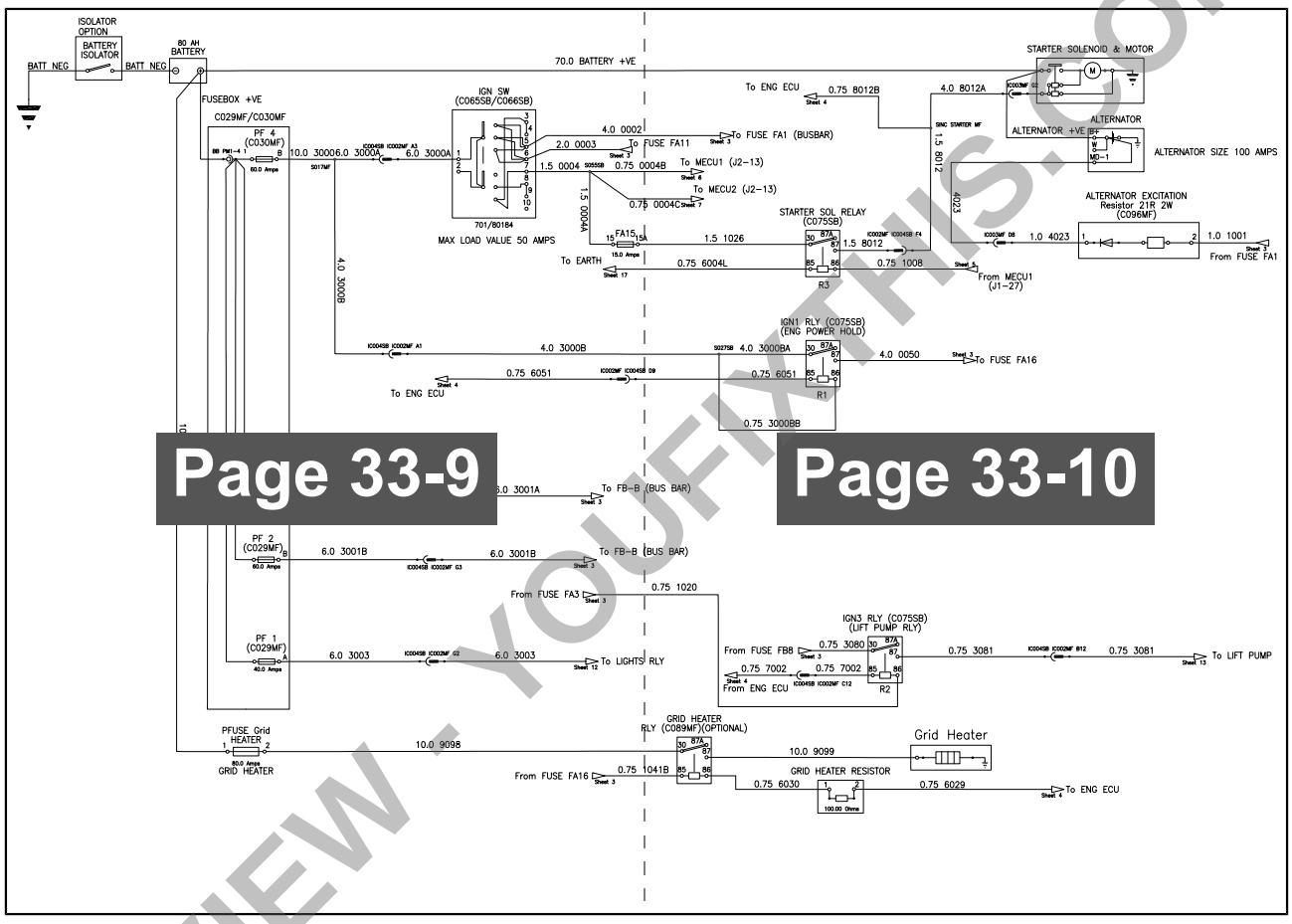
Diagram

Sheet 1 is not included as it only contains an index to the other sheets.

Sheet 2 - PDM (Primary Fusing, Ignition Switch, Charging System)

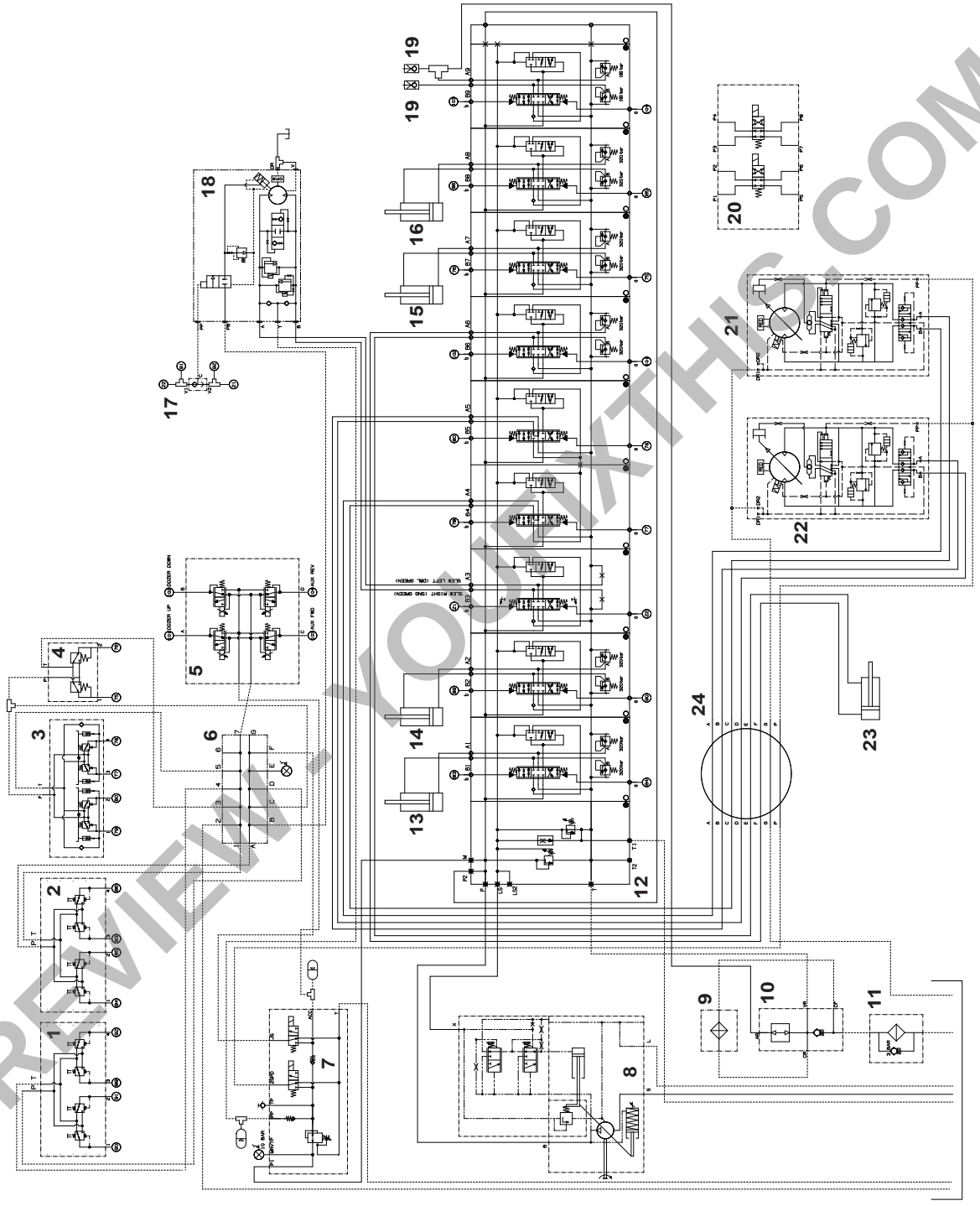
Figure 800.



