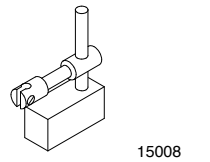
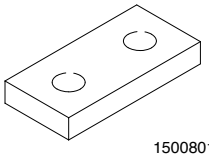
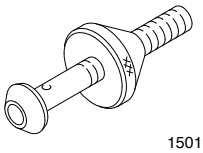
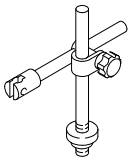
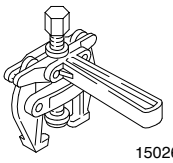
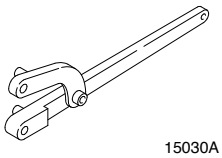
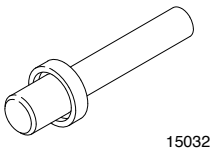
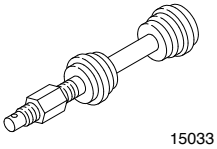
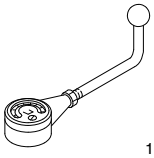
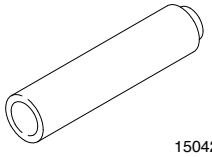
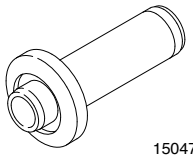
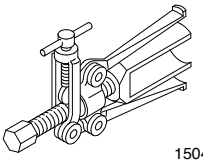
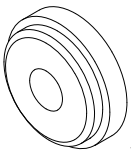
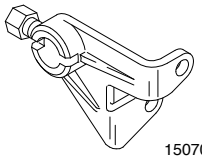
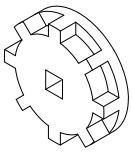
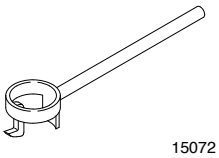
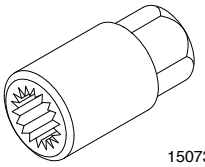
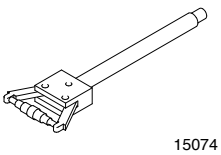
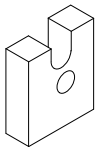
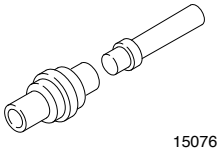
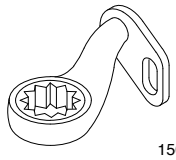
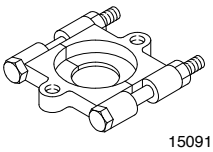
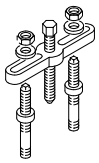
Differential Assembly – Overhaul (assembly removed) (15 254 6)

Special Tools

 15008	**15-008** Dial indicator fixture
 1500801	**15-008-01** Adaptor for dial indicator fixture
 15019	**15-019** Gauge bar
 15022A	**15-022A** Dial indicator fixture
 15026A	**15-026A** Differential bearing remover
 15030A	**15-030A** Universal flange–holding wrench
 15032	**15-032** Differential bearing installer
 15033	**15-033** Bearing ring installer
 15041	**15-041** Torque gauge
 15042	**15-042** Pinion bearing installer

 15047A	**15-047A** Pinion oil seal installer
 15048	**15-048** Driveshaft oil seal remover
 15068	**15-068** Adaptor
 15070	**15-070** Rear axle mounting bracket
 15071	**15-071** Differential bearing adjusting wrench
 15072	**15-072** Oil seal remover
 15073	**15-073** Pinion socket wrench
 15074	**15-074** Bearing ring remover
 15075	**15-075** Step gauge
 15076	**15-076** Driveshaft oil seal installer

 15090	**15-090** Holding wrench, drive pinion nut
 15091	**15-091** Separator
 15092	**15-092** Bridge, drive pinion bearing remover

Workshop Equipment

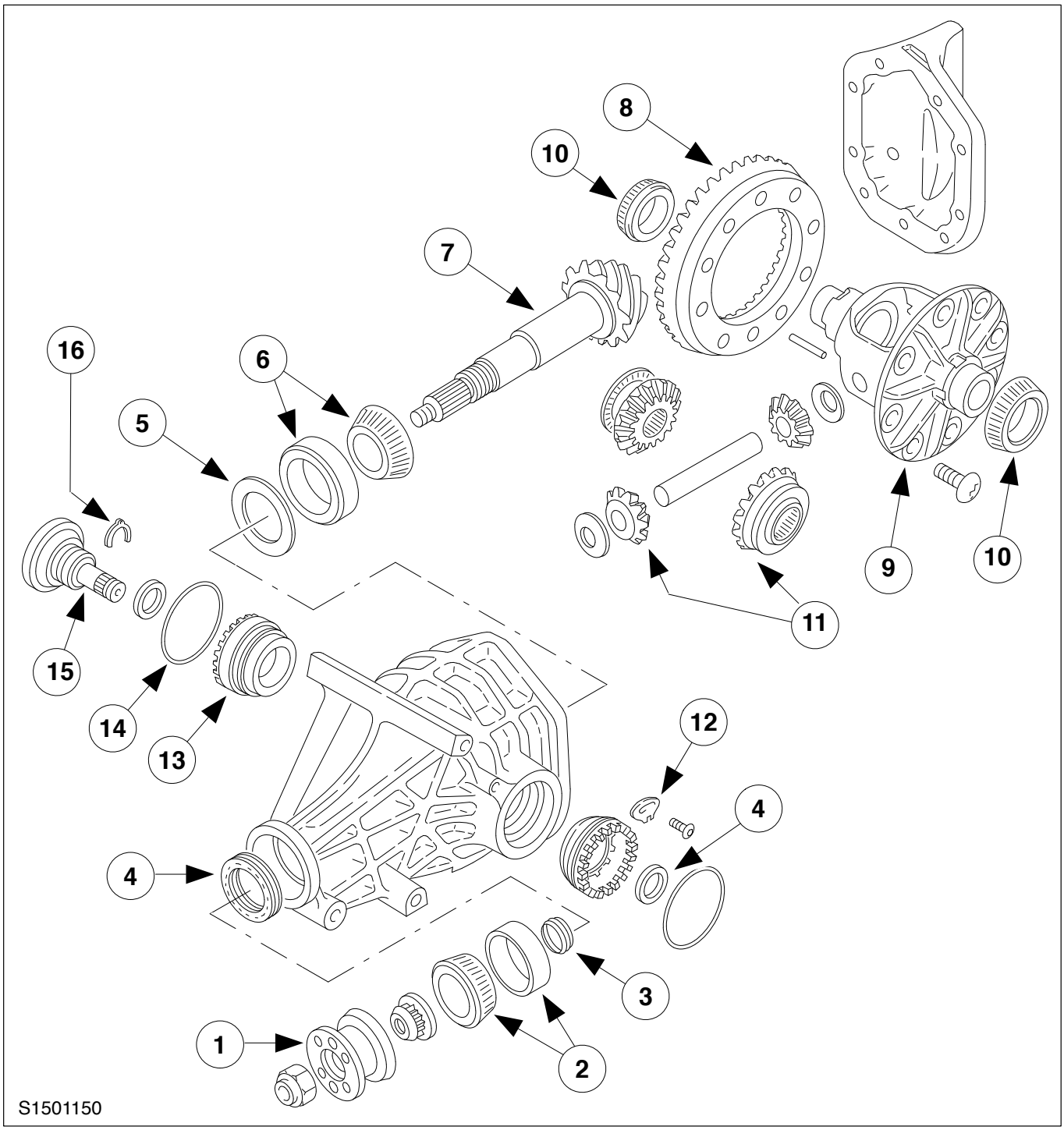
Assembly stand	

Lubricants and Sealers

Sealer	SQM-4G9523-A
Bearing housing grease	ESEAM-1C1014-A
Hypoid oil	SQM-2C9002-AA

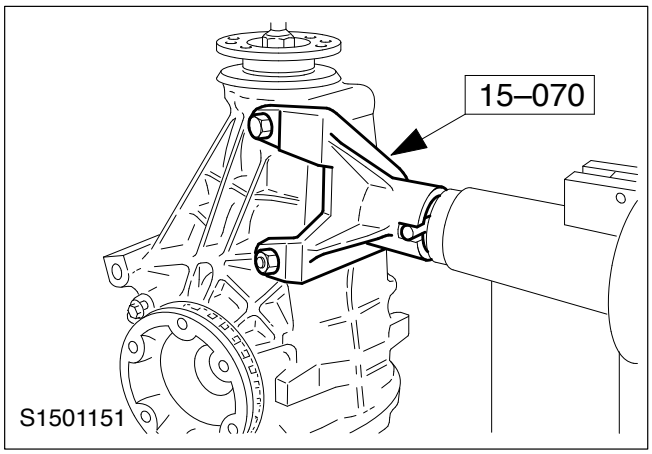
Proprietary Tools

Two-legged puller



Exploded view of differential assembly.

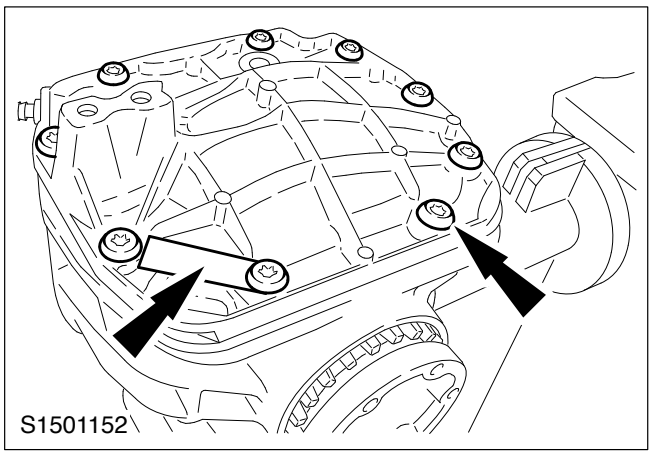
Item	Description
1	Drive flange
2	Outer taper roller bearing
3	Collapsible spacer
4	Radial oil seal
5	Shim (production type)
6	Inner taper roller bearing
7	Drive pinion
8	Crown wheel
9	Differential housing
10	Differential taper roller bearings
11	Differential gears
12	Bearing housing retainer
13	Bearing housing
14	O-ring
15	Drive flange
16	Drive flange circlip



Dismantle

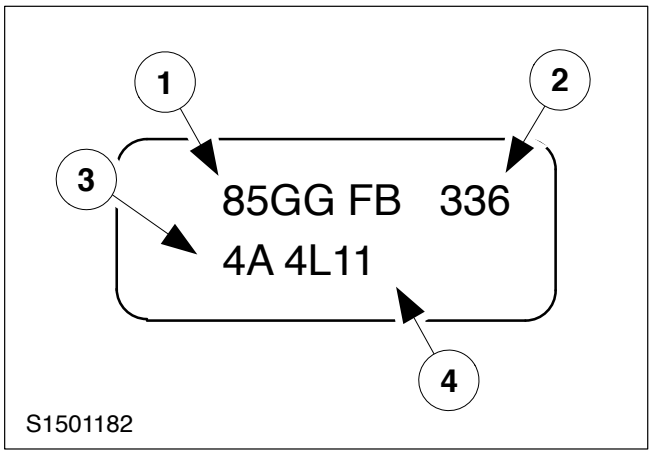
1. Mount the differential assembly on a stand.

