Service Manual

Mini CX

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Section 2 - Care & Safety

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Section K - Engine



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Safety Checklist

Safety - Yours and Others

INT-1-3-1_3

All machinery can be hazardous. When a 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.

In this manual and on the machine you will find warning messages. Read and understand them. They tell you of potential hazards and how to avoid them. If you do not fully understand the warning messages, ask your employer or JCB distributor to explain them.

But safety is not just a matter of responding to the warnings. All the time you are working on or with the machine you must be thinking what hazards there might be and how to avoid them.

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

General Safety

T1-007_3

WARNING

Operator Manual

You and others can be injured if you operate or maintain the machine without first studying the Operator Manual. Read the safety instructions before operating the machine. If you do not understand anything, ask your employer or JCB dealer to explain it. Keep the Operator Manual clean and in good condition. Do not operate the machine without an Operator Manual in the cab, or if there is anything on the machine you do not understand.

INT-1-3-2_2

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. Remove rings, watches and personal jewellery.

INT-1-3-6_2

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 while operating the machine or attachments. Be aware of medicines which can cause drowsiness.

INT-1-3-9_2

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Pre Start Cold Checks, Service Points and Fluid Levels

	Operation	10	50	500	1000	2000
ENGINE						
Oil level	- Check	☐	☐	☐	☐	☐
Oil and Filter	- Change			☐	☐	☐
Air Cleaner Element (1)	- Change			☐	☐	☐
Air Cleaner Hose Security	- Check and Adjust			☐	☐	☐
Air Cleaner Dust Valve	- Clean		☐	☐	☐	☐
Coolant Level/Antifreeze Strength	- Check	☐	☐	☐	☐	☐
Coolant	- Change				☐	☐
Fuel Sedimenter	- Drain and Clean		☐	☐	☐	☐
Fuel Filter	- Change			☐	☐	☐
Fuel Lift Pump	- Clean			☐	☐	☐
Fuel System	- Check for Leaks and Contamination	☐	☐	☐	☐	☐
External Oil Leaks	- Check	☐	☐	☐	☐	☐
Fan Belt Tension/Condition	- Check and Adjust			☐	☐	☐
Cylinder Head Nuts	- Check				☐	☐
Valve Clearances(2)	- Check and Adjust				☐	☐
Engine and Pump Mounting Bolts for Tightness	- Check		☐	☐	☐	☐
Radiator Hose Condition	- Check			☐	☐	☐
Radiator and Cooler	- Clean			☐	☐	☐
TRANSMISSION AND AXLES						
Motor Mounting Bolts Security	- Check			☐	☐	☐
Wheel Nut Security	- Check	☐	☐	☐	☐	☐
Rear Axle Mount Security	- Check			☐	☐	☐
Rear Axle Differential Oil Level	- Check				☐	☐
Front Axle Pivot	- Grease		☐	☐	☐	☐
Front Wheel Bearing Play	- Check			☐	☐	☐
Front Axle Pivot Bush Play	- Check			☐	☐	☐
Tyre Pressures/Condition	- Check	☐	☐	☐	☐	☐
HYDRAULICS						
Oil Level	- Check	☐	☐	☐	☐	☐
Oil Filter	- Change				☐	☐
Oil(2)	- Sample/Change					☐
Rams - Piston Rods for Damage or Leaks	- Check	☐	☐	☐	☐	☐
Hoses and Pipework - Damage/Leaks	- Check	☐	☐	☐	☐	☐
Pump drive Coupling	- Inspect/Renew				☐	☐

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Zinc Plated Fasteners and Dacromet Fasteners

Table 2. Torque Settings - UNF Grade 'S' Fasteners

Bolt Size		Hexagon (A/F)	Condition 1			Condition 2		
in.	mm	in.	Nm	kgf m	lbf ft	Nm	kgf m	lbf ft
1/4	6.3	7/16	11.2	1.1	8.3	10.0	1.0	7.4
5/16	7.9	1/2	22.3	2.3	16.4	20.0	2.0	14.7
3/8	9.5	9/16	40.0	4.1	29.5	36.0	3.7	26.5
7/16	11.1	5/8	64.0	6.5	47.2	57.0	5.8	42.0
1/2	12.7	3/4	98.00	10.0	72.3	88.0	9.0	64.9
9/16	14.3	13/16	140.0	14.3	103.2	126.0	12.8	92.9
5/8	15.9	15/16	196.0	20.0	144.6	177.0	18.0	130.5
3/4	19.0	1 1/8	343.0	35.0	253.0	309.0	31.5	227.9
7/8	22.2	1 15/16	547.0	55.8	403.4	492.0	50.2	362.9
1	25.4	1 1/2	814.0	83.0	600.4	732.0	74.6	539.9
1 1/8	31.7	1 7/8	1181.0	120.4	871.1	1063.0	108.4	784.0
1 1/4	38.1	2 1/4	1646.0	167.8	1214.0	1481.0	151.0	1092.3

