

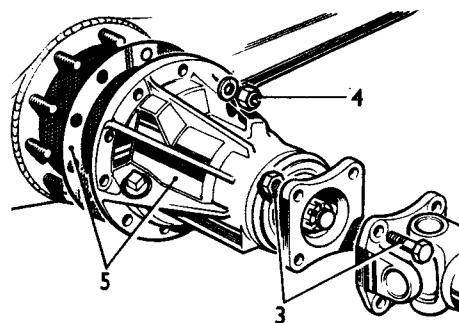
DIFFERENTIAL ASSEMBLY

Remove and refit 54.10.01

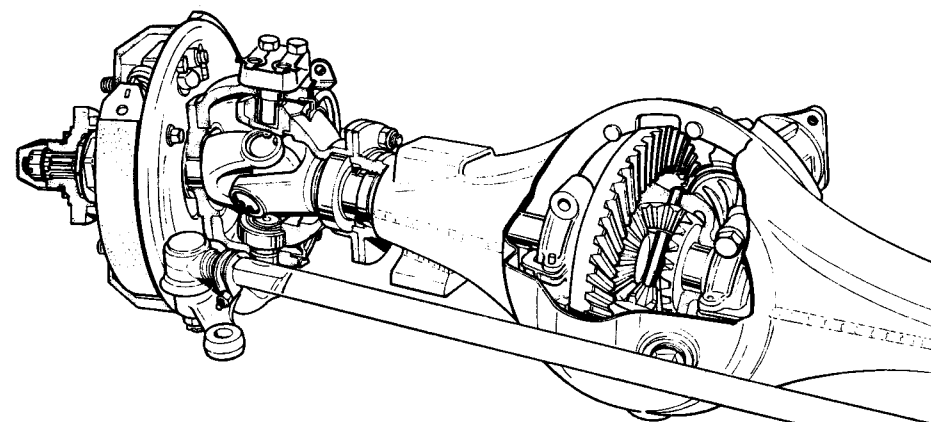
Service tool: 601763 Ball joint extractor

Removing

- 1 Remove the half shafts and swivel axles. 54.20.01.
- 2 Drain the differential housing.
- 3 Disconnect the front propeller shaft at the front axle.
- 4 Remove the nuts and spring washers securing the differential to the axle.
- 5 Withdraw the differential assembly and gasket.



2RC269 A



0715

Refitting

- 6 Ensure that the mating faces of the differential flange and axle casing are clean. Renew the gasket.
- 7 Reverse instructions 1 to 5.
- 8 Bleed the brakes.

DIFFERENTIAL ASSEMBLY

Overhaul 54.10.07

Service tools:

Press 47

Pinion height gauge. 605004.

Pinion head bearing remover. 18G 47 BK.

Pinion bearing track remover/replacer. 262757, 262757/1.

Spanner bearing nuts. 530105.

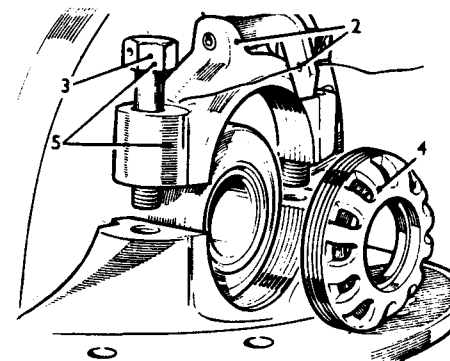
Dial gauge. 18G 191.

Flange holder. 18G 1205.

Dismantling

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.

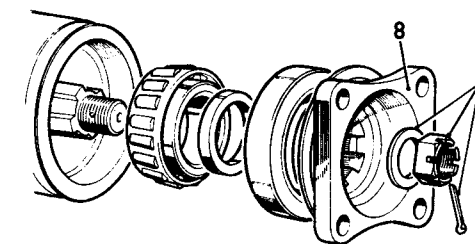
- 1 Remove the differential assembly from the axle. 54.10.01.
- 2 Drift out the roll pin securing the bearing nut locking fingers to the bearing caps. Remove the locking fingers.
- 3 Slacken the bearing cap bolts.
- 4 Remove the bearing adjusting nuts.
- 5 Remove the bearing cap bolts and bearing caps.



