

SERVICE MANUAL

EXCAVATOR
210X, 220X

EN - 9813/9600 - ISSUE 2 - 02/2018

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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



Notes:

 <p>SERVICE MANUAL Volume 1 210X, 220X</p> <p>EN 9813/9600</p>	 <p>SERVICE MANUAL Volume 2 210X, 220X</p> <p>EN 9813/9600</p>
 <p>SERVICE MANUAL Volume 3 210X, 220X</p> <p>EN 9813/9600</p>	 <p>SERVICE MANUAL Volume 4 210X, 220X</p> <p>EN 9813/9600</p>



Notes:



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	
01-06-03 Model and Serial Number	01-15
01-06-06 Using the Manual	01-16
01-09 Description	
01-09-12 Main Component Locations	01-21
01-09-15 Service Point Locations	01-22
01-33 Cleaning	
01-33-00 General	01-29



Acronyms Glossary

ARV	Auxiliary Relief Valve
CAC	Charge Air Cooler
DEF	Diesel Exhaust Fluid
ECU	Electronic Control Unit
FEAD	Front End Accessory Drive
HVAC	Heating Ventilation Air Conditioning
MRV	Main Relief Valve
PIL	Parts Identification List
PPE	Personal Protective Equipment
SCR	Selective Catalytic Reduction



03 - Safety

Contents	Page No.
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



Notes:

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, you must 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.

06 - Safety Warnings

Introduction

In this manual there are safety notices. Each notice starts with a signal word. The signal word meanings are given below.

The signal word 'DANGER' indicates a hazardous situation which, if not avoided, will result in death or serious injury.

The signal word 'WARNING' indicates a hazardous situation which, if not avoided, could result in death or serious injury.

The signal word 'CAUTION' indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

The signal word 'Notice' indicates a hazardous situation which, if not avoided, could result in machine damage.

The safety alert system symbol (shown) also helps to identify important safety messages in this manual. When you see this symbol your safety is involved, carefully read the message that follows.

Figure 1. The safety alert system symbol



09 - General Safety

Introduction

Training

To operate the machine safely you must know the machine and have the skill to use it. You must abide by all relevant laws, health and safety regulations that apply to the country you are operating in. The operator's manual instructs you on the machine, its controls and its safe operation; it is not a training manual. Ensure that you receive the correct training before operating any machinery. Failing to do so will result in incorrect operation of the machine and you will be putting yourself and others at risk. In some markets, and for work on certain jobsites, you may be required to have been trained and assessed in accordance with an operator competence scheme. Make sure that you and your machine comply with relevant local laws and jobsite requirements – it is your responsibility.

Care and Alertness

All the time you are working with or on the machine, take care and stay alert. Always be careful. Always be alert for hazards.

Clothing

You can be injured if you do not wear the correct clothing. Loose clothing can get caught in the machinery. Keep cuffs fastened. Do not wear a necktie or scarf. Keep long hair restrained. Remove rings, watches and personal jewellery.

Alcohol and Drugs

It is extremely dangerous to operate machinery when under the influence of alcohol or drugs. Do not consume alcoholic drinks or take drugs before or while operating the machine or attachments. Be aware of medicines which can cause drowsiness.

Feeling Unwell

Do not attempt to operate the machine if you are feeling unwell. By doing so you could be a danger to yourself and those you work with.

Mobile Phones

Switch off your mobile phone before entering an area with a potentially explosive atmosphere. Sparks in such an area could cause an explosion or fire resulting in death or serious injury.

Switch off and do not use your mobile phone when refuelling the machine.

Lifting Equipment

You can be injured if you use incorrect or faulty lifting equipment. You must identify the weight of the item to be lifted then choose lifting equipment that is strong enough and suitable for the job. Make sure that lifting equipment is in good condition and complies with all local regulations.

Raised Equipment

Never walk or work under raised equipment unless it is supported by a mechanical device. Equipment which is supported only by a hydraulic device can drop and injure you if the hydraulic system fails or if the control is operated (even with the engine stopped).

Make sure that no-one goes near the machine while you install or remove the mechanical device.

Raised Machine

Never position yourself or any part of your body under a raised machine which is not correctly supported. If the machine moves unexpectedly you could become trapped and suffer serious injury or be killed.

