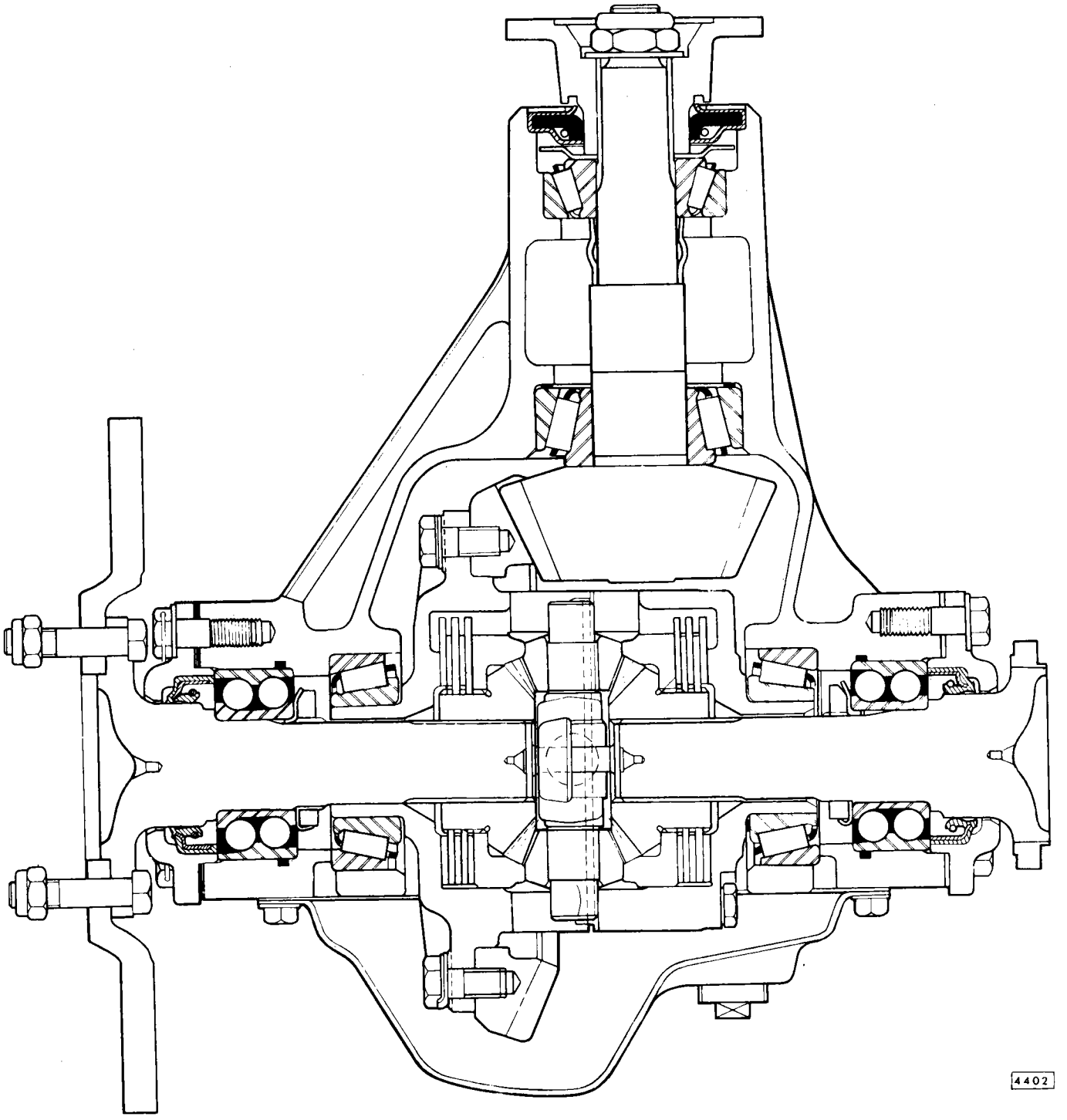
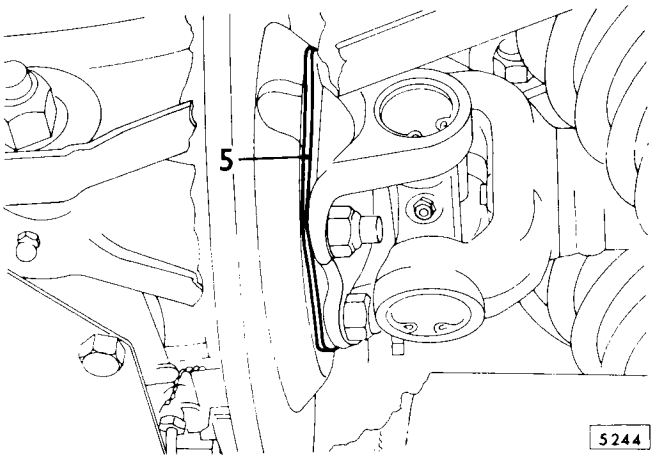
CONTENTS


4402

HALF SHAFT

Remove and refit **51.10.03**



Removing

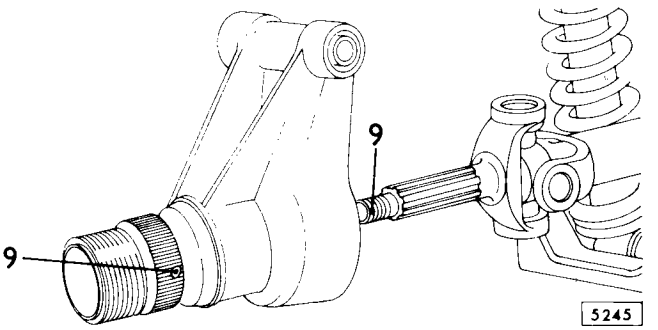
1. Remove rear suspension unit – 64.25.01.
2. Remove hub – 64.15.01.
3. Remove forward damper and spring unit – 64.20.02.
4. Remove four steel self locking nuts securing half shaft flange to drive shaft flange and brake disc.
5. Draw half shaft from suspension unit noting number of camber shims fitted between half shaft flange and brake disc.

Refitting

6. Replace camber shims removed in operation 5.
7. Fit half shaft inner universal joint over four bolts and fit steel locknuts. Torque to 6,9 to 7,6 kg.m. (50 to 55 lb.ft.).
8. Refit forward damper and spring unit.
9. Refit hub.

NOTE: If car fitted with wire wheels and associated splined hub, rotate half shaft to align split pin hole with access hole in hub.

10. Refit rear suspension.
11. Check rear wheel camber – 64.25.18.



HALF SHAFT

Overhaul **51.10.14**

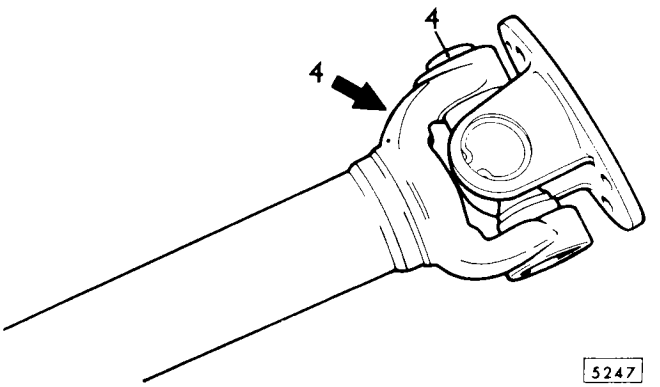
1. Remove half shaft from car – 51.10.03.

