PROFESSIONAL
PRODUCT SUPPORT

Service Manual

2CX Backhoe Loader

PUBLISHED BY THE
TECHNICAL PUBLICATIONS DEPARTMENT
OF JCB SERVICE; ©
ROCESTER,STAFFORDSHIRE, ST14 5LS,
ENGLAND
Tel. ROCESTER (0889) 590312
PRINTED IN ENGLAND

Publication No. 9803/7100

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All construction and agricultural equipment can be hazardous. When a JCB machine is correctly operated and properly maintained, it is a safe machine to work with. But when it is carelessly operated or poorly maintained it can become a danger to you (the operator) and others.

Do not work with the machine until you are sure that you can control it.

Do not start any job until you are sure that you and those around you will be safe.

If you are unsure of anything, about the machine or the job, ask someone who knows. Do not assume anything.

Remember

BE CAREFUL
BE ALERT
BE SAFE

GEN-1-6

General Safety

⚠ WARNING

Decals

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

INT-1-3-4

⚠ WARNING

Care and Alertness

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

INT-1-3-5

⚠ WARNING

Clothing

You can be injured if you do not wear the proper clothing. Loose clothing can get caught in the machinery. 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.

INT-1-3-6

⚠ 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

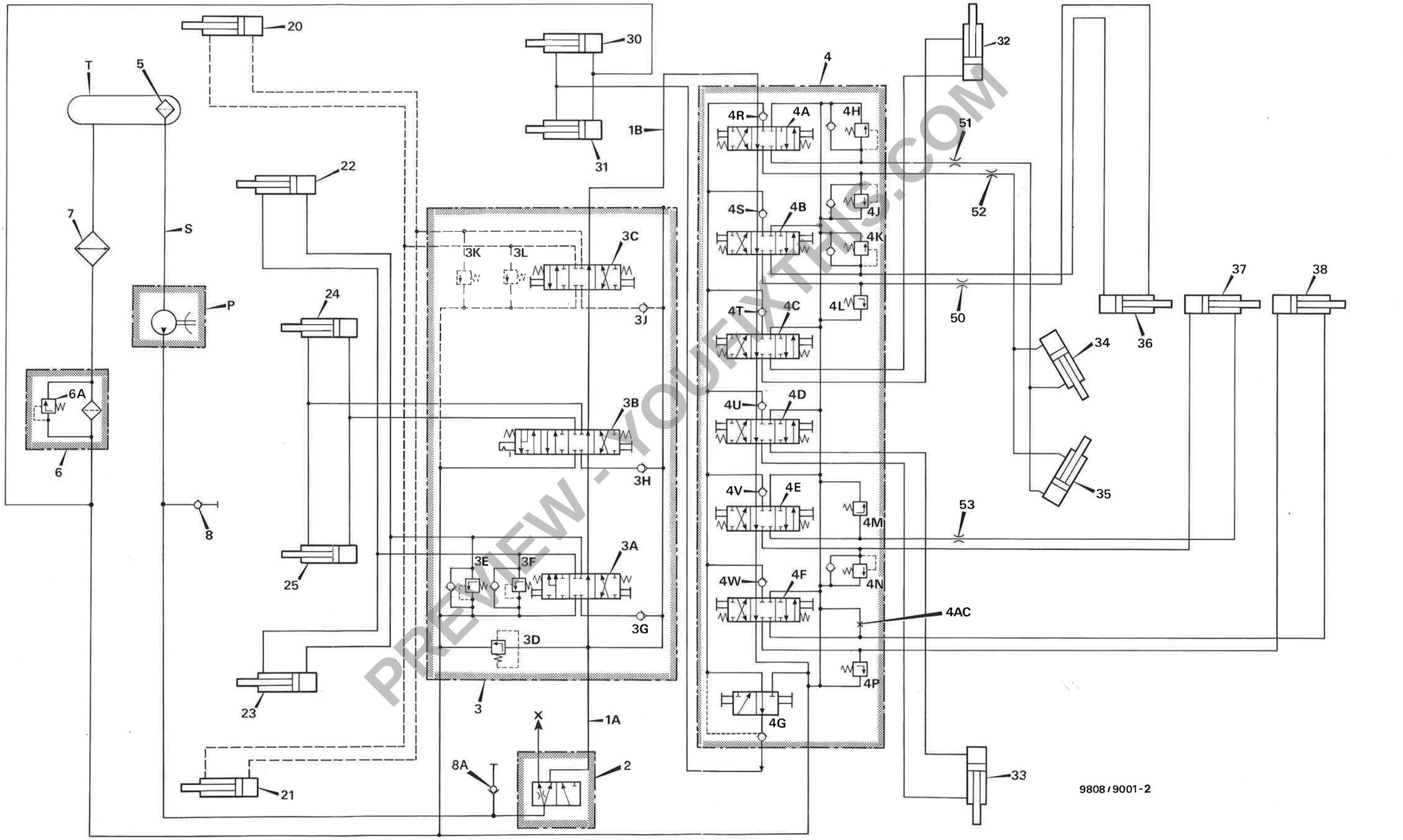
Raised Attachments

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

INT-1-3-8

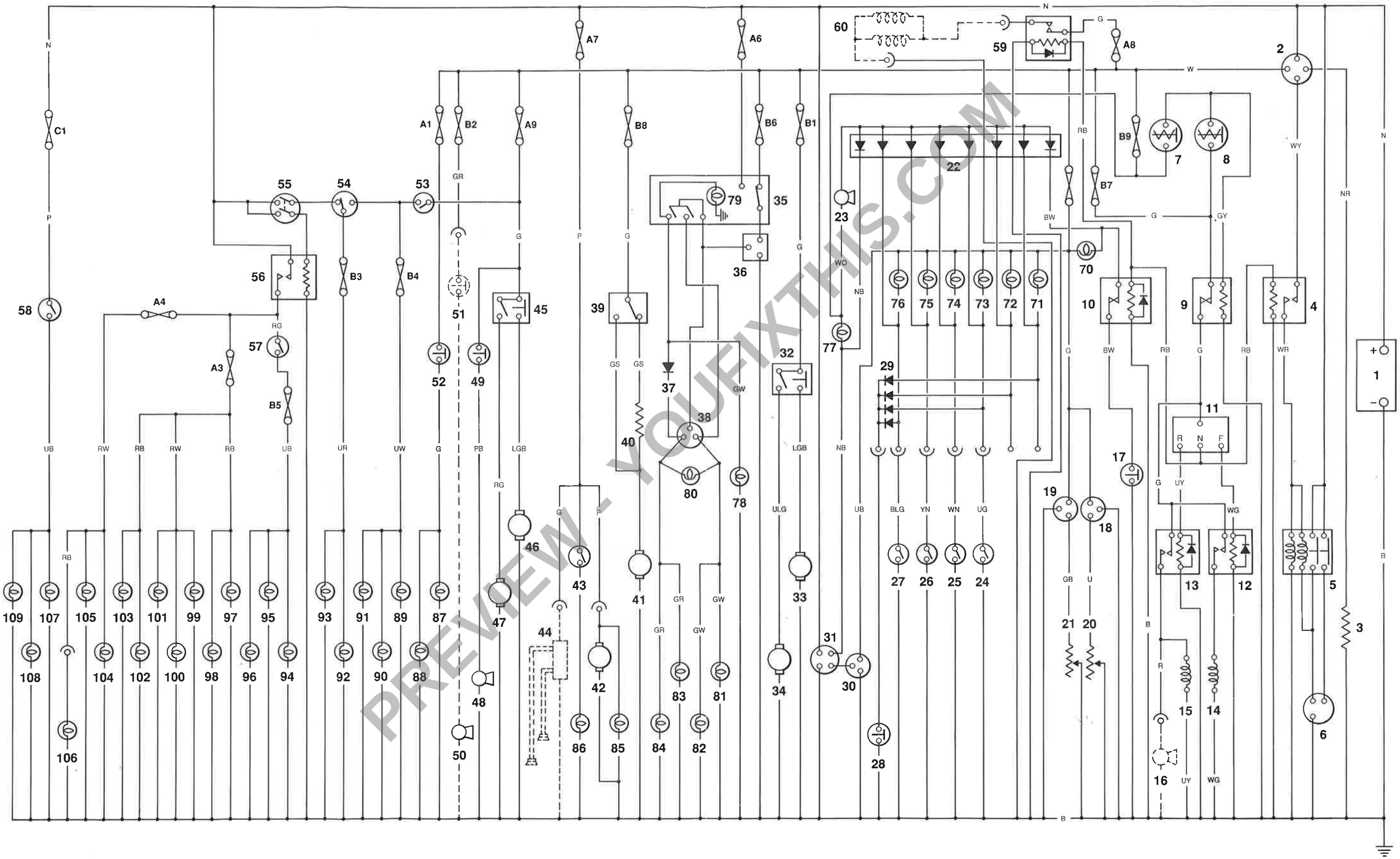
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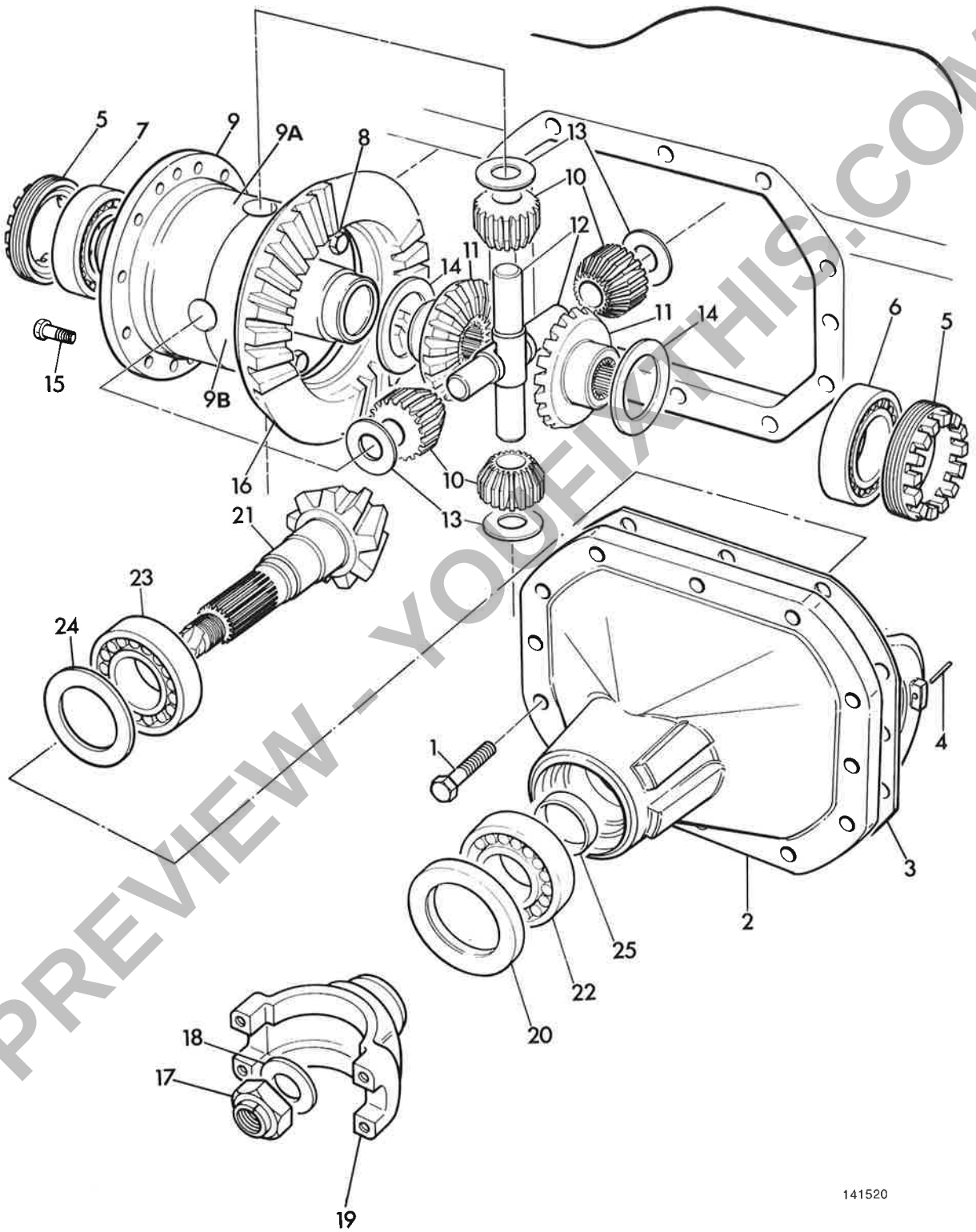
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Torque Settings

