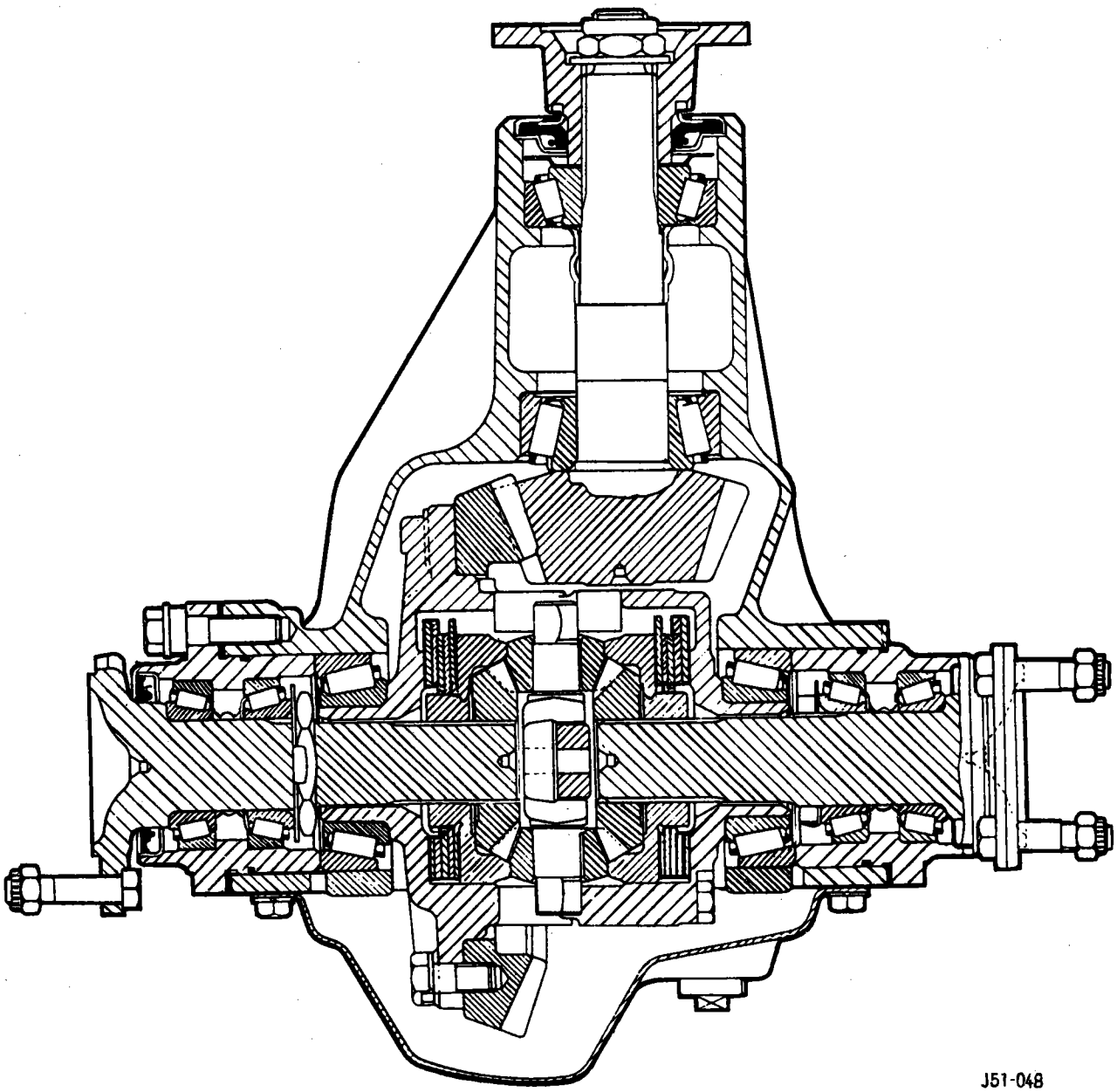
CONTENTS



CROSS-SECTION OF THE LIMITED SLIP REAR AXLE

TORQUE WRENCH SETTINGS

Item	Spanner Size	Description	Tightening Torque		
			Nm	kgf/m	lbf/ft
Caliper mounting bracket to unit	$\frac{5}{8}$ in AF	$\frac{7}{16}$ in UNC setbolts	81,3 to 93	8,3 to 9,54	60 to 69
Differential bearing caps	$\frac{3}{4}$ in AF	$\frac{1}{2}$ in UNC setbolts	85,4 to 97	8,71 to 9,95	63 to 72
Drive pinion nut	$1\frac{1}{8}$ in AF	$\frac{3}{4}$ in UNF nut	244 to 256	24,92 to 26,34	180 to 190
Drive gear to differential flange	$\frac{5}{8}$ in AF	$\frac{7}{16}$ in UNF setbolts	102 to 118	10,78 to 12,16	77 to 88
Powr-Lok differential case	$\frac{9}{16}$ in AF	$\frac{3}{8}$ in UNC setbolts	58,3 to 67	5,95 to 6,9	43 to 50
Rear cover attachment	$\frac{1}{2}$ in AF	$\frac{5}{16}$ in UNC setbolts	20,5 to 27	2,1 to 2,76	15 to 20
Ring gear attachment	$\frac{11}{16}$ in AF	$\frac{7}{8}$ in UNF Rippbolt	136 to 151	13,8 to 15,46	100 to 111

SERVICE TOOLS

Tool No.	Description
18G 120 5	Flange Holder
18G 134 (MS 550, 550, SL 550)	Adaptor Handle
SL 550-1	Outer Pinion Cup Remover
47 (MS 47, SL 14)	Hand Press
{SL14-3/2	Differential Side Bearing Remover
{SL14-3/1	Differential Side Bearing Remover Button
{SL 3	Clock Gauge Tool
{4 HA	Pinion Height Setting Gauge
SL 550-9	Pinion Inner Bearing Cup Replacer
SL 550-8/1	Pinion Outer Bearing Cup Replacer
{SL 47-1/1	Pinion Head Bearing Remover
{SL 47-1/2	Pinion Head Bearing Replacer
18G 1428	Rear Oil Seal Replacer
SL 15A	Spanner
18G 681 CBW 548	Torque Driver
{SL 47-3/1	Output Shaft Outer Bearing Remover
{SL 47-3/2	Output Shaft Outer Bearing Replacer
JD 14	Dummy Shaft

{Items marked thus are sold as sets.

DESCRIPTION

The standard transmission unit is a Salisbury 4HU final drive, incorporating a 'Powr-Lok' differential when specified; this is identified by the letters 'PL' on a tab under a cover bolt. A Powr-Lok differential differs from a conventional bevel gear unit by the addition of plate clutches loaded by input torque to oppose rotations of the output shafts relative to the differential cage. Clutch plates are splined to the cage, and their mating discs to the output bevels; the loading between plates and disc increases with input torque due partly to the separating forces of bevels and also to the bevel pinion cross-shafts being carried on ramps instead of being positively located in the cage. Increase in output torque causes the cross-shafts to move 'up' the ramps and, by pressing plates and discs together, to 'lock' the differential; this gives the effect of a differential-less axle at maximum torque without increasing the disadvantages of this type of axle in low-torque conditions. Some low-torque stiffness, to reduce one-wheel spin on ice, is provided by forming the outer plates as Belleville washers to produce compression between plates and discs; if one wheel is held and the propeller shaft is disconnected, a torque of between 5,6 and 9,6 kgf/m (40 to 70 lbf/ft) is required to turn the other wheel.

The final drive unit is rigidly attached to a fabricated sheet steel cross-beam which is flexibly mounted to the body structure by four rubber and metal sandwich mountings. Noises coming from the vicinity of the final drive unit usually originate from incorrect meshing of drive gear and pinion, or from bearings on differential or pinion shafts developing play. Operation procedures for the correction of these noise sources are fully covered in operation 51.25.19, but a noise occurring at low speeds only, under braking, could be caused by loss of pre-load in the output shaft bearings. Bearing inspection involves the removal and renewal of an oil seal before resetting pre-load, and is covered in operation 51.20.04, while if inspection indicates that bearing renewal is advisable this is detailed in operation 51.10.22.

TO CHECK THE TOOTH CONTACT PATTERN

Sparingly paint eight or ten of the drive gear teeth with a stiff mixture of marking raddle or engineers blue. Move the painted gear teeth in mesh with the pinion until a good impression of the total contact is obtained. The result should conform with the ideal tooth contact pattern (Fig. 1).

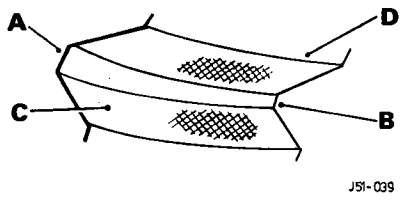


Fig. 1 Ideal tooth contact pattern.

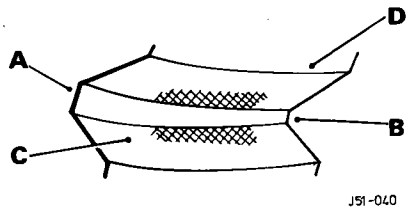


Fig. 2 High tooth contact pattern.

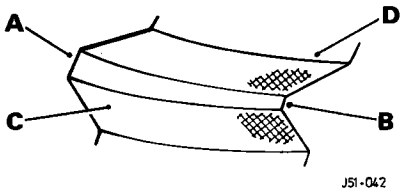


Fig. 3 Low tooth contact pattern.

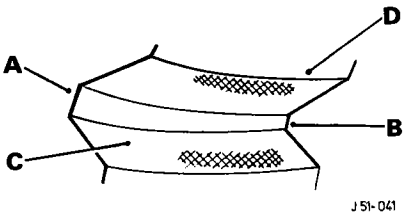


Fig. 4 Toe contact pattern.

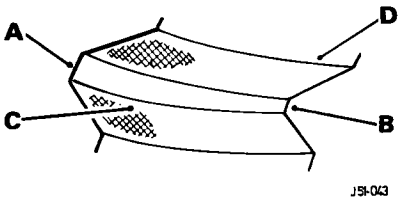


Fig. 5 Heel contact pattern.

A The HEEL is the larger outer end of the tooth.

B The TOE is the small or inner end of the tooth.

C The DRIVE side of the drive gear tooth is convex.

D The COAST side of the drive gear tooth is concave.

FAULT DIAGNOSIS

TOOTH PATTERN	REMEDY
The ideal tooth bearing impression on the drive and coast sides of the gear teeth is evenly distributed over the working depth of the tooth profile and is located nearer to the toe (small end) than the heel (large end). This type of contact permits the tooth bearing to spread towards the heel under operating conditions when allowance must be made for deflection.	———
In High Tooth Contact it will be observed that the tooth contact is heavy on the drive gear face or addendum. To rectify this condition, move the pinion deeper into mesh, that is, reduce the pinion cone setting distance, by adding shims between the pinion inner bearing cup and the housing and fitting a new collapsible spacer.	Move the drive pinion deeper into mesh. i.e. reduce the pinion cone setting.
In Low Tooth Contact it will be observed that the tooth contact is heavy on the drive gear flank or dedendum. This is the opposite condition from that shown in High Tooth Contact and is therefore corrected by moving the pinion out of mesh, that is, increase the pinion cone setting distance by removing shims from between the pinion inner bearing cup and housing and fitting a new collapsible spacer.	Move the drive pinion out of mesh. i.e. increase the pinion cone setting
Toe Contact occurs when the bearing is concentrated at the small end of the tooth.	Move the drive gear out of mesh, that is, increase backlash, by transferring shims from the drive gear side of the differential to the opposite side.
Heel Contact is indicated by the concentration of the bearing at the large end of the tooth.	Move the drive gear closer into mesh, that is, reduce backlash, by adding shims to the drive gear side of the differential and removing an equal thickness of shims from the opposite side. **NOTE: It is most important to remember when making this adjustment to correct a heel contact that sufficient backlash for satisfactory operation must be maintained. If there is insufficient backlash the gears will at least be noisy and have a greatly reduced life, whilst scoring of the tooth profile and breakage may result. Therefore, always maintain a minimum backlash requirement of 0,10 mm. (0.004 in).**

DRIVE PINION SHAFT OIL SEAL

Renew **51.20.01**

Service tools: Torque screwdriver 18G 681, Oil seal replacer 18G 1428.

