

OVERHAUL REAR AXLE DIFFERENTIAL ASSEMBLY — Land Rover Ninety Heavy Duty (option)

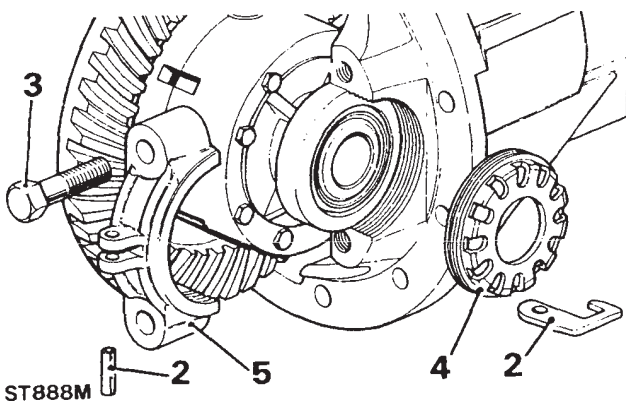
Service tools:

- 18G 1205 flange holder tool;
- 18G 191 pinion height setting gauge;
- 18G 191-4 universal setting block;
- 18G 47-6 pinion head bearing remover/replacer;
- 18G 1382 oil seal replacer;
- RO 262757A extractor for pinion bearing caps;
- RO 262757-1 replacer — use with RO 262757A;
- RO 262757-2 adaptor tail bearing cap replacer;
- RO 530105 spanner — differential flange and carrier bearing nuts;
- RO 530106 bracket for dial gauge and indicator;
- MS 47 press

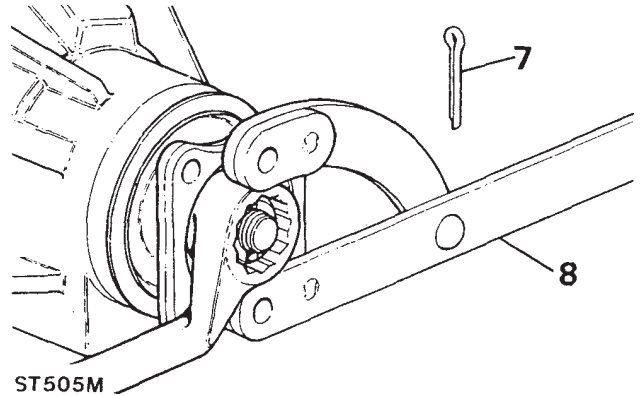
DISMANTLE

It is essential that differential components are marked in their original positions and relative to other components so that, if refitted, their initial setting is maintained. Note that the bearing caps **must not** be interchanged.

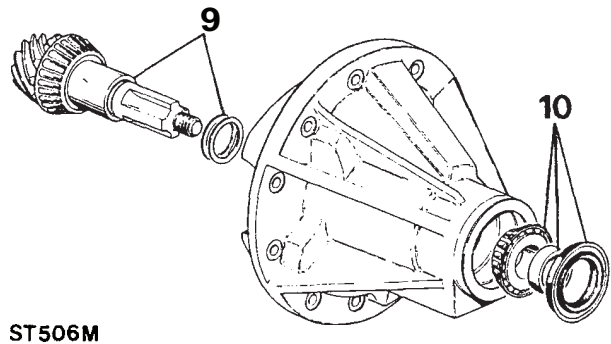
1. Remove the differential assembly from the axle.
2. Drift out the roll pin securing the bearing nut locking fingers to the bearing caps. Remove the locking fingers.
3. Slacken the bearing cap bolts and mark the caps for reassembly.
4. Using service tool RO 530105, remove the bearing adjusting nuts.
5. Remove the bearing cap bolts and bearing caps.
6. Lift out the crown wheel, differential unit and bearings.



7. Remove the split pin securing the pinion flange nut.
8. Remove the pinion flange nut using service tool 18G 1205, to restrain the flange.

