



OPERATOR'S MANUAL



COMPACT EXCAVATOR
8014 CTS, 8016 CTS, 8018 CTS, 8020 CTS

EN - 9821/6100
ISSUE 4 - 03/2017

THIS MANUAL SHOULD ALWAYS STAY WITH THE MACHINE



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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.

Machine Delivery and Installation

Even if you have operated this type of equipment before, it is very important that your new machines operations and functions are explained to you by a JCB Dealer Representative following delivery of your new machine.

Following the installation you will know how to gain maximum productivity and performance from your new product.

Please contact your local JCB dealer if the Installation Form (included in this manual) has not yet been completed with you.

Your local JCB Dealer is



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Acronyms Glossary

CESAR	Construction Equipment Security and Registration
DEF	Diesel Exhaust Fluid
ECU	Electronic Control Unit
EHTMA	European Hydraulic Tool Manufacturers Association
ESOS	Engine Shut-Off Solenoid
FOGS	Falling Object Guard System
FOPS	Falling Object Protective Structure
HVAC	Heating Ventilation Air Conditioning
ISO	International Organization for Standardization
LCD	Liquid Crystal Display
LED	Light Emitting Diode
PIN	Product Identification Number
PPE	Personal Protective Equipment
RMS	Root Mean Square
ROPS	Roll-Over Protective Structure
SWL	Safe Working Load
TOPS	Tip-Over Protective Structure

Introduction About this Manual

Model and Serial Number

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

Model	From:	To:
8014 CTS	2069289	2071289
	2475101	2475500
	2541501	2541670
8016 CTS	2071290	2073290
8018 CTS	2073291	2075291
	2496951	2497950
	2544672	2545670
8020 CTS	2075292	2077292
	2097875	2098875

Using the Manual

This operator's manual is arranged to give you a good understanding of the machine and its safe operation. It also contains maintenance and technical data.

Read this manual from the front to the back before you use the machine for the first time, even if you have used machines of a similar/same type before as the technical specification, systems and controls of the machine may have changed. Particular attention must be given to all the safety aspects of operating and maintaining the machine.

If there is anything you are not sure about, ask your JCB dealer or employer. Do not guess, you or others could be killed or seriously injured.

The general and specific warnings in this section are repeated throughout the manual. Read all the safety statements regularly, so you do not forget them. Remember that the best operators are the safest operators.

The illustrations in this manual are for guidance only. Where the machines are different, the text and or the illustration will specify.

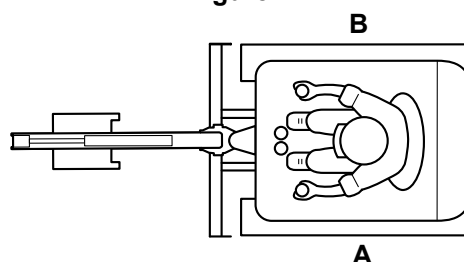
The manufacturer's policy is one of continuous improvement. The right to change the specification of the machine without notice is reserved. No responsibility will be accepted for discrepancies which may occur between specifications of the machine and the descriptions contained in this manual.

All of the optional equipment included in this manual may not be available in all territories

Left-Hand Side, Right-Hand Side

In this manual, 'left' and 'right' mean your left and right when you are seated correctly in the machine.

Figure 1.



A Left

B Right

Cab/Canopy

This manual frequently makes references to the cab. For example, 'do not operate the machine without an operator's manual in the cab'. These statements also apply to canopy build machines.

Cross References

In this manual, cross references are made by presenting the subject title in blue (electronic copy only). The number of the page upon which the subject begins is indicated within the brackets. For example: [Refer to: Cross References \(Page 2\)](#).

Location of Manual

Machines fitted with a cab have a operator's manual located in a vinyl document pouch behind the operators seat. Machines fitted with a canopy have a operator's manual located inside a lockable case on the canopy roof.

Safety

Safety - Yours and Others

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.

Safety Warnings

In this manual and on the machine, 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 (shown) also helps to identify important safety messages in this manual and on the machine. When you see this symbol, be alert, your safety is involved, carefully read the message that follows, and inform other operators.

Figure 2. The safety alert system



General Safety

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. If you are a new operator, get yourself trained in the skills of using a machine before trying to work with it. If you don't, you will not do your job well, and you will be a danger to yourself and others. 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.

Clothing and Personal Protective Equipment (PPE)

Do not wear loose clothing or jewellery that can get caught on controls or moving parts. Wear protective clothing and personal safety equipment issued or called for by the job conditions, local regulations or as specified by your employer.



Notes:

About the Product

Introduction

General

Before you start using the machine, you must know how the machine operates. Use this part of the manual to identify each control lever, switch, gauge, button and pedal. Do not guess, if there is anything you do not understand, ask your JCB dealer.

Name and Address of the Manufacturer

JCB Compact Products Limited, Harewood Estate, Leek Road, Cheadle, Stoke On Trent, United Kingdom, ST10 2JU

Product Compliance

Your JCB product was designed to comply with the laws and regulations applicable at the time of its manufacture for the market in which it was first sold. In many markets, laws and regulations exist that require the owner to maintain the product at a level of compliance relevant to the product when first produced. Even in the absence of defined requirements for the product owner, JCB recommend that the product compliance be maintained to ensure safety of the operator and exposed persons and to ensure the correct environmental performance. Your product must not be altered in any way which could affect or invalidate any of these requirements. For advice consult your JCB dealer.

For its compliance as a new product, your JCB and some of its components may bear approval numbers and marking's, and may have been supplied with a Declaration/Certificate of Conformity. These marking's and documents are relevant only for the country/region in which the product was first sold to the extent that the laws and regulations required them.

Re-sales and import/export of products across territories with different laws and regulations can cause new requirements to become relevant for which the product was not originally designed or specified. In some cases, pre owned products irrespective of their age are considered new for the purposes of compliance and may be required to meet the latest requirements which could present an insurmountable barrier to their sale/use.

Despite the presence of any compliance related marking's on the product and components, you should not assume that compliance in a new market will be possible. In many cases it is the person responsible for import of a pre owned product into a market that becomes responsible for compliance and who is also considered the manufacturer.

JCB may be unable to support any product compliance related enquiry for a product which has been moved out of the legislative country/region where it was first sold, and in particular where a product specification change or additional certification would have been required in order for the product to be in compliance.

Description

General

JCB Compact excavators are self-propelled tracked excavators with an upper structure capable of 360° rotation. They excavate, elevate, swing and discharge material by the action of a bucket fitted to the boom and dipper, without moving the undercarriage during any part of the working cycle of the machine.

Intended Use

The machine is intended to be used in normal conditions for the applications and in the environmental conditions as described in this manual.

When used normally with a bucket fitted to the machine the work cycle consists of, digging, elevating, slewing and the discharging of material without movement of the undercarriage.

Applications include earthmoving, road construction, building and construction, landscaping and similar applications.

An excavator can also be used for object handling if it is suitably equipped with relevant parts and systems. [Refer to: Lifting and Loading \(Page 65\)](#).

The machine is not intended for use in mining and quarrying applications, in demolition activities, forestry, any use underground or in any kind of explosive atmosphere.

The machine must not be used in the following scenarios because of the risk of overturning; used for forestry, used with attachments of unknown weight, used on surfaces of unknown stability. This list is not exhaustive.

If the machine is to be used in applications where there is a high silica concentration, risk due to materials containing asbestos or similar hazards, additional protective measures such as the use of PPE (Personal Protective Equipment) may be required.

The machine should not be operated by any person who does not have an appropriate level of qualification, training or experience of use of this type of machine.

Prior to use of the machine, its suitability (size, performance, specification etc.) should be considered with regards to the intended application and any relevant hazards that may exist. Contact your JCB dealer for support in determining the appropriate JCB machine, attachment and any optional equipment that is suitable for the application and environment.

Log Moving/Object Handling

Do not use the machine to move or handle logs unless sufficient log protection is installed. You could cause serious injury to yourself and damage to the machine. For more information, contact your JCB dealer.

Optional Equipment and Attachments

A wide range of optional attachments are available to increase the versatility of your machine. Only the JCB approved attachments are recommended for use with your machine. Contact your JCB dealer for the full list of approved attachments available.

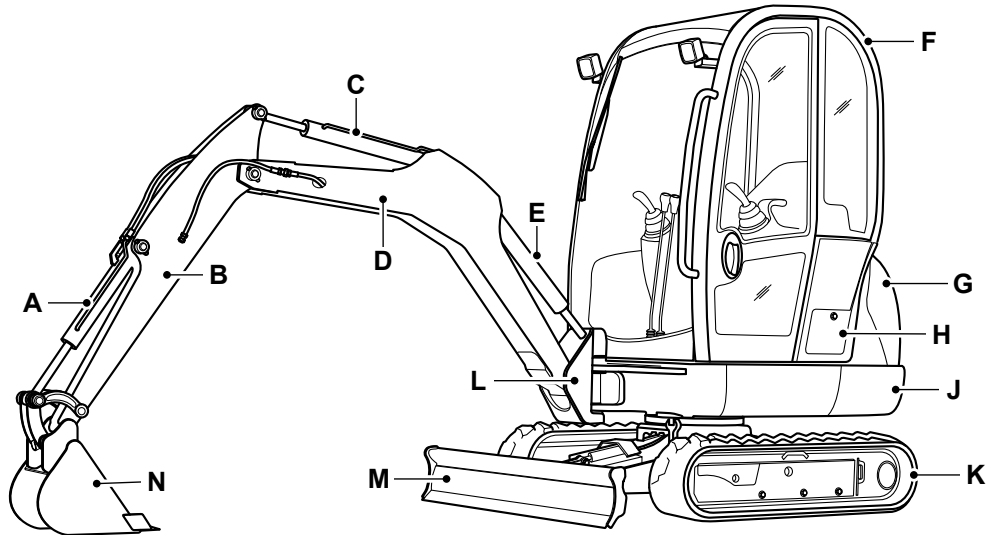
Danger Zone

The danger zone is any zone within and/or around the machinery in which a person is subject to a risk to their health or safety. The danger zone includes the area in immediate proximity to any hazardous moving parts, areas into which working equipment and attachments can be moved to quickly, the machine normal stopping distances and also areas into which the machine can quickly turn under normal conditions of use. Depending on the application at the time, the danger zone could also include the area into which debris, from use of an attachment or working tool, could be projected and any area into which debris could fall from the machine. During the operation of the machine, keep all persons out of the danger zone. Persons in the danger zone could be injured.

Before you do a maintenance task, make the product safe.

Main Component Locations

Figure 3.



- A Bucket ram
- C Dipper ram
- E Boom ram
- G Engine cover
- J Chassis
- L Kingpost
- N Bucket

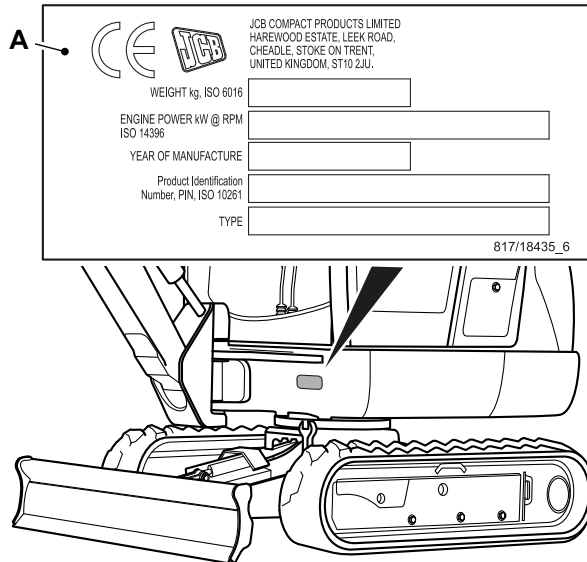
- B Dipper (part of the excavator arm)
- D Boom (part of the excavator arm)
- F Cab (contains the operator station)
- H Tool box
- K Undercarriage
- M Dozer blade

Product and Component Identification

Machine

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 4.



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, JCB08025L01226500.

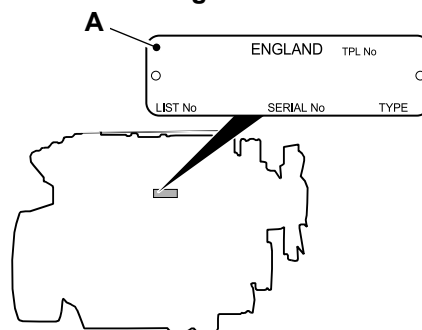
Table 1. Explanation of the PIN

Digit	Description
1 to 3	World manufacturer identification. For example, JCB = UK Build.
4 to 8	Machine type and model. For example, 08025 = 8025.
9	Random check Letter. The check letter is used to verify the authenticity of a machine's PIN.
10 to 17	Machine serial number.

Engine

The engine data label is located on the cylinder block as shown.

Figure 5.



A Engine data label

The data label includes the engine identification number. The engine identification number has 15 digits and must be read from left to right. For example, GJU65692500405P.

Table 2. Explanation of the engine identification number

Digit	Description
1 to 2	Engine type. For example, GJ = Naturally aspirated.
3	Country of manufacture. For example, U = United Kingdom.
4 to 8	Build number.
9 to 14	Engine serial number.
15	Year of manufacture.

Operator Protective Structure

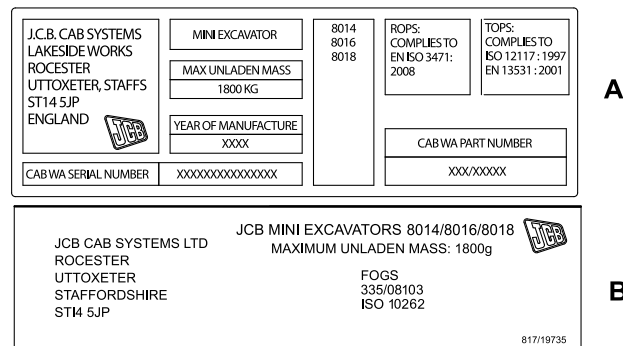
▲ WARNING Modified and wrongly repaired ROPS, TOPS and FOGS are dangerous. Do not modify the TOPS. Do not attempt to repair the ROPS, TOPS and FOGS. If the ROPS, TOPS and FOGS has been in an accident, do not use the machine until the structure has been examined and repaired. This must be done by a qualified person. For assistance, contact your JCB dealer. Failure to take precautions could result in death or injury to the operator.

WARNING Machines with a ROPS, FOPS, FOGS or TOPS are equipped with a seat belt. The ROPS, FOPS, FOGS or TOPS is designed to give you protection in an accident. If you do not wear the seat belt you could be thrown off the machine and crushed. You must wear a seat belt when using the machine. Fasten the seat belt before starting the engine.

Machines built to the ROPS (Roll-Over Protective Structure) and TOPS (Tip-Over Protective Structure) standards have an identification label attached to the cab/canopy.

A bolt on FOGS (Falling Object Guard System) is available which also carries a certified label. This label certifies the cab to the FOGS standard.

Figure 6.



A ROPS and TOPS identification label

B FOGS certified label

When a machine is used in an application with the risk of falling objects, the machine must be equipped with the optional FOGS. The FOGS is compliant to ISO10262 level 1 and is intended for protection from small objects, for example small rocks, small debris and other small objects encountered in operations such as highway maintenance, landscaping and other construction site services.

Safety Labels

General

▲ WARNING Safety labels on the machine warn you of particular hazards. You can be injured if you do not obey the safety instructions shown.

The safety labels are strategically placed around the machine to remind you of possible hazards.

If you need eye-glasses for reading, make sure you wear them when reading the safety labels. Do not over-stretch or put yourself in dangerous positions to read the safety labels. If you do not understand the hazard shown on the safety label, then refer to Safety Label Identification.

Keep all of the safety labels clean and readable. Replace a lost or damaged safety label. Make sure the replacement parts include the safety labels where necessary. Each safety label has a part number printed on it, use this number to order a new safety label from your JCB dealer.

Safety Label Identification

Figure 7.

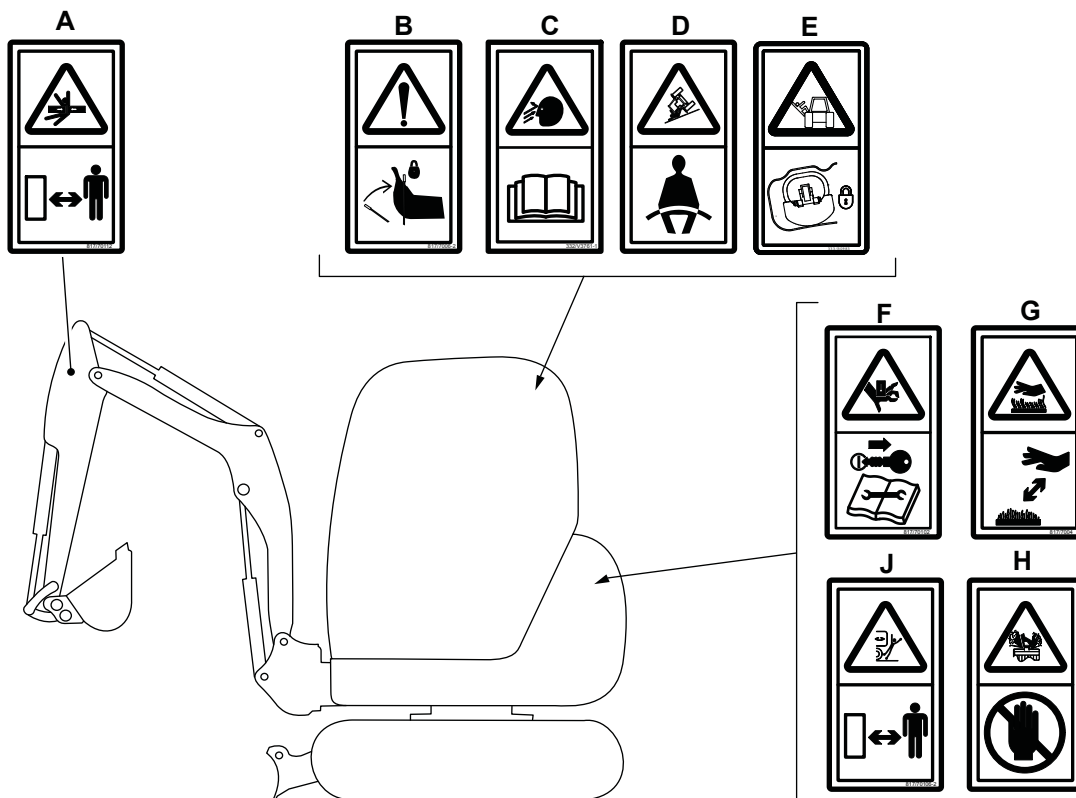


Table 3. Safety labels

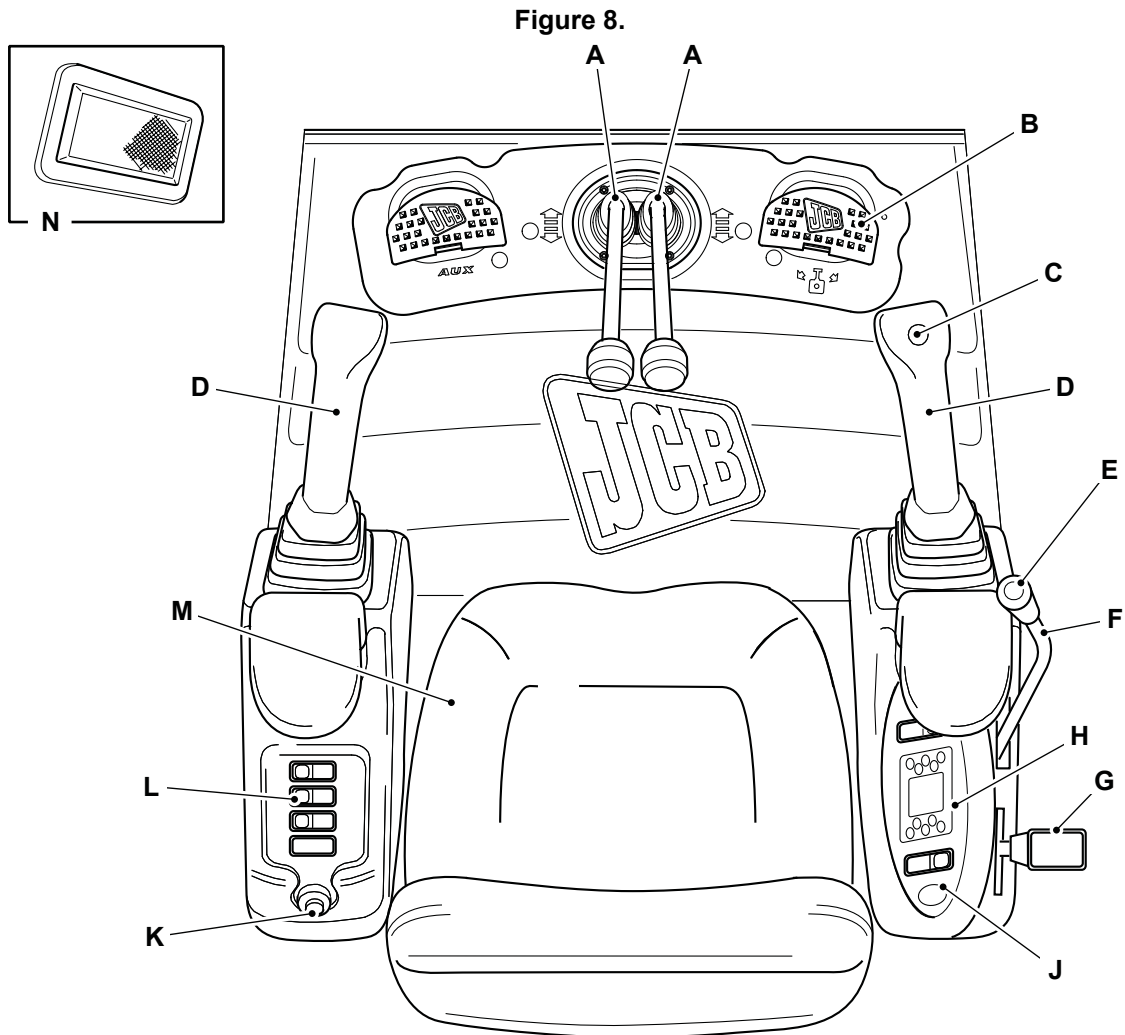
Item	Part Number	Description	Qty
A	817/70112	Crush hazard. Keep a safe distance from the moving parts.	2
B	817/70006	Fall. Unexpected machine movement because of accidental contact with the machine controls if the hydraulic functions are not isolated.	1
C	332/V3761	Flying debris warning. Refer to: ttachments (Page 87).	1
D	817/70029	Crush hazard. Wear the seatbelt when you operate the machine.	1
E	333/R0983	Fall. Unexpected machine movement because of accidental contact with the controls when the hydraulic system is not isolated.	1
F	817/70102	Crushing of fingers or hands. Remove the starter key and refer to the Service Manual before you start maintenance work.	1
G	817/70004	Burns to fingers and hands. Stay a safe distance away. Warning.	1



Item	Part Number	Description	Qty
H	817/70005	Hot fluid under pressure. Refer to: Cooling System (Page 141).	1
J	817/70106	Strike to whole body (machine swing). Keep a safe distance from the machine.	1

Operator Station

Component Locations



A Track controls Refer to: [Track Controls \(Page 52\)](#).

C Horn Refer to: [Excavator Arm Controls \(Page 58\)](#).

E Two-speed tracking switch

G Hand throttle control Refer to: [Hand Throttle Control \(Page 52\)](#).

J Ignition switch Refer to: [Ignition Switch \(Page 15\)](#).

L Console switches Refer to: [Console Switches \(Page 16\)](#).

N Cab interior light Refer to: [Cab Interior Light \(Page 15\)](#).

B Swing/auxiliary pedal Refer to: [Excavator Arm Controls \(Page 58\)](#).

D Excavator controls Refer to: [Excavator Arm Controls \(Page 58\)](#).

F Dozer blade control Refer to: [Dozer Blade Controls \(Page 61\)](#).

H Instrument panel Refer to: [Instrument Panel \(Page 53\)](#).

K Auxiliary power socket Refer to: [Auxiliary Power Socket \(Page 74\)](#).

M Operator seat Refer to: [Operator Seat \(Page 36\)](#).

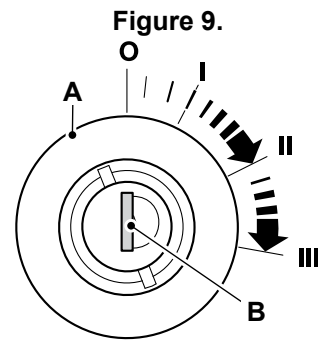
Interior Switches

Ignition Switch

The ignition key operates the four-position ignition switch. The ignition key can only be inserted or removed in position 0.

If the engine fails to start, the ignition key must be returned to position 0 before the starter motor is re-engaged.

Do not operate the starter motor for more than 20s without the engine firing. If the engine fires but does not fully start, let the starter motor cool for at least 2min between starts.



A Ignition switch

B Ignition key

Table 4. Switch Positions

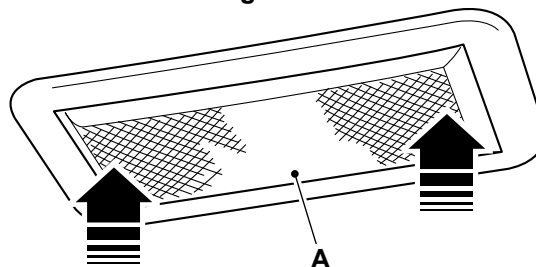
Position	Function
0	Off/Stop the Engine: Turn the ignition key to this position to stop the engine. Make sure the controls are in neutral and the excavator and dozer are lowered before you stop the engine.
I	On: Turn the ignition key to this position to connect the battery to all of the electrical circuits. The ignition key will return to this position when it is released from position II or position III.
II	Heat position. Turn the ignition key to this position to operate the glow plugs or grid heater (if applicable).
III	Start: Turn the ignition key to this position to operate the starter motor and turn the engine. The ignition switch has an inhibitor to stop the ignition switch being turned ON when the engine is running.

Cab Interior Light

Press either end of the light unit to switch on the cab interior light. Pressing the other end will switch the light off.

Make sure the light is turned off when you intend to leave the machine for a long period of time.

Figure 10.



A Cab interior light

Console Switches

General

The installed switches and their positions can change according to the specification of the machine.

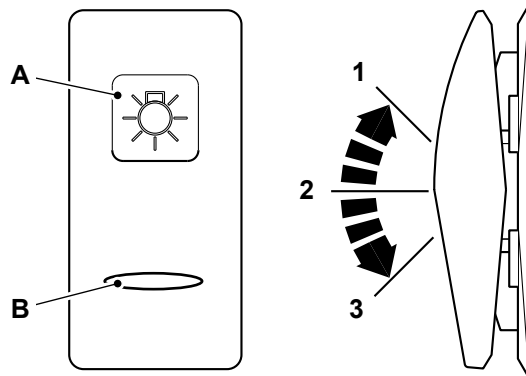
Each switch has a graphic symbol to show the function of the switch. Before you operate a switch, make sure that you understand its function.

The rocker switches have two or three positions (as shown).

If the switch has a backlight, then the graphic symbol illuminates when the ignition switch or side lights are in the on position.

The light bar illuminates to show that the switch function is active.

Figure 11.



A Graphic symbol

B Light bar

Work Lights



Two or three position rocker switch. The switch functions operate when the ignition switch is in the on position.

Position : 1 = Off

Position : 2 = Boom work light on

Position : 3 = Boom and cab work lights on (if installed)

Beacon



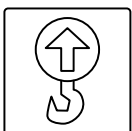
Two or three position rocker switch. The switch functions operate when the ignition switch is in the on and off positions.

Position : 1 = Off

Position : 2 = Beacon on

Refer to: [Beacon \(Page 47\)](#).

Overload Warning System



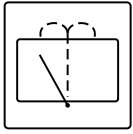
Two position rocker switch. The switch functions operate when the ignition switch is in the on position.

Position : 1 = Off

Position : 2 = On

Refer to: [Overload Warning System \(Page 66\)](#).

Window Wipers



Three position rocker switch. The switch functions operate when the ignition switch is in the on position. The wiper will self-park when switched off.

Position : 1 = Off

Position : 2 = On

Position : 3 = Washer on (if installed)

Operation Introduction

General

The aim of this part of the manual is to guide the operator step-by-step through the task of learning how to operate the machine efficiently and safely. Read the Operation section through from beginning to end.

The operator must always be aware of events happening in or around the machine. Safety must always be the most important factor when you operate the machine.

When you understand the operating controls, gauges and switches, practice using them. Drive the machine in an open space, clear of people. Get to know the 'feel' of the machine and its driving controls.

Do not rush the job of learning, make sure you fully understand everything in the Operation section. Take your time and work efficiently and safely.

Remember:

- Be careful.
- Be alert.
- Be safe.

Operating Safety

General

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 out door 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.

Unstable Ground Conditions

Do not operate the machine on soft and unstable ground conditions. Operating the machine on soft and unstable ground conditions can cause the machine to tilt under its own weight, resulting in the machine tipping over or sinking into the ground.

Visibility

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

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. Firefighters must use self-contained breathing apparatus.

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.

Worksite Safety

▲ 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.

Risk Assessment

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.

Walk-Around Inspection

General

▲ **WARNING** Walking or working under a raised boom and dipper is hazardous. You could be crushed by the boom and dipper or get caught in the linkages. Lower the boom and dipper before doing these checks.

The following checks must be made each time you return to the machine after leaving it for any period of time. We advise you also to stop the machine occasionally during long work sessions and do the checks again.

All these checks concern the serviceability of the machine. Some concern your safety. Get your service engineer to check and correct any defects.

1. Check for cleanliness.
 - 1.1. Clean the windows, light lenses and the rear view mirrors (where applicable).
 - 1.2. Remove dirt and debris, especially from around the linkages, rams, pivot points and radiator.
 - 1.3. Make sure the cab step and handrails are clean and dry.
 - 1.4. Clean all of the safety and instructional labels. Replace any label that is missing or cannot be read.
2. Check for damage.
 - 2.1. Examine the machine generally for damaged and missing parts.
 - 2.2. Make sure that the attachment is correctly attached and in good condition.
 - 2.3. Make sure that all of the pivot pins are correctly installed.
 - 2.4. Examine the windows for cracks and damage. Glass splinters can blind.
 - 2.5. Check for oil, fuel and coolant leakages below the machine.

WARNING! *You could be killed or injured with damaged tracks. Do not use the machine with damaged or excessively worn tracks.*

3. Check the tracks.

[Refer to: Tracks \(Page 143\).](#)
4. Make sure that all of the filler caps are installed correctly.
5. Make sure that all of the access panels are closed correctly.

[Refer to: Access Apertures \(Page 125\).](#)
6. If the filler caps and access panels are installed with locks, we recommend that you lock them to prevent theft or tampering.

Entering and Leaving the Operator Station

General

▲ WARNING For safety reasons, machines installed with single access canopies from new must not have the barrier removed. The machine must always be entered/exited with the left hand isolator raised via the left hand side.

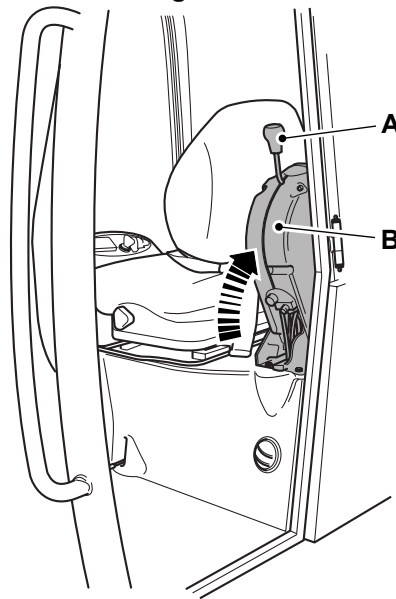
WARNING Do not enter or exit the cab unless the controls isolation lever is in the fully raised position.

CAUTION Entering or leaving the operator station must only be made where steps and handrails are provided. Always face the machine when entering and leaving. Make sure the step(s), handrails and your boot soles are clean and dry. Do not jump from the machine. Do not use the machine controls as handholds, use the handrails.

Entering the Cab

1. Open the cab door and if necessary attach it in the open position.
[Refer to: Operator Door \(Page 30\).](#)
2. Check that the left controls console is raised. When the left controls console is in the raised position the excavator, track, dozer, swing, and auxiliary controls cannot be operated.
[Refer to: Control Lock \(Page 49\).](#)

Figure 12.

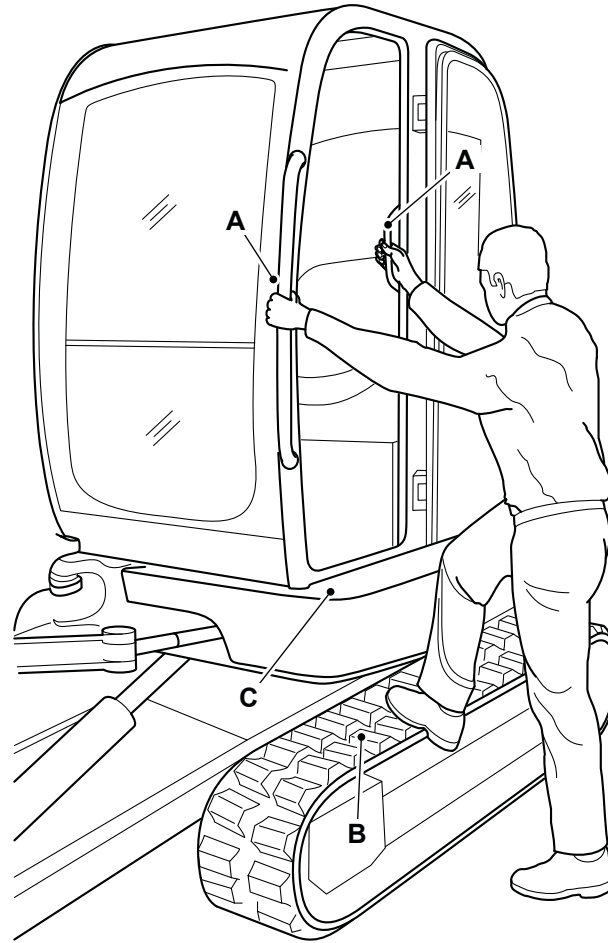


A Handle

B Left controls console

3. Hold the two handrails (one each side of the cab entrance), use the track to climb to the step.

Figure 13.



A Handrails
C Step

B Track

4. Hold the left handrail, step into the cab and swing yourself into the operators seat.

Leaving the Cab

1. Park the machine on solid, level ground with the upper structure parallel to the undercarriage.
2. Stop the engine.
3. Turn the ignition switch to position 1.
4. Operate the hydraulic controls several times to release any residual hydraulic pressure in the system.
5. Turn the ignition key to position 0.
6. Raise the left controls console.
7. Open the cab door and latch it in the open position.
8. Hold the left handrail and turn your back towards the step.
9. Hold both handrails and use the track to step down backwards from the step onto the ground.

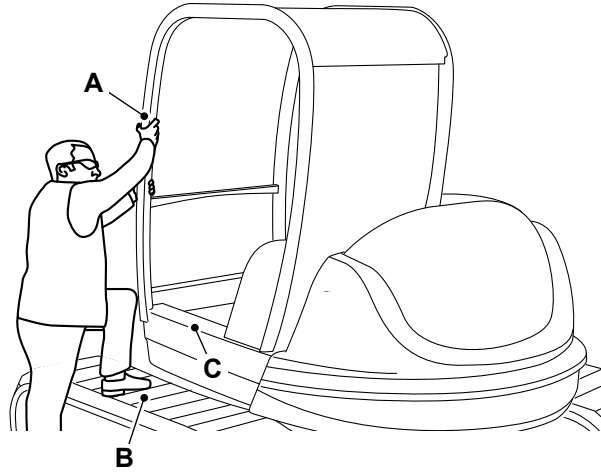
Entering the Canopy

1. Check that the left controls console is raised. When the left controls console is in the raised position the excavator, track, dozer, swing, and auxiliary controls cannot be operated.

Refer to: [Control Lock \(Page 49\)](#).

2. Hold the front canopy pillar with both hands and use the track to climb to the cab step.

Figure 14.



A Front canopy pillar
C Step

B Track

3. With one hand still on the front canopy pillar, step into the cab and swing yourself into the operators' seat.

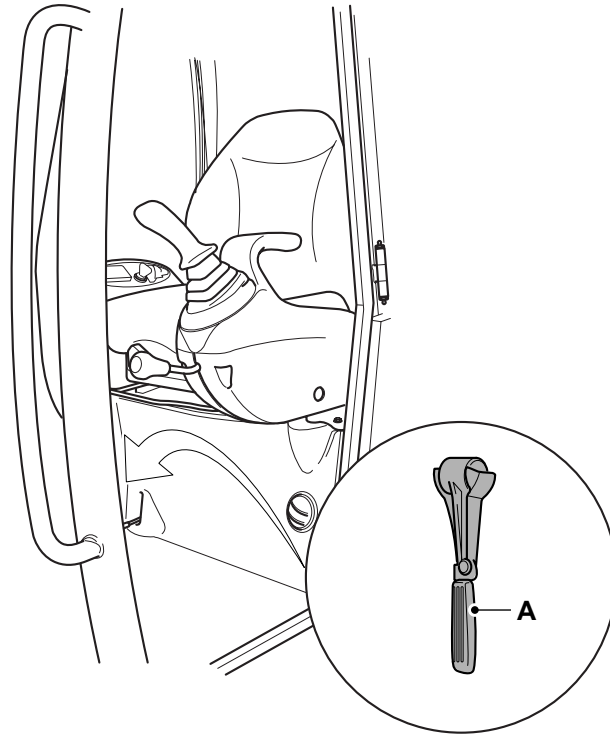
Leaving the Canopy

1. Park the machine on solid, level ground with the upper structure parallel to the undercarriage.
2. Stop the engine.
3. Turn the ignition switch to position 1.
4. Operate the hydraulic controls several times to release any residual hydraulic pressure in the system.
5. Turn the ignition key to position 0.
6. Raise the left controls console.
7. Turn your back towards the cab step with one hand on the front canopy pillar.
8. Hold the front canopy pillar with both hands and use the track to step down backwards from the cab step onto the ground.

Emergency Exit

Remove the glazing breaker and strike the rear screen near the corner, this will shatter the screen which can then be knocked out.

Figure 15.



A Glazing breaker

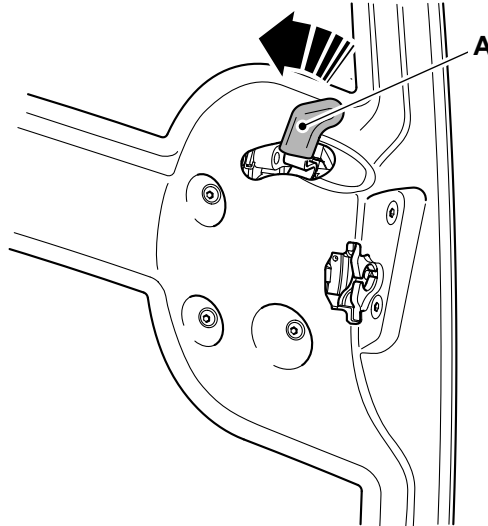
Doors

Operator Door

To open the door from the outside, unlock it with the ignition key and press the lock barrel to release the latch. Pull the handle towards you.

To open the door from inside, pull the lever towards you.

Figure 16.



A Lever

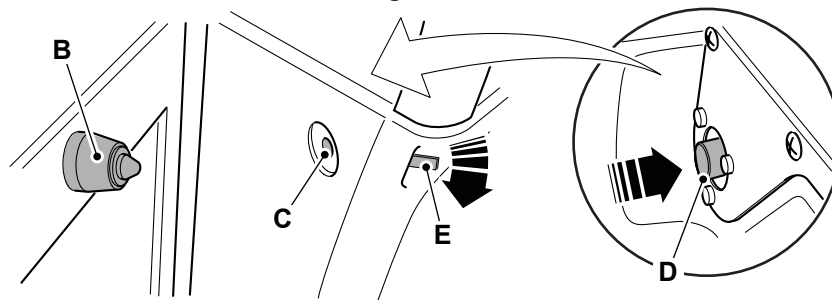
Close the door from the inside by pulling it towards you, it will latch itself.

Latch the Door in the Open Position

To latch the door in the open position open the door until the spigot on the door latches correctly in the socket in the side of the cab.

To release the door from the stowed position push the button inside the cab or pull the lever outside the cab.

Figure 17.



B Spigot
D Button

C Socket
E Lever

Windows

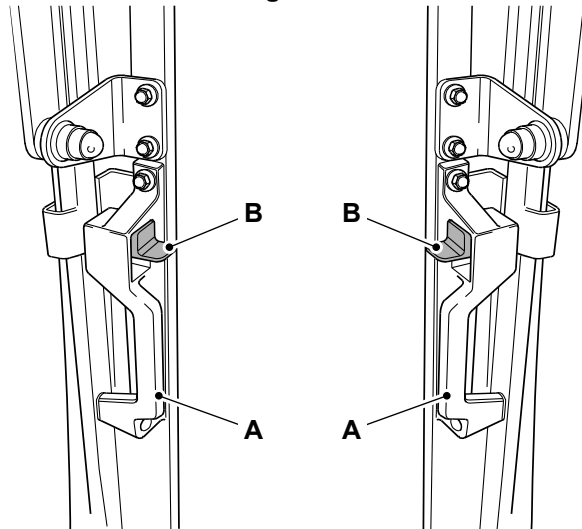
Front Window

- ▲ **CAUTION** Take care when raising and lowering the window. Lower your head as you pull the window back. Isolate the hydraulic controls before opening and closing the window.

To open the up and over window:

1. Hold the handles, press and hold down the levers.
2. Lift the screen into a position parallel with the roof using the handles. Release the levers to hold it in position.

Figure 18.



A Handles

B Levers

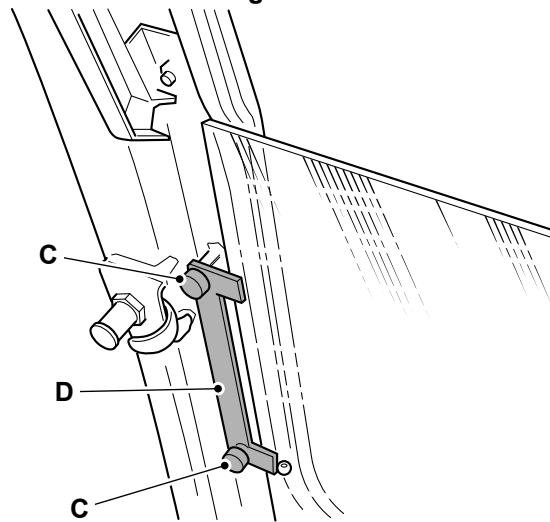
Care must be taken when lowering the window not to bump the top edge of the lower front window.

Removing and Installing the Front Window Lower Panel

- ▲ **CAUTION** When handling the removed front window lower panel, take care not to step backwards out of the cab through the front window aperture.

1. Make sure that the engine is stopped and the hydraulic controls are isolated.
2. Open the front window and hold it in a position parallel with the roof.
3. Loosen the bolts and remove the retaining bar.

Figure 19.

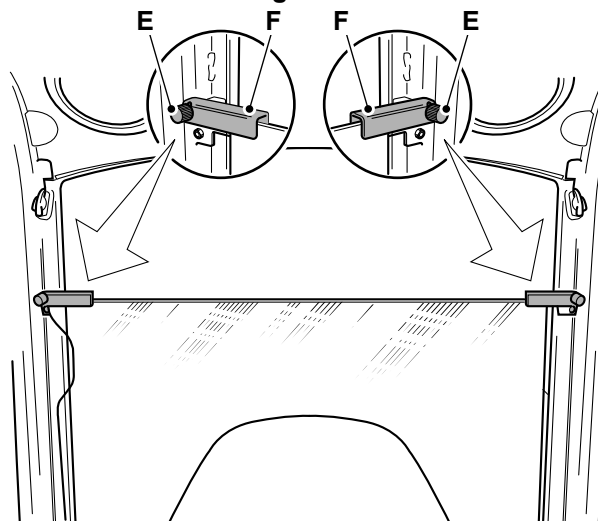


C Bolts

D Retaining bar

- Loosen the bolts and turn retainers to the raised position.

