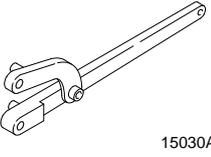
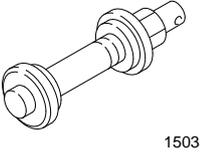
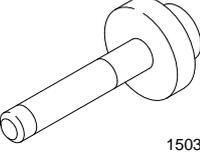
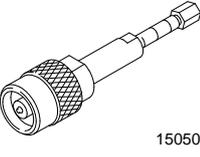
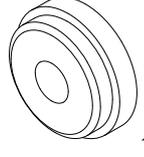
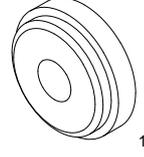
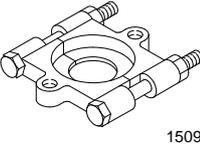
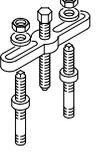
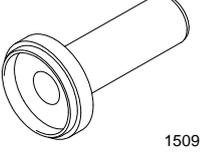
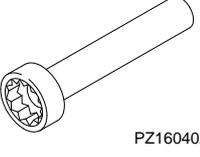
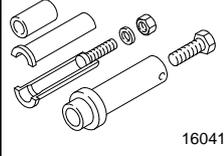
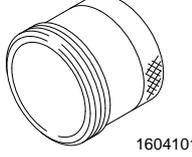
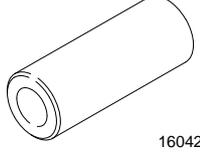
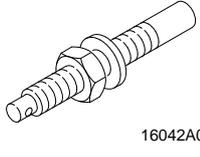
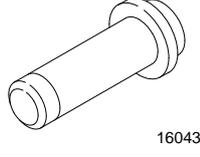
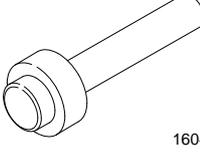
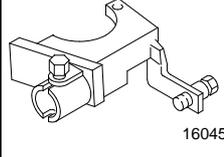
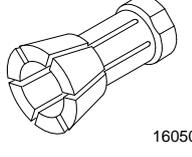
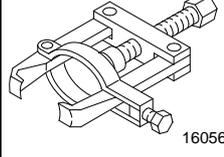
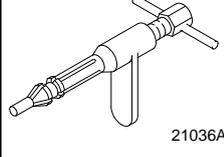
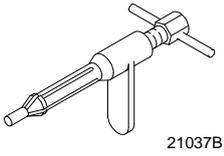
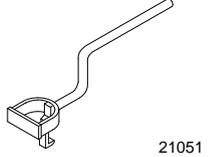
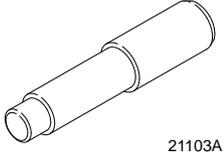
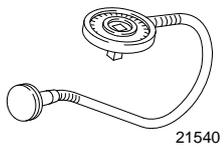


**Manual Transmission – Overhaul (transmission removed) (16 118 8)**

**Special Tools**

 15030A	<b>15-030A</b> Universal flange-holding wrench
 15035	<b>15-035</b> Bearing ring installer
 15036	<b>15-036</b> Countershaft roller bearing installer
 15050A	<b>15-050A</b> Remover (basic tool)
 15064	<b>15-064</b> Adaptor for 15-035, bearing cones
 15068	<b>15-068</b> Adaptor for 15-033, bearing cones
 15091	<b>15-091</b> Separator
 15092	<b>15-092</b> Bridge, remover
 15096	<b>15-096</b> Installer
 PZ16040A	<b>16-040A</b> Guide sleeve wrench

 16041	<b>16-041</b> Front transmission housing remover and installer
 1604101	<b>16-041-01</b> Adaptor for 16-041
 16042A	<b>16-042-A</b> Adaptor for 16-042 A-01
 16042A01	<b>16-042A-01</b> Threaded spindle
 16043A	<b>16-043A</b> Drive flange oil seal installer
 16044	<b>16-044</b> Guide sleeve oil seal installer
 16045	<b>16-045</b> Mounting bracket
 16050	<b>16-050</b> Collet for 15-050 A
 16056	<b>16-056</b> Remover
 21036A	<b>21-036A</b> Remover for pilot bearing

	<b>21-037B</b> Pilot bearing remover
	<b>21-051</b> Oil seal remover
	<b>21-103A</b> Locator
	<b>21-540</b> Angle gauge

**Materials**

Cable ties	
Sealer	ESKM-4G242-A
High-temperature grease	ESDM-1C220-A
Transmission fluid	ESDM-2C186-A

**Proprietary Tools**

Two-legged puller
Internal extractor
30 mm socket wrench (double hexagon)
8 mm Allen key
14 mm Allen key
17 mm Allen key
T40 Torx wrench
9,5 mm twist drill bit

**Workshop Equipment**

Assembly stand	
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**Dismantle**

**1. General notes.**

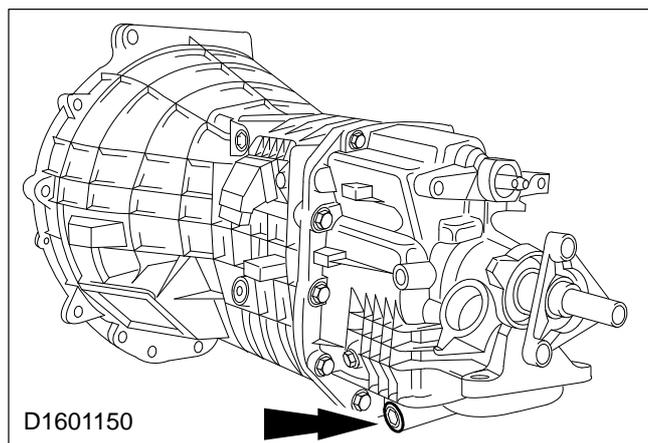
Some synchroniser units and bearings are identical and must be marked for reuse.

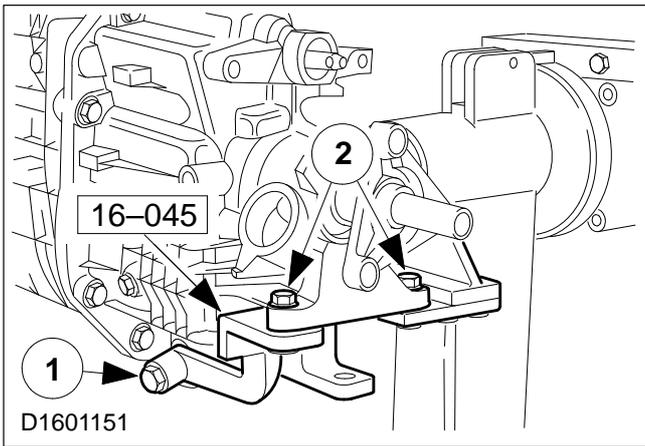
Mark the synchroniser units in the direction of travel of the vehicle.

All the bearings are paired and must not be mixed up.

Use soft jaws for all operations in a vice.

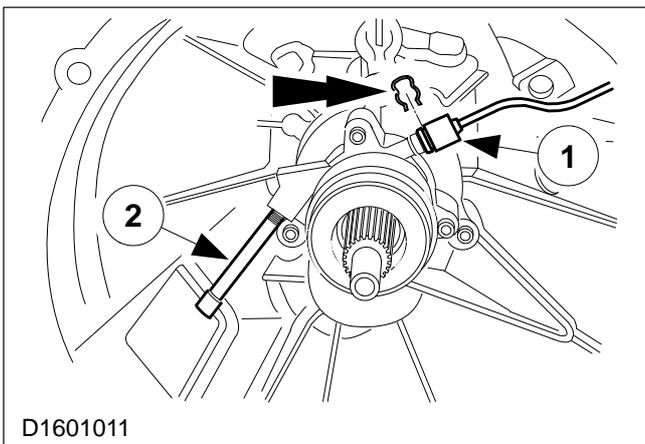
**2. Drain off the transmission fluid (transmission for diesel engine shown).**





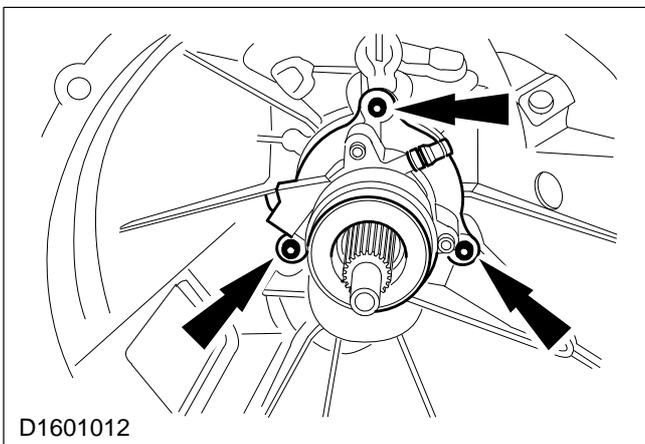
**3. Mount the transmission on an assembly stand.**

- 1 Screw the tool bolt into the threaded hole for the oil drain plug and tighten it.
- 2 Secure the mounting bracket to the transmission.

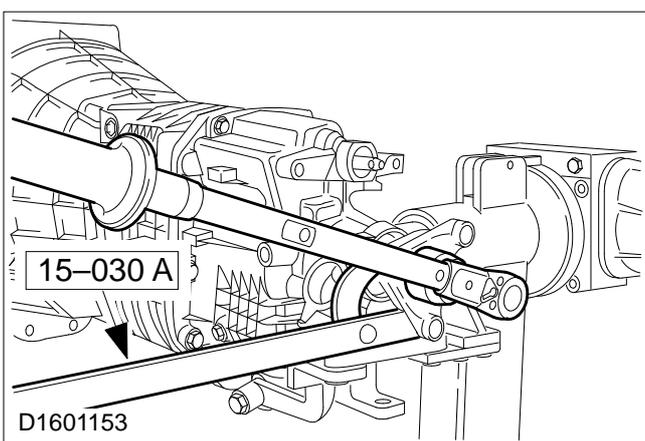


**4. Detach the pressure line and the bleed screw.**

- 1 Pull out the spring clip; disconnect the quick-release coupling.
- 2 Remove the bleed screw.

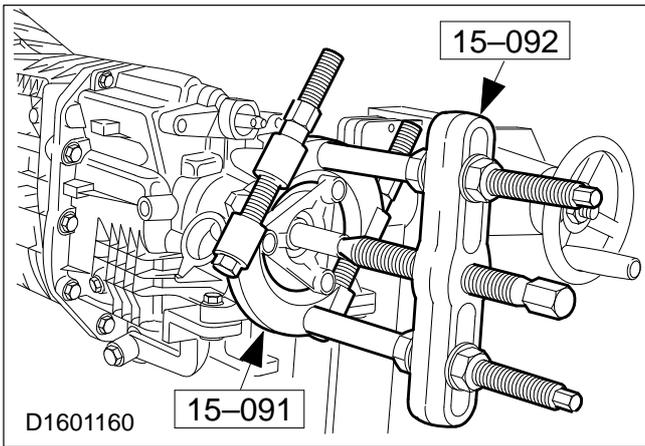


**5. Remove the slave cylinder complete with the release bearing.**

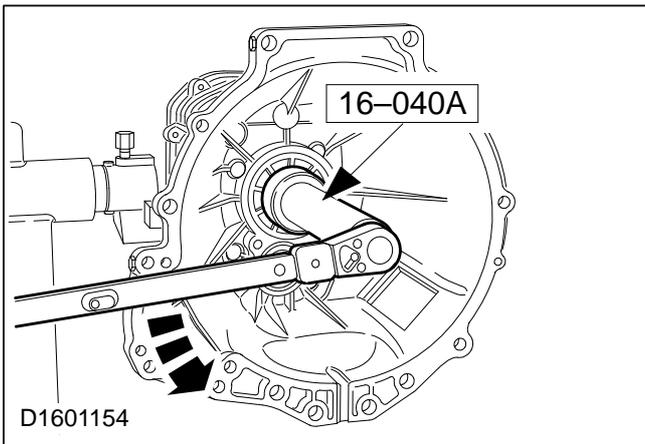


**6. Unscrew the drive flange nut from the mainshaft.**

- Use a 30 mm socket wrench.
- Hold with the special tool.
- Discard the nut.

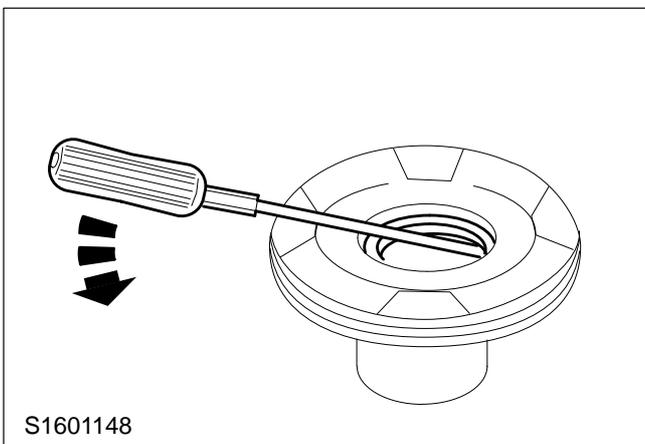


**7. Pull off the drive flange.**



**8. Remove the guide sleeve.**

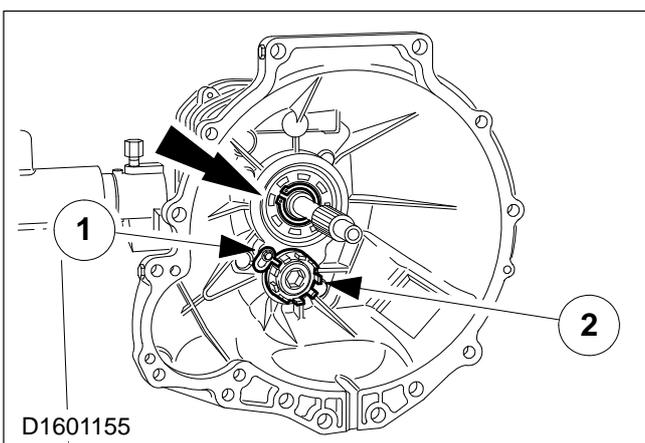
Remove the thrust washer.



