Open front screen

SERVICE MANUAL

TELESCOPIC HANDLER

520 (Up to SN 270587)

JCB SERVICE ©
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Preface

This volume is published mainly for the benefit of JCB Distributor Service Engineers, but copies are available from JCB Distributors to individual machine users.

The manual is compiled in sections,the first three of which are numbered and contain Care and Safety aspects of workshop procedure, Technical Data and Routine Maintenance. The remaining sections are alphabetically coded and deal with Dismantling, Overhaul etc., of specific components.

For Example:–

B = Body and Framework
E = Hydraulics

All sections are listed on the front cover, the bands of which coincide with divider cards for rapid reference. Each individual section also has its own Contents Page.

Removal, Replacement, Dismantling and Assembly procedures should be carried out in accordance with the sequences shown on the illustrations, paying particular attention to items noted in the text.

Where more detailed information is necessary, this is given in the text in the form of step by step instructions.

Left Hand and Right Hand, where used, are as viewed from the rear of the machine.

Torque Settings in this Publication are given as 'mean' figures and may vary by 3% higher or lower.

Distributor copies of the manual will be continuously updated by the issue of Replacement Pages. These should be inserted at the appropriate place and the existing page (if any) withdrawn and discarded.

Where possible, revised information is indicated by an asterisk (*)against the item concerned, the page issue number in the bottom right hand corner being similarly marked. Where the entire page or illustration has been revised the asterisk will not be used, only the page issue number will be raised.

A publication detailing all the special tools required for the machines is available separately.

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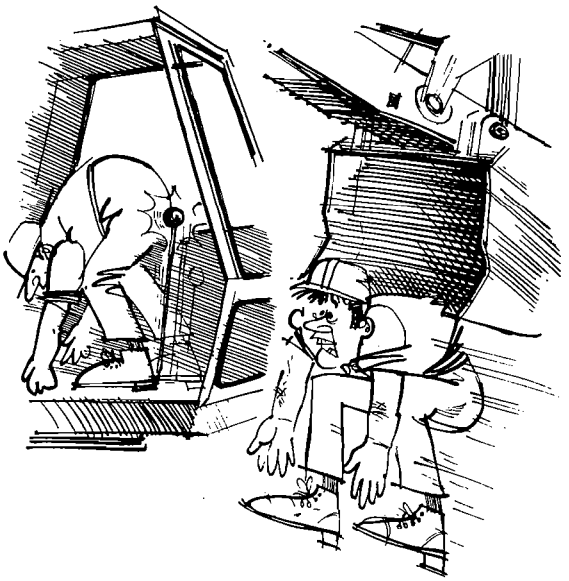
COMPONENT REMOVAL

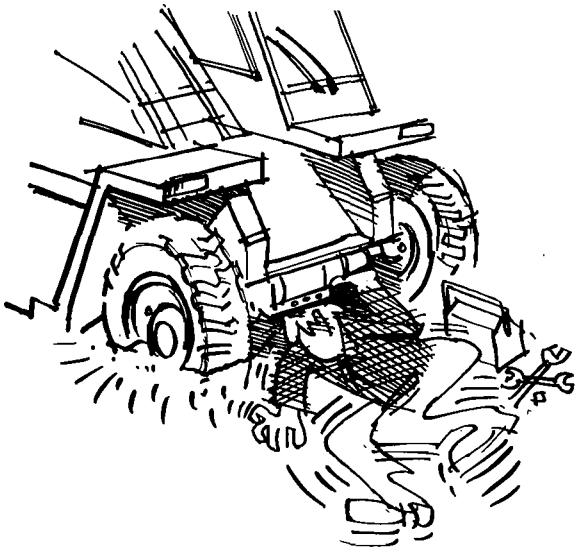
Secure all moving parts of the machine to prevent inadvertent actions by other personnel causing dangerous movement and possible injury.

For example: Always set buckets and shovels on the ground or on adequate supports before work is commenced.



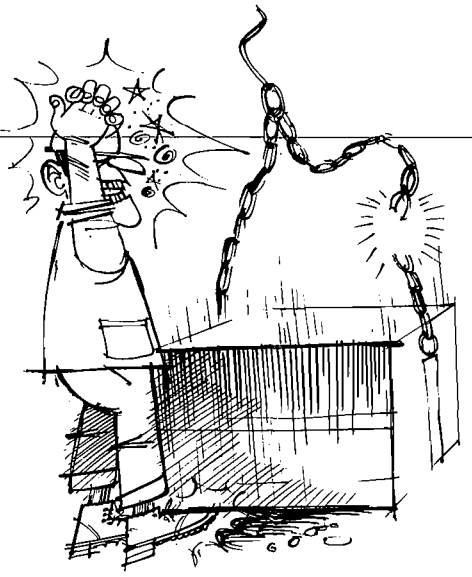
Safety first!