Drain off the oil by unscrewing the oil level check plug.



2. Detach the housing cover.

Remove the identification tag from the differential (see step 3.).



3. Information on identification tag.

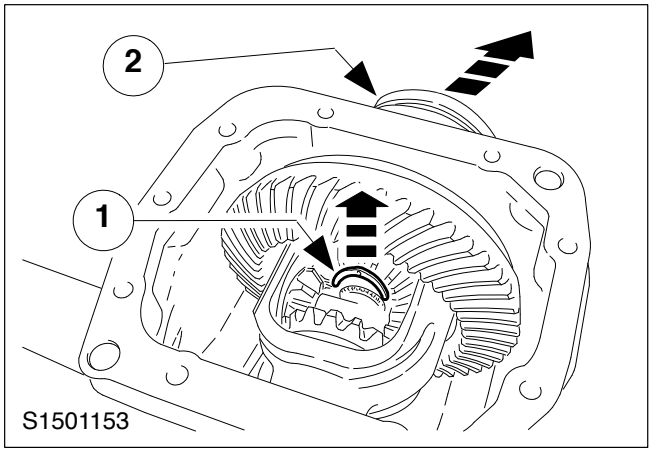
1 Part number

2 Axle ratio = 3,36:1

3 Assembly plant

4 Build date

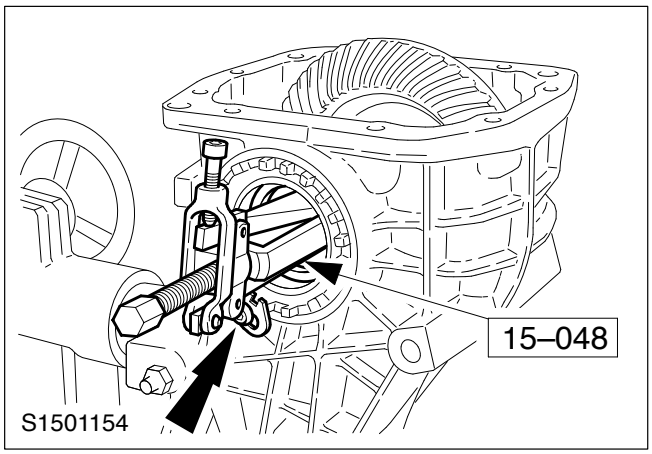
- 4 = build year
- L = build month (November)
- 11 = build day



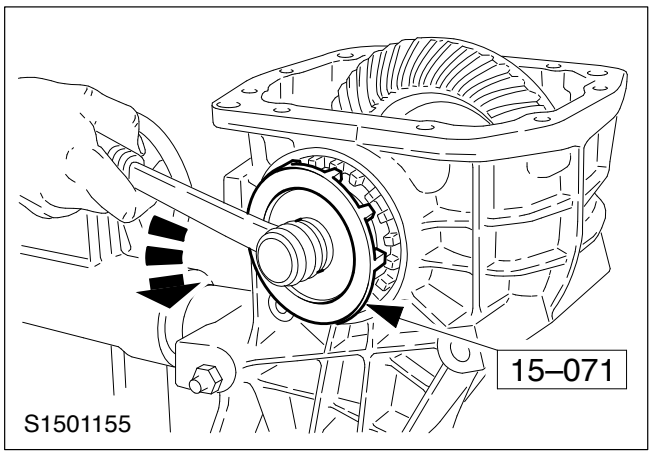
4. Remove the left and right-hand driveshaft flanges.

1 Pull out the circlips.

2 Prise out the drive flanges.

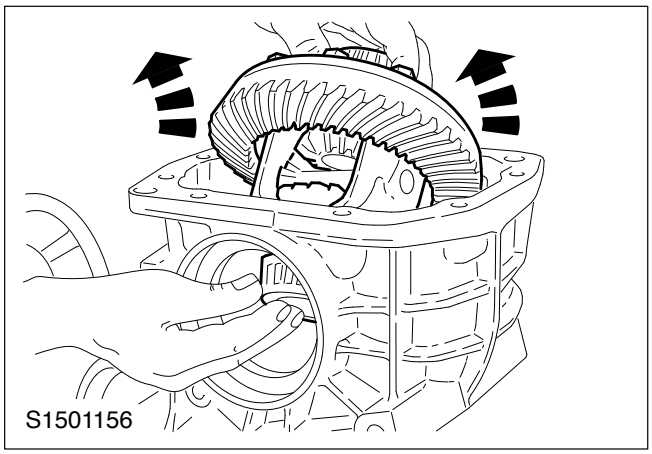


5. Remove the radial oil seals, unlock the bearing housings.



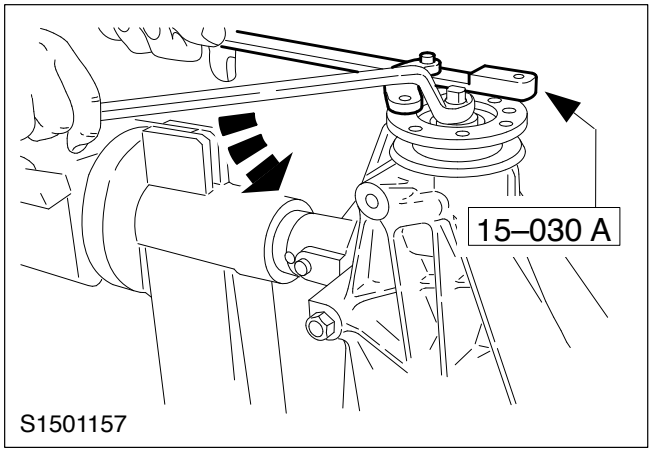
NOTE: Mark the positions of the bearing housings for refitment.

6. Unscrew the two bearing housings.



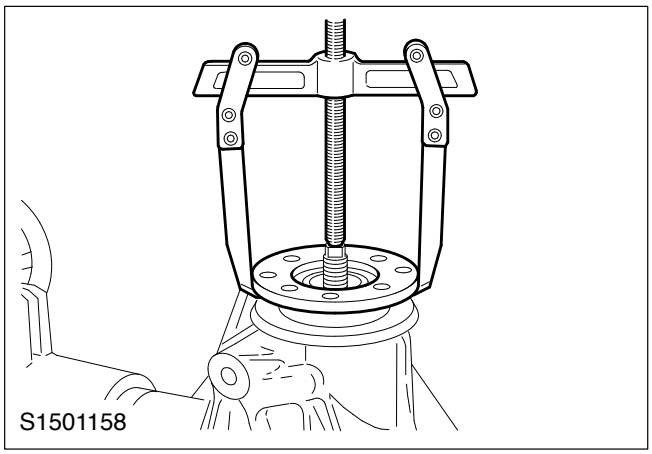
NOTE: Lift out the crown wheel side first.

7. Remove the differential.



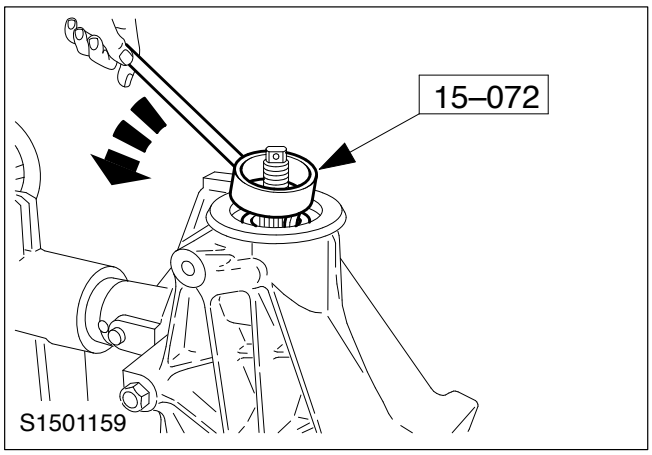
8. Unscrew the flange nut.

Hold the flange with the special tool.



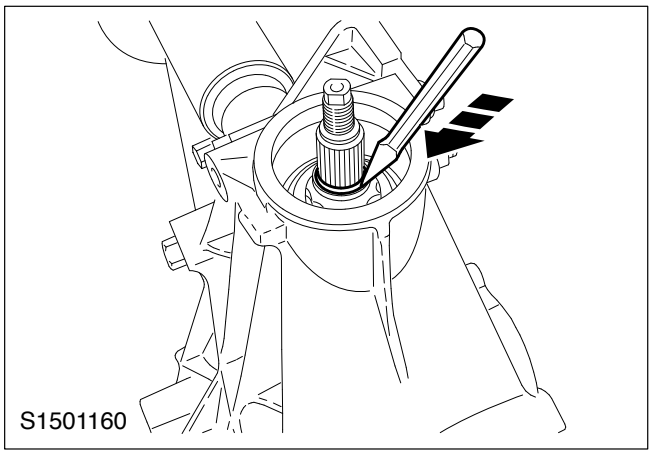
9. Pull off the drive pinion flange.

Pull off the flange using a two-legged puller.



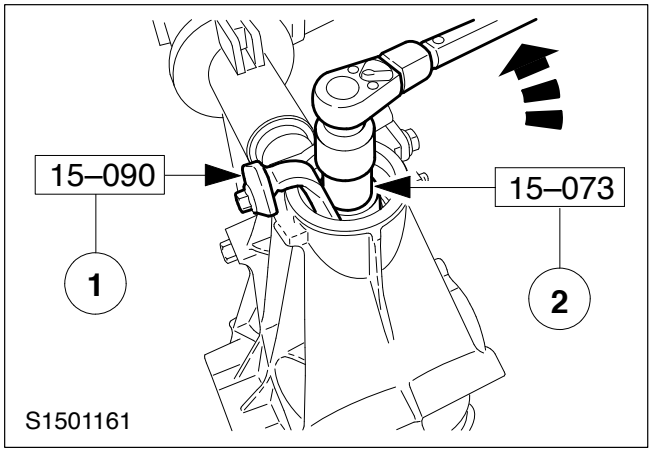
⚠ **CAUTION:** Take care not to damage the housing.

10. Remove the drive pinion oil seal.



NOTE: Insert a chisel in the circlip groove.