Figure 20.



E Bolts

F Retainers

- Carefully lift out the front window lower panel and stow it next to the rear window as shown.
- Turn retainers to hold the panel and tighten bolts.

To install the front window lower panel, reverse the removal procedure. Make sure the right hand edge of the panel is located correctly in the groove on the front window pillar before installing the retaining bar.

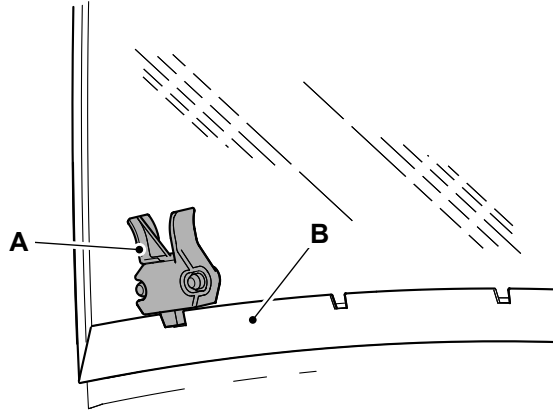
Side Window

The side window is held closed by a latch operated from inside the cab.

To open the window, pinch and hold the latch then slide the window to the desired position.

To close the window, pinch and hold the latch then slide the window fully shut. Check that the latch has located on the frame.

Figure 21.



A Latch

B Frame

Battery Isolator

General

▲ **Notice:** Before carrying out arc welding on the machine, disconnect the battery and alternator to protect the circuits and components. The battery must still be disconnected even if a battery isolator is installed.

Notice: Do not isolate the machine electrics when the engine is running, this may cause damage to the machine electrics.

To allow the engine ECU (Electronic Control Unit) to shutdown correctly, you must wait 30s before you isolate the battery. The 30s period starts when you turn the ignition off. If a radio is fitted, you may lose any settings.

Disconnect the Machine Electrics:

1. Turn the ignition key to the off position.
2. Wait for the engine ECU to shutdown correctly.
Duration: 30s
3. Get access to the battery isolator.
[Refer to: Service Points \(Page 123\).](#)
4. Turn the battery isolator key in a counter-clockwise direction and remove.

Connect the Machine Electrics:

1. Make sure the ignition is switched off.
2. Insert the battery isolator key and turn in a clockwise direction.

Before Starting the Engine

General

▲ DANGER Before lowering the attachments to the ground, make sure that the machine and the area around it are clear of other people. Anyone on or close to the machine could fall and be crushed by the attachments, or get caught in the linkages.

WARNING Secure all loose articles. Loose articles can fall and strike you or roll on the floor. You could be knocked unconscious, or the controls could get jammed. If that happens you could lose control of the machine.

CAUTION Machines installed with hose burst protection valves cannot have their attachments lowered with the engine stopped. Start the engine and lower the attachments before doing the walk-around inspection.

1. Read the Operating in Low Temperatures or Operating in High Temperatures procedures in the Operation section if you will be using the machine in very cold or very hot climates.

[Refer to: Operating Environment \(Page 83\).](#)

2. If the fuel tank was empty or if any part of the fuel system has been drained or disconnected, the fuel system must be primed before you try to start the engine.

[Refer to: Bleed \(Page 139\).](#)

3. Lower the excavator bucket and dozer to the ground, if they are not already there. They will lower themselves under their own weight when you operate the controls. Operate the controls carefully to control the rate of descent.

[Refer to: Operating Levers/Pedals \(Page 58\).](#)

4. For your own safety (and others) and for the maximum service life of your machine, do a pre-start inspection before you start the engine.

4.1. If you have not done it, do a walk-around inspection of the outside of the machine.

[Refer to: Walk-Around Inspection \(Page 25\).](#)

4.2. Remove any dirt and rubbish from the cab interior, specially around the pedals and control levers.

4.3. Remove any oil, grease and mud from the pedals and control levers.

4.4. Make sure that your hands and shoes are clean and dry.

4.5. Remove or stow all loose articles in the cab, for example tools.

4.6. Examine the ROPS (Roll-Over Protective Structure), FOPS (Falling Object Protective Structure) and FOGS (Falling Object Guard System) for damage. Get your JCB dealer to repair any damage. Make sure all securing bolts are installed and correctly tightened.

4.7. Check around the cab for loose or missing bolts, screws etc. Replace or tighten where necessary.

4.8. Check the excavator lever gaiters are not damaged or loose, replace or attach as required with new fasteners.

4.9. Examine the seat belt and its mountings for damage and excessive wear.

[Refer to: Check \(Condition\) \(Page 132\).](#)

4.10. Make sure that the following operate correctly: lights, horn, all switches, front window washer and wipers (if installed).

[Refer to: Electrical System \(Page 150\).](#)

5. Adjust the seat so that you can comfortably reach all the driving controls. You must be able to operate the control pedal with your back against the seat back. Make sure the seat locking lever has fully engaged.

[Refer to: Operator Seat \(Page 36\).](#)

6. Adjust the rear view mirrors (where applicable) to give you a good view close behind the machine, when you are correctly seated.

7. Fasten the seat belt.

Operator Seat

General

▲ **CAUTION** Position the seat so that you can comfortably reach the machine controls. Do not adjust the seat while the machine is moving. You could have an accident if you operate the machine with the seat in the wrong position.

The operator's seat can be adjusted for your comfort. A correctly adjusted seat will decrease the operator fatigue.

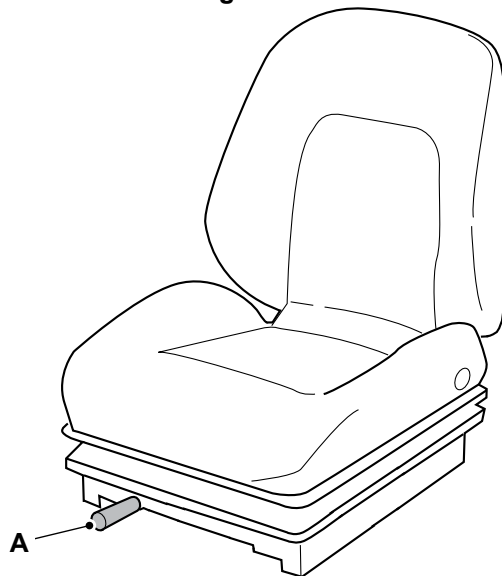
Adjust the seat so that you can comfortably reach the machine controls.

For driving the machine, adjust the seat so that you can push the pedals fully down when your back is against the seat back.

Stop using the machine if the operators seat becomes defective. Repair or replace the seat before using the machine again.

Basic Seat

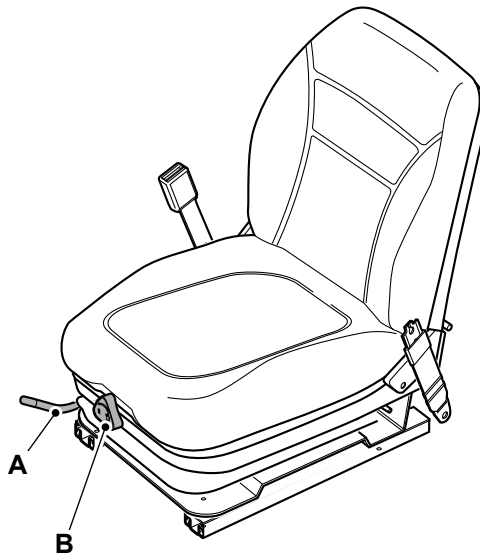
Figure 22.



A Lever (forward and backwards adjustment)

Suspension Seat

Figure 23.



A Lever (fowards/backwards adjustment)

B Lever (weight adjustment)

Seat Belt

General

▲ **WARNING** Operating the machine without a seat belt can be dangerous. Before starting the engine, make sure your seat belt is fastened. Check the tightness and condition of the seat belt securing bolts regularly.

WARNING When a seat belt is installed on your machine replace it with a new one if it is damaged, if the fabric is worn, or if the machine has been in an accident.

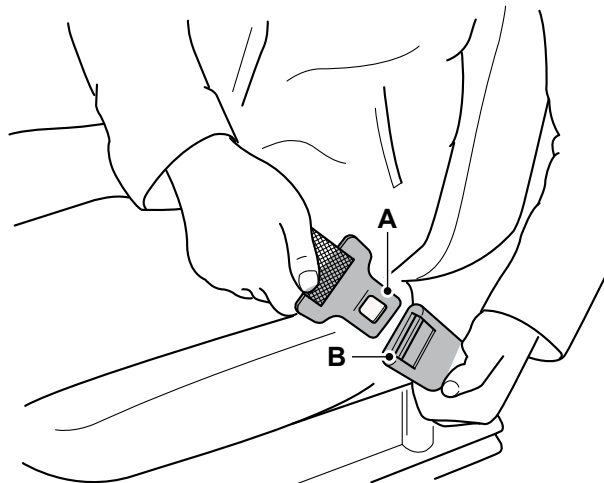
Inertia Reel Seat Belt

Fasten the Seat Belt

▲ **WARNING** If you do not wear your seat belt you could be thrown about inside the machine, or thrown out of the machine and crushed. You must wear a seat belt when using the machine. Fasten the seat belt before starting the engine.

1. Sit correctly in the seat.
2. Pull the seat belt and the tongue from the inertia reel holder in one continuous movement.
3. Push the tongue into the latch. Make sure the seat belt worn is snug and properly located on the body. Make sure the seat belt is not twisted and that it is over your hips not your stomach.
 - 3.1. If the seat belt 'locks' before the tongue is engaged, let the seat belt retract into the inertia reel holder then try again. The inertia mechanism can lock if you pull the seat belt too quickly or if the machine is parked on an slope.

Figure 24.



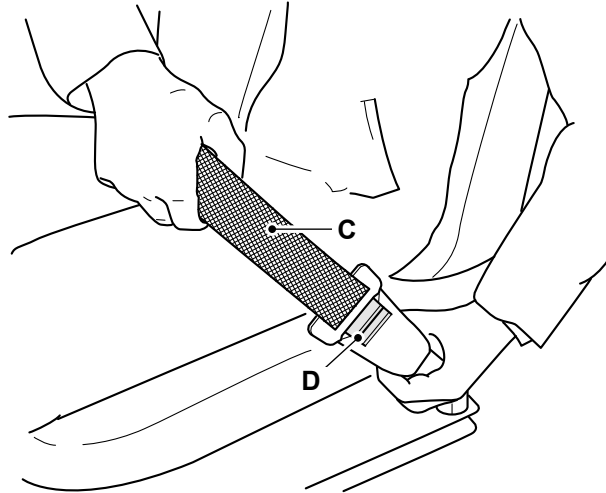
A Tongue

B Latch

WARNING! If the seat belt does not 'lock' when you check if the seat belt is operating correctly, do not drive the machine. Get the seat belt repaired or replaced immediately.

4. To make sure the seat belt operates correctly, hold the middle of the seat belt and pull quickly. The seat belt should 'lock'. Refer to Figure 25.

Figure 25.



C Seat belt

D Button

Release the Seat Belt

▲ WARNING Release the seat belt only after safely stopping the machine, switching off the engine and engaging the park brake (if applicable).

1. Push the button and pull the tongue from the latch.
2. Carefully let the seat belt retract into the inertia reel holder.

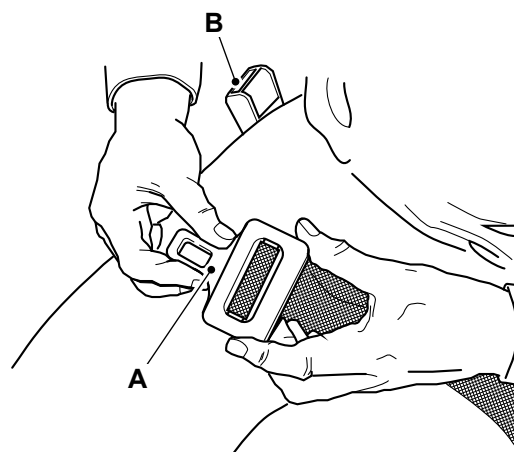
Static Seat Belt

Fasten the Seat Belt

▲ WARNING If you do not wear your seat belt you could be thrown about inside the machine, or thrown out of the machine and crushed. You must wear a seat belt when using the machine. Fasten the seat belt before starting the engine.

1. Sit correctly in the seat.
2. Push the tongue into the latch. Make sure the seat belt is worn snug and properly located on the body. Make sure the seat belt is not twisted and that it is over your hips not your stomach.

Figure 26.



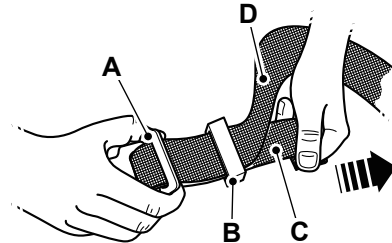
A Tongue

B Latch

Adjust

1. Move the toggle the required distance down the strap.
2. To make the strap longer, pull the end as far as it will go.
3. To make the strap shorter, pull the end as far as it will go.

Figure 27.



A Tongue

C Strap (pull here to lengthen)

B Toggle

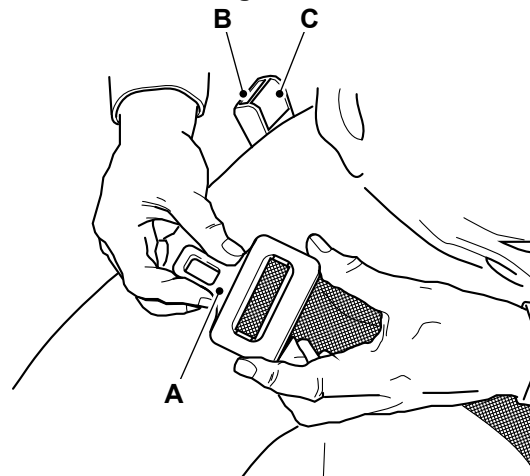
D Strap (pull here to shorten)

Release the Seat Belt

▲ WARNING Release the seat belt only after safely stopping the machine, switching off the engine and engaging the park brake (if applicable).

1. Push the button and pull the tongue from the latch.

Figure 28.



A Tongue

C Button

B Latch

Starting the Engine

General

▲ **WARNING** Thoroughly warm the hydraulic oil before operating the excavator services. Before selecting boom up, check there are no overhead obstructions or electric power cables.

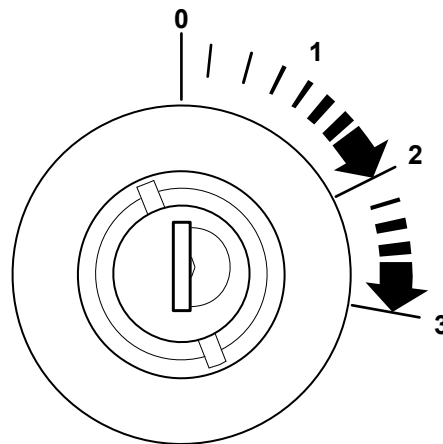
Notice: Do not use ether or other starting fluids to assist cold starting. Using these fluids may result in an explosion causing possible injury and/or damage to the engine.

The engine noise and or tone may be louder than usual when cold. The engine will become quieter when the engine reaches normal operating temperature.

1. Make sure that the machine is ready to start.
[Refer to: Before Starting the Engine \(Page 35\).](#)
2. If the machine has an immobiliser then you must disarm the immobiliser before you can start the engine.
3. Make sure the left arm rest is in the raised position.
[Refer to: Control Lock \(Page 49\).](#)
4. Move the throttle lever to the half speed position.
5. To warm the engine combustion chambers, turn the ignition key to position 2 for
Duration: 6s
6. Extend the time if the outside temperature is below
Temperature: 0°C (32.0°F)
7. Turn the ignition key further to position 3 and hold it there until the engine starts. Do not operate the starter for more than.
Duration: 15s
8. If the engine does not start, return the ignition key to the 0 position. Allow the starter to cool for a few minutes before repeating steps 4-7.

Notice: *If the oil pressure low light does not go out within 15s of the engine starting, stop the engine immediately to avoid engine damage. Do not start the engine until the fault has been rectified.*
9. When the engine has started, check that all the warning lights have gone off. Do not race the engine until the oil pressure warning light has gone off.
10. If any warning lights fail to go off, or come on while the engine is running, stop the engine as soon as it is safe to do so.
11. Warm the engine and hydraulics.
[Refer to: Warming Up \(Page 45\).](#)

Figure 29.



0 Ignition off/engine stop position
2 Glow plug position

1 Ignition on position
3 Crank position

Immobiliser

(if installed)

There are two different JCB immobiliser systems, one uses a keypad and the other a unique key system.

If your machine has an immobiliser system installed, then your JCB dealer should enable the system as part of the standard machine installation. If you prefer that the system is not enabled, then you must tell your JCB dealer. Your JCB dealer can enable the system at a later date. Machines with immobilisers installed should always be parked as per the instructions in the operators manual.

Introduction

Before attempting to disarm the immobiliser check that the machine is ready to start and that you have your four digit PIN (Product Identification Number) code available.

The green LED (Light Emitting Diode) will illuminate every time that a keypad button is fully depressed. Do not operate buttons with sharp objects, they may damage and disable the keypad.

If you make an error entering your PIN code and you realise this before pressing the ENT button then pressing the MD button cancels inputs and allows you to re-commence.

If the PIN code is incorrectly entered five times the immobiliser will lock for 15min. In this event it is recommended that you contact the machine owner for confirmation of the PIN code.

The PIN code will have to be entered every time that the ignition is switched off for longer than two minutes.

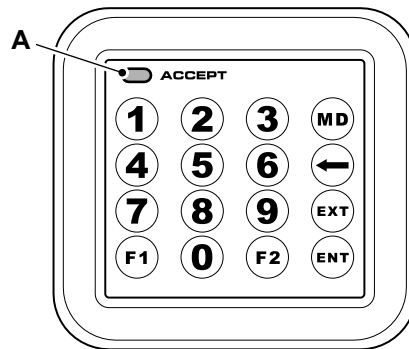
To Disarm the Immobiliser to Allow the Machine to be Used

1. Put the ignition key in the ignition switch. Turn the ignition key to position 1.
2. Enter your four digit PIN code using the keypad.
3. Push the 'ENT' button. The LED will come on for three seconds if the PIN code is correct and the machine can be started.
4. If an incorrect PIN code is entered the unit will lock. The LED will flash twice quickly, pause and then flash twice again and will continue this pattern until the ignition key is turned to the off position. In this event return to step 1 to try again.

4.1. After five failed tries the system will lock.

Duration: 15min

Figure 30.



A LED

To Arm the Immobiliser

1. Stop the engine. Remove the ignition key.
2. The immobiliser arms automatically after two minutes. The green LED flashes for 60 seconds, then goes off.
3. If you restart the engine within two minutes, the system disarms automatically.

To Add a New or Additional PIN Code

Before you try to add a new or additional PIN code, make sure that the machine is ready to start and that you have your six digit master code and your new four digit PIN code available.

If you are unsure of the master code or your new PIN code, then do not start this procedure.

The keypad immobiliser can be programmed to accept up to 14 different four digit PIN codes, any of which will let the machine be started.

1. Put the ignition key in the ignition switch. Turn the ignition key to position 1
2. Enter your six digit master code using the keypad. Push the 'ENT' button.
3. The LED will flash three times to indicate the acceptance of the master code.
4. Within 59 seconds of the three flashes, push the 'MD' button.
5. Enter your new four digit PIN code using the keypad. Push the 'ENT' button. The LED will flash four times to indicate that the new PIN code has been successfully entered.
6. Turn the ignition key to the off position, then a minimum of five seconds later, turn the ignition key to position 1. The new PIN code is now entered and recorded.
7. If another PIN code is to be entered, turn the ignition key to the off position, then return to step 1.

To Delete all of the PIN Codes

Deleting all the PIN codes does not allow the immobiliser to be bypassed. A four digit PIN code must be entered before the machine can be started.

If you are unsure of the master PIN code or your new PIN code, then do not start this procedure.

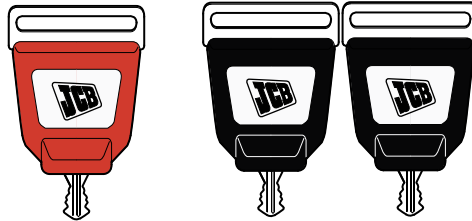
1. Put the ignition key in the ignition switch. Turn the ignition key to position 1.
2. Enter your six digit master PIN code using the keypad. Push the 'ENT' button. The LED will flash three times to indicate the acceptance of the code.
3. Push the buttons in the following sequence, 'MD', 'F1', 'ENT'. The LED will flash five times to indicate the acceptance of the delete command.

Unique Key Immobiliser System

Introduction

Each machine is supplied with a master key (red) and two ignition keys (black). The master key is used by the operator to program the ignition keys. You must use an ignition key to start or operate the machine.

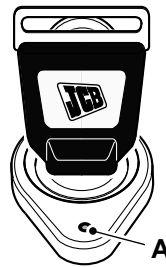
Figure 31.



To Disarm the Immobiliser

1. Put the ignition key in the ignition switch.
2. Start the engine.

Figure 32.



A LED (The position may vary).

To Arm the Immobiliser

1. Stop the engine. Remove the ignition key.
2. The immobiliser immediately arms automatically.

To Add a New or Additional Ignition Key

The ignition keys can be programmed to start more than one machine.

1. Put the master key in the ignition switch.
2. Turn the master key to position 1. The LED will flash three times.
3. Turn the master key to position 0. Remove the master key.
4. Put a new or an additional ignition key in the ignition switch. Turn the ignition key to position 1. The LED will flash four times.
5. The new key has been added.

To Remove the Program From an Ignition Keys

The ignition keys can still be used on any other machine on which they have been programmed.

1. Put the master key in the ignition switch.

2. Turn the master key to position 1. The LED will flash three times.
3. Keep the master key in position 1 for 60 seconds. The ignition keys codes have now been deleted from the ECU (Electronic Control Unit).
4. Turn the master key to position 0. Remove the master key.
5. Add the required black keys in the system.

The starter keys will still be able to be used on any other machine on which they have been programmed.

If a non-programmed key or standard key is used, then a symbol will appear on the LCD (Liquid Crystal Display) screen, and the machine will not start.

Warming Up

Before starting work in temperatures below -15°C (5.0°F), the hydraulic fluid must be warmed.

1. Warm up the engine.
 - 1.1. Start the engine.
 - 1.2. Set the throttle lever to the mid position and run for
Duration: 10min
 - 1.3. Do not operate any services.
2. After the warm up period make sure that everyone is clear of the machine.
3. Warm up the hydraulic oil.
 - 3.1. Increase the engine speed to maximum.
 - 3.2. Warm the hydraulic oil by repeatedly selecting bucket crowd by moving the right hand lever to the left for
Duration: 5s
 - 3.3. Repeat for several minutes.
 - 3.4. Select dozer up by moving the dozer control lever backwards, keep it selected for
Duration: 1min
4. Warm up the hydraulic circuit.
 - 4.1. Reduce the engine speed by moving the throttle lever to the middle position.
 - 4.2. Raise and lower the boom from ground level to full height, five times.
 - 4.3. Move the dipper fully in both directions, five times.
 - 4.4. Rotate the bucket fully in both directions, five times.
 - 4.5. Slew the upper structure clockwise for one revolution and stop. Slew the upper structure counter clockwise for one revolution and stop.
 - 4.6. Repeat step 4.3 three times.
5. If the operation still appears slow, then repeat the steps 4.2 and 4.3.

Stopping and Parking

General

▲ **WARNING** Make sure that the excavator is in a safe condition.

CAUTION Low speed must always be selected when unloading the machine from a vehicle or tracking down steep slopes. The machine will take longer to stop when the levers are released if high speed is selected.

CAUTION Before stopping the engine, lower the dozer blade to the ground.

1. Park the machine on solid, level ground.
2. Release the two track levers then push the hand throttle lever to the idle position.
3. Lower the bucket and dozer to the ground.
4. Stop the engine.
5. Discharge the hydraulic pressure.
[Refer to: Discharge \(Page 147\).](#)
6. Switch off all unnecessary switches. If you are leaving the machine, make sure that all switches are set to off.
7. Leave and secure the machine.
 - 7.1. Raise the left armrest or engage the lever lock(s).
 - 7.2. Use the handrails to leave the cab.
 - 7.3. If you are leaving the machine for a long period, close and latch the window(s) and lock the door. Make sure that the fuel filler cap is locked (if a lock is installed).

Emergency Stop Procedure

Switch the engine off with the key and then lower the excavator arm safely to the ground. [Refer to: Excavator Arm \(Emergency Operation\) \(Page 77\).](#)

Preparing for Travel

General

When you travel on the road or on site there are usually local rules and safety regulations for the machine travel position.

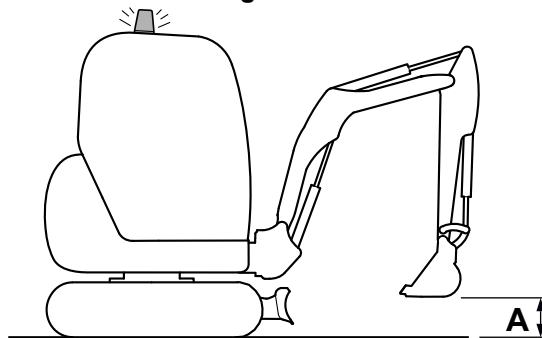
This publication contains recommendations that may help you meet the requirements of these regulations, they are not necessarily the applied law.

Make sure that before you travel on the road or on site, you and your machine comply with all the relevant local laws - it is your responsibility.

Preparing for Worksite Travel

1. Activate the warning beacon if installed.
[Refer to: Beacon \(Page 47\).](#)
2. Position the excavator.
 - 2.1. Position the cab facing forward over the dozer.
 - 2.2. Raise the dozer blade.
 - 2.3. Level Site Conditions: Position boom fully up, operate dipper fully in and bucket fully crowded, i.e. bucket rotated fully towards cab.
 - 2.4. Uneven Site Conditions: Lower the boom so that the bucket or attachment is clear of the ground. Refer to Figure 33.

Figure 33.

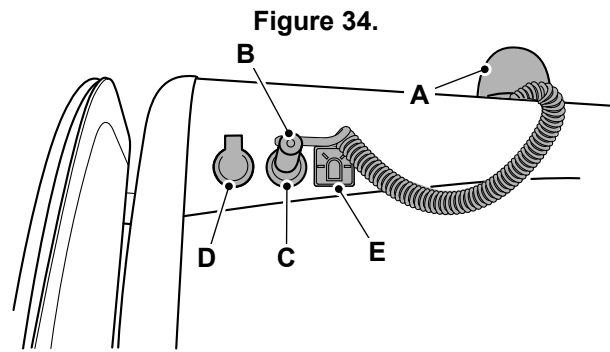


A 150mm

Beacon

In certain territories you will be breaking the law if you do not install a beacon before you travel on site/public highways - make sure you are complying with local laws.

Be careful when you operate the machine with a beacon. The total height of the machine is increased when the beacon is in the operating position.



- | | |
|----------------------------------|----------------------------------|
| A Beacon | B Plug |
| C Socket for green beacon | D Socket for amber beacon |
| E Green beacon label | |

1. Put the beacon on the cab roof. A magnetic base keeps the beacon in position.
2. Put the plug into the socket on the cab roof.
3. Use the beacon switch in the cab on the console to operate the amber beacon. The indicator light in the switch illuminates when the beacon is operating. Refer to Figure 34.

The green beacon will only illuminate when the seat belt is fastened.

Safety Equipment

General

▲ **WARNING** The slew lock must be engaged when travelling on road or trailer, otherwise the boom could slew to one side and cause injury or death.

The requirement for controls isolation varies according to local legislation. You must comply with local legislation at all times. The controls lock is designed to isolate the control(s) in the neutral position.

You must isolate the controls before you travel on public roads.

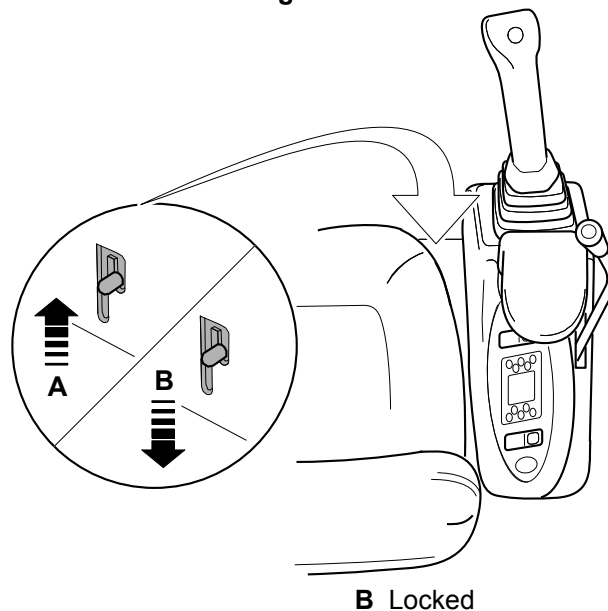
Slew Lock

The slew lock is in the seat bulkhead.

Lift and move the slew lock to the required position.

Make sure the slew lock is unlocked before you operate the excavator controls.

Figure 35.



A Unlocked

B Locked

Control Lock

▲ **WARNING** Isolate the controls when not in use and when there are persons in the danger zone, to avoid accidentally operating the controls and causing a dangerous movement of the machine. Before adjusting the cab environment, e.g. opening the windows or adjusting the seat, you must always isolate the controls.

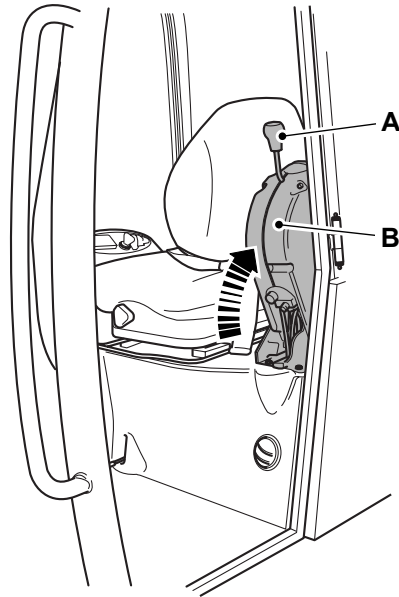
WARNING When the machine is installed with a hand held hydraulic tool circuit and the operator is out of the seat with the left hand console lowered and the control isolation switch activated, then track, dozer, swing and auxiliary controls are active.

WARNING The dozer and swing are operational under gravity when the ignition is off. Do not operate the swing pedal and dozer lever when the ignition is off.

When the handle and the left hand console are in the raised position the excavator, track, dozer, swing, and auxiliary controls cannot be operated. Lowering the handle to the normal position and then pressing the controls isolation switch (if fitted) connect the excavator, track, dozer, swing, and auxiliary controls and allows the normal operation of the levers.

The handle and the left hand console must be in the raised position before the engine can be started.

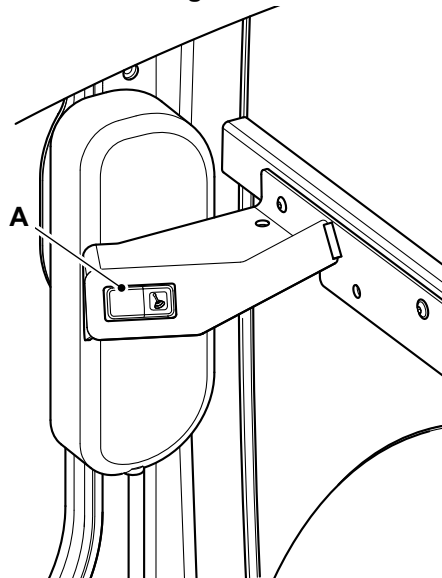
Figure 36.



A Handle

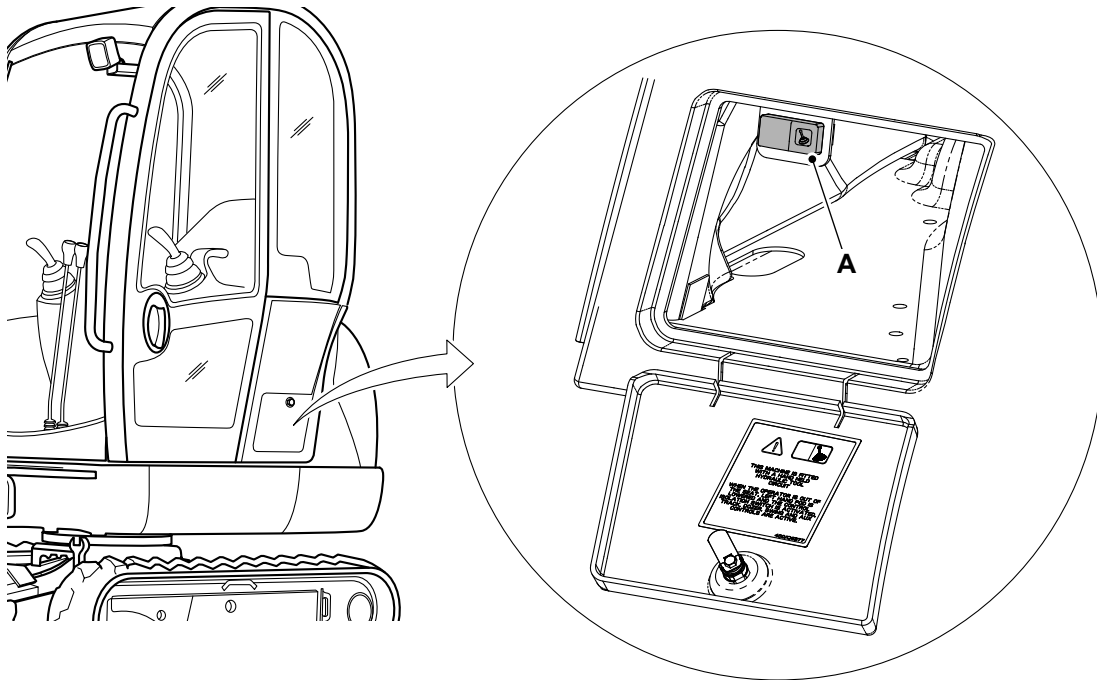
B Left hand console

Figure 37.



A Controls isolation switch (in operator station)

Figure 38.



A Controls isolation switch (in toolbox compartment)

Make a note that the control isolation switch in the toolbox compartment mainly used to enable hydraulics for operating the hand held tool kit when operator is outside of the cab.

Drive Controls

Track Controls

▲ WARNING When the cab is swung around so that it is facing the track motor end of the undercarriage, the action of the track controls is reversed. Take extra care!

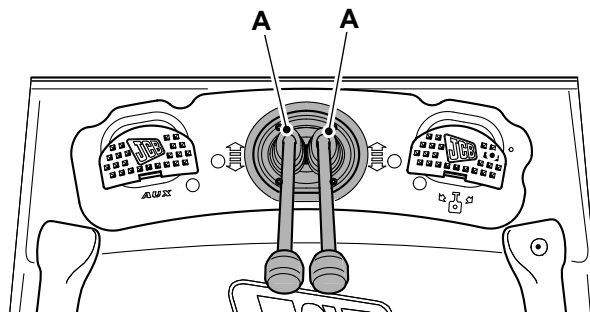
The tracks are controlled using the control levers in front of the operator seat.

The left control lever controls the left track. The right control lever controls the right track.

The two levers can be operated individually or together as necessary to move the machine as required. The control levers are spring loaded to a central position. In this position the tracks do not operate.

The control levers can be operated using one hand or both.

Figure 39.



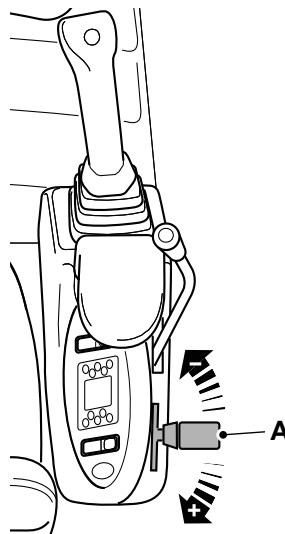
A Control levers

Hand Throttle Control

A hand operated throttle lever on the right console in the cab controls the speed of the engine.

Move the lever to increase or to decrease the engine speed. The lever can be left in any position between idle and maximum as required.

Figure 40.



A Hand throttle control
- Decrease the engine speed

+ Increase the engine speed

Instruments

General

Indicators for the engine and related systems are mounted in the instrument cluster in the right hand console.

Instrument Panel

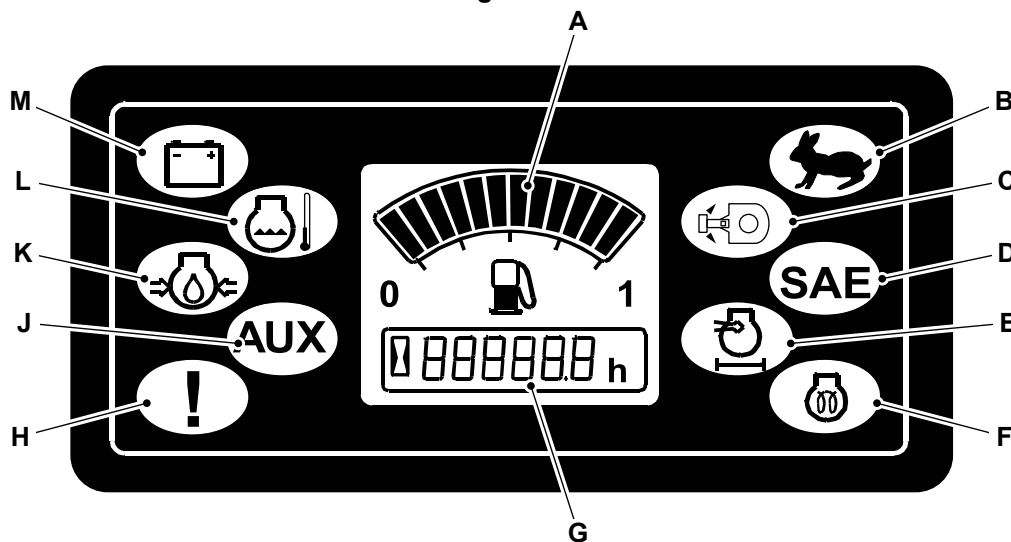
▲ CAUTION If any of the audible/visual warnings operate while the engine is running, stop the engine as soon as it is safe to do so and rectify the fault.

Set the ignition key to position 0 to reset all operations.

A buzzer will sound if the Charge (Fault) Indicator, the Coolant Temperature (High) Indicator or the Engine Oil (Low) Indicator display a machine fault.

If the fault is ignored the buzzer will sound continuously for 180s, after which it will sound intermittently, 1s on, 2s off.

Figure 41.



A Fuel Gauge

C Indicator is not installed on this machine.

E Air Filter (Blocked) Indicator - Illuminates yellow when the air filter is blocked.

G Hourmeter - Records the total running time of the engine. A flashing hour-glass icon indicates that the hourmeter is accumulating time.

J Indicator is not installed on this machine.

L Coolant Temperature (High) Indicator - Illuminates red when the coolant temperature is too high.

B Two Speed (High Engaged) Indicator - Illuminates green when high speed is engaged.
D SAE Controls (Selected) Indicator - Illuminates green when the SAE control pattern is selected.

F Glow Plugs (on) Indicator - Illuminates yellow when the glow plugs are energised.

H Indicator is not installed on this machine.

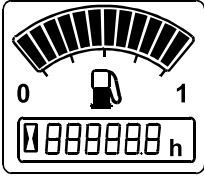
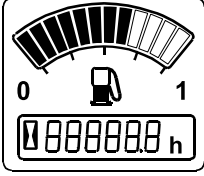
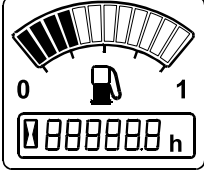
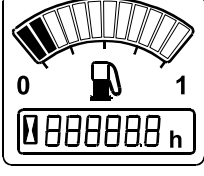
K Engine Oil (Low) Indicator - Illuminates red when the engine oil pressure is too low.

M Charge (Fault) Indicator - Illuminates red when a fault occurs. (Alternator operation.)

Fuel Gauge

The fuel gauge shows the amount of fuel in the fuel tank. It functions only when the ignition switch is set to position 1.

Table 5. Bars

Number of bars		Description
	Full Tank	All bars illuminated. Pump symbol illuminated.
	4 bars to Full	Pump symbol illuminated. All bars illuminated and reducing as level drops ie. 11 bars, 10 bars, 9 bars etc.
	4 bars to 3 bars	Buzzer gives 3 short beeps. Pump symbol starts to flash.
	3 bars to 1 bar	Pump symbol remains flashing. 1 bar illuminated (nearly empty). 0 bars illuminated (tank empty).

The flashing of all fuel level bars and the filler pump symbol indicates a fault in the fuel sender circuit. Contact your JCB distributor.

Getting the Machine Moving

General

▲ **WARNING** Do not dismount a moving machine.

The machine does not have gears. Do not overwork the engine unnecessarily. Operate at an engine speed suitable for the duty being carried out.

When moving the machine, keep it under control at all times. Stay alert for obstructions and possible hazards. Approach deep mud slowly.

Take particular care when reversing. Make sure that the way behind is clear before reversing.

Procedure

After you have warmed up the engine, move off as described below.

Control and switch locations are provided within this manual.

1. Make sure that your seat belt is correctly fastened.
2. Make sure that the seat is correctly adjusted.
3. Make sure that the cab slew lock is disengaged and the slew switch is pressed.
4. Move off.
 - 4.1. Check that the attachments are in the travel position.
 - 4.2. Take hold of both track control levers in one hand or put your feet on the foot pedals.
 - 4.3. Make sure that it is safe to move off.
 - 4.4. Move the levers forward or backward as required and pull the throttle lever slowly backwards until the desired speed is attained.
 - 4.5. To increase tracking speed operate the two speed tracking switch.

Slopes

General

▲ WARNING Make sure that you have been trained and are familiar with the use of machines on slopes, and understand the adverse affects that slopes and site conditions can have on stability. Never use the machine on a slope if you do not understand the recommended practices for the use of machines in such applications.

There are a number of factors which can adversely affect the stability of the machine and the safety of the machine and operator when used on a slope.

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

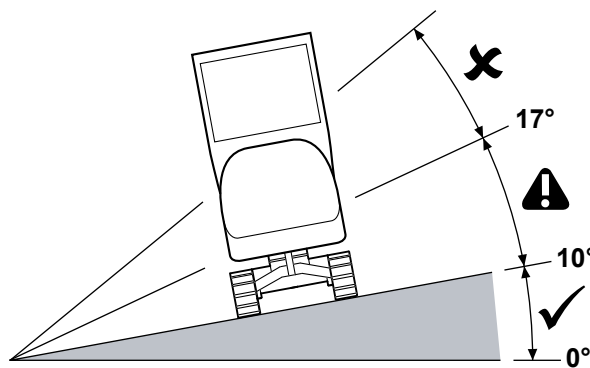
Driving on Slopes

0–10°: Machine can be operated normally on stable ground conditions without any detriment to its system.

10–17°: Machine can be operated normally on stable ground conditions without any detriment to its system. However, operator must use his discretion and proceed with extreme caution.

Refer to: [General \(Page 20\)](#).

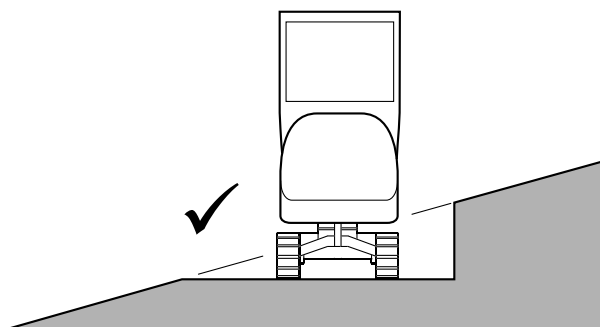
Figure 42.



Working on Slopes

When working on inclines, position the dozer for maximum stability. This may mean the dozer and the boom are at the same end of the machine, especially if digging down hill, lower the dozer sufficiently to bring the machine level. If necessary, to prevent an instability problem, cut a level platform for the machine to stand on.

Figure 43.



Driving the Machine

General

▲ WARNING When the cab is swung around so that it is facing the track motor end of the undercarriage, the action of the track controls is reversed. Take extra care!

