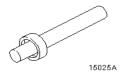
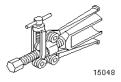
«REMOVAL AND INSTALLATION»

### **Transmission - Dismantle and Assemble (16 118 8)**

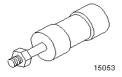
### **Special Tools**



15-025 Alnstaller, differential bearing



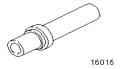
15-048Remover, output shaft bearing ring



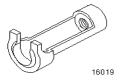
15-053Draw hammer



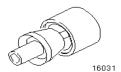
15-085Installer, differential bearing ring



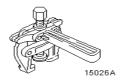
16-015Installer



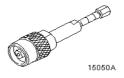
16-019Remover and installer, selector shaft oil seal 16-020Installer, bearing rings



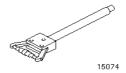
16-031Installer, circlip



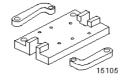
15-026 ARemover, differential bearing



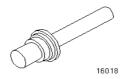
15-050 ARemover, basic tool



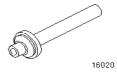
15-074Remover, differential bearing ring

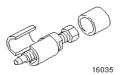


15-105Transmission mounting bracket



16-018Installer, driveshaft oil seals

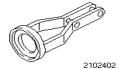




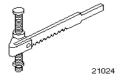
16-035Remover, fifth gear



### 16-086Remover, clutch release fork bush



# 21-024-02Adaptor for 21-024



# 21-024Valve spring compressor



#### 21-051Oil seal remover

# 21-024-07Adaptor for 21-024

17048

17-048Collet for 15-050 A



### 21-031 BTransmission mounting bracket

#### Proprietary Tools

Magnetic fixture	
Dial gauge	
Hot air fan	

#### Workshop Equipment

Press	
Assembly stand	

#### Materials

Description	Ford Specification
High temperature grease	ESDM-1C220-A
Ford EP gear oil (SAE 80)	SQM-2C9008-A
Universal Sealer (Hylomar)	ESEE-M4G1008-A
Freezing spray	

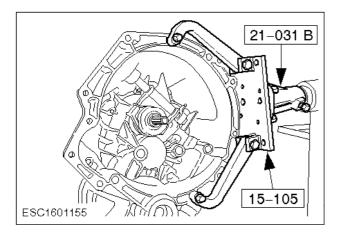
### Measuring and Adjusting Shims

Description	Shim thickness
Measuring shim	3,8 mm
Shim availability (from - to)	0,1 - 1,1

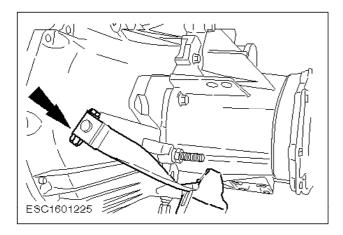
#### **Dismantle**

### 1. General note:

- Measurement of the differential and balancing the end float with the shim is only necessary on vehicles with an 1,8 I diesel engine, 1,6 I turbo and vehicles with a strengthened transmission design.
- Whenever items are clamped in a vice, soft jaws must be used.
- Only use a plastic or copper hammer to avoid damage.
- Do not reuse snap rings, circlips or self-locking nuts.

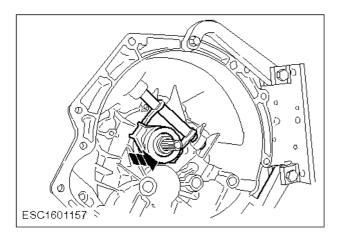


**c** 2. Fit the transmission on an assembly stand.



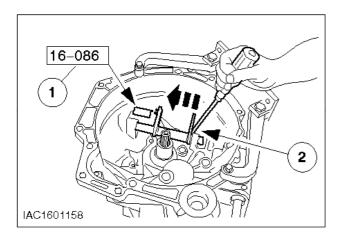
**3**. Remove the clutch release lever.

Take off the rubber gaiter.



4. Remove the release bearing.

Pull the release bearing forward and unhook it.

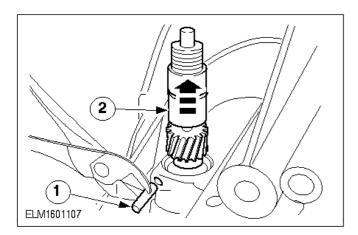




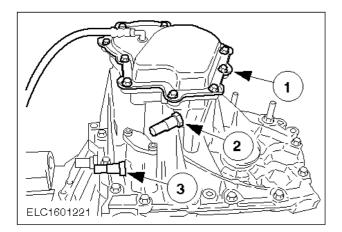
# CAUTION:

Turn the clutch release fork outwards until it touches the housing.

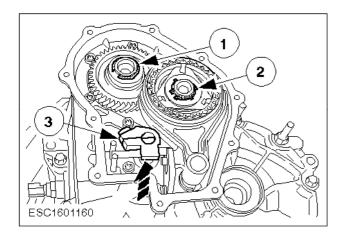
- **5**. Remove the clutch release fork.
  - 1 Insert the special tool.
  - 2 Push the clutch release fork up and take out the bearing bush. Take out the clutch release fork.



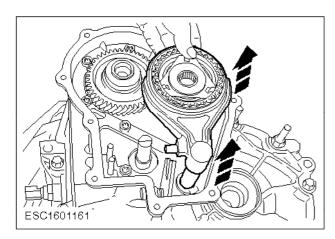
- **6**. Remove the speedometer drive pinion.
  - 1 Withdraw the roll pin.
  - 2 Pull off the drive pinion and the sleeve.



- **c** 7. Remove the end cover and the detent mechanisms.
  - 1 End cover
  - 2 Fifth gear detent mechanism
  - 3 Auxiliary selector shaft detent mechanism

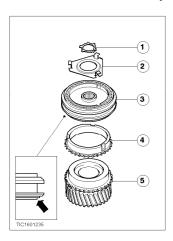


- **c** 8. Remove the circlips and the selector finger.
  - 1 Circlip for fifth gear wheel.
  - 2 Circlip for fifth gear synchroniser.
  - 3 Slacken the bolt and remove the selector finger.



**9**. Remove the fifth gear synchroniser.

Detach the synchroniser complete with the selector fork from the output shaft.



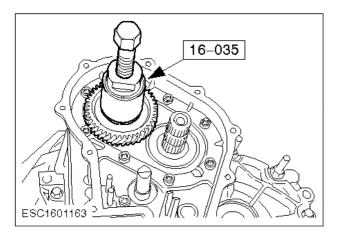
- 10. Fifth gear wheel assembly.
  - 1 Circlip

#### 2 Retaining plate

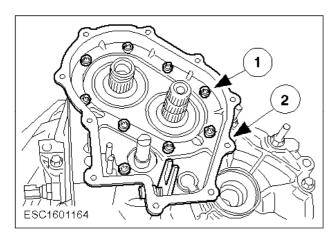
#### Note:

Mark the synchroniser clutch before dismantling it.

