

VOLVO

Service Manual

Reconditioning

Section 4 (43)

Reconditioning
automatic
transmission

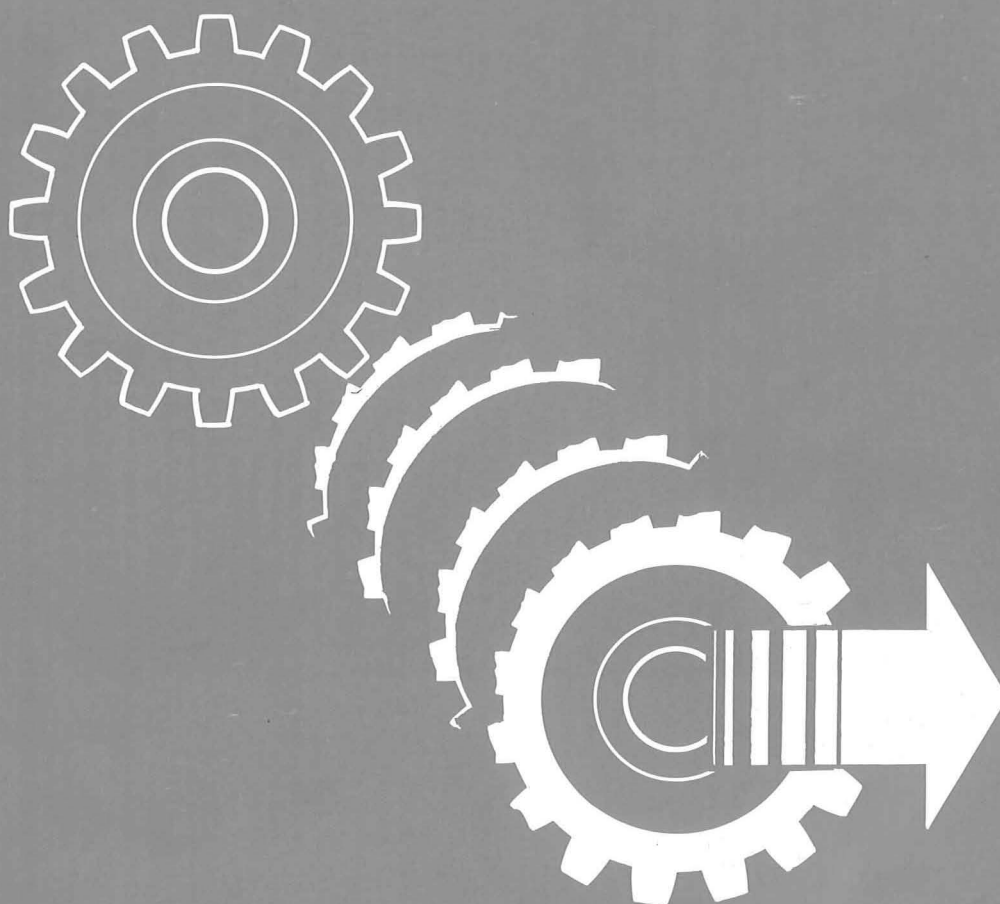
AW 70/70 L

AW 71/71 L

AW 72 L

700, 1982-19 ..

TP 31635/1



Volvo Cars North America

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This manual deals only with reconditioning of the transmission unit itself. See separate manuals regarding work on the transmission in the car, as well as its removal and installation.

Order No. TP 31635/1

We reserve the right to make alterations without prior notification.

Specifications

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Identification of transmission



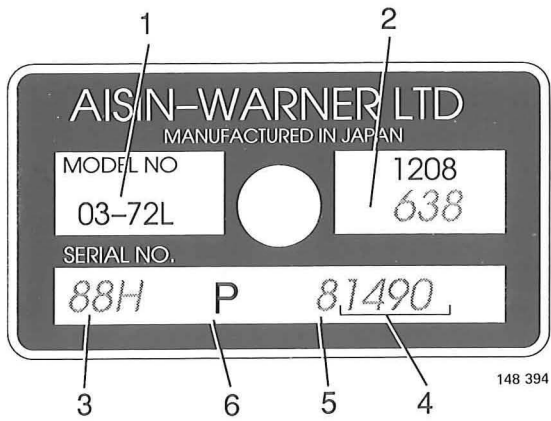
148 396

148 395

This manual deals with reconditioning of the following automatic transmissions installed in models from 1982 on:

- **AW 70**
- **AW 70 L** (L indicates that unit is equipped with lock-up function)
- **AW 71**
- **AW 71 L** (L indicates that unit is equipped with lock-up function)
- **AW 72 L** (AW 72 is available only with lock-up function)

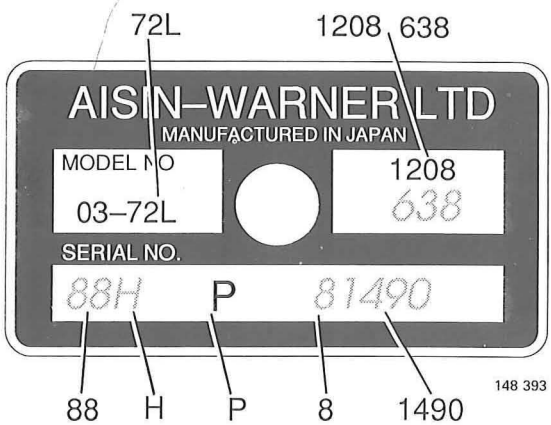
The transmission is identified from the product plate on the left-hand side of the unit.



Identification

The product plate on the unit specifies:

1. Type designation
2. Volvo part number
3. Year and month of manufacture
4. Serial number (four-digit)
5. Figure 8 indicates that transmission has been manufactured for Volvo
6. Transmission type code



Example:

- 72 L – AW 72 L
- 1208638 – Volvo part number (as from 1983)
- 88 – Manufactured in 1988
- H – Manufactured in August (A = January, B = February.... M = December. I is not used)
- P – AW 72 L (C = AW 70, K = AW 70 L, F = AW 71 and H = AW 71 L)
- 8 – Transmission manufactured for Volvo
- 1490 – Aisin-Warner serial number (commences with 0001 each month)

Specifications

Clearances

Oil pump: Pump housing – ring gear (runner)	0.07–0.15 mm (0.0027–0.010 in)
arc segment – ring gear	0.11–0.14 mm (0.0043–0.010 in)
axial clearance	0.02–0.05 mm (0.0007–0.0019 in)
Brake BO: Clearance between clutch pressure plate and retaining ring	0.35–1.60 mm (0.01–0.06 in)
Clutch C2, brakes B1 and B2: Clearance between clutch pressure plate and retaining ring	0.3–1.2 mm (0.01–0.05 in)
Input shaft, clutch CO, axial clearance	0.3–0.9 mm (0.01–0.04 in)
Output shaft, axial clearance	0.3–0.9 mm (0.01–0.04 in)

Transmission fluid

Type	Models to 1983 inclusive: ATF, type F or G Models from 1984 on: ATF, type Dexron II D
Capacity	7.5 l (approx. 2.5 l in torque converter)

Transmission by model year and engine type

Model year	Engine	Trans- mission	Volvo P/N
1990–	B 230 FT (Eur) ¹⁾	AW 71 L	1208643
1990–	B 230 FT (USA)	AW 71	1208642
1989–	B 234 F (USA)	AW 72 L	1208666
1989–	B 234 F (Eur)	AW 72 L	1208667
1989–	B 230 FT	AW 71	1208661
1989–	B 200 F (Fi)	AW 70	1208659
1989–	B 230 F (Eur)	AW 70 L	1208652
1989–	B 234 F (Eur)	AW 72 L	1208638
1989	B 234 F (USA)	AW 72 L	1208637
1989–	B 230 F ²⁾	AW 70 L	1208604
1987–1988	B 230 F (USA)	AW 70 L	1208563
1987–	B 280 E (Eur)	AW 71	1208534

Model year	Engine	Trans- mission	Volvo P/N
1987–	B 280 E (No)	AW 71	1208533
1987–	B 280 F	AW 71	1208532
1986–	B 230 K	AW 71 L	1208417
1985–	B 200 E	AW 70	1208415
1985–1987	B 230 K	AW 71 L	1208371
1985–1987	B 28 A	AW 71	1208360
1984–	B 23/B 230 FT	AW 71	1208334
1985–1987	B 19/B 200 K	AW 70	1208332
1984–1985	B 19 E	AW 70	1208314
1982–1987	B 28 E	AW 71	1208310
1985–1987	B 230 A	AW 71	1208304
1984–1985	B 23 E	AW 71	1208300
1983–1987	B 28 F	AW 71	1208248

¹⁾ New turbocharger unit from 1990 on

²⁾ USA, Canada, Japan, Australia

Kickdown cable, torque converter

Length of cable projecting into engine compartment with cable attached to transmission		Kickdown cable										Torque converter							
		980/79	900/115	1072/79	770/76	770/76	900/179	590/177	900/130	900/99									
Length, cable sleeve																			
Marking, kickdown cable		yell./pi.	yell./yell.	yell./whi.	yell./whi./blu.	yell./whi./pi.	yell./whi./yell.	yell./red/whi.	yell./red/red	yell./red/blu.	6 CYL. 248 mm 177K	4 CYL. 248 mm 190K	4 CYL. 248 mm 217K	4 CYL. 254 mm 206K	4 CYL. 254 mm 206K	4 CYL. 254 mm 190K	4 CYL. 248 mm 217K	6 CYL. 248 mm 177K	4 CYL. 254 mm 217K
Volvo P/N, kickdown cable		1239930	1239932	1239933	1239934	1340044	1340048	1377680	3502073	3520189	1239685	1239686	1239882	1239940	3520962	3502496	1340122	1340134	6814907
Transmission Volvo P/N																			
AW 71 L	1208643		•											•					
AW 71	1208642		•									•							
AW 72 L	1208666									•		•							•
AW 72 L	1208667									•									•
AW 71	1208661		•									•							
AW 70	1208659	•											•						
AW 70 L	1208652		•											•					
AW 72 L	1208638								•										•
AW 72 L	1208637								•			•							•
AW 70 L	1208604		•											•					
AW 70 L	1208563		•											•					
AW 71	1208534							•											•
AW 71	1208533							•											•
AW 71	1208532							•											•
AW 71 L	1208417						•						•						
AW 70	1208415	•										•							
AW 71 L	1208371						•						•						
AW 71	1208360				•					•									
AW 71	1208334		•									•							
AW 70	1208332						•					•							
AW 70	1208314	•										•							
AW 71	1208310			•							•								
AW 71	1208304				•							•							
AW 71	1208300	•										•							
AW 71	1208248		• ¹⁾								•								

¹⁾ 1233359 to March 1982 incl.

Kickdown cable, torque converter

Thickness of new plate Min. dimension in brackets ().	CO 1 off		BO 3 off		C1 4 off	C2 3 off	B1 1 off	B2 3 off		B3 5 off*
	1.70 mm (1.53)	2.30 mm (2.10)	1.70 mm (1.53)	2.30 mm (2.10)	2.30 mm (2.10)	2.30 mm (2.10)	2.30 mm (2.10)	2.00 mm (1.85)	2.30 mm (2.10)	2.30 mm (2.10)
Transmission Volvo P/N										
AW 71 L 1208643		•	•		•	•	•		•	•
AW 71 1208642		•	•		•	•	•		•	•
AW 72 L 1208666		•	•		•	•	•	•		•
AW 72 L 1208667		•	•		•	•	•	•		•
AW 71 1208661		•	•		•	•	•		•	•
AW 70 1208659		•		•	•	•	•		•	•
AW 70 L 1208652		•		•	•	•	•		•	•
AW 72 L 1208638		•	•		•	•	•	•		•
AW 72 L 1208637		•	•		•	•	•	•		•
AW 70 L 1208604		•		•	•	•	•		•	•
AW 70 L 1208563		•		•	•	•	•		•	•
AW 71 1208534	•		•		•	•	•		•	•
AW 71 1208533	•		•		•	•	•		•	•
AW 71 1208532	•		•		•	•	•		•	•
AW 71 L 1208417		•	•		•	•	•		•	•
AW 70 1208415		•		•	•	•	•		•	•
AW 71 L 1208371		•	•		•	•	•		•	•
AW 71 1208360		•	•		•	•	•		•	•
AW 71 1208334		•	•		•	•	•		•	•
AW 70 1208332		•		•	•	•	•		•	•
AW 70 1208314		•		•	•	•	•		•	•
AW 71 1208310		•	•		•	•	•		•	•
AW 71 1208304		•	•		•	•	•		•	•
AW 71 1208300		•	•		•	•	•		•	•
AW 71 1208248		•	•		•	•	•		•	•

* AW 70, 4 plates

Specifications

Valve spring specifications

Spring for	Designation in manual	Free length (mm)	Active turns	Wire dia. (mm)	Outside dia. (mm)	Remarks
Accumulator B2	B2	66.7	14.0	2.8	17.3	AW 70 (1208820, 284)
		68.3	13.0	2.6	17.9	AW 70 (1208320)
		66.7	12.0	3.2	20.4	AW 71
Accumulator C2	C2	61.2	11.5	2.5	16.5	AW 70
		55.2	8.5	2.0	15.9	AW 71
		32.2	6.5	1.6	14.7	AW 72 L, orange ²⁾
		43.6	9.5	1.8	14.3	AW 72 L, blue ²⁾
		68.6	15.5	2.0	17.5	AW 70, AW 71
Accumulator C1	C1	64.8	13.0	2.0	17.2	AW 70 (1208320)
Governor valve	—	20.6	1.5	0.9	9.1	
Kickdown valve	1A	21.9	8.0	0.7	8.6	
Throttle valve	2A	43.0	15.5	1.2	10.9	
Detent regulator valve	6B	31.4	13.5	0.9	8.9	
Modulator valve, manual 3–2						
type 1	5B	25.6	11.5	1.1	9.0	AW 70
type 2	5B	27.3	9.5	1.1	9.0	AW 71, AW 72 L
Control valve, rear clutch	4C	37.6	14.5	1.2	9.2	
Governor modulator valve	(3B)	36.1	12.0	0.7	9.1	AW 70, AW 71
Modulator valve, manual 2–1	2B	42.4	15.0	0.8	9.2	earlier type, yellow
Downshift valve manual 3–2	1B	35.1	12.5	0.8	9.0	
Downshift valve, manual 2–1	3C	34.6	13.0	0.6	7.6	
Shift valve, manual 4–3	2C	—	—	—	—	No spring
Relief valve	1C	32.1	9.0	2.0	13.1	
By-pass valve	13C	33.3	7.0	1.,	13.8	
Shift valve 3–4						
type 1	6C	37.9	14.5	1.1	10.6	AW 70
type 2	6C	33.65	14.5	1.1	10.6	AW 71
Primary valve						
type 1	8C	73.3	15.0	1.6	16.7	AW 70
type 2	8C	61.2	13.0	1.8	17.2	AW 71
Secondary regulator valve	3A	71.3	15.0	1.9	17.4	
Signal valve, lock-up	9C	37.8	12.5	1.1	9.6	AW 70 L (1208652)
	9C	37.0	13.0	1.1	9.6	AW 72 L, green
	9C	37.4	13.5	1.1	9.7	AW 71 L (1208417, 643)
						AW 70 L (1208563, 604)
						dark red
Changeover valve, lock-up	10C	18.5	13.5	0.5	5.2	white

Note: The table may be used only for identifying the springs during assembly. A spring is not necessarily defective if a parameter, such as the spring length, does not agree exactly with the specified value. Special test equipment is required to determine whether or not the spring characteristics are acceptable.

¹⁾ A = Upper front valve body

B = Upper rear valve body

C = Lower valve body

²⁾ Two springs in accumulator piston C2

Accumulator pistons, accumulator springs

Transmission Volvo P/N	Accumulator piston			Accumulator springs																								
	C1	C2	B2	C1	C2						B2																	
	1239584	1239825	1340064 (double springs)	1239823	1340127 (double springs)	1239583	1239953 (yellow)	1340060 (black)	1239746 (yellow)	1239824 (white)	1239926 (orange)	1340041	1340062 (white)	1340063 (red)	3520954 (green)	1340128 (blue)	3520337 (green)	3502176 (orange)	1239822 (light green)	1239876 (red)	1239952 (green)	1340035 (light grey)	1340132 (light grey)	1340131 (red)	3502156 (light green)	3502174 (natural)	3502176	6814941 (yellow)
AW 71 L 1208643 ¹	•		•	•			•						•	•														•
AW 71 1208642 ¹	•		•	•			•						•	•						•								
AW 72 L 1208666 ¹	•		•	•			•								•		•											•
AW 72 L 1208667 ¹	•		•	•			•								•		•											•
AW 71 1208661	•	•		•			•				•											•						
AW 70 1208659	•	•		•		•										•										•		
AW 70 L 1208652 ²	•	•		•			•	•															•	•				
AW 72 L 1208638 ¹	•		•	•			•								•		•											•
AW 72 L 1208637 ¹	•		•	•			•								•		•											•
AW 70 L 1208604 ²	•	•		•			•	•															•	•				
AW 70 L 1208563 ²	•	•		•			•	•															•	•				
AW 71 1208534 ^{1,2}	•		•	•			•						•	•										•			•	
AW 71 1208533 ¹	•		•	•			•								•		•									•		
AW 71 1208532 ¹	•		•	•			•								•		•									•		
AW 71 L 1208417 ^{1,2}	•		•	•			• ⁴	• ³					•		•								•	•				
AW 70 1208415	•	•		•		•		•															•					
AW 71 L 1208371 ¹	•		•	•			• ⁴	• ³					•	•					•									
AW 71 1208360	•	•		•			• ⁴	• ³				•								•								
AW 71 1208334	•	•		•			• ⁴	• ³				•											•					
AW 70 1208332	•	•		•		•		•															•					
AW 70 1208314	•	•		•		•		•															•					
AW 71 1208310	•	•		•			• ⁴	• ³		•								•										
AW 71 1208304	•	•		•			• ⁴	• ³			•											•						
AW 71 1208300	•	•		•			•			•													•					
AW 71 1208248	•	•		•		• ⁴	• ³	•										•										

¹ Double springs in piston C2.² Double springs in B2.³ From May 1985.⁴ To April 1985 inclusive.

Torques**Important!**

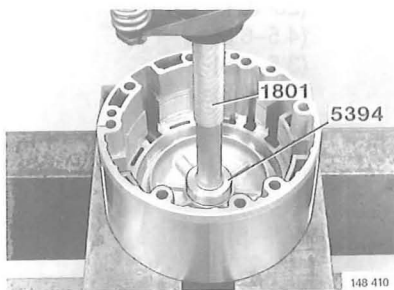
Automatic transmissions are manufactured almost exclusively from aluminium alloy (light alloy) with bolt and screw threads cut directly in the material. Consequently, it is extremely important that the bolts and screws engage the threads correctly and that they are tightened to the correct torque.

Bolt location	Nm	(ft.lb)
Torque converter housing – engine, M 10	35–50	(26–37)
M 12	55–90	(41–66)
Drive plate – torque converter	41–50	(30–37)
Centre support – gearbox housing:		
Tighten alternately in steps of 7 Nm (5 ft.lb)	24–28	(18–21)
Pump body – pump cover	6–9	(4.5–6.5)
Pump – gearbox housing	22–28	(16–21)
Parking pawl, locking plate	6–9	(4.5–6.5)
Torque converter housing – gearbox housing		
4 x M 10	27–42	(20–31)
2 x M 12	48–68	(34–50)
Rear extension housing – gearbox housing	27–47	(20–35)
Valve body, for cam, M 6	6–9	(4.5–6.5)
other bolts, M 5	5–6	(3.5–4.5)
Strainer – lower valve body	5–6	(3.5–4.5)
Cover plate – gearbox housing (governor), M 6	6–9	(4.5–6.5)
Control system – gearbox housing	8–12	(6–9)
Oil sump – gearbox housing	4–5	(3–3.5)
Coupling flange – output shaft	40–50	(30–37)
Plug, pressure gauge tapping	5–9	(3.5–5)
Oil cooler connections – gearbox housing	20–30	(15–22)
Speedometer drive, mounting	4–6	(3–4.5)
Nut, fluid filler tube	80–90	(59–66)
Solenoid valve	10–16	(7–12)
Drain plug, oil sump	18–23	(13–17)

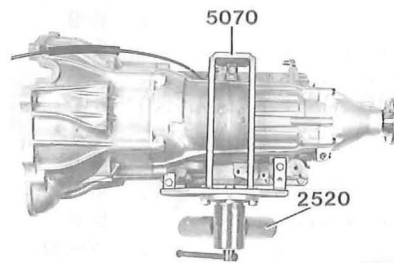
* Use locking fluid 1161 053-2/1161 054-0

Special tools

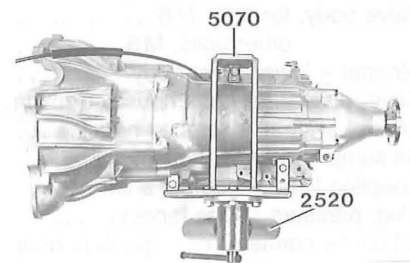
999	Description – use
1801-3	Shaft – for installing needle thrust bearing in overdrive housing
2520-8	Universal stand – for reconditioning work
5070-1	Fixture – for reconditioning work
5071-9	Extractor – for oil pump
5072-7	Press tool – for removing/installing clutch return springs
5073-5	Press tool – for removing return springs, brake B3
5075-0	Drift – for installing seal/drive flange in rear extension housing
5077-6	Centering clamp – for aligning oil pump assembly
5117-0	Drift – for installing oil pump seal



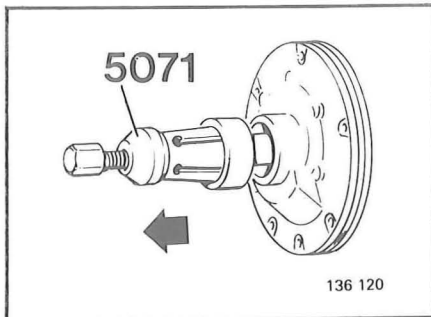
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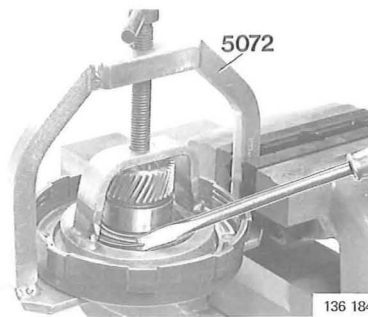
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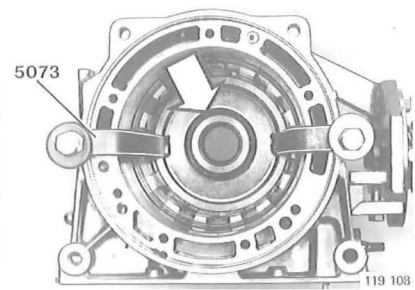
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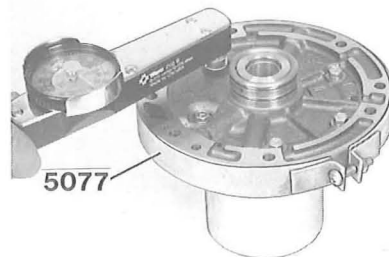
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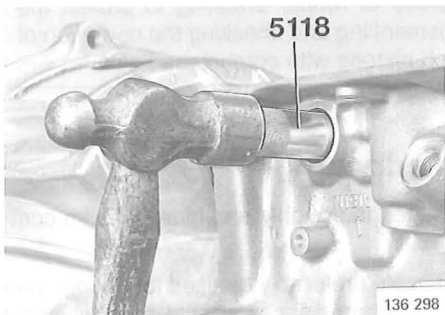


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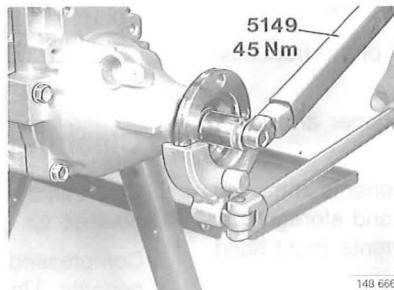


5117

999	Description – use
5118-8	Drift – for installing gear selector shaft seal
5149-3	Counterhold – for holding drive flange
5231-9	Storage tray – for valve body components
5241-8	Guide pins – for overdrive unit
5304-4	Extractor – for removing drive flange from rear extension housing
5394-5	Sleeve – for installing bearing in overdrive housing
5404-2	Drift – for removing bush in rear extension housing
5971-0	Mounting plate – for setting up dial gauge (measurement of axial clearance)



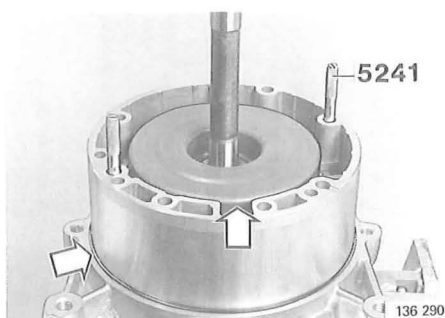
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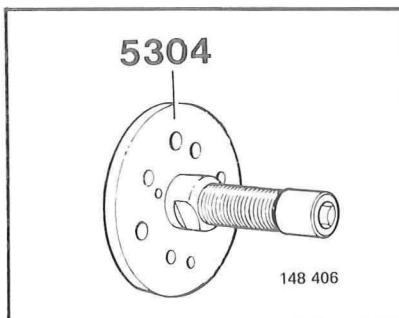
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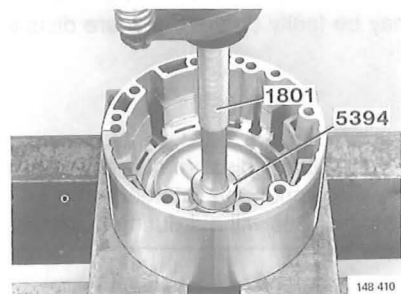
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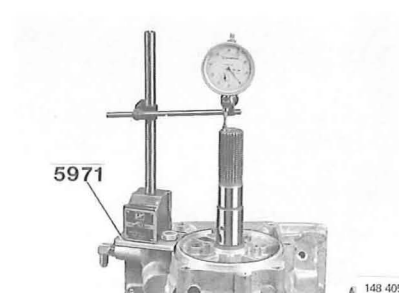
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5404



5971

Pre-dismantling instructions

Working procedures

The working procedures described are, as far as possible, common to the different transmission types. Since the description is based on the AW 72 L unit (with lock-up and kickdown inhibitor), some deviations may be noticed in the illustrations. Differences which affect the working procedures are described in text and illustrations.

Fold-out sheets

Three fold-out sheets are included at the rear of the manual.

Sheet 1 shows the locations and names of the transmission components.

Sheet 2 shows the components of the upper and lower valve bodies.

Sheet 3 shows the locations of the components in the top of the lower valve body (left-hand side) and storage tray **5231**, complete with valve body components (right-hand side).

Dismantling

Inspect the transmission for leakage before dismantling.

Also try to identify any component or components which may be faulty before these are dismantled.

Note: During disassembly of transmission components, keep components in order removed on a suitable workbench. This will aid during transmission assembly.

Do not prise apart components which are stuck. Instead, tap **carefully** with a plastic mallet. Never employ sharp-edged tools, but use well-rounded screwdrivers. Always use a plastic mallet. See also under 'Control system, general'.

Checking operation

Note: Use a piece of rubber sheeting to protect the fingers when dismantling and checking the operation of brake and clutch pistons with compressed air.

Cleaning and drying

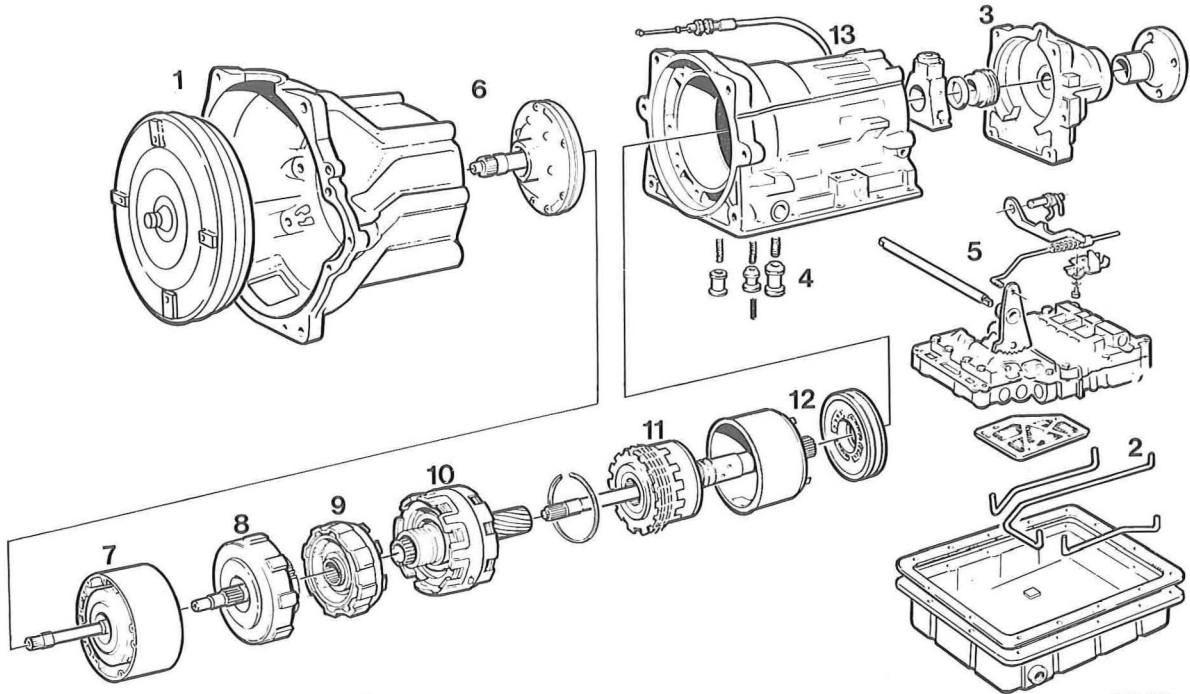
Clean all oil passages thoroughly and blow out with compressed air.

Compressed air should preferably be used for drying components. Under no circumstances should rags or cloths which may leave fluff or threads in the passages be used for this purpose.

Dismantling into main components

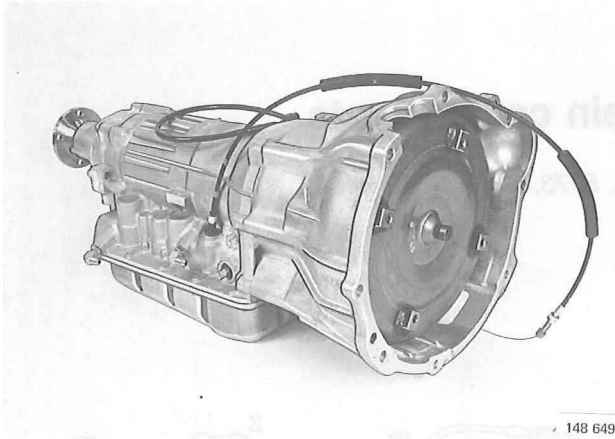
Special tools: 2520, 5070, 5071, 5073, 5149, 5241, 5404

The transmission is dismantled more or less in the numerical order indicated in the figure. See also fold-out sheet 1, page 131.



148 213

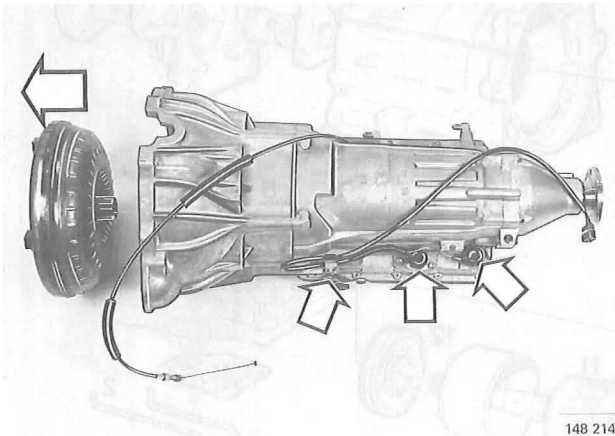
- | | |
|---|---------------------------------------|
| 1. Torque converter | 8. Front clutch, C1 |
| 2. Oil sump, oil pipes and control system | 9. Rear clutch, C2 |
| 3. Extension housing and governor | 10. Centre support unit, B1-F1-B2 |
| 4. Accumulator pistons | 11. Planetary unit, F2 |
| 5. Gear selector mechanism | 12. Brake piston + take-up sleeve, B3 |
| 6. Oil pump and torque converter housing | 13. Gearbox housing and components |
| 7. Overdrive unit, CO-BO | |



A1

Clean unit externally

Locate leakage(s), if any.



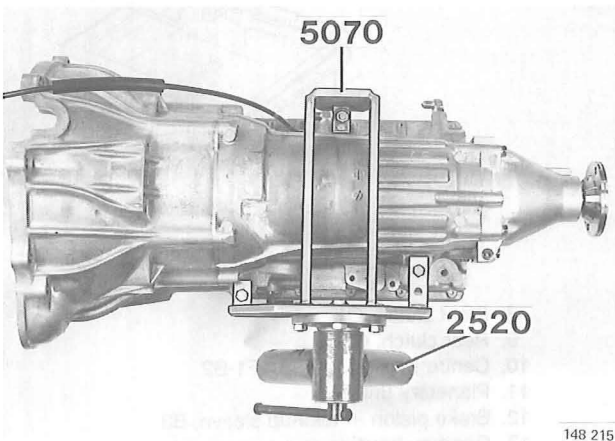
A2

Remove torque converter

Use both hands to withdraw from shaft.

Remove gear change lever

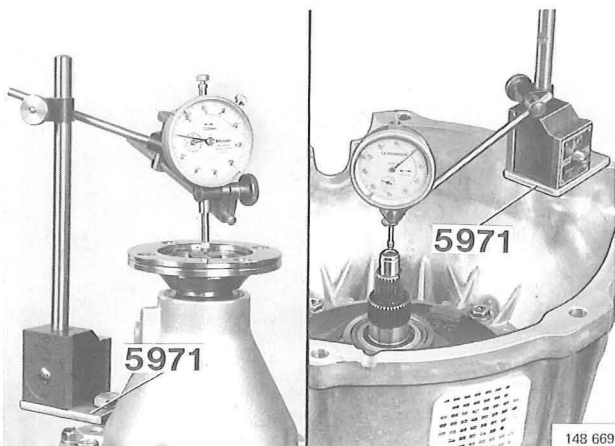
Remove solenoid valve and O-rings, kickdown inhibitor switch, wiring and clips



A3

Attach fixture 5070 to gearbox. Mount fixture and unit on stand 2520

Place container underneath stand to collect oil.



A4

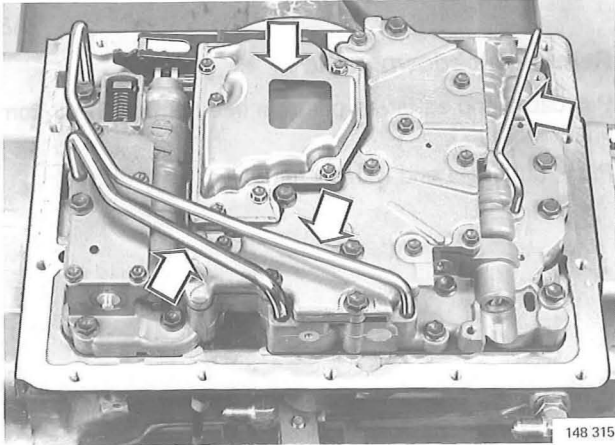
Measure and record axial clearances of input and output shafts

Purpose is to check condition of needle thrust bearings.

Permissible clearance: 0.3–0.9 mm.

Use mounting plate 5971, magnetic stand and dial gauge.

A5



Remove:

- Oil sump and gasket.
- Particle magnets in sump.
(units without lock-up are fitted with one magnet only).
- Oil pipes (3 off) (2 on units without kickdown inhibitor).
- Prise each end alternately with a screwdriver.
- Fluid strainer complete with upper gasket, spacer and lower gasket.

A6

Remove control system mounting screws (17)

Illustration shows location of screws on system with lock-up function.

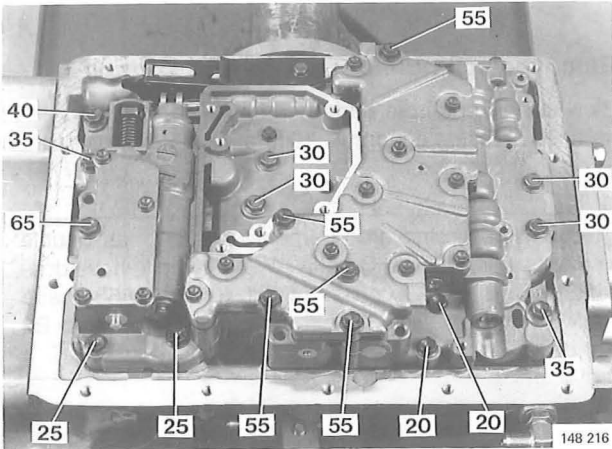
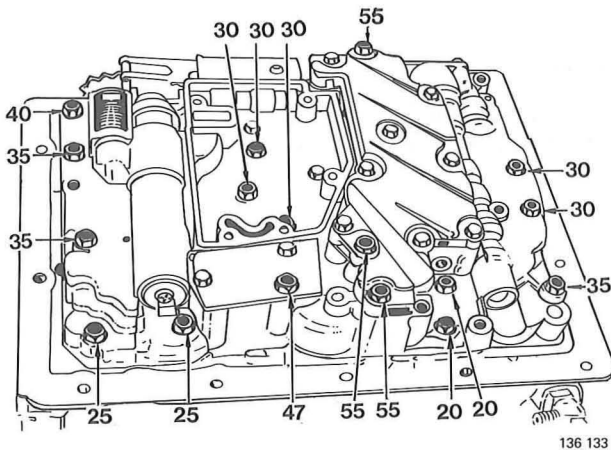


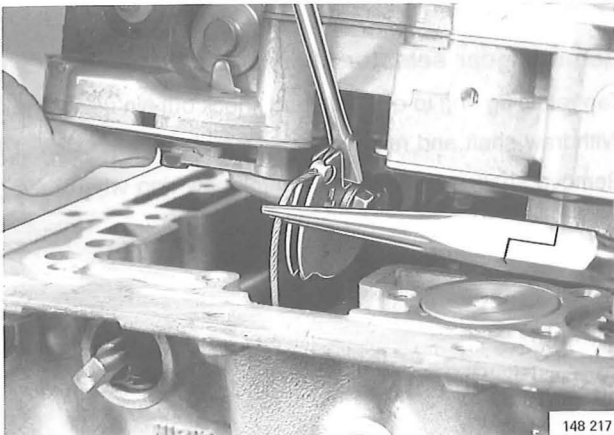
Illustration shows location of screws on control system without lock-up function.

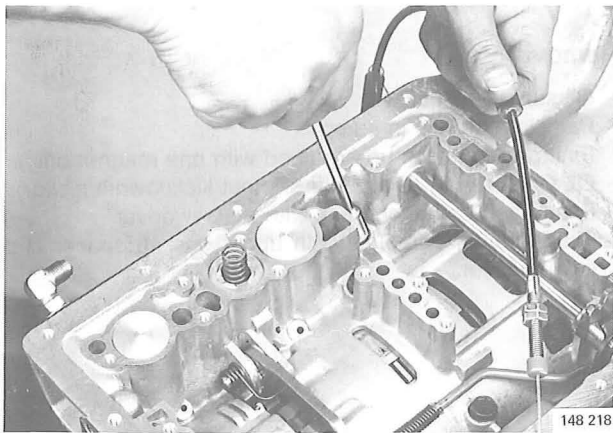


A7

Lift off control system assembly

Raise assembly slightly and release kickdown cable from throttle cam.



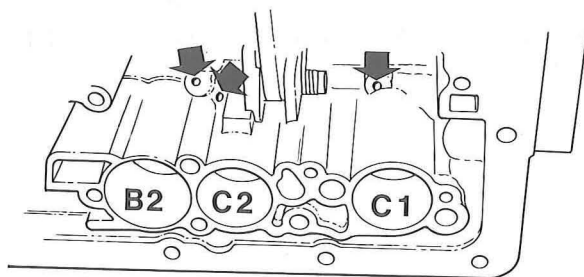


A8

Remove kickdown cable

Pull cable end as far as possible into housing. (Pull from underneath.)

Press out cable end with 10 mm drive.

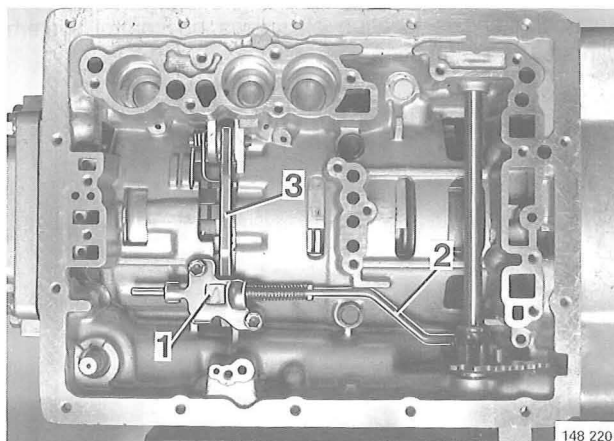


A9

Remove accumulator pistons and springs

Blow out pistons from underneath with compressed air at reduced pressure of approx. 10 kPa. Hold hand over piston to prevent damage.

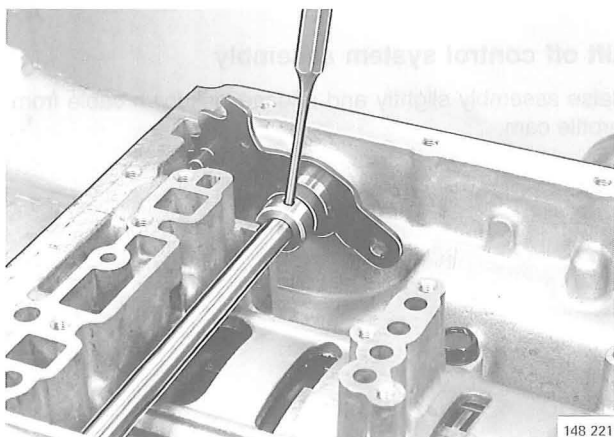
Note: Note spring arrangement. AW 72 L has double springs in piston C2. Certain AW 70/71 units have double springs in C2 or B2. AW 71 (No. 1208534) and AW 71 L (No. 1208417) have double springs in both B2 and C2.



A10

Remove:

- Retainer (1) and pushrod (2).
- Parking pawl complete with spring and spindle (3).



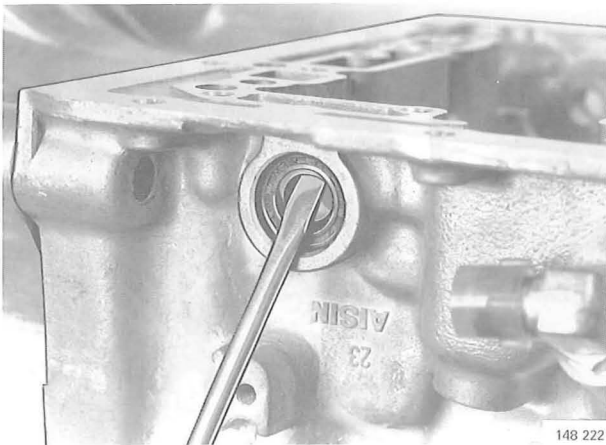
A11

Remove gear selector shaft and cam

Tap retaining ring to one side and knock out pin using drift. Withdraw shaft and remove cam.

Remove shaft retaining ring. (Install new ring when reassembling.)

A12

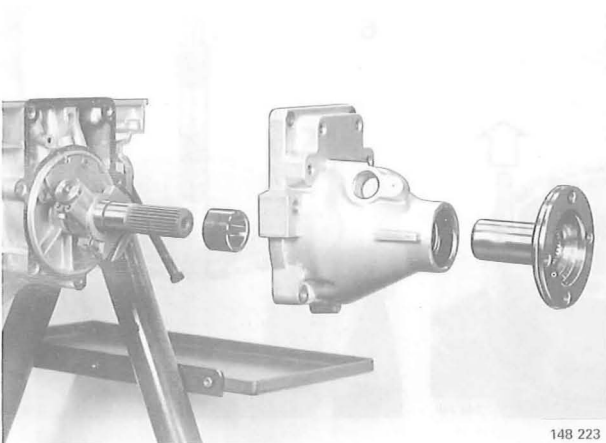


148 222

Remove oil seals from selector shaft

Prise out seals (2 off) with screwdriver.

A13



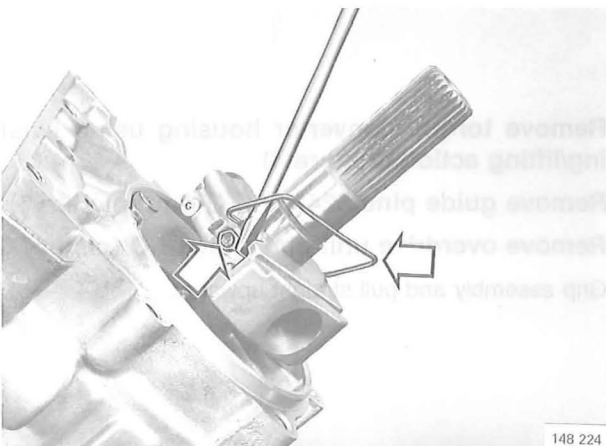
148 223

Remove:

- Drive flange. Use counterhold **5149**.
- Extension housing and gasket.
- Spacer.

Use extractor **5304** if drive flange is seated firmly on shaft.

A14



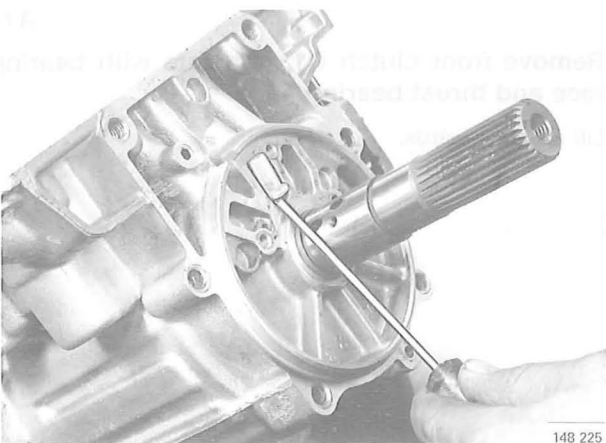
148 224

Remove governor

Bend out locking tab and remove bolt and tab washer.

Remove locking spring, prise out end with screwdriver and withdraw governor from shaft.

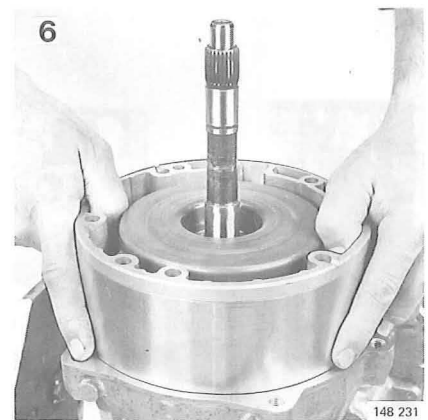
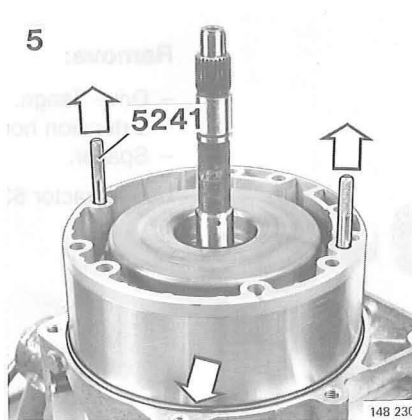
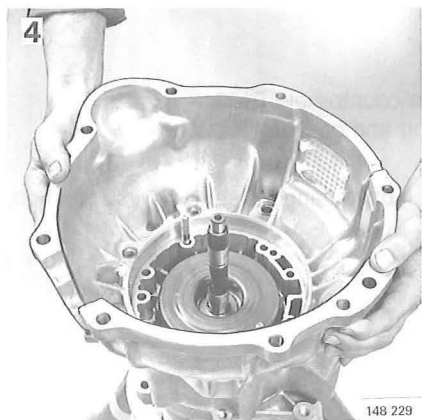
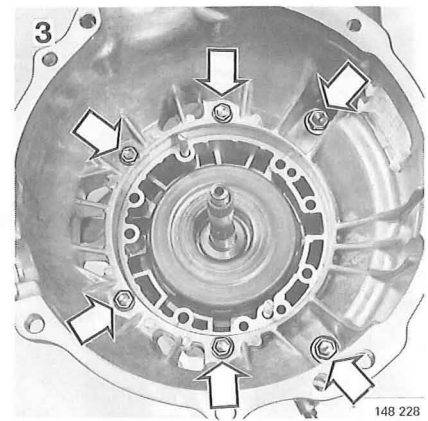
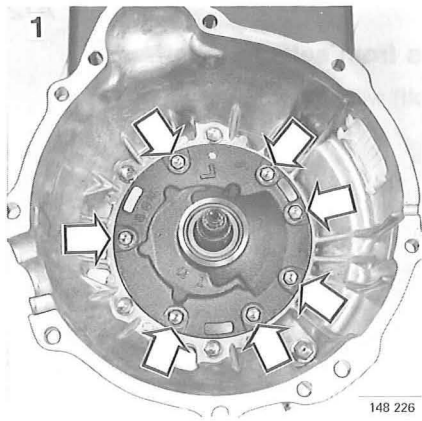
A15



148 225

Remove:

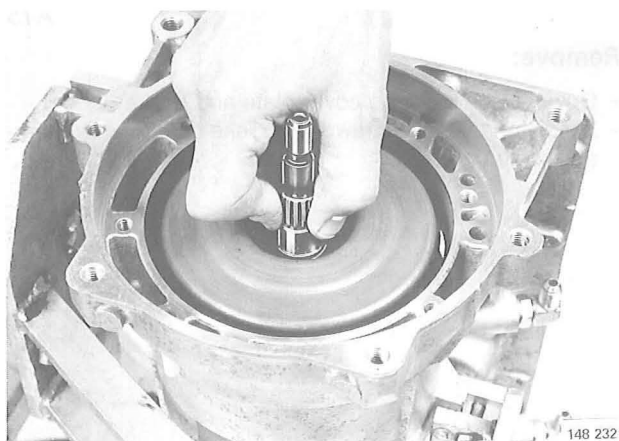
- Governor oil passage cover plate and gasket
- Fluid strainer. Use screwdriver. Take care to avoid damage to strainer!



A16

- Remove oil pump mounting bolts (picture 1)
- Insert guide pins 5241 (picture 2)
- Remove oil pump using extractor 5071 (picture 2)
- Remove torque converter housing bolts (6 off) (picture 3)

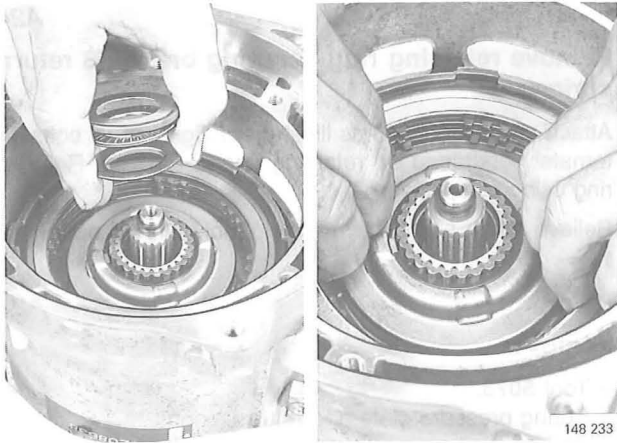
- Remove torque converter housing using twisting/lifting action (picture 4)
- Remove guide pins 5241 and O-ring (picture 5)
- Remove overdrive unit and clutch CO (picture 6)
- Grip assembly and pull straight upwards.



A17

- Remove front clutch C1 complete with bearing race and thrust bearing
- Lift clutch upwards.

A18



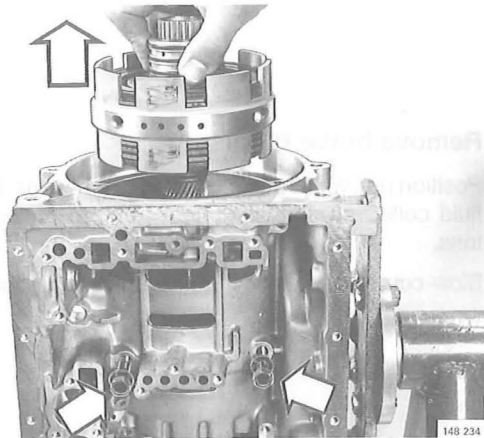
Remove rear clutch bearing races and thrust bearing

(Front race may remain seated in rear of clutch CO.)

Remove rear clutch C2

Grip as illustrated.