Lightning

Lightning can kill you. Do not use the machine if there is lightning in your area.

Machine Modifications

This machine is manufactured in compliance with prevailing legislative requirements. It must not be altered in any way which could affect or invalidate its compliance. For advice consult your JCB dealer.

12 - Maintenance Safety

Introduction

Raised Machine

Never position yourself or any part of your body under a raised machine which is not correctly supported. If the machine moves unexpectedly you could become trapped and suffer serious injury or be killed.

Air Conditioning Maintenance

The air conditioning system is a closed loop system and contains pressurised refrigerant. No part of the system should be disconnected until the system has been discharged by a refrigeration engineer or a suitably trained person. You can be severely frostbitten or injured by escaping refrigerant.

Compressed Air

Compressed air is dangerous. Wear personal protective equipment. Never point a compressed air jet at yourself or others.

Springs

Always wear personal protective equipment when dismantling assemblies containing components under pressure from springs. This will protect against eye injury from components accidentally flying out.

Metal Splinters

You can be injured by flying metal splinters when driving metal pins in or out. Use a soft faced hammer or copper drift to remove and install metal pins. Always wear personal protective equipment.

Communications

Bad communications can cause accidents. If two or more people are working on the machine, make sure each is aware of what the others are doing. Before starting the engine make sure the others are clear of the danger areas. Examples of danger areas are: the rotating blades and belt on the engine, the attachments and linkages, and anywhere beneath or behind the machine. People can be killed or injured if these precautions are not taken.

Repairs

If your machine does not function correctly in any way, get it repaired straight away. Neglect of necessary repairs could result in an accident or affect your health. Do not try to do repairs or any other type of maintenance work you do not understand. To avoid injury and/or damage get the work done by a specialist engineer.

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before connecting or removing any hydraulic hose, residual hydraulic pressure trapped in the service hose line must be vented. Make sure the hose service line has been vented before connecting or removing hoses. Make sure the engine cannot be started while the hoses are open.

'O' rings, Seals and Gaskets

Badly installed, damaged or rotted 'O' rings, seals and gaskets can cause leakages and possible accidents. Renew whenever disturbed unless otherwise instructed. Do not use Trichloroethane or paint thinners near 'O' rings and seals.

Arc Welding

To prevent the possibility of damage to electronic components, disconnect the battery and the alternator before arc-welding on the machine or attached implements.

If the machine is equipped with sensitive electrical equipment, i.e. amplifier drivers, electronic control units (ECUs), monitor displays, etc., then disconnect them before welding. Failure to disconnect the sensitive electrical equipment could result in irreparable damage to these components.

Parts of the machine are made from cast iron, welds on cast iron can weaken the structure and break. Do not weld cast iron. Do not connect the welder cable or apply any weld to any part of the engine.

Always connect the welder earth (ground) cable to the same component that is being welded to avoid damage to pivot pins, bearings and bushes. Attach the welder earth (ground) cable a distance from the part being welded no more than 0.6m.

Counterweights

Your machine may be installed with counterweights. They are extremely heavy. Do not attempt to remove them.

Accumulators

The accumulators contain hydraulic fluid and gas at high pressure. Prior to any work being carried out on systems incorporating accumulators, the system pressure must be discharged by a JCB dealer, as the sudden release of the hydraulic fluid or gas may cause serious injury or death.

Hot Components

Touching hot surfaces can burn skin. The engine and machine components will be hot after the unit has been running. Allow the engine and components to cool before servicing the unit.

Soft Ground

A machine can sink into soft ground. Never work under a machine on soft ground.

Working Under the Machine

Make the machine safe before getting beneath it. Make sure that any attachments on the machine are correctly attached. Engage the park brake, remove the ignition key, disconnect the battery. If the machine has wheels use blocks to prevent unintentional movement.

Lifting the Machine

Under no circumstances must the engine be run with the transmission in gear and only one driving wheel jacked clear of the ground, since the wheel on the ground will move the machine.

