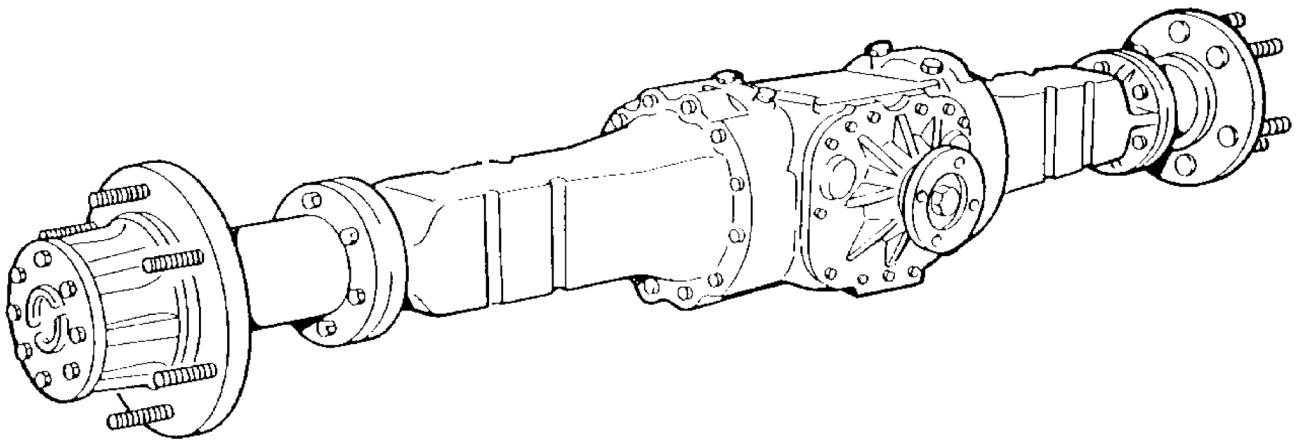
WINGET



NEWAGE 360 SERIES AXLE SERVICE MANUAL

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Section 1

INTRODUCTION

Introduction

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

The procedures described within this manual should enable experienced service personel to strip, repair and re-build Newage 360 series axles fitted to Winget 4B and 4S range site dumpers in a safe and competant 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 and 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 work 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 conjuction 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 operators 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 and Safety is a matter of common sense. If common sense is applied correctly the risk of accidents can be reduced.

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

Limited. Always quote your machines serial number and model together with axle serial number and model when ordering spare parts.

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

Whilst every effort is made to ensure the contents of this manual are accurate Winget Limited and Newage Transmissions reserve the right to alter specification without prior notification and certain sections of this manual may then no longer apply.

Section 2

GENERAL DESCRIPTION

General Description

The 360 series is a double reduction drive axle with integral long life oil immersed, multiplate disc brakes.

Housed within the central casing are the brake pistons, spiral bevel crownwheel and pinion assembly. The crownwheel is mounted on a four pinion differential.

The planetary reduction gears and brake plates are housed within the inner ends of the axle arms.

The axle halfshafts are fully floating and the wheel hubs run on opposed taper roller bearings.

The approximate weight is 166Kg (365lb).

Section 3

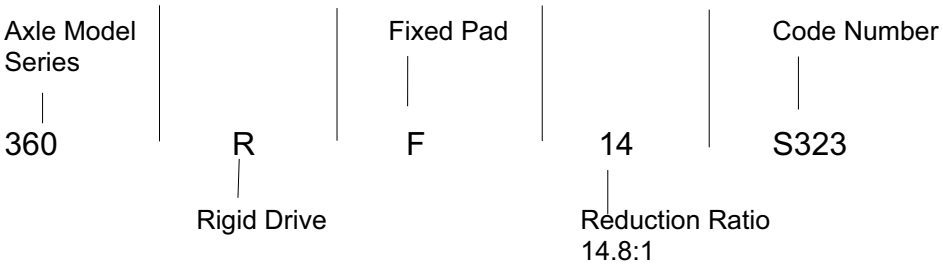
IDENTIFICATION

Identification

A plate is attached to the centre housing of each axle on which are stamped details of the axle specification (see illustration below) and the axle serial number.

If you require spares, both numbers on the plate should be quoted together with the machine model and serial number.

The model number allocated to each axle describes the basic specification as follows:-



Section 4

GENERAL SERVICE INFORMATION

General Service Information

Routine Maintenance

Check	Interval
For oil leaks around joints and seals	Weekly/50 hours
Wheel nut tightness	Daily/8 hours
Hub bearing adjustment	12 monthly/1000 hours
Axle arm/centre case bolts	Weekly/50 hours
Halfshaft securing nuts	Weekly/50 hours
Propshaft nuts and bolts	Weekly/50 hours
Brake Pipe Connections	Weekly/50 hours

Lubricants

The oils used must have the correct additives to be compatible with the mineral oil braking system, therefore, only those lubricants shown below or their direct equivalents must be used.

Mobil Fluid 422
Agricastrol AS Special
Esso Torque Fluid 56 or 62
Gulf Universal Tractor Oil
Total Universal Plant Oil
Total Transmission MP

The oil is added via the combined filler level plug located in the face of the centre housing on the opposite face from the input flange.

