

# Service Manual

**8027Z**  
**8032Z**

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Product: JCB 8027Z,8032Z Mini Excavator Service Repair Manual  
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## Introduction

This publication is designed for the benefit of JCB Distributor Service Engineers who are receiving, or have received, training by JCB Technical Training Department.

It is assumed that these personnel have a sound knowledge of workshop practice, safety procedures and general techniques associated with the maintenance and repair of hydraulic earthmoving equipment. Therefore, these basic subjects generally are omitted from this manual, the intention being to convey only more specialised information concerning particular aspects of a machine or component.

For example, renewal of oil seals, gaskets etc., and any component showing obvious signs of wear or damage is expected as a matter of course and, therefore, information of this nature is included only in the context of specialised procedures or where a range of wear tolerances is required. Similarly, it is expected that components will be cleaned and lubricated where appropriate, also that any opened hose or pipe connections will be blanked to prevent excessive loss of hydraulic fluid and ingress of dirt. Finally, please remember above all **SAFETY MUST COME FIRST!**

The manual is compiled in sections, the first three are numbered and contain information as follows:

- 1 = General Information** - includes torque settings and service tools.
- 2 = Care & Safety** - includes warnings and cautions pertinent to aspects of workshop procedures etc.
- 3 = Routine Maintenance** - includes service schedules and recommended lubricants for the machine.

The remaining sections are alphabetically coded and deal with Dismantling, Overhaul etc. of specific components, for example:

- A = Optional Equipment**
- B = Body & Framework ...etc**

The page numbering in each alphabetically coded section is not continuous. This allows for the insertion of new items in later issues of the manual.

Section contents, technical data, circuit descriptions, operation descriptions etc. are inserted at the beginning of each alphabetically coded section.

All sections are listed on the front cover; tabbed divider cards align directly with individual sections on the front cover for rapid reference.

Illustrations which show a dismantled component are numbered as a guide to the dismantling sequence, which generally can be reversed for assembly.

Torque settings are given as a 'mean' figure which may be varied by plus or minus 3%. Torque figures indicated are for dry threads, hence for lubricated threads may be reduced by one third.

'Left Hand' and 'Right Hand' are as viewed from the rear of the machine.

References to alternative servicing intervals are to be treated on a 'whichever occurs first' basis.



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The machine has a Data Plate attached to the left hand front face of the machine.

The serial numbers of the machine, engine and gearboxes are stamped on this plate.

If the engine is replaced, stamp the new serial number in place of the old one.

### Explanation of Vehicle Identification Number (VIN)

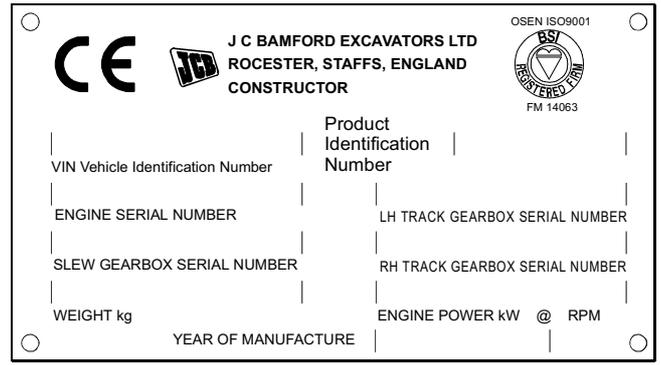
Code	A	B	C	D	E
Example	<b>SLP</b>	<b>0803</b>	<b>X</b>	<b>E</b>	<b>0765001</b>

- A World Manufacturer Identification SLP = JCB
- B Machine Model 0803 = 803
- C Year of Manufacture
  - R = 1994 W = 1998 2 = 2002
  - S = 1995 X = 1999 3 = 2003
  - T = 1996 Y = 2000 4 = 2004
  - V = 1997 1 = 2001 5 = 2005
- D Manufacturers Location E = England
- E Machine Serial Number 0765001

### Explanation of Engine Identification Number

Code	A	B	C	D	E
Example	<b>KE</b>	<b>50390</b>	<b>J</b>	<b>000001</b>	<b>y</b>

- A Engine Type
- B Engine Parts List
- C Country of Manufacture
- D Engine Serial Number
- E Year of Manufacture



### Preparation for Storage

The operations to place a machine into storage (-15 °C [5 °F] to 44 °C [111 °F]) are given below.

- 1** Park the machine safely with the bucket and dipper rams retracted and the dig end outstretched. Lower the boom until the bucket rests on the ground. Lower the dozer to the ground.
- 2** Switch off the engine. Operate controls to release pressure from the rams.
- 3** Disconnect the battery to prevent discharge.
- 4** Ensure that the fuel tank is filled to a maximum, leaving no air space.
- 5** Ensure that the hydraulic tank is filled to maximum on the sight gauge.
- 6** Spray exposed ram rods with Waxoyl.
- 7** Slacken off rubber tracks until no visible spring tension exists.

### Preparation after Storage

The operations to remove a machine into storage (-15 °C [5 °F] to 44 °C [111 °F]) are given below.

- 1** Lower the fuel level to ensure that sufficient air space exists in the tank.
- 2** Check all oil and water levels, adjust contents to correct levels as necessary.
- 3** Ensure that the battery is fully charged.
- 4** Reconnect the battery.
- 5** Remove the electrical supply from the fuel injection pump solenoid.
- 6** Crank the engine for 20 seconds or until the oil pressure warning light goes out.
- 7** Reconnect the electrical supply to the fuel injection pump solenoid.
- 8** Start the engine. If the engine fails to start after several attempts, bleed the fuel system.
- 9** Adjust track tensions.
- 10** Grease all lubrication points.

## Introduction

This chapter is arranged to guide you step-by-step through the task of learning how to use the machine. Read it through from beginning to end. By the end of the chapter you should have a good understanding of the machine and how to operate it.

Pay particular attention to all safety messages. They are there to warn you of possible hazards. Do not just read them-think about what they mean. Understand the hazards and how to avoid them.

If there is anything you do not understand, ask your JCB dealer, he will be pleased to advise you.

When you have learned where the driving controls are and what they do, practise using them. Practise driving the machine in a safe, open space clear of other people.

Get to know the "feel" of the machine and its driving controls.

Move on to the attachment controls only when you can drive the machine confidently and safely.

Take great care when practising with the attachment controls. Practise in an open space, keep people clear. Do not jerk the controls: operate them slowly until you understand the effect they have on the machine.

Finally, do not rush the job of learning. Take your time and take it safely.

Remember

**BE CAREFUL**  
**BE ALERT**  
**BE SAFE**

## Before Entering the Cab

### WARNING

**Walking or working under raised attachments can be hazardous. You could be crushed by the attachments or get caught in the linkages.**

Lower the attachments to the ground before doing these checks. If you are new to this machine, get an experienced operator to lower them for you.

If there is nobody to help you, study this handbook until you have learned how to lower the attachments. Also make sure that the slew lock is engaged before doing these checks.

The following checks should 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.

## Machine Walk Round Inspection

### 1 Check for cleanliness:

- a Clean the windows and light lenses.
- b Remove dirt and debris, especially from around the linkages, rams, pivot points and radiator.
- c Make sure the cab and handrails are clean and dry.
- d Clean all safety decals. Replace any that are missing or cannot be read.

### 2 Check for damage:

- a Inspect the machine generally for damaged and missing parts.
- b Make sure that the bucket teeth are secure and in good condition
- c Make sure that all the pivot pins are secured correctly in place
- d Inspect the windows for cracks and damage
- e Check for oil, fuel and coolant leakages beneath the machine.

### WARNING

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

HOP27

### 3 Check the Tracks (Rubber)

Check for cut rubber and penetration by sharp objects. Do not use a machine with damaged tracks.

### 4 Check the engine cover/panels and fuel filler cap

- a Make sure the engine cover / panels are fitted and securely locked.
- b Make sure the fuel filler cap is tightly closed (we also recommend that you lock it).