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

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

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Loader Arm Safety Strut

⚠ WARNING

Raised loader arms can drop suddenly and cause serious injury. Before working under raised loader arms, fit the loader arm safety strut.
2-1-1-6

Installing

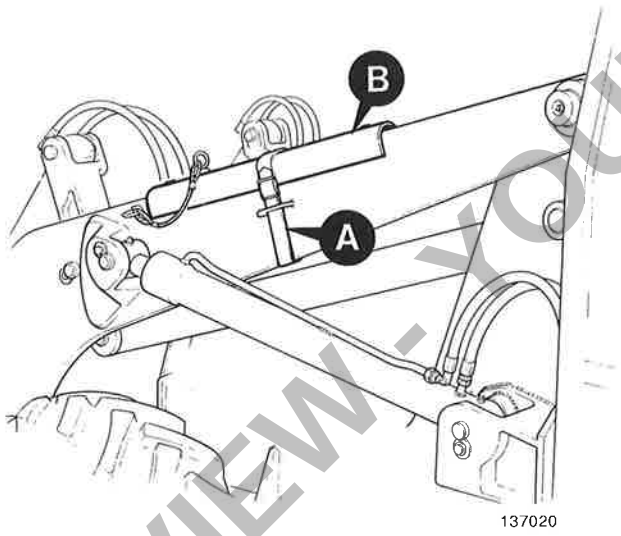
1 Empty the shovel and raise the loader arms fully.

2 Stop the engine and remove the starter key.

⚠ WARNING

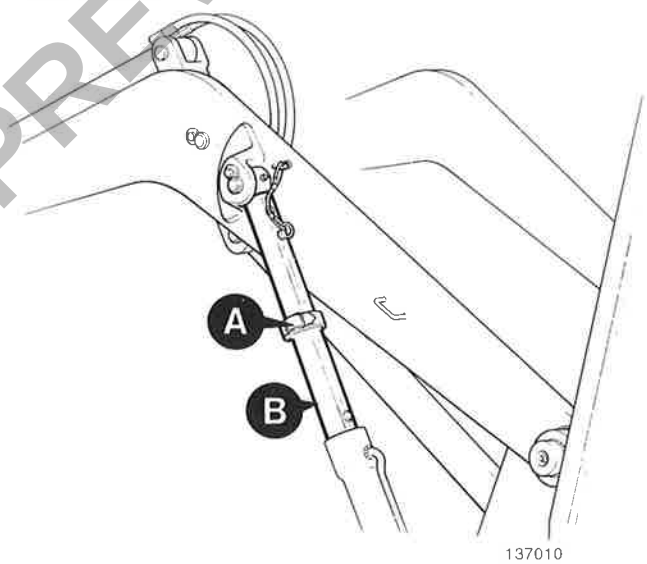
You could be killed or injured if the loader control is accidentally operated. Make sure no-one comes near the machine while you release the safety strut.
2-3-1-2

3 Undo strap **A** and remove strut **B**.



137020

4 Position strut **B** over the ram piston rod. Secure the strut with strap **A**.



137010

5 Lower the strut onto the ram.

To prevent any chance of the loader arms creeping down and trapping your fingers, the loader arms should be carefully lowered onto the safety strut.

Start the engine and slowly lower the loader arms onto the safety strut, stop the movement immediately the weight of the loader arms is supported by the safety strut.

Note: When lowering the loader, operate the control lever carefully. 'Feather' the lever to lower the loader very slowly.

Removing

1 Fully raise the loader arms to take the weight off the safety strut.

2 Stop the engine and remove the starter key.

⚠ WARNING

You could be killed or injured if the loader control is accidentally operated. Make sure no-one comes near the machine while you remove the safety strut.
2-3-1-3

3 Undo strap **A**. Remove the strut **B** from the ram piston rod.

4 Secure the strut to its stowage position on the loader arm with strap **A**.

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Syncro Shuttle - Fault Finding

Before carrying out the checks listed the machine should, if possible, be operated to determine the fault area(s), and bring the systems to their normal working temperatures. Ensure that the correct quantity and grade of oil is used and that there are no obvious leaks.

A If the transmission is noisy, start at check 1.

B If the transmission is overheating, start at check 4.

C If the transmission will not pull, start at check 12.

D If there is no drive in one or both directions, start at check 17.

E If the transmission is jumping out of gear, start at check 29.

F If the transmission is sticking in gear, start at check 39.

G If ratios are 'crash changing', start at check 41.

CHECK		ACTION
1	Is there noise when selecting direction?	YES: Check 3 NO: Check 2
* 2	Is there noise when running with direction selector in neutral and ratio selector in a gear?	YES: Check 9 NO: Check 19
3	Is there air in the hydraulic system?	YES: Continue running to expel air. NO: Check 4
4	Is the fluid level correct?	YES: Check 5 NO: Check level only when machine is cold and top-up as required.
5	Are the oil passages restricted?	YES: Clear the restriction. NO: Check 6
6	Is the suction strainer restricted?	YES: Remove and clean strainer. NO: Check 7
7	Is pump pressure as specified?	YES: Check 9 NO: Check clutch pressure maintenance valve is free to operate.
8	When flow testing pump, is output low?	YES: Renew pump. NO: Check converter sprag clutch for wear or slip.
9	Does the noise continue when direction selector is in forward or reverse?	YES: Check 10 NO: Check 11
10	Is transmission misaligned?	YES: Renew mountings and check position. NO: Check 'converter out' pressure and flow.
11	Are the pump bushes worn?	YES: Renew NO: Check converter for wear or cooler for restriction to flow.
12	Is the transmission not pulling in one direction only?	YES: Check 16 NO: Check 13
13	Is the transmission not pulling in both Forward and Reverse?	YES: Stall test machine, Check 14. NO: Check 16