THE OIL CAPACITY IS APPROXIMATELY 6 LITRES (10.6 PINTS)

Greases

The areas listed below should be packed with grease during overhauls or repairs.

Input Pinion Oil Seals

Using the one of the following greases or their equivalents.

Mobil grease MP
Esso Beacon 2
Total Multis EP2

Brake Fluid

The oil immersed brakes are operated using a mineral hydraulic fluid. On no account must a vegetable based brake fluid be used otherwise all braking system seals will be damaged.

Whenever the brakes are serviced it is essential that the cylinder bores, pistons and seals are cleaned before assembly and lubricated using one of the following mineral oils or equivalent.

Total Azzola ZS46	Total Azzola ZS22	
Shell Tellus 27	Mobil DTE 24	Esso Nuto H32

Liquid Sealants

On assembly the following mating surfaces should be coated as indicated. Under no circumstances should Silicone RTV Compound be used on the Pinion Housing/Cartridge or the Axle Arm to Case Joints.

Pinion Housing/Cartridge to Maincase	Hermatite
Axle Arm to Main Centre Housing	Hermatite
Stub Axle to Axle Arm (Where applicable)	Hermatite
Halfshaft to Hub Compound	Silicone RTV

Tightening Torques

Description	**Torque**	
	Kpm	(lbft)
Differential Assembly Nuts & Bolts	5.8	42
Nuts and Bolts Differential Bearing Housing to Maincase	5.8	42
Pinion Housing to Maincase Setscrews	5.8	42
Axle Arm to Maincase Bolts	5.8	42
Halfshaft to Hub Nuts	10	72
Short Stub Axle to Axle Arm Nuts and Bolts	10	72
Hub Assembly Ring Nut	14	100
Wheel Nut 5/8 BSF	25	180
Wheel Nut 18mm	28	200
Brake Pipe Adaptors	2.8	20

NEWAGE TRANSMISSIONS: TORQUE VALUES FOR FASTENERS WITH CLEAN & DRY THREADS

IMPERIAL IN POUNDS-FEET (LBF-FT) PLAIN THREADS									
	GRADE S			GRADE V			GRADE X		
SIZE	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.
1/4	8	10	7	11	13	10	14	16	12
5/16	17	19	14	23	26	19	28	32	23
3/8	30	35	26	41	47	35	50	58	43
7/16	48	55	40	65	75	55	79	91	67
1/2	73	84	62	100	115	85	121	140	103
5/8	146	168	124	200	230	170	243	279	206
3/4	255	294	217	349	402	297	423	487	360
1"	606	696	515	829	953	704	1004	1155	853

METRIC IN NEWTON/METRES (Nm) PLAIN THREADS									
	GRADE 8.8			GRADE 10.9			GRADE 12.9		
SIZE	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.
5	6	7	5	8	9	7	10	11	8
6	10	11	8	14	16	12	17	19	14
8	24	28	20	33	37	29	40	47	34
10	48	56	40	67	77	57	80	92	68
12	83	96	72	115	130	100	140	161	119
16	206	210	160	280	320	240	347	399	295
20	401	450	340	560	640	480	677	779	576
24	694	770	570	920	1040	800	1171	1347	995

