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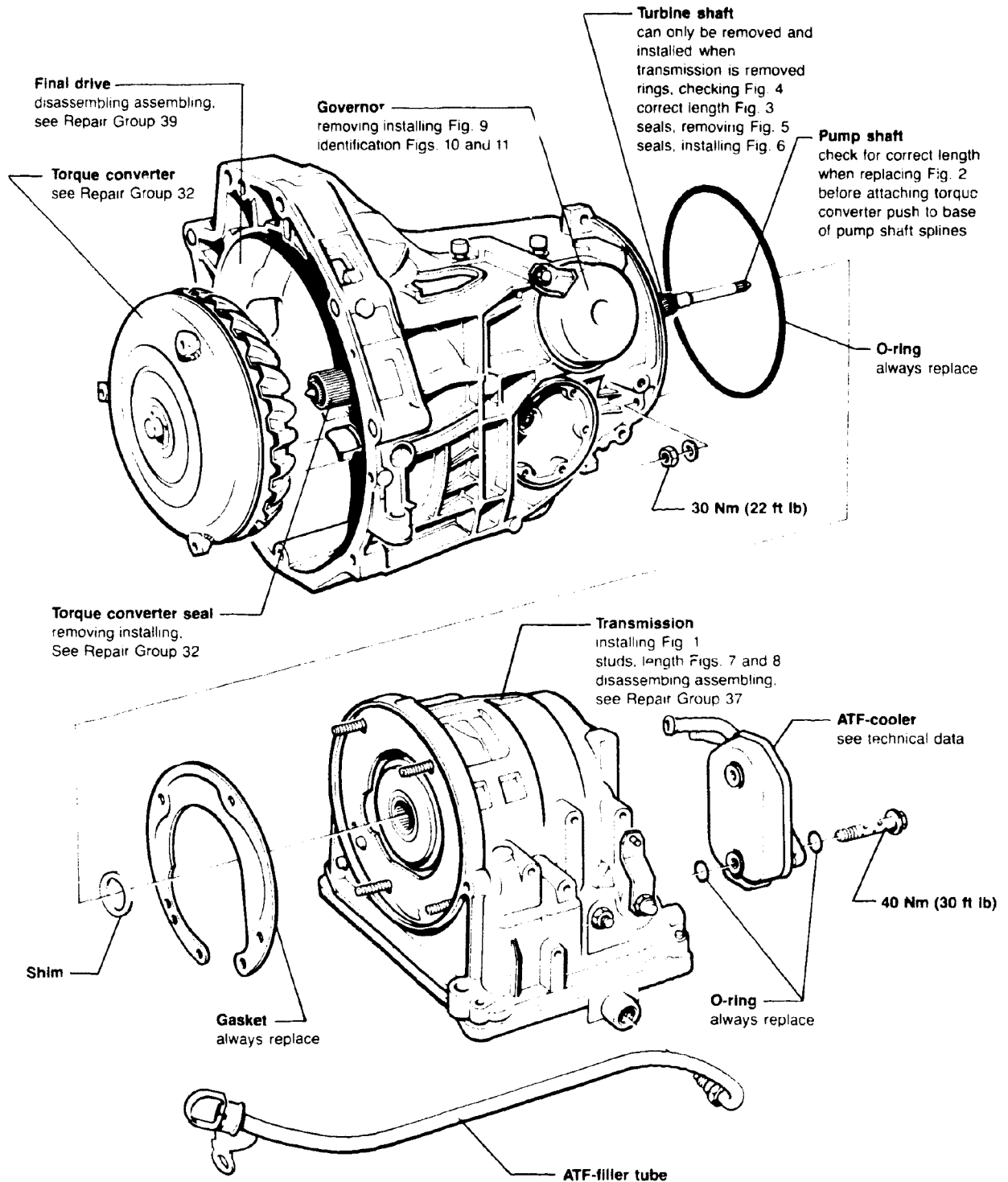
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Automatic Transmission – Case, Gears, Shaft

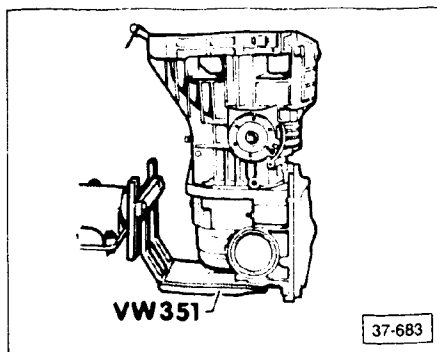


Note

After repair work on final drive or transmission, check
end play and adjust if necessary (page 38.26).

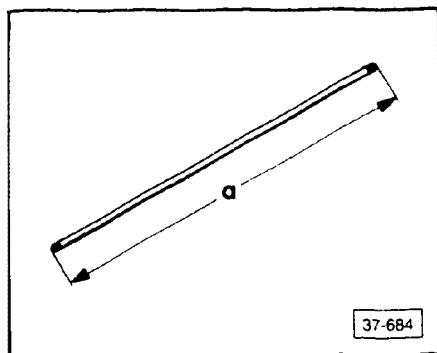
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Automatic Transmission – Case, Gears, Shaft



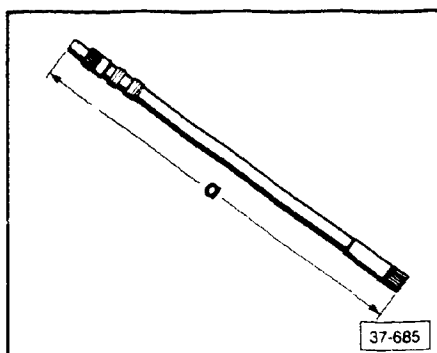
► Fig. 1 Transmission, installing on repair stand

- drain ATF and remove ATF-cooler
- mount transmission as shown



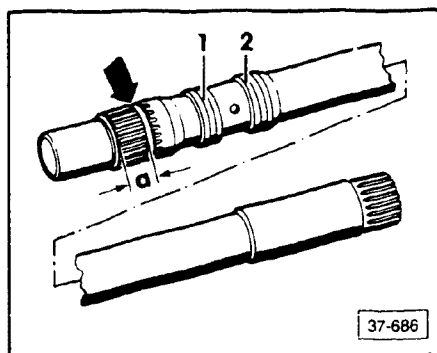
► Fig. 2 Pump shaft, length

- a = 513 mm (20.2 in.)



► Fig. 3 Turbine shaft, length

- turbine shafts are available in different lengths; measure before installation
- a = 424.5 mm (16.7 in.)



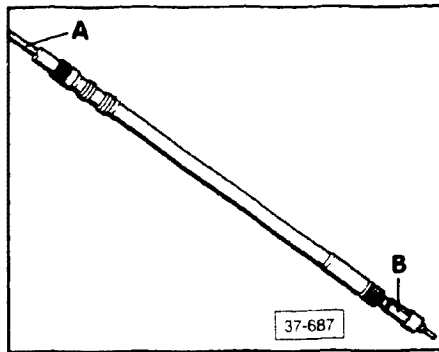
► Fig. 4 Turbine shaft rings, checking

- the length of the spline a in the forward coupling is limited by a circlip (arrow). Check rings 1 and 2 for correct seating

CAUTION

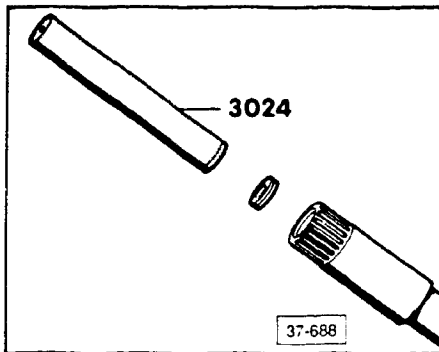
Never install shaft without circlip.

Automatic Transmission – Case, Gears, Shaft



► Fig. 5 Turbine shaft seal, removing

- pull out sealing ring with puller **B**
(e.g. **Kukko 21-1**)
- use an old oil pump shaft or suitable round rod **A** as a drift

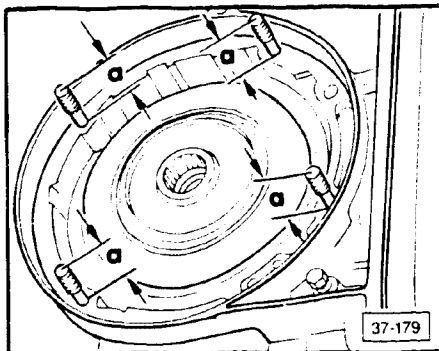


► Fig. 6 Turbine shaft sealing ring, installing

- insert seal so that the open side faces outward
- push seal in to stop

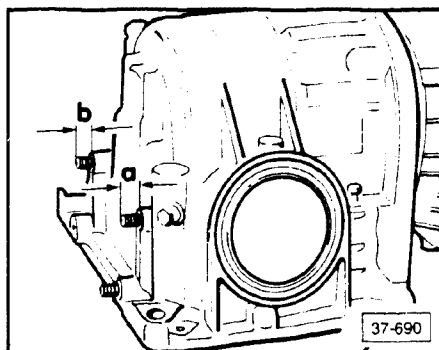
Note

In turbine shafts with seal only use pump shaft with tapered spline ends.



► Fig. 7 Front studs, length

a = 31.5 mm (1 1/4 in.)



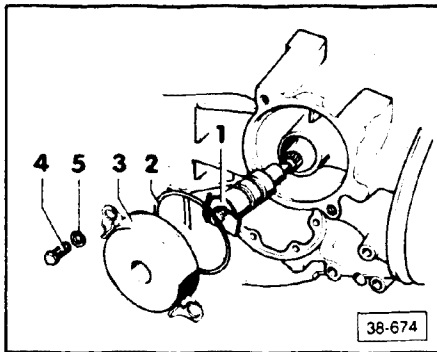
► Fig. 8 Rear stud bolts, length

a and **b** = 18 mm (0.71 in.)

Note

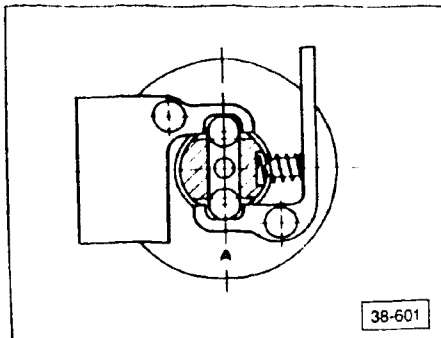
Housings are shipped as replacement parts without studs. Torque studs to the indicated lengths during assembly.

Automatic Transmission – Case, Gears, Shaft



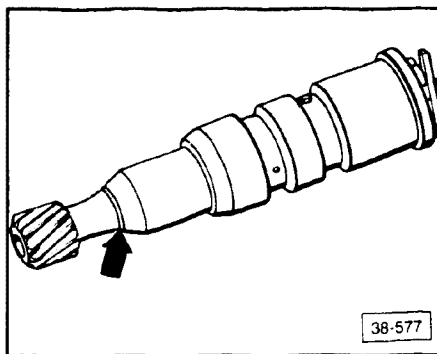
► Fig. 9 Governor, removing/installing

- 1 — Governor
- 2 — O-ring
 - always replace
- 3 — Governor cover
- 4 — Bolt
- 5 — Lock washer



► Fig. 10 Governor, identification

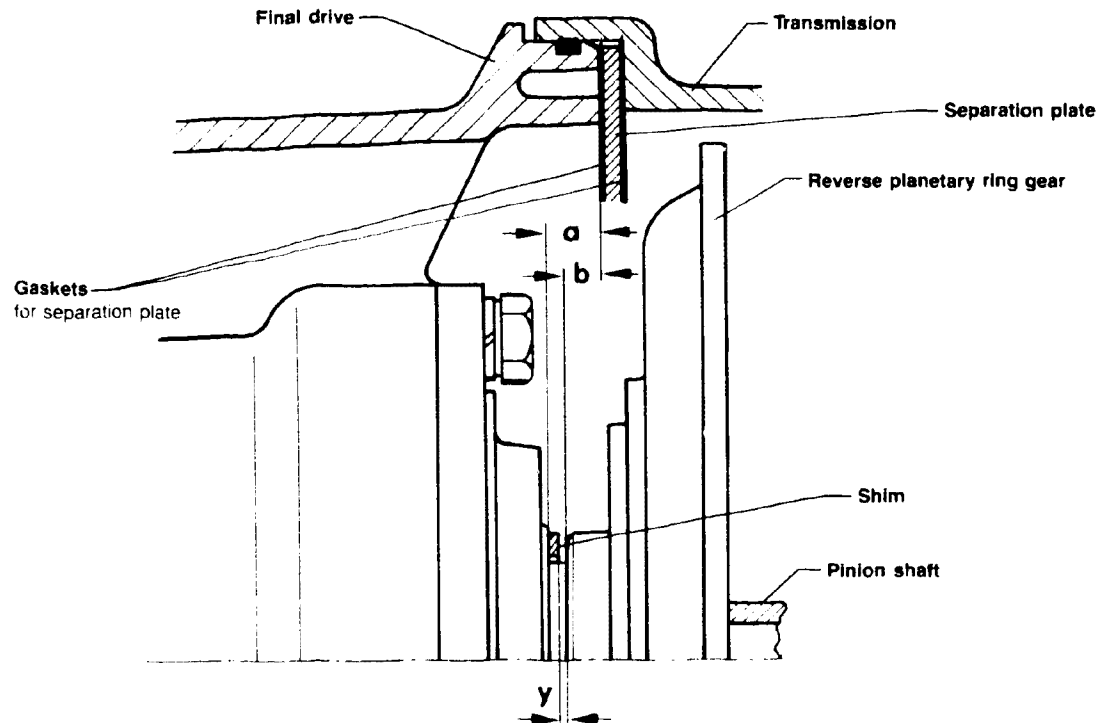
- an identification letter is stamped on the governor head
- governor identification letter **A**



► Fig. 11 Governor, identification

- groove on governor shaft (**arrow**)

Automatic Transmission – Case, Gears, Shaft



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Note

The end play **y** between transmission and final drive must be adjusted to limit the end play of the reverse planetary ring gear.