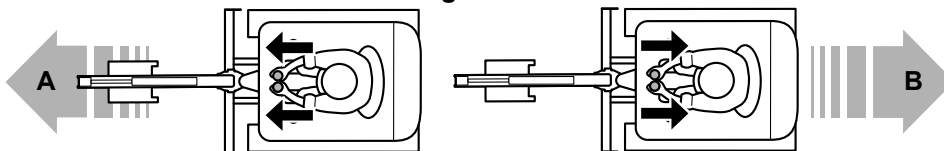
CAUTION Drive the machine smoothly. Spin turn manoeuvres, zig-zag driving or turning too fast can cause the vehicle to overturn.

The track controls operate as described when the excavator is positioned about the dozer (or track motors at the rear). If the excavator is at the opposite end to the dozer, the lever operation will be reversed. Always travel the machine with the excavator positioned at the same end as the dozer, especially on hard and rocky ground. Ensure you have complete field of vision when driving the machine.

To move the machine forward, push both levers forward. Release the levers to stop. Track motor braking occurs automatically when the levers are released.

To move the machine backward, pull both levers backward. Release the levers to stop. Track motor braking occurs automatically when the levers are released.

Figure 44.

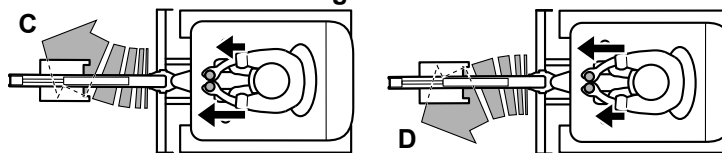


A Forward travel

B Backward travel

To turn the machine while you travel, move the lever back towards the central position on the side towards which direction you want to go, for example, move the left lever back to turn left. This causes one of the tracks to move slower than the other. The faster moving track will push the machine around. Release the lever to stop.

Figure 45.

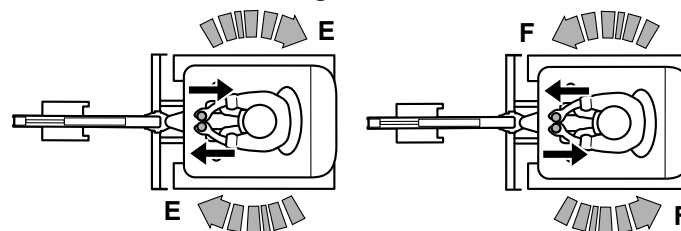


C Turn right

D Turn left

To spin the machine around through 360°, without moving it, operate one lever, in a forward position and the other in a reverse position. This will cause the tracks to drive in opposite directions and hence push the machine around.

Figure 46.



E Spin right

F Spin left

Operating Levers/Pedals

General

▲ WARNING Make sure it is clear overhead before raising the boom. Keep an adequate safe distance from all electrical power lines. Contact your local power company for safety procedures.

CAUTION Keep the machine controls clean and dry. Your hands and feet could slide off slippery controls. If that happens you could lose control of the machine.

Control Layouts

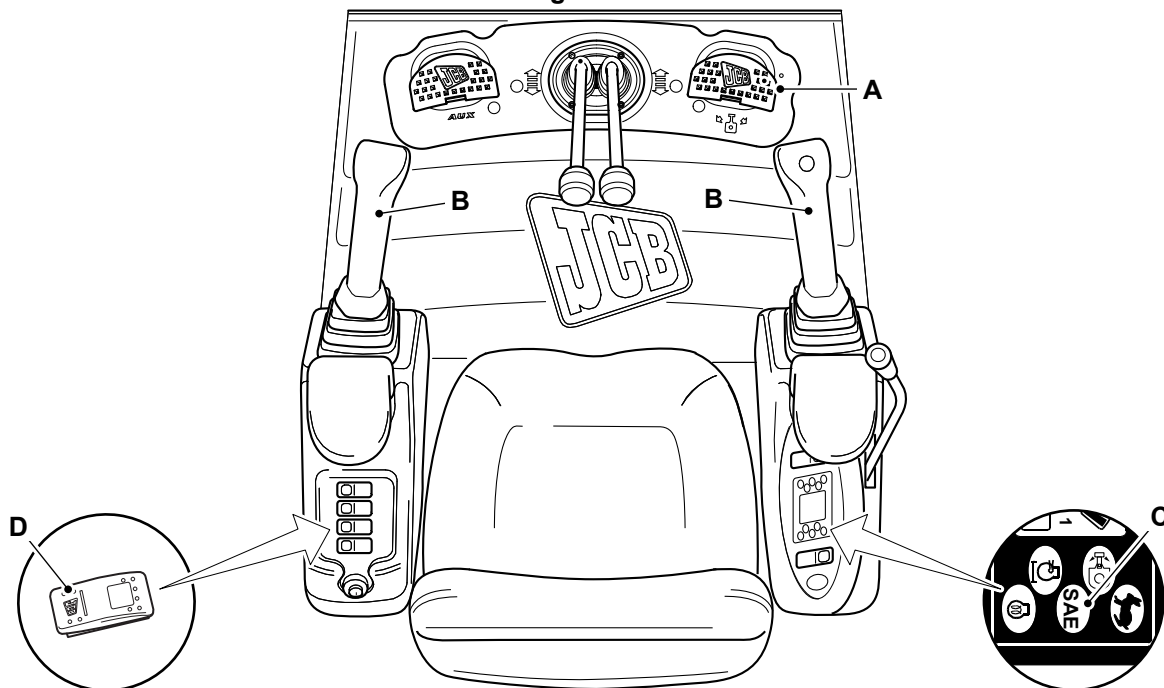
▲ WARNING Control lever/switch action may vary on machines, instructional labels near the levers/switches show by symbols, which levers/switches cause what actions. Before operating control levers/switches check the instructional label to make sure you select the desired action.

The control levers and switches may vary on machines.

Excavator Arm Controls

ISO/SAE Switch

Figure 47.



A Swing pedal
C SAE indicator lamp

B Excavator levers
D ISO/SAE switch

The ISO/SAE switch allows the operator to select either the ISO or SAE excavator control pattern.

Before you operate the excavator controls check the SAE indicator lamp to see which control pattern has been selected. The indicator lamp illuminates to show that the SAE controls pattern is selected. If the lamp is not illuminated the ISO controls pattern is selected. Operate the machine slowly until you are familiar with the pattern selected.

The excavator controls consist of the excavator levers and the swing pedal.

The excavator levers are spring loaded to the central position. In this position related services will not operate. The speed and movement of the associated hydraulic function depends on how far you move the lever. The further you move the lever, the faster the action.

The boom ram incorporates damping at the limit of boom raise, reducing the speed of the ram and eliminating shock loadings.

Most excavating movements are achieved using a combination of both the levers and the pedals at the same time. Practice such movements until you are familiar with the operations that can be achieved safely.

Make sure the slew lock is unlocked before operating the excavator controls. Refer to: [Slew Lock \(Page 49\)](#).

Horn Button

The horn button is located on the right hand excavator control lever. Refer to: [Component Locations \(Page 14\)](#).

Press and hold the button to activate the horn. It functions only when the ignition switch is on.

Travel Speed Selector Switch

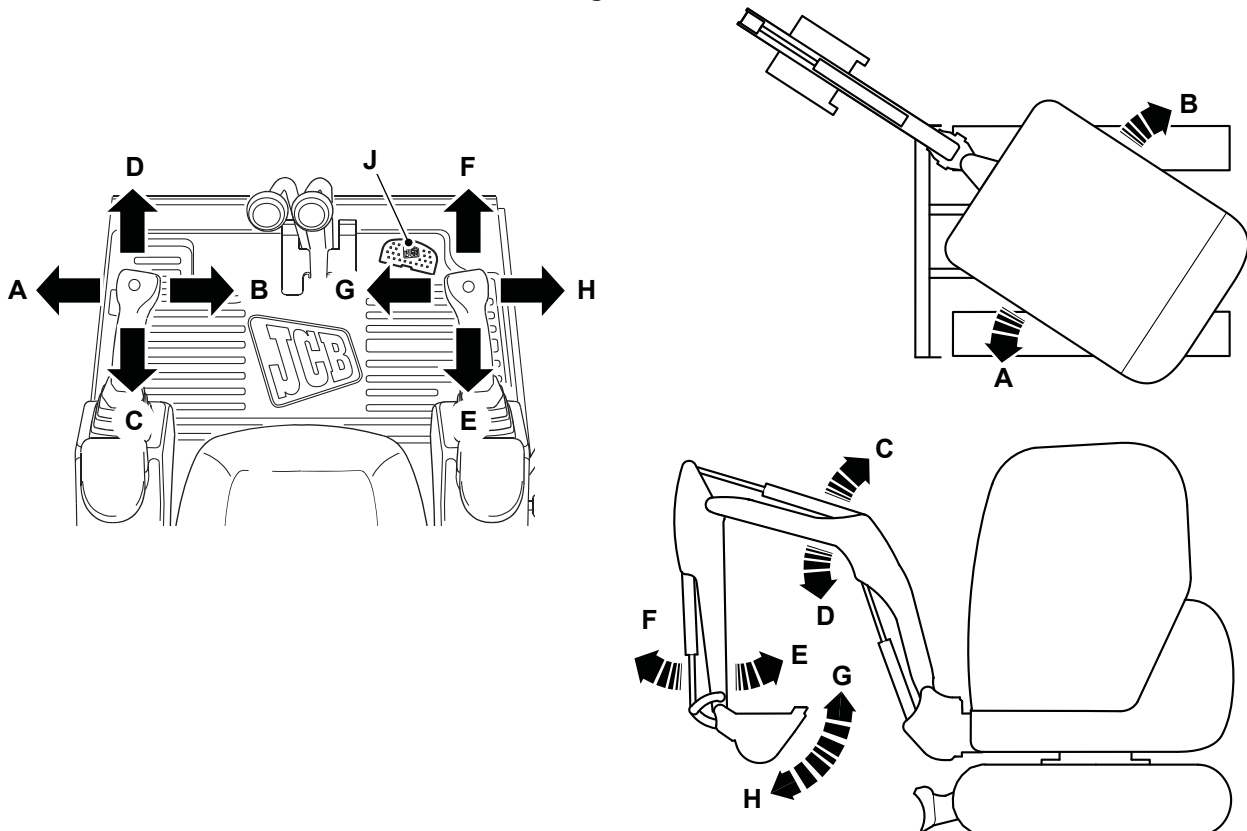
The travel speed selector switch is located on the dozer lever. Refer to: [Component Locations \(Page 14\)](#).

Press the switch to select either normal or high speed.

If the travel speed indicator lamp on the instrument panel is illuminated high speed has been selected. If the travel speed indicator lamp on the instrument panel is not illuminated normal speed has been selected. Refer to: [Instrument Panel \(Page 53\)](#).

Excavator Levers (SAE Control Pattern)

Figure 48.

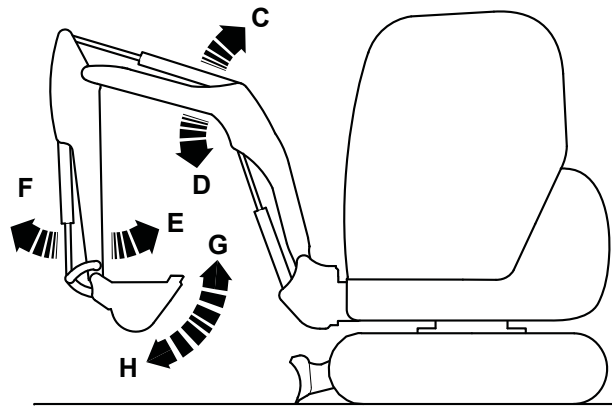
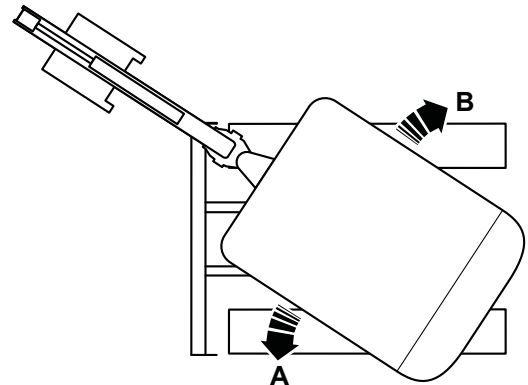
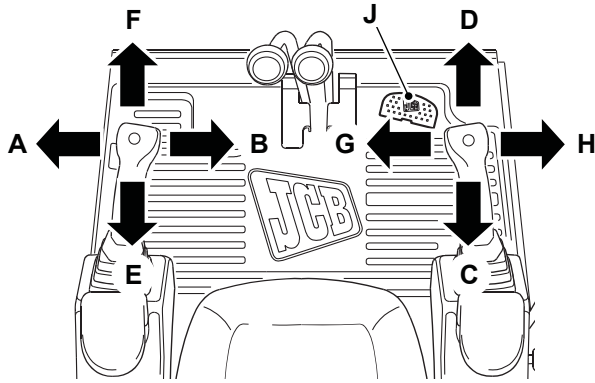


- A Slew cab left
- C Raise boom
- E Dipper in
- G Crowd bucket (to gather a load)
- J Swing boom

- B Slew cab right
- D Lower boom
- F Dipper out
- H Dump bucket (to dump a load)

Excavator Levers (ISO Control Pattern)

Figure 49.



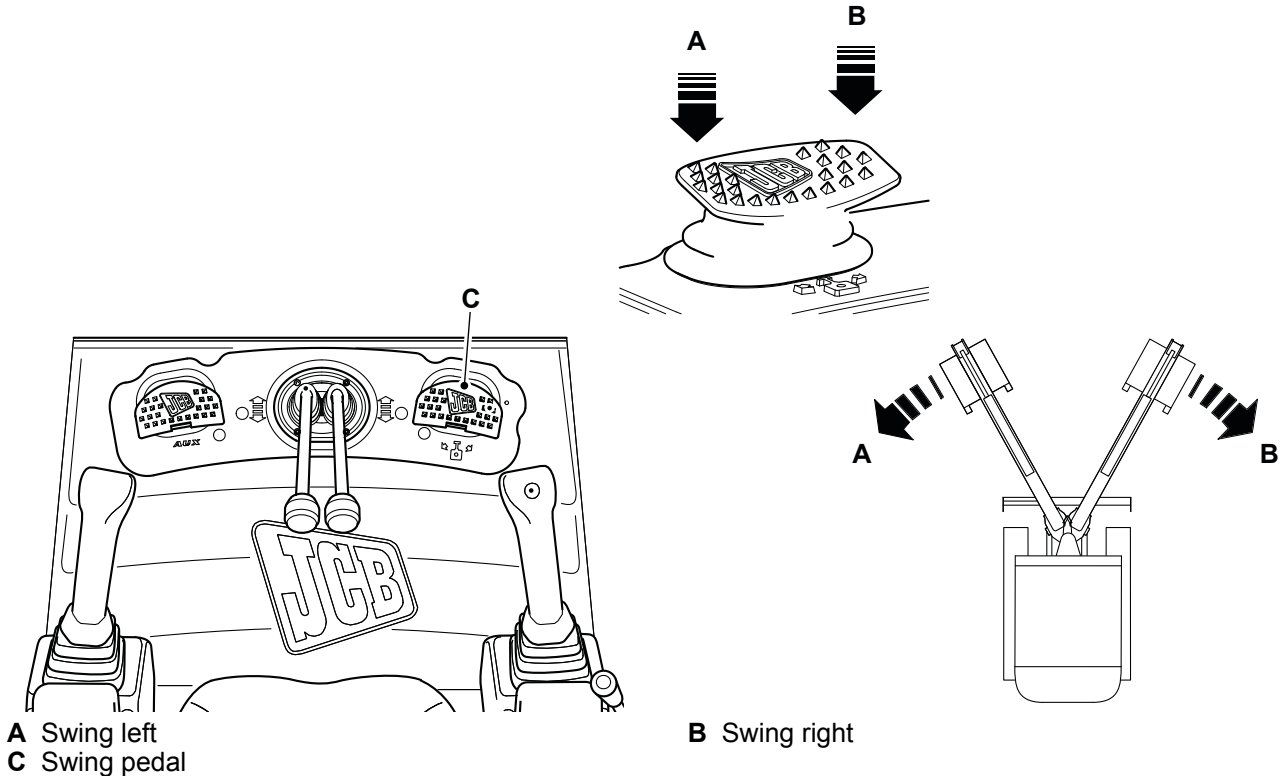
- A Slew cab left
- C Raise boom
- E Dipper in
- G Crowd bucket (to gather a load)
- J Swing boom

- B Slew cab right
- D Lower boom
- F Dipper out
- H Dump bucket (to dump a load)

Swing Pedal

▲ **CAUTION** The slew pedal must be in the locked position when not in use.

Figure 50.



A Swing left
C Swing pedal

B Swing right

To swing the boom to your left:

- Unlock the swing pedal. (Pivot the swing pedal forward into its operating position).
- Push the swing pedal to the left side.
- Release the pedal when the excavator end has reached the required position.

To swing the boom to your right:

- Unlock the swing pedal. (Pivot the swing pedal forward into its operating position).
- Push the swing pedal to the right side.
- Release the pedal when the excavator end has reached the required position.

Dozer Blade Controls

▲ **Notice:** Before operating the dozer blade, make sure that large rocks or other objects will not jam the dozer mechanism.

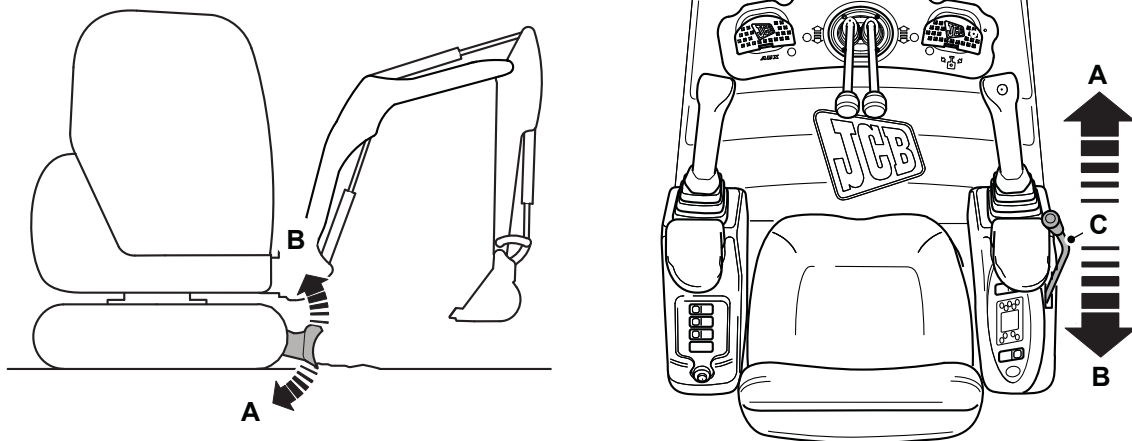
The dozer is operated by a single control lever on the right side of the cab.

The lever is spring loaded to the central position. In this position the dozer will not move.

To raise the dozer pull the lever backwards. At the required position release the lever.

To lower the dozer push the lever forward until an increased resistance is felt and the blade moves. At the required position release the lever.

Figure 51.



A Lower the dozer
C Control lever

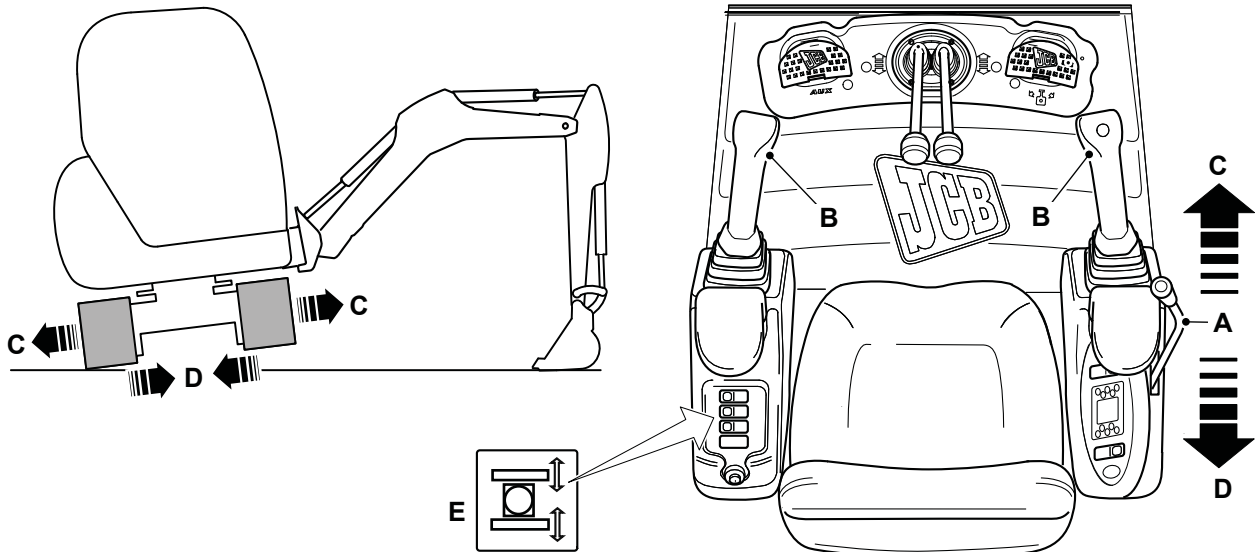
B Raise the dozer

Extending Undercarriage Controls

To extend or retract the undercarriage (option):

1. Stop the machine on level ground.
2. Make sure that all persons are away from the machine and the surrounding area.
3. Operate the dozer control lever to lift the dozer blade.
[Refer to: Dozer Blade Controls \(Page 61\).](#)
4. Operate the excavator controls to slew the machine 90 degrees across the tracks.
[Refer to: Excavator Arm Controls \(Page 58\).](#)
5. Operate the excavator controls to select boom down and lift one track just off the ground.
6. Push the switch on the left console.
7. Operate the dozer control lever to move the undercarriage to the required position.
 - 7.1. Move the lever forward to retract the undercarriage.
 - 7.2. Move the lever backward to extend the undercarriage.
8. When the undercarriage is fully extended/retracted, push the switch to return the dozer control lever to its normal operating function.
9. Operate the excavator controls to select boom up and slowly lower the track to the ground.

Figure 52.



- A Dozer control lever
- C Forward - Retract
- E Undercarriage switch

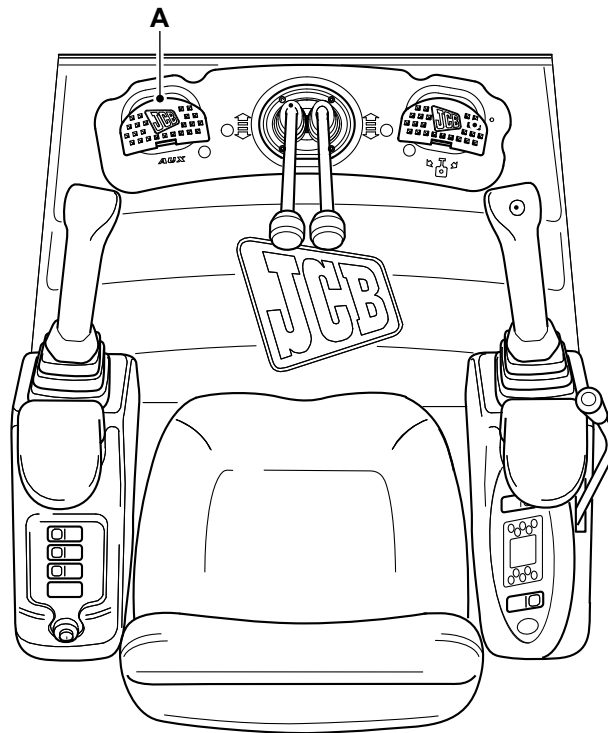
- B Excavator control lever
- D Backward - Extend

Auxiliary Circuit Controls

▲ WARNING Before operating the auxiliary control system make sure that you are aware of all safety notices that apply to the attachment you are using. Also make sure you have installed the attachment correctly and have read its operator's manual.

Push the swing/auxiliary pedal to the left or right depending on the attachment installed and the function required. Refer to the operator manual supplied with the attachment.

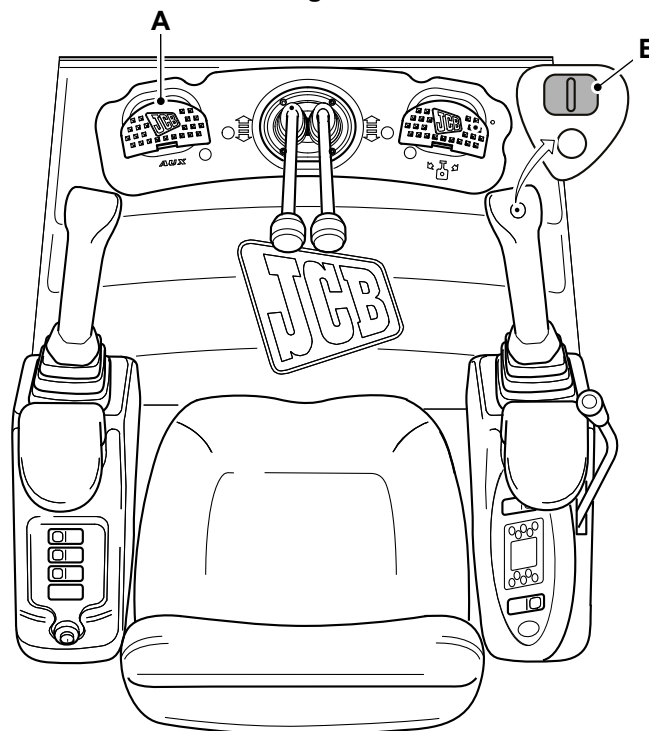
Figure 53.



A Auxiliary pedal

Electro-proportional Controls (if installed)

Figure 54.



A Left hand pedal disabled

B Right hand aux roller switch

The attachment is operated by the right hand joystick roller switch. Move the switch left or right depending on the attachment installed and function required. Refer to the operator manual supplied with the attachment.

Lifting and Loading

General

▲ WARNING A high load can block your view and reduce the machine's stability. Travel with the load low to the ground. Travel slowly and with caution over rough, muddy or loose surfaces.

WARNING When transporting a load on a slope, drive slowly and keep the load uphill of the machine. This will increase stability.

WARNING Do not use the machine for object handling unless it is equipped for this purpose. Without the relevant devices the machine can become unstable and tip over. You and others could be seriously injured or killed.

WARNING Before you lift a load with the machine, you must read and understand this section. Failure to take the precautions shown can result in death or injury.

If your machine is not installed with a lifting point (for example a hook or shackle), hose burst check valves, load charts and an overload warning system then it must not be used for object handling.

If your machine is not installed with this equipment you must only use the machine for earthmoving purposes.

Lifting (Object Handling) Regulations

The owner and/or operator must make sure that they fully understand the laws and regulations concerning the use of the JCB machine as an earthmover and for lifting. Consult your JCB dealer for more information.

In certain countries safety regulations in force call for the application of specific safety factors. Consult your JCB dealer for more information.

All figures and lift capacities (if applicable) in this publication are based on the machine being on level, solid ground.

Safe Working Loads

The maximum load which may be lifted depends on the equipment attached to the machine and the laws and regulations in force at the time and in the country in which the machine is being used.

If your machine is equipped to be operated under 'Exemption Certificate' rules, your Exemption Certificate will specify the safe working loads.

Fit for Purpose Tests for Lifting Equipment

All lifting equipment (for example forks, lifting hooks and shackles) needs regular inspections and testing by a competent person to make sure they are fit for purpose. These may be needed every six months or at least annually in some countries to meet and comply with legislation and for insurance purposes. [Refer to: Functional Tests and Final Inspection \(Page 120\)](#). Check with your local JCB dealer for further advice.

Load Charts

The SWL (Safe Working Load) of the machine depends on how far the boom is extended and the angle it is raised to.

All lifting operations must be carried out using the load charts in the cab. The load charts refer to the lift capacities relevant to the machine specification when equipped with an approved JCB tipping link, shackle and bucket ram.

The weights of buckets, slings and auxiliary devices must be deducted from these capacities. Care must be taken to make sure that these loads are not exceeded.

If a load chart is not provided in the cab, the machine is not designed for lifting.

The load chart is only installed on machines with object handling equipment, it is located on the right hand window. The chart shows how far you can raise and extend a load without exceeding the safe working load. Each machine model has its own specific load chart.

The relevant load chart for your machine contains a part number. If the chart is missing or damaged a new decal must be attached, contact your JCB dealer for advise if you are not sure.

[Refer to: Performance Dimensions \(Page 162\).](#)

Overload Warning System

The overload warning system senses the pressure in the boom raise pressure circuit, and gives an audible warning when the pressure exceeds the predetermined limits and there is a risk that the machine could become unstable.

When the machine is used for lifting, the system must be switched on. The system defaults to on every time the hydraulic isolation switch is pressed to activate the hydraulics. Push the overload warning switch to silence the buzzer when in an overload state. When the system is active the symbol on the display is illuminated.

WARNING! *When the overload protection system buzzer sounds, you must decrease the machine lift. If you do not decrease the machine lift a stability hazard could occur. When the machine is in a safe position the buzzer stops.*

If the safe operating lift limit is exceeded the buzzer will sound. When the buzzer sounds, the operator must do the necessary corrective action to reduce the lift. When this is fulfilled, the buzzer is cancelled and the system resets automatically.

All lifting operations must be done in accordance within local lifting regulations.

Working with the Excavator Arm

General

▲ WARNING When using the boom and dipper fully extended, take the following precautions, otherwise the machine could get damaged or become unstable and become a danger to you and other people.

Make sure you do not exceed the working capacity of the boom at maximum reach. Slew the boom slowly to prevent any chance of the machine becoming unstable. For the same reason avoid dumping downhill if possible.

WARNING Care must be taken with machines installed with an extra long dipper as it may affect the stability of the machine.

Before you start using the excavator, you must convert the machine into a safe and stable working platform. [Refer to: Preparing to Use the Excavator Arm \(Page 67\).](#)

To use the excavator efficiently and safely you must know the machine and have the skill to use it. This manual instructs you on the machine, its controls and its safe operation. It is not a training manual on the art of excavating. If you are a new operator, get yourself trained in the skills of using the excavator before trying to work with it. If you don't, you will not do your job well, and you will be a danger to yourself and others.

If you will be working with a labourer, make sure you both understand what each other will be doing. Learn and use the recognised signalling procedures. Do not rely on shouting - he or she will not hear you.

Make sure the correct bucket for the job is installed. [Refer to: Buckets \(Page 98\).](#)

Preparing to Use the Excavator Arm

When choosing a digging position, avoid digging downhill if possible. When possible, dump the load on the uphill side of the excavation. Both of these precautions will help to keep the machine stable.

When the machine is in the required position on the worksite, lower the dozer blade to the ground (if fitted). Ensure you have complete field of vision before using the excavator arm.

Lifting With the Excavator Arm

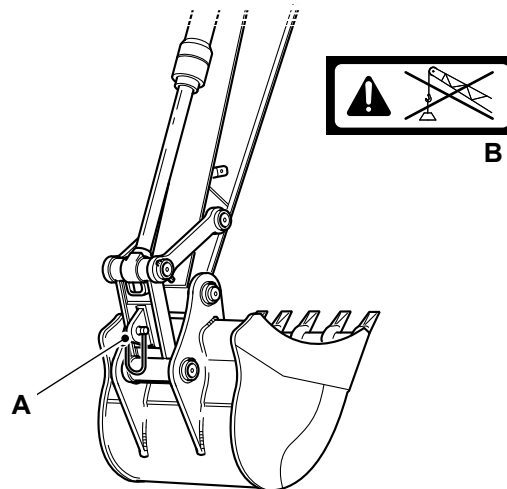
▲ WARNING You must turn on the overload warning system before you use the excavator for object handling, or a stability hazard could occur.

Lifting operations must be carried out with the overload warning system turned on. [Refer to: Overload Warning System \(Page 66\).](#)

Use a signalman when lifting with the excavator. Make sure you both understand and use the recognized signals. Keep all persons clear of the load and machine while the load is on the excavator.

1. A bucket must be installed when lifting with the excavator to prevent the link swinging. Check that the load is not greater than the safe working load for the bucket.
2. The correct JCB lifting shackle must be fitted. The bucket ram must be fully extended. If your machine is not installed with this equipment there will be a decal in the operators cab and you must use the machine for earth moving purposes only. The lifting shackle must be removed when excavating to prevent the possibility of damage.

Figure 55.



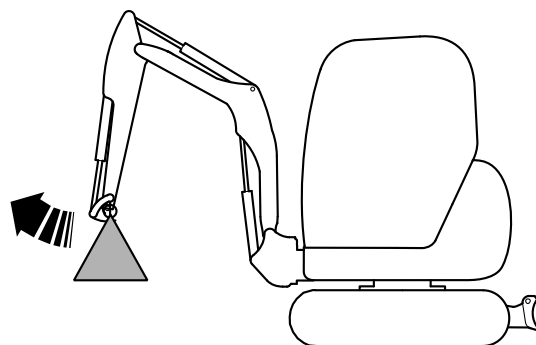
A Lifting shackle

B Decal

3. Attach lifting chains to the shackle. Keep the chain length as short as possible, to prevent swinging. Always use lifting tackle which is strong enough and in good condition. Check the load weight before choosing the lifting chains.
4. Attach a handline to the load. Make sure the person holding the handline stands clear of the load and machine.
5. Test the load by lifting it then slowly manoeuvring it across the ground with the excavator controls. Lower the load to the ground if you feel any instability of the load or the machine. When you are using the dipper movement to lift, always lift by moving the dipper away from you, as shown, not towards you. This is because hose burst protection valves (if installed) are provided only on the 'dipper-in' side.

Distance: 25–50mm

Figure 56.



Digging

General

▲ WARNING Do not use pedals which are not locked in position as foot rests.

Notice: When carrying out deep digging it is advisable to have the super structure swung in line with the chassis. It is possible that part of the dig end may contact the machine. Take extra care when digging to avoid damaging the machine.

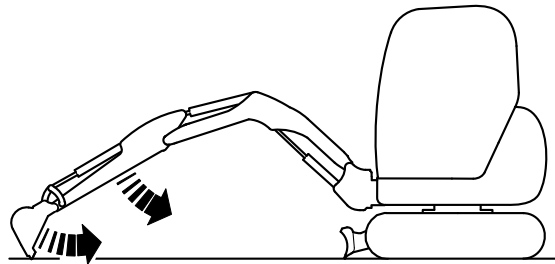
Notice: Do not excavate on hard or rocky ground with the boom positioned diagonally across the undercarriage. The resulting rocking motion could cause damage to the track gearbox sprockets and tracks.

Notice: Do not use the side of the excavation to stop the bucket when slewing back into position for the next dig. Similarly, do not use the side of the bucket to push soil into the excavation. Both these practices will damage the machine.

It is possible when excavating, to use either full machine slew when discharging a loaded bucket, or if conditions dictate, swinging the excavator end only to the required dumping area.

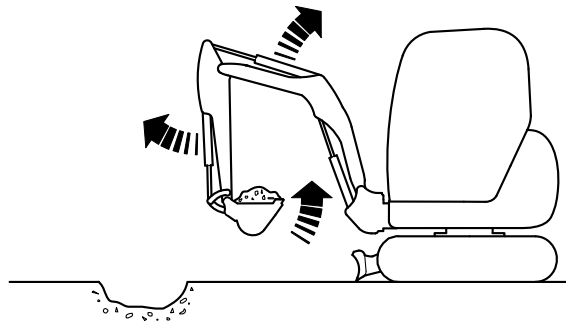
1. To start the dig, reach out with the boom and dipper and position the bucket.
2. Slowly crowd the bucket at the same time bring the dipper in. Make sure the bucket stays at the same angle to the ground while it travels. If necessary, at the same time apply a downward pressure on the boom, to increase the digging force on the bucket.

Figure 57.



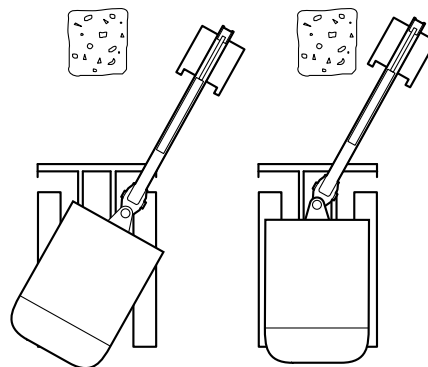
3. When the bucket is full, crowd it fully and at the same time move the dipper out a small distance. This will keep soil from building up under the machine.

Figure 58.



4. Slew the machine or swing the bucket to the dump area.

Figure 59.



5. Start dumping as the bucket approaches the pile. Do not waste time by dumping too far from the excavation. Dump close to the start dig position.

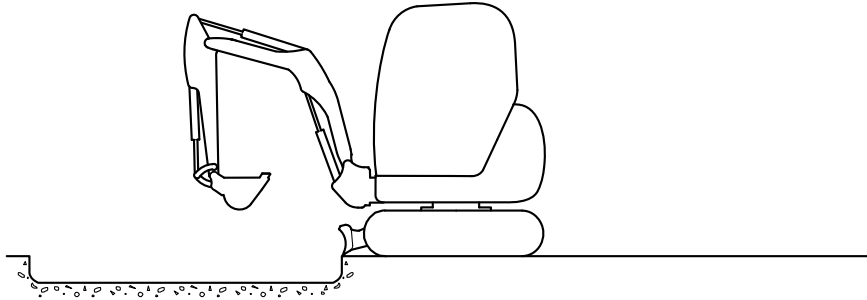
6. Swing the bucket back to the excavation and start the next dig.

Backfill the excavation by loading the bucket with soil from the pile. Do not push the soil with the side of the bucket.

Moving the Machine While Digging

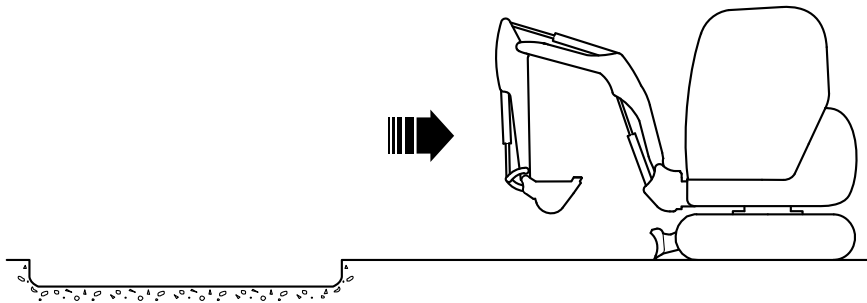
When digging a trench or hole which is longer than the excavator's reach, dig to the required depth and width until it is not possible to dig any closer without contacting the machine.

Figure 60.



When this position is reached, move the machine a suitable distance away from the excavation.

Figure 61.



Lower the dozer blade until the machine is level, then continue digging.

Working with the Dozer Blade

General

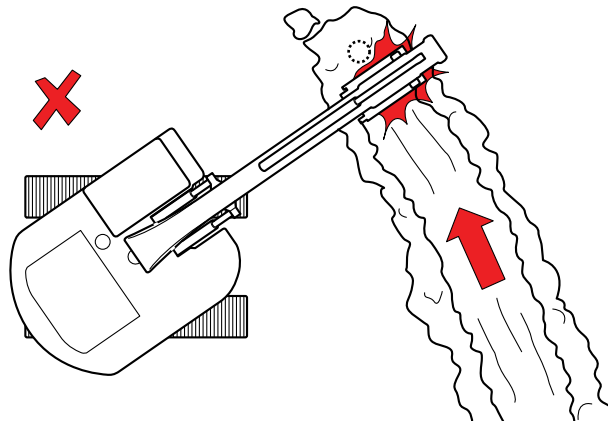
When you work with the dozer blade, remember that you will be driving the machine. Keep alert for bystanders, animals and possible hazards.

When you work with the dozer blade, make sure the slew lock is engaged.

When possible, do not slew the machine to do a dozer blade task. If you must slew the machine to do a dozer blade task, use a smooth slew action and make sure there are no obstacles.

When the machine is slewed to do a dozer blade task, it will create large side loads on the dig end and this will cause twisting and bending.

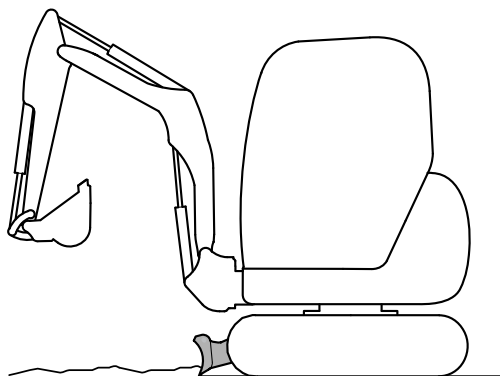
Figure 62.



Dozing and Grading

Keep the bottom of the dozer parallel to the ground. When grading a site remove high spots first, then use this soil to fill in troughs. Do not use excessive downward pressure on the dozer or machine traction could be lost. When working with the dozer, set the excavator straight with the machine, as for road travel. Keep the dozer high during travel as this increases the machines ground clearance.

Figure 63.



Scraping and Cutting

If a deep cut is to be made, do it in steps of about 50mm.

Do not forget to adjust the height of the dozer blade when the machines tracks enter the cut.

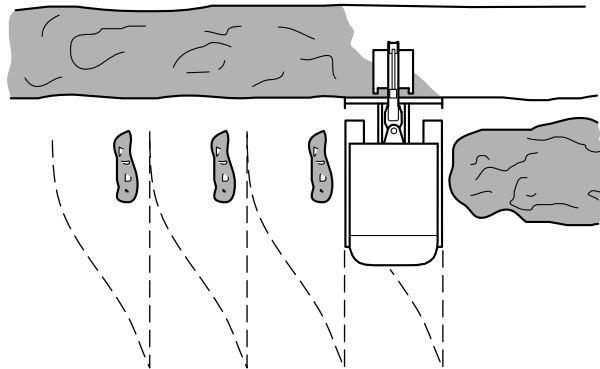
Backfilling

When you backfill on a slope, pile the material on the high side of the trench when possible.

Move the dozer blade level to the ground. Work at right angles to the trench, fill a dozer blades width at a time. Leave any spillage until the trench is filled.

Use the spillage to finish the job by driving the length of the trench with the dozer blade low to the ground.

Figure 64.



Heating, Ventilating and Air-Conditioning (HVAC)

General

The operator must set the controls to obtain the best working environment in the operator station.

Close doors and windows for best HVAC (Heating Ventilation Air Conditioning) performance and in dusty conditions.

Poor ventilated air can cause tiredness. Do not operate the machine for long periods without ventilation or with the operator station fully closed and the fan turned off.

Cab Heater Controls

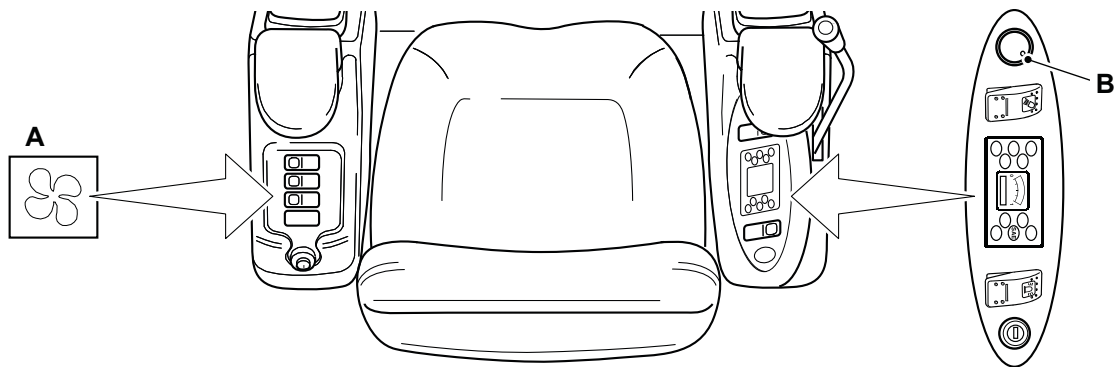
Machines with a Heater

Set the cab heater switch to the ON position. [Refer to: Console Switches \(Page 16\)](#).

Turn the temperature control knob clockwise to increase the temperature.

Turn the temperature control knob counterclockwise to decrease the temperature.

Figure 65.