Detach the four bolts (1, Fig. 6) securing propeller shaft to final drive flange; support propeller shaft rear end and clean flange and nose of final drive.

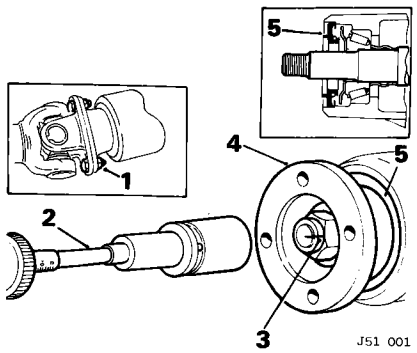


Fig. 6

Accurately measure torque required to turn flange through backlash, using torque screwdriver 18G 681 (2, Fig. 6) with a suitable adaptor and socket.

NOTE: Set screwdriver initially to 0,057 kgf/m (5 lbf/in) and increase setting progressively until torque figure is reached at which flange commences to move. Flange MUST be turned fully anti-clockwise through backlash between each check.

Mark nut and pinion shaft so that in refitting, nut may be returned to its original position on shaft (3, Fig. 6).
Unscrew nut and remove washer and place both washer and nut aside for refitting.
Draw flange (4, Fig. 6) off pinion shaft using extractor.
Prise oil seal (5, Fig. 6) out of final drive casing.

Refitting (using original bearings)

Thoroughly clean splines on pinion shaft and flange. Clean oil seal recess and coat internally with Welseal liquid sealant. Using tool No. 18G1428 tap new oil seal squarely into position with sealing lip facing to rear (1, Fig. 7).

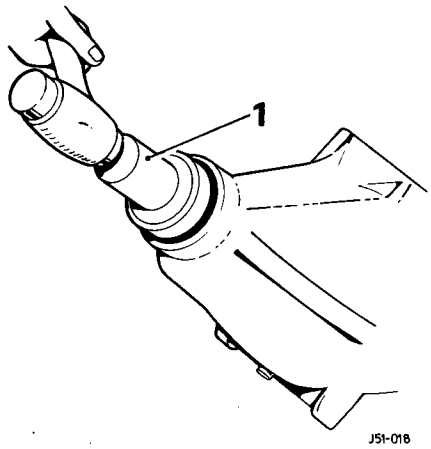


Fig. 7

Smear sealing lip with grease.
Apply grease lightly to outer two thirds of pinion shaft splines.
Lightly tap flange back on pinion shaft, using wooden mallet.
Refit washer and nut and tighten nut until it exactly reaches position previously marked.
Re-check turning torque. Torque required to turn pinion shaft through backlash should exceed by 0,7 to 1,4 kgf/m (5 to 10 lbf/in) the torque recorded earlier. If, however, torque required to turn pinion shaft exceeds 0,52 kgf/m (45 lbf/in), final drive overhaul, operation 51.25.19 MUST be carried out.
Lift propeller shaft into position, replace bolts, fit and tighten nuts to correct torque.
Check oil level in final drive unit and top up if necessary.
Remove car from ramp and road test.
If final drive is noisy, an overhaul must be carried out.

FINAL DRIVE REAR COVER GASKET

Renew **51.20.08**

Remove the fourteen $\frac{1}{2}$ in AF bolts and setscrews (1, Fig. 8) securing the bottom tie-plate to the cross-beam and inner fulcrum brackets.
Drain the oil from the final drive.
Remove the ten $\frac{1}{2}$ in AF setscrews (1, Fig. 9) and remove the rear cover (2, Fig. 9) noting the position of the identification tabs.
Clean off any gasket or sealant from the rear cover and the hypoid housing.
Smear the rear cover flange with Wellseal jointing compound and place the gasket on the casing.
Refit the rear cover and secure with the ten setscrews, prior to fitting coat the threads of the bolts with Loctite.
Refill with new oil.

NOTE: The vehicle must be on level ground before checking the oil level.

Replace the bottom tie-plate and tighten the bolts and setscrews to the correct torque.

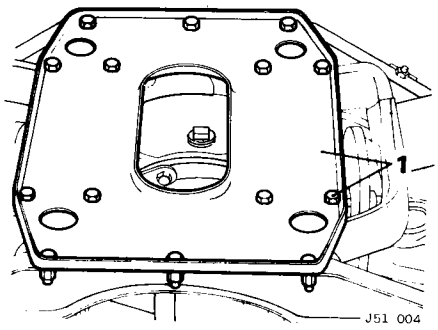


Fig. 8

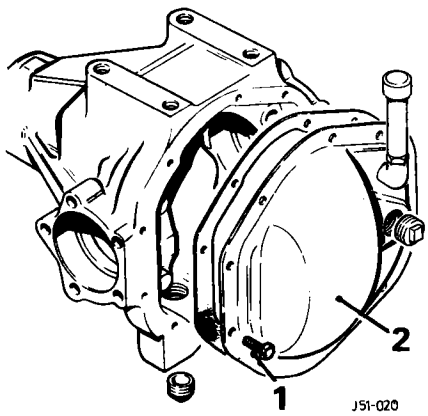


Fig. 9

OUTPUT SHAFT ASSEMBLY (One Side)

Renew **51.10.20**

To remove an output shaft it is necessary to detach the inboard end of the drive shaft, the forward attachment of the radius rod, and to remove the brake caliper and disc (1, Fig. 10).

These operations are detailed in Section 70, the Brake System.

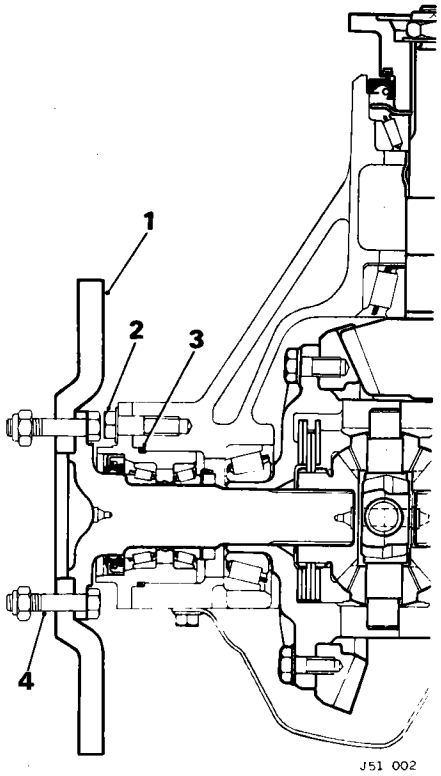


Fig. 10

Cut locking wire and remove five set bolts (2, Fig. 10) securing caliper mounting flange to final drive. Withdraw complete output shaft assembly and discard 'O' ring (3, Fig. 10).

Before fitting, ensure that four bolts (4, Fig. 10) are in position, and that new 'O' ring (3, Fig. 10) is fitted. Lightly oil splines and outside of bearing with final drive oil, insert assembly, fit bolts with spring washers, tighten to 8,4 to 9,66 kgf/m (60 to 69 lbf/ft), tightening the bolt nearest to the input flange first, and wire lock bolt heads together so that wire tension is tending to tighten bolts.

Replace brake caliper and disc as described in Brake System section; check camber angle of rear wheels, and adjust if necessary, refer to Section 64 for the correct procedure.

OUTPUT SHAFT BEARINGS

Renew **51.10.22**

Service tools: 47 Press, Torque screwdriver 18G 681, Adaptor, Spanner SL 15A or 15, Output shaft bearing remover/replacer SL 47-3/1, SL 47-3/2.

Remove output shaft assembly incorporating bearing to be removed.

Clean assembly and clamp caliper mounting bracket between suitably protected jaws of vice.

Turn down tabs of lock washer and remove nut (1, Fig. 11) from shaft, using spanner SL 15A (Fig. 12).

Remove and discard lock washer.

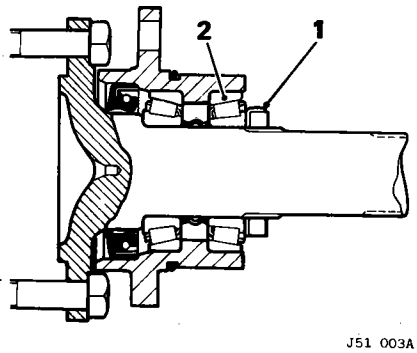


Fig. 11

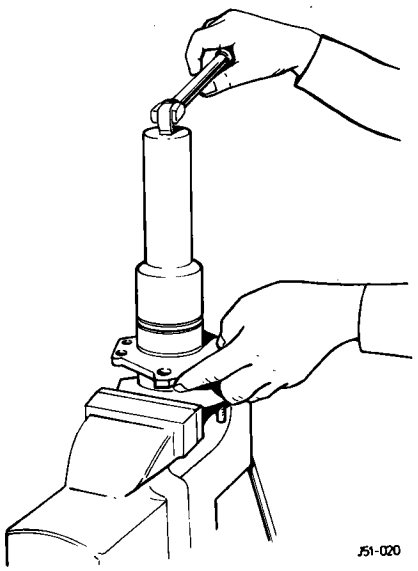


Fig. 12

Withdraw output shaft (1, Fig. 13) from caliper mounting bracket (2, Fig. 13). Collect inner bearing (3, Fig. 13) and cone. Discard collapsed spacer (4, Fig. 13).

NOTE: If outer bearing remains on shaft and pushes oil seal out of caliper mounting bracket on withdrawal, remove it from shaft using tool SL 47-3/1, 47 (1, Fig. 14).

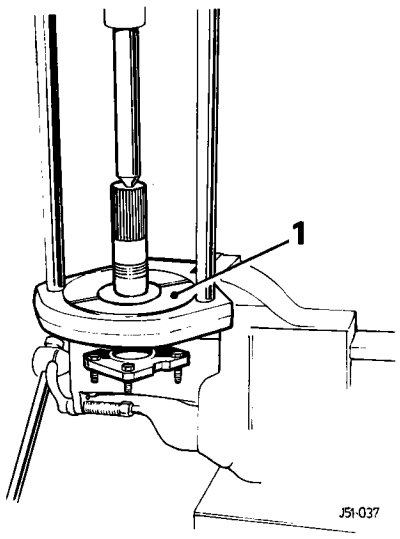


Fig. 14

Prise oil seal from caliper mounting bracket. Collect outer bearing and cone. Discard oil seal.

Using a suitable drift, gently tap bearing cups (5, Fig. 13) out of housing.

Remove caliper mounting bracket from vice and carefully clean internally.

