



**DRIVETRAIN
SYSTEMS**

Service Manual

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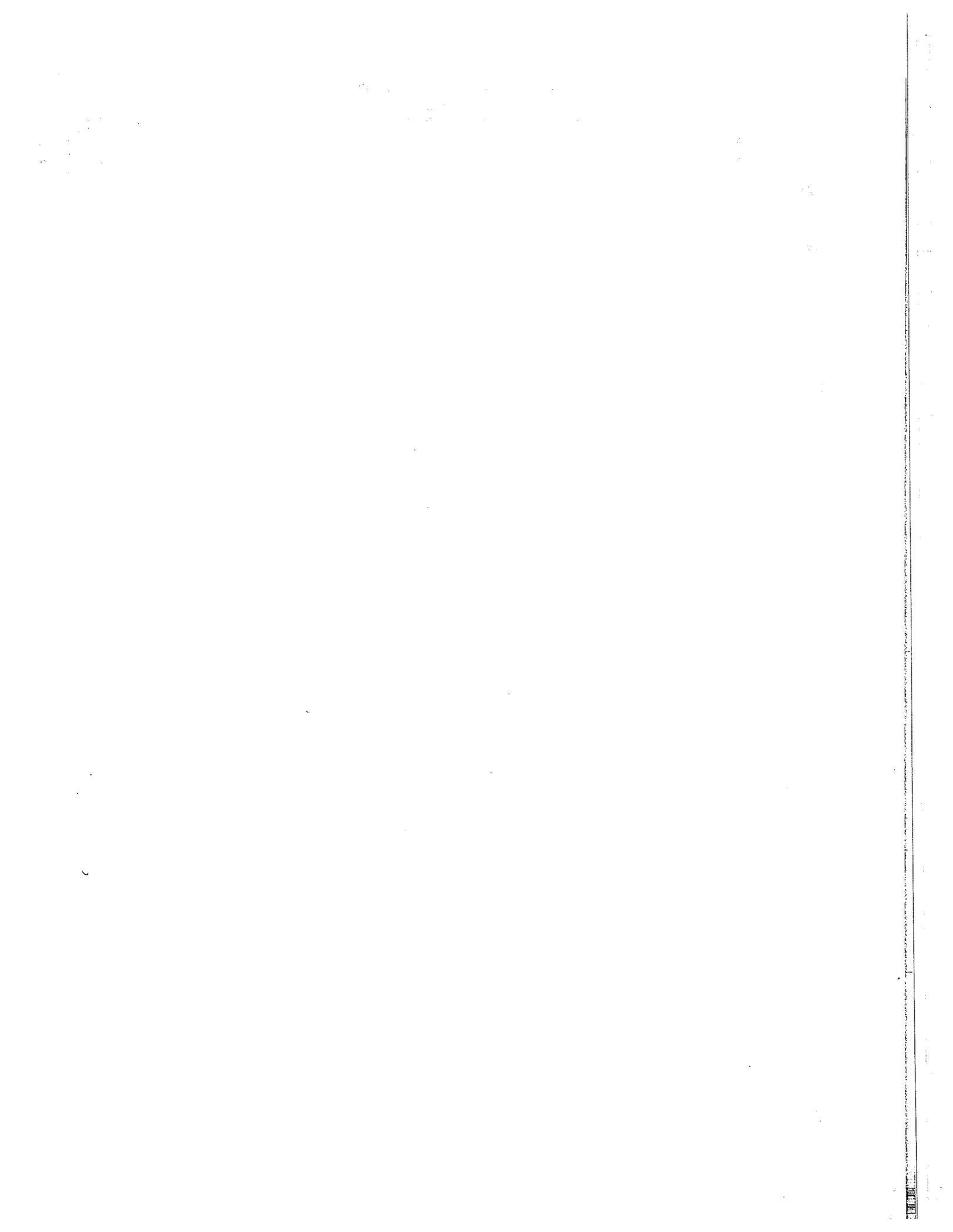
General Information	1
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NOTE

All references in this manual to 'Forward' and 'Reverse' assume a front-mounted engine.

SD 80 AND SD 80PT AXLES CENTRAL AND OFFSET DRIVE HEAD

Publication No. 9803/9230
Issue 5



SD 80/80PT Axles Service Manual

Publication No. 9803/9230

Record of Changes

3rd Update

Date	Page	Issue	Changes
Dec 1998	Cover	4	Issue number raised.
	2/4-2	2	Warnings GEN-1-12 and GEN-1-13 added.
	5/5-1	3	Sealing plugs Y and Z added to illustration.
	5/5-2	3	Note regarding excessive wear added to item 10.
	5/5-3	3	Sealing plug Y added to illustration.
	5/5-4	3	Notes added to items 16 and 20. Item 20 changed.
	5/5-5	3	Residual brake system pressure note added. (Taken from 9803/3620 - 520 - 50 S/M).
	5/12-1	2	Sealing plugs Y and Z added to illustration.
	5/12-2	2	Note regarding excessive wear added to item 10.
	5/12-3	2	Sealing plugs Y and Z added to illustration.
	5/12-4	2	Items 8, 11 and 12 Loctite 242 was Lock and Seal. Notes added to items 17 and 19. Item 19 changed.
	5/12-5	2	Residual brake system pressure note added. Item 23 revised.
	6/1	3	Residual brake system pressure added.
	6/5-1	3	Mobil DTE 11M added to oil specification. Item 6 reference changed.
	6/7-1	3	Residual brake system pressure information added.

SD 80/80PT Axles Service Manual

Publication No. 9803/9230

Record of Changes

2nd Update

Date	Page	Issue	Changes
Jan 1998	Cover	3	Issue Update
	1i	3	Limited Slip Differential changed to Axle Build Identification
	1/1-1	3	Limited Slip Differential changed to Axle Build Identification. Reference system modified.

SD 80/80PT Axles Service Manual

Publication No. 9803/9230

Record of Changes

1st Update

Date	Page	Issue	Changes
June 1997	Cover	2	Title changed to include SD 80PT Axle
	1i	2	Limited Slip Differential added to contents.
	1/1-1	2	Limited Slip Differential added,
	1/3-1	2	Part numbers revised. Part numbers added.
	1/3-1	2	Part numbers revised. Part numbers added.
	1/4-1	2	Part No. 992/07614 deleted.
	1/4-3	2	Oil Seal Insertion Tool and Annulus Removal Tool added. Piston nut Spanner list altered. Temperature Probe added.
	1/5-1	2	Part numbers altered.
	3i	2	SD 80PT Axle and Lubricants - Health and Safety added to contents.
	3/1-1	2	SD 80PT Axle added. Grease reference changed.
	3/1-2	2	Lubricants - Health and Safety added.
	3/2-1	2	Note regarding Service Checks added. Axle Greasing note and Service Periods added. Brake Fault note added.
	3/3-3	1	New page for SD 80PT grease points.
	3/4-2	2	SD 80PT Axle added.
	4i	2	SD 80PT Axle and Power Track Rod added to contents.
	4/1-1	2	SD 80PT information added.
	4/2-1	2	SD 80 added to title. Page reference in text removed.
	4/2-2	2	SD 80 added to title.
	4/2-3	2	SD 80 added to title. Page reference in text removed. Loctite references revised.
	4/2-4	2	Original information moved to 2-8. SD 80PT Power Track Rod inserted.
	4/2-5	1	New page for SD 80PT. Power Track Rod Dismantling and Assembly.
	4/2-6	1	New page for SD 80PT. Power Track Rod Dismantling and Assembly, continued.
	4/2-7	1	New page for SD 80PT. Power Track Rod Dismantling and Assembly, continued.
	4/2-8	1	New page. Information moved from 2-4, Issue 1.
	5i	2	SD 80PT added to contents. SD 80 Central Drive Head, Pad/Pin Mounted, Inboard Brakes added to contents.
	5/1-2	1	Pin mount added. SD90PT Data added.
	5/1-3	1	New page - SD 80PT Technical Data added.
	5/2-2	2	Title changed.
	5/2-3	1	New page.
	5/3-2	2	Removal - Item 2 changed.
	5/3-3	2	Lithium based No. 2 consistency grease changed to Mobil HP222 grease.
	5/4-1	2	Item 2 changed. Photographs replaced by illustrations.
	5/4-2	2	Text changed. Photograph replaced by illustration.
	5/5-1	2	Annotation 42 added.
	5/5-2	2	Item 10 text changed. Illustration changed.
	5/5-3	2	Annotation 42 added.
	5/5-4	2	Items 4 and 6 corrected. Note 2, item 11 added. Item 14 text changed.

Date	Page	Issue	Changes
June 1997	5/5-5	2	Item 23 revised. Item 28 changed. Note removed.
	5/7-1	2	Heading changed. Pin mounted illustration added.
	5/7-2	2	Heading changed. Items 3 and 7 changed.
	5/7-3	2	Heading changed. Page reference removed.
	5/8-1	2	Heading changed. Page references changed.
	5/9-1	2	Heading and title changed. Annotations added.
	5/9-2	2	Heading and title changed. Item 3 changed. Note removed. Item 17 corrected. Items 19, 20 and 21 added. Item 10 changed.
	5/9-3	2	Heading and title changed. Annotations added.
	5/9-4	2	Heading and title changed. Item 1 changed. Items 4 and 5 added - subsequent item numbers amended. Note 2 added.
	5/9-5	2	Heading changed.
	5/10-1	2	Heading changed. Cross reference changed. Brake information added.
	5/11-1	2	Original information moved to 14-1. SD 80PT Axle information inserted.
	5/11-2	2	Original information moved to 14-2. SD 80PT Axle information inserted.
	5/11-3	1	New page.
	5/11-4	1	New page.
	5/11-5	1	New page.
	5/11-6	1	New page.
	5/11-7	1	New page.
	5/11-8	1	New page.
	5/11-9	1	New page.
	5/11-10	1	New page.
	5/12-1	1	New page.
	5/12-2	1	New page.
	5/12-3	1	New page.
	5/12-4	1	New page.
	5/12-5	1	New page.
	5/14-1	1	New page. Information transferred from 11-1, Issue 1.
	5/14-2	1	New page. Information transferred from 11-2, Issue 1.
	6i	2	Contents revised.
	6/1-1	2	SD 80PT Technical data added.
	6/2-1	2	Photographs replaced by illustrations. Heading changed.
	6/2-2	2	Photographs removed. Heading changed. Items 3 and 6 changed. Item 6 illustration added.
	6/2-3	1	Page deleted.
	6/3-1	2	Original information moved to 2-2. New information moved from 4-1, Issue 1. Heading changed.
	6/3-2	2	Original information moved to 2-2. New information moved from 4-2, Issue 1. Heading changed.
	6/3-3	1	New page. Information moved from 4-3, Issue 1.
	6/3-4	1	New page. Information moved from 4-4, Issue 1.
	6/4-1	1	New page. Axle breather information added.
	6/5-1	2	Heading changed.
	6/6-1	2	Heading changed.
	6/7-1	2	Heading changed.

Introduction

This publication is designed for the benefit of Service Engineers.

These personnel should have a sound knowledge of workshop practice, safety procedures, and general techniques associated with the maintenance and repair of hydraulic equipment.

Renewal of oil seals, gaskets, etc., and any component showing obvious signs of wear or damage is expected as a matter of course. It is expected that components will be cleaned and lubricated where appropriate, and that any opened hose or pipe connections will be blanked to prevent excessive loss of hydraulic fluid and ingress of dirt. Finally, please remember above all else

SAFETY MUST COME FIRST!

The manual is compiled in sections, the first three are numbered and contain information as follows:

- 1 = **General Information** - includes torque settings and service tools.
- 2 = **Care & Safety** - includes warnings and cautions pertinent to aspects of workshop procedures etc.
- 3 = **Routine Maintenance** - includes service schedules and recommended lubricants etc.

The remaining sections deal with Dismantling, Overhaul etc. of specific components:

- 4 = **Hydraulics**
- 5 = **Axles**
- 6 = **Brakes**

The page numbering in each section is not continuous. This allows for the insertion of new items in later issues of the manual.

Section contents, technical data, operation descriptions etc. are inserted at the beginning of each section.

All sections are listed on the front cover; tabbed divider cards align directly with individual sections on the front cover for rapid reference.

Page cross references are generally made by presenting the subject title printed in bold, followed by the title of the section containing the subject. For example:

"24 If the axle is still on the machine, fit the brake calipers (see **Brake Caliper Removal and Replacement**, Section 6)."

Note: If only the subject title in bold is given, i.e. no section title, the cross reference is to another part of the same section.

Use the contents list at the beginning of each section to find the exact page number.

Where a torque setting is given as a single figure it may be varied by plus or minus 3%. Torque figures indicated are for dry threads, hence for lubricated threads may be reduced by one third.

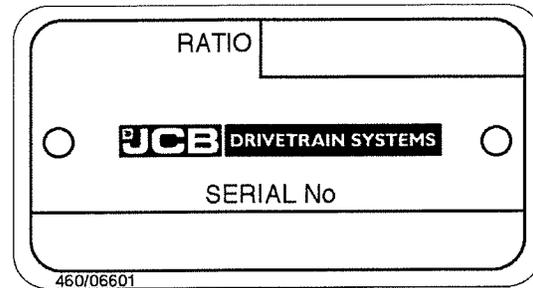
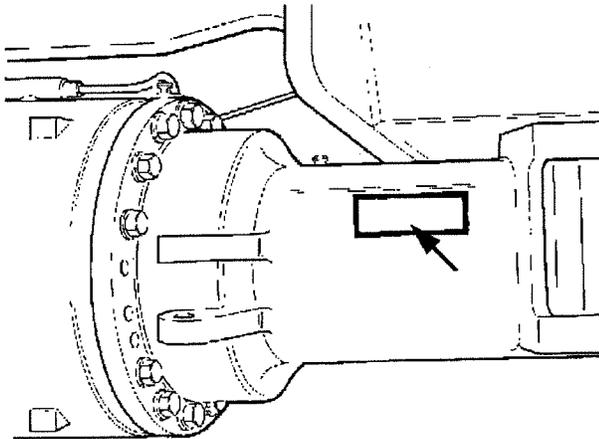
'Left Hand' and 'Right Hand' are as viewed from the rear of the machine facing forwards.

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* Axle Build Identification	1 - 1
Torque Settings	2 - 1
Service Tools Numerical List	3 - 1
Service Tools	4 - 1
Sealing and Retaining Compounds	5 - 1

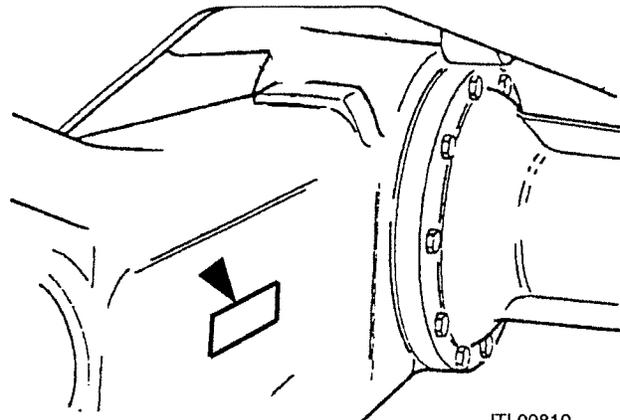
Unit Identification

Axle Serial Plate (Central Drive Head)

The axle serial number is stamped on a plate mounted to the front face of the axle, as shown.



234620



ITL00810

Replacement Parts

- 1 When replacement parts are required, always ensure that the correct parts are obtained, e.g. in the case of gear replacements, always check the part number stamped on the gear, and the number of teeth.
- 2 When ordering replacement parts, quote the details on the serial plate shown.
- 3 It is essential that all gaskets and seals removed while dismantling, should be renewed on reassembly.
- 4 On reassembly care should be taken that all parts are correctly replaced since any component omitted or incorrectly assembled can lead to a complete failure.
- 5 Lubricants should comply with the recommended list as provided in this manual. It is important to adhere to the oil changing procedure.
- 6 It is advisable to lightly lubricate with a recommended lubricant, parts such as gears, shafts, thrust washers and oil seals during reassembly.

Axle Serial Plate (Offset Drive Head)

The axle serial number is stamped on a plate mounted on the axle.

Axle Build Identification

To identify an axle build the number on the axle data plate should be cross-referenced with the part number in the parts information.

Example:

450 / 2760 / 1 / 0091
A
B
C

- A** 450/2760: Axle assembly part number (450/27600) without the final zeros.
- B** /1: Internal issue number of the main manufacturing drawing.
- C** /0091: Axle serial number. The complete 12 digit number must be quoted for warranty purposes. The parts information will detail the number of friction plates required for the axle.

Torque Settings

Use only where no torque setting is specified in the text. Values are for dry threads and may be within three per cent of the figures stated. For lubricated threads the values should be REDUCED by one third.

UNF Grade 'S' Bolts

Bolt Size in	(mm)	Hexagon (A/F) in	Torque Settings		
			Nm	kgf m	lbf ft
1/4	(6.3)	7/16	14	1.4	10
5/16	(7.9)	1/2	28	2.8	20
3/8	(9.5)	9/16	49	5.0	36
7/16	(11.1)	5/8	78	8.0	58
1/2	(12.7)	3/4	117	12.0	87
9/16	(14.3)	13/16	170	17.3	125
5/8	(15.9)	15/16	238	24.3	175
3/4	(19.0)	1 1/8	407	41.5	300
7/8	(22.2)	1 5/16	650	66.3	480
1	(25.4)	1 1/2	970	99.0	715
1 1/4	(31.7)	1 7/8	1940	198.0	1430
1 1/2	(38.1)	2 1/4	3390	345.0	2500

Metric Grade 8.8 Bolts

Bolt Size (mm)	Hexagon (A/F) mm	Torque Settings			
		Nm	kgf m	lbf ft	
M5	(5)	8	7	0.7	5
M6	(6)	10	12	1.2	9
M8	(8)	13	28	3.0	21
M10	(10)	17	56	5.7	42
M12	(12)	19	98	10	72
M16	(16)	24	244	25	180
M20	(20)	30	476	48	352
M24	(24)	36	822	84	607
M30	(30)	46	1633	166	1205
M36	(36)	55	2854	291	2105

*** Metric Grade 12.9 Bolts**

Bolt Size (mm)	Torque Settings			
	Nm	kgf m	lbf ft	
M8	(8)	48	4.9	35
M10	(10)	94	9.6	69
M12	(12)	166	16.9	122
M14	(14)	320	32.6	236
M16	(16)	400	40.8	295

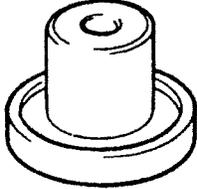
Note: All bolts are high tensile and must not be replaced by bolts of a lesser tensile specification.

Service Tools Numerical List

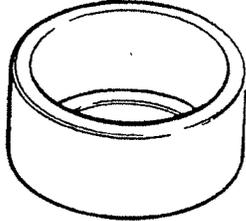
Page No.

4003/0211	Anti-Seize Paste	5 - 1
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* 4102/0551	Loctite 275	5 - 1
* 4102/1212	Loctite 574 or Permabond A136	5 - 1
* 4102/1951	Loctite 577	5 - 1
* 4103/0955	Superbonder	5 - 1
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Service Tools



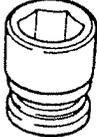
992/07604 Replacer - Crownwheel Bearing and Differential Bearing Cones



992/07606 Measuring Cup - Pinion Bearing



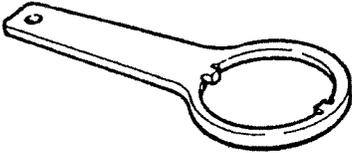
992/07609 Adapter - Steer/Drive Axle Pinion Bearing Cone



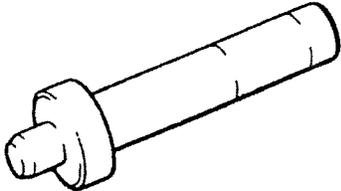
892/00817 17 mm A/F x 3/4 in square drive
 892/00818 22 mm A/F x 3/4 in square drive
 892/00819 15 mm A/F x 1/2 in square drive
 892/00333 19 mm A/F x 3/4 in square drive



992/07607 Spacer - Pinion Bearing Preload

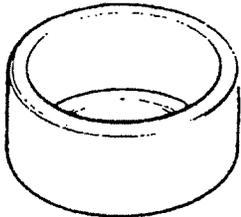
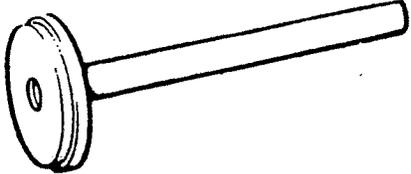


992/07601 Spanner for Half Shaft Nuts



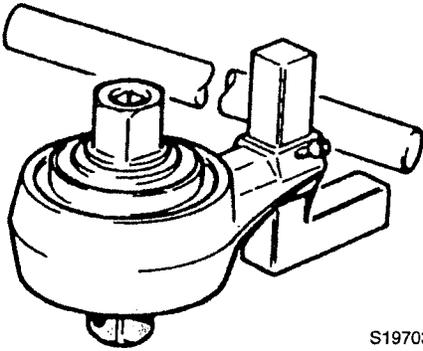
892/00182 Bearing Pad Driver

* 892/00174
 Measuring Cup - Pinion Head Bearing
 S190770

992/07603 Replacer - Pinion Head Bearing Cup

Service Tools (cont'd)



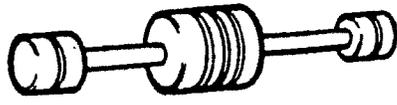
992/04000

Torque Multiplier (use in conjunction with a torque wrench to give a 5:1 multiplication when tightening pinion nuts)

S197030



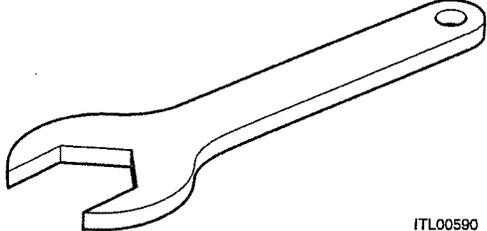
992/00800 Extractor for removing axle pivot pin



892/00224

Impulse Extractor Set for Hub Bearing Seals

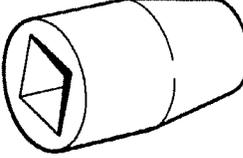
S197070



ITL00590

Hexagon Spanners for Cylinder Pistons and End Caps

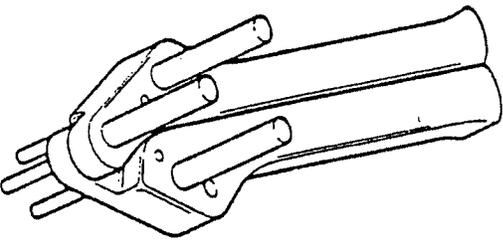
992/10800	50 mm A/F
992/09300	55 mm A/F
992/09400	65 mm A/F
992/09500	75 mm A/F
992/09700	95 mm A/F



892/00822

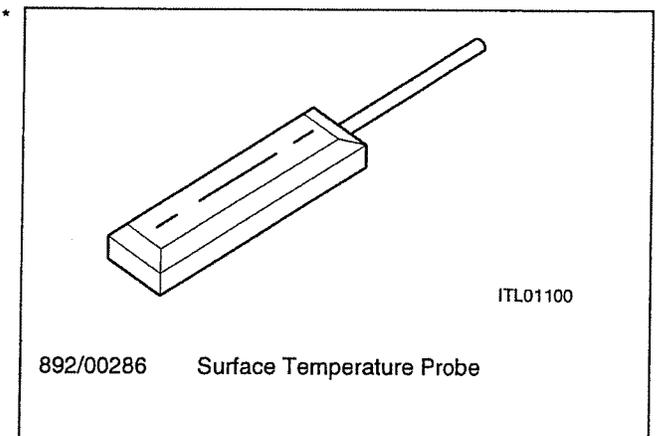
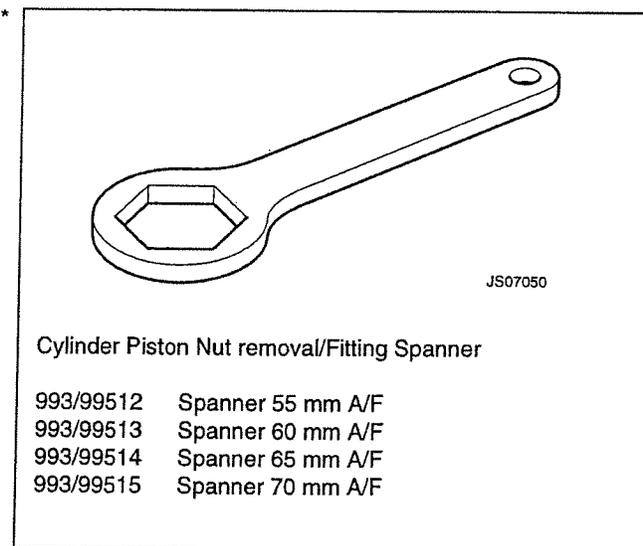
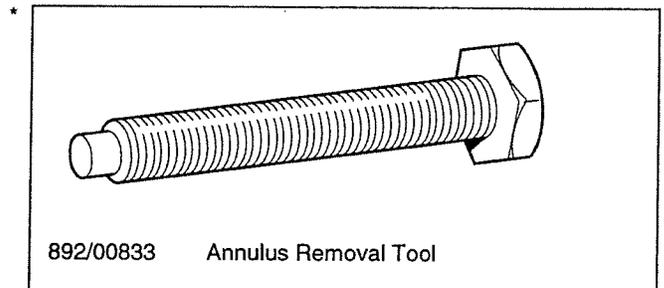
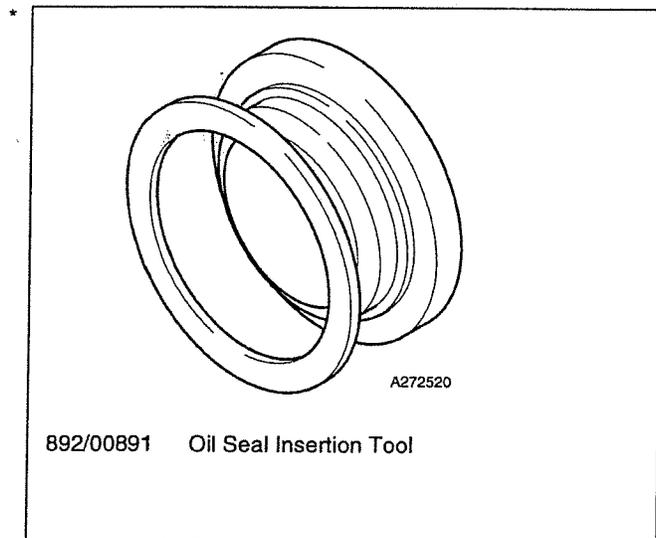
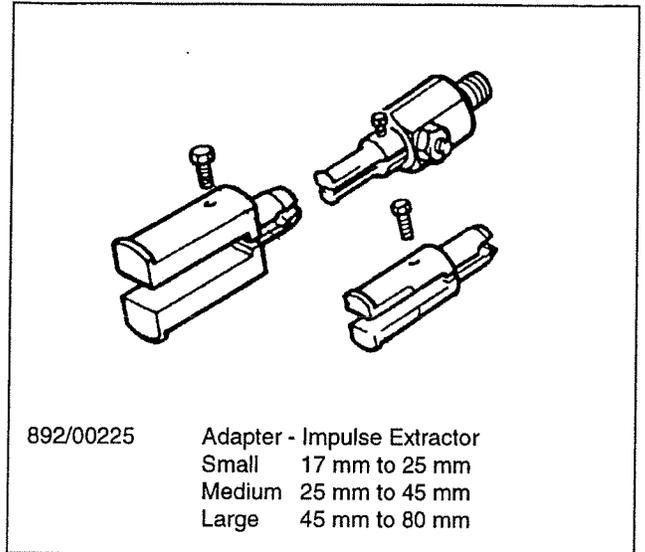
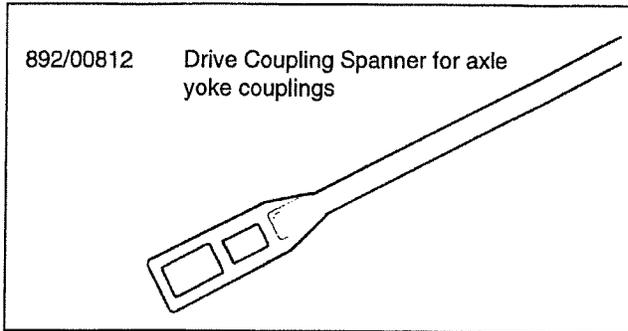
Splined Bolt Socket for driveshafts

S197060



892/00334 Gland Seal Fitting tool

Service Tools (cont'd)



Sealing and Retaining Compounds

* Loctite 574 or Permabond A136	A medium strength sealant suitable for all sizes of gasket flanges, and for hydraulic fittings of 25-65 mm diameter.	4102/1212	
* Loctite 275 or Permabond A140	For all size of flanges where the strength of the joint is important.	4102/0551	
* Loctite 932 or Permabond A137	For all retaining parts which are likely to be dismantled and for use on threads larger than 50 mm dia.	† 4101/0451	
* Loctite 242 or Permabond A113	A medium strength locking fluid for sealing and retaining nuts, bolts, and screws up to 50mm diameter, and for hydraulic fittings up to 25 mm diameter.	†4101/0251	
* Loctite 243	A medium strength locking fluid similar to Loctite 242 but with greater resistance to thread contamination.	4101/0250	
* Loctite 648 or Permabond A118	For retaining parts which are unlikely to be dismantled.	4101/0651	
* Loctite 577	A medium strength thread sealing compound.	4102/1951	
* Superbonder	Bonding/Sealanat	† 4103/0955	
* Loctite Activator	A cleaning primer which speeds the curing rate of anaerobic products.	† 4104/0251 † 4104/0253	Aerosol Bottle
* Cleaner/Degreaser	For degreasing components prior to use of anaerobic adhesives and sealants.	† 4104/1557	Aerosol
Anti-Seize Paste	A compound used for assembly and prevention of thread seizure.	† 4003/0211	

Note: The above list is the range of sealants and retaining compounds available. Items marked † are those referred to within the sections.

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General safety	2 - 1
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Safety Notices

In this publication and on the machine, there are safety notices. Each notice starts with a signal word. The signal word meanings are given below.

DANGER

Denotes an extreme hazard exists. If proper precautions are not taken, it is highly probable that the operator (or others) could be killed or seriously injured.

INT-1-2-1

WARNING

Denotes a hazard exists. If proper precautions are not taken, the operator (or others) could be killed or seriously injured.

INT-1-2-2

CAUTION

Denotes a reminder of safety practices. Failure to follow these safety practices could result in injury to the operator (or others) and possible damage to the machine.

INT-1-2-3

All machinery, whether mobile or static, can be hazardous. When equipment is correctly operated and properly maintained it can be safe to work with. But when it is carelessly operated or poorly maintained it can become a danger.

Do not work with any equipment until you are sure that it is serviceable, that you know how to control it and be aware of all relevant safety requirements.

If the equipment covered by this manual forms part of a larger product (eg. a vehicle) be sure to observe the safety requirements which relate to the product as a whole, as well as those given in this manual.

On this and the following pages and throughout this manual, you will find safety messages. Please read and understand these safety messages before using and working on the equipment covered in this manual.

Make sure you also read and understand all other safety messages contained in operator handbooks and service manuals concerned with the product of which this equipment forms part.

Remember

**BE CAREFUL
BE ALERT
BE SAFE**

General Safety

WARNING

Decals

This equipment may include safety decals

You can be injured if you do not obey decal safety instructions. Keep decals clean. Replace unreadable or missing decals with new ones before operating the equipment. Make sure replacement parts include warning decals where necessary.

WARNING

Clothing

You can be injured if you do not wear the proper clothing. Loose clothing can get caught in the equipment. Wear protective clothing to suit the job. Examples of protective clothing are: a hard hat, safety shoes, safety glasses, a well fitting overall, ear-protectors and industrial gloves. Keep cuffs fastened. Do not wear a necktie or scarf. Keep long hair restrained.

WARNING

Alcohol and Drugs

It is extremely dangerous to operate machinery when under the influence of alcohol or drugs. Do not consume alcoholic drinks or take drugs before or whilst operating the machine or attachments. Be aware of medicines which can cause drowsiness.

INT-1-3-9

WARNING

Lifting Equipment

You can be injured if you use faulty lifting equipment. Make sure that lifting equipment is in good condition. Make sure that lifting tackle complies with all local regulations and is suitable for the job. Make sure that lifting equipment is strong enough for the job.

INT-1-3-7

WARNING

Raised Attachments

Raised attachments on certain kinds of equipment can fall and injure you. Do not walk or work under raised attachments unless they are safely blocked.

INT-1-3-8

WARNING

Care and Alertness

All the time you are working with or on the equipment, take care and stay alert. Always be careful. Always be alert for hazards.

Operating Safety

WARNING

Equipment Condition

Defective equipment can injure you or others. Do not operate equipment which is defective or has missing parts. Make sure all maintenance procedures are completed before using the equipment.

WARNING

Controls

You or others can be killed or seriously injured if you operate machine control levers from outside the cab. Operate the control levers only when you are correctly seated inside the cab.

WARNING

Equipment Limits

Operating equipment beyond its design limits can damage the equipment, it can also be dangerous. Do not operate the equipment outside its limits. Do not try to upgrade the equipment performance with unapproved modifications.

WARNING

Engine/Steering Failure

If the engine or steering on the 'parent' machine fails, stop the machine as quickly as possible. Do not operate the machine until the fault has been corrected.

WARNING

Engine

The engine on the 'parent' machine has rotating parts. Do not open the engine cover while the engine is running. Do not use the machine with the cover open.

DANGER

Sparks

Explosions and fire can be caused by sparks from the exhaust or the electrical system. Do not use the machine in closed areas where there is flammable material, vapour or dust.

INT-2-2-10

WARNING

Exhaust Gases

Breathing the 'parent' machine exhaust gases can harm and possibly kill you. Do not operate the machine in closed spaces without making sure there is good ventilation. If possible, fit an exhaust extension. If you begin to feel drowsy, stop the machine at once. Get out of the cab into fresh air.

WARNING

Communications

Bad communications can cause accidents. Keep people around you informed of what you will be doing. If you will be working with other people, make sure any hand signals that may be used are understood by everybody. Work sites can be noisy, do not rely on spoken commands.

INT-2-2-3

WARNING

The transmission can be in 4 wheel drive until de-selected by hydraulic pressure to 2 wheel drive. If the machine is to be raised and the engine/transmission run, make sure all four wheels are off the ground and supported by axle stands. If only the rear wheels are raised, the machine could still drive through the front axle.

Maintenance Safety

WARNING Repairs

Do not try to do repairs or any other type of maintenance work you do not understand. To avoid injury and/or damage get the work done by a specialist engineer.

GEN-1-5

WARNING Modifications and Welding

Non-approved modifications can cause injury and damage. Welds on cast iron can weaken the structure and break. Do not weld cast iron. Contact your distributor for advice before modifying the equipment.

WARNING Metal Splinters

You can be injured by flying metal splinters when driving metal pins in or out. Use a soft faced hammer or drift to remove and fit metal pins. Always wear safety glasses.