A Cab heater switch

B Temperature control knob

Power Sockets

Auxiliary Power Socket

Your machine may be installed with one or more 12V auxiliary power sockets, which can be used for mobile phone chargers or other 12V powered devices.

Only connect items which are compatible with the power rating of the socket and have the correct plug.

Always operate the engine during the prolonged use of the electrical accessories, or the battery can discharge.

Make sure that the socket cap is closed when the socket is not in use.

Fire Extinguisher

General

Location

The fire extinguisher is located behind the seat and is held in position by a stowage bracket. Keep the fire extinguisher in this position until you need to use it.

Operation

▲ WARNING Do not use the fire extinguisher in a confined space. Make sure that the area is well ventilated during and after using the fire extinguisher.

WARNING After any use, the extinguisher must be replaced or serviced.

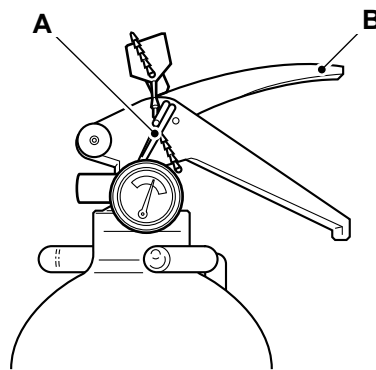
Make sure that you understand how to use the fire extinguisher. If necessary, refer to the instructions found on the fire extinguisher.

Only try to extinguish a fire if the circumstances permit and your safety is not endangered. If necessary, contact your nearest fire department.

Using the fire extinguisher:

1. If the circumstances permit and your safety is not endangered, move the machine to a safe place to prevent the fire from spreading.
2. Remove extinguisher from its stowage bracket.
3. Remove safety pin.
4. Aim directly at the fire from an upwind position, if possible.
5. Squeeze trigger to operate the extinguisher, release the trigger to stop the flow.

Figure 66.



A Safety pin

B Trigger

Moving a Disabled Machine

General

If the machine becomes disabled, the machine must be made safe, lifted onto a transporter and moved to a location where it can be repaired.

You must contact your nearest JCB dealer before you try to tow, winch or push the machine.

Towing, winching or pushing the machine without following the correct procedure will damage parts of the hydraulic system. If possible, repair the disabled machine where it stands.

Getting the Machine Unstuck

You can use the following methods to get the machine unstuck:

- Rock the machine forwards and backwards using drive
- Use the dig end to lift the undercarriage
- Position steel boards in front of the tracks

Jump-Starting the Engine

▲ WARNING In temperatures below freezing, the battery electrolyte may freeze if the battery is discharged or poorly charged. Do not use a battery if its electrolyte is frozen. To prevent the battery electrolyte from freezing, keep the battery at full charge.

If you try to charge a frozen battery or jump-start and run the engine, the battery could explode.

Batteries produce a flammable gas, which is explosive. Do not smoke when checking the electrolyte levels.

When jump-starting from another vehicle, make sure that the two vehicles do not touch each other. This prevents any chance of sparks near the battery.

Switch off all circuits which are not controlled by the ignition key.

Do not connect the booster (slave) supply directly across the starter motor.

Use only sound jump leads with securely attached connectors. Connect one jump lead at a time.

The machine has a negative earth electrical system. Check which battery terminal is positive (+) before making any connections. Keep metal watch straps and jewellery away from the jump lead connectors and the battery terminals - an accidental short could cause serious burns and damage equipment. Make sure you know the voltage of the machine. The booster (slave) supply must not be higher than that of the machine. Using a higher voltage supply will damage your machine's electrical system. If you do not know the voltage of your booster (slave) supply, then contact your JCB dealer for advice. Do not attempt to jump-start the engine until you are sure of the voltage of the booster (slave) supply. The negative (-) terminal on the battery is connected to frame earth.

1. Lower the excavator bucket and dozer blade (if fitted) to the ground, if they are not already there. They will lower themselves under their own weight when you operate the controls. Operate the controls carefully to control the rate of descent.

[Refer to: Operating Levers/Pedals \(Page 58\).](#)

2. Set all switches in the cab to their off positions.

3. Get access to the battery.

[Refer to: Access Apertures \(Page 125\).](#)

4. Connect the booster cables:

- 4.1. Connect the positive booster cable to the positive (+) terminal on the machine battery. Connect the other end of this cable to the positive (+) terminal of the booster supply.

- 4.2. Connect the negative (-) booster cable to a good frame earth on the machine, away from and below the battery. A good frame earth is a part of the machine frame, free from paint and dirt. Do not use a pivot pin for an earth.

- 4.3. Connect the other end of this cable to the negative (-) terminal on the booster supply.
5. Do the pre-start checks.
6. Start the engine.
7. Disconnect the booster cables:
 - 7.1. Disconnect the negative booster cable from the machine frame earth. Then disconnect it from the booster supply.
 - 7.2. Disconnect the positive booster cable from the positive (+) terminal on the battery. Then disconnect it from the booster supply.

Retrieval

▲ Notice: It is not recommended to tow a disabled machine. Permanent damage to the track motors of the disabled machine may occur if the machine is towed.

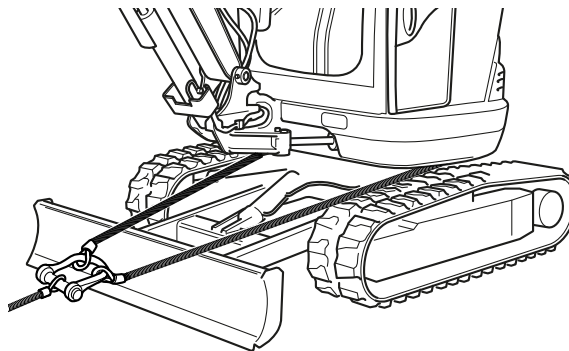
In the event that towing the machine to a safe location is unavoidable then attach wire rope or chain capable of pulling the machine around the slew ring as shown. Refer to Figure 67.

Notice: Do not use the tow eye or tie down points (if installed) to tow the machine, as this will cause damage to the machine.

Apply the minimum force to move the machine slowly (not greater than 2km/h (1.2mph) smoothly and without shocks).

Tow the machine the minimum distance to a safe location for recovery by lifting (not to exceed 20m). Following this procedure the machine must be inspected by a qualified person for damage to the track motors.

Figure 67.



Excavator Arm (Emergency Operation)

The excavator has an accumulator installed. The accumulator stores a limited amount of hydraulic pressure for use in an emergency (engine failure for example). This hydraulic pressure must be used to move the dipper and lower the boom into a safe position.

Do not try to operate other machine functions as this will deplete the hydraulic pressure in the accumulator and it may then not be possible to move the dipper and lower the boom.

If an emergency occurs:

1. Turn the ignition key to the on position.
2. Enable the controls.

[Refer to: Control Lock \(Page 49\).](#)

3. Use the right and left control levers to move the dipper and lower the boom.
4. Vent the hydraulics.
[Refer to: Discharge \(Page 147\).](#)
5. Turn the ignition key to the off position.

Lifting the Machine

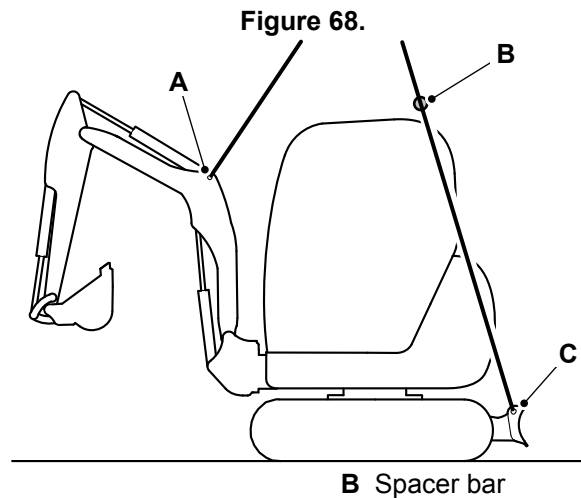
General

▲ DANGER Do not stand underneath the raised load during the lifting/lowering procedure. Stand clear and to one side until the load has been safely lowered. Make sure that the area is clear of other people before lowering the load. If you do not follow these precautions you or others could be killed or seriously injured.

WARNING Do not lift the machine by the extended dozer blade (if installed), remove the extensions before lifting. Make sure the lifting slings do not interfere with the top of the cab, damaging the top glazing. It may be necessary to remove the FOGS (if installed).

Carry out the following procedure when lifting a machine:

1. Remove all attachments.
2. Remove all loose equipment from machine exterior.
3. Check the unladen weight of the machine.
[Refer to: Static Dimensions \(Page 155\).](#)
4. Attach lifting equipment to each end of the dozer blade.
5. Attach lifting equipment to each side of the boom.
6. Take the weight of the machine. Make sure the slings do not interfere with the cab. It may be necessary to use a spacer bar between the slings.
7. Check that the lifting eye is positioned directly above the machine centre of gravity.



- A** Boom lift point
C Dozer blade lift point

B Spacer bar

Transporting the Machine

General

▲ WARNING The safe transit of the load is the responsibility of the transport contractor and driver. Any machine, attachments or parts that may move during transit must be adequately secured.

WARNING Make sure that the ramp incline does not exceed the machine's operational limits.

CAUTION Before moving the machine onto the trailer, make sure that the trailer and ramp are free from oil, grease and ice. Remove oil, grease and ice from the machine tracks. Make sure the machine will not foul on the ramp angle.

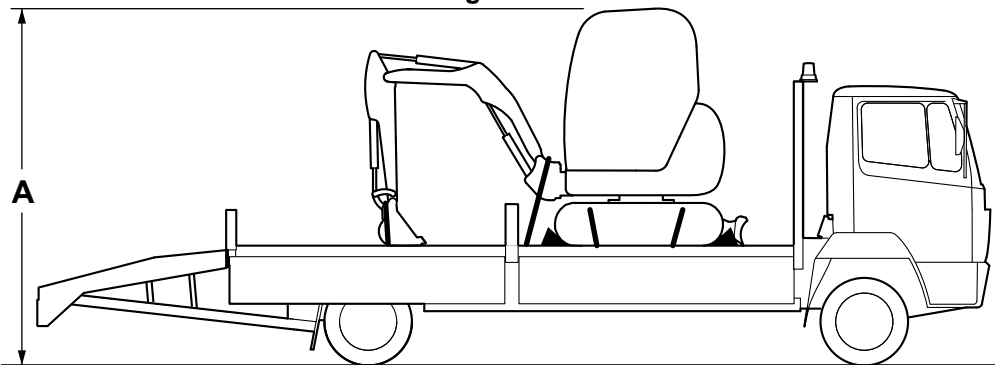
Before transporting the machine make sure you will be obeying the local rules and laws regarding machine transportation of all the areas that the machine will be carried through.

Check the condition of the transporting vehicle before loading the machine on to its trailer:

Check the Condition of the Transporting Vehicle

1. Make sure that the transporting vehicle is suitable for the dimensions and weight of your machine. Measure the clearance height. Make sure that the truck driver knows the clearance height before he drives away.

Figure 69.



A Clearance height

2. Remove all loose dirt that may otherwise come off and obstruct the highway and damage other vehicles.
3. Check the operation of the park brake.
4. Check the trailer bodywork for signs of damage.
5. Check the tyre pressures are correct (consult the manufacturer's manual).
6. Check the trailer lights are working and are the correct voltage for the towing vehicle (consult the manufacturer's manual).
7. Check the breakaway cable is serviceable.

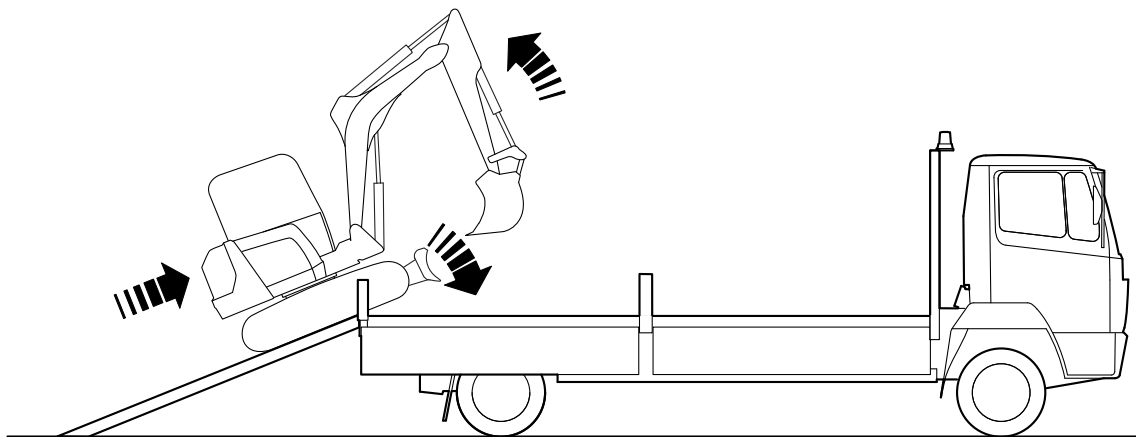
Loading the Machine onto the Transporting Vehicle/Trailer

▲ CAUTION The machine must be securely tied down to the transport vehicle to prevent lateral movement, fore-and-aft movement, and slewing of the superstructure. Failure to do so could cause injury to yourself or others.

1. Position the transporting vehicle on solid, level ground.
2. Apply the park brakes and lower any stability jacks.
3. Attach the loading ramps on to the transporter correctly.
4. Align the machine with the loading ramps, position the dozer blade to the front and fully raised.

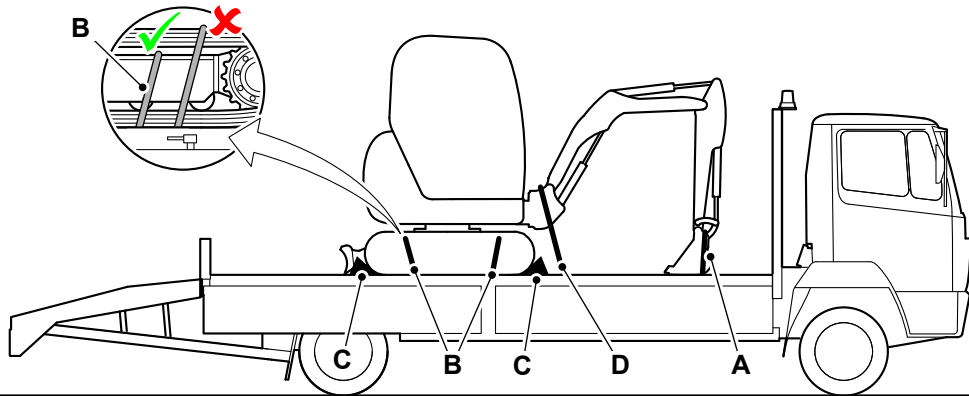
5. Slightly extend the boom and dipper for stability.
6. With the machine in low speed mode, track forward onto the ramp slowly and smoothly. Make sure the bucket will not contact the transporter ramps when loading the machine.
7. Slowly drive the machine to the top of the ramps.
8. Lower the boom until the bucket contacts the transporter deck.
9. Slowly drive forward. As the tracks begin to clear the ramps, gently raise the boom allowing the machine to rock forward onto the transporter bed.

Figure 70.



10. Slew the cab.
Angle: 180°
11. Engage the slew lock.
12. Lower the bucket onto the transporter bed.
13. Crowd the bucket. Position the dipper vertically and lower the boom until the bucket rests on a wooden block on the trailer bed.
14. Stop the engine.
15. Position a strap of suitable breaking strain over the bucket and secure to the trailer shackles.
16. Place skids under each track at the front and rear to prevent movement of the machine in the fore and aft direction.
17. Position a strap of suitable breaking strain over the front and rear of the two track legs. Attach the straps to the trailer shackles to prevent lateral movement of the machine.
18. Attach straps of suitable breaking strain to the kingpost and attach them to the trailer shackles to prevent the superstructure from slewing.
19. Remove both ramps and attach them in their transport position.
20. Raise any jacks to their transport position.

Figure 71.



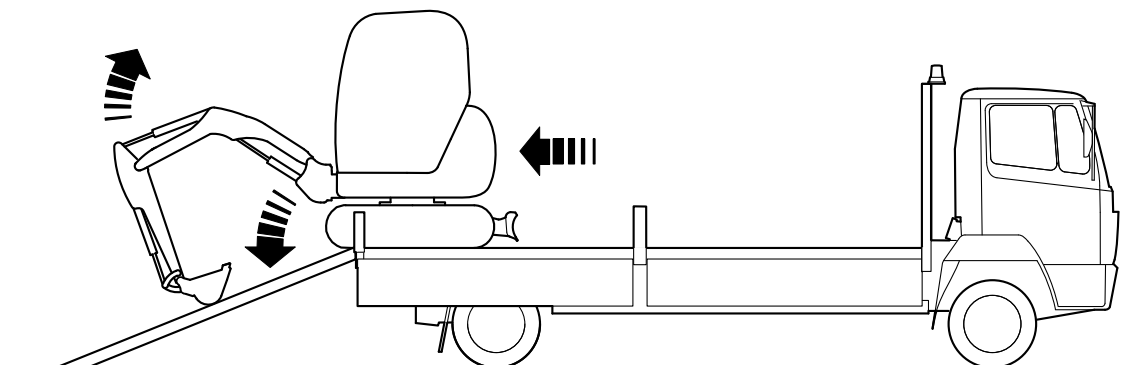
- | | |
|----------------------------------|----------------------------------------------------------------|
| A Securing strap (bucket) | B Securing strap (front and rear of the two track legs) |
| C Skids | D Securing strap (kingpost) |

Unloading the Machine from the Transporting Vehicle/Trailer

▲ WARNING If the dozer blade is to the rear, the track controls will be reversed. Use extreme caution when tracking off the trailer.

1. Position the transporting vehicle on solid, level ground.
2. Apply the park brakes and lower any stability jacks.
3. Attach the loading ramps on to the transporter. Ramps must be level with each other in the lowered position.
4. Remove the straps from the machine and stow them.
5. Start the machine and raise the bucket.
6. Raise the dozer.
7. Track slowly to the ramps.
8. Lower the boom until the bucket contacts the ground.
9. Continue to track forward until the tracks are over the lowered ramps.
10. Carefully raise the boom, allowing the machine to rock onto the ramps.
11. Slowly drive off the transporter.

Figure 72.



Operating Environment

General

In low and high temperature conditions, take the following precautions. They will make it easier to start and prevent possible damage to your machine.

Operating in Low Temperatures

▲ Notice: Do not connect two batteries in series to give 24V for starting as this can cause damage to the electrical circuits.

1. Use the correct viscosity engine lubricating oil.
[Refer to: Fluids, Lubricants and Capacities \(Page 173\).](#)
2. If available, use a low temperature diesel fuel.
3. Use the correct coolant mixture.
4. Keep the battery at full charge.
5. Fill the fuel tank at the end of each work period, this will help to prevent condensation forming on the tank walls.
6. Protect the machine when its not in use. Park the machine inside a building or cover it with a tarpaulin.
7. Install a cold weather starting aid. In very low temperatures (less than the value shown) additional starting aids may be needed. Examples are fuel, oil and coolant heaters. Ask your JCB dealer for advice.
Temperature: -20°C (-4.0°F)
8. Before the engine is started, remove any snow from the engine compartment or snow could get into the air filter.

Operating in Extremely Low Temperatures

In extremely low temperatures (below 0°C (32.0°F)) special care must be taken. Extend the warm up time and cover the front faces of the radiator and oil cooler. After warm up, remove the covers.

1. Until the machine is thoroughly warmed up never try to slew quickly or operate the travel system, or damage can occur.
2. Before the machine is operated after a warm up, make sure that the boom, dipper bucket, slew and travel services all operate correctly. A time lag may occur when selecting these services if the hydraulic oil is not sufficiently warm.
3. If the machine will be left outside for more than one day without being used, remove the battery and take it indoors.
4. Drain the water collected in the fuel system to prevent it freezing.
5. Clean the machine after use and put it on wooden blocks. Keep the rams as fully retracted as possible. Remove any water from the exposed portion of the piston rods.
6. Additional low temperature fuel and lubricants and batteries may be required. Contact your local JCB dealer for advice.

Operating in High Temperatures

1. Use the correct viscosity engine lubricating oil.
2. Use the correct coolant mixture.
3. Check the coolant system regularly, keep the coolant at the correct level. Make sure there are no leaks.

4. Keep the cooling pack and engine clean, regularly remove dirt and debris from the cooling pack and the engine.
5. Check the fan belt regularly.
6. Check the air vents. Make sure that the air vents to and from the engine compartment are not blocked.
7. Check the engine pre-cleaner regularly (if installed).
8. Check the battery electrolyte level.

Refuelling

General

▲ **CAUTION** Spilt fuel may cause skidding and therefore accidents. Clean any spilt fuel immediately.

Do not use fuel to clean the machine.

When filling with fuel, choose a well aired and ventilated area.

Notice: Consult your fuel supplier or JCB dealer about the suitability of any fuel you are unsure of.

Low Fuel Levels

If you operate the machine on very low fuel levels, then air can enter the fuel system. To prevent the entry of air, always add more fuel when the fuel gauge shows a low level of fuel.

If air enters the fuel system, the engine speed will vary dramatically and low power will be experienced. The symptoms may be made worse when the machine operates on steep slopes.

If you increase the engine speed or load when there is air in the fuel system, then damage to the engine can occur.

If the fuel supply contains air, you must stop the engine, fill the fuel tank then bleed the fuel system to remove the air. [Refer to: Bleed \(Page 139\)](#).

You must bleed the fuel system after changing the fuel filter(s).

Filling the Tank

▲ **WARNING** Do not use petrol in this machine. Do not mix petrol with the diesel fuel. In storage tanks the petrol will rise to the top and form flammable vapours.

At the end of every working day, fill the tank with the correct type of fuel. This will prevent overnight condensation from developing in the fuel.

Do not fill the tank completely, leave some space to allow the fuel to expand.

1. Unlock and remove the fuel cap.
2. Carefully fill with fuel.
3. Install and lock the fuel cap, make sure that the vent is clear.

[Refer to: Service Points \(Page 123\)](#).



Notes:

Attachments

Working with Attachments

Introduction

Attachments

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

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

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.

Attachments

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

Some attachments are supplied with the instructions on the safety, installation, removal, operation and maintenance procedures. Read and fully understand these procedures before the attachment is installed, used and serviced. If there is anything you do not understand, ask your JCB dealer.

Before you use an attachment, make sure you understand how the attachment will affect the operational safety.

When an attachment is installed, there may be changes in the machines centre of gravity or overall dimensions. These change can effect for example, the machine stability, the gradients on which it is safe to operate or the safe distance from power lines.

Practice with an attachment off the job before you work with it for the first time.

A JCB attachment is designed and manufactured specifically to suit the machines hydraulic system, mounting components and safe load requirements.

An attachment which is not designed for use with the machine can cause damage and create a safety hazard for which JCB cannot be held responsible. Also the machines warranty and any other legislative compliance can be affected by the use of non JCB approved attachments.

If your machine needs the hydraulic system adapting to use an auxiliary attachment, you must consult your JCB dealer. Only suitably qualified personnel must re-route the hydraulic hoses.

All optional attachments will have limits on their operation for example, the lifting capacity, speeds, hydraulic flow rates. Always check the instructions supplied with the attachment or in the Specification section of this manual. Some specification limits may also be shown on the data/rating plate on the attachment.

This section of the Operator's Manual includes general information on the operation of the attachment and the procedures for the installation and removal of the attachment.

Attachments for your Machine

▲ CAUTION Operation of this machine with an earth drill or breaker attached will alter machine stability.

Attachments will help increase the productivity of your machine, for more information contact your JCB dealer.

Remember, do not operate an attachment until you have read and fully understand the attachment operating instructions.

Do not operate or work with attachments until the machine hydraulic oil has reached its normal working temperature.

Notice: Some attachments may contact parts of the machine when in the fully folded position. Take extra care to avoid damage to the machine.

Connecting/Disconnecting Hydraulic Hoses

▲ WARNING Fine jets of fluid at high pressure can penetrate the skin. Keep face and hands well clear of fluid under pressure and wear personal protective equipment. Hold a piece of cardboard close to suspected leaks and then examine the cardboard for signs of fluid. If fluid penetrates your skin, get medical help immediately.

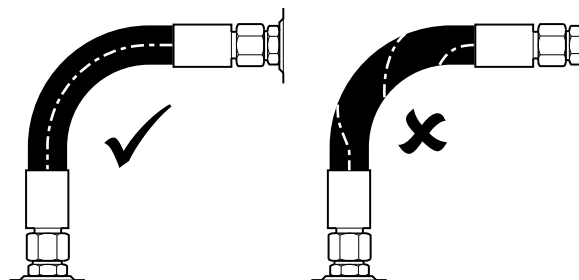
WARNING Hydraulic fluid at system pressure can injure you. Before connecting or removing any hydraulic hose, residual hydraulic pressure trapped in the service hose line must be vented. Make sure the hose service line has been vented before connecting or removing hoses. Make sure the engine cannot be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

Some attachments are hydraulically powered. The following procedures show how to connect and disconnect the hydraulic hoses safely.

Connecting the Hydraulic Hoses

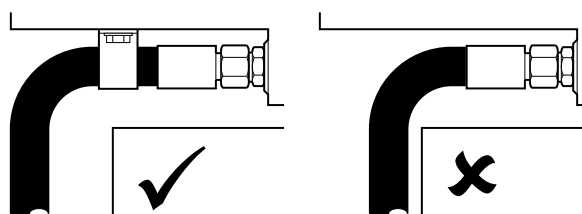
1. Make the machine safe.
[Refer to: Maintenance Positions \(Page 122\).](#)
2. Vent the hydraulic system.
[Refer to: Discharge \(Page 147\).](#)
3. Check the hoses and adaptors for damage.
[Refer to: Check \(Condition\) \(Page 147\).](#)
4. Connect the hoses:
 - 4.1. Make sure that the hose is not twisted. Pressure applied to a twisted hose can cause the hose to fail or the connections to loosen.

Figure 73.



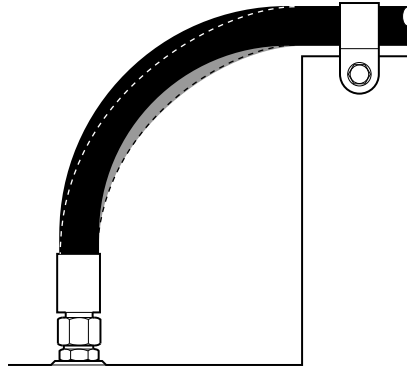
- 4.2. Make sure that the hose does not touch hot parts. High ambient temperatures can cause the hose to fail.
- 4.3. Make sure that the hose does not touch parts which can rub or cause abrasion.
- 4.4. Use the hose clamps (where possible) to support long hose runs and keep the hoses away from moving parts, etc.

Figure 74.



- 4.5. To allow for length changes when the hose is pressurised, do not clamp at the bend. The curve absorbs the change.

Figure 75.



5. Check for leaks:
 - 5.1. Start the engine.
 - 5.2. Operate the related controls to increase the pressure in the hydraulic system.
 - 5.3. Stop the engine then remove the ignition key.
 - 5.4. Check for indications of leakage at the hose connections. Correct, as necessary.

Disconnecting the Hydraulic Hoses

1. Make the machine safe.
[Refer to: Maintenance Positions \(Page 122\).](#)
2. Vent the hydraulic system.
[Refer to: Discharge \(Page 147\).](#)
3. Disconnect the hoses.
4. Check the hoses and adaptors for damage.
[Refer to: Checking For Damage \(Page 107\).](#)
5. If necessary, install the blanking caps.
6. Check for leaks:
 - 6.1. Start the engine.
 - 6.2. Operate the related controls to increase the pressure in the hydraulic system.
 - 6.3. Stop the engine then remove the ignition key.
 - 6.4. Check for indications of leakage at the hose connections. Correct, as necessary.

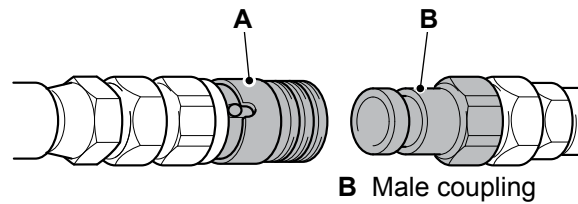
Quick Release Couplings

▲ WARNING The external surfaces of the couplings must be clean before connecting or disconnecting. Ingress of dirt will cause fluid leaks and difficulty in connecting or disconnecting. You could be killed or seriously injured by faulty quick release couplings.

The flat face quick release couplings allow the operator to remove and install attachments swiftly and efficiently.

Generally, your machine pipework will be installed with a female coupling and a male coupling. The optional attachment hoses will also be installed with a female coupling and a male coupling.

Figure 76.



A Female coupling

B Male coupling

The quick release couplings will be trouble free and relatively easy to connect and disconnect, if they are kept clean and used correctly. The recommendations listed below must always apply when using flat face quick release couplings.

Read the correct connecting and releasing procedures before you install or remove any optional attachment connected with quick release couplings.

Essential do's:

- Before connecting or removing any hydraulic hose, the 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 the hoses.
- Always wipe the two mating faces clean before connecting.
- Use caps and plugs when the couplings are disconnected.
- Always align the external locking ball (if used) with the notch in the locking sleeve and then pull the locking sleeve back fully to disconnect.
- If a coupling sticks, first check that pressure has been released. Make sure the locking ball and notch in the locking sleeve are aligned, pull back the sleeve and twist the couplings apart. Sticking is normally caused by dirt in the coupling or physical damage due to abuse.
- Connect and disconnect the new couplings two or three times to work the PTFE seals. Sometimes a new coupling will stick if the seal has not been worked.
- When connecting the couplings, only apply the spanner or grips to the hexagon and nowhere else.
- Avoid damage to the coupling faces. Burrs and scratches cause damage to the seals and cause leaks. They can also impede connection and disconnection of the couplings.
- Periodically lubricate the internal locking balls on the female half of the coupling with silicone grease.

Essential don'ts:

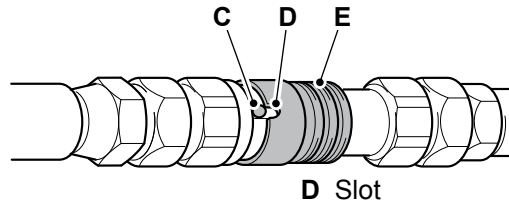
- Never try to reconnect using a damaged half coupling as this will destroy the seals in the mating half and necessitate replacement of both halves.
- Do not leave the coupling where it may be run over by a machine or otherwise crushed, this will distort the sleeve and prevent connection and disconnection.
- Never try to turn the sleeve when the coupling is disconnected as this will cause the locking ball to jam under the locking sleeve and damage the coupling.
- Never try to strip the coupling down, there are no user serviceable parts. If the coupling is damaged it must be replaced with a new one.
- Never hit the centre poppet of the coupling to try and release the locked in pressure. This can cause irreparable damage to the coupling and serious injury.
- When connecting the couplings, never clamp on the sleeve of the female or nose of the male, this will cause distortion and/or damage.
- Never subject the couplings to external forces, especially side load. This can decrease the life of the coupling or cause failure.
- Never allow the torsional forces transmitted from the hoses to unscrew/screw together the couplings.
- Never use a coupling as a plug.
- Do not connect and disconnect with pressure in the line unless the coupling type is specifically designed to do so.

Connecting Quick Release Couplings

1. Remove any residual hydraulic pressure trapped in the service line hose.
2. Wipe the two faces of the male and female couplings and make sure they are clean.
3. Make sure that ball in the female coupling is located in one of its slots.

4. Connect the male coupling into the female coupling.
5. Where applicable, rotate the sleeve half a turn and make sure that the locking ball does not align with the slot.

Figure 77.



C Ball
E Sleeve

Disconnecting Quick Release Couplings

1. Remove any residual hydraulic pressure trapped in the service line hose.
2. Where applicable, align the slot with ball.
3. Pull back the sleeve to release the coupling.

Impact Protection

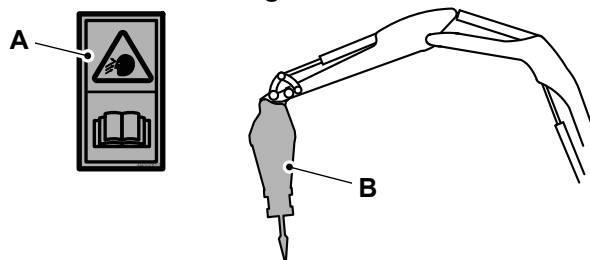
▲ CAUTION When using an attachment for example a hydraulic breaker, where the risk of flying debris is present, a protective layer or screen guard must be attached to the front of the canopy (or close the cab front window(s)) to protect the operator from flying debris which could cause injury.

The safety label warns the operator against the risk of flying debris when they use an attachment. The attachment must not be used if a protective layer or screen guard has not been installed on the machine.

Make sure that the attachment, for example a hydraulic breaker is positioned in front of the cab before it is operated. Do not slew the boom to the side during operation of the attachment.

Consult your JCB dealer for further information.

Figure 78.



A Safety label

B Hydraulic breaker

Direct-Mounted Attachments

General

▲ WARNING If two people are doing this job make sure that the person working the controls is a competent operator. If the wrong control lever is moved, or if the controls are moved violently, the other person could be killed or injured.

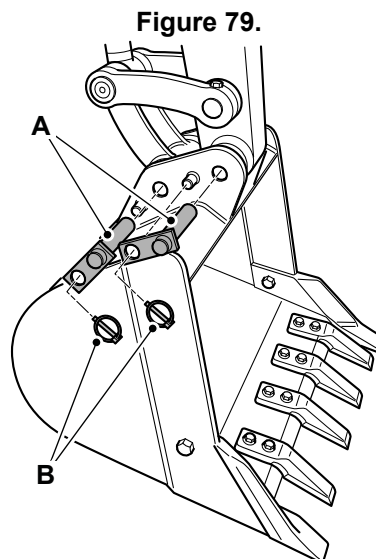
Installation

This operation is easier done by two people - one person to operate the controls and one to line up the pivots.

1. Set the bucket flat on solid, level ground, using a suitable lifting device.

CAUTION! Do not use your fingers through the holes to align the links.

2. Carefully align the holes in the dipper and bucket link with the bucket. If necessary move the machine to align the pivot pin holes.
3. Install the pivot pins and lynch pins.



A Pivot pin

B Lynch pin

Removal

1. Slew the boom so that it is straight in front of the machine.
2. Rest the bucket on solid, level ground, with the dipper approximately vertical and the bucket flat to the ground. Block the bucket to prevent its movement.

CAUTION! Stand clear and to one side of the bucket while you remove the pivot pins. With the pins removed, the bucket could roll over.

3. Remove the lynch pin and the pivot pins.
4. Using the controls, carefully lift the dipper clear of the bucket.

Quickhitch

Excavator Arm Quickhitch

General

▲ CAUTION When the quickhitch is installed and its attachment attached, there is a danger of the attachment hitting the machine. Operate the boom and dipper carefully when the quickhitch and its attachment are attached.

CAUTION When the quickhitch is attached to the machine, allowance must be made for the weight of the quickhitch on the rated operating load. The mass of the Quickhitch is stamped on the data plate.

The Excavator Quickhitch, which is attached to the dipper enables the fast removal and installation of the bucket (and other attachments).

To prevent premature wear, failure and breakage, the Quickhitch assembly must be used with a rockbreaker for short periods only.

If the machine is to be used for rock breaking for a long period of time, it is recommended that the rockbreaker is installed directly on the machine.

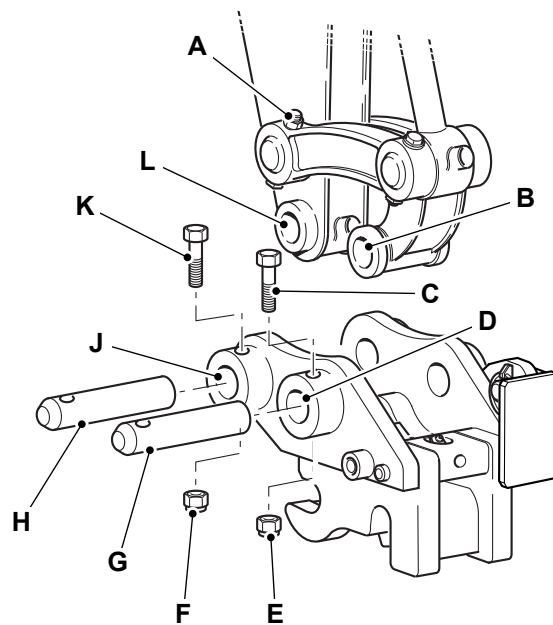
When using a rockbreaker, it must be curled towards the machine (as a typical digging operation). Do not use the rockbreaker as a lever as this causes excessive loads on the locking mechanism.

Installation

This operation is easier done by two people, one person to operate the controls and one to line up the pivots.

1. Before the Quickhitch is installed, make sure that the tipping lever locking bolt assembly is attached with the nut.
2. Put the Quickhitch on solid, level ground. Use the safe and correct lifting equipment to move the Quickhitch.
3. Move the machine so that the dipper arm and Quickhitch are correctly aligned as shown. Refer to Figure 80.
4. Engage the dipper:
 - 4.1. Operate the controls to line up the hole in the dipper arm with the holes in the Quickhitch.
 - 4.2. Install the pivot pin and secure it with the nut and bolt.
5. Engage the tipping link:
 - 5.1. Operate the controls to line up hole in the tipping link with hole in the Quickhitch.
 - 5.2. Install the pivot pin and attach it with the nut and bolt.

Figure 80.



- A Nut (tipping lever - locking bolt)
- C Bolt (tipping link - pivot pin)
- E Nut (tipping link - pivot pin)
- G Pivot pin (tipping link)
- J Hole (Quickhitch)
- L Hole (dipper arm)

- B Hole (tipping link)
- D Hole (Quickhitch)
- F Nut (dipper - pivot pin)
- H Pivot pin (dipper)
- K Bolt (dipper - pivot pin)

Removal

The removal of the Quickhitch is a reversal of the installation procedure. Pay particular attention to safety notices.

Maintenance

Examine the Quickhitch daily for broken or missing parts.

Remove any debris from the latch hook locking mechanism.

If the Quickhitch is cleaned by high pressure water, always grease the latch hook pivot pin. Always grease the latch hook pin every week.

Auxiliary Circuits

Handheld Hydraulic Tool Circuits

▲ WARNING Make sure that the hydraulic tool circuit is disabled before connecting or disconnecting hydraulic hand held tool hoses.

WARNING When the machine is installed with a hand held hydraulic tool circuit and the operator is out of the seat with the left hand console lowered and the control isolation switch activated, then track, dozer, swing and auxiliary controls are active.

WARNING Do not work using hand held tool under raised boom.

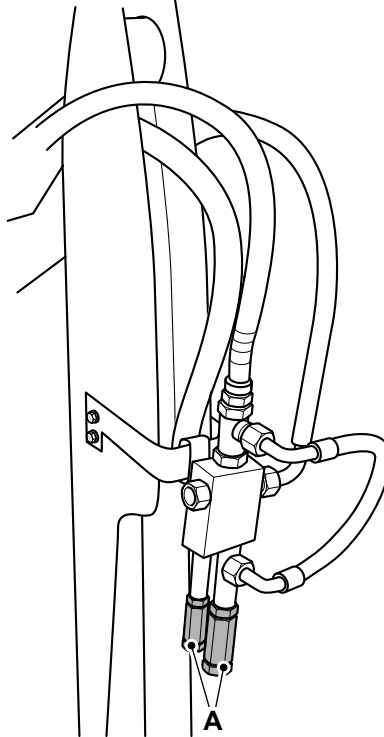
CAUTION The springs inside the couplings are strong. Considerable force is required to engage them. Make sure that the couplings have fully engaged.

To allow the use of hand held tools the machine is installed with a EHTMA (European Hydraulic Tool Manufacturers Association) Class 'C' hydraulic circuit (20L/min at 138bar (2,000.0psi)), only tools to this standard should be installed. Quick release coupling to which the tools connect are mounted.

Connecting the Hand Held Tool

1. Make the machine safe.
[Refer to: Maintenance Positions \(Page 122\).](#)
2. Connect the hand tool quick release couplings to the machine coupling.

Figure 81.



A Machine couplings

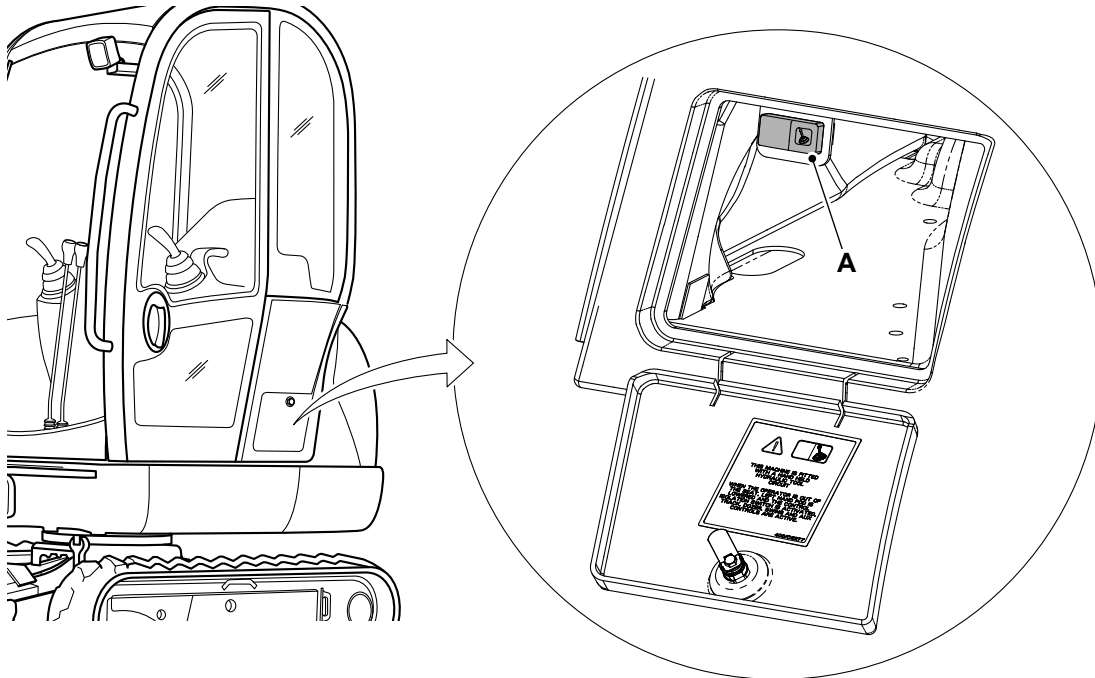
Operating the Hand Held Tool

1. Start the engine and use the hand throttle to set the rpm as per the attachment installed.
2. Lower the dozer.
3. Lower the excavator arm so the attachment is flat on the ground.
4. Leave the cab/canopy.

Refer to: [Entering and Leaving the Operator Station \(Page 26\)](#).