Chemicals

Certain seals and gaskets (e.g. crankshaft oil seal) on JCB machines contain fluoroelastomeric materials such as Viton®, FluorelTM and Technoflon®. Fluoroelastomeric materials subjected to high temperatures can produce highly corrosive hydrofluoric acid. This acid can severely burn. New fluoroelastomeric components at ambient temperature require no special safety precautions. Used fluoroelastomeric components whose temperatures have not exceeded 300°C (571.6°F) require no special safety precautions. If evidence of decomposition (e.g. charring) is found, refer to the next paragraph for safety instructions. Do not touch component or surrounding area. Used fluoroelastomeric components subjected to temperatures greater than 300°C (571.6°F) (e.g. engine fire) must be treated using the following safety procedure. Make sure that heavy duty gloves and special safety glasses are worn: Thoroughly wash contaminated area with 10% calcium hydroxide or other suitable alkali solution, if necessary use wire wool to remove burnt remains. Thoroughly wash contaminated area with detergent and water. Contain all removed material, gloves etc. used in this operation in sealed plastic bags and dispose of in accordance with Local Authority Regulations. Do not burn fluoroelastomeric materials.

Hydraulic Hoses

Never re-use hydraulic hose end crimps or use reusable hose end crimps.

Personal Protective Equipment

Use the appropriate personal protective equipment before performing maintenance on the machine, otherwise you could be injured.

Working at Height

Use appropriate access equipment such as ladders or a working platform if it is necessary to work at height to perform maintenance tasks on the machine. If you do not use suitable access equipment there is a risk of falling, resulting in personal injury or death.

18 - Operating Safety

Introduction

Training

Make sure that you have had adequate training and that you are confident in your ability to operate the machine safely before you use it. Practice using the machine and its attachments until you are completely familiar with the controls and what they do. With a careful, well trained and experienced operator, your machine is a safe and efficient machine. With an inexperienced or careless operator, it can be dangerous. Do not put your life, or the lives of others, at risk by using the machine irresponsibly. Before you start to work, tell your colleagues what you will be doing and where you will be working. On a busy site, use a signalman.

Before doing any job not covered in this manual, find out the correct procedure. Your local JCB distributor will be glad to advise you.

Fuel

Fuel is flammable, keep naked flames away from the fuel system. Stop the engine immediately if a fuel leak is suspected. Do not smoke while refuelling or working on the fuel system. Do not refuel with the engine running. Completely wipe off any spilt fuel which could cause a fire. There could be a fire and injury if you do not follow these precautions.

Machine Condition

A defective machine can injure you or others. Do not operate a machine which is defective or has missing parts. Make sure the maintenance procedures in this manual are completed before using the machine.

Machine Limits

Operating the machine beyond its design limits can damage the machine, it can also be dangerous. Do not operate the machine outside its limits. Do not try to upgrade the machine performance with unapproved modifications or additional equipment.

Engine/Steering Failure

If the engine or steering fails, stop the machine as quickly as possible. Do not operate the machine until the fault has been corrected.

Exhaust Gases

Machine exhaust gases can harm and possibly kill you or bystanders if they are inhaled. Do not operate the machine in closed spaces without making sure there is good ventilation. If possible, install an exhaust extractor. If you begin to feel drowsy, stop the machine at once and get into fresh air.

Worksites

Worksites can be hazardous. Examine the site before working on it. You could be killed or injured if the ground gives way under your machine or if piled material collapses onto it. Check for potholes and hidden debris, logs, ironwork etc. Any of these could cause you to lose control of your machine. Check for utilities such as electric cables (overhead and underground), gas and water pipes etc. Mark the positions of the underground cables and pipes. Make sure that you have enough clearance beneath overhead cables and structures.

Communications

Bad communications can cause accidents. Keep people around you informed of what you will be doing. If you will be working with other people, make sure any hand signals that may be used are understood by everybody. Worksites can be noisy, do not rely on spoken commands.

Parking

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

Banks and Trenches

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

Safety Barriers

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

Sparks

Explosions and fire can be caused by sparks from the exhaust or the electrical system. Do not use the machine in closed areas where there is flammable material, vapour or dust.

Hazardous Atmospheres

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

Regulations

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

Electrical Power Cables

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

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

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

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

Working Platform

Using the machine as a working platform is hazardous. You can fall off and be killed or injured. Never use the machine as a working platform unless with approved man-basket or man-crate (if applicable).

Machine Safety

Stop work at once if a fault develops. Abnormal sounds and smells can be signs of trouble. Examine and repair before resuming work.

Hot Components

Touching hot surfaces can burn skin. The engine and machine components will be hot after the unit has been running. Allow the engine and components to cool before servicing the unit.