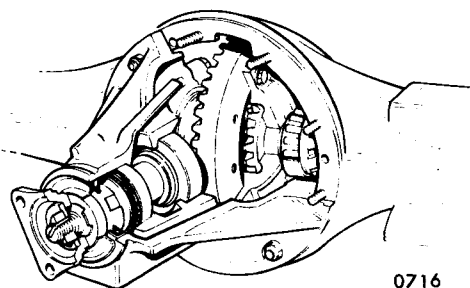
0708

- 6 Lift out the crown wheel, differential unit and bearings.
- 7 Remove the split pin, slotted nut and washers securing the pinion flange. Flange holder tool 18G 1205.
- 8 Withdraw the pinion flange.

continued



0706

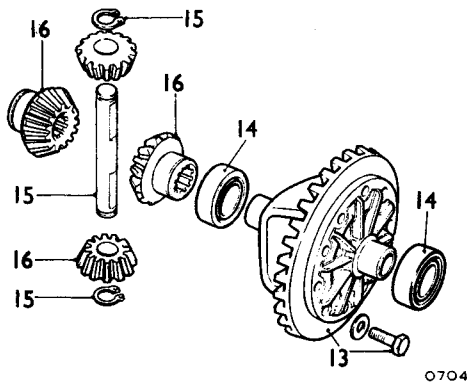


0716

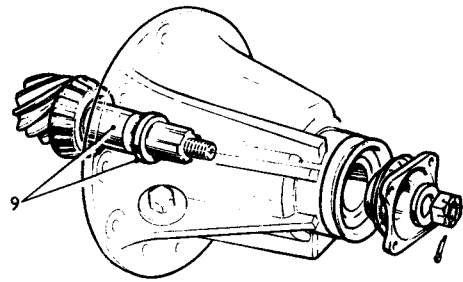
- 9 Withdraw the pinion complete with pinion head bearing and outer bearing shims. Withdraw the shims.
- 10 Remove the pinion flange oil seal, spacer and bearing. Discard the oil seal.
- 11 Remove the pinion head bearing track and shim and the outer bearing track from the differential housing. Tool 262757.
- 12 Remove the pinion head bearing. Tool 18G 47 BK.
- 13 Remove the bolts and washers securing the crown wheel to the differential flange. Withdraw the crown wheel.
- 14 Remove the differential carrier bearings.
- 15 Remove the circlips securing the differential cross shaft. Extract the cross shaft.
- 16 Withdraw the differential gears and pinions.
- 17 Thoroughly clean all components.

Inspecting

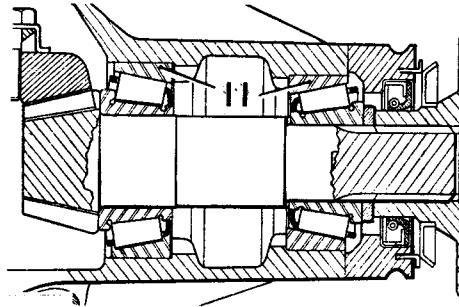
- 18 Check all bearings for wear and/or pitting.
- 19 Check all gears for wear, scuffing, pitting and damaged teeth.
- 20 Note: The crown wheel and pinion are supplied as a matched set, and also the pinion housing and bearing caps.