Table 3. Torque Settings - Metric Grade 8.8 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	5.8	0.6	4.3	5.2	0.5	3.8
M6	6	10	9.9	1.0	7.3	9.0	0.9	6.6
M8	8	13	24.0	2.4	17.7	22.0	2.2	16.2
M10	10	17	47.0	4.8	34.7	43.0	4.4	31.7
M12	12	19	83.0	8.5	61.2	74.0	7.5	54.6
M16	16	24	205.0	20.9	151.2	184.0	18.8	135.7
M20	20	30	400.0	40.8	295.0	360.0	36.7	265.5
M24	24	36	690.0	70.4	508.9	621.0	63.3	458.0
M30	30	46	1372.0	139.9	1011.9	1235.0	125.9	910.9
M36	36	55	2399.0	244.6	1769.4	2159.0	220.0	1592.4

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Circuit Diagrams

Series 1 Machines, JCB (+) pattern controls

Component Key

⇨ *Fig 1. (E-44)*

F	Filter
P1	Main Pump
P2	Charge Pump
P3	Service Gear Pump
M	Drive Motor
S	Suction Strainer
T	Tank
1	Steering Priority Valve
2	Steering Unit
3	Steering Ram
4	Excavator Valve Block
4a	Boom Spool
4b	Slew (Swing) Spool
4c	Stabiliser Spool
4d	Stabiliser Spool
4e	Bucket Spool
4f	Dipper Spool
4g	Boom Ram Head Side ARV
4h	Boom Ram Rod Side ARV
4j	Slew (Swing) ARV
4k	Slew (Swing) ARV
4l	Bucket Ram Head Side ARV
4m	Dipper Ram Rod Side ARV
4n	Dipper Ram Head Side ARV
4p	Main relief Valve (MRV)
5	Loader Valve
5a	Auxiliary Service Spool
5b	Shovel Spool
5c	Lift Spool
5d	Auxiliary Service ARV
5e	Auxiliary Service ARV
5f	Shovel Ram Head Side ARV
5g	Lift Ram Head Side ARV
5h	Lift Ram Rod Side ARV
6	Boom Ram
7	Slew (Swing) Rams
8	Stabiliser Ram
9	Stabiliser Ram
10	Bucket Ram
11	Dipper Ram
12	Auxiliary Service
13	Shovel rams
14	Lift Rams
15	Change-over Solenoid Valve
16	Excavator Auxiliary Valve (optional)
16a	Excavator Auxiliary Spool
16b	Auxiliary Service ARV
16c	Auxiliary Service ARV