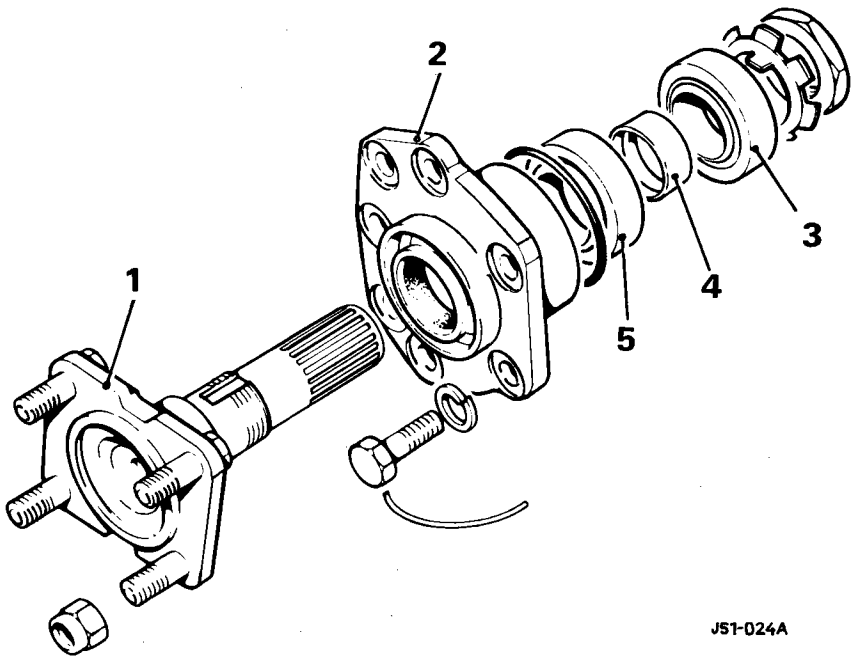


Fig. 13

NOTE: When bearings are to be renewed, always replace complete bearings. Never fit new cone and roller assemblies into used cups.

Before fitting, bearings should be lightly greased, but it is most important that at least 4 cc of hypoid oil is added to the cavity between the bearings during assembly, and that the oil seal is lubricated by packing the annular space between its sealing edges with grease. This prevents premature seal or bearing wear before oil flow begins from the axle centre.

Refitting

Press cups of replacement bearings into housing, using suitble press and adaptors to ensure that cups are pressed fully home in housing.

Place roller and cone assembly of outer bearing (already greased) in position.

Press replacement oil seal into position (1, Fig. 15) ensuring that spring-loaded sealing edge is adjacent to bearing. Load seal with grease between sealing edges.

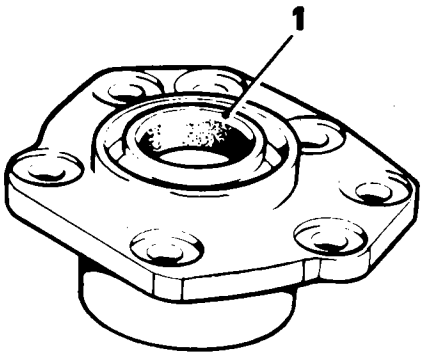


Fig. 15

Clamp caliper mounting bracket between protected jaws of vice.

Check that four special bolts for brake disc are in position in output shaft flange and enter shaft through seal and outer bearing.

Fit new collapsible spacer and fill the space between bearings with Hypoid EP 90 oil before replacing rollers and cone of inner bearing and fitting new lock washer on shaft.

Place nut on shaft, grease face next to washer and tighten finger-tight only.

Using spanner SL15A and a tommy-bar at disc attachment bolts to oppose torque, tighten nut on shaft just sufficiently to almost eliminate play from bearings. Torque required to turn shaft should be 0,14 to 0,28 kgf/m (10 to 20 lbf/in).

Further tighten nut, very slightly (not more than a thirty-second of a turn — about 5 mm ($\frac{3}{16}$ in) at perimeter of nut) and re-check torque required to turn shaft. Continue to tighten nut in very small increments, turning shaft to seat bearings and measuring torque after each increment, until correct figure is reached.

CAUTION: If torque required to turn shaft exceeds by more than 0,28 kgf/m (20 lbf/in) torque recorded in first check, it is necessary to dismantle assembly, discard collapsed spacer and rebuild with new collapsible spacer. It is not permissible to slacken back nut after collapsing spacer as bearing cones are then no longer rigidly clamped.

Turn down tab washers in two places to lock nut and remove assembly from vice. Refit output shaft assembly to final drive unit, see operation 51.10.20.

OUTPUT SHAFT OIL SEAL

Renew **51.20.04**

Service tools: 47 Press, torque screwdriver 18G 681, Adaptor, Spanner SL 15A or 15 Output shaft bearing remover/replacer SL 47-3/1, SL 47-3/2.

Remove output shaft assembly.
Clean assembly and clamp caliper mounting bracket between suitably protected jaws of vice.
Turn down tabs of lock washer (1, Fig. 16) and remove nut from shaft, using spanner SL15A (1, Fig. 17).

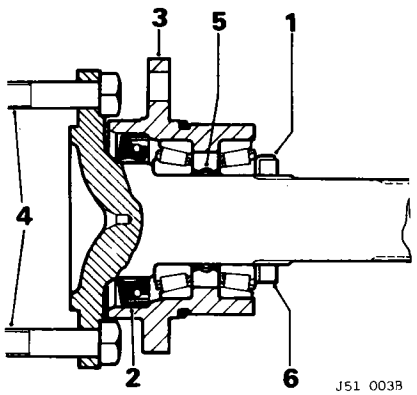


Fig. 16

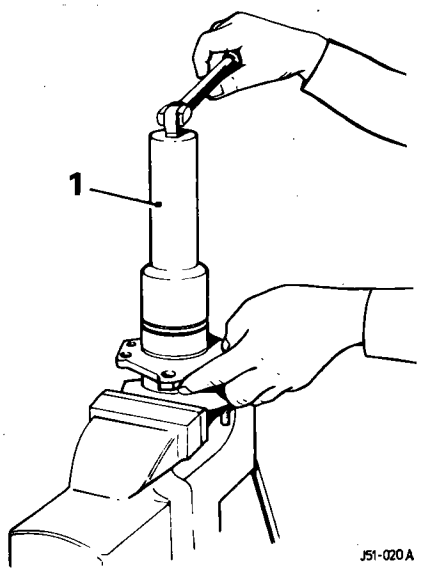


Fig. 17

Remove and discard lock washer.

Withdraw output shaft from caliper mounting bracket. Collect inner bearing and cone and mark for correct reassembly. Discard collapsed spacer.
Prise oil seal from caliper mounting bracket and discard. Collect outer bearing and cone.
Remove caliper mounting bracket from vice and thoroughly clean internally.
If outer bearing remains on shaft and pushes oil seal out of caliper mounting bracket on withdrawal, remove it from shaft using tool SL47-3/1, 47 (1, Fig. 18).

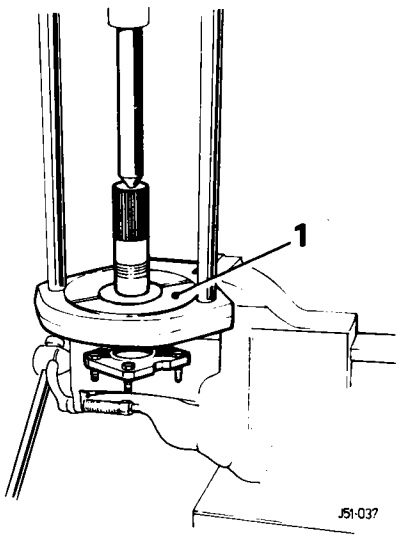


Fig. 18

NOTE: Carefully inspect taper roller bearing components before refitting. If any fault is found in either bearing, replace both complete bearings. Refer to operation 51.10.22, for full details. Never fit new cone and roller assemblies into used cups.

Before fitting, bearings should be lightly greased, but it is most important that at least 4 cc of hypoid oil is added to the cavity between the bearings during assembly, and that the oil seal (2, Fig. 16) is lubricated by packing the annular space between its sealing edges with grease. This prevents premature seal or bearing wear before oil flow begins from the axle centre.

Refitting (using original bearings)

Place roller and cone assembly of outer bearing (already greased) in position.
Press replacement oil seal into position, ensuring that spring-loaded sealing edge is adjacent to bearing. Load seal with grease between sealing edges.
Clamp caliper mounting bracket (3, Fig. 16) between protected jaws of vice.
Check that four special bolts (4, Fig. 16) for brake disc are in position in output shaft flange and enter shaft through seal and fit the outer bearing using tools SL47-3/1, SL47-3/2 (1, Fig. 19).

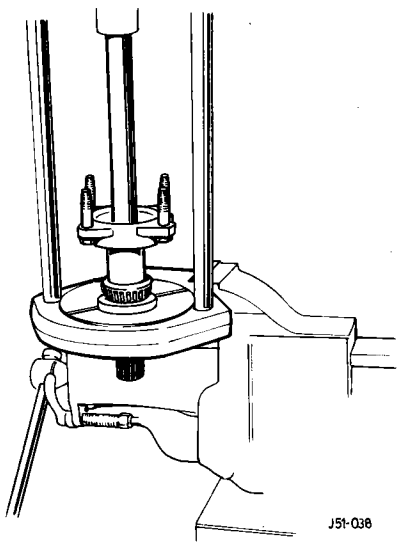


Fig. 19

Smear oil on portion of shaft in contact with seal.
Fit new collapsible spacer (5, Fig. 16) and fill the space between bearings with Hypoid EP 90 oil before replacing rollers and cone of inner bearing and fitting new lock washer on shaft.
Place nut (6, Fig. 16) on shaft, grease face next to washer and tighten finger-tight only.
Using torque screwdriver 18G 681 and adaptor check torque required to turn shaft in caliper mounting bracket against resistance of the oil seal. Record the torque.

NOTE: Set screwdriver initially to 0,05 kgf/m (4 lbf/in). Setting should then be progressively increased until torque figure is established at the point when shaft commences to turn.

Using spanner SL15A and a tommy-bar at disc attachment bolts to oppose torque, tighten nut on shaft just sufficiently to almost eliminate play from bearings. Repeat torque check. Torque required to turn shaft should be unchanged, if it has increased, slacken nut very slightly and re-check.

Further tighten nut, very slightly (not more than a thirty-second of a turn — about 5 mm ($\frac{3}{16}$ in) at perimeter of nut — and re-check torque required to turn shaft. If this torque exceeds by 0,05 to 0,10 kgf/m (4 to 8 lbf/in) the torque recorded earlier, correct bearing pre-load has been achieved, otherwise continue to tighten nut in very small increments, turning shaft to seat bearings and measuring torque after each increment, until correct figure is reached.

CAUTION: If torque required to turn shaft exceeds by more than 0,10 kgf/m (8 lbf/in) torque recorded initially, it is necessary to dismantle assembly, discard collapsed spacer and rebuild with new collapsible spacer. It is not permissible to slacken back nut after collapsing spacer as bearing cones are then no longer rigidly clamped.

Turn down tab washer in two places to lock nut and remove assembly from vice.

Refit output shaft assembly to final drive unit, refer to operation 51.10.20 for full details.

FINAL DRIVE UNIT

Renew **51.25.13**

Service tool: Dummy shaft JD 14.

The final drive unit cannot be removed from the vehicle unless it is detached as part of the rear suspension unit, removal of this item is detailed in the rear suspension section.

Drain the oil from the unit to prevent any leakage from the breather, and invert the whole assembly onto a workbench.

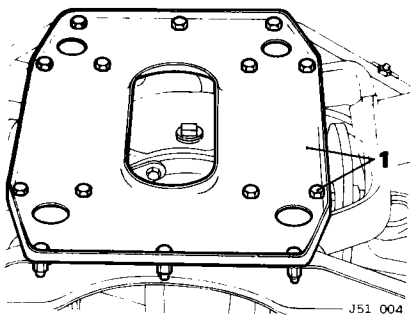


Fig. 20

Remove the fourteen $\frac{1}{2}$ in AF bolts, nuts and setscrews (1, Fig. 20) securing the bottom tie-plate to cross-beam and inner fulcrum brackets.

