

WINGET

SERVICE MANUAL

SALISBURY 5HA AXLES

**WINGET LIMITED
P.O. BOX 41
EDGEFOLD INDUSTRIAL ESTATE
PLODDER LANE
BOLTON
LANCS
TEL: ++ 44 (0) 1204 854650
FAX: ++ 44 (0) 1204 854663
parts@winget .co.uk
service@winget.co.uk
www.winget.co.uk**

Introduction

Winget Limited gratefully acknowledge the assistance given by GKN Salisbury in the preparation of this manual, however neither Winget Limited or Salisbury can be held responsible for any errors or omissions.

The procedures described within this manual should enable experienced service personnel to strip, repair and re-build Salisbury 5HA series axles fitted to Winget Site Dumpers in a safe and competent manner. The procedures are not intended to be used by personnel who are unfamiliar with the product or mechanically inexperienced.

It is assumed that personnel are aware of the Health & Safety Regulations which should be applied but the following should act as a reminder.

Whenever possible any repairs or service should be carried out in a clean environment. If work must be carried out on site or in the field steps should be taken to ensure that dirt or foreign materials cannot enter the assembly.

Ensure all works tools are in good condition and only use the correct tool for the job in hand.

Always wear safety spectacles when using soft or hard faced hammers, chisels, drifts or when using air tools. Wear safety spectacles when cleaning components or when grinding.

Do not misuse air lines and be aware of the damage compressed air can cause if misused.

Always make sure lifting equipment is in good condition and the Safe Working Load exceeds the weight of the component to be lifted.

Always use suitable supports i.e. axle stands or baulks of timber in conjunction with hydraulic jacks etc. Never rely on hydraulic jacks alone to support a machine.

Be aware of hot surface temperatures and take care when draining hot oils. Always dispose of waste oils in accordance with local and national regulations.

Whenever possible always disconnect the battery or battery isolator when working on the machine to prevent electrical shorts and unauthorised starting.

Refer to the operator's handbook for a guide to the correct sequence for assembling components and sub-assemblies.

Oils, fuels, silicone sealer etc can cause skin diseases if allowed to contaminate the skin. Always apply barrier creams, wear suitable protective clothing or when contamination is unavoidable clean the area with soap and water as soon as possible. Do not use thinners or other solvents to clean skin.

Health & Safety is a matter of common sense. If common sense is applied correctly the risk of accidents can be reduced.

Spares for Salisbury Axles fitted to Winget Equipment can only be obtained from Winget Limited or one of our authorised distributors and not from GKN Salisbury.

Always quote your machine's serial number and model together with axle serial number and model when ordering spare parts.

5HA series axles are designed to operate under arduous conditions and providing they are regularly and correctly maintained they will provide long trouble free service.

The contents of this manual although correct at the time of publication, may be subject to alteration by the manufacturers without notice and Winget Limited can accept no responsibility for any errors or omissions contained within the following pages. Nor can we accept any liability whatsoever arising from the use of this manual howsoever caused.

Winget Limited operate a policy of continuous product development. Therefore, some illustrations or text within this publication may differ from your machine.

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Section A

CENTRE HUB ASSEMBLIES

SECTION A.1. DISMANTLING AND REASSEMBLY OF SHIM ADJUSTED CENTRE & SUB ASSEMBLIES

This section covers certain 7HA, 4HA, 4HU, 5HA 4HS/5HS, 8HA 8HS, 8HD 10HA and 10HD centre sub assemblies.

DISMANTLING

1. Drain oil and remove the halfshafts/axle shafts.
2. Remove carrier cover and gasket - discard gasket, ('a' - figure AF1).
3. Note markings on bearing caps ('a' - figure AF2) and axle casing ('b' - figure AF2) for use when refitting.
4. Remove bearing caps using the loosened bolts to ease the caps away from the bearing. ('c' - figure AF2).
5. Remove any inclusions from stretcher holes ('d' - figure AF2) and rectify any damage on edges of holes in order that the carrier stretcher tool will fit correctly.
6. Check turn buckle on carrier stretcher tool is free and fit tool to carrier ensuring that pegs locate fully in stretcher hole.
7. Checking that no foul condition exists rotate turn buckle by spanner in order to stretch carrier - **IMPORTANT - DO NOT STRETCH CARRIER MORE THAN .010" - .012" MEASURED ACROSS STRETCHER HOLE.**
8. Remove differential assembly complete with ring gear. It may be necessary to lever the case out of the carrier. In order to prevent damage, do not lever against stretcher or carrier, but use packing.
9. Ease off turn buckle and remove spreader.
10. Remove ring gear from differential case assembly if necessary.
11. Remove bearing cones from differential case trunnion diameter, if necessary.
12. Disassemble differential in accordance with appropriate sheet.
13. Prevent rotation of companion flange by using service tool having pegs locating in flange bolt holes. Remove the locknut and washer.
14. Remove companion flange from pinion using withdrawal tool by supporting pinion inside carrier and tapping flange with hide or other suitable hammer.
15. Remove pinion complete with inner bearing cone.
16. Remove oil seal, gasket and oil thrower - discard seal and gasket.
17. Remove outer bearing cone.
18. Remove inner and outer bearing cups from carrier. (Extraction slots are provided in the carrier for ease of removal purposes). Carefully note the shim pack thickness under both cups. Discard the shims because of possible damage during removal.
19. Remove inner bearing cone from pinion using service tool.

CLEAN AND CAREFULLY CHECK ALL COMPONENTS FOR WEAR OR DAMAGE PRIOR TO REASSEMBLY

REASSEMBLY

20. Check that pinion and gear are matched in that the serial no's. on the end face of the pinion and on the outer diameter of the gears are identical. (It should be noted that marks on the pinion end adjacent to serial number have no significance in service.)
21. Assemble inner bearing cone onto pinion using service tool or suitable press.
22. Select new shim pack the size of that removed from the inner bearing. Insert into carrier. Press inner bearing cup into housing, using press and suitable adaptor (if new gear set or bearings are used the shim pack is to be chosen to give the correct pinion height setting as described later.)
23. Select new shim pack the size of that removed from the outer bearing. Insert into carrier. Press outer bearing cup into housing using press and suitable adaptor (if new gear set or bearings are used the shim pack is to be chosen to give a bearing preload as stated in table AT2).

