


Opel Astra  Opel Kadett

Workshop Manual

Section K

Clutch — Manual Transmission and Automatic Transmissior

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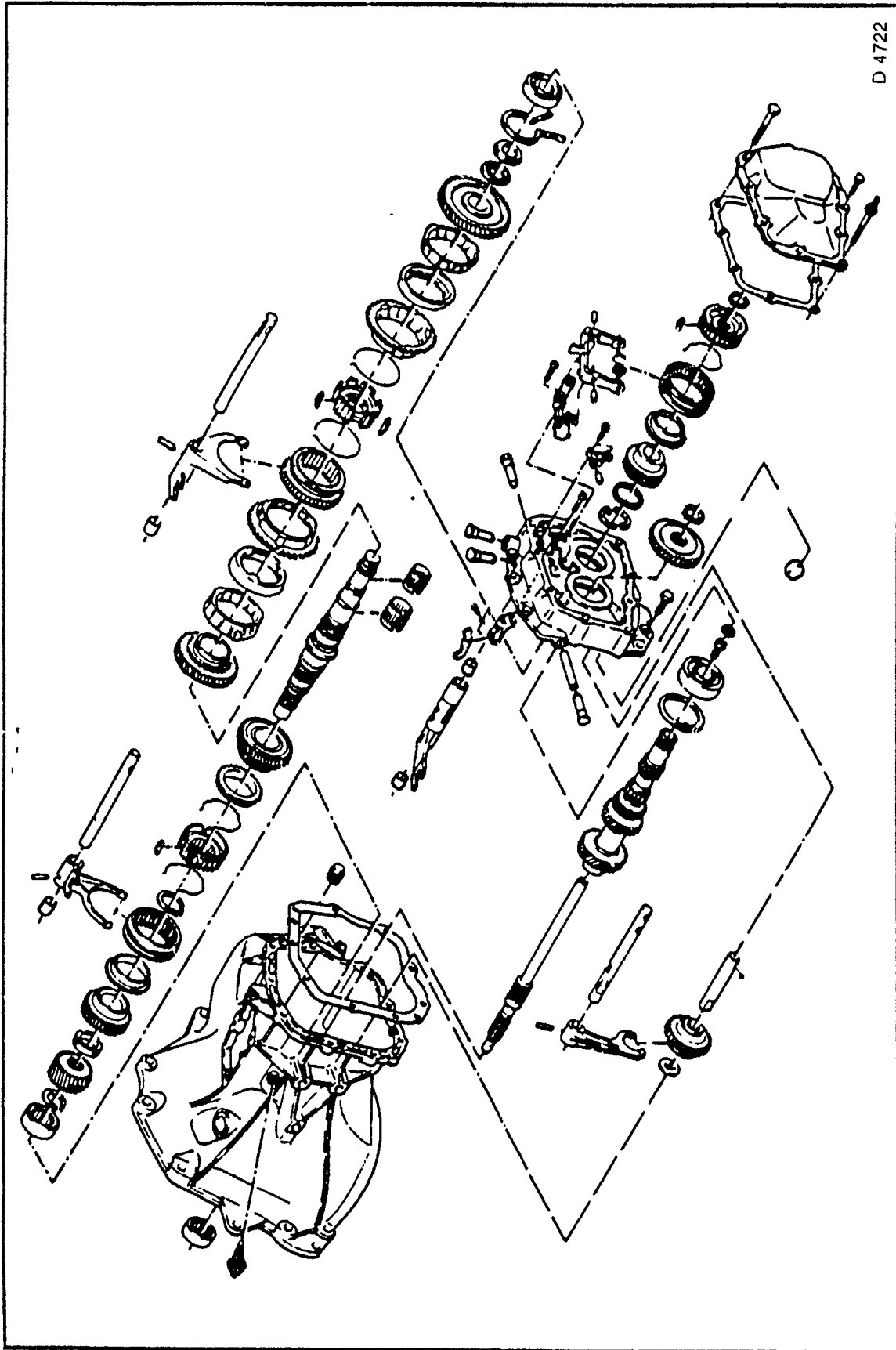
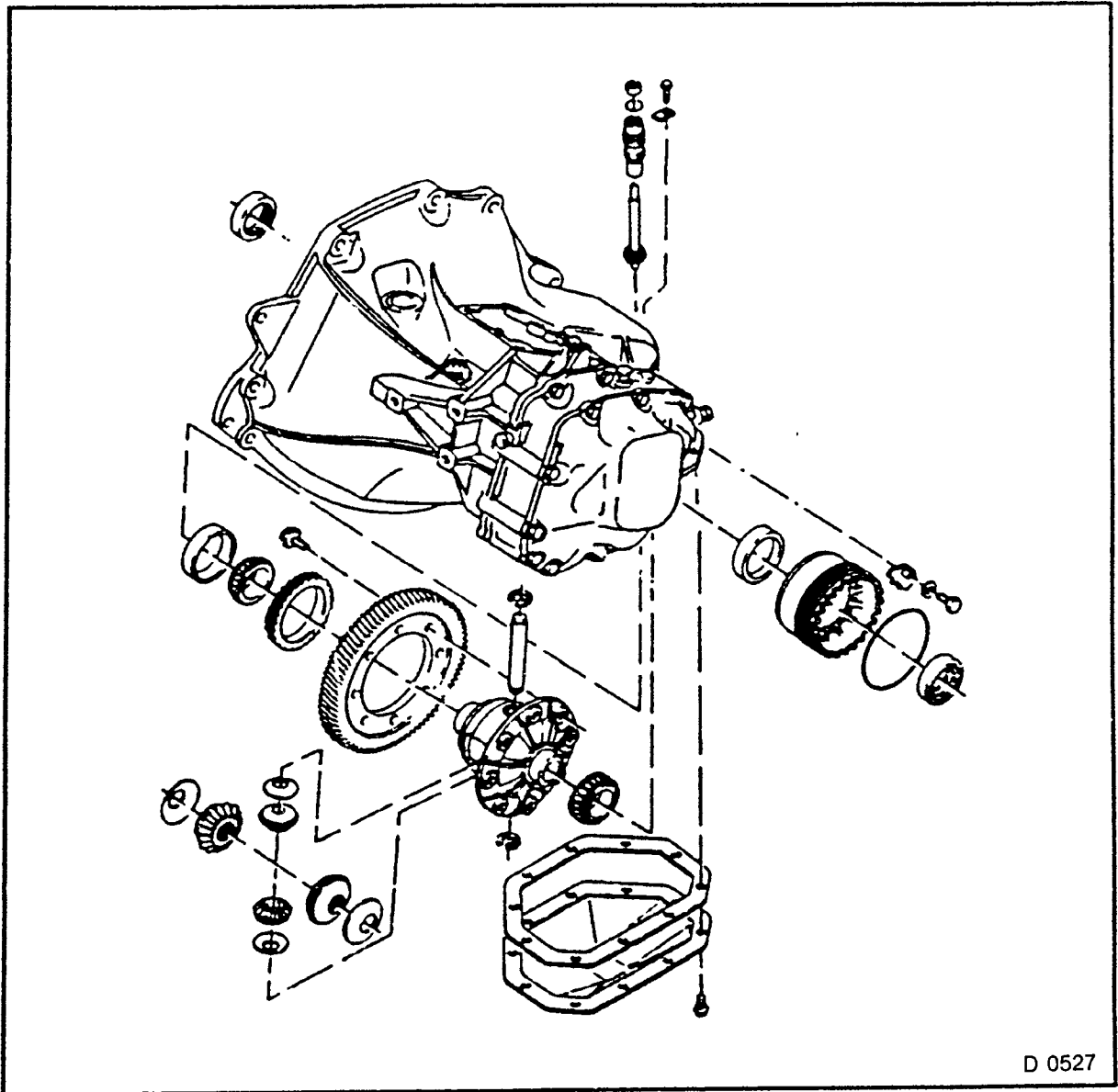
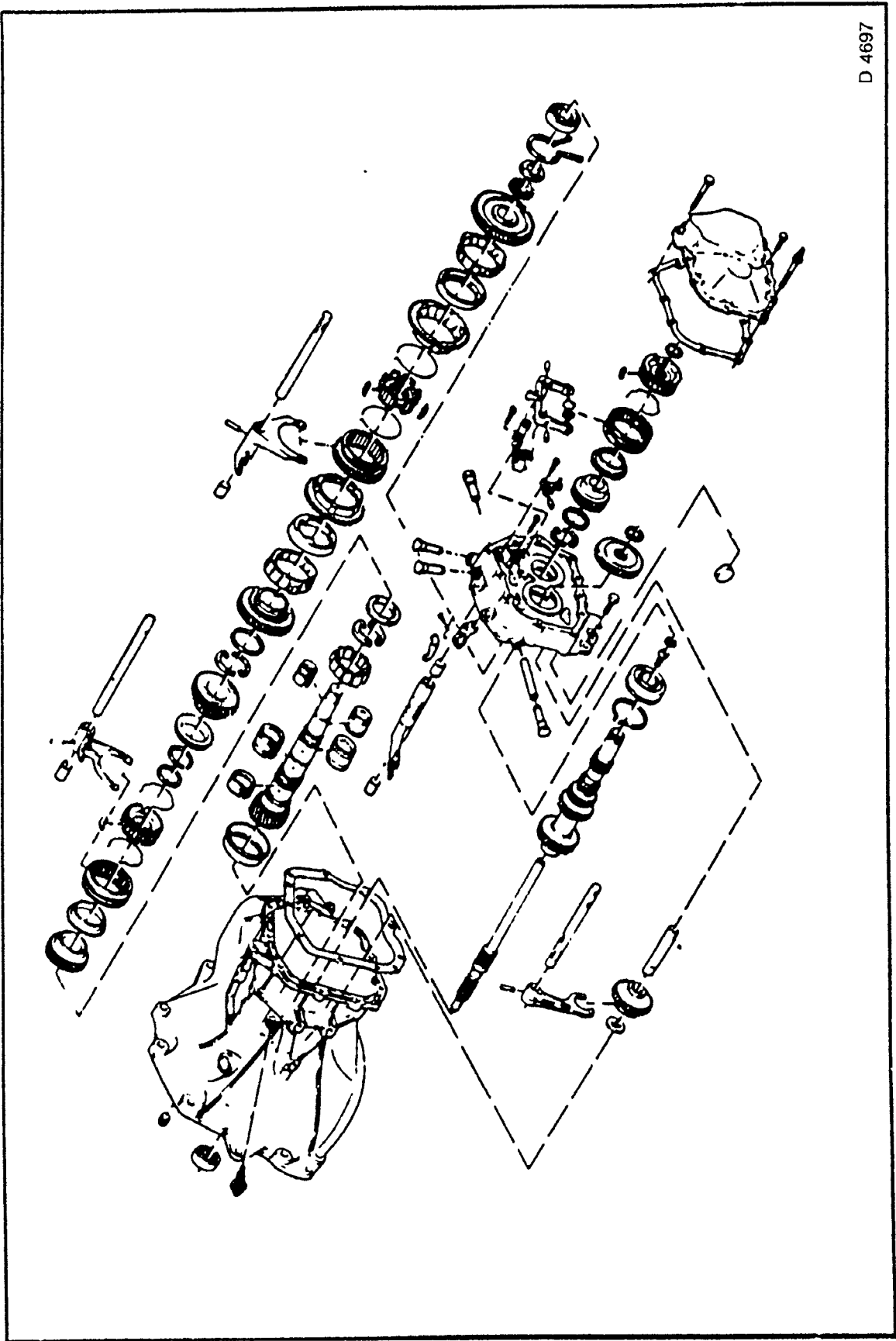


Fig 1 — Manual Transmission F 10/5, F 13/5



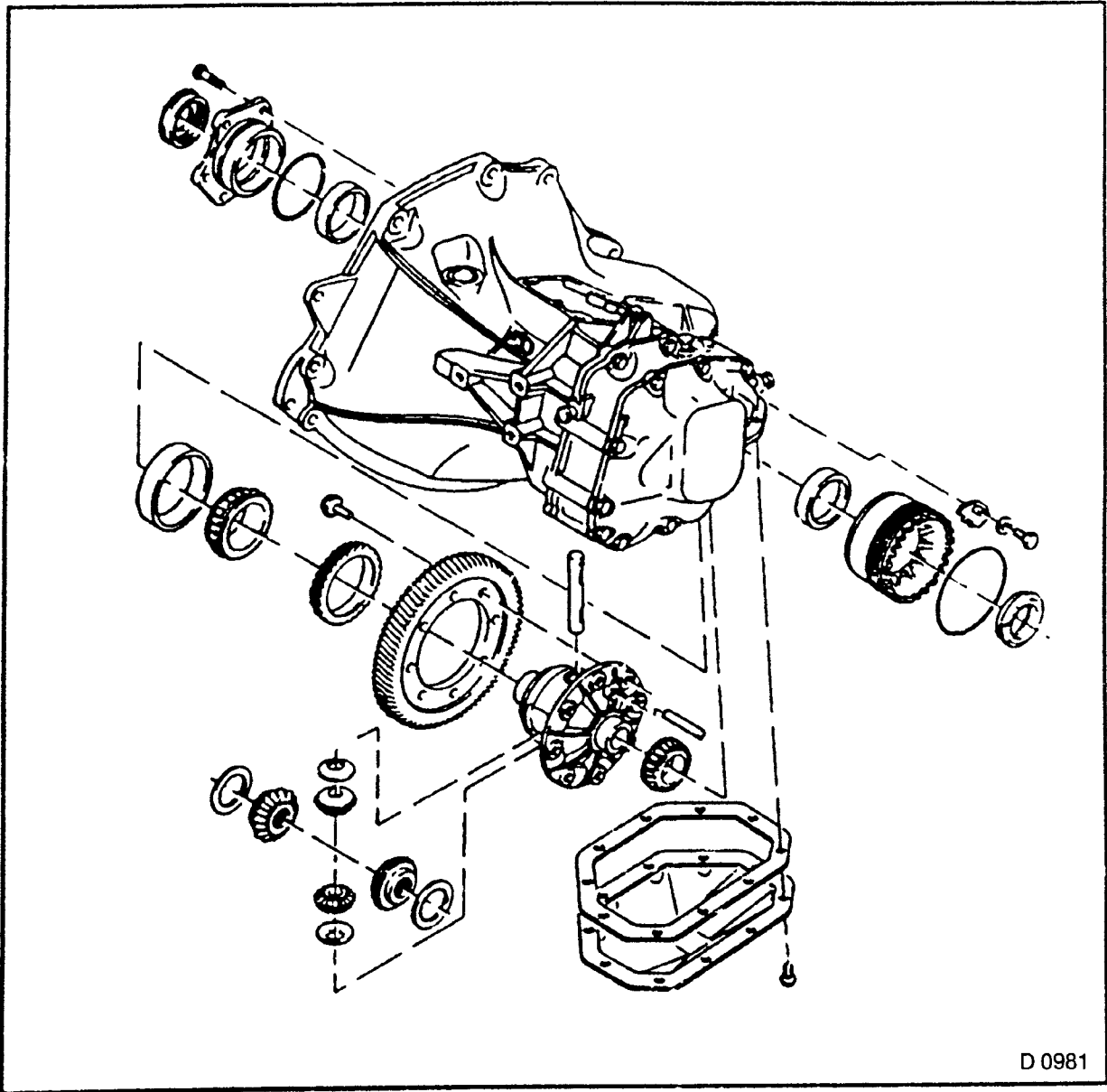
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Fig. 2 — Differential F 10, F 13



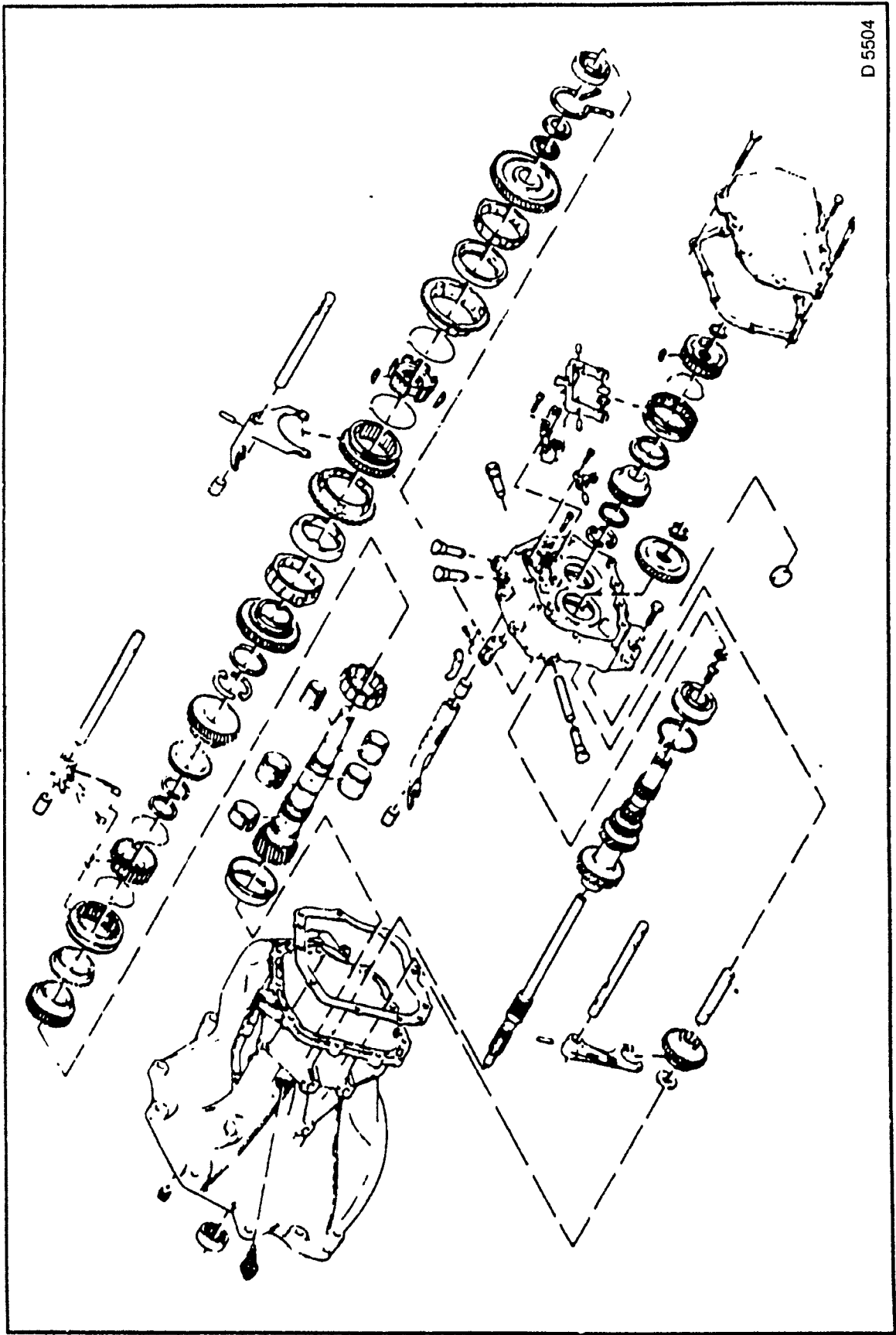
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Fig. 3 — Manual Transmission F 16/5



D 0981

Fig. 4 — Differential F 16



D 5504

Fig 5 — Manual Transmission F 20

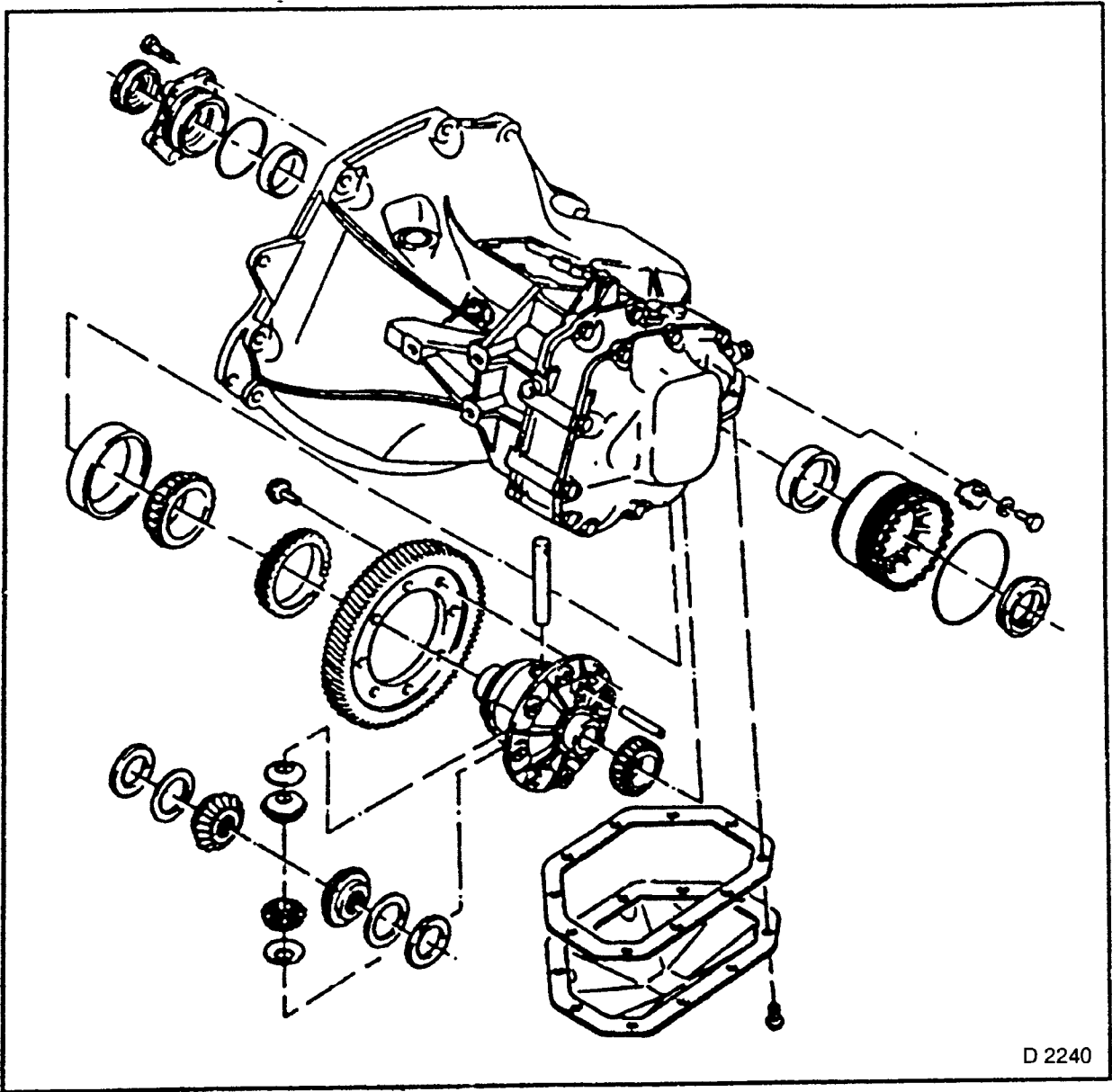


Fig. 6 — Differential F 20

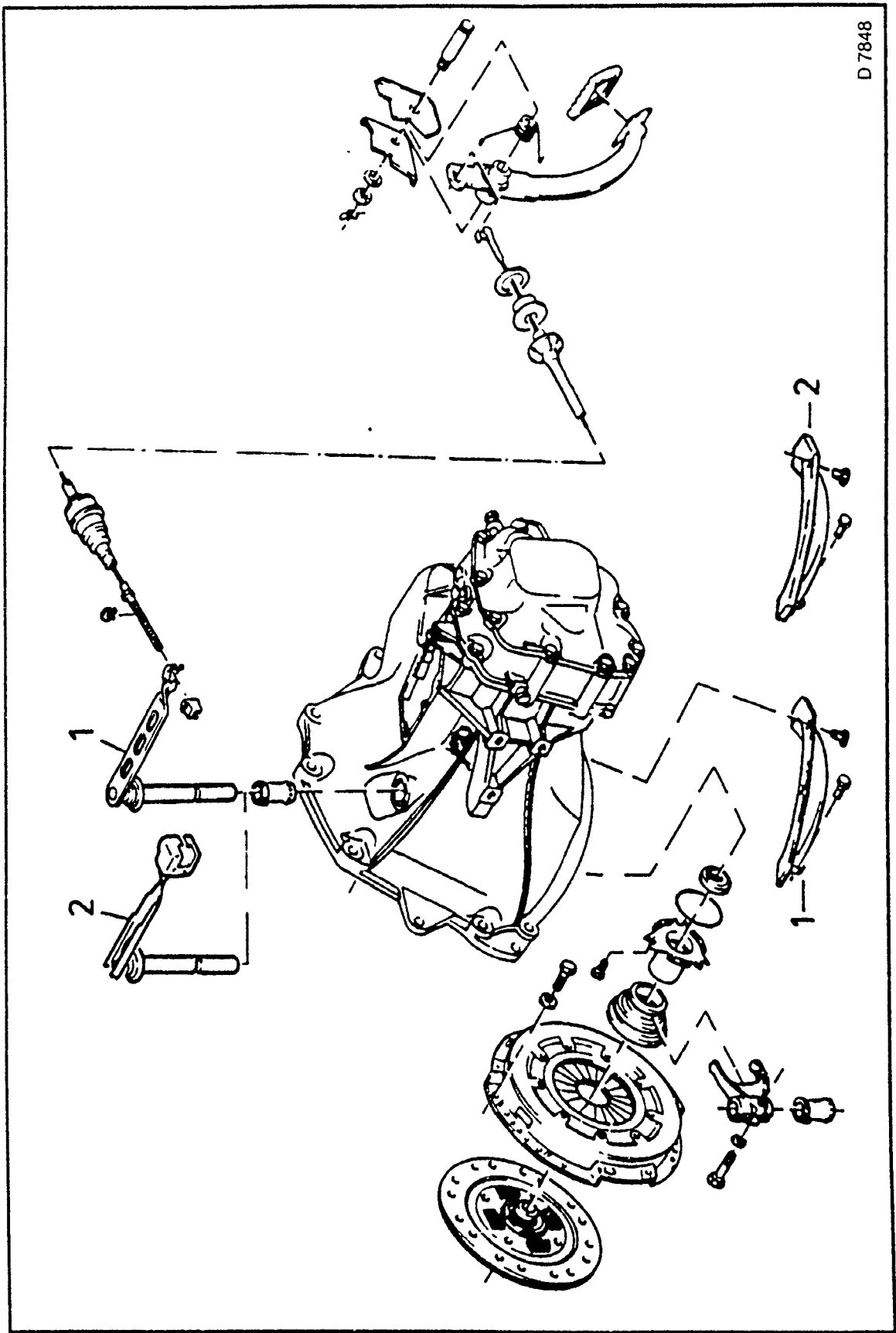


Fig 7 — Clutch Assembly
Version 1 F 10, F 13, F 16 Manual Transmission
Version 2 F 20 Manual Transmission

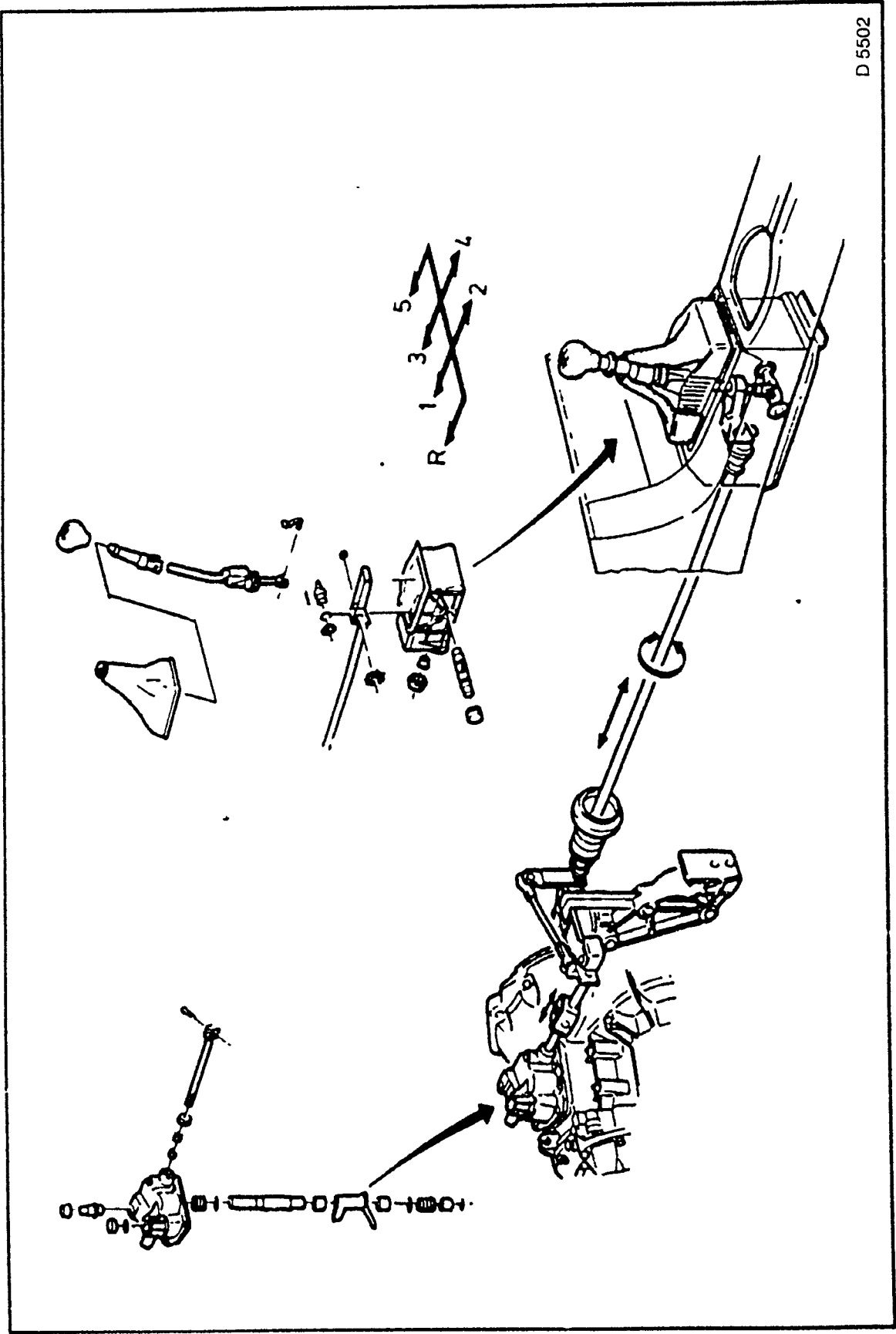


Fig 8 — Transmission Shift Linkage

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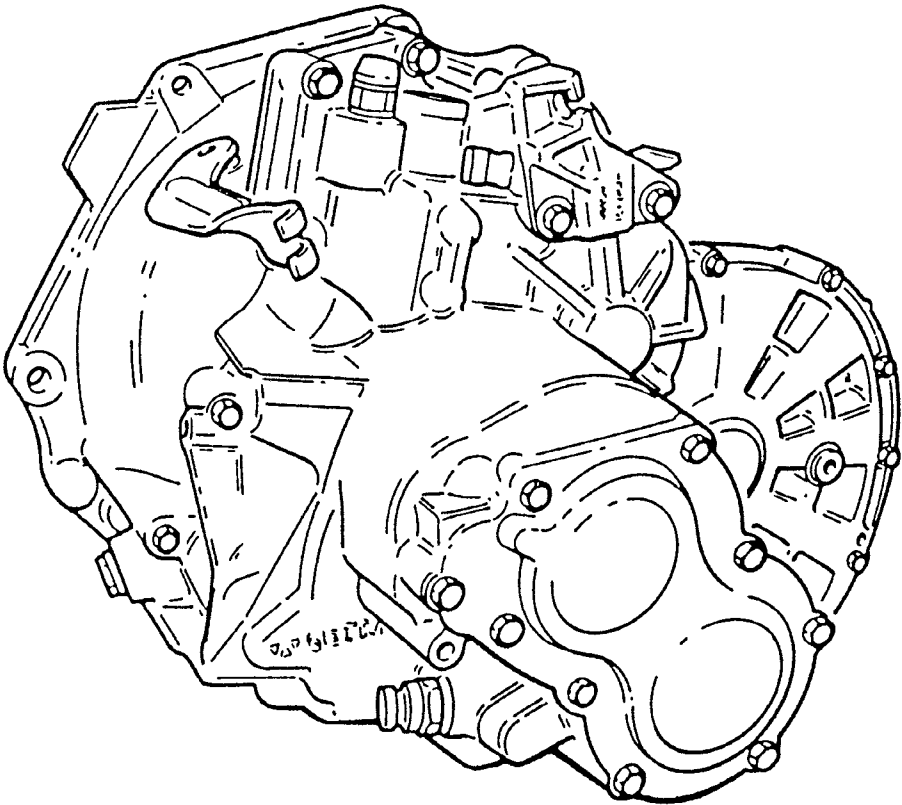
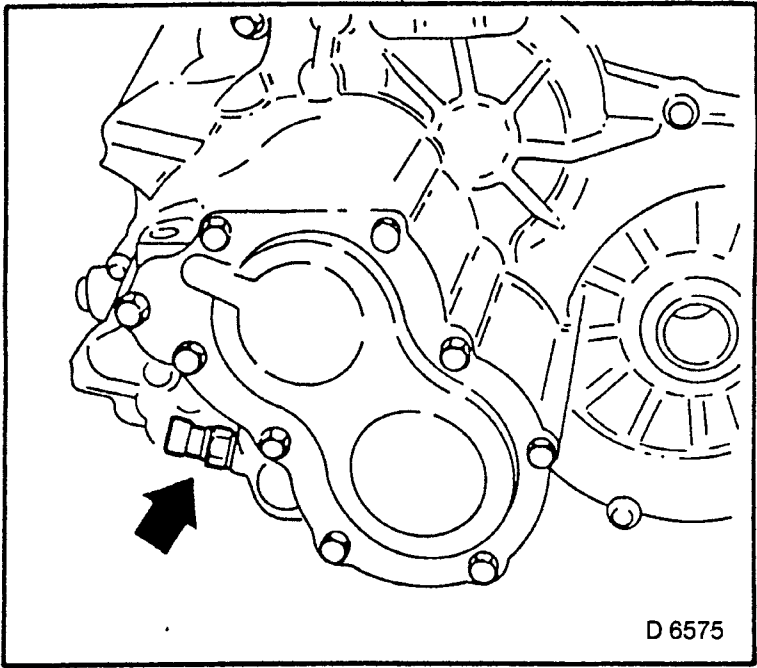


Fig. 9 — F 28 Manual Transmission

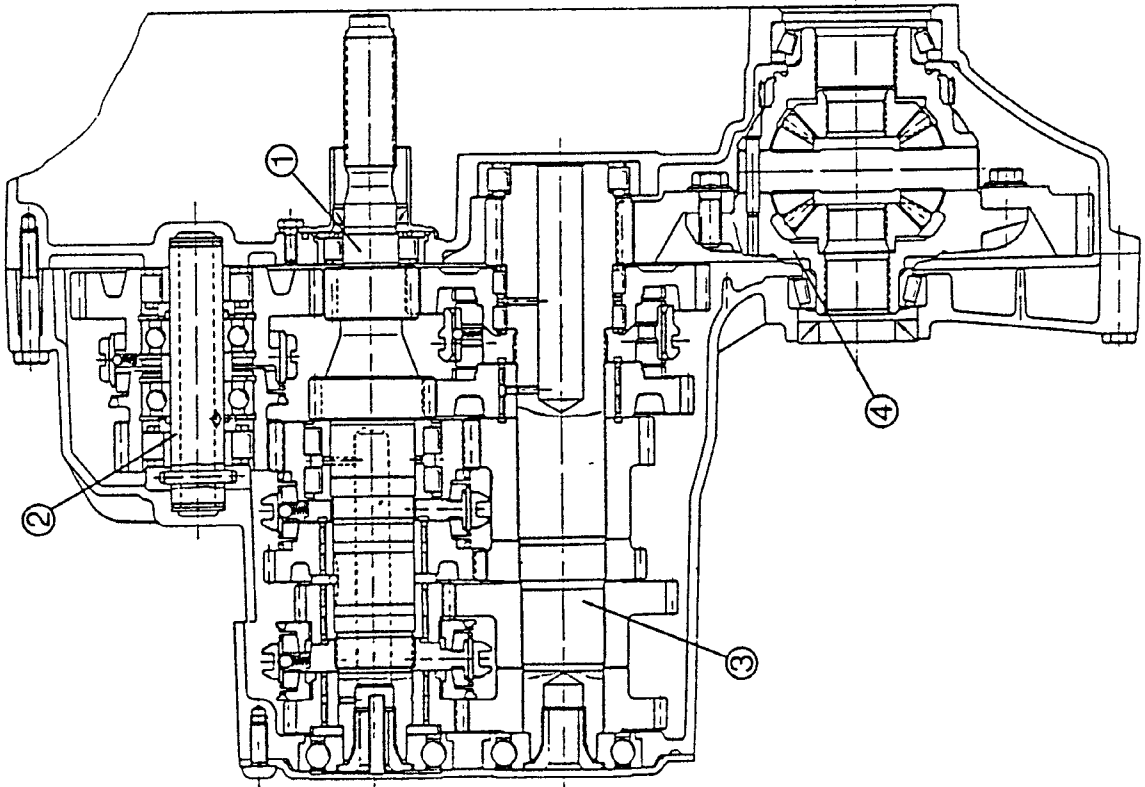
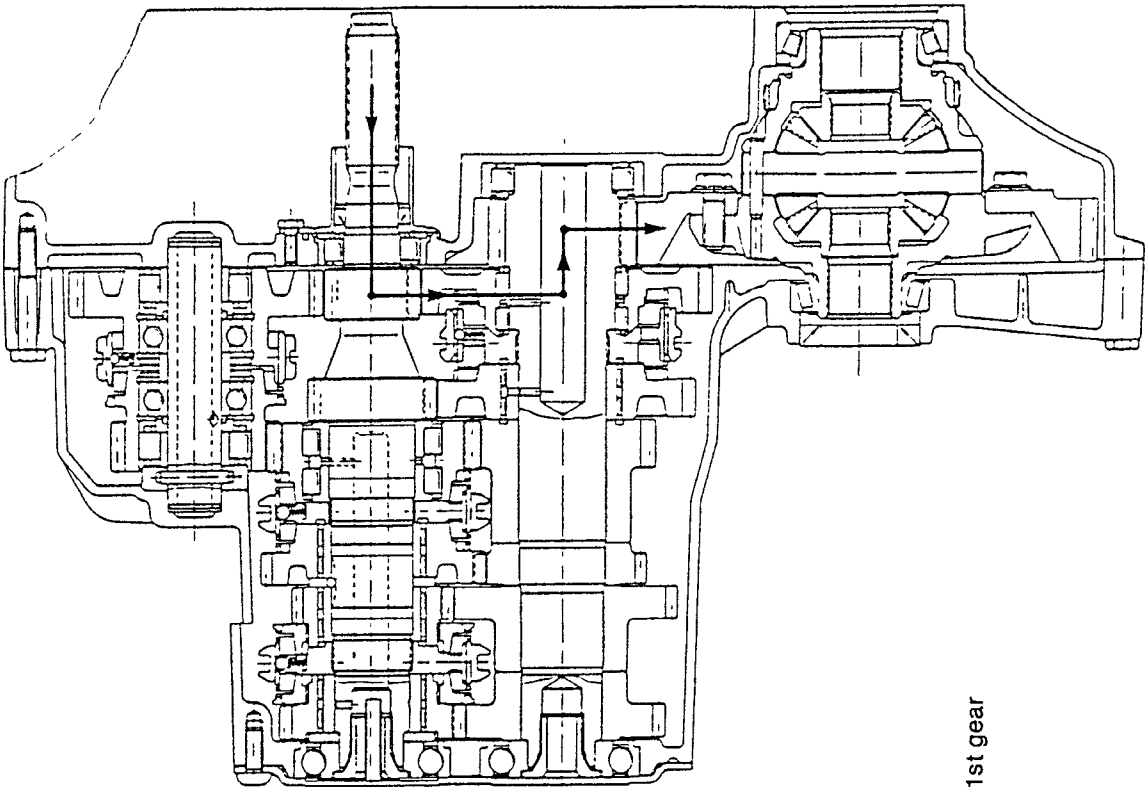


Fig 9A — F 28

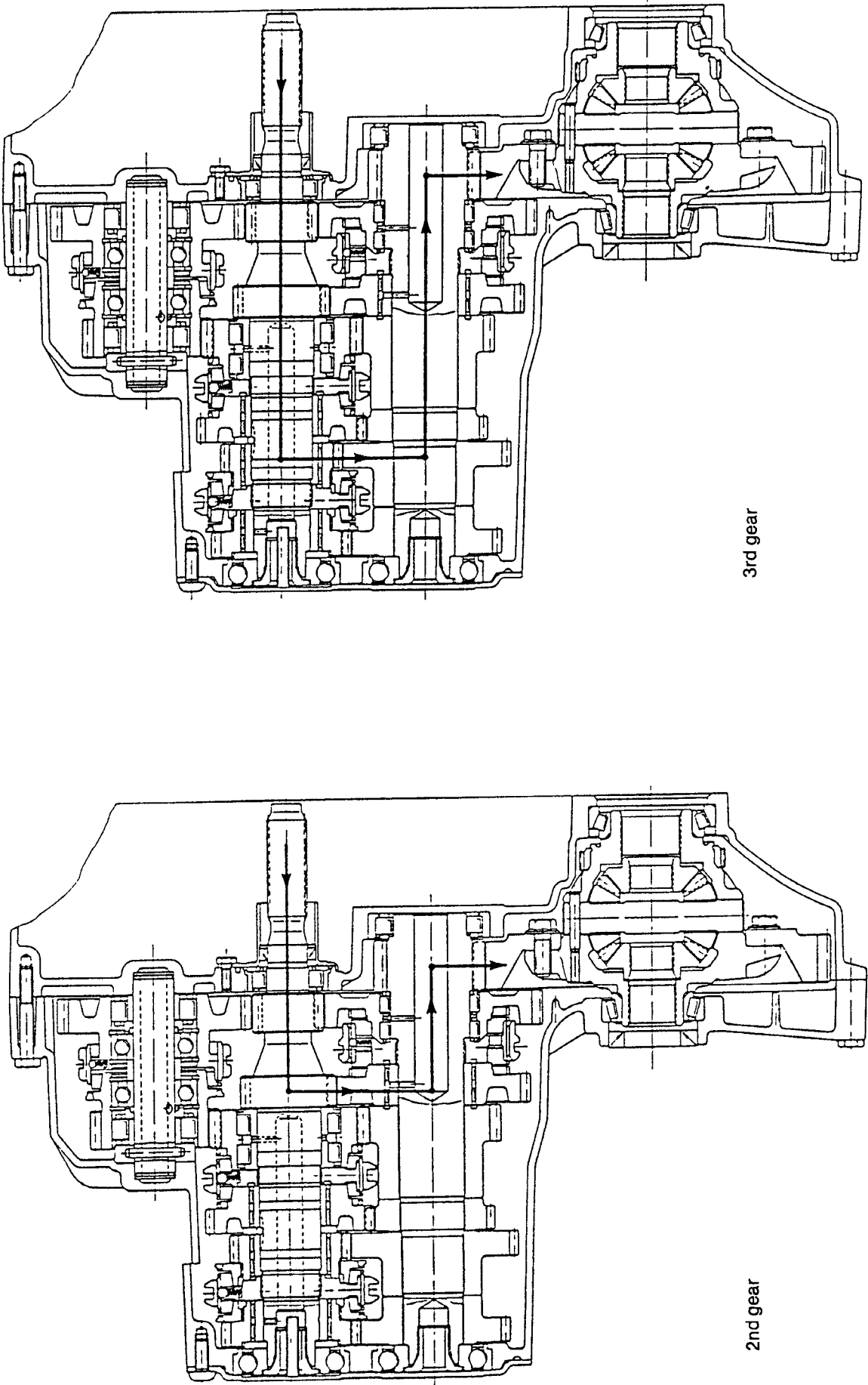
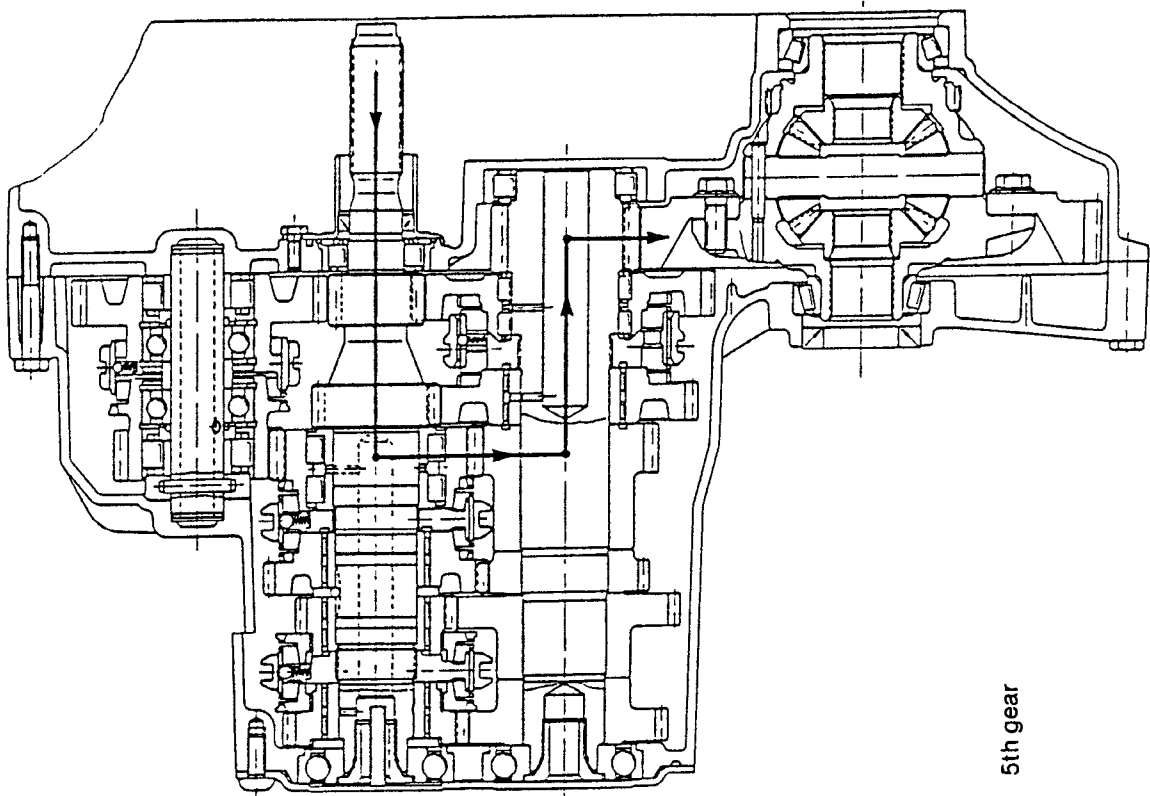
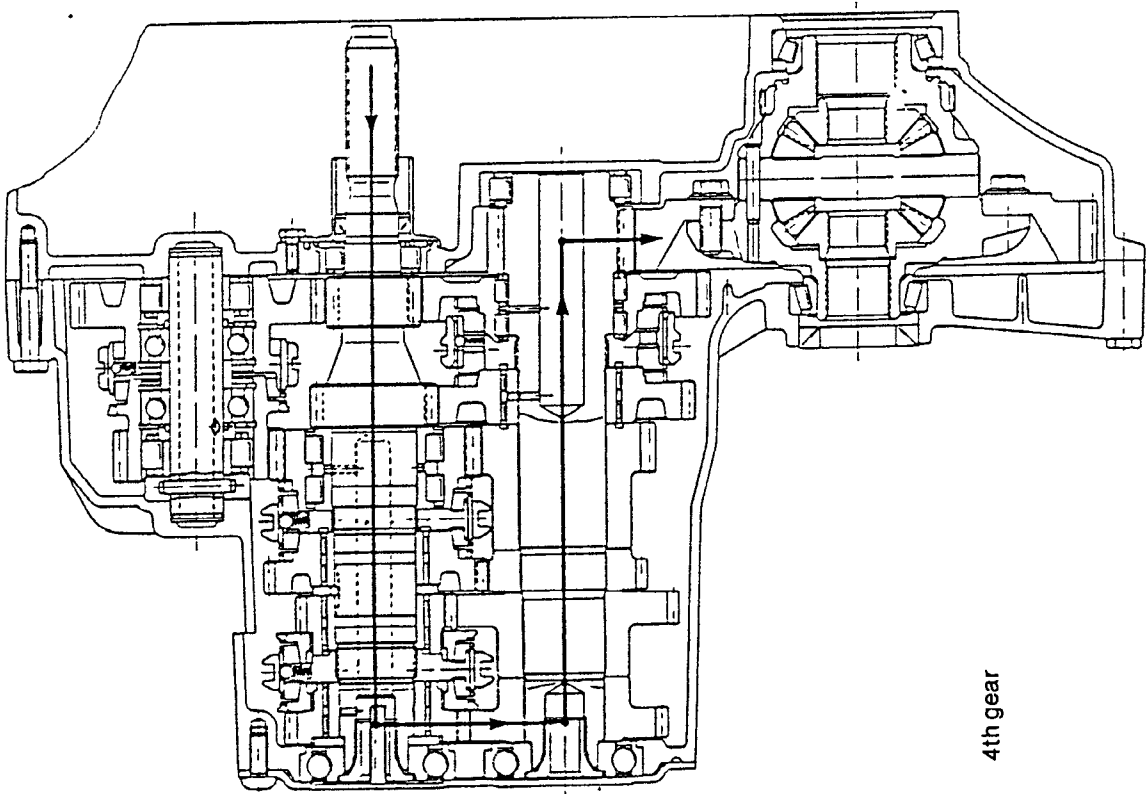


Fig 9B — F 28



5th gear



4th gear

Fig 9C — F 28

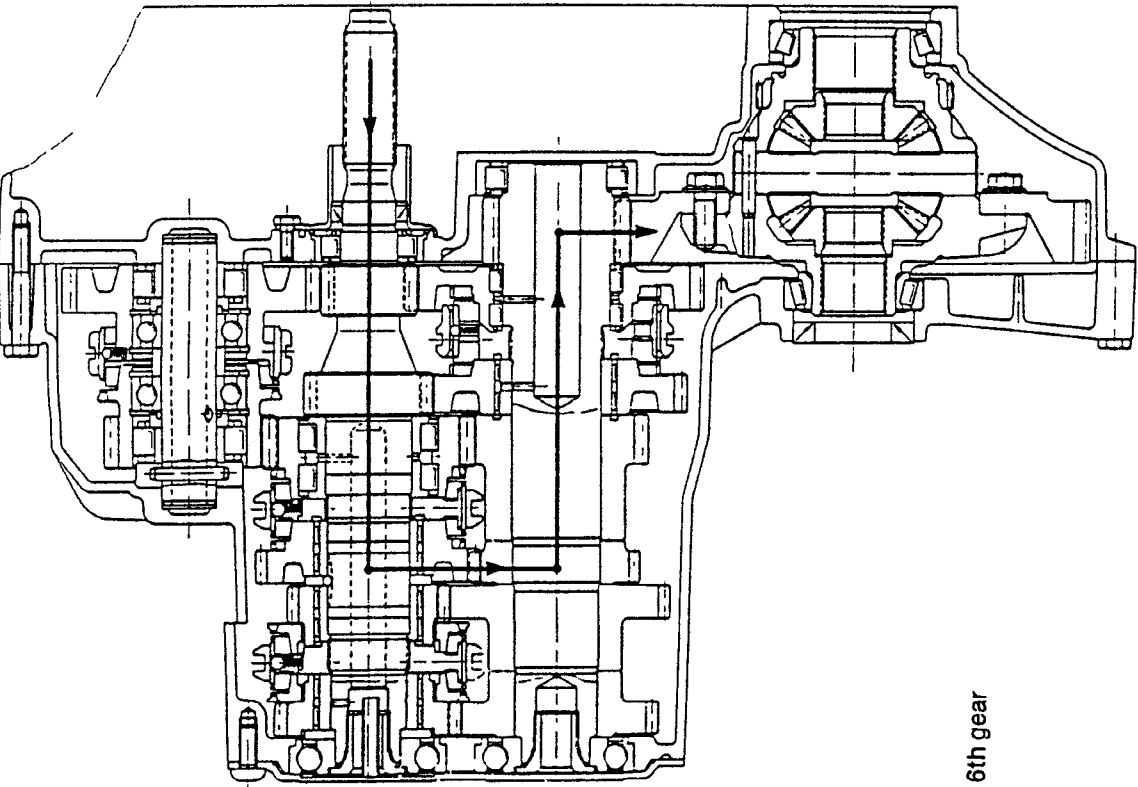
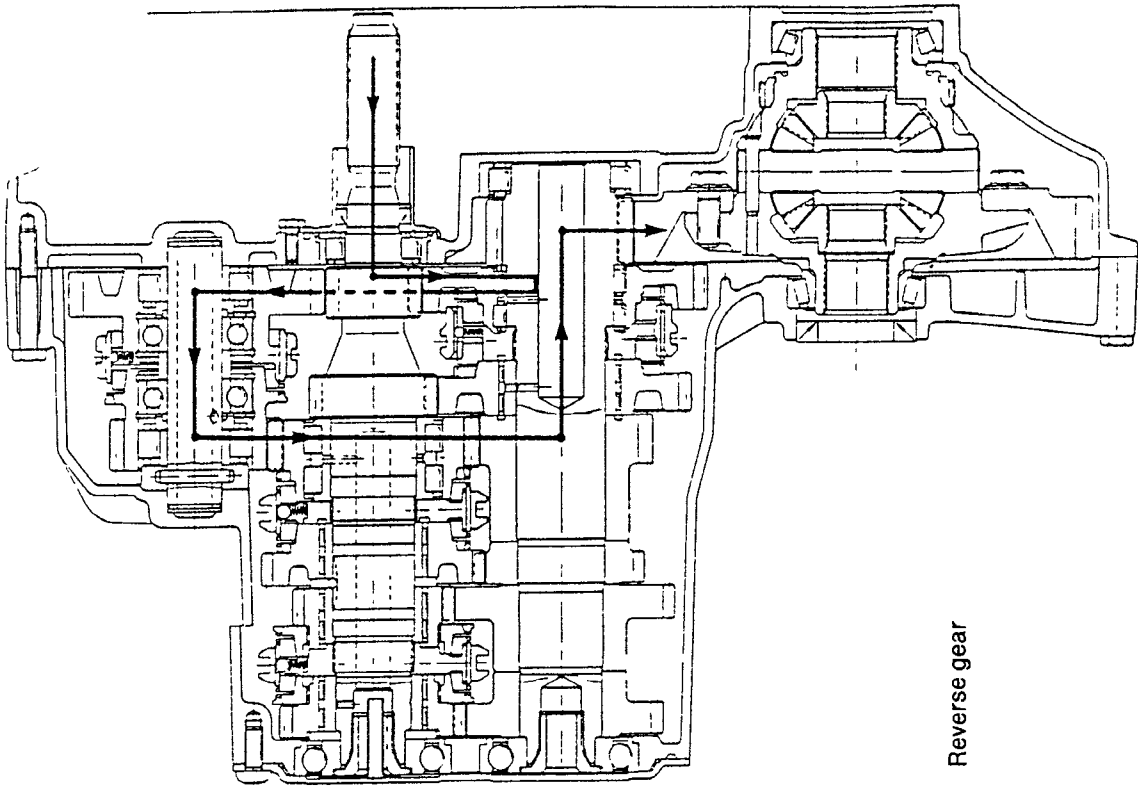


Fig. 9D — F 28

MANUAL TRANSMISSION AND DIFFERENTIAL

Six transmissions are available ex works for the ASTRA-F. The identification F 10, F 13, F 16 or F 20, F 28, AF 20 is embossed on the upper side of the housing during the casting process.

F 10/4, 14NV (Astra/Kadett)

F 13/5: 14 NV Kadett, C 16 NZ, C 16 SE

F 16/5: 1800SE, 2,0 SEH

F 20/5: on C 20 XE LN (DOHC engine)

AF 20/4 1800 SE

F28/6 2,0 LET (DOHC)

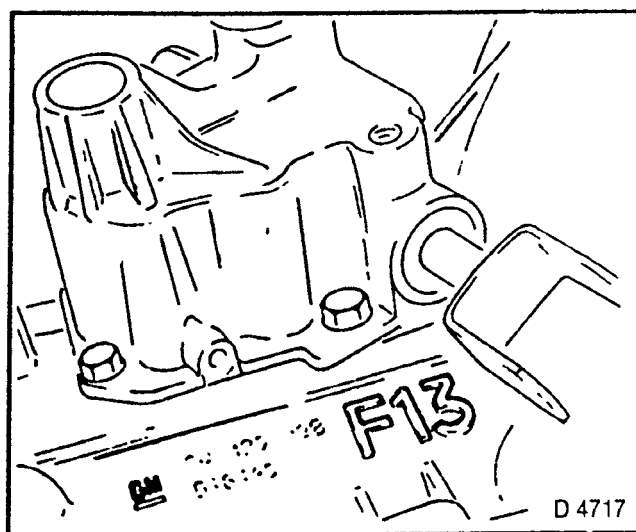


Fig. 10

TRANSMISSION IDENTIFICATION

The transmission number can be read off from the combination of numbers and letters on the end shield cover.

Example: "A 126 1 2 W 372..."

A (1) = Manufacturing plant (not for F 16)

126 (2) = Day of year

1 (3) = Last digit of year

2 (4) = Works shift; 1 = early shift,
2 = late shift

W (6) = Transmission code/high ratio (not for F 20)

C (6) = Transmission code/low ratio

372 (7) = Axle ratio

.. (5) = Space for numbers or letters for special purposes

The identification may also consist of two lines. If the end shield cover is replaced, the identification must be copied onto the new cover.

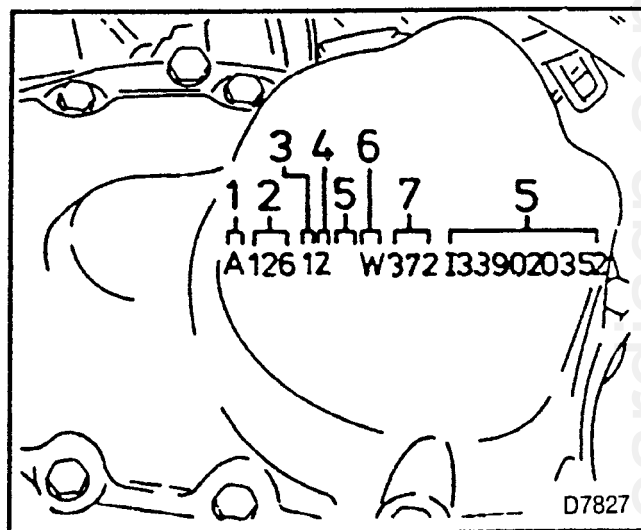


Fig. 10A

CHECKING AND
ADJUSTING
OPERATIONS

Transmission Fluid Level
— Check

REMOVE, DISCONNECT

- 1. Engine compartment cover
F 10, F 13, F 28: checking aperture rear left.
F 16, F 20: checking aperture rear right.

Fill through opening for ventilation screw in shifting cover.

MANUAL TRANSMISSION — F28/6:
Filling through aperture for bleeder screw.

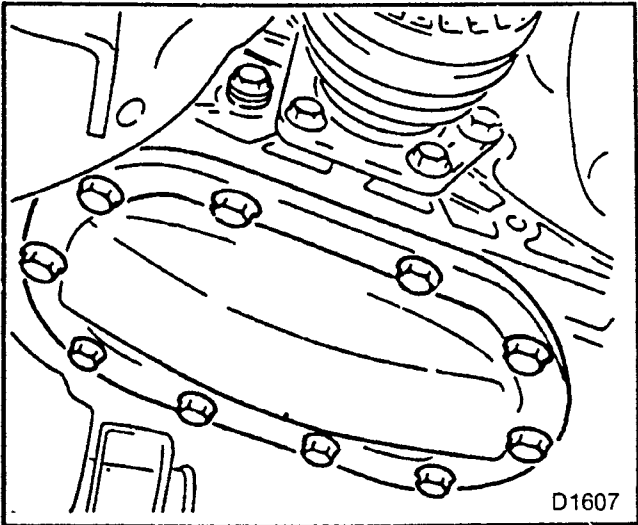


Fig. 11

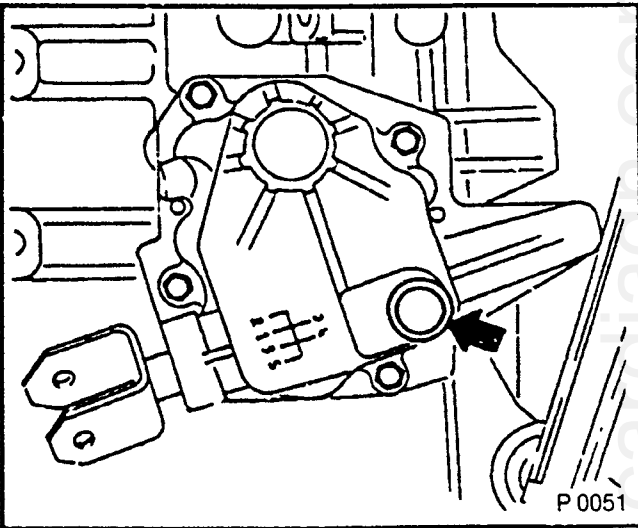


Fig. 12

To check fluid level, prepare tool (e.g. from welding wire) according to illustration on right.

	Fluid level up to lower edge of checking aperture: (factory provided)	Filling quantity after repair:
F 10, F 13:	— 20 mm	1,6 litres
F 16, F 20:	— 0 mm	1,9 litres
F 28:	— 0 mm	1,8 litres

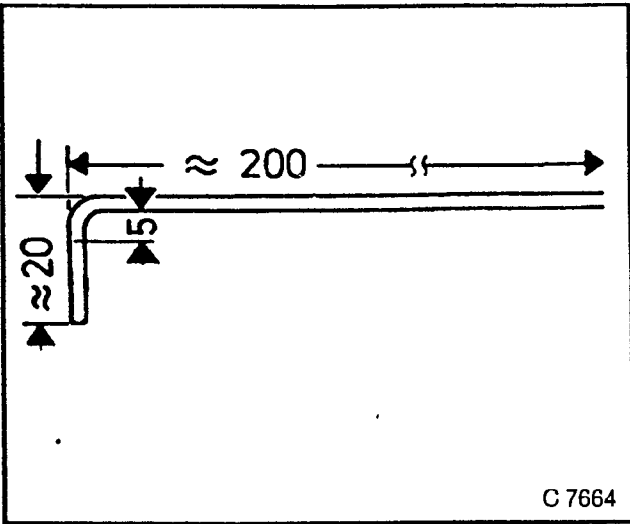


Fig. 13

When oil is service filled, it can be topped up until it flows out of the checking aperture.

On all manual transmissions, use Transmission Fluid B0400075.

INSTALL, CONNECT

1. Engine compartment cover

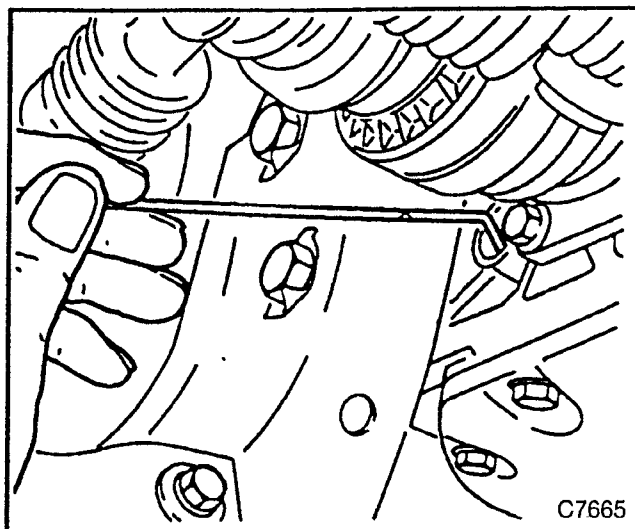


Fig 14

Transmission Shift Linkage — Adjust

Put manual shift lever in neutral

REMOVE, DISCONNECT

1. Shift lever cover from shift tunnel
2. Turn up rubber cap of manual shift lever.
3. Loosen screw for shift rod clamp (arrow).
4. Remove plug for adjusting bore from switching cover.

ADJUST

1. Turn shift rod to left.
2. Insert KM-527 or KM-527-A up to stop in adjustment bore hole.
3. Transmission shift linkage on vehicles with F 28/6 manual transmission.

NOTE:
If KM-527 (1) is used, the chamfer on the short leg must be ground down by approximately 3 mm.
KM-527-A (2) is already modified accordingly.

INSPECT

1. Remove KM-527 or KM-527-A and close bore with new plug.

INSTALL, CONNECT

1. Shift lever cover on shift tunnel.

INSPECT

All transmission gears should be easy to engage with vehicle at rest, engine running and clutch disengaged.

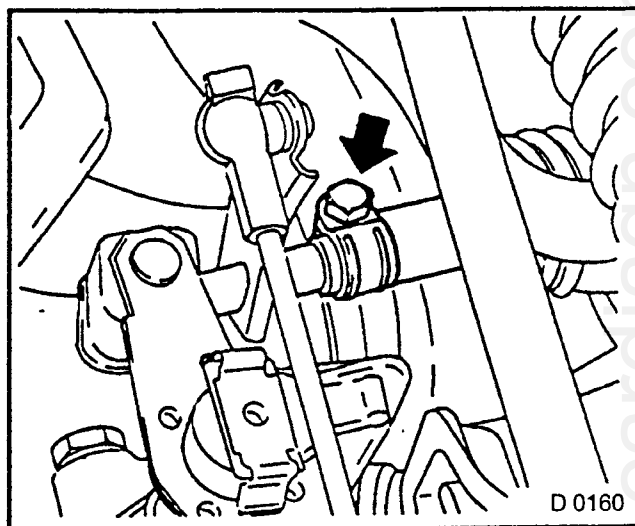


Fig 15

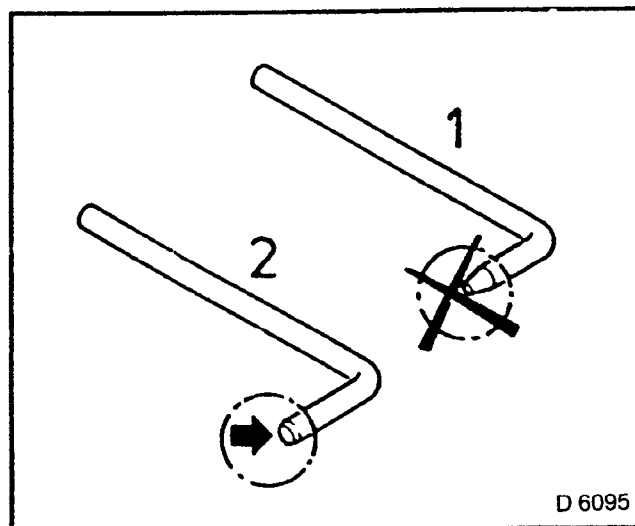


Fig. 16

OPERATIONS ON TRANSMISSION SHIFT LINKAGE

Manual Shift Lever — Remove and Install

MANUAL SHIFT LEVER IN NEUTRAL

REMOVE, DISCONNECT

1. Shift lever cover from shift tunnel.
2. Turn up rubber cap
3. Remove manual shift lever.
4. Press clip from lever (1) and pull pin with clip from bearing (2).

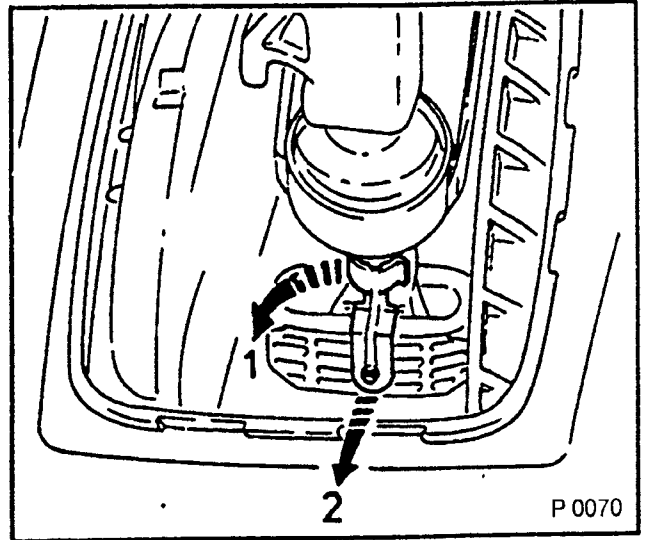


Fig. 17

INSTALL, CONNECT

1. Bolts in shift lever housing.
2. Secure with clamp.
3. Shift lever cover on shift tunnel.

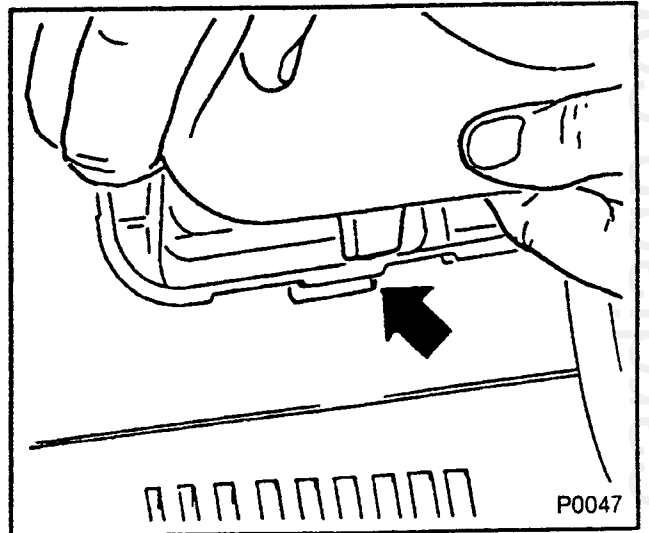


Fig. 18

Rubber Cap for Manual Shift Lever — Remove and Install

REMOVE, DISCONNECT

MANUAL SHIFT LEVER

1. Knock off shift lever knob from shift lever, when replacing, saw off.
On shift lever knob with leather covering: Clamp shift lever and place open ended wrench under metal inset of shift lever knob.
2. Rubber cap.
3. Replace O-ring on shift lever.

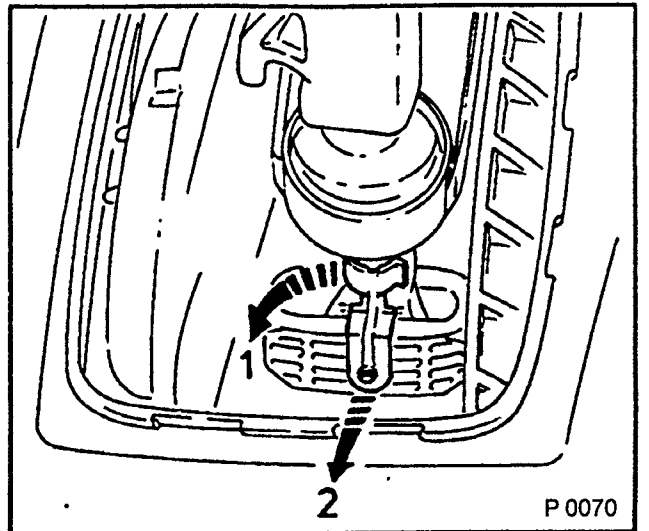


Fig. 19

INSTALL, CONNECT

1. New rubber cap, pull on as far as offset.
2. Apply liquid soap to reverse gear pawl.
3. New shift lever knob on shift lever.

On plastic shift lever knob:

Heat knob to approximately 80°C/176°F
(water bath, suitable temperature gauge)

On shift lever knob with leather covering:

Heat inset of shift lever knob with industrial hot air blower.

Shift Linkage — Remove and Install

REMOVE, DISCONNECT

Manual shift lever.

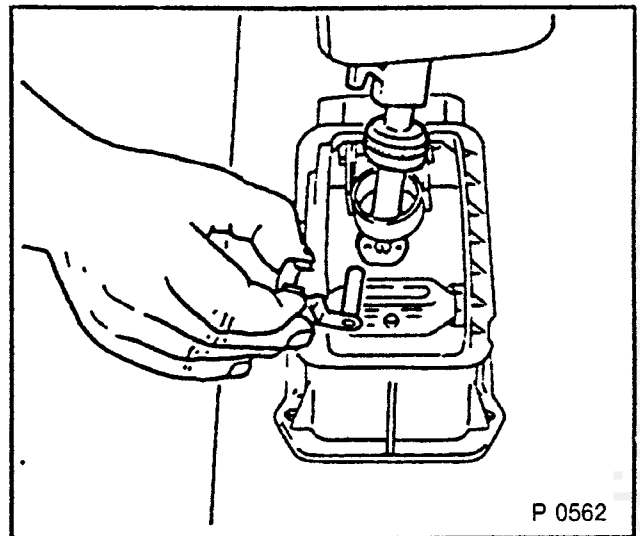


Fig. 20

1. Loosen bolt for shift rod clamp (arrow)
2. Press shift lever off from knurled bolts.

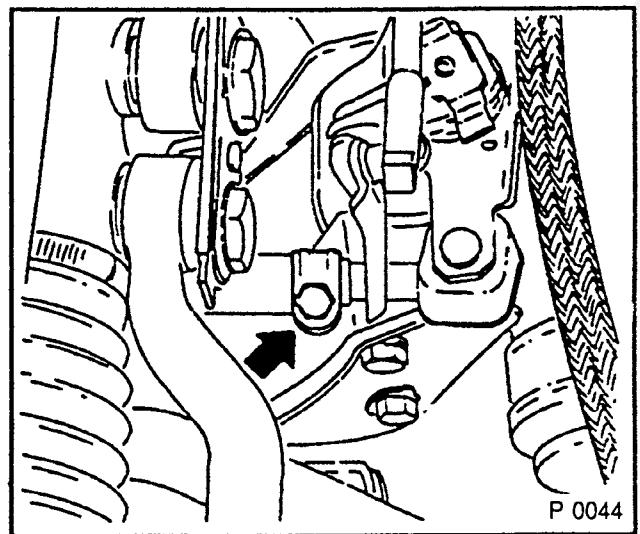


Fig. 21

REMOVE, DISCONNECT

1. Shift housing with shift linkage from underbody.

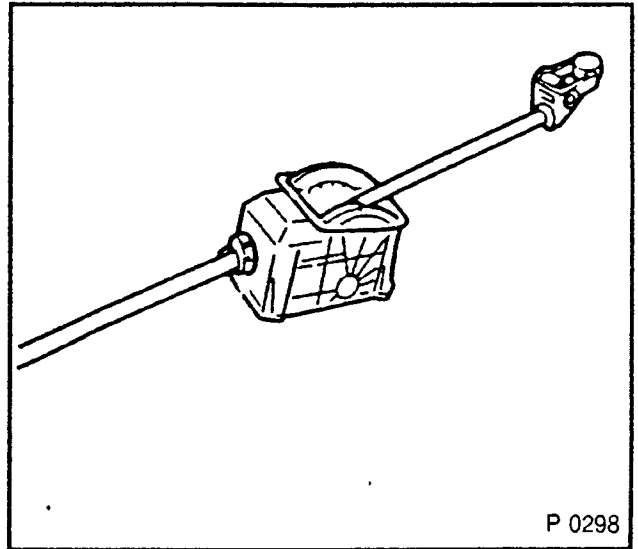


Fig. 22

2. Shift linkage from bearing bushing.
3. Bushing with bearing bushing from shift housing.

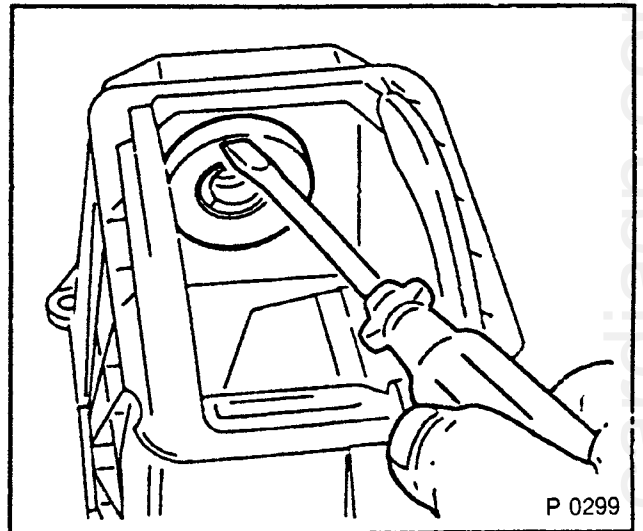


Fig. 23

REMOVE, DISCONNECT

1. Bearing bushing from bushing.
2. Replace bushing.

INSTALL, CONNECT

1. Press new bearing bushing (A) in bushing (B).
2. Press bearing ring into shift housing from inside.
3. Fill inside grooves of bushing with Silicon Grease (B0400571).
4. Shift linkage in bearing bushing.

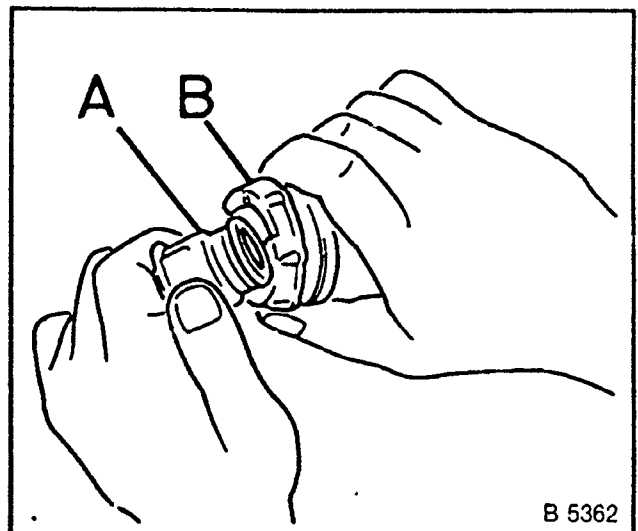


Fig. 24

TIGHTEN (TORQUE)

- 1. Shift housing to underbody, 6 Nm.

INSTALL, CONNECT

- 1. Shift lever

ADJUST

- 1. Transmission shift linkage.

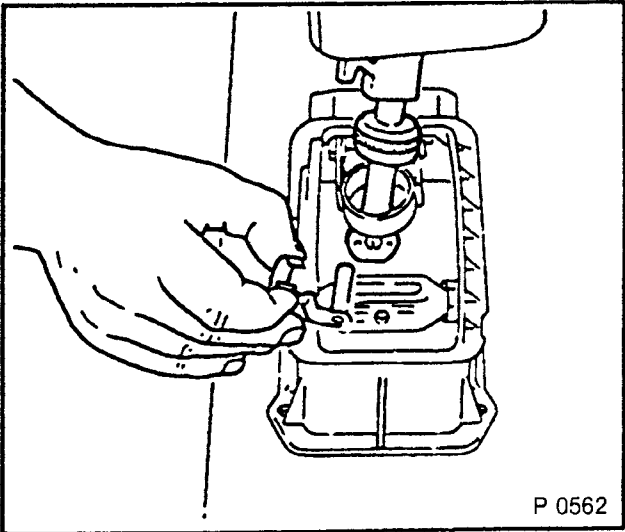


Fig. 25

Folding Cover on Shift Linkage — Replace

- 1. Loosen bolt for shift rod clamp (arrow).
- 2. Remove shift lever in 4th gear position — disconnect plug connection.

REMOVE, DISCONNECT

- 1. Clamp and folding cover from shift linkage/bulkhead.

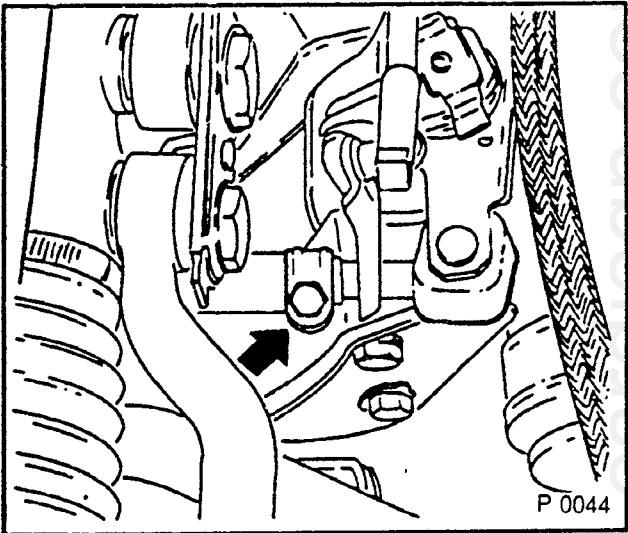


Fig 26

INSTALL, CONNECT

- 1 New folding cover, must not lie twisted.

ADJUST

- 1. Transmission shift linkage.

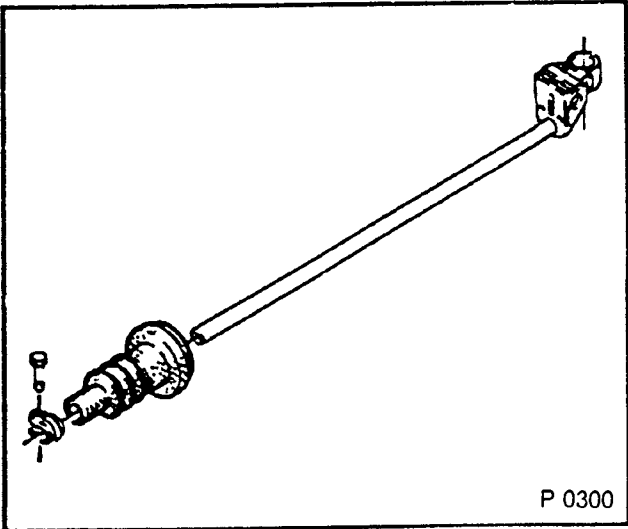


Fig. 27

Shift Guide — Remove and Install Selector Rod — Replace

REMOVE, DISCONNECT

- 1. Both ball sockets of selector rod (arrow) from ball pivot.
- 2. Press plastic clips outwards with screwdriver
- 3. Replace selector rod in assembly.

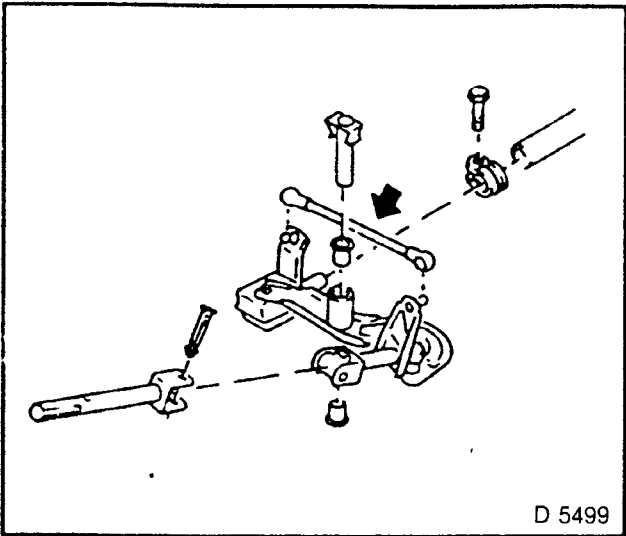


Fig. 28

Shift Linkage Lever — Remove and Install

REMOVE, DISCONNECT

- 1. Selector rod.
- 2. Press together retaining springs of hollow pin (1) and press out hollow pin (arrow).
- 3. Replace hollow pin after removal.

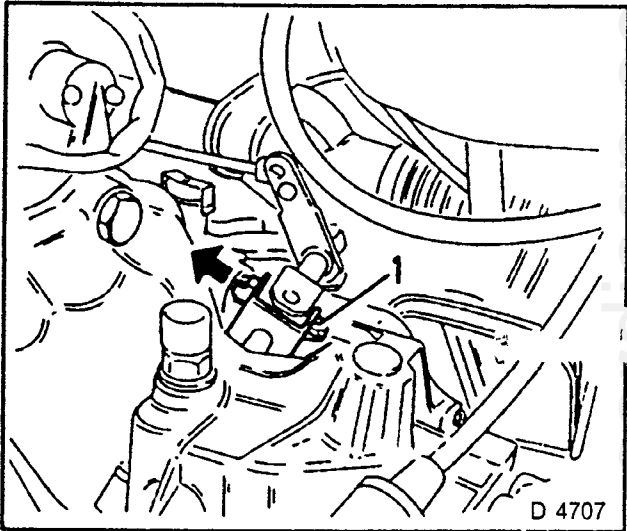


Fig. 29

- 4. Loosen bolt for shift rod clamp (arrow left).

REMOVE, DISCONNECT

- 1. Pin with spring clamps (arrow right) from shift linkage lever bearing.
- 2. Shift linkage lever assembly from bracket for rear engine suspension.

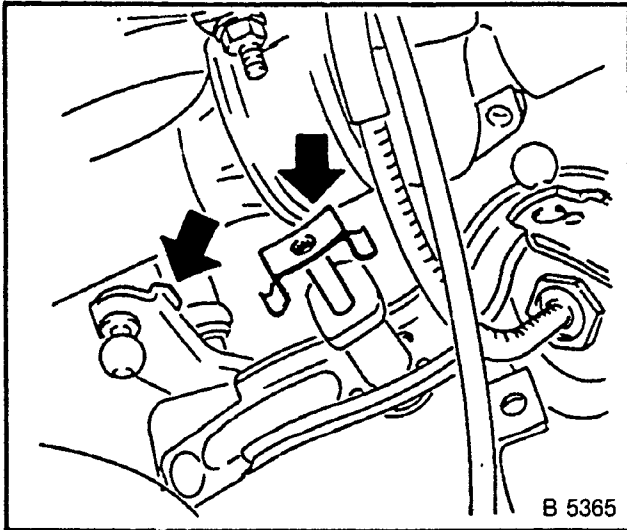


Fig. 30

3. Both bushings of shift linkage lever bearing may be replaced. If necessary, replace joints at cardan joint.

NOTE:
DO NOT DISASSEMBLE SHIFT LINKAGE LEVER ANY FURTHER.

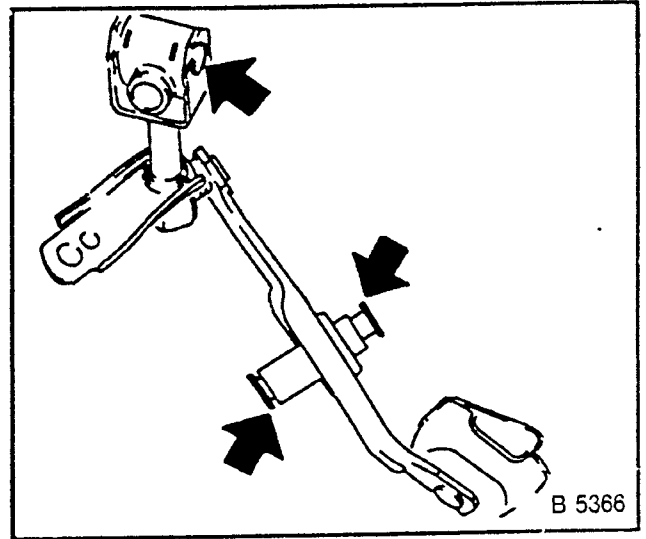


Fig. 31

INSTALL, CONNECT

1. Shift linkage lever assembly to transmission with pin.
2. Spring clamps catch.
3. Lubricate bearing bushings, Silicon Grease.

4. Knurled bolt of shift linkage lever in shift linkage.
DO NOT tighten linkage clamp.
5. New hollow pin at cardan joint, engage expanding springs (1).
6. Lubricate pin, Silicon Grease.
7. Selector rod.

ADJUST

1. Transmission shift linkage.

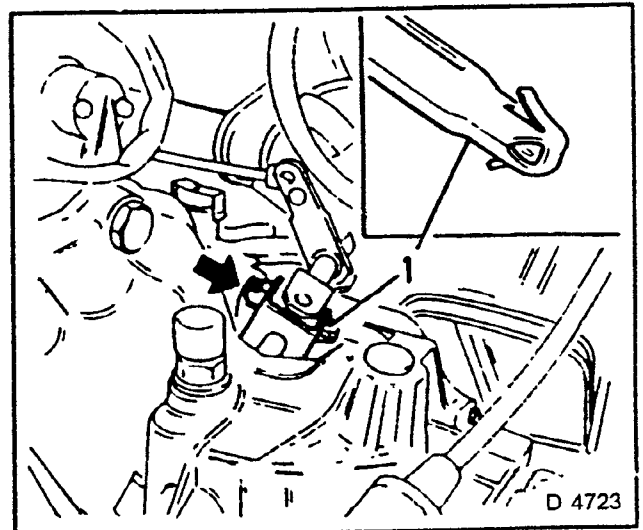


Fig. 32

Shift Cover — Remove and Disassemble

TRANSMISSION INSTALLED:

REMOVE, DISCONNECT

1. Press together retaining springs of hollow pin (1) and press out hollow pin (arrow).
2. Replace hollow pin after removal.
3. Closure bolt for transmission vent (arrow) from shift cover.
4. Remove transmission shift cover.
5. Pull out plug from adjusting bore and insert KM-527-A.
6. When using KM-527, grind down chamfer heel on short end by approximately 3 mm.

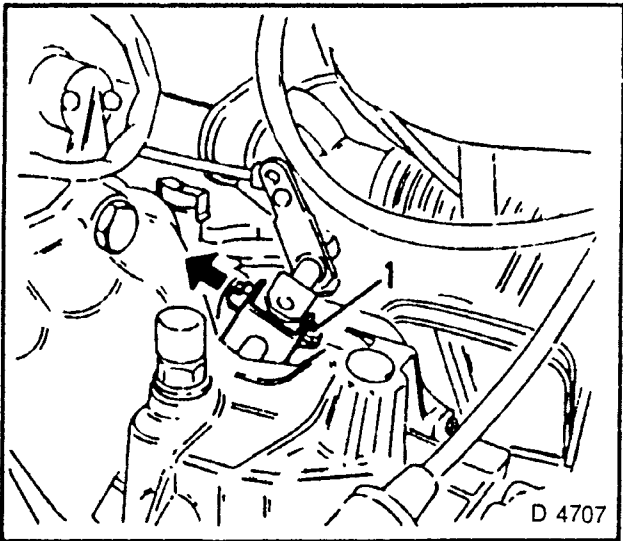


Fig 33

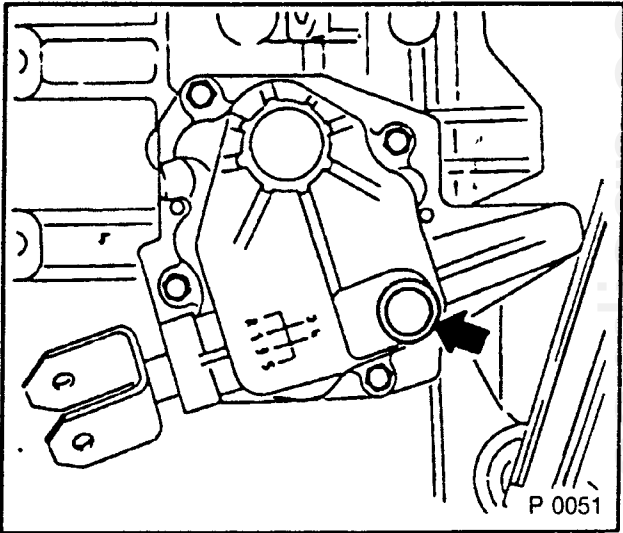


Fig 34

INSTALL, CONNECT

1. Shift cover to KM-552 or KM-488.

DISASSEMBLE

1. Retaining ring.
2. Bushing.
3. Pressure spring.
4. Intermediate shift lever.
5. Washer.
6. Spring from guide pin.

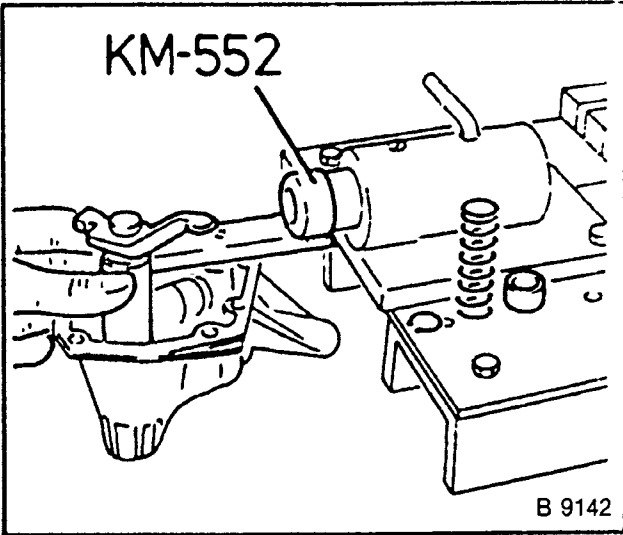


Fig. 35

REMOVE, DISCONNECT

1. Tension pin (1) from shift finger (2) and shift rod (3) — using drift, note depression in cover.
2. Shift rod.
- DO NOT** disassemble cover further.
3. Replacement available only as guide pin and cap assembly.

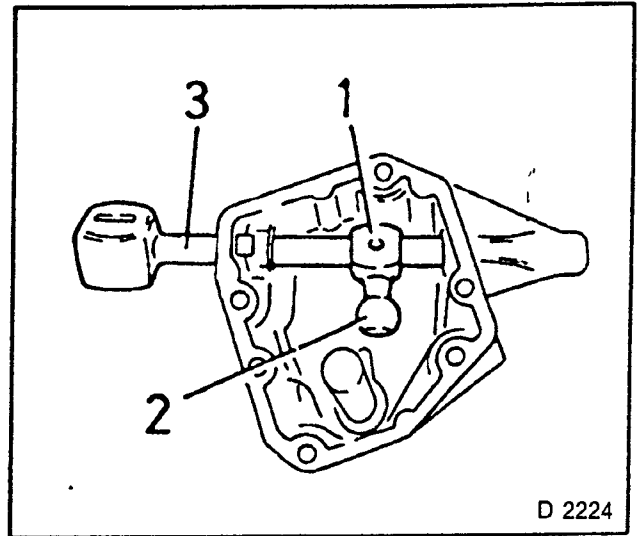


Fig 36

Shift Cover — Assemble and Install

REPLACE SEAL RING IN COVER

INSTALL, CONNECT

1. Drive in new seal ring flush with suitable sleeve (arrow).
2. Lubricate seal lips with Grease.

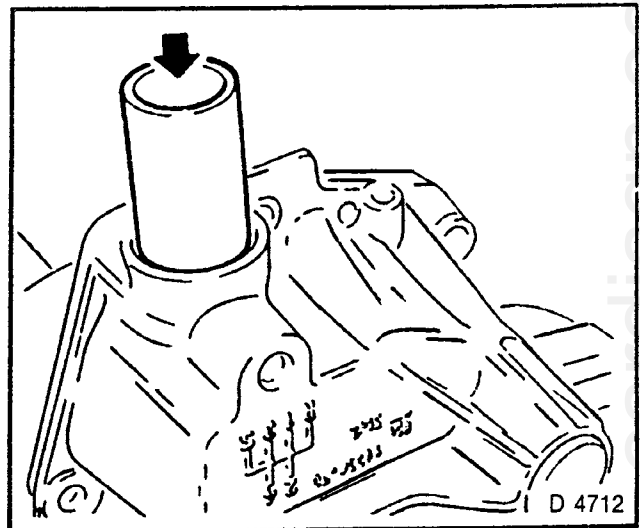


Fig 37

ASSEMBLE

1. Install shift rod and shift finger in cover, KM-308.
Allow new tension pin to protrude approximately 2 mm.
2. Install spring (1).
3. Washer (2).
4. Intermediate shift lever (3).
5. Washer (4).
6. Pressure spring (5).
7. Bushing (6) on guide pin.
8. Secure with new retaining ring.

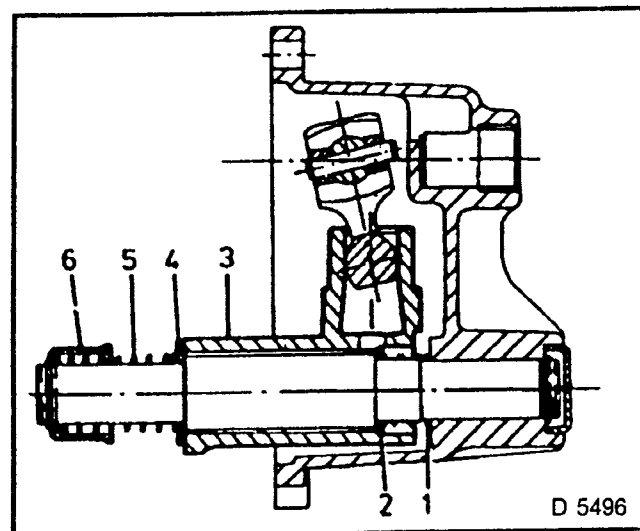


Fig. 38

BEFORE INSTALLATION OF SHIFT COVER:**MEASURE**

1. Play (1) between dowel pin (2) and actuation of 3rd/4th gear shift rod with feeler gauge.
- 2 Play (1) should be approximately 0.5 mm.

ADJUST

If play is too large:

1. Drive dowel pin (2) into transmission housing with drift and measure play again.

If play is too small:

Correction of play is not required as the shift rod presses the dowel pin into the correct position.

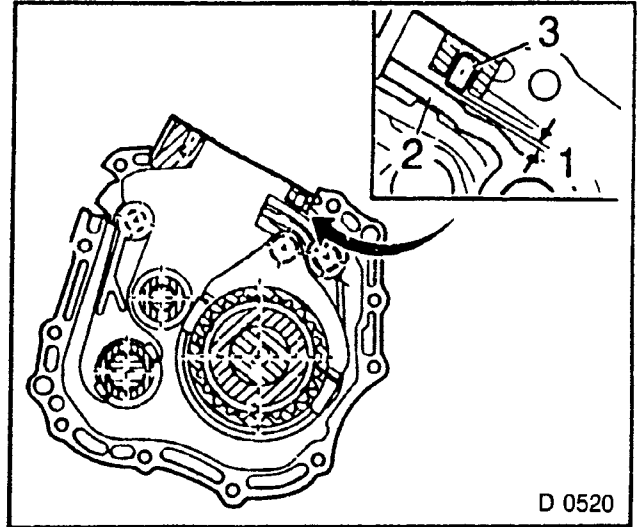


Fig. 39

TIGHTEN (TORQUE)

1. Place KM-527-A in adjusting bore.
2. Cement new gasket with Anti-friction Bearing Grease at housing. Transmission in neutral.
3. Place cover for shift at transmission and tighten — 15 Nm.
4. Remove KM-527-A.
5. Insert new plug in adjusting bore.

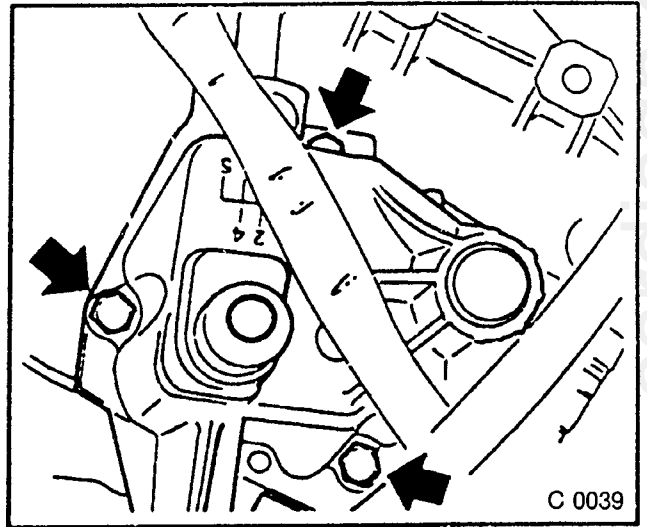


Fig. 40

INSTALL, CONNECT

1. Locking bolt for transmission ventilation.
2. Coat new hollow pin with Silicon Grease (B0400571).
3. New hollow pin (1) to cardan joint, expanding springs catch.

INSPECT

1. Transmission fluid level.

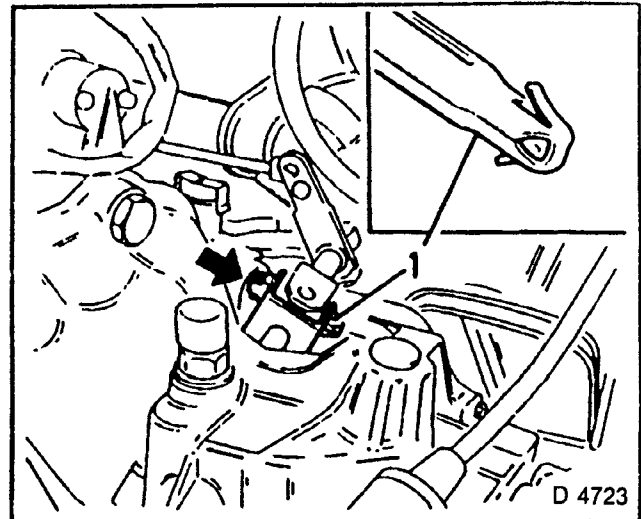


Fig. 41

SEALING OPERATIONS
ON INSTALLED
TRANSMISSION

Axle Shaft Seal Rings —
Replace

REMOVE, DISCONNECT

- 1. Both front wheels.
- 2. Swivel joints from steering knuckles — KM-507-C
If present: engine compartment cover.
If present: stabilizer fastening from control arms — (see Section E).

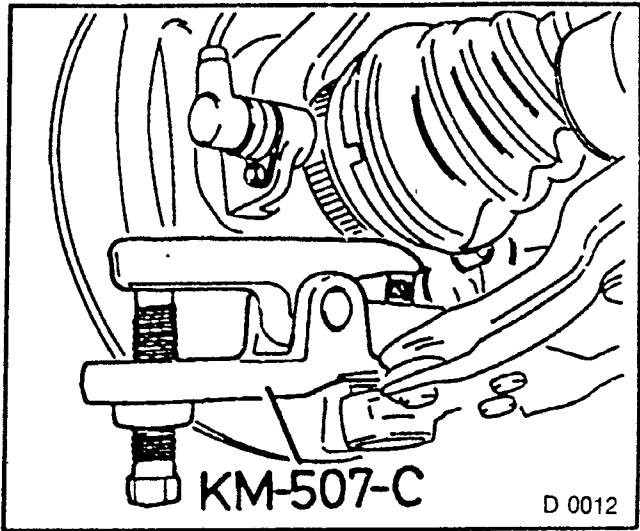


Fig. 42

REMOVE, DISCONNECT

Axle shafts from transmission.

	Left	Right
F 10, F 13	KM-460-2-A	KM-460-2-A
F 16, F 20*	KM-503-A	KM-460-2-A
F28	KM-503-A	Soft metal drift.

Chamfered side of tool points towards transmission.

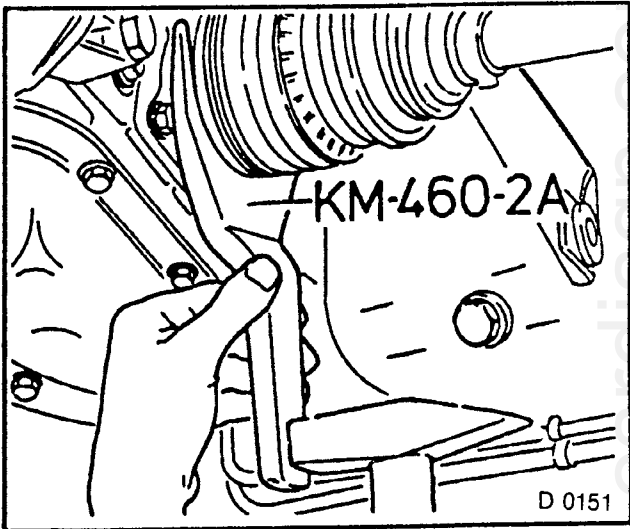


Fig. 43

NOTE:

With F 20 — left side:

- * KM-503-A (1) at differential cover (2), do not support against tapered roller bearing adjusting nut (3).

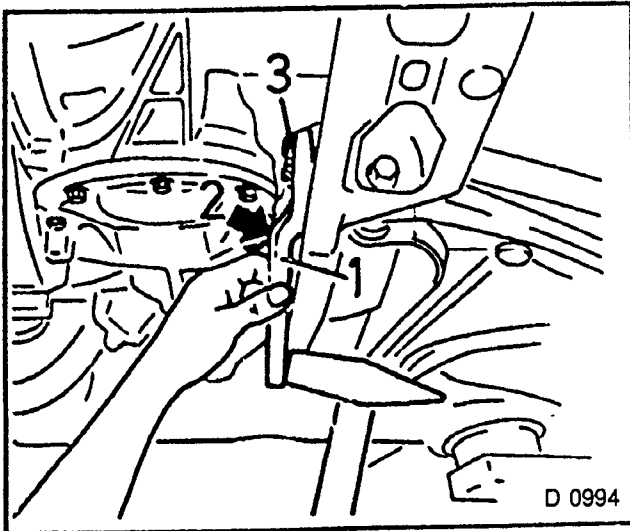


Fig. 44

WARNING:
FLUID ESCAPES. CLOSE OPENINGS.
BIND UP AXLE SHAFTS.

REMOVE, DISCONNECT

1. Seal ring
 F 16, F 20 transmission: from bearing ring/bearing flange.
 F 10, F 13 transmission: from bearing ring/transmission housing — MKM-557 (1) for each.
 F28/6 transmission — from transmission housing.

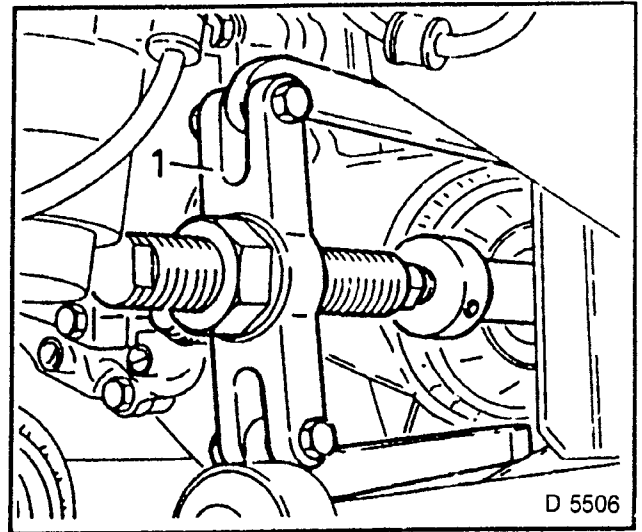


Fig 45

INSTALL, CONNECT

1. Seal rings
 F 10, F 13 transmission: in transmission housing/bearing ring, KM-446
 F 16, F 20 transmission: bearing flange/bearing ring, KM-519
 F28 transmission — from transmission housing, KM-519.
2. Drive in seal rings flush.

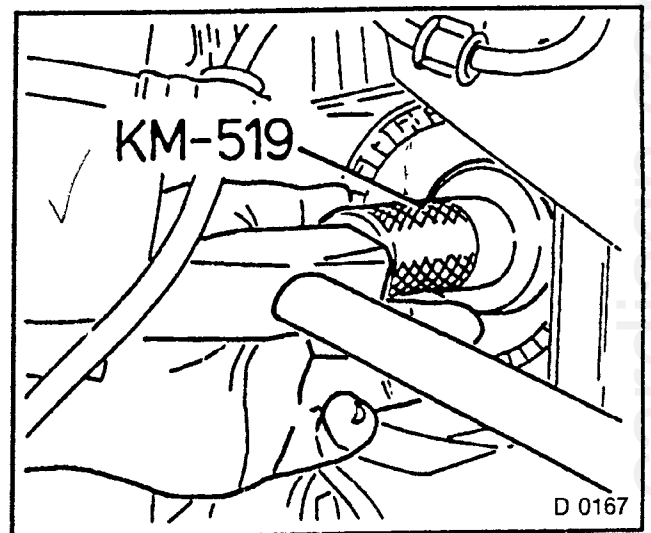


Fig. 46

INSTALL, CONNECT

1. New retaining ring (1) on axle shaft.
2. Lubricate splines with Transmission Fluid (B0400075).
3. Insert axle shaft in transmission.
4. Place square drift on welding bead of friction welding seam (2).
5. Drive in axle shaft until it engages.

INSPECT

1. Firm fit of axle shaft by pulling on joint circumference.
DO NOT pull on shaft itself.

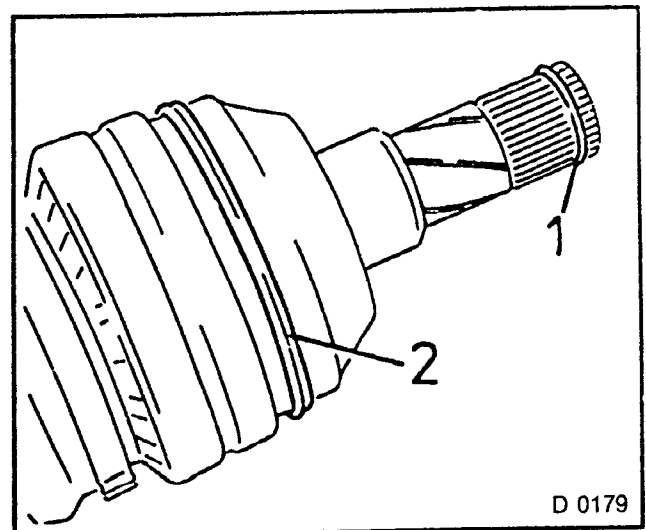


Fig. 47

TIGHTEN (TORQUE)

1. Castellated nuts to swivel joints, 70 Nm.
2. Secure with retaining spring.
3. If removed: stabilizer fastening to control arm — pretensioning measurement
 "1" = 38 to 39 mm.
 New nut, 20 Nm — see Section E.
 Wheel bolts, 110 Nm.

INSPECT

1. Transmission fluid level.
2. Install engine compartment cover.

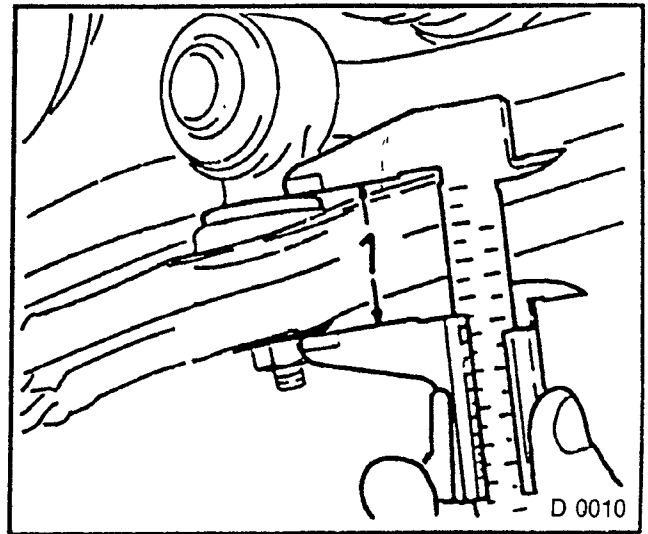


Fig 48

RUBBER O-RING FOR SPEEDOMETER HELICAL GEAR (DRIVEN) — REPLACE

REMOVE, DISCONNECT

1. Speedometer cable (1) and/or wiring harness plug for odometer frequency sensor (2).
2. Bolt for guide piece.
3. Lever guide piece out of transmission housing.
4. Rubber O-ring from groove.

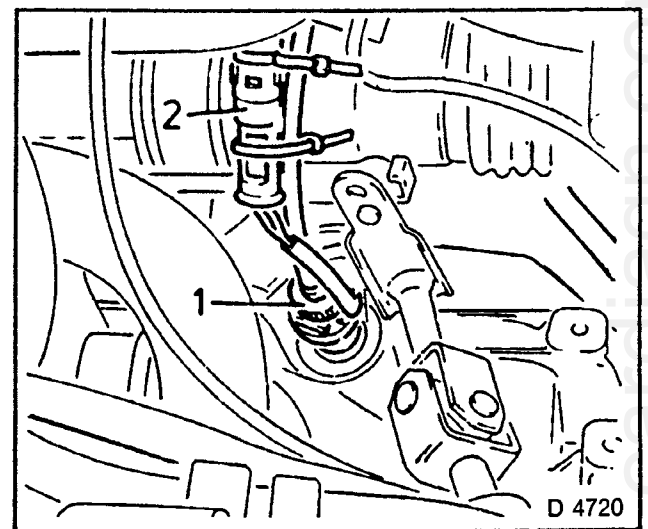


Fig. 49

INSTALL, CONNECT

1. New rubber O-ring (2) in groove (arrow).
2. Lubricate splines of speedometer helical gear with Bearing Grease (B0400852).
3. Insert guide piece (1) in transmission housing.

TIGHTEN (TORQUE)

1. Bolt (3) for guide piece (1) to transmission housing, 4 Nm.

INSTALL, CONNECT

1. Speedometer cable and/or wiring harness plug for odometer frequency sensor.

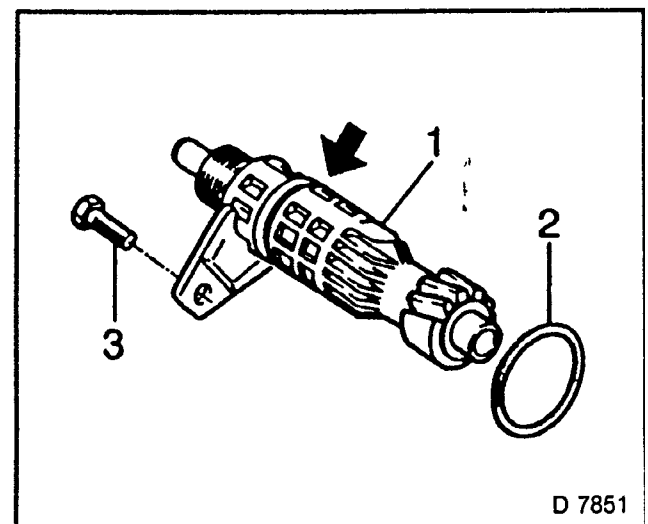


Fig. 50

Gasket for Shift Cover — Replace

See “Shift Cover, Remove and Install” page 28. (disassembly and assembly are not necessary)

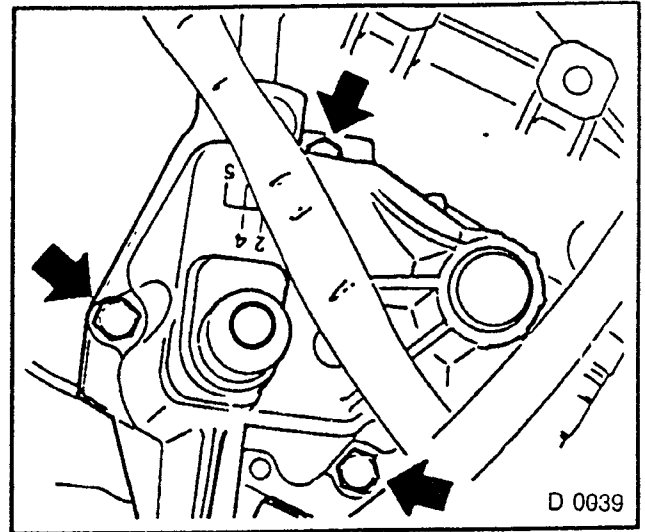


Fig 51

NOTE:

Before installation, check the play between the dowel pin and shift rod actuation.

See “Shift Cover, Assemble and Install”, page 28.

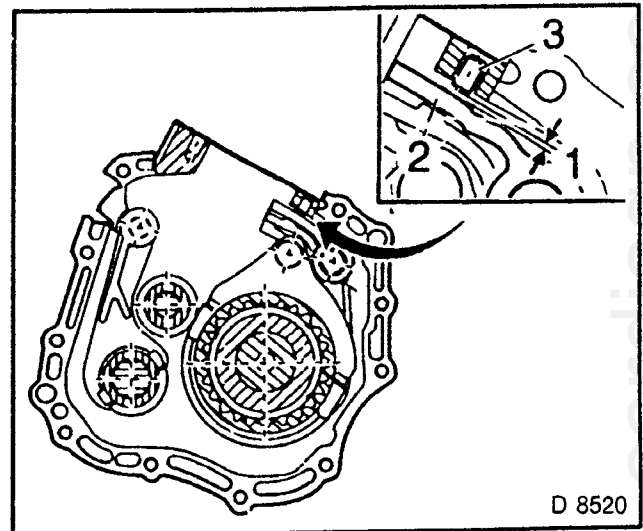


Fig 52

Gasket for End Shield — Replace

REMOVE, DISCONNECT

1. Ground cable from battery.
2. Shift cover.
3. Front left wheel.
4. Protective panelling from left wheel well.
5. See “Wing, Remove and Install” in Section A.
6. Reversing lamp switch.
7. Hold engine with KM-263-A and spring hook.
8. End shield cover from transmission.
9. Damper block from left front frame side member.
10. Engine suspension remains connected to transmission.

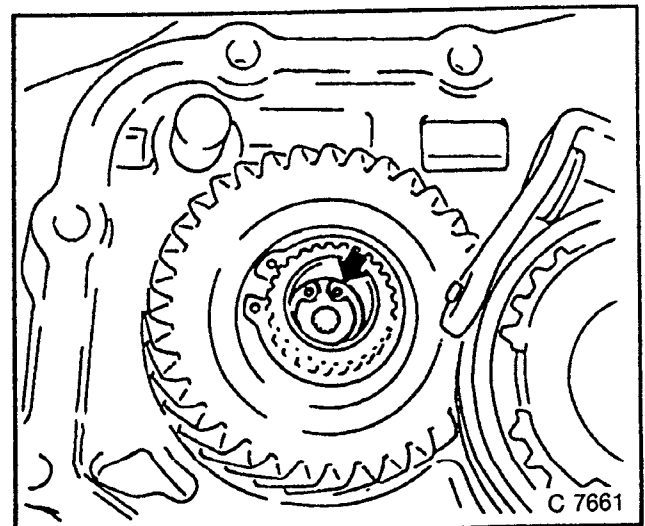


Fig 53

11. Lower engine with KM-263-A until end shield can be guided past front frame side member.
Axle shaft **must not** lie on front axle body.
12. Remove transmission drive shaft with KM-556-1-A and KM-556-4 from clutch splines and gear cluster — see “Clutch Disc and Pressure Plate, Remove and Install” Page 90.
13. End shield from transmission.

NOTE:
FLUID ESCAPES.

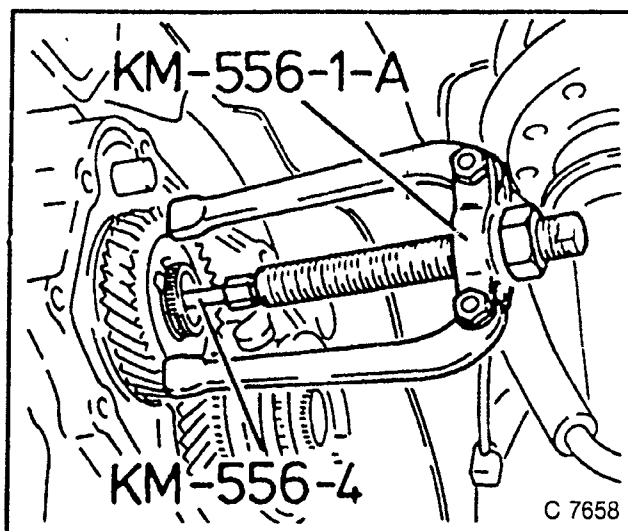


Fig. 54

ATTACH NEW GASKET TO TRANSMISSION WITH ANTI-FRICTION BEARING GREASE.

TIGHTEN (TORQUE)

1. End shield to transmission,
M 7: 15 Nm.
M 8: 20 Nm.
- Note spacing washer (axle reverse idler gear) and magnet.
2. Reversing lamp switch to transmission, 20 Nm.
 3. Press in transmission drive shaft to gear cluster and clutch splines. See “Clutch Disc and Pressure Plate, Remove and Install” Page 90.

