

JCB Robot 160, 170 and 180

[Section 1 - General Information](#)

[Section 2 - Care and Safety](#)

[Section 3 - Maintenance](#)

[Section A - Attachments](#)

[Section B - Body and Framework](#)

[Section C - Electrics](#)

[Section D - Controls](#)

[Section E - Hydraulics](#)

[Section F - Transmission](#)

[Section G - Brakes](#)

[Section J - Tracks](#)

[Section K - Engine](#)



Publication No.
9803/9450-1



Copyright © 2004 JCB SERVICE. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any other means, electronic, mechanical, photocopying or otherwise, without prior permission from JCB SERVICE.

Issued by JCB Technical Publications, JCB Service, World Parts Centre, Beamhurst, Uttoxeter, Staffordshire, ST14 5PA, England. Tel +44 1889 590312 Fax +44 1889 593377

World Class
Customer Support

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: www.heydownloads.com by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL



Section 1 - General Information Torque Settings

Zinc Plated Fasteners and Dacromet Fasteners

Table 4. Metric Grade 10.9 Fasteners

Bolt Size		Hexagon (A/F)	Condition 1			Condition 2		
ISO Metric Thread	mm	mm	Nm	kgf m	lbf ft	Nm	kgf m	lbf ft
M5	5	8	8.1	0.8	6.0	7.3	0.7	5.4
M6	6	10	13.9	1.4	10.2	12.5	1.3	9.2
M8	8	13	34.0	3.5	25.0	30.0	3.0	22.1
M10	10	17	67.0	6.8	49.4	60.0	6.1	44.2
M12	12	19	116.0	11.8	85.5	104.0	10.6	76.7
M16	16	24	288.0	29.4	212.4	259.0	26.4	191.0
M20	20	30	562.0	57.3	414.5	506.0	51.6	373.2
M24	24	36	971.0	99.0	716.9	874.0	89.1	644.6
M30	30	46	1930.0	196.8	1423.5	1737.0	177.1	1281.1
M36	36	55	3374.0	344.0	2488.5	3036.0	309.6	2239.2

Table 5. Metric Grade 12.9 Fasteners

Bolt Size		Hexagon (A/F)	Condition 1			Condition 2		
ISO Metric Thread	mm	mm	Nm	kgf m	lbf ft	Nm	kgf m	lbf ft
M5	5	8	9.8	1.0	7.2	8.8	0.9	6.5
M6	6	10	16.6	1.7	12.2	15.0	1.5	11.1
M8	8	13	40.0	4.1	29.5	36.0	3.7	26.5
M10	10	17	80.0	8.1	59.0	72.0	7.3	53.1
M12	12	19	139.0	14.2	102.5	125.0	12.7	92.2
M16	16	24	345.0	35.2	254.4	311.0	31.7	229.4
M20	20	30	674.0	68.7	497.1	607.0	61.9	447.7
M24	24	36	1165.0	118.8	859.2	1048.0	106.9	773.0
M30	30	46	2316.0	236.2	1708.2	2084.0	212.5	1537.1
M36	36	55	4049.0	412.9	2986.4	3644.0	371.6	2687.7

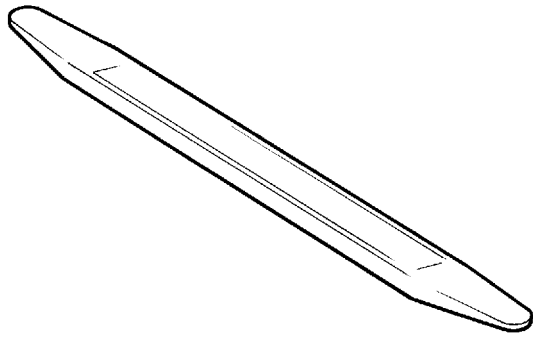


Fig 18.

Nylon Spatula - general tool used for smoothing sealants - also used to re-install glass in rubber glazing because metal tools will chip the glass edge.

JCB part number - 892/00847

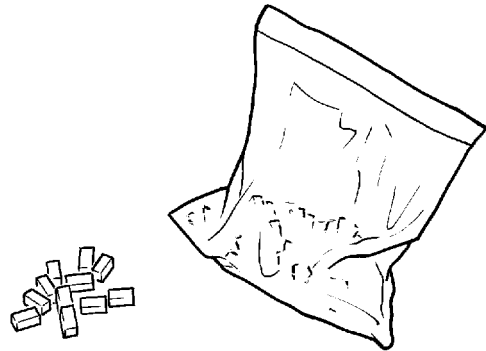
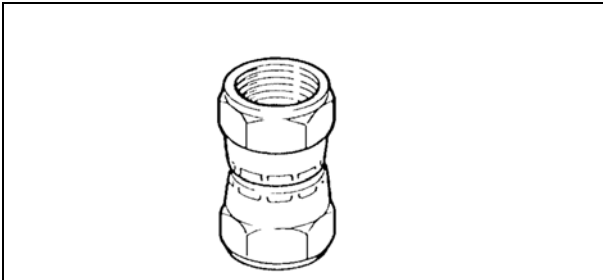


Fig 19.

Rubber Spacer Blocks - used to provide the correct set clearance between glass edge and cab frame.

JCB part number - 926/15500 (unit quantity = 500 off)



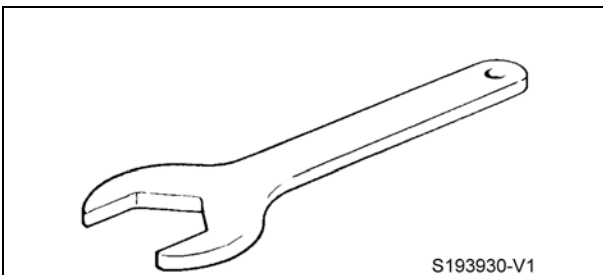
S193900-V1

Fig 33. Female Connectors

892/00074 3/8 in BSP x 3/8 in BSP

892/00075 1/2 in BSP x 1/2 in BSP

892/00077 3/4 in BSP x 3/4 in BSP



S193930-V1

Fig 34. Hexagon Spanners for Ram Pistons and End Caps

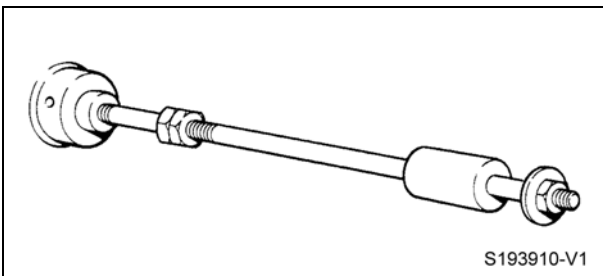
992/09300 55 mm A/F

992/09400 65 mm A/F

992/09500 75 mm A/F

992/09600 85 mm A/F

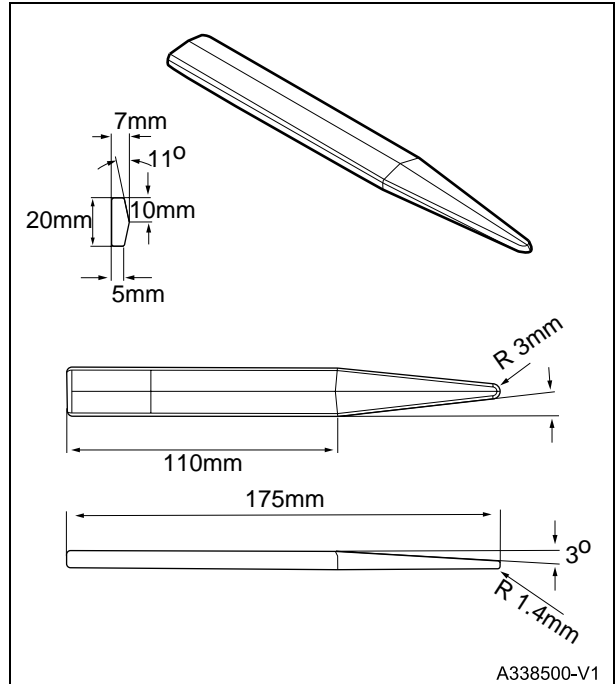
992/09700 95 mm A/F



S193910-V1

Fig 35. Slide Hammer

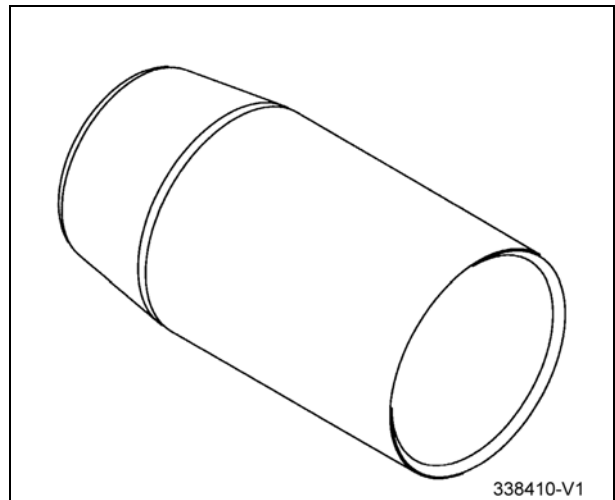
993/68100



A338500-V1

Fig 36. Piston Seal Assembly Tool

892/01027



338410-V1

Fig 37. Ram Seal Protection Sleeves

892/01018 For 40 mm Rod Diameter

892/01019 For 50 mm Rod Diameter

WARNING

You could be killed or seriously injured if you operate a machine with a damaged or missing ROPS/FOPS. If the Roll Over Protection Structure (ROPS)/Falling Objects Protection Structure (FOPS) has been in an accident, do not use the machine until the structure has been renewed. Modifications and repairs that are not approved by the manufacturer may be dangerous and will invalidate the ROPS/FOPS certification.