NOTES

- a. Ensure both cups are pressed and firmly seated into carrier.
 - b. Take care not to damage face or taper of bearings whilst assembling.
 - c. Both bearing cups may be assembled together if the appropriate service tool is available.
24. Insert pinion and pinion bearing into housing and support in position.
 25. Fit outer bearing cone over pinion and seat into cup.
 26. Fit oil slinger.
 27. Fit new oil seal gasket and oil seal. The seal is to be fitted with the lip facing inwards. As an aid to assembly and to prevent lip damage, apply a small amount of grease to lip prior to assembly. The oil seal should be pressed into housing using a suitable adaptor locating near the outer diameter of the seal.
 28. Fit companion flange. If it is necessary to press or tap the flange into position do not let flange react against bearing but react against support on pinion head.
 29. Fit washer and new lock nut.
 30. Before tightening locknut apply a small amount of oil to both bearings.
 31. Tighten nut gradually to figure given in table AT3 rotating the pinion assembly slightly at intervals throughout.
 32. Check the correct positional setting of the pinion is as follows:
 - a. Check the nominal pinion cone setting distance from table AT1.
 - b. Check the variation figure marked on the head of the pinion (see figure AF3). This figure is given in thousandths of an inch.
 - c. Add these figures to give the actual required pinion cone setting distance.

Example:

Nominal cone distance	=	2.500		2.500
Marked variation	=	(+3) + .003	(-2)	- .002
Actual required distance	=	2.503		2.498

- d. Read the differential bearing seat diameter from table AT1.
- e. Subtract half the figure at 32(d) from that at 32(c) to give nominal clock setting height.

Example

32(c)	=	2.503
32(d)	=	1.500

Clock setting height		1.003

- 33. Using a small magnetic base clock and setting piece or slipblocks set the clock to the dimension obtained in 32(e). this method of clock setting is shown in figure AF4.
- 34. Ensure the pinion end is free from burrs.
- 35. Mount the magnetic base of the clock onto the pinion end so that the stylus registers in the bottom of the differential bearing bore. This is shown in figure AF5. The clock can be moved slightly to and fro by turning the pinion in order to ensure maximum reading is obtained.
- 36. Repeat operation on other differential bearing bore.
- 37. Add the two readings and halve the result in order to obtain the mean figure. If the pinion is set correctly a mean reading of zero should be obtained. A negative reading indicates the pinion is set too high and shims need to be removed from under the inner pinion bearing cup.

A positive reading indicates that the pinion is set too low and more shims need to be added under the inner pinion bearing cup.

NOTES

- a. The amount of variation away from zero gives the amount of shim adjustment required.
- b. If a change in shim pack is required it is essential that a corresponding opposite change takes place under the outer pinion bearing cup i.e. if .003" is removed from the inner bearing cup shim pack to give the correct pinion height the .003" must be added to the outer bearing cup shim pack. This is in order to maintain the correct preload for the two bearings as given in table AT2.

38. Assemble ring gear onto differential case and bolt together by gradually and evenly tightening the bolts. Do not tighten one bolt at a time but work on diametrically opposite bolts. This ensures the ring gear is seated correctly on the case. It is advised to use Loctite 'studlock' grade or similar locking compound on the bolt threads. Do not use excessively and remove any surplus. Tighten bolts to torque figures given in table AT3.
39. Assemble differential bearing cones to differential case using press and suitable adaptor. **NOTE** when pressing second bearing cone onto case, seat first bearing cone into its cup in order to prevent damage to bearing case etc.
40. With bearing cups fitted onto cones lower differential case assembly into the carrier. Take care when meshing gear and pinion not to damage teeth.
41. Position a dial gauge as shown in figure AF6.
42. Fit suitable shim packs between the differential bearing cups and carrier on each side in order to give a reading of .007" on the dial gauge when the gear backlash is measured. It is important that the pinion is not moved when measuring ring gear backlash otherwise false results are obtained.

The shim packs should be a resistance fit.

Shims are available in .003", .005", .010" and .030"

NOTE

When using new bearings rotate differential assembly approx. six times whilst pressing towards each bearing in turn - this is in order to settle bearings. Following this adjust shim packs if necessary to give resistance fit and repeat backlash check.

43. Remove differential assembly together with shim packs. Carefully note to which end the shim pack relates - add .003" shim to each pack in order to give bearing preload.
44. Remove one differential bearing cone from case and fit appropriate shim pack to case trunnion. Refit bearing cone.
45. Repeat above on other differential bearing.
46. Fit carrier stretcher tool to carrier and stretch carrier - **IMPORTANT - DO NOT STRETCH CARRIER MORE THAN .010" - .012" MEASURED ACROSS STRETCHER HOLES.**
47. Assemble differential assembly together with bearing cups into carrier. It may be necessary to tap lightly in order to assemble. Do not force assembly into position as this could cause damage to bearings.
48. Fit bearing caps noting that markings match with markings on carrier.
49. Tighten bearing cap bolts to torque figures as stated in table AT3.
50. Check companion torque to turn figures as stated in table AT2.
51. Re-fit carrier cover using new gasket. Tighten cover bolts to figure given in table AT3.
52. Re-fit half shafts/axle shafts.
53. Re-fill with oil of correct grade.

SECTION A.2. DISMANTLING AND REASSEMBLY OF AXLE CENTRE ASSEMBLIES USING COLLAPSIBLE SPACER

This section covers certain 7HA, 4HA, 4HU, 8HA 8HS, 8HD 10HA and 10HD centre sub assemblies.

DISMANTLING

1. Drain oil and remove the halfshafts/axle shafts.
2. Remove carrier cover and gasket - discard gasket, ('a' - figure AF1).
3. Note markings on bearing caps ('a' - figure AF2) and axle casing ('b' - figure AF2) for use when refitting.
4. Remove bearing caps using the loosened bolts to ease the caps away from the bearing. ('c' - figure AF2).
5. Remove any inclusions from stretcher holes ('d' - figure AF2) and rectify any damage on edges of holes in order that the carrier stretcher tool will fit correctly.
6. Check turn buckle on carrier stretcher tool is free and fit tool to carrier ensuring that pegs locate fully in stretcher hole.
7. Checking that no foul condition exists rotate turn buckle by spanner in order to stretch carrier - **IMPORTANT - DO NOT STRETCH CARRIER MORE THAN .010" - .012" MEASURED ACROSS STRETCHER HOLE.**
8. Remove differential assembly complete with ring gear. It may be necessary to lever the case out of the carrier. In order to prevent damage, do not lever against stretcher or carrier, but use packing.
9. Ease off turn buckle and remove spreader.
10. Remove ring gear from differential case assembly if necessary.
11. Remove bearing cones from differential case trunnion diameter, if necessary.
12. Disassemble differential in accordance with appropriate sheet.
13. Prevent rotation of companion flange by using service tool having pegs locating in flange bolt holes. Remove the locknut and washer.
14. Remove companion flange from pinion using withdrawal tool by supporting pinion inside carrier and tapping flange with hide or other suitable hammer.
15. Remove pinion complete with inner bearing cone.
16. Remove oil seal, gasket and oil thrower - discard seal and gasket.
17. Remove outer bearing cone and collapsible spacer - discard spacer.
18. Remove inner and outer bearing cups from carrier. (Extraction slots are provided in the carrier for ease of removal purposes). Carefully note the shim pack thickness under inner cup. Discard the shims because of possible damage during removal.
19. Remove inner bearing cone from pinion using service tool.

