission cover and adjusted spur gears). No adjustment of the preload of the taper roller bearings is therefore required.

Dismantling and assembling intermediate plate

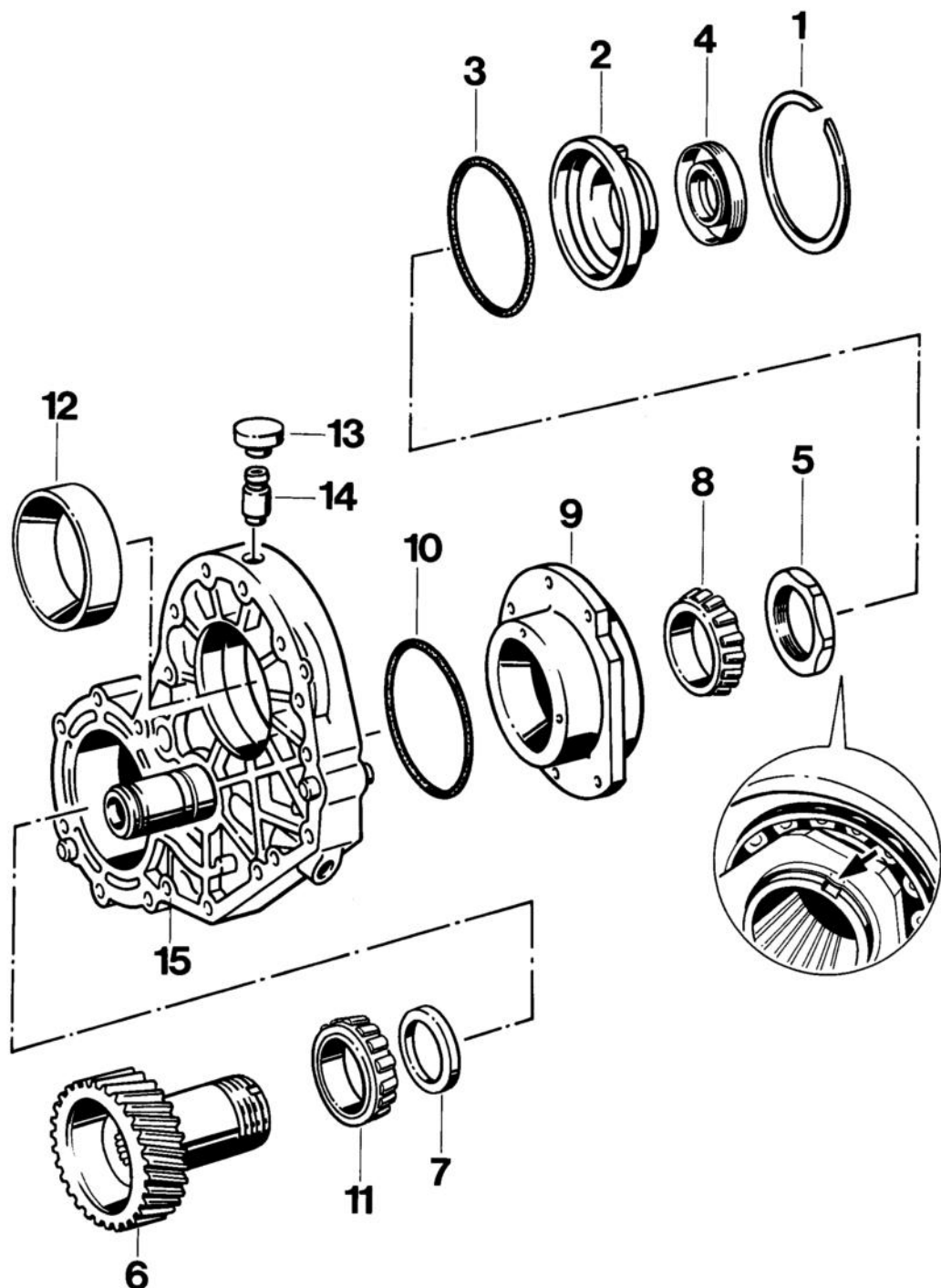
Tools



1027-37

No.	Designation	Special tool	Order number	Explanation
	Retaining device	9340	000.721.934.00	

Dismantling and assembling intermediate plate



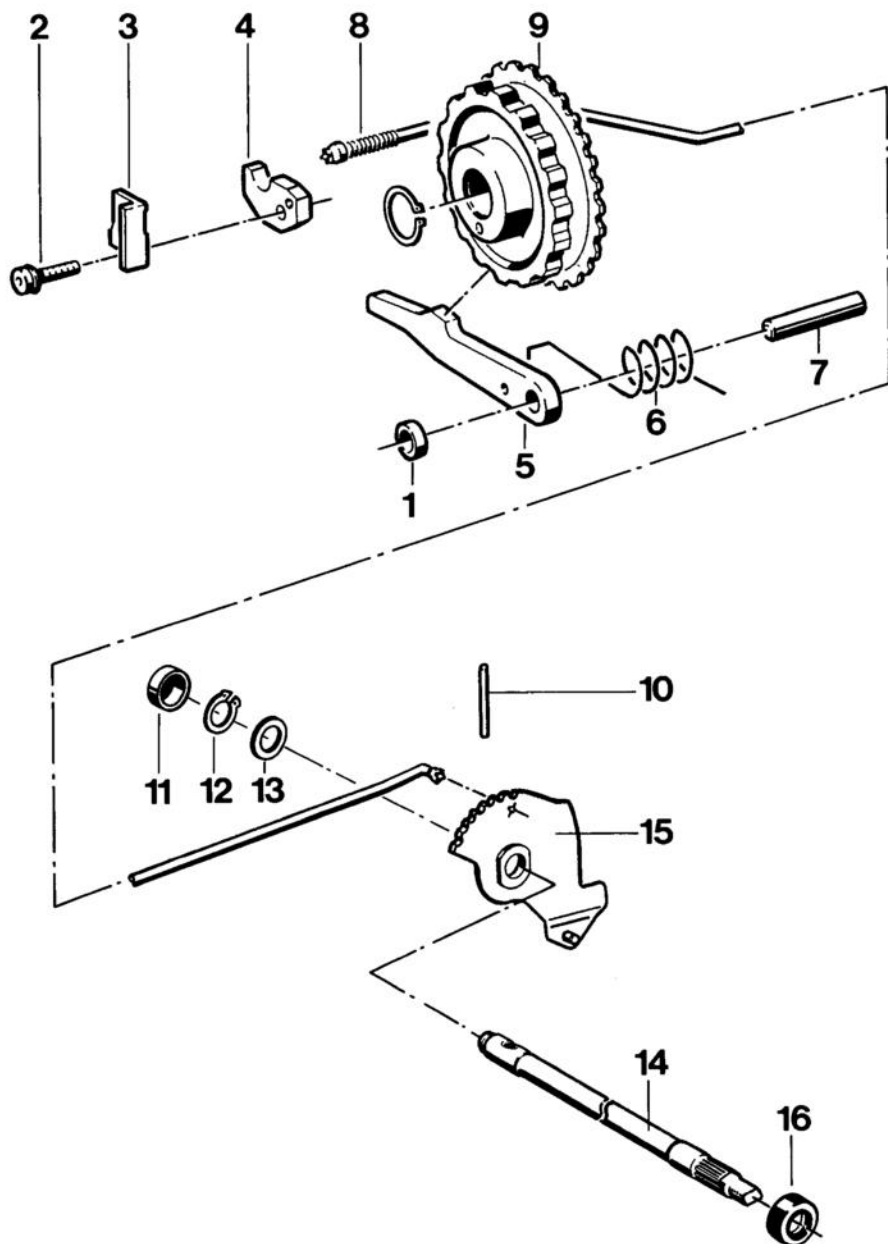
No.	Designation	Qty.	Note:	
			Removal	Installation
1	Snap ring	1		
2	Bearing cover	1	Grab at lugs to lift out	
3	Round seal	1		Replace, coat with ATF fluid
4	Shaft seal	1		Fitting depth 2.0 ± 0.5 mm
5	Lock nut	1	Fit Special Tool 9340 into vise. Put intermediate plate into position and undo nut.	Tighten to 250 Nm (184 ftlb). Lock by upsetting the flange (2 x 180°)
6	Helical gear	1	Press out using a hydraulic press.	
7	Adjuster ring*	X	Record thickness for reassembly	Thickness can only be determined by manufacturer
8	Inner race of taper roller bearing*	1	Mark for reassembly	Heat to approx. 120°C and press on
9	Bearing cover *	1		
10	Round seal	1		Replace, coat with ATF fluid
11	Inner race of taper roller bearing*	1	Remove across assembly bore of helical gear. Mark for reassembly.	Heat to approx. 120°C and press into place
12	Outer race of taper roller bearing	1		Heat intermediate plate to approx. 120°C and press into place
13	Breather cover	1	Lever off	
14	Breather tube	1	Pull out	Press in to stop
15	Intermediate plate	1		

Note

The parts identified by an * have been preadjusted by the manufacturer.

Disassembling and assembling the parking lock

Disassembling and assembling the parking lock



No.	Designation	Qty.	Note:	
			Removal	Installation
1	Bushing	1		
2	Fillister head screw	1	Remove with Torx insert T27	Tighten with 10 Nm
3	Guide plate	1		
4	Guide piece	1		
5	Catch	1		
6	Spring	1		Insert in correct position
7	Pin	1		
8	Circlip	1		
9	Parking lock wheel	1		Make sure that the square ring is correctly seated
10	Clamping pin	1		
11	Protective cap	1	Drive out to the outside by gentle blows on shaft No. 14	Replace
12	Circlip	1		
13	Shim ring	1		
14	Shaft	1	Mark installation position	Insert in correct position
15	Notched disk	1		
16	Rotary shaft seal	1	With transmission in built-in condition, remove position switch and carefully lever out with a suitable screwdriver	Wind plastic insulating tape around the shaft toothing as an assembly aid, slightly oil sealing lip and press in flush

Work instructions for disassembling and assembling

Disassembling

1. Remove transmission.
2. Remove intermediate plate.

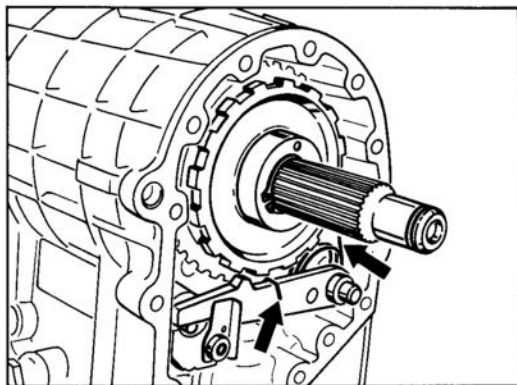
Note

Part Nos. 11 to 15 can be removed only when the rear transmission case and the ATF pan have been dismantled.

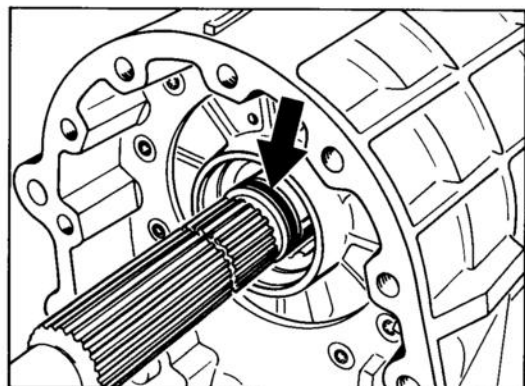
Assembly

1. Replace O-ring on output shaft.

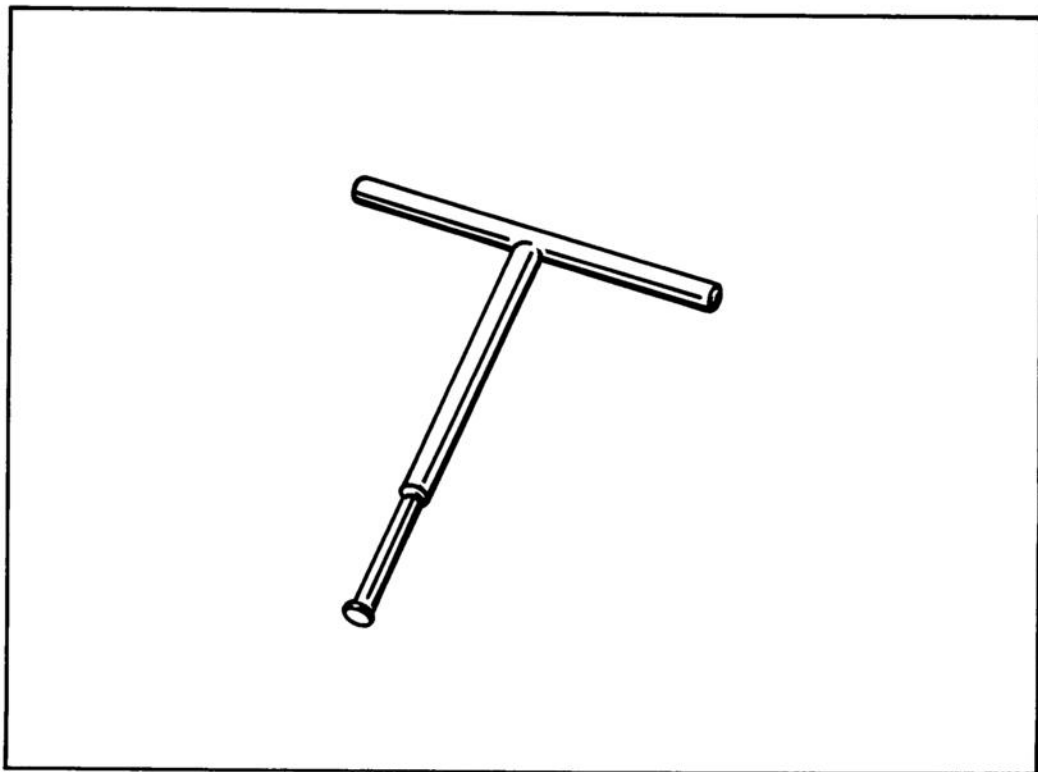
2. Insert spring for catch in correct position.



418-37



417-37

Dismantling and assembling transmission

No.	Designation	Special tool	Order number	Explanation
	Removal handle	9327	000.721.932.70	

No.	Designation	Qty.	Note:	
			Removal	Installation
1	Plug	1		Tighten to 40 Nm (29 ftlb)
2	Seal	1		Replace
3	Banjo bolt	1		Tighten to 40 Nm (29 ftlb)
4	Seal	2		Replace
5	Hexagon head bolt	6		Tighten to 6 Nm (4 ftlb)
6	Bracket (straight leg)	2		Short legs must force on the ATF pan
7	Bracket (curved leg)	4		Short legs must force on the ATF pan
8	ATF pan	1		
9	Gasket	1		
10	Magnet	2		Place into grooves in ATF pan
11	Pan head screw (M 6 x 65)	3		Tighten to 8 Nm (6 ftlb)
12	ATF strainer	1		
13	Round seal	1		Replace
14	Hexagon nut	1		Tighten to 12 Nm (9 ftlb)
15	Pan head screw	14		Observe correct length, tighten to 8 Nm (6 ftlb)
16	Spring washer	1		
17	Bracket	1		
18	Inductive rpm pickup	1		
19	Hydraulic control unit with wiring harness	1		The straight surface on the harness socket must point towards the outside
20	Round seal	1		Replace
21	Pan head screw	11		Observe correct length, tighten to 8 Nm (6 ftlb)
22	Adapter	1		
23	Snap ring	7		

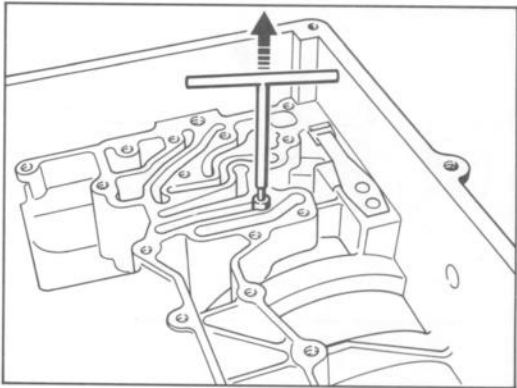
No.	Designation	Qty.	Note:	
			Removal	Installation
24	Thrust spring (short)	4		
25	Thrust spring (long)	3		
26	Sealing sleeve	6	Pull out with Special Tool 9327	Press in to stop using a suitable mandrel
27	Sealing sleeve	1	Pull out with Special Tool 9327	Press in to stop, observ- ing correct position
28	Sealing nut	1		Tighten to 30 Nm (22 ftlb)
29	Seal	1		Replace
30	Banjo bolt	1		Tighten to 40 Nm (29 ftlb)
31	Seal	2		Replace
32	Flange	1		
33	Ball (6 mm dia.)	1		
34	Countersunk screw	2		Tighten to 5 Nm (4 ftlb)
35	ATF indicator tube	1		
36	Sealing ring	1		Replace
37	Hose clamp	2		
38	Flange	1		
39	Hose	1		
40	Transmission case	1		

Dismantling and assembly notes

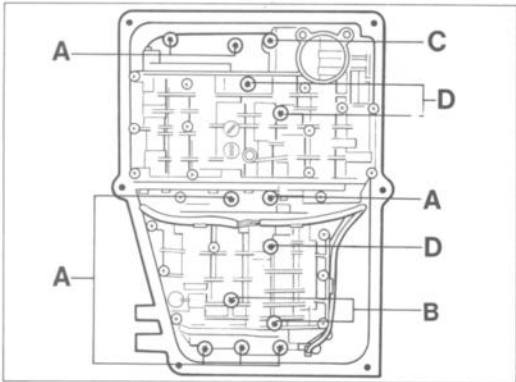
Dismantling

- 1. Remove and install rear transmission case (page 37 - 103).
- 2. Remove and install intermediate plate (page 37 - 107).
- 3. Remove and install parking lock (page 37 - 111).
- 4. Drain ATF fluid.
- 5. Unscrew 13 mounting screws (head dia. 12 mm) for hydraulic control unit and lift off control unit.

- 6. Pull sealing sleeves out of the bores, using Special Tool 9327.



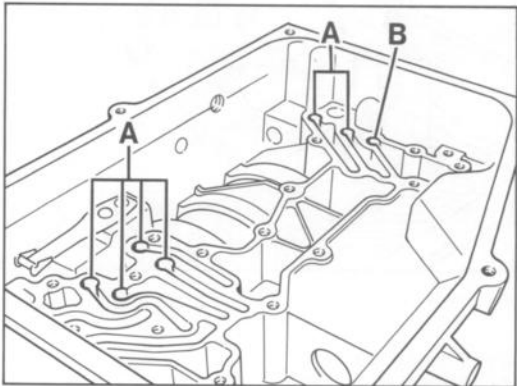
838-37



399-38

Assembly

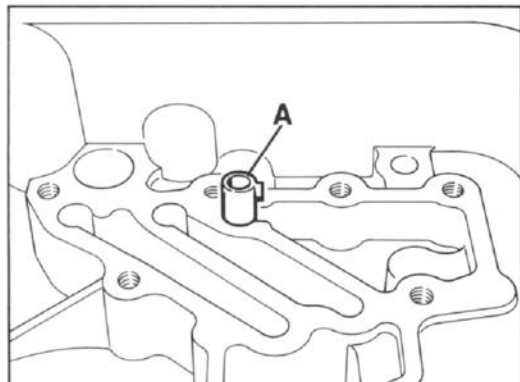
- 1. Using a suitable mandrel, press sealing sleeves into the bores of the transmission case. Make sure the sleeves are not tilted or damaged.