INT-2-1-9_6

WARNING

Work Sites

Work sites can be hazardous. Inspect the site before working on it. Look for potholes, weak ground, hidden rocks etc. Check for utilities such as electric cables (overhead and underground), gas and water pipes etc. Mark the positions of the underground cables and pipes. Make sure that you have enough clearance beneath overhead cables and structures.

INT-2-2-1

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

Parking

An incorrectly parked machine can move without an operator. Follow the instructions in the Operator Manual to park the machine correctly.

INT-2-2-4_2

WARNING

Banks and Trenches

Banked material and trenches can collapse. Do not work or drive too close to banks and trenches where there is danger of collapse.

INT-2-2-5

WARNING

Ramps and Trailers

Water, mud, ice, grease and oil on ramps or trailers can cause serious accidents. Make sure ramps and trailers are clean before driving onto them. Use extreme caution when driving onto ramps and trailers.

INT-2-2-6

WARNING

Safety Barriers

Unguarded machines in public places can be dangerous. In public places, or where your visibility is reduced, place barriers around the work area to keep people away.

INT-2-2-8

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

Hazardous Atmospheres

This machine is designed for use in normal out door atmospheric conditions. It should not be used in an enclosed area without adequate ventilation. Do not use the machine in a potentially explosive atmosphere, i.e. combustible vapours, gas or dust, without first consulting your JCB Distributor.

INT-2-1-14

CAUTION

Regulations

Obey all laws, work site and local regulations which affect you and your machine.

INT-1-3-3



Section 2 - Care & Safety Safety Check List

Safety Decals

Page left intentionally blank

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

DANGER

Electrolyte

Battery electrolyte is toxic and corrosive. Do not breathe the gases given off by the battery. Keep the electrolyte away from your clothes, skin, mouth and eyes. Wear safety glasses.

INT-3-2-1_3

CAUTION

Damaged or spent batteries and any residue from fires or spillage should be put in a closed acid proof receptacle and must be disposed of in accordance with local environmental waste regulations.

INT-3-1-12

WARNING

Battery Gases

Batteries give off explosive gases. Keep flames and sparks away from the 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.

INT-3-1-8

Checking for Damage

T3-013

- 1 Inspect steelwork for damage. Note damaged paintwork for future repair.
- 2 Make sure all pivot pins are correctly in place and secured by their locking devices.
- 3 Ensure that the steps and handrails are undamaged and secure.
- 4 Check for broken or cracked window glass. Replace damaged items.
- 5 Check all bucket teeth for damage and security.
- 6 Check all lamp lenses for damage.
- 7 Inspect the tyres for damage and penetration by sharp objects.
- 8 Check that all safety decals are in place and undamaged. Fit new decals where necessary.

- 3 Remove covers **A**. Look at the level in each cell. The electrolyte should be 6 mm (1/4 in) above the plates. Top up if necessary with distilled water or de-ionized water.

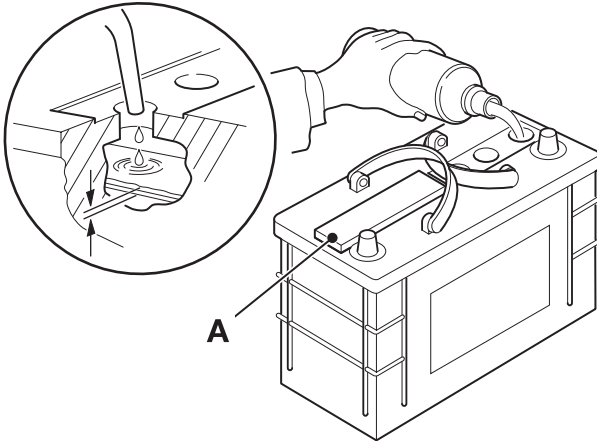


Fig 11.

- 4 Refit battery.
- 5 Close and lock the battery compartment.

Jump Starting the Engine

T3-021

⚠ WARNING

Do not use a battery if its electrolyte is frozen. To prevent the battery electrolyte from freezing, keep the battery fully charged.

Do not try to charge a frozen battery or jump-start and run the engine, the battery could explode.

Batteries produce a flammable gas, which is explosive; do not smoke when checking the electrolyte levels.

When jump-starting from another vehicle, make sure that the two vehicles do not touch each other. This prevents any chance of sparks near the battery.

Set all the machine switches to their OFF positions before connecting the external power supply. Even with the starter switch set to off some circuits will be energised when the external power supply is connected.

Do not connect the booster (slave) supply directly across the starter motor. Doing this by-passes the neutral gear safety switch. If the machine is in gear, it may 'runaway' and kill or injure bystanders.

Use only sound jump leads with securely attached connectors. Connect one jump lead at a time.

The machine has a negative earth electrical system. Check which battery terminal is positive (+) before making any connections.

Keep metal watch straps and jewellery away from the jump lead connectors and the battery terminals - an accidental short could cause serious burns and damage equipment.

Make sure you know the voltage of the machine. The booster (slave) supply must not be higher than that of the machine. Using a higher voltage supply will damage your machine's electrical system.

If you do not know the voltage of your booster (slave) supply, then contact your JCB dealer for advice. Do not attempt to jump-start the engine until you are sure of the voltage of the booster (slave) supply.

4-2-2-3_1

Checking the Coolant Level

WARNING

The cooling system is pressurised when the coolant is hot. When you remove the cap, hot coolant can spray out and burn you. Make sure that the engine is cool before checking the coolant level or checking the system.

9-3-3-1_1

- 1 Park the machine on level ground. Stop the engine and let it cool down. Open the engine compartment top cover.
- 2 Check the level of coolant in the expansion bottle **A**. If necessary remove the filler cap **B** and top up to the level indicated.
- 3 Refit the filler cap and make sure it is tight.
- 4 Run the engine for a while to raise the coolant to working temperature and pressure. Stop the engine and checks for leaks.
- 5 Close and lock the engine compartment top cover.

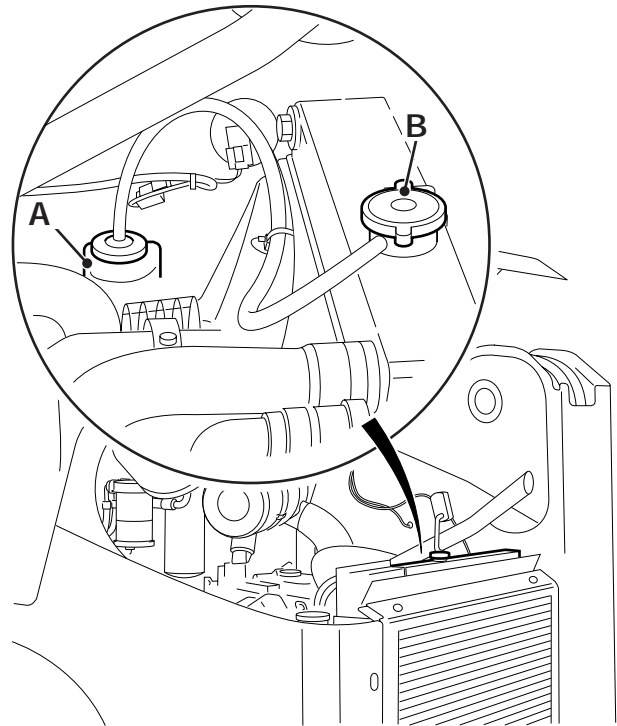


Fig 20.

Changing the Charge Filter Element

The oil level should be checked when the oil is cool or cold.

CAUTION

Ensure that dirt etc. does not enter the hydraulic system during this job.

5-3-4-4

- 1 Stop the engine and wait until the system has cooled.
- 2 Open the engine compartment top cover.
- 3 Loosen the hydraulic tank filler cap **B**. [⇒ Fig 31. \(□ 3-45\)](#) and allow all pressure to dissipate. Remove the filler cap.
- 4 Unscrew the old filter canister **C**, using a chain wrench if necessary, and discard.
- 5 Lubricate seal **D** on the new filter canister with clean engine oil.
- 6 Screw on the new filter canister **hand tight** only.
- 7 Add engine oil through filler point **B**. [⇒ Fluids, Lubricants and Capacities \(□ 3-12\)](#).
- 8 Refit cap **B**, run the engine for a few minutes, then recheck the oil level.

Note: Old filters should be disposed of in accordance with local Health and Safety regulations.

