
ENTATAS

1.7 TONNE MINI EXCAVATOR

OPERATING INSTRUCTIONS



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1. INTRODUCTION:

The following information on the operation of the Hitachi ZX17U mini excavator has been provided to enable the safe operation of the machine by a competent operator.

The machine must only be operated by a competent operator, it is the responsibility of any person intending to operate the machine to ensure they are competent in the safe operation and servicing of the machine prior to its use.

2. SAFETY:

2.1. PPE

Wear close fitting hi viz clothing and safety equipment appropriate to the job, e.g., safety shoes, safety glasses/goggles/face shield, hearing protection, wet weather gear, respirator/filtered mask.



2.2. PRESTART INSPECTION

Inspect the machine carefully each day before start-up to avoid personal injury or damage to the machine.

Use the checklist provided to ensure each check point is inspected.



2.3. GENERAL PRECAUTIONS FOR CAB

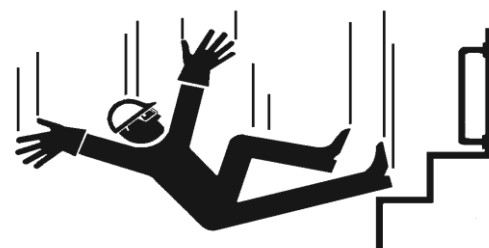
Before entering the cab area ensure your hands, boots are free of dirt and/or grease and oil, this could cause a foot to slip off a control or step/control lever.

Keep the operator's area clear of tools, drink bottles or other objects to prevent trip hazards and/or jamming of control pedals/levers

Always use the handrails and crawler/tracks when mounting and dismounting, never use controls as handholds

Always maintain 3 points of contact,

Always face the machine when mounting and dismounting,



2.4. BEFORE RISING FROM OR LEAVING OPERATOR'S SEAT

Before rising from the operator's seat and/or leaving the machine,

- be sure to first lower the front attachment to the ground
- move the pilot control shut off lever to the lock position to avoid unexpected movement due to unintentional contact with a control lever.

2.5. FASTEN YOUR SEAT BELT

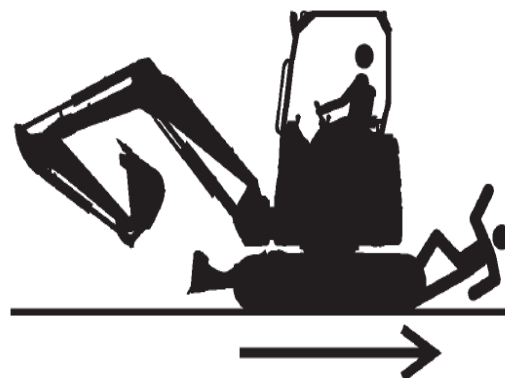
- Prior to operating the machine, thoroughly examine webbing, buckle and attaching hardware. If any item is damaged or worn, replace the seat belt or component before operating the machine.
- Be sure to remain seated with the seat belt securely fastened at all times when the machine is in operation to minimize the chance of injury from an accident.



2.6. MOVE AND OPERATE MACHINE SAFELY

Note: Bystanders can be run over

- Take extra care not to run over bystanders. Confirm the location of bystanders before moving, swinging, or operating the machine.
- Always keep the travel alarm and horn in working condition (if equipped). It warns people when the machine starts to move.
- Use a signal person when moving, swinging, or operating the machine in congested areas. Coordinate hand signals before starting the machine.
- Use appropriate illumination. Check that all lights are operable before operating the machine. If any faulty illumination is present, immediately repair it.
- If a canopy cover is installed, ensure that window coverings are open, you have a clear field of view and take extra care of 'blind spots' when operating machine



2.7. OPERATE ONLY FROM OPERATOR'S SEAT

Inappropriate engine starting procedures may cause the machine to run away, possibly resulting in serious injury or death.

- Start the engine only when seated in the operator's seat.
- NEVER start the engine while standing on the track or on ground.
- Do not start engine by shorting across starter terminals.
- Before starting the engine, confirm that all control levers are in neutral.
- Before starting the engine, confirm the safety around the machine and sound the horn to alert bystanders