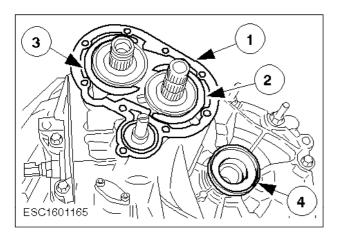
- Synchroniser clutch 3
- Synchroniser ring Fifth gear wheel 4
- 5



11. Pull off the fifth gear wheel.

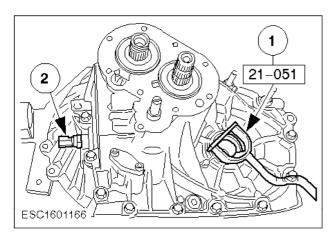


- Detach the fifth gear housing.
  - Unscrew the bolts. 1
  - 2 Remove the housing.

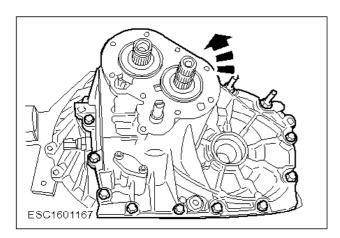


- Remove the gasket, detach the circlips.
  - Gasket
  - 2 Output shaft circlip

- 3 Input shaft circlip
- 4 Withdraw the auxiliary plug.

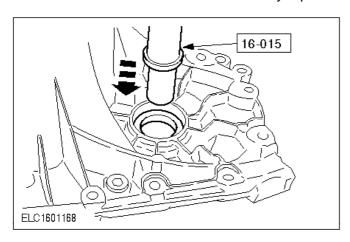


- 14. Remove the oil seals.
  - 1 Prise the oil seals out with the special tool.
  - 2 The reversing light switch only needs to be removed if the threads need sealing due to a leak.



15. Separate the transmission housing sections.

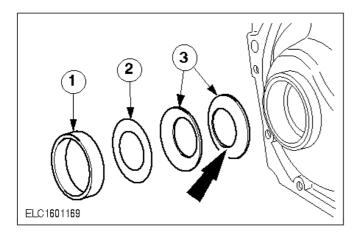
Unscrew the bolts and carefully tap the housing sections apart.



Note

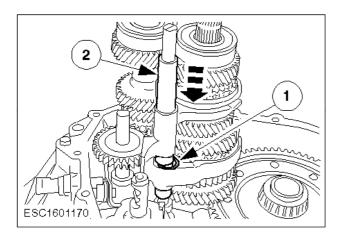
See sub-operation for the position of the shim pack.

16. Remove the bearing ring.

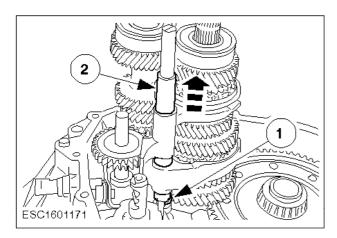


A standard transmission does not have a distance shim.

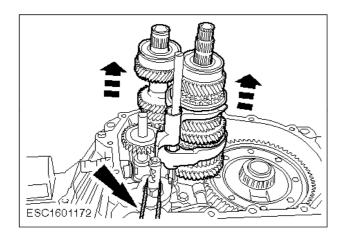
- 17. Installation sequence of differential shim pack.
  - 1 Bearing ring
  - 2 Shim
  - 3 Spring (Belleville) washers (smaller diameters touching).



- 18. Remove the upper circlip of the selector shaft guide sleeve.
  - 1 Remove the upper circlip.
  - 2 Slide the guide sleeve downwards.

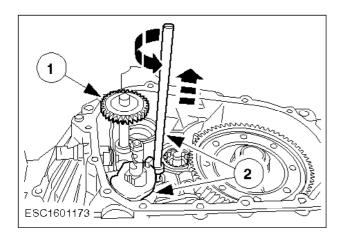


- 19. Remove the selector shaft guide sleeve.
  - 1 Remove the guide sleeve lower circlip.
  - 2 Withdraw the sleeve.

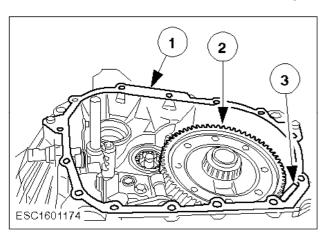


Attach a rubber band to the auxiliary selector shaft as an aid to assembly.

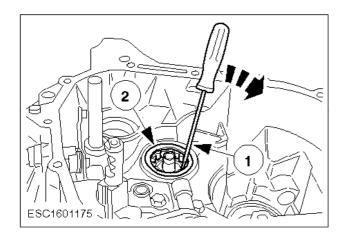
**c** 20. Lift out the input and output shafts together with the selector forks.



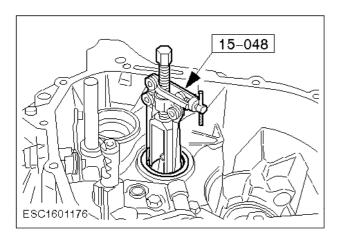
- 21. Remove the reverse gear idler and selector shaft with the locking plate.
  - 1 Remove the reverse gear idler.
  - 2 Remove the selector shaft together with the locking plate.



- **c** 22. Remove the gasket, differential and permanent magnet.
  - 1 Gasket
  - 2 Lift out the complete differential assembly.
  - 3 Permanent magnet



- 23. Remove the output shaft taper roller bearing.
  - 1 Press the rollers out of the bearing cage.
  - 2 Remove the bearing cage.

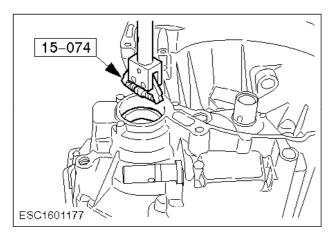




Only use the tool in the position shown, otherwise the blanking plug will be pushed out of the transmission.

24. Withdraw the output shaft bearing ring.

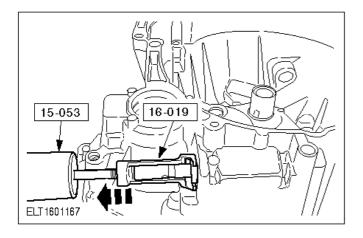
Remove the oil slinger.



Note:

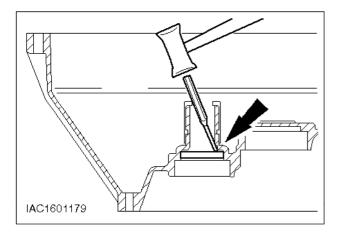
Locate the remover in the housing recesses.