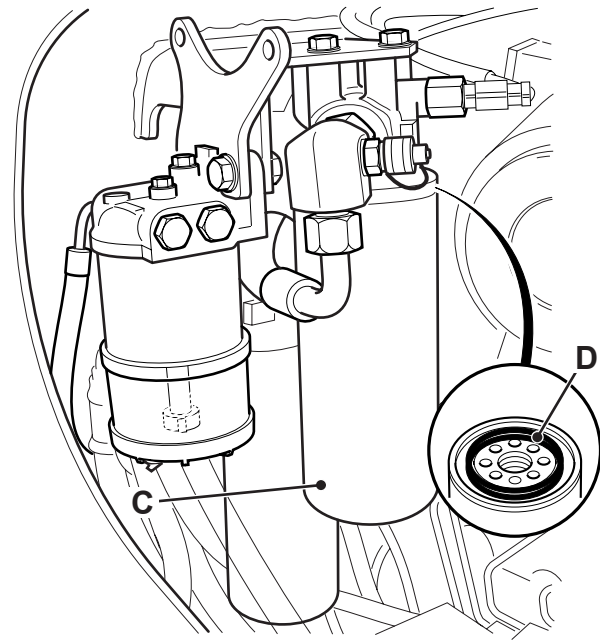


Fig 32.



Section A - Attachments

Contents

Page No.



Page left intentionally blank



Page left intentionally blank

GETS ONTO YOUR SKIN

Flush with water, remove affected clothing. Cover burns with a sterile dressing then get medical help.

5-3-4-3_1

Testing

This test is to determine the electrical condition of the battery and to give an indication of the remaining useful 'life'.

Before testing ensure that the battery is at least 75% charged (SG of 1.23 to 1.25 for ambient temperature up to 27°C).

Ensure that the battery is completely disconnected from the vehicle.

Connect up the battery tester as follows:

- 1 Set the CHECK/LOAD switch **7-A** to OFF.
- 2 Set rocker switch **7-B** to the battery voltage (12V).
- 3 Connect the red flying lead to the battery positive (+) terminal and the black flying lead to the battery negative (-) terminal.

- 4 Set the CHECK/LOAD switch **7-A** to CHECK to read the battery no-load voltage which should be at least 12.4 volts.
- 5 Set the CHECK/LOAD switch **7-A** to LOAD and hold down for 5-10 seconds until the meter reading stabilises. The reading should be at least 9 volts.

Note: Do not hold the switch in the LOAD position for more than 10 seconds.

- 6 → [Table 1. Fault Diagnosis \(□ C-8\)](#), if the foregoing tests are unsatisfactory.

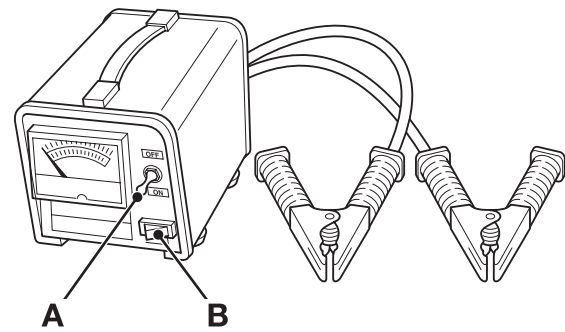


Fig 7. Battery Tester

Table 1. Fault Diagnosis

Battery Tester Readings	Remedy
1 CHECK: 0 - 12.6 Volts LOAD: less than 6 Volts	Renew battery
2 CHECK: 6 - 12.4 Volts LOAD: less than 9 Volts and falls steadily but remains in yellow zone.	Recharge and re-test. If tests still unsatisfactory renew battery.
3 CHECK: less than 10 Volts LOAD: less than 3 Volts	Indicates battery has been over-discharged and unlikely to recover. Renew battery.
4 CHECK: more than 11 Volts LOAD: 6 - 10 Volts steady	Charge battery which will probably recover.

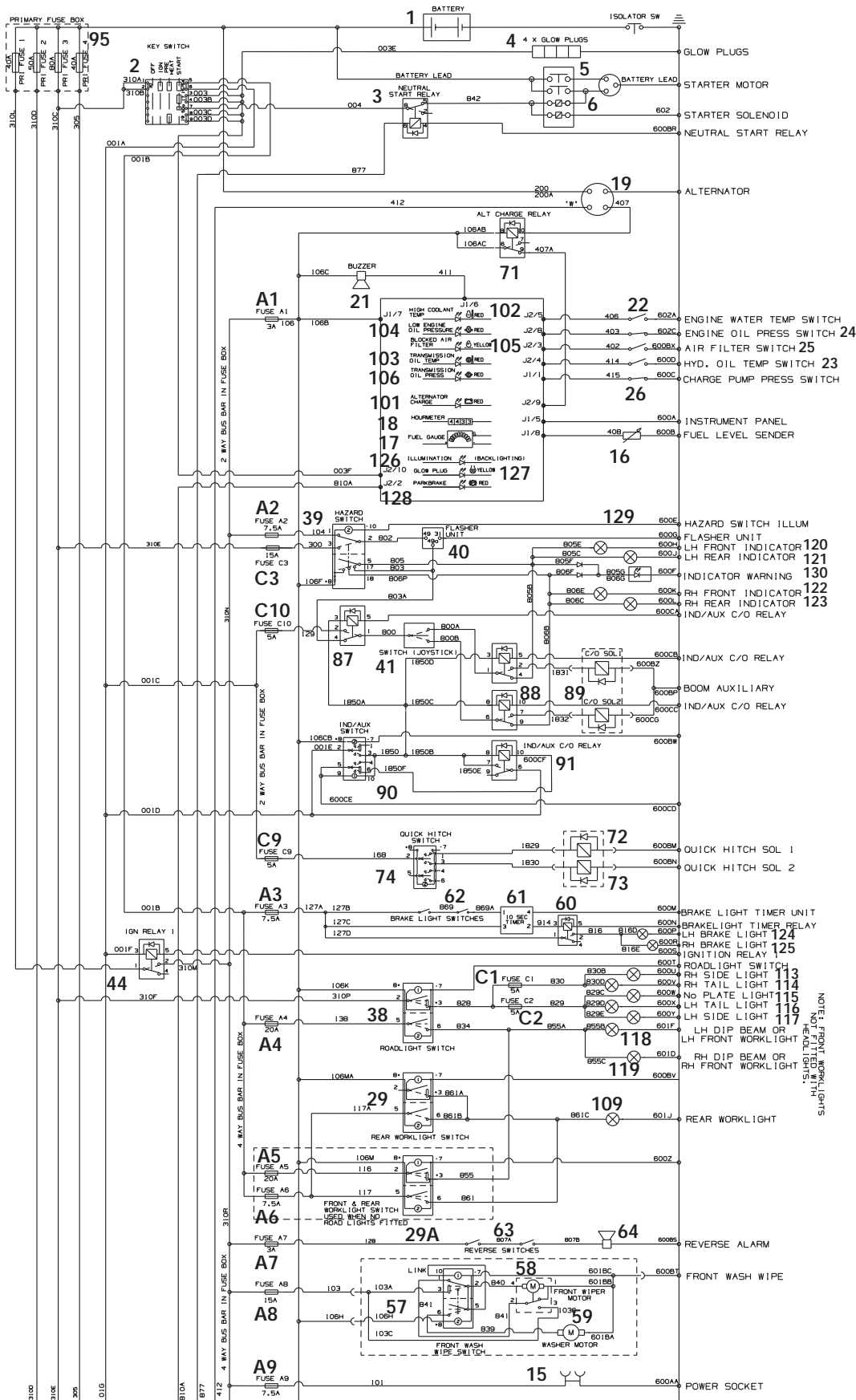


Fig 12. Circuit Diagram Sheet 1

ME
AUX OPSS ECU

1	600BG	1.0	RA-1	7	517	1.0	PG-7
2	526A	1.0	TB-2	8	7210	0030	
3	506	1.0	PG-2	9	504A	1.0	TG-2
4	516	1.0	DC-7	10	531A	1.0	TD-2
5	524A	1.0	TC-2	11	532A	1.0	TE-2
6	505	1.0	PG-3	12	199A	1.0	TF-2

12 Way DT06 Socket Housing : 1 : 7219/0016
12 Way DT06 Wedge : 1 : 7219/0012

MF
PMS ECU

1	600AF	1.0	RA-1	7	412	1.0	NG-3
2	7210	0030		8	7210	0030	
3	7210	0030		9	508	1.0	MFA-2
4	650	1.0	DD-2B	10	980	1.0	NA-1
5	660	1.0	RB-1	11	7210	0030	
6	509	1.0	DN-2	12	144C	1.0	SK-1