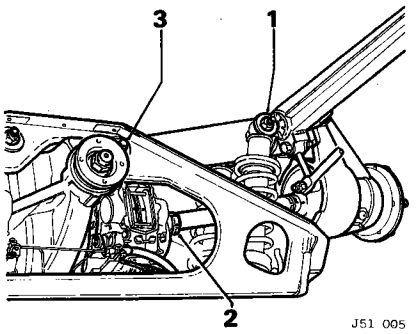


Fig. 21

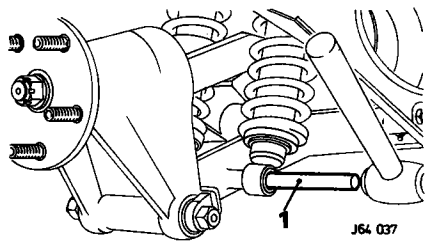


Fig. 22

Remove the $\frac{11}{16}$ in AF nuts and washers (1, Fig. 21) securing the dampers to the wishbone and drift out the retaining pins (1, Fig. 22) recover the spacers and tie-down brackets.

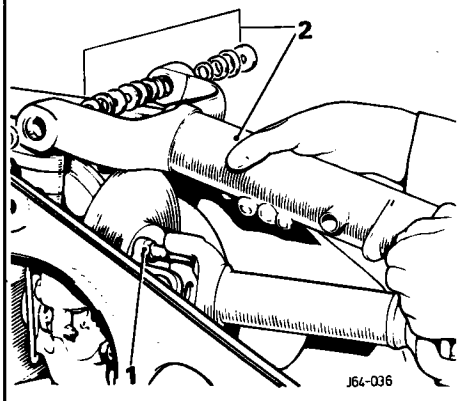


Fig. 23

Slacken the clips (2, Fig. 21) securing the inner universal joint shrouds and slide the shrouds outwards.

Remove the four $\frac{11}{16}$ in AF self locking nuts (1, Fig. 23) either side securing the drive shaft inner universal joint to the brake disc and output flange.

Remove the $\frac{3}{4}$ in AF nut (3, Fig. 21) from the inner wishbone fulcrum shaft and drift out the shaft (1, Fig. 24) collecting the spacers, seals and bearings from the wishbone pivots (2, Fig. 23).

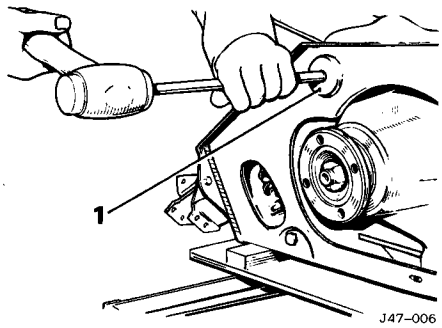


Fig. 24

Remove the drive shaft, hub and wishbone assembly from the rear suspension assembly.

Remove the camber shims from the drive shaft flange studs at the brake disc on both sides.

Remove the spacer tubes from between the lugs of the fulcrum brackets and turn the suspension assembly over on the bench.

Disconnect the brake feed pipes from the calipers, seal the ends of the pipes and the ports in the calipers. Release the brake return springs from the operating levers.

Cut the locking wire and remove the four $\frac{3}{4}$ in AF bolts (1, Fig. 25) securing the final drive to the cross-beam and lift the cross-beam off the unit (Fig. 26).

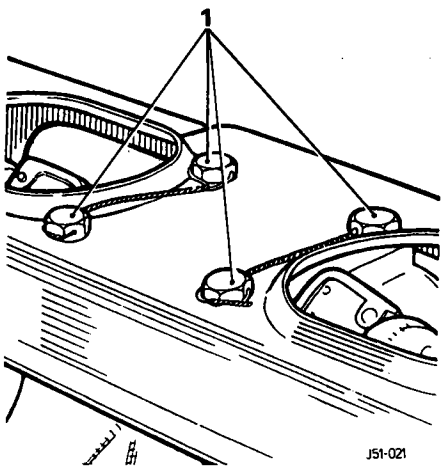


Fig. 25

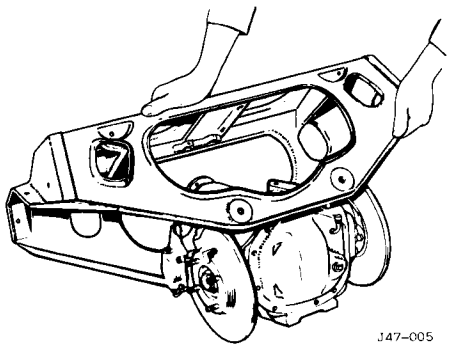


Fig. 26

Invert the unit and remove the locking wires and the $\frac{11}{16}$ in AF setscrews securing the fulcrum brackets to the final drive unit (1, Fig. 27).

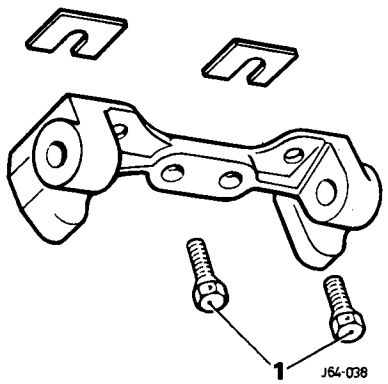


Fig. 27

Remove the brackets, noting the position and number of shims at each attachment point.

Cut the wires from the $\frac{5}{8}$ in AF caliper mounting bolts, remove the bolts and calipers (1, Fig. 28). Remove the brake discs, noting the number of shims between the discs and the flanges.

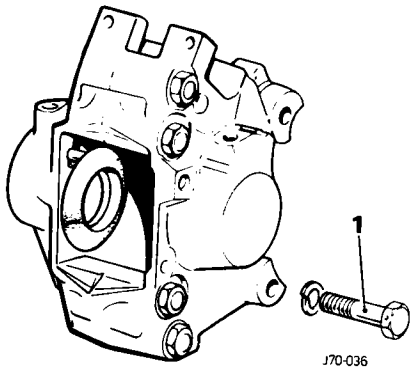


Fig. 28

Replace the shims and disc on one output shaft flange and secure with two nuts. Replace the caliper, tighten the mounting bolts and check the centering and the run out of the disc. The centering tolerance is ±0.25 mm (0.010 in), this can be rectified by transferring shims from one side of the disc to another. The disc run out should not exceed 0.15 mm (0.006 in).

Tighten the caliper bolts to a torque of 6.78 - 7.60 kgf/m 66.4 - 74.5 Nm (49 - 55 lb/ft).

Repeat the above operations on the opposite side. Remove the nuts from both discs.

Place the cross-beam over the final drive, align and replace the bolts and tighten to the correct torque and wire lock. 10.4 kgf/m, 101.68 Nm (75 lb/ft). Slacken the brake feed pipes at the centre union, unseal the brake pipes and the ports in the caliper, align and fit the pipes and tighten the unions.

Replace the handbrake lever return springs and invert the assembly on the bench. Position the fulcrum brackets against the final drive unit and locate each bracket loosely with two setscrews. Replace the shims between the fulcrum brackets and the final drive unit.

Tighten the setscrews and wire lock. Refit the camber shims to the drive shaft studs on one side. Fit the drive shaft on to the studs and loosely fit the nuts, and then tighten fully. Replace the spacer tube between the lugs of the fulcrum bracket.

Clean, inspect and grease the lower wishbone bearings, thrust washer etc. Fit new seals and offer up the wishbone fulcrum bracket lugs and locate with dummy shafts.

Tool No. JD14 (1, Fig. 29).

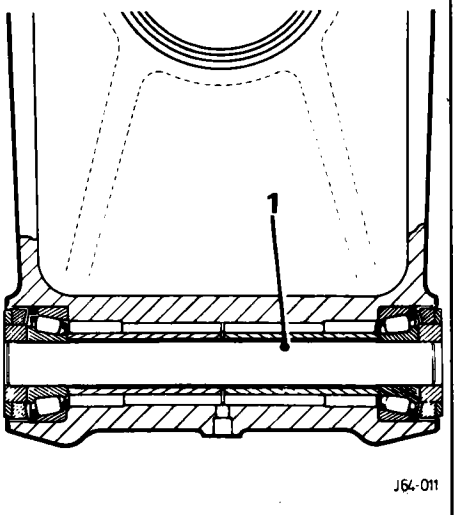


Fig. 29

Take great care not to displace any component during this operation. Drift the dummy shafts from the fulcrum bracket with the fulcrum shaft. Restrain the dummy shafts to prevent spacers or thrust washers dropping out of position.

Tighten the fulcrum shaft nuts to a torque of:

Inner 61.0 - 67.8 Nm, 6.23 - 6.91 kgf/m (45 - 50 lb/ft).

Outer 131 - 145 Nm, 13.4 - 14.8 kgf/m (97 - 107 lb/ft).

Reposition the drive shaft shroud and secure it with the clip. Line up the damper lugs with the wishbone bosses and replace the damper shaft, including the spacer and tie down bracket and tighten the nuts to a torque of 43.4 - 48.8 Nm, 4.43 - 4.97 kgf/m (32 - 36 lb/ft).

Replace the wishbone, drive shaft and damper shaft on the opposite side. Replace the bottom tie-plate and tighten the bolts and setscrews.

Replace the rear suspension unit.

Check the rear wheel camber. Bleed the brakes and fill the final drive with oil as necessary.

NOTE: Use Shell Super Spirax 90 or BP Gear Oil 1453 if new gears have been fitted; otherwise use a recommended refill or top up oil as specified in Section 09.

FINAL DRIVE UNIT

Overhaul 51.25.19

Service tools: 18G 1205, 47, SL 47-1/1, 18G 134, SL 550/1, SL 14-3/1, SL 14-3/2, SL 550-1, SL 3, 4HA, SL 550-9, SL 550-8-1, SL 47-1/1, SL 47-1/2, 18G 1428.

Dismantling

Ensure that all lubricant is drained from the unit and support the unit in a vice.

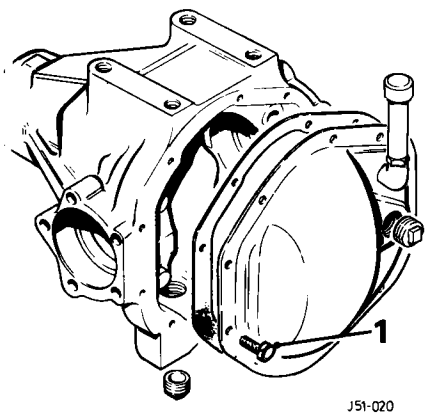


Fig. 30

Remove the ten $\frac{1}{2}$ in AF rear cover securing bolts (1, Fig. 30), the cover and the gasket.
Remove the locking wire and five $\frac{5}{8}$ in AF bolts securing the caliper mounting bracket on one side and withdraw the output shaft assembly.
Repeat for the shaft on the other side.
Remove the two $\frac{3}{4}$ in AF bolts (1, Fig. 31) securing the differential bearing cap, lift out the cap from the differential housing, repeat for the other side.

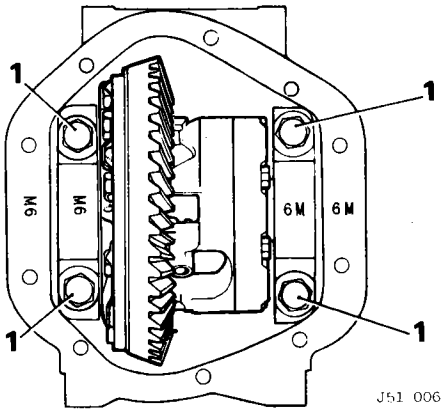


Fig. 31

Using two suitably padded levers, prise out the differential unit.
Using tool 18G 1205 (1, Fig. 32) to hold the drive flange, remove the pinion nut and washer and withdraw the flange (2, Fig. 32).