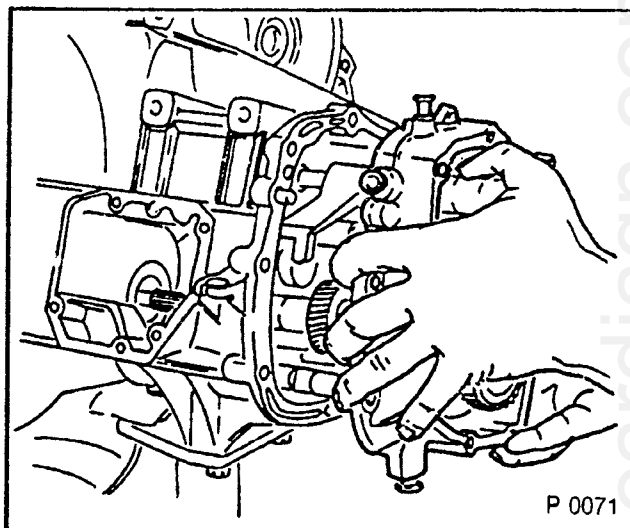


Fig. 55

4. End shield cover to transmission,
M 7 x 1.0: 15 Nm.
M 8 x 1 25:20 Nm.
5. Raise transmission with hydraulic jack.
6. Damper block with new bolts to front frame side member, 75 Nm.
7. Install protective panelling.
8. Wheel bolts, 110 Nm.

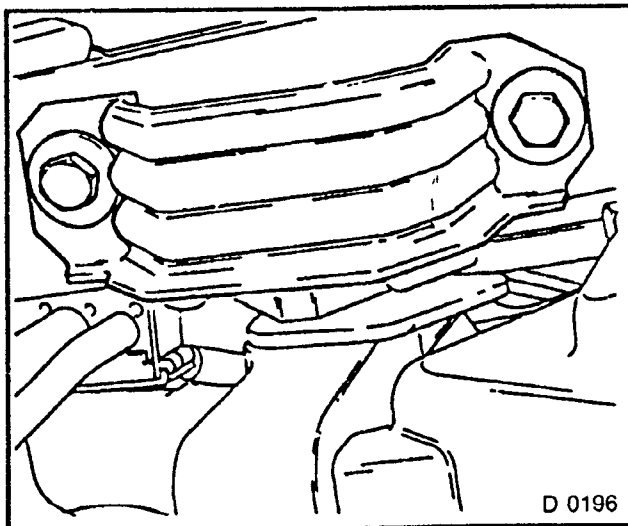


Fig. 56

Shift cover to transmission — see “Shift Cover, Assemble and Install” page 28.

NOTE:
CHECK PLAY BETWEEN DOWEL PIN
AND SHIFT ROD ACTUATION
BEFORE INSTALLATION.

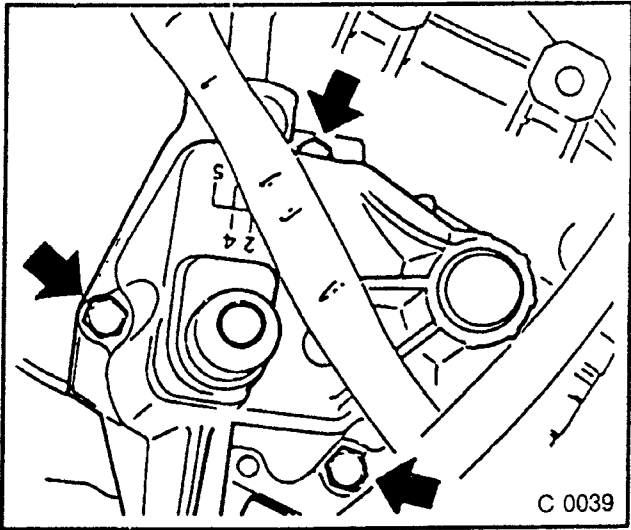


Fig. 57

INSTALL, CONNECT

- 1. Lubricate new hollow pin with Silicon Grease (B0400571).
- 2. New hollow pin (1) at cardan joint, engage expanding springs.
- 3. Remove KM-263-A.
- 4. Ground cable to battery.
- 5. Fill up with Transmission Fluid (B0400075)

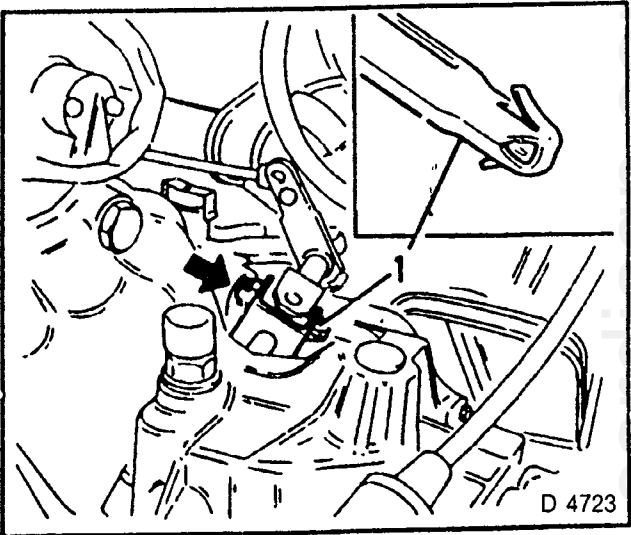


Fig. 58

Gasket for Differential Cover — Replace

REMOVE, DISCONNECT

- 1. Differential cover — fluid escapes.

CLEAN

- 2. Sealing surfaces at cover and transmission.

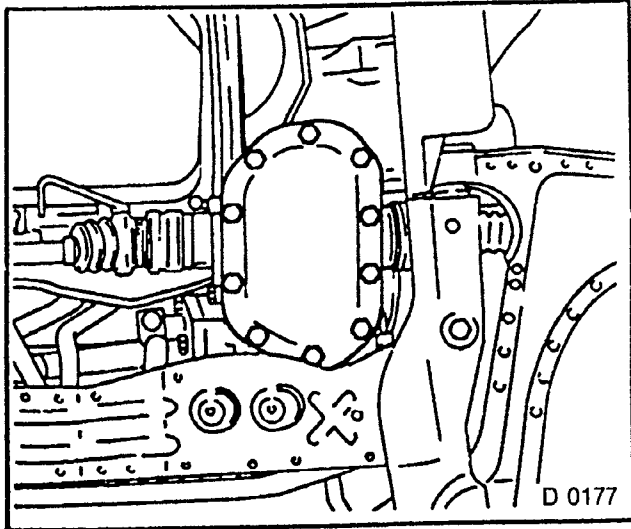


Fig. 59

3. Stick new gasket to cover with Anti-friction Bearing Grease (B0400852).

TIGHTEN (TORQUE)

Cover to transmission — Sheet metal version 30 Nm.
— Light alloy version 18 Nm.

INSPECT

Transmission fluid level.

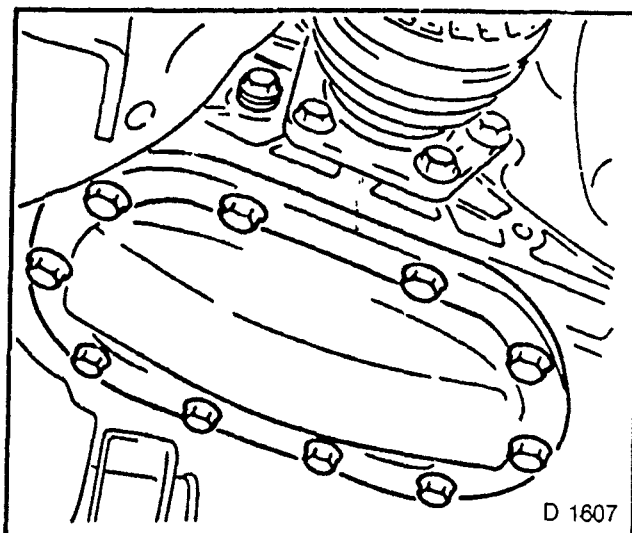


Fig 60

OPERATIONS ON MANUAL TRANS- MISSION AND DIFFERENTIAL

F 28/6 Manual Trans- mission; Switch for 1st Gear Recognition — Seal or Replace

REMOVE, DISCONNECT

1. Raise circlip.
2. Remove wiring harness plug (1).
3. Switch for 1st gear recognition (2) from manual transmission.

INSTALL, CONNECT

1. Screw in switch for 1st gear recognition (2) with Sealing Compound (Loctite 242), 20 Nm. Connect wiring harness plug (1), circlip must engage.

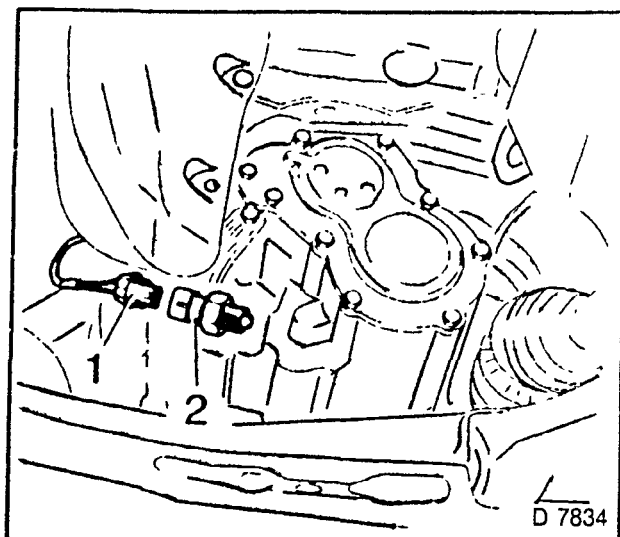


Fig 61

Reversing Lamps Switch — Seal or Replace

REMOVE, DISCONNECT

1. Raise circlip.
2. Remove wiring harness plug (1).
3. Reversing lamps switch (2) from manual transmission

INSTALL, CONNECT

1. Screw in reversing lamps switch (2) with Sealing Compound (Loctite 242).
2. Connect wiring harness plug (1), circlip must engage.

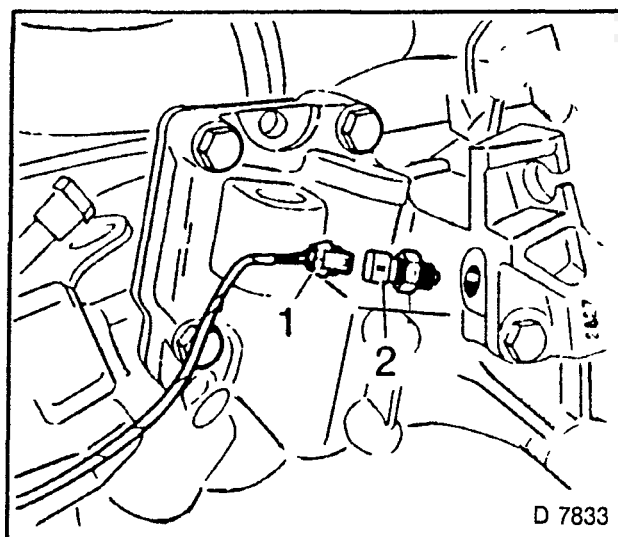


Fig. 62

Manual Transmission and Differential — Remove and Install

REMOVE, DISCONNECT

1. Ground cable from battery.
2. Loosen bolt for shift rod clamp (arrow).
3. Remove gearshift lever in 4th gear position — disconnect plug connection.

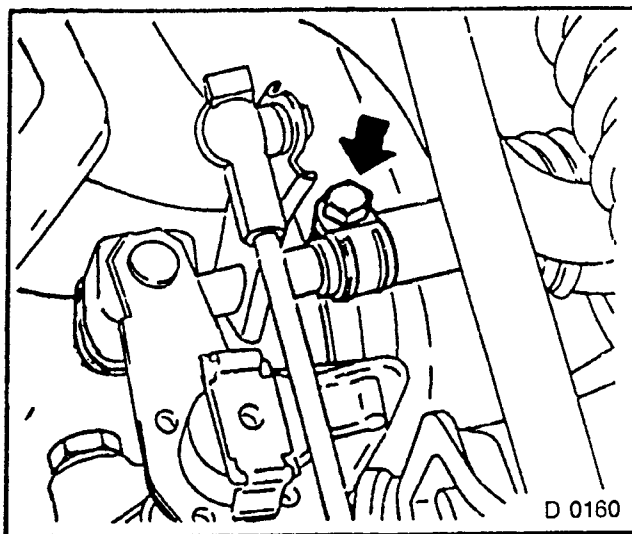


Fig. 63

Vehicles with C 20 XE engine:

1. Disconnect oxygen sensor wiring harness plug behind coolant compensation tank.
2. Retaining clamp from clutch cable.
3. Press down release lever with installing iron.
4. Clutch cable from release lever.
5. Wiring harness plug for reversing lamps.

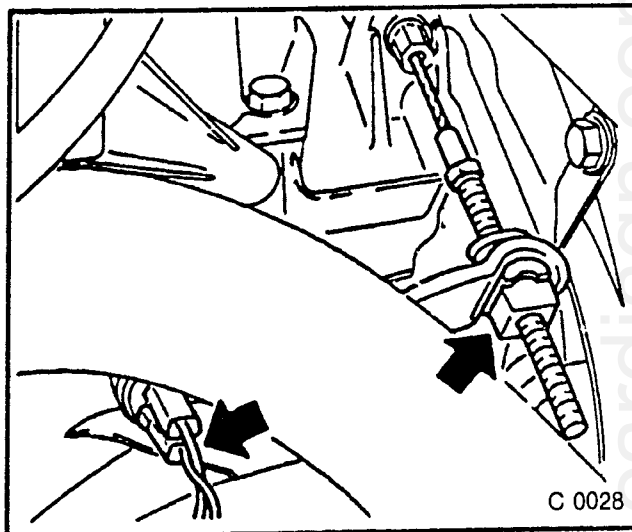


Fig. 64

REMOVE, DISCONNECT

1. Wiring harness plug from odometer frequency sensor (2) and/or speedometer cable (1) from transmission.

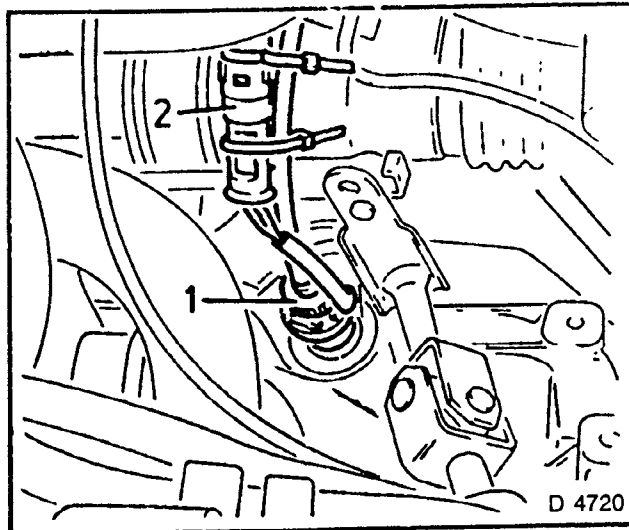


Fig. 65

2. Three upper bolts for transmission to engine.

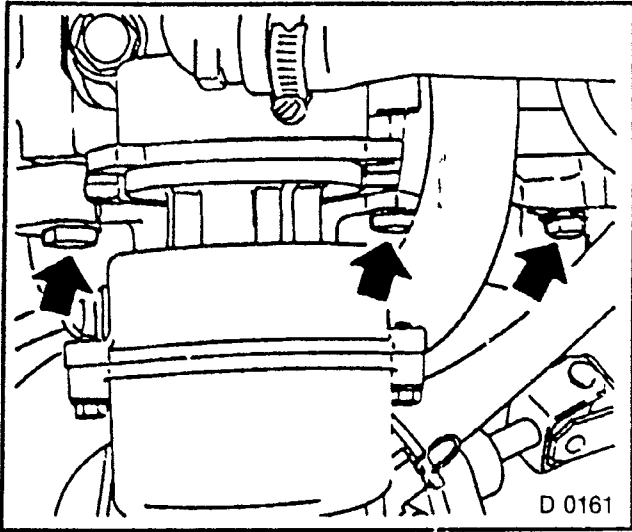


Fig 66

3. Hold engine with KM-263-A and spring hook.
4. Fasten spring hook to transport strap behind ignition distributor.

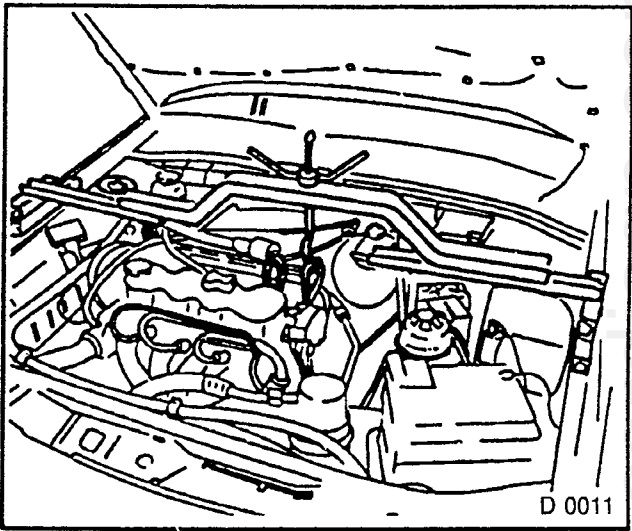


Fig 67

REMOVE, DISCONNECT

1. Both front wheels.
 2. Engine compartment cover.
 3. Front exhaust pipe with plug connection if connection flanged or jointed: Separate exhaust at flange or joint only.
- Front axle body — see Section E.

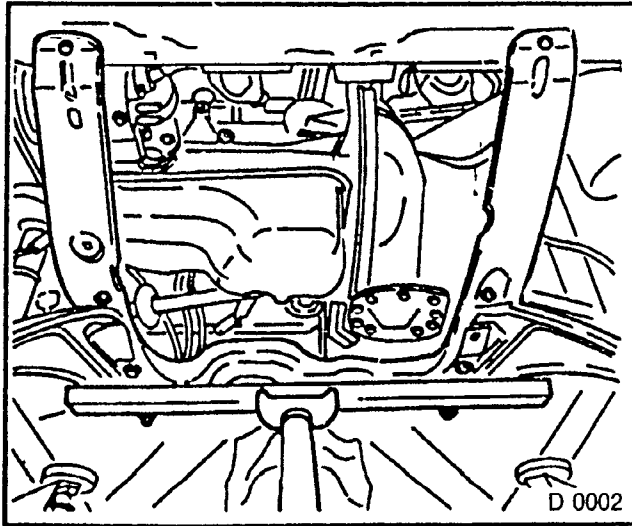


Fig. 68

REMOVE, DISCONNECT

Remove axle shafts — see operation “Axle Shaft Seal Rings, Replace”

WARNING:
FLUID ESCAPES. CLOSE
OPENINGS. TIE UP AXLE SHAFTS.

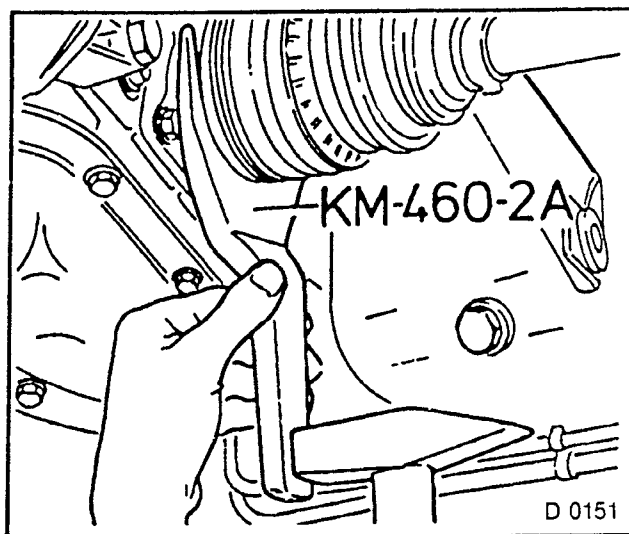


Fig. 69

REMOVE, DISCONNECT

1. Engine suspension bracket, front left.
 Vehicles with F28/6 manual transmission — Ground cable from manual transmission. Wiring harness plug from 1st gear recognition switch.
 Other transmissions — Ground cable from end shield cover.
2. Lower vehicle.
3. Lower engine by approximately 5 cm with KM-263-A.
 Release lever is located below front frame side member.

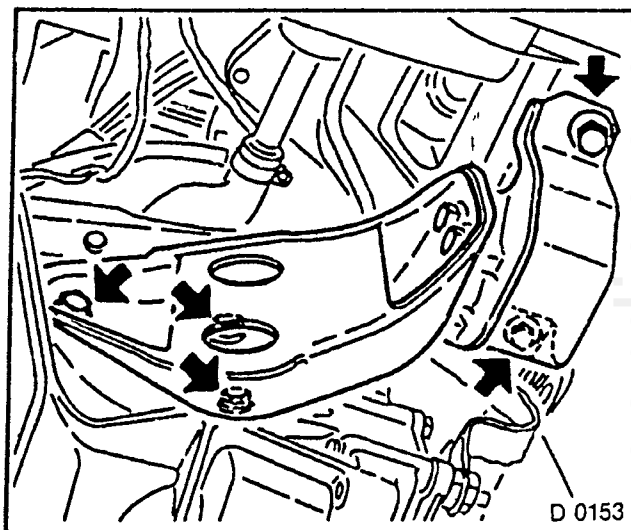


Fig. 70

4. Raise vehicle.
5. Pull transmission drive shaft out of clutch splines and gear cluster — See “Clutch Disc and Pressure Plate, Remove and Install” Page 90.
6. Bolt KM-444-B to transmission, 65 Nm.
7. Support transmission with hydraulic jack and KM-444-B.
8. Bolt two detent pins to KM-444-B.

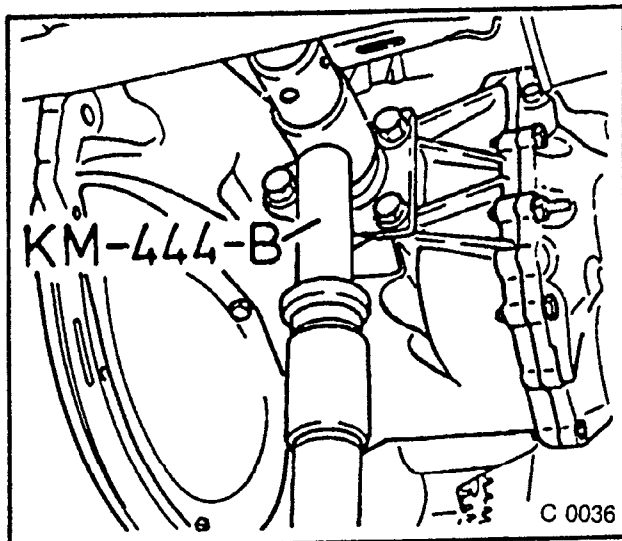


Fig. 71

REMOVE, DISCONNECT

1. Cover plate from transmission (A).
2. Transmission from engine (B).
3. Press transmission off engine block and lower.

WARNING:
WHEN LAYING ASIDE THE TRANSMISSION, DO NOT DAMAGE ATTACHING PARTS.

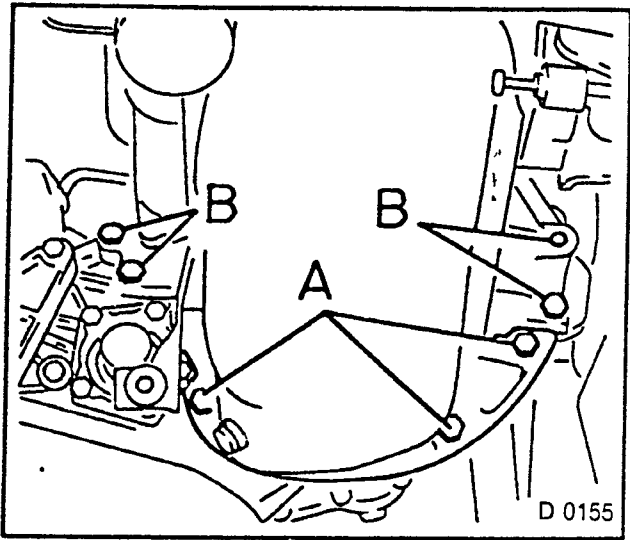


Fig. 72

INSPECT

1. Easy movement of threaded bores for damper block on left front frame side member; if necessary recut M 10 x 1.25.
2. Install transmission with KM-444-B on hydraulic jack.

3. Attach transmission to engine block.

TIGHTEN (TORQUE)

1. Transmission to engine block (B), 75 Nm.
2. Cover plate to transmission (A), 7 Nm.

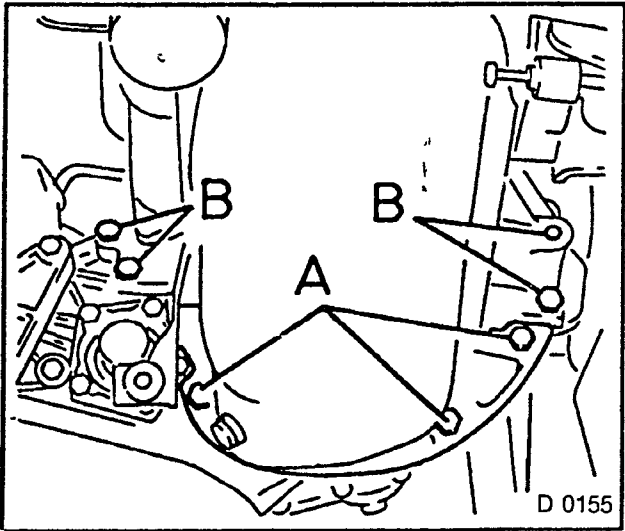


Fig. 73

3. Raise transmission until KM-564 can be applied to end shield.
4. Press in drive shaft. See "Clutch Disc and Pressure Plate, Remove and Install" Page 90.

INSTALL, CONNECT

1. Ground cable to end shield cover
F28/6 manual transmission — ground cable to manual transmission Wiring harness plug to 1st gear recognition switch.

REMOVE, DISCONNECT

1. KM-444-B.

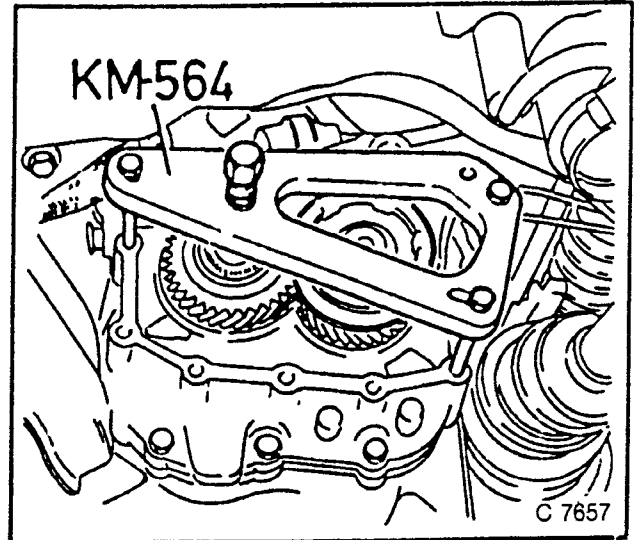


Fig. 74

2. Align transmission with hydraulic jack.

TIGHTEN (TORQUE)

1. Bolts for engine suspension to transmission, 65 Nm.
2. Two new bolts for damper block to front frame side member, 75 Nm.

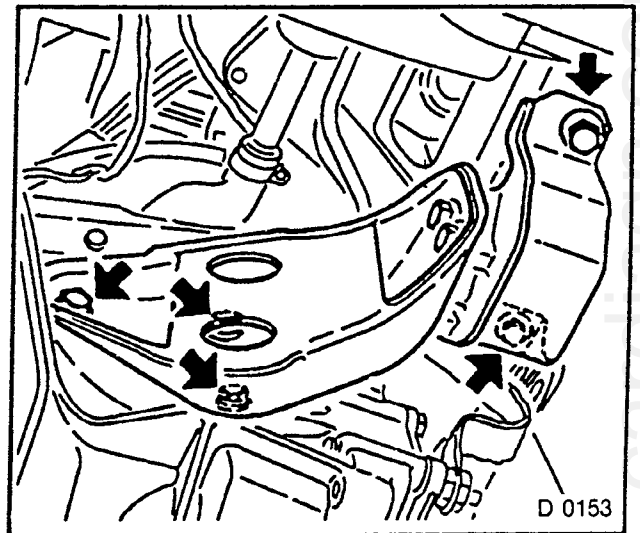


Fig. 75

INSTALL, CONNECT

1. Cable for reversing lamp switch (front side of transmission).
2. Both axle shafts — See "Axle Shaft Seal Rings, Replace" Page 30.
3. Front axle body — See Section E.

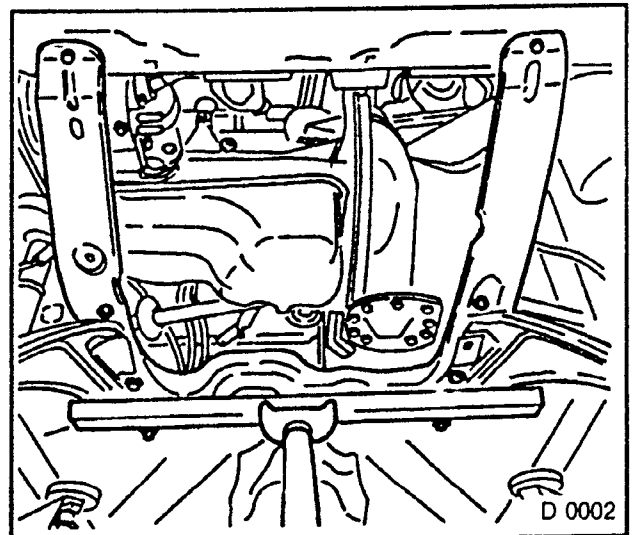


Fig. 76

4. Front exhaust pipe with plug connection.
5. Flanged or jointed connection.
Bolt exhaust with new gasket to flange/joint — see Section L.
6. Lower vehicle.

REMOVE, DISCONNECT

1. KM-263-A.

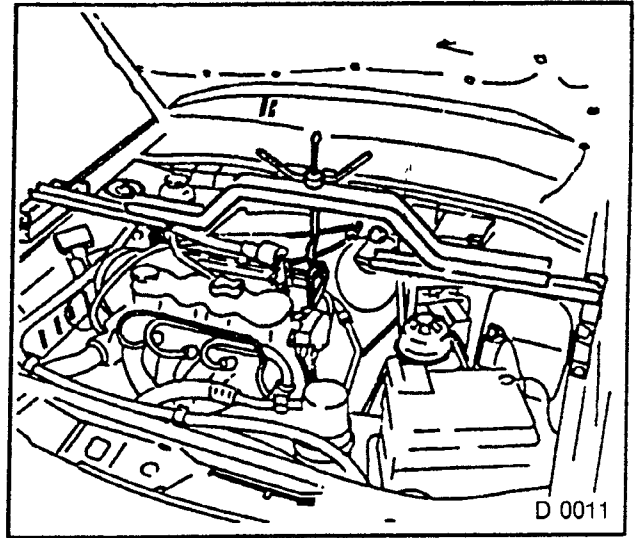


Fig. 77

TIGHTEN (TORQUE)

1. Wheel bolts, 110 Nm.
2. Transmission to engine block, 75 Nm.

INSTALL, CONNECT

1. Speedometer cable and/or wiring harness plug for odometer frequency sensor.
2. Clutch bowden cable.
3. Secure with retaining clamp.
4. Shift rod to knurled bolts of shift linkage lever. Only tighten clamp screw after adjustment.
5. Ground cable to battery.

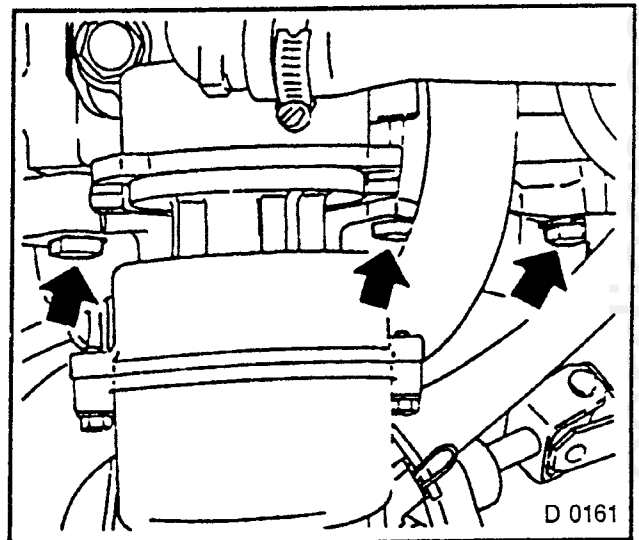


Fig. 78

INSPECT

1. Transmission fluid level

INSTALL, CONNECT

1. Engine compartment cover.

ADJUST

1. Transmission shift linkage.

Transmission Housing — Replace

Remove transmission KM-444-B (65 Nm and KM-489 to transmission;
transmission to transmission support.

DISASSEMBLE

1. Shift cover from transmission
2. End shield with main shaft and drive shaft from transmission.
3. Differential.
4. Clutch pressure bearing and clutch fork.
5. Clutch release lever and clutch pressure bearing guide.
6. Clutch cover from transmission.
7. Both bearing bushings for clutch release lever, KM-304
8. Speedometer helical gear (driven).

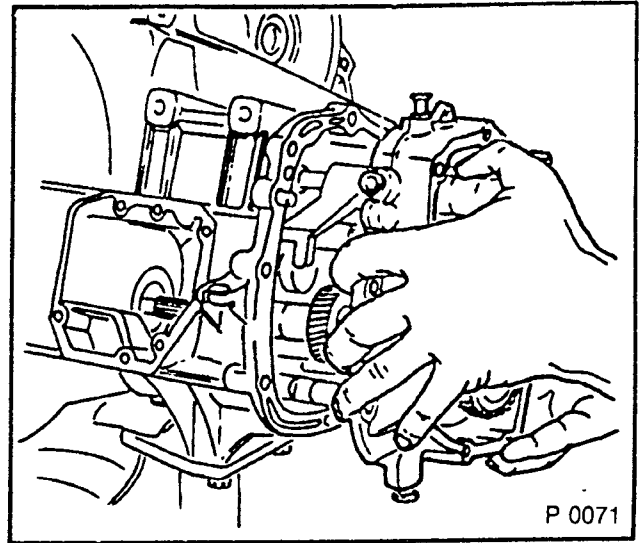


Fig. 79

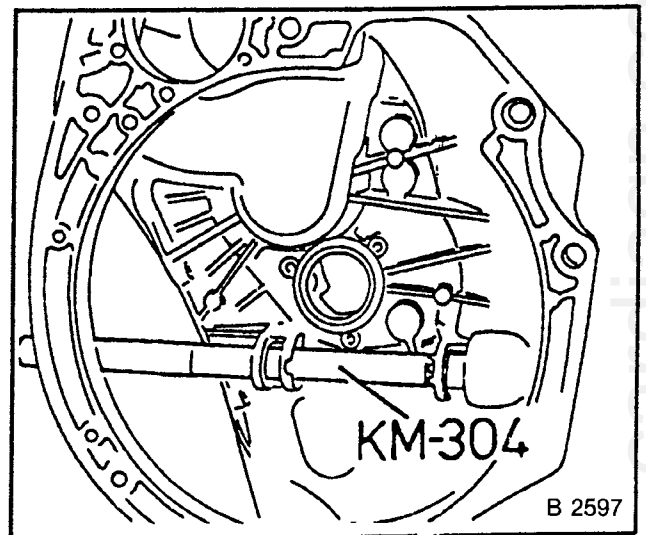


Fig. 80

F 10/F 13 MANUAL TRANSMISSION:

REMOVE, DISCONNECT

1. Needle sleeve for bearing of drive shaft, KM-454-1 and KM-454-4

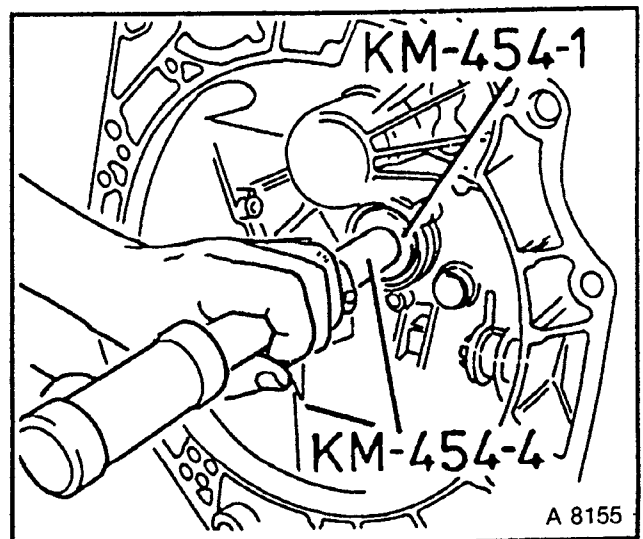


Fig. 81

INSTALL, CONNECT

- 1. Drive in needle sleeve for bearing of drive shaft flush with lettered side to transmission, KM-454-2 and KM-454-4

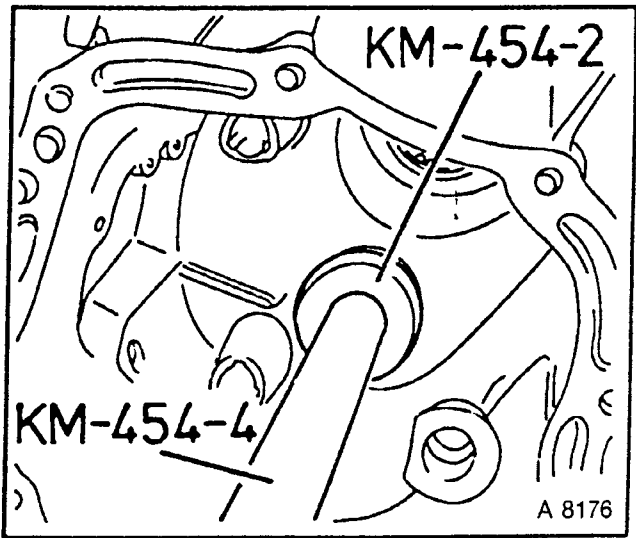


Fig 82

F 10/F 13 MANUAL TRANSMISSION:

REMOVE, DISCONNECT

- 1. Needle sleeve for bearing of main shaft, KM-556-A or Kukko Remover 21/4 with Counterhold 22-1

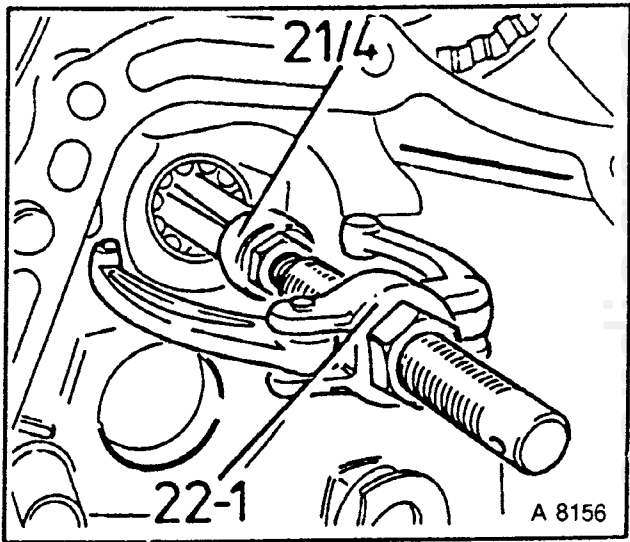


Fig. 83

INSTALL, CONNECT

- 1. Drive in needle sleeve for bearing of main shaft flush KM-454-3 and KM-454-4.

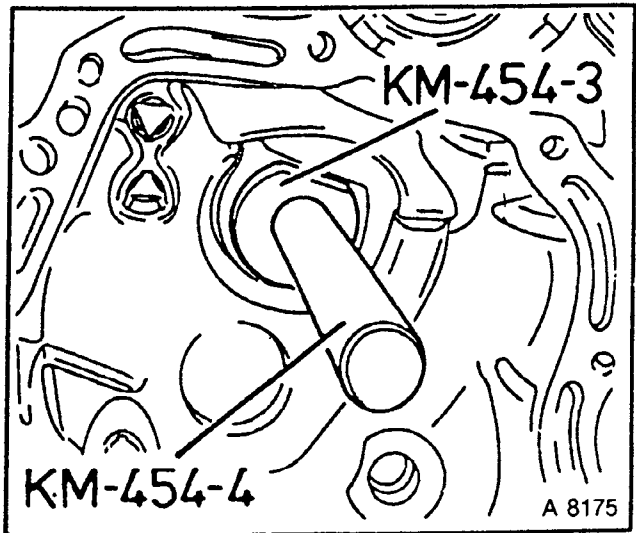


Fig. 84

F 16/F 20 MANUAL TRANSMISSION:**REMOVE, DISCONNECT**

1. Needle sleeve for bearing of drive shaft, KM-523-1 and KM-523-3.
2. Outer ring of roller bearing for main shaft, KM-J-26941 (1), KM-483 (2) and KM-313 (3)

If difficult to move, heat transmission housing with hot-air dryer.

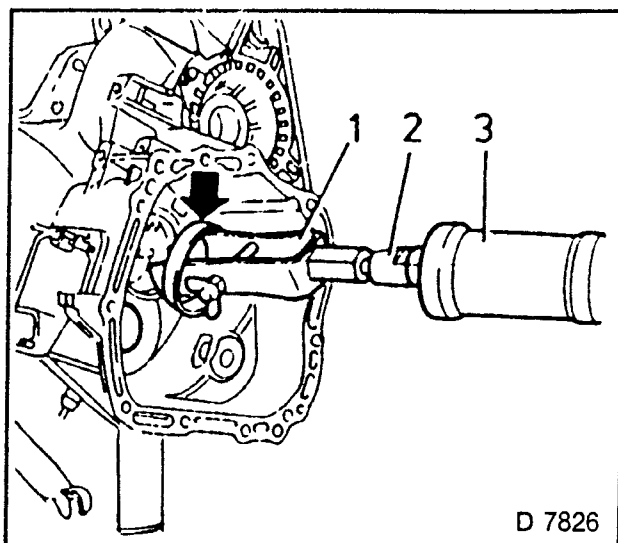


Fig. 85

INSTALL, CONNECT

1. Drive in needle sleeve for bearing of drive shaft flush with lettered side to transmission, KM-523-1 and KM-523-2.
2. Press in outer ring of roller bearing for main shaft to stop (do not drive in), KM-523-1 and KM-523-4.

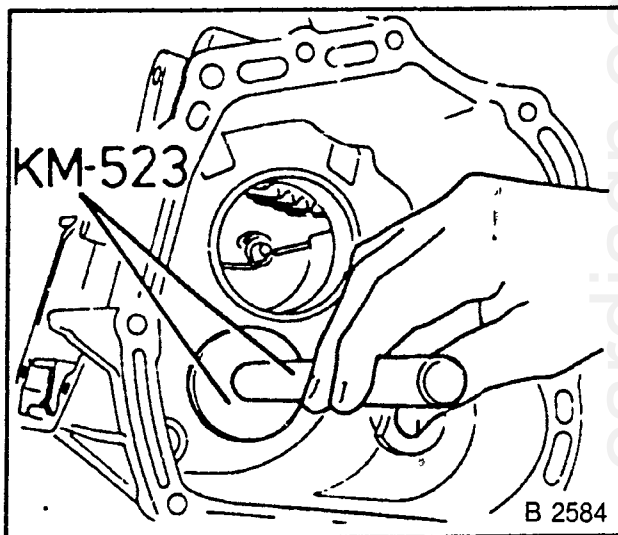


Fig. 86

TIGHTEN (TORQUE)

1. Drive in both bearing bushing for clutch release lever, KM-304.
2. Insert bushing cams in housing recesses.
3. Coat inside of bushings. Molybdenum Disulphide Paste.

Differential

See corresponding operations.

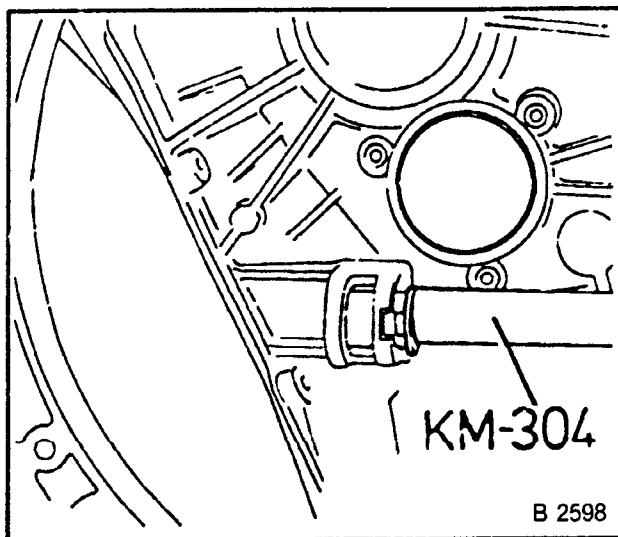


Fig 87

TIGHTEN (TORQUE)

1. End shield to transmission,
M 7: 15 Nm
M 8: 20 Nm.
2. Clutch pressure bearing guide, 5 Nm.
3. Clutch release lever to transmission.
4. Clutch fork to clutch release lever,
35 Nm.
5. Clutch pressure bearing to clutch fork.
6. Clutch closure plate to transmission:
sheet metal version, 12 Nm.
light alloy version, 6 Nm.
7. Shift cover to transmission
(measurement required).
8. Install transmission.

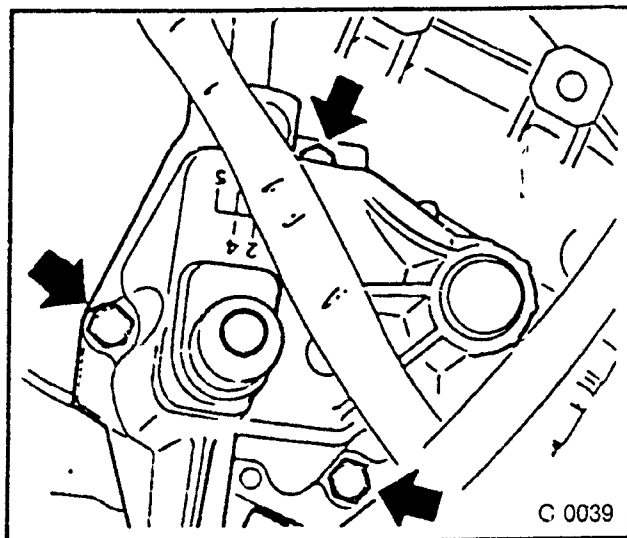


Fig. 88

**DIFFERENTIAL,
OVERHAUL**

**Differential — Remove
and Disassemble**

F 10, F 13 TRANSMISSION INSTALLED

REMOVE, DISCONNECT

- 1. Axle shafts from transmission — see “Axle Shaft Seal Rings, Replace” page 30.
- 2. Differential cover from transmission.
- 3. Mark bearing ring position in relation to transmission (arrow).

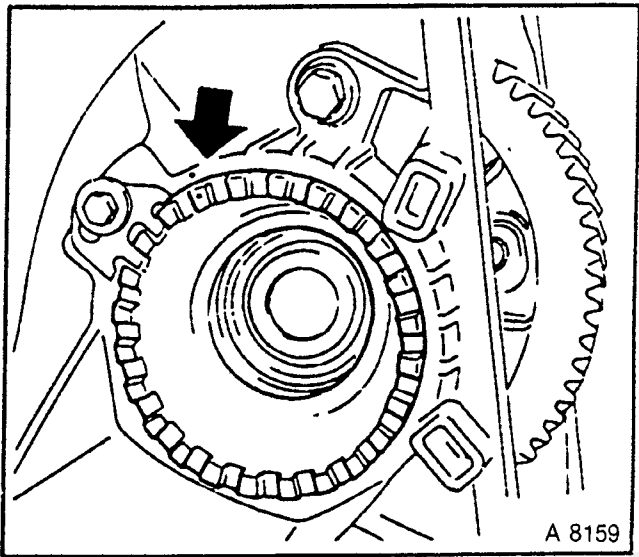


Fig. 89

INSPECT

- 1. Play of tapered roller bearings.
- 2. Move differential housing in axial direction. Allow for possible play in assembly” — see “Tapered Roller Bearing (Differential), Prescribed Adjustment” Page 58.

REMOVE, DISCONNECT

- 1. Locking plate from bearing ring.
- 2. Bearing ring, KM-447.
- 3. Differential from transmission.

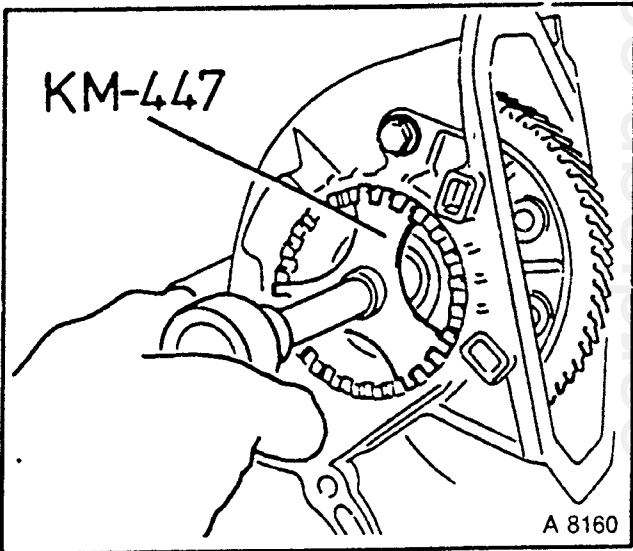


Fig. 90

REMOVE, DISCONNECT

- 1. Seal ring from bearing ring and transmission, KM-454-2 and KM-454-4.
Only necessary if bearings are replaced.
- 2. Tapered roller bearing outer race from bearing ring, KM-304 and KM-451, place KM-303 underneath.

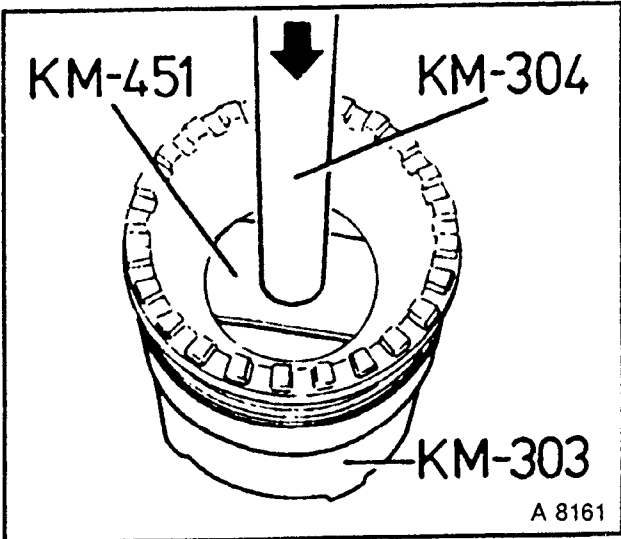


Fig. 91

Only necessary if bearings are replaced.

1. Tapered roller bearing outer race from transmission, KM-304 and KM-451.
If transmission has been removed, KM-304 and KM-451.

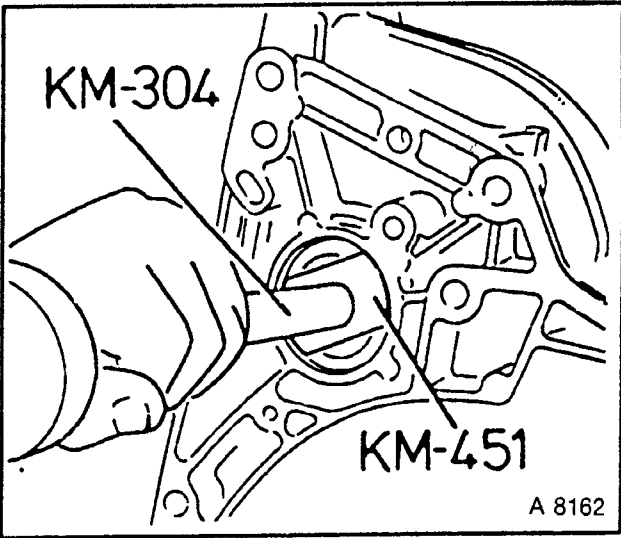


Fig. 92

Only necessary if replaced

REMOVE, DISCONNECT

1. Both tapered roller bearing inner races from differential housing, KM-161-A, KM-161-3, KM-161-4.

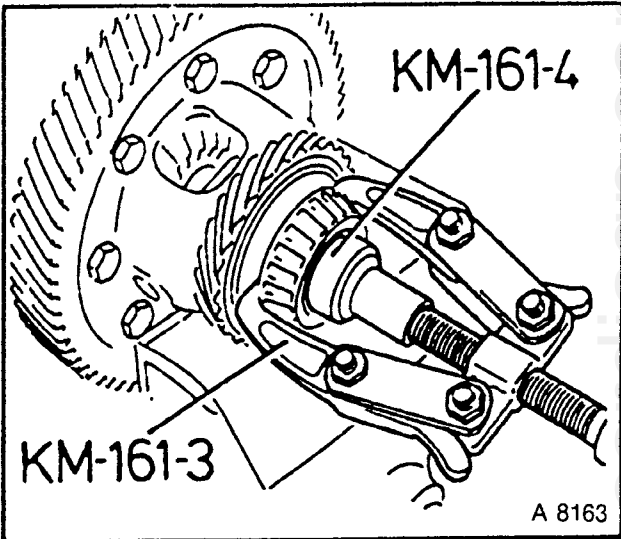


Fig. 93

2. Drive gear from differential housing.
3. Knock off drive gear, brass drift.

NOTE:
Always replace drive gears in pairs (driving and driven). Observe groove marking around tooth head circumference — see "Technical Data".

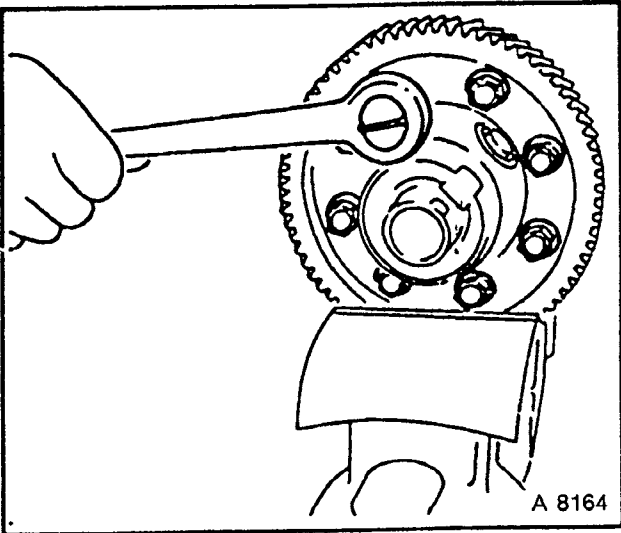


Fig. 94

Only necessary if replaced:

REMOVE, DISCONNECT

- 1 Drive off speedometer helical gear (driving) from differential housing (destroys gear).
- 2 Retaining rings from bevel gear axle.
- 3 Bevel gear axle.

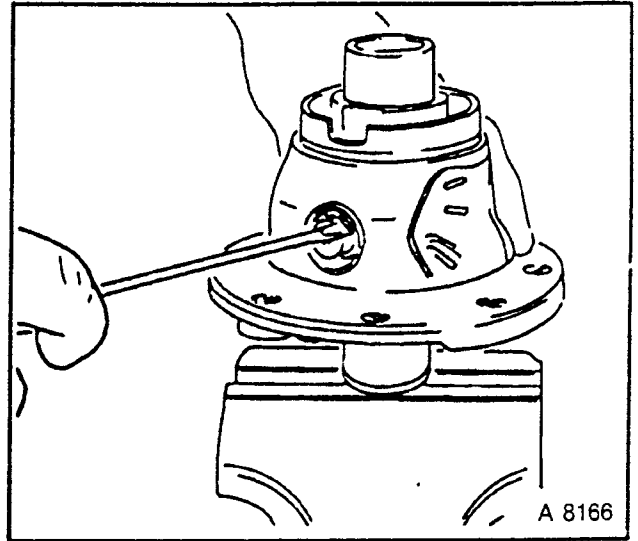


Fig 95

4. Screw out differential and axle shaft bevel gears.
5. Remove friction washers.
6. Clean removed parts.

INSPECT

1. Removed parts for wear, scuffing, damage, hairline cracks; replace if necessary.
2. Lubricate rotating parts with Transmission Fluid BO 400075 at the bearing, running, seating and pressing surfaces.

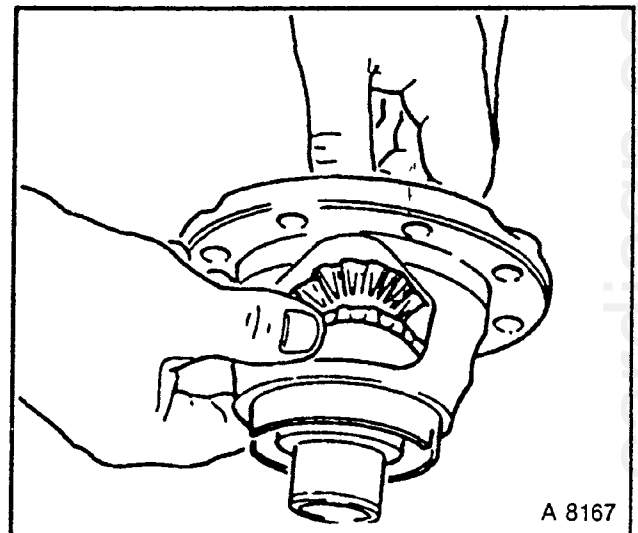


Fig 96

Differential — Remove and Disassemble

F 16 AND F 20:

Transmission installed, illustrations show removed transmission.

REMOVE, DISCONNECT

1. Axle shafts — see “Axle Shaft Seal Rings, Replace” Page 30.
2. Differential cover from transmission.
3. Mark bearing ring position relative to transmission (arrow).

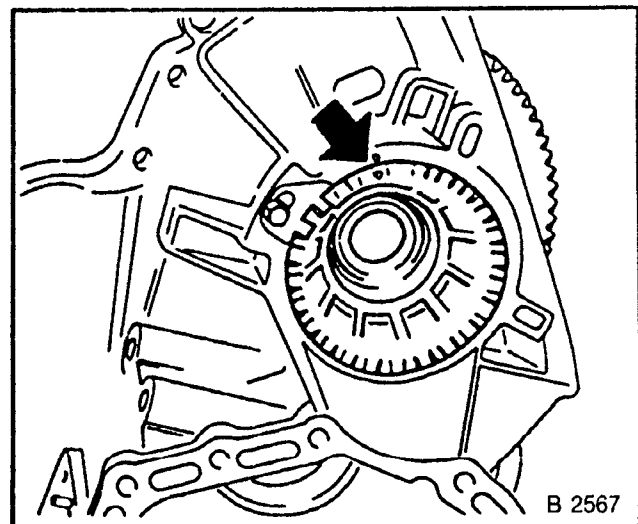


Fig. 97

INSPECT

1. Play of tapered roller bearings.
2. Move differential housing in axial direction.
3. Allow for possible play when assembling — see “Tapered Roller Bearings (Differential), Prescribed Adjustment” Page 58.

REMOVE, DISCONNECT

1. Locking plate from bearing ring.
2. Bearing ring, KM-520.

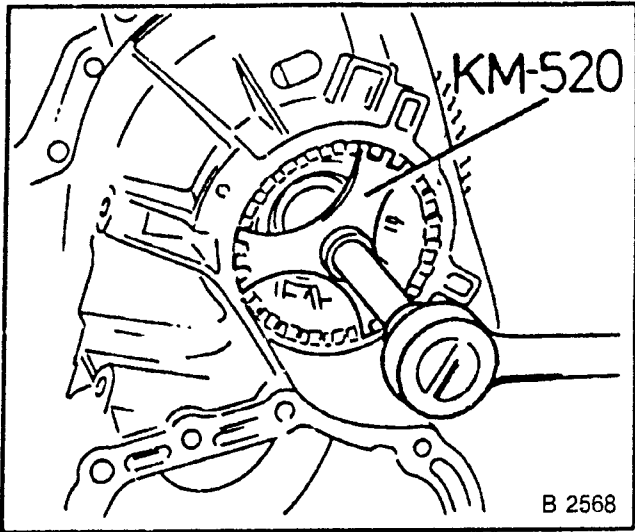


Fig. 98

REMOVE, DISCONNECT

1. Bearing flange from transmission.
2. Differential from transmission.
3. Replace rubber O-rings on bearing flange and bearing ring.

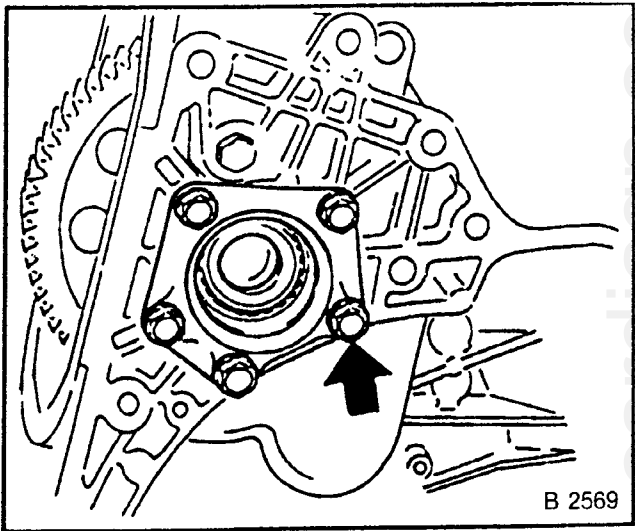


Fig. 99

4. Both seal rings from bearing flange and bearing ring, KM-466-3.
5. Place KM-466-2 underneath. Only necessary if replacement: tapered roller bearing outer races from bearing ring and bearing flange, KM-304, KM-451, place KM-502-A underneath.

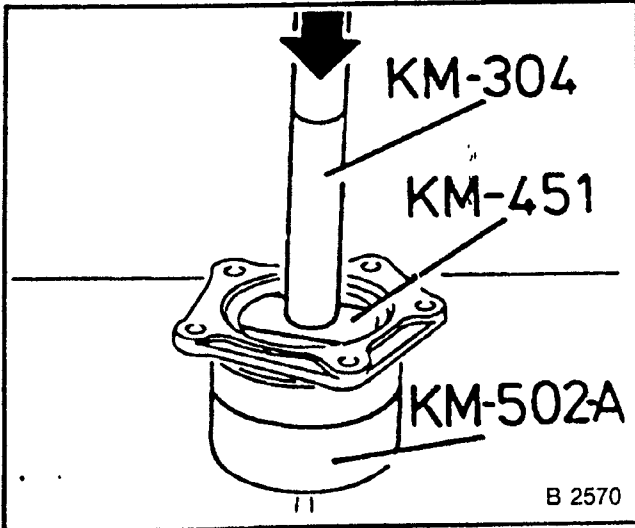


Fig. 100

Only necessary if replaced:

REMOVE, DISCONNECT

1. Both tapered roller bearing inner races, KM-161-A

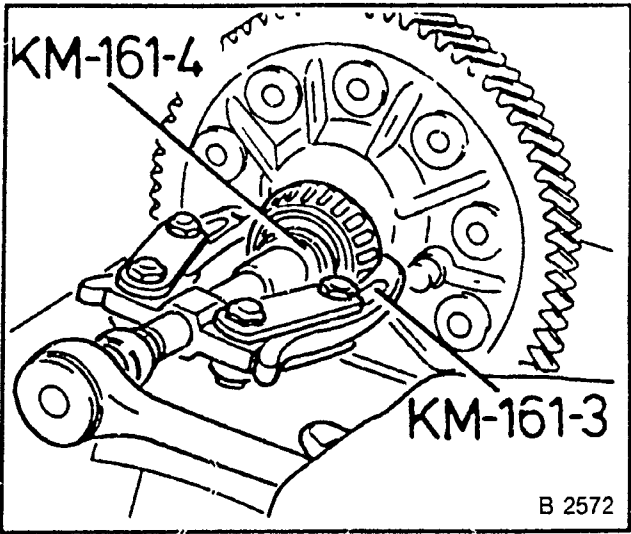


Fig 101

2. Drive off (destroy) speedometer helical gear from differential housing. At same time, correct seat of remover hooks under tapered roller bearing inner race on speedometer side.

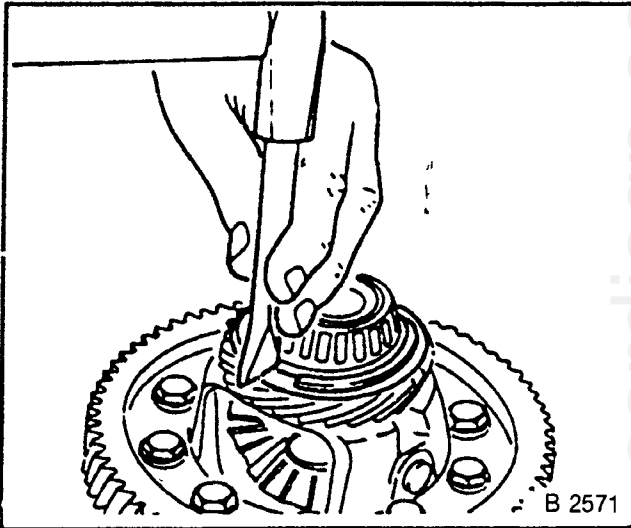


Fig 102

REMOVE, DISCONNECT

1. Drive gear (driven) from differential housing — brass drift.

NOTE:
 Always replace drive gears (driving gear with main shaft) in pairs. Note groove identification running around tooth tip — see “Technical Data” Page 263.
 Following illustrations show further disassembly without replacement of tapered roller bearing inner races.

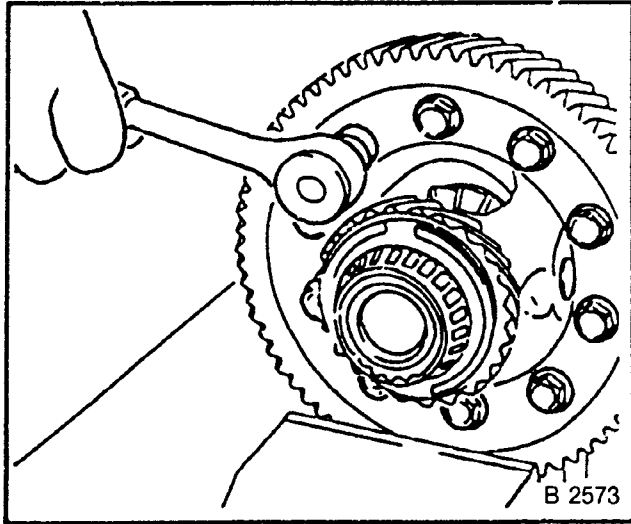


Fig 103

REMOVE, DISCONNECT

1. Drive out pin for securing bevel gear axle.
2. Bevel gear axle from differential housing.

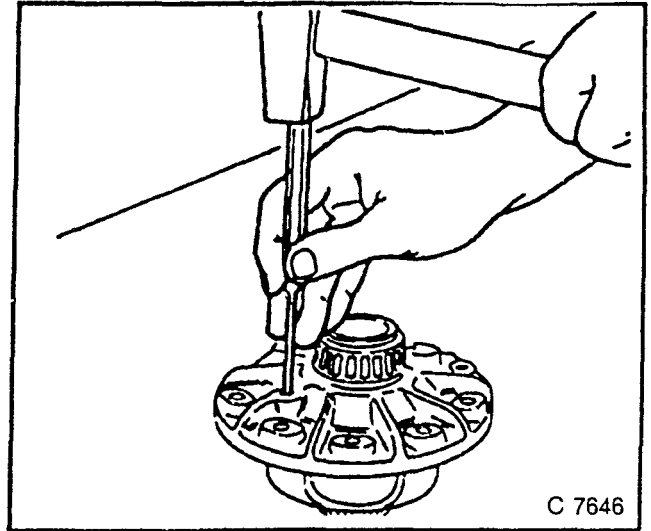


Fig. 104

REMOVE, DISCONNECT

1. Differential and axle shaft bevel gears from differential housing.
Belleville spring washers and flat friction washers from bevel gears.
On F 20, belleville spring washers from axle shaft gears, as well.

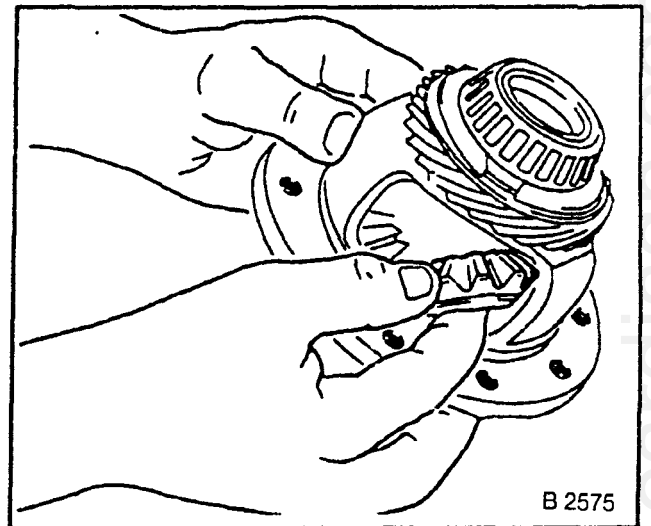


Fig 105

CLEAN

1. Removed parts, differential housing.

INSPECT

1. Removed parts for wear, scuffing, damage, hairline cracks; replace if necessary.
2. Lubricate rotating parts with Transmission Fluid (B0400075) at their bearing, running, seating and pressing surfaces.

Differential — Assemble and Install

F 10, F 13:

INSTALL, CONNECT

1. Axle shaft gears and differential bevel gears, belleville spring washers and bevel gear axle in differential housing.
2. Pre-install differential bevel gears and belleville spring washers, KM-456.
3. Install axle shaft bevel gears and belleville spring washers in differential housing.

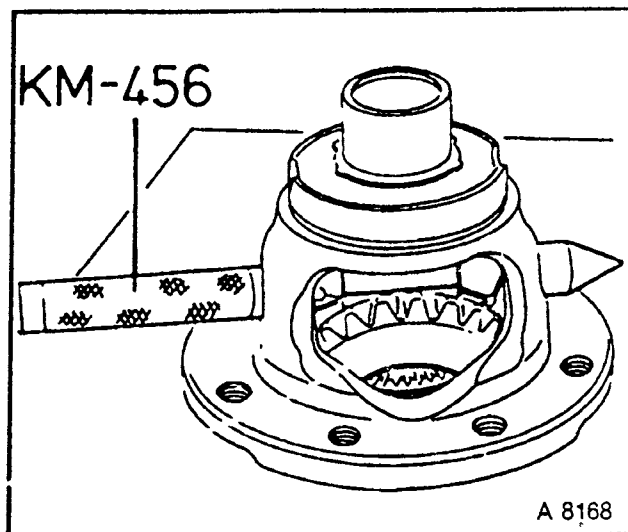


Fig 106

4. Tension differential housing in vice, KM-458-A.
5. Bevel gear axle.
6. New retaining rings (grip set 12, commercially available).
7. New speedometer helical gear to differential housing, KM-459.
8. Heat speedometer helical gear and KM-459 to 80°C/176°F (water bath, suitable temperature gauge)
9. Gear cams must align with recesses in housing.
10. Grease splines: Anti-friction Bearing Grease (B0400852).

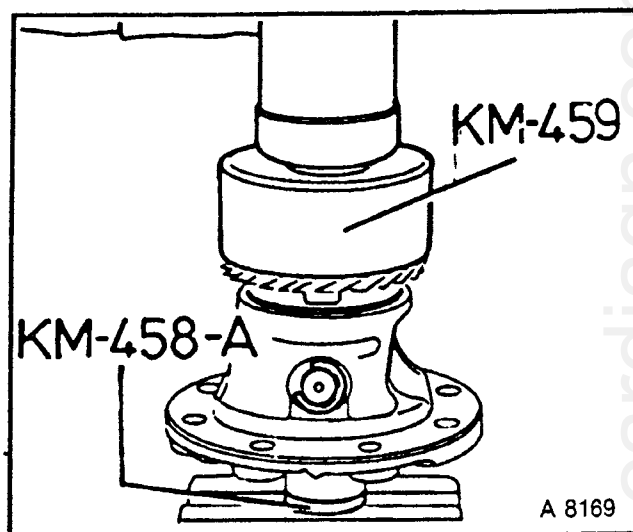


Fig 107

TORQUE — ANGLE METHOD

1. Drive gear with new bolts to differential housing, 70 Nm plus 30° to 45°.
2. Heat drive gear to 80°C/176°F (check temperature with thermocolour pencils, if available, or suitable temperature gauge).

NOTE:

Always replace drive gears (driving and driven) in pairs. Observe circular grooved identification — Technical Data. Press tapered roller bearing inner races onto differential housing, KM-453.

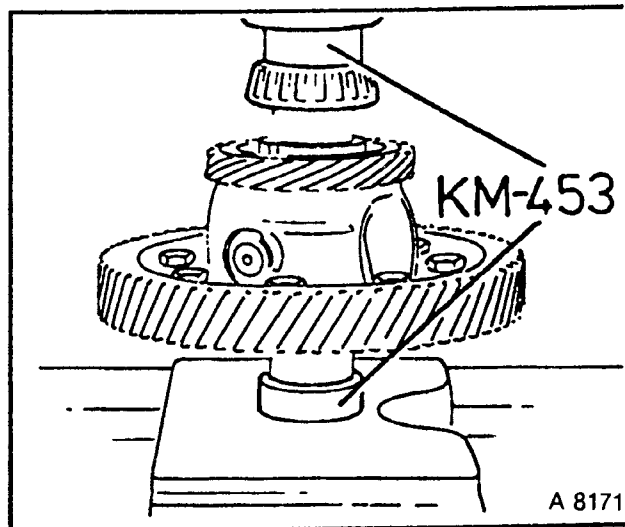


Fig 108

INSTALL, CONNECT

1. Each tapered roller bearing outer race in transmission or bearing ring, KM-120-2 and KM-451 (transmission installed).
2. Tap tapered roller bearing outer race lightly into housing.
3. With transmission removed: KM-304 and KM-451 may be used for both sides.

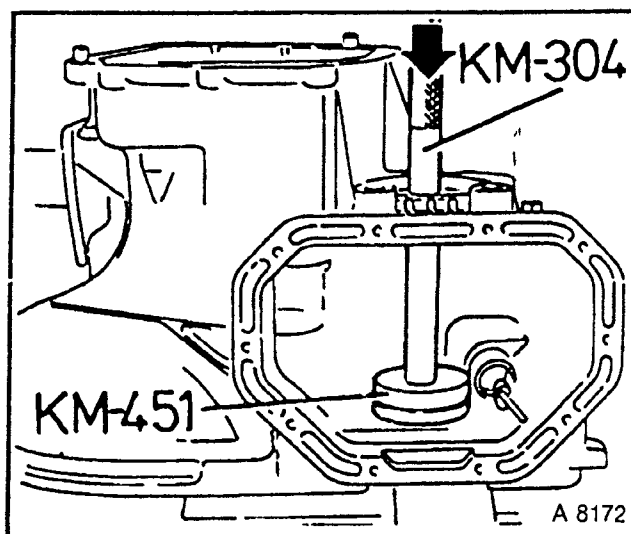


Fig. 109

INSTALL, CONNECT

1. Drive in new axle shaft seal rings flush in bearing ring or transmission, KM-446. Dust lip points outwards.
2. Fill sealing lips with Multipurpose Grease.
3. Differential in transmission.
4. Bearing ring in housing, KM-447.
5. Multipurpose Grease (B0400852) on thread and rubber O-seal ring; joint must be leakproof.
6. Tapered roller bearing prescribed adjustment (differential).
7. Axle shafts in transmission — see "Axle Shaft Seal Rings, Replace" Page 30.
8. Check transmission fluid level

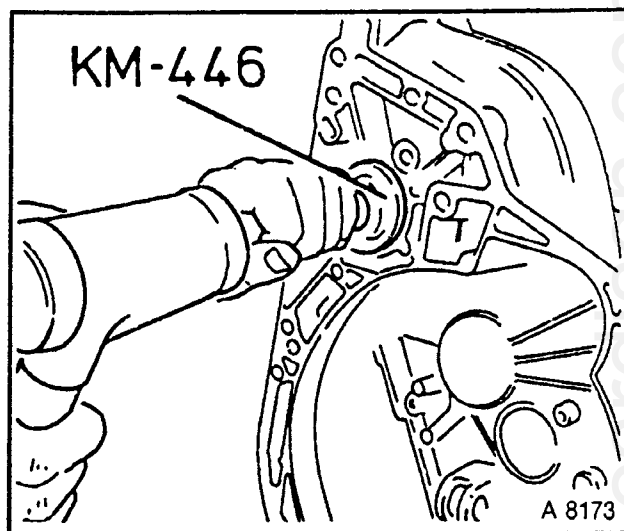


Fig. 110

Differential — Assemble and Install

F16, F20

ASSEMBLE

F 16:

1. Axle shaft and differential bevel gears, belleville spring washers or flat friction washers and bevel gear axle in differential housing.
2. Centre differential bevel gears and friction washers — KM-160-4.

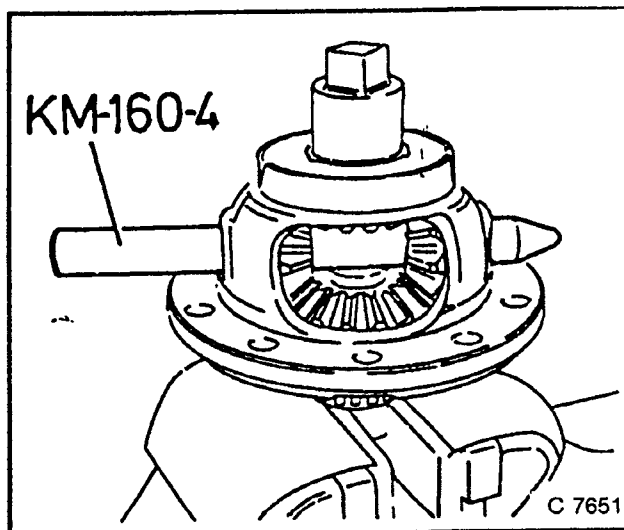


Fig. 111

ASSEMBLE

F20:

- 1 Clamp differential housing in vice with soft protective jaws.
- 2 Re-finish lateral inner edges of installation aperture using a round file, to assist in the installation of friction washers.
- 3 Grind an open ended wrench, size 13, to narrow it on both sides, in order to be able to release pre-tension of the axle shaft gears after installing differential gears.

INSTALL, CONNECT

- 1 Axle shaft gears with Belleville spring washers and friction washers, differential gears with friction washers in differential housing.
- 2 Insert axle shaft gears, pre-tension using KM-670 until differential gears can be inserted with friction washers in splines and screwed in.

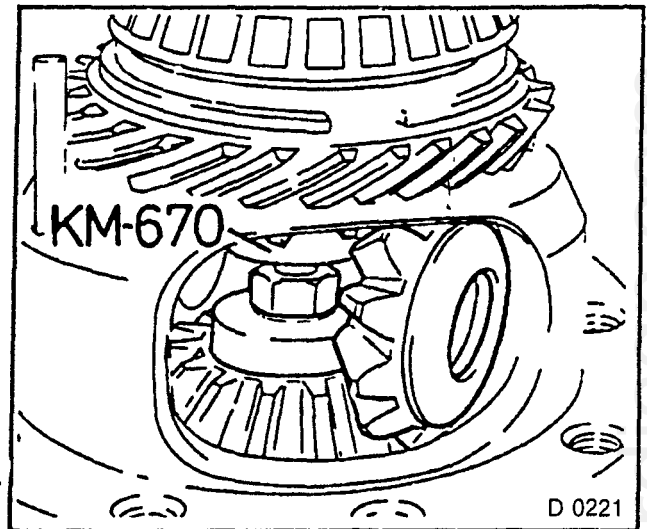


Fig. 112

REMOVE, DISCONNECT

- 1 KM-670 — with narrow-ground open ended wrench size 13.
- 2 Centre differential bevel gears and friction washers, KM-160-4.

INSTALL, CONNECT

- 1 Bevel gear axle — **DO NOT** yet pin.

ADJUST

- 1 Pre-tensioning of axle shaft gears.
- 2 Measure complete spin torque for installation without play (no play in tooth profile) — KM-J-28544, MKM-536.
- 3 Select friction washers of axle shaft gears so that spin torque is 8 to 15 Nm.

Available washer thicknesses: 0.82 mm, 0.88 mm, 0.92 mm.

- 4 After adjustment, pin bevel gear axle and secure by corner — punch on edge of bore hole.

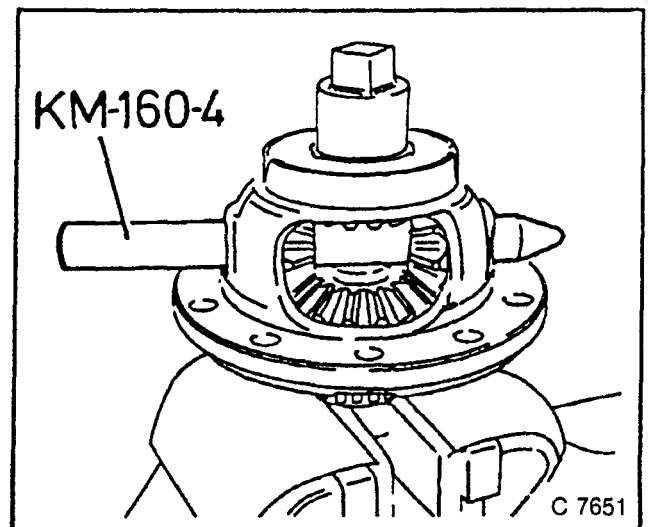


Fig. 113

F 16 AND F 20**INSTALL, CONNECT**

1. Tension differential housing in vice, KM-524-A.
2. New speedometer helical gear (driving) on differential housing, KM-525.
3. Heat helical gear and KM-525 to approximately 80°C/176°F (water bath, suitable temperature gauge).
4. Cams of helical gear must align with recesses in housing.
5. Grease splines: Anti-friction Bearing Grease (B0400852).

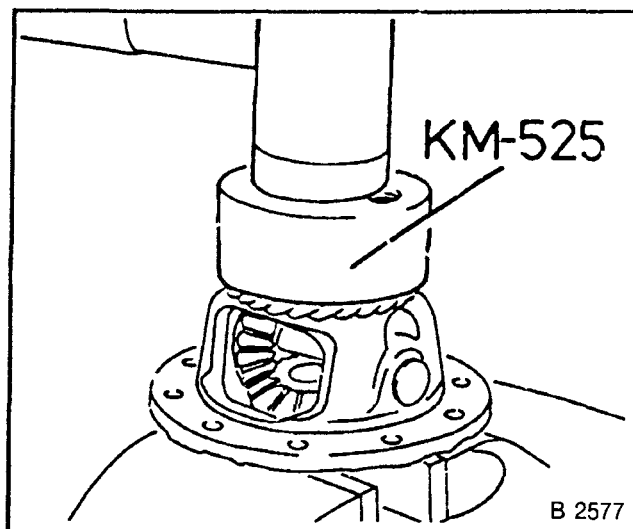


Fig. 114

TORQUE — ANGLE METHOD

1. Drive gear with new bolts to differential housing, 70 Nm plus 30° to 45°.
2. Heat drive gear to 80°C/176°F (check temperature with thermocolour pencils, if available or suitable temperature gauge).

NOTE:

1. Always replace drive gear (driving drive gear and main shaft) in pairs.
2. Observe circular grooved identification — Technical Data.
3. Both tapered roller bearing inner rings to differential housing. KM-522 (x2).

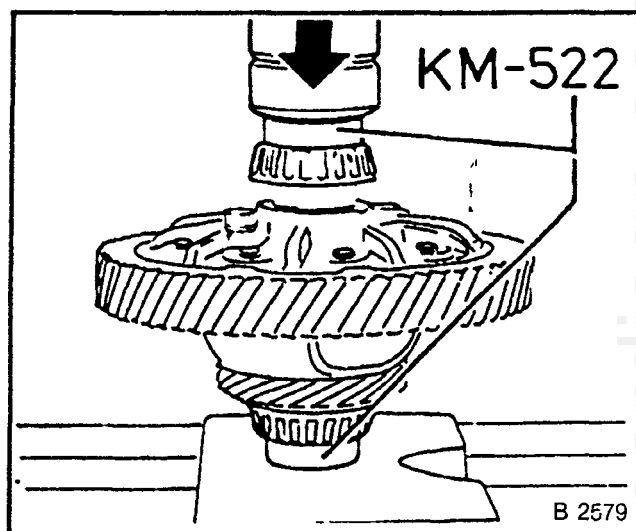


Fig 115

INSTALL, CONNECT

- 1. Each tapered roller bearing outer race in bearing flange or bearing ring, KM-305, KM-451.
- 2. Drive in seal rings for axle shafts onto bearing ring or bearing flange flush — KM-519; dust lip points inwards; coat sealing lips with Multipurpose Grease (B0400852).
- 3. Differential in transmission (second mechanic).

TIGHTEN (TORQUE)

- 1. Bearing flange to transmission, 25 Nm.

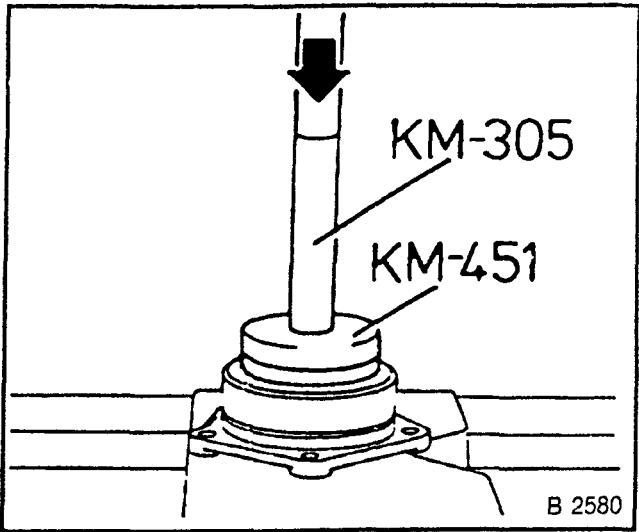


Fig. 116

INSTALL, CONNECT

- 1. Bearing ring on transmission, KM-520.
- 2. Differential tapered roller bearing prescribed adjustment.
- 3. Multipurpose Grease (B0400852) on thread and rubber O-seal rings; joint must be leakproof.
- 4. Axle shafts — see “Axle Shaft Seal Rings, Replace”.
- 5. Check transmission fluid level.

Tapered Roller Bearing (Differential) — Prescribed Adjustment

ADJUST

- 1. Bearing pre-tensioning by screwing in bearing ring.
At checking speed of one revolution per second keep to specified spin torques.

F 10, F 13: Torsiometer MKM-536 with KM-455 (see “Special Tools”)
F 16, F 20: Torsiometer MKM-536 with KM-J-28544 (see “Special Tools”)

Repair case	Transmission removed Spin torque (Ncm)	Transmission installed Spin torque (Ncm)
1). Adjustment after marking (without axial play) Reuse of all parts removed	Place bearing ring at position marked	Place bearing ring at position marked
2). Adjustment after marking (with axial play) Reuse of all parts removed	60 to 100	Total spin torque plus 80*
3) Reuse of bearings Replacement of bearing ring, bearing flange, differential or transmission housing	60 to 100	60 to 100
4) Bearing as new part	150 to 210	150 to 210

* In repair case 2) with transmission installed; place bearing ring at position marked, measure total spin torque (with transmission gear set) and then adjust to value given.
In all other repair cases, carry out measurement without transmission gear set (end shield removed).

TIGHTEN (TORQUE)

- 1. Bolts for locking plate of bearing ring to transmission housing, 9 Nm.

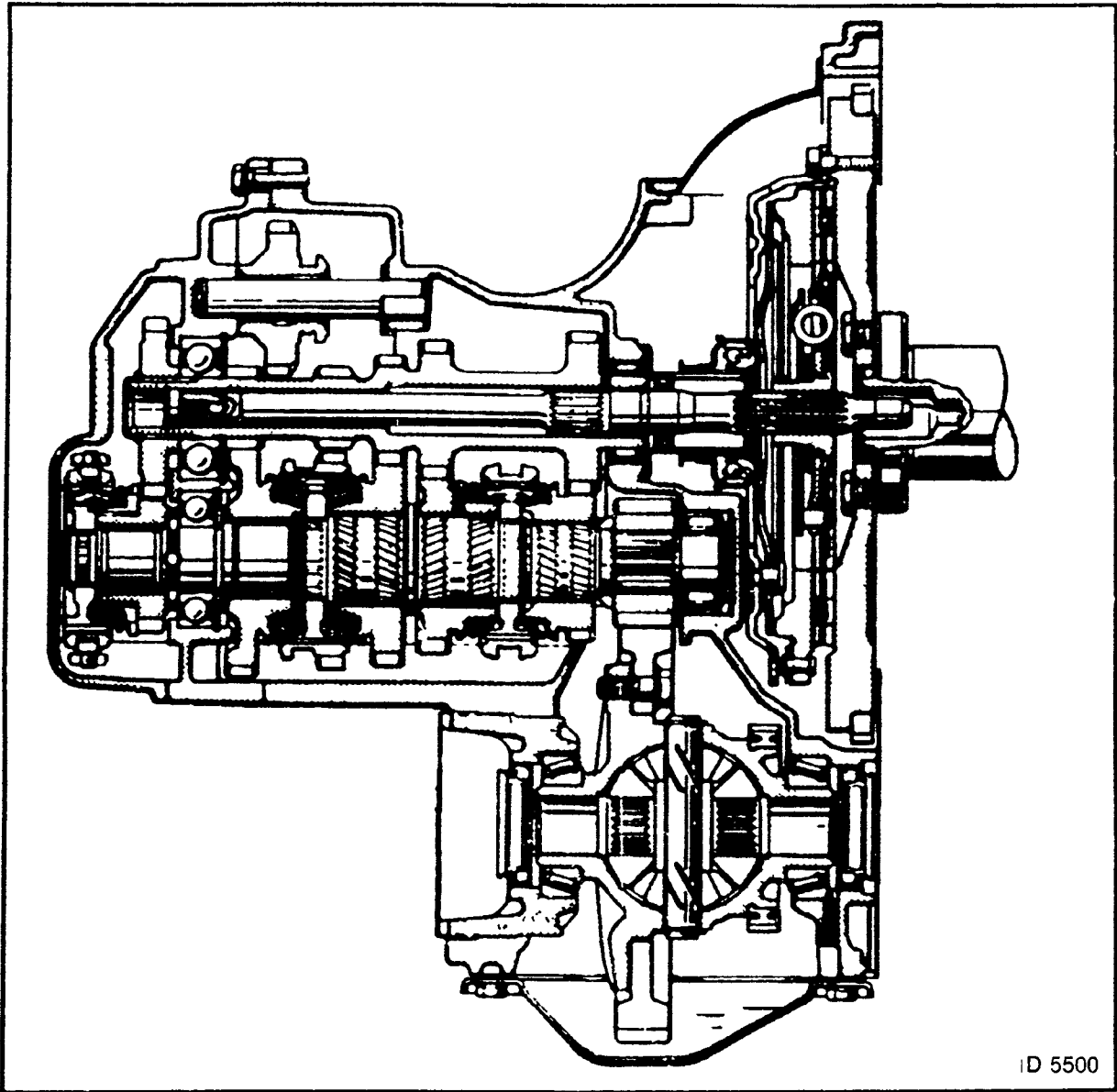
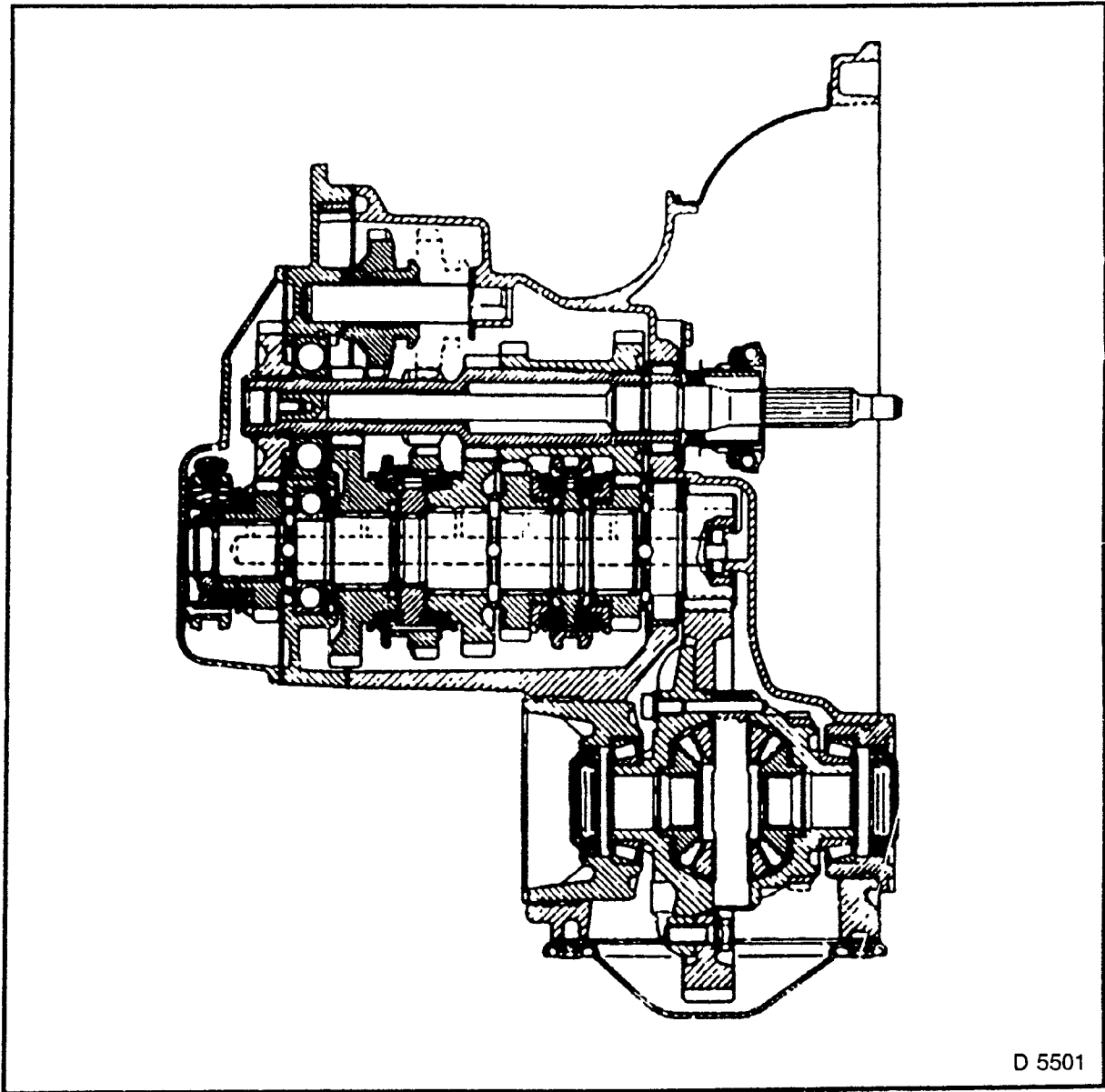


Fig. 117 — F 10/5, F 13/5 Manual Transmission



D 5501

Fig. 118 — F 16/5 Manual Transmission

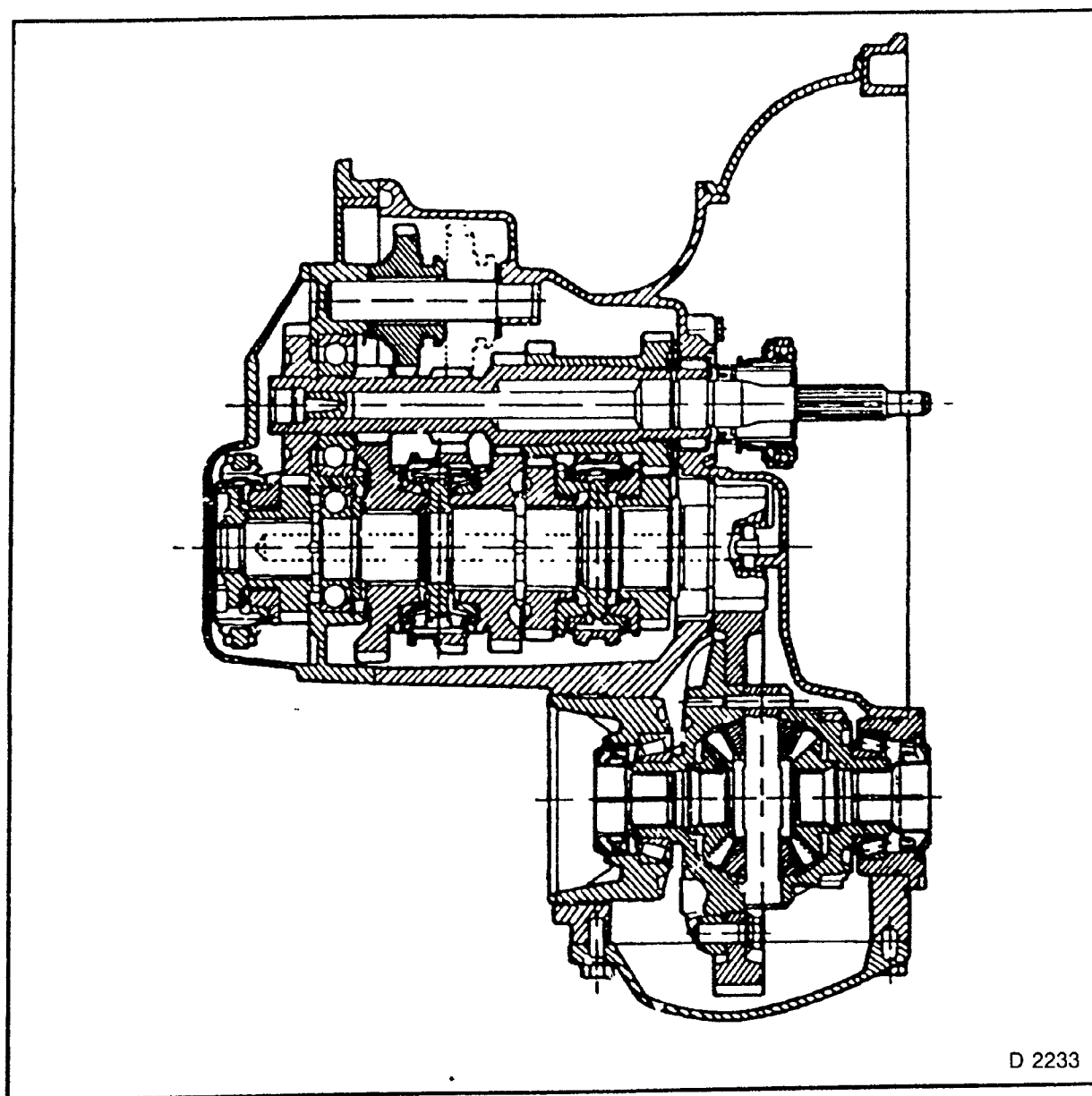


Fig. 119 — F 20/5 Manual Transmission.

MANUAL TRANSMISSION — OVERHAUL

End Shield with Main Shaft and Drive Shaft — Remove and Disassemble

NOTE:

If operations are planned on the synchronizer rings or gears only, they can be carried out with installed transmission, by removing the end shield.

See operations “Sealing Operations on Installed Transmission” and “Synchroizer Rings, Replace” Page 30 and 86.

REMOVE, DISCONNECT

1. Transmission.
2. Fasten transmission to transmission support using Transmission Holder KM-444-B in conjunction with Base KM-489.

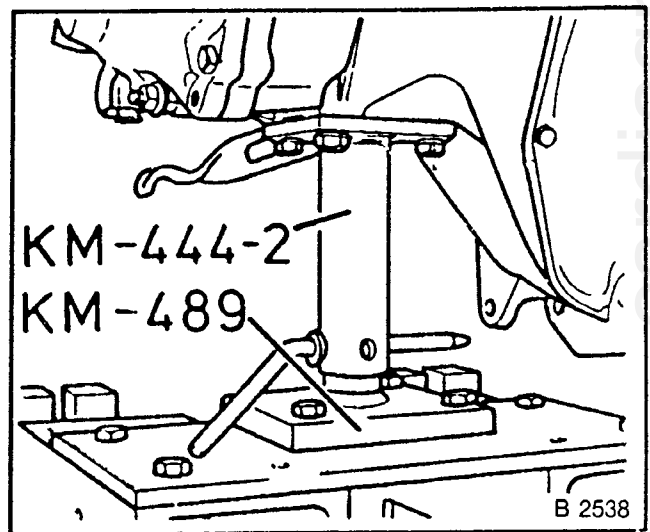


Fig 120

REMOVE, DISCONNECT

1. Shift cover from transmission.
2. End shield cover.

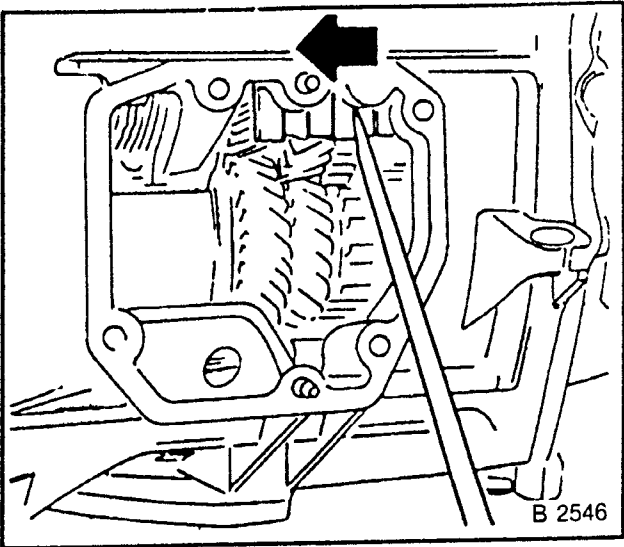


Fig. 121

3. Reversing lamps switch.

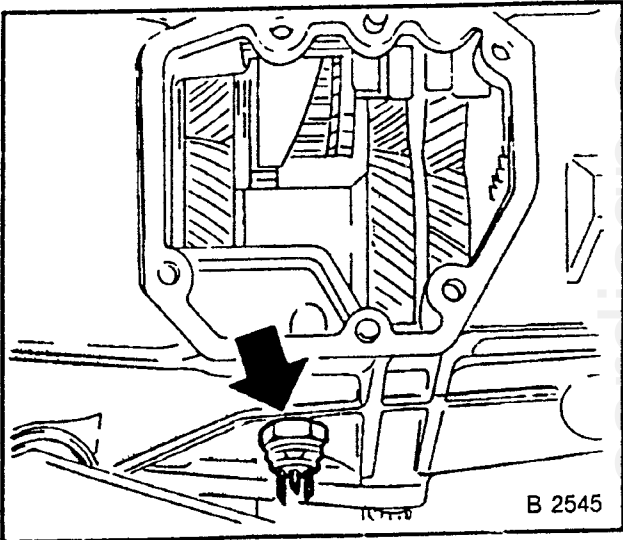


Fig. 122

REMOVE, DISCONNECT

1. End shield assembly from transmission.
Note that magnets are released.
Fig. 123 shows removed transmission.

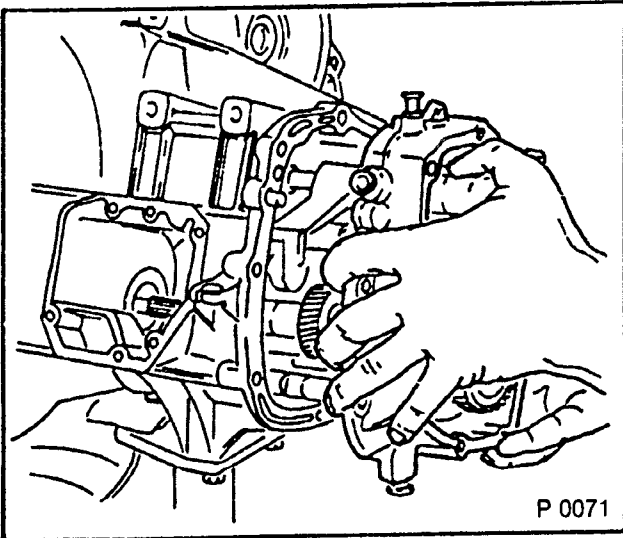


Fig. 123

2. Secure end shield to transmission stand, KM-552, KM-113-2.

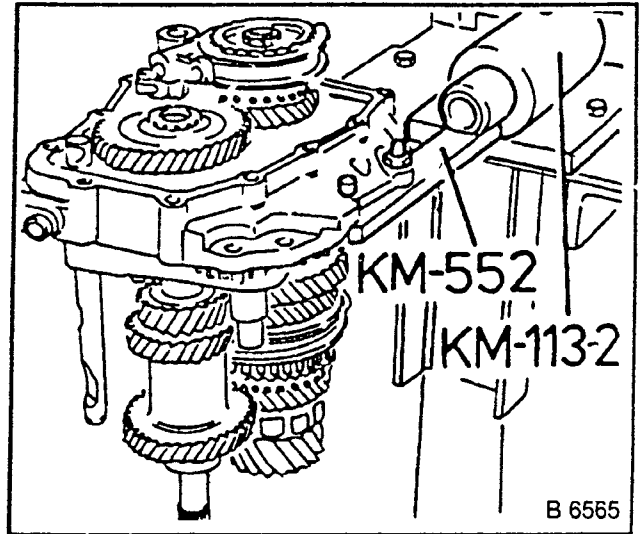


Fig 124

REMOVE, DISCONNECT

1. Bearing support with rocker arm from end shield (arrows).

NOTE:

Micro-encapsulated bolts.

If stiff, heat end shield with hot-air dryer to approximately 80°C/176°F. (Check temperature with thermo-colour pencils if available, or use suitable temperature gauge).

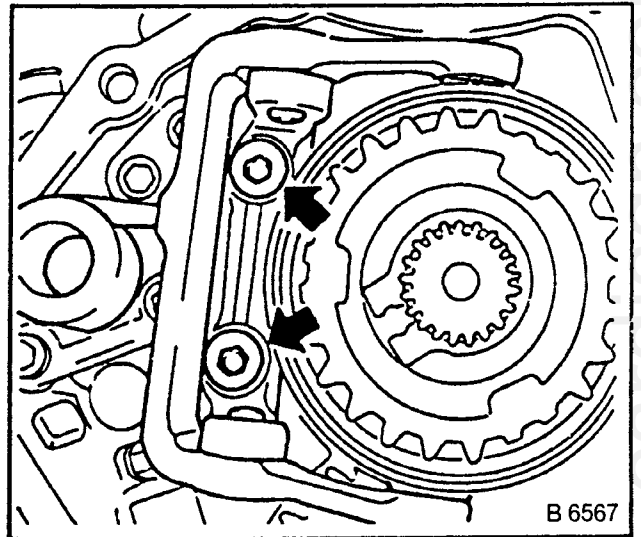


Fig 125

REMOVE, DISCONNECT

1. Retaining ring in front of synchromesh body from main shaft 5th gear synchromesh body from main shaft, KM-161-A, KM-161-2 or KM-553-A.
2. Engage two gears simultaneously (e.g. 3rd and reverse).

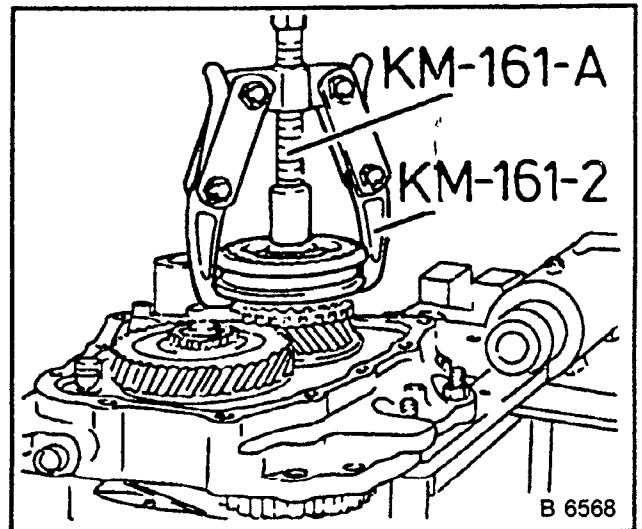


Fig 126

REMOVE, DISCONNECT

1. 5th gear (driven).
2. Needle bearing for 5th gear.
3. Needle bearing (for F 16/5 in two parts) is slotted, bend up slightly.
4. Retaining ring for thrust washer.
5. Thrust washer halves from main shaft.

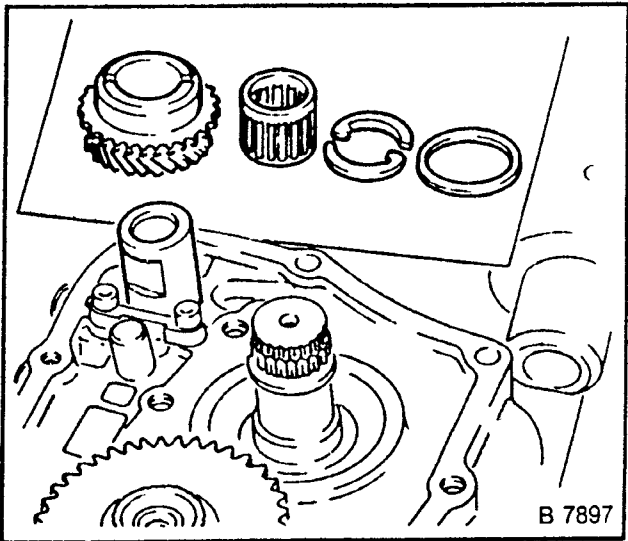


Fig 127

6. Retaining ring of gear from gear cluster.
7. Remove retaining ring of 5th gear (driving) from gear cluster, KM-553-A.
8. Place pressure piece on gear cluster; **do not** support pressure piece on the driving shaft on the gear cluster.

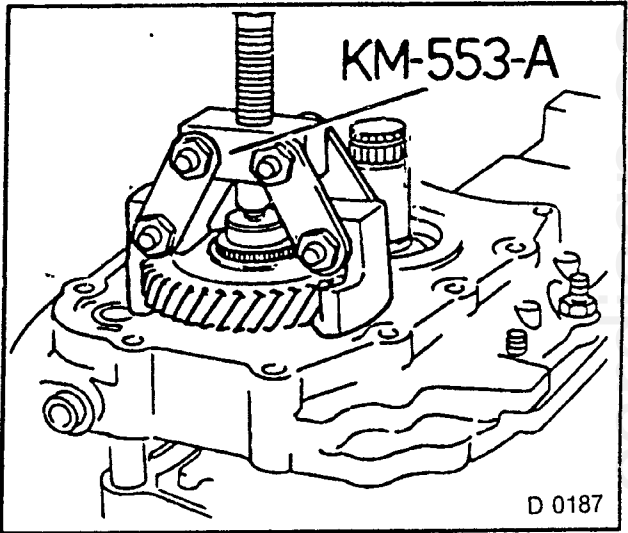


Fig. 128

REMOVE, DISCONNECT

1. Bearing support with pawl from end shield.
To replace pawl, press out pin from bearing support.

NOTE:
Micro-encapsulated bolts.
If stiff, heat end shield with hot-air dryer.

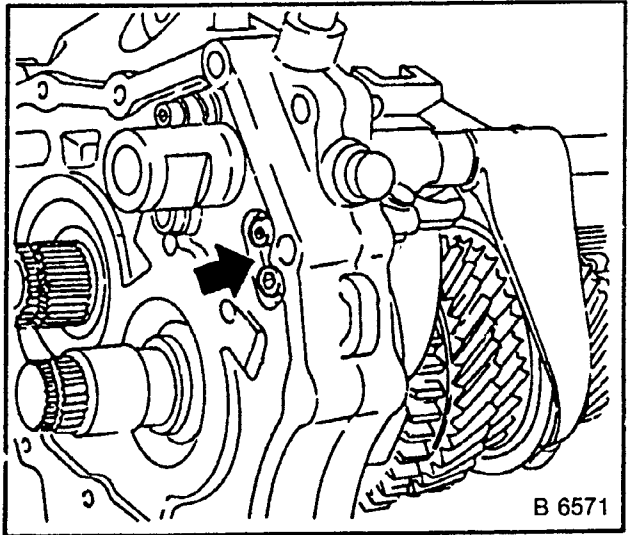


Fig. 129

REMOVE, DISCONNECT

- 1 Plugs for switch catch from end shield, KM-727, KM-328-B
- One long plug (1)
- Three short plugs (2)

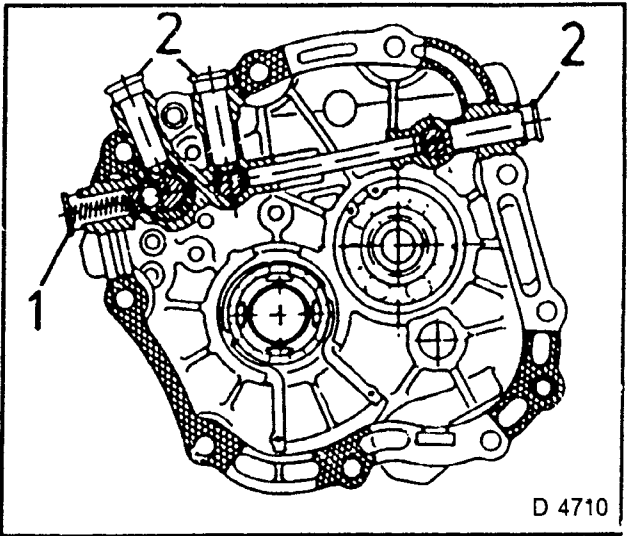


Fig 130

REMOVE, DISCONNECT

- 1. Unbolt bridge for pawl from end shield (large arrows).

NOTE:
Micro-encapsulated bolts.
If stiff, heat end shield with hot-air dryer to approximately 80°C/176°F (check temperature with thermo-colour pencils if available, or use suitable temperature gauge).

Engage 2nd and 5th gears (with shift driver).
If 3rd gear is now engaged, the bridge will be pushed out.

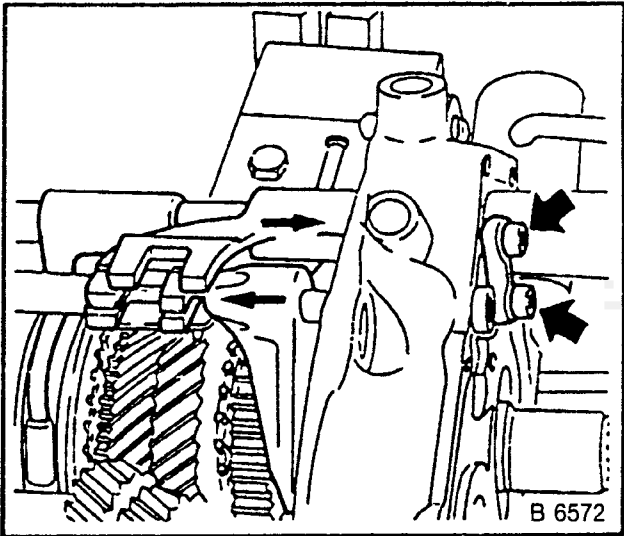


Fig 131

REMOVE, DISCONNECT

- 1. Pins from 3rd and 4th gear shift fork and also from reverse gear shift fork — punch
- 2. Release pressure on rod guide, support shift rod at top with wood.

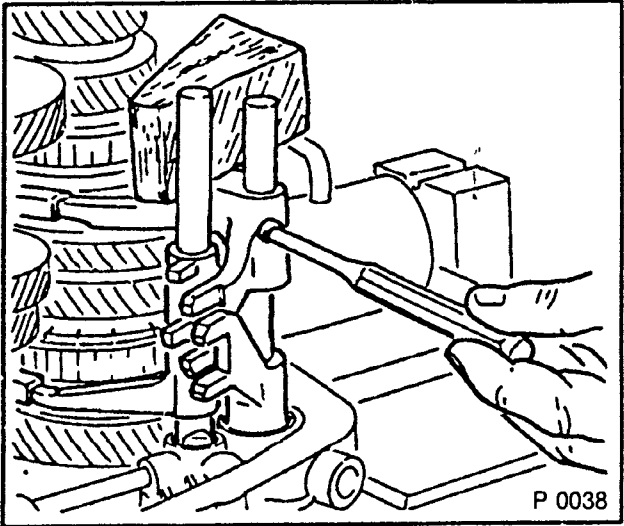


Fig. 132

REMOVE, DISCONNECT

- 1 3rd and 4th gear shift rods and shift forks.
2. Reverse gear from end shield.
3. 5th gear shift driver from end shield.
4. Shift sleeve in neutral position.

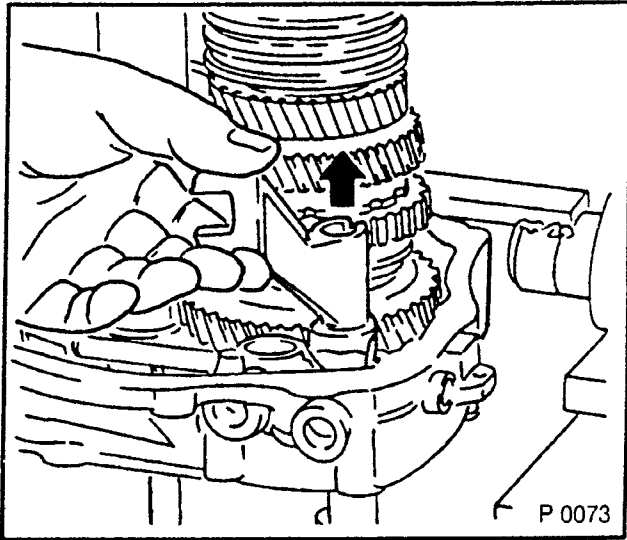


Fig. 133

REMOVE, DISCONNECT

1. Locking pin for catch from end shield bore holes.

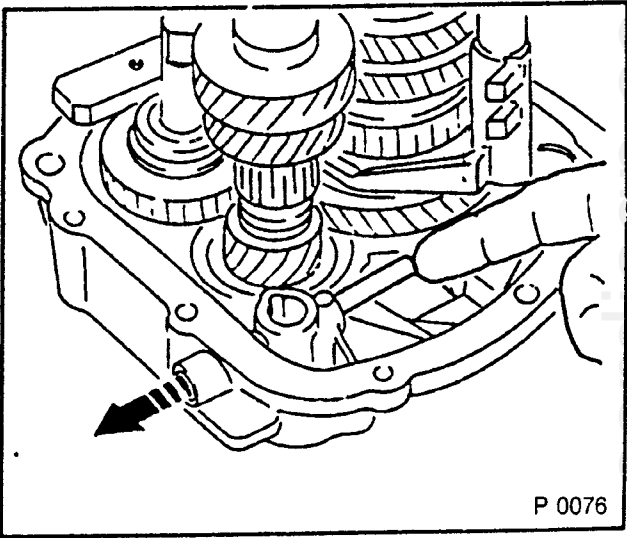


Fig. 134

F 10/5, F 13/5 MANUAL TRANSMISSION:

REMOVE, DISCONNECT

1. Remove retaining rings from grooves in end shield, KM-443-A. As assembly aid, tension retaining ring for main shaft with installation plate (A). Measurements for own construction, see Fig. 137.

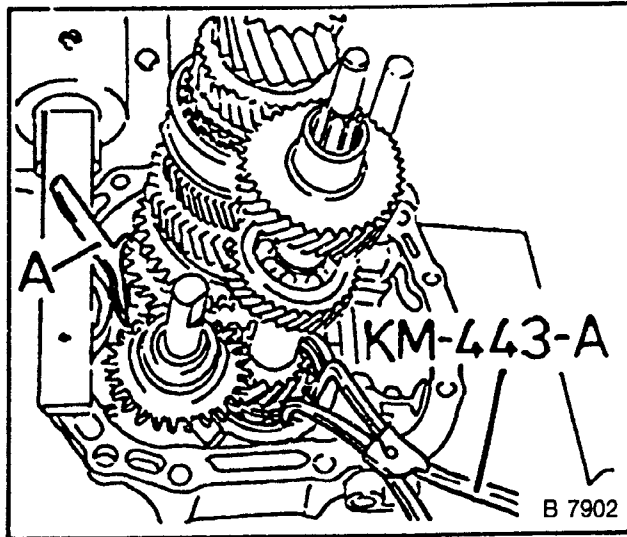


Fig. 135

F 16/5, F 20 MANUAL TRANSMISSION:

Press retaining ring for bearing main shaft together with ring pliers (KM-443-B) and hold under tension with mounting plate (A). **Simultaneously** press apart retaining ring (B) for bearing of gear cluster with flat ring pliers (second mechanic).