Dismantling

2. Clean paint and dirt from splines and both universal joints.
3. Remove snap rings from grooves.

NOTE: If snap ring difficult to remove, tap bearing inwards to relieve pressure on ring.

4. Hold flanged yoke in hand and tap lug with soft faced hammer. Bearing will gradually emerge and can finally be removed with the fingers.
5. Repeat operation for opposite bearing and remove flanged yoke.
6. Rest exposed trunnions on wood or lead blocks, and tap yoke to remove remaining two bearings.
7. Repeat operations 4 to 6 inclusive on splined yoke end of shaft.
8. If it is required to remove outer universal joint cover, release jubilee clip and drill out rivets.



Inspection

9. Wash all parts in petrol.
10. Check splined yoke for wear of splines.
11. Examine bearing races and spider journals for signs of looseness, load markings, scoring or distortion.
12. Spider or bearings should not be renewed separately, as this will cause premature failure of the replacement.
13. It is essential that bearing races are a light drive fit in yoke trunnion.

Reassembling

14. Fit new cork gaskets and gasket retainers to spiders.
15. Fit needle rollers in bearing housings.
    Retain, if necessary, with petroleum jelly during assembly.
16. Insert two spider journals in a yoke, and using a soft round drift ,8 mm. (.031 in.) smaller in diameter than hole in yoke, tap bearings into position.
17. Fit two spider journals to shaft yoke and assemble bearings as in operations 14, 15 and 16.
18. When four bearings are assembled to joint, fit new snap rings to retain bearing housings.
19. If joint appears to bind, tap it lightly with soft faced hammer and exercise it until free.
20. Complete assembly of opposite end of half shaft.
21. If outer universal joint cover has been removed pop rivet two halves of replacement together with open end of cup towards splined yoke joint.
22. Open jubilee clip and fit around half shaft to secure collar of joint cover.

DRIVE FLANGE

Remove and refit **51.15.36**

CAUTION: The drive flange securing nut must not be loosened for any reason other than carrying out a procedure detailed in this workshop manual.
If the nut is moved in error, the complete procedure, Final drive unit, overhaul – 51.25.19, must be used to ensure subsequent satisfactory operation of the final drive.

DRIVE PINION SHAFT OIL SEAL

Remove and refit **51.20.01**

As the collapsible spacer preloading the pinion shaft taper roller bearings must be replaced each time the pinion flange securing nut is released, it is impossible to change the pinion shaft oil seal without removing final drive unit from car, see operation 51.25.13. Further, to ensure that tolerance build up does not disturb backlash, pinion settings and tooth meshing, it is adviseable to carry out full overhaul procedure, operation 51.25.19., when renewing the oil seal.

DRIVE SHAFT OIL SEAL

Remove and refit **51.20.19**

The drive shaft oil seal is integral with the caliper mounting bracket.

Removing

1. Remove half shaft – 51.10.03.
2. Remove locking wire and withdraw two bolts and lockwashers securing brake caliper to final drive unit.
3. Remove discs, noting number of shims removed between brake disc and drive shaft flange.
4. Remove locking wire and remove five bolts securing caliper mounting bracket.
5. Withdraw drive shaft, together with caliper mounting bracket shims, ball bearing and square section oil seal from housing.
6. Turn down tab washer and remove nut from drive shaft.
7. Remove ball bearing and caliper mounting bracket from drive shaft.

Refitting

8. Lightly oil new square section seal, position carefully, and press squarely to fully seat in drive shaft ball bearing housing.

   CAUTION: Under no circumstances must the portion of oil seal protruding above the housing be removed. This induces a metal to metal contact between housing and bearing, and completely destroys the seal properties.

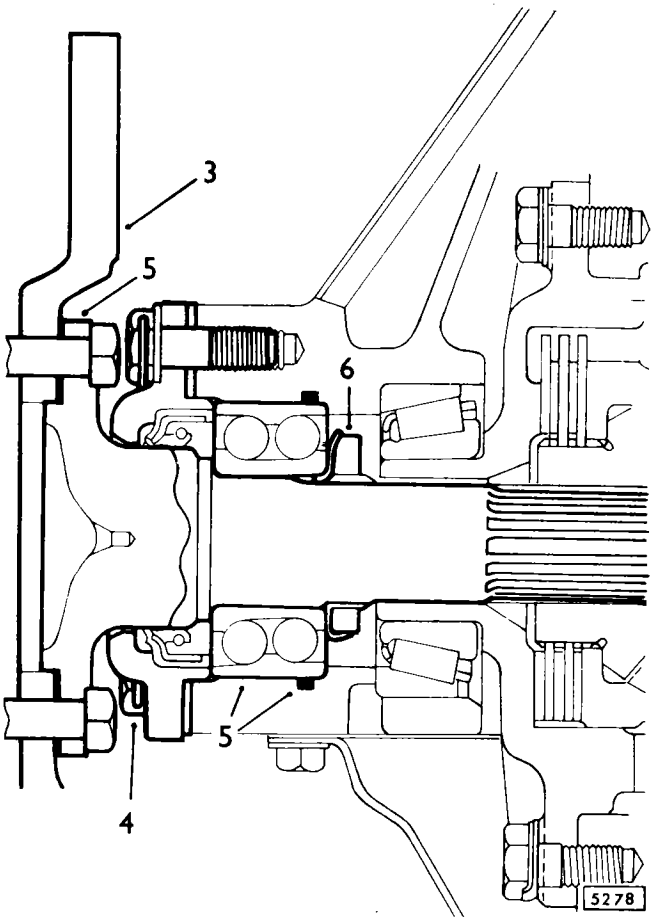
9. Coat oil seal with hypoid gear oil, fit four special flange bolts and position caliper mounting bracket and oil seal assembly over drive shaft.

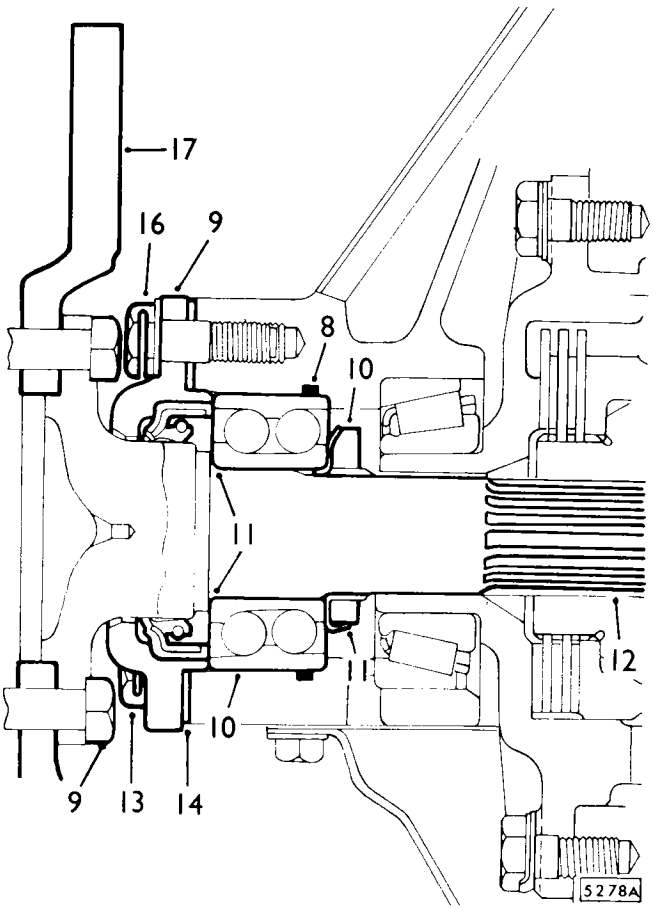
   NOTE: Brackets are handed.