11. Unlock the drive pinion nut.

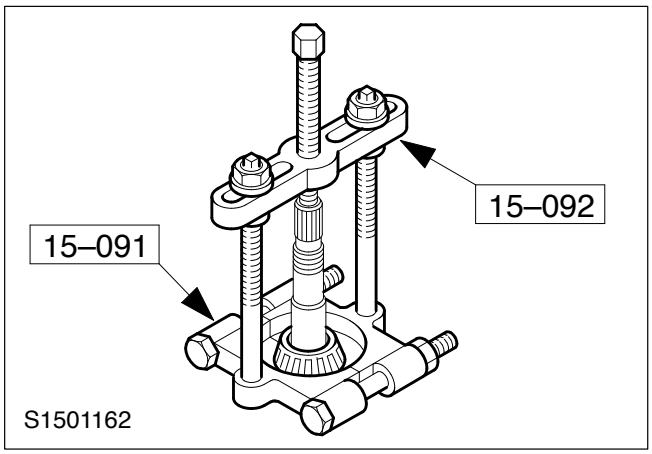


12. Remove the drive pinion.

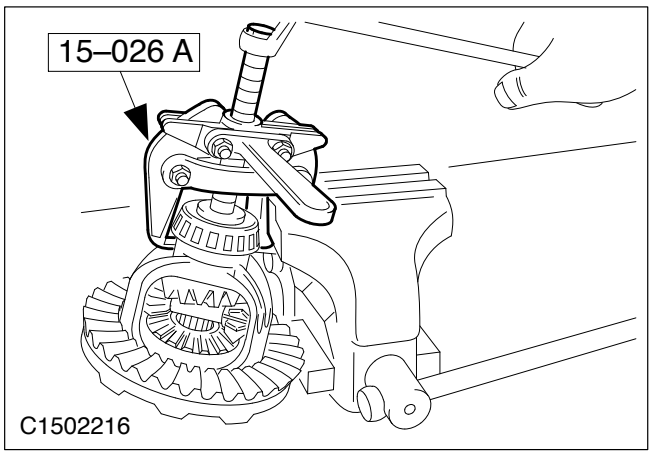
1 Fit the holding tool.

2 Turn the drive pinion anti-clockwise using the special wrench.

- Remove the holding tool.
- Drive out the pinion through the bottom.
- Remove the outer taper roller bearing.



13. Pull the taper roller bearing off the drive pinion.

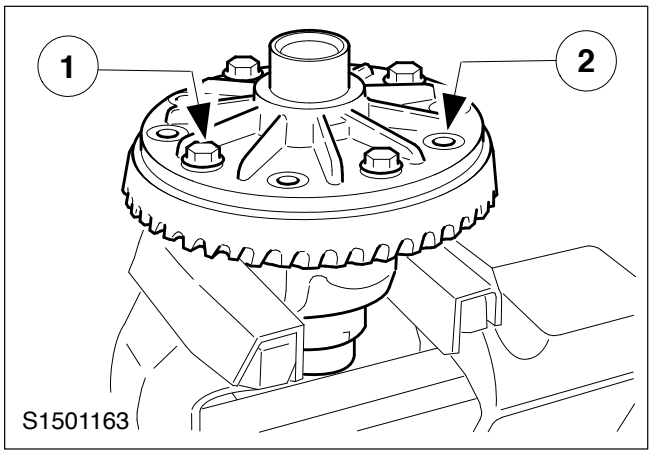


Dismantle differential

NOTE: New taper roller bearings are only available complete with the bearing housing.

14. Pull the bearing off the differential.

- Mark the position.
- Locate the puller arms in the recesses on the housing.

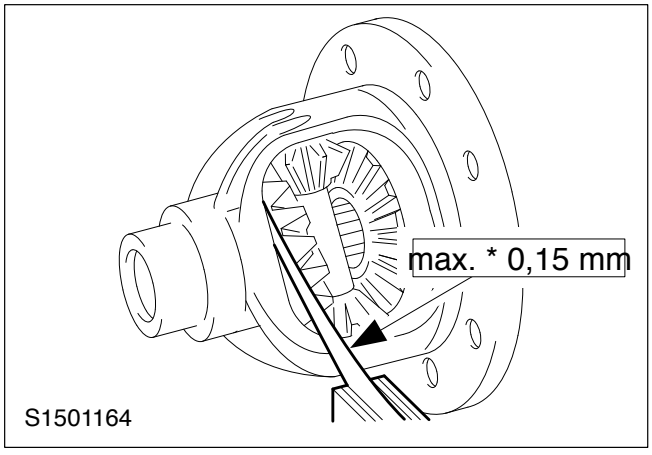


15. Remove the crown wheel.

1 Working diagonally, slacken four bolts five turns.

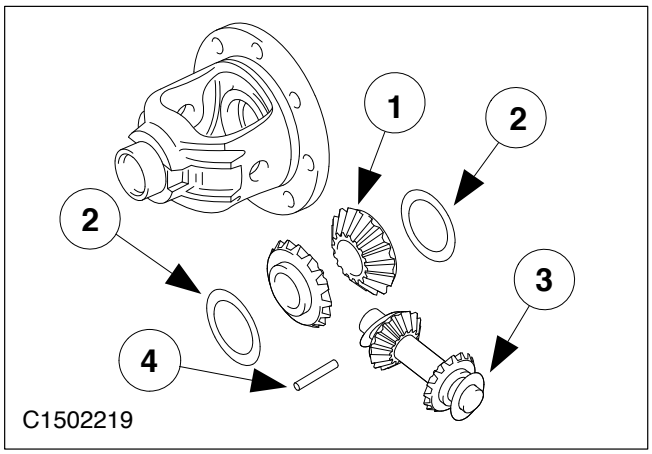
2 Unscrew the six bolts.

- Detach the crown wheel evenly from the differential housing by tapping the bolt heads.



NOTE: If the end float is outside the required range, adjust it by fitting new shims (see step 17.).

16. Measure the end float of the drive pinions.



17. Exploded view of differential.

1 Side gear

2 Shims

- Available shims: From 1,05 ± 0,03 mm up to 1,96 ± 0,03 mm in increments of 0,07 mm.

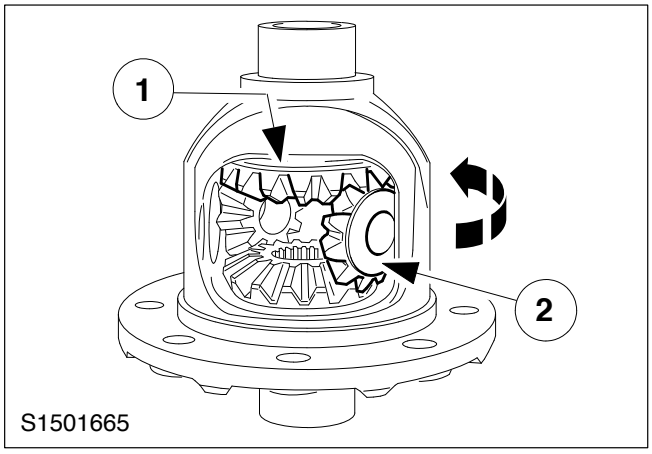
3 Shaft with differential pinions and thrust washers

4 Roll pin

Assemble

18. Preparatory operations.

- Renew components that are visibly damaged.



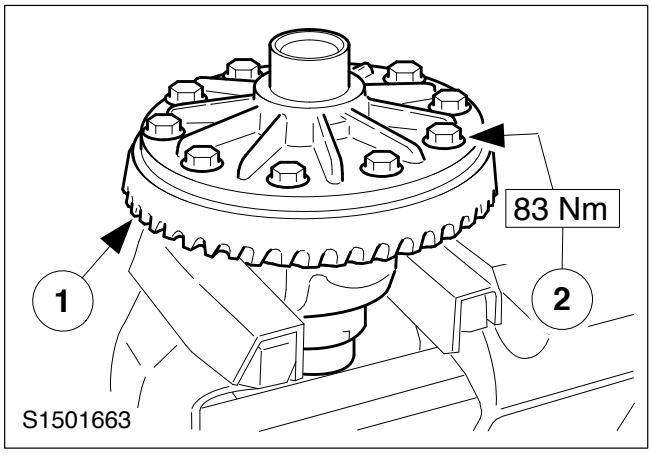
Assemble differential

19. Fit the differential pinions.

1 Insert the side gears with the shims.

2 Insert the pinion gears and thrust washers into the housing and evenly turn them into position.

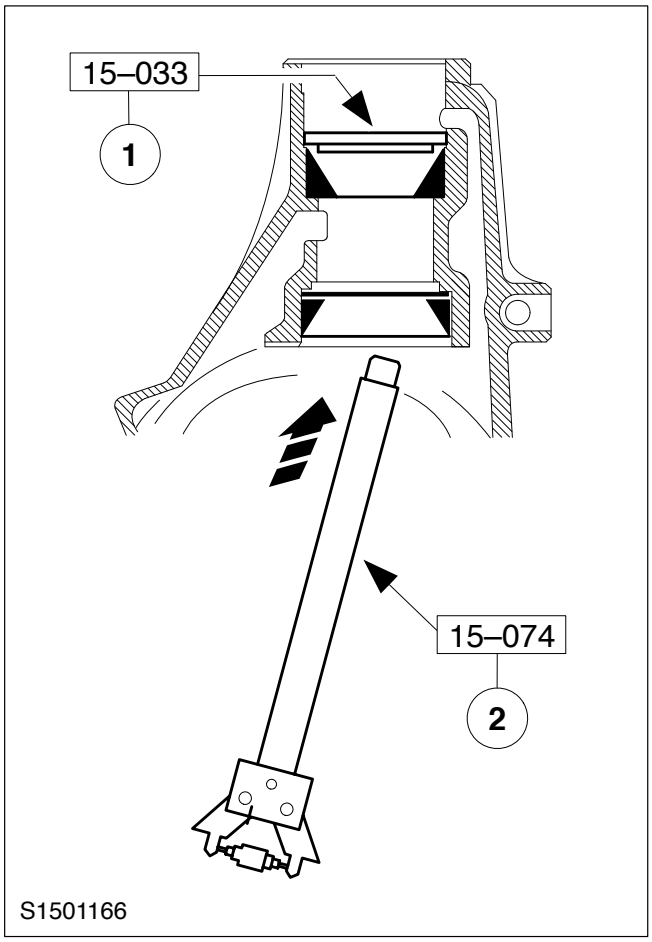
- Insert the differential pinion shaft and secure it with the roll pin.