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Technical Data

Type	Perkins D3.152 naturally aspirated
Number of cylinders	3
Bore and Stroke	91.44 mm (3.60 in) x 127.0 mm (5.00 in)
Swept Volume	2500 cm^3 (152.7 in^3)
Compression Ratio	18.5:1
Compression Pressure	17-31 bar (250-450 lbf/in^2)
	[maximum variation between cylinders; 3.5 bar (50 lbf/in^2)]
Injection Sequence	1,2,3
Valve Clearance - Cold	0.30 mm (0.012 in)
Oil Pressure (Hot) at maximum speed	2.1-4.1 bar (30-60 lbf/in^2)

Fuel System

Injection Pump Type	C.A.V., D.P.A., mechanically governed
Injection Pump Setting Code	Perkins/ISO 36960TW/2/2470
Maximum Governed Speed	2250 rev/min
Maximum No-load Speed	2470 rev/min
Idling Speed	750 rev/min
Injection Timing Static	20° BTDC (equivalent to 0.192 in displacement)
	Engine Angle 27° (checked at TDC compression)
	Fuel Pump Angle 37°
Injectors - Working Pressure	170 atm
- Setting Pressure	185 atm

Cooling System

Coolant Pressure	0.48 bar (7 lbf/in^2)
Coolant Temperature (normal)	80-85 deg C
Temperature Warning Light operates at	98 deg C

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Service Schedules

EVERY 10 OPERATING HOURS OR DAILY
whichever occurs first

1 Machine generally
2 Engine air filter pre-cleaner - if fitted

Check (Engine Stopped)

3 Generally for damage
4 Engine coolant level and condition
5 Engine oil level and condition
6 Engine generally for leaks
7 Hydraulic fluid level
8 Hydraulic system for leaks
9 Syncro Shuttle oil level
10 Brake fluid level
11 Tyre pressures and condition
12 Tightness of wheel nuts
13 Parking brake lever operation
14 Windscreen washer level
15 Seat belt condition and security-*when fitted*

Check (Engine Running)

16 Instrument readings, warning lights and audible alarm
17 Operation of all electrical equipment
18 Footbrake operation
19 Steering operation
20 Alignment of road wheels
21 Operation of all hydraulic services
22 Optional Attachments (as needed)
23 Exhaust for excessive smoke

Grease

24 All pivot pins
25 Kingpost & carriage
26 6-in-1 clamshovel (if fitted)
27 Axle pivots
28 Steering swivels
29 Steering rams
* 30 Excavator Quickhitch (if fitted)

Test

* 31 Warning lights

Note: Check the hydraulic fluid level with the loader shovel on the ground and backhoe in the travel position.

EVERY 50 OPERATING HOURS OR WEEKLY
whichever occurs first

Do the Daily jobs plus:

Clean

1 Fuel sediment bowl

Check (Engine Stopped)

2 Front and rear axles for oil leaks - check level if leaking
3 Front and rear hubs for oil leaks - check level if leaking
4 Transmission oil cooler connections
5 Radiator and hoses condition
6 Fan belt tension and condition
7 Optional attachments (as needed)
8 Condition of ram piston rods
9 Hoses and pipework for chafing/damage
10 Air cleaner hose security
11 Electrical wiring for chafing

Grease

12 Propshafts - universal and sliding joints

Oil

13 Control levers
14 All cables
15 All hinges

Drain

16 Fuel filter
17 Fuel sediment bowl

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Colour Coding

The following colour coding, used on illustrations to denote various conditions of oil pressure and flow, is standardised throughout JCB Service Publications.

Blue: Neutral Circuit Pressure.

Red: Pressure generated by the operation of a service. Depending on application this may be anything between Neutral Circuit Pressure and M.R.V. Operating Pressure.

Pink: Pressure that is above Neutral Circuit Pressure but lower than that denoted by Red.

Green: Exhaust.

Light Green: Oil subjected to a partial vacuum due to a drop in pressure (cavitation).

Yellow: Oil trapped within a chamber or line, preventing movement of components (lock-up).