## Entering/Exiting the Cab

### **⚠ WARNING**

**Do not enter or exit the cab unless the arm rest or lever lock is fully engaged (raised position).**

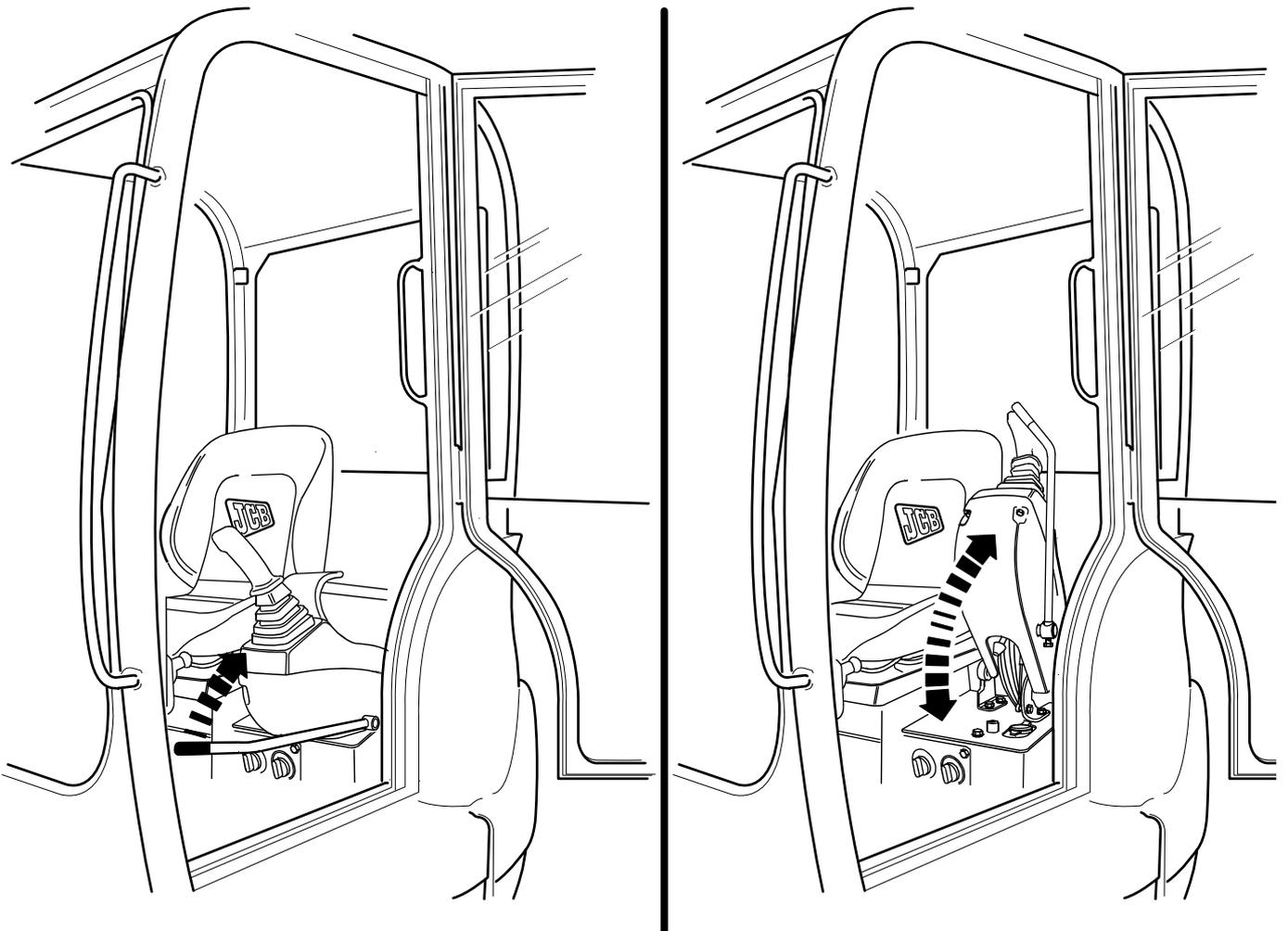
To give sufficient clearance to enter or leave the cab, the left lever lock must be raised.

When the lever lock and control pod are in the raised position the excavator controls cannot be operated. Lowering the lever lock to the normal position connects the excavator controls and allows normal operation.

It is recommended that the engine is switched off before exiting the machine.

### **⚠ WARNING**

**Always face the machine when entering or leaving the cab. Use the step(s) and handrails. 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 or lever locks as handholds, use the handrails. Failure to follow these instructions could result in unexpected movement of the machine.**



## Cab

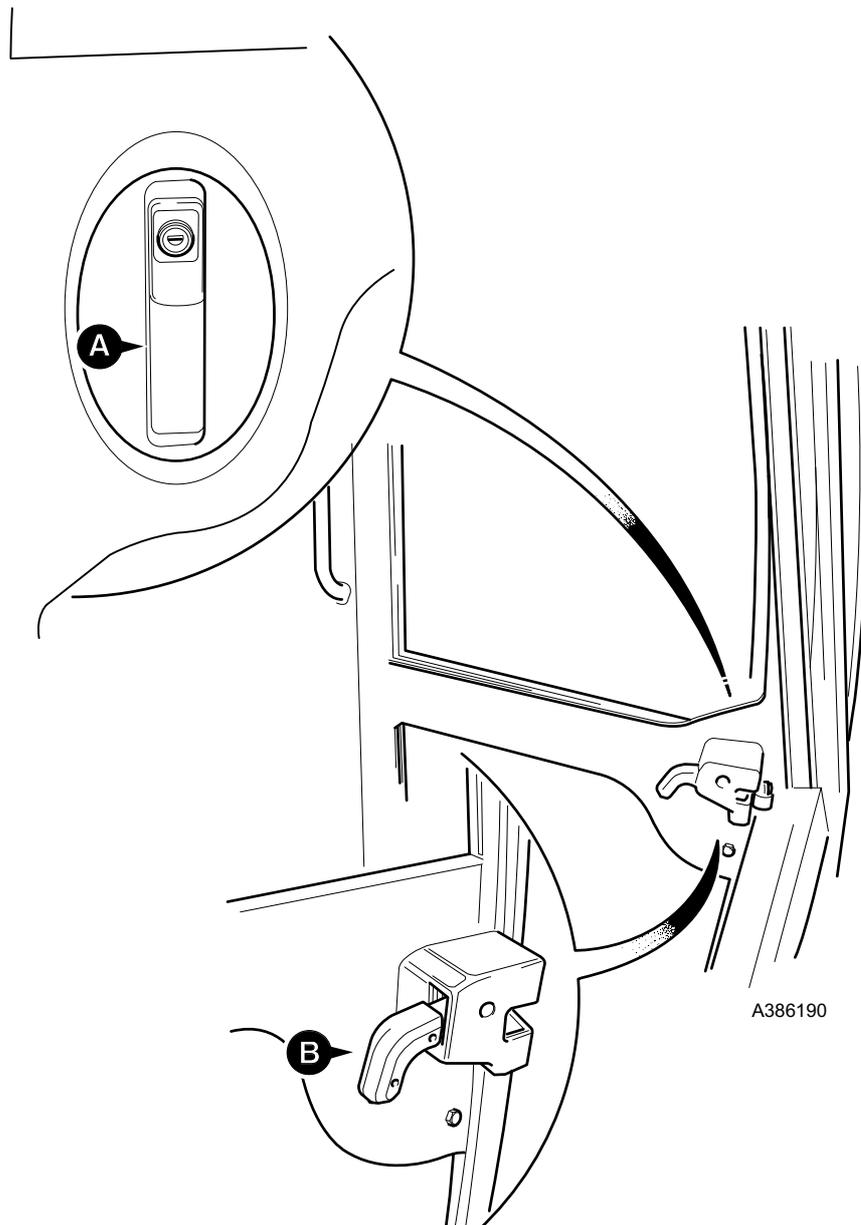
The cab is bolted on top of the mainframe and is a welded steel construction. The cab has a sliding windows on the right side, a hinged door also containing an opening window and an up and over windscreen. All windows are of toughened glass. The cab is fitted with a windscreen wash/wipe, heater fan, seat and all operating controls and instruments.

### CAUTION

**Do not drive the machine with the door unlatched. It must be correctly closed when operating the machine.**

## Opening and Closing the Door

To open a door from the outside, unlock it with the key provided to release the catch. To open a door from inside, push lever **B**. Close the door from the inside by pulling it firmly using the handle, it will latch itself. The door must be in the closed position when operating the machine.