CLEAN AND CAREFULLY CHECK ALL COMPONENTS FOR WEAR OR DAMAGE PRIOR TO REASSEMBLY

REASSEMBLY

20. Check that pinion and gear are matched in that the serial no's. on the end face of the pinion and on the outer diameter of the gears are identical. (It should be noted that marks on the pinion end adjacent to serial number have no significance in service.)
21. Assemble inner bearing cone onto pinion using service tool or suitable press.
22. Select new shim pack the size of that removed from the inner bearing. Insert into carrier. Press inner bearing cup into housing, using press and suitable adaptor (if new gear set or bearings are used the shim pack is to be chosen to give the correct pinion height setting as described later.)
23. Select new shim pack the size of that removed from the outer bearing. Insert into carrier. Press outer bearing cup into housing using press and suitable adaptor.

NOTES

- a. Ensure both cups are pressed and firmly seated into carrier.
 - b. Take care not to damage face or taper of bearings whilst assembling.
 - c. Both bearing cups may be assembled together if the appropriate service tool is available.
24. Insert pinion and pinion bearing into housing and support in position.
 25. Fit new collapsible spacer over pinion shank, slide outer bearing cone over pinion and seat onto collapsible spacer.
 26. Fit oil slinger.
 27. Fit new oil seal gasket and oil seal. The seal is to be fitted with the lip facing inwards. As an aid to assembly and to prevent lip damage, apply a small amount of grease to lip prior to assembly. The oil seal should be pressed into housing using a suitable adaptor locating near the outer diameter of the seal.
 28. Fit companion flange. If it is necessary to press or tap the flange into position do not let flange react against bearing but react against support on pinion head.
 29. Fit washer and new lock nut.
 30. Before tightening locknut apply a small amount of oil to both bearings.
 31. Tighten nut gradually, rotating the pinion assembly slightly at intervals throughout, until torque to turn companion flange stated in table AT2 is attained.
NOTE: Take care to tighten nut gradually as torque loading on bearings is applied rapidly.
 32. Check the correct positional setting of the pinion is as follows:
 - a. Check the nominal pinion cone setting distance from table AT1.
 - b. Check the variation figure marked on the head of the pinion (see figure AF3). This figure is given in thousandths of an inch.
 - c. Add these figures to give the actual required pinion cone setting distance.

Example:

Nominal cone distance	=	2.500		2.500
Marked variation	=	(+3) + .003	(-2)	-.002
Actual required distance	=	2.503		2.498

- d. Read the differential bearing seat diameter from table AT1.
- e. Subtract half the figure at 32(d) from that at 32(c) to give nominal clock setting height.

Example

32(c)	=	2.503
32(d)	=	1.500

Clock setting height		1.003

- 33. Using a small magnetic base clock and setting piece or slipblocks set the clock to the dimension obtained in 32(e). this method of clock setting is shown in figure AF4.
- 34. Ensure the pinion end is free from burrs.
- 35. Mount the magnetic base of the clock onto the pinion end so that the stylus registers in the bottom of the differential bearing bore. This is shown in figure AF5. The clock can be moved slightly to and fro by turning the pinion in order to ensure maximum reading is obtained.
- 36. Repeat operation on other differential bearing bore.
- 37. Add the two readings and halve the result in order to obtain the mean figure. If the pinion is set correctly a mean reading of zero should be obtained. A negative reading indicates the pinion is set too high and shims need to be removed from under the inner pinion bearing cup. A positive reading indicates that the pinion is set too low and more shims need to be added under the inner pinion bearing cup.

NOTES

- a. The amount of variation away from zero gives the amount of shim adjustment required.
- b. If a change in shim pack is required it is essential that a new collapsible spacer is fitted when rebuilding. Each spacer can be used once only.

38. Assemble ring gear onto differential case and bolt together by gradually and evenly tightening the bolts. Do not tighten one bolt at a time but work on diametrically opposite bolts. This ensures the ring gear is seated correctly on the case. It is advised to use Loctite 'studlock' grade or similar locking compound on the bolt threads. Do not use excessively and remove any surplus. Tighten bolts to torque figures given in table AT3.
39. Assemble differential bearing cones to differential case using press and suitable adaptor. **NOTE** when pressing second bearing cone onto case, seat first bearing cone into its cup in order to prevent damage to bearing case etc.
40. With bearing cups fitted onto cones lower differential case assembly into the carrier. Take care when meshing gear and pinion not to damage teeth.
41. Position a dial gauge as shown in figure AF6.
42. Fit suitable shim packs between the differential bearing cups and carrier on each side in order to give a reading of .007" on the dial gauge when the gear backlash is measured. It is important that the pinion is not moved when measuring ring gear backlash otherwise false results are obtained.

The shim packs should be a resistance fit.

Shims are available in .003", .005", .010" and .030"

NOTE

When using new bearings rotate differential assembly approx. six times whilst pressing towards each bearing in turn - this is in order to settle bearings. Following this adjust shim packs if necessary to give resistance fit and repeat backlash check.