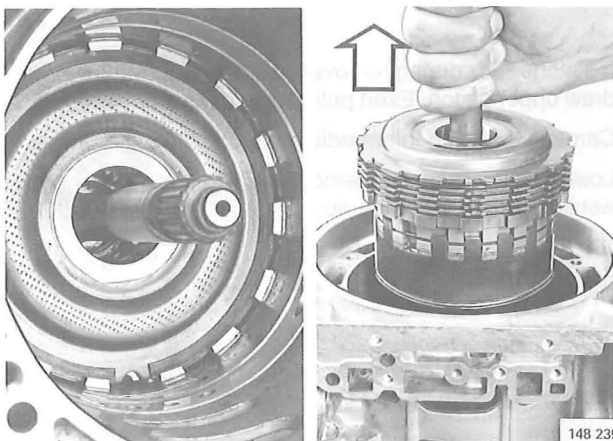
A19



Remove centre support unit

Remove bolts (2 off). Lift centre support unit as illustrated.

A20



Remove reaction plate retaining ring

Use large screwdriver. Prise out retaining ring and work off by degrees using flat-nosed pliers.

A21

Remove planetary drive unit and brake B3 plate assembly

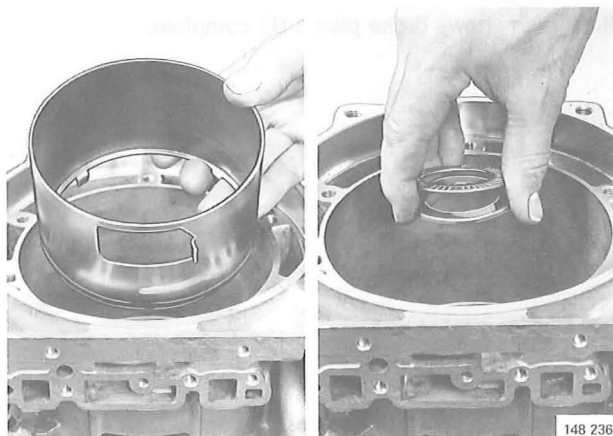
A22

Remove brake B3 take-up sleeve

A23

Remove thrust bearing and race

(Rear thrust bearing, output shaft).



A24

Remove retaining ring securing brake B3 return springs

Attach press tool **5073** as illustrated. Tighten tool bolts alternately until load on retaining ring is relieved. Remove ring using screwdriver.

Relieve return springs by undoing tool bolts alternately.

A25

Remove:

- Tool **5073**.
- Spring pressure plate and return springs (Components are separate on some units).

A26

Remove brake B3 pistons

Position unit with front end facing downwards. Place rags in fluid collection container under unit to protect brake pistons.

Blow compressed air quickly and distinctly through hole.

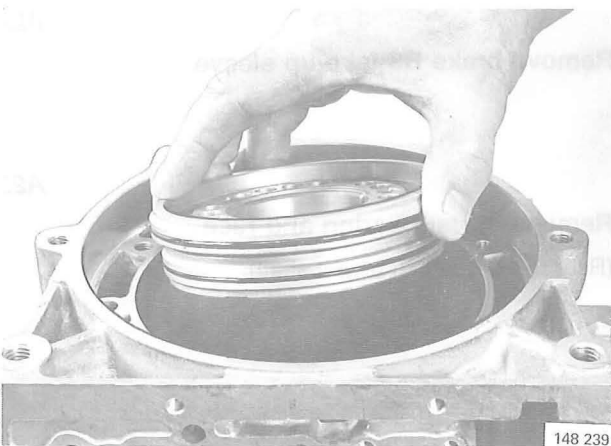
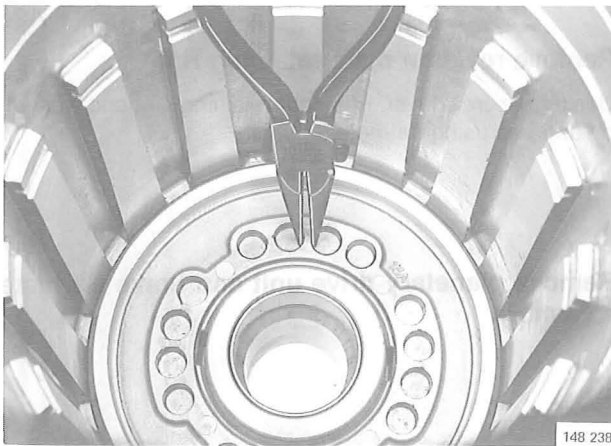
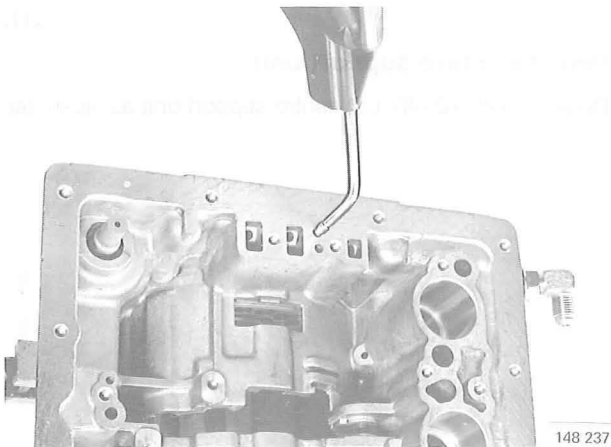
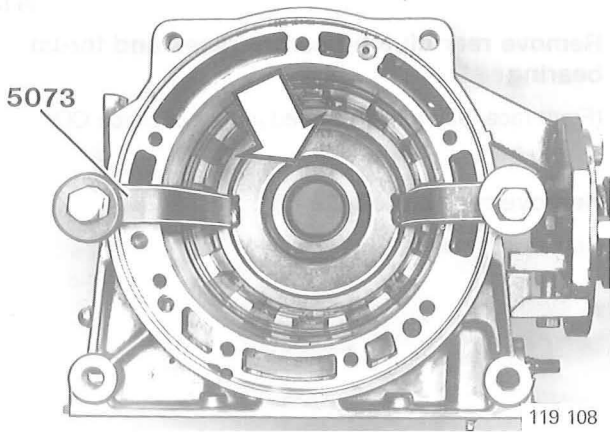
A27

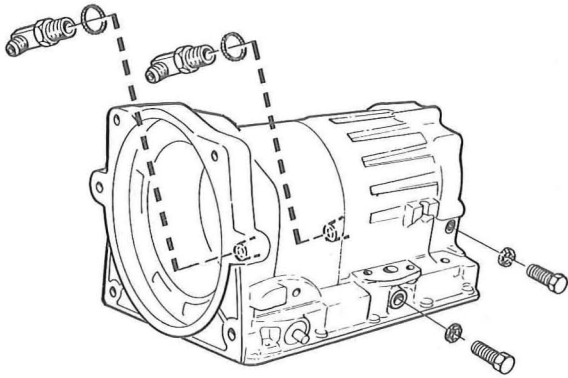
If pistons stick during removal, use flat-nosed pliers to withdraw upper piston. Exert pull evenly around circumference.

Carefully prise up intermediate piston using screwdriver.

Lower piston may be removed using two well rounded welding rods bent at the tip.

Illustration shows brake piston B3 complete.





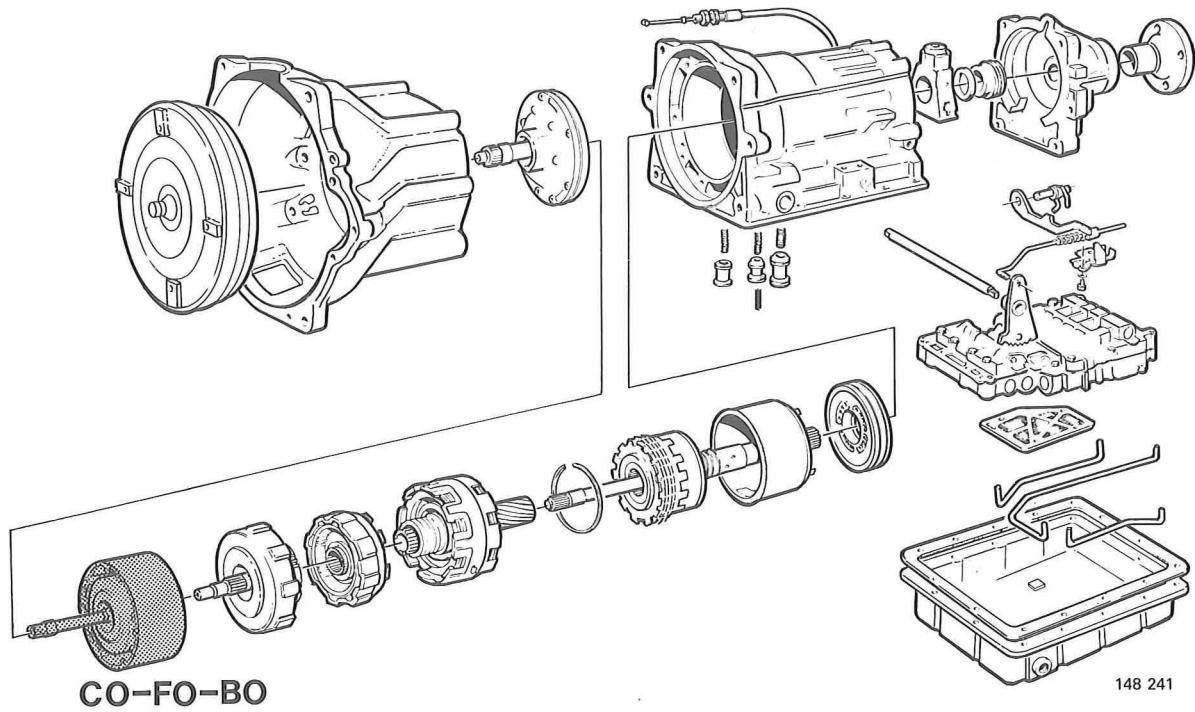
148 240

Remove:

- Oil cooler connections.
- Pressure tapping plugs.

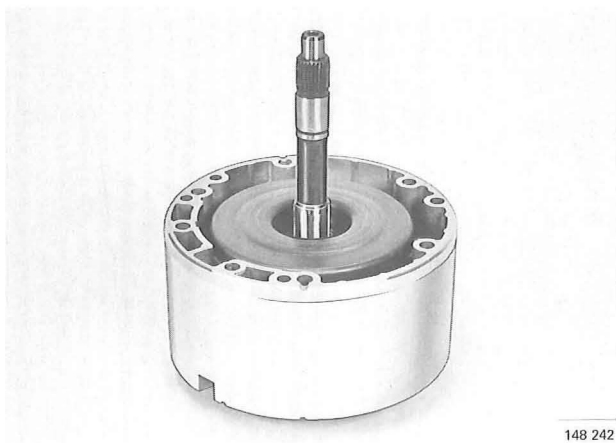
Overdrive unit, dismantling

Special tool: 5072



B1

Withdraw input shaft and clutch CO from overdrive housing

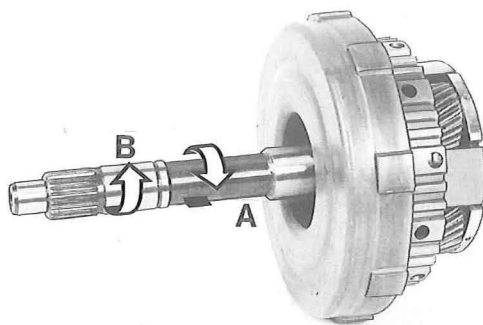


B2

Check operation of freewheel FO before dismantling clutch

Hold clutch housing and turn input shaft.

Shaft should be free to rotate clockwise (A) and should be locked in counterclockwise direction (B).



148 243

B3

Remove bearing race and thrust bearing from input shaft

(Front thrust bearing, CO).

AW 70/early AW 71: Two separate races and bearing.

Late AW 71/AW 72 L: One separate race and bearing with race attached.

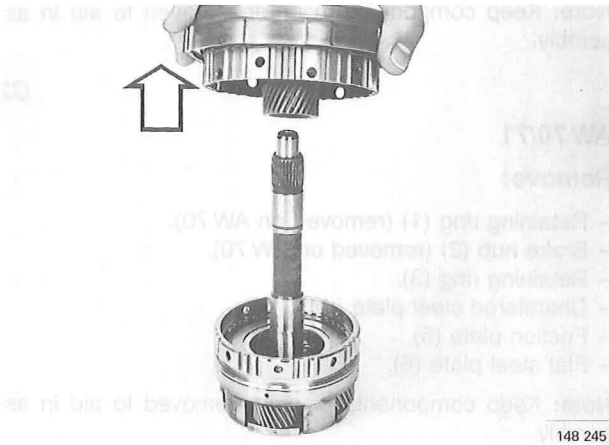
Check that neither thrust bearing nor race remains in rear of oil pump housing opening.



B4

AW 71/72 L

Remove clutch from input shaft



B5

AW 70

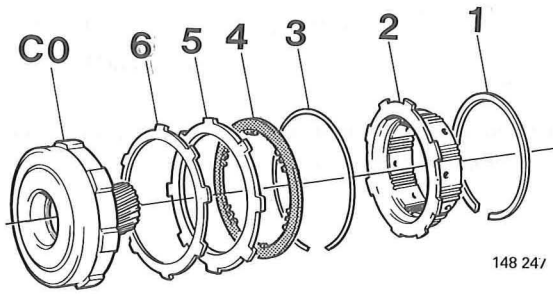
Remove:

- Retaining ring.
- Brake hub.

Remove clutch from input shaft.



Clutch CO, dismantling



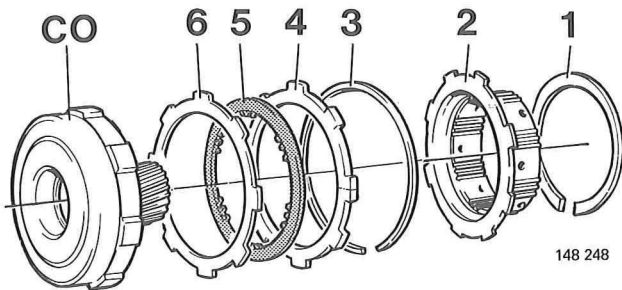
C1

AW 72 L

Remove:

- Retaining ring (1).
- Brake hub (2).
- Friction plate (4).
- Retaining ring (3).
- Heavy steel plate (5).
- Dished steel plate (6).

Note: Keep components in order removed to aid in assembly.



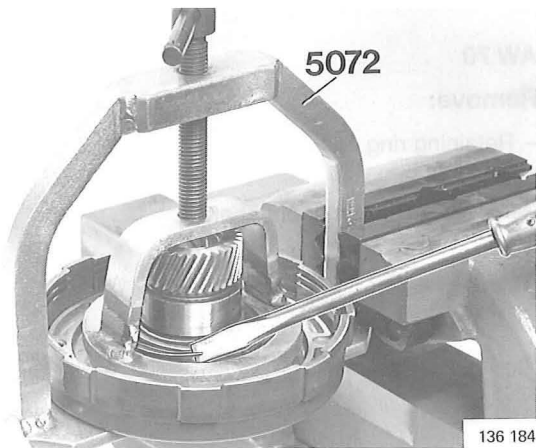
C2

AW 70/71

Remove:

- Retaining ring (1) (removed on AW 70).
- Brake hub (2) (removed on AW 70).
- Retaining ring (3).
- Chamfered steel plate (4).
- Friction plate (5).
- Flat steel plate (6).

Note: Keep components in order removed to aid in assembly.



C3

Remove return springs

Compress springs using press tool 5072.

Remove:

- Retaining ring.
- Tool 5072.
- Spring retainer.
- Return springs.



C4

Remove clutch piston from housing

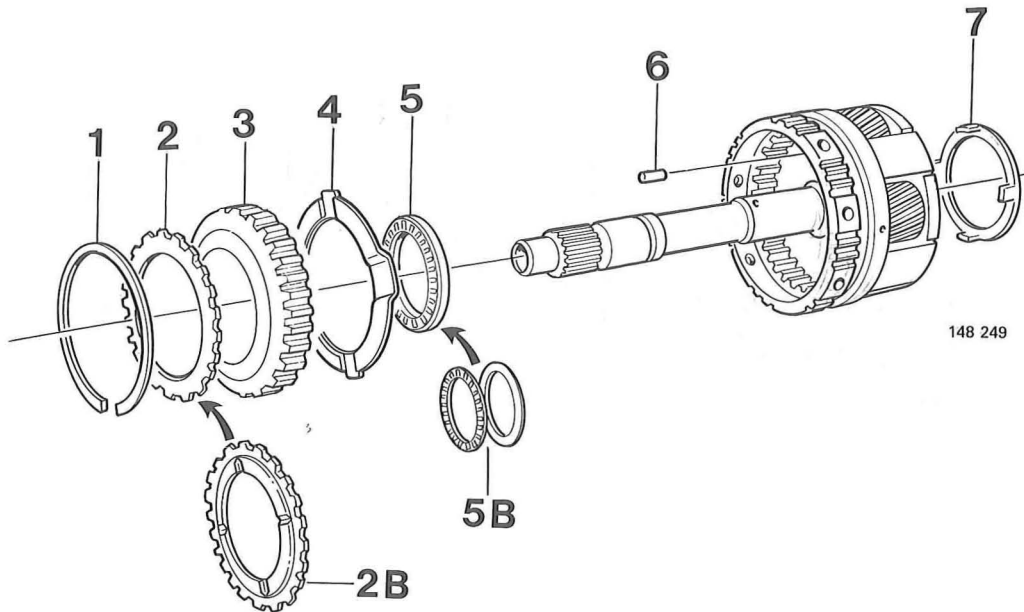
Blow through hole on inside with compressed air at reduced pressure of 100 kPa (43.5 psi). Block opposite hole with finger.

If piston does not loosen, press back in and repeat.

C5

Remove O-rings from operating piston

Input shaft – planet gear carrier and freewheel FO, dismantling

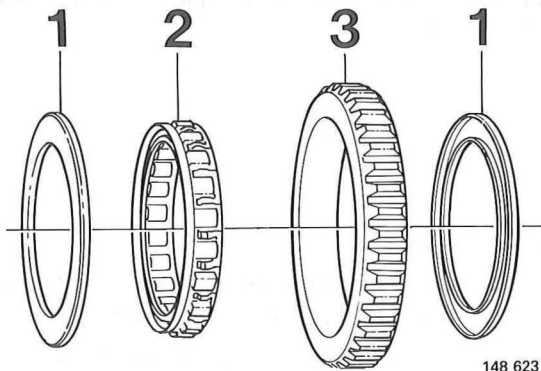


D1

Remove:

- Retaining ring (1).
- Pressure plate (2).
- Plate functions as thrust bearing on AW 70 (2B).
- Freewheel FO and outer race (3).
- Thrust washer (4).

- Thrust bearing AW 72 L (5).
- AW 70 L/71/71 L: Bearing and race (5B).
- AW 70: No thrust bearing.
- Oil passage plugs (4 off) (6) (AW 70/71 only).
- Thrust washer (7).

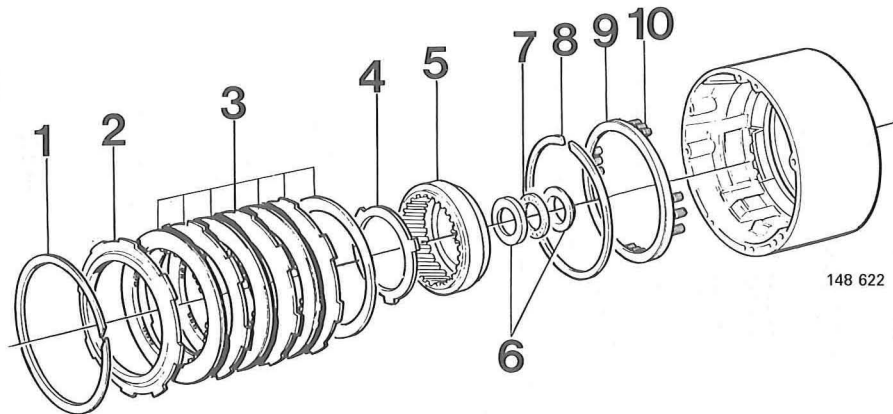


D2

Remove freewheel FO and retaining rings from outer race

1. Bearing retainers (2 off).
2. Freewheel FO.
3. Outer race.

Overdrive housing, dismantling



148 622

E1

E2

Remove:

- Brake assembly retaining ring (1).
Use screwdriver.
- Brake assembly pressure plate (2).
- Brake plates and spring plate (3).
No damper plate on AW 70.
- Bearing race (4).
- Ring gear (5).
- Bearing races (6) and thrust bearing (7). (Rear thrust bearing, front ring gear).

Remove:

- Brake piston retaining ring (8).
- Spring retainer (9).
- Return springs (10).
AW 71/72 L: 12 springs (3 x 4)
AW 70: 16 springs (4 x 4)

AW 72 L and late AW 71:

Flat pressure plate (2); friction plates (3 off), thickness 1.7 mm (new).

AW 70 and early AW 71

Stepped pressure plate (2); friction plates (3 off), thickness 2.3 mm (new).



148 250

E3

Remove brake piston

Blow out piston through hole as illustrated. Use compressed air at reduced pressure of 100 kPa.

Withdraw piston using flat-nosed pliers if removal by compressed air is unsuccessful.

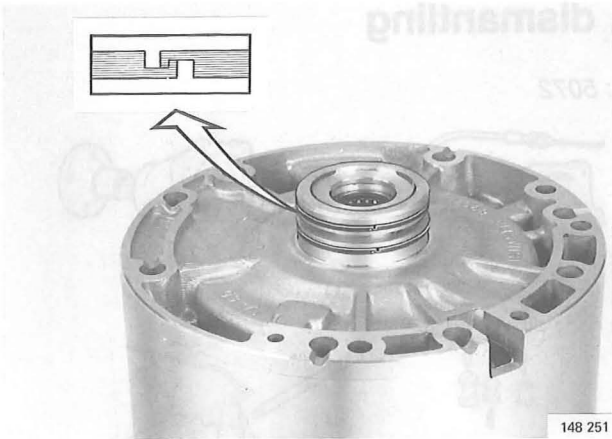
E4

Remove O-rings from piston

E5

Remove oil seals from overdrive housing

Unhook seals by hand.

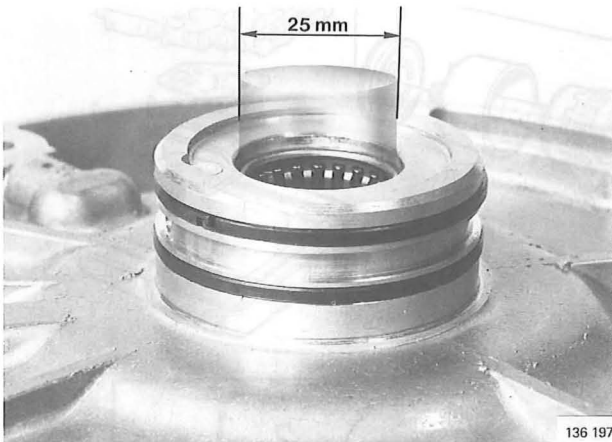


E6

Applicable only if needle thrust bearing must be replaced:

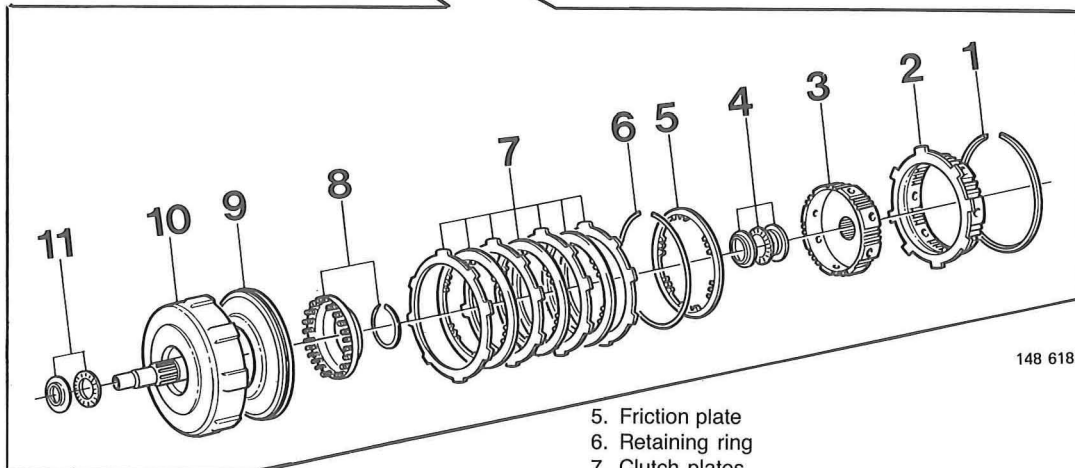
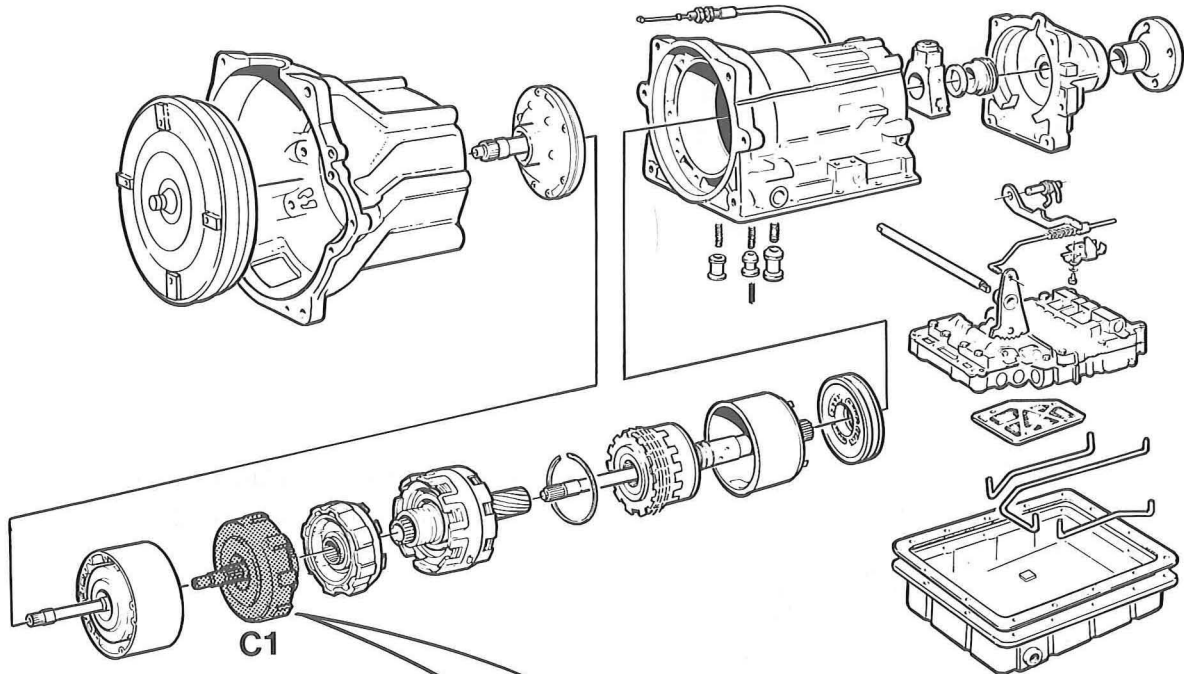
Remove bearing from overdrive housing.

Tap out bearing using 25 mm o.d. sleeve.

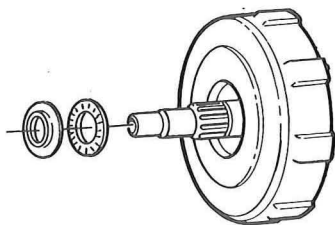


Front clutch C1, dismantling

Special tool: 5072



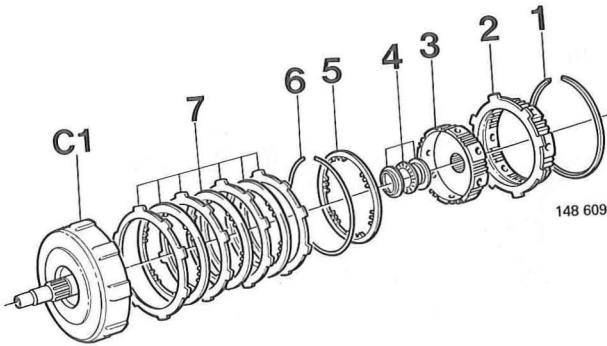
1. Retaining ring
2. Hub facing rear clutch
3. Front clutch hub
4. Thrust bearing and races (intermediate thrust bearing C1)
5. Friction plate
6. Retaining ring
7. Clutch plates
8. Spring retainer with return springs and retaining ring
9. Clutch piston
10. Clutch housing
11. Thrust bearing and race (Front thrust bearing C1)



F1

Remove bearing race and thrust bearing (11) from input shaft

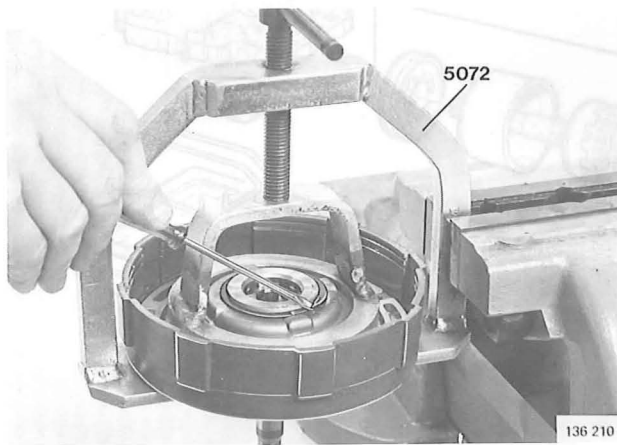
F2



Remove:

- Retaining ring (1). Use screwdriver.
- Hub facing rear clutch (2).
- Front clutch hub (3).
- Bearing races and thrust bearing (4).
- Friction plate (5).
- Retaining ring (6).
- C1 clutch plates (7).

F3



Remove return springs

AW 72 L: 20 springs; AW 70/71: 18 or 20 springs.

Compress return springs using tool 5072.

Remove:

- Retaining ring.
- Tool 5072.
- Spring retainer and return springs.

F4

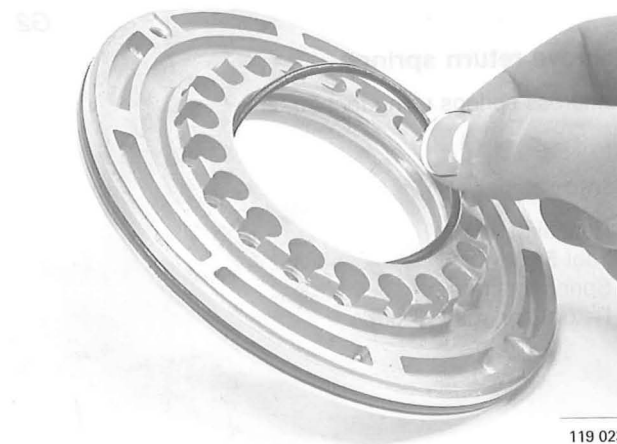


Remove clutch piston

Position clutch housing as illustrated. Cover two of the four inside holes. Blow through one of the opposite holes with compressed air at reduced pressure of 100 kPa.

If piston does not loosen completely, press back in and repeat.

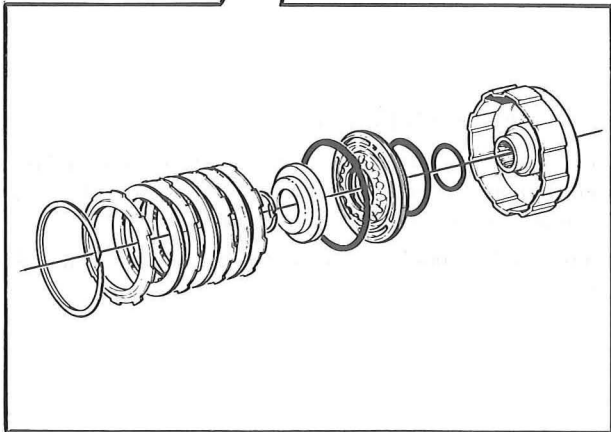
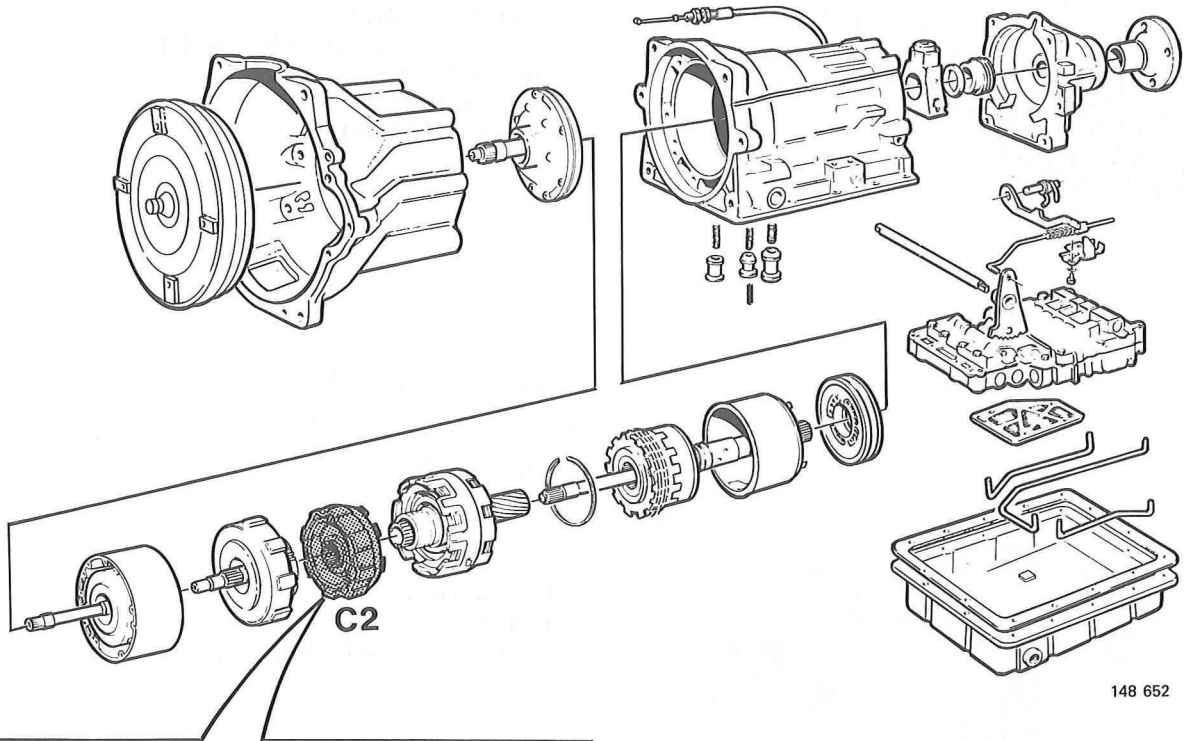
F5



Remove O-rings from piston

Rear clutch C2, dismantling

Special tool: 5072



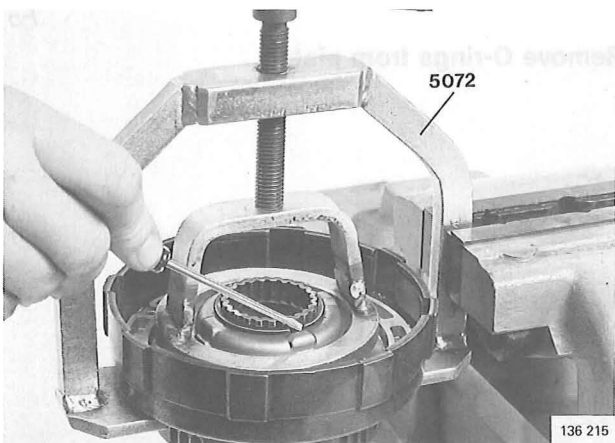
G1

Remove clutch assembly

Remove retaining ring.

Remove assembly.

Note: Order of components for assembly.



G2

Remove return springs

Compress springs using tool 5072.

Remove:

- Retaining ring.
- Tool 5072.
- Spring retainer.
- Return springs (18 off).

G3



148 253

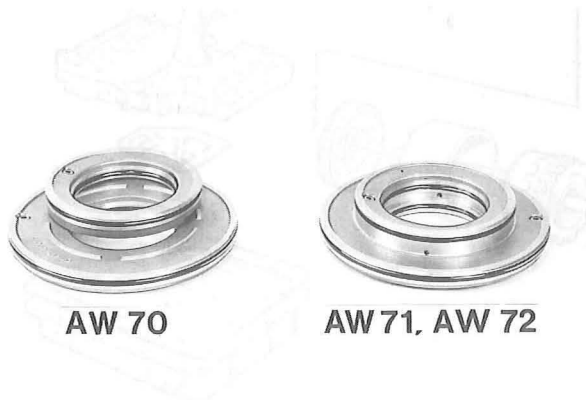
Remove clutch piston(s)

Position clutch housing as illustrated and blow through either of the two upper inside holes with compressed air at reduced pressure of 100 kPa.

Block opposite hole with finger. If piston does not loosen completely, press back in and repeat.

Note: Two-part piston on AW 70.

G4



AW 70

AW 71, AW 72

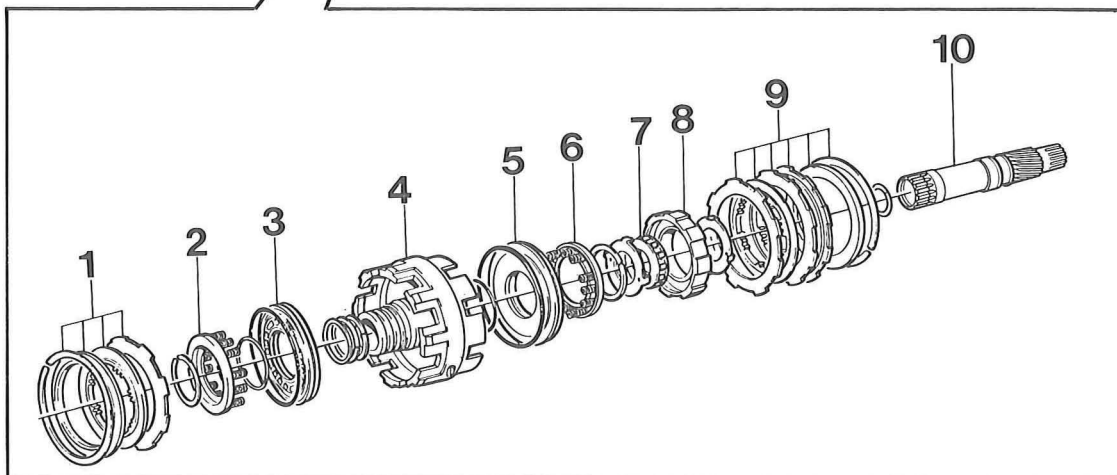
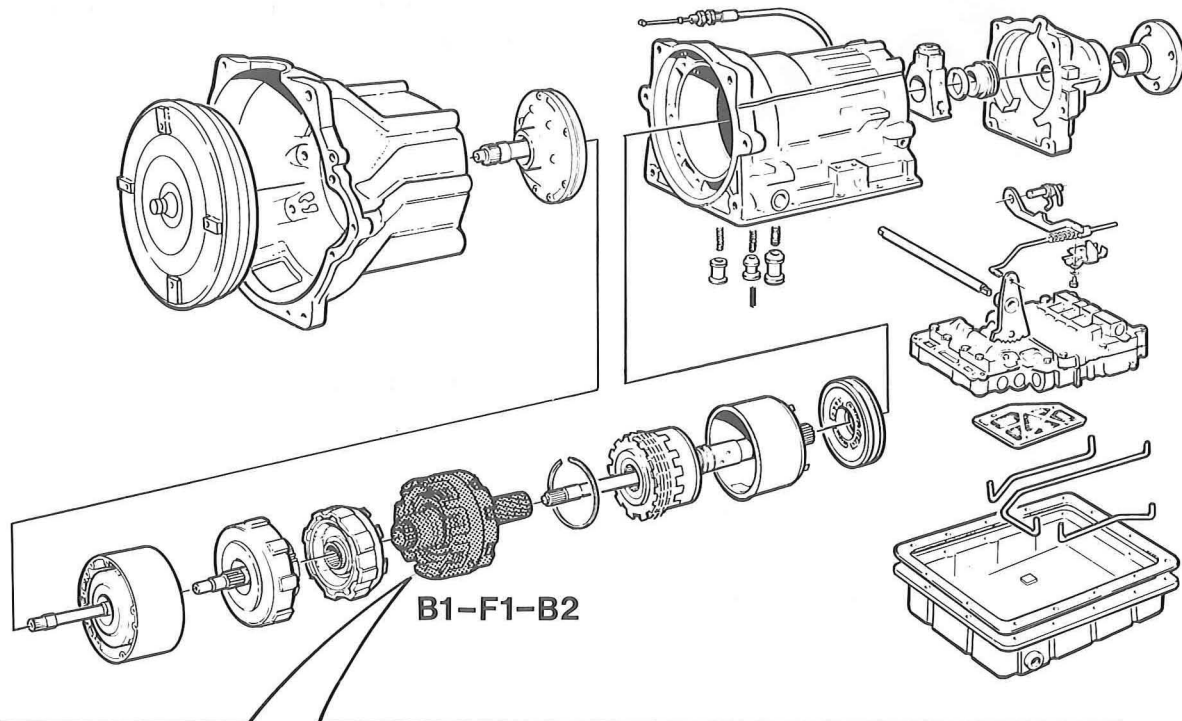
148 254

Remove O-rings

Remove rings (4 off).

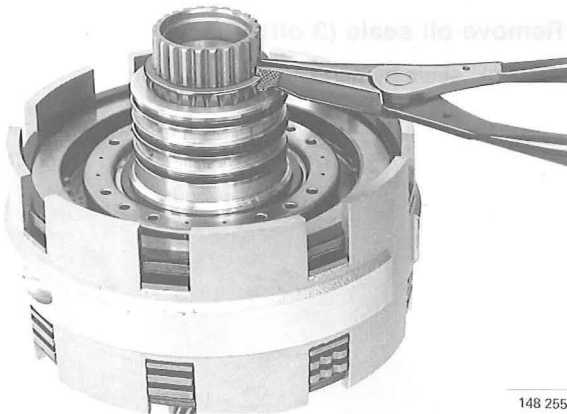
Centre support unit, dismantling

Special tool: 5072



148 613

- | | |
|--|--|
| 1. Clutch assembly B1 | 6. Spring retainer and return springs B2 |
| 2. Spring retainer and return springs B1 | 7. Freewheel F1 |
| 3. Brake piston B1 | 8. Brake hub |
| 4. Clutch housing | 9. Clutch assembly B2 |
| 5. Brake piston B2 | 10. Sun wheel shaft |



148 255

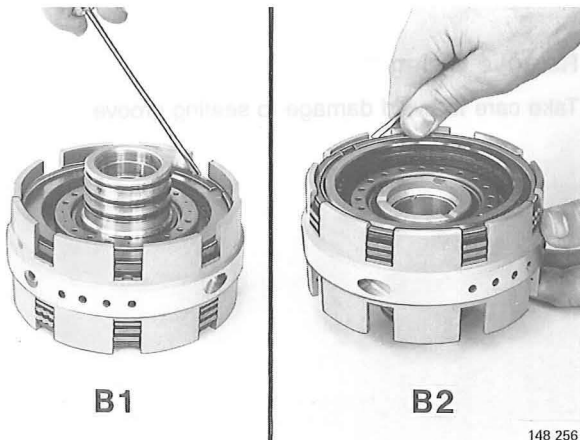
H1

Remove retaining ring from sun wheel shaft

H2

Remove centre support unit from sun wheel shaft

Freewheel F1 should remain in position on shaft.

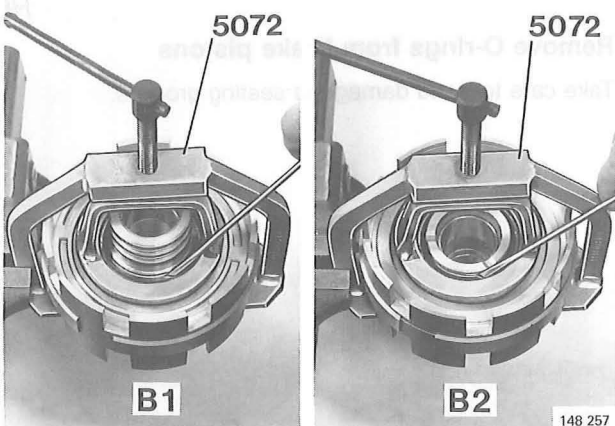


148 256

H3

Remove:

- Retaining ring securing brake B1 plate assembly.
- B1 brake assembly.
- Retaining ring securing brake B2 plate assembly.
- B2 brake assembly.



148 257

H4

Remove B1 and B2 spring retainers and return springs

Compress springs using tool 5072.

Remove:

- Retaining ring.
- Tool 5072.

AW 72 L:

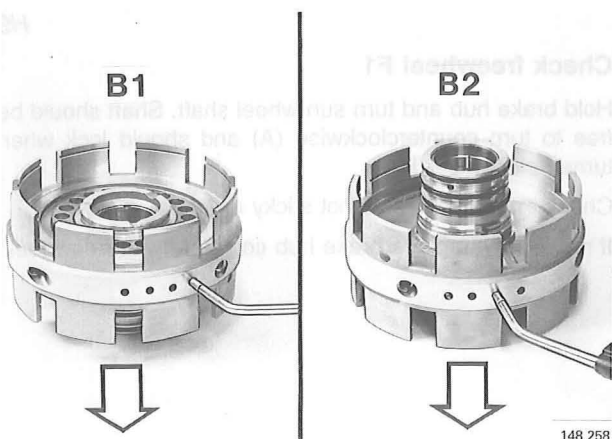
B1: 12 springs attached to retainer.

B2: 20 springs attached to retainer.

AW 70/71:

B1: 12 springs, separate or attached.

B2: 12 or 20 springs, separate or attached.



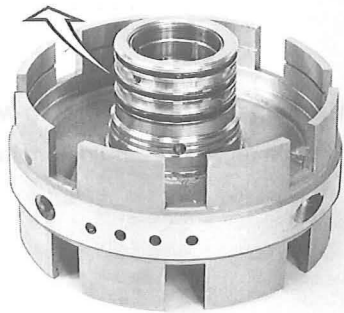
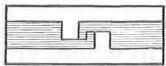
148 258

H5

Remove B1 and B2 pistons

Blow through holes with compressed air at reduced pressure of 100 kPa.

Allow pistons to drop out.

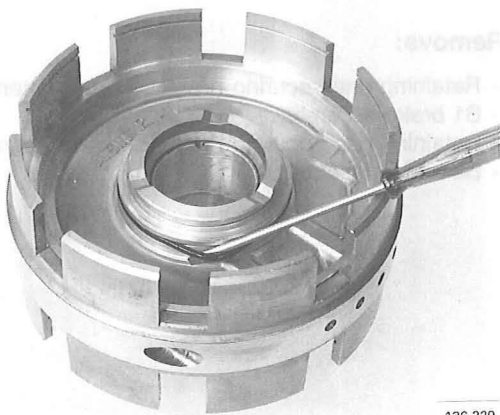


148 259

H6

Remove oil seals (3 off)

'Unhook' seals by hand.



136 220

H7

Remove O-ring

Take care to avoid damage to seating groove.

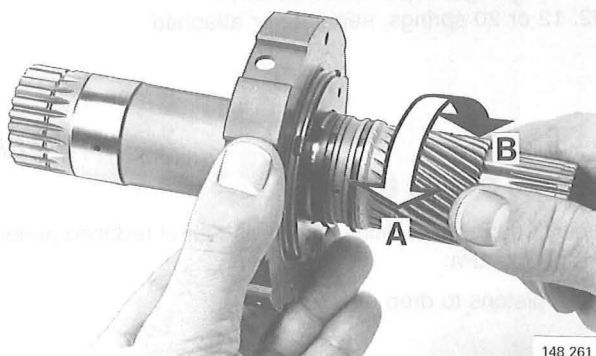


148 260

H8

Remove O-rings from brake pistons

Take care to avoid damage to seating grooves.



148 261

H9

Check freewheel F1

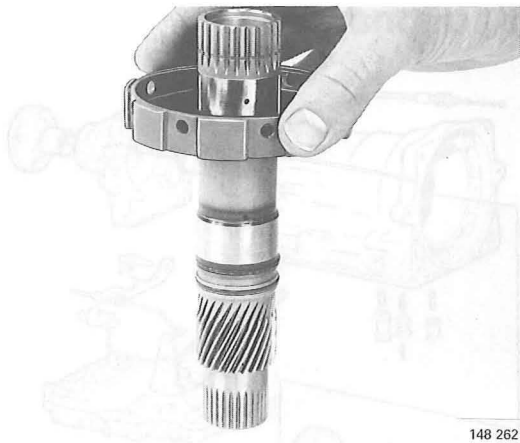
Hold brake hub and turn sun wheel shaft. Shaft should be free to turn counterclockwise (A) and should lock when turned clockwise (B).

Check that freewheel is not sticky or loose.

If necessary, replace brake hub complete with freewheel.

H10

Remove freewheel F1 and brake hub from sun wheel shaft

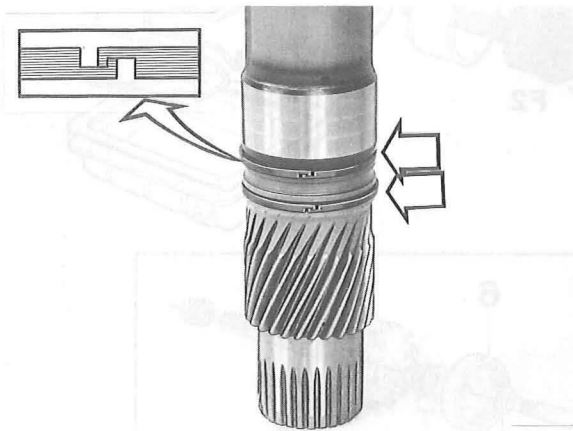


148 262

H11

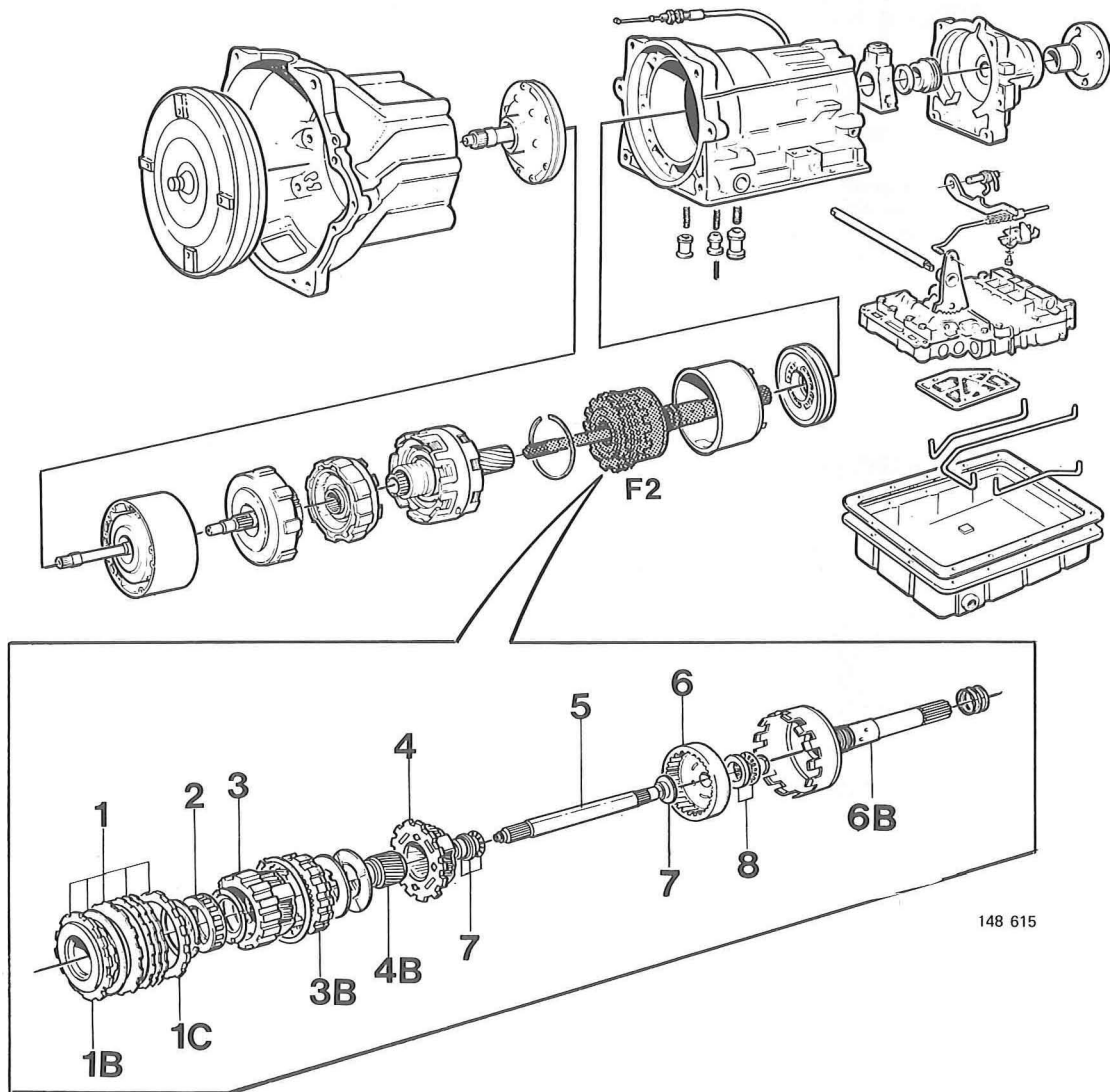
Remove oil seals (2 off) from sun wheel shaft

'Unhook' and pull off seals.