12 Way DT06 Socket Housing : 1 : 7219/0016
12 Way DT06 Wedge : 1 : 7219/0012

MFA
PMS RESET

1	144A	1.0	SK-2
2	508	1.0	MF-9

2 Way DT06 Socket Housing : 1 : 7212/0052
2 Way DT06 Wedge : 1 : 7212/0031
2 Way DT04 Blanking Plug : 1 : 715/20009

MG
AUX OPSS ECU RESISTOR

1	536	1.0	TB-1
2	524	1.0	TC-1

2 Way DT06 Socket Housing : 1 : 7212/0052
2 Way DT06 Wedge : 1 : 7212/0031

MH
BUZZER

1			
2	106C	1.0	SC-1
3			
4			
5			
6	411	0.5	DBA-6
7			
8			
9			

9 Way Mini Relay Housing : 1 : 7241/0005

MJ
FLASHER

1			
2	803,803A	1.5	1.0 PJ-17,EA-2
3			
4	802	1.5	PJ-2
5			
6	600G	1.0	SX-4
7			
8			
9			
10			

9 Way Mini Relay Housing : 1 : 7241/0005

MK
NEUTRAL START RELAY

1			
2			
3			
4	600BR	1.0	SX-5
5	842	3.0	NGA-1
6	877A,877	1.0	NM-1,DU-1
7			
8	004	3.0	PHA-7
9			
10			

9 Way Mini Relay Housing : 1 : 7241/0005
90 Deg Passive Bracket for Relay Housings : 1 : 7241/0023

ML
PARKBRAKE & HORN RELAY

1	122	1.5	MC-12
2	815	1.0	DM-2
3	865	1.0	NE-1
4	810	1.0	TK-3
5	600AW	1.0	SX-15
6	312,312A	1.5	1.0 MD-8,ML-8
7	871	1.0	MA-2
8	312A	1.0	ML-6
9			
10	870	1.0	NZ-4

10 Way Twin Micro Relay Base : 1 : 7241/0003
90 Deg Active Bracket for Relay Housings : 1 : 7241/0024

MM
BRAKELIGHT & ALTR CHARGE RELAY

1	127D	1.0	SJ-2
2	816,816E	1.0	NP-4,NK-4
3	914	1.0	MT-2
4			
5	600N	1.0	SX-6
6	106AC	1.0	SC-3
7			
8	106AB	1.0	SC-4
9	407A	0.5	DBB-9
10	407	1.0	NG-2

10 Way Twin Micro Relay Base : 1 : 7241/0003

MN
FLOAT LATCH RELAY

1	7210	0030	
2	903	1.0	PG-5
3	902	1.0	PB-2
4	902A	1.0	PA-1
5	600BC	1.0	SX-7
6	7210	0030	

6 Way DT06 Socket Housing : 1 : 7216/0018
6 Way DT06 Wedge : 1 : 7216/0016

MP
IGN1 & IGN 2 RELAY

1	310L	4.0	NS-B
2	310M	4.0	SD-3
3	001F	1.0	TA-2
4			
5	600S	1.0	SX-8
6	310D	6.0	NT-A
7	310S	6.0	SE-3
8	001G	1.0	TA-3
9			
10	600BA	1.0	SX-9

10 Way Twin Micro Relay Base : 1 : 7241/0003
90 Deg Passive Bracket for Relay Housings : 1 : 7241/0023

MS
INDICATOR SW RELAY

1	800,800C	1.0	EA-3,MS-6
2	805B	1.0	SS-1
3	800A	1.0	NZ-3
4			
5	601K	1.0	SX-10
6	800C	1.0	MS-1
7	806B	1.0	ST-1
8	800B	1.0	NZ-1
9			
10	601L	1.0	SX-11

10 Way Twin Micro Relay Base : 1 : 7241/0003
90 Deg Active Bracket for Relay Housings : 1 : 7241/0024

MT
BRAKE LIGHT TIMER

1	869A	1.0	PDB-2
2	914	1.0	MM-3
3	127C	1.0	SJ-3
4	600M	1.0	SX-13

4 Way HW090 Socket Housing : 1 : 7214/0001
4 Way HW090 Socket Retainer : 1 : 7214/0003

MV
SRS SOLS

A	1828	1.0	DK-3
B	600AY	1.0	SW-1
C	1828C	1.0	DF-1A

3 Way DT06 Socket Housing : 1 : 7213/0031
3 Way DT06 Wedge : 1 : 7213/0016
3 Way DT04 Blanking Plug : 1 : 715/20011

MW
5V REGULATOR

A	199C	1.0	TF-1
B	504	1.0	TG-1
C	610A	1.0	RA-1

3 Way DT06 Socket Housing : 1 : 7213/0031
3 Way DT06 Wedge : 1 : 7213/0016

MX
LH FRONT SIDE LIGHTS

1	805E	1.0	SS-2
2	829E	1.0	MD-4
3	600H	1.0	SW-2

3 Way HW090 Socket Housing : 1 : 7213/0005
3 Way HW090 Socket Retainer : 1 : 7213/0007

MY
FRONT WIPE & WASH

1	103	2.0	MB-16
2	600BT	2.0	SW-3
3	106H	1.0	SC-5

3 Way HW090 Socket Housing : 1 : 7213/0005
3 Way HW090 Socket Retainer : 1 : 7213/0007
Front Wash Wipe Switch Decal : 1 : 817/17261

MZ
HEATER

1	102	2.0	MB-20
2	600AC	2.0	SW-4
3	106R	1.0	SC-6

3 Way HW090 Socket Housing : 1 : 7213/0005
3 Way HW090 Socket Retainer : 1 : 7213/0007

NA
PMS DUMP SOL

1	980	1.0	MF-10
2	600AG	1.0	SW-5

2 Way DT06 Socket Housing : 1 : 7212/0052
2 Way DT06 Wedge : 1 : 7212/0031

NBA
LOADER LOCK 1 SOL

1	815B	1.0	SN-1
2	600AT	1.0	SW-6

2 Way DT06 Socket Housing : 1 : 7212/0052
2 Way DT06 Wedge : 1 : 7212/0031
Lock Decal : 1 : 817/17319

NBB
LOADER LOCK 2 SOL

1	815C	1.0	SN-2
2	600AU	1.0	SW-7

2 Way DT06 Socket Housing : 1 : 7212/0052
2 Way DT06 Wedge : 1 : 7212/0031

NCA
AUX OPSS SOL 1

1	531	1.0	TD-1
2	524B	1.0	TC-3

2 Way DT06 Socket Housing : 1 : 7212/0052
2 Way DT06 Wedge : 1 : 7212/0031
Aux 1 Decal : 1 : 817/17306

NCB
AUX OPSS SOL 2

1	532	1.0	TE-1
2	524C	1.0	TC-4

2 Way DT06 Socket Housing : 1 : 7212/0052
2 Way DT06 Wedge : 1 : 7212/0031
Aux 2 Decal : 1 : 817/17307

ND
PARK BRAKE SOL

1	936	1.0	DH-3
2	600BU	1.0	SW-8

2 Way DT06 Socket Housing : 1 : 7212/0052
2 Way DT06 Wedge : 1 : 7212/0031
2 Way DT04 Blanking Plug : 1 : 715/20009

NE
RESTRAINT SW

1	865	1.0	ML-3
2	7210	0001	
3	864	1.0	PS-1

3 Way HW090 Socket Housing : 1 : 7213/0005
3 Way HW090 Socket Retainer : 1 : 7213/0007

NF
SELF LEVEL SOL

1	893	1.0	DK-1
2	600AR	1.0	SV-1

2 Way DT06 Socket Housing : 1 : 7212/0052
2 Way DT06 Wedge : 1 : 7212/0031

NG
ENG CONNR 1

1	406	0.5	DBB-5
2	407	1.0	MM-10
3	412	1.0	MF-7
4	403	0.5	DBB-8
5	105	1.0	MC-16
6	7210	0030	
7	7210	0030	
8	7210	0030	

8 Way DT06 Socket Housing : 1 : 7218/0013
8 Way DT06 Wedge : 1 : 7218/0009

NGA
ENG CONNR 2

1	842	3.0	MK-5
2	7210	0030	

2 Way DT06 Socket Housing : 1 : 7212/0064
2 Way DT06 Wedge : 1 : 7212/0062

NCB
ENG CONNR3

1	1003E	6.0	SR-1
---	-------	-----	------

1 Way Power DT Size 8 : 1 : 7211/0005

721/12434 issue 1, sheet 5

Fig 21.