Never work beneath a machine unless it is standing on hard ground,preferably concrete or tarmacadam. If a machine is lifted to improve accessibility, always place substantial supports under the main frame or track frame before work is commenced.

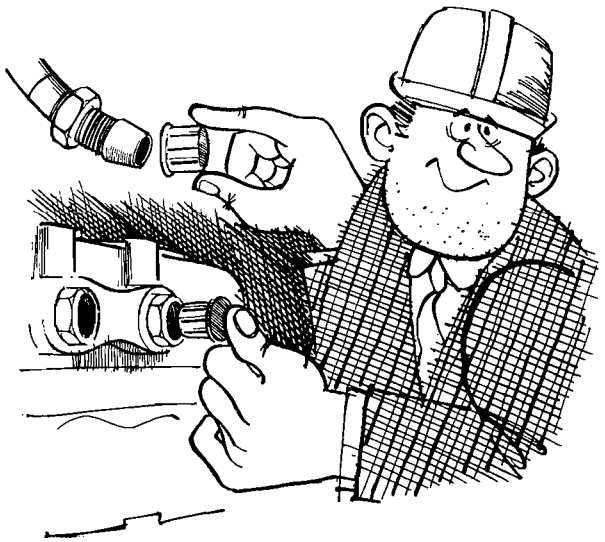


Never take risks!

Always check lifting equipment, slings, chains etc. before components are hoisted. Always use equipment which is adequate for the job in hand.

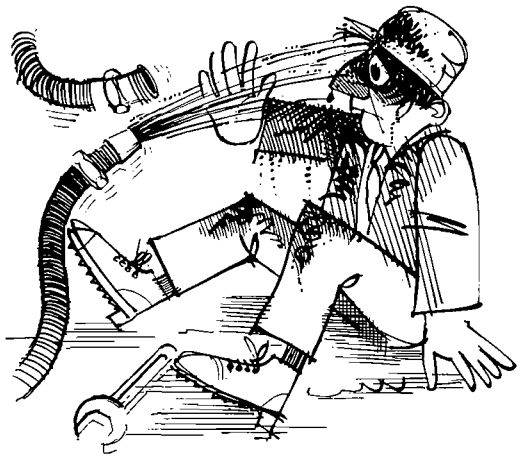


HOSES AND PIPES



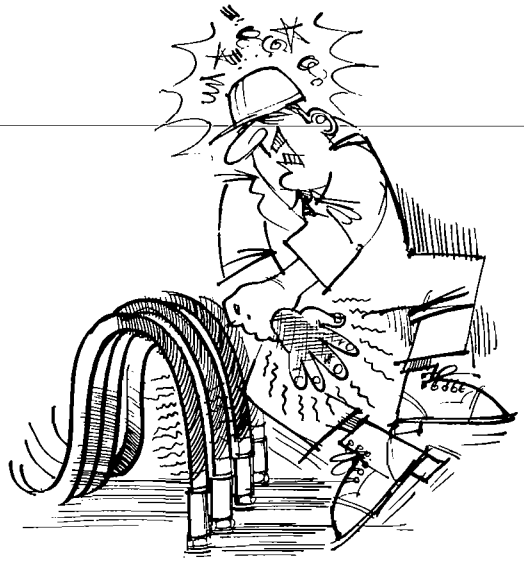
Always fit blanking plugs whenever hoses or pipes are disconnected. Serious damage can occur if dirt or abrasive material enters the hydraulic system.

Dirt...the enemy!



Rest the digging equipment on the ground, stop the engine and operate all control levers to vent any residual pressure from the hydraulic circuit before hoses or pipes are disconnected. This minimises the chance of injury from spurting oil when a connection is loosened.

Hot oil burns!



Test the temperature of adjacent pipework and components with the hand prior to disconnecting a hose or pipe. If the oil is considered too hot for safety, allow sufficient time for it to cool before a connection is loosened.

Renew hoses if any of the following faults are found.

1 End fitting damaged or leaking.

If hose elbows are dented or crushed, oil flow is restricted and the speed at which the service operates will be reduced. Badly crushed elbows can completely block the oil flow and prevent the service from operating.

2 Outer covering chafed or cut and wire reinforcing exposed.

If a hose remains in service in this condition water will seep into the internal wire reinforcing and cause concealed corrosion and consequent weakening of the hose structure. This may not be apparent until the hose subsequently fails.

3 Outer covering ballooning locally.

This is caused by failure of the hose structure which allows hydraulic oil to leak internally. The oil eventually forces its way into the outer layers of the hose's construction and ultimately causes the hose to burst.