20. Fit the crown wheel.

1 Heat the crown wheel to approx. 100°C and pull it on evenly using four of the old bolts.

2 Insert new bolts and tighten them.

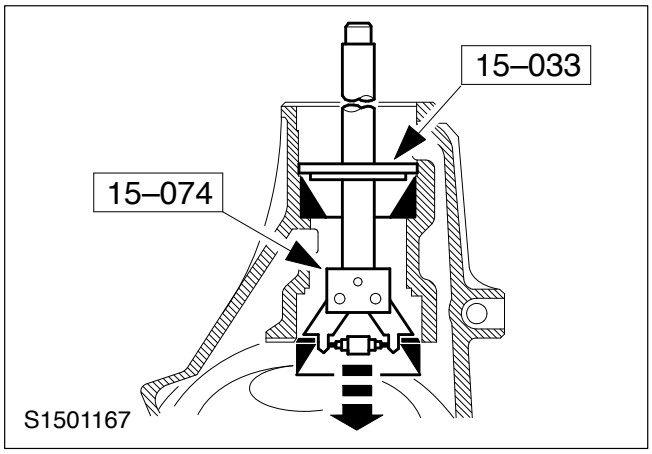


Renew drive pinion bearing rings

21. Insert the remover.

1 Fit a stepped washer as a guide.

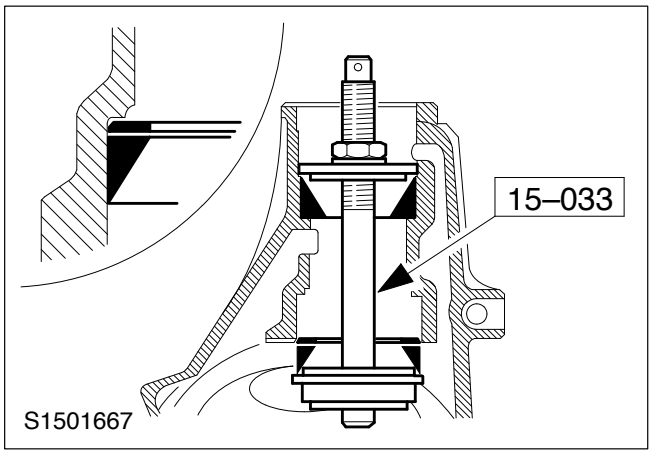
2 Insert the remover from below.



⚠ **CAUTION:** Never remove both bearing rings. Continue with step 23.

22. Remove the drive pinion inner bearing ring.

- Drive out the bearing ring with the shim.
- Discard the shim.

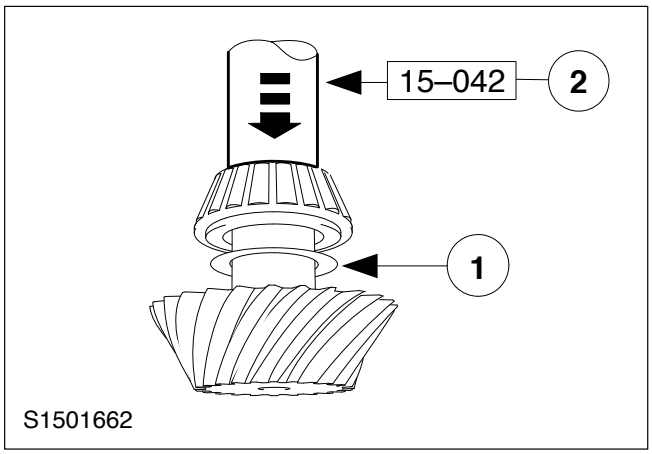


NOTE: Fit the shim with the chamfered side facing towards the housing.

23. Fit the inner bearing ring.

Fit the bearing ring with a standard shim (2 mm thick).

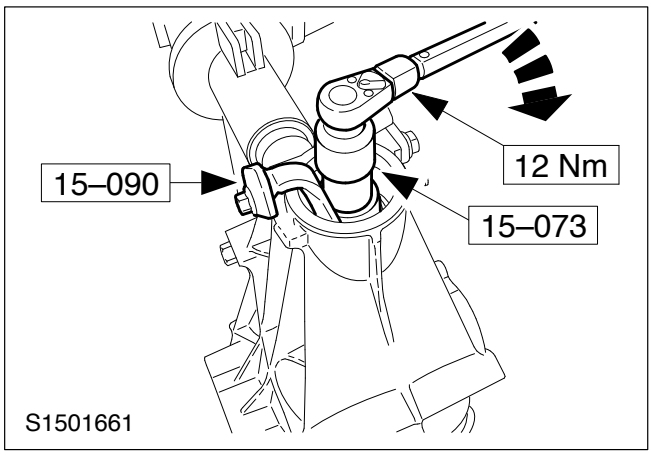
24. Change the outer bearing ring in the same way.



25. Fit a new taper roller bearing.

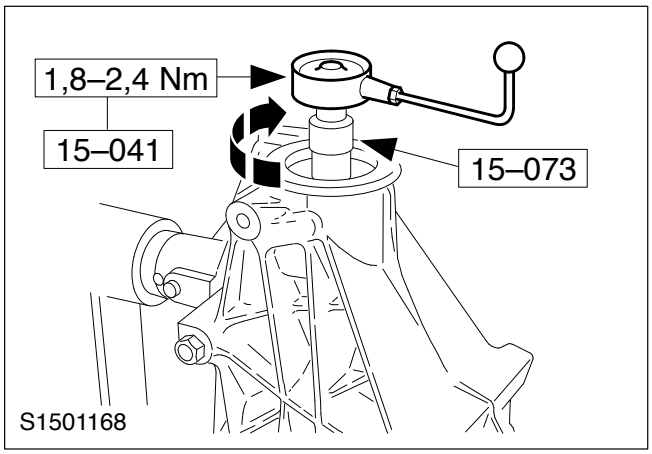
1 Fit a shim (1 mm thick).

2 Press on the bearing.



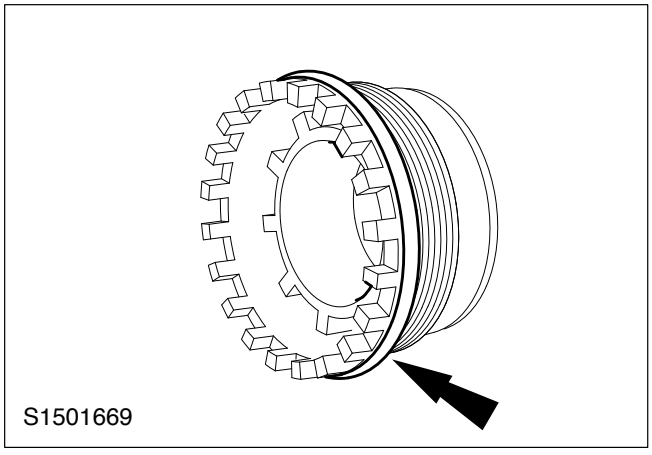
26. Fit the drive pinion without the collapsible spacer.

- Lubricate both taper roller bearings with oil.
- Fit the pinion, fit the bearing and nut.
- Tighten the nut and tighten the pinion to a maximum of 12 Nm.



NOTE: Tighten or slacken the nut further until the specified turning torque is obtained.

27. Measure the drive pinion turning torque.



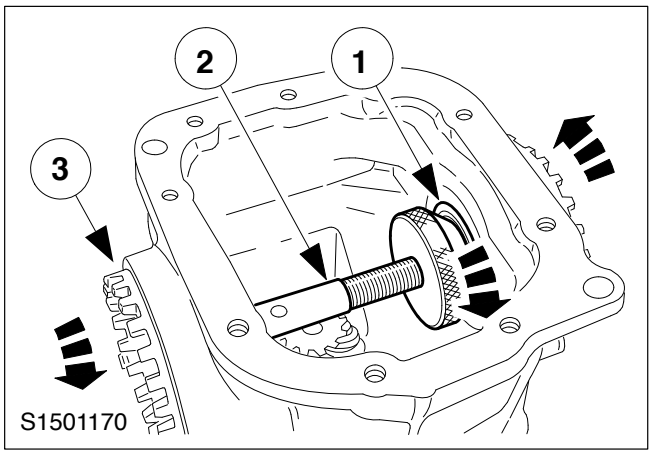
28. Fit the two bearing housings.

⚠ **CAUTION:** Do not mix up the taper roller bearings

1 Remove the O-ring.

2 Lubricate the thread with bearing housing grease (ESEAM–1C1014–A).

- Screw in the bearing housings to approx. the required depth.



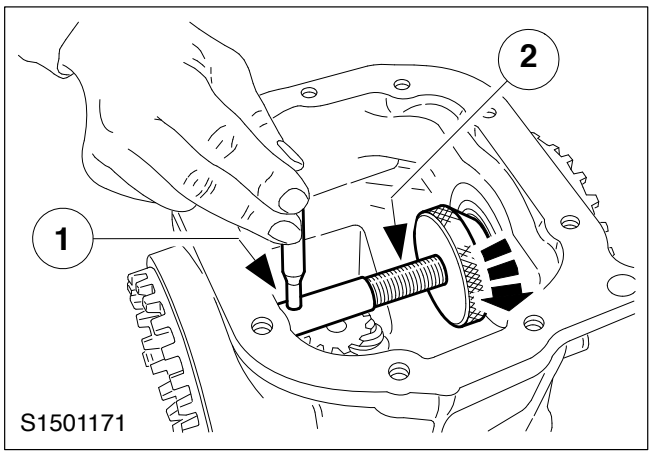
29. Fit the gauge bar.

1 Lubricate the bearing with hypoid oil and insert it in the bearing housings.

2 Insert the gauge bar.

3 Screw in the bearing housings to the required depth.

- Turn the adjusting nut until the bearings make contact with the gauge bar.

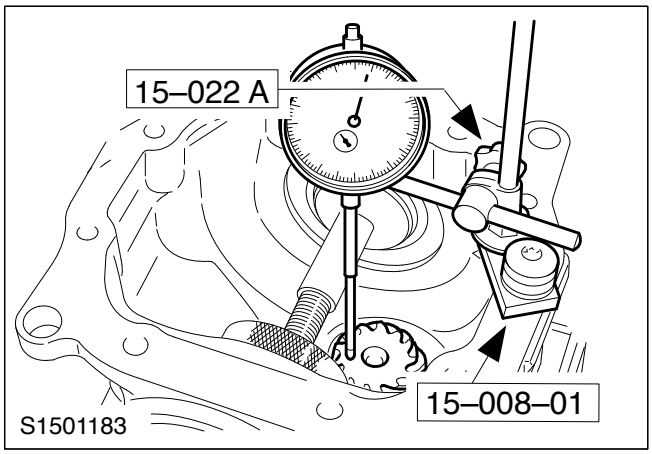


NOTE: Repeat sub-operations 1 and 2 until the adjusting nut can just be turned without holding the bar.

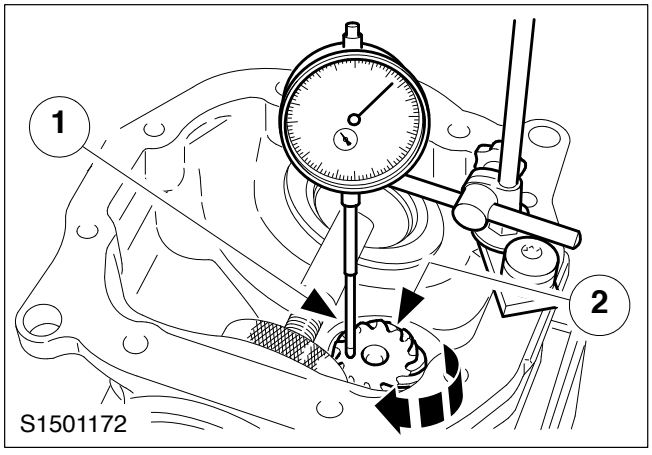
30. Set up the gauge bar.