### Opening the Windscreen

To open the up and over window, hold handles **A**, press and hold down securing levers **B**. Lift the screen into a position parallel with the roof using handles **A**, secure in position by releasing levers **B**.

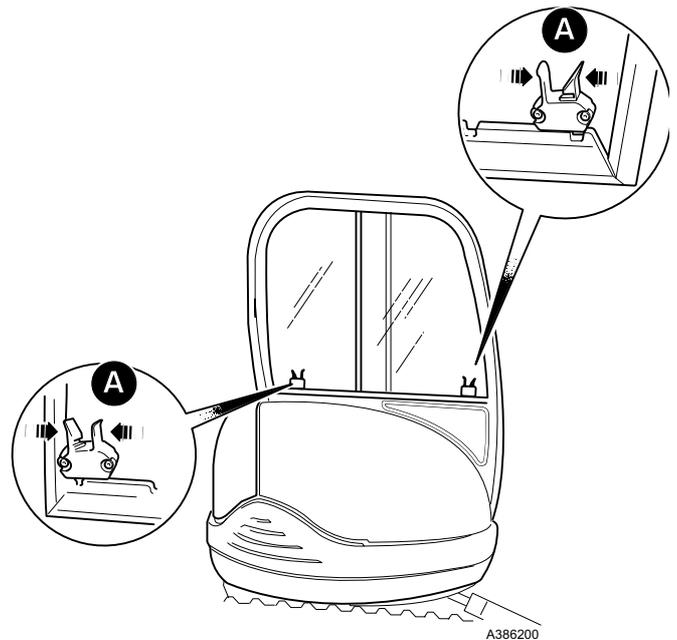
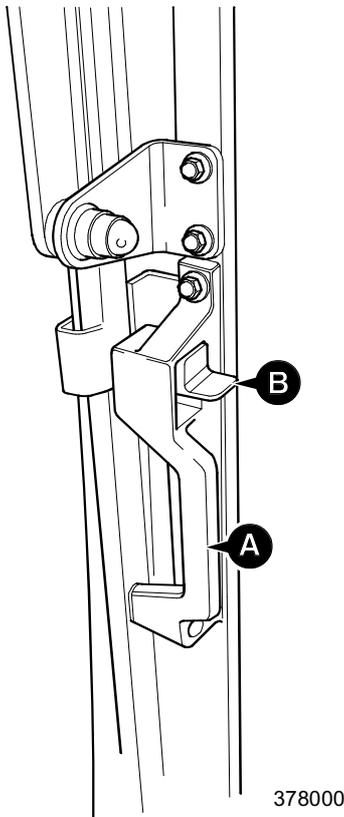
**Note:** Care must be taken when lowering the window not to bump the top edge of the lower front window.

### Opening the Side Windows and Door Window

The side windows are held closed by catches **A** operated from inside the cab.

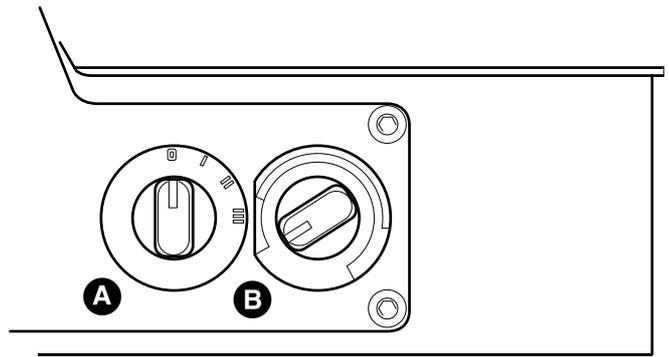
To open the windows, operate the catches **A** and slide the windows to the desired position.

To close a window, slide the window fully shut and check that the catch **A** has located on the frame.



### Heater Controls

Air can be directed into the cab by selecting the required fan speed using switch **A**. Temperature can be selected by means of rotary dial **B**.



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## Seat Control

### **⚠ WARNING**

**Do not adjust the seat with the engine running otherwise your legs could knock the control levers.**

HOP31

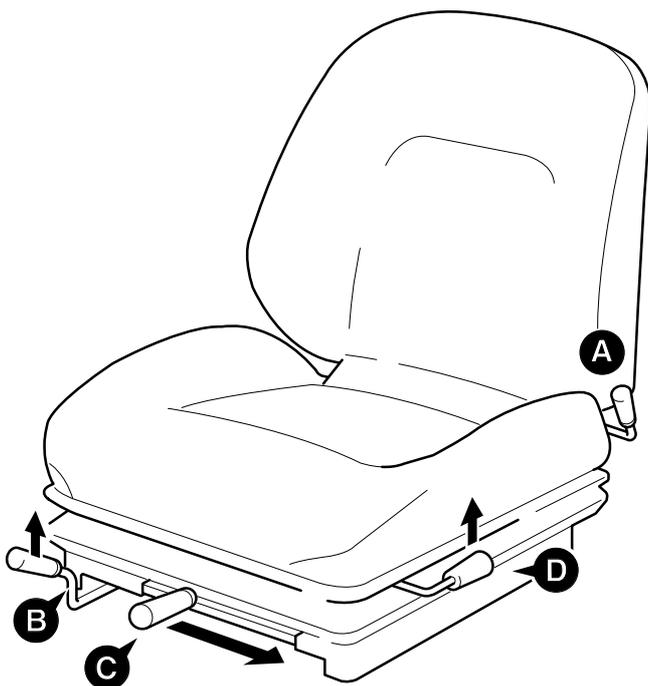
Depending on the type of machine various adjustments can be made to the positions of the control levers and the seat consoles/armrests.

The operators seat can be adjusted for your comfort. A correctly adjusted seat will reduce operator fatigue. Position the seat so that you can comfortably reach the controls with your feet on the cab floor. The seat is adjustable for height and reach.

### **⚠ CAUTION**

**Having adjusted the seat position, ensure the seat locking lever has engaged fully.**

- A** Backrest angle adjustment
- B** Horizontal adjustment
- C** Weight adjustment (50 - 120 kg [110 - 243 lb])
- D** Seat cushion tilt control



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## Seat Belt

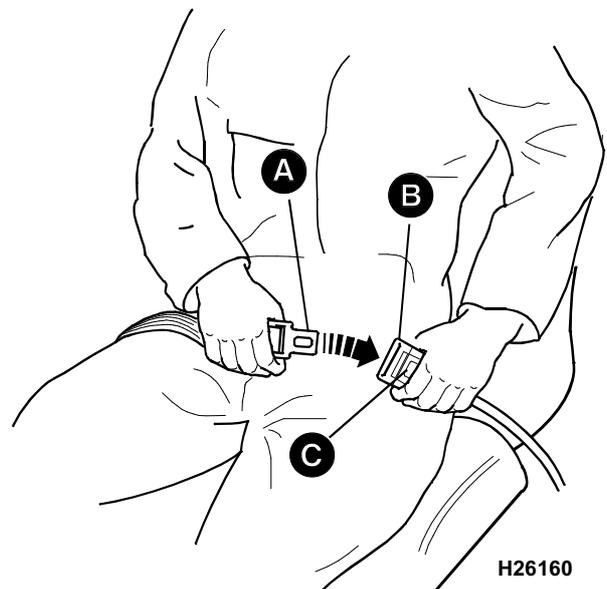
### Fasten the seat belt

Sit correctly in the seat. Make sure the belt is not twisted. Push the male fitting **A** into the buckle **B** until it latches.

### Release the seat belt

Press button **C** and pull the recoil side of the belt outwards.