**c** 25. Remove the differential bearing ring.



**c** 26. Remove the selector shaft oil seal.

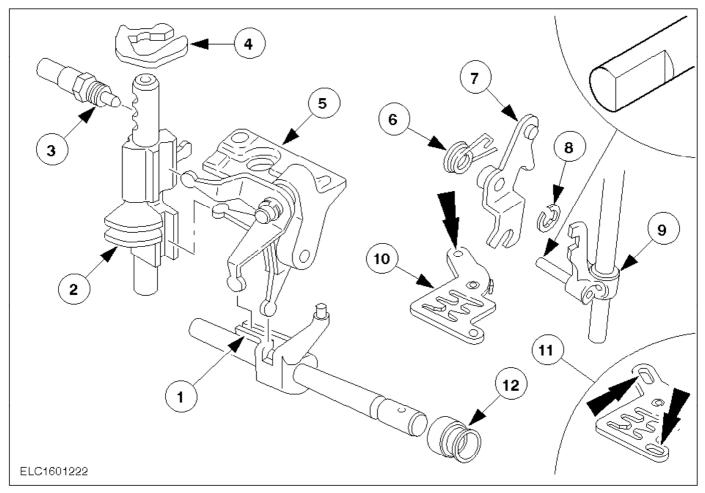
Pull off the gaiter.



Note:

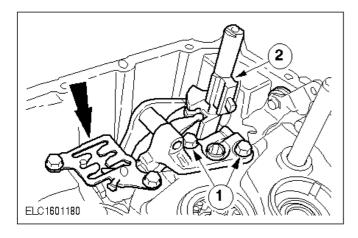
Put a pin punch in the cut-out and drive out the oil seal.

**c** 27. Remove the driveshaft oil seal.



Internal gearshift mechanism layout

Item	Description
1	Main selector shaft with selector block
2	Auxiliary selector shaft
3	Auxiliary selector shaft detent mechanism
4	Shift locking plate
5	Mounting block with relay levers
6	Return spring (reverse gear shift lever)
7	Crank lever (reverse gear)
8	Circlip
9	Selector shaft (fifth/reverse gear)
10	Gate (service version)
11	Gate (production version)
12	Selector shaft oil seal



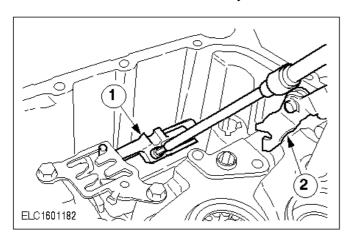
### Remove internal gearshift mechanism



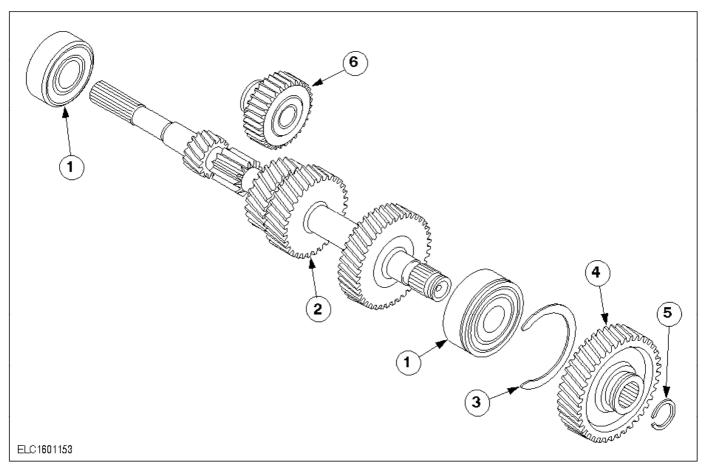
### CAUTION:

The gate is adjusted in production. If the gate is released, it must be replaced with the service gate.

- **c** 28. Remove the auxiliary selector shaft.
  - 1 Unscrew the bolts of the relay lever retaining plate.
  - 2 Remove the auxiliary selector shaft together with the relay levers.

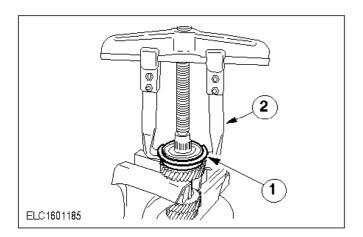


- **c** 29. Remove the selector shaft and the reverse gear shift lever.
  - 1 Detach the selector block from the selector shaft (remove the bolt). Withdraw the selector shaft and remove the selector block.
  - 2 Detach the circlip and remove the shift lever and spring.



Input shaft layout

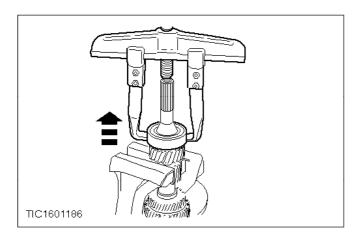
Item	Description
1	Ball bearing
2	Input shaft
3	Circlip
4	Fifth gear driving gear
5	Circlip
6	Reverse gear idler



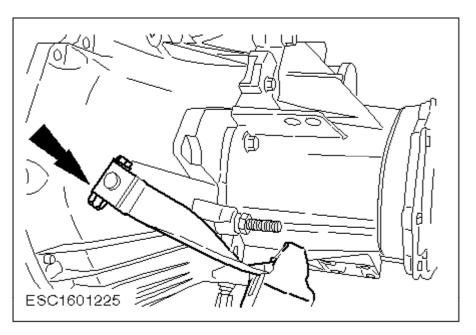
### Dismantle input shaft

**c** 30. Pull off the ball bearing at the transmission end.

- 1 Fit the circlip.
- 2 Locate the puller under the circlip and pull off the bearing.



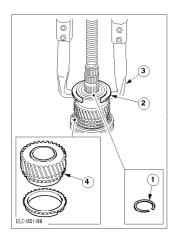
# **c** 31. Pull off the ball bearing at the clutch end.



Output shaft layout

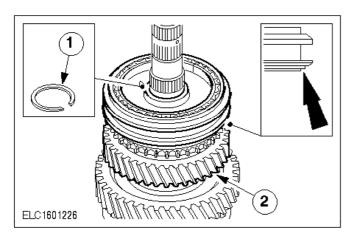
Item	Description
1	Roller bearing (without bearing inner ring)
2	Output shaft
3	First gear wheel
4	First gear synchroniser ring
5	First/second gear synchroniser with reverse gear wheel
6	Circlip
7	Second gear synchroniser ring
8	Second gear wheel
9	Half rings
10	Closed retaining ring

11	Third gear wheel
12	Third gear synchroniser ring
13	Third/fourth gear synchroniser
14	Fourth gear synchroniser ring
15	Fourth gear wheel
16	Ball bearing
17	Snap ring
18	Fifth gear wheel
19	Fifth gear synchroniser ring
21	Retaining plate



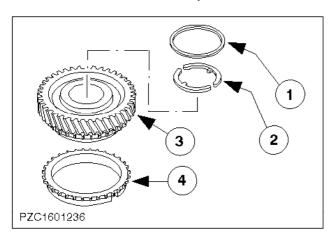
### Dismantle output shaft

- 32. Pull off the ball bearing.
  - Detach the circlip. 1
  - Fit the circlip. 2
  - Pull off the bearing using a conventional puller. Remove the fourth gear wheel. 3

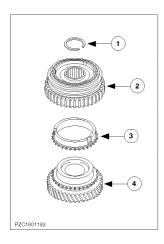


- Detach the third/fourth gear synchroniser. 33.
  - 1 Detach the circlip.