Travelling at High Speeds

Travelling at high speeds can cause accidents. Always travel at a safe speed to suit working conditions.

Hillsides

Operating the machine on hillsides can be dangerous if the correct precautions are not taken. Ground conditions can be changed by rain, snow, ice etc. Check the site carefully. When applicable, keep all attachments low to the ground.

Visibility

Accidents can be caused by working in poor visibility. Use your lights to improve visibility. Keep the road lights, windows, mirrors and cameras clean (when fitted).

Do not operate the machine if you cannot see clearly.

Modification of the machine's configuration by the user (e.g. the fitting of large and non-approved attachments) may result in a restriction of the machine visibility.

Hands and Feet

Keep your hands and feet inside the machine.

When using the machine, keep your hands and feet clear of moving parts. Keep your hands and feet within the operator compartment while the vehicle is in motion.

Controls

You or others can be killed or seriously injured if you operate the control levers from outside the machine. Operate the control levers only when you are correctly seated.

Passengers

Passengers in or on the machine can cause accidents. Do not carry passengers.

Fires

If your machine is equipped with a fire extinguisher, make sure it is checked regularly. Keep it in the correct machine location until you need to use it.

Do not use water to put out a machine fire, you could spread an oil fire or get a shock from an electrical fire. Use carbon dioxide, dry chemical or foam extinguishers. Contact your nearest fire department as quickly as possible.

Roll Over Protection

If the machine starts to roll over, you can be crushed if you try to leave the cab. If the machine starts to roll over, do not try and jump from the cab. Stay in the cab, with your seat belt fastened.

Confined Areas

Pay extra attention to proximity hazards when operating in confined areas. Proximity hazards include buildings, traffic and bystanders.

Safe Working Loads

Overloading the machine can damage it and make it unstable. Study the specifications in the Operator's Manual before using the machine.

Lightning

If you are inside the machine during a lightning storm stay in the machine until the storm has passed. If you are outside of the machine during a lightning storm stay away from the machine until the storm has passed. Do not attempt to mount or enter the machine.

If the machine is struck by lightning do not use the machine until it has been checked for damage and malfunction by trained personnel.

21 - Worksite Safety

Introduction

▲ WARNING You or others can be killed or seriously injured if you do unfamiliar operations without first practising them. Practise away from the worksite on a clear area. Keep other people away. Do not perform new operations until you are sure you can do them safely.

WARNING There could be dangerous materials such as asbestos, poisonous chemicals or other harmful substances buried on the site. If you uncover any containers or you see any signs of toxic waste, stop the machine and advise the site manager immediately.

WARNING Before you start using the machine, check with your local gas company if there are any buried gas pipes on the site.

If there are buried gas pipes we recommend that you ask the gas company for any specific advice regarding the way you must work on the site.

Some modern gas pipes cannot be detected by metal detectors, so it is essential that an accurate map of buried gas pipes is obtained before any excavation work commences.

Hand dig trial holes to obtain precise pipe locations. Any cast iron pipes found must be assumed to be gas pipes until contrary evidence is obtained.

Older gas pipes can be damaged by heavy vehicles driving over the ground above them.

Leaking gas is highly explosive.

If a gas leak is suspected, contact the local gas company immediately and warn all personnel on the site. Ban smoking, make sure that all naked lights are extinguished and switch off any engines which may be running.

You are strongly advised to make sure that the safety arrangements on site comply with the local laws and regulations concerning work near buried gas pipes.

CAUTION Before you start using the machine, check with your local public water supplier if there are buried pipes and drains on the site. If there are, obtain a map of their locations and follow the advice given by the water supplier.

You are strongly advised to make sure that the safety arrangements on site comply with the local laws and regulations concerning work near buried pipes and drains.

CAUTION If you cut through a fibre optic cable, Do not look into the end of it, your eyes could be permanently damaged.

An applicable worksite organisation is required in order to minimise hazards that are caused by restricted visibility. The worksite organisation is a collection of rules and procedures that coordinates the machines and people that work together in the same area. Examples of worksite organisation include:

- Restricted areas
- Controlled patterns of machine movement
- A system of communication.

You and/or your company could be legally liable for any damage you may cause to public utilities. It is your responsibility to make sure that you know the locations of any public utility cables or pipes on the worksite which could be damaged by your machine.