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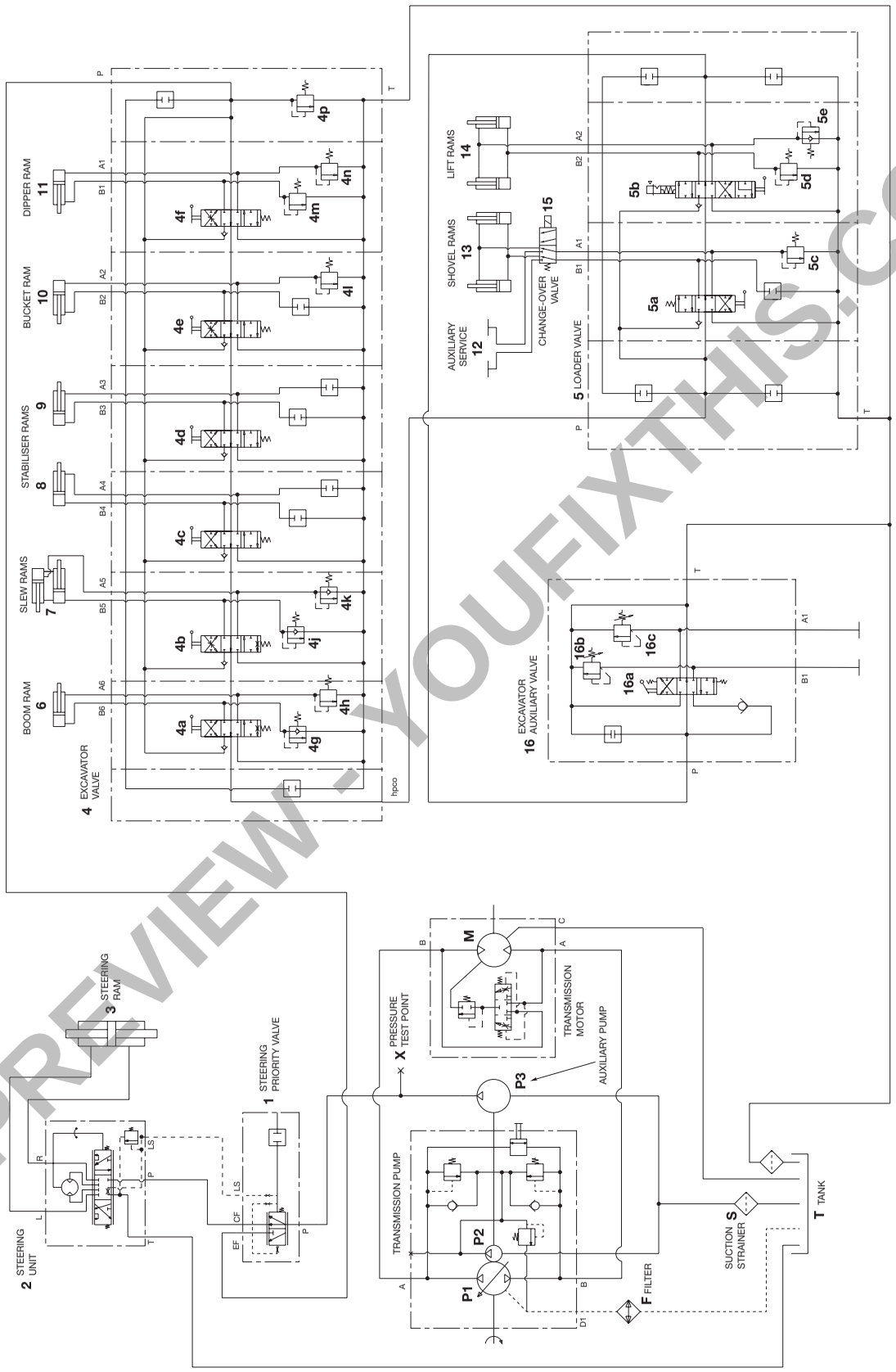
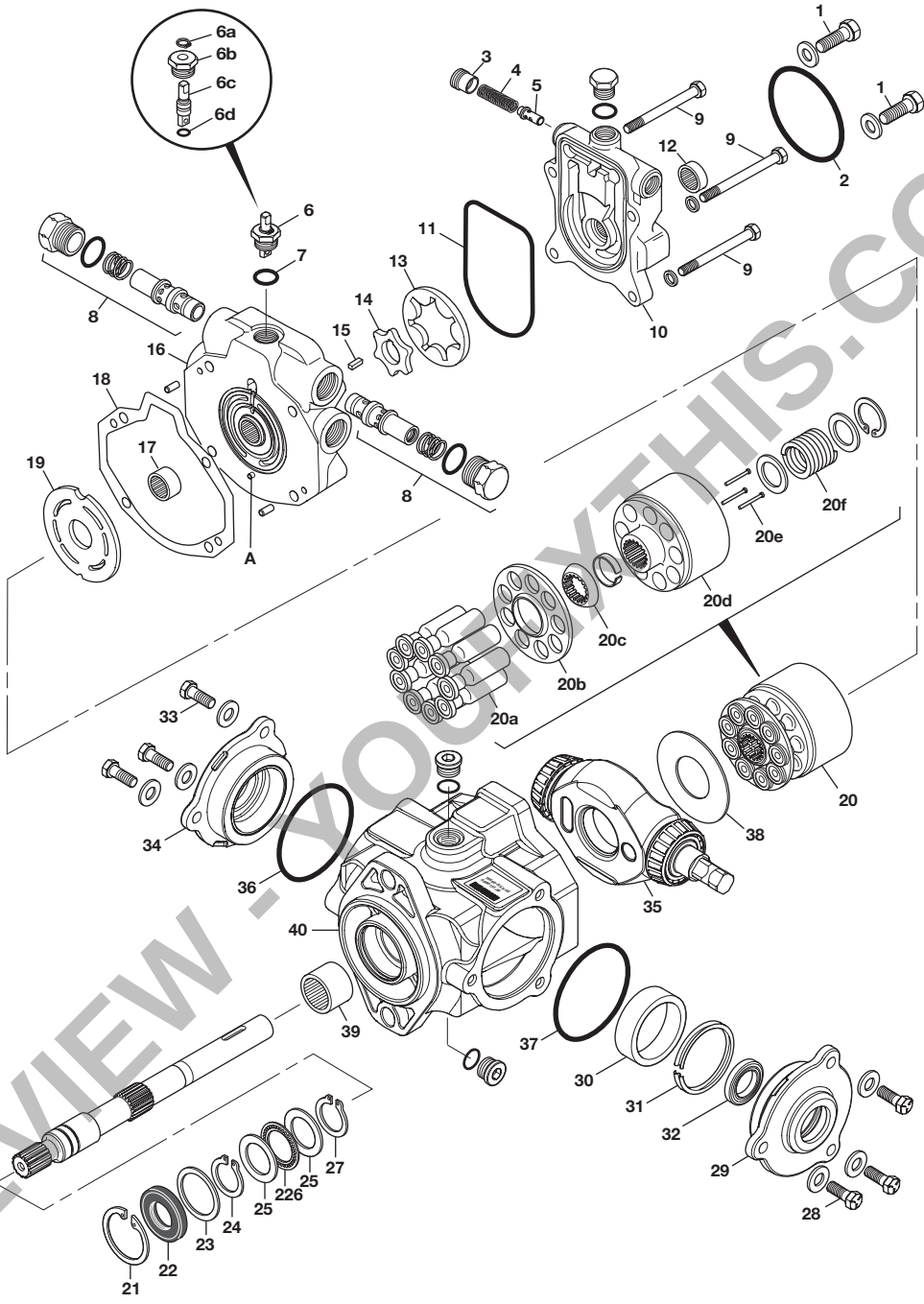