INT-3-1-3

WARNING Electrical Circuits

Understand the electrical circuit before connecting or disconnecting an electrical component. A wrong connection can cause injury and/or damage.

INT-3-1-4

WARNING Battery Gases

Batteries give off explosive gases. Keep flames and sparks away from the vehicle battery. Do not smoke close to the battery. Make sure there is good ventilation in closed areas where batteries are being used or charged. Do not check the battery charge by shorting the terminals with metal; use a hydrometer or voltmeter.

WARNING Hydraulic Fluid

Fine jets of hydraulic fluid at high pressure can penetrate the skin. Do not use your fingers to check for hydraulic fluid leaks. Do not put your face close to suspected leaks. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of hydraulic fluid. If hydraulic fluid penetrates your skin, get medical help immediately.

INT-3-1-10/1

DANGER Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11/1

WARNING Oil

Oil is toxic. If you swallow any oil, do not induce vomiting, seek medical advice. Used engine oil contains harmful contaminants which can cause skin cancer. Do not handle used engine oil more than necessary. Always use barrier cream or wear gloves to prevent skin contact. Wash skin contaminated with oil thoroughly in warm soapy water. Do not use petrol, diesel fuel or paraffin to clean your skin.

INT-3-2-3

WARNING Soft Ground

A machine can sink into soft ground. Never work under a machine on soft ground.

INT-3-2-4

WARNING

Always wear safety glasses when dismantling assemblies containing components under pressure from springs. This will protect against eye injury from components accidentally flying out.

GEN 6-2

CAUTION Cleaning

Cleaning metal parts with incorrect solvents can cause corrosion. Use only recommended cleaning agents and solvents.

INT-3-2-11

CAUTION

'O' rings, Seals and Gaskets

Badly fitted, damaged or rotted 'O' rings, seals and gaskets can cause leakages and possible accidents. Renew whenever disturbed unless otherwise instructed. Do not use Trichloroethane or paint thinners near 'O' rings and seals.

INT-3-2-12

Maintenance Safety (cont'd)**⚠ WARNING****Fires**

Do not use water to put out an equipment fire, you could spread an oil fire or get a shock from an electrical fire. Use carbon dioxide, dry chemical or foam extinguishers. Contact your nearest fire department as quickly as possible. Firefighters should use self-contained breathing apparatus.

⚠ WARNING**Jacking**

A machine can roll off jacks and crush you unless the wheels have been chocked. Always chock the wheels at the opposite end of the machine that is to be jacked. Do not work underneath a machine supported only by jacks. Always support a jacked-up machine on axle stands before working underneath it.

INT-3-2-8

⚠ WARNING**Hydraulic Hoses**

Damaged hoses can cause fatal accidents. Inspect the hoses regularly for:

- Damaged end fittings
- Chafed outer covers
- Ballooned outer covers
- Kinked or crushed hoses
- Embedded armouring in outer covers
- Displaced end fittings.

INT-3-3-2

⚠ WARNING

Make the machine safe before working underneath it. Park the machine on level ground. Apply the parking brake, put the transmission in neutral and stop the engine. Chock both sides of all four wheels.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN-1-2/IT

⚠ WARNING

To avoid burning, wear protective gloves when handling hot components. To protect your eyes, wear goggles when using a wire brush to clean components.

HYD 1-3

⚠ WARNING

Some lubricants contain lead. The repeated swallowing of very small quantities can cause chronic lead poisoning. Do not smoke or touch food while handling this lubricant. Dispose of waste (rags etc.) in accordance with local regulations.

2-1-1-8/IT

⚠ WARNING**Fluoroelastomeric Materials**

Certain seals and gaskets (e.g. transmission oil seals) may contain fluoroelastomeric materials such as Viton, Fluorel and Technoflon. Fluoroelastomeric materials subjected to high temperatures can produce highly corrosive hydrofluoric acid. THIS ACID CAN SEVERELY BURN.

New fluoroelastomeric components at ambient temperature require no special safety precautions.

Used fluoroelastomeric components whose temperatures have not exceeded 300°C require no special safety precautions. If evidence of decomposition (e.g. charring) is found, refer to the next paragraph for safety instructions DO NOT TOUCH COMPONENT OR SURROUNDING AREA.

Used fluoroelastomeric components subjected to temperatures greater than 300°C (e.g. engine fire) must be treated using the following safety procedure. Make sure that heavy duty gloves and special safety glasses are worn:

- 1 Ensure that components have cooled then remove and place material into plastic bags.
- 2 Thoroughly wash contaminated area with 10% calcium hydroxide or other suitable alkali solution, if necessary use wire wool to remove burnt remains.
- 3 Thoroughly wash contaminated area with detergent and water.
- 4 Contain all removed material, gloves etc. used in this operation in sealed plastic bags and dispose of in accordance with Local Authority Regulations.

DO NOT BURN FLUOROELASTOMERIC MATERIALS.

If contamination of skin or eyes occurs, wash the affected area with a continuous supply of clean water or with calcium hydroxide solution for 15-60 minutes. Get medical attention immediately.

INT-3-3-5/1/IT

⚠ WARNING

Protect your eyes when grinding metal. Wear safety glasses or goggles. Remove or protect any combustible materials from the area which could be ignited by sparks.

GEN-1-12

⚠ WARNING

Before carrying out any servicing, park the machine on firm level ground and apply the parking brake. Make sure the transmission selector and gear lever are in the neutral position. Switch OFF the engine and remove the starter key. Operate the control levers and remove the hydraulic filler cap to vent any residual pressure. Disconnect the battery.

GEN-1-13

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Lubricants & Capacities

ITEM	CAPACITY		FLUID/LUBRICANT	INTERNATIONAL SPECIFICATION
	Litres	UK Gals		
Axle - SD 80 Offset Drive Head (Hub Brakes)				
Housing	18.0	3.96	Mobil Fluid 424	API GL4, M2C-41B/134D, JD20C
Hubs (x2)	1.7	0.37		MF M1135/M1141/M1143
* Axle - SD 80PT Central Drive Head (Hub Brakes)				
Housing	26.0	5.72	Mobil Fluid 424	API GL4, M2C-41B/134D, JD20C
Hubs (x2)	2.0	0.44		MF M1135/M1141/M1143
Axle - SD 80 Central Drive Head (Inboard Brakes)				
Housing	23.0	5.06	Mobil Fluid 424	API GL4, M2C-41B/134D, JD20C
Hubs (x2)	1.5	0.33		MF M1135/M1141/M1143
* Grease Points	-	-	Mobil HP222	Mobil HP222
Brake System	-	-	Mobil DTE 11M CAUTION: Do not use ordinary brake fluid (J 1703)	ISO VG 15

Note 1: Mobil 424 should always be used for axles fitted with brakes. For Axles without brakes Mobilube HD90 or Mobil Fluid 424 can be used.

Note 2: Axles with limited slip differentials must use Mobil Fluid 424.

Hygiene

Lubricants are not a health risk when used properly for their intended purposes.

However, excessive or prolonged skin contact can remove the natural fats from your skin, causing dryness and irritation.

Low viscosity oils are more likely to do this, so take special care when handling used oils, which might be diluted with fuel contamination.

Whenever you are handling oil products you should maintain good standards of care and personal and plant hygiene. For details of these precautions we advise you to read the relevant publications issued by your local health authority, plus the following:

Storage

Always keep lubricants out of the reach of children.

Never store lubricants in open or unlabelled containers.

Waste Disposal

All waste products should be disposed of in accordance with all the relevant regulations.

The collection and disposal of used oil should be in accordance with any local regulations. Never pour used oil into sewers, drains or on the ground.

Handling

New Oil

There are no special precautions needed for the handling or use of new oil, beside the normal care and hygiene practices.

Used Oil

Used lubricants contain harmful contaminants.

Here are precautions to protect your health when handling used oil:

- 1 Avoid prolonged, excessive or repeated skin contact with used oils.

- 2 Apply a barrier cream to the skin before handling used oil.

- 3 Note the following when removing oil from skin:

- a Wash your skin thoroughly with soap and water.
- b Using a nail brush will help.
- c Use special hand cleansers to help clean dirty hands.
- d Never use petrol, diesel fuel, or paraffin for washing.

- 4 Avoid skin contact with oil soaked clothing.

- 5 Don't keep oily rags in pockets.

- 6 Wash dirty clothing before re-use.

- 7 Throw away oil-soaked shoes.

First Aid - Oil

Eyes

In the case of eye contact, flush with water for 15 minutes. If irritation persists, get medical attention.

Swallowing

If oil is swallowed do not induce vomiting. Get medical advice.

Skin

In the case of excessive skin contact, wash with soap and water.

Spillage

Absorb on sand or a locally approved brand of absorbent granules. Scrape up and remove to a chemical disposal area.

Fires

Extinguish with carbon dioxide, dry chemical or foam. Fire-fighters should use self-contained breathing apparatus.

Service Schedules

A badly maintained machine is a danger to the operator and the people working around him. Make sure that the regular maintenance and lubrication jobs listed in the service schedules are done to keep the machine in a safe and efficient working condition.

WARNING

A raised and badly supported machine can fall on you. Position the machine on a firm, level surface before raising one end. Ensure the other end is securely chocked. Do not rely solely on the machine hydraulics or jacks to support the machine when working under it.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN-1-1

Apart from the daily jobs, the schedules are based on machine running hours. Keep a regular check on the hourmeter readings to correctly gauge service intervals. Do not use a machine which is due for a service. Make sure any defects found during the regular maintenance checks are rectified immediately.

Calendar equivalents:

10 Hours =	Daily
50 Hours =	Weekly
500 Hours =	Six Months
1000 Hours =	Yearly
2000 Hours =	2 Years

* Service checks should be carried out as in the table at whichever time occurs first.

Pre-start Cold Checks Service Points and Fluid Levels	Operation	10 Hr	50 Hr	†100 Hr	500 Hr	1000 Hr	2000 Hr
AXLES AND STEERING							
Axle Oil Level (incl. Hubs when applicable) ①	- Check			•	•	•	•
Axle Oil (incl. Hubs when applicable)	- Change			•	•	•	•
Drive Shafts	- Security/Grease				•	•	•
Steer Axle Movement/Shimming ②	- Check			•	•	•	•
* Axle Pivot and Steering Joints ††	- Grease			•	•	•	•
HYDRAULICS							
Cylinders - Chrome Condition	- Check				•	•	•
Functional Test and Final Inspection	Operation	10 Hr	50 Hr	†100 Hr	500 Hr	1000 Hr	2000 Hr
AXLES AND STEERING							
Steering Modes - Operation	- Check	•	•	•	•	•	•
Steering Proximity Switch - Operation ②	- Check			•	•	•	•
Wheel Nut Torque	- Check	•	•	•	•	•	•
Steer Phasing ②	- Check				•	•	•
Steer Cylinders - Balance ②	- Check			•	•	•	•
Steer Circuit Pressure ②	- Check			•	•	•	•

† **Note:** First 100 Hours Service only, to be completed by your Distributor.

* †† **Note:** Mobil HP222 Grease must be used at 500 hour intervals. If an alternative grease is used, the Service Interval must be reduced to 50 hours/weekly.

① **Note:** Check for leaks every 50 hours, check level if leaking.

② **Note:** Jobs which should only be done by a specialist are indicated by a ②.

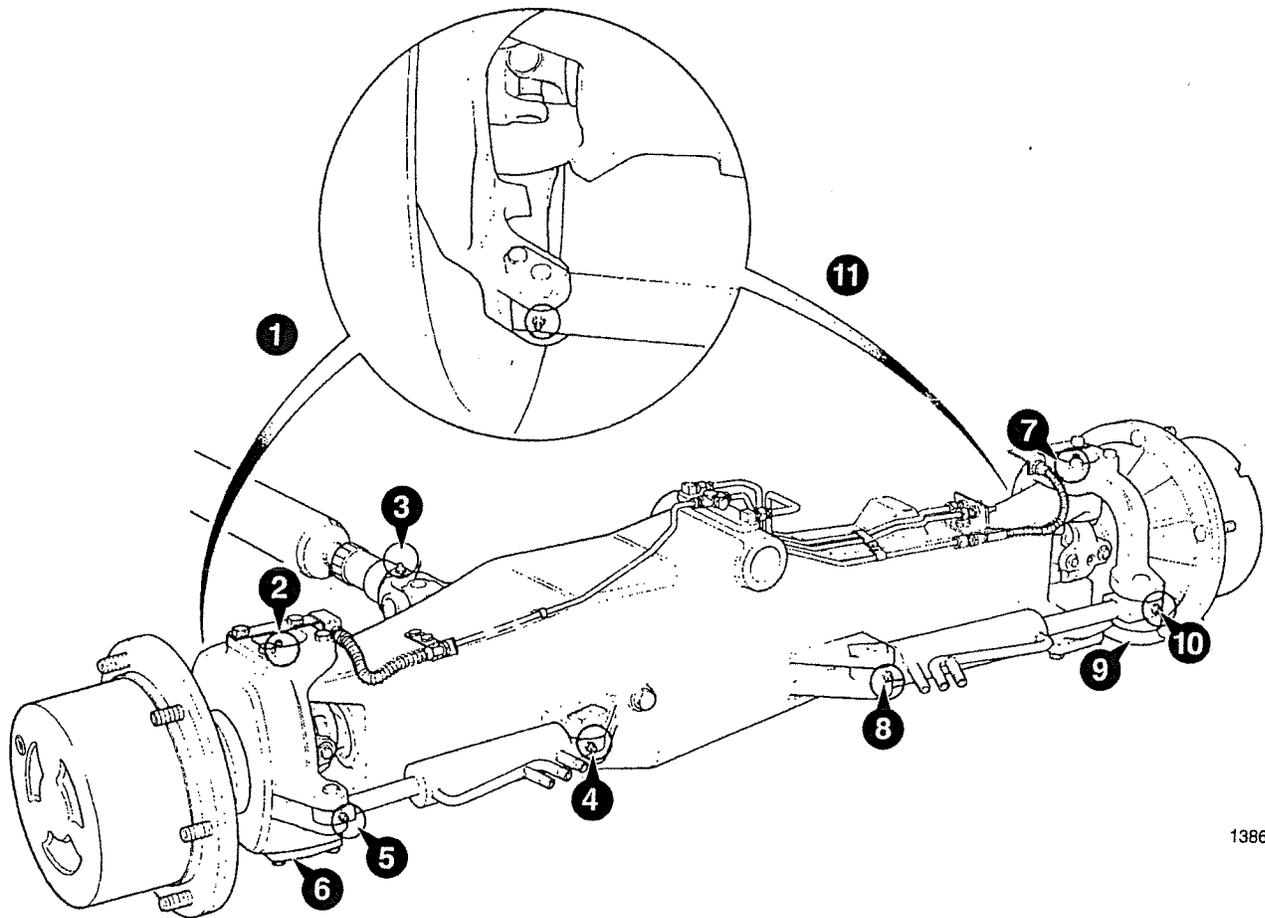
Note: Check generally for leaks on ALL systems, for example, hydraulics, axles etc. If a leak is evident find the source and repair as required. Make sure that the system is topped up with the recommended fluid after repair.

* **Note:** Faults in the braking system must be rectified **immediately**. Ensure the correct brake fluid is used (see **Lubricants and Capacities**) and all is clean and free from water contamination. Under no circumstances should water be allowed to enter the braking system.

Greasing

SD80 Axle - Offset Drive Head
- for Interval see Service Schedule

11 Grease Points

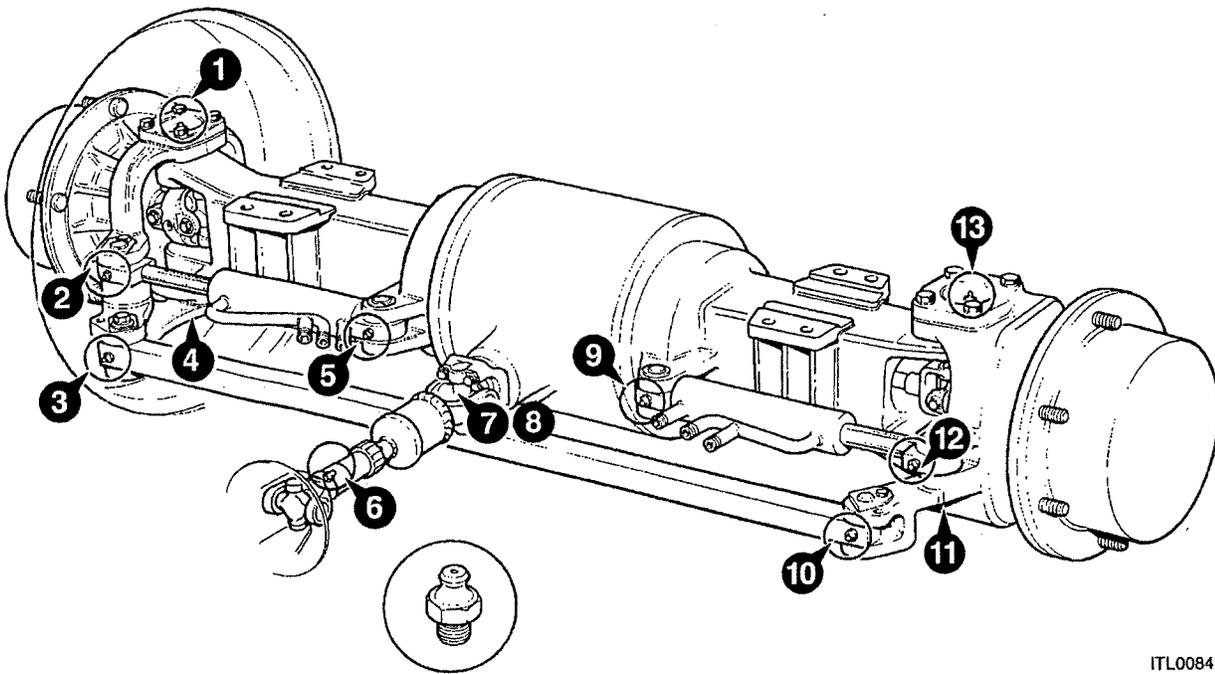


138680

Greasing

SD80 Axle - Central Drive Head
- for Interval see Service Schedule

13 Grease Points

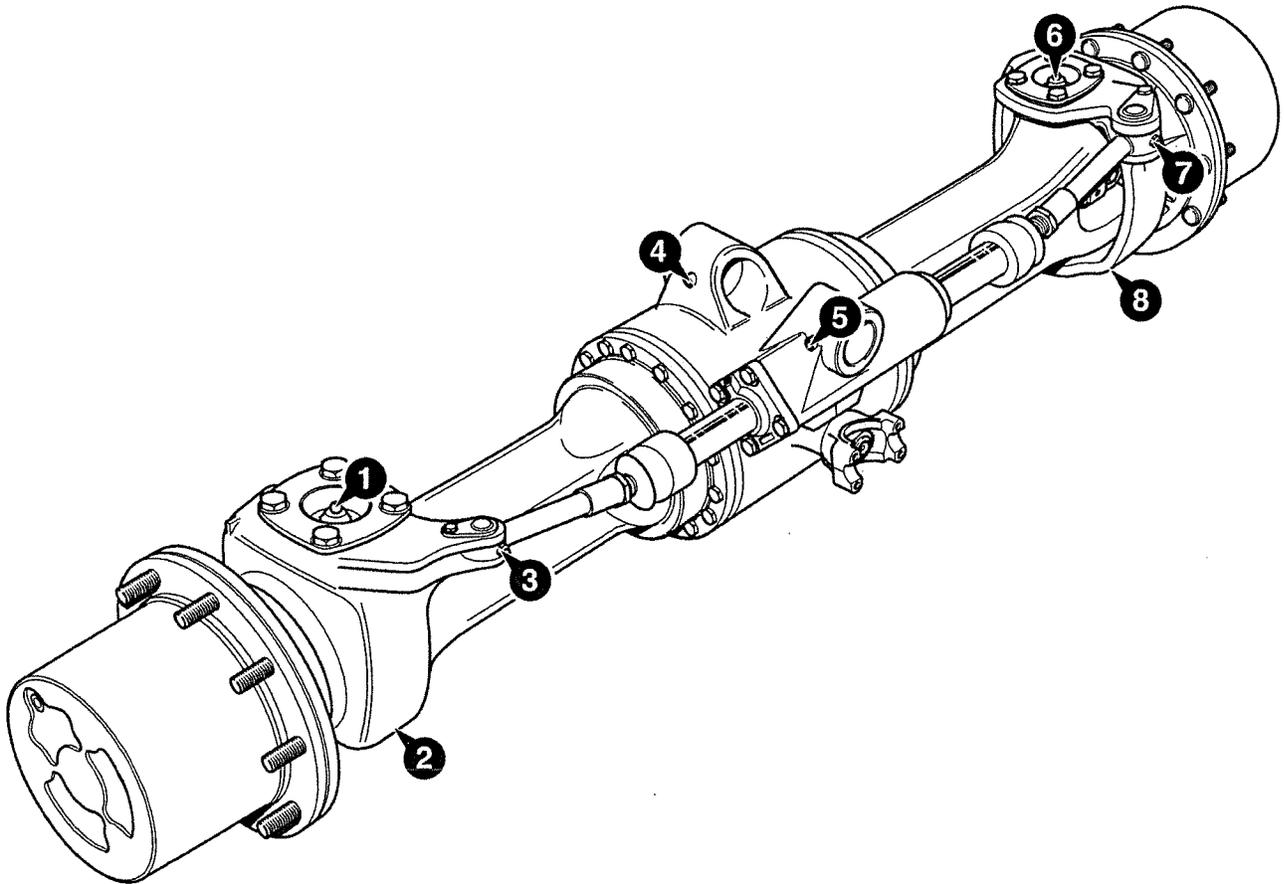


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Greasing

SD 80PT Axle - Central Drive Head
- for Interval see Service Schedule

8 Grease Points



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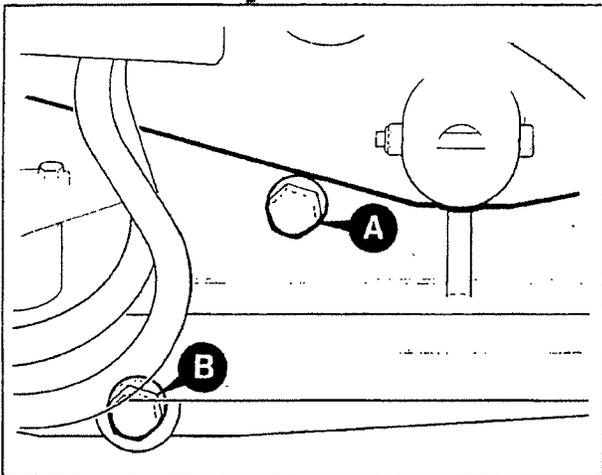
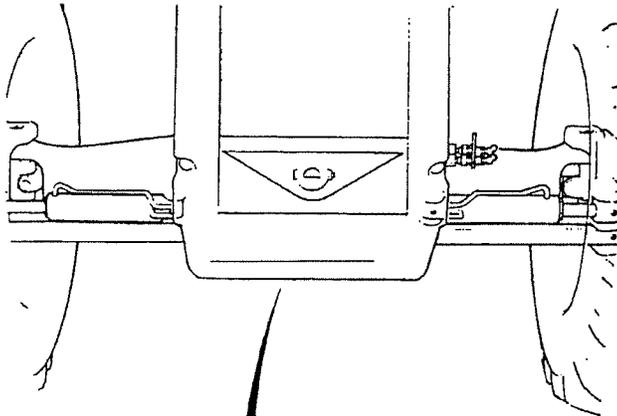
Axle Oil Level - SD80 - Offset Drive Head

Check Differential Oil Level - for Interval see Service Schedule

- 1 Remove fill/level plug **A**. Oil should be level with the bottom of the fill/level hole.
- 2 If necessary, top up with recommended axle oil. Clean and refit fill/level plug **A**, torque tighten to 79 Nm (58 lbf ft).

Change Differential Oil - for Interval see Service Schedule

- 1 Remove fill/level plug **A** and drain plug **B**. Allow time for the oil to drain out.
- 2 Clean and refit drain plug **B**, torque tighten to 79 Nm (58 lbf ft).
- 3 Fill the axle with recommended axle oil through the fill/level hole **A**. Oil should be level with the bottom of the fill/level hole.
- 4 Clean and refit fill/level plug **A**, torque tighten to 79 Nm (58 lbf ft).



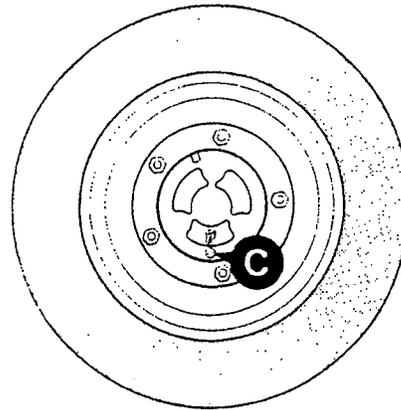
ITL00520

Check Hub Oil Level - for Interval see Service Schedule

- 1 Make sure the **OIL LEVEL** mark on the hub is horizontal.
- 2 Remove fill/level plug **C**. Oil should be level with the bottom of the fill/level hole.
- 3 If necessary, top up with recommended axle oil. Clean and refit fill/level plug **C**.

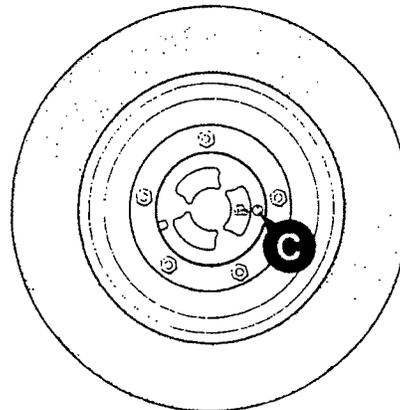
Change Hub Oil - for Interval see Service Schedule

- 1 Set the machine level, with the tyres just clear of the ground. Manually rotate the wheels to bring the **OIL LEVEL** mark on the hubs to the vertical position, with the fill/level plug **C** at the bottom.



113430

- 2 Remove fill/level plug **C**. Allow time for the oil to drain out.
- 3 Set **OIL LEVEL** marks to the horizontal.



ITL00530

- 4 Fill the hubs with recommended axle oil through the fill/level hole **C**. Oil should be level with the bottom of the fill level hole.
- 5 Clean and refit fill/level plug **C**.

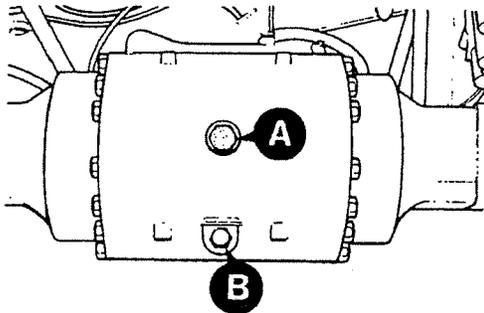
* Axle Oil Level - SD 80 and SD 80PT - Central Drive Head

Check Differential Oil Level - for Interval see Service Schedule

- 1 Remove fill/level plug **A**. Oil should be level with the bottom of the fill/level hole.
- 2 If necessary, top up with recommended axle oil. Clean and refit fill/level plug **A**.

Change Differential Oil - for Interval see Service Schedule

- 1 Remove fill/level plug **A** and drain plug **B**. Allow time for the oil to drain out.
- 2 Clean and refit drain plug **B**.
- 3 Fill the axle with recommended axle oil through the fill/level hole **A**. Oil should be level with the bottom of the fill/level hole.



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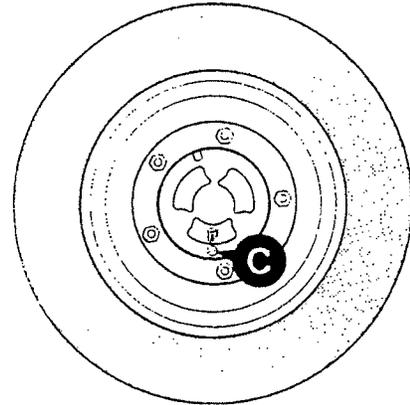
- 4 Clean and refit fill/level plug **A**.

Check Hub Oil Level - for Interval see Service Schedule

- 1 Make sure the **OIL LEVEL** mark on the hub is horizontal.
- 2 Remove fill/level plug **C**. Oil should be level with the bottom of the fill/level hole.
- 3 If necessary, top up with recommended axle oil. Clean and refit fill/level plug **C**.

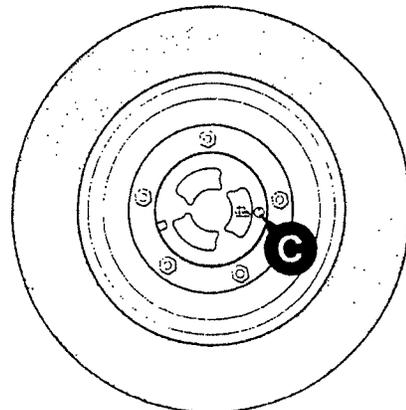
Change Hub Oil - for Interval see Service Schedule

- 1 Set the machine level, with the tyre just clear of the ground. Manually rotate the wheel to bring the **OIL LEVEL** mark on the hub to the vertical position, with the fill/level plug **C** at the bottom.



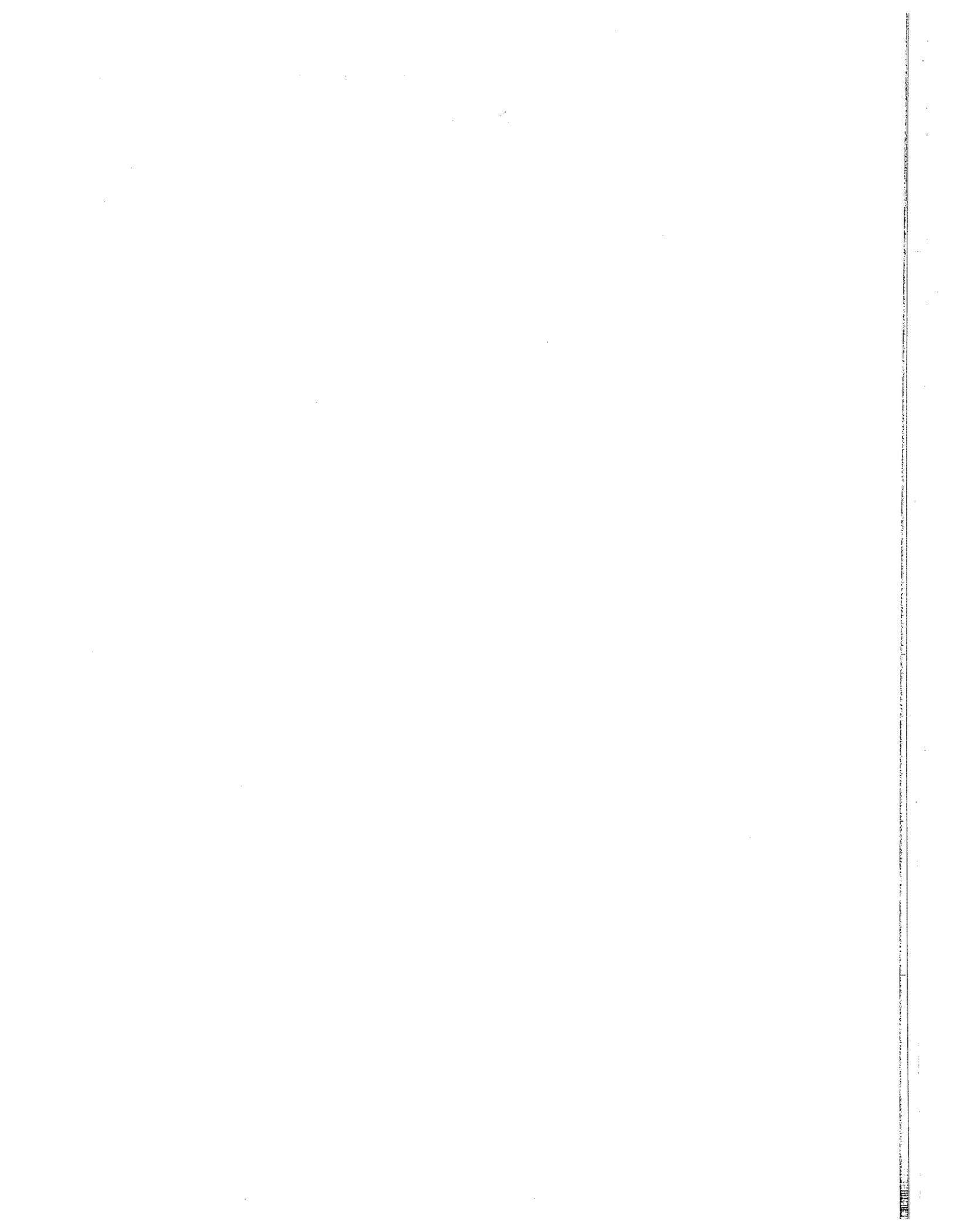
113430

- 2 Remove fill/level plug **C**. Allow time for the oil to drain out.
- 3 Set **OIL LEVEL** mark to the horizontal



ITL00530

- 4 Fill the hub with recommended axle oil through the fill/level hole **C**. Oil should be level with the bottom of the fill level hole.
- 5 Clean and refit fill/level plug **C**.



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Steering

Relief Valve Pressure @ 1500 rpm
Shock Valve Pressure

Refer to Machine Operator Handbook
Refer to Machine Operator Handbook

JCB Drivetrain Steer Cylinder Data (SD 80 Axle)**Torque Settings**

Piston Head	405 Nm	41 kgf m	300 lbf ft
End Cap	678 Nm	69 kgf m	500 lbf ft

Sizes

Bore Diameter	60 mm (2.35 in)
Rod Diameter	30 mm (1.18 in)

Note: The above data refers to JCB Drivetrain Steer Cylinders, please check the type of cylinder fitted before using this section. For different cylinders refer to original manufacturer's data.

Power Track Rod Cylinder Data (SD 80PT Axle)**Torque Settings**

Cylinder Cover Screws	166 Nm	17 kgf m	122 lbf ft
-----------------------	--------	----------	------------

Sizes

Bore Diameter	75 mm (2.95 in)
Rod Diameter	42 mm (1.65 in)

*Steer Cylinder (SD 80 Axle)

Removal and Replacement

This procedure is for a typical steering cylinder removal and replacement.

⚠ WARNING

A raised and badly supported machine can fall on you. Position the machine on a firm, level surface before raising one end. Ensure the other end is securely chocked. Do not rely solely on the machine hydraulics or jacks to support the machine when working under it.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN-1-1

When Removing

Disconnect and cap hydraulic hoses to prevent loss of fluid and ingress of dirt. Label hoses for identification and correct refitting.

Remove locking bolts **A** and pivot pins **B**.

Remove steering cylinder from machine.