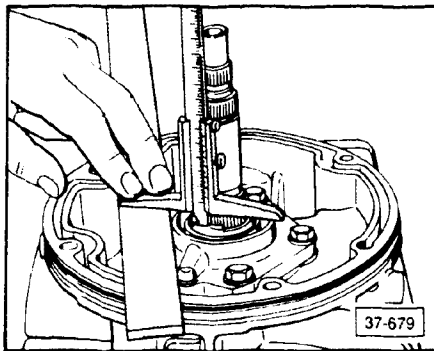
Measurement points:

- a** — Final drive housing: joint to oil seal sleeve
- b** — transmission housing: shim contact shoulder to separation plate with gasket

Note

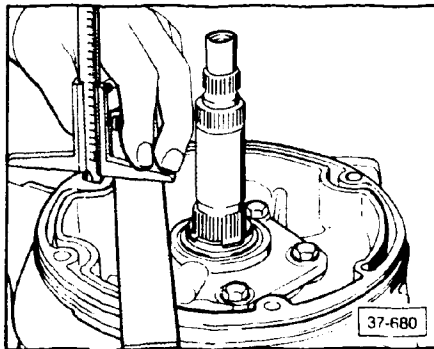
Sequence for determining the shim for the transmission final drive, see page 38.7.

Automatic Transmission – Case, Gears, Shaft



Shim for transmission/final drive, determining

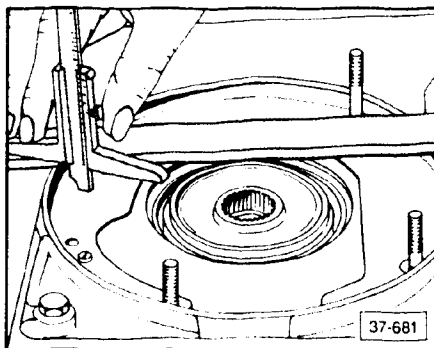
- measure dimension **a** on final drive
- put straightedge on case and measure to seal sleeve



- measure from straightedge to final drive housing joint

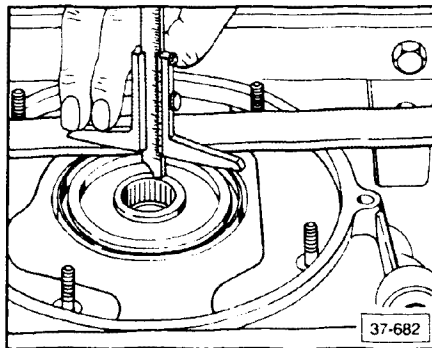
Example

from straightedge to sleeve	18.7 mm
from straightedge to housing joint	- 8.0
dimension a	= 10.7 mm



- measure dimension **b** on transmission
- put straightedge on case (housing) and measure to gasket

Automatic Transmission – Case, Gears, Shaft



- measure from straightedge to shim shoulders

Example:

from straightedge to gasket 19.2 mm
 from straightedge to shoulder -- 10.0 mm
 dimension **b** = 9.2 mm

- determine dimension **x**

● $x = a - b$

Example:

dimension **a** 10.7 mm
 dimension **b** -- 9.2 mm
 dimension **x** = 1.5 mm

- select shims from the following table:

Dimension x (mm)	Shims (mm)
0.23 . . . 0.84	none
0.85 . . . 1.24	1 x 0.4
1.25 . . . 1.64	2 x 0.4
1.65 . . . 2.04	1 x 1.2
2.05 . . . 2.44	1 x 0.4
	1 x 1.2
2.45 . . . 2.84	2 x 0.4
	1 x 1.2
0.85 . . . 3.24	2 x 1.2
3.25 . . . 3.64	1 x 0.4
	2 x 1.2
3.65 . . . 3.88	2 x 0.4
	2 x 1.2

Available shims

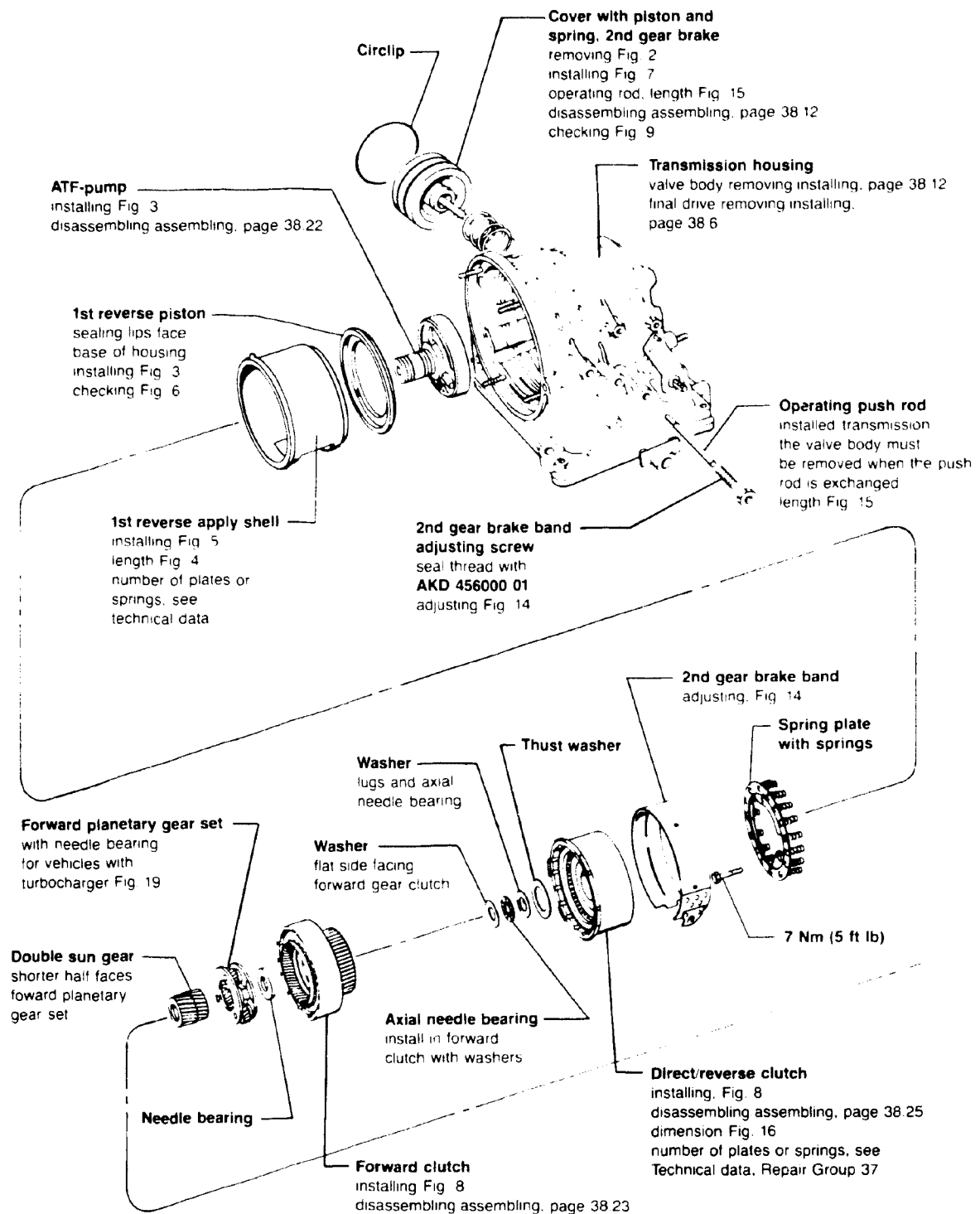
0.4 mm — part number 010 323 345 A

1.2 mm — part number 010 323 346 A

Automatic Transmission – Case, Gears, Shaft

intentionally
left blank

Automatic Transmission – Case, Gears, Shaft

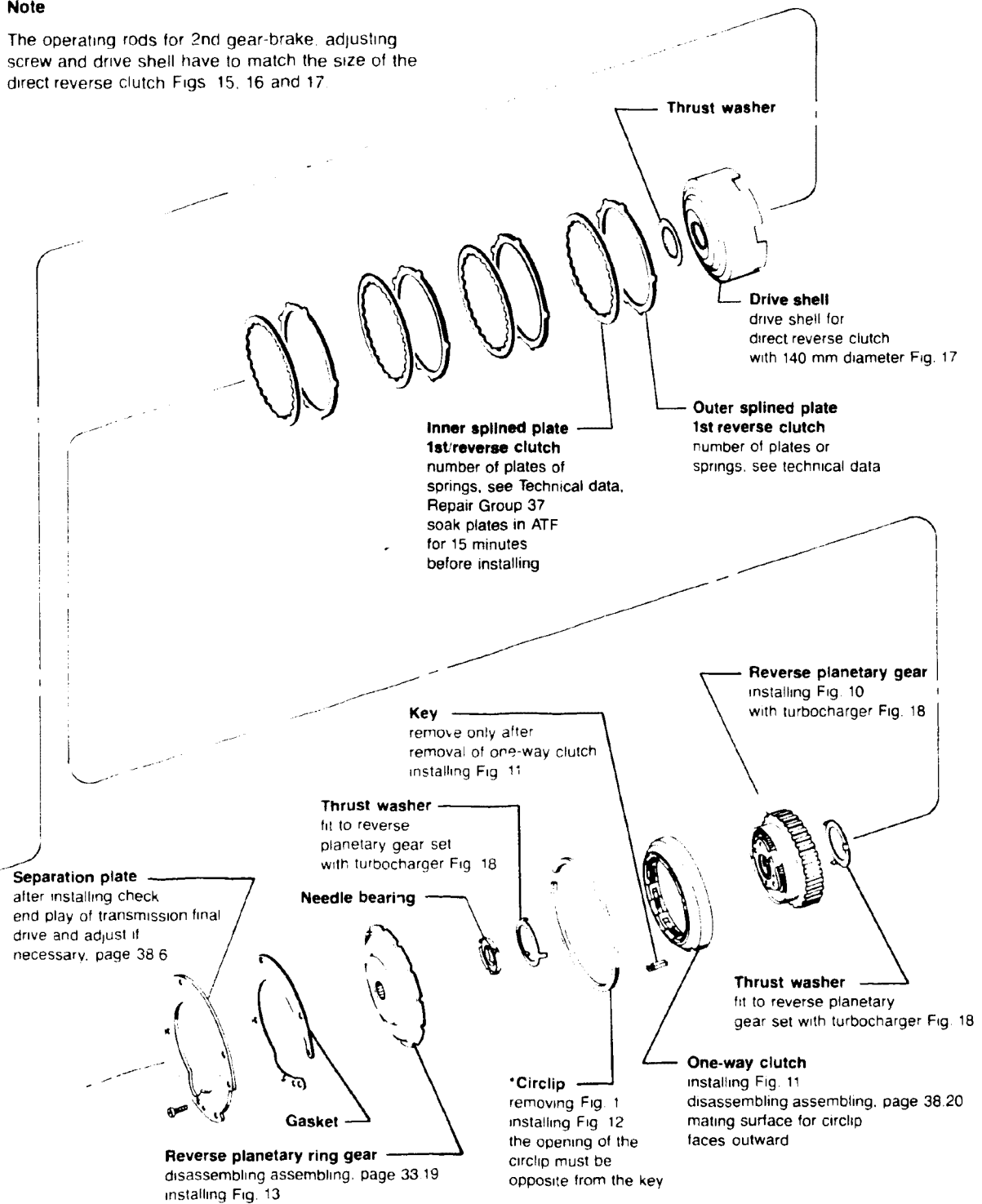


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Automatic Transmission – Case, Gears, Shaft

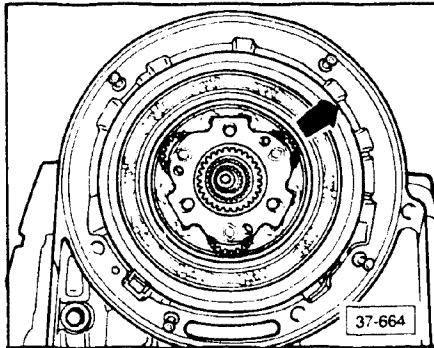
Note

The operating rods for 2nd gear-brake, adjusting screw and drive shell have to match the size of the direct reverse clutch Figs 15, 16 and 17.