43. Remove differential assembly together with shim packs. Carefully note to which end the shim pack relates - add .003" shim to each pack in order to give bearing preload.
44. Remove one differential bearing cone from case and fit appropriate shim pack to case trunnion. Refit bearing cone.
45. Repeat above on other differential bearing.
46. Fit carrier stretcher tool to carrier and stretch carrier - **IMPORTANT - DO NOT STRETCH CARRIER MORE THAN .010" - .012" MEASURED ACROSS STRETCHER HOLES.**
47. Assemble differential assembly together with bearing cups into carrier. It may be necessary to tap lightly in order to assemble. Do not force assembly into position as this could cause damage to bearings.
48. Fit bearing caps noting that markings match with markings on carrier.
49. Tighten bearing cap bolts to torque figures as stated in table AT3.
50. Check companion torque to turn figures as stated in table AT2.
51. Re-fit carrier cover using new gasket. Tighten cover bolts to figure given in table AT3.
52. Re-fit half shafts/axle shafts.
53. Re-fill with oil of correct grade.

Section B

DIFFERENTIAL ASSEMBLIES

SECTION B - DIFFERENTIAL UNITS

B1. 2 PIN DIFFERENTIAL

DISMANTLING

1. Remove fixings and withdrawn crown wheel.
2. Remove pinion mate shaft fixing pin.
3. Withdraw pinion mate shaft.
4. Hold one side gear and rotate the other until pinion mates can be withdrawn from differential case
5. Remove pinion mate thrustwashers.
6. Remove side gears and side gear thrustwashers.
7. Remove differential bearing cones using extractor and press.

INSPECTION

8. Examine all components and replace as necessary.
 - a. Replace all thrustwashers.
 - b. Bearing cones must be a push fit on the trunnion.
 - c. Remove all nicks, burrs etc., from crown wheel location surfaces.

ASSEMBLY

9. Reverse the procedure for dismantling (1 to 6).
10. Fit ring gear as per section on dismantling and reassembly of axle centres.
11. Bearing cones and shims to be fitted in accordance with instructions for setting backlash.

SECTION B - DIFFERENTIAL UNITS

B2. 4 PIN DIFFERENTIAL

DISMANTLING

1. Remove fixings and withdrawn crown wheel.
2. Mark the two halves so that alignment can be maintained on reassembly.
3. Remove the fixings and lift off the upper case.
4. Remove upper side gear and thrustwasher.
5. Lift out cross shaft, 4 pinion mates and spherical thrustwashers.
6. Withdraw lower side gear and thrustwasher.
7. Remove differential bearing cones using extractor and press.

INSPECTION

8. Examine all components and replace as necessary.
 - a. The two casing halves are matched and can only be replaced as a pair.
 - b. Replace all thrustwashers.
 - c. Bearing cones must be a push fit on trunnions.
 - d. Remove all nicks and burrs from differential mounting surface and crown wheel location face and spigot.
 - e. Crown wheels and pinions are supplied as matched pairs and must not be replaced separately (see section on dismantling axle assemblies.)

ASSEMBLY

9. Reverse the procedure for dismantling (1 to 7) taking care to align casing halves.
10. Torque bolts in accordance with table AT3 tightening on opposite sides and not to be followed around the diameter for diff bolts and crown wheel bolts.
11. Mount differential trunnions on vee blocks and check runout of crown wheel back face. This must not exceed 0.05mm (0.002"). If excessive check for dirt or damage.
12. Bearing cones and shims to be fitted in accordance with instruction for setting backlash.

Section C

HUB ASSEMBLIES

SECTION C - HUB ASSEMBLIES

C-1 - SEMI FLOATING HUB

1. Remove split pin.
2. Unscrew shaft nut (rectifying damage is necessary).
3. Pull-off hub using either conventional 3 leg puller or proprietary pullers engaging either on extractor thread or hub studs.

N.B.

Shock treatment may be necessary in which case try:-

- a. Striking opposite shaft end using soft hammer

Or

- b. Striking hub to be removed with blunt cold chisel in proximity of shaft key.

4. Re-assemble in reverse order being sure to smear anti scuffing paste (rouge etc) on shaft taper.

Replace shaft key if any sign of fretting causing loose fit. Nut must be really tight. Grease seal journal lightly with lithium-based grease.

SECTION C - HUB ASSEMBLIES

C-2 - SEMI FLOATING OUTRIGGER HUB

1. Remove split pin.
2. Unscrew shaft nut (rectifying damage is necessary).
3. Pull-off hub using either conventional 3 leg puller or proprietary pullers engaging either on extractor thread or hub studs.

N.B.

Shock treatment may be necessary in which case try:-

- c. Striking opposite shaft end using soft hammer

Or

- d. Striking hub to be removed with blunt cold chisel in proximity of shaft key.

4. Re-assemble in reverse order being sure to smear anti scuffing paste (rouge etc) on shaft taper.

Replace shaft key if any sign of fretting causing loose fit. Nut must be really tight. Grease seal journal lightly with lithium-based grease.

SECTION C - HUB ASSEMBLIES

C-3 - FULLY FLOATING HUB

1. Remove axle shaft securing bolts (discard tags if fitted).
2. Withdraw axle shafts (discard gasket if not torn in removal).
3. Unbend locking tab on Tube Nut Locktab and remove both tube nuts.
4. Steadying Hub to keep in position, withdraw outer Bearing Cone.
5. Pull off (with gentle shock if necessary) Hub.
6. Remove Inner Bearing Cone.
7. Examine Bearings Cups for signs of wear and replace both cup and cone if necessary. Cut-outs in the cup abutments are provided for drift access. Removal of inner bearing cup will cause oil seal to be knocked out at the same time. If an oil seal fault is suspected, seal must be removed in this manner.
8. Examine oil seal for wear, misplaced garter spring etc and re-new if necessary. Use smear of gasket sealant in either event. The oil seal journal on the axle tube should also be examined.
9. (If necessary) press-in replacement bearing cups, preferably with the recommended Service Tool or on a hand press using convenient dollies (which will not damage either bearing or bearing bore) to ensure proper abutment. The inner bearing must be inserted complete with cone, liberally greased, which will then be held in situ by the fitment of the oil seal.
10. Having greased oil seal journal, carefully offer Hub onto tube end with gentle pressure, until resistance is felt by bearing inner cone coming against its journal. Gently tab hub home with soft hammer until bearing is hard against its abutment. (Note if gentle pressure does not result in movement of Hub, alignment is incorrect).
11. Position outer bearing cone, having applied a liberal quantity of lithium-based grease.
12. Tighten inner Tube Nut until slight binding is felt when rotating Hub in both directions. Back-off nut a quarter of a turn. Insert tab washer in place and tighten outer tube nut to a force of 100-120 lbf ft. Check end-float which should be as follows:-

Drum Brake applications - .003" - .008"

Disc Brake applications - .003" - .005"

If end float is incorrect, reposition inner tube nut as appropriate and repeat operations.