148 263

Planetary drive unit, dismantling



148 615

- 1. Brake B3 plate assembly
- 1B. Reaction plate
- 1C. Pressure plate
- 2. Freewheel F2
- 3. Front end planet gear
- 3B. Front ring gear

- 4. Rear planet gear
- 4B. Sun wheel (AW 72 only)
- 5. Intermediate shaft
- 6. Ring gear
- 6B. Output shaft
- 7. Thrust bearing, sun wheel
- 8. Front thrust bearing, output shaft

J1

Mount planetary drive unit in vice with soft jaws

Note: Shaft may be gripped only by splined section.



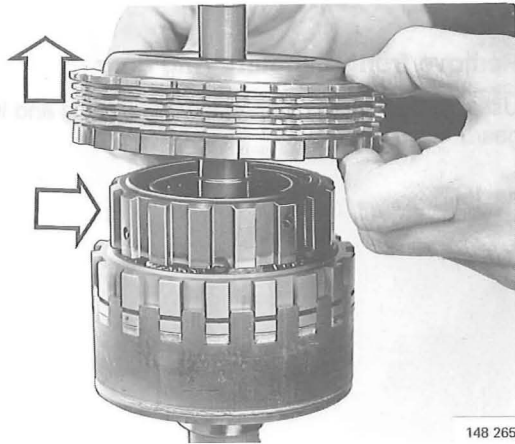
148 264

J2

Remove brake B3 plate assembly

Lift off plate assembly.

Note whether freewheel F2 planet carrier accompanies plate assembly. If so, support planet carrier by hand so that it does not drop off. See operation J4.



148 265

J3

Remove front planet carrier and freewheel F2

Remove thrust washers (2 off).

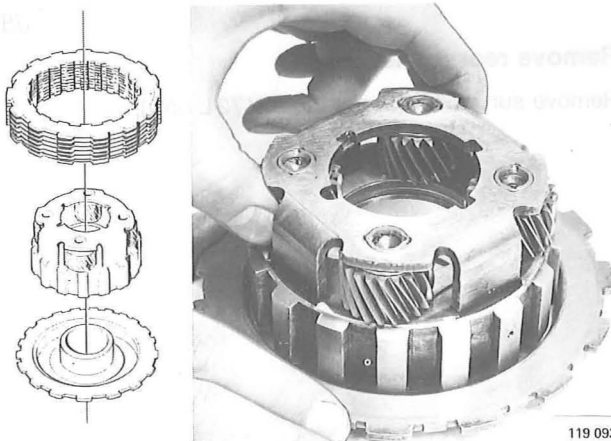


148 266

J4

If planet carrier accompanies plate assembly:

Separate planet carrier from plate assembly.



119 093

J5

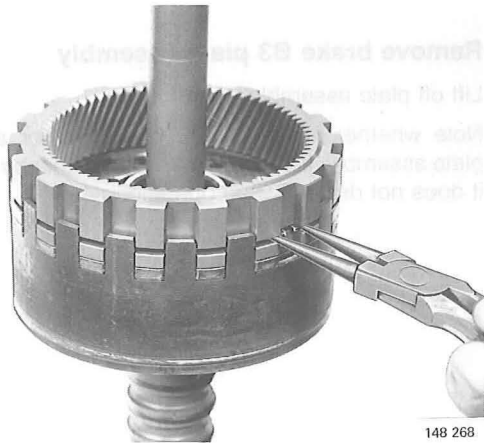
Remove freewheel F2

Remove:

- Retaining ring.
- Freewheel F2 and washers.
- Pressure plate.



148 267



J6

Remove front planetary ring gear

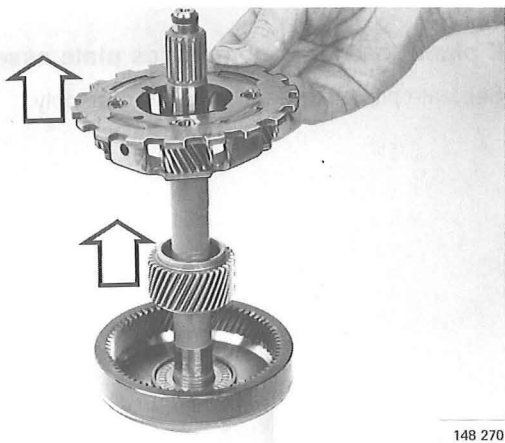
Use circlip pliers to compress retaining ring and lift off ring gear.



J7

Remove:

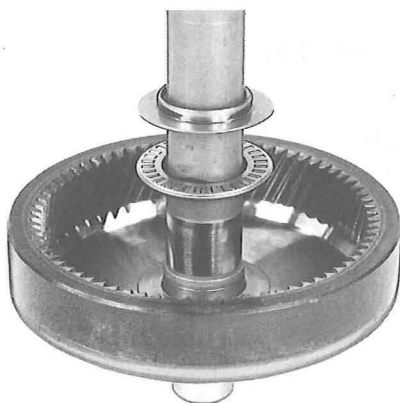
- Intermediate shaft and rear planetary ring gear.
- Bearing race and thrust bearing.
(Front thrust bearing, output shaft).



J8

Remove rear planet carrier

Remove sun wheel (applies to AW 72 L only).



J9

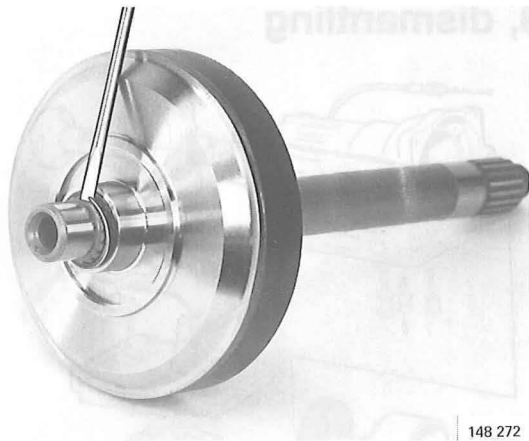
AW 70/71:

Remove sun wheel bearing race and thrust bearing

J10

Remove ring gear from intermediate shaft

Remove retaining ring.



148 272

J11

AW 72 L:

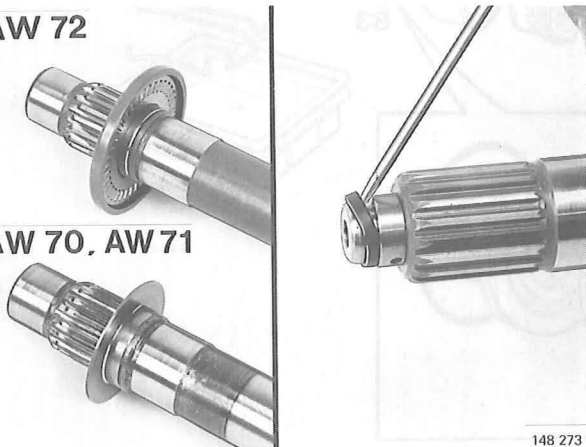
Remove thrust bearing and race from intermediate shaft.

AW 70/71:

Remove bearing race from intermediate shaft.

AW 72

AW 70, AW 71



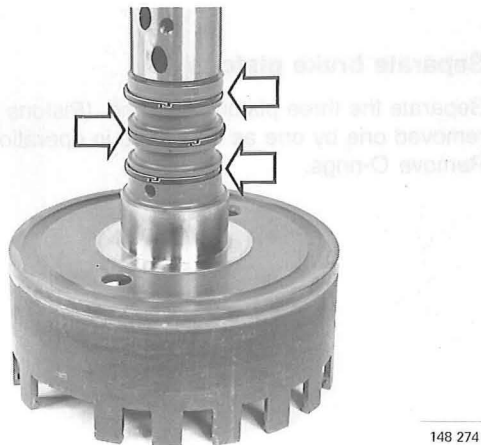
148 273

J12

Remove output shaft from vice

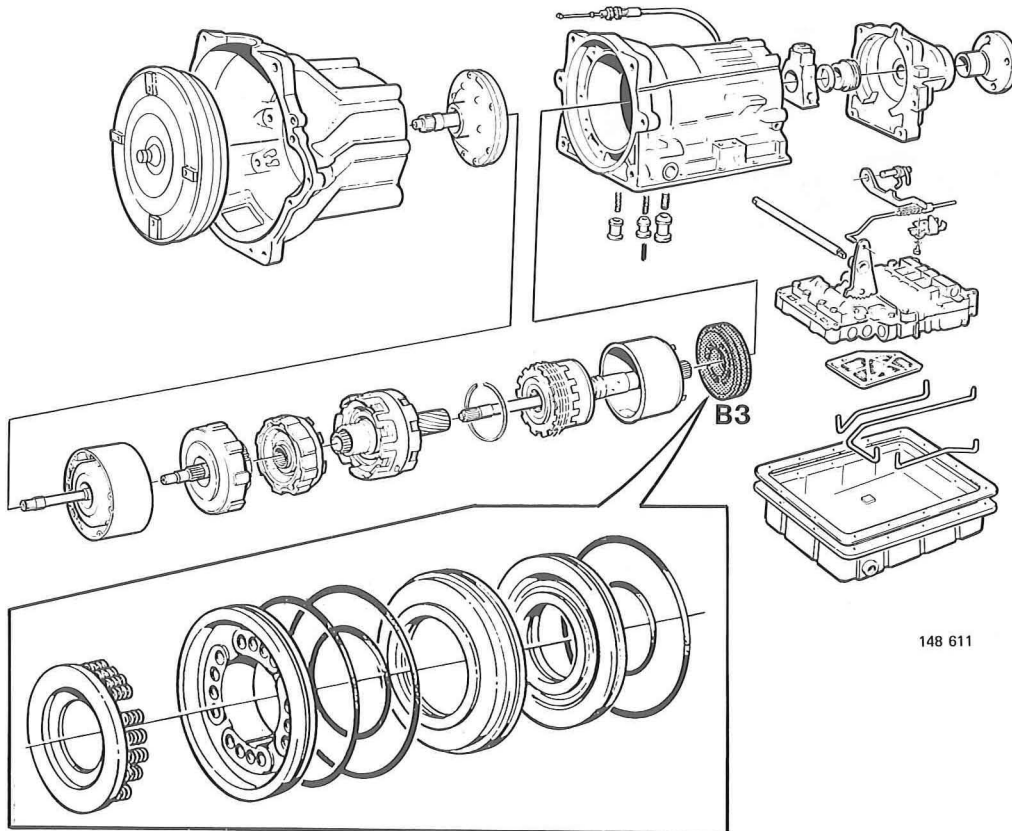
Remove oil seals (3 off)

'Unhook' and pull off seals.



148 274

Brake pistons B3, dismantling



148 611

K1

Separate brake pistons

Separate the three pistons by hand. (Pistons may also be removed one by one as described in operation A27.)
Remove O-rings.



148 275

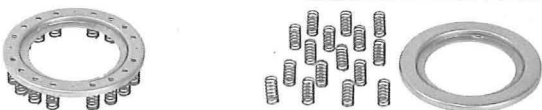


AW72L, certain versions of AW70/71:

Springs (16 off) are attached to retainer.

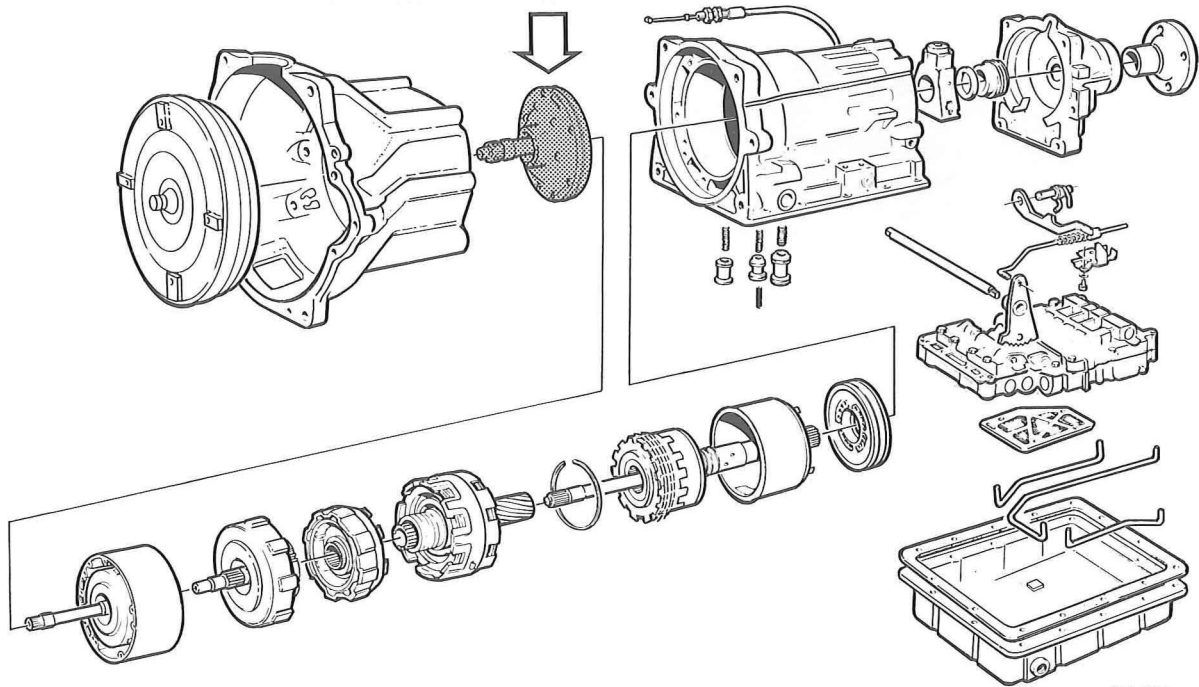
Other versions of AW70/71:

Springs (16 off) and retainer are separate items.

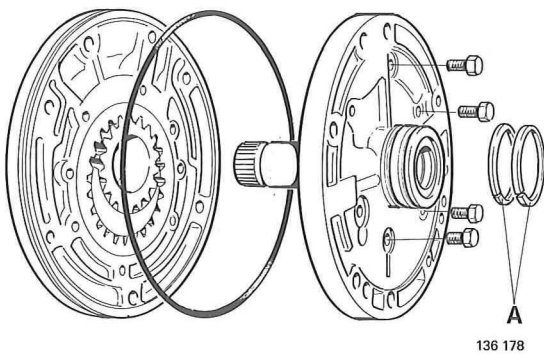


148 276

Oil pump, dismantling



148 277



136 178

L1

Remove oil seals (A)

'Unhook' and withdraw seals from pump housing.

L2

Remove retaining bolts (6 off) between front and rear halves of pump housing

Separate housing halves.

Remove O-ring.

L3

Check that thrust bearing or, alternatively, clutch CO bearing race is not in locked position at rear of pump housing opening

See operation B3.

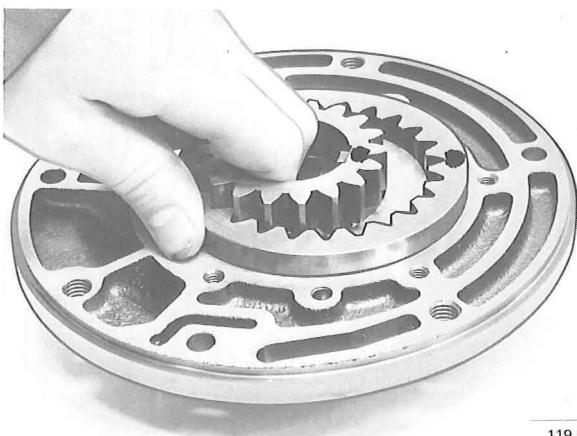
L4

Mark position of gears

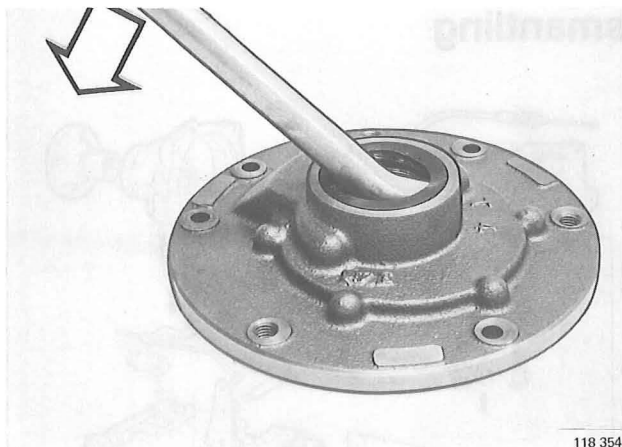
Mark top side with felt pen or similar instrument.

Important! Do not punch or scribe surface!

Remove gears.



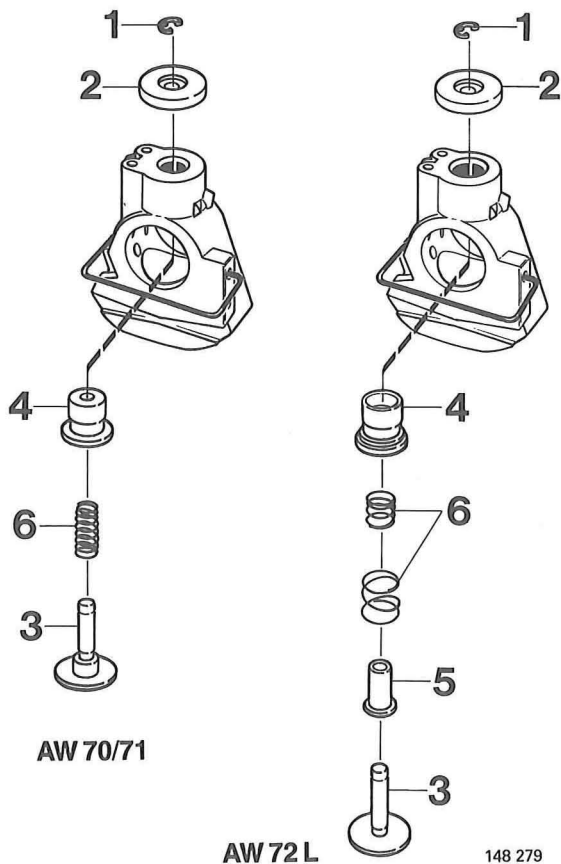
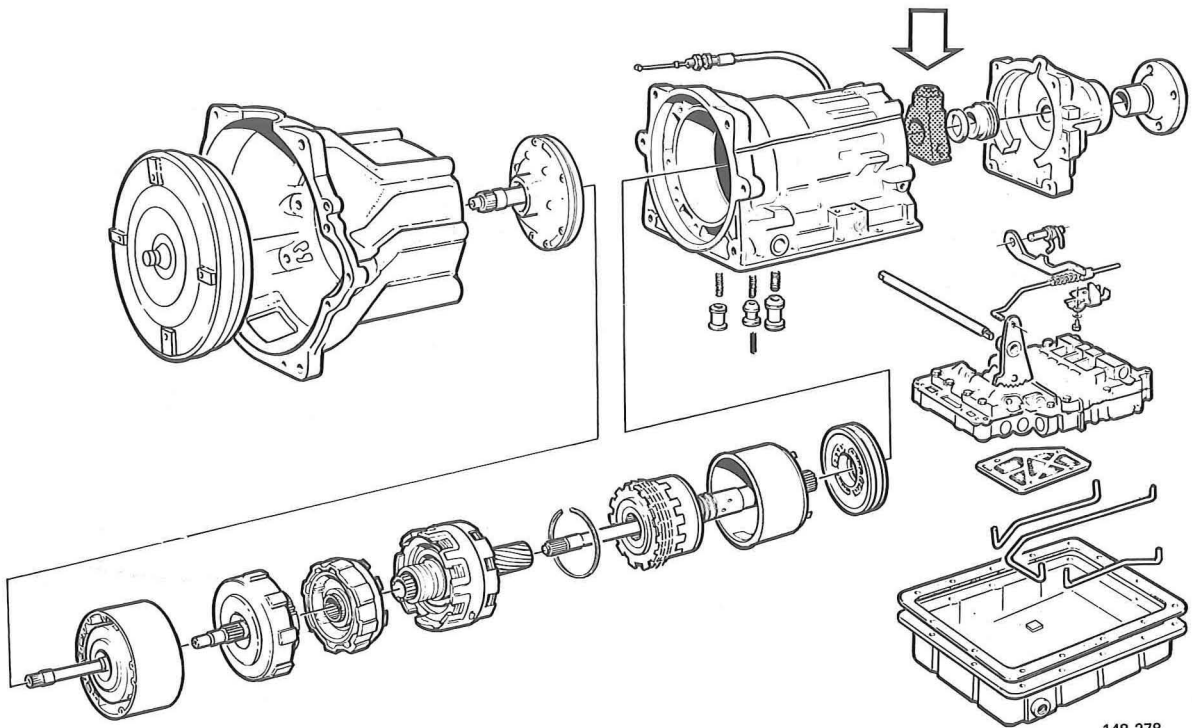
119 002



Remove torque converter shaft oil seal

Use lever to prise out.

Governor, dismantling



148 279

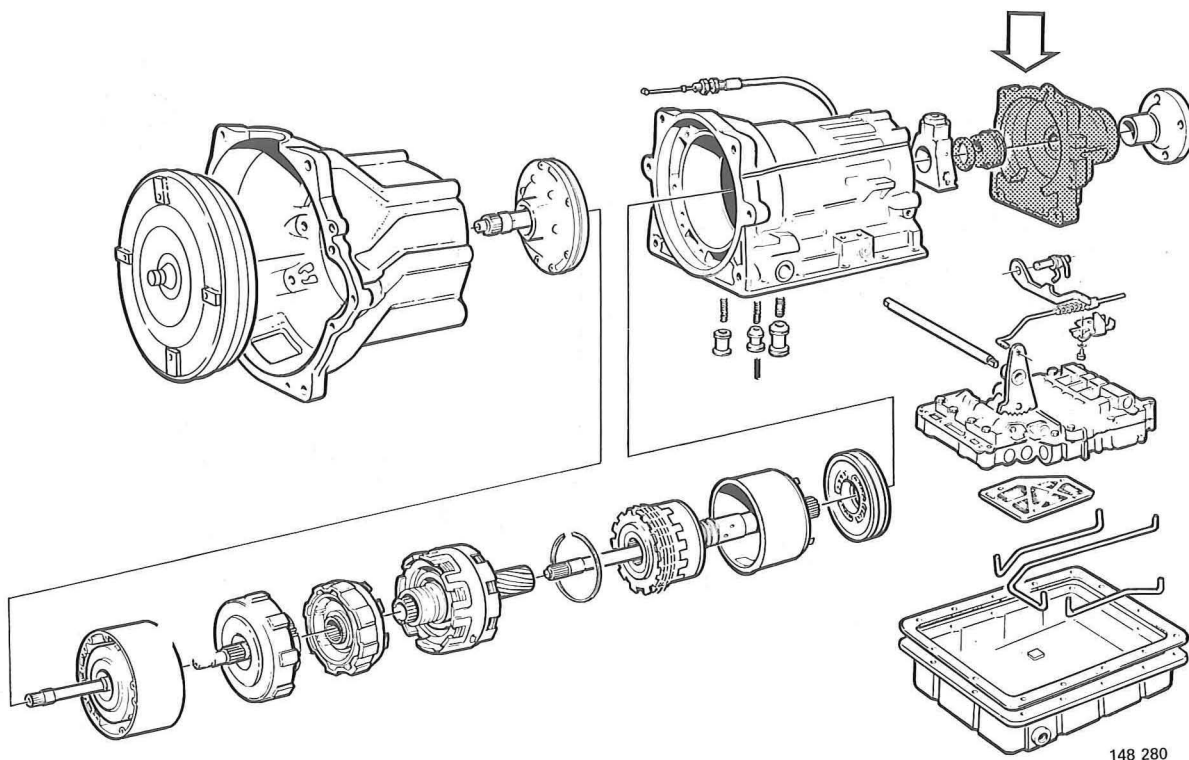
Remove:

- Retaining ring (1).
- Governor weight (2).
- Valve stem (3).
- Valve (4).
- Spring guide (5).
(No guide in AW 70/71.)
- Springs (2 off) (6).
Only one spring (6) in AW 70/71.

M1

Extension housing, dismantling

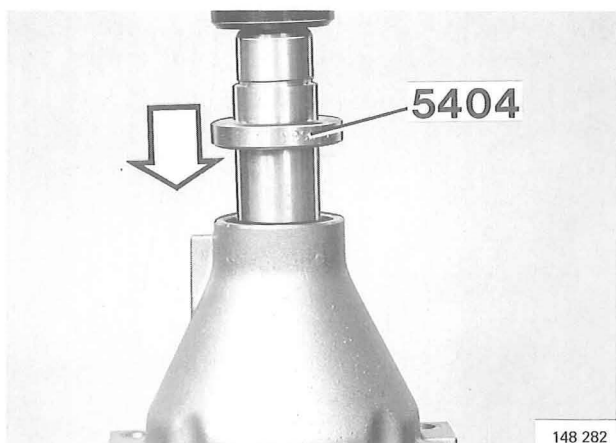
Special tool: 5404



Remove output shaft seal

Use lever to prise out.

N1

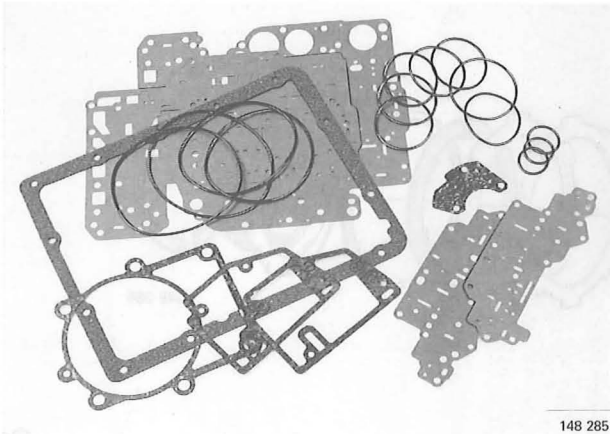


Check bushing

Replace if worn or scored. See operation Z1.
Remove bushing using drift 5404.

N2

General assembly instructions



148 285

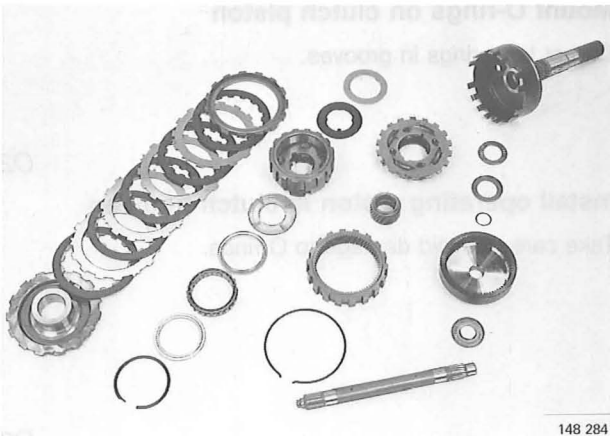
Replace all gaskets, O-rings and seals

Inspect all components for signs of wear, seizing, cracking etc.

Replace overheated or worn plates (grooves worn away). See minimum dimensions under 'Specifications'.

Soak new friction plates for 15–20 minutes in ATF fluid prior to assembly.

Important! Use ATF, type F or G for models to 1983 inclusive, and ATF, type Dexron II D for models from 1984 on.



148 284

Wash all components except plates in cleaning fluid

Blow clean with compressed air.

Wadding must **not** be used for cleaning.

Clean all oil passages carefully and blow clean with compressed air.

Lubricate and grease components

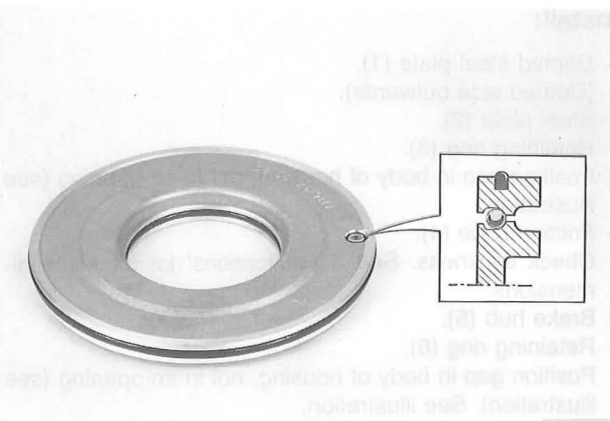
Grease O-rings, seals and gaskets with a thin layer of vaseline.

P/N	1 161 151-4	1 kg tin
	1 161 150-6	22 g tube

Do **not** use gasket compound on gaskets.

Lubricate other moving components with ATF fluid.

Important! Use ATF, type F or G for models to 1983 inclusive, and ATF, type Dexron II D for models from 1984 on.



148 283

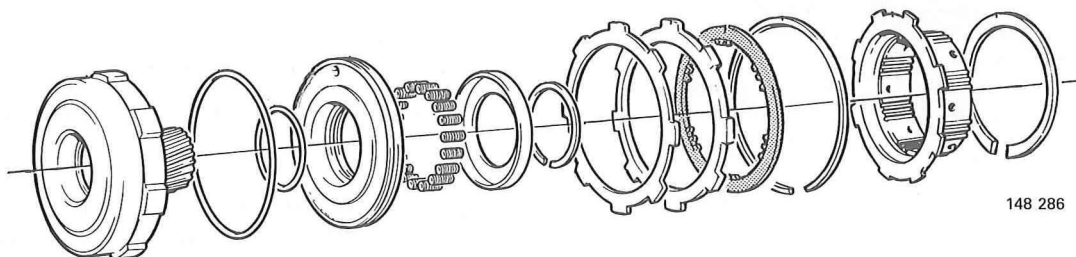
Ensure that thrust washers and needle thrust bearings are installed in correct positions

Use vaseline **sparingly** to hold in position. Too much vaseline may clog control system passages.

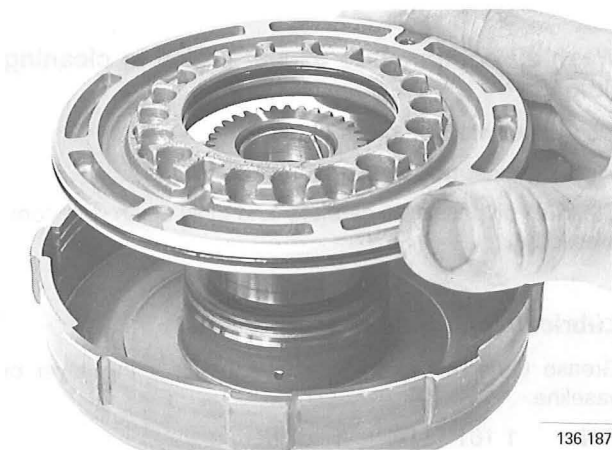
Check freedom of movement of balls in ball valves of operating pistons CO, C1 and C2.

Clutch CO, assembly

Special tool: 5072



148 286



136 187

O1

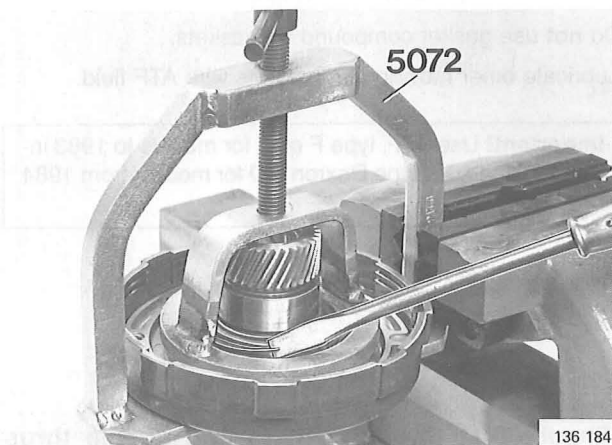
Mount O-rings on clutch piston

Do not twist rings in grooves.

O2

Install operating piston in clutch housing

Take care to avoid damage to O-rings.



136 184

O3

Install return springs (18 off) and spring retainer

Ensure that springs are correctly seated.

O4

Install retaining ring

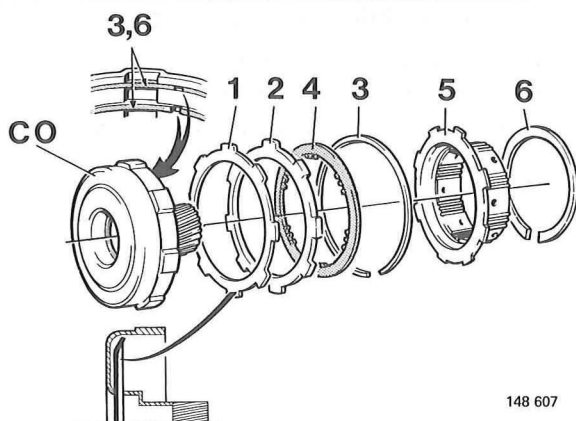
Use tool 5072.

O5

AW 72 L

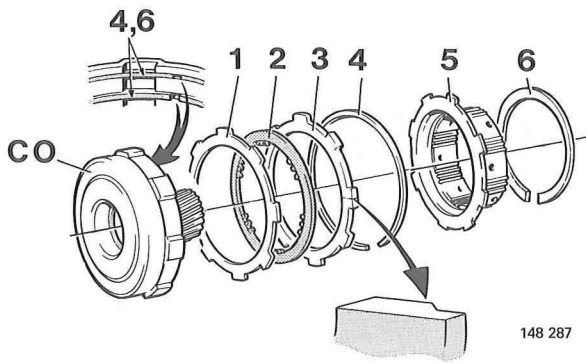
Install:

- Domed steel plate (1).
(Domed side outwards).
- Steel plate (2).
- Retaining ring (3).
Position gap in body of housing, not in an opening (see illustration).
- Friction plate (4).
Check thickness. See 'Specifications' for minimum dimensions.
- Brake hub (5).
- Retaining ring (6).
Position gap in body of housing, not in an opening (see illustration). See illustration.



148 607

O6



AW 70/71

Install:

- Thin steel plate (1).
- Friction plate (2).
Check thickness.
See 'Specifications' for minimum dimensions.
- Chamfered steel plate (3)
(Chamfer faces outwards).
- Retaining ring (4).
Position gap in body of housing, not in an opening (see illustration).
- Brake hub (5).
- Retaining ring (6).
Position gap in body of housing, not in an opening (see illustration).

O7



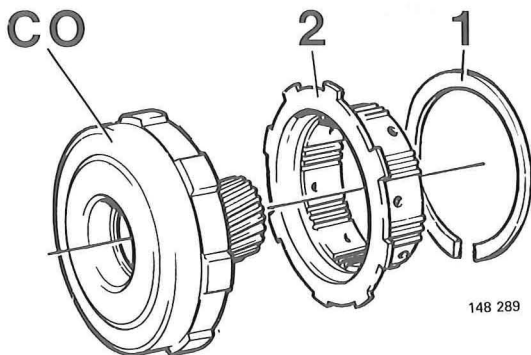
Check operation of clutch piston

Blow through one hole with compressed air at reduced pressure of 100 kPa.

Cover other hole with finger.

'Sucking' noise should be heard clearly.

O8



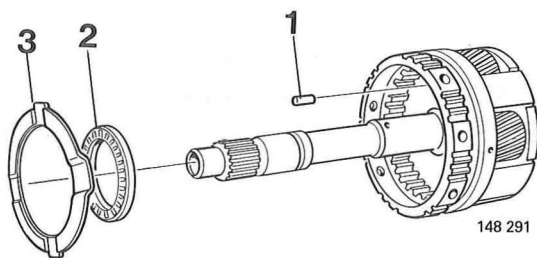
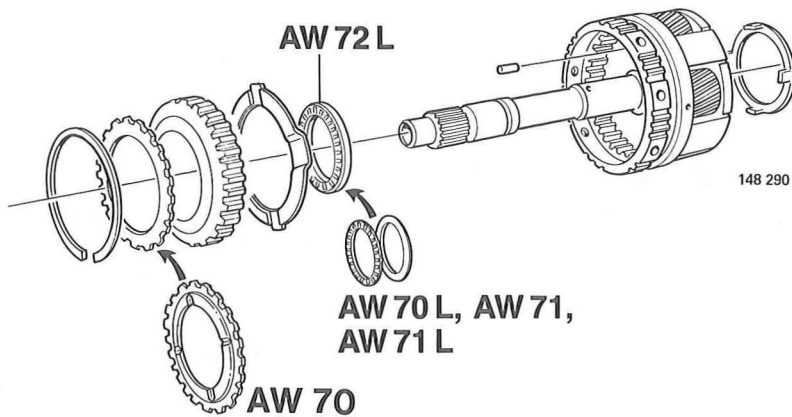
AW 70

Remove:

- Retaining ring (1).
- Brake hub (2).

These components are installed in operation P5.

Input shaft, planet carrier and freewheel FO, assembly

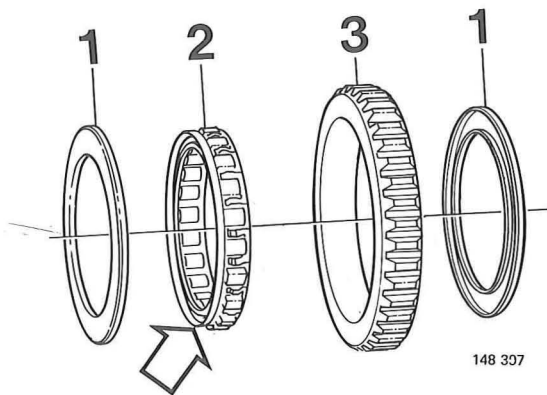


P1

Install:

- Oil passage plugs (4 off) (1).
(AW 70/71 only).
Use magnetic screwdriver.
- Needle thrust bearing and attached race (2) (Bearing and race are separate on AW 70 L and AW 71/71 L. AW 70 is not equipped with separate thrust bearing.
- Thrust washer (3), with slots facing outwards.

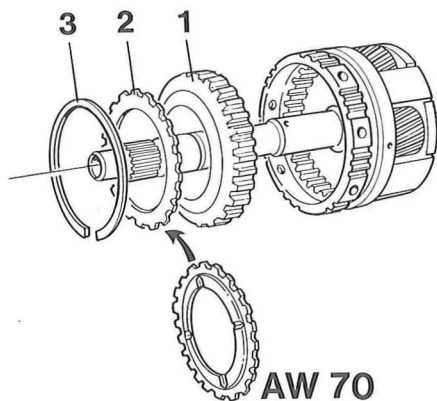
P2



Reassemble freewheel (2) and outer race (2)

- Install washers (1).
Note chamfer (arrowed).

P3



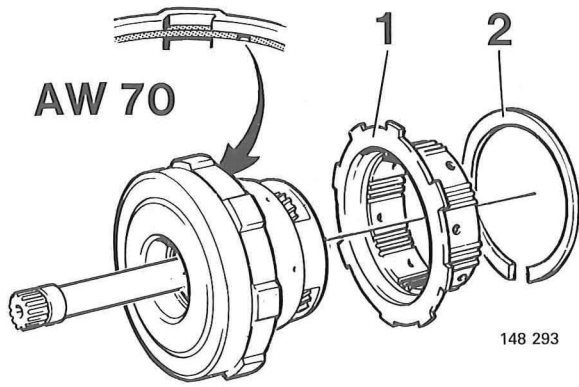
Install freewheel assembly (1) in planet carrier

Note: Chamfered edge on freewheel should face towards front (outwards) in planet carrier. See operation P2.

Install:

- Pressure plate (2).
- Retaining ring (3).

Note: Thrust bearing side (raised side) of pressure plate should face towards front (outwards) on AW 70.



P4

Reassemble clutch CO and input shaft/planet carrier

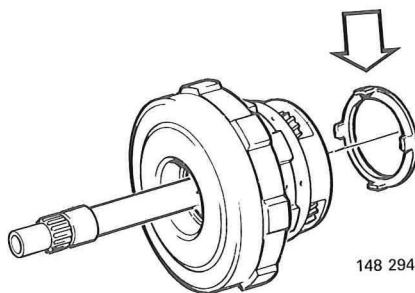
Ensure that planet carrier fits in plate assembly.

P5

AW 70

Install:

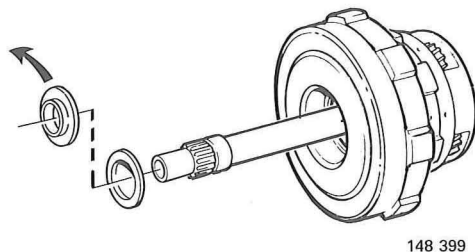
- Brake hub (1).
- Retaining ring (2).
Position gap in body of housing, not in an opening (see illustration).



P6

Install thrust washer in rear of planet carrier

Apply vaseline to hold washer in position.



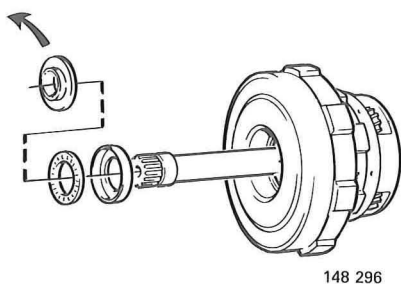
P7

Mount components of front needle thrust bearing, CO:

AW 72 L/late AW 71 (two components)

Install:

- Bearing race
Bearing with race attached is installed in oil pump when assembling gearbox. See operation AZ19.



AW 70/early AW 71

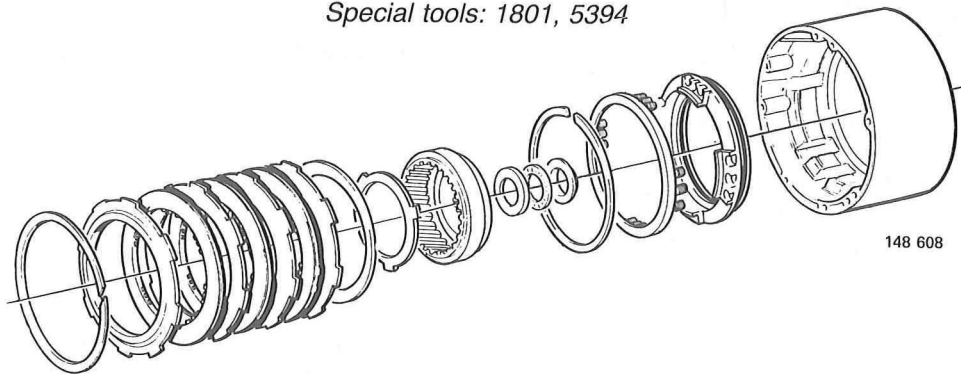
Install:

- Inner (rear) bearing race
- axial needle bearing.

Outer (front) race is installed on oil pump when reassembling transmission. See AZ19.

Overdrive housing, assembly

Special tools: 1801, 5394



148 608

Q1

Check that plugs (2 off) are in position



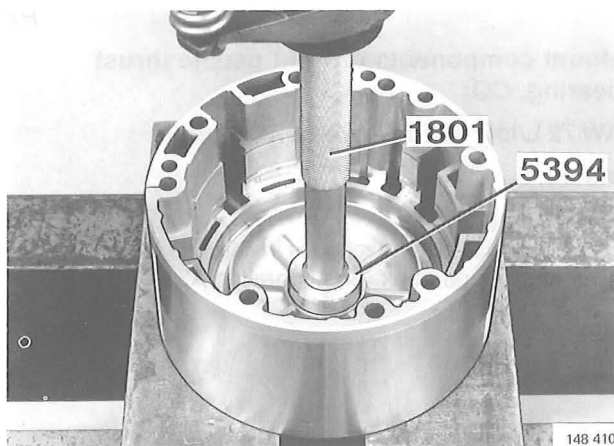
148 409

Q2

If replacing thrust bearing:

Install bearing in overdrive housing.

Press into position using tool 5394 and handle 1801 until rim of tool is in firm contact with housing.



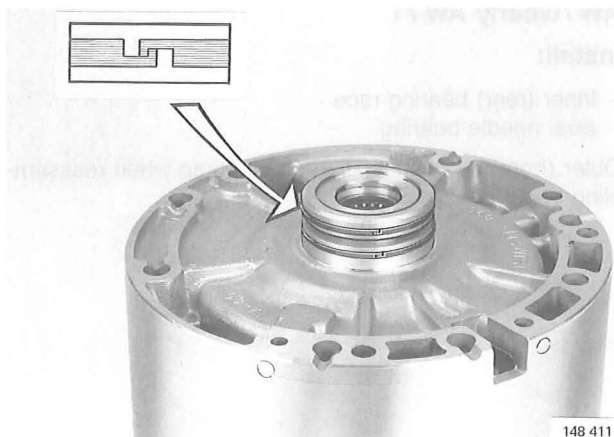
148 410

Q3

Install new oil seals

Hook seals together.

Check that seals are free to move in grooves.



148 411

Q4

Install new O-rings

Inner and outer O-rings on brake piston BO. Do not twist rings in grooves.

Q5

Install brake piston BO

Press in piston taking care not to damage O-rings.

Q6

Install return springs

Versions differ in terms of number of openings in piston and number of springs. If number of springs (12 off) is different to number of openings, locate springs symmetrically as illustrated.

Q7

Install:

- Spring retainer.
- Retaining ring.

Use screwdriver. Position retaining ring gap in body of housing, not in an opening (see illustration).

Q8

Install rear thrust bearing and front ring gear

Install:

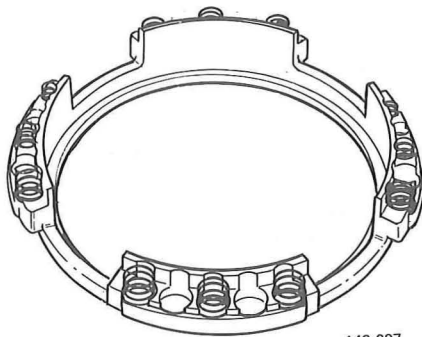
- Bearing race.
- Thrust bearing.
- Bearing race.

Use vaseline to hold in position.

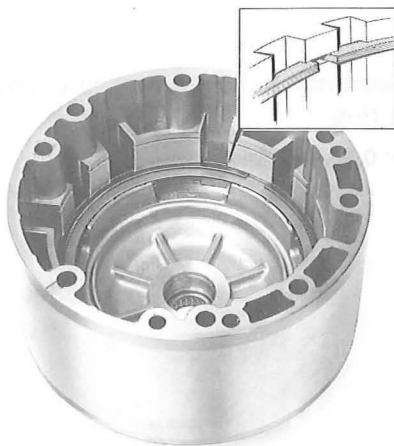
Locate as illustrated.



148 412



148 297

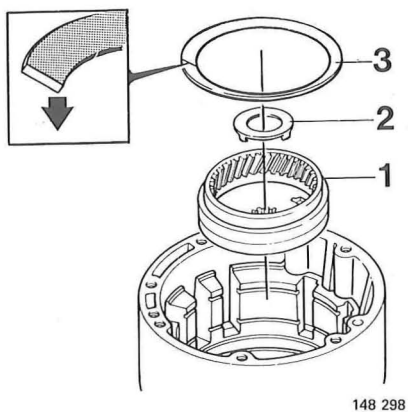


136 456



148 413

Q9



148 298

Install:

- Bearing race (2) in ring gear.
- Use vaseline to hold in position.
- Ring gear (1).
- Spring plate (3).
Position with convex side downwards.

Q10



148 414

Install:

- Brake BO plate assembly
Check friction plates. See 'Specifications' for minimum dimensions.
Arrangement: Steel plate – friction plate – steel plate etc.
- Pressure plate
AW 70, certain versions of AW 71:
Raised shoulder on pressure plate should face retaining ring groove.
- Retaining ring
Position gap in body of housing, not in an opening.

Q11

Check clearance between pressure plate and retaining ring

Clearance: 0.35–1.60 mm.

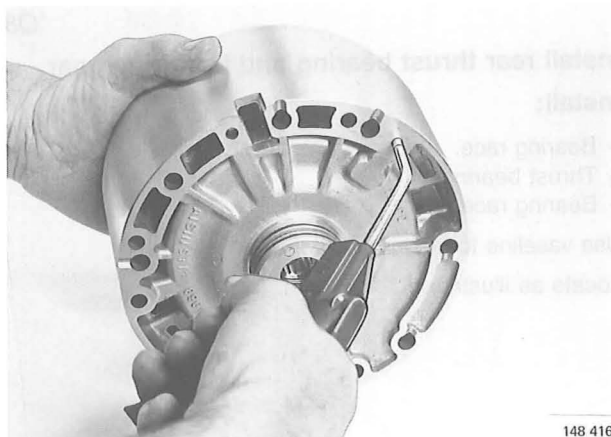


148 415

Q12

Check operation of brake piston

- Hold one hand against pressure plate.
- Blow with compressed air at reduced pressure of 100 kPa.
- Check that plate assembly moves.

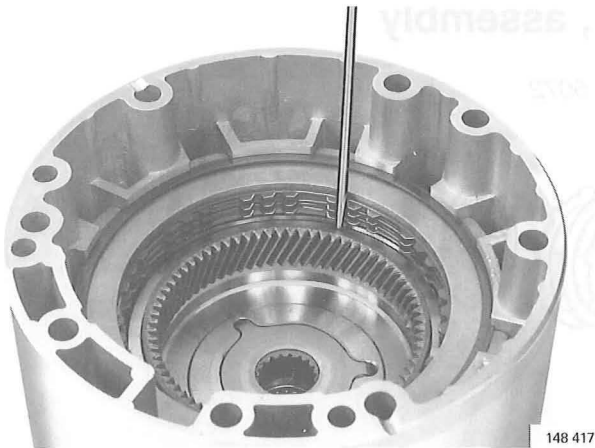


148 416

Q13

Align plates

Use screwdriver.



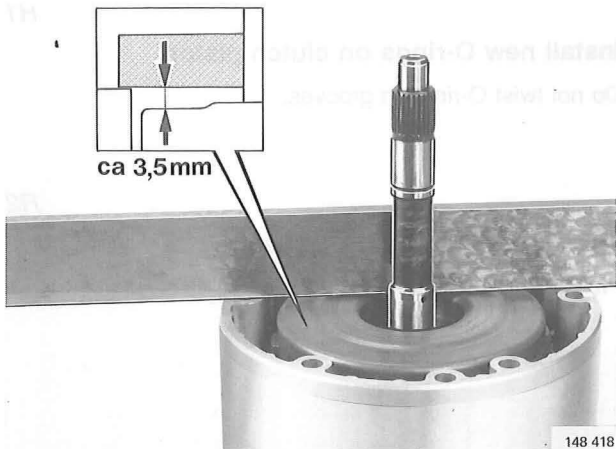
148 417

Q14

Install input shaft/planet carrier

Check that thrust washer at rear of planet carrier is in position. (See operation P6)

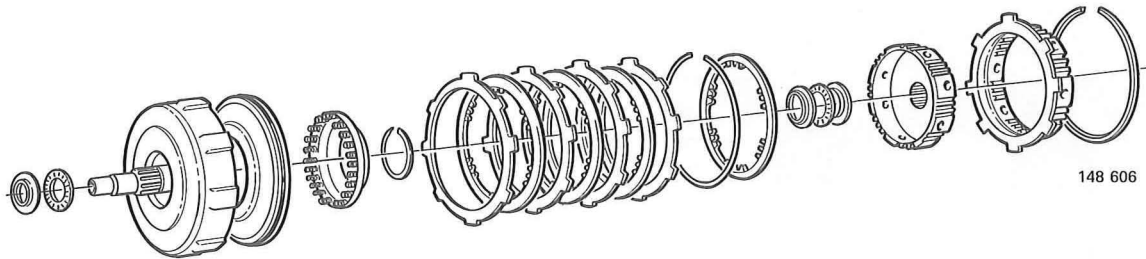
Check that edge of clutch housing CO is approx. 3.5 mm below edge of overdrive housing.



148 418

Front clutch C1, assembly

Special tool: 5072



R1

Install new O-rings on clutch piston

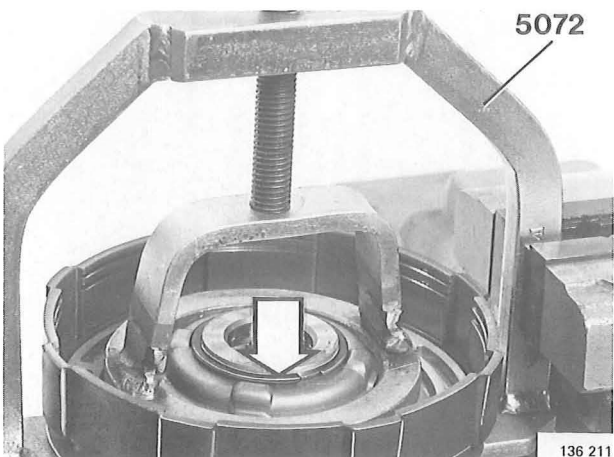
Do not twist O-rings in grooves.