Remove input shaft guide sleeve oil seal

**9. Remove the radial oil seal.**

Prise out the radial oil seal using a suitable lever.

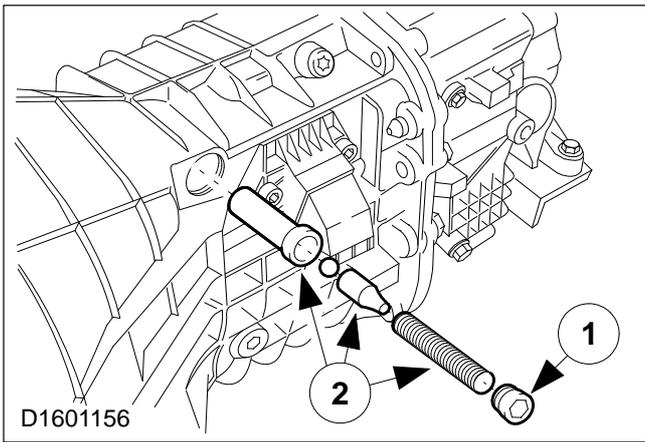


**10. Remove the input shaft circlip.**

**11. Remove the countershaft bearing housing.**

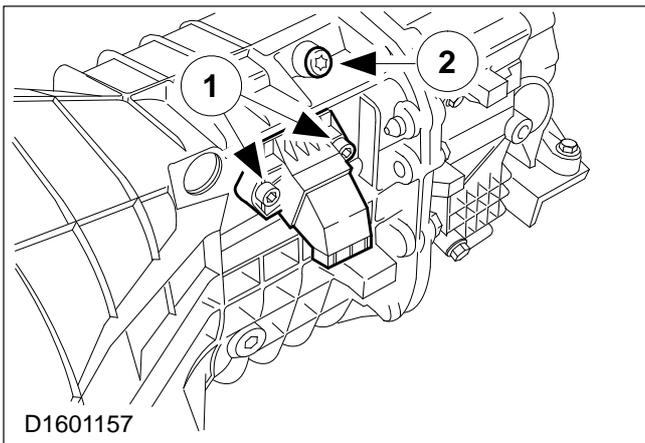
1 Remove the bearing housing locking plate.

2 Unscrew the bearing housing using a 17 mm Allen key.



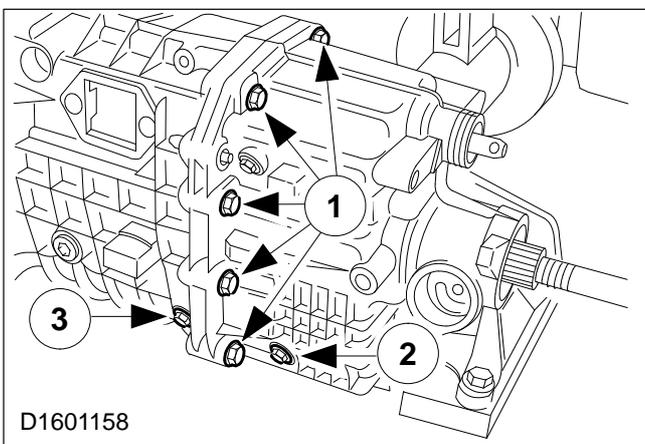
**12. Remove the selector interlock mechanism.**

- 1 Remove the plug with a 14 mm Allen key.
- 2 Remove the spring, pin, ball and sleeve.



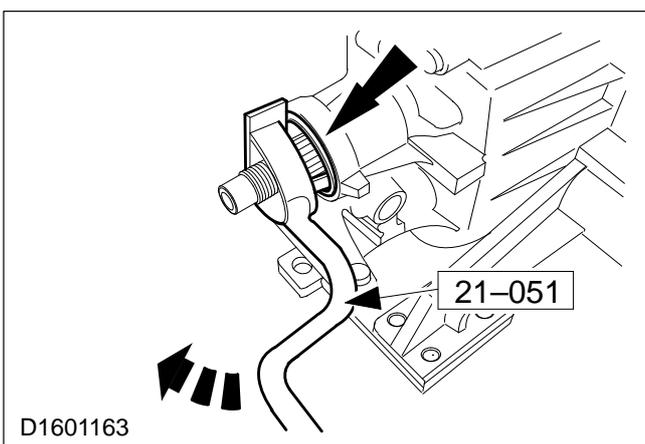
**13. Remove the reversing light switch and the locking screw.**

- 1 Reversing light switch
- 2 Locking plate locking screw.

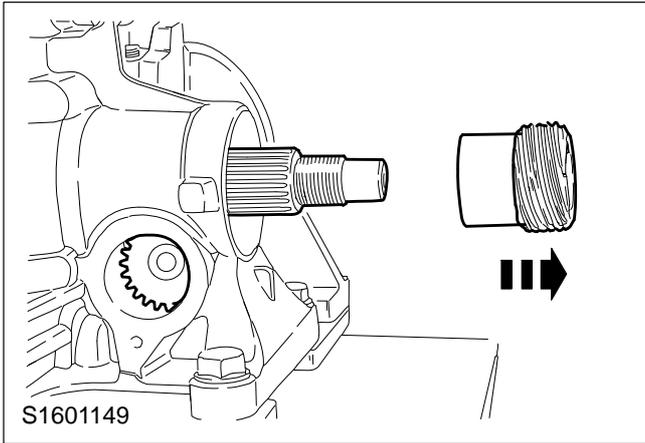


**14. Unscrew the transmission housing bolts.**

- 1 Housing flange (10 bolts).
- 2 Only slacken the bolt of the reverse gear idler shaft (marked in blue).
- 3 Unscrew the bolt of the reverse gear idler shaft (marked in blue).

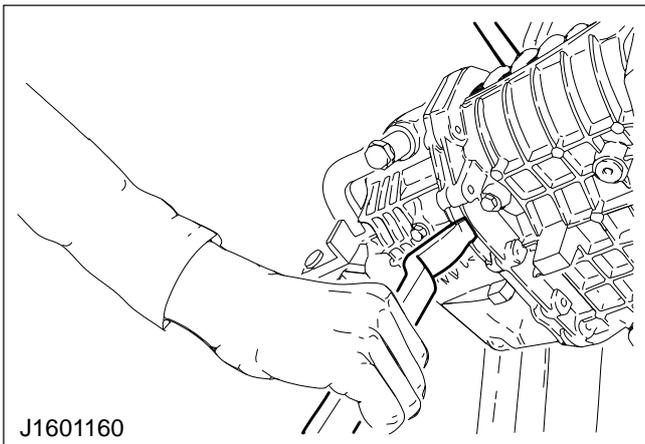


**15. Prise out the radial oil seal.**



**16. Remove the speedometer drive pinion and worm gear.**

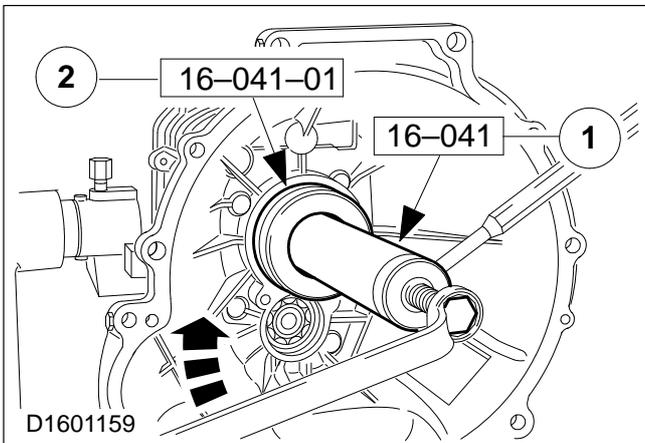
Remove the blanking cover.



**NOTE:** Do not drive out the housing locating dowels.

**17. Separate the transmission housing halves.**

**NOTE:** Only apply the levers to the reinforcing ribs.

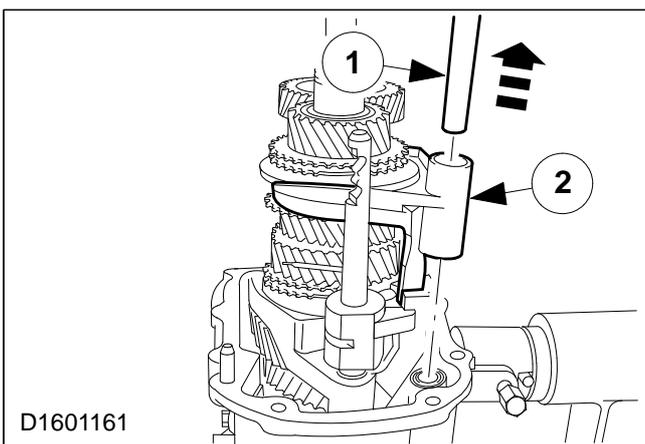


**CAUTION:** Take care not to apply excessive pressure to the input shaft through the special tool as this could damage the 4th gear synchroniser ring.

**18. Pull off the front transmission housing.**

**NOTE:** Hold the special tool with a drift.

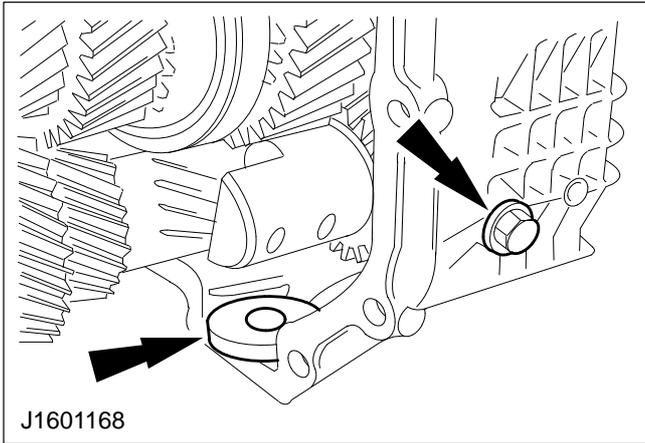
- 1 Attach the puller.
  - 2 Screw the adaptor into the threaded hole of the guide sleeve.
- If necessary, assist with levers.



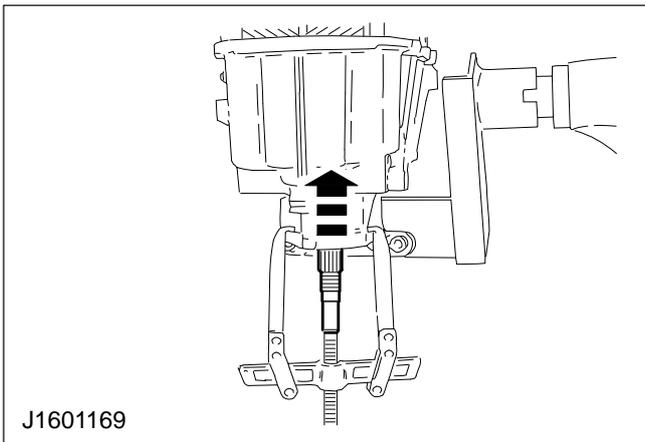
**19. Remove the 3rd/4th gear selector fork.**

- Move the main selector shaft to the neutral position.

- 1 Pull out the auxiliary selector shaft.
- 2 Remove the 3rd/4th gear selector fork.



**20. Remove the second retaining bolt of the reverse gear idler shaft (marked in blue) and the magnetic disc.**



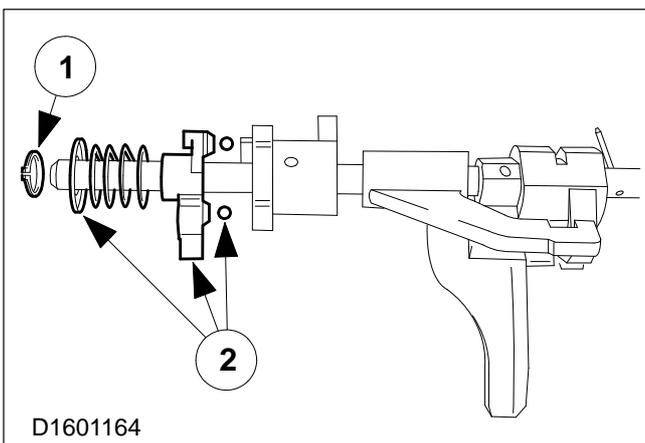
**⚠ CAUTION:** Move the selector shaft to the neutral position so that the locating pin does not break off the shift finger holder.

**NOTE:** Locate the puller on the housing bosses.

**21. Press the mainshaft out of the bearing in the rear transmission housing.**

**22. Remove the main selector shaft with the selector fork.**

**23. Lift out the complete gear train.**

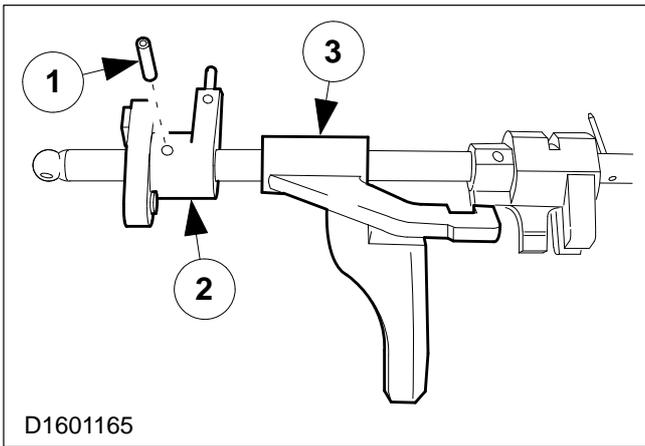


**Dismantle main selector shaft**

**NOTE:** Catch the two balls from the spring carrier.

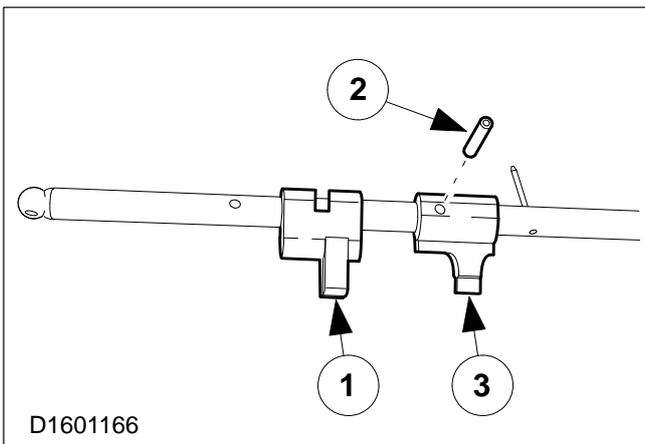
**24. Dismantle main selector shaft**

- 1 Remove the circlip.
- 2 Remove the spring cup, spring and spring carrier.