10. Slide a ball bearing on to drive shaft followed by a new tab washer and nut.
11. Ensure bearing seats square to drive shaft shoulder. Tighten nut to 12,4 to 14,2 kg.m. (90 to 110 lb.ft.) and turn up tab washer.
12. Lightly oil drive shaft splines and fit shaft into differential casing.
13. Fit five bolts and spring washers to retain mounting bracket. Screw up until finger tight.

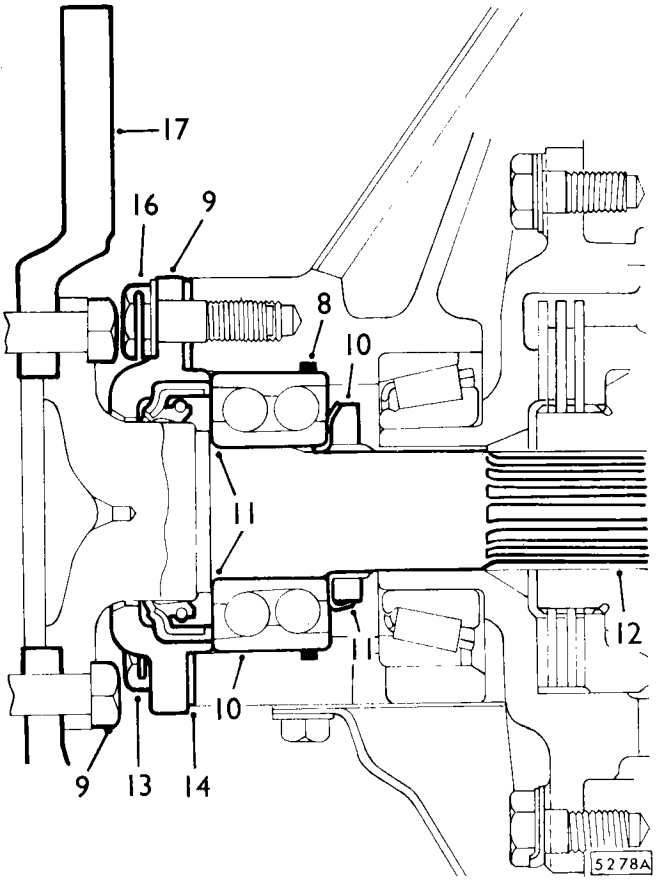
    NOTE: Allowance has been made when calculating shimming required for ,076 mm. (.003 in.) squash of the oil seal when fully tightened.

14. Using feeler gauges, measure dimension between inside face of caliper mounting bracket and differential housing. The measurement obtained determines shimming required to give correct degree of nip on outer ball bearing race and oil seal flange. Shims are available in the following thicknesses: ,076 mm., ,127 mm., ,254 mm., and ,762 mm. (.003 in., .005 in., .010 in. and .030 in.).





15. Remove drive shaft, select shims of required thickness, thinly coat mating faces and shims with Hylomar (NOT grease). Tighten bolts to 7,6 to 9,7 kg.m. (55 to 70 lb.ft.) by diagonal selection.
16. Wire lock five securing bolts to tension bolt in clockwise direction.
17. Fit discs to drive shaft flanges, using shims removed in operation 3 between disc and flange.
18. Fit caliper to mounting bracket using two bolts and lockwashers.
19. Fit distance tubes (oversize nuts) to disc studs and secure using four nuts. Use feeler gauges to ensure disc central between jaws of caliper. If necessary add to or remove from shim pack between drive flange and disc.
20. Wire lock caliper bolts.
21. Refit half shaft.

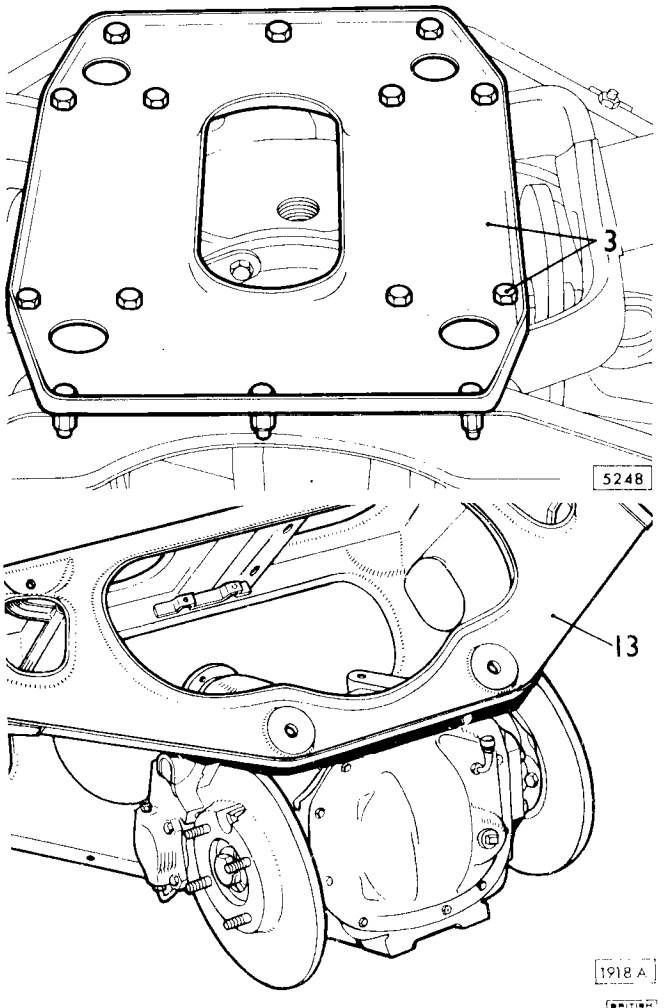


FINAL DRIVE UNIT

Remove and refit 51.25.13

Removing

1. Remove rear suspension unit – 64.25.01.
2. Remove final drive drain plug and allow oil to drain.
3. Invert suspension assembly on bench and remove bolts and lock nuts securing tie plate.
4. Remove hydraulic dampers and road springs – 64.20.02.
5. Remove four self locking nuts securing half-shaft inner universal joint to brake disc and final drive output flange.
6. Withdraw half-shaft from bolts on flange noting the number of camber shims.
7. Remove one nut from inner wishbone fulcrum shaft and drift out shaft.
8. Withdraw hub, half-shaft, wishbone and radius arm assembly
9. Repeat operations 5 to 8 on opposite side of suspension.
10. Disconnect hydraulic brake pipes from calipers. Plug holes to prevent ingress of dirt.
11. Remove split pins, clevis pins and washers securing handbrake levers to compensator.
12. Remove locking wire from differential carrier bolts.
13. Turn assembly over, unscrew carrier bolts and remove crossbeam from carriers by tilting forward over the nose of the pinion.
14. Remove locking wire, and withdraw two bolts and lock washers securing each caliper to the final drive unit.
15. Remove discs noting number of shims removed between brake disc and drive shaft flange.