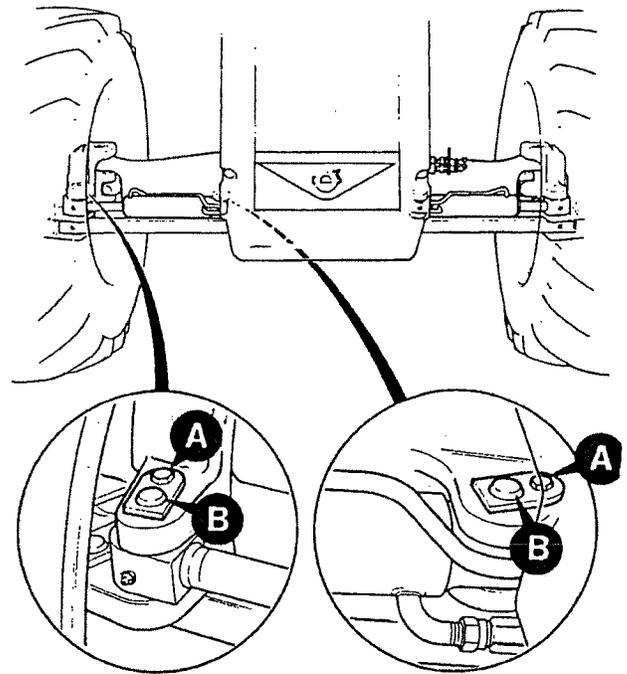
When Replacing

Replace steering cylinder by reversing the removal procedure.

Apply anti-seize paste, part number 4003/0211 to pivot pins **B**, to facilitate subsequent removal.

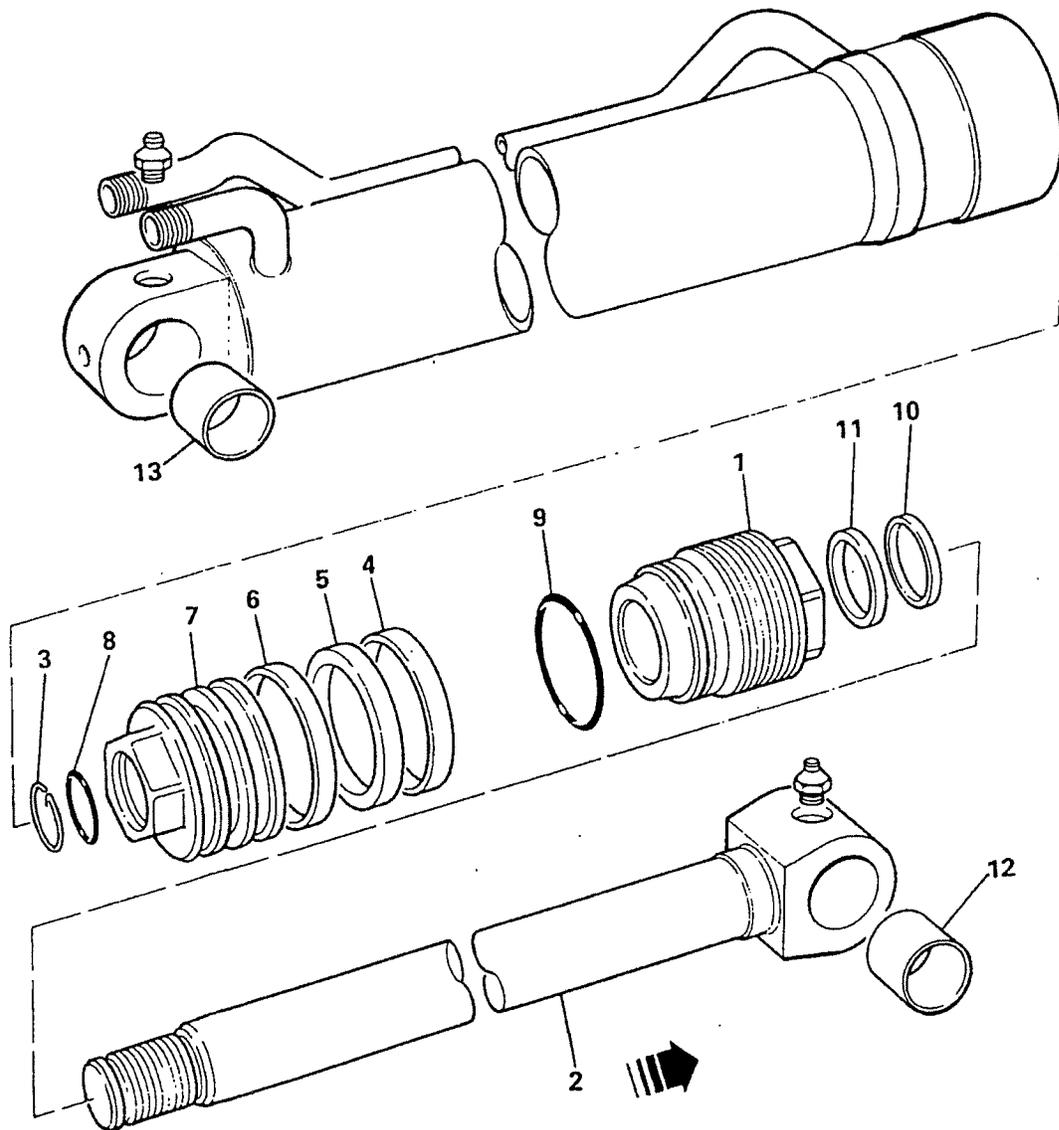
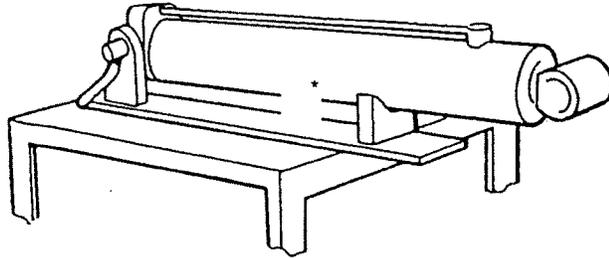
After connecting hoses check hydraulic fluid level, if necessary top up.

*Bleed hydraulic steering system (see **Steering System - Bleeding Procedure**).



148220

* Steer Cylinder (SD 80 Axle) (cont'd)



147640

* **Steer Cylinder (SD 80 Axle) (cont'd)****Dismantling and Assembly**

The numerical sequence shown on the illustration is intended as a guide to dismantling.

For assembly the sequence should be reversed.

Dismantling

Place cylinder assembly on a locally manufactured strip/rebuild bench as shown.

Slacken end cap 1 using special spanner (see **Service Tools**, Section 1) and remove the piston rod assembly 2 from the cylinder.

⚠ WARNING

If air or hydraulic pressure is used to force out the piston assembly, ensure that the end cap is securely fitted. Severe injury can be caused by a suddenly released piston rod.

HYD 1-2

Position piston rod assembly on bench in place of cylinder. Remove seal and wear rings from piston head.

Remove locking ring 3.

Heat piston head to 180 - 210 °C to degrade the Loctite between piston head and rod. To check temperature, use Surface Temperature Probe (see **Service Tools**, Section 1).

CAUTION: Do not exceed 300 °C or the Loctite will char, causing thread pick-up.

⚠ WARNING

To avoid burning, wear protective gloves when handling hot components. To protect your eyes, wear goggles when using a wire brush to clean components.

HYD 1-3

Remove piston head from rod using special spanner (see **Service Tools**, Section 1).

Remove end cap from piston rod and remove the seals and 'O' ring.

Ensure that metal components are free from scoring, nicks and burrs. A damaged rod will impair the life of the gland seal.

*** Assembly**

Clean threads of piston rod, piston head, end cap and cylinder using a wire brush.

* Use Loctite Cleaner/Degreaser to ensure that all threads are free from grease, hydraulic oil and old Loctite. Allow 15 minutes for solvent to dry before applying Loctite.

Ensure that lubricants used during assembly do not come into contact with Loctite.

* Refer to the '**Gland Seal Fitting Procedure**'. Fit seals 10 and 11 into end cap then fit the end cap onto the piston rod.

* Apply Loctite Activator to threads of piston rod, end cap and cylinder. Allow Activator to dry for 15 minutes before bringing into contact with Loctite.

Note: Neither Loctite nor Activator must be allowed to contact seals, bearing rings, or 'O' rings.

Apply Loctite 262 to all threads of piston rod. Renew 'O' ring in piston head, lubricating only the 'O' ring with Lithium based No. 2 consistency grease. Fit and torque tighten the piston head. Fit a new locking ring 3.

Fit new seal and wear rings to piston head.

Position cylinder on bench and install rod assembly into cylinder.

Apply Loctite 932 to thread of end cap, fit a new 'O' ring 9 and torque tighten the end cap into the cylinder.

Note: If hydraulic oil contacts uncured Loctite a weakening of the bond will result. Cure times vary according to the ambient temperature and type of Activator used. The following approximate cure times apply at 20 °C and are the minimum periods between assembly and filling the cylinder with oil.

* Loctite 262 or 932 with Activator - 1 hour

Torque Settings

Item	Nm	kgf m	lbf ft
7	405	41.3	300
1	678	69.2	500

Note: Cold weather operation. When operating in conditions which are consistently below freezing, it is recommended that the cylinders are operated slowly to their full extent before commencing normal working.

* Power Track Rod (SD 80PT Axle)

Removal and Replacement

⚠ WARNING

A raised and badly supported machine can fall on you. Position the machine on a firm, level surface before raising one end. Ensure the other end is securely chocked. Do not rely solely on the machine hydraulics or jacks to support the machine when working under it.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN-1-1

Removal

Note: Depending on accessibility, the steer cylinder can be removed and replaced with the axle on the machine. Where accessibility is limited, the axle should be removed before removal of the cylinder (see **SD 80PT Axle - Central Drive Head - Pin Mounted - Hub Brakes, Removal and Replacement, Section.5**).

- 1 Thoroughly clean external parts.
- 2 Disconnect and cap hydraulic hoses to prevent loss of fluid and ingress of dirt. Label hoses for identification and correct refitting.
- 3 Remove locking screws **A** and pivot pins **B**. Swing the track-rod clear of the steering joints.
- 4 Remove screws **C** and washers **D** (4 off each) from the cylinder mounting flange.

- 5 Using a soft faced hammer, tap the closed end of the cylinder and carefully withdraw the cylinder and track-rod from the housing.

Note: Before removal, mark the cylinder flange and housing for relocation.

Replacement

Replace the power track rod by reversing the removal procedure.

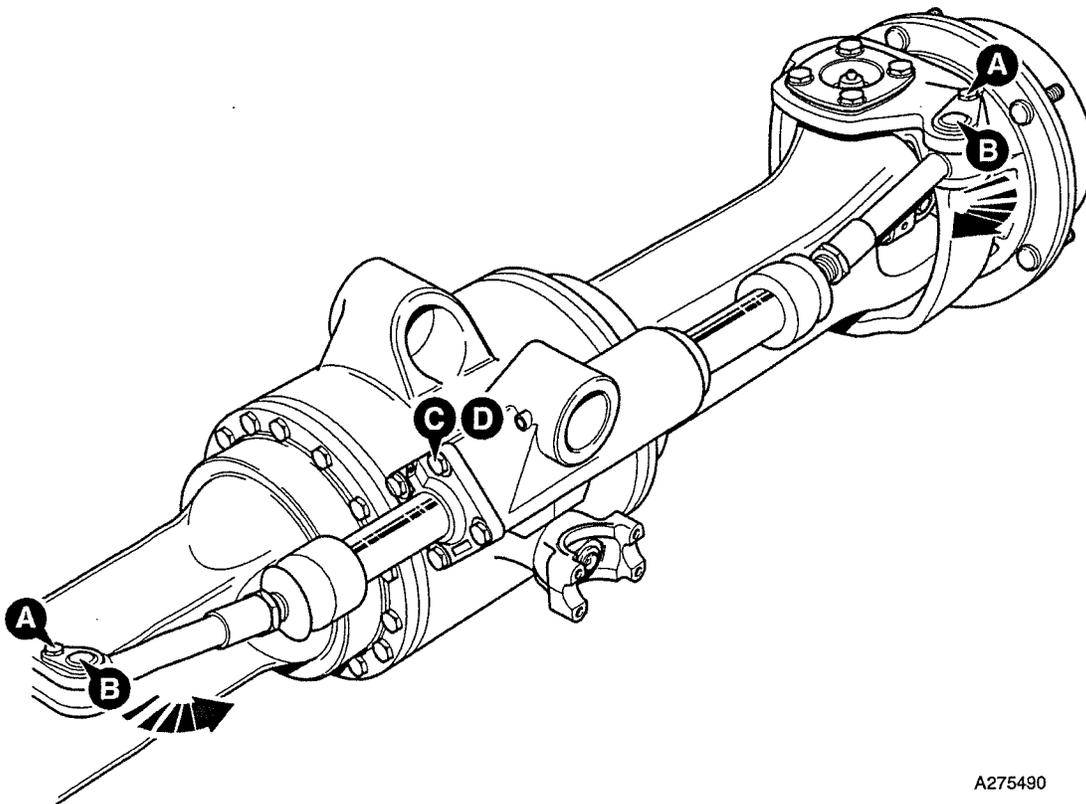
Apply Anti-Seize Paste, Part No. 4003/0211 to pivot pins **B** to facilitate subsequent removal.

After connecting hoses, check the hydraulic fluid level, and if necessary top-up.

Bleed the Hydraulic System (see **Steering System - Bleeding Procedure**).

Torque Settings

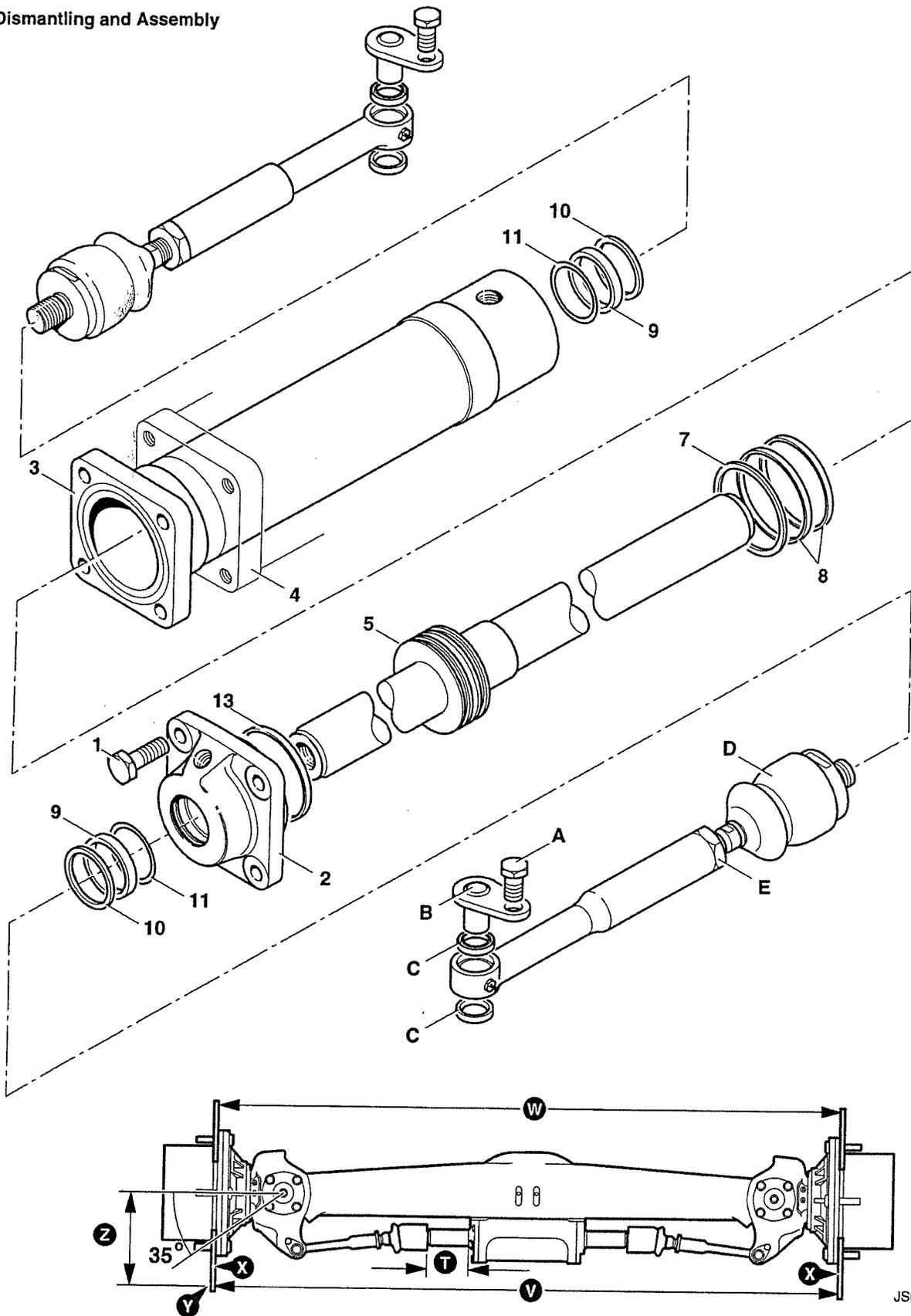
Item	Nm	kgf m	lbf ft
A	56	5.6	41
C	166	16.8	122



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Power Track Rod (SD 80PT Axle)

Dismantling and Assembly



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Power Track Rod (SD 80PT Axle) (cont'd)

Dismantling and Assembly (cont'd)

The following procedures can only be carried out with the axle removed from the machine (see **SD 80PT Axle - Central Drive Head - Pin Mounted - Hub Brakes, Removal and Replacement**, Section 5).

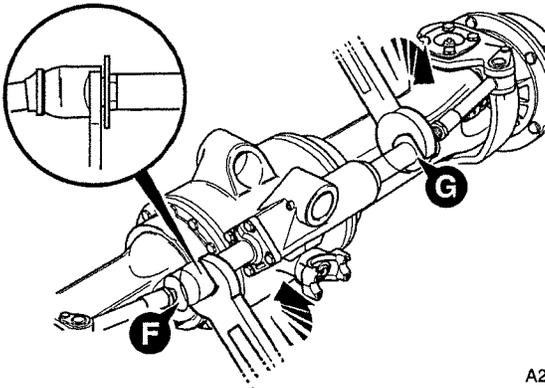
It will be necessary to provide a suitable stand on which to support the axle once it has been removed from the machine.

Dismantling

- 1 Remove setscrew **A**, extract pivot pin **B** and disengage the track rod ends from the steering knuckles.
- 2 Remove ball joints **D**.

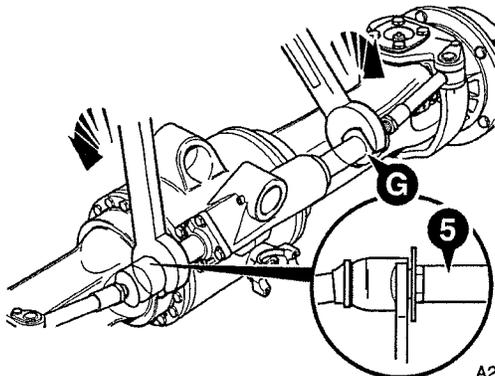
Note: The piston rod operates at full length and damage to the surface will cause fluid leaks. DO NOT attempt to grip the rod with pipe grips etc.

- i Using two suitable open ended spanners located on the flats at **F** and **G**, rotate against each other until one ball joint unscrews.



A277050

- ii Unscrew the ball joint until an open ended spanner can be fitted on rod **5**. Screw the ball joint against the spanner to secure the spanner and to prevent damage to the rod.



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- iii Using the spanner at **5** to lock the rod, rotate the spanner at **G** to undo the other ball joint.

Note: Mark cover **2** and cylinder flange **3** relative to housing flange **4** before removal.

- 3 Take out screws **1** (4 off) and remove the cylinder cover/piston guide **2**. Remove and discard seals **9** and **10** with back-up washer **11** and seal **13**.

- 4 Pull piston/rod assembly **5** out of the cylinder. Remove and discard guide rings **8** and seal **7** from the piston.

Note: The piston is shrunk onto the piston rod. DO NOT attempt to remove it.

- 5 Using a soft faced hammer, carefully tap the closed end of cylinder **3** and withdraw the cylinder from its housing **4**. Remove and discard seals **9** and **10** with back-up washer **11**.

Assembly

- 1 Fit new seal **7** and guide rings **8** to the piston. Ensure they are seated correctly.

- 2 Grease piston rod seal **9**, wiper ring **10** and back-up washer **11** and fit them into the grooves in the closed end of cylinder **3**. Ensure they are seated correctly.

- 3 Grease the machined external shoulders on cylinder **3** and insert the closed end into housing **4**. Using a soft faced hammer, carefully tap the flange until the cylinder is fully seated in the housing. Align the flange marking with the housing mark.

- 4 Apply grease to piston seal **7** and the surfaces of the piston rod. Insert piston/rod assembly **5** into the cylinder, ensuring it is the correct way round, with the piston sleeve towards the closed end of the cylinder, carefully guiding the rod through the seals in the closed end of cylinder **3**.

- 5 Grease and fit seal **9**, wiper ring **10**, back-up washer **11** and cover seal **13** to the cylinder cover/piston guide. Ensure they are seated correctly.

- 6 Apply Loctite 574 to cylinder flange face **3**.

Locate cover/piston guide **2** onto the piston rod and slide into position against cylinder flange **3**, aligning the location mark made during dismantling.

- 7 Insert screws **1** (4 off) and torque tighten to 166 Nm (122 lbf ft).

- 8 Coat the first three external threads of track rod end ball joint **D** with Loctite 242 and screw into the end of the steering piston rod. Torque tighten to 400 Nm (295 lbf ft).

- 9 Grease and fit new web seals **C** to the hub steering knuckle. Ensure the seals are fitted correctly and are fully seated in position.

Power Track Rod (SD 80PT Axle) (cont'd)

Dismantling and Assembly (cont'd)

- 10 Connect the track rod ends to the hub carrier steering knuckles.

Coat the surface of pivot pin **B** with anti-seize paste (see **Sealing and Retaining Compounds**, Section 1) and insert the pin into the hub carrier and fit the setscrew **A**. Apply Loctite 242 to the threads and torque tighten to 56 Nm (41 lbf ft).

- 11 Centralise the steering so that the distance **T** measured from the end of the piston guide to the steering ball joint face is 111 mm (4.37 in).

- 12 Attach a straight edge **X** to both hubs using a wheel mounting nut.

Make a mark at position **Y** which corresponds to the distance **Z**, wheel centre to rim flange on each straight edge.

- 13 Measure the distance **V** between the two straight edges. Rotate both hubs through 180° and measure the distance **W**. The two measurements should be the same. If not, carry out step 14.

- 14 Loosen the locknut **E** on each track rod end. To adjust the tracking, use a spanner to rotate the inner ends of the track rods.

Repeat steps 13 and 14 until the two measurements are the same.

Check that a steering angle of 35° can be achieved in both directions. If the steering angle is not the same in both directions it is necessary to adjust both track rod ends to compensate while still meeting the requirements of step 13.

Finally torque tighten the locknut **E** on each track rod end to 240/260 Nm (177/192 lbf ft).

Steering System - Bleeding Procedure

Whenever any hydraulic steering component is disconnected or removed the system must be bled as follows:

With the engine running, this procedure must be carried out in the correct order that is laid down. You must not alter the order of selections and operations.

- 1 Select 2 Wheel Steer**
 - a Turn steering wheel to left, until front wheels are fully locked to the left.
 - b Turn steering wheel to right, until front wheels are fully locked to the right.
- 2 Select 4 Wheel Steer**
 - a Turn steering wheel to left, until front wheels are fully locked to the left.
- 3 Select 2 Wheel Steer**
 - a Turn steering wheel to full right lock.
 - b Turn steering wheel to full left lock.
 - c Turn steering wheel to full right lock.
- 4 Select 4 Wheel Steer**
 - a Turn steering wheel to left, until the front wheels are fully locked to the left.
- 5 Select 2 Wheel Steer**
 - a Turn steering wheel to full right lock.
 - b Turn steering wheel to full left lock.
 - c Turn steering wheel to full right lock.
- 6 Select 4 Wheel Steer**
 - a Turn steering wheel to left, until front wheels are fully locked to the left.
- 7 Select 2 Wheel Steer**
 - a Turn steering wheel to full right lock.
 - b Turn steering wheel to full left lock.
 - c Turn steering wheel to full right lock.
- 8 Select 4 Wheel Steer**
 - a Turn steering wheel to left, until the front and rear wheels are fully locked.

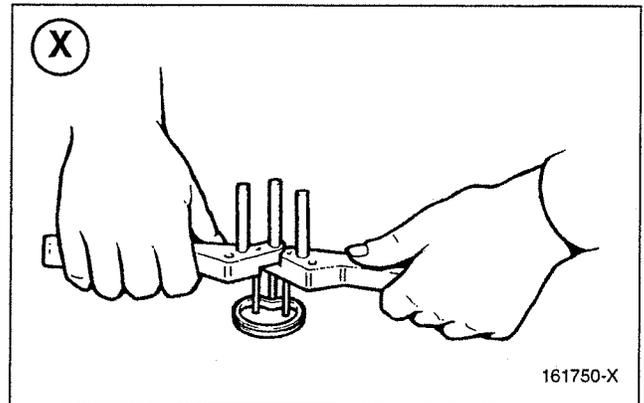
Gland Seal Fitting Procedure

The size (diameter) and position of pins **A** is determined by the diameter and radial width of the gland seal being fitted.

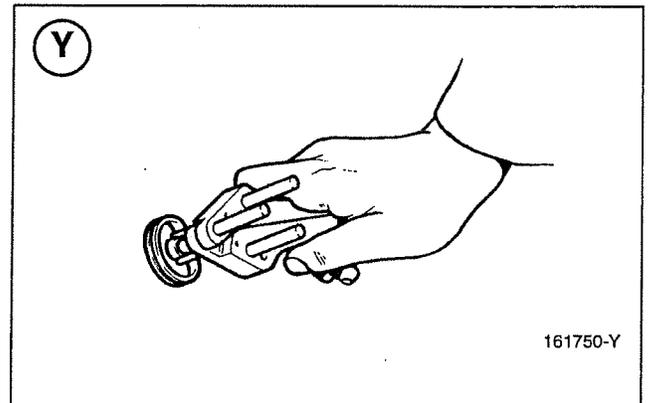
The pins are screwed into threaded holes in the tool body, the spacing of the holes are designed to suit small or large diameter gland seals.

To fit a new gland seal:

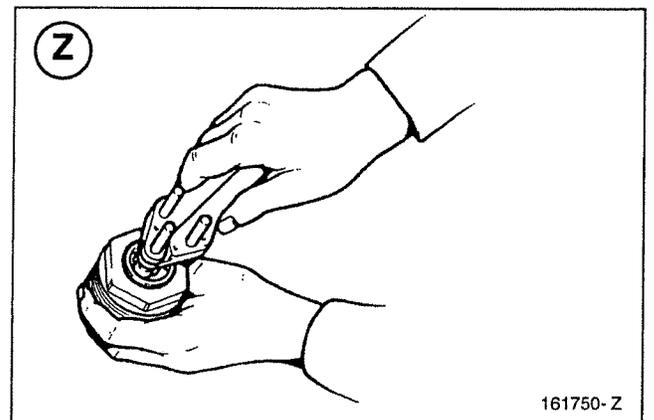
- 1 Open the tool as shown at **X** and insert the new gland seal, the seal must be fitted behind the two front pins but in front of the rear pin as shown.

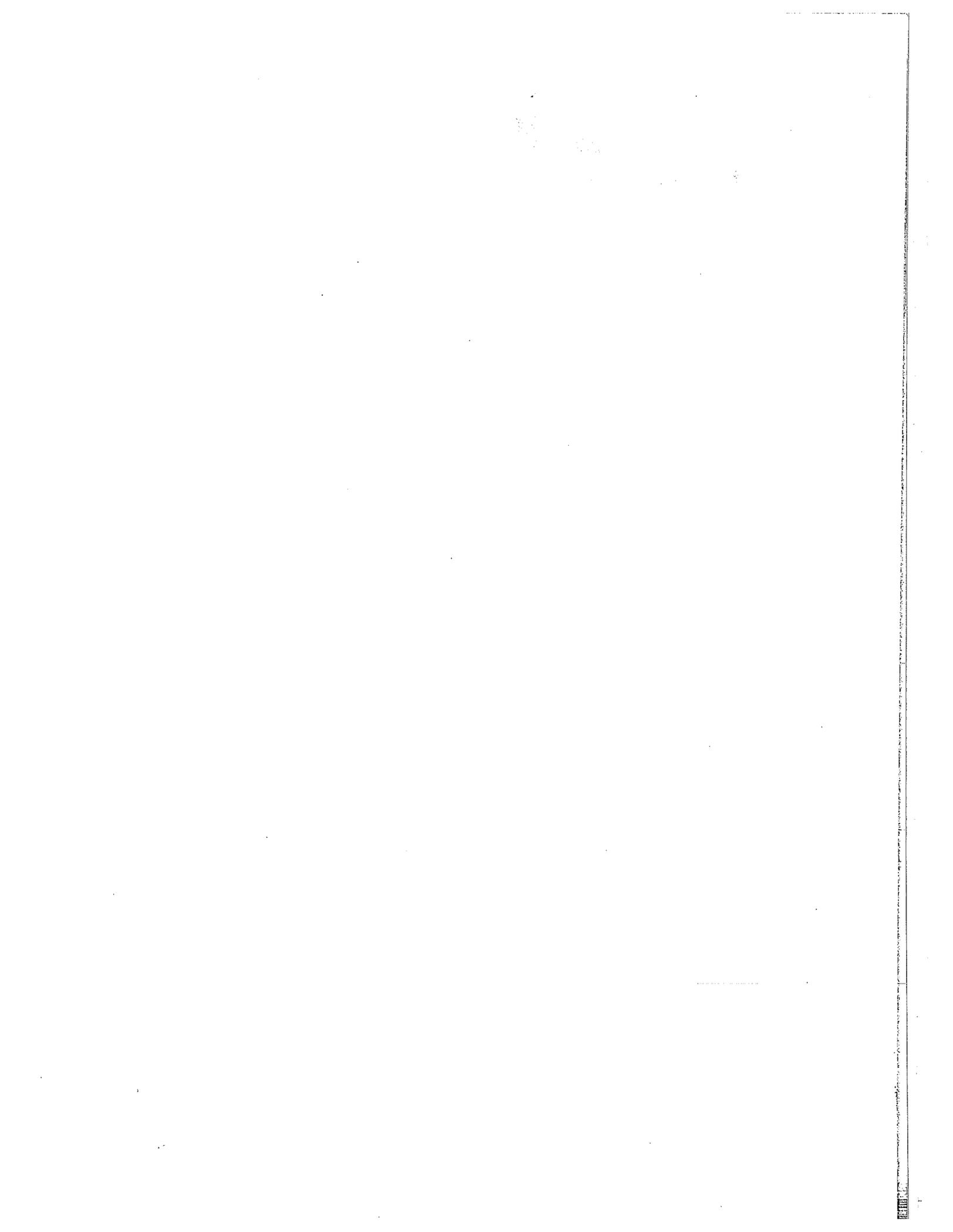


- 2 Close the tool as shown at **Y**. The seal must form a reniform (kidney shape).



- 3 Locate the seal in the end cap groove, shown at **Z**, when the seal is in position, open the tool to release the seal. Make sure the seal is correctly installed in its grooved and remove the tool.





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SD80 Axle - Offset Drive Head (Hub Brakes) - Pin Mounted

Note: It is essential that the correct ratio axle in relationship to the gearbox ratio is fitted to the machine. Do not fit a new axle with a different ratio to the axle being replaced.

Type	Spiral bevel input with epicyclic hub reduction.					
Designation	SD80					
Installation	Centre pivot					
Number of steer cylinders	2					
Weight (dry, with no steer cylinders and without wheels)	450 kg (992 lb) approximately					
Hub Brakes	3 plate (each hub) standard retraction					
Ratios	OPTION 1	OPTION 2	OPTION 3	OPTION 4	OPTION 5	OPTION 6
Overall	10.46:1	12.4875:1	13.7:1	15.78:1	18.16:1	24.975:1
Crownwheel and Pinion	1.937:1	2.313:1	2.538:1	2.923:1	3.363:1	4.625:1
Number of Teeth						
Crownwheel	31	37	33	38	37	37
Pinion	16	16	13	13	11	8
Hub Reduction	5.4:1					
Input Type	1480 Half yoke					
Oscillation	± 5°					
Toe-in	0°					
Castor Angle	0°					
Camber Angle	1°					
King - pin inclination	0°					

*SD80 Axle - Central Drive Head (Inboard Brakes) - Pad/Pin Mounted

Note: It is essential that the correct ratio axle in relationship to the gearbox ratio is fitted to the machine. Do not fit a new axle with a different ratio to the axle being replaced.

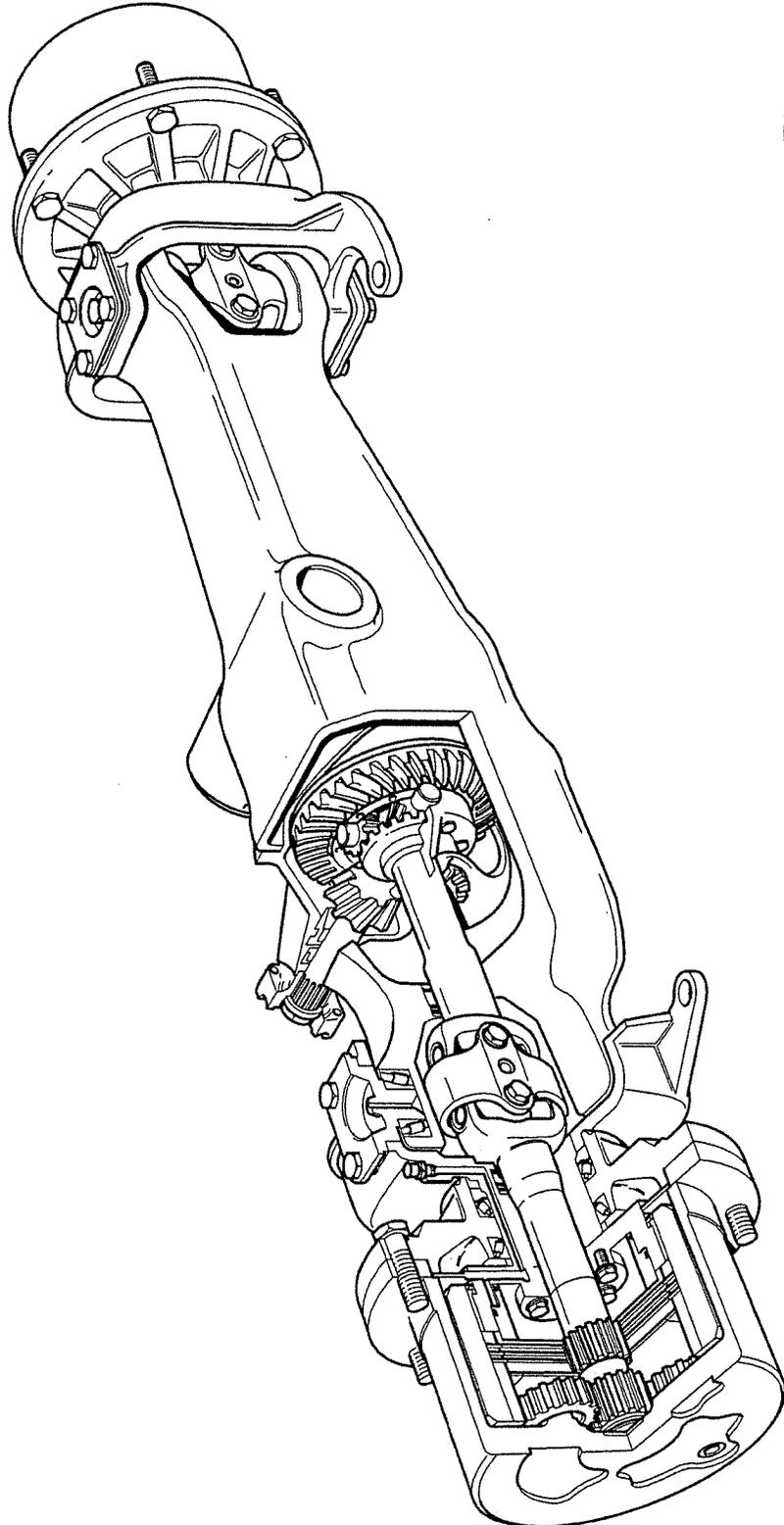
Type	3 piece spiral bevel input with epicyclic hub reduction and inboard braking.					
Designation	SD80					
Installation	Rigid pad mount or pin mount option					
Number of steer cylinders	2					
Weight (dry, with no steer cylinders and without wheels)	420 kg (926 lb) approximately					
Half (Axle) Shaft Braking/Type	5 plate (each half shaft) Standard or positive retraction type					
Input Type	1480 half yoke					
* Oscillation (Pin mounted)	± 5°					
Toe-in	0°					
Castor Angle	0°					
Camber Angle	1°					
King - pin inclination	0°					
Hub Reduction	5.4:1					
Ratios	OPTION 1	OPTION 2	OPTION 3	OPTION 4	OPTION 5	OPTION 6
Overall	10.46:1	12.4875:1	13.7:1	15.78:1	18.16:1	24.975:1
Crownwheel and Pinion	1.937:1	2.313:1	2.538:1	2.923:1	3.363:1	4.625:1
Number of Teeth						
Crownwheel	31	37	33	38	37	37
Pinion	16	16	13	13	11	8

SD 80PT Axle - Central Drive Head (Hub Brakes) - Pin Mounted

Note: It is essential that the correct ratio axle in relationship to the gearbox ratio is fitted to the machine. Do not fit a new axle with a different ratio to the axle being replaced.