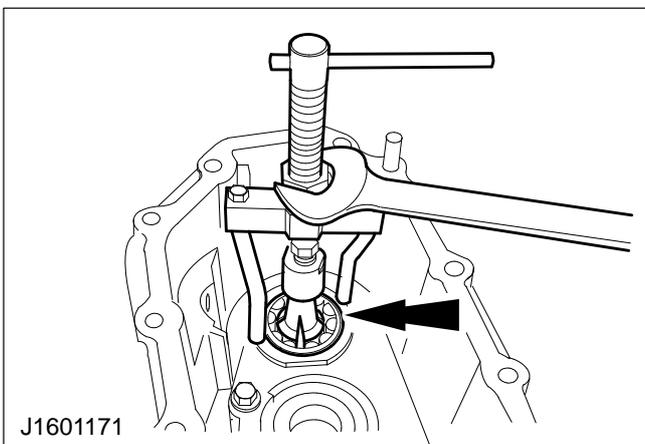
**25. Dismantle the main selector shaft (continued).**

- 1 Drive the roll pin out of the shift finger holder and the main selector shaft.
- 2 Remove the shift finger holder.
- 3 Remove the 1st/2nd gear selector fork.



**26. Dismantle the main selector shaft (continued).**

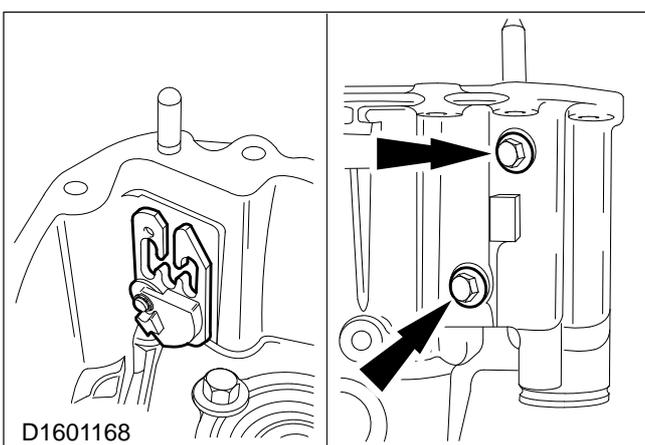
- 1 Remove the locking sleeve.
- 2 Drive the roll pin out of the shift finger and the main selector shaft.
- 3 Remove the shift finger.



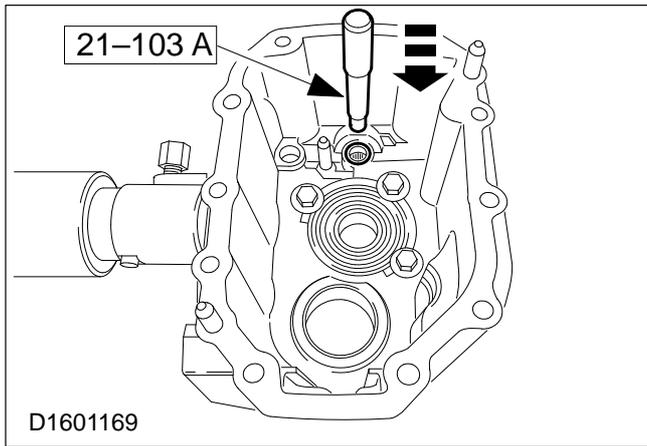
**Dismantle rear transmission housing**

**27. Remove the countershaft rear roller bearing.**

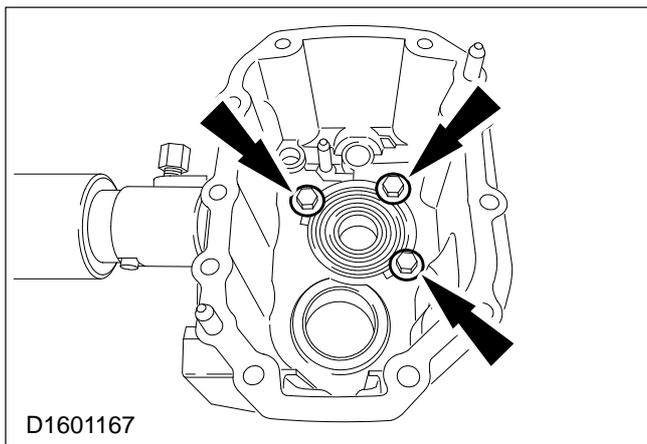
Use a proprietary internal extractor.



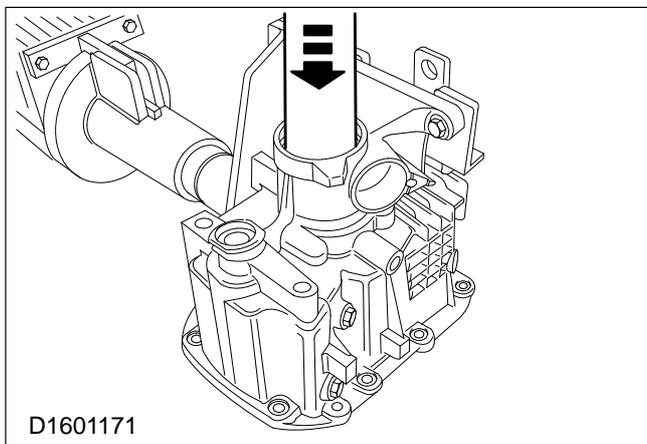
**28. Remove the selector gate.**



**29. Drive out the main selector shaft ball sleeve together with the radial oil seal.**

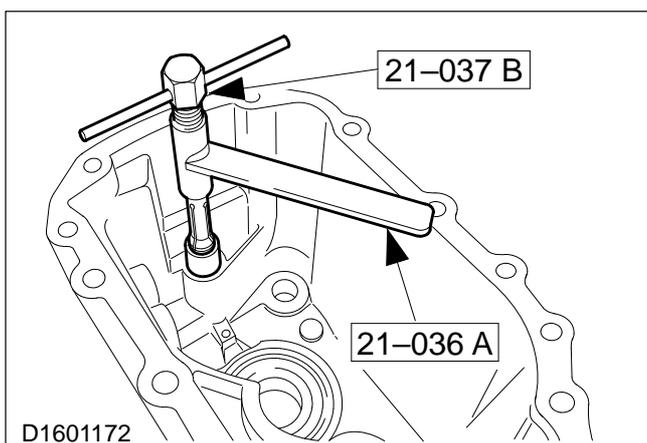


**30. Unscrew the retaining bolts of the mainshaft ball bearing.**



**31. Remove the mainshaft ball bearing.**

Drive out the mainshaft ball bearing using a suitable length of tube.

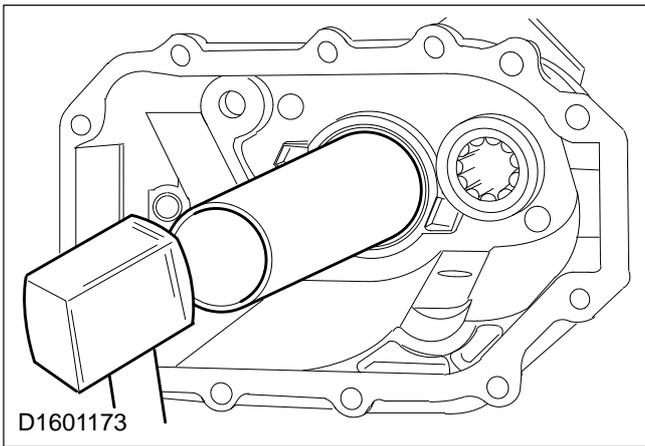


Dismantle front transmission housing

**NOTE:** Insert a spacer (approx. 63 mm) in the hole.

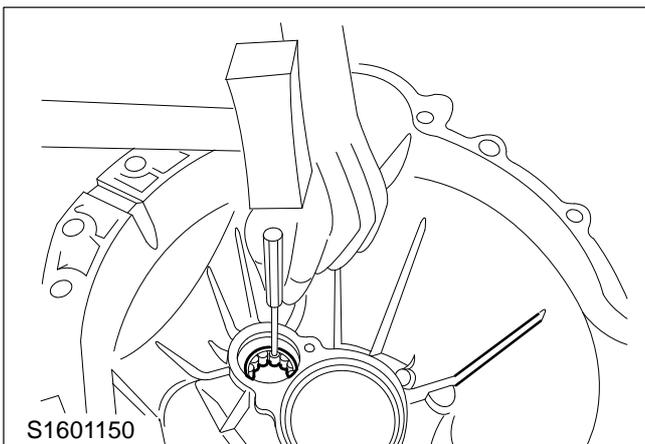
**NOTE:** Use remover 21-036 A with the thrust element of 21-037 B.

**32. Remove the main selector shaft ball sleeve.**



### 33. Remove the input shaft ball bearing.

Use a suitable length of tube or Special Tool 15-096.



**⚠ CAUTION:** Take care not to damage the bearing housing thread in the housing.

### 34. Drive out the countershaft roller bearing.

## Dismantle mainshaft

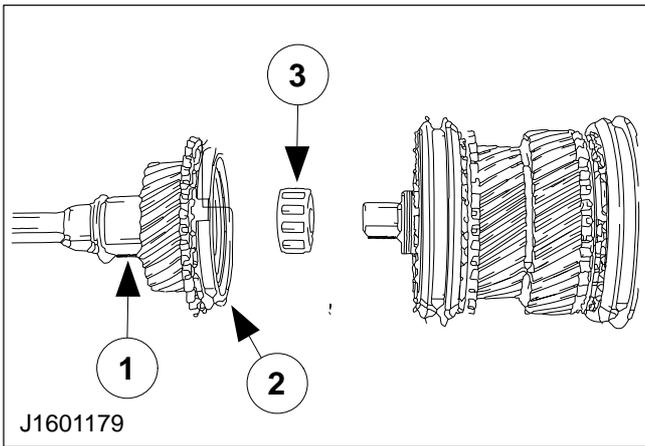
### 35. General notes.

**⚠ CAUTION:** From build date 17.8.1994 onwards (see table on page 2, General Specifications) the synchroniser rings for 1st, 2nd and 3rd gear have a taper angle of  $7^\circ$  and are coated with molybdenum. The synchroniser rings for 4th, 5th and reverse gear have a taper angle of  $6,5^\circ$  as previously.

Vehicles manufactured from build date 17. 6.1996 are fitted with a 1st/2nd gear double synchroniser unit.

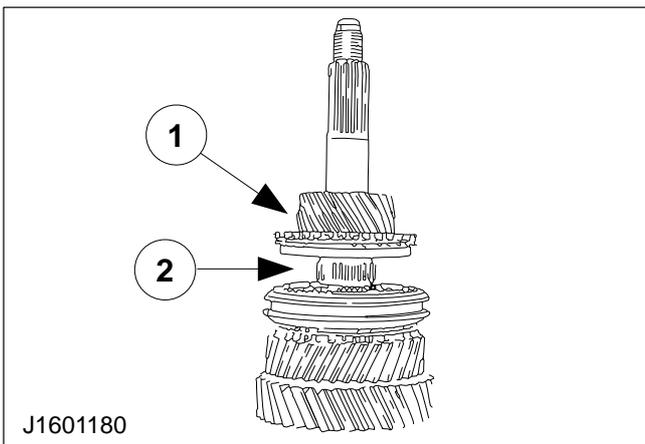
When the shaft is dismantled, the synchroniser rings and synchroniser units must be marked.

When dismantling the synchroniser units, also mark the synchroniser hubs in relation to the shift rings.



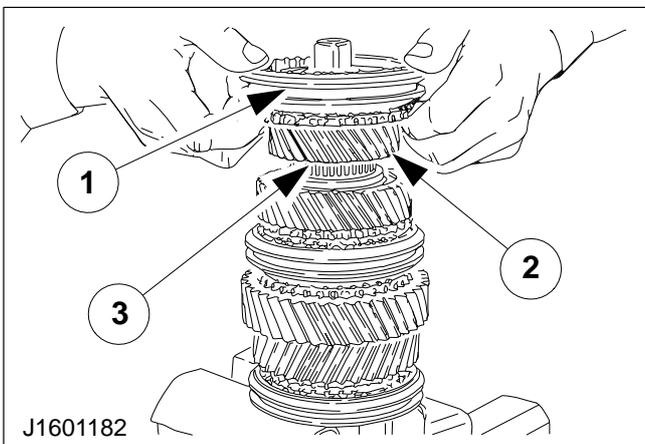
**36. Remove the input shaft with the 4th gear synchroniser ring from the mainshaft.**

- 1 Input shaft
- 2 4th gear synchroniser ring
- 3 Roller bearing



**37. Remove the 5th gear wheel with the synchroniser ring from the mainshaft.**

- 1 5th gear wheel
- 2 Needle roller bearing

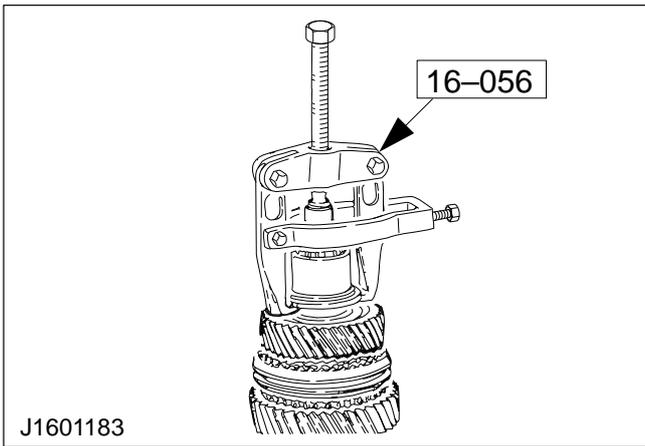


**⚠ WARNING:** The synchroniser units must not be allowed to fall apart as there is a danger of injury from springs, blocker bars and balls.