Refitting

16. Fit discs to drive shaft flanges, using shims removed in operation 15 between disc and flange.
17. Fit caliper to mounting bracket using two bolts and lockwashers.
18. Temporarily position half shaft inner universal joint at disc and secure using four nuts. Use feeler gauges to ensure disc central between jaws of caliper. If necessary add to or remove from shim pack between drive flange and disc.
    Remove four nuts securing half shaft.
19. Wire lock caliper bolts.
20. Reverse operations 1 to 13 inclusive, wire locking to tension bolts in a clockwise direction.
21. Check rear wheel camber – 64.25.18.

FINAL DRIVE UNIT

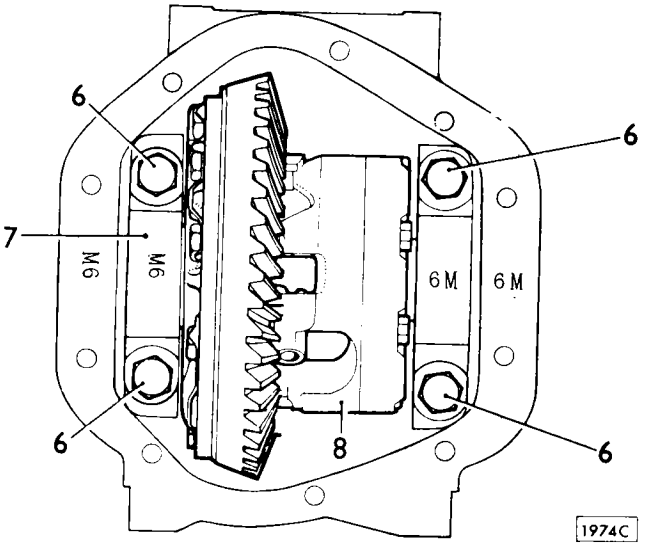
Overhaul **51.25.19**

Service tools

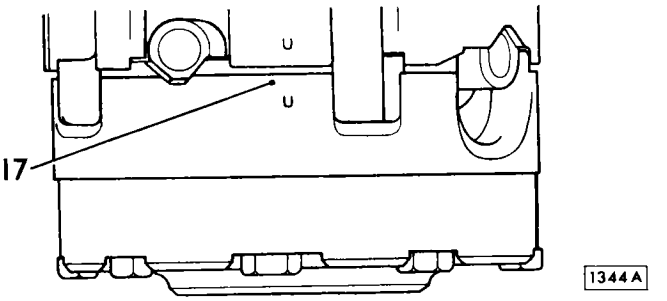
Puller SL.14
SL.14/1
SL.14/3
Gauge mount SL.3
Pinion oil seal replacer SL.4
Gauge block 4 HA
Press tool SL.550/4
Handle 550

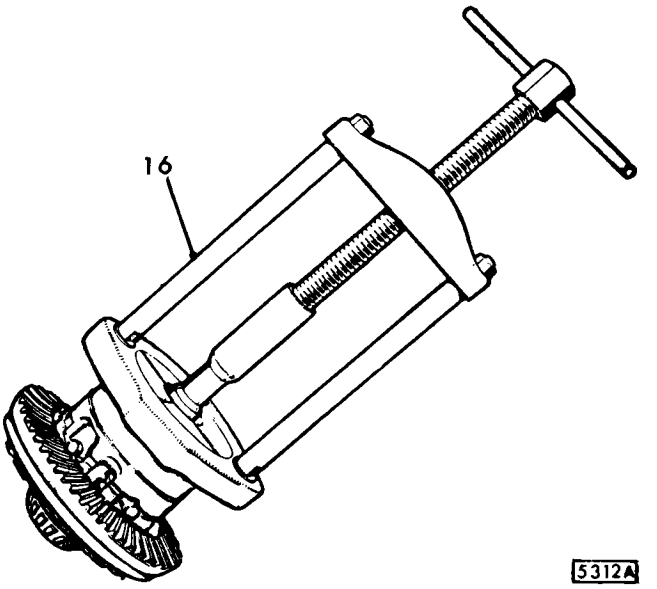
Dismantling

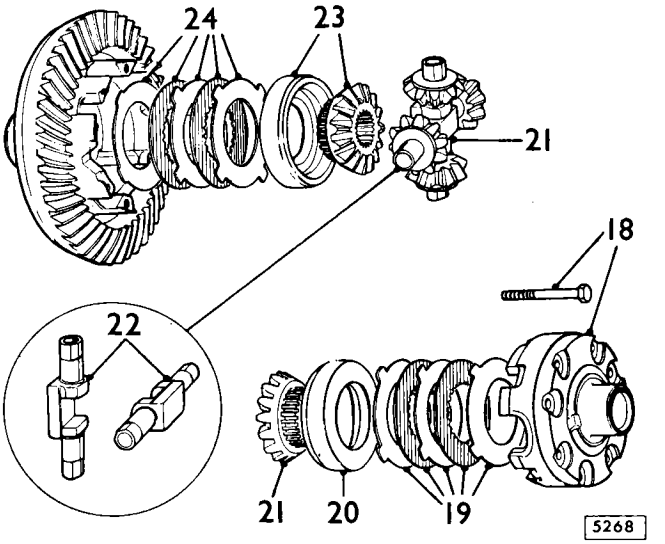
1. Support unit in vice.
2. Remove rear cover.
3. Remove locking wire and remove five bolts securing caliper mounting bracket.
4. Withdraw drive shaft, together with caliper mounting bracket shims, ball bearings and square section oil seal. Turn down tab washer, remove nut and withdraw ball bearing and caliper mounting bracket from drive shaft.
5. Carry out operations 3 and 4 on second drive shaft.
6. Remove two bolts holding each differential bearing cap.
7. Lift caps out of differential housing.
8. Using two levers, suitably padded to prevent damage to differential carrier, prise out differential unit, crownwheel and bearing assembly.
9. Remove drive pinion nut.
10. Remove 'D' washer.
11. Suitably mark relative positions of companion flange to pinion shaft.
12. Withdraw companion flange.
13. Using a suitable press, extract pinion from differential housing.
14. Remove oil seal, oil thrower and outer bearing cone.
**15. Examine inner and outer bearing cups for wear. If replacement is required extract cups using tools No. SL.14 and SL.14/1.
16. Remove differential side bearings using Tools SL.14 and SL.14/3.**



17. In the absence of any alignment marks, scribe a line across both halves of differential casing to facilitate reassembly.
18. Remove eight bolts securing both halves of differential casing.
19. Split casing and remove clutch discs and plates from one side.
20. Remove differential side ring.
21. Remove pinion side gear and pinion cross shafts complete with gears.
22. Separate cross shafts.
23. Remove remaining side gear and ring.
24. Extract remaining clutch discs and plates.