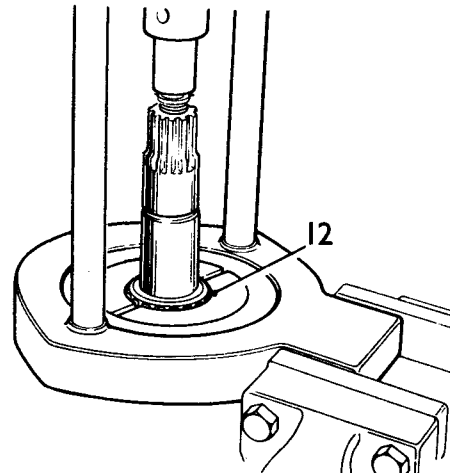
0704



0703



0707

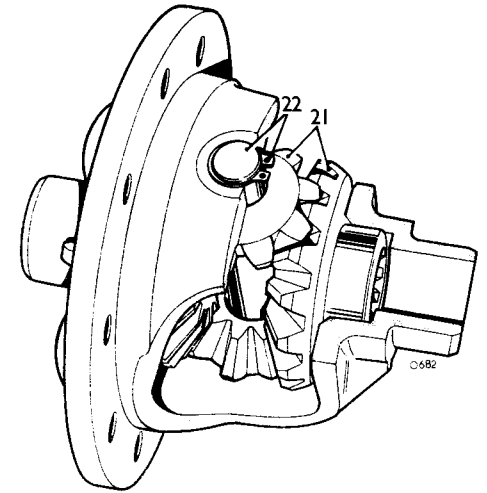


0683

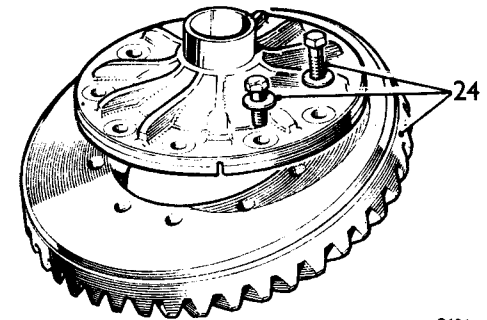
Assembling

Differential gears

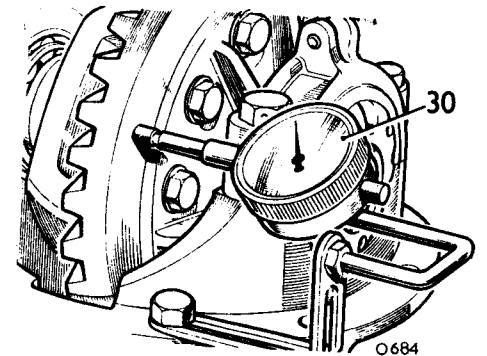
- 21 Fit the differential gears to the differential housing.
- 22 Fit the differential cross shaft and retaining circlips.
- 23 Check the gears for freedom of rotation and backlash. Nominal backlash should be present. Excessive backlash will necessitate renewal of the gears and/or the differential housing. No provision is made for backlash adjustment.
- 24 Ensuring that the differential housing flange and crown wheel are thoroughly clean fit the crown wheel bolts and washers and evenly tighten.
- 25 Fit the carrier bearings and bearing tracks.
- 26 Place the differential housing complete with crown wheel and bearings in the pinion housing.
- 27 Fit the bearing caps and bolts. Do not fully tighten the bolts.
- 28 Fit the bearing adjusting nuts and adjust to obtain zero end-float.
- 29 Tighten the bearing cap bolts.
- 30 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.
- 31 When satisfied that run-out is within the specified limits remove the differential housing from the pinion housing.
- 32 Remove the crown wheel bolts and refit them using Loctite Studloc. Evenly tighten the bolts to 6,3 to 7,6 kgf. m (45 to 55 lbf. ft.).



0682



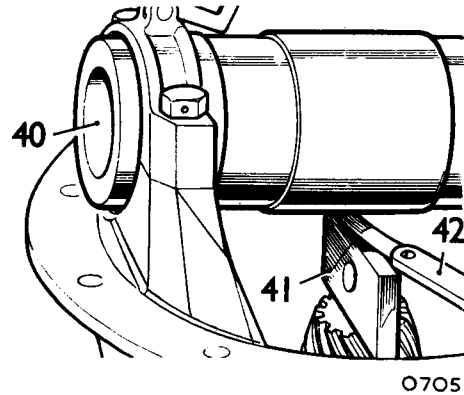
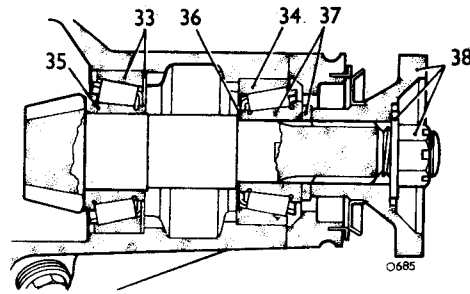
0686



0684

Pinion

- 33 Fit the pinion head bearing track and the original shim to the pinion housing. Tools 262758, 262757. If the original shim was damaged or mislaid use a new shim of at least 1,27 mm (0.050 in.) thickness.
- 34 Fit the pinion outer bearing track to the pinion housing.
- 35 Fit the pinion head bearing to the pinion.
- 36 Slide the original shim (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.
- 37 Enter the pinion in its location in the pinion housing and fit the outer bearing and spacer.
- 38 Fit the driving flange, washer and nut. Do not fit the oil seal at this stage.
- 39 With the pinion flange nut tightened to a torque of 9,6 to 16,5 kgf. m (70 to 120 lbf. ft.) the force required to rotate the pinion shaft should be within 6,9 to 28,7 kgf. cm (6 to 25 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.
- 40 Locate the pinion height gauge in the pinion housing and secure with the bearing caps.