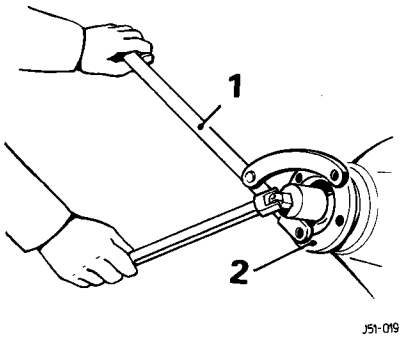


Fig. 32

Using a suitable press extract the pinion from the housing.
Using tool 18G 134 remove the oil seal, oil thrower and outer bearing cone.
Examine the inner and outer bearing cups for wear, if replacement is required extract the outer cup using tools 18G 134 and SL550/1 for inner bearing removal, carefully tap the bearing cone out with a brass punch in the cut-outs provided in the differential casing and carefully collect the shims.
Remove the pinion head bearing using tools 47 (1, Fig. 33), SL 47-1/1 (2, Fig. 33).

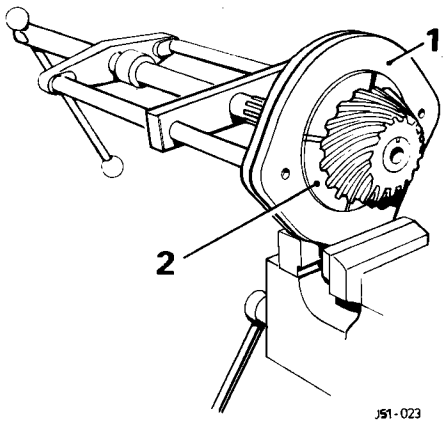


Fig. 33

Remove the differential side bearings using tool Nos. 47 (1, Fig. 34), SL 14-3/2 (2, Fig. 34) and SL 14-3/1 (3, Fig. 34), and collect the shims.

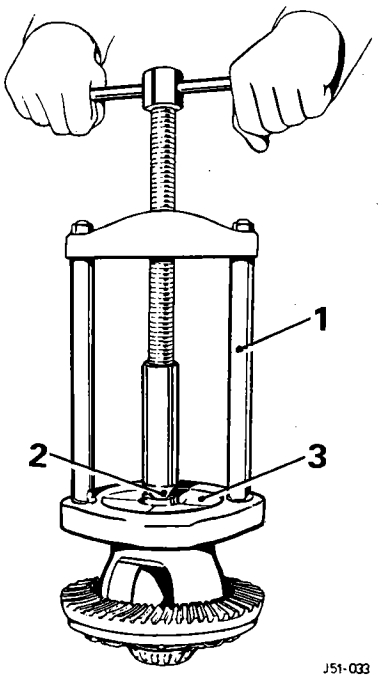


Fig. 34

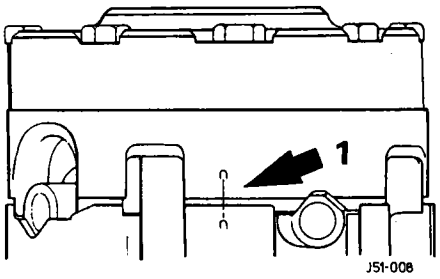


Fig. 35

Powr-Lok only
In the absence of any alignment marks (1, Fig. 35), scribe a line across both halves of differential casing to facilitate reassembly.
Remove the ten $\frac{11}{16}$ in AF crown wheel bolts (1, Fig. 36) and remove the crown wheel (2, Fig. 36).
Remove the eight $\frac{9}{16}$ in AF bolts (1, Fig. 37), securing both halves of the differential casing (2, Fig. 37).
Remove differential side ring (3, Fig. 37).
Remove pinion side gear and pinion cross-shafts complete with gears (4, Fig. 37).
Separate cross-shafts (5, Fig. 37).
Remove remaining side gear (6, Fig. 37) and ring (7, Fig. 37).
Extract the remaining clutch discs (8, Fig. 37) and plates (9, Fig. 37).

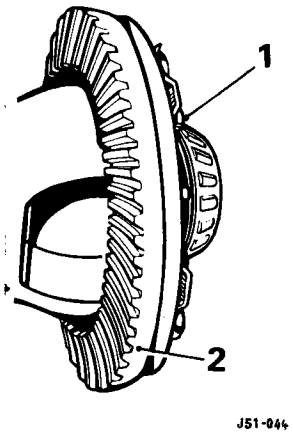


Fig. 36

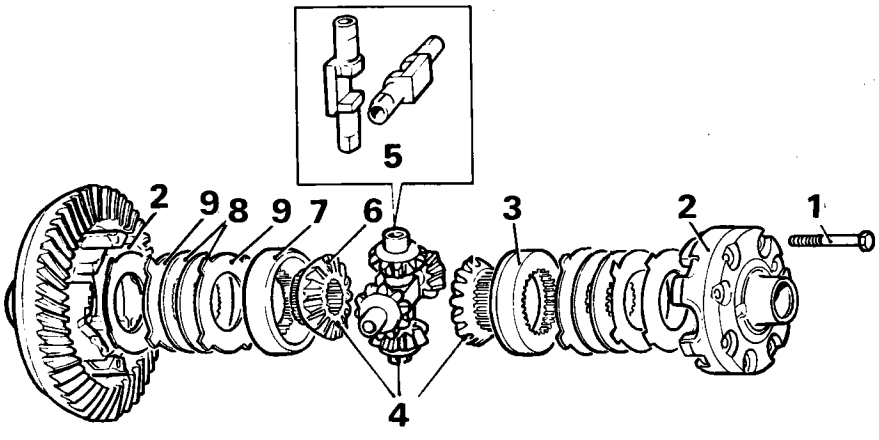


Fig. 37

Reassembling

NOTE: Before commencing assembly, check from reference numbers and letters that pinion and drive gear are a matched pair.

The same serial number must be marked on the pinion end and the outer periphery of the crown wheel (1, Fig. 38), (e.g. 7029). If these requirements are not met the unit must be exchanged.

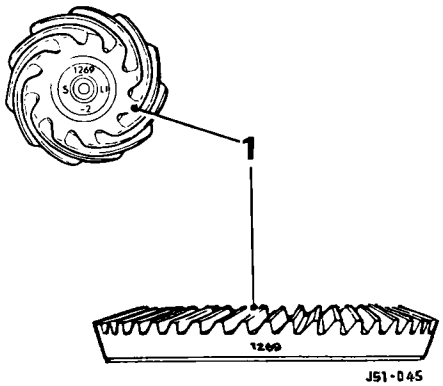


Fig. 38

Powr-Lok only

Prior to reassembly coat all plates and discs with Powr-lok oil.

Refit two Belleville clutch plates (2, Fig. 39) so that convex sides are against differential casing.

Refit clutch plates (4, Fig. 39) and discs (3, Fig. 39) as shown into each half of the casing.

Fit side ring (5, Fig. 39).

Position one side gear into ring recess (6, Fig. 39).

Fit cross-shafts.

Refit pinion mating cross-shafts complete with pinion gears ensuring that ramps on the shafts coincide with the mating ramps in the differential case (7, Fig. 39).

Assemble remaining side gear (6, Fig. 39) and ring (7, Fig. 39).

Offer up right-hand half of differential case (8, Fig. 39) to flange half in accordance with identification marks and position clutch friction plate tongues so that they align with grooves in differential case.

Assemble right-hand half to flange half of differential case using eight bolts coated with Loctite 275 but do not tighten at this stage (9, Fig. 39).

Tighten eight bolts to a torque of 6,05 to 6,9 kg/m (43 to 50 lb/ft) while drive shafts are in position (1, Fig. 40, 1, Fig. 41). With one drive shaft locked, the torque to turn the other (2, Fig. 41) should be between 40 lb/ft and 70 lb/ft. e.g. hold one shaft in vice soft jaws whilst turning the other.

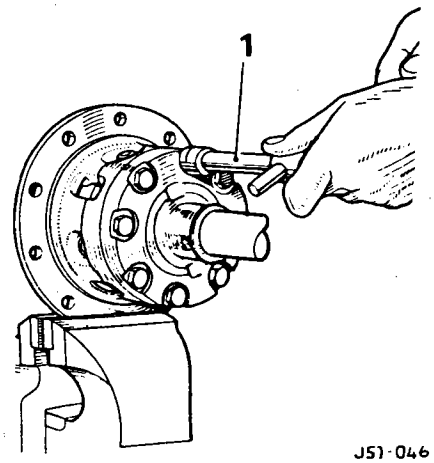


Fig. 40

NOTE: Ensure that prior to assembly the crown wheel mounting face is free from damage or burrs, particularly on the edge; should any burrs be left on the carrier they must be removed with an oil stone prior to fitment of the crown wheel.

Fit the crown wheel to the carrier diametrically using the ten bolts and tab washers, torque up the bolts to 10,78 to 12,4 kgf/m (77 to 88 lb/ft).

Thickness of shims required in the installation of the differential side bearings is determined as follows:

Fit the differential side bearings (1, Fig. 42) using tools 18G 134 (2, Fig. 42) and SL 550-1 (3, Fig 42) without the shims onto the differential case, making sure that

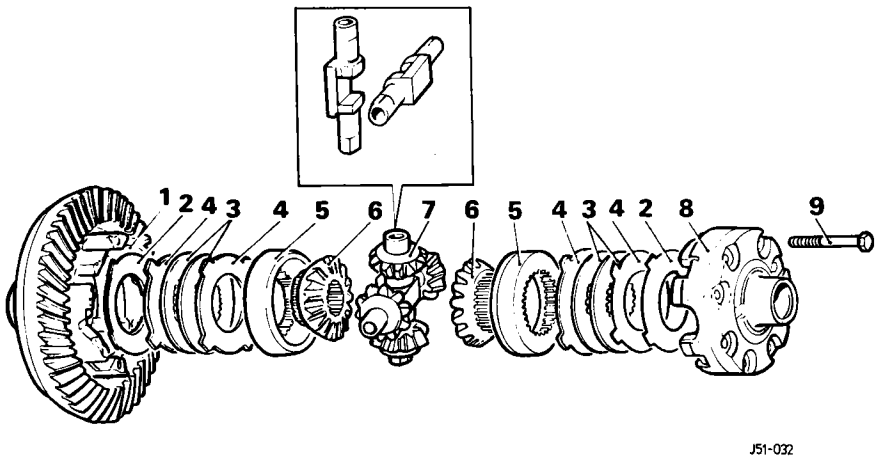


Fig. 39

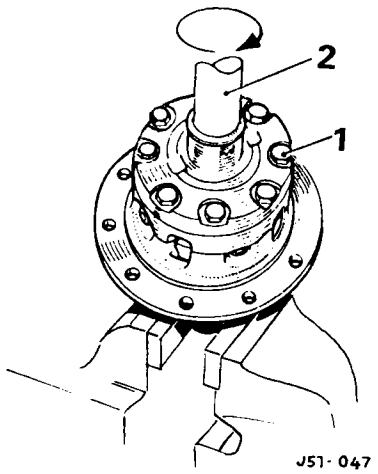


Fig. 41

the bearings and housing are perfectly clean.

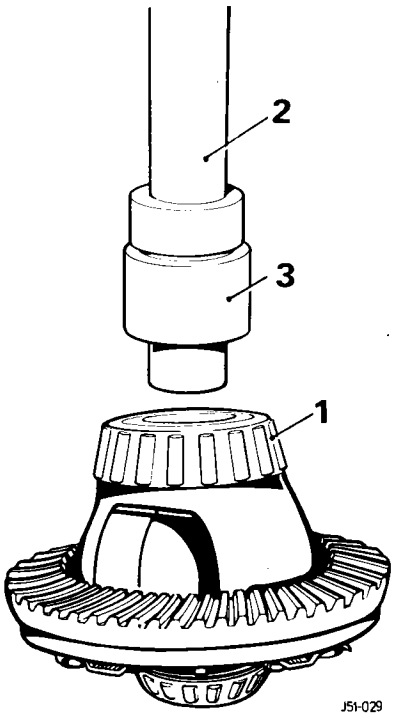


Fig. 42

Place the differential assembly with the bearings in their housing into the differential case without the pinion in position.