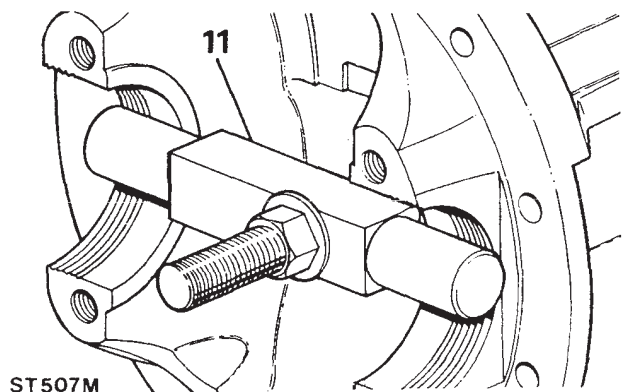


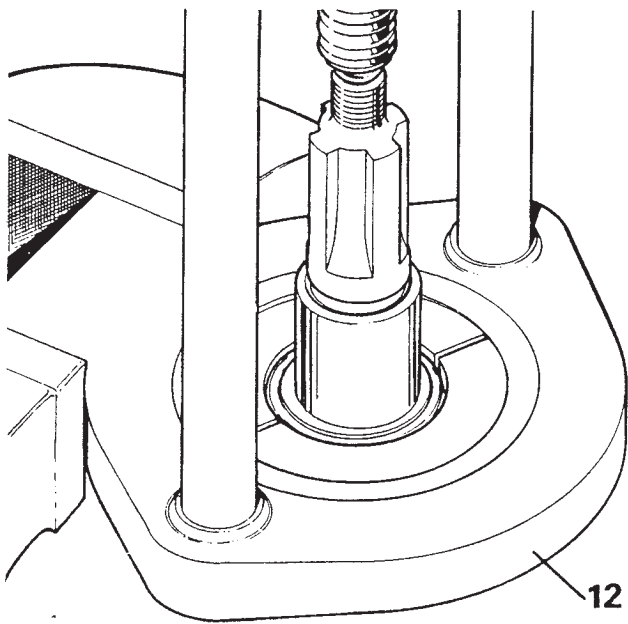
9. Withdraw the pinion complete with pinion head bearing and outer bearing shims. Withdraw the shims.
10. Remove the pinion flange oil seal, spacer and bearing. Discard the oil seal.



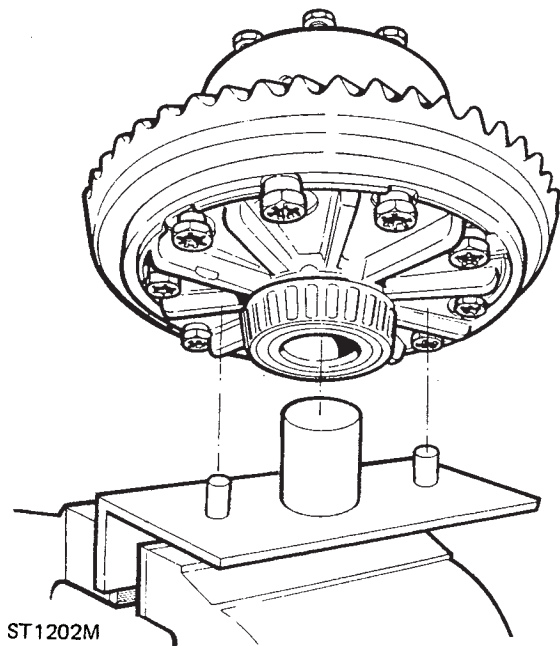
11. Using service tool RO 262757A remove the pinion head bearing track and shim and drift out the outer bearing track from the differential housing.

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12. Remove the pinion head bearing with service tool MS 47 and adaptor 18G 47-6.
13. For reassembly purposes, add alignment marks to the crown wheel and differential case halves.

18. Dismantle the pinions and crosspin assembly, noting the relevant positions of all components.
19. If required, extract the roller bearings and place them in their relative outer tracks.