R2

Install piston in clutch housing

Press down piston taking care to avoid damage to O-rings.



R3

Install return springs and spring retainer

AW 72L: 20 springs.

AW 70/71: 18 or 20 springs.

Ensure that springs are correctly seated.

R4

Install retaining ring

Compress return springs with tool 5072.

Install retaining ring, ensuring that it is correctly seated in groove.

Remove tool 5072.

R5

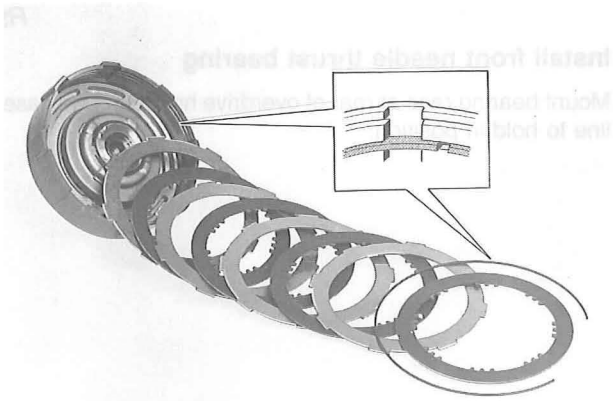
Install clutch C1 plate assembly

Check friction plates. See 'Specifications' for minimum dimensions.

Arrangement: Steel plate – friction plate – steel plate etc.

Install thin retaining ring after last plate. Position gap in body of housing, not in an opening (see illustration).

Install last friction plate.

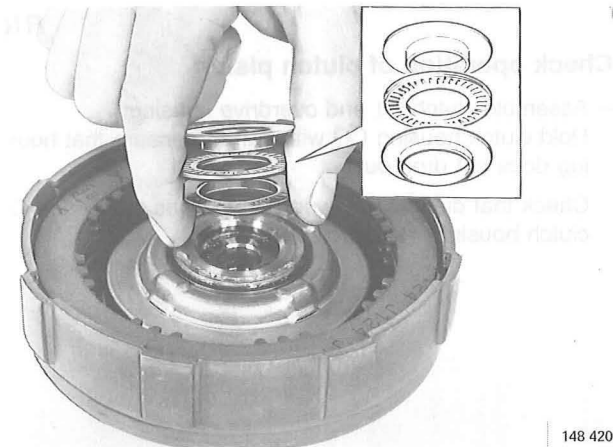


136 212

R6

Install bearing races and thrust bearing

Note: Note arrangement.

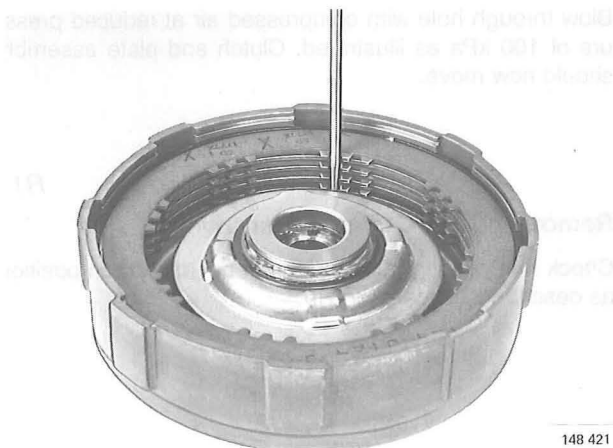


148 420

R7

Align plates

Use screwdriver.

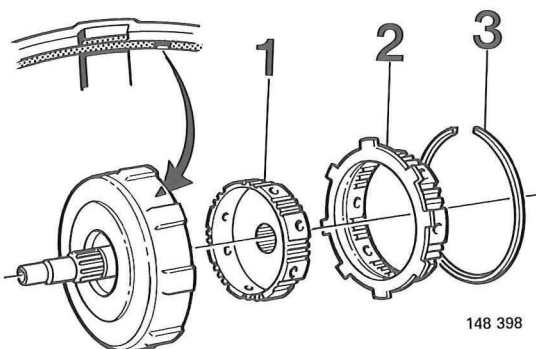


148 421

R8

Install:

- Front clutch hub (1).
Check that thrust bearing and races are in position. Ensure that hub fits in plate assembly.
- Rear clutch hub (2).
- Retaining ring (3).
Position gap in body of housing, not in an opening (see illustration).



148 398

R9

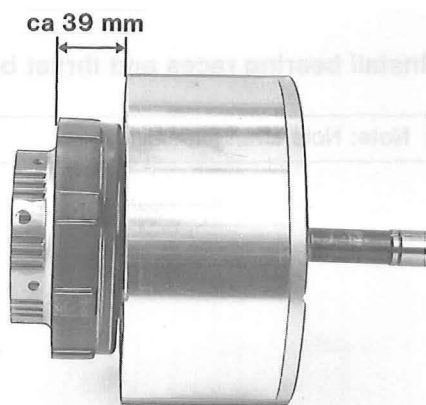


148 422

Install front needle thrust bearing

Mount bearing race at rear of overdrive housing. Use vaseline to hold in position.

R10



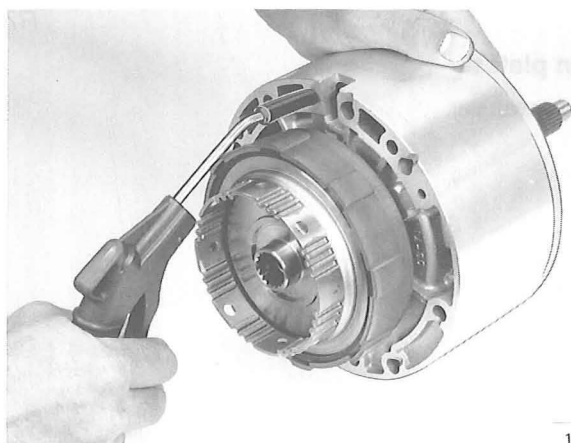
148 423

Check operation of clutch piston

– Assemble clutch C1 and overdrive housing. Hold clutch housing CO with hand to ensure that housing does not drop out.

Check that distance between rear edges of CO and C1 clutch housings is approx. 39 mm.

R11



148 424

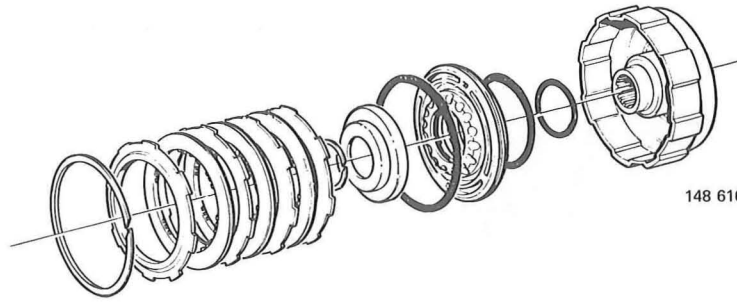
Blow through hole with compressed air at reduced pressure of 100 kPa as illustrated. Clutch and plate assembly should now move.

Remove clutch C1 from overdrive housing

Check that bearing race and thrust bearing are in position as described in operation R9.

Rear clutch C2, assembly

Special tool: 5072



S1

Install new O-rings (4 off) on clutch piston

Piston on AW 70 is in two parts.

Do not twist O-rings in grooves.



148 254

S2

AW 71/72 L:

Install piston in clutch housing.

AW 70:

Install inner, then outer piston

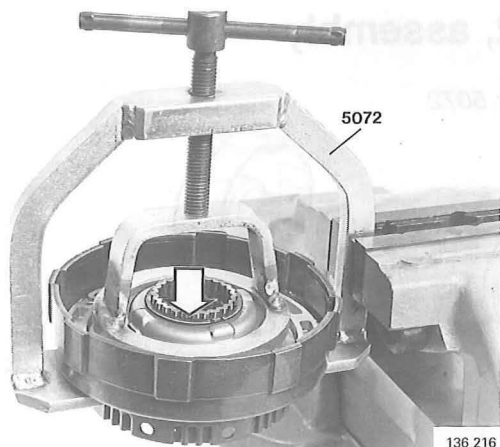


S3

Install return springs (18 off) and spring retainer

Ensure that springs are correctly seated.





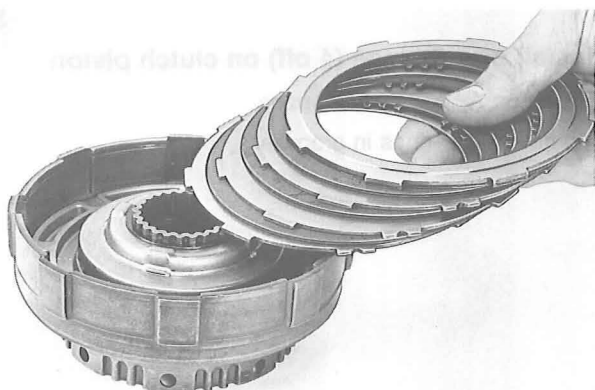
S4

Install retaining ring

Compress springs using tool **5072**.

Install retaining ring, ensuring that it is correctly seated in groove.

Remove tool **5072**.



S5

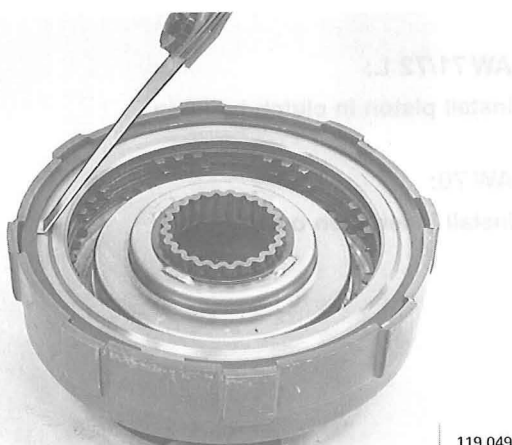
Install plate assembly

Inspect friction plates. See 'Specifications' for minimum dimensions.

Arrangement: Steel plate – friction plate – steel plate etc.

Position pressure plate with chamfered side facing outwards towards retaining ring.

Plain pressure plate is fitted in certain AW 70 units.



S6

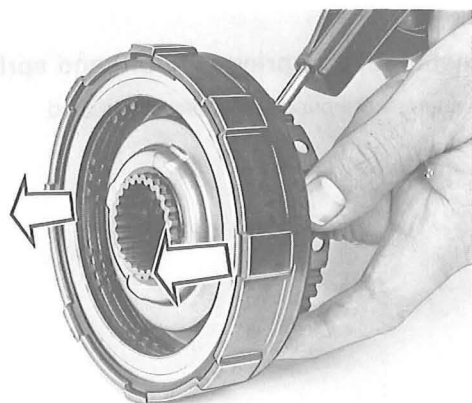
Install retaining ring

Ensure that retaining ring is correctly seated in groove with gap in body of housing, not in an opening (see illustration).

S7

Check clearance between retaining ring and uppermost plate

Clearance: 0.3–1.2 mm



S8

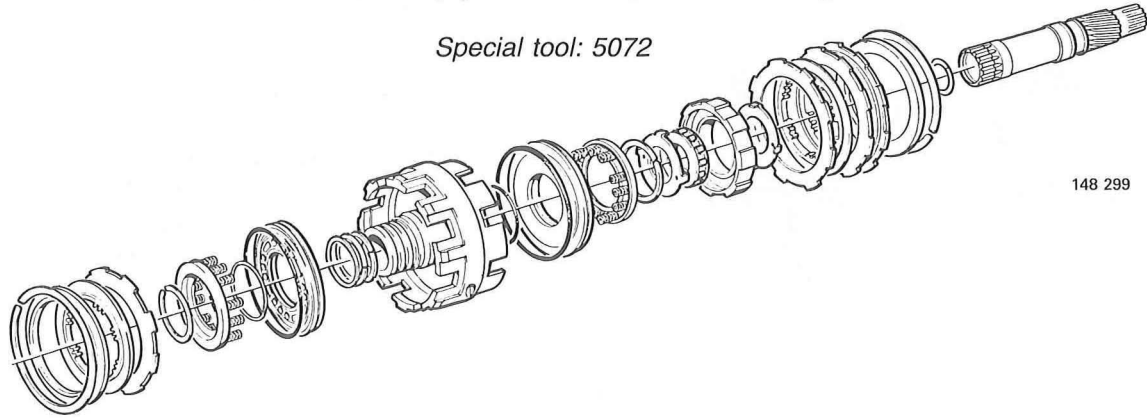
Check operation of piston

Blow through one of rear inside holes with compressed air at reduced pressure of 100 kPa. Block opposite hole with finger.

Plate assembly should move in direction of retaining ring.

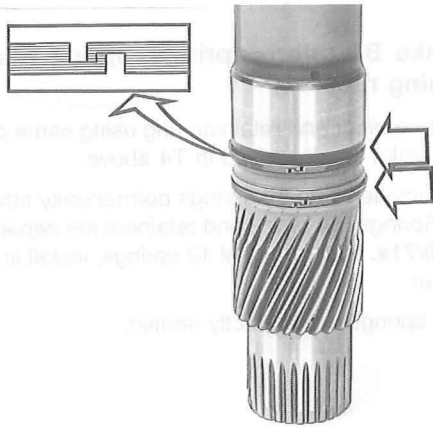
Centre support unit, assembly

Special tool: 5072



148 299

T1



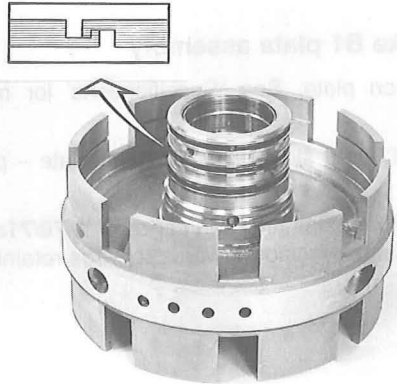
Install new oil seals

Install two seals on sun wheel shaft.

Hook seals together.

Check that seals are free to move in grooves.

148 263



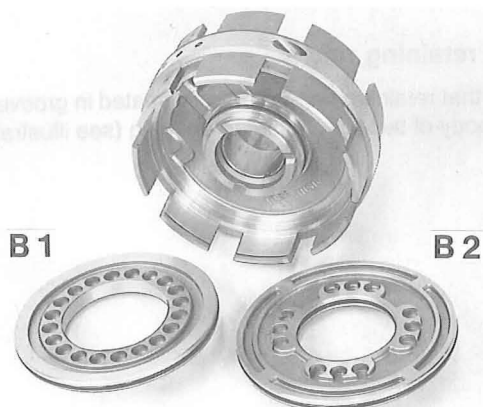
Install three seals on centre support.

Hook seals together.

Check that seals are free to move in grooves.

148 259

T2



Install new O-rings

- Brake piston B1: 1 ring.
- Brake piston B2: 2 rings.
- Centre support: 1 ring.

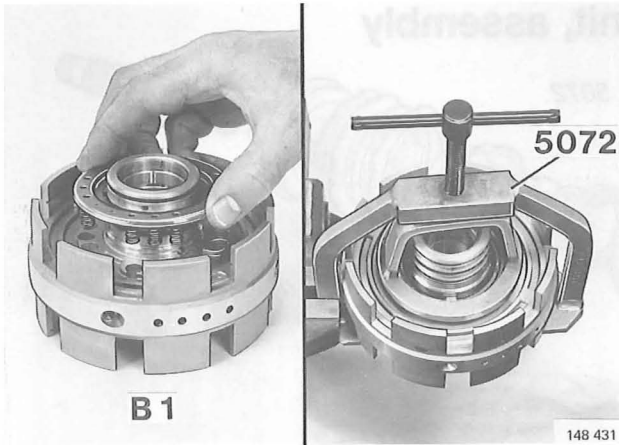
Do not twist O-rings in grooves.

T3

Install brake B1 piston

Take care to avoid damage to O-rings.

148 430



T4

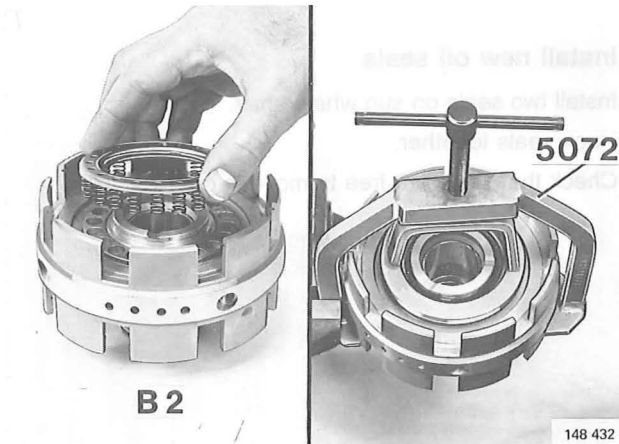
Install brake B1 return springs, spring retainer and retaining ring

AW 72L is provided with 12 springs permanently attached to retainer.

Springs (12 off) and retainers are separate in some AW 70/71s. Ensure that springs are correctly seated.

Compress springs using tool 5072. Install retaining ring, ensuring that it is correctly seated in groove.

Remove tool 5072.



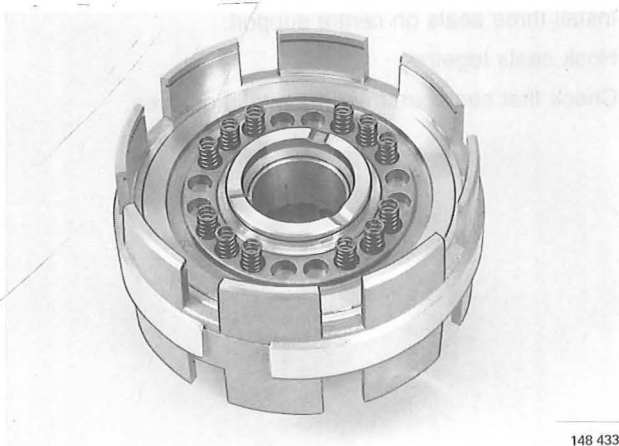
T5

Install brake B2 return springs, spring retainer and retaining ring

Install spring retainer and retaining ring using same procedure as for brake B1 described in T4 above.

AW 72L is provided with 12 springs permanently attached to retainer. Springs (12 or 20) and retainers are separate in some AW 70/71s. In the case of 12 springs, install in three groups of four.

Ensure that springs are correctly seated.



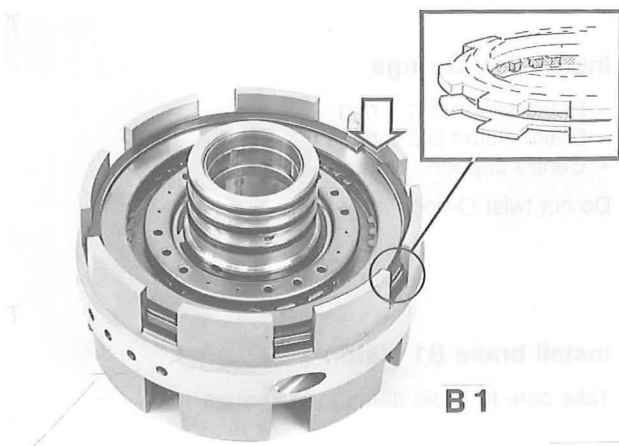
T6

Install brake B1 plate assembly

Inspect friction plate. See 'Specifications' for minimum dimensions.

Arrangement: Light steel plate – friction plate – pressure plate.

Pressure plate is chamfered on certain AW 70/71s. Install plate with chamfer facing outwards towards retaining ring.

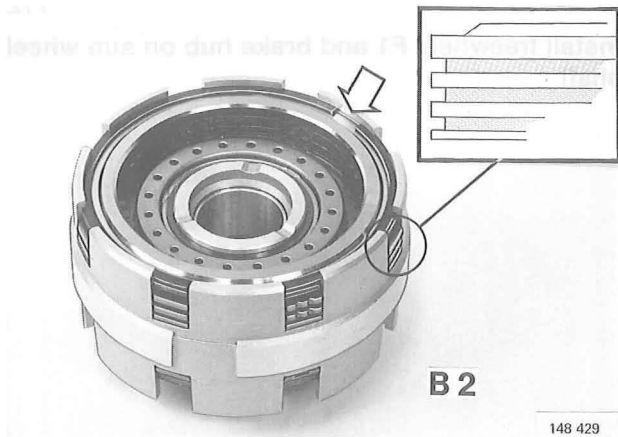


T7

Install retaining ring

Ensure that retaining ring is correctly seated in groove with gap in body of support, not in an opening (see illustration).

T8



Install brake B2 plate assembly

Inspect friction plate. See 'Specifications' for minimum dimensions.

Arrangement: Thin steel plate, followed alternately by friction and steel plates.

Install pressure plate with chamfer facing outwards towards retaining ring.

Plain pressure plate is fitted on certain gearboxes.

T9

Install retaining ring

Ensure that retaining ring is correctly seated in groove with gap in body of support, not in an opening (see illustration).

T10

Check clearance between retaining ring and uppermost plate

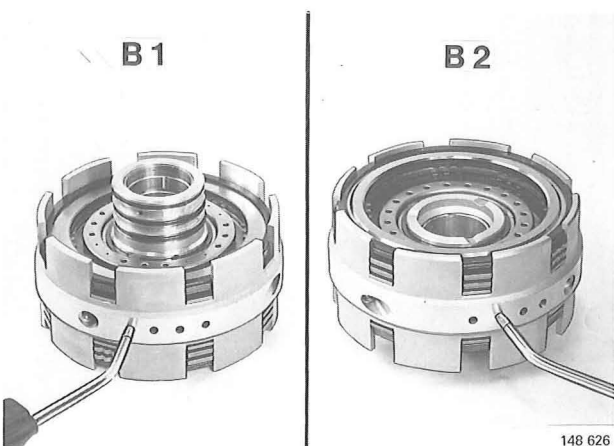
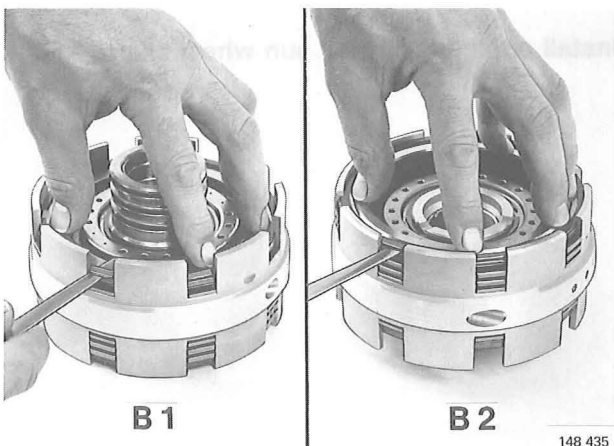
Clearance, B1 and B2: 0.3–1.2 mm

T11

Check operation of pistons

Blow through holes as illustrated using compressed air at reduced pressure of 100 kPa.

Plate assembly should move in direction of retaining ring.

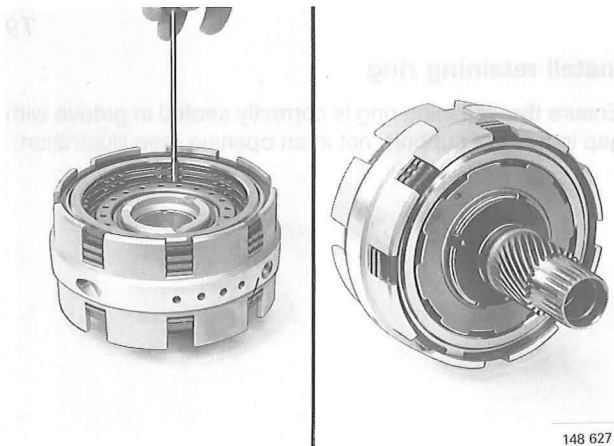




148 262

T12

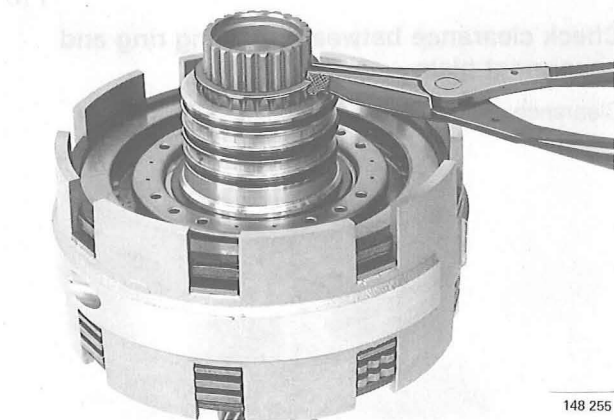
Install freewheel F1 and brake hub on sun wheel shaft



148 627

T13

**Align plates with brake B2
Insert brake hub in plate assembly**

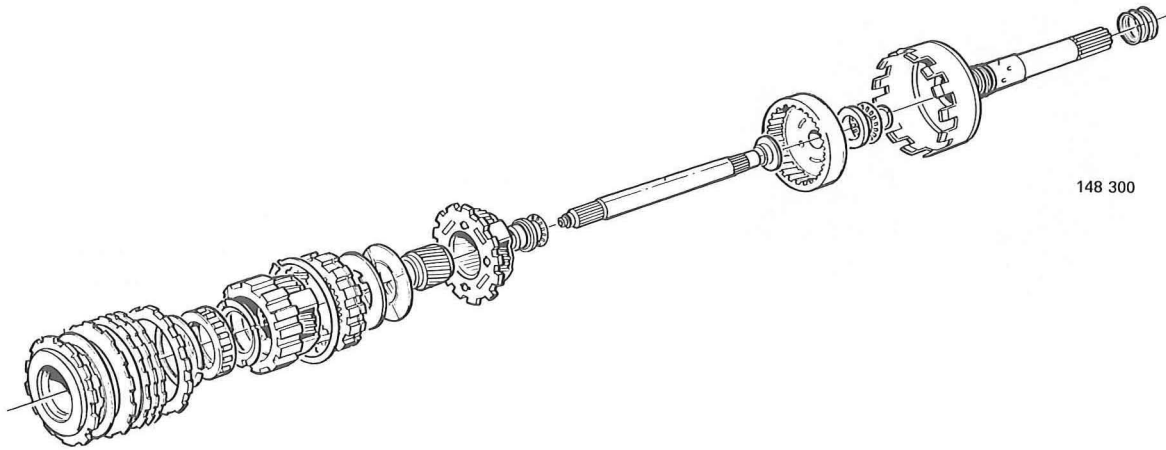


148 255

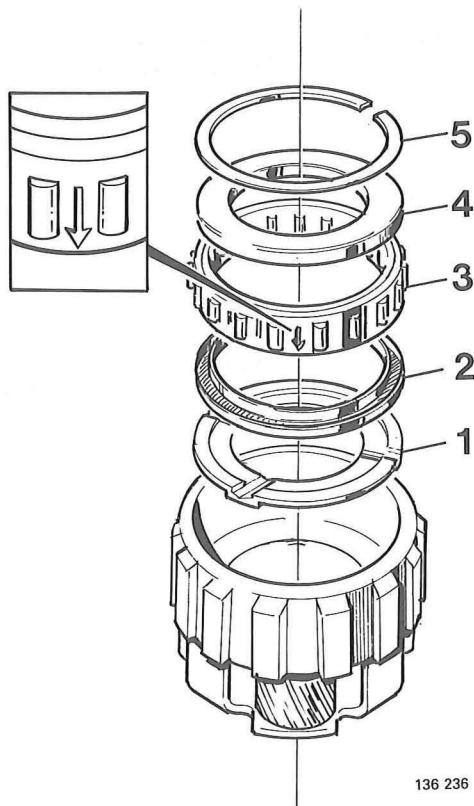
T14

Install retaining ring on sun wheel shaft

Planetary drive unit, assembly



148 300



136 236

U1

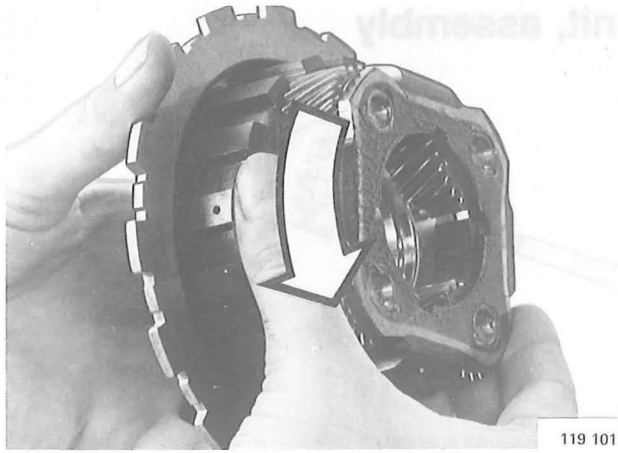
Install:

- Thrust washer (1).
Locate projections in planet carrier. Washer can be installed in one position only.
- Inner bearing retainer (2).
- Freewheel F2 (3).
Press in freewheel by hand with arrow pointing inwards and flange facing outwards.
If freewheel is difficult to install, use discarded O-ring to compress rollers as illustrated below.
- Outer bearing retainer (4).
- Retaining ring (5).
Ensure that retaining ring is correctly seated in groove.



148 638

Installation of freewheel F2 with aid of O-ring.



119 101

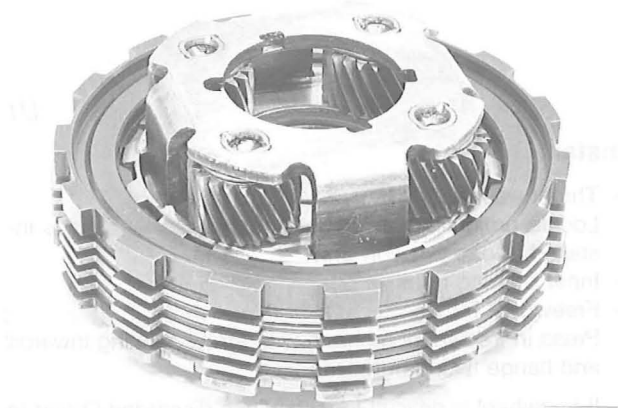
U2

Assemble plate assembly reaction plate and front planet carrier

U3

Check freewheel

Front planetary train should lock when turned in clockwise direction and should be free to rotate when turned counter-clockwise (in direction of arrow). Freewheel must not be sticky or loose.



119 092

U4

Install brake B3 plates on front planet carrier

Inspect friction plates. **AW 71/72 L:** 5 plates; **AW 70:** 4 plates. See 'Specifications' for minimum dimensions.

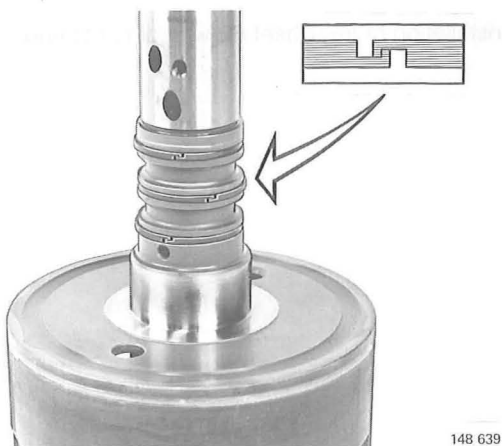
Arrangement:

AW 71/72 L

Friction plate beside reaction plate, followed alternately by steel plates and friction plates. Install pressure plate in outermost position.

AW 70

Steel plate beside reaction plate, followed by plates in same order as above. (AW 70 is equipped with only four friction plates.)



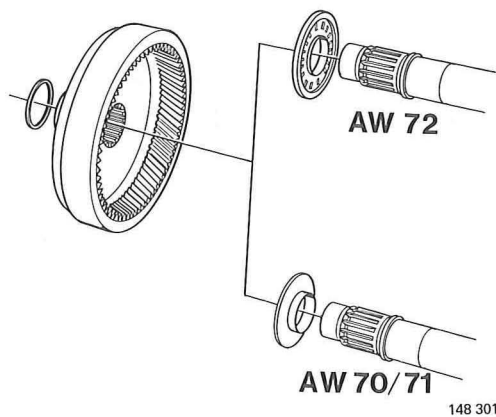
148 639

U5

Install oil seals

Install three seals on output shaft. Hook seals together. Check that seals are free to move in grooves.

U6



Install on intermediate shaft:

AW 72 L:

Sun wheel bearing and attached race.

AW 70/71:

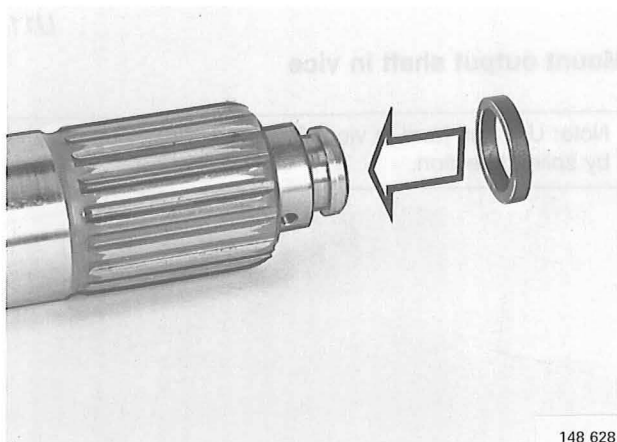
Bearing race. Bearing is installed in rear ring gear. See operation U8.

Both gearboxes:

- Rear ring gear.
- Retaining ring.

U7

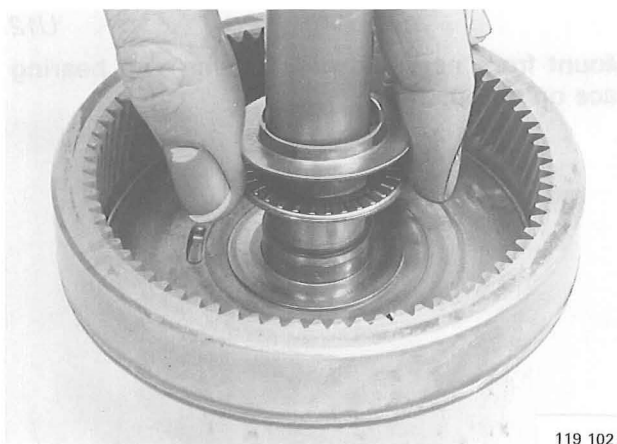
Install new seal on front end of intermediate shaft



U8

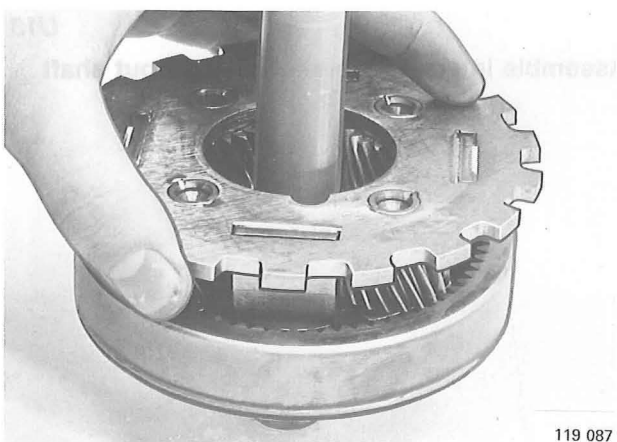
AW 70/71:

Install needle thrust bearing and bearing race on intermediate shaft.

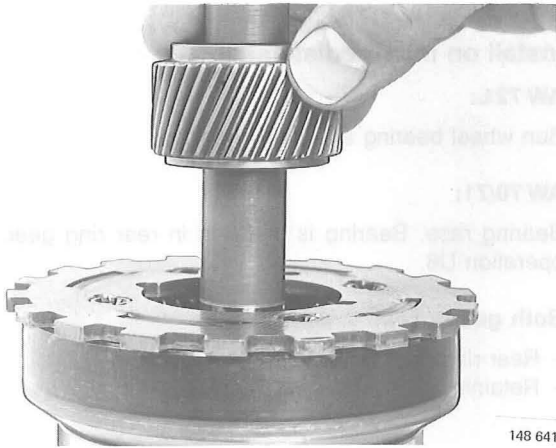


U9

Install rear planet carrier in rear ring gear.



U10

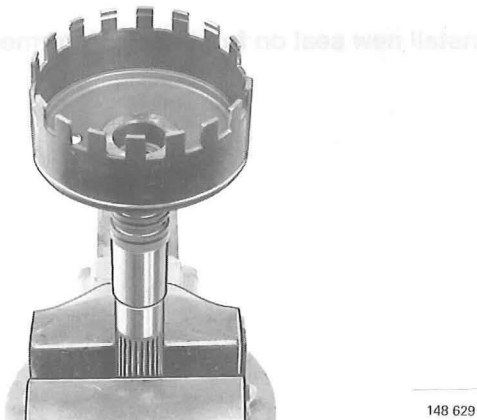


AW 72 L:

Mount rear section of sun wheel shaft.

(AW 70/71 has integral sun wheel shaft).

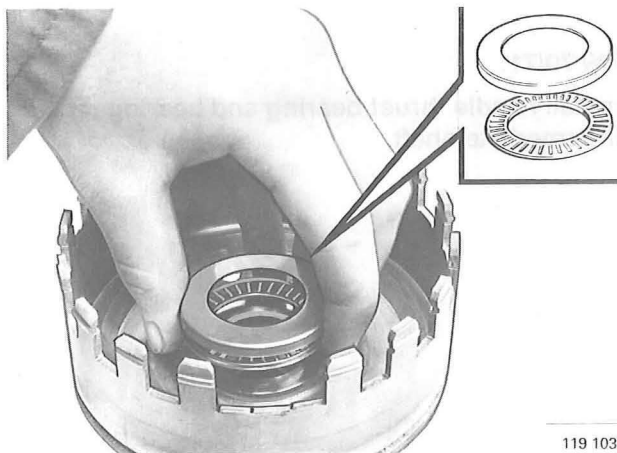
U11



Mount output shaft in vice

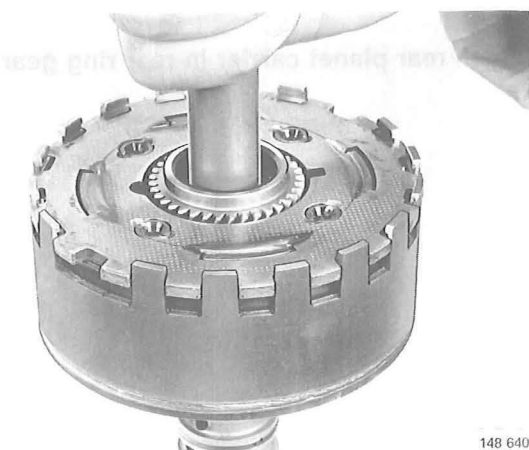
Note: Use soft jaws in vice. Shaft may be gripped only by splined section.

U12



Mount front needle thrust bearing and bearing race on output shaft

U13



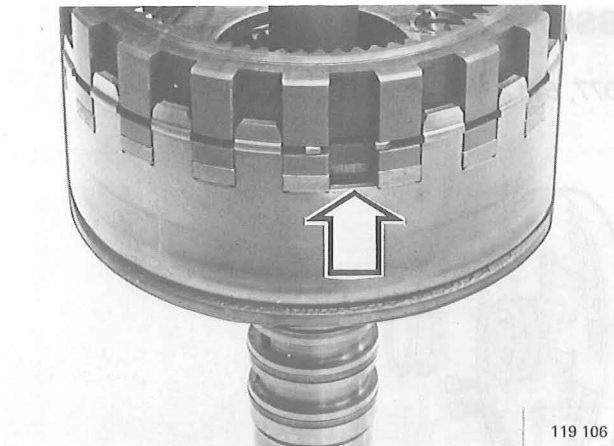
Assemble intermediate shaft and output shaft

U14

Place front ring gear on top of rear ring gear

Locate retaining ring gap in opening provided by missing tooth in output shaft coupling (arrowed in picture).

When correctly installed, width of retaining ring gap should be same as tooth pitch on front ring gear.



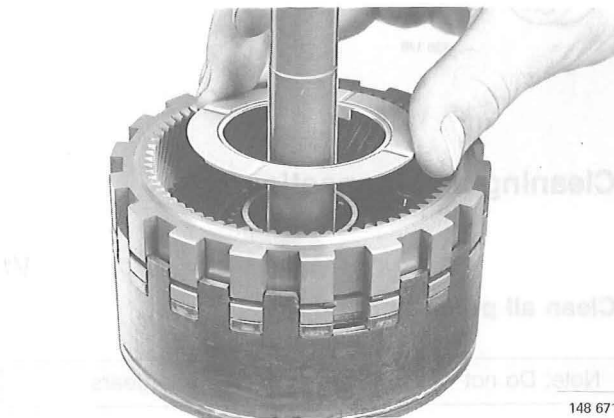
U15

Install thrust washer in rear planetary train

Locate projections in recesses in rear planet holder.

AW 70/72 L: Nylon washer.

AW 71: Steel washer.



U16

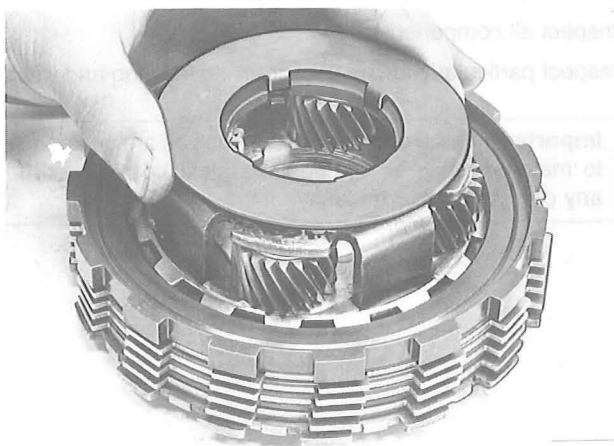
Install thrust washer in front planetary train

Locate projections in recesses in planet holder.

Use vaseline to hold in position.

AW 70/72 L: Steel washer.

AW 71: Nylon washer.

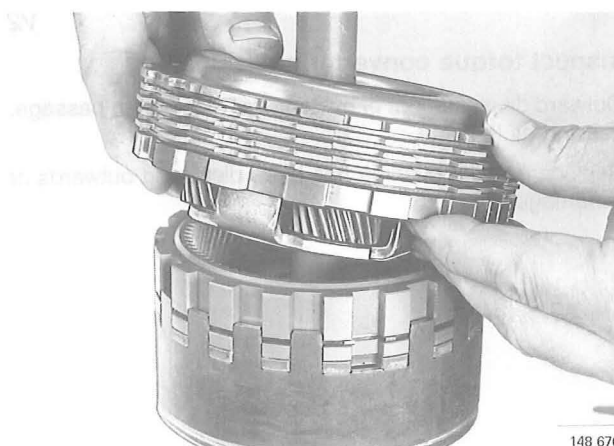


U17

Assemble front and rear planetary trains

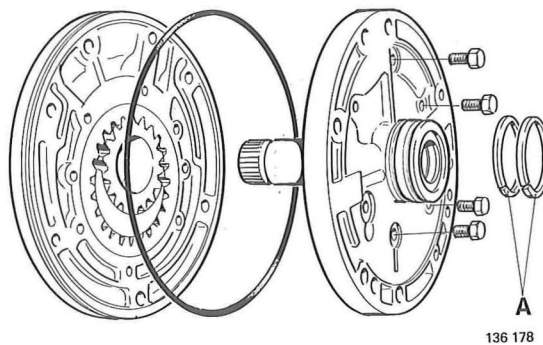
Ensure that thrust washers have remained in position and that front planetary train is properly seated in front ring gear.

Note: Hold planet holder and freewheel to prevent them falling out of plate assembly.



Oil pump, assembly

Special tools: 5077, 5117



Cleaning and inspection

V1

Clean all parts thoroughly

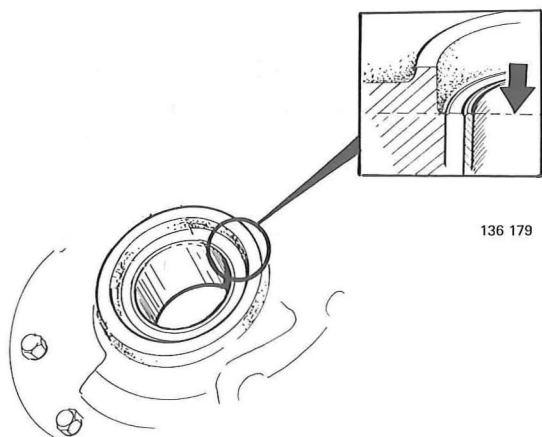
Note: Do not wash off markings on pump gears.

Dry components with compressed air.

Inspect all components.

Inspect particularly for signs of cracking, scoring and wear.

Important! Since gears and pump halves are designed to match closely, all components must be replaced if any one is found to be faulty.

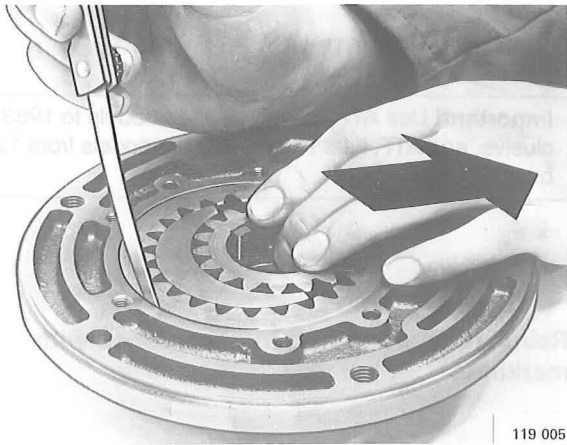


V2

Inspect torque converter shaft bushing

Outward displacement of bushing will block drain passage, causing oil leakage.

Replace pump if bushing has been displaced outwards or is damaged.



Assembly

V3

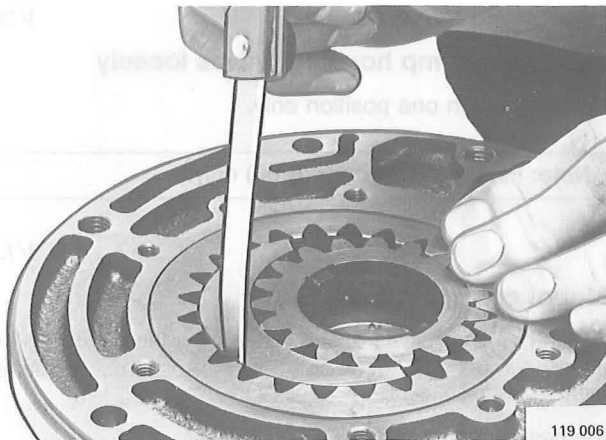
Install gears in hub in accordance with markings

V4

Check clearance between housing and runner

Pull both gears forward (see arrow) and measure clearance with feeler gauges.

Clearance: 0.07–0.15 mm

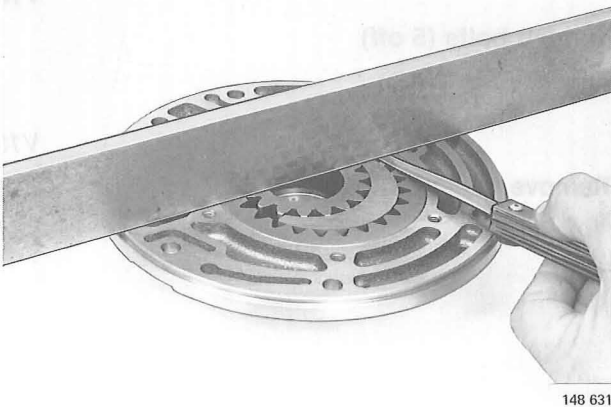


V5

Check clearance between top of teeth on runner and crescent-shaped section of housing

Check clearance as illustrated.

Clearance: 0.11–0.14 mm



V6

Check axial clearance of both gears

Place steel rule across face as illustrated.

Measure axial clearance of both gears with feeler gauges.

Clearance: 0.02–0.05 mm

Remove gears.



V7

Install new torque converter shaft oil seal

Use tool 5117.

Note: Take care to avoid damage to machined surface on pump housing.

V8

Oil all moving parts with ATF fluid

Important! Use ATF, type F or G for models to 1983 inclusive, and ATF, type Dexron II D for models from 1984 on.

V9

Reinstall gears in hub in accordance with markings

V10

Assemble pump housing halves loosely

Holes match in one position only.

Note: Finger-tighten bolts (5 off) only.

V11

Mount centering clamp 5077

Adjust housing halves until 8.5 mm cylindrical drift can be inserted in each of seven bolt holes for assembly of pump with overdrive unit.

Tighten centering clamp 5077.

V12

Tighten bolts (5 off)

Torque: 8 Nm (6 ft.lb)

V13

Remove centering clamp 5077

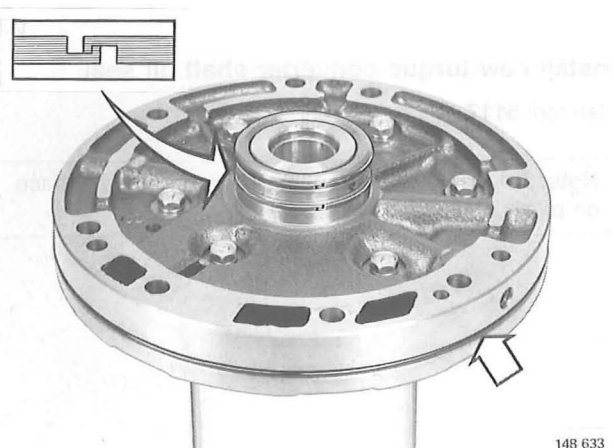
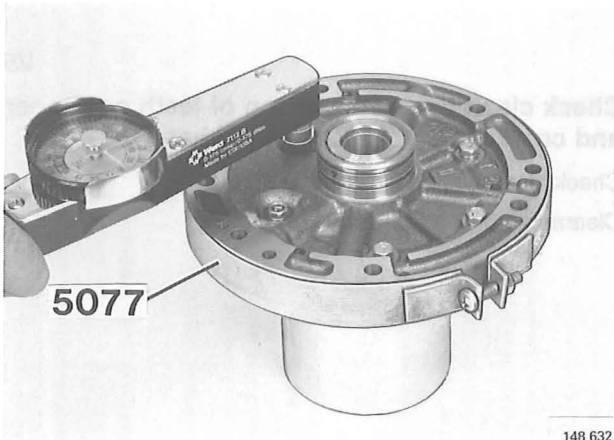
V14

Fit O-ring around pump housing

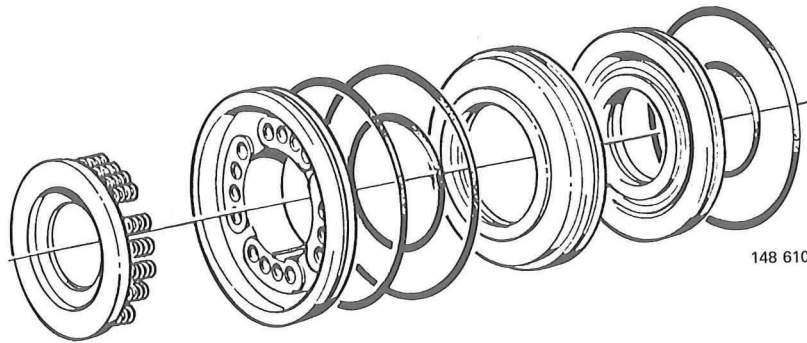
Install oil seals on pump hub

Hook seals together.

Check that seals are free to move in grooves.



Brake pistons B3, assembly



Install new O-rings

Do not twist rings in grooves.

X1

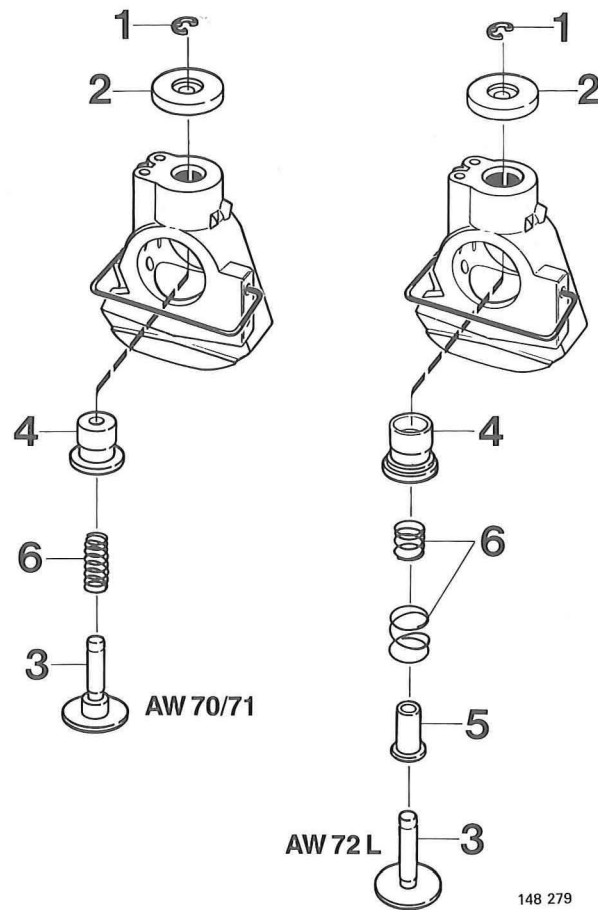


Assemble pistons

Compress pistons by hand.