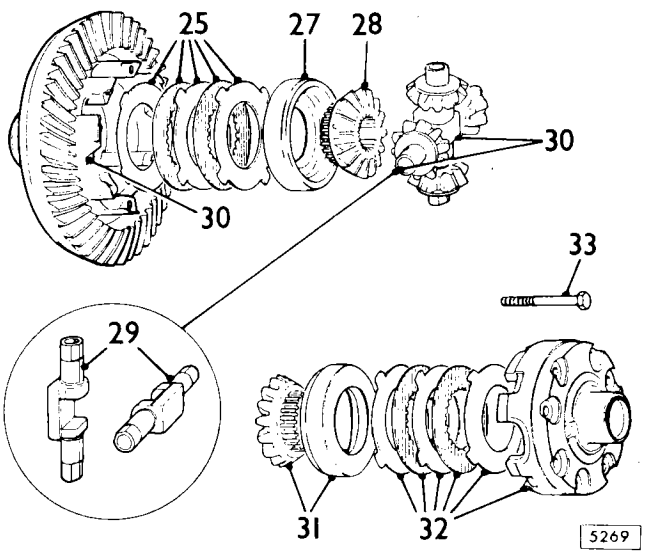






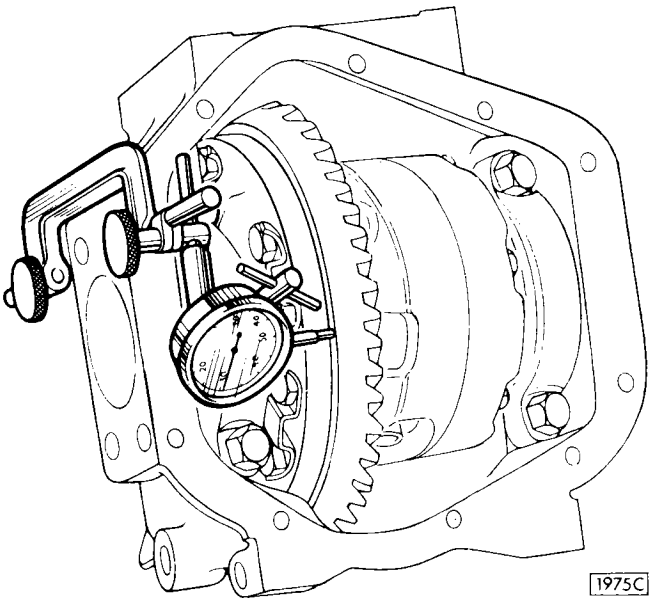
Reassembling

25. Refit clutch plates and discs alternately into flange half of the casing.
26. Fit two belleville clutch plates so that convex sides are against differential casing.
27. Fit side ring.
28. Position one side gear into ring recess.
29. Fit cross shafts.
30. Refit pinion mating cross shafts complete with pinion gears ensuring that ramps on the shafts coincide with the mating ramps in the differential case.
31. Assemble remaining side gear and ring.
32. Offer up bottom half of differential case to flange half in accordance with identification marks and position clutch friction plate tongues so that they align with grooves in differential case.
33. Assemble bottom half to flange half of differential case using eight bolts, but do not tighten at this stage.
34. Check alignment of splines by inserting two drive shafts.
35. Tighten eight bolts to a torque of 4,8 to 6,2 kg.m. (35 to 46 lb.ft.) while drive shafts are in position.
36. With one drive shaft locked, the other drive shaft must not turn radially more than 19 mm. (.75 in.) measured on a 152 mm. (6 in.) radius.



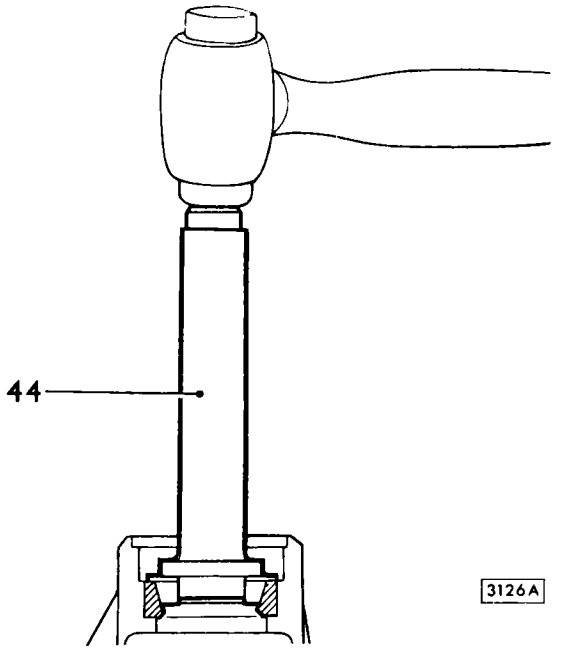
Thickness of shims required in the installation of the differential side bearings is determined as follows:-

37. Fit differential side bearings, without shims, on the differential case, making sure that bearings and housing are perfectly clean.
38. Place the differential assembly, with the bearings in their housing, within the gear carrier, the pinion not being assembled.
39. Install dial indicator gauge (tool No. SL.3), setting the button against back face of drive gear.
40. Inserting two levers between housing and the bearing cups, move the differential assembly to one side of the carrier.
41. Set the dial indicator to zero.
42. 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.

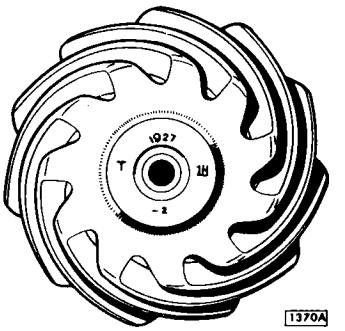


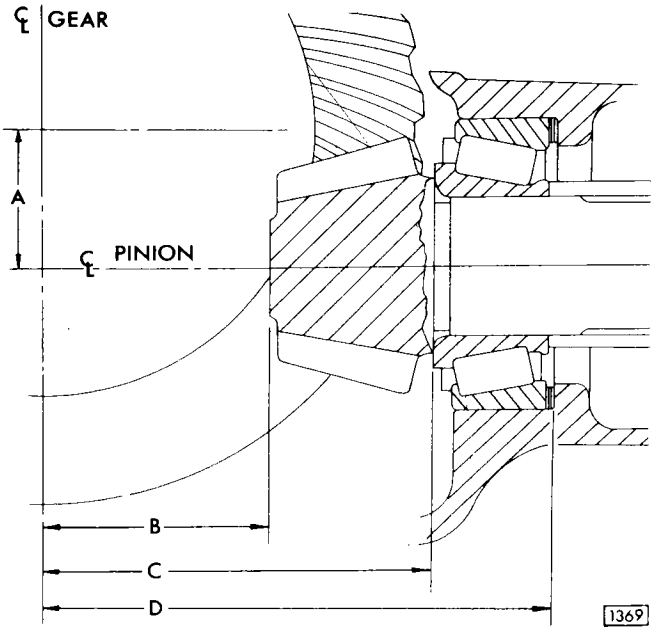
NOTE: Add ,13 mm. (.005 in.) more to the clearance reading to give preload: This thickness of shims to be used in the installation of the differential bearings, the shims being divided to give the gear position with correct backlash.

43. Remove differential assembly from the gear carrier.
44. Re-install the pinion outer bearing cup using tool No. SL.550/4 with 550 Handle.
45. Fit inner bearing cup adjusting shims and install inner bearing cup.
46. Press inner bearing cone on to pinion using an arbor press and length of tube contacting the inner race only. Do not press on roller retainer.



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 at the top is also marked on the drive gear, 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 (–).
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 ,0508 mm. (.002 in.) and a pinion marked Minus two (–2) to the cone setting distance minus .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 – ,0508 mm. (2.623 in. i.e. 2.625 – .002) and for a pinion marked Plus three (+3) the cone setting distance should be 66,746 mm. (2.628 in.).