5. Lower the left hand console and press the control isolation switch (in toolbox compartment) to enable the hydraulics.

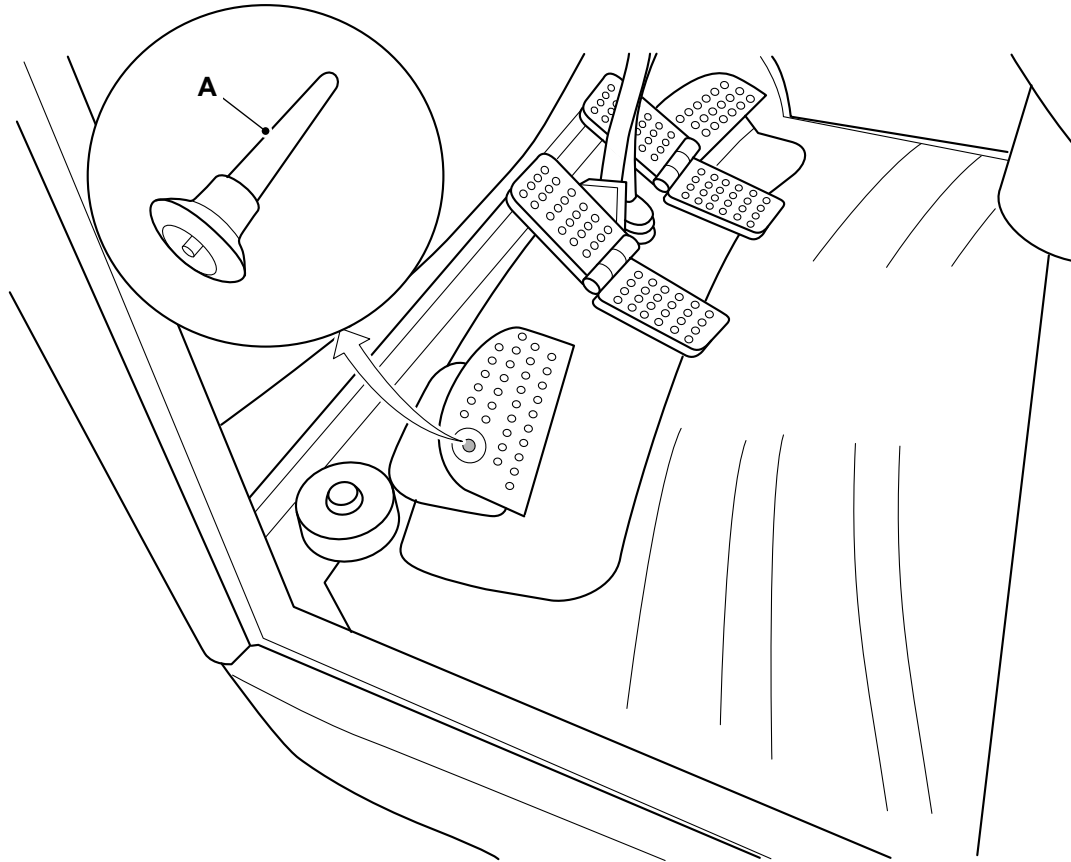
Figure 82.



A Control isolation switch (in toolbox compartment)

6. Latch the Auxiliary service pedal into position (extreme left) using the locking peg supplied.

Figure 83.



A Auxiliary locking peg

7. Insert the peg through the pedal by pressing the red button.
8. Make sure that peg sits properly in the hole and locked in position.
9. Hand held tool is live now and ready to use. Operate the hand held tool in accordance with the relevant tool operator manual.

Disconnecting the Hand Held Tool

1. Make the machine safe.
[Refer to: Maintenance Positions \(Page 122\).](#)
2. Disable the hydraulic tool circuit.
3. Operate the hydraulic hand tool a few times to release any pressure trapped in the hoses.
4. Disconnect the hand tool quick release couplings.

Buckets

General

▲ WARNING The bucket selected must be the correct width to suit the hole/trench to be excavated. However, if the hole width demands a larger bucket, consideration must be given to the density/weight of the material to be moved affecting the stability of the machine especially if working on a slope. If there is danger of the machine's stability being compromised, then select a smaller bucket or reposition the machine.

Use the 300mm wide bucket for narrow excavations or for maximum penetration when digging in hard, rocky or clay soils.

Larger buckets are ideally suited to bulk shifting light or loose materials.

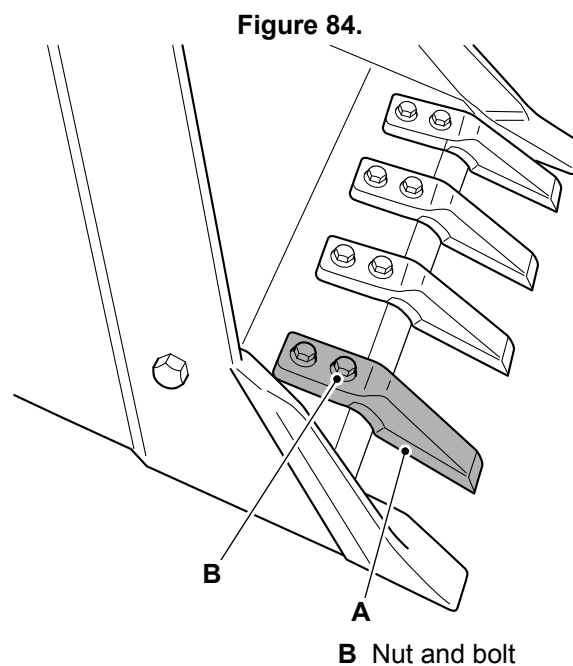
Notice: When buckets 750mm or wider are attached to the machine, use extreme caution in operation to avoid contact with the cab.

Bucket Teeth

Standard Teeth

Removal

1. Park the machine on solid, level ground.
2. Put the bucket on the ground.
3. Stop the engine.
4. Remove the ignition key.
5. Discharge the hydraulic pressure.
[Refer to: Discharge \(Page 147\).](#)
6. Remove the nut and bolt.
7. Remove the tooth.



A Tooth

B Nut and bolt

Installation

1. Put the tooth in position.
2. Install the nuts and bolts to secure the tooth in position.

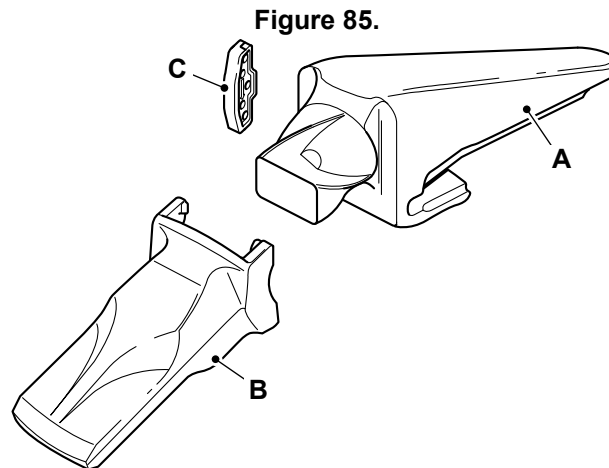
ESCO Teeth

Introduction

This information only relates to the ESCO buckets supplied by JCB. If a bucket from another source is used, refer to the relevant manufacturer's manual.

A wide range of Super V-teeth are available for your machine, which are suitable for all digging conditions. The Super V system consists of an adaptor, tooth and locking pin. Refer to Figure 85.

The adaptor remains attached to the bucket and the teeth can be easily and quickly changed by one person. The method of removal/installation is the same for all types of teeth.



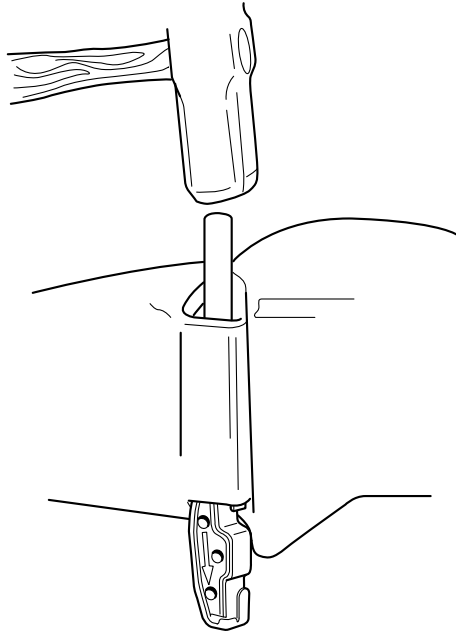
A Adaptor
C Locking pin

B Tooth

Removal

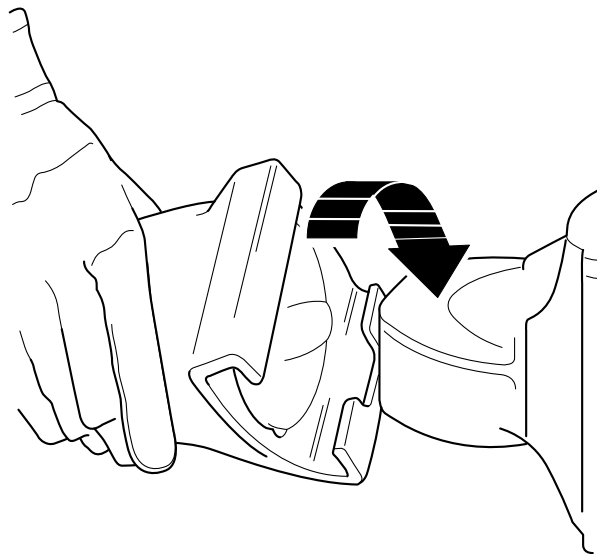
1. Move the bucket into position.
 - 1.1. Make sure that the bucket is securely supported off the ground with sufficient space for the removal of the locking pin.
2. Stop the engine.
3. Remove the ignition key.
4. Remove the locking pin.
 - 4.1. Use a hammer and suitable drift, to carefully knock the locking pin down and out of its guide. Refer to Figure 86.

Figure 86.



5. Remove the tooth from the adaptor. Refer to Figure 87.

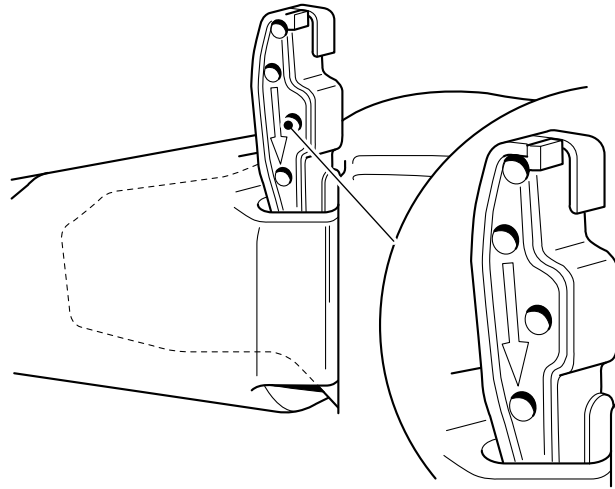
Figure 87.



Installation

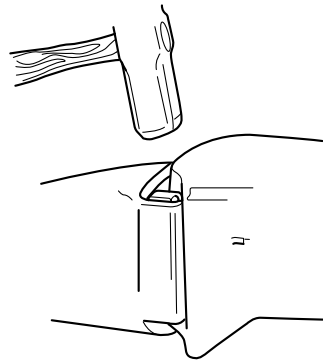
1. Install the tooth over the adaptor. (The reverse movement of step 5, in the Removal procedure. Refer to Figure 87).
2. Install a new locking pin. Make sure that the locking pin is the correct position, (the arrow points downwards on the outside edge). Refer to Figure 88.

Figure 88.



3. Carefully hit the locking pin with a hammer until it is flush with its guide and locks in position. Refer to Figure 89.

Figure 89.



Rockbreaker

General

▲ WARNING The attachment will move when released. Stand clear and to one side when releasing the attachment.

WARNING The rockbreaker must be positioned correctly before attempting to release it from the quickhitch. If incorrectly positioned, the rockbreaker could swing or fall suddenly from the machine when releasing the quickhitch latch hook.

WARNING Always install the quickhitch latch hook locking pin (mechanical only). Failure to install the pin will result in possible failure of the latching mechanism. Such a failure would result in the sudden release of an attachment from the machine and you or others could be killed or seriously injured.

To prevent premature wear, failure and breakage, the Quickhitch assembly must be used with a rockbreaker for short periods only. If the machine is to be used for rock breaking for a long period of time, it is recommended that the rockbreaker is installed directly on the machine.

When using a rockbreaker, it must be curled towards the machine (as a typical digging operation).

Do not use the rockbreaker as a lever as this causes excessive loads on the locking mechanism.

Installation

1. Set the rockbreaker on solid, level ground. Use safe and correct lifting equipment to move bucket.
2. Position the machine.
3. Use the excavator controls to engage the jaw of the Quickhitch with the pivot pin of the breaker.
4. Use the excavator controls to roll the Quickhitch in until the latch hook has fully engaged the pivot pin on the breaker. It may be necessary to apply a load to achieve Quickhitch connection. Alternatively, use the tommy bar to lever the latch off, allowing the breaker pivot pin to locate in jaw of the Quickhitch.

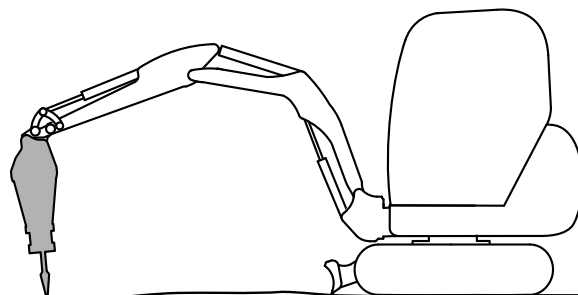
WARNING! Make sure that the latch hook has fully engaged, otherwise the attachment could fall and you could be killed or injured

5. Install the latch hook locking pin and secure with the lynch pin.

Removal

1. When possible, put the Quickhitch attachments on solid, level ground to make the installation procedure safe and easier.
2. Park the machine on solid, level ground.
3. Position the rockbreaker just clear of the ground and at an angle such that the rockbreaker does not detach from the front pivot pin when the Quickhitch is unlatched.

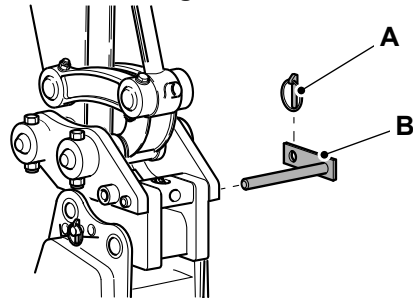
Figure 90.



4. Stop the engine.
5. Turn the ignition key to position 1.

6. Operate the auxiliary attachment control pedal, this will release any hydraulic pressure trapped in the system.
7. Disconnect the attachment hydraulic hoses from the excavator.
8. Remove lynch pin and locking pin.

Figure 91.

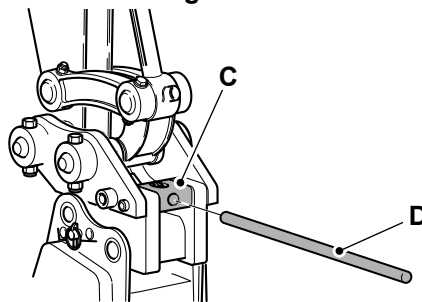


A Lynch pin

B Locking pin

9. Insert the tommy bar into the hole of the latch hook.

Figure 92.

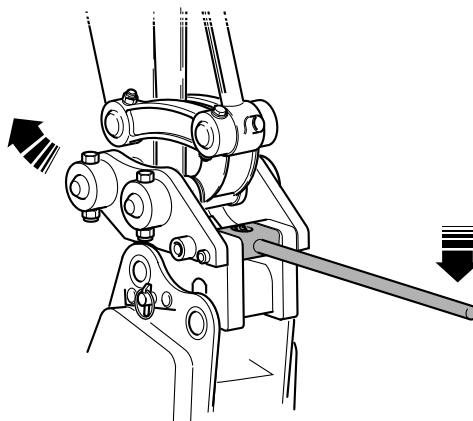


C Latch hook

D Tommy bar

10. Apply a downward pressure on the bar to release the breaker's rear pivot pin from the latch hook, allowing the breaker to swing forward as shown.

Figure 93.

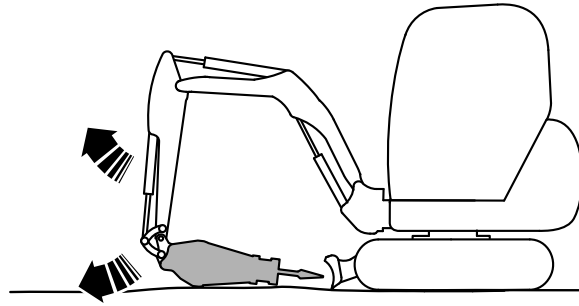


11. Remove the tommy bar from the Quickhitch.

12. Install the locking pin and lynch pin. Failure to install the pin will result in the breaker re-latching as it is lowered to the ground. Make sure that the hydraulic hoses do not become trapped under the breaker. Refer to Figure 94.

13. Start the engine and carefully lower the breaker to the ground as shown.

Figure 94.



Operation

The Rockbreaker is a single acting attachment, make sure the ball valve is in the correct position. [Refer to: Auxiliary Circuit Controls \(Page 63\)](#).

Preservation and Storage Cleaning

General

▲ WARNING When using cleaning agents, solvents or other chemicals, you must adhere to the manufacturer's instructions and safety precautions.

CAUTION To avoid burning, wear personal protective equipment when handling hot components. To protect your eyes, wear goggles when using a brush to clean components.

Notice: Cleaning metal parts with incorrect solvents can cause corrosion. Use only recommended cleaning agents and solvents.

Notice: The efficiency of the rams will be affected if they are not kept free of solidified dirt. Clean dirt from around the rams regularly. When leaving or parking the machine, close all rams if possible to reduce the risk of weather corrosion.

Notice: Never use water or steam to clean inside the operator station. The use of water or steam could damage the machine electrics and render the machine inoperable. Remove dirt using a brush or damp cloth.

Clean the machine with water and/or steam. Do not let mud, debris etc. to collect on the machine.

Before you do any service procedures that require components to be removed:

- The cleaning must be done either in the area of components to be removed, or in the case of major work, or work on the fuel system, the whole engine and the surrounding machine must be cleaned.
- When cleaning is complete, move the machine away from the wash area or alternatively, remove the material washed from the machine.

When you remove components, be aware of exposure to dirt and debris. Cover any open ports and remove the deposits before proceeding.

Refer to the individual clean procedures throughout the Maintenance section. [Refer to: Maintenance Schedules \(Page 118\)](#).

Detergents

Do not use a full strength detergent. Always dilute the detergents as per the manufacturer's recommendations, or damage to the paint finish can occur.

Always obey the local regulations regarding the disposal of debris created from cleaning the machine.

Pressure Washing and Steam Cleaning

▲ CAUTION When using a steam cleaner, wear safety glasses or a face shield as well as protective clothing. Steam can cause personal injury.

Notice: The engine and other components could be damaged by high pressure washing systems. Special precautions must be taken if the machine is to be washed using a high pressure system.

Make sure that the alternator, starter motor and any other electrical components are shielded and not directly cleaned by the high pressure cleaning system. Do not aim the water jet directly at bearings, oil seals or the engine air induction system.

Use a low pressure water jet and brush to remove dried mud or dirt.

Use a pressure washer to remove soft dirt and oil.

The machine must always be greased (if appropriate) after pressure washing or steam cleaning.

Preparation

1. Make the machine safe.

[Refer to: Maintenance Positions \(Page 122\)](#).



2. Stop the engine and let it cool for at least one hour. Do not try to clean any part of the engine while it is running.
3. Make sure that all of the electrical connectors are correctly coupled. If the connectors are open, attach the correct caps or seal with water proof tape.



Checking For Damage

General

Refer to the individual condition checks throughout the Maintenance section. [Refer to: Maintenance Schedules \(Page 118\)](#).

Storage

General

If the machine will not be used for an extended period, you must store the machine correctly. If you prepare the machine carefully and apply on-going care you can prevent deterioration and damage to the machine while it is in storage.

Storage Area

The machine can be stored in a temperature range of: -40°C (-39.9°F) to 54°C (129.1°F)

When possible, you must keep the machine in a dry building or shelter.

If only an outdoor storage area is available, look for a storage area with good drainage.

Prepare the Machine for Storage

1. Clean the machine to remove all unwanted material and corrosive products.
2. Dry the machine to remove solvents and moisture.
3. Touch-up any damaged paint.
4. Apply grease to the moving parts (if applicable).
5. Examine the machine for worn or damaged parts. Replace if necessary.
6. Fill the fuel tank to prevent a build up of condensation in the tank (if applicable).
7. Examine the coolant condition. Replace if necessary.
8. Examine all fluid levels. Top up if necessary.

Put into Storage

1. Park the machine on solid, level ground.
 - 1.1. Park the machine in an area where it is easy to access. (In case the machine does not start at the end of the storage period).
 - 1.2. Put suitable timbers under the machine to eliminate direct contact with the ground.
2. Retract all of the rams and lower the attachment to the ground.
3. Vent the hydraulic system.
4. Remove the ignition key.
5. Apply a thin layer of grease or petroleum jelly to all of the exposed ram piston rods.
6. Remove the battery.
 - 6.1. Keep the battery in warm, dry conditions.
 - 6.2. Charge the battery periodically.
7. If you keep the machine outdoors, cover the machine with tarpaulins or plastic sheets.

During Storage

Operate the machine functions each week to prevent a build up of rust in the engine and hydraulic circuits, and to minimise the deterioration of the hydraulic seals.

1. Remove the grease or petroleum jelly from the ram piston rods.
2. Examine all fluid levels. If necessary, add more fuel.

3. Install a charged battery.
4. Start the engine.
5. Operate the hydraulic controls. Make sure that the hydraulic functions operate correctly.
6. Prepare the machine for storage.

Take out of Storage

1. Examine the coolant condition. Replace if necessary.
2. Examine all fluid levels. If necessary replace the fluid or add more fluid.
3. Clean the machine to remove all unwanted material and corrosive products. Dry the machine to remove solvents and moisture
4. Remove the grease or petroleum jelly from the ram piston rods.
5. Install a charged battery.
6. Start the engine.
7. Operate the hydraulic controls. Make sure that the hydraulic functions operate correctly.

Security

General

Vandalism and the theft of unattended machines is an ever increasing problem and JCB is doing everything possible to help stop this.

Your JCB dealer will be pleased to provide information on any of these sensible precautions. Act now!

JCB Plantguard

JCB Plantguard is a comprehensive package available to help you safeguard your machine. It includes such devices as vandal proof covers, window etching, immobiliser, concealed serial number, battery isolator, tracker security system etc.

Remember that the installation of any one of these security devices will help to minimise not only the damage or loss of your machine, but also subsequent lost productivity. It could also help to reduce insurance premiums.

Construction Equipment Security and Registration Scheme (CESAR)

CESAR (Construction Equipment Security and Registration) is a simple, effective method of machine identification and registration that operates throughout the United Kingdom and Ireland and across the whole spectrum of JCB products.

CESAR is a scheme to help decrease plant theft, and was developed by the Metropolitan Police and the Home Office Plant Theft Action Group.

The key to the scheme is its simplicity and it will mean that every police officer in the country will know how to identify construction machinery and verify ownership. This will provide a major leap forward in both protecting machinery, and recovering it.

The Construction Equipment Association is managing the scheme, and Datatag are providing the security material and support. JCB is fully supportive of the CESAR initiative and will offer it as a factory option across the range.

The CESAR kit includes 2 tamper proof triangular identification plates installed on either side of the machine, a unique transponder, mini radio frequency identification tags concealed throughout the machine, Datatag micro dots, and a unique DNA coded chemical painted on the machines major components. Plus a registration certificate logged onto the CESAR or DVLA databases, and a change of keeper form.

Maintenance Introduction

General

Your machine has been designed and built to give maximum performance, economy and ease of use under a wide variety of operating conditions. Prior to delivery, your machine was inspected both at the factory and by your dealer to make sure that it reaches you in optimum condition. To maintain this condition and trouble free operation it is important that the routine services, as specified in this manual, are done by an approved JCB dealer at the recommended specified intervals and it is recommended that this is done by an approved JCB dealer using genuine JCB parts. Servicing/repairs carried out by unauthorised personnel or the use of non-genuine inferior quality parts could limit machine warranty.

This section of the manual gives full details of the service requirements necessary to maintain your JCB machine at peak efficiency. A service manual for your machine is available from your JCB dealer. The service manual contains information on how to repair, disassemble and assemble your machine correctly.

It can be seen from the service schedules on the following pages that many essential service checks must only be done by a JCB trained specialist competent person. Only JCB dealer service engineers have been trained by JCB to do such specialist tasks, and only JCB dealer service engineers are equipped with the necessary special tools and test equipment to do such tasks, thoroughly, safely, accurately and efficiently.

After completing any routine maintenance or repairs you must complete the functional checks according to the maintenance schedule.

JCB regularly updates its dealers to advise them of any machine developments, changes in specifications and procedures. Therefore only a JCB dealer is fully able which makes them best placed to maintain and service your machine.

A service record sheet or book is provided which will enable you to plan your service requirements and keep a service history record. It must be dated, signed and stamped by your dealer each time your machine is serviced.

Remember, if your machine has been correctly maintained, not only will it give you improved reliability but its resale value will be greatly enhanced.

When the machine is removed from service, local regulations for machine decommissioning and disposal will vary. Contact your nearest JCB dealer for further information.

Owner/Operator Support

JCB together with your dealer wants you to be completely satisfied with your new JCB machine. However, if you do have a problem, you can contact your dealers service department who are there to help you!

You will have been given the names of the relevant service contacts at your dealer when the machine was supplied.

To get the most from your dealer please help them to satisfy you by providing them with:

1. Your name, address and telephone number.
2. Your machine model and serial number.
3. The date of purchase and hours of work.
4. The nature of the problem.

Remember, only your JCB dealer has access to the vast resources available at JCB to help support you. In addition, your dealer is able to offer a variety of programmes covering warranty, fixed price servicing, safety inspections, including weight tests, covering both legal and insurance requirements.

Service/Maintenance Agreements

To help plan and spread the costs of maintaining your machine, we strongly recommend you take advantage of the many service and maintenance agreements your dealer can offer. These can be tailor made to meet your operating conditions, work schedule etc.

Please consult your JCB dealer for details.

Obtaining Spare Parts

If you use non-genuine JCB parts or consumables, then you can compromise the health and safety of the operator and cause machine failure.

A parts book for your machine is available from your JCB dealer. The parts book will help you identify parts and order them from your JCB dealer.

Your dealer will need to know the exact model, build and serial number of your machine. [Refer to: Product and Component Identification \(Page 10\)](#).

The data plate also shows the serial numbers of the engine, transmission and axle(s), where applicable. Remember, if any of these units have been changed, the serial number on the data plate may be wrong. Check on the unit itself.

Maintenance Safety

General

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 injury.

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®, Fluorel™ 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.

Fluids and Lubricants

Oil

Oil is toxic. If you swallow any oil, do not induce vomiting, seek medical advice. Used engine oil contains harmful contaminants which can cause skin cancer. Do not handle used engine oil more than necessary. Always use barrier cream or wear gloves to prevent skin contact. Wash skin contaminated with oil thoroughly in warm soapy water. Do not use petrol, diesel fuel or paraffin to clean your skin.

Fluid Under Pressure

Fine jets of fluid at high pressure can penetrate the skin. Keep face and hands well clear of fluid under pressure and wear personal protective equipment. Hold a piece of cardboard close to suspected leaks and then examine the cardboard for signs of fluid. If fluid penetrates your skin, get medical help immediately.

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.

Hygiene

JCB lubricants are not a health risk when used correctly for their intended purposes.

However, excessive or prolonged skin contact can remove the natural fats from your skin, causing dryness and irritation.

Low viscosity oils are more likely to do this, so take special care when handling used oils, which might be diluted with fuel contamination.

Whenever you are handling oil products you must maintain good standards of care and personal and plant hygiene. For details of these precautions we advise you to read the relevant publications issued by your local health authority, plus the following.

Storage

Always keep lubricants out of the reach of children.

Never store lubricants in open or unlabelled containers.

Waste Disposal

▲ CAUTION It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants.

Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use authorised waste disposal sites.

CAUTION Damaged or spent batteries and any residue from fires or spillage must be put in a closed acid proof receptacle and must be disposed of in accordance with local environmental waste regulations.

All waste products must be disposed of in accordance with all the relevant regulations.

The collection and disposal of used oil must be in accordance with any local regulations. Never pour used engine oil into sewers, drains or on the ground.

Handling

▲ CAUTION The temperature of the hydraulic oil will be high soon after stopping the machine. Wait until it cools before beginning maintenance.

New Oil

There are no special precautions needed for the handling or use of new oil, beside the normal care and hygiene practices.

Used Oil

Used engine crankcase lubricants contain harmful contaminants.

Here are precautions to protect your health when handling used engine oil:

- Avoid prolonged, excessive or repeated skin contact with used oil
- Apply a barrier cream to the skin before handling used oil. Note the following when removing engine oil from skin:
 - Wash your skin thoroughly with soap and water

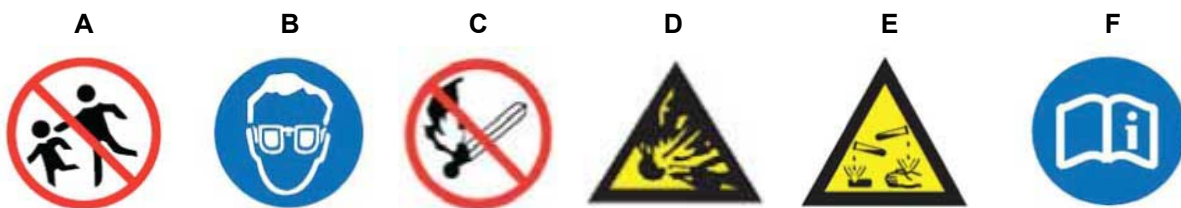
- Using a nail brush will help
- Use special hand cleansers to help clean dirty hands
- Never use petrol, diesel fuel, or paraffin for washing
- Avoid skin contact with oil soaked clothing
- Don't keep oily rags in pockets
- Wash dirty clothing before re-use
- Throw away oil-soaked shoes

Battery

Warning Symbols

The following warning symbols may be found on the battery.

Figure 95.



A Keep away from children

C No smoking, no naked flames, no sparks

E Battery acid

B Shield eyes

D Explosive gas

F Note operating instructions

First Aid - Oil

Eyes

In the case of eye contact, flush with water for 15min. If irritation persists, get medical attention.

Swallowing

If oil is swallowed do not induce vomiting. Get medical advice.

Skin

In the case of excessive skin contact, wash with soap and water.

Spillage

Absorb with sand or a locally approved brand of absorbent granules. Scrape up and remove to a chemical disposal area.

Fires

▲ WARNING Do not use water to put out an oil fire. This will only spread it because oil floats on water.

Extinguish oil and lubricant fires with carbon dioxide, dry chemical or foam. Fire fighters must use self contained breathing apparatus.

First Aid - Electrolyte

Eyes

In the case of eye contact, flush with water for 15min. always get medical attention.

Swallowing

Do not induce vomiting. Drink large quantities of water or milk. Then drink milk of magnesia, beaten egg or vegetable oil. Get medical help.

Skin

Flush with water, remove affected clothing. Cover burns with a sterile dressing then get medical help.

First Aid - DEF (if applicable)

Do not drink or inhale DEF (Diesel Exhaust Fluid). If large quantities of DEF have been swallowed a doctor should be called immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person.

Avoid prolonged or repeated skin contact. After contact with skin wash thoroughly with plenty of soap and water. If irritation develops seek medical advice.

Avoid contact with eyes, skin and clothing. Wear chemical resistant gloves, overalls and safety goggles complying with an approved standard. If in contact with eyes, rinse immediately with plenty of clean water. If irritation occurs seek medical attention. Always wash hands and arms thoroughly after handling before eating, drinking, smoking or using the lavatory.

Maintenance Schedules

General

▲ 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.

To ensure the correct functioning of the engine and emissions control system all operation and maintenance must be conducted in accordance with the instructions in this manual. Incorrect operation, maintenance or repair of the engine and emissions control system may lead to reduced product life, loss of performance or malfunctions. It is the machine owner's responsibility to ensure maintenance is conducted properly in accordance with the requirements in this manual.

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.

How to Use the Maintenance Schedules

The schedules show the service tasks which must be done and their intervals.

The services must be done at either the hourly interval or the calendar equivalent, whichever occurs first.

The intervals given in the schedules must not be exceeded. If the machine is operated under severe conditions (high temperature, dust, water, etc.) shorten the intervals.

Table 6.

○	Service task can be completed by a competent operator. Details of how to complete the service task are given in the Operator's Manual.
□	We recommend that a Service Engineer completes the service task. Details of how to complete the service task are given in the Service Manual.

Maintenance Intervals

Table 7.

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

Pre-start Cold Checks, Service Points and Fluid Levels

Table 8.

Component	Task	10	50	500	1,000	2,000
Attachments/Optional Equipment						
As Required	Lubricate	○	○	□	□	□
As required	Check (condition)	○	○	□	□	□
Body and Framework						
General	Clean	○	○	□	□	□
General	Check (condition)	○	○	□	□	□
Slew Ring Bearing	Lubricate		○	□	□	□
Slew Ring Pinion and Gear Teeth	Lubricate				□	□
Cab Mounts	Check (condition)					□
Pivot Pins	Lubricate	○	○	□	□	□
Kingpost - Kingpin Retaining Plate Bolts Torque	Check (condition)			□	□	□
Operator Station						
Operator Protective Structure	Check (condition)	○	○	□	□	□
Seat Belt	Check (condition)	○	○	□	□	□
Engine						
Oil	Check (leaks)	○	○	□	□	□
Oil	Check (level)	○	○	□	□	□
Oil	Replace			□	□	□
Drive Belt	Check (condition)		○	□	□	□
Valves ⁽²⁾	Check (condition)			□	□	□
Engine Component Security	Check (condition)			□	□	□
Air Filter						
Air Filter ⁽¹⁾	Check (condition)		○	□	□	□
Air Filter (outer)	Replace				□	□
Air Filter (inner)	Replace					□
Air Filter (dust valve)	Clean			□	□	□
Fuel System						
Fuel System	Check (leaks)	○	○	□	□	□
Fuel Filter	Replace			□	□	□
Water Separator	Clean	○	○	□	□	□
Fuel Pre Filter	Replace			□	□	□
Fuel Injectors ⁽²⁾	Clean					□
Fuel Lift Pump	Clean			□	□	□
Cooling System						
Coolant	Check (leaks)	○	○	□	□	□
Coolant	Check (condition)	○	○	□	□	□
Coolant	Check (level)	○	○	□	□	□

Component	Task	10	50	500	1,000	2,000
Coolant	Replace					<input type="checkbox"/>
Cooling Pack	Clean	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gearbox						
Track Gearbox Security	Check (condition)			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Slew Gearbox Security	Check (condition)			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Track and Slew Gearbox Oil	Replace			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tracks						
Track Condition	Check (condition)		<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Idler Wheels Oil and Seals	Replace				<input type="checkbox"/>	<input type="checkbox"/>
Track Roller Bolts	Check (condition)			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Track Roller Oil and Seals	Replace				<input type="checkbox"/>	<input type="checkbox"/>
Track Tension	Check (operation)		<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hydraulics						
Hose and Pipework	Check (leaks)		<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oil	Check (level)	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oil	Replace					<input type="checkbox"/>
Rams	Check (condition)		<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Return Filter	Replace			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Suction Strainer	Clean				<input type="checkbox"/>	<input type="checkbox"/>
Security of Mounting Bolts on Major Components	Check (condition)				<input type="checkbox"/>	<input type="checkbox"/>
Electrics						
Wiring	Check (condition)		<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Battery	Clean		<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Battery Electrolyte Level (if applicable)	Check (level)			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Battery Isolator	(Check (operation)		<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Starter Motor	Check (condition)					<input type="checkbox"/>
Alternator	Check (condition)					<input type="checkbox"/>
Window Washer Fluid Level	Check (level)	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Miscellaneous						
Fire Extinguisher	Check (condition)	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(1) *Dusty conditions only.*

(2) *Jobs which must be performed by a specialist.*

Functional Tests and Final Inspection

Table 9.

Component	Task	10	50	500	1,000	2,000
Body and Framework						
Excavator Lever and Pedal Locks	Check (operation)			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Engine						
Idle and Maximum Speed	Check (operation)			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Component	Task	10	50	500	1,000	2,000
General	Check (condition)	○	○	□	□	□
Fuel System						
Fuel System	Check (leaks)		○	□	□	□
Hydraulics						
Hoses and Pipework	Check (operation)		○	□	□	□
Relief Valves ⁽¹⁾	Check (condition)			□	□	□
Services	Check (operation)	○	○	□	□	□
Electrics						
General	Check (operation)		○	□	□	□
Miscellaneous						
Fit for Purpose Test ⁽²⁾	Check (operation)			□	□	□

(1) *Dusty conditions only.*

(2) *Jobs which must be performed by a specialist.*

Maintenance Positions

General

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

WARNING 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.

Make the machine safe before you start a maintenance procedure.

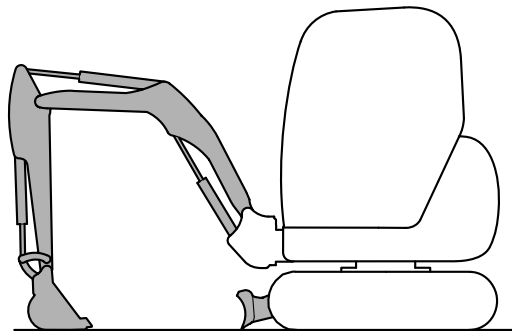
Unless a maintenance procedure instructs you differently, you must lower the excavator arm. [Refer to: Maintenance Positions \(Page 122\)](#).

The machine has a cab tilt feature. This feature must only be used out by trained personnel. Refer to the service manual for the cab tilt procedure.

Maintenance Position (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 96.
3. Lower the excavator so the attachment is flat on the ground. Refer to Figure 96.

Figure 96.



4. Stop the engine.
5. Discharge the hydraulic pressure.
[Refer to: Discharge \(Page 147\)](#).
6. Isolate the controls.
[Refer to: Control Lock \(Page 49\)](#).
7. Disconnect the battery to prevent accidental operation of the engine.

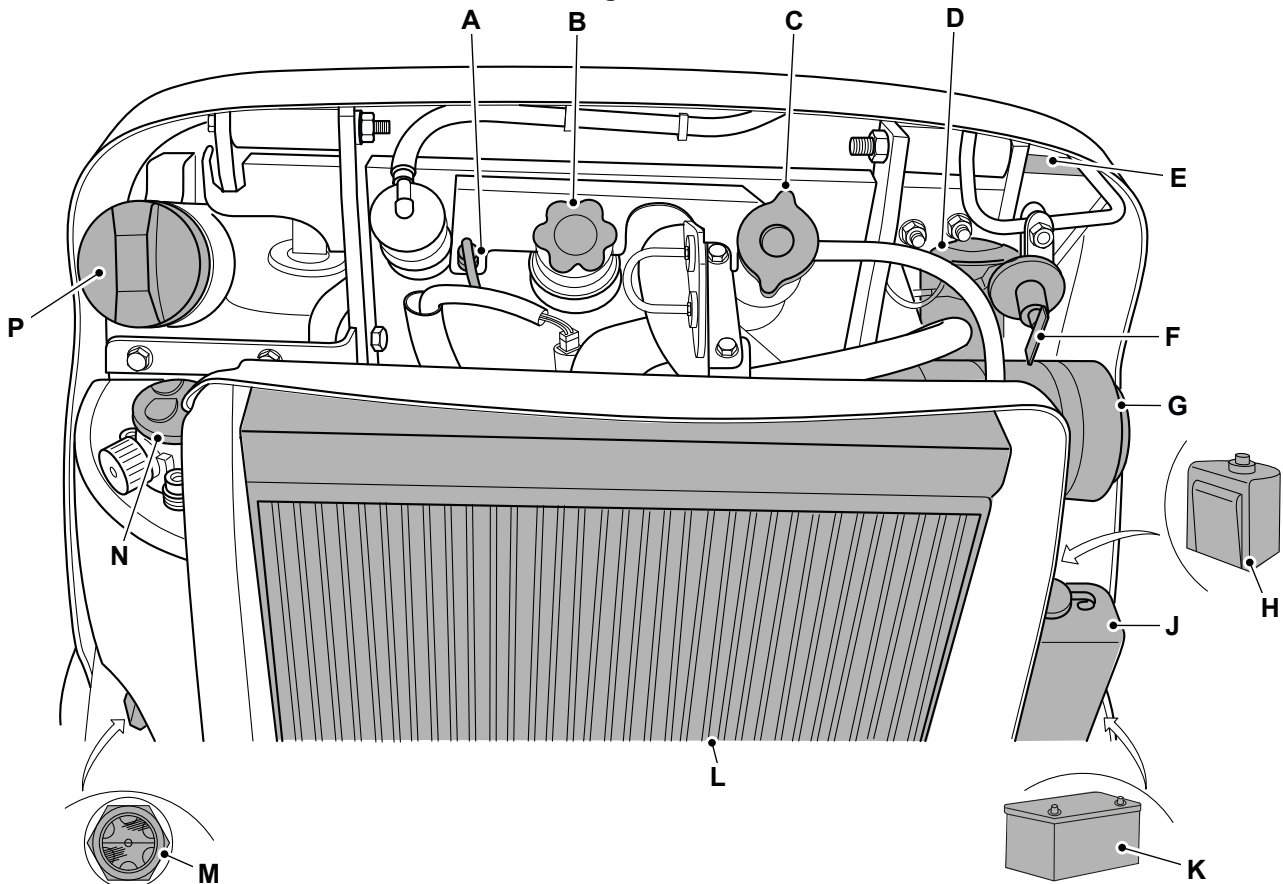
Service Points

General

The following illustrations identify the service points for the operator to perform the daily and weekly maintenance tasks.

Engine Compartment

Figure 97.



A Engine oil dipstick

C Radiator filler cap

E Fuses

G Air intake

J Windscreen washer bottle

L Radiator

N Hydraulic fluid filler cap

B Engine oil filler cap

D Fuel filter

F Battery isolator switch

H Radiator coolant expansion bottle

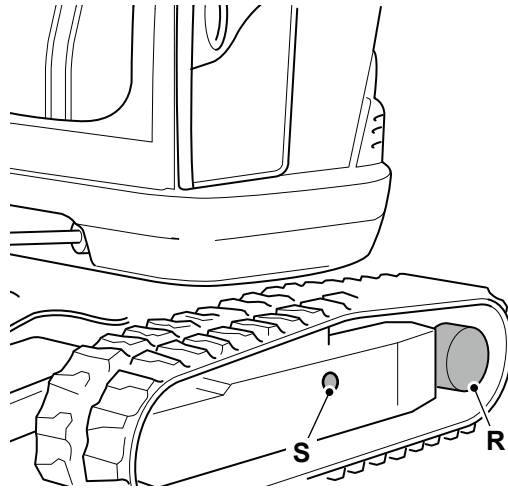
K Battery

M Hydraulic fluid level indicator

P Fuel tank filler cap

Cab and Exterior

Figure 98.



R Track gearbox

S Track tensioner

Access Apertures

General

When moved to their maintenance position, the access panels give you access to parts or areas of the machine that are not required during machine operation.

Before you operate the machine, make sure that all of the access panels are correctly in their closed or installed positions.

Engine Compartment Cover

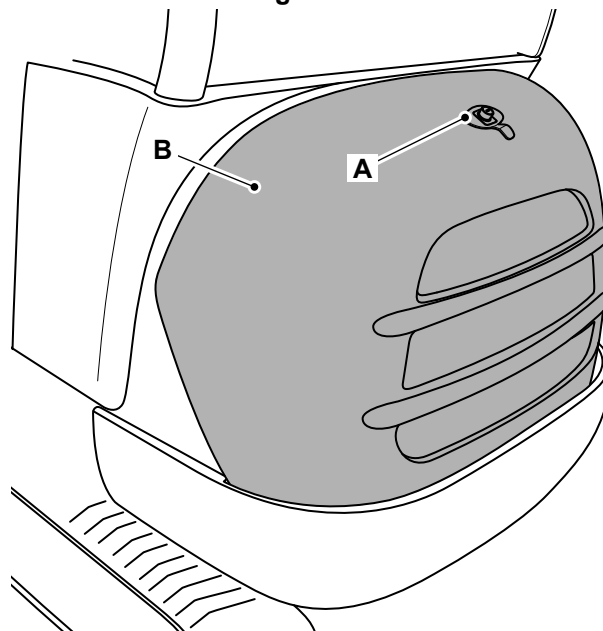
Open

▲ WARNING The engine has exposed rotating parts. Switch off the engine before working in the engine compartment. Do not use the machine with the engine cover open.

WARNING Airborne particles of light combustible material such as straw, grass, wood shavings, etc. must not be allowed to accumulate within the engine compartment or in the propshaft guards (when installed). Examine these areas frequently and clean at the beginning of each work shift or more often if required. Before opening the engine cover, make sure that the top is clear of debris.

1. Make the machine safe with the excavator lowered.
2. Use the ignition key in the combined button/lock to unlock the engine compartment cover.
3. Push the button and lower the engine compartment cover.

Figure 99.



A Button

B Engine compartment cover

Close

1. Lift the engine compartment cover and make sure it latches in the closed position.
2. Use the ignition key to lock the engine compartment cover.