2 Remove the synchroniser clutch complete with the third gear wheel.



- **c** 34. Remove the second gear assembly with synchroniser ring.
  - 1 Retaining ring
  - 2 Half rings
  - 3 Gear wheel
  - 4 Synchroniser ring

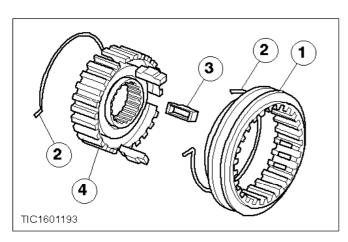


- **Solution** 35. Detach the first gear wheel with the synchroniser.
  - 1 Detach the circlip.

#### Note:

The synchroniser and gear wheel can be detached together.

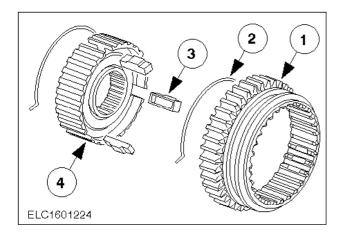
- 2 First/second gear synchroniser clutch with reverse gear wheel.
- 3 Synchroniser ring
- 4 Gear wheel





### Before dismantling mark the installation position of the shift ring.

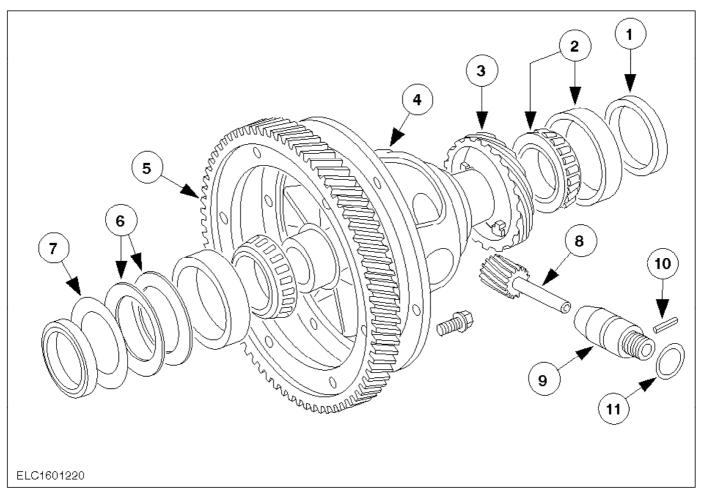
- 36. Dismantle the synchroniser clutch.
  - 1 Shift ring
  - 2 Synchroniser spring
  - 3 Blocker bar
  - 4 Synchroniser clutch hub





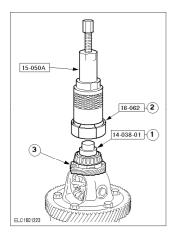
# Before dismantling mark the installation position of the shift ring.

- **37**. Dismantle the synchroniser clutch.
  - 1 Shift ring
  - 2 Synchroniser spring
  - 3 Blocker bar
  - 4 Synchroniser clutch hub



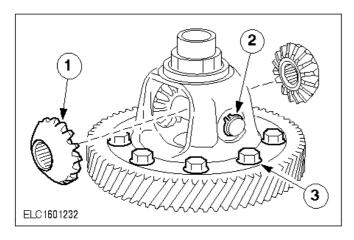
Differential layout

Item	Description
1	Radial oil seal
2	Taper roller bearing
3	Speedometer drive worm wheel
4	Differential case
5	Crown wheel
6	Spring (Belleville) washers (x 2)
7	Distance shim (not on standard transmissions)
8	Speedometer drive pinion
9	Speedometer drive pinion bearing
10	Roll pin
11	0-ring



#### Dismantle the differential

- 38. Dismantle the differential.
  - 1 Put the thrust pad in place.
  - 2 Pull off the taper roller bearing.
  - 3 Remove the speedometer worm drive.



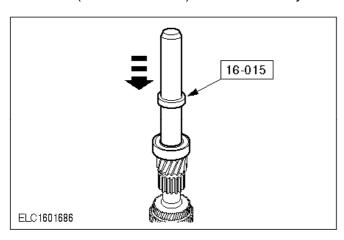
- **Solution** 39. Remove the differential pinion gear wheels.
  - 1 Turn the pinion gear wheels 905 in the differential case and take them out.
  - 2 Remove the circlip and drive out the shaft.

Take out the pinion gear wheels and the plastic thrust pads.

3 Unscrew the bolts and push the crown wheel down evenly off the differential.

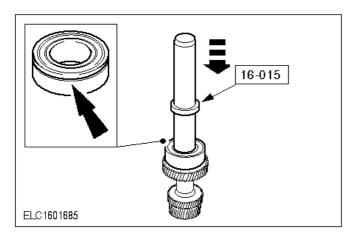
#### **Assemble**

40. Clean all parts carefully, check them and lubricate all running surfaces with transmission fluid (SQM-2C9008-A) before assembly.



### Assemble input shaft

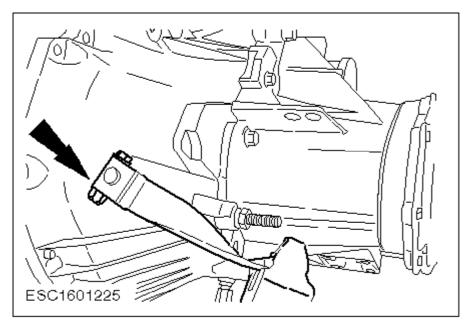
41. Press on the ball bearing.



Note:

Fit the ball bearing with the annular groove facing outwards.

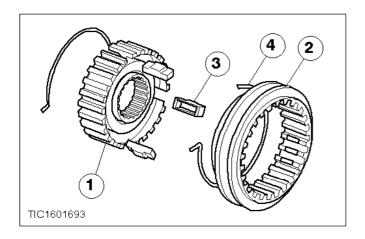
**c** 42. Press on the ball bearing.