Fig 1. Series 1 Machines, JCB (+) pattern controls

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Transmission Pump - Series 1 Machines



707510-1

Fig 2.

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Problem Solving

Hydrostatic Transmission

The purpose of this section is to help you trace transmission problems to a faulty unit (pump, motor, etc). Once you have traced the faulty unit, refer to the appropriate dismantling, inspecting and test instructions given elsewhere in the manual.

1 Before you begin problem solving, read the Safety Information at the beginning of this manual.

2 Make simple checks before removing and/or stripping a major component.

3 Make sure that the hydraulic fluid is at correct working temperature (50 ºC, 122 ºF).

4 Whatever the fault, check the condition of the hydraulic fluid. Drain and replace if necessary.

5 Be sure to remove ALL contamination and if possible identify its origin. It may be part of a component from elsewhere in the circuit.

PROBLEM	CAUSE - series 1 machines	CAUSE - series 2 machines
No drive in either forward or reverse	1, 2, 6, 9, 10, 11, 12	1, 3, 6, 9, 10, 11, 12, 18, 19
Operates in one direction only	2	3, 6, 18
Poor drive performance, no tractive effort	2, 5, 6, 8, 10	4, 5, 6, 8, 10, 12, 16, 17, 18, 19, 20
Machine creeps in neutral	2, 7	16, 20
Machine will bnot move at idle but moves at max. revs.	2	12, 16, 17, 19, 20
Hydraulic fluid is overheating	1, 4, 13, 14, 15	1, 4, 14, 15

	KEY TO CAUSE	REMEDY	PAGE REF.
1	No oil in hydraulic system or oil level low	Top-up as necessary.	⇨ *Hydraulic System (📄 3-43)*
2	Control linkage set incorrectly or faulty	Adjust, repair or replace linkage as necessary.	
3	No electrical supply to direction solenoids. Solenoids or direction switch faulty	Check electrical circuit. Replace direction switch or solenoids if faulty.	
4	Charge pressure low	Check charge pressure at transmission pump. Clean or replace charge relief valve if faulty.	⇨ *Pump Pressure Test Points - Series 1 Machines (📄 E-65)* or ⇨ *Pump Pressure Test Points - Series 2 Machines (📄 E-66)*
5	No or low pump output	Check pump - carry out motor speed check.	⇨ *Checking Motor Speed - Series 1 Machines (📄 E-63)*
6	Bypass (Tow) valve open/set incorrectly	Check valve has been reset after towing. Replace relief valve and re-check.	

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⚠ WARNING

Electrical Power Cables

You could be electrocuted or badly burned if you get the machine or its attachments too close to electrical power cables.

You are strongly advised to make sure that the safety arrangements on site comply with the local laws and regulations concerning work near electric power lines.

Before you start using the machine, check with your electricity supplier if there are any buried power cables on the site.