**38. Remove the 3rd/4th gear synchroniser unit with the 3rd gear wheel.**

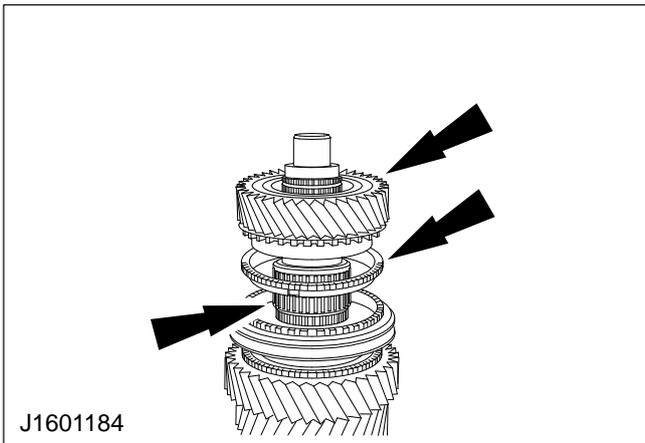
- Clamp the mainshaft in a vice with the output shaft pointing downwards.
- Remove the circlip.

- 1 3rd/4th gear synchroniser unit
- 2 3rd/4th gear wheel
- 3 Needle roller bearing



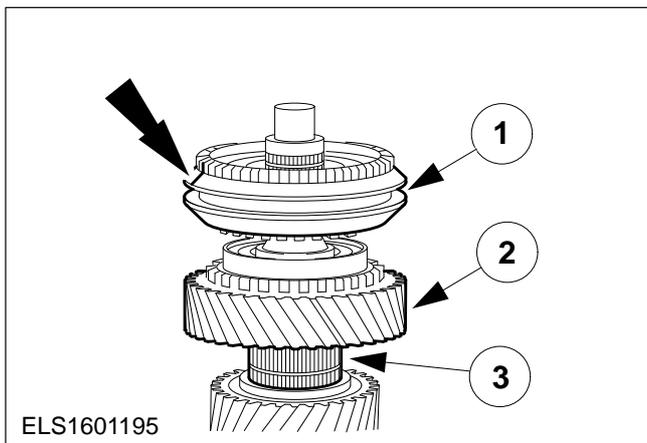
**39. Pull off the 3rd gear bearing ring.**

Locate the puller in the recesses in the bearing ring.



**NOTE:** Mark the parts.

**40. Remove the 2nd gear wheel with the needle roller bearing and synchroniser ring.**



Vehicles manufactured from build date 17. 6. 1996 are fitted with a 1st/2nd gear synchroniser unit.

**NOTE:** Mark the shift ring for the gear synchroniser. Components are paired.

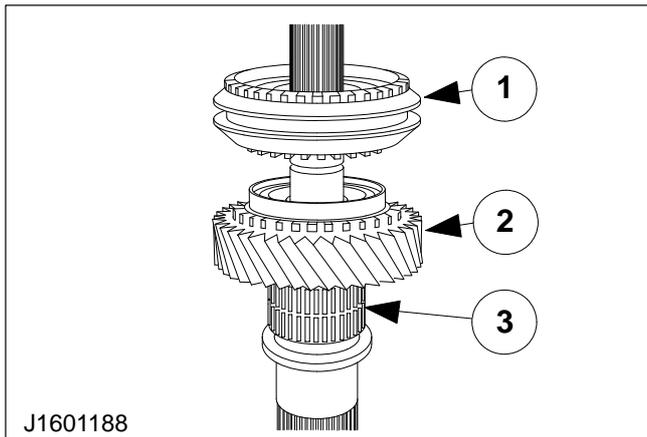
**41. Remove the 1st/2nd gear synchroniser unit with the 1st gear wheel.**

- Remove the circlip for the 1st/2nd gear synchroniser unit.

1 1st/2nd gear synchroniser unit

2 1st gear wheel

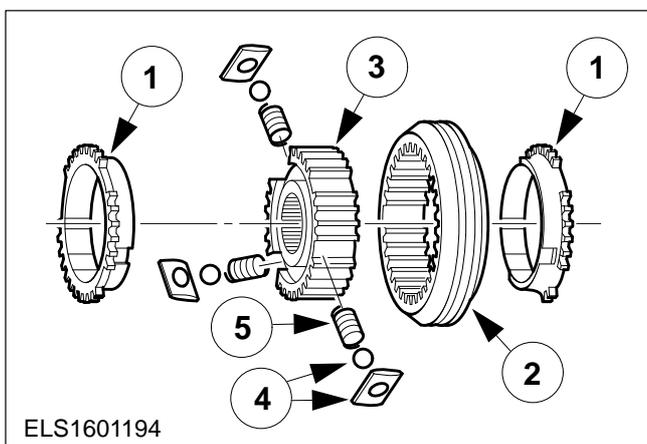
3 Needle roller bearing



**NOTE:** Mark the shift ring for the gear synchroniser. The components are paired.

**42. Remove the 5th/reverse gear synchroniser unit with the reverse gear wheel and needle roller bearing.**

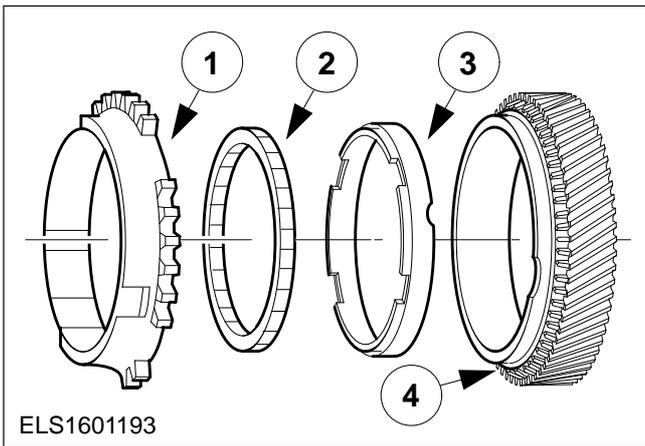
- Clamp the mainshaft the other way round in the vice.
  - Circlip
- 1 Synchroniser unit
  - 2 Reverse gear wheel
  - 3 Needle roller bearing



**⚠ WARNING:** Take care when removing the shift ring from the synchroniser hub. The balls and blocker bars are spring-loaded.

**43. Dismantle the synchroniser unit.**

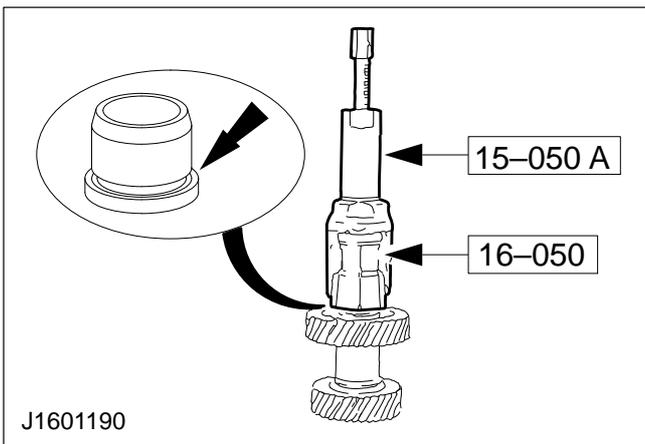
- 1 Synchroniser rings
- 2 Shift ring
- 3 Synchroniser hub
- 4 Ball and blocker bar
- 5 Compression spring



Vehicles manufactured from built date 17. 6.1996 are fitted with a 1st/2nd gear double synchroniser unit.

**44. Double synchroniser unit components.**

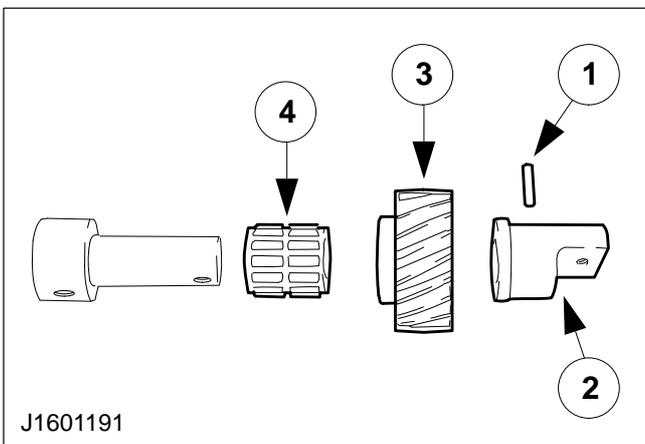
- 1 Outer synchroniser ring
- 2 Inner synchroniser ring
- 3 Synchroniser cone
- 4 Gear wheel



**Dismantle countershaft**

**NOTE:** Insert the puller in the annular groove provided in the ring.

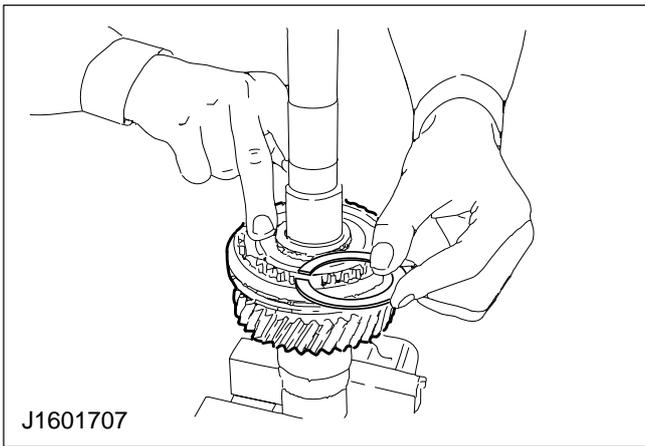
**45. Pull the inner ring off the countershaft.**



**Dismantle reverse gear idler shaft**

**46. Dismantle the reverse gear idler shaft.**

- 1 Drive out the roll pin.
- 2 Bearing housing
- 3 Idler
- 4 Needle roller bearing



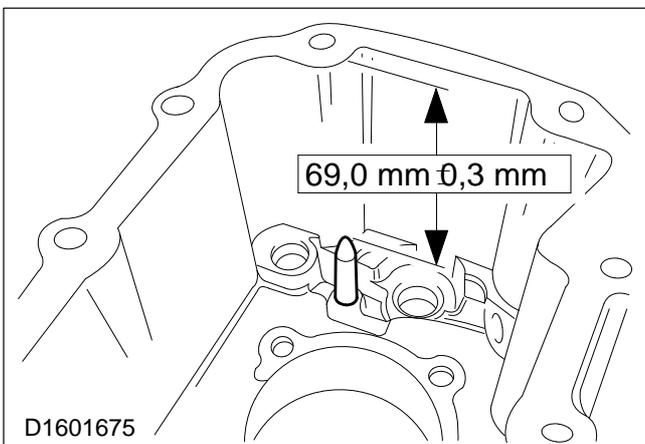
## Assemble transmission

### 47. General notes.

- Lubricate all moving parts with transmission fluid before or during assembly.
- Renew all the circlips, oil seals and self-locking nuts.
- Measure the circlips so that they fit into their grooves without free play.

### 48. Preparatory operations.

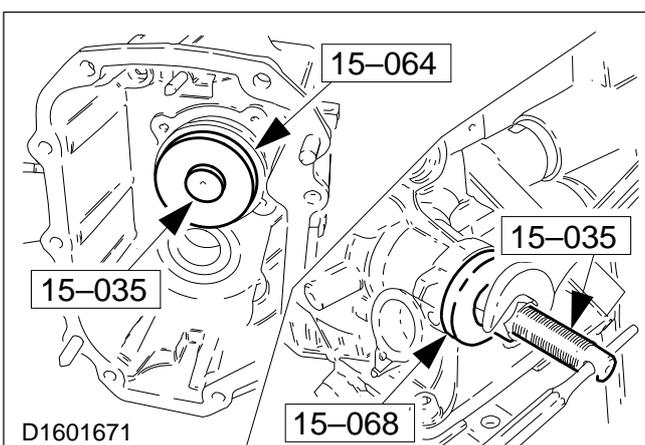
Clean and check all parts thoroughly and renew if necessary.



## Assemble rear transmission housing

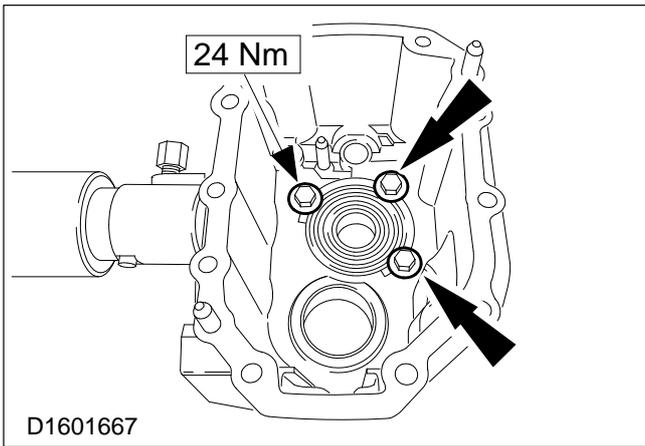
**NOTE:** If the rear transmission housing is renewed, a new detent pin must be fitted.

The distance from the tip of the detent pin to the housing mating face must be  $69,0 \pm 0,3$  mm.