839-37

- A – short sealing sleeves
- B – bevelled sealing sleeve for lubrication pressure feed

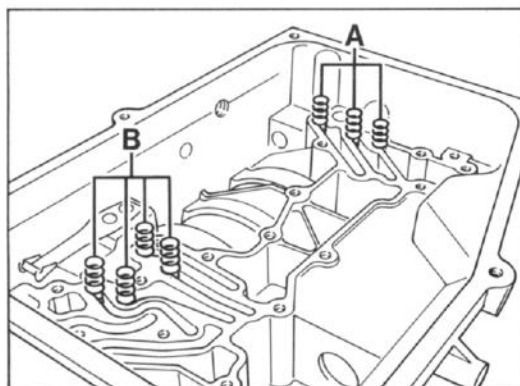
2. Installation position of the bevelled sealing sleeve for lubrication pressure feed.



840-37

A - Sealing sleeve

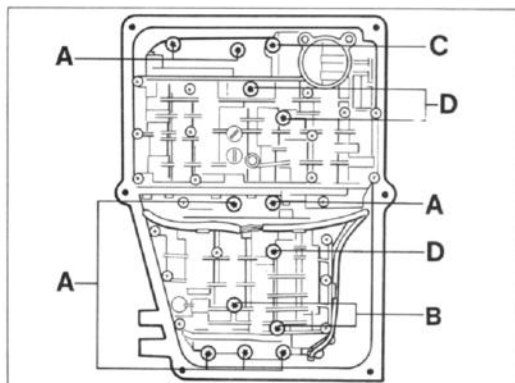
3. Place thrust springs into position and locate with snap rings.



881-38

A - Long thrust springs
B - Short thrust springs

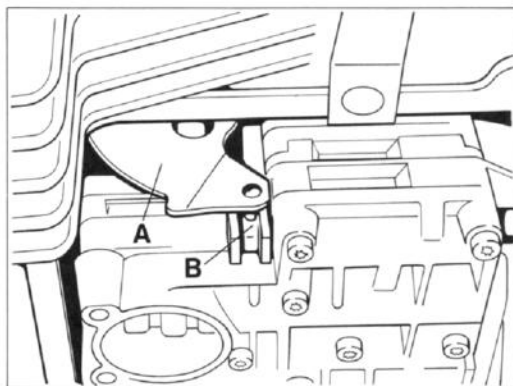
4. Fit wiring harness to transmission case (straight surface on socket points to outside), place control unit into position and tighten all mounting screws lightly.



399-38

A = Screw length = 80 mm
B = Screw length = 65 mm
C = Screw length = 105 mm
D = Screw length = 60 mm

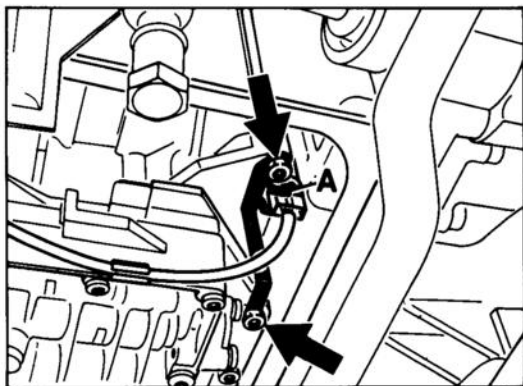
5. Put control unit into position, placing detent disk into position 1 (1st gear) and pushing control unit back until it contacts the detent disk. Keeping the unit in this position, tighten mounting screws to **8 Nm**.



385-38

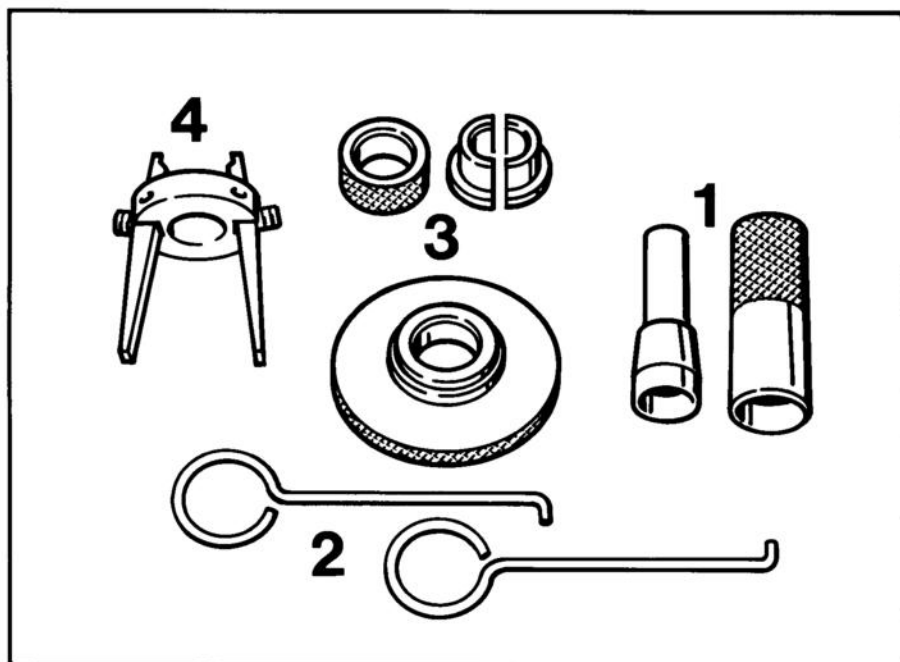
A - Detent disc
B - Selector valve

6. Place inductive rpm pickup into position and fit retainer plate in such a manner that the lugs engage into the grooves of the connector.



390-38b

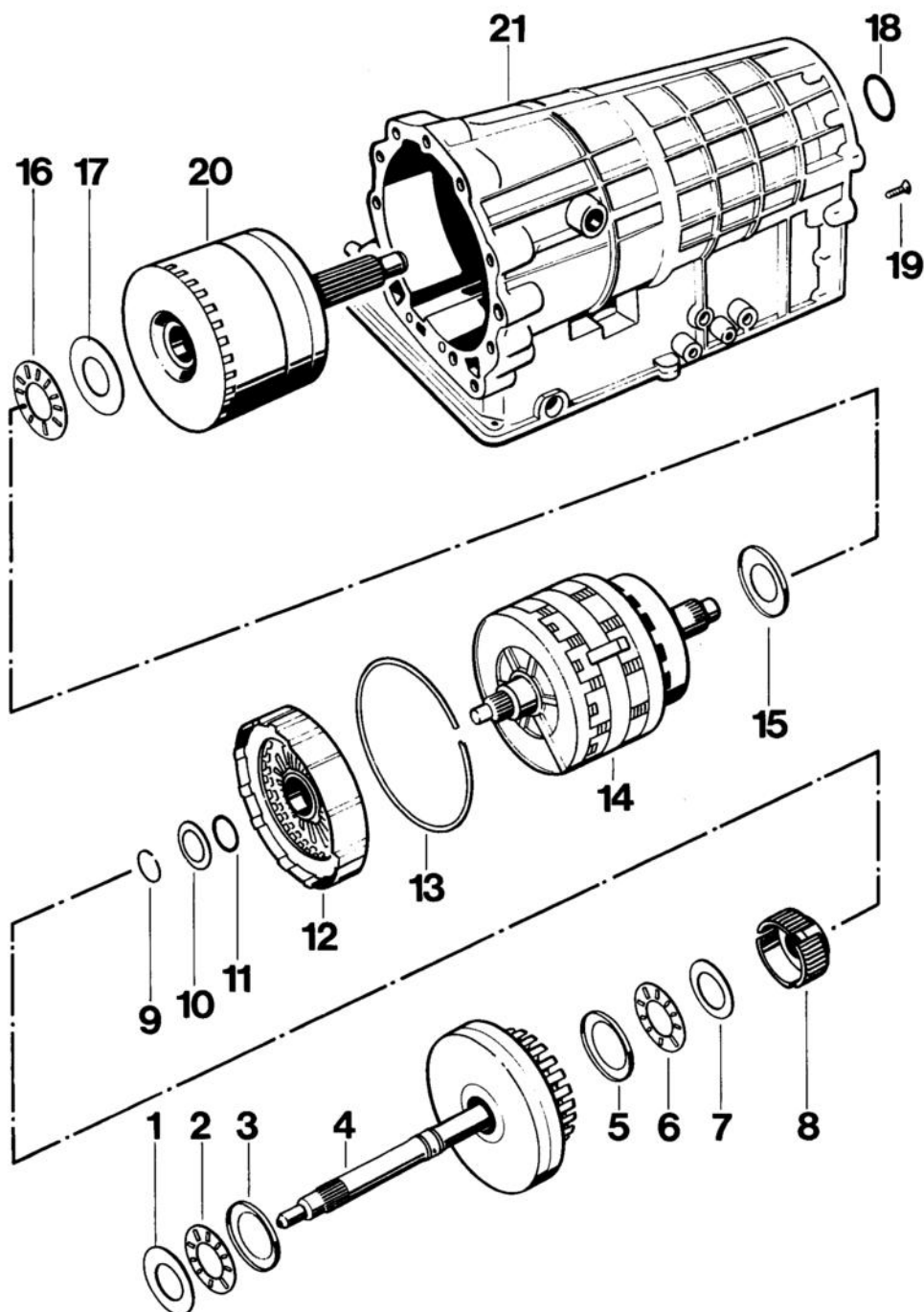
Dismantling and assembling transmission



897-37

No.	Designation	Special tool	Order number	Explanation
1	Assembly sleeve	9331	000.721.933.10	
2	Puller hook	9328/1	000.721.932.81	
3	Retaining device	9329/1	000.721.932.91	
4	Clamp	9334	000.721.933.40	

Dismantling and assembling transmission



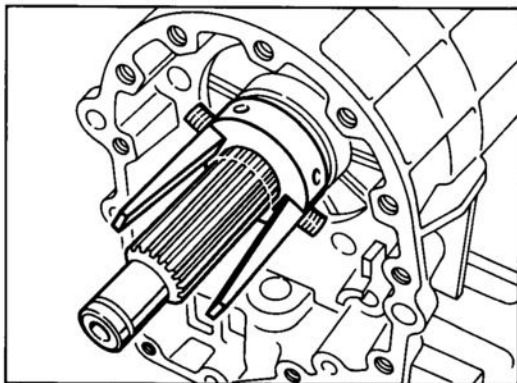
No.	Designation	Qty.	Note:	
			Removal	Installation
1	Adjusting shim	X	Record thickness for reassembly	Check shim thickness whenever the transmission has been dismantled and redetermine correct thickness as required (refer to page 38 - 171)
2	Axial needle roller cage	1	For dismantling and assembly, refer to page 38 - 168	Install in correct position
3	Angled disc	1		
4	Drive shaft with coupling A	1		
5	Angled disc	1		
6	Axial needle roller cage	1		Use grease (vaseline) to stick to drive shaft in correct position
7	Thrust washer	1		
8	Disc carrier	1		
9	Snap ring	1		
10	Support ring	1		
11	Round seal	1		
12	Clutch B	1	Pull out using Special Tool 9328/1 . For dismantling and assembly, refer to page 38 - 161	Replace, fit with Special Tool 9331 Check rectangular ring for correct position
13	Snap ring	1	Lift out with Special Tool 9329/1 and place on Special Tool 9314 . For dismantling and assembly, refer to page 38 - 143	Install with Special Tool 9329/1 , making sure the 4 oil feed bores line up with the bores for the sealing sleeves
14	C/D pack	1		
15	Angled disc	1		
16	Axial needle roller cage	1		Use grease (vaseline) to stick to spider shaft, observing correct position

No.	Designation	Qty.	Note:	
			Removal	Installation
17	Thrust washer	1		Replace
18	Round seal	1		
19	Countersunk screw (Torx bit TX 30)	10		
20	4th gear tower	1	Use Special Tool 9334 to lift out	Insert with Special Tool 9334 , making sure the three oil feed bores of cylinder E and transmission case line up with each other
21	Transmission case	1		

Dismantling and assembly notes

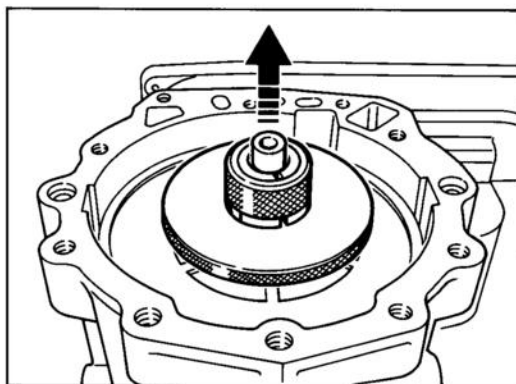
Dismantling

1. Remove round seal from output shaft and put Special Tool 9334 into place.



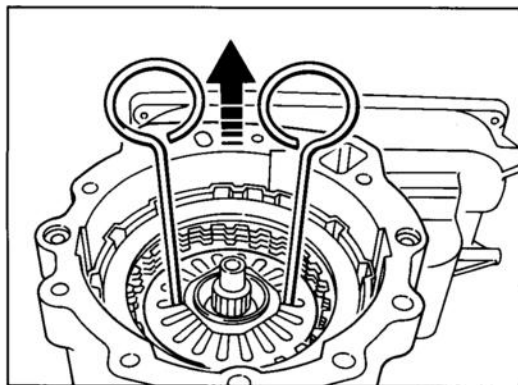
891-37

3. Take out entire brake pack C'/C/D using Special Tool 9329/1.



893-37

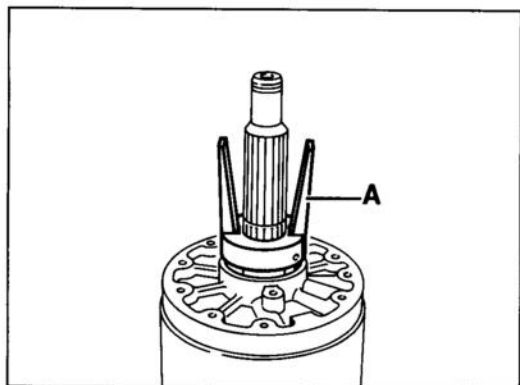
2. Pull out clutch B using Special Tool 9328/1, lifting clutch until a resistance is felt, press back down again and pull out in one go.



892-37

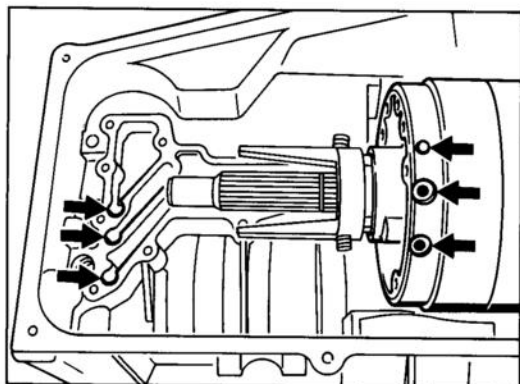
Assembly

1. To prevent the preassembled 4th gear tower from separating again, allow Special Tool 9334 to engage into the groove of the round seal.



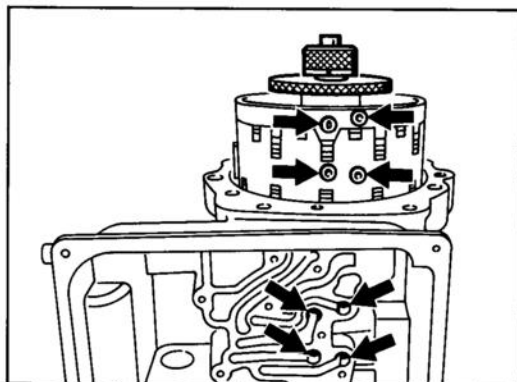
885-37

2. Place 4th gear tower minus planetary gear set and sun wheel into housing, observing correct position. The three oil feed bores of cylinder E and transmission case must line up.



894-37

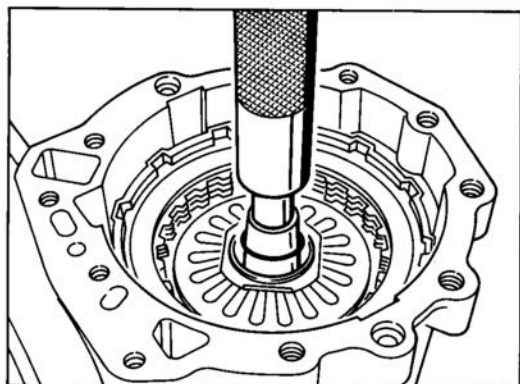
3. Place axial needle roller cage, thrust washers, planetary set and sun wheel into place (refer to page 38 - 122).
4. Place brake pack C'/C/D with Special Tool 9329/1 into transmission case, making sure the 4 oil feed bores line up with the bores for the sealing sleeves.



895-37

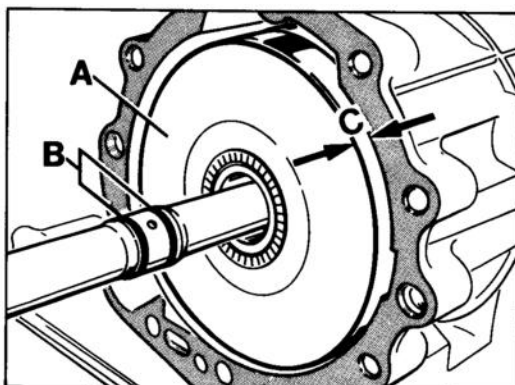
5. Place complete clutch assembly B into housing and press down to stop. Slip round seal onto inner part of Special Tool 9331 up to the taper and use outer section to push it in to stop.

Fit support ring and snap ring in the same way.



914-37

6. Place drive shaft complete with clutch A into housing and rotate cylinder A to and fro until the teeth, the disc carrier and the discs engage fully with each other. The correct position is achieved if the cylinder face protrudes by approx. 8.5 mm beyond the housing face.



416-37

- A - Clutch A
B - Rectangular rings
C - Fitting depth

Checking the ATF fluid level

The prescribed fluid level is extremely important for perfect functioning of the automatic transmission.

Preconditions for checking:

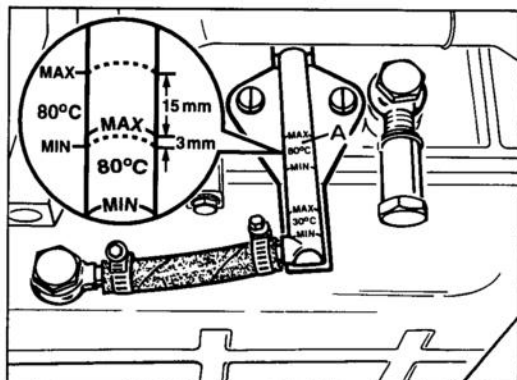
- Transmission underbody cladding removed
- Vehicle must be horizontal
- Engine operating at idling speed
- Hand brake applied
- Selector lever in position "P"
- ATF temperature 80°C

Check ATF level at 80°C.

Note

The ATF capacity was increased by 0.5 l. The ATF level therefore rises and the 80°C check marks move further up on the oil level tube. Refer to imaginary and dotted lines in the close-up insert.

When checking the ATF level, make sure the fluid level is between those two lines (maximum level **15 mm above the 80°C MAX mark** present, lowest level approx. **3 mm below the 80°C MIN mark** present).



1958-38

A = invalid 80°C mark

The exact ATF temperature can be determined with the system tester 9288.

If necessary, top up missing ATF fluid via the quick-fill device (also refer to page 38-103).

Changing ATF fluid and cleaning the ATF strainer

Capacity: approx. 9.5 l

Change quantity: approx. 3.5 l

Oil type:

ATF-Dexron IID

The ATF fluid must be changed and the ATF strainer cleaned every 40,000 km

When changing the ATF fluid, the vehicle must be horizontal and the engine switched off.

Drain ATF fluid, remove ATF pan and ATF strainer (refer to page 38-109).

Thoroughly clean the strainer and pan.