13. Using large screwdriver, bend over locking tabs onto nearest convenient flat on both inner and outer tube nuts.
14. Clean off faces of both hubs and shaft and fit new gasket, applying sealant to both faces.
15. Replace axle shaft and secure bolts using either lockwashers or fresh lockstraps as appropriate. Tighten bolts to 38 - 43 lbf.ft.

SECTION C - HUB ASSEMBLIES

C-4 SERVICE INSTRUCTIONS FOR ADJUSTMENT OF AXLE SHAFT END FLOAT ON SEMI FLOATING SEALED BRAKED AXLES (05HA SERIES)

The recommended end float for the axle shaft of the above axle is .003" - .008" (0.08 - 0.20mm). As it is unlikely that servicing agents would have the necessary DTL gauges suitable for directly measuring this adjustment, the following procedure is recommended:

a. For replacing single axle shaft.

1. Jack axle clear of ground and remove road wheels.
2. Remove hub assembly, bearing housing, hub adjustment shims and axle shaft to be replaced.
3. Re-assemble axle shaft taking care to carefully align splines in both differential side gear and brake plates.
4. Assemble bearing housing complete with bearing over axle shaft and locate on brake housing studs.
5. Fit bearing housing retaining nuts on the studs and finger tighten sufficient only to locate bearing housing.
6. Tap lightly end of shaft to ensure that no free play is apparent in opposing shaft assembly. If necessary re-tighten bearing housing retainer nuts sufficient only to 'lightly pinch' bearing housing.
7. Using feeler gauges measure gap between bearing housing and brake housing faces. Measurements to be taken at four equally spaced points around the bearing housing circumference.
8. Obtain the mean reading and add to this dimension .005" (0.12mm).
9. This dimension thus found is the shim thickness required.
10. Remove bearing housing and re-assemble using above shim pack between bearing housing and brake housing faces.
11. Assemble and tighten bearing housing nuts to correct torque figure.
12. Assemble hub componentry.
13. Check that end float exists on axle shaft assembly.
14. Re-fit road wheels.

b. For replacing both axle shafts.

When removing bearing housing note shim thickness as fitted. Re-assemble one side of housing using a shim pack thickness the same as that removed. Re-assemble other side of axle using method as described in (a) above.

Section D

BRAKES

SECTION 3 - BRAKES

D - 1 - DRUM BRAKES

1. Remove the brake drums.
2. Remove the hub as outlined in section C1 or C2 as appropriate.
3. Remove brake securing screws which may be of either the nut and bolt variety or tapped into the tube flange.
4. Note the position of the adjuster, actuator etc. to identify correct handling of replacement brake assembly.
5. Reassemble in reverse order as specified in the appropriate section. Ensure that the brake drum path is clear and smooth. Difficulty in fitting the brake drum may mean that the brake shoe adjuster is fully expanded.

SECTION 3 - BRAKES

D-2 - DISC BRAKES

1. Break the locking wire securing the two caliper mounting bolts.
2. Remove the caliper mounting bolts, being careful not to lose the washers and shims.
3. Remove the caliper assembly.
4. Clean the disc faces.
5. Present the replacement caliper assembly onto the mounting flange (having ensured the correct "handing").
6. Insert shims between the caliper lug and the mounting flange on the tube to ensure that the (Hydraulic) pads are equidistant from the disc. The securing bolts must be tightened to ensure correct seating of all the components. To apply these, first seat the small plain washer against the bolt head and then the large plain washer next to that.
7. Tighten to 35/40 lbt ft and reapply locking wire. If hand brakes are fitted, these are self adjusting and will be positioned correctly after initial application of the hand brake lever.

SECTION D - BRAKES

D3 - INSTRUCTIONS FOR REPLACING AND ADJUSTING BRAKES FOR STL 5HA OIL IMMERSSED BRAKED AXLES (S/F TYPE DESIGN).

DIS-ASSEMBLY

If brake adjustment only is required, the following axle strip down need not apply.

Adjustment instructions are given separately.

1. Remove axle shaft nut lock pin.
2. Remove axle shaft lock nut and washer.
3. Withdraw hub complete with Key.
4. Remove the nuts and washers holding the bearing housing in position.
5. Withdraw housing assembly from studs. The bearing housing assembly incorporates the oil seal, shaft bearing cup and bearing housing 'O' ring.
6. Carefully remove the retaining bearing housing shims taking care not to damage them.
7. Withdraw axle shaft complete with axle shaft bearing cone.
8. Remove the nuts retaining brake housing plate.
9. Withdraw brake housing cover plate from studs.
10. Remove the brake friction discs and reaction plates which will now be loose within the brake housing.
11. Remove brake reaction pin.
12. Remove brake housing pressed cover and gasket. Upon removal of this cover the conical return spring will be free and should be removed also.
13. From end opening of brake housing remove the circlip retaining the pin between the pull rod and the brake actuator.
14. Push pin through pull rod and swing pull rod away from actuator.
15. Remove actuator from housing.
16. Remove internal brake friction discs and reaction plates from brake housing.
17. Discard all worn plates. Worn plates are identified when the plate surface goes below both of the circular grooves. This worn condition is evidenced by the noticeable increase in pedal effort for the same vehicle retardation.

ASSEMBLY

GENERAL NOTE

Replace all worn or damaged components and lightly grease bearings and oil seals prior to assembly.

1. Insert correct number of internal brake friction discs and reaction plates into housing in correct sequence.
2. Loosely assemble actuator plate into housing.
3. Locate actuator plate arms in correct position with pull rod and insert locator pin complete with inner circlip, from back of the brake housing.
4. Attach outer circlip to pin. Use new circlip.
5. Assemble correct number of brake friction discs and reaction plates onto shaft spline in correct order.
6. Assemble shaft complete with bearing cone together with brake plates and discs through actuator plate and inner friction discs and reaction plates, taking care whilst engaging the shaft splines into both inner side gear and the brake discs.
7. Assemble brake reaction pin into brake housing ensuring that all brake reaction plates are correctly aligned.
8. Assemble brake cover plate over studs ensuring correct location of brake reaction pin. Fit cover plate locking nuts and tighten to correct torque. Use a good quality gasket sealant beneath plate surface, i.e. silicone gasket compound.
9. Fit correct shim amount (i.e. that removed from the axle) over bearing housing location studs. Assemble bearing housing* together with bearing cup and seal onto studs. Fit lockwashers and nuts and tighten to recommended torque. Fit leather wiping seal.
10. Fit hub assembly* complete with bearing cup onto shaft.
11. Fit shaft key.
12. Fit shaft washer and nut and tighten to recommended torque.
13. Fit new nut locking pin.