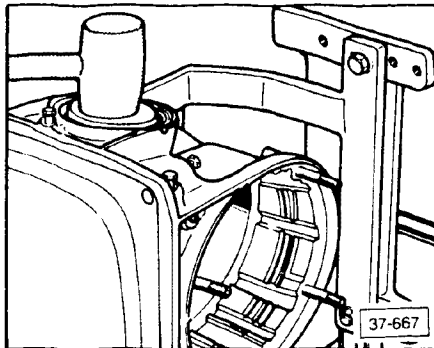


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Automatic Transmission – Case, Gears, Shaft

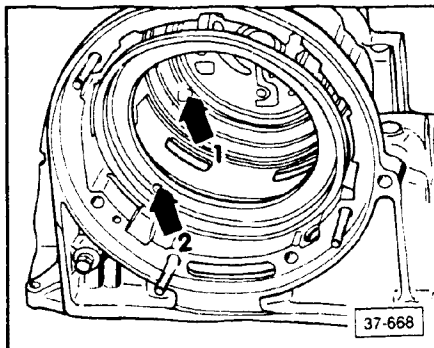


► Fig. 1 Circlip, removing



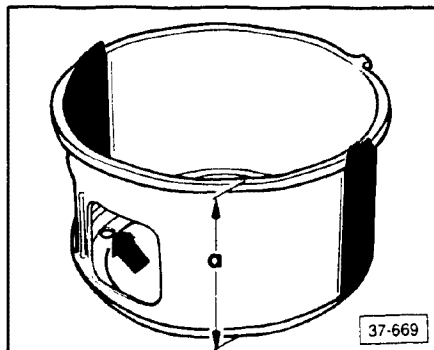
► Fig. 2 2nd gear brake band piston, removing

- remove circlip
- remove piston by tapping with a rubber mallet



► Fig. 3 1st/reverse gear piston, installing

- push piston onto ATF pump housing
- insert ATF pump into transmission case so that the thin rib points upward and the piston ball valve (**arrow 2**) is aligned with the bore of the transmission case (**arrow 1**)



► Fig. 4 1st/reverse apply shell, measuring

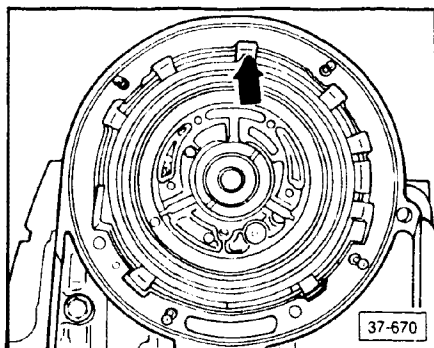
- different shells are available
- install only shell with indicated dimension a

Allocation:

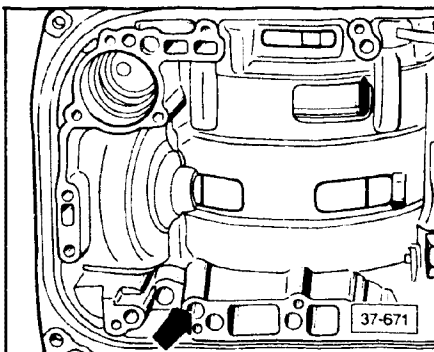
Inner splined plates	Outer splined plates	Dimension a
4 each	4 each	97 mm

- the bore (**arrow**) must be aligned with the 1st reverse piston ball valve
- number of splined plates, see technical data

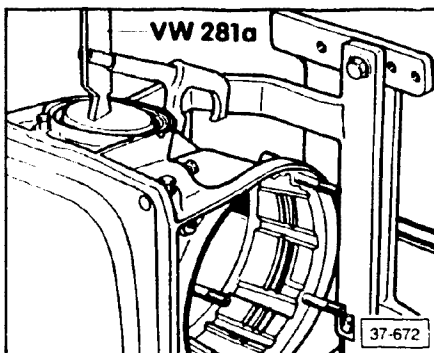
Automatic Transmission – Case, Gears, Shaft



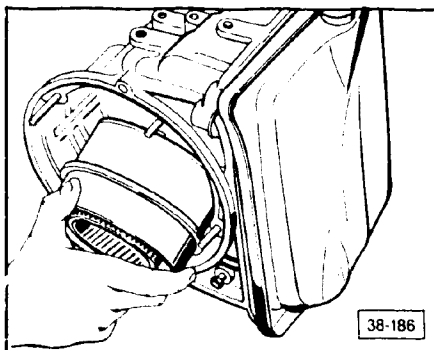
► **Fig. 5 1st/reverse shell, installing**
 ■ insert tab (**arrow**) in groove



► **Fig. 6 1st/reverse clutch, checking**
 ■ apply low air pressure to part (**arrow**)
 ● piston must compress the springs
 ● when compressed air is removed, the piston must return to original position



► **Fig. 7 2nd gear brake band piston, installing**
 ■ push piston as shown
 ■ insert circlip and install 2nd gear brake band



► **Fig. 8 Direct/reverse and forward clutches, installing**
 ■ assemble direct/reverse and forward clutches first
 ■ insert axial needle bearing in forward clutch
 ■ with transmission case opening angled downward, push clutches onto the neck of oil pump
 ■ turn transmission case until opening points upward
 ● check that axial needle bearing is seated correctly on the ATF pump neck

Automatic Transmission – Case, Gears, Shaft

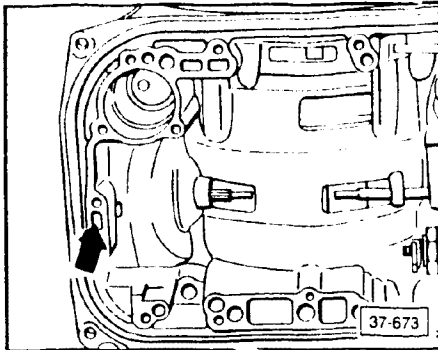


Fig. 9 2nd gear brake band, checking

- apply low air pressure to part (**arrow**)
 - piston must compress brake band
 - when air is removed, piston must return to its original position

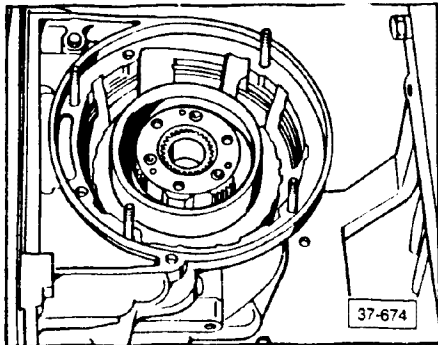


Fig. 10 Reverse planetary gear set, installing

- insert splined plates

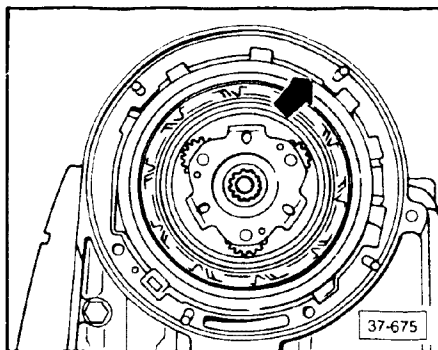


Fig. 11 One-way clutch and locking key, installing

- the parts are assembled correctly if the slot for circlip is open (**arrow**)
- test one way clutch
 - planetary gear set must **not** turn counter-clockwise

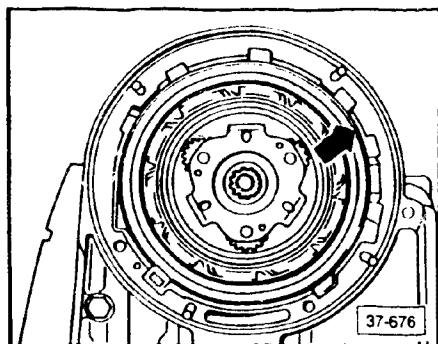
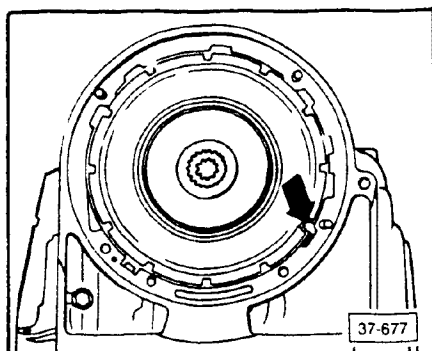


Fig. 12 Circlip, installing

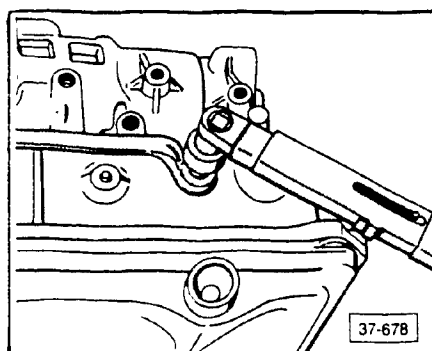
- circlip opening (**arrow**) must be opposite the locking key

Automatic Transmission – Case, Gears, Shaft



► Fig. 13 Reverse planetary ring gear, installing

- planetary gear notches must be centered with parking pawl (arrow)

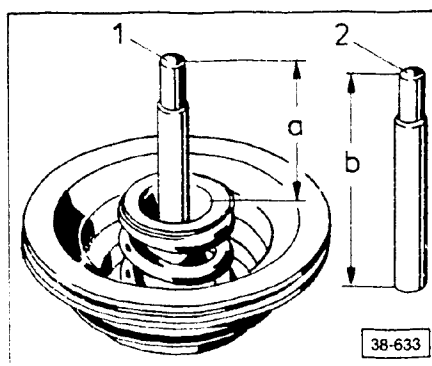


► Fig. 14 2nd gear brake band, adjusting

- seal adjusting bolt thread with Part No. **AKD 456 000 Ø1**
- tighten adjusting bolt to **10 Nm (7 ft lb)**. Loosen and re-tighten to **5 Nm (44 in. lb or 51 cm kg)**
- turn out adjusting bolt exactly **2 or 2-1/2 turns** (see Technical data, Repair Group 37)
- tighten locknut

CAUTION

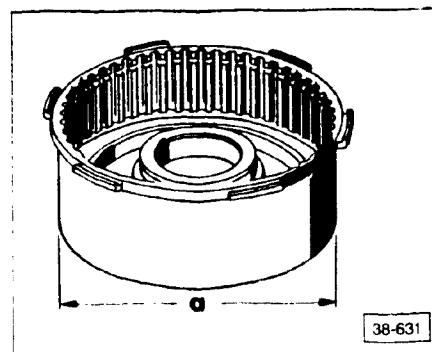
Adjust brake band only with transmission in horizontal position, otherwise band may jam.