X2

Governor, assembly



Y1

Oil all components with ATF fluid

Important! Use ATF, type F or G for models to 1983 inclusive, and ATF, type Dexron II D for models from 1984 on.

Y2

Install:

- Valve stem (3).
 - Spring guide (5). (No guide in AW 70/71).
 - Springs (6) (Only one spring in AW 70/71).
 - Valve (4).
- Install components in governor housing.

Y3

Install:

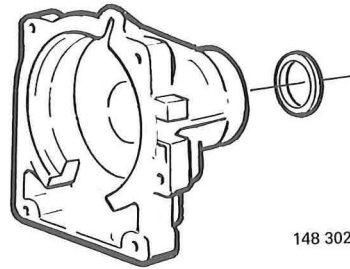
- Governor weight (2).
- Retaining ring (1).

Y4

Check that valve is not sticking

Rear extension housing, assembly

Special tools: 5075, 5404



Z1

If bushing only is to be replaced

Install new bushing.

New bushing is not provided with holes and may be located in any desired position.

Use drift **5404**.

Oil outside of bushing with ATF fluid.

Important! Use ATF, type F or G for models to 1983 inclusive, and ATF, type Dexron II D for models from 1984 on.



Z2

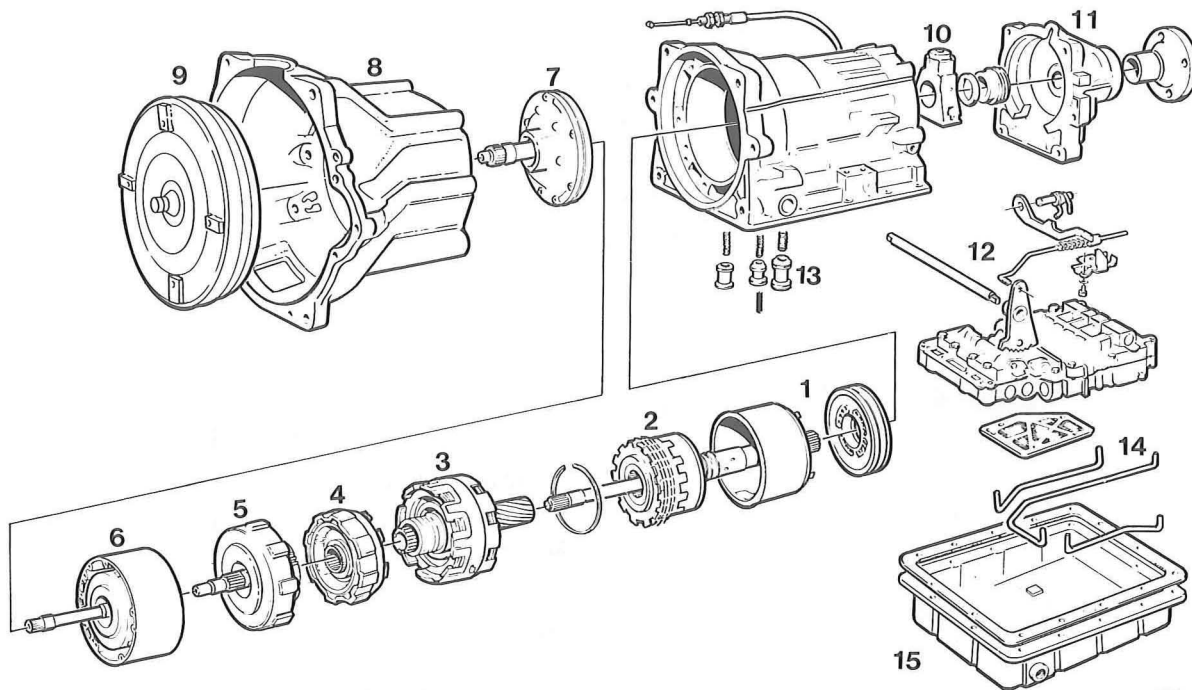
Install seal

Lubricate lip of seal as specified in Z1 above.

Mount seal on drift **5075** and press into position.

Complete reassembly

Special tools: 2520, 5070, 5073, 5118, 5149, 5241, 5971



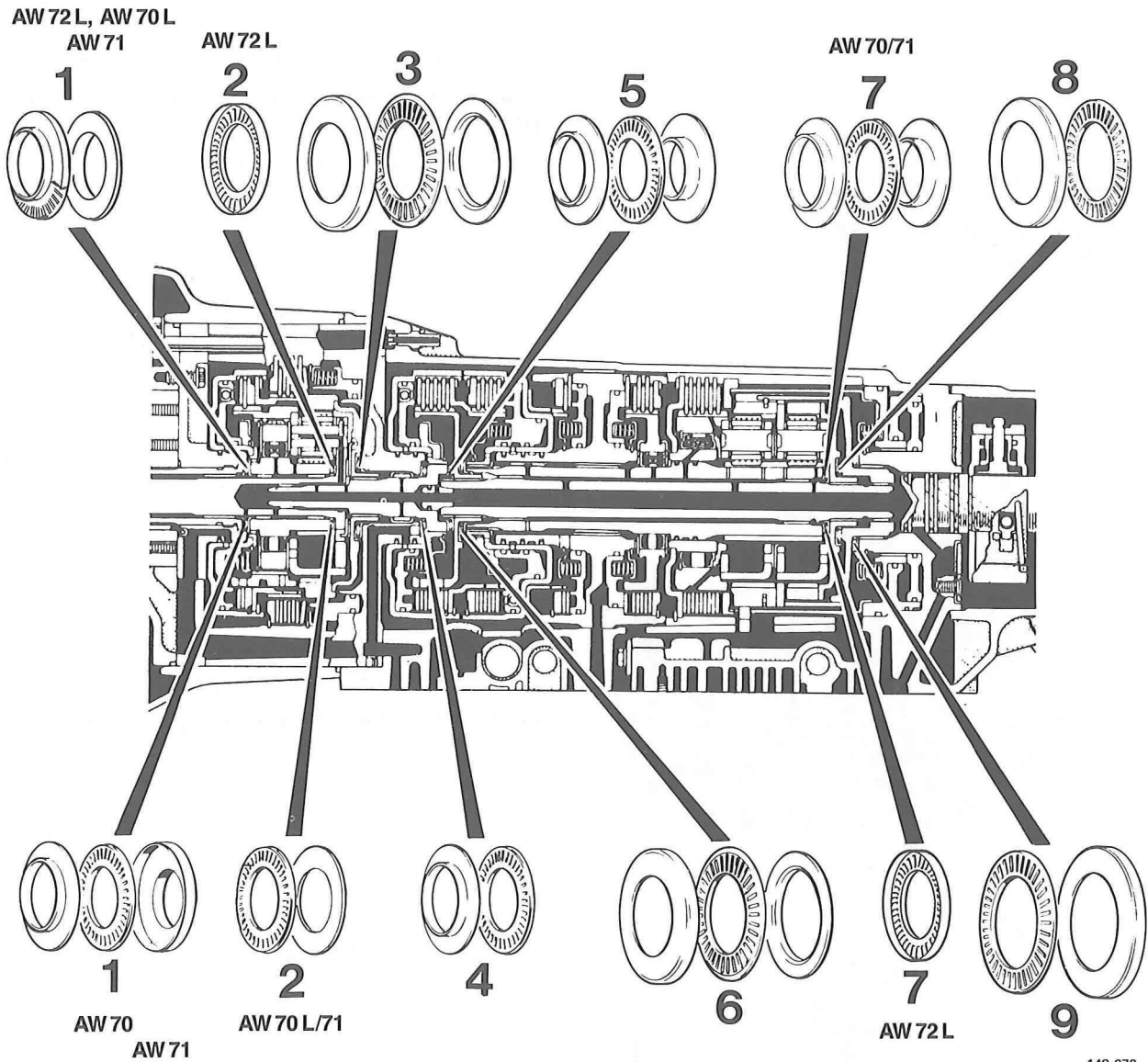
1. Take-up sleeve and brake pistons B3
2. Planetary drive unit F2
3. Centre support unit B1-F1-B2
4. Rear clutch C2
5. Front clutch C1
6. Overdrive unit
7. Oil pump

8. Torque converter housing
9. Torque converter
10. Governor
11. Rear extension housing, drive flange
12. Gear selector mechanism
13. Accumulator pistons
14. Control system and oil pipes
15. Oil sump

The transmission is assembled more or less in the above numerical order.

Prior to assembly, check that all component units are correctly assembled.

Ensure that needle thrust bearings and races are installed in correct positions as shown in figure on page 77.

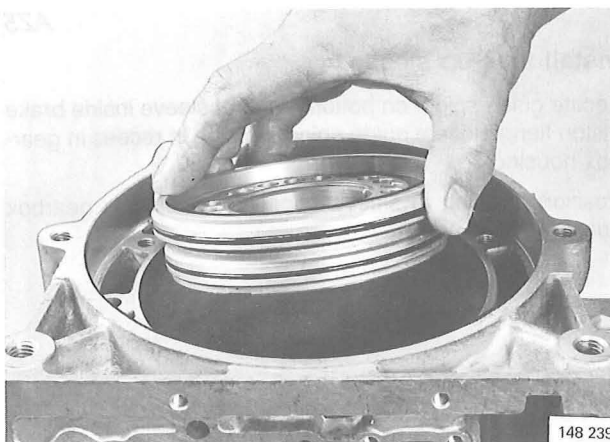


148 672

1. Front thrust bearing, CO (AW 72L/late AW 71: two components. AW 70/early AW 71: three components).
2. Intermediate thrust bearing, CO (not installed on AW 70).
3. Rear thrust bearing, front ring gear.

4. Front thrust bearing, C1.
- *5. Intermediate thrust bearing, C1.
6. Rear thrust bearing, C1.
- *7. Sun wheel thrust bearing.
- *8. Front thrust bearing, output shaft.
9. Rear thrust bearing, output shaft.

* Installed earlier during assembly of unit in question.



AZ1

**Turn gearbox housing into vertical position
Install brake B3 pistons**

Take care to avoid damage to O-rings. Tool 5073 may be used, with great care, to press down pistons.

AZ2

Install spring retainer and return springs

Certain gearboxes are equipped with separate springs (16 off) and separate retainer.

In this case, ensure that springs are correctly seated. Install spring retainer.



148 313

AZ3

Install retaining ring

Compress springs using tool 5073.

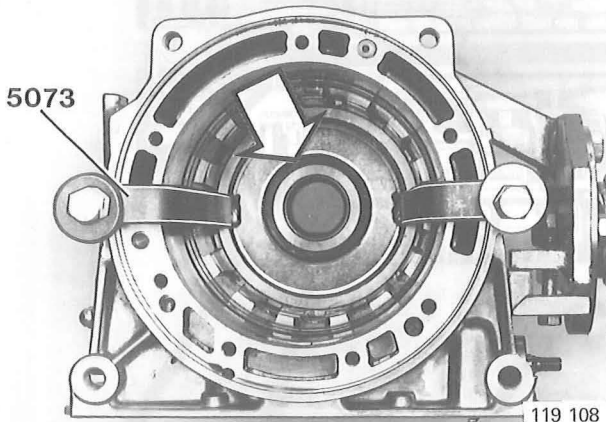
Mount tool using two M10 bolts approx. 30 mm long.

Tighten bolts alternately, first by hand and then by wrench.

Ensure that spring pressure plate is not unevenly loaded.

Install retaining ring. Remove tool 5073.

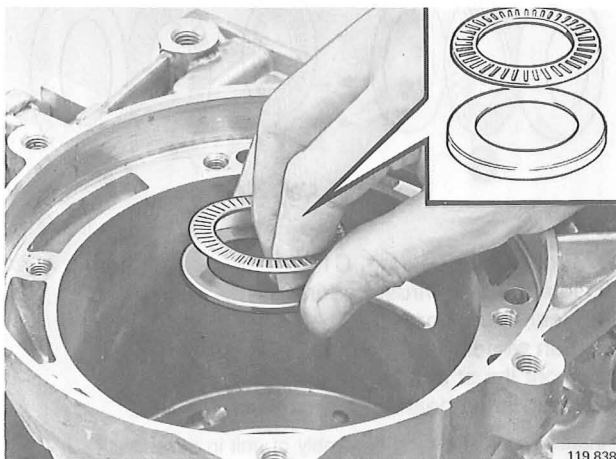
Ensure that retaining ring is correctly seated in groove.



119 108

AZ4

Install output shaft thrust bearing and bearing race in gearbox housing



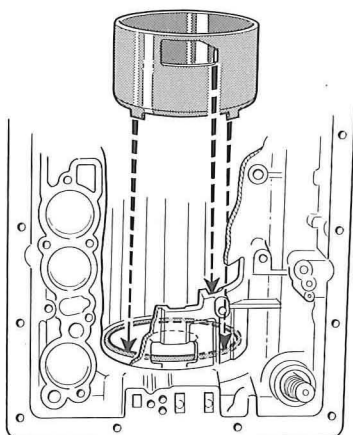
119 838

AZ5

Install take-up sleeve

Locate guide spigot on bottom edge of sleeve inside brake piston flange locate guide spigot on side in recess in gearbox housing.

Position opening in sleeve opposite opening in gearbox housing.



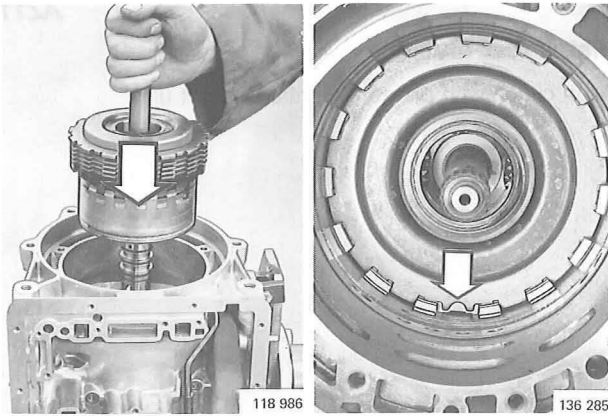
148 304

AZ6

Install planetary drive unit and brake B3 plate assembly

Align plates with grooves in gearbox housing. Align semi-circular recess in reaction plate with corresponding recess in plate assembly.

Lower assembly carefully into position.

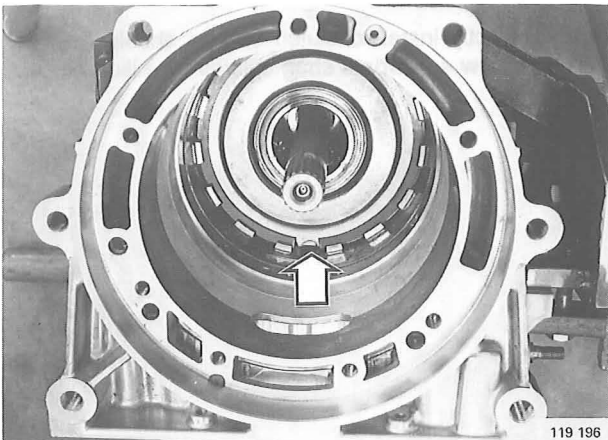


AZ7

Install planetary drive unit retaining ring

Use two screwdrivers.

Position retaining ring gap between two splines as illustrated.



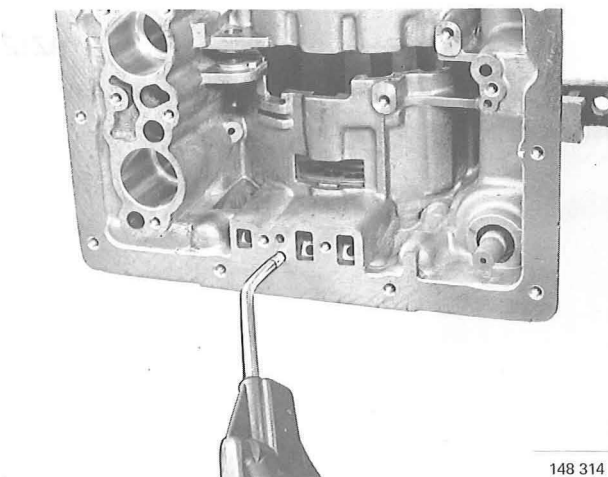
AZ8

Check operation of brake pistons B3

Blow through one of the two holes with compressed air at reduced pressure of 100 kPa.

'Sucking' noise should be heard clearly when blowing has stopped.

If piston does not move, dismantle and inspect.



AZ9

Ensure that freewheel F1 brake hub is correctly installed in brake B2 plate assembly

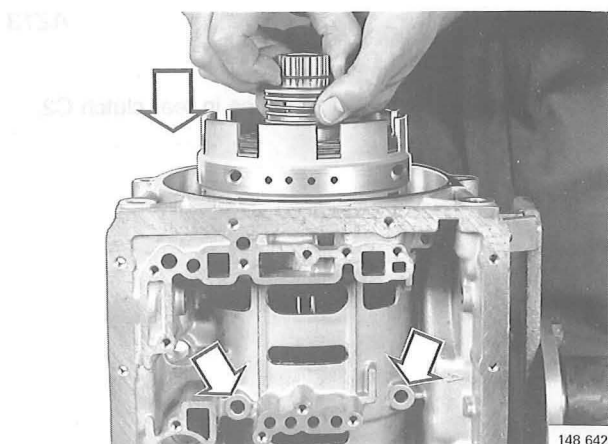
AZ10

Install centre support unit

Note: Hold sun wheel shaft so that brake hub does not slip out of position.

Insert bolts arrowed in picture. Finger-tighten only to avoid mis-threading.

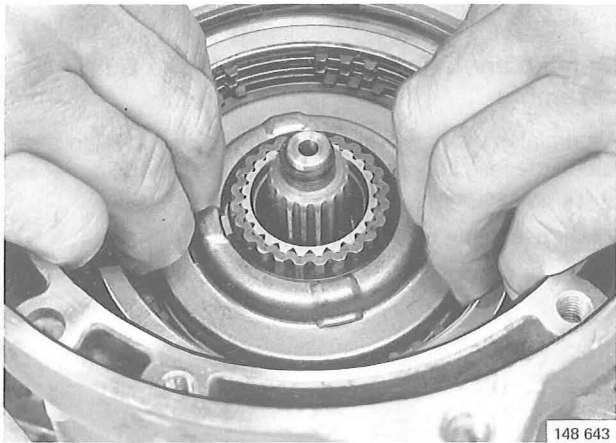
Note: Do not torque bolts!



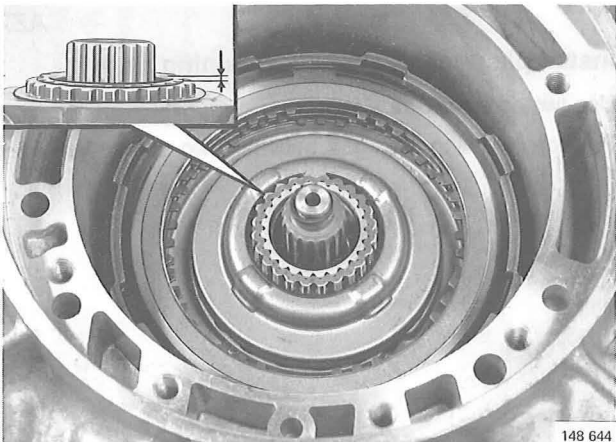
AZ11

Install rear clutch

Align clutch with plates in centre support unit.



148 643



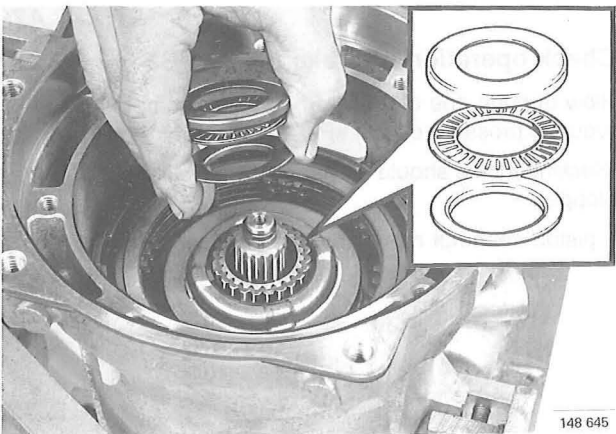
148 644

When correctly installed clutch splines should be **flush with or below** sun wheel shaft splines (see illustration).

AZ12

Install C1 rear thrust bearing and races

Use vaseline to hold races in position.

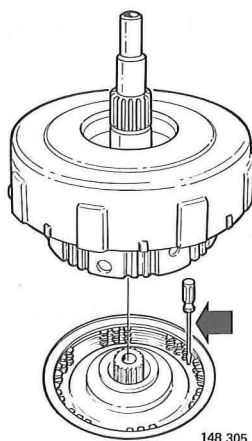


148 645

AZ13

Install front clutch C1

Use small screwdriver to align plates in rear clutch C2.



148 305

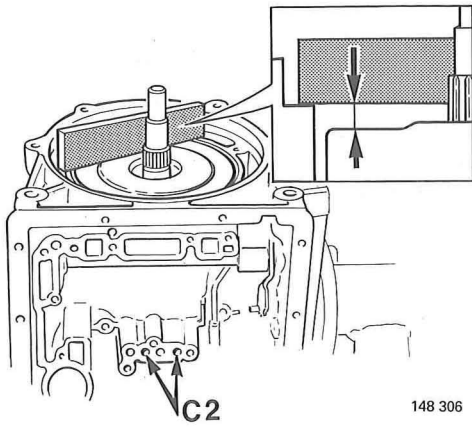
AZ14

Assemble front clutch C1 with rear clutch C2

This will be facilitated by locking rear clutch plates in position. Blow through one of holes arrowed in illustration with air at reduced pressure of 100 kPa.

Face of front clutch should be located slightly below edge of gearbox housing. If too high, it is not correctly seated in rear clutch. If oil pump is mounted in this position, rear clutch plates will be irreparably damaged.

Check that C1 front thrust bearing is in place on input shaft. (Bearing was installed as part of operation R9.)

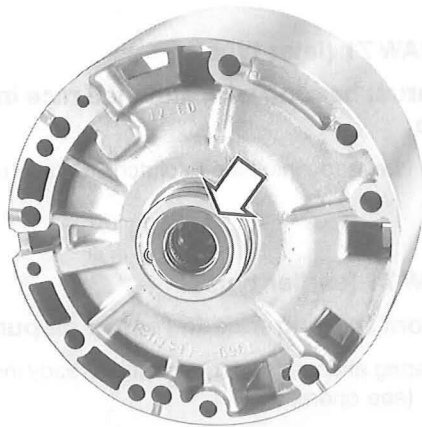


148 306

AZ15

Check that bearing race at rear of overdrive unit is in position

Race was installed in operation R9.

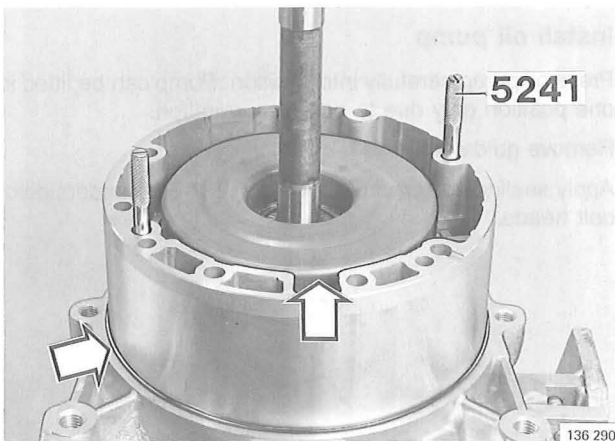


148 646

AZ16

Install:

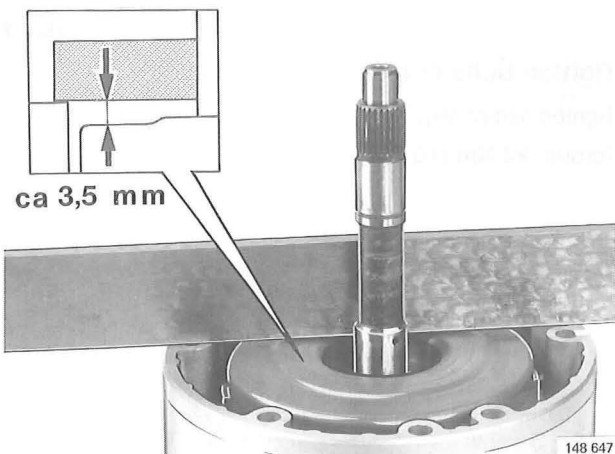
- Guide pins 5241 for centering overdrive unit.
- Overdrive unit. Opening (arrowed) should face oil sump.
- O-ring.



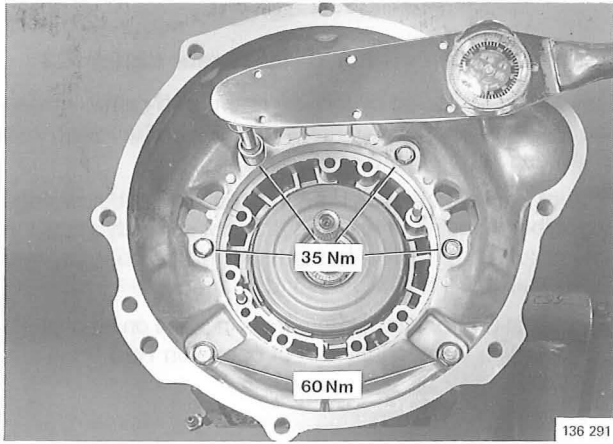
136 290

AZ17

Check that face of clutch C0 is approx. 3.5 mm below edge of overdrive unit housing



148 647



AZ18

Install torque converter housing

Use vaseline to lubricate mating surface between overdrive unit and torque converter housing.

Tighten

- 4 upper bolts (see illustration) to **35 Nm** (26 ft.lb)
- 2 lower bolts (see illustration) to **60 Nm** (44 ft.lb).



AZ19

AW 72 L/AW 71 (later type)

Install thrust bearing with attached race in rear of oil pump

Rear race is already installed in clutch CO (see operation P7).

AW 70/AW 71 (earlier type)

Install front bearing race in rear of oil pump

Thrust bearing and rear (inner) race are already installed in clutch CO (see operation P7).

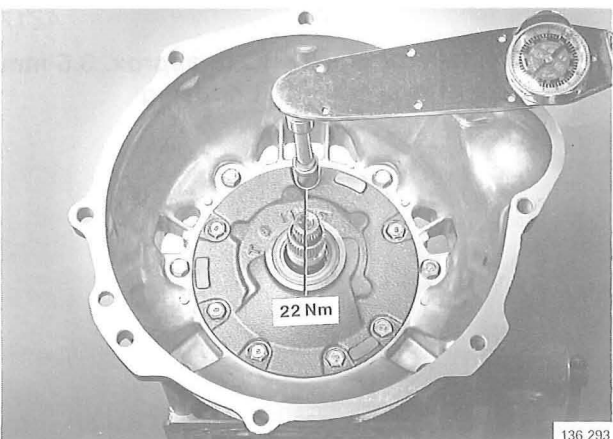
AZ20

Install oil pump

Press oil pump carefully into position. Pump can be fitted in one position only due to hole configuration.

Remove guide pins 5241.

Apply sealing compound (P/N 1 161 277-7) to underside of bolt heads.



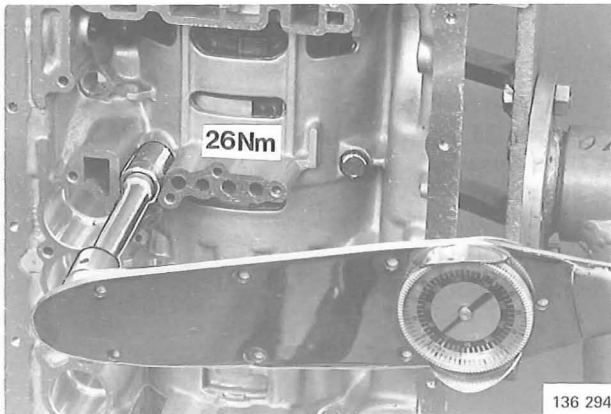
AZ21

Tighten bolts (7 off)

Tighten alternately.

Torque: **22 Nm** (16 ft.lb).

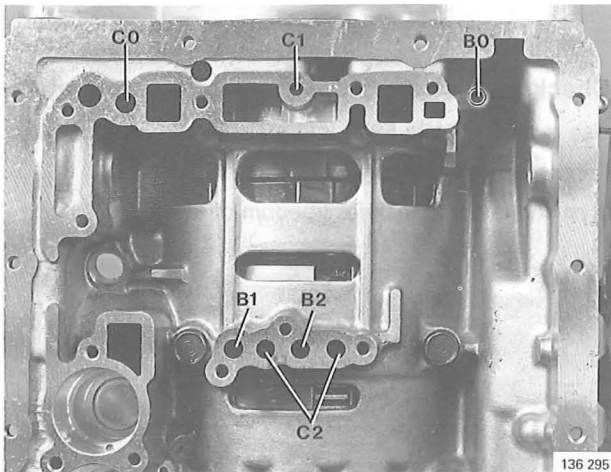
AZ22



Tighten centre support unit bolts

First tighten bolt nearest accumulator piston seats to **7 Nm** (5 ft.lb). Then tighten other bolts to same torque. Continue tightening in stages to **14 Nm** (10 ft.lb) and **21 Nm** (15 ft.lb), and finally to **26 Nm** (19 ft.lb).

AZ23

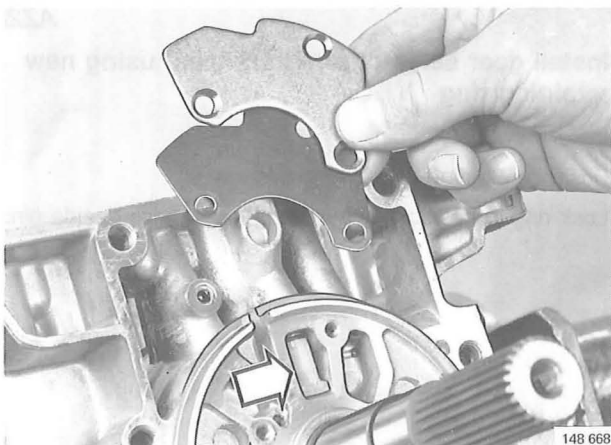


Check operation of B1, B2 and C2 pistons

Blow through holes indicated in illustration with air at reduced pressure of 100 kPa. 'Sucking' sound should be heard clearly when blowing is stopped.

If pistons do not move, dismantle and inspect.

AZ24

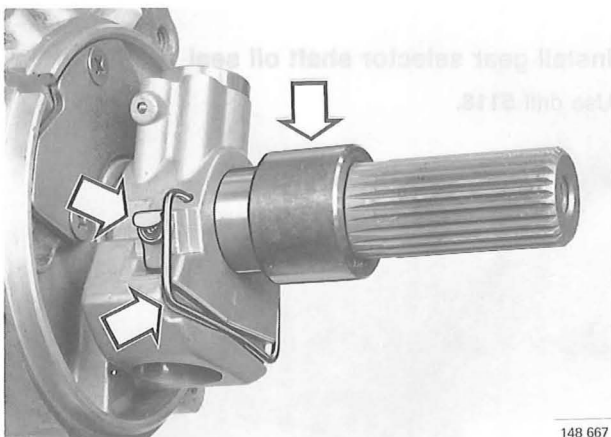


Install:

- Oil strainer.
- Oil passage gaskets.
- Cover plate.

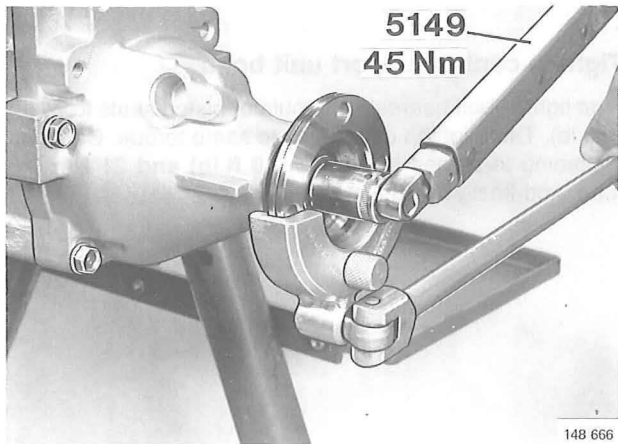
Torque: **6-9 Nm** (4.5-6.5 ft.lb)

AZ25



Install governor

- Tighten bolt with tab washer.
Torque: **4 Nm** (3 ft.lb).
Bend locking tab into position against bolt head.
- Locking clip.
- Spacer.

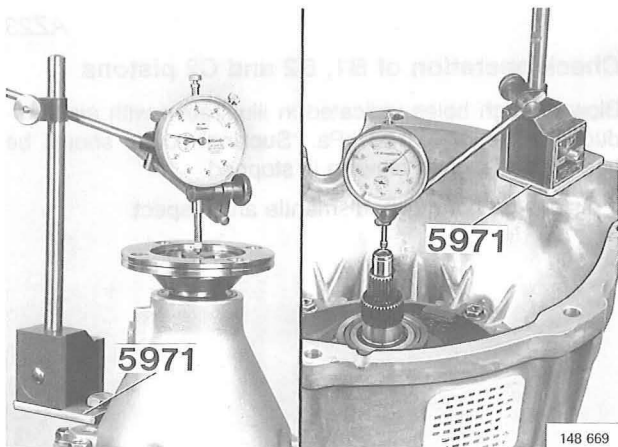


AZ26

Install:

- Rear extension housing (use new gasket).
Torque: **35 Nm** (26 ft.lb).
- Drive flange.
Secure bolt with thread locking fluid (P/N 1 161 053-2/1 161 054-0).

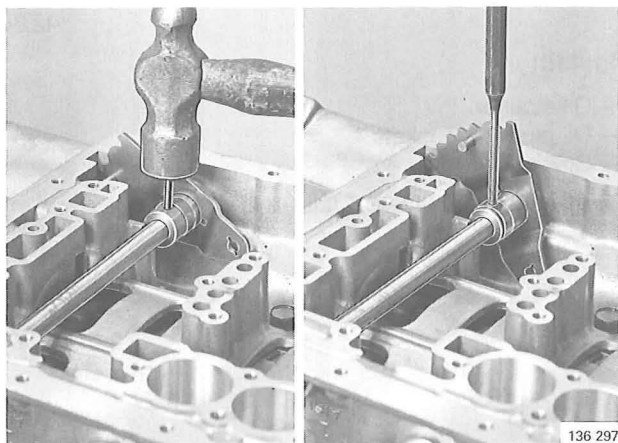
Use counterhold **5149**.
Torque: **45 Nm** (33 ft.lb)



AZ27

Check axial clearance of input and output shafts

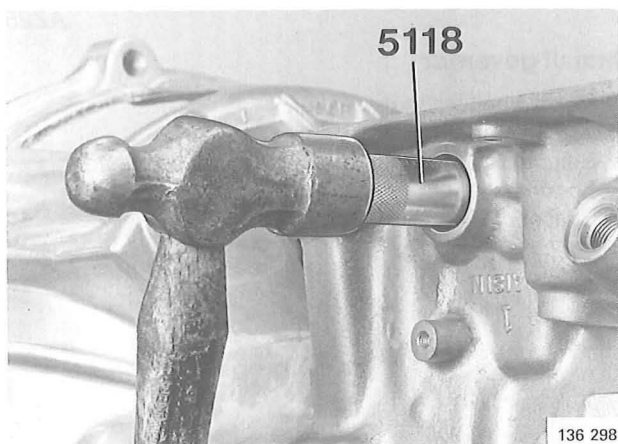
Use mounting plate **5971**, magnetic stand and dial gauge.
Permissible clearance: 0.3–0.9 mm.
Turn shafts and check for freedom of movement.



AZ28

Install gear selector shaft and cam using new retaining ring

Install new locking pin.
Position retaining ring over locking pin.
Lock ring in position by punching into recess beside pin.

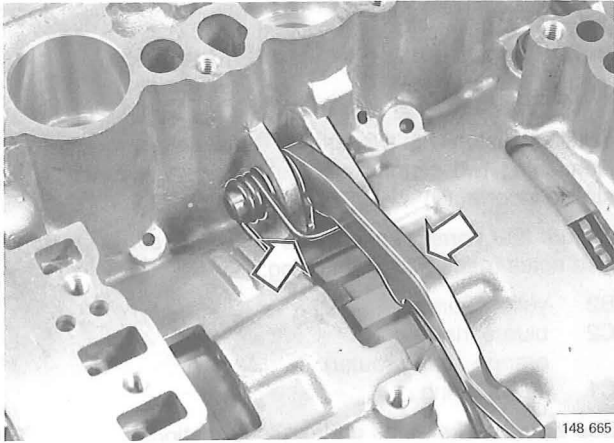


AZ29

Install gear selector shaft oil seal

Use drift **5118**.

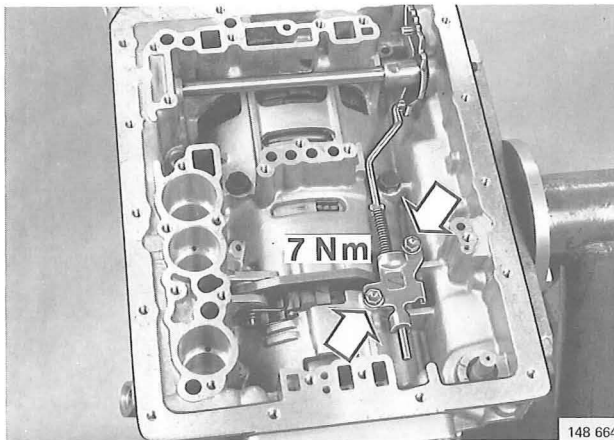
AZ30



Install parking pawl, spring and shaft

Position spring as illustrated.

AZ31

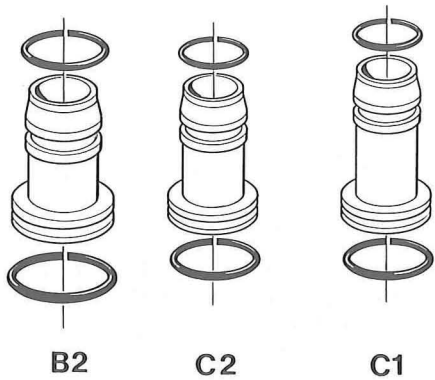


Install pushrod

Insert pushrod in selector cam and install retaining plate. Tighten bolts.

Torque: **7 Nm** (5 ft.lb).

AZ32

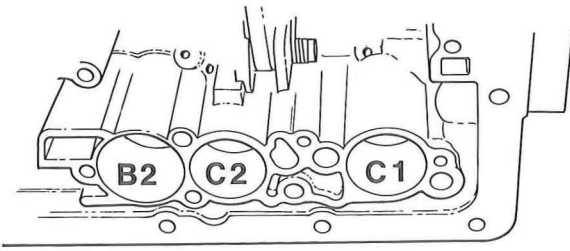


Inspect accumulator pistons

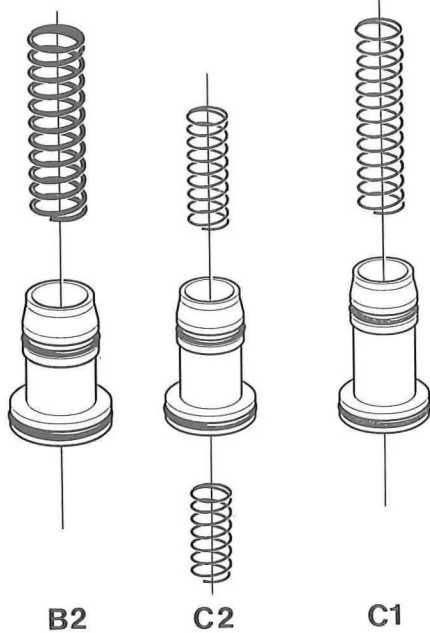
Replace worn or sticky pistons.

Install new O-rings.

148 307



148 308



148 309

Install accumulator pistons and springs

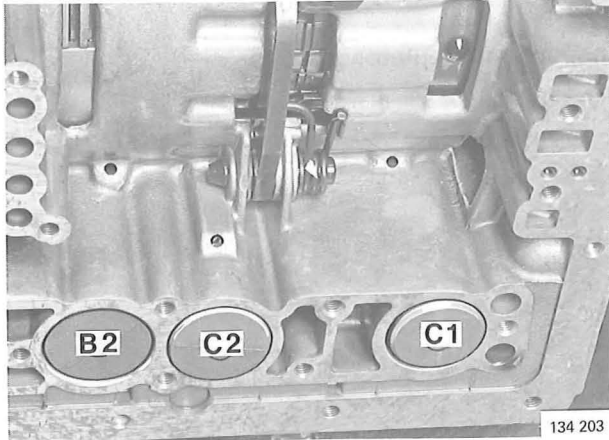
AW 72 L:

Smallest piston with two springs is installed in middle (C2). Remaining two pistons are dissimilar and cannot be installed incorrectly.

Ensure that correct springs are fitted with correct pistons. See notes made when removing.

- B2 yellow spring
- C2 blue spring (inner)
orange spring (outer)
- C1 black spring

See also list of springs under 'Specifications'.



134 203

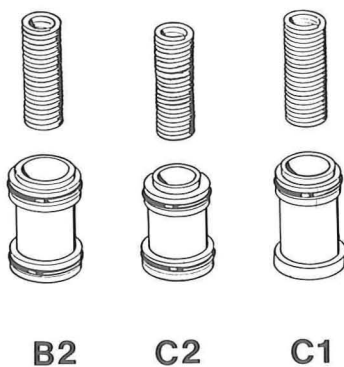
AW 70/71:

Smallest piston is installed in middle (C2). Remaining two pistons are dissimilar and cannot be installed incorrectly. Install springs for these pistons as noted when dismantling.

Certain AW 70/71 units are equipped with double springs (outer and inner) in piston B2 or C2. AW 71 (No. 1208534) and AW 71 L (No. 1208417) are equipped with double springs in both B2 and C2.

See also list of springs under 'Specifications'.

AW 70/71



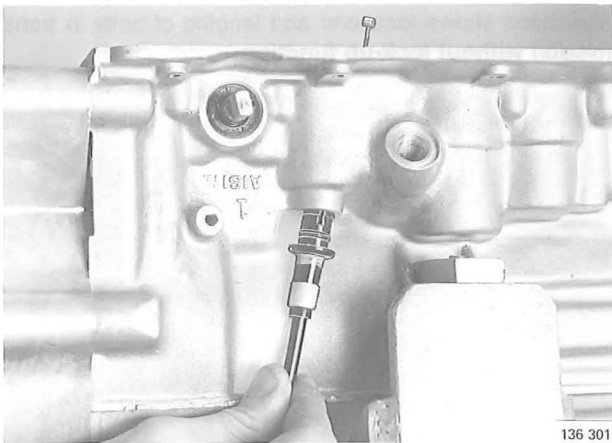
148 310

AZ34

Install kickdown cable in gearbox housing

Use new cable.

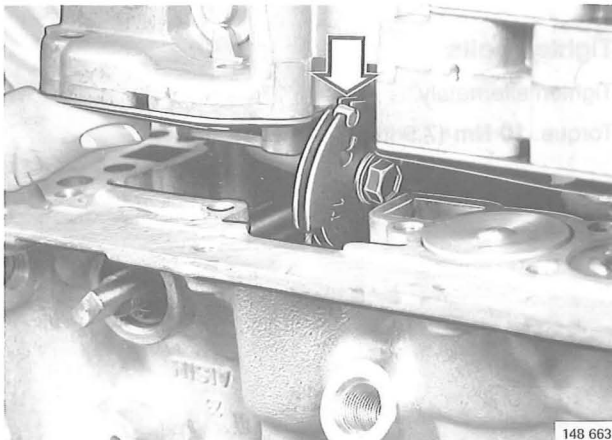
Note: Cables differ depending on engines and transmissions. See 'Specifications'.



AZ35

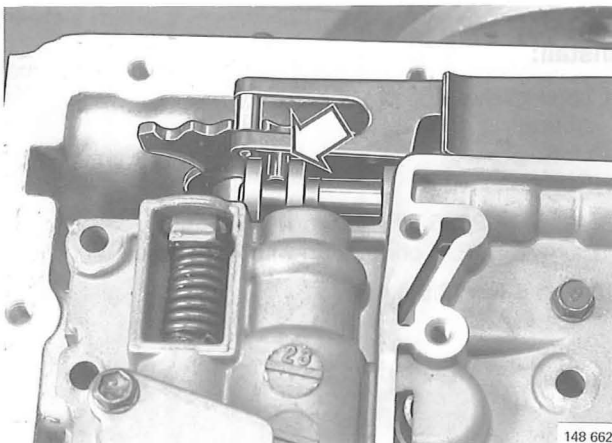
Install control system

Attach kickdown cable to throttle cam



AZ36

Insert guide spigot (pilot) of gear selector cam in groove in gear selector valve

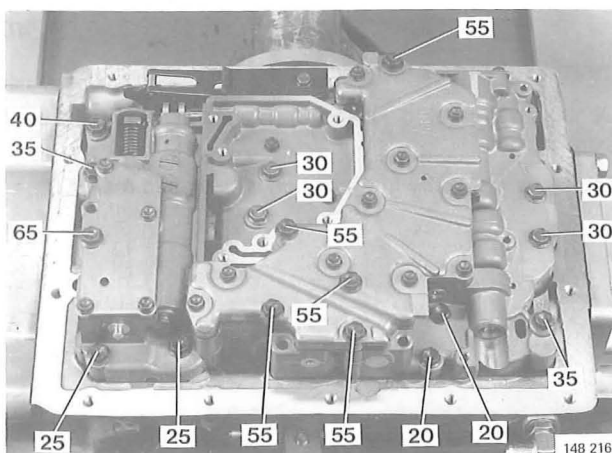


AZ37

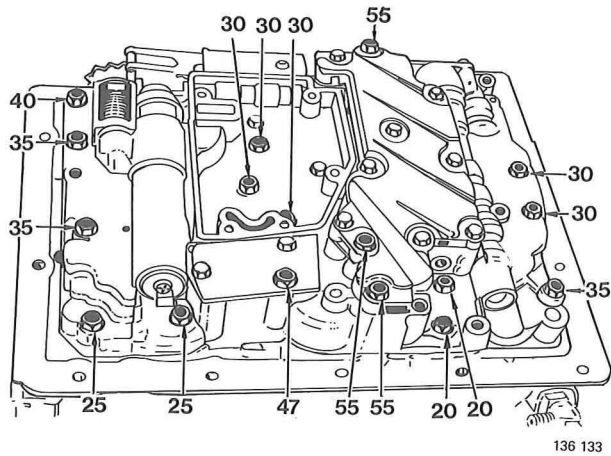
Place control system in position and insert bolts (17 off)

Do not tighten bolts.

Illustration shows locations and lengths of bolts in transmission with lock-up function.



Complete reassembly



136 133

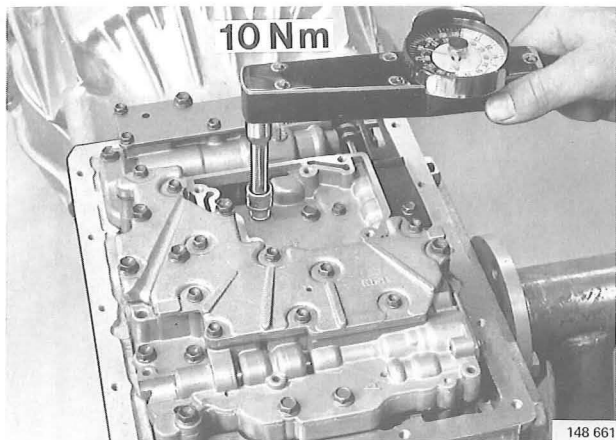
Illustration shows locations and lengths of bolts in transmission **without lock-up function**.

AZ38

Tighten bolts

Tighten alternately.

Torque: **10 Nm** (7.5 ft.lb).



148 661

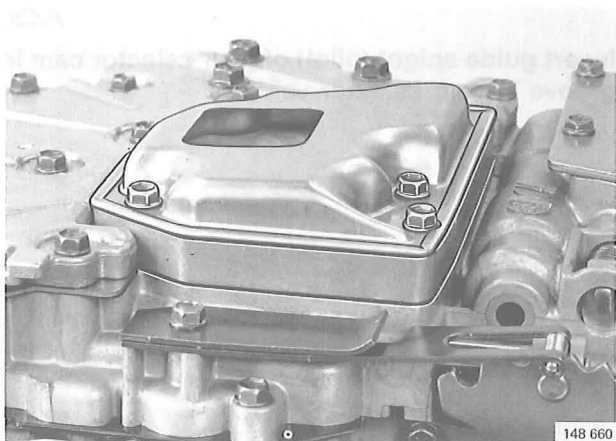
AZ39

Install:

- Inner gasket.
- Spacer.
- Outer gasket.
- Suction strainer.

Bolts: M8 x 28, 5 off (system with lock-up)
M8 x 22, 6 off (system without lock-up)

Torque: **5 Nm** (3.5 ft.lb).



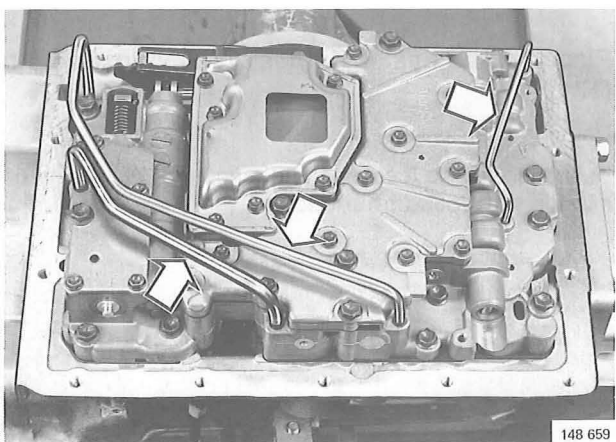
148 660

AZ40

Install oil pipes

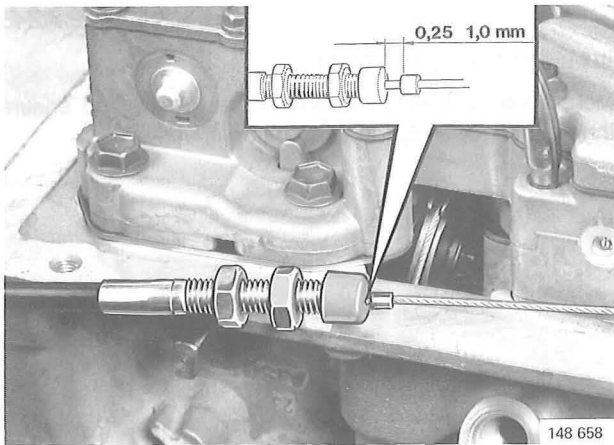
Control system with kickdown inhibitor is equipped with extra pipe.

Tap pipes **carefully** into position with plastic mallet.



148 659

AZ41



Attach cable clip

Pull cable gently until throttle cam is about to move.
 Check that cable is seated in throttle cam groove.
 Secure clip 0.25–1.0 mm from end of cable sleeve.

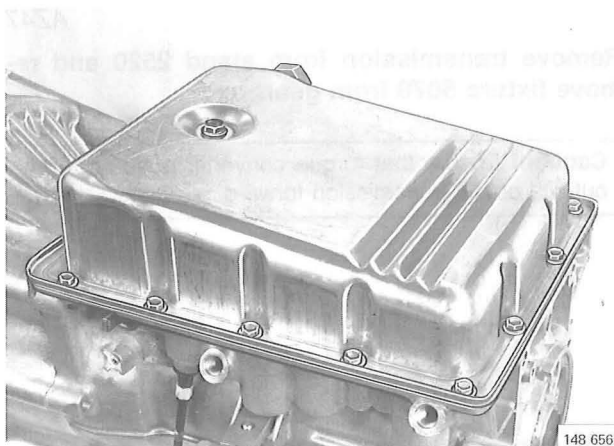
AZ42



Install particle magnet(s)

Ensure that magnet(s) are clean.
 Install directly under control system suction oil strainer.

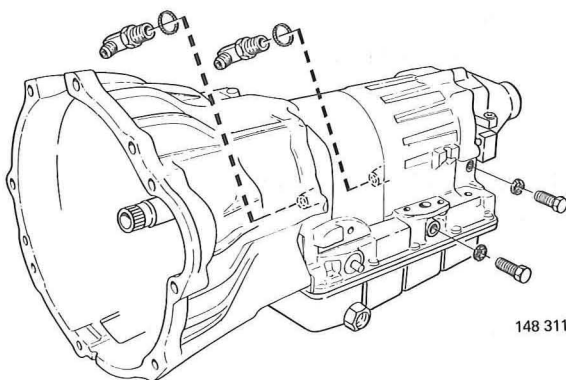
AZ43



Install oil sump

Use new gasket.
 Bolts: M8 x 14 (14 off with washers).
 Torque: **5 Nm** (3.5 ft.lb).
 Fit new drain plug and seal.
 Torque: **18–23 Nm** (13–17 ft.lb).