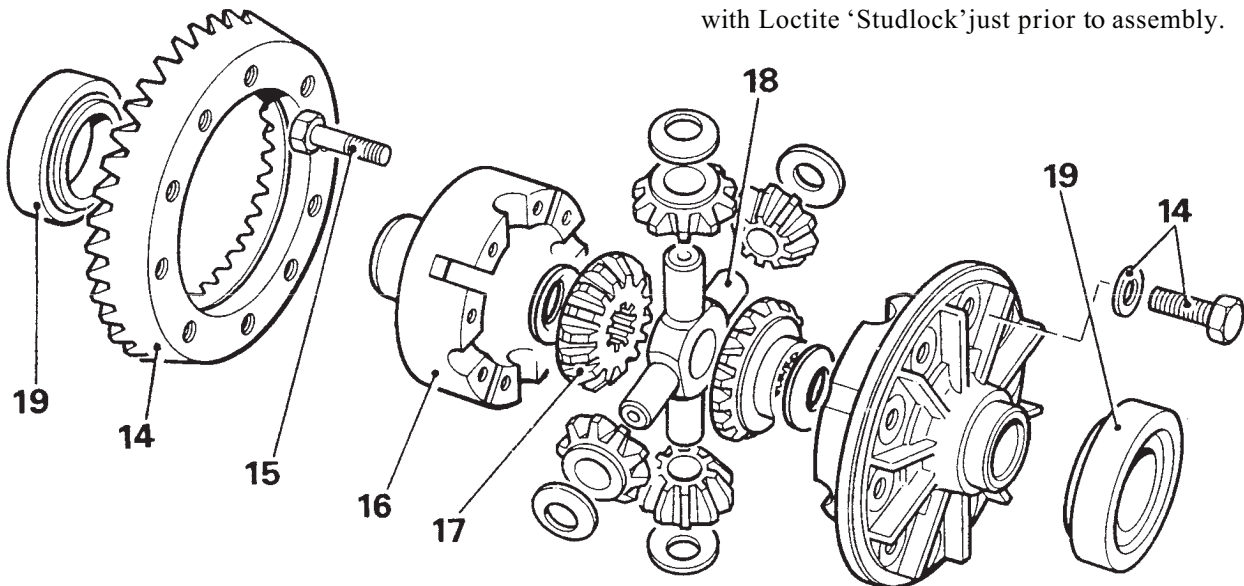
WARNING: To avoid personal injury, the differential assembly must be very securely retained while removing the bolts from the crown wheel and case halves, as these bolts are Loctited and may be difficult to remove.

INSPECTING

A retaining fixture can be made from angle iron with a tube and two bolts welded to it, as illustrated, so that when the fixture is clamped in a vice, the differential assembly can be located over the tube with the fixture bolts between the case webs.

20. Examine all components for obvious wear or damage.
21. All bearings must be press fit, except the flange end pinion bearing, which must be a slide fit on the shaft.
22. The crown wheel and pinion are only supplied as a matched set and must not be interchanged separately.
23. Bevel pinion housing and bearing caps are matched sets and must not be interchanged separately.
24. The differential case halves are a matched set and must not be interchanged separately. New screws for securing the case halves are already coated with a dry locking compound and do not require the application of Loctite. If the old screws are being reused, the threads must be cleaned and coated with Loctite 'Studlock' just prior to assembly.

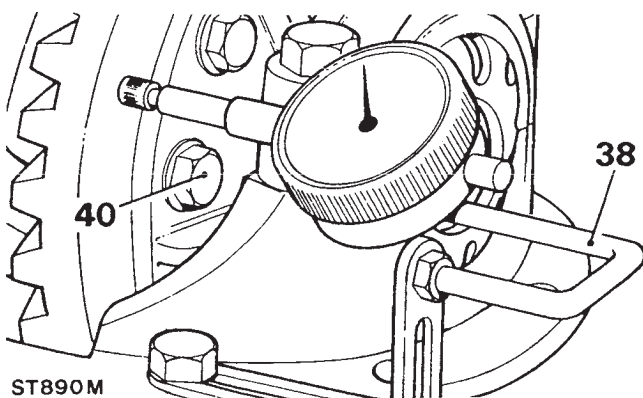
14. Remove the crown wheel.
15. Remove the screws holding the case halves together.
16. Withdraw the upper half of the casing.
17. Withdraw the upper side gear. Note that there may be thrust washers fitted to the side gears.