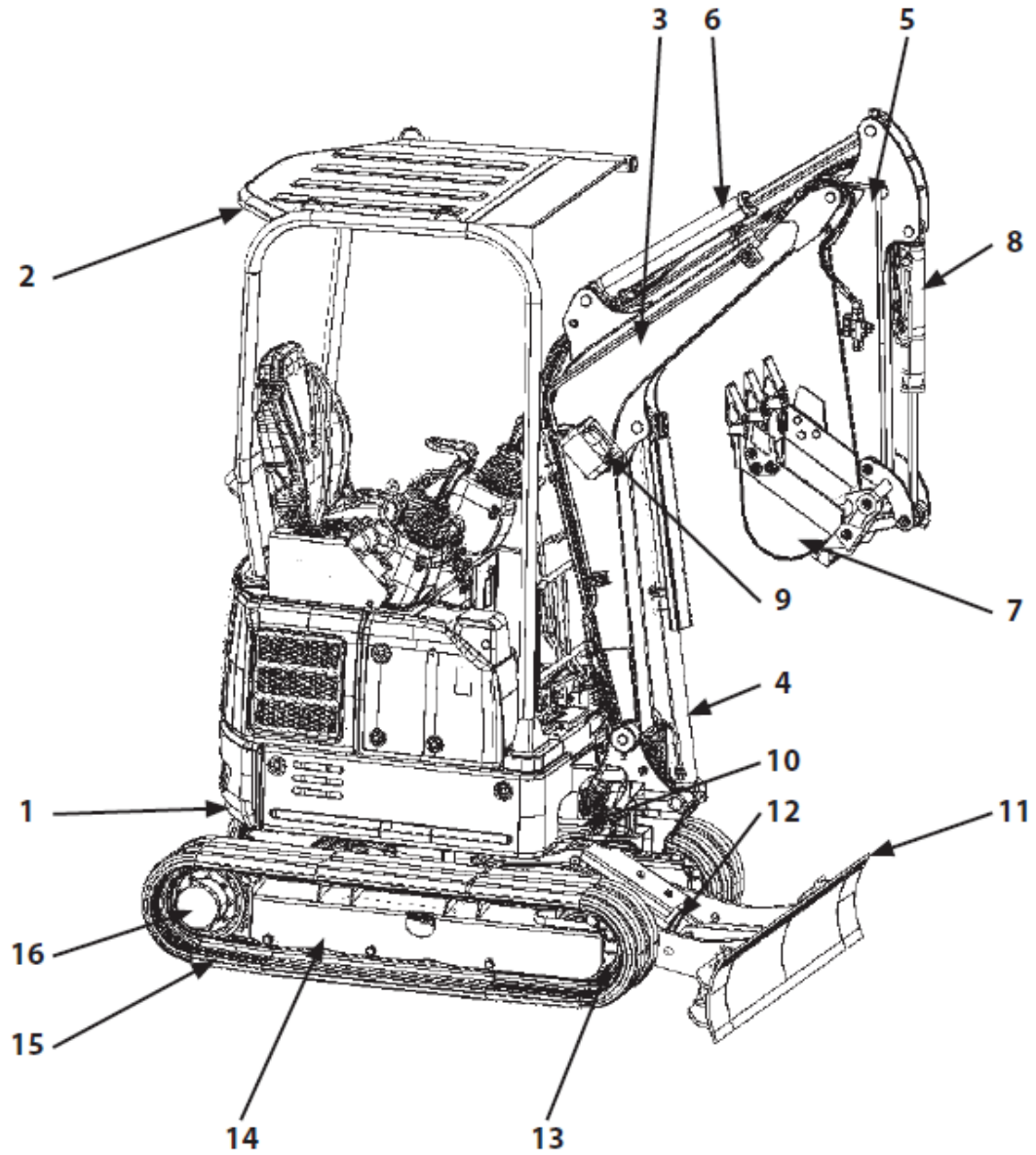
2.8. KEEP RIDERS OFF MACHINE

Never allow anyone to ride attachments or load. This is an extremely dangerous practice. Riders on machine are subject to injury such as being struck by foreign objects and being thrown off the machine.

- Only the operator should be on the machine. Keep riders off
- Riders also obstruct the operator's view, resulting in the machine being operated in an unsafe manner



3. COMPONENTS NAME



1- Counterweight

2- Canopy

3- Boom

4- Boom Cylinder

5- Arm

6- Arm Cylinder

7- Bucket

8- Bucket Cylinder

9- Work Light

10- Boom Swing Cylinder

11- Blade

12- Blade Cylinder

13- Front Idler

14- Track Frame

15- Track Shoe

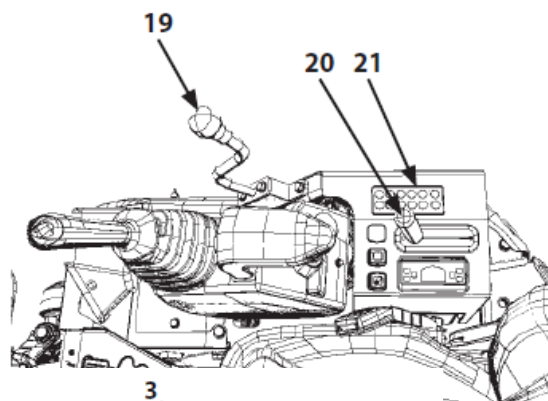
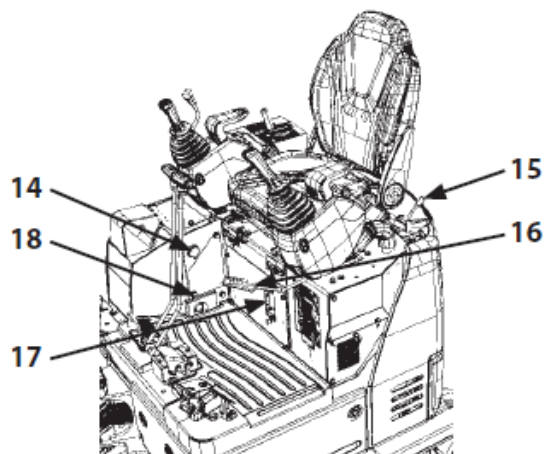
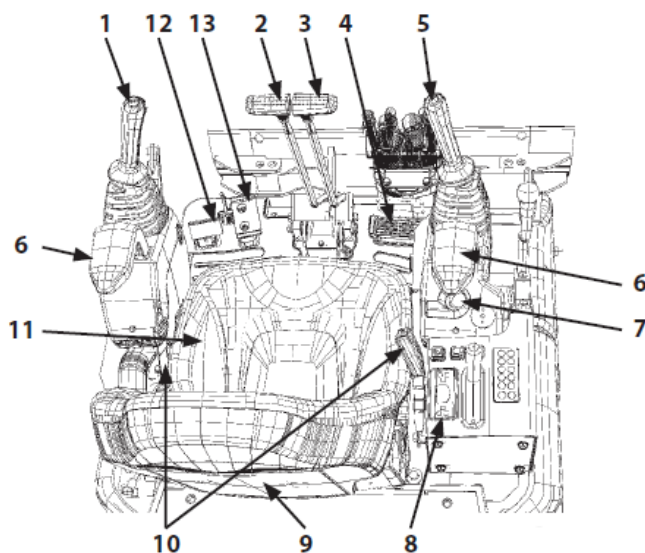
16- Travel Device

4. OPERATOR'S STATION

4.1. LAYOUT

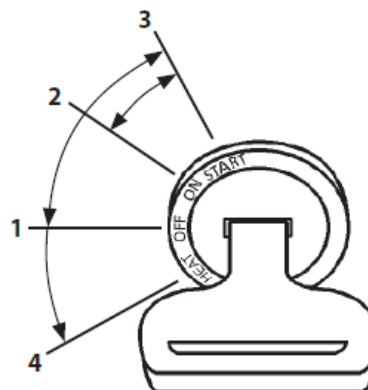
ZX17U-5A

- 1- Left Control Lever
- 2- Left Travel Lever
- 3- Right Travel Lever
- 4- Swing Pedal
- 5- Right Control Lever/Horn Switch
- 6- Wrist Rest
- 7- Key Switch
- 8- Monitor
- 9- Seat Back Box (Optional)
- 10- Seat Belt
- 11- Operator's Seat
- 12- Travel Mode Pedal
- 13- Auxiliary Pedal
- 14- Auxiliary Power (Optional)
- 15- Side Frame Extend/Retract Lever
- 16- Pilot Control Shut-Off Lever
- 17- Fuse Box
- 18- Selector Valve
- 19- Blade Lever
- 20- Engine Control Lever
- 21- Numeric Keypad Lock System (Optional)