NOTE: Four variations of height gauge are in use. These are 601998, 262761, 600299 and 605004; any of these gauges may be used.

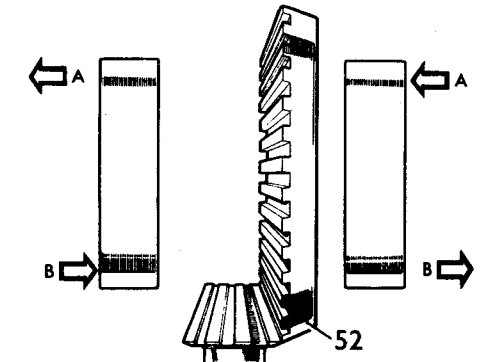
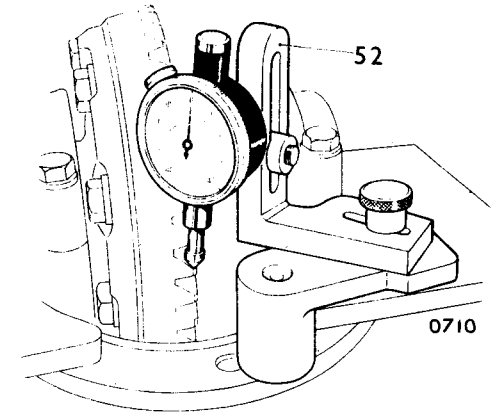
- 41 Place the slip gauge on the pinion face and hold firmly in place.

- 42 Using feeler gauges measure the clearance between the slip gauge and the height gauge.
The required clearance is:
Height gauges 601998, 262761 and 600299. – 0,07 to 0,10 mm (0.003 to 0.004 in.).
Height gauge 605004. – 0,28 to 0,30 mm (0.011 to 0.012 in.).
Determine the shim thickness required for the pinion head bearing to obtain the above requirement.

- 43 Remove the pinion head bearing track and substitute a shim of the calculated thickness.

NOTE: Adjustment to the pinion head shim will necessitate an equal plus or minus adjustment to the bearing pre-load shim.

- 44 Refit the pinion head bearing and recheck clearance (Instruction 42).
- 45 If clearance is satisfactory remove the pinion height gauge. If clearance is incorrect repeat instruction 43.
- 46 Remove the pinion flange.
- 47 Smear the outer periphery of the new pinion flange oil seal with jointing compound. Fit the oil seal (seal lips towards the pinion).
- 48 Lubricate the seal lips and fit the flange, nut and split pin. Nut torque (70 to 120 lbf. ft.).
- 49 Place the differential housing in the pinion housing.
- 50 Fit the bearing caps and bolts. Do not fully tighten the bolts.
- 51 Fit the bearing adjusting nuts.
- 52 Set crown wheel/pinion backlash to 0,20 to 0,25 mm (0.008 to 0.010 in.) with zero end-float. Move the serrated adjusting nuts in direction A to reduce backlash: move in direction B to increase backlash.
- 53 Tighten both adjusting nuts half a serration.
- 54 Evenly tighten the bearing cap bolts torque 8,3 kgf. m (60 lbf. ft.).
- 55 Recheck crown wheel/pinion backlash.
- 56 Bend the locking fingers to accommodate adjusting nut serrations as required. Fit the locking fingers and roll pins.
- 57 Lubricate the bearings and gears.



DATA

Pinion bearing pre-load	7.6 to 13 kgf. cm (7 to 12 lbf. ins.)
Pinion height setting	Gauges. 601998, 262761, 600299 0,07 to 0,10 mm (0.003 to 0.004 ins.) Gauge. 605004 0,28 to 0,30 mm (0.011 to 0.012 in.)
Crown wheel run-out	0,10 mm (0.004 in.)
Crown wheel/pinion backlash	0,20 to 0,25 mm (0.008 to 0.010 in.)