► Fig. 15 Piston/push rod, identification

- 1 — 2nd gear brake piston push rod
- 2 — adjusting screw push rod

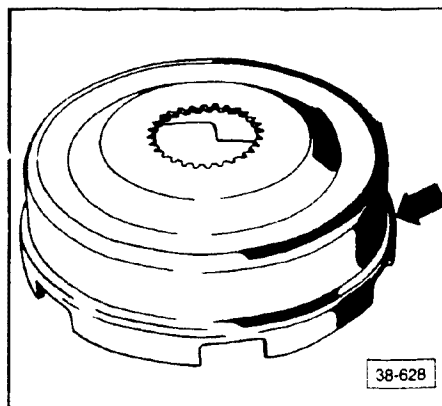
	Dimension A 1 (mm)	Dimension B 2 (mm)
Direct/reverse clutch 140 mm diameter	40	82.5



► Fig. 16 Direct/reverse clutch, dimension

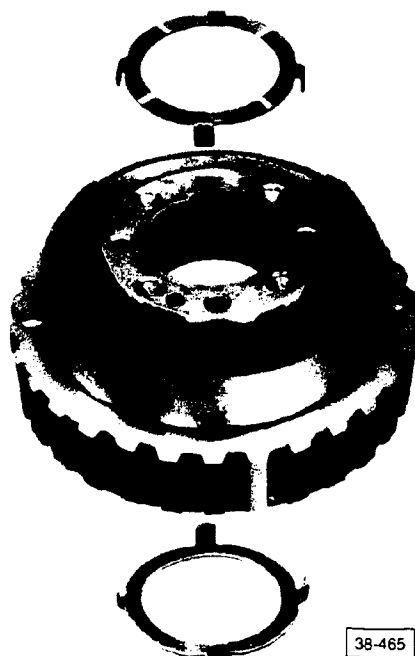
Dimension A = 140 mm

Automatic Transmission – Case, Gears, Shaft



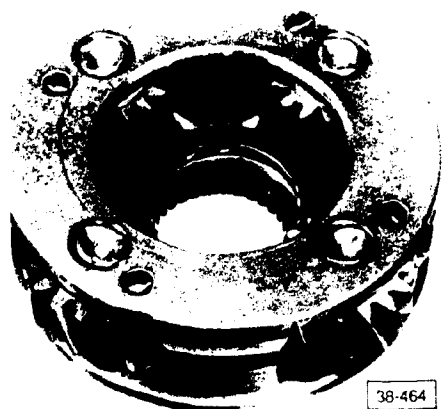
► Fig. 17 Drive shell, modification

- the drive shell for the direct reverse clutch has been widened to 140 mm
- drive shell is identified by shoulder (arrow)



► Fig. 18 Reverse planetary gear, modification

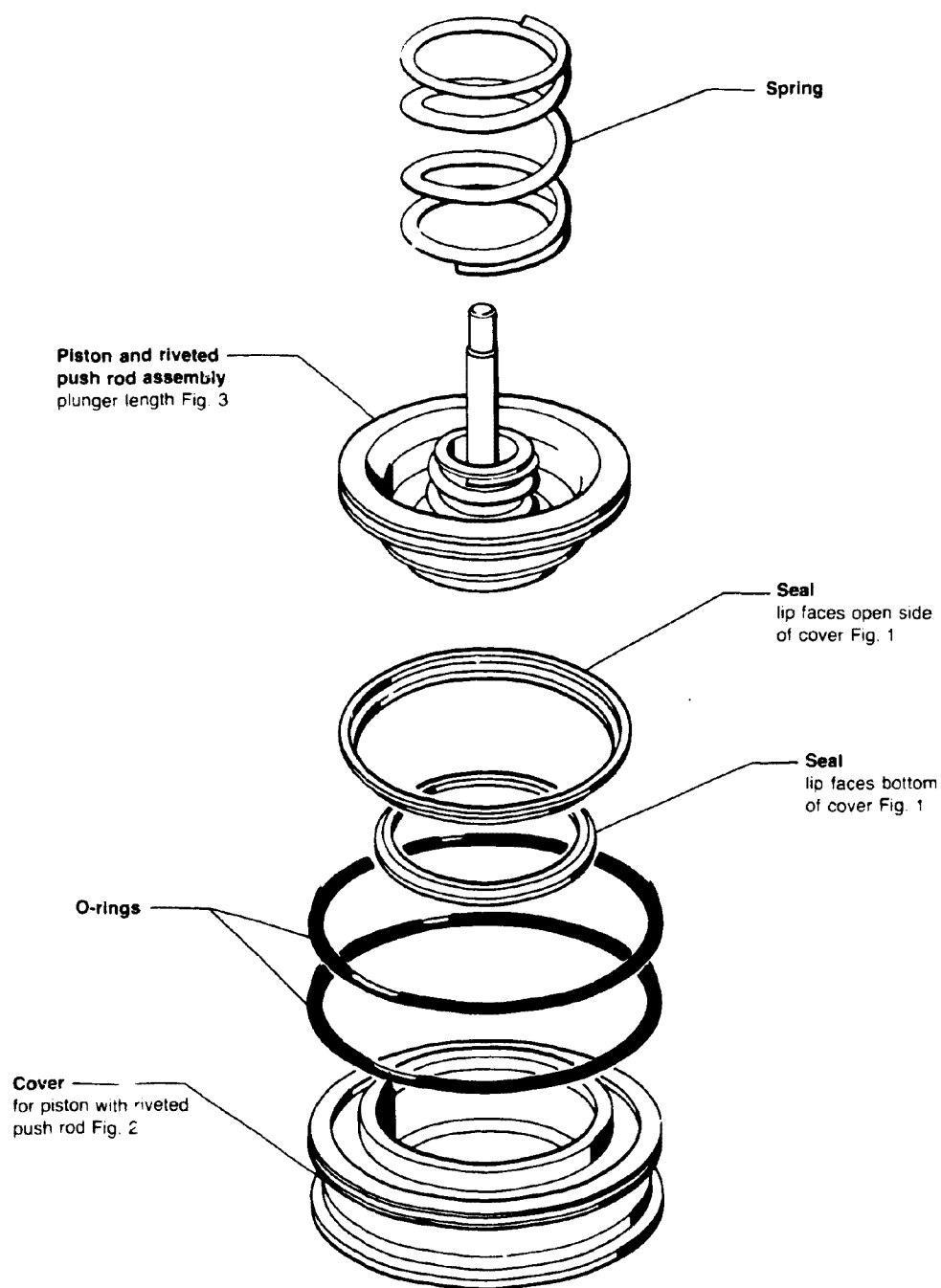
- turbocharged vehicles:
 - reverse planetary gear has 4 planet pinions and thrust washers with 4 retaining tabs



► Fig. 19 Forward planetary, modification

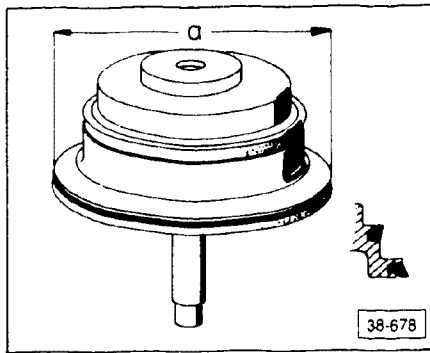
- turbocharged vehicles:
 - forward planetary gear set has 4 planet pinions for turbocharged vehicles

Automatic Transmission – Case, Gears, Shaft



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Automatic Transmission – Case, Gears, Shaft

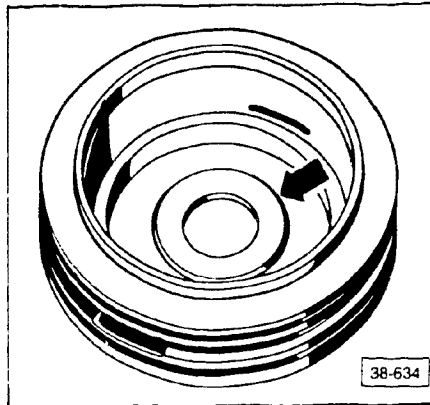


► Fig. 1 Position of piston seals

- piston diameter varies according to transmission version

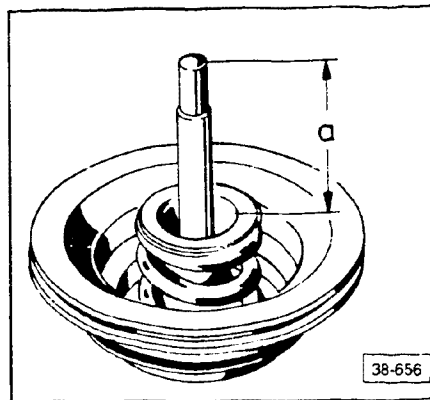
Dimension **a** = 96.5 mm

- push rod, spring, disc and pressure plate are riveted to the piston



► Fig. 2 2nd gear brake band piston cover

- 2nd gear brake cover has a recess (**arrow**) to give washer sufficient clearance