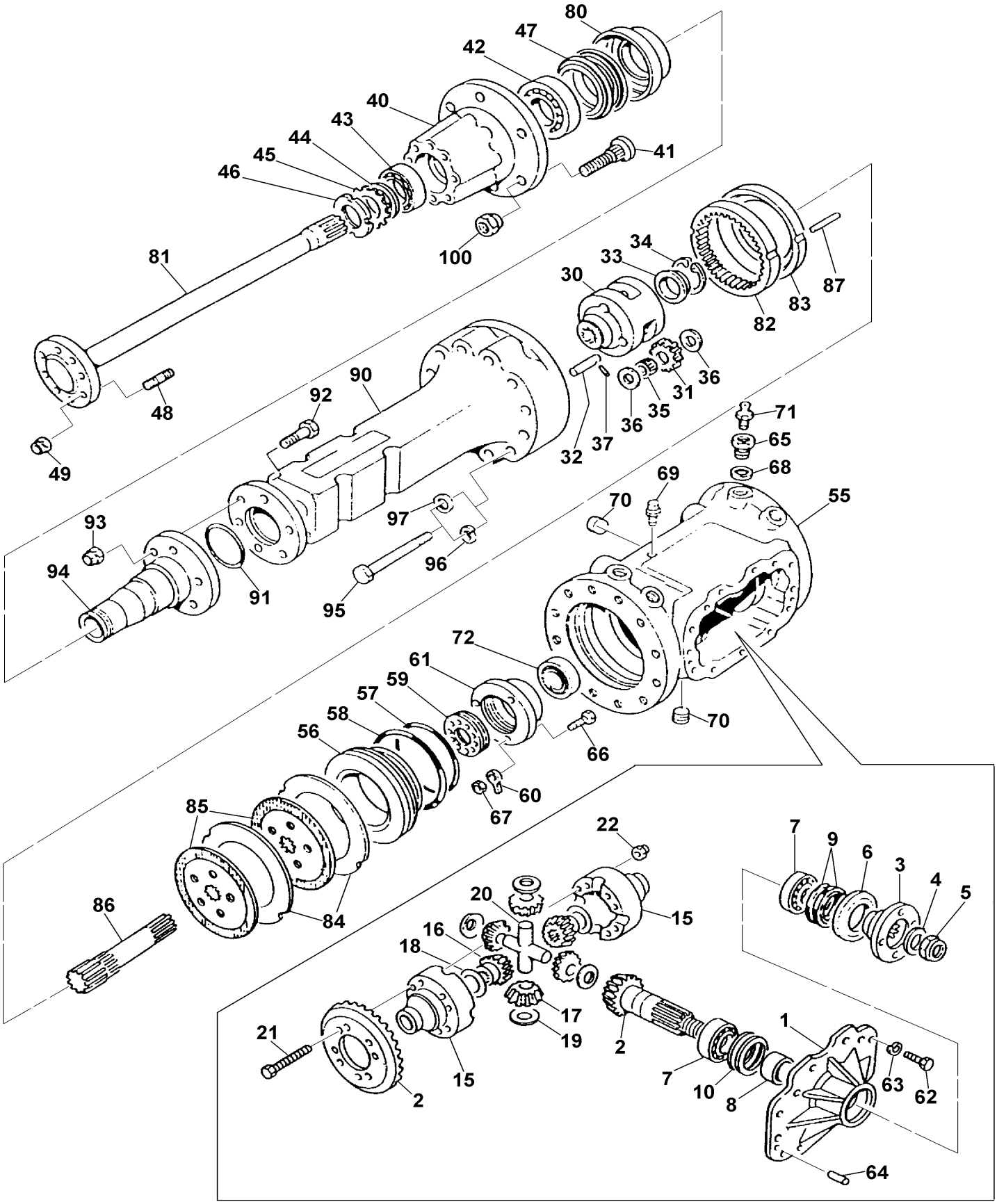
IMPERIAL IN POUNDS-FEET (LBF-FT) COATED THREADS, ZINC & ZINC PASSIVATED									
	GRADE S			GRADE V			GRADE X		
SIZE	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.
1/4	10	12	9	14	16	12	17	20	15
5/16	21	24	18	28	33	24	35	40	29
3/8	38	43	32	52	59	44	63	72	53
7/16	59	68	51	81	94	69	99	113	84
1/2	91	105	78	125	144	106	152	174	129
5/8	183	210	156	250	288	213	303	349	258
3/4	319	367	271	437	502	371	529	609	450
1"	757	871	643	1036	1191	881	1255	1443	1067

METRIC IN NEWTON/METRES (Nm) COATED THREADS, ZINC & ZINC PASSIVATED									
	GRADE 8.8			GRADE 10.9			GRADE 12.9		
SIZE	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.
5	7	8	6	10	12	9	12	14	10
6	12	14	10	17	20	15	21	24	18
8	30	34	25	42	48	36	51	58	43
10	59	68	50	84	96	71	100	115	85
12	104	119	88	146	168	124	175	201	149
16	257	296	219	362	416	307	434	499	369
20	502	577	426	706	811	600	847	974	720
24	868	998	737	1220	1403	1037	1464	1684	1244

Section 5

EXPLODED VIEWS

AXLE 360RF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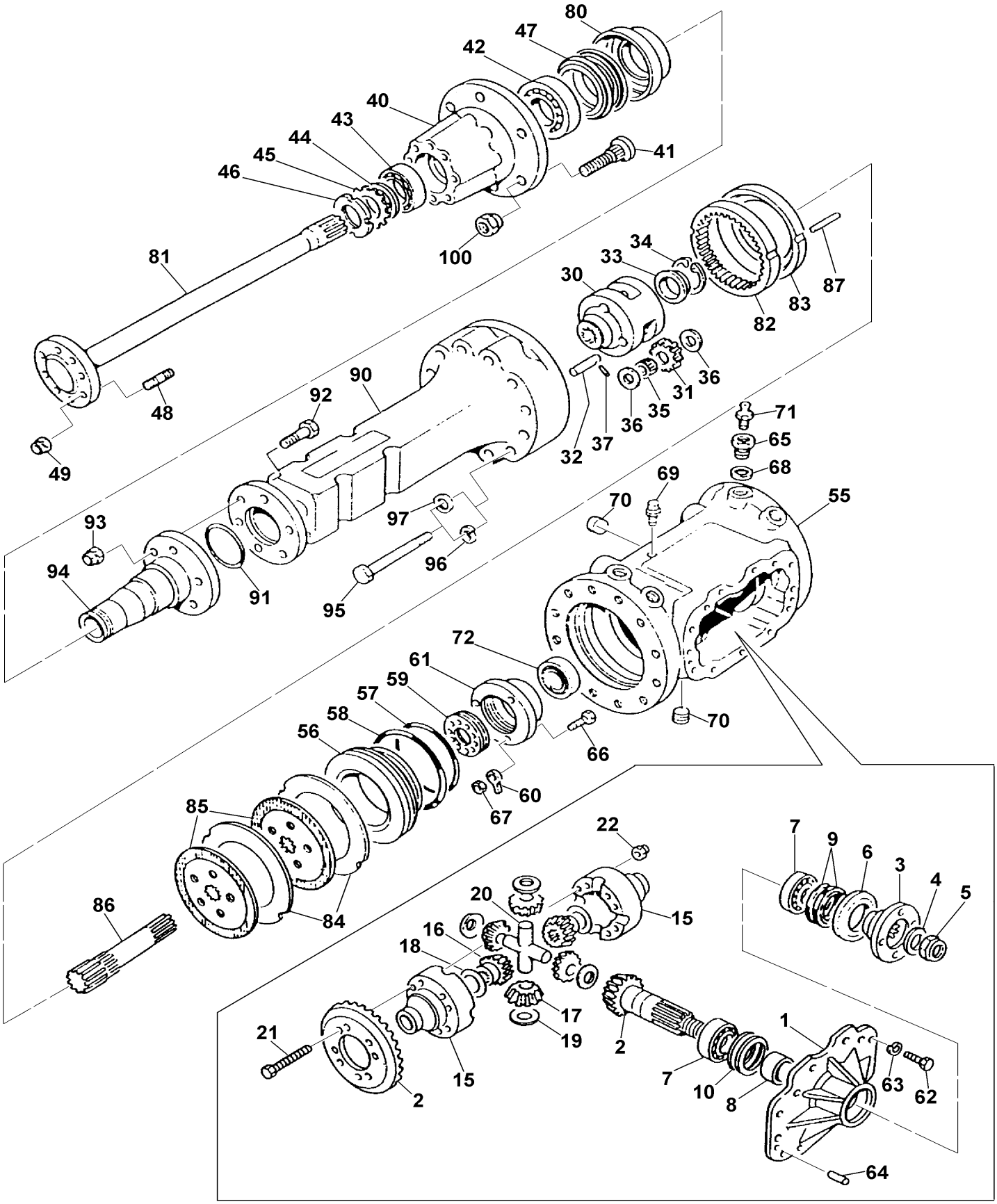
AXLE 360RF