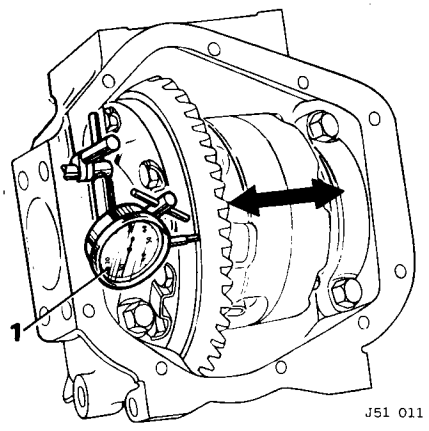


Fig. 43

Install a dial indicator gauge setting the button against the back face of the crown wheel (1, Fig. 43).

Inserting two levers between housing and the bearing cups, move the differential assembly to one side of the carrier.

Set the dial indicator to zero.

Move the assembly to the other side and record indicator reading, giving total clearance between bearings, as now assembled, and abutment faces of the gear carrier housing.

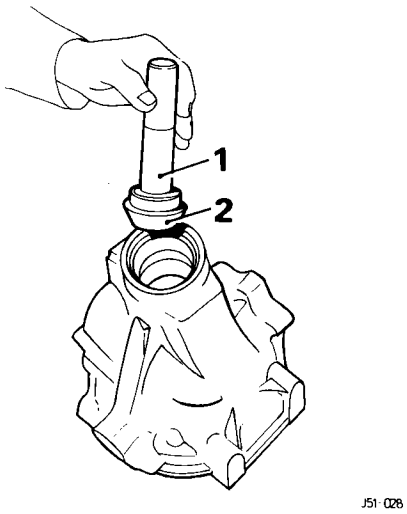


Fig. 44

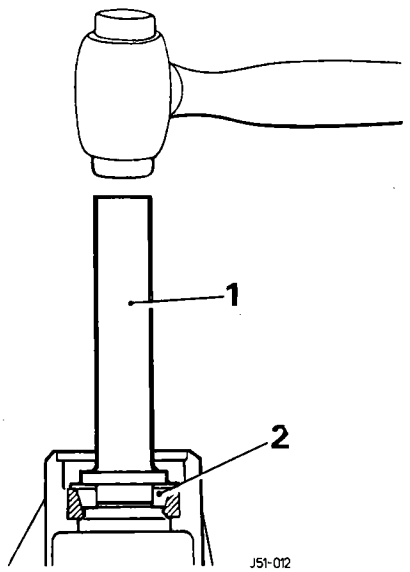


Fig. 45

Remove differential assembly from the gear carrier.

Re-install the pinion outer bearing cup using tools 18G 134 (1, Fig. 44 & 45) and SL 550-9 (2, Fig. 44 & 45).

Fit the inner bearing cup (1, Fig. 46) and shims using tools 18G 134 and SL 550-8 (2, Fig. 46).

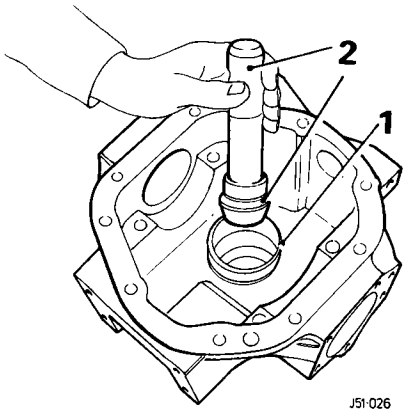


Fig. 46

Press the inner bearing cone onto the pinion using tools 47 (1, Fig. 47), SL 47-1/1 (2, Fig. 47) and SL 47-1/2 (3, Fig. 47).

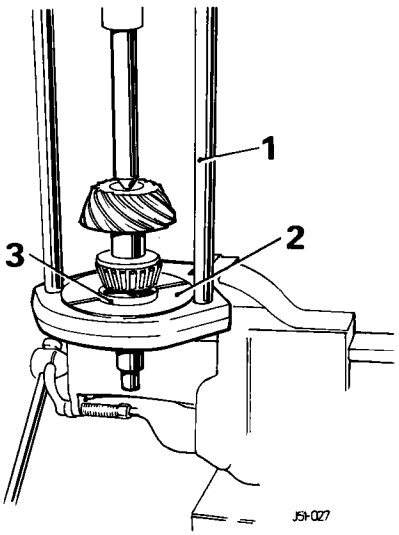


Fig. 47

NOTE: The hypoid drive pinion must be correctly adjusted before attempting further assembly, the greatest care being taken to ensure accuracy.

The correct pinion setting is marked on the ground end of the pinion. The matched assembly serial number is also marked on the periphery of the crown wheel, and care should be taken to keep similarly marked gears and pinions in their matched sets as each pair is lapped together before despatch from the factory. The letter on the left is a production code letter and has no significance relative to assembly or servicing of any axle. The letter and figure on the right refer to the tolerance on offset or pinion drop dimension, which is stamped on the cover facing of the gear carrier housing. The number at the bottom gives the cone setting distance of the pinion and may be Zero (0), Plus (+) or Minus (−). (Fig. 48).

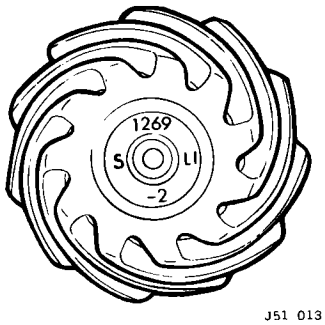


Fig. 48

When correctly adjusted a pinion marked Zero will be at the zero cone setting distance dimension which is 66,67 mm (2.625 in) (i.e. from the centre line of the gear to the face on the small end of the pinion. A pinion marked Plus two (+2) should be adjusted to the nominal (or Zero) cone setting plus 0,0508 mm (0.002 in) and a pinion marked Minus two (−2) to the cone setting distance minus 0,0508 mm (0.002 in). Thus for a pinion marked Minus two (−2) the distance from the centre of the drive gear to the face of the pinion should be 66,619 mm i.e. 66,67 - 0,0508 mm (2.623 in i.e. 2.625 - 0.002 in) and for a pinion marked Plus three (+3) the cone setting distance should be 66,746 mm (2.628 in). Place pinion, together with inner bearing cone, into gear carrier.

A Pinion drop 38,1 mm (1.5 in)

B Zero cone setting 66,67 mm (2.625 in)

C Mounting distance 108,52 mm (4.312 in)

D Centre line to bearing housing 139,57 mm (5.495 in) to 139,83 mm (5.505 in).

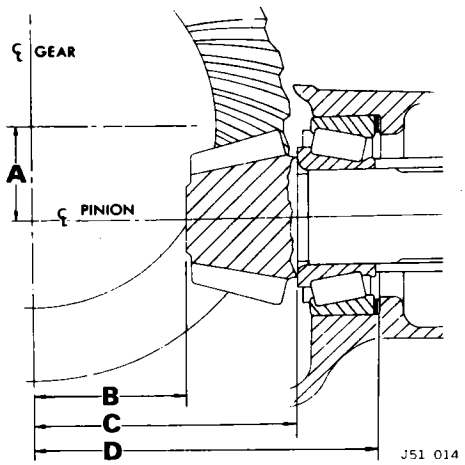


Fig. 49

Turn carrier over and support pinion with a suitable block of wood for convenience before attempting further assembly.
Fit pinion outer bearing cone, companion flange, washer and nut only, omitting the collapsible spacer, oil thrower and oil seal, and tighten nut to remove all backlash.
Check pinion setting distance by means of gauge tool SL3 (1, Fig. 50).

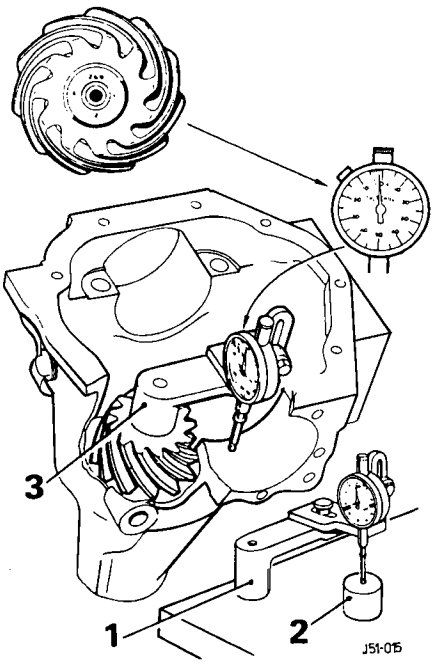


Fig. 50

Adjust bracket carrying dial indicator using 4HA setting block. For differentials with a white painted circle on the rear cover use tool no. SL3-2. (2, Fig. 50) and set dial face to zero.
Check pinion setting by taking a dial indicator reading on the differentail bearing bore with the assembly firmly seated on the ground face of the pinion (3, Fig. 50). The correct reading will be the minimum obtained; that is, when the indicator spindle is at the bottom of the bore. Slight movement of the assembly will enable the correct reading to be easily ascertained. The dial indicator shows the deviation of the pinion setting from the zero cone setting and it is important to note the direction of any such deviation as well as the magnitude.
If pinion setting is incorrect it is necessary to dismantle the pinion assembly and remove the pinion inner bearing cup. Add or remove shims as required from the pack locating the bearing cup and re-install the shim pack and bearing cup. Adjusting shims are available in thicknesses of 0,076 mm, 0,127 mm and 0,254 mm (0.003 in, 0.005 in and 0.010 in). Repeat setting operations until satisfactory result is obtained.
Extract pinion shaft from gear carrier far enough to enable the outer bearing cone to be removed from the pinion.
Fit the collapsible spacer to the pinion ensuring that it seats firmly on the machined shoulder on the pinion shaft.
Insert pinion into gear carrier.
Refit the outer bearing cone, oil thrower and using tool 18G 1428 (1, Fig. 51) fit the oil seal. Loctite the splines of the pinion shaft and fit the flange. Fit a new washer, convex face outermost. Fit, but DO NOT tighten the flange retaining nut.
Begin tightening the flange nut, stopping at frequent intervals to check the torque required to turn the pinion, using the string and spring balance, until the required torque is obtained.

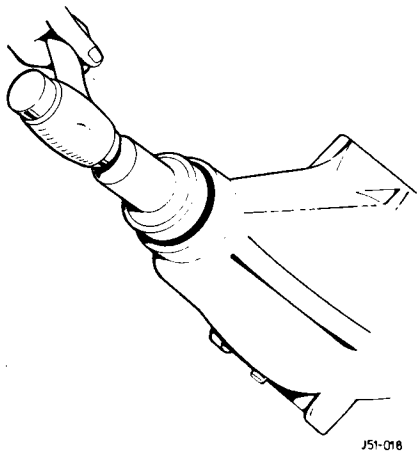


Fig. 51

The flange nut may have to be tightened to as much as 18 kgf/m (130 lbf/ft).
Torque required to turn pinion bearings and oil seal:
Old bearings — 0,20 to 0,28 kgf/m (20 to 25 lbf/in).
New bearings — 0,35 to 0,46 kgf/m (30 to 40 lbf/in).
Note the actual figure required to turn the pinion.
If the above values are exceeded a new collapsible spacer must be fitted. ON NO account must the nut be slackened off and retightened as the collapsed spacer will not then sufficiently clamp the bearing cones.
Place differential assembly complete with side bearings but less shims, in the housing. Ensure that bearings and housing are perfectly clean.
Using the shim pack previously selected, vary the shim thicknesses between each bearing cup and the carrier face to achieve a backlash of 0,15 to 0,25 mm (0.006 to 0.010 in) measured at the outer edge of the ring gear (Fig. 52)
Add an additional 0,07 mm (0.003 in) shim to each pack and carefully note from which side of the differential case the pack was removed.
Remove the bearing cups and cones from the differential case using SL 14-3/2 and SL 14-3/1.
Fit appropriate shim pack to the differential case and refit the bearing cone.
Ensure that the matching shim pack and cone are fitted to the same side of the differential housing that they were removed from.