► Fig. 3 Direct/reverse clutch push rod, length

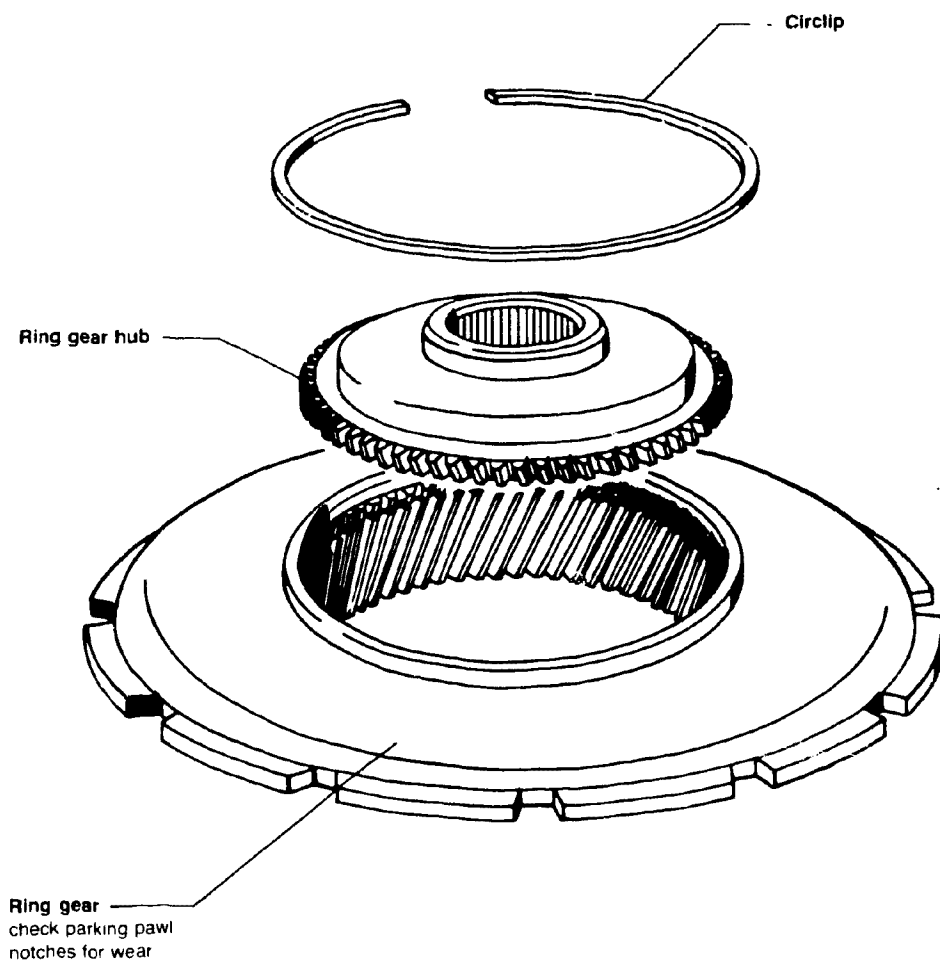
direct reverse
clutch

140 mm
diameter

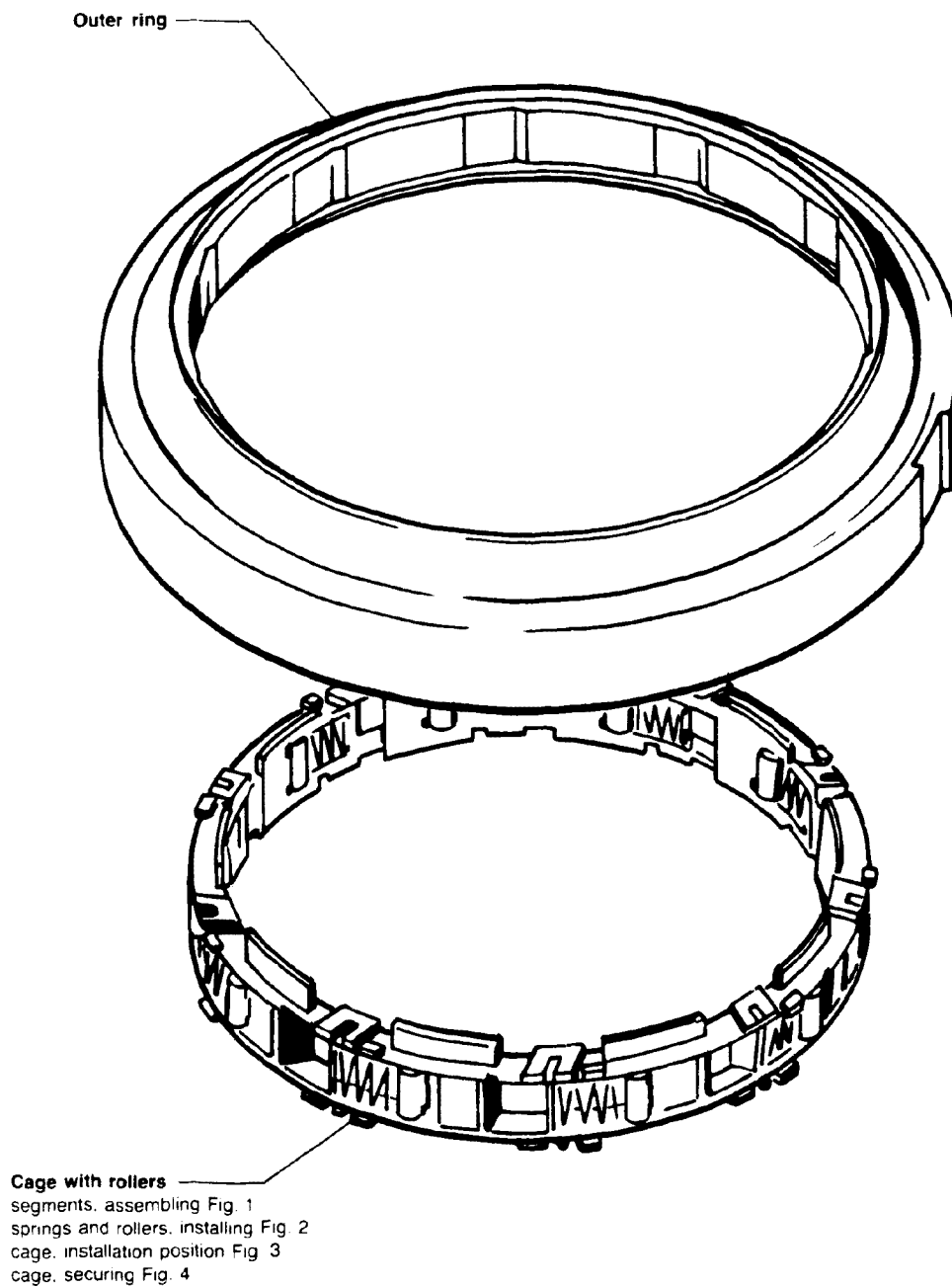
dimension **a**

40 mm

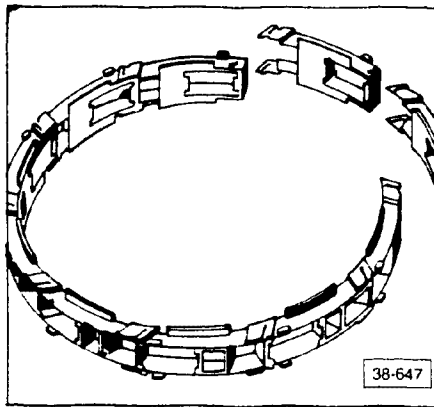
Automatic Transmission – Case, Gears, Shaft



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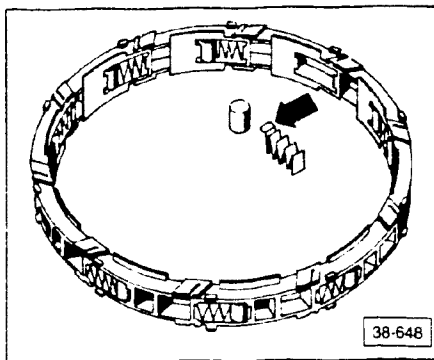


Automatic Transmission – Case, Gears, Shaft



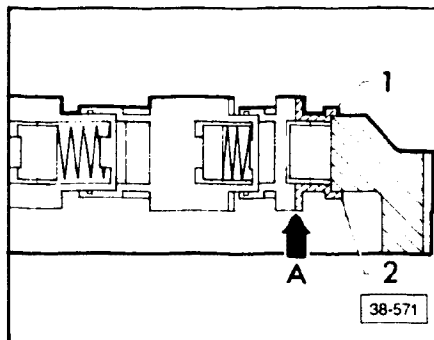
► Fig. 1 Cage segments, assembling

- assemble 10 segments to form a ring



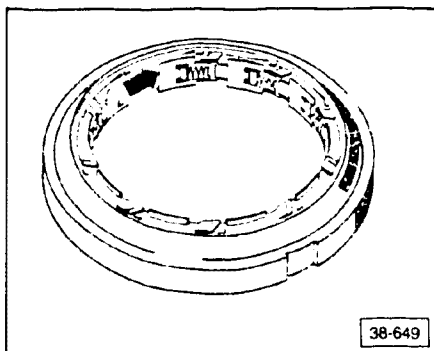
► Fig. 2 Springs and rollers, installing

- install spring tab (**arrow**) facing roller



► Fig. 3 Cage, installation position

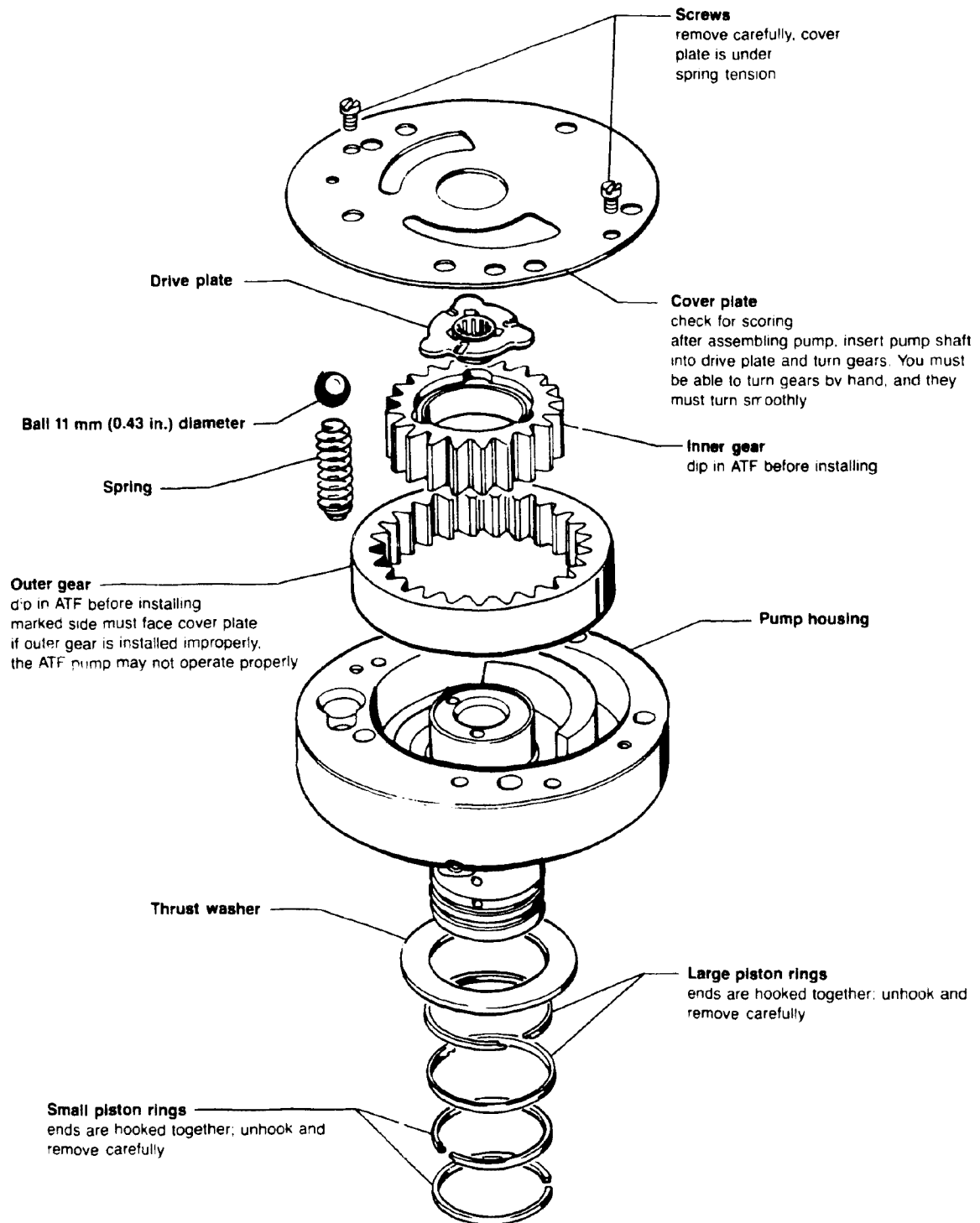
- insert cage into outer ring from below (**arrow A**)
 - small ledge 1 at top
 - large ledge 2 at bottom



► Fig. 4 Cage, securing

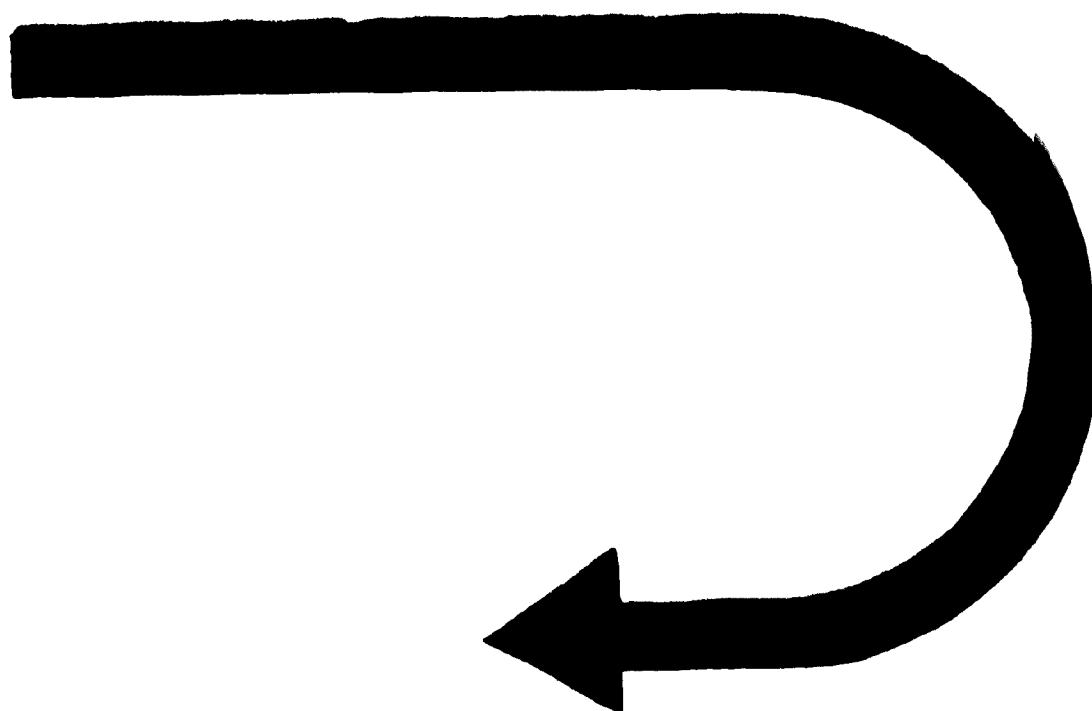
- turn cage in direction of **arrow** to secure