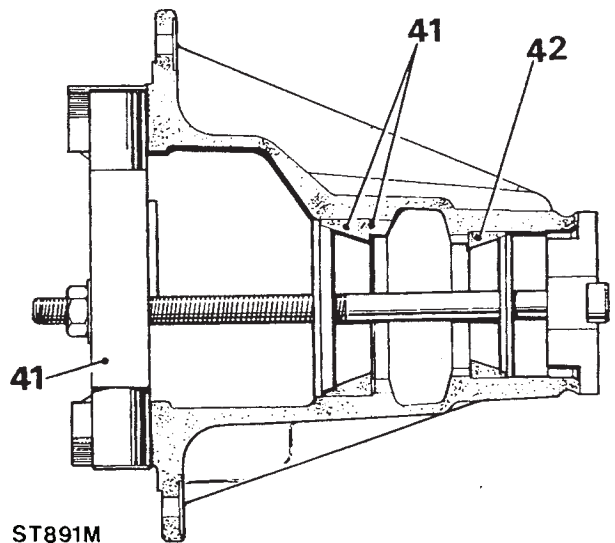
ASSEMBLY

NOTE: If thrust washers were removed from the side gears during dismantling, the washers must be lubricated with EP90 oil and refitted during the following procedure. DO NOT allow oil to contact any holes or bolts that are to be Loctited.

25. Position the smaller case half with the open side uppermost and fit the side gear into the case.
26. Assemble the crosspins, pinions and thrust washers, lubricate the thrust washers with EP90 oil.
27. Fit the crosspin assembly on to the side gear already contained in the differential case half, ensuring that the gears locate correctly.
28. Fit the other side gear to the crosspin assembly ensuring that all the gears locate correctly.
29. Fit the two case halves together, maintaining the alignment marking and ensuring correct gear mating.
30. Fit the correct (high grade) screws and tighten them evenly to a torque of 3,0 to 3,7 kgf m (22 to 27 lbf ft) (30 to 36 Nm).
31. Check that the serial number marked on the pinion end face matches that marked on the crown wheel.
32. Ensure that the differential housing flange and crown wheel are thoroughly clean. Align the crown wheel with the differential case, fit the bolts and washers and tighten evenly.
33. If removed, press on the differential roller bearings.
34. Place the differential housing complete with crown wheel and bearings in the pinion housing.
35. Fit the bearing caps and bolts. Do not fully tighten the bolts.
36. Fit the bearing adjusting nuts and adjust to obtain zero end-float.
37. Tighten the bearing cap bolts.
38. Using a dial gauge check the crown wheel for run-out. This should not exceed 0,10 mm (0.004 in). If excessive run-out is recorded remove the crown wheel and examine crown wheel and mounting flange for burrs, grit, etc. Refit the crown wheel and recheck. Run-out, attributable to a buckled or damaged differential housing flange can be corrected only by renewing the differential gear housing.
39. When satisfied that run-out is within the specified limits remove the differential housing from the pinion housing.



40. Remove the crown wheel bolts and refit them using Loctite 'Studlock'. Evenly tighten the bolts to 5,5 to 6,3 kgf m (40 to 45 lbf ft).