4 Evidence of kinking or crushing on flexible part of hose.

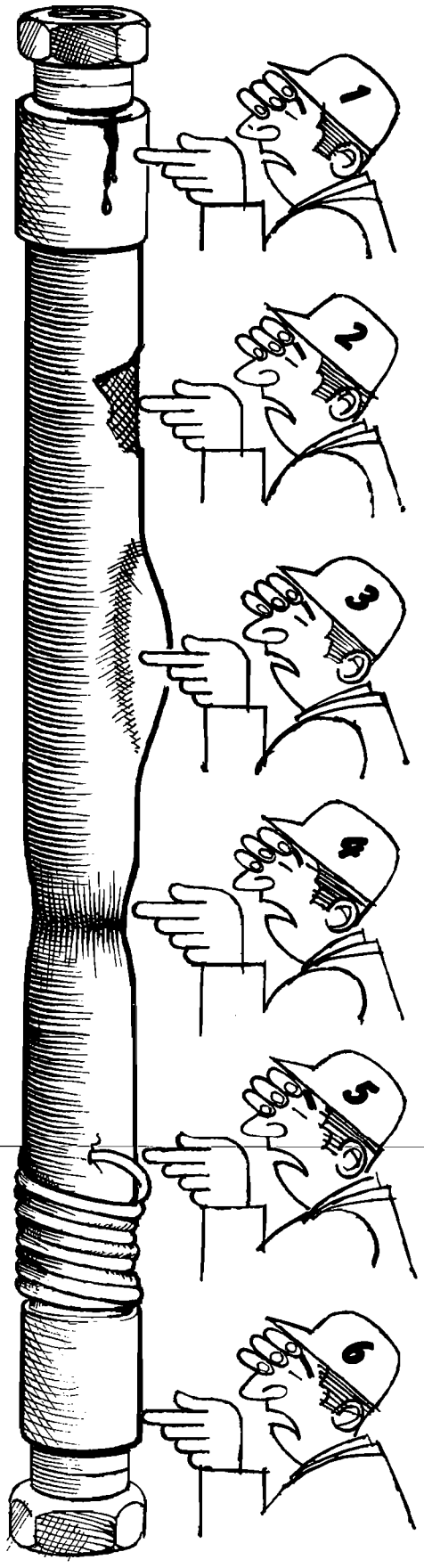
If a hose is deformed past its designed limits, damage to the internal structure is caused. This can result in restriction of oil flow or local weakening of the hose.

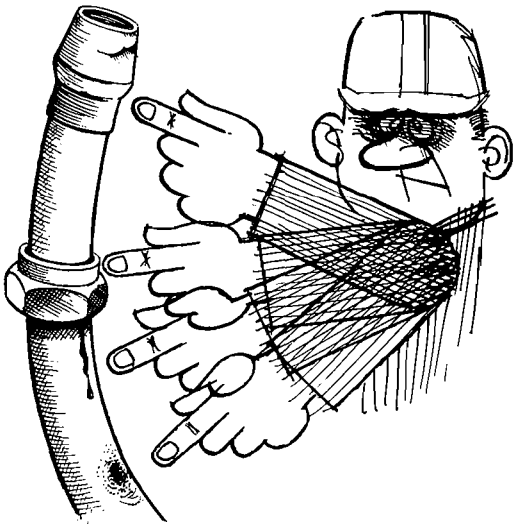
5 Armouring embedded in outer cover.

If armouring is deformed, internal damage similar to that caused by crushing or kinking will almost certainly have occured.

6 End fittings displaced.

If the swaged sleeve of an end fitting appears to have moved from its original position, there is a possibility that partial failure has occured in the area where the sleeve grips the flexible part of the hose. Ultimately the end fitting will pull off.





Renew pipes if any of the following faults are found.

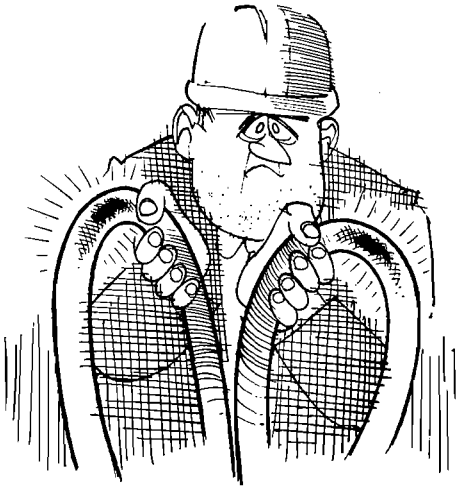
1 Cone damaged or distorted.

2 Thread damaged.

3 End fittings damaged or leaking.

4 Outer surfaces damaged or severely corroded.

Check carefully!