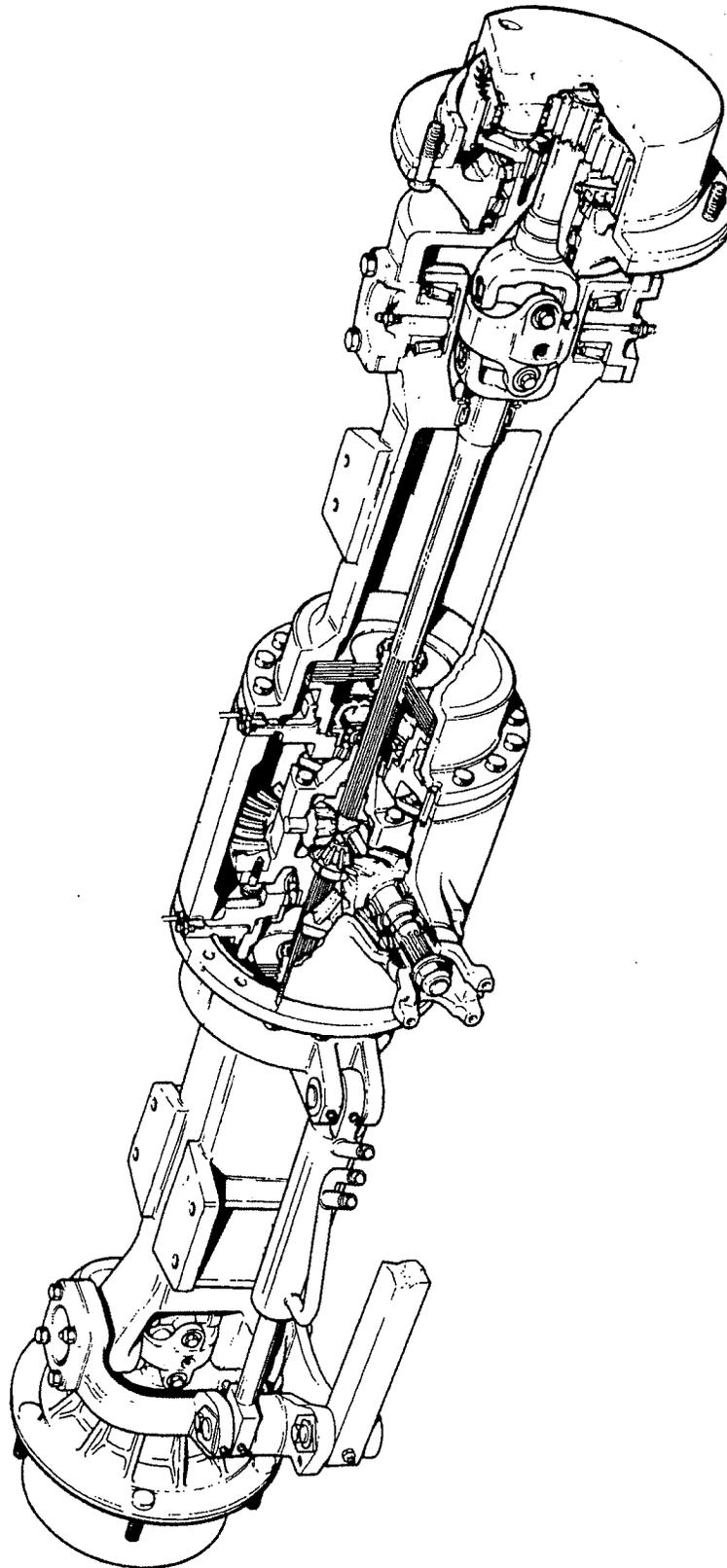
Type	3 piece spiral bevel input with epicyclic hub reduction.					
Designation	SD 80PT					
Installation	Centre pivot					
Number of steer cylinders	Power track rod, integral cylinder					
Weight	540 kg (1,191 lb) approximately					
Hub Brakes	4 plate (each hub), positive retraction					
Ratios	OPTION 1	OPTION 2	OPTION 3	OPTION 4	OPTION 5	OPTION 6
Overall	10.46:1	12.4875:1	13.7:1	15.78:1	18.16:1	24.975:1
Crownwheel and Pinion	1.937:1	2.313:1	2.538:1	2.923:1	3.363:1	4.625:1
Number of Teeth						
Crownwheel	31	37	33	38	37	37
Pinion	16	16	13	13	11	8
Hub Reduction	5.4:1					
Input Type	1480 Half Yoke					
Oscillation	± 5°					
Toe-in	0°					
Castor Angle	0°					
Camber Angle	1°					
King - pin inclination	0°					

Cutaway of SD80 Axle - Offset Drive Head
(Steering cylinders not shown)



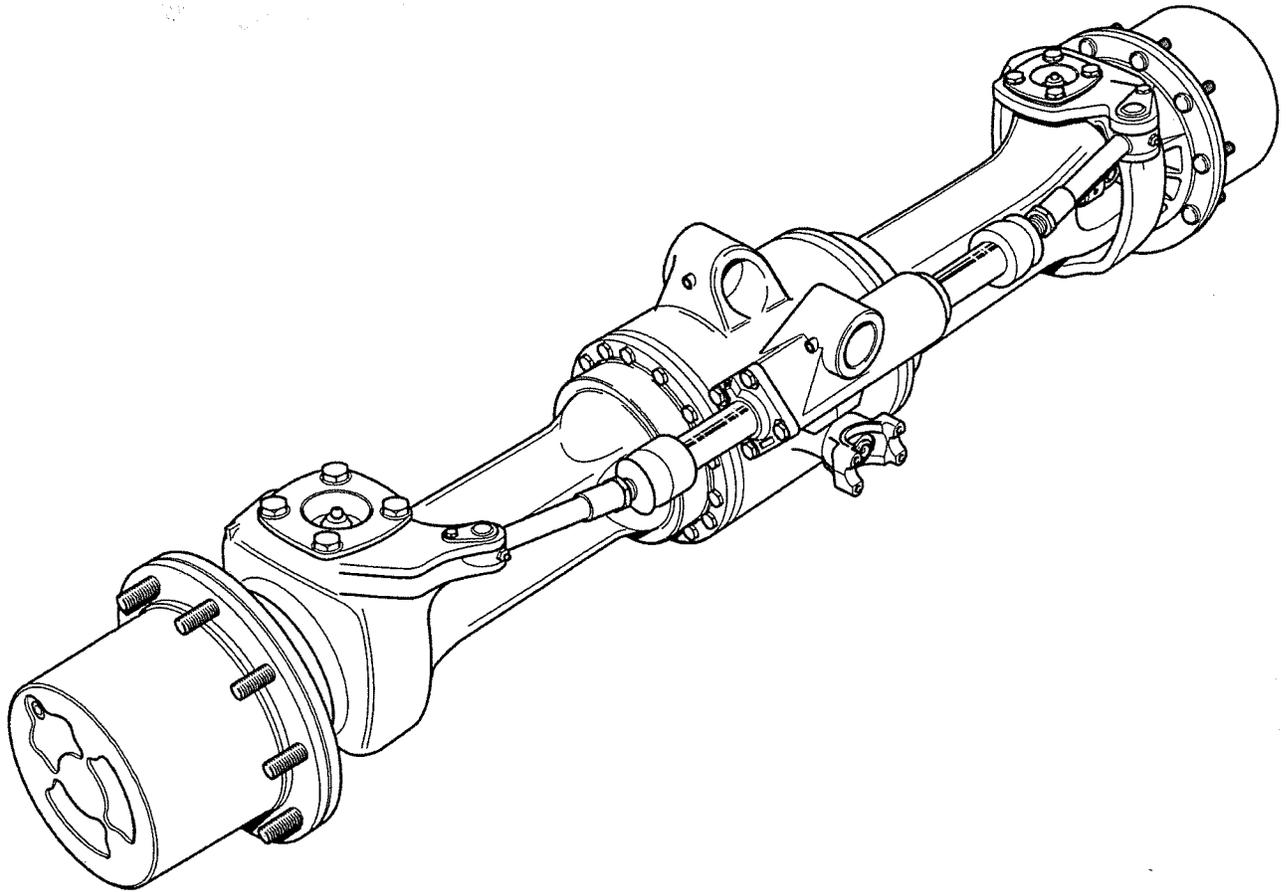
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* Cutaway of SD 80 Axle - Central Drive Head (Inboard Brakes)



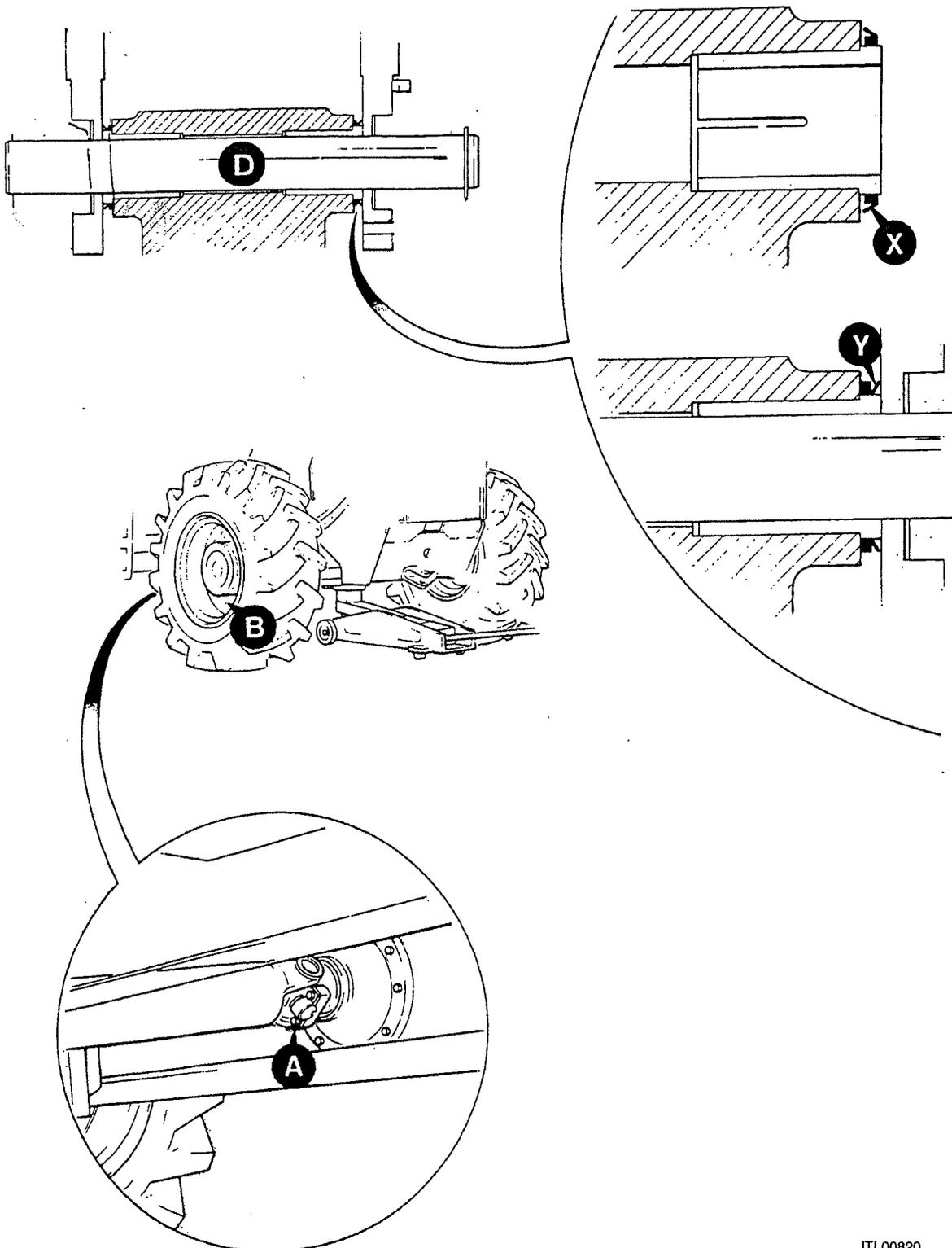
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SD 80PT Axle - Central Drive Head (Hub Brakes) - Pin Mounted



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Removal and Replacement



ITL00820

Removal and Replacement (cont'd)

⚠ WARNING

A raised and badly supported machine can fall on you. Position the machine on a firm, level surface before raising one end. Ensure the other end is securely chocked. Do not rely solely on the machine hydraulics or jacks to support the machine when working under it.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN 1-1

Removal

- 1 Disconnect the propshaft coupling from the axle by unscrewing bolts **A**.
- *2 Disconnect and plug the hydraulic hoses to the steer cylinders and brakes.
- 3 Remove the steering proximity switch from its mounting bracket and tie up out of the way.
- 4 Slacken off roadwheel retaining nuts **B** then raise and support the machine on axle stands or blocks positioned under the chassis. Remove the roadwheels.
- 5 Support the axle on a trolley jack.
- 6 Remove the screws securing the axle pivot and drive pivot pin **D**.

Note: Take care not to damage the load sensing boss during this operation.

- 7 Lower the axle clear of the mounting yoke and withdraw from the machine.

Replacement

Replacement is generally the reverse of the removal sequence.

The following procedure must be used to assemble the grease seals fitted to the axle pivot. Failure to do this will result in damage to the seal lips.

- 1 Fit the seals onto the outer flange of the pivot bush with the seal lip turned inwards as shown at **X**.
- 2 Assemble the axle to the machine taking care not to disturb the seals and fit pivot pin **D**.
- 3 Using a suitable blunt tool, turn the seal over so that the lip faces outwards as shown at **Y**.

Coat threads of screws with Loctite 242 and secure pivot pin **D**.

Grease the axle pivot before driving the machine.

Bleed the brake system (see **Bleeding**, Section 6) and steering system (see **Steer System, Bleeding Procedure**, Section 4).

Refit the road wheels and carry out the tightness checks as detailed in the Machine Service Manual and Machine Operator Handbook.

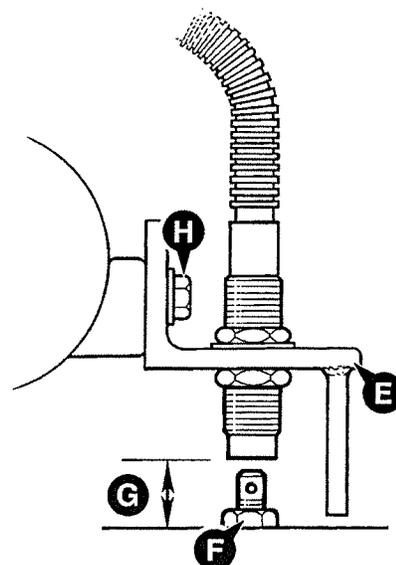
Proximity Switch Setting (JCB Supply)

When fitting or if the setting of the steering proximity switch has been disturbed, proceed as follows:

- 1 Align the hubs in the straight ahead position.
- 2 Position the proximity switch directly over the stud in the track rod. Tighten the locknuts so that the bottom face of the switch is 24 to 26 mm (0.9 to 1.0 in) **G** above the top face of the track rod. Tighten the locknuts.
- 3 Adjust the proximity stud on the track rod towards the switch until the LED on the switch illuminates.
- 4 Advance the stud a further 1/2 to 3/4 of a turn towards the switch then tighten the stud locknut.
- 5 Make sure bracket **E** does not foul on proximity stud **F** or the track rod.

Torque Settings

Item	Nm	kgf m	lbf ft
A	75-85	7.7-8.7	55-63
B	680	69	500
H	56	5.7	41.3



S136080

Propshafts

Removal and Replacement

Removal

Before removing propshafts always mark both companion flanges and also mark the sliding joints prior to removal.

Replacement

* Upon reassembly, after lubricating sliding joints with Mobil HP222 grease, align the shafts against identification marks previously made or, in the case of a shaft being renewed, use the manufacturer's alignment markings.

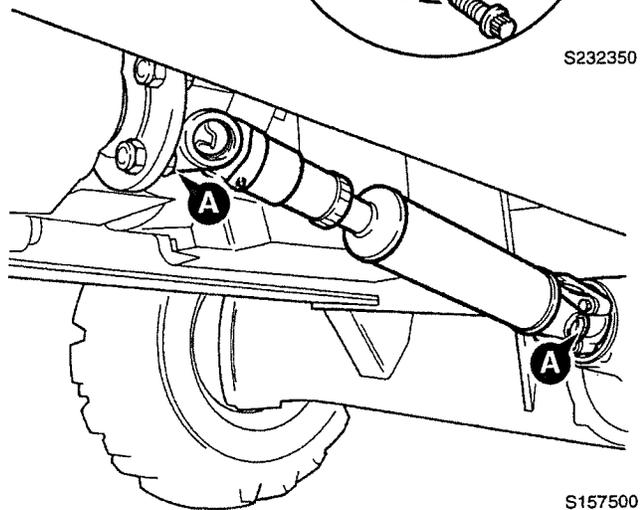
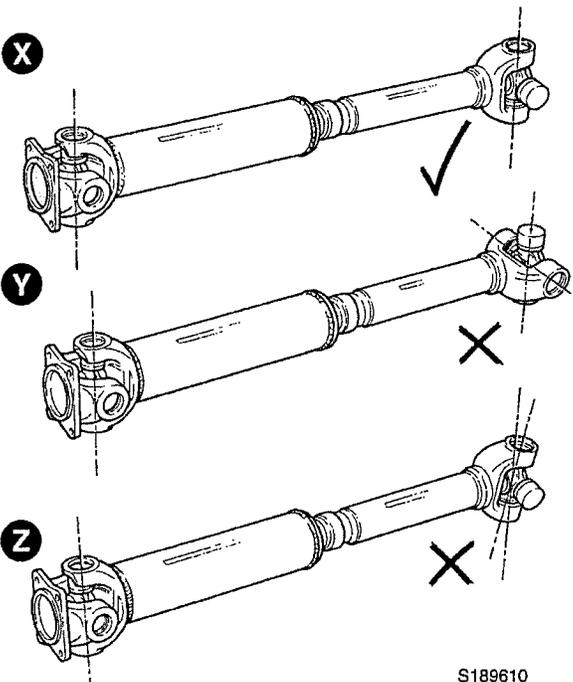
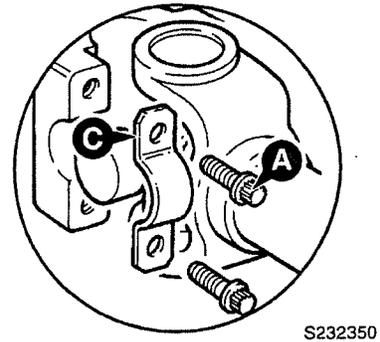
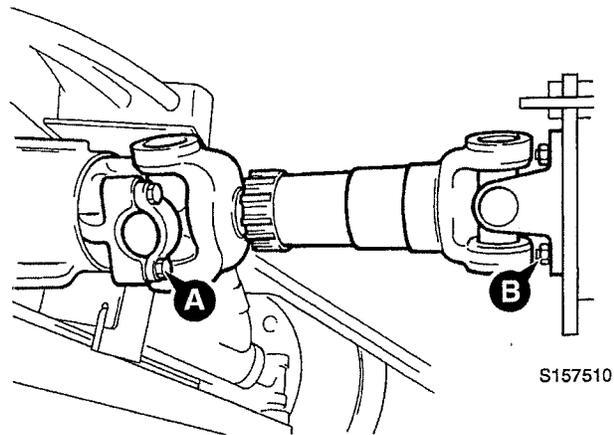
Apply Loctite 242 to threads of all flange bolts.

Retaining straps **C** stretch with use, therefore these straps must always be replaced with new ones.

The propshaft must have both ends exactly on the same plane as shown at **X**. The yokes must not be at right angles as at **Y** or at an intermediate angle as at **Z**.

Torque Settings

Item	Nm	kgf m	lbf ft
A	75 - 85	7.7 - 8.7	55 - 63
B	118	12	87



Renewing the Pinion Oil Seal

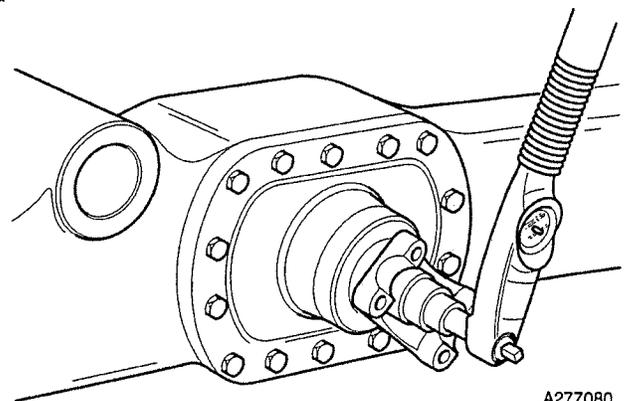
WARNING

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Disconnect the battery, to prevent the engine being started while you are beneath the machine.

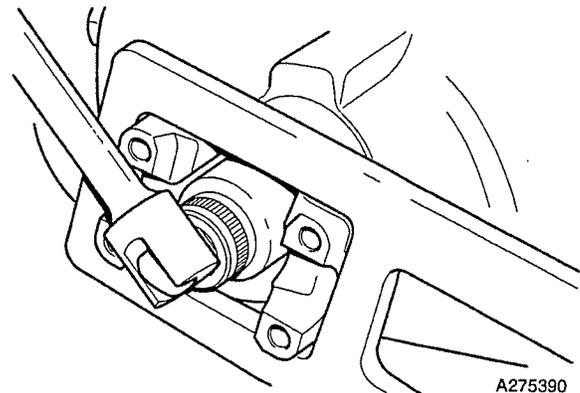
GEN 1-1

-
- 1 Remove the roadwheels and uncouple the axle driveshaft. Measure the axle rolling torque and record reading.



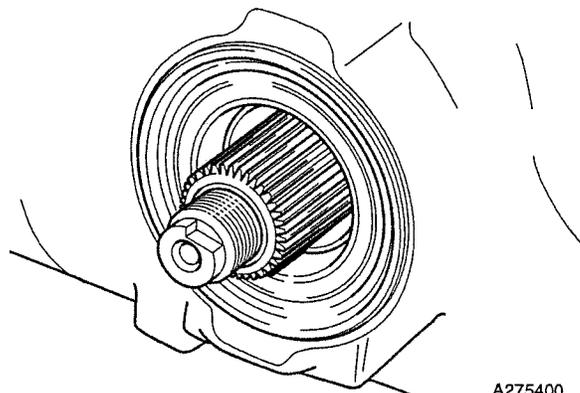
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- *2 Mark the position of the coupling yoke on the splined shaft. Using Service Tool 892/00812, remove the coupling yoke together with its stake nut and washer.

Note: On later axles, the stake nut and washer are combined. The separate nut and washer should be discarded and replaced with the new combined nut and washer.



-
- 3 Remove the seal and fit a new one. Pack between the lips of the new seal with grease before fitting.

Note: Take care not to damage housing when removing the old oil seal.



Renewing the Pinion Oil Seal (cont'd)

- * 4 Align the locating marks on the yoke and splined shaft. Fit the coupling yoke and a new combined stake nut and washer.

Note: Do not excessively hammer the yoke during assembly or damage to the shaft bearings could occur. If necessary, press fit the parts. Fully support the shaft during assembly.

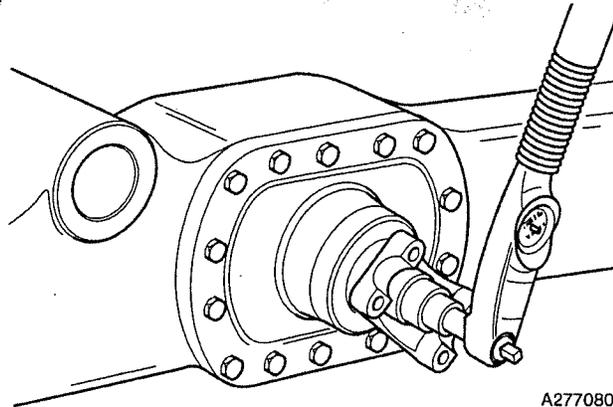
- 4.1 Using Service Tool 892/00812 (see **Service Tools**, Section 1), tighten the nut to 250 Nm (184lbf ft; 25.5kgf m).

- 4.2 Measure the rolling torque. The reading should be 0.5 to 1Nm (0.37 to 0.74lbf ft; 0.05 to 0.1kgf m) more than that recorded in Step 1 (see **Note** below).

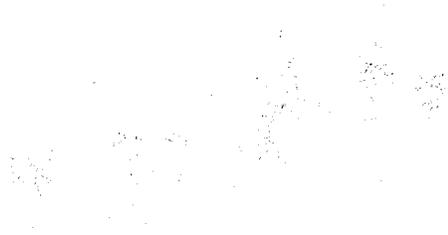
- 4.3 If necessary, progressively torque tighten nut to achieve correct rolling torque.

Note: If the rolling torque figure (new pinion seal fitted) exceeds the reading recorded in step 1 by 1Nm (0.74 lbf ft; 0.1 kgf m) or more, then the collapsible spacer mounted on the axle pinion **MUST** be renewed.

- 4.4 Stake the nut using a square ended staking tool.



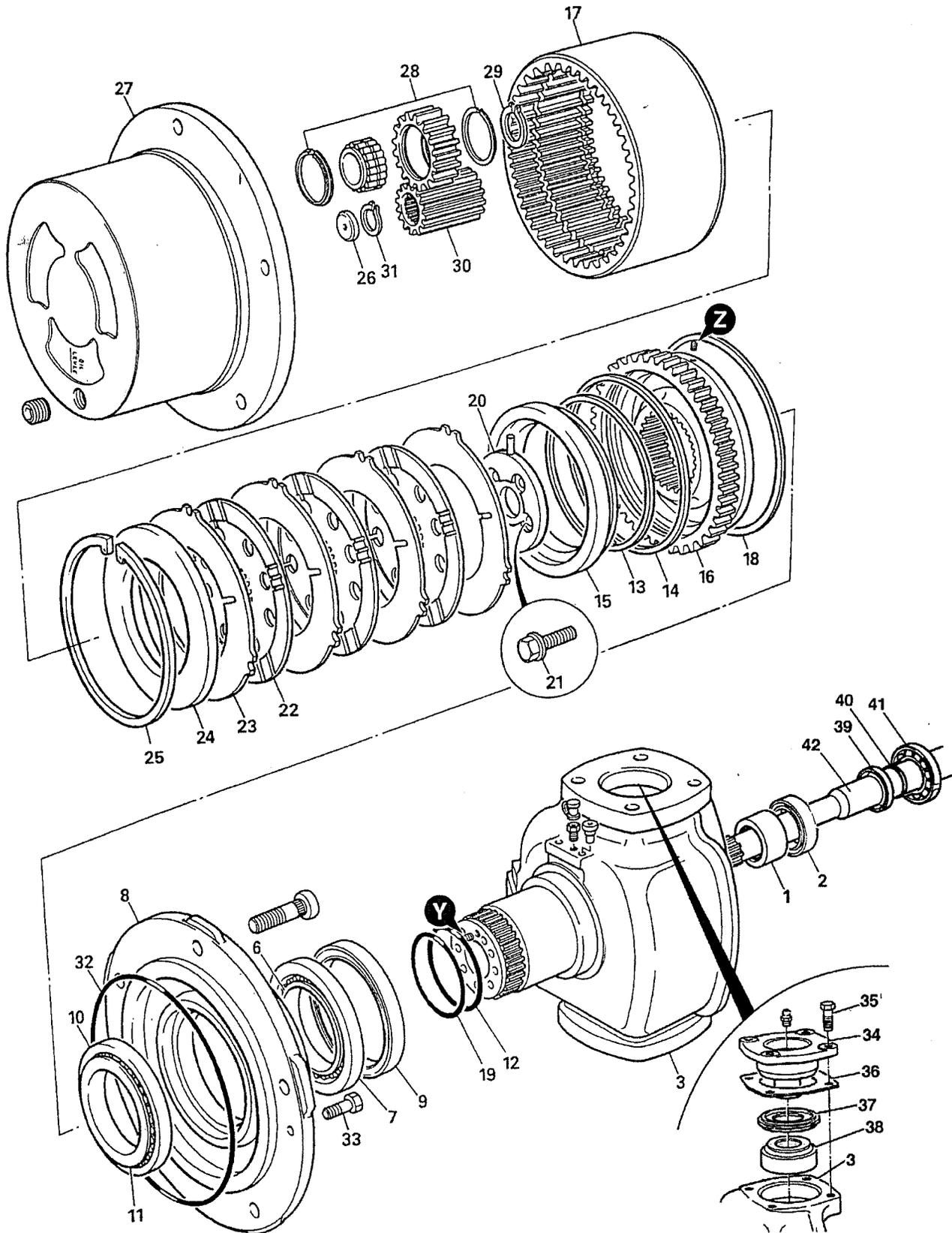
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Axle Hub and Driveshaft - 3 Plate, Standard Retraction Brakes

Dismantling



ITL00801

Axle Hub and Driveshaft - 3 Plate, Standard Retraction Brakes (cont'd)

Dismantling (cont'd)

⚠ WARNING

Make the machine safe before getting beneath it. Park the machine on level ground. Make sure the engine is stopped, the parking brake engaged and the transmission is in neutral. Disconnect the battery. Chock both sides of all four wheels.

5-3-2-1

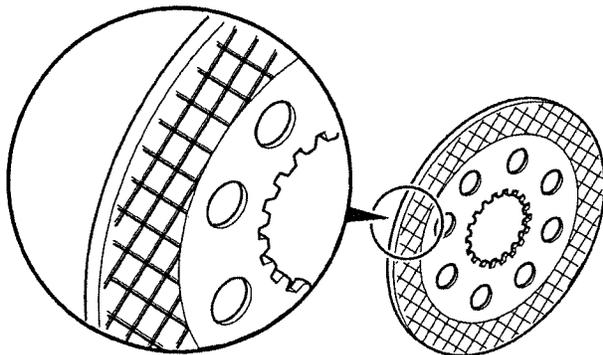
- 1 Disconnect the track rod and steering cylinders. Drain oil from the hub.

Note: If the track rod is to be removed completely, identify R.H. and L.H. ends to ensure correct assembly.

- 2 Remove screws 33.
- 3 Lever off planet gear carrier 27 at the levering points. Remove and discard 'O' ring 32.
- 4 Remove planet gears 28 only if defective. Note that gears can only be removed as assemblies, which comprise the gear, the bearing and two 'L' shaped circlips. To remove a planet gear, first remove external circlip 29.
- 5 Pull off planet gear 28.
- 6 The driveshaft thrust pad 26 is drilled and tapped M6 for removal purposes.
- 7 Remove circlip 31 to allow sun gear assembly 30 to be slid off the driveshaft.
- 8 Remove circlip 25 to allow the brake pack assembly to be slid off the driveshaft.
- 9 Remove brake pressure plate 24, counter plates 23 and friction plates 22.

Note: If the brake pack is to be re-used, note the positions of the plates before removing.

- 10 Examine the friction plates.



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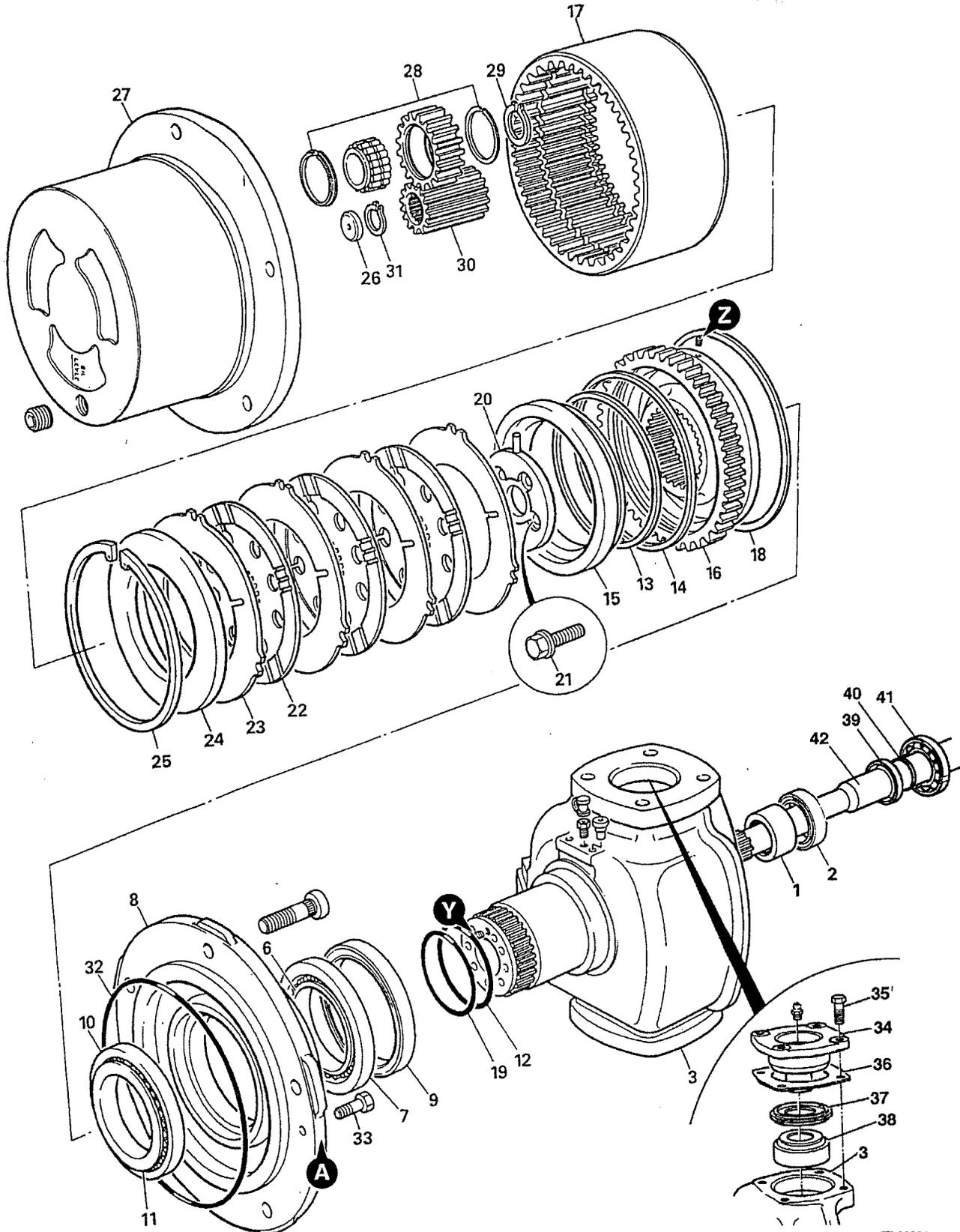
* **Note:** Excessive wear of the brake and counter plates can indicate sticking brakes or possible residual pressure in the braking system. See **Residual Brake System Pressure**, Section 6.