Automatic Transmission – Case, Gears, Shaft



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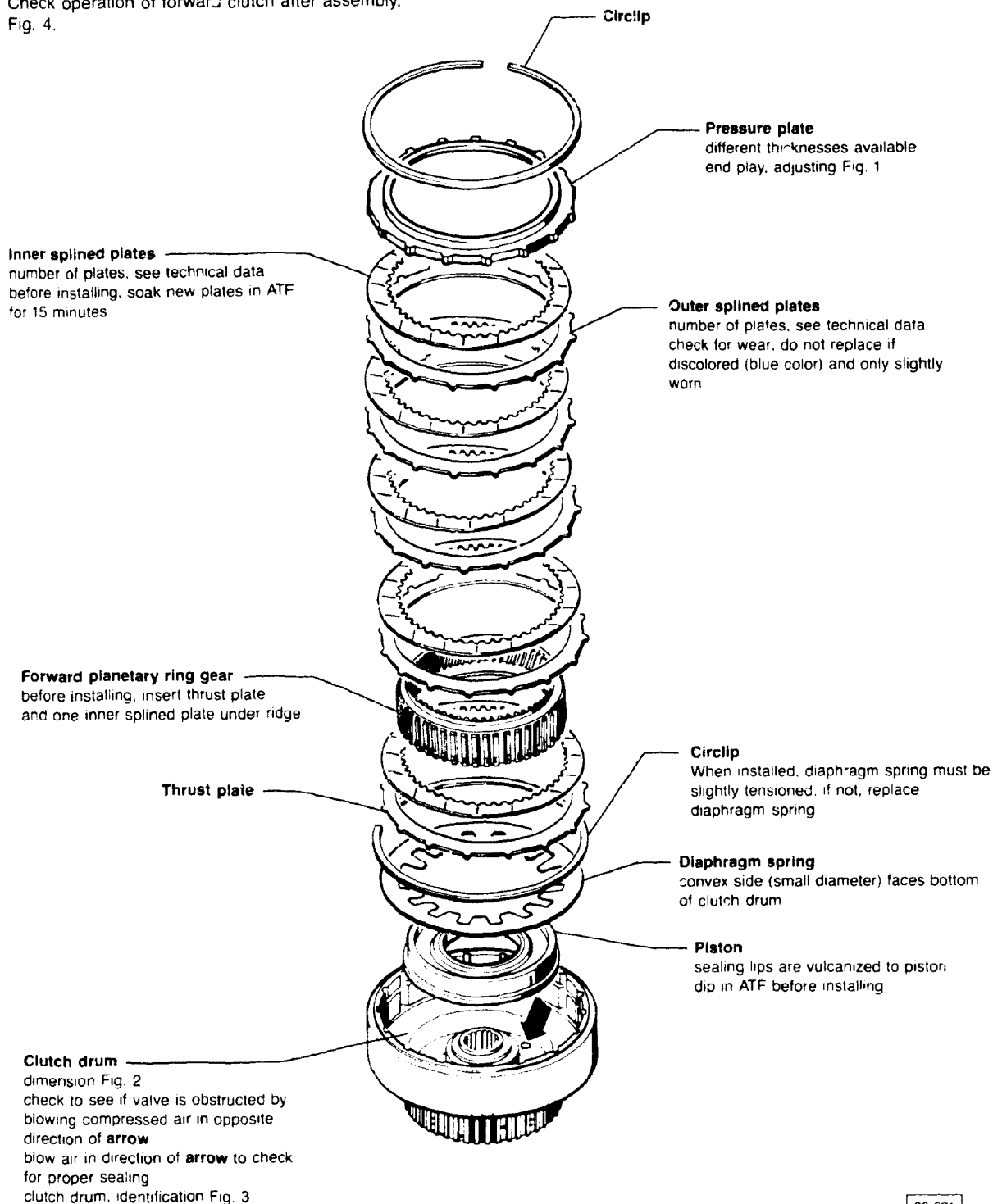
CONTINUED IN THE
BEGINNING OF NEXT ROW



Automatic Transmission – Case, Gears, Shaft

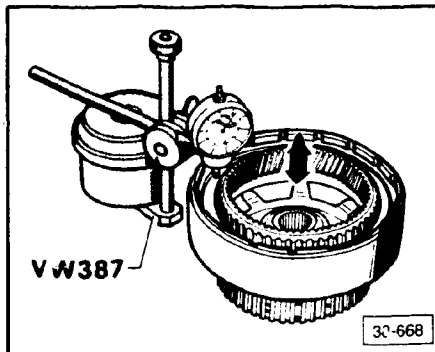
Note

Check operation of forward clutch after assembly, Fig. 4.



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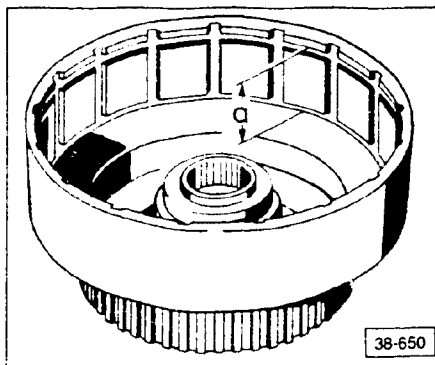
Automatic Transmission – Case, Gears, Shaft



► Fig. 1 Forward clutch end play, adjusting

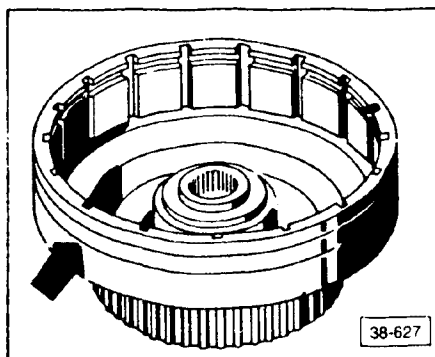
- measure play (**arrow**)
 - specification: 0.50 - 0.90 mm (0.020 - 0.035 in.)
- adjusting end play
 - select pressure plate from table

Thickness	Part Number
2.3 mm	010 323 253 G
2.7 mm	010 323 253 H
3.1 mm	010 323 253 J
3.5 mm	010 323 253 K
3.9 mm	010 323 253 L



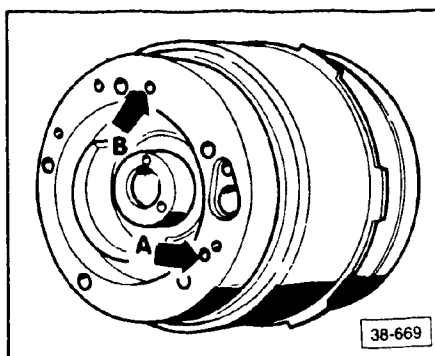
► Fig. 2 Forward clutch drum, dimension

- measure depth of groove for circlip
dimension **a** = 29.8 mm (1.17 in.)



► Fig. 3 Clutch drum, identification

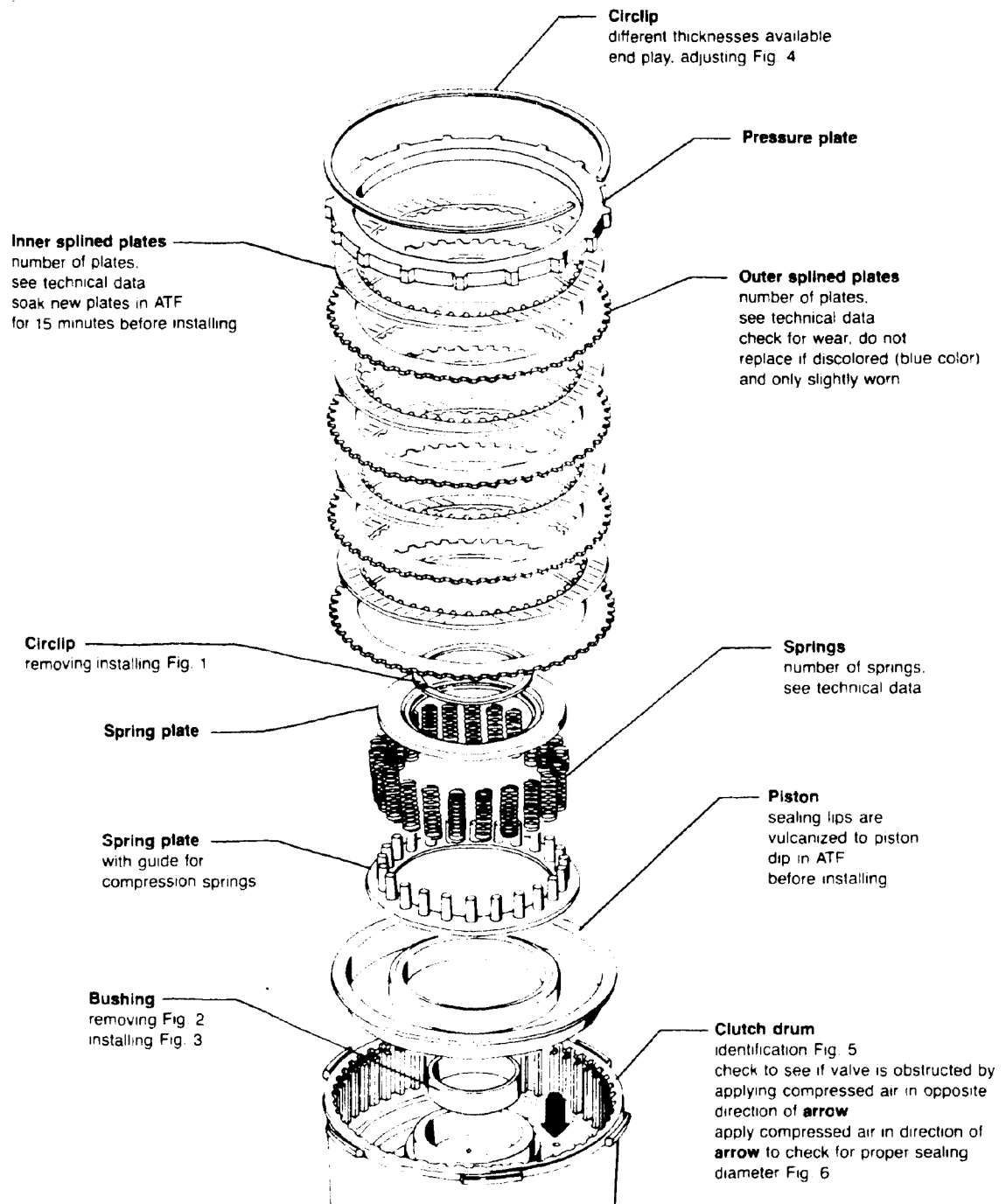
- with a direct/reverse clutch with 140 mm (5.5 in.) use clutch drum with 2 grooves (**arrow**)



► Fig. 4 Forward clutch assembly, checking operation

- install forward clutch and direct/reverse clutch with thrust washers or needle bearing on ATF pump, and apply compressed air to port (**arrow a**).
 - piston must compress clutch plates
 - piston must release plates when compressed air is removed

Automatic Transmission – Case, Gears, Shaft

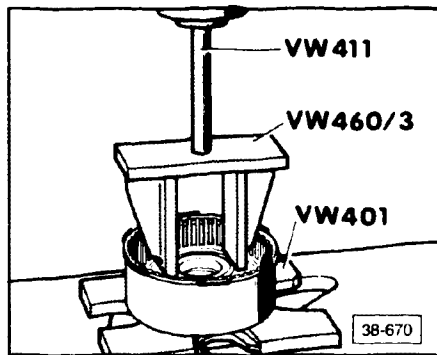


Note

Check operation of direct reverse clutch after assembly, Fig. 7.

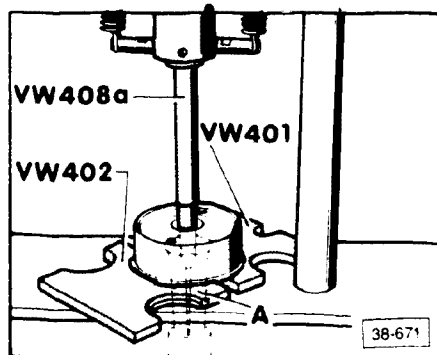
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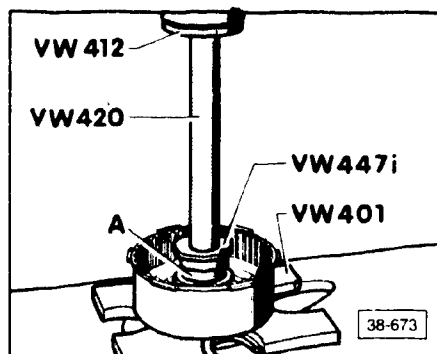
► Fig. 1 Circlip, installing/removing

- press spring plate down and remove circlip groove
- insert circlip into groove



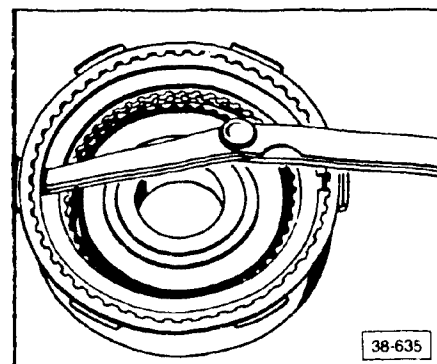
► Fig. 2 Bushing in clutch drum, removing

- puller a, e.g. Kukko no. 21/6 (37-46 mm)



► Fig. 3 Bushing in clutch drum, installing

- press bushing in flush with VW 433
 - use old bushing a to press new bushing 1.7 mm (0.067 in.) below top edge



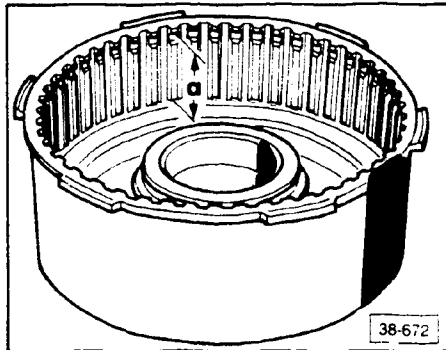
► Fig. 4 End play, adjusting

- measure play
 - specified value = 2.05-2.50 mm (0.081-0.098 in.)