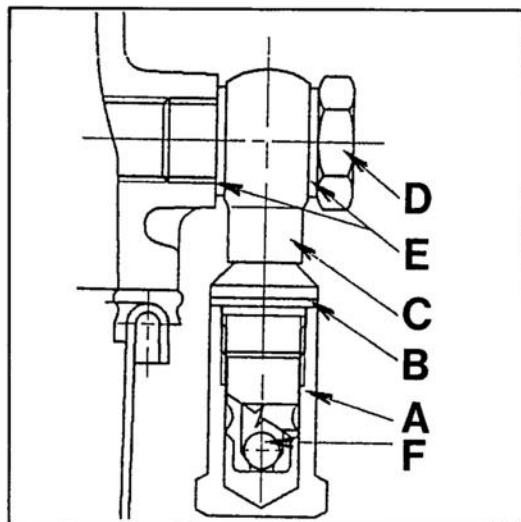
Fit the ATF strainer with a new O-ring.

Tighten the fixing screws with **8 Nm (6 ftlb)**.

Fit the ATF pan with seal. Tighten the fixing screws with **8 Nm (6 ftlb)**.

Fill with ATF fluid:

First, fill ATF fluid up to the 30°C max. mark via the quick-fill connection with the engine stationary.

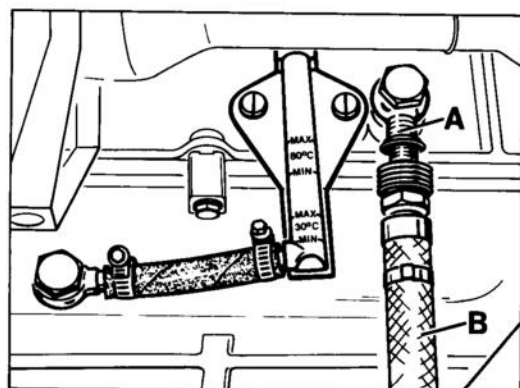


391-38

A = Hexagon cap nut (tightening torque
30 Nm = 22 ftlb)

B = Sealing ring (replace)

C = Quick-fill connection



388-38

A = Quick-fill connection

B = Hose from filling device

Start engine in selector lever position "P" and allow to run at idle speed. Observe the ATF level in the oil level pipe and top up to the 30°C max. marking immediately if required.

Note

The ATF level in the transmission changes with the fluid temperature.

Drive the transmission warm and check the ATF fluid at 80° C.

Be sure to observe the note on page 38-101.

Here, the fluid level must be between the 80°C min. and max. marks.

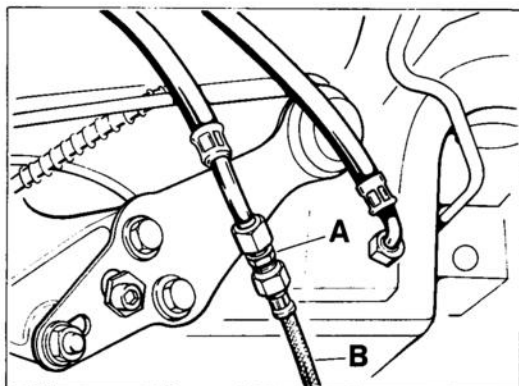
The exact ATF temperature can be determined with the system tester 9288.

Flushing ATF cooler and lines

Information

If the ATF is carbonized, or if there is sludge or evidence of lining abrasion in the ATF sump, it is not sufficient merely to repair or replace the gearbox; the ATF cooler and line system must be flushed with ATF.

Attach additional hose of ATF filling device (see Workshop Manual Group 3/4) to ATF line with conventional twin connecting piece and flush out cooler and line system using filling device.



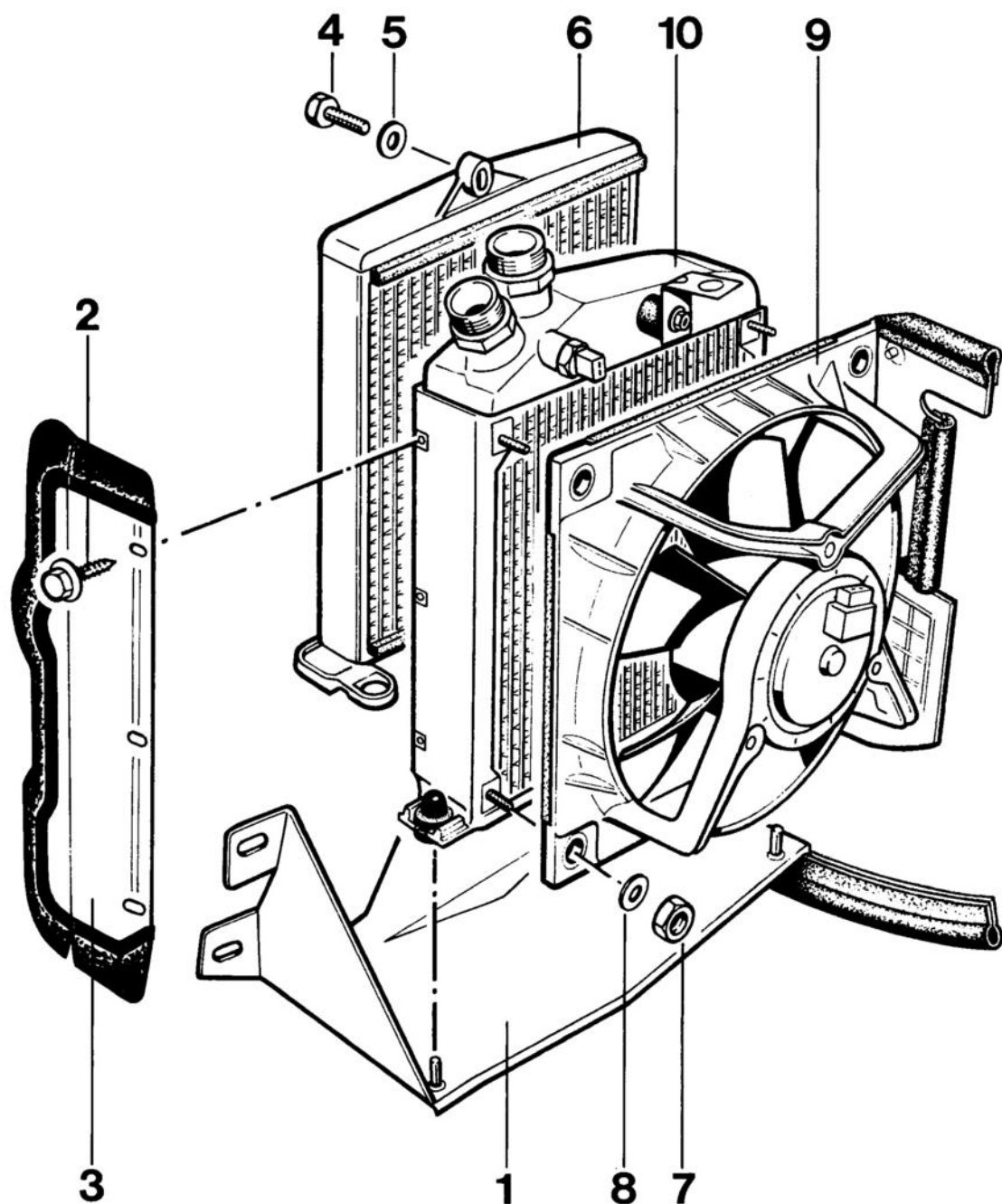
490-38

A = Twin connecting piece M 16 x 1.5
with conical seal

B = Additional hose

Removing and installing ATF cooler

Removing and installing ATF cooler



No.	Designation	Qty.	Note:	
			Removal	Installation
1	Bracket	1		
2	Washer-and-screw assembly	3		
3	Air deflector	1		
4	Hexagon screw	1		Tighten to 10 Nm (7.3 ftlb)
5	Washer	1		
6	ATF cooler	1		

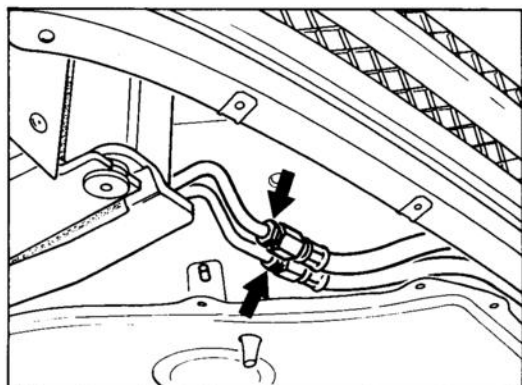
Removing and installing ATF cooler

Information

The ATF cooler is located in the wheel house in front of the front right-hand wheel. It is attached to the engine oil cooler and is ventilated by the engine oil cooler's two-stage electric blower.

Removal

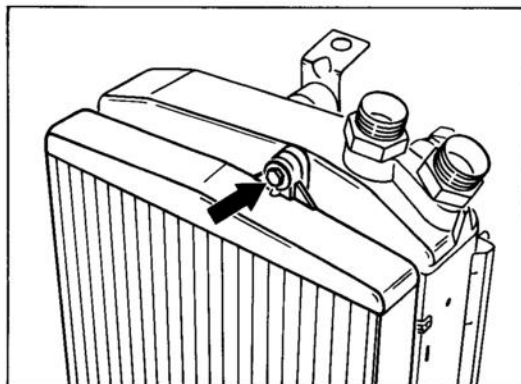
1. Remove front wheel house liner and lower panel
2. Disconnect ATF lines and seal with suitable plugs.



489-38

3. Unfasten retaining bracket on headlamp housing.
4. Remove bracket, undoing three self-locking hexagon nuts (M8) on the wheel arch and one (M6) for the diagonal brace.
5. Remove air deflector.

6. Remove hexagon screw and take out ATF cooler (illustration shows cooler removed).

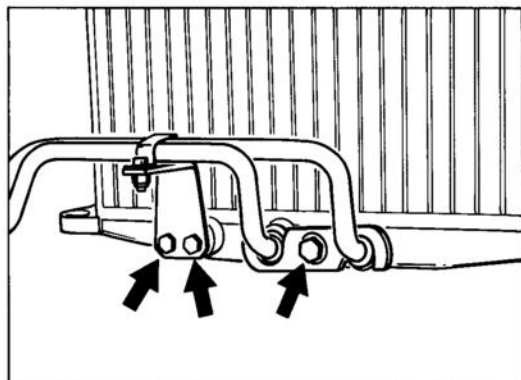


487-38

Note

Do not disconnect oil lines from engine oil cooler. Cooler remains in wheel house.

7. Remove ATF lines on cooler.



488-38

1. Installation is carried out in reverse order.

2. Replace O-rings for ATF lines on cooler.

3. Check that rubber edging strips on fan housing and bracket fit properly.

4. Check ATF level and if necessary top up.

Installation

Tightening torques: (= ftlb)

Connection ATF line = 30 Nm (22.0ftlb)

Retaining bracket to headlamp housing = 23 Nm (16.9 ftlb)

Bracket to wheel house = 23 Nm (16.9 ftlb)

Diagonal brace to bracket = 10 Nm (7.3 ftlb)

ATF cooler to engine oil cooler = 10 Nm (7.3 ftlb)

Bolt to ATF cooler = 10 Nm (7.3 ftlb)

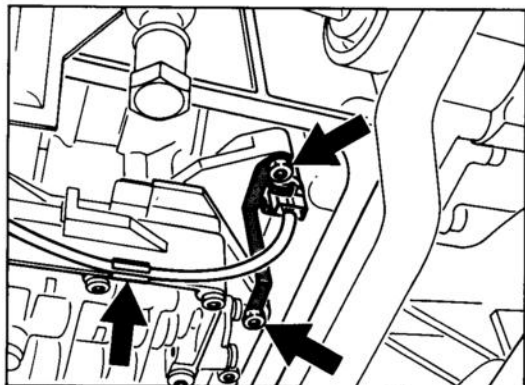
Retaining bracket to ATF cooler = 6 Nm (4.4 ftlb)

Retaining plate to retaining bracket = 3 Nm (2.2 ftlb)

Removing and installing the inductive speed sensor

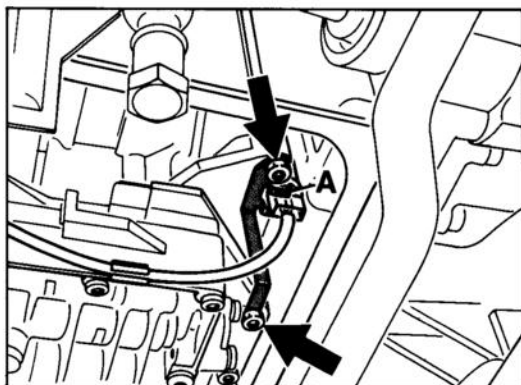
Removing

1. Remove the transmission underbody cladding and ATF pan (refer to page 38-109).
2. Remove the holder for the inductive sensor and pull out sensor.



390-38a

Insert the sensor and mount the holding plate so that the lugs engage in the groove on the connector.



390-38b

A = Connector groove

Installing

Tightening torque:

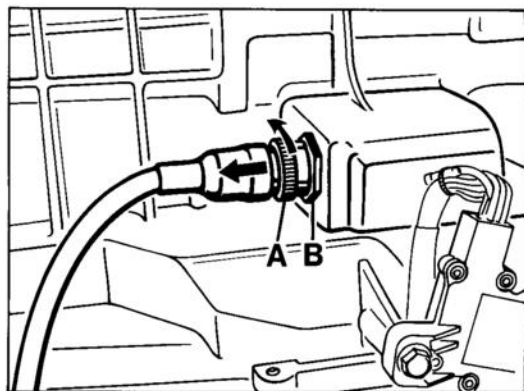
Holder to control unit = 8 Nm

Installation takes place in reverse order.

Removing and installing the wiring harness for the transmission

Removing

1. Remove the transmission underbody cladding.
2. Remove the position switch (refer to page 37-101).
3. Disconnect the connector from the transmission socket. To do this, turn the bayonet lock to the left and disconnect the connector:

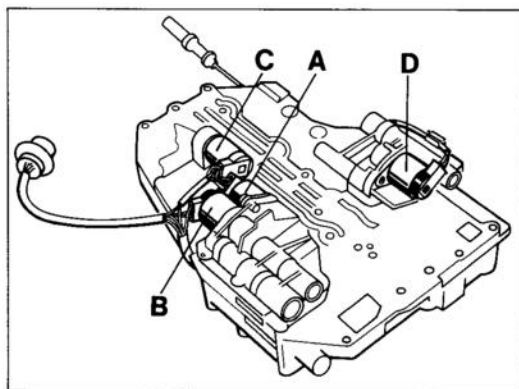


387-38a

A = Bayonet lock
B = Hexagon nut (a/f 30)

4. Unscrew the hexagon nut for the transmission socket with a suitable extension.
5. Remove the hydraulic control unit with wiring harness (also refer to page 38-109).

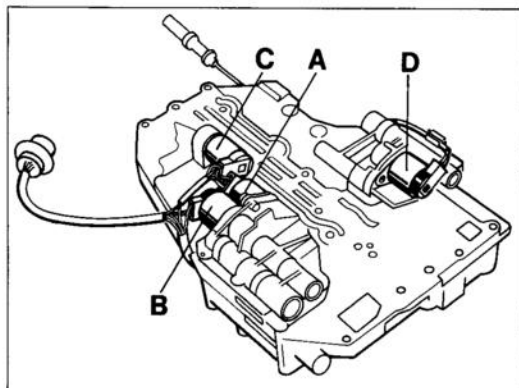
6. Mark the push-on sleeves for re-installation and pull off from the solenoid valves.



383-38

Installing

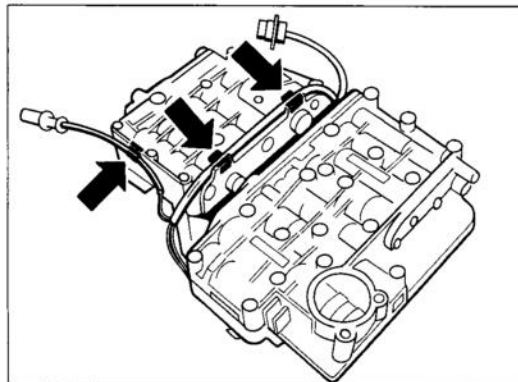
1. Push the push-on sleeves for the solenoid valves up to the stop. Pay attention to cable colors.



383-38

	Solenoid valves	Cable colors
A	Solenoid valve 1	(grey-violet)
B	Solenoid valve 2	(green-violet)
C	Solenoid valve 3	(red-violet)
D	Pressure regulator	(blue-violet)

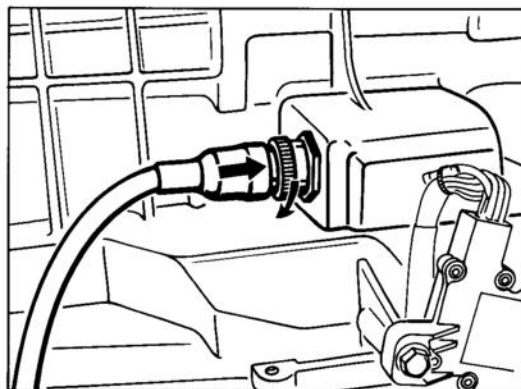
2. Route wiring harness and hang in cable clamps.



384-38

3. Place hydraulic control unit on a suitable surface (e.g. transmission jack) at installation height.
4. Insert the socket with **new O-ring** so that the flattened side faces upwards. Tighten hexagon nut with **12 Nm (9 ftlb)**.
5. Install hydraulic control unit.

6. Connect wiring harness with transmission socket. To do this, carefully insert the connector in the socket (fits only in one position) and lock by turning the bayonet lock to the right.



387-38b

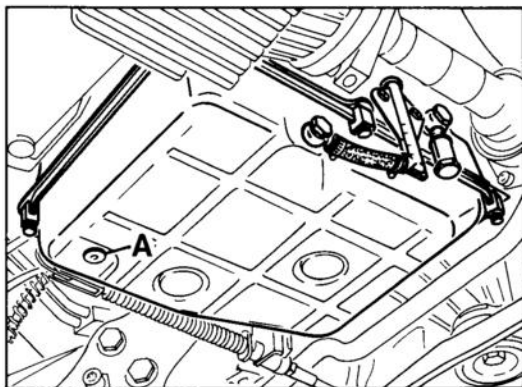
7. Install the position switch and readjust.

Removing and installing the hydraulic control unit

Removing

The transmission wiring harness remains on the transmission.

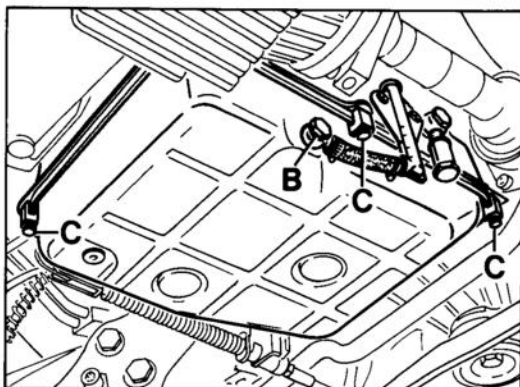
1. Remove the transmission underbody cladding.
2. Drain off ATF fluid.



386-38a

A = Drain screw with sealing ring

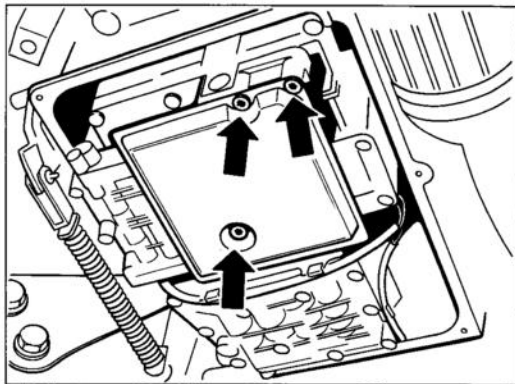
3. Remove ATF pan. To do this, unscrew hollow screw for oil level pipe and six fixing screws.