Orange: Oil pressure used in a controlling device (servo).

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Axle Oil Level

Check Differential Oil Level - *for Interval see Service Schedule*

*1 Remove fill/level plug **A** and its bonded washer. Oil should be level with the bottom of the fill/level hole.

*2 If necessary, top up with JCB recommended axle oil as specified on page 1 - 1. Clean and refit fill/level plug **A** with new bonded washer.

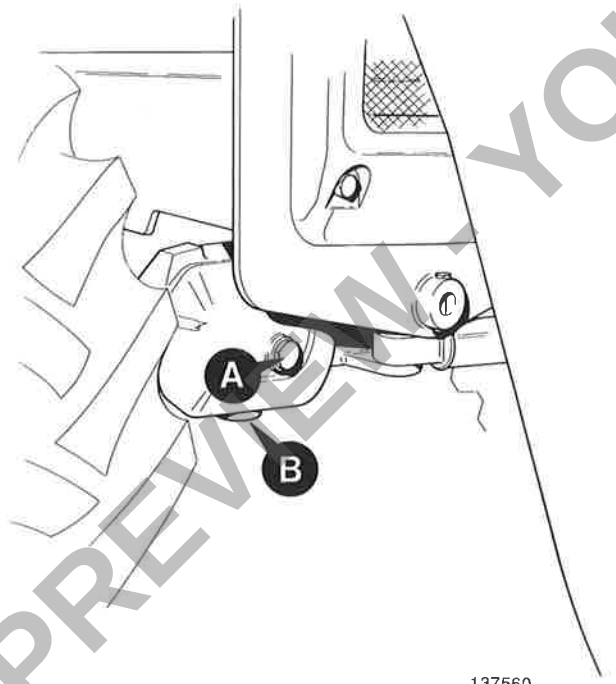
Change Differential Oil - *for Interval see Service Schedule*

*1 Remove fill/level plug **A** and drain plug **B**, together with their bonded washers. Allow time for the oil to drain out.

*2 Clean and refit drain plug **B** with a new bonded washer. Tighten to 79 Nm (58 lbf ft).

3 Fill the axle with JCB 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** with a new bonded washer.



137560

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 JCB recommended axle oil. Clean and refit fill/level plug **C**.

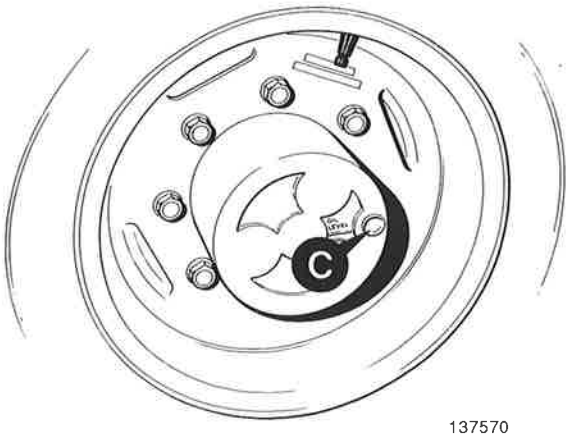
Change Hub Oil - *for Interval see Service Schedule*

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 plugs **C** at the bottom.



2 Remove fill/level plugs **C**. Allow time for the oil to drain out.

3 Set **OIL LEVEL** marks to the horizontal.



137570

4 Fill the hubs with JCB recommended axle oil, as specified on page 1 - 1, through the fill/level holes **C**. Oil should be level with the bottom of the fill/level hole.

5 Clean and refit fill/level plugs **C**.

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Machine Neutral Circuit

Oil is drawn through a suction strainer **5** from the hydraulic tank **T** by the engine-driven hydraulic pump **P**. Oil from the pump flows on to the loader valve block **3** by way of the priority valve **2**, which always gives priority demand to the steering circuit.

From the loader valve neutral gallery, oil flows via a high pressure carry-over line to the excavator valve **4**.