There is a minimum clearance required for working beneath overhead power cables. You must obtain details from your local electricity supplier.

2-2-5-4

⚠ CAUTION

If you have an attachment which is not covered in the Operator Manual do not install it, use it or remove it until you have obtained, read and understood the pertinent information. Install attachments only on the machines for which they were designed.

5-5-1-1_2

⚠ WARNING

Use only the JCB approved attachments that are specified for your machine. Operating with non-specified attachments can overload the machine, causing possible damage and machine instability which could result in injury to yourself or others.

The use of non-approved attachments could invalidate your warranty.

2-4-5-2_1

⚠ CAUTION

If you have an attachment which is not covered in the Operator Manual do not install it, use it or remove it until you have obtained, read and understood the pertinent information. Install attachments only on the machines for which they were designed.

5-5-1-1_2

⚠ CAUTION

Fork Spacing

Loads can fall off incorrectly spaced forks. Always space the forks correctly for the load. Make sure the forks are completely under the load before lifting.

5-1-4-2

⚠ CAUTION

One-Fork Lifting

A load lifted on one fork can slip off. Never lift a load with one fork.

5-1-4-3

⚠ CAUTION

Unloading

Never unload the forks by stopping the machine suddenly. Follow the procedures in the Operator Manual for unloading.

5-1-4-4_2

⚠ CAUTION

Uneven Ground

Loads stacked on uneven ground can topple. Never stack loads on uneven ground.

5-1-4-5

⚠ WARNING

Scaffolding

Overloaded scaffolding can collapse. Never load scaffolding beyond the regulation capacity.

5-1-4-6

⚠ CAUTION

Overhead Clearance

A raised mast can strike overhead objects. Always check for overhead clearance before raising the mast.

9-1-3-1

⚠ WARNING

Mast/Travelling

Operating the mast and carriage while travelling can cause accidents. You will not have total control. Never operate the mast and carriage while travelling.

9-1-3-2

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Backhoe and Stabilisers - Mini CX

Switch off the engine and ensure it cannot be started while you are doing this job.

Note: *Grease points **14**, **15, 17** and **22** are on the opposite side of the machine.*

Total 25 grease points.