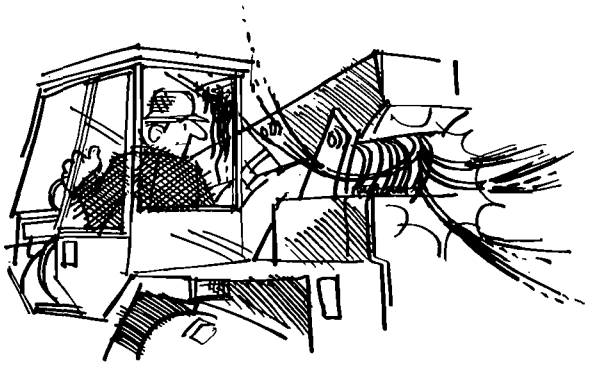


Unsupported hoses or pipes must not touch each other or adjacent components or chafing will be caused.

Good fitting pays!

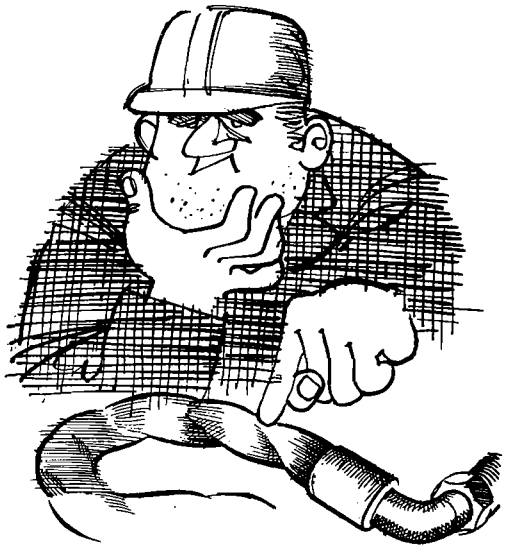
Loosely connect each end, settle the hose or pipe into position and tighten connections Clamps should be tightened sufficiently to retain the hose or pipe without causing crushing.

If a hose is connected to moving components, the components should be moved over the full extent of their travel to check that the hose does not foul as it is bent.



Care!

Hoses must never be twisted when fitting.



DISMANTLING & ASSEMBLY

Thoroughly clean the exterior of all components before dismantling. If dismantling is commenced without removing a component from the machine, cleanliness is doubly important since the service life of a component is drastically reduced if dirt or abrasive matter is not excluded at all times.

Clean it..first!

Sometimes components are dismantled in adverse conditions without workshop facilities being available. If this is necessary, suitable precautions must be taken to prevent dust and dirt settling on internal parts, particularly on oiled surfaces where it will be retained and contaminate any new oil with which a component is filled.

Clean with care!

Select cleaning agents and solvents with care. The following are recommended: Petrol, alcohol, methylated spirits and carbon tetrachloride. All these solvents evaporate at room temperature and do not leave residue.

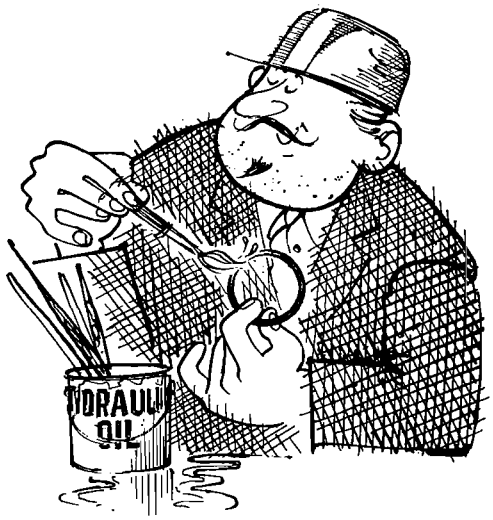
WARNING: Solvent type cleaners are dangerous when used in a confined area. Avoid inhalation of the vapour or contact with the skin. Do not use near a naked flame.

Trichlorethylene or paint thinners must not be used in the presence of seals and 'O' rings because they can severely damage certain types of rubber.

Care!

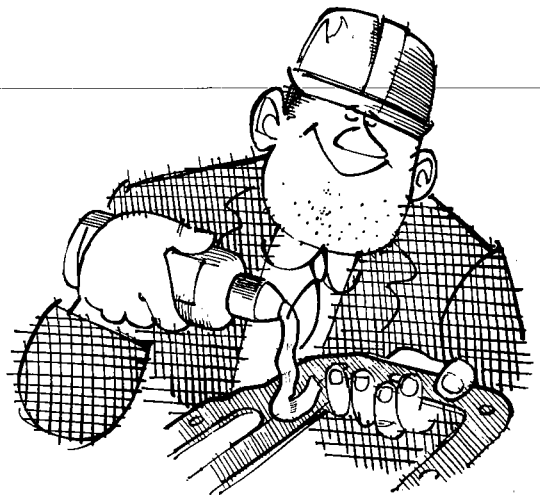
Renew 'O' rings, seals and gaskets, regardless of condition, whenever they are disturbed, unless instructed otherwise.