DIFFERENTIAL ASSEMBLY

From the following axle numbers:
 109" and 88" Land Rover front axle right hand drive 91133272H
 109" and 88" Land Rover front axle left hand drive 91452230H
 88" Land Rover rear axle 90260573G

Overhaul 54.10.07

Service tools:

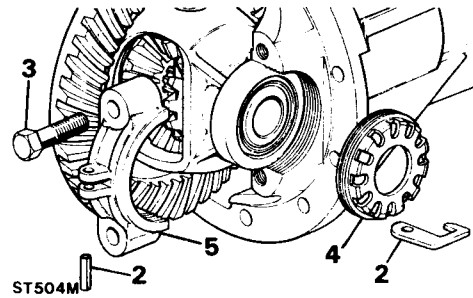
18G 1205	Flange holding wench.
18G 191	Pinion height setting gauge.
18G 191-4	Universal setting block.
18G 47-6	Pinion head bearing remover/replacer
18G 1382	Oil seal replacer.
RO 262757A	Extractor for pinion bearing cups.
RO 262757-1	Replacer — use with RO 262757A.
RO 262757-2	Adaptor tail bearing cup replacer.
RO 530105	Spanner — differential flange and carrier bearing nuts.
RO 530106	Bracket for dial gauge indicator.
MS 47	Press.

Dismantling

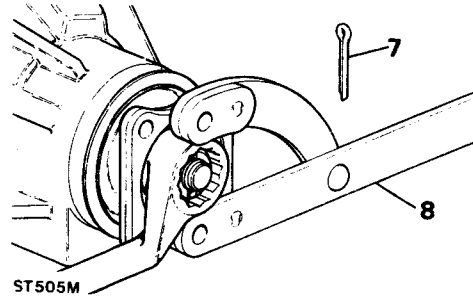
It is essential that differential components are marked in their original positions and relative to other components so that, if refitted, their initial setting is maintained.

NOTE: The bearing caps must not be interchanged.

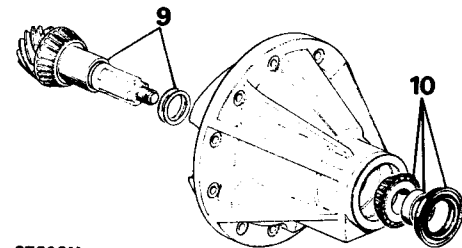
- 1 Remove the differential assembly from the axle. 54.10.01.
- 2 Drift out the roll pin securing the bearing nut locking fingers to the bearing caps. Remove the locking fingers.
- 3 Slacken the bearing cap bolts, and mark the caps for reassembly.
- 4 Remove the bearing adjusting nuts.
- 5 Remove the 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.

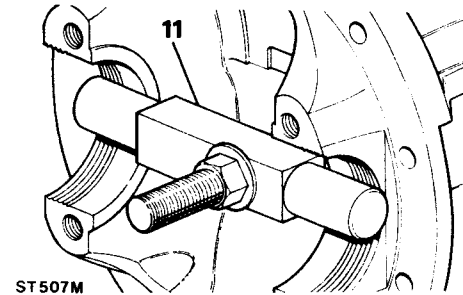


- 9 Withdraw the pinion complete with pinion head bearing and outer bearing shims. Withdraw the shims.
- 10 Remove the pinion flange oil seal spacer and bearing. Discard the oil seal.

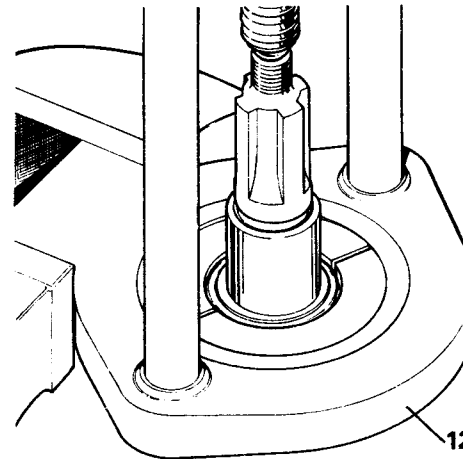


ST506M

- 11 Using Service tool RO 262757A, remove the pinion head bearing track from the differential housing.

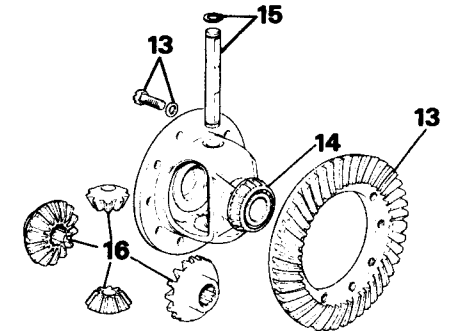


- 12 Remove the pinion head bearing with service tool MS47 and adaptor 18G 47-6.