4.2. KEY SWITCH

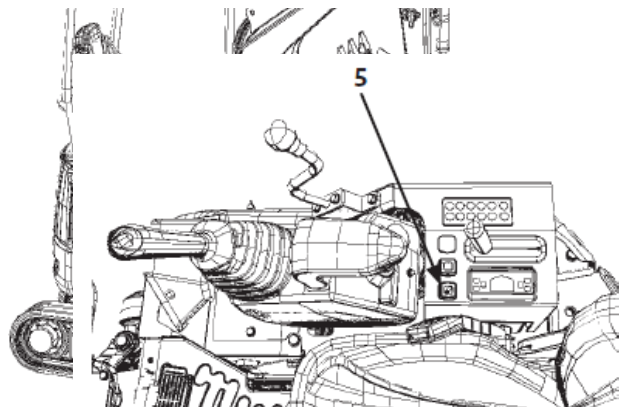
- 1- OFF (Engine Off)
- 2- ON
- 3- START (Engine Start)
- 4- HEAT (Engine Preheat)



4.3. SWITCH PANEL

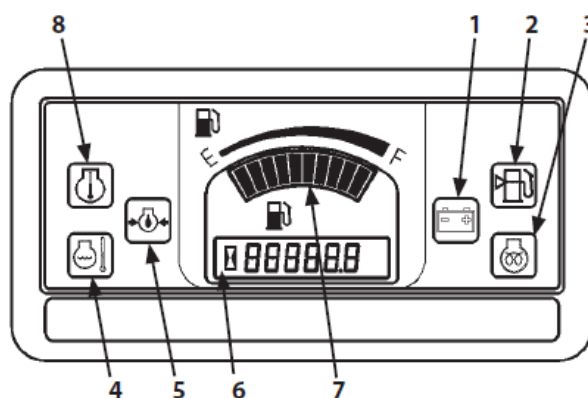
5- Work Light Switch

Press switch (5) to turn ON work light (9) located on the boom.



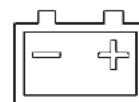
4.4. MONITOR PANEL

- 1- Alternator Indicator
- 2- Fuel Level Indicator
- 3- Preheat Indicator
- 4- Overheat Indicator
- 5- Engine Oil Pressure Indicator
- 6- Hour Meter
- 7- Fuel Gauge
- 8- Coolant Temperature Indicator



4.5. ALTERNATOR INDICATOR

The red indicator will light when low alternator output is present.
Check the electrical system such as the alternator and/or battery system.



4.6. FUEL LEVEL INDICATOR

When the remaining fuel level indicator comes ON at flat ground, the remaining fuel level is at approximately 5 litres. Refill fuel as soon as possible.



4.7. PREHEAT INDICATOR

It is lit when the key switch is turned to the HEAT position. After turning the key switch to the HEAT position, the preheat indicator turns OFF when preheating is finished. Preheating time on the ZX17U-5A approximately 4 seconds



4.8. OVERHEAT INDICATOR

If the coolant temperature rises extremely high, this indicator lights. If the red light comes ON, the buzzer sounds at the same time. Immediately stop machine operation and reduce engine speed to the slow idle speed to lower the coolant temperature.



4.9. ENGINE OIL PRESSURE INDICATOR

The red indicator will light when the engine oil pressure is low. If the red indicator comes ON, the engine oil pressure warning buzzer will sound at the same time. Immediately stop the engine. Check the engine oil pressure system and the oil level for any abnormality.



4.10. HOUR METER

Total (accumulated) machine operation hours counted since the machine started working, are displayed in the unit of HOUR (h). One digit after the decimal point indicates the tenths of an hour (6 minutes).



4.11. FUEL GAUGE

The gauge segment position indicates the fuel level. Refill the fuel before only the E-marked segment comes ON.



4.12. COOLANT TEMPERATURE INDICATOR

When the key switch is turned to the ON position, the indicator will light when the engine coolant temperature is low.

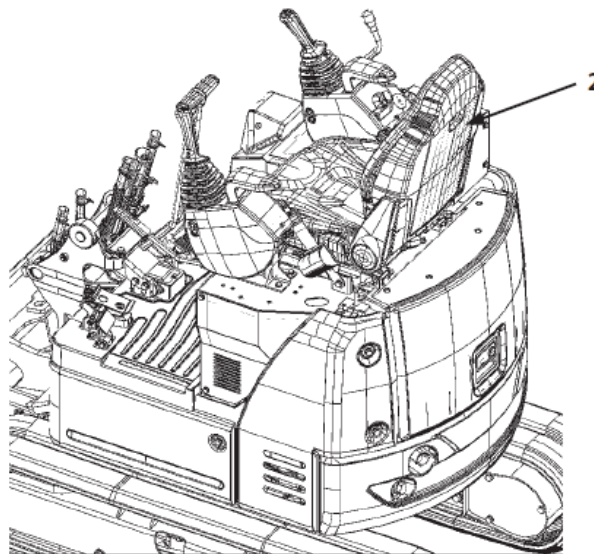
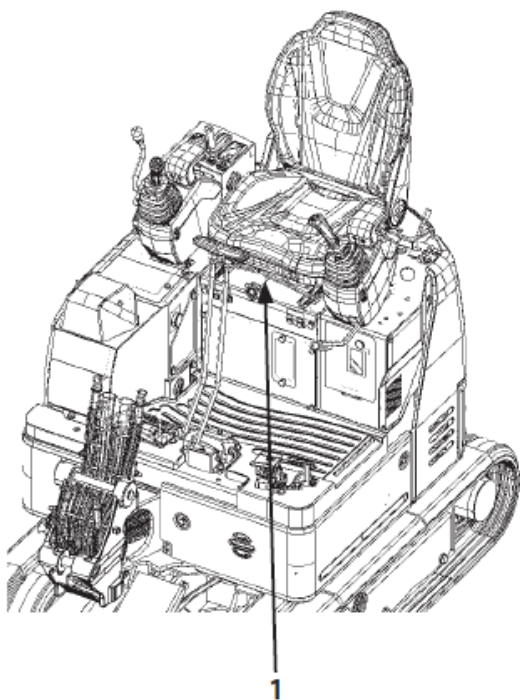


4.13. ADJUSTING THE SEAT

Seat Fore-aft Adjustment:

Release the seat lock by pulling in adjuster bar (1) horizontally. Move the seat backward and forward. Seat fore-aft is adjustable as follows:

Pictured below, the ZX17U-5A adjustable range is 14 steps (140 mm in total)



4.14. SEAT BACK BOX

Pictured above right, the Pocket (2) is located at the back side of the seat. Put the operator's manual inside.