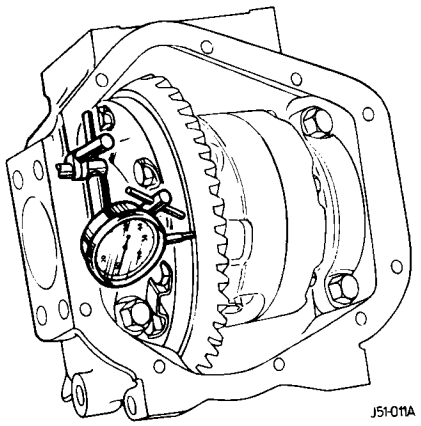


Fig. 52

Lower differential assembly into position lightly tapping the bearings home with a hide hammer.

NOTE: Ensure that gear teeth are led into mesh with those of the pinion. Careless handling at this stage may result in bruising the gear teeth. Removal of the consequent damage can only be partially successful and will result in inferior performance.

When refitting side bearing caps, ensure that position of the numerals marked on gear carrier housing face and side bearing cap coincide (1, Fig. 53).
Tighten cap bolts to a torque of 8,82 to 10,08 kg/m (63 to 72 lb/ft) (2, Fig. 53).

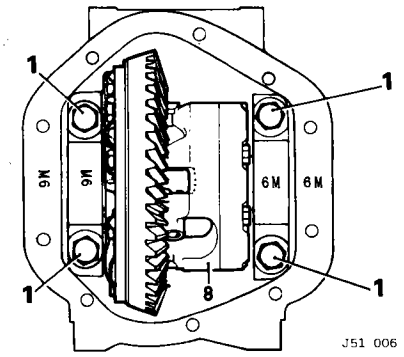
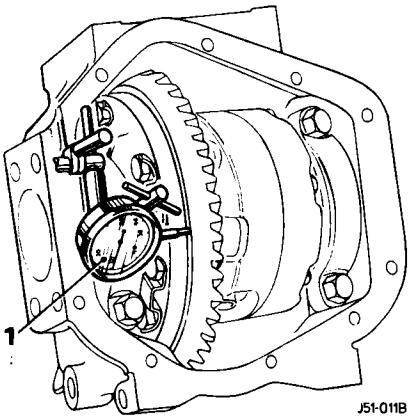


Fig. 53

Mount a dial indicator on gear carrier housing with the button against back face of gear (1, Fig. 54).



Turn pinion by hand and check run out on back face of gear. Run out should not exceed 0,13 mm (0.005 in). If run out excessive, strip the assembly and rectify by cleaning the surfaces locating the drive gear. Any burrs on these surfaces must be removed.

Remount dial indicator on gear carrier housing with button tangentially against one of drive gear teeth (1, Fig. 55).

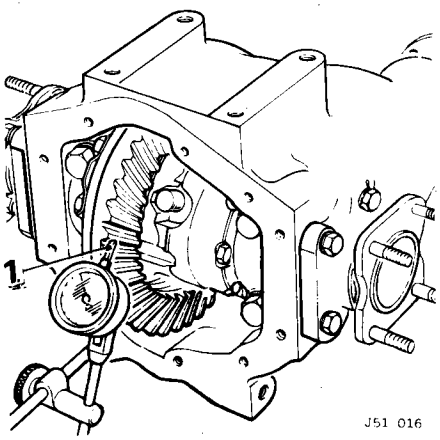


Fig. 55

Move drive gear by hand to check backlash which should be 0,15 to 0,25 mm (0.006 to 0.010 in). If backlash is not to specification, transfer the necessary shims from one side of the differential case to the other to obtain the desired setting. Check backlash in at least four positions of drive gear, ensuring that backlash is always greater than 0,15 mm (0.006 in).

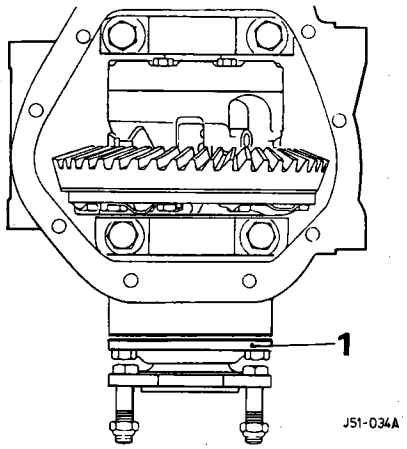


Fig. 56

Check that the torque to turn the input flange is 1,4 to 2,8 kgf/m (10 to 20 lbf/in) additional to the torque measured previously to turn the pinion (page 51-15)

Smear cover flange only with Welseal jointing compound, place gasket on final drive casing, place cover over gasket and insert two bolts to retain, coating threads with Loctite.
Replace remaining eight bolts, coating threads with Loctite and replace the tabs.
Tighten screws by diagonal selection to correct torque 2,1 to 2,8 kgf/m (15 to 20 lbf/ft).

Refit both output shaft assemblies (1, Fig. 56) and torque the bolts to 8,4 to 9,66 kgf/m (60 to 69 lbf/ft), replace the drain plug and refit the drive unit to the cross-member (1, Fig. 57).

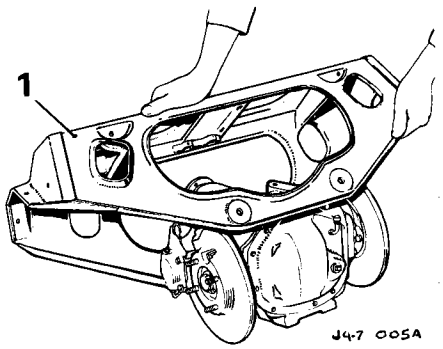


Fig. 57

Secure with bolts (1, Fig. 58) torque and lockwire (2, Fig. 58), ensuring that when lockwired, the wire is tightening the bolts.

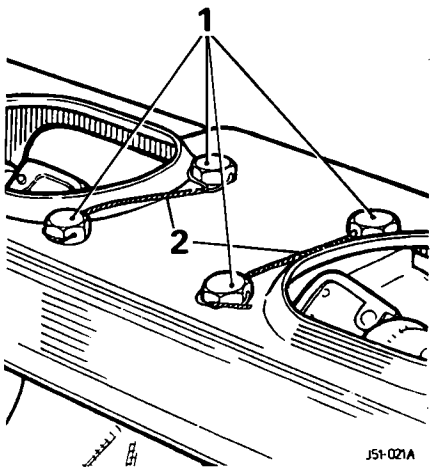


Fig. 58

After refitting the unit to the vehicle fill with new oil.

CONTENTS

TORQUE WRENCH SETTINGS

ITEM	DESCRIPTION	TIGHTENING TORQUE		
		Nm	kgf m	lbf ft
Centre bearing mounting plate to body	$\frac{5}{16}$ in U.N.F. bolts	19 to 24,4	1,94 to 2,48	14 to 18
Centre bearing to mounting plate	$\frac{5}{16}$ in U.N.F. bolts	19 to 24,4	1,94 to 2,48	14 to 18
Drive shaft to drive unit (Cleveloc)	$\frac{7}{16}$ in U.N.F. nut	66,4 to 74,5	6,78 to 7,6	49 to 55
Drive shaft to hub carrier	$\frac{3}{4}$ in U.N.F. nut	136 to 163	13,8 to 16,6	100 to 120
Propeller shaft flange bolts — Automatic gearbox	$\frac{3}{8}$ in U.N.F. bolts and nuts	36,7 to 43,4	3,74 to 4,42	27 to 32
— Manual gearbox	10 mm bolts and nuts	50	5,12	37
Rear propeller shaft to centure U.J.		36,8	3,75	27

SERVICE TOOLS

Tool No.	Description
JD1D	Hub remover

DRIVE SHAFTS AND PROPELLER SHAFT

Description

The drive shafts replace the half shafts of a conventional rear axle, and in addition serve as upper transverse members to locate the rear wheels; their inner universal joints are attached to the final drive unit by bolts which also carry the brake discs, but the brakes are not disturbed in drive shaft removal. The outer joints are integral with the hub driving shafts, and the hubs must therefore be separated from the drive shafts before they can be removed.

The propeller shaft is a two universal joint type, at the front end of which is a reverse spline fitting coupled to the gearbox and at the rear a flange bolted to the input drive flange of the final drive unit.

When fitting a propeller shaft it is essential to ensure that the universal joints operate freely; any stiffness, even in a single joint, will initiate propeller shaft vibration.

DRIVE SHAFT

Remove and refit 47.10.01

Service tool: Hub remover JD 1D.

To remove a drive shaft it is necessary to detach the hub and to swing one suspension unit aside to clear the inner joint.

Ensure that car is securely supported on stands before removing the wheel. Release clips (1, Fig. 1) and before removing nut from drive shaft in hub, slide inner shroud along shaft.

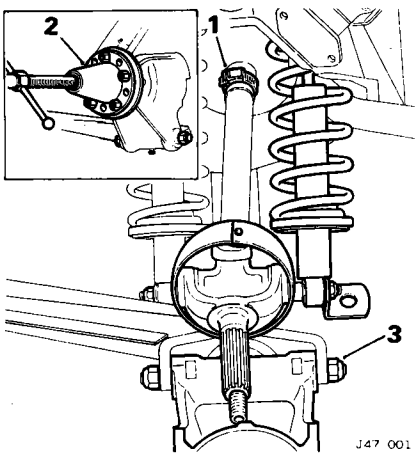


Fig. 1

Remove grease nipple from hub carrier, and using tool JD 1D (2, Fig. 1), withdraw hub from shaft. Allow the hub carrier to pivot about wishbone pin. Before detaching inner joint, release lower end of rear spring/damper unit (3, Fig. 1) and swing aside to clear joint. Collect and retain any camber setting shims fitted between inner joint and brake disc.

Refitting

Replacement drive shafts are supplied without shrouds, oil seal track or spacer; remove these items and transfer them to the new shaft. Seal shroud joints with underseal. Ensure that chamfer on oil seal track clears radius on shaft, and apply Loctite to spline before refitting hub. Tighten all nuts and bolts to the correct torque. Check and if necessary adjust hub bearing end-float and ensure that camber angles of the wheels are correct.

DRIVE SHAFT

Overhaul 47.10.08

Dismantling

Remove drive shaft.

Remove grease nipples (1, Fig. 2), place shaft in vice and remove two opposed circlips (2, Fig. 2).

NOTE: Tap bearings slightly inwards to assist removal of circlips.

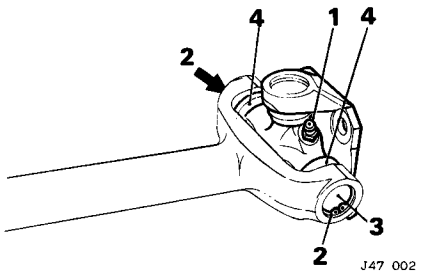


Fig. 2

Tap one bearing inwards to displace opposite bearing (3, Fig. 2).

Trap displaced bearing in vice and remove shaft and joint from bearing.

Replace shaft in vice, displace second bearing by tapping joint spider across and extract second bearing.

Remove two grease seals (4, Fig. 2).

Detach spider, with end section of shaft, from centre section of shaft.

Place end section of shaft in vice and repeat above operations.

Remove spider from end section of shaft.