Wear limit of friction plates is to the depth of the crosshatching. Check all plates for flatness and damage. (Wear and polishing of the counterplates is normal.) Renew the brake pack complete if excessively worn or damaged. Do not renew individual plates.

- 11 Remove Verbus Ripp bolts 21 and retaining plate 20. These bolts are very tight and care must be taken not to distort the bolt heads. Use as short an extension bar as possible with a six sided socket. Discard the Verbus Ripp bolts after removal.
 - 12 Remove brake seal 19 then mark the relationship between annulus carrier 16, annulus ring 17 and the hub swivel. Remove the annulus carrier with the annulus ring from the hub swivel.
 - 13 Remove circlip 18 to separate the annulus ring from the annulus carrier. Remove brake seal 12 from the hub swivel.
 - 14 Carefully withdraw brake piston 15 from its housing, if removal is necessary. A hydraulic hand pump can be used to force the piston out of the housing.
 - 15 Remove and discard seals 13 and 14. Inspect the housing bore for damage and scoring. Nicks or cuts in the seals may be responsible for loss of brake fluid.
 - 16 Pull off bearing carrier 8 together with outer bearing 11.
 - 17 Pull off inner bearing 6.
 - 18 Remove and discard combination seal 9.
- Note:** Earlier type axles may have 'O' ring and wear ring fitted. These parts should be discarded.
- Note:** The top and bottom trunnions are very similar (bottom trunnion not illustrated), the only difference being that shims 36 are fitted to the top trunnion only.
- 19 Mark the position of top and bottom trunnions 34, remove bolts 35 and remove trunnions. Retain shims 36 with top trunnion. Withdraw hub swivel 3.
- Note:** Trunnions may be removed easily and without damage to the shims by pumping grease through the grease nipple.
- 20 Remove top and bottom trunnion seals 37 and bearings 38.
 - 21 Withdraw drive shaft 42 from the axle casing.
 - 22 Prise out driveshaft outer oil seal 2.
 - 23 Remove bearing 1 using tool 892/00225.
 - 24 Prise out driveshaft inner seal 39.
 - 25 Remove circlip 40.
 - 26 Remove bearing 41 using tool 892/00225.
 - 27 If there has been a component failure, remove all traces of debris and clean the magnetic drain plug.

Axle Hub and Driveshaft - 3 Plate, Standard Retraction Brakes

Assembly



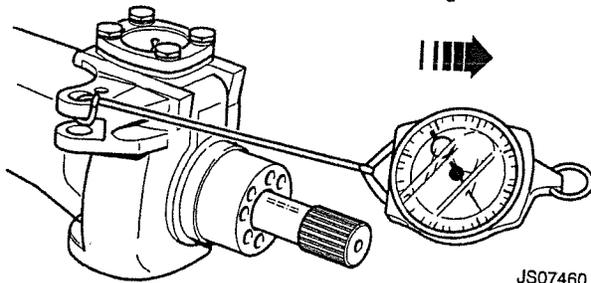
ITL00801

Axle Hub and Driveshaft - 3 Plate, Standard Retraction Brakes (cont'd)

Assembly (cont'd)

Note: The top and bottom trunnions are very similar (bottom trunnion not illustrated), the only difference being that shims 36 are fitted to the top trunnion only.

- 1 Tap the driveshaft inner bearing 41 into position in the axle casing.
- 2 Fit circlip 40.
- 3 Fit new oil seal 39. Pack grease between the lips of the seal.
- 4 Tap the driveshaft outer bearing 1 into position in the hub swivel driveshaft bore.
- 5 Fit new oil seal 2. Pack grease between lips of seal.
- 6 Fit driveshaft 42, taking care to locate inner end into splines of differential gears.
- 7 Press new top and bottom trunnion oil seals 37 into position, followed by bearings 38. Grease the bearing and the oil seal before fitting the axle.
- 8 Locate hub swivel 3 and fit bottom trunnions 34. Apply Loctite 242 to threads of bottom trunnion bolts 35 and then torque tighten bolts to 56 Nm (42 lbf ft, 6 kgf m). Fit top trunnion 34 with nominal 0.25 mm (0.010 in) shim 36 and leave top trunnion bolts 35 finger tight.
- 9 Attach a spring balance to track rod swivel and note pull required to turn the swivel. Tighten the top trunnion bolts 35 to eliminate end float but without bearing pre-load, i.e. no increase in spring balance reading.



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- 10 Measure the gap at top trunnion and subtract 1 mm (0.040 in) to give shim thickness (bearing pre-load). For example:

Gap	=	1.55 mm (0.061 in)
less	=	1.00 mm (0.040 in)
Shim	=	<u>0.55 mm (0.021 in)</u>

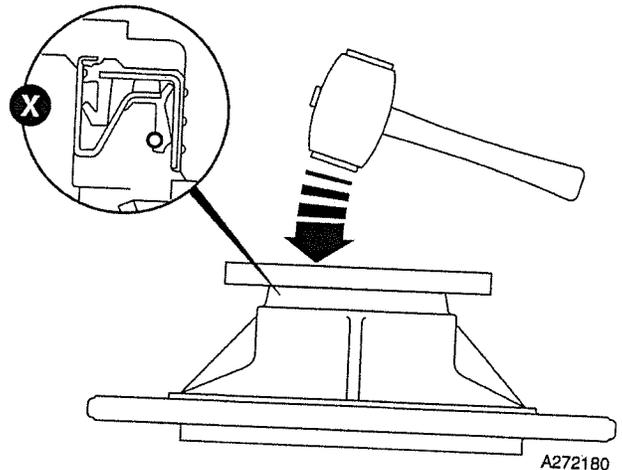
Note 1: If the gap measures 1 mm, then no shim is required.

Note 2: If after fitting shims, the bearing pre-load is unattainable, fit new bearings.

- 11 Refit the top trunnion. Apply Loctite 242 to the top trunnion bolt threads, fit and tighten to 56 Nm (42 lbf ft, 6 kgf m).

Check the spring balance reading which should be 4.5 kgf (10 kgf) more than the reading recorded at Step 6.

- 12 Connect the track rod and steering cylinder to the axle steer knuckles. Tighten the track rod nut to a minimum torque of 135 Nm (100 lbf ft, 13.8 kgf m), then continue to tighten to next castellation and insert pin.
- 13 Lightly oil inner wheel bearing 6 and its cup 7, then fit them into bearing carrier 8.
- 14 Fit a new combination seal 9 into the bearing carrier.



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Do not lubricate before fitting. Using service tool and spacer drive seal squarely into carrier 19 until flush, as shown at X.

Note: After assembling the bearing carrier to the swivel hub, make sure that there is sufficient clearance between the hub and seal.

- 15 Install the cup of outer wheel bearing 10 into bearing carrier 8. Grease the bore of the seal and the surface of the stub.

- 16 Fit bearing carrier 8 onto hub swivel 3.

* **Note:** The bearing carrier must be fully supported during the fitting operation; do not allow any weight to rest on the bearings otherwise the inner bearing will be displaced and damage the seal.

- 17 Fit new brake seal 12 to the hub swivel.

- 18 Fit new seals 13 and 14 into the grooves in brake piston 15 and annulus carrier 16. Make sure they seat squarely in their grooves.

- 19 Carefully press piston 15 all the way into the annulus carrier housing.

Axle Hub and Driveshaft - 3 Plate, Standard Retraction Brakes (cont'd)

Assembly (cont'd)

- * 20 Align relationship marks made on dismantling. Assemble annulus ring 17 to annulus carrier 16 and secure with circlip 18. Make sure the two blanking plugs Z are fitted to the annulus carrier. Apply Loctite 242 to threads.

* **Note:** Inspect the inside of the annulus carrier and piston for marks. Any signs of scoring on a seal contact surface can cause leaks.

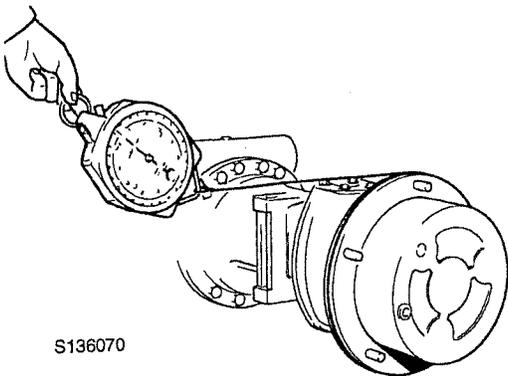
* **Note:** Make sure blanking screws Y are fitted. Apply Loctite 242 to threads.

- 21 Fit the annulus assembly onto the splined hub, check that the relationship marks align. Push the annulus assembly into the splined hub until the splines of the annulus assembly are flush with the end of the splined hub. Fit brake seal 19 onto the hub swivel.

- 22 Fit retaining plate 20, making sure the breather hole and brake galleries align. Secure using new Verbus Ripp bolts 21 and tighten until the annulus assembly just rocks.

- 23 Check the seal drag rolling force:

- i Use a spring balance and cord wrapped around the planet carrier flange as shown. Pull the spring balance so that the hub rotates, do several times to let the seal bed in and record the reading.



- ii Remove the planet gear carrier and tighten new Verbus Ripp bolts 21 to 166 Nm (122 lbf ft, 17 kgf m).

- iii Repeat steps 23, 23i and record the reading.

- iv To get the rolling force, subtract seal drag rolling force (see Step 23 i) from reading obtained at this step, the result should be 14 to 152 N (3 to 34 lbf, 1.4 to 15.3 kgf).

If the resulting figure is outside these limits check seal 9 is fitted correctly and/or renew bearings 7 and 11.

Note: A high rolling force reading may indicate that the oil seal was damaged during fitting.

- 24 Assemble friction plates 22 and counterplates 23 onto the carrier. If the original brake pack is being used, return the plates to their original positions (see **Dismantling**, Step 9). Soak new friction plates in gear oil before assembly.

- 25 Assemble the brake pressure plate 24. Fit circlip 25.

* **Note:** Where axles are fitted to machines utilising the main hydraulic circuit to operate the brakes:

- i Bleed the brake system. Gently apply the brakes and release the pressure with the engine running. Check the piston activates and retracts correctly and does not stick in the applied position before fitting the hub carrier.

- ii If the brake piston has not yet retracted, the brake seal or piston assembly may have been assembled incorrectly. Alternatively, there may be residual hydraulic brake pressure holding the piston - Release the brake bleed nipple with the engine running and check if the piston retracts when the pressure is released. Investigate the cause if the piston remains in the applied position (see **Residual Brake System Pressure**, Section 6).

- 26 Press driveshaft thrust pad 26 (chamfered side lowermost) into the recess in planet carrier 27.

- 27 Fit new planet gears 28 in place of any that were removed (see **Dismantling**, Step 4). Secure with circlip 29.

Note: The large radius at the end of the bearing bore fits onto the pin first.

- 28 Slide sun gear 30 onto the driveshaft and secure with circlip 31. Fit a new 'O' ring 32.

Fit planet gear carrier 27 onto bearing carrier 8, turning it slightly to engage the gear teeth and aligning the two tapped holes A in the bearing carrier. (The tapped holes are diametrically opposite one another.) Ensure the planet gear carrier butts fully against the bearing carrier.

Note: Do not strike the centre of planet gear carrier 27 when fitting, as this may dislodge driveshaft thrust pad 26.

- 29 Fit screws 33 and torque tighten to 56 Nm (41.3 lbf ft, 5.71 kgf m).

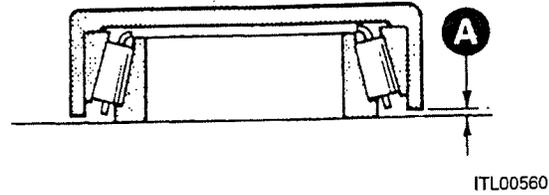
- 30 Fill the axle hub with oil (see **Lubricants and Capacities**, Section 3).

Drive Head (cont'd)

Assembly

Pinion Depth Setting Procedure

- 1 Place new pinion inner bearing 31 and outer race 28 (see page 5/6 - 1) on a flat surface and position bearing cup 892/00174 over the bearing assembly.
- 2 Measure gap **A** (e.g. 0.20 mm) and add this to the cup depth stamped on the tool (e.g. 30.01 mm) to obtain the bearing depth.
- 3 From the face of the pinion, obtain the etched deviation figure (e.g. + 2) which is in units of 0.01 mm. If positive, add this to the bearing depth; if negative, subtract from the bearing depth.
- 4 Obtain the deviation figure (e.g. —1) stamped on the differential housing bolt flange. If negative, add to bearing depth; if positive, subtract from bearing depth.
- 5 Subtract the total of the above figures from the standard value of 31.19 mm. The result will be the thickness of shims required behind the pinion inner bearing outer race.



Example (all dimensions in millimeters)

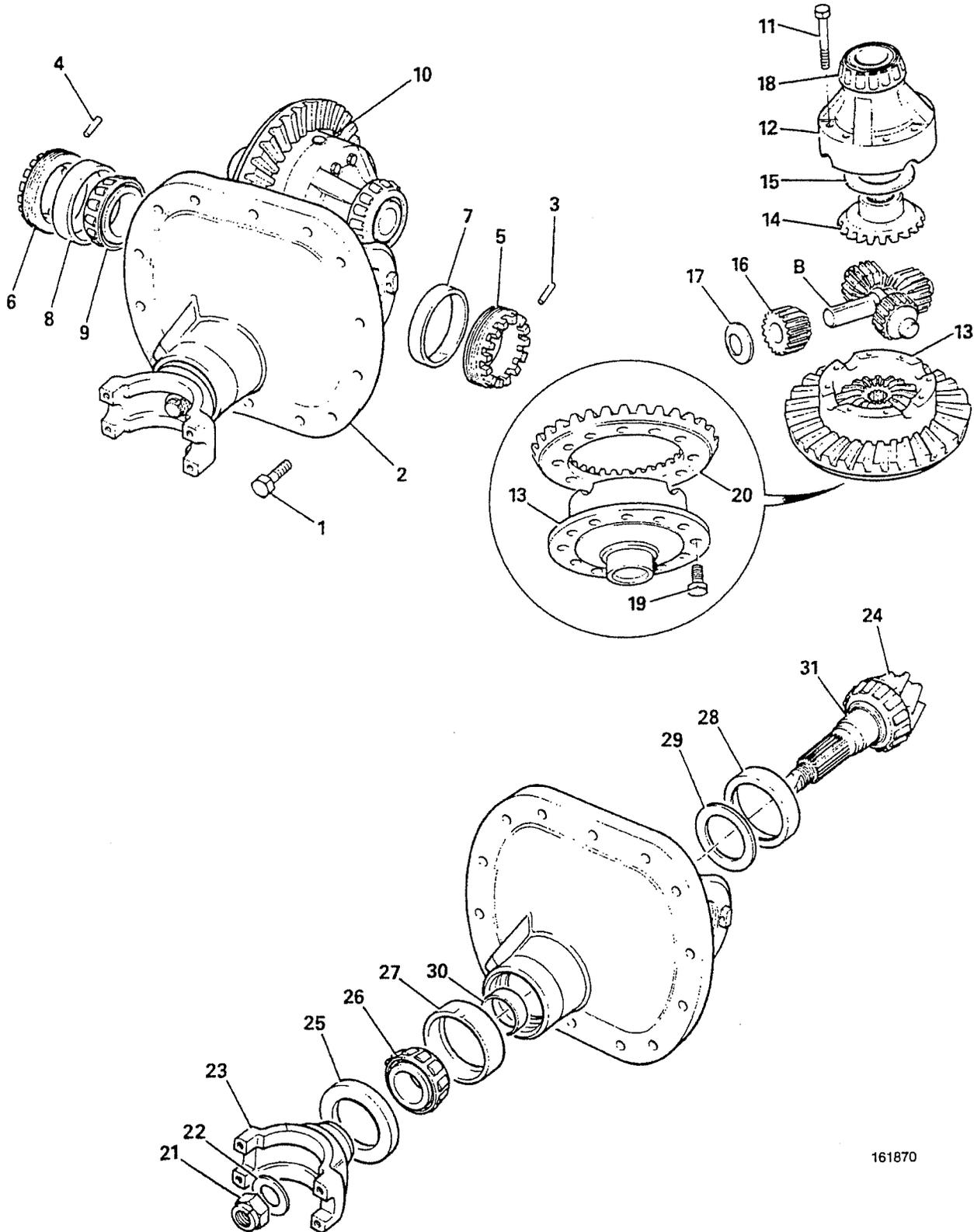
Cup Depth	30.01
Gap A	+ 0.20
Bearing Depth	30.21
Pinion Deviation (+ 2)	+ 0.02
Housing Deviation (—1)	+ 0.01
	30.24
Total	30.24
	31.19
Standard Value	31.19
Less Total From Above	30.24
	0.95
Shim Thickness	0.95

Note: In rare instances, it is possible that the setting data stamp may be omitted from the drivehead casing. In these circumstances the following setting procedure should be used:

Revise the shim pack size by the difference in setting height marked on the old and new crownwheel and pinion sets.

Drive Head (cont'd)

Assembly (cont'd)



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Drive Head (cont'd)**Assembly (cont'd)**

Note 1: The crownwheel **20** and pinion **24** are matched and should be renewed as a pair if either one is damaged or excessively worn. The two differential case halves **12** and **13** are also matched as are gears **14** and **16**. Do not use unmatched halves or gears.

Make sure all bearings are lightly oiled before fitting and setting. Make sure bearings are rotated whilst being set.

- 1 Fit to the drive head carrier **2** the pinion inner bearing outer race **28** together with the required thickness of shim(s) **29** to give correct pinion depth. (See **Pinion Depth Setting Procedure**, page 5/6 - 3). Fit the shims behind the outer race as shown.
 - 2 Fit new taper roller bearing cone **31** and a new collapsible spacer **30** onto pinion **24**.
 - 3 Fit outer race **27** to the drive head carrier **2**.
 - 4 Insert the pinion **24** into its bore. (Before inserting, ensure that the pinion matches the crownwheel. The code numbers etched on the pinion end face and the crownwheel perimeter should be the same).
 - 5 Fit new taper roller bearing cone **26**. Pack the cavity between the lips of the new oil seal **25** with grease and fit the seal to the drive head carrier **2**.
 - 6 Install the drive coupling yoke **23** and secure it with a new combined stake nut **21** and washer **22**:
 - 6.1 Hold the yoke **23** with Service Tool 892/00812.
 - 6.2 Tighten the stake nut until end float is almost zero then check seal drag torque is between 0.40 to 0.75 Nm (3.5 to 6.6 lbf in).
 - 6.3 Continue to tighten the stake nut to collapse spacer **30** and give a rolling torque of 1.7 to 2.8 Nm (1.3 to 2.1 lbf ft) excluding seal drag, crownwheel not fitted.

IF THE STAKE NUT IS OVER-TIGHTENED, THE COLLAPSIBLE SPACER MUST BE RENEWED.

Make sure that yoke **23** is rotated in both directions to fully seat bearings before measuring rolling torque.
 - 6.4 When the torque is correct, stake the nut to the pinion shaft using a square ended staking tool.
 - 7 Fit crownwheel **20** to case half **13**, torque tighten 'Verbus Ripp' bolts **19** to 166 Nm (122 lbf ft; 16.9 kgf m).
 - 8 Assemble planet gears **16** and thrust washers **17** (4 off each) onto trunnion pins **B**. Fit the planet gear assembly and differential side gears **14**, thrust washers **15** (2 off each) into case half **13**.
 - 9 Position top case half **12** onto bottom half assembly **13** aligning the match mark letters (see **Note 1** opposite). Apply Loctite 242 to the threads of bolts **11** then fit and torque tighten to 56 Nm (42 lbf ft; 6 kgf m). Check the gears for free rotation.
 - 10 Press taper roller bearing cone **18** onto the spigot of case half **12**.
 - 11 Install the differential assembly **10** into the drive head carrier **2**.
 - 12 Press taper roller bearing cone **9** onto the spigot of case half **13**.
 - 13 Fit bearing outer races **7** and **8**, castellated nuts **5** and **6** to the drive head carrier **2**.
 - 14 Adjust castellated nuts **5** and **6** to give a bearing pre-load (see **Note 2**) of 1.36 to 2.5 Nm (1.0 to 1.84 lbf ft; 0.14 to 0.26 kgf m).
- Note 2:** Measure the pre-load by taking another rolling torque reading and subtracting the torque figure measured at step 6.3. The difference is the bearing pre-load.
- 15 Measure the crownwheel backlash which should be 0.13 to 0.2 mm (0.005 to 0.008 in). Adjust castellated nuts **5** and **6** by equal amounts when altering backlash. When backlash and pre-load are both correct, fit tension pins **3** and **4**.
 - 16 Verify crownwheel and pinion are set correctly: use engineers marker on three of the pinion teeth and check markings on the crownwheel are as indicated on page 5/6-6. Adjust if necessary.
 - 17 Apply Loctite 275 to the drive head carrier mating face then fit to the axle casing (the carrier assembly locates on two dowels). Make sure the assembly is fitted in the same match-marked position (see step 3, **Dismantling**, page 5/6 - 2).
 - 18 Apply Loctite 242 to bolts **1** and torque tighten as detailed in **Notes 3** and **4**.
 - 19 Assemble both hub and driveshafts, refit the propshaft to the gearbox.
 - 20 Fill the axle with recommended oil (see **Lubricants and Capacities**, Section 3).
- Note 3:** Torque tightening depends on bolt type. The grade is stamped on the bolt head. If standard grade 8 bolt, tighten to 98 Nm (72 lbf ft; 10 kgf m).
- If Verbus Ripp 12.9 grade bolt is used, tighten to 166 Nm (122 lbf ft; 17 kgf m).
- Use heavy duty socket 892/00817.
- Note 4:** Verbus Ripp bolts must **NOT** be re-used.

Drive Head (cont'd)

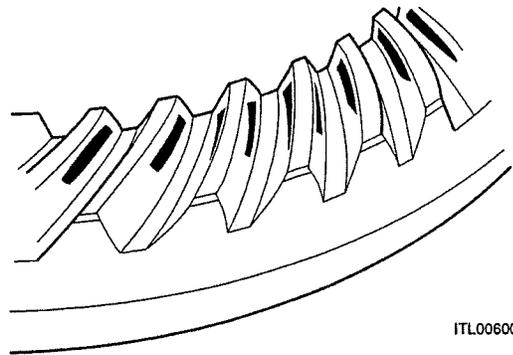
Assembly (cont'd)

Crownwheel and Pinion Adjustment

Meshing of the gears should be checked by marking three of the pinion teeth with engineers marking compound and rotating the pinion.

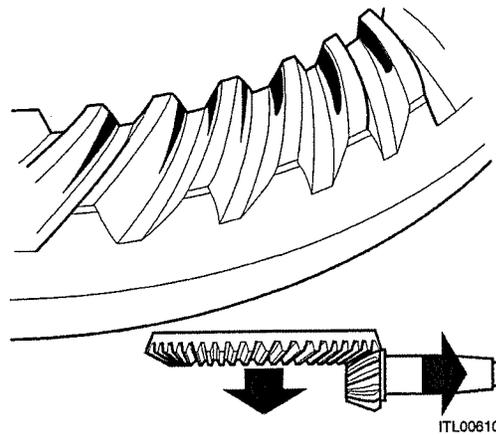
The marking will then be transferred to the crown wheel teeth.

Correct tooth marking.



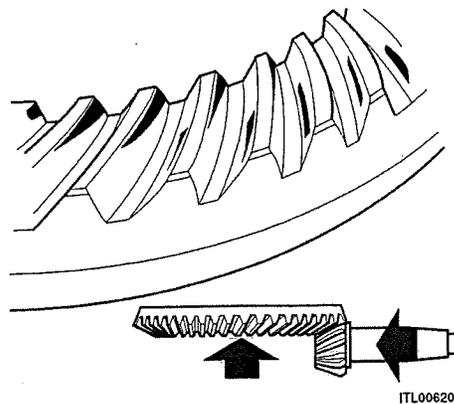
Pinion too deeply in mesh.

Decrease the shim thickness between the pinion inner bearing cup and the axle casing. Move the crown wheel towards the pinion to correct the backlash.



Pinion too far out of mesh.

Increase the shim thickness between the pinion inner bearing cup and the axle casing. Move the crown wheel away from the pinion to correct the backlash.

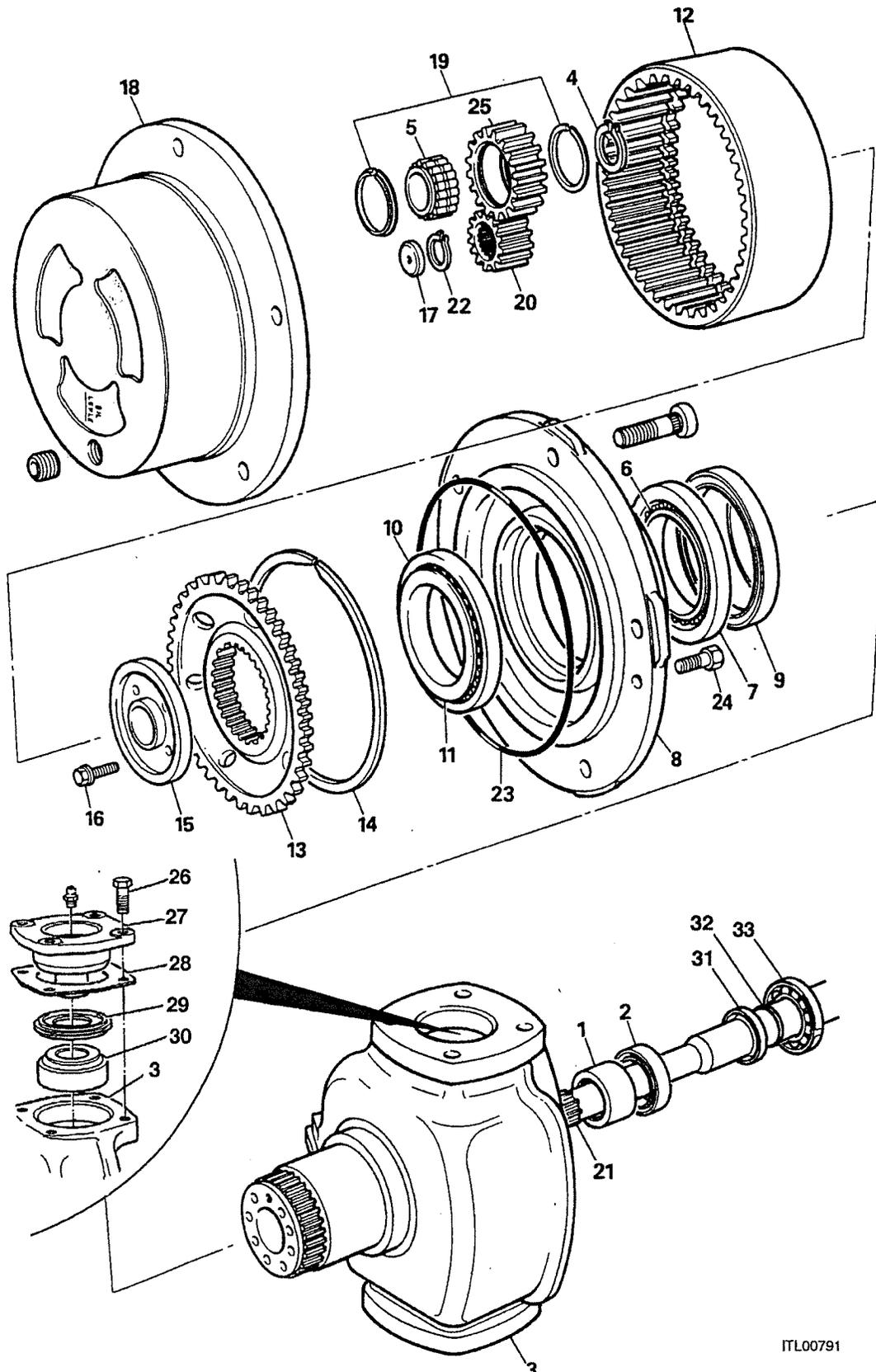


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* Axle Hub and Driveshaft

* Dismantling



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*** Axle Hub and Driveshaft (cont'd)****Dismantling (cont'd)**

- 1 Drain oil from the axle hub.
- 2 Remove screws 24.
- * 3 Using a soft-faced mallet, tap the planet gear carrier 18 to 'crack' the joint between the carrier and bearing carrier 8, then lever the planet gear carrier off the bearing carrier. Remove and discard 'O' ring 23.
- 4 Remove a planet gear 25 only if it is defective. Note that a planet gear can only be renewed as an assembly, which comprises the pinion, the bearing 5 and two 'L' shaped circlips 19. To remove a planet gear, first remove the external circlip 4, then pull off the planet gear.
- 5 The driveshaft thrust pad 17 is drilled and tapped M6 for removal purposes.
- 6 Remove external circlip 22 and sun gear 20.
- * 7 Remove Verbus Ripp bolts 16. These bolts are very tight and care must be taken not to distort the bolt heads. Use as short an extension bar as possible with a six sided socket. Discard the Verbus Ripp bolts after removal.
- 8 Using special tool (part number 892/00833) as jacking screws, jack the annulus assembly 12, 13 and 14 off the bearing carrier 8.
- 14 Mark position of top and bottom trunnions 27, remove bolts 26 and remove trunnions. Retain shims 28 with top trunnion. Withdraw the hub swivel 3.
- Note:** Trunnions may be removed easily and without damage to the shims by pumping grease through the grease nipple.
- 15 Remove the top and bottom trunnion seals 29 and bearings 30.
- 16 Withdraw drive shaft 21 from the axle casing.
- * 17 Prise out drive shaft outer oil seal 2.
- * 18 Remove bearing 1 using tool 892/00225.
- * 19 Prise out driveshaft inner seal 31.
- * 20 Remove circlip 32.
- * 21 Remove bearing 33 using tool 892/00225.
- * 22 If there has been a component failure, remove all traces of debris and clean the magnetic drain plug.

Note: Ensure annulus ring position is marked for reassembly.

Note: Fretting between the hub swivel and annulus carrier mating faces might be evident; this condition is normal, do not attempt to repair.

If the hub swivel and annulus carrier are to be renewed they must be renewed as pairs and not individually.

- * 9 Remove internal circlip 14 to separate the annulus ring 12 from the annulus carrier 13.
- 10 Pull off the bearing carrier 8 together with the outer wheel bearing cone and cup 11. Withdraw the inner bearing cup from the inboard side of the carrier.
- 11 Pull off the inner wheel bearing 6.

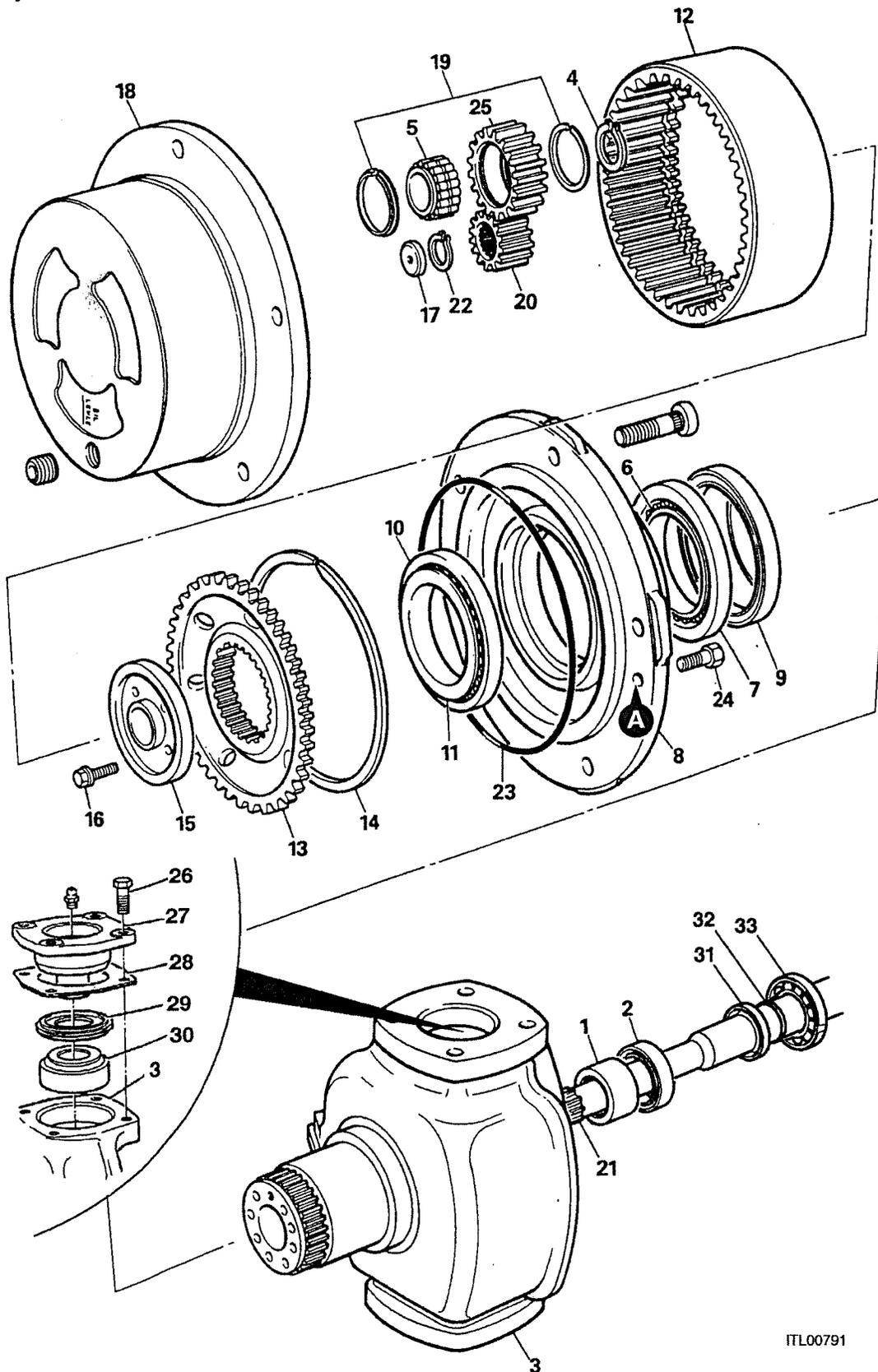
Note: Earlier type axles may have 'O' ring and wear ring fitted. These parts should be discarded.