Mainframe Harness Sheet 5 → Fig 22. (□ C-29)



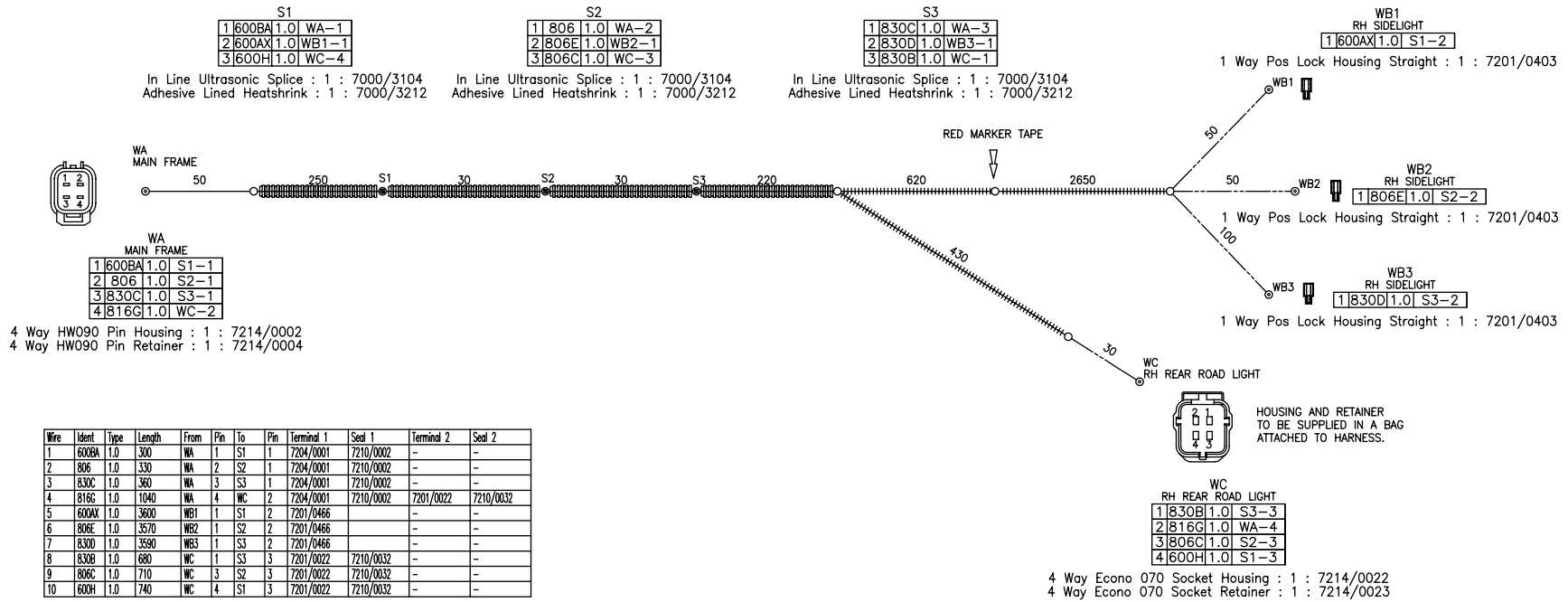
CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: www.heydownloads.com by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL



721/10752 issue 3, sheet 1

Fig 31.
Right Hand Side Light Harness Sheet 1



Check the rotor poles and the inner faces of the stator for signs of rubbing, which indicates worn bearings. The drive end bearing is part of bracket **17** and cannot be removed separately. If requiring renewal, needle roller bearing **20** should be pressed out in the direction of the arrow.

Assembling

Reverse the dismantling procedure, but note the following:

Ensure that spacers **14**, **16** and **18** are correctly positioned as shown.

Ensure that the slip rings **J** are clean and smooth, using extra fine glass paper to rectify slight imperfections.

Ensure that insulation bushes **9** and washer **5** are positioned as shown.

Take care not to damage the brushes when fitting the brush box and regulator assembly.

Table 5. Torque Settings

Item	Nm	kgf m	lbf ft
3	2.7	0.28	2.0
5	4.1	0.41	3.0
6	3.4	0.35	2.5
7	5.4	0.55	4.0
12	60.0	6.10	44.2

Manual Control Linkage - Foot Operated Loader

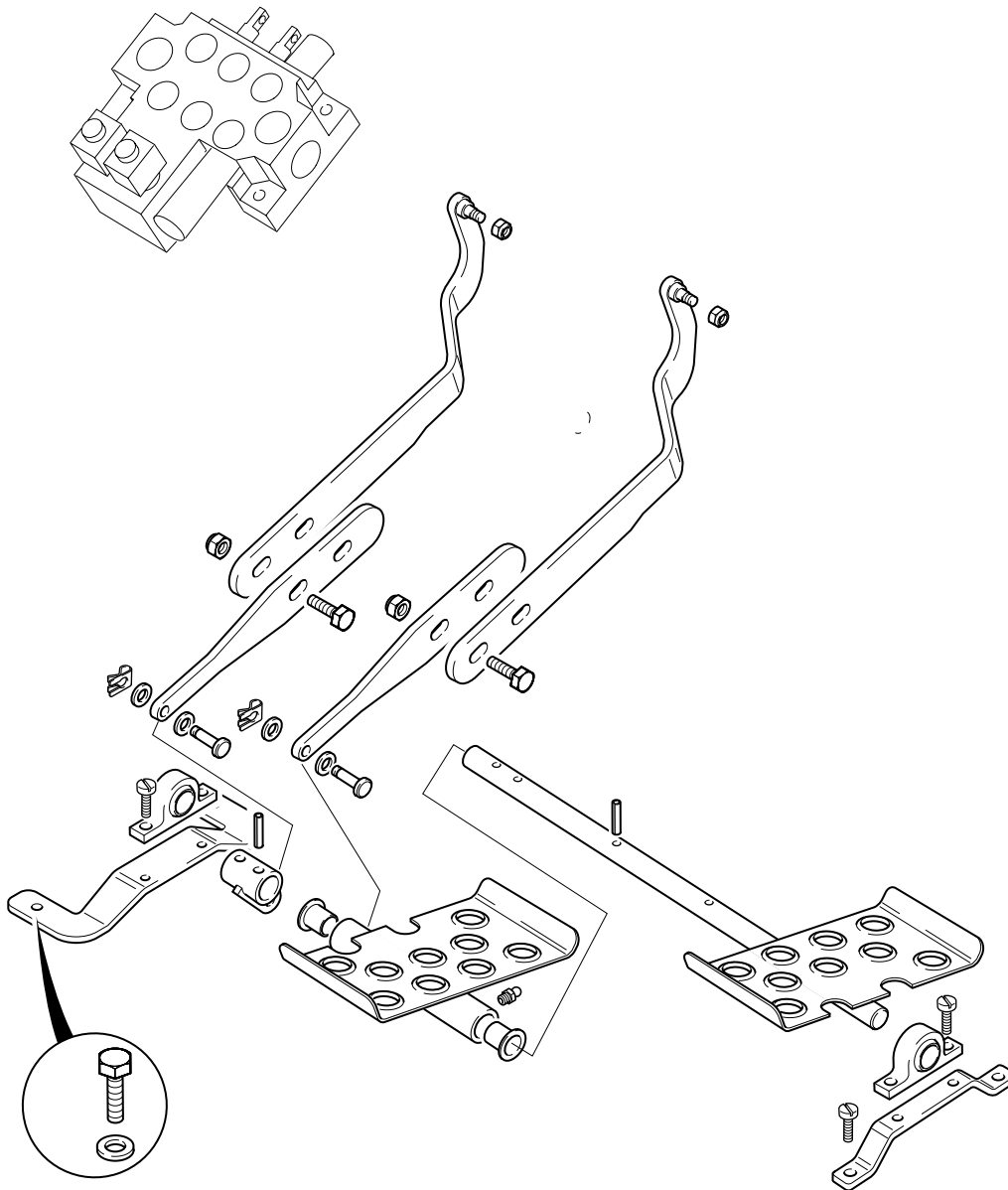


Fig 1.

Operation Description

Introduction to Hydraulic Schematic Symbols

TE-001

General (Basic and Functional Symbols)

Complex hydraulic components and circuits can be described to the engineer by using graphical symbols. The following pages illustrate and give a brief description for some of the more common symbols used.

There are many symbols in use and it would be impossible to include them all here. However it should be noted that most are only variations or refinements on the basic principles explained here. If more detailed information is required you are recommended to obtain a copy of BS2917 or ISO1219.

Once familiar with the symbols, the engineer can use hydraulic circuit diagrams as an aid to fault finding. It will be possible to see the complete hydraulic circuit and decipher the relationship between hydraulic components.

Table 1. General

	Spring
	Flow restriction affected by viscosity
	Direction of flow
	Indication of rotation
	Indication of direction and paths of flow
	Variable control

Table 2. Rams

	Single acting
	Double acting
	Double ended
	Double acting with damping at rod area end

Table 3. Pumps and Motors

	Variable capacity pump two directions of flow
	Fixed capacity motor one direction of flow
	Fixed capacity motor two directions of flow
	Variable capacity motor one direction of flow
	Variable capacity motor two directions of flow

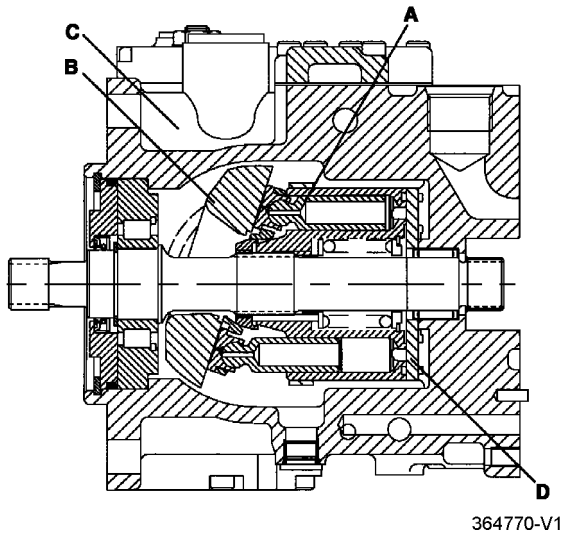


Fig 10.