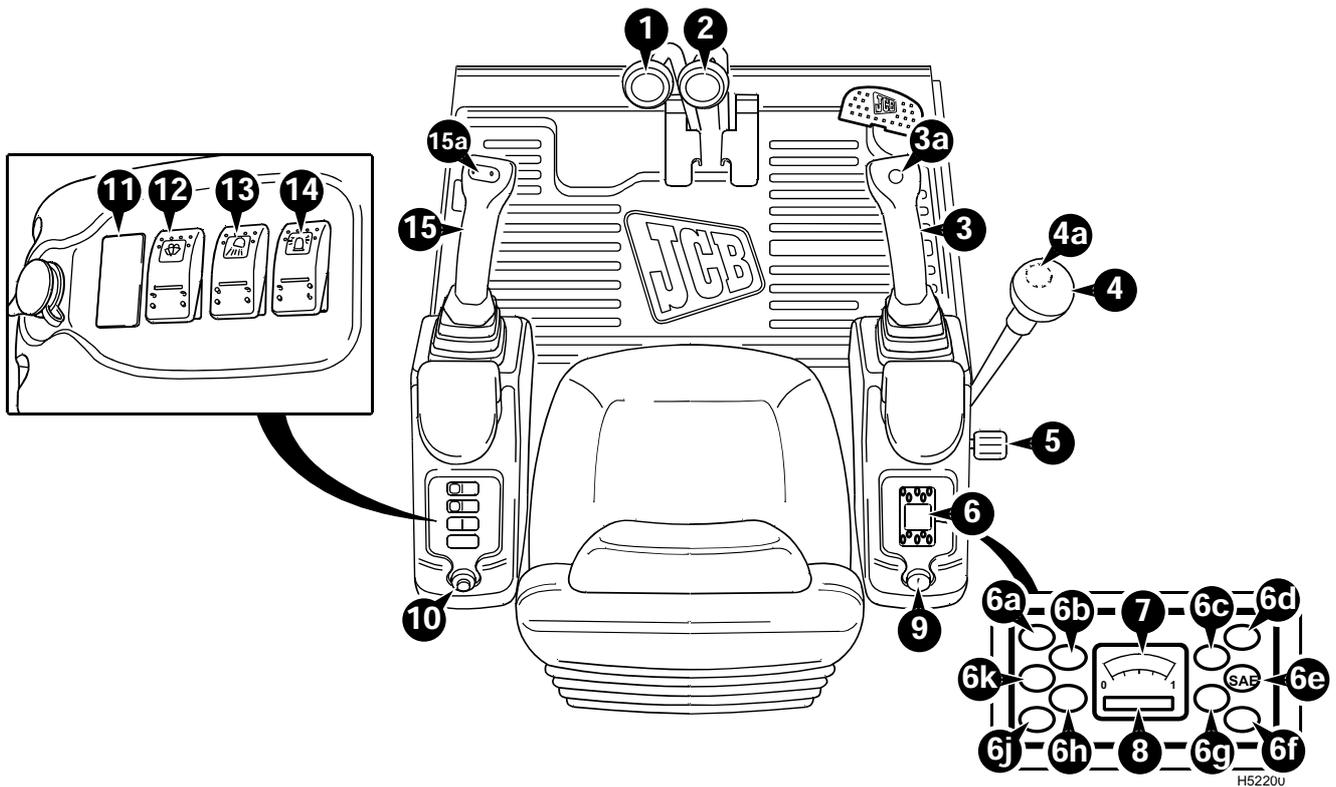
**Note:** Your machine is fitted with a seat belt, USE IT!



H26160

**Engine and Track Controls, Switches and Instruments**

- 1 Left Track Control Lever
- 2 Right Track Control Lever
- 3 Right Hand Controller
- 3a Horn Button
- 4 Dozer Lever
- 4a Two speed Tracking Switch
- 5 Hand Throttle Lever
- 6 Instrument Cluster
- 6a Charge (Fault) Indicator
- 6b Coolant Temperature (High) Indicator
- 6c Not operational on this machine
- 6d Two Speed (High Engaged) indicator
- 6e SAE Controls (selected) indicator
- 6f Glow Plugs (On) indicator
- 6g Air Filter (Blocked) indicator
- 6h Not operational on this machine
- 6j Not operational on this machine
- 6k Engine Oil pressure (Low) indicator
- 7 Fuel Gauge
- 8 Hourmeter
- 9 Ignition Switch
- 10 Accessory Power Socket (Beacon etc.)
- 11 Blank
- 12 Windscreen Wash/Wipe Switch
- 13 Work Lights Switch
- 14 Rotating Beacon Switch
- 15 Left Hand Controller
- 15a Slew / Swing Selector Switch



H5220U

## Engine and Track Controls, Switches and Instruments (continued)

### Track Controls

The two tracks are controlled by a pair of control levers **A** in front of the seat. Each lever controls one track and is spring loaded to a central position. In this position the track does not operate. The left side lever controls the left track. The right side lever controls the right track. The two levers can be operated individually or together as necessary to move the machine as required. This can be done using one hand or both, or by using the spring-loaded pedals **D**. An increase in speed can be achieved by operating the push button switch **B** located in the dozer lever. When high speed is selected indicator **C** will illuminate.

#### **⚠ WARNING**

**Make sure that all persons are clear before moving.**

#### **⚠ WARNING**

**The track controls operate as described when the dozer is located in front of the windscreen. If the dozer is positioned behind the cab, the lever operation will be reversed. It is advisable when tracking to always position the dozer to the front of the machine.**

#### **Forward**

To move the machine forward, push both levers forward. Release the levers to stop.

#### **Reverse**

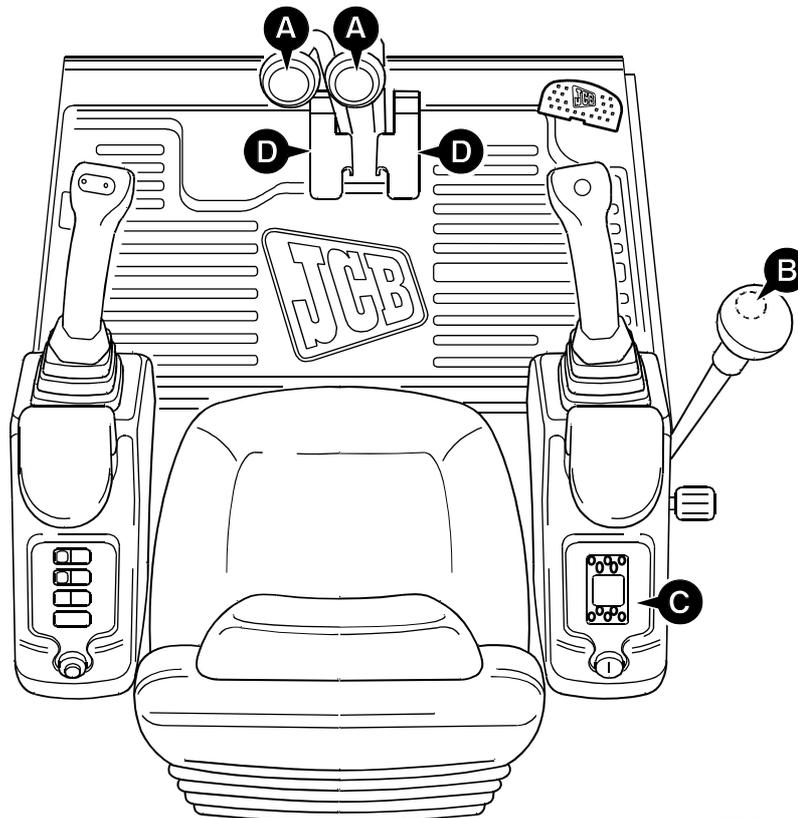
To move the machine backward, pull both levers backward. Release the levers to stop.

#### **Turn**

To turn the machine whilst travelling, move the lever back towards the central position on the side towards which you want to go e.g. 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.

#### **Spin**

To spin the machine around though 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.



H52240

## Engine and Track Controls, Switches and Instruments (continued)

### Engine Controls

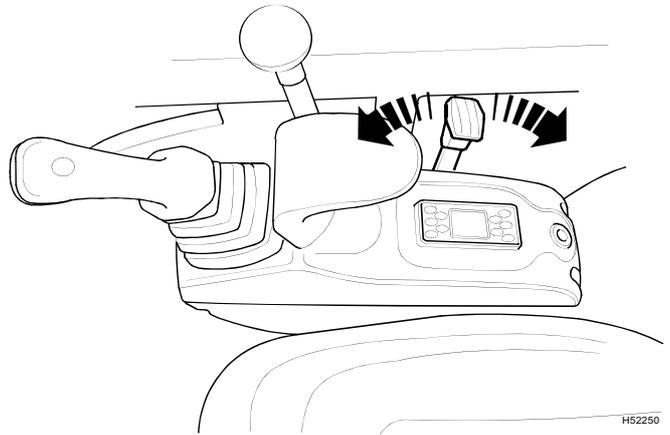
#### Engine Speed

A hand operated throttle lever in the cab, controls the speed of the engine.