5. GETTING ON/OFF THE MACHINE

Foothold (1) and handrails (4) are provided around the entrance. These are used to get on and off the cab safely as well as to do inspection and maintenance of the machine safely.

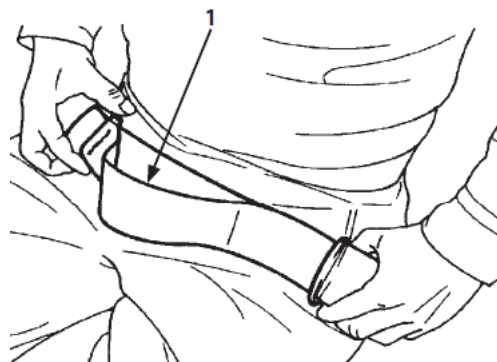
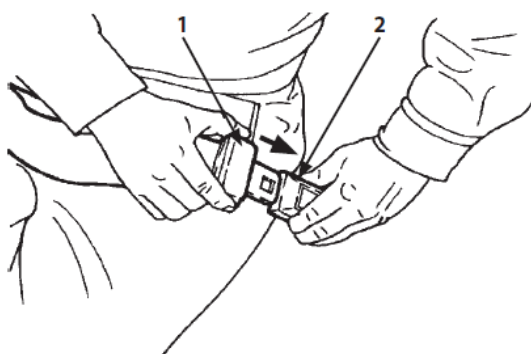
Never jump on or off the machine as it is very dangerous. Take extra care not to contact door striker (2).

WARNING:

- Never attach a wire on handrails (4) and door striker (2) to lift the cab or main body, or while transporting the machine on a truck or trailer as it is dangerous.
- Do not hold the control lever (3) or pilot control shut-off lever (8) when getting on and off the machine.

5.1. SEAT BELT

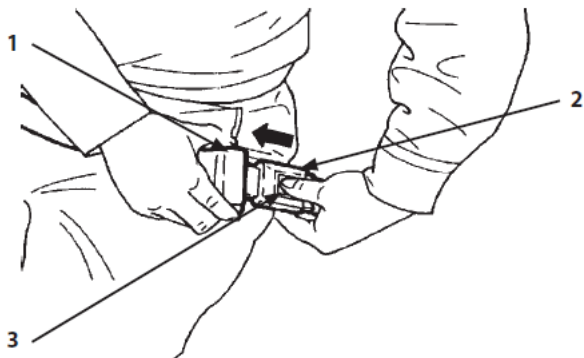
1. *Confirm that seat belt (1) is not twisted. Securely insert the end of seat belt (1) into buckle (2). Lightly pull on the belt to confirm that the buckle locks securely.*



⚠ WARNING:

- Be sure to use seat belt (1) when operating the machine.
- Before operating the machine, be sure to examine seat belt (1) and the hardware attached for any failure.
- Replace seat belt (1) and the hardware attached if they are damaged and/or worn.
- Replace seat belt (1) every 3 years regardless of its appearance.

2. Push button (3) on buckle (2) to unfasten seat belt (1).



6. BREAKING IN NEW MACHINE

IMPORTANT: Operating a new machine at full load without first breaking in can cause scratches and/or seizures, consequently affecting the service life of the machine. Thoroughly perform the break-in operation.

The service life and the performance of the machine can be greatly affected by operation and maintenance of the machine during the initial stage of operation. Perform the break- in operation with the engine output less than 80% of the maximum output for the first 50 hours.

7. OPERATING THE ENGINE

7.1. INSPECT MACHINE DAILY BEFORE STARTING

Perform the required daily check before starting the engine.

Engine

- Level and contamination of engine oil and coolant*
- Starting easiness, exhaust gas colour, and noise
- Oil and water leaks, damage to hoses and pipelines
- Clogging and damage to radiator, oil cooler
- Looseness and missing of mounting bolts and nuts

Upper structure

- Fuel level, leaks, and contamination of fuel in tank*
- Hydraulic oil level, leaks, and contamination of hydraulic oil tank*
- Movement, play and operating force of all control levers • Operation of all hydraulic components, oil leaks and damage to pipelines and hoses
- Deformation, break, and abnormal noise of upper structure
- Looseness and missing of mounting bolts and nuts • Washer Fluid*

Undercarriage

- Sag, wear, and break of crawler*

- Oil leaks and wear on upper/lower rollers and front idlers
- Oil leaks from travel devices
- Looseness and missing of mounting bolts and nuts

Working Device

- Check cylinders, pipelines and hoses for oil leaks and damages
- Wear and damage of the bucket
- Check bucket teeth for looseness, wear and missing*
- Lubrication state of the working device
- Check for pin anti-extraction pins, stoppers, rings, and bolts for damage
- Looseness and missing of mounting bolts and nuts

Others

- Operation of instruments, switches, lights, and buzzer/horn*
- Function of parking brake • Deformation and break of head guard
- Abnormal outside appearance of machine • Wear and damage of the seat belt*

NOTE: Item with *mark: Refer to "Maintenance" section for detailed information.

7.2. BEFORE STARTING ENGINE

1. Confirm that pilot control shut-off lever (1) is in the LOCK position.
2. Confirm that all control levers are placed in neutral.
3. Check indicator bulbs as follows:

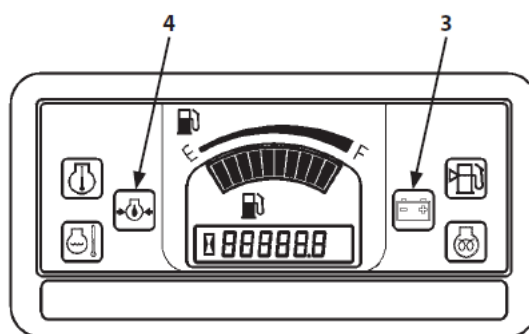
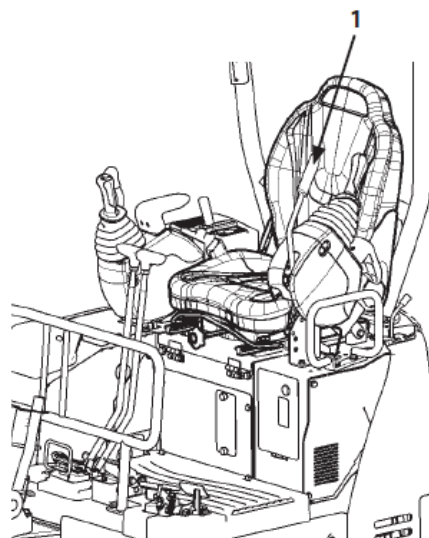
Turn, key switch to the ON position. All indicator lights and warning lamps will come on. They will stay on for approximately 2 seconds, except for alternator (3) and engine oil pressure (4) indicator, which will continue to stay on further.