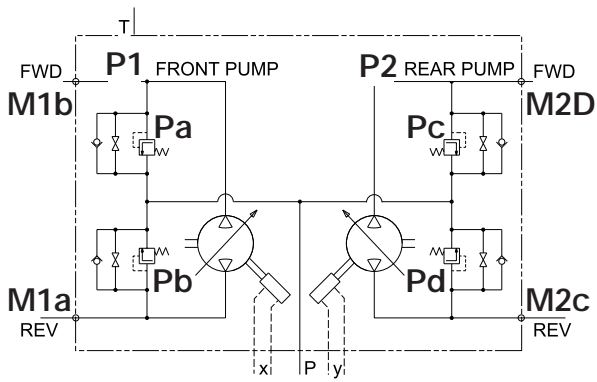


Fig 11.

Lift Arm Lower

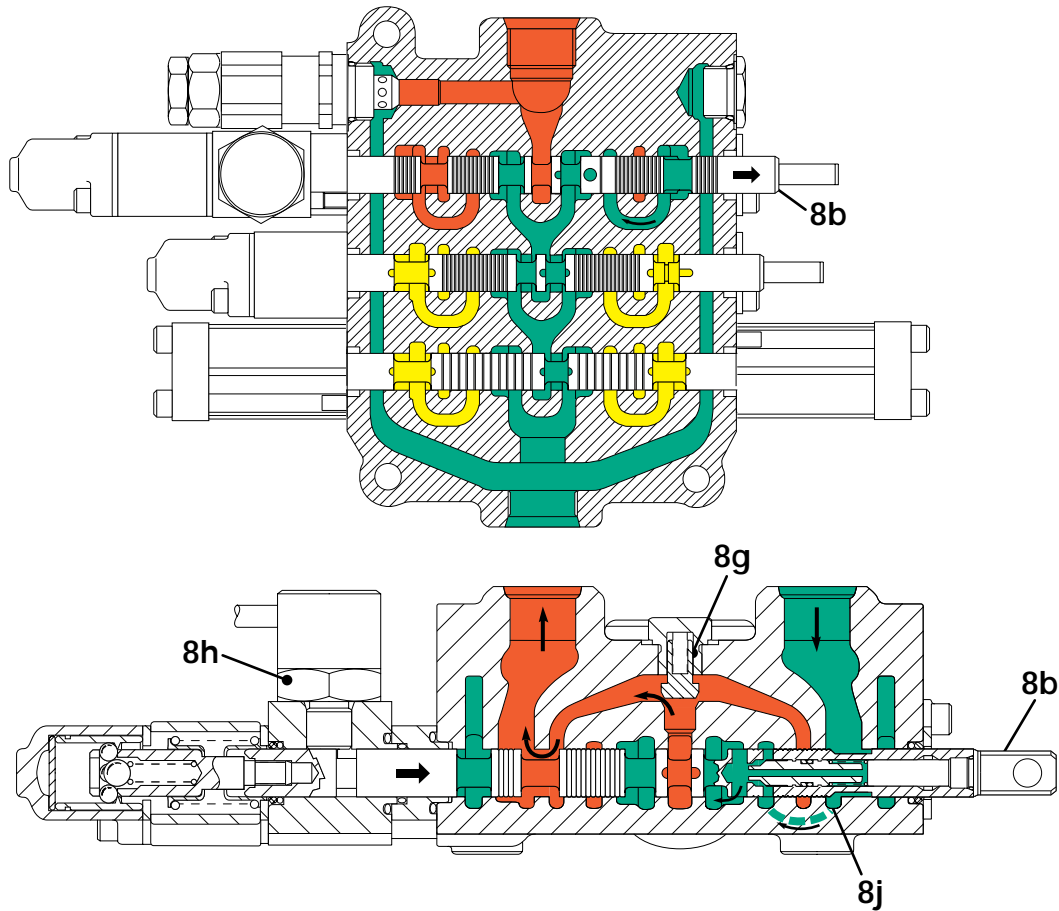


Fig 20.

[Fig 20.](#) ([E-24](#)) shows lift arm lower selected. On servo machines, when the joystick is moved servo oil is supplied to the appropriate end of the tilt spool **8b** which moves to select the lower service. On manual valves the spool is operated mechanically by movement of the control lever.

The oil entering the valve block is diverted by the lift spool **8b** to load hold check valve **8g** which opens to allow pressurised oil to flow out of the valve block to operate the lift ram.

Oil returning from the opposite end of the lift ram enters the valve block and lifts check spool **8j** which allows the oil restricted flow through the centre of spool **8b** before it enters the neutral circuit gallery and returns to tank.

WARNING

Fluid Under Pressure

Fine jets of fluid at high pressure can penetrate the skin. Keep face and hands well clear of fluid under pressure and wear protective glasses. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of fluid. If fluid penetrates your skin, get medical help immediately.

INT-3-1-10_2

- 3 To ensure correct replacement after the test is complete, mark the motor feed hoses **A** and **B** for the left hand (upper) motor, **C** and **D** for the right hand (lower) motor.
- 4 Swop the motor feed hoses from one side to the other as indicated in the illustration [⇒ Fig 27. \(□ E-33\)](#), i.e. swop hoses **A** and **C** then swop hoses **B** and **D**.

Note: *It may be found more convenient to use separate additional hoses to extend the existing feed hoses.*

- 5 Restart the engine and re-check the operation of left and right motors. Note that when the left motor is selected the right motor should now drive and the left motor should drive when the right motor is selected. If the previously faulty motor now functions then the fault lies in the relevant pump unit. If the motor still does not operate then the motor itself is faulty.



Section E - Hydraulics Fault Finding

Loader Circuit

Key to Cause	Remedy	Page Ref.
1 Insufficient hydraulic fluid.	Check for leaks and top up as required.	
2 Hydraulic leaks in system.	Check hoses, replace as required.	
3 Main relief valve (MRV) setting incorrect.	Check and adjust as required.	⇒ Loader Main Relief Valve (M.R.V.) (□ E-60)
4 Low loader pump flow.	Check pump flow, if necessary service or replace pump.	
5 Hydraulic filter clogged.	Change hydraulic filter.	
6 Charge filter by-pass valve leaking.	Check condition of hydraulic filter. Check operation of by-pass valve.	
7 Charge pressure incorrect.	Check relief valve or charge pump	
8 Servo pressure low	Carry out charge pressure check. Check for blocked service feed hose or faulty joystick.	⇒ Transmission Charge Pressure (□ E-62)
9 Loader pump flow low.	Check flow rate.	
10 Neutral circuit or low pressure lines leaking, damaged, trapped or kinked.	Check pipe lines and replace as required.	
11 Restriction in neutral circuit lines.	Check hoses and pipes, replace as necessary.	
12 Air in hydraulic system	Bleed System	⇒ Bleeding the Hydraulic System (□ E-53)
13 Service pipe lines leaking, damaged, trapped or kinked.	Check hoses and pipes, replace as required.	
14 Ram or pipe lines from ram leaking.	Check and rectify as required.	
15 Valve spool not operating.	Check for leaks, rectify as required. Make sure that spool lock-out is operating (check for faulty wiring, solenoid sticking, burr on spool, etc.)	

Circuit Diagrams

Standard and High-flow Servo Machines

Component Key

See [Fig 42.](#) ([E-55](#))

C	Cooler
F1	Charge Filter
F2	Loader Filter
P1	Transmission Pump - Run in Tandem
P2	Transmission Pump - Run in Tandem
P3	Loader Gear Pump
P4	Charge Pump
P5	High Flow Pump
M1	Left Hand Drive Motor
M1a	Left Hand Motor Shuttle Valve
M2	Right Hand Drive Motor
M2a	Right Hand Motor Shuttle Valve
S	Suction Strainer
T	Tank
X1	Pressure Test Point
X2	Pressure Test Point
Y	Plan View of Pump showing Servo Connections
Z	Plan View of Valve Block showing Servo Connections

1	Accumulator	11	Servo Cut-off Valve
2	Lift Ram	12	Drive Servo Control Valve
3	Float Valve (Optional)	12a	Forward
4	Levelling Valve (Optional)	12b	Left
5	Tilt Ram	12c	Reverse
6	Dump Valve	12d	Right
7	Brake Valve	12e	Shuttle Valves
8	Manual Load Lower Valve	13	Loader Servo Control Valve
9	Loader Valve Block	13a	Crowd
9a	Main Relief Valve (MRV)	13b	Tip
9b	Lift Spool	13c	Lift
9c	Tilt Spool	13d	Lower
9d	Auxiliary Spool	14	Charge Pressure Switch
9f	Anti-cavitation Valve	15	Attachment Proportional Solenoid Valve
10	Auxiliary Couplings	16	Check Valve (0.5 bar)
		17	Check Valve (2 bar)
		19	High-flow Control Valve ⁽¹⁾
		19a	High-flow Relief Valve
		19b	High-flow Valve Spool
		20	Attachment Motor

(1) *Items 19, 19a and 19b (and the relevant hydraulic lines shown dotted) are fitted to High Flow machines only.*



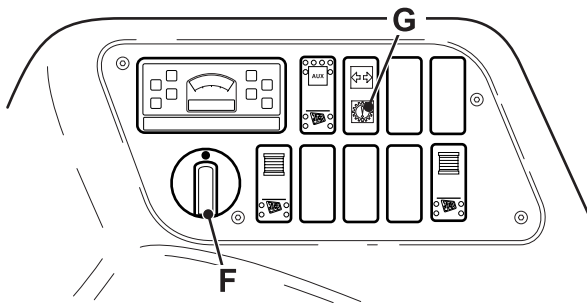


Fig 53.