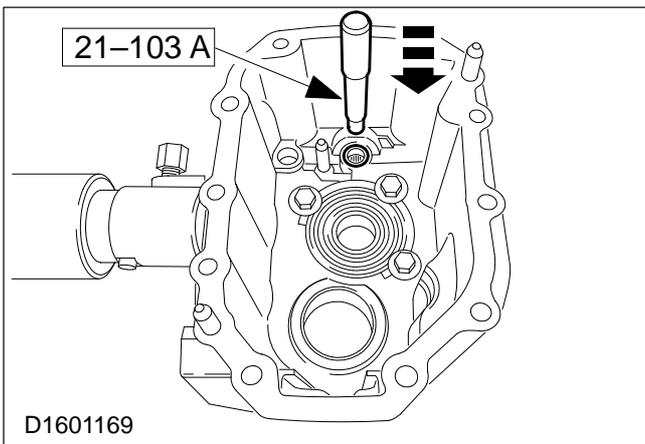


### 49. Fit the mainshaft ball bearing.

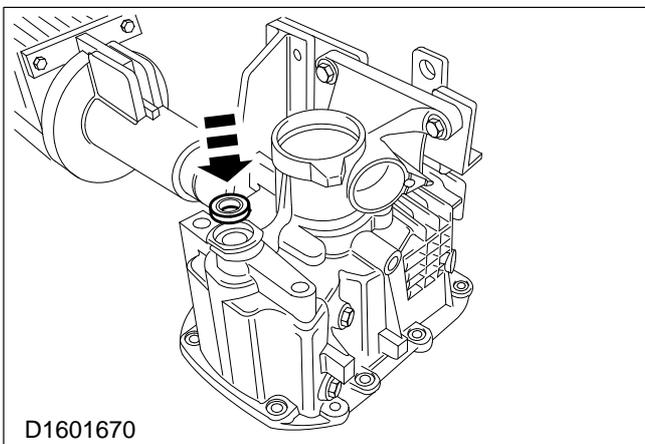
Use only the spindle of 15-035.



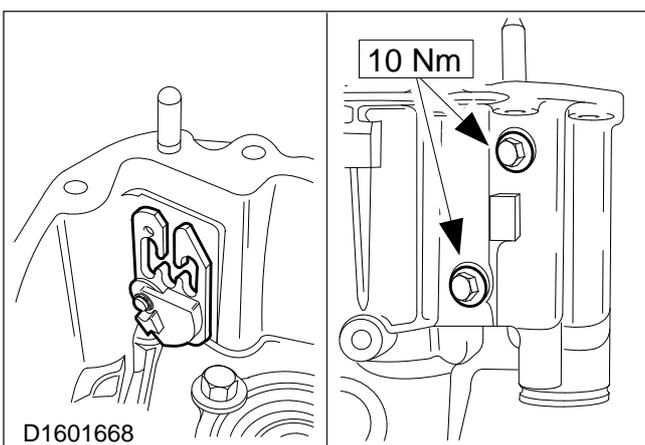
**50. Secure the mainshaft ball bearing with bolts and washers.**



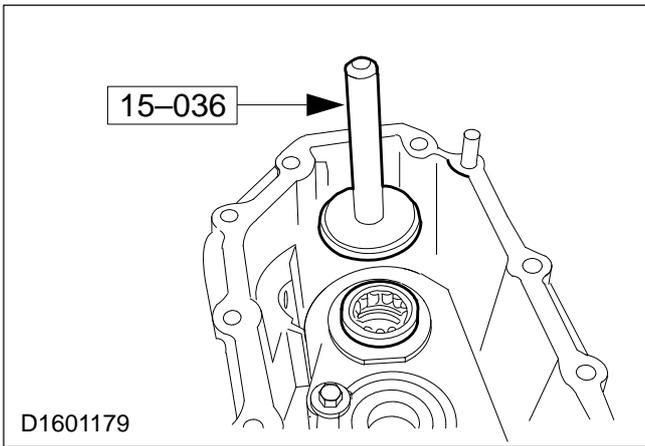
**51. Drive in the main selector shaft ball sleeve flush.**



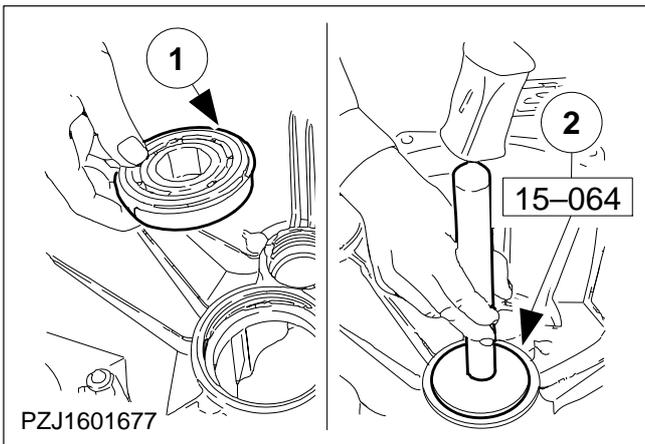
**52. Fit the main selector shaft radial oil seal.**



**NOTE:** Use new locating bolts.  
**53. Fit the selector gate.**



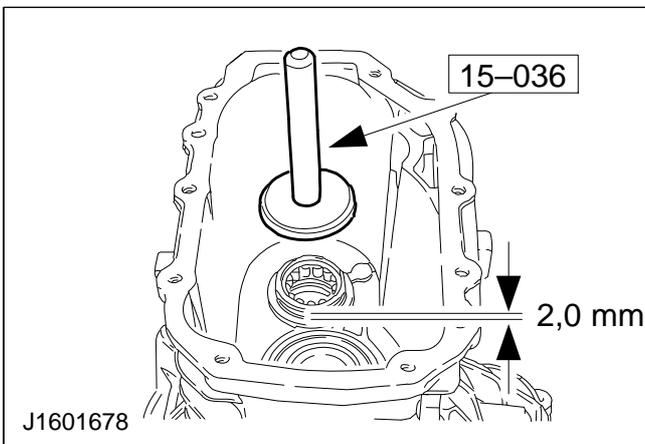
**54. Drive in the countershaft roller bearing as far as the stop.**



**Assemble front transmission housing**

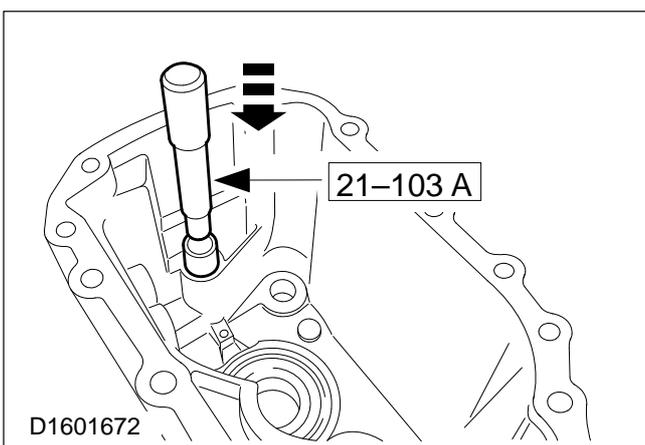
**55. Fit the input shaft ball bearing.**

- 1 Fit the circlip in the annular groove of the ball bearing.
- 2 Drive in the ball bearing from the clutch side

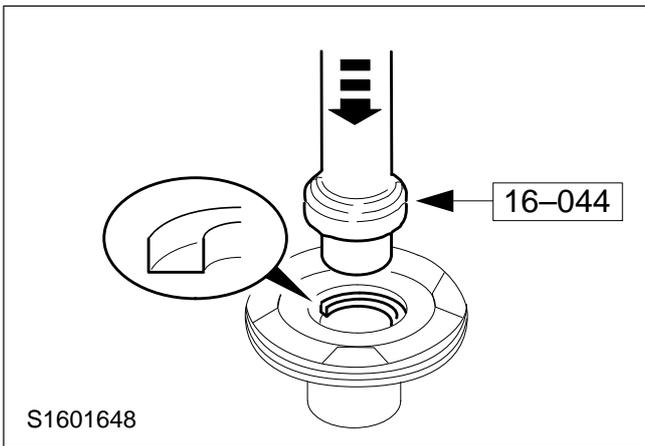


**NOTE:** Do not drive the roller bearing in flush but allow it to protrude approx. 2 mm on the inside.

**56. Fit the countershaft roller bearing.**



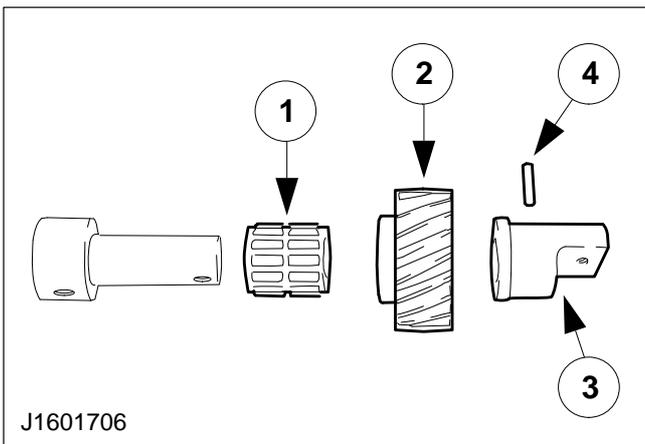
**57. Drive in the main selector shaft ball sleeve flush.**



Install input shaft guide sleeve oil seal

**NOTE:** The sealing lip must face the tool on installation.

**58. Drive in the radial oil seal.**

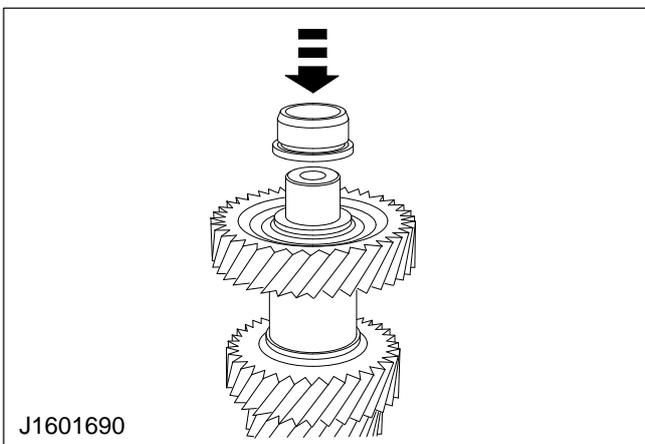


Assemble reverse gear idler shaft

**NOTE:** Do not fit the bearing housing twisted. The threaded holes must line up with one another.

**59. Assemble the reverse gear idler shaft.**

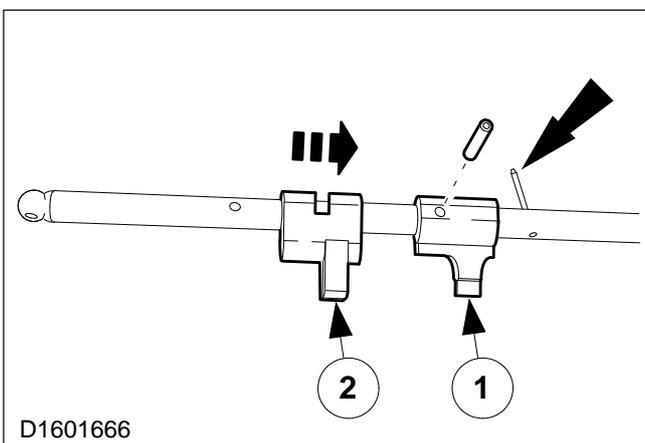
- 1 Needle roller bearing
- 2 Idler
- 3 Bearing housing
- 4 Drive in the roll pin.



Assemble countershaft

**60. Fit the bearing rings.**

Heat the bearing rings to approx. 100°C and slide them on.

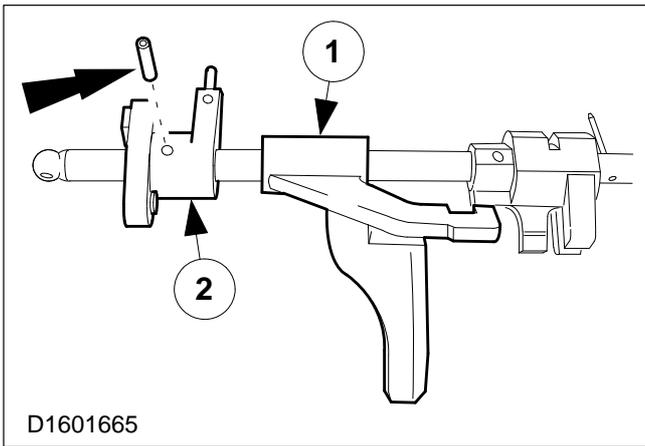


Assemble main selector shaft

**NOTE:** The shift finger must point in the opposite direction to the actuating pin of the reversing light switch.

**61. Assemble main selector shaft**

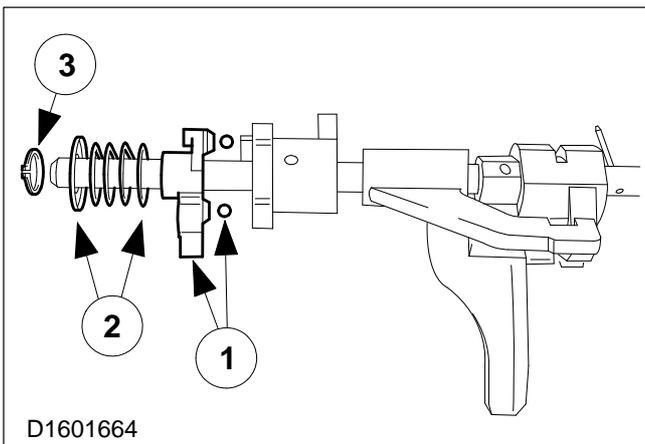
- 1 Slide the shift finger onto the main selector shaft and secure it with a roll pin.
- 2 Slide the locking sleeve onto the selector shaft and shift finger.



**NOTE:** The roll pin must be aligned centrally.

**62. Assemble the selector shaft (continued).**

- 1 Fit the 1st/2nd gear selector fork on the selector shaft.
- 2 Slide the shift finger holder onto the selector shaft and secure it with a roll pin.