- 12 On later type axles remove and discard combination seal 9.
- 13 Disconnect the track rod and steering cylinder from the axle steer knuckles.

Note: The top and bottom trunnions are very similar (bottom trunnion not illustrated), the only difference being that shims 28 are fitted to the top trunnion only.

* Axle Hub and Driveshaft (cont'd)

Assembly



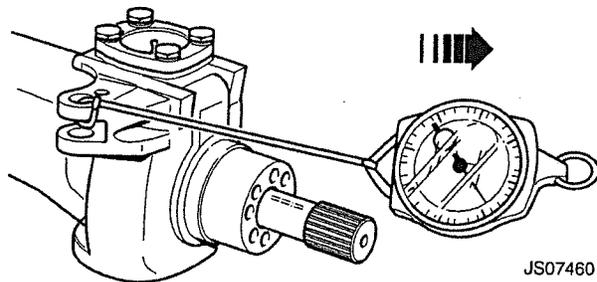
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* Axle Hub and Driveshaft (cont'd)

Assembly (cont'd)

Note: The top and bottom trunnions are very similar (bottom trunnion not illustrated), the only difference being that shims 28 are fitted to the top trunnion only.

- *1 Tap the drive shaft inner bearing 33 into position in the hub swivel driveshaft bore, secure with circlip 32.
- *2 Fit new oil seal 31. Pack grease between lips of seal.
- *3 Fit driveshaft 21, taking care to locate inner end into splines of differential gears.
- *4 Tap driveshaft outer bearing 1 into position in the hub swivel.
- *5 Fit new oil seal 2. Pack grease between the lips of the seal.
- *6 Press new top and bottom trunnion oil seals 29 into position followed by bearings 30. Grease bearing and oil seal before fitting axle.
- *7 Locate hub swivel 3 and fit bottom trunnion 27. Apply Loctite 242 to threads of bottom trunnion bolts 26 and then torque tighten bolts to 56 Nm (42 lbf ft; 6 kgf m). Fit top trunnion 27 with nominal 0.25 mm (0.010 in) shim 28 and leave top trunnion bolts 26 finger tight.
- *8 Attach a spring balance to track rod swivel and note pull required to turn the swivel. Tighten the top trunnion bolts 26 to eliminate end float but without bearing pre-load, i.e. no increase in spring balance reading.



- *9 Measure gap at top trunnion and subtract 1 mm (0.040 in) to give shim thickness (bearing pre-load). For example:

Gap	=	1.55 mm (0.061 in)
less	=	1.00 mm (0.040 in)
Shim	=	<u>0.55 mm (0.021 in)</u>

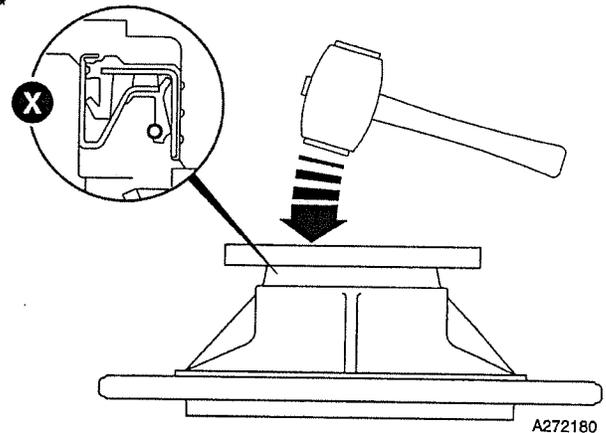
* Note 1: If the gap measures 1 mm, then no shim is required.

* Note 2: If after fitting shims, the bearing pre-load is unattainable, fit new bearings.

- * 10 Refit top trunnion. Apply Loctite 242 to the top trunnion bolt threads, fit and tighten to 56 Nm (42 lbf ft; 6 kgf m).

Check spring balance reading which should be 4.5 kgf (10 lbf) more than the reading recorded at Step 6.

- * 11 Connect the track rod and steering cylinder to the axle steer knuckles. Tighten track rod nut to a minimum torque of 135 Nm (100 lbf ft; 13.8 kgf m), then continue to tighten to next castellation and insert pin.
- * 12 Lightly oil the inner wheel bearing 6 and its cup 7, then fit them into the bearing carrier 8.
- * 13 Fit a new combination seal 9 into the bearing carrier.



Do not lubricate before fitting. Using service tool and spacer drive the seal squarely into carrier 19 until flush, as shown at X.

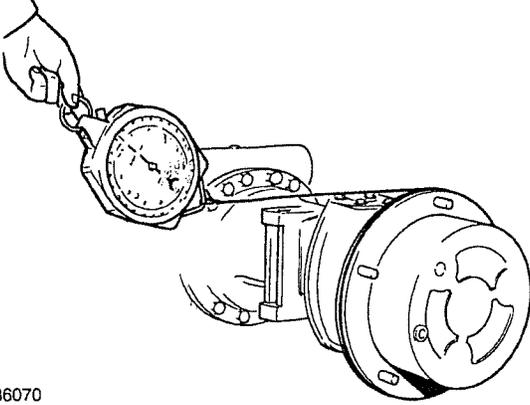
- * Note: After assembling the bearing carrier to the swivel hub, make sure that there is sufficient clearance between the hub and seal.
- * 14 Install the cup of outer wheel bearing 10 into the bearing carrier 8. Grease the bore of the seal and the surface of the stub.
- * 15 Fit the bearing carrier 8 onto the hub swivel 3.
- * 16 Lightly oil the bearing race of outer wheel bearing 11. Fit the bearing onto the axle arm. Rotate the carrier 8 (and therefore the bearings) during fitting.
- * 17 Assemble the annulus ring 12 to the annulus carrier 13. Secure with circlip 14.
- * 18 Fit annulus assembly in the same angular position as removal (see Note on page 5/9-2) using new Verbus Ripp bolts 16. Do not fully tighten bolts but allow the bearing carrier to rock slightly.

* Axle Hub and Driveshaft (cont'd)

Assembly (cont'd)

* 19 Check the seal drag rolling force:

- i Use a spring balance and cord wrapped around the planet carrier flange as shown. Pull the spring balance so that the hub rotates, do several times to let the seal bed in and record the reading.



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- ii Remove the planet gear carrier and tighten new Verbus Ripp bolts 16 to 166 Nm (122 lbf ft, 17 kgf m).
- iii Repeat steps 19, 19i and record the reading.
- iv To get the rolling force, subtract seal drag rolling force (see Step 19i) from reading obtained at this step, the result should be 14 to 152 N, (3 to 34 lbf; 1.4 to 15.3 kgf).

If the resulting figure is outside these limits check the seal 9 is fitted correctly and/or renew bearings 6 and 11.

Note: Do not strike the centre of the planet gear carrier 18 when fitting, as this may dislodge the driveshaft thrust pad 17.

- * 23 Fit screws 24 and torque tighten to 56 Nm (41.3 lbf ft, 5.71 kgf m).
- * 24 Fill the axle hub with oil (see **Lubricants and Capacities**, Section 3).

* **Note:** A high rolling force reading may indicate that the oil seal was damaged during fitting.

- * 20 Press the driveshaft thrust pad 17 (chamfered side lowermost) into the recess in the planet gear carrier 18.
- * 21 Fit new planet gears 25 in place of any that were removed (see **Dismantling**, Step 4). Secure with circlip 5.

* **Note:** The large radius at end of bearing bore fits onto the pin first.

- * 22 Slide sun gear 20 onto the driveshaft and secure with circlip 22. Fit a new 'O' ring 23.

Fit planet gear carrier 27 onto bearing carrier 8, turning it slightly to engage the gear teeth and aligning the two tapped holes A in the bearing carrier. (The tapped holes are diametrically opposite one another.) Ensure the planet gear carrier butts fully against the bearing carrier.

*** Drive Head***** Dismantling and Assembly**

The procedure for dismantling and assembly of the Drive Head on the SD 80 Axle with inboard brakes is the same as the drive head on the SD 80 PT Axle. Please refer to **SD 80PT Axle, Drive Head - Dismantling and Assembly**.

* The procedure for dismantling and assembly of the inboard brakes is given in Section 6. Please refer to **SD80 Axles - Central Drive Head - Inboard Brakes, Standard and Positive Retraction**.

* Removal and Replacement

⚠ WARNING

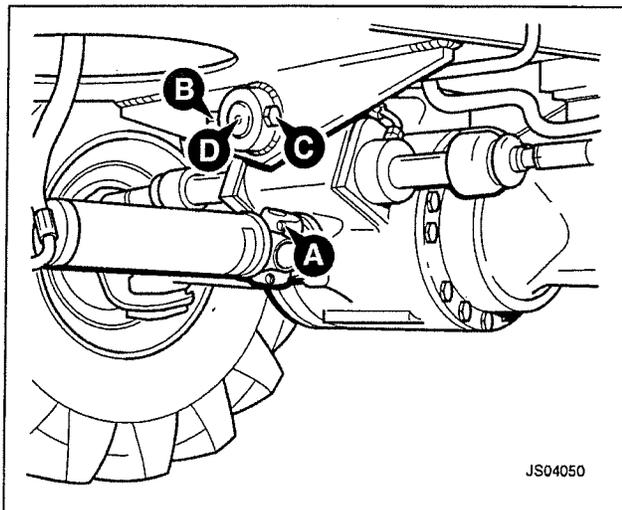
A raised and badly supported machine can fall on you. Position the machine on a firm, level surface before raising one end. Ensure the other end is securely chocked. Do not rely solely on the machine hydraulics or jacks to support the machine when working under it.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN-001

Removal

- 1 Remove nuts **A** to disconnect the propshaft from the axle. Remove the propshaft from the splined sliding coupling (see *SD 80 Axle - Propshafts, Removal and Replacement*).
- 2 Loosen the road wheel retaining nuts.
- 3 Make sure the wheels are blocked. Engage the parking brake.
- 4 Raise the front wheels off the ground. Prop the machine on each side.
- 5 Release the axle locking rams.
- 6 Switch off the engine and remove the starter key. Operate the brake pedal a few times and turn the steering wheel back and forth to relieve circuit pressure.
- 7 Disconnect the brake pipes from the axle swivel hubs, blank off the exposed connections.
- 8 Disconnect the hydraulic pipes from the power track rod, blank off all exposed connections.
- 9 Remove the road wheels.
- 10 Position a jack underneath the balance point of the axle and support the axle weight.
- 11 Remove nut **B** and pivot pin retaining bolt **C**.
- 12 Remove the pivot pin **D**.
- 13 Lower the jack so that the axle is clear of the mounting yoke and remove the axle.



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Replacement

- 1 Replacing is the reverse of the removal sequence.
- 2 Apply Loctite 242 to the threads of nuts **A**.

⚠ CAUTION

Bleed the brake system before driving the machine.

BRAK 1-6

Torque Settings

Item	Nm	lbf ft
A	75-85	55-63
B/C	137	101
Wheel nuts	680	500

* Power Track Rod

Removal and Replacement

⚠ WARNING

A raised and badly supported machine can fall on you. Position the machine on a firm, level surface before raising one end. Ensure the other end is securely chocked. Do not rely solely on the machine hydraulics or jacks to support the machine when working under it.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN-1-1

Removal

Note: Depending on accessibility, the steer cylinder can be removed and replaced with the axle on the machine. Where accessibility is limited, the axle should be removed before removal of the cylinder (see **Axles, Removal and Replacement**).

- 1 Thoroughly clean external parts.
- 2 Disconnect and cap hydraulic hoses to prevent loss of fluid and ingress of dirt. Label hoses for identification and correct refitting.
- 3 Remove locking screws **A** and pivot pins **B**. Swing the track-rod clear of the steering joints.
- 4 Remove screws **C** and washers **D** (4 off each) from the cylinder mounting flange.

- 5 Using a soft faced hammer, tap the closed end of the cylinder and carefully withdraw the cylinder and track-rod from the housing.

Note: Before removal, mark the cylinder flange and housing for relocation.

Replacement

Replace the power track rod by reversing the removal procedure.

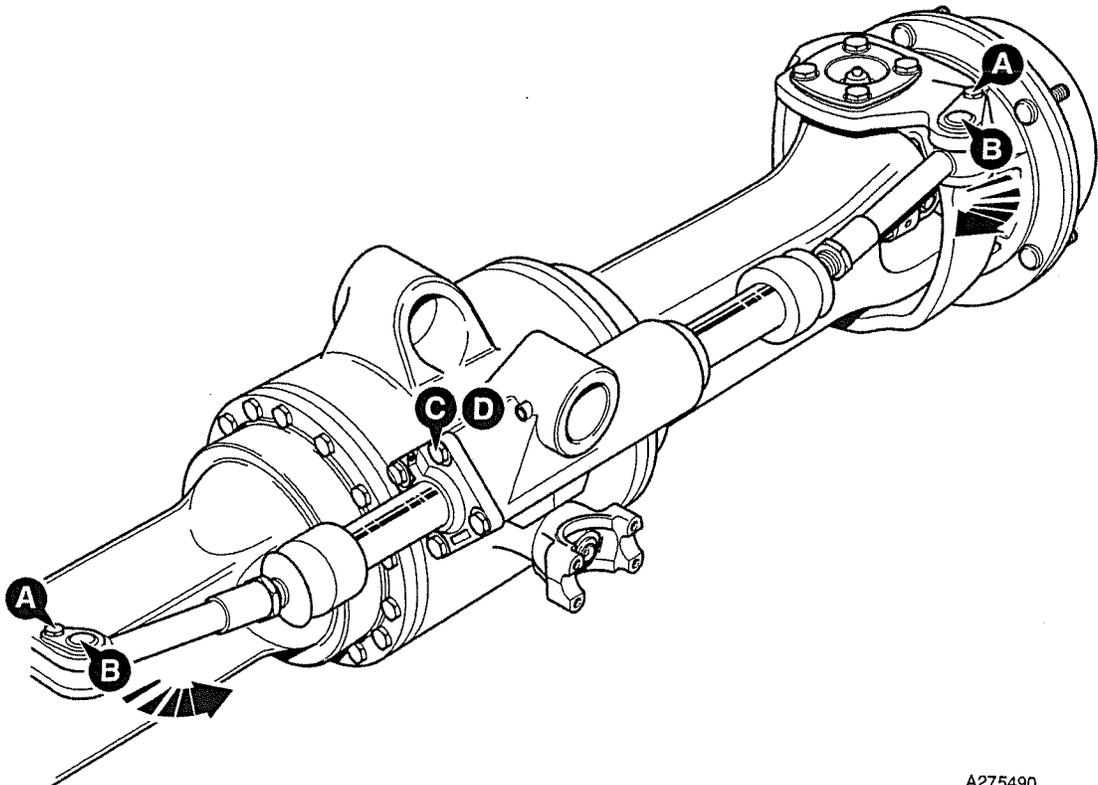
Apply Anti-Seize Paste, Part No. 4003/0211 to pivot pins **B** to facilitate subsequent removal.

After connecting hoses, check the hydraulic fluid level, and if necessary top-up.

Bleed the Hydraulic System (see **Service Brakes - Bleeding Procedure**, Section 6).

Torque Settings

Item	Nm	kgf m	lbf ft
A	56	5.6	41
C	166	16.8	122



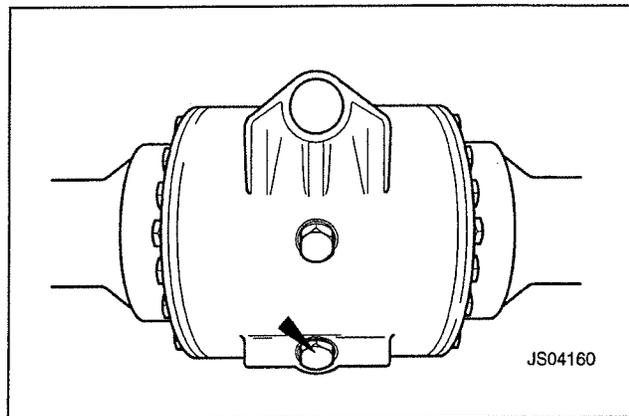
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Drive Head - Dismantling

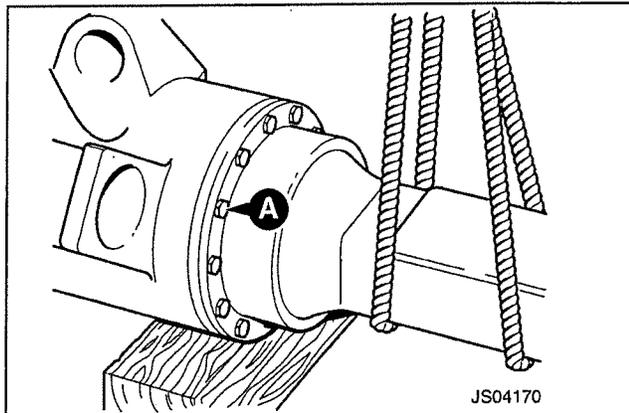
The following procedures can only be carried out with the axle removed from the machine (see **Axles, Removal and Replacement**).

It will be necessary to provide a suitable stand on which to support the axle once it has been removed from the machine.

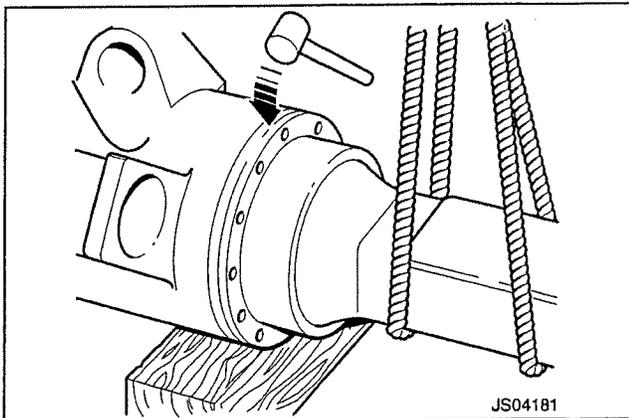
- 1 Remove the oil drain plug from the axle housing and drain the oil.



- 2 Support the axle arm and remove bolts A.

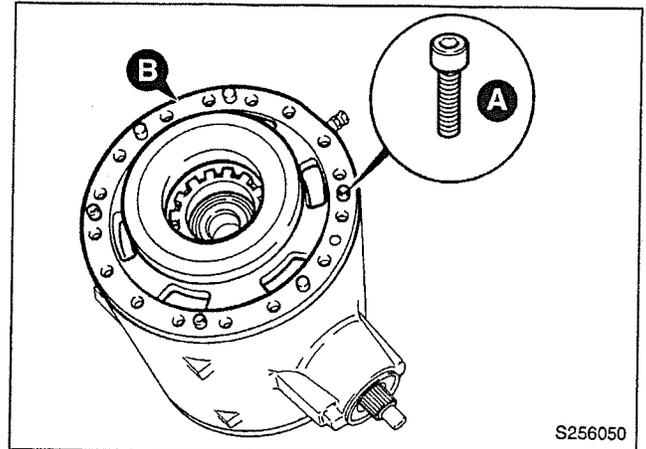


- 3 Separate the axle arm from the drive head by tapping the flange with a soft faced hammer. Remove all traces of gasketing from the mating faces.



Drive Head - Dismantling (cont'd)

- 4 Position the drive head as shown, with the crownwheel at the top. (For coupling removal see **Renewing the Pinion Oil Seal**). Remove capscrews **A**.
- 5 Match-mark the brake piston housing **B** and drive head. Pull off the brake piston housing.

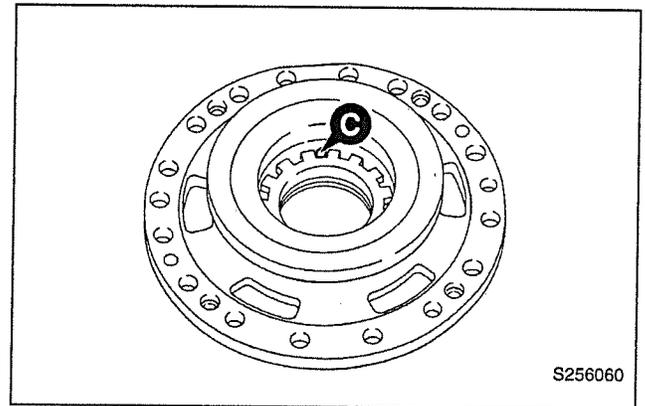


- 6 Drive out the differential side nut locking pin **C**, to allow readjustment on assembly. Remove the other brake piston housing only if damaged, but remove its locking pin **C** regardless (to allow sideload adjustment on assembly).

⚠ WARNING**Metal Splinters**

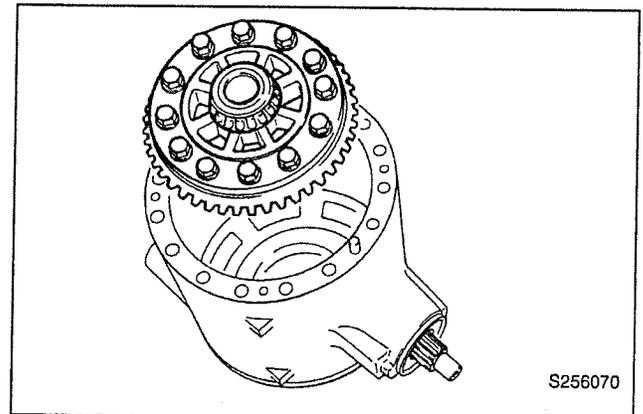
You can be injured by flying metal splinters when driving metal pins in or out. Use a soft faced hammer or drift to remove and fit metal pins. Always wear safety glasses.

INT-3-1-3

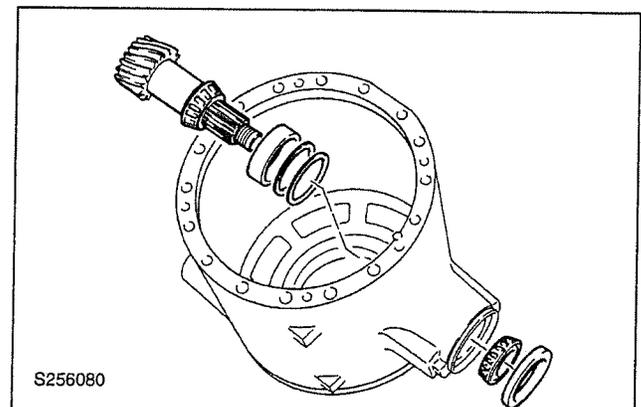


- 7 Lift out the crownwheel/differential assembly.

Note: If both brake piston housings are to be removed, mark the crownwheel end of the drive head casing to ensure that the assembly is returned to its original position.

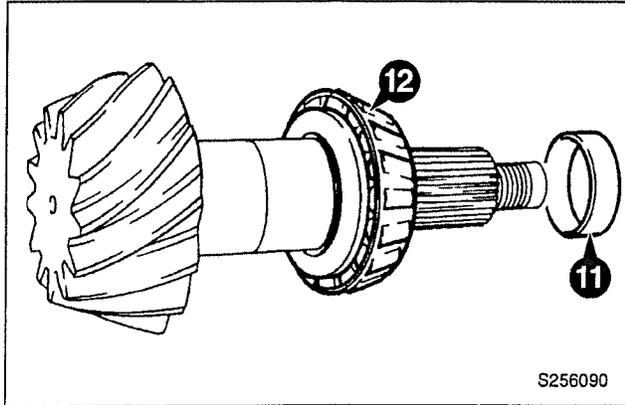


- 8 Using a soft faced hammer, hit the pinion end shaft until the pinion is free from its front bearing, then withdraw the pinion.
- 9 Withdraw the pinion seal and outer bearing cone.
- 10 If necessary, drive out the pinion inner bearing cup and shims. Discard the shims. Repeat for the outer bearing cup if required. Note that there are no shims for the outer bearing cup.



Drive Head - Dismantling (cont'd)

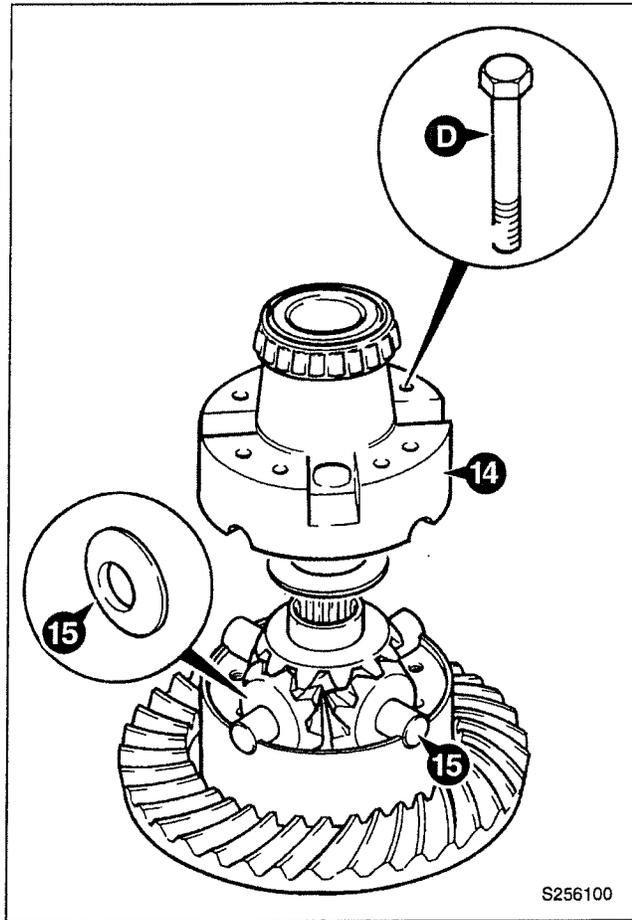
- 11 Remove and discard the pinion collapsible spacer.
- 12 Pull off the bearing cone.



- 13 To dismantle the differential assembly, first remove bolts D.
- 14 Lift off the top half housing.
- 15 Remove the differential gears and spherical washers. Pull off both differential bearing cones.

If required, remove the crownwheel and discard the Verbus Ripp bolts.

Note: For axles with Limited Slip Differential, see Limited Slip Differential.



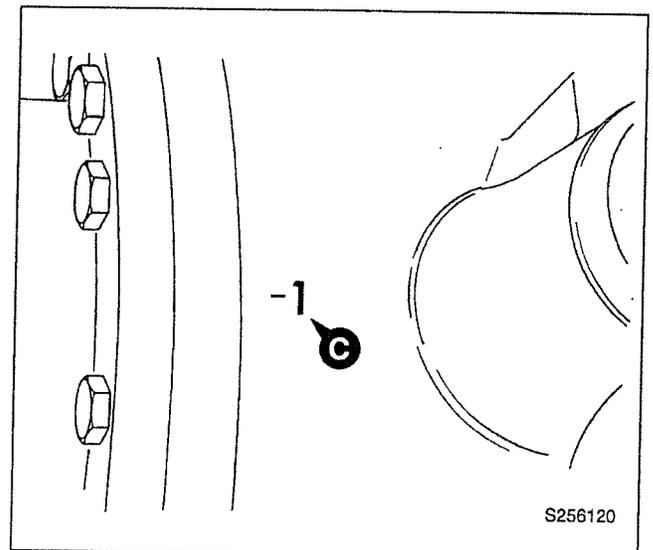
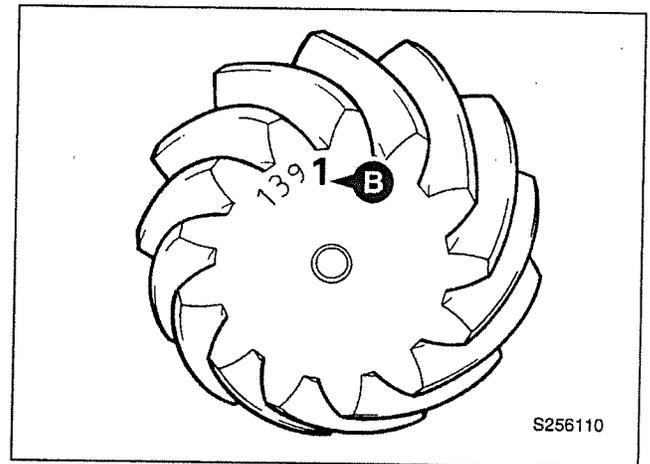
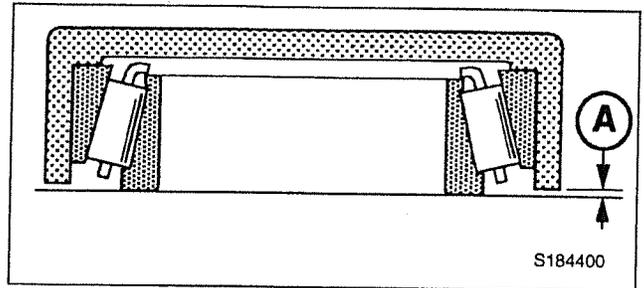
Drive Head - Assembly

Pinion Depth

Determine the pinion depth setting as follows:

Note: See **Crownwheel and Pinion Adjustment in Drive Head - Assembly** for general guidance on crownwheel and pinion adjustment.

- 1 Assemble the pinion inner bearing and its cup on a flat surface.
- 2 Place Service Tool 892/00174 (see **Service Tools**, Section 1) over the bearing assembly. Measure gap **A**. Add tool depth (30.01 mm) to gap **A** to give bearing depth.
- 3 Note the mounting distance figure **B** etched on the pinion and the deviation figure **C** on the drive head housing. Both figures are in units of 0.01 mm.
- 4 If dimension **B** is positive, add it to the bearing depth. If dimension **B** is negative, subtract it from the bearing depth.
- 5 If dimension **C** is positive, subtract it from the total. If dimension **C** is negative, add it to the total.
- 6 Subtract the result from the standard value of 31.19 mm to give the required shim thickness.



Example (Dimensions in mm)

Dimension A	0.25
Add tool depth	+30.01
Total	<u>30.26</u>
Add dimension B if positive. (Subtract if negative.)	+0.01
Total	<u>30.27</u>
Add dimension C if negative. (Subtract if positive.)	+0.01
Total	<u>30.28</u>
Standard Value	31.19
Less calculated total from above	-30.28
SHIM THICKNESS	<u>0.91</u>

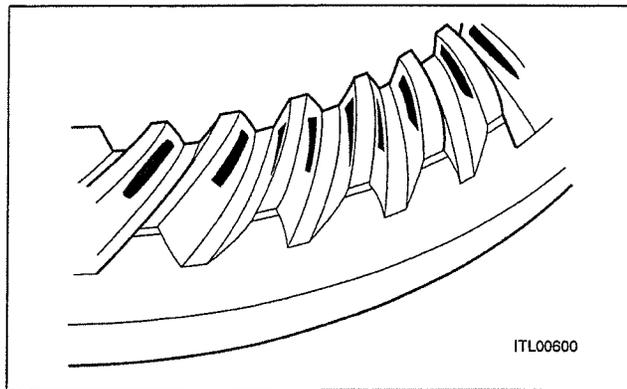
Drive Head - Assembly (cont'd)

Crownwheel and Pinion Adjustment

Meshing of the gears should be checked by marking three of the pinion teeth with engineers' marking compound and rotating the pinion.

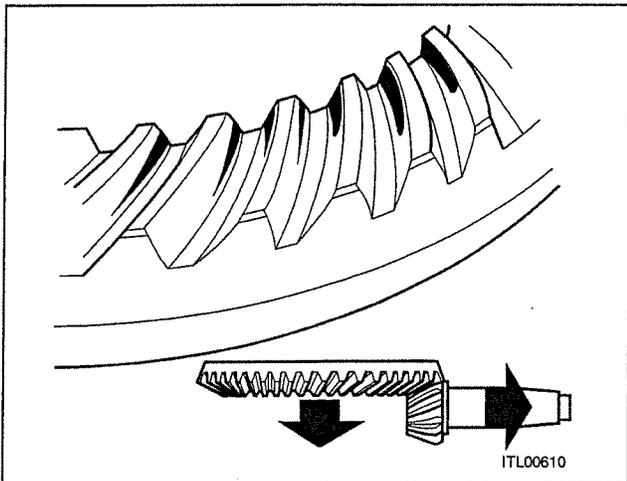
The marking will then be transferred to the crown wheel teeth.

Correct tooth marking.



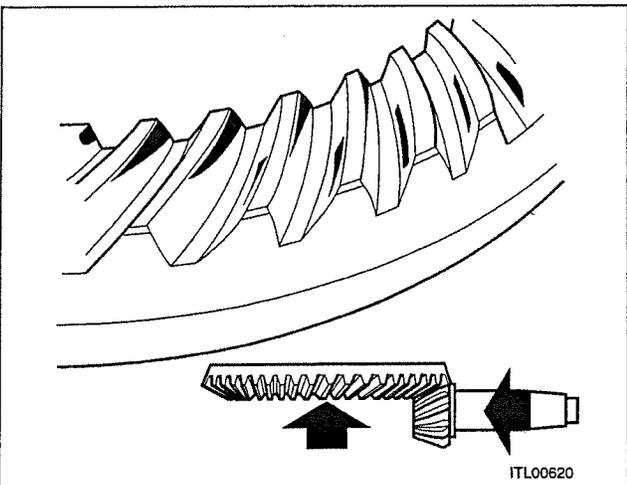
Pinion too deeply in mesh.

Decrease the shim thickness between the pinion inner bearing cup and the axle casing. Move the crown wheel towards the pinion to correct the backlash.



Pinion too far out of mesh.

Increase the shim thickness between the pinion inner bearing cup and the axle casing. Move the crown wheel away from the pinion to correct the backlash.



Drive Head - Assembly (cont'd)

Note: The crownwheel and pinion are matched and should be renewed as a pair if either one is damaged or excessively worn.

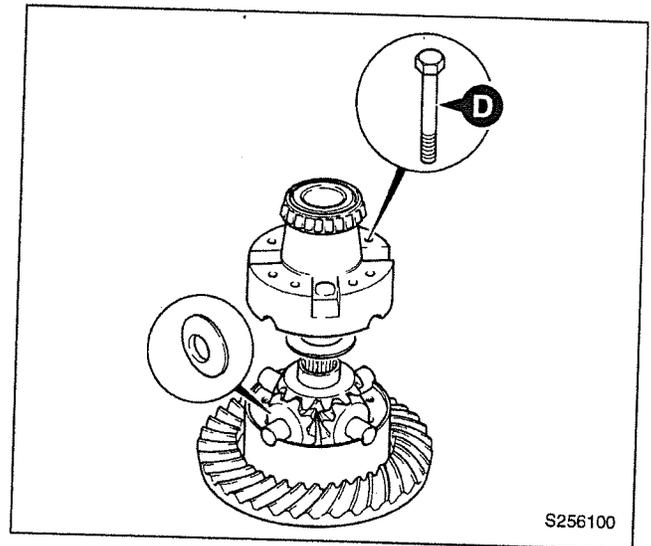
The two differential case halves are also matched as are the differential side gears and planet gears, do not use unmatched halves or gears.