Lightly coat 'O' rings and gaskets with hydraulic oil before fitting, unless instructed otherwise.



Good sealing pays!

Coat gaskets with a suitable jointing solution before fitting, unless instructed otherwise. Proprietary solutions which are compatible with the various oils used by JCB are given and are referred to where appropriate.

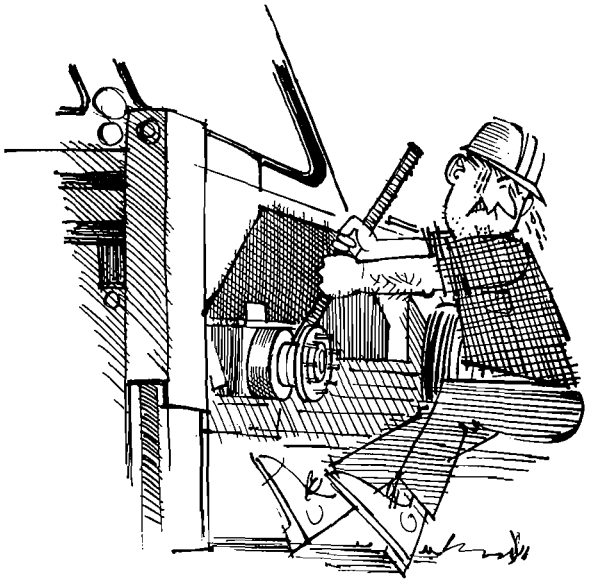


BEARINGS

REMOVAL

Do not remove bearings unless they are to be renewed (see Inspection) or unless unavoidable in a dismantling sequence.

Whenever possible, use a suitable puller or extractor to minimise risk of damage to both the bearing and adjacent parts. Keep bearings with loose rings, balls or rollers as matched assemblies; they are selectively assembled and parts do not interchange from one bearing to another.



Check carefully !

INSPECTION

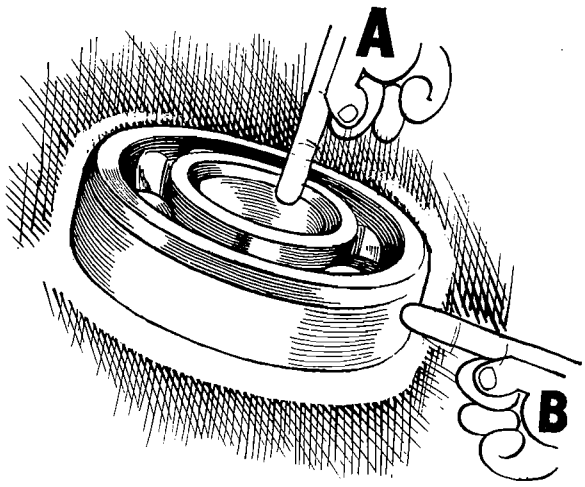
Check that the bearing has had ample lubrication and that the lubricant has not been contaminated.

Check for discoloration and signs of overheating.

Check the bearing for excessive clearance and the cage for wear, cracks and scuffing. If in doubt regarding the clearance, compare this with an identical new bearing.

NOTE. Journal bearings are graded by the internal clearance when new, this is indicated by one, two or three feint circles marked on one ring. Ensure that both bearings are of the same grade when comparing new with old.

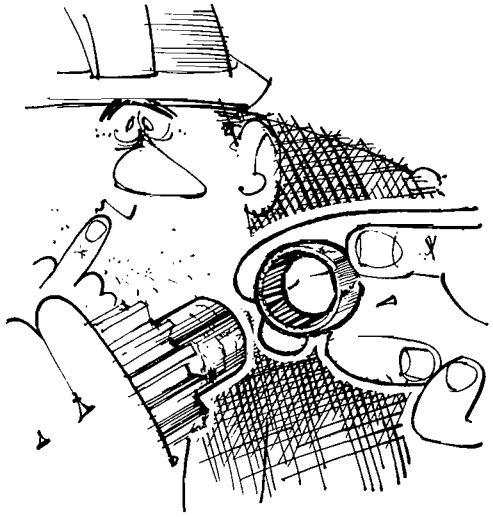
Check the finish of the locating surfaces A & B. They may have been lightly marked on assembly but should not be polished. Polishing indicates that the ring has been turning relative to its seating– this is confirmed if the seating is also polished.



If bearing rings have been turning, the mating parts must be either renewed or built up and machined to their original sizes.

Check the bearing tracks, rollers or balls for surface imperfections.

Check thoroughly!