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

#### Engine Start / Stop

To start and stop the engine use the starter switch, see Switches on the following page.



### Switches

#### Starter Switch

This is operated by the starter key. It has four positions. The key can only be removed when in the 'O' position.

#### O Off/Stop Engine

Turn the key to this position to stop the engine. Make sure the controls are in neutral and the excavator and dozer are lowered before stopping the engine.

#### I On

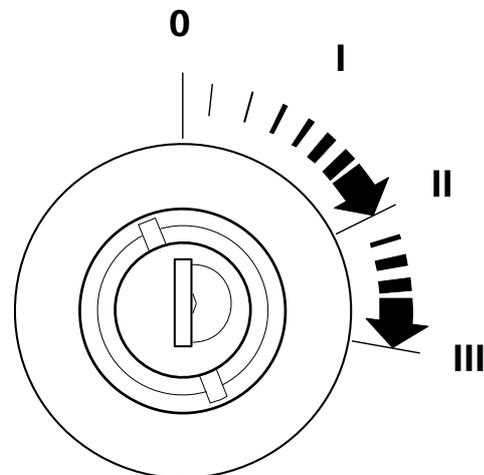
Turning the key in this position connects the battery to the electrical circuits. The key will spring back to this position when released from II.

#### II Heat Position

Holding the key in this position switches on the glow plugs. The glow plugs warm the engine combustion chambers for cold weather starting. Do not hold in this position for more than 15 seconds. The key will spring back to I when released.

#### III Start

Operates the starter motor to turn the engine.



H04432

**Note:** Do not operate the starter for more than 20 seconds at one time.

## Engine and Track Controls, Switches and Instruments (continued)

### Switches - continued

#### Work Light Switch B

On/Off Switch

#### Windscreen Wash/Wipe Switch C

Press the switch down once to switch the windscreen wiper On.

Put the switch to the off position to switch off the windscreen wiper, which will then self park.

To operate the Wash function, press the switch past the wipe position.

Functions only with the starter switch at I.

#### Horn Button D (not illustrated)

This is a push button switch located in the R.H. excavator control lever.

Press the switch to activate the horn.

#### Cab Light E (not illustrated)

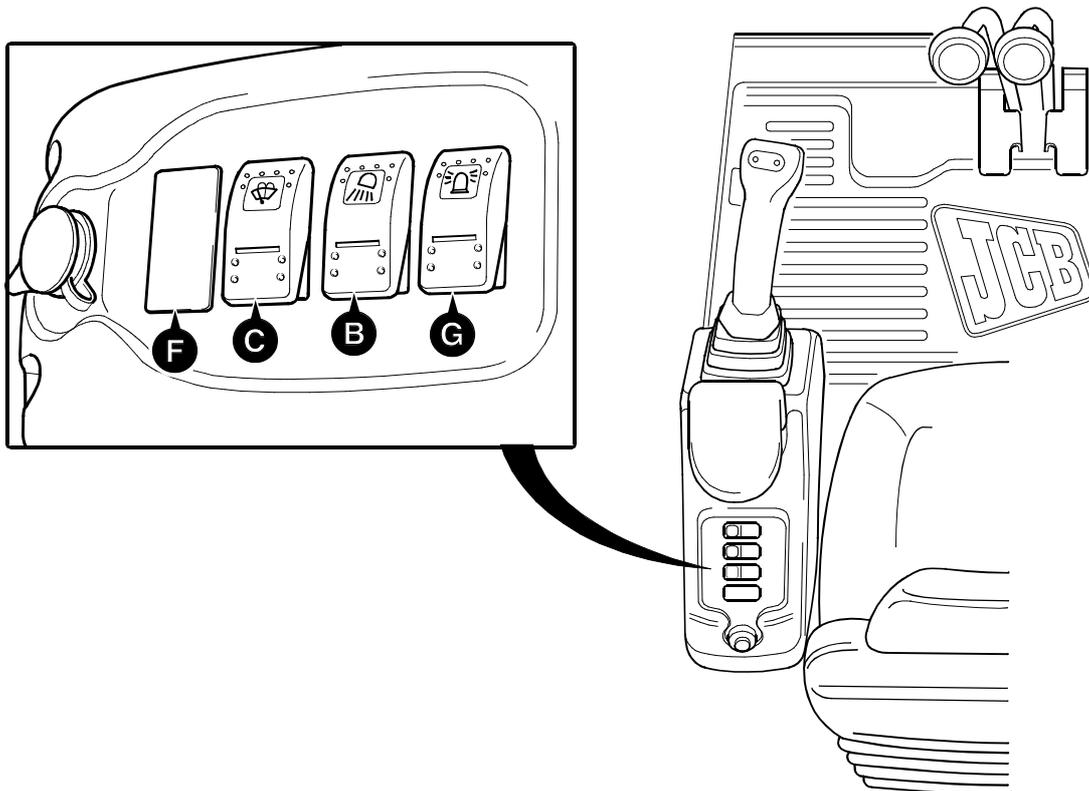
A cab light is situated on the left side of the cab, above the door. It is operated by pressing either end of the light lens.

#### Blank position F

#### Flashing Beacon Switch G

On/Off Switch

Functions with ignition On or Off

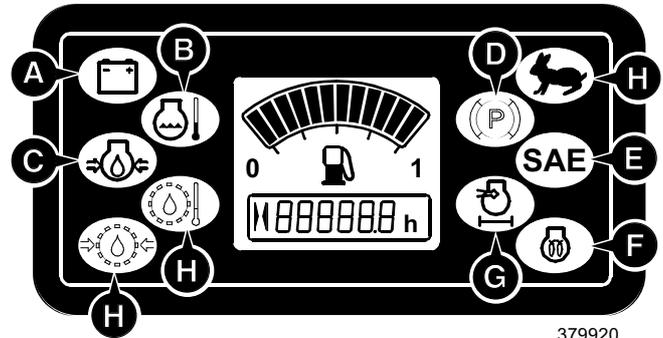


## Engine and Track Controls, Switches and Instruments (continued)

### Instrument Cluster

Indicators for the engine and related systems are mounted in the instrument cluster in the R.H. console.

- A Charge (Fault) Indicator.**  
Indicates Alternator operation, illuminates RED when a Fault occurs.
- B Coolant Temperature (High) Indicator.**  
Illuminates RED when coolant temperature is too high.
- C Engine Oil (Low) Indicator.**  
Illuminates RED when engine oil pressure is too low.
- D Two Speed (High Engaged) Indicator.**  
Illuminates GREEN when high speed is engaged.
- E SAE Controls (Selected) Indicator.**  
Illuminates Green when SAE control pattern is selected.
- F Glow Plugs (On) indicator.**  
Illuminates YELLOW when the Glow Plugs are energised.
- G Air Filter (Blocked) indicator**  
Illuminates YELLOW when the Air Filter is blocked.
- H** Indicators not fitted on this machine.



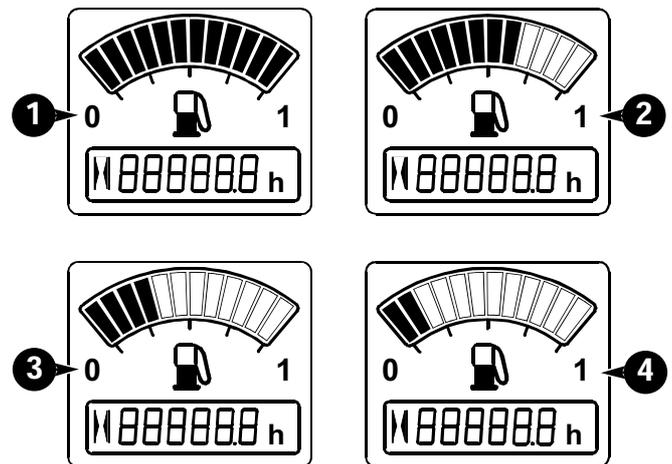
379920

### Digital LCD Fuel Gauge

Fuel Tank Level Indication

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

**Note:** The flashing of all fuel level bars and the filler pump symbol, indicates a fault in the fuel sender circuit. Contact your JCB dealer.



379930

### Audible Warnings

A buzzer will sound if any of the following display a machine fault.

- Charge indicator
- Coolant indicator
- Engine oil pressure indicator
- Air Filter indicator (see instrument cluster illustration)

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

Switch the ignition off, to reset all operations.

## Dozer Controls

The dozer is operated by a single control lever on the right side of the cab. This lever is spring loaded to the central position. In this position the dozer will not move.

### **⚠ CAUTION**

Before operating the dozer, make sure that large rocks or other objects are not between it and the tracks that can jam the mechanism.

HOP34

### **⚠ CAUTION**

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

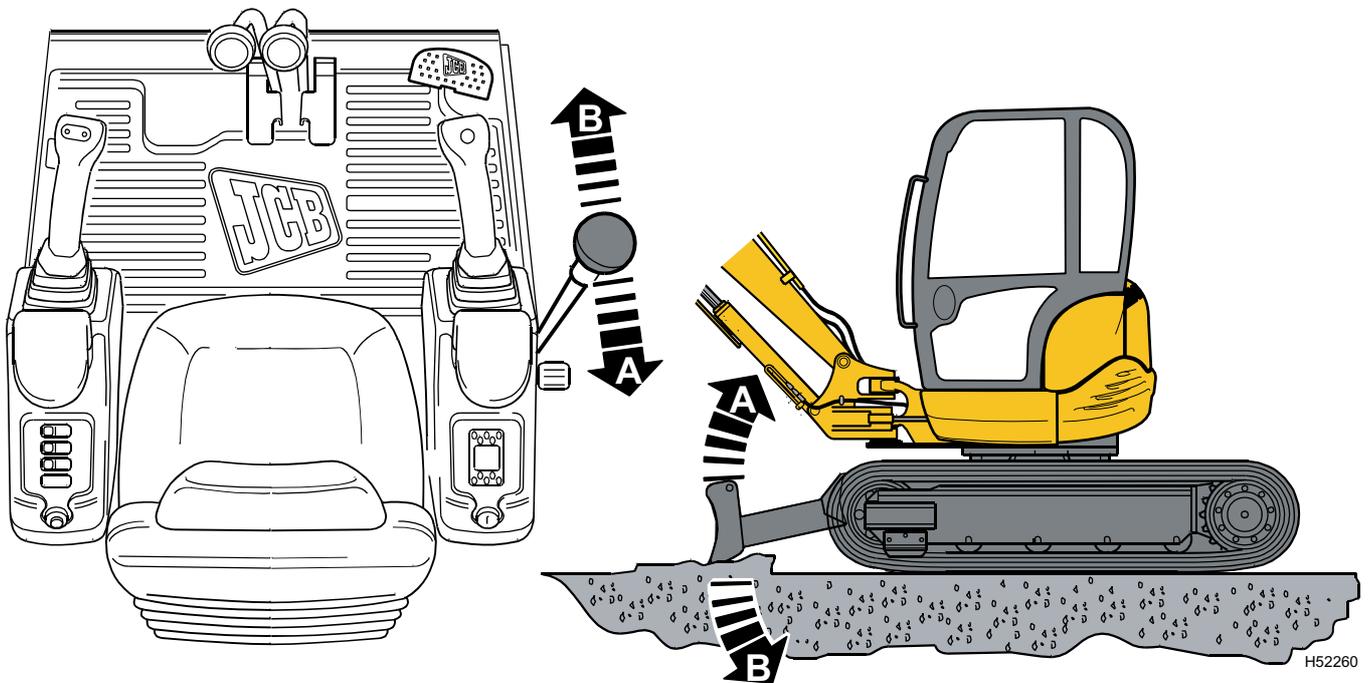
HOP35

### **Raise dozer 'A'**

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

### **Lower dozer 'B'**

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.



H52260

## Excavator Controls

The slew lock is situated in the seat base. Lift and turn it through 90° to unlock. Ensure it is UNLOCKED before operating the excavator controls.

The excavator controls consist of those levers which operate the boom, dipper and bucket and swing the machine.

There are two excavator controllers **A** and **B** which control all the functions. The controls are situated in the operators seat armrests. Raising the left armrest when leaving the cab prevents the services operating. When re-entering the cab, ensure the armrest is replaced firmly to ensure correct operation.

The left side controller **A** controls excavator swing and cab slew, via a selector switch **C** in the controller, it also controls dipper functions.

The right side controller **B** controls boom and bucket functions as standard.

It is possible to specify SAE style operating functions i.e. left controller **A** controlling swing/slew and boom. The right hand controller **B** controlling dipper and bucket operation. Both controllers are spring loaded to the central position. In this position related services will not operate.

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

### **⚠ WARNING**

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

**Make sure you do not exceed the working capacity of the boom at maximum reach.**

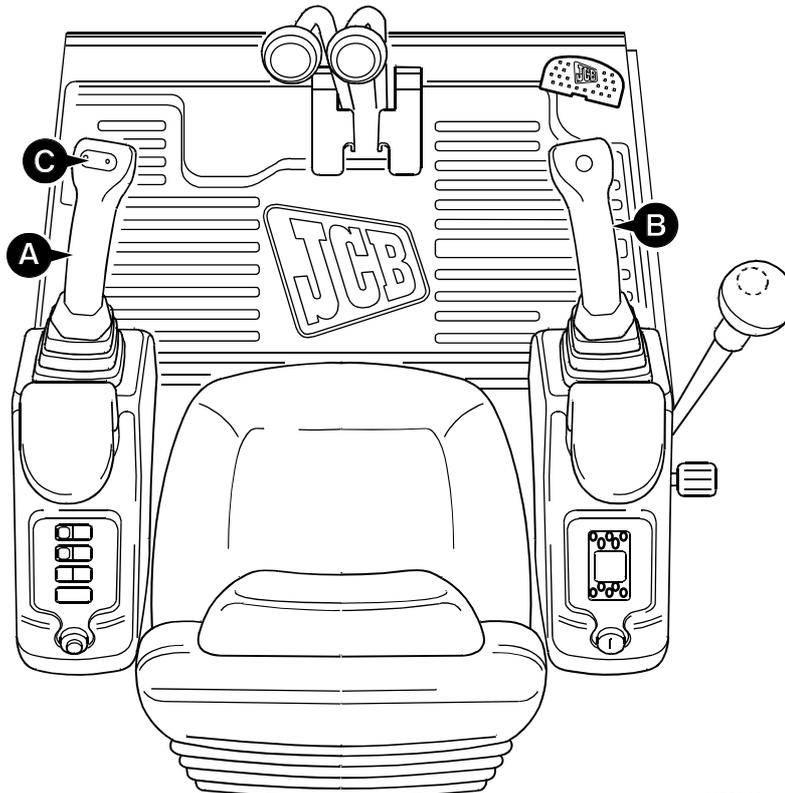
**Swing the boom slowly to prevent any chance of the machine becoming unstable. For the same reason avoid dumping downhill if possible.**

HOP36

### **⚠ CAUTION**

**Do not excavate on hard or rocky ground with the boom set diagonally across the undercarriage. This induces a rocking motion that can cause damage to the track gearbox sprockets and tracks.**

HOP37



H52240

## Excavator Controls (continued)

Before slewing the mainframe ensure the slew lock **D** is disengaged, (the up position).

The slew/swing function is selected by operation of a single switch in the left hand controller.

The control will always default to slew function when the ignition is switched off.

The machine should be set for slew operation. Ensure you are in slew mode by operating the left hand control lever and noting the movement.

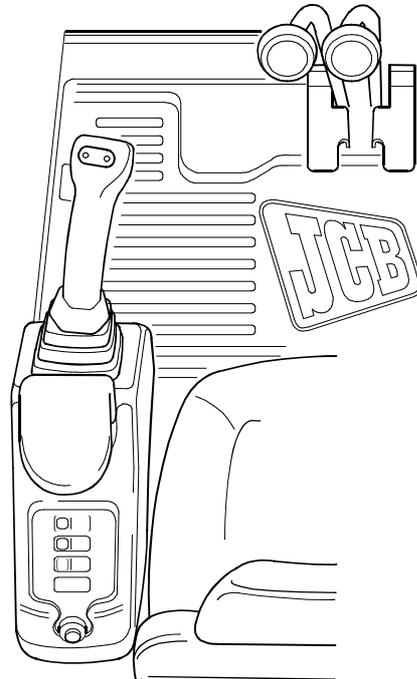


### Slew mainframe left

To slew the cab to your left, move the left controller to the left. Release the controller when you have moved to the desired position.