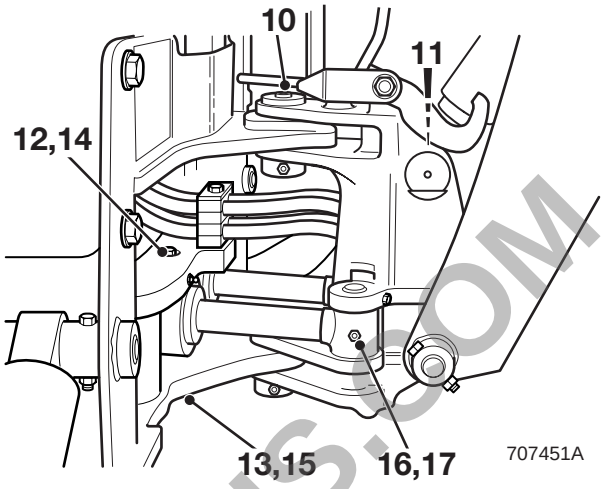


Fig 11. Mini CX

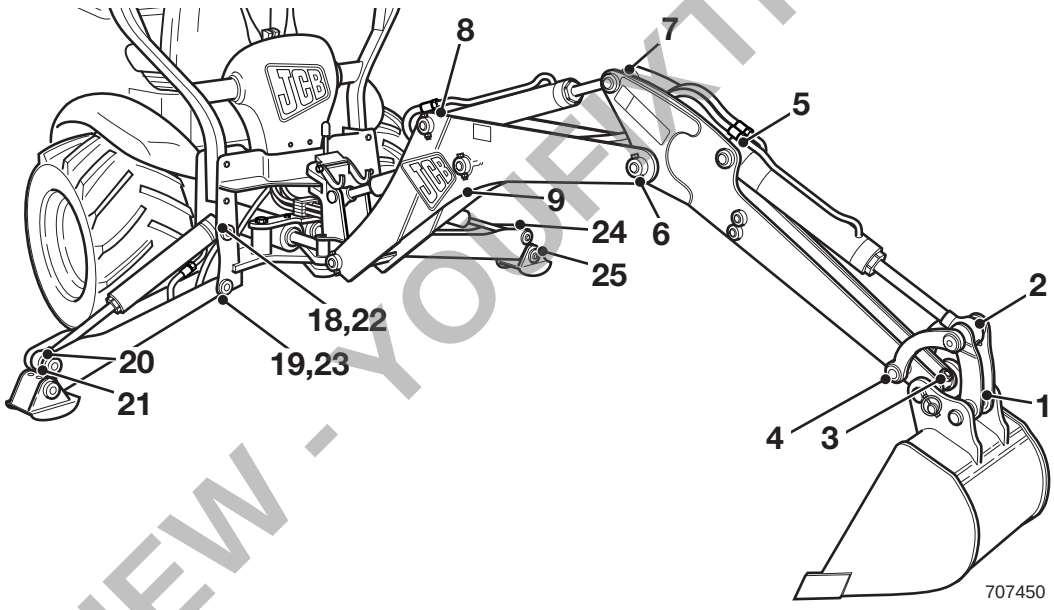
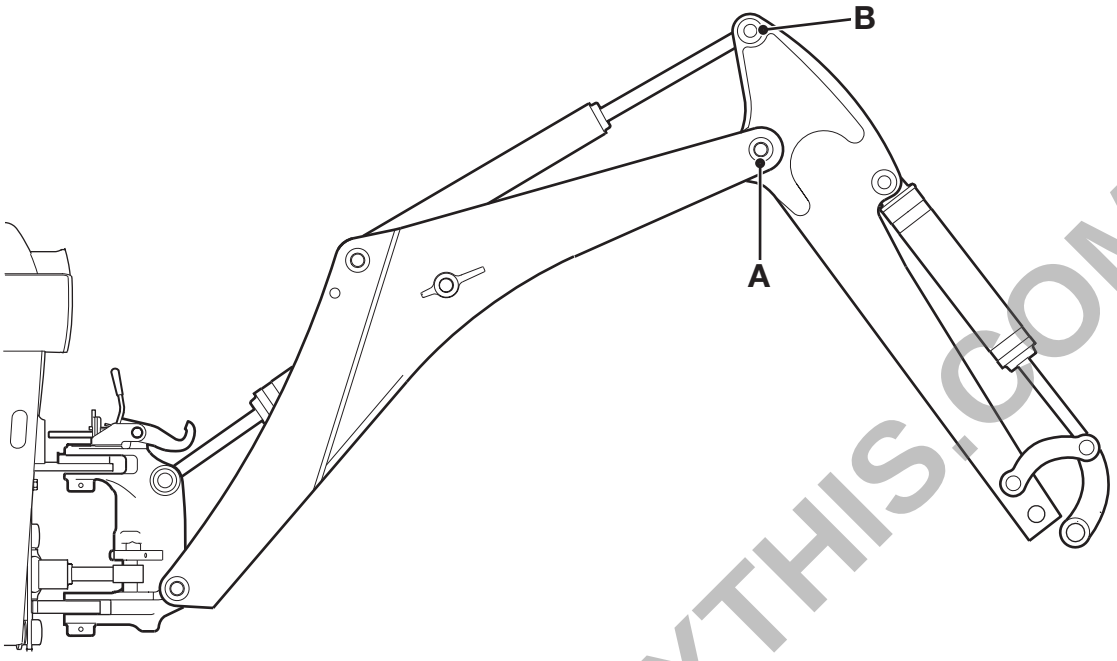


Fig 12. Mini CX

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Fig 1.

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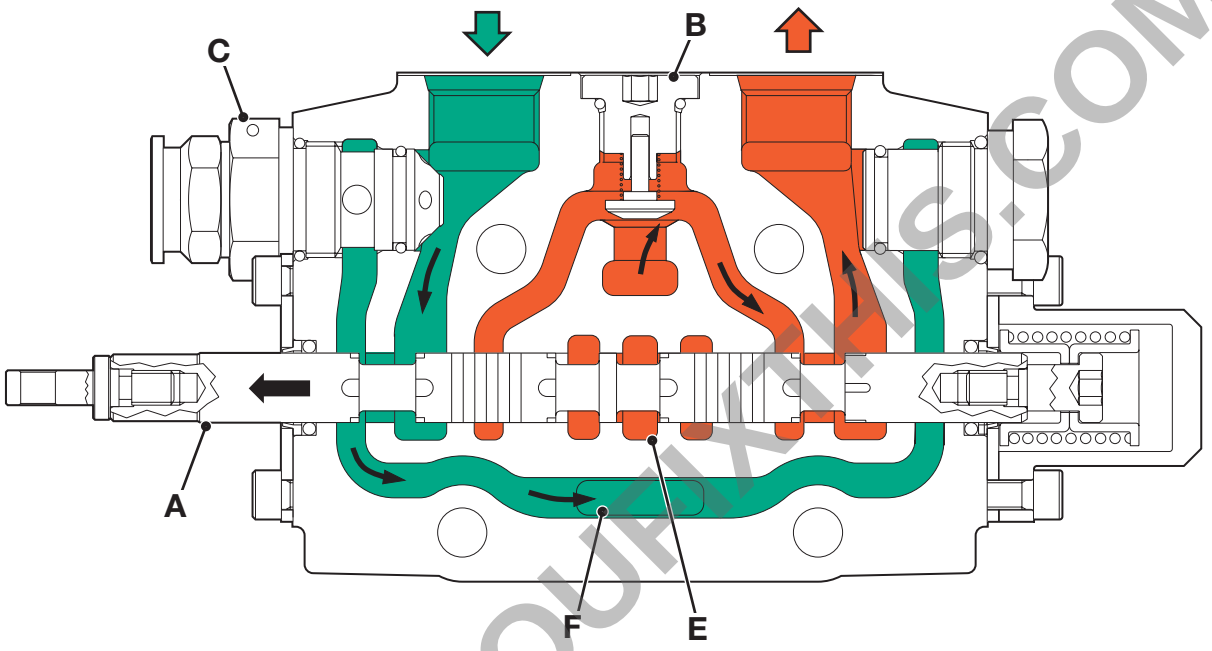
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Spool Closed Selected