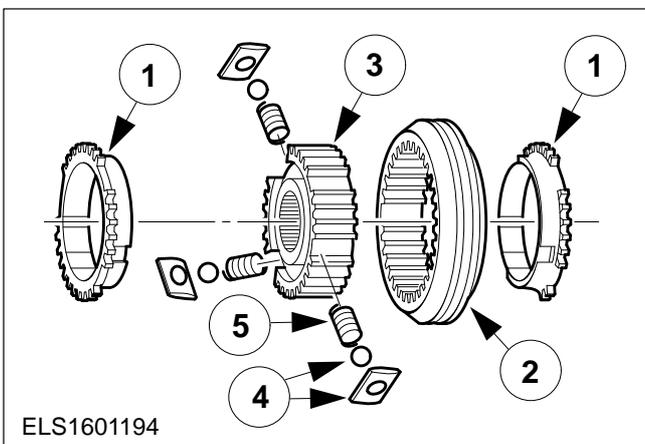
**63. Assemble the main selector shaft (continued).**

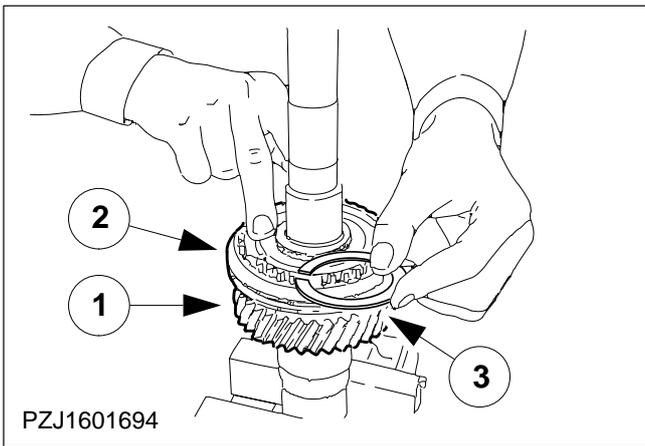
- 1 Fit the spring carrier on the selector shaft with two balls.
- 2 Fit the spring and spring cup.
- 3 Secure them with a circlip.

**Assemble mainshaft**

**64. Assemble the synchroniser unit.**

- 1 Fit the compression springs.
- 2 Synchroniser hub
- 3 Ball and blocker bar
- 4 Position the shift ring correctly and slide it on.
- 5 Fit the synchroniser rings.





**NOTE:** Marking

**65. Fit the needle roller bearing and reverse gear wheel with the synchroniser unit.**

- Clamp the mainshaft in a vice with the output end pointing upwards.

1 Reverse gear wheel

2 Synchroniser unit

3 Select a circlip which fits without free play and fit it.

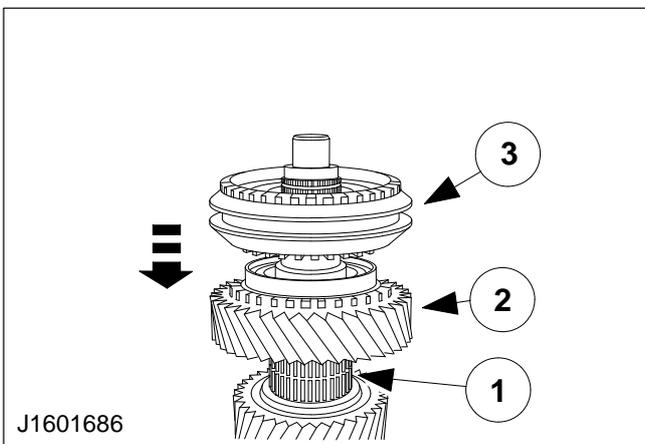
- Available circlips:

2,03 mm

2,07 mm

2,11 mm

2,15 mm



Vehicles manufactured from build date

17. 6. 1996 are fitted with a 1st/2nd gear double synchroniser unit.

**NOTE:** Marking

**66. Fit the 1st/2nd gear synchroniser unit.**

- Clamp the mainshaft the other way round.

1 Fit the needle roller bearing.

2 Fit the 1st gear wheel.

3 Fit the 1st/2nd gear synchroniser unit.

- Select a circlip which fits without free play and fit it.

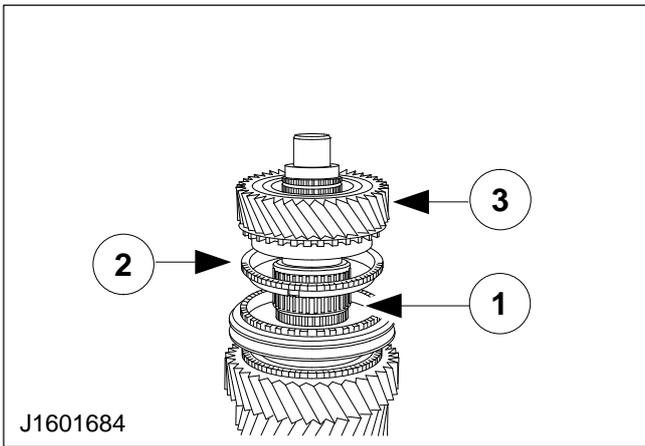
- Available circlips:

2,03 mm

2,07 mm

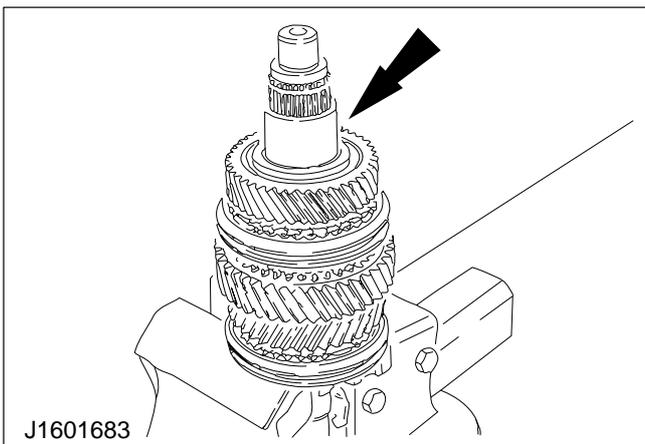
2,11 mm

2,15 mm



**67. Fit the synchroniser ring, needle roller bearing and 2nd gear wheel.**

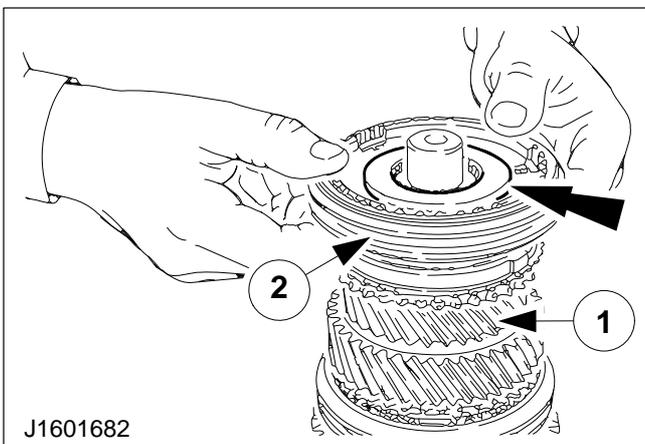
- 1 Needle roller bearing
- 2 Synchroniser ring
- 3 2nd gear wheel



**NOTE:** Slide the inner bearing ring onto the mainshaft as far as the shoulder.

**68. Fit the 3rd gear wheel inner bearing ring.**

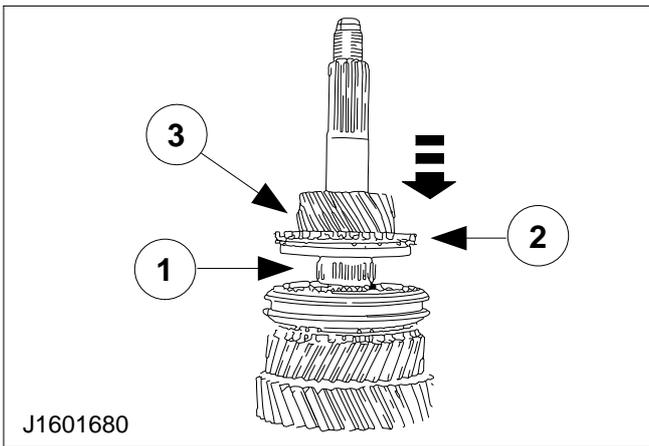
Heat the inner bearing ring to approx. 100°C.



**NOTE:** Fit the synchroniser unit with the small collar facing upwards.

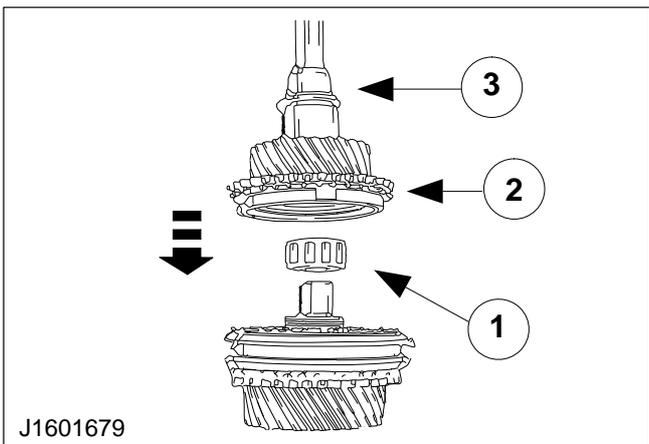
**69. Fit the 3rd/4th gear synchroniser unit.**

- Fit the needle roller bearing.
- 1 Fit the 3rd gear wheel.
- 2 Fit the 3rd/4th gear synchroniser unit.
- Select a circlip which fits without free play and fit it.
- Available circlips:
  - 1,99 mm
  - 2,03 mm
  - 2,07 mm
  - 2,11 mm
  - 2,15 mm
  - 2,19 mm



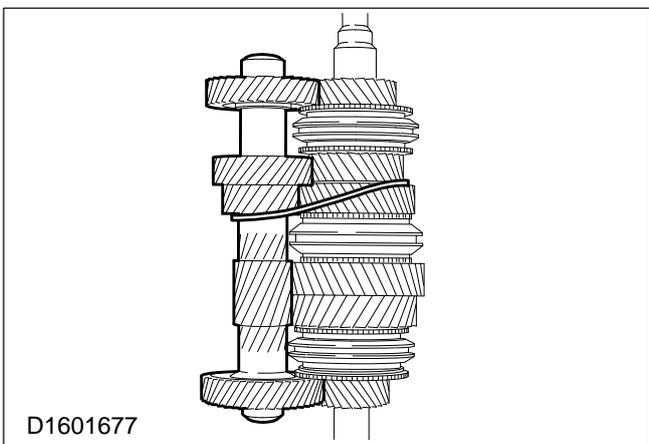
**70. Fit the 5th gear wheel.**

- Clamp the mainshaft the other way round.
- 1 Needle roller bearing
  - 2 5th gear synchroniser ring
  - 3 5th gear wheel

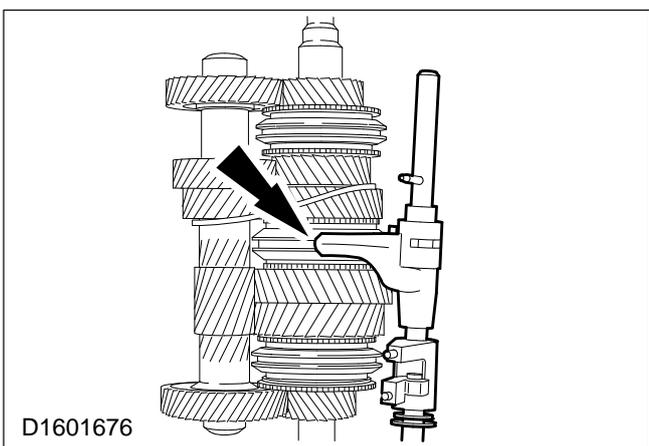


**71. Fit the input shaft.**

- Clamp the mainshaft the other way round.
- 1 Roller bearing
  - 2 4th gear synchroniser ring
  - 3 Input shaft

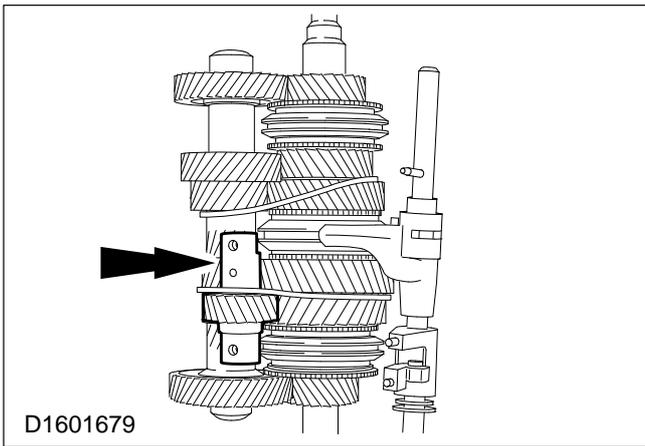


**72. Assemble the countershaft with the mainshaft and secure the assembly with a cable tie.**



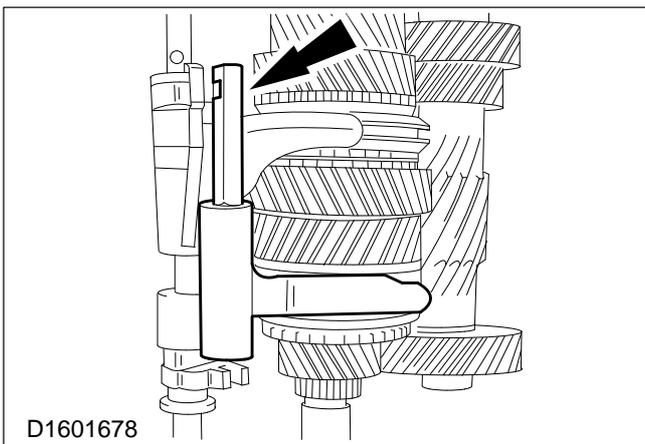
**NOTE:** The 1st/2nd gear selector fork must engage in the 1st/2nd gear synchroniser unit in the middle.