1 Hold the gauge bar and screw in the adjusting nut.

2 Turn the gauge bar several times to settle the bearings.



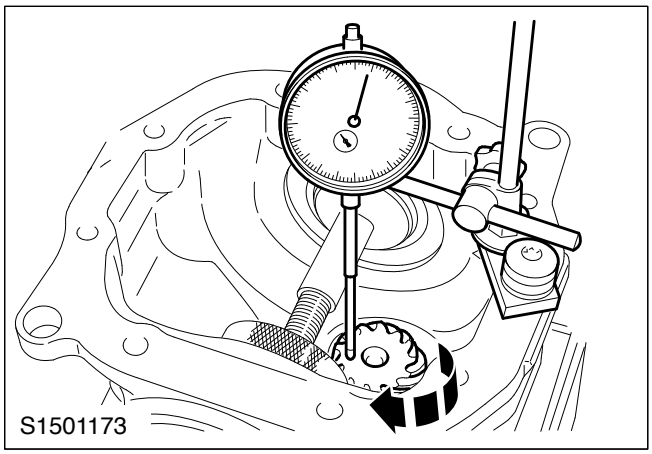
31. Set up a dial indicator.



32. Measure the run out of the drive pinion.

1 Position the plunger on the outer edge of the drive pinion near the gauge bar.

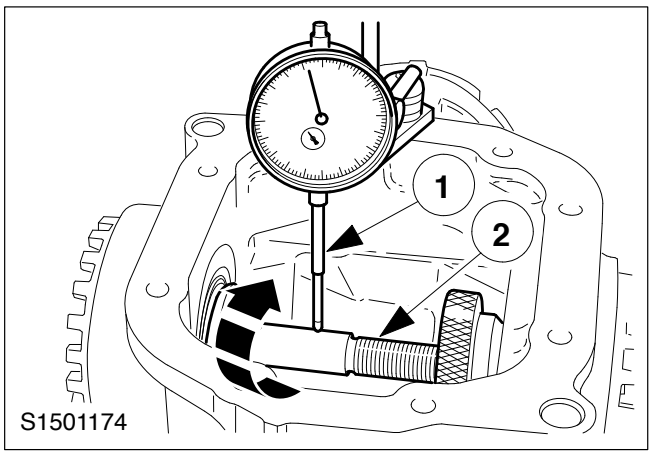
2 Turn the pinion one revolution and note the total deflection.


S1501173

NOTE: The pinion must not be turned any more after this.

33. Centre the drive pinion.

Turn the drive pinion until the dial indicator reads half the total deflection (from step 32.).

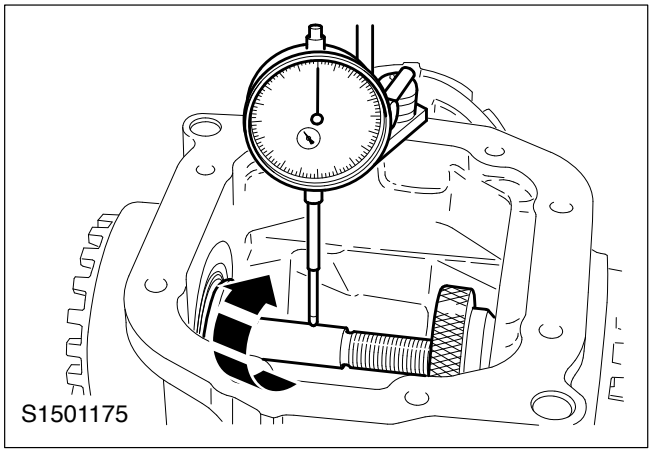


S1501174

34. Measure the run out of the gauge bar.

1 Position the plunger centrally on the gauge bar.

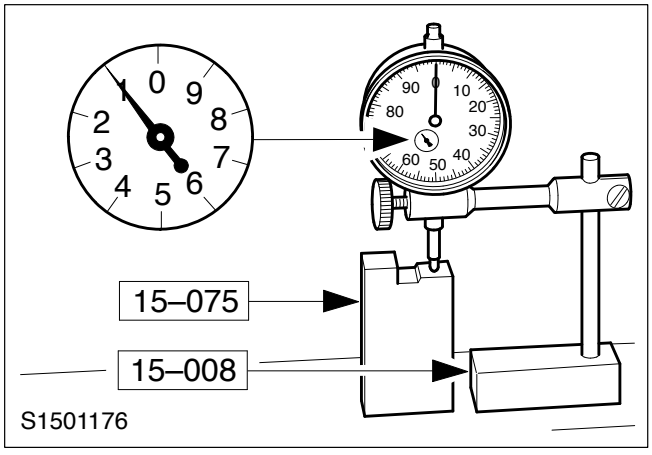
2 Turn the gauge bar one revolution and note the total deflection.


S1501175

NOTE: The gauge bar must not be turned any more after this.

35. Centre the gauge bar.

Turn the gauge bar until the dial indicator reads half the total deflection (from sub-operation 34.).



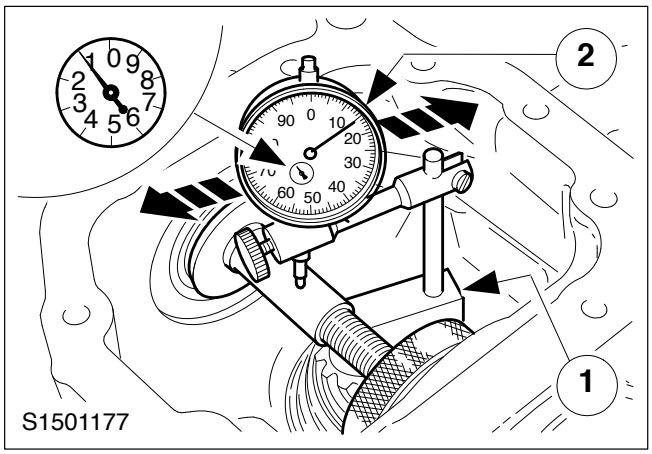
S1501176

⚠ **CAUTION:** The pre-load is essential as otherwise the measurements will be incorrect.

NOTE: Use the bottom step for 7,5” axles.

36. Adjust the dial indicator.

Set the dial indicator to “0” on a gauge plate with a “1 mm pre-load”.



NOTE: Carry out the measurement accurately several times

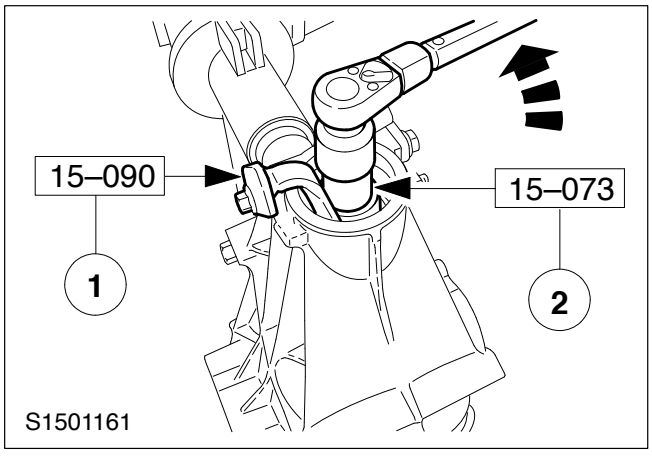
37. Establish the thickness of shim required for the drive pinion.

1 Set up the dial indicator fixture centrally on the drive pinion with the plunger positioned centrally on the gauge bar.

2 Slide the dial indicator transversely across the gauge bar and note the maximum deflection.

- Example: Dial indicator reading at maximum deflection = 1,15 mm, required shim = 1,15 mm.

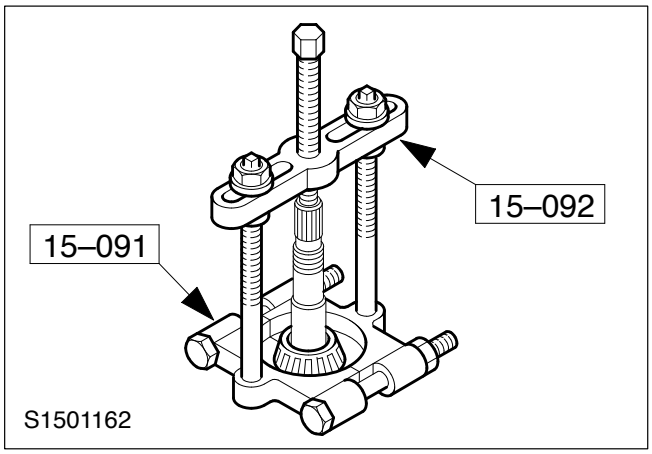
- Available shims: From 0,99 ± 0,01 mm up to 1,24 ± 0,01 mm in increments of 0,01 mm.



38. Remove the drive pinion again.

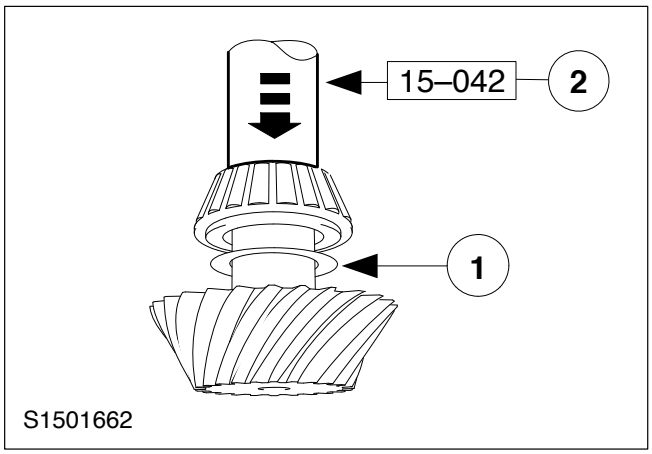
1 Fit the holding tool.

2 Turn the drive pinion anti-clockwise using the special socket wrench.



39. Pull the taper roller bearing off the drive pinion.

Remove the shim (1 mm thick).

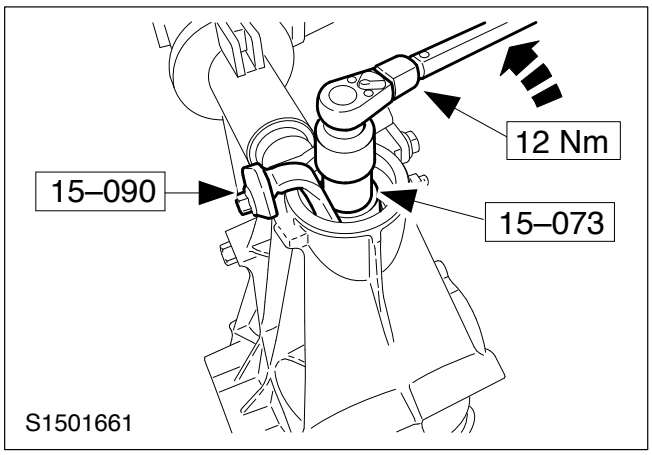


NOTE: See step 37.