5 On machines not fitted with sensitivity control F:

- a Remove front switch panel.

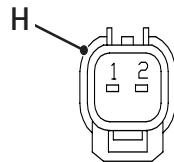
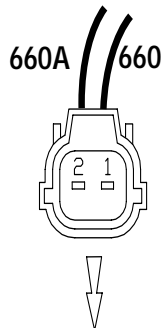


Fig 54.

- b Locate the socket fed by wires 660 and 660A. Remove linking plug H from the socket.

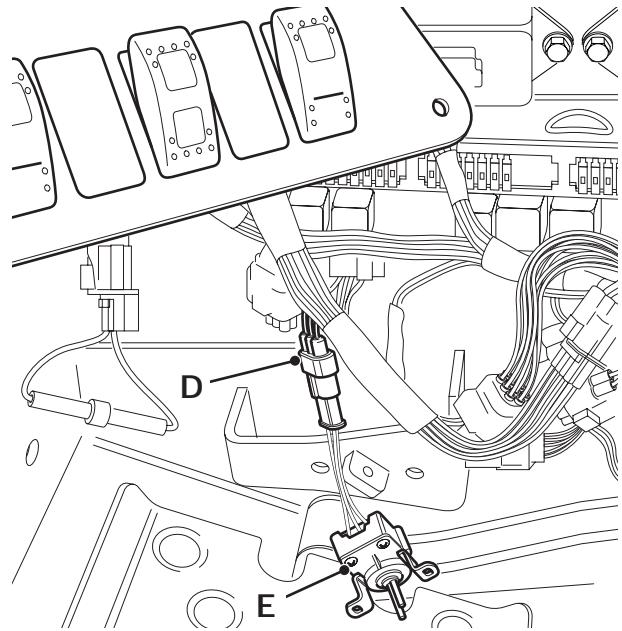


Fig 55.

- c Remove blanking plug from connector D ⇒ Fig 55. (□ E-64) (fed by wire numbers 144B, 509 and 600AH). Connect potentiometer E into the harness as shown. Potentiometer is part number 716/30334. If required, fit knob 331/21736.

- d Turn potentiometer E fully clockwise.

6 On machines fitted with sensitivity control F (standard fitting on High Flow machines), turn control F fully clockwise.

7 On all machines:

Set up a tachometer to read engine speed from either the crankshaft pulley or the fan pulley.

Note: The tachometer reading on the fan pulley will be higher than crankshaft speed ⇒ Table 13. (□ E-65).

8 Press button C, switch on ignition until red light G on instrument panel begins to flash (1 flash per second), ⇒ Fig 53. (□ E-64). Then release button C.

9 Start engine. Gradually increase engine speed until the tachometer shows the speed shown at stage 1 ⇒ Table 13. (□ E-65). Turn potentiometer or control F until pressure gauge reads 10 bar (145 lb/in²).

Start-Up Procedure

The following start-up procedure should always be followed when starting up a new installation or when restarting an installation in which either a pump or motor has been removed from the system.

Note: If a new or rebuilt pump is being fitted always refill the pump with filtered oil prior to start up. Use the correct fluid see **Fluids, Lubricants and Capacities**.

WARNING

The start-up procedure requires the machine to be disabled (wheels raised off the ground, work function disconnected, etc.) while the procedure is carried out.

HYD-8-1

Place the machine safely onto blocks, so that all four wheels are clear of the ground. Ensure that the machine is stable.

WARNING

It is not possible to vent all residual pressure. Loosen the connection one full turn and allow the pressure to dissipate. Keep face and hands well clear of pressurised hydraulic oil and wear protective glasses.

HYD-4-3

WARNING

Fluid Under Pressure

Fine jets of fluid at high pressure can penetrate the skin. Keep face and hands well clear of fluid under pressure and wear protective glasses. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of fluid. If fluid penetrates your skin, get medical help immediately.

INT-3-1-10_2

Fill the hydraulic tank with the correct fluid (see **Fluids, Lubricants and Capacities**) via a 10 micron filter (no by-pass).

Check that the pump inlet line from the hydraulic filter to the pump unit is filled with fluid, by slackening the hose connection at the loader pump.

Bleed air from the pump casing by slackening hose connection at **C** → [Fig 64.](#) ([E-74](#)) until oil flows freely, then retighten the connections.

Install a 0 - 40 bar (0 - 600 lbf/in², 0 - 42 kgf/cm²) pressure gauge in the pressure test point at the hydraulic filter.

Remove the ESOS fuse to prevent the engine from starting. With the Drive Control Lever (in the cab) at Neutral, 'jog' the engine using the starter. The pressure gauge should show a small rise in pressure as the engine turns. If so, replace the ESOS fuse and operate the starter whilst slowly increasing the throttle lever setting until the engine starts and runs at the lowest possible speed.

As air leaves the system, the charge pressure (as indicated on the gauge) should rise to a minimum of 14 bar (203 lbf/in², 14.3 kgf/cm²). If charge pressure is not registered on the gauge, shut-down and determine the cause.

Once charge pressure has been established, operate the drive system 10 times in all directions with the engine at idle then slowly increase the engine speed whilst continuing to operate the system. Finally operate the system in all directions several times with the engine running at maximum speed.

Check the charge pressure at maximum engine speed which should be as specified → [General Data](#) ([E-1](#)).

Stop the engine and remove the gauge. Check the system for leaks and top up the fluid as necessary.

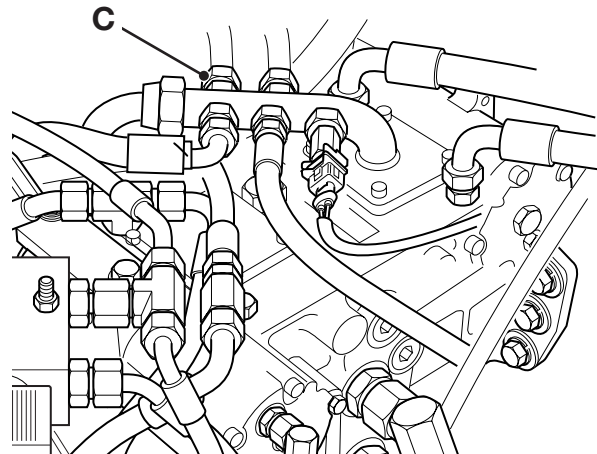


Fig 64.

Motor Bearing Housing

Removal and Replacement

Removal

- 1 Remove the parking brake mechanism from the chain case (see **Section G**).
- 2 Release the drive chains from the sprockets (see **Section F**).
- 3 Remove the seat and seat plate. Remove the pump cover.
- 4 Disconnect the hydraulic hoses from the motors. Plug exposed connections. Remove bolts **A** and withdraw the bearing housing and motor complete.

Ensure mating surfaces of bearing housing and chain case are clean. Lightly lubricate a new 'O' ring with petroleum jelly and fit into the groove in the bearing housing.

After replacement, torque tighten bolts **A** diagonally to 184 Nm (136 lbf ft; 18.8 kgf m). Ensure that washers **B** are fitted concave side towards the bolt head as shown.

Note: Bolts **C** are used for drive chain adjustment (see **Section F**).

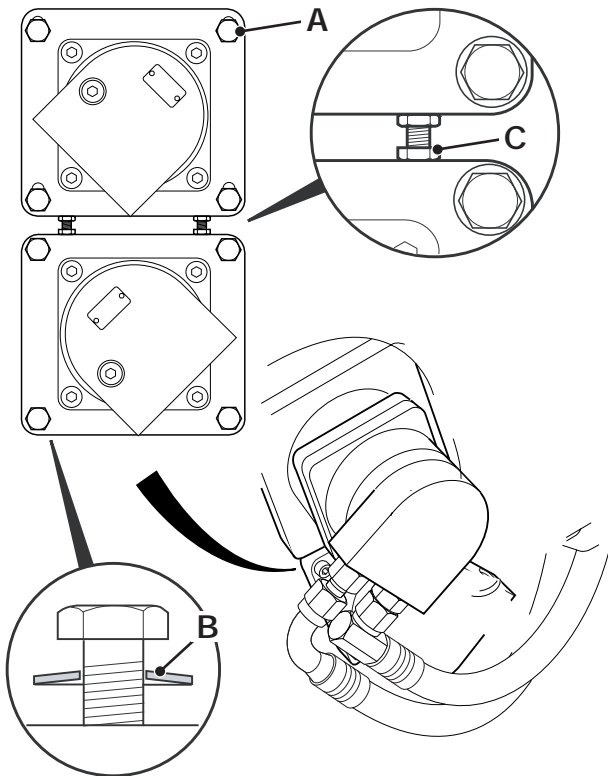


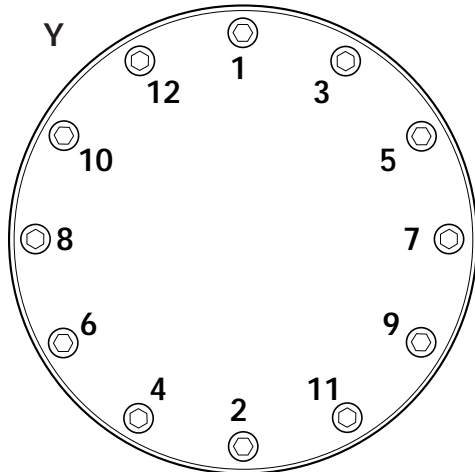
Fig 72.