24 - Risk Assessment

Introduction

It is the responsibility of the competent people that plan the work and operate the machine to make a judgement about the safe use of the machine, they must take into account the specific application and conditions of use at the time.

It is essential that a risk assessment of the work to be done is completed and that the operator obeys any safety precautions that the assessment identifies.

If you are unsure of the suitability of the machine for a specific task, contact your JCB dealer who will be pleased to advise you.

The following considerations are intended as suggestions of some of the factors to be taken into account when a risk assessment is made. Other factors may need to be considered.

A good risk assessment depends on the training and experience of the operator. Do not put your life or the lives of others at risk.

Personnel

- Are all persons who will take part in the operation sufficiently trained, experienced and competent? Are they fit and sufficiently rested? A sick or tired operator is a dangerous operator.
- Is supervision needed? Is the supervisor sufficiently trained and experienced?
- As well as the machine operator, are any assistants or lookouts needed?

The Machine

- Is it in good working order?
- Have any reported defects been corrected?
- Have the daily checks been carried out?
- Are the tyres still at the correct pressure and in good condition and is there sufficient fuel to complete the job (if applicable)?

The Load

- How heavy is it? Is it within the capabilities of the machine?
- How bulky is it? The greater the surface area, the more affected it will be by wind speeds.
- Is it an awkward shape? How is the weight distributed? Uneven loads are more difficult to handle.
- Is there a possibility of the load shifting while being moved?

Loading/Unloading Area

- Is it level? Any slope of more than 2.5% (1 in 40) must be carefully considered.
- Is more than one direction of approach to the load possible? Approaching across the slope must be avoided, if possible.
- Is the ground solid? Will it support the weight of the machine when loaded?
- How rough is the ground? Are there any sharp projections which could cause damage, particularly to the tyres?
- Are there any obstacles or hazards in the area, for example, debris, excavations, manhole covers, power lines?
- Is the space sufficient for safe manoeuvring?
- Are any other machines or persons likely to be in or to enter the area while operations are in progress?

The Route to be Travelled

- How solid is the ground, will it provide sufficient traction and braking? Soft ground will affect the stability of the machine and this must be taken into account.
- How steep are any slopes, up/down/across? A cross slope is particularly hazardous, is it possible to detour to avoid them?

Weather

- How windy is it? High wind will adversely affect the stability of a loaded machine, particularly if the load is bulky.
- Is it raining or is rain likely? The ground that was solid and smooth when dry will become uneven and slippery when wet, and it will not give the same conditions for traction, steering or braking.

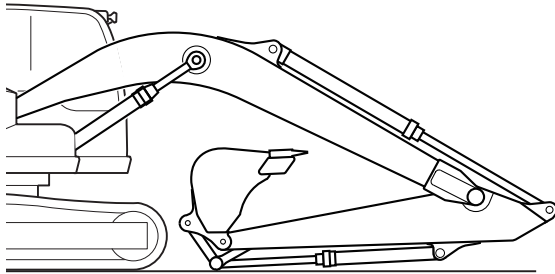
27 - Maintenance Positions

Introduction

Maintenance Position (Excavator Arm Lowered)

1. Park the machine on solid, level ground, with the upper structure parallel to the undercarriage.
2. If applicable, lower the dozer blade.
3. Lower the excavator so the dipper is flat on the ground. Refer to Figure 2.

Figure 2.



4. Stop the engine.
5. Remove the ignition key.
6. Discharge the hydraulic pressure.
[Refer to: PIL 30-00-00.](#)
7. Isolate the battery to prevent the accidental operation of the engine.
[Refer to: PIL 33-03-03.](#)



06 - About this Manual

Contents	Page No.
01-06-03 Model and Serial Number	01-15
01-06-06 Using the Manual	01-16



Notes:



03 - Model and Serial Number

Introduction

This manual provides information for the following model(s) in the JCB machine range:

Model	From:	To:
210X	2500051	
220X	2500051	

06 - Using the Manual

Introduction 01-16
 Fault-Finding 01-18

Introduction

Information in this manual conforms to a standard JCB service manual format. The format uses section headings taken from a PIL (Parts Identification List). These headings are assigned numerical identification references.

Table 1.