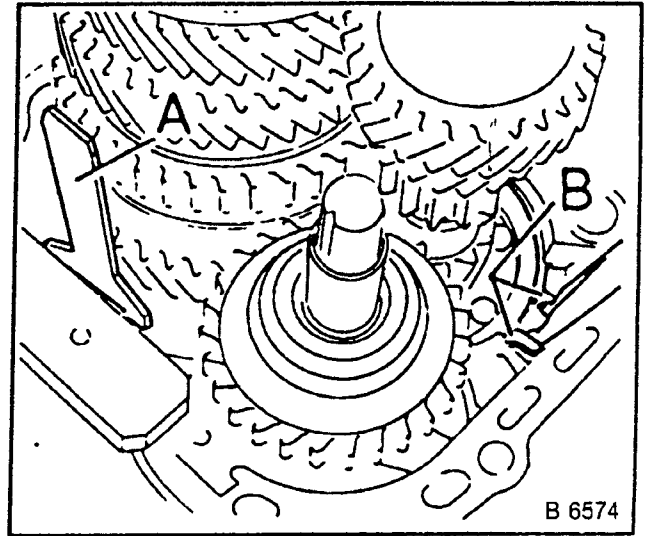


Fig. 136

Prepare installation plate according to the dimensions on right.

Tool KM-443-B contains ring pliers and mounting plate.

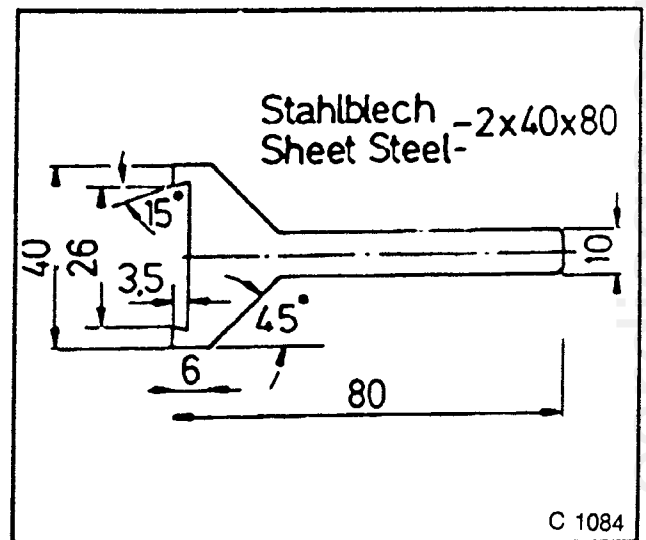


Fig. 137

ON ALL TRANSMISSIONS:**REMOVE, DISCONNECT**

1. Pull out main shaft.
2. Drive shaft.
3. Reverse idler gear.
4. Shift fork.
5. Shift rod 1st and 2nd gear from end shield.

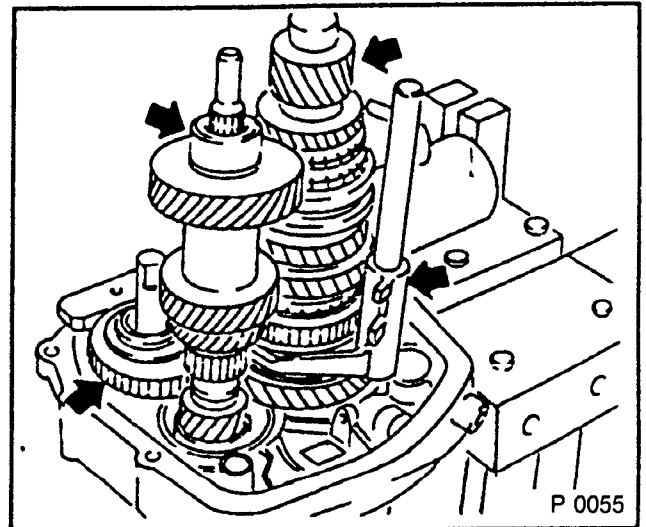


Fig. 138

REMOVE, DISCONNECT

- 1 Reverse idler gear axle from end shield.
- 2 Clamp axle between protective jaws in vice.
- 3 Knock off end shield carefully, brass punch.
4. Note locking ball

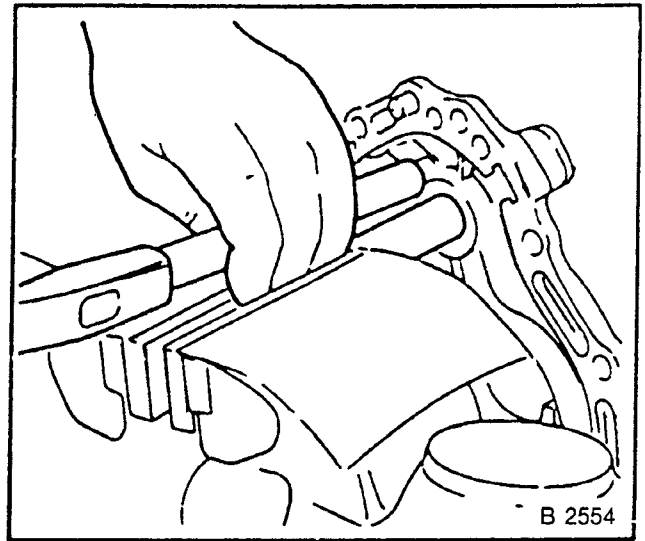


Fig. 139

**Drive Shaft —
Disassemble**

NOTE:
IF GEAR CLUSTER TEETH ARE
DAMAGED, ALWAYS REPLACE
CORRESPONDING GEAR ON THE
MAIN SHAFT AS WELL.

REMOVE, DISCONNECT

1. Press drive shaft out of gear cluster with suitable drift (arrow).

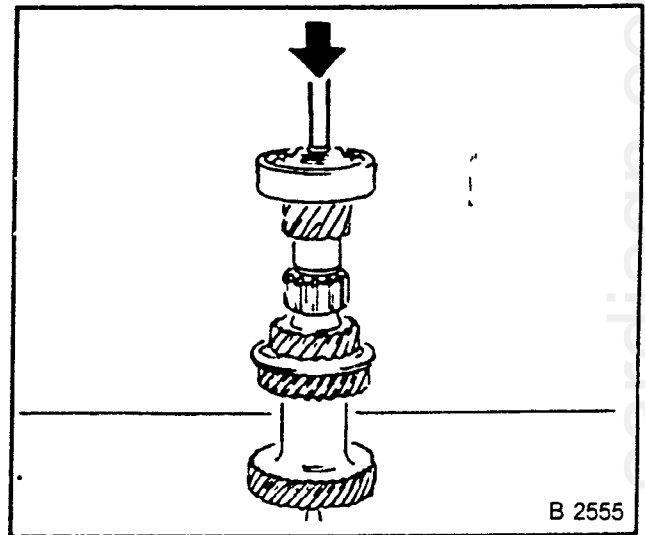


Fig. 140

REMOVE, DISCONNECT

1. Press ball bearing off from gear cluster.
F 10, F 13 with suitable pipe.
(Remove retaining ring and washer)
F 16, F 20 with KM-407-A
(Remove retaining ring)

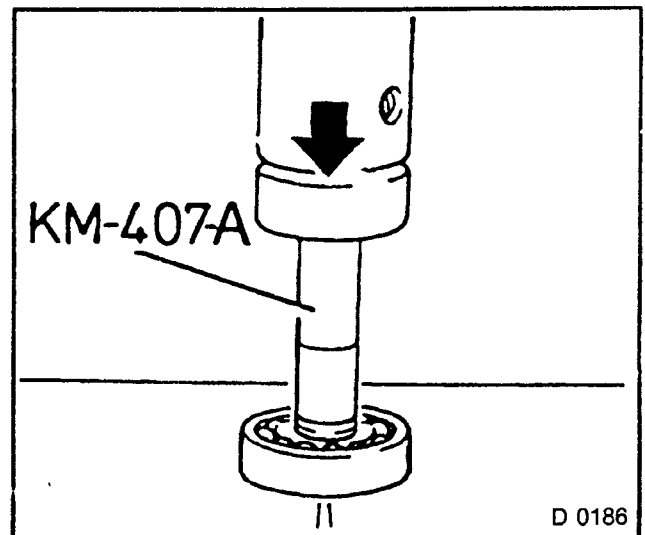


Fig. 141

Main Shaft — Disassemble

F10, F 13 MANUAL TRANSMISSION:

If gear wheels are damaged, always replace gear cluster as well.

DISASSEMBLE

- 1 Retaining ring on front of ball bearing.
- 2 Press off ball bearing, retaining ring (long leg), spacing washer, axial needle bearing and 1st gear with suitable drift.
- 3 Remove needle bearing for 1st gear from main shaft.
- 4 Remove three synchronizer rings (1st gear), shift sleeve and sliding blocks.
- 5 Remove retaining ring for 1st/2nd gear synchromesh body.
- 6 Press off 1st/2nd gear synchromesh body, three synchronizer rings (2nd gear) and 2nd gear with suitable drift, KM-307-B.

REMOVE, DISCONNECT

1. Retaining ring for drive gear (driving) from main shaft.
- 2 Press drive gear (driving) off from main shaft, KM-307-B and suitable drift.

NOTE:
ALWAYS REPLACE DRIVE GEARS
(DRIVING AND DRIVEN) IN PAIRS.

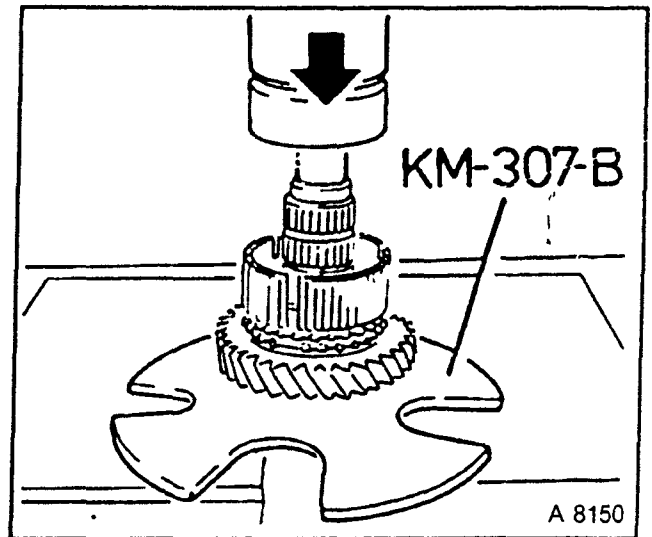


Fig. 142

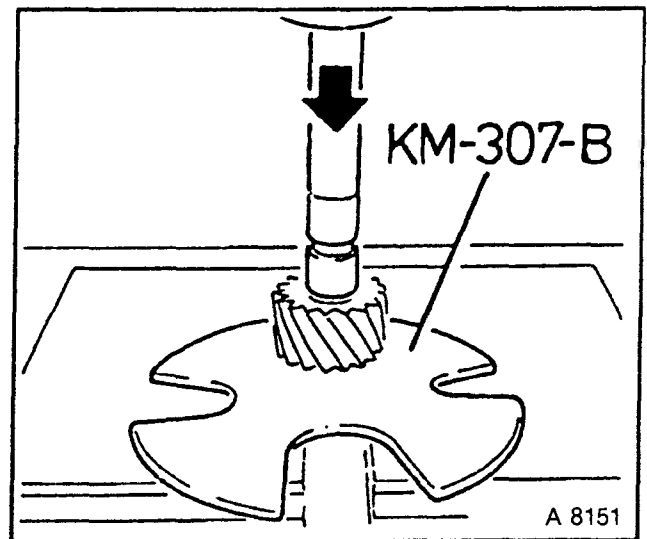


Fig. 143

REMOVE, DISCONNECT

1. Press off spacing washer and also 4th gear, KM-479-A.
2. Place KM-479-A in groove of 4th gear.

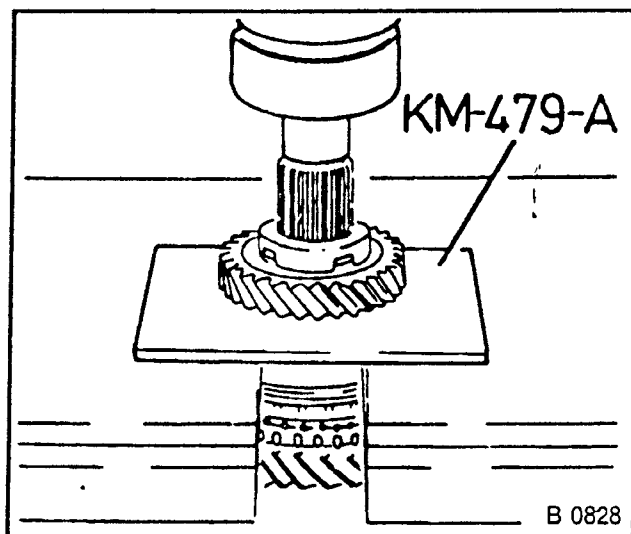


Fig. 144

REMOVE, DISCONNECT

1. Remove synchronizer ring (4th gear), shift sleeve and sliding blocks.
2. Retaining ring for 3rd/4th synchromesh body.
3. Press off 3rd/4th gear synchromesh body and 3rd gear with suitable drift.

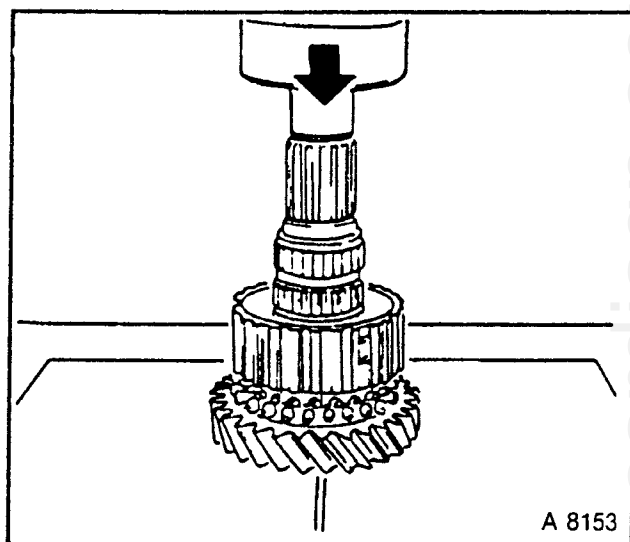


Fig. 145

Main Shaft — Disassemble**F 16, F 20 MANUAL TRANSMISSION:**

If gear wheels are damaged, always replace gear cluster as well.

DISASSEMBLE

1. Remove retaining ring from ball bearing.
2. Press off ball bearing, retaining ring (long leg), spacer washer, axial needle bearing and 1st gear from main shaft with suitable drift.
3. Place KM-307-B or two L-bars under gear.
4. Needle bearing for 1st gear from main shaft.

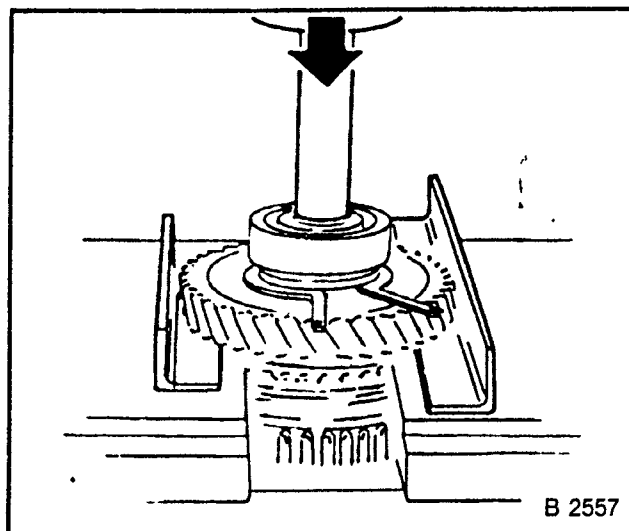


Fig. 146

REMOVE, DISCONNECT

1. Retaining ring for 1st/2nd gear synchromesh body.
2. Synchromesh body and also 2nd gear.
3. To press off, use KM-307-B or place two L-bars under 2nd gear
4. Needle bearing for 2nd gear from main shaft.

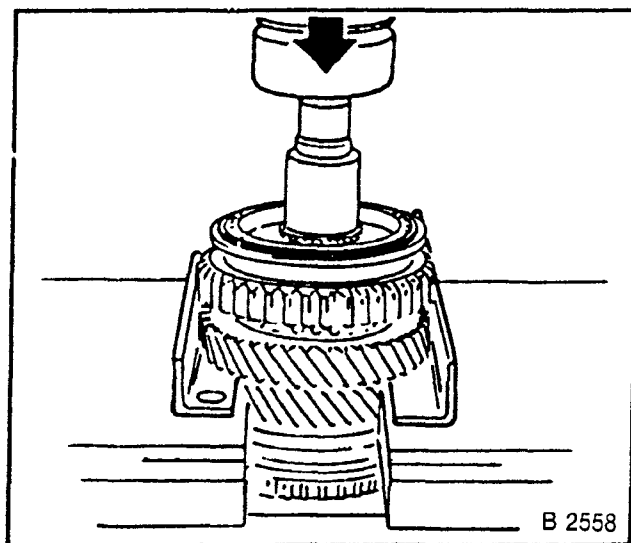


Fig. 147

5. Retaining ring for thrust washer.
6. Thrust washer halves.
7. 3rd gear from main shaft.
8. Needle bearing is slotted, bend up slightly.
9. Retaining ring and washer in front of 3rd/4th gear synchromesh body from main shaft.
10. Synchromesh body and also 4th gear from main shaft.
11. To press off, use KM-307-B or place two L-bars under gear.

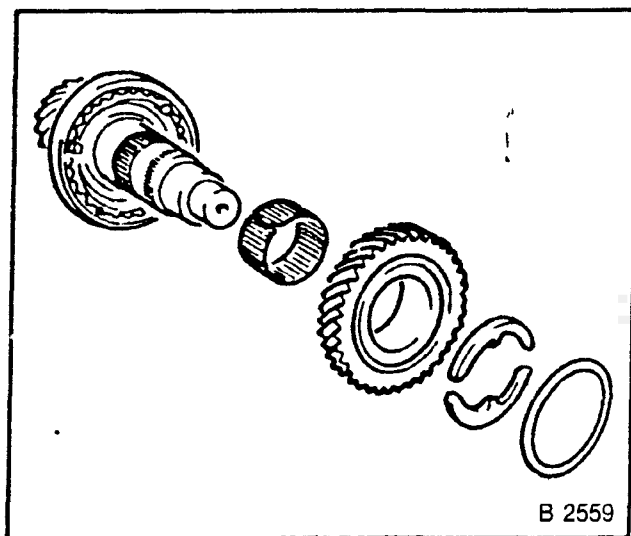


Fig. 148

F 16 MANUAL TRANSMISSION:**REMOVE, DISCONNECT**

1. Retaining ring for thrust washer.
2. Halves of thrust washer.
3. Slotted needle bearing for 4th gear (bend apart slightly).
4. Roller bearing from main shaft.

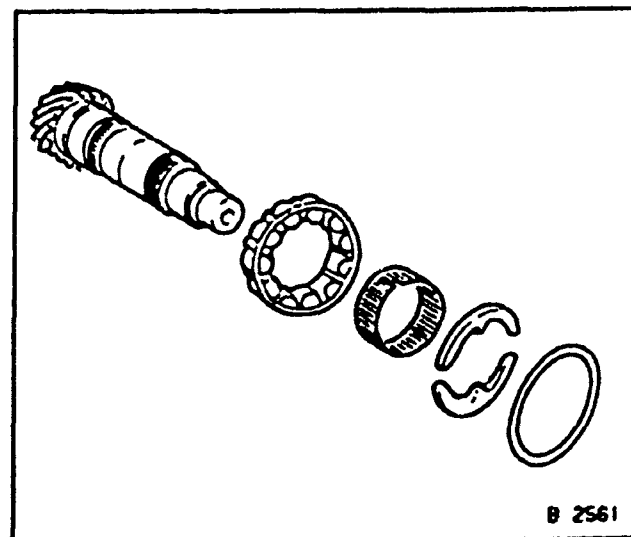


Fig. 149

F 20 MANUAL TRANSMISSION:

Needle bearing for 4th gear, roller bearing, needle bearing and roller bearing are slotted (1), bend apart slightly.

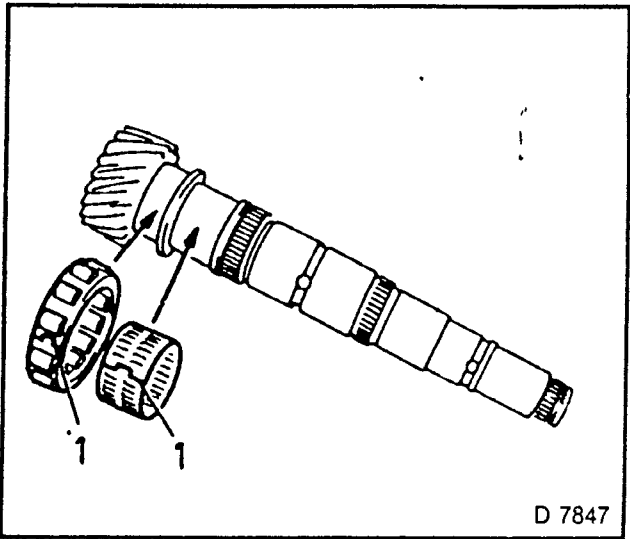


Fig. 150

F 16 and F 20 MANUAL TRANSMISSION:

Main shaft and drive gear (driving) are one part and may not be disassembled. Always replace drive gears in pairs. Note groove identification running around tip of tooth — see "Technical Data" Page 263.

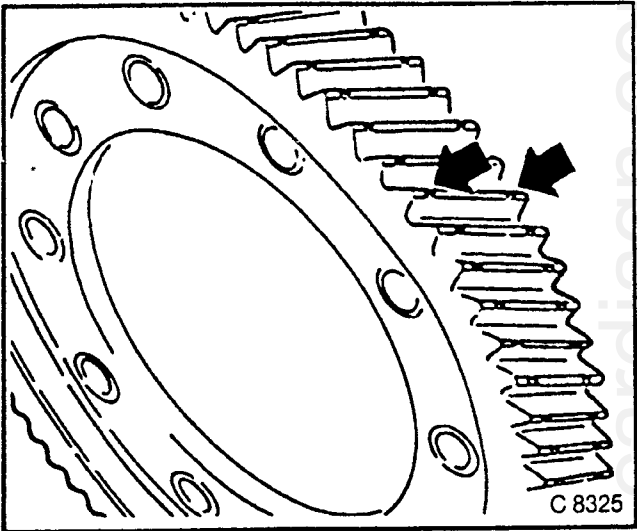


Fig. 151

Bearing Rings in Transmission Housing — Replace

F 10, F 13 MANUAL TRANSMISSION:

REMOVE, DISCONNECT

1. Clutch pressure bearing.
2. Clutch fork from clutch release lever.
3. Clutch release lever from transmission.
4. Clutch pressure bearing guide.
5. Needle sleeve for drive shaft bearing from transmission.

Transmission installed: KM-454-1,
KM-454-4

Transmission removed: KM-556-A.

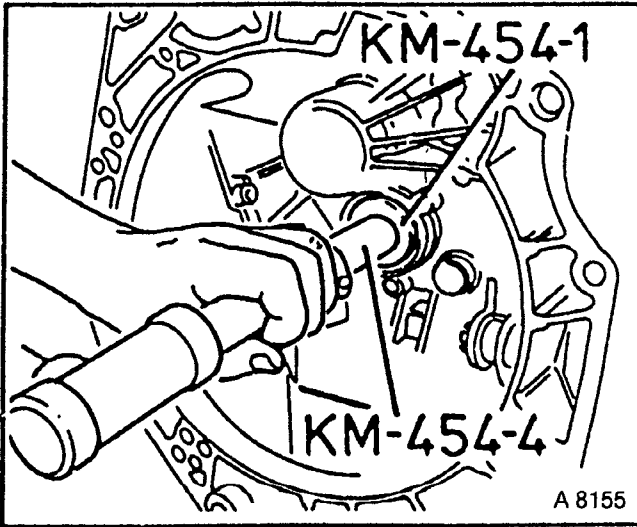


Fig. 152

REMOVE, DISCONNECT

1. Differential.
2. Needle sleeve for main shaft bearing from transmission, KM-556-A or Kukko Remover 21/4 with Counterhold 22-1.

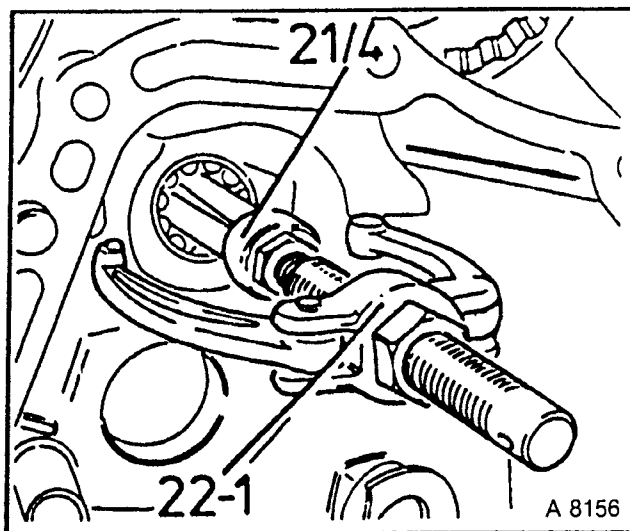


Fig. 153

INSTALL, CONNECT

1. Drive in new needle sleeve for main shaft bearing flush, KM-454-3 and KM-454-4.

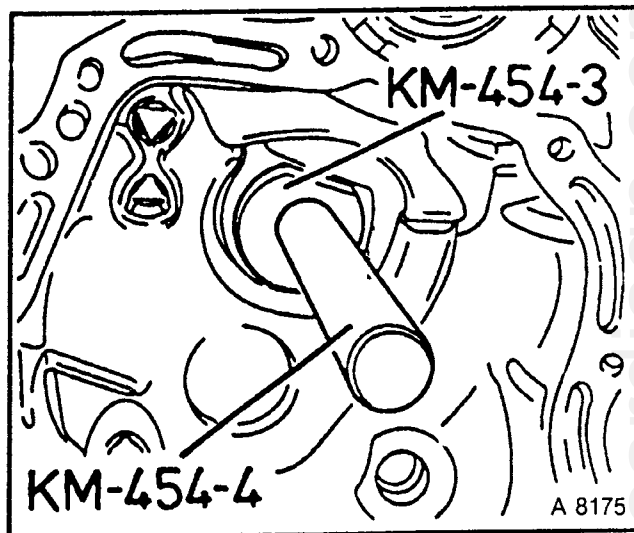


Fig. 154

INSTALL, CONNECT

1. Drive in new needle sleeve for drive shaft bearing flush with lettered side to transmission, KM-454-2, KM-454-4.

TIGHTEN (TORQUE)

1. Clutch pressure bearing guide to transmission, 5 Nm lubricate sliding surfaces with Molybdenum Disulphate Paste (B0400852).
2. Clutch fork to clutch release lever, 35 Nm.
3. Clutch pressure bearing to clutch fork.

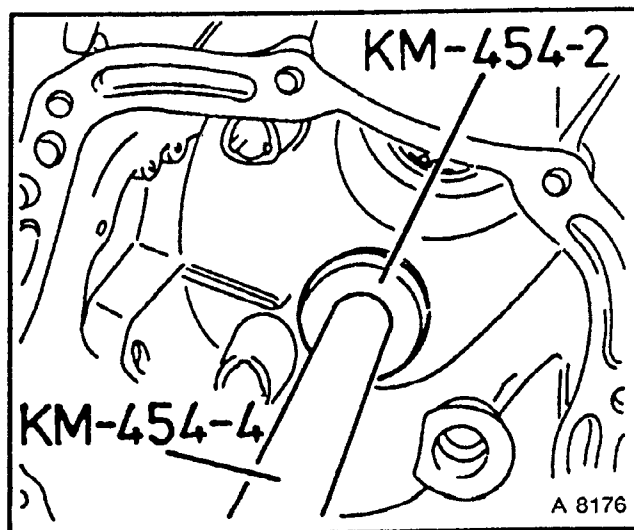


Fig. 155

Bearing Rings in Transmission Housing — Replace

F 16, F 20 MANUAL TRANSMISSION:

REMOVE, DISCONNECT

1. Clutch pressure bearing and clutch fork from clutch release lever.
2. Clutch release lever and clutch pressure bearing guide from transmission.
3. Needle sleeve for drive shaft bearing from transmission, KM-523-1, KM-523-3.
4. Outer ring of roller bearing for main shaft bearing, KM-J-26941 (1), KM-483 (2) and KM-313 (3).

If difficult to move, heat transmission housing with hot-air dryer

INSTALL, CONNECT

- 1 Press on new outer ring for main shaft bearing up to stop.
(do not drive on), KM-523-1 and KM-523-4.

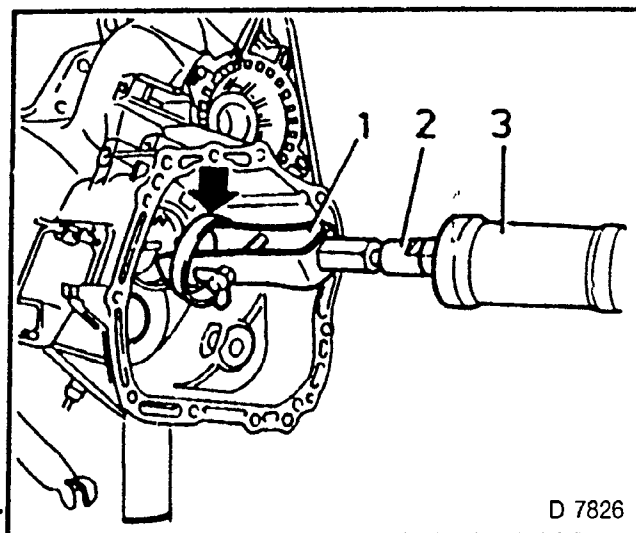


Fig. 156

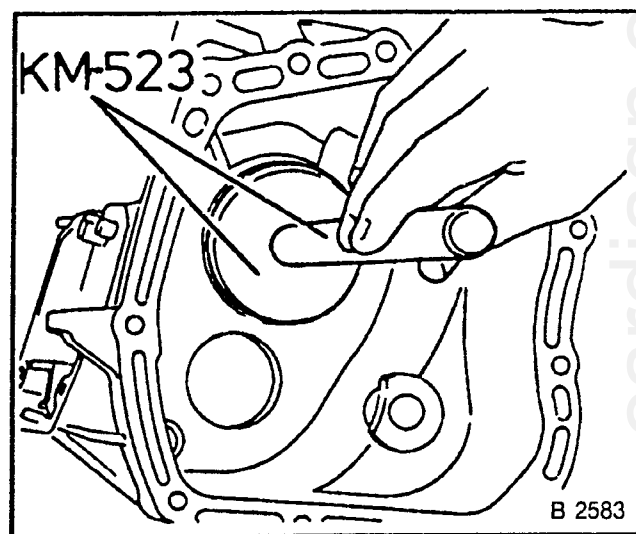


Fig. 157

2. Drive in new needle sleeve for drive shaft bearing flush with lettered side to transmission, KM-523-1, KM-523-2.

TIGHTEN (TORQUE)

1. Clutch pressure bearing guide to transmission, 5 Nm.
2. Lubricate sliding surfaces with Molybdenum Disulphate Paste (B0400852).
3. Clutch fork to clutch release lever, 35 Nm.
4. Clutch pressure bearing to clutch fork.

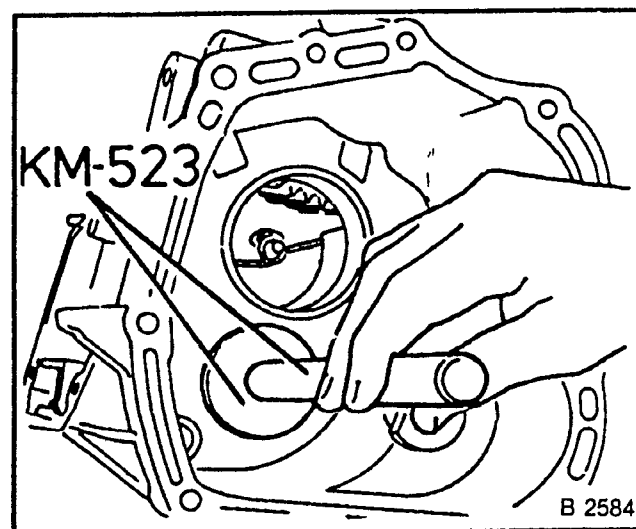


Fig. 158

CLEAN**INSPECT**

1. Removed parts for damage and wear.
2. Before installing, submerge all parts in Transmission fluid (B0400075).

All transmissions have three cone synchronization for 1st/2nd gear:

- 1 = 2nd gear
- 2 = Inner synchronizer rings
- 3 = intermediate rings
- 4 = outer synchronizer rings
- 5 = shift sleeve
- 6 = synchronizer springs
- 7 = sliding blocks
- 8 = synchromesh body (carrier)
- 9 = 1st gear

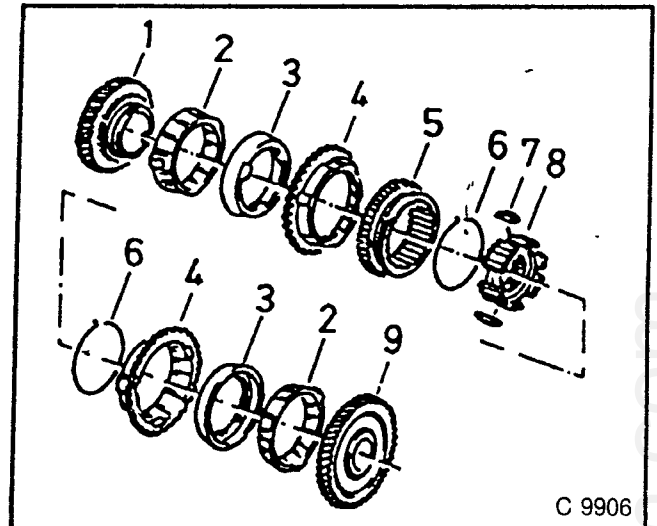


Fig 159

Main Shaft — Assemble

F 10, F 13 MANUAL TRANSMISSION:

ASSEMBLE

1. Synchromesh bodies, 1st/2nd gear and also 3rd/4th gear.
2. Attach synchronizer springs in sliding block with their hooks facing opposite directions, so that free end of spring hangs away from synchromesh body.
3. Insert sliding block into flat middle tooth of sliding sleeve.

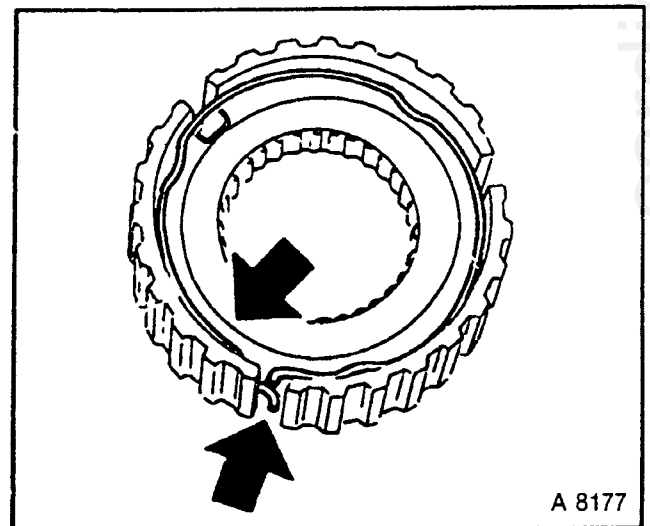


Fig. 160

4. Slide 3rd gear from drive gear side onto main shaft.
5. Lubricate bearing bore hole with Transmission Fluid (B0400075).
6. Place synchronizer ring onto 3rd gear cone.
7. Press on 3rd/4th gear synchromesh body assembly, KM-277.
8. Heat assembly to 100°C/212°F (thermocolour pencils, if available, or use suitable temperature gauge).
9. Lubricate contact surfaces of main shaft with Transmission Fluid (B0400075).
10. New retaining ring.

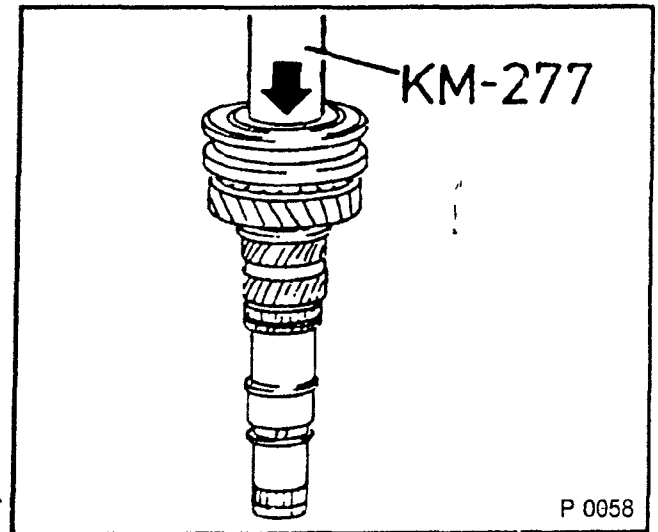


Fig. 161

INSTALL, CONNECT

1. Slide synchronizer ring and 4th gear onto main shaft.
2. Press spacing washer and drive gear (driving) onto main shaft, KM-311/2.
3. Heat both parts to 100°C/212°F (thermocolour pencils, if available, or use suitable temperature gauge).
4. Lubricate contact surfaces of main shaft with Transmission Fluid (B0400075).
5. Retaining ring in front of drive gear (driving).
6. Grooves on spacing washer point towards gear
7. Always replace drive gears in pairs. Circular groove identification on tip of tooth.
8. Drive gear front surface with collar points towards spacing washer.
9. Lubricate bearing bore holes and seat surfaces of main shaft with Transmission Fluid (B0400075).
10. Push 2nd gear onto main shaft.
11. Place inner synchronizer ring, intermediate ring and outer synchronizer ring on 2nd gear cone so that lugs fit in the recesses on each outer synchronizer ring.
12. Heat synchromesh body assembly to approximately 100°C/212°F, (thermocolour pencils, if present, or use suitable temperature gauge).
13. Push 1st/2nd gear synchromesh body assembly onto main shaft so that groove in shift fork points to ball bearing seat, KM-277.
14. New retaining ring.

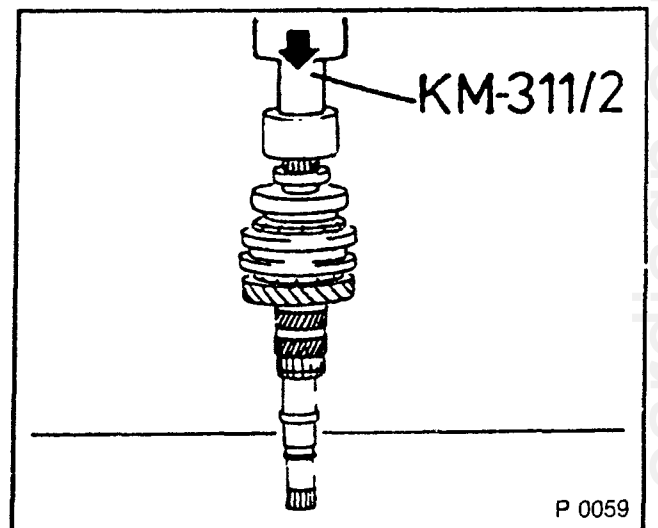


Fig. 162

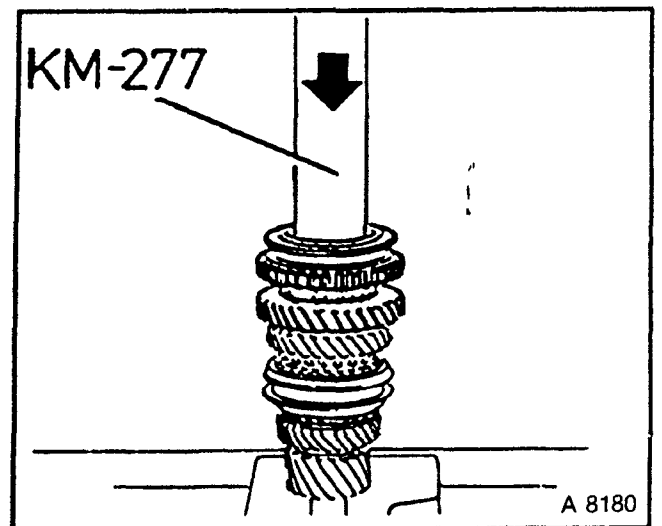


Fig. 163

INSTALL, CONNECT

1. Place outer synchronizer ring, intermediate ring and inner synchronizer ring on synchromesh body so that the lugs fit in the recesses of each outer synchronizer ring.
2. 1st gear needle bearing on main shaft
3. Push 1st gear onto needle bearing.
4. Place axial needle bearing (arrow) on 1st gear.
5. Lubricate both needle bearings and bearing bore hole of gear with Transmission Fluid (B0400075).

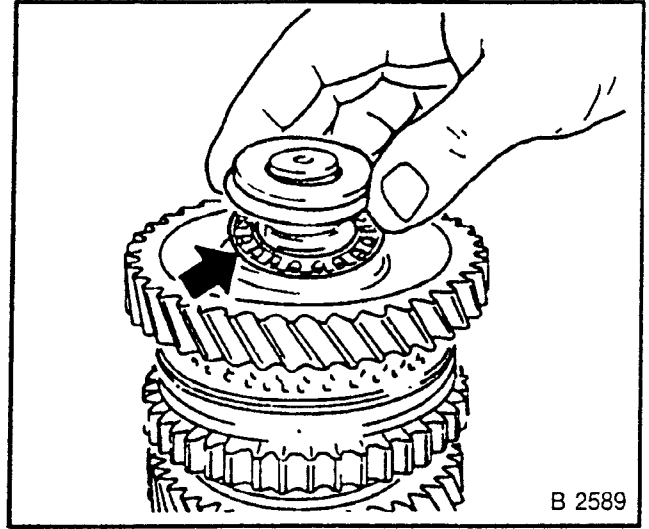


Fig 164

6. Attach new retaining ring with long sides for main shaft to end shield.
7. Press on spacing washer and ball bearing, KM-334.
8. Heat spacing washer to approximately 100°C/212°F, (thermocolour pencils, if present, or use suitable temperature gauge).
9. Grooves on spacing washer point towards gear.
10. Lubricate seating surface of spacing washer on main shaft, Transmission Fluid (B0400075).
11. Secure ball bearings with new retaining ring.
12. Gears for 1st and 5th gears have needle bearings (slotted bearing).

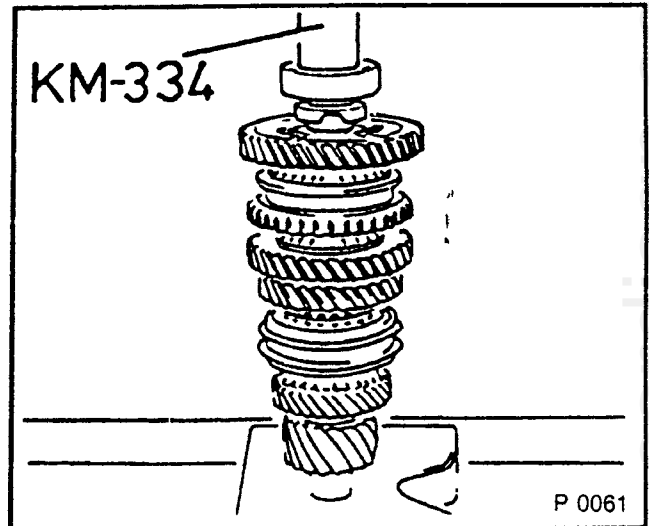


Fig 165

Main Shaft — Assemble

F 16, F 20 MANUAL TRANSMISSION:

1. Main shaft with drive gear is one part.
2. Always replace drive gears (driving and driven) in pairs.
3. Observe groove identification running around tip of tooth.
4. Gears, needle bearings, and synchromesh body bodies on the main shaft are set on the shaft in one direction.
5. Assemble 1st/2nd gear and 3rd/4th gear synchromesh bodies.
6. Attach synchronizer springs with their hooks in sliding block facing in opposite directions. Springs are not interlaced.
7. Place sliding block onto flat middle tooth of sliding sleeve.

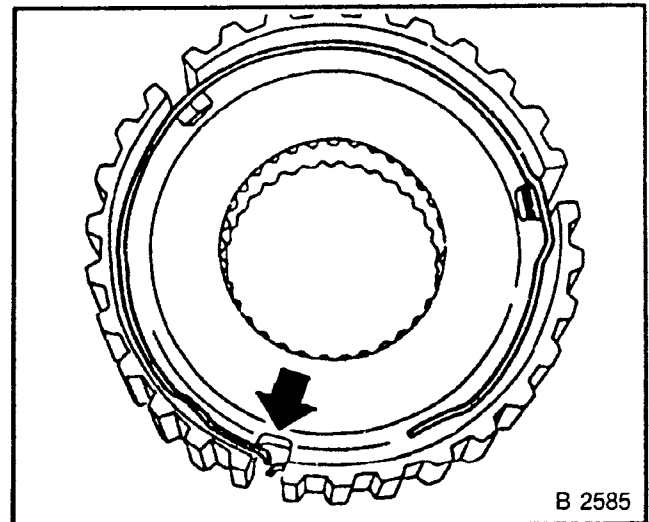


Fig 166

F 16 MANUAL TRANSMISSION:

1. Slide roller bearing onto main shaft.
2. Small roller retainer diameter points towards drive gear.
3. Connect thrust washer halves on main shaft with retaining ring.
4. Slide slotted single-row needle bearing onto main shaft and also 4th gear onto needle bearing

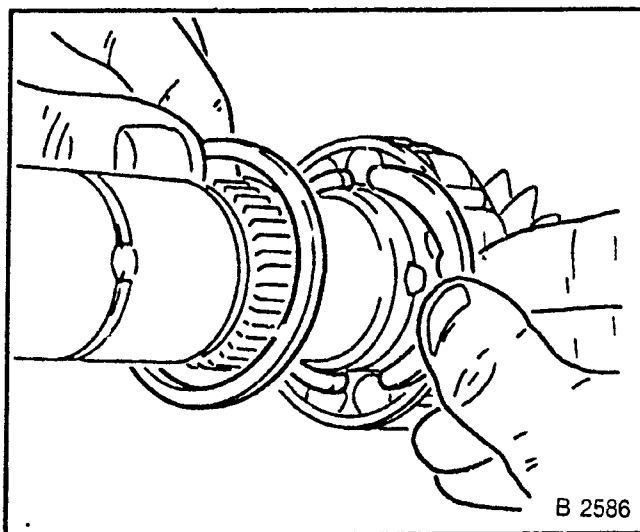


Fig. 167

F 20, MANUAL TRANSMISSION:**INSTALL, CONNECT**

1. Push slotted roller bearing on to main shaft, which must engage audibly
2. Mount two-row slotted needle bearing and 4th gear on main shaft.

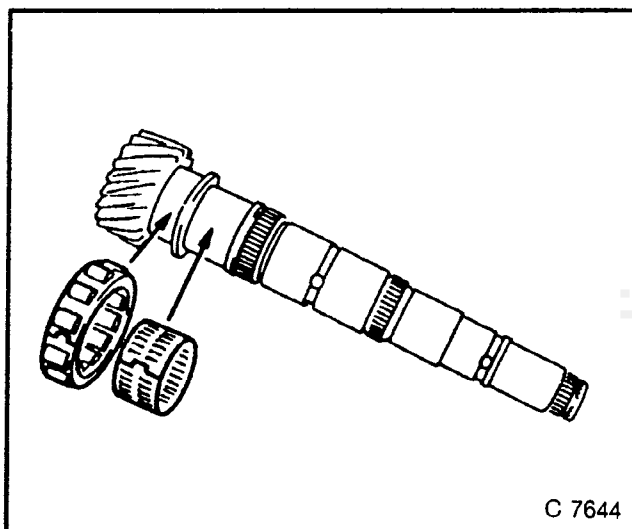


Fig. 168

F 16 AND F 20 MANUAL TRANSMISSION:

1. Lubricate needle bearing and bearing bore of gear with Transmission Fluid (B0400075).

INSTALL, CONNECT

1. Place synchronizer ring on cone of 4th gear
2. Heat 3rd/4th synchromesh body assembly to approximately 100°C/212°F and press on, KM-514 — (thermocolour pencil, if available, or use suitable temperature gauge).
3. Lubricate seating surfaces on main shaft with Transmission Fluid (B0400075).
4. Insert washer; new retaining ring.

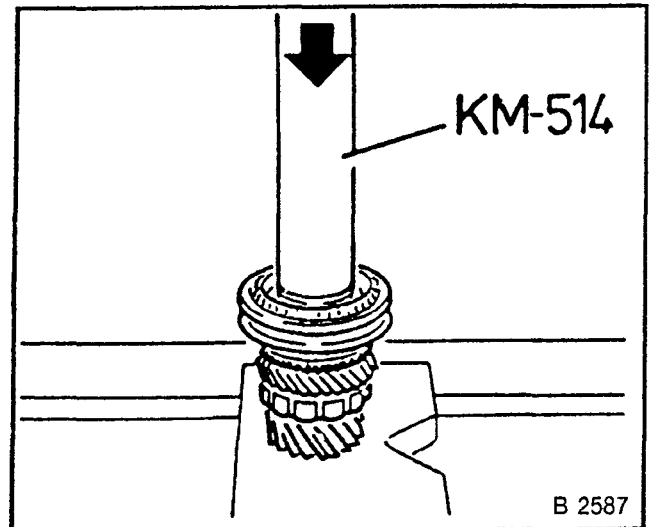


Fig 169

5. Push slotted needle bearing on main shaft and 3rd gear (with synchronizer ring) on needle bearing.
6. Lubricate needle bearing, gear bore hole and seating surfaces of main shaft with Transmission Fluid (B0400075).
7. Join two thrust washer halves on main shaft with retaining ring.
8. Push needle bearing onto main shaft and 2nd gear onto needle bearing.
9. Lubricate needle bearing and bearing bore hole with Transmission Fluid (B0400075).
10. Place inner synchronizer ring, intermediate ring and outer synchronizer ring on cone of 2nd gear so that lugs fit in recesses of each outer synchronizer ring.

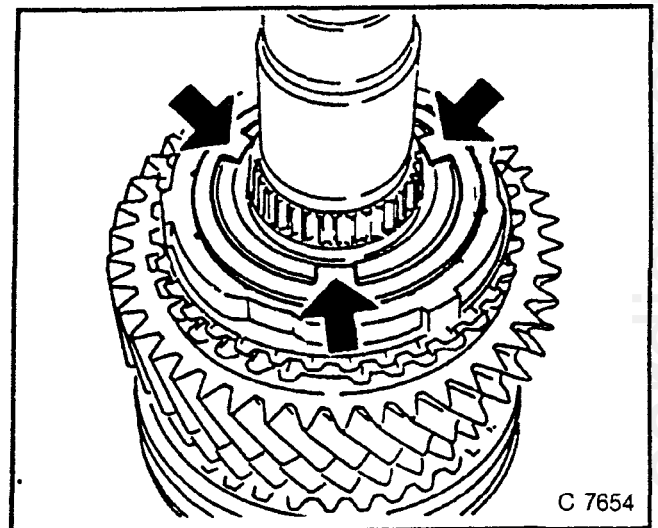


Fig. 170

INSTALL, CONNECT

1. Heat synchromesh body assembly to approximately 100°C/212°F (thermocolour pencils, if available, or use suitable temperature gauge).
2. Press 1st/2nd gear synchromesh body assembly onto main shaft so that groove in shift fork points to 1st gear, KM-514.
3. New retaining ring.

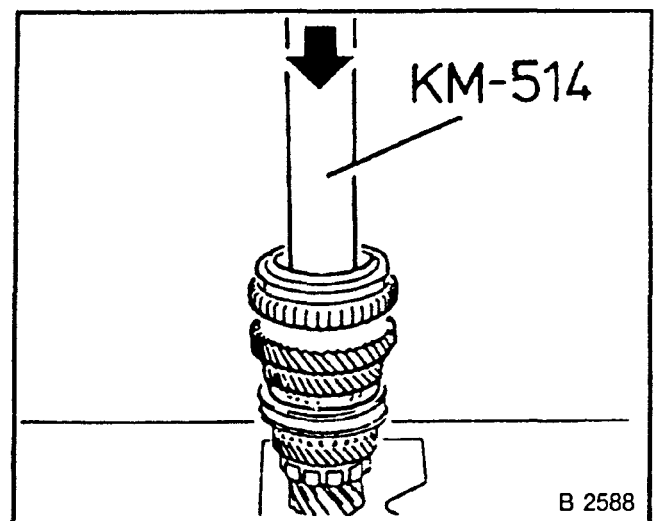


Fig. 171

- 4 Place outer synchronizer ring, intermediate ring and inner synchronizer ring on synchromesh body so that lugs fit in recesses of each outer synchronizer ring.
5. 1st gear needle bearing on main shaft.
- 6 Push 1st gear onto needle bearing.
7. Place axial needle bearing onto 1st gear.
8. Lubricate both needle bearings and bearing bore hole with Transmission Fluid (B0400075).

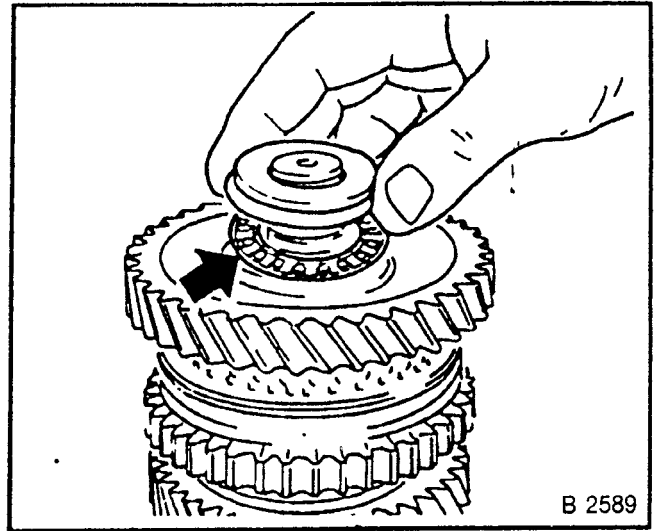


Fig 172

INSTALL, CONNECT

1. Press on spacing washer first, then ball bearing, KM-334.
2. Attach new retaining ring with long sides (for main shaft to end shield).
3. Heat spacing washer to approximately 100°C/212°F (thermocolor pencils, if available, or use suitable temperature gauge).
4. Large diameter of washer points towards axial needle bearing.
5. Cage side of ball bearing points towards end shield side.
6. New retaining ring for ball bearing.
7. All gears should turn easily.

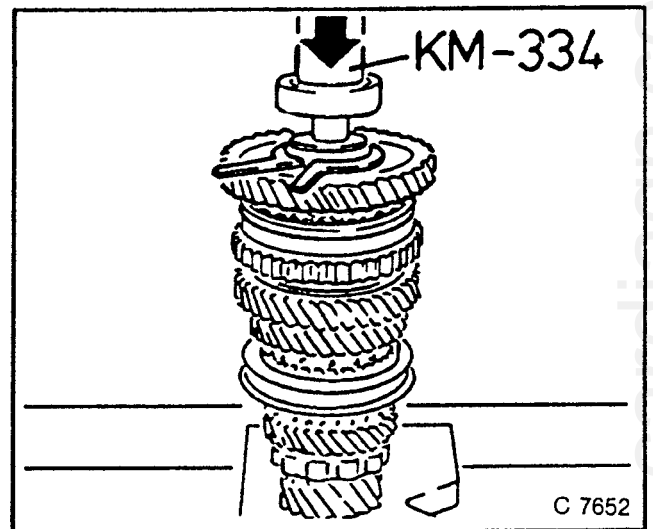


Fig 173

Drive Shaft — Assemble

F 10/F 13 MANUAL TRANSMISSION:

1. Press ball bearings onto gear cluster, KM-311/2.
2. Attach new retaining ring for gear cluster on end shield.
3. Secure ball bearing on gear cluster with new retaining ring.
4. Attach washer.
5. Press drive shaft into gear cluster.
6. With small longitudinal thread first; place KM-311/2 underneath.

Do not damage splines in gear cluster.
 Note different versions of drive shaft and gear cluster (gear ratios, see "Technical Data"; clutch splines, see P & A catalogue).

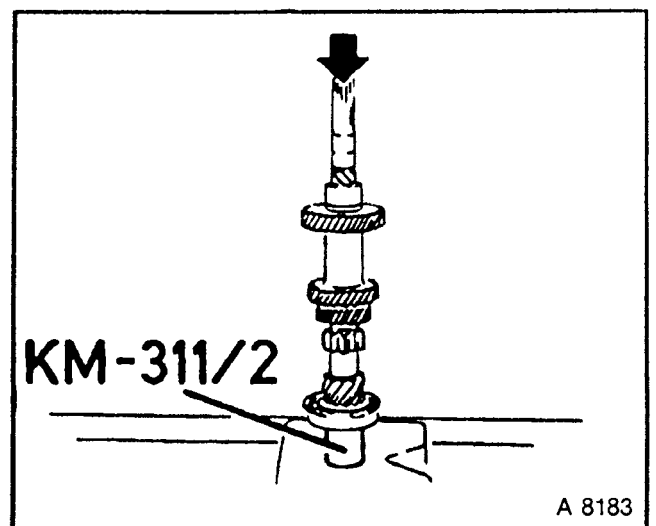


Fig 174

Drive Shaft — Assemble

F 16/F 20 MANUAL TRANSMISSION:

- 1 Press ball bearing onto gear cluster, KM-334.
- 2 Cage side of ball bearing points towards end shield side.
- 3 Attach new retaining ring for gear cluster to end shield.
- 4 New retaining ring for ball bearing.

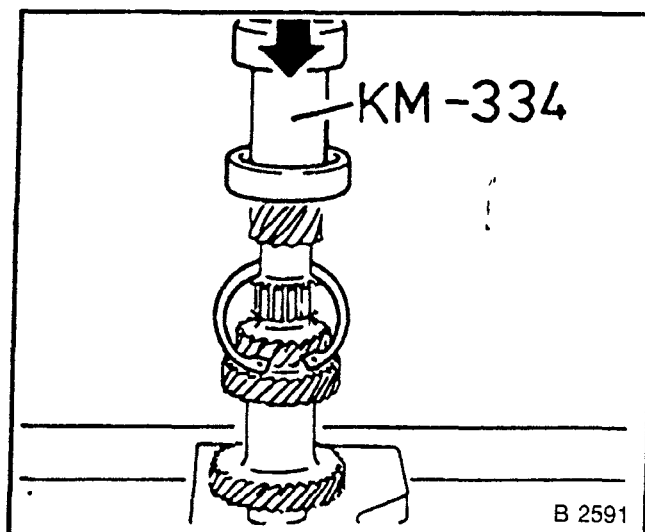


Fig 175

INSTALL, CONNECT

1. Press drive shaft on, with thin part first, against ball bearing in gear cluster.

NOTE:

Do not damage splines in gear cluster.

Note relative dimensions:

Press drive shaft size 1 by hand into gear cluster:

Dimension A = 5 mm max.

If dimension A is smaller than 0 mm, use a drive shaft with size 2.

If dimension A is larger than 5 mm, replace gear cluster.

Colour coding:

Size 1 = green

Size 2 = no identification

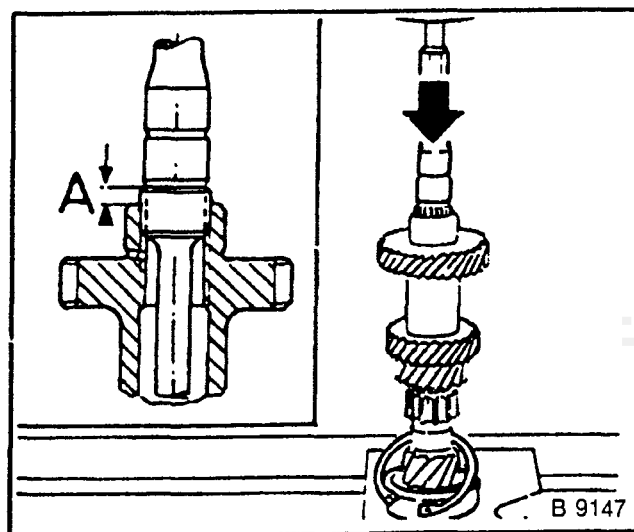


Fig 176

End Shield — Assemble

INSTALL, CONNECT

1. Axle for reverse idler gear with inserted retaining ball into end shield. Press in to stop.
2. Locking pin for gear stop in end shield bore (point 1 on assembly in Fig. 180)

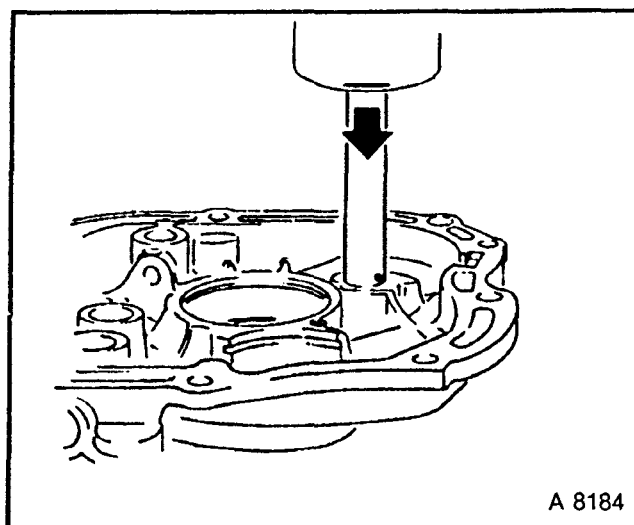


Fig. 177

3. Pin 1st/2nd gear shift fork and shift rod, KM-308/2.
4. Allow new pin to project approximately 2 mm.
See assembly (Fig. 180) in this operation.

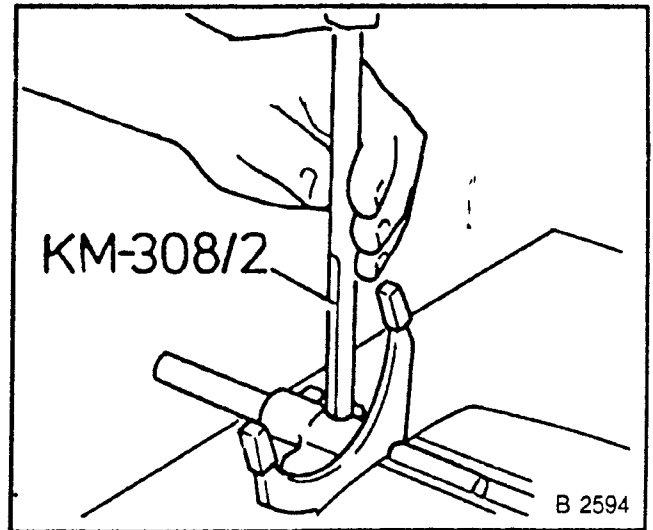


Fig 178

INSTALL, CONNECT

1. Guide main shaft.
2. Drive shaft.
3. 1st and 2nd gear shift fork.
4. Shift rod.
5. Reverse idler gear into end shield.
6. End shield attached to KM-552.
7. Reverse idler gear shift fork nut points upwards (arrow).
8. Lubricate reverse idler gear bore hole with Transmission Fluid.
9. Place thrust washer on reverse idler gear shaft.
10. Secure main shaft and drive shaft, KM-444-3.
11. New retaining rings should lock properly in grooves.

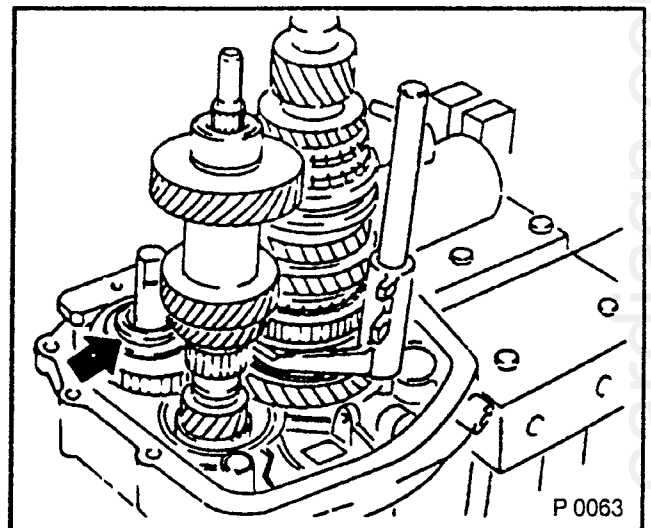


Fig 179

- 1: Gear catch locking pin
- 2: 5th gear shift driver
- 3: Reverse gear shift fork
- 4: Reverse gear shift rod
- 5: 3rd/4th gear shift rod
- 6: 3rd/4th gear shift fork
- 7: 1st/2nd gear shift fork and shift rod

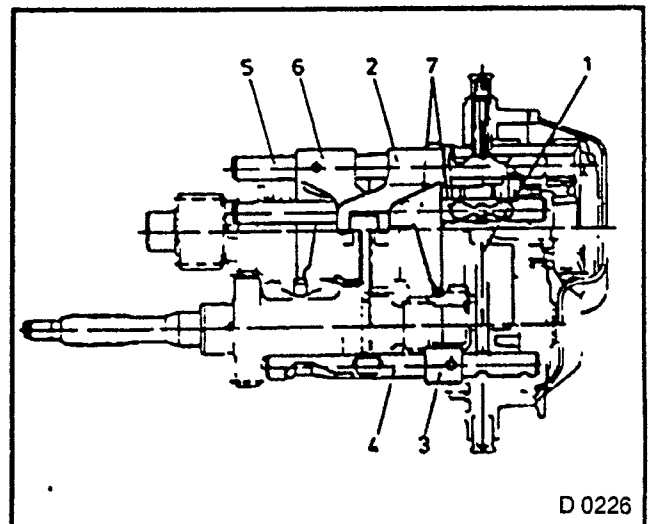


Fig. 180

INSTALL, CONNECT

1. Insert and pin together reverse gear shift rod (Item 4, Fig. 180).
2. Shift fork (Item 3).
3. 5th gear shift driver (Item 2).
4. 3rd/4th gear shift rod (Item 5).
5. Shift fork (Item 6).
6. Locking pin for gear catch (Item 1) in end shield.
7. KM-308.
8. New tension pins.
9. Disengage rod guides; support shift rods with wood.

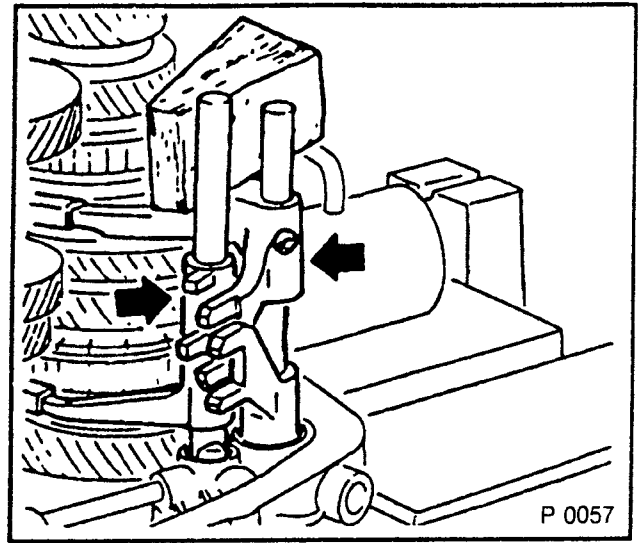


Fig 181

TIGHTEN (TORQUE)

1. Bridge for locking pin on end shield, 7 Nm.
2. Insert new bolts with Locking Compound (Locktite 242).

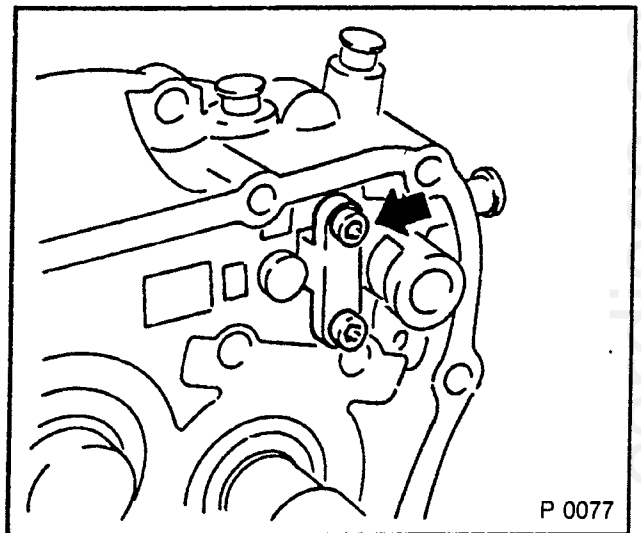


Fig 182

TIGHTEN (TORQUE)

1. Bearing support with pawl on end shield, 7 Nm.
2. Slot in 3rd/4th gear shift rod must align with pawl.
3. Insert new bolts with Locking Compound (Locktite 242).

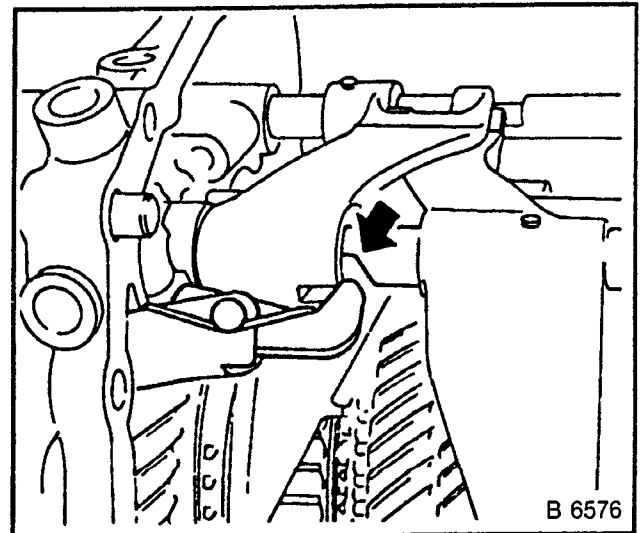


Fig. 183

INSTALL, CONNECT

1. Drive four detent pin plugs for ball stop oiltight into end shield.
2. One long plug (1).
3. Three short plugs (2).
4. Use plastic hammer or soft metal drift.

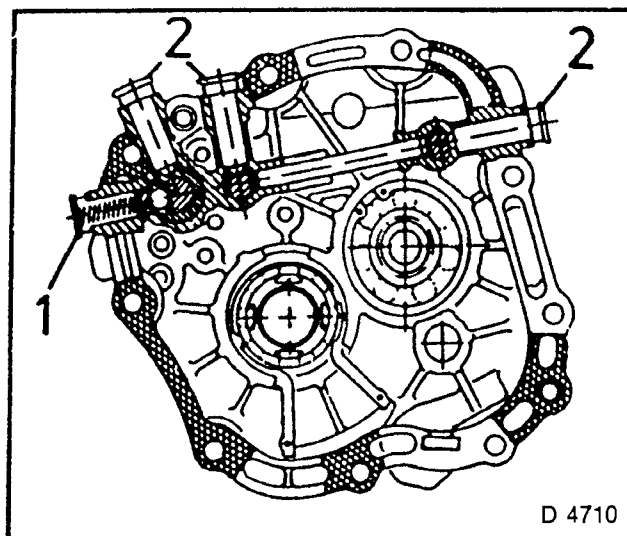


Fig 184

INSTALL, CONNECT

1. Place end shield assembly onto KM-554.
2. Press 5th gear (driving) onto gear cluster, KM-466-3.
3. Long gear hub points towards ball bearing
4. New retaining ring.
5. Push 5th gear (driven) and synchronizer ring onto main shaft.

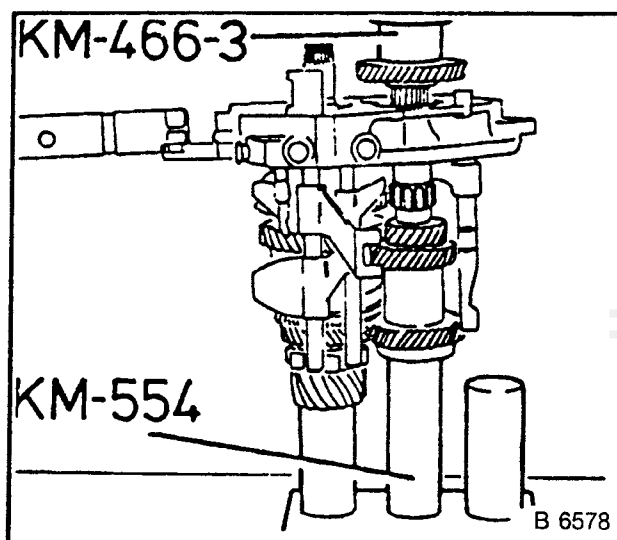


Fig. 185

6. Press 5th gear synchromesh body onto main shaft, KM-334.
7. Heat assembly to approximately 100°C/212°F (thermocolor pencils, if available, or use suitable temperature gauge).
8. Synchronizer spring points towards gear.
9. New retaining ring.

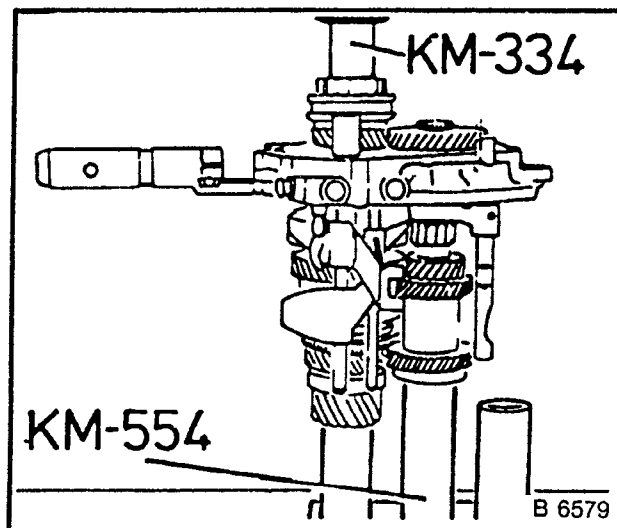


Fig 186

INSPECT

1. Thread for bearing support for free movement, recut M8 x 1.25 if required.

TIGHTEN (TORQUE)

1. Bearing support with rocker arm (arrows) to end shield, 22 Nm.
2. Insert new bolts with Locking Compound (Locktite 242).

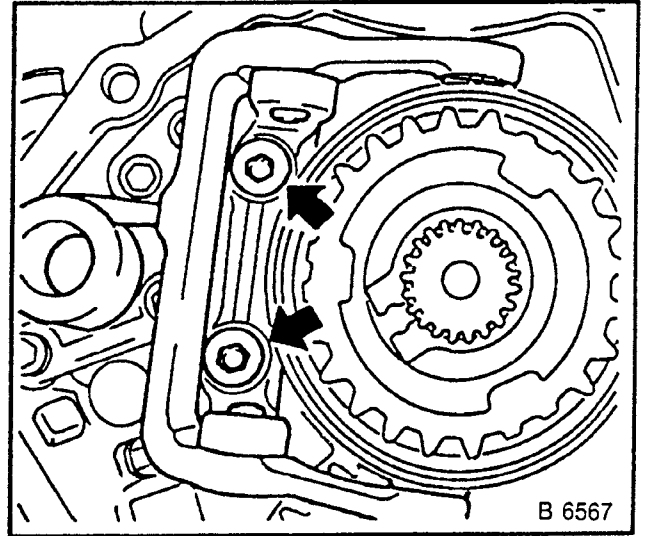


Fig 187

3. Stick new gasket onto transmission with bearing grease.
4. Place magnet in end shield.
5. End shield assembly (without transmission cover) carefully to transmission, 20 Nm.
6. End shield cover to end shield, M7 x 1.0 — 15 Nm. M8 x 1.25 — 20 Nm.
7. Speedometer helical gear (driven) with new rubber O-ring 4 Nm.
8. Lubricate splines, Anti-friction Bearing Grease (B0400852).
9. Reversing light switch to transmission, 20 Nm.
10. Shift cover to transmission, 15 Nm (measurement necessary).
11. Install transmission.

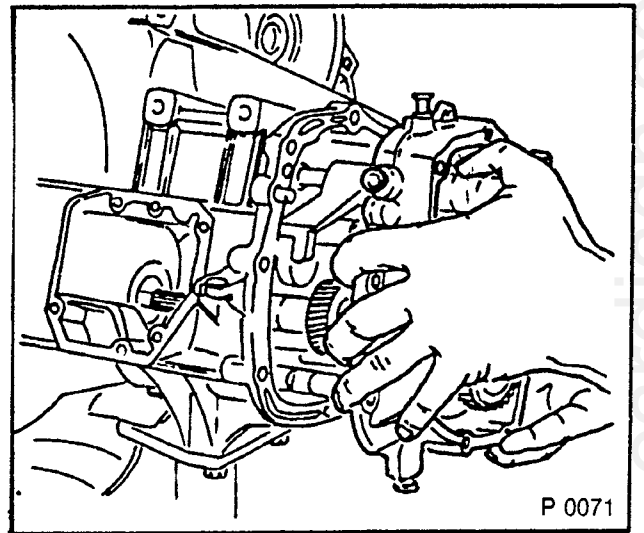


Fig. 188

Synchronizer Rings — Replace

TO BE CARRIED OUT WITH INSTALLED TRANSMISSION

The removal of the transmission is only necessary when replacing transmission housing or for additional operations in Section J.

REMOVE, DISCONNECT

- 1 Shift cover from transmission.
2. Reversing light switch from transmission.
- 3 End shield from transmission — see
“Sealing Operations on Installed
Transmission” Page 30.

Operations on main shaft and drive shaft:
see “Manual Transmission, Overhaul”
Page 62.

Drive Gears (Driving and Driven) — Remove and Install**TRANSMISSION INSTALLED****DRIVE GEAR (DRIVEN), REMOVE AND INSTALL:****REMOVE, DISCONNECT**

1. Differential — see “Differential, Overhaul” Page 48.
2. Differential housing in vice,
F 10, F 13 — KM-520
F 16, F 20 — KM-524-A.
3. Knock off drive gear from differential housing with brass drift.

TORQUE — ANGLE METHOD

- 1 Drive gear to differential housing, 70 Nm plus additional turn of 30° to 45°.
2. Heat drive gear to 80°C/176°F in water bath (thermocolor pencils, if available, or use suitable temperature gauge).
3. Install differential into transmission — prescribed adjustment tapered roller bearing (differential housing).
4. Differential cover to transmission,
Sheet metal version 30 Nm.
Light alloy version 18 Nm.
5. Fill up with transmission fluid — see
“Transmission Fluid Level, Check”
Page 19.

Drive Gear (Driving) — Remove and Install

REMOVE, DISCONNECT

- 1 Both front wheels.
- 2 Shift cover from transmission — see “Sealing Operations on Installed Transmission” Page 30.
- 3 End shield from transmission — see “Sealing Operations on Installed Transmission” Page 30.
- 4 Main shaft and drive shaft from end shield — see “Manual Transmission, Overhaul” Page 62.
5. Drive gear
F 10, F 13 — Press off drive gear from main shaft, KM-307-B and suitable drift; remove retaining ring.
F 16, F 20 — Disassemble main shaft completely, main shaft and drive gear (driving) are one part.
If necessary, replace needle sleeve and roller bushing in transmission housing. See “Manual Transmission, Overhaul” Page 62.

INSTALL, CONNECT

1. **F 10, F 13** — Heat drive gear to approximately 100°C/212°F (check temperature with thermocolour pencils, if available, or use suitable temperature gauge).
2. Press drive gear onto main shaft.
3. Secure with retaining ring, KM-331-2.
For **F 16, F 20**-Assemble main shaft.
1. Main shaft and drive shaft in end shield. See “Manual Transmission, Overhaul” Page 62.
2. End shield onto transmission — see “Transmission, Seal” Page 30.
3. Shift cover onto transmission (measurement required).
4. Fill up with Transmission Fluid (B0400075).
5. Adjust transmission shift linkage.
6. Tighten wheel bolts alternating crosswise, 110 Nm.

Speedometer Helical Gear (Driving) — Remove and Install

TRANSMISSION INSTALLED

REMOVE, DISCONNECT

1. Axle shafts from transmission — see “Axle Shaft Seal Rings, Replace” Page 30.
2. Differential — see “Differential, Overhaul” Page 48.
3. Knock off speedometer helical gear (driving) from differential housing.
4. Press on new speedometer helical gear until it catches; **F 10, F 13** — KM-458; **F 16, F20** — KM-525.
5. Heat helical gear and tool to 80°C/176°F (water bath, suitable temperature gauge)

INSTALL, CONNECT

1. Differential onto transmission — prescribed adjustment tapered roller bearing (differential housing).

TIGHTEN (TORQUE)

1. Differential cover to transmission
Sheet metal version 30 Nm.
Light alloy version 18 Nm.
2. Fill up with Transmission Fluid (B0400075) — see “Transmission Fluid Level, Check and Correct” Page 19.

Speedometer Helical Gear (Driven) — Remove and Install

Corresponds to operation “Rubber O-ring for Speedometer Helical Gear (Driven), Replace” Page K-32.

CLUTCH

Clutch Disc and Pressure Plate — Remove and Install

As of May '92, the previous flat flywheel is being gradually replaced by a pot flywheel. Before clutch repairs, check whether a pot flywheel is installed in the affected vehicle by removing the closure cover.

1. Remove the manual transmission on vehicles with pot flywheels.
Vehicles with flat flywheel: manual transmission installed.
2. Retaining clamp (arrow) from cable.
3. Press back clutch release lever with installing iron.
4. Cable from clutch release lever.

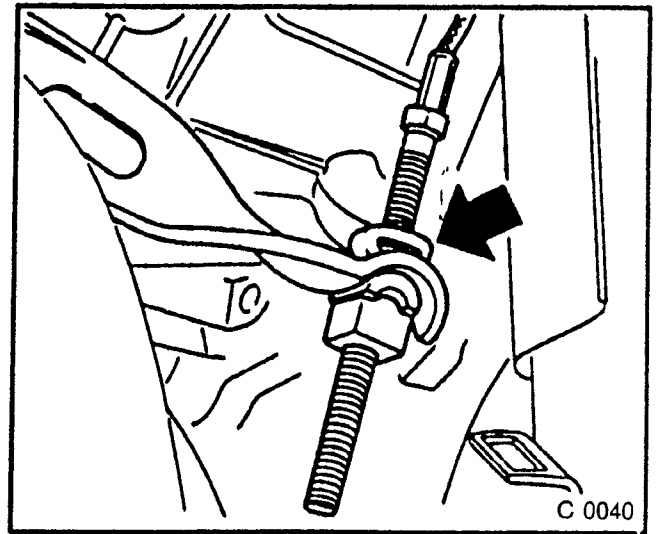


Fig. 189

REMOVE, DISCONNECT

1. Left front wheel.
2. End shield cover, fluid escapes.
3. Clutch closure cover.
4. Retaining ring from drive shaft (arrow).
5. Fillister head bolt from drive shaft.

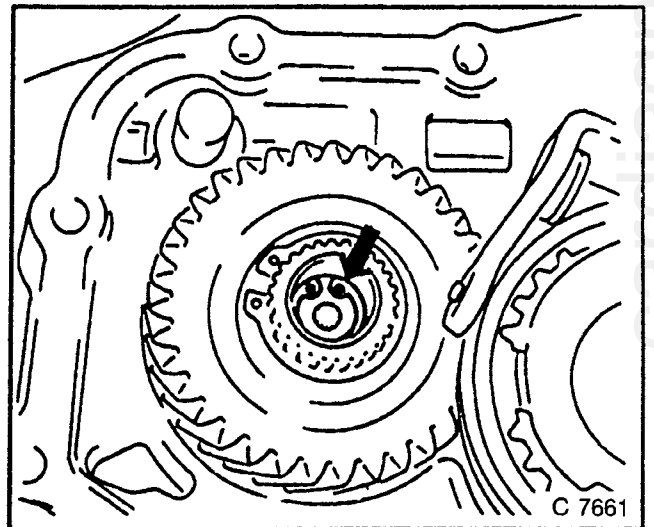


Fig. 190

REMOVE, DISCONNECT

1. Remove transmission drive shaft with KM-556-1-A and KM-556-4 up to stop from gear block and clutch disc.

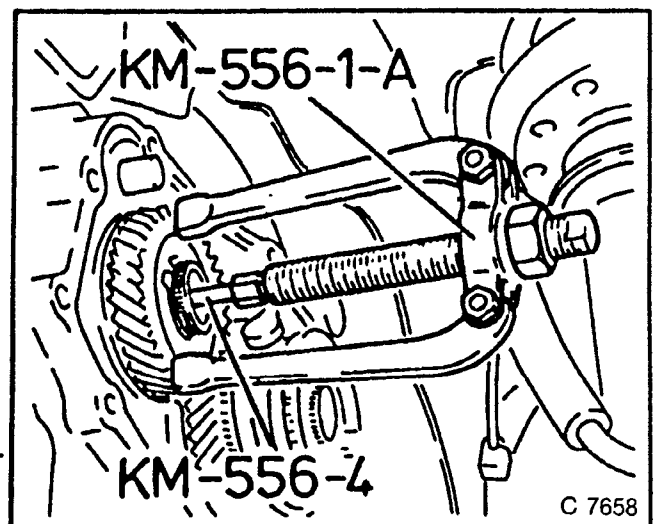


Fig. 191

2. Press back release lever with installing iron to tension diaphragm spring of clutch pressure plate.
3. Attach three Clamps KM-526-A (arrow) distributed around circumference.

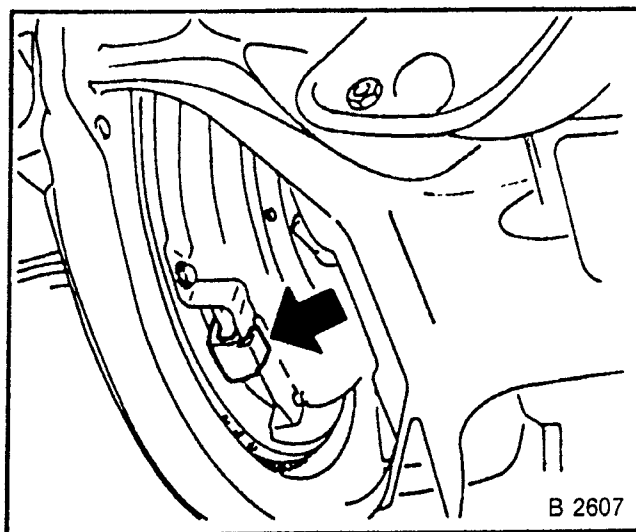


Fig. 192

INSTALLED OR REMOVED TRANSMISSION:**REMOVE, DISCONNECT**

1. Clutch pressure plate with clutch disc from flywheel.
2. Clutch pressure bearing from clutch fork.
3. Fastening bolt (arrow) of clutch fork.

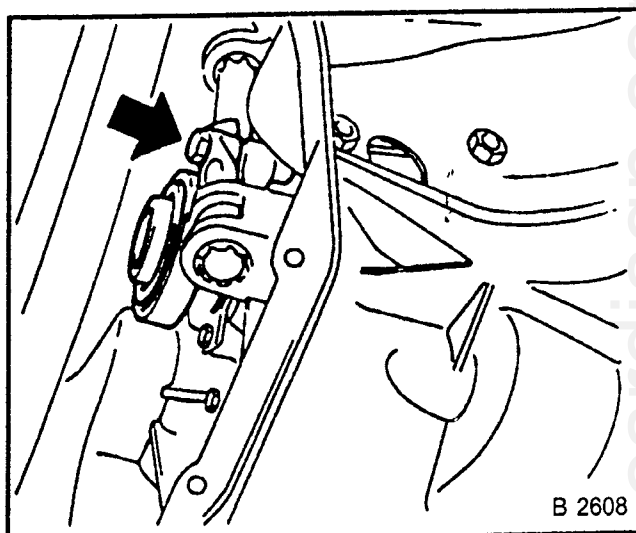


Fig. 193

REMOVE, DISCONNECT

1. Clutch release lever.
2. Clutch fork.
3. Pressure bearing guide (arrow).
4. Seal ring from pressure bearing guide.

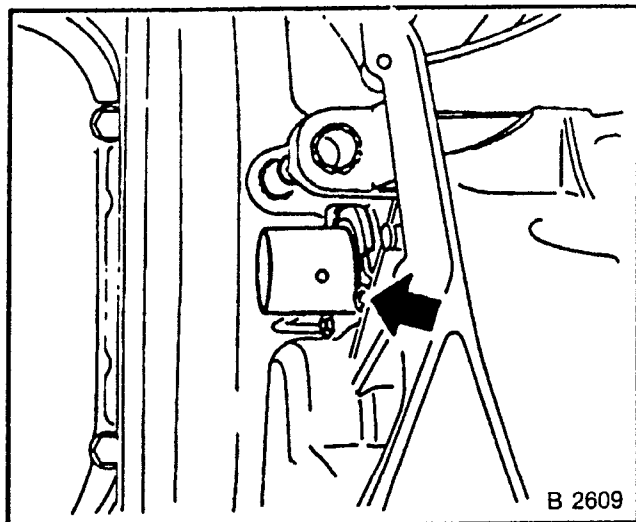


Fig. 194

INSTALL, CONNECT

1. New seal ring into pressure bearing guide.
2. Fill seal ring between sealing lips with
3. Multipurpose Grease (B0400852).
4. Press in seal ring:
F 10, F 13 — KM-445.
F 28/6, F 16, F 20 — KM-518.
5. Rubber O-ring into housing groove, free of grease and oil.

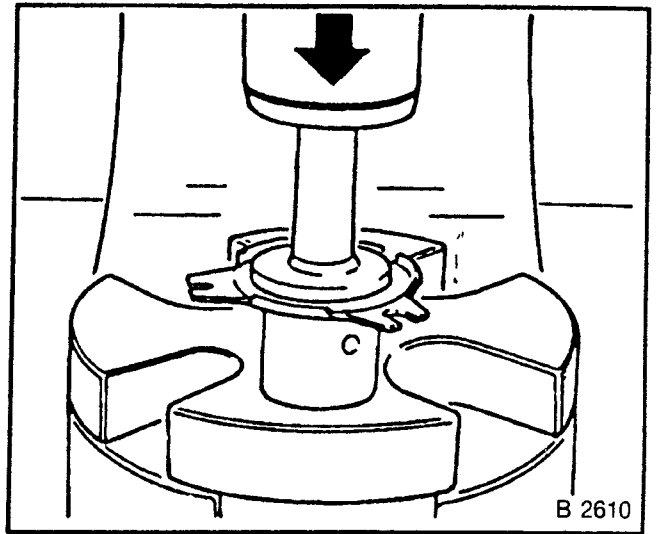


Fig 195

TIGHTEN (TORQUE)

1. Pressure bearing guide to transmission, 5 Nm.
2. Lubricate gliding surface for clutch pressure bearing, Grease (B0400852).
3. Clutch pressure bearing, clutch fork to clutch release lever, 35 Nm.

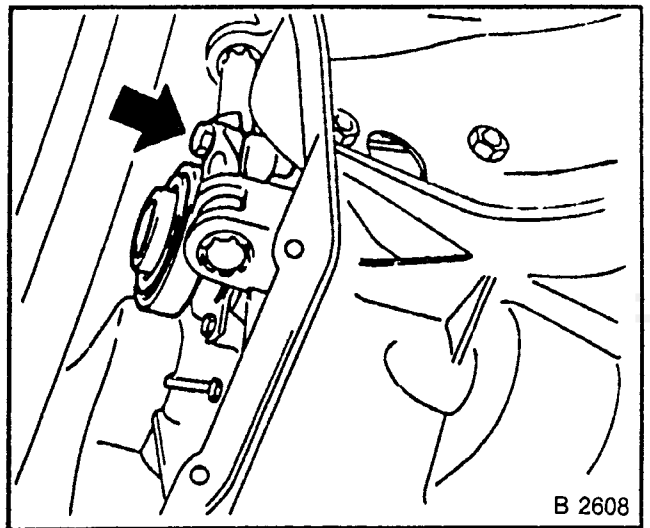


Fig. 196

TRANSMISSION INSTALLED:

If clutch pressure plate is being replaced:

1. Press diaphragm spring of clutch pressure plate under clamp.
2. Install three Clamps KM-526-A distributed on circumference of new clutch pressure plate.

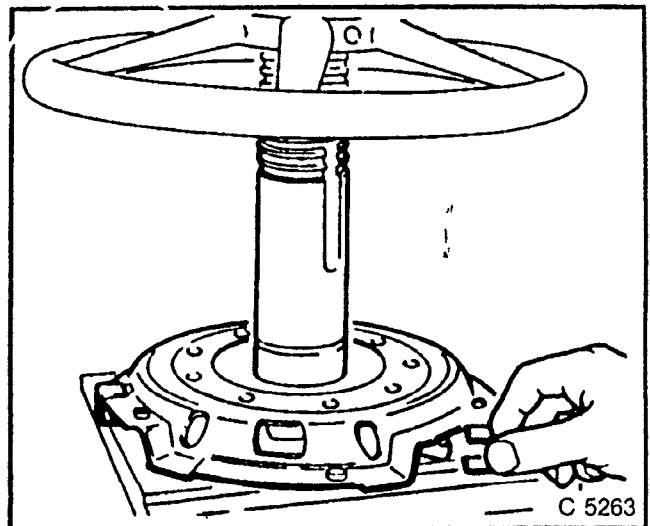


Fig. 197

INSTALL, CONNECT

- 1. Clutch pressure plate with clutch disc loosely on flywheel.
- 2. Lubricate splines of clutch disc, Grease (B0400852).
- 3. If there is no inscription “Getriebeseite” (transmission side), install long part of clutch disc hub pointing to transmission.

NOTE:
MARKS ON CLUTCH PRESSURE
PLATE AND FLYWHEEL (ARROW)
MUST MATCH.

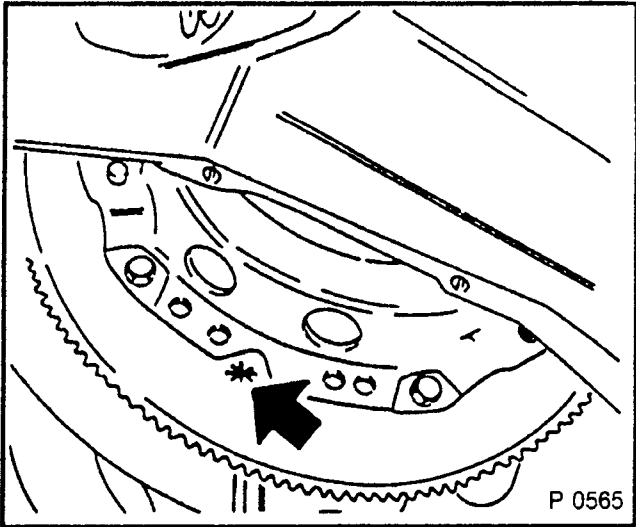


Fig 198

INSTALL, CONNECT

- 1. Raise clutch plate and centre with transmission drive shaft.
- 2. Insert drive shaft into clutch plate and gear cluster splines carefully by hand.

TIGHTEN (TORQUE)

- 1 Clutch assembly to flywheel, 15 Nm.

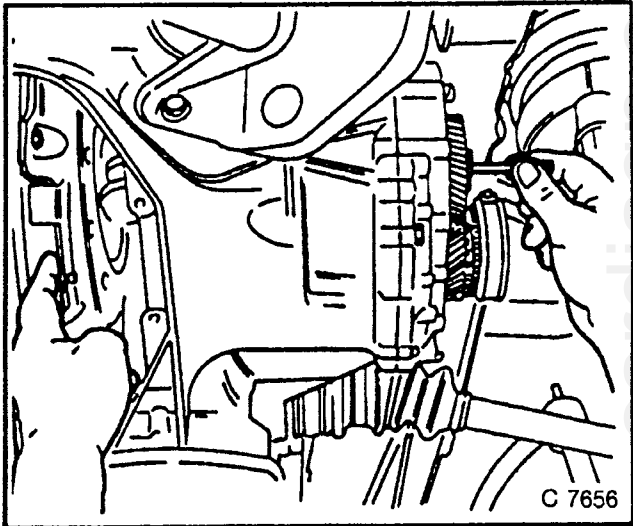


Fig. 199

- 2. Fillister head bolt in drive shaft — 15 Nm.

INSTALL, CONNECT

- 1. Press in drive shaft until stop, KM-564.
- 2. Fillister head screw in drive shaft.

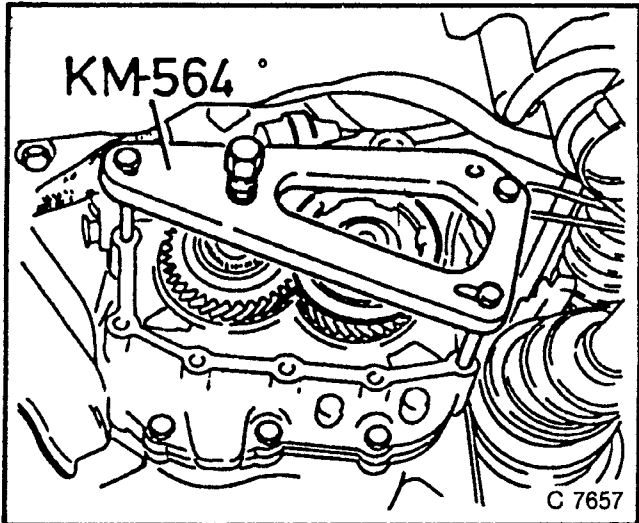


Fig. 200

REMOVE, DISCONNECT

- 1. KM-564.
- 2. KM-526-A (arrow) with clutch release lever actuated.

TIGHTEN (TORQUE)

- 1. Clutch closure cover to transmission:
Sheet metal version; 12 Nm.
Light alloy version; 6 Nm.
- 2. Transmission cover to transmission and end shield,
M 7 x 1.0 — 15 Nm.
M 8 x 1.25 — 20 Nm.

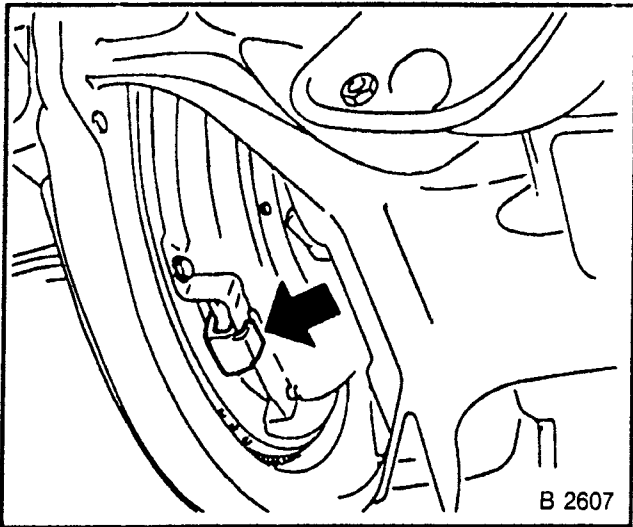


Fig. 201

TRANSMISSION REMOVED: CENTRE CLUTCH DISC

Manual transmission	F 10/F 13	F 16/F 20	F28/6
2,0 LET Engine	—	—	KM-736
Crankshaft with needle bearing	—	KM-534	—
Crankshaft without needle bearing	KM-734	KM-735	—

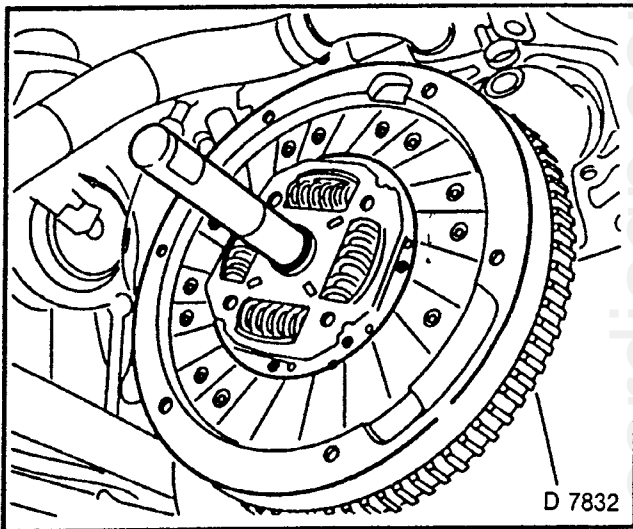


Fig. 202

INSTALL, CONNECT

- 1. Clutch pressure plate to flywheel, 15 Nm.

NOTE:
MARKS ON CLUTCH PRESSURE PLATE AND FLYWHEEL MUST MATCH.

INSTALL, CONNECT

- 1. Manual transmission.

ALL TRANSMISSIONS:

INSPECT

- 1. Transmission fluid level.

INSTALL, CONNECT

- 1. Clutch cable to release lever.
- 2 Retaining clamp (arrow).

ADJUST

- 1. Clutch pedal.
See "Clutch Cable, Replace" Page 96.

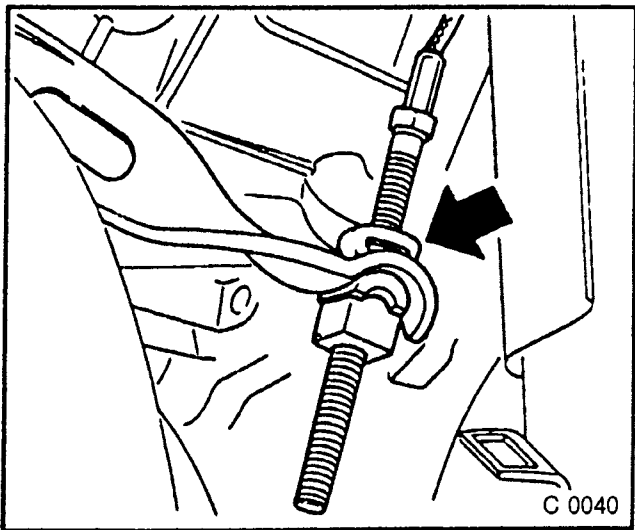


Fig 203

Clutch Pressure Bearing and Release Lever — Remove and Install

This operation corresponds to "Clutch Disc and Pressure Plate, Remove and Install" Page 90.
The procedure differs for vehicles with pot flywheel and for vehicles with flat flywheel.

Bearing Bushings for Clutch Release Lever — Remove and Install

ALL TRANSMISSIONS EXCEPT F 28/6

REMOVE, DISCONNECT

- 1. Clutch pressure bearing and release lever. See operation "Clutch Disc and Pressure Plate, Remove and Install" Page 90.
- 2. Bearing bushings for clutch release lever, KM-304.

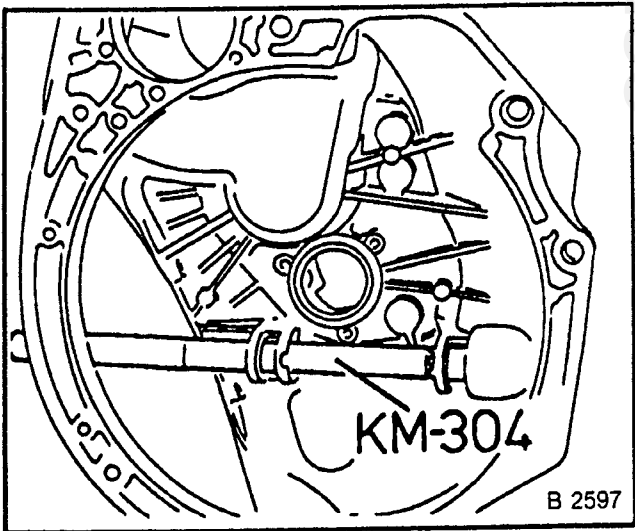


Fig. 204

INSTALL, CONNECT

1. New bearing bushings (arrows), KM-J-7004, with washer.
2. Bushing cam should lie in housing recess.
3. Lubricate bushing inner surface, Multipurpose Grease (B0400852).

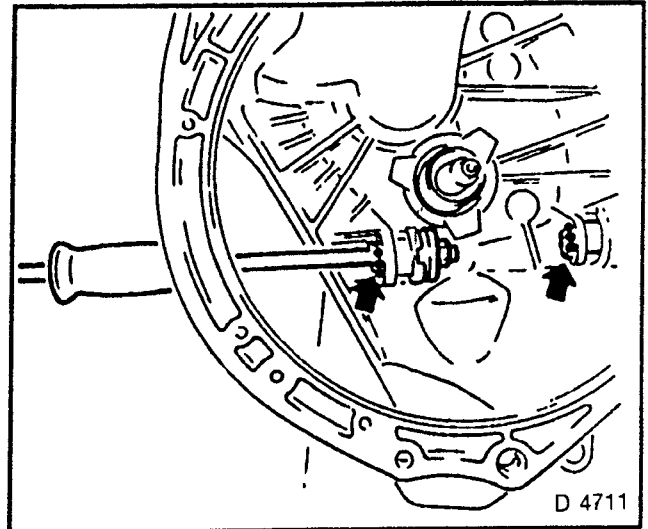


Fig. 205

F 28/6 TRANSMISSION:**REMOVE, DISCONNECT**

1. Clutch pressure bearing and release lever See "Clutch Disc and/or Pressure Plate, Remove and Install" Page 90.
2. Press locking lugs together.
3. Press out bearing bushings.

INSTALL, CONNECT

1. Press in new bearing bushings until locking lugs engage.
2. Lubricate sliding surfaces of bushings, Grease (B0400852).

Clutch Cable — Replace**MEASURE**

1. Thread length.

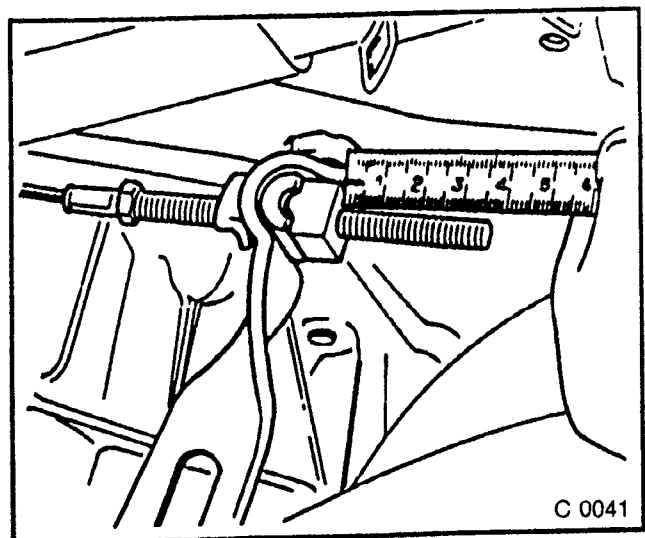


Fig. 206

REMOVE, DISCONNECT

1. Retaining clamp (arrow) from cable.
2. Press back release lever with installing iron.
3. Cable from release lever.
4. Cable from bracket for damper

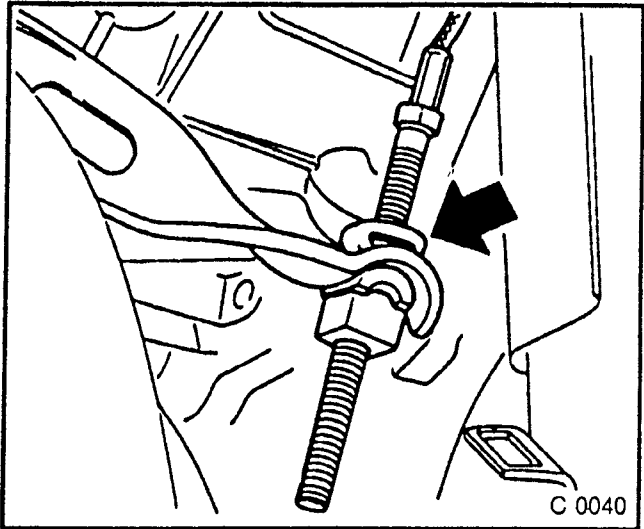


Fig. 207

REMOVE, DISCONNECT

1. Return spring and clutch cable from clutch pedal.

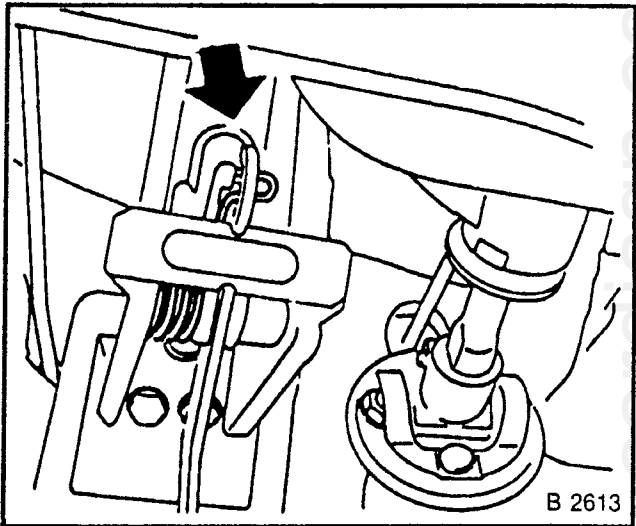


Fig. 208

2. Clutch cable.
3. Remove engine compartment side cable from bulkhead.

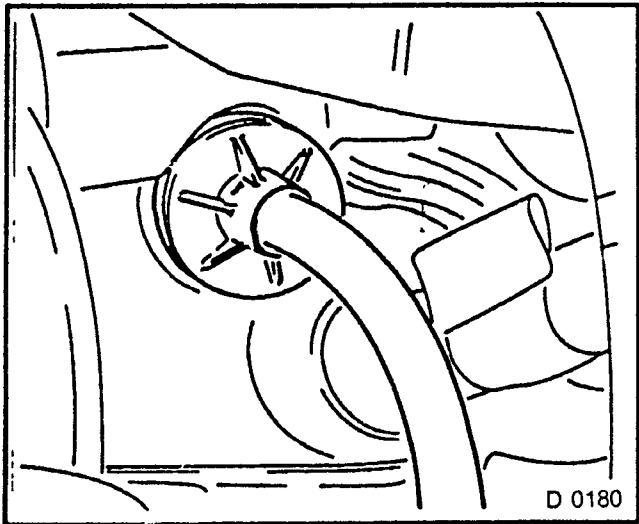


Fig. 209

INSTALL, CONNECT

1. Clutch cable onto bulkhead.
2. Clutch cable and return spring to clutch pedal.
3. Cable in bracket for damper.
4. Clutch cable in release lever.
5. Adjust clutch actuating nut to measured value.

ADJUST

1. CLUTCH PEDAL

Dimension A distance from middle of clutch pedal to lower edge of steering wheel circumference.
Pedal not depressed.

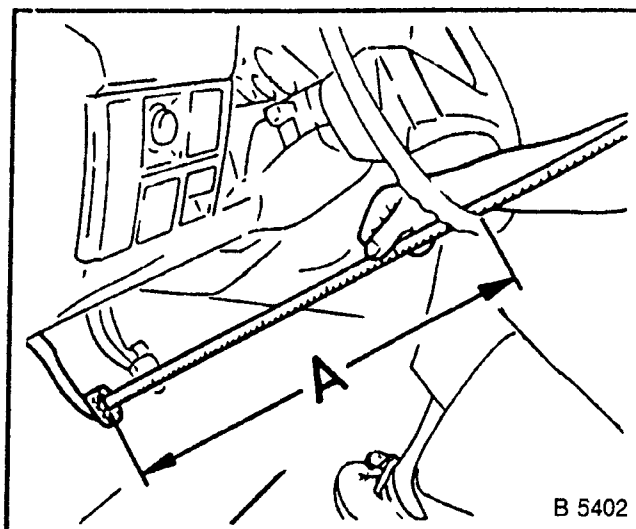


Fig. 210

CLUTCH CABLE

Dimension B: Measure from lower edge of steering wheel circumference but with pedal depressed.

The difference between two values (B minus A) must be 134 to 141 mm.

2. Correct pedal displacement at cable threaded rod if necessary.
3. Secure cable with retaining clamp.

NOTE:

Clutch pedal is higher than brake pedal. Placing pedals on the same level is not correct. There should be no play in clutch pedal. Clutch pedal moves upwards with progressive wear of clutch linings.

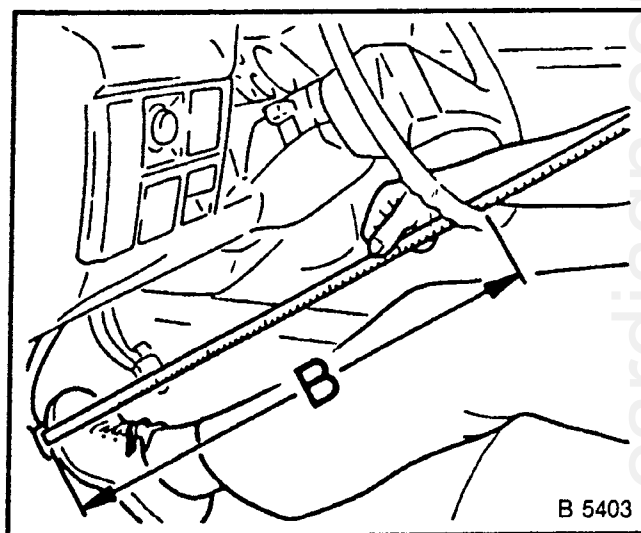


Fig. 211

Clutch Pedal — Remove and Install

REMOVE, DISCONNECT

1. Clutch cable from release lever.
2. Return spring from pedal support.
3. Retaining wire, hex nut and washers from pedal axle.
4. Pedal axle.
5. Pedal.
6. Return spring and clutch cable from clutch pedal.

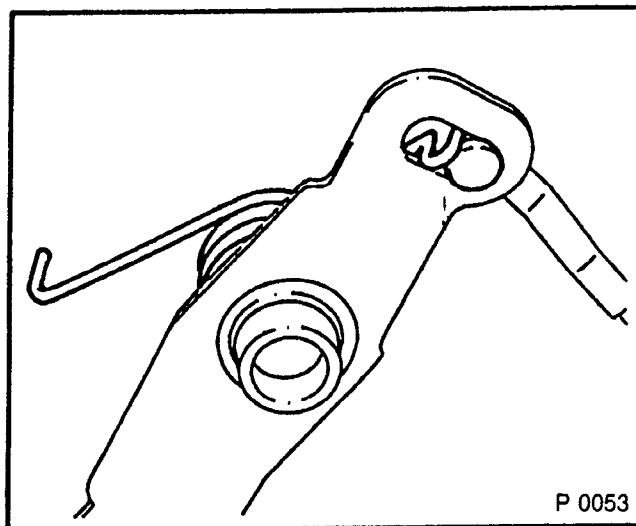


Fig. 212

INSTALL, CONNECT

1. Clutch pedal.
2. Lubricate pedal axle, Multipurpose Grease (B0400852).
3. Clutch pedal assembly replaced with pedal bushing.
4. Clutch cable and return spring onto pedal support.
5. Clutch cable onto release lever.
6. Secure clutch cable with retaining clamp.

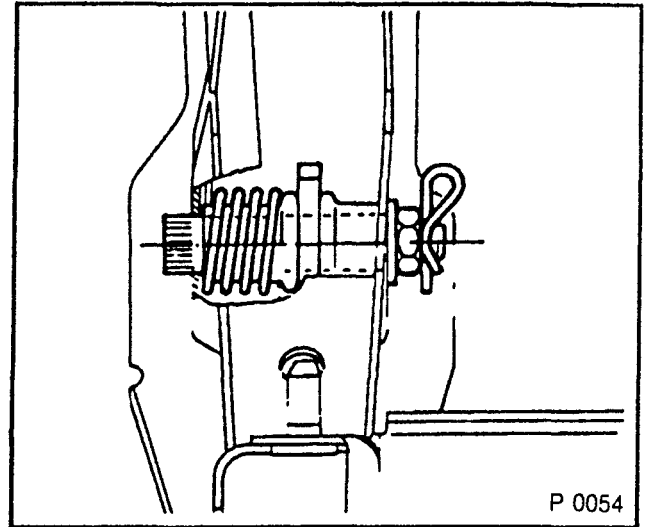


Fig 213

INSPECT

1. Clutch pedal adjustment.
See "Clutch Cable, Replace" Page 96.

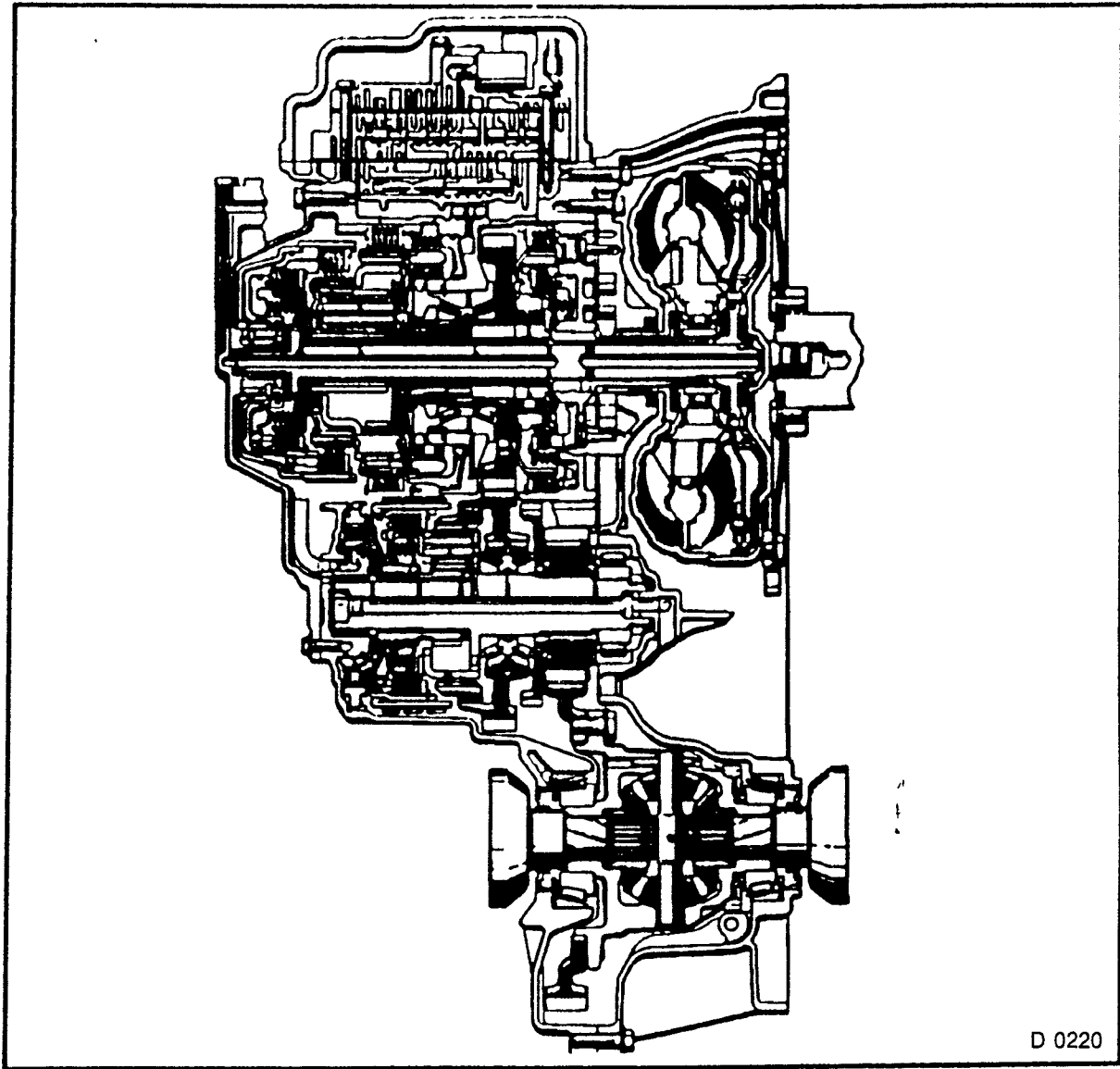


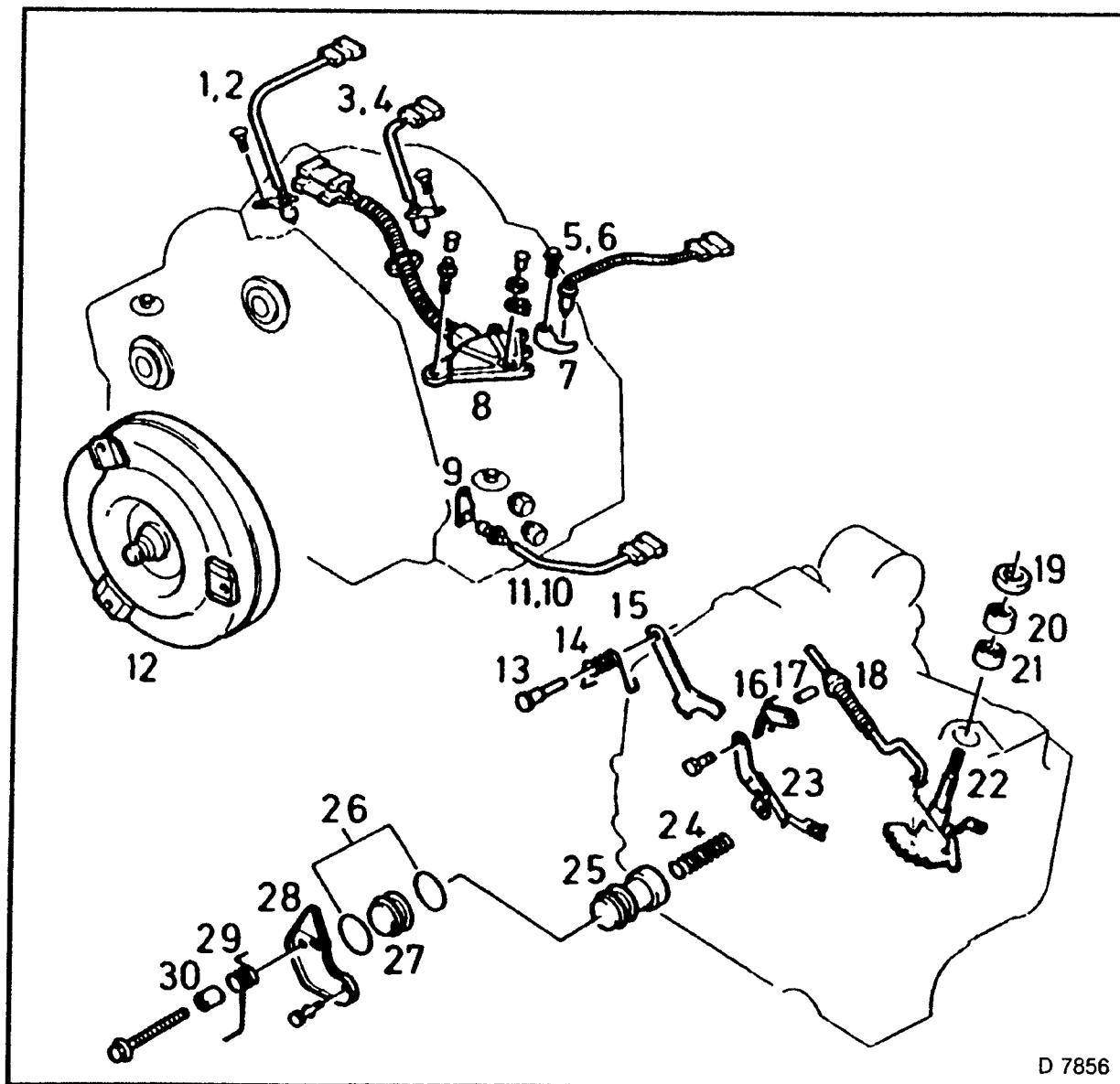
Fig. 214 — Automatic Transmission AF 20.