AZ44

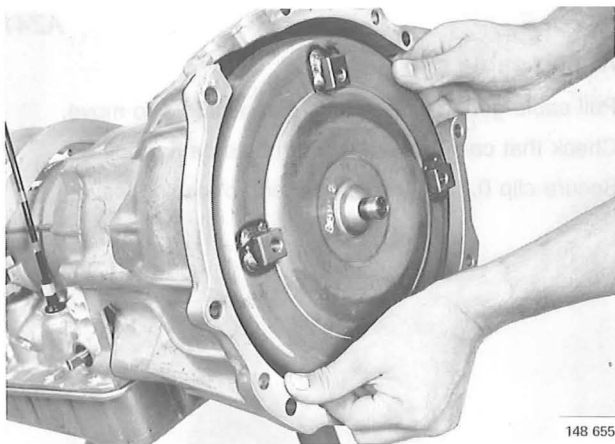


Install:

- Oil cooler connections and new O-rings. Adjust connections to suit oil pipes in car.
- Pressure tapping plugs and new O-rings.

Torque: **8 Nm** (6 ft.lb).

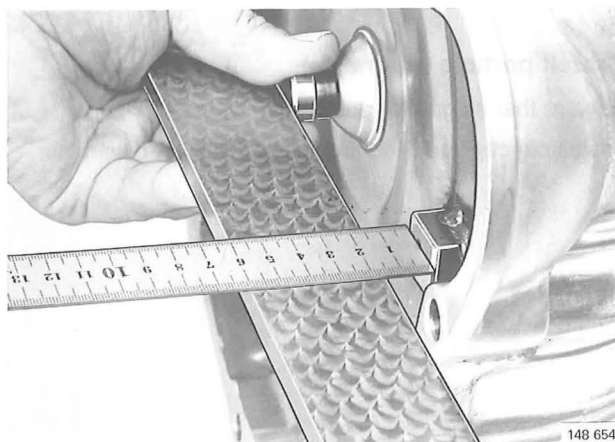
Complete reassembly



AZ45

Install torque converter

Mount converter on input shaft. Turn slowly and ensure that unit engages splines and pump drive keyway.

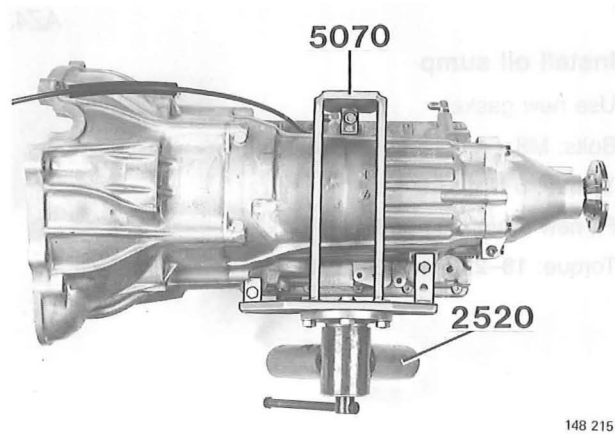


AZ46

Check position of torque converter

Place steel rule against converter housing. Measure distance between rule and converter mounting lugs.

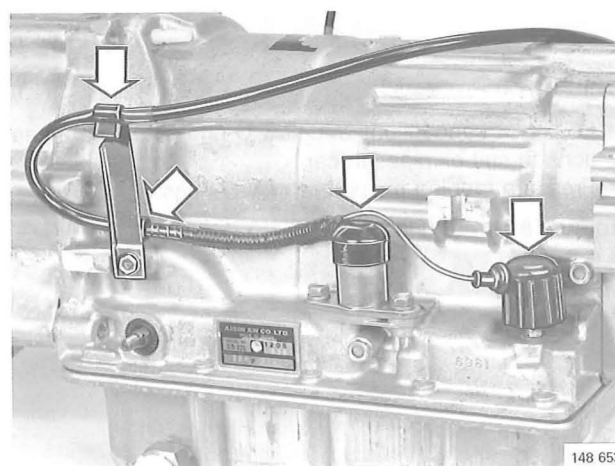
Permissible clearance:
AW 70/71: 16.2–19.6 mm
AW 72 L: 15.5 mm



AZ47

Remove transmission from stand 2520 and remove fixture 5070 from gearbox

Caution! Ensure that torque converter does not drop out. Do not tilt transmission forward.



AZ48

Install solenoid valve

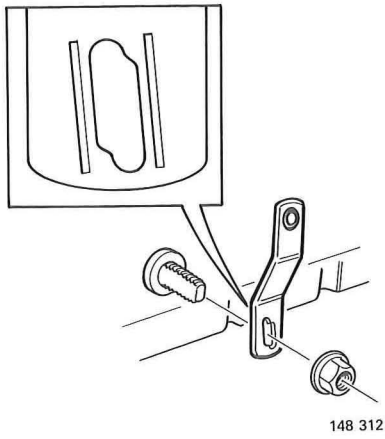
Use vaseline to hold O-rings in position.
Torque: 13 Nm (9.5 ft.lb).

AZ49

**Units with kickdown inhibitor only:
Install oil pressure switch**

AZ50

Secure wiring in clips on gearbox housing

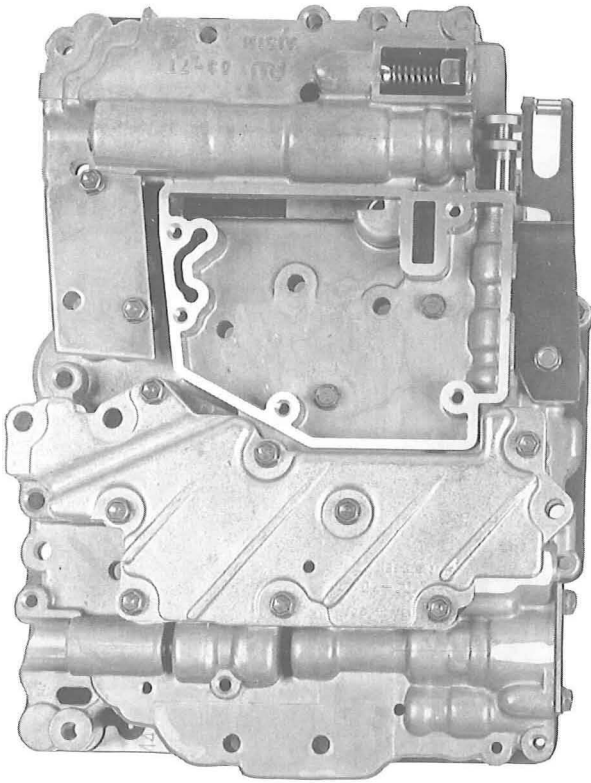


Install:

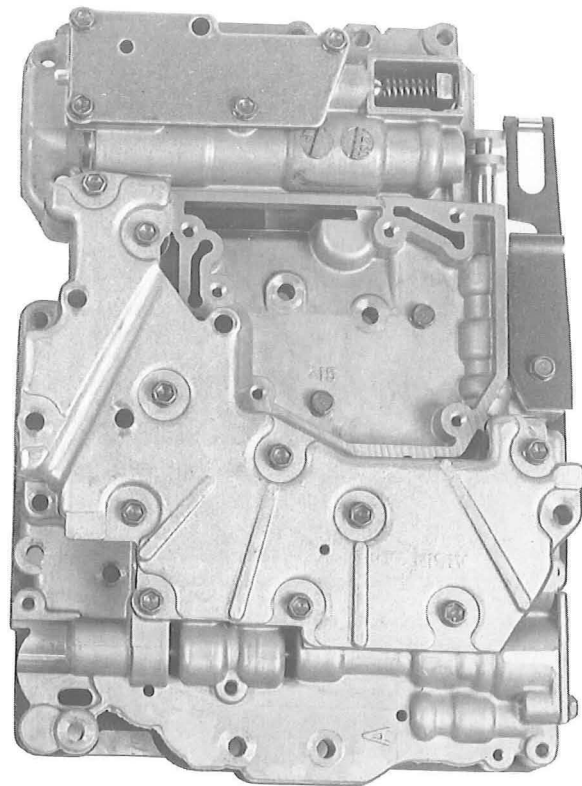
- Gear selector lever.
Torque: **14 Nm** (10 ft.lb).

Control system

General



Control system without lock-up function

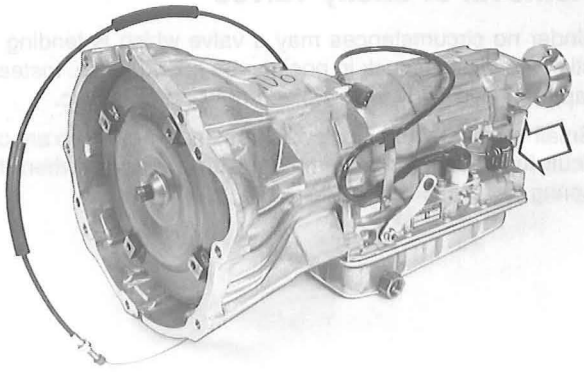


148 316

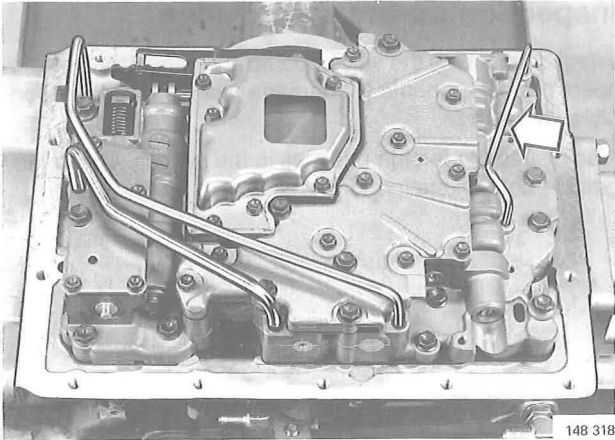
Control system with lock-up function

Hydraulic control systems have been modified successively over the years, the most significant advance being the introduction of the lock-up function. This may be a feature of all transmissions used in combination with the B 230 F/

FT/K and B 234 F engines. Lock-up requires an additional two valves – a control valve and a changeover valve. See also Service Manual 4 (43), Fault tracing, repair, maintenance, design and function (brown frame).



148 317



148 318

Another major function which has been introduced is the **kickdown inhibitor**. This is a feature of the AW 71 unit combined with the B 230 FT (Europe), B 280 E and B 280 F (excluding USA/Canada) engines, and on the AW 72 L unit (excluding USA/Canada).

Additional components required for the kickdown inhibitor function are an oil pressure switch (arrowed in the illustration) and an extra oil pipe in the lower valve body (arrowed in bottom picture).

Other, minor modifications have been made in addition to these.

Working procedures

As far as possible, common procedures are used for reconditioning different versions of the control system. Since the description is based on the AW 72 L unit (with lock-up and kickdown inhibitor), some differences may appear in the illustrations. Differences which affect the procedures are described in text and illustrations.

Fold-out sheets at the rear of the manual show the gearbox, control system and their components. These may be of assistance when dismantling and reassembling the units.

Important!

Never interchange components from control systems of different designs. Installing an incorrect component may alter the gear change positions or render the changing function inoperable.

See 'Specifications' regarding identification of gearboxes and control systems.

Cleanliness

Strict cleanliness is important. The control system is extremely sensitive to dirt and other impurities.

Clean the work station and tools before commencing work.

Never use rags, wadding or paper which may leave behind threads or fluff. Use compressed air for drying and cleaning.

Use a chamois leather if it is necessary to use a cloth for drying.

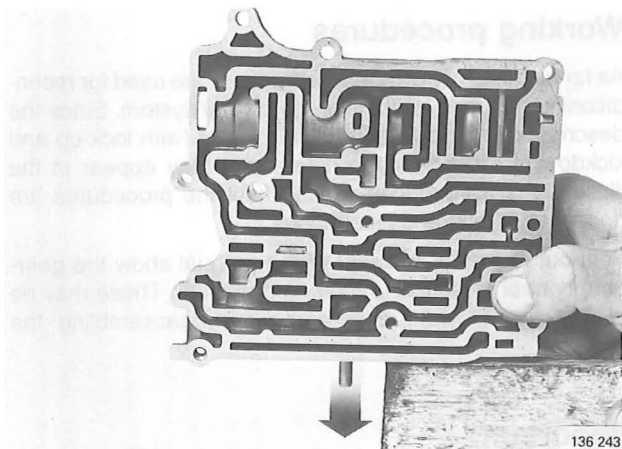
Damage

Apart from mechanical damage which may occur when dismantling and reassembling, damage to the control system is a rare occurrence. As a result, attention in the form of thorough cleaning and inspection will usually suffice.

Removal of sticky valves

Under no circumstances may a valve which is tending to stick or which is stuck in position be prised loose. Instead, tap the valve body with a piece of wood or plastic.

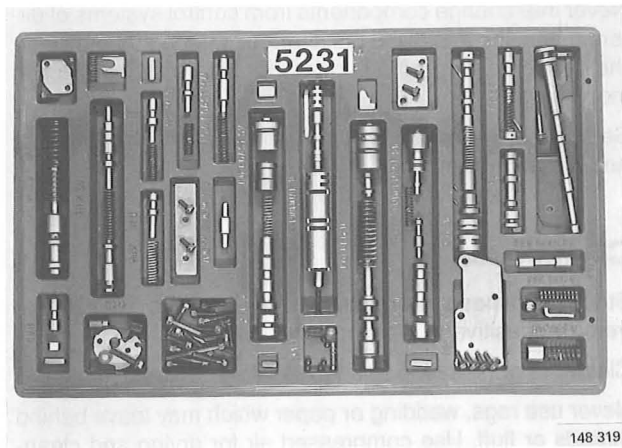
Small valve retainers (lock washers and pins) which are difficult to reach may be removed with a magnet when the spring force has been relieved.



Inspection during dismantling

When dismantling the valve bodies and separator plate, inspect the components for damage which may be responsible for leakage.

Also inspect for foreign particles in the system. These may provide an explanation for transmission faults.



Special tool – storage tray

Storage tray 5231 is an excellent tool for keeping track of components when working on the control system. Use of the tray minimizes the risk of losing a component or installing it in the wrong position.

Note: Always place the components in their proper compartments as they are removed from the control system.

The illustrations in the following sections show the correct storage locations of the components.

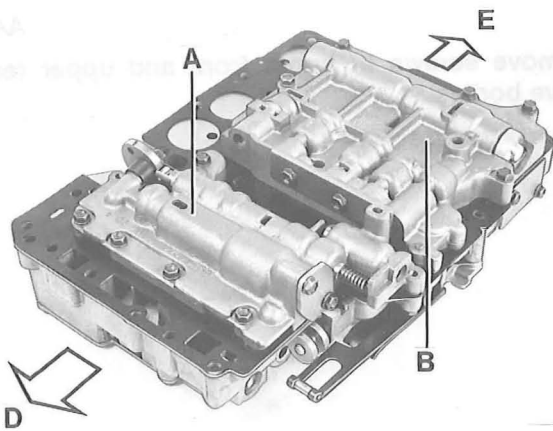
These locations are also shown in **fold-out sheet 3** at the rear of the manual.

Control system – dismantling into main components

See fold-out sheets 2 and 3 at rear of manual.

Top (gearbox side)

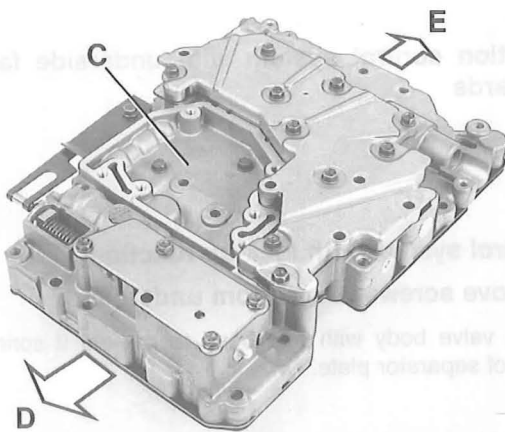
- A. Upper front valve body.
- B. Upper rear valve body.
- C. Lower valve body.
- D. Front (facing torque converter).
- E. Rear.



148 320

Bottom (oil sump side)

- C. Lower valve body.
- D. Front (facing torque converter).
- E. Rear.



148 650

AA1

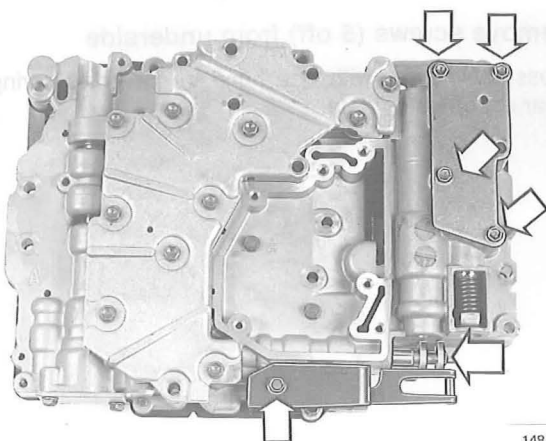
Place control system on clean workbench

AA2

Control system with lock-up function

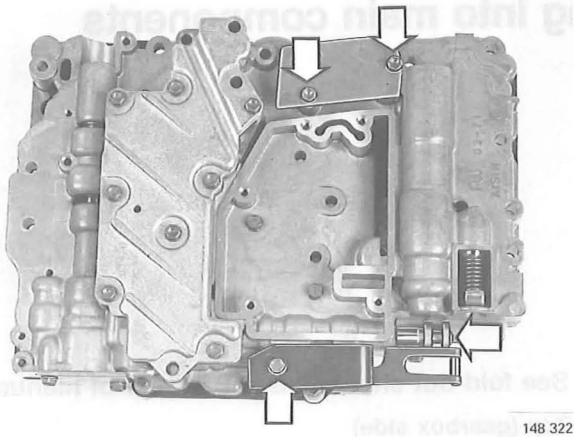
Remove:

- Locking spring and plate.
- Gear selector valve.
- Cover plate and gasket.



148 321

Dismantling into main components



Control system without lock-up function:

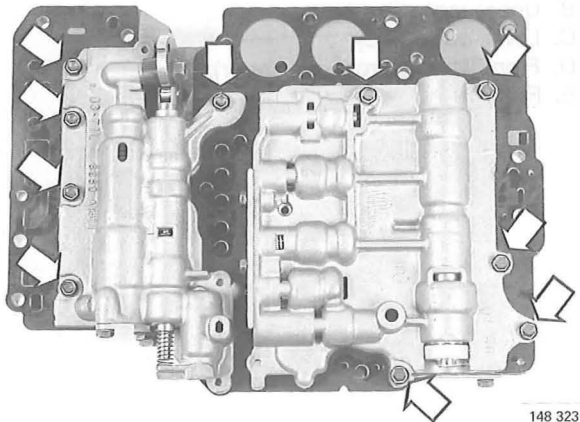
Remove:

- Locking spring and plate.
- Gear selector valve.
- Cover plate and gasket.

AA3

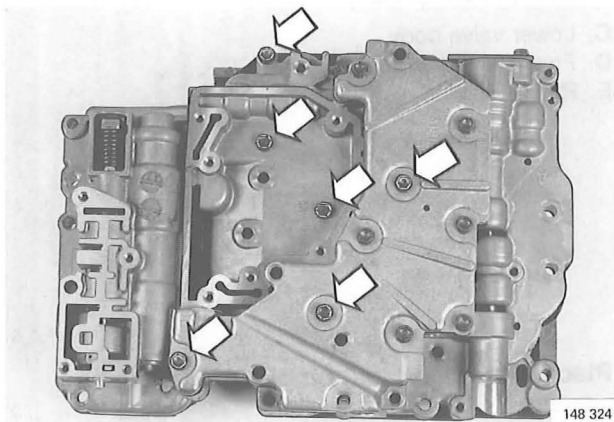
Remove screws in upper front and upper rear valve bodies

Total number of screws: 10



AA4

Position control system with underside facing upwards



AA5

Control system with lock-up function:

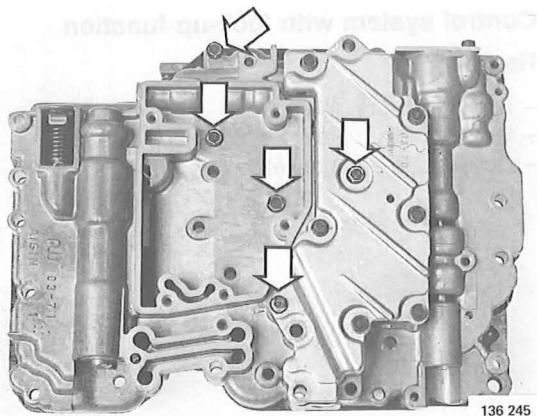
Remove screws (6 off) from underside

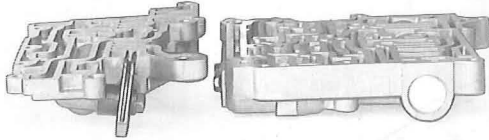
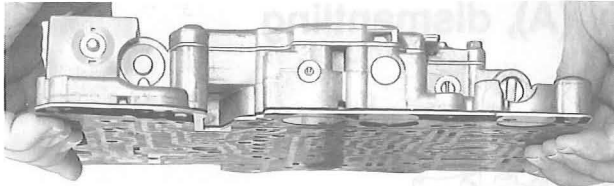
Press valve body with one hand to prevent it springing clear of separator plate.

Control system without lock-up function:

Remove screws (5 off) from underside

Press valve body with one hand to prevent it springing clear of separator plate.





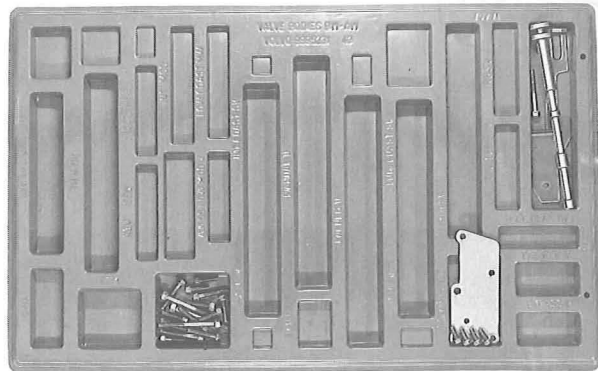
148 326

AA6

Slide lower valve body carefully to one side and lift off

Hold gaskets and separator plate so that balls and springs do not fall out of valve body.

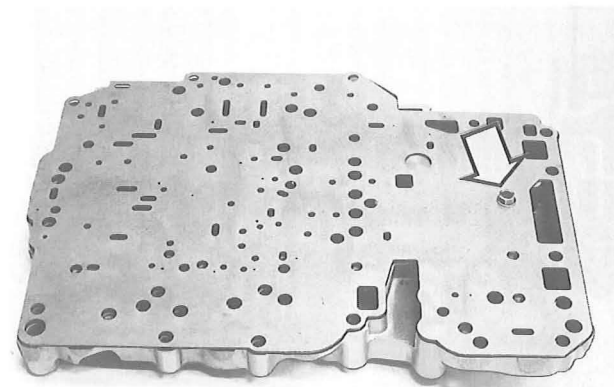
Position body with gaskets and separator plate facing upwards.



148 325

AA7

Place components removed in storage tray



119 169

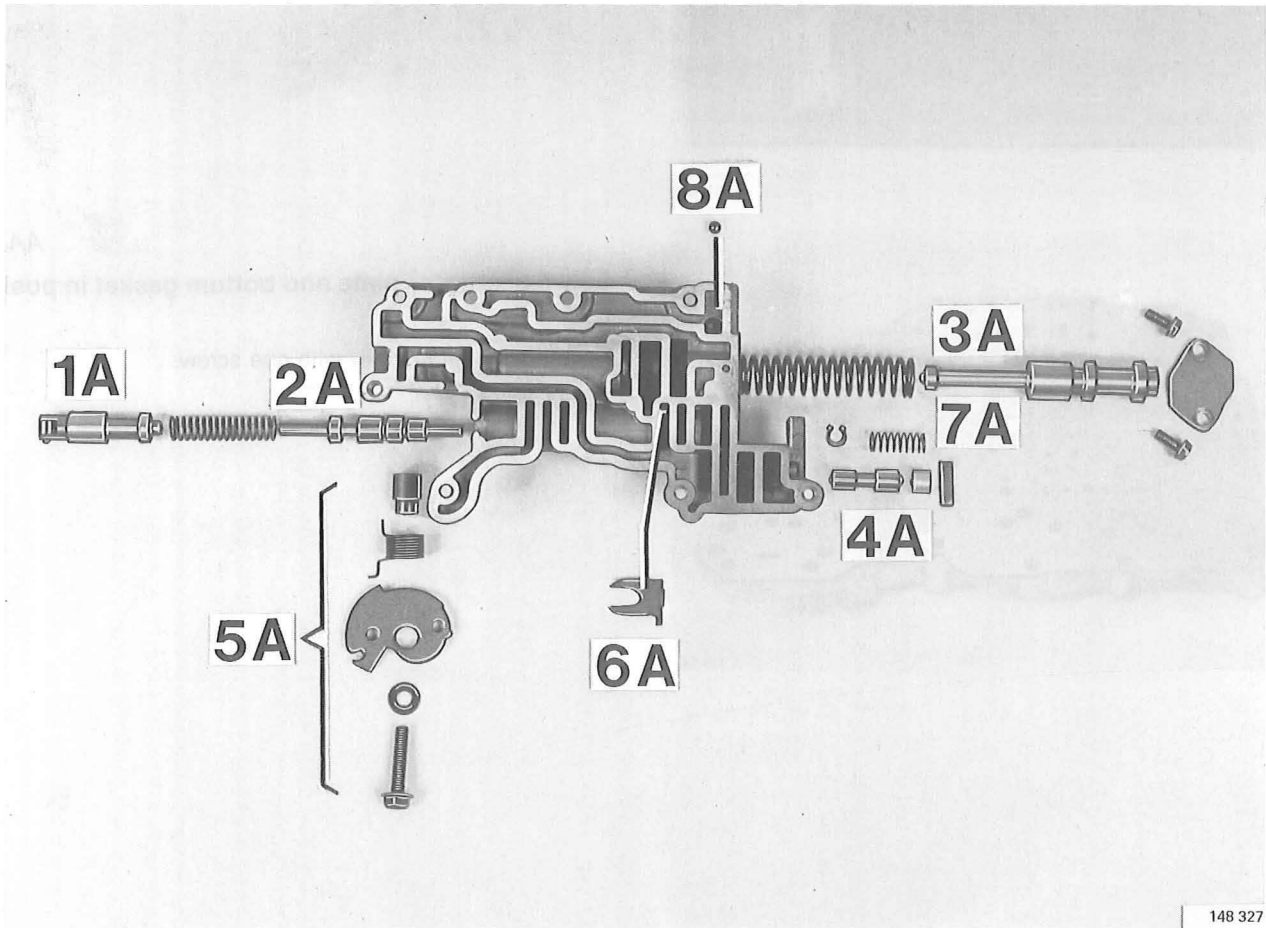
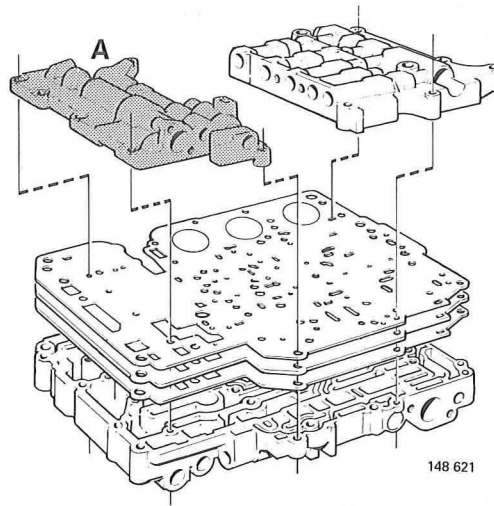
AA8

Leave separator plate and bottom gasket in position

Secure plate temporarily with one screw.

Screw: M5 x 12.

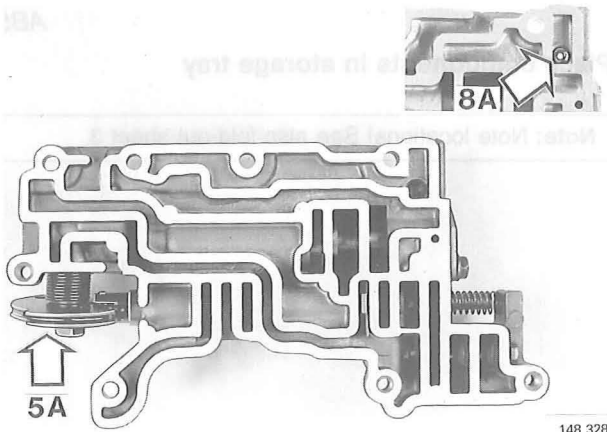
Upper front valve body (A), dismantling



- 1A. Kickdown valve.
- 2A. Throttle valve.
- 3A. Secondary regulator valve.
- 4A. Cutback valve.
- 5A. Throttle cam, complete.

- 6A. Throttle valve stop.
- 7A. Throttle valve spring.
(adjusting washers may also be fitted)
- 8A. Rubber ball, dia. 5.5 mm (systems without lock-up only)

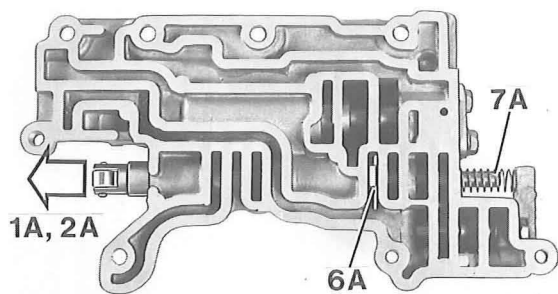
AB1



Remove:

- Rubber ball (8A)
(applies only to control system without lock-up function).
- Throttle cam, complete (5A).

AB2



Remove:

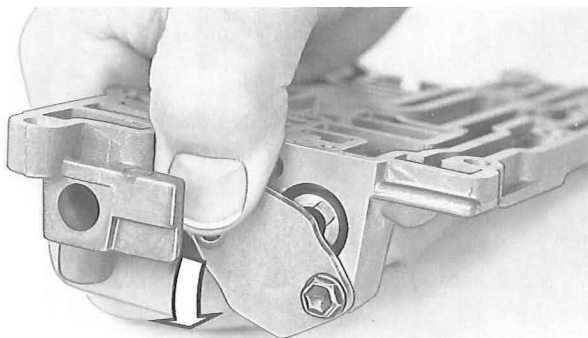
- Kickdown valve (1A).
- Throttle valve stop (6A)-
- Throttle valve (2A) and spring (7A). Note number of adjusting washers, if fitted.

Place components in storage tray

See illustration for operation AB5.

148 329

AB3



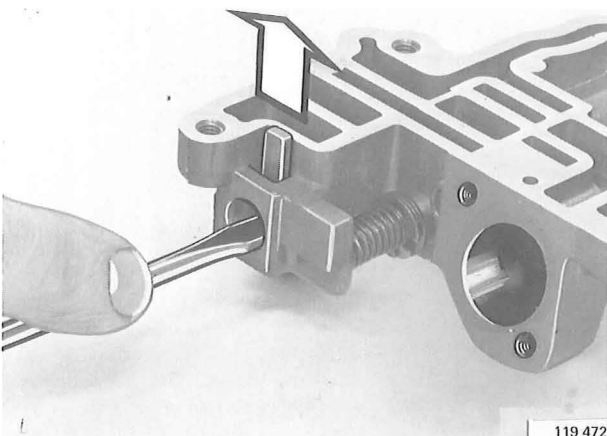
Remove secondary regulator valve (3A)

Remove one screw and move cover aside to release valve.

Note: Strong spring pressure!

148 330

AB4

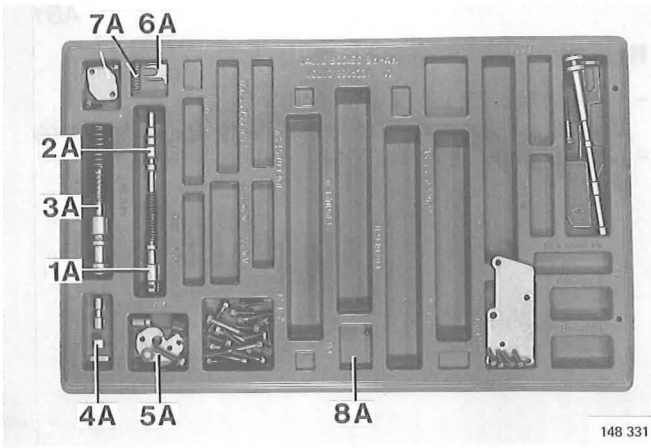


Remove cutback valve (4A)

119 472

Upper front valve body (A), dismantling

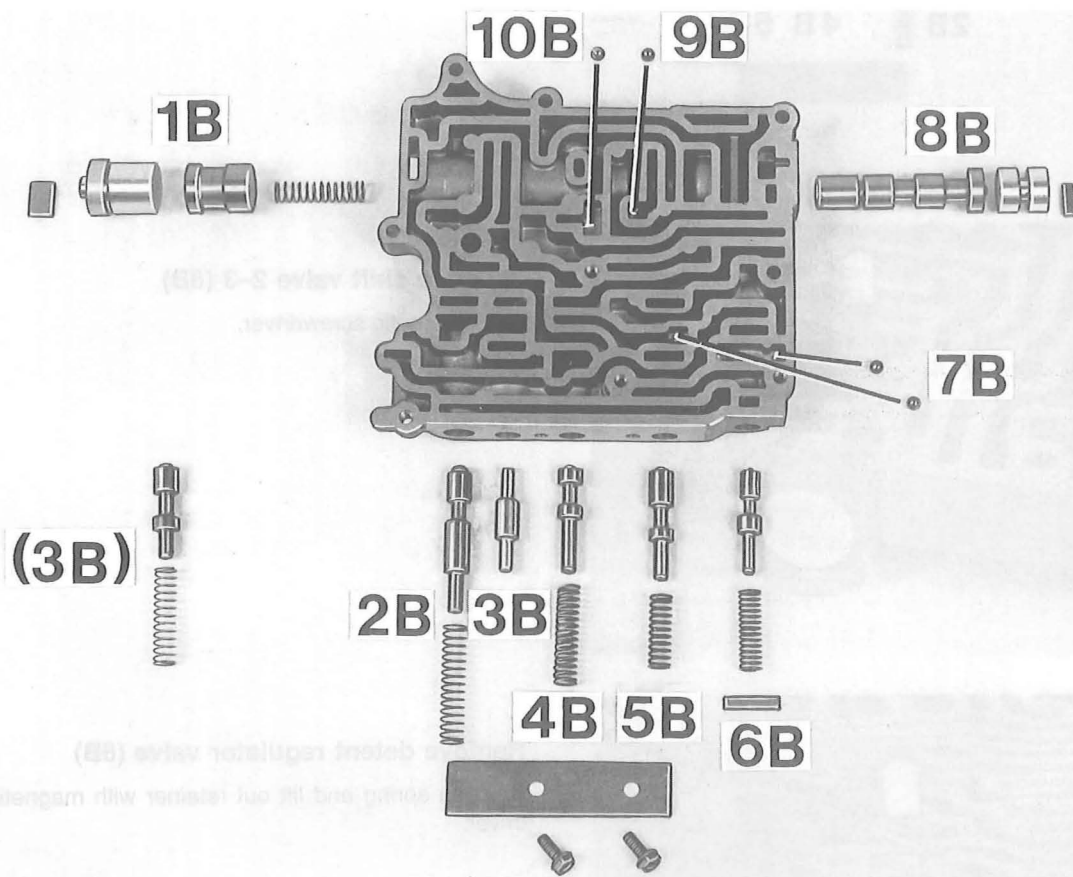
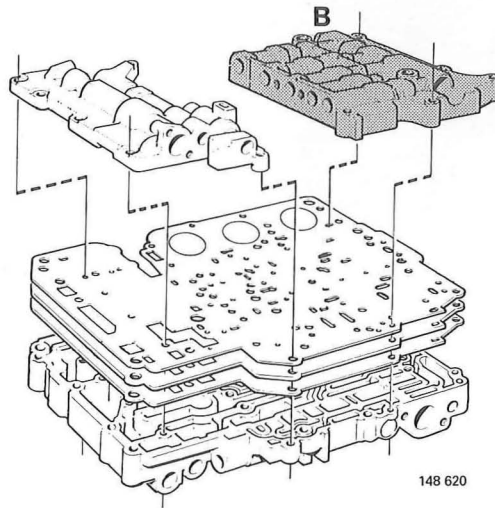
AB5



Place components in storage tray

Note: Note locations! See also fold-out sheet 3.

Upper rear valve body (B), dismantling



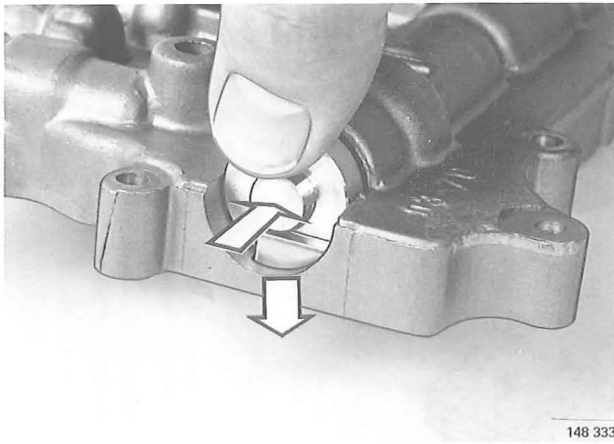
148 332

- 1B. Downshift valve 3-2.
- 2B. Modulator valve 2-1, manual.
- 3B. Governor modulator valve. Two versions: Aluminium plug or steel valve + spring.
- 4B. Control valve, clutch C2.
- 5B. Modulator valve 3-2, manual.

- 6B. Detent regulator valve.
- 7B. Rubber balls (2 off), dia. 5.5 mm.
- 8B. Shift valve 2-3.
- 9B. Rubber ball, dia. 5.5 mm.
- 10B. Steel ball, dia. 5.5 mm.

Upper rear valve body (B), dismantling

AC1



Note: Before dismantling:

Remove all balls (3 rubber balls and 1 steel ball, 7B, 9B and 10B)

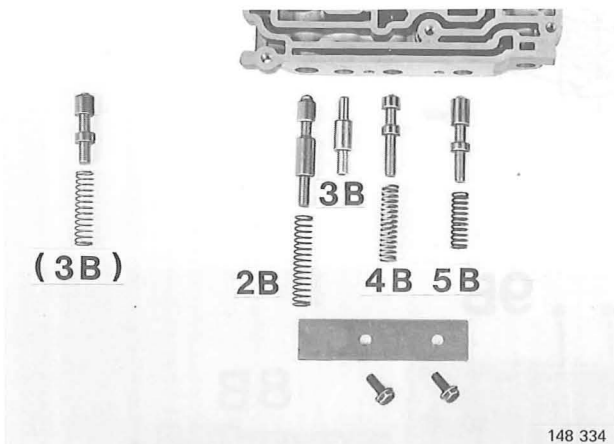
Place balls in storage tray. See illustration for operation AC6.

AC2

Remove downshift valve 3-2 (1B) and retainer

AC3

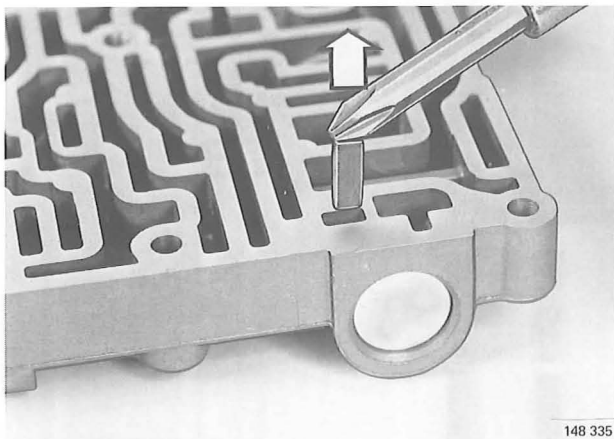
Remove cover plate, and valves 2B, 3B, 4B and 5B



AC4

Remove shift valve 2-3 (8B)

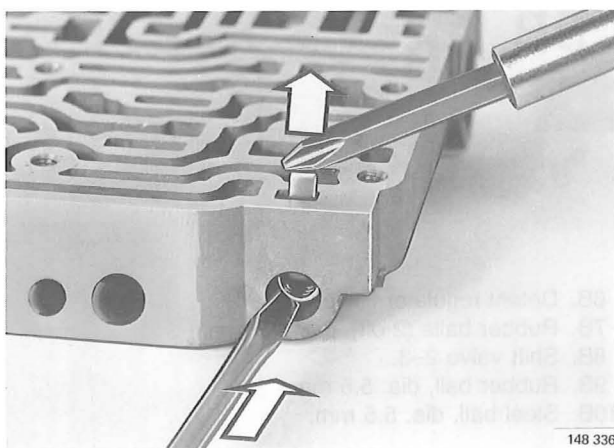
Use magnetic screwdriver.



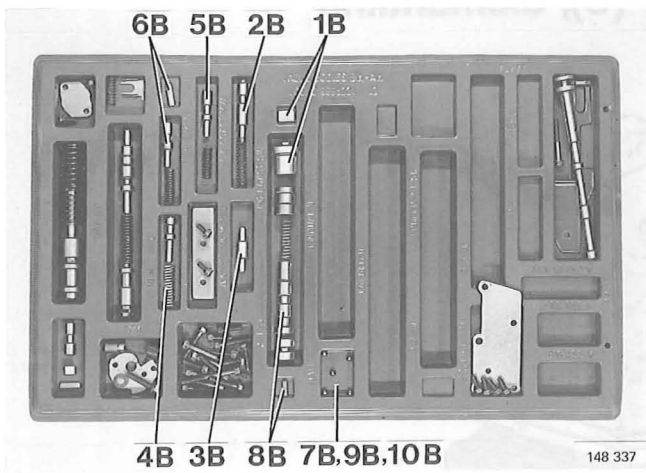
AC5

Remove detent regulator valve (6B)

Press in spring and lift out retainer with magnetic screwdriver.



AC6



Place components in storage tray

Note: Note locations! See also fold-out sheet 3.

Lower valve body (C), dismantling

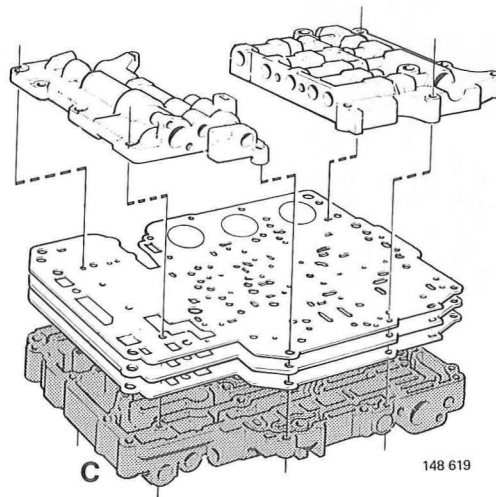
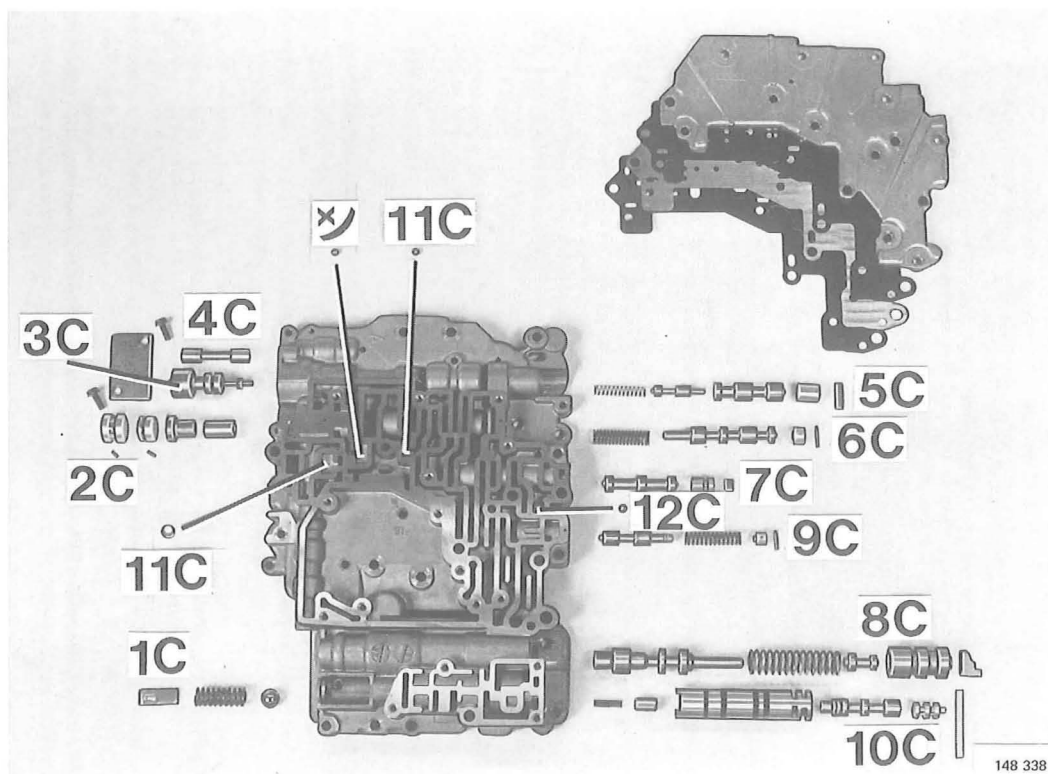
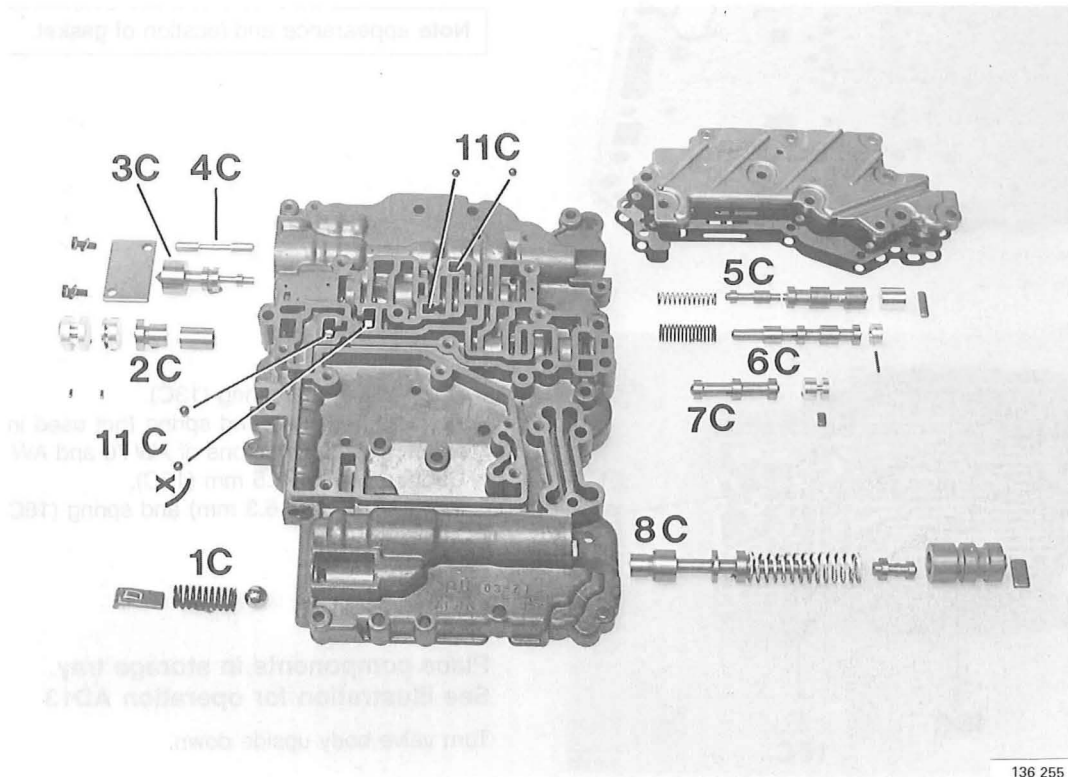


Illustration shows control system with lock-up function



- 1C. Relief valve.
- 2C. Downshift valve 4-3, manual.
- 3C. Downshift valve 2-1, manual.
- 4C. Control valve, rear brake B3.
- 5C. Shift valve 1-2.
(One unit in earlier version of AW 70/71).
- 6C. Shift valve 3-4.

- 7C. Regulator valve D-2, manual.
- 8C. Primary regulator valve.
- 9C. Lock-up function signal valve.
- 10C. Lock-up function changeover valve.
- 11C. Rubber balls (3 off), dia. 5.5 mm. (Ball marked x installed only in units without kickdown inhibitor).
- 12C. Rubber ball (1 off), dia. 6.3 mm.



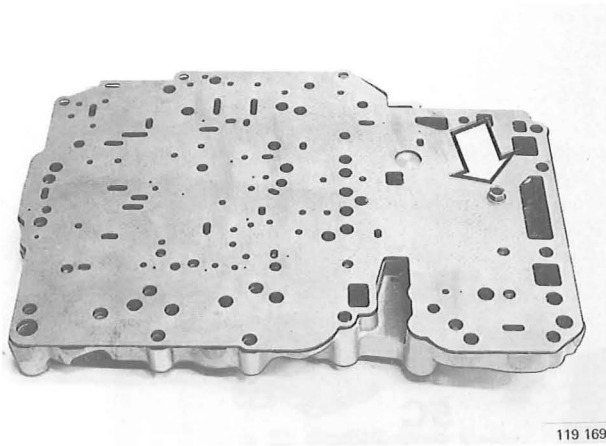
136 255

Illustration shows control system without lock-up

Items 1C-8C: See control system with lock-up function on previous page. Valves 9C and 10C are omitted.

11C. Rubber balls (4 off), dia. 5.5 mm. (Ball marked x installed only in units without kickdown inhibitor)

Lower valve body (C), dismantling

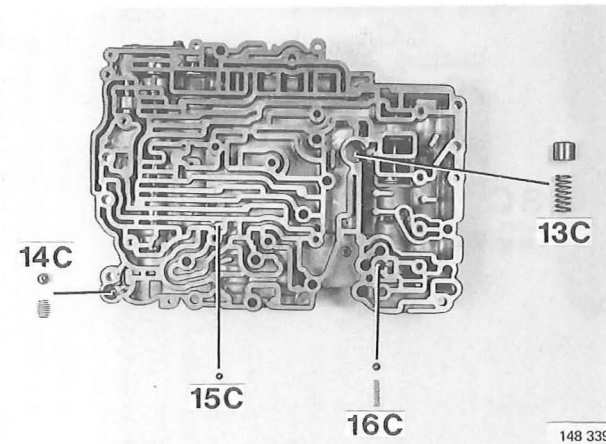


AD1

Remove separator plate and bottom gasket

(Plate is secured temporarily with one screw).

Note appearance and location of gasket.



AD2

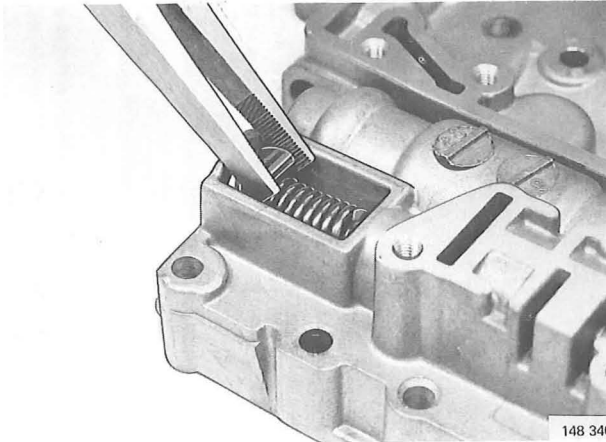
Remove:

- Relief valve and spring (13C).
- Ball (dia. 9.5 mm) and spring (not used in control systems on earlier versions of AW 70 and AW 71) (14C).
- Rubber ball, dia 5.5 mm (15C).
- Rubber ball (dia. 6.3 mm) and spring (16C).

AD3

**Place components in storage tray.
See illustration for operation AD13**

Turn valve body upside down.