Renew the needle roller bearings if:–

1 Rollers, cages or rings are damaged.

2 Rollers fall from cage.

3 Rollers can be moved noticeably out of alignment.

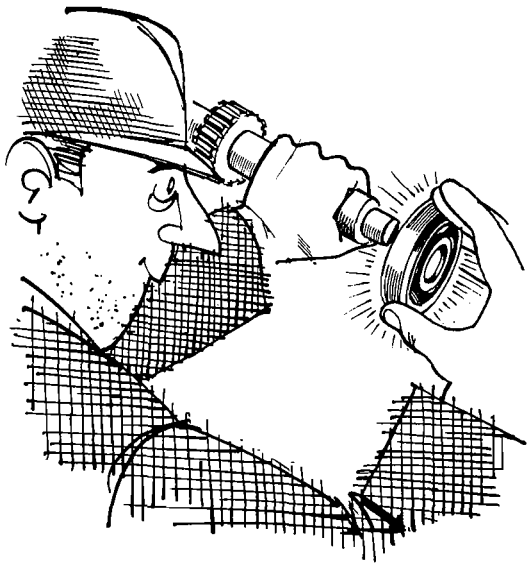
4 The shaft surface is damaged or worn. If this has occured, shaft particles will have entered the bearing and subsequent early failure is almost inevitable.

If in doubt, renew!

If a bearing is judged to be fit for further service, it should be carefully washed in clean solvent and immersed in clean oil for temporary storage.

FITTING

Bearings are normally a press fit on rotating parts and a sliding fit on static components such as housings.
Whenever possible fit the bearing to the rotating part first.

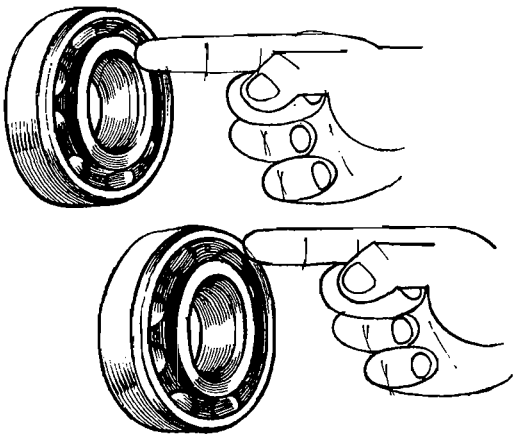


Good fitting pays!

Use a tubular drift or press tool but ensure that it does not contact the ring lip since damage may be caused.

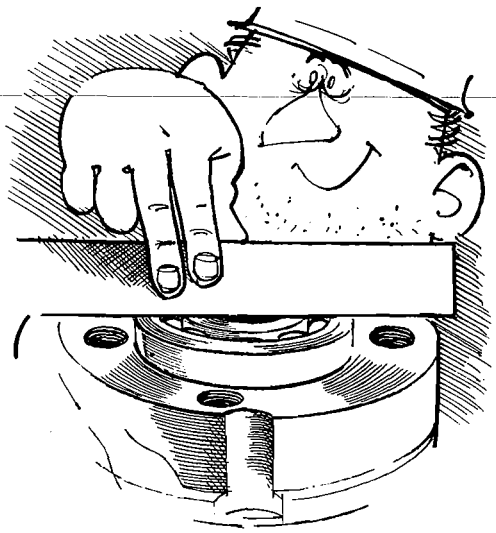
Bearing on shaft—Exert effort against the inner ring.

Bearing in housing—Exert effort against the outer ring.



If a press is not available when fitting large bearings, it is preferable to either heat the bearing in hot oil or to heat the housing rather than use a large hammer and drift.

Care !



Check that the bearing abuts squarely against the locating face.

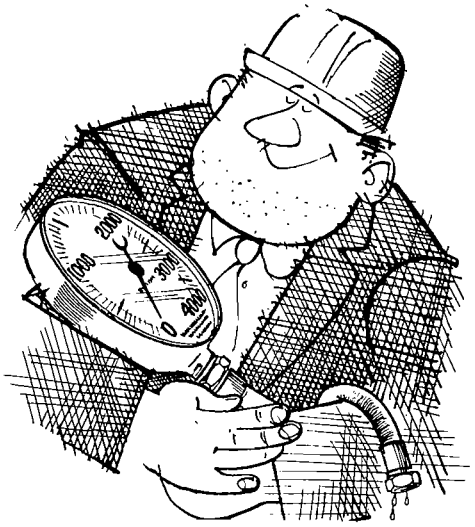
Any peculiarities regarding the fitting of specific bearings are covered in the appropriate assembly sequence.

PRESSURE TESTING

Ensure that there are no leaks from hoses or pipework before pressure testing is carried out.

Readings should be taken using a gauge of adequate pressure range for the test, either liquid filled or fitted with a restrictor or damper.

Before adjusting a valve, unscrew the adjusting screw two or three turns to release any trapped dirt.



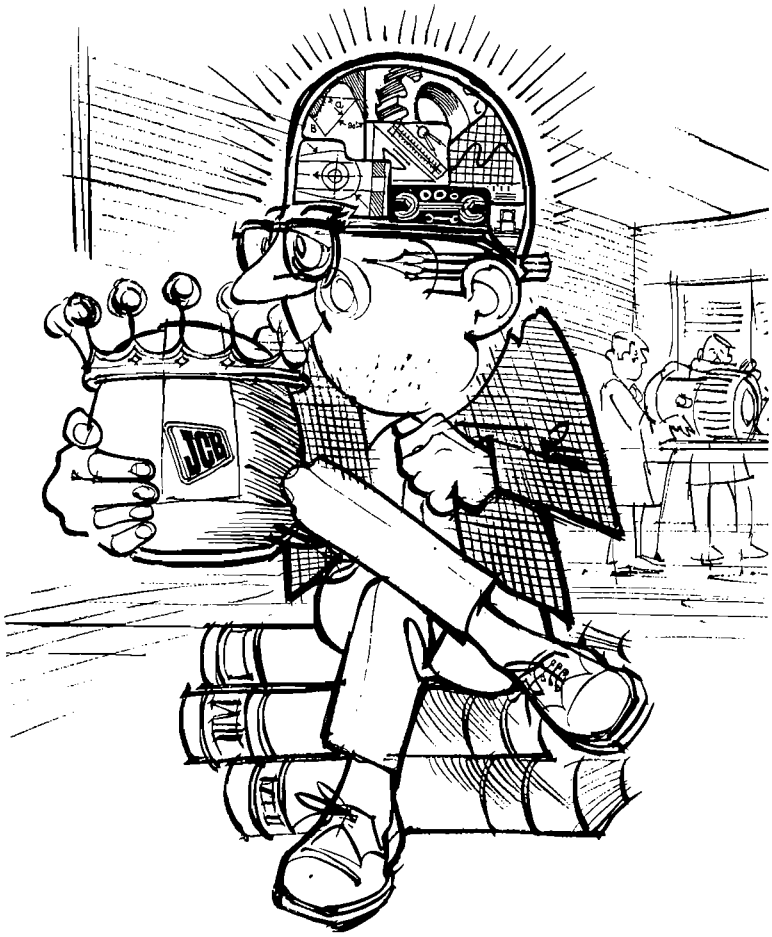
SUCTION STRAINERS

Thoroughly wash suction strainers in petrol or carbon tetrachloride, using a soft brush and air blasting if necessary.

Remove all traces of gummy deposit. It should be possible to see light through the mesh.

TRAINING

Training courses suitable for all grades of personnel are held at regular intervals. Details are readily available from JCB Service.



Contents

Contents

BRAKES

Service Brake

Type	Oil immersed multiplate, mounted in front hubs.
Plate Diameter	254mm. (10in.)
Operation	Direct Hydraulic
Master Cylinder	Girling CB 38.1mm. (1.5in.) bore.
Master Cylinder Pushrod clearance	Minimum of 3mm (0.12in)

Parking Brake

Type	Girling caliper disc mounted on front axle input shaft.
Disc diameter	280mm. (11in.)
Operation	Hand lever and cable

CAPACITIES

Engine Oil	11.1 litres	(2.45 UK gal)
Cooling System	19.3 litres	(4.25 UK gal)
Torque Converter/Powershift	16.7 litres	(3.7 UK gal)
Axle Hub (each)	4.6 litres	(1 UK gal)
Axle Differential	5.1 litres	(1.1 UK gal)
Hydraulic Tank	168 litres	(37 UK gal)
Hydraulic System – 3 spool including tank	209 litres	(46 UK gal)
– 6 spool including tank	215.5 litres	(47.4 UK gal)
Fuel Oil	146 litres	(32 UK gal)

ELECTRICAL

System	Chassis Return, Negative Earth
Battery	12 volt 110 to 135 amp. hr. (according to type)
Alternator	Lucas 18ACR
Starter Motor	Lucas M50
Fuses	Twelve Ceramic – 8 amp continuous
Headlights	45/40 watt UEC (Duplo D), UK 50/40 watt
Reversing Lights	48 watt BPF
Side Lights	5 watt SBC
Stop/Tail Lights	21/5 watt SBC offset pin
*Direction Indicators	21 watt SCC
Warning Lights	2 watt or 2.2 watt MCC
Interior Light	18 watt festoon
Flashing Beacon (optional)	36 watt SBC
Number Plate Light	5 watt SBC
*Rear Fog Lamps	21watt SCC

ENGINE

Type	BLMC 4/98NT Diesel (Non-Balanced)
Swept Volume	3.77 litres ($230in^3$)
Injection Sequence	1, 3, 4, 2
Injection Timing	14^o before top dead centre
Idling Speed	675–725 rev/min
Max. No. load Speed	2130–2150 rev/min.
Oil Pressure (hot)	2.5–4.2 kgf/cm^2 (35–60 lbf/in^2) at 2000 rev/min.
Oil Pressure Switch Operates at	0.6–0.9 kgf/cm^2 (9–13 lbf/in^2)
Water Temperature Switch Operates at	$93–99^oC$
Valve Clearance (hot or cold)	0.33mm. (0.013in.)