D 0219

- 1 = Sensor, transmission output speed
- 2 = Seal ring
- 3 = Sensor, transmission input speed
- 4 = Seal ring
- 5 = Solenoid valves wiring harness
- 6 = Seal ring
- 7 = Retaining plate
- 8 = Selector lever position switch
- 9 = Cover plate for fluid temperature sensor
- 10 = Seal ring
- 11 = Fluid temperature sensor
- 12 = Converter
- 13 = Axle for parking pawl
- 14 = Torsion spring no. 1
- 15 = Pawl for parking pawl
- 16 = Cam plate
- 17 = Pin for parking pawl
- 18 = Actuating rod for parking pawl
- 19 = Seal ring
- 20*) = Outer needle bearing
- 21*) = Inner needle bearing
- 22 = Ratchet
- 23 = Detent spring
- 24 = Compression spring
- 25 = Accumulator piston
- 26 = Seal rings
- 27 = Accumulator cover
- 28 = Accumulator bracket
- 29 = Torsion spring no. 2
- 30 = Sleeve for spring guide

*) One part on newer transmissions



D 7856

Fig 216 — AF 20 — attaching parts

- 1 = Plug — M8
- 2 = Seal ring
- 3 = Lubrication oil line
- 4 = Pipe clamp
- 5 = Roller bearing
- 6 = Seal ring
- 7 = Oil baffle plate, auxiliary housing
- 8 = Magnet (x 3)
- 9 = Plug — M8
- 10 = Seal ring
- 11 = Auxiliary housing cover
- 12 = Seal ring
- 13 = Drain bolt
- 14 = Axle shaft seal ring
- 15 = Hooked seal ring
- 16 = Main pressure pipe no. 1
- 17 = Pipe clamp
- 18 = Actuation pipe
- 19 = Lubrication pipe
- 20 = Axle shafts seal ring
- 21 = Gaskets for regulator
- 22 = Gaskets for actuation (x 2)
- 23 = Side cover
- 24 = Main housing plate
- 25 = Oil baffle plate, main housing
- 26 = Oil screen
- 27 = Main pressure pipe no. 2
- 28 = Pipe clamp
- 29 = Seal ring

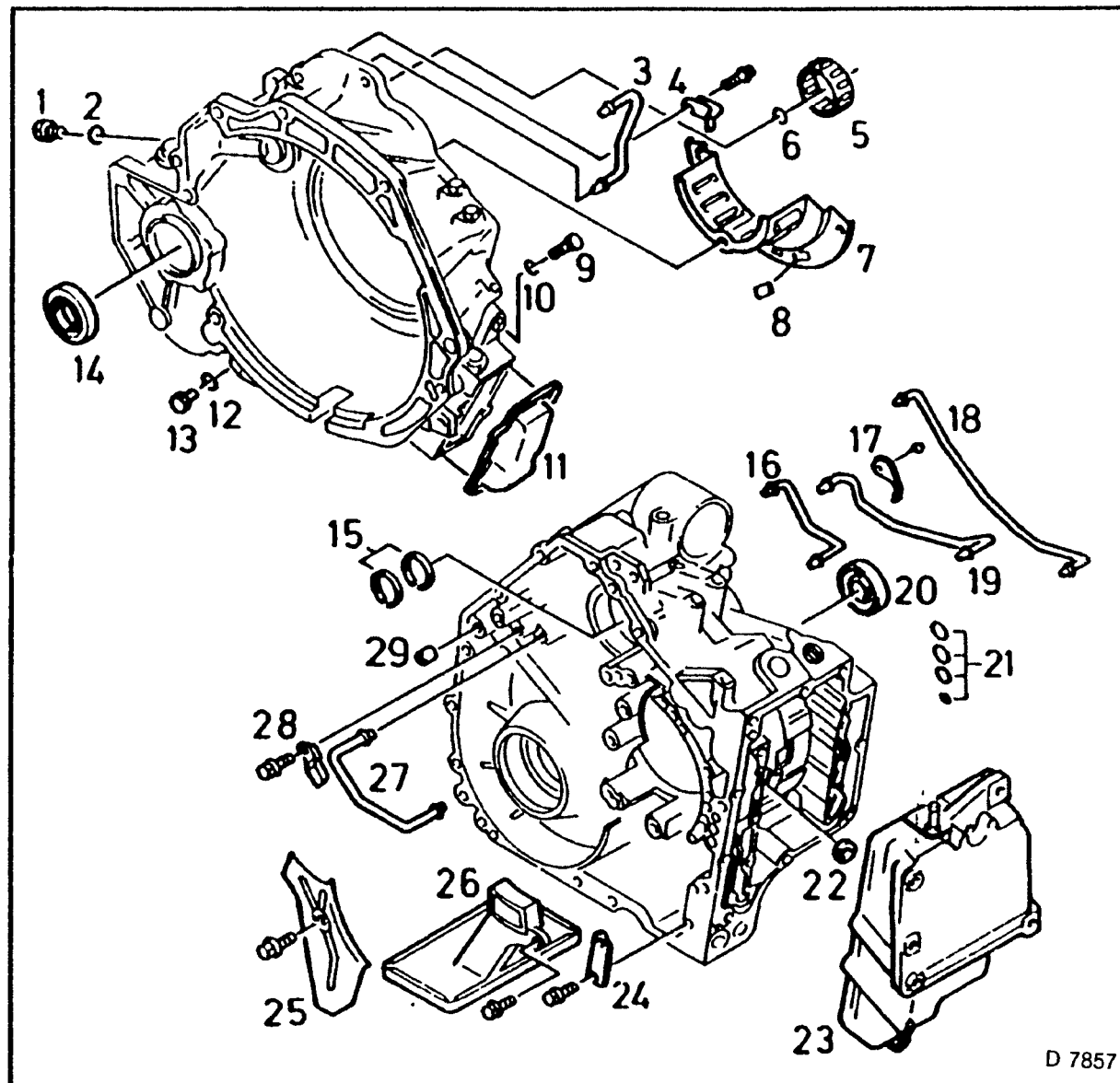


Fig 217 — AF 20 — housing parts

AUTOMATIC TRANSMISSION AF 20

Important Instructions for Operations on Automatic Transmissions

Before disassembling transmission, carry out fluid pressure check according to Checking Procedures. (Opel Electronic 4-Speed Automatic Transmission AF 14/20) in installed condition. The diagnosis will allow precise repairs to be made.

NOTE:

WHEN DISASSEMBLING:

During all operations on automatic transmissions, ensure that attaching parts and tools are as clean as possible. Malfunctions in transmissions are frequently caused by dirt and foreign objects.

Disconnect ground cable of battery before working on transmission.

Clean removed parts after disassembling, check for wear and damage. If defective seal rings are found when disassembling, inspect grooves and seating surfaces for foreign objects, burr formation or damage.

If metal chippings or clutch lining remnants are found when draining fluid, disassemble transmission completely and clean. If foreign objects are found when flushing converter, replace converter.

If a defect is found where floating particles could get into the fluid (bearing or gear is run in, clutch is burned), the valve body must be disassembled for flushing.

Proceed with the utmost caution, since inner parts of valve body are not available as replacement parts. **Do not** damage piston seal rings and springs. **Do not** lose retaining wedges.

The electrohydraulic pressure regulator is not available as a single part and if defective must be replaced together with the valve body (completely).

When disassembling valve body, set aside pistons, springs and valves as installed to avoid confusion. Thoroughly flush the valve body — especially the bore holes and ducts — and then blow dry. If in doing so chippings, scoring or other damage to functioning surfaces are visible, replace the valve body.

When placing attaching parts in vice, always use soft protective jaws.

If incorrect values are found when spin torques are measured, disassemble the relevant attaching part and overhaul bearings.

The retaining pin of Transmission Holder KM-694 is designed to be turnable and can be stopped after every 1/4 turn so that a favourable installing position can be attained.

Exception: When loosening housing bolts and separating housing parts, always keep transmission fixed horizontally (auxiliary housing points upwards), since assemblies are free and can fall out.

IMPORTANT!

WHEN ASSEMBLING:

Always renew gaskets and securing elements, **DO NOT** overstretch retaining rings.

When reinstalling, immerse attaching parts and bolts in transmission fluid. Insert bearings and gaskets with Installation Grease, if necessary stick to the relevant installation areas.

Blow dry all attaching parts — especially the ducts — after using cleaning agents. Function checks are usually carried out with low pressure air (4 bar); use pressure reducing valve and adjust appropriately.

Place new clutch plates and brake bands in transmission fluid for at least two hours before installing.

The installation position of thrust bearings and friction washers can be seen in Fig. 492 at beginning of section "Assemblies, Install in Transmission".

New rubber O-seal rings are identified by their outer and cord diameters; values can be found in Technical Data.

Install housing parts using Sealing Compound.

Transmission Identification

Identification plate is located on top side of transmission.

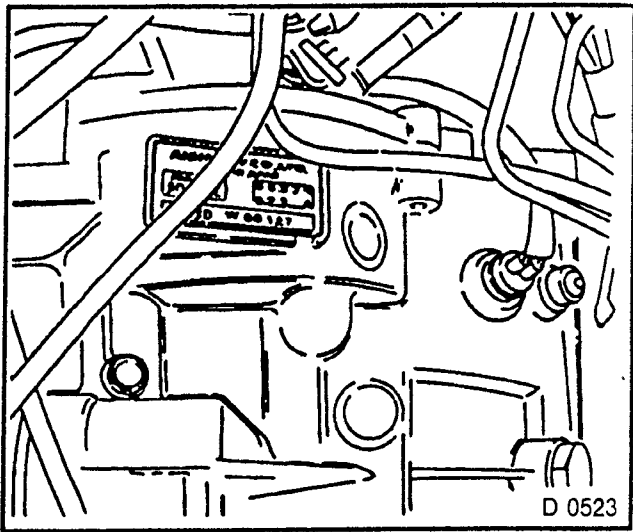


Fig. 218

- 1 = AW transmission type
- 2 = Opel transmission type
- 3 = Model code
- 4 = Opel Parts No.
- 5 = Cal. code
- 6 = Series No.

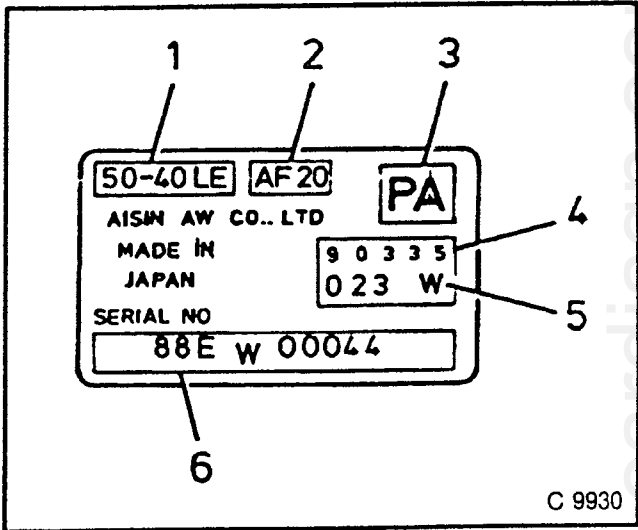


Fig. 219

CHECKING AND
ADJUSTING
OPERATIONS

Transmission Fluid
Level — Check

IMPORTANT!

Selector lever position “P” — maintain during fluid level check, engine 1 to 2 minutes at idle speed.

MEASURE

Transmission fluid level — with engine running.
Note markings on dipstick corresponding to transmission fluid temperature, transmission is at operating temperature after driving approximately 20 km.
If necessary (e.g. to inform customer on travelled distance), measure transmission fluid temperature with TECH 1 — see Checking Procedures “Opel Electronic 4-Speed Automatic Transmission AF 14/20”, Quick Check from FO: Data List.
If necessary, top up with transmission fluid, filling quantity and quality: Technical Data.
Fill with engine off.

Selector Lever Position
Switch — Check

INSPECT

1. Functioning of selector lever position switch.
- | Selector lever position | Function |
|-------------------------|---------------------------------|
| P (1), N (2) | Starting of engine possible |
| R, D, 3, 2, 1 | Starting of engine not possible |
| R | Reversing lamps switched on |

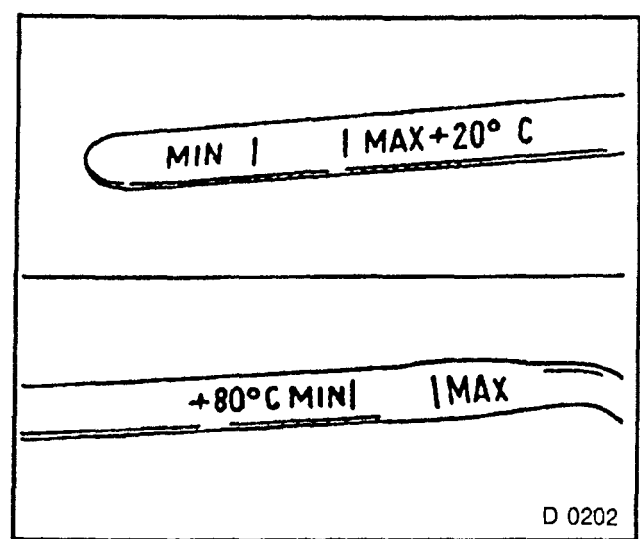


Fig. 220

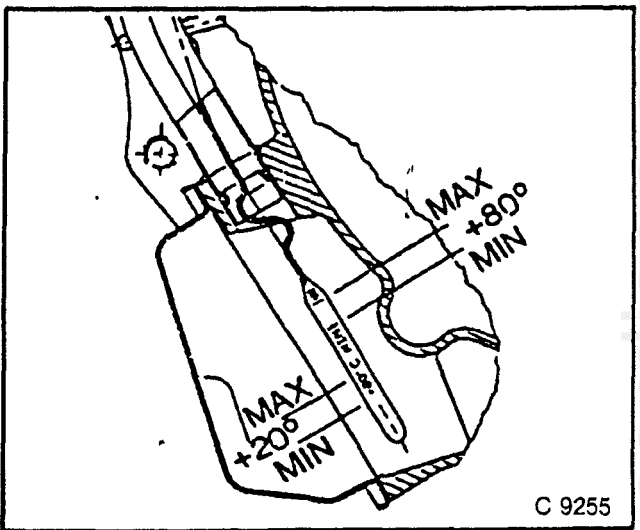


Fig. 221

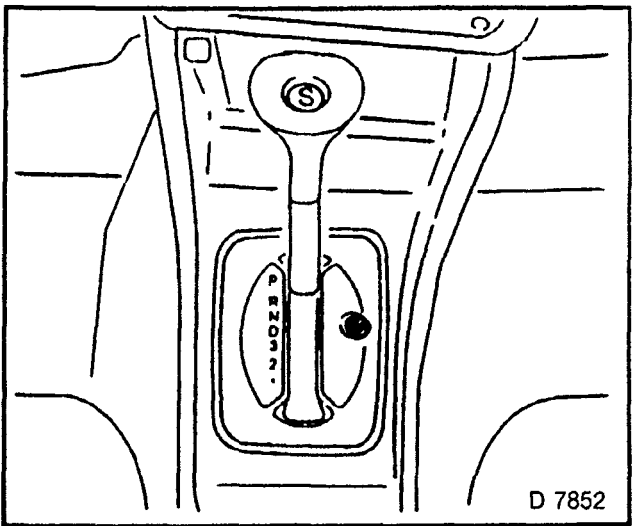


Fig. 222

WITH INCORRECT FUNCTION:**INSPECT**

1. Selector actuation cable adjustment.
2. Adjustment of selector lever position switch. See operation on Selector lever position switch — electrical functioning. See Checking Procedures "Opel Electronic 4-Speed Automatic Transmission AF 14/20"

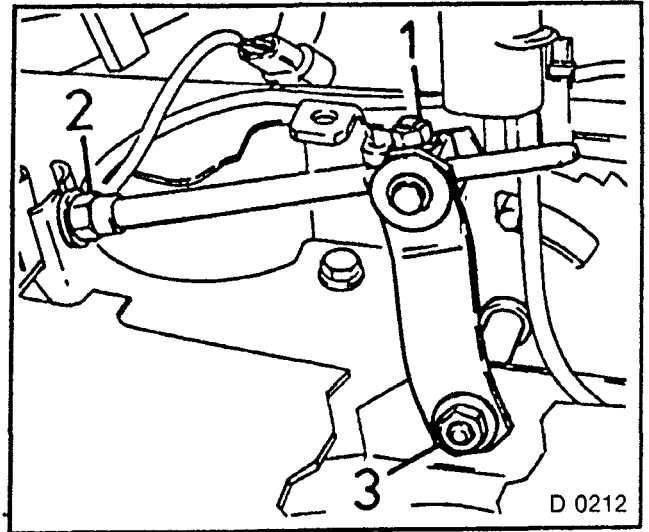


Fig 223

Selector Lever Position Switch — Adjust

REMOVE, DISCONNECT

1. Bowden cable from actuation lever — remove retaining clamp and remove Bowden cable.
2. Bring selector lever shaft into neutral position by turning actuation lever. Turn first to right stop, then turn back two notches ("P", "R", "N").

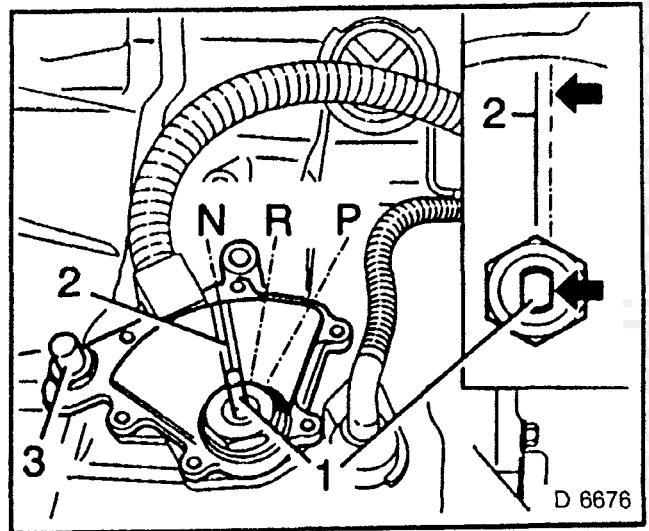


Fig 224

3. The flattened part of the selector lever shaft (1) must align with the split (2) in the selector lever position switch housing (arrows).
4. For correct adjustment, loosen the stop screw (3)
5. Turn selector lever position switch so that split aligns with flattened part of selector lever shaft (1).
6. Tighten stop screw — 25 Nm.

INSTALL, CONNECT

1. Bowden cable to actuation lever — secure with clamp.

Fluid Pressure Check (Mechanical)

NOTE:
CHECK TRANSMISSION FLUID
LEVEL.
ELIMINATE POSSIBILITY OF
OPERATING FAULT.

Full load check values measured at
an engine speed of 2500 + 150 rpm.
For full load checks, engage parking
brake and depress service brake. DO
NOT check for longer than five
seconds, due to risk of overheating.
Allow pauses for cooling.

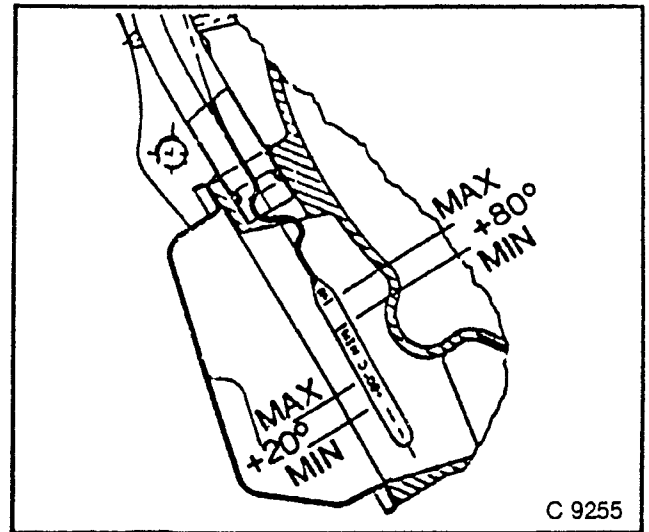


Fig. 225

INSPECT

1. Main pressure with KM-580 or KM-498-B.
2. Unscrew plug M 8 above joint of left axle shaft on transmission side and connect adapter.
3. Selector lever position

	Idle speed	Full load
R	5.0 — 5.8 bar	17.0 — 19.0 bar
D, 3, 2, 1	2.6 — 3.0 bar	11.4 — 12.6 bar
4. Screw in plug M 8 — 8 Nm.
Checking values: See also Checking Procedures (Opel Electronic 4-speed Automatic Transmission AF 14/20).

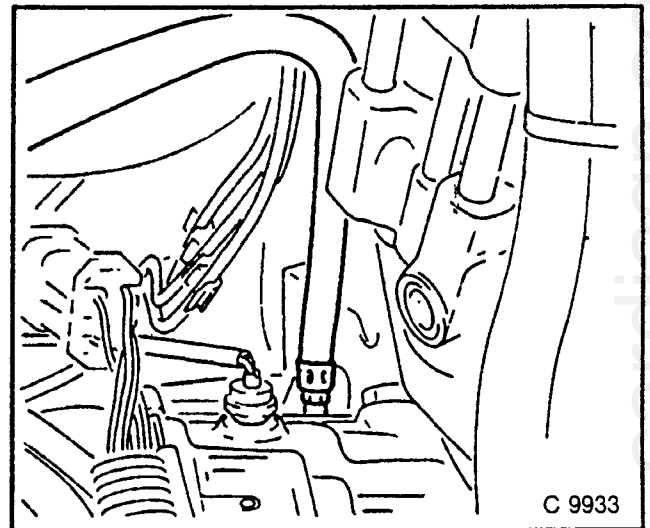


Fig. 226

INSPECT

1. Fluid circuit C1 with KM-580 and KM-498-B, connect as shown in illustration.
2. Selector lever position

	Idle speed	Full load
R	0 bar	0 bar
D, 3, 2, 1	2.8 bar	12 bar

Checking values: See also Checking Procedures (Opel Electronic 4-speed Automatic Transmission AF 14/20) and section "Technical Data".
3. Screw in plug M 8 — 8 Nm.

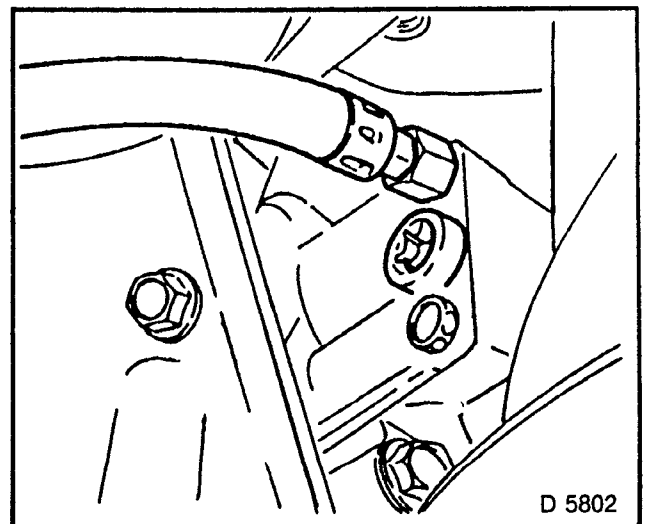


Fig. 227

4. Fluid circuit C2 with KM-498-4 and KM-498-A or KM-498-B, connection as in Fig. 227, however screw in adapter in Torx bolt bore hole (Torx insert T 55 or MKM-604-22) below connection C1.

5. Selector lever position

	Idle speed	Full load
R	5.0 bar	18.0 bar
D, 3, 2, 1	0 bar	0 bar

Checking values: See also Checking Procedures (Opel Electronic 4-speed Automatic Transmission AF 14/20).

6. Screw in Torx bolt — 35 Nm.

INSPECT

1. Fluid circuit B4 — connect as in Fig. 228.

2. Selector lever position

	Idle speed	Full load
R	5.0 bar	18.0 bar
D, 3, 2, 1	2.8 bar	12.0 bar

Checking values: See also Checking Procedures (Opel Electronic 4-speed Automatic Transmission AF 14/20).

3. Screw in plug — 35 Nm..

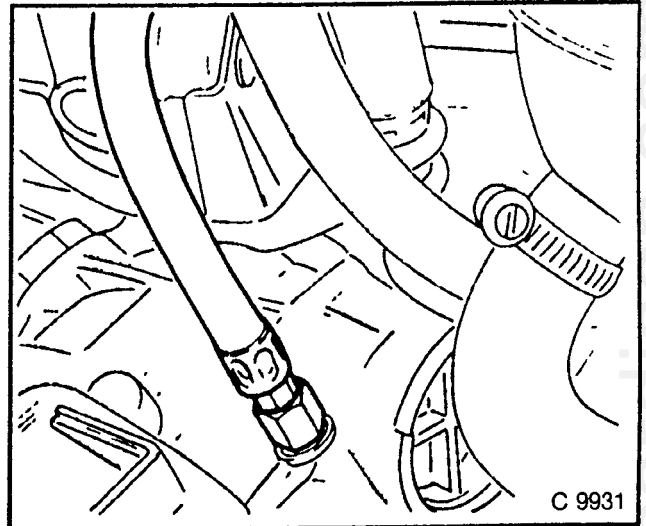


Fig 228

OPERATIONS ON INSTALLED TRANSMISSION

Electronic Control Unit — Remove and Install

REMOVE, DISCONNECT

1. Control unit.
2. Glove compartment, completely — see section C.
3. Disconnect wiring harness plug (1), unclip control unit from bracket (2).

INSTALL, CONNECT

1. Control unit.
2. Clip into bracket (2).
3. Connect wiring harness plug (1).
4. Install glove compartment.

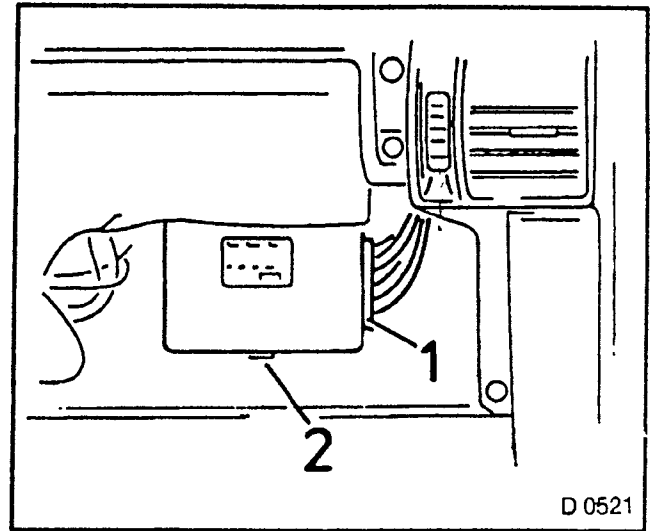


Fig. 229

Selector Actuation Cable — Adjust

INSPECT

- 1 Adjustment of selector auction cable.
2. Put selector lever consecutively into positions "P, R, N, D, 3, 2, 1" — lift pull knob up to first or second stop.
3. The auction lever on transmission must catch at each of the following: "P" (foremost position, 1), "R", "N" (2), "D", "3", "2", "1".

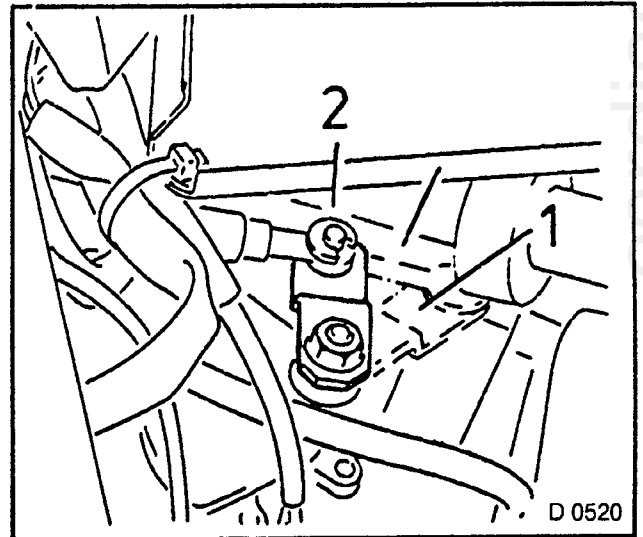


Fig. 230

If actuation lever does not catch:

REMOVE, DISCONNECT

1. Unclip shift cover from shift tunnel — by pressing on the surface marked by arrows — and turn until aperture for cable clamp is visible.

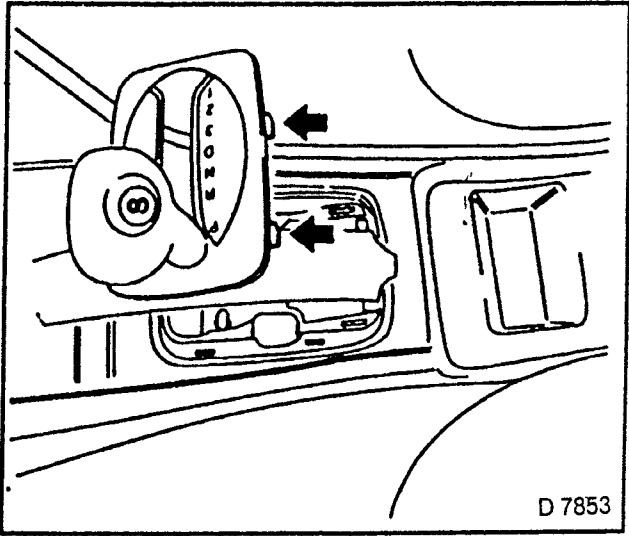


Fig. 231

ADJUST

1. Selector actuation Bowden cable (Fig. 232B) — centre console removed.
2. Loosen cable clamp bolt (1) — guide box spanner through aperture (Fig. 232A).
3. Selector lever in position “P”, ensure by moving selector lever forwards and backwards without lifting pull knob that lever correctly catches in position “P”.
4. Turn actuation lever on transmission right (towards battery holder) as far as stop (Fig. 230 Item 1) — must catch.
5. Turn at the front wheels so that parking pawl in transmission correctly catches.

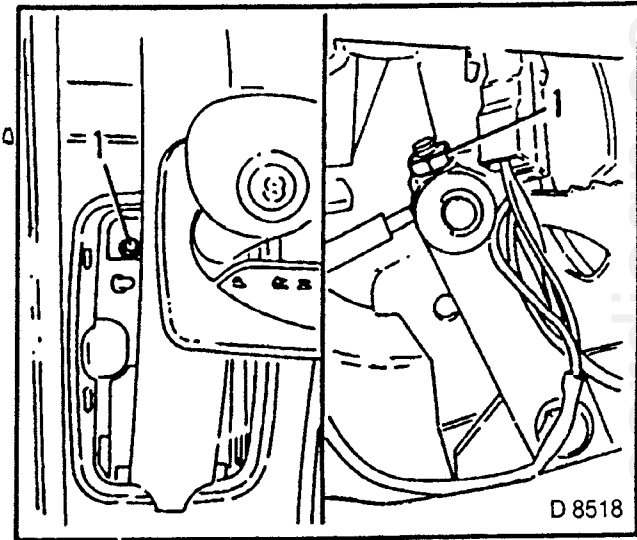


Fig. 232

TIGHTEN (TORQUE)

1. Cable clamp bolt — 6 Nm

Check as described above. See operation “Selector Lever Position Switch, Check” page 106.

INSTALL, CONNECT

1. Clip shift panel to shift tunnel.

Kickdown Switch — Adjust

INSPECT

1. Cable adjustment
2. Depress accelerator until kickdown system point of contact is reached — throttle valve must be fully opened: accelerator must actuate kickdown switch centrally.
3. Depress accelerator past point of contact — kickdown switch should release electrical contact in control unit.
4. Electronic transmission control system shifts down at appropriate speed — Technical Data, dynamometer or test drive.
5. When accelerator is at idle position — adjust cable to intake manifold idle stop without play.

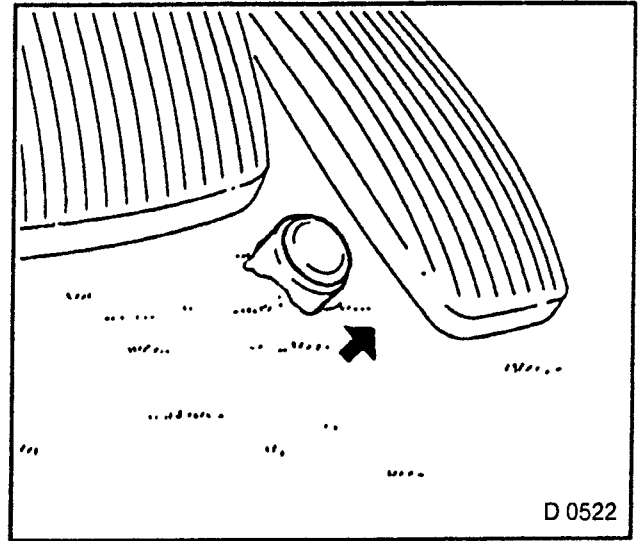


Fig. 233

Solenoid Valves or Fluid Pressure Regulator — Remove and Install

REMOVE, DISCONNECT

1. Side cover from transmission.
2. Solenoid valve 2 — 3 (1).
3. Solenoid valve 1 — 2/3 — 4 (2).
4. Fluid pressure regulator (3) — remove retaining clip.
5. Bridge clutch solenoid valve (4).
6. Disconnect affected wiring harness plug, if necessary loosen from cable retainer.
7. Electrically check solenoid valves — see "Valve Body, Overhaul" at end of section "Assemblies, Disassemble and Assemble", pages 151 and 199.

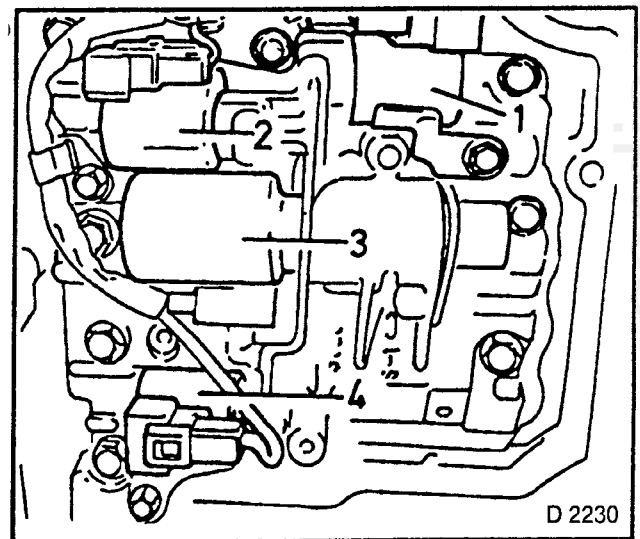


Fig. 234

NOTE:

THE PRESSURE REGULATOR IS NOT AVAILABLE AS A SINGLE PART AND IF DEFECTIVE MUST BE REPLACED TOGETHER WITH THE VALVE BODY.

TIGHTEN (TORQUE)

1. Solenoid valves with new rubber O-seal rings to valve body — 7 Nm.
2. Side cover to transmission.
3. Check fluid level and correct — page 106.

Solenoid Valve Wiring Harness — Replace

REMOVE, DISCONNECT

- 1. Side cover from transmission.
- 2. Retaining plate for wiring harness beside selector lever position switch.
- 3. Wiring harness plug from solenoid valves or fluid pressure regulator.
- 4. Wiring harness plug (outer) from transmission wiring harness.
- 5. Remove wiring harness from cable retainer and guide outwards.

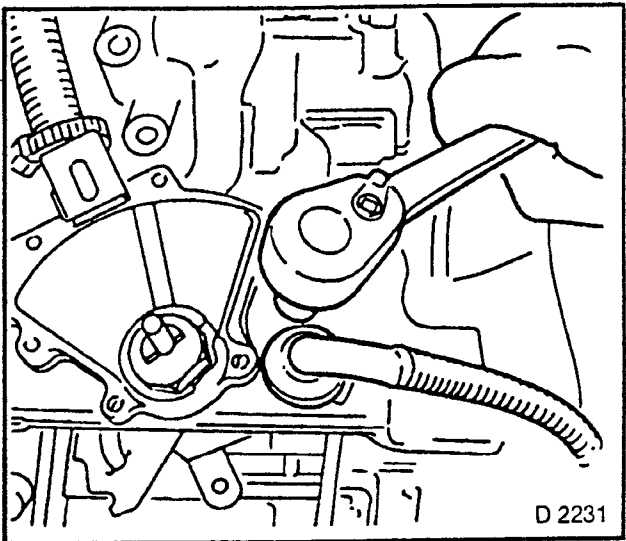


Fig. 235

INSTALL, CONNECT

- 1. Install wiring harness from outside inwards using new rubber O-seal ring.
- 2. Insert wiring harness in cable retainer (1), connect to solenoid valves (2) or fluid pressure regulator (3) (different cable lengths).
- 3. Wiring harness plug (outer) to transmission wiring harness.

TIGHTEN (TORQUE)

- 1. Retaining plate for wiring harness to transmission — 13 Nm.
- 2. Install side cover, check fluid level.

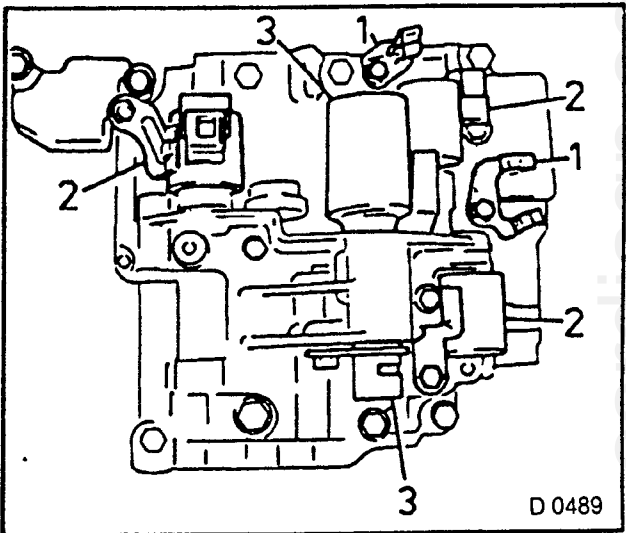


Fig. 236

Axle Shaft Seal Rings — Replace

- 1. Hold engine with KM-263-A and spring hooks.
- 2. Disconnect oxygen sensor cable connection (behind coolant expansion tank).

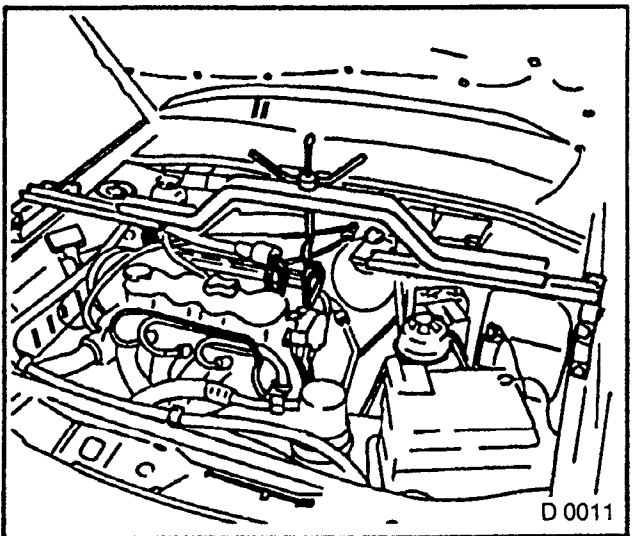


Fig. 237

REMOVE, DISCONNECT

- 1 Ground lead from battery, front wheels.
- 2. Front exhaust pipe, front axle body — see Section E or Section L.

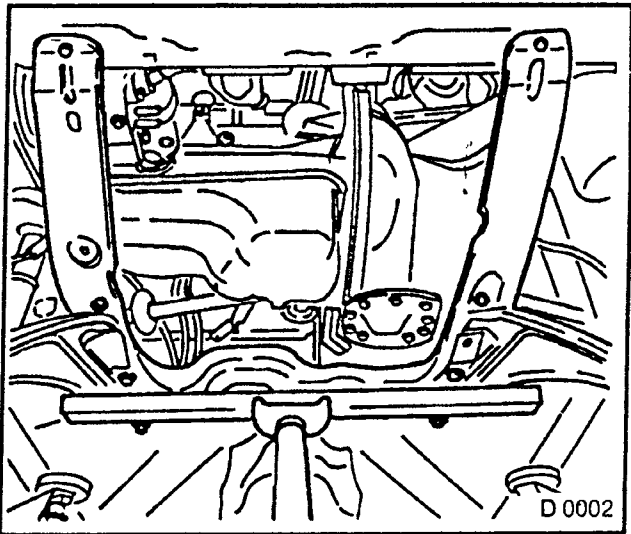


Fig 238

REMOVE, DISCONNECT

- 1 Axle shafts from transmission — see “Transmission, Remove and Install”, page 128.
- 2. Sealing rings from transmission — KM-557.

INSTALL, CONNECT

- 1. Drive in new seal rings flush — KM-519. If necessary push left spring strut to one side.
- 2. Axle shafts.
- 3. Front axle body.
- 4. Front wheels
- 5. Oxygen sensor cable connection.
- 6. Remove KM-263-A.

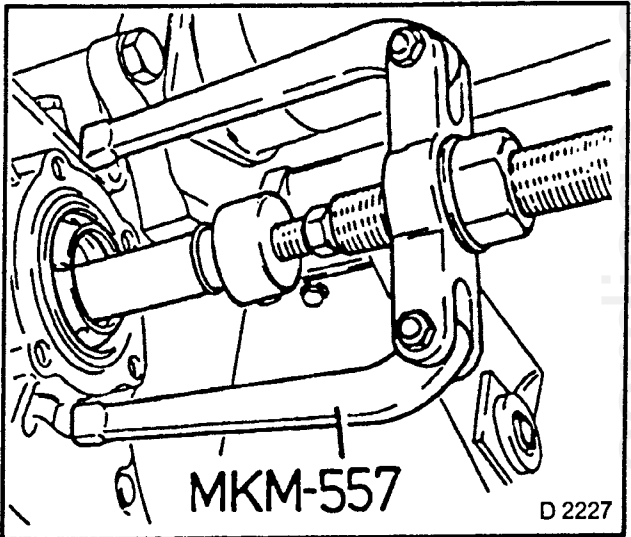


Fig. 239

INSPECT

- 1. Transmission fluid level.

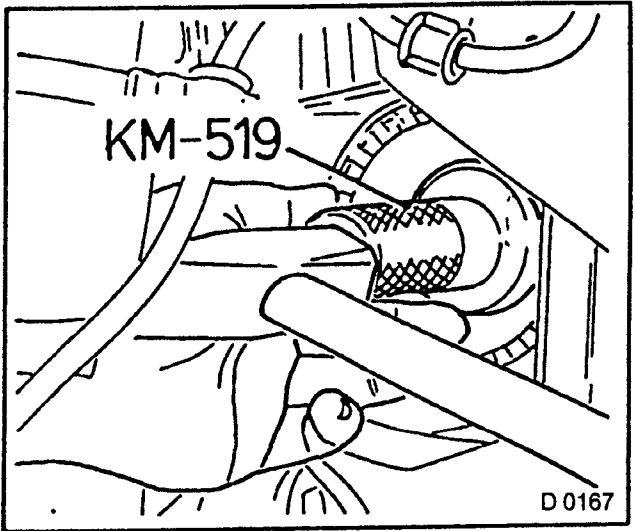


Fig. 240

Fluid Filler Pipe and/or Gasket — Replace

REMOVE, DISCONNECT

1. Fluid dipstick.
2. Fluid filler pipe — loosen fastening bolt on selector lever position switch; remove pipe upwards
3. Replace rubber O-seal ring.

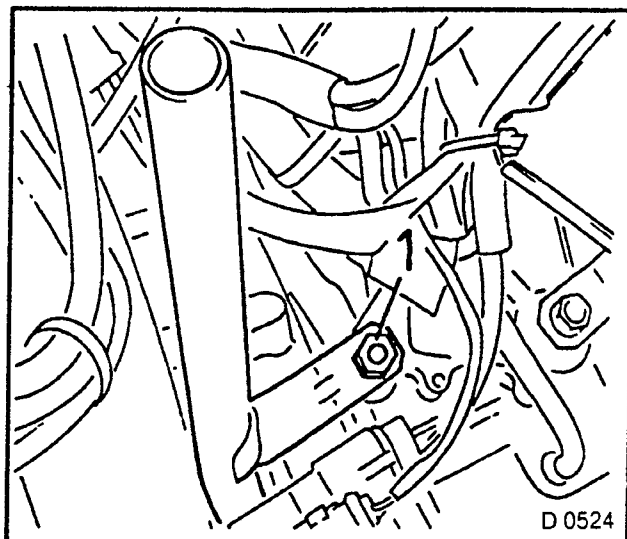


Fig. 241

INSTALL, CONNECT

1. Fluid filler pipe in transmission — coat rubber O-seal ring and area of press fit in housing bore with installation grease.
2. Press in pipe as far as stop, if necessary assist by lightly tapping with plastic hammer.

TIGHTEN (TORQUE)

1. Fastening bolt of fluid filler pipe to selector lever position switch — 20 Nm.
2. Insert dipstick.

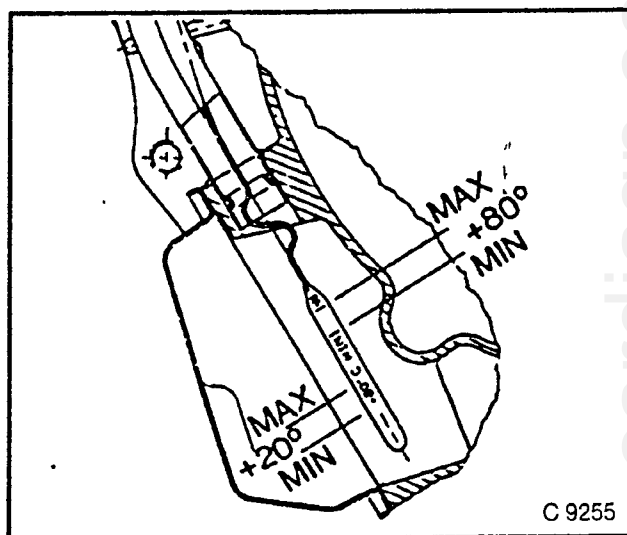


Fig. 242

Speedometer Helical Gear (Driven) and/or Seal Ring — Replace

REMOVE, DISCONNECT

1. Speedometer cable.
2. Speedometer helical gear.
3. Seal ring from groove.

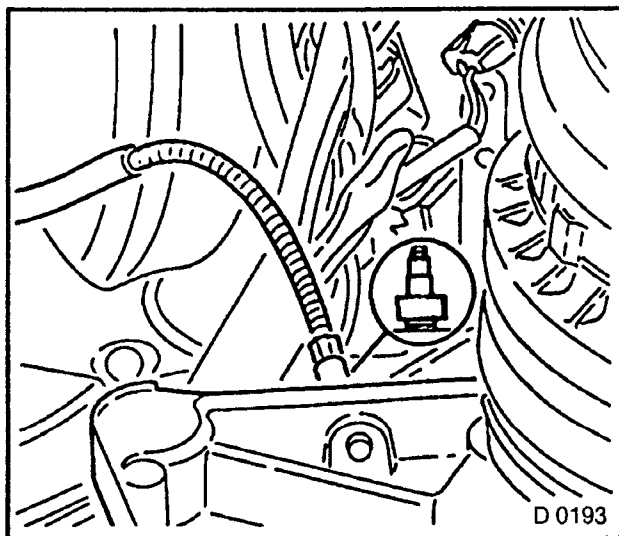


Fig. 243

INSTALL, CONNECT

1. New seal ring in groove.
2. Speedometer helical gear, lubricate splines with installation grease.

TIGHTEN (TORQUE)

1. Speedometer helical gear to transmission — 4 Nm.

INSTALL, CONNECT

1. Speedometer cable.

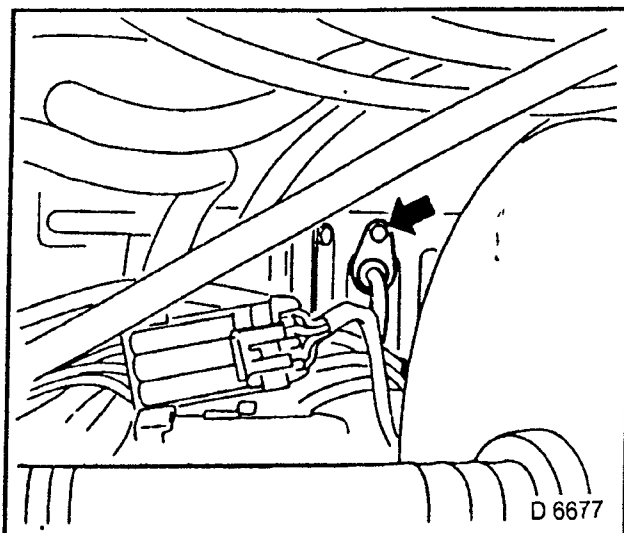


Fig. 244

Sensor — Transmission Input/Output Speed — Remove and Install

REMOVE, DISCONNECT

1. Torx bolt for transmission input speed sensor (1).
2. Torx bolt for transmission output speed sensor (2).
3. Replace seal ring.

TIGHTEN (TORQUE)

1. Torx bolt for sensor to transmission — 6 Nm.

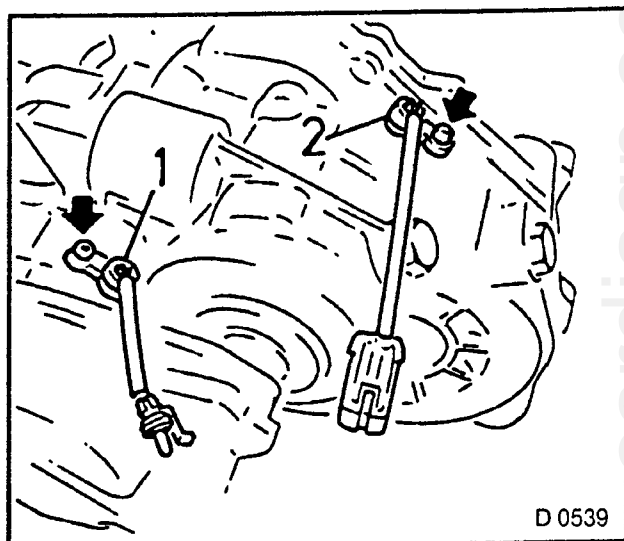


Fig. 245

Fluid Temperature Sensor and/or Gasket — Replace

REMOVE, DISCONNECT

1. Cover plate from side cover and transmission (1), replace seal ring.
2. Fluid temperature sensor (arrow).

TIGHTEN (TORQUE)

1. Fluid temperature sensor to transmission — 25 Nm.
2. Cover plate to side cover — 25 Nm.

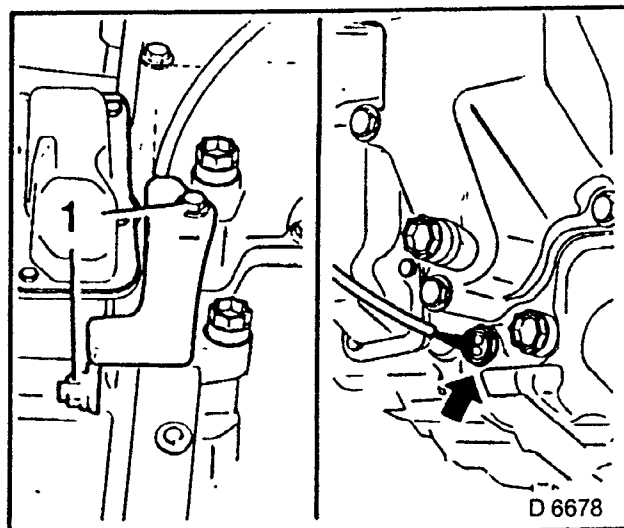


Fig. 246

Fluid Cooler Lines, Connecting Hose and/or Seal Rings — Replace

REMOVE, DISCONNECT

1. Fluid cooler lines (2) from fluid cooler or transmission.
2. Loosen connecting hoses at hose clamps (1) and remove — fluid escapes.
3. Replace seal rings.

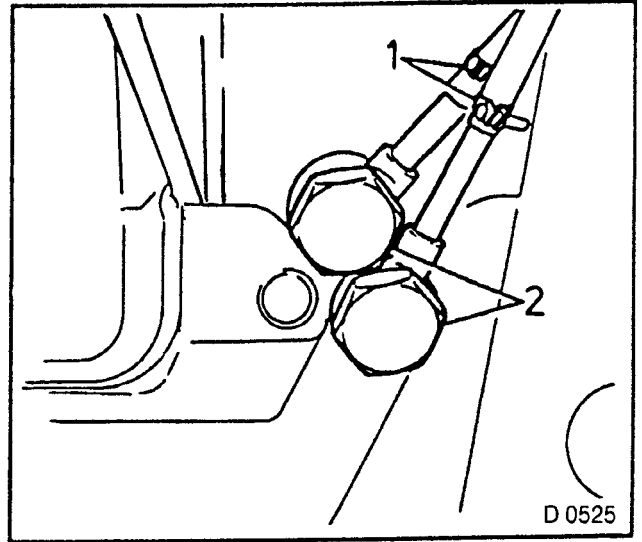


Fig 247

NOTE:

NOTE INSTALLATION POSITION OF FLUID COOLER LINES, SO THAT THE CONNECTING HOSES CAN BE INSTALLED WITHOUT KINKING OR TWISTING.

ALLOW FOR TILTING MOTION OF ENGINE.

TIGHTEN (TORQUE)

1. Fluid cooler lines (2) with new seal rings to fluid cooler or transmission — 22 Nm.
2. **DO NOT** turn too much — cooler housing is made of plastic.
3. Hose clamps (1) to connecting hoses — 1.2 Nm align without kinking and twisting.

Seal Rings for Check Bore (Fluid Pressure) — Replace

REMOVE, DISCONNECT

1. Affected plug — fluid escapes.
2. Replace seal ring.

TIGHTEN (TORQUE)

1. Plug M 8 (1) to transmission — 8 Nm.
2. Plug M 14 (2) to transmission — 35 Nm.
3. Plug M 18 (3) to transmission — 35 Nm.
4. Plug M 20 (4) to transmission — 35 Nm.

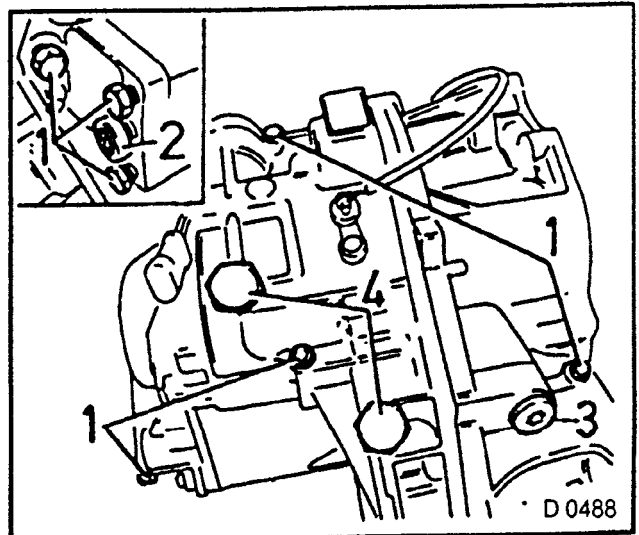


Fig. 248

Auxiliary Housing Cover and/or Gasket — Replace

REMOVE, DISCONNECT

1. Cover plate from side cover.
2. Auxiliary housing cover.

CLEAN

1. Sealing surfaces on cover and transmission.

TIGHTEN (TORQUE)

1. Cover to transmission — 5 Nm. Insert with Sealing Compound (Loctite 242).
2. Cover plate to side cover — 25 Nm.

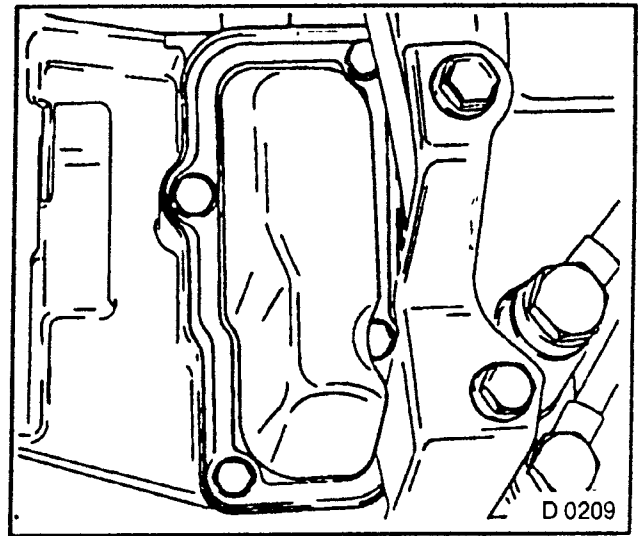


Fig. 249

Gasket for Side Cover — Replace

Hold engine with KM-263-A and spring hook.

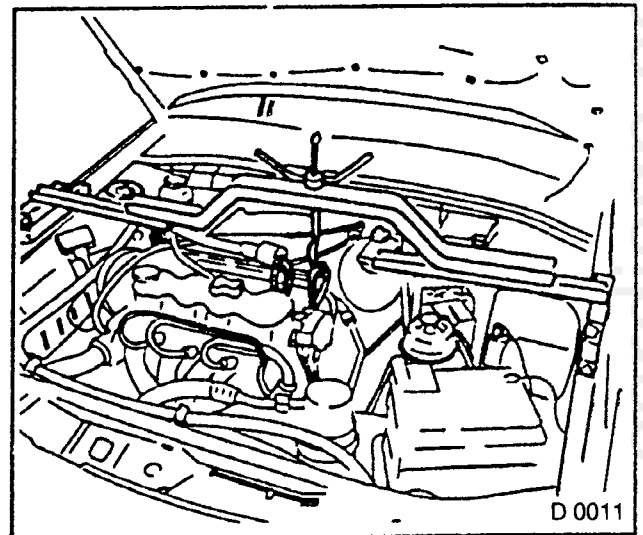


Fig. 250

REMOVE, DISCONNECT

1. Ventilation pipe from transmission — under battery bracket.
2. Fluid line from side cover or transmission.
3. Fluid escapes — close off lines.
4. Front left engine suspension bracket from transmission and front frame side member.

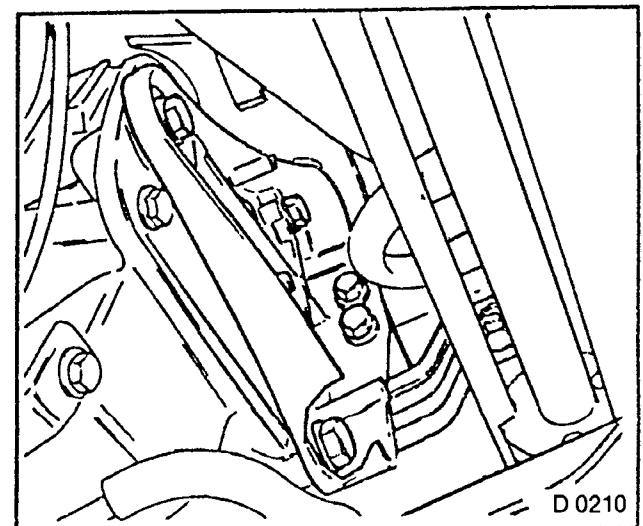


Fig. 251

REMOVE, DISCONNECT

- 1 Side cover from transmission (nine bolts)
— fluid escapes.
2. One guide bushing present.

CLEAN

1. Sealing surfaces on cover and transmission.

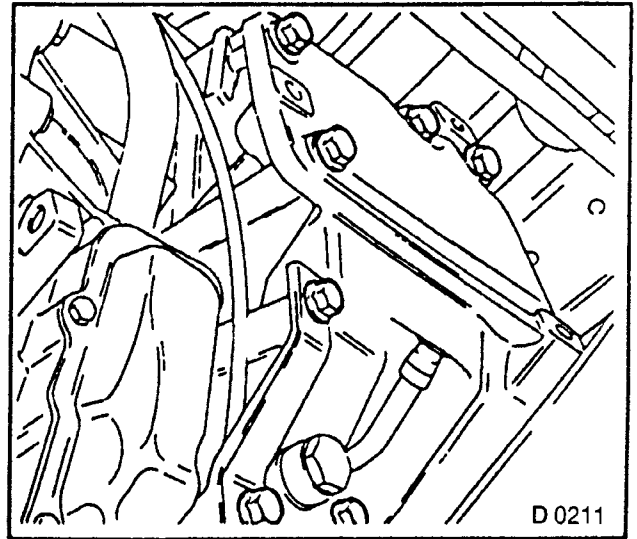


Fig. 252

TIGHTEN (TORQUE)

1. Cover to transmission — 25 Nm. Insert with Sealing Compound.
2. Front left engine suspension bracket to transmission — 65 Nm.
3. Front left engine suspension bracket to front frame side member — 75 Nm (Two new bolts).
4. Lower fluid cooler line — 22 Nm, note installation position, so that the connecting hose can be routed without kinking or twisting.

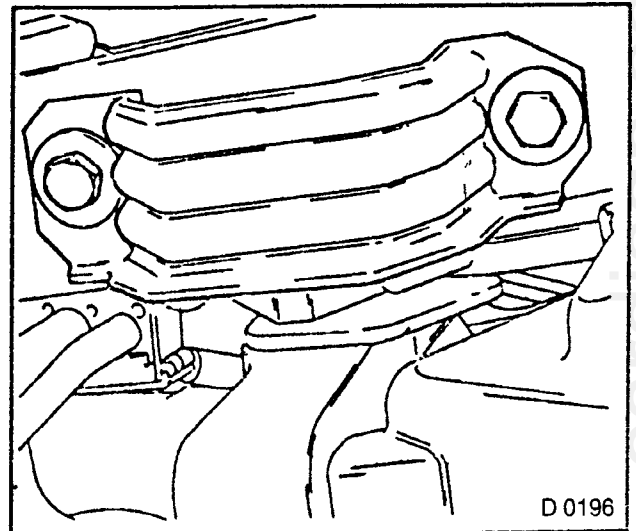


Fig. 253

TIGHTEN (TORQUE)

1. Hose clamp to connecting hose — 1.2 Nm or if removed:
2. Fluid cooler line connections to transmission and side cover — 22 Nm. Fluid escapes.
3. Remove KM-263-A, attach ventilation hose.
4. Check transmission fluid level.

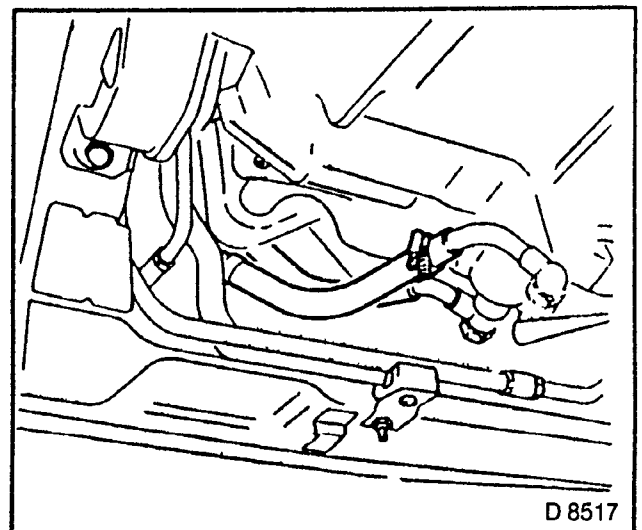


Fig. 254

OPERATIONS ON TRANSMISSION SHIFT LINKAGE

Bulb/Socket for Lighting — Remove and Install

REMOVE, DISCONNECT

1. Selector lever cover from gearshift tunnel — see page 122. "Selector Actuation Cable. Remove and Install".
2. Bulb with socket from switch cover.

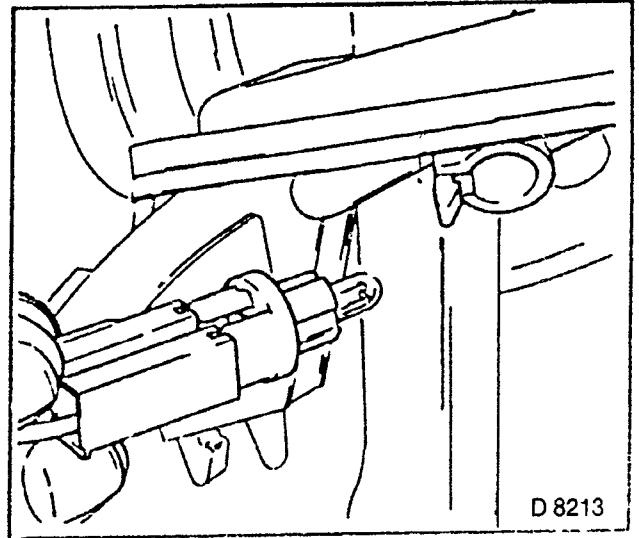


Fig. 255

INSTALL, CONNECT

1. Bulb/socket.
2. Selector lever cover.

Driving Mode Switch — Remove and Install “Winter” Mode

REMOVE, DISCONNECT

1. Selector lever cover from shift tunnel — see page 122. "Selector Actuation Cable, Remove and Install".
2. Switch from switch cover — disconnect wiring harness plug.

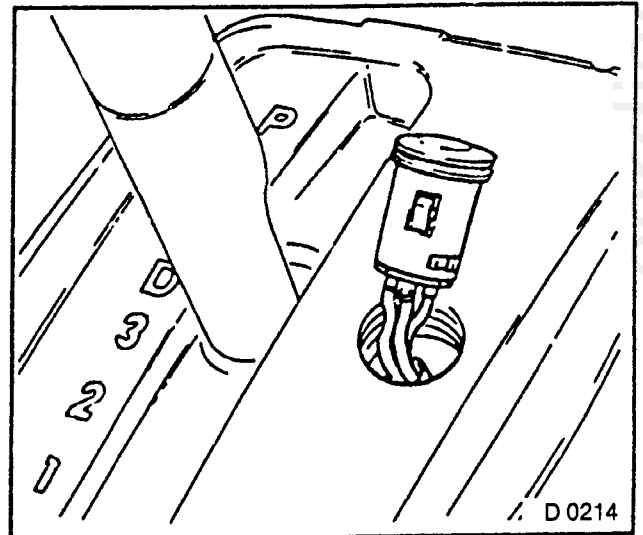


Fig. 256

INSTALL, CONNECT

1. Wiring harness plug.
2. Switch.
3. Selector lever cover.

“Sport” Mode

REMOVE, DISCONNECT

- 1. Selector lever.
“Selector Lever Assembly, Remove and Install” — page 123.
- 2. Press out driving mode switch with electrode wire (1).
- 3. Solder cables (2).

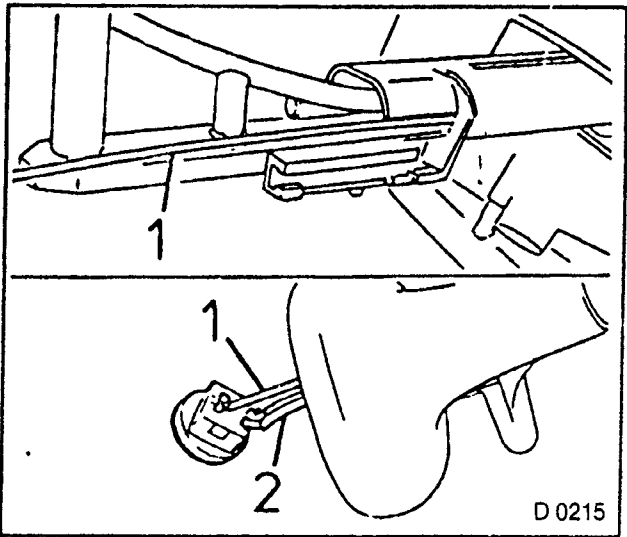


Fig. 257

Kickdown Switch — Remove and Install

- 1. Loosen carpet bracket on the left under the accelerator pedal.
- 2. Fold back carpet.
- 3. Remove two-pin wiring harness plug.
- 4. Remove kickdown switch upwards from bracket (arrow).

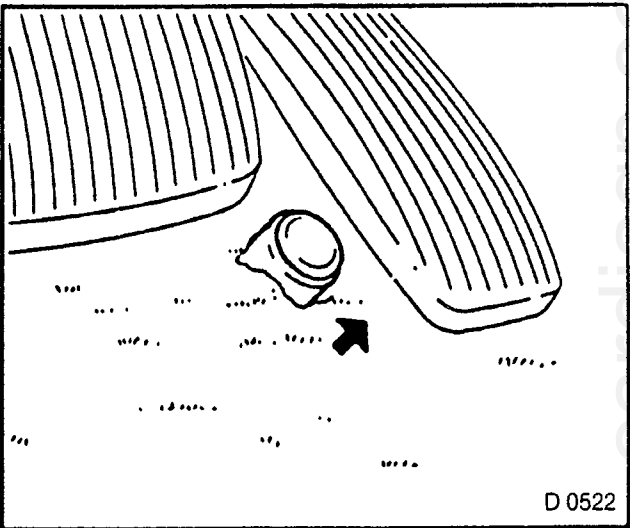


Fig. 258

INSTALL, CONNECT

- 1 Guide two-pin wiring harness plug through aperture in carpet.
- 2. Connect.
- 3. Press kickdown switch down to stop on bracket.
- 4. Fasten carpet bracket.
- 5. Accelerator pedal must actuate kickdown switch centrally
- 6. Adjust kickdown switch.

Selector Actuation Cable — Remove and Install

REMOVE, DISCONNECT

1. Cable from selector actuation.
2. Retaining clamp and washer from actuation lever on transmission.
3. Fastening nuts from bracket for cable on transmission.

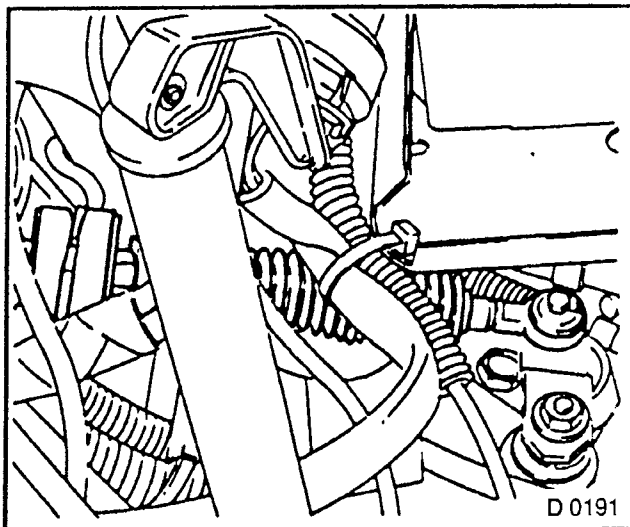


Fig. 259

REMOVE, DISCONNECT

1. Selector lever cover from shift tunnel.
2. Centre console — see Section C.

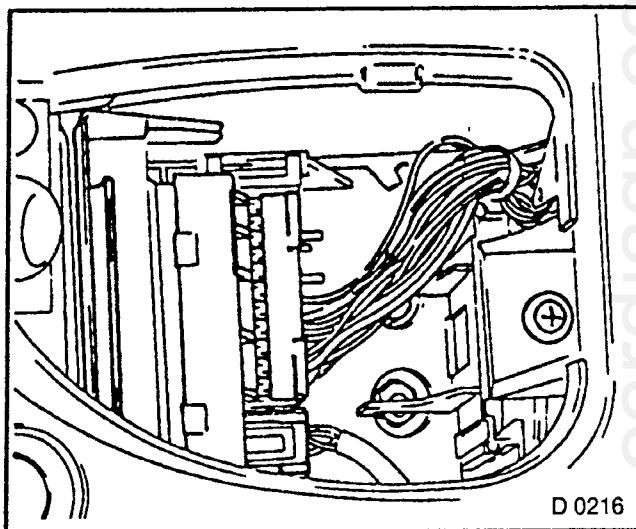


Fig. 260

REMOVE, DISCONNECT

1. Cable from selector lever and console (1, 2).
2. Loosen clamp (1), retaining nut (2) from threaded part.
3. Pull out cable to engine compartment through bulkhead.

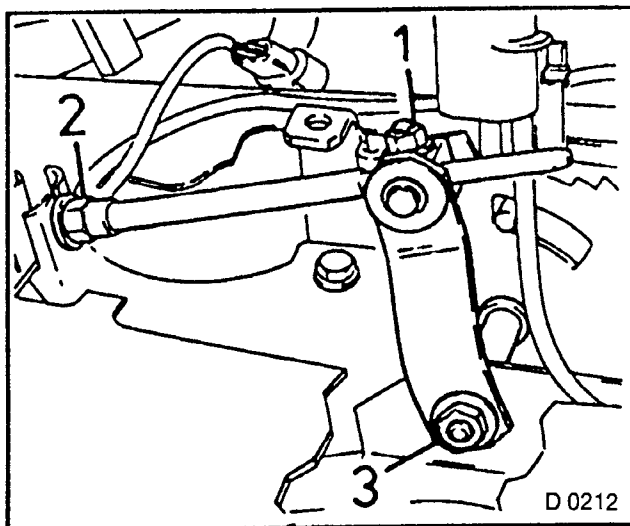


Fig. 261

INSTALL, CONNECT TIGHTEN (TORQUE)

1. Cable to actuation lever and also to console and selector lever.
Note correct positioning of rubber sleeve in bulkhead.
Cable to console — 6 Nm.
- 2 Adjust selector lever.

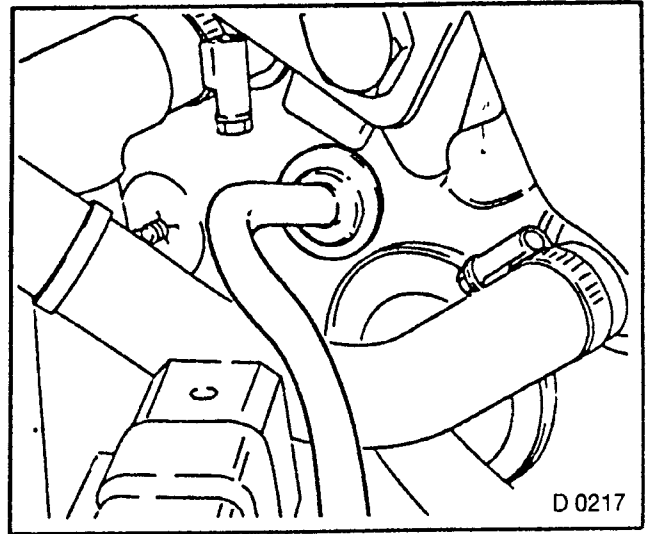


Fig. 262

Selector Lever Assembly — Remove and Install

REMOVE, DISCONNECT

1. Selector lever cover from shift tunnel — see "Selector Actuation Cable, Remove and Install" page 122.
2. Cable from selector lever and console (1, 2).
3. Cable plug from driving mode switches "Winter" and "Sport".
4. Lighting socket from shift panel.

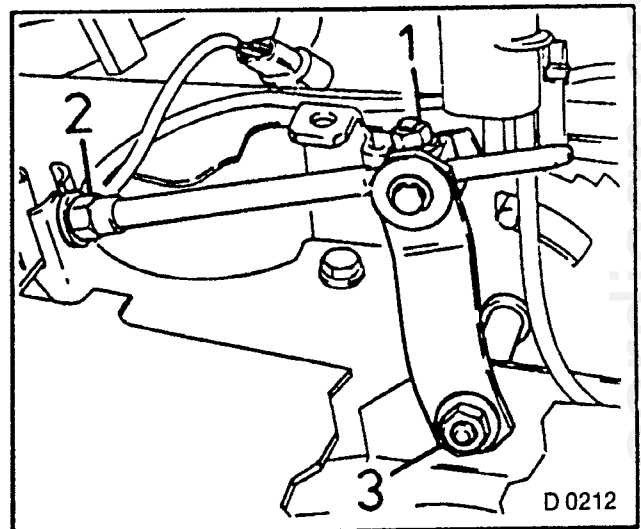


Fig. 263

REMOVE, DISCONNECT

1. Selector lever from console.
2. Unbolt lever from selector lever axle (Fig. 263 Item 3).
3. Remove selector lever sideways from position in console.

DISASSEMBLE

1. Selector lever.
2. Driving mode switch "Winter" from shift panel.
3. Driving mode switch "Sport" from selector lever.
4. Press out with electrode wire (1).
5. Unsolder cable connections (2) — mark.

Do not disassemble selector lever further; spare part is only available in assembly with shift panel.

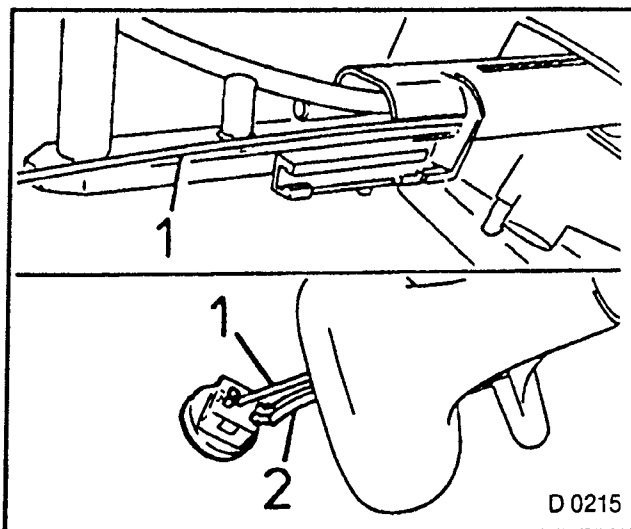


Fig. 264

INSTALL, CONNECT

1. Solder cable connections for driving mode switch "Sport" — mark.

TIGHTEN (TORQUE)

1. Selector lever to console (3) 28 Nm.
2. Cable to console (2) — 6 Nm.
3. Adjust selector actuation.

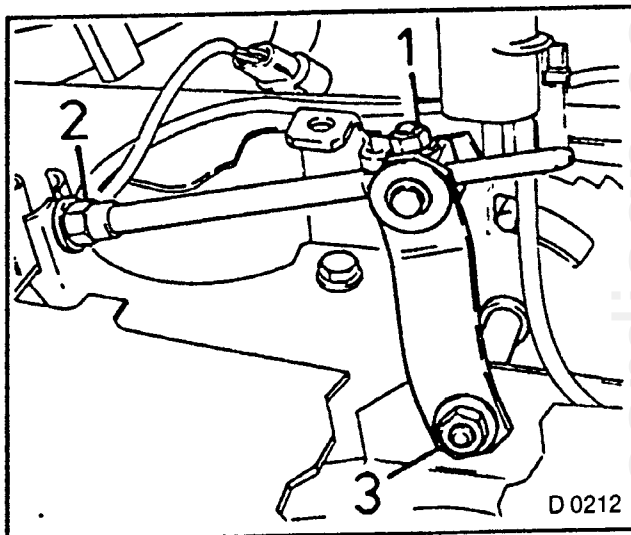


Fig. 265

Selector Lever Console — Remove and Install

REMOVE, DISCONNECT

1. Selector lever from console
2. See "Selector Lever Assembly, Remove and Install", page 123.
Disassembly operations on selector lever do not apply.
2. Console from floor panel — four screws.

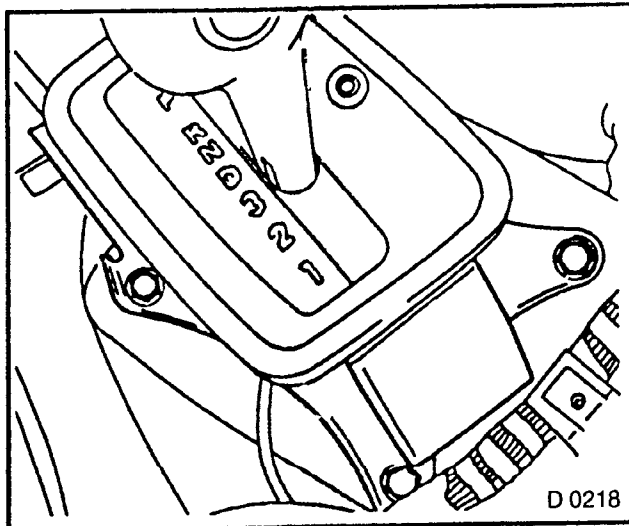


Fig. 266

TIGHTEN (TORQUE)

1. Console to floor panel — 10 Nm.
2. Cable to console (2) — 6 Nm.
3. Install cable on clamp — **DO NOT** tighten yet.
4. Adjust selector actuation

INSTALL, CONNECT

1. Selector lever cover.

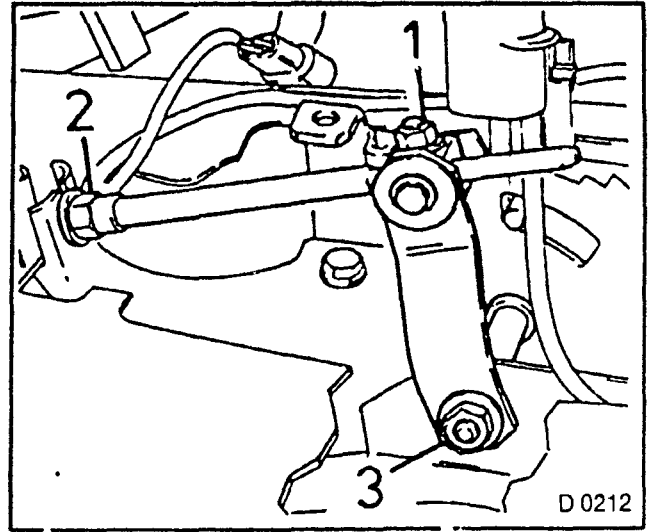


Fig. 267

OPERATIONS ON REMOVED TRANSMISSION

Converter and/or Fluid Pump Seal Ring — Replace

REMOVE, DISCONNECT

1. Transmission.
2. Converter from transmission.
3. Seal ring from transmission — KM-J-7004 and KM-586.

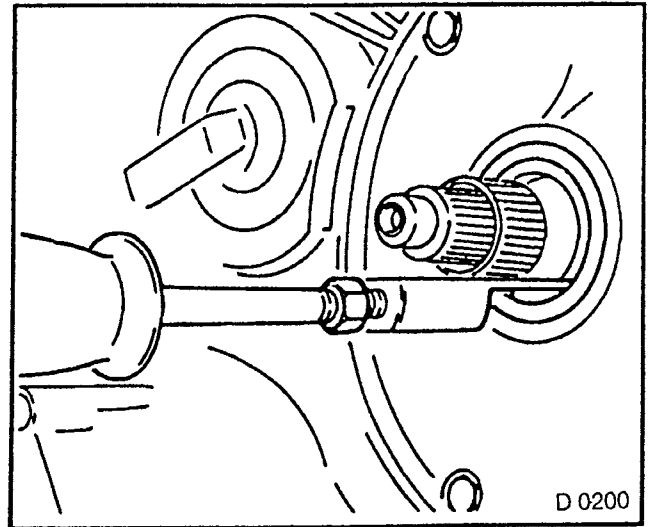


Fig. 268

INSTALL, CONNECT

1. Drive in new seal ring flush — KM-674.
2. Converter in transmission.
3. Transmission.

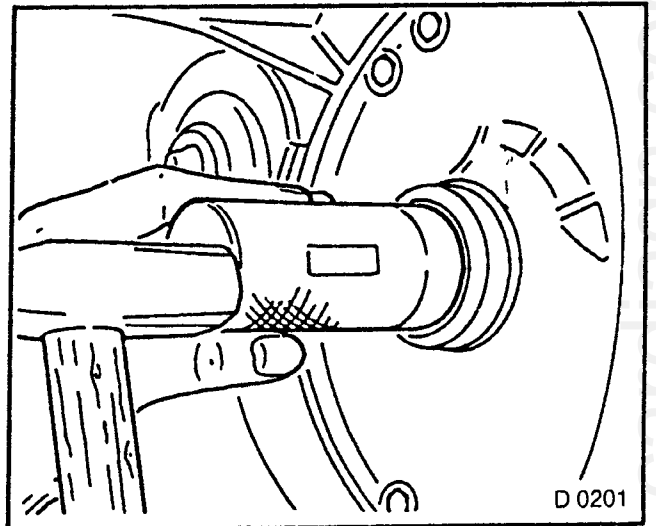


Fig. 269

Housing Parts and/or Gasket — Replace

REMOVE, DISCONNECT

1. Transmission — drain transmission fluid.
Drain bolt (1), on right housing underside.

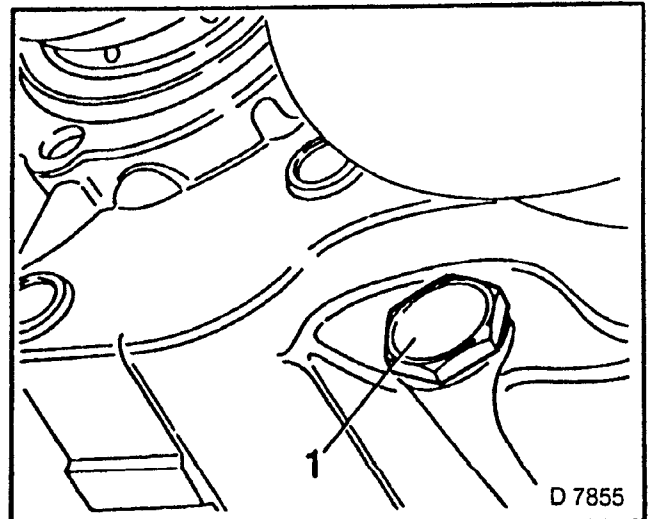


Fig. 270

INSTALL, CONNECT

- 1. KM-694 (1) on transmission.
- 2 Place assembly on Base KM-113-2 (2) and arrest horizontally.

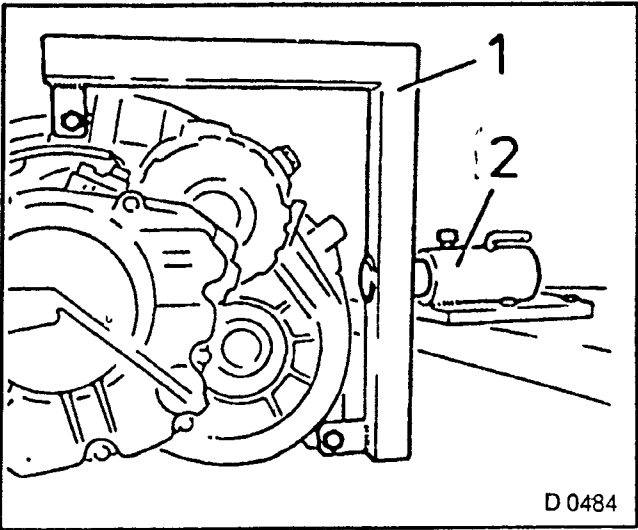


Fig. 271

REMOVE, DISCONNECT

- 1. Converter — fluid escapes.
- 2. When replacing main housing and/or auxiliary housing, but without disassembling assemblies — see page 135 “Transmission, Overhaul”.
- 3. Fix transmission horizontally using KM-113-2 (auxiliary housing points upwards), since during separation of housing parts assemblies are freed and can fall out.

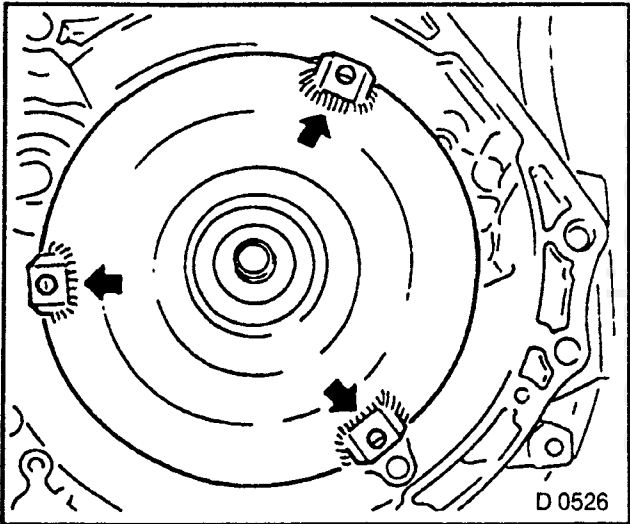


Fig. 272

- 4. Fifteen bolts of auxiliary housing from main housing (1).
- 5. Separate housing parts, if necessary use plastic hammer.
- 6. Fluid filter (3), fluid retaining plate from auxiliary housing three bolts, Fig. 274, Item (1).

CLEAN

- 1. Sealing surfaces of housing parts.
- 2. Fluid filter.
- 3. Three magnets behind fluid retaining plate.
- 4. Following this, blow parts dry.

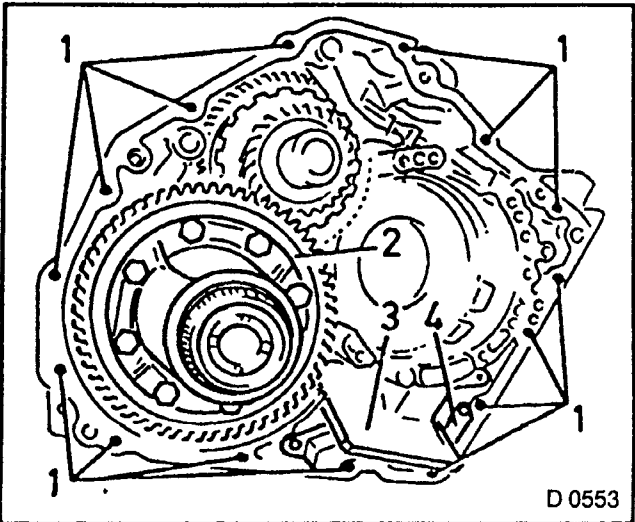


Fig. 273

TIGHTEN (TORQUE)

1. Fluid retaining plate to auxiliary housing (1) — 6 Nm.
2. Fluid filter to main housing — 6 Nm.

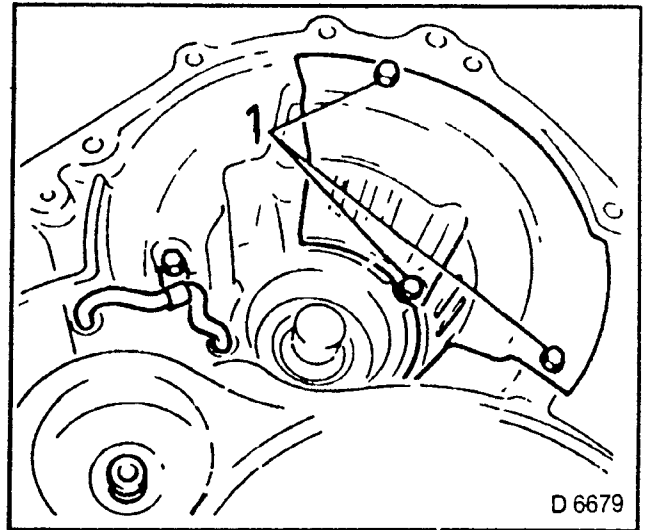


Fig 274

3. Auxiliary housing to main housing — 30 Nm (Fifteen bolts). Coat sealing surface with Sealing Compound (Loctite 242), not centering pin.

INSTALL, CONNECT

1. Converter — ensure it engages correctly in fluid pump shaft.
2. Transmission.
3. Fill with transmission fluid (B0400075) — filling quantity: see Technical Data, page 263.
4. Check for leaks.

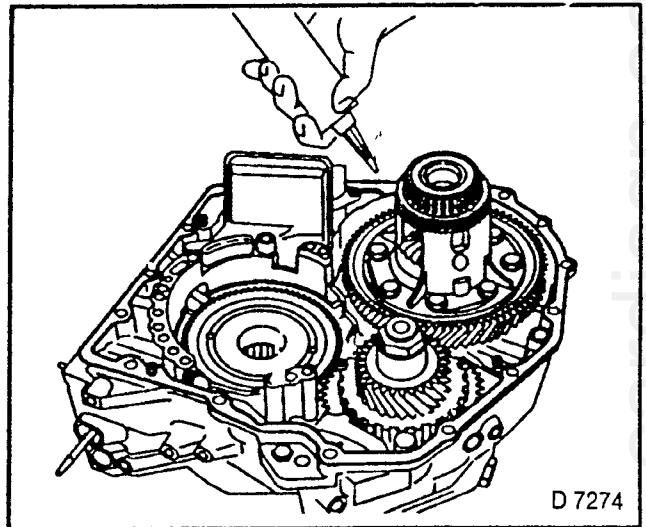


Fig. 275

**Transmission —
Remove and Install****REMOVE, DISCONNECT**

1. Ground cable from battery.
2. Cable from selector actuation.
3. Retaining clamp from cable.
4. Cable from bracket.

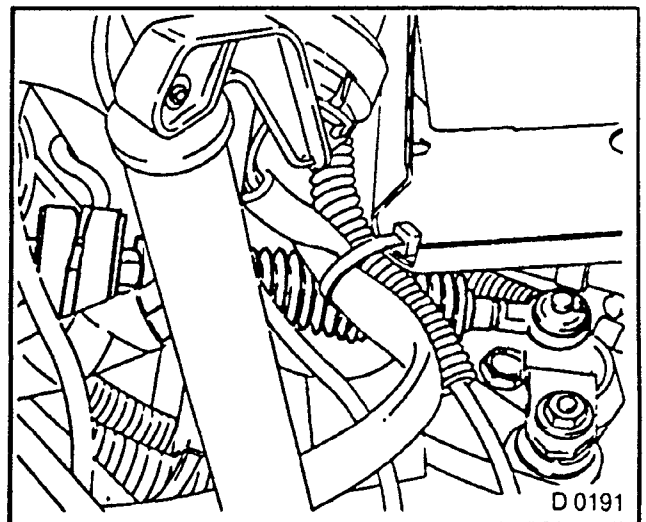


Fig 276

- 4 Vent hose from transmission — below battery bracket.
5. Disconnect transmission wiring harness plug.
6. Bracket for wiring harness from transmission.

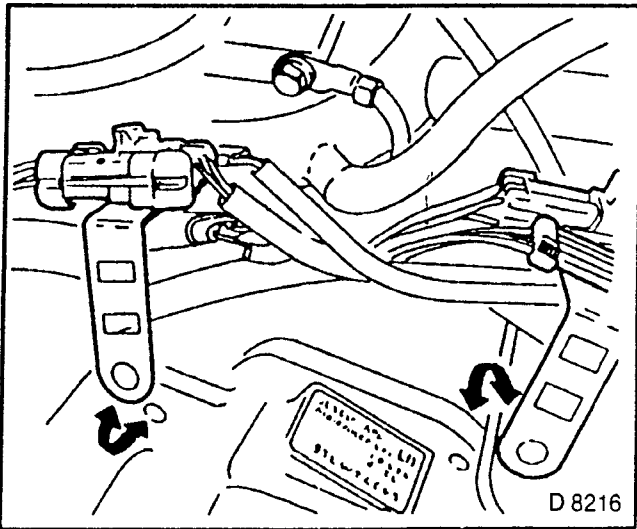


Fig. 277

REMOVE, DISCONNECT

1. Three upper screws from transmission on engine
2. Oxygen sensor cable connection (behind coolant expansion tank).

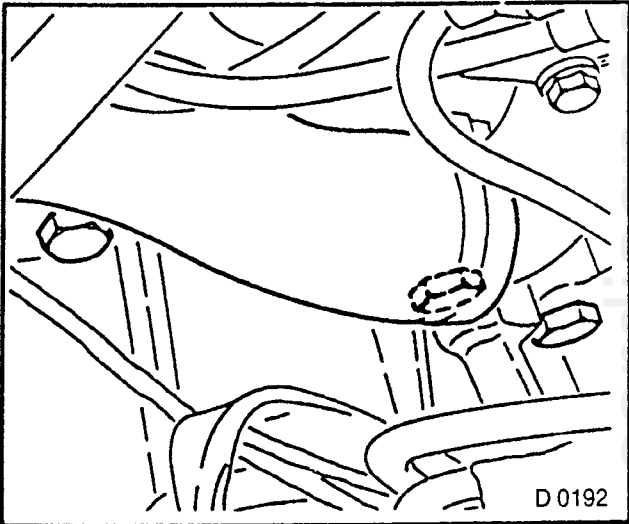


Fig. 278

3. Hold engine with KM-263-A and spring hook.
4. Fasten spring hooks to shackle behind distributor.

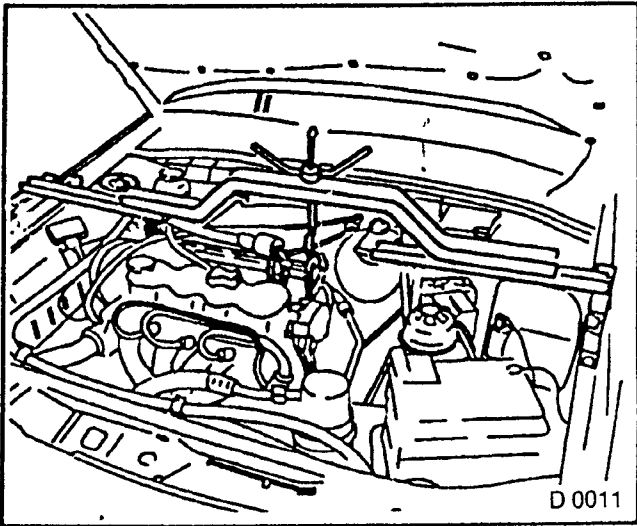


Fig 279

REMOVE, DISCONNECT

1. Front exhaust pipe.
2. Front axle body.
3. Speedometer cable (Fig. 280).

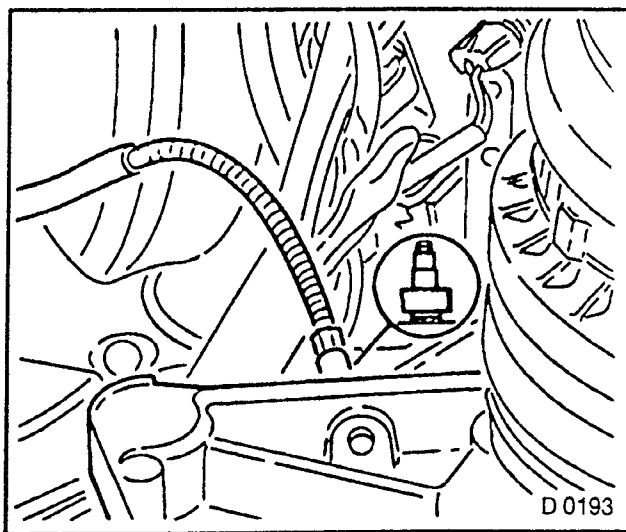


Fig. 280

4. Axle shafts from transmission.
 - Left KM-503-A (1)
 - Right KM-460-2-A
5. Chamfered side to transmission — fluid escapes.
6. Close off openings.
7. Secure axle shafts in position.

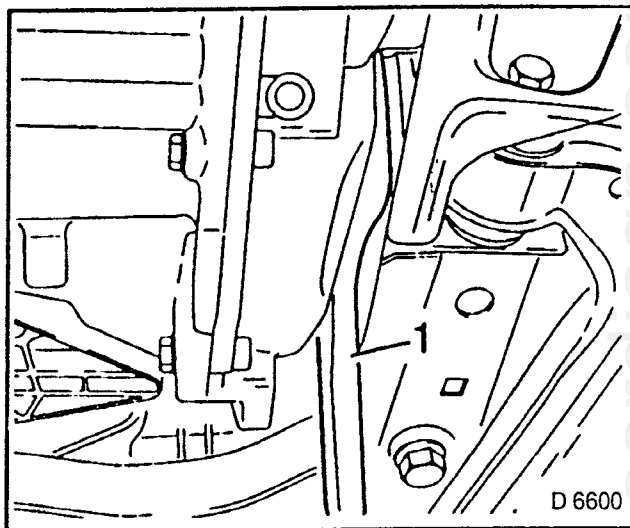


Fig. 281

REMOVE, DISCONNECT

1. Connecting hoses.
2. Transmission/fluid cooler
3. Loosen hose clamps on transmission.
4. Close openings — fluid escapes.

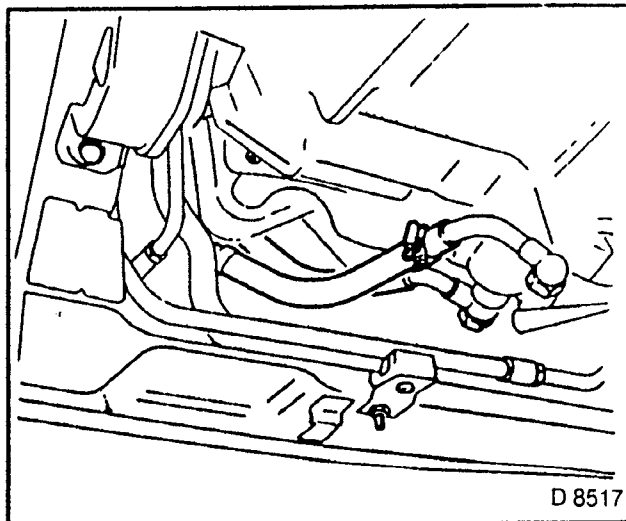


Fig. 282

- 5. Cover plate from transmission
- 6. Converter from drive disc — three bolts, counterhold drive disc.

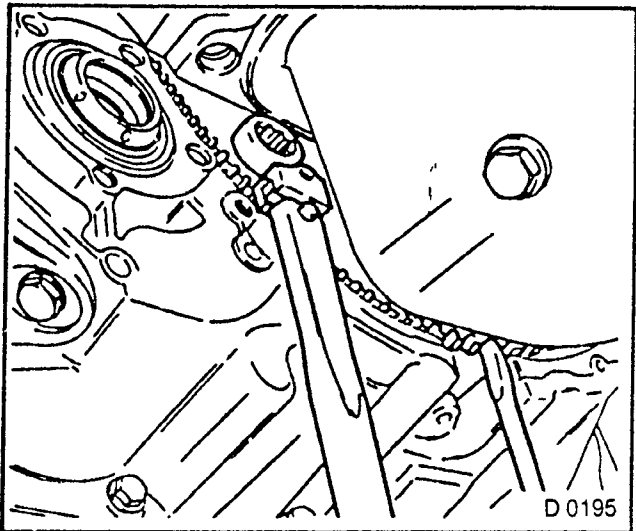


Fig 283

REMOVE, DISCONNECT

- 1. Damper block from front frame side member
- 2. Bracket remains on transmission.
- 3. Lower engine — transmission housing upper edge aligns with front frame side member.

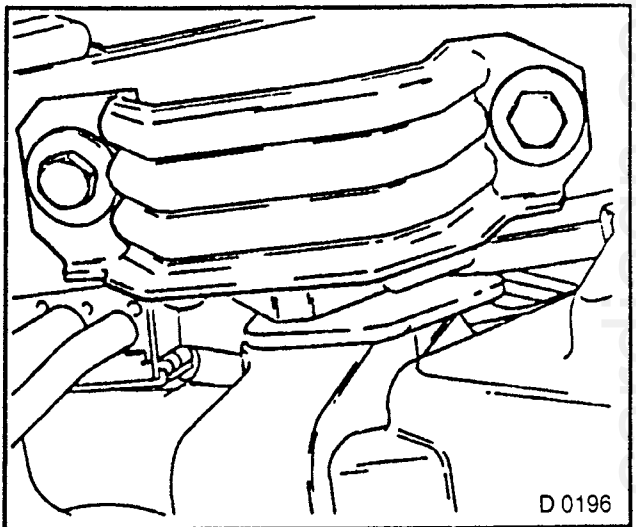


Fig 284

- 4 Three lower bolts (arrows) from transmission to engine.
Hold transmission with hydraulic jack and lower.

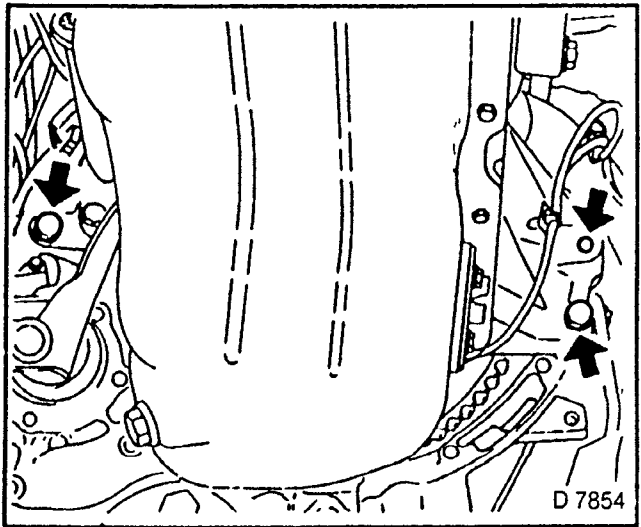


Fig. 285

REMOVE, DISCONNECT

1. Converter from transmission — fluid escapes.

CLEAN

1. Recut thread of converter (arrows), M 10 x 1.25.
2. Recut thread for damping block to left front frame side member; M 10 x 1.25
3. When replacing transmission: fluid cooler.

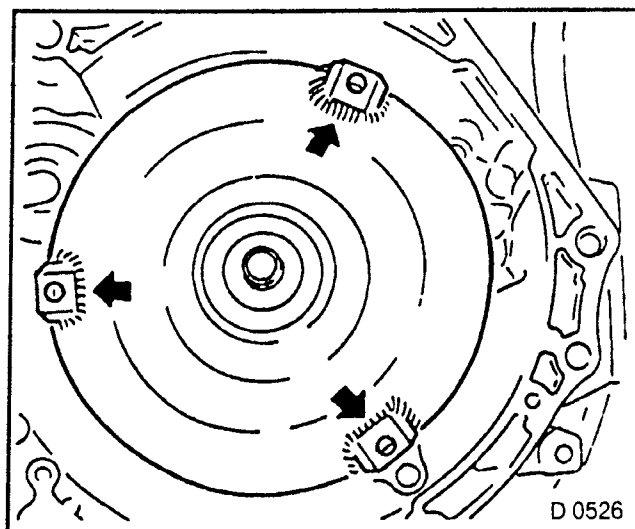


Fig. 286

INSTALL, CONNECT

1. Attach transmission to engine on hydraulic jack, one guide bushing

TIGHTEN (TORQUE)

1. Three lower bolts (arrows) for transmission to engine — 75 Nm.
2. Raise engine with KM-263-A

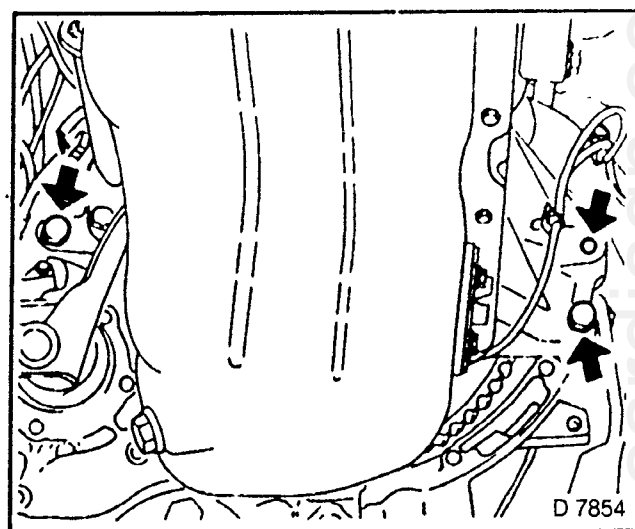


Fig 287

TIGHTEN (TORQUE)

1. Damper block to front left frame side member — 65 Nm.
2. New screws; align transmission with hydraulic jack.
3. Converter to drive disc — 50 Nm.
4. New screws, use torque wrench with flat ring cap, counterhold drive disc.
5. Cover plate to transmission — 7 Nm.

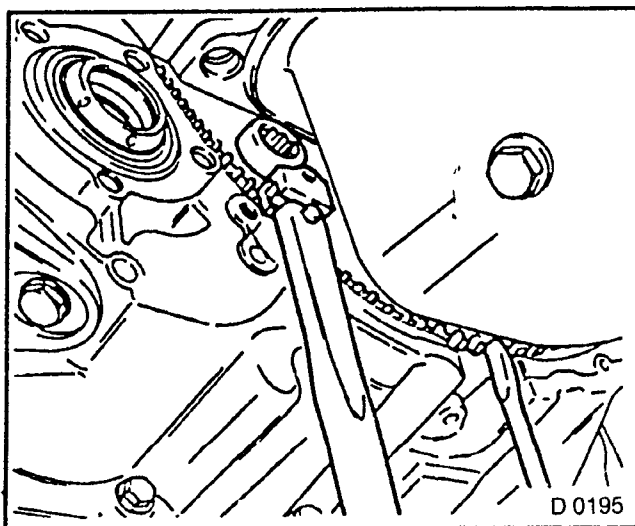


Fig. 288

TIGHTEN (TORQUE)

- 1 Connecting hoses, transmission/fluid cooler to transmission — 1.2 Nm.
New hose clamps.
Fluid escapes.

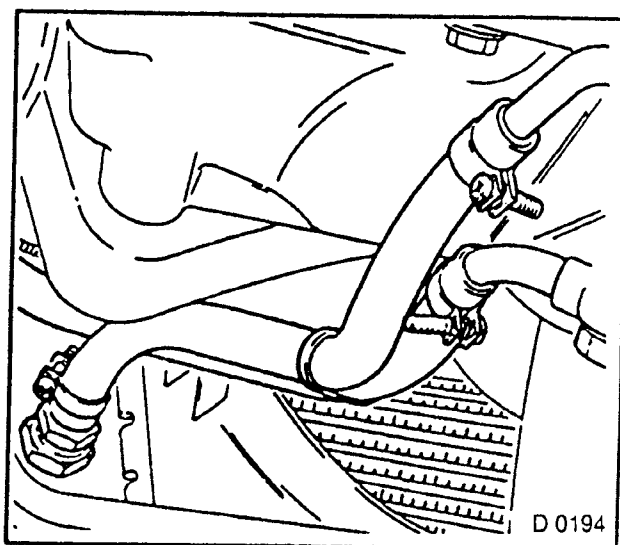


Fig. 289

INSTALL, CONNECT

1. Axle shafts.
2. New retaining ring (1).
3. Lubricate splines.
4. Automatic transmission fluid — Dexron IID.
5. Insert both axle shafts into transmission
6. Place square head drift at welding bead of friction welding seam (2) (not on sheet metal panelling).
7. Drive in axle shaft, retaining ring catches audibly.

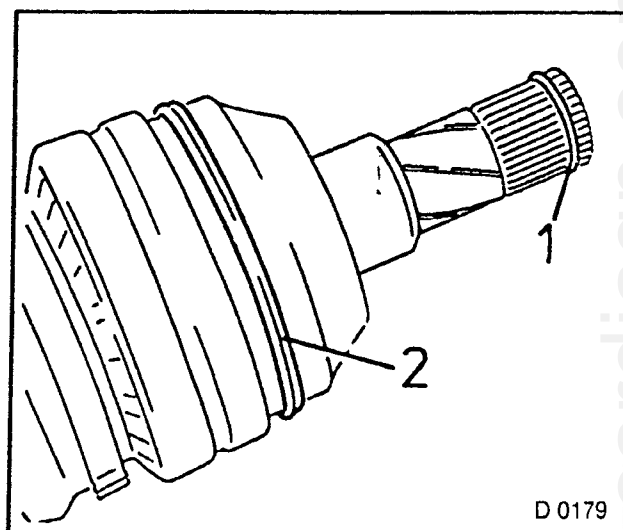


Fig. 290

INSPECT

1. Axle shaft position — pull on circumference of joint (**DO NOT** pull on shaft itself)

INSTALL, CONNECT

1. Speedometer cable.
2. Front axle body.
3. Front exhaust pipe. See Sections E and L.
4. Front wheels.
5. Lower vehicle, remove KM-263-A.

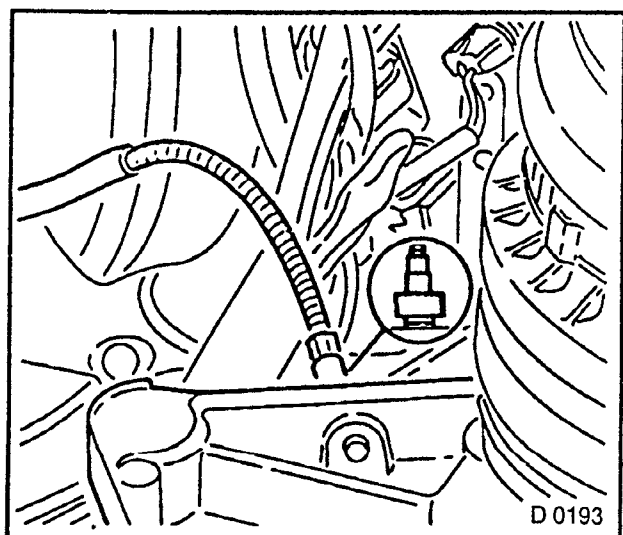


Fig. 291

INSTALL, CONNECT

1. Oxygen sensor cable connection (behind coolant expansion tank).
2. Ventilation pipe to transmission — under battery bracket.

TIGHTEN (TORQUE)

1. Three upper bolts for transmission to engine block — 75 Nm.
2. Cable to bracket — 6 Nm.

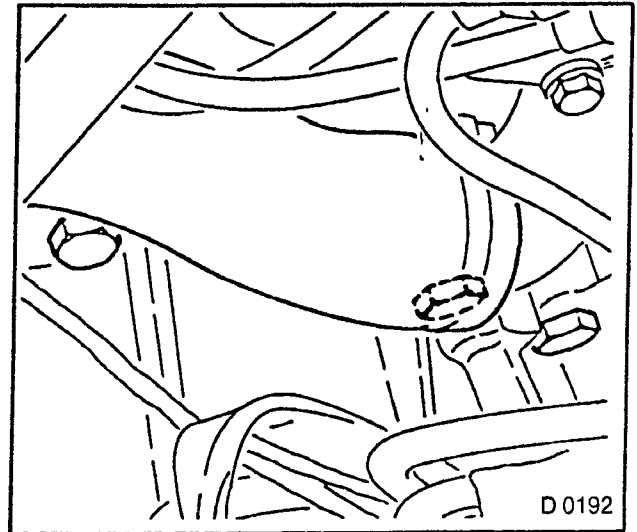


Fig. 292

TIGHTEN (TORQUE)

1. Two brackets for wiring harness to transmission, 30 Nm.
2. Connect transmission wiring harness plug.

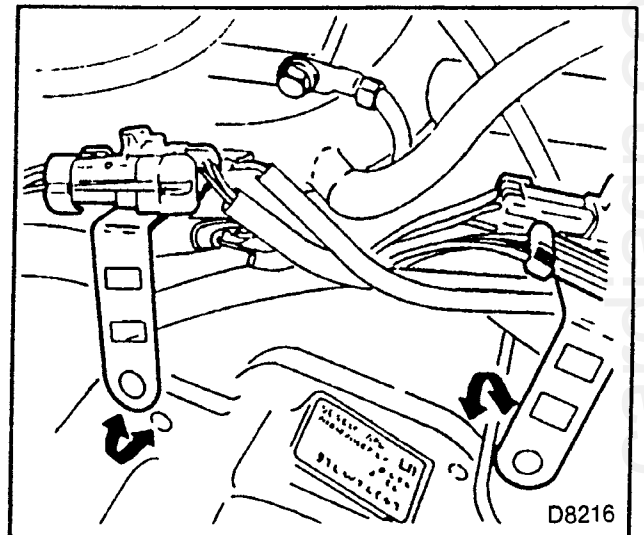


Fig. 293

INSTALL, CONNECT

1. Cable to actuation lever.
2. Washer and retaining clamp to actuation lever.
3. Ground lead to battery.
4. Adjust selector actuation.
5. Fill up with transmission fluid.