The following circlips are available for adjusting end play.

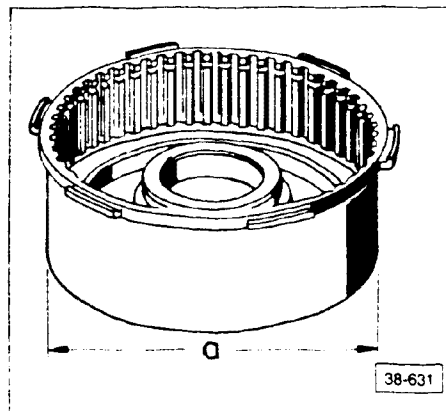
For clutch drum with 140 mm (5.5 in.) diameter

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► Fig. 5 Clutch drum, identification

Thickness	Part Number
1.5 mm	087 323 157
1.7 mm	087 323 157 A
2.0 mm	087 323 157 B
2.3 mm	087 323 157 C
2.5 mm	087 323 157 D



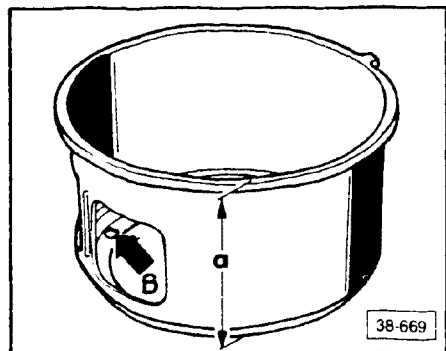
► Fig. 6 Clutch drum, diameter

Inner splined plates	Outer splined plates
4	4

dimension a = 31.25 mm (1.230 in.)

Note

Only install clutch drums with 51 grooves for outer splined plates.



► Fig. 7 Direct/reverse clutch assembly, checking

- install forward clutch and direct reverse clutch with thrust washers or needle bearing on ATF pump, and apply compressed air to port (**arrow B**)
 - piston must compress clutch plates
 - piston must release plates when compressed air is removed

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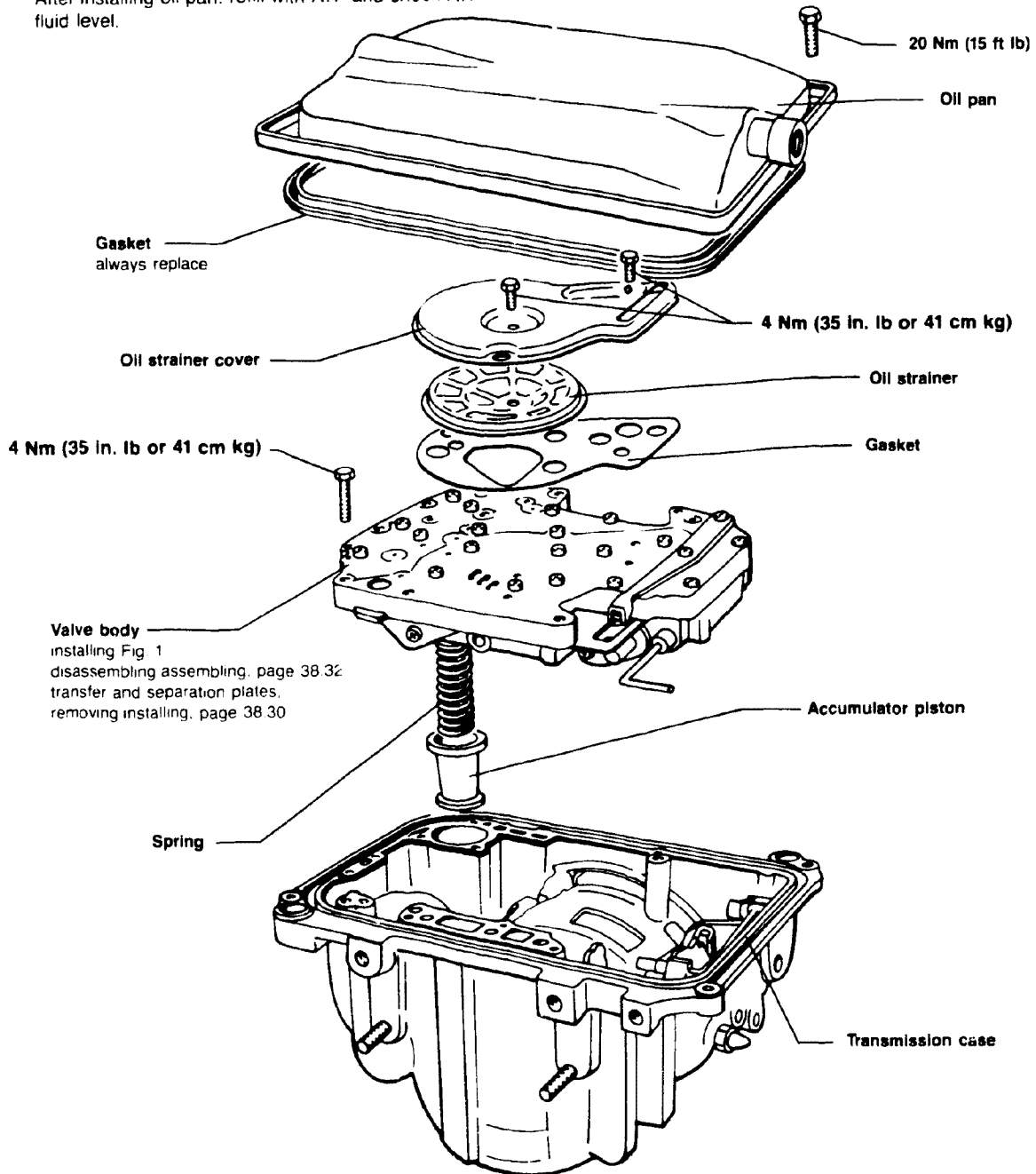
Note

The valve body can be removed with transmission in vehicle.

After installing oil pan: refill with ATF and check ATF fluid level.

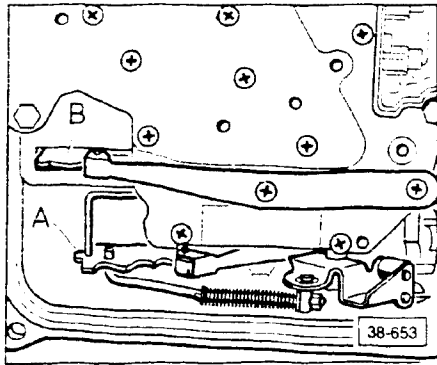
CAUTION

Do not run engine or tow vehicle when oil pan is off or with no oil in transmission.



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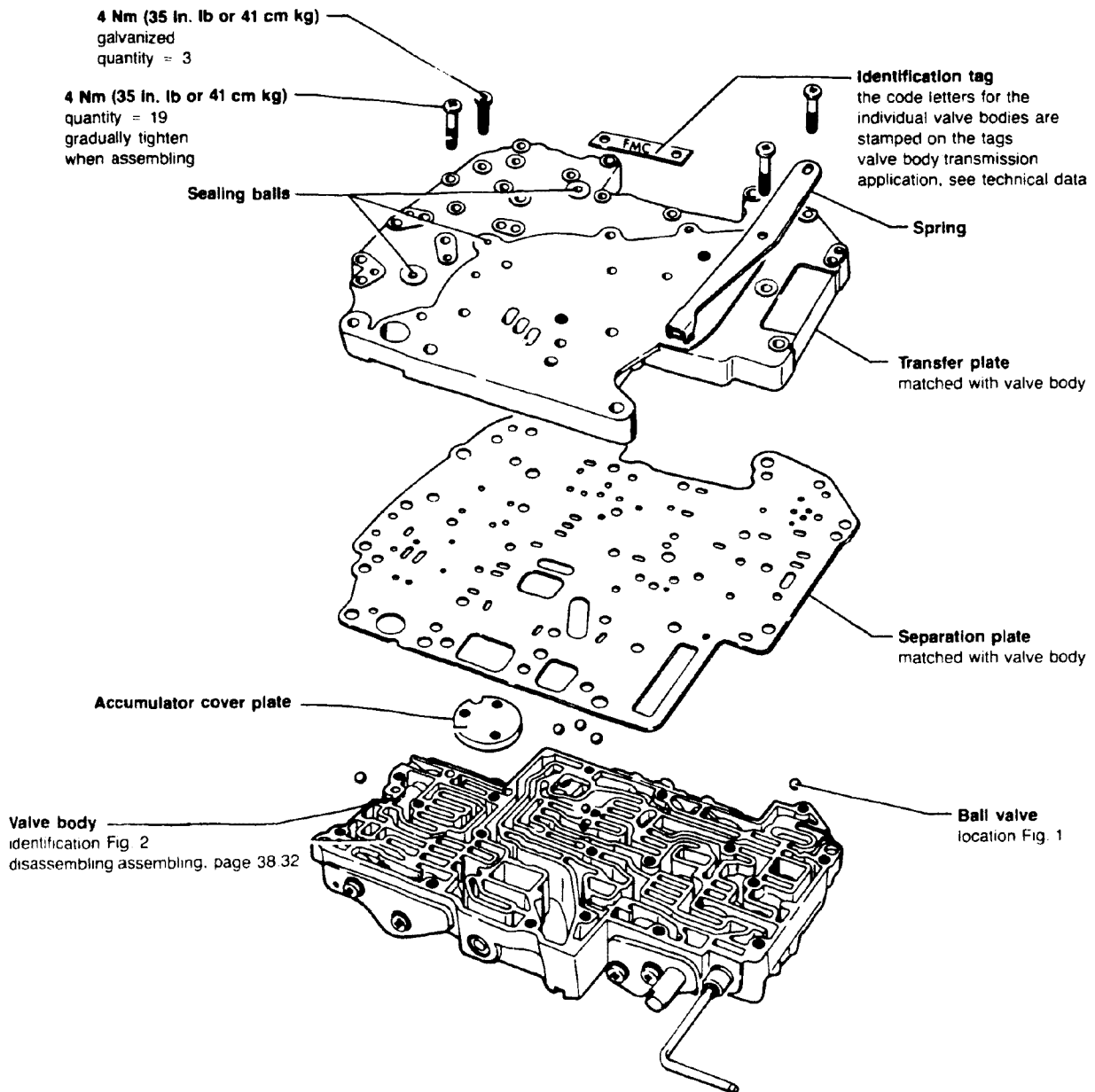
Automatic Transmission – Case, Gears, Shaft



► Fig. 1 Valve body, installing

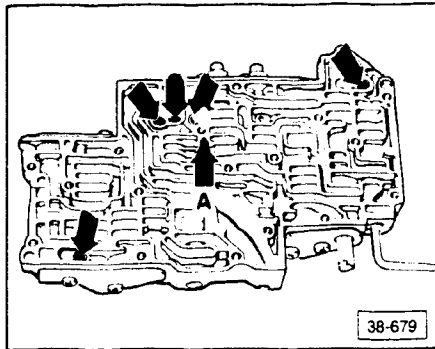
- connect manual valve **A** and lever for kickdown valve **B**
- tighten all bolts diagonally to specified torque

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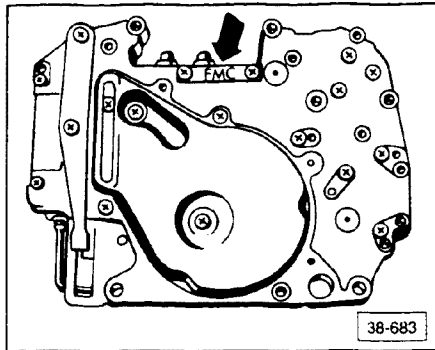
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► Fig. 1 Ball valves, locations