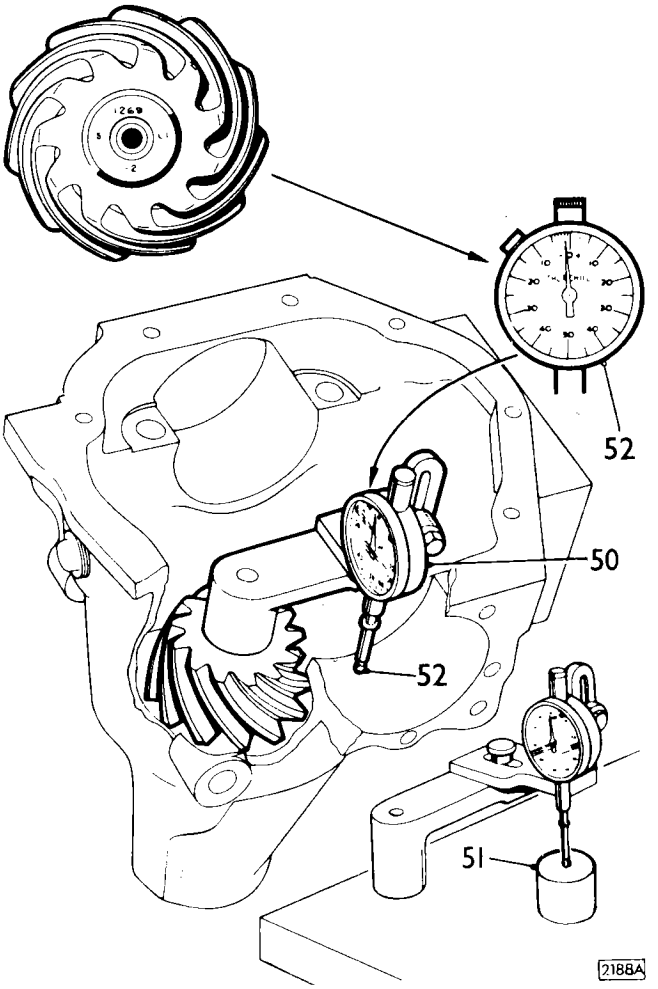


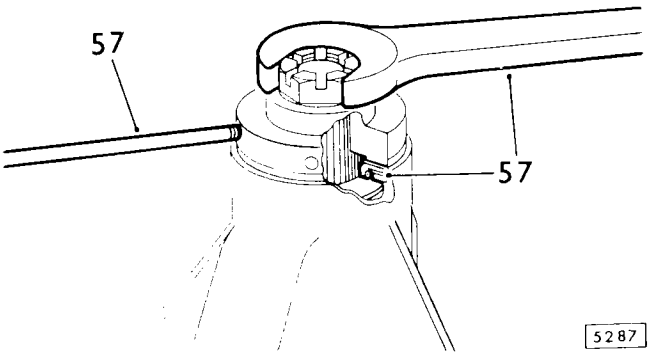


A	Pinion drop 1.5 in. (38.1 mm)
B	Zero cone setting 2.625 in. (66.67 mm)
C	Mounting distance 4.312 in. (108.52 mm)
D	Centre line to bearing housing 5.495 in. (139.57 mm) to 5.505 in. (139.83 mm)

47. Place pinion, together with inner bearing cone, into gear carrier.
48. Turn carrier over and support pinion with a suitable block of wood for convenience before attempting further assembly.
49. Fit pinion outer bearing cone, companion flange, washer and nut only, omitting the collapsible spacer, oil thrower and oil seal, and tighten nut.
50. Check pinion setting distance by means of gauge, tool No. SL.3.
51. Adjust bracket carrying dial indicator using 4 H.A. setting block and set dial face to zero.
52. Check pinion setting by taking a dial indicator reading on the differential bearing bore with the assembly firmly seated on the ground face of the pinion. 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.
53. If pinion setting is incorrect it is necessary to dismantle the pinion assembly and remove 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 ,076 mm., ,127 mm. and ,254 mm. (.003 in., .005 in. and .010 in.). Repeat operations 52 and 53 until satisfactory result is obtained.
54. Extract pinion shaft from gear carrier sufficiently far to enable the outer bearing cone to be removed from the pinion.
55. Fit the collapsible spacer to the pinion ensuring that it seats firmly on the machined shoulder on the pinion shaft.
56. Insert pinion into gear carrier.
57. Refit outer-bearing cone, oil thrower and oil seal.
58. Lightly grease splines of pinion shaft and fit companion flange.

NOTE: Ensure reference marks made during dismantling are in alignment.



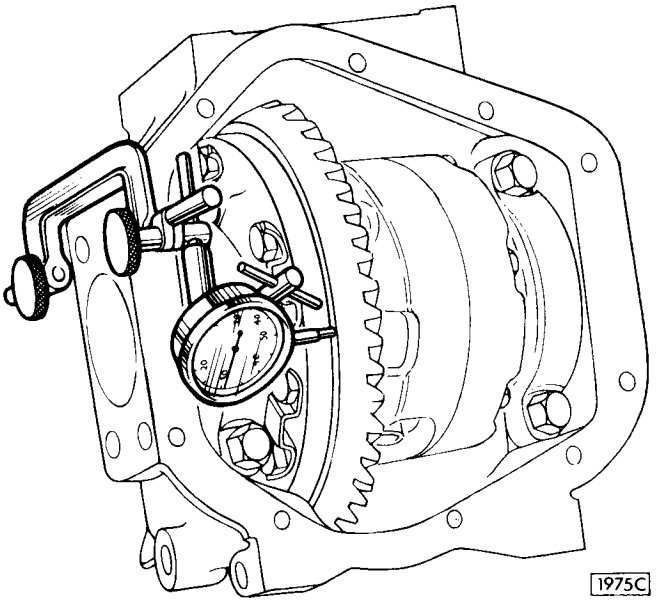


59. Fit new 'D' washer, convex side facing towards the end of the shaft.
60. Fit the nut but DO NOT tighten at this stage.
61. Place differential assembly complete with side bearings but less shims, in the housing. Ensure that bearings and housing are perfectly clean.
62. Install a dial indicator on the housing with button on back face of drive gear.
63. Insert two small levers between housing and side bearing. Move differential case and drive gear assembly away from pinion until opposite side bearing is seated against housing.
64. Set dial indicator to zero, then move differential assembly towards pinion until drive gear is in metal to metal contact, and deeply in mesh with pinion.

    NOTE: The indicator reading now obtained (i.e. clearance between drive gear and pinion) minus the backlash allowance etched on the drive gear (e.g. B/L .007) denotes the thickness of shims (in inches) to be placed between the differential case and the side bearing on the drive gear side of the differential.

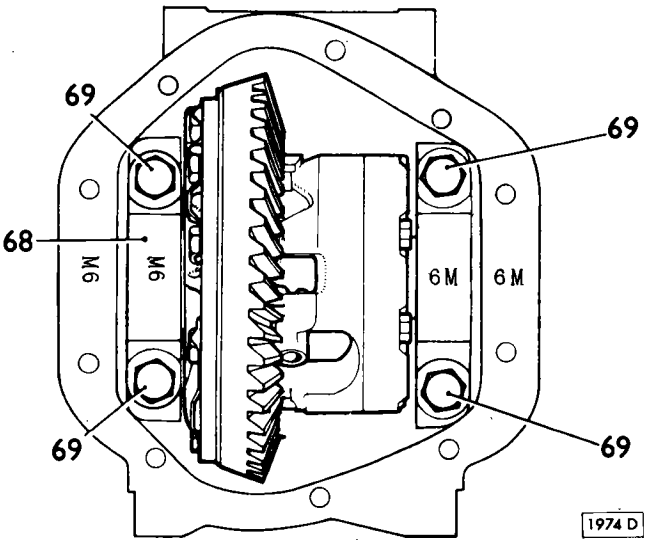
65. Install thickness of shims, determined in operation 64, on drive gear side of differential, taking shims from pack determined previously in operation 42.
66. Install balance of total shims required on opposite side of differential case.