IMPORTANT:

The monitor panel indicates the machine **operating conditions**. If the machine is operated with an indicator bulb or a warning lamp burned out, the alarm will not be displayed even if any abnormality occurs on the machine. Accordingly, in case any of the indicator bulbs or the warning lamps do not come ON, immediately contact your authorized dealer for repair. If any of alternator (3), or engine oil pressure (4) indicator fails to light after indicator light check is completed, the machine may have trouble. Immediately contact your authorized dealer for repair.

4. Adjust the seat to allow full pedal and control levers stroke with operator's back against the backrest. Fasten the seat belt.

NOTE: The monitor surface is a resin product. When the surface becomes dusty, lightly wipe the surface with a wet cloth. Never use an organic solvent.



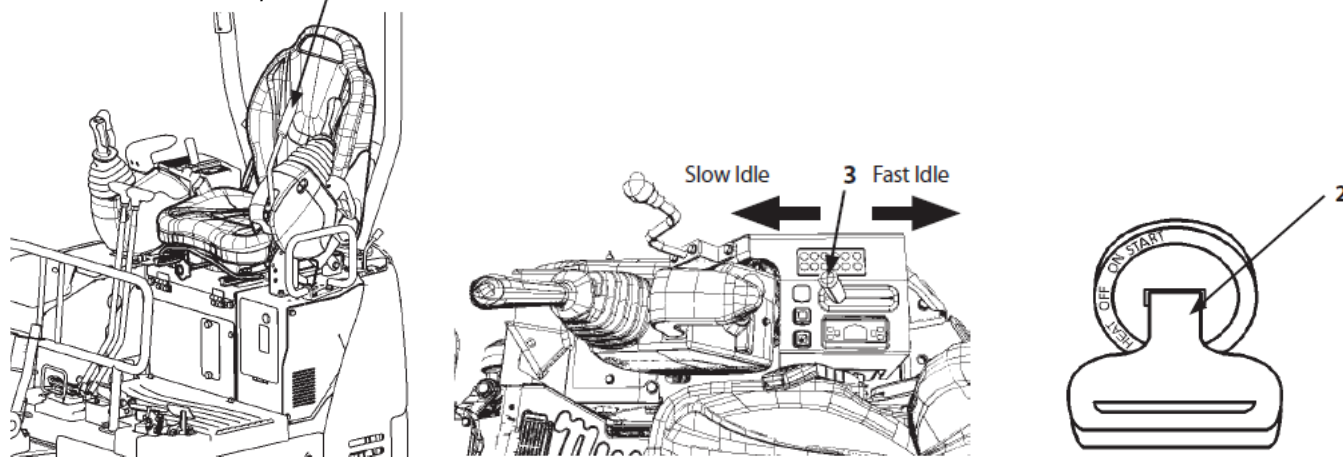
7.3. STARTING THE ENGINE

7.3.1. STARTING THE ENGINE AT NORMAL TEMPERATURE

1. Confirm that pilot control shut-off lever (1) is in the LOCK position.
2. Turn engine control lever (3) to the slow idle position.
3. Sound horn to alert bystanders.

4. Turn, key switch (2) to START position to rotate the starter. The engine will start.

NOTE: The horn sounds even though key switch (2) is turned OFF. The engine does not start unless pilot control shut-off lever (1) is in the LOCK position.



7.3.2. STARTING IN COLD WEATHER

Preheating:

1. Confirm that pilot control shut-off lever (1) is in the LOCK position.
2. Turn engine control lever (3) to around the middle between the slow idle and fast idle position.
3. Turn, key switch (2) to the HEAT position; hold it until preheat indicator (4) turns OFF.
4. Sound the horn to alert bystanders.
5. As soon as preheat indicator (4) goes OFF, turn, key switch (2) to START position to rotate the starter.

IMPORTANT:

Never operate the starter for more than 15 seconds at a time. If engine fails to start, return key switch to OFF. Wait for more than 30 seconds, then try again. Failure to do so may cause damage to the starter and/or discharging the batteries.

5. Release key switch (2) immediately after the engine has started. Key switch (2) will automatically return to ON position.

7.4. CHECK INSTRUMENTS AFTER STARTING ENGINE

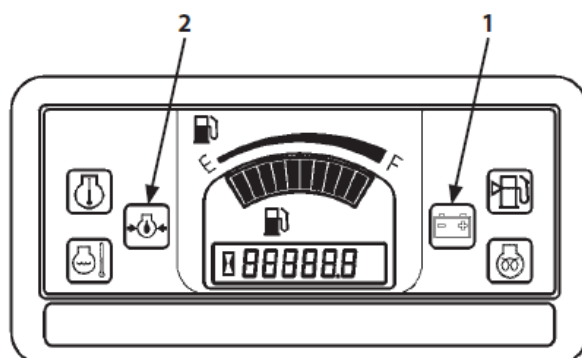
Checking instruments through monitor functions

After starting the engine, check the following points through the monitor functions.

1. Check that alternator alarm indicator (1) is OFF. In case alternator alarm indicator (1) stays ON, immediately stop the engine. Inspect the alternator and the battery system for any abnormality.

2. Check that engine oil pressure indicator (2) is OFF.

In case engine oil pressure indicator (2) stays ON, immediately stop the engine. Inspect the engine oil pressure system and the oil level.



IMPORTANT:

In case any abnormality is found on the monitor unit, immediately stop the engine. Inspect the possible cause of the trouble and report for repair if required.

Check engine noise and exhaust gas colour:

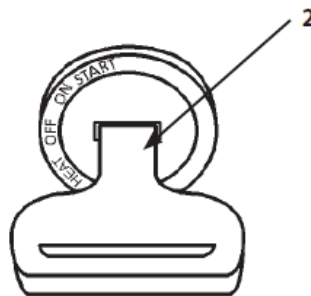
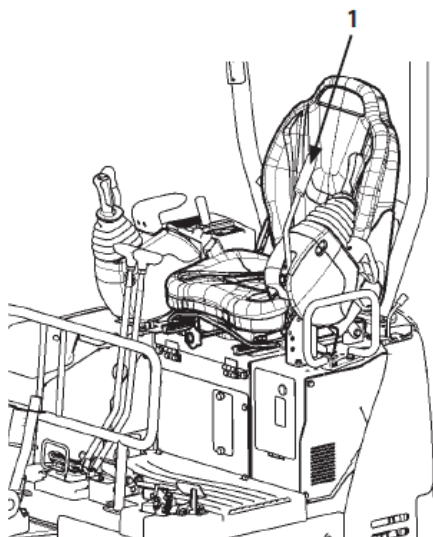
Check that the engine noise and exhaust gas colour are normal.