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Figure 647. Standard Machine With Single Acting, with High Flow, EP Auxiliary (9 Spool)



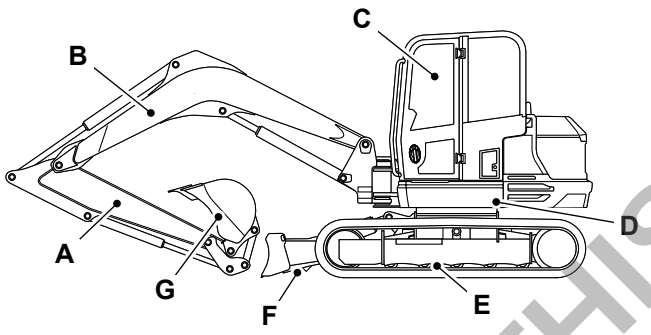
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12 - Main Component Locations

Component Identification

Figure 3.



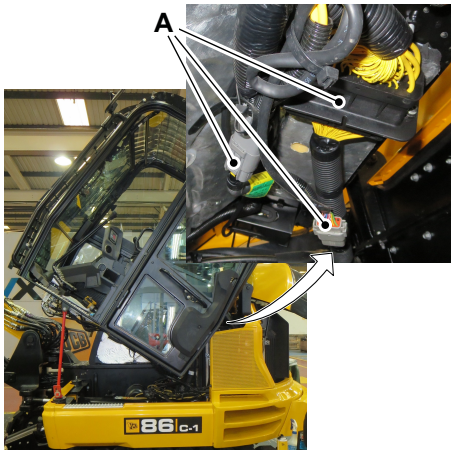
A Dipper (part of the excavator arm)
B Boom (part of the excavator arm)
C Cab (contains the operator station)
D Upper structure
E Undercarriage
F Dozer blade
G Bucket

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7. Put a label on the hoses to help installation.
8. Disconnect the electrical harnesses from the operator station.

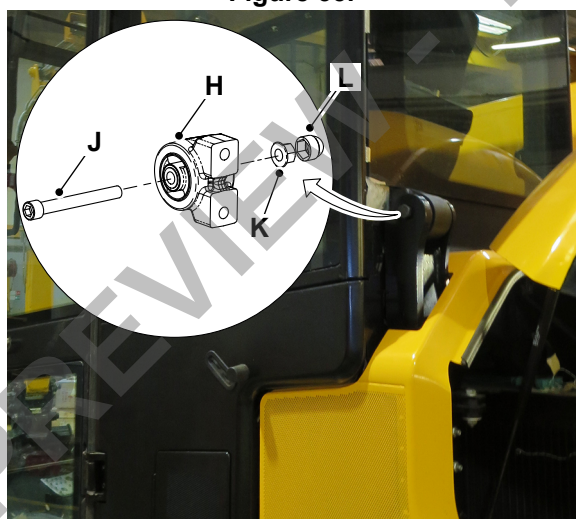
Figure 34.



A Electrical connectors

9. Attach suitable lifting equipment to the operator station and support its weight.
10. Remove the gas strut.
11. Remove the safety strut.
12. Lower the operator station.
13. Remove the plastic cap (x2) from the nut.

Figure 35.



H Operator station mount
J Capscrew
K Nut
L Plastic cap

14. Remove the nut (x2) and the capscrew (x2).
15. Remove the operator station from the machine with suitable lifting equipment.

Install

1. The installation procedure is the opposite of the removal procedure.
2. Tighten the capscrew to the correct torque value.

Table 9. Torque Values

Item	Description	Nm
J	Capscrew	200

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90 - Fault Codes

Introduction 33-312
Technical Data 33-314

Introduction

The fault codes are displayed on the right hand instrument panel. The procedure for navigating between screens is described in the machine operator manual.

The colour of the screen will change according to the severity of the fault displayed:

- Critical Fault: The display screen is Red, the buzzer will sound, an icon representing the area of the machine affected and a fault code will display to indicate faults that may result in serious damage to the machine or make the machine dangerous to operate. This is known as a ‘Critical’ fault. A fault code may be displayed on the left hand side of the display. To interpret the fault code refer to Fault code technical data.

Figure 1072. Critical Fault Warning Display

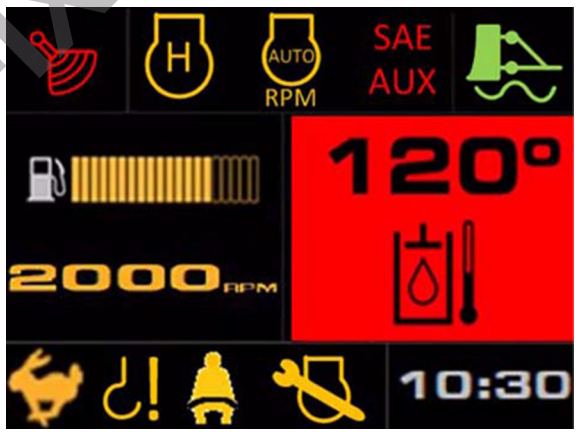
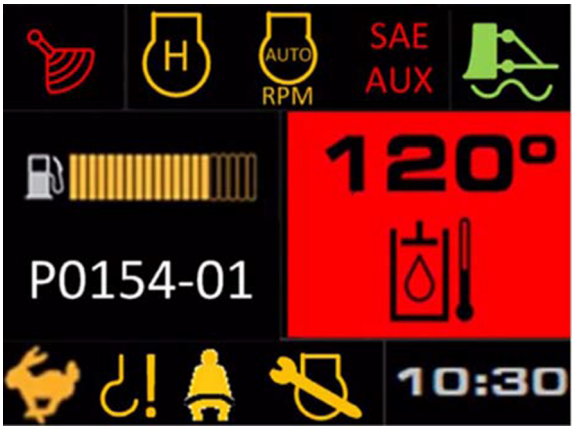


Figure 1073. Critical Fault with Fault Code



- Service/Operator Fault: The display screen is Amber, the buzzer will sound for 1 second, an icon representing the area of the machine affected and a fault code is displayed. This indicates faults that may result in reduced machine performance but are not dangerous.