40. Fit the required shim.

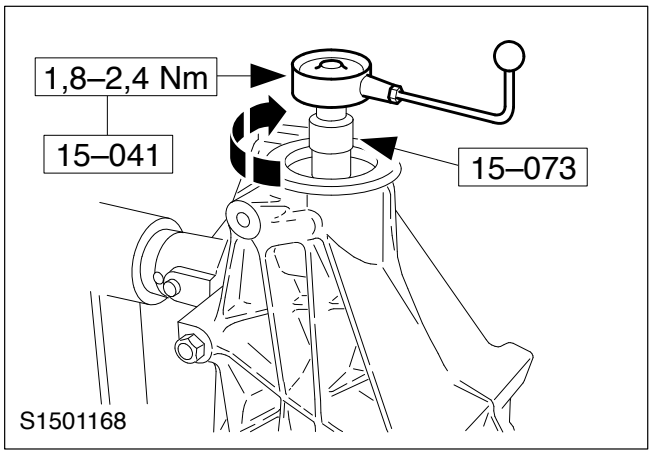
1 Shim

2 Press on the bearing.



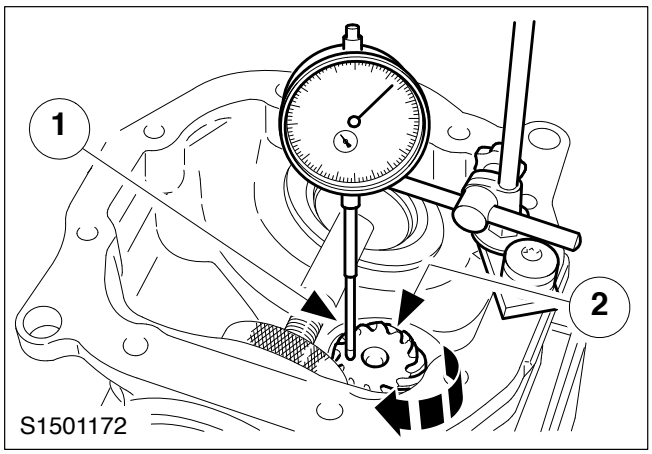
41. Fit the drive pinion without the collapsible spacer.

- Oil the two taper roller bearings.
- Insert the pinion and fit the bearing and nut.
- Hold the nut and tighten the pinion to 12 Nm.



NOTE: Tighten or slacken the nut until the specified turning torque is obtained.

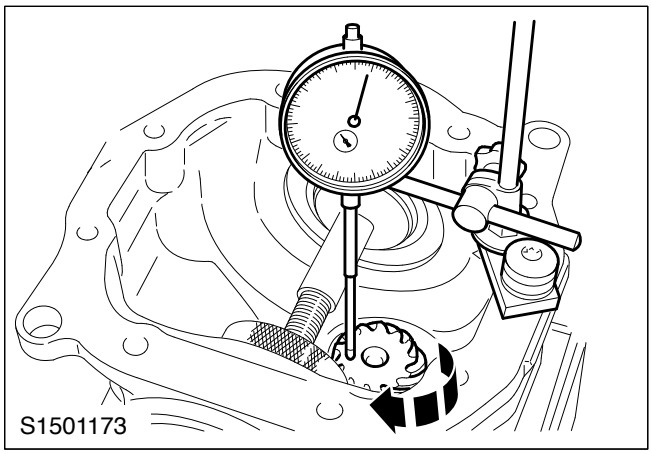
42. Measure the turning torque of the drive pinion.



43. Measure the run out of the drive pinion.

1 Set up the plunger on the outer edge of the drive pinion near the gauge bar.

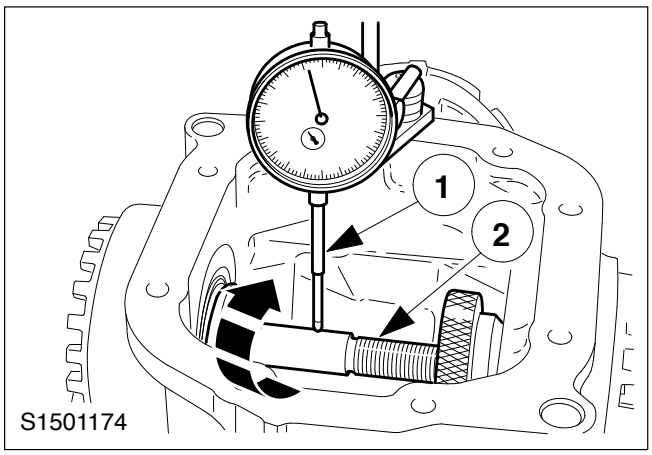
2 Turn the pinion one revolution and note the total deflection.


S1501173

NOTE: The pinion must not be turned any more after this.

44. Centre the drive pinion.

Turn the pinion until the dial indicator reading is half the total deflection (from step 43.).

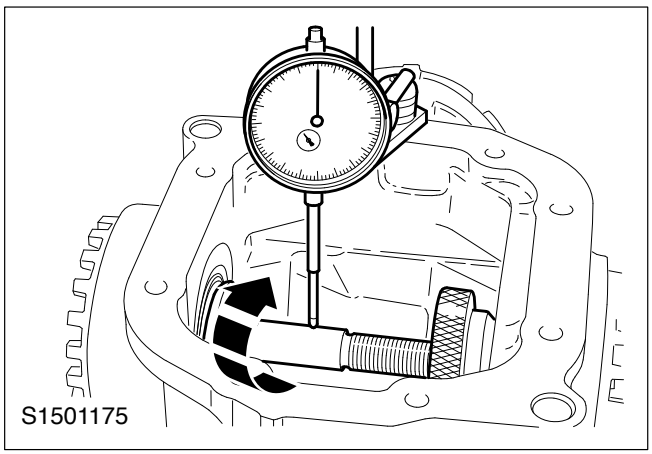


S1501174

45. Measure the run out of the gauge bar.

1 Position the plunger on the middle of the gauge bar.

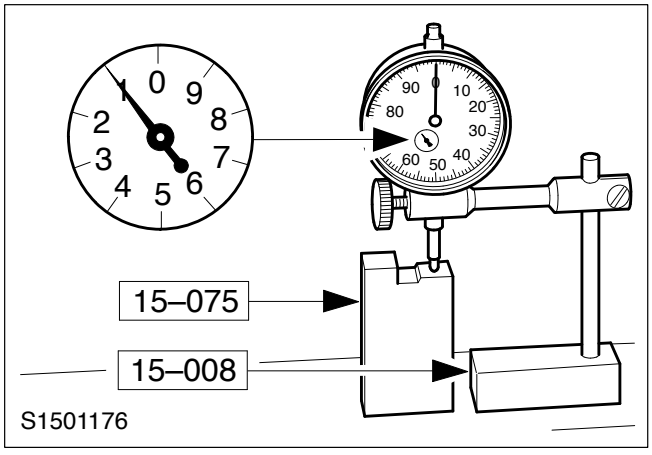
2 Turn the gauge bar one revolution and note the total deflection.


S1501175

NOTE: The gauge bar must not be turned any more after this.

46. Centre the gauge bar.

Turn the gauge bar until the dial indicator reading is half the total deflection (from step 45.).



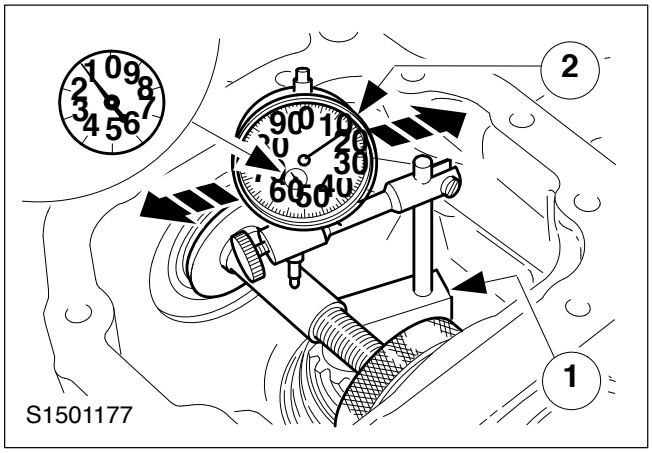
S1501176

⚠ **CAUTION:** The pre-load is essential as otherwise the measurements will be incorrect.

NOTE: Use the bottom step for 7,5” axles.

47. Adjust the dial indicator.

Set the dial indicator to “0” on a gauge plate with a “1 mm pre-load”.



NOTE: Carry out the measurement accurately several times.

48. Check the drive pinion shim.

NOTE: The dial indicator reading must now be 1,00 ± 0,01 mm.

1 Set up the dial indicator fixture centrally on the drive pinion with the plunger positioned centrally on the gauge bar.

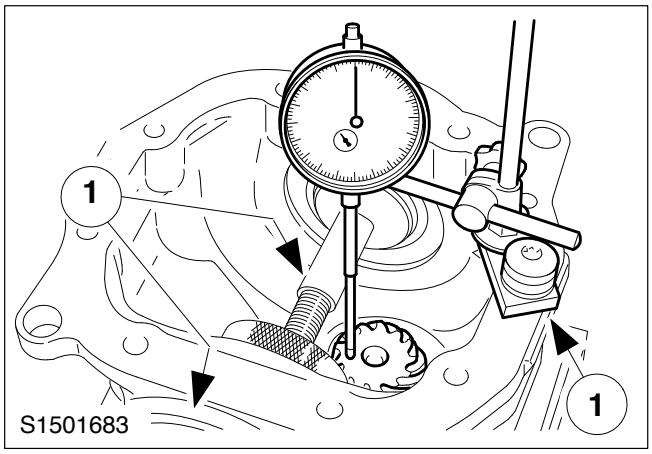
2 Slide the dial indicator transversely across the gauge bar and note the maximum deflection.

- Should the reading be more or less than the specified value, repeat the entire operation from step 38. to 48.

  Example:

  Measurement 1,08 mm = shim 0,08 mm too thin.

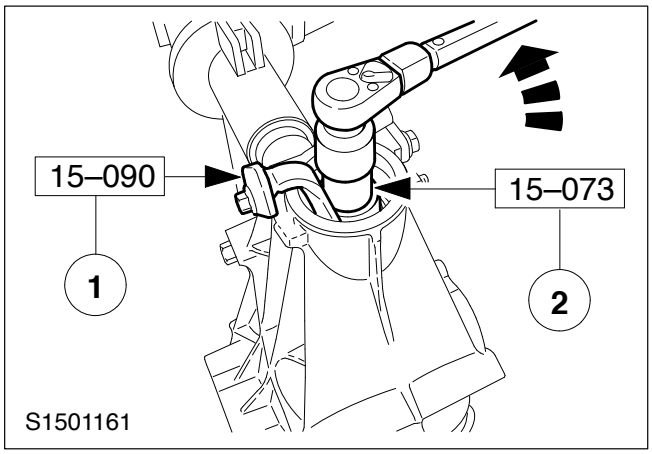
  Measurement 0,92 mm = shim 0,08 mm too thick.