NOTE: For full details, refer to Engine Service Manual (publication no. 9803/1200).

HYDRAULICS

Pump	Hamworthy PA1911 R20 B2A, gear type
Max. flow at system pressure and 2000 rev/min.	88 litres/min. (19.5 UK gal/min)
Control Valve	Hamworthy VB1107 series, parallel service
Spool Type	Double-acting, spring centred
Filtration	
–Suction Strainer	142 micron
–Full-flow Filter	18 micron

Relief Valve Operating Pressures

	Bar	Kgf/cm^2	lbf/in^2
Main Relief Valve (M.R.V.)	138	141	2000
Auxiliary Relief Valves (A.R.V.)			
–Tilt Ram Head Side	138	141	2000
–Tilt Ram Rod Side	83	84	1200
–4th Spool (when fitted)	103	105	1500

Note: Refer to Section E for A.R.V. setting pressures.

***Rams**

	Bore		Rod Dia.	
	mm.	in.	mm.	in.
Boom Extension	101	4	63	2.5
Boom Lift	101	4	63	2.5
Tilt	101	4	51	2.0
Compensating	101	4	51	2.0
Side Tilt (optional)	70	2.75	38	1.5
Multi-Hitch Carrier (optional)	101	4	51	2.0
Mast Lift (optional)	101	4	51	2.0

STEERING

System Type	Full power hydrostatic
Pump	Dowty IP3060, gear type (in tandem with transmission charging pump).
Flow Rate (controlled flow)	16.4 to 19 litres/min. (3.6 to 4.2 UK gal/min).
Relief Valve Type	Dowty 7624 (in pump rear cover)
Relief Valve Setting	121 bar (123 kgf/cm^2 or 1750 lbf/in^2)
Control Unit	Danfoss Orbitrol
Ram	70mm. (2.75in.) bore; 38mm. (1.5in.) rod dia.
Toe-in	1.57mm. (0.062mm)

TRANSMISSION

Torque Converter/Powershift

Type	Brockhouse DR44 Torque Converter & Gearbox with hydraulically actuated multiplate clutches.
Control System	Solenoid Valves, 12 volt
*Ratios	
—Torque Multiplication at stall	2.8 : 1
—1st	4.58 : 1
—2nd	2.77 : 1
—3rd	1.51 : 1
—4th	0.91 : 1
Maximum Travel Speed	22 km/h (14 mile/h)
Charging Pump	Dowty IP3072 (in tandem with steering pump)
Flow Rate at 2000 rev/min.	43.5 litres/min. (9.6 UK gal/min)
Converter Out Temperature	82–93°C (180–200°F)
Oil Temperature Switch Operates at	103–107°C (217–225°F)
Filtration	Suction Strainer 125 micron Full Flow Filter 15 micron

*Working Pressures	Bar	kgf/cm^2	lbf/in^2
—Converter Inlet	3.5–5.5	3.5–5.6	50–80
—Converter Out	2.4–3.1	2.5–3.1	35–45
—Lubrication	0.7–2.4	0.7–2.5	10–35
—Range Clutches	15.9–19.3	16.2–19.7	230–280
—Ratio/Direction Clutches	8.3–9.7	8.5–10.0	120–140
—Safety Valve	4.8–5.5	4.9–5.6	70–80

Driving Axle

Type	Bevel hypoid with epicyclic hub reduction
Ratios	
—Differential	2.82 : 1
—Hub	6.50 : 1

NOTE: A NoSPIN differential may be fitted as optional equipment.

TYRES

Front	Bar	kgf/cm^2	lbf/in^2
14.5 x 20–10 ply	2.5	2.53	36
16/70 x 20–10 ply	3.25	3.3	47
Rear			
9.00 x 16–10 ply (See Note below)	5.15	5.3	75
10.5/80 x 18–10 ply	4.6	4.7	67
12.0/75 x 18–12 ply	2.75	2.8	40
12.5/80 x 18–8 ply	3.25	3.3	47
13.0/65 x 18–10 or 12 ply	2.75	2.8	40

Note: The pressure quoted for 9.00 x 16–10 ply applies ONLY to Dunlop EM5 or Firestone Dumper tyres fitted to the 6.50 H x 16 rim. (See Management Information 121/H, 70/E).

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 No.	(mm)	Hexagon 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