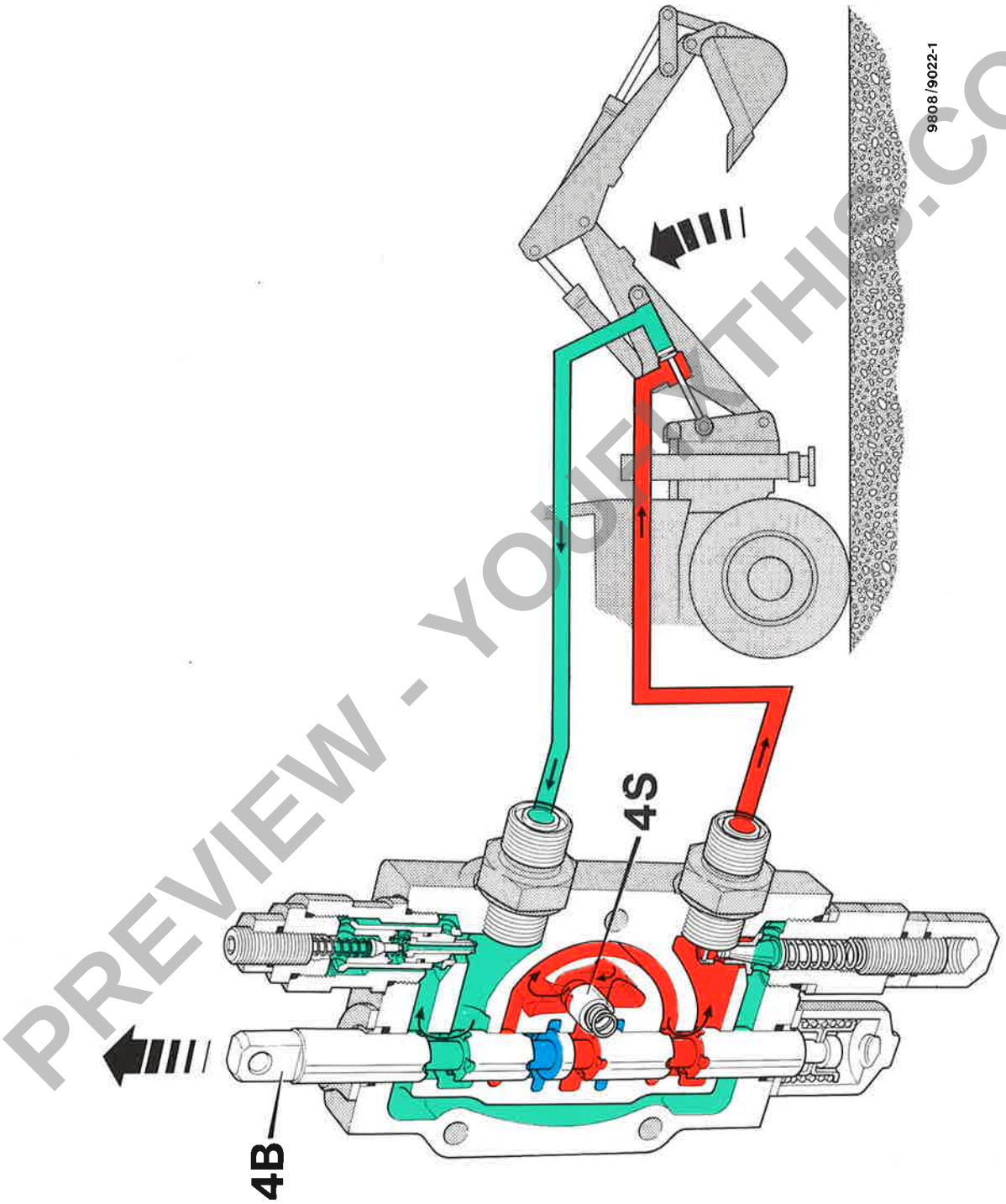
Exhaust oil from the excavator valve flows back to the tank through an in-line filter **6** and a cooler **7**. A pressure test connector **8** is located between the hydraulic pump **P** and the priority valve **2**.

***Note:** From Machine No. 655604 the pump outlet hose has been re-routed to pass in front of the pump and down the left hand side of the machine to the priority valve **2**. As a result, the pressure test point **8** has been repositioned immediately in front of the priority valve **2**.

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TYPICAL RAM (with dowelled piston head)

Dismantling and Assembly

When Assembling (cont'd)

Fit piston head seals **2**, **3** and **4**.

Position the cylinder on the bench and install the rod assembly into the cylinder.

Apply Loctite 932 to the first three threads of the cylinder. Fit the end cap and torque tighten.

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 deg C and are the minimum periods between assembly and filling the ram with oil.
Loctite 262 or 932 with Activator N - 1 hour
Loctite 262 or 932 with Activator T - 2 hours

Torque Settings

Item	Nm	kgf m	lbf ft
1	678	69.2	500
6	405	41.5	300

Note: When fitting cylinder and piston eye bushes **12**, ensure that the split in the bush is set at 90° to the longitudinal centreline of the cylinder.