49. Detach the measuring equipment.

1 Dial indicator with fixture.

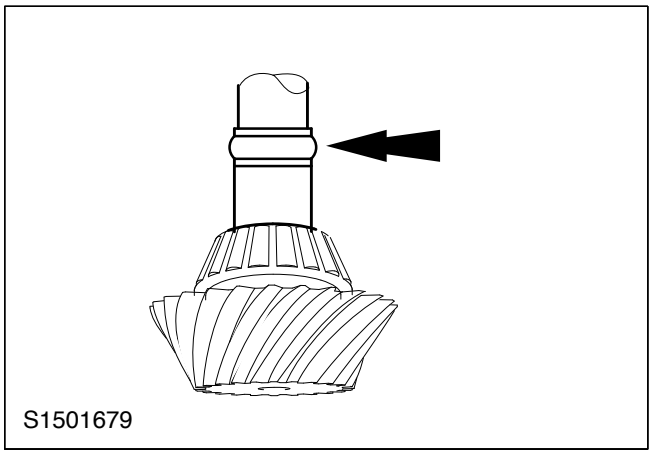
2 Bearing housings and gauge bar



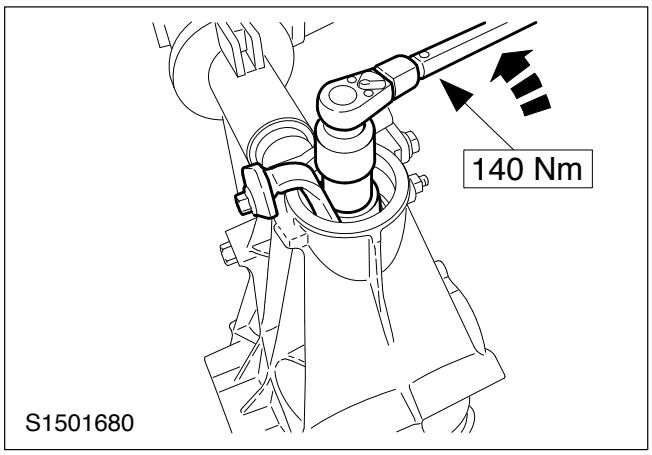
50. Remove the drive pinion again.

1 Fit the holding tool.

2 Turn the drive pinion anti-clockwise using the special socket wrench.


S1501679

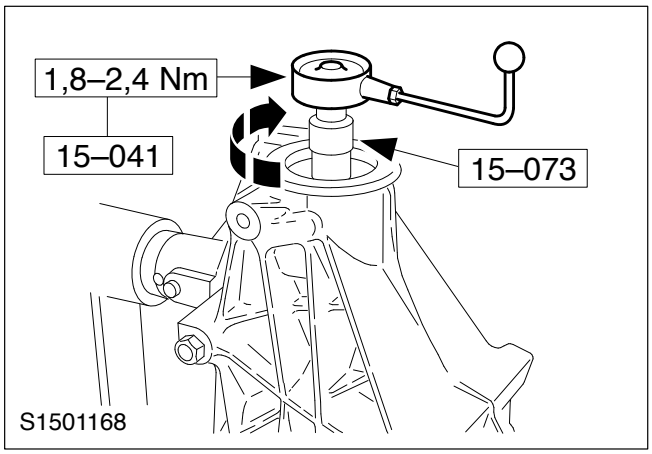
51. Fit a new collapsible spacer.



S1501680

52. Fit the drive pinion

- Insert the pinion, fit the bearing and nut.
- Hold the nut and tighten the pinion to a maximum of 140 Nm.



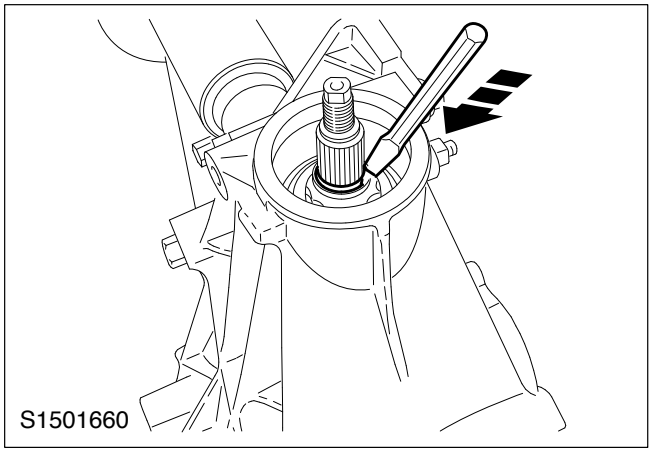
S1501168

⚠ **CAUTION:** If the specified turning torque is exceeded, renew the collapsible spacer. Correction by slackening the pinion nut is not permitted.

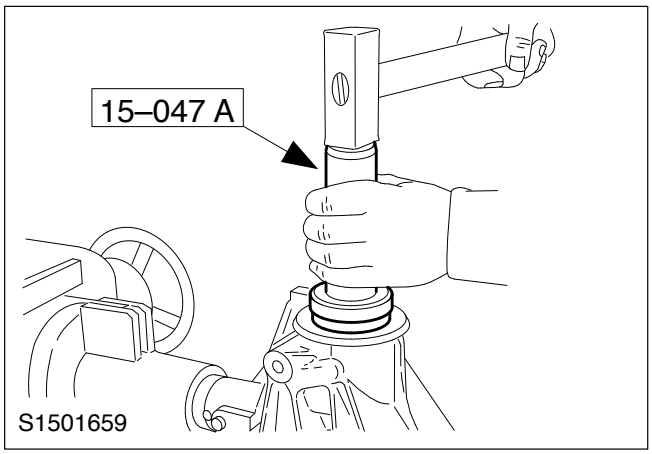
NOTE: Aim for the lower turning torque when re-using bearings and for the upper turning torque when fitting new bearings.

NOTE: Tighten the nut further until the specified turning torque is obtained.

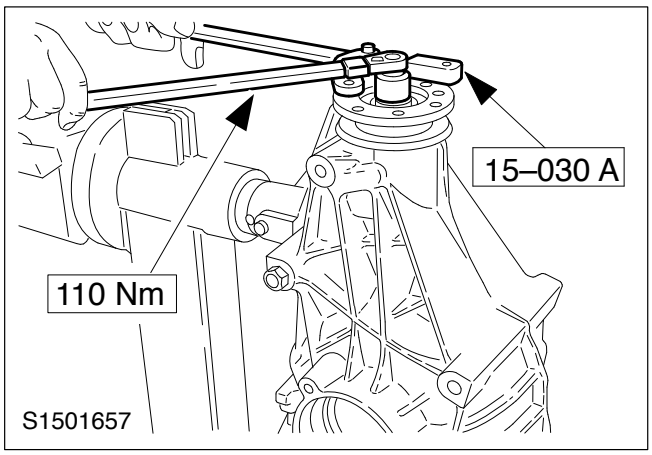
53. Measure the turning torque of the drive pinion.


S1501660

54. Secure the drive pinion nut.

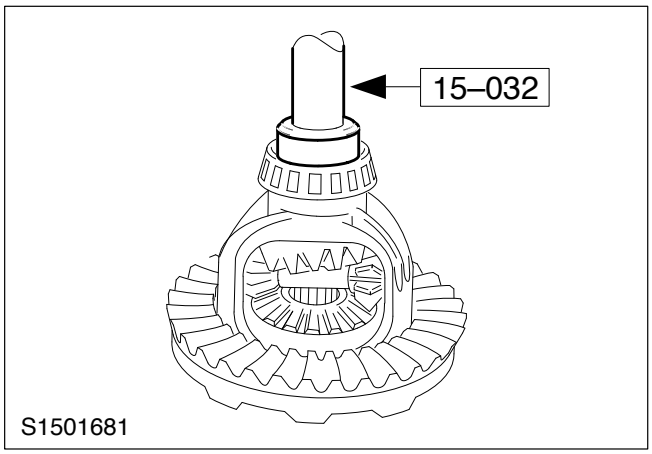


55. Drive the drive pinion oil seal home.



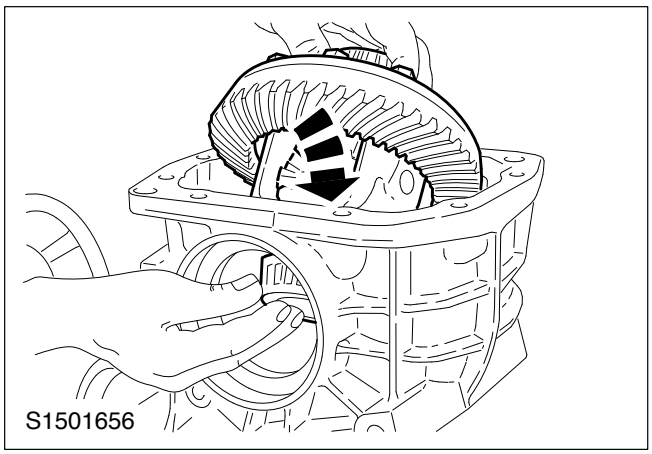
56. Fit the drive flange using a new self-locking nut.

- Hold using the special tool.
- Turn the transmission through 180°.



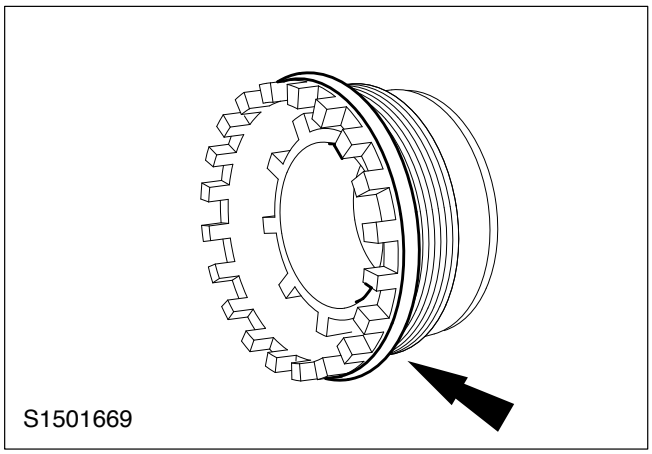
NOTE: Do not mix up the bearings.

57. Fit the taper roller bearings.



NOTE: Oil the taper roller bearings.

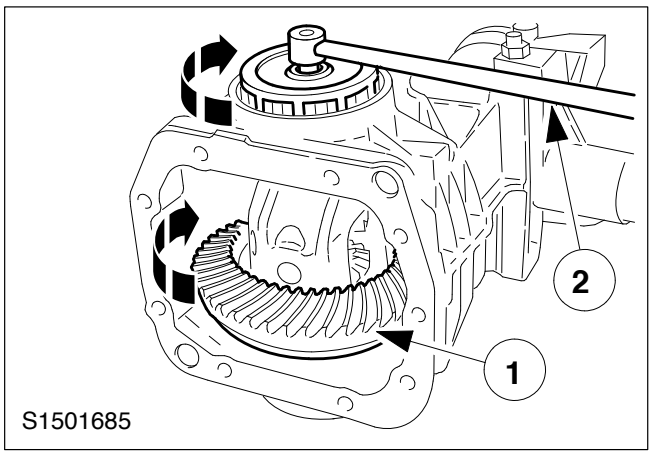
58. Fit the differential.