On axles built prior to June 1979, (Serial No. prefix F79) bearing housing 05HA - 014-012 and hub 05HA-928-113 were used in place of the above mentioned components. (It should be noted that the old level hub and bearing housings are not interchangeable as individual items with the new level components).

ADJUSTMENT

1. Tighten pull rod nut to lock brakes and thus take up all slack in the system.
2. Loosen pull rod nut until a clearance of .0001" (0.25mm) per working brake surface is obtained. With an eight plate assembly this would give .016" (.4mm)* total clearance. This clearance should be measured by two shims of correct thickness being inserted between a suitable brake disc and brake reaction plate either side of axle shaft from top cover.

* Although .016 (.4mm) is the theoretical clearance figure to use, in practice it is found that a .015 shim is more readily available.

3. When correct adjustment is achieved re-assemble brake housing cover complete with conical return spring correctly located in position.

RECOMMENDED TORQUE TIGHTNESS

Axle Shaft Nut	- 130/140 lbf.ft	(175/190 Nm)
Bearing Housing Nuts	- 38/43 lbf.ft	(51/58Nm)
Brake Cover Nuts	- 65/75 lbf.ft	(89/102 Nm)
Brake Pressing Cover Pressing Bolts	- 19/22 lbf.ft	(26/30 Nm)

Section E

BLANK

Section F

AXLE SHAFTS

SECTION F - AXLE SHAFTS
F-1. SEMI FLOATING

1. Remove brake drum.
2. Remove hub in accordance with Page C1.
3. Remove the brake back plate retaining bolts, the outer oil seal assembly, the hub bearing retainer plate and the brake back plate, taking care not to lose or damage any of the shaft bearing adjusting shims which control the shaft endfloat.
4. Check outer oil seal for wear, misplaced garter spring etc and replace if necessary.
5. Remove the axle shaft with its taper roller bearing.
6. To remove a broken axle shaft, make a loop at one end of a length of stiff wire, slide the loop down the axle tube and over the broken end of the shaft for a sufficient distance so that on pulling the loop will bind on the shaft and withdraw it from the differential side gear. This applies where sufficient shaft remains. (i.e. minimum length 6").
- 6a. To remove a broken axle shaft with the break close to the spline, it is necessary then to withdraw the opposite shaft and remove the differential assembly complete i.e. follow the instruction conveyed in Pages A-1, A-2 or A-3.
7. Examine the shaft oil seal which is pressed inside the axle tube, and if necessary withdraw same and replace with a new seal.
8. Examine the shaft bearing for wear and if replacement is necessary, the cone may be withdrawn from the shaft by means of the extractor tool with suitable adaptor.
9. Fit the replacement bearing (if required) making sure that the cone is pressed squarely on the bearing diameter until it firmly abuts against the shoulder provided. If the bearing is not pressed home, it will creep in service, resulting in excessive shaft endfloat, which will damage the surfaces due to hammering.
10. Re-assemble in reverse order ensuring inner shaft oil seal is not damaged when shaft is re-fitted.
- 10a. If new bearing is fitted ensure correct axle shaft endfloat (.003" - .009") is obtained by the removal/addition of shims from one axle end only.
11. Refit hub in accordance with Page C-1.
N.B. New paper gaskets must be fitted when components are re-assembled.
12. Re-grease the assembly by means of the grease nipple.

SECTION F - AXLE SHAFTS

F-2. SEMI FLOATING OUTRIGGER

1. Remove brake drum.
2. Remove hub in accordance with Page C2.
3. Remove the bearing housing/brake back plate mounting bolts.
4. Remove the brake back plate and the bearing housing, taking care not to lose or damage any of the hub bearing adjusting shims which control the shaft endfloat.
- 4a. Check oil seal as fitted into bearing housing for wear, misplaced garter spring etc and replace is necessary.
5. Remove axle shaft complete with bearing cone.
6. To remove a broken axle shaft, make a loop at one end of a length of stiff wire, slide the loop down the axle tube and over the broken end of the shaft for a sufficient distance so that on pulling the loop will bind on the shaft and withdraw it from the differential side gear. This applies where sufficient shaft remains. (i.e. minimum length 6").
- 6a. To remove a broken axle shaft with the break close to the spline, it is necessary then to withdraw the opposite shaft and remove the differential assembly complete i.e. follow the instruction conveyed in Page A-1, A-2 or A-3.
7. Examine shaft oil seal which is pressed inside the axle tube for wear, misplaced garter spring etc and replace if necessary.
8. Examine the shaft bearing for where and replace if necessary.
9. If replacing axle shaft bearing ensure bearing cup is seated correctly in bearing housing, if this is not done creeping will occur which will result in excessive shaft end float which in turn will damage the bearing.
10. Re-assemble components in reverse ensuring that inner shaft oil seal is not damaged when shaft is re-fitted.
- 10a. If new bearing is fitted ensure correct axle shaft endfloat (.003" - .009") is obtained by the removal/addition of shims from one axle end only.
11. Refit hub in accordance with Page C-2.
N.B. New paper gaskets must be fitted when components are re-assembled.
12. Re-grease the assembly by means of the grease nipple.