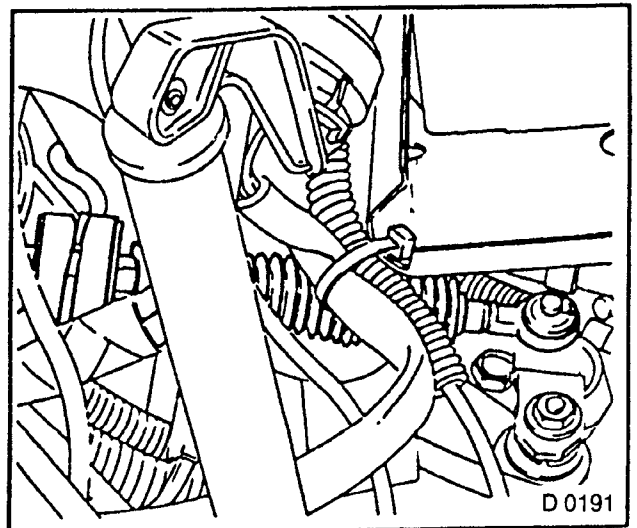
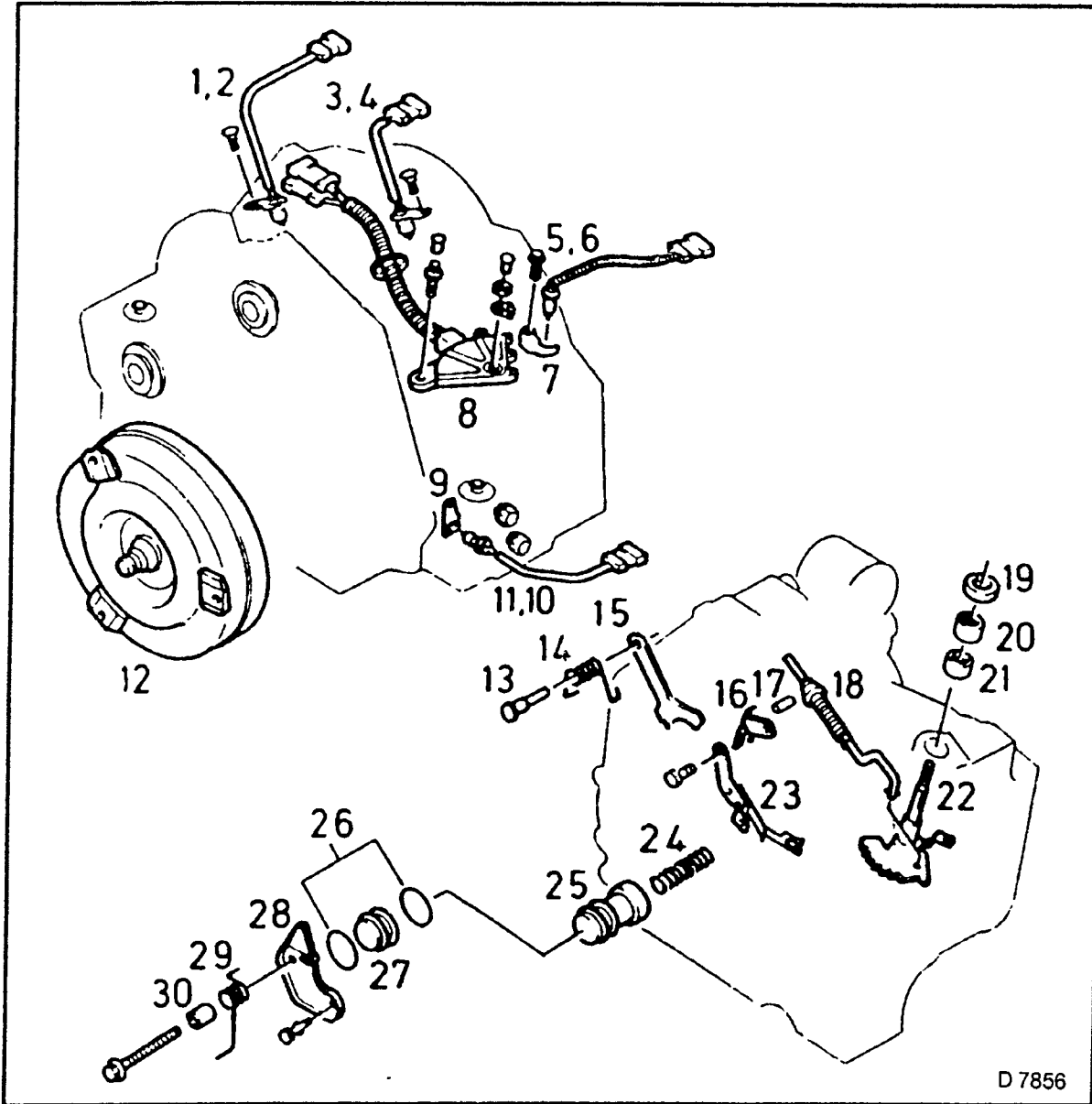


Fig. 294



D 7856

Fig. 295 — AF 20 — attaching parts.

- | | |
|--|-------------------------------------|
| 1 = Sensor, transmission output speed | 17 = Pin for parking pawl |
| 2 = Seal ring | 18 = Actuating rod for parking pawl |
| 3 = Sensor, transmission input speed | 19 = Seal ring |
| 4 = Seal ring | 20*) = Outer needle bearing |
| 5 = Solenoid valves wiring harness | 21*) = Inner needle bearing |
| 6 = Seal ring | 22 = Ratchet |
| 7 = Retaining plate | 23 = Detent spring |
| 8 = Selector lever position switch | 24 = Compression spring |
| 9 = Cover plate for fluid temperature sensor | 25 = Accumulator piston |
| 10 = Seal ring | 26 = Seal rings |
| 11 = Fluid temperature sensor | 27 = Accumulator cover |
| 12 = Converter | 28 = Accumulator bracket |
| 13 = Axle for parking pawl | 29 = Torsion spring no 2 |
| 14 = Torsion spring no. 1 | 30 = Sleeve for spring guide |
| 15 = Pawl for parking pawl | |
| 16 = Cam plate | |

*) One part on newer transmissions

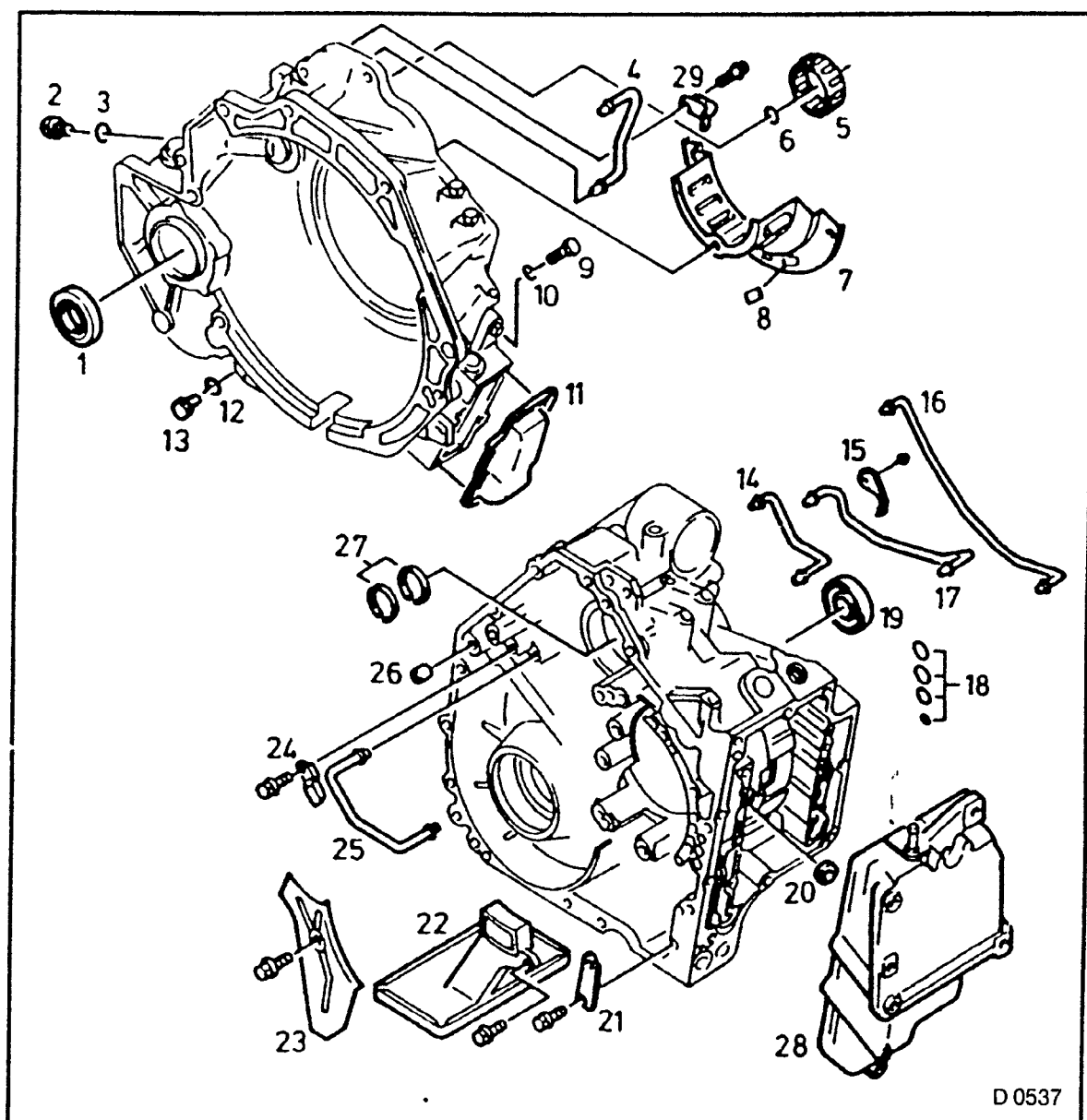


Fig. 296 — AF 20 — housing parts.

- | | |
|---|-------------------------------------|
| 1 = Plug — M 8 | 16 = Main pressure pipe no 1 |
| 2 = Seal ring | 17 = Pipe clamp |
| 3 = Lubrication oil line | 18 = Actuation pipe |
| 4 = Pipe clamp | 19 = Lubrication pipe |
| 5 = Roller bearing | 20 = Axle shafts seal ring |
| 6 = Seal ring | 21 = Gaskets for regulator |
| 7 = Oil baffle plate, auxiliary housing | 22 = Gaskets for actuation (x 2) |
| 8 = Magnet (x 3) | 23 = Side cover |
| 9 = Plug — M 8 | 24 = Main housing plate |
| 10 = Seal ring | 25 = Oil baffle plate, main housing |
| 11 = Auxiliary housing cover | 26 = Oil screen |
| 12 = Seal ring | 27 = Main pressure pipe no. 2 |
| 13 = Drain bolt | 28 = Pipe clamp |
| 14 = Axle shaft seal ring | 29 = Seal ring |
| 15 = Hooked seal rings | |

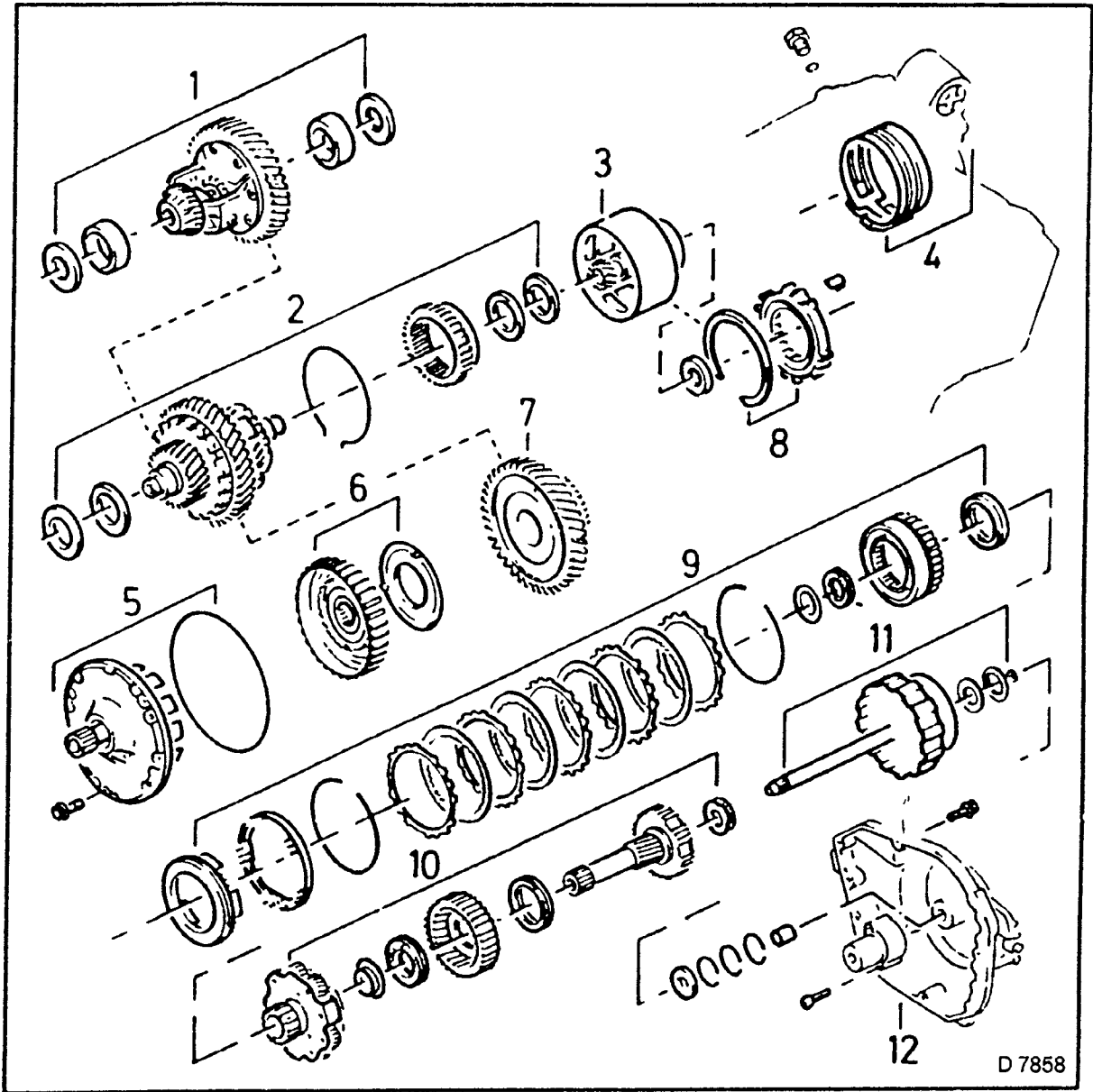


Fig. 297 — AF 20 — assemblies.

- 1 = Differential
- 2 = Planetary gear set P2
- 3 = Multi-plate clutch C3
- 4 = Brake band B4
- 5 = Fluid pump
- 6 = Freewheel F1
- 7 = Intermediate drive gear
- 8 = Freewheel F3
- 9 = Multi-disc brake B3 and freewheel F2
- 10 = Planetary gear set P1
- 11 = Multi-plate clutch C1 and C2-drive shaft assembly
- 12 = Rear cover

TRANSMISSION, OVERHAUL

Assemblies — Remove from Transmission

TRANSMISSION REMOVED:
Drain transmission fluid.
Drain bolt (1), on right housing underside.

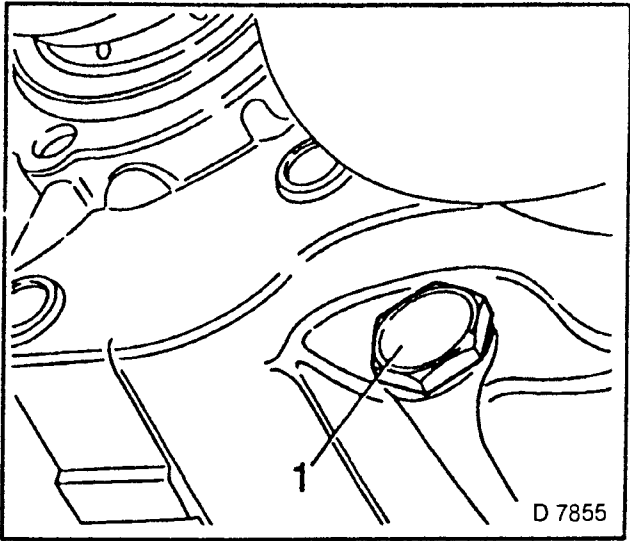


Fig 298

INSTALL, CONNECT

- 1 Holder KM-694 (1) on transmission.
- 2. Place assembly on Base KM-113-2 (2).

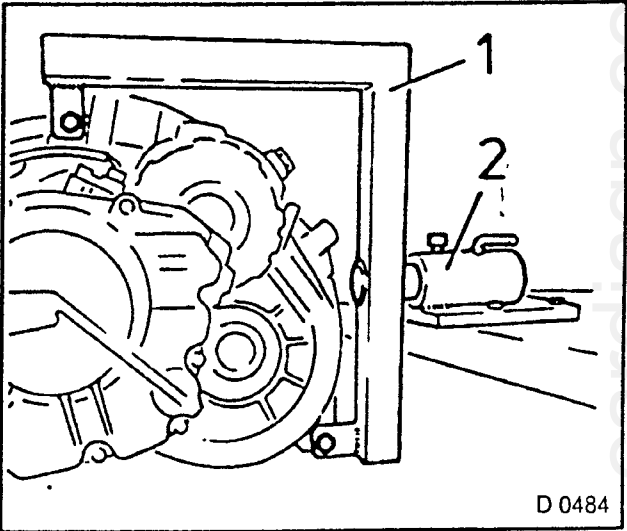


Fig 299

Attaching Parts from Transmission — Remove

REMOVE, DISCONNECT

- 1. Converter — fluid escapes.
- 2. Fluid filler tube and selector lever position switch.
- 3. Actuation lever (3) from selector lever shaft (2).
- 4. Retaining plate (1, with screwdriver).
- 5. Pull switch upwards from selector lever shaft (2).

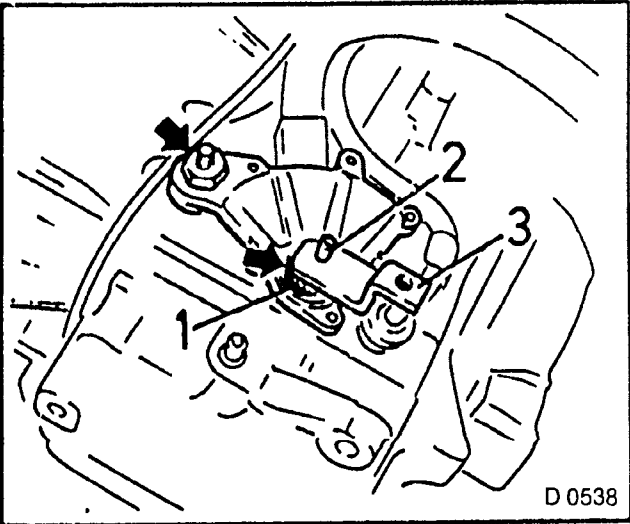


Fig. 300

- 6. Transmission input speed sensor (1).
- 7 Transmission output speed sensor (2)
- 8. Speedometer helical gear (driven).
- 9 Replace all seal rings.

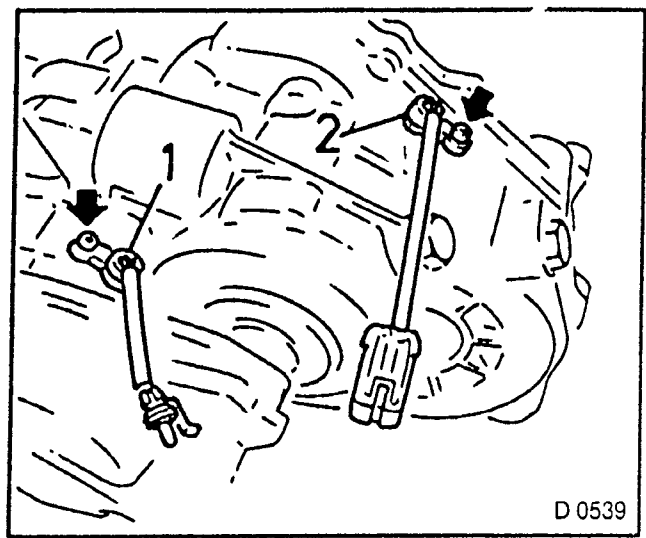


Fig 301

REMOVE, DISCONNECT

- 1. Seven plugs M 8 (1).
- 2. One plug M 14 (2).
- 3. One plug M 18 Torx (3).
- 4. Two plugs M 20 (4).
- 5. Renew seal rings of plugs.

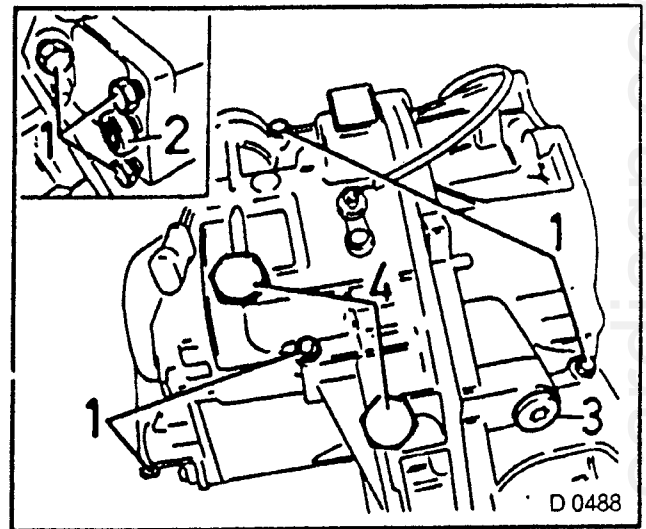


Fig 302

- 6. Cover plate for fluid temperature sensor (arrows).
- 7. Fluid temperature sensor (1).
- 8. Auxiliary housing cover (2).

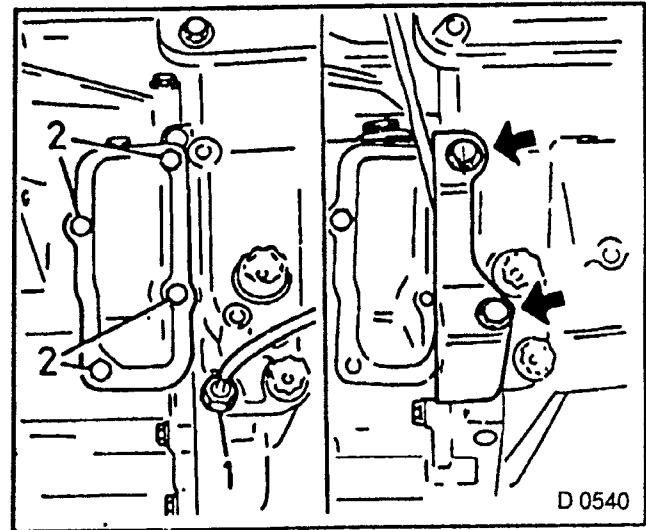


Fig 303

REMOVE, DISCONNECT

- 1 Side cover (seven bolts, arrows).

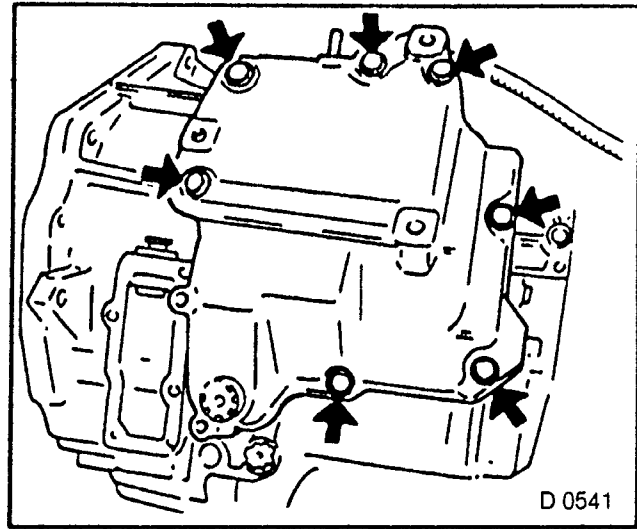


Fig. 304

2. Four wiring harness plugs (1) for solenoid valves of fluid pressure regulator.
3. Remove wiring harness from cable retainers.
4. Valve body — two bolts for intake cover (2).
5. Seven bolts for valve body from transmission (3).

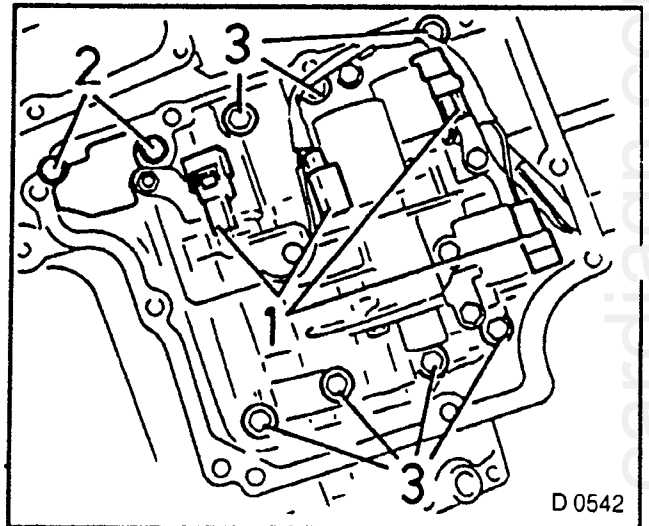


Fig. 305

REMOVE, DISCONNECT

1. Connecting rod (1) from ratchet (2).
Hold valve body, if necessary lift locking spring (3), so that ratchet (2) can be turned.
2. Ratchet (2) — guide sideways out of main housing.
3. Lever out seal ring with screwdriver.
4. Solenoid valves wiring harness.
5. Loosen retaining plate (4). Renew rubber O-seal ring.
6. Two gaskets for actuation (5).

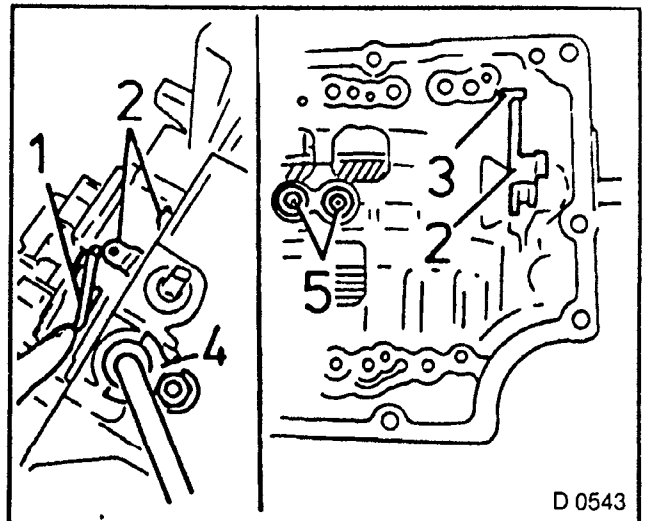


Fig. 306

7. Fluid pump from transmission — eight bolts, Remover KM-702 in two threaded bores of fluid pump.

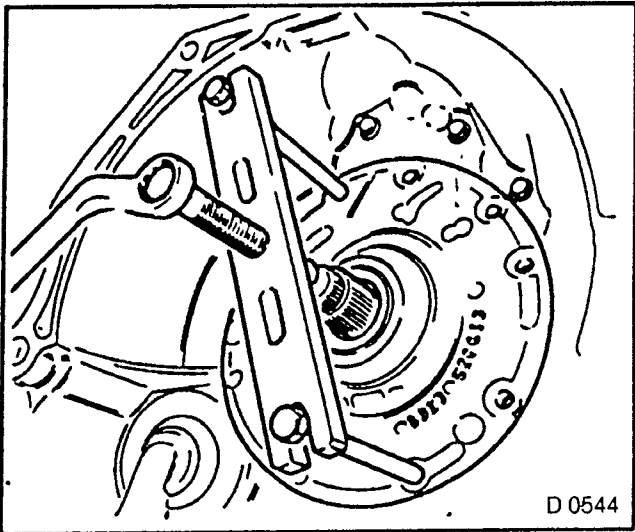


Fig 307

REMOVE, DISCONNECT

1. Freewheel F1 from drive shaft.

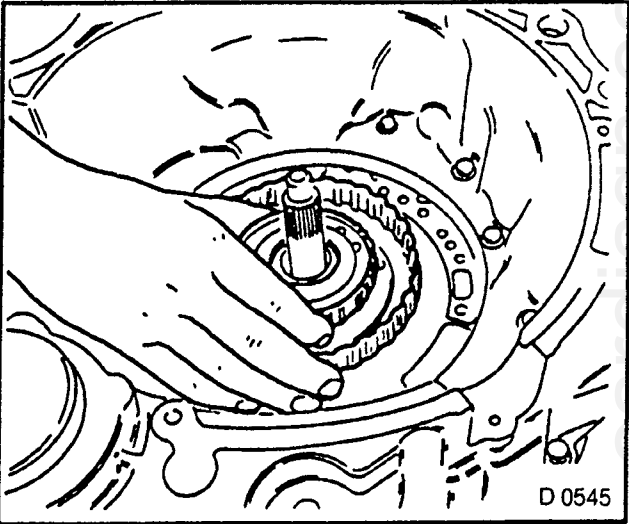


Fig 308

2. Rear housing cover — Nine bolts (arrows, left).
3. Four gaskets — behind housing cover (arrows).

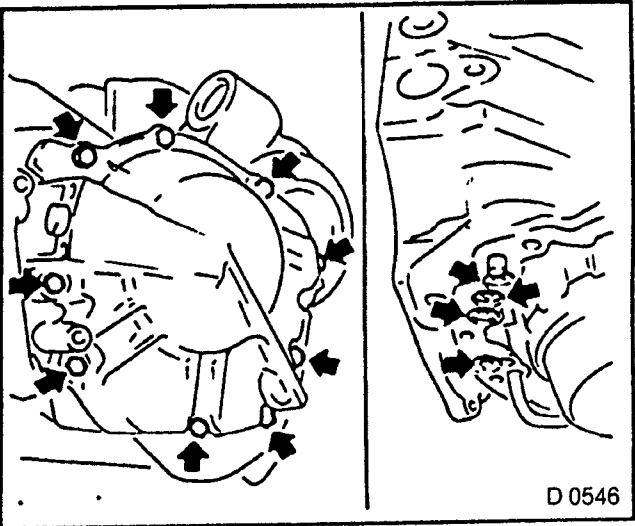


Fig 309

REMOVE, DISCONNECT

1. Pipes for actuation (3) — One pipe clamp, lever out pipe ends.
If resistant; remove pipe lines with Slide Hammer KM-J-7004 and Hook KM-586.

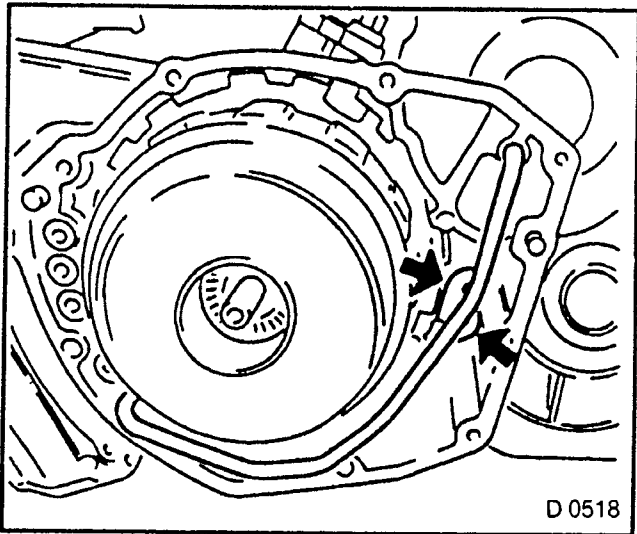


Fig 310

2. Drive shaft assembly (remove in direction of arrow).
NOTE CONDITION AND INSTALLATION POSITION OF THRUST BEARING AND RACE ASSEMBLY.

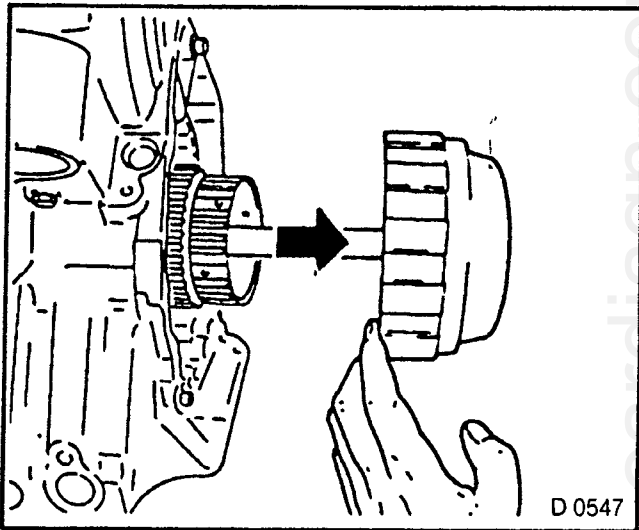


Fig 311

REMOVE, DISCONNECT

1. Planetary gear set P1 with sun gear from transmission.
NOTE CONDITION AND INSTALLATION POSITION OF THRUST BEARING AND RACE ASSEMBLY.

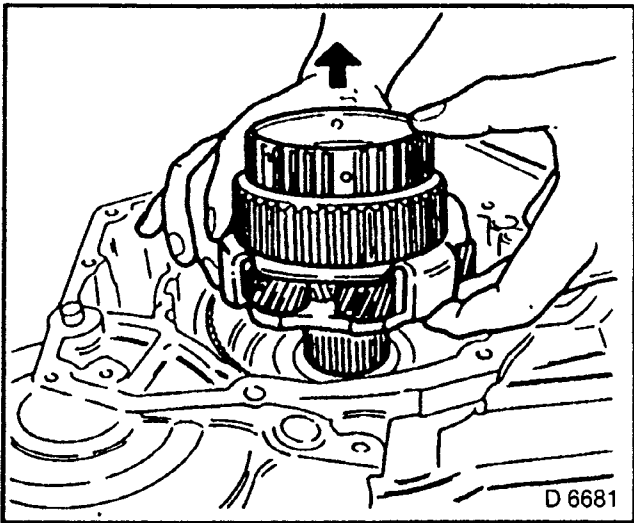


Fig 312

2. Front internal gear and freewheel no. 2 — retaining ring.
- 3 Assembly with steel plates.
4. Remove lining plates and flange of multi-disc brake B3.

INSPECT

1. Steel and lining plates for damage and wear.
Before installing, lay new lining plates for at least two hours in transmission fluid.

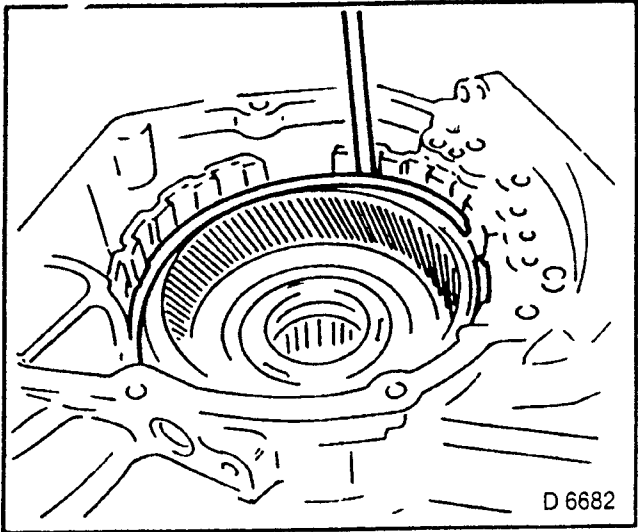


Fig. 313

REMOVE, DISCONNECT

1. Return spring assembly (1).
2. Retaining ring.

MEASURE

1. Free length of return springs, including spring cup — Measurement value: 20 mm.

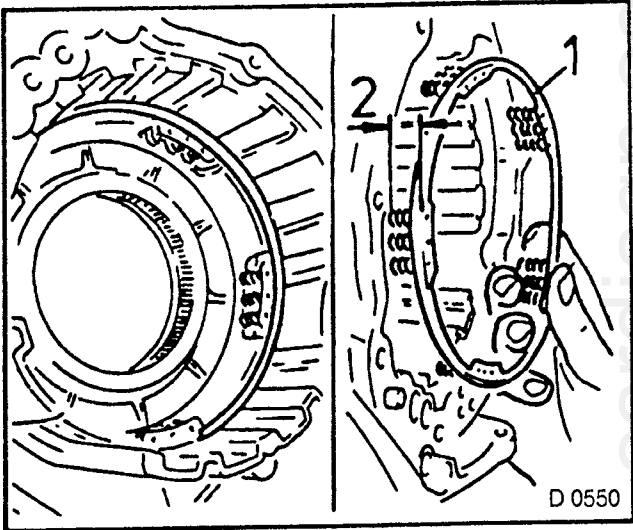


Fig. 314

REMOVE, DISCONNECT

1. Piston for multi-disc brake B3.
2. Blow in low pressure air (arrow); if necessary, assist with pliers.
3. Renew inner and outer seal rings on pistons (arrows).

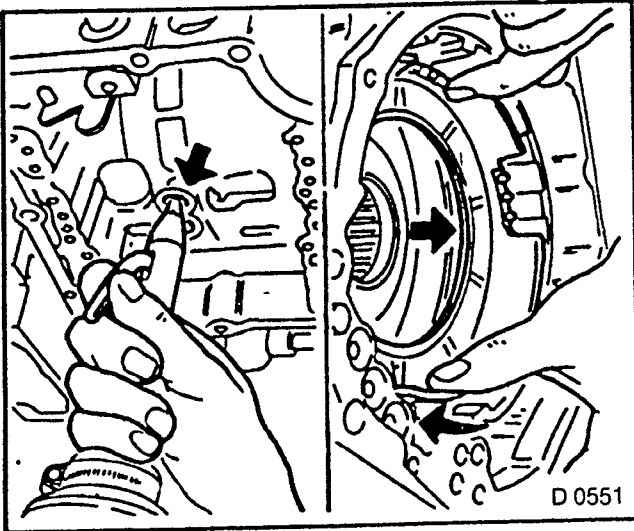


Fig. 315

REMOVE, DISCONNECT

1. Intermediate drive gear.
2. Retaining ring Remove component towards reverse (arrow)

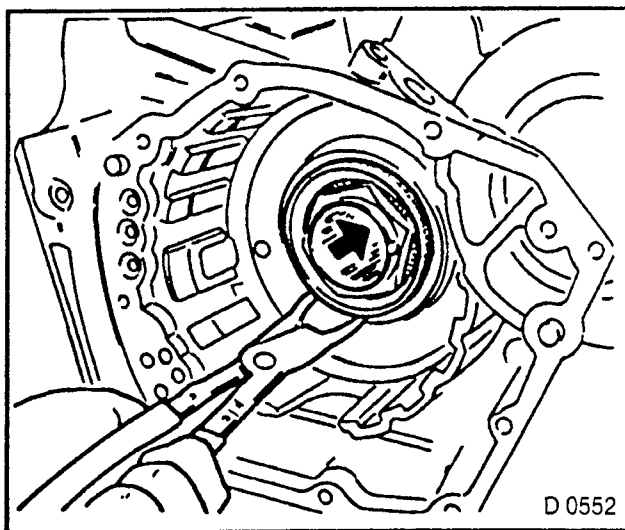


Fig. 316

- 3 Lock transmission horizontally
Fifteen bolts (1) of auxiliary housing — if necessary separate housing parts with plastic hammer
- 4 Differential (2).
5. Fluid filter.
6. One bolt (3).
7. Main housing plate.
- 8 Two bolts (4, located next to fluid filter).

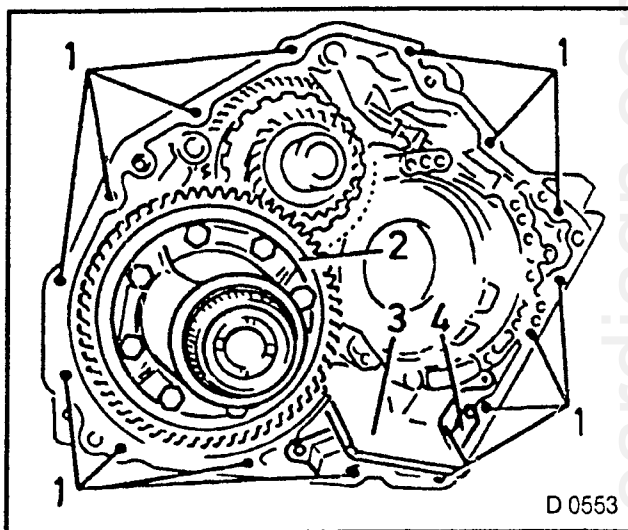


Fig 317

REMOVE, DISCONNECT

1. Seal ring from main housing (arrow).

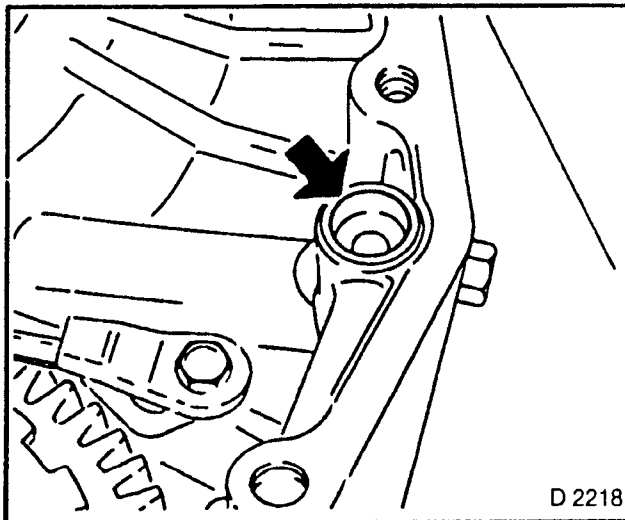


Fig 318

2. Both axle shaft seal rings from main or auxiliary housing.
3. Drive from inside outwards using suitable drift.

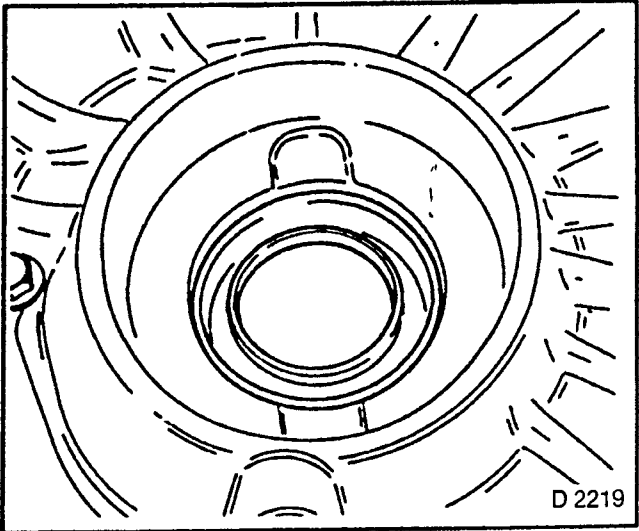


Fig. 319

DISASSEMBLE

1. Auxiliary housing.
2. Roller bearing from housing — KM-J-26941, KM-313, KM-483. If difficult to move, heat transmission housing with hot air blower to approximately 80°C/176°F (thermocolour pencils, or use suitable temperature gauge).

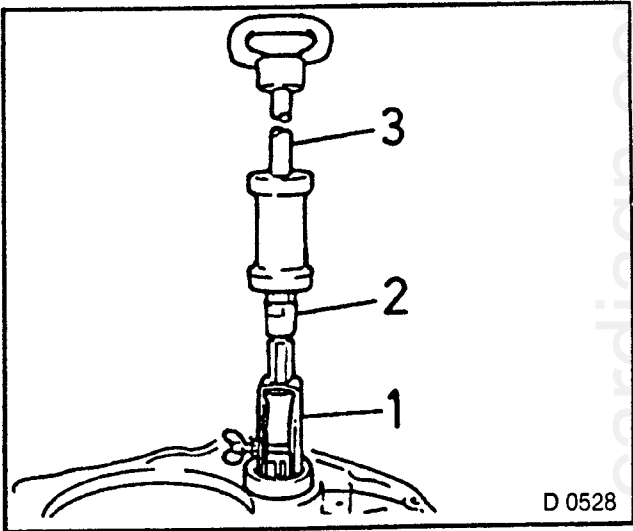


Fig. 320

3. Fluid line — loosen pipe clamp (1), lever out line using screwdriver.
4. Fluid retaining plate — Three bolts (2), Three magnets (on underside of fluid retaining plate).
5. Hook seal ring from pin in housing (3).
6. Ring ends are L-shaped. Press one ring end in groove, hook out the other. With new transmissions, as cut seal ring without hooks.

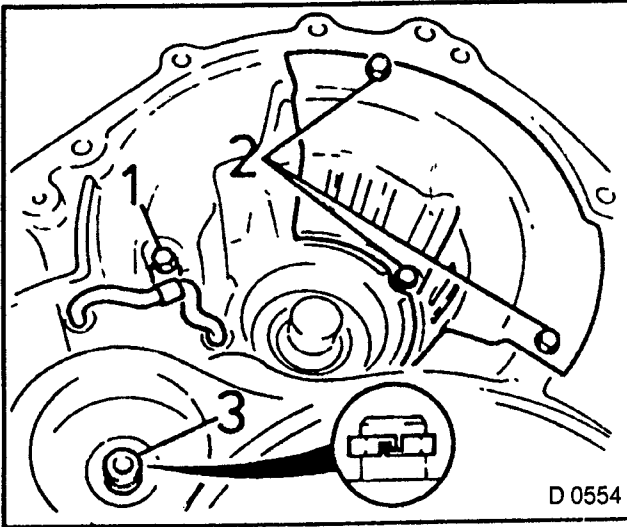


Fig. 321

REMOVE, DISCONNECT

- 1. Fluid retaining plate (1)
- 2. Main pressure pipe no. 2.
- 3. Loosen pipe clamp.
- 4. Lever out line using screwdriver (2).

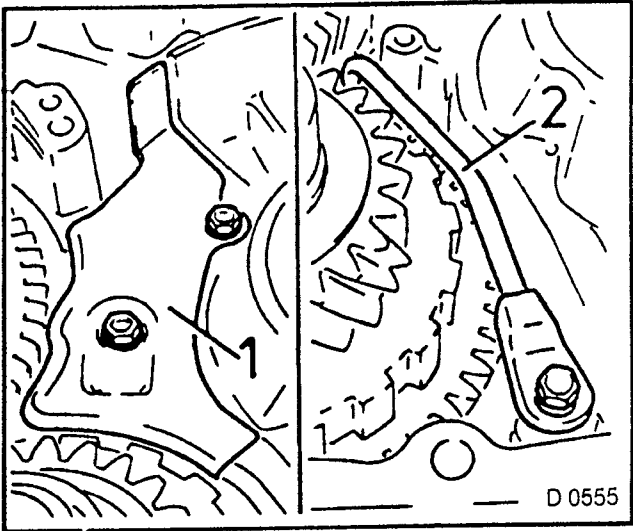


Fig 322

- 5. Parking pawl assembly
- 6. Detent spring — two bolts (1), guide rear spring end over detents of toothed segment
- 7. Actuation rod for parking pawl (2) from toothed segment — align recesses in toothed segment with lugs on rod (2) by turning.
- 8. Cam plate (3), axle for parking pawl and spring no. 1 (4).
- 9. Remove upwards.
- 10. Claw for parking pawl (5).
- 11. Pin for parking pawl — under cam plate (3)

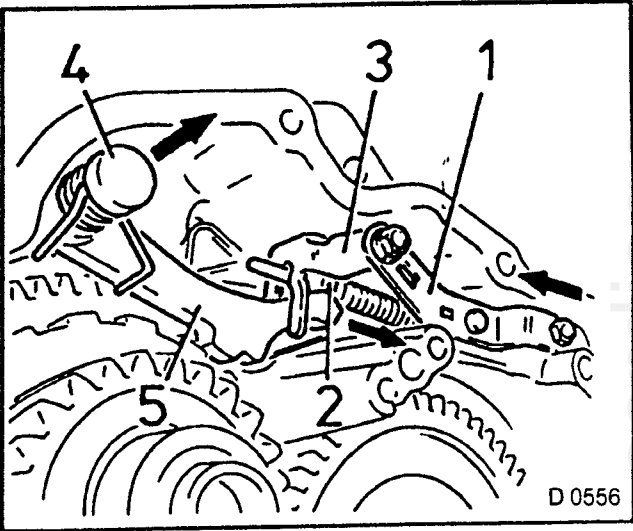


Fig 323

REMOVE, DISCONNECT

- 1. Accumulator cover for reduction brake.
One Torx bolt (1),
One bolt (2) with torsion spring no. 2 (3).
Cover (5),
Accumulator piston (6),
Spring (4),
Blow in low pressure air (arrow).
- 2. Renew rubber O-seal rings on cover (5) and piston (6).

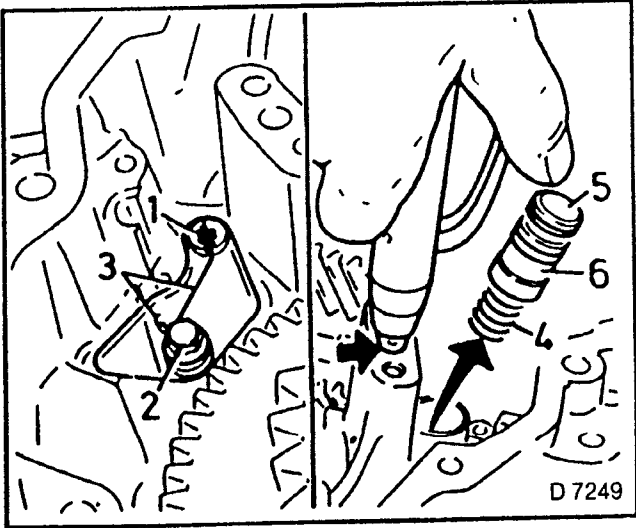


Fig. 324

3. Planetary gear set P2 (1) — note condition and installation position of thrust bearing and race assembly (2 — located in internal gear).

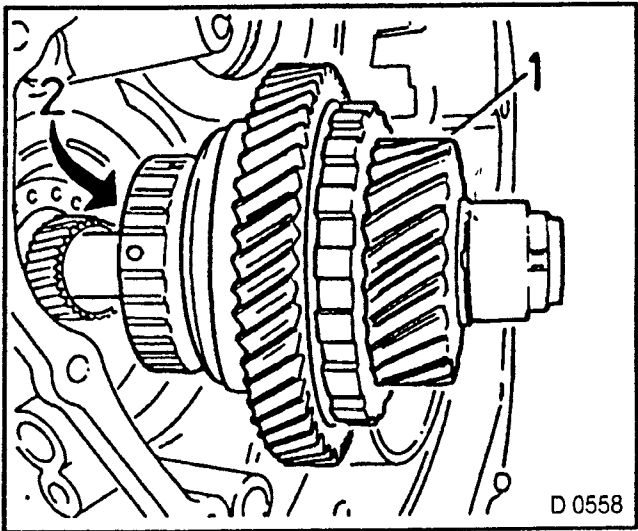


Fig. 325

REMOVE, DISCONNECT

1. Reduction clutch (1).
2. Turn counter-clockwise and lift.
3. Thrust bearing (2),
Brake band B4 (3) — unscrew anchor bolt,
(4 protrudes from outside through housing).
4. Renew rubber O-seal ring.

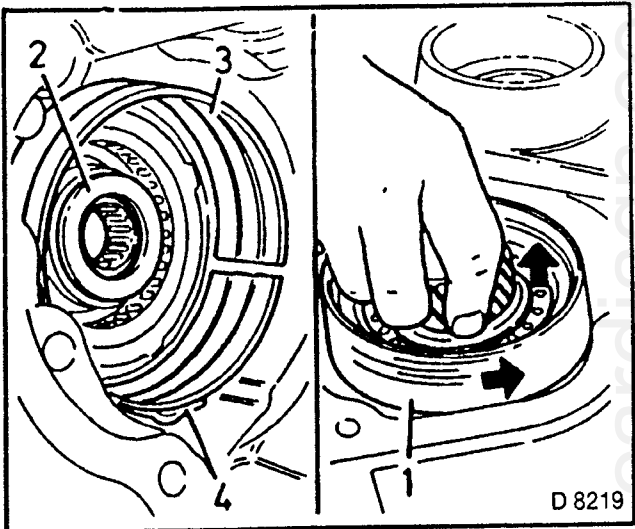


Fig 326

5. Freewheel F3 (2) — mark top side.
6. Retaining ring (1).

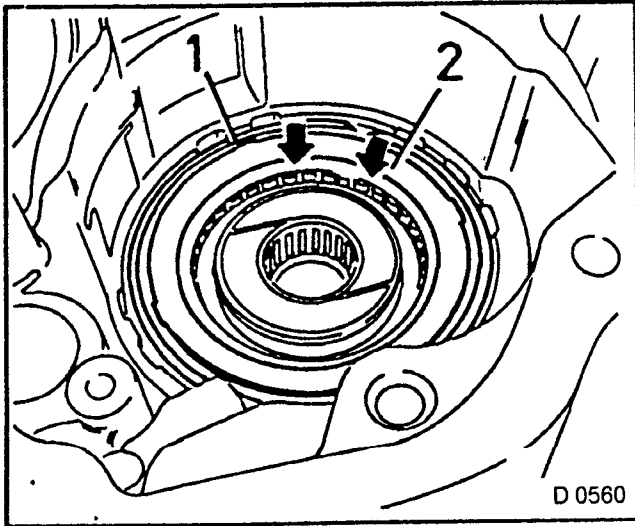


Fig. 327

REMOVE, DISCONNECT

- 1. Needle bearing for reduction clutch.
- 2. Pull out from main housing using KM-556-1 (1) and KM-556-2 (2). If necessary (arms of KM-556-1 too short), lay KM-502-A underneath.

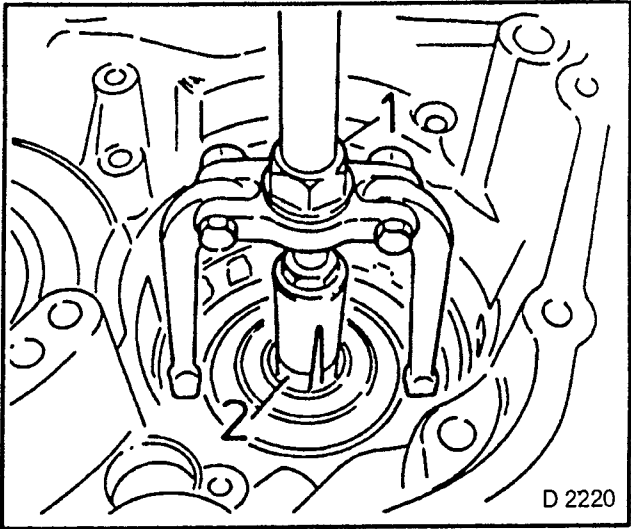


Fig 328

- 3 Seal ring for shaft of toothed segment from main housing.
 - 4 Needle bearings for shaft of toothed segment (two pieces).
 - 5 Drive both bearings from outside inwards using suitable drift.
- Single — part version in new transmissions.
When replacing bearings on older transmissions, also use the single-part version.

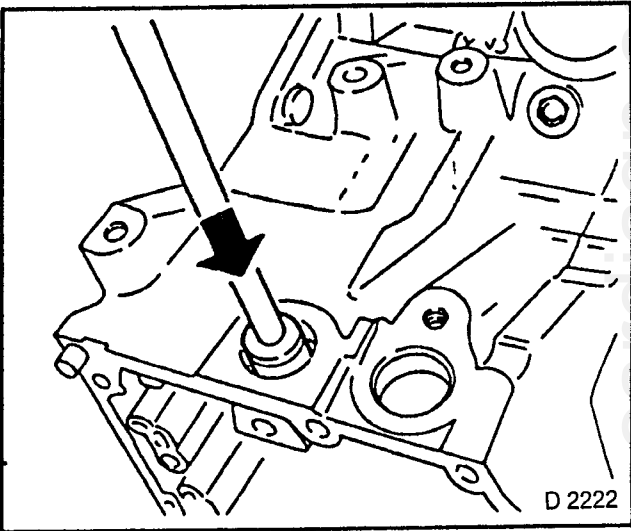


Fig. 329

REMOVE, DISCONNECT

- 1. Two hook seal rings from pin in housing — ring ends are L-shaped.
- 2. Press one ring end into groove, hook out the other.

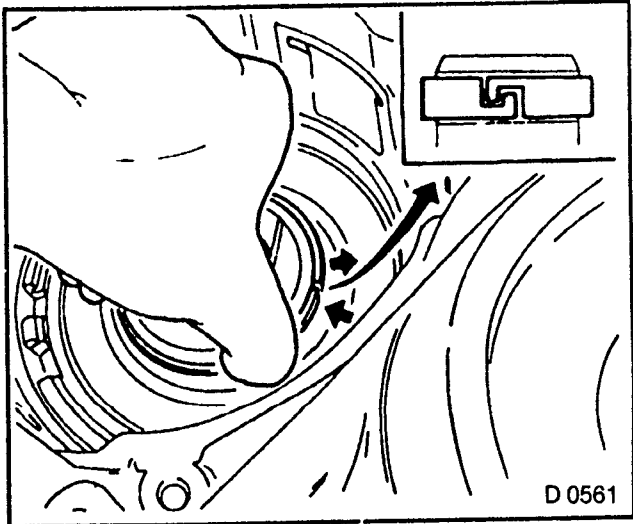


Fig. 330

3. Piston for reduction brake.

CAUTION

Varying tolerances require special caution:
Cover is spring-tensioned, secure against
springing out
Retaining ring with retaining ring pliers

REMOVE, DISCONNECT

1. Retaining ring.
- 2 Cover (if difficult, assist using pliers).
- 3 Piston (1),
Pressure spring (2),
Damping spring (3).
If difficult:
Blow in low pressured air at inner side of
housing (arrow).
4. Renew seal rings (4) at cover and
piston (1).

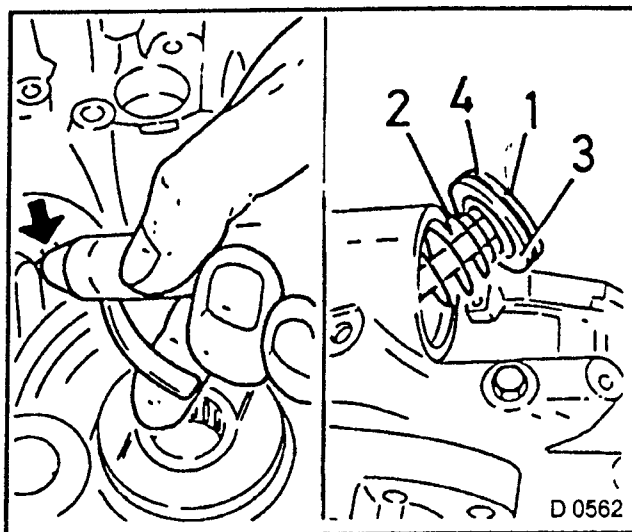


Fig. 331

**ASSEMBLIES,
DISASSEMBLE AND
ASSEMBLE**

**Fluid Pump, Multi-disc
Brakes B1 and B2 —
Overhaul**

INSPECT

- 1. Easy turnability of fluid pump drive gear
— insert KM-704 in splines of fluid pump
shaft and turn in both directions
- 2. Function of multi-disc brake B1.
- 3. Blow in compressed air (4 bar, arrow 2).
- 4. Piston must move uniformly and actuate
inner lining plates.
- 5. Function of multi-disc brake B2.
- 6. Blow in compressed air (4 bar, arrow 1).
- 7. Piston must move uniformly and actuate
outer lining plates.

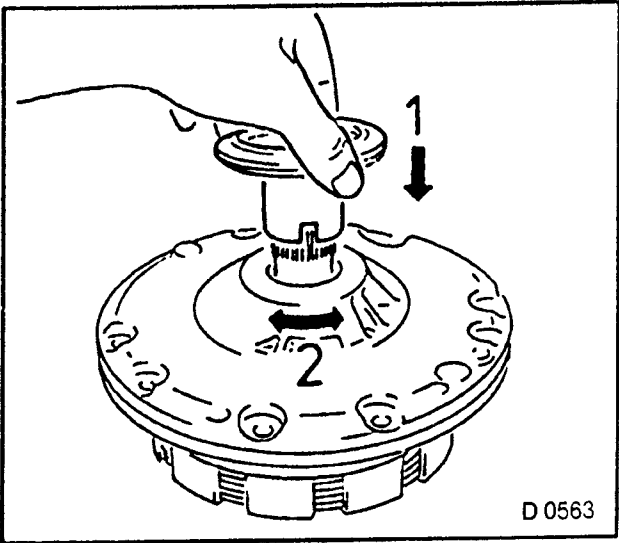


Fig. 333

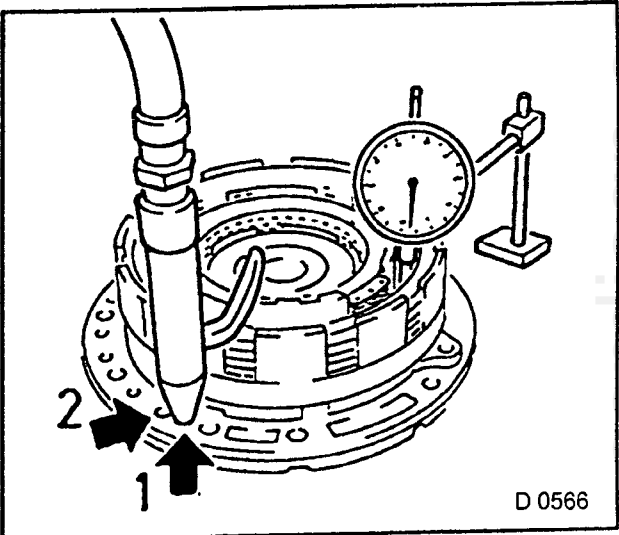


Fig. 334

DISASSEMBLE

- 1. Multi-disc brake B1.
- 2. Remove retaining ring (1).
- 3. Remove brake flange (2) and clutch
plates.

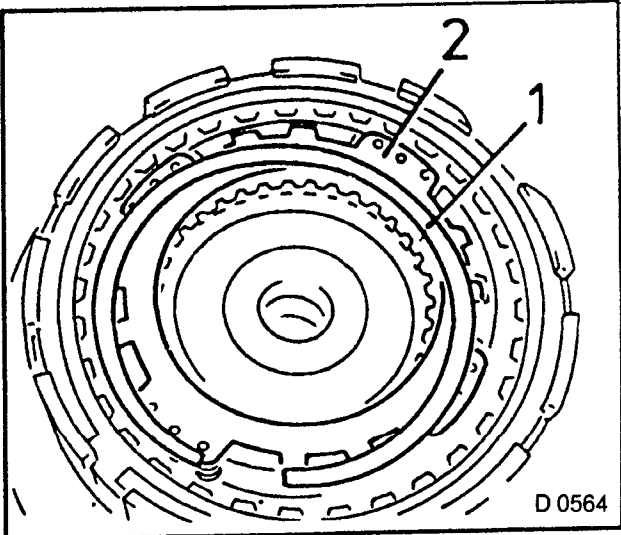


Fig. 335

4. Press together spring cup (1) with KM-699 (2) under a clamp.
5. Remove retaining ring.
6. Spring cup (1) from housing.

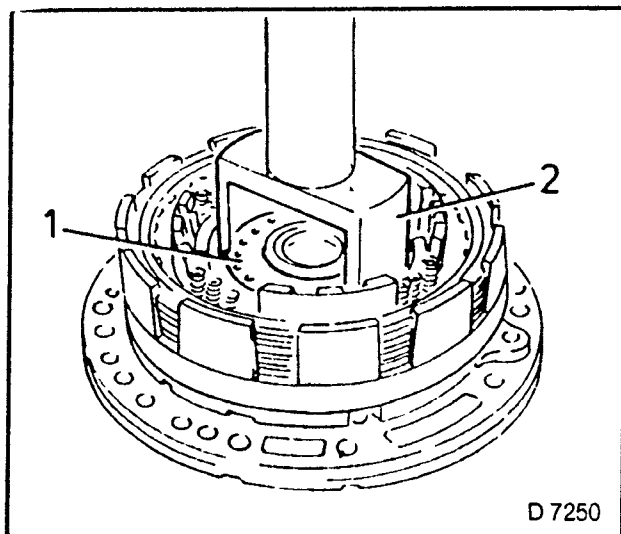


Fig 336

REMOVE, DISCONNECT

1. Piston for freewheel F1 — blow in low pressure air (arrow), if necessary assist with pliers.
2. Renew rubber O-seal rings (2)

INSPECT

1. Sliding surfaces of lining plates for wear — if necessary, replace.
Before installing, lay new lining plates for at least two hours in transmission fluid.

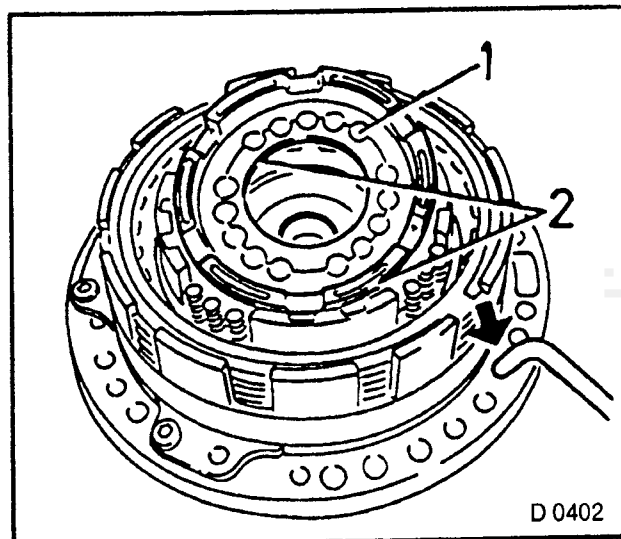
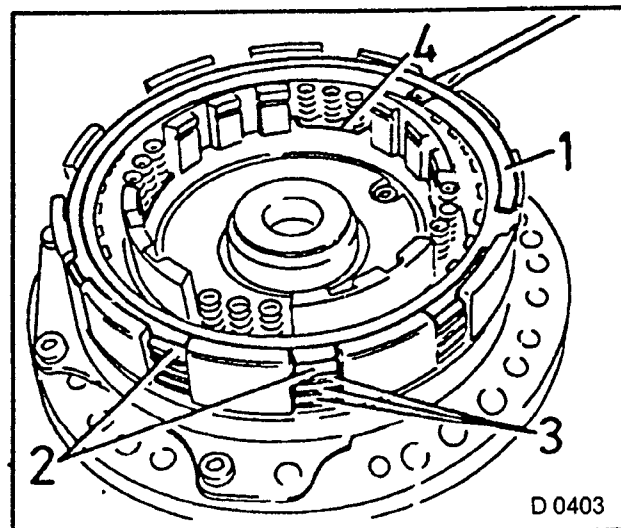


Fig 337

DISASSEMBLE

1. Multi-disc brake B2.
2. Remove retaining ring (1).
Remove brake flange (2),
Lining plates (3 pieces),
Steel plates (3 pieces),
Return spring assembly (4).



D 338

REMOVE, DISCONNECT

- 1. Piston for multi-disc brake B2 (1) — blow in low pressure air (arrow), if necessary assist with pliers.
- 2. Renew seal rings (2).

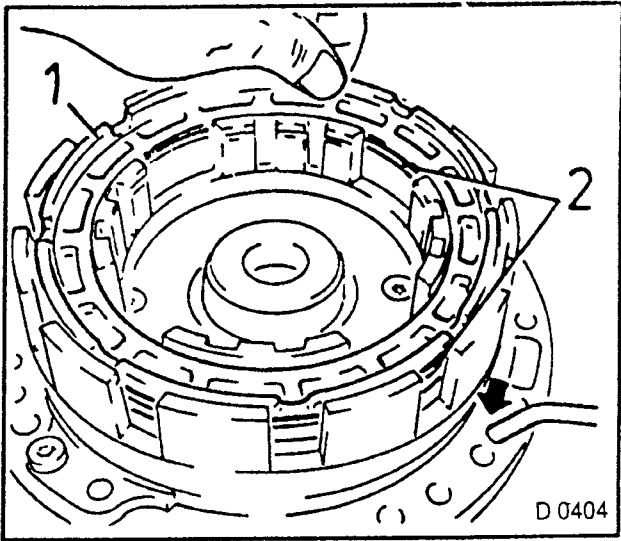


Fig. 339

DISASSEMBLE

- 1. Fluid pump,
Fourteen bolts (Torx 30), fluid pump plate from pump housing (mark top side).

INSPECT

- 1. Both sides of plate for wear and scoring.

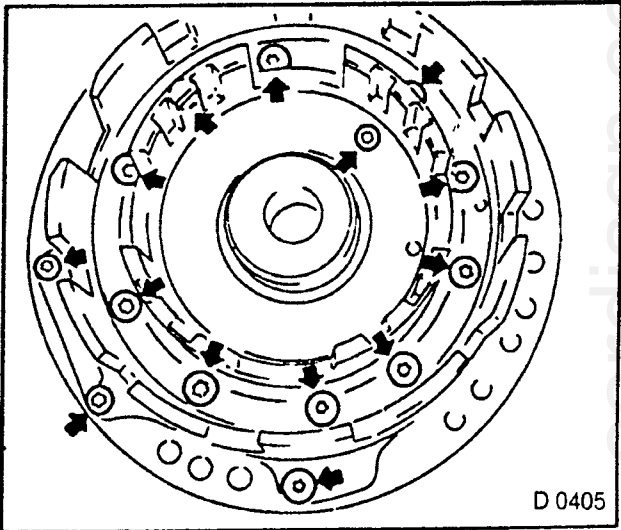


Fig. 340

MEASURE

- 1. Play between driven gear (1, press to one side of housing) and pump housing — feeler gauge (3).
- Measurement value: 0.075 to 0.2 mm

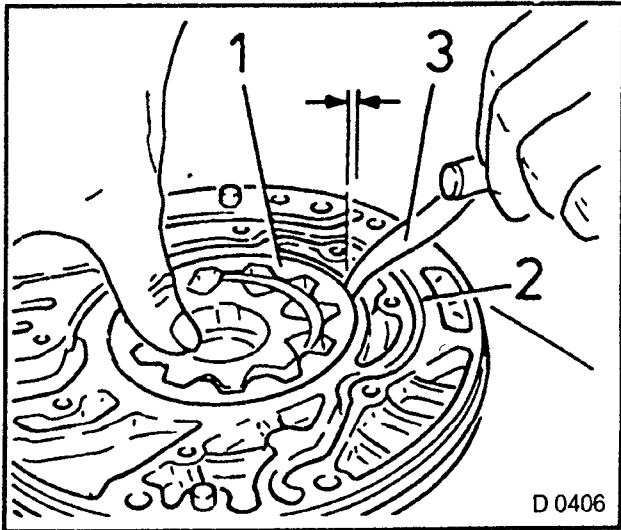


Fig. 341

2. Bottom play between drive gear (1) and crescent-shaped part (2) — feeler gauge (3).

Measurement value: 0.015 to 0.34 mm.

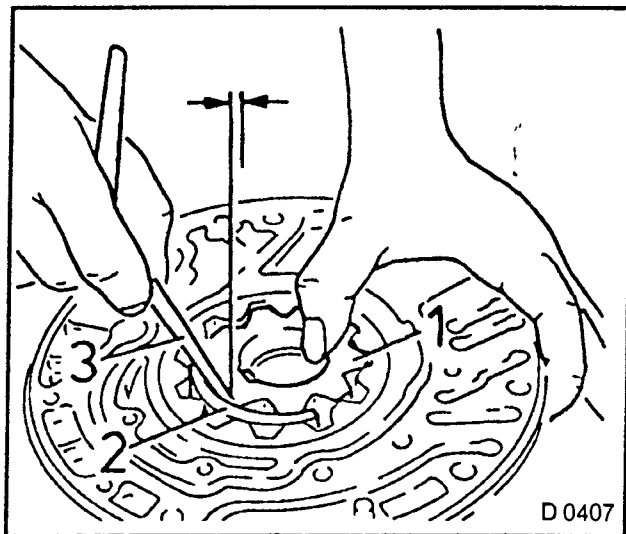


Fig 342

MEASURE

- 1 Bottom play between driven gear (1) and crescent-shaped part (2) — feeler gauge (3).

Measurement value: 0.005 to 0.3 mm.

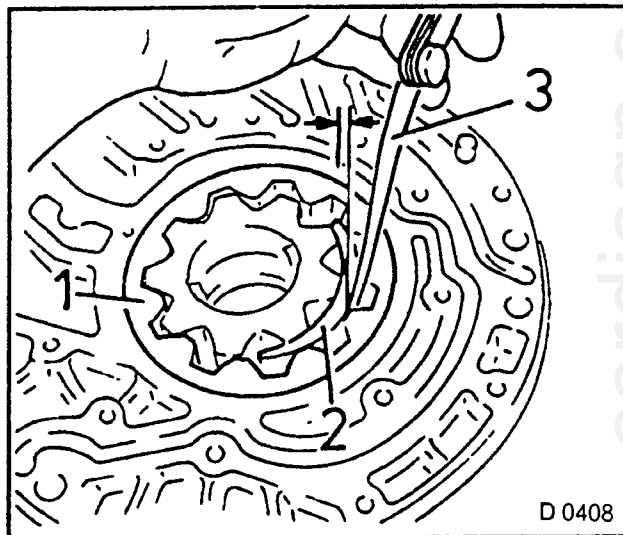


Fig 343

2. Axial play between both gears (1) and pump housing (2) — feeler gauge (3), steel ruler (4)

Measurement value: 0.02 to 0.05 mm
wear limit 0.1 mm.

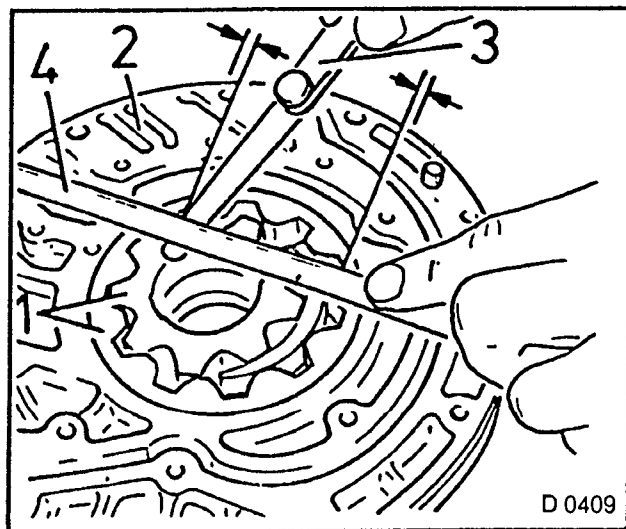


Fig 344

REMOVE, DISCONNECT

- 1. Both gears from fluid pump — mark top side of each.
- 2. Fluid seal ring from pump housing with suitable drift. Do not damage seating in housing.

INSPECT

- 1. Running surfaces and tooth profiles of both gears, carrier of drive gear (arrows) for damage and wear. If necessary, replace both gears — driving and driven.

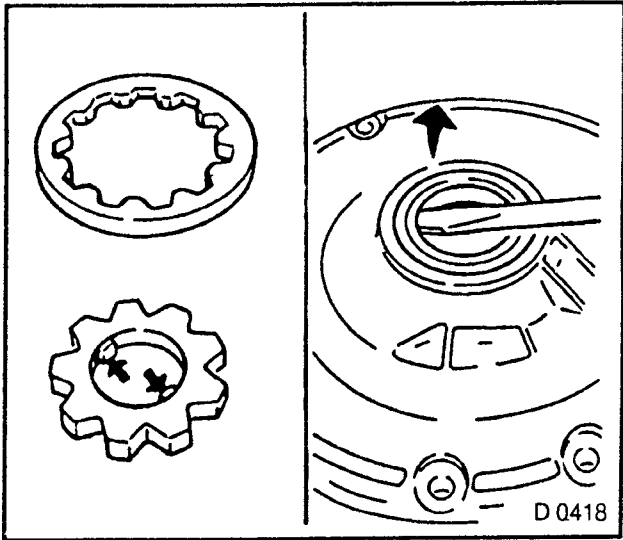


Fig 345

MEASURE

- 1 Inner diameter of bushing in pump housing (1).
- 2. Gauge with probe for inner diameter, measure at different points, take average. Measurement value: 38.113 to 38.180 mm. If necessary replace pump housing.
- 3. Inner diameter of front (2) and rear stator shaft bushing (3) — same measurement as before. Measurement value: 21.5 to 21 57 mm. If necessary replace stator shaft.

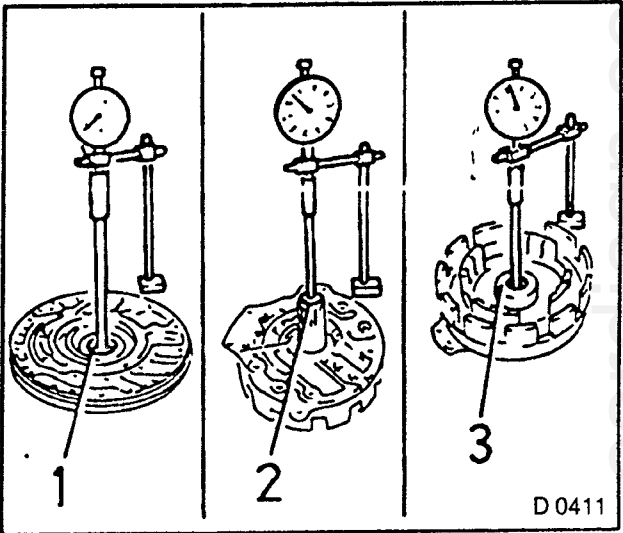


Fig. 346

ASSEMBLE

- 1. Fluid pump.
- 2. Drive in new fluid seal ring flush as far as upper edge of housing — KM-674. Fig. 347 shows procedure with fluid pump installed.

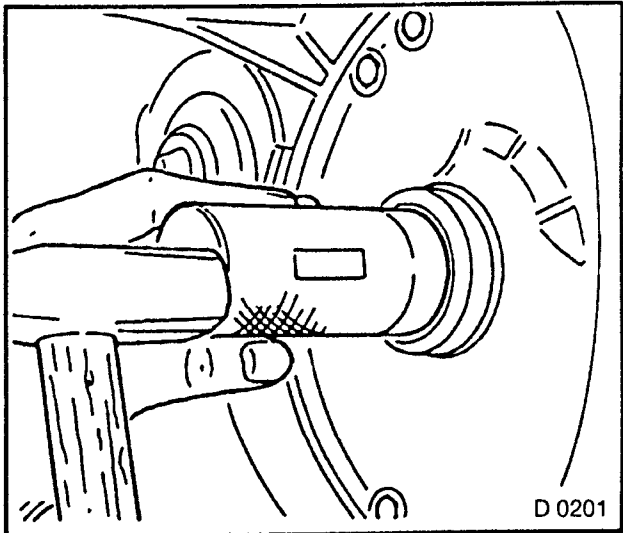


Fig 347

3. Both gears in pump housing — note marking.
- 4 Fluid pump plate to pump housing (dowel pin and marking)
- 5 New rubber O-seal ring between fluid pump plate and pump housing.

TIGHTEN (TORQUE)

1. Stator shaft to fluid pump — (Torx 30), 12 Nm.

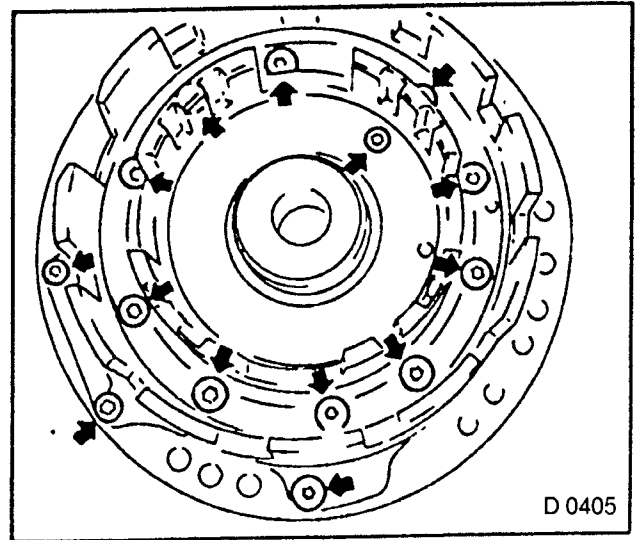


Fig 348

INSPECT

1. Easy turnability of fluid pump drive gear — insert KM-704 in splines of fluid pump shaft and turn in both directions

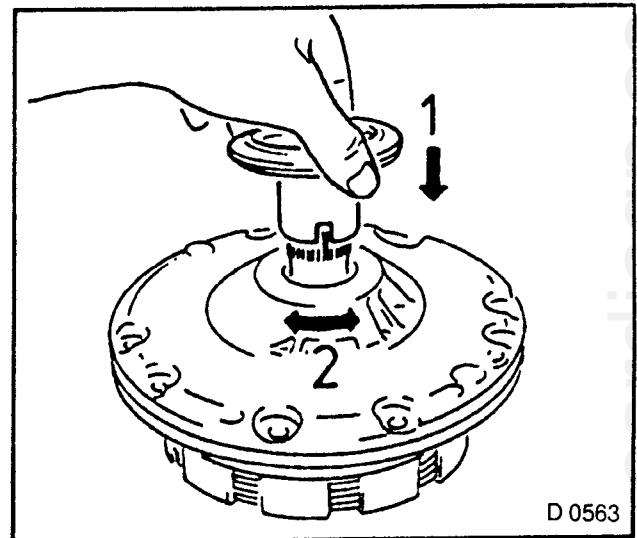


Fig 349

ASSEMBLE

1. Multi-disc brake B2.
2. Insert piston for multi-disc brake B2 with new rubber O-seal rings in stator shaft (spring mounts point upwards).
- 3 Place return spring assembly on piston.
4. Alternately install steel plates and lining plates (three), steel plate first, steel flange last (rounded side points towards lining).
5. Insert retaining ring.

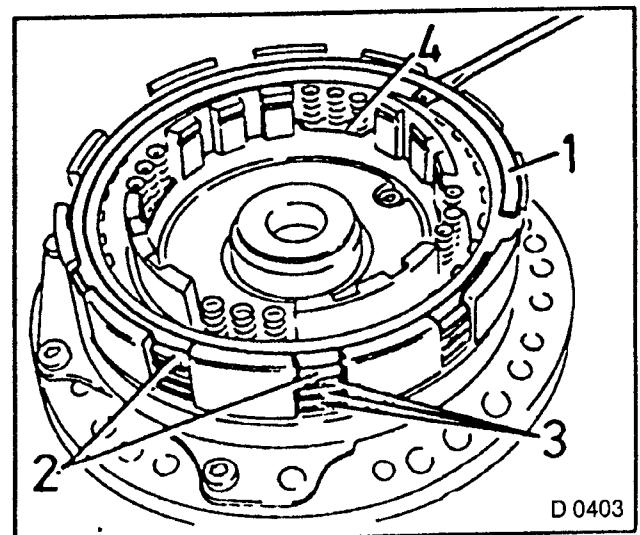


Fig 350

ASSEMBLE

1. Multi-disc brake B1.
2. Insert piston for freewheel F1 with new rubber O-seal rings in stator shaft (spring mounts point upwards)
3. Insert spring cup (1) and compress with KM-699 (2) in clamp.
4. Insert retaining ring
- 5 Alternately install steel plates and lining plates, steel plate first, steel flange last (rounded side points towards lining).
6. Insert retaining ring.

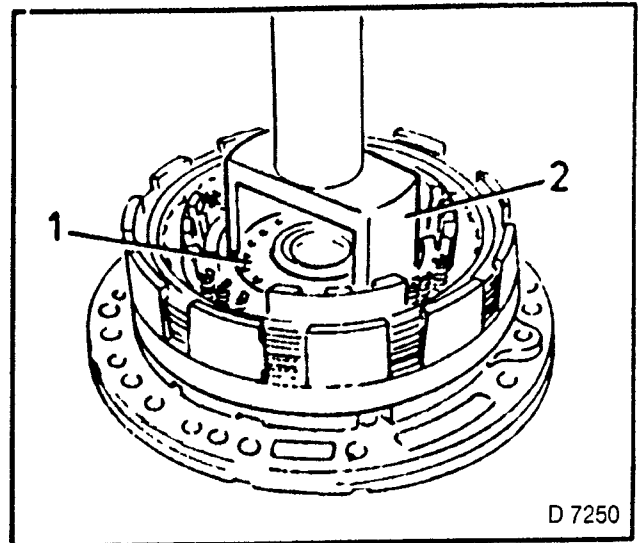


Fig 351

MEASURE

1. Piston stroke of multi-disc brake B2 — with gauge.
2. Blow in low pressure air (4 bar, arrow 1).
3. Place probe on uppermost lining plate. Measurement value: 1.14 to 1.86 mm.
4. Piston stroke of multi-disc brake B1 — with gauge.
5. Blow in low pressure air (4 bar, arrow 2).
6. Place probe on uppermost lining plate. Measurement value: 0.76 to 1.44 mm.

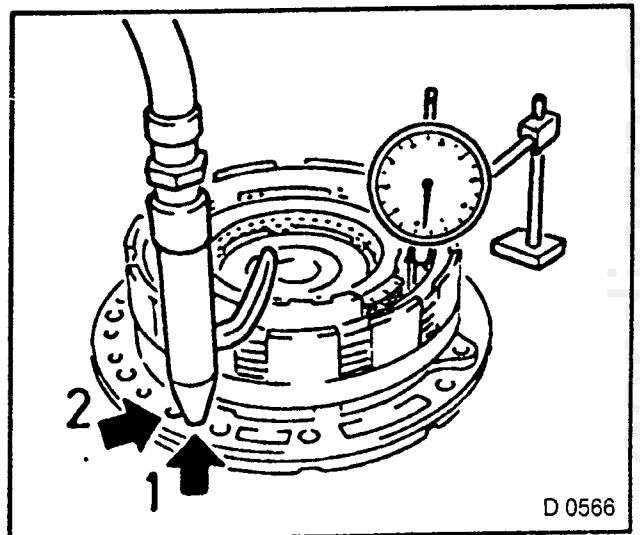


Fig 352

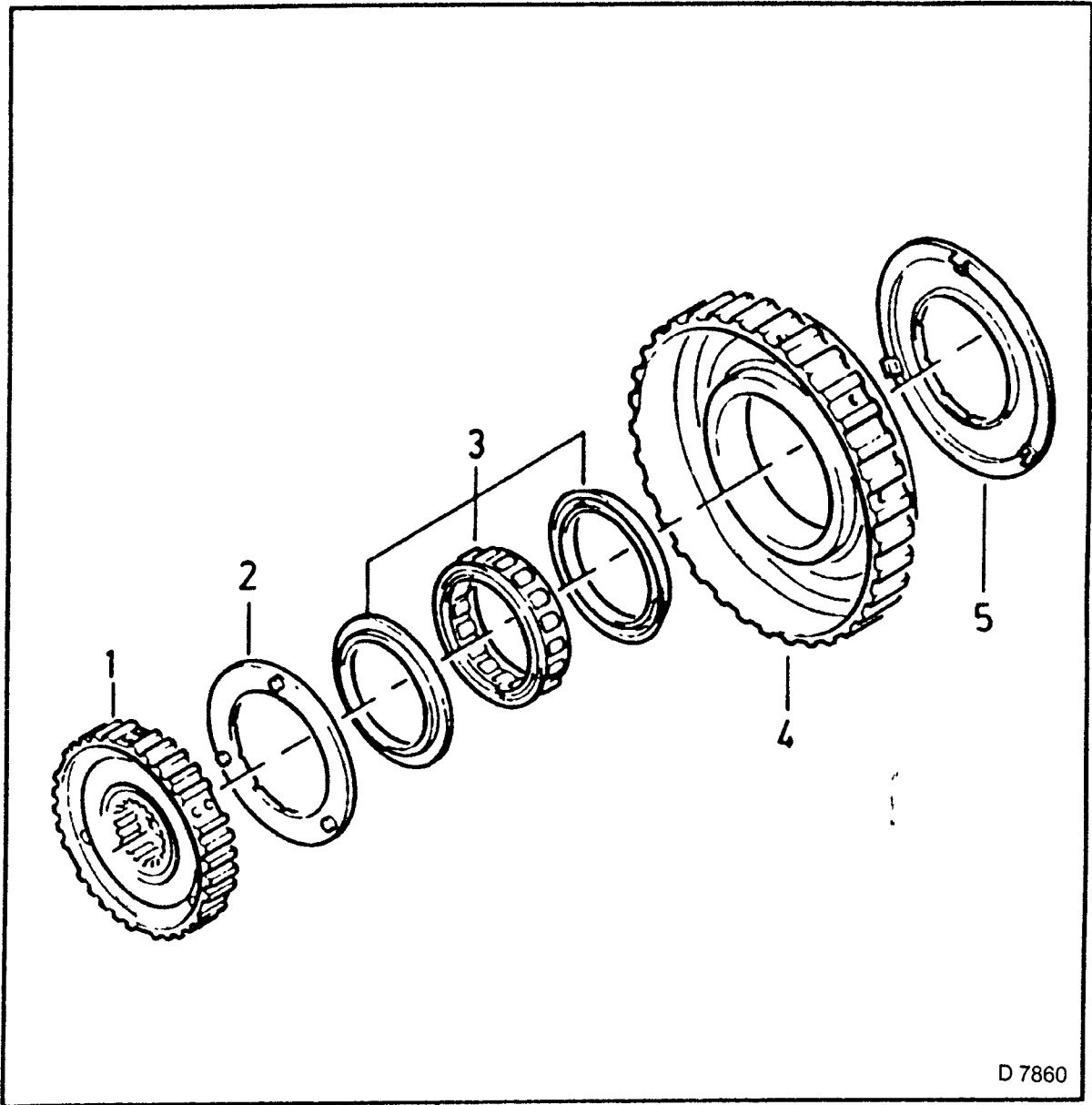


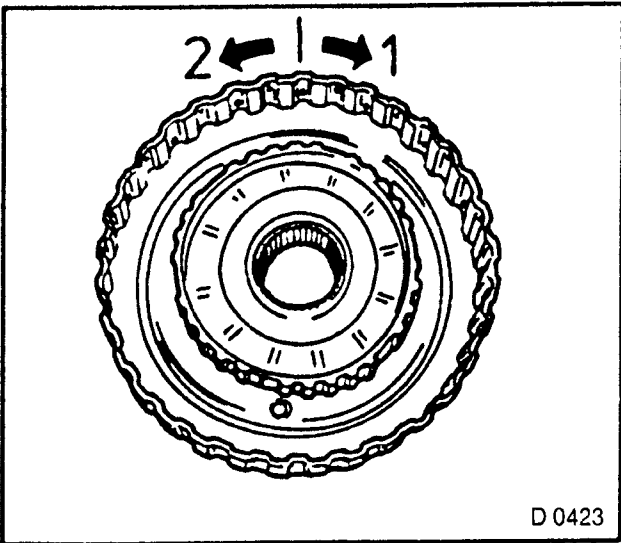
Fig 353 — Freewheel F1

- 1 = Inner gear (freewheel brake hub)
- 2 = Friction washer
- 3 = Freewheel F1
- 4 = Outer gear (2nd gear brake hub)
- 5 = Friction washer

Freewheel F1, Overhaul

INSPECT

- 1. Freewheel clutch function.
- 2. Hold outer gear fixed, inner gear must turn clockwise (1) and lock counter-clockwise (2).

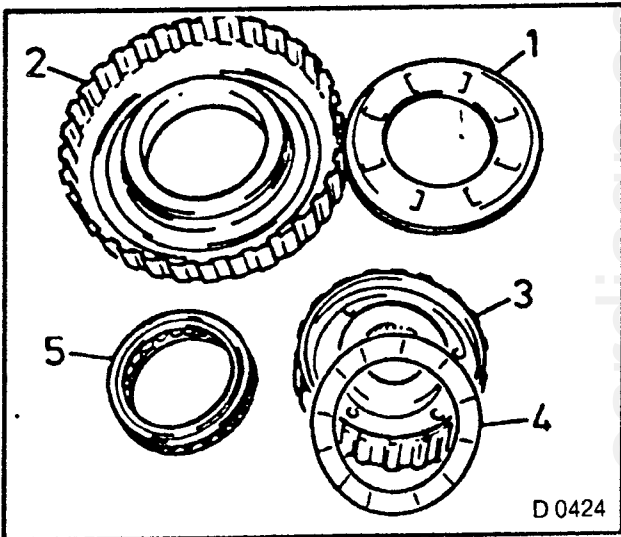


D 0423

Fig 354

DISASSEMBLE

- 1. Freewheel clutch F1.
- 2. Friction washer (1) from outer gear (2).
- 3. Inner gear (3) from outer gear (2)
- 4. Friction washer (4) from inner gear
- 5. Freewheel F1 (5) from outer gear

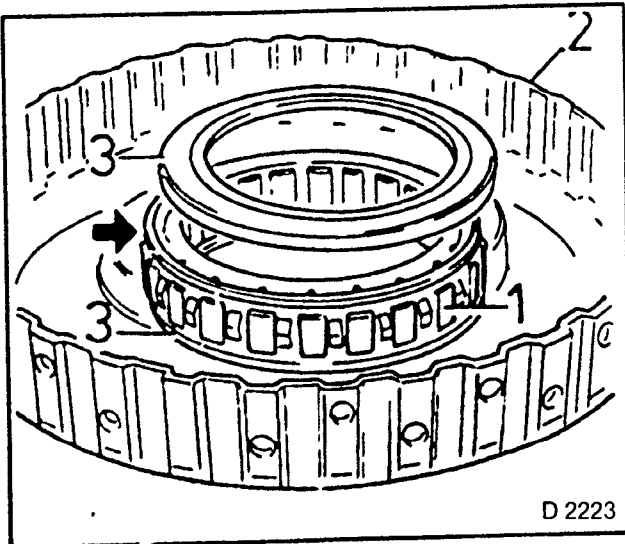


D 0424

Fig 355

ASSEMBLE

- 1 Freewheel clutch
- 2. Freewheel F1 (1) in outer gear (2) — installation direction: collar of freewheel — visible after removal of cover (3) — towards open side of outer gear.



D 2223

Fig 356

- 3 Friction washer (4) to inner gear (3) — note lug and recess
- 4 Inner gear (3) in outer gear (2) — turn and insert.
5. Friction washer (1) on outer gear (2) — note lug and recess

INSPECT

1. Functioning of freewheel clutch — as described at beginning of overhaul.

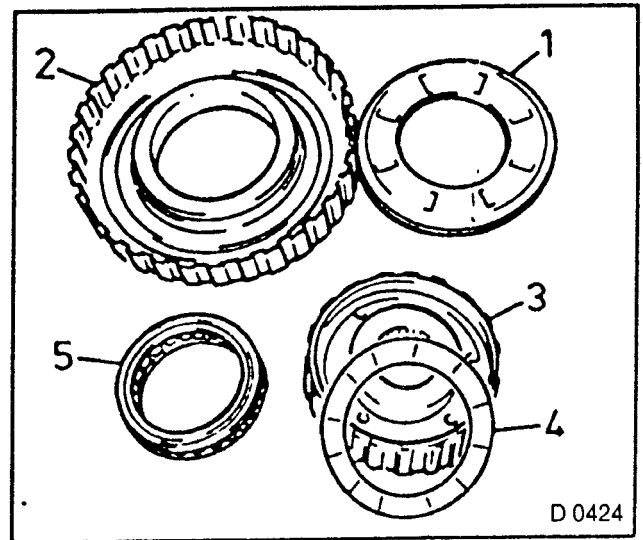


Fig. 357

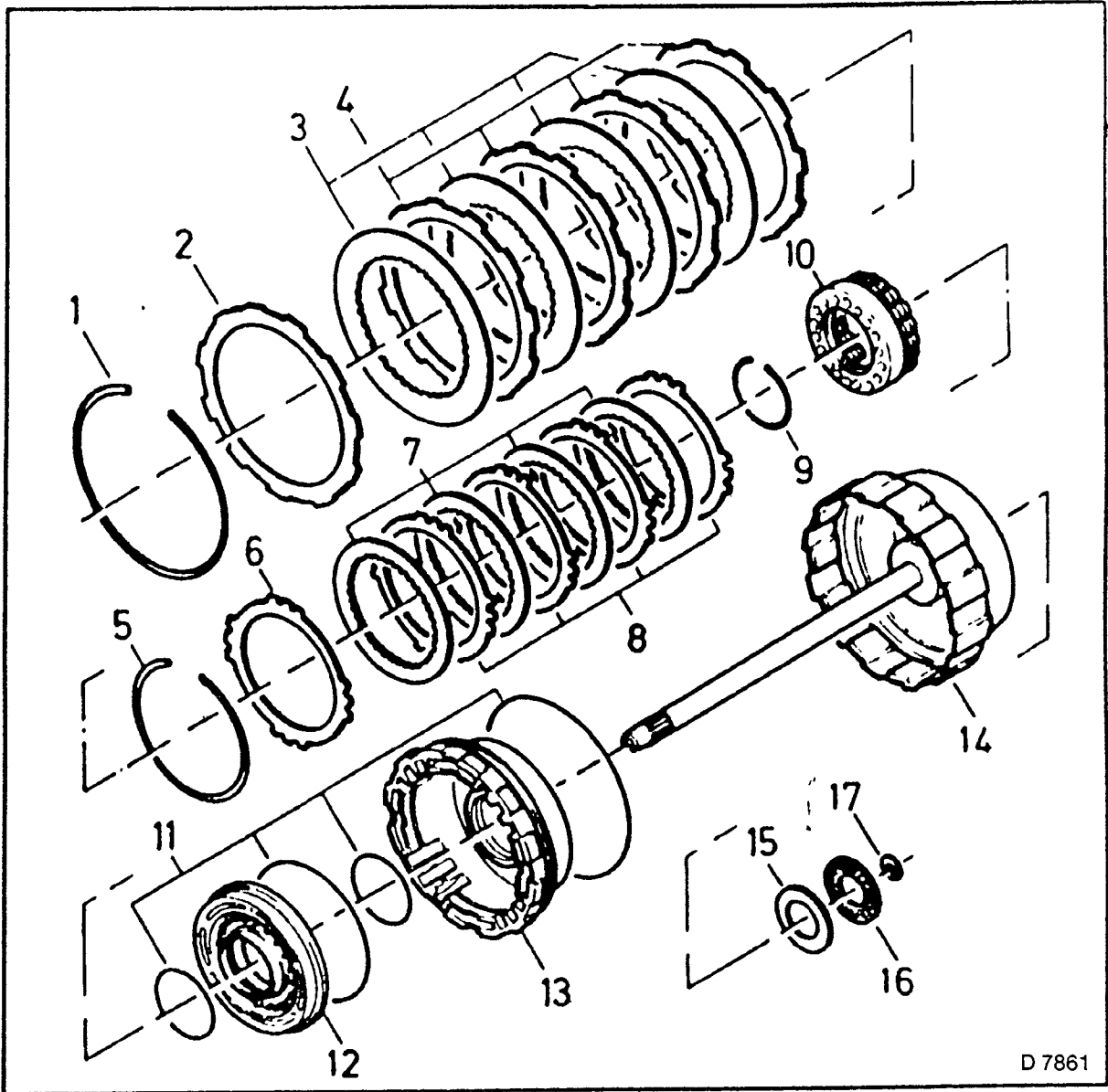
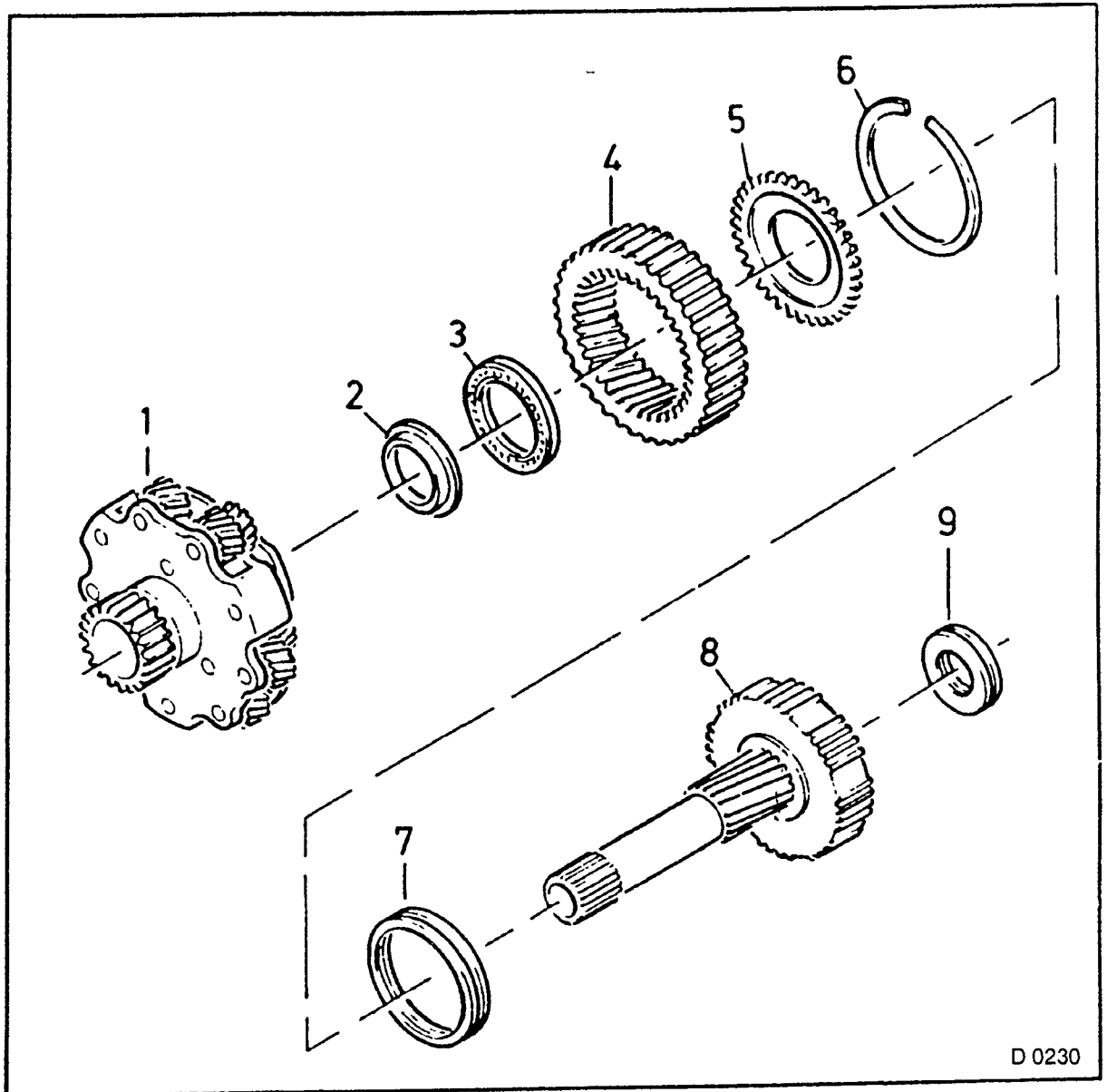


Fig. 358 — Multi-plate Clutch C1 and C2 Assembly.

- 1 = Retaining ring
- 2 = Flange C1
- 3 = Lining plates C1
- 4 = Steel plates C1
- 5 = Retaining ring
- 6 = Flange C2
- 7 = Lining plates C2
- 8 = Steel plates C2
- 9 = Retaining ring
- 10 = Return spring assembly
- 11 = Rubber O-seal rings (4 pieces)
- 12 = Piston C2
- 13 = Piston C1
- 14 = Drive shaft
- 15 = Race
- 16 = Thrust bearing
- 17 = Seal ring



D 0230

Fig. 371 — Planetary Gear Set Assembly P1

- 1 = Planetary carrier
- 2 = Race
- 3 = Thrust bearing
- 4 = Rear internal gear
- 5 = Flange
- 6 = Retaining ring
- 7 = Thrust bearing
- 8 = Sun gear
- 9 = Thrust bearing

Multi-plate Clutch Assembly C1 and C2 — Overhaul

INSPECT

1. Piston of multi-plate clutch C1 (1).
2. Install drive shaft on rear housing cover.
3. Seal rings at rear cover and at rear side of drive shaft must still be in place.
4. Blow in compressed air (approximately 4 bar, arrow 2), ensure free passage of piston.

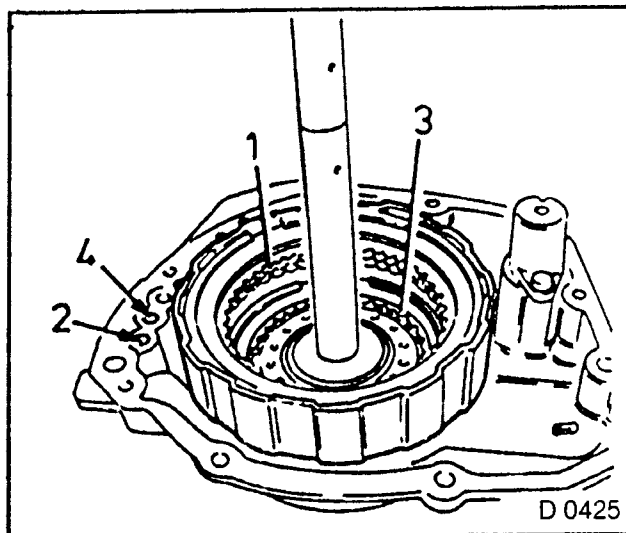


Fig. 359

5. Piston of multi-plate clutch C2 (3).
6. Same check as above, compressed air in bore (4).
7. Pistons (1 and 3) are each located under the plate packet.

DISASSEMBLE

1. Multi-plate clutch C1.
2. Remove retaining ring.
3. Remove flange, lining plates and steel plates.

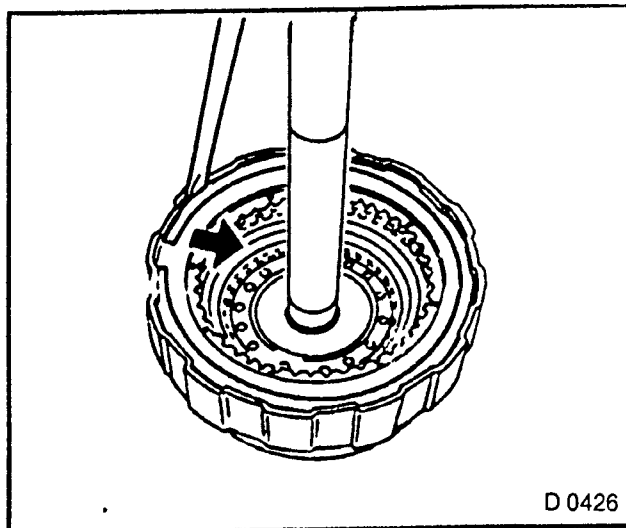


Fig. 360

4. Multi-plate clutch C2.
5. Same procedure as with multi-plate clutch C1.

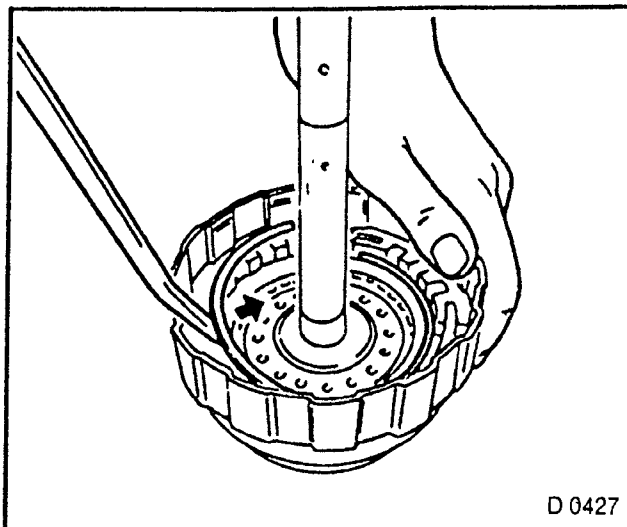


Fig 361

REMOVE, DISCONNECT

1. Return spring assembly.
2. Place KM-698 (1) with KM-514 (2) and KM-697 or suitable pipe on spring cup (3) and compress using a clamp (arrows).
3. Loosen retaining ring (4) with KM-396.

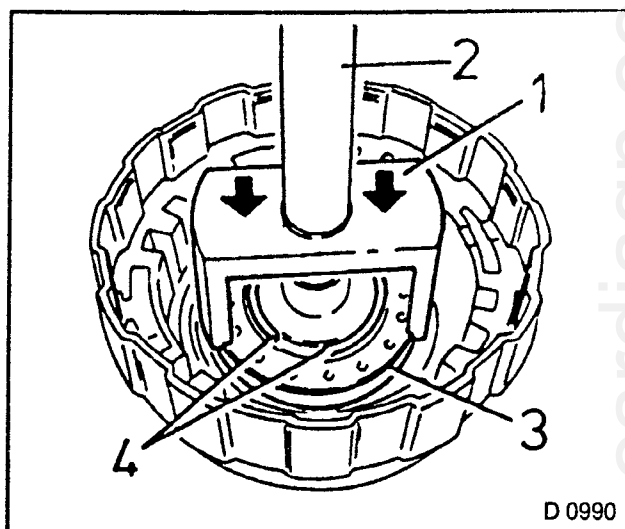


Fig. 362

4. Piston for multi-plate clutch C2.
5. Install drive shaft assembly at rear housing cover, blow in low pressure air (arrow), if necessary assist with pliers.
6. Renew rubber O-seal rings of piston.

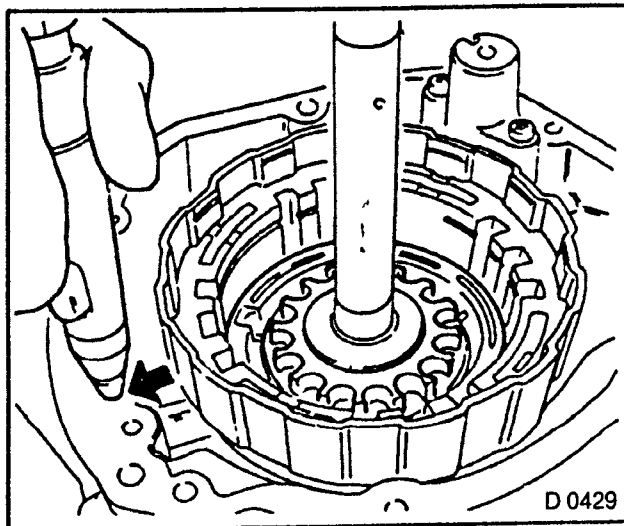


Fig. 363

REMOVE, DISCONNECT

1. Piston for multi-plate clutch C1.
2. Same procedure as with piston for multi-plate clutch C2.
3. Blow in compressed air in the neighbouring bore hole (arrow).

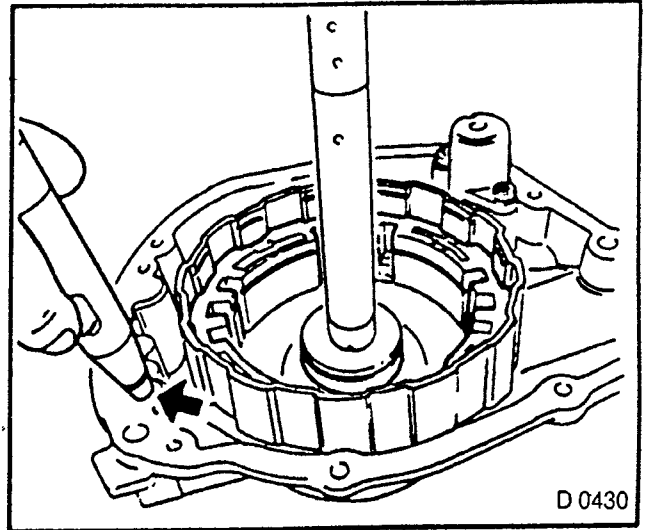


Fig. 364

4. Hook seal ring from drive shaft.
5. Take drive shaft from rear cover and clamp in vice.
6. Ring end is L-shaped — press one ring end into groove, hook out the other.
7. As cut seal ring without hooks on new transmissions.

INSPECT

1. Sliding surfaces of lining plates and steel plates for damage and wear — if necessary, replace.
2. Before installing, lay new lining plates in transmission fluid for at least two hours.

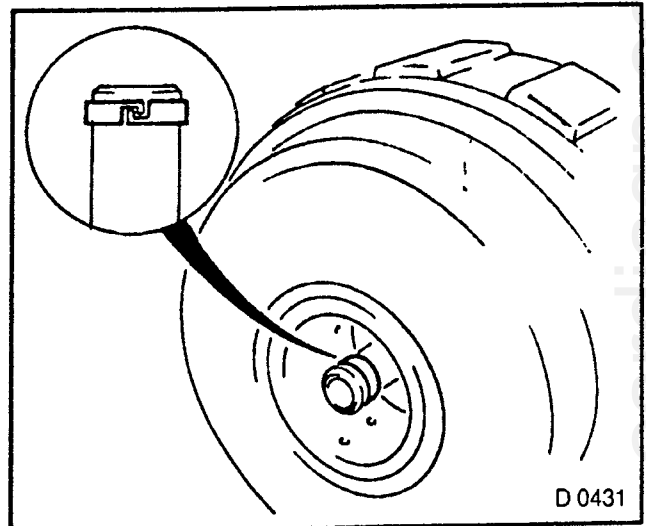


Fig 365

MEASURE

1. Free spring lengths of return springs.
Measurement value including spring cup:
23.6 mm.

INSPECT

1. Lock ball of piston for multi-plate clutch C2.
2. Check by shaking that lock ball can move.
3. Check using low pressure air that valve is tight.

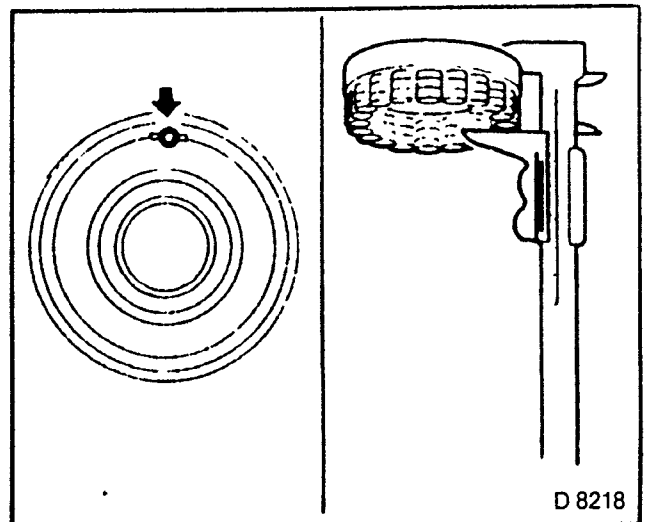


Fig. 366

ASSEMBLE

1. Multi-plate clutch C1 and C2.
2. Piston for multi-plate clutch C1 in drive shaft.
3. Piston for multi-plate clutch C2 in drive shaft.
4. Return spring assembly (3) onto piston C1 — compress with KM-698 (1) and KM-514 (2), KM-697 or suitable pipe using clamp.
5. Insert retaining ring (4) with KM-396.

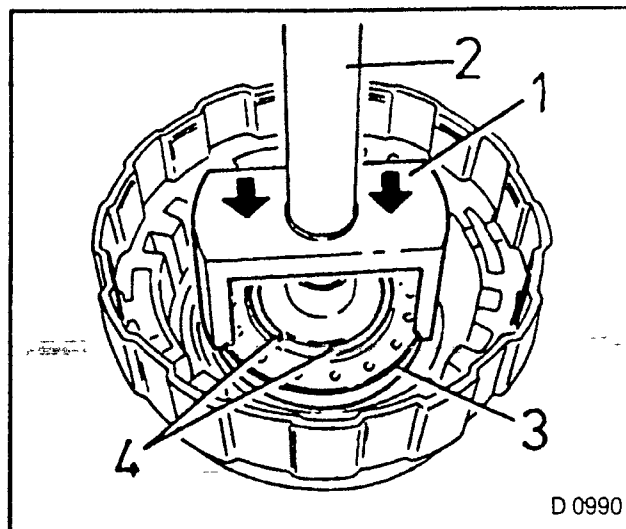


Fig 367

In each case alternately steel plate (first), lining plate and lastly flange (surfaces with rounded edge points towards lining plate) onto piston C1 or C2 — see exploded view Fig. 358.

5. Insert retaining ring for each.

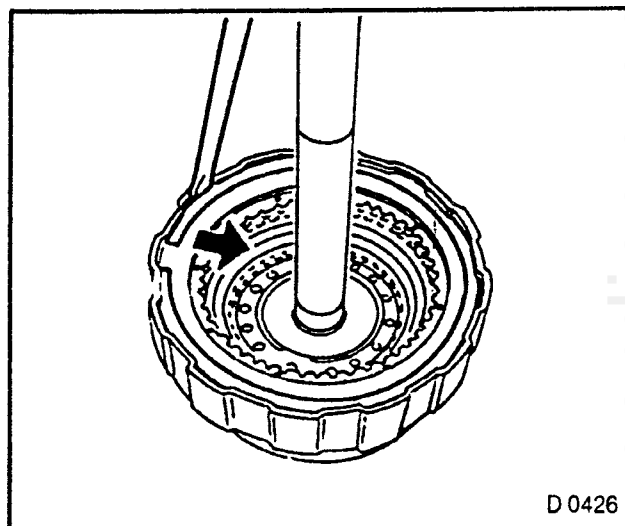


Fig 368

INSTALL, CONNECT

1. New hook seal ring on drive shaft.
Do not expand more than necessary, place one ring end in groove, hook in the other.
As cut seal ring without hooks on new transmissions.

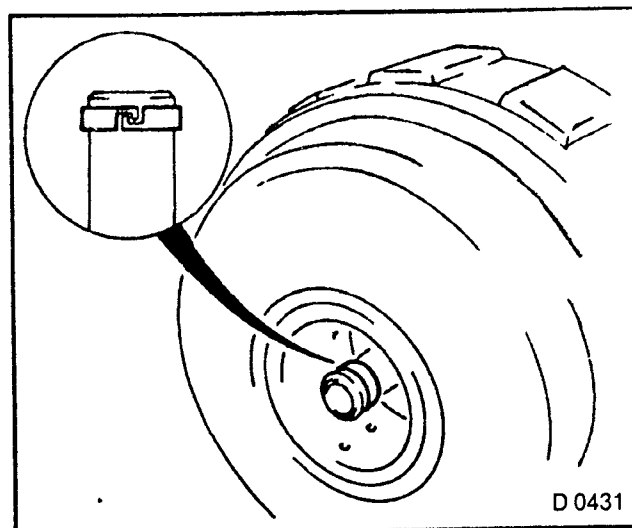


Fig. 369

MEASURE

1. Piston stroke of multi-plate clutch C1
2. Mount drive shaft in rear cover, blow compressed air in bore hole at rear cover (4 bar, arrow 1).
3. Place probe of gauge on the uppermost lining disc (3),
Measurement values:
Version with four lining discs: 1.52 to 1.89 mm,
Version with three lining discs: 1.14 to 1.46 mm.
4. Piston stroke of multi-plate clutch C2 — same procedure and measurement values as with piston stroke C1
5. Place probe of gauge on flange of multi-plate clutch C2 (4).
6. Blow compressed air into corresponding bore hole (arrow 2).

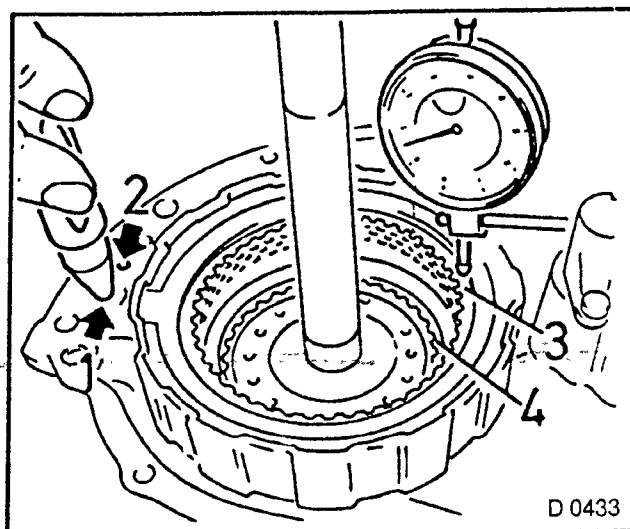


Fig 370

Planetary Gear Set P1 — Overhaul**REMOVE, DISCONNECT**

1. Thrust bearing (1) from flange (2) — observe condition and installation position. If necessary replace.
2. Flange from rear internal gear.
3. Retaining ring (3).

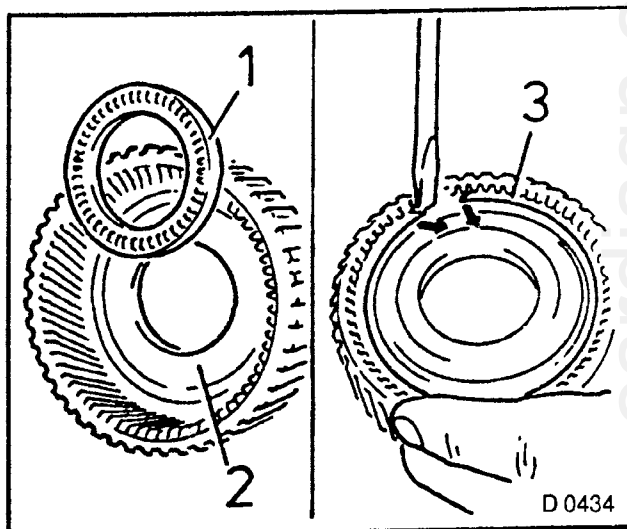


Fig 372

INSTALL, CONNECT

1. Flange (4) on rear internal gear (3).
2. Retaining ring (5).
3. Thrust bearing (2) to flange (4).
4. Friction washer (1) to thrust bearing (2).

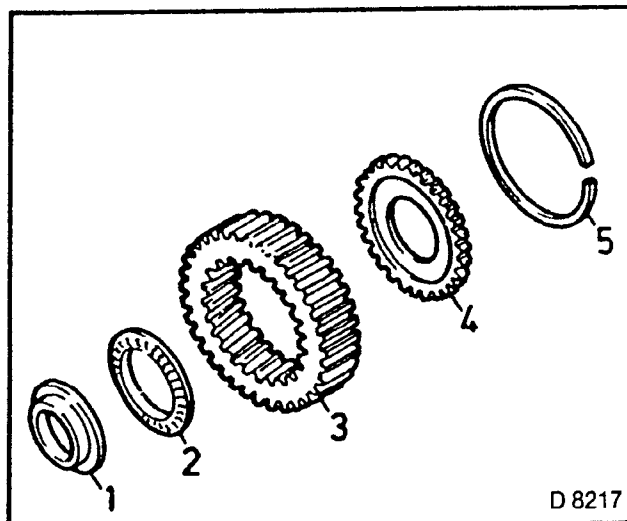


Fig. 373

MEASURE

1. Inner diameter of planetary carrier bushing.
2. Gauge with probe for inner diameter, carry out several measurements, take average

Measurement value 30.0 to 30.026 mm, if necessary replace planetary carrier assembly

Play between planetary gears and housing — feeler gauge.