    NOTE: As an example of differential and drive gear adjustment, assume that the total indicator reading obtained in operation 42 is 2,032 mm. (.080 in.). This figure plus ,127 mm. (.005 in.) for the recommended preload, equals 2,159 mm. (.085 in.) which denotes the total thickness of shims to be used. Also assuming the clearance between drive gear and pinion to be 1,067 mm. (.042 in.) determined as in operations 61 to 64, subtract the backlash as etched on the gear, say ,178 mm. (.007 in.) from the 1,067 mm. (.042 in.) clearance. The ,889 mm. (.035 in.) difference denotes the thickness of shims to be placed between the differential case and side bearing on the drive gear side of the differential. Then subtract the thickness of shims ,889 mm. (.035 in.) inserted on the drive gear side of the differential case from 2,159 mm. **(.085 in.)** and the 1,270 mm. (.050 in.) difference denotes the thickness of shims to be installed on the opposite side of the case.

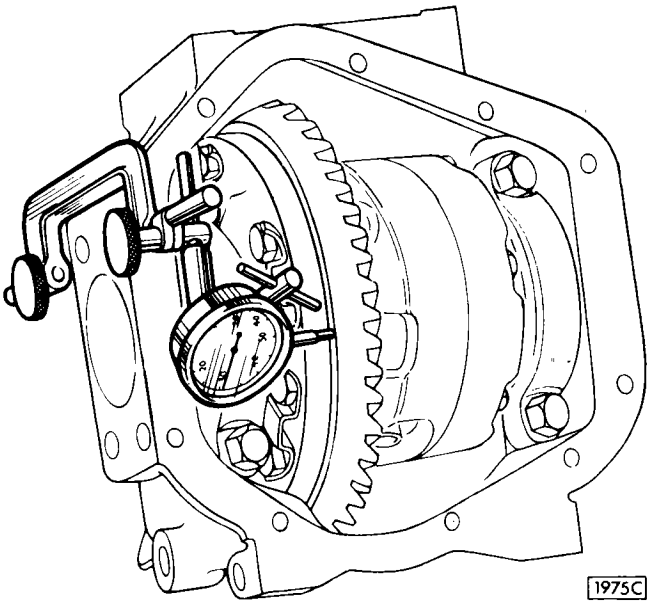


67. Lower differential assembly into position lightly tapping the bearings home with a hide hammer.

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.

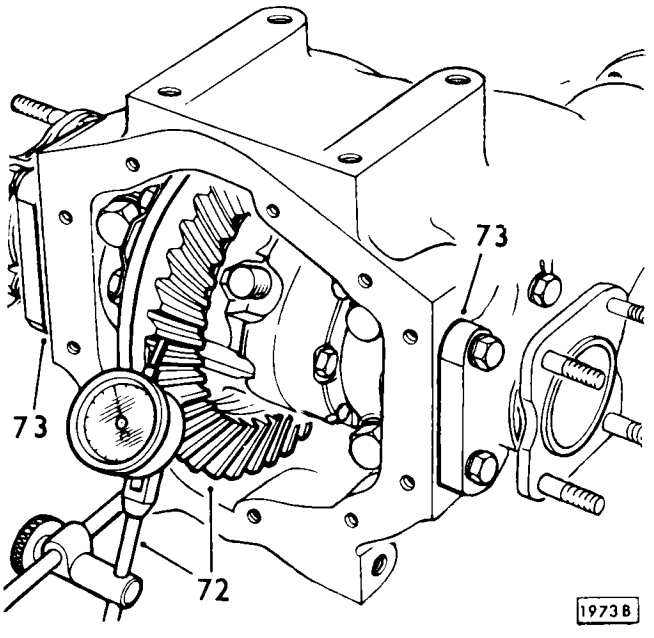


68. When refitting side bearing caps, ensure that position of the numerals marked on gear carrier housing face and side bearing cap coincide.
69. Tighten caps to a torque of 8,3 to 9,0 kg.m. (60 to 65 lb.ft.).
70. Mount a dial indicator on gear carrier housing with the button against back face of gear as for operation 62.
71. Turn pinion by hand and check run out on back face of gear. Run out should not exceed ,13 mm. (.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.
72. Remount dial indicator on gear carrier housing with button tangentially against one of drive gear teeth.
73. Move drive gear by hand to check backlash which should be as etched on the gear. 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.



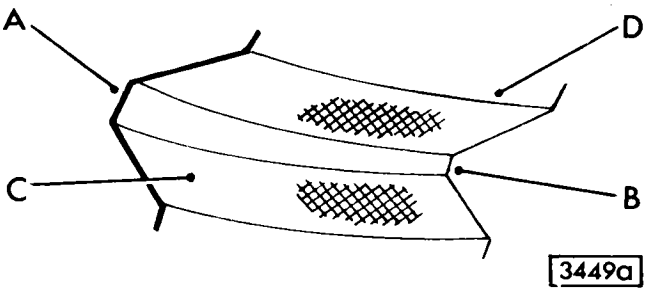
NOTE: To increase backlash remove shims from the drive gear side of the differential and install on the opposite side. To decrease backlash transfer shims to the drive gear side from the opposite side of the differential case.

74. After setting backlash to required figure use a small brush to sparingly paint eight or ten of the drive gear teeth with a stiff mixture of marking raddle or with engineers blue. Move painted gear teeth in mesh with pinion until a good impression of the total contact is obtained. The result should conform with ideal impression given. Correction procedure of poor meshing is also given.
75. 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.

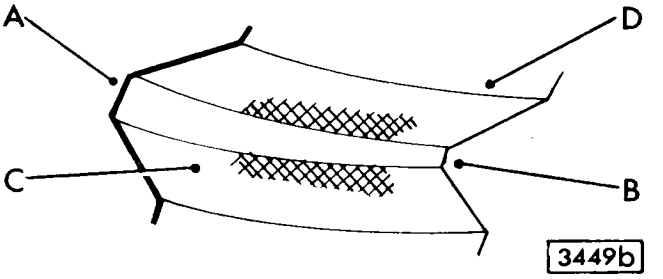


NOTE: If 'ideal' impression obtained, proceed with operation 80, otherwise continue with operation 76, 77, 78 or 79 as applicable.
Nomenclature referring to gear teeth is as follows:-

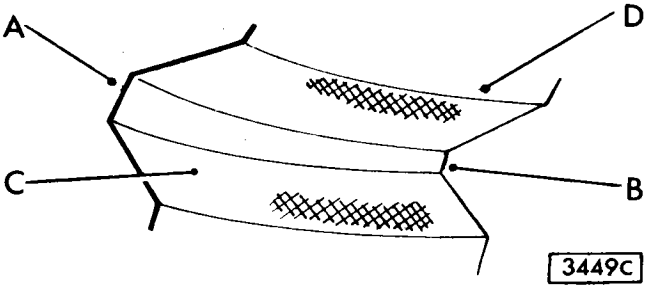
The HEEL is the large or outer end of the tooth (see 'A')
The TOE is the small or inner end of the tooth (see 'B')
The DRIVE side of the drive gear tooth is CONVEX (see 'C')
The COAST side of the drive gear tooth is CONCAVE (see 'D')



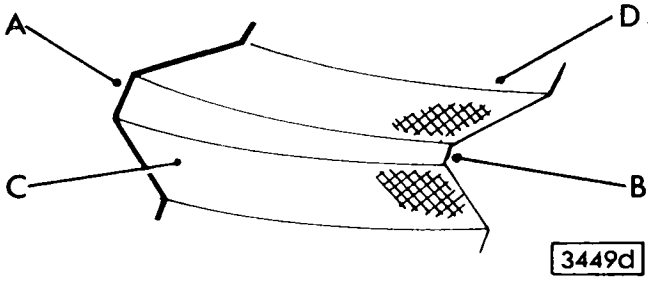
76. In High Tooth Contact it will be observed that the tooth contact is heavy on the drive gear face or addendum. To rectify this condition, move the pinion deeper into mesh, that is, reduce the pinion cone setting distance, by adding shims between the pinion inner bearing cup and the housing and fitting a new collapsible spacer.
This correction has a tendency to move the tooth bearing towards the toe on drive and heel on coast, and it may therefore be necessary after making this change to adjust the drive gear as described in operations 78 and 79.