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27 - Maintenance Positions

Introduction 01-12
Health and Safety 01-13

Introduction

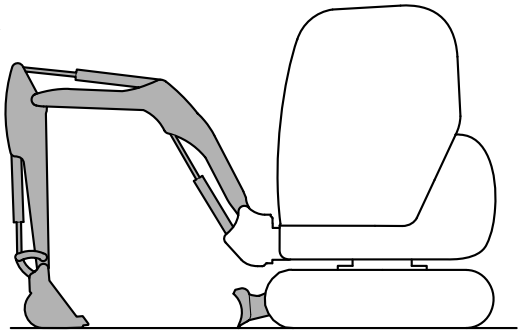
Make the machine safe before you start a maintenance procedure. Unless a maintenance procedure instructs you differently, you must lower the excavator arm.

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.



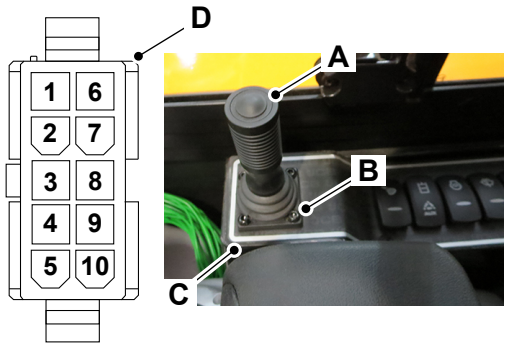
4. Stop the engine.
5. Discharge the hydraulic pressure. Refer to (PIL 30-00).
6. Isolate the controls.
7. Disconnect the battery to prevent accidental operation of the engine. Refer to (PIL 33-03).

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Component Identification

Figure 65.



A Dozer blade control lever
B Screw
C Trim panel
D Electrical connector

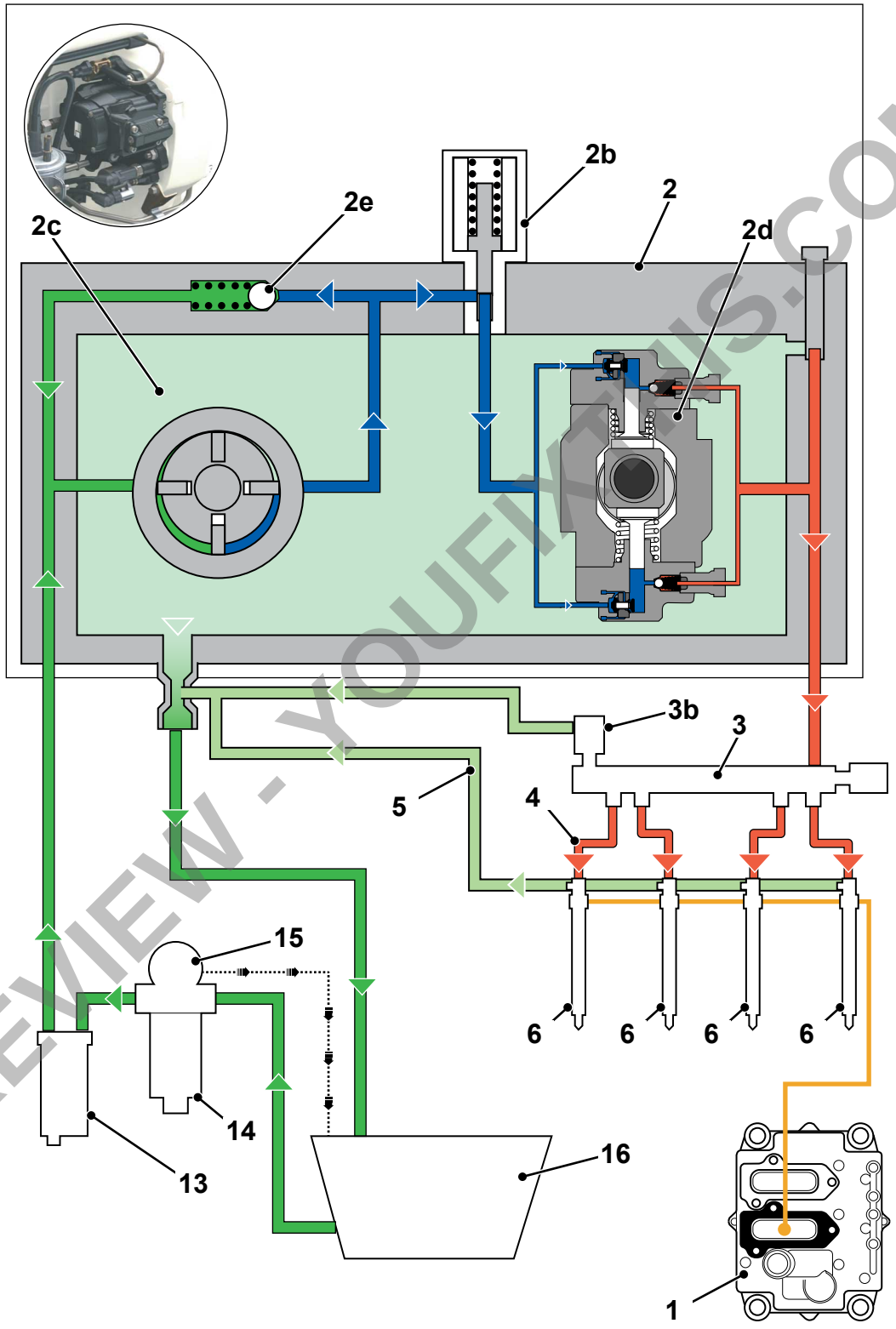
Table 10.

Pin	Function
1	5 Supply (Y axis)
2	Earth (Y axis)
3	0.5–4.5 Variable signal (Y axis)
4	Button
5	Button
6	Not used
7	Not used
8	Not used
9	Not used
10	Not used

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Figure 384.



1 ECM
2 Fuel high pressure pump
2b IMV
2c Fuel high pressure pump (transfer section)

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Fault-Finding

Fault

General Fault Diagnosis Table 163. Page 30-7

Before carrying out the fault diagnosis, make sure that where applicable:
1. The correct hydraulic fluid is used and the system is filled to the correct level.
2. The hydraulic fluid, filter and suction strainer are clean.
3. There are no visible leaks in the system.
4. Engine maximum speed and condition is as specification.
5. Hydraulic pressures for each service are correct to specification.

If possible, the machine should be operated to identify the fault and to bring the systems to their normal working temperature.
After completing the initial checks, continue with the fault diagnosis as follows:
1. If all the hydraulic services are at fault start at check 1.
2. If servo controllers only are at fault start at check 13.
3. If tracking services only are at fault start at check 16.
4. If slew service only is at fault start at check 21.

Table 163. General Fault Diagnosis

Check			Action
1	Is the fault in all services or one only?	Yes	Do check 2.
		No	Do check 6.
2	Are the hydraulics inoperative or lacking in power?	Yes	Do check 4.
		No	Do check 3.
3	Is the servo pressure to specification?	Yes	Do check 4.
		No	Adjust.
4	Is the pump operating correctly?	Yes	Check the MRV (Main Relief Valve).
		No	Do check 5.
5	Is the pump noisy in operation?	Yes	Purge air from the pump casing.
		No	Do check 6.
6	Is the pump drive broken?	Yes	Replace.
		No	Do check 7.
7	Is one service only down on pressure?	Yes	Do check 8.
		No	Do check 9.
8	Is the control valve spool sticking?	Yes	Overhaul valve block section.
		No	Do check 10.
9	Is the service ARV (Auxiliary Relief Valve) operating correctly?	Yes	Do check 10.
		No	Replace.
10	Is the valve block section cracked?	Yes	Replace section and check valve block mounting.
		No	
11	Are the rams faulty	Yes	Overhaul or replace.
		No	
12	Is the fault in all servo operated services or only one?	Yes	Check the servo isolator microcircuit, servo solenoid valve, and do check 14.
		No	Do check 15.
13	Is the servo system operating correctly?	Yes	Do check 15.
		No	Check servo pressure maintenance valve.
14	Is the hand controller plunger leaking/ moving freely?	Yes	Refer to PIL (09-27-09).
		No	
15	Is the tracking fault in both tracks and in one or both directions?	Yes	If in both the tracks do check 4.
		No	If in one track check the servo control and do check 17.

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Technical Data

Boom Pivot Pin and Bushes

Table 4.

	Pivot pin	Pivot bush
Reference value	64.94mm diameter	65mm internal diameter
Allowable limit	64.894mm diameter	64.89mm - 65.14mm diameter

Dipper Pivot Pin and Bushes

Table 5.

	Pivot pin	Pivot bush
Reference value	64.94mm diameter	65mm internal diameter
Allowable limit	64.894mm diameter	64.89mm - 65.14mm diameter

Dipper Dimension and Weights

Table 6.

Dipper Configuration	Overall Length	Weight
Long dipper	1,650mm diameter	175kg
Long dipper	2,000mm diameter	210kg
Long dipper	2,100mm diameter	220kg
Long dipper	2,250mm diameter	240kg

Tipping Linkage Pivot Pin and Bushes

Table 7.

	Pivot pin	Pivot bush
Reference value	44.95mm diameter	45mm Internal diameter
Allowable limit	44.911mm diameter	45.12mm - 44.92mm diameter

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Calibrate

Cylinder check

1. Place the crankcase on a workbench.
2. Measure the diameter at all the points shown in the figure using a dial gauge.
3. Rotate the dial gauge by the specified angle and measure again the diameter at all the points shown in the figure.

   Angle: 90°
4. Refer to the technical data of the crankcase for the class and approved dimensional values.

   Refer to: Engine > Crankcase (Page 15-22).

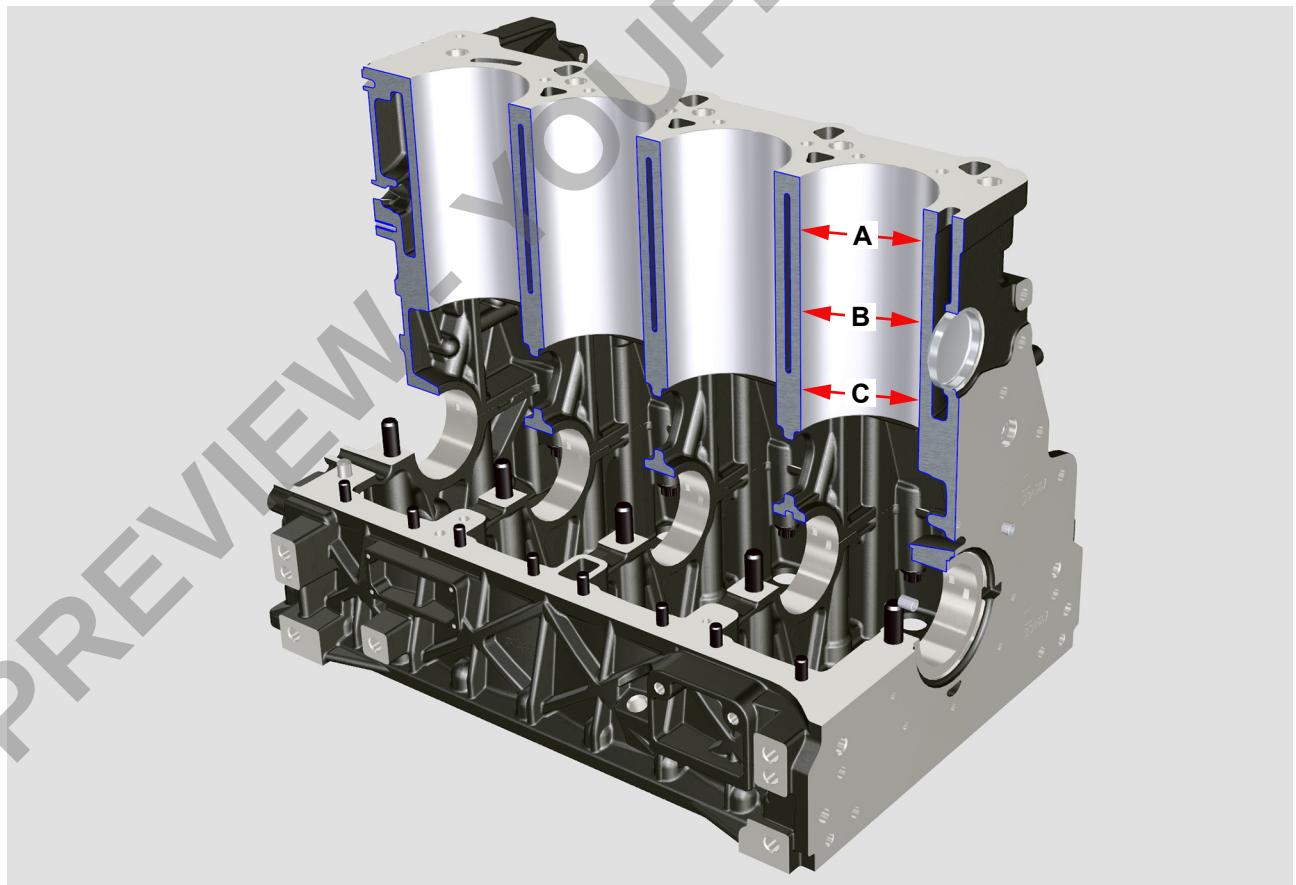
   4.1. If the cylinder is oval or wear is greater than 0.05mm (.00197in), the cylinder must be reconditioned.

   4.2. When reconditioning, make sure that the working angle is between the specified value.

   Angle: 45–55°

   4.3. Make sure that the average roughness (Ra) is between 0.25-0.5.
5. The cylinders can be oversized by 0.50mm (0.01968in)-1.00mm (0.03937in), in compliance with the manufacturer's specifications.
6. Do not finish the internal surface of the cylinders using an emery cloth.
7. Lubricate the contact surfaces to prevent oxidation.

Figure 93. Measurement points



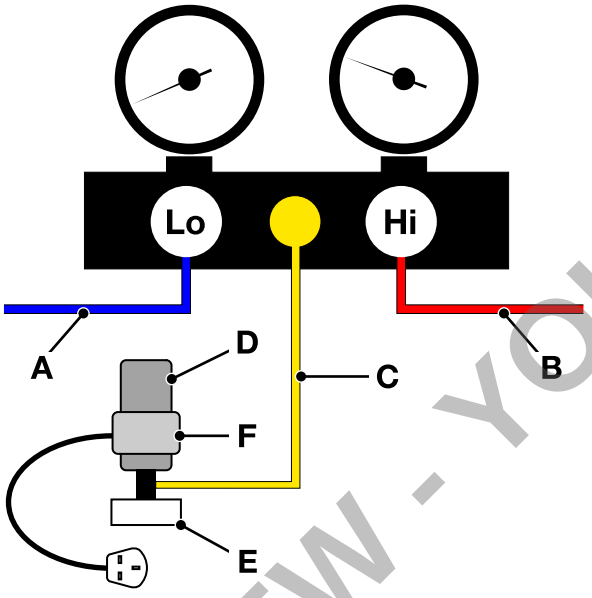
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recharging with gas follow the manufacturers instructions and recharge only via the low pressure port. Do not use liquid refrigerant at the low pressure port.

3. Slowly open the high pressure valve and allow the vacuum to draw-in refrigerant to the specified weight for the system. Refer to Technical Data. Add refrigerant until the scales indicate the specified weight for the system or the weight obtained when the system refrigerant was previously recovered. Note: To speed up the process a thermostatically controlled thermal blanket can be used around the replenishing cylinder.
4. Close all valves and remove the equipment.

Figure 74.



A Low pressure hose (blue)
B High pressure hose (red)
C Hose (yellow)
D Refrigerant cylinder
E Scales
F Thermal blanket

Electronic Vacuum Gauge

The CPS VG100 vacuum gauge is an electronic type using LED's to indicate various states of vacuum. It is used in place of or to supplement the gauge on the vacuum pump. Before connecting into the system, switch on to check that the first LED lights to show that the battery is in good condition.

Note: The indicator lights show pressure in inches of mercury (Hg) and vacuum in microns (0.001mm Hg).

Figure 75.

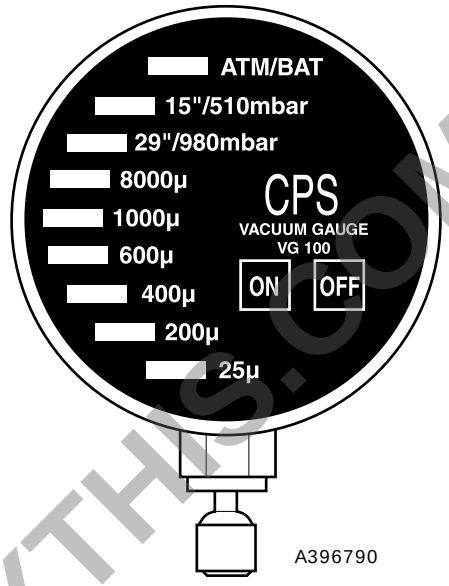


Table 20.

Gauge Reading	Description
ATM/BAT	Normal atmospheric pressure reading. Battery condition.
15"/510mbar	381mm (15 in)Hg. Partial vacuum - Vacuum system is operating.
29"/980mbar	736mm (29 in)Hg. No vacuum drawn - Possible system leakage.
8000	8.0mm (0.31 in)Hg. Partial vacuum - If the reading does not progress the system may have a slow leak.
1000	1.0mm (0.039 in)Hg. Deeper vacuum.
600	0.6mm (0.023 in)Hg. Deep vacuum.
400	0.4mm (0.015 in)Hg. Deep vacuum.
200	0.2mm (0.0078 in)Hg. Deep vacuum.
25	0.025mm (0.00098 in)Hg. Pump Test. Maximum sustainable vacuum.

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Technical Data

Table 36. Crankcase and Bedplate Data

Main bearing bolts torque[1]	
First stage	40N·m
Second stage	70N·m
Third stage	120N·m
Peripheral bolts	
Fourth stage	20N·m
Fifth stage	35N·m

(1) Torque information must be used in conjunction with recommended procedures contained in this manual. Failure to use the appropriate and correct removal, replacement, dismantle and assembly procedures may result in an engine failure in service. Refer also to the procedures for the correct bolt tightening sequence.

Table 37. Cylinder bore Data

Dimensional Class[1]	**Cylinder Diameter[1]**	**Piston Diameter[1]**	**Clearance[1]**
STD	88.003mm (3.4647in)-88.017mm (3.4652in)	87.943mm (3.4623in)-87.957mm (3.4628in)	0.046mm (0.0018in)-0.074mm (0.0029in)
R+0.1	88.103mm (3.4686in)-88.117mm (3.4691in)	88.043mm (3.4663in)-88.057mm (3.4668in)	
+0.5	88.503mm (3.4843in)-88.517mm (3.4849in)	88.443mm (3.4820in)-88.457mm (3.4826im)	
+1	89.003mm (3.5041in)-89.017mm (3.5046in)	88.943mm (3.5017in)-88.957mm (3.5022in)	

(1) This table shows the reference values and their classification applicable for new engines only.

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00 - General

Introduction

⚠ **WARNING** Maintenance must be done only by suitably qualified and competent persons.

Before doing any maintenance make sure the machine is safe, it must be correctly parked on solid, level ground.

To prevent anyone starting the engine, remove the ignition key. Disconnect the battery when you are not using electrical power. If you do not take these precautions you could be killed or injured.

A badly maintained machine is a danger to the operator and the people working around the operator. Make sure that the regular maintenance and lubrication tasks listed in the service schedules are done to keep the machine in a safe and efficient working condition.

Apart from the daily tasks, the schedules are based on the machine running hours. Keep a regular check on the hourmeter readings to correctly gauge the service intervals. When there is no hourmeter installed, use the calendar equivalents to determine the service intervals.

Do not use a machine which is due for a service. Make sure any defects found during the regular maintenance checks are corrected immediately.

More frequent checks of engine components than the engine manufacturer recommends do not invalidate emissions warranty.

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SERVICE MANUAL

EXCAVATOR

100 C-1, 85 Z-1, 86 C-1, 90 Z-1

EN - 9813/2700 - ISSUE 2 - 2016-09-28

This manual contains original instructions, verified by the manufacturer (or their authorized representative).

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Foreword

The Operator's Manual

⚠

You and others can be killed or seriously injured if you operate or maintain the machine without first studying the Operator's Manual. You must understand and follow the instructions in the Operator's Manual. If you do not understand anything, ask your employer or JCB dealer to explain it.

Do not operate the machine without an Operator's Manual, or if there is anything on the machine you do not understand.

Treat the Operator's Manual as part of the machine. Keep it clean and in good condition. Replace the Operator's Manual immediately if it is lost, damaged or becomes unreadable.

Contents

01 - Machine

03 - Attachments, Couplings and Load Handling

06 - Body and Framework

09 - Operator Station

12 - Heating, Ventilating and Air-Conditioning (HVAC)

15 - Engine

18 - Fuel and Exhaust System

21 - Cooling System

27 - Driveline

30 - Hydraulic System

33 - Electrical System

72 - Fasteners and Fixings

75 - Consumable Products

78 - After Sales

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01 - Machine

Contents **Page No.**

Acronyms Glossary 01-2

01-03 Safety
- 01-03-03 Safety - Yours and Others 01-3
- 01-03-06 Safety Warnings 01-4
- 01-03-09 General Safety 01-5
- 01-03-12 Maintenance Safety 01-6
- 01-03-18 Operating Safety 01-8
- 01-03-21 Worksite Safety 01-10
- 01-03-24 Risk Assessment 01-11
- 01-03-27 Maintenance Positions 01-12

01-06 About this Manual
- 01-06-06 Using the Manual 01-15

01-09 Description
- 01-09-12 Main Component Locations 01-19
- 01-09-15 Service Point Locations 01-20

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03 - Safety - Yours and Others

Introduction

All machinery can be hazardous. When a machine is correctly operated and maintained, it is a safe machine to work with. 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 inform you of potential hazards and how to avoid them. If you do not fully understand the warning messages, ask your employer or JCB dealer to explain them.

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 of 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 work until you are sure that you and those around you will be safe.

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

Remember:

- Be careful
- Be alert
- Be safe.

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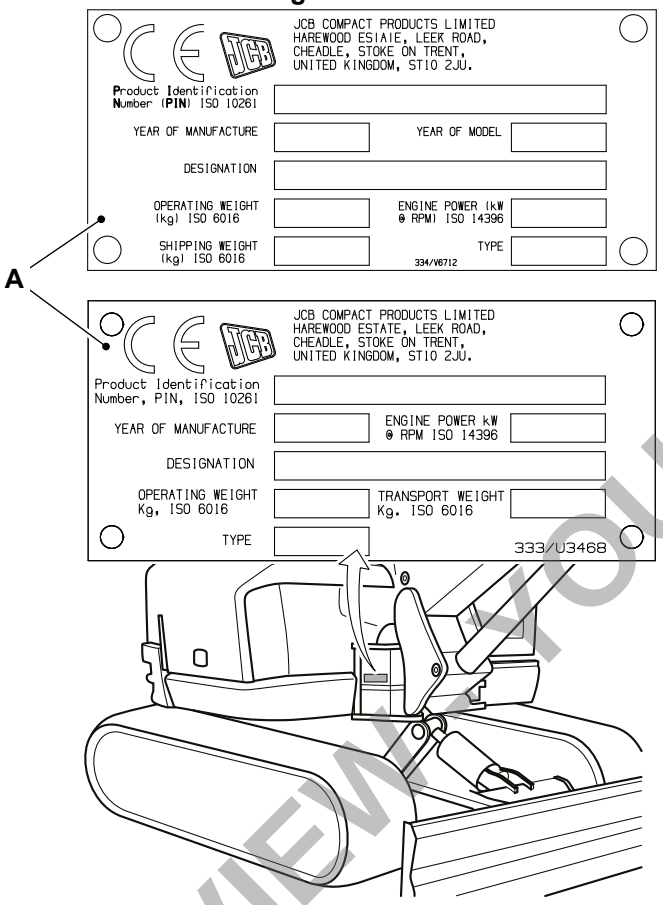
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03 - Machine

Introduction

Your machine has an identification plate mounted as shown. The product identification number (PIN), weight, engine power, year of manufacture and serial number of the machine are shown on the plate.

Figure 27.



A Identification plate

The machine model and build specification are indicated by the PIN. The PIN has 17 digits and must be read from left to right. For example, JCB08085L01226500.

Table 8. Explanation of the PIN

Digit	Description
1 to 3	World manufacturer identification. For example, JCB = UK Build.
4 to 8	Machine type and model. 085Z1 = 85 Z-1, 086C1 = 86 C-1.
9	Random check Letter. The check letter is used to verify the authenticity of a machine's PIN.
10 to 17	Machine serial number.

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Notes:

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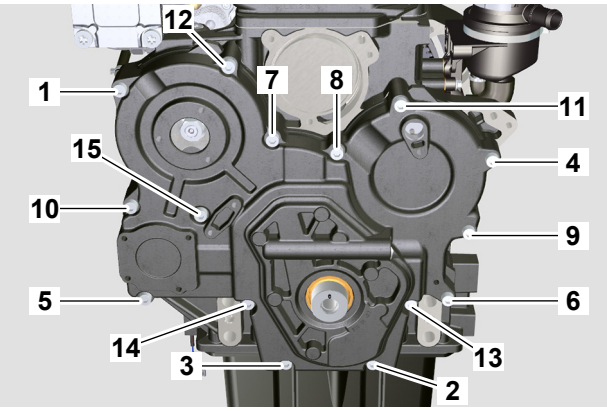
Remove and Install

IMPORTANT: This procedure requires specialist air conditioning equipment for refrigerant charging and discharging and must only be carried out by qualified service personnel who have received specialist training on the air conditioning system. Refer to the Health and Safety section (PIL 12-00) Refer to: Heating, Ventilating and Air-Conditioning (HVAC) > General > General > Health and Safety (Page 12-4).

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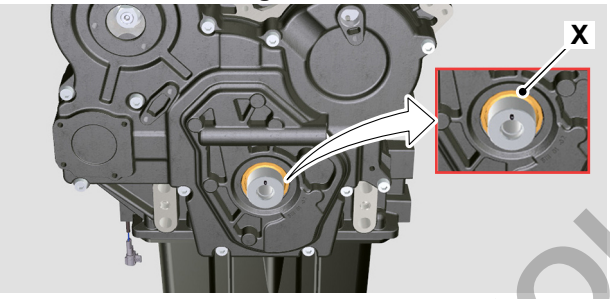
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Figure 287. Torque Sequence



12. Apply oil on the lip of the new front crankshaft seal.

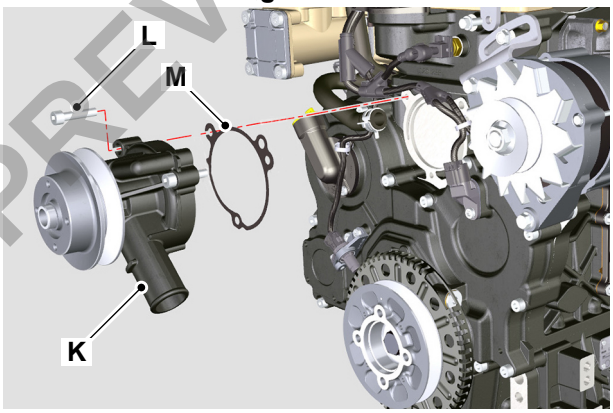
Figure 288.



X Front crankshaft seal

13. Install the front crankshaft seal with the appropriate tool.
14. Install the water pump.
    14.1. Always replace the gasket after each removal.
    14.2. Put the gasket and water pump on the timing gear case.

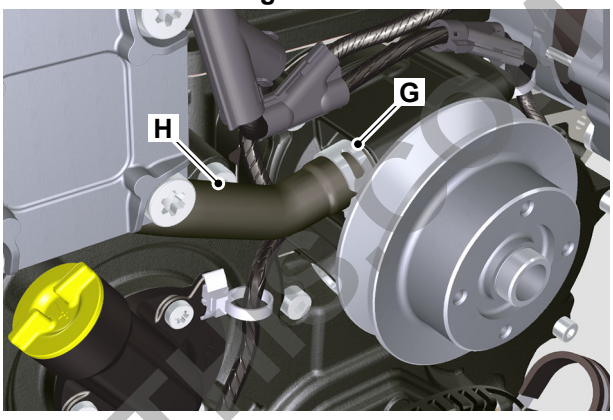
Figure 289.



K Water pump
L Screw
M Gasket

    14.3. Attach the water pump with the screws.
    14.4. Tighten the screws to the correct torque value.
    14.5. Install the pipe on the water pump.

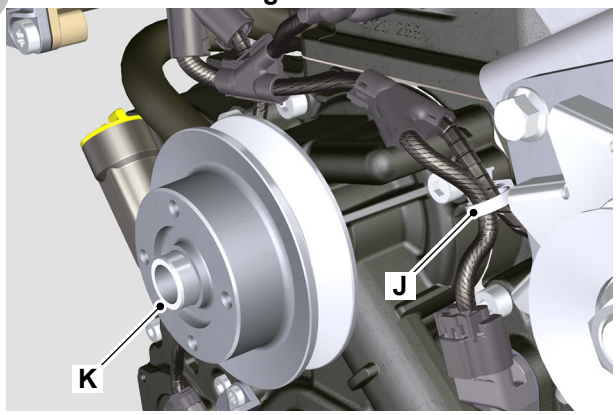
Figure 290.



G Clamp
H Pipe

    14.6. Attach the pipe to the water pump with the clamp.
    14.7. Install the clamp on the pump.

Figure 291.



J Clamp
K Water pump

15. Install the engine pulley and phonic wheel assembly.
    15.1. Make sure that the pin is engaged properly on the crankshaft.
    15.2. Put the pulley unit on the crankshaft. Make sure that the pin on the crankshaft is aligned with the hole on the pulley.
    15.3. Apply grease on the bolt thread.

    Consumable: Special MPL-EP Grease

    15.4. Put the flywheel crown mounting tool in the seat of the starter motor and secure with the starter motor mounting bolts.

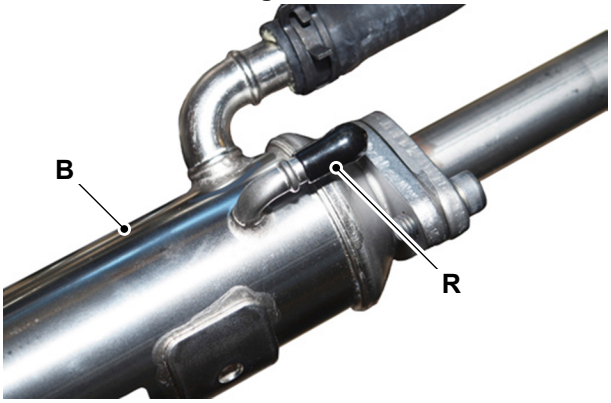
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Store and Recommission

Put protective caps on all open ports of the EGR cooler.

Figure 486.



B EGR cooler
R Protective cap

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Remove and Install

Consumables

Description	Part No.	Size
EP Hammer Grease	4003/2107	0.4kg
	4003/2106	12.5kg

Remove

1. Make the machine safe. Refer to the (PIL 01-03).
2. Discharge the hydraulic pressure. Refer to (PIL 30-00).
3. Position the machine with the upper structure slewed at an angle to the tracks.

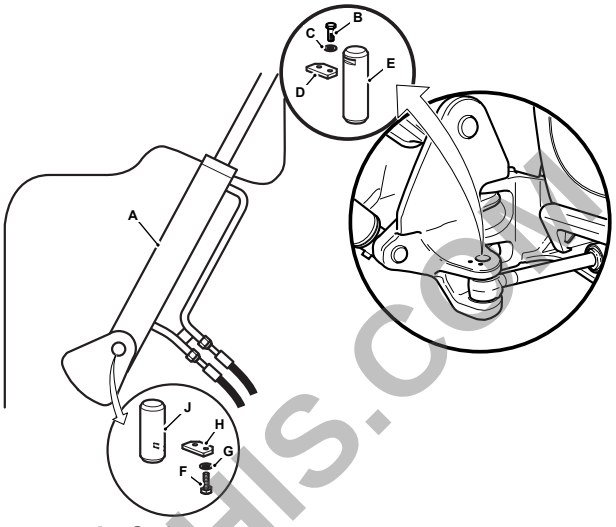
   Angle: 90°
4. Remove the hoses from the swing ram.

   4.1. Put labels on the hydraulic hoses to help identification for installation.

   4.2. Put caps on all the open ports and hoses to prevent contamination.
5. Remove the bolts and washers that attach the plate at the rod end of the swing ram. Refer to Figure 678.
6. Remove the pivot pin from the rod end of the swing ram. Refer to Figure 678.
7. Remove the bolts and washers that attach the plate at the cylinder head of the swing ram. Refer to Figure 678.

   7.1. The cylinder head pate of the swing ram is attached below the slew frame of the machine.
8. Remove the pivot pin from the cylinder head of the swing ram. Refer to Figure 678.
9. Remove the rod end of the ram from the kingpost and remove the ram from the front side of the machine. Refer to Figure 678.
10. Clean the pivot pins.

Figure 678.



A Swing ram
B Bolts
C Washers
D Plate - rod end
E Pin - rod end
F Bolts
G Washers
H Plate - cylinder head
J Pin - cylinder head

Install

1. Installation is the opposite of the removal procedure.
2. Apply grease to the swing ram pivot pins before assembly.

   2.1. Apply grease to the pivot points through the grease nipples.

   Consumable: EP Hammer Grease
3. Connect the hoses to the swing ram cylinder.
4. Check the hydraulic fluid level is correct in the tank.
5. Do an operational check of the hydraulic circuit.