The illustration ⇒ *Fig 32. (E-40)* shows the service selected. The spool is moved by the control lever.

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

Oil returning from the opposite end of the tilt ram enters the valve block and flows past spool **A** into the exhaust gallery and back to tank.



707930B-1

Fig 32.

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Transmission Pump - Series 2 Machines

Drive Shaft Oil Seal

Removal

1 Wrap tape around the pump shaft splines to prevent damage to the seal lips.

2 Remove retaining ring **A**.

3 Fit screws into the two rubber lined holes in the shaft seal.

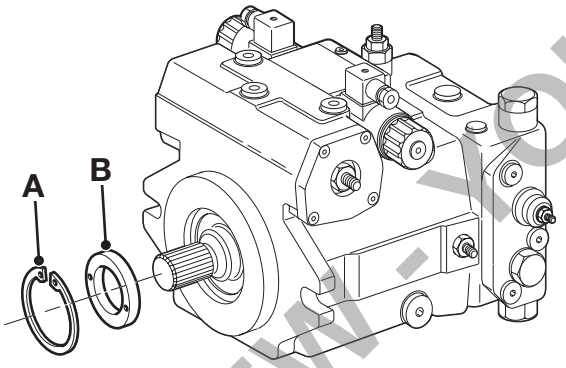
4 4Withdraw the shaft seal **B** using pliers.

Replacement

1 Lightly grease the seal lips, dust seal and the sealing area of the shaft.

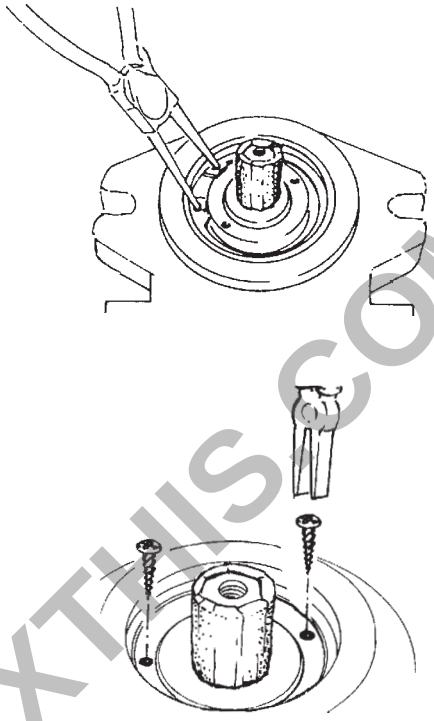
2 Using a suitable bush, press the seal **B** fully into the pump housing.

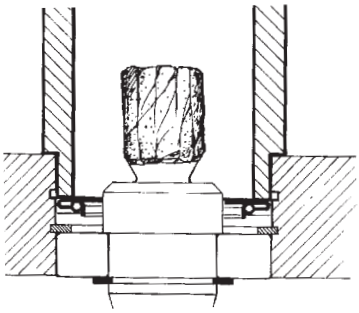
3 Refit retaining ring **A**.



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Fig 8.