S1501669

NOTE: Do not mix up the bearing housings.

59. Fit both bearing housings.

- Fit the O-rings.
- Screw up the bearing housings uniformly until they make contact with the taper roller bearings. There must be appreciable backlash.
- Turn the housing through 90°.

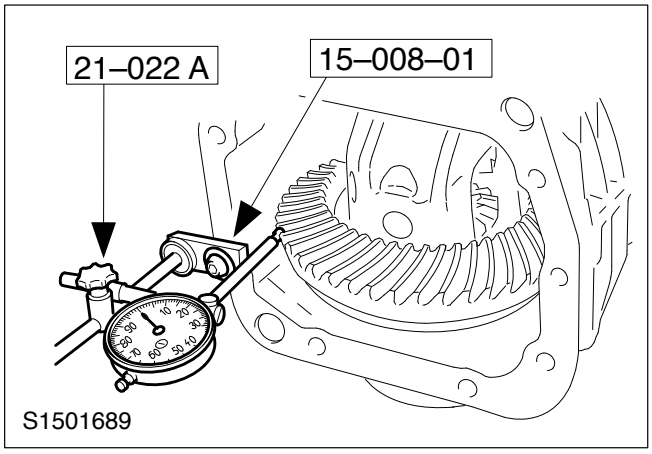


S1501685

60. Adjust the bearings.

1 Turn the differential several times to settle the bearings.

2 Adjust the bearing housings until they make contact with the taper roller bearings; there must be appreciable backlash.

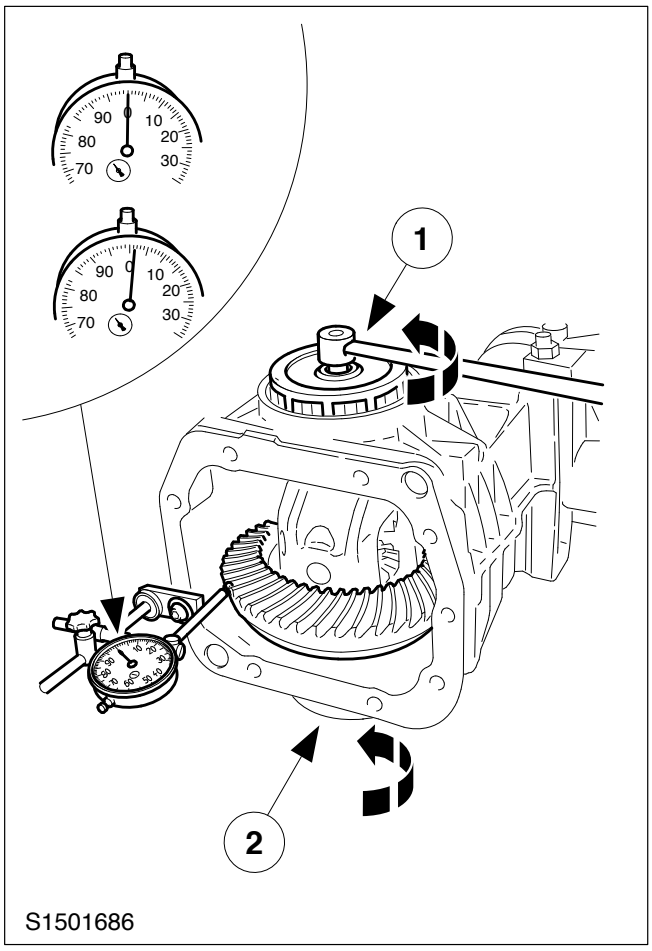


S1501689

Adjust backlash

NOTE: Set up the dial indicator so that the plunger is at 90° to the flank of a tooth.

61. Fit and set up a dial indicator.



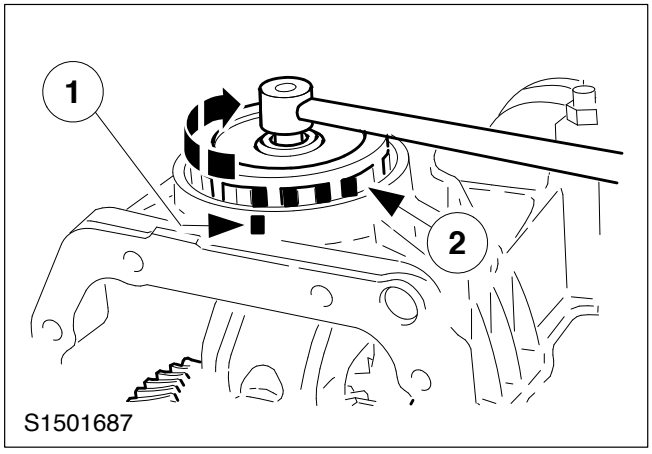
S1501686

NOTE: Repeat sub-operations 1 and 2 until a backlash of 0,01 mm is obtained. One castellation tooth + gap = 0,04 mm change in backlash.

62. Set the backlash to 0,01 mm.

1 Slacken the bearing housings.

2 Adjust the bearing housings until they make contact with the taper roller bearings.

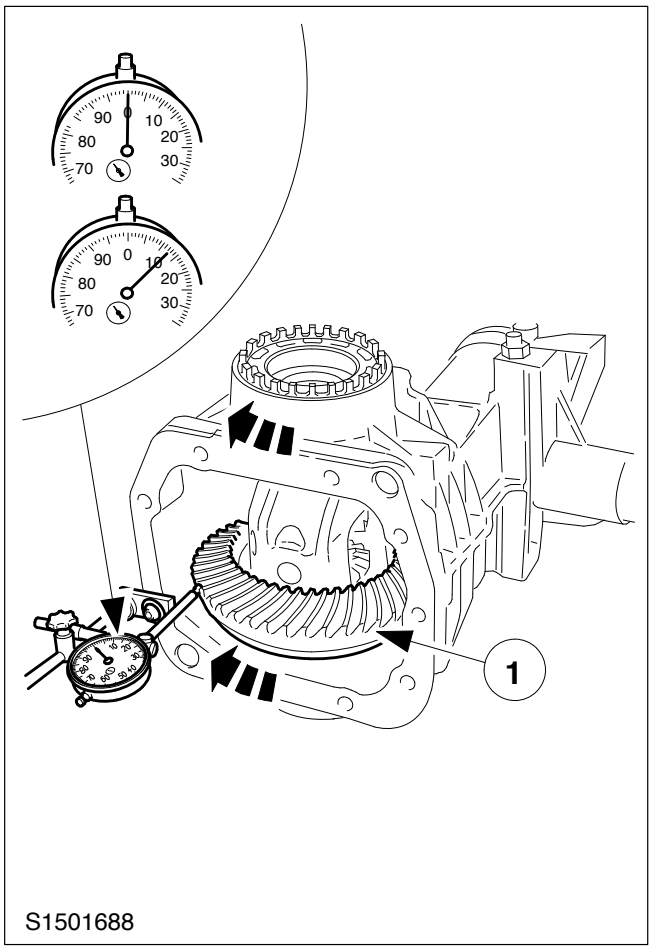


S1501687

63. Adjust the bearing pre-load.

1 Mark the position of the bearing housing in relation to the differential housing.

2 Turn the bearing housing exactly 4 castellation teeth further.



NOTE: The specified backlash should be achieved if the preceding operations have been carried out correctly.

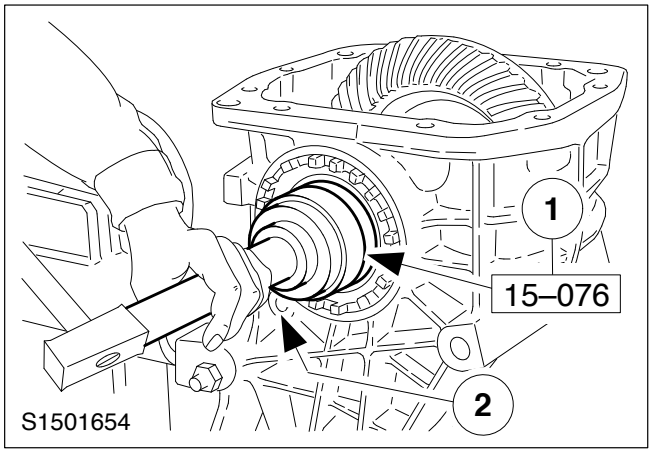
NOTE: Differences in backlash must not exceed 0,03 mm.

64. Check the backlash.

- Turn the differential several revolutions.
- Recheck the backlash at three points.

65. Check the crown wheel run out.

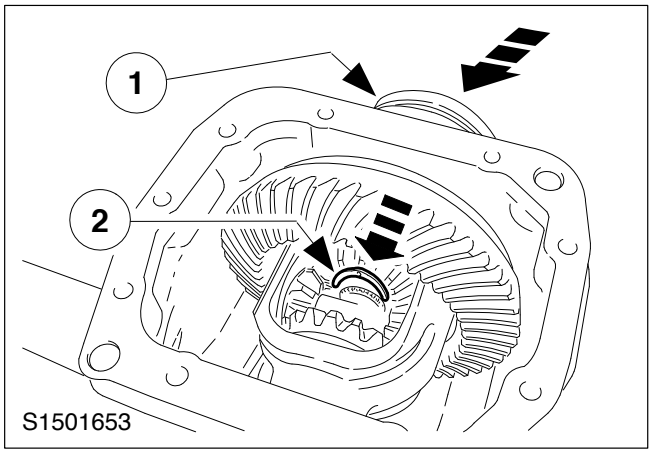
Should not exceed 0,05 mm.



66. Fit the radial oil seals.

1 Drive the oil seals home.

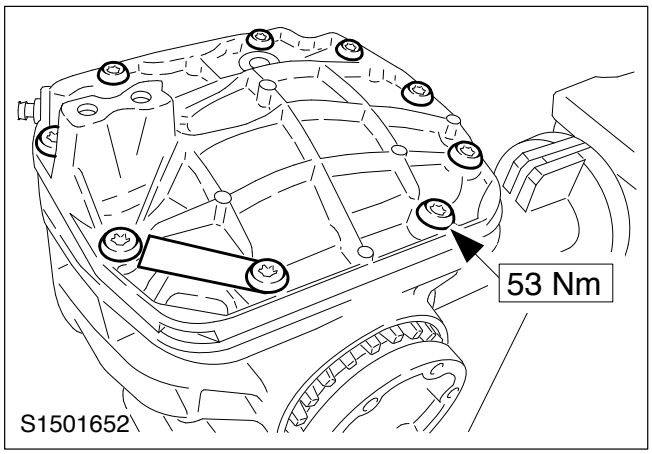
2 Fit the bearing housing retainer.



67. Install the rear axle driveshaft flanges.

1 Insert the left and right-hand rear axle driveshafts.

2 Fit the circlips.



NOTE: The mating face must be dry.

68. Fit the differential cover.

Apply sealer (SQM–4G9523–A) to the mating face.