77. 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 76 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.
This correction has a tendency to move the tooth bearing towards the heel on drive and toe on coast, and it may therefore be necessary after making this change to adjust the drive gear as described in operations 78 and 79.

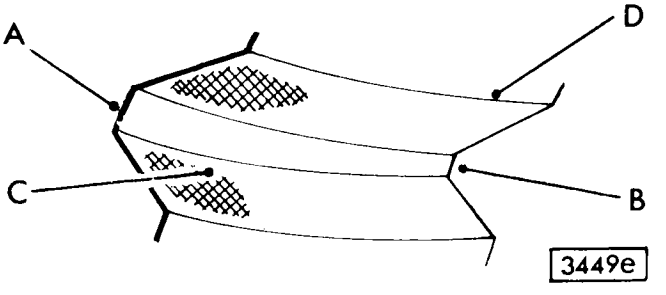


78. Toe Contact occurs when the bearing is concentrated at the small end of the tooth. To rectify this condition, move the drive gear out of mesh, that is, increase backlash, by transferring shims from the drive gear side of the differential to the opposite side.

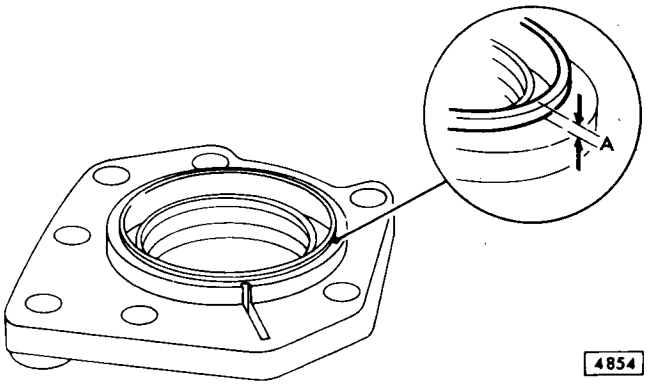


79. Heel Contact is indicated by the concentration of the bearing at the large end of the tooth. To rectify this condition move the drive gear closer into mesh, that is, reduce backlash, by adding shims to the drive gear side of the differential and removing an equal thickness of shims from the opposite 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 ,10 mm. (.004 in.).



80. Lightly oil new square section seal, position carefully, and press squarely to fully seat in drive shaft ball bearing housing.

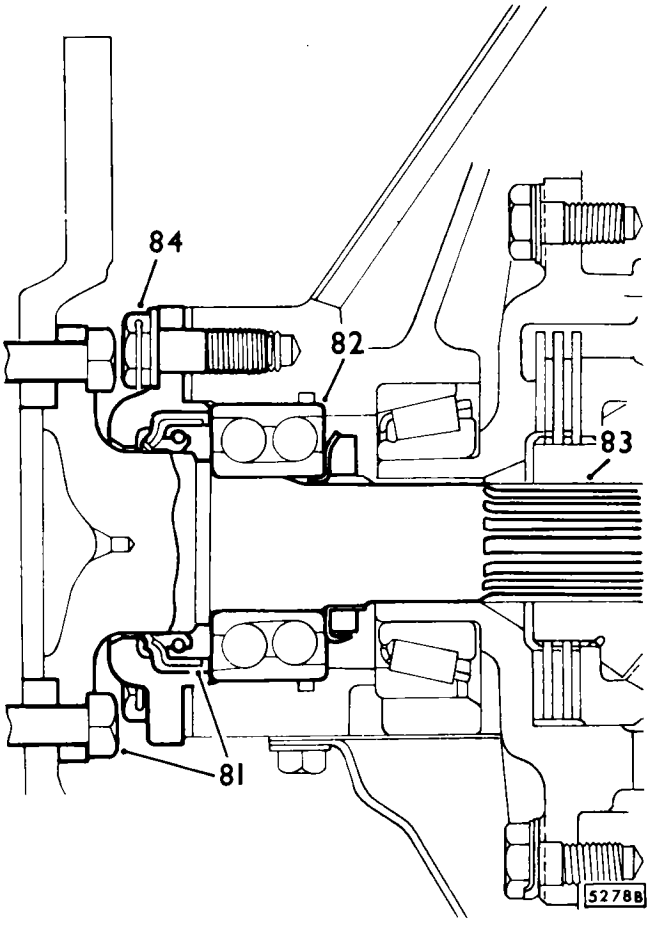


81. Coat oil seal with hypoid gear oil, fit four special flange bolts and position caliper mounting bracket and oil seal assembly over drive shaft.

CAUTION: Under no circumstances must the portion of caliper mounting bracket oil seal 'A' protruding above the housing be removed. This induces a metal to metal contact between housing and bearing and completely destroys the seal properties.

82. Slide a ball bearing on to drive shaft followed by new tab washer and nut. Ensure bearing seats square to drive shaft shoulder. Tighten nut to 12,4 to 14,2 kg.m. (90 to 110 lb.ft.) and turn up tab washer.
83. Lightly oil drive shaft splines and fit shaft into differential casing.
84. Fit five bolts and spring washers to retain mounting bracket. Screw up until finger tight.

NOTE: Allowance has been made when calculating shimming required for ,076 mm. (.003 in.) squash of the oil seal when fully tightened.



85. Using feeler gauges, measure dimension between inside face of caliper mounting bracket and differential housing. The measurement obtained determines shimming required to give correct degree of nip on outer ball bearing race and oil seal flange.
Shims are available in the following thicknesses: ,076 mm., ,127 mm., ,254 mm. and ,762 mm. (.003 in., .005 in., .010 in. and .030 in.).
86. Remove drive shaft, select shims of required thickness. Thinly coat mating faces and shims with Hylomar (NOT grease), Fit four special flange bolts and refit drive shaft. Tighten bolts to 7,6 to 9,7 kg.m. (55 to 70 lb.ft.) by diagonal selection.
87. Wire lock five securing bolts to tension bolt in clockwise direction.

CAUTION: Exercise the greatest care when torquing companion flange nut as overtightening will necessitate almost complete dismantling of final drive unit to replace collapsible spacer.

88. Tighten companion flange securing nut to 16,6 to 19,34 kg.m. (120 to 140 lb.ft.). During tightening operation, the companion flange should be rotated periodically to ensure correct seating of the taper roller bearings.
Should the nut be inadvertently overtightened, the flange must be removed and a new collapsible spacer fitted. On no account must the nut be slackened off and re-torqued, as this will result in incorrect preloading of drive pinion bearings.
89. Using new gasket coated with Hylomar fit rear cover. Fit axle ratio tab beneath one of securing bolts.
90. Refit final drive unit to rear suspension unit.