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lead to the existing harness and secure using the crimp tool. Note that each of the splices detailed is colour-coded to make size and range readily visible. They are secured using the corresponding size and matching colour-coded jaws of the crimp tool to ensure joint security. This tool also incorporates a ratchet closing mechanism which will not release until the splice is fully closed to the correct compression size.

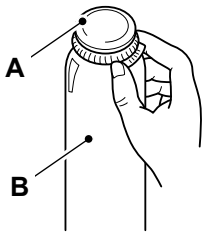
Special Tool: Wiring Splice (1.5-2.5mm Blue, contains 50 off) (Qty.: 1)
Special Tool: Wiring Splice (3-6mm Yellow, contains 50 off) (Qty.: 1)
Special Tool: Wiring Splice (0.5-1.5mm Red, contains 50 off) (Qty.: 1)

3. With the Butane heater assembly, seal the connection.

Special Tool: Butane Heater (Qty.: 1)

3.1. Remove the cap from the end of the disposable gas cartridge.

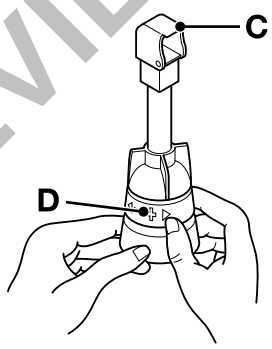
Figure 834.



A Cap
B Gas cartridge

3.2. Before assembling the gas cartridge to the reflector element, turn the red ring to the left, (in the direction of the minus sign marked on the ring).

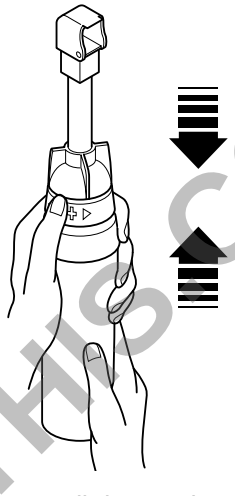
Figure 835.



C Reflector element
D Red ring

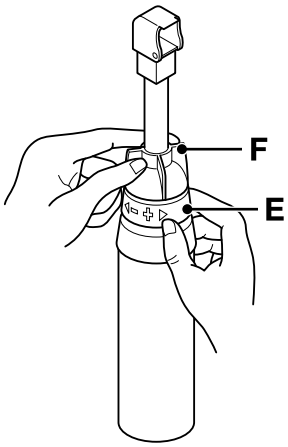
3.3. Position the tube hanging down from inside the reflector assembly into the hole at the top of the gas cartridge. Then press the gas cartridge up into the reflector assembly as far as possible until the two elements are clasped firmly together. An audible click will be heard.

Figure 836.



3.4. Turn the small ring so that the air holes are completely closed.

Figure 837.



E Small ring
F Air holes

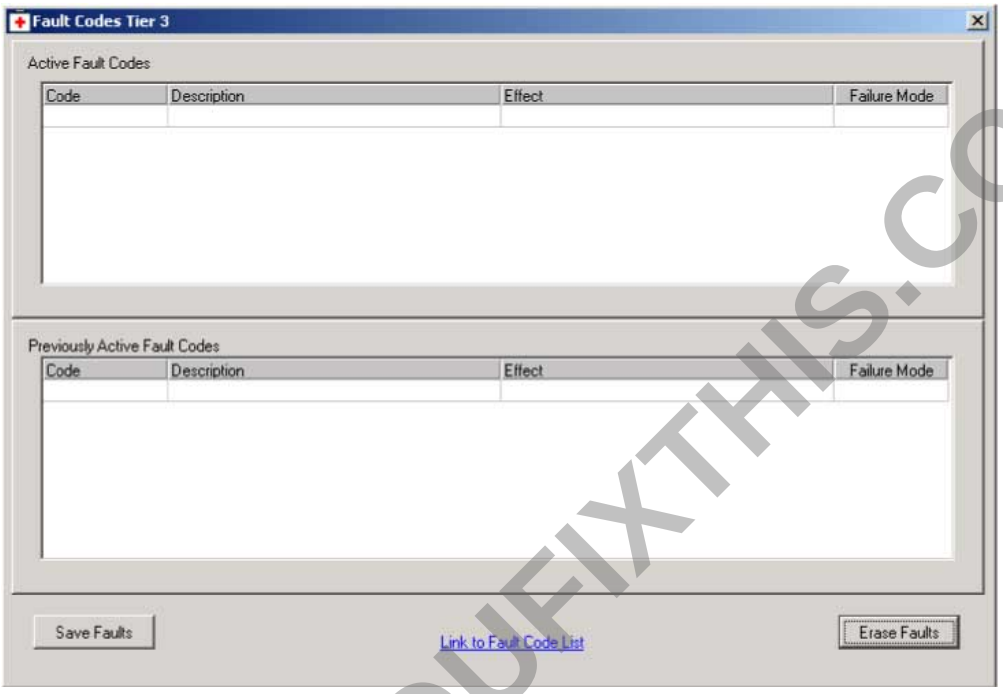
3.5. Turn the red ring to the right (in the direction of the plus sign) in order to turn on the gas. Important: Before turning the heater on, make sure that the cartridge is not hotter than the reflector element. This may occur if the cartridge is held in the hand for a long time. The temperature difference between the cartridge and the reflector element may cause long yellow flames to appear on ignition.

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Fault Codes Page

Figure 998.



This page allows the engineer to access fault codes logged by the ECM. The ECM logs a fault code if sensor or actuator signals are not valid. These codes are useful when fault finding.

- Active Fault Codes: Displays fault codes for active faults in real time. To link to information about the fault code click on the code. Note: Start the engine to see all the active fault codes. Note: To check if a fault code is no longer active set engine ignition system to OFF and then restart the engine. The Servicemaster log display will not delete codes that are no longer active until the engine ignition system is set to OFF.
- Previously Active Fault Codes: Displays fault codes for faults that have occurred but are not necessarily active. To link to information about the fault code click on the code.
- Save Faults: Click the button to save the fault code lists as a file to a computer location.
- Link to Fault Code List: Click to link to a complete list of possible fault codes.
- Erase Fault Codes: Click the button to erase logged fault codes from the ECM memory.

Engine Setup Data Tool-User Guide

Introduction

The Engine Setup software tool is part of the JCB Servicemaster software suite.

The Engine Setup Up tool can be used to view and change data stored the ECM. If the machine or engine specification is changed due to operational or maintenance requirements the relevant data must be changed in the ECM.

Connecting Engine Setup

To use Vehicle Setup your laptop computer must be connected to the machine CANbus.

Starting Engine Setup

1. Turn ON the machine ignition and additionally start the engine if required (taking normal precautions).
2. Start JCB Servicemaster on the laptop computer.

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