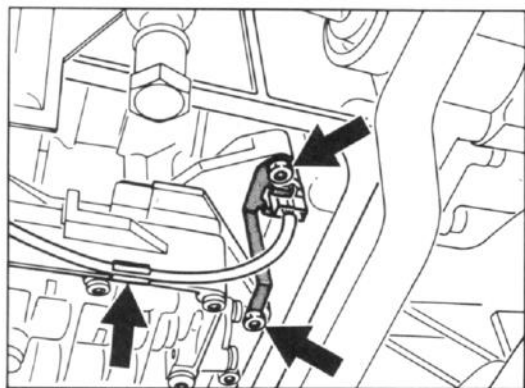
386-38b

B = Hollow screw
C = Fixing screws

4. Remove ATF strainer with **Torx insert T 27**.



382-38



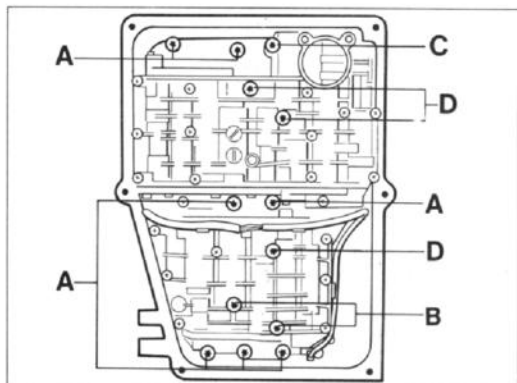
390-38a

6. Unscrew 13 fixing screws (head diameter 12 mm) **with Torx insert T 27** and lower control unit only so far as to guarantee that the wiring harness is not subjected to any tension.

Place the control unit on a suitable surface (e.g. transmission jack).

Note

Do not allow the control unit to hang from the wiring harness under any circumstances.



399-38

- A = Screw length 80 mm
 B = Screw length 65 mm
 C = Screw length 105 mm
 D = Screw length 60 mm

7. Mark the push-on sleeves for re-installation and pull off from the solenoid valves.
8. Pull the wiring harness out of the holding clamps and remove the control unit.

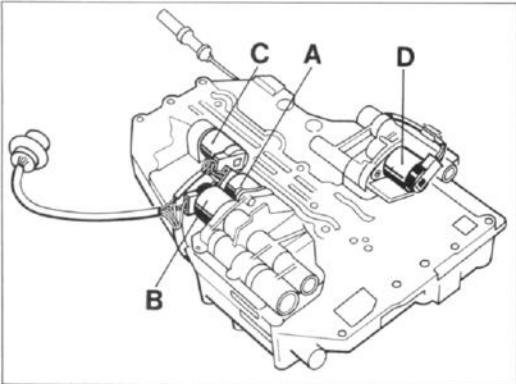
Installing

Installation takes place in reverse order.

1. Tightening torques:

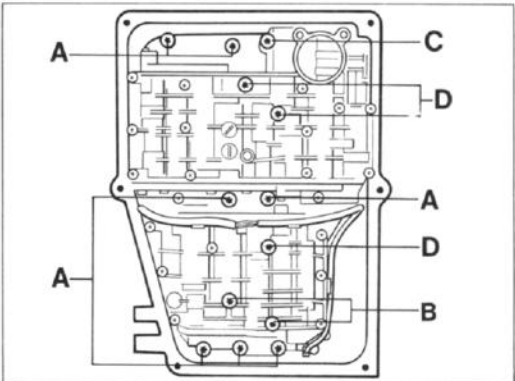
- Control unit to transmission = 8 Nm (6 ftlb)
 ATF strainer to control unit = 8 Nm (6 ftlb)
 ATF pan to transmission = 6 Nm (4 ftlb)
 Drain screw to ATF pan = 40 Nm (29 ftlb)
 Hollow screw to ATF pa = 40 Nm (29 ftlb)

2. Push on push-on sleeves for solenoid valves up to the stop. Pay attention to cable colors.



383-38

4. Screw in the fixing screws for the control unit and counter slightly. Pay attention to screw lengths.



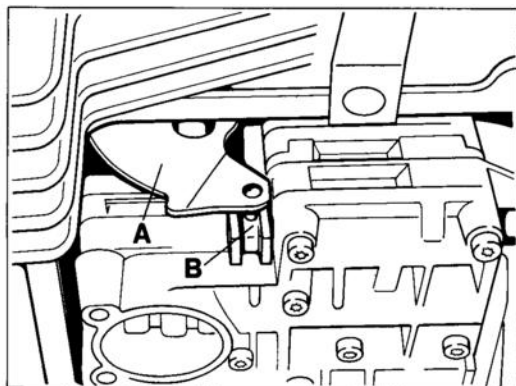
399-38

	Solenoid valves	Cable colors
A	Solenoid valve 1	(grey-violet)
B	Solenoid valve 2	(green-violet)
C	Solenoid valve 3	(red-violet)
D	Pressure regulator	(blue-violet)

3. Mount the control unit so that the pin of the notched disk projects into the recess of the selector slide.

- A = Screw length 80 mm
- B = Screw length 65 mm
- C = Screw length 115 mm
- D = Screw length 60 mm

5. Position control unit. To do this, move notched disk to position 1 (1st gear) and push control unit back until it rests against the notched disk. Tighten fixing screws with 8 Nm in this position.



385-38

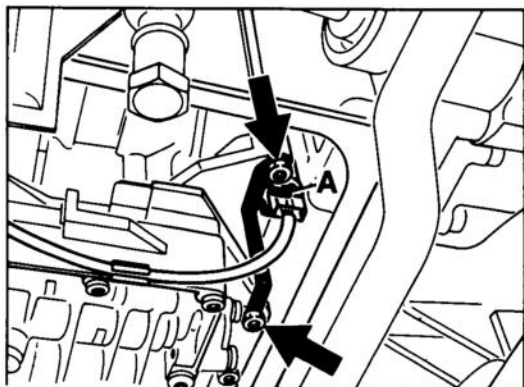
Note

The two holding brackets with the straight legs must be mounted at the side.

9. Screw in ATF drain screw with new sealing ring. Tightening torque **40 Nm**.
10. Screw in hollow screw for oil level pipe with new sealing rings. Tightening torque **40 Nm**.
11. Fill with ATF fluid (refer to page 38-103).

A = Notched disk
B = Selector slide

6. Insert inductive speed sensor and mount holding plate so that the lugs engage in the connector grooves.

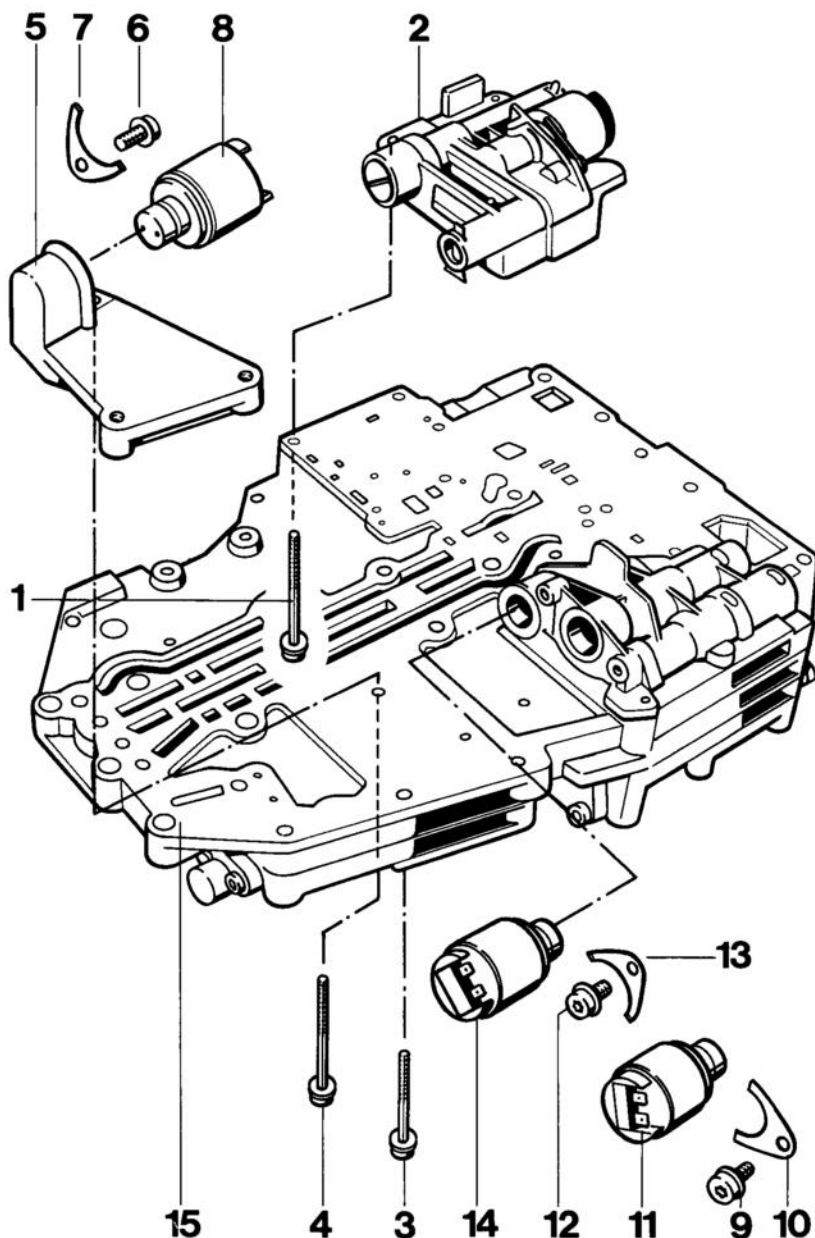


390-38b

7. Fit ATF strainer with O-ring. Tightening torque **8 Nm**.
8. Place two magnets in the beads of the ATF pan, fit seal and secure the pan with the holding brackets so that the short legs press onto the ATF pan.

Removing and installing solenoid valves

Removing and installing solenoid valves



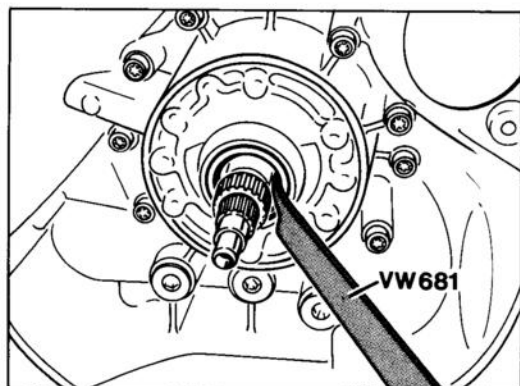
409-38

No.	Designation	Qty.	Note:	
			Removal	Installation
1	Fillister head screw	5	Remove with Torx insert T 27	Tighten with 5 Nm (4 ftlb)
2	Housing with pressure regulator	1		Set by the manufacturer, only replace complete
3	Fillister head screw	2	Remove with Torx insert T 27	Tighten with 5 Nm
4	Fillister head screw	1	Remove with Torx insert T 27	Tighten with 5 Nm
5	Holder	1		
6	Fillister head screw	1	Remove with Torx insert T 27	Tighten with 5 Nm
7	Holding plate	1		Fit in correct position, lugs point to holder No. 5
8	Solenoid valve 3	1	Mark for re-installation	Do not confuse with solenoid valves Nos. 11 and 14
9	Fillister head screw	1	Remove with Torx insert T 27	Tighten with 5 Nm
10	Holding plate	1		Fit in correct position, lugs point to housing
11	Solenoid valve 2	1	Mark for re-installation	Do not confuse with solenoid valves Nos. 14 and 8
12	Fillister head screw	1		Tighten with 5 Nm
13	Holding plate			Fit in correct position, lugs point to housing
14	Solenoid valve 1	1	Mark for re-installation	Do not confuse with solenoid valves Nos. 11 and 8
15	Hydraulic control unit	1		

Removing and installing the rotary shaft seal for the ATF pump

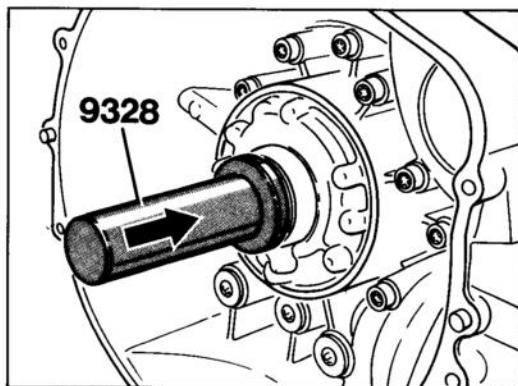
Removing

1. Remove transmission and converter.
2. Lever out sealing ring with **VW 681**



419-38

2. Press in sealing ring with special tool **9328** as far as it will go.



420-38

Installing

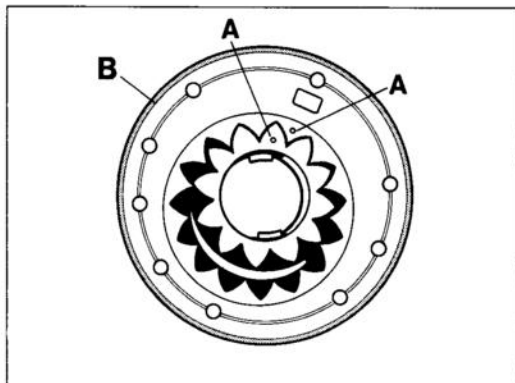
Installation takes place in reverse order.

1. Wet sealing lip with ATF.

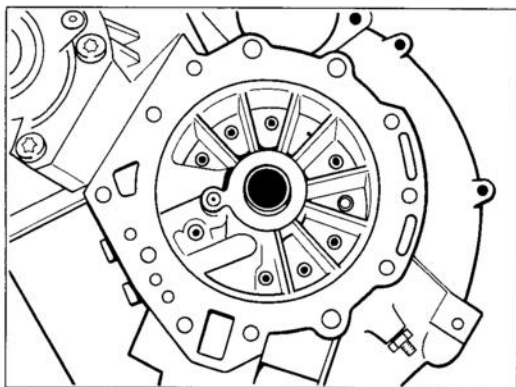
Removing and installing the ATF pump

Removing

1. Remove transmission.
2. Remove torque converter and rear transmission case.
3. Unscrew fixing screws with **Torx insert T27** and remove pump. To do this, screw in two screws opposite each other and carefully drive out the pump by gentle blows on the screw heads



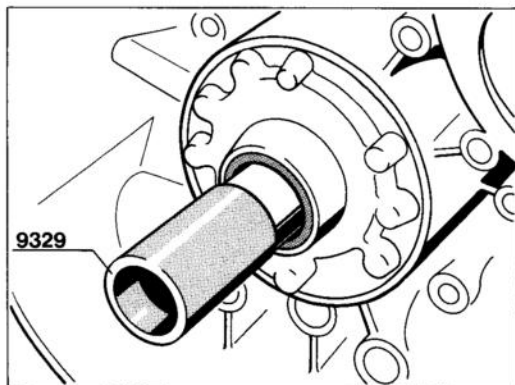
405-38



406-38

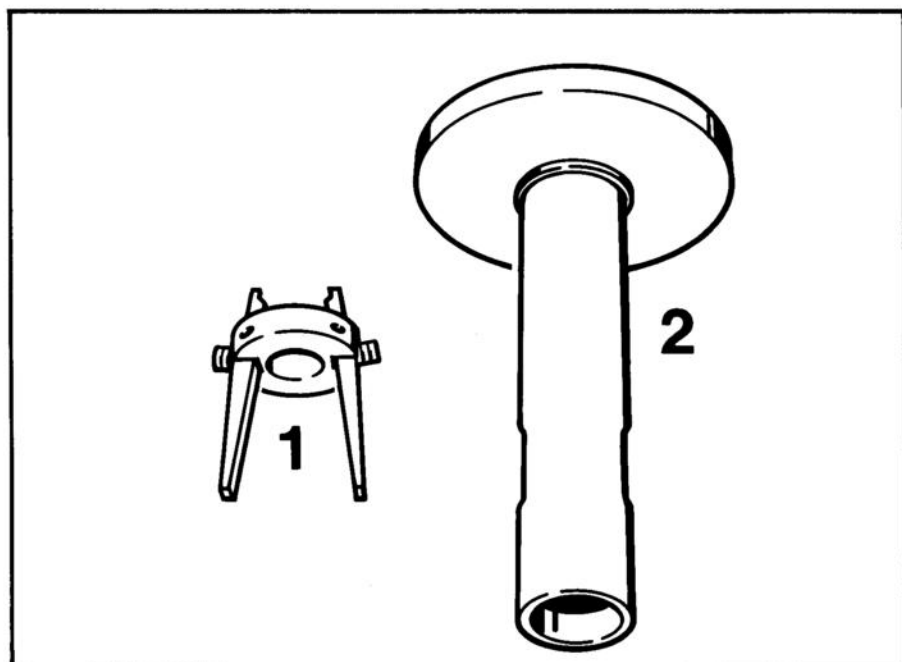
Installing

1. Check bearing bush for run-in scores or damage. The pump must be replaced if there are signs of damage.
2. Oil both pump wheels with ATF fluid and place in the housing so that both installation markings are visibly facing up.



421-38

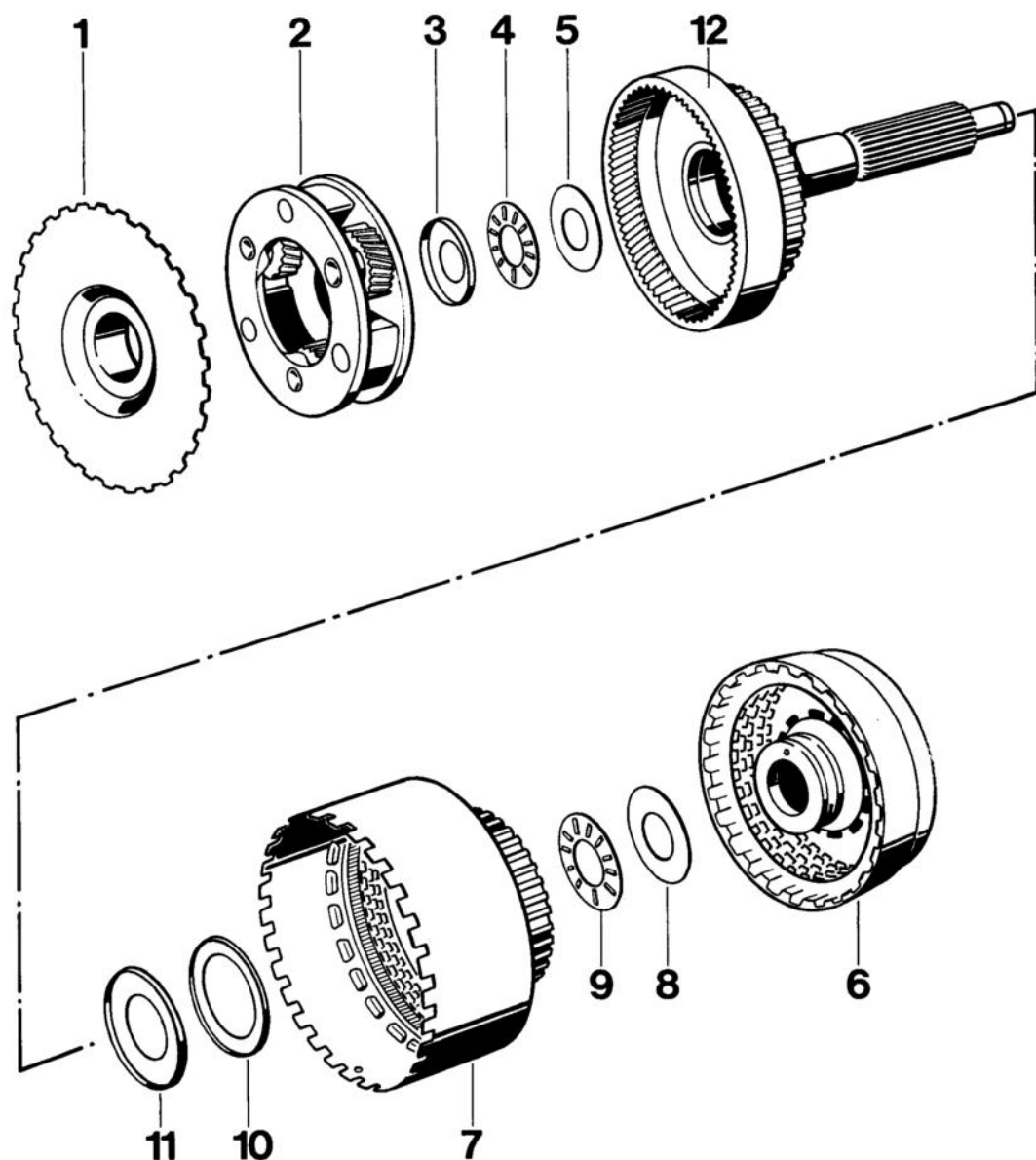
Dismantling and assembling 4th gear tower



911-38

No.	Designation	Special tool	Order number	Explanation
1	Clamp	9334	000.721.933.40	
2	Assembly support	9314	000.721.931.40	

Dismantling and assembling 4th gear tower



No.	Designation	Qty.	Note:	
			Removal	Installation
1	Sun wheel	1		
2	Planetary set	1		Check for correct seating of the rectangular ring. Engage into hollow gear with a slight rotary motion
3	Angled disc	1		Fit in correct position
4	Axial needle roller cage	1		
5	Thrust washer	1		
6	Brake F	1	For dismantling, refer to page 38 - 137	Make sure rectangular rings are located correctly. Rotate them slightly to move them into installation position
7	Clutch E	1	For dismantling, refer to page 38 - 131	Fit with a rotary motion. The specified position is achieved when cylinder E rests against the copper angle disc
8	Thrust washer	1		
9	Axial needle roller cage	1		
10	Copper angle disc	1		Install in correct position
11	Steel angle disc	1		Install in correct position
12	Output shaft with freewheel	1	For dismantling, refer to page 38 - 127	

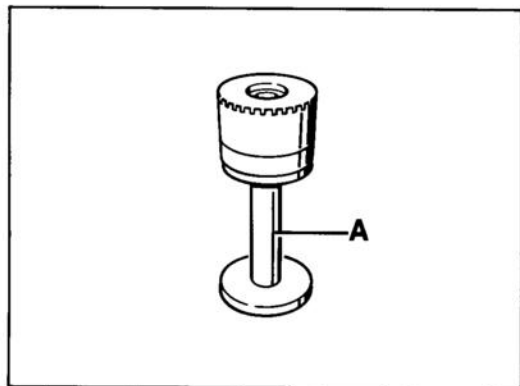
Note

Parts No. 1 to 5 should be fitted only after the 4th gear tower has been installed

Dismantling and assembly notes

Dismantling

1. Take Special Tool **9334** off the output shaft, lift the complete pack by the cylinder and place onto Special Tool **9314**.