Example	Section	Main Assembly / Heading	Component / Sub-heading
PIL reference	15	03	03
Heading	Engine	Crankcase	Gasket

Information within each PIL reference is included under a set of standard headings such as Introduction, Health and Safety, Technical Data and Operation for example. Where additional relevant information is contained within another PIL reference a cross reference is provided.

Machine Variants

Where information is different depending on machine variant, the applicable information sets are included within the same PIL reference. Headings are included to identify which information is for which variant. Make sure you use the correct information.

Systems Descriptions

Where relevant procedures are included with full systems descriptions. These describe how the machine responds to operator inputs from devices such as control levers, electrical switches and electronic interfaces.

Diagnostics and Fault Finding

Information in this manual can help you diagnose machine faults.

Before attempting to diagnose possible faults check the following.

- Ensure that the operator understands the machine controls, functions and use. Refer to the applicable Operator Manual.
- Check that the maintenance record complies with the applicable schedule for the operating environment. Refer to (PIL 78-24).
- Check that the fuel and hydraulic oil in use complies with the standards specified. Refer to (PIL 75-03 and 75-18).
- Ensure that the machine electronic setup is applicable. Use the applicable Servicemaster vehicle setup tool. Refer to (PIL 33-57-03).

- Use the applicable Servicemaster diagnostics tools. Refer to (PIL 33-57-03).

To help you reference the applicable information as quickly as possible refer to Fault Finding in this section. Tables are given for the primary fault types. Applicable cross references are then given to the specific fault finding, check procedures and systems descriptions.

Remove and Install

Before removal of components or assemblies, clean the applicable parts of the machine. After removal cap open ports and hoses to prevent contamination. Refer to (PIL 01-33-00).

Use new sealing elements such as gaskets and O-rings.

Do not install defective components or assemblies. If necessary replace them with new ones.

Dismantle and Assemble

Before dismantling an assembly clean it.

After dismantling, clean the individual components and check them for wear and defects. If necessary replace them with new ones.

During assembly use new sealing elements such as gaskets and O-rings.

Torque Tightening

Use the torque tightening values contained in the individual procedures (Remove and Install, Disassemble and Assemble etc.). If no values are specified, use the standard torque tightening values. Refer to (PIL 72-00).

Always use the correct grade of fastener.

Consumable Products

Some procedures require the use of consumable products such as lubricants, sealants, adhesives and locking fluids. Use the correct products. Where products are available from JCB the applicable part numbers are given in the procedures. A complete list of consumable products available from JCB is given in this manual. Refer to (PIL 75-00).

After Sales

Some procedures require the use of equipment such as special tools and PPE (Personal Protective Equipment). Where special tools are available from JCB the applicable part numbers are given in the

procedures. Full details about the applicable special tools are given in this manual. Refer to (PIL 78-00).

Use the correct PPE to comply with local and employer regulations.

Fault-Finding

Fault

Engine does not start / stop	Table 2.	Page 01-18
Engine performance is not as expected	Table 3.	Page 01-18
Hydraulic services do not operate	Table 4.	Page 01-18
Hydraulic services do not operate as expected ⁽¹⁾	Table 5.	Page 01-18
Some excavator hydraulic services do not operate as expected ⁽¹⁾	Table 6.	Page 01-18
Slew service does not operate as expected (including the slew brake) ⁽¹⁾	Table 7.	Page 01-19
Travel service does not operate as expected ^{(1)/(2)}	Table 8.	Page 01-19
HVAC (Heating Ventilation Air Conditioning) system does not operate as expected	Table 9.	Page 01-19
Fault codes displayed on the instrumentation	Table 10.	Page 01-19

Table 2. Engine does not start / stop

Cause	Remedy
Engine fault	Refer to Fault Finding (PIL 15-00-00)
Start / stop electrical fault	Refer to Ignition Switch (PIL 33-30)
Fuel pump fault	Refer to Check (Operation) (PIL 18-21-00)
Fuel / exhaust system fault	Refer to Fault Finding (PIL 18-00-00)
Fuel injection fault	Refer to Fault Finding (PIL 18-18-00)