ST508M

- 13 Remove the bolts and washers securing the crown wheel to the differential flange. Withdraw the crown wheel.
- 14 Remove the differential carrier bearings.
- 15 Remove the circlips securing the differential cross shaft. Extract the cross shaft.
- 16 Withdraw the differential gears and pinions.
- 17 Thoroughly clean all components.



ST509M

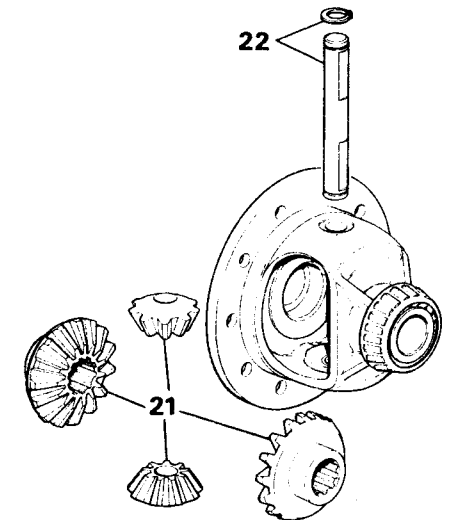
Inspecting

- 18 Check all bearings for wear and/or pitting.
- 19 Check all gears for wear, scuffing, pitting and damaged teeth.
- 20 **NOTE:** The crown wheel and pinion are supplied as a matched set, also the pinion housing and bearing caps.

Assembling

Differential gears

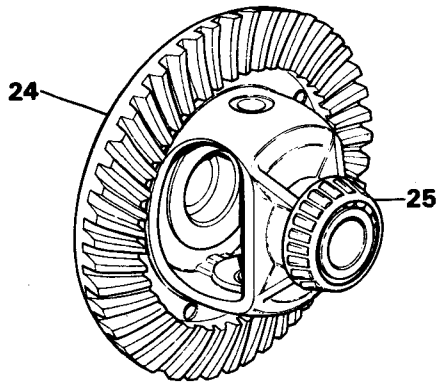
- 21 Fit the differential gears to the differential housing.
- 22 Fit the differential cross shaft and retaining circlips.



ST510M

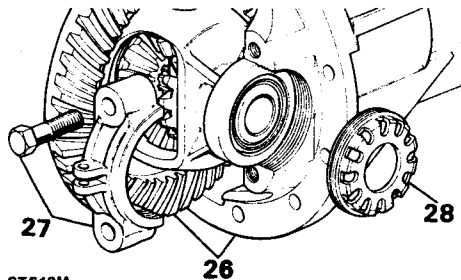
continued

- 23 Check the gears for freedom of rotation and backlash. Nominal backlash should be present. Excessive backlash will necessitate renewal of the gears and/or the differential housing. No provision is made for backlash adjustment.
- 24 Ensuring that the differential housing flange and crown wheel are thoroughly clean fit the crown wheel. Fit the crown wheel bolts and washers and evenly tighten.
- 25 Fit the carrier bearings using a suitable press or drift and assemble the tracks to the bearings.



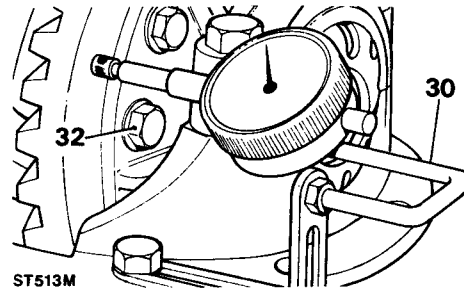
ST511M

- 26 Place the differential housing complete with crown wheel and bearings in the pinion housing.
- 27 Fit the bearing caps and bolts. Do not fully tighten the bolts.
- 28 Fit the bearing adjusting nuts and adjust to obtain zero end-float.
- 29 Tighten the bearing cap bolts.



ST512M

- 30 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.
- 31 When satisfied that run-out is within the specified limits remove the differential housing from the pinion housing.
- 32 Remove the crown wheel bolts and refit them using Loctite Studloc. Evenly tighten the bolts to 6,3 and 7,6 kgf. m (45 to 55 lbf. ft.).