Output shaft layout

Item	Description
1	Roller bearing (without bearing inner ring)
2	Output shaft
3	First gear wheel
4	First gear synchroniser ring
5	First/second gear synchroniser with reverse gear wheel
6	Circlip
7	Second gear synchroniser ring
8	Second gear wheel

9	Half rings
10	Closed retaining ring
11	Third gear wheel
12	Third gear synchroniser ring
13	Third/fourth gear synchroniser
14	Fourth gear synchroniser ring
15	Fourth gear wheel
16	Ball bearing
17	Snap ring
18	Fifth gear wheel
19	Fifth gear synchroniser ring
20	Fifth gear synchroniser
21	Retaining plate



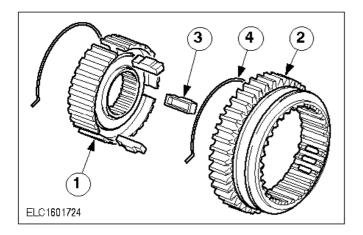
# Assemble output shaft

- **43.** Assemble the synchroniser clutch.
  - 1 Synchroniser clutch hub

#### Note:

Installation position mark.

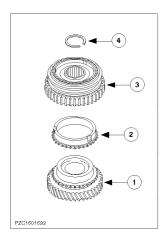
- 2 Put the shift ring onto the clutch hub.
- 3 Put the blocker bars in place.
- 4 Put the synchroniser spring in place.



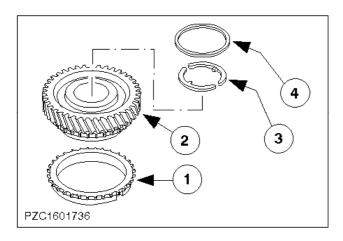
- 44. Assemble the synchroniser clutch.
  - 1 Synchroniser clutch hub

Installation position mark.

- 2 Put the shift ring onto the clutch hub.
- 3 Put in the blocker bars.
- 4 Put in the synchroniser ring.

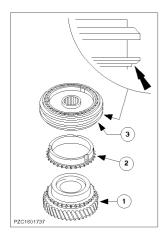


- **45.** Fit the first gear wheel and the synchroniser.
  - 1 Gear wheel
  - 2 Synchroniser ring
  - 3 First/second gear synchroniser clutch with reverse gear wheel
  - 4 Circlip



**46.** Fit the second gear wheel and synchroniser ring.

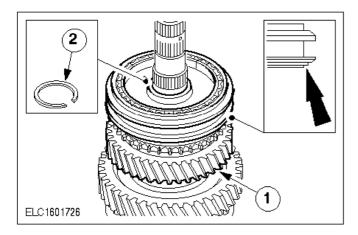
- 1 Synchroniser ring
- 2 Gear wheel
- 3 Half rings
- Closed retaining ring



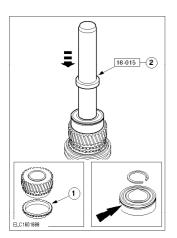
- 47. Pre-assemble the third gear synchroniser assembly.
  - Gear wheel 1
  - 2 Synchroniser ring

Installation position of the synchroniser clutch.

3 Synchroniser clutch



- Fit the third gear synchroniser assembly.
  - Fit the synchroniser clutch complete with the third gear wheel. 1
  - Fit the circlip. 2

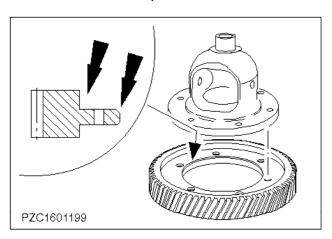


- 49. Fit the fourth gear wheel and ball bearing.
  - 1 Fit the synchroniser ring with the fourth gear wheel.

Make sure the annular groove faces outwards.

2 Press on the bearing.

Fit the circlip.

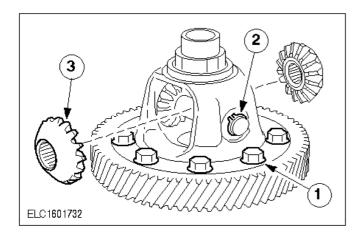


#### **Assemble differential**

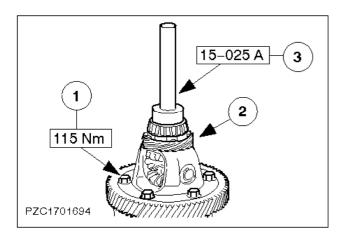
Note:

The crown wheel is asymmetric. Fit the larger shoulder and the larger chamfer pointing towards the differential cage.

**5**0. Fit the differential cage.



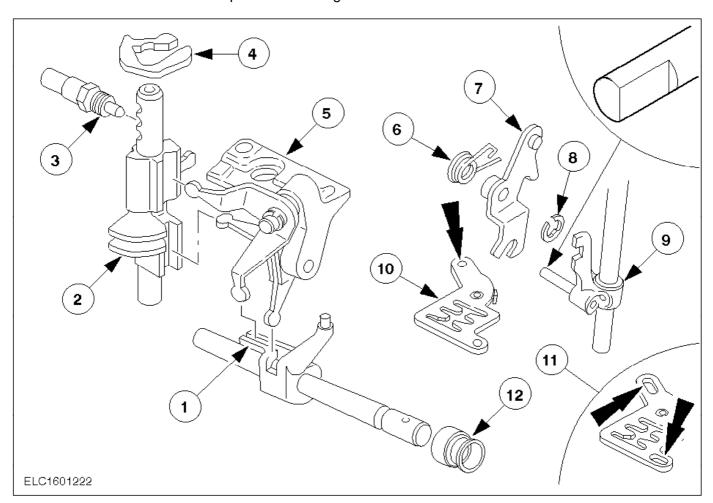
- **51.** Draw the crown wheel up and install the differential pinion.
  - 1 Pull on the crown wheel evenly using the old bolts. Put the plastic thrust pads and both pinion wheels into installation position.
  - 2 Drive in the shaft and secure it.
  - 3 Put the pinion wheels in place and turn them round 905 in the differential cage.



- 52. Fit the taper roller bearing and tighten the crown wheel.
  - Fully tighten the crown wheel using new bolts. Locate the worm drive wheel in the cut-outs. 1
  - 2

Do not use the lower taper roller bearing for support.

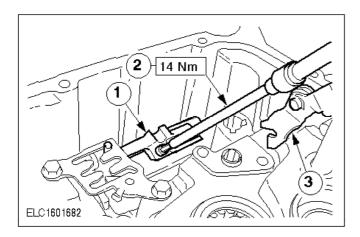
3 Drive on the two taper roller bearings.



Internal gearshift mechanism layout

Item	Description
1	Main selector shaft with selector block
2	Auxiliary selector shaft
3	Auxiliary selector shaft detent mechanism

4	Shift locking plate
5	Mounting block with relay levers
6	Return spring (reverse gear shift lever)
7	Crank lever (reverse gear)
8	Circlip
9	Selector shaft (fifth/reverse gear)
10	Gate (service version)
11	Gate (production version)
12	Selector shaft oil seal



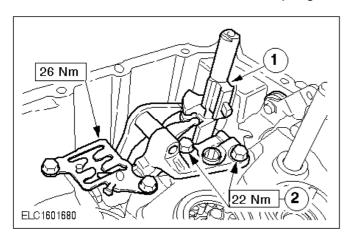
### Install internal gearshift mechanism

- **5**3. Install the selector shaft and the reverse gear shift lever.
  - 1 Fit the selector block. Put the selector shaft in.