Replacement

Replacement is the reversal of the removal procedure.

Table 21. Torque Settings

Item	Nm	kgf m	lbf ft
10 (8 off)	70 - 77	7.2 - 7.9	52 - 57
1 (12 off)	35 - 39	3.6 - 4.0	26 - 29



364350

Fig 82.

Motor Dismantling

⇒ [Fig 80.](#) ([E-92](#)).

Remove the brake assembly ⇒ [Dismantling](#) ([E-93](#)).

Withdraw shaft **18**. Inspect bush **19** for wear and remove if necessary using a suitable puller.

Mark the relative positions of the front case **50**, rear case **21** and brake housing **12**.

Remove capscrews **20** and separate the rear case assembly **21** from the sinusoidal cam rotational assembly **24** and set aside in a clean area. Separate the sinusoidal cam rotational assembly from the front case **50**.

Remove and discard 'O' rings **22** and **25**.

Rotating and Rear Casing Assembly

Withdraw the cylinder block **24** from the sinusoidal cam assembly **23**. Remove each piston and roller assembly **26** and **27** from the cylinder block. If difficulty is experienced, apply low pressure air to the ports in the cylinder block. Remove the roller **26** from each piston assembly.

To release distributor **28**, drop the rear case **21** assembly from a height of approximately 8 cm (3 in) onto a wooden surface. Take care not to damage the timing face. Collect the six springs **29**.

Remove stop pin **30** from the rear case. Also remove and discard seal rings **31** to **34**.

Flushing Spool Assembly

Note: If the flushing spool assembly is working correctly it need not be disturbed.

Remove plug **36** from the rear case **21**. Remove spring **38** and washer **39**. Depress spool **40**; this should move freely back and forth.

Remove spool **40** and spring **41**.

Remove plug **42**, spring **44**, together with shim(s) **45**, and flushing relief spool **46**. Check orifice in spool is clear.

Flush the rear case **21** thoroughly.

Front Housing

Using a soft steel drift, remove split ring **47** and washer **48**.

Support the front case on blocks and press shaft **49** out of bearings **51** and **54**. Remove and discard seal **52**.

Remove the cone from bearing **54**. Using a soft steel drift, remove bearing cups **51** and **54** from the front casing.

Remove bearing cone **54** from shaft **49** using a puller. This action may damage the bearing cone, in which case it should be replaced.

Remove and discard shaft seal **53** from front casing **50**.

Reassembling

Thoroughly clean all components. Use new seals and 'O' rings. Lubricate components with engine oil on re-assembly.

Front Housing

Warm outer bearing cone **51** and press onto shaft **49** using a bench press.



Section F - Transmission Wheel Hubs and Drive Shafts

Wheel Hub Assembly (right hand)

Torque tighten nut **A** and bolts **B** to 220 Nm (162 lbf ft, 22.4 kgf m).

Refit cover plate **C** using a new gasket.

Refill the chain case with the correct oil.

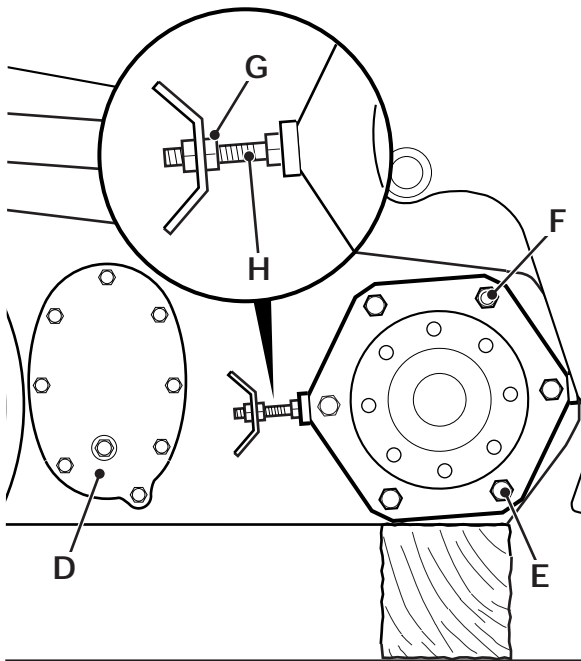


Fig 13.



Section J - Tracks

Contents

Page No.

Outer Track Rubber - Cracks

Cause:

- 1 Bending fatigue of the rubber after excessive use.
- 2 Long storage (a few months) outside in the sunlight.

Prevention:

- 1 Ensure cracks do not reach the metallic components of the track.
- 2 Tracks must be stored indoors or under cover away from the direct sunlight and bad weather.



Fig 16.

Additional Notes:

The track can be used as long as the cracks do not reach the metallic components of the track. When the cracks expose the steel cords, the track must be replaced or repaired.

Outer Track Rubber - Longitudinal Cracks

Cause:

- 1 The edges of the rubber track are often deformed largely due to a bumpy ground surface, stones and other objects, which cause intensive stress on the edges resulting in damage. Especially when a machine drives over concrete pavements, this type of damage easily occurs.

Prevention:

- 1 Operate the machine with care, avoid concrete pavements and big rocks.



430020-V1

Fig 17.

Rear Idler Wheel

Removal

These components can be removed without removing the track frame from the machine.

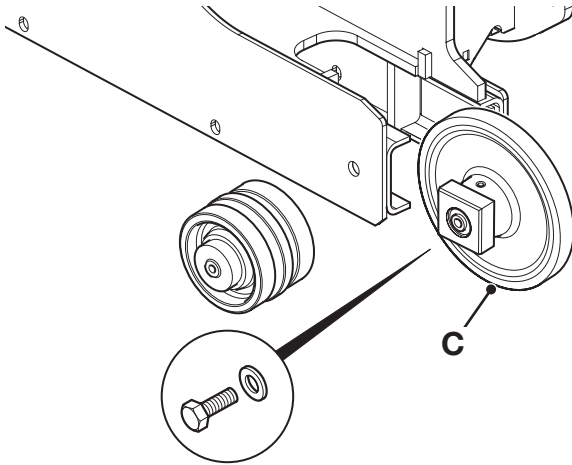


Fig 28.

- 1 Remove track (see → [Removal \(J-15\)](#)).
- 2 Remove securing bolts from each side of idler wheel C.
- 3 Pull rear idler wheel assembly C out of track frame.

Replacement

Replacement is a reversal of the removal procedure.

Apply JCB Threadlocker & Sealer to threads of securing bolts and tighten to 395 Nm (291 lbf ft; 40 kgf m).

Dismantling

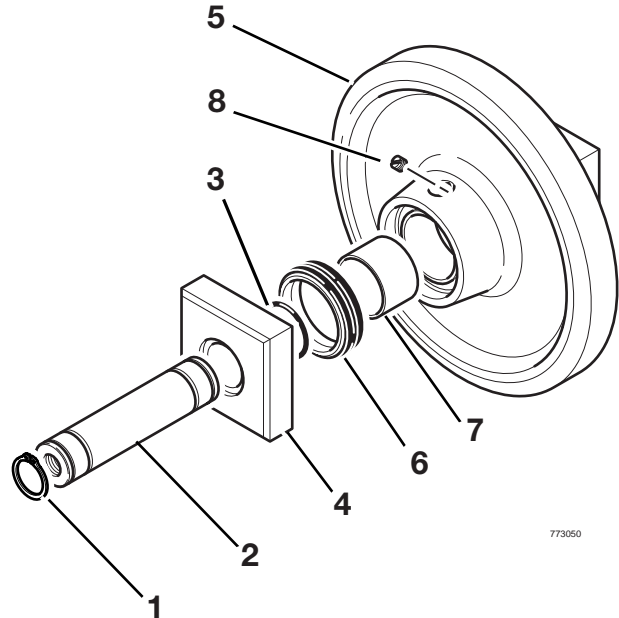


Fig 29.

Clean the assembly thoroughly before attempting to dismantle.

- 1 Remove circlip 1.
- 2 Drift shaft 2 out of the idler wheel assembly. Remove and discard 'O' rings 3.
- 3 Lift off bracket 4.
- 4 Remove idler wheel assembly 5.
- 5 Remove outer portion of metal face seals 6 from the brackets 4 and the inner portions from the idler wheel 5.
- 6 Renew bush 7 as necessary.

Assembly

Assembly is a reversal of the dismantling procedure.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: www.heydownloads.com by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL