27 - Maintenance Positions

Introduction 01-12
Health and Safety 01-13

Introduction

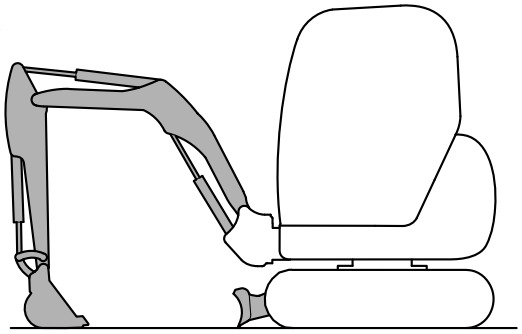
Make the machine safe before you start a maintenance procedure. Unless a maintenance procedure instructs you differently, you must lower the excavator arm.

The machine has a cab tilt feature. This feature must only be used by trained personnel. Refer to the cab tilt procedure (PIL 09-00).

Excavator Arm Lowered

1. Park the machine on solid, level ground.
   1.1. Release the two track levers.
   1.2. Push the hand throttle lever to the idle position.
2. Lower the dozer. Refer to Figure 2.
3. Lower the excavator arm so the attachment is flat on the ground. Refer to Figure 2.

Figure 2.



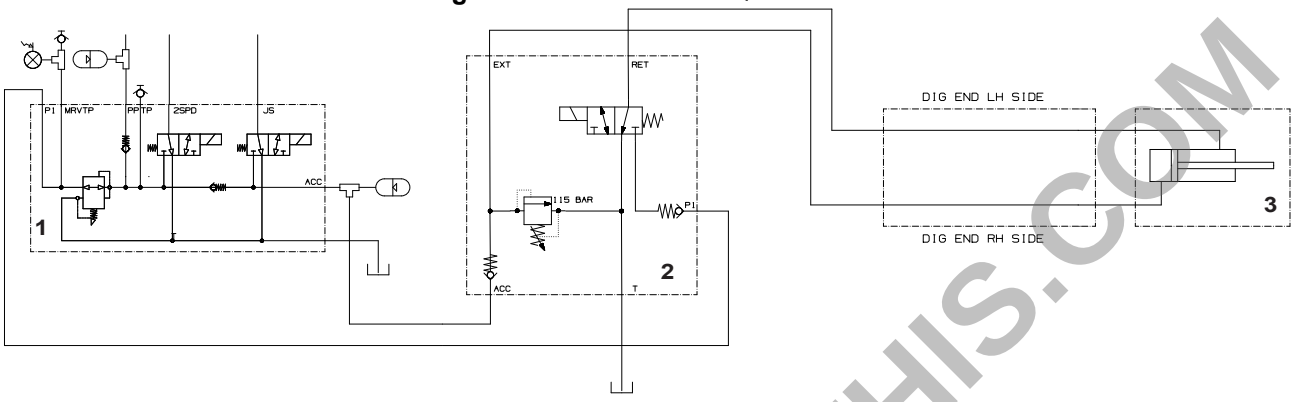
4. Stop the engine.
5. Discharge the hydraulic pressure. Refer to (PIL 30-00).
6. Isolate the controls.
7. Disconnect the battery to prevent accidental operation of the engine. Refer to (PIL 33-03).

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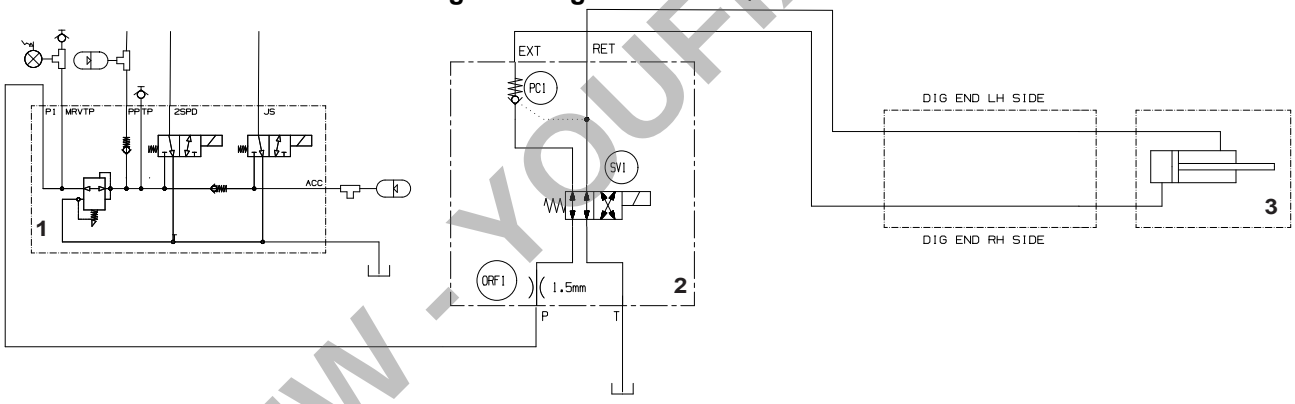
Diagram

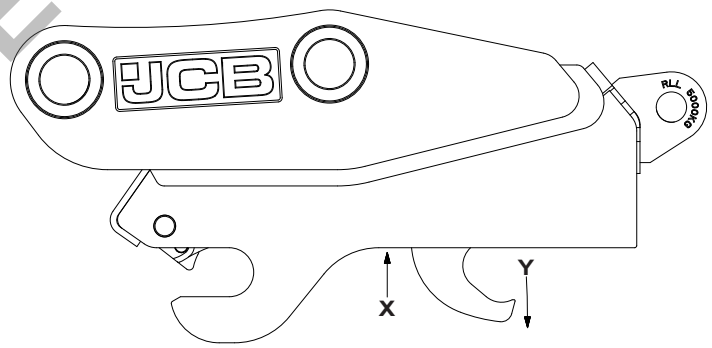
Figure 6. Low Pressure Quickhitch



1 PMV (Pressure Maintenance Valve)
2 Quickhitch valve
3 Quickhitch

Figure 7. High Pressure Quickhitch





1 PMV
2 Quickhitch valve
3 Quickhitch
X Retract
Y Extend

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Remove and Install

Special Tools

Description	Part No.	Qty.
Slide Hammer Kit	993/68100	1

Consumables

Description	Part No.	Size
Special MPL-EP Grease	4003/1501	0.4kg
	4003/1506	12.5kg
	4003/1510	50kg

⚠ **WARNING** A raised and badly supported machine can fall on you. Position the machine on a firm, level surface before raising one end. Ensure the other end is securely chocked. Do not rely solely on the machine hydraulics or jacks to support the machine when working under it. Disconnect the battery, to prevent the engine being started while you are beneath the machine.

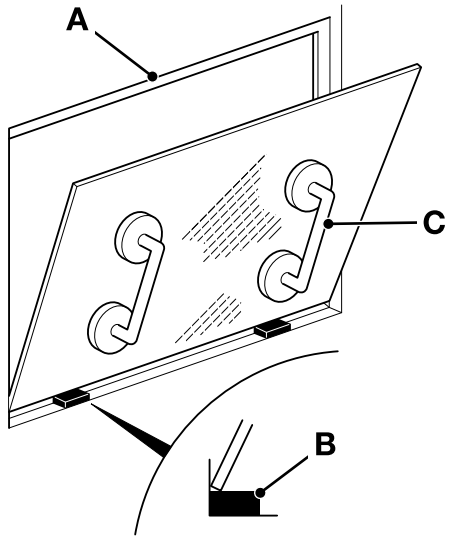
Remove

1. Make the machine safe with the excavator arm lowered. Refer to (PIL 01-03).
2. Remove the hydraulic pressure from the system. Refer to (PIL 30-00).
3. Remove the bucket. Refer to (PIL 03-27).
4. Remove the self-locking nuts and bolts from the pivot pins. Refer to Figure 15.
5. Remove the circlip. Refer to Figure 15.
6. Support the bucket and ram links.
7. Use a slide hammer to drive out the bucket link pivot pin. Refer to (PIL 06-30). Refer to Figure 15.
8. Remove the bucket link. Refer to Figure 15.
9. Use a slide hammer to drive out the ram pivot pin. Refer to Figure 15.
10. Retract the bucket ram clear of the tipping link. Refer to Figure 15.
11. Use a slide hammer to drive out the tipping link pivot pin. Refer to Figure 15.
12. Remove the tipping link. Refer to Figure 15.
13. Clean all the links and pivot pins.
    Special Tool: Slide Hammer Kit (Qty.: 1)
14. Check all the link bushes and the pivot pins for wear or damage. Replace as necessary. Refer to Technical Data (PIL 06-15)

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Figure 28.

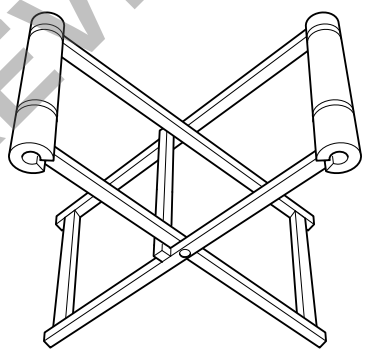


A Frame aperture
B Spacer blocks
C Glass lifters

2. After checking for size, remove the new glass and place it on a purpose made glass stand. Small panes of glass will need locating on a 600 x 700 mm x 15 to 19 mm thick plywood board, sourced locally to fit the glass stand. It is recommended that an access hole is cut in the board to accommodate the glass lifter, making it easier and safer to handle small panes of glass. The board should be covered with felt or carpet to give an anti-scratch surface. Resting the glass on four spacer blocks will ensure clearance of the cartridge nozzle tip during application of the polyurethane sealant.

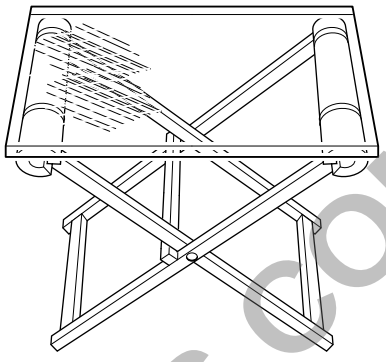
   Special Tool: Rubber Spacer Blocks (Qty.: 4)
   Special Tool: Folding Stand (Qty.: 1)

Figure 29.



3. Make sure the glass is positioned on the stand the correct way up (i.e. with the black ceramic ink band upwards) ready for application of primer etc.

Figure 30.



4. Clean the glass.

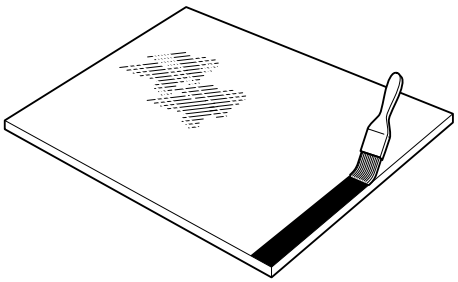
   4.1. Use surface cleaner to thoroughly clean and prime the black ceramic ink band printed on the glass (see Note). Use a lint free cloth to apply the cleaner, allow to dry. Important: Do not touch the glass after cleaning with the surface cleaner.

   Duration: 5min
   Consumable: Surface Cleaning Fluid

   4.2. If the glass does not have a black ceramic ink band, paint a band on the glass using Black Primer. Make sure that the band measures the correct width and that the edge is a neat straight line.

   Dimension: 25mm
   Consumable: Black Primer/Activator

Figure 31.



5. Install the Ultra Fast Adhesive cartridge into a suitable applicator gun:

   Special Tool: Static Oven (240V) (Qty.: 1)
   Special Tool: Mobile Oven (12V) (Qty.: 1)
   Special Tool: Cartridge Gun (Qty.: 1)
   Consumable: Polyurethane Adhesive

   5.1. Remove the aluminium disc cover from the base of the cartridge and discard the dessicant capsule.

   5.2. Make sure that the rolled edge of the cartridge is not damaged - if necessary, the

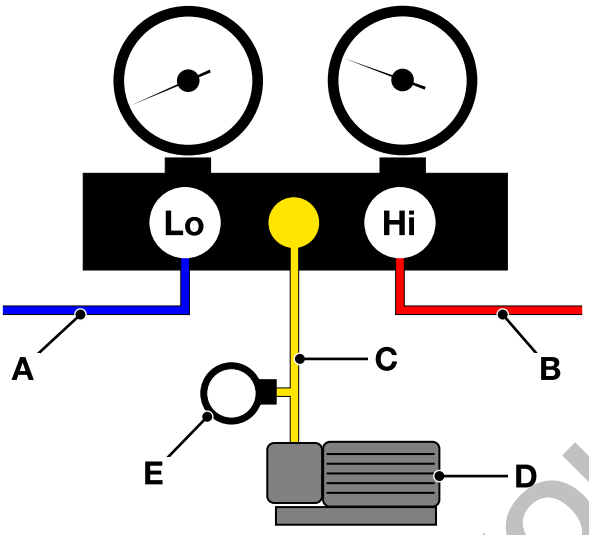
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Maximum gauge reading will be 25mm (1 in) less for every 305 metres (1000 feet) above sea level.

6. Maintain suction for approximately 30 minutes. Note: If the vacuum falls rapidly the system is leaking. Check all connections and reseal. If the point of leakage is not obvious, recharge the system and test again.

7. Close the valves and remove all equipment.

Figure 57.



A Low pressure hose (blue)
B High pressure hose (red)
C Hose (yellow)
D Vacuum pump
E Electronic vacuum gauge

Re-lubricate

Pre-lubrication is essential after recovering the system refrigerant, vacuuming and component flushing. The system should be evacuated to a vacuum of 740mm (29 in) of mercury before re-lubricating.

1. Make sure that the engine is OFF and the engine is cool.

2. Remove the starter key.

3. Close all valves and connect the manifold as shown, with the blue hose connected to the oil injector and the red hose to the system high pressure port.

4. Connect the yellow hose to the vacuum pump.

5. Connect the other end of the oil injector to the system low pressure point.

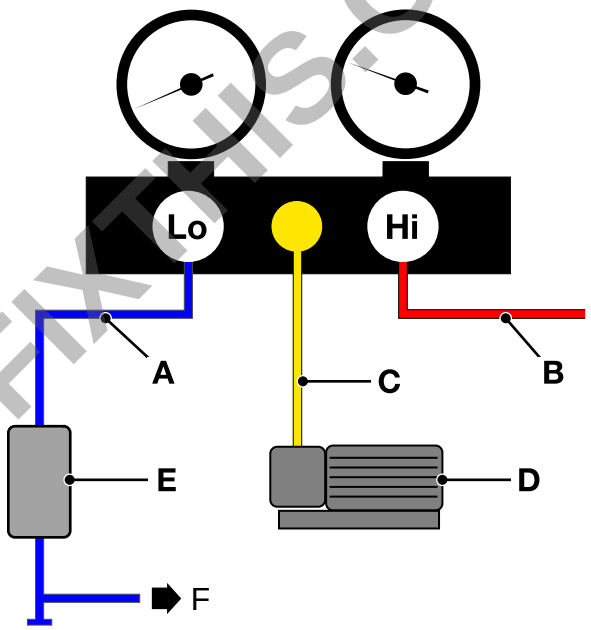
6. Switch on the vacuum pump and open the high pressure side valve.

7. Unscrew the oil injector cap and add the specified quantity of refrigerant oil.

8. When 740mm (29 in) mercury shows on the vacuum gauge, open the oil injector valve to allow the oil into the system.

9. If more oil is needed repeat the above procedure. The quantity of oil should be the same as that taken out during the Recovery procedure. Note: Use only PAG oil in R-134a systems.

Figure 58.



A Low pressure hose (blue)
B High pressure hose (red)
C Hose (yellow)
D Vacuum pump
E Oil injector
F Low pressure point

Charge

This procedure is the industry recommended practice for refilling air conditioning systems with refrigerant. Evacuate the system beforehand to 740mm (29 in) of mercury.

1. Close all valves and connect the manifold as shown. Connect the blue hose to system low pressure and the red hose to system high pressure. Connect the yellow hose to the refrigerant cylinder.

2. Invert the single valve cylinder on the scales and zero the scale reading. Note: Some refrigerant cylinders have separate valves for gas and liquid. Be sure to connect to the liquid port when following the above procedure. Note: Refrigerant can be used either in gas or liquid form. If

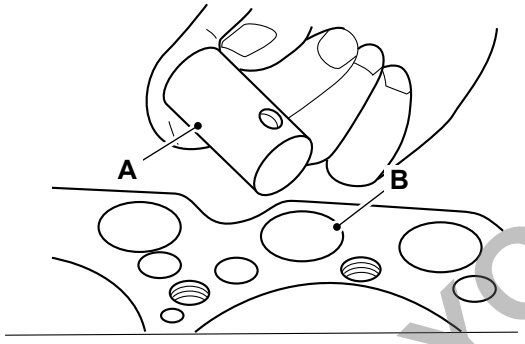
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Technical Data

Table 37. Cylinder bore data

Description	Data
Diameter of bore	84–84.019mm
Bore service limit	84.2mm
Flatness of the top of the cylinder	Less than 0.05mm
Service limit for the flatness	0.12mm
Clearance between the tappet and the tappet bore (Maximum)	0.058mm
Clearance between the tappet and the tappet bore (Service limit)	0.08mm

Figure 70.

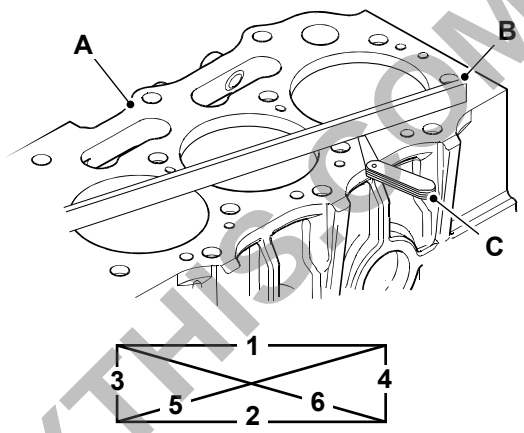


A Tappet
B Tappet bore

Check (Condition)

1. Check the six positions for flatness with a straight edge and the feeler gauge. Refer to Figure 71.

Figure 71.



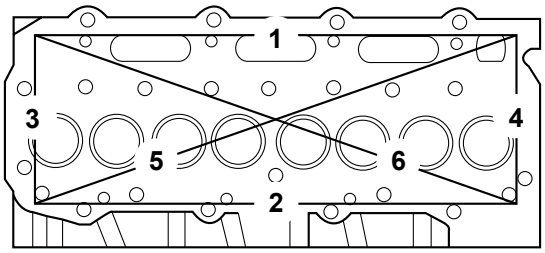
A Crankcase
B Straight edge
C Feeler gauge

2. Inspect the top of the crankcase for cracks, damage and warping.
3. Inspect each cylinder bore.
   - 3.1. Make sure that there are no signs of scoring or corrosion.
   - 3.2. Measure each cylinder bore with a suitable gauge.
   - 3.3. Measure the area of each cylinder bore that is in contact with the top, middle and bottom piston rings.
   - 3.4. Make sure that you measure each cylinder bore at right angles to the crankshaft.
   - 3.5. Do NOT use the flex-hone process on this engine.
4. Make sure that the cylinder bore dimensions do not exceed the specified service limits. Refer to Technical data (PIL 15-03).
5. If the service limit for the crankcase is exceeded, you must replace the crankcase.

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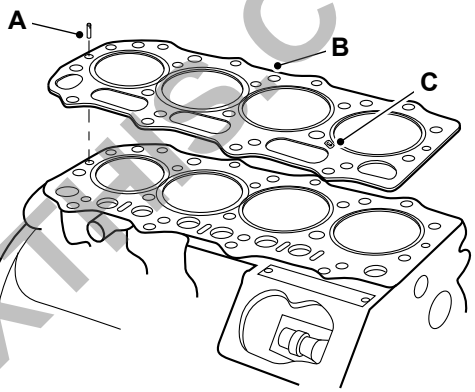
Figure 74.



Calibrate

- The dowel pins in the crankcase hold the cylinder head gasket in the correct position when the cylinder head is installed. Refer to Figure 75.
- The stamped marking on the cylinder head gasket must face upward. This makes sure that the cylinder head gasket is installed correctly. Refer to Figure 75.

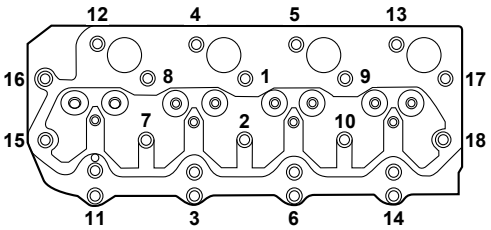
Figure 75.



A Dowel pins
B Gasket
C Stamped marking

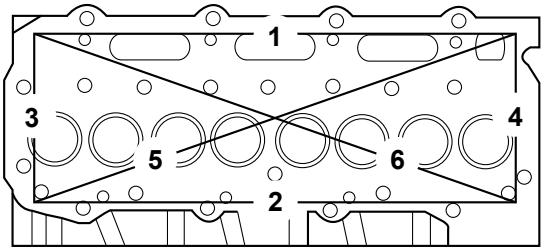
- Before you tighten the bolts, apply clean engine oil on the threads of the bolts. The bolts must be tightened to the torque of 101N·m in the specified numerical sequence only. Refer to Figure 76.

Figure 76.



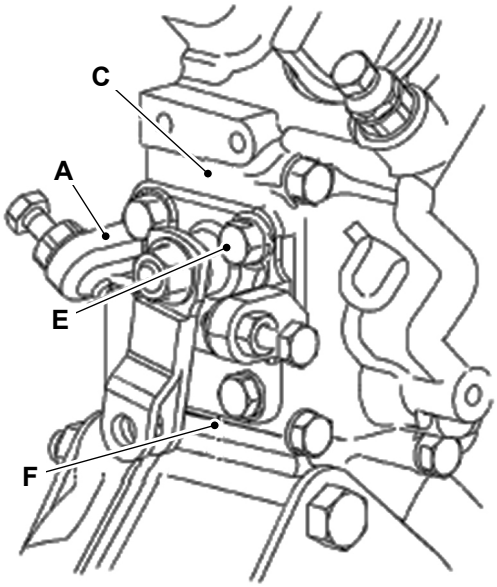
- Use a straight edge and a feeler gauge to check the six positions for distortion. Refer to Figure 77.

Figure 77.



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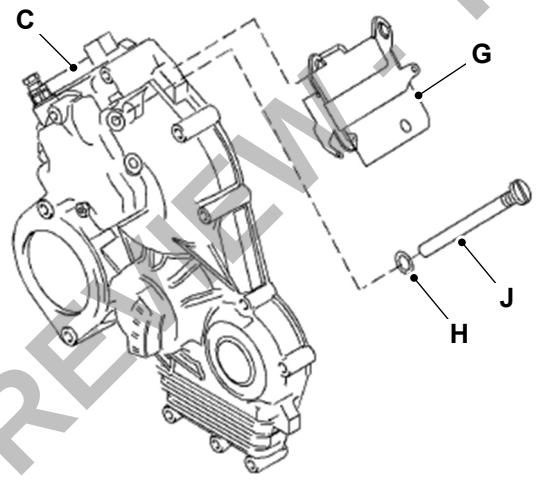
Figure 161.



A Throttle control assembly
C Front case
E Bolt
F Joint

6. Remove the shaft1 from the front case. Refer to Figure 162.
7. Remove the lever assembly1 from the front case. Refer to Figure 162.

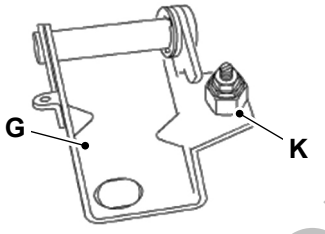
Figure 162.



C Front case
G Lever assembly1
H Sealing washer1
J Shaft1

8. Remove the sealing washer1 from the shaft1. Refer to Figure 162.
9. If installed, remove the adjuster unit from the lever assembly1. Refer to Figure 163.

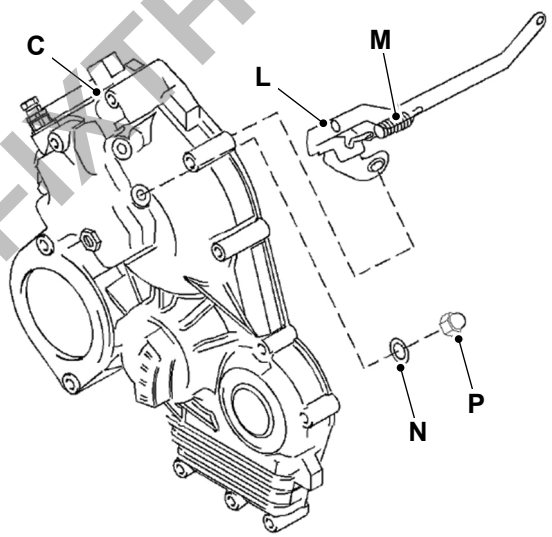
Figure 163.



G Lever assembly1
K Adjuster unit

10. Disconnect the spring from the front case. Refer to Figure 164.
11. Remove the nut and the sealing washer2 from the front case. Refer to Figure 164.

Figure 164.



C Front case
L Lever assembly2
M Spring
N Sealing washer2
P Nut

12. Remove the shaft2 and the lever assembly2 from the front case. Refer to Figure 165.

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Check (Operation)

The operation check of the fuel system checks for air in the fuel system. The procedure also helps to find the source of the air in the system.

1. Examine the fuel system for leaks.
2. Make sure that the fuel pipe fittings are properly tightened.
   2.1. Air can enter the fuel system on the suction side between the fuel pump and the fuel tank.
3. Check the fuel level in the fuel tank.
4. Install a suitable fuel flow tube with a visual sight gauge in the fuel return line.
5. When possible, install the sight gauge in a straight section of the fuel line that is at least as long as the specified length.
   Length: 304.8mm
6. Do not install the sight gauge near the following devices that create turbulence:
   6.1. Elbows.
   6.2. Relief valves.
   6.3. Check valves.
7. Observe the fuel flow during engine cranking.
   7.1. Look for air bubbles in the fuel.
   7.2. If there is no fuel present in the sight gauge, bleed the fuel system. Refer to (PIL 18-00).
   7.3. If the engine starts, check for air in the fuel at varying engine speeds.
   7.4. When possible, operate the engine under the conditions which have been suspect.
8. If excessive air is seen in the sight gauge in the fuel return line, install a second sight gauge at the inlet to the fuel pump.
   8.1. If a second sight gauge is not available, move the sight gauge from the fuel return line and install the sight gauge at the inlet to the fuel pump.
   8.2. Observe the fuel flow during engine cranking.
   8.3. Look for air bubbles in the fuel.
   8.4. If the engine starts, check for air in the fuel at varying engine speeds.
9. If excessive air is not seen at the inlet to the fuel pump, air is entering the system after the fuel pump.
10. If excessive air is seen at the inlet to the fuel pump, air is entering through the suction side of the fuel system.
11. Pressurize the fuel tank to the specified pressure.
    Pressure: 0.35bar (5.1psi)
    11.1. Do not use more than the specified pressure to pressurize the fuel tank, to avoid damage.
    Pressure: 0.55bar (8.0psi)
    11.2. Check for leaks in the fuel lines between the fuel tank and the fuel pump.
    11.3. Repair any leaks that are found.
    11.4. Check the fuel pressure to make sure that the fuel transfer pump is operating properly.
12. If the source of the air is not found, disconnect the supply line from the fuel tank and connect an external fuel supply to the inlet of the fuel pump.
13. If this corrects the problem, repair the fuel tank or the stand pipe in the fuel tank.

Figure 229.

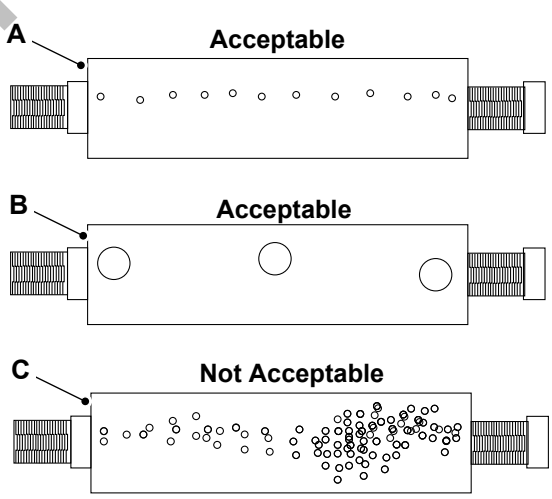


Table 94. Air in Fuel Acceptable Conditions

Condition	Description
A - Acceptable Refer to Figure 229.	A steady stream of small bubbles with a diameter of approximately 1.6mm is an acceptable amount of air in the fuel
B - Acceptable Refer to Figure 229.	Bubbles with a diameter of approximately 1.6mm are also acceptable, if there is 2–3s intervals between the bubbles
C - Not Acceptable Refer to Figure 229.	Excessive air bubbles in the fuel are not acceptable

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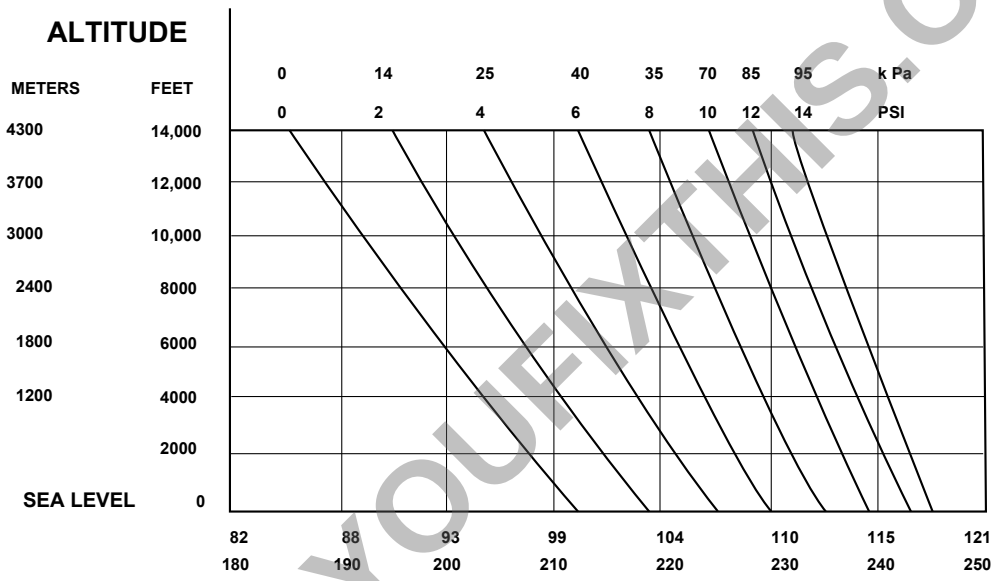
Check (Pressure)

Special Tools

Description	Part No.	Qty.
Hand Pump Pressure Test	892/00223	1

Make a note that the temperature and pressure work together. When a diagnosis is made of a cooling system problem, the temperature and pressure must be checked. The cooling system pressure will have an effect on the cooling system temperature. Refer to Figure 283.

Figure 283. Cooling system pressure at specific altitudes and boiling points of water



1. Make the machine safe. Refer to (PIL 01-03).
2. Make sure that the engine is safe to work on. If the engine has been running, let it cool before you start the service work.
3. Loosen the filler cap.
4. Allow the pressure to release from the cooling system and then remove the filler cap.
5. Make sure that the coolant is at the correct level. Refer to (PIL 21-00).
6. Inspect the filler cap carefully.
   - 6.1. The pressure loss in the cooling system can be caused by the faulty seal on the filler cap.
   - 6.2. Look for damage to the seal.

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Remove and Install

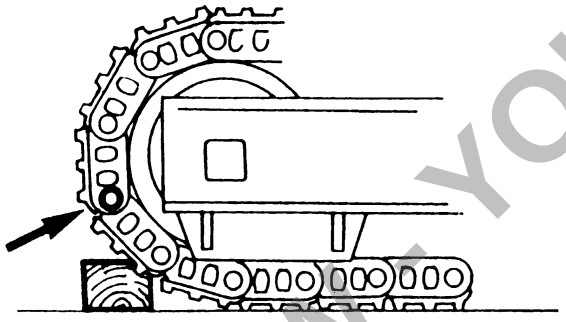
Consumables

Description	Part No.	Size
JCB Threadlocker and Sealer (Medium Strength)	4101/0250	0.01L
	4101/0251	0.05L
Special HP Grease	4003/2017	0.4kg
	4003/2006	12.5kg
	4003/2005	50kg

Remove

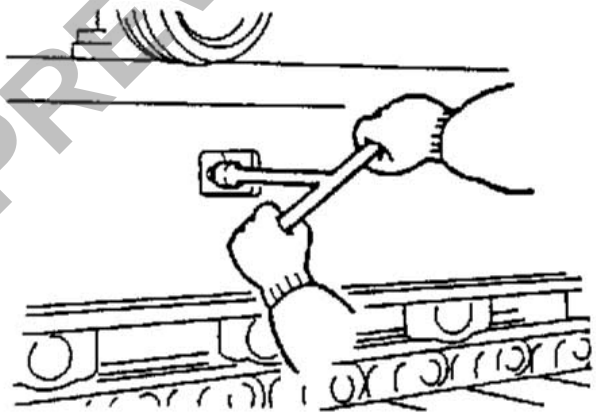
1. Move the track link until the master pin takes the position over the roller. Refer to Figure 362.
   1.1. The master pin may be identified by the indentation on the end, which is to help removal.
   1.2. Put a wooden block below the track shoe. Refer to Figure 362.

Figure 362.



2. Release the tension of the check valve to bleed out the grease. Refer to Figure 363.

Figure 363.



3. Remove the master pin to disconnect the track link.
   3.1. Remove the bolts and remove the track shoes adjacent to the master pin. Refer to Figure 364.
   3.2. Put a suitable hydraulic press and align the ram with the master pin.
   3.3. Insert the spacer bar between the master pin and the hydraulic ram.
   3.4. Slowly operate the hydraulic ram and press out the master pin. Refer to Figure 365.
   3.5. Remove the seal rings from each side of the chain link.

Figure 364.

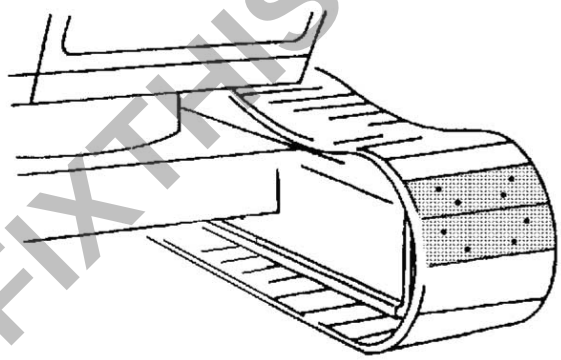
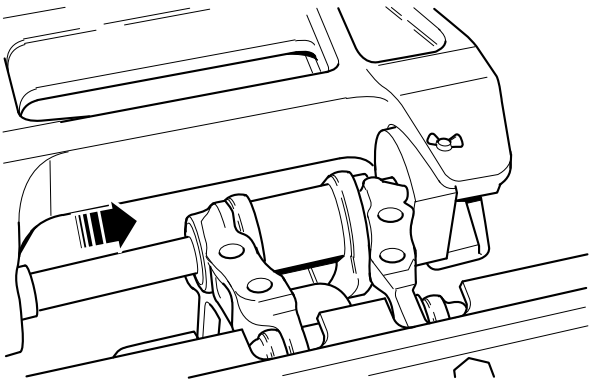
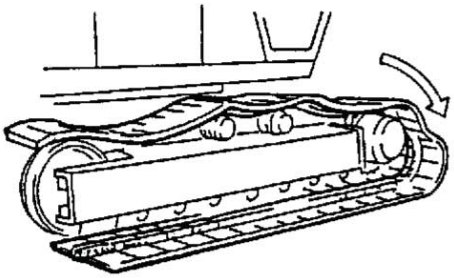


Figure 365.



4. Operate the traction motor to remove the track. Refer to Figure 366.

Figure 366.



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Discharge and Pressurise

⚠ **CAUTION** Allow the hydraulic fluid temperature to cool before removing the hydraulic tank filler cap. Open the cap slowly to prevent oil being forced out of the filler neck.

CAUTION Do not run the engine with the hydraulic tank filler cap removed.

Auxiliary venting - Automatic

1. With ignition on and engine off, press Aux 1 button. Display asks for confirmation, press 2-GO button.

Figure 381.



2. Display shows Aux. venting symbol and buzzer sounds until complete.

Figure 382.



Auxiliary venting - Manual

1. Make the machine safe. Refer to (PIL 01-03).
2. For removing the hydraulic pressure from the electro-hydraulically controlled auxiliary service hose lines, follow the procedure (procedure to be carried out within one minute of engine shutdown to make sure that pilot accumulator is fully charged):
   - 2.1. Turn the ignition key to position 1 and enter the immobiliser code (if requested). Do not start the engine.
   - 2.2. Enable the hydraulic controls.
   - 2.3. Enable the aux 1/aux 2 function using the button on the top of the left control lever.
   - 2.4. Auxiliary status will be displayed on the machine display screen and make sure that the required function is selected. Change auxiliary mode using the aux. mode select switch on the right hand console, if required.
   - 2.5. Operate the aux. control rollers (right electro-proportional switch and left electro-proportional switch) on the control lever, fully in both directions to release the stored pressure in aux /attachment hoses.
   - 2.6. Where the attachment has tilt/grab enabled, operate the tilt/grab changeover button and operate the RH (Right Hand) electro-proportional switch (for aux 1) for both states to ensure full venting when attachment the is installed.
3. Turn the ignition key to position 0.
4. Remove the ignition key.
5. Carefully remove the hydraulic tank filler cap to vent the residual tank hydraulic pressure.
6. Install the hydraulic tank filler cap.

Hydraulic Services venting

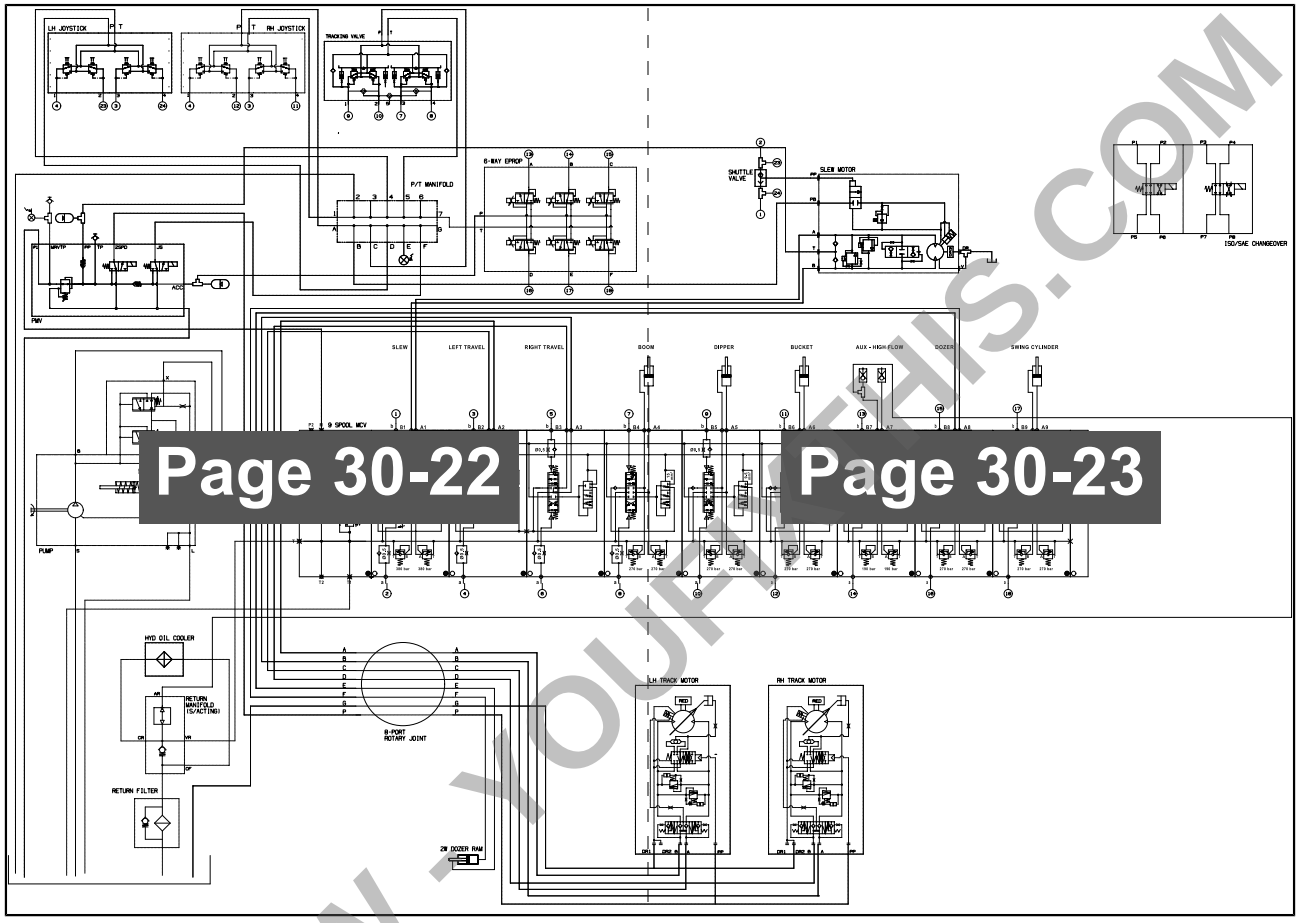
1. Make the machine safe. Refer to (PIL 01-03).
2. For removing the hydraulic pressure from the hydraulically controlled service hose lines, follow the procedure:
   - 2.1. Turn the ignition key to position 1 and enter the immobiliser code (if requested). Do not start the engine.
   - 2.2. Enable the hydraulic controls.
   - 2.3. Operate the controls of the service(s) to be disconnected several times in both directions to release the pressure stored in the hoses.
3. Turn the ignition key to position 0.
4. Remove the ignition key.
5. Carefully remove the hydraulic tank filler cap to vent the residual tank hydraulic pressure.
6. Install the hydraulic tank filler cap.

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Diagram

Figure 388. Hydraulic schematic 400/A7000-1 (sheet 1) 9 Spool Valve Block



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Remove and Install

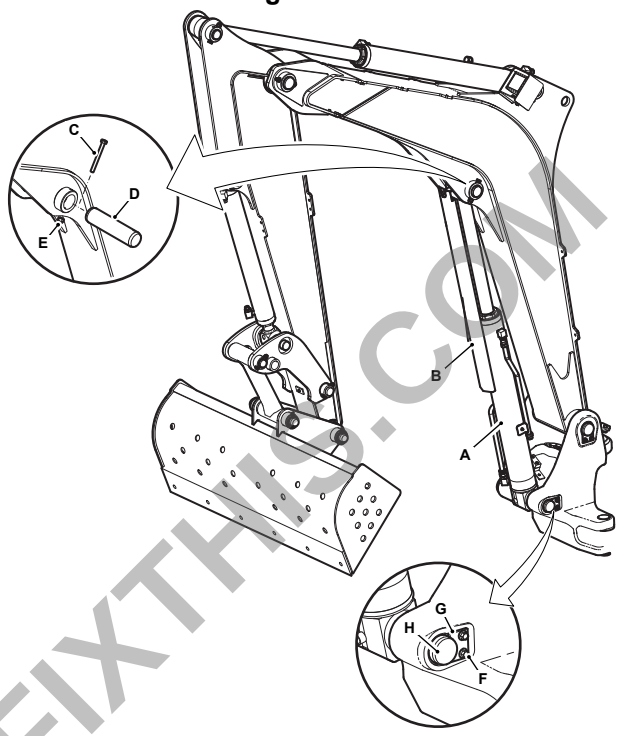
Consumables

Description	Part No.	Size
Special MPL-EP Grease	4003/1501	0.4kg
	4003/1506	12.5kg
	4003/1510	50kg

Remove

1. Make the machine safe. Refer to (PIL 01-03).
2. Discharge the hydraulic pressure from the hydraulic system. Refer to (PIL 30-00).
3. Set the machine with the bucket on the ground.
4. Engage the supporting structure below the boom/dipper pivot.
5. Remove the protection plate from the boom ram. Refer to Figure 417.
6. Remove the hoses from the boom ram.
   - 6.1. Put labels on the hydraulic hoses to help identification for installation.
   - 6.2. Put caps on all the open ports and hoses to prevent contamination.
7. Remove the locknut and bolt from the pivot pin at the rod end of the ram. Refer to Figure 417.
8. Remove the pivot pin from the rod end of the ram. Refer to Figure 417.
9. Lower the rod end of the boom ram onto a suitable support.
10. Remove the bolts that attach the plate to the pivot pin at the cylinder head of the boom ram. Refer to Figure 417.
    - 10.1. Remove the plate from the pivot pin.
11. Remove the pivot pin from the cylinder head of the boom ram. Refer to Figure 417.
12. Remove the boom ram from the machine.
13. Clean the pivot pins.

Figure 417.



A Boom ram
B Protection plate
C Bolt
D Pivot pin
E Locknut
F Bolts
G Plate - pivot pin
H Pivot pin

Install

1. Installation is the opposite of the removal procedure.
2. Apply grease to the boom ram pivot pins before assembly.
   - 2.1. Apply grease to the pivot points through the grease nipples.

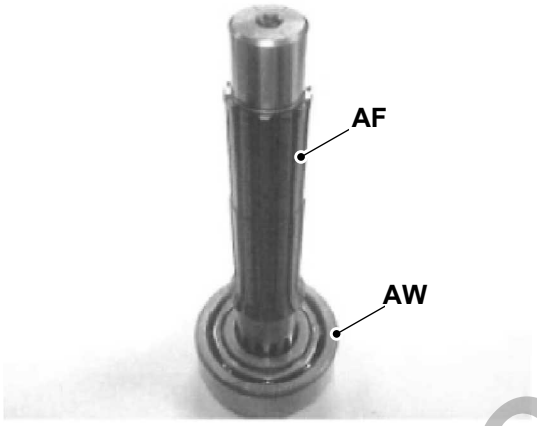
     Consumable: Special MPL-EP Grease
3. Connect the hoses to the boom ram cylinder.
4. Attach the protection plate to the boom ram.
5. Check the hydraulic fluid level is correct in the tank.
6. Do an operational check of the hydraulic circuit.

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13. Install the pin2, barrel holder and shoe holder assembly into the cylinder barrel to make up the cylinder barrel assembly. Refer to Figure 472.
14. Install the cylinder barrel assembly into the slew motor body. Refer to Figure 471.
15. Install the pin 3 into the plate. Refer to Figure 470.
16. Install the springs B into the brake piston. Refer to Figure 469.
17. Press fit the bearing 3 onto the shaft. Refer to Figure 494.

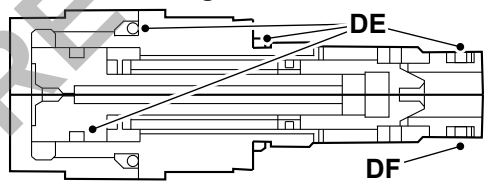
Figure 494.



AF Shaft
AW Bearing 3

18. Install the shaft kit and swash plate into the plate. Refer to Figure 468.
19. Install the plate on the slew motor body. Refer to Figure 467.
20. Instal the screw 2 on the plate. Tighten the screw 2 to the correct torque value. Refer to Figure 466.
21. Install new O-rings and back up rings into the relief valve. Refer to Figure 495.

Figure 495.

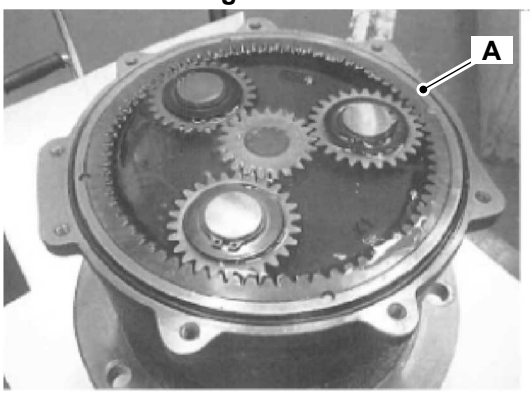


DE O-rings
DF Back up rings

22. Install the relief valves into the motor. Tighten the relief valve to the correct torque value. Refer to Figure 465.
23. Install the timer valve and the screw 3. Tighten the screw 3 to the correct torque value. Refer to Figure 464.
24. Install the bypass valve and the screw 4. Tighten the screw4 to the correct torque value. Refer to Figure 463.
25. Place the ring 1 and the thrust washer 1 onto the four pins of the carrier 1. Refer to Figure 487.
26. Place the B1 gear and the needles 1 (x92) onto the four pins of the carrier 1. Refer to Figure 486.
27. Install the thrust plate and the snap ring 2 (x4) on the carrier 1. Refer to Figure 485.
28. Install the thrust washer 1 and the ring 2 onto the three pins of the carrier 2. Refer to Figure 484.
29. Install the S1 gear onto the carrier 2. Refer to Figure 483.
30. Install the B1 gear, the needles 2 (x72) and the snap ring 2 onto the three pins of the carrier 2. Refer to Figure 482.
31. Install the carrier1 onto the reduction gear body. Make sure that the spline of the carrier are aligned with the pinion shaft. Refer to Figure 481.
32. Place the carrier 2 assembly into the reduction gear body. Make sure that the spline of S1 gear are aligned with the splines of B1 gear. Refer to Figure 480.
33. Place S2 gear on the carrier 2. Refer to Figure 479.
34. Install the O-ring 1 into the reduction gear body. Refer to Figure 478.
35. Fill the reduction gear body with the correct oil. The oil should be below the top of B2 gear by the specified distance. Refer to Figure 496.

    Distance: 2–3mm

Figure 496.



A Reduction gear body

36. Make sure that you remove all of the oil from the flange surface.
37. Join the slew motor and the reduction gear body together with the screw 2. Refer to Figure 462.

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50 - Schematic Circuit

Introduction 33-5
Diagram 33-8

Introduction

A schematic wiring diagram is a simplified pictorial representation of the machines electrical circuit. It shows the components of the circuit as simplified electrical symbols, and the power and signal connections between the devices. The wiring diagram is used to troubleshoot problems and to make sure that all the connections have been made and that everything is present.

Detailed schematics for individual systems are given in the relevant PIL section. Use the schematics together with the correct electrical harness drawings to reference the connector pin details.

Understanding Electrical Schematics

This section contains sets of electrical schematics for different machine variants.

Use the applicable schematic set to trace wires and connections between electrical devices. In most cases it will be necessary to trace wires across more than one schematic sheet.

The example shows how to follow a typical set of wires from a power supply (+ ve) through to the path to earth (- ve).

Figure 539.

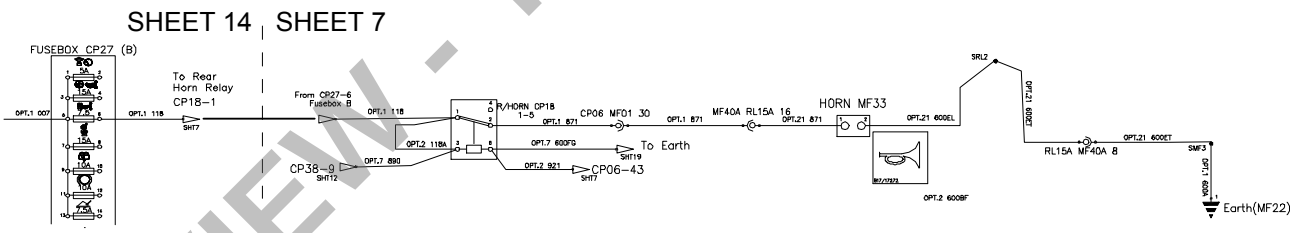


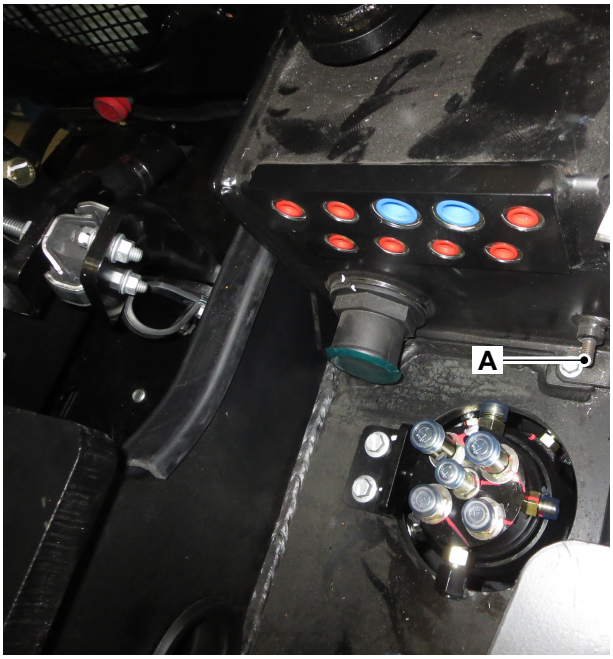
Table 195. Example- Horn Energised

Item[1]	Description	State	Pins[2]	Wire No	Sheet	Explanation
CP27	Fuse box B	+ ve supply	6	118	14	Power supply from 7.5 A fuse
CP18	Relay	closed	1-2		7	Completes circuit to horn
CP06 / MF01	Harness interconnection		30	871	7	
MF40A / RL15A	Harness interconnection		16		7	
MF33	Horn	energised	1-2		7	
SRL2	Splice[3]			600EL	7	
MF40A / RL15A	Harness interconnection		8	600ET	7	

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Component Identification

Figure 560. Hydraulic Tank Earth Point



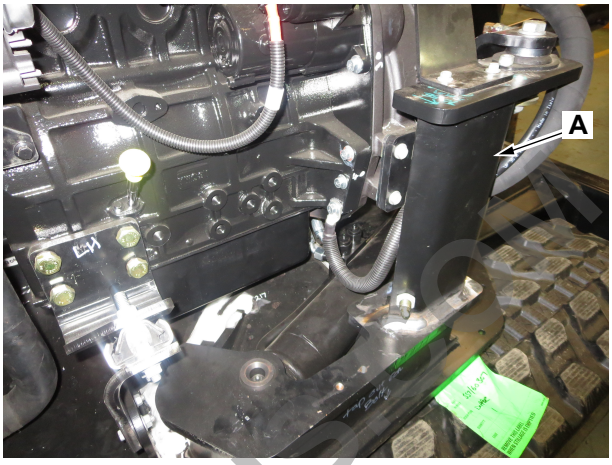
A Earth point

Figure 561. Operator Station Earth Point



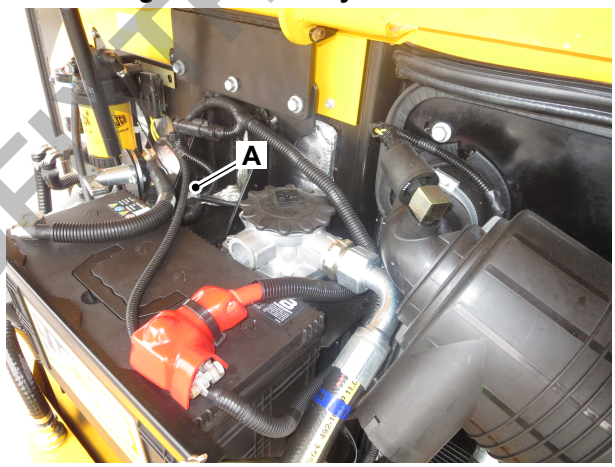
A Earth point

Figure 562. Engine Earth Point



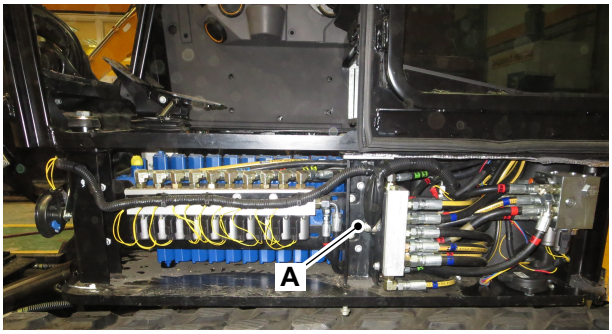
A Earth point

Figure 563. Battery Earth Point



A Earth point

Figure 564. Mainframe Earth Point

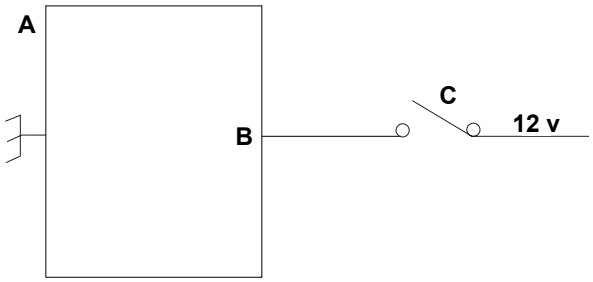


A Earth point

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Figure 625.

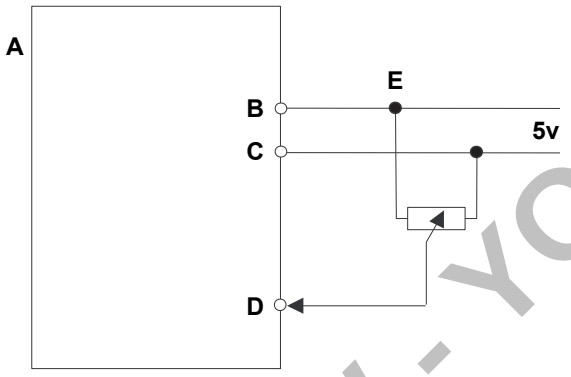


A ECU
B Input
C Switch (lights etc.)

Analogue inputs (Sensor type switch inputs)

Analogue inputs are sensor type inputs that provide a varying type input to the ECU. This input could be a voltage, resistance or frequency type input.

Figure 626.



A ECU
B Sensor ref voltage
C Sensor ref 0 voltage
D Thumbwheel input (potentiometer type input)
E Thumbwheel position switch

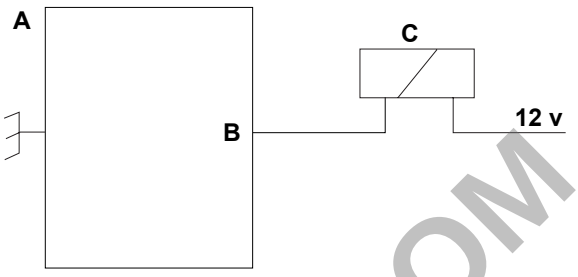
ECU Outputs

There are three main types of outputs. Low side output, High side output and Modulated output.

Low side output

In the low side output circuit, the solenoid or relay which is being driven already has a positive feed available. The ECU then provides ground to the circuit.

Figure 627.

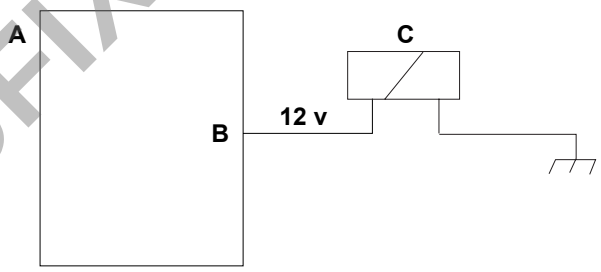


A ECU
B Output
C Solenoid or relay coil

High side output

In the high side output circuit, the solenoid or relay which is being driven already has a ground available. The ECU provides the positive side of the circuit.

Figure 628.

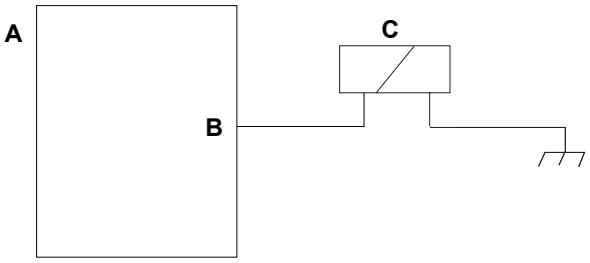


A ECU
B Output
C Solenoid or relay coil

Modulated outputs

In the modulated output circuit, the ECU provides a PWM (Pulse Width Modulation) signal to a proportional valve. As the ECU varies the duty cycle of the signal, the proportional valve will be selected depending on the change in duty cycle.

Figure 629.

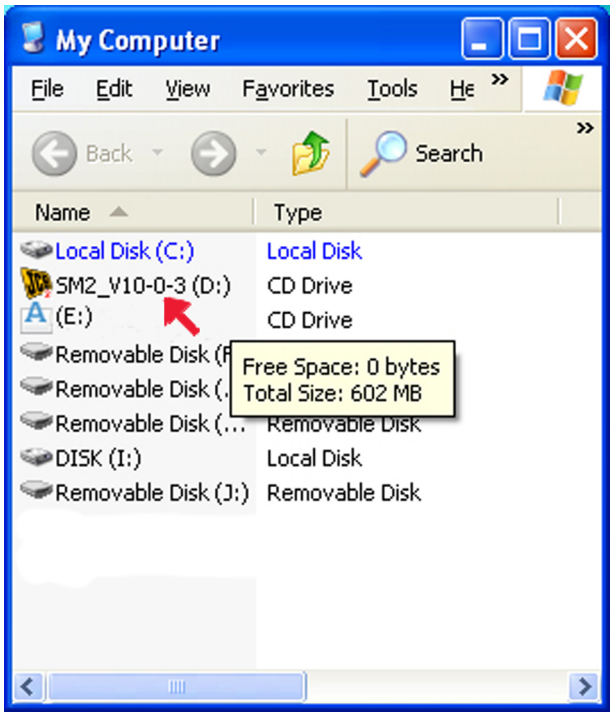


A ECU
B Output
C Proportional solenoid

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Figure 679.



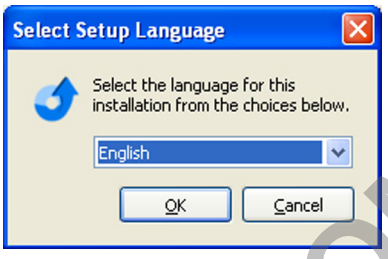
4. Select and open the "Setup.exe" application.
5. A new window "JCB Servicemaster Setup" will appear on the screen.
   5.1. Click the "Install V10.0.3" option to start the setup application. Refer to Figure 680.

Figure 680.



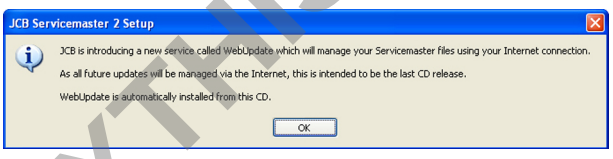
6. A new window "Select Setup Language" will appear on the screen. Refer to Figure 681.
   6.1. Use the drop down option to select the suitable language.
   6.2. Click the "OK" option to confirm selected language.

Figure 681.



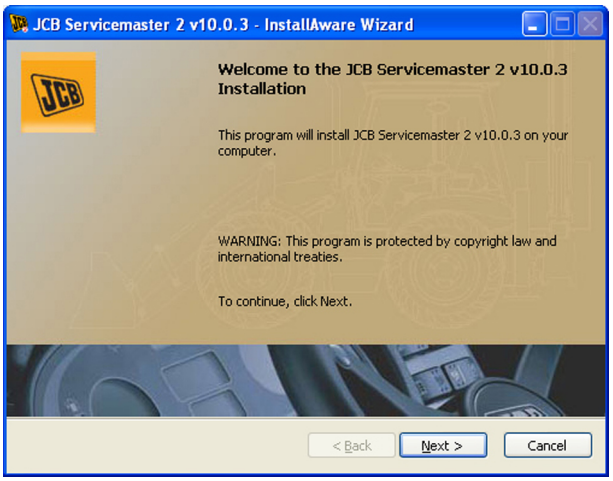
7. A warning message window will appear on the screen. Refer to Figure 682.
   7.1. Click the "OK" option.

Figure 682.



8. A new window "JCB Servicemaster Installation Wizard" will appear on the screen. Refer to Figure 683.
   8.1. Click the "Next" option to proceed.

Figure 683.



9. Put "User Name" and "Organization" details into the "Customer Registration" screen. Refer to Figure 684.
   9.1. Click the "Next" option when you inserted details.

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00 - General

Introduction

Fastener Types

Some external fasteners on JCB machines are manufactured using an improved type of corrosion resistant finish. This type of finish is called Dacromet and replaces the original Zinc and Yellow Plating used on earlier machines. The two types of fasteners can be readily identified by colour and part number suffix. Refer to Table 1. Fastener Types.

Table 220.

Fastener Type	Colour	Part Number Suffix
Zinc and Yellow	Golden Finish	Z (e.g. 1315/3712Z)
Dacromet	Mottled Silver Finish	D (e.g. 1315/3712D)

Note: As the Dacromet fasteners have a lower torque setting than the Zinc and Yellow fasteners, the torque figures used must be relevant to the type of fastener.

A Dacromet bolt should not be used in conjunction with a Zinc or Yellow plated nut, as this could change the torque characteristics of the torque setting further. For the same reason, a Dacromet nut should not be used with a Zinc or Yellow plated bolt.

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

Dacromet bolts, due to their high corrosion resistance are used in areas where rust could occur. Dacromet bolts are only used for external applications. They are not used in applications such as gearbox or engine joint seams or internal applications.

Torque and Angle Tightening

Insufficient pre-load of a bolted joint can cause major problems, such as cylinder head warp, leaking gasket joints etc. There are several methods of achieving an accurate pre-load of a bolted joint, the two main methods used on the JCB engine are:

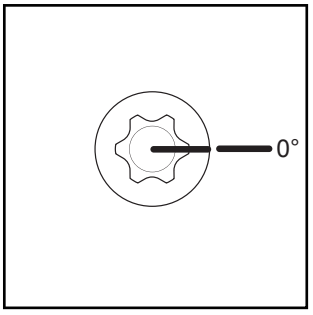
- Torque Control Tightening - Using a torque meter to control the torque is the most popular means of controlling pre-load, and in the majority of instances this method is adequate. It should be noted that with this process, the majority of the torque is used to overcome friction, therefore slight variations in the frictional conditions can lead to large changes in the bolt pre-load.
- Angle Control Tightening - Where a more precise pre-load is required, the torque and angle tightening method is used. The bolt is tightened to a predetermined torque (this may be done in stages), and then as a final sequence, the bolt is tightened to a predetermined angle - this method of tightening the bolts results in a smaller variation in the final pre-load. It is critical that the predetermined tightening angle is accurately achieved, failure to tighten accurately to the specified angle could result in the bolt pre-load being incorrect - this will lead to eventual failures. It is good practice to replace all bolts that have been tightened using the torque + angle procedure.

Tightening Method

The following example explains the recommended torque and angle procedure. A torque angle gauge should be used for accuracy, but as a visual check, the bolts can be match marked as described below.

1. Tighten the bolt to the specified torque (specified torque values will be detailed in the relevant PIL sections).
2. Mark a line across the centre of the bolt, and a second line on the part to be clamped - the two lines should be aligned. Refer to Figure 756.

Figure 756.



3. Mark a third line at the specified torque angle - in this instance the additional torque angle is 90°. This line must be marked the specified angle in a clockwise direction (to further tighten the bolt). Refer to Figure 757.

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03 - Engine

Introduction

New engines DO NOT require a running-in period. The engine/machine should be used in a normal work cycle immediately. Glazing of the piston cylinder bores, resulting in excessive oil consumption, could occur if the engine is gently run-in. Under no circumstances should the engine be allowed to idle for extended periods; (e.g. warming up without load).

A minimum API CJ4 grade oil must be used. Superior grade oils may be more appropriate for heavy duty applications (such as sustained high loads and operation at elevated temperatures).

The choice of lubricant viscosity should be made based on the lowest ambient temperature at which the machine will be started and the maximum ambient temperature at which it will operate.

The technical data section provides guidance as to the temperature range that can be accommodated by standard oil viscosities and can be used to select an appropriate grade.

Important: When selecting the oil viscosity grade make sure the oil conforms with or exceeds the recommended specification.

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03 - Maintenance Intervals

Introduction

Table 247.

Interval (h)	Calendar Equivalent
10	Daily
50	Weekly
500	Six months
1000	Yearly
2000	Two years

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Notes:

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Check (Operation)

Special Tools

Description	Part No.	Qty.
Digital Multimeter	892/00298	1

The operational check of the coolant temperature sensor must be done when the engine is running.

1. Use a suitable digital multimeter to measure the resistance of the coolant temperature sensor.

   Special Tool: Digital Multimeter (Qty.: 1)

2. When the temperature of the coolant is less than the specified, disconnect the wire connector from the coolant temperature sensor.

   Temperature: 50°C (121.9°F)

3. Place one lead of the multimeter on the connector of the coolant temperature sensor. Place the other lead of the multimeter on a ground for the coolant temperature sensor.

4. Measure the resistance. Make sure that the resistance is within the specified limit.

   Resistance: 54 ± 2Ω

5. Repeat the step 3 and 4 when the temperature of the coolant is approximately specified.

   Temperature: 120°C (247.8°F)

6. Measure the resistance. Make sure that the resistance is not less than the specified value.

   Resistance: 15Ω

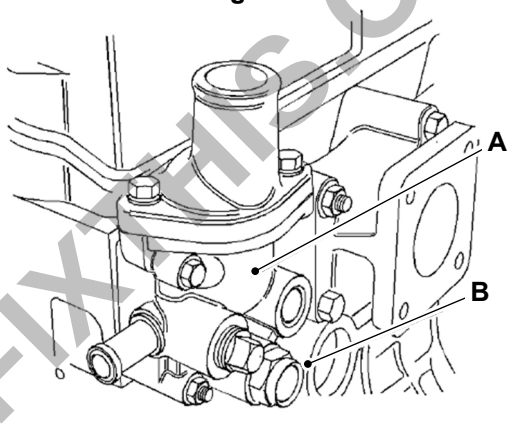
7. If the resistance through the coolant temperature sensor is not within the given resistances, replace the coolant temperature sensor.

Remove and Install

Remove

1. Drain the cooling system. Refer to (PIL 21-00).
2. Disconnect the harness from the coolant temperature sensor.
3. Remove the coolant temperature sensor from the thermostat housing.

Figure 213.



A Coolant temperature sensor
B Thermostat housing

Install

1. The installation procedure is the opposite of the removal procedure. Additionally do the following steps.
2. If you install a used coolant temperature sensor, apply a thin layer of pipe sealant to the threads.
3. Tighten the coolant temperature sensor to the correct torque value.

Table 87. Torque Values

Item	Description	Nm
A	Coolant temperature sensor	27

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93 - Hose

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