SECTION F - AXLE SHAFTS

F-3. FULLY FLOATING

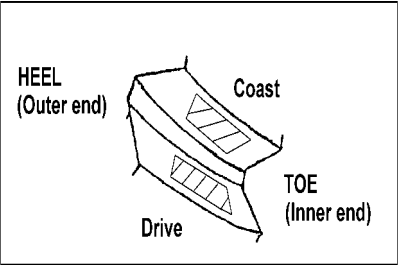
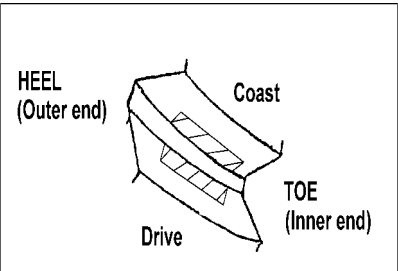
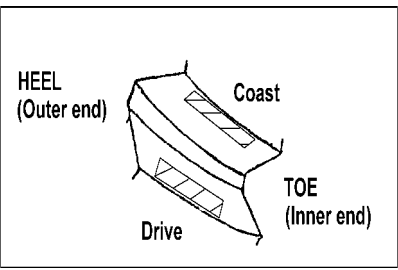
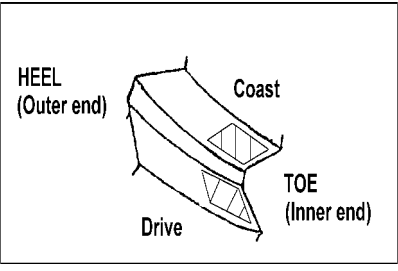
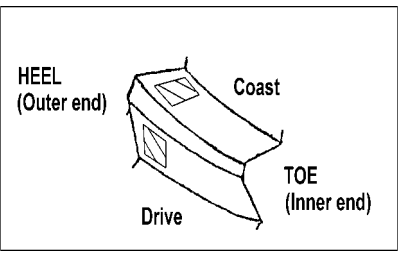
This procedure is covered within the strip and re-build procedure for the fully floating hub in Page C-3.

Section G

GEAR TOOTH CONTACT

TOOTH CONTACT CHART

Diagrams show contact on drive gear tooth.

	TOOTH CONTACT	CONDITION	REMEDY
A		IDEAL TOOTH CONTACT Evenly spread over profile, nearer toe than heel	0 -- 0
B		HIGH TOOTH CONTACT Heavy on the top of the drive gear tooth profile.	Move the Drive PINION DEEPER into MESH i.e. Reduce the pinion cone setting.
C		LOW TOOTH CONTACT Heavy in the root of the drive gear tooth profile.	Move the Drive PINION OUT of MESH i.e. Increase The pinion cone Setting.
D		TOE CONTACT Hard on the small end of the drive Gear tooth.	Move the Drive GEAR OUT of mesh i.e. INCREASE BACKLASH
E		HEEL CONTACT Hard on the large end of the drive gear tooth.	Move the Drive GEAR into MESH i.e. DECREASE BACKLASH BUT MAINTAIN MINIMUM BACKLASH

Section H

TABLES

SALISBURY TRANSMISSION LIMITED

TABLE AT1

	4HA/4HU	5HA	7HA/7DR	8HA/8DR	10HA/10HD/10DR
NOMINAL PINION CONE	2.625	2.9685	2.219	3.125	3.500
DIFF BEARING SEAT	3.2660	3.4385	2.8920	3.8140	4.1273 } } } Heavy
DIAMETER	3.2674	3.4399	3.8934	3.8155	4.1256 } 3.8155 } } } Light } 3.8140 }

SALISBURY TRANSMISSION LIMITED

TABLE AT2

MODEL	TORQUE TO TURN PINION WITH OIL	TORQUE TO TURN PINION AND DIFFERENTIAL	TORQUE TO TURN COMPLETE AXLE
	A LBF. IN.	* B LBF. IN.	* C LBF. IN.
4HU 2 PIN	30-40	5-15	2-10
4HU POWER-LOK	30-40	10-20	2-10
4HA/4HS	30-40	5-15	2-10
5HA	23-35	5-15	
10HD	30-40	5-15	
7DR/8DR 8HA/8HS/10HA	** 30-40	5-10 5-15	

NOTE:

Torque B is additional to A and C is additional to B.

i.e. 35 at A + 10 at B = 45 + 8 at C = 53lbf in total.

7DR/8DR/10DR	<u>Helical Ratio</u>	<u>Torque to turn helical Gears and Hypoid Pinion</u>
		lbf. In.
	1.4 - 2.0	6 - 9
	2.0 - 2.6	4 - 7
	2.6 - 4.4	3 - 5

Torque to turn hypoid pinion assy 15 - 20 lbf. In.

Primary input pinion bearing end float 0.002" - 0.005"

SALISBURY TRANSMISSION LIMITED

TABLE AT3

TORQUE TIGHTNESS lbf ft

MODEL	DRIVE PINION NUT*	DRIVE GEAR BOLT	DIFF BRG. CAP BOLT	GEAR CARRIER COVER SCREW	DIFF CASE BOLT
4HA/4HU	¾" UNF 'T'	3/8" or 7/16" UNF 'X'	½" UNC 'R'	5/16" UNC 'S'	3/8" UNC 'X'
4HS	180/190	49/56-70/88	63/72	18/20	43/50
5HA	180/190	7/16" UNF 'X'	63/72	3/8" UNC 'S'	5/16" UNC 'W'
		70/88		29/33	23/26
7HA	5/8" UNF	3/8" UNF 'X'	3/8" UNC 'T'	5/16" UNC 'S'	3/8" UNC 'X'
	95/105	49/56	32/36	18/20	43/50
8HA/10HA	7/8" UNF	½" UNF 'X'	½" UNC 'R'	3/8" UNC 'S'	7/16" UNC 'V'
	250/270	118/135	63/72	20/28	60/69
8HD	250/270	118/135	63/72	3/8" UNC 'R'	60/69
				26/30	

TORQUE TIGHTNESS Nm

MODEL	DRIVE PINION NUT*	DRIVE GEAR BOLT	DIFF BRG. CAP BOLT	GEAR CARRIER COVER SCREW	DIFF. CASE BOLT	STRADDLE HSG.BO
8HA/10HA	24mm- 8*	12mm - 12.9 Grade 129/142	12mm - 10.9 Grade 125/142	10mm - 8.8 Grade 27/38	12mm - 8.8 Grade 98/102	

- For axles with collapsible spacers the nut is tightened until the torque to turn the pinion is in accordance with table AT2.