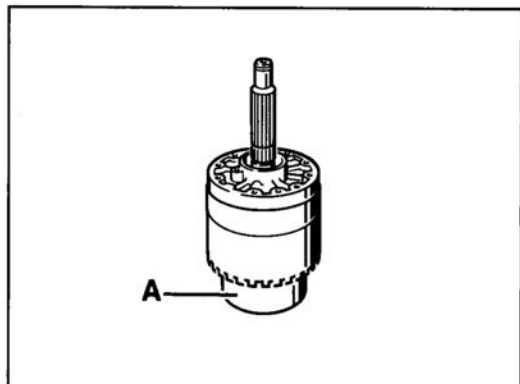


882-38

A - Special Tool **9314**

2. Take off sun wheel and planetary set.

3. Turn over the complete pack on the output shaft and place on a suitable support (e.g. Special Tool **9508/1**).



883-38

A = Special Tool **9508/1**

4. Take off cylinder F and E

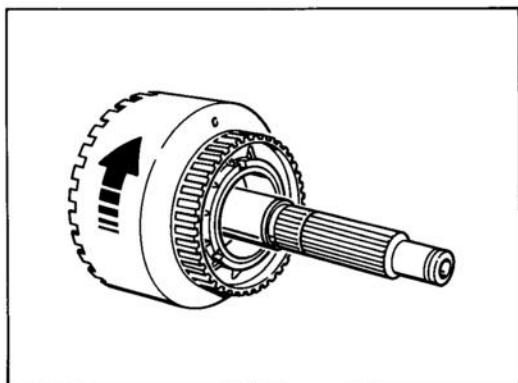
Assembly

1. Place preassembled output shaft on a suitable support (e.g. **9508/1**).
2. Put steel and copper angle disc in place and fit cylinder E with a rotary motion.

Note

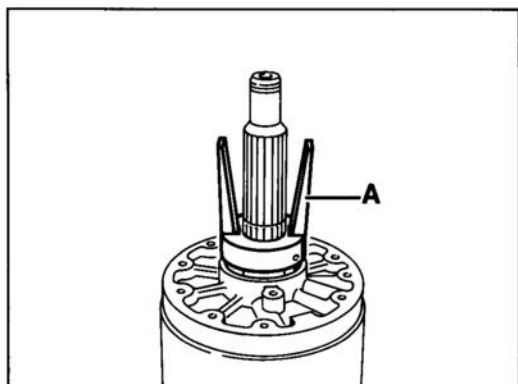
The teeth of the end disc and of the free-wheel outer ring must engage with each in such a manner that cylinder E rests on the copper angle disc.

4. If the freewheel has been fitted correctly, cylinder E must be free to rotate clockwise with the output shaft being held, but it must lock when an attempt is made to rotate it counterclockwise.



880-38

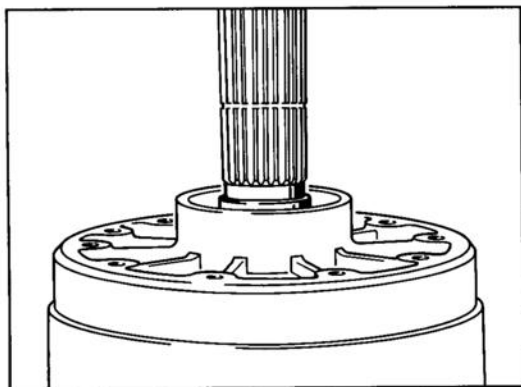
6. To prevent the preassembled pack from separating, allow **Special Tool 9334** to engage into the groove of the round seal.



885-37

A – Special Tool 9334

5. Fit axial needle roller cage and thrust washer. Place cylinder F onto cylinder E with a rotary motion until it is in assembly position.

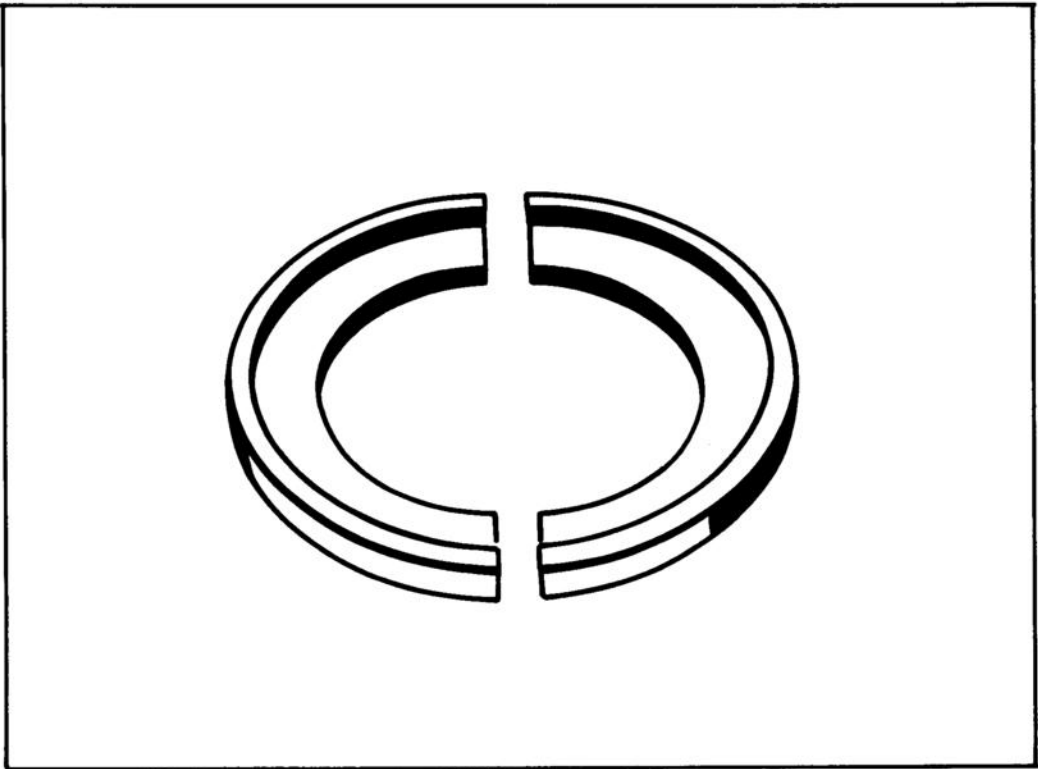


884-38

Note

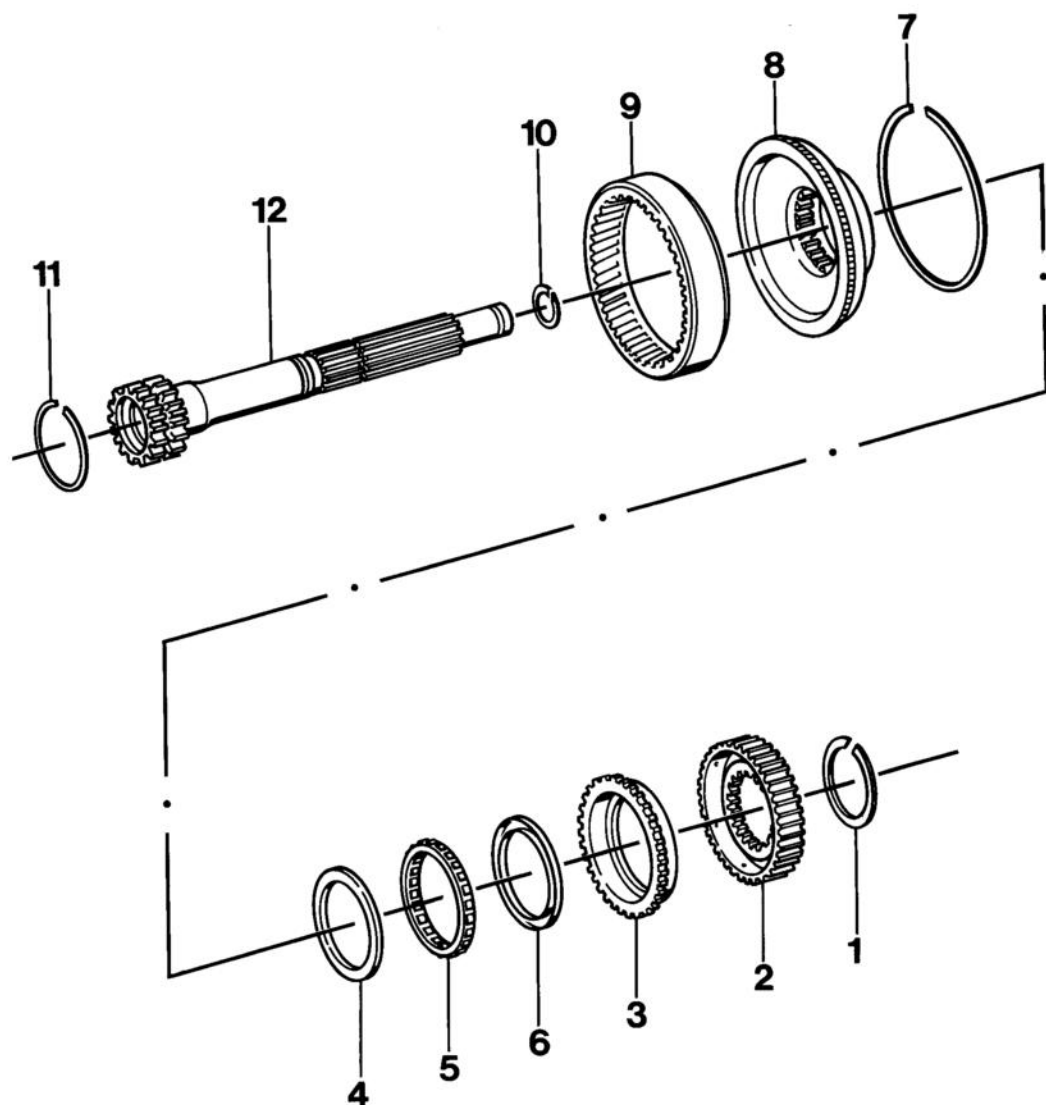
The teeth of end disc and freewheel outer ring engage only over a length of approx. 3 mm.

Dismantling and assembling output shaft and freewheel



No.	Designation	Special tool	Order number	Explanation
	Assembly ring	9336	000.721.933.60	

Dismantling and assembling output shaft and freewheel



902-38

No.	Designation	Qty.	Note:	
			Removal	Installation
1	Snap ring	1	Remove with suitable pliers and screwdriver	Install with suitable pliers (e.g. VW 161a)
2	Disc carrier	1		
3	Freewheel outer ring	1	Rotate to lift off along with freewheel cage	Rotate clockwise to push onto inner ring along with freewheel cage
4	Thrust washer	1		
5	Freewheel cage	1	Mark installation position for reassembly. Press carefully out of outer ring	Use Special Tool 9336 to place into outer ring
6	Thrust washer	1		
7	Snap ring	1		
8	Freewheel inner ring	1		
9	Hollow gear	1		
10	Rectangular ring	1		Replace
11	Snap ring	1		
12	Output shaft	1		

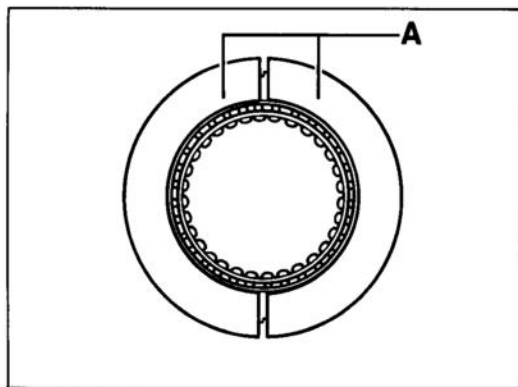
Dismantling and assembly notes

Dismantling

1. Remove snap ring (No. 1) and take off freewheel assembly along with disc carrier and hollow gear.

Assembly

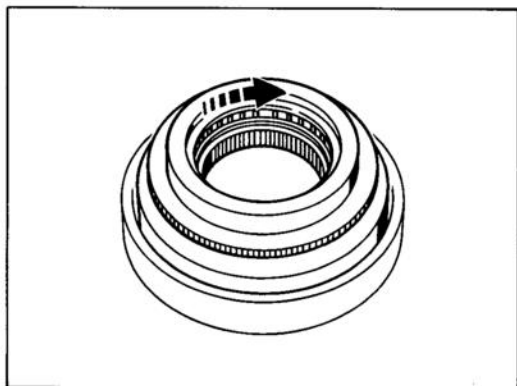
1. Place freewheel cage onto outer ring and align.
2. Use Special Tool 9336 to compress freewheel cage and to push it into the outer ring.



886-38

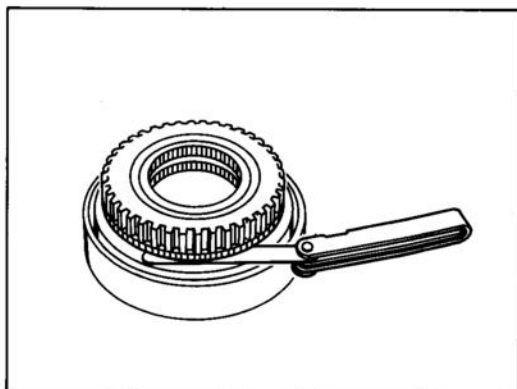
A - Special Tool 9336

3. Push freewheel outer ring onto inner ring, following a clockwise rotary motion.



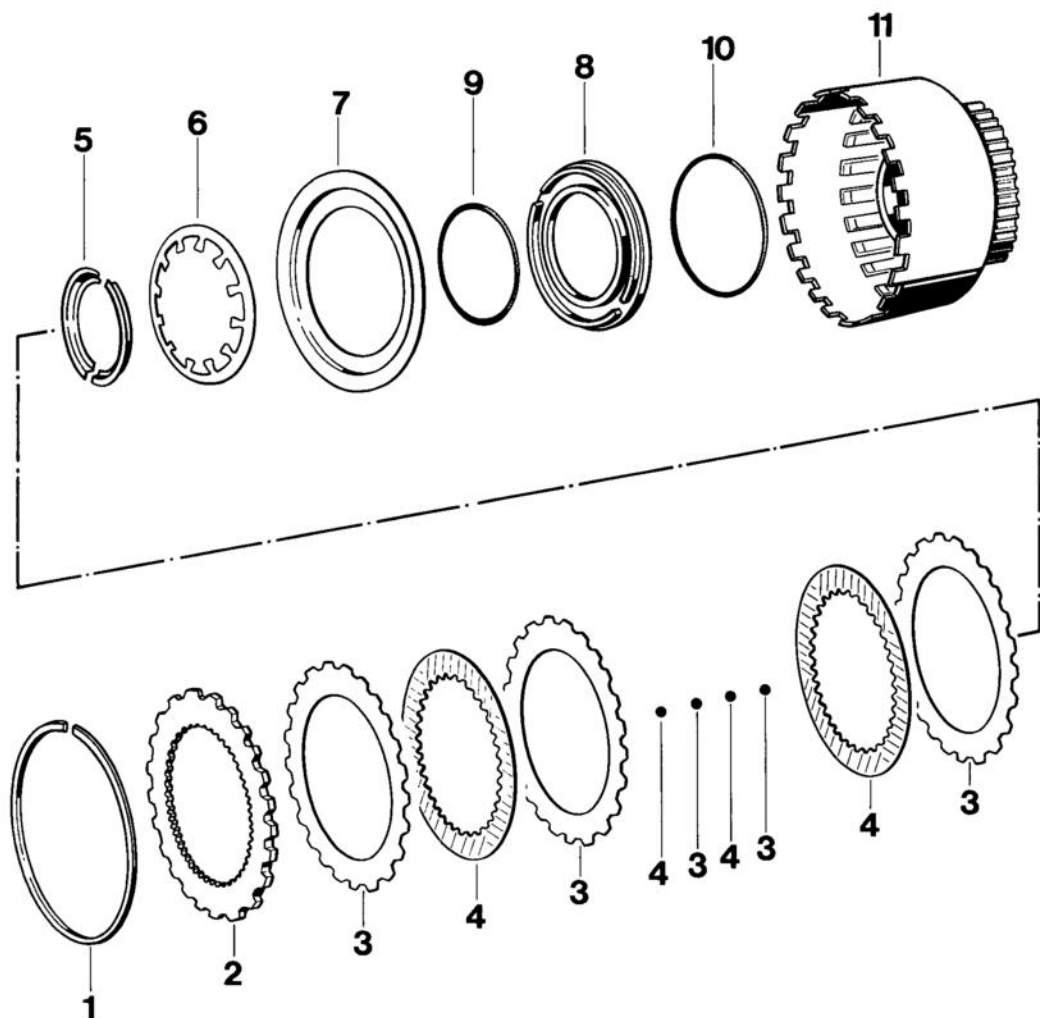
887-38

4. Determine gap between freewheel inner ring and freewheel outer ring. A minimum gap of 0.1 mm must remain.



888-38

Dismantling and assembling clutch E



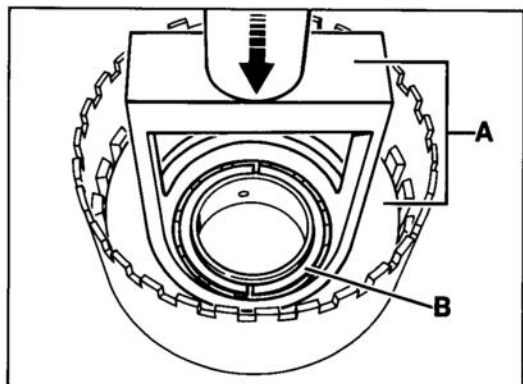
908-38

No.	Designation	Qty.	Note:	
			Removal	Installation
1	Snap ring	1		
2	End disc (with internal teeth)	1		Do not confuse with end disc of brake F
3	Outer disc (1.5 mm thick)	5		Do not confuse with outer discs of brake F
4	Inner disc	4		
5	Retainer ring	1	Remove with Special Tool 9335, using a press	Install with Special Tool 9335, using a press
6	Cup spring	1		Convex side faces retainer ring
7	Thrust cup	1		Place into position with convex side facing down
8	Piston	1	To remove, apply compressed air across oil feed bore	Grease round seals (with Vaseline) and press piston carefully in place, making sure it does not bind
9	Round seal	1		Replace
10	Round seal	1		Replace
11	Cylinder	1		

Dismantling and assembly notes

Dismantling

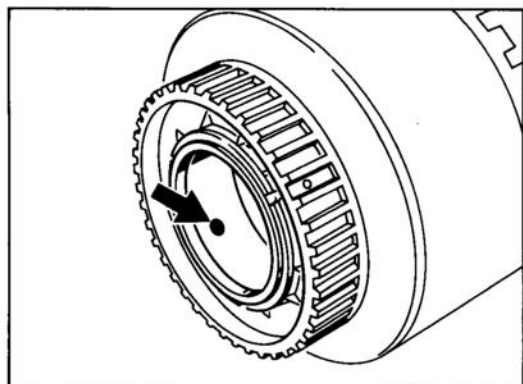
1. Remove retainer ring with Special Tool **9335** and a bar magnet, using a press.