Verbus Ripp bolts must be replaced throughout assembly.

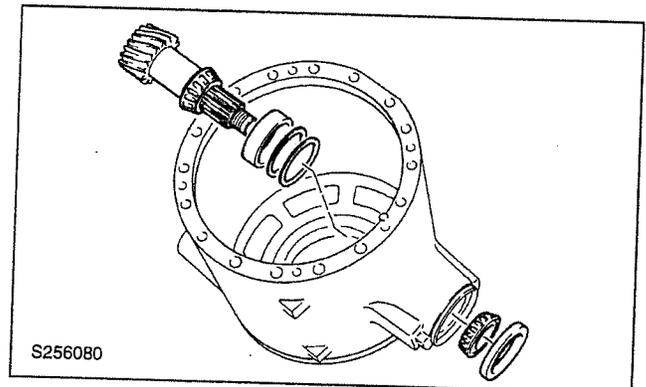
- 1 If required, fit a new crownwheel to the differential case half, torque tighten the new crownwheel retaining bolts to 166 Nm (122 lbf ft; 17 kgf m).

Assemble the differential gears and their spherical washers into the bottom half housing. Fit the differential bearing cones.

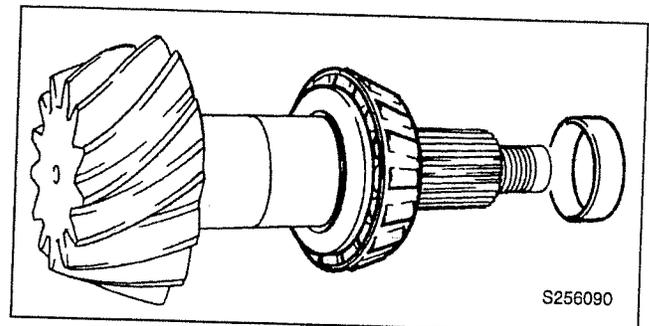
- 2 Position the top half housing onto the differential, aligning the match mark letters (see Note above). Apply Loctite 242 to the threads of bolts **D**, then fit and torque - tighten to 56 Nm (42 lbf ft, 6 kgf m). Check the gears for free rotation.



- 3 Fit the pinion inner bearing cup, together with the required thickness of shims to give correct pinion depth (see **Pinion Depth**). To ensure the cup is fitted square, use a suitable puller assembly. Do not use a hammer. Fit the outer bearing cup.

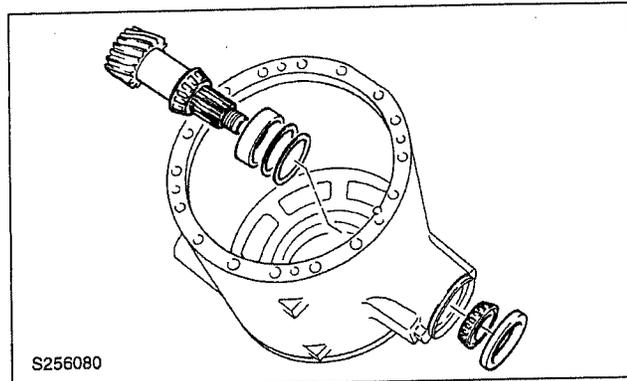


- 4 Fit the pinion inner bearing cone and a new collapsible spacer.



Drive Head - Assembly (cont'd)

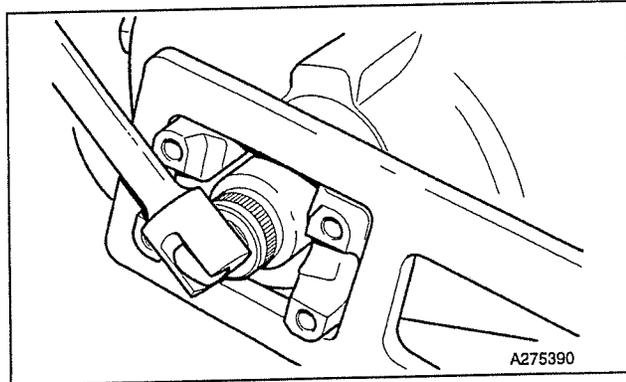
- 5 Insert the pinion into its bore. (Before inserting, ensure that the pinion matches the crownwheel. The code numbers etched on the pinion end face and the crownwheel perimeter should be the same.)
- 6 Fit the pinion outer bearing cone and the seal. Pack between the lips of the seal with grease before fitting.



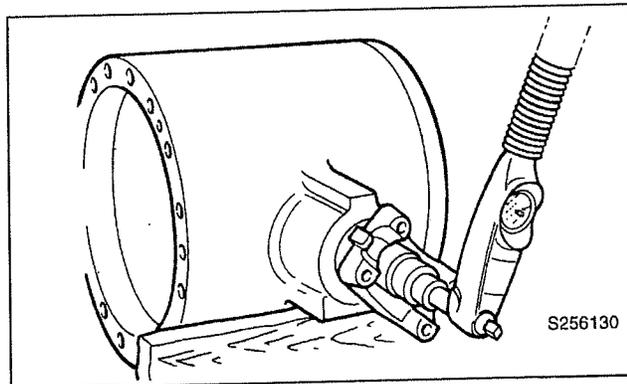
- 7 Install the drive coupling yoke and secure it with a new combined stake nut and washer. For coupling replacement see **Renewing the Pinion Oil Seal**.

Hold the yoke with Service Tool 892/00812 (see **Service Tools**, Section 1). Tighten the stake nut until end float is almost zero then check seal drag torque is between 0.40 to 1.0 Nm (3.5 to 8.9 lbf in).

Continue to tighten the stake nut to achieve the correct rolling torque; see Step 8. If the nut is overtightened, the collapsible spacer must be renewed.



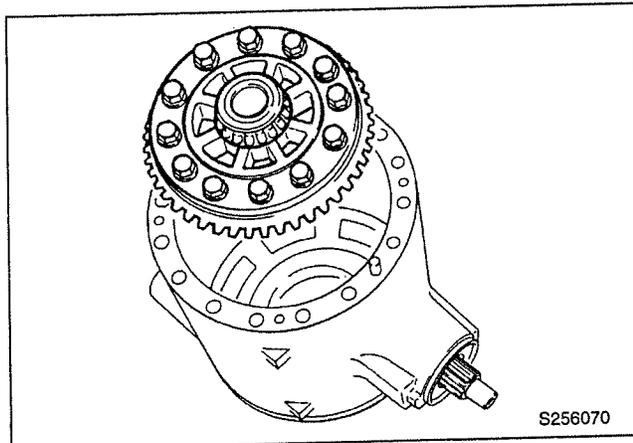
- 8 Measure the rolling torque, which should be 1.7-2.8 Nm (1.3-2.1 lbf ft; 0.17-0.28 kgf m) excluding seal drag. When the torque is correct, stake the nut to the pinion shaft using a square-ended staking tool.
- 9 If both brake piston housings were removed, fit the one at the opposite end to the crownwheel, using the procedure in Step 8. Then install the crownwheel/differential assembly into the drive head.



- 10 Apply Loctite 275 sealant to the drive head mating face, then fit the brake piston housing. Ensure that the match marks made during dismantling are aligned. Fit capscrews **A** (see **Note**) and torque tighten to 56 Nm (42 lbf ft, 5.7 kgf m). (Applies to both piston housings.)

Note: When refitting the cap screws, clean the threads with a wire brush and coat the threads with Loctite 242. Fit and torque tighten to the figure quoted above.

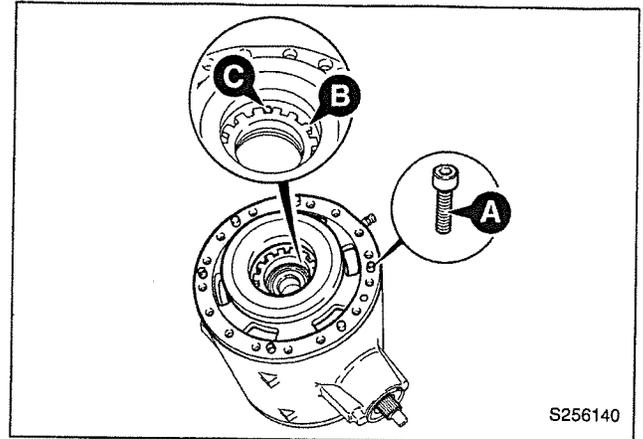
New capscrews are encapsulated and do not require cleaning or manually coating with sealant.



Drive Head - Assembly (cont'd)

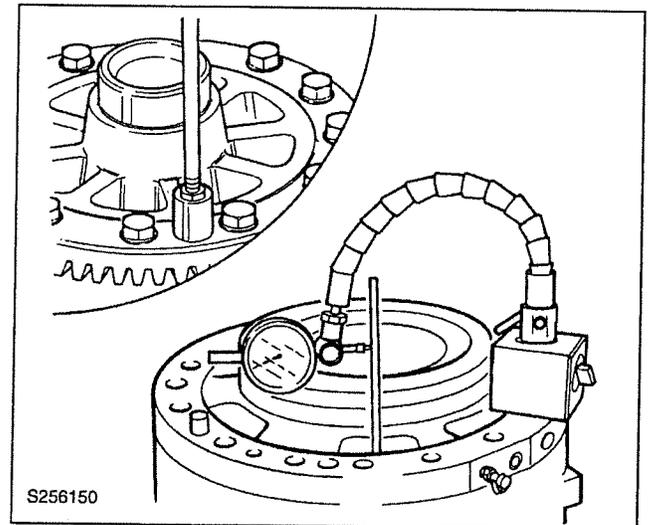
- 11 Adjust differential side nuts **B** to give a bearing preload of 1.36 - 2.5 Nm (1.0 - 1.84 lbf ft; 0.14 - 0.26 kgf m).

Measure the preload by taking another pinion rolling torque reading and subtracting the torque figure measured at Step 8. The difference is the bearing preload.

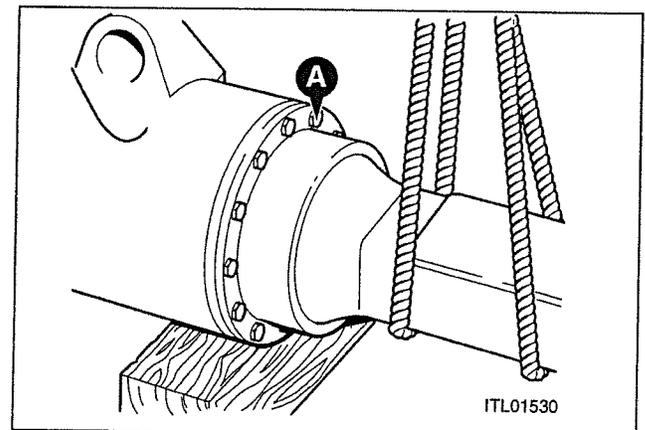


- 12 Measure the crownwheel backlash (see **Note**), which should be 0.13 - 0.2 mm (0.005 - 0.008 in). Adjust the differential side nuts by equal amounts when altering backlash. When backlash and preload are both correct, fit the sidenut locking pins **C**. (see illustration, step 11). Verify crownwheel, pinion and pre-load are set correctly, see **Crownwheel and Pinion Adjustment**.

Note: To measure the backlash, use a magnet drilled and tapped 6 mm to accept a length of rod threaded 6 mm on one end. Position the magnet in-between the crown wheel locking bolts as shown in the inset.

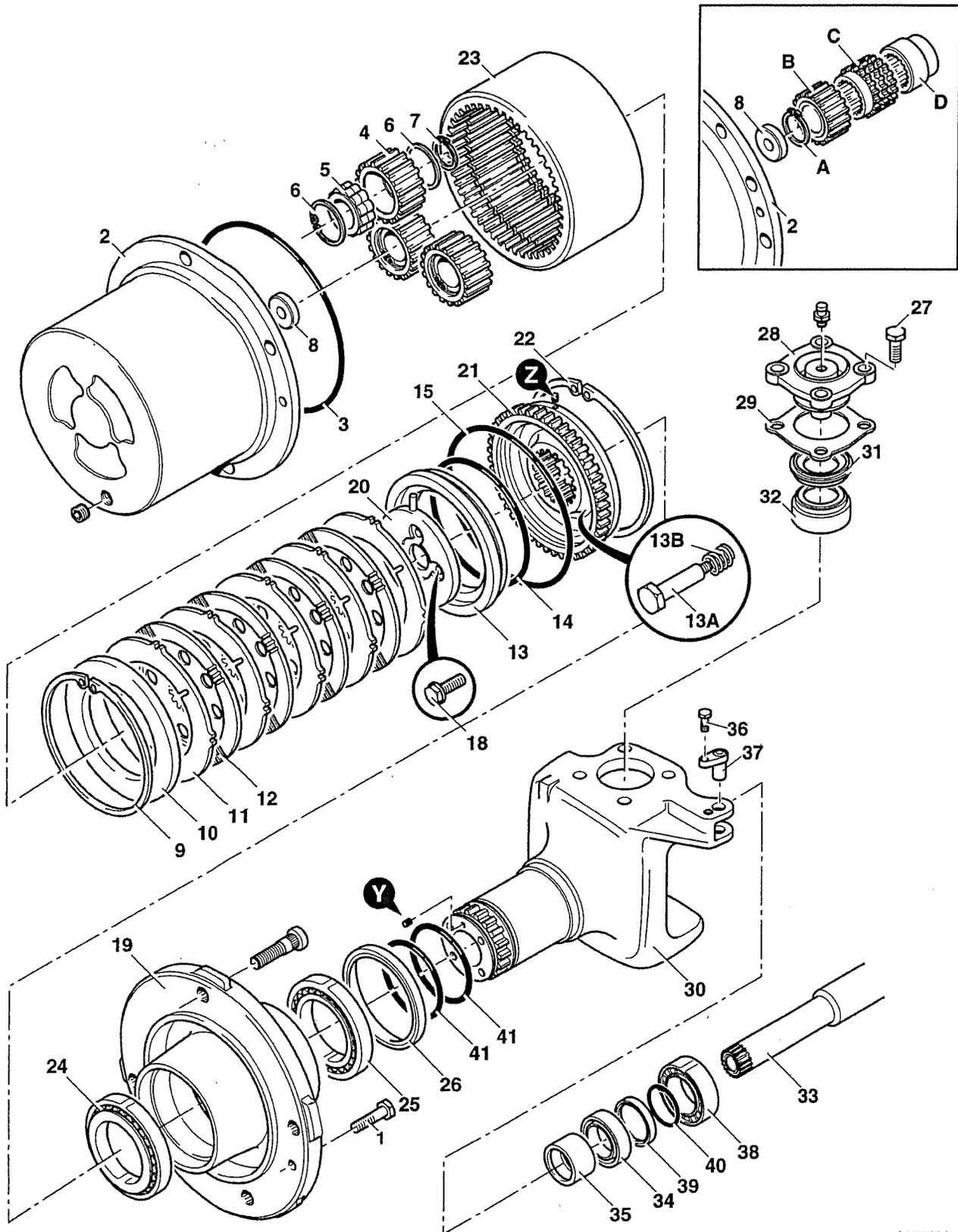


- 13 Apply Loctite 275 to the mating face of the drive head. Locate the axle arm onto the drive head, with the embossed word 'TOP' on the axle arm uppermost. Fit bolts **A** and torque tighten to 400 Nm (295 lbf. ft; 41 kgf m).



Axle Hub and Driveshaft - 4 Plate, Positive Retraction Brakes

Dismantling

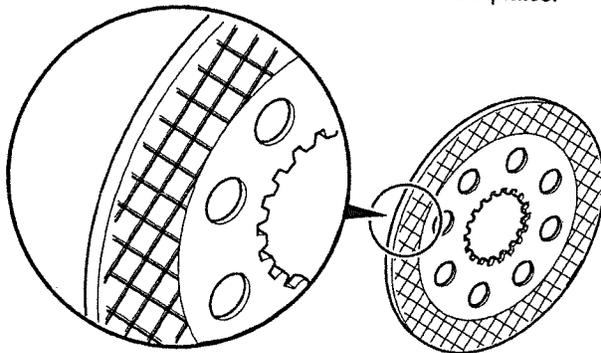


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Axle Hub and Driveshaft - 4 Plate, Positive Retraction Brakes (cont'd)

Dismantling (cont'd)

- 1 Drain oil from the axle hub, remove screws 1.
- 2 Using a soft-faced mallet, tap the planet gear carrier 2 to 'crack' the joint between the carrier and bearing carrier 19, then lever the planet gear carrier off the bearing carrier. Discard 'O' ring 3.
- 3 Remove a planet gear 4 only if it is defective. Note that a planet gear can only be renewed as an assembly, which comprises the pinion, the bearing 5 and two 'L' shaped circlips 6. To remove a planet gear, first remove external circlip 7, then pull off the planet gear.
Remove circlip A, sun gear B.
- 4 The driveshaft thrust pad 8 is drilled and tapped M6 for removal purposes.
- 5 Remove circlip 9 and brake pressure plate 10.
- 6 There are five counterplates 11 and four friction plates 12. If the brake pack is to be re-used, note the positions of the plates before removing them.
- 7 Wear limit of friction plates 12 is to the depth of the cross-hatching. Check all plates for flatness and damage. (Wear and polishing of the counterplates 11 is normal.) Renew the brake pack complete if excessively worn or damaged. Do not renew individual plates.

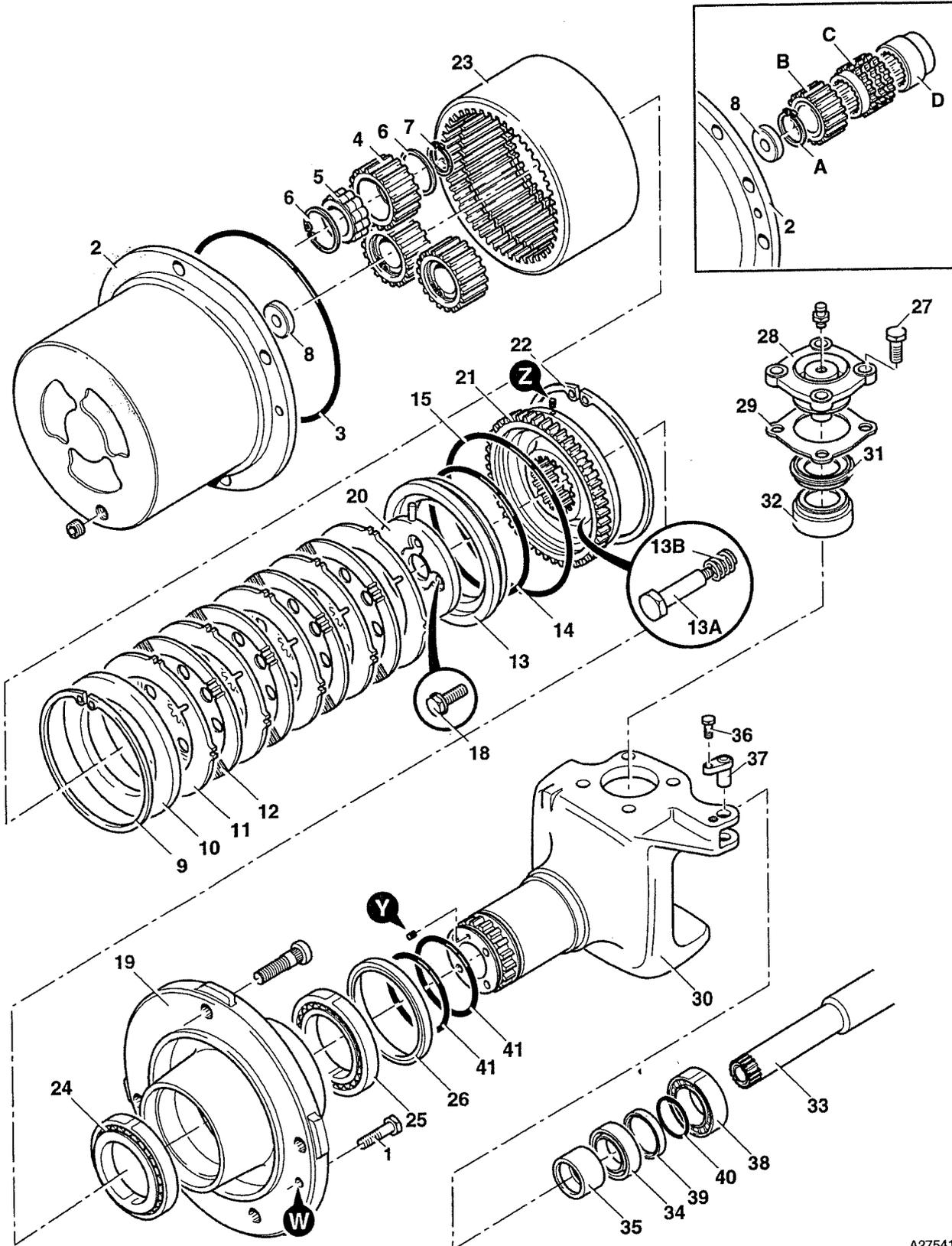


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* **Note:** Excessive wear of the brake and counter plates can indicate sticking brakes or possible residual pressure in the braking system. See **Residual Brake System Pressure**, Section 6.

- 8 Remove brake piston back-up bolt 13A and spring 13B (2 off each). Carefully withdraw brake piston 13 from its housing, if removal is necessary. A hydraulic hand pump can be used to force the piston out of the housing, or if the brakes system is still connected use the brake pedal. Remove and discard 'O' rings 14 and 15.
- 9 Remove brake plate carrier C and spacer D.
- 10 Remove Verbus Ripp bolts 18. These bolts are very tight and care must be taken not to distort the bolt heads. Use as short an extension bar as possible with a six sided socket. Discard the Verbus Ripp bolts after removal. Remove retaining plate 20.
- 11 Using special tool (part number 892/00833 (see **Service Tools**, Section 1)) as jacking screws, jack the annulus assembly 21, 22 and 23 off bearing carrier 19.
Note: Fretting between the hub swivel and annulus carrier mating faces might be evident; this condition is normal, do not attempt to repair. If the hub swivel and annulus carrier are to be re-used, the carrier must be assembled in the same angular position it was removed; match mark the hub swivel and carrier before removing the carrier.
- 12 Remove internal circlip 22 to separate annulus ring 23 from annulus carrier 21.
- 13 Pull off bearing carrier 19 together with outer wheel bearing cone and cup 24. Withdraw the inner bearing cup from the inboard side of the carrier.
- 14 Pull off inner wheel bearing 25.
- 15 Remove and discard combination seal 26 and 'O' rings 41.
- 16 Remove setscrew 36 and pivot pin 37 and disengage track rod end from the steering knuckle.
Note: The top and bottom trunnions are very similar (bottom trunnion not illustrated), the only difference being that shims (if required) 29 are fitted to the top trunnion only.
- 17 Mark position of top and bottom trunnions 28, remove bolts 27 and remove trunnions. Retain shims 29 (if fitted) with top trunnion. Withdraw the hub carrier 30.
Note: Trunnions may be removed easily and without damage to the shims by pumping grease through the grease nipple.
- 18 Remove the top and bottom trunnion seals 31 and bearings 32.
- 19 Withdraw drive shaft 33 from the axle casing. Prise out drive shaft outer oil seal 34. Remove bearing 35 using tool 892/00225 (see **Service Tools**, Section 1).
- 20 Prise out drive shaft inner oil seal 39.
- 21 Remove circlip 40.
- 22 Remove inner bearing 38 using tool 892/00225 (see **Service Tools**, Section 1).
- 23 If there has been a component failure, remove all traces of debris and clean the magnetic drain plug.

**Axle Hub and Driveshaft - 4 Plate, Positive Retraction Brakes
Assembly**



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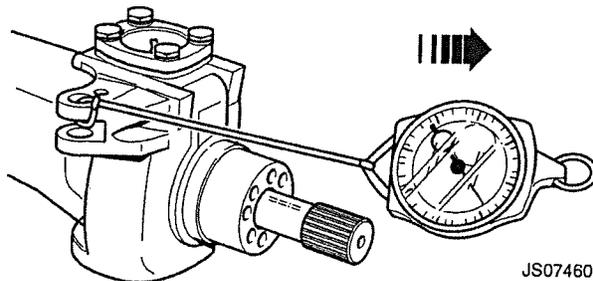
Axle Hub and Driveshaft - 4 Plate, Positive Retraction Brakes (cont'd)

Assembly(cont'd)

Note: The top and bottom trunnions are very similar (bottom trunnion not illustrated), the only difference being that shims 29 (if required) are fitted to the top trunnion only.

- 1 Tap the drive shaft inner bearing 38 into position in the axle casing.
- 2 Fit circlip 40.
- 3 Fit new oil seal 39. Pack grease between lips of seal.
- 4 Tap the drive shaft outer bearing 35 into position in the hub swivel driveshaft bore.
- 5 Fit new oil seal 34. Pack grease between lips of seal.
- 6 Fit driveshaft 33, taking care to locate inner end into splines of differential gears.
- 7 Press new top and bottom trunnion oil seals 31 into position followed by bearings 32. Grease bearing and oil seal before fitting axle.
- * 8 Locate hub swivel 30 and fit bottom trunnion 28. Apply Loctite 242 to threads of bottom trunnion bolts 27 and then torque tighten bolts to 98 Nm (72 lbf ft; 10 kgf m).

Fit top trunnion and leave top trunnion bolts finger tight.
- 9 Attach a spring balance to track rod swivel as shown and note the reading. Tighten the top trunnion bolts 27 to eliminate end float but without bearing pre-load, i.e. no increase in spring balance reading.
- 10 Measure gap at top trunnion and subtract 1 mm (0.040



in) to give shim thickness (bearing pre-load). For example:

Gap	=	1.55 mm (0.061 in)
less	=	1.00 mm (0.040 in)
Shim	=	0.55 mm (0.021 in)

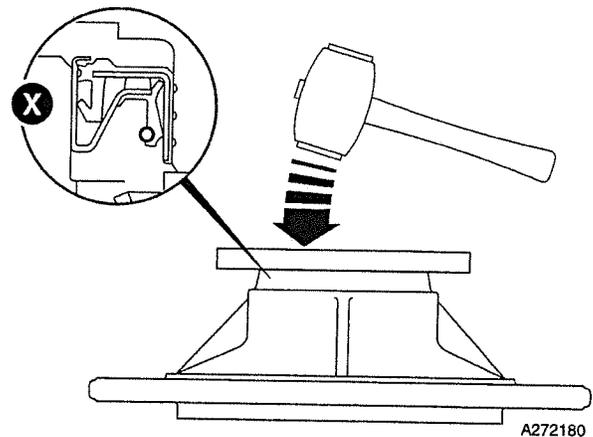
Note 1: If the gap measures 1 mm, then no shim is required.

Note 2: If, after fitting shims, the bearing pre-load is unattainable, fit new bearings.

- * 11 Refit top trunnion. Apply Loctite 242 to the top trunnion bolt threads, fit and tighten to 98 Nm (72 lbf ft; 10 kgf m).

Check spring balance reading which should be 4.5 kgf (10 lbf) more than the reading recorded at Step 9.

- * 12 Connect the track rod to the axle steer knuckle. Insert pivot pin 37 and apply Loctite 242 to the threads on setscrew 36 and tighten to a torque of 56 Nm (41 lbf ft; 5.7 kgf m).
- 13 Lightly oil inner wheel bearing 25 and its cup, then fit them into bearing carrier 19.
- 14 Fit a combination seal 26 into the bearing carrier.



Do not lubricate before fitting. Using service tool and spacer drive the seal squarely into carrier 19 until flush, as shown at X.

Note: After assembling the bearing carrier to the swivel hub, make sure that there is sufficient clearance between the hub and seal.

- 15 Install the cup of outer wheel bearing 24 into the bearing carrier 19. Grease the bore of the seal and the surface of the stub.
- 16 Fit new 'O' rings 41.
- 17 Fit bearing carrier 19 onto hub swivel 30.

* **Note:** The bearing carrier must be fully supported during the fitting operation; do not allow any weight to rest on the bearings otherwise the inner bearing will be displaced and damage the seal.

- 18 Lightly oil the bearing race of outer wheel bearing 24. Fit the bearing onto the axle arm. Rotate carrier 19 (and therefore the bearings) during fitting.

Axle Hub and Driveshaft - 4 Plate, Positive Retraction Brakes (cont'd)

Assembly(cont'd)

* 19 Assemble the annulus ring 23 to annulus carrier 21. Secure with circlip 22. Make sure the two blanking plugs Z are fitted to the annulus carrier. Apply Loctite 242 to threads.

* **Note:** Inspect the inside of the annulus carrier and piston for marks. Any signs of scoring on a seal contact surface can cause leaks.

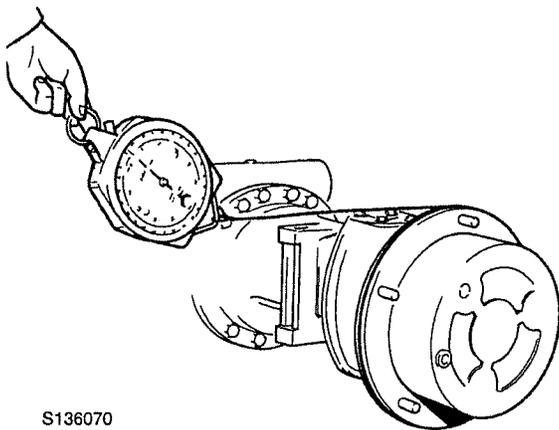
* **Note:** Make sure blanking screws Y are fitted. Apply Loctite 242 to threads.

20 Fit the annulus assembly and the retaining plate 20 in the same angular position as removal (see **Note in Dismantling**) using new Verbus Ripp bolts 18. Do not fully tighten bolts but allow the bearing carrier to rock slightly.

21 Temporarily refit the planet gear carrier 2, DO NOT fit the sun gear.

Check the seal drag rolling force:

i Use a spring balance and cord wrapped around the planet carrier flange as shown. Pull the spring balance so that the hub rotates, do several times to let the seal bed in and record the reading.



S136070

ii Remove the planet gear carrier and tighten new Verbus Ripp bolts 18 to 166 Nm (122 lbf ft, 17 kgf m).

iii Repeat steps 21, 21i and record the reading.

iv To get the rolling force, subtract seal drag rolling force (see step 21i) from reading obtained at this step, the result should be 14 to 152 N (3 to 34 lbf, 1.4 to 15.3 kgf).

If the resulting figure is outside these limits check; the seal 26 is fitted correctly; and/or renew bearings 24 and 25.

Note: A high rolling force reading may indicate that the oil seal was damaged during fitting.

22 Fit spacer D and brake plate carrier C.

Lubricate new seals 14 and 15 with hydraulic oil and fit them into their grooves in the brake piston 13 and annulus carrier 21. Make sure they seat squarely in their grooves.

* 23 Carefully press the piston 13 all the way into its housing. Fit brake piston back-off springs 13B and bolts 13A (2 off each). Torque tighten to 5 Nm (0.5 kgf m, 3.5 lbf ft).

24 Assemble the friction plates 12 and counterplates 11 onto the driveshaft and annulus ring 23. If the original brake pack is being re-used, return the plates to their original positions (see **Dismantling**, Step 6). Soak new friction plates in gear oil before assembly.

25 Assemble the brake pressure plate 10 with its chamfer towards the brake pack. Fit circlip 9.

* **Note 4:** Where axles are fitted to machines utilising the main hydraulic circuit to operate the brakes:

i Bleed the brake system. Gently apply the brakes and release the pressure with the engine running. Check the piston activates and retracts correctly and does not stick in the applied position before fitting the hub carrier.

ii If the brake piston has not yet retracted, the brake seal or piston assembly may have been assembled incorrectly. Alternatively, there may be residual hydraulic brake pressure holding the piston - Release the brake bleed nipple with the engine running and check if the piston retracts when the pressure is released. Investigate the cause if the piston remains in the applied position (see **Residual Brake System Pressure**, Section 6).

26 Fit sun gear B and circlip A.

27 Press the driveshaft thrust pad 8 (chamfered side lowermost) into the recess in the planet gear carrier 2.

28 Fit new planet gears 4 in place of any that were removed (see Step, 3 in **Dismantling**). Secure with circlip 7.

Note: Large radius at end of bearing bore fits onto pin first.

29 Fit new 'O' ring 3.

Fit the planet gear carrier 2 onto the bearing carrier 19, turning it slightly to engage the gear teeth and aligning the two tapped holes W in the planet gear carrier with their mating holes in the bearing carrier. (The tapped holes are diametrically opposite one another.) Ensure the planet gear carrier butts fully against the bearing carrier.

Note: Do not strike the centre of the planet gear carrier 2 when fitting, as this may dislodge the driveshaft thrust pad 8.

Axle Hub and Driveshaft - 4 Plate, Positive Retraction Brakes (cont'd)**Assembly(cont'd)**

- 30 Fit screws 1 and torque tighten to 56 Nm (41.3 lbf ft, 5.71 kgf m).
- 31 Fill the axle hub with oil (see **Lubricants and Capacities**, Section 3).

Axle Breather

Later axles, having inboard brakes, are fitted with extended breathers **A** as shown in the illustration. Original breathers fitted to earlier units should be replaced using the following procedure:

The extended breather **A** is now available in either metal or plastic construction and is now fitted as standard to all inboard braked axles. Both metal and plastic breathers are fully interchangeable provided the correct fitting procedure is followed.