NOTE: Check the exhaust gas colour as follows. (After warm-up operation, run the engine with no loads.)

- Colourless or light blue - Normal (Perfect combustion)
- Black - Abnormal (Imperfect combustion, abnormal fuel system)
- White - Abnormal (Oil is leaking into the combustion chamber, abnormal fuel system)

7.5. STOPPING THE ENGINE

1. Except for special cases, before stopping the engine, lower the bucket and the blade to the ground.
2. Pull pilot control shut-off lever (1) to LOCK position.
3. Turn the engine control lever to the slow idle position and run the engine for 5 minutes to cool the engine.
4. Turn, key switch (2) OFF to stop the engine.



8. DRIVING THE MACHINE

8.1. TRAVEL LEVERS (ZX17U-5A)

Travel operation can be performed with the mechanical levers.

WARNING:

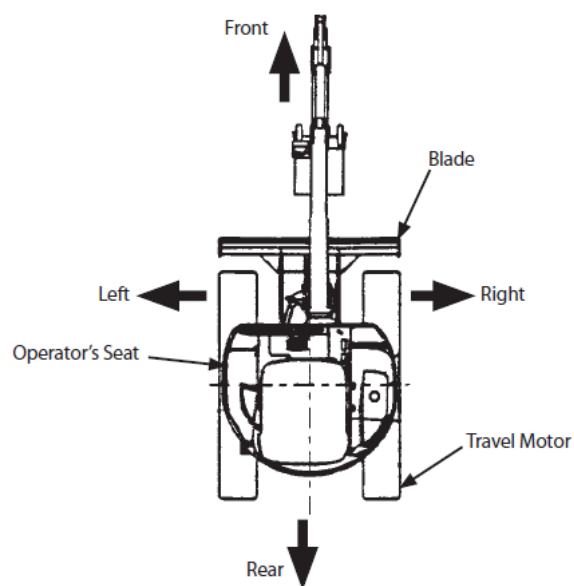
In the standard traveling position, the front idlers are located in front of the operator's seat and the travel motors at the rear. If the travel motors are positioned at the front of the machine, when the travel levers are operated in the direction as illustrated on the operation decals, the travel direction of the machine will be reversed. Be sure to confirm the position of the travel motors before traveling.

IMPORTANT:

Because of the hydraulic circuit structure, the arm and bucket will not move while operating the travel lever in the full stroke. When combined operation is needed, set the travel lever in an intermediate position.

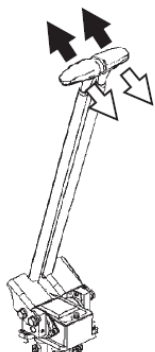
NOTE:

Travel lever dampers are provided for smooth control. In extremely cold weather (lower than -20 °C), the travel lever will become heavy to operate. This is caused by increase in oil viscosity which is not abnormal.

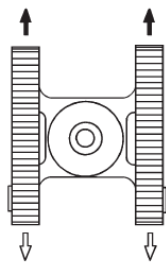


8.1.1. FORWARD/REVERSE TRAVEL

Move both levers forward together to travel forward. Pull the levers back together to travel in reverse. The travel speed can be controlled by adjusting the lever operating stroke.



Forward/Reverse Travel Direction

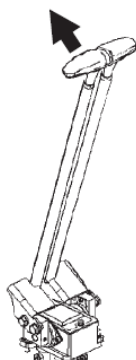


8.1.2. ASCENDING/DESCENDING SLOPES

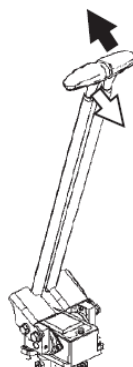
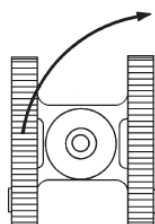
The machine gradeability is 25° (47%). Slowly operate the travel levers when descending a slope. When the travel levers are placed in neutral, the travel brakes are automatically applied to stop the machine.

8.1.3. PIVOT TURN

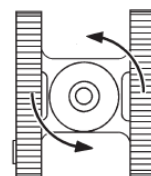
Steer the machine by driving only one side crawler. Operate either of the travel levers.



Pivot Turn



Spin Turn



8.1.4. SPIN TURN


Steer the machine in a position by driving both side crawlers in opposite directions each other. Move one lever forward and pull the other back at the same time.

CAUTION:

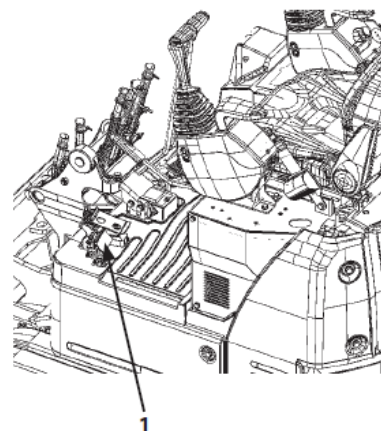
During pivot or spin turn machine operations, the base machine may shake. When turning the machine in a tight area, slowly operate the machine while taking care not to allow the machine to come into contact with the surrounding objects.

8.2. TRAVEL MODE PEDAL (ZX17U-5A)

WARNING:

 Never attempt to shift the travel mode from the slow to fast while descending a slope. Return the travel levers to neutral once before shifting the travel mode.

Depress the travel mode pedal (1) to select the fast travel mode while depressing. When release the travel mode pedal (1), return to the slow travel mode.



8.3. TRAVELING

CAUTION:

Use a signal person when traveling the machine along road shoulders or in congested areas. Coordinate hand signals before starting the machine.

- Be sure to confirm the position of travel motors before traveling and operate the travel levers/pedals.
- Select a travel route that is as flat as possible. Steer the machine as straight as possible, making small gradual changes in direction.
- Before traveling on them, check the strengths of bridges and road shoulders, and reinforce if necessary.
- Use wood plates in order not to damage the road surface. Be careful of steering when operating on asphalt roads in summer.
- When crossing train tracks, use wooden plates in order not to damage them.
- Do not make contact with electric wires or bridges.
- When crossing a river, measure the depth of the river using the bucket and cross slowly. Do not cross the river when the depth of the river is deeper than the upper edge of the upper roller.
- When traveling on rough terrain, reduce engine speed. Select slow travel speed. Slower speed will reduce possible damage to the machine.
- Avoid operations that may damage the track and undercarriage components.
- During freezing weather, always clean snow and ice from track shoes before loading and unloading machine, to prevent the machine from slipping.