**73. Fit the main selector shaft.**



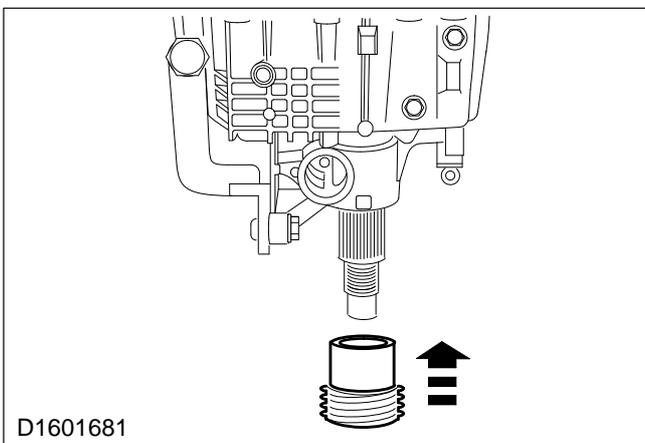
**74. Assemble the reverse gear idler with the countershaft and mainshaft assembly.**

- The end of the shaft with the flat points upwards.
- Secure the assembly with a cable tie.



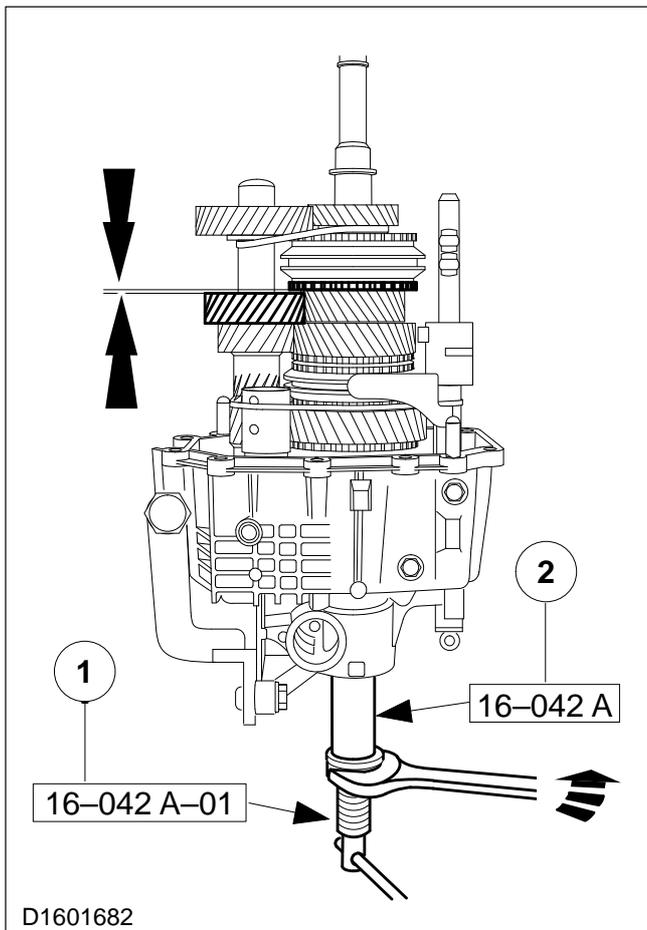
**75. Fit the 5th/reverse gear selector fork in the lower synchroniser unit.**

The outrigger points upwards.



**76. Fit the complete gear assembly in the rear transmission housing.**

**77. Slide the speedometer worm gear onto the mainshaft.**



**NOTE:** During installation, guide the main selector shaft into the ball sleeve correctly.

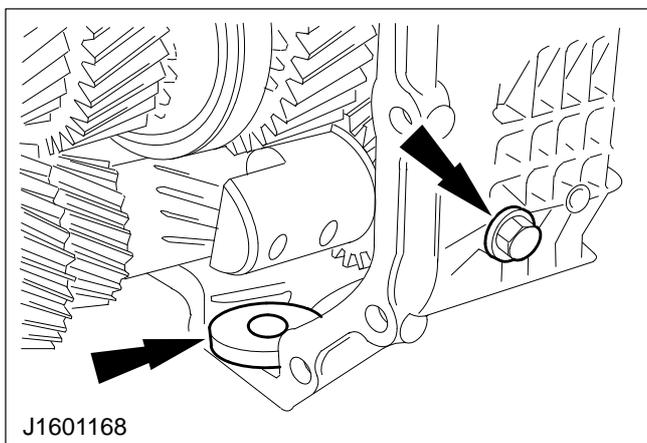
**NOTE:** The distance between the countershaft and the synchroniser ring must not be zero.

**78. Draw the mainshaft into the rear transmission housing.**

- 1 Screw the spindle into the mainshaft.
- 2 Fit the adaptor.

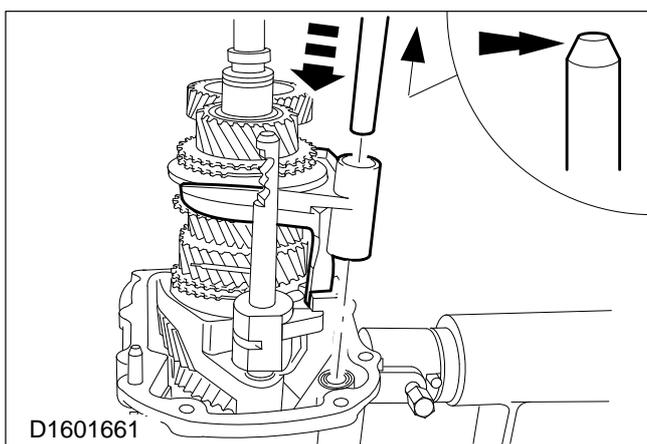
- Guide the countershaft into the rear roller bearing.

**79. Remove the speedometer worm gear.**



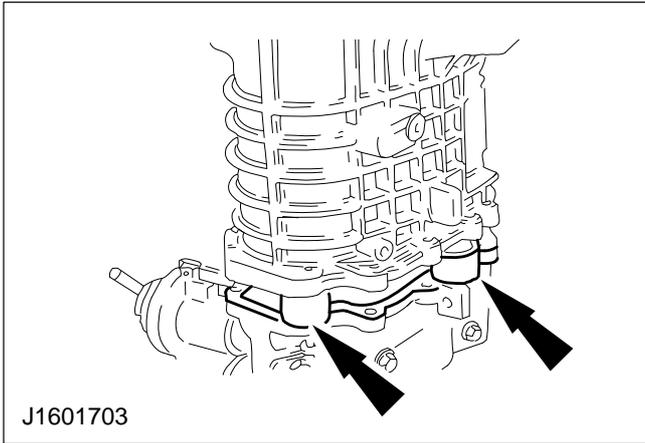
**80. Insert the retaining bolt for the reverse gear idler shaft and screw it up finger tight.**

- Remove the cable ties from the gear assembly.
- Fit the magnetic disc.



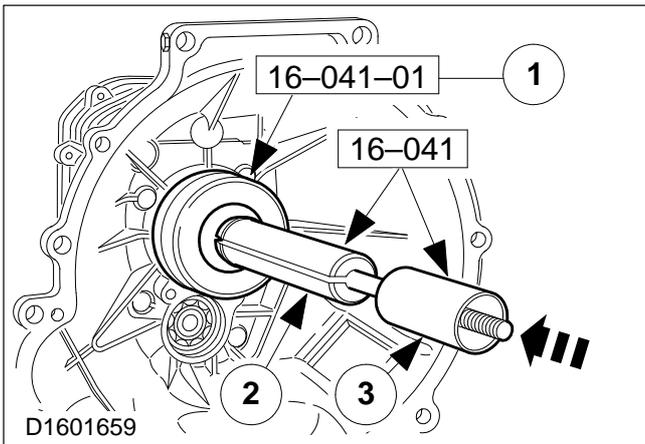
**NOTE:** The chamfered end of the selector shaft points upwards.

**81. Fit the 3rd/4th gear selector fork in the upper synchroniser unit and the auxiliary selector shaft.**



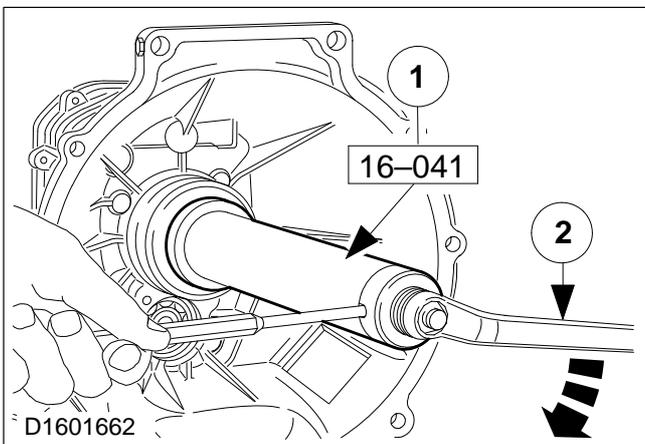
**82. Fit the front transmission housing.**

Position three spacers approx. 25 mm in length between the housing sections.



**83. Draw on the front transmission housing.**

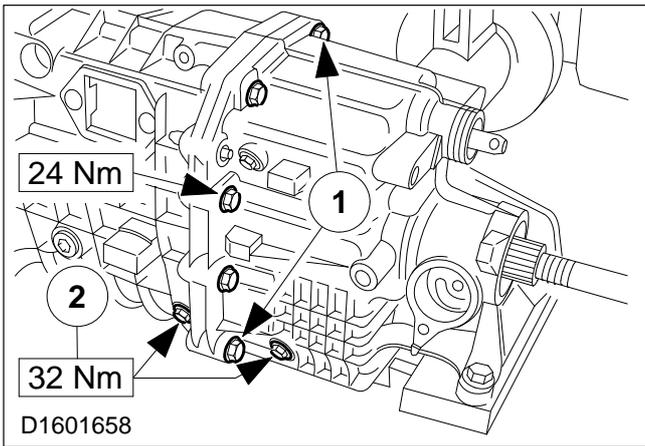
- 1 Attach the adaptor.
- 2 Attach the two clamping shells to the input shaft.
- 3 Secure them with the sleeve.



**NOTE:** During installation, guide the countershaft correctly into the bearing. Tighten the flange bolts within 15 minutes.

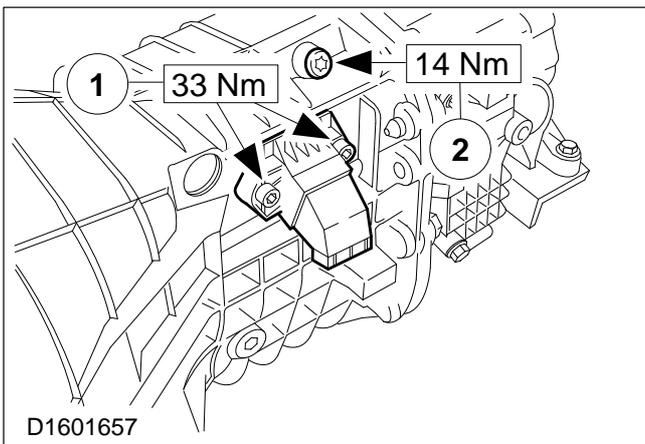
**84. Draw on the front transmission housing (continued).**

- 1 Slide the large sleeve over the clamping shells and sleeve.
  - Remove the spacers and apply sealer to the mating faces of the rear transmission housing.
  - Apply sealer (ESKM-4G242-A) to the inside of the mating faces.
- 2 Draw on the housing.



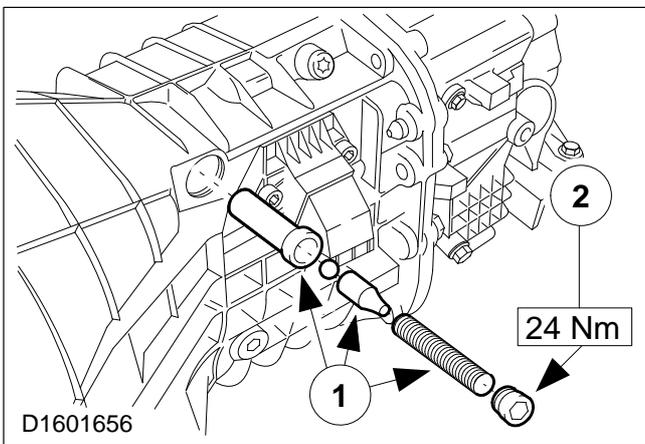
**85. Bolt the housing halves together.**

- 1 Insert two housing bolts on opposite sides and draw the housing sections together.
- Fit the remaining eight bolts and tighten them.
- 2 Tighten the bolts of the reverse gear idler shaft (both bolts are marked in blue).



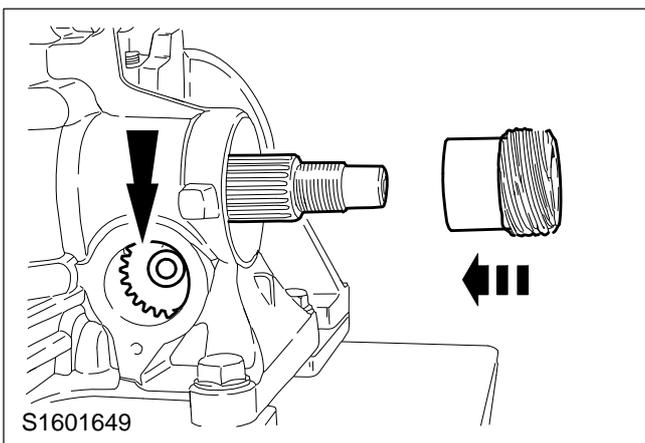
**86. Fit the reversing light switch and the locking screw.**

- 1 Reversing light switch
- 2 Locking plate locking screw



**87. Fit the selector interlock mechanism.**

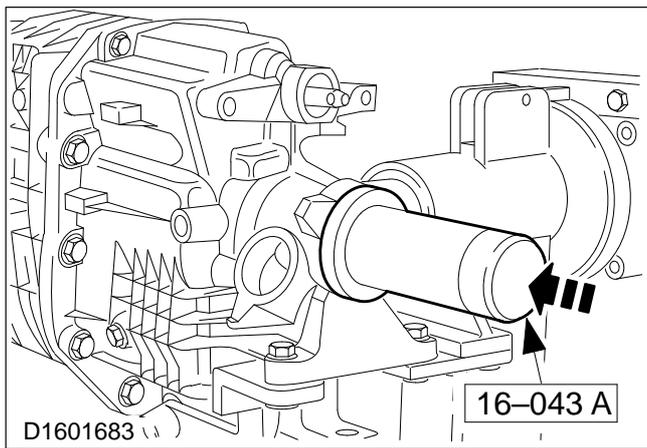
- 1 Insert the sleeve, ball, pin and spring.
- 2 Apply sealer (ESKM-4G242-A) and screw in the plug (14 mm Allen key).