Item No	Description	Qty
	AXLE, type 360RF14S323 shown	
	Bevel Wheel & Pinion Assembly	
1	HOUSING, pinion	1
2	BEVEL WHEEL & PINION	1
3	FLANGE, input	1
4	WASHER	1
5	NUT	1
6	COVER, seal	1
7	BEARING, cup & cone kit	2
8	SPACER	1
9	SEAL, oil	2
10	SHIM, 0.25mm	AR
10	SHIM, 0.30mm	AR
10	SHIM, 0.40mm	AR
	Differential assembly	
15	CASING, differential, two halves	1
16	WHEEL, differential	2
17	PINION, differential	4
18	WASHER, thrust, differential wheel	2
19	WASHER, thrust, differential pinion	4
20	SPIDER	1
21	BOLT	8
22	NUT	8
	Planet Carrier assemblies	
30	CARRIER, planet gears	2
31	GEAR, planet	6
32	PIN, planet gear	6
33	SPACER	2
34	CIRCLIP	2
35	BEARING, needle roller	6
36	WASHER, thrust	12
37	DOWEL	6
	Hub assemblies	
40	HUB	2
41	STUD, wheel	12
42	BEARING, cup & cone kit	2
43	BEARING	2
44	SPACER	2
45	WASHER, tab	2
46	LOCKNUT	2
47	SEAL, oil	2
48	STUD	16
49	NUT	16

FOR PART NUMBERS REFER TO RELEVANT PARTS MICROFICHE OR OPERATORS HANDBOOK

AXLE 360RF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AXLE 360RF

Item No	Description	Qty
	AXLE, type 360RF14S323 shown	
	Main casing	
55	CASING, main	1
56	PISTON, brake	2
57	SEAL, 'O' ring	2
58	SEAL, 'O' ring	2
59	NUT	2
60	PLATE, locking	2
61	HOUSING, bearing	2
62	SCREW, set	13
63	WASHER, spring	13
64	DOWEL	2
65	ADAPTOR, brake pipe	4
66	SCREW	6
67	NUT	6
68	SEAL, bonded	4
69	VALVE, breather	1
70	PLUG	2
71	VALVE, brake bleeding	1
72	BEARING	2
	General parts	
80	HOUSING, oil, seal	2
81	SHAFT	2
82	ANNULUS	2
83	SPACER	2
84	PLATE, brake	4
85	PLATE, disc	4
86	GEAR, sun	2
87	DOWEL	6
	Axle arm assemblies	
90	CASING, axle arm	2
91	SEAL, 'O' ring	2
92	BOLT	12
93	NUT	12
94	STUB AXLE	2
95	BOLT	24
96	WASHER, spring	22
97	SEAL, bonded	2
100	NUT, wheel	12

FOR PART NUMBERS REFER TO RELEVANT PARTS MICROFICHE OR OPERATORS HANDBOOK

Section A

PINION HOUSING

Servicing the Pinion Housing Assembly
Section A

Place a suitable container below the axle drain plug underneath the centre housing, remove the plug and drain the oil. Dispose of the oil safely in accordance with local bylaws and national regulations.

Remove the setscrews securing the pinion housing to the centre casing and lift off the assembly. The housing is located on dowels and will require carefully prising apart from the centre casing using a pry bar or other suitable tool.

Prevent the flange from turning, undo and remove the self locking nut and flat washer securing the flange to the pinion, using a suitable puller or drift remove the flange and gently drift the pinion shaft out through the housing. Take care to avoid damaging the gear teeth, splines or threads. Prise out the oil seals from the pinion housing, slide the old collapsed spacer off the shaft and discard the spacer.