Measurement value:

For short gears: 0.20 to 0.60 mm

For long gears: 0.20 to 1.0 mm.

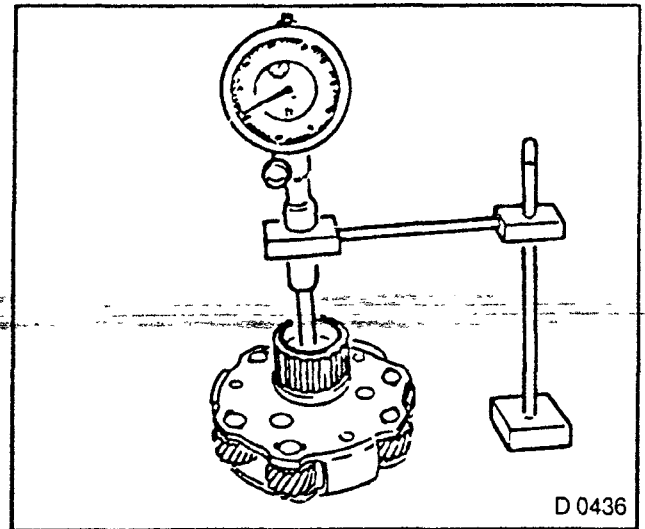


Fig. 374

3. Inner diameter of sun gear bushing.

Same measurement as before.

Measurement value: 21.501 to 21.527 mm

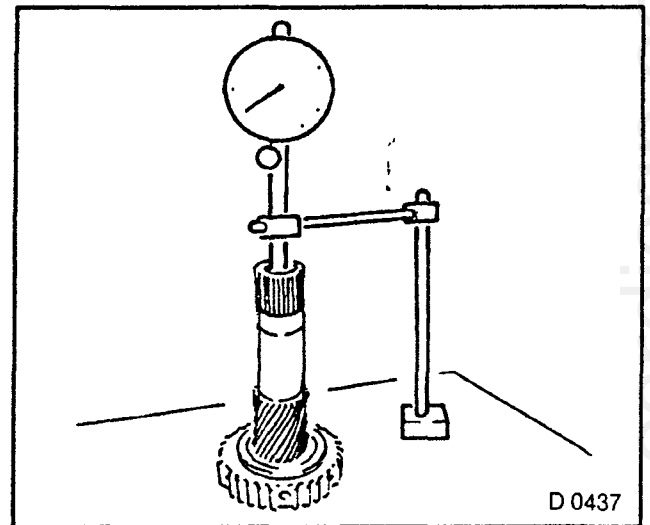
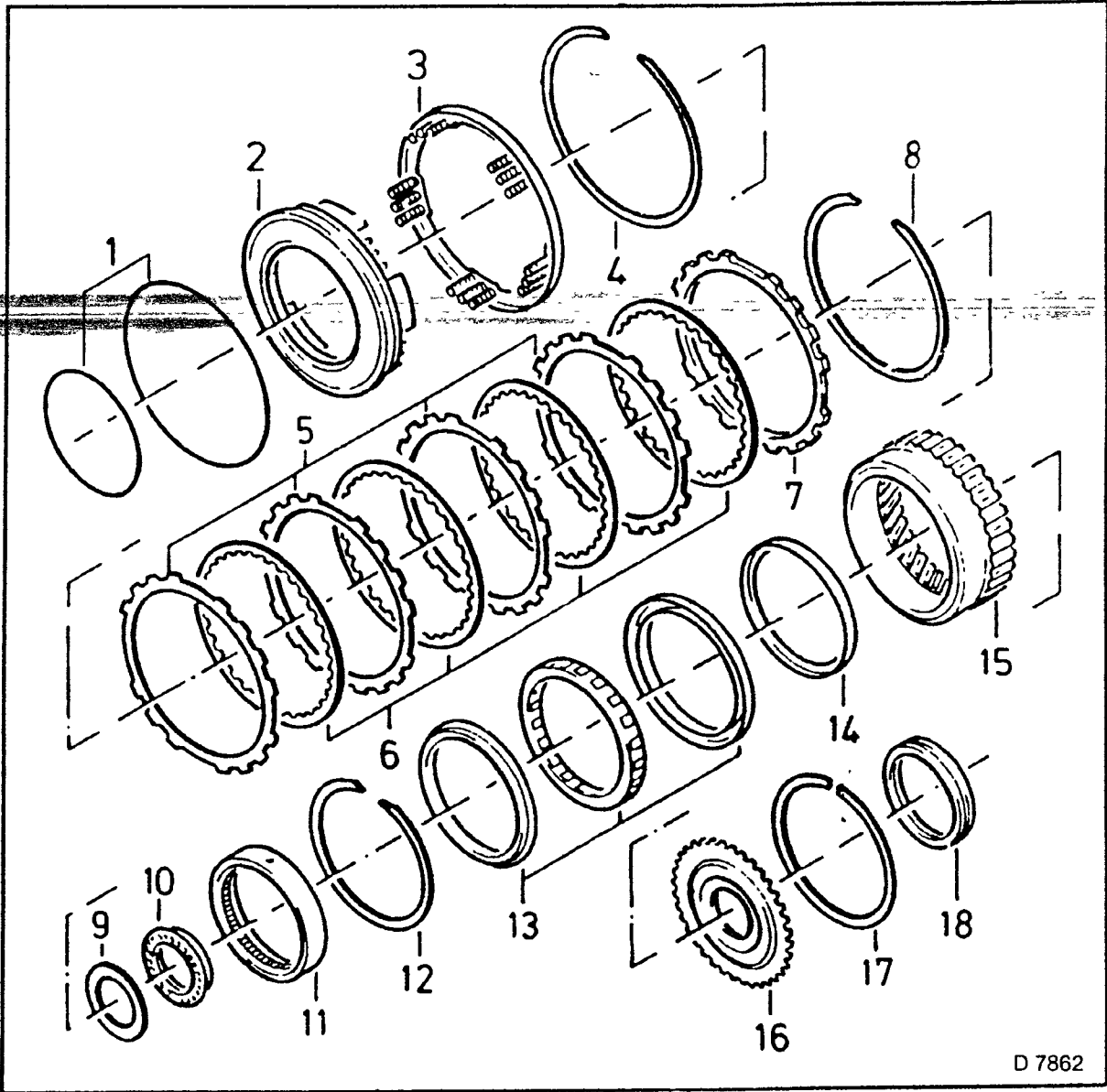


Fig. 375



D 7862

Fig 376 — Multi-disc Brake B3 and Freewheel F2

- 1 = Rubber O-seal ring
- 2 = Piston B3
- 3 = Return spring assembly
- 4 = Retaining ring
- 5 = Steel plates B3
- 6 = Lining plates B3
- 7 = Flange
- 8 = Retaining ring
- 9 = Friction washer
- 10 = Thrust bearing
- 11 = Freewheel inner race
- 12 = Retaining ring
- 13 = Freewheel F2
- 14 = Thrust washer
- 15 = Front internal gear
- 16 = Flange
- 17 = Retaining ring
- 18 = Friction washer

Multi-disc Brake B3 and Freewheel F2 — Overhaul

MULTI-DISC BRAKE B3 REMOVED.

INSPECT

1. Function of freewheel clutch.
2. Place freewheel clutch (1) and inner race (2) in front internal gear (3).
3. Hold internal gear fixed, inner race **must** turn counter-clockwise (4), and lock clockwise (5).

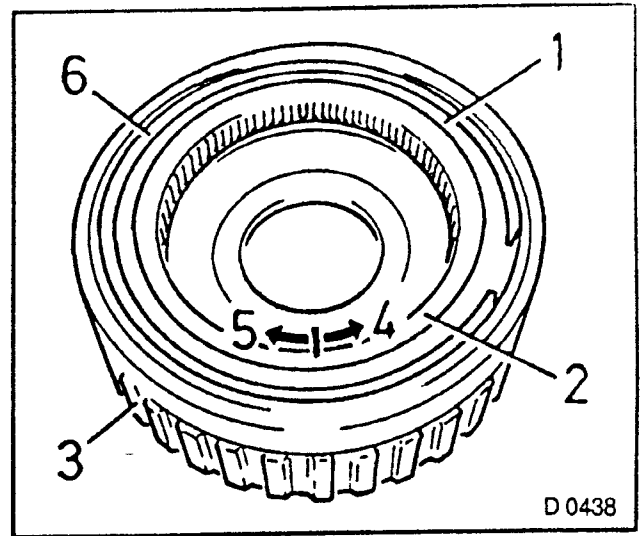


Fig. 377

DISASSEMBLE

1. Freewheel clutch.
2. Set aside as installed bearing ring, thrust bearing (1), freewheel inner race (2).
3. Retaining ring (3) and Fig. 377, Item 6, Freewheel F2 (4), Friction washer (5).

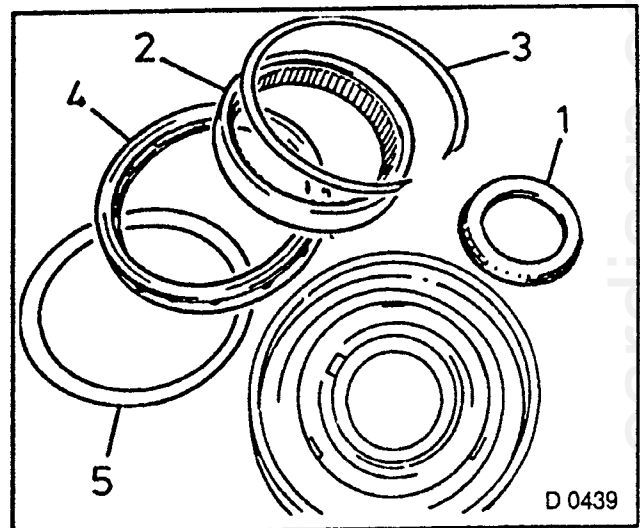


Fig 378

REMOVE, DISCONNECT

1. Thrust bearing (1).
2. Retaining ring (2).
3. Flange (3) from front internal gear (4).

ASSEMBLE

1. Freewheel clutch — flange (3) in front internal gear (4) — ring pliers.

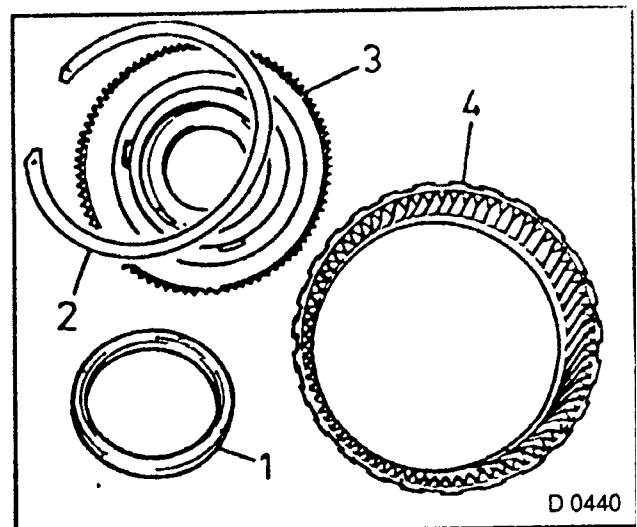


Fig. 379

2. Friction washer (5, flat surface points to flange)
3. Freewheel (4) in internal gear.
(Installation direction: when the internal gear is held, freewheel can be turned anti-clockwise).
4. Insert retaining ring (3).
5. Freewheel inner ring (Fig. 380, Item 2).

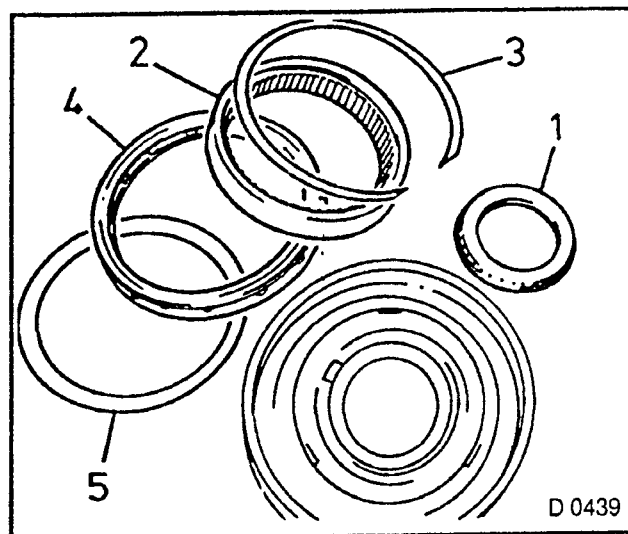
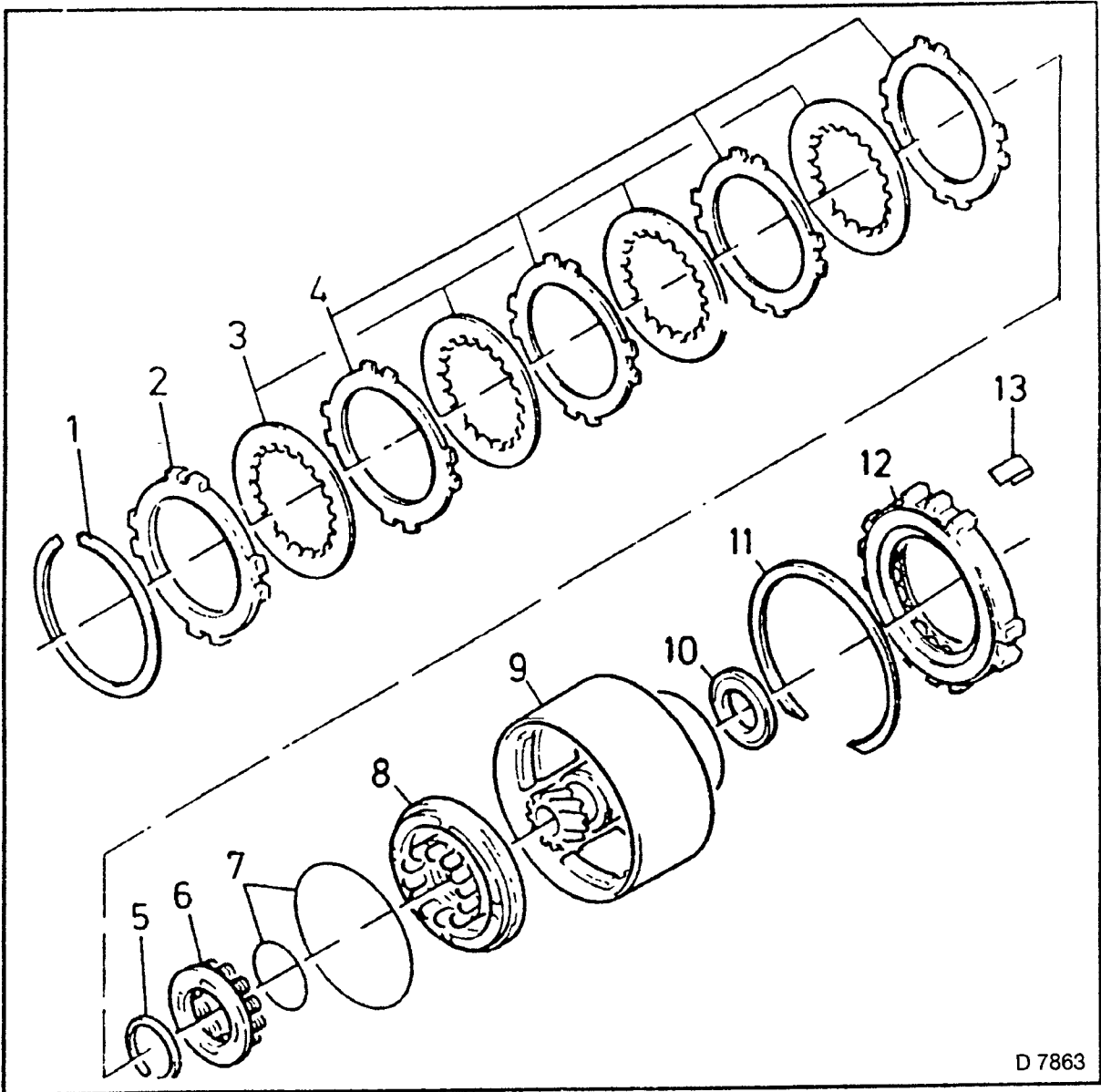


Fig 380



D 7863

Fig. 381 — Multi-plate Clutch C3 and Freewheel F3.

- 1 = Retaining ring
- 2 = Flange
- 3 = Lining plate C3
- 4 = Steel plate C3
- 5 = Retaining ring
- 6 = Return spring assembly
- 7 = Seal rings
- 8 = Piston C3
- 9 = Clutch body
- 10 = Thrust bearing
- 11 = Retaining ring
- 12 = Freewheel F3
- 13 = Freewheel F3 outer race, bracket

Multi-plate Clutch C3 and Freewheel F3 — Overhaul

DISASSEMBLE

1. Multi-plate clutch C3
2. Flange, lining plates and steel plates from clutch body.
3. Remove retaining ring (1).
4. Freewheel F3 (2) from clutch body.

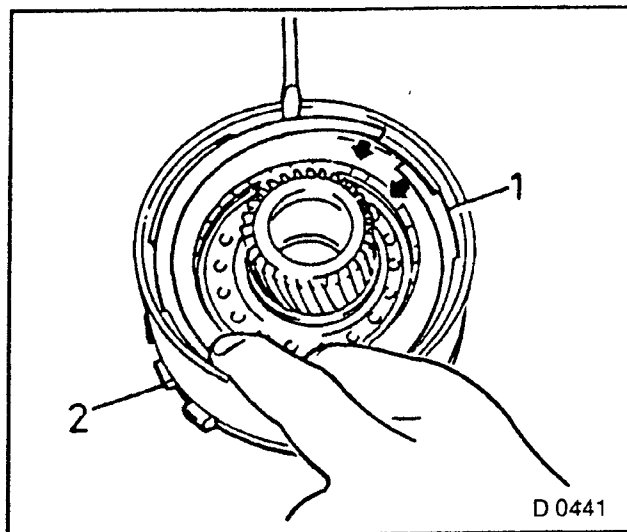


Fig. 382

5. Compress return spring assembly (1) in vice with protective jaws — KM-698 (2).
6. Loosen retaining ring (3) with KM-396.
7. Remove spring cup with springs.

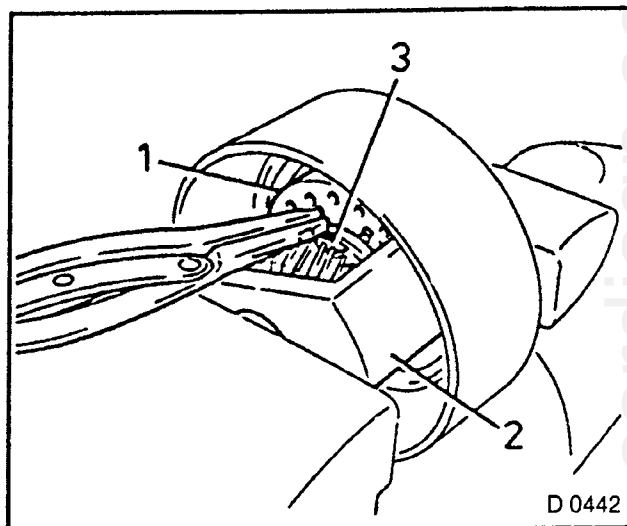


Fig. 383

REMOVE, DISCONNECT

1. Piston C3 from clutch body.
2. Place clutch body in transmission.
3. Blow in low pressure air (arrow), if necessary assist with pliers.
4. Renew rubber O-seal rings (1) on piston.

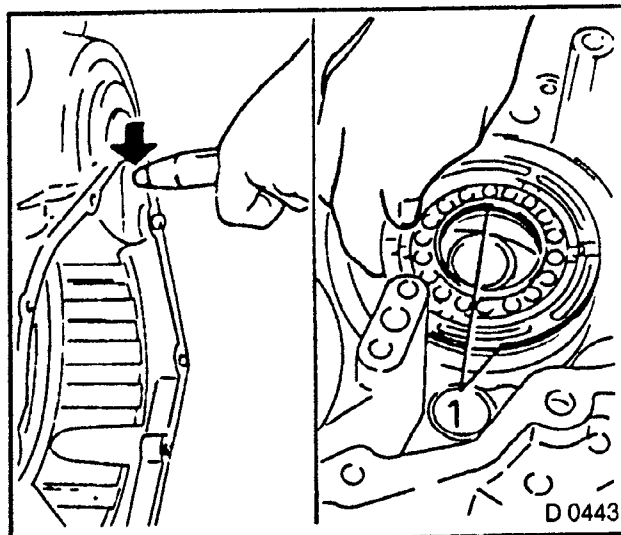


Fig. 386

INSPECT

- 1. Flange (1).
- 2. Lining plates (2).
- 3. Steel plates (3)
for damage and wear — before installing.
- 4. Lay new lining plates in transmission
fluid for at least two hours

MEASURE

- 1. Free spring lengths of return springs.
Measurement value including spring cup (4):
20 mm — note that all springs must have
same length.

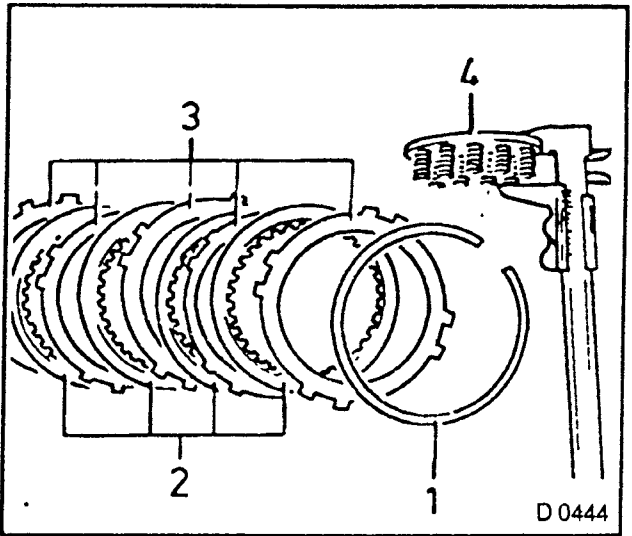


Fig. 387

INSPECT

- 1. Lock ball of piston C3.
- 2. Check by shaking that lock ball (1) can
be moved.
- 3. Check with low pressure air (arrow) that
valve is tight

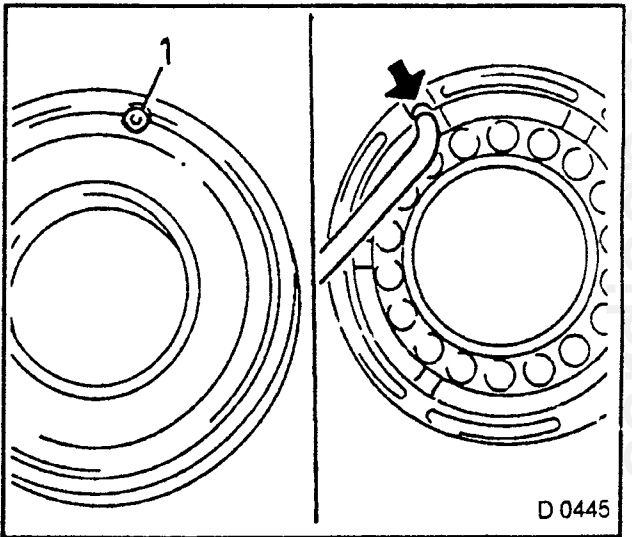


Fig. 388

MEASURE

- 1. Inner diameter of front and rear clutch
body bushings — gauge with probe for
inner diameter.
Carry out several measurements, take
average.

Measurement value: 28.5 to 28.525 mm.

If worn, replace clutch body; the
bushings cannot be replaced individually.

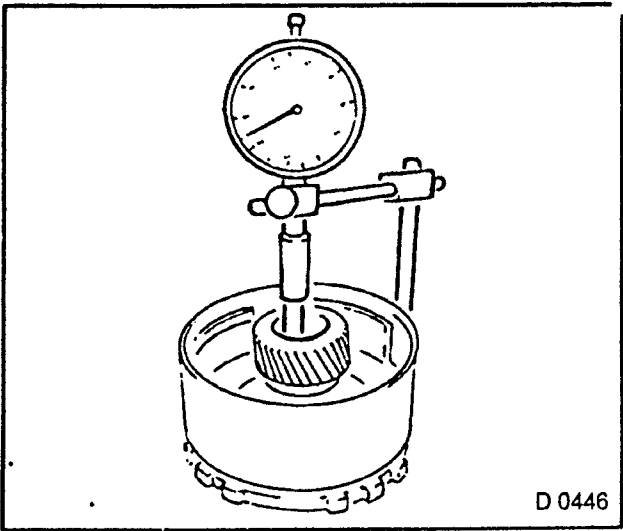


Fig. 389

INSPECT

- 1. Clutch body for damage or wear.
- 2 Contact surface of seal rings (1).
- 3. Contact surface of freewheel (2).
- 4 Contact surface of brake band (3).
- 5. Replace clutch body if necessary.

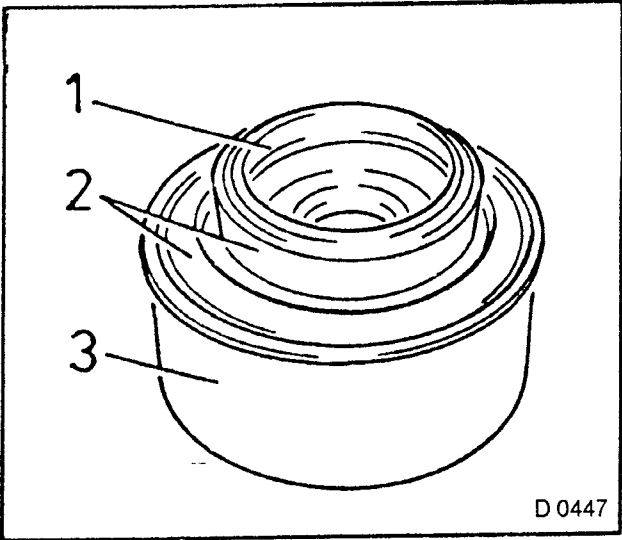


Fig 390

ASSEMBLE

- 1. Multi-plate clutch C3.
- 2. Insert piston C3 in clutch body (spring mount points upwards).
- 3. Place return spring assembly and retaining ring on piston C3.

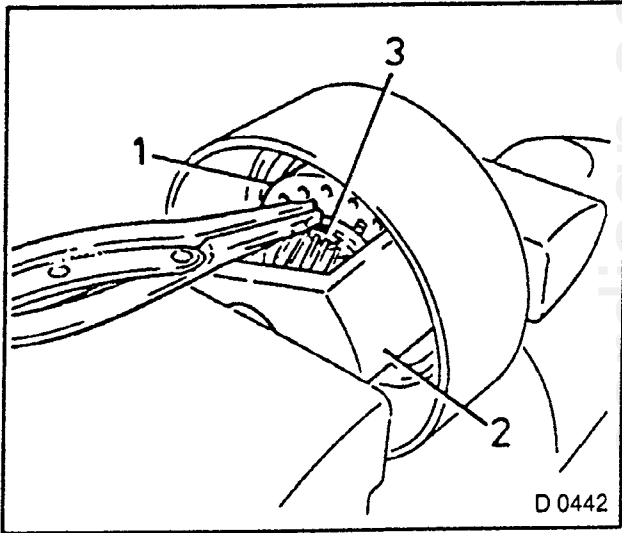


Fig. 391

ASSEMBLE

- 1. Multi-plate clutch C3.
- 2. Compress spring plate (1) in vice — KM-698 (2).
- 3. Install retaining ring (3) with KM-396.

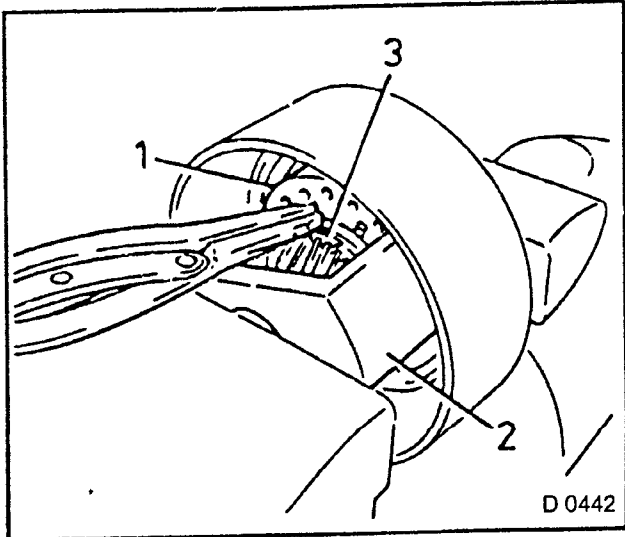


Fig. 392

4. Alternate with steel plate (3) first, then lining plate (2), lastly flange — rounded side points towards lining plate
5. Insert retaining ring (1).

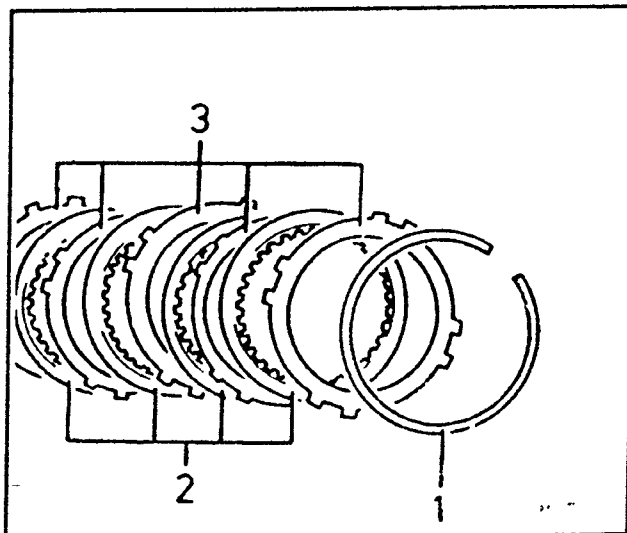


Fig. 393

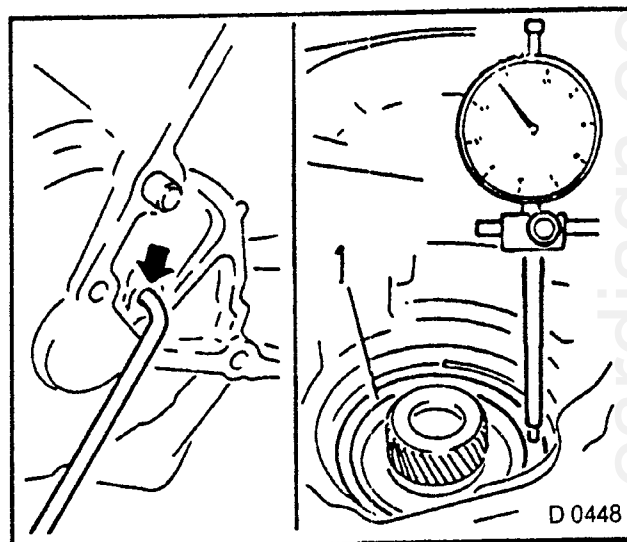
MEASURE

1. Piston stroke of multi-plate clutch C3.
2. Insert clutch body in transmission.
3. Place gauge on flange (1) blow in compressed air (4 bar, arrow).

Measurement value:

With 4 lining plates: 1.52 to 1.89 mm.

With 3 lining plates: 1.14 to 1.46 mm.

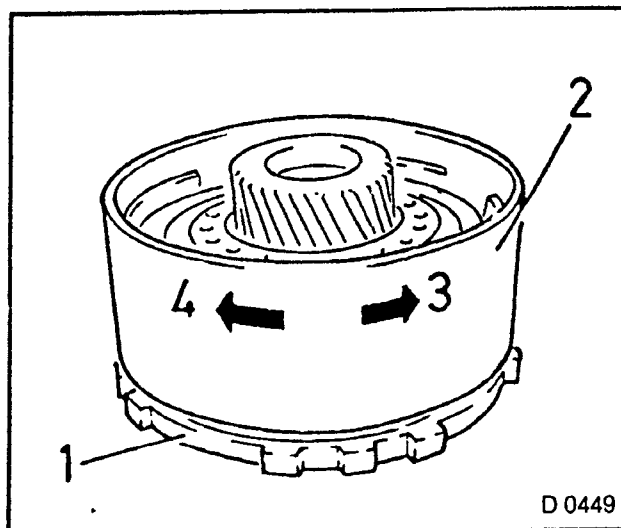


D 0448

Fig. 394

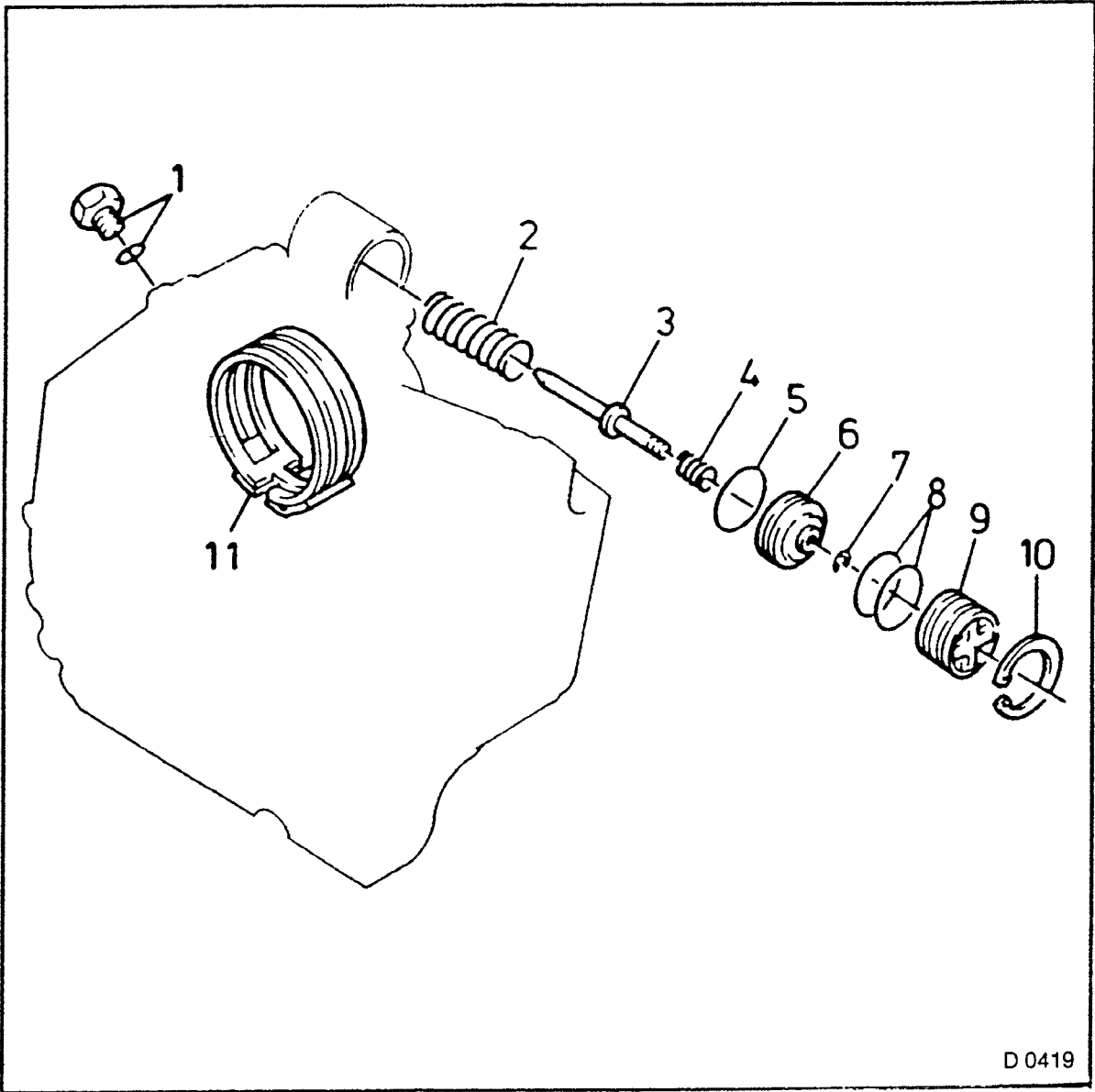
INSPECT

1. Function of freewheel F3.
2. Install freewheel (1) on clutch body (2).
3. Hold freewheel fixed, clutch body must be turnable counter-clockwise (3) and lock clockwise (4).



D 0449

Fig. 395



D 0419

Fig. 396 — Reduction Brake.

- 1 = Anchor bolt with seal ring
- 2 = Pressure spring
- 3 = Piston rod
- 4 = Cushion spring
- 5 = Seal ring
- 6 = Piston
- 7 = Retainer ring
- 8 = Seal rings
- 9 = Cover
- 10 = Retaining ring
- 11 = Brake band B4

Reduction Brake — Overhaul

DISASSEMBLE

- 1. Reduction brake.
- 2. Piston for brake band B4 — see: “Assemblies, Remove from Transmission”, page 138.
- 3. Renew rubber O-seal rings (4) on piston (1) and cover.

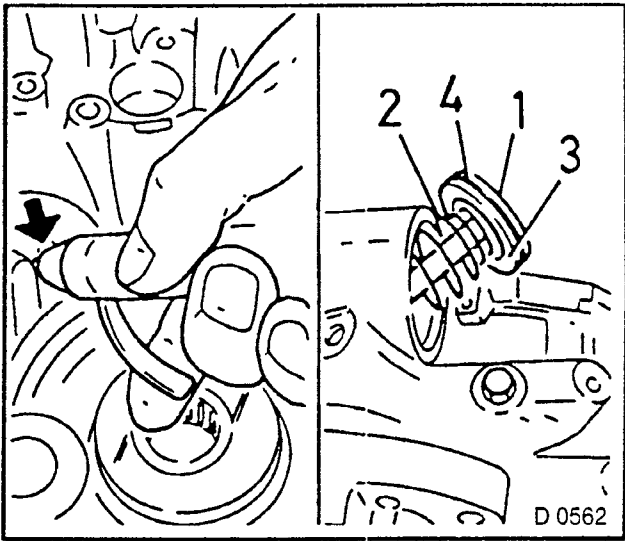


Fig 397

- 4. Piston rod for reduction brake
- 5. Remove retainer ring (1) from piston rod (2) using pliers, Pressure spring (3), Cushion spring (4), Washer (5), from piston rod.

MEASURE

- 1 Free length and outer diameter of pressure spring (3).

Measurement values:
Length (6): 63.2 mm, outer diameter (7): 29.7 mm

Length of piston rod (2), measurement value: 70.5 mm.

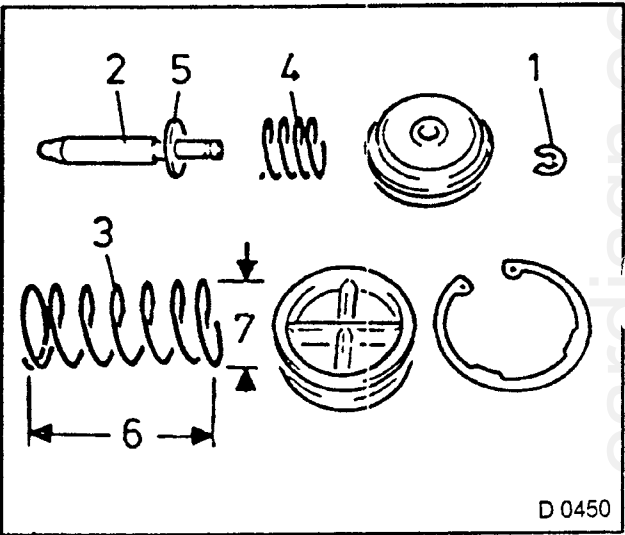


Fig 398

ASSEMBLE

1. Piston for brake band B4
2. Install piston rod.
Washer.
Pressure spring.
Cushion spring on piston.
Secure with new retainer ring.

INSTALL, CONNECT

- 1 Piston for brake band B4 in main housing
Insert piston with pressure spring and cover in transmission.
Compress and install retaining ring.

INSPECT

1. Correct seating of retaining ring in groove.

INSTALL, CONNECT

1. Freewheel F3 (2) in main housing.
2. Insert retaining ring (1).

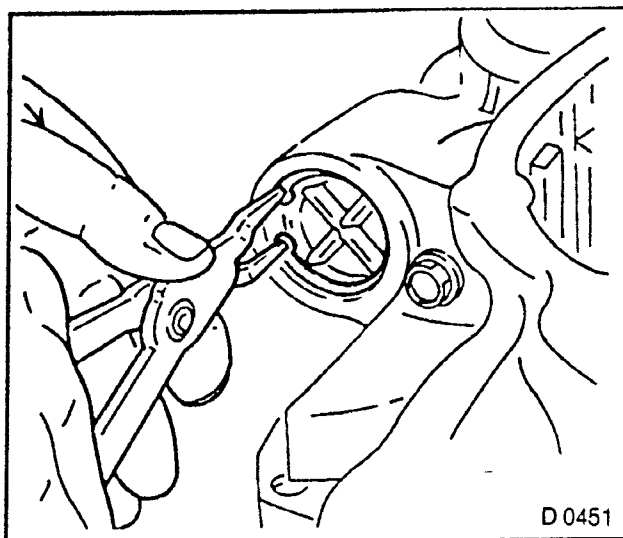


Fig. 399

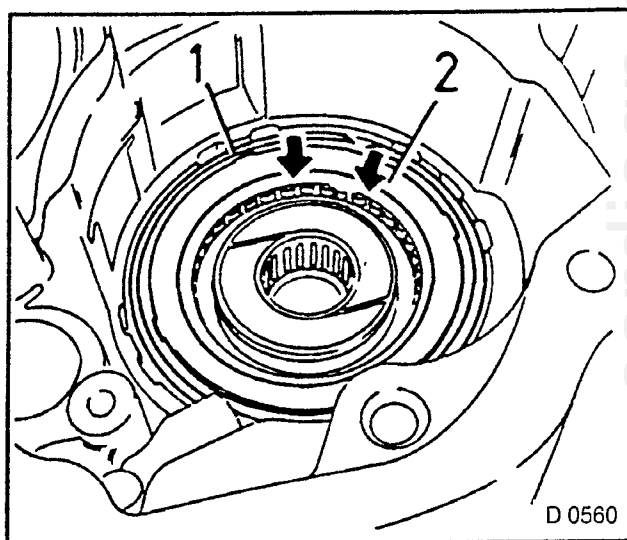


Fig. 400

- 3 Brake band B4, anchor bolt (1) — protrudes from outside through housing; piston rod must contact brake band actuation centrally (2).

TIGHTEN (TORQUE)

1. Anchor bolt to main housing — 170 Nm, note correct seating at brake band.

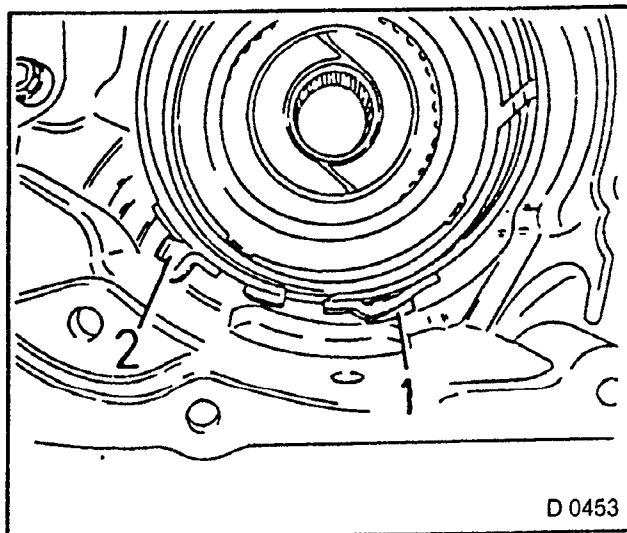


Fig. 401

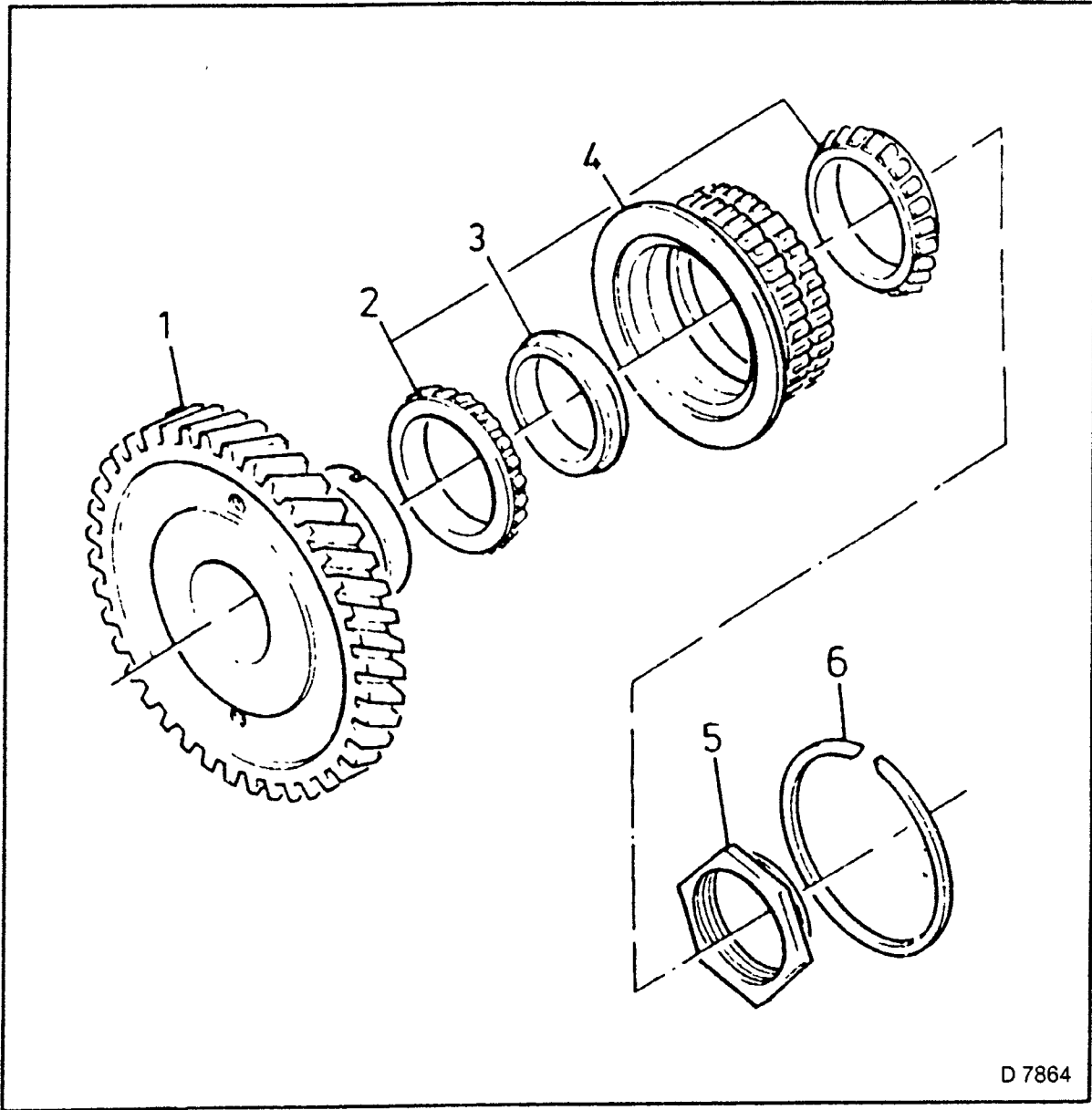


Fig. 402 — Intermediate Drive Gear

- 1 = Intermediate drive gear
- 2 = Bevel gear bearing
- 3 = Spacer
- 4 = Outer race
- 5 = Retaining nut
- 6 = Retaining ring

Intermediate Drive Gear. — Check

INSPECT

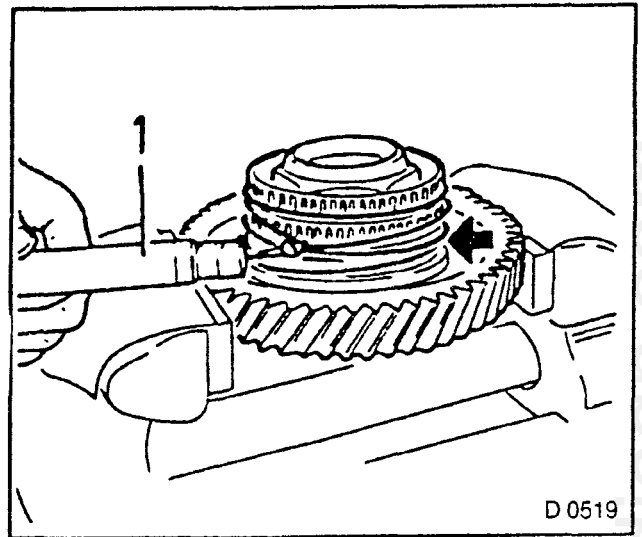
1. Splines of intermediate drive gear for damage and wear.
If necessary, replace assembly, an overhaul of the intermediate drive gear is not anticipated.

In case no external damage is determined:

MEASURE

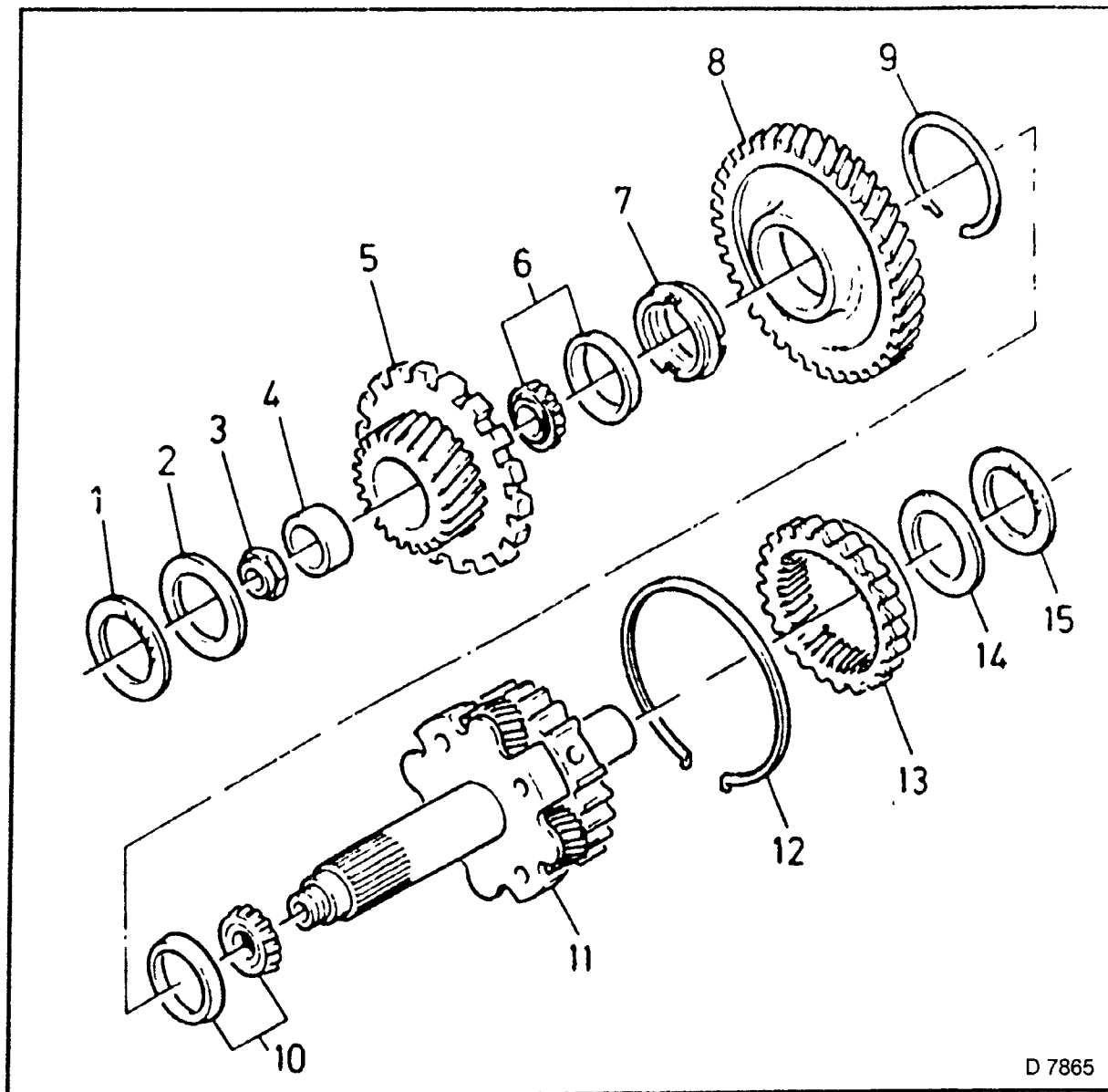
- 1 Pre-tension of intermediate drive gear.
2. Intermediate drive gear in vice — carefully clamp to splines.
3. Starting torque with spring tension gauge (1) — attach with cord at groove of outer race (arrow).

Measurement value: 30 to 80 Ncm, if necessary replace assembly.



D 0519

Fig 403



D 7865

Fig. 404 — Planetary Gear Set P2

- 1 = Thrust bearing
- 2 = Race assembly
- 3 = Fastening nut
- 4 = Inner race
- 5 = Drive gear (driving), parking lock wheel
- 6 = Bevel gear bearing
- 7 = Spacer
- 8 = Driven intermediate gear
- 9 = Retaining ring
- 10 = Bevel gear bearing
- 11 = Planetary carrier
- 12 = Retaining ring
- 13 = Internal gear
- 14 = Race assembly
- 15 = Thrust bearing

Planetary Gear Set P2 — Overhaul

INSPECT

1. Splines of planetary gear set P2 for damage and wear. If necessary, replace assembly.

An overhaul is only provided for the planetary gear set mount.

MEASURE

1. Pre-tension of planetary gear set P2 — KM-703 (1, on new transmissions with hexagon spanner, size 36) and MKM-536 (2).
2. Assembly in vice — KM-696.
3. Using upper locking bolt (3), secure against turning.
4. Locking bolt threads (3) lie against side of recess (detail) — **DO NOT** tighten so that it locks the planetary gear set (as the component could no longer be turned).
5. Carry out several measurements and take average.

Starting torque: 0.55 to 1.35 Nm.

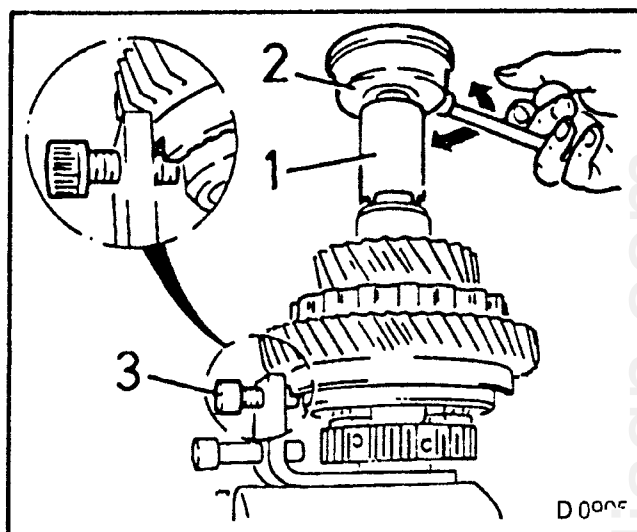


Fig. 405

DISASSEMBLE

1. Planetary gear set and drive gear.
2. Position component with fastening nut downwards in vice.
3. Tension retaining ring (1) in recess of driven intermediate gear (2) using ring pliers.
4. Guide out of groove and remove internal gear upwards.

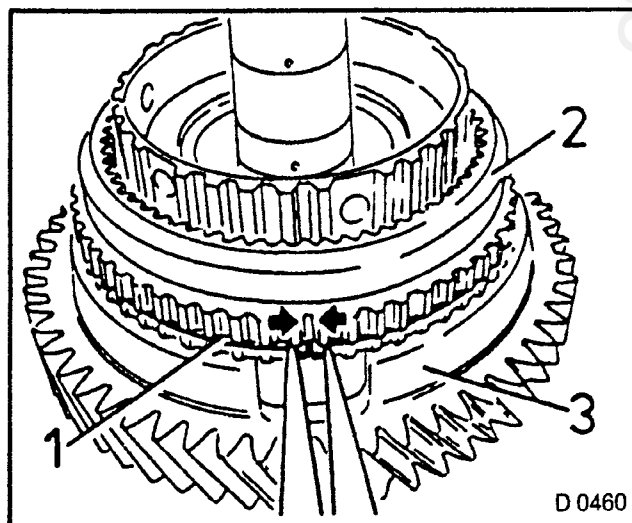


Fig. 406

INSPECT

1. Splines of internal gear and planetary gears for damage and wear.
- If necessary replace planetary gear set P2.

In case no damage is visible:

MEASURE

1. Play (1) between planetary gears and planetary carrier — with feeler gauge. Measurement value: 0.20 to 0.60 mm. If necessary, replace planetary gear set P2.

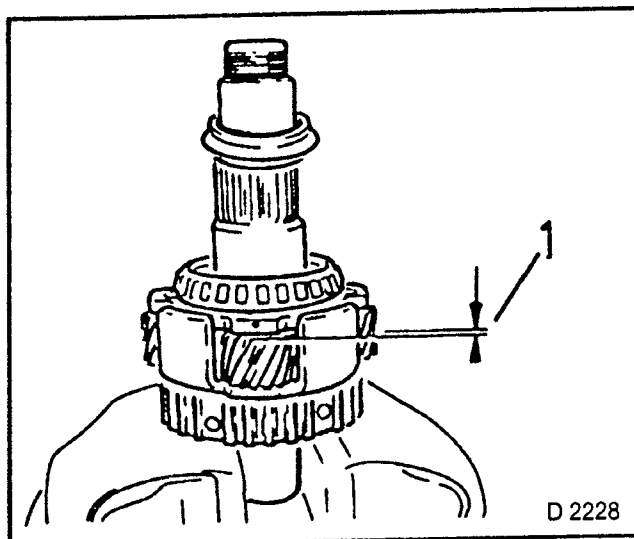


Fig. 407

Overhaul bearings (only necessary if starting torque is not correct):

DISASSEMBLE

1. Planetary gear set P2.
2. Loosen two caulkers at the fastening nut with a chisel.
3. Fastening nut from planetary carrier — KM-703 (1, on new transmissions with hexagon spanner, size 36).
4. Thrust bearing and race assembly remain installed, if necessary stick with grease.
5. Drive gear in vice — KM-696 (2), secure against turning with lower locking bolt (3) at bore hole in planetary carrier.

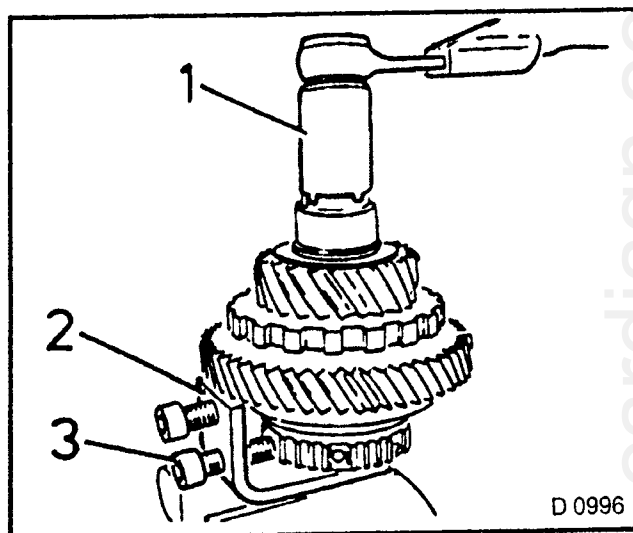


Fig. 408

NOTE:

RELEASE TORQUE VERY HIGH.

REMOVE, DISCONNECT

1. Drive gear (1) and inner race from planetary carrier (2).
2. Plate from KM-701 (3) between parking lock wheel and driven intermediate gear.
3. Press out from under a clamp using KM-407-A (4).

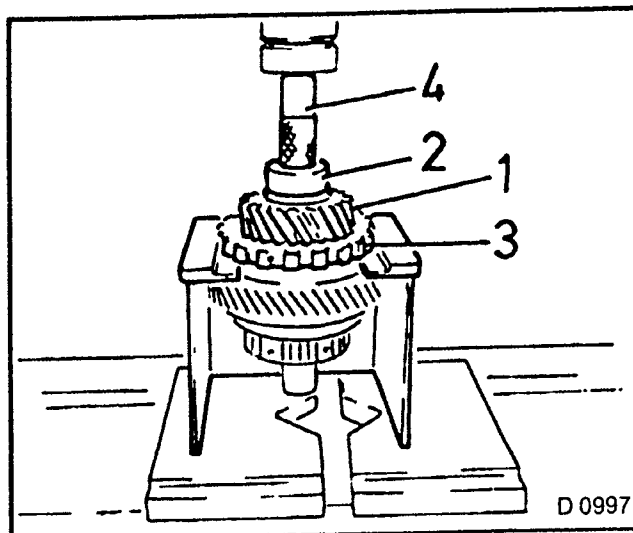


Fig. 409

REMOVE, DISCONNECT

- 1 Press off driven intermediate gear (1) and front bevel gear bearing (2).
- 2 Planetary gear set points downwards, **SUPPORT** intermediate gear (1), **DO NOT** damage thread (3).

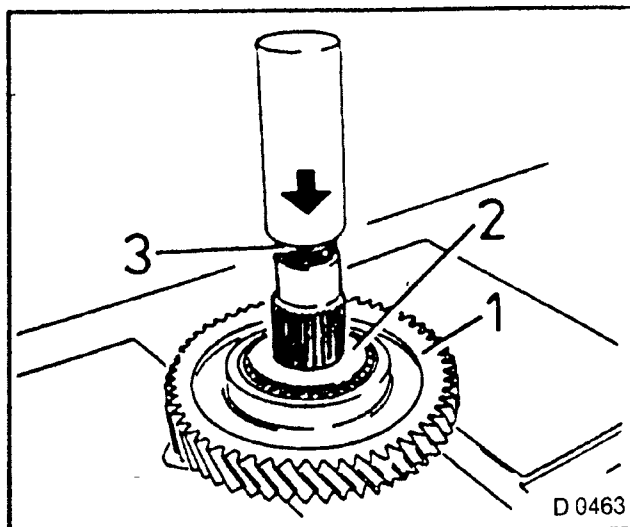


Fig. 410

3. Spacer from planetary carrier
4. Rear bevel gear bearing — with KM-171 (1, in vice).
5. Remove KM-528 (2). Use KM-407-A (3) and thrust plate from KM-171.

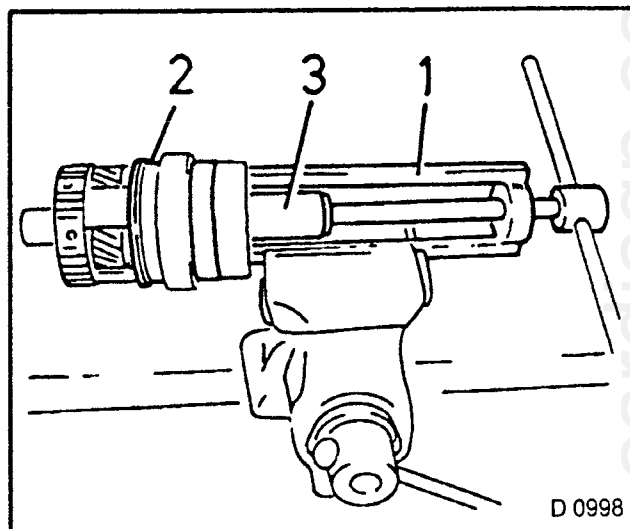


Fig. 411

REMOVE, DISCONNECT

1. Two bearing outer races (1) from intermediate gear.
2. Drive out using suitable drift. **DO NOT** damage seating surface.
3. Retaining ring (2).

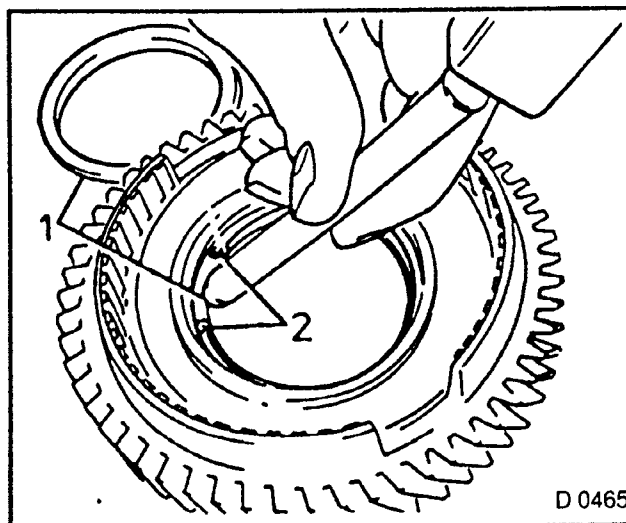


Fig. 412

ASSEMBLE

1. Planetary gear set P2.
2. Insert retaining ring in groove of intermediate gear.
3. Press in two new bearing outer races until they rest against retaining ring — KM-695 (1) and KM-305 (2).

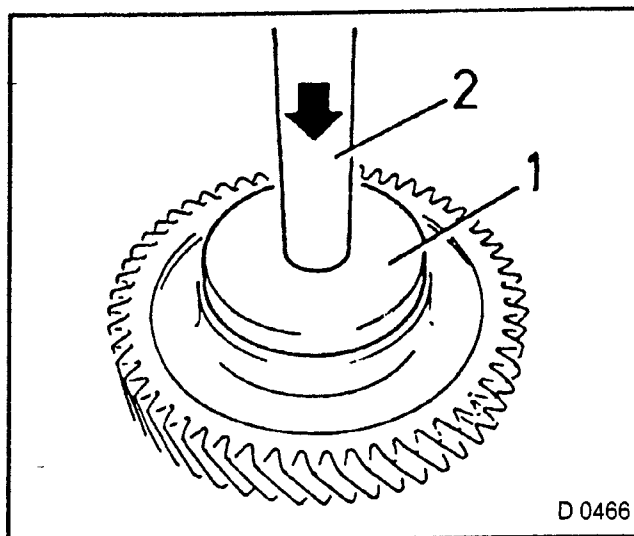


Fig. 413

INSTALL, CONNECT

1. New rear bevel gear bearing (1) — drive on with KM-697 (2).
2. Place new spacer on roller bearing.

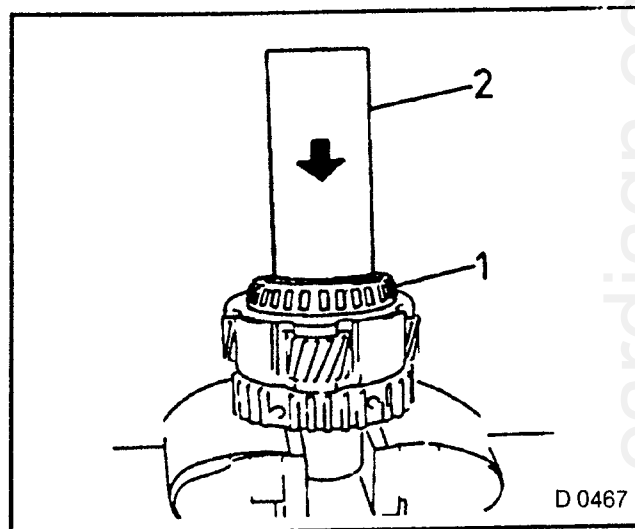


Fig. 414

3. Driven intermediate gear (1).
4. New front bevel gear bearing (2).
Press on with KM-697 (3) until resting on spacer.

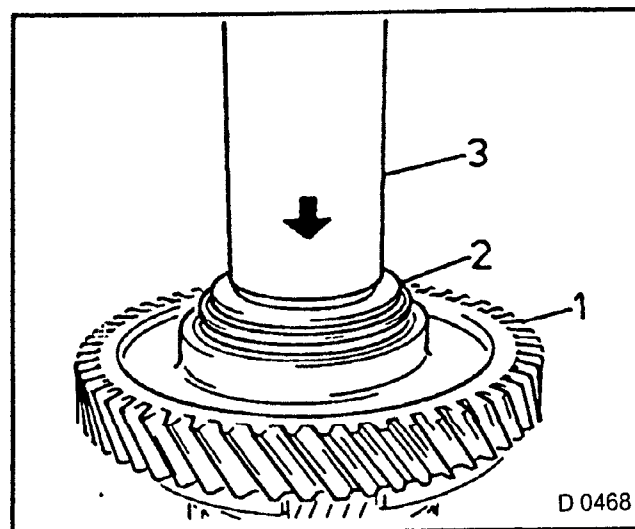


Fig. 415

INSTALL, CONNECT

1. Press in drive gear (driving, 1) with KM-697 (2).

CAUTION

PRESS IN ONLY UNTIL THE DRIVEN INTERMEDIATE GEAR CAN STILL BE TURNED SLIGHTLY, CHECK WHILE PRESSING (ARROW).

INSTALL, CONNECT

- 1 Press in bevel gear bearing inner race with KM-697 until seated against drive gear.

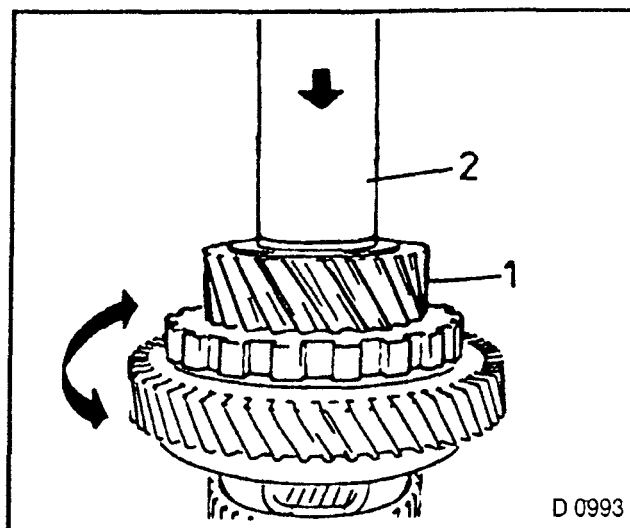


Fig. 416

2. Pre-tighten new fastening nut and loosen again (for placing bearing) — KM-703 (1, on new transmissions with hexagon spanner, size 36).
3. Drive gear assembly in vice — KM-696 (2), secure against turning with locking bolt (3).

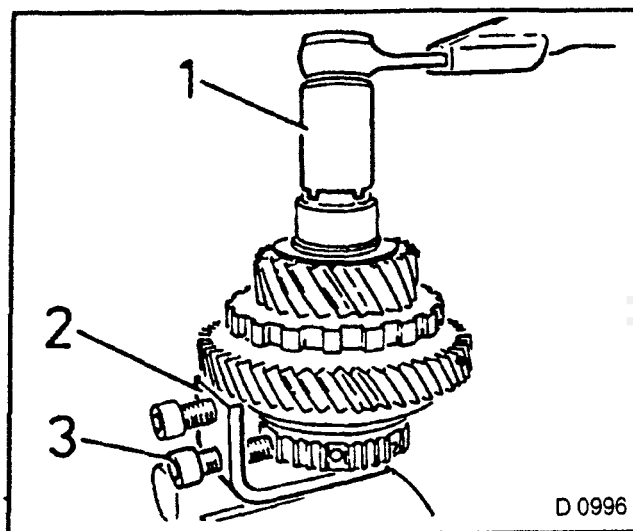


Fig. 417

ADJUST

1. Measure pre-tension of planetary gear set P2 — KM-703 (1, on new transmissions with hexagon spanner, size 36) and MKM-536 (2).
- 2 Assembly in vice — KM-696.
3. Using upper locking bolt (3), secure against turning.
4. Locking bolt threads (3) lie against side of recess (detail), **DO NOT** tighten so that it locks the planetary gear set.
5. Before measurement, spin on both sides (placing of bearings).
6. Tighten fastening nut until starting torque is 0.55 to 1.35 Nm, carry out several measurements and take average.
7. Secure fastening nut at two points by caulking.

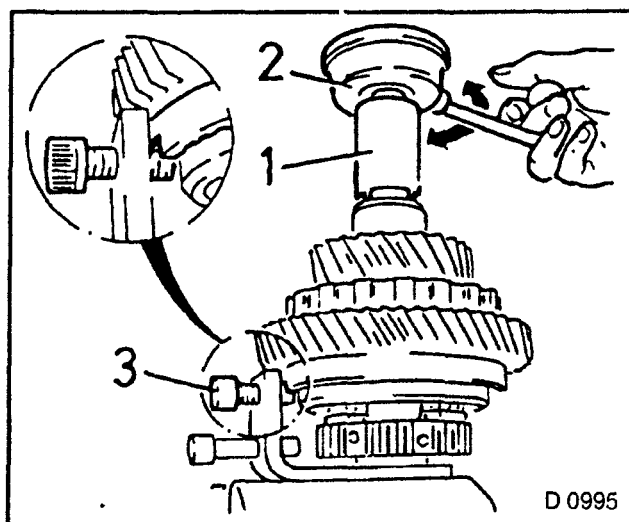


Fig. 418

ASSEMBLE

- 1. Planetary gear set and drive gear (driving).
- 2. Position component with fastening nut downwards in vice.
- 3. Thread internal gear (2) into planetary gear set.
- 4. Align hooks of retaining ring (1) with recess of intermediate gear (3).
- 5. Tension retaining ring.
- 6. Insert internal gear.
- 7. Snap retaining ring in groove of intermediate drive gear.

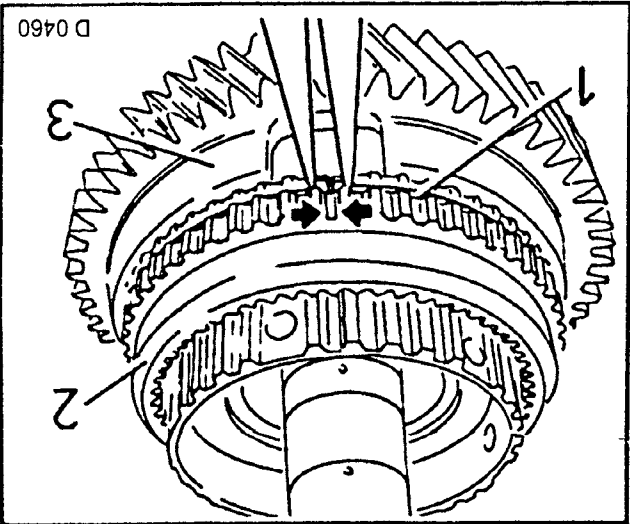
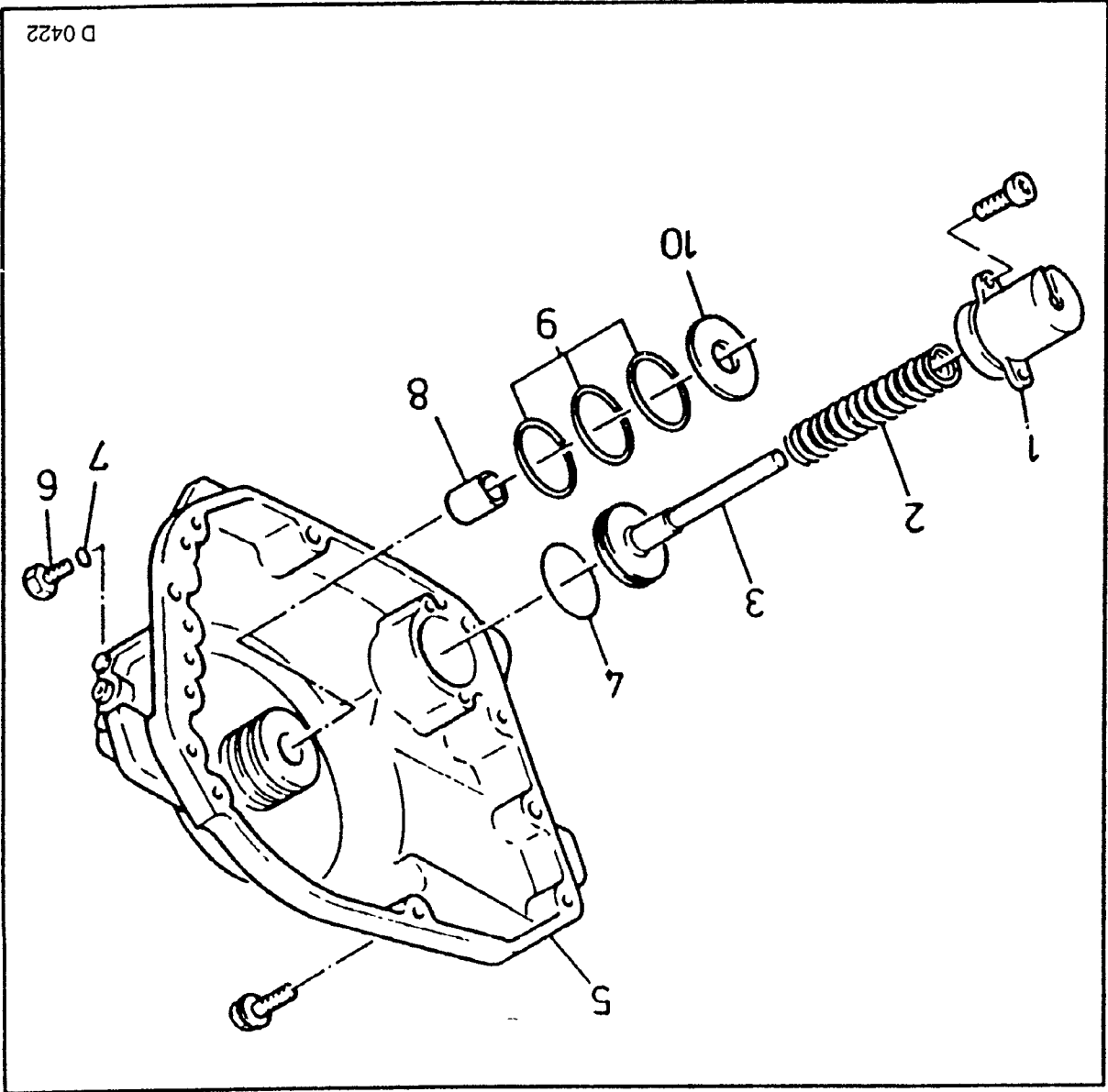


Fig. 420 — Rear Cover with Piston C1

- 1 = Cover for piston C1
- 2 = Spring
- 3 = Piston C1
- 4 = Seal ring
- 5 = Rear cover
- 6 = Plug, M 8
- 7 = Seal ring
- 8 = Needle bearing
- 9 = Hook seal rings
- 10 = Race



Rear Cover with Piston C1 — Overhaul

DISASSEMBLE

1. Rear cover.
2. Thrust bearing (1).
3. Three hook seal rings from bearing journal (2) — ring ends are L-shaped. Press in one ring end in groove, hook out the other.
4. Cover for piston C1 (3).
5. Spring and piston C1 (Fig. 422, Item 3) — Renew rubber O-seal rings on piston (Fig. 422, Item 1)

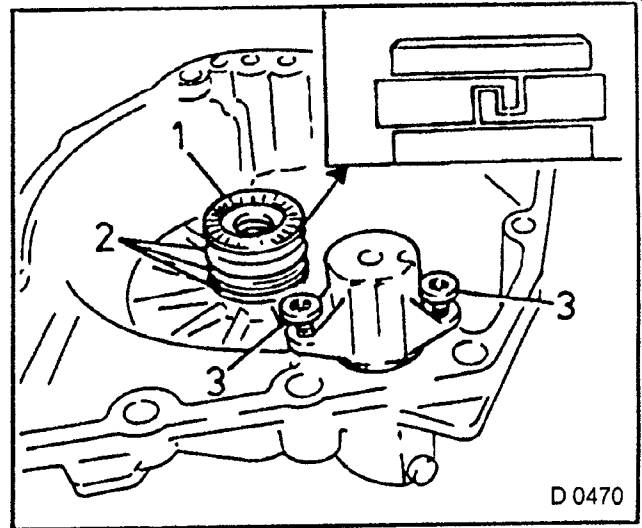


Fig 421

MEASURE

- 1 Length (4) and outer diameter (5) of spring C1.
Measurement values: Length (4) 78.1 mm, outer diameter (5) 20.7 mm.

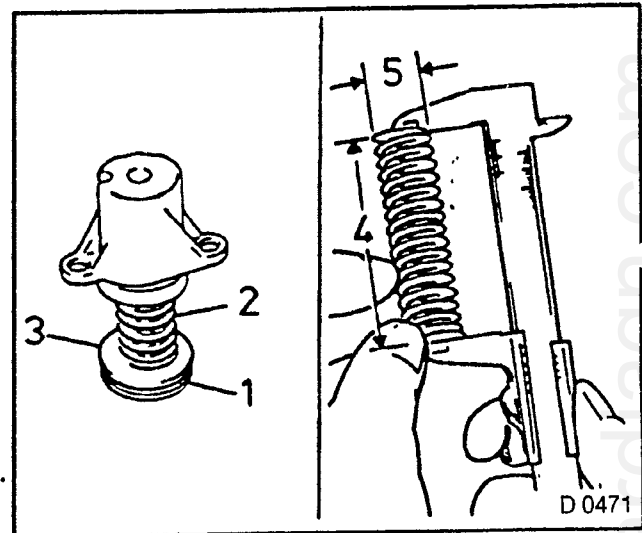


Fig. 422

REMOVE, DISCONNECT

1. Needle bearing from journal in rear cover
2. Pull out with MKM-691 (1) and KM-556-1 (2).
If necessary (arms of KM-556-1 too short), place KM-502-A under the arms of KM-556-1.

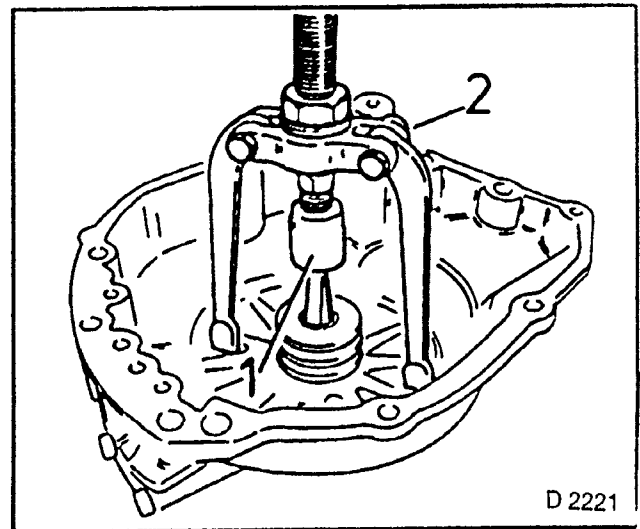
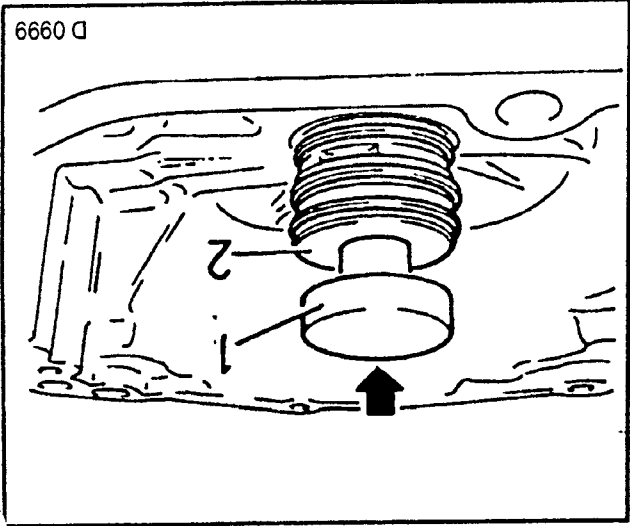


Fig 423

INSTALL, CONNECT

- 1. Needle bearing in journal.
- 2. Drive in with KM-711-2 (1) until tool stops at journal (2).

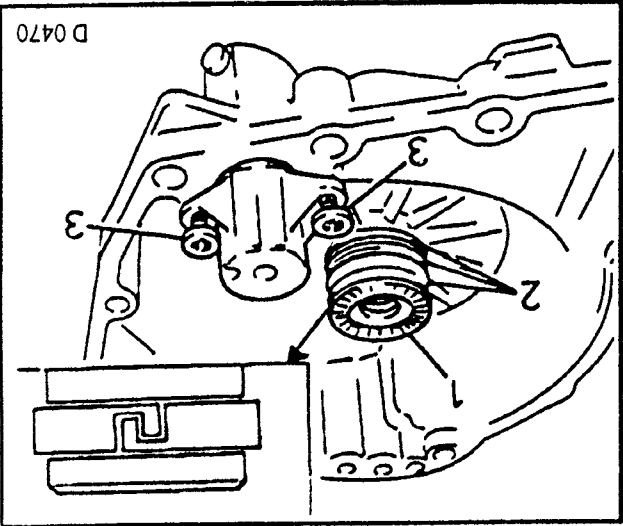


ASSEMBLE

- 1. Rear cover.
- 2. Piston C1, spring and cover.

TIGHTEN (TORQUE)

- 1. Cover C1 to rear cover — 10 Nm.



INSTALL, CONNECT

- 1. Three hook seal rings on bearing journal — ring ends are L-shaped.
- Hook out as described for removal.
- DO NOT** expand more than necessary.

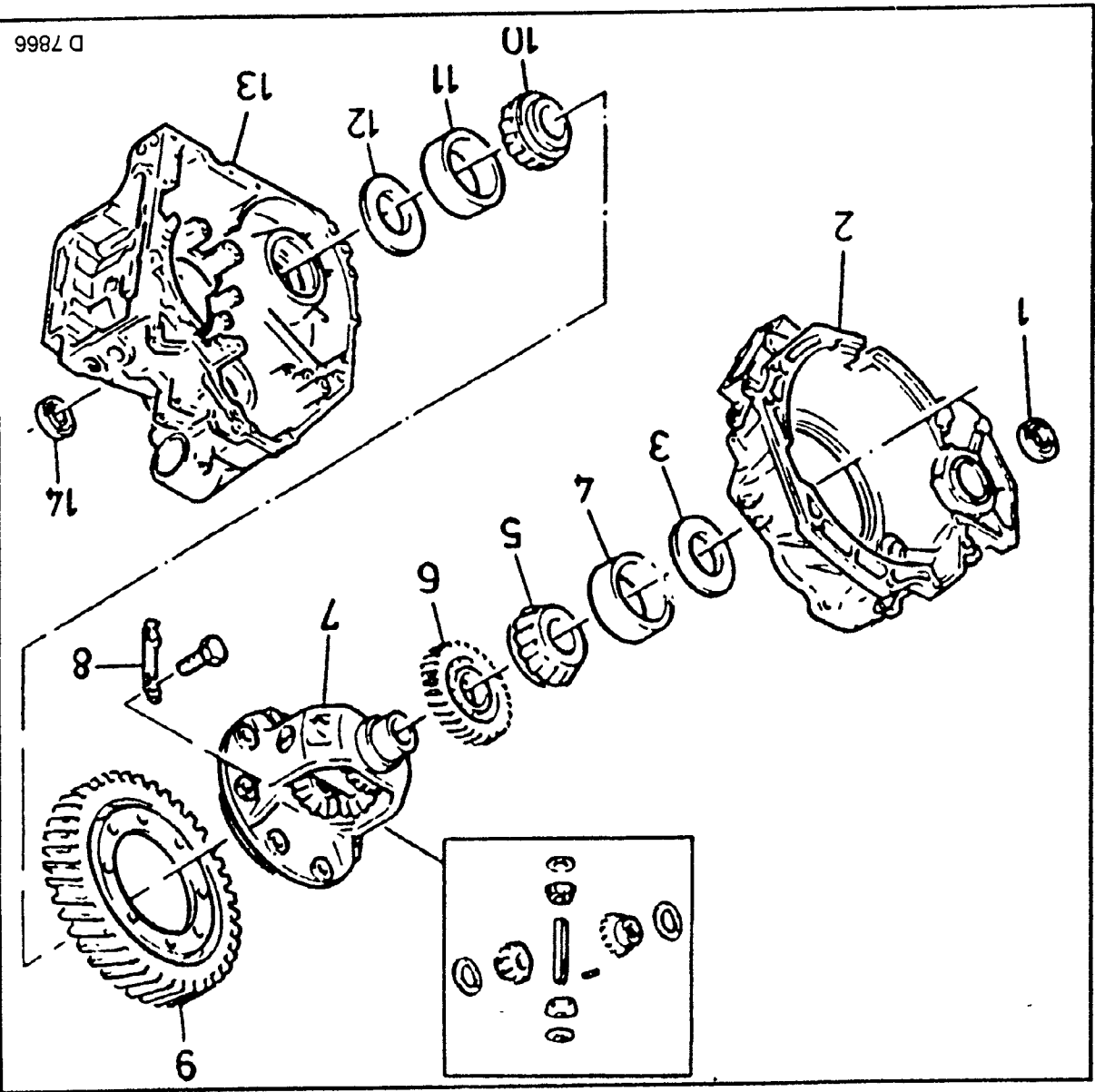


Fig 426 — Differential

- 1 = Axle shaft seal ring.
- 2 = Auxiliary housing.
- 3 = Friction washer (auxiliary housing).
- 4 = Bevel gear bearing outer race
- 5 = Bevel gear bearing inner race
- 6 = Speedometer gear (driving).
- 7 = Differential.
- 8 = Locking plate.
- 9 = Drive gear (driven).
- 10 = Bevel gear bearing inner race.
- 11 = Bevel gear bearing outer race.
- 12 = Friction washer (main housing).
- 13 = Main housing.
- 14 = Axle shaft seal ring.

D 7866

Differential — Overhaul

DISASSEMBLE

1. Differential.
2. Both bevel gear bearing inner races (1) — KM-161-A (2).
- Hooks KM-161-3 (3) and Thrust Plate KM-403 (4).
- If necessary unscrew remover hooks from counter and install individually on bearing.
3. Remove speedometer helical gear (driving, 5).

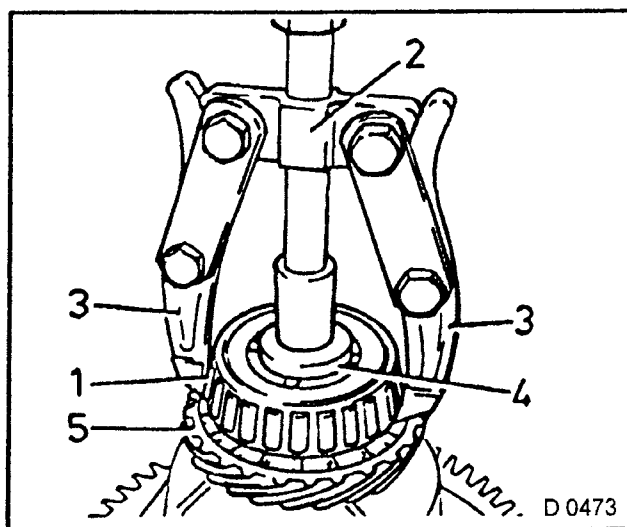


Fig. 427

- 4 Drive gear (driven).
5. Mark position of drive gear relative to differential housing.
6. Release locking plates.
7. Remove eight bolts and remove locking plates.
8. Loosen drive gear, if necessary with plastic hammer.

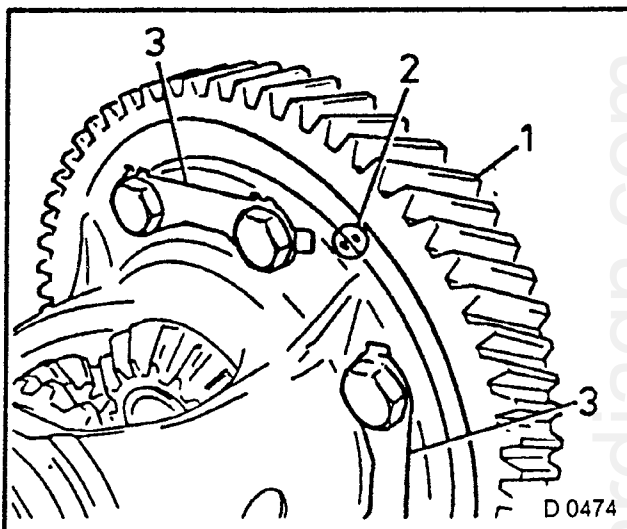


Fig. 428

REMOVE, DISCONNECT

1. Parallel pin (1) with drift, bevel gear axle (2).
- Remove differential gears with friction washers (3) through installation aperture by turning at one of the two axle shaft gears.
2. Axle shaft gears with friction washers (4).

INSPECT

1. Inner parts of differential for damage and wear. If necessary, replace assembly — reuse drive gear (driven).

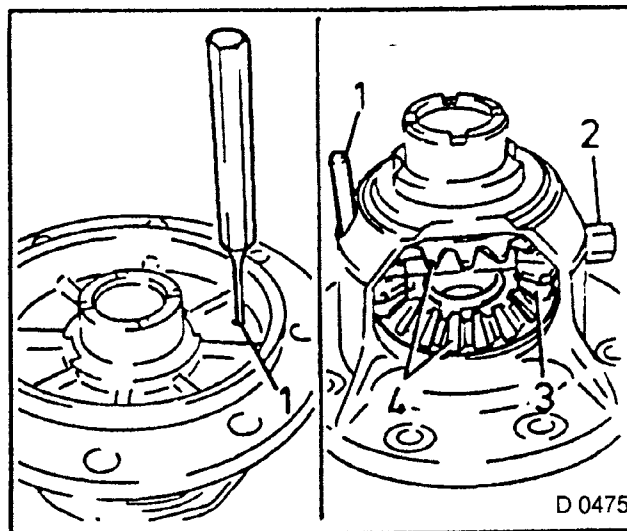


Fig. 429

2. Drive both axle shaft seal rings out of main or auxiliary housing from inside outwards (if not yet removed)

3. Remove both bevel gear bearing outer races together with friction washers — KM-210-A (1), KM-709 (2 and 3).

Remove hooks grip in recess under friction washer.

NOTE:

Before removing (tool inserted as described above and slightly pretensioned), heat housing to approximately 80°C/176°F with hot air blower.

ASSEMBLE

- 1. Differential.
- 2 Press in both bevel gear bearing outer races with friction washers — KM-695 or KM-710 (1) and KM-305 (2). Friction washer thickness for bearing in auxiliary housing: 2,5 mm. With new bearings for outer race in main housing, use smallest washer thickness.

- If no damage of inner parts is determined.
- 3. Axle shaft gears with friction washers (1) in differential
 - 4 Align differential gears (2) and friction washers with bore for bevel gear axle by turning at one of the axle shaft gears.
 - 5 Bevel gear axle (3) in differential housing.
 - 6. Drive parallel pin in bevel gear axle and secure by centre punch at edge of bore.

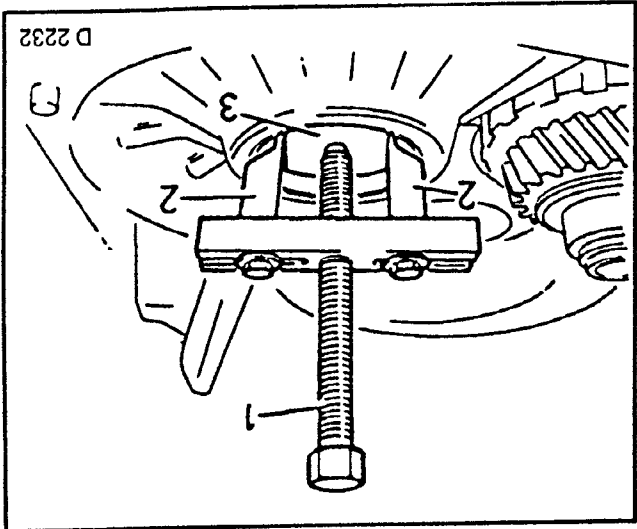


Fig. 430

D 2232

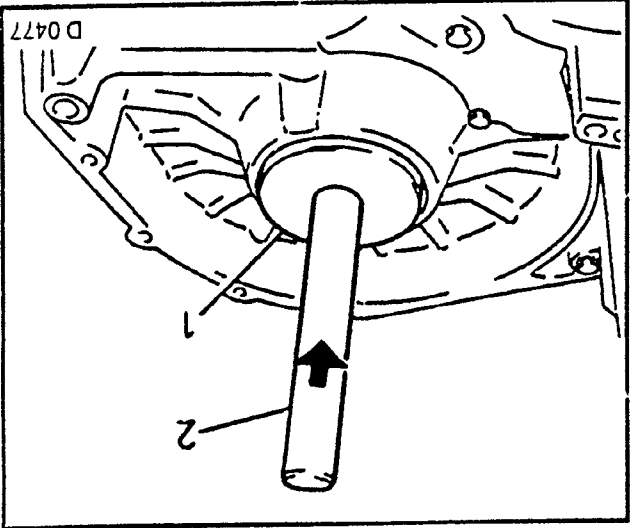


Fig 431

D 0477

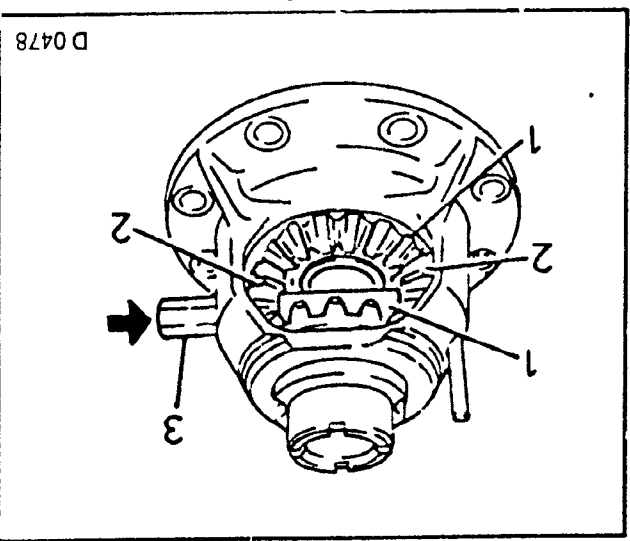


Fig. 432

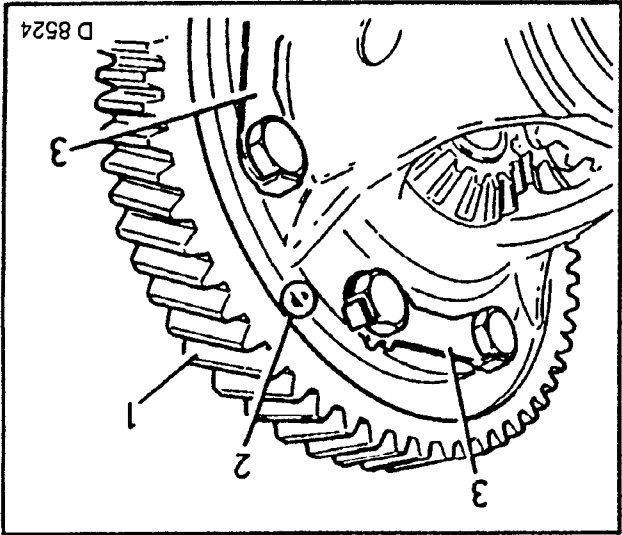
D 0478

INSTALL, CONNECT

- 1. Drive gear (driven) on differential housing.
- 2. Heat drive gear (driven) to approximately 100°C/212°F in fluid (thermocolor pencils or suitable temperature gauge).
- 3. Drive gear to differential housing. Observe markings.

TIGHTEN (TORQUE)

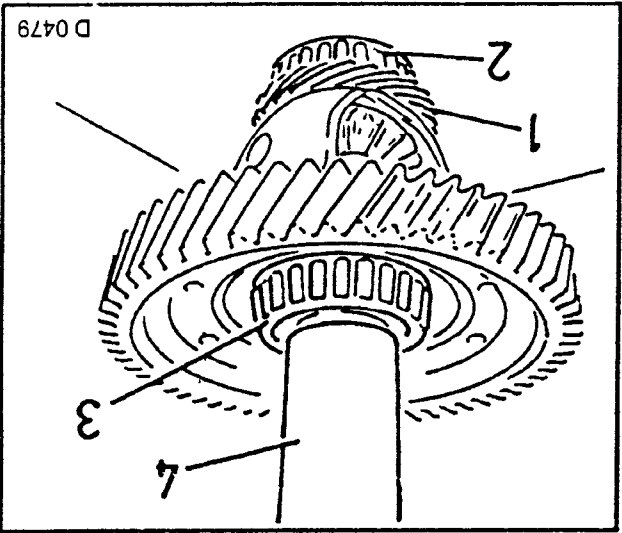
- 1. Drive gear (driven 1) — 100 Nm. Use new bolts and locking plates (3). Secure bolts.



INSTALL, CONNECT

- 1. Speedometer gear (driving, 1) — note retaining lug.
- 2. Press on both bevel gear bearing inner races (2 and 3) — KM-697 (4)

NOTE:
INSTALL WITH SMALL OUTER DIAMETER OF BEARING (2) ON SPEEDOMETER GEAR SIDE.

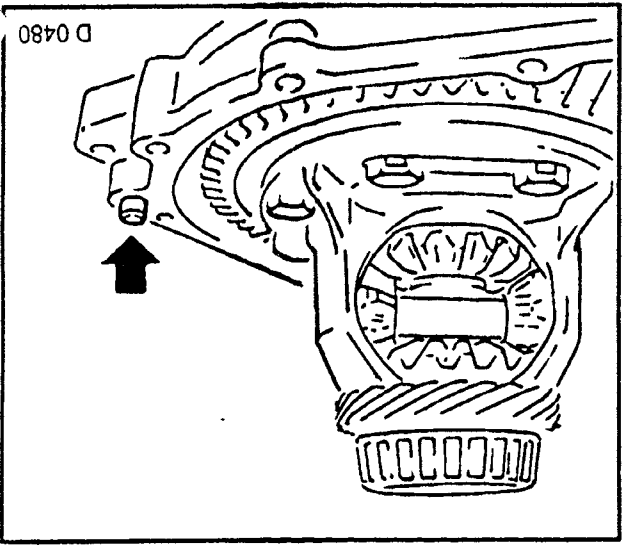


ADJUST

- 1. Pre-tension of differential bevel gear bearing.
- 2. Place differential in main housing.

TIGHTEN (TORQUE)

- 1. Auxiliary housing to main housing — 30 Nm. Eleven bolts. Note centering pin (arrow).



MEASURE

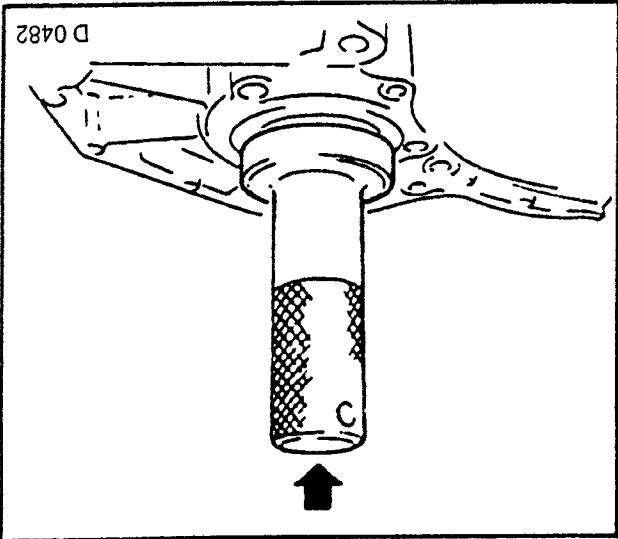
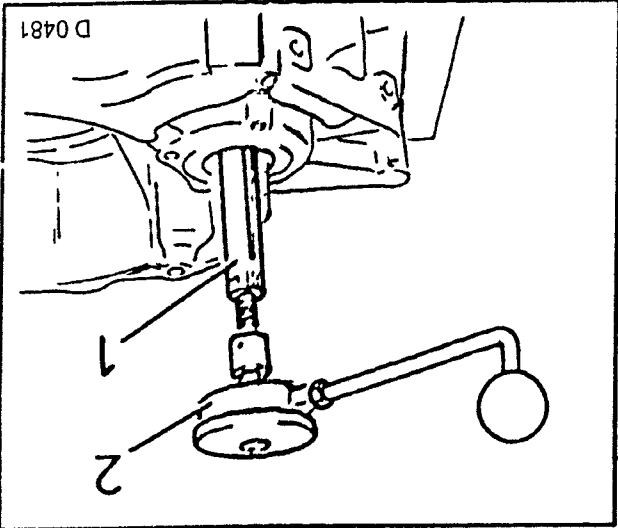
- 1. Starting torque of differential.
Without gear set, with KM-J-28544-A
(1, see also section "Special Service
Tools") and MKM-536 (2).
Measurement value:
New bearing: 0,7 to 1,2 Nm.
Used bearing: 0,35 to 0,6 Nm.
2. Correct by selecting suitable friction
washers under bevel gear bearing outer
race of main housing.

REMOVE, DISCONNECT

- 1. Auxiliary housing.
2. Differential.
If necessary bevel gear bearing outer
race of main housing (only if adjustment
is necessary)

INSTALL, CONNECT

- 1. After adjustment of pre-tension:
Axle shaft seal rings with KM-519.



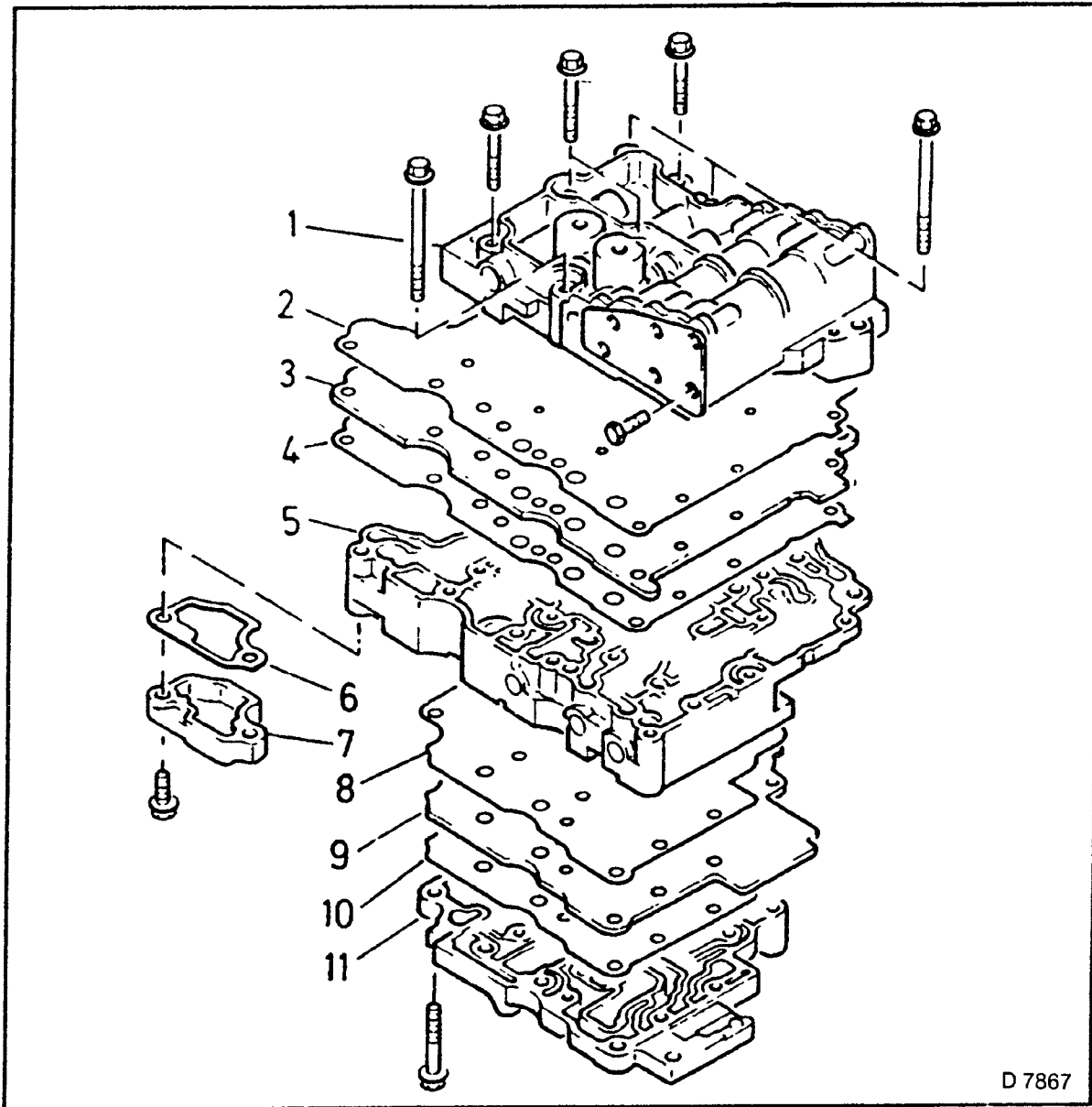
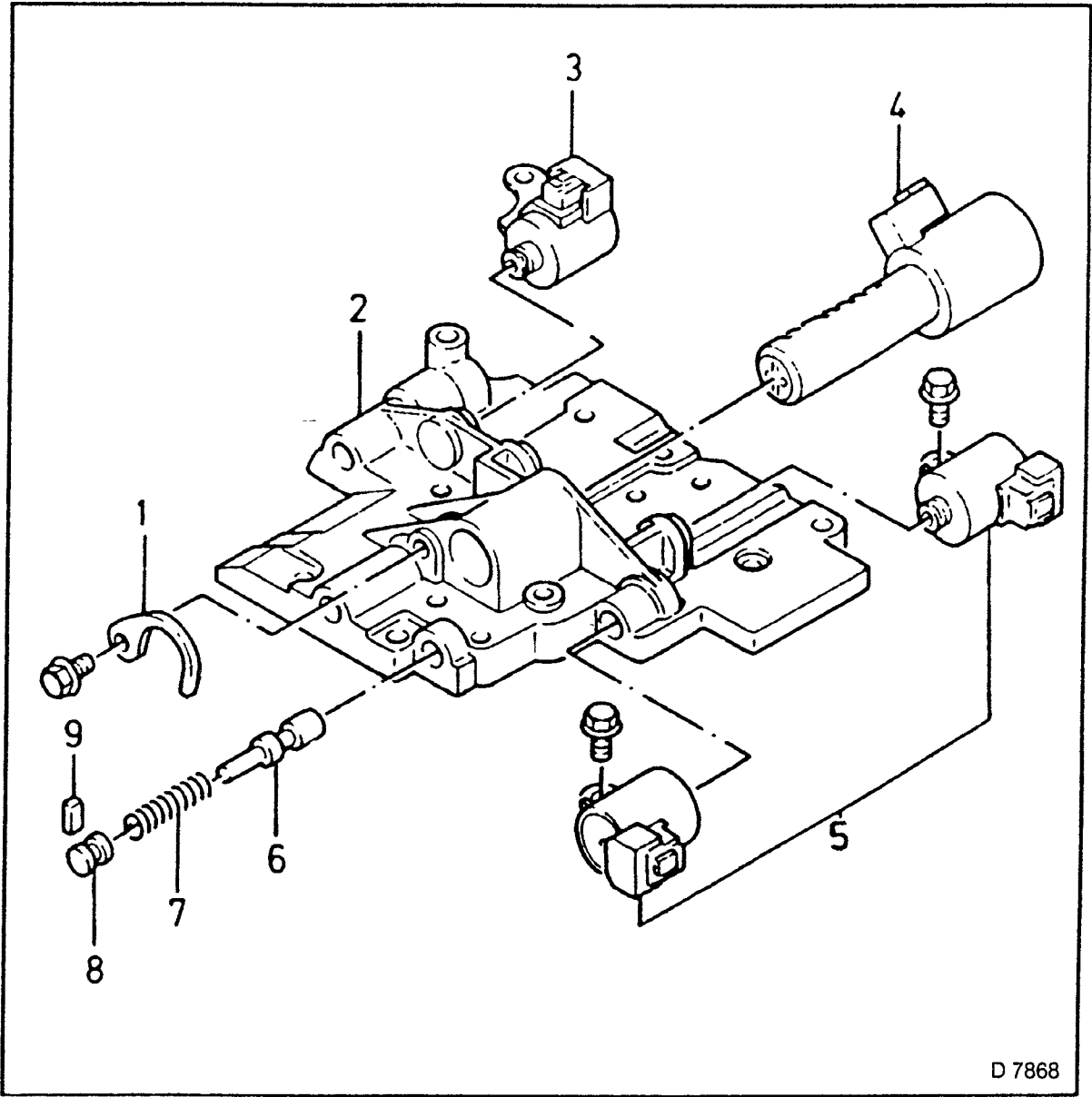


Fig. 438 — Valve Body Assembly.

- 1 = Rear valve body
- 2 = Rear valve body gasket
- 3 = Centre valve body plate
- 4 = Centre valve body gasket
- 5 = Centre valve body
- 6 = Intake cover gasket
- 7 = Intake cover
- 8 = Centre valve body gasket
- 9 = Front valve body plate
- 10 = Front valve body gasket
- 11 = Front valve body



D 7868

Fig. 439 — Front Valve Body

- 1 = Fluid pressure regulator terminal
- 2 = Front valve body
- 3 = Solenoid valve
- 4 = Fluid pressure regulator
- 5 = Solenoid valve
- 6 = Modulator valve
- 7 = Modulator valve pressure spring
- 8 = Modulator valve plug
- 9 = Modulator valve wedge

Valve Body — Overhaul

NOTE:

Valve body is disassembled only for checking and cleaning purposes, an exchange of inner parts is not provided for. Do not damage the inner parts, in particular the piston seal rings and springs.

Set aside removed parts as installed to avoid confusion. If damage is determined during checking, replace the complete valve body.

REMOVE, DISCONNECT

1. Two cable retainers (1).
2. Three solenoid valves (2).
Renew rubber O-seal rings.
3. Fluid pressure regulator (3) — remove bolt and retaining clip.

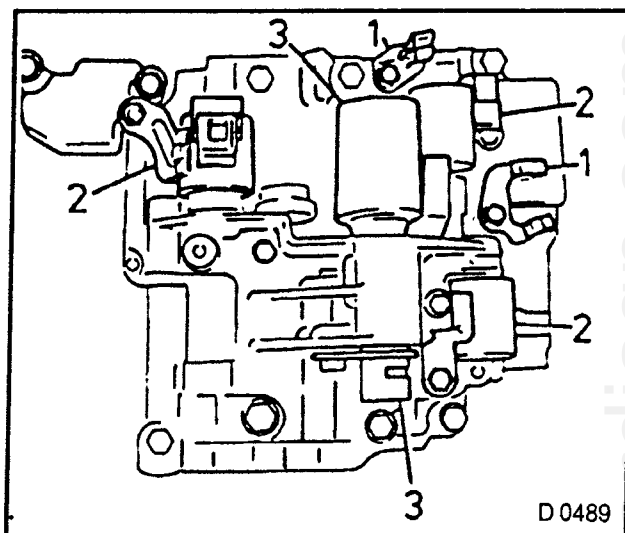


Fig. 440

Remove — Disconnect

1. Front from centre valve body.
2. Two bolts from rear valve body (1), turn valve body.
3. Five bolts from front valve body (2).

NOTE:

1. Set aside front valve body on its top side.
2. Separate centre and rear valve bodies together with plate and gaskets from front valve body by moving sideways, so that the lock balls remain in their ducts.
3. Set aside assembly on lower valve body. Remove plate and gaskets by moving sideways and set aside as installed.

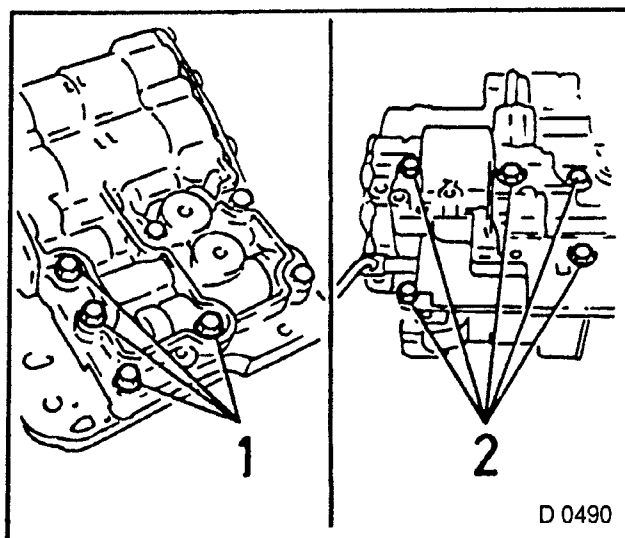


Fig. 441

INSPECT

1. Function of solenoid valves (three pieces).
2. Measure electrical resistance between terminal (1) and housing (2) — with ohmmeter.
Measurement value. 10 to 16 ohms.
3. Battery voltage (12 V) to solenoid valve — positive pole at terminal (1), negative pole at housing (2), Valve must switch audibly.

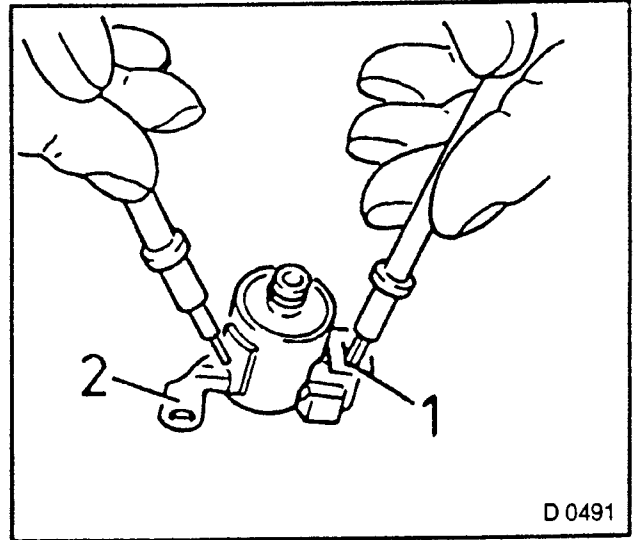


Fig 442

4. Function of fluid pressure regulator.
5. Measure electrical resistance between both terminals — with ohmmeter.
Measurement value: 3.2 to 3.9 ohms (at room temperature — approximately 20°C/68°F).

NOTE:

THE PRESSURE REGULATOR IS NOT AVAILABLE AS A SINGLE PART AND IF DEFECTIVE MUST BE REPLACED TOGETHER WITH THE VALVE BODY.

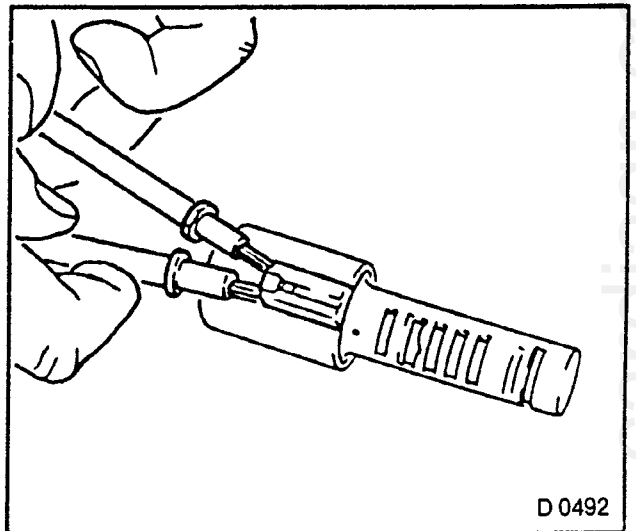


Fig 443

REMOVE — DISCONNECT

1. Centre from lower valve body — Three bolts (1).

NOTE:

1. Turn assembly.
2. Remove centre valve body together with plate and gaskets (2) from lower valve body by moving sideways.
3. Set aside with gasket down

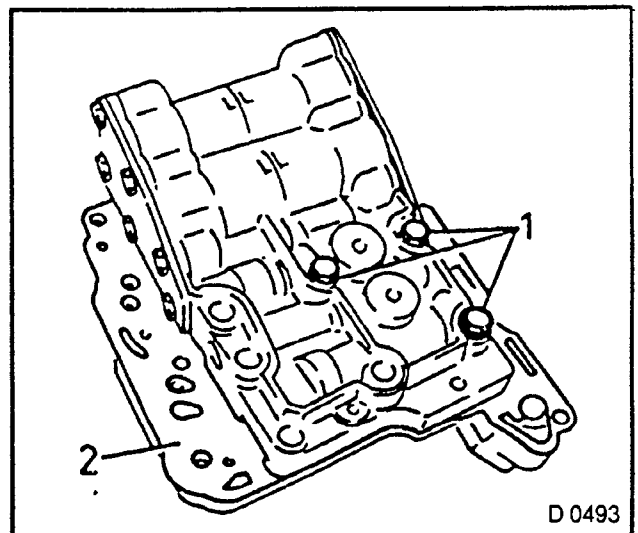


Fig. 444

DISASSEMBLE

- 1. Front valve body.
- 2. Modulator valve — remove wedge with magnetic lifter (1); Press plug (2).
- 3. Remove plug, Valve spring (3), Valve (4), If necessary assist with bent electrode wire.