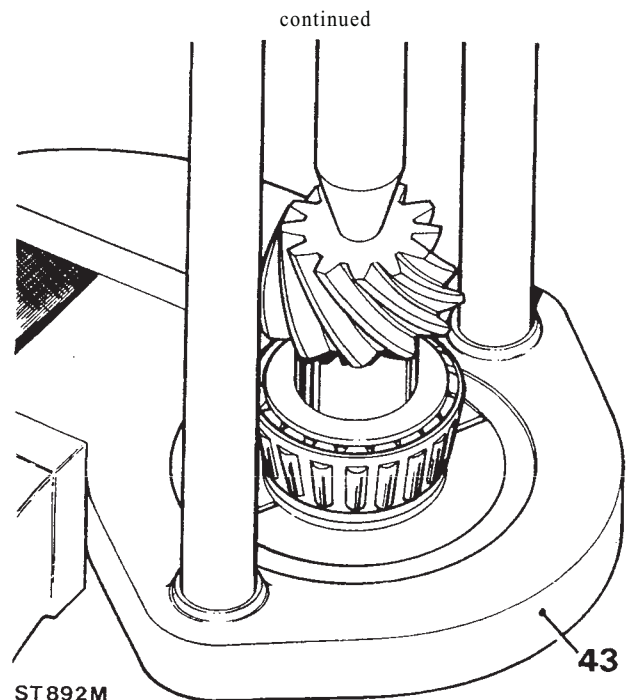
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Drive pinion

41. Fit the pinion head bearing track and the original shim to the pinion housing using service tools RO 262757A and RO 262757-1. If the original shim was damaged or mislaid use a new shim of at least 1,27 mm (0.050 in) thickness.
42. Fit the pinion outer bearing track to the pinion housing with service tool RO 262757A and RO 262757-2.

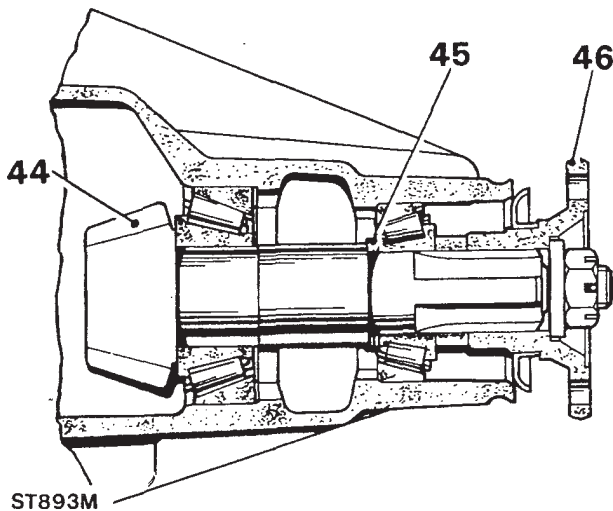
NOTE: Instructions 41 and 42 are carried out in one operation as illustrated.

43. Fit the pinion head bearing to the pinion using service tool 18G 47-6.



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44. Enter the pinion in its location in the pinion housing. Do not fit the shims for bearing pre-load at this stage.
45. Fit the outer bearing and spacer.
46. Fit the driving flange, washer and nut.

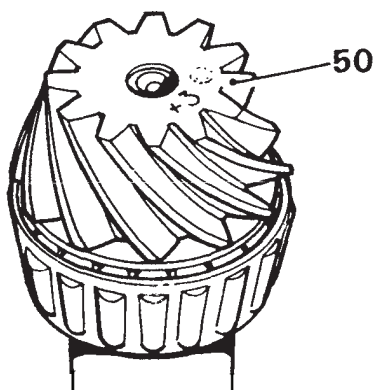


47. Do not fit the oil seal at this stage.
48. Tighten the pinion flange nut slowly until the force required to rotate the pinion is 23 to 40,5 kgf cm (20 to 35 lbf in). This will pre-load the bearings in order to check the pinion height dimension.

NOTE: If using original bearings, which are bedded in, the pre-load figure is 11,5 to 17,25 kgf cm (10 to 15 in lb).

Drive pinion markings

49. The markings on the end face adjacent to the serial number are of no significance during servicing.
50. The figure marked on the end face opposite to the serial number indicates, in thousandths of an inch, the deviation from nominal required to correctly set the pinion. A pinion marked plus (+) must be set below nominal, a minus (-) pinion must be set above nominal. An unmarked pinion must be set at nominal.