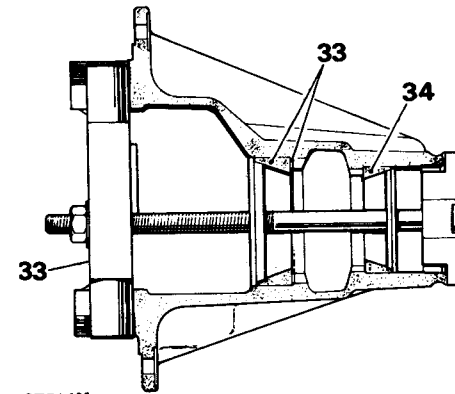


ST513M

Pinion

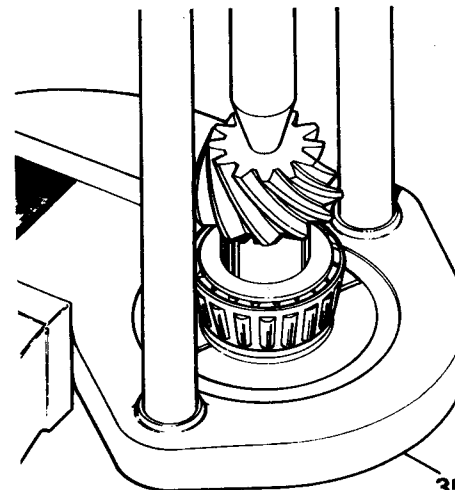
- 33 Fit the pinion head bearing track and the original shim to the pinion housing, using Service tools RO 262757A and RO 262757-1. If the original shim was damaged or mislaid use a new shim of at least 1,27 mm (0.050 in) thickness.
- 34 Fit the pinion outer bearing track to the pinion housing with Service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

NOTE: Instructions 33 and 34 are carried out in one operation, as illustrated.



ST514M

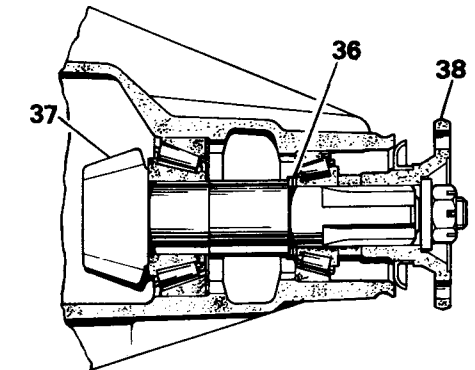
- 35 Fit the pinion head bearing to the pinion using Service tools MS 47 and 18G 47-6.



ST515M

- 36 Slide the original shim (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.
- 37 Enter the pinion in its location in the pinion housing and fit the outer bearing and spacer.

- 38 Fit the driving flange washer and nut.
- 39 Do not fit the oil seal at this stage.
- 40 With the pinion flange nut tightened to a torque of 9,6 to 16,5 kgf. m (70 to 120 lbf. ft.) the force required to rotate the pinion shaft should be within 6,9 to 28,7 kgf. cm (6 to 25 lbf. in) 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.

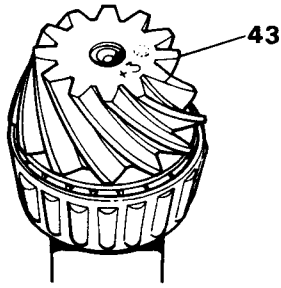


ST516M

Drive pinion markings

- 41 Check that the serial number marked on the pinion end face matches that marked on the crown wheel.
- 42 The markings on the end face adjacent to the serial number are of no significance during servicing.
- 43 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.*
- 44 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.

continued



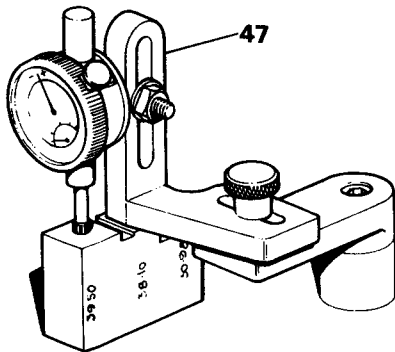
ST517

Drive pinion adjustment

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

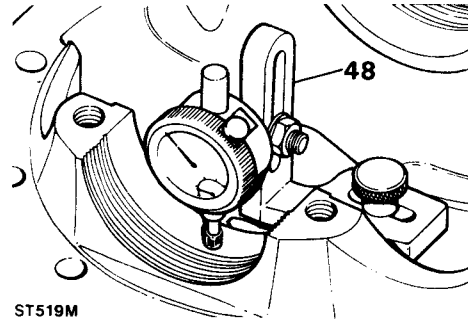
NOTE: The setting block has three setting heights as follows:

- 39.50 Rationalised axle.
 38.10 Pre-rationalised axle.
 30.93 Salisbury axle.