8.4. TRAVELING ON SOFT GROUND

Avoid traveling on soft ground as much as possible. If traveling on a soft ground is unavoidable, carefully operate the machine while observing the following points.

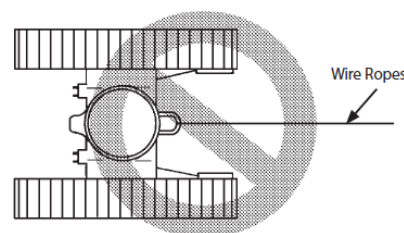
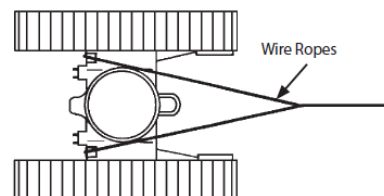
- Drive the machine as far as the machine can move by its own propelling power. Towing the machine may become necessary. Do not drive the machine to a deeper location than towing the machine is possible.
- In case it becomes impossible for the machine to travel by its own propelling power, lower the bucket to the ground. While supporting the machine weight with the boom and the arm, slowly pull the arm to evacuate the machine. Operate the boom, the arm, and the travel levers simultaneously at this time to prevent the machine from being loaded abnormally.
- If the track frame bottom comes in contact with the ground, or if mud and/or grabbles are tightly packed into the undercarriage, the machine may become impossible to travel. Raise each track above the ground with the boom and arm extended, remove mud and/or grabbles from the track. Then, evacuate the machine. Rotate the raised track in forward or reverse directions alternately to remove the caught rocks and/or mud from the track.
- Tow the machine with another machine if the machine becomes stuck in soft ground and impossible to evacuate by its own propelling power. Refer to the descriptions for TOWING MACHINE for the correct usage of wire ropes.

8.5. TOWING MACHINE

In case it is difficult for the machine to evacuate from a soft terrain by own propelling power, attach wire ropes as illustrated to the right. Tow the machine using another machine. Be sure to attach the wire ropes around the track frames. To prevent the wire ropes from being damaged, place pieces of soft protective material between the wire ropes and the edge corners if the frame.

IMPORTANT:

A bracket is provided on the track frame to install a shackle for towing a lightweight object on some machines. Never attempt to tow the machine using this lightweight object-towing bracket. Breaking the towing bracket may result. Refer to the descriptions on Shackle Bracket Usage on page 5-15 in "Operating the Machine" section for usages of the shackle bracket. In addition, do not tow the machine with the complete machine lifting holes prepared on the blade. The lifting holes may be damaged.



8.6. OPERATING IN WATER OR MUD

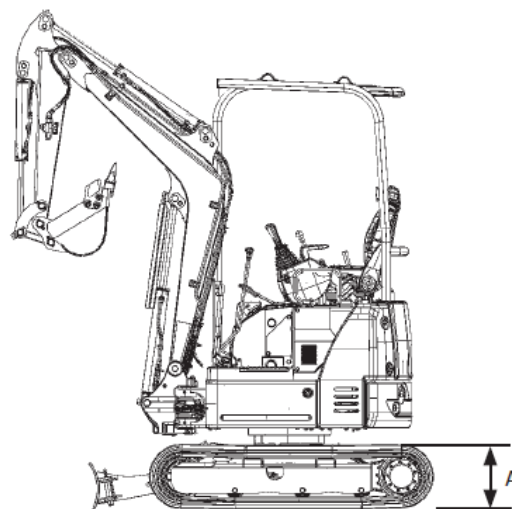
The machine can be operated in water up to the upper edge of the upper rollers only if worksite footing has sufficient strength to prevent the machine from sinking under the upper edge of the upper roller, and only if the water is flowing slowly.

When operating in such conditions, check the machine's position often. Reposition the machine if necessary.

Avoid submerging the swing bearing, swing gears and centre joint.

IMPORTANT:

If the swing bearing, swing gears and centre joint are submerged in water or mud by mistake, premature wearing on parts such as the swing bearing may result. Grease must be changed, or overhauling will be required immediately. Stop operating the machine as soon as possible, and contact your authorized dealer.



ZX17U-5A Swing Internal Gear Grease Capacity – 0.6L

ZX17U-5A Operable Water Depth (A) – 370 mm

Lubricate Swing Bearing. (See Maintenance Guide, 500 hours)

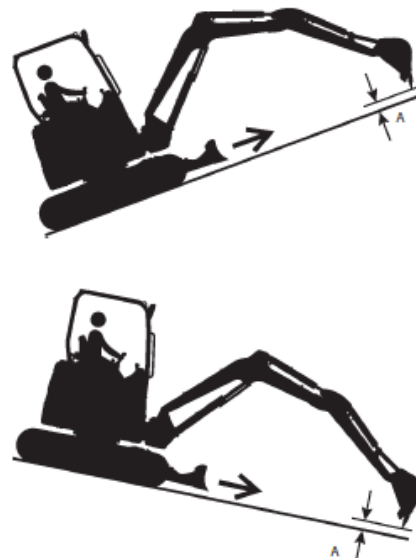
8.7. PRECAUTIONS FOR TRAVELING ON SLOPES

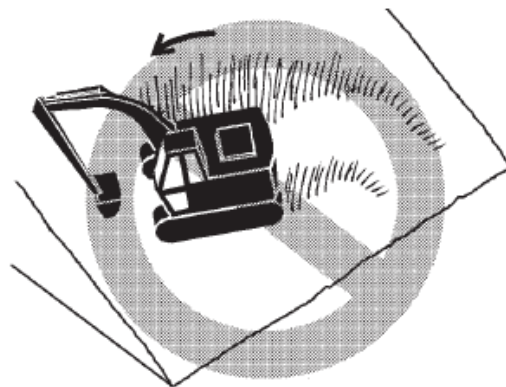
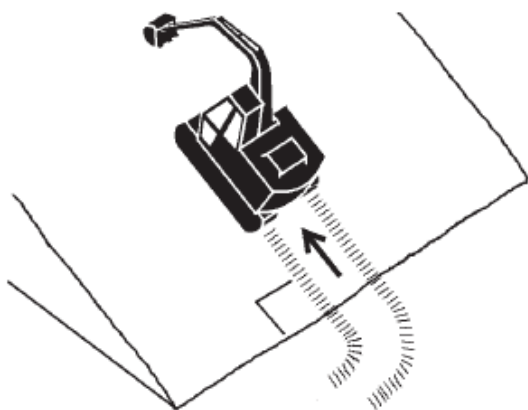
CAUTION:

Avoid possible injury from traveling on slopes. Tipping over or skidding down of the machine may result.