Note: A new spacer should always be fitted.

Inspect the bearings for wear or damage, check the teeth on both the crownwheel and pinion and make a visual check through the diffrential of the “Wheels”. If the front bearing race on the pinion shaft needs replacing use a suitable bearing puller to avoid damaging the shaft. If the outer cones require replacing they can easily be drifted out of each end of the housing. Take care not to damage the shims positioned behind the innermost cone.

Important: If new pinion bearings are fitted check the Crownwheel/Pinion backlash, see Section F “Crownwheel/Pinion Set Up”.

To re-assemble the housing reverse the above procedure fitting a new collaspible spacer, install the pinion shaft through the innermost bearing cone and fit the rear bearing over the pinion shaft. Carefully fit the new oil seals and pack with one of the recommended greases. Refit the flange, coat the inner surface of the flat washer with silicone sealer and loosely refit the washer and self locking nut.

Prevent the flange from turning and tighten the nut until the spacer begins to collapse and all the end float between the pinion bearing is taken up, but without preloading the bearings.

Slowly continue to tighten the nut, frequently checking the preload, until a preload of 2.75-3.5KG (6.06-7.76lbs) for new bearings or 1.75-2.75KG (3.85-6.06lbs) for used bearings is obtained. The preload is measured by winding a length of string round the flange and measuring the load required to turn the flange with a spring balance. Care should be exercised when tightening the pinion nut otherwise the required preload will quickly be exceeded.

If the old bearings have been reused coat the mating surfaces of the centre casing and pinion housing with the recommended sealant and refit the housing to the axle.

If new bearings have been fitted refer to Section F.

Refit the drain plug and tighten, remove the combined filler/level plug located midway up the face of the centre housing and fill the axle with one of the recommended oils. Refit and tighten the level plug.

Section B

DIFFERENTIAL ASSEMBLY

Servicing the Crownwheel and Differential Assembly
Section B

Refer to sections A and D and remove the Pinion Housing and Axle Arm Assemblies.

Remove the sun gears, if not already removed with the axle arms, withdraw the brake pistons from the centre housing.

Undo the nuts and bolts securing the bearing housings and withdraw the bearing housings. The housings are provided with threaded holes into which jacking screws can be inserted to aid removal of the housing. (Unless new differential bearings are to be fitted do not disturb the position of the bearing adjusting ring nuts within the bearing housings). The differential/crownwheel assembly can be removed through the pinion housing opening in the centre case. Mark the centre casing so that the differential assembly is correctly re-assembled into the same end of the centre casing. (Assembling the crownwheel into the opposite side of the centre casing from which it was removed will result in the rotation of the axle being reversed.

Remove the 8 nuts and withdraw the crownwheel complete with the 8 bolts from the differential assembly, the differential case halves can now be separated and the pinions, wheels, thrust washers and spider removed.

Examine the parts for wear or damage and replace as necessary. Assemble in reverse order ensuring that no dirt or foreign objects enter the assembly. Align any indent marks on the differential housing.

If new differential bearings are fitted it will be necessary to check both bearing preload and Crownwheel/Pinion backlash as described in Section F.

If the bearings are not replaced the bearing housings should be refitted in their original position without turning the adjusting ring nuts from their original position and there is then no need to re-check the backlash or preload.

Reassemble the axle and refill with oil.

Section C

PLANET CARRIER ASSEMBLY

Servicing the Planet Carrier Assembly
Section C

To gain access to the planet carrier remove the axle arm as described in section D.

Withdraw the plain and friction brake discs, sun gear and brake spacer plates. Lift out the planet carrier assembly.

Check the teeth on the planet gears, sun gears and annulus gear for damage or wear. The planet gears should run freely on the planet pins without excessive radial play.

To replace the planet gears, pins or bearings, drift the small dowel pins which retain the planet pins into the centre of the planet pins and lightly drift the planet pins out of the carrier. The axle shaft thrust washer is retained by a circlip which can be removed to allow inspection of the washer.

Before re-assembling the unit remove the old spring dowels from the planet pins and ensure new dowels are fitted on re-assembly.

If necessary the annulus which is retained by the dowels can be withdrawn from the axle arm. If the annulus is replaced the dowels should also be replaced. Ensure the annulus is fitted squarely into the axle arm on re-assembly.

Locate the planet carrier assembly back into the axle arm engaging the teeth on the annulus gear and sun gear

Refit the brake plates as described in Section E.

Refit the axle arm assembly as described in Section D.

Remove the combined filler/level plug and top up the axle oil.

Section D

AXLE ARM & HUB ASSEMBLY

Axle Arm, Stub Axle and Hub Assembly
Section D

The hub, halfshaft and stub axle can be serviced with the axle in situ on the machine.

The Hub Assembly

Remove the self locking nuts securing the axle shaft to the hub and withdraw the shaft. Inspect the splines for wear or damage and the shaft for twist and distortion. (A drip tray placed below the hub will catch any oil which runs from the hub).

Straighten the locking tabs on the lockwasher securing the ring nut, undo the ring nut and remove the nut, lockwasher and bearing spacer. The hub can now be withdrawn off the opposed taper roller bearings.