Tools

General

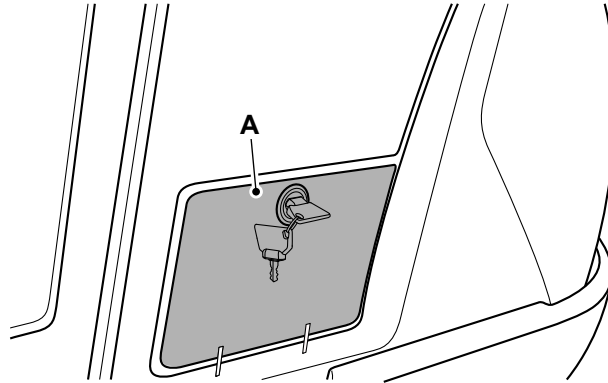
All tools must be kept in the toolbox (if installed) when not in use.

Toolbox

The machine has a lockable toolbox on the side of the cab.

Use the ignition key to open and close the toolbox.

Figure 100.



A Toolbox

Lubrication

General

▲ **CAUTION** Waxoyl contains turpentine substitute which is flammable. Keep flames away when applying Waxoyl. Waxoyl can take a few weeks to dry completely. Keep flames away during the drying period.

Do not weld near the affected area during the drying period. Take the same precautions as for oil to keep Waxoyl off your skin. Do not breathe the fumes. Apply in a well-ventilated area.

You must grease the machine regularly to keep it working efficiently. Regular greasing will also lengthen the machine's working life.

Refer to the individual condition checks throughout the Maintenance section.

The machine must always be greased after pressure washing or steam cleaning.

Greasing must be done with a grease gun. Normally, two strokes of the grease gun is sufficient. Stop greasing when fresh grease appears at the joint.

Use only the recommended type of grease. Do not mix different types of grease, keep them separate.

Attach the dust caps after greasing (if installed).

Preparation

Make the machine safe. [Refer to: Maintenance Position \(Excavator Arm Lowered\) \(Page 122\)](#).

You can complete the greasing procedures with the excavator lowered.

Attachments

General

Lubricate

Where applicable, refer to the specific manufacturers manual for instructions on the lubrication of optional attachments.

Check (Condition)

Where applicable, refer to the specific manufacturers manual for instructions on the maintenance of optional attachments.

Body and Framework

General

Clean

Keep all intakes and grilles clear from snow, ice and debris.

Debris can collect under the boom. Remove all debris from under the boom.

Thoroughly dry the piston rams and protect them with clean transmission or hydraulic oil if necessary.

Check (Condition)

1. Make sure that all of the guards and protective devices are in position, secured by their locking devices and free from damage.
2. Inspect all of the steelwork for damage. Include the following:
 - 2.1. Examine all of the lifting point welds.
 - 2.2. Examine all of the pivot point welds.
 - 2.3. Examine the condition of all the pivot pins.
 - 2.4. Check that the pivot pins are correctly in position and secured by their locking devices.
3. Check the steps and handrails are undamaged and correctly attached.
4. Check for broken, cracked or crazed window glass and mirrors. Replace the damaged items.
5. Check that the lamp lenses are undamaged.
6. Check that all of the attachment teeth are undamaged and correctly attached.
7. Check that all of the safety and instructional labels are undamaged and in position. Install new labels where necessary.
8. Note any damaged paintwork for future repair.
9. Inspect the machine for broken or loose fasteners.

Slew Ring Bearings

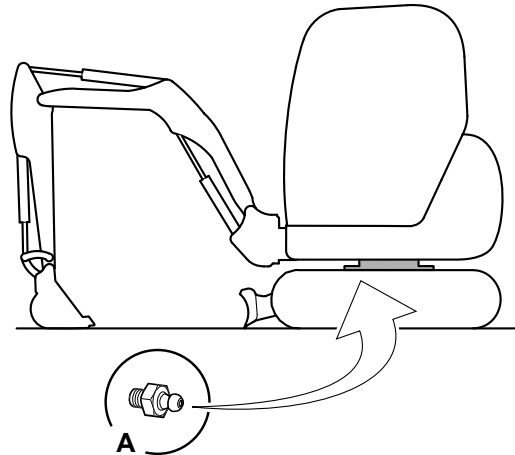
Lubricate

Make sure that the slew ring is kept full of grease.

With the cab in the straight ahead position as shown, the grease point is located near the front of the slew ring. Refer to Figure 101.

Notice: Do not overgrease the slew ring as this will result in the displacement of the grease seal.

Figure 101.



A Grease point

1. Make the machine safe with the excavator lowered.
[Refer to: Maintenance Position \(Excavator Arm Lowered\) \(Page 122\).](#)
2. Get safe access to the grease point.
3. To make sure that the grease is fully distributed:
 - 3.1. Grease in, use four strokes of the grease gun, then turn the upper structure.
Angle: 180°
 - 3.2. Grease in, use four strokes of the grease gun, then turn the upper structure.
Angle: 180°
 - 3.3. Grease in, use four strokes of the grease gun.

Pivot Pins

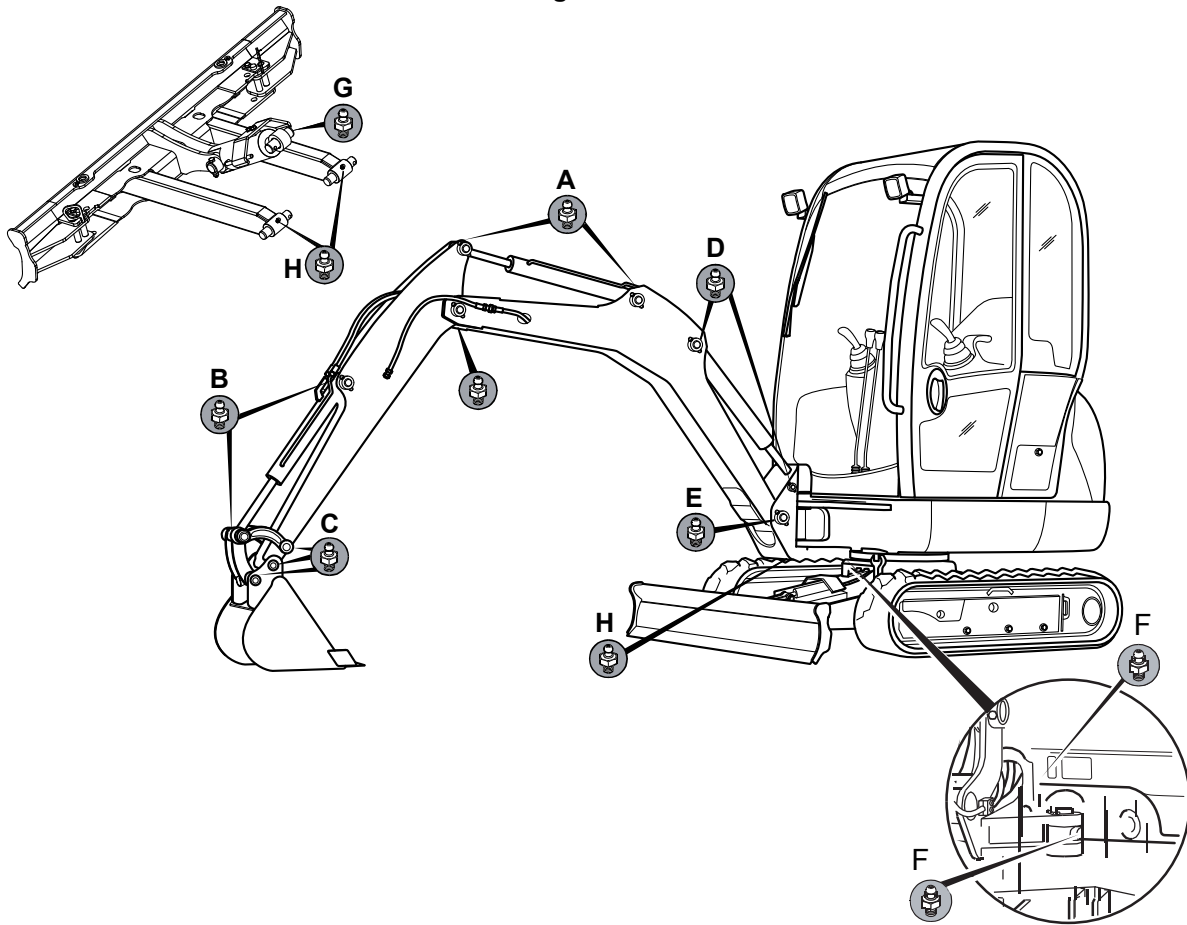
Lubricate

▲ WARNING You will be working close into the machine for these jobs. Lower the attachments. Remove ignition key and disconnect the battery. This will prevent the engine being started.

Make the machine safe with the excavator lowered. [Refer to: Maintenance Position \(Excavator Arm Lowered\) \(Page 122\).](#)

Grease the pivot pins according to the illustration. Refer to Figure 102.

Figure 102.



- A Dipper ram pivot pins
- C Bucket pivot pins
- E Kingpost ram pivot pins
- G Dozer ram pivot pins

- B Bucket ram pivot pins
- D Boom ram pivot pins
- F Swing ram pivot pins
- H Dozer arm pivot pins

Operator Station

General

Clean

▲ **Notice:** Never use water or steam to clean inside the operator station. The use of water or steam could damage the machine electrics and render the machine inoperable. Remove dirt using a brush or damp cloth.

Remove debris and loose articles from inside the cab.

Operator Protective Structure

Check (Condition)

▲ **WARNING** You could be killed or seriously injured if you operate a machine with a damaged or missing ROPS/FOPS/FOGS. If the ROPS/FOPS/FOGS has been in an accident, do not use the machine until the structure has been renewed. Modifications and repairs that are not approved by the manufacturer may be dangerous and will invalidate the ROPS/FOPS/FOGS certification.

A failure to adhere to these precautions can cause death or injury to the operator. For assistance, contact your JCB dealer.

1. Make the machine safe.
[Refer to: Maintenance Positions \(Page 122\).](#)
2. Check the structure for damage.
3. Make sure that all of the ROPS/FOPS mounting bolts are undamaged and in position.
4. Make sure that the ROPS/FOPS mounting bolts are tightened to the correct torque setting.
[Refer to: Torque Values \(Page 181\).](#)

Seat

Check (Condition)

1. Check that the seat adjustments operate correctly.
2. Check the seat is undamaged.
3. Check the seat mounting bolts are undamaged, correctly installed and tight.
4. Make sure the seat is clear from unwanted materials and hazards at all times.

Seat Belt

Check (Condition)

▲ **WARNING** When a seat belt is installed on your machine replace it with a new one if it is damaged, if the fabric is worn, or if the machine has been in an accident.

WARNING If the seat belt does not 'lock' when you check if the seat belt is operating correctly, do not drive the machine. Get the seat belt repaired or replaced immediately.

1. Make sure the seat belt can be adjusted.
2. Examine the seat belt for signs of fraying and stretching.
3. Check that the stitching is not loose or damaged.

4. Check that the belt mounting bolts are undamaged, correctly installed and tight.
5. Check that the buckle assembly is undamaged and operates correctly.

Controls

Check (Operation)

Check the operation of the non-hydraulic and non-electrical operator station controls.

Engine

General

Clean

Engine

Do not allow mud to build up on the engine and transmission. Pay particular attention to the exhaust area, remove all combustible material.

The engine or certain components could be damaged by high pressure washing systems, special precautions must be taken if the engine is to be washed using a high pressure system.

Do not attempt to clean any part of the engine while it is running. Stop the engine and allow it to cool for at least one hour.

1. Disconnect the battery.
2. Do not wash any part of the:
 - 2.1. Fuel injection pump and injectors.
 - 2.2. Cold start device.
 - 2.3. ESOS (Engine Shut-Off Solenoid) if applicable.
 - 2.4. Electrical connections.
 - 2.5. ECU (Electronic Control Unit) if applicable.
3. Ensure that the alternator, starter motor and any other electrical components are shielded and not directly cleaned by high pressure cleaning system.

Check (Condition)

Start the engine and check for:

- Excessive smoke
- Excessive vibration
- Excessive noise
- Overheating
- Performance
- Unusual smells.

Oil

Check (Leaks)

Before you start the machine, do a check for oil leaks:

1. Make the machine safe.
2. Get access to the engine compartment (if applicable)
3. Check the engine and the area below for oil leaks.
4. Close the engine cover (if applicable).
5. If necessary, contact your JCB dealer.

Check (Level)

▲ WARNING Never check the oil level or add oil with the engine running. Be careful of hot lubricating oil. Danger of scalding.

Notice: Do not exceed the correct level of engine oil in the sump. If there is too much engine oil, the excess must be drained to the correct level. An excess of engine oil could cause the engine speed to increase rapidly without control.

1. Make the product safe.
[Refer to: Maintenance Positions \(Page 122\).](#)
2. Wait for the oil to drain back into the engine sump before you take a reading. If not, a false low reading may be recorded which can cause the engine to be overfilled.
3. Get access to the engine compartment (if applicable).
[Refer to: Access Apertures \(Page 125\).](#)
4. Remove and clean the dipstick.
[Refer to: Service Points \(Page 123\).](#)
5. Replace the dipstick.
6. Remove the dipstick.
7. Check the oil level. The oil should be between the two marks on the dipstick.
8. If necessary, add more oil:
 - 8.1. Remove the filler cap.
[Refer to: Service Points \(Page 123\).](#)
 - 8.2. Add the recommended oil slowly through the filler point
[Refer to: Fluids, Lubricants and Capacities \(Page 173\).](#)
 - 8.3. Replace the dipstick.
 - 8.4. Remove the dipstick.
 - 8.5. Check the oil level, if necessary add more oil.
 - 8.6. Replace the dipstick
 - 8.7. Replace the filler cap.
9. Close and secure the engine cover (if applicable).

Replace

▲ Notice: Do not exceed the correct level of engine oil in the sump. If there is too much engine oil, the excess must be drained to the correct level. An excess of engine oil could cause the engine speed to increase rapidly without control.

WARNING Hot oil and engine components can burn you. Make sure the engine is cool before doing this job.

Used engine crankcase lubricants contain harmful contaminants. In laboratory tests it was shown that used engine oils can cause skin cancer.

CAUTION It is illegal to pollute drains, sewers or the ground. Clean up all spilt fluids and/or lubricants.

Used fluids and/or lubricants, filters and contaminated materials must be disposed of in accordance with local regulations. Use authorised waste disposal sites.

1. Make the machine safe.
2. Get access to the engine compartment.
3. Remove the oil filler cap.
4. Remove the engine oil drain plug. Drain the oil in to a suitable container.
5. Clean the drain plug. Install the drain plug. Tighten the drain plug to the correct torque value.

6. Remove the cap from the oil filter housing (if applicable).
7. Remove and discard the oil filter cartridge.
8. Fit a new filter with new gaskets.
9. Fit and tighten the cover on the oil filter housing (if applicable). Tighten the cover to the correct torque value.
10. Add the correct specification and quantity of oil.
11. Check the oil level.
12. Install the oil filler cap.
13. Close and secure the engine cover.
14. Operate the engine at idle speed until the oil pressure low warning light has extinguished and the new filter has primed before the engine speed is increased above idle speed.
15. Check for leaks.
16. Check the oil level when the oil has cooled.
 - 16.1. Fill with clean engine oil, if necessary.

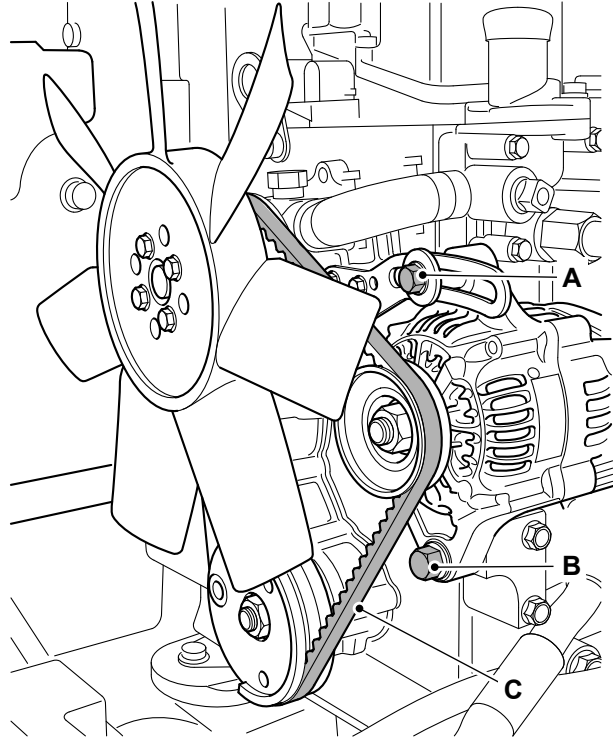
Drive Belt

Check (Condition)

▲ Notice: A drive belt that is loose can cause damage to itself and/or other engine parts.

1. Make the machine safe with the excavator lowered.
[Refer to: Maintenance Position \(Excavator Arm Lowered\) \(Page 122\).](#)
2. Open the engine cover.
[Refer to: Engine Compartment Cover \(Page 125\).](#)
3. Make sure the deflection at the mid point between the alternator and the crankshaft pulley is correct.
[Refer to: Torque Values \(Page 181\).](#)
4. If necessary, adjust the drive belt:
 - 4.1. Loosen the top and bottom mounting bolts.
 - 4.2. Move the alternator so that deflection at the mid point is correct.
 - 4.3. Tighten the top mounting bolt, then the bottom mounting bolt. Refer to Figure 103.

Figure 103.



A Top mounting bolt
C Mid point deflection

B Bottom mounting bolt

5. Close the engine cover.

Air Filter

General

Check (Condition)

1. Make the machine safe.
[Refer to: Maintenance Positions \(Page 122\).](#)
2. Get access to the air filter.
[Refer to: Service Points \(Page 123\).](#)
3. Check the system hoses for:
 - 3.1. Condition.
 - 3.2. Damage.
 - 3.3. Security.
4. Replace the system hoses if necessary.
5. Close the engine cover.

Dust Valve

Check (Condition)

- Check the dust valve for rips/tears.
- Check there are no obstructions.
- Check that the dust valve is free of dirt and dust.
- Check that the dust valve securely attached to the air filter housing.

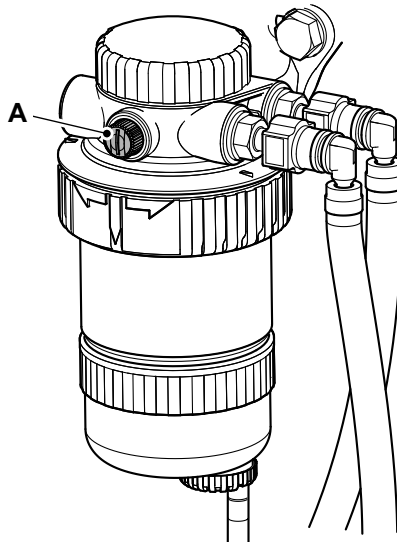
Fuel System

General

Bleed

1. Make the machine safe.
[Refer to: Maintenance Positions \(Page 122\).](#)
2. Open the engine cover.
[Refer to: Access Apertures \(Page 125\).](#)
3. Loosen the bleed screw. Refer to Figure 104.

Figure 104.



A Bleed screw

4. Turn the ignition key to the on position (this will start the electric fuel pump).
5. When all of the air has been released, tighten the bleed screw .
6. Close the engine cover.
7. Turn the ignition key to the off position.

Check (Leaks)

1. Make the machine safe.
2. Get access to the engine compartment (if applicable).
3. Check the engine compartment (if applicable), fuel lines and the area below for leaks.
4. If necessary, contact your JCB dealer.

Water Separator

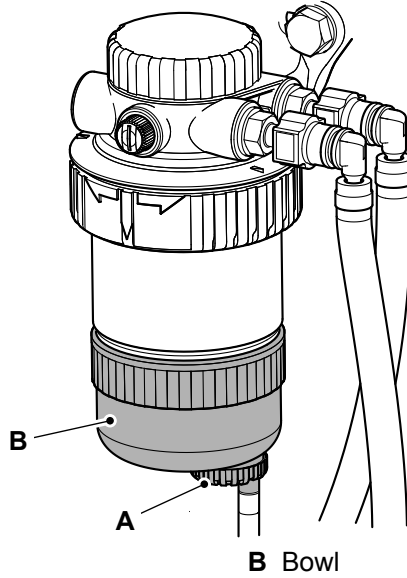
Clean

Draining the Water Separator

1. Make the machine safe.
[Refer to: Maintenance Positions \(Page 122\).](#)

2. Get access to the engine compartment
[Refer to: Access Apertures \(Page 125\).](#)
3. If there is water but no sediment, open the tap to drain the water. If there is any sediment in the bowl replace the fuel filter element.
4. Close the engine cover.

Figure 105.



A Tap

B Bowl

Cooling System

General

Check (Leaks)

Before you start the machine, inspect the system for leaks:

1. Make the machine safe.
[Refer to: Maintenance Positions \(Page 122\).](#)
2. Get access to the cooling pack.
[Refer to: Access Apertures \(Page 125\).](#)
3. Check the cooling system for leaks.
4. If necessary, contact your JCB dealer.

Coolant

Check (Condition)

[Refer to: Coolant \(Page 180\).](#)

Check (Level)

1. Make the machine safe.
[Refer to: Maintenance Positions \(Page 122\).](#)
2. Let the engine cool.
3. Get access to the radiator filler cap and expansion bottle.
[Refer to: Service Points \(Page 123\).](#)

CAUTION! The cooling system is pressurised when the coolant is hot. When you remove the cap, hot coolant can spray out and burn you. Make sure that the engine is cool before you work on the cooling system.

4. Check the level of coolant in the radiator and in the expansion bottle. If necessary, top-up the system:
 - 4.1. Carefully remove the filler cap.
 - 4.2. If necessary top-up the coolant to the neck of the expansion tube.
 - 4.3. If necessary top-up the coolant in the expansion bottle so that it is half full.
 - 4.4. Install the filler cap, make sure that it is tight.

Cooling Pack

Clean

1. Make the machine safe.
[Refer to: Maintenance Positions \(Page 122\).](#)
2. Let the engine cool.
3. Get access to the cooling pack.
[Refer to: Access Apertures \(Page 125\).](#)
4. If necessary, use a soft bristle brush or compressed air to remove all debris from the cooling pack.

Check (Condition)

1. Make the machine safe.
[Refer to: Maintenance Positions \(Page 122\).](#)
2. Let the engine cool.
3. Get access to the radiator.
[Refer to: Service Points \(Page 123\).](#)
4. Check the condition of the coolant hoses.
5. Check the radiator and intercooler surfaces for signs of damage.
6. If necessary, contact your JCB dealer for any service requirements.

Tracks

General

Clean

1. Make the machine safe.
[Refer to: Maintenance Position \(Excavator Arm Lowered\) \(Page 122\).](#)
2. Park the machine on solid, level ground.
3. Lower the bucket to the ground.
4. Clean the tracks with water.
5. Track forwards or backwards to clean the remainder of the tracks.
6. Make the machine safe.
7. Examine the track, roller sprockets and idler wheels for damage or oil leaks. Replace any damaged parts.
If in doubt consult your JCB distributor.

Steel

Check (Operation)

▲ **WARNING** Recoil unit servicing must only be carried out by JCB dealers. You could be killed or injured if you tamper with it.

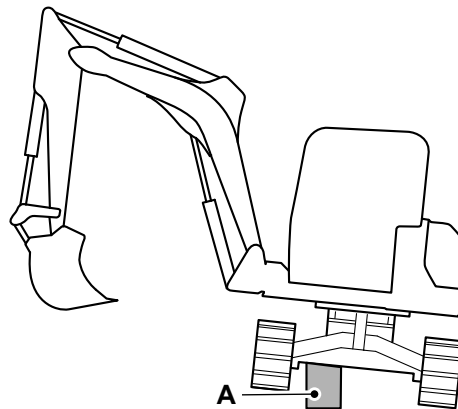
Notice: Always make sure that the track tension measurement is not less than specified or severe strain to the track will result.

Check the Tension

▲ **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.

1. Park the machine on solid, level ground.
2. Operate the tracks backwards and forwards several times.
3. Stop the machine after operating the tracks forwards.
4. Set the machine in the posture shown with the track to be checked raised from the ground and supported. Add a support under the machine.

Figure 106.

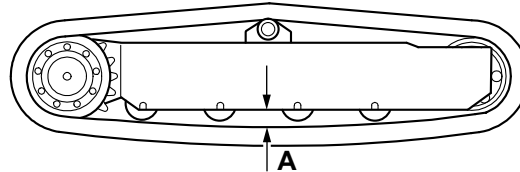


A Block

5. Check that the tension measurement is correct.

[Refer to: General \(Page 185\).](#)

Figure 107.



A Tension measurement

- 5.1. If the measurement is incorrect then you must adjust the track tension.

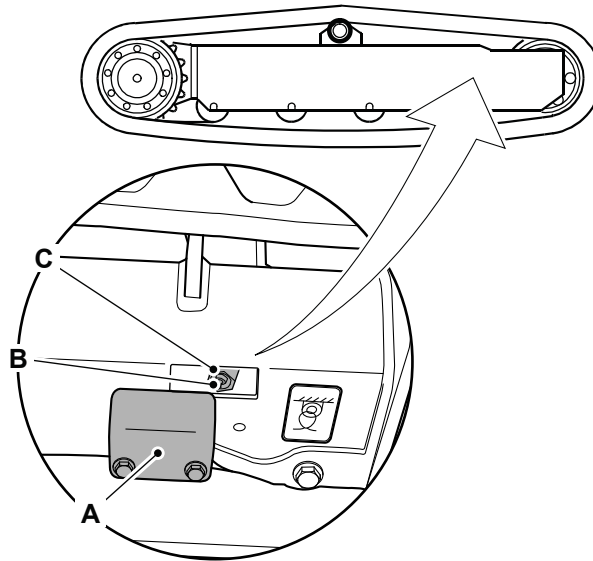
Tighten the Track

1. Remove the cover plate.
2. Add grease through the nipple in the adjusting screw until track tension is correct.
3. Rotate the track. Track tension will increase during rotation.
4. Check the track tension at its tightest point to avoid over tensioning.
5. Install the cover plate.

Loosen the Track

1. Remove the cover plate (if installed).
2. Loosen adjusting screw until track tension is correct.
3. Rotate the track. Track tension will increase during rotation.
4. Check the track tension at its tightest point to avoid over tensioning.
5. Install the cover plate.

Figure 108.



A Cover plate (if installed)
C Adjusting screw

B Nipple

Check (Condition)

Check the condition of the track plates.

Check the track plate bolt torques. [Refer to: Torque Values \(Page 181\)](#).

Rubber

Check (Operation)

[Refer to: Check \(Operation\) \(Page 143\)](#).

Check (Condition)

Check the condition of the rubber track. Check for splits.

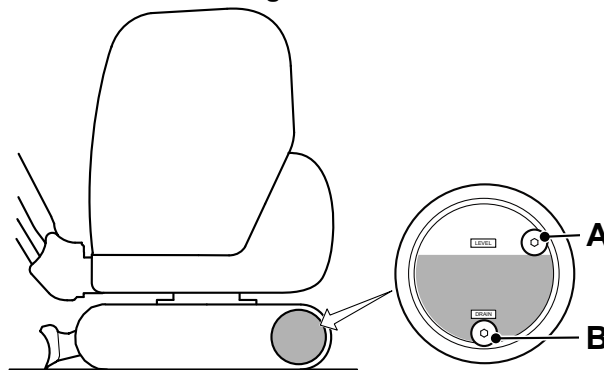
Track Gearbox

Oil

Check (Level)

1. Park the machine on solid, level ground.
2. Make the machine safe with the excavator lowered.
[Refer to: Maintenance Position \(Excavator Arm Lowered\) \(Page 122\).](#)
3. Clean the area around the fill/level plug.
4. Remove the fill/level plug.
5. Make sure that the oil inside the gearbox is level with the fill/level plug.
6. Top up the oil if necessary.
[Refer to: Fluids, Lubricants and Capacities \(Page 173\).](#)
7. Clean the fill/level plug.
8. Install the fill/level plug, make sure it is tight.

Figure 109.



A Fill/Level plug

Hydraulic System

General

Discharge

▲ 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.

1. Make the machine safe.
2. Operate the controls to remove the hydraulic pressure from the service hose lines
 - 2.1. For manually operated services, operate the controls (several times) of the service(s) to be disconnected.
 - 2.2. For electrical services, turn the ignition key to position 1. Operate the controls (several times) of the service(s) to be disconnected. Press the relevant console switch (to make the relevant service active).
3. Turn the ignition key to position 0.
4. Remove the ignition key.
5. Carefully remove the hydraulic tank filler cap to vent residual tank hydraulic pressure.
6. Install the hydraulic tank filler cap.

Check (Condition)

Hydraulic Hoses

▲ WARNING Damaged hoses can cause fatal accidents. Examine the hoses regularly. Do not use the machine if a hose or hose fixture is damaged.

Examine the hoses for:

- Damaged hose ends
- Worn outer covers
- Ballooned outer covers
- Kinked or crushed hoses
- Embedded armouring in the outer covers
- Displaced hose end fittings.

Replace a damaged hose before you use the machine again.

The replacement hoses must be of the same size and standard. If necessary, for more information contact your JCB dealer.

Accumulator

1. Stop the machine on solid, level ground.
2. Raise the boom and extend the dipper.
[Refer to: Operating Levers/Pedals \(Page 58\).](#)
3. Stop the engine. Do not raise the controls isolation lever.
[Refer to: Safety Equipment \(Page 49\).](#)
4. Lower the boom. Stop the boom several metres from the ground.
5. Lower the boom to the ground.

There must be sufficient pressure stored in the accumulator to lower the boom to the ground in two stages. If this is not possible, contact your JCB dealer.

Check (Leaks)

▲ **Notice:** If the fluid is cloudy, then water or air has contaminated the system. This could damage the hydraulic pump. Contact your JCB dealer immediately.

1. Make the machine safe.
2. Open the access covers.
3. Check the hydraulic hoses for damage.
4. Close the access covers.
5. If necessary, contact your JCB dealer.

Services

Check (Operation)

Check the operation of all the hydraulic services. Check for:

- Speed of operation
- Strength of operation
- Juddering
- Abnormal noises.

Do not use the machine if one or more of these faults are found. You must make sure that the hydraulic service is repaired immediately.

Oil

Check (Level)

1. Make the machine safe with the boom lowered.
[Refer to: Maintenance Position \(Excavator Arm Lowered\) \(Page 122\).](#)
2. Get access to the hydraulic oil level indicator and hydraulic oil filler cap.
[Refer to: Service Points \(Page 123\).](#)
3. Check the hydraulic oil level indicator. The hydraulic oil level must be visible in the level indicator.
4. Top up oil level if necessary:
 - 4.1. Remove the hydraulic oil filler cap.
 - 4.2. Add hydraulic oil.
[Refer to: Fluids, Lubricants and Capacities \(Page 173\).](#)
 - 4.3. Install the filler cap.

Cylinder Rams

Check (Condition)

Extend each ram fully, one at a time and visually examine for score marks, dents, leaks or similar defects. Make the machine safe before inspecting each ram.



If a ram piston appears defective, contact your service engineer or JCB dealer.

Electrical System

General

Check (Operation)

Make sure all of the electrical equipment operates correctly, for example:

- Switches
- Warning lights
- Beacon
- Alarms
- Horn
- Wipers
- Hourmeter/display
- Battery
- Lights

All defective equipment must be repaired before the machine is used.

Check (Condition)

▲ DANGER Batteries give off an explosive gas. Do not smoke when handling or working on the battery. Keep the battery away from sparks and flames.

Battery electrolyte contains sulphuric acid. It can burn you if it touches your skin or eyes. Wear goggles. Handle the battery carefully to prevent spillage. Keep metallic items (watches, rings, zips etc) away from the battery terminals. Such items could short the terminals and burn you.

Set all switches to off before disconnecting and connecting the battery. When disconnecting the battery, take off the earth (-) lead first.

Re-charge the battery away from the machine, in a well ventilated area. Switch the charging circuit off before connecting or disconnecting the battery. When you have installed the battery in the machine, wait 5min before connecting it up.

When reconnecting, attach the positive (+) lead first.

DANGER Batteries give off explosive gases. Keep flames and sparks away from the battery. Do not smoke close to the battery. Make sure there is good ventilation in closed areas where batteries are being used or charged. Do not check the battery charge by shorting the terminals with metal. Use a hydrometer or voltmeter.

WARNING Battery electrolyte is toxic and corrosive. Do not breathe the gases given off by the battery. Keep the electrolyte away from your clothes, skin, mouth and eyes. Wear safety glasses.

CAUTION Understand the electrical circuit before connecting or disconnecting an electrical component. A wrong connection can cause injury and/or damage.

Examine the electrical circuits regularly for:

- Damaged connectors
- Loose connections
- Chafing on the wiring harnesses
- Corrosion
- Missing insulation
- Incorrect routing of the wiring harnesses.

Do not use the machine if one or more of these faults are found. You must make sure that the electrical circuit is repaired immediately.

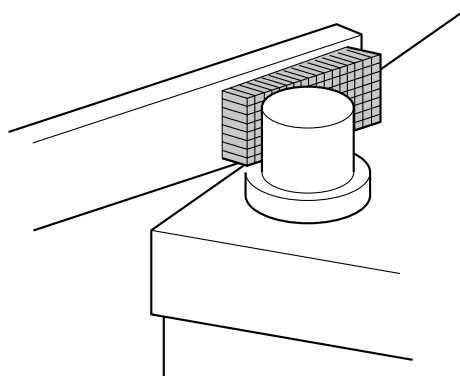
Battery

Clean

▲ **WARNING** Keep metal watch straps and any metal fasteners on your clothes, clear of the positive (+) battery terminal. Such items can short between the terminal and nearby metal work. If it happens you can get burned.

1. Make the machine safe.
[Refer to: Maintenance Positions \(Page 122\).](#)
2. Get access to the battery.
[Refer to: Access Apertures \(Page 125\).](#)
3. If the terminal posts are corroded and covered with white powder wash them with hot water. If there is considerable corrosion, clean the terminal posts with a wire brush or abrasive paper. Refer to Figure 110.

Figure 110.



4. Apply a thin layer of petroleum jelly to the terminal posts.

Connect

▲ **CAUTION** The machine is negatively earthed. Always connect the negative pole of the battery to earth.
When connecting the battery, connect the earth (-) lead last.
When disconnecting the battery, disconnect the earth (-) lead first.

1. Get access to the batteries.
[Refer to: Disconnect \(Page 151\).](#)
2. Connect the battery leads. Connect the earth (-) terminal last.
3. If the machine has a battery isolator, move the switch to the on position.
[Refer to: Battery Isolator \(Page 34\).](#)

Disconnect

▲ **CAUTION** The machine is negatively earthed. Always connect the negative pole of the battery to earth.
When connecting the battery, connect the earth (-) lead last.
When disconnecting the battery, disconnect the earth (-) lead first.

Notice: Do not disconnect the battery while the engine is running, otherwise the electrical circuits may be damaged.

1. Make the machine safe.

[Refer to: Maintenance Positions \(Page 122\).](#)

2. Get access to the batteries.

[Refer to: Access Apertures \(Page 125\).](#)

3. If the machine has a battery isolator, move the switch to the off position then remove the key.

[Refer to: Battery Isolator \(Page 34\).](#)

4. Disconnect the battery leads. Disconnect the earth (-) terminal first.

Battery Isolator

Check (Operation)

▲ Notice: Do not isolate the machine electrics when the engine is running, this may cause damage to the machine electrics.

1. Isolate the machine electrics.
2. Make sure that the machine electrics are isolated.

A defective isolator must be repaired before the machine is used. For more information, contact your JCB dealer.

Fuses

Replace

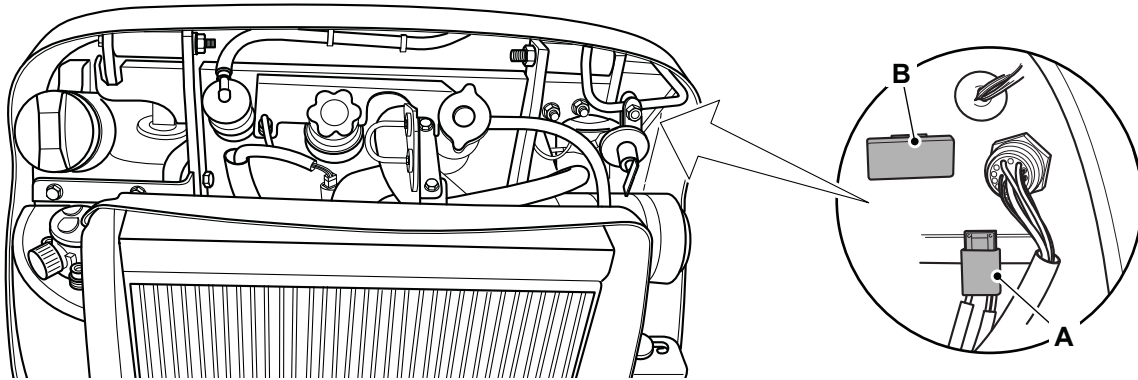
The electrical circuits are protected by fuses. If a fuse blows, find out why before a new one is installed.

Notice: Always replace fuses with ones of correct ampere rating to avoid electrical system damage.

[Refer to: Fuses \(Page 182\).](#)

1. Make the machine safe.
[Refer to: Maintenance Position \(Excavator Arm Lowered\) \(Page 122\).](#)
2. The primary and secondary fuses are located in the engine compartment underneath the right side engine compartment cover hinge.
 - 2.1. Open the engine compartment cover.
 - 2.2. Remove the cover to get access to the secondary fuses.
 - 2.3. Install the cover.
 - 2.4. Close the engine compartment cover

Figure 111.



A Primary fuse

B Cover/Secondary fuses

Window Washer

Check (Level)

1. Make the machine safe.
[Refer to: Maintenance Positions \(Page 122\).](#)
2. Get access to the front window washer bottle.
[Refer to: General \(Page 123\).](#)
3. Remove the filler cap.
4. Fill the washer bottle with clean water. The liquid should contain a de-icing fluid to prevent it freezing.
[Refer to: Fluids, Lubricants and Capacities \(Page 173\).](#)
5. Replace the filler cap.

Do not use engine coolant antifreeze.

Do not use the window washer when there is no liquid in the washer bottle as it will cause damage to the motor.

Miscellaneous

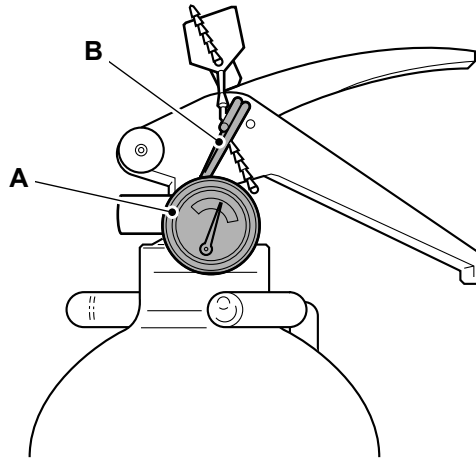
Fire Extinguisher

Check (Condition)

In addition to the operator check the extinguisher must be serviced every 12 months by a suitably qualified person.

1. Examine the fire extinguisher for damage and leaks.
2. Make sure the fire extinguisher is correctly attached.
3. Make sure that the gauge indicates that the extinguisher is charged i.e. the needle is in the green segment
 - 3.1. If the needle is in or very near the red segment at either end of the gauge, the extinguisher must be serviced or replaced.
4. Make sure the safety pin is correctly installed.

Figure 112.



A Gauge

B Safety Pin

Technical Data Static Dimensions

Dimensions

For: 8014 CTS	Page 155
For: 8016 CTS	Page 156
For: 8018 CTS	Page 157
For: 8020 CTS	Page 158

(For: 8014 CTS)

Figure 113.

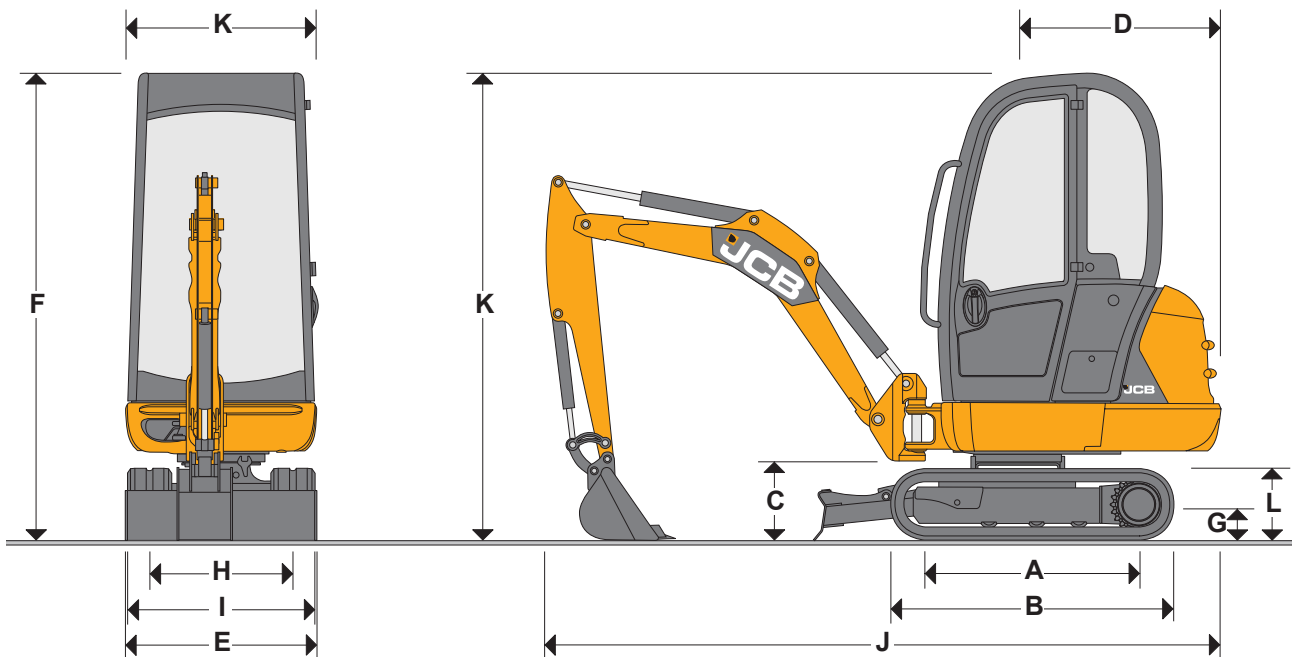


Table 10. Machine Dimensions

Dimension	Description	8014 CTS
		mm
A	Sprocket idler centres	1,027
B	Undercarriage (overall length)	1,382
C	Kingpost clearance	373
D	Tailswing radius	1,059
E	Overall width	996
F	Height over the cab	(without fogs) 2,318 (with fogs) 2,340
G	Ground clearance	146
H	Track gauge	742
I	Width over the tracks - retracted	972
F	Width over the tracks - extended	N/A
J	Transport length - standard dipper	3,409
J	Transport length - long dipper	N/A
J	Transport length - gravemaster dipper	N/A

(For: 8016 CTS)

Figure 114.