### Slew mainframe right

To slew the cab to your right, move the left controller to the right. Release the controller when you have moved to the desired position.



To select swing press button on left hand controller once.

### Swing boom left

To swing the boom to your left, move the left controller to the left. Release the controller when you have reached the desired position.

### Swing boom right

To swing the boom to your right, move the left controller to the right. Release the controller when you have reached the desired position.

## **⚠ CAUTION**

**When the requirement for boom swing has finished, position boom to the straight ahead configuration and reset machine to 360° slew by pressing the button on the left hand controller once.**

## Excavator Controls (continued)

### **⚠ WARNING**

Thoroughly warm the hydraulic oil before operating the excavator services. To ensure smooth boom operation damping is incorporated into the boom lift circuit, this means when boom raise is released, the boom may continue to rise for a fraction of a second if the oil is not at the correct operating temperature. Before selecting boom up, check there are no overhead obstructions or electric power cables.

### **⚠ CAUTION**

The boom service is operated by the R.H. controller on standard ISO control machines or by the L.H. controller on the optional SAE control pattern machines.

HOP41

### **Raise boom**

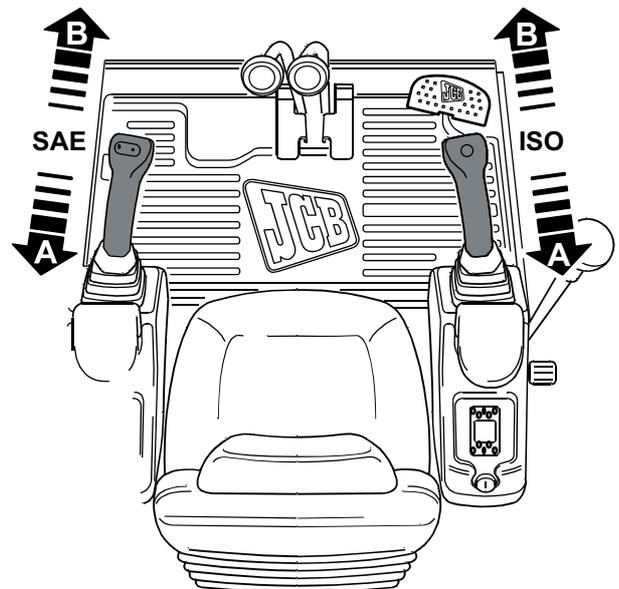
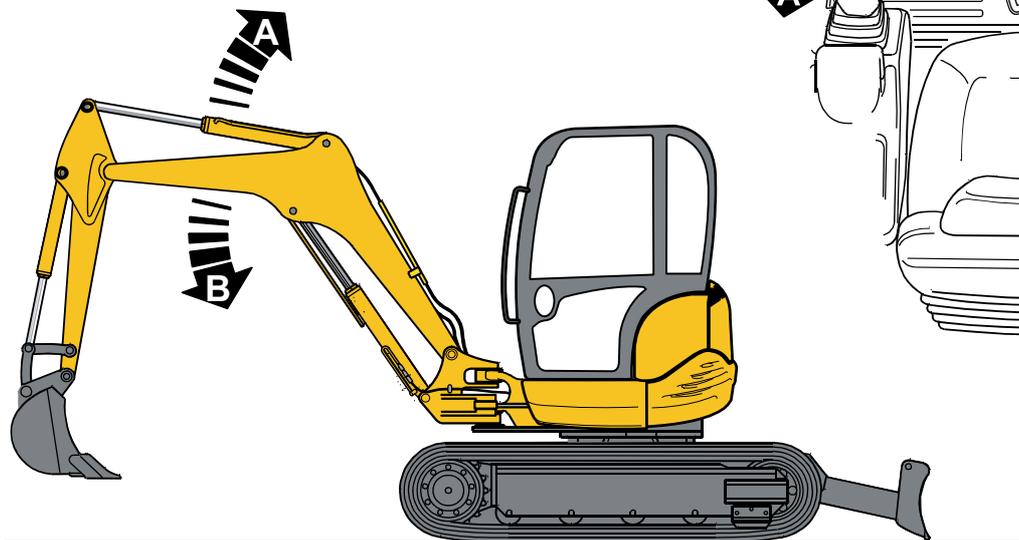
To raise the boom pull the respective controller backwards **A**. Release the controller when the boom has reached the desired position. The boom ram incorporates damping at the limit of boom raise, reducing the speed of the ram, eliminating shock loadings.

### **Boom boost**

Partial selection of the controller will limit the speed of boom raise. Boom Boost is automatically engaged when controller is fully selected.

### **Lower boom**

To lower the boom, push the respective controller forwards **B**. Release the controller when the boom has reached the desired position.



379310

## Excavator Controls (continued)

### ⚠ CAUTION

The dipper service is operated by the L.H. controller on standard ISO control machines or by the R.H. controller on the optional SAE control pattern machines.

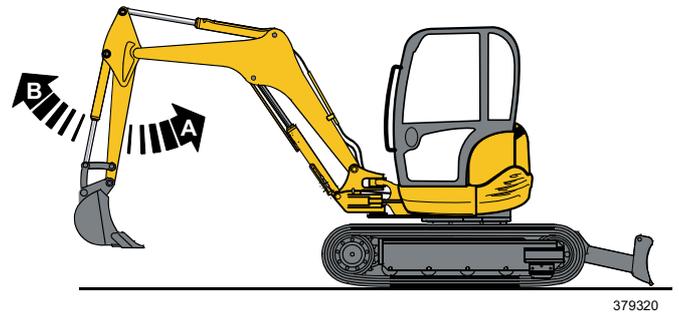
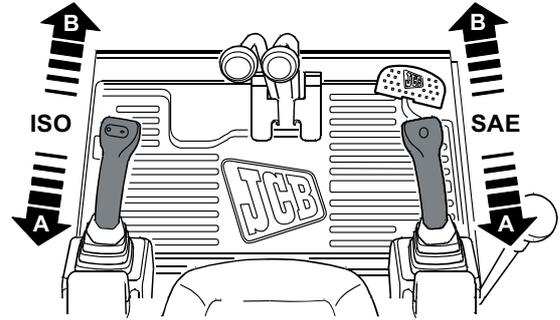
HOP42

#### Dipper In

To bring the dipper in, pull the respective controller backward **A**. Release the controller when the dipper is at the desired position.

#### Dipper Out

To push the dipper out, push the respective controller forward **B**. Release the controller when the dipper is at the desired position.



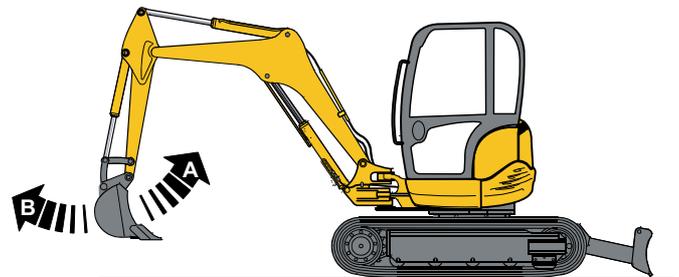
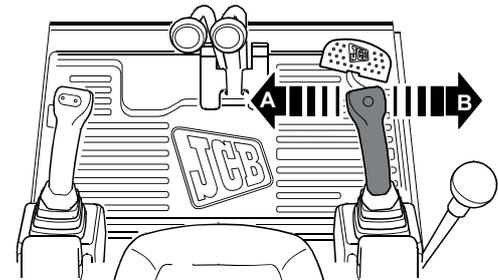
379320

#### Close bucket

To close the bucket (to gather a load), move the right controller to the left **A**. Release the controller when the bucket is closed sufficiently.

#### Open bucket

To open the bucket (to dump a load), move the right controller to the right **B**. Release the controller when the bucket is open far enough.



379330

## Refuelling the Machine

### **⚠ WARNING**

Diesel fuel is flammable. Keep flames away from the machine. **DO NOT** smoke while fuelling the machine or working on the engine. Do not refuel with the engine running. There could be a fire and injury if you do not follow these precautions.