SALISBURY TRANSMISSION LIMITED

TABLE AT4

TORQUE TIGHTNESS FIGURES - (DR AXLES)

MODEL	HELICAL PINION NUT	HYPOID PINION NUT	DRIVE GEAR BOLT **	DIFF BRG CAP BOLT	GEAR CARRIER COVER SCREW**	DIFF CASE BOLT**	PRIMARY GEAR	HYPOID COVER
7DR	20mm - 8.8 217 - 244Nm	*	10mm - 12.9 86/98Nm	10mm - 8.8 51-58Nm	8mm - 8.8 26-30Nm	8mm - 14.9 51-58Nm	12mm - 8.8 89-102Nm	8mm - 8.8 26-30Nm
8DR	20mm - 8.8 217/244Nm ¼" UNF 180-190	*	12mm - 12.9 150/170Nm ½" UNF 'X' 118/135	12mm - 10.9 125/142Nm ½" UNF 'R' 63/72	10mm - 8.8 27/38Nm 3/8" UNC 'S' 15/25	12mm - 8.8 89/102Nm 7/16" UNC 'V' 60/69	12mm - 8.8 129/142Nm 7/16" UNC 'R' 42/48	8mm - 8.8 26/30Nm 5/16" UNC 'S' 16/19
10DR	22mm - 8.8 340- 370Nm	*	12mm- 12.9 150-170Nm	12mm - 10.9 125-142Nm	10mm - 8.8 27-38Nm	12mm - 8.8 89-102Nm	12mm - 8.8 129- 142Nm	8mm - 8.8 26-30Nm

* Because these axles are built with collapsible spacers, the nut is tightened until the torque to turn the pinion is in accordance with table AT2.

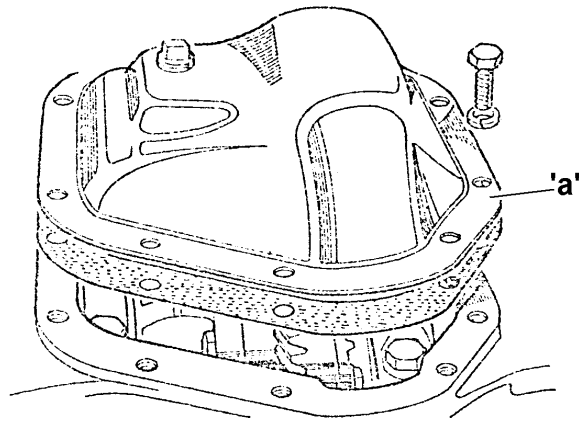
** Bolts marked thus '**' must be locitted prior to fitment.

Section J

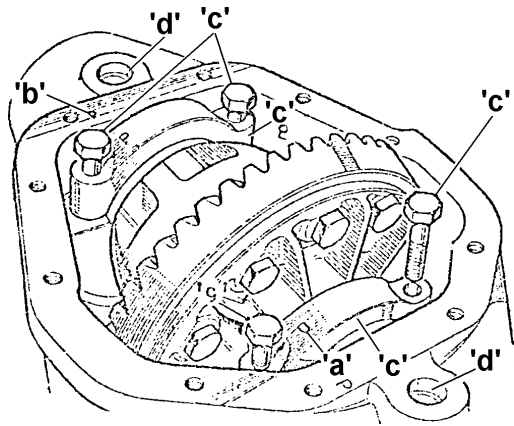
DIAGRAMS

SECTION J: DIAGRAMS

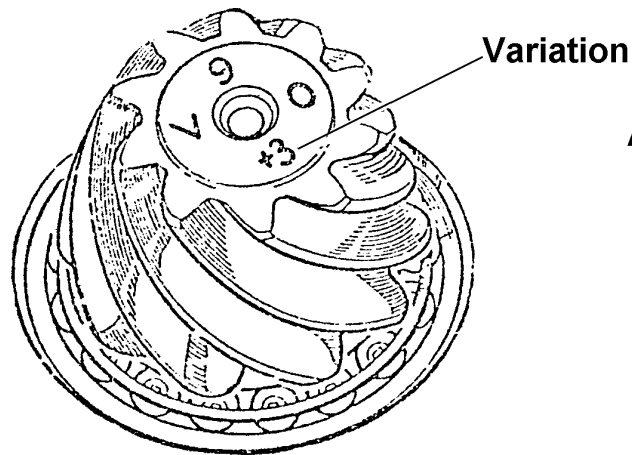
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AF1



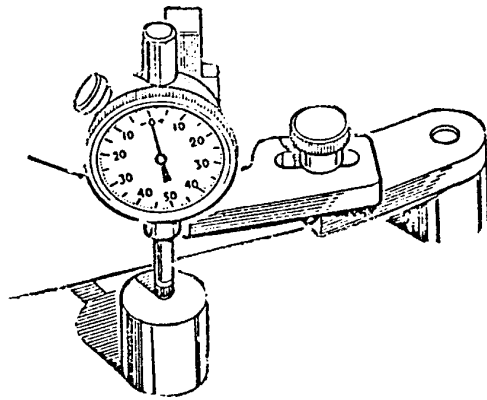
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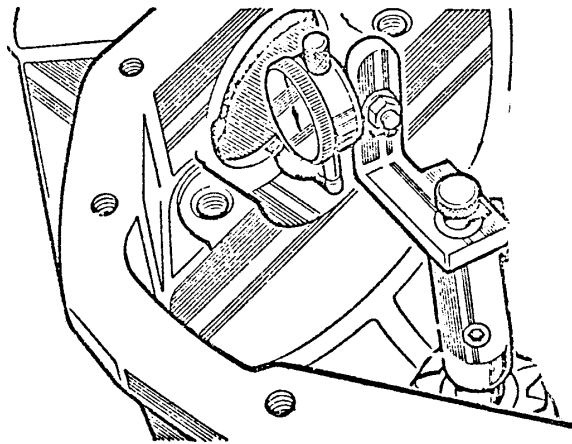
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SECTION J: DIAGRAMS

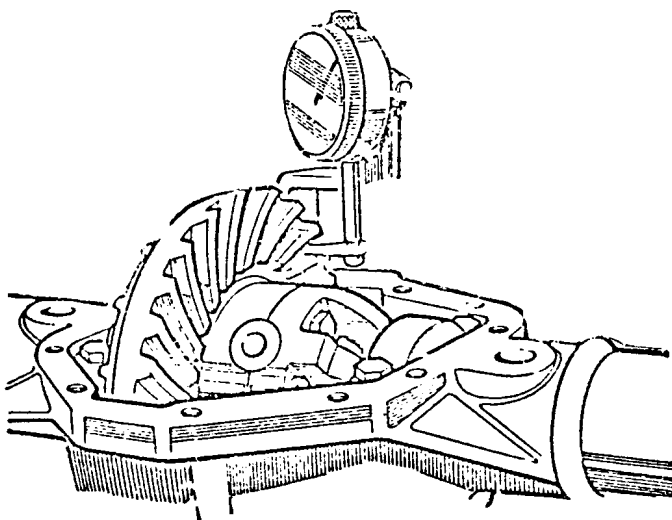
J2



AF4



AF5



AF6