870-38

A - Special Tool **9335**
B - Split retainer ring

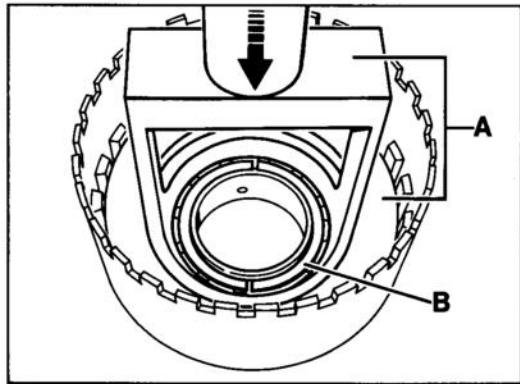
2. Remove piston by applying compressed air across the oil feed bore.
Use a air gun fitted with a sealing sleeve.



871-38

Assembly

1. Fit split retainer ring with Special Tool **9335** and a press, observing the correct position.

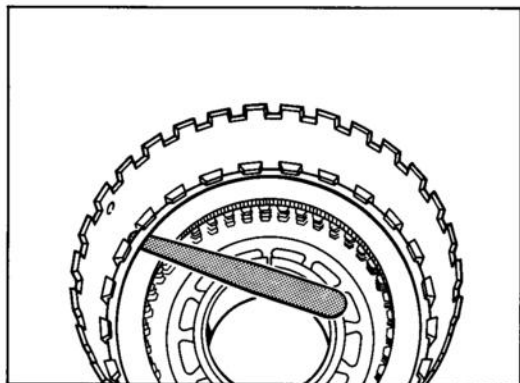


870-38

2. Coat discs with ATF fluid.

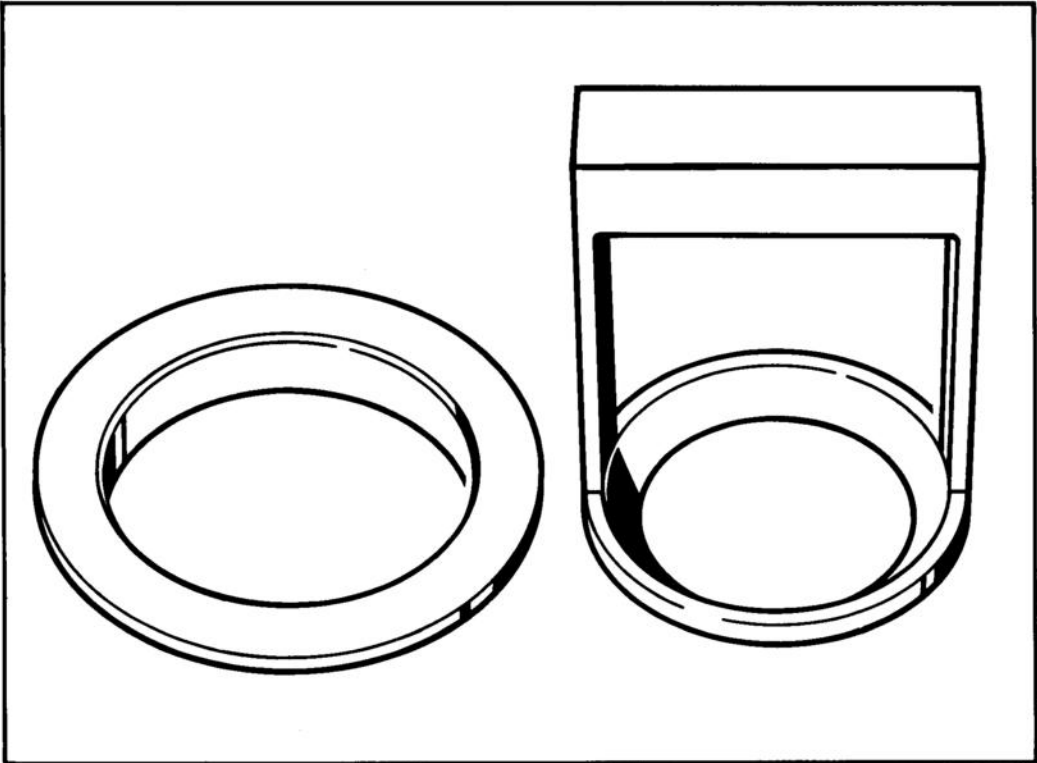
Measure air gap**Standard: 1.16...2.74 mm**

1. Use a screwdriver to press snap ring upwards along its entire circumference and measure air gap with a feeler gauge. If the wear limit has been reached, the entire disc pack must be replaced.



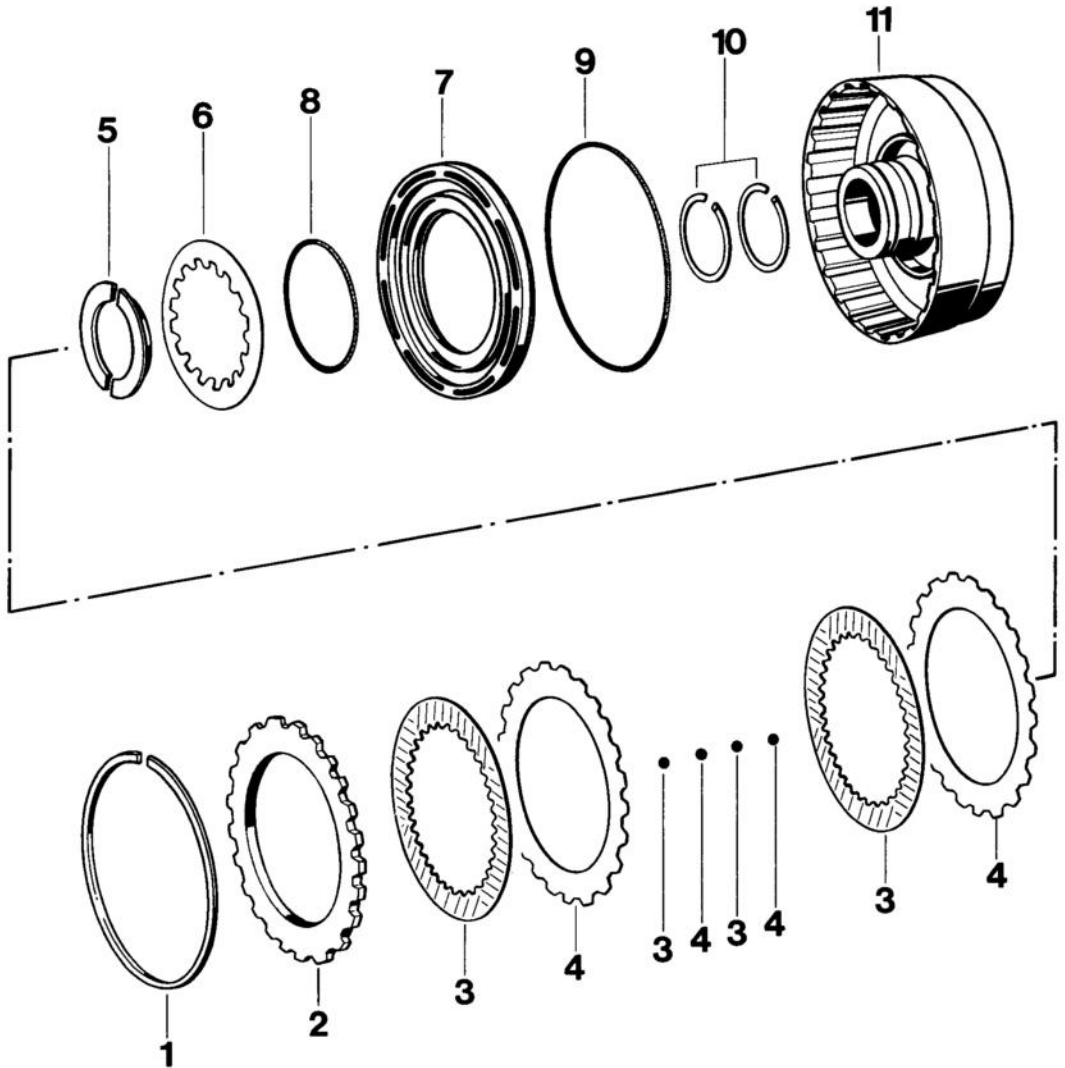
918-38

Dismantling and assembling brake F



No.	Designation	Special tool	Order number	Explanation
	Assembly tool	9335	000.721.933.50	

Dismantling and assembling brake F



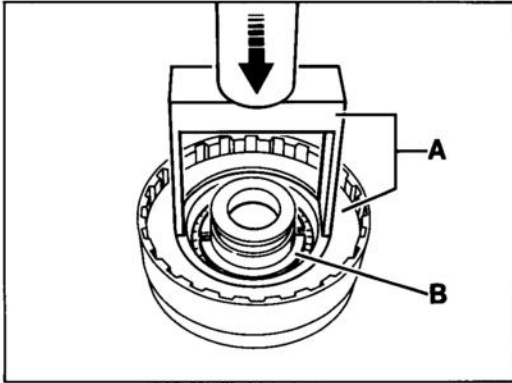
920-38

No.	Designation	Qty.	Note:	
			Removal	Installation
1	Snap ring	1		
2	End disc (without internal teeth)	1		Do not confuse with end disc of clutch E
3	Inner disc	4		
4	Outer disc (2.1 mm thick)	4		Do not confuse with outer disc of clutch E
5	Ring (split)	1	Remove with Special Tool 9335 and a press	Install with Special Tool 9335 and a press, observing correct position. Stepped side faces inside.
6	Cup spring	1		Lugs face inside
7	Piston	1	Press out of cylinder from outside, using a suitable tool	Grease round seals (with vaseline) and press carefully into cylinder, making sure the piston does not bind.
8	Sealing ring	1		Replace To avoid damage, expand ring slightly and fit at once
9	Round seal	1		Replace
10	Rectangular ring	2		Hooked ends must engage into each other
11	Cylinder	1		

Dismantling and assembly notes

Dismantling

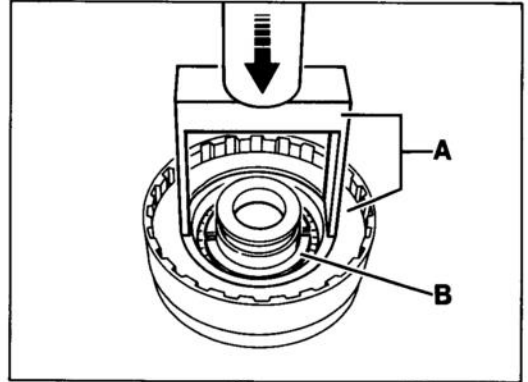
1. Remove split ring with Special Tool 9335 and a bar magnet, using a press.



863-38

Assembly

1. Install split ring with Special Tool 9335 and a press.

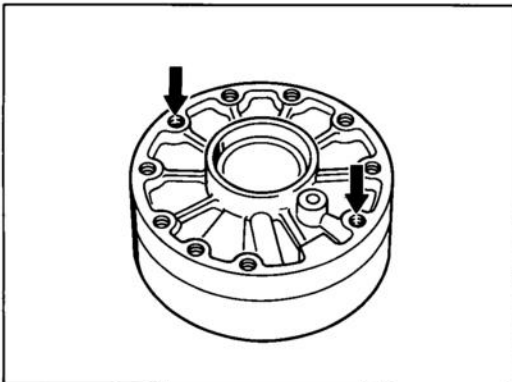


863-38

A - Special Tool 9335

B - Split ring

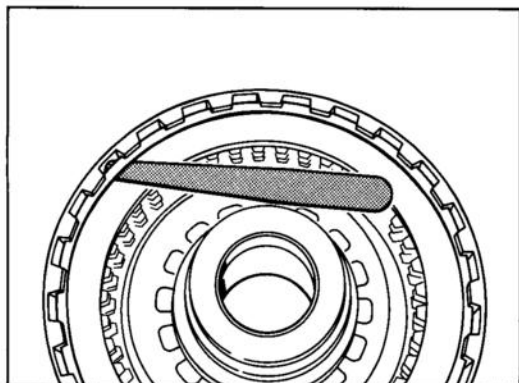
2. Using a suitable tool, press piston out of cylinder from the outside.



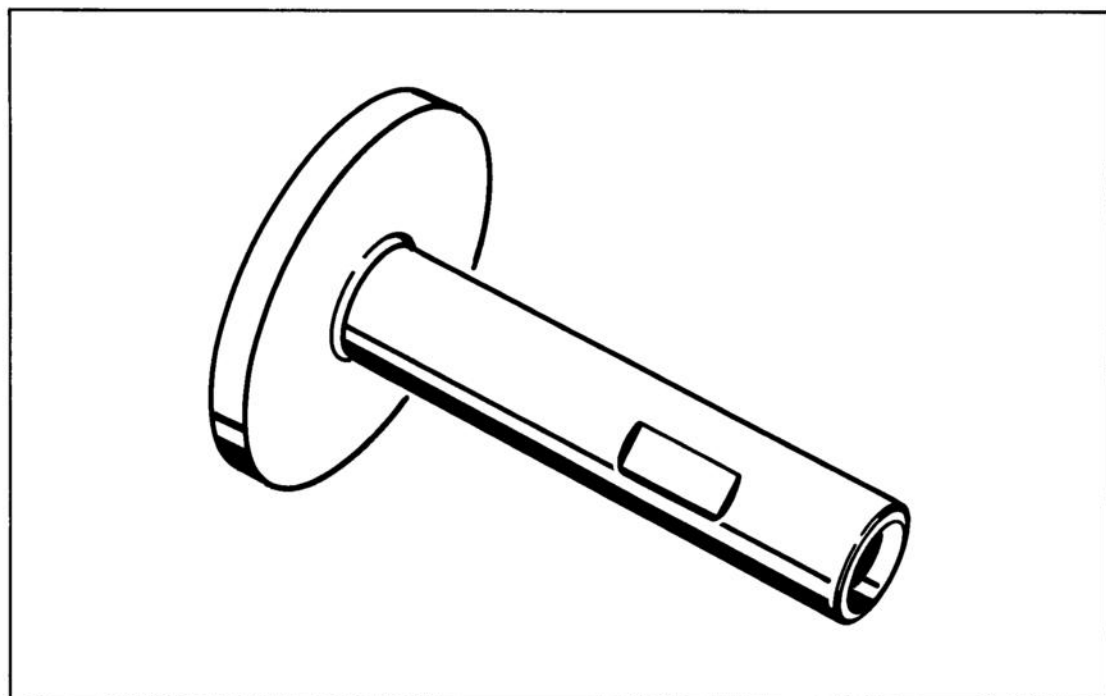
864-38

Measure air gap**Standard: 1.45...2.75 mm**

1. Use a screwdriver to press snap ring upwards along its entire circumference and measure air gap with a feeler gauge. If the wear limit has been reached, the complete disc pack must be replaced.



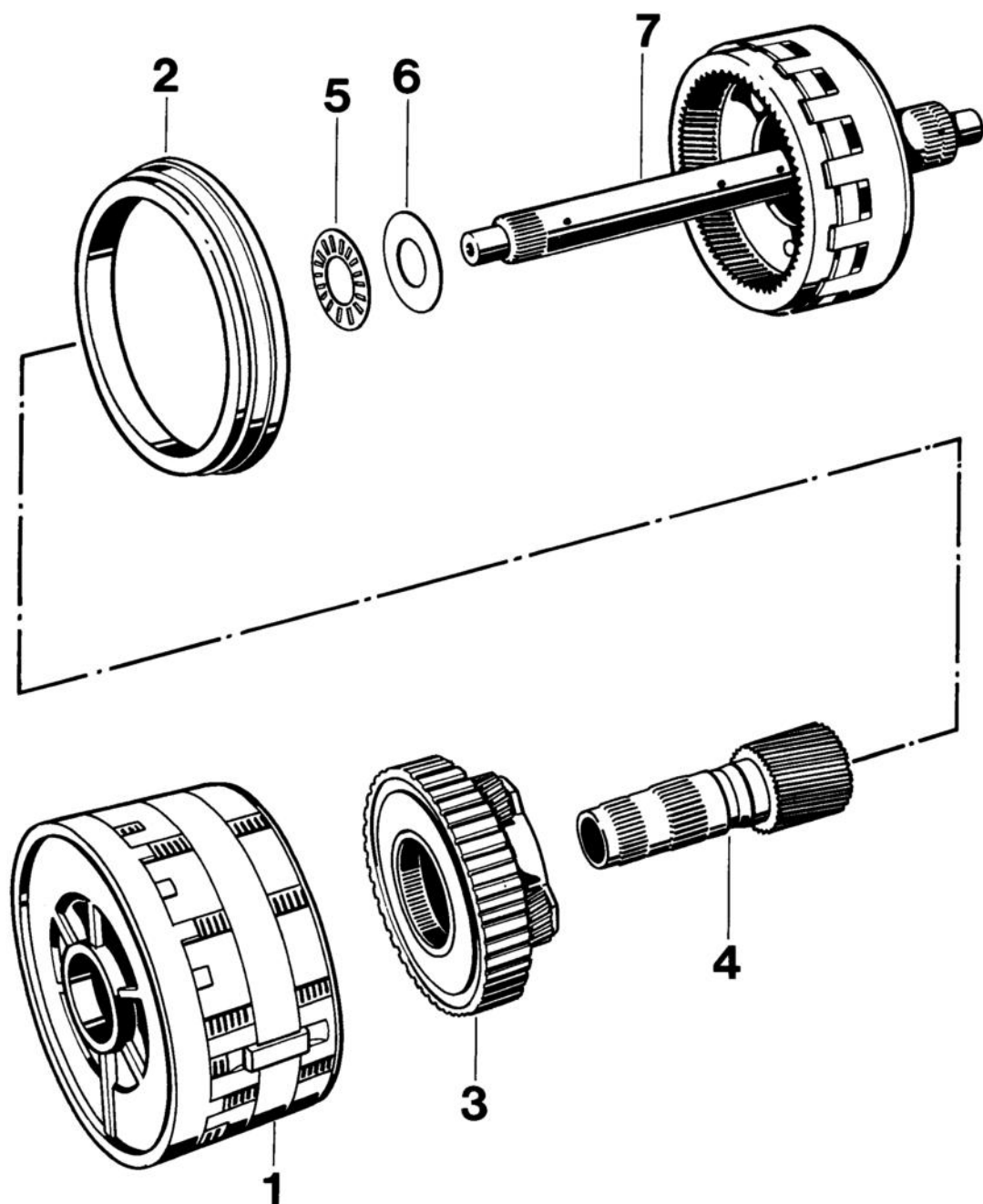
919-38

Dismantling and assembling brake pack CD with spider shaft

899-38

No.	Designation	Special tool	Order number	Explanation
	Assembly support	9314	000.721.931.40	