INT-3-2-2

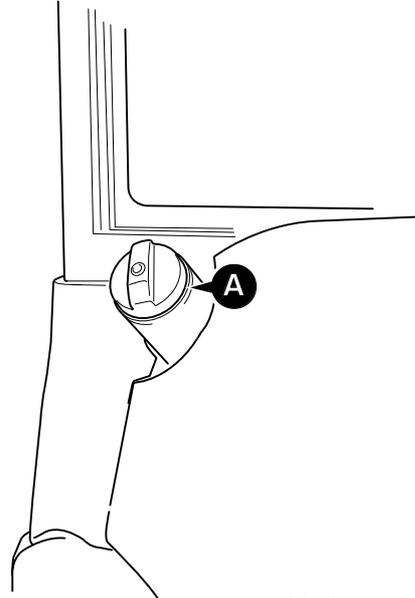
### **⚠ CAUTION**

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

**Do not use fuel to clean the machine.**

When refuelling, unlock and remove filler cap **A**, (choose a well aired and ventilated area), add the amount of fuel required, replace filler cap and lock the cap in place.

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



A391090

## Before Starting the Engine

**Note:** Read Operating in Low Temperatures or Operating in High Temperatures in operation section if you will be using the machine in very hot or cold climates.

### WARNING

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.

HOP43

#### 1 Lower the attachments to the ground.

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.

#### 2 Do a pre-start inspection.

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

- a If you haven't already done it, do a walkround inspection of the outside of the machine. See before entering the cab in operation section
- b Remove dirt and rubbish from the cab interior, especially round the pedal and control levers.
- c Remove oil, grease and mud from the pedals and control levers.

### WARNING

Keep the machine controls clean and dry. Your hands and feet could slide off slippery controls. If that happens you will lose control of the machine. HOP44

- d Make sure that your hands and shoes are clean and dry.

### WARNING

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 will lose control of the machine.

HOP45

- e Remove or secure all loose articles in the cab, such as lunch boxes, tools etc.
- f Check round the cab for loose or missing bolts, screws etc. Fit new ones or tighten where necessary.
- g Inspect the seat belt and its mountings for damage and excessive wear.
- h Check that the following are in working order: Lights, Horns, all Switches and Wiper.
- j Check the excavator lever gaiters are not damaged or loose, replace or secure as required with new fasteners.

#### 3 Adjust the Seat

Adjust the seat so that you can comfortably reach all driving controls. You should be able to operate the control pedal with your back against the seat back.

Ensure the seat locking lever has engaged fully.

#### 4 Set the hand Throttle Lever

Set the hand throttle lever to idle.

**1 Start the engine**

Move the throttle lever to full speed position. Turn the starter key to the glow plug position II for approximately 6 seconds to warm the engine combustion chambers.

**Note:** Outside temperatures below 0° C (32° F) will require extended times.

Turn the starter key further to position III and hold it there until the engine starts; do not exceed 20 seconds. If the engine does not start, return to the OFF position before repeating step 1.

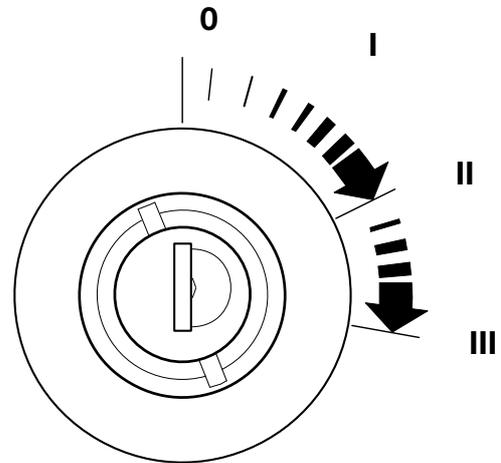
**2 Check the indicators****⚠ CAUTION**

Once the engine has started, move the throttle lever to the idle position. Check that all the warning lights have gone out. Do not race the engine until the 'oil pressure low' light has extinguished.

If any indicator fails to extinguish, or if they illuminate while the engine is running, make the machine safe, stop the engine and investigate the cause. HOP46

**3 Warm up the engine and hydraulics**

Allow the engine to warm up at idle speed for five minutes. If the engine has been jump-started, remove the booster cables (see jump starting the engine). Operate the excavator a few times to help warm up the hydraulic system.



HO4432

## Jump Starting the Engine

**Note:** Read battery pages in section **C** of this handbook before carrying out any work with the battery.

Follow the instructions on this and the following page to start the engine using booster cables. Your machine has a 12 V starting system. The negative (-) terminal on the battery is connected to frame earth.

### **⚠ WARNING**

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

Do not use a battery if its electrolyte is frozen. To prevent the battery electrolyte from freezing, keep the battery at full charge.

### **⚠ WARNING**

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

HOP43

#### 1 Lower the Attachments to the Ground

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 control. Operate the control carefully to control the rate of descent.

#### 2 Set all switches in the cab to off

### **⚠ CAUTION**

The booster supply should not be higher than 12 V. Using a welder or higher voltage supply will damage your machine's electrical system.

### **⚠ CAUTION**

Do not connect two batteries together to give 24 V. This could burn out the glow plugs and damage the starter motor.

#### 3 Remove the left hand mainframe skirt to gain access to the battery.

#### 4 Connect the Booster Cables

- a Remove battery cover if fitted.
- b 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.
- c Connect the negative (-) booster cable to a good frame earth on the machine, away from and below the battery.

**Note:** A good frame earth is part of the machine frame, free from paint and dirt. Do not use a pivot pin for an earth.

- d Connect the other end of this cable to the negative (-) terminal on the booster supply.

#### 5 Do the pre-start Checks

See before starting the engine

#### 6 Start the engine - see Starting the Engine

#### 7 Disconnect the Booster Cables

- a Disconnect the cable from the machine frame earth, then disconnect it from the booster supply.
- b Disconnect the positive booster cable from the positive (+) terminal on the battery, then disconnect it from the booster supply.

#### 8 Fit battery cover (if required).

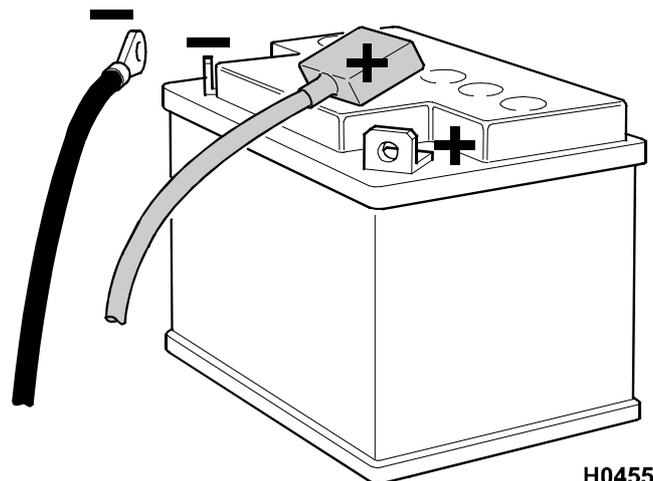
#### 9 Refit items removed to gain access to the battery.

### **⚠ WARNING**

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

Make sure that the fuel filler cap is tightly fitted. Make sure that all spilt fuel is cleaned away from the battery area.

HOP48



H04551

## Cold Climate Warm Up

Before starting work in temperatures below -15 °C (5 °F), hydraulic fluid must be warmed.

### 1 Warm up Engine

After starting the engine (see starting engine) set the throttle lever to mid position and run for 10 minutes.

DO NOT operate any services. After the warm up period make sure that everyone is clear of the machine.

### 2 Warm up Hydraulic Oil

a Increase engine speed to maximum. Warm the hydraulic oil by repeatedly selecting bucket crowd by moving the right hand lever to the left for 5 seconds. Repeat for several minutes.

b Select dozer up by moving dozer control lever backwards, keep selected for one minute.

### 3 Warm up Hydraulic Circuit

a Reduce engine speed by moving throttle lever to mid position.

b Raise and lower boom from ground level to full height five times.

c Stroke the dipper fully in both directions, five times.

d Rotate the bucket fully in both directions, five times.

e Swing the upper structure clockwise for one revolution and stop. Swing the upper structure anti-clockwise for one revolution and stop.

f Repeat step 3c three times.

4 The machine should now operate correctly. Should operation still appear slow, then steps 3b and 3c may be repeated.