51. The nominal setting dimension is represented by the setting gauge block 18G 191-4 which is referenced from the pinion end face to the bottom radius of the differential bearing bore.

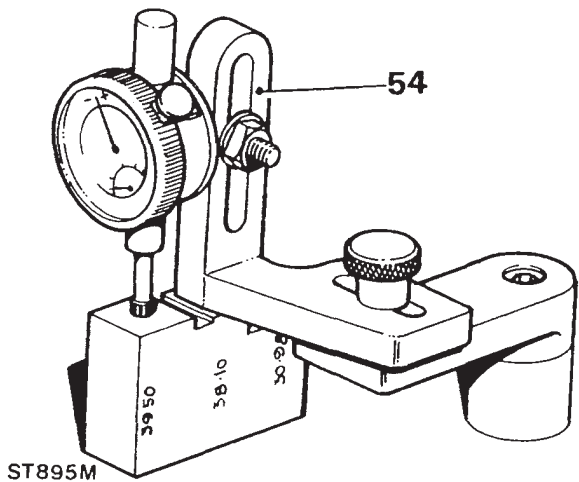
Drive pinion adjustment

52. Ensure that the pinion end face is free of raised burrs around the etched markings.
53. Remove the keep disc from the magnetised base of dial gauge tool 18G 191.
54. Place the dial gauge and setting block on a flat surface and zero the dial gauge stylus on the setting block.

NOTE: The setting block has three setting heights as follows:

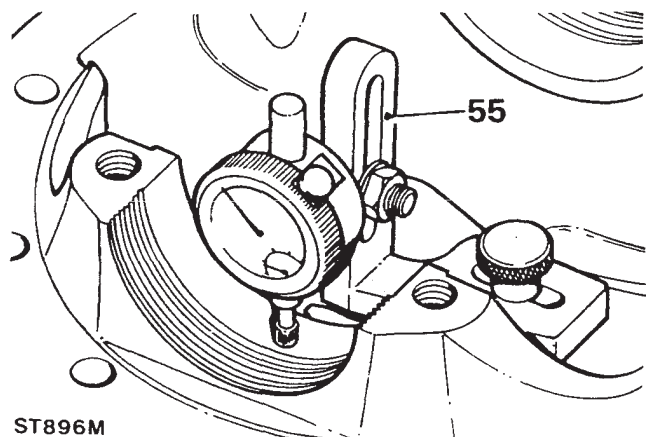
- 39.50 mm Rationalised axle
- 38.10 mm Pre-Rationalised axle
- 30.93 mm Salisbury axle

Ensure that the height marked 39.50 mm is used for this differential.



55. Position the dial gauge centrally on the pinion end face with the stylus registering on the lowest point on one differential bearing bore. Note the dial gauge deviation from the zeroed setting.

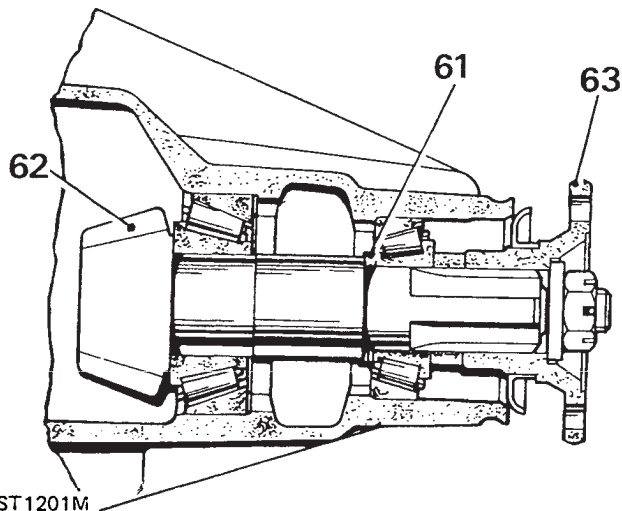
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56. Repeat on the other bearing bore. Add together the readings then halve the sum to obtain the mean reading. Note whether the stylus has moved up or down from the zeroed setting.
 - a. Where the stylus has moved down, the amount is equivalent to the thickness of shims that must be removed from under the pinion inner track to bring the pinion down to the nominal position.
 - b. Where the stylus has moved up, the amount is equivalent to the additional thickness of shims required to bring the pinion up to the nominal position.
57. Before adjusting the shim thickness, check the pinion face marking and if it has a plus (+) figure, subtract that amount in thousandths of an inch from the shim thickness figure obtained in the previous item.
58. Alternatively, if the pinion has a minus (-) figure, add the amount to the shim thickness figure.
59. Adjust the shim thickness under the pinion head bearing track as necessary.
59. Recheck the pinion height setting. If the setting is correct, the mean reading on the dial gauge will agree with the figure marked on the pinion end face. For example, with an end face marking of +3, the dial gauge reading should indicate that the pinion is +0.003 ins.