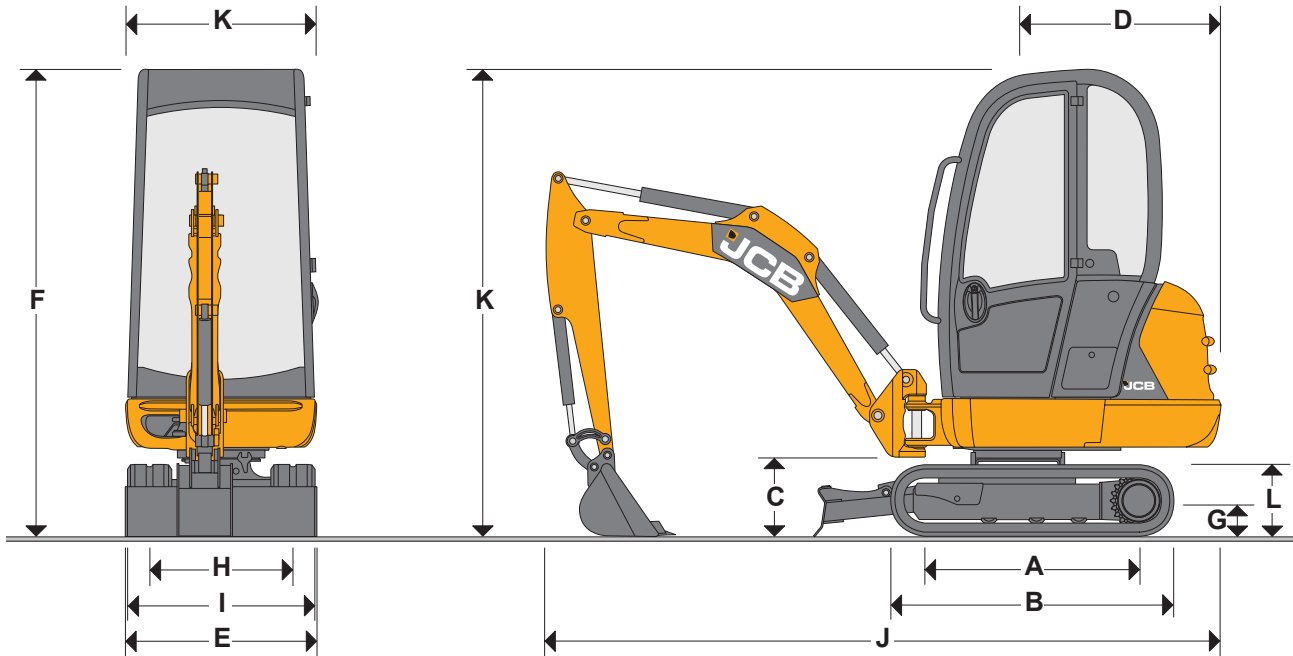


Table 11. Machine Dimensions

Dimension	Description	8016 CTS
		mm
A	Sprocket idler centres	1,127
B	Undercarriage (overall length)	1,484
C	Kingpost clearance	394
D	Tailswing radius	1,080
E	Overall width	996
F	Height over the cab	2,318
G	Ground clearance	158
H	Track gauge	750 to 1,110
I	Width over the tracks - retracted	980
F	Width over the tracks - extended	1,340
J	Transport length - standard dipper	3,523
J	Transport length - long dipper	3,467
J	Transport length - gravemaster dipper	3,265

(For: 8018 CTS)

Figure 115.

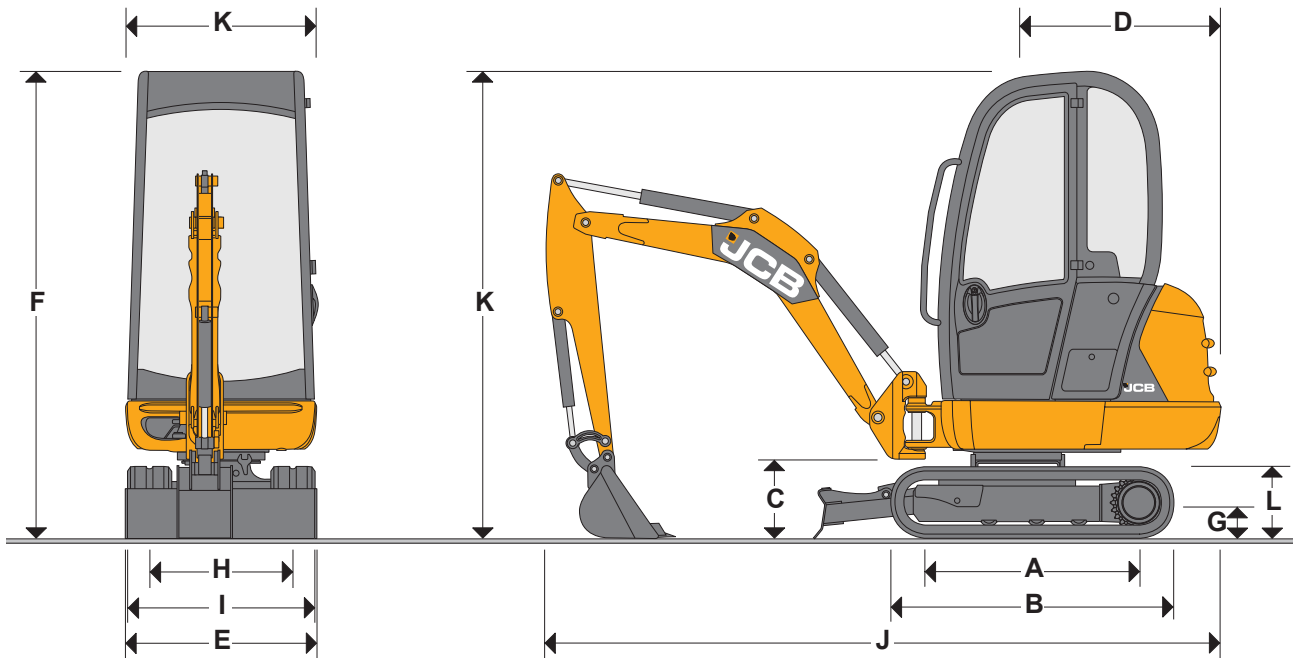


Table 12. Machine Dimensions

Dimension	Description	8018 CTS
		mm
A	Sprocket idler centres	1,127
B	Undercarriage (overall length)	1,484
C	Kingpost clearance	394
D	Tailswing radius	1,080
E	Overall width	996
F	Height over the cab	2,318
G	Ground clearance	158
H	Track gauge	750 to 1,110
I	Width over the tracks - retracted	980
F	Width over the tracks - extended	1,340
J	Transport length - standard dipper	3,523
J	Transport length - long dipper	3,467
J	Transport length - gravemaster dipper	3,265

(For: 8020 CTS)

Figure 116.

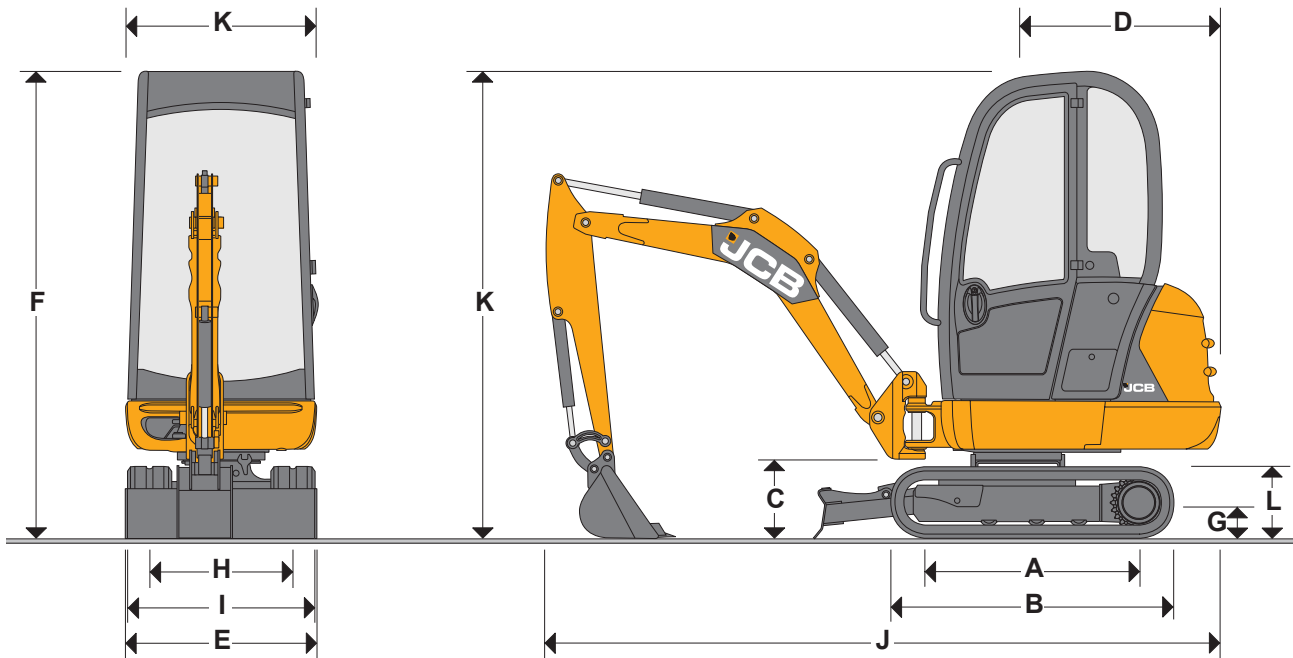


Table 13. Machine Dimensions

Dimension	Description	8020 CTS
		mm
A	Sprocket idler centres	1,362
B	Undercarriage (overall length)	1,724
C	Kingpost clearance	435
D	Tailswing radius	1,058
E	Overall width	996
F	Height over the cab	2,318
G	Ground clearance	148
H	Track gauge	752 to 1,112
I	Width over the tracks - retracted	1,002
F	Width over the tracks - extended	1,362
J	Transport length - standard dipper	NA
J	Transport length - long dipper	3,599
J	Transport length - gravemaster dipper	NA

Weights

For: 8014 CTS	Page 158
For: 8016 CTS	Page 159
For: 8018 CTS	Page 159
For: 8020 CTS	Page 159

(For: 8014 CTS)

Approximate figures with a 75kg operator, a standard dipper, a 300mm bucket and a full fuel tank.

Table 14. Machine Weights

Machine model	8014
	kg
Machine with cab and steel tracks	NA
Machine with cab and rubber tracks	1,634
Machine with canopy and steel tracks	NA
Machine with canopy and rubber tracks	1,554

(For: 8016 CTS)

Approximate figures with a 75kg operator, a standard dipper, a 300mm bucket and a full fuel tank.

Table 15. Machine Weights

Machine model	8016
	kg
Machine with cab and steel tracks	1,727
Machine with cab and rubber tracks	1,657
Machine with canopy and steel tracks	1,647
Machine with canopy and rubber tracks	1,577

(For: 8018 CTS)

Approximate figures with a 75kg operator, a standard dipper, a 300mm bucket and a full fuel tank.

Table 16. Machine Weights

Machine model	8018 CTS
	kg
Machine with cab and steel tracks	1,892
Machine with cab and rubber tracks	1,822
Machine with canopy and steel tracks	1,812
Machine with canopy and rubber tracks	1,742

(For: 8020 CTS)

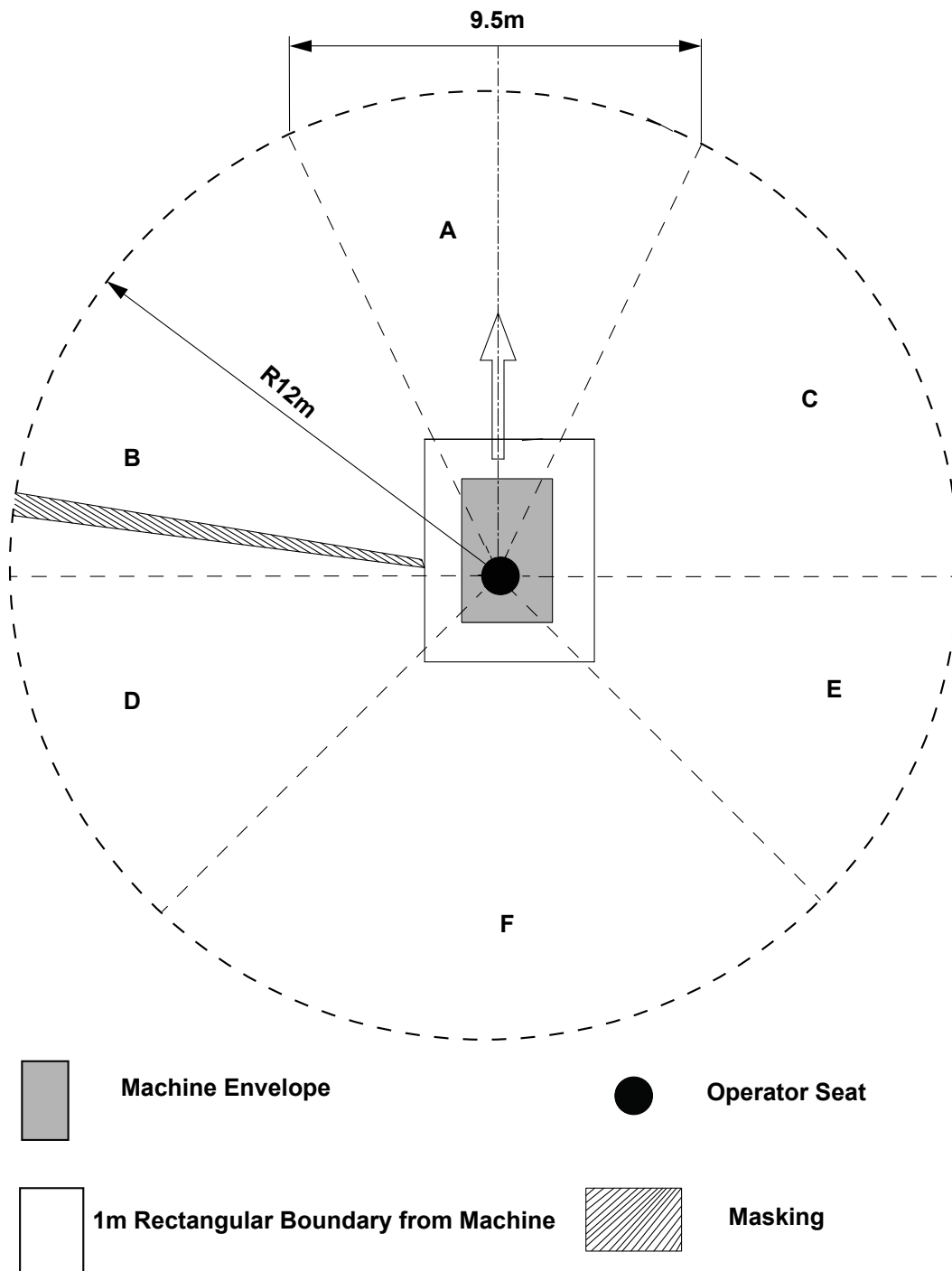
Approximate figures with a 75kg operator, a standard dipper, a 300mm bucket and a full fuel tank.

Table 17. Machine Weights

Machine model	8020 CTS
	kg
Machine with cab and steel tracks	2,153
Machine with cab and rubber tracks	2,067
Machine with canopy and steel tracks	2,073
Machine with canopy and rubber tracks	1,987

Visibility Diagrams

Figure 117. Visibility Map- 8020 CTS



The visibility map provided in this manual is for guidance, and may be used to improve visibility or as part of a risk assessment for work site safe operation, introduction of additional visual aids or site management. [Refer to: Risk Assessment \(Page 23\)](#).

The visibility map shown within this manual is to scale with the machine in travel position.

The visibility map shows the approximate blind spots of direct vision from a test object 1.2m high and 0.3m wide. The operator's eye position is 0.68m above and 0.02m in front of the Seat Index Point and an eye

width of 0.045m as per ISO (International Organization for Standardization) 5006:2006. This represents the approximately visible area to operator from the seat wearing a seat belt.

The visibility map does not represent the visibility requirements as specified in EN 474 part 1:2006 i.e ISO 5006:2006.

The machine is compliant with the visibility requirements as specified in EN 474 part 1:2006 i.e ISO 5006:2006.

Performance Dimensions

Excavator Arm Dimensions and Performance

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For: 8016 CTS	Page 164
For: 8018 CTS	Page 166
For: 8020 CTS	Page 168

(For: 8014 CTS)

Digging

Figure 118.

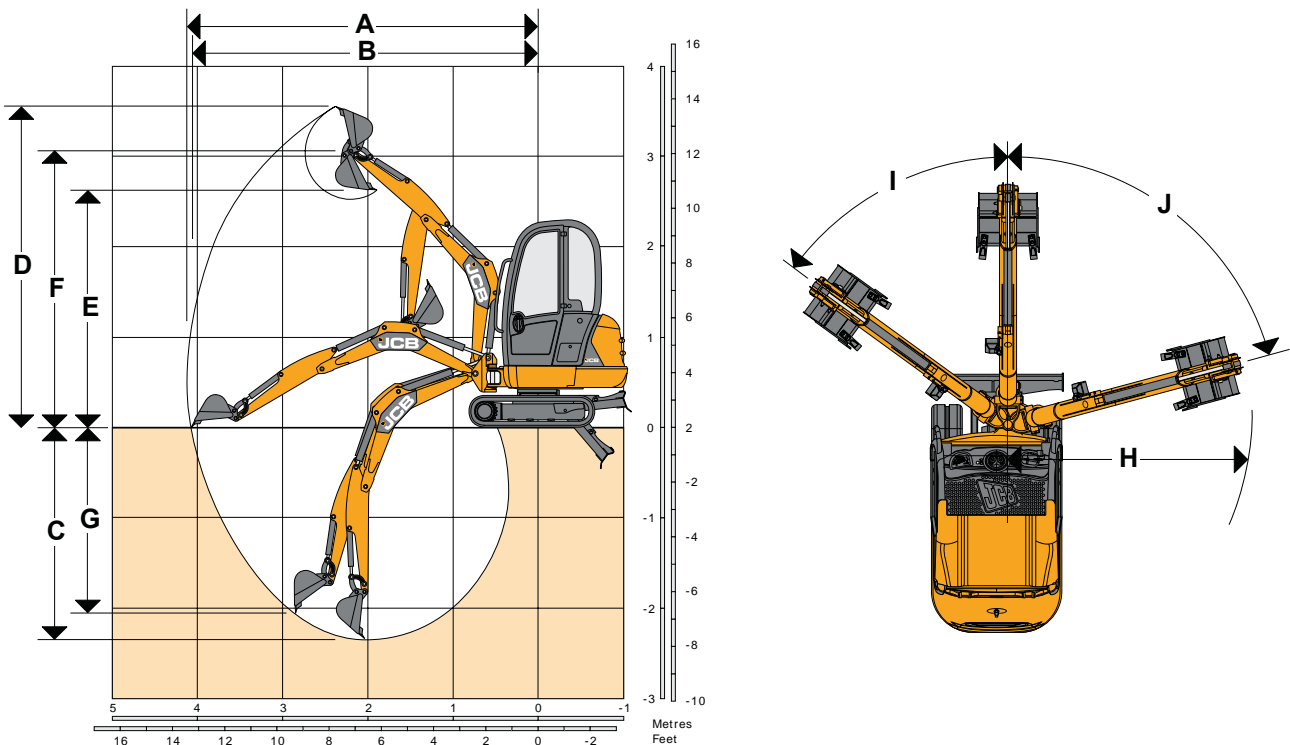


Table 18. Machine Dimensions

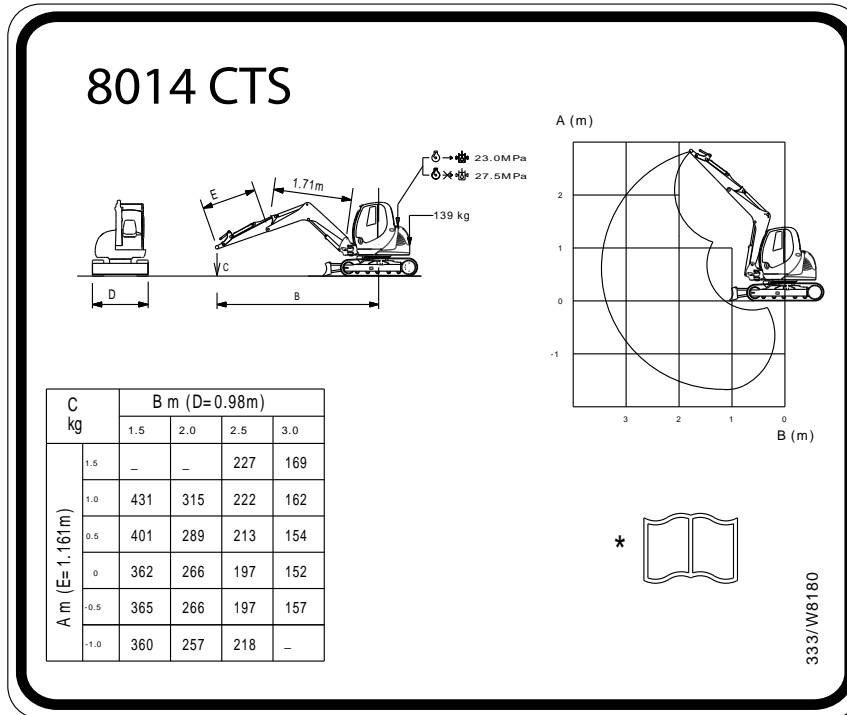
Dimension	Description	8014 CTS Length mm
Boom length		1,715
Dipper length		1,161
A	Max. digging reach	4,021
B	Max. dumping reach on ground	3,973
C	Max. digging depth - dozer up	2,271
C	Max. digging depth - dozer down ⁽¹⁾	2,271
D	Max. digging height	3,453
E	Max. dump height	2,531
F	Max. height to the dipper nose - pivot pin	2,953
G	Max. vertical wall cut depth	1,961
H	Minimum front swing radius - no offset	1,570
H	Minimum front swing radius - fully offset	1,356

(1) Max. dig depth when dozer blade fully lowered.

Lifting

1.16 Metre Dipper

Figure 119.



(For: 8016 CTS)

Digging

Figure 120.

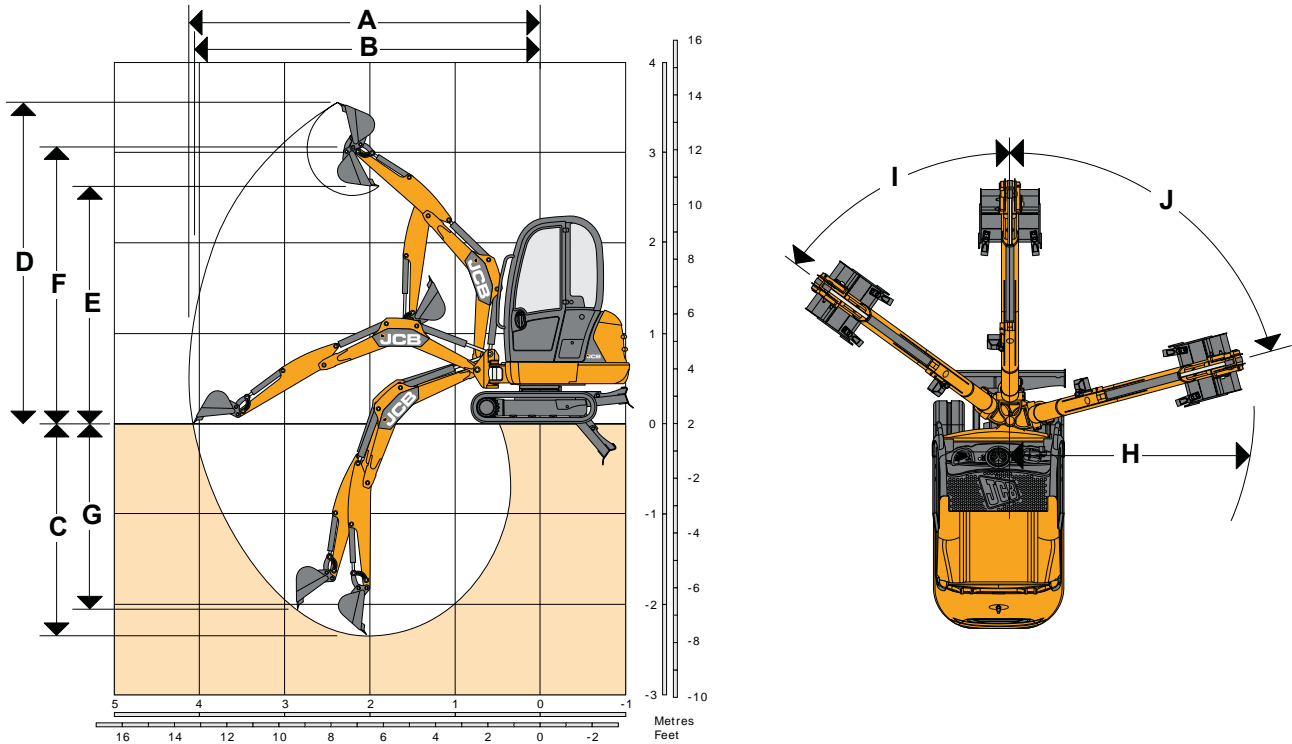


Table 19. Machine Dimensions

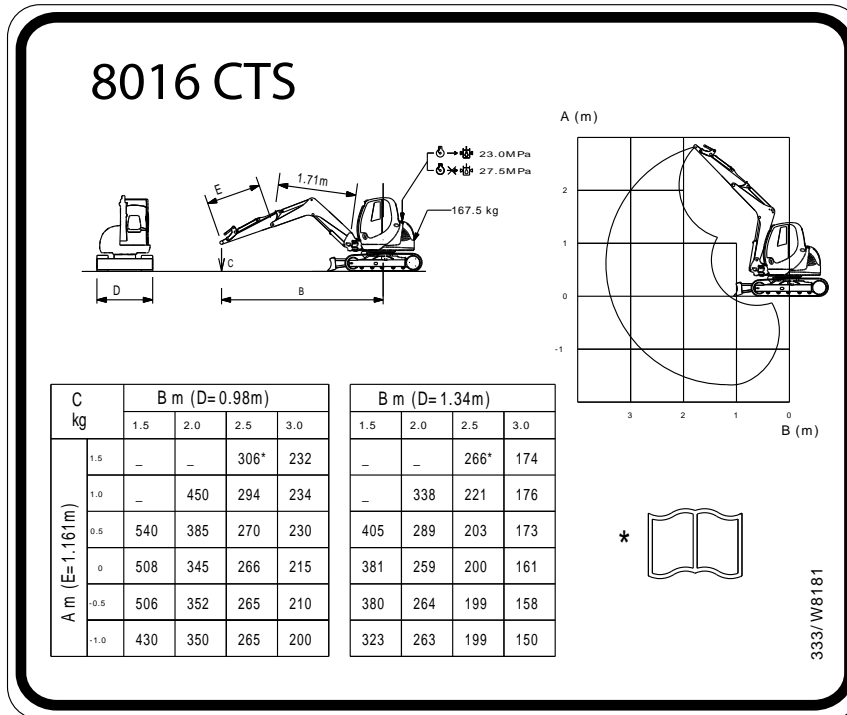
Dimension	Description	8016	
		mm	mm
Boom length		1,715	1,715
Dipper length		1,161	1,261
A	Max. digging reach	4,021	X (-)
B	Max. dumping reach on ground	3,973	4,060
C	Max. digging depth - dozer up	2,271	2,366
C	Max. digging depth - dozer down ⁽¹⁾	X (-)	X (-)
D	Max. digging height	3,453	3,531
E	Max. dump height	2,531	2,626
F	Max. height to the dipper nose - pivot pin	2,953	3,017
G	Max. vertical wall cut depth	1,961	2,056
H	Minimum front swing radius - no offset	1,570	1,570
H	Minimum front swing radius - fully offset	1,356	1,356

(1) Max. dig depth when dozer blade fully lowered.

Lifting

1.16 Metre Dipper

Figure 121.



(For: 8018 CTS)

Digging

Figure 122.

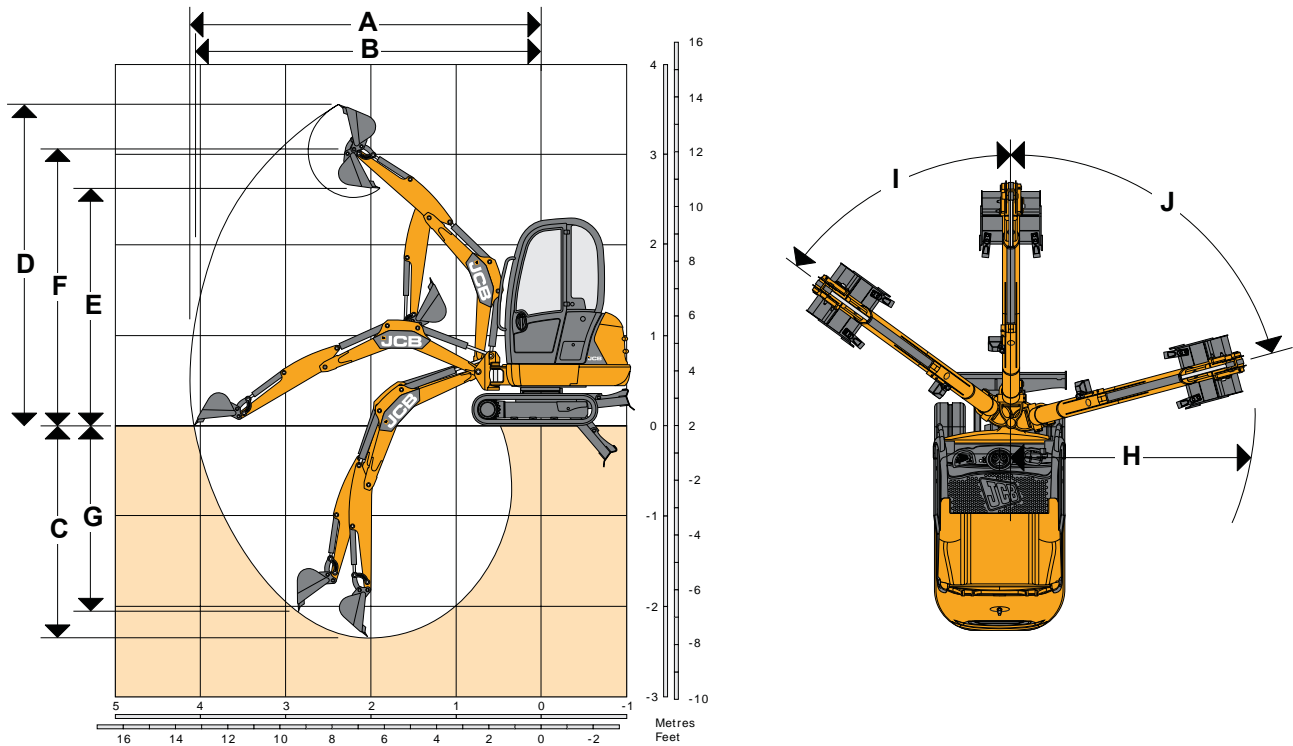


Table 20. Machine Dimensions

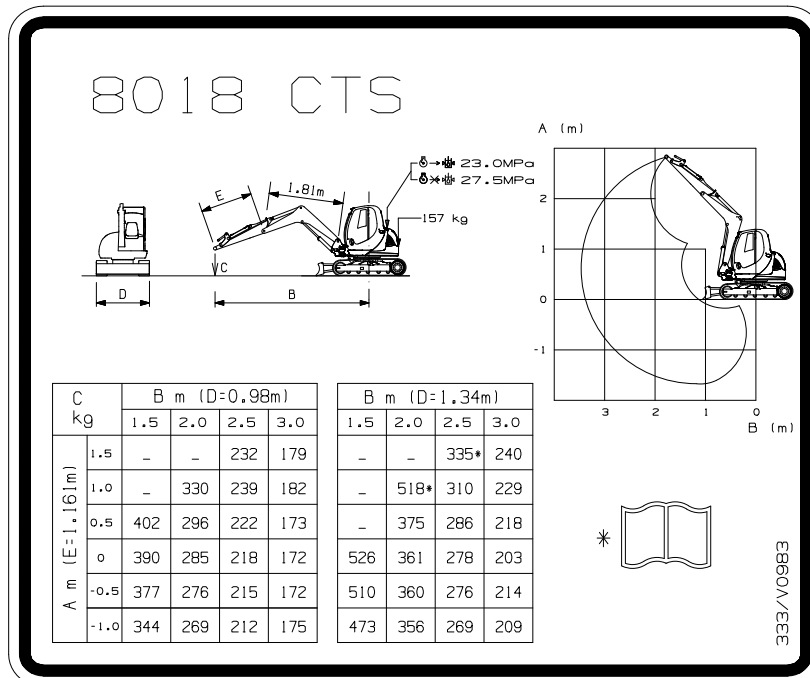
Dimension	Description	8018 CTS		
		mm	mm	mm
Boom length		1,807	1,807	1,807
Dipper length		1,161	1,261	1,500
A	Max. digging reach	4,121	4,222	4,449
B	Max. dumping reach on ground	4,073	4,170	4,401
C	Max. digging depth - dozer up	2,343	2,442	2,682
C	Max. digging depth - dozer down ⁽¹⁾	2,736	2,836	3,075
D	Max. digging height	3,555	3,620	3,774
E	Max. dump height	2,628	2,692	2,846
F	Max. height to the dipper nose - pivot pin	3,054	3,118	3,272
G	Max. vertical wall cut depth	2,053	2,148	2,376
H	Minimum front swing radius - no offset	1,638	1,654	1,693
H	Minimum front swing radius - fully offset	1,427	1,442	1,477

(1) Max. dig depth when dozer blade fully lowered.

Lifting

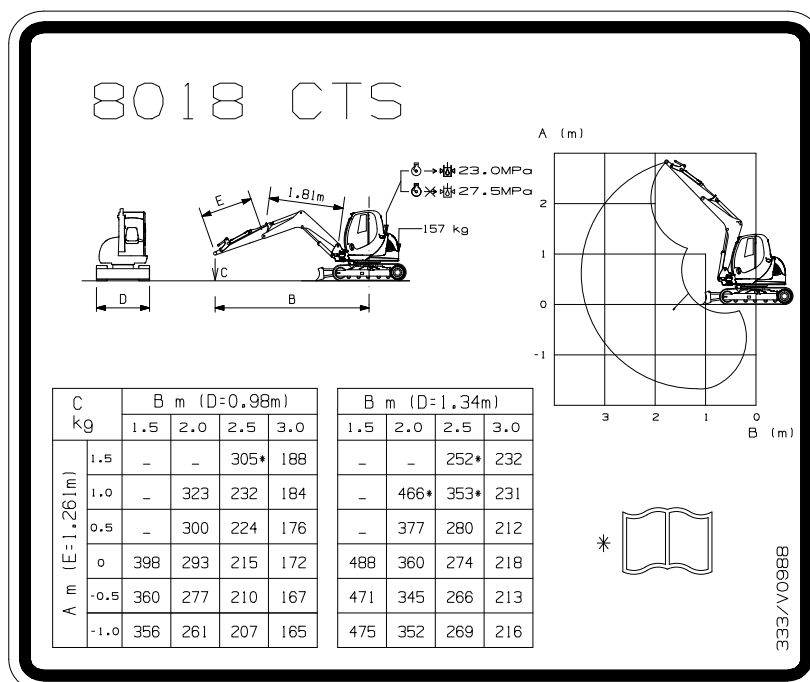
1.16 Metre Dipper

Figure 123.



1.26 Metre Dipper

Figure 124.



(For: 8020 CTS)

Digging

Figure 125.

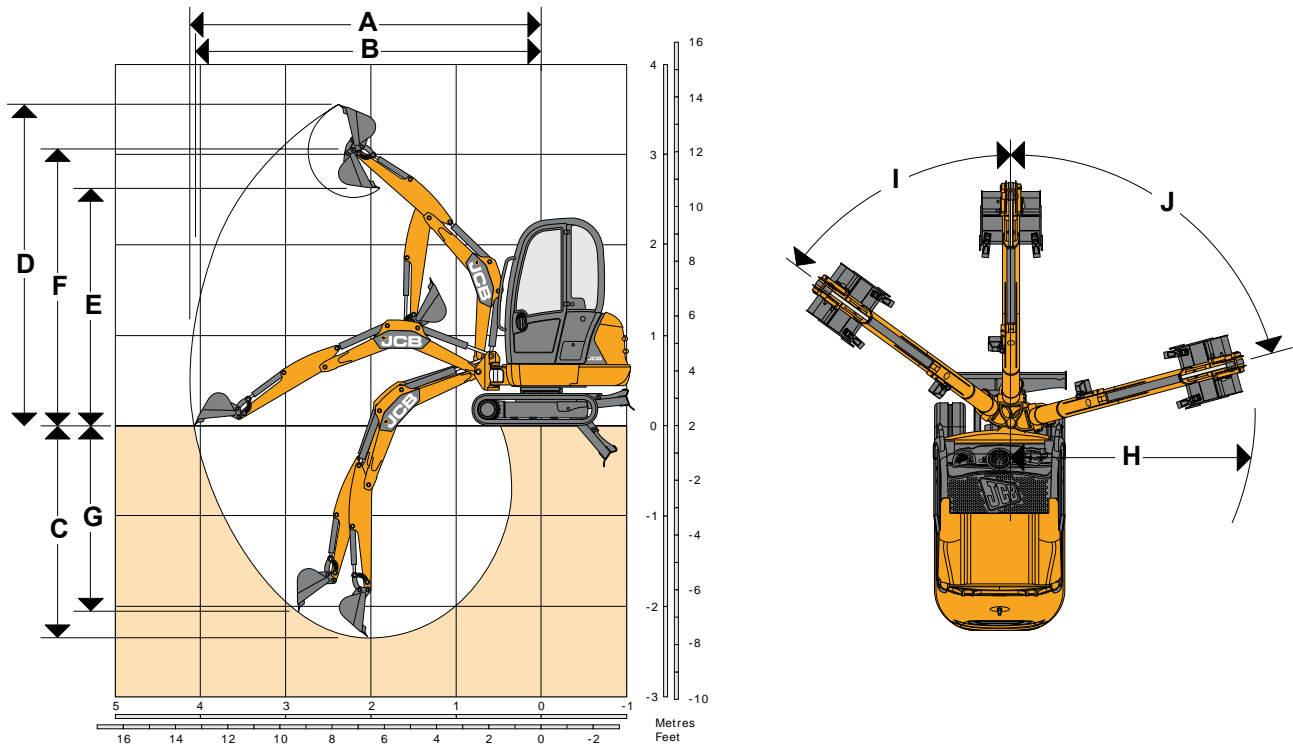


Table 21. Machine Dimensions

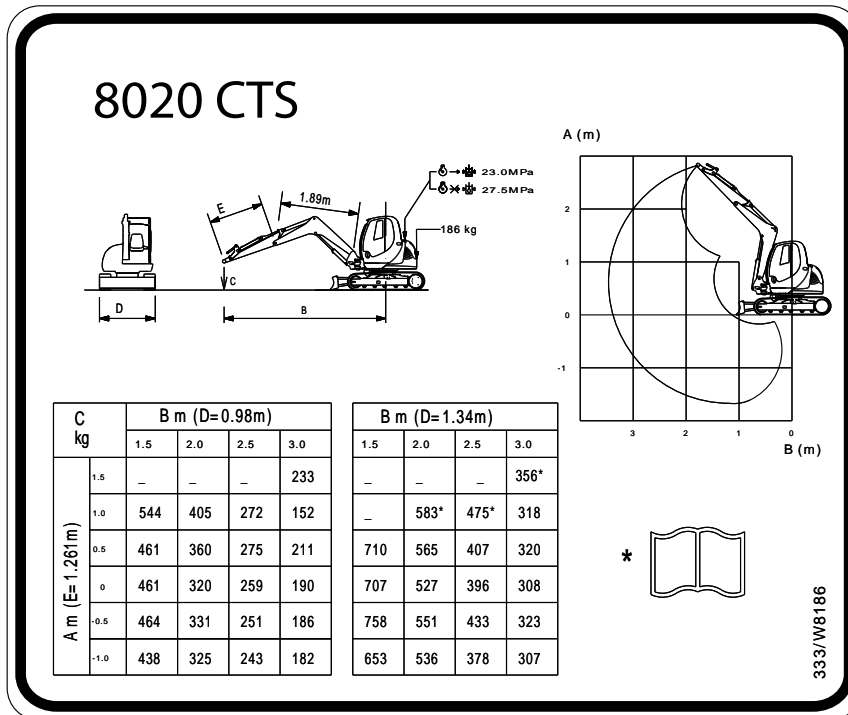
Dimension	Description	8020 CTS mm
Boom length		1,899
Dipper length		1,261
A	Max. digging reach	4,308
B	Max. dumping reach on ground	4,252
C	Max. digging depth - dozer up	2,504
C	Max. digging depth - dozer down ⁽¹⁾	X (-)
D	Max. digging height	3,689
E	Max. dump height	2,779
F	Max. height to the dipper nose - pivot pin	3,194
G	Max. vertical wall cut depth	2,187
H	Minimum front swing radius - no offset	1,737
H	Minimum front swing radius - fully offset	1,519

(1) Max. dig depth when dozer blade fully lowered.

Lifting

1.26 Metre Dipper

Figure 126.



Noise Emissions

General

To assist in compliance with European Directives 2000/14/EC and 2005/88/EC, the noise data values for this type of machine have been provided on the following page(s) and may be used for the assessment of risks to exposure from noise.

The noise data values shown only apply to CE marked machines.

For information relating to this machine when used with other JCB approved attachments, please refer to the literature accompanying the attachments.

Table 22. Definition of terms

Term	Definition	Notes
LpA	A-weighted sound pressure level measured at the operator's station.	Determined in accordance with the test method defined in ISO 6396 and the dynamic test conditions defined on 2000/14/EC.
LwA	Equivalent A-weighted sound power level emitted by the machine.	Guaranteed equivalent sound power (external noise) determined in accordance with the dynamic test conditions defined in 2000/14/EC.

Noise Data

Table 23. All Machines

Model	Engine rating (kW) ⁽¹⁾	LpA	LwA
All models	14.7	78	93

(1) *Nett installed power.*

Vibration Emissions

General

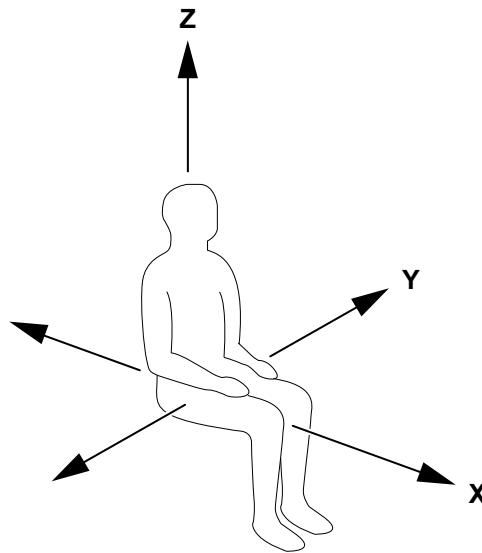
To assist in compliance with the European Directive 2002/44/EC, the duty specific vibration emission values for this machine type have been provided on the following page(s) and may be used for the assessment of risks to exposure from vibration.

Unless otherwise indicated for a specific operating condition, the vibration values are calculated with the machine equipped with the standard attachments (for example bucket, shovel, fork, etc.) for the respective operating condition.

The vibration values are calculated from measurements in three perpendicular axes (X, Y and Z). The highest weighted (RMS (Root Mean Square)) value is used to specify the vibration emission.

The axis upon which the highest weighted (RMS) value occurs is shown on the vibration chart for each of the machine operating duties, see dominant axis (X, Y or Z).

Figure 127.



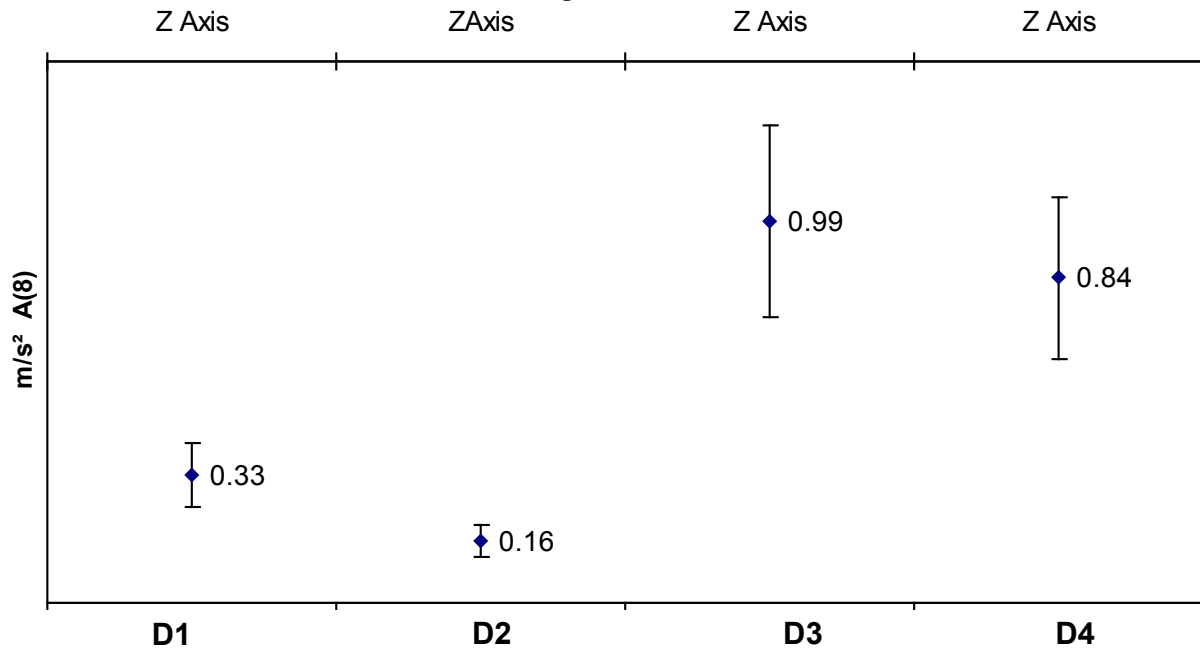
Exposure to Vibration

Exposure to vibration can be minimised through:

- Selection of the correct size and capacity of machine, equipment and attachments for a particular application
- Use of a machine equipped with an appropriate seat, keeping the seat maintained and adjusted
- Checks to make sure that the machine is correctly maintained, reporting and correcting any faults
- Steering, braking, accelerating, shifting gears, moving the attachments and load smoothly
- Adjusting the machine speed and travel path to minimise the vibration level
- Keeping the terrain on worksites where the machine works and travels in good condition, removing any large rocks or obstacles and filling in any ditches and holes
- Choosing routes that avoid rough surfaces and, if this is not possible, drive more slowly to avoid bumping and jolting
- Travel over longer distances at an adjusted (medium) speed
- Avoiding bad postures, i.e. slumping in your seat, constantly leaning forward or sideways or driving with your back twisted.