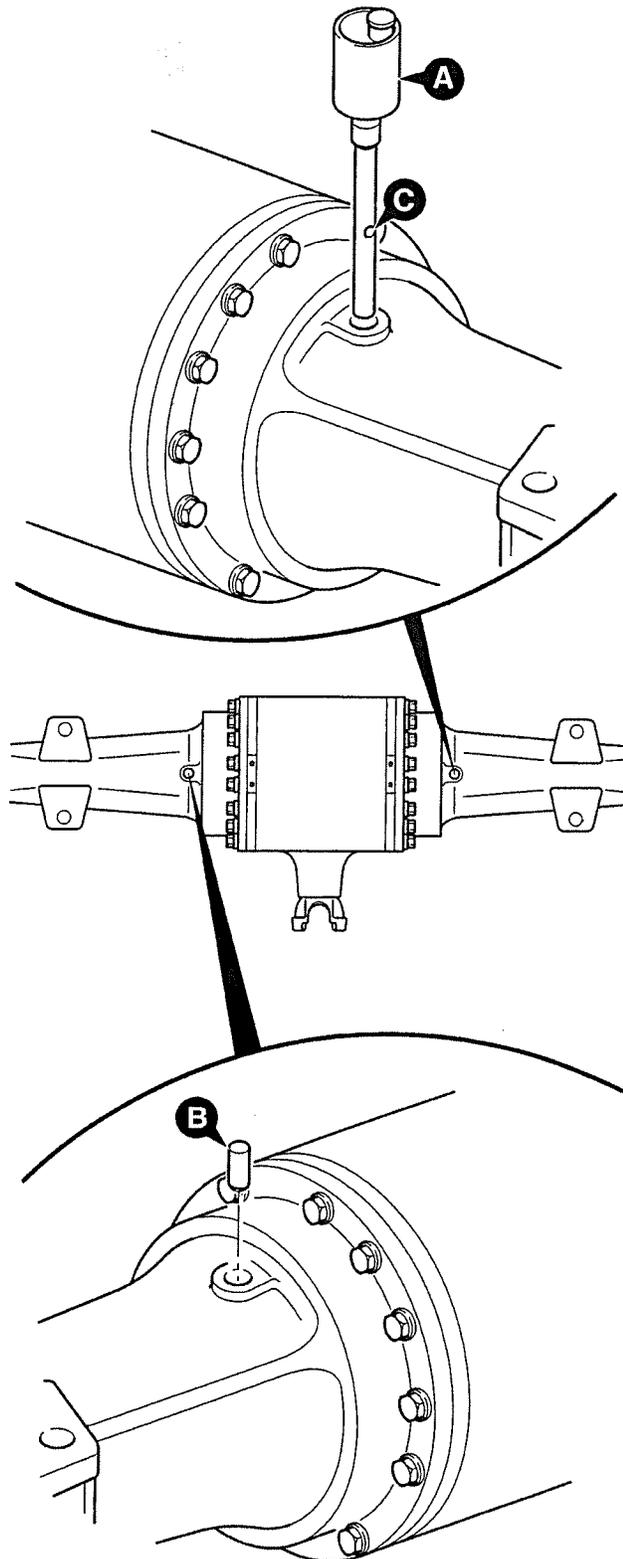
SERVICE PROCEDURE

- 1 Park the machine on firm level ground, engage the parking brake and set the transmission to neutral. Lower all hydraulically operated fittings to the ground.
- 2 Remove debris and loose material from the top of the axle.
- 3 Remove existing breathers or degrease breather hole as applicable.
- 4 Refer to illustration and fit plug **B** (if not already fitted) and the extended breather after ensuring hole **C** in the breather is pointing towards the road wheel.

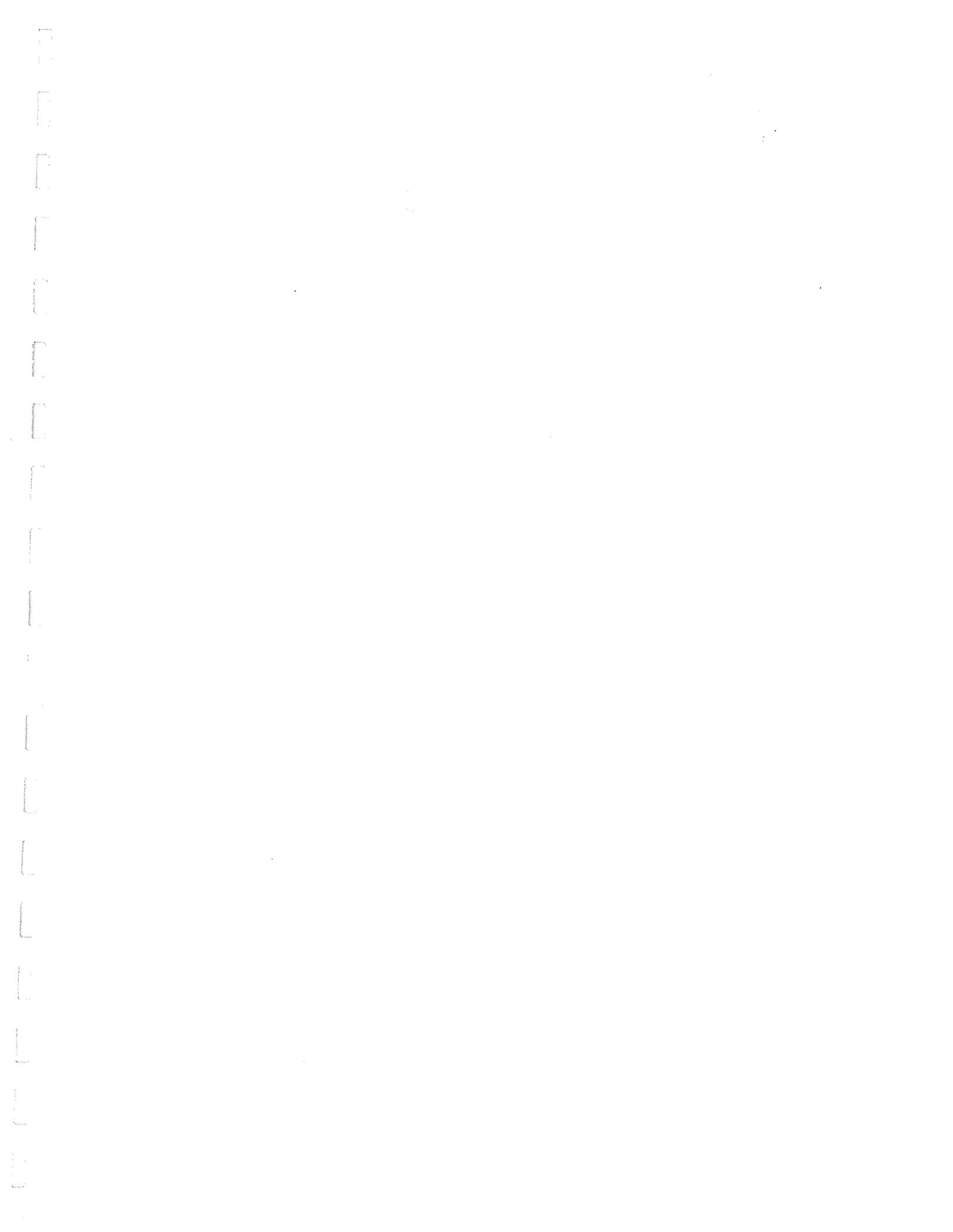
For plastic breathers either a suitable plastic to metal bonding sealant or bonding, part No. 4103/0955 is required, with sufficient preparation and cure time as specified in the manufacturer's instructions.

For the axle location of the plug **B** and breather **A** refer to the Machine Operator Handbook.

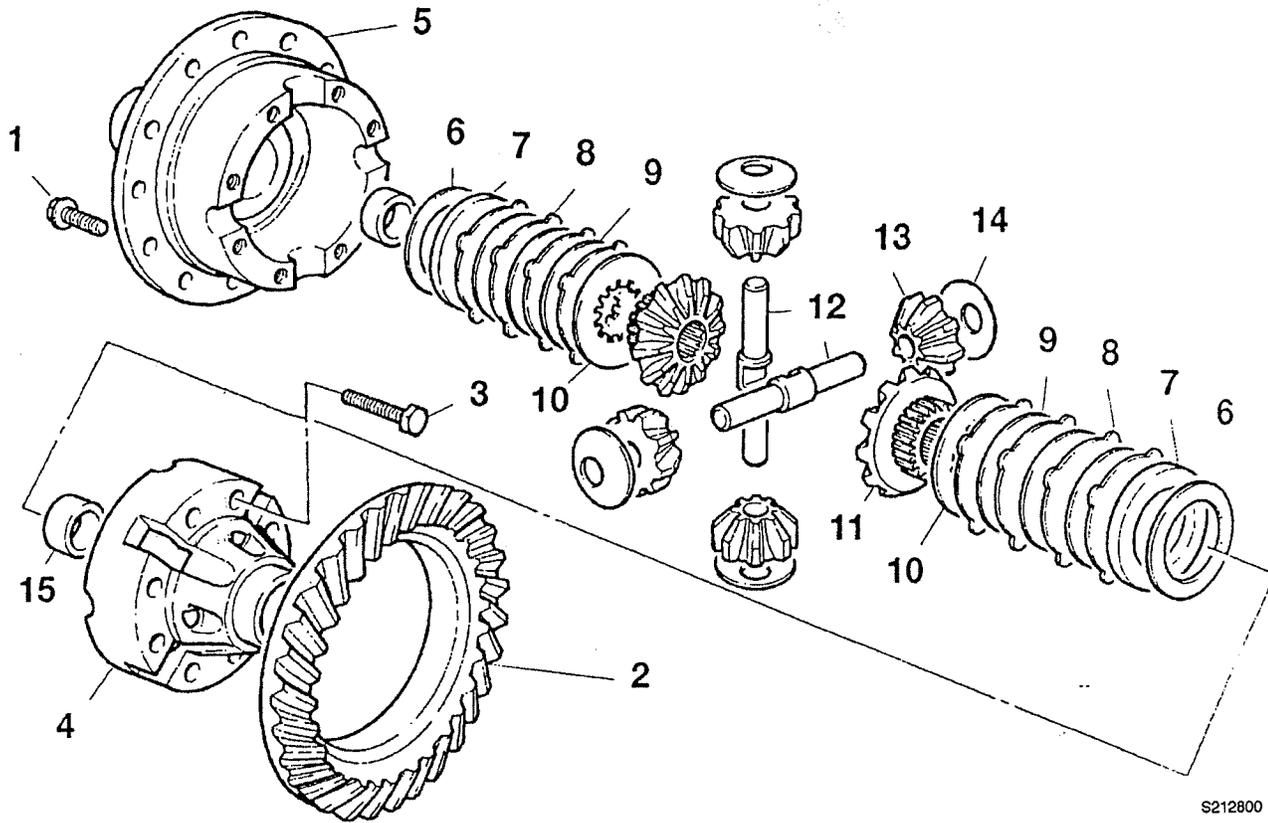
Note: Under no circumstances should an axle fitted with oil immersed brakes be operated without an approved breather.



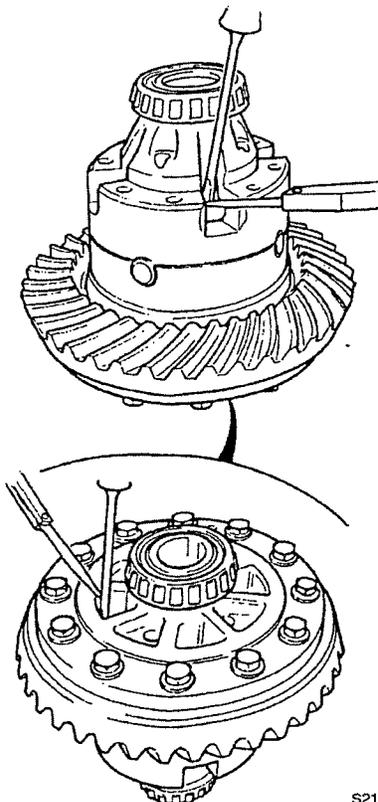
ITL01570



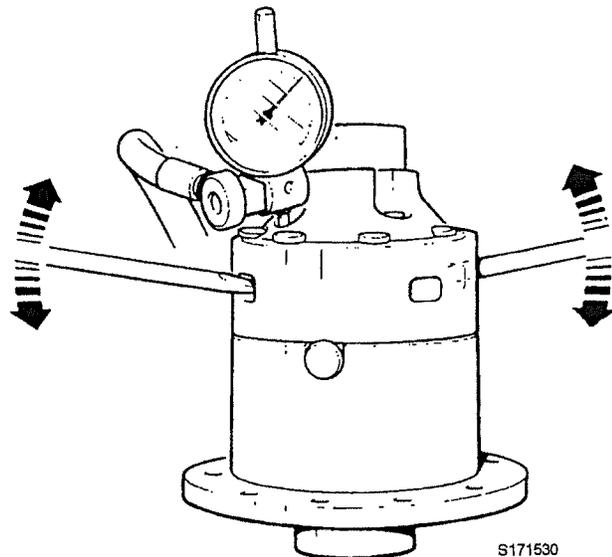
Limited Slip Differential (Optional)



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S171530

Limited Slip Differential (Optional) (cont'd)

Dismantling and Assembly

The number of friction and counter plates shown in the illustration is typical only. The actual number of plates is specified by the manufacturer and **must not** be altered without approval.

The numerical sequence shown on the illustration is intended as a guide to dismantling.

Dismantling

Mark the two differential halves before dismantling, for subsequent assembly.

Note the relative positions of the friction and counter plates before dismantling, they must be fitted in the same positions.

If worn, the friction and counter plates must be renewed as a complete set.

Assembly

- 1 Assemble trunnion pins 12, side gears 11 with pressure plates 10, counter plates 8, friction plates 9, planet gears 13 and thrust washers 14 into the crownwheel half of the differential assembly 5.

Note: Do not fit shims 6 at this point.

- 2 Align the two halves of the differential assembly with the marks made during dismantling. Assemble using bolts 3.
- 3 Using a dial test indicator (or feeler gauges), with two screwdrivers or suitable levers, gently apply pressure to side gear 11 away from the trunnion pins 12 as shown. Measure and note the end-float of the side gear.
- 4 Turn the differential assembly over and repeat step 3 for the second side gear.
- 5 Dismantle the differential assembly. Add shims 6 to give end-float between 0.1 and 0.2 mm (0.004 and 0.008 in.).

Note: Shimming must be carried out whenever the differential is dismantled, however the end float 0.1 and 0.2 mm (0.004 and 0.008 in.) can be exceeded on previously assembled differential as this is only an initial setting figure which allows for bedding in.

- 6 Repeat steps 2, 3 and 4. If the end float is correct, tighten bolts 3 to 56 Nm (41 lbf ft).
- 7 Fit crownwheel 2 using new Verbus Ripp bolts 1, torque tighten to 166 Nm (122 lbf ft; 16.9 kgf m).

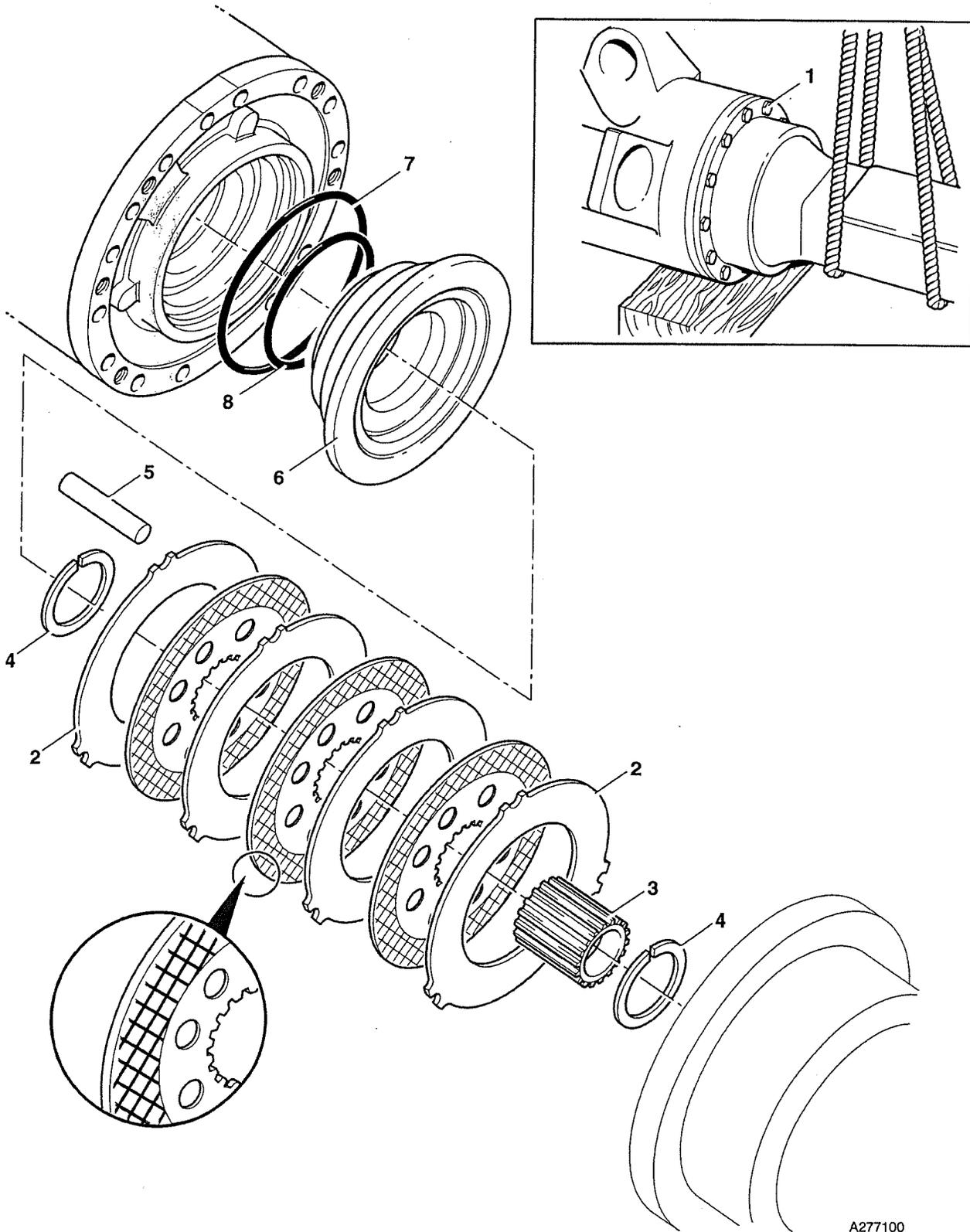
Friction Plate Wear Limits

Measure and note the thickness of the friction plate, the result must not be less than 1.25 mm (0.049 in).

Check the condition of the friction material, which should be even over both surfaces.

If in doubt, discard the set (friction and counter plates).

Dismantling



A277100

* Dismantling (cont'd)

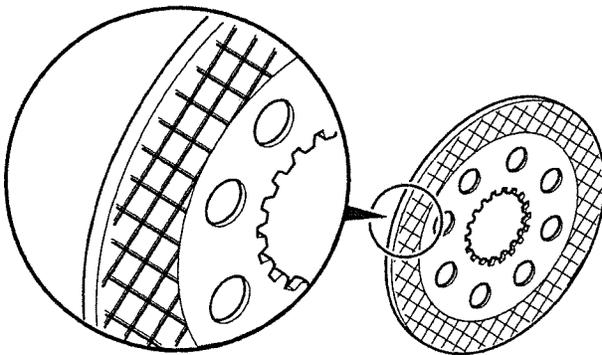
⚠ WARNING

A raised and a badly supported machine can fall on you. Position the machine on a firm, level surface before raising one end. Ensure the other end is securely chocked. Do not rely solely on the machine hydraulics or jacks to support the machine when working under it.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN-1-1

- 1 It is recommended that the axle be removed from the machine when dismantling the axle brakes.
 - 2 Remove bolts 1. Use a heavy duty socket to unscrew them.
 - 3 Separate the axle arm from the drive head by tapping the flange with a soft faced hammer. Remove all traces of gasketing from the mating faces.
 - 4 There are two counterplates 2, one at each end of the brake pack, which are not secured to the plate carrier 3. If the plates are to be re-used, note their positions and which way round they are then withdraw the brake pack.
 - 5 Remove the circlip 4. If the brake pack is to be re-used, note the positions of the plates before removing them.
- Note:** The plate carrier 3 has an internal chamfer at the end which faces away from the drive head.
- 6 Wear limit of friction plates is to the depth of the crosshatching. Check all plates for flatness and damage. (Wear and polishing of the counterplates is normal.) Renew the brake pack complete if excessively worn or damaged. Do not renew individual plates.
 - 7 Remove the three reaction pins 5. Inspect for damage.



A276990

- 8 Carefully withdraw the brake piston 6 from its housing, if removal is necessary. A hydraulic hand pump can be used to force the piston out of the housing.

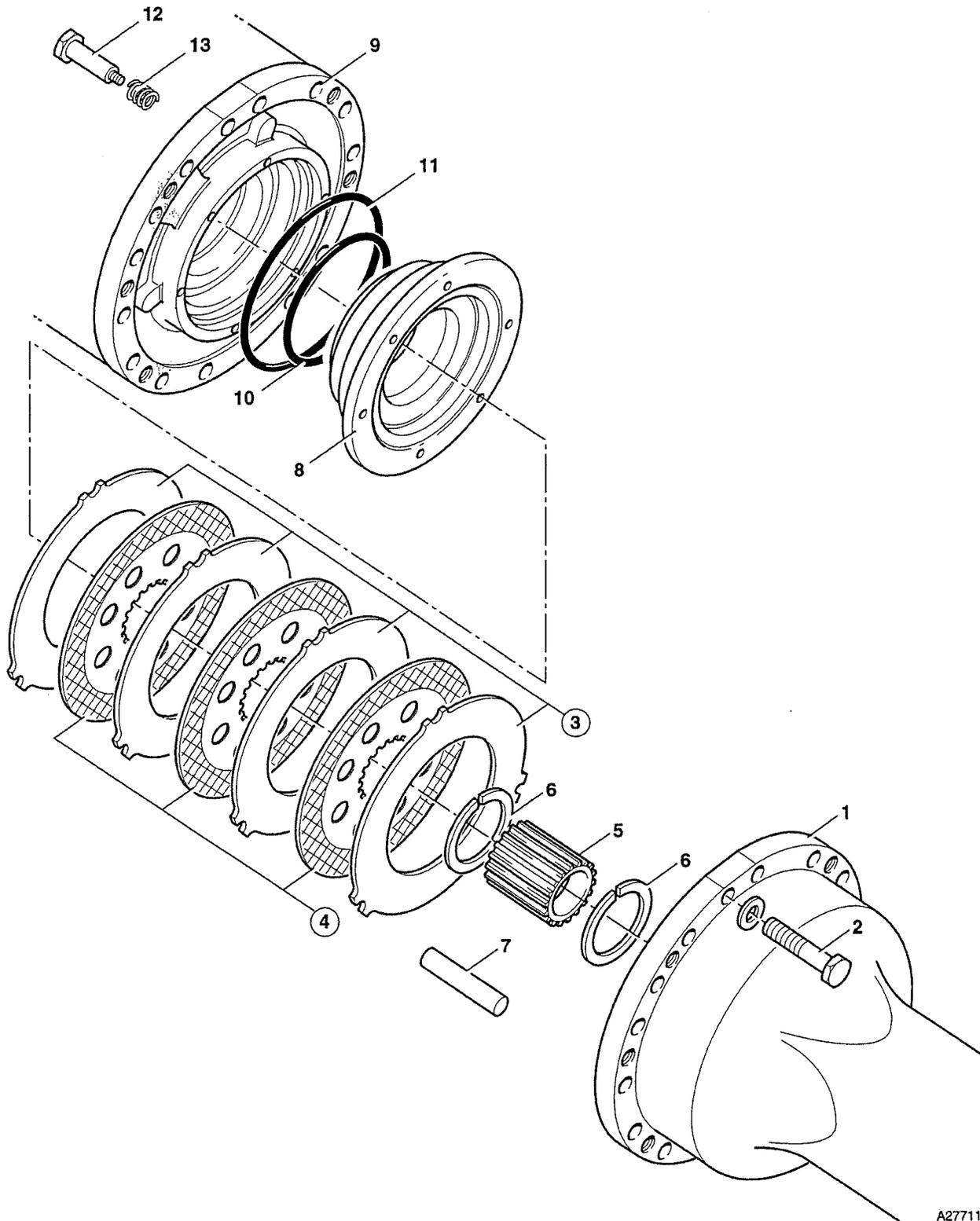
- 9 Remove and discard seals 7 and 8. Inspect the housing bore for damage and scoring. Nicks or cuts in the seals may be responsible for loss of brake fluid.

* Assembly

- 1 Fit new seals 7 and 8. Make sure they seat squarely in their grooves.
- 2 Carefully press the piston 6 all the way into its housing.
- 3 Assemble the friction plates and counterplates 2 onto the carrier 3. If the original brake pack is being re-used, return the plates to their original positions (see **Dismantling**, Step 4). Soak new friction plates in gear oil before assembly. Fit circlip 4.
- 4 Locate the three reaction pins 5 into their grooves, securing them with grease. Push the pins fully into their location holes in the housing.
- 5 Install one counterplate 2 into the housing, then the brake pack, then the other counterplate. Ensure that the chamfered end of the brake carrier 3 faces away from the drive head. Return re-used counterplates to their original positions. Push the brake pack fully home.
- 6 Apply Loctite 275 to the mating face of the drive head, and Loctite 242 to the threads of bolts 1. Locate the axle arm onto the drive head, with the embossed word 'TOP' on the axle arm uppermost.
- 7 Fit bolts 1 and torque tighten.

Note: Check the grade of bolts fitted. Grade 8.8 should be tightened to 244 Nm (178 lbf ft, 24.9 kgf m), grade 12.9 should be tightened to 400 Nm (295 lbf ft, 40.8 kgf m).

Assembly



A277110

Assembly (cont'd)

- 1 Fit new seals **10** and **11**. Make sure they seat squarely in their grooves.
- 2 Carefully press the piston **8** all the way into its housing **9**.
- 3 Place the housing and piston on a firm flat surface, piston downwards. Install springs **13** and threaded pins **12**.
- 4 Fit the piston housing to the drive head (see **Drive Head - Assembly**, Section 5).
- 5 Assemble the friction plates **4** and counterplates **3** onto carrier **5**. If the original brake pack is being re-used, return the plates to their original position (see **Dismantling**, Step 4). Soak new plates in gear oil before assembly. Fit circlip **6**.
- 6 Locate the three reaction pins **7** into their grooves, securing them with grease. Push the pins fully into their location holes in the housing.
- 7 Install one counterplate **3** into the axle arm housing, followed by the brake pack, then the other counterplate **3**. Ensure that the chamfered end of brake carrier **5** faces away from the drive head. Return re-used counterplates to their original position. Push the brake pack fully home.
- 8 Apply Loctite 275 to the mating face of the drive head, and Loctite 242 to the threads of bolts **2**. Locate axle arm **1** onto the drive head, with the word 'TOP' on the axle uppermost.
- 9 Fit bolts **2** and torque tighten to:

Pin mounted axle	400 Nm (41 kgf m, 295 lbf ft)
Pad mounted axle	244 Nm (25 kgf m, 180 lbf ft)
- 10 Refill the differential with the correct grade of oil (see **Lubricants and Capacities**, Section 3).

Axle Breather

Later axles, having inboard brakes, are fitted with extended breathers **A** as shown in the illustration. Original breathers fitted to earlier units should be replaced using the following procedure:

The extended breather **A** is now available in either metal or plastic construction and is now fitted as standard to all inboard braked axles. Both metal and plastic breathers are fully interchangeable provided the correct fitting procedure is followed.

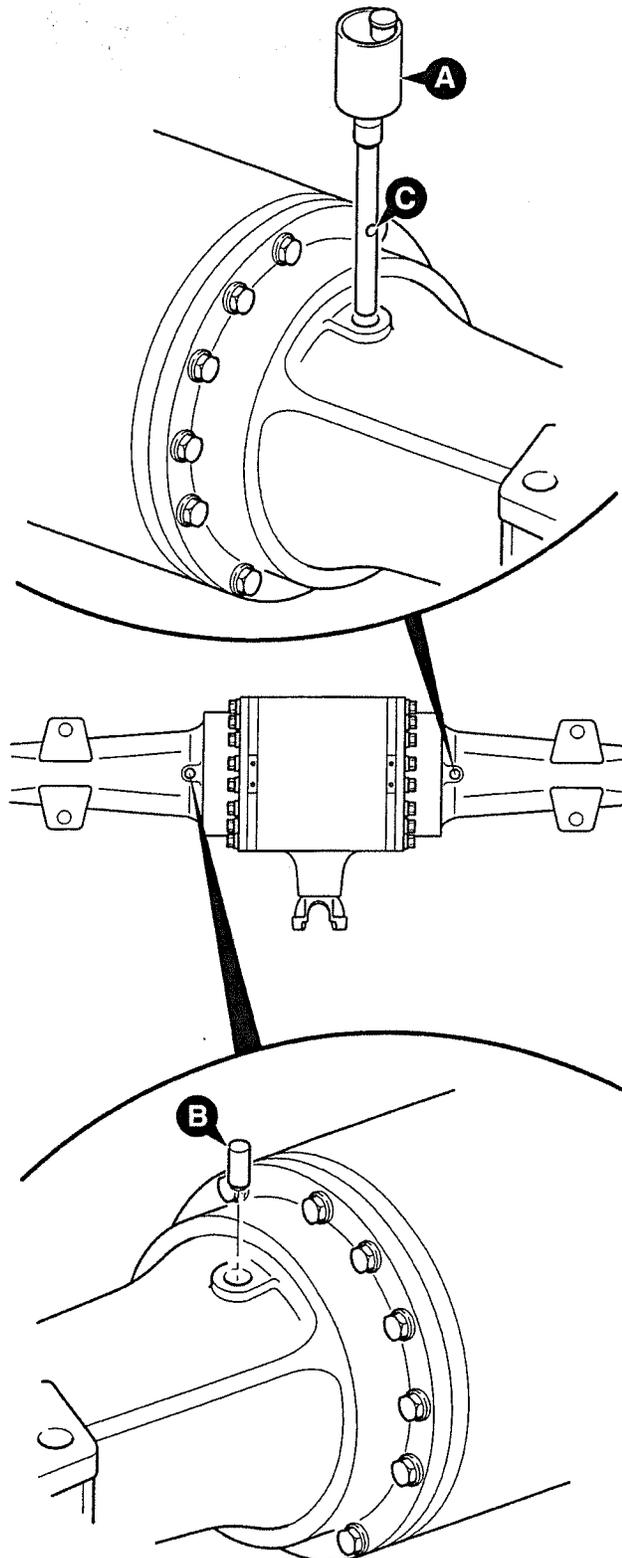
SERVICE PROCEDURE

- 1 Park the machine on firm level ground, engage the parking brake and set the transmission to neutral. Lower all hydraulically operated fittings to the ground.
- 2 Remove debris and loose material from the top of the axle.
- 3 Remove existing breathers or degrease breather hole as applicable.
- 4 Refer to illustration and fit plug **B** (if not already fitted) and the extended breather after ensuring hole **C** in the breather is pointing towards the road wheel.

For plastic breathers either a suitable plastic to metal bonding sealant or bonding, part No. 4103/0955 is required, with sufficient preparation and cure time as specified in the manufacturer's instructions.

For the axle location of the plug **B** and breather **A** refer to the Machine Operator Handbook.

Note: Under no circumstances should an axle fitted with oil immersed brakes be operated without an approved breather.



ITL01570

Brake Piston Seal Leakage Test

The following procedure explains how to check if a brake piston seal is severely damaged/perished or if the seal has a small cut or nick. The test must only be done when the axle is COLD.

⚠ WARNING

Before working on the brake system make sure the machine is on level ground and chock all four wheels.

BRAK 1-4

⚠ WARNING

Do not drive the machine with any part of its brake system disconnected. When the following test has been completed reconnect all brake pipes and bleed the brake system using the recommended procedure.

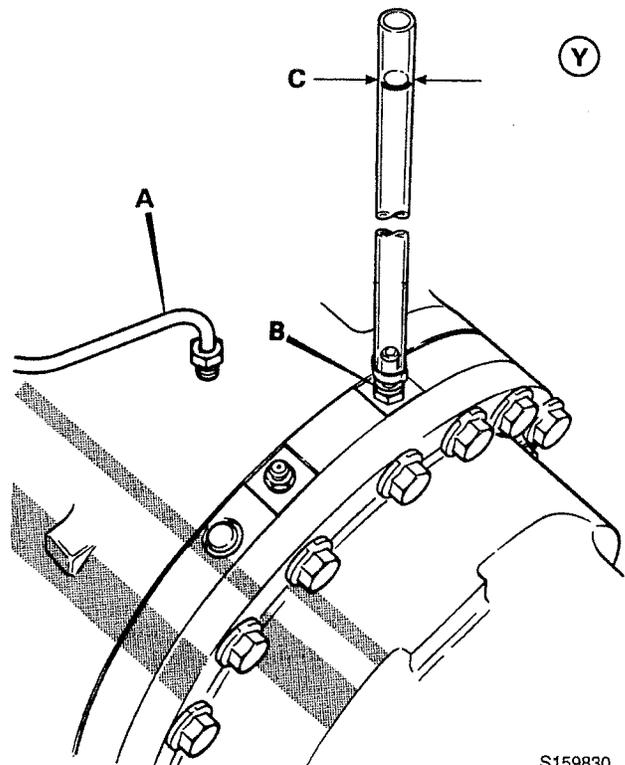
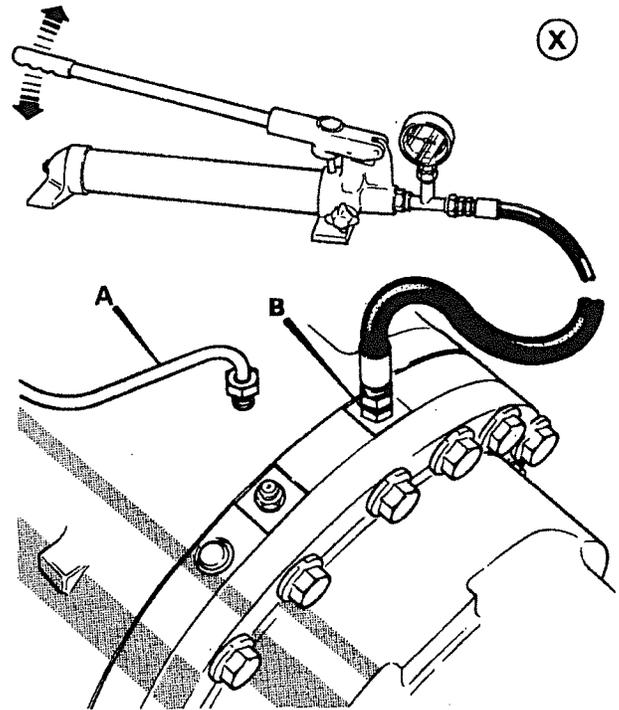
BRAK 2-1

- 1 Remove and cap brake piston feed pipe A.
- * 2 Fill the brake piston housing with Mobil DTE 11M Hydraulic Fluid.
- 3 Check for severe piston seal damage:
 - 3.1 Install a hand pump (see Note 1) fitted with a 0 - 40 bar (0 - 600 lbf/in²) pressure gauge to port B, as shown at X.
- * Note 1: The hand pump MUST be filled with Mobil DTE 11M Hydraulic Fluid. DO NOT exceed 69 bar (1000 lbf/in²).
- 3.2 Use the hand pump to generate a pressure in the brake piston housing.
- 3.3 If the pressure falls off rapidly, or if no pressure reading can be obtained, the seal is severely damaged and needs replacing with a new one.
- 4 Check for small cuts or nicks in the piston seal:
 - 4.1 Install an adapter fitted with a piece of clear tube (approximately 122 mm [4.8 in] long) to the brake piston port B, as shown at Y (see Note 2).

* Note 2: The tube must be kept vertical during the test, use tape to attach the tube to the side of the machine.

- 4.2 Fill the tube until approximately three quarters full with Mobil DTE 11M Hydraulic Fluid.
- 4.3 Using a suitable pen, mark the level line of the brake fluid on the tube, as shown at C.
- 4.4 After approximately 1/2 hour, check if the level has dropped below the original marked line, if it has then check the brake piston seal for slight nicks, cuts or generally for wear.

- 5 Repeat steps 1 to 4 for the opposite brake piston seal.
- * 6 Reconnect all brake pipes and bleed the brake system as recommended on page 6/6-1.



S159830