### Note:

Smear the bolt with thread-locking compound before fitting it.

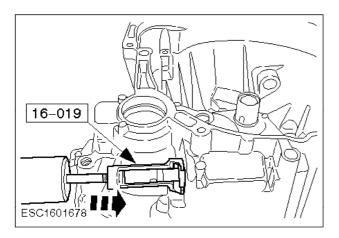
- 2 Screw in the bolt.
- 3 Fit the shift lever with the spring and fit the circlip.





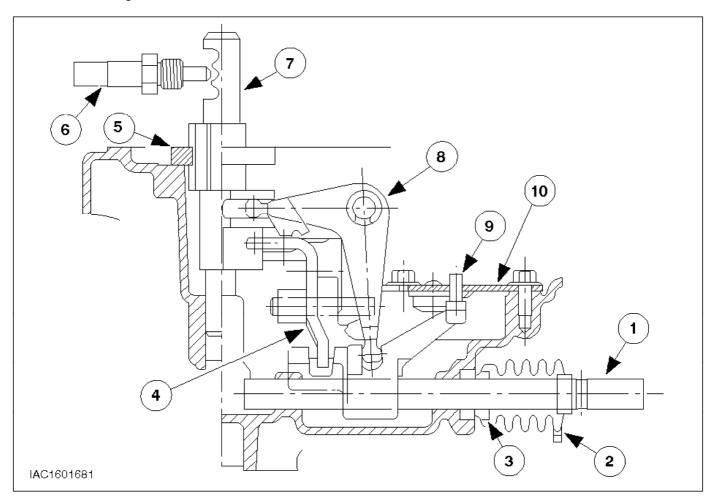
The gate is adjusted in production. If the gate is released, it must be replaced by the service gate.

- 54. Install the auxiliary selector shaft.
  - 1 Insert the auxiliary selector shaft together with the relay levers.
  - 2 Tighten the bolts of the relay lever retaining plate.



55. Install the selector shaft oil seal.

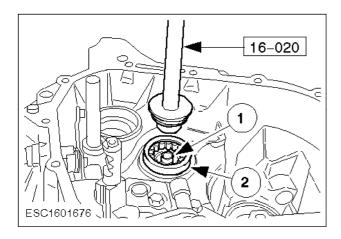
Fit the gaiter.



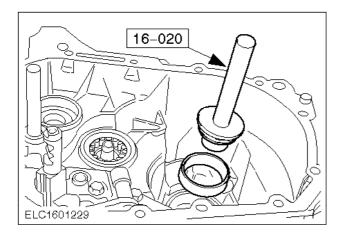
Internal gearshift mechanism - assembled

Item	Description
1	Main selector shaft

2	Gaiter (vent pointing downwards)
3	Radial oil seal
4	Relay lever (select)
5	Shift locking plate
6	Detent mechanism
7	Auxiliary selector shaft
8	Relay lever (shift)
9	Selector block
10	Gate (adjusted in production)

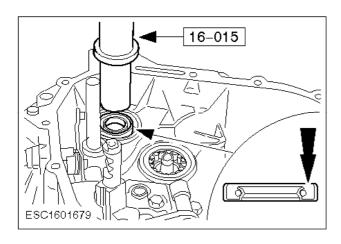


- 56. Fit the output shaft roller bearing.
  - 1
  - Fit the oil slinger. Drive the roller bearing home. 2



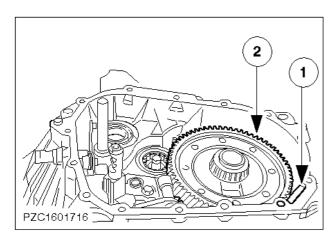
Use the installer 15-085 on transmissions with strengthened bearings.

57. Drive in the differential bearing ring.

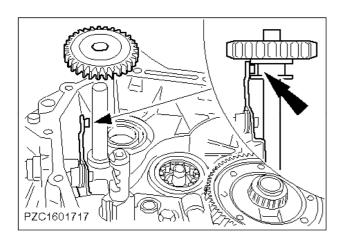


Fit the radial oil seal with the open side facing upwards.

58. Install the input shaft oil seal.

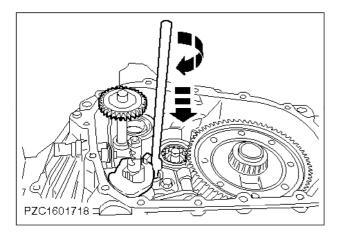


- 59. Fit the differential and the permanent magnet.
  - 1 Permanent magnet
  - 2 Differential

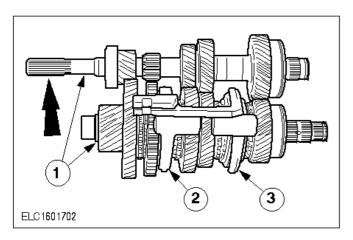


Note: Position.

**6**0. Fit the reverse gear idler.



61. Fit the selector shaft with the locking plate.



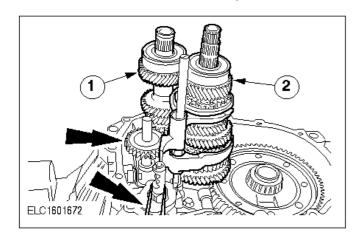
**62.** Prepare the gear train for installation.



### CAUTION:

Wrap the clutch splines of the input shaft with linen tape to avoid damage to the radial oil seal.

- 1 Bring the input shaft and output shaft into mesh with one another.
- 2 Fit the first/second gear selector fork.
- 3 Fit the third/fourth gear selector fork.

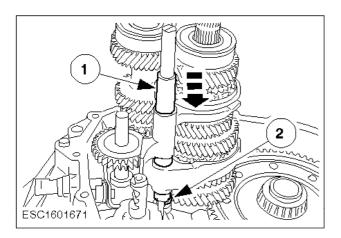


63. Install the gear train.

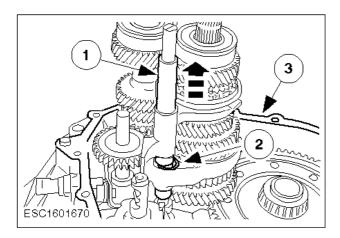
Attach a rubber band to the auxiliary selector shaft as an aid to assembly.

- 1 Insert the input shaft approximately 50 mm and swivel it slightly to the side.
- 2 Insert the output shaft until it is level with the input shaft and bring the gear teeth into mesh.

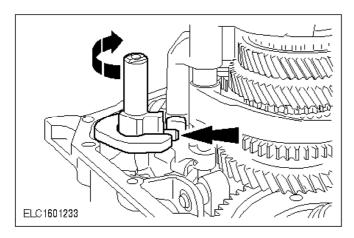
Note: Position of reverse gear idler. Bring the shafts into position together.