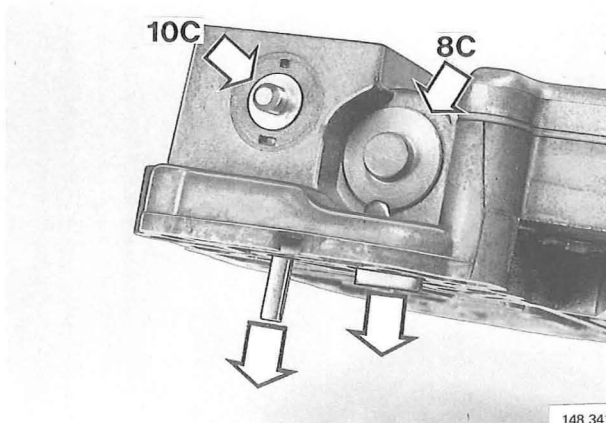


AD4

Remove relief valve retainer (1C)

Use flat-nosed pliers.

Note: Strong spring pressure. Hold spring with hand.



AD5

Remove primary regulator valve (8C)

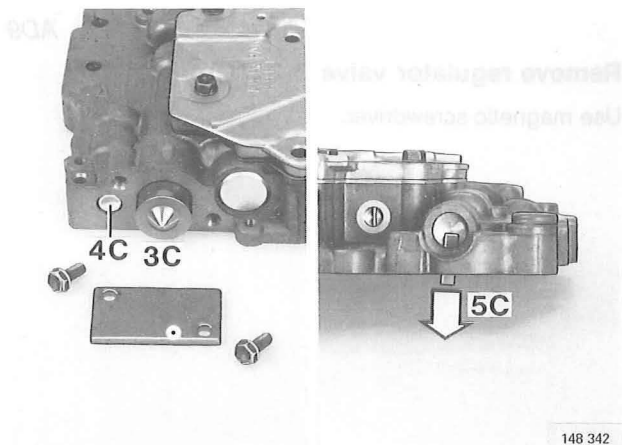
Press in valve by hand.

Illustration shows control system with lock-up function.

Remove changeover valve (10C)

(Applies only to control system with lock-up function.)

AD6



148 342

Remove:

- Cover plate.
- Downshift valve 2-1 (3C).
- Control valve for B3 (4C).
- Shift valve 1-2 (5C).

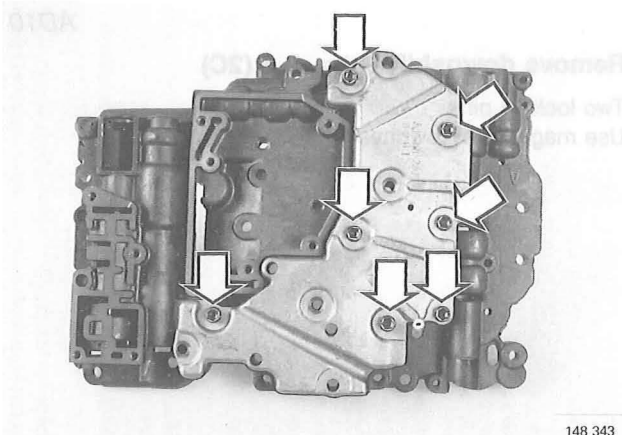
AD7

Remove cover, separator plate and gaskets

Note appearance and location of gaskets.

Control system with lock-up function:

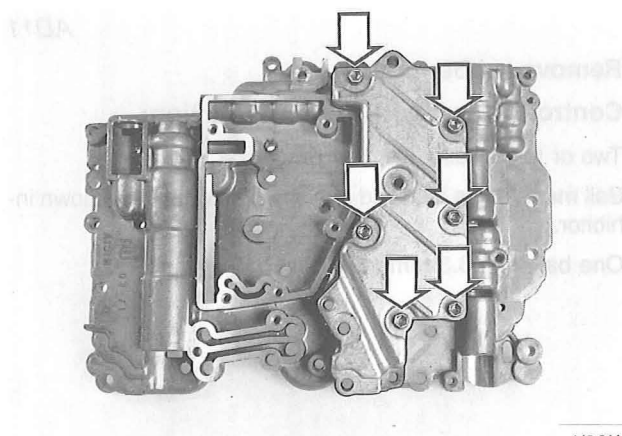
7 screws.



148 343

Control system without lock-up function:

6 screws.



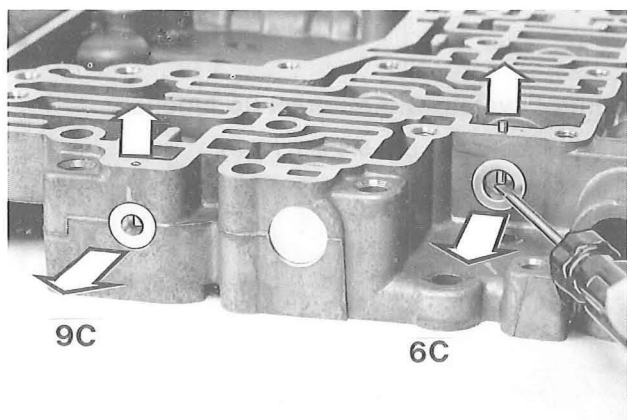
148 344

AD8

Remove:

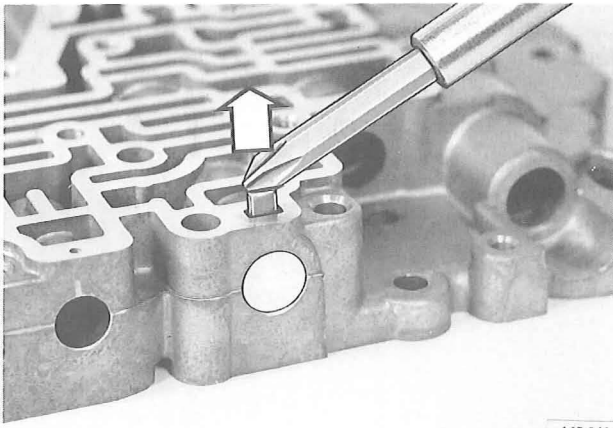
- Shift valve 3-4 (6C).
- Lock-up signal valve (9C).

Prise out locking pin carefully with screwdriver.



148 345

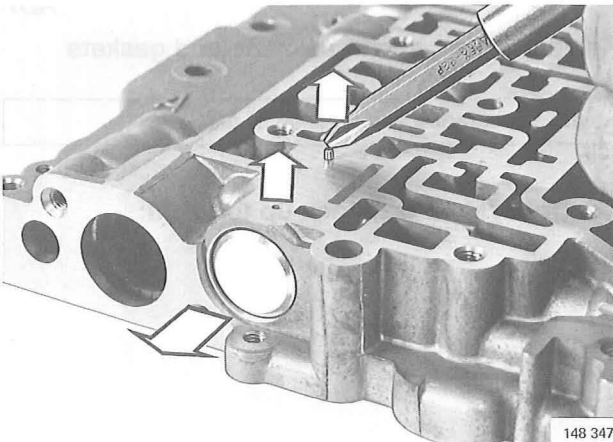
Lower valve body (C), dismantling



AD9

Remove regulator valve D-2 (7C)

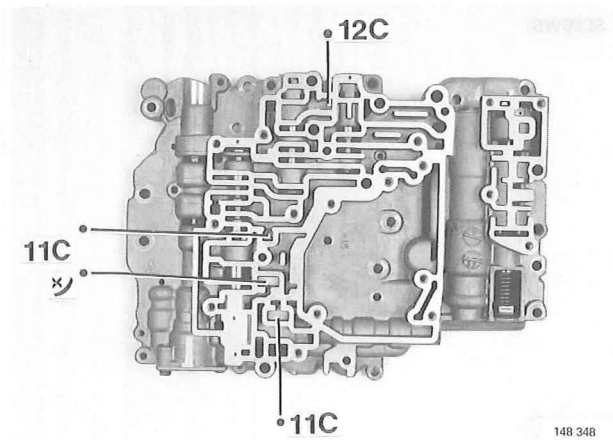
Use magnetic screwdriver.



AD10

Remove downshift valve 4-3 (2C)

Two locking pins.
Use magnetic screwdriver.



AD11

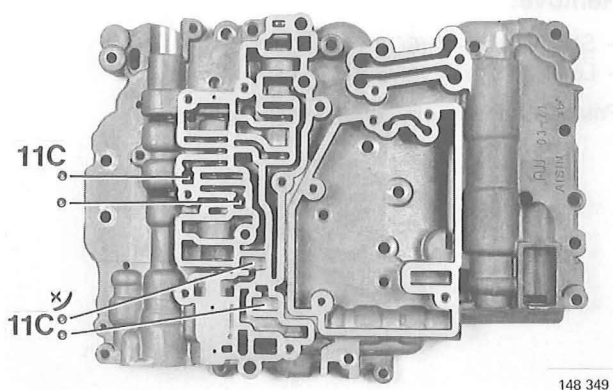
Remove rubber balls

Control system with lock-up function:

Two or three balls, dia. 5.5 mm (11C).

Ball marked x is installed only in units without kickdown inhibitor.

One ball, dia. 6.3 mm (12C)



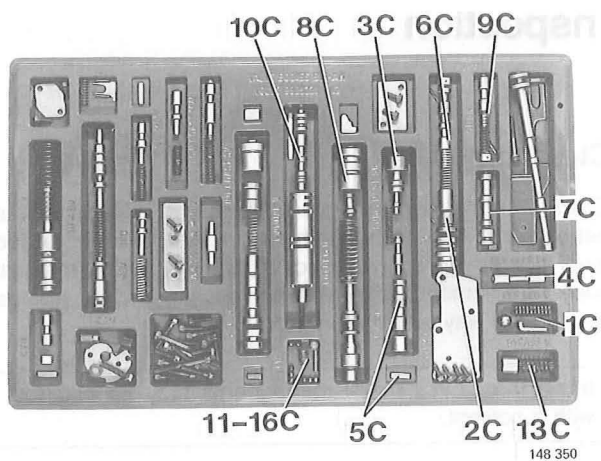
AD12

Control system without lock-up function:

Three or four balls, dia. 5.5 mm (11C).

Ball marked x is installed only in units without kickdown inhibitor.

AD13



Place components in storage tray

Note location of components! See also fold-out sheet 3.

Cleaning and inspection

Cleaning

Clean all metal components thoroughly in a fluid such as petrol, paraffin or trichloroethylene. Dry with compressed air. If necessary to dry with a cloth, use a non-fluffy material such as chamois leather. Cotton wadding must **not** be used under any circumstances!

Important! Only metal components may be cleaned with a solvent.

Inspect valve bodies

Ensure that oil passages and other openings are clear. Also check that valve bores are not abraded or worn.

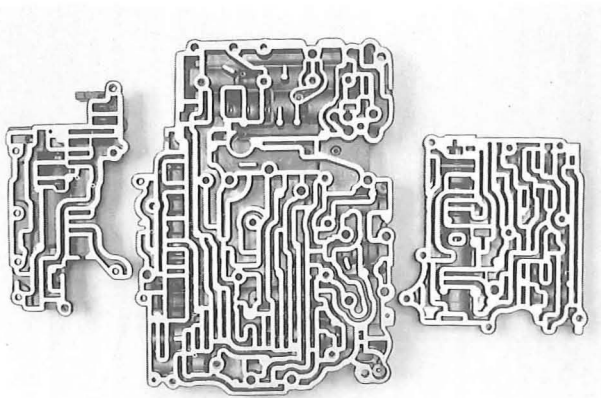
Inspect valves

Check all valves for marks of abrasion or wear. Check freedom of movement in bores. If necessary, valves may be polished carefully with extremely fine emery cloth.

In some cases, valves may stick only when the control system is installed, with no indication of a fault when dismantled.

Faults of this nature are due to excessively close tolerances between valves and valve body, and to 'settlement' of the control system when mounted on the gearbox. In some cases, this type of fault may be corrected by polishing the valve **carefully** with **extremely fine** emery cloth.

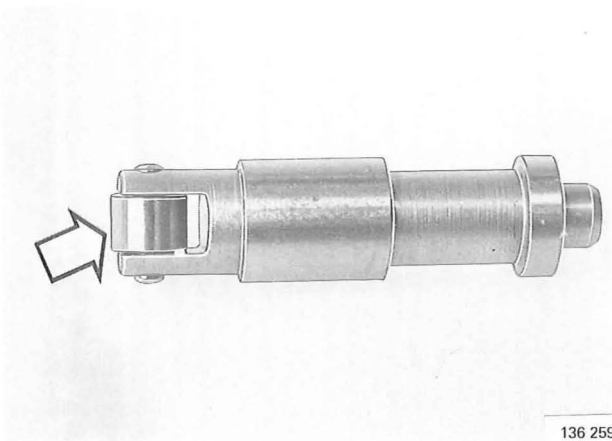
Important: polish carefully.



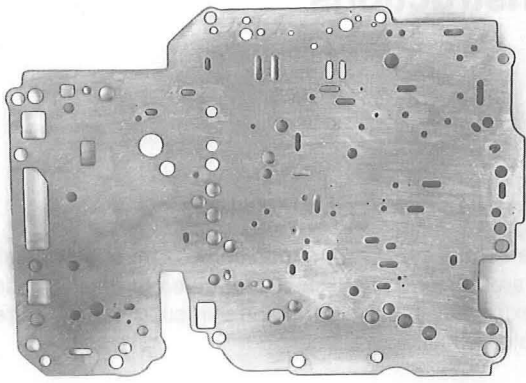
148 351

Inspect kickdown valve spool

Check that spool is not worn or sticky.



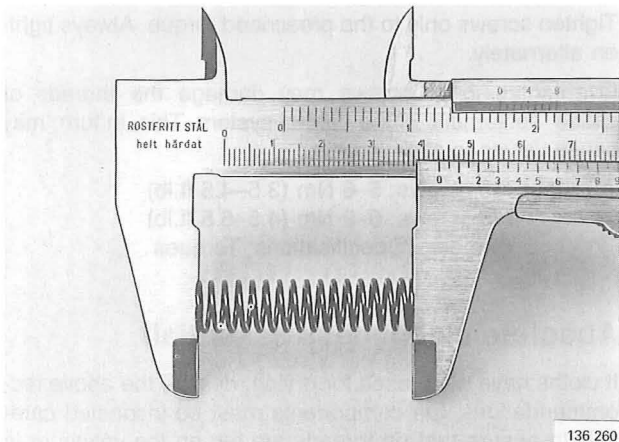
136 259



119 162

Check separator plate

Check that plate is clean and that all holes are clear.



136 260

Measure valve spring lengths

See details under 'Specifications'.

Measurement may also be carried out as valves are installed in valve body.

General assembly instructions

Vaseline

Vaseline must **not** be used to hold valve balls in position. This may cause the balls to stick!

Never force in a sticky valve

Check instead if dirt or burring is interfering with valve movement. If necessary, polish **carefully** with **extremely fine** emery cloth. Check carefully to ensure that valves, springs and pistons are not jamming against edges of valve body. Ensure that all components are installed in their correct positions!

Never turn the valve bodies/control system upside down in the course of work. Loose components may fall out. Follow the procedure described!

Use new gaskets and balls

Always use new gaskets when reassembling the control system. Check that the new gaskets are the same as the originals.

Do not interchange components from different versions of control system

Interchanging springs and valves may alter the gear change positions or render the changing function inoperable.

The control system and governor are accurately matched to ensure that the gear change positions are correct.

See 'Specifications; Replacement schedule – control system' if the complete system must be replaced by a later version.

Different control system types

Since control systems are modified continuously and since they are designed specifically for different engine options, it is extremely important that the particular system be reassembled exactly as dismantled.

Torques

Tighten screws only to the prescribed torque. Always tighten alternately.

Overtightening of screws may damage the threads or cause 'settlement' of the control system. This, in turn, may cause valves to stick.

Torques: M5 screws: 5–6 Nm (3.5–4.5 ft.lb)

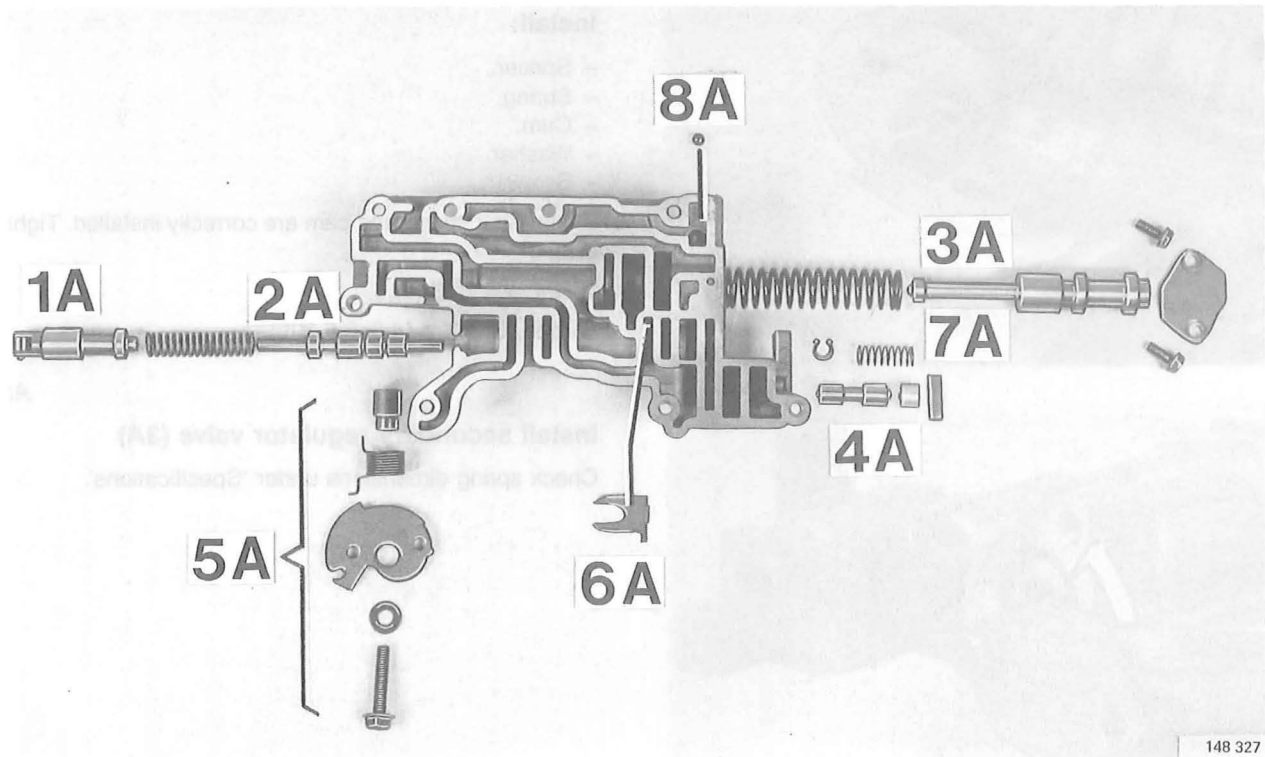
M6 screws: 6–9 Nm (4.5–6.5 ft.lb)

See also 'Specifications; Torques'.

Absolute cleanliness essential!

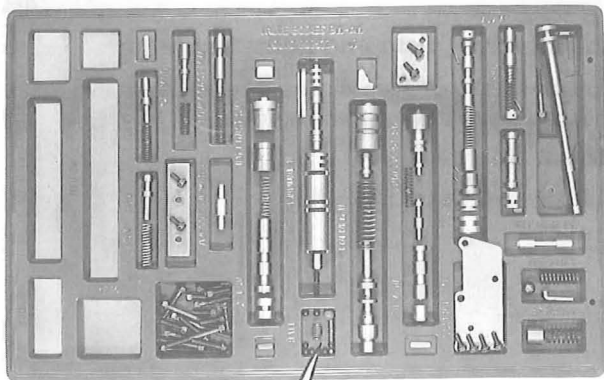
If cloths have been used for drying, despite the above recommendations, the components must be inspected carefully to ensure that no threads are left on the valves or in the valve bodies.

Upper front valve body (A), assembly



148 327

Rubber ball, dia. 5.5 mm (8A) is installed only in transmissions without lock-up function.



8A

148 352

Storage tray with components for upper front valve body (1A–8A) removed.

See also fold-out sheet 3.

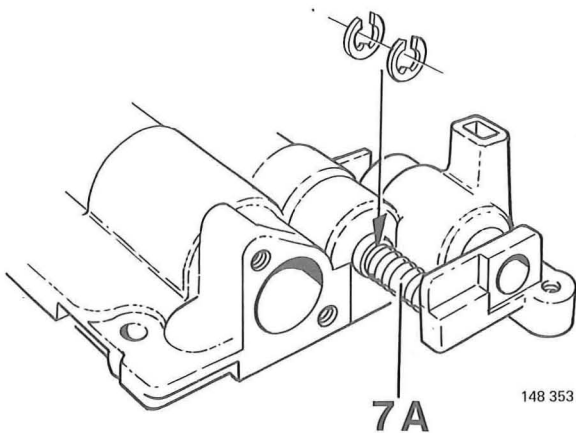
AE1

Install throttle valve (2A), spring and kickdown valve (1A)

Check spring dimensions under 'Specifications'.

Install spring (7A) and adjusting washers (if fitted)

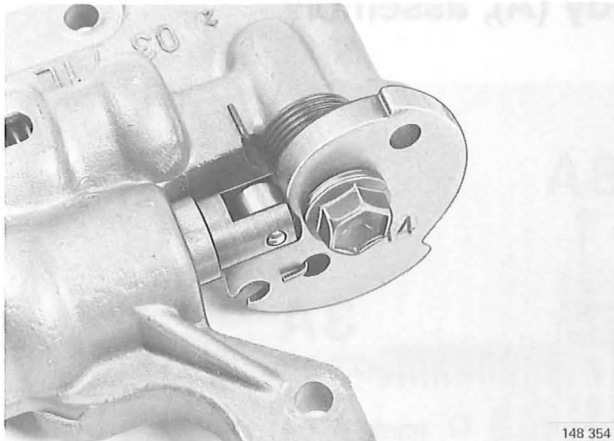
Note: Install same number of adjusting washers as when dismantling.



7A

148 353

Upper front valve body (A), assembly



AE3

Install throttle cam, complete (5A)

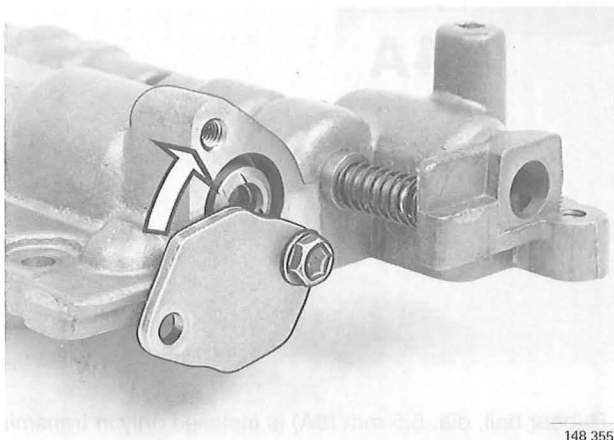
Install:

- Spacer.
- Spring.
- Cam.
- Washer.
- Screw.

Ensure that spring and cam are correctly installed. Tighten screw.

Screw: M6 x 28.

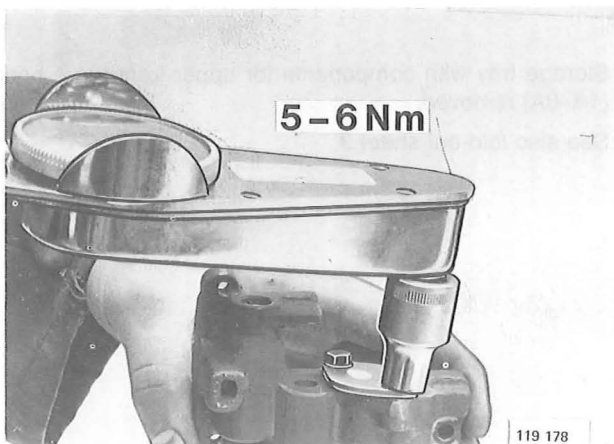
Torque: **6–9 Nm** (4.5–6.5 ft.lb).



AE4

Install secondary regulator valve (3A)

Check spring dimensions under 'Specifications'.



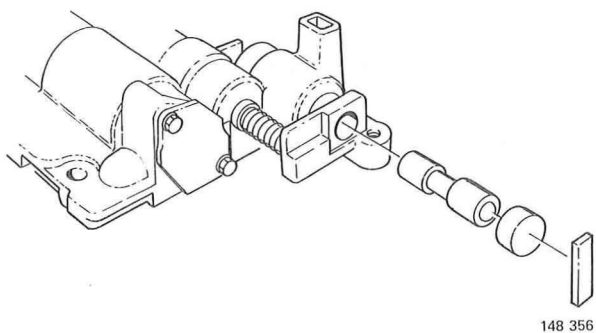
AE5

Install cover plate and tighten screws

Ensure that cover plate is correctly oriented so that it is not bearing on kickdown valve and spring.

Screw: M5 x 12.

Torque: **5–6 Nm** (3.5–4.5 ft.lb).



AE6

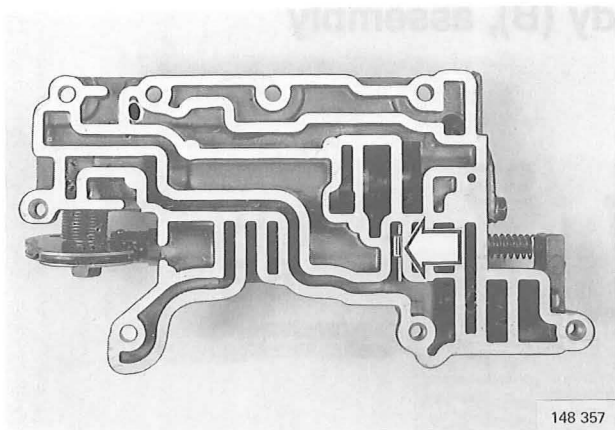
Install cutback valve (4A)

- Valve (small end inwards).
- Spacer.
- Retainer.

AE7

Install throttle valve (6A) stop

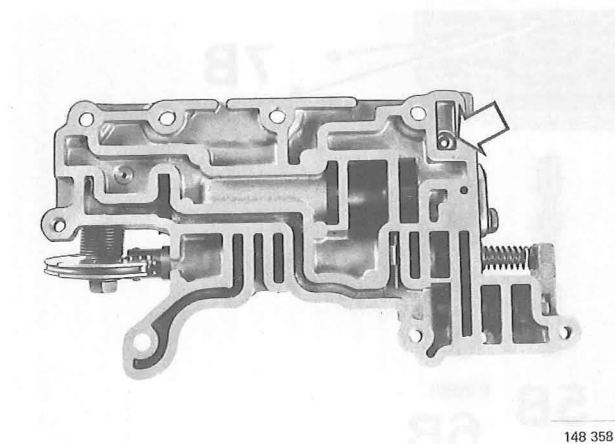
Note: Position with flanges facing left (towards throttle cam) as illustrated.



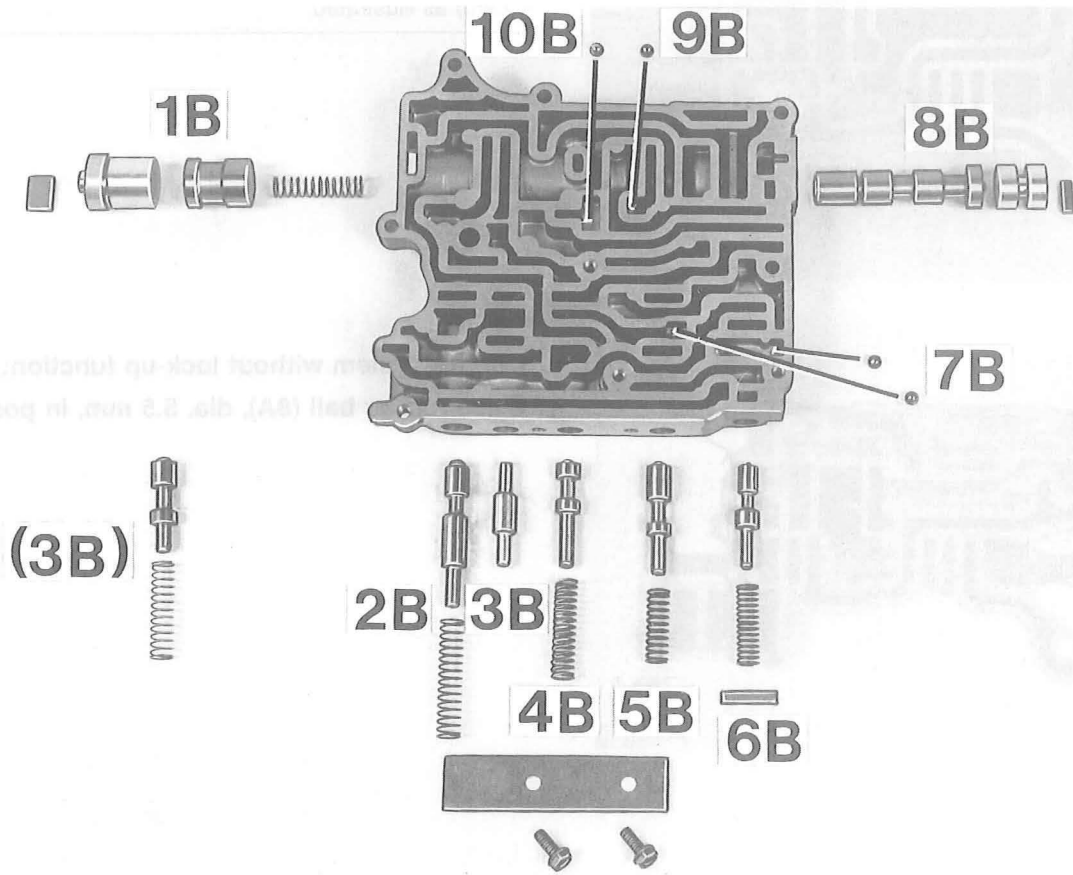
AE8

Control system without lock-up function:

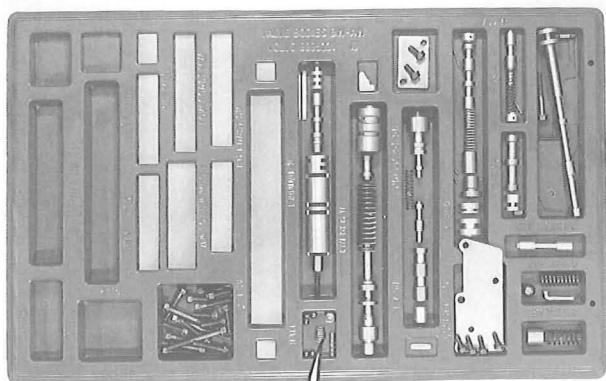
Place rubber ball (8A), dia. 5.5 mm, in position.



Upper rear valve body (B), assembly



148 332



7B, 9B, 10B

148 359

Storage tray with components for upper rear valve body removed.

See also fold-out sheet 3.

AF1

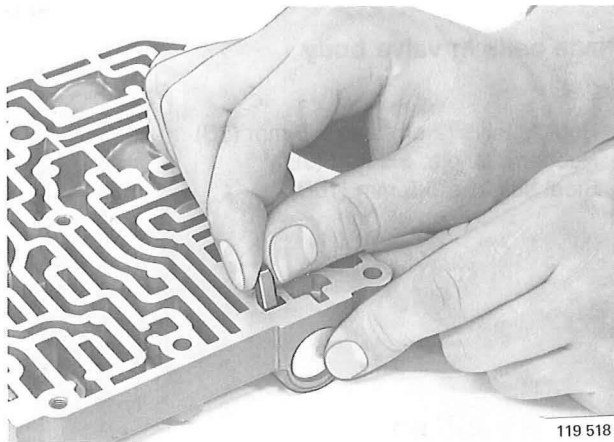


Install downshift valve 3-2 (1B)

Install valve, plug and retainer.

Spring is installed in operation AF2 below.

AF2

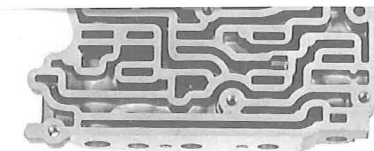


Install shift valve 2-3 (8B)

Install spring in valve. Insert valve, plug and retainer.

Check spring dimensions under 'Specifications'.

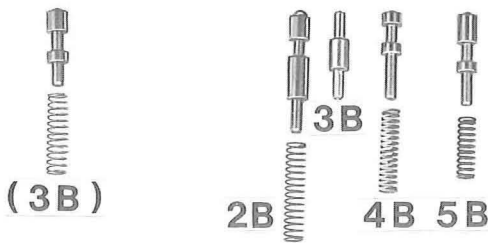
AF3



Install:

- Modulator valve 2-1 (2B)
- Governor modulator valve (3B) (two types of valve are used)
- Control valve, clutch C2 (4B)
- Modulator valve 3-2 (5B)

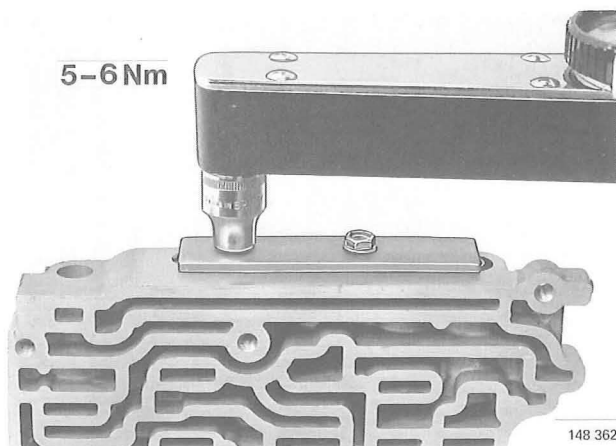
Check spring dimensions under 'Specifications'.



148 361

AF4

5-6 Nm



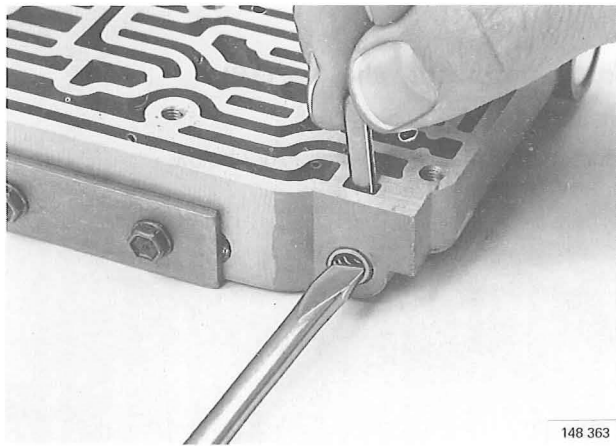
Install cover plate and tighten screws

Screw: M5 x 12

Torque: 5-6 Nm (3.5-4.5 ft.lb).

148 362

Upper rear valve body (B), assembly

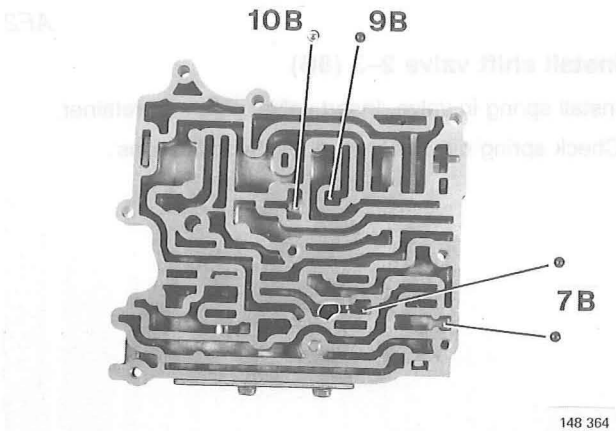


148 363

AF4

Install detent regulator valve (6B)

Check spring dimensions under 'Specifications'.
Press in spring with screwdriver and insert retainer.



148 364

AF6

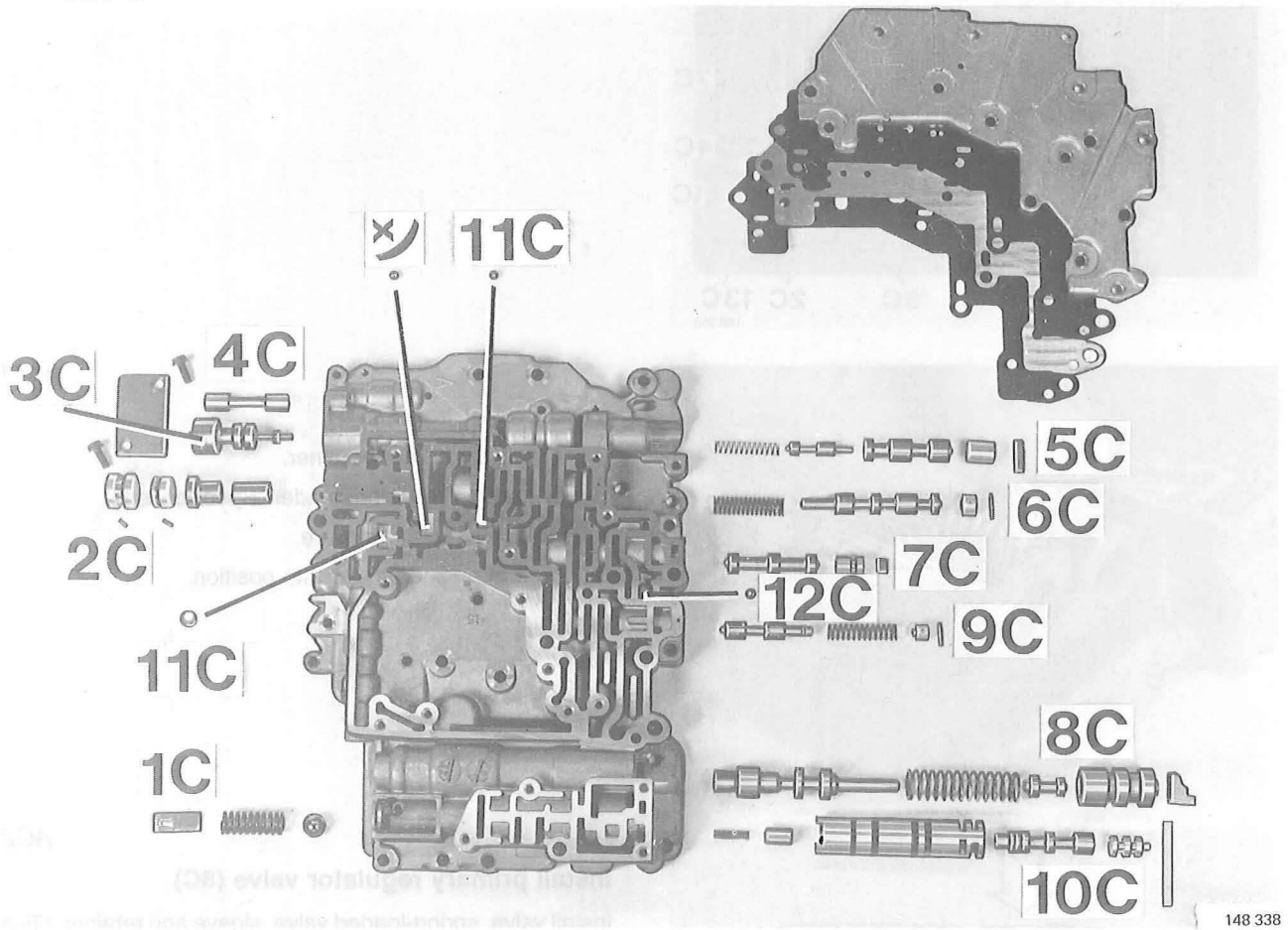
Place balls in valve body

Install:

- Rubber balls (2 off), dia. 5.5 mm (7B)
- Rubber ball, dia. 5.5 mm (9B)
- Steel ball, dia. 5.5 mm (10B)

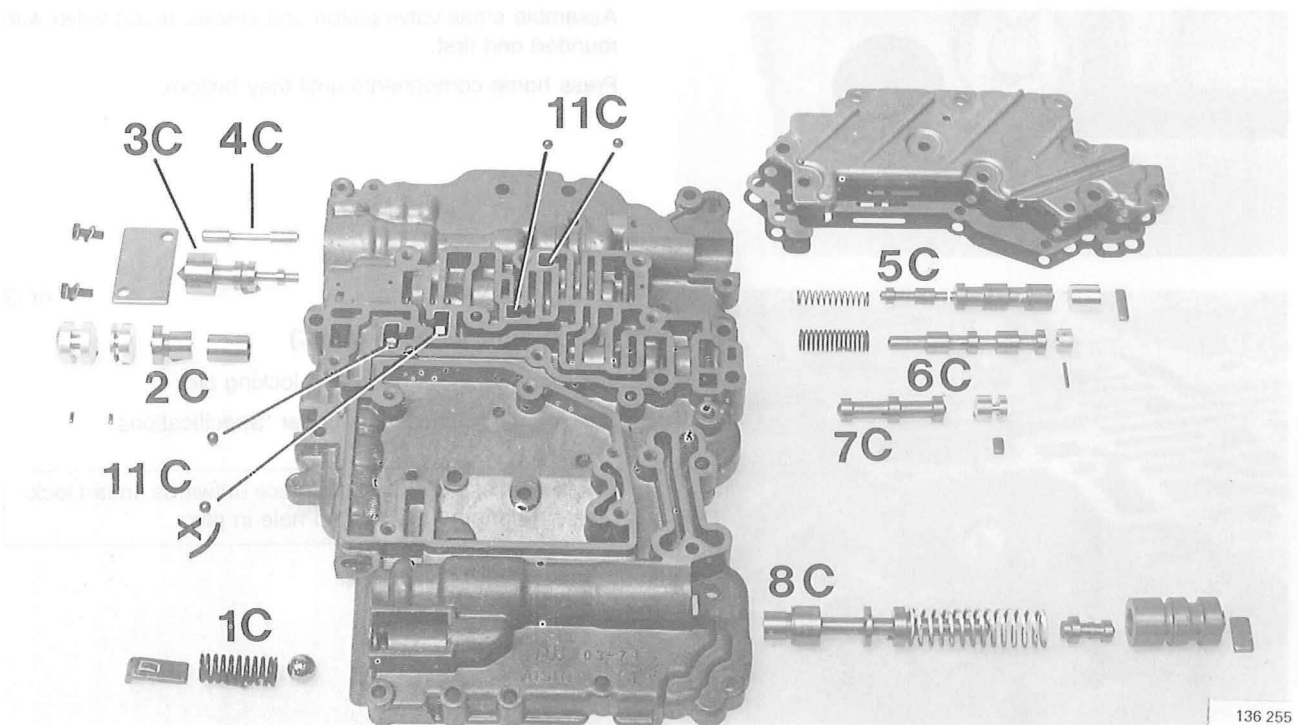
Lower valve body (C), assembly

Control system with lock-function



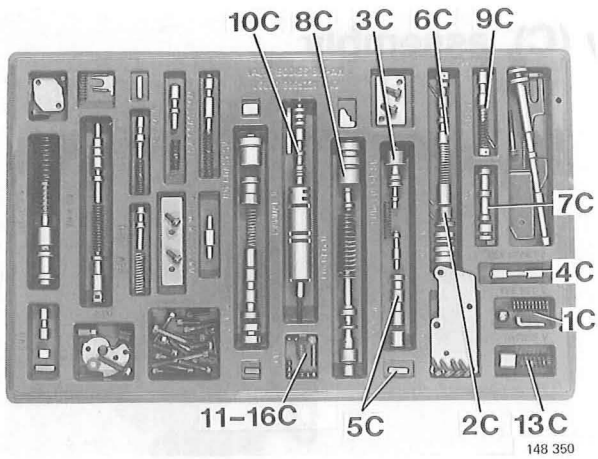
148 338

Control system without lock-upfunction



136 255

Lower valve body (C), assembly



Storage tray with components for lower valve body indicated.

See also fold-out sheet 3.

AG1

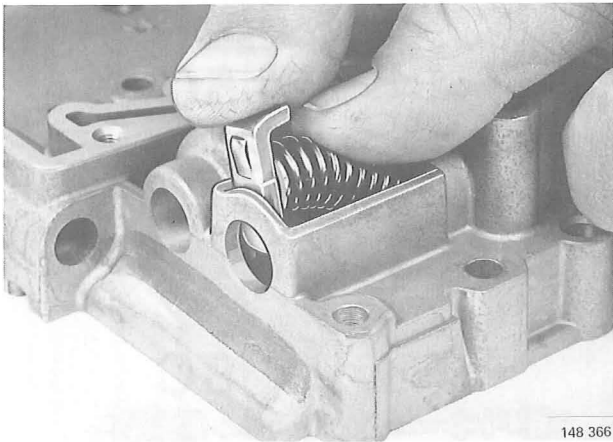
Install relief valve (1C)

Install ball, spring and retainer.

Check spring dimensions under 'Specifications'.

Note: Strong spring pressure.

Ensure that retainer snaps into position.



AG2

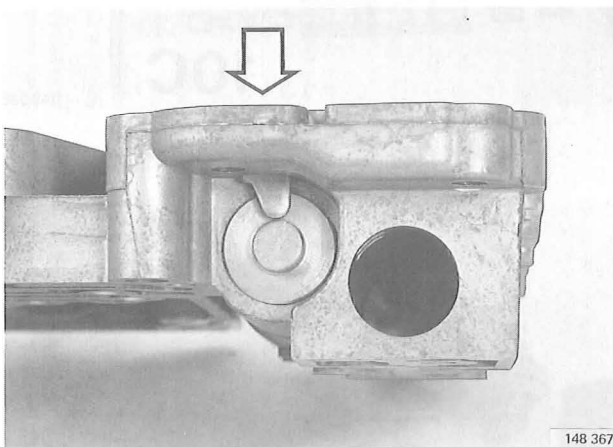
Install primary regulator valve (8C)

Install valve, spring-loaded valve, sleeve and retainer. (Two types of retainer are used.)

Illustration shows control system with lock-up function.

Assemble small valve piston and sleeve. Insert valve with rounded end first.

Press home components until they bottom.



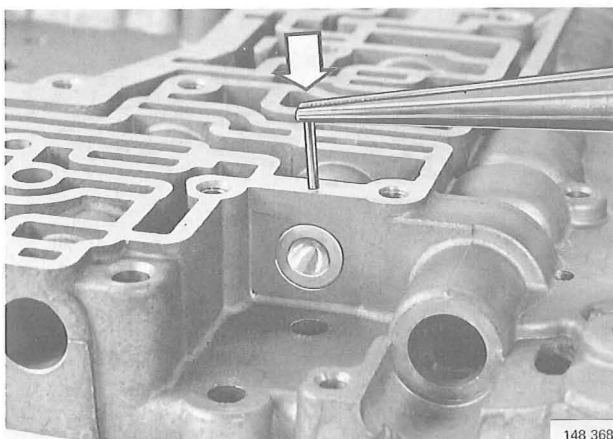
AG3

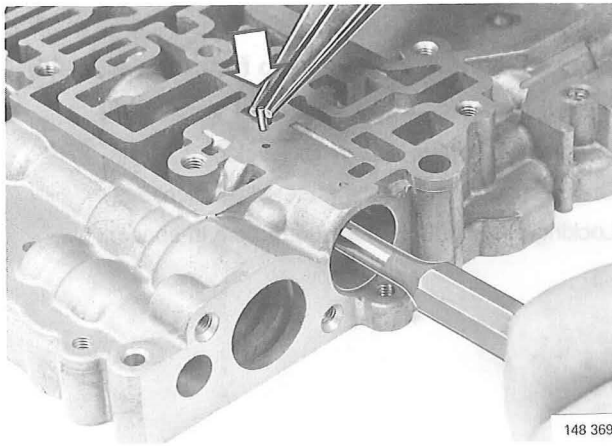
Install shift valve 3-4 (6C)

Install spring, valve, plug and locking pin.

Check spring dimensions under 'Specifications'.

Note: Recess in plug should face outwards. Insert locking pin (length 15.5 mm) in hole in plug.





AG4

Install downshift valve 4-3 (2C)

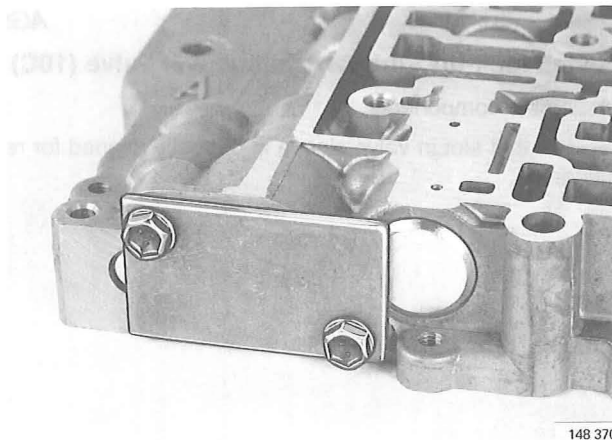
Install sleeve with recess facing spring, followed by valve and inner locking plug.

Ensure that components are not sticking in valve body.

Install inner locking pin. Pin should be located in groove in locking plug.

Install outer locking plug with chamfer facing outwards.

Do not install locking pin at this point. (Pin is installed in operation AG11.)



AG5

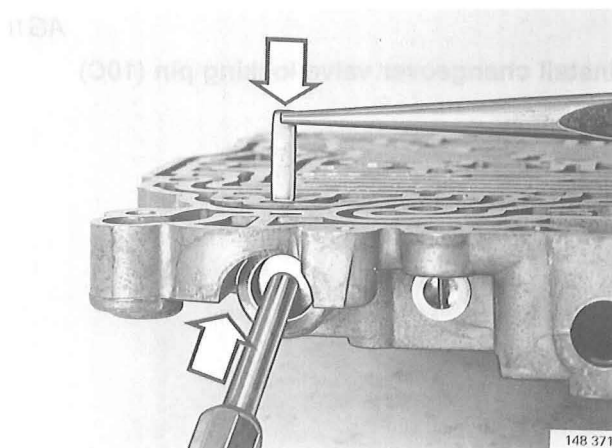
Install downshift valve 2-1 (3C)

Install rear brake B3 control valve (4C)

Install cover plate and tighten bolts

M5 x 12

Torque: 5-6 Nm (3.5-4.5 ft.lb)



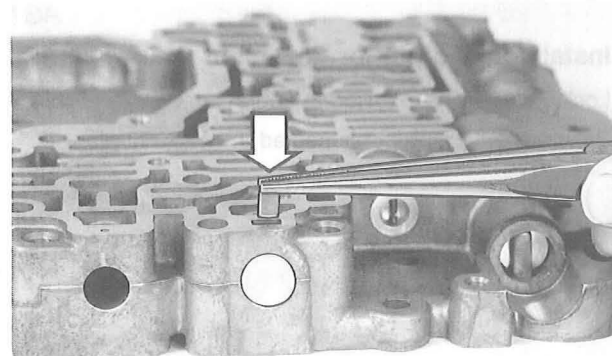
AG6

Install shift valve 1-2 (5C)

Install spring-loaded valve, valve, spacer and retainer.

Check spring dimensions under 'Specifications'.

Ensure that valve is not sticking in valve body.



AG7

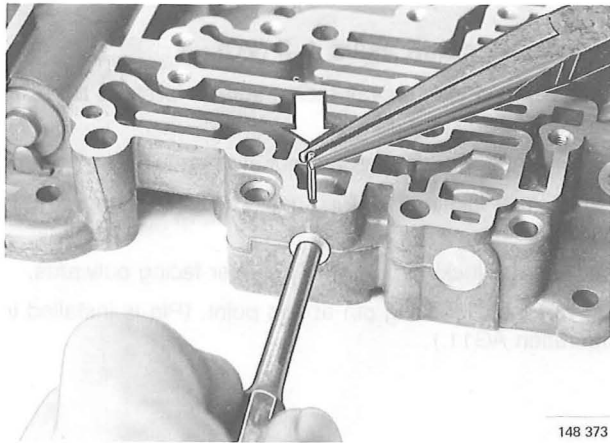
Turn valve body upside down

Install control valve D-2 (7C). Install valve, locking plug and retainer

Smaller end of valve should face inwards. Retainer should be located in locking plug groove.

Note: Orientation of locking plug. Do not turn valve body over until operation AG17. Loose components may fall out.

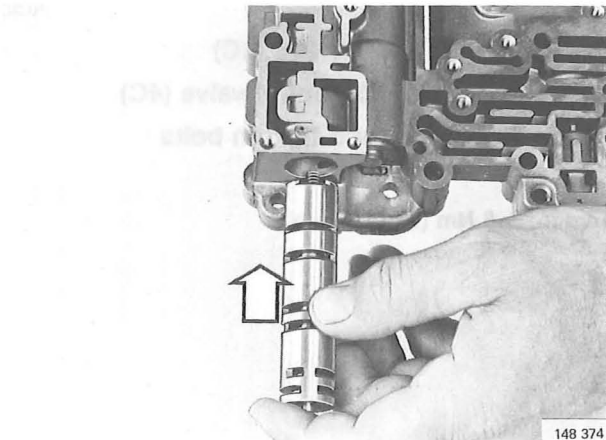
Lower valve body (C), assembly



AG8

Control system with lock-up function, AG8-AG10
Install lock-up function signal valve (9C)

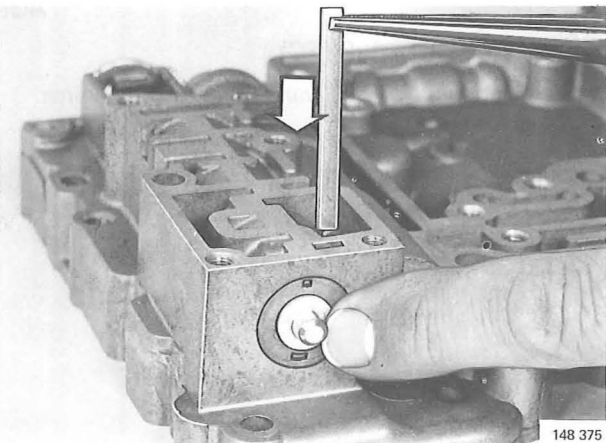
Install valve spring, spacer and locking pin.
Check spring dimensions under 'Specifications'.
Locking pin should be located in hole in spacer.