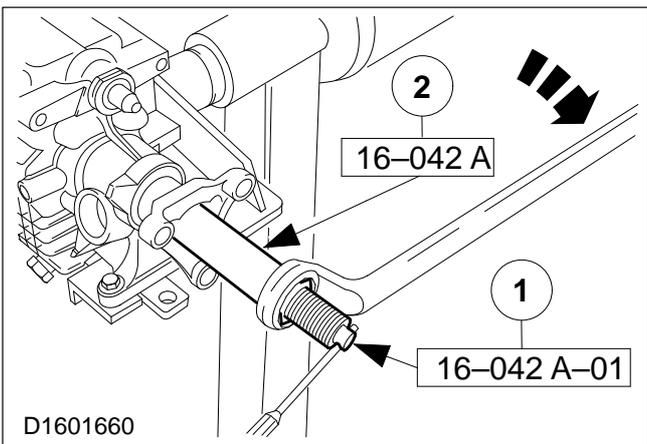
**88. Fit the speedometer worm gear.**

**89. Fit the speedometer drive pinion in the rear transmission housing.**

Apply sealer (ESKM-4G242-A) and fit the speedometer drive pinion cap.

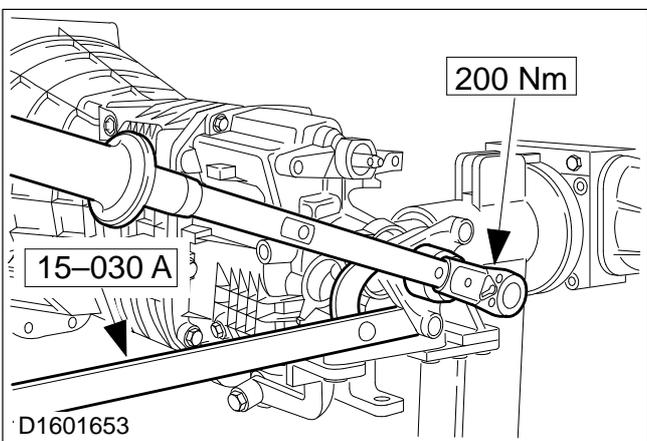


**90. Fit the drive flange radial oil seal.**



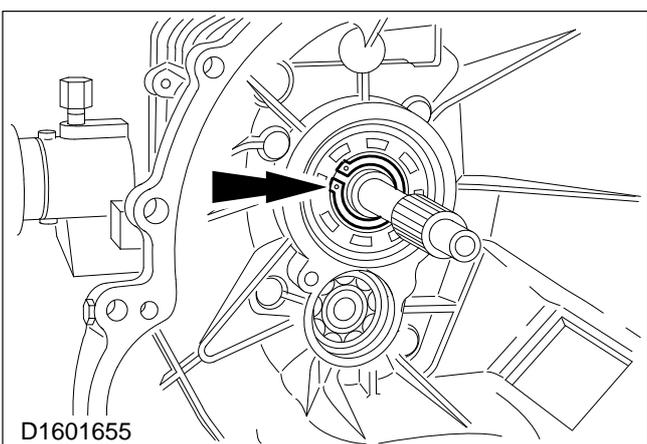
**91. Draw the drive flange onto the mainshaft.**

- Fit the flange.
- 1 Screw the spindle into the mainshaft.
- 2 Screw on the adaptor.
- Hold the spindle with a drift.



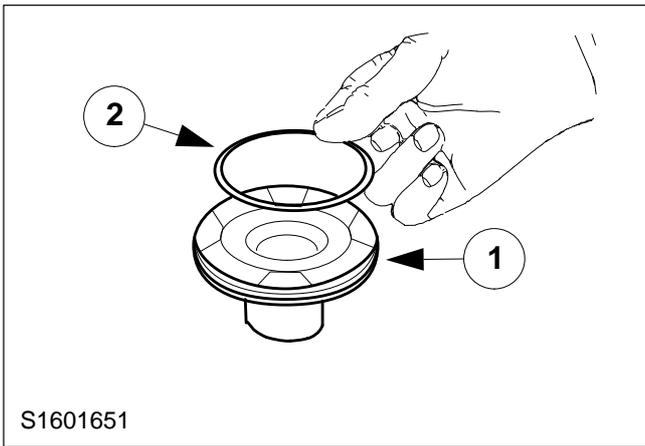
**92. Secure the drive flange with a new nut.**

Hold the drive flange.

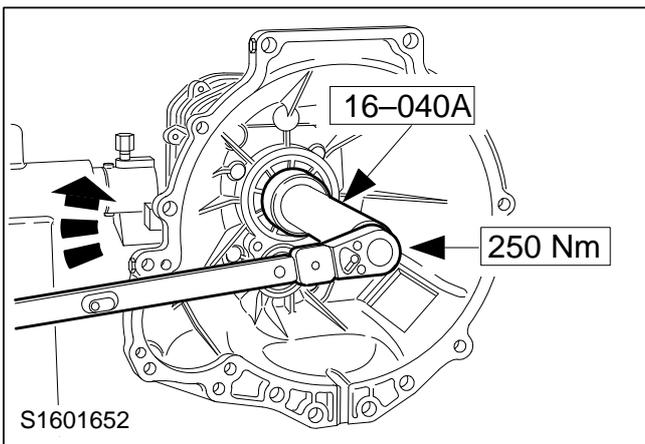


**93. Fit the input shaft circlip.**

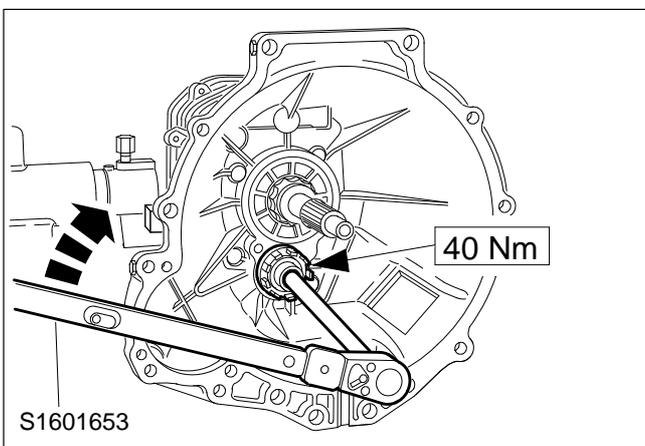
- Select a circlip which fits without free play and fit it.
- Available circlips:
  - 2,26 mm
  - 2,30 mm
  - 2,34 mm
  - 2,38 mm
  - 2,42 mm



- 94. Prepare the guide sleeve for installation.**
- 1 Fit a new O-ring.
  - 2 Stick the thrust washer in place with grease.

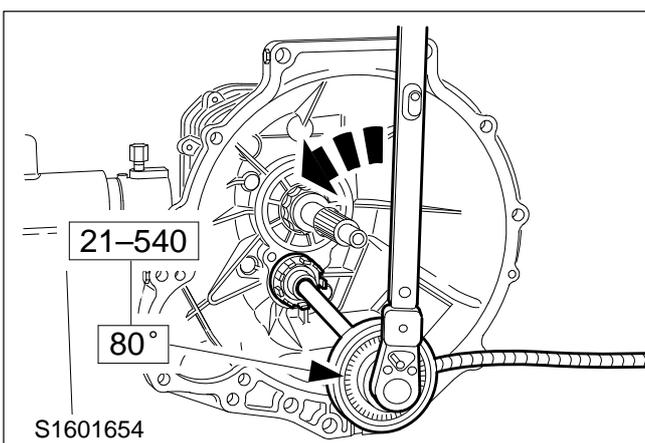


- 95. Secure the guide sleeve.**

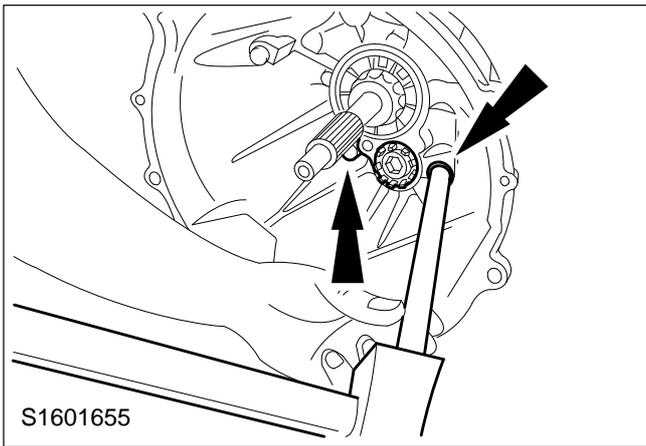


- 96. Fit the countershaft bearing housing using a new O-ring.**

- Grease the O-ring.
- Screw in the bearing housing with a 17-mm Allen key.



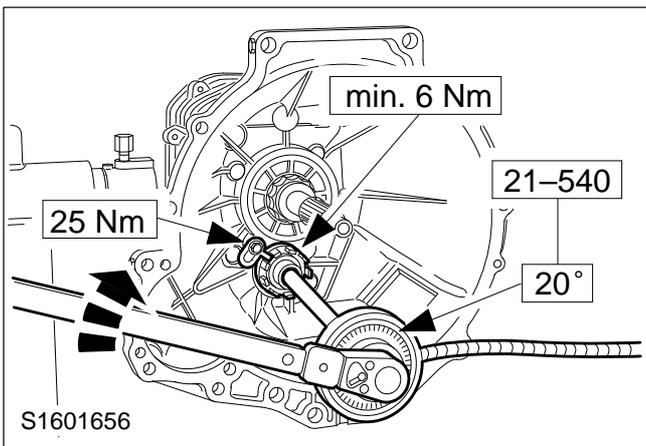
- 97. Unscrew the bearing housing 80°.**



**NOTE:** Tilt the clutch housing downwards at least 45°.

**98. Drive the countershaft bearing home against the bearing housing.**

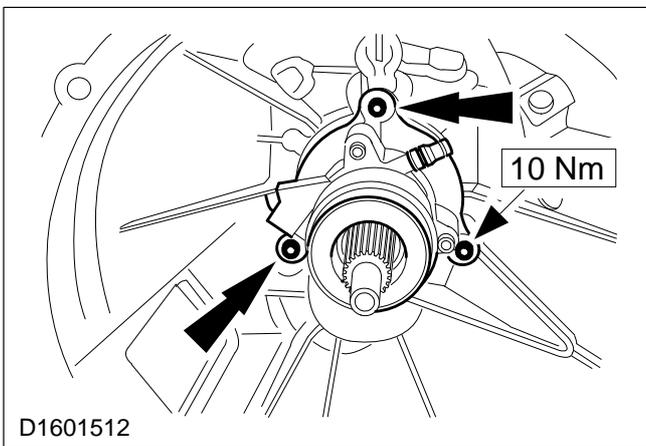
Strike two blows on each of the bosses using a brass drift and hammer. This will drive the bearing home against the bearing housing.



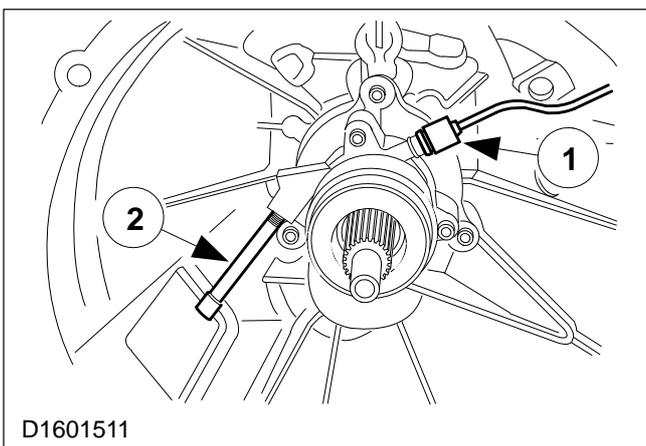
**CAUTION:** A minimum torque of 6 Nm must be achieved.

**99. Tighten the bearing housing 20° and secure it with the locking plate.**

If the 6 Nm are not achieved, sub-operations 97. to 99. must be repeated.



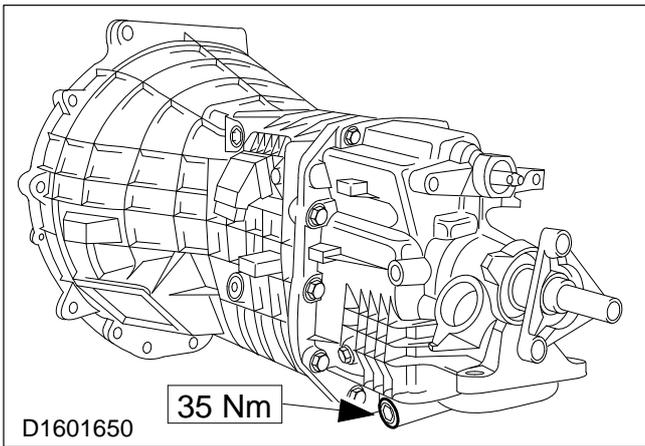
**100. Fit the slave cylinder complete with the release bearing.**



**NOTE:** Make sure that the quick-release coupling is locked securely.

**101. Fit the clutch pressure line and bleed screw.**

- 1 Connect the quick-release coupling.
- 2 Screw in the bleed screw.



**102. Detach the transmission from the assembly stand and detach the mounting bracket.**

**103. Tighten the oil drain plug.**