ST518M

- 48 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.



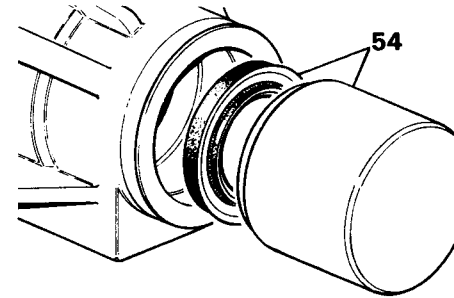
ST519M

- 49 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 the shims that must be removed from under the pinion inner cup 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.

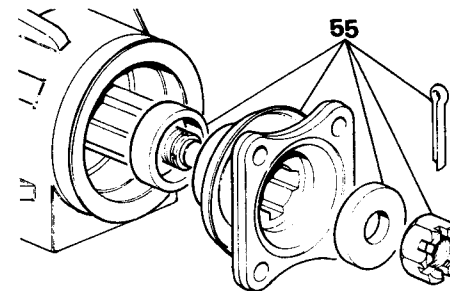
- 50 Before adjusting the shim thickness check the pinion face marking and if it has a plus (+) figure, subtract that amount in thousandths of an inch from the shim thickness figure obtained in the previous item.
 51 Alternatively, if the pinion has a minus (-) figure, add the amount to the shim thickness figure. Adjust the shim thickness under the pinion inner cup as necessary.
 52 Recheck the pinion height setting; if the 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 +0.003in.
 53 Remove the pinion flange.

- 54 Smear the outer periphery of the new pinion flange oil seal with jointing compound. Fit the oil seal (seal lips toward the pinion) using Service tool 18G 1382 oil seal replacer.



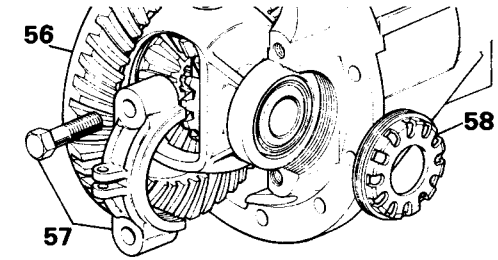
ST520M

- 55 Lubricate the seal lips and apply grease to the seal spring. Fit the distance piece and flange and secure with the washer, nut and new split pin. Tighten the nut to 9.6 to 16.5 kgf. m (70 to 120 lbf. ft.).



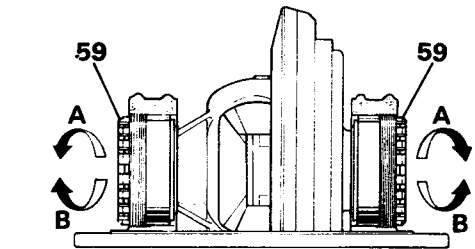
ST521M

- 56 Place the differential housing in the pinion housing.
 57 Fit the bearing caps and bolts. Do not fully tighten the bolts.
 58 Fit the bearing adjusting nuts.



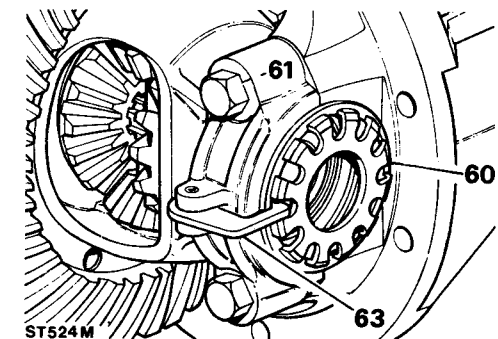
ST522M

- 59 Set crown wheel/pinion backlash to 0,20 to 0,25 mm (0.008 to 0.010 in) with zero end-float. Move the serrated adjusting nuts in direction A to reduce backlash,



ST523M

- move in direction B to increase backlash.
 60 Tighten both adjusting nuts half a serration.
 61 Evenly tighten the bearing cap bolts torque 8,3 kgf. m (60 lbf. ft.).
 62 Recheck crown wheel/pinion backlash.
 63 Bend the locking fingers to accommodate adjusting nut serrations as required. Fit the locking fingers and roll pins.
 64 Lubricate the bearings and gears.



ST524M