AG9

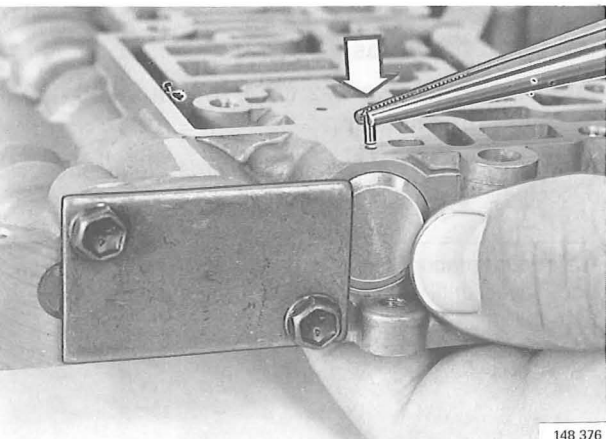
Install lock-up function changeover valve (10C)

Assemble components.
Ensure that slot in valve sleeve is correctly aligned for retainer.



AG10

Install changeover valve locking pin (10C)



AG11

Install locking pin for downshift valve 4-3 (2C)

Locking plug was installed in operation AG4.
Ensure that locking pin is seated in groove in plug.

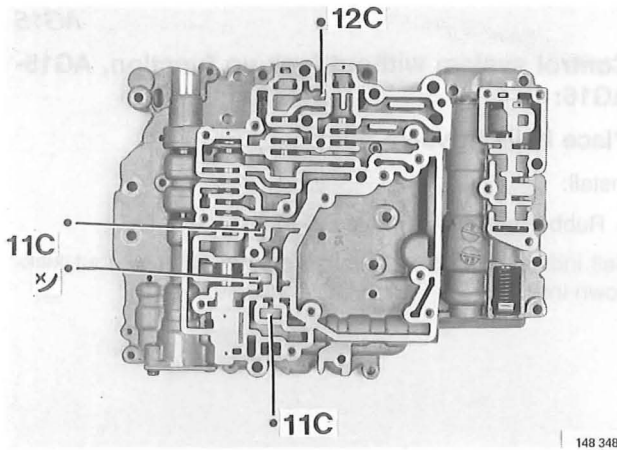
AG12

Control system with lock-up function, AG12-AG14

Place balls in valve body

Install:

- Rubber balls (3 off), dia. 5.5 mm (11C)
Ball indicated by x is installed only in units without kick-down inhibitor.
- Rubber ball, dia. 6.3 mm (12C)



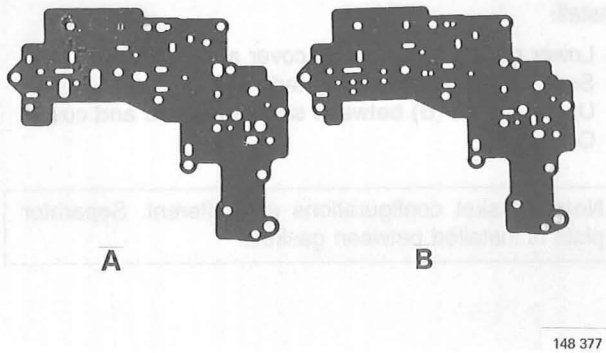
AG13

Install cover

Install:

- Lower gasket (A) between cover and valve body
- Separator plate (not illustrated)
- Upper gasket (B) between separator plate and cover
- Cover

Note: Gasket configurations are different. Separator plate is installed between gaskets.

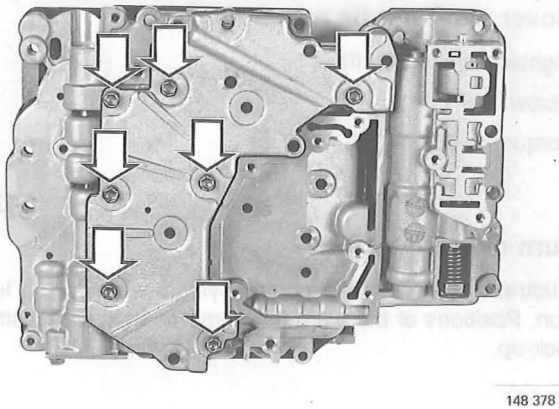


Adjust cover in relation to other screw holes. Cover must not be misaligned

Tighten screws (7 off)

Screw: M5 x 18

Torque: **5-6 Nm** (3.5-4.5 ft.lb)



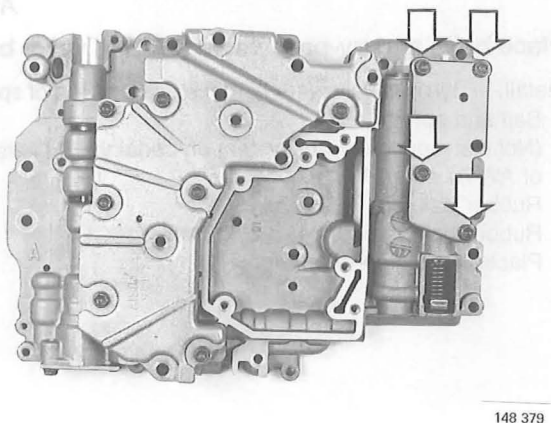
AG14

Install cover plate and gasket

Tighten screws (4 off)

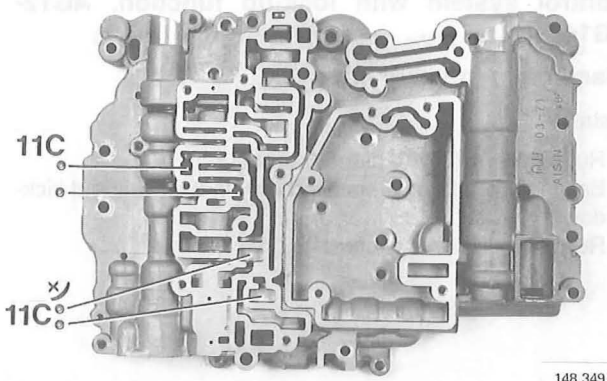
Screw: M5 x 12

Torque: **5-6 Nm** (3.5-4.5 ft.lb)



Lower valve body (C), assembly

AG15



148 349

Control system without lock-up function, AG15-AG16:

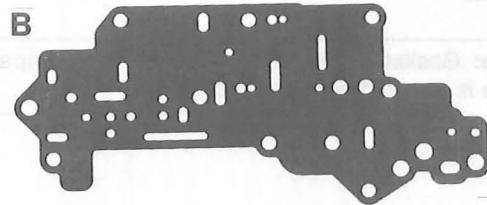
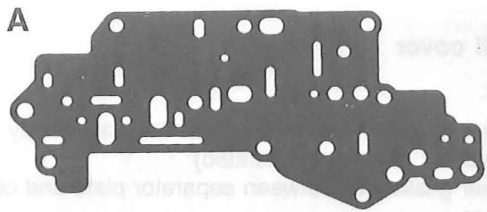
Place balls in valve body

Install:

- Rubber balls (4 off), dia. 5.5 mm (11C)

Ball indicated by x is installed only in units without kick-down inhibitor.

AG16



148 380

Install cover

Install:

- Lower gasket (A) between cover and valve body
- Separator plate (not illustrated)
- Upper gasket (B) between separator plate and cover
- Cover

Note: Gasket configurations are different. Separator plate is installed between gaskets.

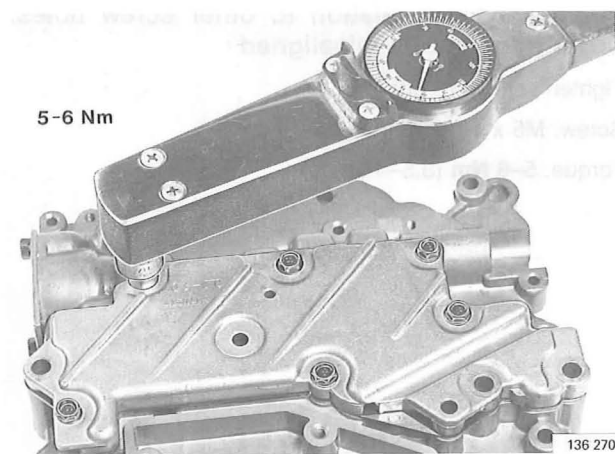
Adjust cover in relation to other screw holes. Cover must not be misaligned

Tighten screws (6 off)

Screw: M5 x 18

Torque: 5-6 Nm (3.5-4.5 ft.lb)

AG17



136 270

Turn over valve body

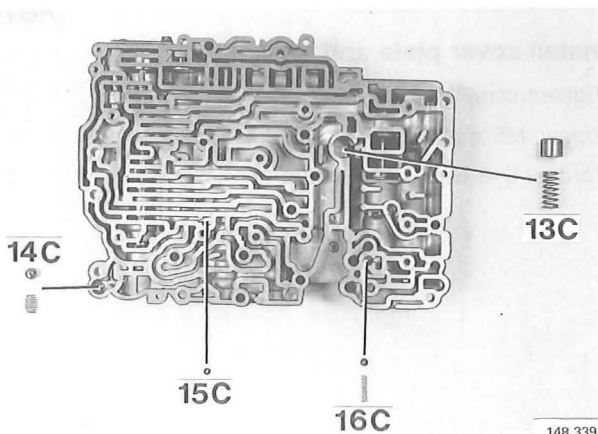
Illustration below shows control system with lock-up function. Positions of balls are the same as in system without lock-up.

AG18

Place balls and by-pass valve (13C) in valve body

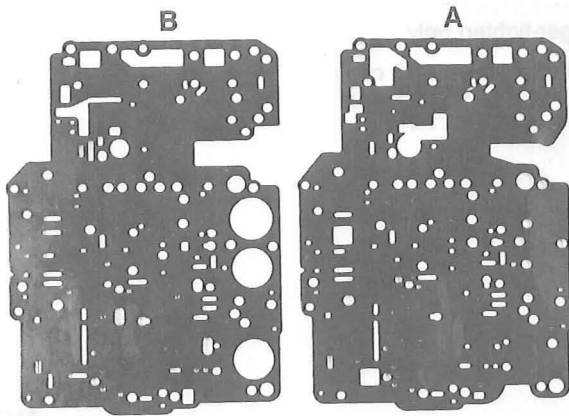
Install:- By-pass valve (13C). Place valve on top of spring.

- Ball and spring (14C)
 - (Not installed in control system on certain early versions of AW 70 and AW 71)
 - Rubber ball, dia. 5.5 mm (15C)
 - Rubber ball and spring, dia. 6.3 mm (16C)
- Place ball on top of spring.



148 339

Control system – complete reassembly



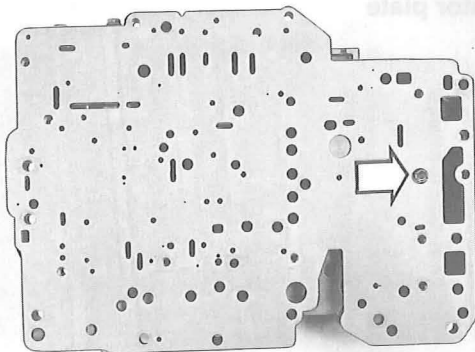
148 381

AH1

Inspect new gaskets

Illustration shows gaskets for lower valve body (C).

Upper and lower gaskets are different. Ensure that gaskets are installed in correct positions with lower gasket (A) immediately adjacent to valve body.



148 382

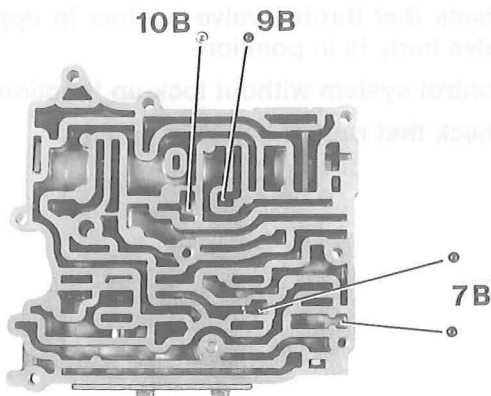
AH2

Check that balls, by-pass valve and valve retainers (including pins) are in position

Place lower gasket and separator plate on valve body

Secure separator plate temporarily with one screw.

Screw: M5 x 12



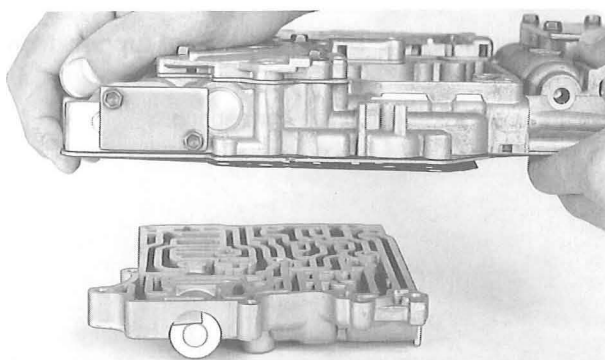
148 364

AH3

Place upper gasket (B in figure above) on top of separator plate

AH4

Check that all balls and valve retainers are in position in upper rear valve body (B)

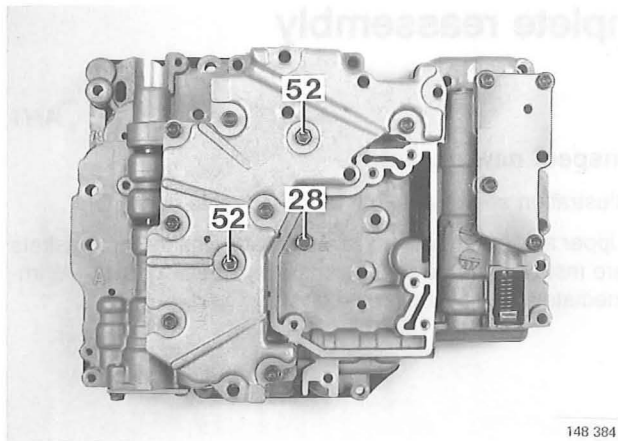


148 383

AH5

Place lower valve body on top of upper rear body
Ensure that gasket and holes correspond.

AH6



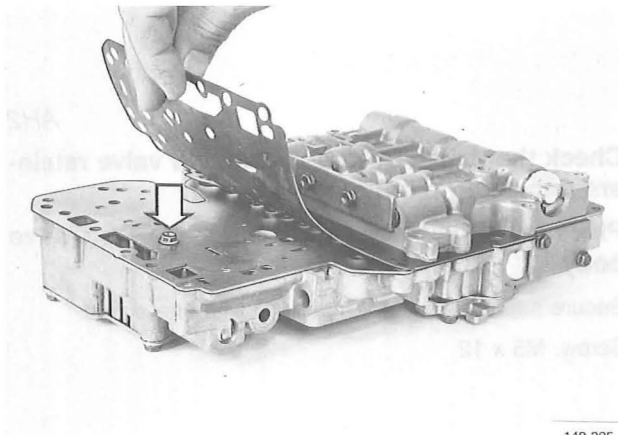
148 384

Install screws

Finger-tighten only.

Screws: M5 x 52 (2 off)
M5 x 28 (1 off)

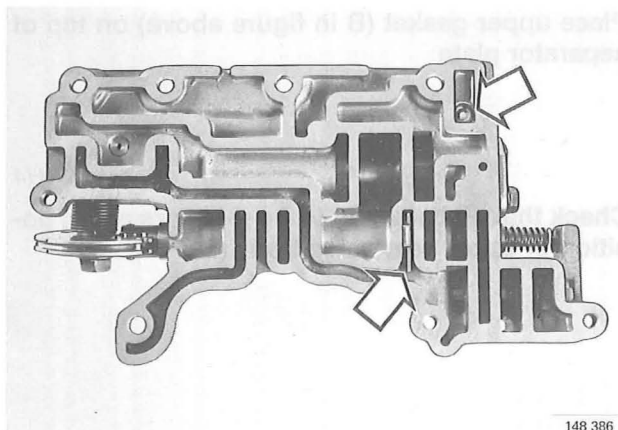
AH7



148 385

Turn over valve body and remove screw securing separator plate

AH8



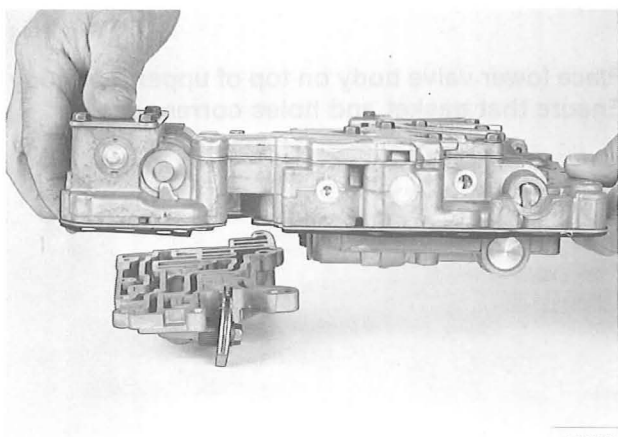
148 386

Check that throttle valve retainer in upper front valve body is in position

Control system without lock-up function:

Check that rubber ball is in position

AH9

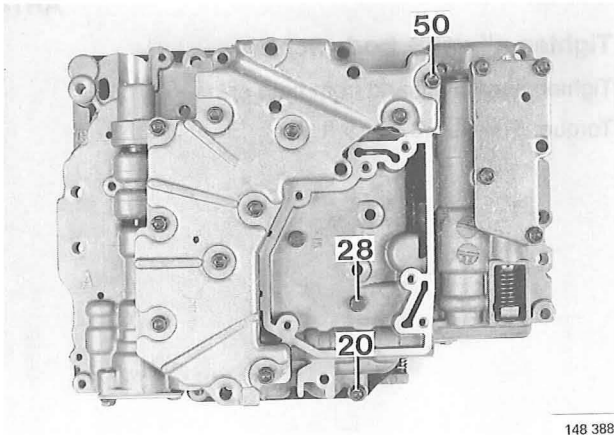


148 387

Place lower valve body on top of upper front body

Ensure that gasket and holes correspond.

AH10



148 388

**Control system with lock-up function:
Install screws in upper front valve body**

Finger-tighten only.

Screws M5 x 20, 28 and 50.

AH11

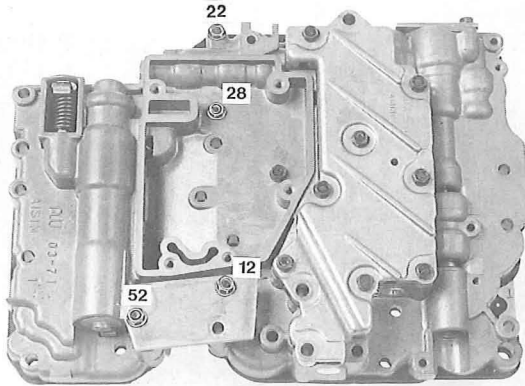
**Control system without lock-up function,
AH11-AH12:**

Install screws in upper front valve body

See figure below.

Finger-tighten only.

Screws M5 x 22 and 28.



136 280

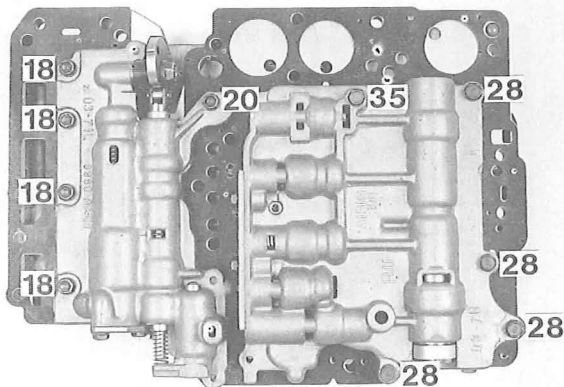
Install cover plate and gasket

Use new gasket.

Finger-tighten screws.

Screws: M5 x 12 and 52.

AH12



148 389

Turn over control system

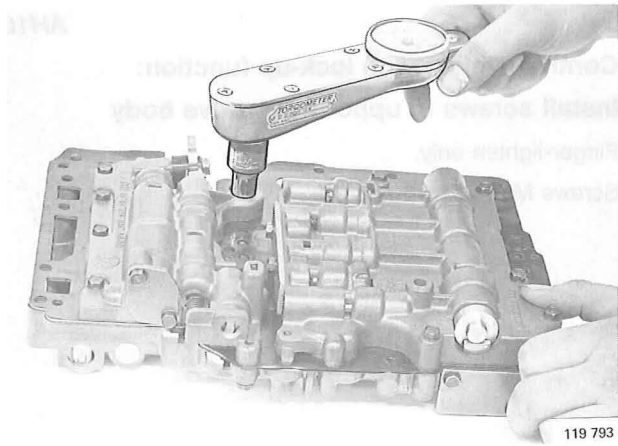
**Insert screws in upper front valve body (5 off) and
upper rear valve body (5 off)**

Check that gaskets are positioned correctly.

Screws: M5 x 18 (4 off), 20, 28 (4 off)

AH13

Complete reassembly

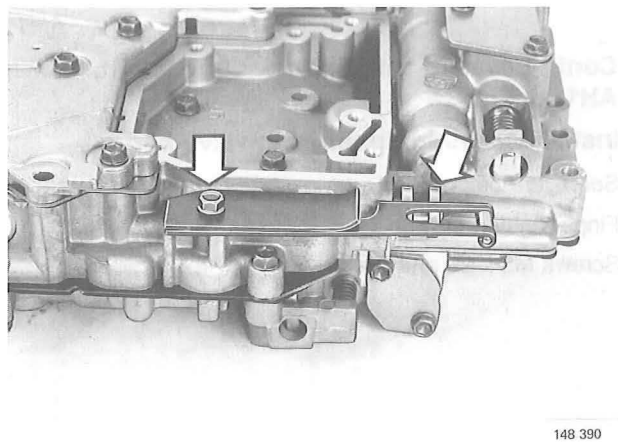


AH14

Tighten all valve body screws

Tighten alternately and from both sides.

Torque: **5–6 Nm** (3.5–4.5 ft.lb)



AH15

Install gear selector valve

Install locking spring and plate

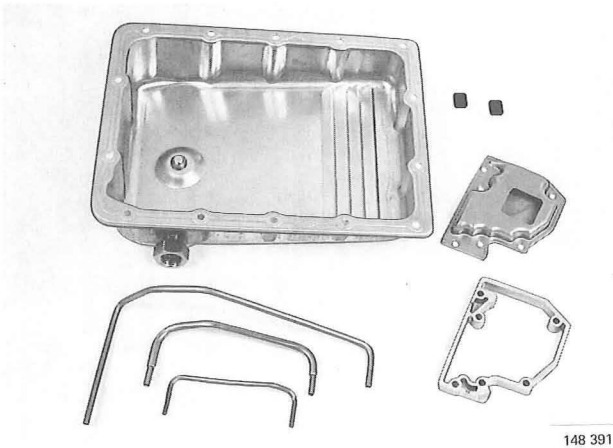
Tighten screw.

Screw M5 x 40.

Torque: **5–6 Nm** (3.5–4.5 ft.lb)

Control system – assembly of other components

AJ1



148 391

Clean and inspect other components not yet included in reconditioning

Clean:

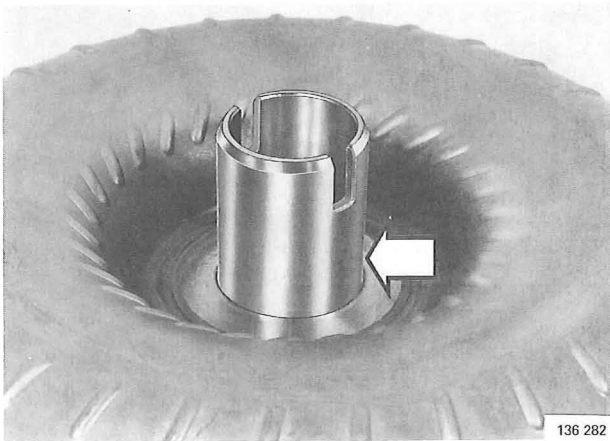
- Oil sump
- Oil strainer
- Oil pipes (2 pipes in gearboxes without kickdown inhibitor)
- Particle magnet(s)

Dry components with compressed air.

Note: Do not use cotton wadding!

Check components for cracks and other damage.

AJ2

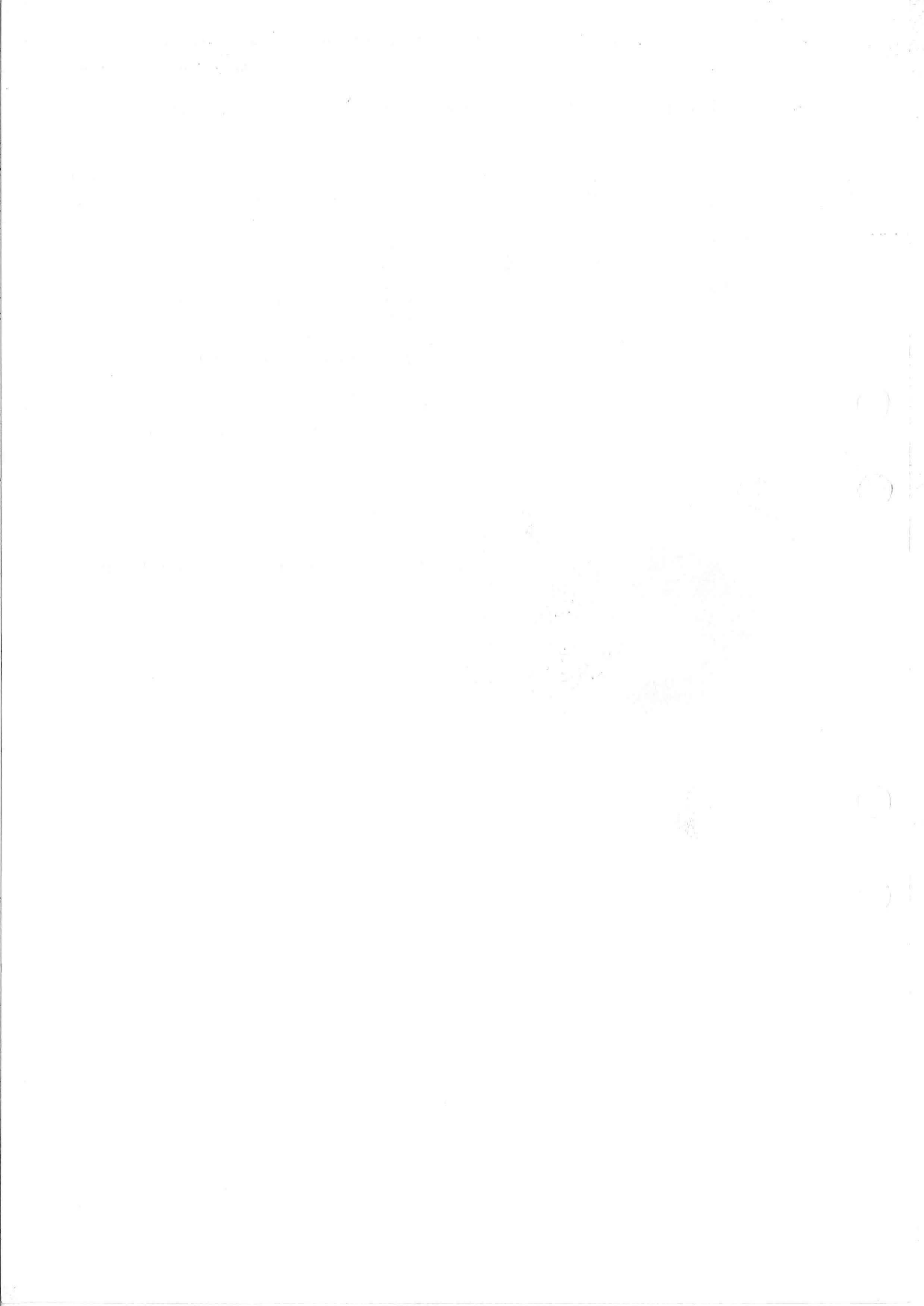


136 282

Torque converter

Inspect torque converter throat

Excessive scoring of throat will result in leakage past oil pump seal.



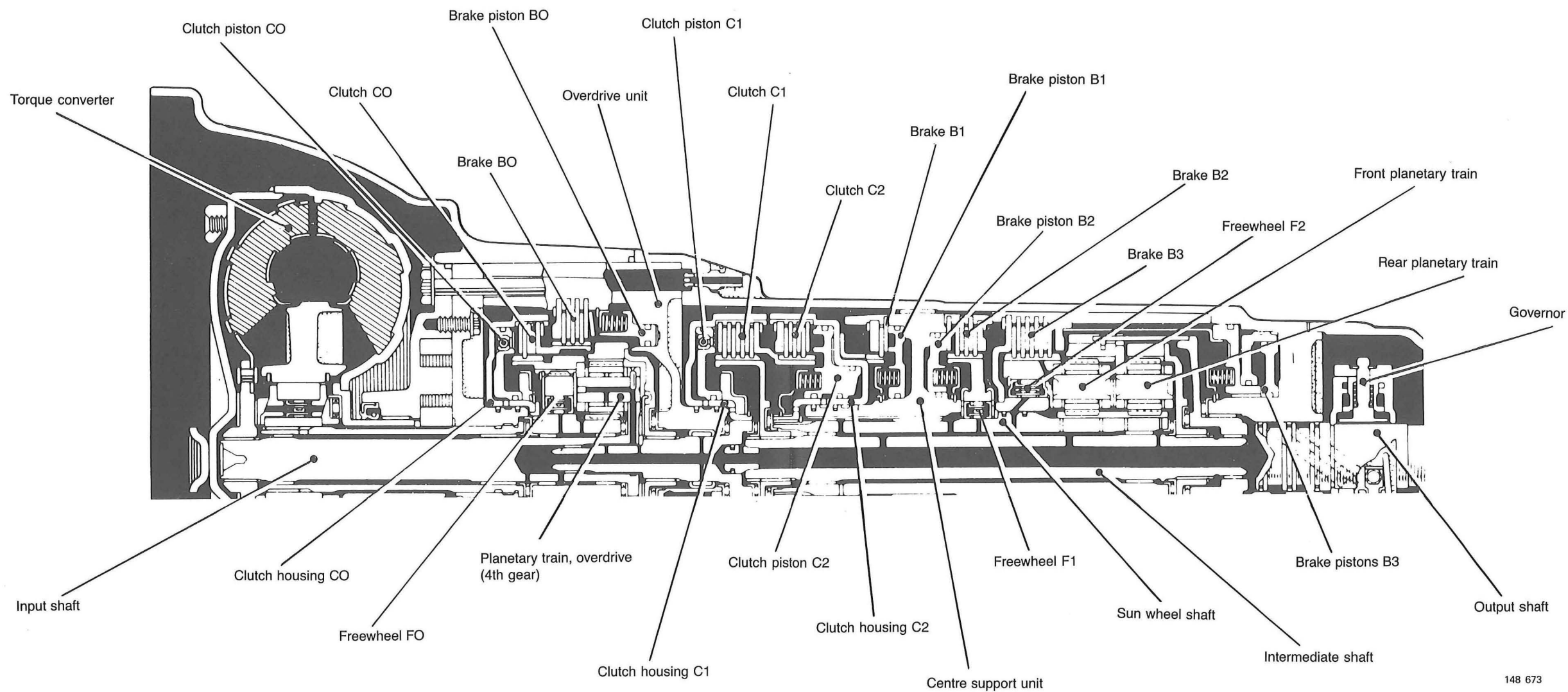
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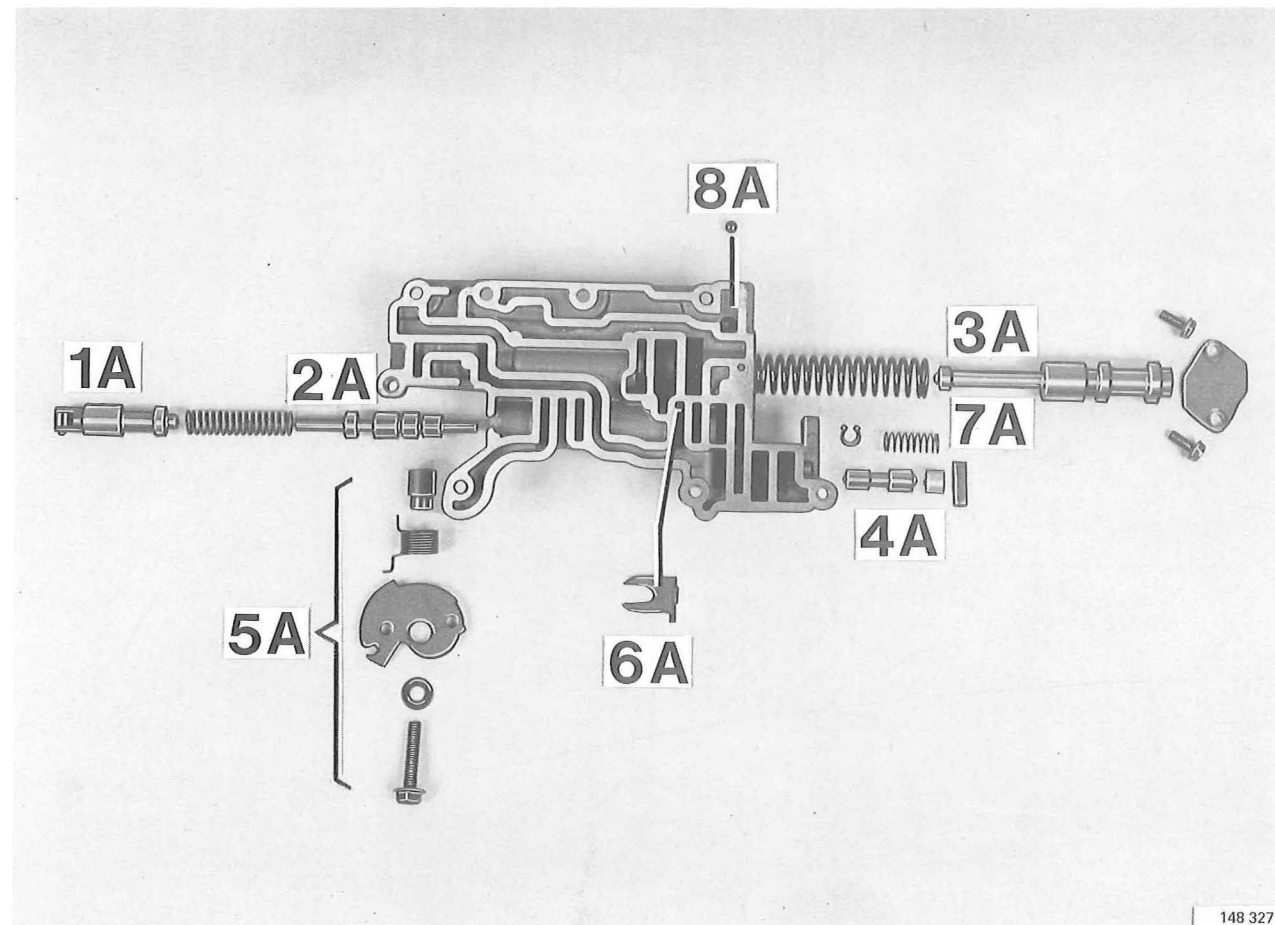
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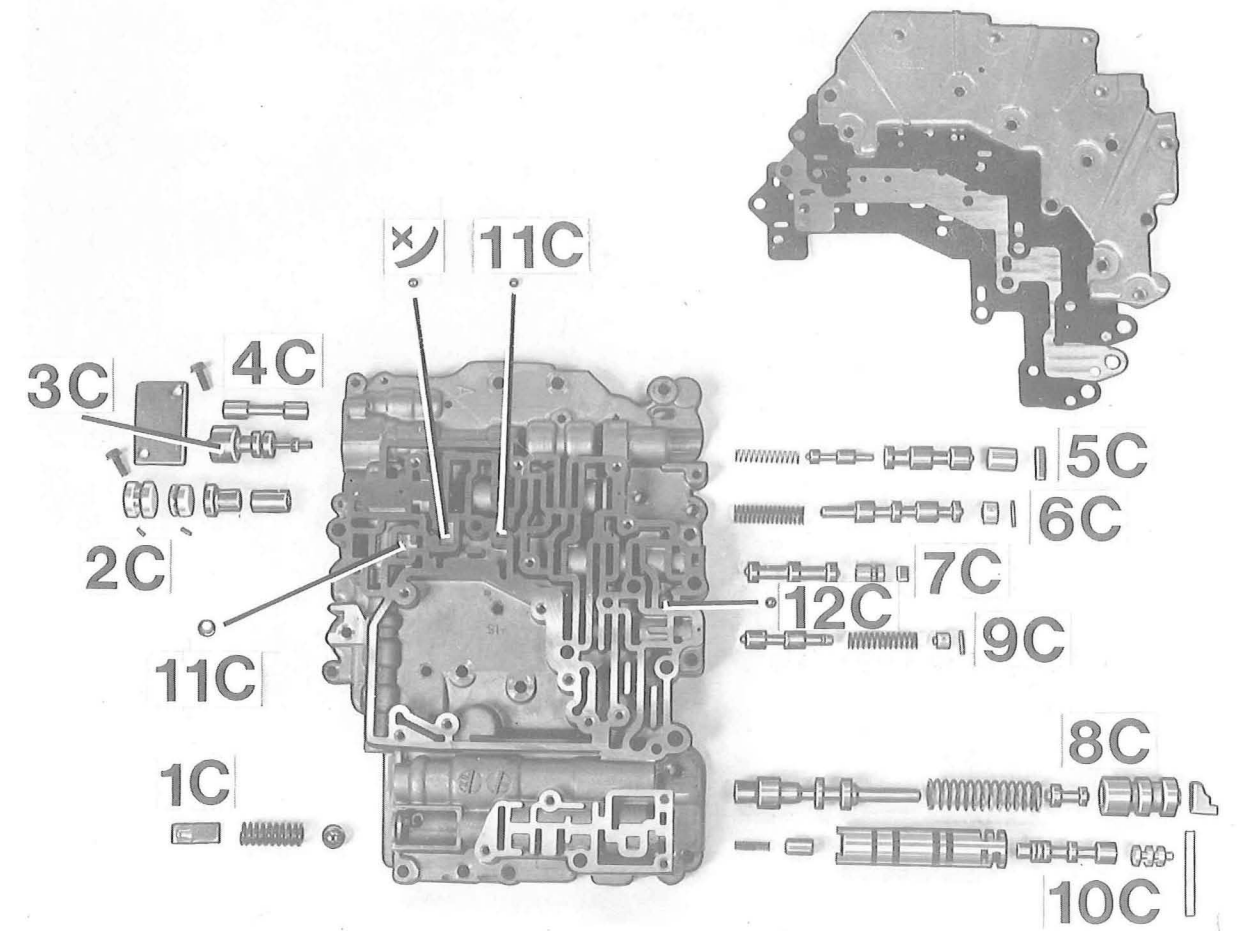
Gearbox – component names and locations



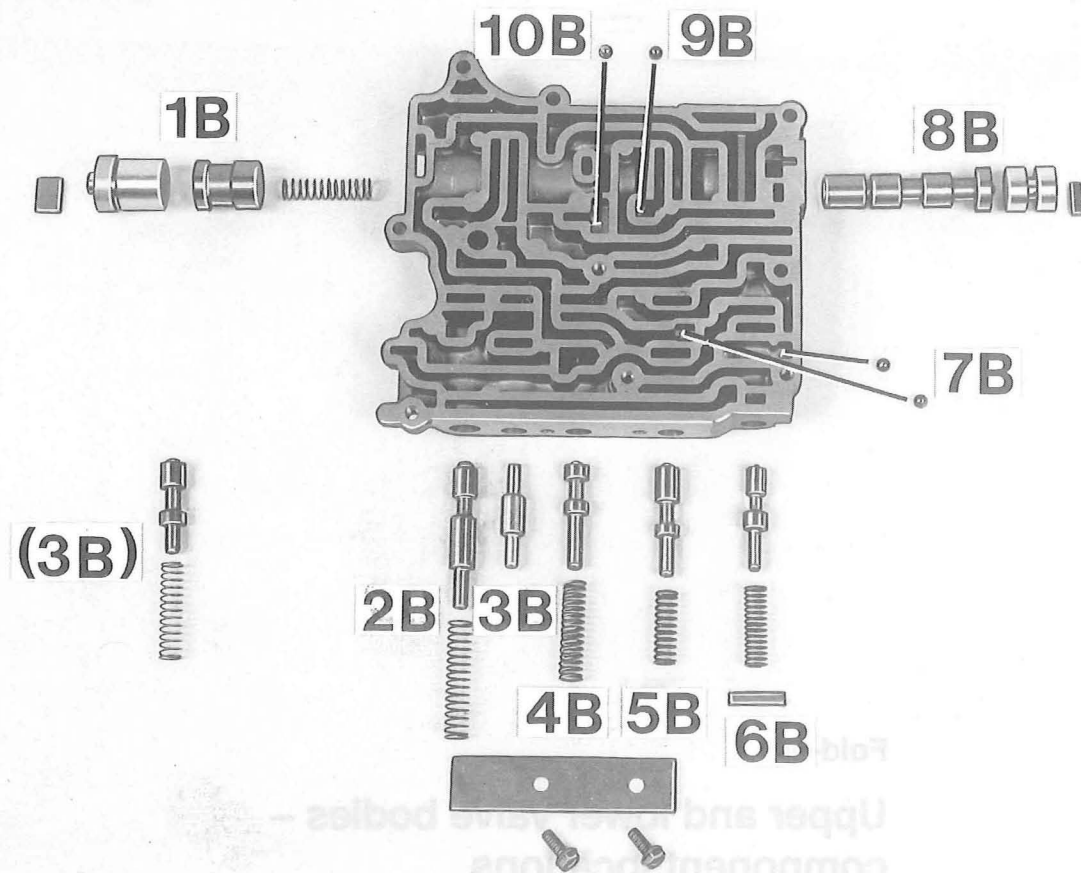
Upper front valve body (A)



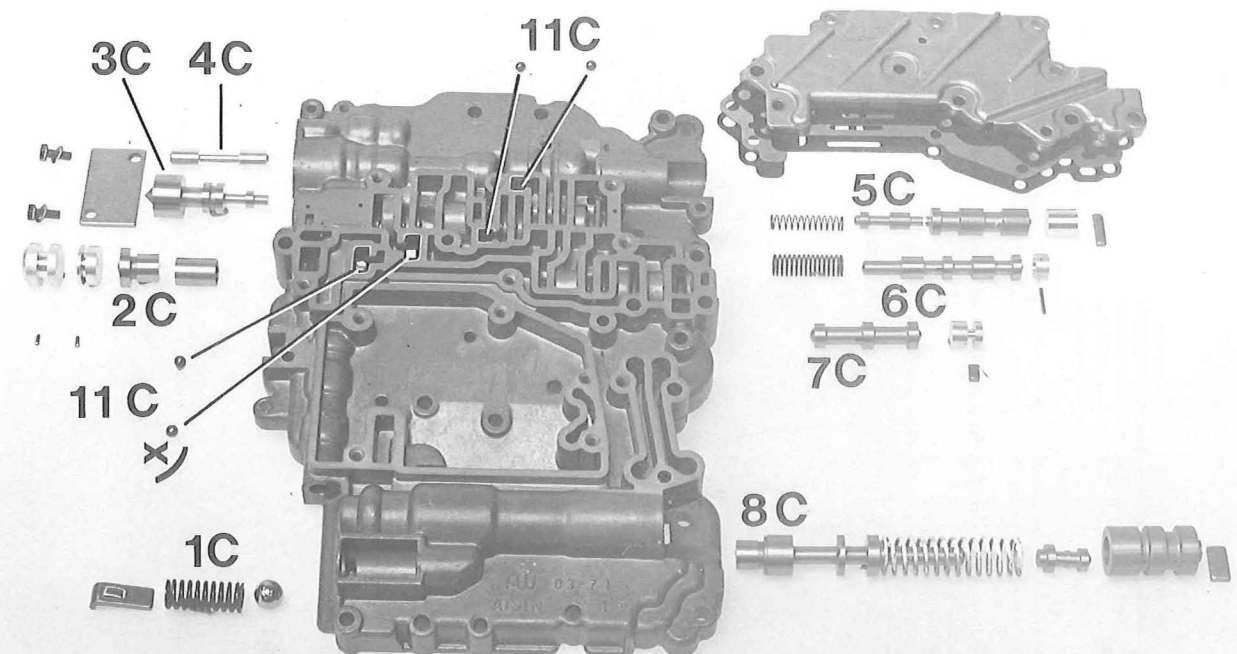
Lower valve body (C) with lock-up function



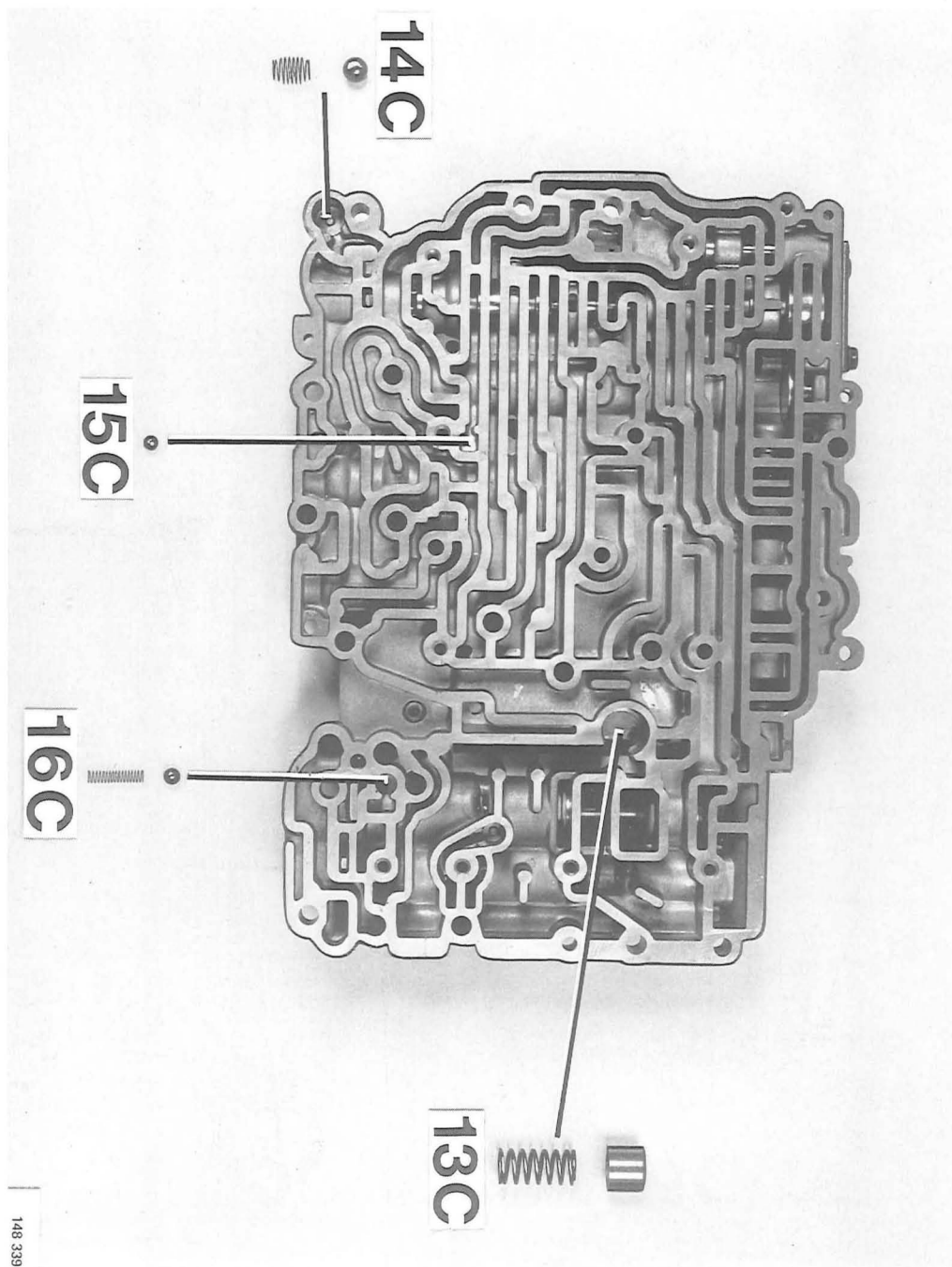
Upper rear valve body (B)



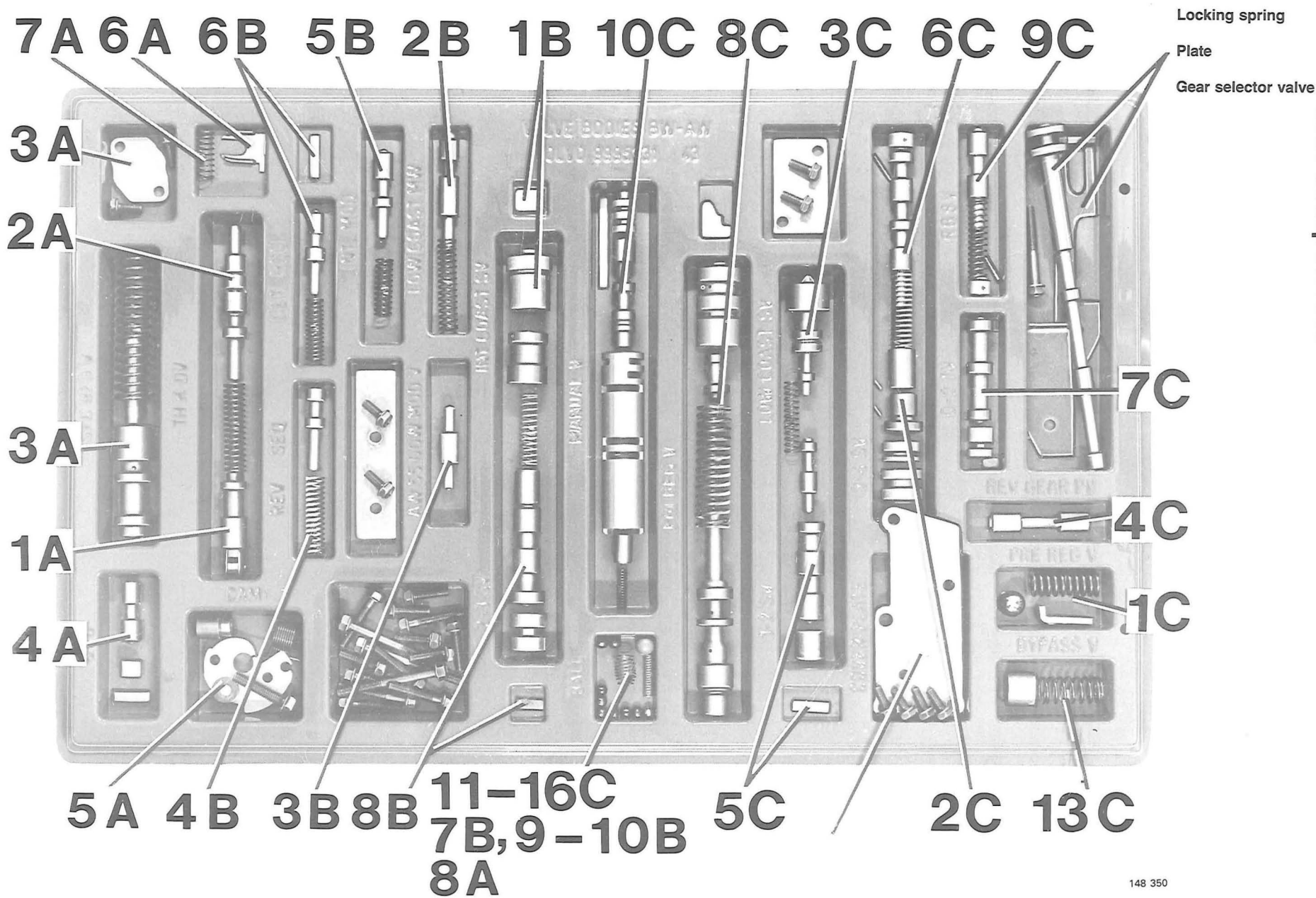
Lower valve body (C) without lock-up function



Lower valve body (C) – top



148 339



Storage tray 5231, complete with components

148 350