Examine all the bearings and oil seals for damage and wear, replace if necessary. The hub oil seal assembly should be replaced regardless of visual condition. The hub bearing outer cones can be drifted out of the hub if they need replacing. When fitting new cones ensure that they are aligned squarely to their bores before tapping home. If the oil seal housing needs replacing it can be drifted off the stub axle. When fitting the replacement care must be taken not to damage the oil seal contact surface or to distort the housing. Apply “loctite” grade 601 to both the stub axle and seal housing mating surfaces before assembly.

To re-assemble the unit reverse the procedure, lightly oiling the hub seal and bearings with axle oil before assembly. Fit a new locking washer.

To Adjust the Hub Bearings

Tighten the ring nut upto a torque of 14Kpm (100lbft). Turn the wheel hub in each direction at least three times to ensure the bearings have correctly “seated” in and re-check the torque (this operation should be repeated until the locknut no longer turns when rechecking the torque). Slacken the ring nut back a distance equal to 1 tab of the lockwasher then bend down a tab to secure the ring nut in place.

Coat the mating surfaces of the hub and halfshaft with the recommended sealant. Refit the halfshaft, it may be necessary to turn the hub slightly to engage the splines on the halfshaft with the planet carrier within the axle case. Tighten the self locking nuts. Remove the combined filler/level plug and top up the axle oil.

Axle Arm Removal

It is recommended that the axle is removed from the dumper before attempting to remove the axle arm.

Drain the oil from the axle as described under Section A.

Whilst it is possible to remove the axle arm with the halfshaft in place it is strongly recomended that the halfshaft be removed as decribed previously.

Support the weight of the axle arm and remove the ring of bolts round the flange of the axle arm. Place a drip tray below the arm and case to catch any oil which may run out. Withdraw the axle arm taking care not to dislodge the sun gear, brake plates etc.

On refitting the arm ensure the mating surfaces of the arm and centre housing are coated with the recommended sealant. Align the arm with the centre casing, engage the sun gear with the differential, ensure the dowels are aligned and refit the bolts. Tighten the bolts to the correct torque.

Stub Axle Removal

The stub axle is retained to the axle arm via a ring of nuts and bolts and is sealed using an “O” Ring.

To remove the stub axle it will be necessary to remove the halfshaft. Remove the ring of nuts and bolts lift the stub axle clear of the arm.

Check all parts for damage, replace the “O” ring, coat the mating surfaces with the recommended sealant and refit the stub axle.

Refit the halfshaft and top up the axle oil.

Section E

BRAKES

BRAKES
Section E

Note the brakes operate on a mineral hydraulic fluid. On no account must a vegetable based brake fluid be used otherwise all braking system seals will be damaged.

To gain access to the brake components it will be necessary to refer to section D and remove the axle arm assemblies.

Remove the brake friction and fixed plates from the sun gear and withdraw the sun gear from the planet carrier. Remove the brake spacer plates from within the axle arms. Withdraw the brake pistons from the cylinders machined into the axle centre case and remove the seals. The brake piston seals should be replaced even if visually in good condition, ensure replacement seals are suitable for use with mineral hydraulic fluid.

Examine all parts for wear or damage, under normal operating conditions the brake plates should last several years, but should be replaced if blued, distorted or badly scored or the wear exceeds the limits given below.

Blueing of the brake plates indicates that the brakes have been overheating and slipping. Both sets of plates, plain and sintered bronze, should be replaced and the piston seals renewed.

Distortion normally occurs in conjuction with blueing and again indicates that the brakes have been overheating and slipping. Both sets of plates, plain and sintered bronze should be replaced and the piston seals renewed.

Scoring of the plates indicates that there are loose particles or foriegn material suspended in the oil. The axle casing should be thoroughly cleaned out and if necessary the source of the particles or material should be investigated. Both sets of plates, plain and sintered bronze should be replaced and the axle refilled with clean oil.

Wear, if the sintered groove of the bronze brake disc is worn down to a depth of .025 inch, 0.6mm or less, then the plates have reached the end of their working life and should be replaced. Care should be taken when examining the plain brake plates for over a long period of operation these can show a greater degree of wear than the sintered bronze disc. Do not assume because the bronze disc is well within the wear limits that all the brake plates are in an acceptable condition. Replacing the plain brake plates may prolong the working life of the brakes and restone their efficiency.

Lubricate all the parts with one of the recommended mineral oils and carefully refit the brake pistons taking care not to “nip” the “O” rings.

Refit the brake spacer plates into the axle arms and insert the sun gears into the planet carrier. Slide a friction plate over the sun gears upto the brake spacer plate followed by a plain fixed plate, locate the fixed plates on the dowels in the axle arms. Slide on the next friction plate aligning the oil feed holes in the friction plates, followed by a fixed plate. (A plain fixed plate must be fitted between the last fricion disc and brake piston).

Refer to Section D and refit the axle arms.

Refit the drain plug. Remove the combined filler/lever plug and top up the oil.

Section F

SETTING PROCEDURE CROWNWHEEL & PINION

Setting Up The Crownwheel And Pinion
SectionF

A) When a new Spiral Bevel Pinion is fitted.

Note the Mounting Distance “MD” stamped on the front faces of the old and new bevel pinon.

The shim pack thickness used with the old pinion must be adjusted to suit the new bevel pinion as follows:-

a) If the new MD is less than the old figure increase the shim pack thickness by the difference.

b) If the new MD is greater than the old one reduce the shim pack thickness by the same amount.