5 balls (**arrows**) = 6 mm diameter

1 ball (**arrow A**) = 3 mm diameter



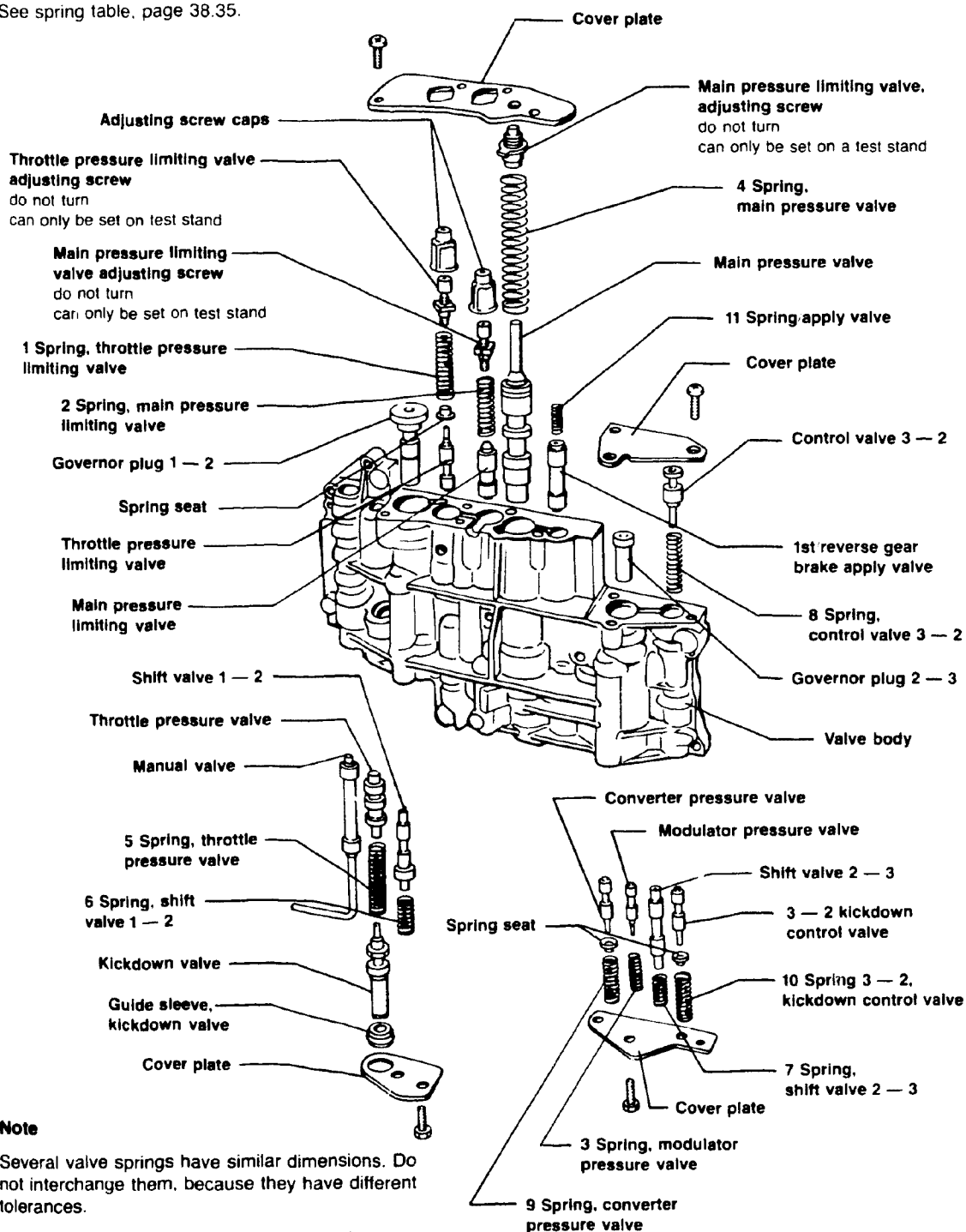
► Fig. 2 Valve body, identification

- code letters are stamped on tag
- tag must remain with valve body
- valve body transmission application, see technical data

Automatic Transmission – Case, Gears, Shaft

Note

See spring table, page 38.35.



Note

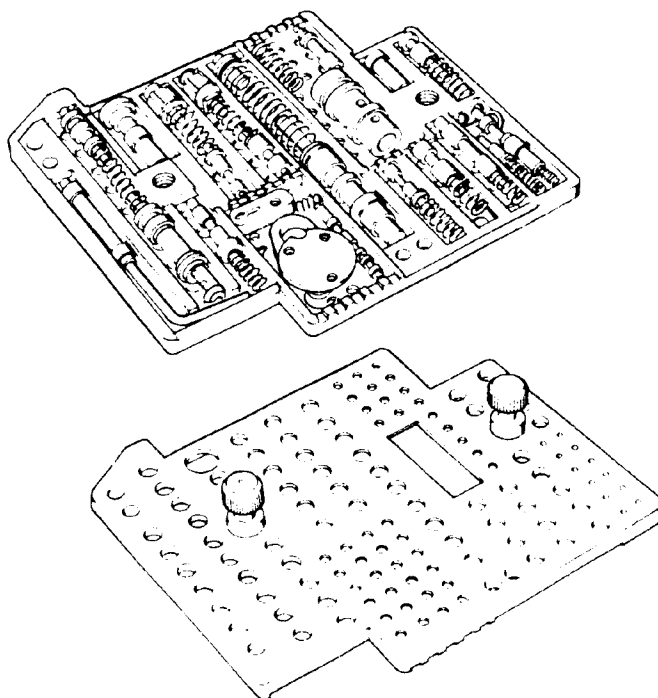
Several valve springs have similar dimensions. Do not interchange them, because they have different tolerances.

Use storage tray when cleaning the valve body, see page 38.33.

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Automatic Transmission – Case, Gears, Shaft

Valve body, disassembling/ assembling



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Valve body, cleaning

To clean the valve body, take out the individual parts if there is excessive dirt. To be sure parts are reinstalled in their original location, they should be placed in the storage tray. Outer shape corresponds to shape of valve body. This makes it easier to install the valves and springs.

Disassembling

The valve body should only be disassembled for cleaning or when transmission damage was caused by burnt friction linings or excessively dirty ATF. If ATF is still fairly clean, place the complete valve body in cleaning solution and then dry it afterwards with compressed air.

- remove end plate
- remove valves and springs one after another, and place them in tray
- remove end plate from other side and repeat procedure
- place lid on storage tray

Note

Valves that are slightly scored may be reused. This will not affect the operation of the transmission.

- immerse tray complete with parts in cleaning solution
- dry with compressed air, do not use water

Assembling

Valve body should be assembled in a clean work area. Do not use any fluffy rags when cleaning. Valves and springs must be put back into the same holes from which they were removed. Insert springs and valves first on valves and springs on the other side, and attach end plates.

Note

Lubricate all valves with ATF when installing, and check for freedom of movement. The valves must slide **under their own weight**.

Spring table

The table allows identification of springs according to their dimensions.

Coil diameter and free length can vary between new and used springs (due to settling).

Check spring wire thickness and number of coils first, as a means of identifying the spring. If this is not sufficient, also use inner coil diameter and free length.

Note

Several valve springs have similar dimensions.

They must not be interchanged because they have different tolerances which must be taken into account when set on the test stand.

The free length can vary due to tolerances and settling.

The inner coil diameter is within a tolerance range of ± 0.3 mm. (0.012 in.)

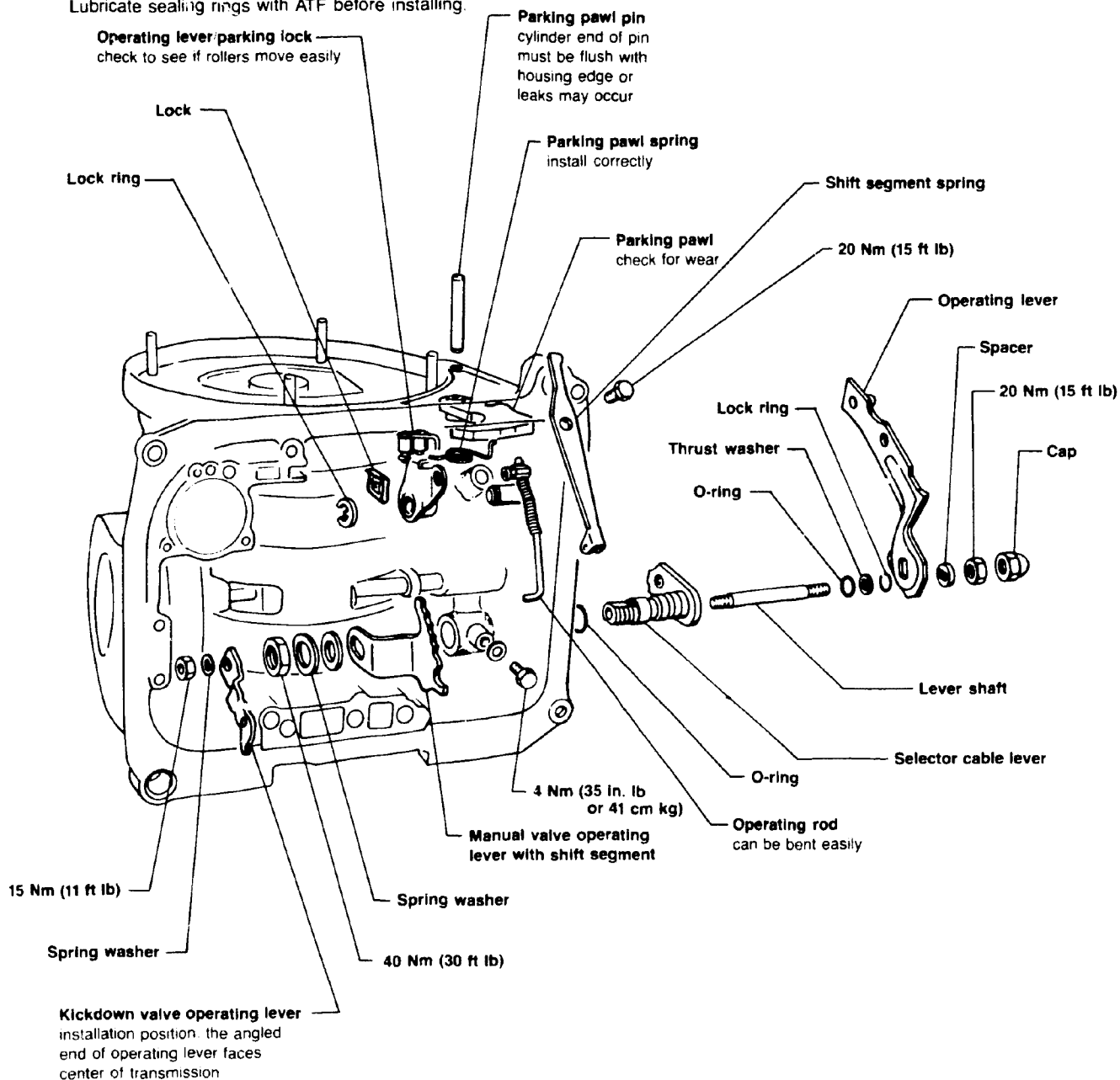
Automatic Transmission – Case, Gears, Shaft

Description	Part Number	Coils	Wire thickness (mm)	Free length (mm)	Inner diameter of coil (mm)
1 Spring throttle pressure limiting valve	010 325 119 A	14.5	1.1	37.9	7.7
2 Spring main pressure limiting valve	010 325 227 B	12.5	1.2	27.5	7.6
3 Spring modulator pressure valve	003 325 185	11.5	0.8	28.6	7.75
4 Spring main pressure valve	010 325 131 B	16.5	1.4	69.2	11.9
5 Spring throttle pressure valve	010 325 175 C	16.5	1.1	44	7.75
6 Spring shift valve 1 — 2	010 325 217	8.5	0.9	28.8	8.1
7 Spring shift valve 2 — 3	010 325 207 B	8.5	0.8	17.4	6.95
8 Spring control valve 3 — 2	003 325 227 A	12.5	1.0	32.4	7.7
9 Spring converter pressure valve	010 325 347	8.5	1.25	22.2	7.7
10 Spring 3 — 2 kickdown control valve	003 325 207 A	11.5	0.9	28.4	8.1
11 Spring apply valve for 1st-reverse gear clutch	010 325 145 A	8.5	0.5	26.6	6.5

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Note

Lubricate sealing rings with ATF before installing.



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