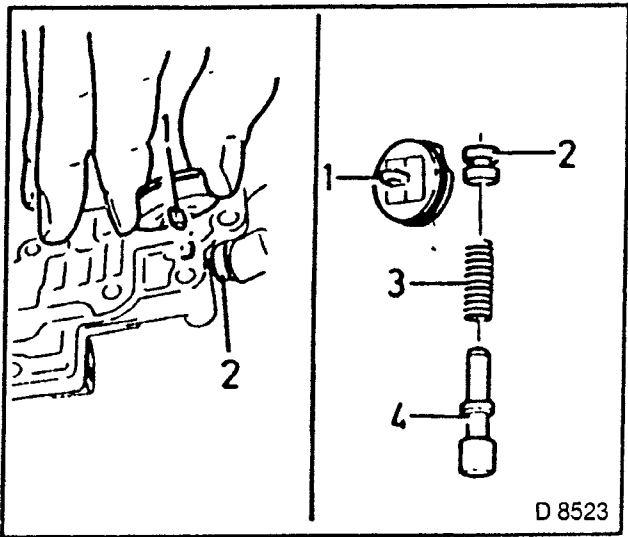


Fig 445

INSPECT

- 1. Valve spring for rust and deformation. Measure free length and outer diameter (caliper gauge). Length (Fig. 446, Item 5): 28.53 mm, diameter (Fig. 446, Item 6): 8.0 mm.
- 2. Valve for damage and wear as well as play — free seating in bore.

If springs do not have identical values, or if play between piston/valves and the affected bore is too large, replace valve body (completely).

CLEAN

- 1. Removed parts, ducts and sealing surfaces of front valve body.
- 2. Blow dry and oil.

ASSEMBLE

- 1. Front valve body — insert modulator valve, valve spring, plug and lock with wedge.

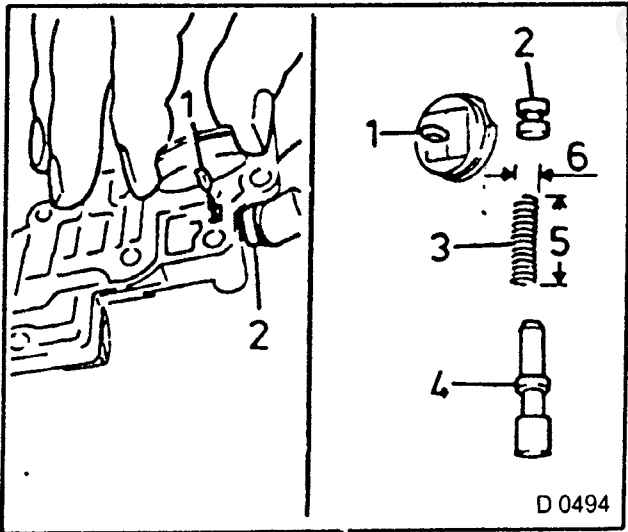
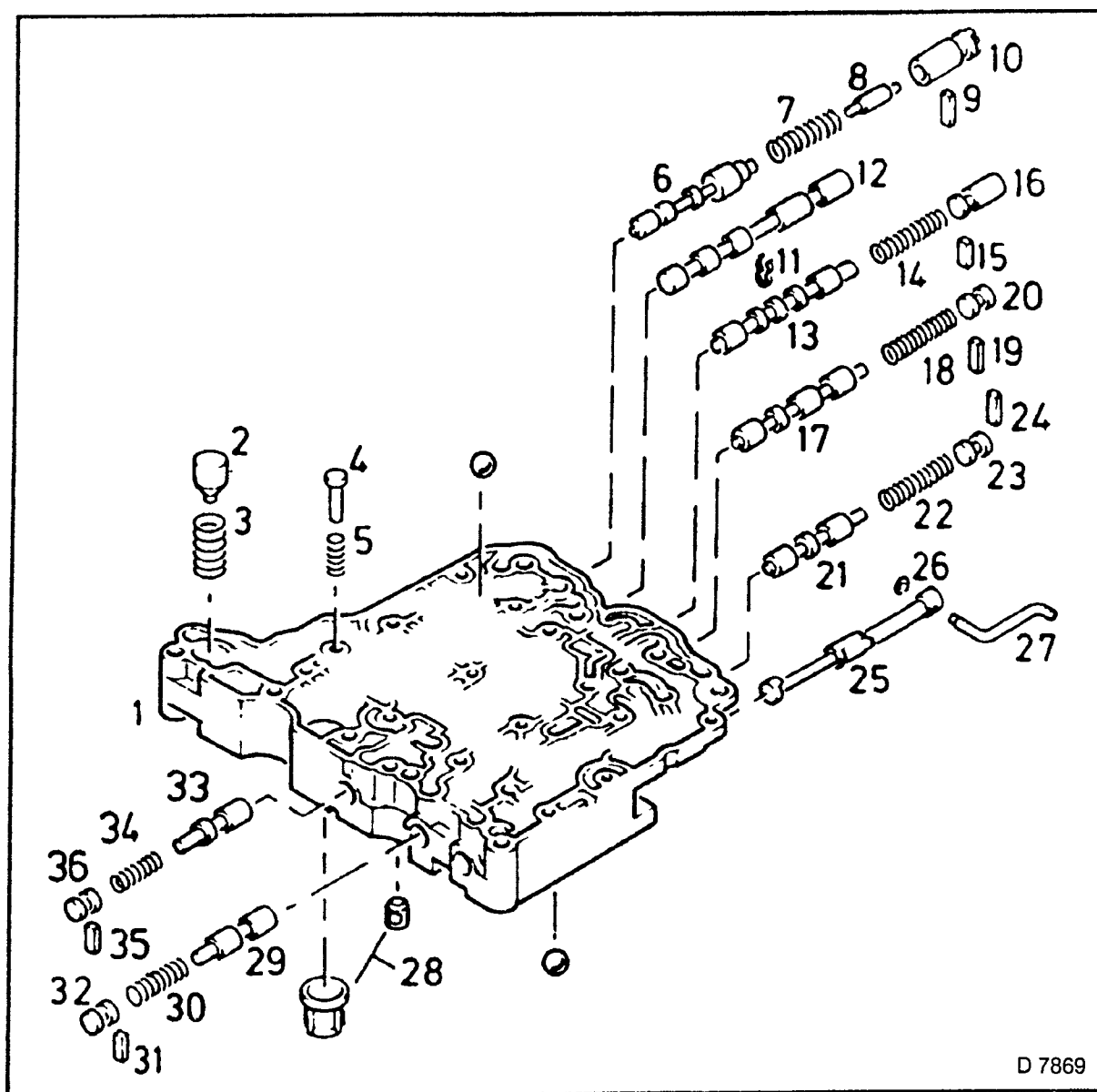


Fig. 446



D 7869

Fig. 447 — Centre Valve Body

- | | |
|-----------------------------------|--------------------------------|
| 1 = Centre valve body | 19 = 3/4 shift valve wedge |
| 2 = Bypass valve | 20 = 3/4 shift valve plug |
| 3 = Bypass valve spring | 21 = 2/3 shift valve |
| 4 = Safety valve | 22 = 2/3 shift valve spring |
| 5 = Safety valve spring | 23 = 2/3 shift valve plug |
| 6 = Primary control valve | 24 = 2/3 shift valve wedge |
| 7 = Primary control valve spring | 25 = Manual selector valve |
| 8 = Primary control valve piston | 26 = Retainer ring |
| 9 = Primary control valve wedge | 27 = Manual selector valve rod |
| 10 = Primary control valve sleeve | 28 = Fluid filters (4) |
| 11 = Retaining bracket | 29 = Valve B1 |
| 12 = Plug for neutral control | 30 = Spring B1 |
| 13 = 1/2 shift valve | 31 = Wedge B1 |
| 14 = 1/2 shift valve spring | 32 = Plug B1 |
| 15 = 1/2 shift valve wedge | 33 = Bridge valve |
| 16 = 1/2 shift valve plug | 34 = Bridge valve spring |
| 17 = 3/4 shift valve | 35 = Bridge valve plug |
| 18 = 3/4 shift valve spring | 36 = Bridge valve wedge |

DISASSEMBLE

- Centre valve body.
- Three fluid filters — small (1).
- One fluid filter — large (2).
- One lock ball (3).

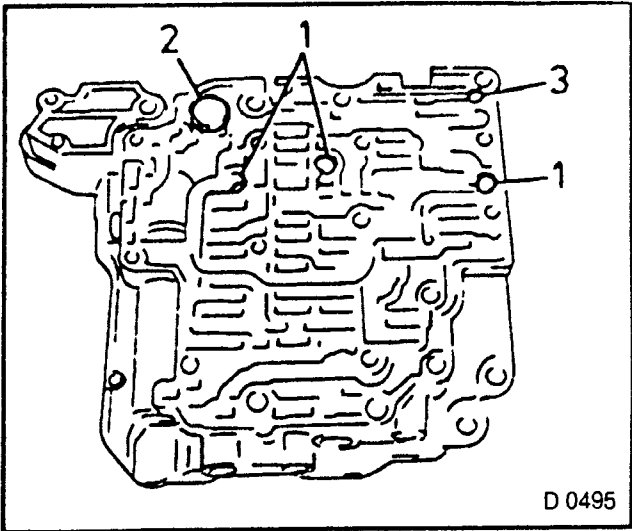


Fig. 448

REMOVE, DISCONNECT

- 1. Turn centre valve body.
- 2. Remove plate and gaskets.
- 3. Lock balls (1 to 8 except 3).
- 4. Bypass valve with spring (9).
- 5. Check valve with spring (10).

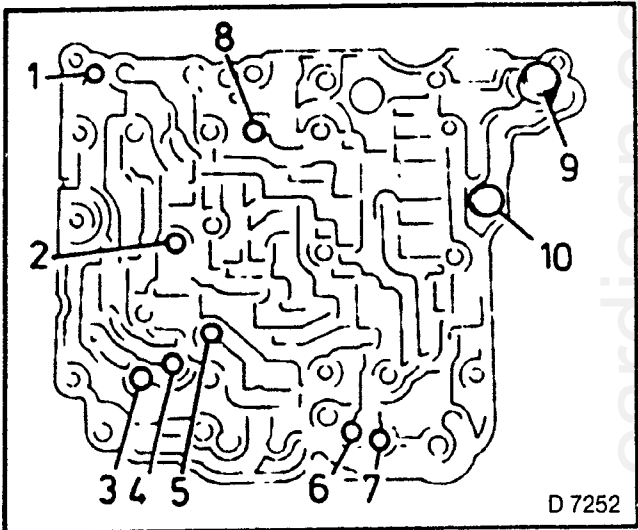


Fig. 449

REMOVE, DISCONNECT

- 1. Press valve B1 — onto plug (1).
- 2. Remove wedge (2) with magnetic lifter.
- 3. Remove plug.
- 4. Spring (3).
- 5. Valve (4).

If necessary assist with bent electrode wire.

INSPECT

- 1. Play-free seating of valve in its bore.
- 2. Valve spring (3) for rust and deformation,
- 3. Measure valve spring,
Caliper gauge, free length: 29.7 mm,
Outer diameter: 8.3 mm.

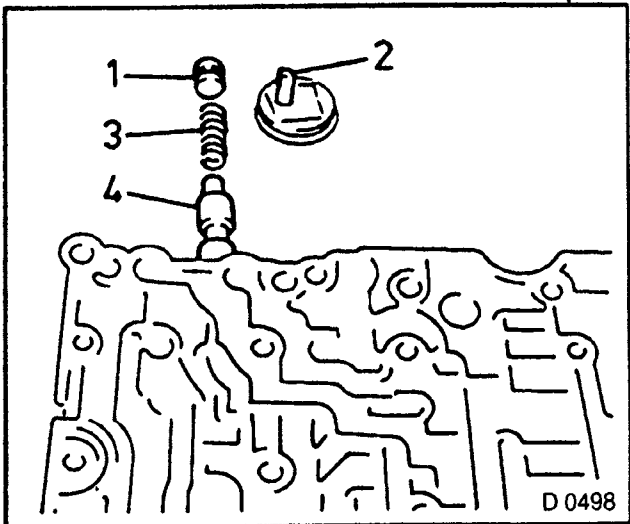


Fig. 450

REMOVE, DISCONNECT

- 1 Bridge valve — wedge (1)
- 2. Plug (2)
- 3 Spring (3).
- 4. Valve (4).

Removal as for valve B1.

INSPECT

Same procedure as for valve B1
Free length: 22.42 mm,
Outer diameter: 8.0 mm

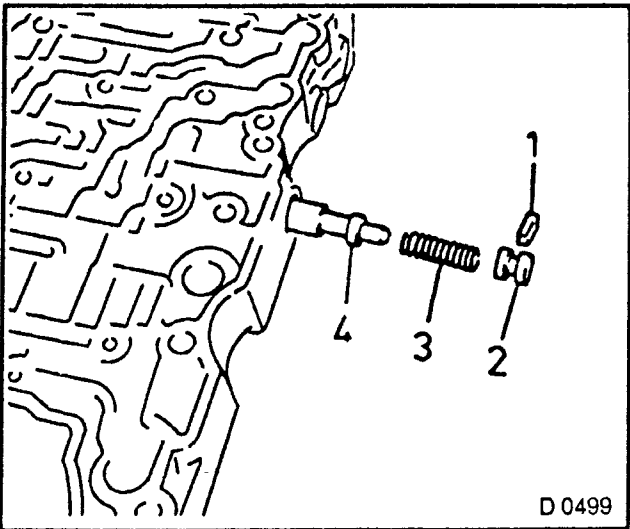


Fig. 451

REMOVE, DISCONNECT

- 1. Primary control valve.
- 2. Remove wedge (1),
Press on sleeve (2) with screwdriver,
sleeve (2), piston (3), spring (4), valve (5),
removal as for valve B1, single parts in
Fig. 453.

INSPECT

Same procedure as for valve B1,
Free length. 29.72 mm,
Outer diameter: 10.5 mm.

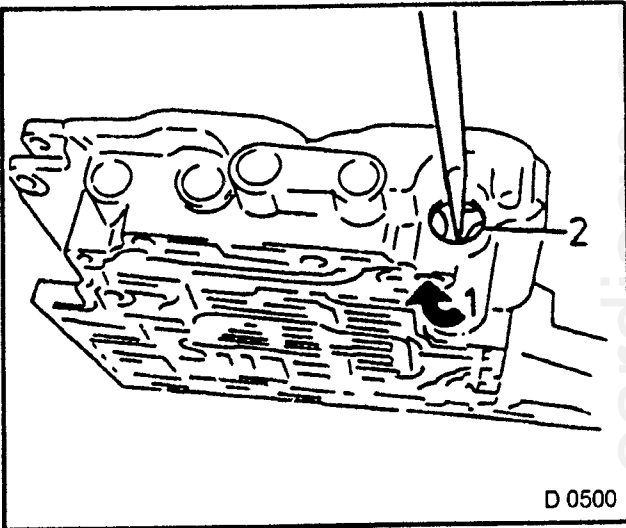


Fig. 452

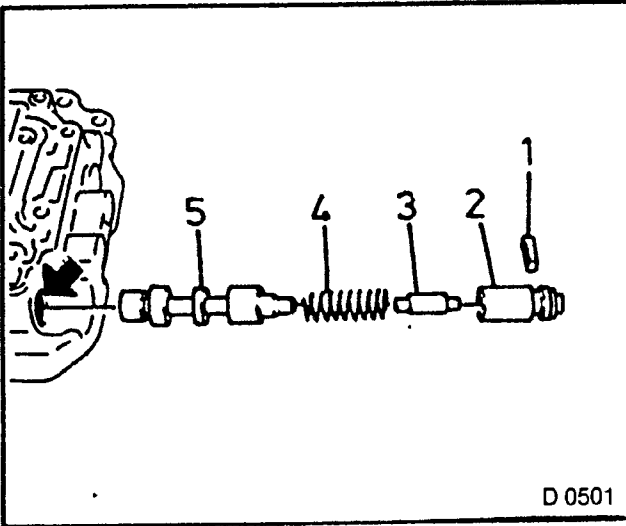


Fig. 453

REMOVE, DISCONNECT

- 1. Plug for neutral control.
- 2. Retaining bracket (1) — hook out with small screwdriver, remove plug (2), if necessary strike lightly against wooden base.

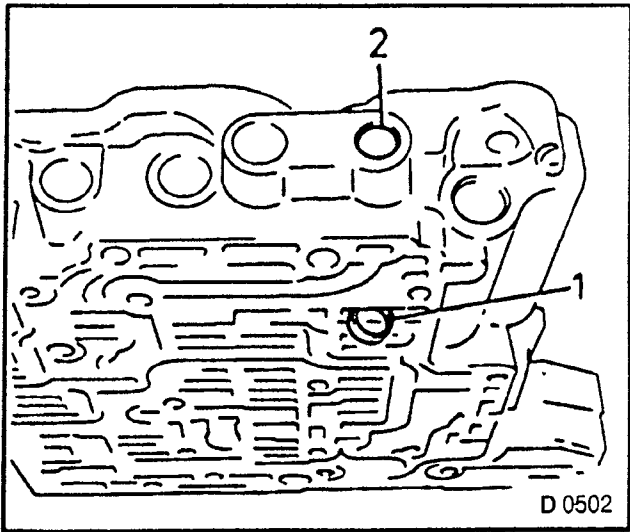


Fig. 454

INSPECT

- 1. Play — free seating of plug in bore.

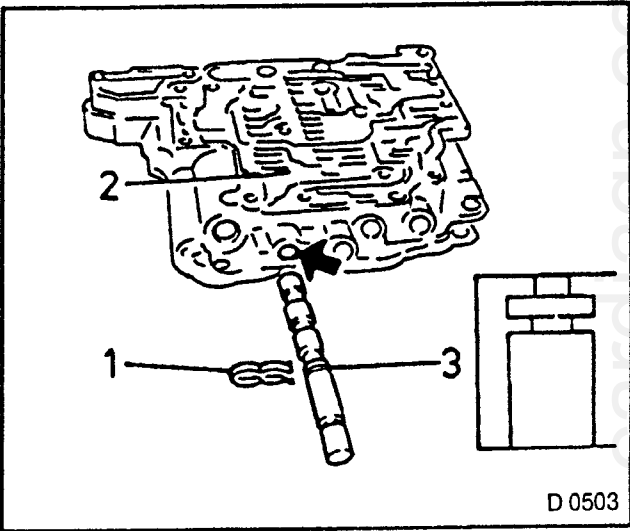


Fig. 455

REMOVE, DISCONNECT

- 1. Remove 1/2 shift valve —
Wedge (1),
Plug (2),
Spring (3).
Valve (4).
Removal as for valve B1.

INSPECT

Same procedure as for valve B1,
Free length: 34.0 mm,
Outer diameter: 8.2 mm.

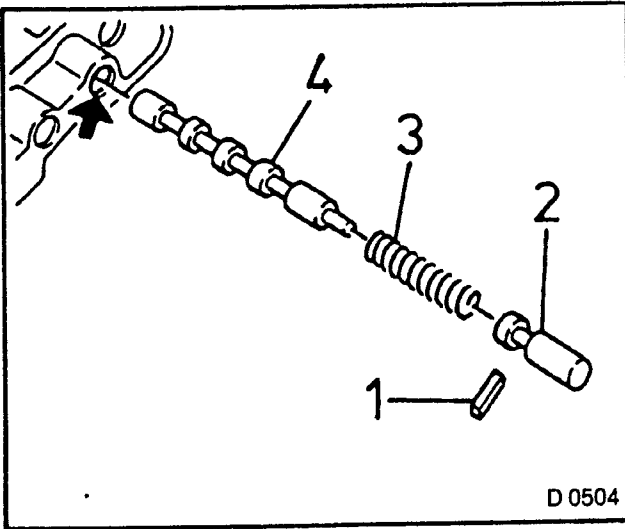


Fig. 456

REMOVE, DISCONNECT

1. Remove 3/4 shift valve —
Wedge (1),
Plug (2),
Spring (3),
Valve (4),
Removal as for valve B1.

INSPECT

Same procedure as for valve B1.
Free length: 34.0 mm.
Outer diameter: 8.2 mm.

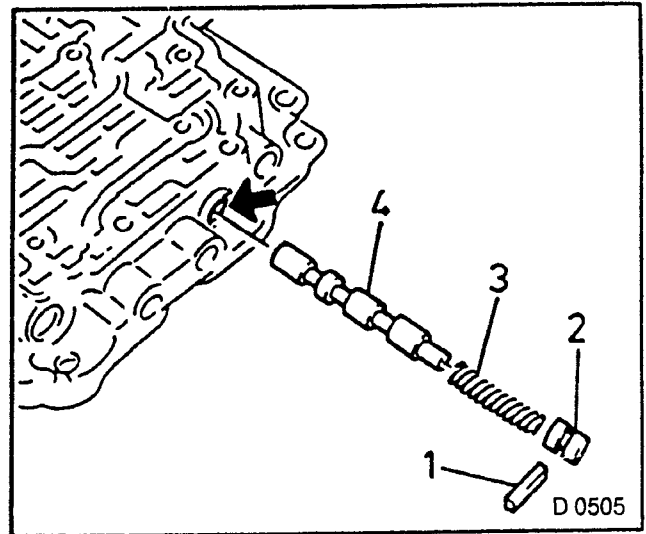


Fig. 457

REMOVE, DISCONNECT

1. Remove 2/3 shift valve,
Wedge (1),
Plug (2),
Spring (3),
Valve (4).
Removal as for valve B1.

INSPECT

Same procedure as for valve B1.
Free length: 33.95 mm.
Outer diameter: 8.2 mm.

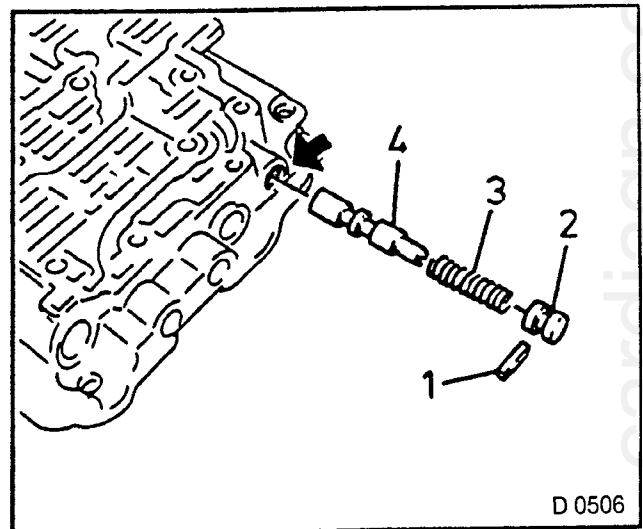


Fig. 458

If springs do not have identical values, or if play between piston/valves and the affected bore is too large, replace valve body (completely).

CLEAN

1. Removed parts, ducts and sealing surfaces of centre valve body.
2. Blow dry and lubricate.

ASSEMBLE

1. Centre valve body.
Always renew gaskets of plates, fluid filters
2. Renew as needed lock balls. Valves are located under plates (bypass and check valves).
3. Selector slide and selector rod.

INSTALL, CONNECT

1. Valve B1.
2. Valve (4).
3. Spring (3).
4. Plug (1) in bore.
5. Press on plug.
6. Insert wedge (2) with magnetic lifter.

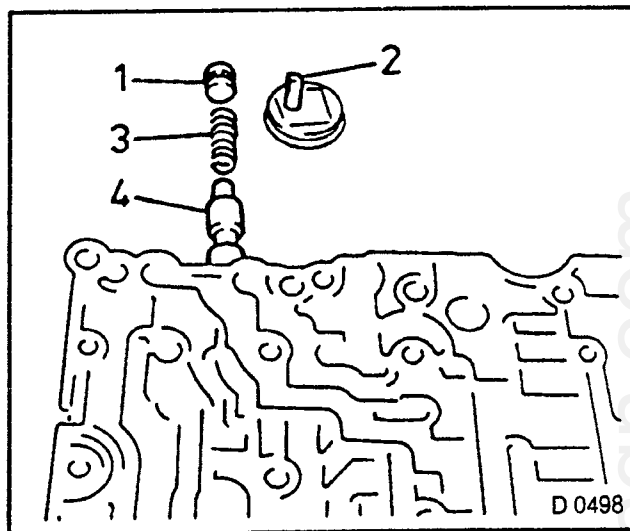


Fig. 459

INSTALL, CONNECT

1. Bridge valve — valve (4).
2. Spring (3).
3. Plug (2) in bore.
4. Insert wedge (1).

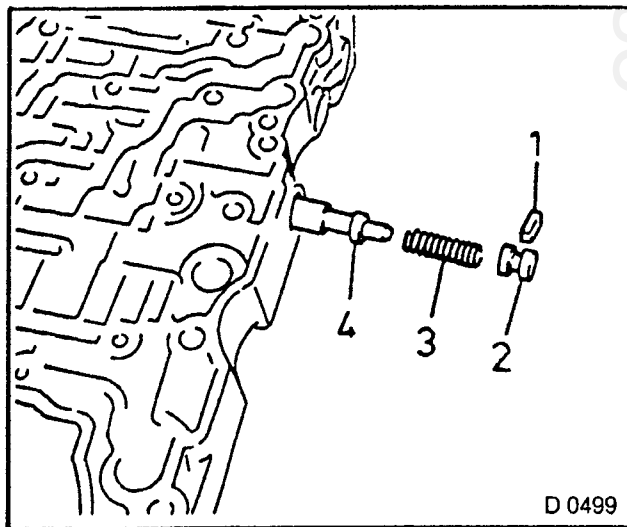


Fig. 460

INSTALL, CONNECT

- 1. Primary control valve — valve (5).
- 2. Spring (4).
- 3. Piston (3).
- 4. Sleeve (2) in bore (arrow).
- 5. Insert wedge (1)

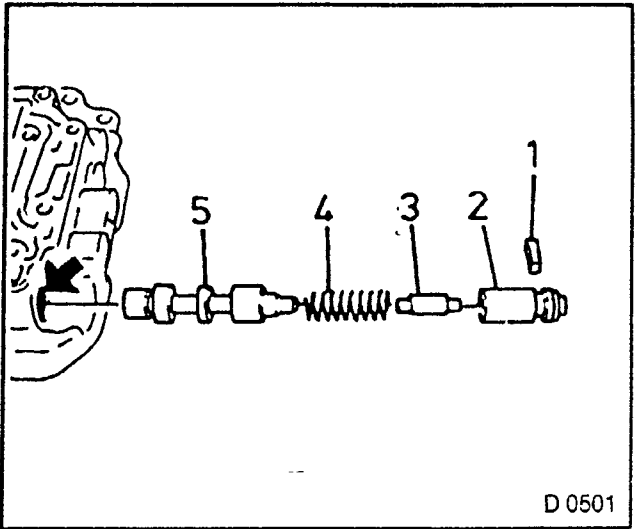


Fig. 461

INSTALL, CONNECT

- 1. Plug for neutral control.
- 2. Plug in bore (arrow).
- 3. Insert retaining bracket (1) in position (2).
- 4. Snap into groove of plug (3).

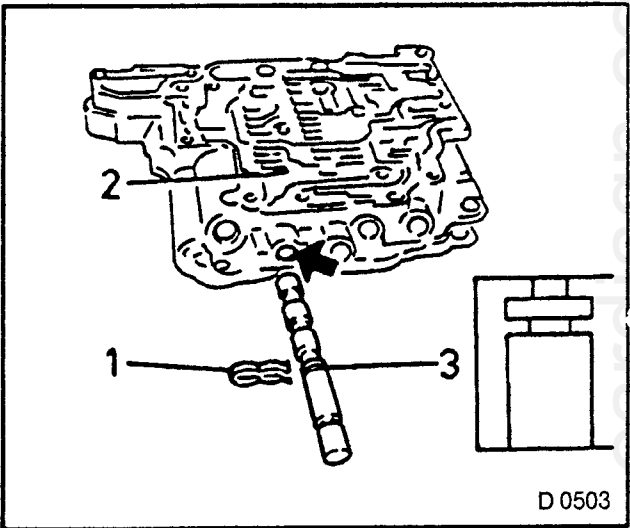


Fig. 462

INSTALL, CONNECT

- 1. 1/2 shift valve — valve (4).
- 2. Spring (3).
- 3. Plug (2) in bore (arrow).
- 4. Insert wedge (1)

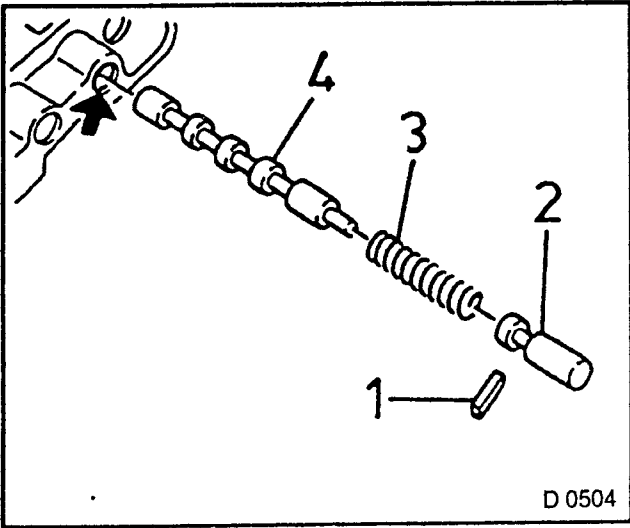


Fig. 463

INSTALL, CONNECT

1. 3/4 shift valve — valve (4).
2. Spring (3).
3. Plug (2) in bore (arrow).
4. Insert wedge (1).

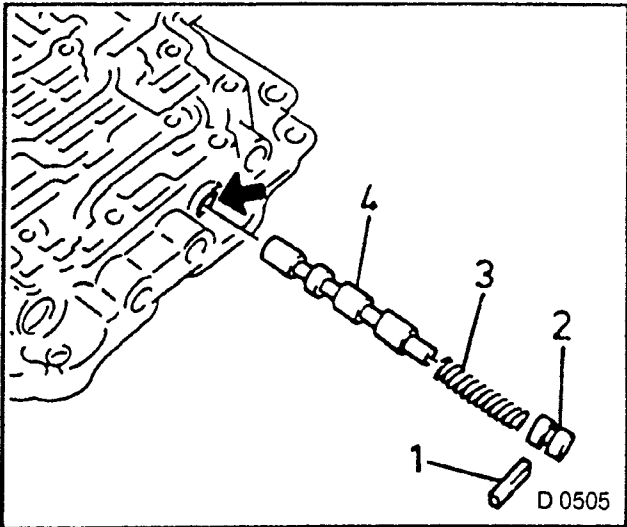


Fig. 464

INSTALL, CONNECT

1. 2/3 shift valve — valve (4).
2. Spring (3).
3. Plug (2) in bore (arrow).
4. Insert wedge (1).

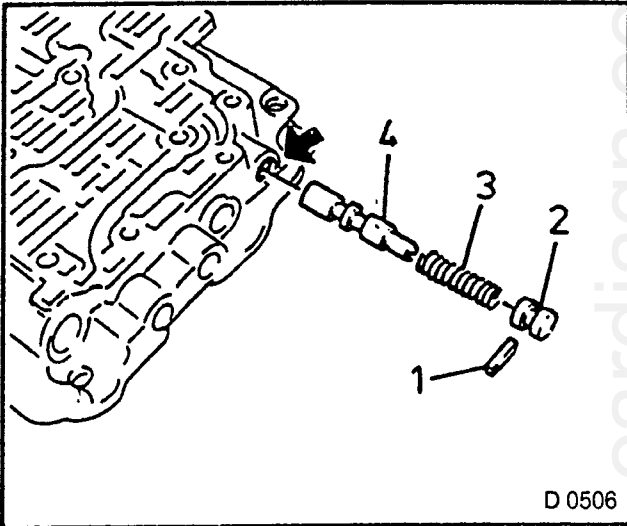


Fig. 465

ASSEMBLE

1. Centre valve body — bypass valve with spring (9).
2. Check valve with spring (10)
3. All lock balls except No. 3
4. Plate with new gaskets on sealing surface.

NOTE:
OBSERVE HOLE ALIGNMENT
POSITION OF PLATE AND GASKETS.

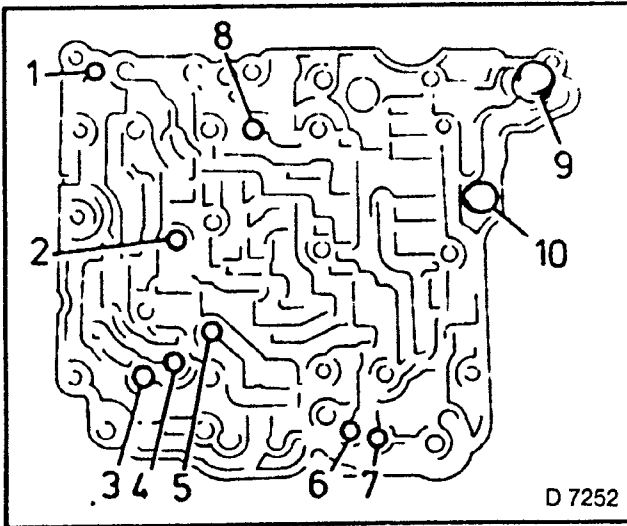
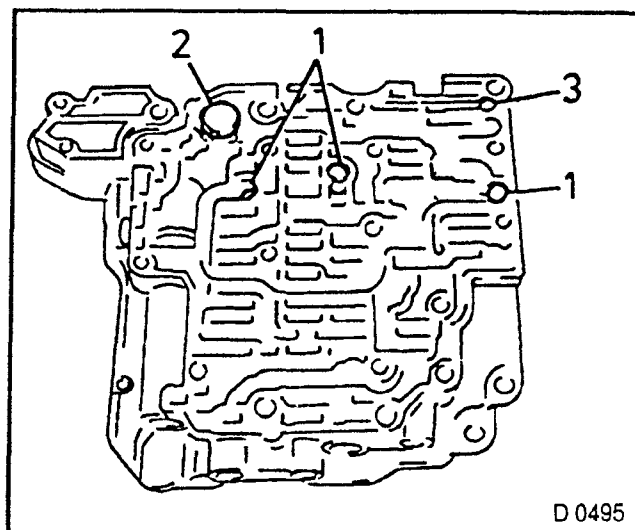


Fig. 466

5. Compress springs of bypass and check valves with plate.
6. Turn centre valve body.
7. Set aside on plate and place under weight, so that lock balls remain at their installation positions.

INSTALL, CONNECT

1. Three fluid filters (1) — small, closed side points downwards.
2. One fluid filter (2) — large, closed side points upwards.
3. One lock ball (3)



D 0495

Fig 467

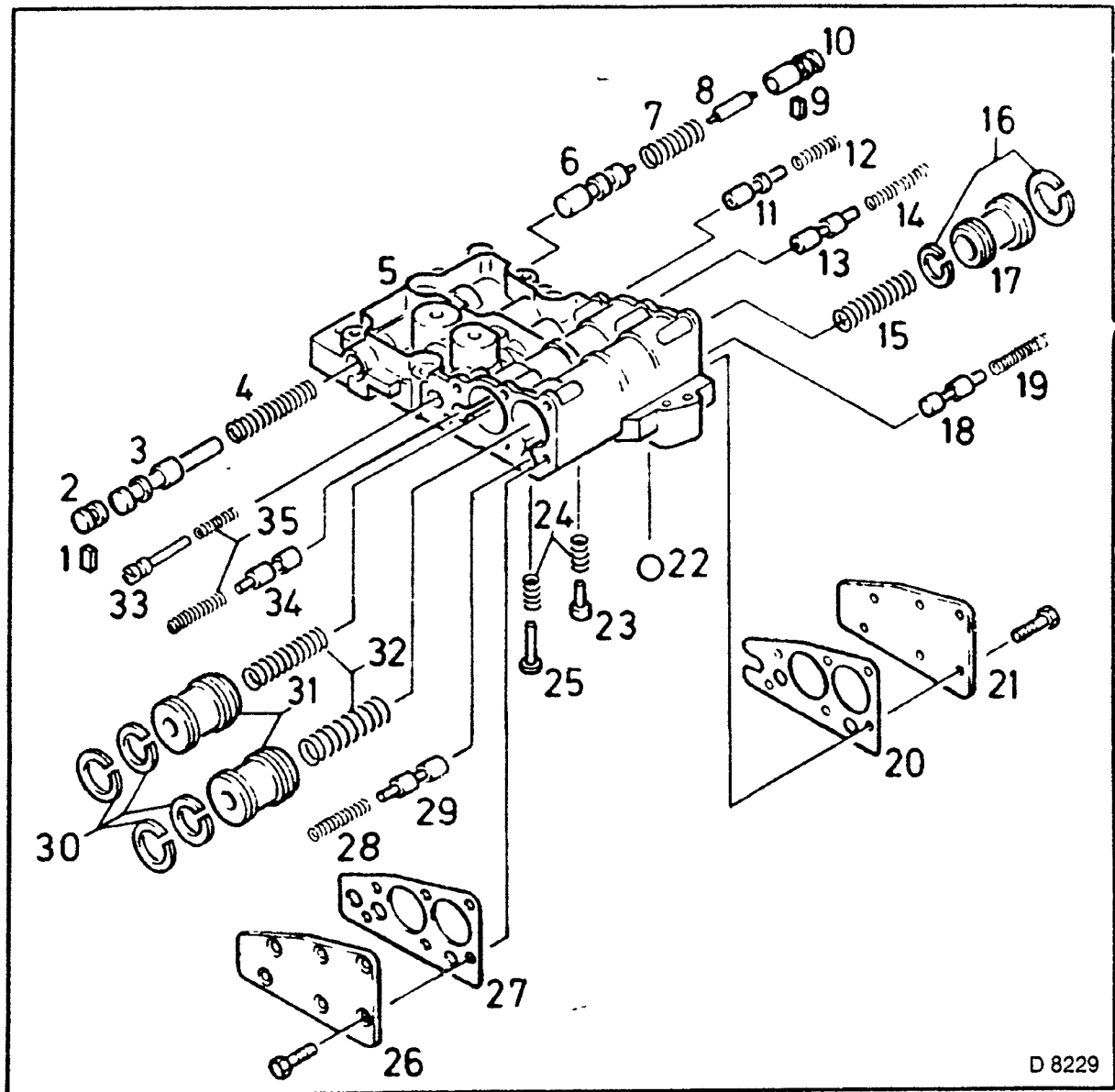


Fig. 468 — Rear Valve Body.

- | | |
|---|---|
| 1 = Wedge for secondary control valve | 20 = Gasket for cover no. 2 |
| 2 = Plug for secondary control valve | 21 = Cover no. 2 |
| 3 = Secondary control valve | 22 = Lock balls (4) |
| 4 = Spring for secondary control valve | 23 = Safety valve |
| 5 = Rear valve body | 24 = Pressure springs |
| 6 = Bridge control valve | 25 = Check valve |
| 7 = Spring for bridge control valve | 26 = Cover no. 1 |
| 8 = Sleeve for bridge control valve | 27 = Gasket for cover no. 1 |
| 9 = Wedge for bridge control valve | 28 = Spring for accumulator valve C2 |
| 10 = Piston for bridge control valve | 29 = Accumulator valve C2 |
| 11 = Freewheel modulator valve | 30 = Seal rings for accumulator piston B2, C2 |
| 12 = Spring for freewheel modular valve | 31 = Accumulator piston B2, C2 |
| 13 = Modulator valve for clutch | 32 = Springs for accumulator piston B2, C2 |
| 14 = Modular valve spring for clutch | 33 = Accumulator control valve |
| 15 = Spring for accumulator piston C3 | 34 = Accumulator valve B2 |
| 16 = Seal rings | 35 = Pressure springs |
| 17 = Accumulator piston C3 | |
| 18 = Accumulator valve C3 | |
| 19 = Spring for accumulator valve C3 | |

DISASSEMBLE

- 1. Rear valve body.
- 2. Check valve with spring (1), safety valve with spring (2), Three lock balls (3).

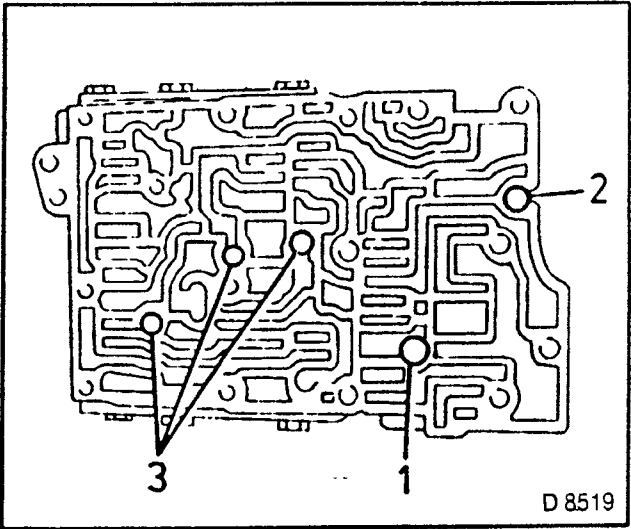


Fig. 469

- 3. Secondary control valve.
- 4. Press against plug (2).
- 5. Remove wedge (1) with magnetic lifter.
- 6. Remove plug.
- 7. Valve (3).
- 8. Spring (4).

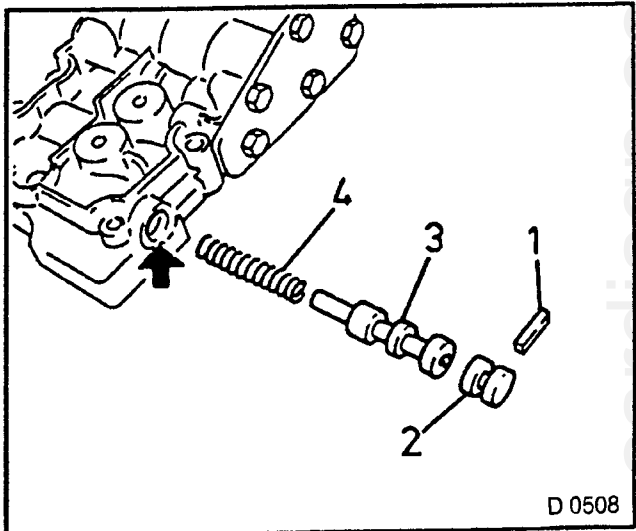


Fig 470

INSPECT

- 1. Play — free seating of valve in bore.
- 2. Valve spring (3) for rust and deformation.
- 3. Measure spring, caliper gauge.
Free length: 47.44 mm,
Outer diameter: 9.5 mm.

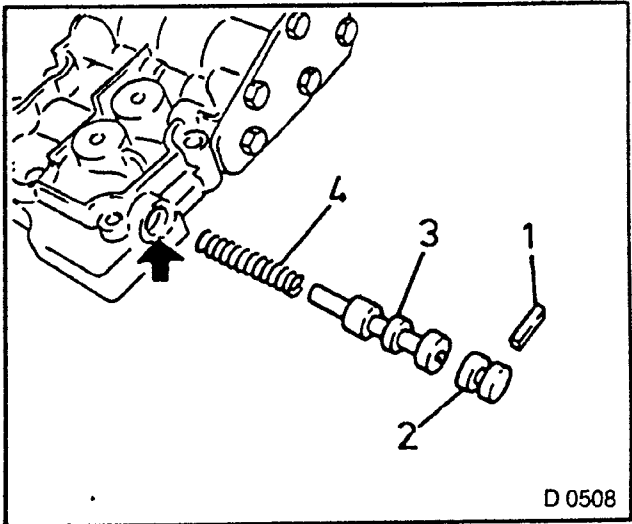


Fig. 471

REMOVE, DISCONNECT

1. Cover no 1 from rear valve body — six bolts.

CAUTION:
CAREFULLY REMOVE COVER AND GASKET, SPRINGS LOCATED IN REAR CAN SPRING OUT.

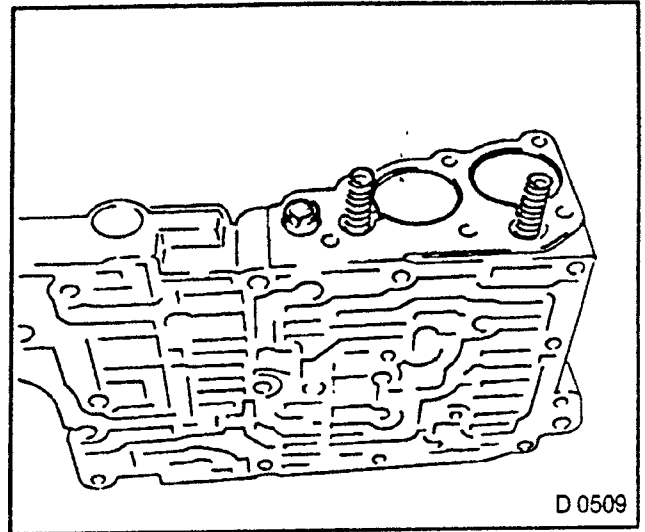


Fig. 472

REMOVE, DISCONNECT

1. Accumulator control valve with spring (1).
2. Accumulator valve B2 with spring (2).
3. Accumulator piston B2 with spring (3).
4. Accumulator piston C2 with spring (4).
5. Accumulator valve C2 with spring (5).
6. Seal rings of accumulator piston B2 and C2 — to clean the ring grooves.

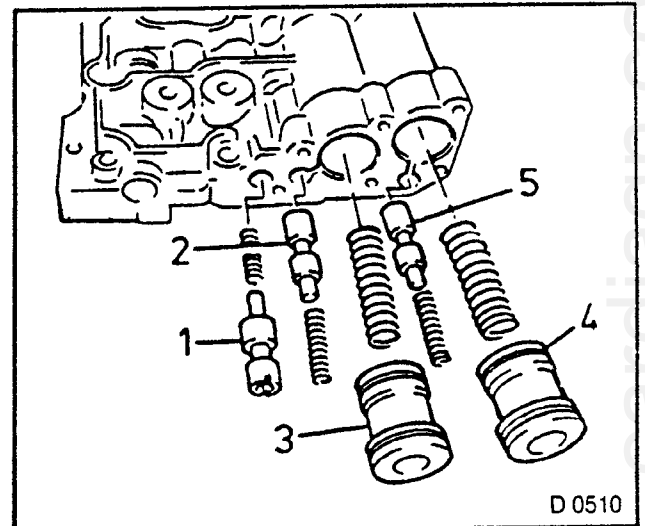


Fig. 473

INSPECT

1. Play — free seating of piston and valves in bores.
2. Springs for rust and deformation.

MEASURE

1. Free lengths and outer diameters of springs (1 to 5).
 Caliper gauge, values in following table:

No	Component.	Free length	Outer diameter:
1.	Acc.-ontrol valve	21.89 mm	6.0 mm
2.	Acc. valve B2	32.77 mm	7.0 mm
3.	Acc piston B2	46.0 mm	11.5 mm
4.	Acc. piston C2	46.0 mm	11.5 mm
5.	Acc. valve C2	32.77 mm	7.0 mm

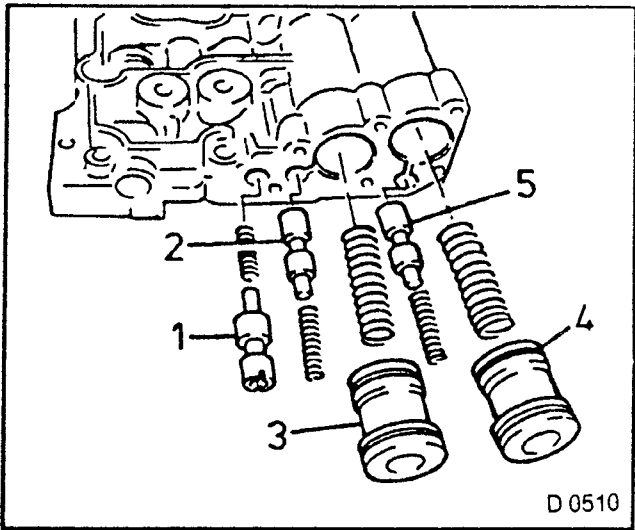


Fig. 474

REMOVE DISCONNECT

- 1. Control valve bridge — same procedure as for secondary control valve.
Remove wedge (1),
Sleeve (2),
Piston (3),
Spring (4),
Control valve (5).

INSPECT

- 1. Seating of valve in bore without play.
- 2. Valve spring for rust and deformation.
- 3. Measure spring, caliper gauge.
Free length: 65.0 mm.
Outer diameter: 9.6 mm.

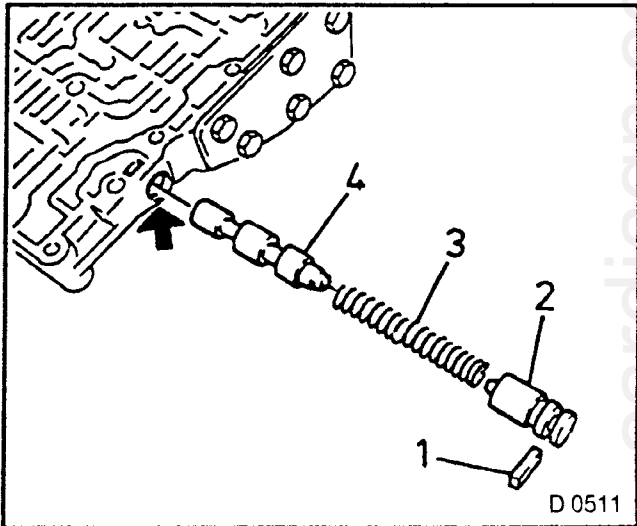


Fig. 475

REMOVE, DISCONNECT

- 1. Cover no. 2 from rear valve body — six bolts.

CAUTION:
CAREFULLY REMOVE COVER,
SPRINGS LOCATED IN REAR CAN
SPRING OUT.

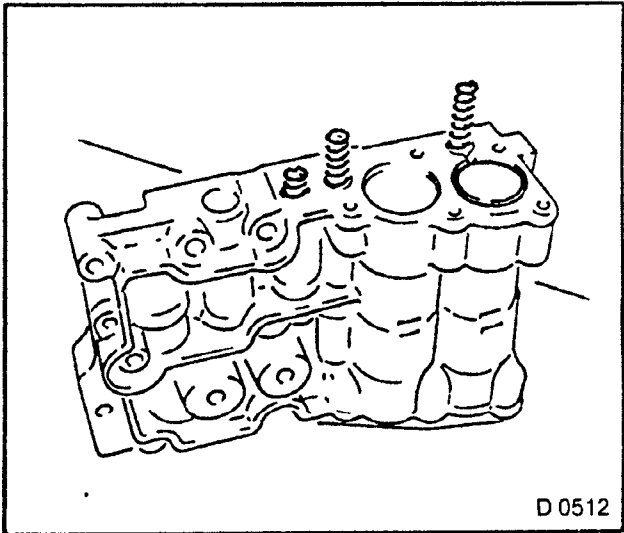


Fig 476

REMOVE, DISCONNECT

- 1. Freewheel modulator valve — with spring (1).
- 2. Modulator valve for clutch with spring (2)
- 3. Accumulator piston C3 with spring (3)
- 4. Accumulator valve C3 with spring (4)
- 5. Hook seal rings from piston C3 — for cleaning ring groove.
- 6. Ring ends are L-shaped.
- 7. Press one ring end in groove
- 8. Hook out the other.
- 9. As cut seal ring without hooks on new transmissions.

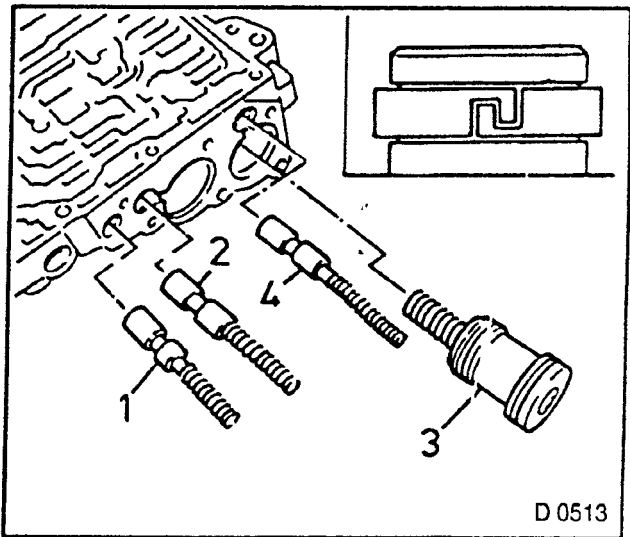


Fig. 477

INSPECT

- 1. Seating of piston and valves in bores without play.
- 2. Springs for rust and deformation.

MEASURE

- 1. Free lengths and outer diameters of springs (1 to 4).
Caliper gauge, values in following table.

No	Component:	Free length	Outer diameter:
1.	Freewheel valve	64.94 mm	9.6 mm
2.	Clutch mod. valve	28.53 mm	8.0 mm
3.	Acc. piston C3	46.0 mm	11.6 mm
4.	Acc. valve C3	30.67 mm	7.0 mm

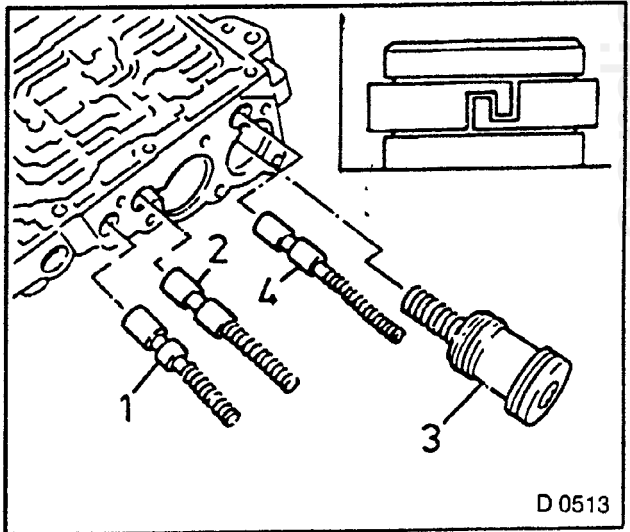


Fig. 478

NOTE:

If springs do not have identical values, or if play between piston/valves and the affected bore is too large, replace valve body (completely).

CLEAN

- 1. Removed parts, ducts and sealing surfaces of rear valve body
- 2. Blow dry and lubricate.

INSTALL, CONNECT

- 1. Secondary control valve — spring (4)
Valve (3).
Plug (2) in bore (arrow).
Insert wedge (1).

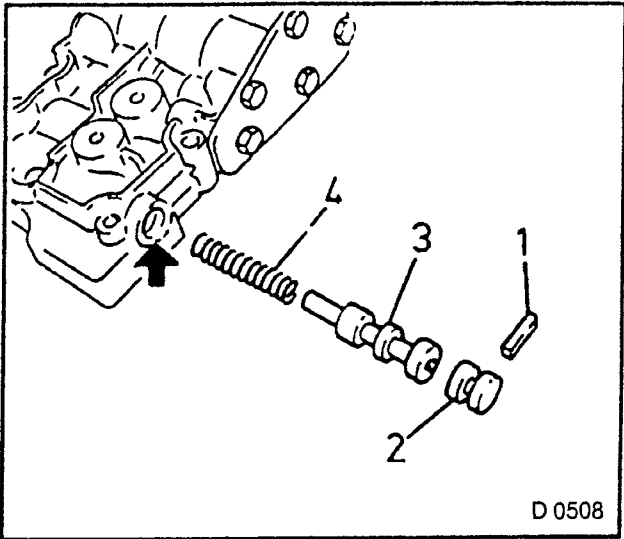


Fig. 479

INSTALL, CONNECT

- 1 Accumulator control valve with spring (1).
- 2 Accumulator valve B2 with spring (2).
- 3 Accumulator piston B2 with spring (3).
- 4 Accumulator piston C2 with spring (4).
- 5 Accumulator valve C2 with spring (5).
- 6 Seal rings on accumulator pistons C2 and B2.

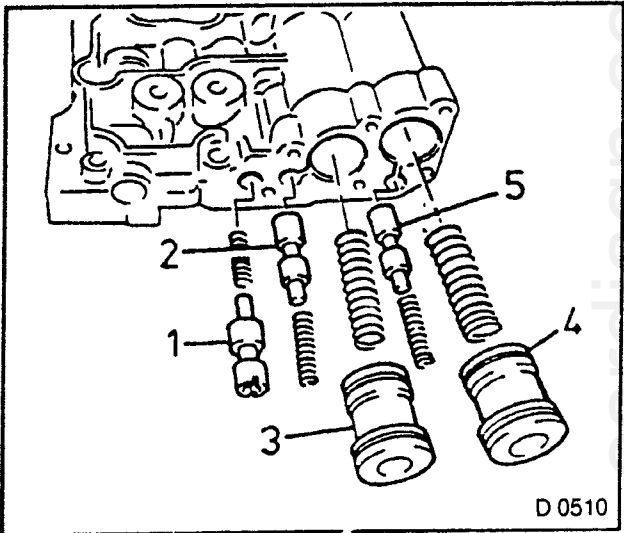


Fig. 480

TIGHTEN (TORQUE)

- 1. Cover no. 1 with new gasket to rear valve body — 7 Nm.
DO NOT bend projecting springs.

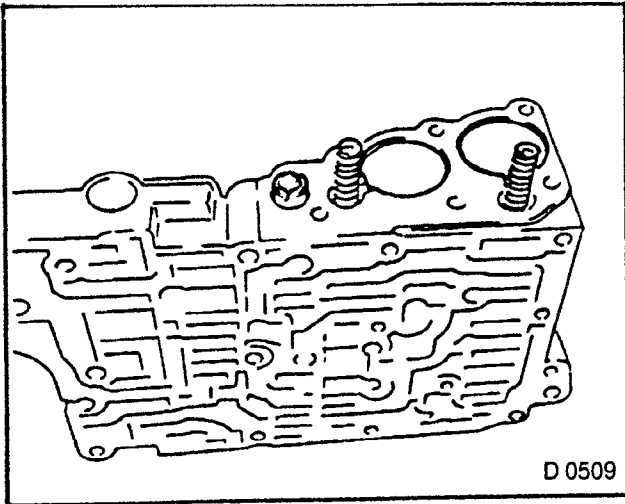


Fig. 481

INSTALL, CONNECT

1. Bridge control valve — valve (4).
Spring (3).
Sleeve (2) in bore (arrow)
Insert wedge (1).

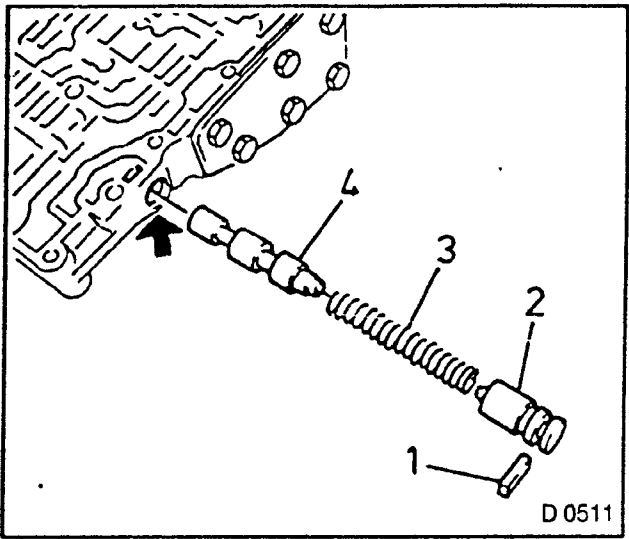


Fig. 482

INSTALL, CONNECT

1. Freewheel modulator valve with spring (1).
2. Modulator valve for clutch with spring (2).
3. Accumulator piston C3 with spring (3).
4. Accumulator valve C3 with spring (4).
5. Seal rings on piston C3 — ring ends are L-shaped.
6. Press one ring end in groove, hook in the other, in doing so, do not overstretch. As cut seal ring without hooks on new transmissions.

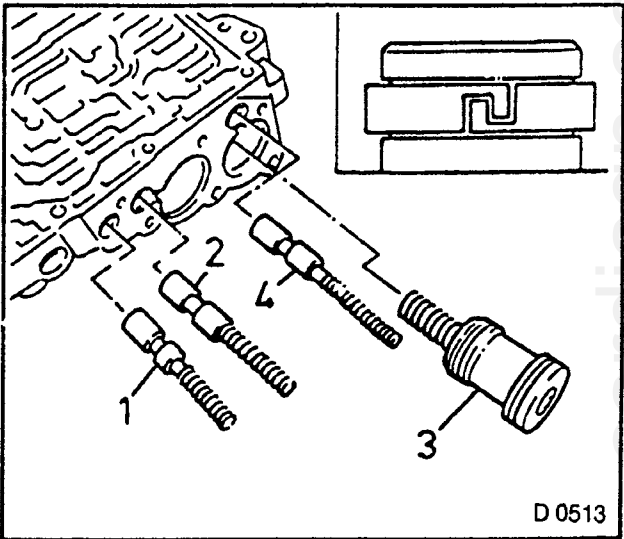


Fig. 483

INSTALL, CONNECT

1. Cover no. 2 with new gasket to rear valve body — 7 Nm.
DO NOT bend projecting springs.

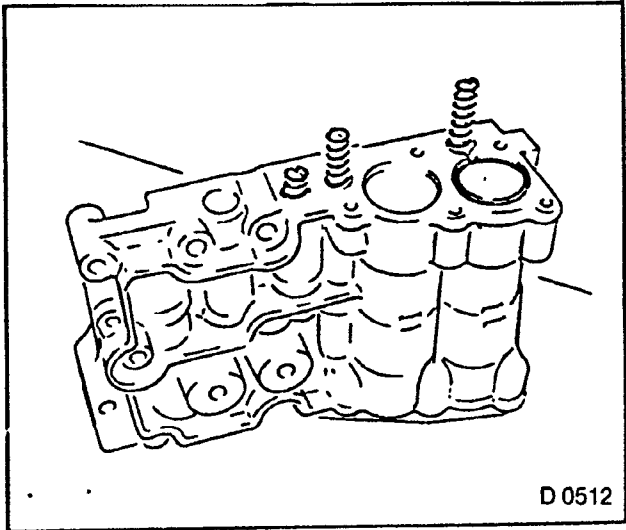


Fig. 484

ASSEMBLE

1. Rear valve body.
2. Check valve with spring (1).
3. Safety valve with spring (2)
4. Three lock balls (3)

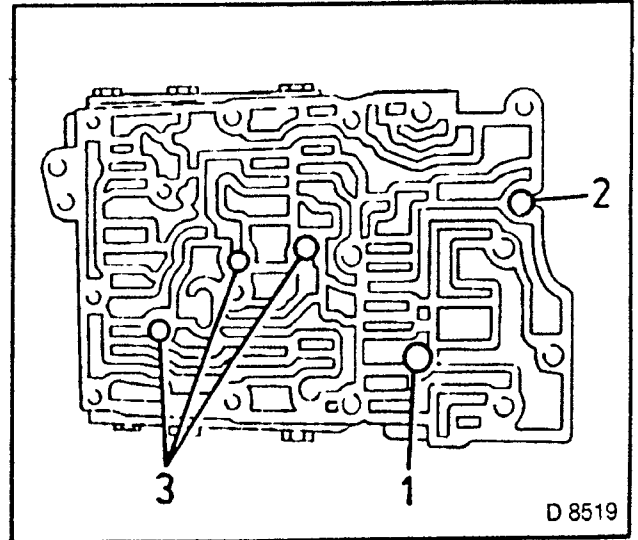


Fig. 485

TIGHTEN (TORQUE)

1. Centre to rear valve body (1) — 7 Nm.

CAUTION

1. Rear valve body is first left lying on underside.
2. Centre valve body with plate and gasket (2) to rear valve body.
3. Keep compressed, so that lock balls and spring-tensioned valves DO NOT fall out.
4. Turn assembly and screw in bolts (1).

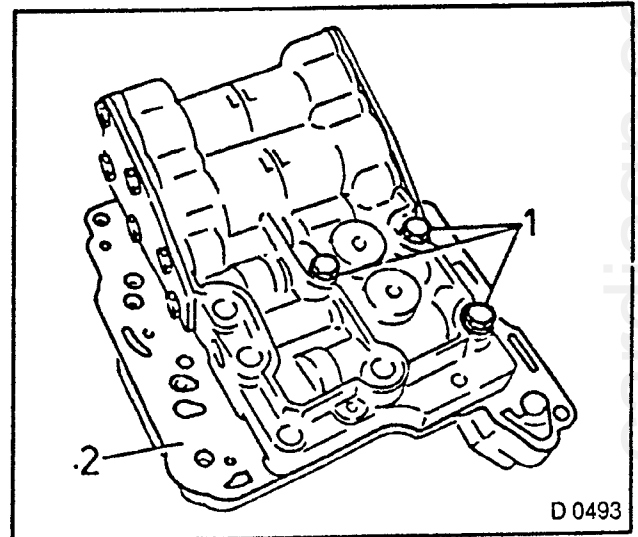


Fig 486

TIGHTEN (TORQUE)

1. Front to centre valve body — 7 Nm.
2. Place plate and new gaskets on top side of centre valve body. Check hole alignment position.
3. Begin with Five bolts (2).
4. Turn assembly and screw in Four bolts (1).

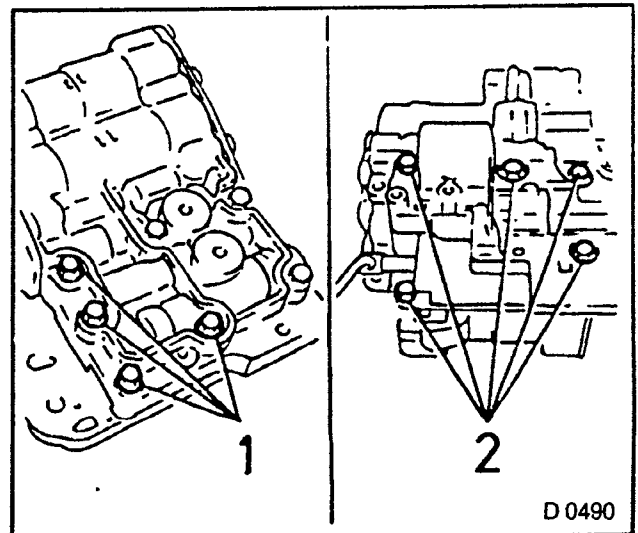


Fig. 487

5. Three solenoid valves (2) with new rubber O-seal rings — 7 Nm.
6. Terminal in groove of fluid pressure regulator (3) — 7 Nm., align valve so that wiring harness plug can be installed.
7. Two cable retainers (1) — align as shown, 7 Nm.

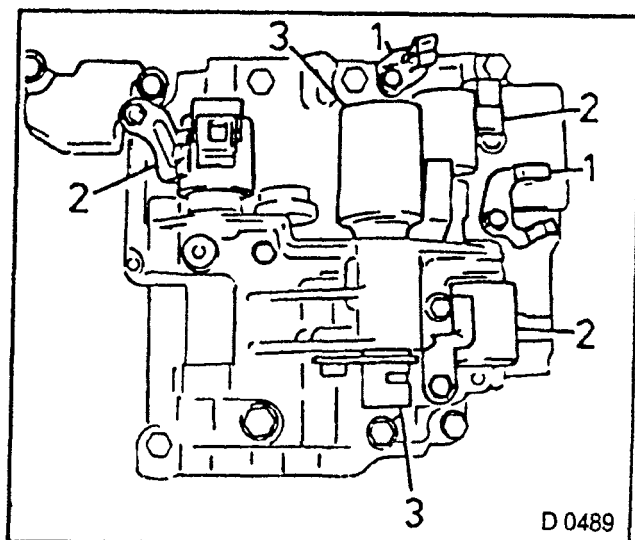


Fig. 488

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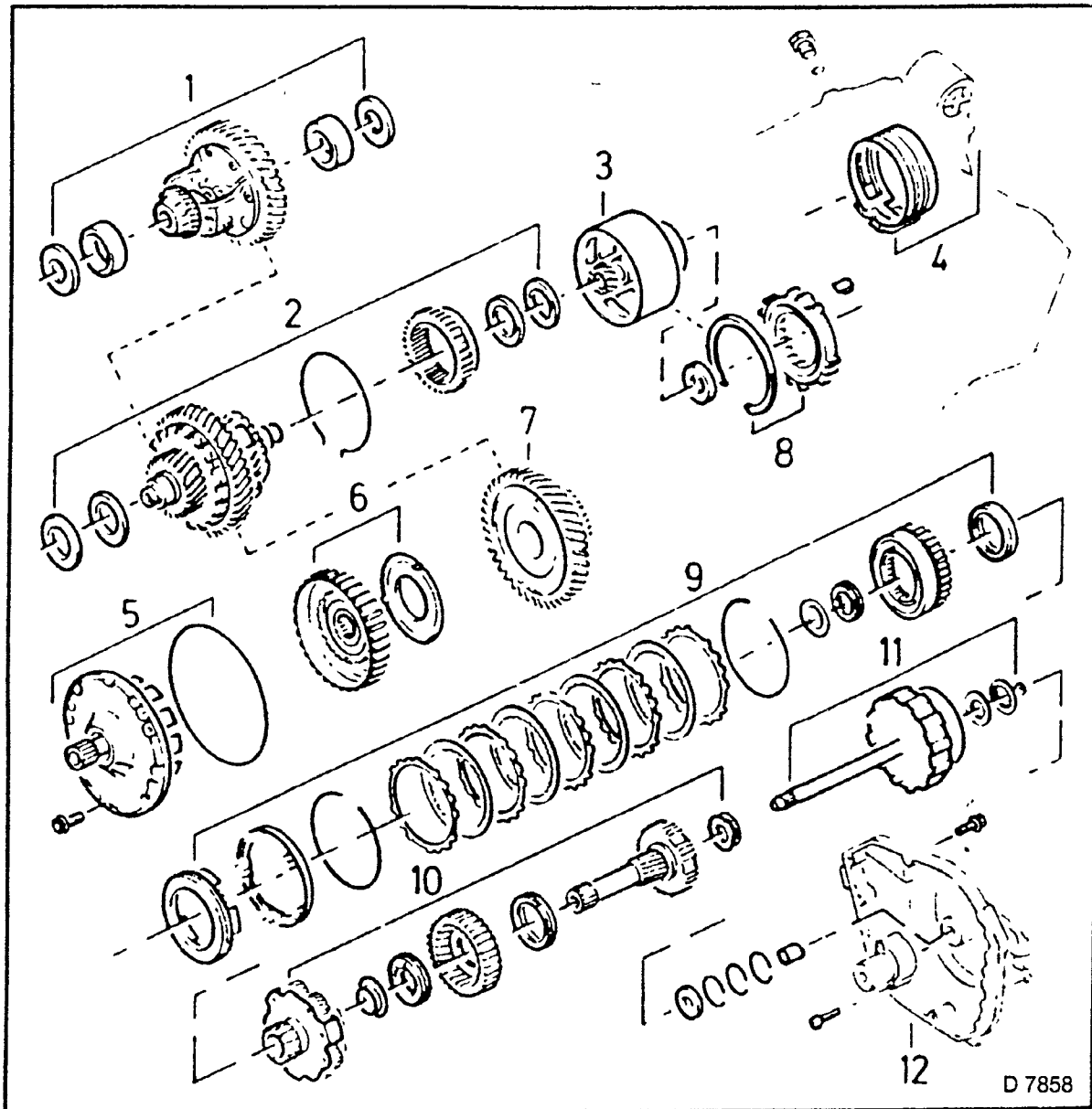
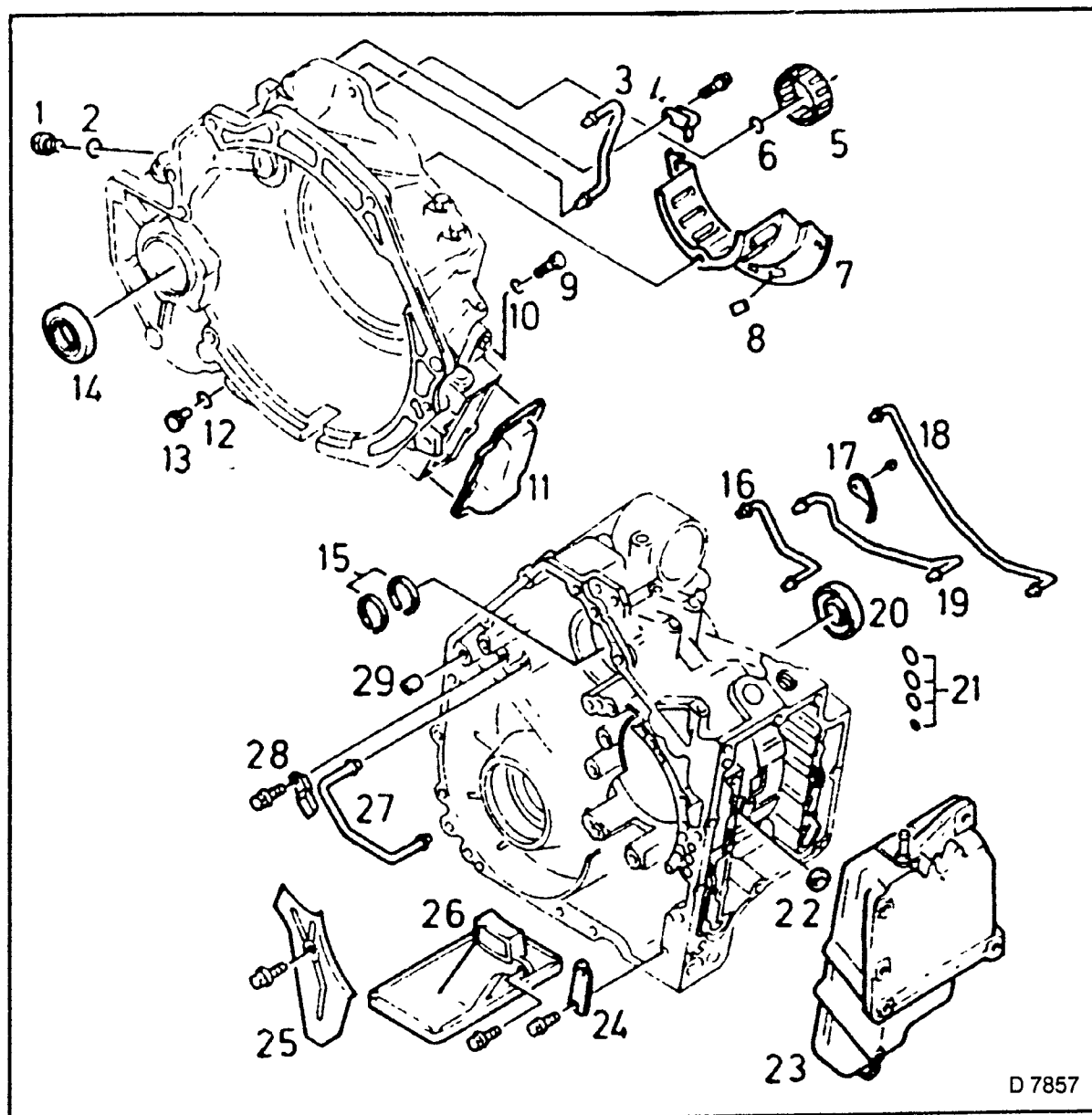


Fig. 489 — AF 20 Assemblies.

- 1 = Differential
- 2 = Planetary gear set P2
- 3 = Multi-plate clutch C3
- 4 = Brake band B4
- 5 = Fluid pump
- 6 = Freewheel F1
- 7 = Intermediate drive gear
- 8 = Freewheel F3
- 9 = Multi-disc brake B3 and freewheel F2
- 10 = Planetary gear set P1
- 11 = Multi-plate clutch C1 and C2, drive shaft assembly
- 12 = Rear cover



D 7857

Fig. 490 — AF 20 Housing Parts

- | | |
|--|--|
| 1 = Plug M 8 | 15 = Hook seal rings |
| 2 = Seal ring | 16 = Main pressure pipe no. 1 |
| 3 = Lubricating fluid line | 17 = Pipe clamp |
| 4 = Pipe clamp | 18 = Actuation pipe |
| 5 = Roller bearing | 19 = Lubricating pipe |
| 6 = Seal ring | 20 = Axle shaft seal ring |
| 7 = Fluid retaining plate, auxiliary housing | 21 = Gaskets for governor |
| 8 = Magnets (3) | 22 = Gaskets for actuators (2) |
| 9 = Plug M 8 | 23 = Side cover |
| 10 = Seal ring | 24 = Main housing plate |
| 11 = Auxiliary housing cover | 25 = Fluid retaining plate, main housing |
| 12 = Seal ring | 26 = Fluid filter |
| 13 = Drain bolt | 27 = Main pressure pipe no. 2 |
| 14 = Axle shaft seal ring | 28 = Pipe clamp |
| | 29 = Seal ring |

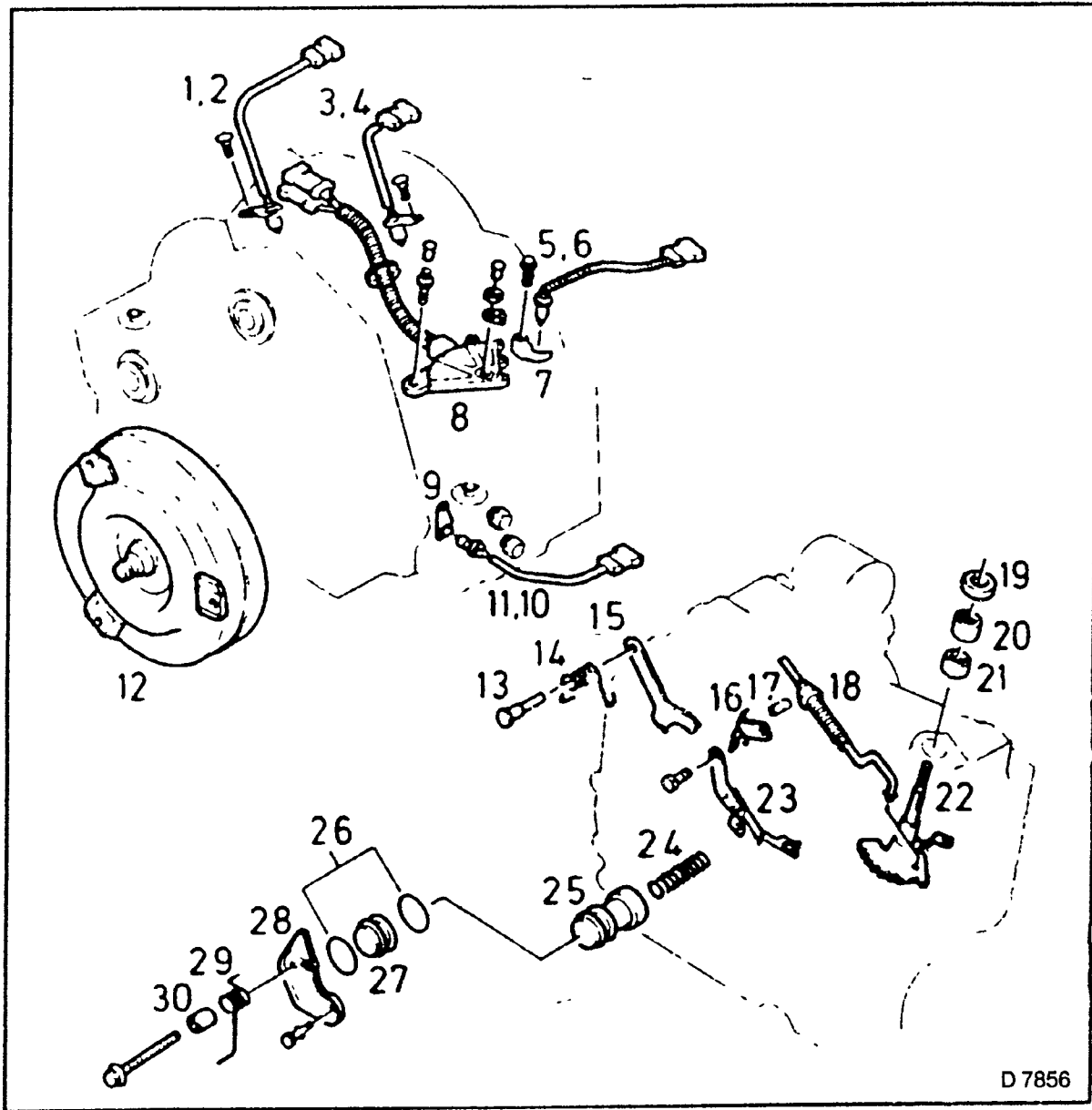


Fig. 491 — AF 20 Attaching Parts.

- | | |
|--|-------------------------------------|
| 1 = Sensor, transmission output speed | 17 = Pin for parking pawl |
| 2 = Seal ring | 18 = Actuation rod for parking pawl |
| 3 = Sensor, transmission input speed | 19 = Seal ring |
| 4 = Seal ring | 20*) = Outer needle bearing |
| 5 = Solenoid valve wiring harness | 21*) = Inner needle bearing |
| 6 = Seal ring | 22 = Ratchet |
| 7 = Retaining plate | 23 = Detent spring |
| 8 = Selector lever position switch | 24 = Pressure spring |
| 9 = Cover plate for fluid temperature sensor | 25 = Accumulator piston |
| 10 = Seal ring | 26 = Seal rings |
| 11 = Fluid temperature sensor | 27 = Cover for accumulator |
| 12 = Converter | 28 = Bracket for accumulator |
| 13 = Axle for parking pawl | 29 = Torsion spring no. 2 |
| 14 = Torsion spring no. 1 | 30 = Sleeve for spring guide. |
| 15 = Pawl for parking pawl | |
| 16 = Cam plate | |

*) Single-part version on newer transmissions.

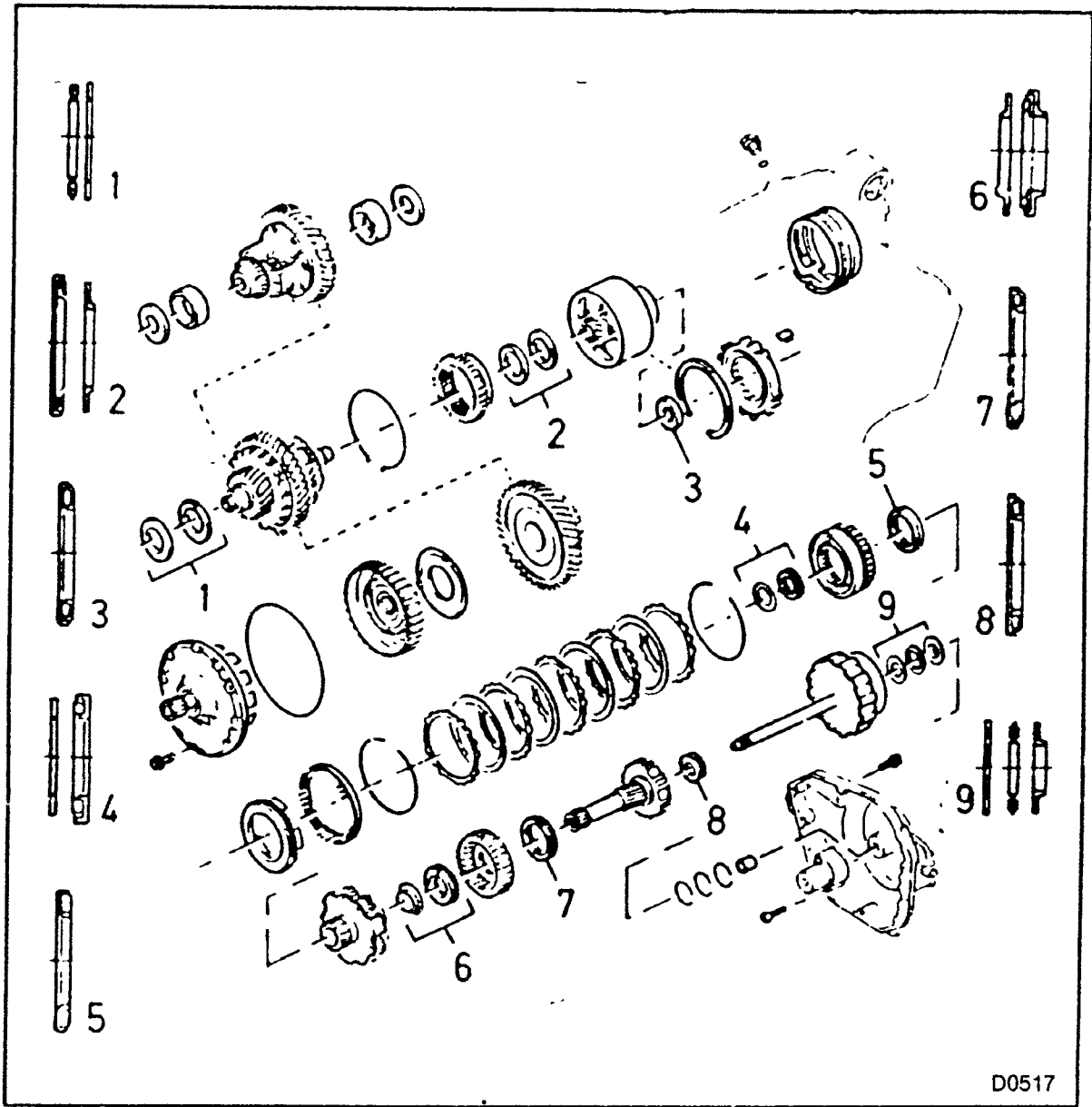


Fig. 492 — AF 20 Thrust Bearing Installation.

	Outer O	Inner O		Outer O	Inner O
1 = Thrust bearing	71.0 mm	49.0 mm	7 = Thrust bearing	67.0 mm	50.0 mm
Race assembly			8 = Thrust bearing	42.0 mm	22.1 mm
(rear)	71.0 mm	49.1 mm	9 = Race assembly		
2 = Thrust bearing	41.8 mm	28.6 mm	(front)	41.0 mm	15.3 mm
Race assembly			Thrust bearing	41.7 mm	23.0 mm
(rear)	42.1 mm	29.1 mm	Race assembly		
3 = Thrust bearing	57.3 mm	36.3 mm	(rear)	41.0 mm	13.5 mm
4 = Race assembly			(front)/(rear): viewed from converter,		
(front)	58.0 mm	43.8 mm	arranged in front of or behind thrust bearing.		
Thrust bearing	61.7 mm	46.0 mm			
5 = Thrust bearing	88.7 mm	72.4 mm			
6 = Race assembly					
(front)	54.0 mm	39.0 mm			
Thrust bearing	57.0 mm	39.0 mm			

Assemblies, Install in Transmission

CLEAN

All sealing surfaces of auxiliary and main housing as well as rear cover.

ASSEMBLE

1. Auxiliary housing.
2. Hook seal ring on journal in housing (3).
3. Ring ends are L-shaped. Press one ring end in groove, hook out the other.
4. As cut seal ring without hooks on new transmission

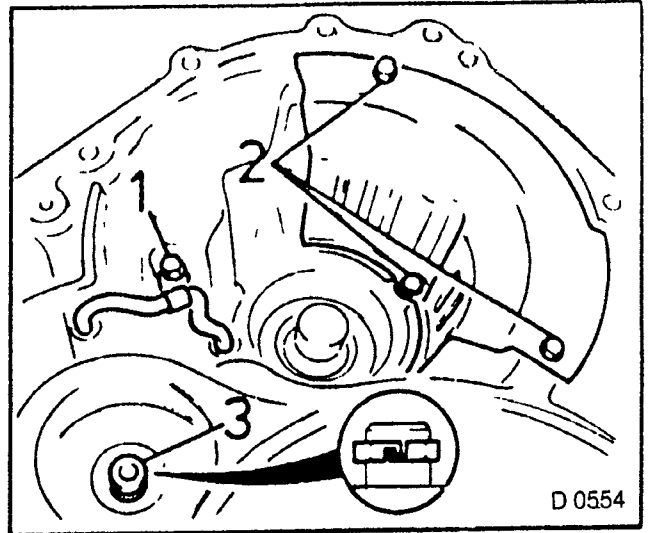


Fig 493

TIGHTEN (TORQUE)

1. Fluid retaining plate — 6 Nm. Three bolts (Fig. 493, Item 2). Three magnets (attach to underside of fluid retaining plate).
2. Pipe clamp to fluid line (Fig. 493, Item 1) — 6 Nm.
Press in line using plastic hammer. Do not damage.

INSTALL, CONNECT

1. New gasket for actuation in bore on main housing (arrow) — on the housing sealing surface, located next to the differential.

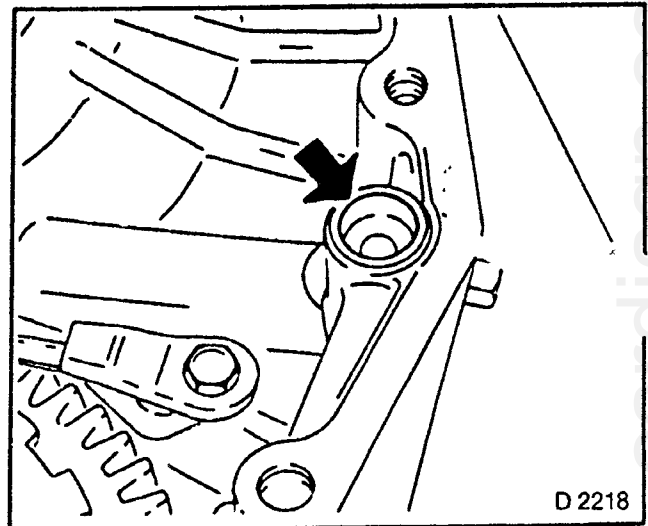


Fig. 494

INSTALL, CONNECT

1. Needle bearing for reduction clutch.
Drive in with KM-711-3 (1) and KM-674 (2) until tool comes to stop at main housing.

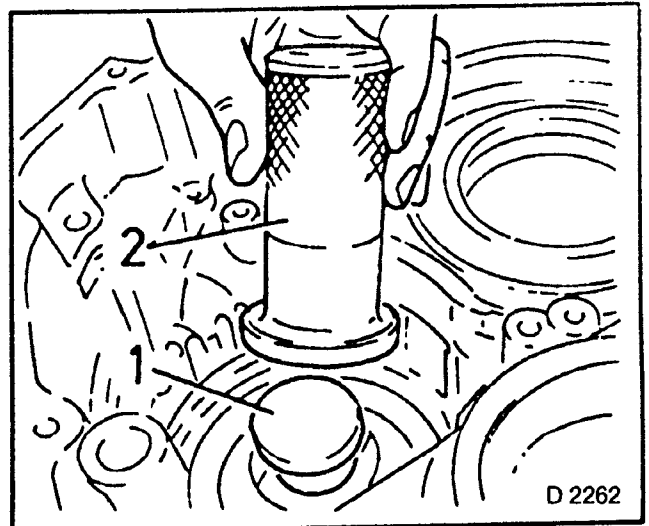


Fig. 495

2. Needle bearing for manual selector valve lever (Two pieces).
3. Place inner bearing (1) on KM-711-1 (3) and drive in as far as possible.
4. Place outer bearing (2) on KM-711-1 and drive in with inner bearing as far as possible.
5. Single-part version on new transmission — interchangeable with the previous version
6. Seal ring for shaft of toothed segment in main housing.
7. Closed side points outwards, drive in up to shoulder using suitable drift.

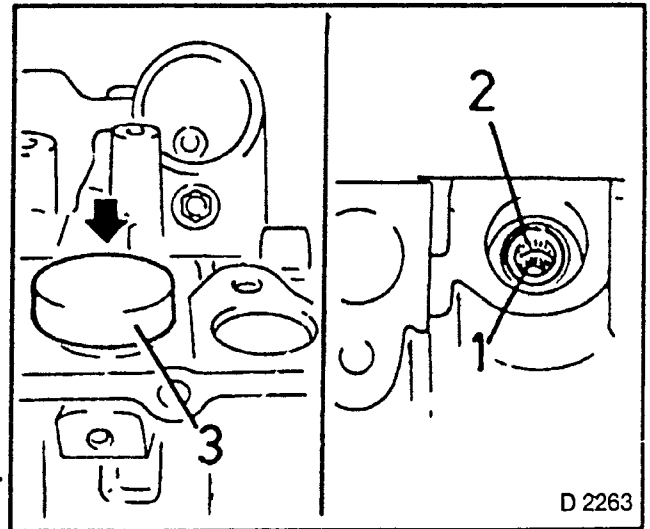


Fig. 496

INSTALL, CONNECT

1. Roller bearing in auxiliary housing — KM-629-1.

MEASURE

1. Installation depth of roller bearing in auxiliary housing — e.g. with steel ruler and feeler gauge. ↑
2. Press in until the upper edge of bearing protrudes 0.7 to 1.3 mm over the upper edge of housing.

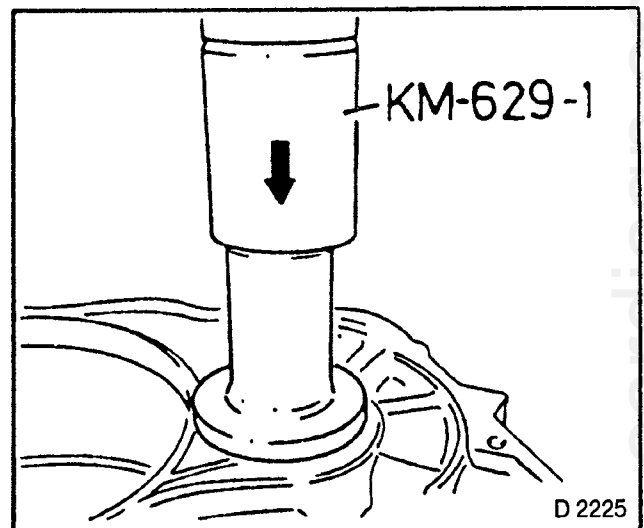


Fig. 497

ASSEMBLE

1. Main housing.
2. Accumulator piston (6) with cover (5) and spring (4) in main housing — Fig. 498B.
3. Renew rubber O-seal rings on cover and piston.

TIGHTEN (TORQUE)

1. Accumulator cover for reduction brake — Fig. 498A — 10 Nm.
One Torx bolt (1).
One bolt (2) with torsion spring no. 2 (3).
2. Snap in short leg of spring in accumulator cover.

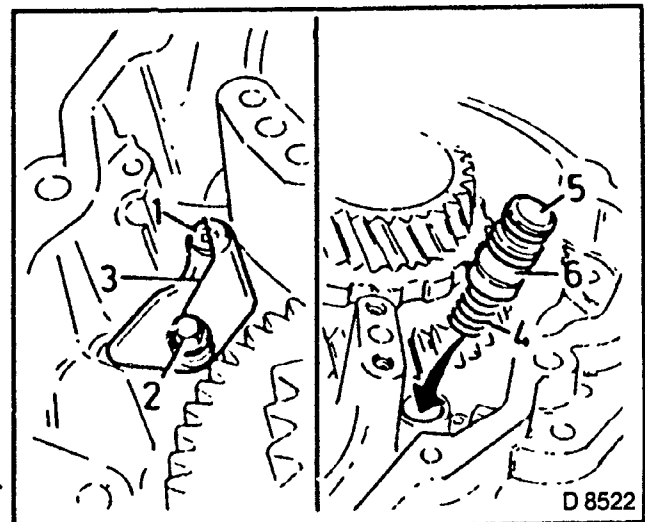


Fig. 498A

Fig. 498B

If the main housing was not renewed, some of the following parts are already installed.

INSTALL, CONNECT

1. Two hook seal rings on journal in main housing — ring ends are L-shaped.
 2. Press one ring end in groove.
 3. Hook in the other.
- DO NOT** expand more than necessary.

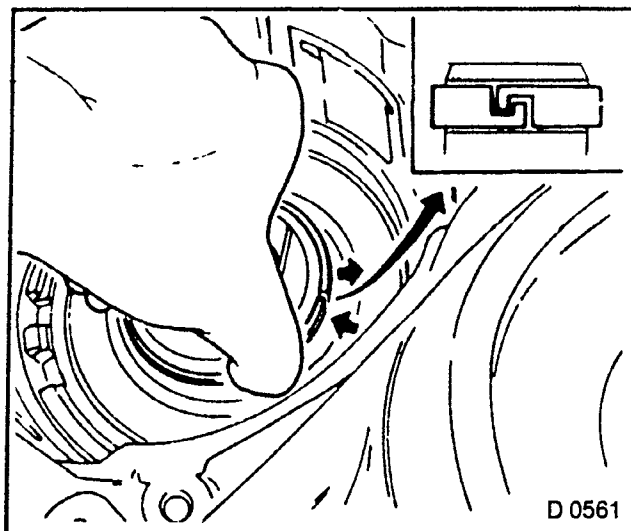


Fig. 499

2. Freewheel F3 (2).
When removing, applied marking upwards, align lug with recesses.
3. Insert retaining ring (1).

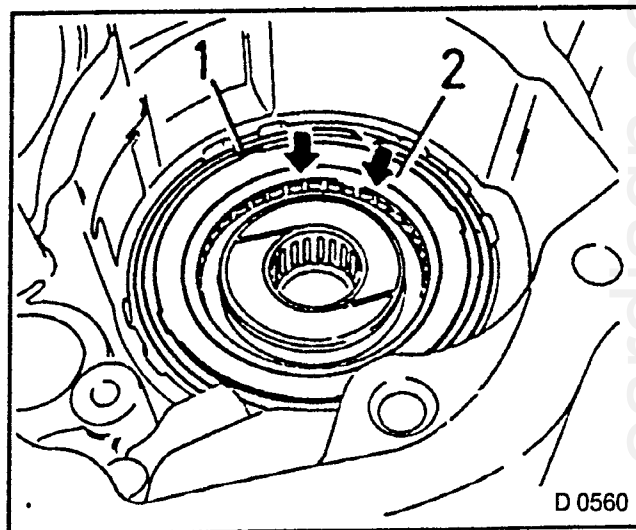


Fig. 500

INSTALL, CONNECT

1. Piston for brake band B4 in main housing — insert piston with pressure spring and cover (1) in transmission.
2. Compress and install retaining ring (2).

NOTE:
POSSIBLY RESISTANT, COVER IS SPRING-TENSIONED.

INSPECT

1. Correct seating of retaining ring in groove.

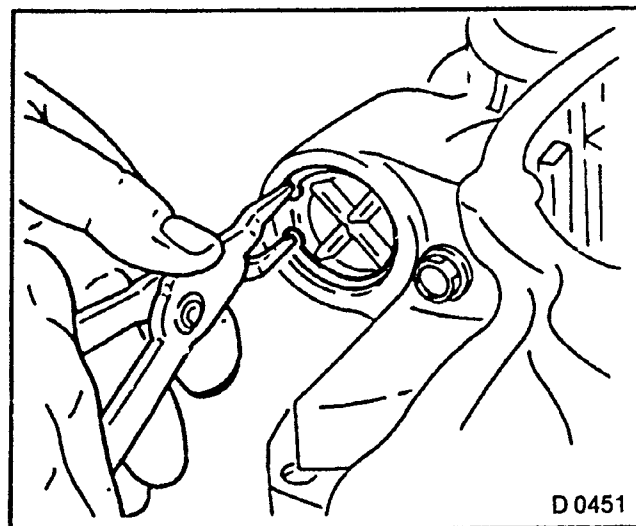


Fig. 501

INSTALL, CONNECT

- 1. Thrust bearing (2) to journal in main housing; if necessary stick on.
- 2. Align brake band B4 (3) with mount for anchor bolt (4) (protrudes from outside through housing).
Place actuation centrally before piston rod (Fig. 504, Item 2).
- 3. Clutch body (1) — turn counter-clockwise and insert.

INSPECT

- 1. Turn at clutch body,
Freewheel must lock clockwise.

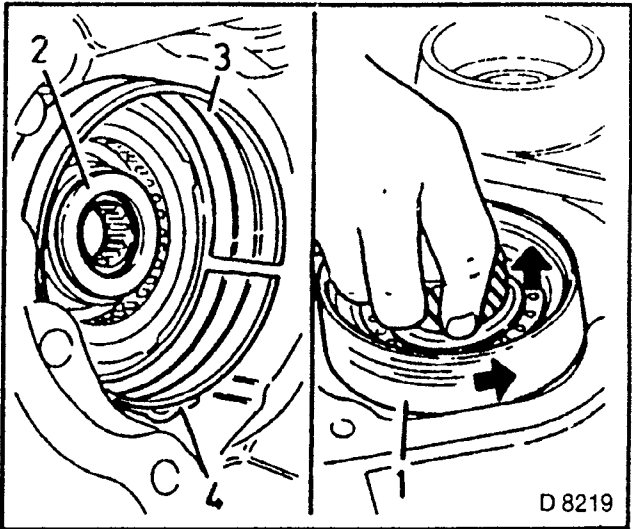


Fig. 502

MEASURE

- 1 When correctly installed, dimension 1 — upper edge of clutch body to upper edge of main housing: 78.0 to 78.5 mm

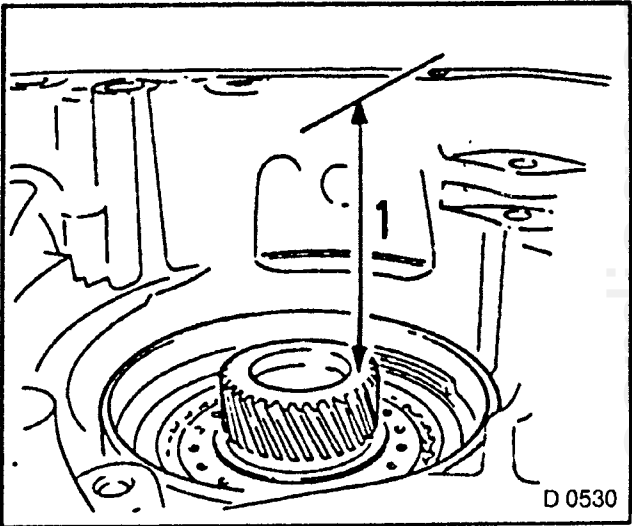


Fig. 503

TIGHTEN (TORQUE)

- 1. Anchor bolt (1) to main housing — 170 Nm.
Note correct seating on brake band.

NOTE:
ACTUATION OF BRAKE BAND (2)
MUST BE SEATED CENTRED IN
FRONT OF THE PISTON ROD.

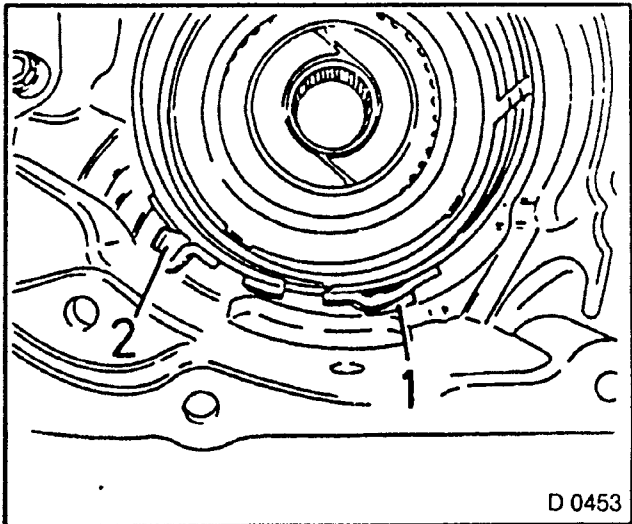


Fig. 504

INSTALL, CONNECT

- 1. Intermediate drive gear in main housing.
- 2. Insert component from converter side (arrow).
- 3. Insert retaining ring.

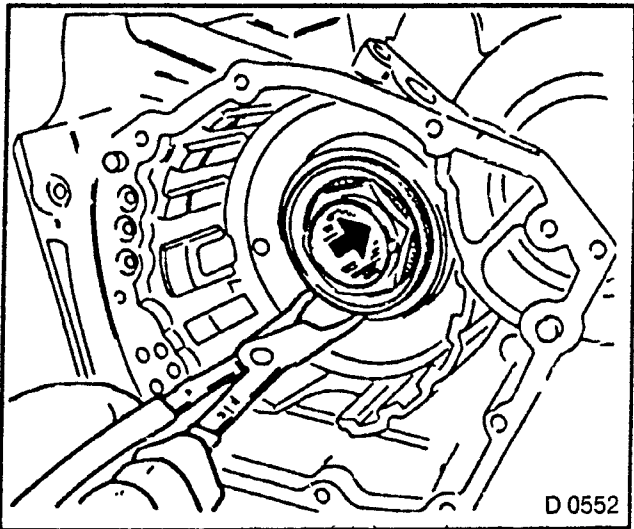


Fig. 505

- 4. Stick thrust bearing and race assembly (2) into internal gear. Arrangement and installation direction according to Fig. 492.
- 5. Planetary gear set P2 (1). Align plates of multi-plate clutch C3 with screwdriver and thread in planetary gear set P2.

INSPECT

- 1. Correct turnability of intermediate drive gear and drive gear (driving) — splines of both align when correctly installed.

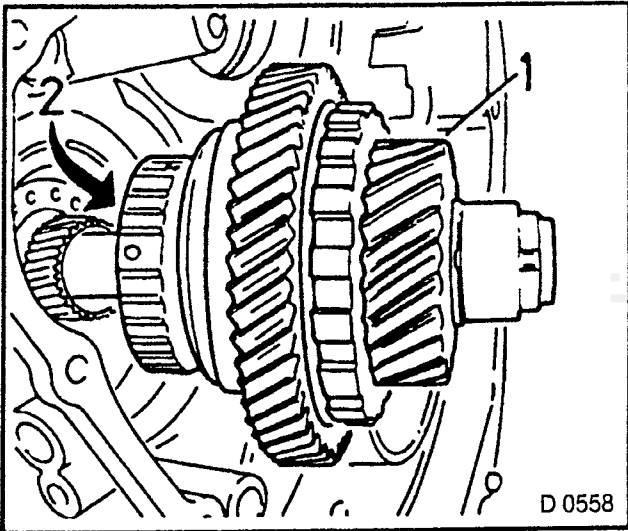


Fig. 506

TIGHTEN (TORQUE)

- 1. Pipe main pressure no. 2 (2) — press in line with plastic hammer. **DO NOT** damage. Tighten pipe clamp — 7 Nm.
- 2. Fluid retaining plate (1) to main housing (next to planetary gear set P2) — 7 Nm.

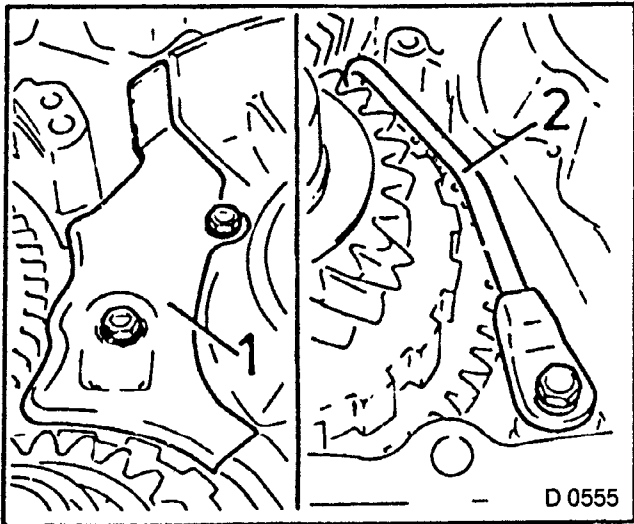


Fig. 507

INSTALL, CONNECT

1. Parking pawl assembly
2. Slide in pin for parking pawl (1) at main housing — up to stop.

TIGHTEN (TORQUE)

1. Cam plate (2) and lock spring (3) to main housing (arrows) — 10 Nm.
Guide end of lock spring through opening in main housing to installation position of ratchet.
Initially tighten only one bolt, so that ratchet can be mounted.

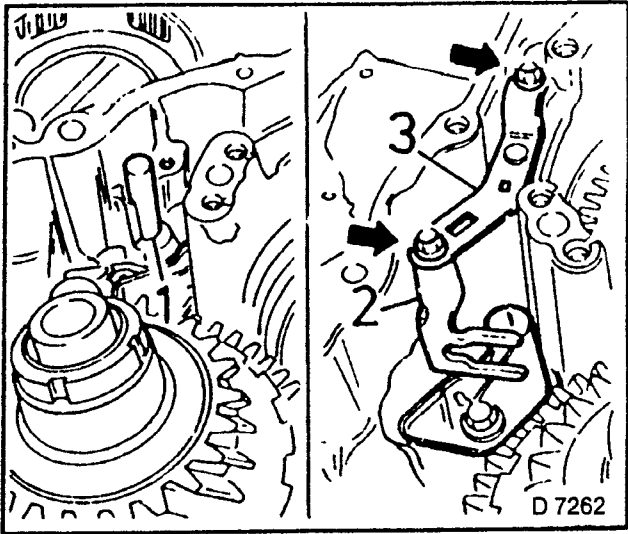


Fig. 508

INSTALL, CONNECT

1. Pawl for parking pawl (1) at mount in main housing as well as at cam plate and torsion spring no. 2 (2)
2. Axle for parking pawl and spring no. 1 (3) from above in mount in main housing. Short spring end to housing inner wall, long spring end to pawl for parking pawl (1).
Spring no. 1 keeps pawl away from parking lock wheel.

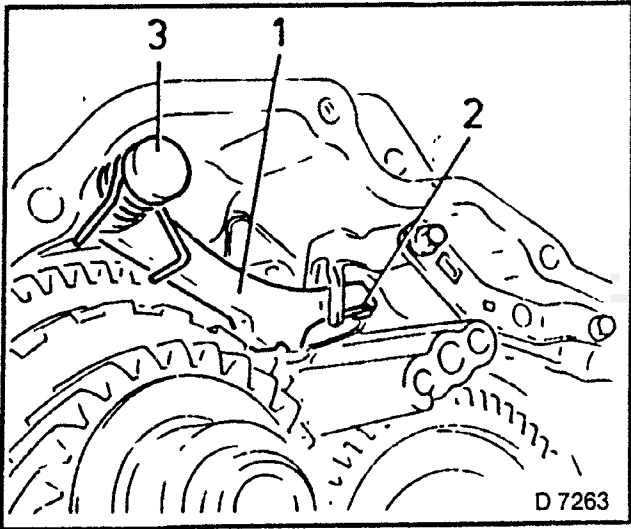


Fig. 509

INSTALL, CONNECT

1. Guide actuation rod for parking pawl (1) through opening in main housing to parking pawl assembly.
Angular end is guided through between ratchet (Fig. 511, Item 2) and housing wall.
2. Insert the shouldered end of the actuation rod between the cam plate (2) and pawl (3).

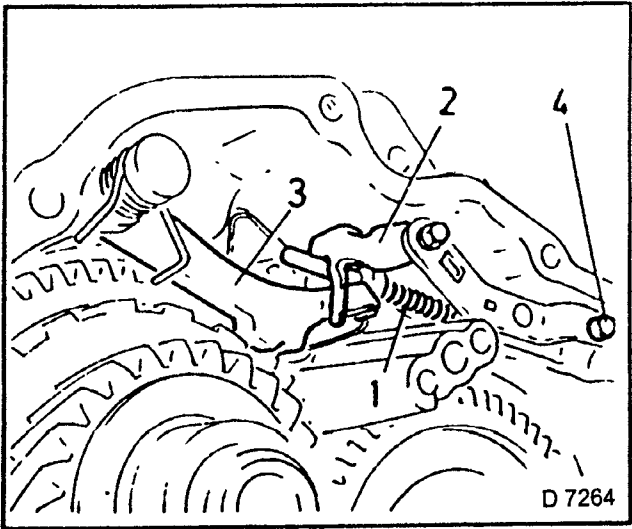


Fig. 510

3. Drive in new seal ring (1) with suitable sleeve.
4. Ratchet (2) at main housing.
5. Insert actuation rod (3) in ratchet (2).
Align lugs at the rod and recesses at the ratchet by turning ratchet.

TIGHTEN (TORQUE)

1. Lock spring to main housing (Fig. 510, Item 4).
Tighten the second bolt — 10 Nm.
2. Lock spring (4) must actuate ratchet (2) at the centre.

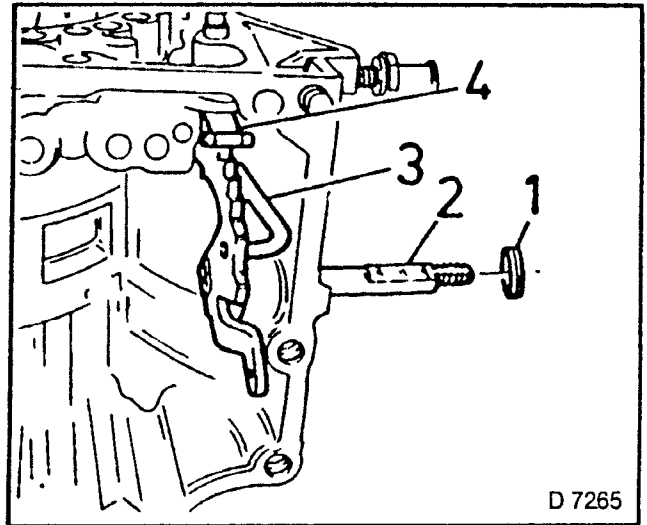


Fig. 511

3. Lock main housing horizontally to bracket.

INSTALL, CONNECT

1. Differential in main housing (Fig. 513, Item 2).
Observe centering pin (arrow) (Fig. 512).

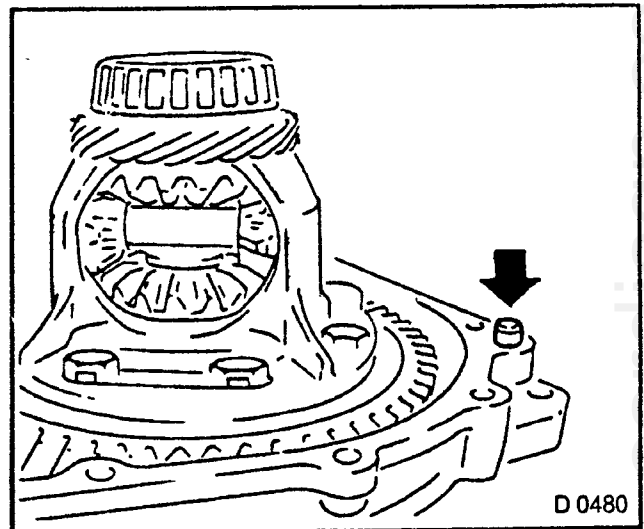


Fig. 512

TIGHTEN (TORQUE)

1. Plate of main housing (4) — 7 Nm, two bolts.
2. Fluid screen (3) — 7 Nm, one bolt.
3. Coat sealing surface with Sealing Compound (Locktite 242).
4. Auxiliary housing to main housing, fifteen bolts (1) — 30 Nm.

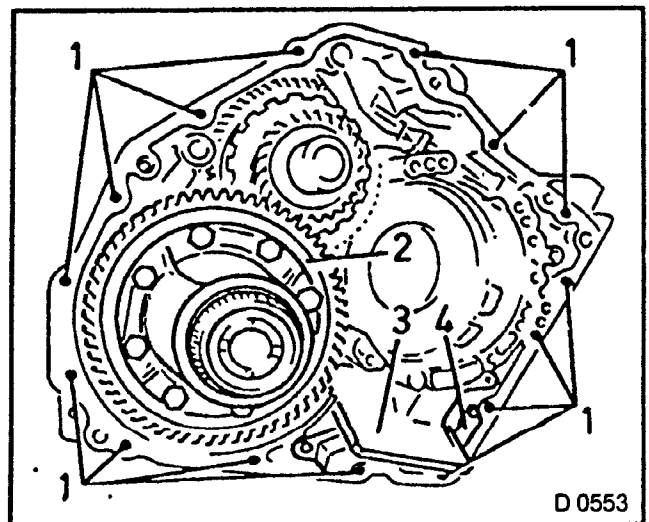


Fig. 513

TIGHTEN (TORQUE)

1. Drain plug (1) — 35 Nm.
Clean magnetic surfaces.
Use new gasket.

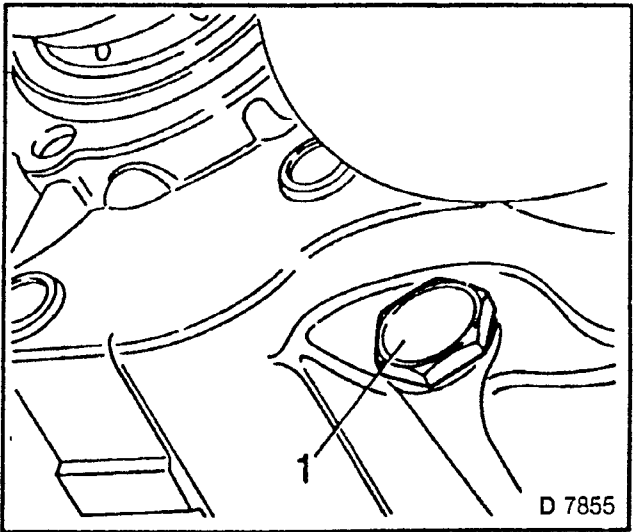


Fig 514

INSTALL, CONNECT

1. Piston of multi-disc brake B3 in transmission.
2. Press in piston with new rubber O-seal rings on intermediate drive gear nut side.
3. Spring mount points upwards.

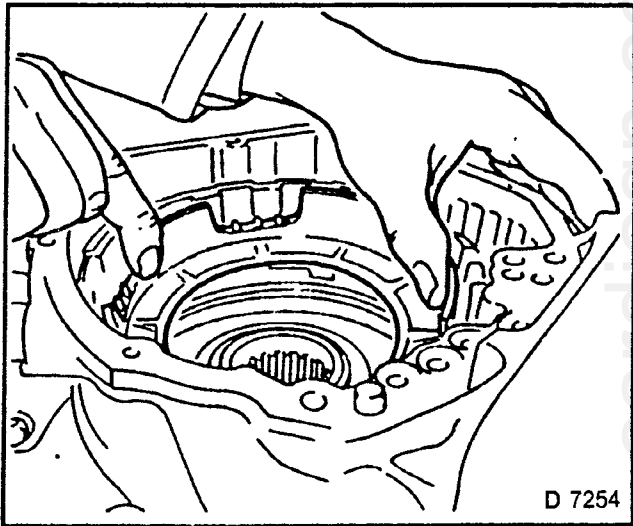


Fig. 515

INSTALL, CONNECT

1. Return spring assembly (1) on piston B3.
2. Insert in spring mount.
3. Insert retaining ring.

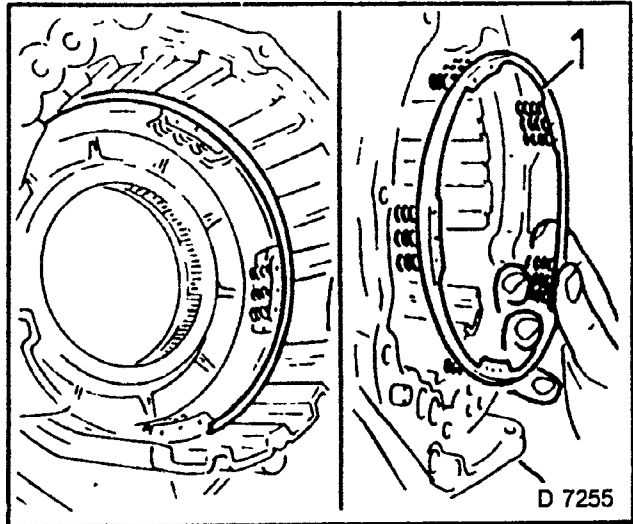


Fig. 516

INSTALL, CONNECT

1. Front internal gear assembly (with freewheel F2) through aperture for rear cover in transmission.
2. Stick thrust bearing and race assembly to underside (arrangement and installation direction according to Fig. 492).