Dismantling and assembling brake pack CD with spider shaft

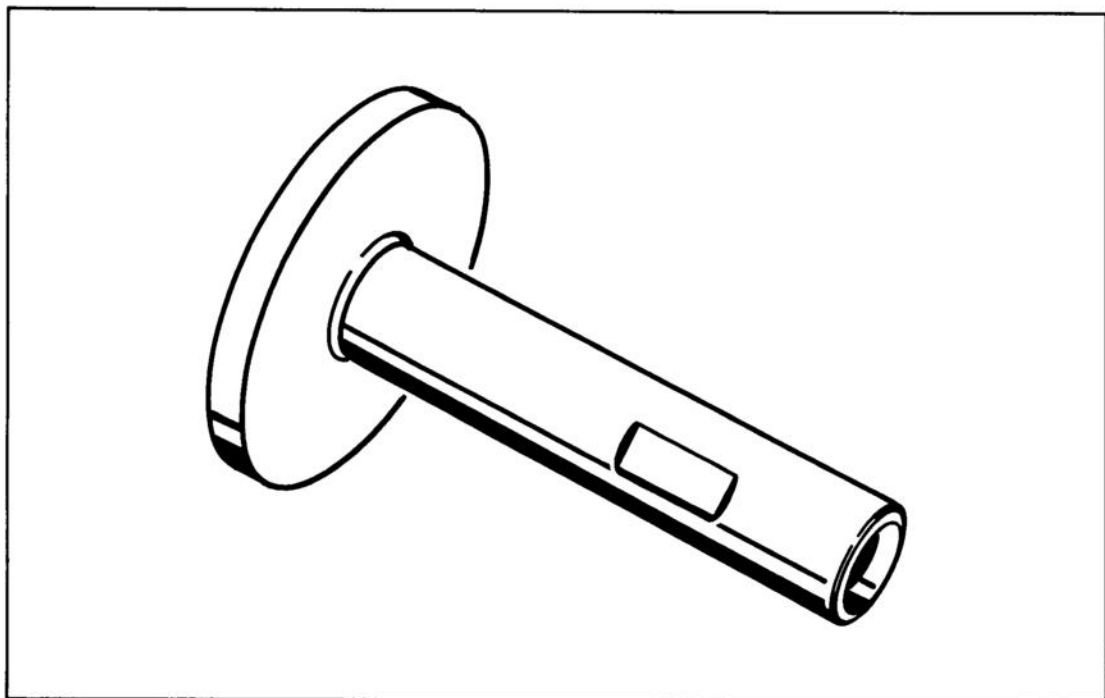


No.	Designation	Qty.	Note:	
			Removal	Installation
1	Cylinder CD	1	Remove with centering plate and support ring. For dismantling, refer to page 38 - 152	Refer to "Dismantling and assembling brake D" (refer to page 38 - 152) Hook ends of rectangular rings into each other
2	Support ring	1		
3	Planetary set	1		
4	Sun shaft	1		
5	Axial needle roller cage	1	For dismantling, refer to page 38 - 147	
6	Thrust washer	1		
7	Spider shaft (with hollow gear and intermediate shaft)	1		

Note

To dismantle, place spider shaft with cylinder CD onto Special Tool **9314**.

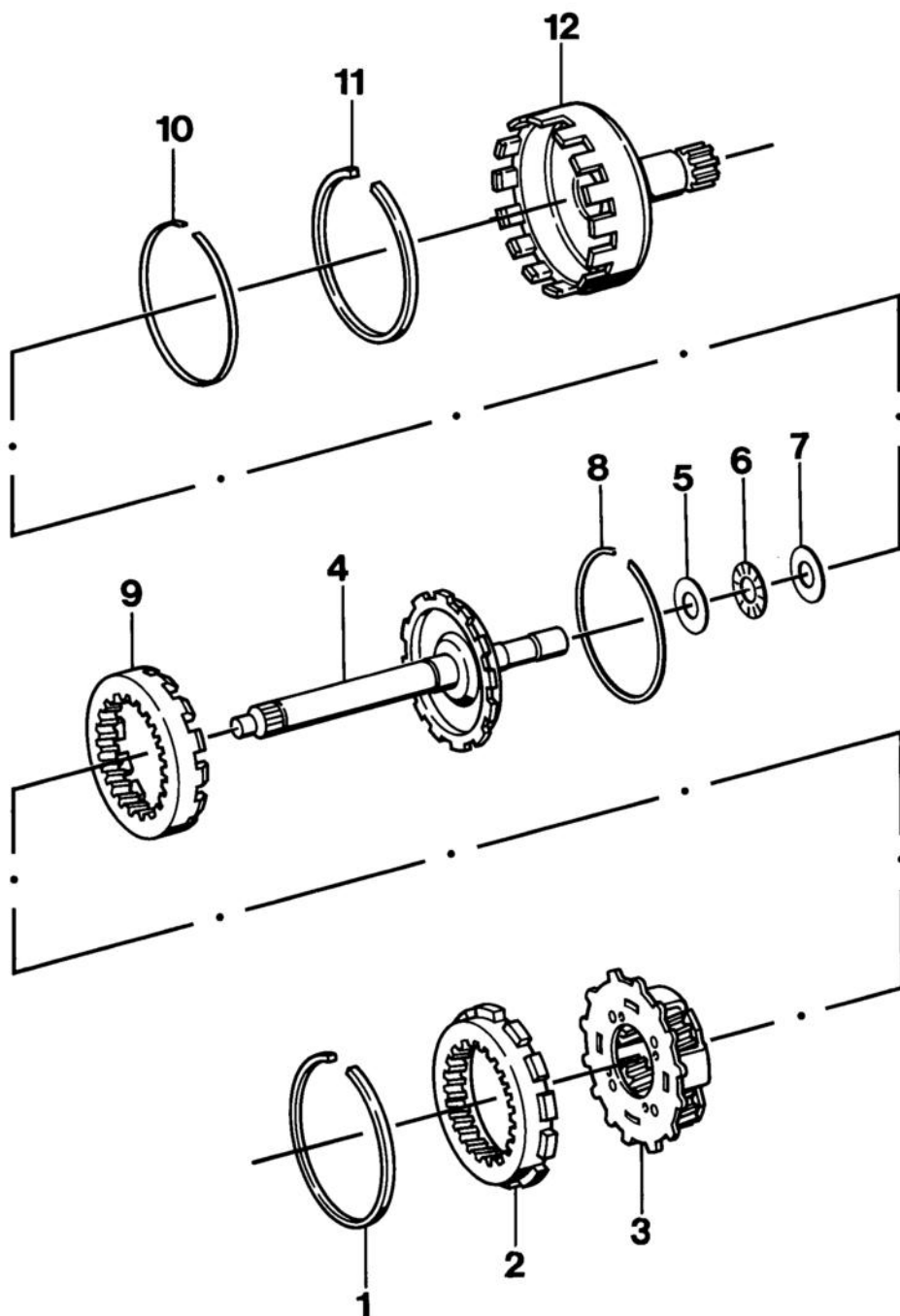
Dismantling and assembling spider shaft



899-38

No.	Designation	Special tool	Order number	Explanation
	Assembly support	9314	000.721.931.40	

Dismantling and assembling spider shaft

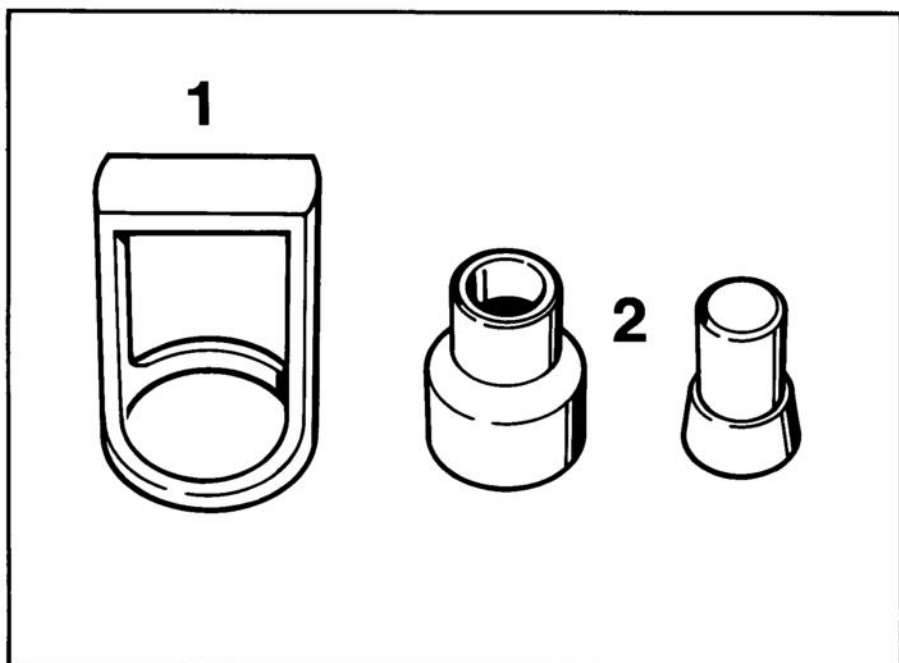


No.	Designation	Qty.	Note:	
			Removal	Installation
1	Snap ring	1		
2	Front hollow gear	1		
3	Planetary set	1		Do not allow to bind, rotate intermediate shaft to place unit in assembly position
4	Intermediate shaft	1		Fit rear hollow gear and place both into spider shaft
5	Thrust washer	1		
6	Axial needle roller cage	1		
7	Thrust washer	1		
8	Snap ring	1		
9	Rear hollow gear	1		
10	Spacer ring	1		
11	Snap ring	1		
12	Spider shaft	1		

Note

To dismantle and assemble the spider shaft, place it onto Special Tool **9314**.

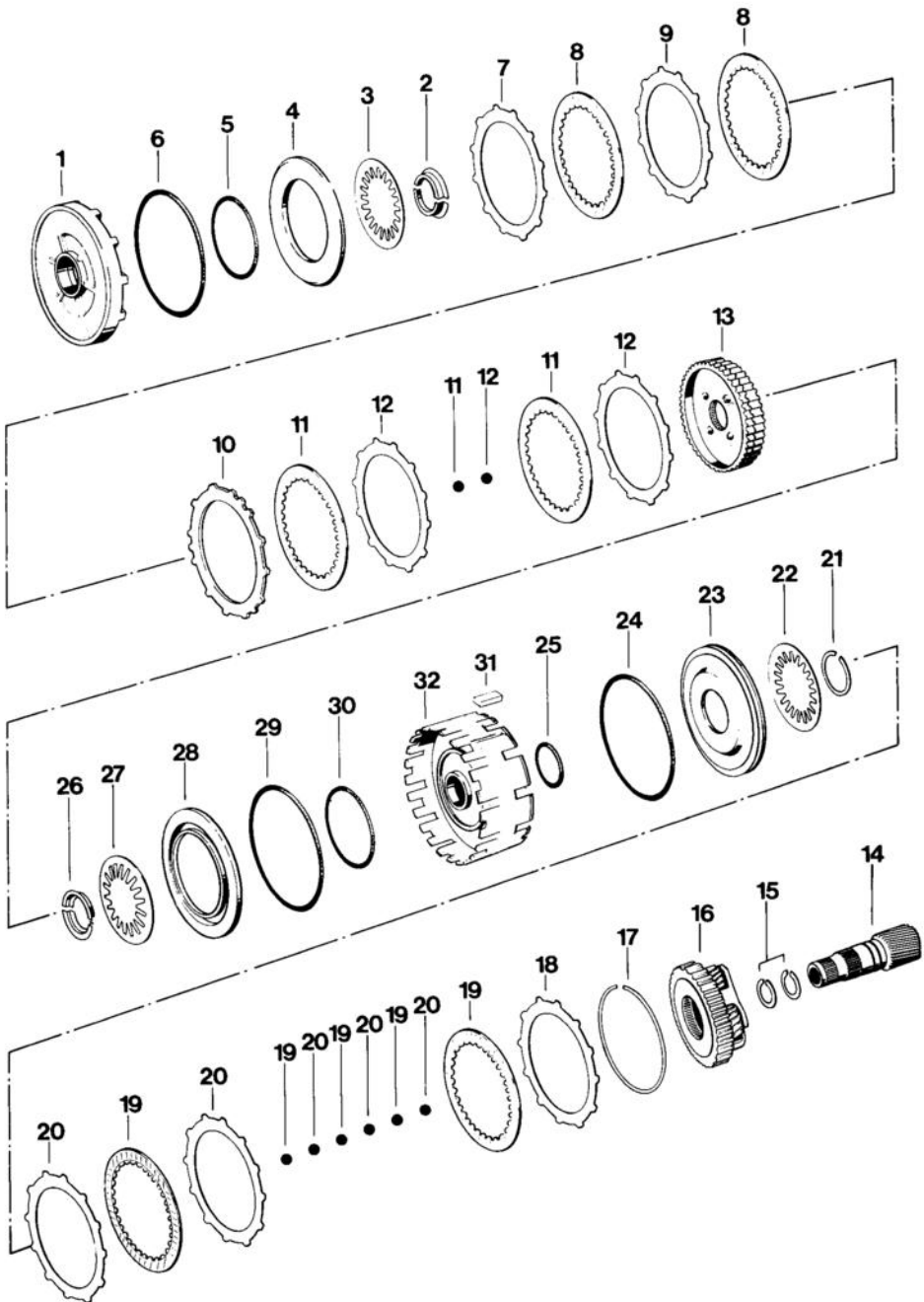
Dismantling and assembling brake C, C' and D



910 - 38

No.	Designation	Special tool	Order number	Explanation
1	Thrust piece	9332	000.721.933.20	
2	Assembly sleeve	9333	000.721.933.30	

Dismantling and assembling brake C, C' and D



916-38

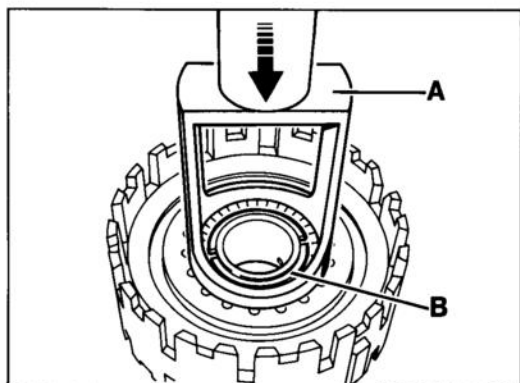
No.	Designation	Qty.	Note:	
			Removal	Installation
1	Centering plate	1		Observe installation position
2	Retainer ring (split)	1	Remove with Special Tool 9332 and a bar magnet, using a press	Install with Special Tool 9332 , using a press
3	Cup spring	1		Center in such a way that it is not squeezed by the retainer ring
4	Piston C'	1	To remove, apply compressed air across the oil feed bore	Do not confuse with piston C. Grease seals with vaseline and push them carefully onto the centering plate, making sure the piston does not bind
5	Round seal	1		Replace
6	Round seal	1		Replace
7	Outer disc (1.8 mm thick)	1		Observe installation position
8	Inner disc	2		
9	Outer disc (2.1 mm thick)	1		Observe installation position
10	End disc	1		Observe installation position
11	Inner disc	3		
12	Outer disc	3		Observe installation position
13	Freewheel (2nd gear)	1		Fit into correct position Wider section of teeth faces inside
14	Sun shaft	1		
15	Rectangular ring	2		Ring ends must be hooked into each other
16	Planetary set	1		
17	Snap ring	1		

No.	Designation	Qty.	Note:	
			Removal	Installation
18	Adjusting outer disc	1		If required, reestablish correct thickness
19	Inner disc	5		To facilitate assembly, reinstall planetary set first
20	Outer disc	5		
21	Snap ring	1	Using Special Tool 9332 and suitable snap ring pliers, remove with a press	Install with Special Tool 9333 , using a press
22	Cup spring	1		
23	Piston D	1	To remove, apply compressed air across the oil feed bore	Grease seals with vaseline and press them carefully into cylinder, making sure the piston does not bind
24	Round seal	1		Replace
25	Round seal	1		Replace
26	Retainer ring (split)	1	Remove with Special Tool 9332 and a bar magnet, using a press	Install with Special Tool 9332 , using a press
27	Cup spring	1		
28	Piston C	1	To remove, apply compressed air across the oil feed bore	Do not confuse with piston C'. Grease seals with vaseline and press carefully into cylinder, making sure the piston does not bind.
29	Round seal	1		Replace
30	Round seal	1		Replace
31	Woodruff key	1		Place exactly into center of cutout of cylinder CD
32	Cylinder CD	1		

Dismantling and assembly notes

Dismantling

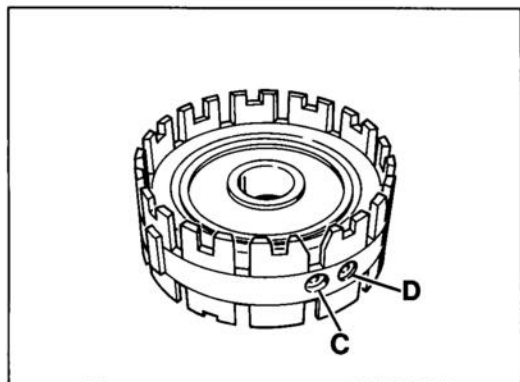
1. Remove retainer ring with Special Tool 9332 and a bar magnet, using a press.



874-38

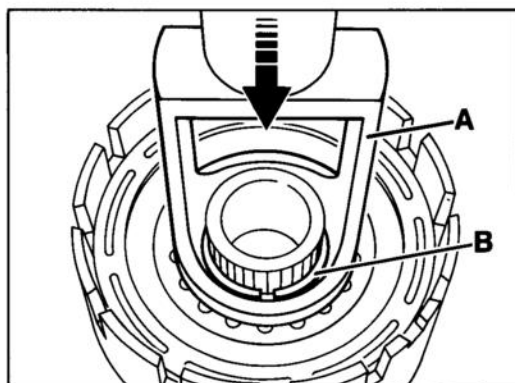
- A - Special Tool 9332
B - Split retainer ring

2. Remove pistons C and D by applying compressed air across the oil feed bores.



875-38

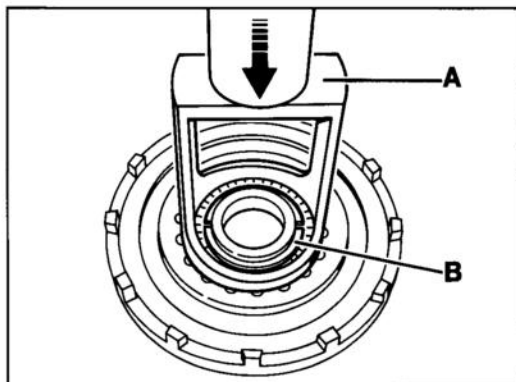
3. Remove snap ring with Special Tool 9332 and suitable pliers, using a press.