Vibration Data

Figure 128.



X-Z Dominant axis

D2 Machine operating duty: Excavating

D1 Machine operating duty: Low idle

D3 Machine operating duty: Tracking (rough terrain)

The whole-body vibration emission under representative operating conditions (according to the intended use) are shown. Refer to Figure 128.

Whole-body vibration emission determined in accordance with ISO 2631-1:1997 for this machine type is 0.31 m/s² normalised to an 8h reference period [A(8)] and based upon a test cycle defined in SAE J1166.

Hand-arm vibration determined in accordance with dynamic test conditions defined in ISO 5349-2: 2001 does not exceed 2.5 m/s.

Errors bars are due to variations in vibration emissions due to measurement uncertainty (50% in accordance with EN 12096:1997).

Fluids, Lubricants and Capacities

General

JCB recommend that you use the JCB lubricants shown as they have been verified by JCB for use on JCB machines. However, you could use other lubricants that are equivalent to the JCB standards and quality or offer the same machine component protection.

Table 24. Fluids, Lubricants and Capacities

Item	Capacity	Fluid/Lubricant	JCB Part Number	Container Size ⁽¹⁾
	L			
Fuel Tank	23.5	Diesel	-	-
Engine (Oil) ⁽²⁾	4	Above -10°C (14°F): JCB Engine Oil HP 15W/40	4001/1705	20L
		-20°C (-4°F) to 50°C (122°F): JCB Cold Climate Engine Oil EP 5W40	4001/2705	20L
Engine Coolant - Canopy Model	4.5	JCB Antifreeze HP/Coolant/Water	4006/1120	20L
Engine Coolant - Cab Model	5	JCB Antifreeze HP/Coolant/Water	4006/1120	20L
Track Gearbox (each)	0.3	JCB Engine Oil HP SAE 30 (Not Multigrade)	4001/0305	20L
Track Idler Wheels	0.025	JCB HD90 Gear Oil	4000/0305	20L
Track Rollers (bottom)	0.025	JCB HD90 Gear Oil	4000/0305	20L
Hydraulic Tank	25.4	Up to 30°C (86°F): JCB Hydraulic Fluid HP32	4002/1025	20L
		Over 30°C (86°F): JCB Hydraulic Fluid HP46	4002/0805	20L
Slew Ring Bearings	As required	JCB HP Grease	4003/2017	0.4kg
Slew Ring Gear Teeth	As required	JCB Special Slew Pinion Grease	4003/1619	0.4kg
All Other Grease	As required	JCB MPL-EP Grease	4003/1501	0.4kg

(1) For information about the different container sizes that are available (and their part numbers), contact your local JCB dealer.

(2) Do not use ordinary engine oil.

Fuel

General Information

Every attempt is made to provide accurate, up to date information. By use of this document you agree that Perkins engines company limited is not responsible for errors or omissions.

The recommendations are subject to change without notice. Contact your local Perkins distributor for the most up to date recommendations.

Diesel Fuel Requirements

The engine performance is dependent on the use of a good quality fuel. The use of a good quality fuel will give the following results, long engine life and acceptable exhaust emissions levels. The fuel must meet the minimum requirements Refer to Table 25.Refer to Table 26.Refer to Table 27.

Table 25.

Perkins Specification for Distillate Diesel Fuel⁽¹⁾				
Property	Units	Requirements	'ASTM' Test	'ISO' Test
Aromatics	% Volume	35 % maximum	D1319	'ISO'3837
Ash	% Weight	0.02% maximum	D482	'ISO'6245
Carbon residue on 10% bottoms	% Weight	0.35% maximum	D524	'ISO'4262
Cetane number ⁽²⁾	-	40 minimum	D613/D6890	'ISO'5165
Cloud point	°C (°F)	The cloud point must not exceed the lowest expected ambient temperature	D2500	'ISO'3015
Copper strip corrosion	-	No 3 maximum	D130	'ISO'2160
Density at 15°C (59.0°F) ⁽³⁾	kg	801 minimum and 876 maximum	No equivalent test	'ISO'3675, 'ISO'12185
Distillation	°C (°F)	10% at 282°C (539.2°F) maximum 10% at 360°C (679.5°F) maximum	D86	'ISO'3405
Flash point	°C (°F)	Legal limit	D93	'ISO'2719
Thermal stability	-	Minimum of 80% reflectance after aging for 180min, at 150°C (301.8°F)	D6468	No equivalent test
Pour point	°C (°F)	6°C (42.8°F) minimum below ambient temperature	D97	'ISO'3016
Sulfur ^(1, 4)	% mass	The level of sulfur that is in the fuel is controlled by emissions regulations.	D5453/D26222	'ISO'20846 'ISO'20844
Kinematic viscosity ⁽⁵⁾	mm	The viscosity of the fuel that is delivered to the fuel injection pump. '1.4 minimum/4 .5 maximum	D445	'ISO'3405
Water and sediment	% Weight	0.1% maximum	D1796	'ISO'3734
Water	% Weight	0.1% maximum	D1744	No equivalent test
Sediment	% Weight	0.05% maximum	D473	'ISO'3735
Gums and resins ⁽⁶⁾	mg/0.1kg	10 mg per 0.1kg	D381	'ISO'6246
Lubricity corrected wear scar diameter at 60°C (139.9°F) ⁽⁷⁾	mm	0.46 maximum	D6079	'ISO'12156-1

(1) This specification includes the requirements for (ULSD) Ultra Low Sulfur Diesel. The ULSD fuel will have <= 15 ppm (0.0015%) sulfur. Refer to 'ASTM D5453', 'ASTM D2622', or 'ISO 20846, ISO 20884' test methods. This specification includes the requirements for LSD (Low Sulfur Diesel). The LSD fuel will have <= 500 ppm (0.05%) sulfur. Refer to 'ASTM 5453', 'ASTM D2622', 'ISO 20846', and 'ISO 20884 test methods'.

(2) A fuel with a higher cetane number is recommended in order to operate at a higher altitude or in cold weather.

(3) Regional regulations, national regulations or international regulations can require a fuel with a specific sulfur limit. Consult all applicable regulations before selecting a fuel for a given engine application. Perkins fuel systems and engine components can operate on high sulfur fuels in territories that are non-emissions

regulated. Fuel sulfur levels affect exhaust emissions. High sulfur fuels also increase the potential for corrosion of internal components. Fuel sulfur levels above 5% may significantly shorten the oil change interval.

(4) Regional regulations, national regulations or international regulations can require a fuel with a specific sulfur limit. Consult all applicable regulations before selecting a fuel for a given engine application. Perkins fuel systems and engine components can operate on high sulfur fuels in territories that are non-emissions regulated. Fuel sulfur levels affect exhaust emissions. High sulfur fuels also increase the potential for corrosion of internal components. Fuel sulfur levels above 0.5% may significantly shorten the oil change interval.

(5) The values of the fuel viscosity are the values as the fuel is delivered to the fuel injection pumps. Fuel should also meet the minimum viscosity requirement and the fuel should meet the maximum viscosity requirements at 40°C (103.9°F) of either the 'ASTM D445' test method or the 'ISO 3104' test method. If a fuel with a low viscosity is used, cooling of the fuel may be required to maintain 1.4 cSt or greater viscosity at the fuel injection pump. Fuels with a high viscosity might require fuel heaters in order to lower the viscosity to 4.5 cSt at the fuel injection pump.

(6) Follow the test conditions and procedures for gasoline (motor).

(7) The lubricity of a fuel is a concern with low sulfur and ultra low sulfur fuel. To determine the lubricity of the fuel, use the 'ISO 12156-1 or ASTM D6079 HFRR (High Frequency Reciprocating Rig)' test. If the lubricity of a fuel does not meet the minimum requirements, consult your fuel supplier. Do not treat the fuel without consulting the fuel supplier. Some additives are not compatible. These additives can cause problems in the fuel system.

Operating with fuels that do not meet the Perkins recommendations can cause the following effects: starting difficulty, poor combustion, deposits in the fuel injectors, reduced service life of the fuel system, deposits in the combustion chamber, and reduced service life of the engine.

Diesel Fuel Characteristics - Perkins Recommendation

Cetane Number

Fuel that has a high cetane number will give a shorter ignition delay. This will produce a better ignition quality. Cetane numbers are derived for fuels against proportions of cetane and heptamethylnonane in the standard CFR engine. Refer to 'ISO 5165' for the test method.

Cetane numbers in excess of 45 are normally expected from current diesel fuel. However, a cetane number of 40 may be experienced in some territories. The USA is one of the territories that can have a low cetane value. A minimum cetane value of 40 is required during average starting conditions. A higher cetane value may be required for operations at high altitudes or in cold weather operations. Fuel with a low cetane number can be the root cause of problems during cold start.

Viscosity

Viscosity is the property of a liquid of offering resistance to shear or flow. Viscosity decreases with increasing temperature. This decrease in viscosity follows a logarithmic relationship for normal fossil fuel. The common reference is to kinematic viscosity. This is the quotient of the dynamic viscosity that is divided by the density. The determination of kinematic viscosity is normally by readings from gravity flow viscometers at standard temperatures. Refer to 'ISO3104' for the test method. The viscosity of the fuel is significant because fuel serves as a lubricant for the fuel system components. Fuel must have sufficient viscosity in order to lubricate the fuel system in both extremely cold temperatures and extremely hot temperatures. If the kinematic viscosity of the fuel is lower than 1.4 cSt at the fuel injection pump damage to the fuel injection pump can occur. This damage can be excessive scuffing and seizure. Low viscosity may lead to difficult hot restarting, stalling and loss of performance. High viscosity may result in seizure of the pump. Perkins recommends kinematic viscosities of 1.4 and 4.5 mm²/sec that is delivered to the fuel injection pump.

Density

Density is the mass of the fuel per unit volume at a specific temperature. This parameter has a direct influence on engine performance and a direct influence on emissions. This determines the heat output from a given injected volume of fuel. This is generally quoted in the following kg/m at 15°C (59.0°F). Perkins recommends a value of density of 841 kg/m in order to obtain the correct power output. Lighter fuels are acceptable but these fuels will not produce the rated power.

Sulfur

The level of sulfur is governed by emissions legislations. Regional regulation, national regulations or international regulations can require a fuel with a specific sulfur limit. The sulfur content of the fuel and the fuel quality must comply with all existing local regulations for emissions. The guidelines for the correct sulfur level for specific territories. Consult all applicable regulations before selecting the fuel for a given engine application.

Table 26.

Territory	Fuel Requirements from 2007		
EPA	Low sulfur (500 ppm) maximum		
EC	Sulfur/power	Low sulfur (300 ppm) maximum for less than or equal to 19 kW	Sulfur (1000 ppm) maximum for greater than 19 kW
	Models	402D-05 and 403D-07	403D-11, 403D-15, 403D-15T, 403D-17, 404D-15, 404D-22, 404D-22T, and 404D-22TA
Non-regulated territories	Sulfur limit of less than 4000 ppm		

Table 27.

Territory	Fuel Requirements from 2010		
EPA	Low sulfur (15 ppm) maximum		
EC	Sulfur/power	Low sulfur (10 ppm) maximum for less than or equal to 37 kW	Sulfur (300 ppm) maximum for greater than 37 kW
	Models	402D-05 403D-07 403D-11 403D-15 403D-15T 403D-17 404D-15	404D-22 404D-22T, and 404D-22TA
Non-regulated territories	Sulfur limit of less than 4000 ppm		

By using the test methods 'ASTM D5453, ASTM D2622, or ISO 20846 ISO 20884', the content of sulfur in LSD (Low Sulfur Diesel) fuel must be below 500 PPM 0.05%. By using the test methods 'ASTM D5453, ASTM D2622, or ISO 20846 ISO 20884', the content of sulfur in ULSD fuel must be below 15 PPM 0.0015%. The lubricity of these fuels must not exceed wear scar diameter of 0.46mm. The fuel lubricity test must be performed on a HFRR, operated at 60°C (139.9°F). Refer to 'ISO 12156-1'.

In some parts of the world and for some applications, high sulfur fuels above 0.5% by mass might only be available. Fuel with very high sulfur content can cause engine wear. High sulfur fuel will have a negative impact on emissions of particulates. High sulfur fuel can be used provided that the local emissions legislation will allow the use. High sulfur fuel can be used in countries that do not regulate emissions.

When only high sulfur fuels are available, it will be necessary that high alkaline lubricating oil is used in the engine or that the lubricating oil change interval is reduced.

Lubricity

This is the capability of the fuel to prevent pump wear. The fluid's lubricity describes the ability of the fluid to reduce the friction between surfaces that are under load. This ability reduces the damage that is caused by friction. Fuel injection systems rely on the lubricating properties of the fuel. Until fuel sulfur limits were mandated, the fuel's lubricity was generally believed to be a function of fuel viscosity.

The lubricity has particular significance to the current low viscosity fuel, low sulfur fuel and low aromatic fossil fuel. These fuels are made in order to meet stringent exhaust emissions. A test method for measuring the lubricity of diesel fuels has been developed and the test is based on the HFRR method that is operated at 60°C (139.9°F). Refer to 'ISO 12156 part 1 and CEC document F06-A-96' for the test method.

Lubricity wear scar diameter of 0.46mm must not be exceeded. The fuel lubricity test must be performed on a HFRR, operated at 60°C (139.9°F). Refer to 'ISO 12156-1'. Fuel additives can enhance the lubricity of a fuel. Contact your fuel supplier for those circumstances when fuel additives are required. Your fuel supplier can make recommendations for additives to use and for the proper level of treatment.

Distillation

This is an indication of the mixture of different hydrocarbons in the fuel. A high ratio of light weight hydrocarbons can affect the characteristics of combustion.

Classification of the Fuels

The diesel engines have ability to burn a wide variety of fuels. These fuels are divided into four general groups. Refer to Table 27.

Table 28.

Fuel Groups	Classification	
Group 1	Preferred fuels	Full life of the product
Group 2	Permissible fuels	These fuels may cause reduced engine life and performance
Group 3	Aviation fuels	These fuels will cause reduced engine life and performance
Group 4	Biodiesel	

Group 1 Specification (Preferred Fuels)

The group 1 of fuel specifications is considered acceptable:

- EN590 DERV Grade A, B, C, E, F, Class, 0, 1, 2, 3, and 4
- 'ASTM D975', Grade 2D S15, and Grade 2D S500
- 'JIS K2204 grades 1,2,3 and special grade 3' This grade of fuel must meet the minimum lubricity requirements that are stated in Refer to Table 25.
- 'BS2869 class A2' off-highway gas oil red diesel

BS2869 can only be used if the sulfur level meets the specifications that are listed in Refer to Table 26. Refer to Table 27.. An analysis of a sample of fuel must be conducted in order to check the sulfur level.

The use of LSD fuel and the use of ULSD fuel is acceptable provided that the fuels meet the minimum requirements that are stated in that tables Refer to Table 25. Refer to Table 26. Refer to Table 27.. The lubricity of these fuels must not exceed wear scar diameter of 0.46mm. The lubricity test must be performed on a HFRR, operated at 60°C (139.9°F). Refer to 'ISO 12156-1'. By using the test methods 'ASTM D5453, ASTM D2622, or ISO 20846 ISO 20884', the content of sulfur in LSD fuel must be below 500 PPM (0.05%). By using the test methods 'ASTM D5453, ASTM D2622, or ISO 20846 ISO 20884', the content of sulfur in ULSD fuel must be below 15 PPM (0.0015%).

Group 2 Specifications (Permissible Fuels)

The group 2 of fuel specifications is considered acceptable, but these fuels may reduce the engine life and performance.

- 'ASTM 0975', Grade 10 S15, and Grade 10 S500
- 'JP7 (MIL-T-38219)'
- 'NATO F63'

JP7 and NATO F63 can only be used if the sulfur level meets the specifications that are listed in the Refer to Table 25., Refer to Table 26.. An analysis of a sample of fuel must be conducted in order to check the sulfur level.

Group 3 Specifications (Aviation Fuels)

The group 3 of fuel specification must be used only with the appropriate fuel additive. This fuel will reduce the engine life and performance.

- 'NATO F34 (MIL-OTL-83133E)', 'NATO F35 (MIL-OTL-83133E)', 'NATO JP8 (MIL-OTL-83133E)', 'NATO F-44 (MIL-OTL-5624U)', 'NATO JP5 (MIL-OTL-5624U)', 'Jet A (ASTM 01655)', 'Jet A1 (ASTM 0 1655)'

All the above fuels can only be used if the sulfur level meets the specifications that are listed in the Refer to Table 25., Refer to Table 26.. An analysis of a sample of fuel must be conducted in order to check the sulfur level.

These fuels are only acceptable provided that these fuels are used with an appropriate fuel additive. These fuels must meet the requirements that are stated in the Refer to Table 25., Refer to Table 26., Refer to Table 27.. Fuel samples should be analyzed for the compliance. These fuels must not exceed lubricity wear scar diameter of 0.46mm. The fuel lubricity test must be performed on a HFRR, operated at 60°C (139.9°F). Refer to 'ISO 12156-1'. Fuels must have minimum viscosity of 1.4 centistokes that is delivered to the fuel injection pump. Fuel cooling may be required in order to maintain minimum viscosity of 1.4 centistokes that is delivered to the fuel injection pump.

Group 4 Biodiesel

The biodiesel is a fuel that can be defined as mono-alkyl esters of fatty acids. Biodiesel is a fuel that can be made from a variety of feedstock. The most commonly available biodiesel in Europe is REM (Rape Methyl Ester). This biodiesel is derived from rapeseed oil. SME (Soy Methyl Ester) is the most common biodiesel in the US. This biodiesel is derived from soybean oil. Soybean oil or rapeseed oil are the primary feedstocks. These fuels are together known as FAME (Fatty Acid Methyl Esters).

Raw pressed vegetable oils are not acceptable for use as a fuel in any concentration in compression engines. Without esterification, these oils gel in the crankcase and the fuel tank. These fuels may not be compatible with many of the elastomers that are used in engines that are manufactured today. In original forms, these oils are not suitable for use as a fuel in compression engines. Alternate base stocks for biodiesel may include animal tallow, waste cooking oils, or a variety of other feedstocks. In order to use any of the products that are listed as fuel, the oil must be esterified.

Engines that are manufactured by Perkins are certified by use of the prescribed EPA (Environmental Protection Agency) and European certification fuels. Perkins does not certify engines on any other fuel. The user of the engine has the responsibility of using the correct fuel that is recommended by the manufacturer and allowed by the EPA and other appropriate regulatory agencies.

Recommendation for the Use of Biodiesel

The neat biodiesel must conform to 'EN14214' or 'ASTM 0675' regulations. A maximum of 10% mixture of biodiesel can be used in mineral diesel fuel. The mineral diesel fuel must conform to 'EN590', 'ASTM 0975' or '8S2869 Grade A2' regulations. In North America, biodiesel and mixtures of biodiesel must be purchased from the 809000 authorized manufacturers and 809000 certified distributors. In other areas of the world, the use of biodiesel that is authorized and certified by an appropriate biodiesel quality body is required.

When biodiesel, or any blend of biodiesel is used, the user has the responsibility for obtaining the proper local exemptions, regional exemptions, and/or national exemptions that are required for the use of biodiesel in any Perkins engine that is regulated by emissions standards. Biodiesel that meets 'EN14214' is acceptable. The biodiesel must be blended with an acceptable distillate diesel fuel at the maximum stated percentages. However, the following operational recommendations must be followed:

- The oil change interval can be affected by the use of biodiesel. Use services oil analysis in order to monitor the condition of the engine oil. Use services oil analysis also in order to determine the oil change interval that is optimum.
- Confirm that biodiesel is acceptable for use with the manufacturer of the fuel filters
- In a comparison of distillate fuels to biodiesel, it provides less energy per gallon by 5% to 7%. Do not change the engine rating in order to compensate for the power loss. This will help to avoid the engine problems when the engine is converted back to 100% distillate diesel fuel.
- The compatibility of the elastomers with biodiesel is being monitored. The condition of seals and hoses should be monitored regularly.
- Biodiesel may pose low ambient temperature problems for both storage and operation. At low ambient temperatures, fuel may need to be stored in a heated building or a heated storage tank. The fuel system may require heated fuel lines, filters, and tanks. Filters may plug and fuel in the tank may solidify at low ambient temperatures if precautions are not taken. Consult your biodiesel supplier for assistance in the blending and attainment of the proper cloud point for the fuel.

- Biodiesel has poor oxidation stability, which can result in long term problems in the storage of biodiesel. The poor oxidation stability may accelerate fuel oxidation in the fuel system. This is especially true in engines with electronic fuel systems because these engines operate at higher temperatures. Consult the fuel supplier for oxidation stability additives.
- Biodiesel is a fuel that can be made from a variety of feedstock. The feedstock that is used can affect the performance of the product. Two of the characteristics of the fuel that are affected are cold flow and oxidation stability. Contact your fuel supplier for guidance.
- Biodiesel or biodiesel blends are not recommended for engines that will operate occasionally. This is due to poor oxidation stability. If the user is prepared to accept some risk, then limit biodiesel to a maximum of B5. Examples of applications that should limit the use of biodiesel are the following, standby generator sets and certain emergency vehicles.
- Biodiesel is an excellent medium for microbial contamination and growth. Microbial contamination and growth can cause corrosion in the fuel system and premature plugging of the fuel filter. The use of conventional anti-microbial additives and the effectiveness of conventional anti-microbial additives in biodiesel is not known. Consult your supplier of fuel and additive for assistance.
- Care must be taken in order to remove water from fuel tanks. Water accelerates microbial contamination and growth. When biodiesel is compared to distillate fuels, water is naturally more likely to exist in the biodiesel.

Fuel for Cold Weather Operation

The European standard 'EN590' contains climate dependant requirements and a range of options. The options can be applied differently in each country. There are five classes that are given to arctic climates and severe winter climates. 0, 1, 2, 3, and 4. Fuel that complies with 'EN590' class 4 can be used at temperatures as low as -44°C (-47.1°F). Refer to 'EN590' for a detailed discretion of the physical properties of the fuel.

The diesel fuel 'ASTM 0975 grade 1-D S15 or SSOO' that is used in the united states of america may be used in very cold temperatures that are below -18°C (-0.4°F). In extreme cold ambient conditions, you may also use fuels that are listed in the table 5. These fuels are intended to be used in temperatures that can be as low as -54°C (-65.1°F).

Table 29.

Light Distillate Fuels⁽¹⁾	
Specification	Grade
'MIL-DTL-5624U'	JP-5
'MIL-DTL-83133E'	JP-8
'ASTM D1655'	Jet-A-1

(1) The use of these fuels is acceptable with an appropriate fuel additive and the fuels must meet minimum requirements that are stated in the tables. Fuel samples should be analyzed for the compliance. Fuels must not exceed 0.46 mm lubricity wear scar diameter that is tested on a HFFR The test must be performed at 60°C (139.9°F). Refer to 'ISO 12156-1'. Fuels must have minimum viscosity of 1.4 centistokes that is delivered to the fuel injection pump. Fuel cooling may be required in order to maintain minimum viscosity of 1.4 centistokes that is delivered to the fuel injection pump.

There are many other diesel fuel specifications that are published by governments and by technological societies. Usually, those specifications do not review all the requirements that are addressed in Refer to Table 25., Refer to Table 26., Refer to Table 27.. To make sure the optimum engine performance, a complete fuel analysis should be obtained before the engine operation. The fuel analysis should include all of the properties that are stated in the Refer to Table 25., Refer to Table 26., Refer to Table 27..

Fuel Additive

Supplemental diesel fuel additives are not generally recommended. This is due to potential damage to the fuel system or the engine. Your fuel supplier or the fuel manufacturer will add the appropriate supplemental diesel fuel additives.

Perkins recognizes the fact that additives may be required in some special circumstances. Fuel additives need to be used with caution. The additive may not be compatible with the fuel. Some additives may precipitate. This action causes deposits in the fuel system. The deposits may cause seizure. Some additives may be corrosive, and some additives may be harmful to the elastomers in the fuel system. Some additives may raise

fuel sulfur levels above the maximum that is allowed by the EPA or the other regulatory agencies. Contact your fuel supplier for those circumstances when fuel additives are required. Your fuel supplier can recommend the appropriate fuel additive and the correct level of treatment.

Coolant

▲ CAUTION Antifreeze can be harmful. Obey the manufacturer's instructions when handling full strength or diluted antifreeze.

Check the strength of the coolant mixture at least once a year, preferably at the start of the cold period.

Replace the coolant mixture according to the intervals shown in the machine's Service Schedule.

You must dilute full strength antifreeze with clean water before use. Use clean water of no more than a moderate hardness (pH value 8.5). If this cannot be obtained, use de-ionized water. For further information advice on water hardness, contact your local water authority.

The correct concentration of antifreeze protects the engine against frost damage in winter and provides year round protection against corrosion.

The protection provided by JCB High Performance Antifreeze and Inhibitor is shown below.

Table 30.

Concentration	Level of protection
50% (Standard)	Protects against damage down to -40°C (-40°F)
60% (Extreme Conditions Only)	Protects against damage down to -56°C (-69°F)

Do not exceed a 60% concentration, as the freezing protection provided reduces beyond this point.

If you use any other brand of antifreeze:

- Make sure that the antifreeze complies with International Specification ASTM D6210.
- Always read and understand the manufacturer's instructions.
- Make sure that a corrosion inhibitor is included. Serious damage to the cooling system can occur if corrosion inhibitors are not used.
- Make sure that the antifreeze is ethylene glycol based and does not use Organic Acid Technology (OAT).



Torque Values

General

Table 31. Torque Values

Item	Torque
	N·m
ROPS (cab mounts) Bolts	70
Track Plate Bolts	74
FOGS Bolts	74

Electrical System

General

Table 32.

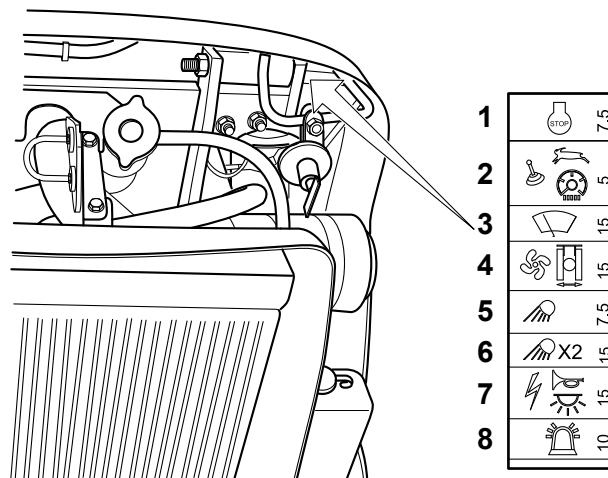
Item	Specification
System voltage	12

Fuses

Table 33. All Machines

Fuse	Circuit	Rating
		A
1	Engine stop	60
2	Servo control, instruments, two-speed range selector	60
3	Windscreen wiper	5
4	Blower	5
5	Boom light	15
6	Work lights	15
7	Horn, interior light, auxiliary power socket	7.5
8	Beacon	15
9	Main fuse	15

Figure 129.



Engine

General

Table 34. Drive Belt Tension

Measurement	Dimension
Deflection at mid point between alternator and crankshaft pulley	5mm

Hydraulic System

Auxiliary Circuits

For: 8014 CTS Page 184
For: 8016 CTS Page 184
For: 8018 CTS Page 184
For: 8020 CTS Page 184

(For: 8014 CTS)

Table 35.

Model	Auxiliary Flow	Auxiliary Pressure
	L/min	bar (psi)
8014 CTS	26	230 (3,333.3)

(For: 8016 CTS)

Table 36.

Model	Auxiliary Flow	Auxiliary Pressure
	L/min	bar (psi)
8016 CTS	26	230 (3,333.3)

(For: 8018 CTS)

Table 37.

Model	Auxiliary Flow	Auxiliary Pressure
	L/min	bar (psi)
8018 CTS	26	230 (3,333.3)

(For: 8020 CTS)

Table 38.

Model	Auxiliary Flow	Auxiliary Pressure
	L/min	bar (psi)
8020 CTS	44	230 (3,333.3)

Tracks

General

For: 8020 CTS Page 185
 For: 8014 CTS Page 185
 For: 8016 CTS, 8018 CTS Page 185

(For: 8020 CTS)

Table 39. Track Tension

Track Type	Minimum Track Tension	Maximum Track Tension
	mm	mm
Rubber Track	55	55
Steel Track	80	80

(For: 8014 CTS)

Table 40. Track Tension

Track Type	mm
Rubber Track	60 ± 2
Steel Track	80

(For: 8016 CTS, 8018 CTS)

Table 41. Track Tension

Track Type	mm
Rubber Track	55 ± 5
Steel Track	80



Declaration of Conformity(For: 8014 CTS, 8016 CTS, 8018 CTS, 8020 CTS)

General

A completed copy of the EC Declaration of Conformity is supplied with all machines manufactured according to EC type examination and/or self-certification requirements.

A sample copy of the EC Declaration of Conformity and a summary of the information that can appear is provided. [Refer to: Data \(Page 187\)](#).

Data

Figure 130.

DECLARATION OF CONFORMITY	
NAME AND ADDRESS OF MANUFACTURER:	<input style="width: 100%; height: 40px;" type="text" value="A"/>
HEREBY DECLARES THAT THE MACHINERY / EQUIPMENT DESCRIBED BELOW:	
DESIGNATION OF MACHINERY/EQUIPMENT:	<input style="width: 100%;" type="text" value="P"/>
DESCRIPTION OF MACHINERY / EQUIPMENT:	<input style="width: 100%;" type="text" value="B"/>
TRADE NAME:	JCB
MODEL NAME:	<input style="width: 100%;" type="text" value="C"/>
SERIAL NUMBER OF MACHINERY / EQUIPMENT	<input style="width: 100%;" type="text" value="D"/>
COMPLIES WITH THE PROVISIONS OF THE "MACHINERY DIRECTIVE" (DIRECTIVE 2006/42/EC AS AMENDED). THE FOLLOWING STANDARDS HAVE BEEN USED:	
<input style="width: 100%;" type="text" value="E"/>	
NAME AND ADDRESS OF THE PERSON WHO COMPILES THE TECHNICAL DOCUMENTATION:	
<input style="width: 100%; height: 40px;" type="text" value="F"/>	
COMPLIES WITH THE PROVISIONS OF THE "ELECTRO-MAGNETIC COMPATIBILITY DIRECTIVE" (DIRECTIVE 2004/108/EC AS AMENDED).	
COMPLIES WITH THE PROVISIONS OF THE "NOISE EMISSIONS IN THE ENVIRONMENT BY EQUIPMENT FOR USE OUTDOORS DIRECTIVE" (DIRECTIVE 2000/14/EC AS AMENDED).	
NAME AND ADDRESS OF THE PERSON WHO KEEPS THE TECHNICAL DOCUMENTATION:	
<input style="width: 100%; height: 40px;" type="text" value="G"/>	
CONFORMITY ASSESSMENT PROCEDURE:	
<input style="width: 100%;" type="text" value="H"/>	
NAME AND ADDRESS OF NOTIFIED BODY:	
<input style="width: 100%; height: 40px;" type="text" value="J"/>	
MEASURED SOUND POWER LEVEL ON EQUIPMENT REPRESENTATIVE FOR THIS TYPE:	
<input style="width: 100%;" type="text" value="K"/>	
GUARANTEED SOUND POWER LEVEL FOR THIS EQUIPMENT:	
<input style="width: 100%;" type="text" value="L"/>	
NET INSTALLED POWER / MASS OF APPLIANCE:	
<input style="width: 100%;" type="text" value="L"/>	
PLACE OF DECLARATION:	
<input style="width: 100%;" type="text" value="M"/>	
DATE OF DECLARATION:	
XX/XX/XXXX	
NAME OF AUTHORISED SIGNATORY:	
POSITION:	
<input style="width: 100%;" type="text" value="N"/>	
SIGNATURE:	
XXXXXX	
English	9814/0850
Issue 4	

Table 42.

A	Refer to: Name and Address of the Manufacturer (Page 7).
B	Excavators, Rope Or Hydraulic (Hydraulic, Tracked, Compact)



C	Refer to: Model and Serial Number (Page 1).
D	Refer to: Machine (Page 10).
E	EN 474-1:2006+A1:2009, EN 474-4:2006 +A1:2009
F	Engineering Manager, JCB Compact Products Limited, Harewood Estate, Leek Road, Cheadle, Stoke On Trent, United Kingdom, ST14 5JP
G	Mr C J Knowles, J. C. Bamford Excavators Limited, Lakeside Works, Rocester, Staffordshire, United Kingdom, ST14 5JP
H	ANNEX VI PROCEDURE 1
J	A. V. Technology, A. V. House, Birdhall Lane, Stockport, Cheshire, United Kingdom, SK3 0XU
K	Refer to: Noise Emissions (Page 170).
L	Refer to: Noise Emissions (Page 170).
M	Rocester
N	Managing Director
P	Compact excavator

Warranty Information

Service Record Sheet

Table 43.

	Signature and stamp		Date
	Annual Insurance (Yes)		Hours

Figure 131. Installation Checklist

			/ /		h


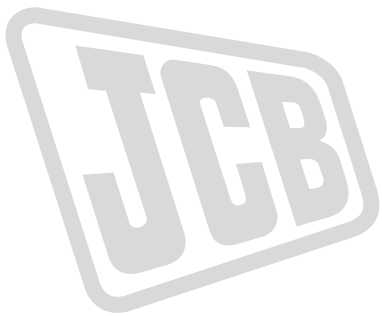


Figure 132. 250h/3 Month

			/ /		h

Figure 133. 500h/6 Month

			/ /		h

Figure 134. 1000h/12 Month

 	 1 / /	 h


		

Figure 135. 1500h/18 Month


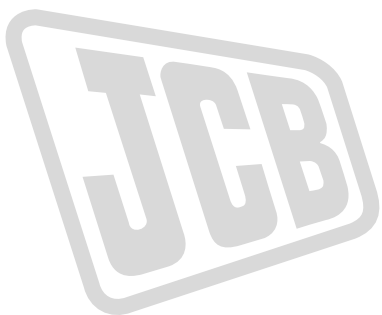



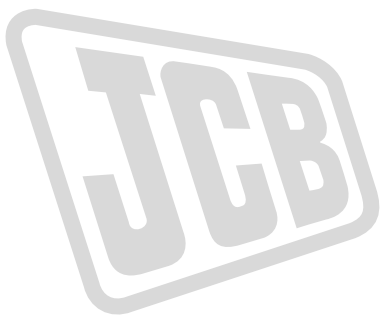


 	 1 / /	 h

Figure 136. 2000h/24 Month

 	 1 / /	 h


		

Figure 137. 2500h/30 Month


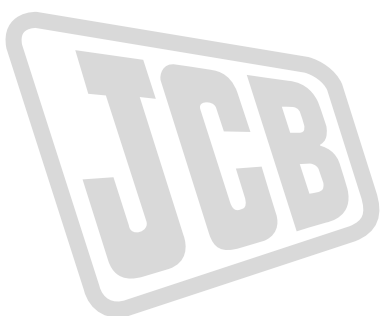



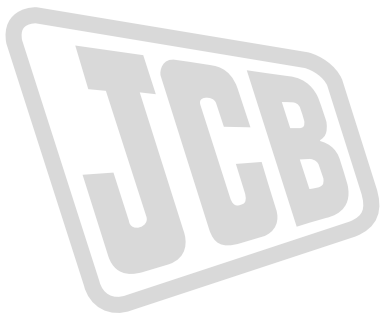


 	 1 / /	 h

Figure 138. 3000h/36 Month

 	 1 / /	 h


		

Figure 139. 3500h/42 Month


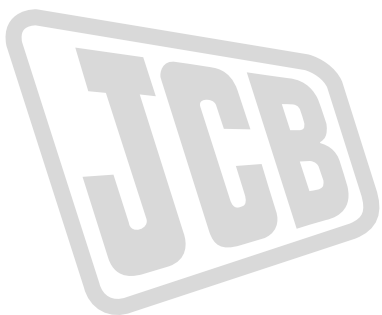



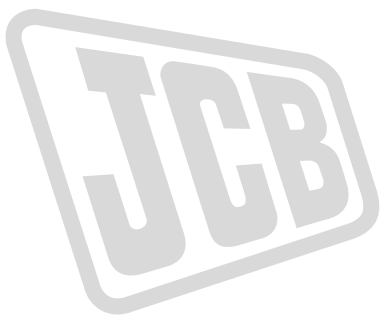


 	 1 / /	 h

Figure 140. 4000h/48 Month

 	 1 / /	 h


		

Figure 141. 4500h/54 Month


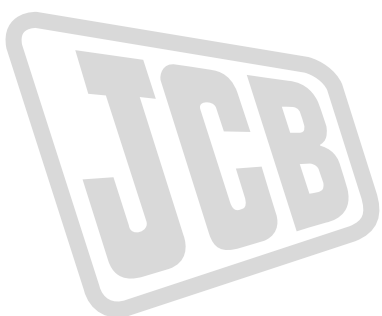



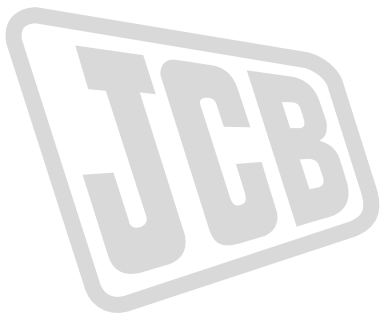


 	 1 / /	 h

Figure 142. 5000h/60Month

 	 1 / /	 h



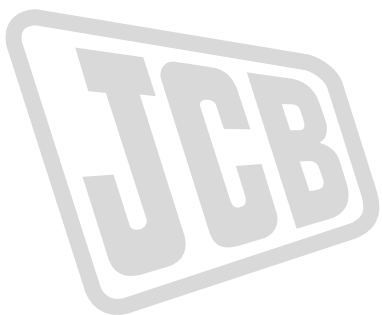


		

Figure 143. 5500h/66 Month

 	 1 / /	 h



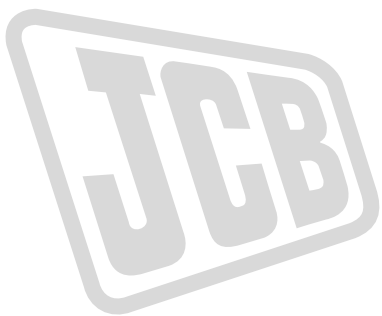


		

Figure 144. 6000h/72 Month

 	 1 / /	 h



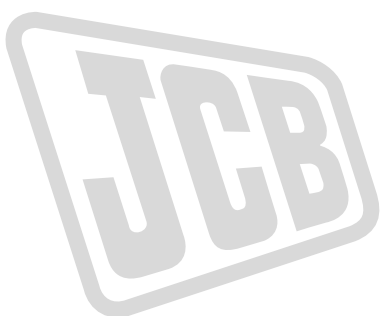


		

Figure 145. 6500h/78 Month

 	 1 / /	 h



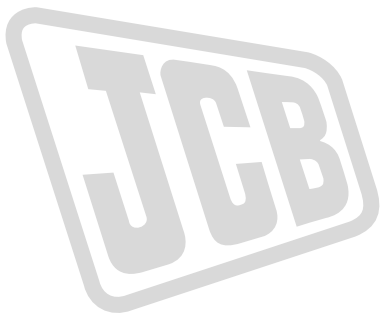


		

Figure 146. 7000h/84 Month

 	 1 / /	 h


		

Figure 147. 7500h/90 Month


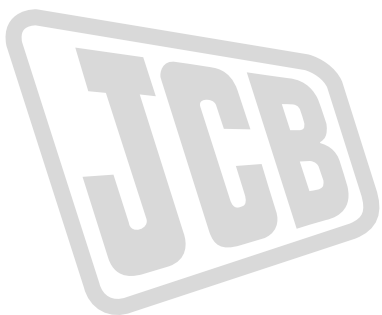



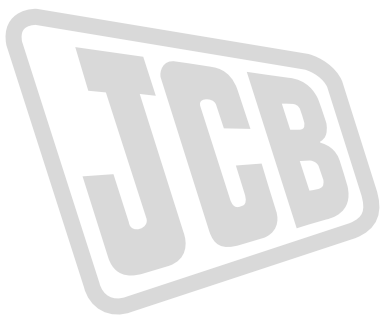


 	 1 / /	 h

Figure 148. 8000h/96 Month

 	 1 / /	 h


		

Figure 149. 8500h/102 Month


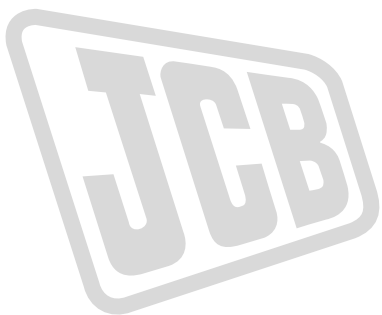



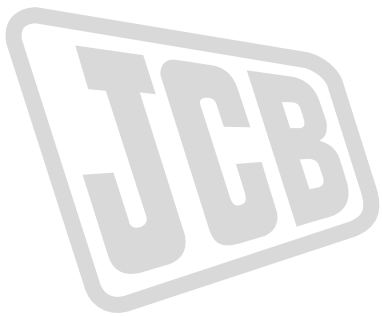


 	 1 / /	 h

Figure 150. 9000h/108 Month

 	 1 / /	 h


		

Figure 151. 9500h/114 Month


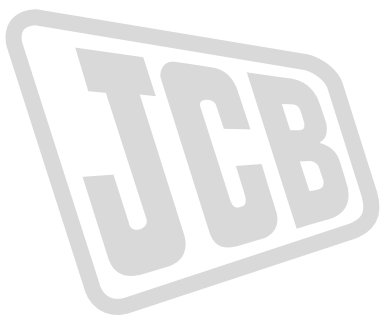



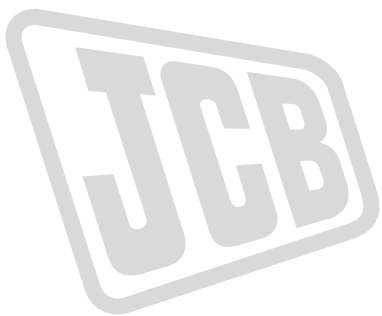


 	 1 / /	 h

Figure 152. 10000h/120 Month

 	 1 / /	 h


		

Figure 153. 10500h/126 Month


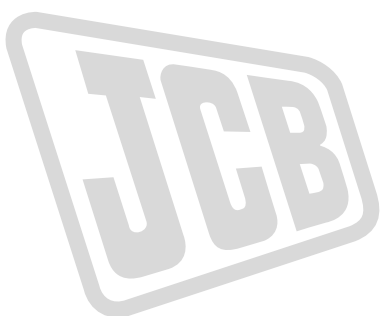


 	 1 / /	 h

Figure 154. 11000h/132 Month

			/ /		h