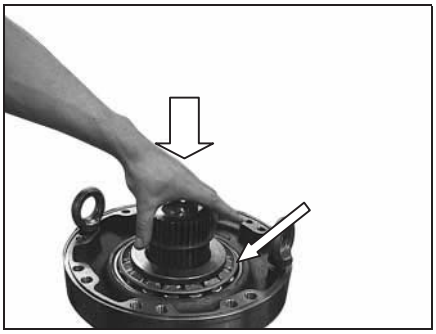


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Fig 9.

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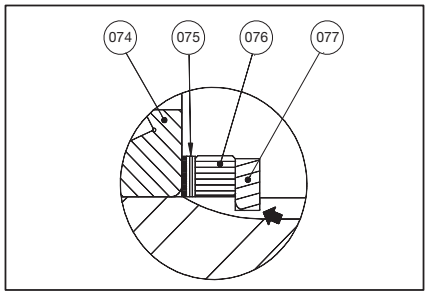
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866050B

Fig 81.

17 Install the thrust ring (076). Whilst applying the press force, install the snap ring (077) with the sharp corner opposite the thrust ring ⇨ *Fig 82. (E-122)*.

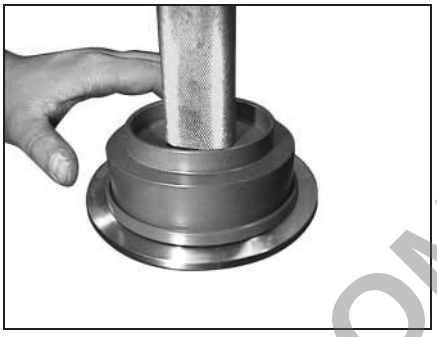


866050C

Fig 82.

Check that it is not possible to turn the thrust ring by hand. Check also that the snap ring outer diameter is not larger than the thrust ring.

18 Install the lip seal on its support using the correct mandrel. Take off the spring to position the seal ⇨ *Fig 83. (E-122)*.



866060A

Fig 83.

19 Visually check the position of the lip seal ⇨ *Fig 84. (E-122)*.



866060B

Fig 84.

20 Coat the external diameter of the seal support with JCB Multigasket ⇨ *Fig 85. (E-122)*.



866060C

Fig 85.

21 Using a mandrel, install the lip seal support into the bearing support ⇨ *Fig 86. (E-123)*.

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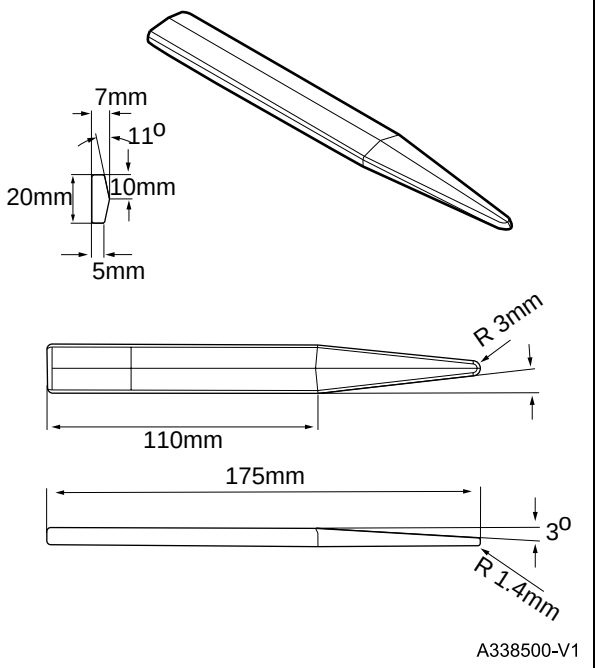


Fig 14. Piston Seal Assembly Tool

892/01027

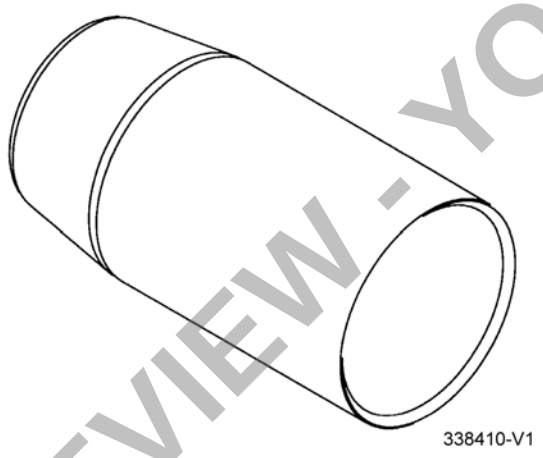


Fig 15. Ram Seal Protection Sleeves

892/01017 For 30 mm Rod Diameter
892/01018 For 40 mm Rod Diameter

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