- 64. Install the selector shaft guide sleeve.
  - 1 Slide in the guide sleeve.
  - 2 Fit the lower circlip.

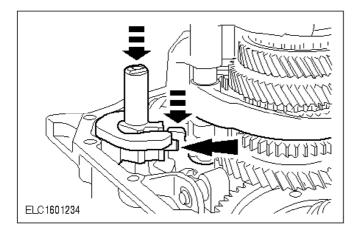


- **65.** Fit the upper circlip of the selector shaft guide sleeve.
  - 1 Raise the guide sleeve.
  - 2 Fit the circlip.
  - 3 Fit the housing gasket.



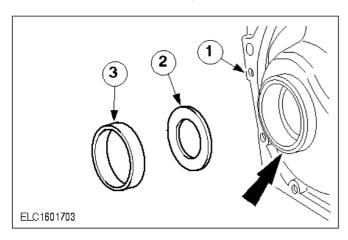
66. Put the internal mechanism into fifth gear.

Turn the auxiliary selector shaft clockwise until the reverse / fifth gear shift path is reached.



• 67. Put the internal mechanism into fifth gear (continued).

Press the auxiliary shaft and shift rod down together.

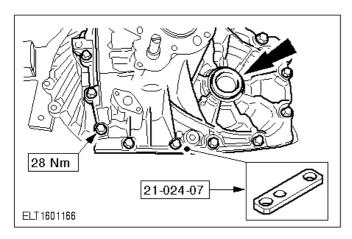


#### Measure differential shim

Note:

Job steps to are not necessary for standard transmissions.

- **68.** Install the measuring shim and the bearing ring.
  - 1 Transmission housing
  - 2 Measuring shim (3,8 mm thick)
  - 3 Put the bearing ring in place and secure by staking the housing edge.





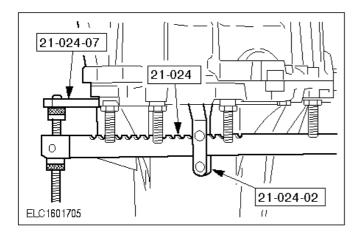
The housing gasket must be fitted for the following measuring operation.

69. Fit the transmission housing.

#### Note:

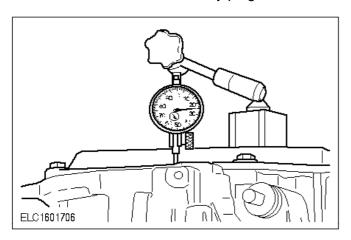
Fit the special tool with the longer bolt. Insert the assembly plug.

- Tighten all the housing bolts.
- Turn the transmission 180°.

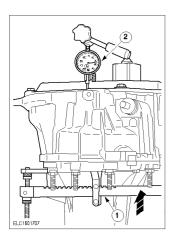


70. Fit the valve spring compressor.

Remove the assembly plug.



- 71. Prepare the differential for measuring.
  - Rotate the differential at least 10 revolutions to settle the bearings.
  - Fit the dial gauge and set it to zero.



72. Measure the differential end float.

- 1 Lift the differential.
- 2 Read off the measurement.

Carry out steps and three times and calculate the average measurement.

- Example:
- First measurement: 0,73 mm
  Second measurement: 0,74 mm
  Third measurement: 0,72 mm

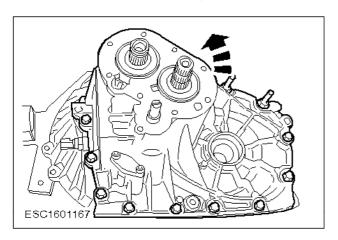
#### Note:

The shim thickness should be rounded down below 0,05 mm and rounded up from 0,06 mm.

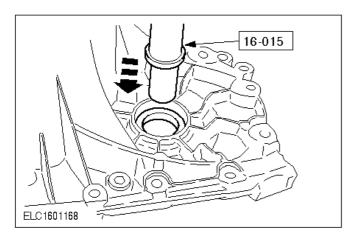
- The shims are available in thicknesses from 0,1 mm to 1,1 mm in steps of 0,1 mm.
- Continue with step

#### 73. Calculate the shim thickness to be fitted.

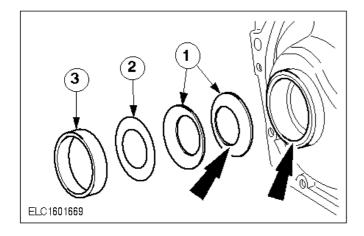
- 0,73 mm = calculated average value
- + 3,80 mm for measuring shim
- + 0,40 mm for bearing preload
- 4,93 mm = sub-total
- - 4,42 mm = thickness of the spring washers
- 0,51 mm = required shim thickness



- 74. Detach the transmission housing again.
  - Insert the upper assembly plug.
  - Turn the transmission 180°.
  - Detach the dial gauge and valve spring compressor.



75. Remove the bearing ring and the measuring shim.

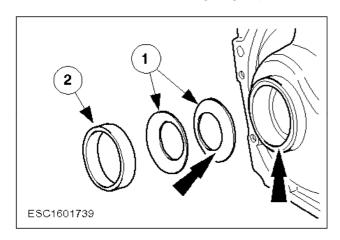


**c** 76. Fit the spring washers, the shim of the required thickness and bearing ring.

#### Note:

The spring washers are fitted with the inside diameters facing one another.

- 1 Spring washers
- 2 Shim of required thickness
- 3 Put the bearing ring in place and secure by staking the housing edge.



#### Note:

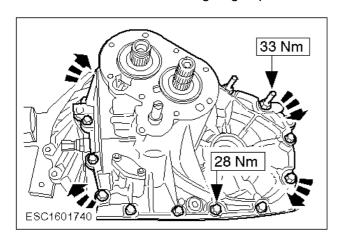
Standard transmissions only.

77. Install the spring washers and bearing ring.

#### Note:

The spring washers are fitted with the inside diameters facing one another.

- 1 Spring washers
- 2 Put the bearing ring in place and secure by staking the housing edge.

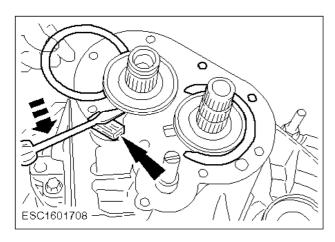


Position of housing gasket.

Note:

The studs are tightened to 33 Nm.

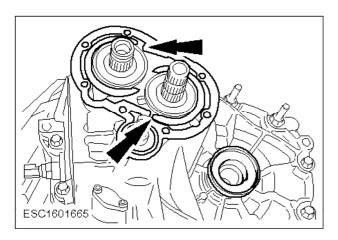
**5** 78. Fit the transmission housing and tighten it down evenly.



Note:

Use a support under the lever.