INSPECT

1. Front internal gear must be turnable counter-clockwise.

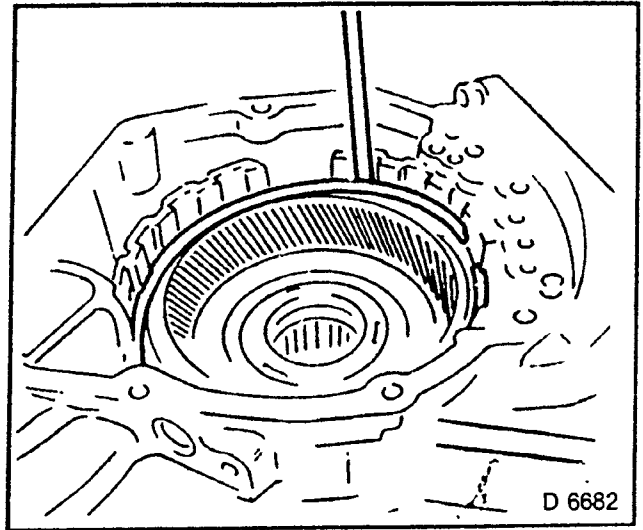


Fig. 517

INSTALL, CONNECT

1. Plate packet B3 in transmission.
2. Alternately steel plates (Five pieces). Lining plates (Five pieces). Lastly, flange.
3. Align lugs of steel plates with recesses in transmission.
4. Insert retaining ring.

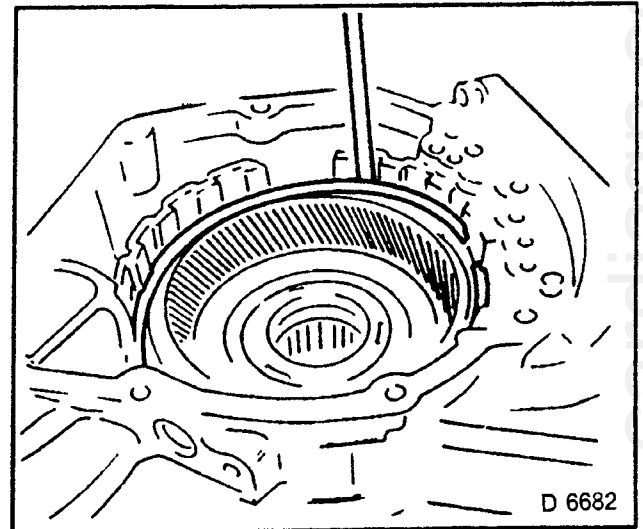


Fig. 518

MEASURE

1. Piston stroke of multi-disc brake B3 — with gauge.
2. Place probe on piston floor. Blow in compressed air (4 bar, arrow), value 1.75 to 2.55 mm.
3. Play between piston and plate packet — with feeler gauge. Measurement value: 0.61 to 1.89 mm.

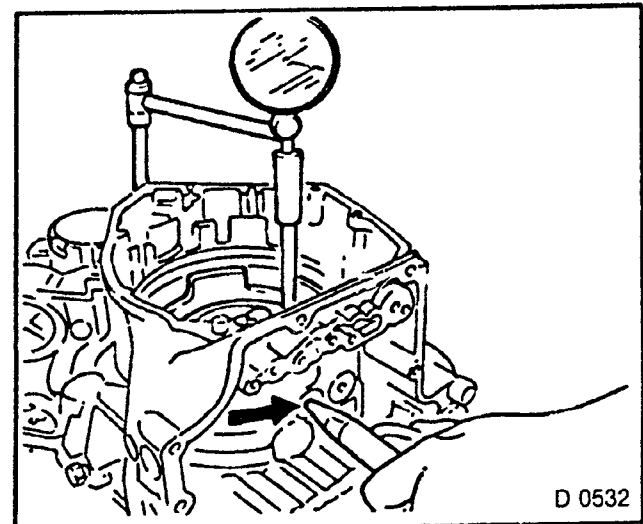


Fig. 519

INSTALL, CONNECT

1. Planetary gear set P1 in transmission — Insert through aperture for rear cover in front internal gear.
2. Stick thrust bearing to underside of planetary gear set P1.
Arrangement and installation direction according to Fig. 492.
Correctly thread planetary gears.

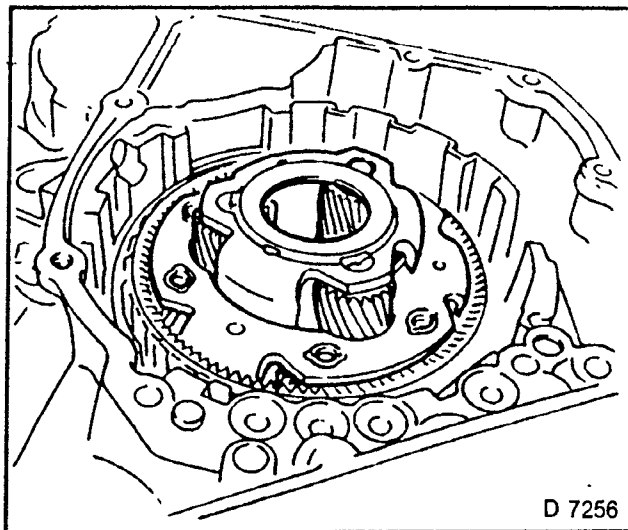


Fig. 520

3. Rear internal gear on planetary gear set P1.
4. Stick thrust bearing to underside of rear internal gear.
Arrangement and installation direction according to Fig. 492.

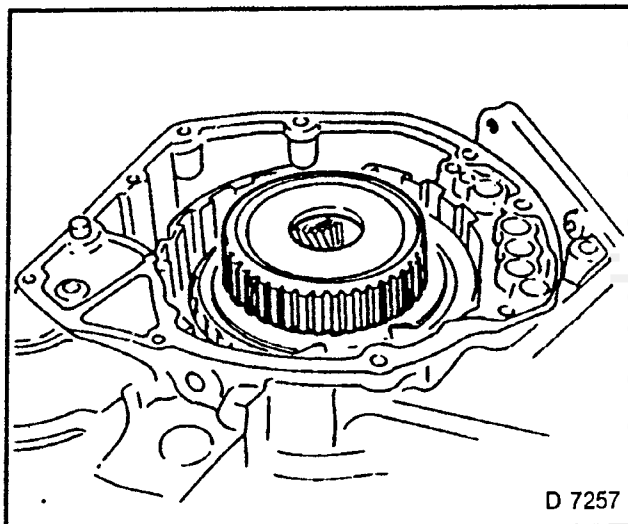


Fig 521

INSTALL, CONNECT

1. Sun gear to planetary gear set P1.
2. Stick thrust bearing to underside of sun gear.
Arrangement and installation direction according to Fig. 492.
3. Insert sun gear in planetary gear set P1.

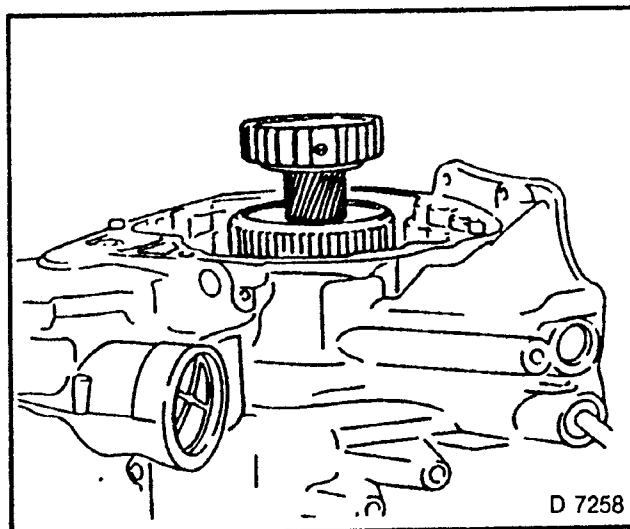


Fig. 522

MEASURE

- 1. When installed correctly, dimension (1) — sun gear inner surface to main housing upper edge — values 31.0 to 32.0 mm.

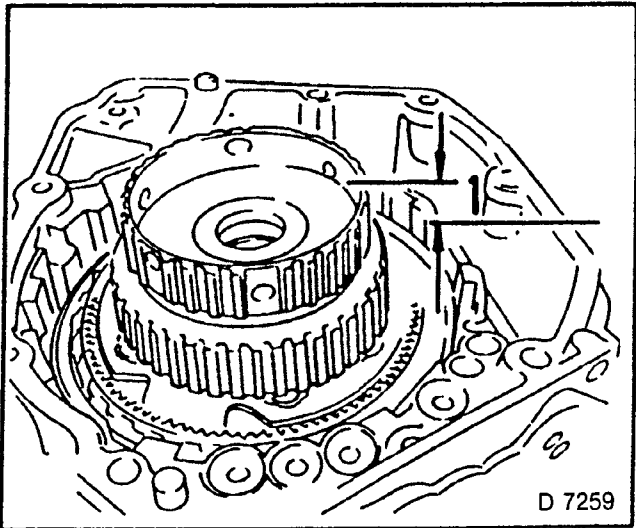


Fig. 523

INSTALL, CONNECT

- 1. Drive shaft assembly (with multi-plate clutch C1 and C2) in transmission.
- 2. Align lining plates C1 and C2 with screwdriver and thread in sun gear or rear internal gear.

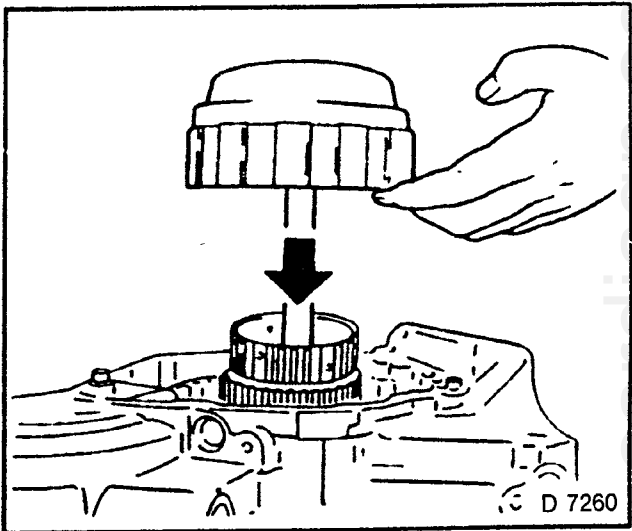


Fig. 524

MEASURE

- 1. When installed correctly, dimension (1) — drive shaft upper edge to main housing upper edge — value 51.3 to 52.3 mm.

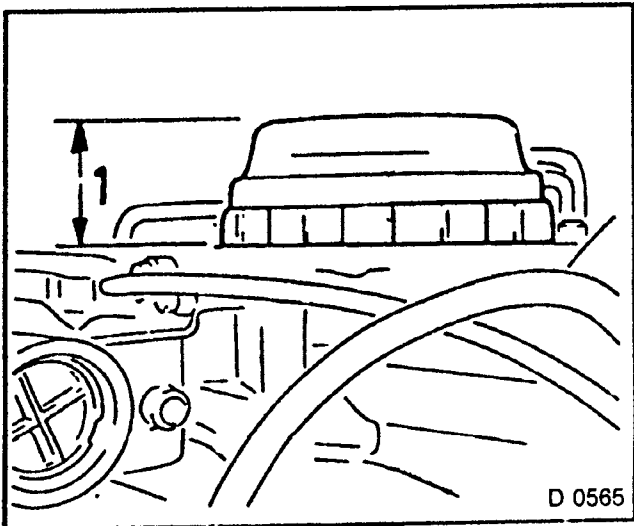


Fig. 525

INSTALL, CONNECT

1. Three actuation pipe lines in transmission.
2. Drive in affected bores in aperture for rear cover with plastic hammer. Do not damage.

TIGHTEN (TORQUE)

1. Pipe clamp to transmission — 7 Nm.

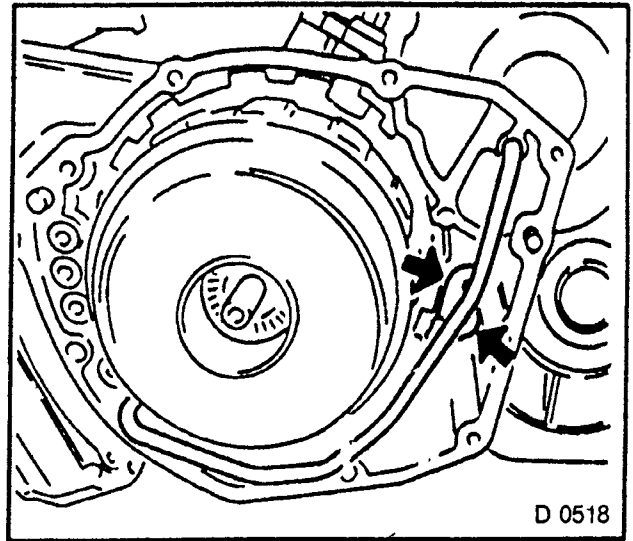


Fig. 526

D 0518

INSTALL, CONNECT

1. Cement four gaskets for fluid circuit regulator to transmission (Fig. 527B) — in the bore holes at the sealing surface for the rear cover.

TIGHTEN (TORQUE)

1. Rear cover to transmission (Fig. 527A) — M 8: 25 Nm, M 6: 10 Nm.
2. Clean sealing surface of rear cover.
3. Blow dry and insert with Sealing Compound (Locktite 242).
4. Check centering pins.

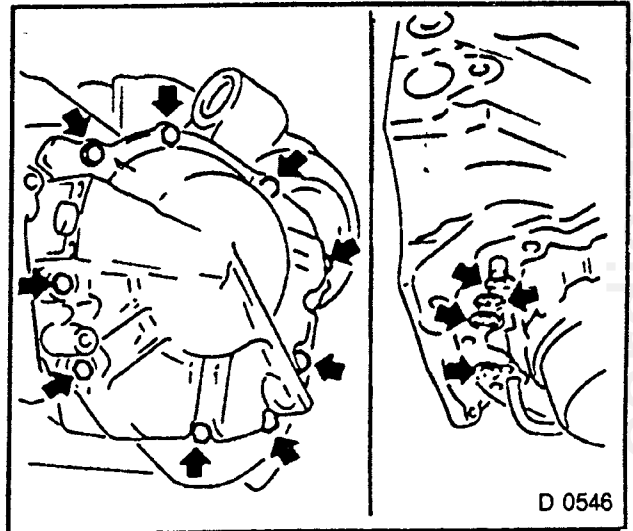


Fig. 527A

Fig. 527B

D 0546

INSTALL, CONNECT

1. Freewheel F1 in fluid pump
2. Align lining plates B1 and B2 with screwdriver, so that freewheel can be installed.

MEASURE

1. When installed correctly, dimension 1 (upper edge of fluid pump plate to upper edge of freewheel) has value 51.1 to 51.7 mm.

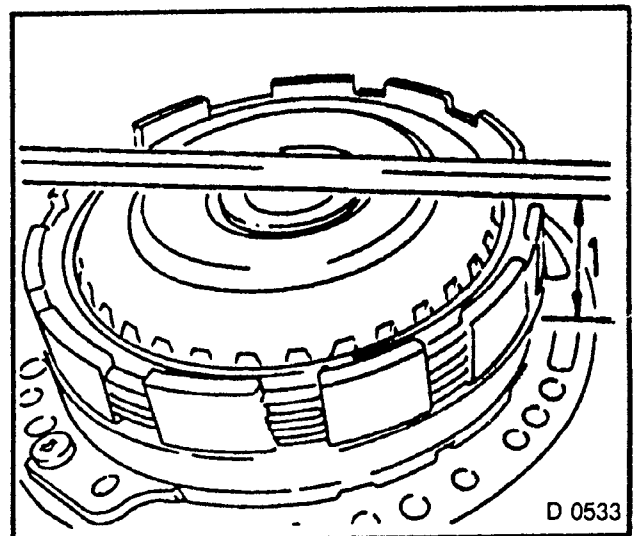


Fig. 528

D 0533

NOTE:

Before installation of fluid pump, protruding drive shaft must show a small amount of play. Fix transmission horizontally.

TIGHTEN (TORQUE)

1. Fluid pump to transmission — 25 Nm.
Fig. 529 shows removal.
Note hole alignment position, asymmetrical version.
If necessary, fluid pump can be aligned in bore thread by turning counters (arrows).

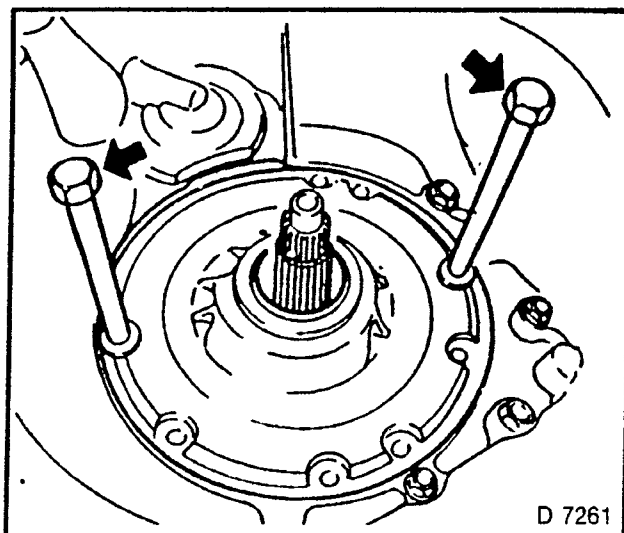


Fig. 529

MEASURE

1. Axial play of drive shaft — with gauge.
Measurement value 0.37 to 0.90 mm.

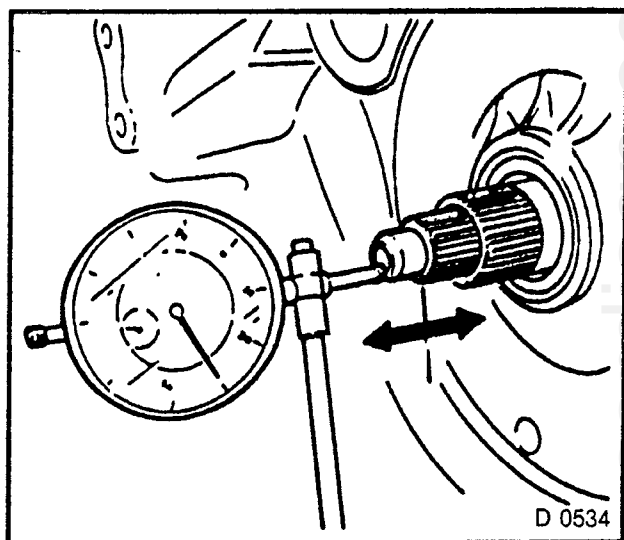


Fig. 530

INSTALL, CONNECT

1. Stick two gaskets for actuation (2) to transmission.
2. Manual selector valve with connecting rod (1) in valve body.

INSPECT

1. Play — free seating in valve body.

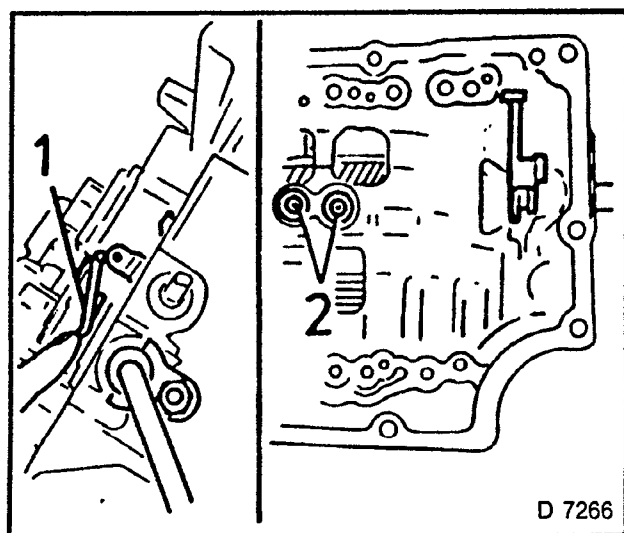


Fig. 531

INSTALL, CONNECT

1. Valve body to transmission
2. Connecting rod (1) to ratchet (2)

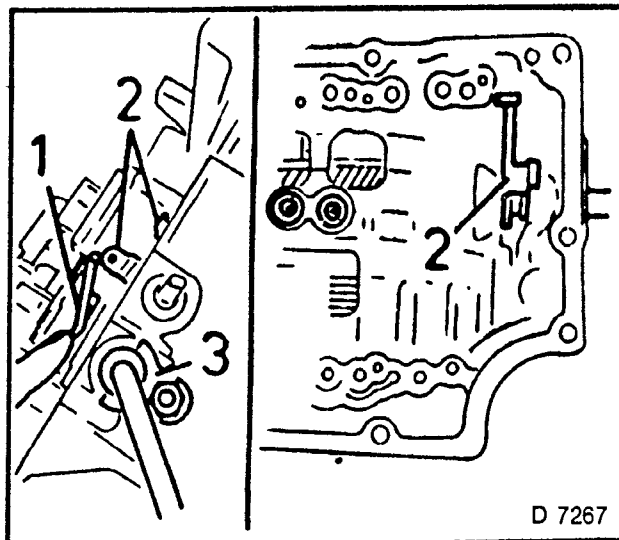


Fig. 532

TIGHTEN (TORQUE)

1. Valve body (3) — Seven bolts. Intake cover with new gasket (2) — two bolts — 10 Nm.
2. Solenoid valve wiring harness (1) — guide four wiring harness plugs from outside through bore in transmission.
3. Retaining plate — 13 Nm.

INSTALL, CONNECT

1. Four wiring harness plugs (1) for solenoid valves/fluid pressure regulator (different cable lengths).
2. Insert cables in retaining clamps.

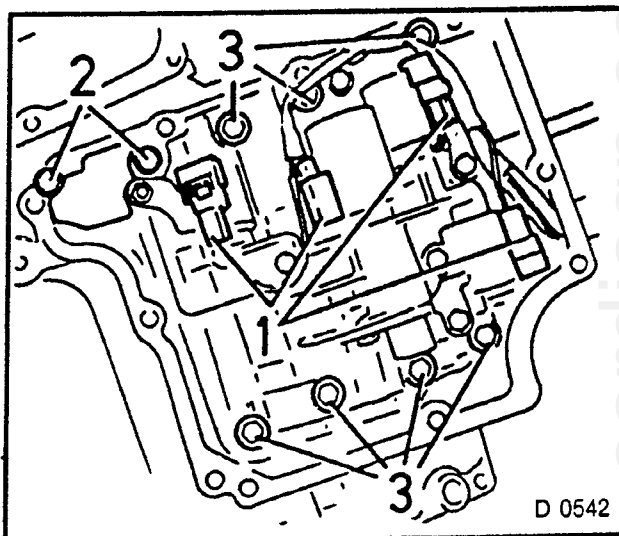


Fig. 533

TIGHTEN (TORQUE)

1. Side cover to transmission — 25 Nm. **DO NOT** yet turn two bolts for cover plate of fluid temperature sensor.
2. Insert side cover with Sealing Compound (Locktite 242).

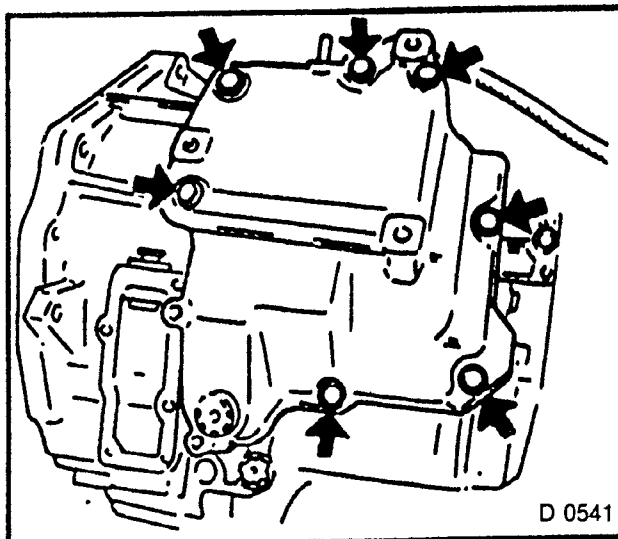


Fig. 534

3. Auxiliary housing cover (2) — 5 Nm.
4. Insert cover with Sealing Compound.
5. Fluid temperature sensor (1) — 25 Nm.
Use new gasket.
6. Cover plate of fluid temperature sensor (arrows) — 25 Nm.

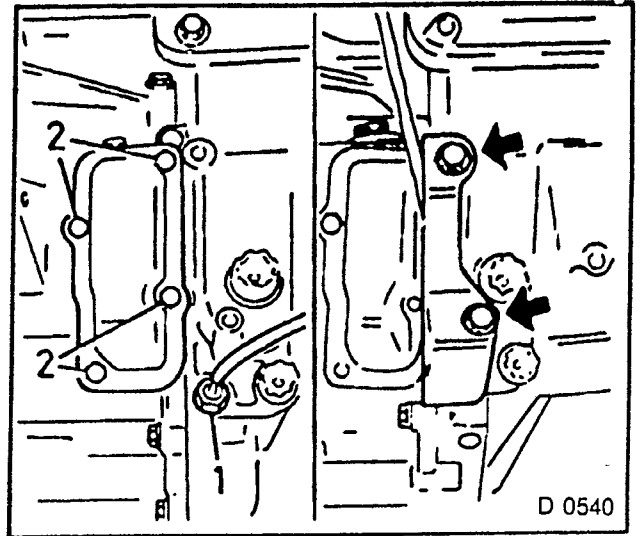


Fig. 535

TIGHTEN (TORQUE)

1. Eleven plugs with new seal rings to transmission.
Seven plugs — M 8 (1) — 8 Nm.
One plug — M 14 (2) — 35 Nm.
One plug — M 18 Torx (3) — 35 Nm.
Two plugs — M 20 (4) — 35 Nm.

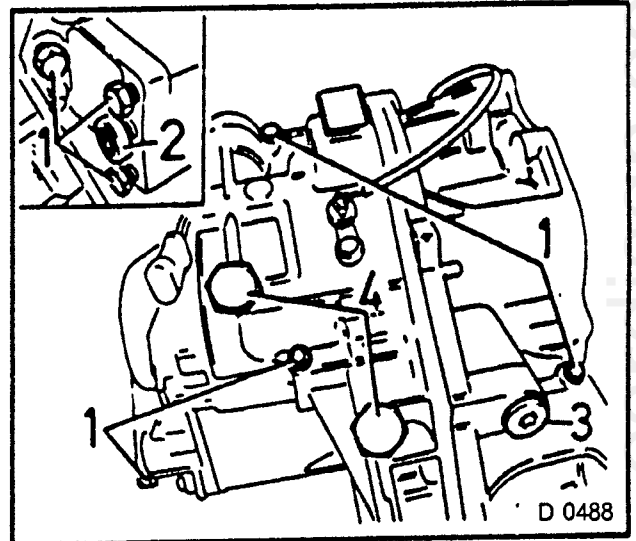


Fig. 536

2. Sensor for transmission input speed (1) — 6 Nm.
3. Sensor for transmission output speed (2) — 6 Nm.

INSTALL, CONNECT

1. Fluid filler pipe to transmission.
Press in with new seal ring up to offset.

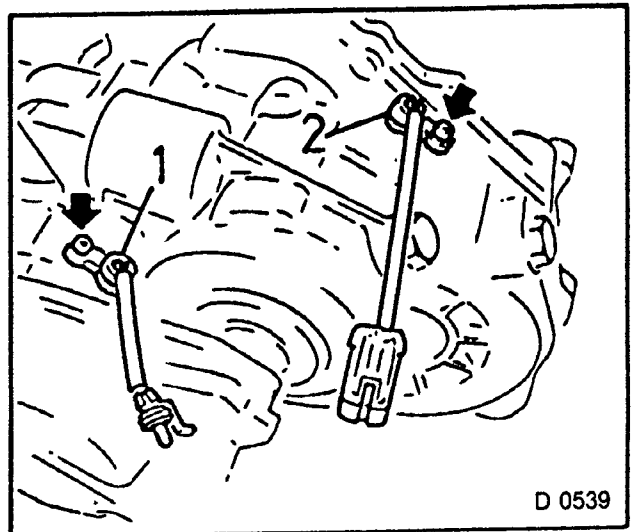


Fig. 537

ADJUST

1. Position of selector lever position switch relative to transmission.
2. Place switch from above on selector lever shaft (1).
3. Selector lever shaft or actuation lever Fig. 539 Item 3 in neutral position — up to stop to the right, then turn back two notches (P, R, N — see Fig. 538).
4. Turn selector lever position switch so that the flattened surface of the selector lever shaft (arrows) runs parallel to the split (2) on the housing of the switch.
5. In this position, tighten the selector lever position switch to the transmission (3).

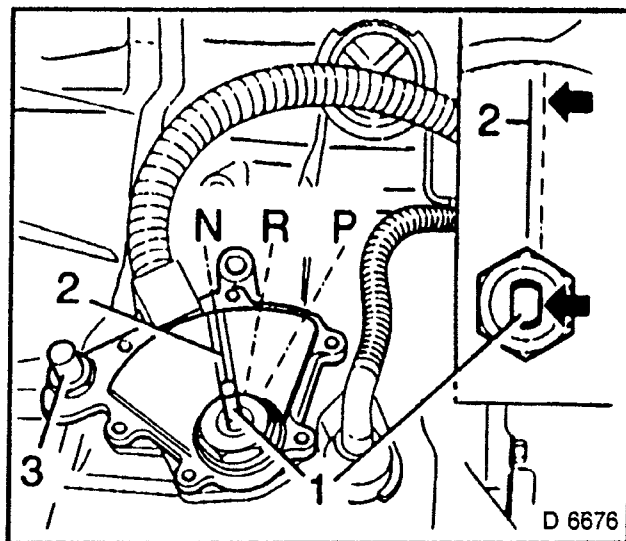


Fig. 538

TIGHTEN (TORQUE)

1. Neutral switch and fluid filler pipe to transmission (arrow, left) — 25 Nm.
2. Selector lever position switch to selector lever shaft — nut (1) — 8 Nm. Secure with locking plate (arrow, right).
3. Actuation lever (3) to selector lever shaft (2) — 16 Nm.
4. Counterhold selector lever shaft at actuation lever with pliers.
5. Speedometer gear (driven) with retaining plate to transmission — 4 Nm.

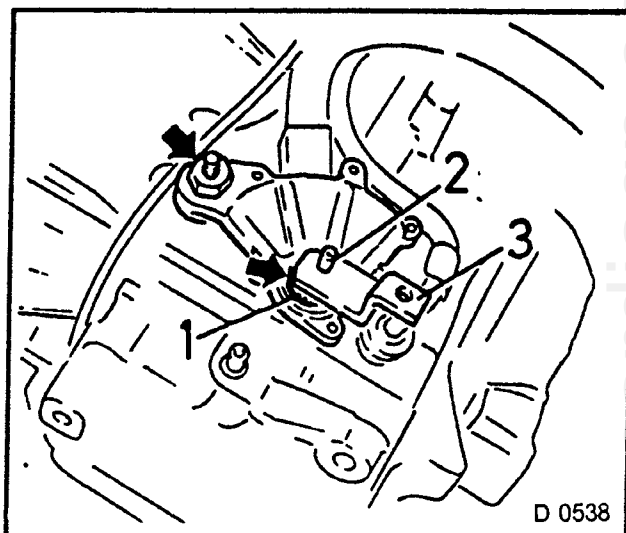


Fig 539

INSTALL, CONNECT

1. Converter in transmission.
2. Transmission.
3. Fill with transmission fluid.

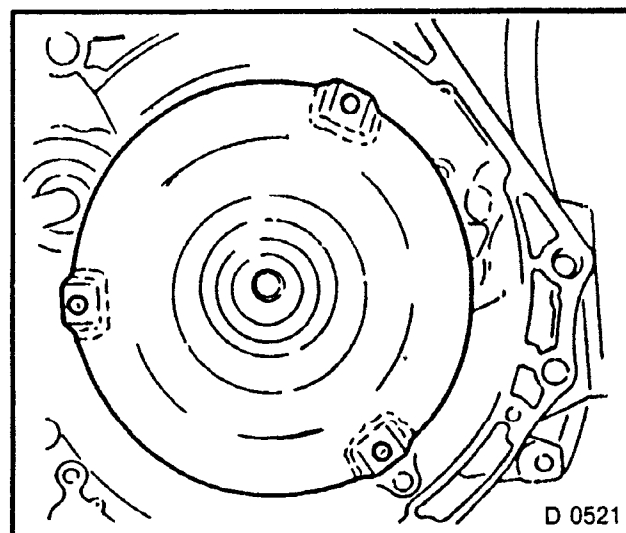


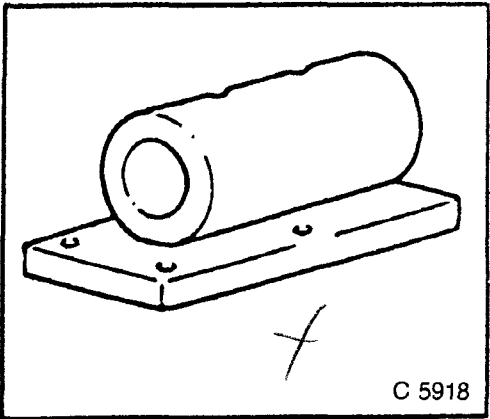
Fig. 540

SPECIAL SERVICE TOOLS

Clutch, Manual Transmission and Differential

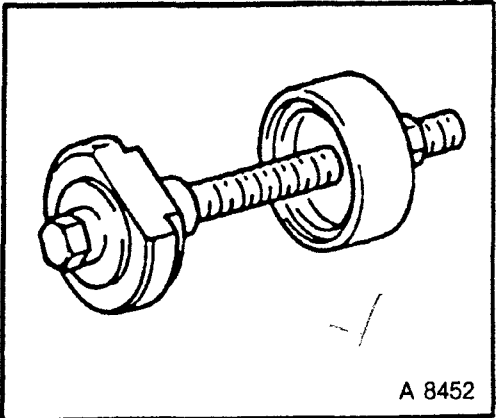
KM-113-2 TRANSMISSION BASE

(in conjunction with KM-552, KM-489)
Mount for transmission bracket
F 10, F 13, F 16, F 20 manual transmission.
To hold transmission when overhauling
with KM-694
AUTOMATIC TRANSMISSION AF 20.



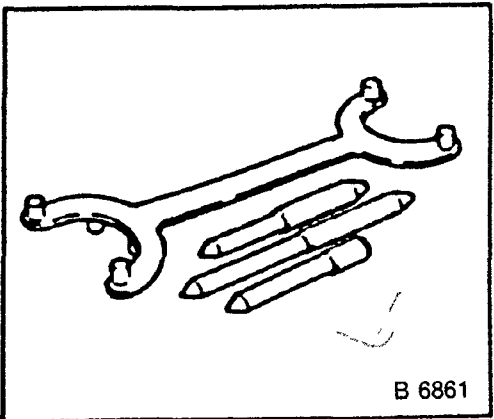
KM-120 REMOVER/INSTALLER

(in conjunction with KM-451)
To insert tapered roller bearing outer ring
F 10 and F 13 manual transmission.



KM-160-4 CENTERING BOLT

To pre-assemble differential
F 16, F 20 manual transmission.



KM-161-A BEARING PULLER

F 10, F 13, F 16, F 20 manual transmission.
To remove both tapered roller bearing inner races from differential housing.

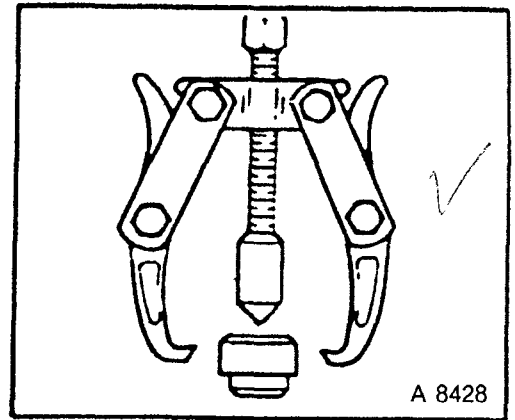
Use Hook -3 and Thrust Pad -4.

To remove 5th gear synchromesh body from main shaft.

Use Hook -2.

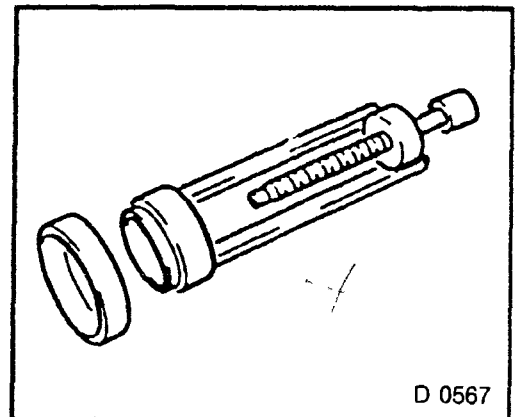
To pull both tapered roller bearing inner races from differential housing with hooks -3 and Thrust Plate KM-403.

AUTOMATIC TRANSMISSION AF 20.

**KM-171 BEARING REMOVER**

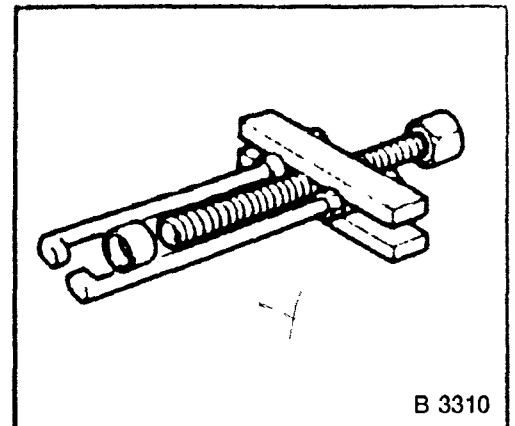
To remove rear tapered roller bearing from planetary gear set P2 with KM-528.

AUTOMATIC TRANSMISSION AF 20.

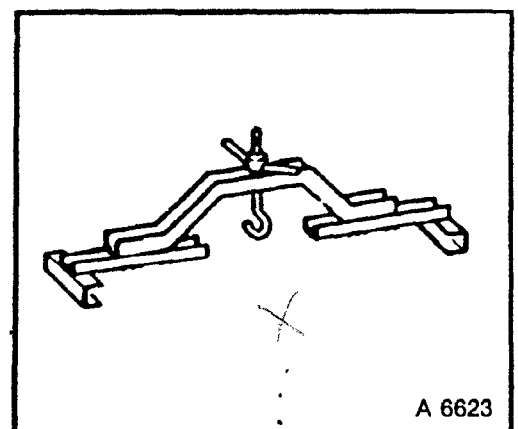
**KM-210-A WHEEL PULLER**

To pull both tapered roller bearing outer races from transmission housing with KM-709.

AUTOMATIC TRANSMISSION AF 20.

**KM-263-A ENGINE LIFTER**

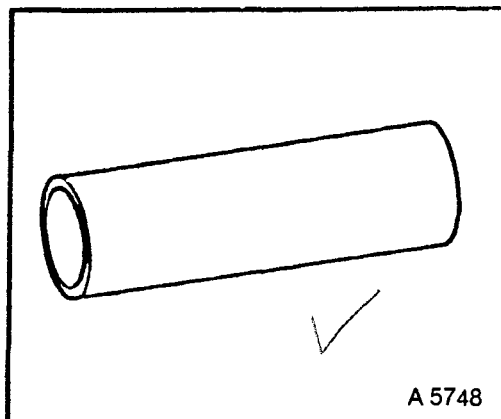
F 10, F 13, F 16, F 20 manual transmission.
To suspend engine with commercially available spring hook.



KM-277 BEARING INSTALLER

F 10, F 13 manual transmission

To press on 3rd and 4th gear synchronizer body assembly.

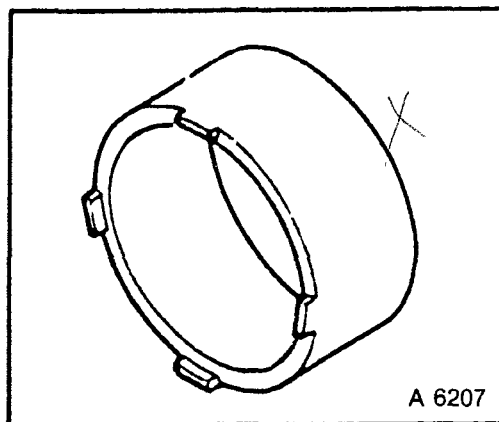


A 5748

KM-303 INSTALLER SLEEVE

F 10, F 13 manual transmission.

Place sleeve underneath while knocking tapered roller bearing outer races out of bearing ring.

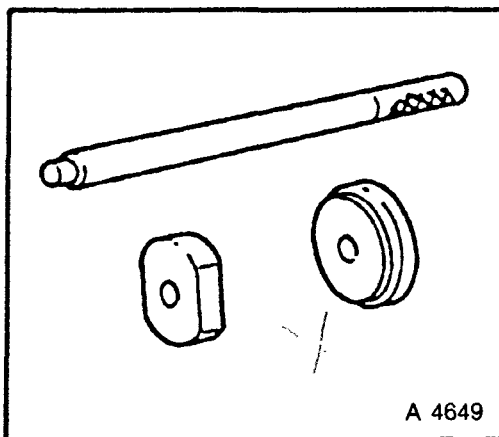


A 6207

KM-304 REMOVER/INSTALLER

F 10, F 13, F 16, F 20 manual transmission.

To knock out tapered roller bearing outer race from transmission in conjunction with KM-451. Place KM-502-A underneath.



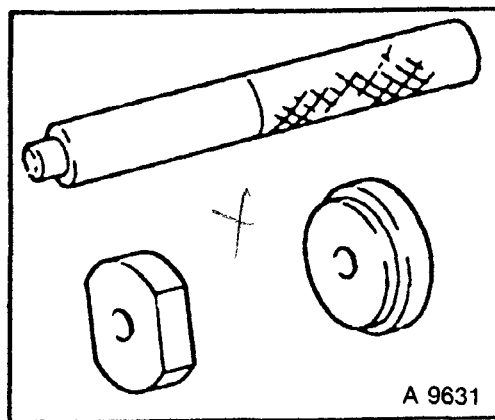
A 4649

KM-305 REMOVER/INSTALLER

F 10, F 13, F 16, F 20 manual transmission.

To remove and install tapered roller bearing outer races from transmission, bearing flange and bearing ring. In conjunction with KM-303 and KM-451.

To remove and install various bearings in transmission with KM-695.

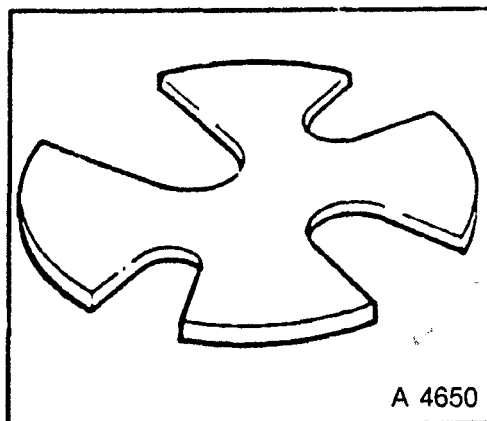
AUTOMATIC TRANSMISSION AF 20.

A 9631

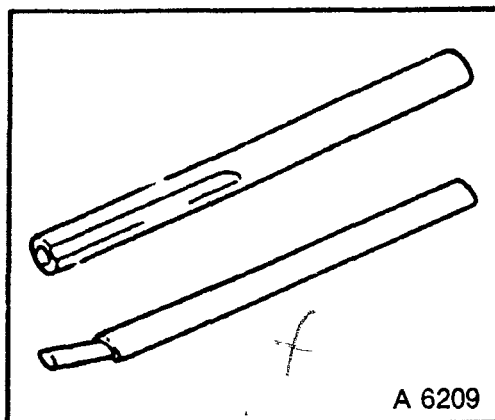
KM-307-B REMOVER PLATE

F 10, F 13, F 16, F 20 manual transmission.
To press off 1st and 2nd gear synchromesh body and also 2nd gear

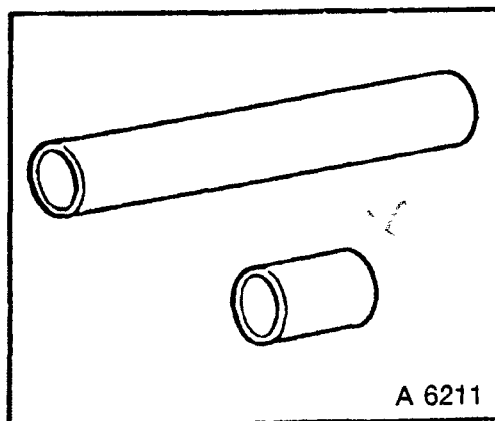
F 10, F 13 manual transmission.
Press off drive gear (driving) from main shaft.

**KM-308 REMOVER/INSTALLER**

F 10, F 13, F 16, F 20 manual transmission.
To drive in and out pins for shift rod and gearshift lever shaft.

**KM-311 INSTALLER**

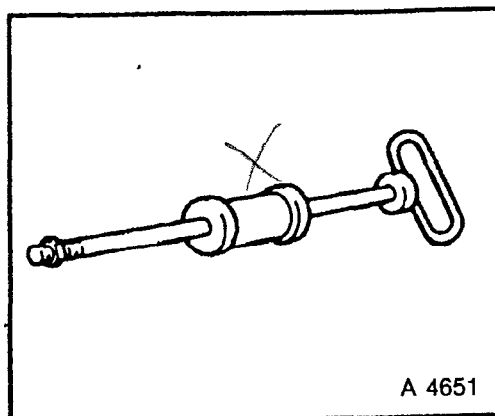
F 10, F 13, F 16, F 20 manual transmission.
To press on spacing washer, ball bearing and synchromesh body on main shaft.
No longer available.

**KM-313 SHAFT REMOVER**

F 16, F 20 manual transmission.
To remove outer sleeve for main shaft bearing from transmission housing in conjunction with KM-483 and KM-J-26941.

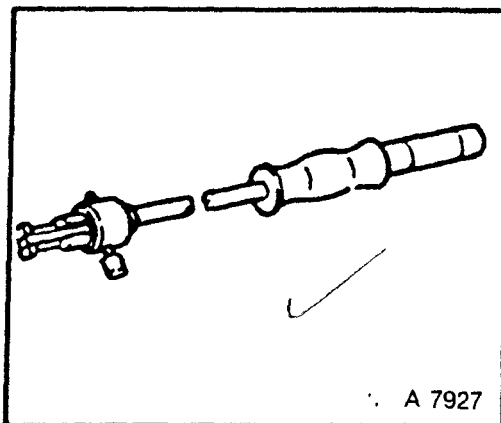
To knock roller bearing out of auxiliary housing with KM-J-26941 and KM-483.

AUTOMATIC TRANSMISSION AF 20.

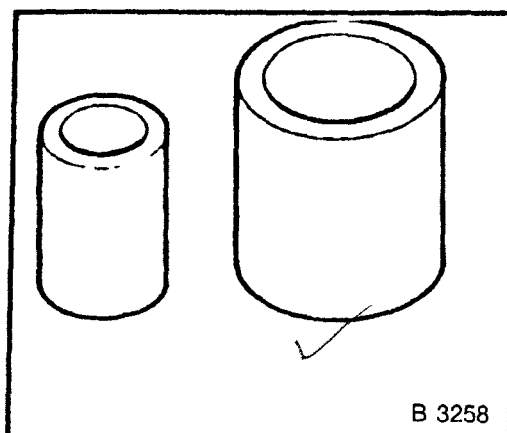


KM-328-B REMOVER

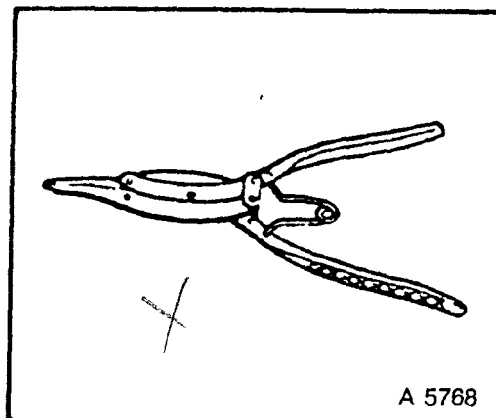
F 10, F 13, F 16, F 20 manual transmission.
To knock out plug for shifting lock from
end shield in conjunction with KM-727

**KM-334 INSTALLER**

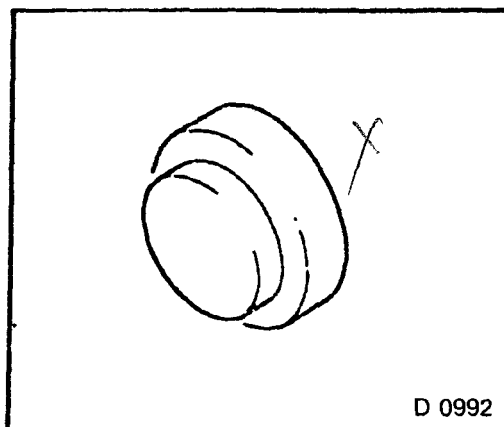
F 10, F 13, F 16, F 20 manual transmission.
To press on spacing washer on main shaft.

**KM-396 RING PLIERS**

To remove and install retaining ring in
clutch body.
AUTOMATIC TRANSMISSION AF 20.

**KM-403 THRUST PLATE**

To remove tapered roller bearing inner race
from differential with KM-161-A.
AUTOMATIC TRANSMISSION AF 20.



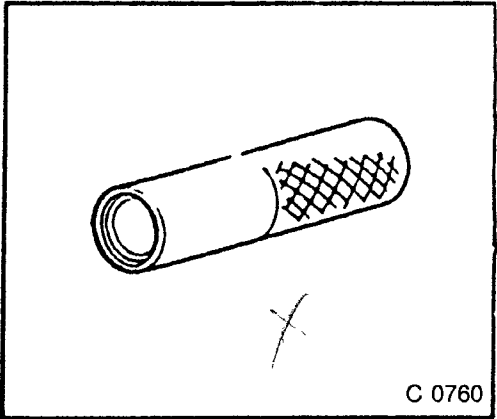
KM-407-A RING INSTALLER

F 16, F 20 manual transmission.

To remove the gear block ball bearing.

To press out driven intermediate gear from planetary carrier with KM-701

AUTOMATIC TRANSMISSION AF 20.

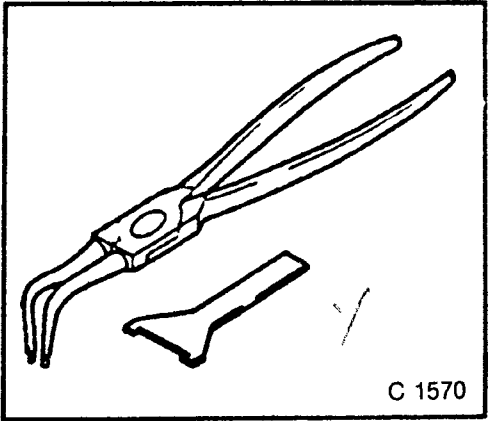


KM-443-A RING PLIERS

KM-443-B RING PLIERS AND ASSEMBLY AID

F 10, F 13, F 16, F 20 manual transmission.

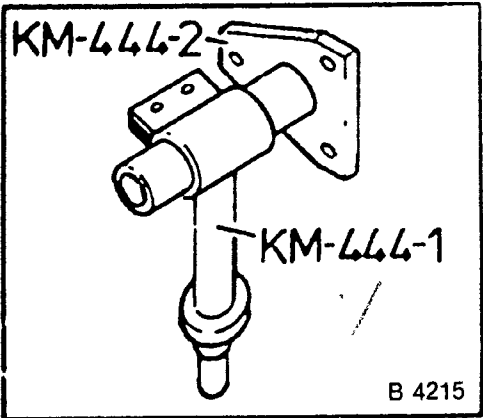
To remove both retaining rings for main shaft and drive shaft attachment.



KM-444-B HOLDING FIXTURE

KM-444-2 to hold transmission during overhaul operation with Fixture Base KM-489.

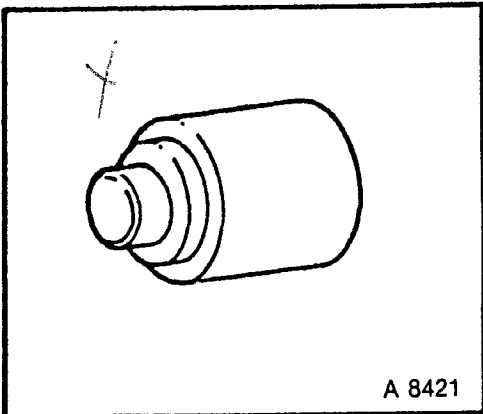
KM-444-B consists of KM-444-1 and KM-444-2, for removal and installation of transmission.



KM-445 SEAL INSTALLER

F 10, F 13 manual transmission.

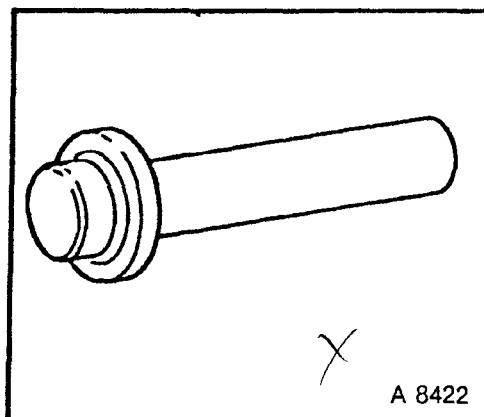
To install new seal ring in thrust bearing guide.



KM-446 SEAL INSTALLER

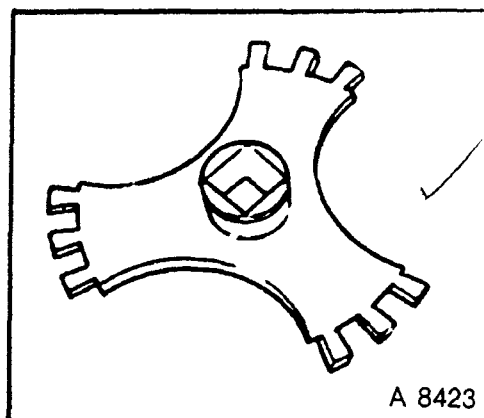
F 10, F 13 manual transmission.

To drive in flush both seal rings for axle shafts in bearing ring and also in transmission.

**KM-447 REMOVER/INSTALLER**

F 10, F 13 manual transmission.

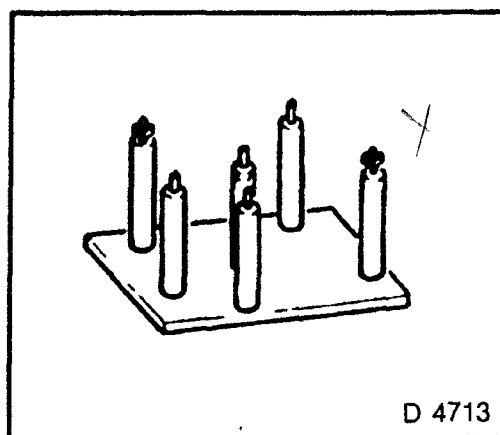
To screw in and out bearing rings from transmission.

**KM-448 INSTALLER**

F 10, F 13, F 16, F 20 manual transmission.

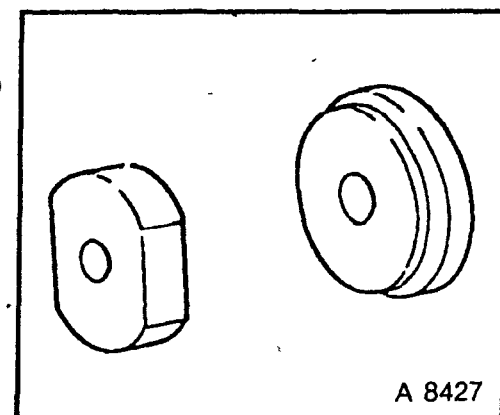
To support the end shield and cover of shifting during overhaul operations.

Alternatively use KM-552.

**KM-451 REMOVER/INSTALLER**

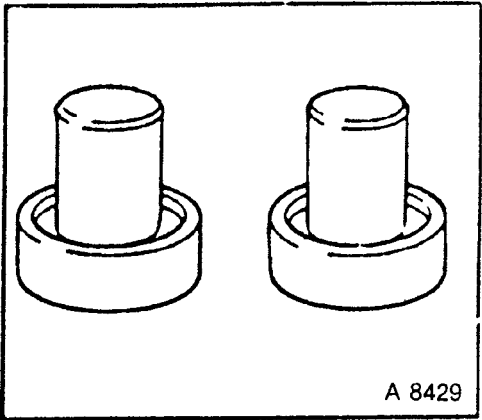
F 10, F 13, F 16, F 20 manual transmission.

To press in and out tapered roller bearing outer race in transmission in conjunction with KM-303, KM-304, KM-305, KM-502-A.



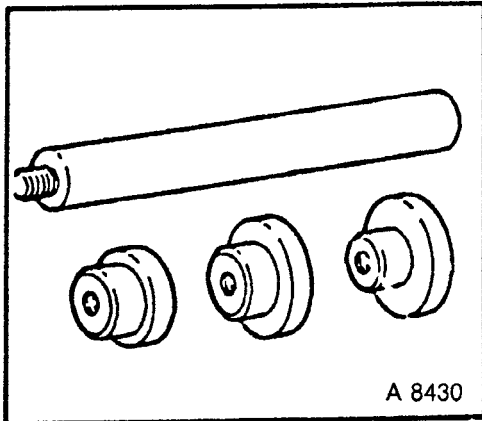
KM-453 INSTALLER

F 10, F 13 manual transmission.
To press-in both tapered roller bearings on differential housing.



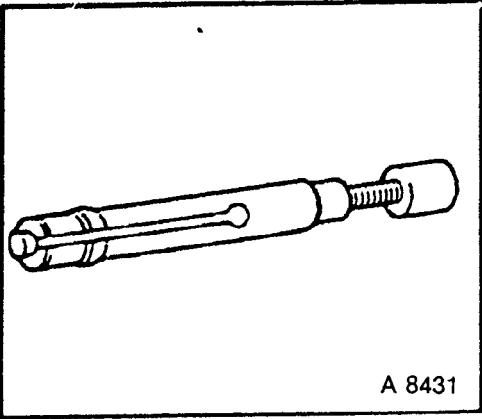
KM-454-A REMOVER/INSTALLER

F 10, F 13 manual transmission.
To drive in and out needle sleeves, seal rings from bearing ring and from transmission.



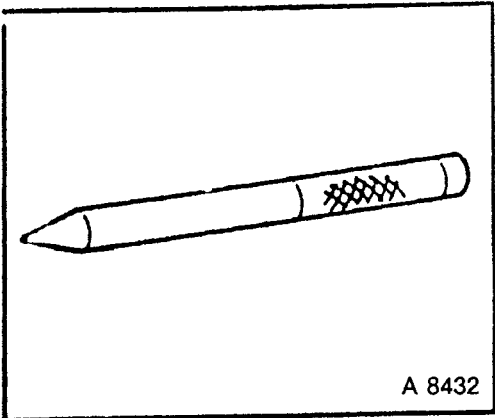
KM-455 CHECKING DEVICE

F 10, F 13 manual transmission.
To measure spin torque in conjunction with MKM-536.



KM-456 CENTERING BOLT

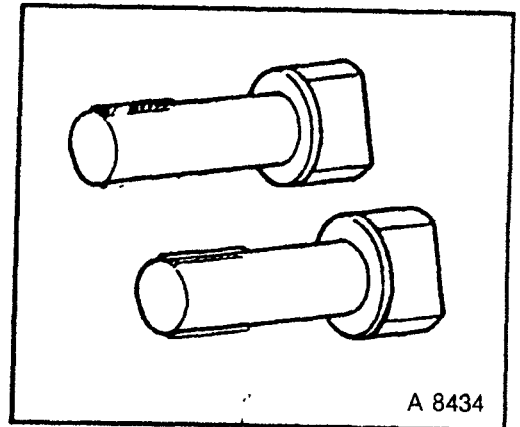
F 10, F 13 manual transmission.
To pre-assemble differential.



KM-458-A INSTALLING BOLTS

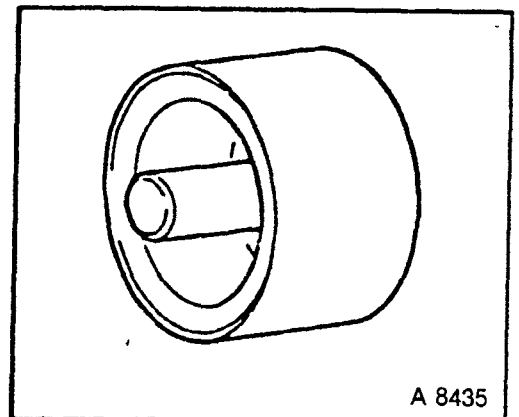
F 10, F 13 manual transmission.

To clamp differential housing in vice.

**KM-459 INSTALLER**

F 10, F 13 manual transmission.

To press speedometer helical gear onto differential housing.

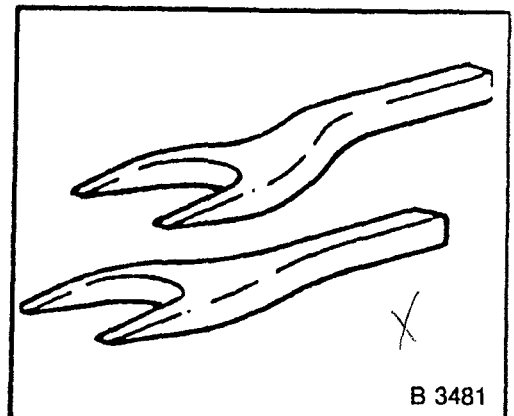
**KM-460-2-A REMOVER FORKS**

F 10, F 13, F 16, F 20 manual transmission.

To knock out axle shaft from transmission.

To knock right axle shaft out of transmission.

AUTOMATIC TRANSMISSION AF 20.

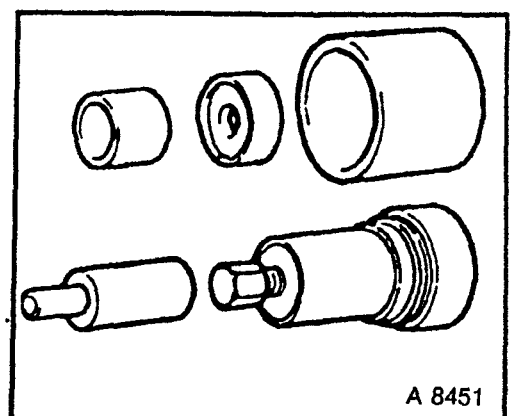
**KM-466-A REMOVER/INSTALLER**

F 16, F 20 manual transmission.

To press out both seal rings from bearing ring and bearing flange.

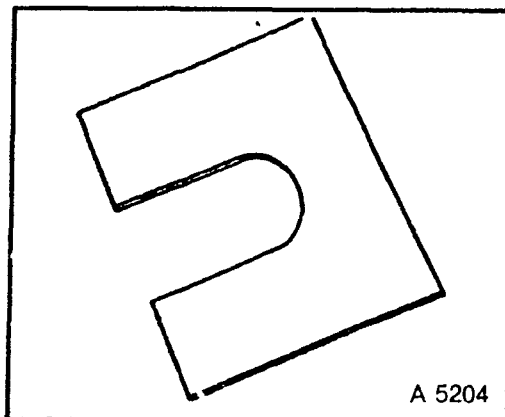
F 10, F 13 manual transmission.

With -3, to press on 5th gear (large) on gear cluster.



KM-479-A REMOVER PLATE

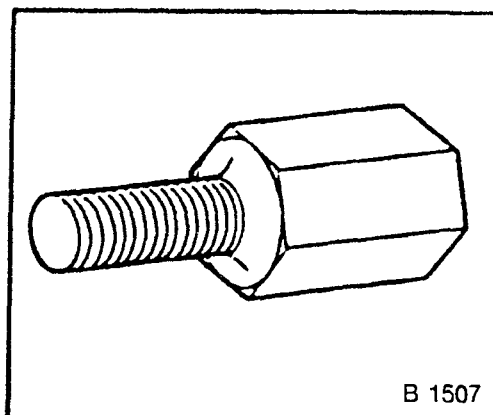
F 10, F 13 manual transmission.
To press off spacing washer in front of 4th gear from main shaft.
Replaced by KM-307-B.

**KM-483 ADAPTER**

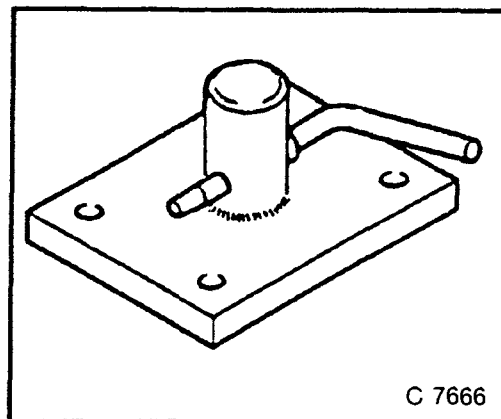
F 16, F 20 manual transmission.
To remove outer sleeve for main shaft bearing from transmission housing in conjunction with KM-313 and KM-J-26941

To knock roller bearing out of auxiliary housing with KM-J-26941 and KM-313.

AUTOMATIC TRANSMISSION AF 20

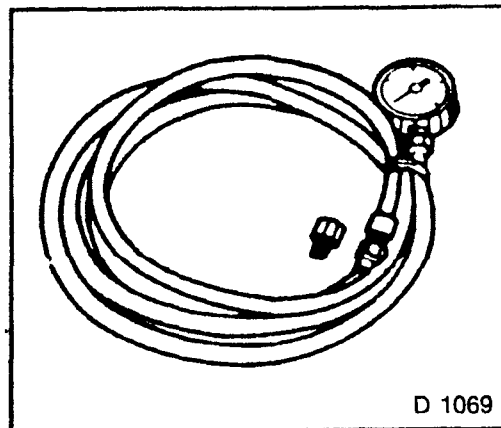
**KM-489 SUPPORT**

F 10, F 13, F 16, F 20 manual transmission.
Support for transmission bracket

**KM-498-A PRESSURE GAUGE**

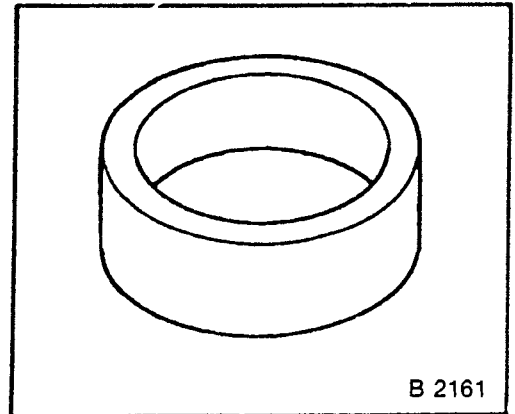
To check the fluid pressure (main and regulating pressure) in conjunction with KM-580, KM-498-B already includes this adapter.

AUTOMATIC TRANSMISSION AF 20.



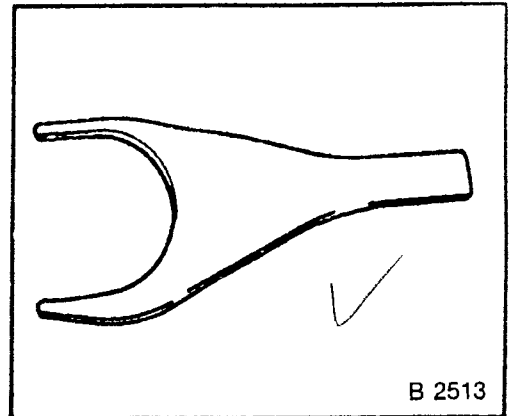
KM-502-A SPACER RING

F 10, F 13, F 16, F 20 manual transmission.
To be placed underneath while knocking out tapered roller bearing outer race in conjunction with KM-304 and KM-451.

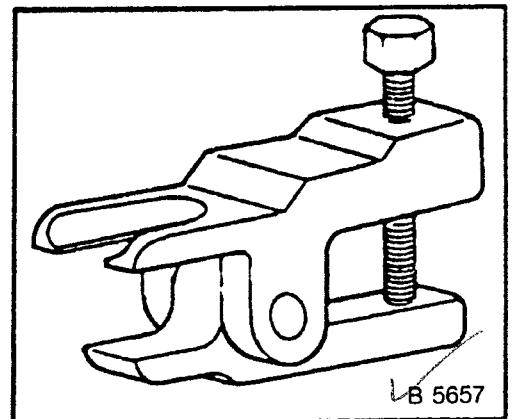
**KM-503-A REMOVING FORKS**

F 16, F 20, F 28 manual transmission.
To knock out left axle shaft from transmission.

AUTOMATIC TRANSMISSION AF 20

**KM-507-C BALL JOINT REMOVER**

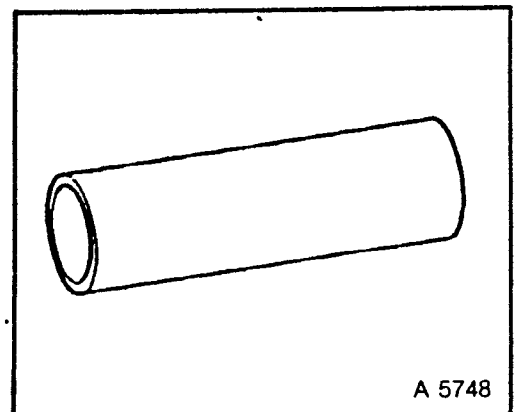
F 10, F 13, F 16, F 20, F 28 manual transmission.
To press out guiding joint and tie rod joint.

**KM-514 INSTALLER**

F 10, F 13, F 16, F 20 manual transmission.
To press synchromesh body onto main shaft.

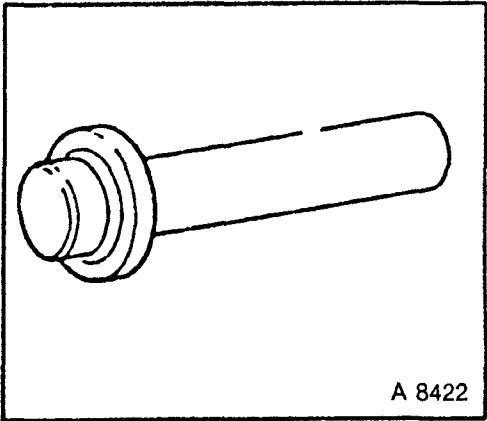
To compress spring plate C1 with KM-697 and KM-698

AUTOMATIC TRANSMISSION AF 20.



KM-518 RING INSTALLER

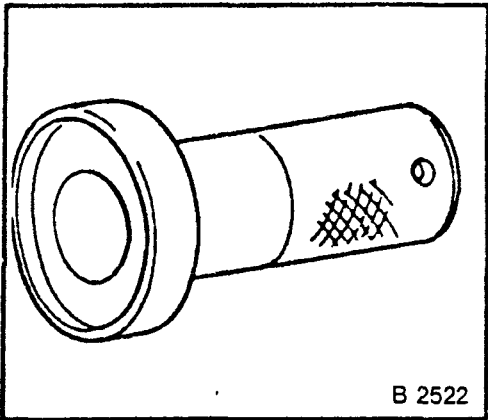
F 16, F 20, manual transmission
To press seal ring in transmission.



KM-519 RING INSTALLER

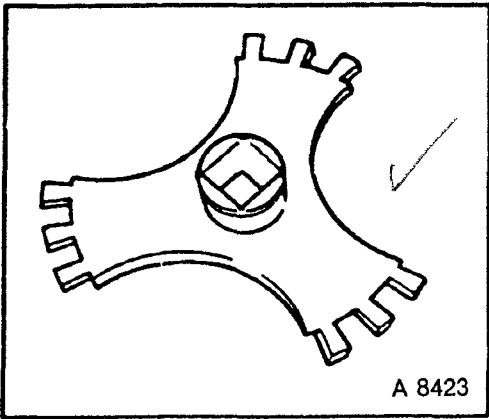
F 16, F 20, F28 manual transmission.
To drive in both seal rings flush into axle shafts.

AUTOMATIC TRANSMISSION AF 20.



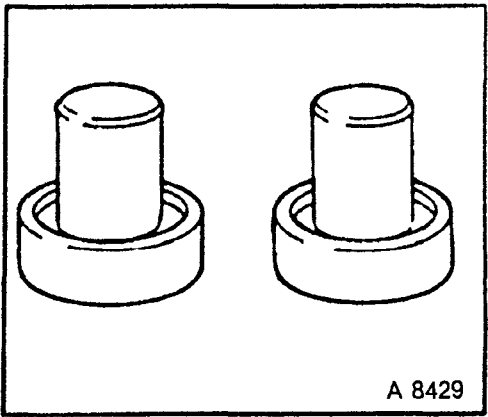
KM-520 REMOVER/INSTALLER

F 16, F 20 manual transmission.
To screw in and out bearing ring from transmission.



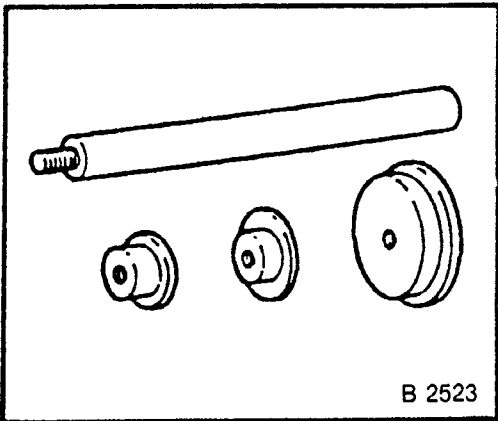
KM-522 INSTALLERS

F 16, F 20, manual transmission.
To press on both tapered roller bearings on differential housing.
Place underneath while pressing on reverse idler gear axle in end shield.



KM-523 REMOVER/INSTALLER

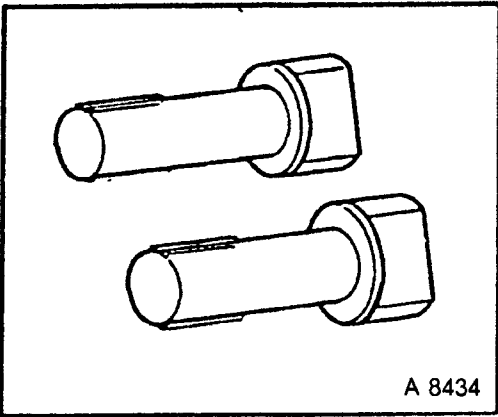
F 16, F 20 manual transmission.
To drive in and out roller bushing and
needle sleeve in transmission.



B 2523

KM-524-A INSTALLING BOLTS

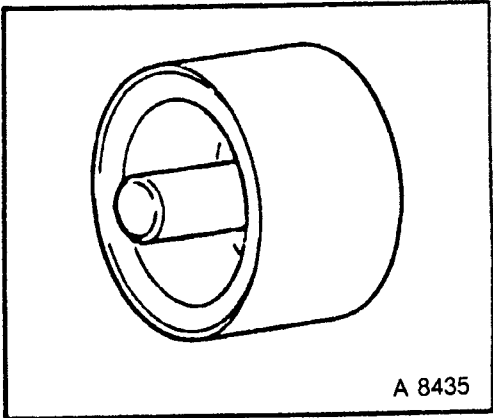
F 16, F 20 manual transmission.
To clamp differential housing in vice.



A 8434

KM-525 INSTALLER

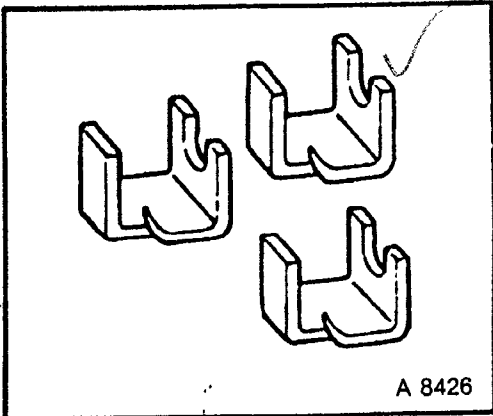
F 16, F 20, manual transmission.
To press on speedometer helical gear on
differential housing.



A 8435

KM-526-A CLAMP SET

F 10, F 13, F 16, F 20 manual transmission.
To keep clutch assembly under tension
with 3 clamps.

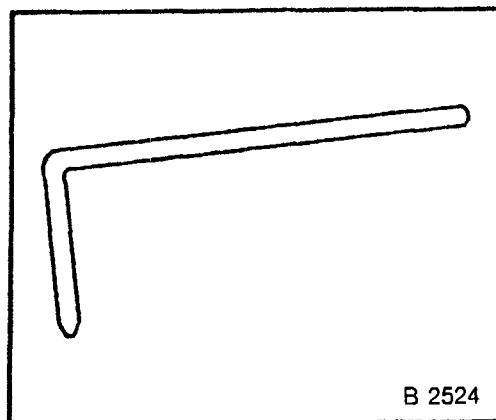


A 8426

KM-527 ADJUSTING TOOL
KM-527-A ADJUSTING TOOL

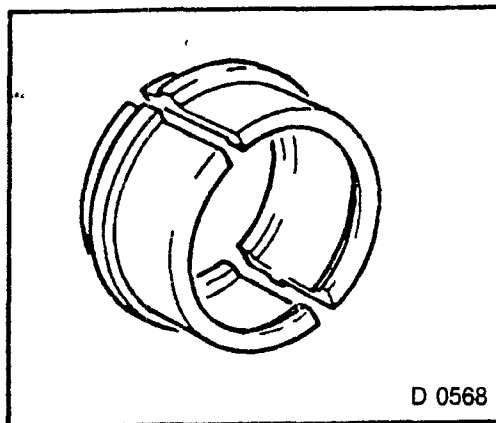
F 10, F 13, F 16, F 20 manual transmission.
To adjust transmission shift linkage and to remove and install the transmission cover.
Grind off approx. 3 mm at heel of short part of KM-527. KM-527-A has been altered accordingly.

With F 28/6 manual transmission, two pieces required.

**KM-528 REMOVER RING**

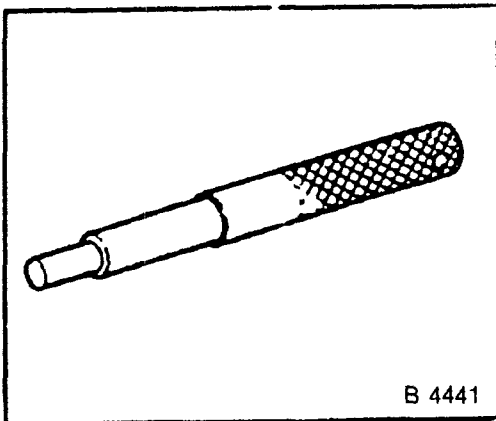
To remove rear tapered roller bearing from planetary gear set P2 with KM-171.

AUTOMATIC TRANSMISSION AF 20

**KM-534 GUIDE BOLT**

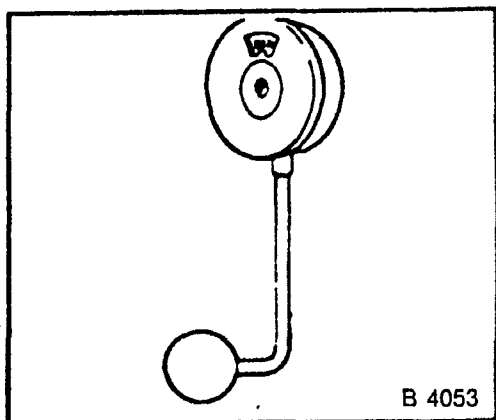
F 16, F 20 manual transmission.

To centre the clutch disc with transmission removed.

**MKM-536 FRICTION COEFFICIENT METER/TORSIOMETER**

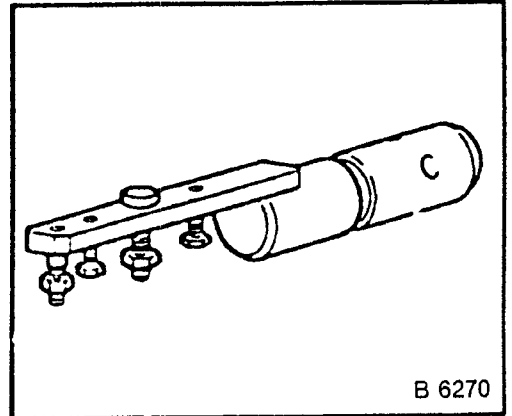
F 10, F 13, F 16, F 20 manual transmission.
To measure slip torque in conjunction with KM-455 or KM-J-28544.

To measure starting and spin torques.
AUTOMATIC TRANSMISSION AF 20.

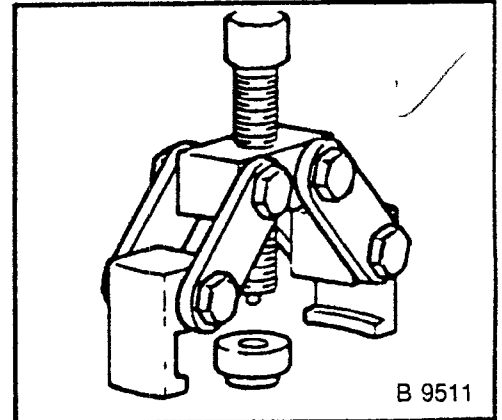


KM-552 FIXTURE

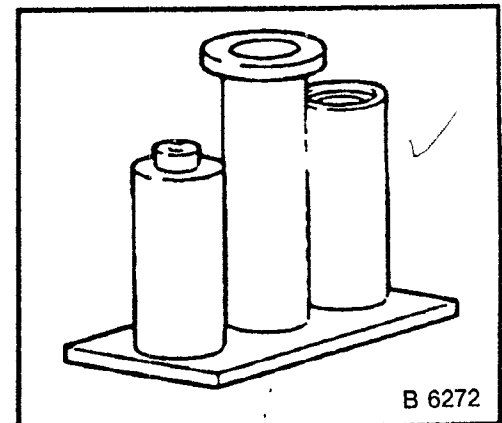
F 10, F 13, F 16, F 20 manual transmission.
To hold bearing plate and shift cover when overhauling.
Alternatively use KM-448.

**KM-553-A REMOVER**

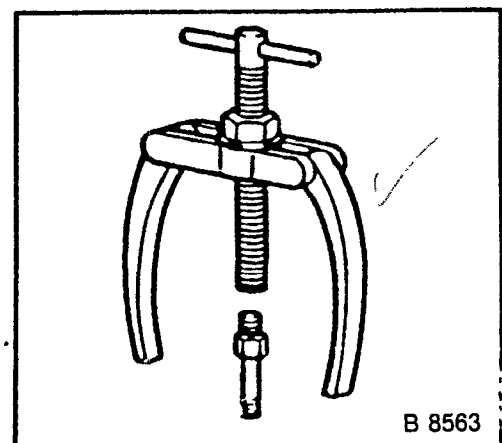
F 10, F 13, F 16, F 20 manual transmission.
To remove 5th gear.

**KM-554 INSTALLER**

F 10, F 13, F 16, F 20 manual transmission.
To press on the 5th gear and synchromesh body.

**KM-556-A PULLER SET**

F 10, F 13, F 16, F 20 manual transmission.
(was KM-449-A in conjunction with Kukko Counter Support 22-1)
To remove transmission driving shaft from gear cluster.
To remove roller bushing for mounting of main shaft.
To remove bearing bushing for mounting of transmission driving shaft.



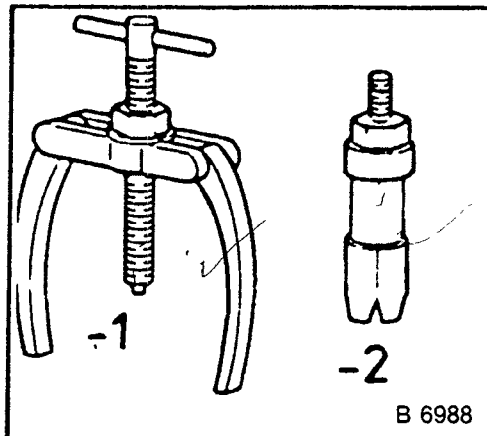
MKM-557 REMOVER

F 10, F 13, F 16, F 20, F 28 manual transmission.

To remove both seal rings from bearing ring and from transmission.

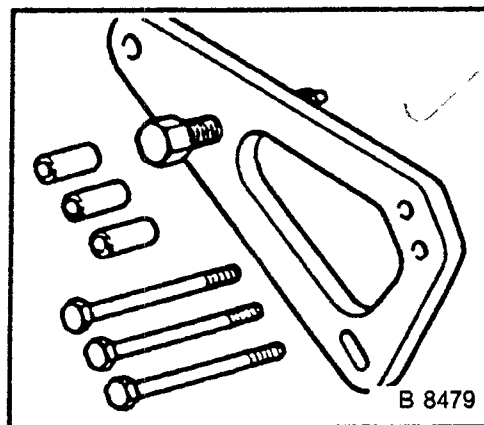
To remove both axle shaft seal rings from transmission.

AUTOMATIC TRANSMISSION AF 20.

**KM-564 INSTALLER**

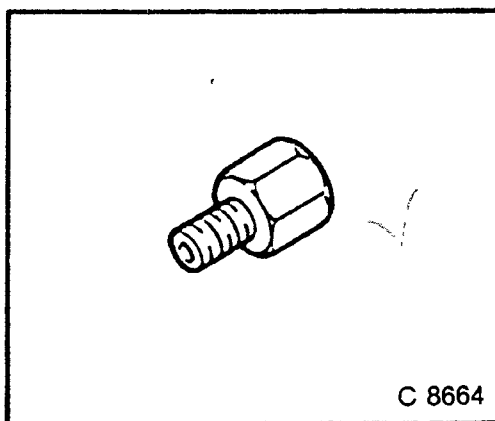
F 10, F 13, F 16, F 20 manual transmission.
(replacement for KM-449-A and KM-555)

To press in transmission drive shaft.

**KM-580 ADAPTER**

To check fluid pressure, in conjunction with KM-498-A KM-498-B already includes this adapter.

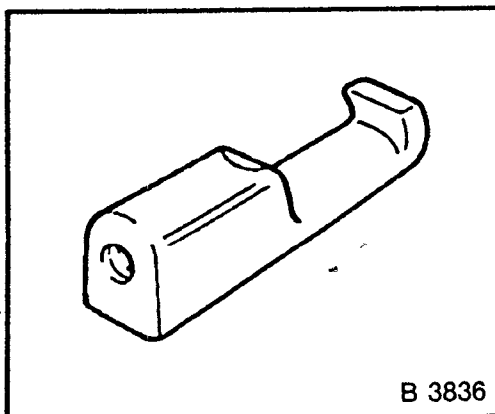
AUTOMATIC TRANSMISSION AF 20.

**KM-J-586 REMOVER HOOK**

(in conjunction with KM-J-7004)

To knock out fluid pump seal ring.

AUTOMATIC TRANSMISSION AF 20.

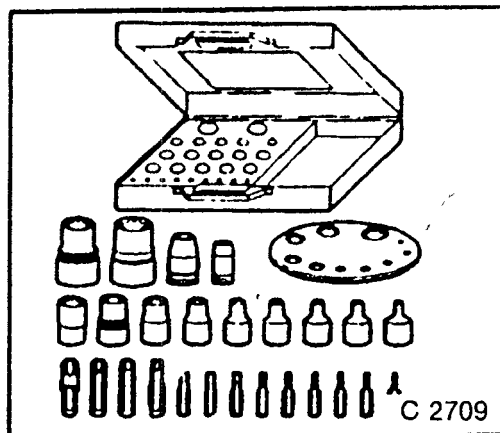


MKM-604-A TORX BIT AND SOCKET SET

To remove and install plug for fluid circuit C2.

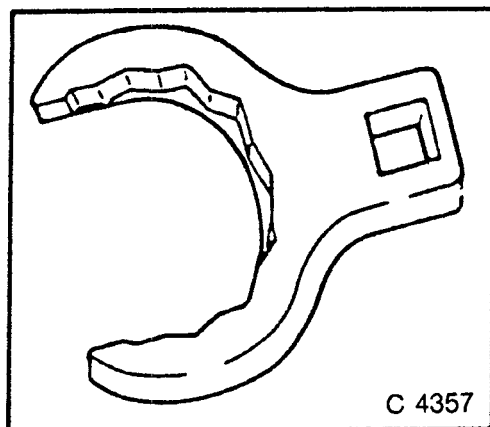
With MKM-604-22.

AUTOMATIC TRANSMISSION AF 20.

**KM-624 PROPSHAFT WRENCH**

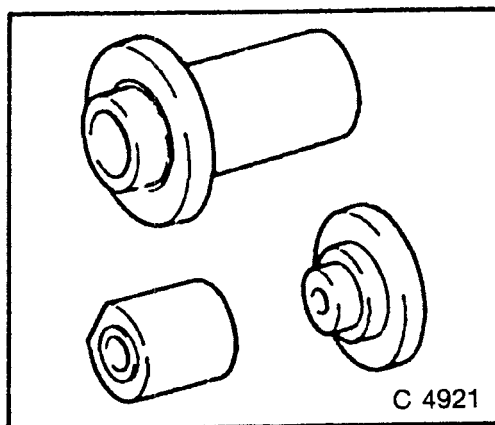
F 16 4x4, F 20 4x4, F 28 manual transmission.

To tighten and loosen slider lock nut on propshaft.

**KM-629 SEAL RING INSTALLER**

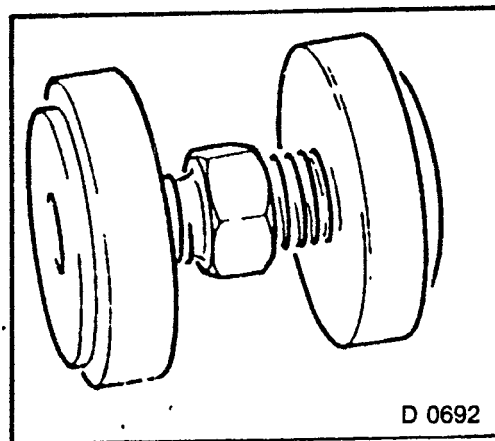
To install roller bearing into auxiliary housing.

AUTOMATIC TRANSMISSION AF 20.

**KM-670 PRE-TENSION TOOL**

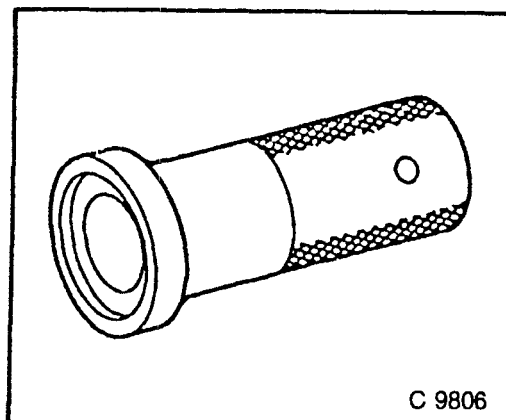
F 16, F 20 manual transmission

To pre-tension axle shaft bevel gears.

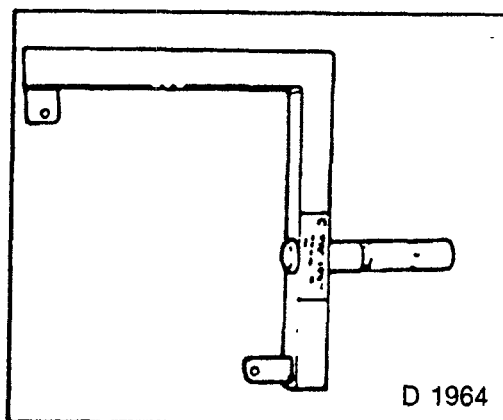


KM-674 INSTALLER

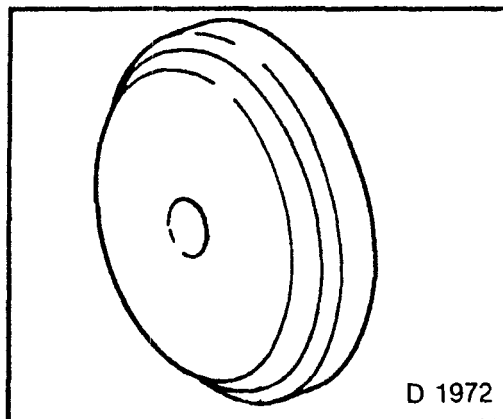
To install fluid pump seal ring and various bearings in transmission
AUTOMATIC TRANSMISSION AF 20.

**KM-694 HOLDING FIXTURE**

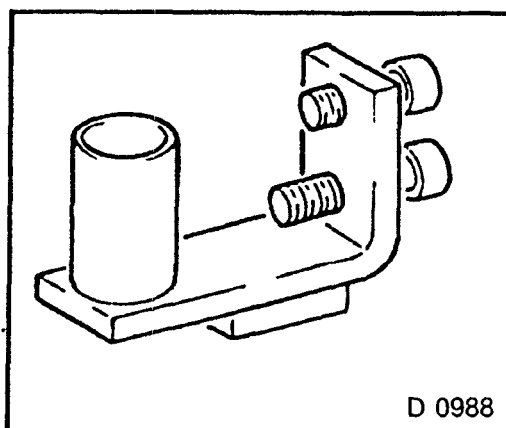
To hold transmission when overhauling with KM-113-2.
AUTOMATIC TRANSMISSION AF 20.

**KM-695 REMOVER/INSTALLER**

To remove and install various bearings in transmission with KM-305. Included in KM-715.
AUTOMATIC TRANSMISSION AF 20.

**KM-696 HOLDER**

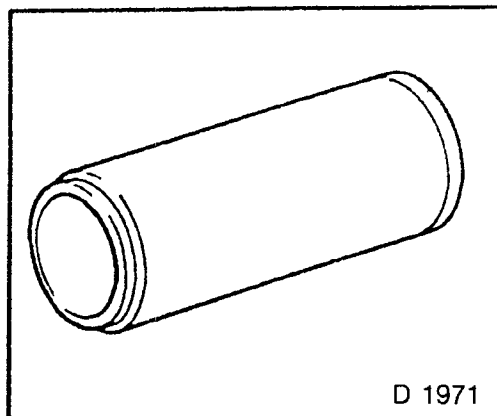
To hold planetary gear set P2 when overhauling.
Included in KM-715.
AUTOMATIC TRANSMISSION AF 20.



KM-697 INSTALLER

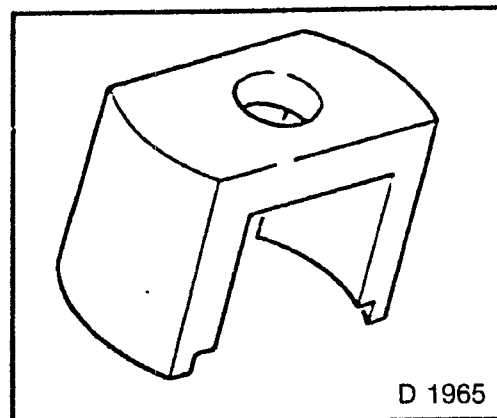
To install various bearings in transmission.
Included in KM-715.

AUTOMATIC TRANSMISSION AF 20.

**KM-698 REMOVER/INSTALLER**

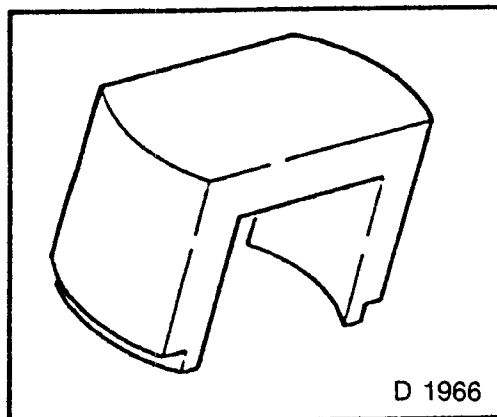
To remove and install return springs from
various clutches in transmission. Included
in KM-715.

AUTOMATIC TRANSMISSION AF 20.

**KM-699 REMOVER/INSTALLER**

To remove and install spring plate from
multi-disc brake B1.
Included in KM-715.

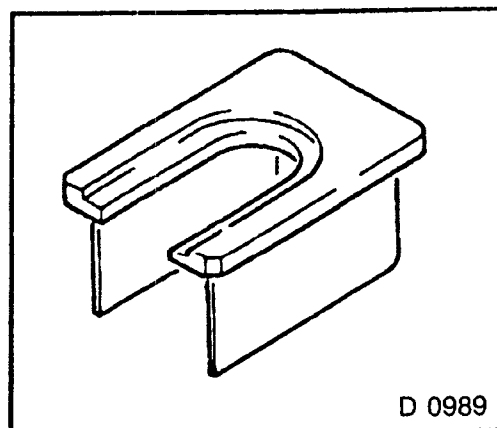
AUTOMATIC TRANSMISSION AF 20.

**KM-701 REMOVER SET**

To press off drive gear from planetary gear
set P2 with KM-407-A.

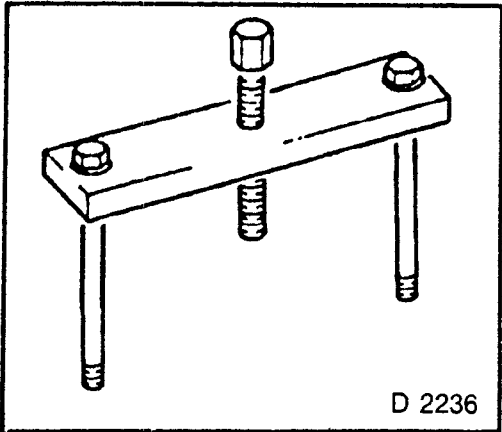
Included in KM-715.

AUTOMATIC TRANSMISSION AF 20.



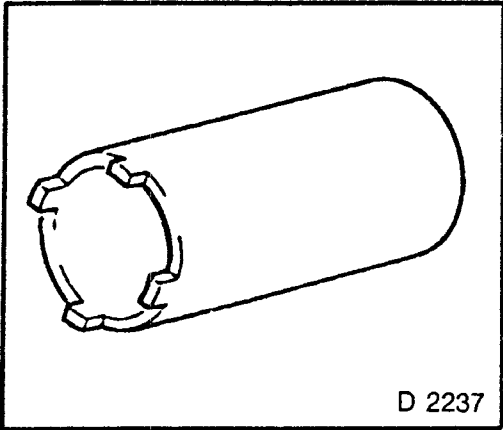
KM-702 REMOVER

To remove fluid pump. Included in KM-715.
AUTOMATIC TRANSMISSION AF 20.



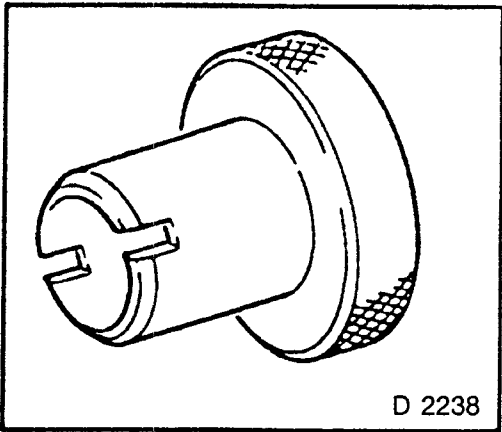
KM-703 WRENCH

To loosen fastening nut on planetary gear set P2.
With new transmissions supplied as hex nut spanner size 36.
Included in KM-715.
AUTOMATIC TRANSMISSION AF 20.



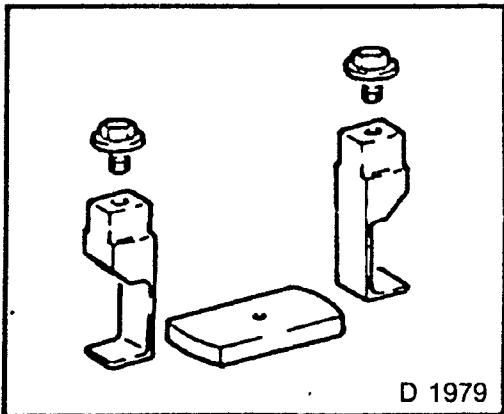
KM-704 CHECKING TOOL

To check easy turnability of fluid pump.
Included in KM-715.
AUTOMATIC TRANSMISSION AF 20.



KM-709 REMOVER

To remove both tapered roller bearing outer races from transmission housing using KM-210-A. Included in KM-715.
AUTOMATIC TRANSMISSION AF 20.

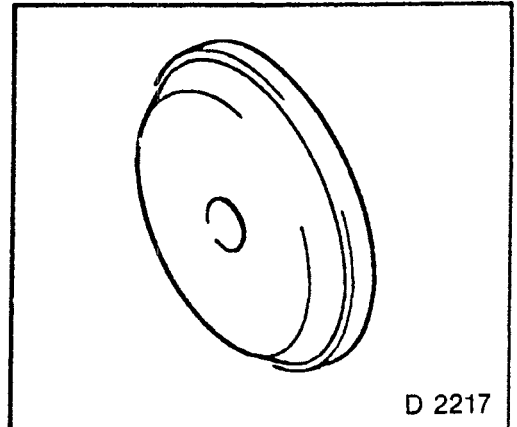


KM-710 INSTALLER

To install tapered roller bearing outer race using drift from KM-305.

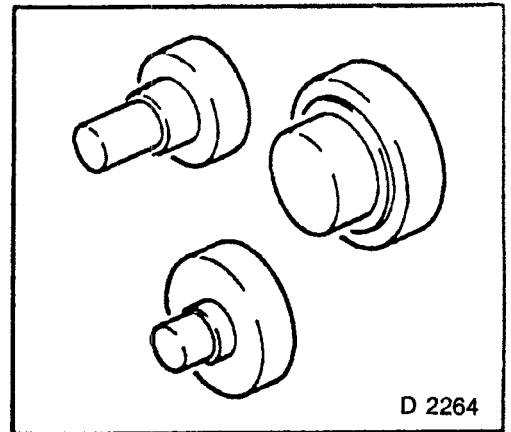
Included in KM-715.

AUTOMATIC TRANSMISSION AF 20.

**KM-711 INSTALLATION DRIFTS**

To drive in needle bearing in transmission housing. Included in KM-715.

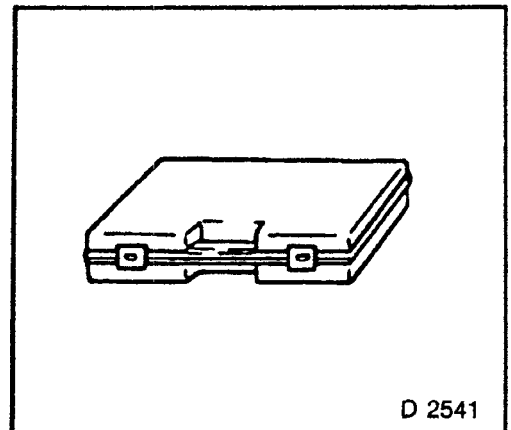
AUTOMATIC TRANSMISSION AF 20.

**KM-715 TOOL SET**

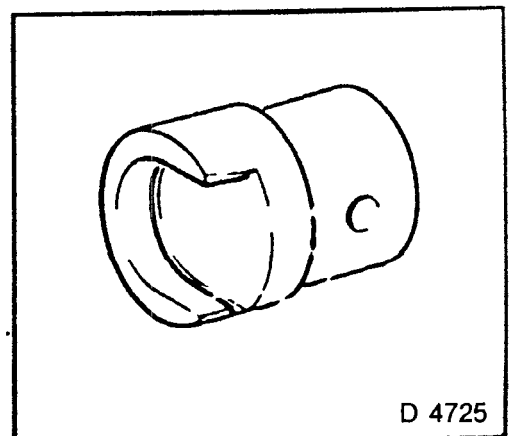
Consists of 12 tools with tool case:

KM-695, KM-696, KM-697, KM-698, KM-699, KM-701, KM-702, KM-703, KM-704, KM-709, KM-710, KM-711.

TO OVERHAUL AUTOMATIC TRANSMISSION AF 20.

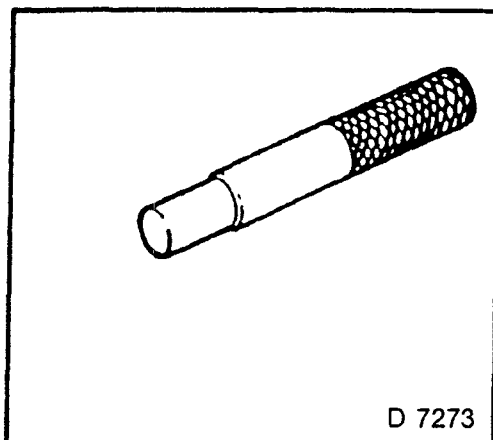
**KM-727 REMOVER**

F 10, F 13, F 16, F 20 manual transmission.
To remove 4 closure plugs for shifting lock from end shield in conjunction with KM-328-B



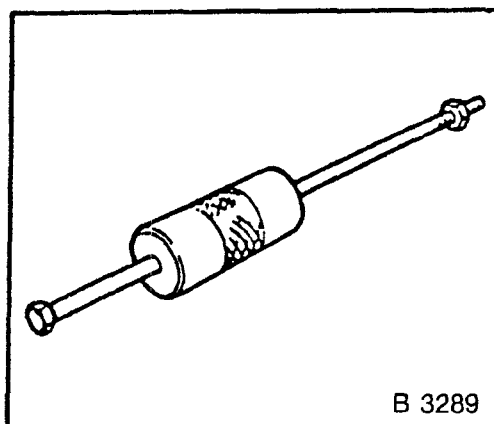
KM-736 GUIDE BOLT

To center clutch plate on vehicles with F 28/6 transmission.

**KM-J-7004 SLIDE HAMMER**

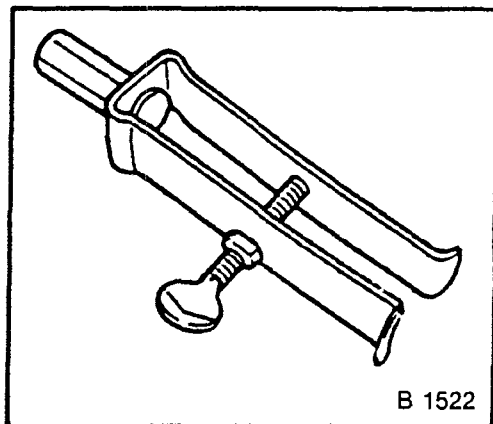
F 10, F 13, F 16, F 20 manual transmission.
To drive in new bearing bushings for clutch release lever in transmission.

To drive fluid pump seal ring out of transmission in conjunction with KM-586
AUTOMATIC TRANSMISSION AF 20

**KM-J-26941 REMOVER**

To remove outer sleeve for main shaft bearing from transmission housing in conjunction with KM-313 and KM-483.

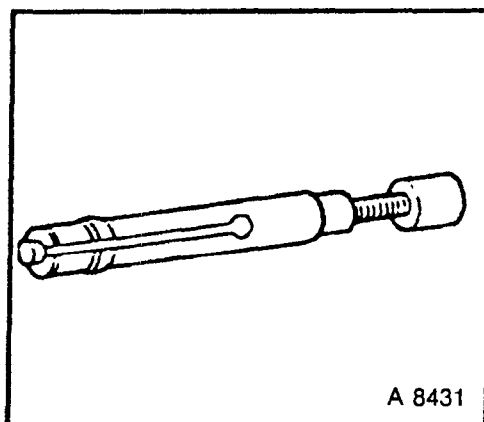
To knock roller bearing out of auxiliary housing with KM-313 and KM-483
AUTOMATIC TRANSMISSION AF 20.

**KM-J-28544 CHECKING DEVICE**

F 16, F 20 manual transmission.
To measure spin torque in conjunction with KM-536.

To measure starting torque with MKM-536.
AUTOMATIC TRANSMISSION AF 20.

To increase the transmitted torque (measurement with transmission gear set), KM-455-A is equipped with a rubber hose. This hose is available separately for retrofitting on the expanding part of KM-J-28544.



TECHNICAL DATA

Clutch

DESIGN: SINGLE PLATE DRY CLUTCH, MANUAL ADJUSTMENT

Engine	Diameter of clutch plate (in./mm)	Outer and inner diameter of lining (mm)	Thickness of lining (mm)	Material
14 NV	7.5/190	190/134	3.5	compressed fibre (asbestos-free)
C 16 NZ	8/200	200/134	3.5	compressed fibre (asbestos-free)
C 16 SE	8.5/216	216/144	3.5	compressed fibre (asbestos-free)
C 20 XE	9/228	228/150	3.5	compressed fibre (asbestos-free)

Manual Transmission and Differential

Survey Engines	14 NV	C 16 NZ	C 16 SE	C 20 XE
Manual transmission	F 10/5	F 13/5	F 13/5	F 20/5 CR
Drive ratio	4.18	4.18	3.94	3.42
(Number of grooves for identification)	(0)	(0)	(3)	(0)

Identification

Engine	Trans- mission	Type	Drive ratio	Converter	Control unit
18SE	AF 20	LH	2,81	K 250	YQ

Fluid Pressure Check

Test conditions: Transmission fluid level correct, transmission at operating temperature.
Use Adapter KM-580 or KM-498-4 and Manometer KM-498-1.
At full load, do not check for more than 5 seconds, danger of overheating.
Tolerances are permissible for the test values given in bar:
± 0.5 bar at idle speed, ± 2.0 bar with increased engine speed.

Test values:

Engine	Selector lever position	Idle speed				Full load			
		Main pressure	C 1	C 2	B 4	Main pressure	C 1	C 2	B 4
18SE	R D, 3, 2, 1	5.0 — 5.8	0	5.0	5.0	17.0 — 19.0*	0*	18.0*	18.0*
		2.6 — 3.0	2.8	0	2.8	11.4 — 12.6*	12.0*	0*	12.0*

*At engine speed 2500 ± 150 rpm.

Shifting Point Table

Engine: 18SE

Selector lever position:

Operating conditions:

Driving mode:

Shifting point (km/h) in driving gear:

		D/3 — D/3		Overall ratio: 2.81		D/3 D/3	
		Minimal throttle valve opening		Kickdown touched (full throttle)		Kickdown depressed	
		Economy	Sport	Economy	Sport	Economy	Sport
1 — 2		14	30	43	59	59	59
2 — 3		23	40	80	105	105	105
	D3 — 4	43	70	135	178	162	162
	D4 — 3	30	30	117	170	152	152
3 — 2		17	17	60	95	95	95
2 — 1		12	12	20	49	49	49

Driving gear

Manual downshifting possible at driving speeds under (km/h):

D — 3 entire speed range
3 — 2 105 — for both driving modes
2 — 1 59 — for both driving modes

Gear shifts possible at driving speeds under (km/h):

D — R 7
N — R 7
R — P 0 — vehicle stationary, (mechanical blocking mechanism)

Variations from the given shifting points are generally tolerances in the speedometer display: — 2% to + 6%

MODEL	DESIG-NATION	TRANSM.	FINAL DRIVE	FIRST GEAR	SECOND GEAR	THIRD GEAR	FOURTH GEAR	FIFTH GEAR	SIXTH GEAR	CLUTCH DIA.
KADETT	140	F10/4 WR	4,18	3,545	1,957	1,303	0,892	0,707	N/A	190/134
ASTRA		F10/4 WR	4,18	3,545	1,957	1,303	0,892	0,892	N/A	190/134
KADETT	140 S	F13/5 CR	3,94	3,545	2,143	1,429	1,121	0,892	N/A	190/134
ASTRA	160i	F13/5 WR	3,94	3,545	1,957	1,303	0,892	0,707	N/A	200/134
KADETT		F13/5 WR	3,94	3,545	1,957	1,303	0,892	0,707	N/A	200/134
ASTRA	160i E	F13/5 CR	3,74	3,545	2,143	1,429	1,121	0,892	N/A	200/134
ASTRA	160i S	F13/5 CR	3,74	3,545	2,143	1,429	1,121	0,892	N/A	200/134
ASTRA	180i	F16/5 WR	3,94	3,545	1,952	1,276	0,892	0,707	N/A	216/144
ASTRA	180i AT	AF20/4	2,81	3,672	2,098	1,391	1,00	N/A	N/A	241
ASTRA	200i	F16/5 WR	3,94	3,545	1,952	1,276	0,892	0,707	N/A	216/144
ASTRA	200i E	F20/5 CR	3,42	3,545	2,158	1,478	1,129	0,886	N/A	228/154
KADETT	200i S	F16/5 CR	3,72	3,545	2,158	1,478	1,129	0,886	N/A	216/144
KADETT	200t S	F28/6 CR	3,72	3,57	2,16	1,45	1,10	0,89	0,74	228/150

Transmission fluid:

Manual — B040075 (Auto-Dexron 11D)

Filling quantity: Manual transmission with differential

- F 10/5 = 1,6 litres
- F 13/5 = 1,6 litres
- F 16/5 = 1,9 litres
- F 20/5 = 1,9 litres

RECOMMENDED TORQUE VALUES (CLUTCH AND TRANSMISSION)

	Nm
Bearing flange for differential to transmission (F 16 and F 20)	25
Bearing support for pawl to end shield	7**
Bolt for shift rod clamp	15
Bridge for rocker arm to end shield	7**
Castellated nut, ball joint to steering knuckle	70
Closure cover for clutch to transmission:	
Light alloy version	6
Sheet metal version	12
Clutch assembly to flywheel	15
Clutch fork to clutch release lever	35
Damping element (gearshift lever) to underbody	6
Differential cover to transmission:	
Light alloy version	18
Sheet metal version	30
Drive gear (driven) to differential housing	70*
End shield cover and end shield to transmission, M 8 x 1.25	20
End shield to transmission, M 7 x 1	15
Engine suspension bracket, front left, damping block to front frame side member	65***
Engine suspension bracket, front left, to transmission	60
Engine suspension bracket, rear, to front frame side member	40
Fillister head bolt to transmission drive shaft	15
Locking plate to adjustment nut for tapered roller bearing (differential)	9
Reversing lamp switch	20
Shift cover to transmission	15
Thrust bearing guide to transmission	5
Transmission to engine block	75
Wheel bolts	110

* Turn a further 30° to 45°.
** Recut threaded bore holes and insert new bolts with Locking Compound (Locktite 242).
***Recut threaded bore holes M 10 x 1.25 and insert new bolts with Locking Compound (Locktite 242).

RECOMMENDED TORQUE VALUES (4-SPEED AUTOMATIC TRANSMISSION AF 20)

	Nm
Accumulator cover for reduction brake to main case	10
Actuating lever to selector lever shaft	16
Anchor bolt to main case	170
Auxiliary housing cover to transmission	5
Auxiliary housing to main case	30
3 bolts for fluid baffle plate to auxiliary housing	6
Bracket, engine suspension front left, to transmission	60
Bracket, engine suspension rear, to front axle body	40
Bracket, wiring harness to transmission	30
Cam plate to main case	10
Centre to rear valve body	7
Clamp bolt to selector lever actuation cable	6
Console to floor panel	10
Converter housing protective plate to transmission	7
Converter to drive disc	50

	Nm
Cover C1 to rear cover	10
Covers no. 1 and no. 2 to rear valve body	7
Damping block to front frame side member	65
Detent spring to main case	10
Drain plug to main case	35
Drive gear (driven) to differential	100
Fluid baffle plate to main case	7
Fluid drain screw to transmission	45
Fluid lines to transmission/fluid cooler	22
Fluid pressure regulator clamp to front valve body	7
Fluid pump to transmission	25
Fluid screen to main case	7
Fluid temperature sensor cover plate to transmission	25
Fluid temperature sensor to transmission	25
Front to centre valve body	7
Hose clamps to fluid lines	1.2
Intake cover to transmission	7
Main case plate to main case	7
Pipe clamp to fluid line	6
7 plugs — fluid pressure M 8:	8
1 plug — fluid pressure M 14:	35
1 plug — fluid pressure M 18 (Torx):	35
2 plugs — fluid pressure M 20:	35
Rear cover to transmission M 8:	25
M 6:	10
Retaining plate for solenoid valves wiring harness to transmission	13
Selector lever actuating cable to console/transmission bracket	6
Selector lever position switch to selector lever shaft	8
Selector lever position switch/fluid filler tube to transmission	25
Selector lever to console	28
Side cover to transmission	25
3 solenoid valves to front valve body	7
Stator shaft to fluid pump (Torx 30)	12
Transmission input speed sensor	6
Transmission output speed sensor	6
Transmission to engine	75
Valve body to transmission	7
Use new micro-encapsulated bolts for:	
Damping block to front frame side member	
Converter to drive disc	
Recut threads M 10 x 1.25	
New hose clamps for: Connection hose, fluid lines to transmission	

Automatic Transmission AF 20

General Data

Manufacturer of transmission:	Aisin AW CO., LTD
Number of gears:	4 forward gears and 1 reverse gear
Shifting:	Automatic and dependent on the position of throttle valve and driving speed
Kickdown	Operates by electric contact to control unit — switch mounted under accelerator
Towing vehicle:	Never tow vehicle backwards. If transmission is operational: can be towed up to 100 km (62 miles) with a maximum permissible speed of 80 km/h (50 mph) If distance is more than 100 km (62 miles) or maximum speed is over 80 km/h (50 mph) or if transmission is defective: raise vehicle at front.

Fluid quality:	Special Fluid Catalogue No. 19 40 690 (90 013 457) (1 litre) and 19 40 691 (90 020 172) (1/2 litre) or 19 40 699 (90 350 341) and 19 40 700 (90 350 342).
Filling quantity:	— after draining fluid: 3.0 to 3.5 litres:

Fluid measurement level:	with engine running and selector lever position “P”; — transmission cold: — transmission at operating temp.:	allow to run in idle speed for 1 to 2 minutes; fluid level on scale side + 20°C must reach the “MAX” mark; fluid level on scale side + 80°C must be between marks “MIN” and “MAX”.
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Fluid change:	Drain and refill every 45 000 km or every 36 months. Filter elements are not replaced
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Trouble-shooting:	The transmission is equipped with a self-diagnosis system. If the fault does not affect operational safety, a trouble code is stored in the control unit; the telltale does not illuminate. The transmission remains functionable, except for the function of the affected component. If the telltale illuminates, the control unit switches automatically to the emergency programme. All stored trouble codes can be read out using TECH 1 — see Checking Procedures “Opel Electronic 4-speed Automatic Transmission AF 14/20”
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Driving Modes

Economy (4 gear sequence, economical driving)

Switching on: Automatic after switching on ignition
When switching off "Sport" programme — button "S"

Switching off: Actuation of "Kickdown"
When switching on "Sport" programme — button "S"

Sport (4 gear sequence, sporty driving)

Switching on and off operates in the opposite way to the "Economy" programme.
"Sport" programme is automatically switched off when engine is switched off.

Winter (for driving on icy roads in 3rd gear)

Switching on: Selector lever position "D" and driving programme
"Economy" — button "*" again

Automatic when selector lever position in "D", driving speed is less than 60 km/h (37 mph) and convertor output temperature is less than 140°C (284°F).

Switching off: Actuation of button "*" again

Automatic when: Any selector lever position except "D" is used
Driving speed is more than approx. 80 km/h (50 mph)
Convertor output temperature is more than 150°C (302°F)
Driving programme "Sport" is switched on
"Kickdown" is actuated
Engine is switched off.

Transmission Maintenance: Rubber O-rings, Dimensions and Use

Component	Installation position	Outer/Inner seal ring	Inner 0 (mm)	Cord 0 (mm)
Piston for multi-disc brake B ₁	Fluid pump	Outer: Inner:	98.25 50.9	2.62 3.1
Piston for multi-disc brake B ₂	Fluid pump	Outer: Inner:	147.0 123.75	2.62 2.62
Piston for multi-plate clutch C ₁	Drive shaft	Outer: Inner:	126.7 47.6	3.1 2.62
Piston for multi-plate clutch C ₂	Drive shaft	Outer: Inner:	98.25 47.6	3.1 2.62
Piston for multi-disc brake B ₃	Main housing	Outer: Inner:	147.0 103.2	2.62 2.62
Piston for multi-plate clutch C ₃	Main housing	Outer: Inner:	98.25 50.9	3.1 2.62
Cover and piston for reduction brake	Main housing	—	41.8	2.4
Anchor bolt for brake band	Main housing	—	17.8	2.4
Cover and piston for reduction brake accumulator	Main housing	—	21.95	2.62
Cover and piston C ₁	Rear cover	—	26.55	2.62
Fluid pressure plugs	Main or auxiliary Housing	M 8: M 14: M 18: M 20:	6.07 11.68 15.41 17.8	1.78 1.98 2.21 2.4
Wiring harness for solenoid valves	Main housing	—	17.8	2.4
Fluid temperature sensor	Main housing	—	11.68	1.98
Fluid pump plate	Fluid pump	—	205.0	3.5

Transmission Maintenance: List of parts, clutches and brakes

Component	Installation position	Flange	Steel plate	Lining plate
Multi-disc brake B ₁	Fluid pump	1	2	2
Multi-disc brake B ₂	Fluid pump	1	3	3
Multi-disc brake B ₃	Main housing	1	5	5
Multi-plate clutch C ₁	Drive shaft	1	4	4
Multi-plate clutch C ₂	Drive shaft	1	4	4
Multi-plate clutch C ₃	Reduction clutch	1	4	4