Fit the correctly sized shim pack behind the bearing cone and assemble the pinion outer bearing cones into the pinion housing. Assemble the pinion into the housing and adjust the preload as described in Section A.

B) When the old MD is not available or a New Pinion Housing is fitted.

Fit the outer bearing cones into the pinion housing, locate the front bearing cone onto the pinion and insert the pinion into the housing. Sit the assembly, pinion down, onto a flat inspection surface and apply a downward force to the housing whilst rotating it around the pinion to ensure the bearings are seated.

Accurately measure the distance between the inspection surface and the underside of the pinion housing mounting flange. This is dimension “X”.

Assemble the crownwheel and differential into the axle case and tighten the adjusting nuts to take up the differential bearing end float, use a depth gauge to accurately measure from the pinion housing flange surface to the ground diameter of the differential casing. This is dimension “Y”.

Read both the Pinion Mounting Distance “MD” and the Pinion Head Thickness “HT” stamped on the front face of the pinion and use the following calculations to determine the shim pack thickness required.

a) $MD - HT - \frac{108.76}{2} = A$

B) Dimension “ Y ” - Dimension “X” = B

C) Shim Pack Thickness required B-A

Select a shim pack of the correct thickness and remove the pinion from the housing. Remove the bearing outer cone race, locate the shim pack and refit the bearing cone. Assemble the pinion into the housing and adjust the pinion bearing preload as described in Section A.

Slacken the differential bearing adjusting nuts and assemble the pinion housing onto the axle centre casing retaining with two setscrews.

Retighten the adjusting nuts to take up the bearing end float and lightly preload the bearings, adjust the ring nuts to give the correct backlash between the teeth on the crownwheel and pinion:-

1310 Hardy Spicer 4 Bolt Flange 0.22 - 0.30mm.

1410 Hardy Spicer 4 Bolt Flange 0.27 - 0.36mm.

The backlash is best checked via a dial indication clock located against a drive flange hole or located against the head of a nut and bolt which is secured in one of the holes within the flange.

Equally tighten both ring nuts by the same amount to give the correct bearing preload, (it is important that the backlash is maintained) the preload is measured by winding a length of string round the pinion flange and measuring the load required to turn the flange with a spring balance.

Differential Bearing Preload	New Bearings	Old Bearings
	6.55-8.7Kg (14.44lbs-19.18lbs)	3.75-5.45Kg (8.26lbs-12.01lbs)

After setting the preload for the differential bearings recheck the crownwheel/pinion backlash.

Remove the pinion housing assembly and brush some “Engineers Blue” onto a few crownwheel teeth and refit the pinion housing. Rotate the pinion flange a few complete rotations in either direction and remove the pinion housing. Examine the contact markings on both flanks of the crownwheel teeth and compare the markings to the illustrations in Section G or the original factory markings.

If the marking is different, refer to the notes in Section G “Spiral Bevel Tooth Contact” and make the necessary adjusments.

Secure the adjusting ring nuts using the locking devices and re-assemble the remainder of the axle as described in Section A, C, D and E.

Remove the combined filler/level plug and top up the axle with oil.