Table 3. Engine performance is not as expected

Cause	Remedy
Engine fault	Refer to Fault Finding (PIL 15-00-00)
Throttle control system fault	Refer to Throttle Control System (PIL 18-00-30)
Variable displacement hydraulic pump fault	Refer to Fault Finding (PIL 30-12-00)
Fuel pump fault	Refer to Check (Operation) (PIL 18-21-00)
Fuel / exhaust system fault	Refer to Fault Finding (PIL 18-00-00)
Fuel injection fault	Refer to Fault Finding (PIL 18-18-00)
Engine sensor fault	Refer to Fault Finding (PIL 15-84-00)
Engine cooling system fault	Refer to Fault Finding (PIL 21-00-00)

Table 4. Hydraulic services do not operate

Cause	Remedy
Controls isolation system fault	Refer to Controls Isolation (PIL 09-27-01)

Table 5. Hydraulic services do not operate as expected⁽¹⁾

Cause	Remedy
Servo pressure not correct	Refer to Check (Pressure) (PIL 30-00-15)
Variable displacement hydraulic pump fault	Refer to Fault Finding (PIL 30-12-00)
Main system pressure not correct	Refer to Check (Pressure) (PIL 30-50-03)
Engine performance is not as expected	Refer to Table 2

(1) Check the hydraulic service cycle times. Refer to Check (Operation) (PIL 30-00-15)

Table 6. Some excavator hydraulic services do not operate as expected⁽¹⁾

Cause	Remedy
Excavator joystick controller fault	Refer to Controls, Excavator Arm (PIL 09-27-09)
	Refer to Fault Finding (PIL 30-60-15)
Excavator control valve fault	Refer to Fault Finding (PIL 30-50-00)
ARV (Auxiliary Relief Valve) fault	Refer to Fault Finding (PIL 30-50-06)
Pressure switch fault	Refer to (PIL 33-90-00)

Cause	Remedy
Two stage MRV (Main Relief Valve) system fault (boost function)	Refer to Check (Pressure) (PIL 30-50-03) Refer to (PIL 33-27-37)
Cylinder ram fault	Refer to Fault Finding (PIL 30-15-00)

(1) Check the applicable hydraulic service cycle times. Refer to Check (Operation) (PIL 30-00-15)

Table 7. Slew service does not operate as expected (including the slew brake)⁽¹⁾

Cause	Remedy
Servo pressure not correct	Refer to Check (Pressure) (PIL 30-00-15)
Excavator joystick controller fault	Refer to Controls, Excavator Arm (PIL 09-27-09) Refer to Fault Finding (PIL 30-60-15)
Excavator control valve fault	Refer to Fault Finding (PIL 30-50-00) ⁽²⁾
Pressure switch fault	Refer to (PIL 33-90-00)
Slew lock system fault	Refer to (PIL 33-27-88)
Slew motor fault	Refer to Fault Finding (PIL 30-39-00)
Slew gearbox excessively worn or defective	Refer to (PIL 30-08-06)
Slew ring bearing excessively worn	Refer to Check (Condition) (PIL 06-24-03)

(1) Check the slew service cycle times. Refer to Check (Operation) (PIL 30-00-15)

(2) Check the applicable service spools.

Table 8. Travel service does not operate as expected⁽¹⁾⁽²⁾

Cause	Remedy
Servo pressure not correct	Refer to Check (Pressure) (PIL 30-00-15)
Excavator control valve fault	Refer to Fault Finding (PIL 30-50-00) ⁽³⁾
Travel system fault	Refer to (PIL 27-00-06)
Track control valve fault	Refer to (PIL 09-27-30) Refer to (PIL 30-60-46)
Track motor fault	Refer to Fault Finding (PIL 27-38-00)
Track components excessively worn or defective	Refer to (PIL 27-36-00)

(1) Check the travel speed times. Refer to Check (Operation) (PIL 30-00-15)

(2) Check the linear travel deviation is acceptable. Refer to Check (Operation) (PIL 30-00-15)

(3) Check the applicable service spools.

Table 9. HVAC (Heating Ventilation Air Conditioning) system does not operate as expected

Cause	Remedy
Control, HVAC unit, cooling, or refrigerant circuit fault	Refer to Fault Finding (PIL 12-00-00)

Table 10. Fault codes displayed on the instrumentation

Cause	Remedy
Machine or engine ECU (Electronic Control Unit) has detected a device fault	Look up the fault code description. Refer to (PIL 33-57-90)

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