Repeat above operations on opposite end of shaft.

Inspection

Wash all parts in petrol.

Check splined yoke for wear of splines.

Examine bearing races and spider journals for signs of looseness, load markings, scoring or distortion.

NOTE: Spider or bearings should not be renewed separately, as this will cause premature failure of the replacement.

It is essential that bearing races are a light drive fit in yoke trunnion.

Reassembling

Remove bearing assemblies from one replacement spider; if necessary, retain rollers in housings with petroleum jelly. Leave grease shields in position.
Fit spider to one end section of shaft.
Fit two bearings and circlips in end section trunnions. Use a soft round drift against bearing housings.
Insert spider in trunnions of centre section of shaft.
Fit two bearings and circlips in centre section trunnions.
Fit grease nipple to spider.
Repeat above operations on opposite end of drive shaft.
Grease joints with hand grease gun.
Refit drive shaft.

PROPELLER SHAFT

Remove and refit **47.15.01**

Service tools: Engine support tool MS 53A or extension jack.

Removing

To provide access, remove the exhaust heat shield where fitted.
Mark the relationship between the propeller shaft and final drive flanges, and remove the bolts securing the flanges.
Remove the bolts securing the centre bearing support plate, to the centre bearing and body.
Remove the support plate. Collect two spacers with the front bolts.
Using service tool MS 53A or, alternatively, place an extension jack under the gearbox, nut under the oil pan, take the weight off the rear engine mounting.
Separate the exhaust system at the down-pipe and intermediate pipe joints.
On cars equipped with a catalyst, slacken the nut and move the exhaust support stay to one side.
Remove the exhaust strengthening plate from the transmission case; collect two spacers and one washer.
Raise the rear of the engine/gearbox unit to reduce the loading on the mounting spring.
Remove the bolts securing the engine mounting to the tunnel closing plate, and detach the mounting plate. Collect spring, two spacers, two special washers and bump stop rubber.
Mark the relationship between the propeller shaft front flange and gearbox flange. Remove the bolts, turning the shaft to give access to each nut.
Separate the flanges and withdraw the complete propeller shaft rearwards through the transmission tunnel.

Refitting

NOTE: Before refitting the shaft, ensure that all the universal joints operate freely; a tight joint will cause vibration.
Insert the propeller shaft through the rear of the tunnel and line up the front flanges as marked.
Fit the bolts through the flanges, fit and tighten the nuts. Refer to torque wrench settings.
Replace the rear engine mounting and strengthening plate and detach the engine support tool or jack.
Replace the rear flange to final drive flange as marked, fit four bolts, fit and tighten the nuts to the correct torque.
Offer up the centre bearing support plate to the centre bearing and body structure. Insert bolts and spacers but do not fully tighten. Move the centre bearing as far as possible to the right-hand side of the tunnel and tighten the bolts.

NOTE: If propeller shaft vibration is experienced, move the centre bearing to the left in small steps until the vibration is eliminated. It is most important that the spacers which control the vertical location of the bearing are replaced as originally installed.

Replace the exhaust stay (catalyst equipped cars) and re-make exhaust flange joint using 'Firegum'.

PROPELLER SHAFT

Overhaul **47.15.10**

including:
Propeller shaft — rear — remove and refit **47.15.03**
Sliding joint and gaiter — remove and refit **47.15.08**
Centre bearing — remove and refit **47.15.33**

NOTE: The propeller shaft is supplied as a balanced unit and it is not possible to replace the front or rear shafts separately. Only the sliding joint gaiter, centre bearing, end flanges and spiders of the universal joints can be renewed.

Dismantling

Remove the propeller shaft assembly from the vehicle and place on a workbench.
Clean the assembly and mark the relationship between the centre yoke and the rear shaft.

Rear propeller shaft

To remove the rear propeller shaft, insert a suitable distance piece (e.g. a scrap nut), between the head of the bolt (1, Fig. 3) securing the centre joint yoke to the rear shaft, and the spider of the centre universal joint.
Using an open-ended spanner, unscrew the bolt (1, Fig. 3) from the rear shaft; to separate the shafts, break the Loctite adhesion between the splines and withdraw the rear shaft from the centre yoke.

Centre bearing

Using a suitable puller, remove the centre bearing from the rear propeller shaft. Engage the legs of the puller in the inner reinforcing ring of the rubber mounting.

Universal joints

To overhaul the propeller shaft universal joints, remove the snap-rings from the grooves (2, Fig. 3).

NOTE: If difficulty is encountered, tap the bearing cup (3, Fig. 3) inwards to relieve the pressure on the snap-ring.

Hold the flange yoke and tap the yoke with a soft-faced hammer. The bearing cup should gradually emerge and can be finally removed.
Alternatively, secure the propeller shaft in a vice. Using a suitable soft metal drift, drift down on a bearing cup to displace the opposite cup.
Remove the propeller shaft from the vice, hold the displaced cup in the vice and separate from the propeller shaft by pulling and twisting.
Repeat the above operations for the opposite bearing cup, and the remaining bearing cups at each end of the shaft.

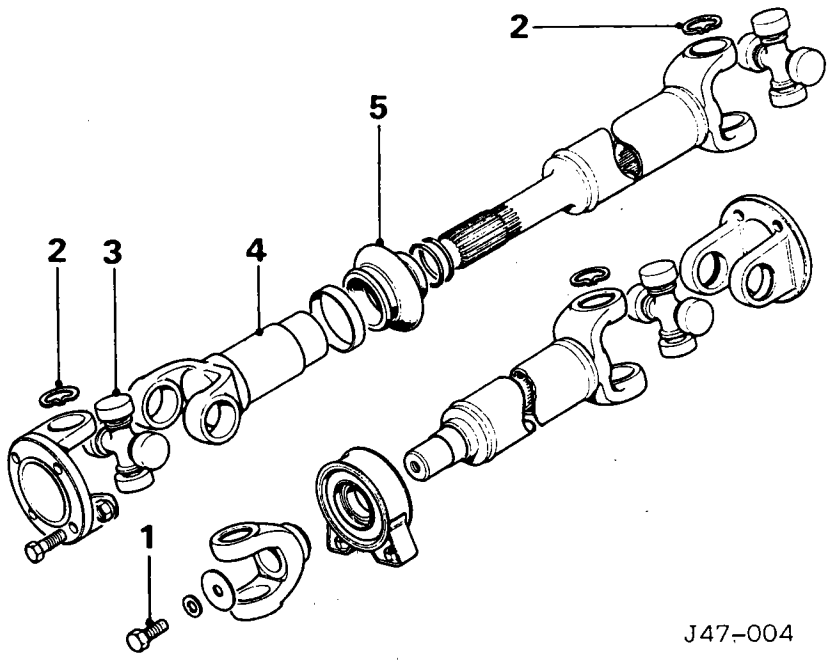


Fig. 3

Sliding joint and gaiter

To remove the gaiter from the sliding joint or the front propeller shaft, clean the gaiter and the area of the shaft adjacent to it. Ensure that the arrows are visible on the sleeve yoke and shaft (1, Fig. 4). Cut the metal and rubber rings (2, Fig. 4) securing the gaiter to the yoke and shaft, withdraw the gaiter (5, Fig. 5) along the shaft.

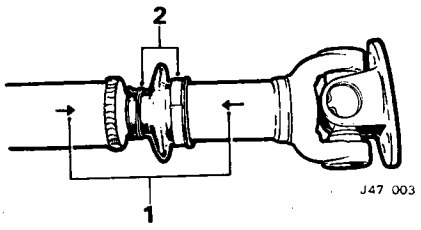


Fig. 4

Partially withdraw the sleeve yoke (4, Fig. 5) from the splined shaft and examine the splines for wear. If there is more than 0,1 mm (0.004 in) circumferential movement measured on the outside diameter of the spline, then the complete propeller shaft assembly must be renewed.
Withdraw the sleeve yoke (4, Fig. 5) from the splines shaft and remove the gaiter (5, Fig. 5).

Inspection

Carefully inspect the internal and external splines of the sliding joint. Ensure that the welch washer in the female spline is secure and leakproof.
Wash all the other components of the propeller shaft assembly in petrol, examine bearing races and spider journals for signs of looseness, load markings, scoring or distortion. Spiders or bearings should not be renewed separately, as this will cause premature failure of the replacement.
It is essential that the bearing cups (3, Fig. 5) are a light drive fit in the yoke trunnions.

Reassembling

Universal joints

Using new universal joint assemblies if necessary, insert the journal cross into the flange, tilting it to engage in the yoke bores.
Ensure that all the needle rollers are in position; fill each bearing cup one-third full of grease of the recommended type.
Fit one of the bearing cups (3, Fig. 5) in the yoke bore, and using a suitable soft metal drift, tap the bearing cup fully home.
Fit a new snap-ring (2, Fig. 5) ensuring it is correctly located in the groove.
Assemble the other spiders and bearing cups, and fit new snap-rings, to retain the bearing cups.

Sliding joint and gaiter

Lubricate the internal and external splines generously with Blended Spline Grease (ref. MNR (A) supplied by Oilene Ltd.), align the arrows and engage the male and female splines.
Ensure that a dimension of less than 185 mm (7.3 in) can be obtained between the yoke joint centre-line and the weld centre-line on the propeller shaft.
Withdraw the shaft and check for complete coverage of the splines by the lubricant.
To prevent damage to the rubber rings and gaiter wrap thin metal or plastic film over the male splines. Pass the two rubber rings over the splines, followed by the smaller end of the gaiter, place the rings over the gaiter.
Remove the protective film from the splines.
Position the metal ring clip on the gaiter, realign the splines and ease the gaiter over the sliding joint. Check that the arrows align (1, Fig. 4) and fit the sleeve yoke to the shaft.
Secure the gaiter clip.

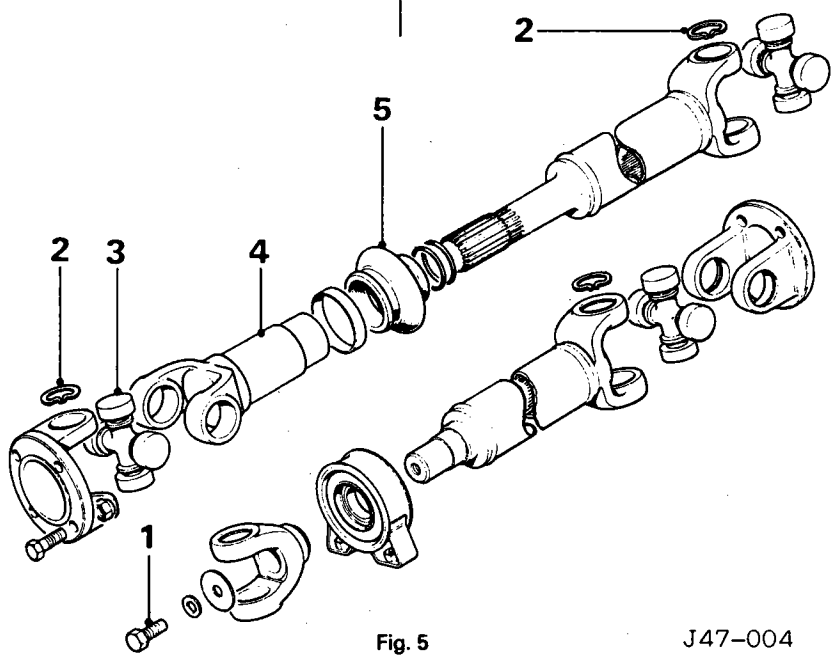


Fig. 5 J47–004

Rear propeller shaft

Coat the splines of the rear propeller shaft with Loctite grade AVV and fit to the centre joint yoke, align the marks previously made.
Fit and tighten the bolt (1, Fig. 5) secure using a new tab washer.