915-38

- A - Special Tool 9332
B - Snap ring

3. Remove retainer ring with Special Tool 9332 and a bar magnet, using a press.

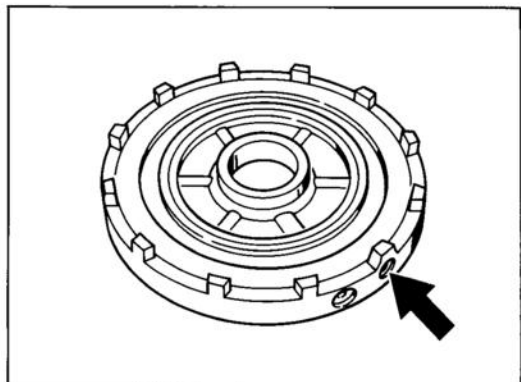


872-38

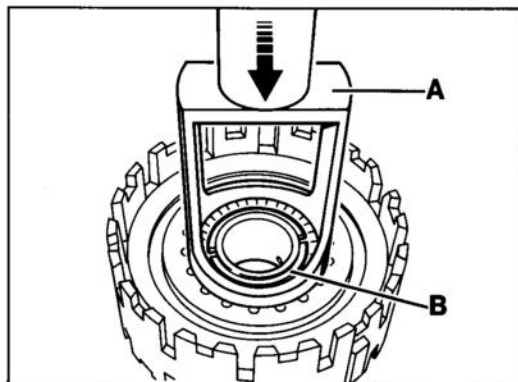
- A - Special Tool 9332
B - Split retainer ring

4. Remove piston C' by applying compressed air across the oil feed bore.

2. Install retainer ring with Special Tool 9332, using a press.



873-38



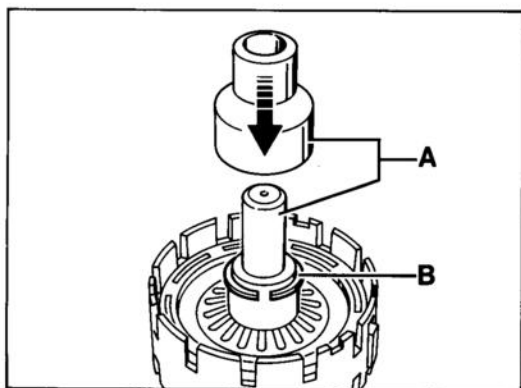
874-38

Assembly

1. Install snap ring with Special Tool 9333, using a press.

3. Coat discs with ATF fluid.

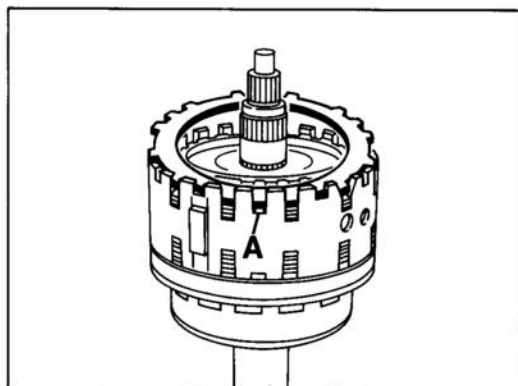
4. Place end disc (No. 10) into position so that the center tooth of the three adjacent teeth rests on the three notches (with cast lugs) of cylinder CD.



879-38

A - Special Tool 9333

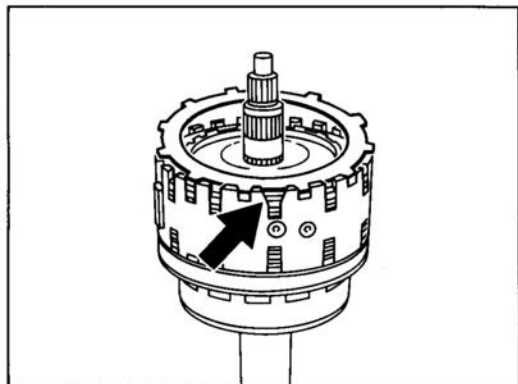
B - Snap ring



877-38

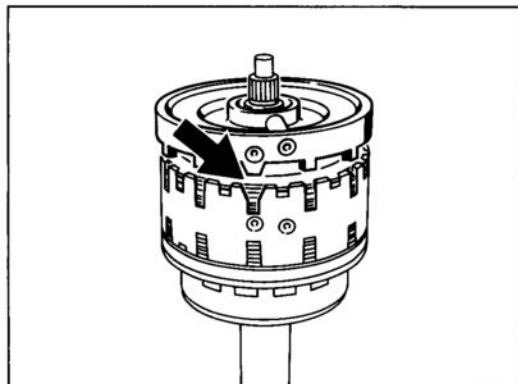
A - Lugs

5. The outer teeth of the outer discs C' must not protrude into the bevelled cutout of the cylinder.



878-38

6. Place centering plate in position so that the bevelled cam fits into the corresponding bevelled cutout of cylinder CD.



876-38

Determining air gap of brakes C', C and D

Brakes C' and C

Brake C'

Specification: 0.55...1.97 mm

Brake C

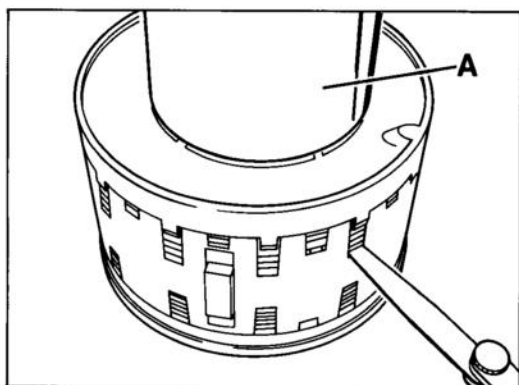
Specification: 0.63...2.40 mm

Determine air gap with a feeler gauge

Note

To avoid false readings, place centering plate under a suitable load (e.g. Special Tool 9508/1).

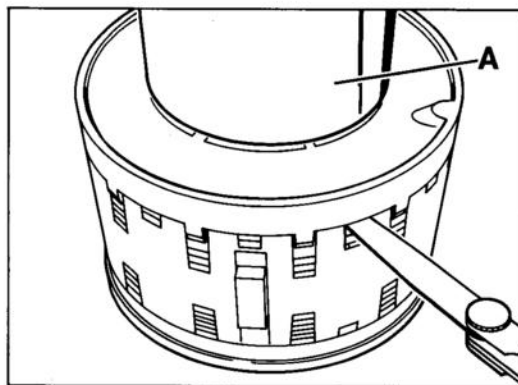
Brake C'



921-38

A - Special Tool 9508/1

Brake C



922-38

A - Special Tool 9508/1

If the wear limit has been reached, all discs must be replaced.

Brake D

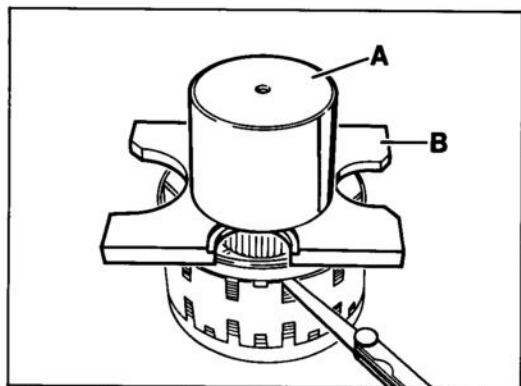
Specification: 1,34...2,39 mm

The air gap may be adjusted using the adjustment outer disc (18) available in a variety of thicknesses.

Determine air gap with a feeler gauge.

Note

To avoid false readings, place support ring under a suitable load (e.g. Special Tool 9508/1).



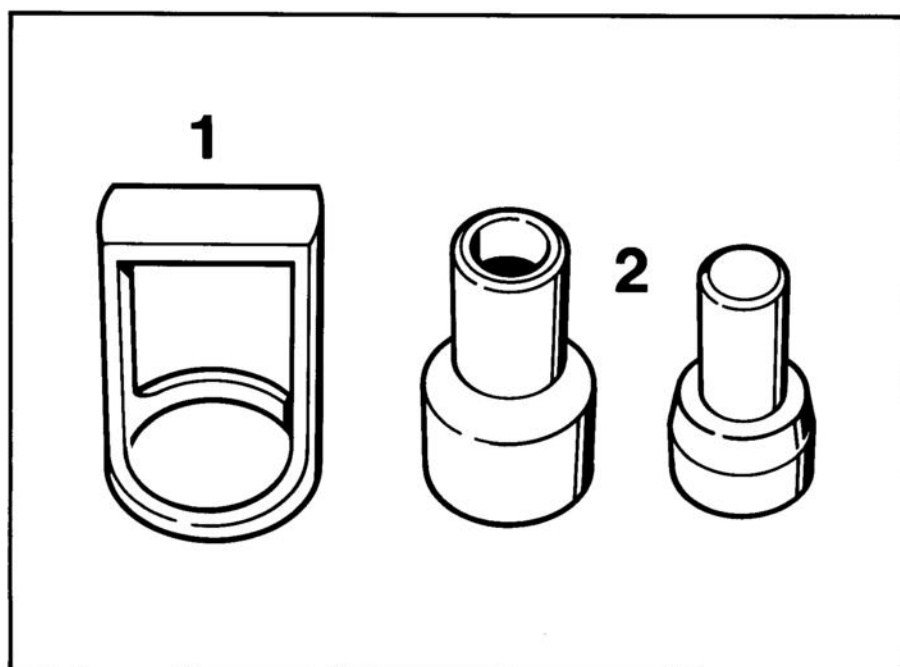
923-38

A - Special Tool 9508/1

B - Special Tool VW 402

If the wear limit has been reached, all discs must be replaced and the air gap must be re-adjusted with the adjustment outer disc (18).

Dismantling and assembling clutch B



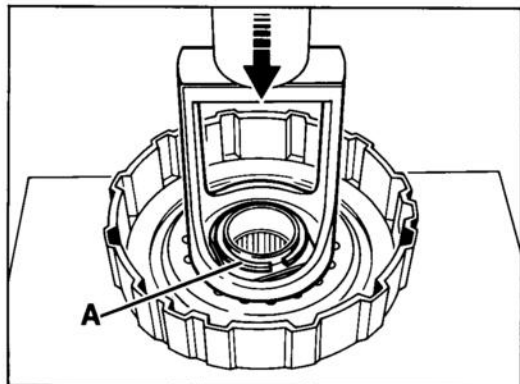
909-38

No.	Designation	Special tool	Order number	Explanation
1	Thrust piece	9332	000.721.933.20	
2	Assembly sleeve	9330/1	000.721.933.01	

Dismantling and assembly notes

Dismantling

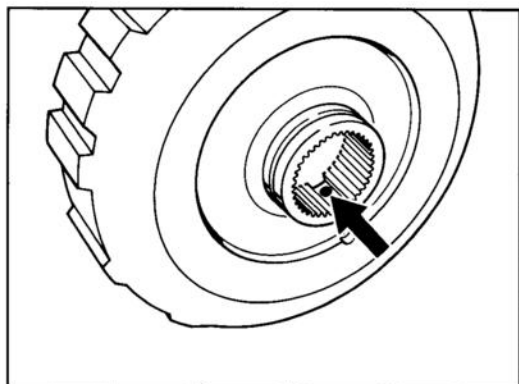
1. Remove snap ring with Special Tool 9332 using a press.



866-38

A = Snap ring

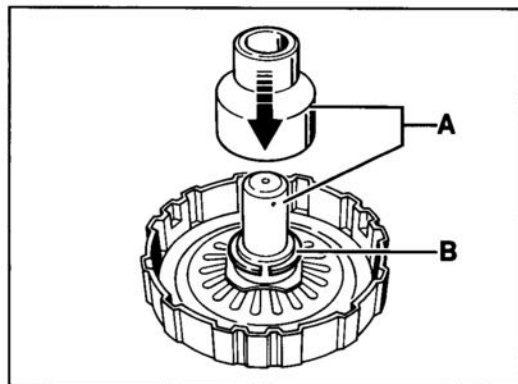
2. To loosen, apply compressed air across the oil feed bore and take out by knocking lightly on a wooden support.



867-38

Assembly

1. Fit snap ring, placing internal section of Special Tool 9330/1 into position and pushing snap ring up to the taper. Then use outer section of Special Tool 9330/1 and a press to push the snap ring into the groove.



865-38

A = Special Tool 9330/1
B = Snap ring

2. Coat discs with ATF fluid.

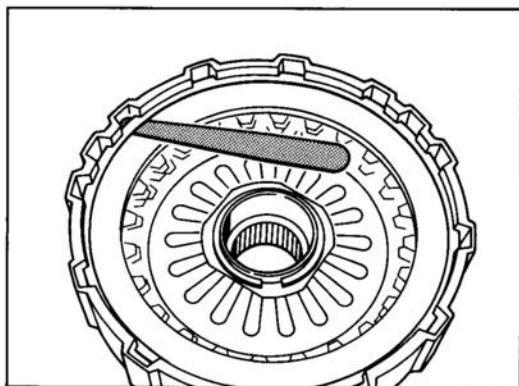
Measuring the air gap

Standard: 1.23...1.57 mm

Note

The air gap can be adjusted with the snap ring (No. 1) that is available in three thicknesses (1.5 - 2.0 - 2.5 mm).

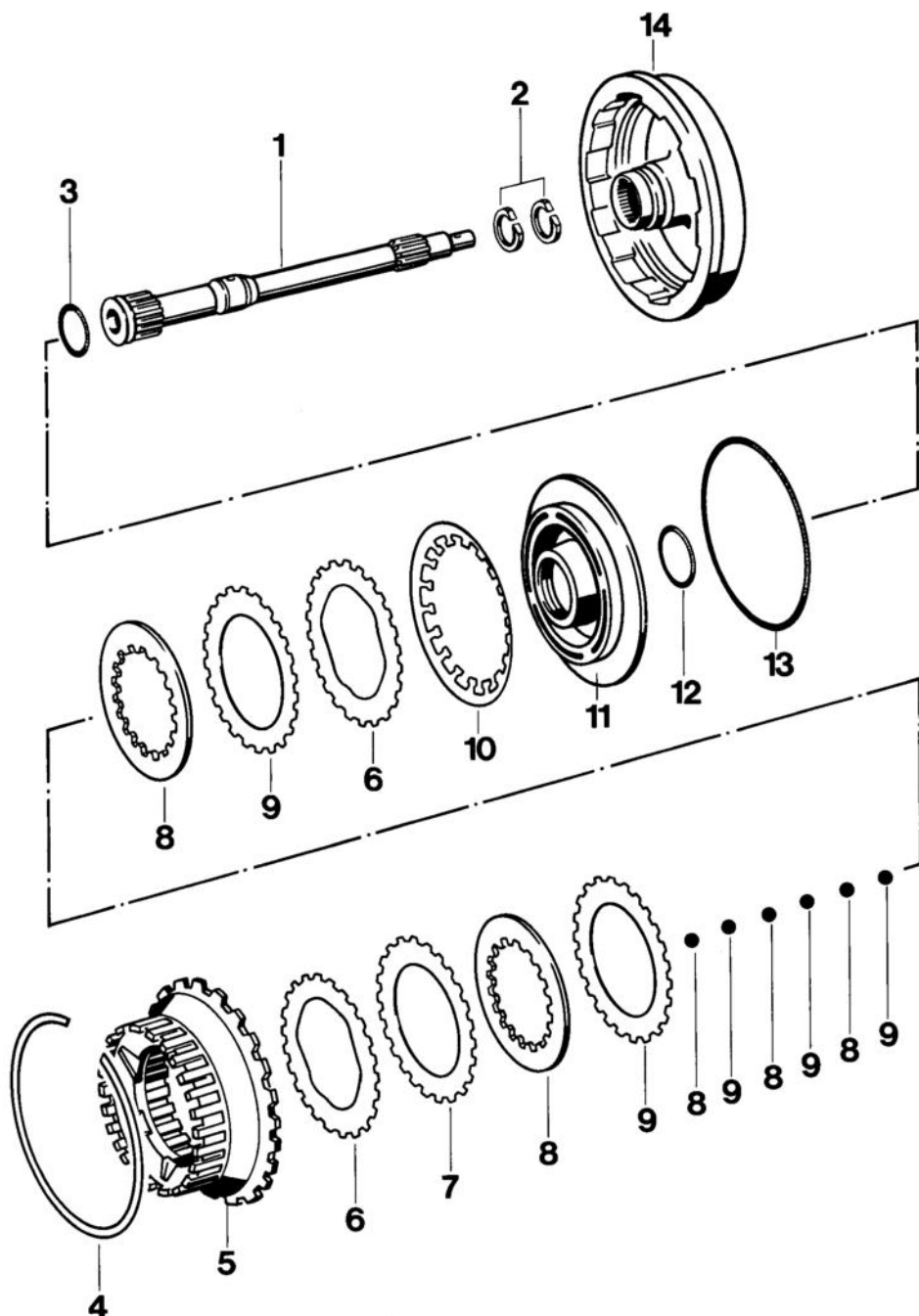
1. Use a screwdriver to press snap ring upwards along its entire circumference and measure air gap with a feeler gauge. If the wear limit has been reached, the entire disc pack must be replaced and the thickness of the snap ring must be redetermined.



917-38

Dismantling and assembling clutch A

Dismantling and assembling clutch A



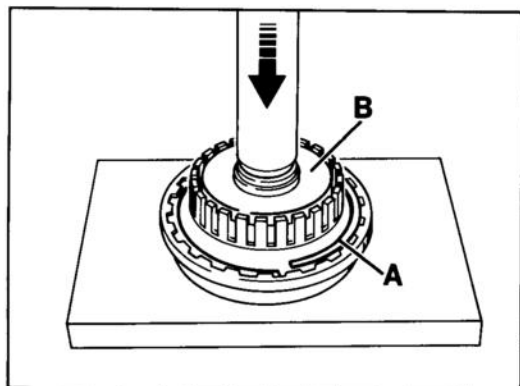
905-38

No.	Designation	Qty.	Note:	
			Removal	Installation
1	Drive shaft	1	Separate from cylinder by tapping lightly on a wooden support	
2	Rectangular ring	2		
3	Round seal	1		Replace, coat with vaseline
4	Snap ring	1	Remove with a suitable thrust piece (e.g. plate of 9329), using a press	Install with a suitable thrust piece (e.g. plate of 9329), using a press
5	Disc pack AB	1		
6	Spring disc	2		
7	Adjustment outer disc	1	Record thickness for reassembly	Refit old discs or use new disc of the same thickness
8	Inner disc	5		Wear limit: Thickness below 1.5 mm
9	Outer disc	5		
10	Cup spring	1		Install in correct position
11	Piston	1	To remove, apply compressed air across oil feed bore	Grease sealing rings (use vaseline) and press carefully into cylinder, making sure the piston does not bind.
12	Round seal	1		Replace
13	Round seal	1		Replace
14	Cylinder	1		

Dismantling and assembly notes

Dismantling

1. Press down disc carrier with a suitable thrust piece (e.g. plate of 9329) using a press, and take out snap ring.

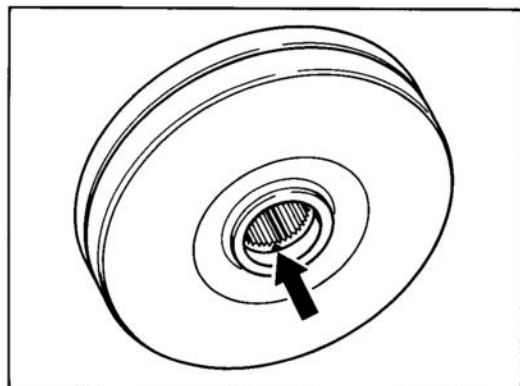


868-38

A - Snap ring

B - Plate of Special Tool 9323

2. To remove piston, apply compressed air across the oil feed bore.



869-38

Assembly

1. If the wear limit of the inner discs has been reached, the entire disc pack must be replaced along with the old adjustment outer disc.
2. Coat discs with ATF fluid.