**c** 79. Fit the circlips of the input shaft and output shaft.

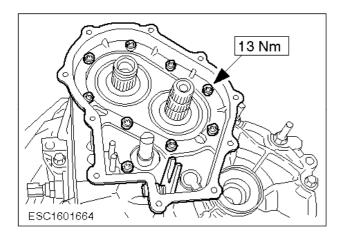


Note:

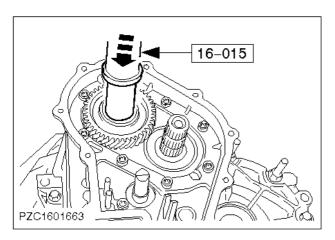
Turn the circlips so that the ends fit in the cut-outs in the gasket.

**6** 80. Fit the gasket.

Insert the assembly plug.



81. Fit the fifth gear housing.





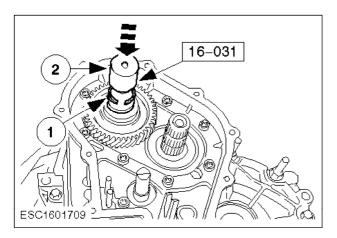
Detach the transmission from the assembly stand and carry out the following operation on the press.

82. Support the clutch splines of the input shaft on the press.

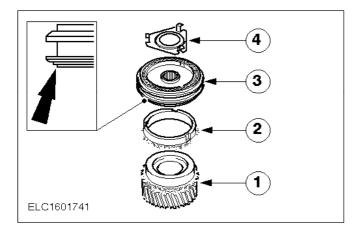
#### Note:

The transmission housing must not rest on the press table.

83. Press the fifth gear driving gear onto the input shaft.



- 84. Fit the circlip for the fifth gear driving gear.
  - 1 Fit the circlip on the special tool.
  - 2 Apply the tool and drive on the circlip.

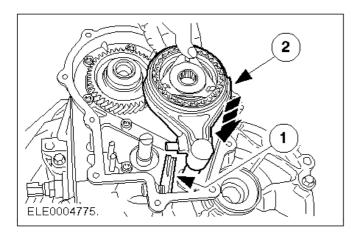


85. Preassemble the fifth gear wheel assembly.

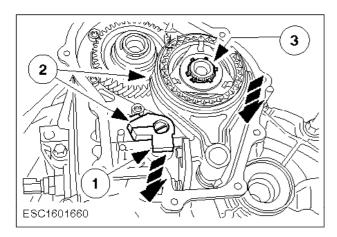
#### Note:

Installation position - synchroniser clutch.

- 1 Fifth gear wheel
- 2 Synchroniser ring
- 3 Synchroniser clutch
- 4 Retaining plate

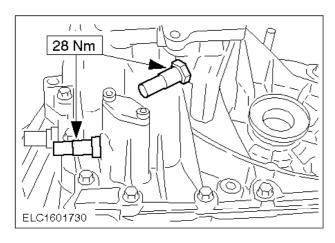


- **6** 86. Fit the fifth gear synchroniser with the selector fork on the output shaft.
  - 1 Swivel the lever upwards.
  - 2 Slide the synchroniser down until it reaches the lever.



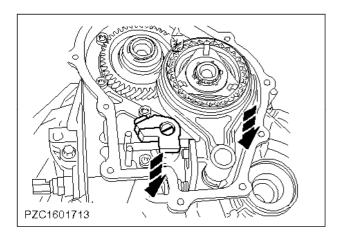
- 87. Fit the selector finger.
  - 1 Insert the selector finger.
  - 2 Bring the selector finger and the synchroniser together into installation position.

### 3 Fit the circlip.



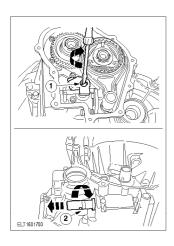
**88.** Fit the detent mechanisms.

Smear the threads with (Hylomar Spec. ESEE-M4G1008-A) sealer.



C 89. Engage fifth gear.

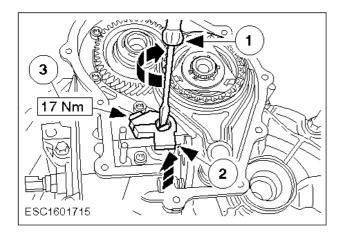
Press the selector fork and selector finger down together.



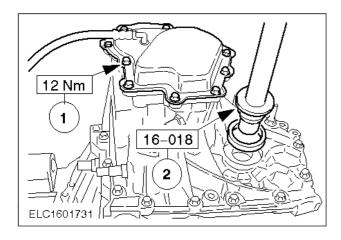
Note:

If the transmission is in neutral.

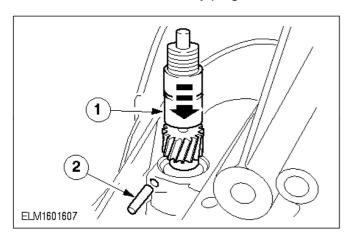
- 90. Engage fifth gear.
  - 1 Turn the fifth gear selector shaft clockwise as far as the stop.
  - 2 Turn the main selector shaft clockwise as far as the stop and pull it out.



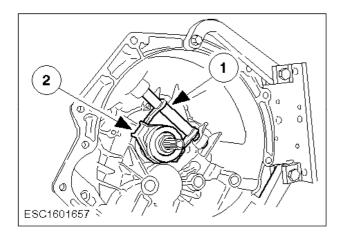
- 91. Adjust the selector finger.
  - Turn the main selector shaft clockwise and press it down. 1
  - Remove the selector finger end float by lifting. Tighten the clamp bolt in this position. 2



- Fit the end cover and the oil seal.
  - Fit the end cover with the gasket.
  - Drive the driveshaft oil seals fully home. Insert the assembly plug.



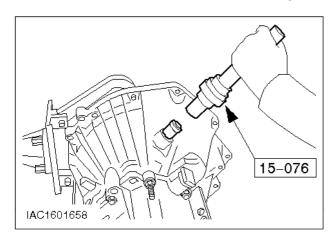
- 93. Install the speedometer drive pinion.
  - 1 Install the speedometer drive.
  - Drive in the roll pin with a hammer.



94. Install the release bearing.

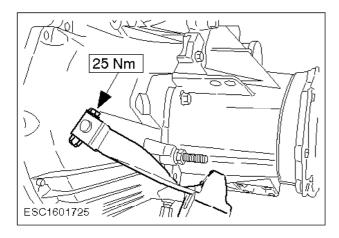
Smear the steel bush and clutch input shaft splines with high-melting point grease (ESDM-1C220-A).

- 1 Put the clutch release fork in place.
- 2 Hook on the release bearing and move it into position ready for assembly.



• 95. Drive in the clutch release fork bearing bush.

Fit the gaiter.



- 96. Fit the clutch release lever.
  - 97. Detach the transmission from the assembly stand.