Bearing pre-load adjustment

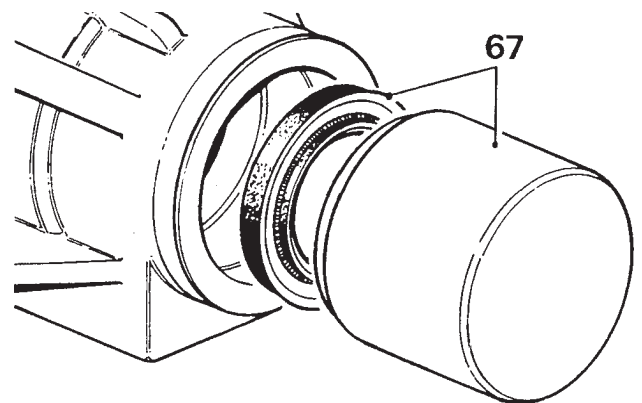
60. Remove the pinion flange, pinion, outer bearing and spacer.
61. Slide new shims, of the same thickness as the originals (bearing pre-load) into position on the pinion shaft. If the original shim was damaged or mislaid use a new shim of at least 4,06 mm (0.160 in) thickness.
62. Enter the pinion in its location in the pinion housing and fit the outer bearing and spacer.
63. Fit the driving flange, washer and nut.
64. Do not fit the oil seal at this stage.



65. With the pinion flange nut tightened to a torque of 9,6 to 16,5 kgf m (70 to 120 lbf ft) (95 to 163 Nm) the force required to rotate the pinion shaft should be within 23 to 40,25 kgf cm (20 to 35 lbf ins) when initial inertia has been overcome. Change the bearing pre-load shim as necessary to obtain this requirement. A thicker shim will reduce pre-load; a thinner shim will increase pre-load.

NOTE: If using original bearings, which are bedded in, the pre-load figure is 11,5 to 17,5 kgf cm (10 to 15 in lb).

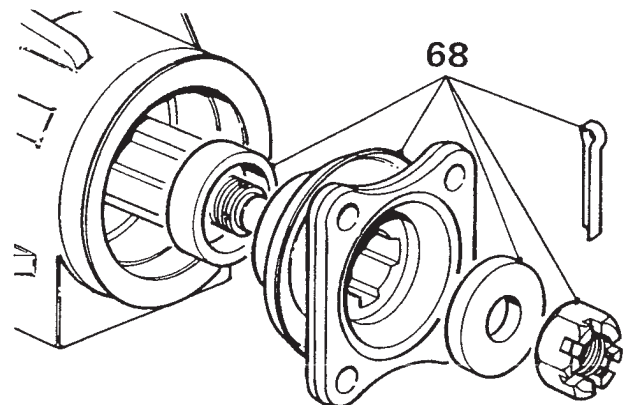
66. Remove the pinion flange.
67. Fit the oil seal (seal lips towards the pinion), using service tool 18G 1382 oil seal replacer.