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

DRILLING DETAILS FOR PISTON HEAD RETENTION
(all dimensions in mm)

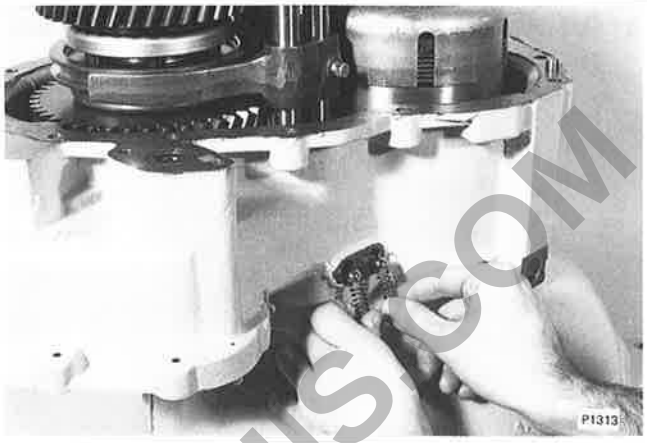
Ram Size	Dowel Size	Guide Drill Ø	Guide Drill Depth	Dowel Drill Ø **X**	Dowel Drill Depth **Y**
50 x 25	20 x 6Ø	4	19	6.1/6.02	23/22
60 x 30	20 x 6Ø	4	19	6.1/6.02	23/22
70 x 40	20 x 6Ø	4	19	6.1/6.02	23/22

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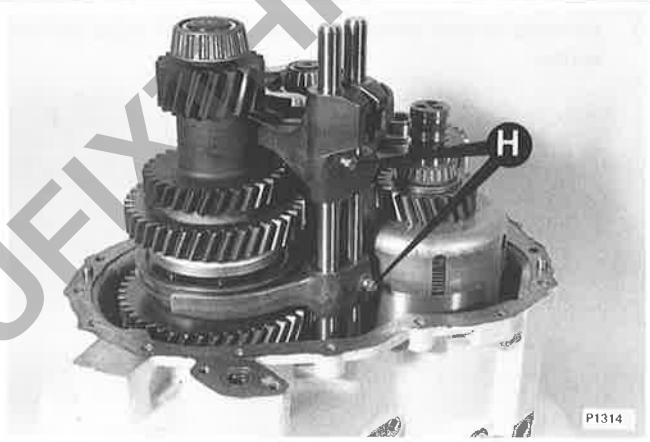
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Gearbox - Dismantling (cont'd)

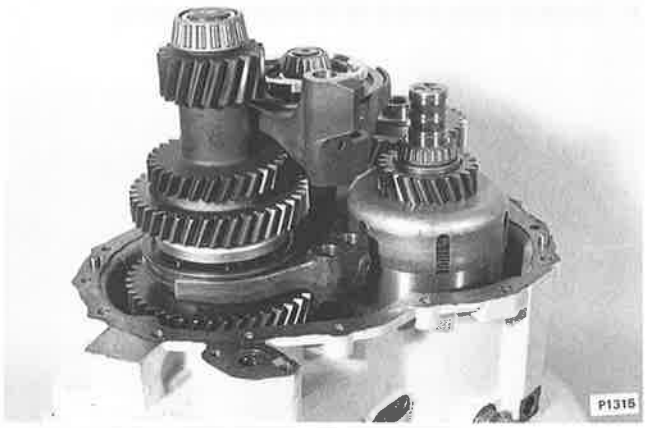
20 Remove selector detent balls and springs.



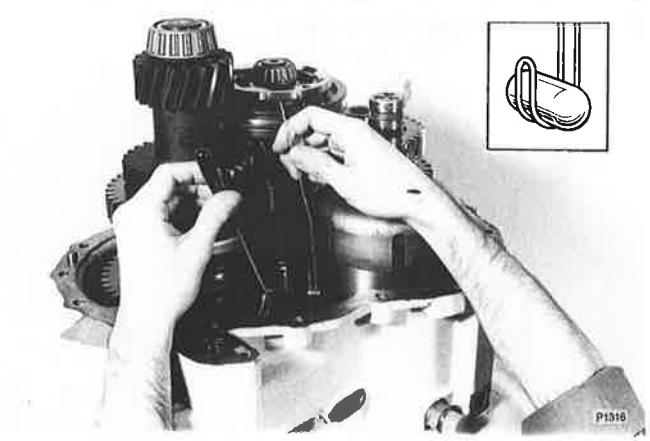
21 Unscrew selector fork retaining screws **H** and lift out selector rods.



22 Remove selector forks.



23 Using a suitable wire support as shown, remove interlock plunger situated between selector rod bores.



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