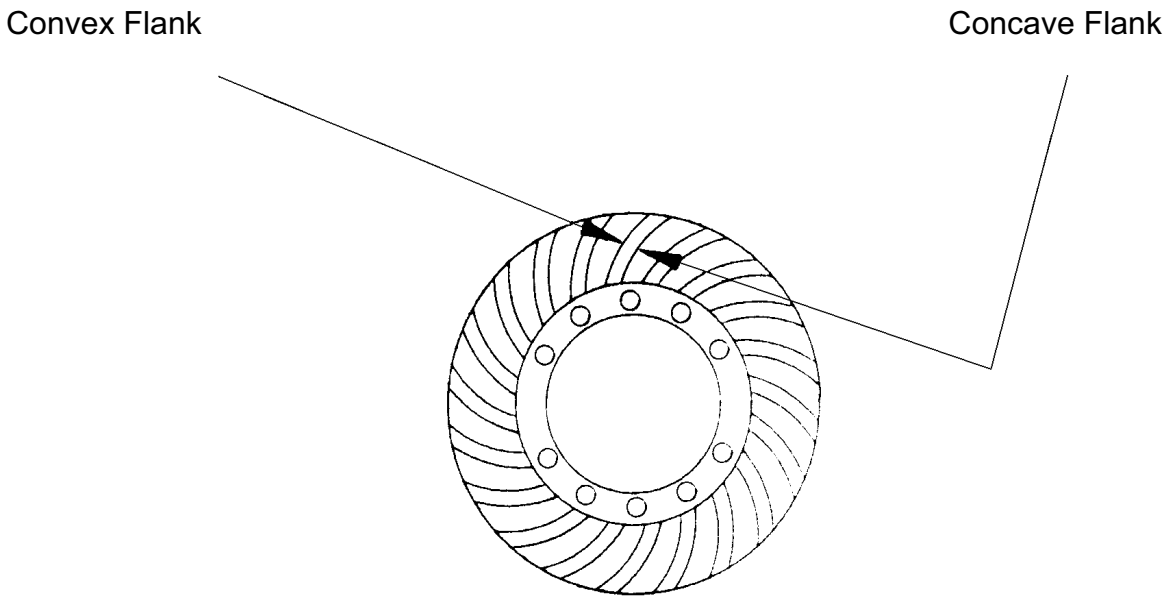
Section G

SPIRAL BEVEL GEAR TOOTH CONTACT

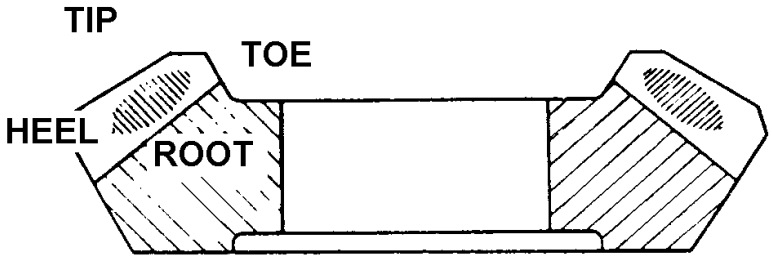
Spiral Bevel Gear Tooth Contact

Section G

The illustration shown below is intended as a reminder to those who are unfamiliar with the terminology applied to Spiral Bevel Gear Teeth



The markings on a crownwheel which is correctly meshed with the pinion should resemble those shown on the illustration below:-

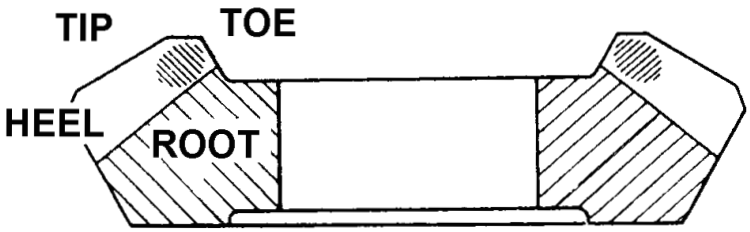


Although the contact point on both flanks of the teeth may vary slightly, generally speaking when correctly setup the markings on both the convex and concave flanks will be in the centre of the tooth form and can still be considered to be correct if, on both flanks, the markings are towards the toe or if crossed slightly e.g. towards the toe on the convex flank and the heel on the concave flank or vice-versa.

If when comparing the contact markings they appear similar to the illustrations below the corrective action indicated is required.

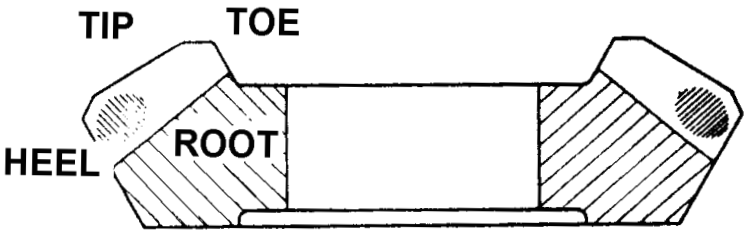
Pinion Too Far Out of Mesh

Convex Flank



Contact markings closer to toe and tip than factory markings

Concave Flank



Contact markings closer to heel and tip than factory markings.

Remedy:-

175 series Re-check and increase shims behind head of pinion.

200 series Re-check and increase shims behind head of pinion.

210 series Re-check and increase shims behind head of pinion.

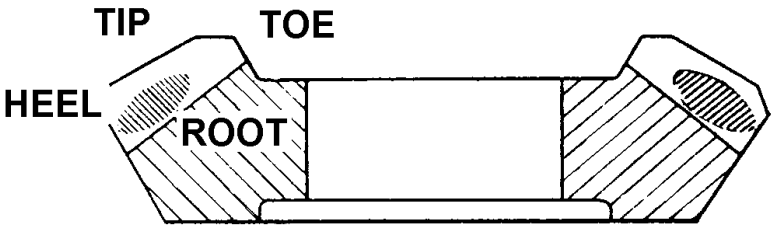
220 series Re-check and increase shims behind head of pinion.

360 series Re-check and increase shims behind pinion front bearing cone.

410 series Re-check and decrease shims between pinion cartridge and axle case.

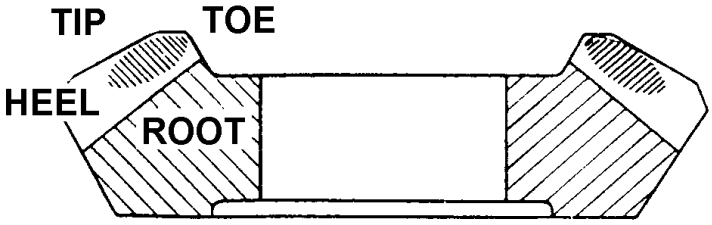
Pinion Too Far into Mesh

Convex Flank



Contact markings closer to heel and root than factory markings

Concave Flank



Contact markings closer to toe and root than factory markings.

Remedy:-

175 series	Re-check and decrease shims behind head of pinion.
200 series	Re-check and decrease shims behind head of pinion.
210 series	Re-check and decrease shims behind head of pinion.
220 series	Re-check and decrease shims behind head of pinion.
360 series	Re-check and decrease shims behind pinion front bearing cone.
410 series	Re-check and increase shims between pinion cartridge and axle case.