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68. Lubricate the seal lips with EP90 oil. Fit the distance piece and flange and secure with washer and nut. Tighten the nut to 9,6 to 16,5 kgf m (70 to 120 lbf ft) (95 to 163 Nm). Fit a new split pin.

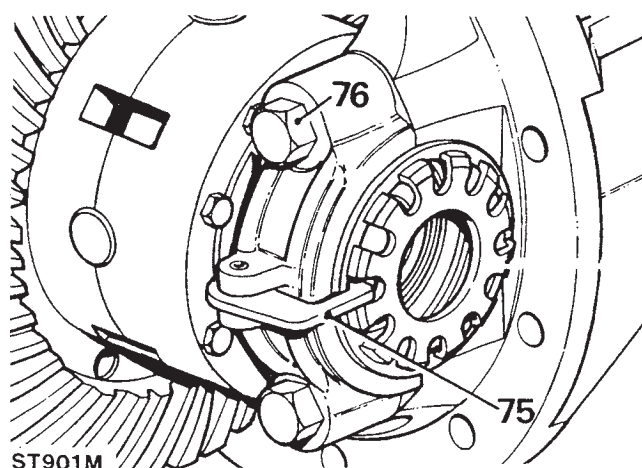
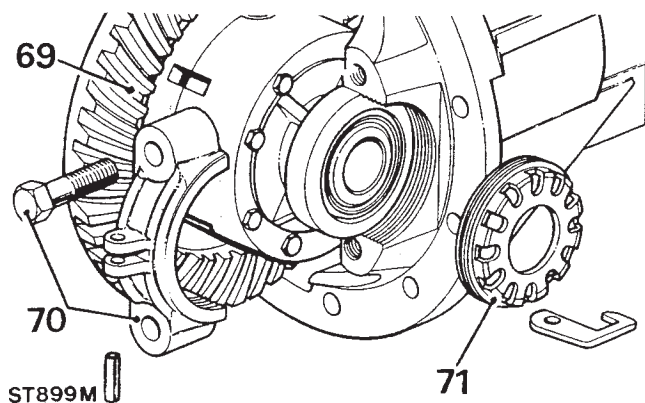
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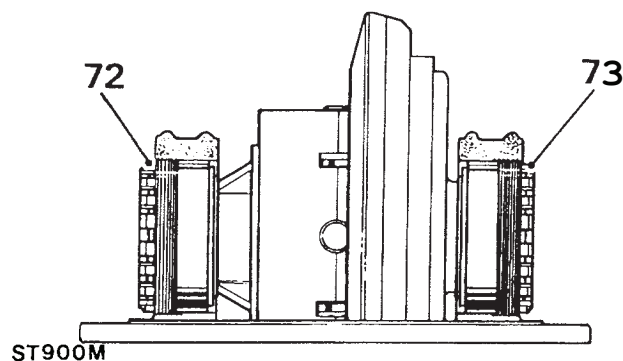
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- 69. Place the differential housing in the pinion housing.
- 70. Fit the bearing caps and bolts. Do not fully tighten the bolts.
- 71. Fit the bearing adjusting nuts.



- 76. Evenly tighten the bearing cap bolts torque 8,3 kgf m (60 lbf ft) (82 Nm).
- 77. Recheck crown wheel/pinion backlash.
- 78. Lubricate the bearings and gears.

- 72. Using service tool RO530105, slacken the left hand bearing adjustment nut (as illustrated) to produce end float.



- 73. Tighten the right hand nut until crown wheel/pinion backlash is just removed.
- 74. Tighten the left hand nut slowly until the crown wheel/pinion backlash is 0,10 to 0,17 mm (0.004 to 0.007 in).
- 75. Fit the locking fingers and roll pins. If necessary, tighten the adjustment nuts slightly to align the locking finger with a slot.

DATA

Pinion bearing pre-load	23 to 40,25 kgf cm (20 to 35 lbf in)
Crown wheel run-out	0,10 mm (0.004 in)
Crown wheel/pinion backlash	0,10 to 0,17 mm (0.004 to 0.007 in)