Thoroughly read and understand precautions below and be sure to travel at slow speed on slopes. Never attempt to travel on slopes with the bucket loaded or any load suspended by the bucket.

- Never attempt to ascend or descend slopes of 25 degrees and over.
- Be sure to fasten the seat belt.
- Keep the bucket pointed in the direction of travel, approximately 200 to 300 mm (8 to 12 in) (A) above the ground. If the machine starts to skid or becomes unstable, lower the bucket immediately.
- Driving across the face of a slope or steering on a slope may cause the machine to skid or turnover. If the direction must be changed, move the machine to level ground, then, change the direction to ensure safe operation.
- Avoid swinging the upper structure on slopes. Never attempt to swing the upper structure downhill. The machine may tip over. If swinging uphill is unavoidable, carefully operate the upper structure and the boom at slow speed.
- If the engine stalls on a slope, immediately lower the bucket to the ground. Return the control levers to neutral. Then, restart the engine.
- Be sure to thoroughly warm up the machine before ascending steep slopes. If hydraulic oil has not warmed up sufficiently, adequate performance may not be obtained.





8.8. PARKING THE MACHINE ON SLOPES

WARNING:

Avoid parking and/or stopping the machine on slopes. The machine may tip over, possibly resulting in personal injury.

If parking the machine on a slope is unavoidable:

- Thrust the bucket teeth into the ground.
- Return the control levers to neutral and pull pilot control shut-off lever (1) to the LOCK position.
- Block both tracks.



8.9. PARKING THE MACHINE

1. Park the machine on a level surface.
2. Lower the bucket and the blade to the ground.

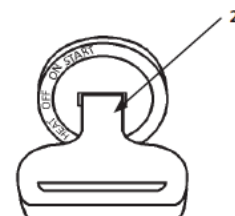
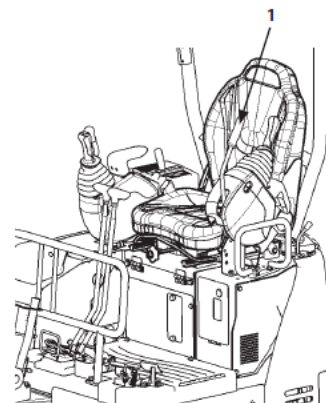
IMPORTANT:

Turbocharger may be damaged if the engine is not properly shut down.

3. Turn the engine control lever counter clockwise to the slow idle position. Run the engine at slow idle speed for approximately 5 minutes to cool the engine.
4. Turn the key switch to OFF. Remove key (2) from the key switch.
5. Pull pilot control shut-off lever (1) to the LOCK position.

IMPORTANT:

Protect cab electrical components from bad weather.



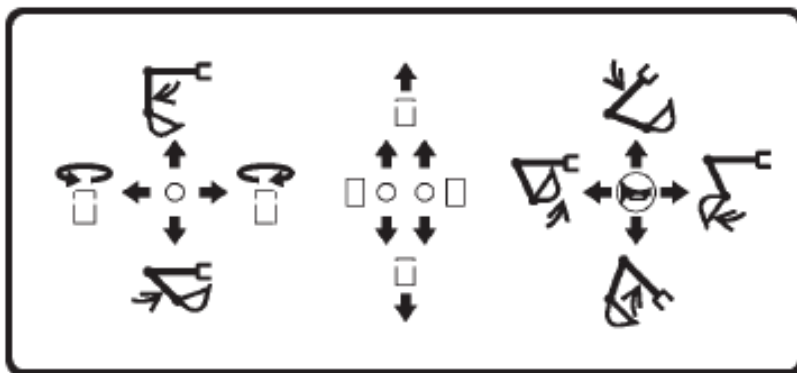
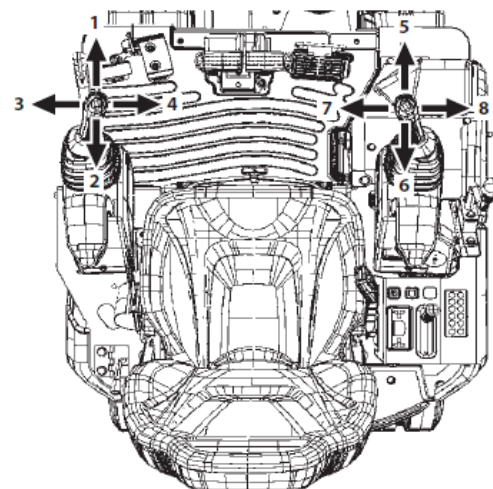
9. OPERATING THE MACHINE

9.1. CONTROL LEVER (ISO PATTERN)

WARNING:

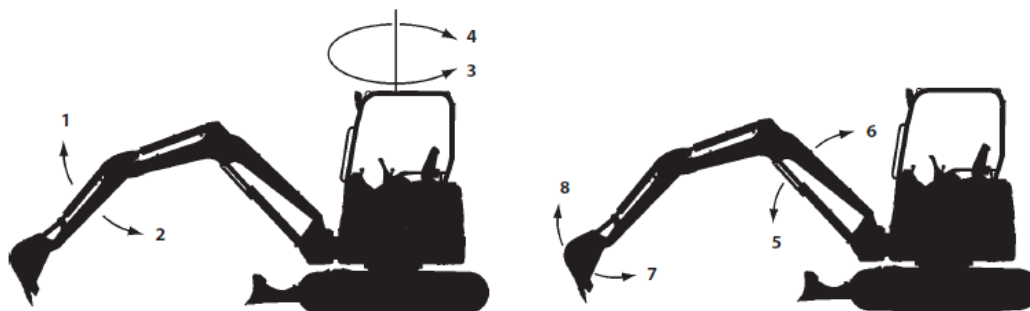
- Never place any part of body beyond window frame. It could be crushed by the boom if boom control lever is accidentally bumped or otherwise engaged. Never remove the window sash bar.
- Make sure you know the location and function of each control before operating.
- Do not change the control lever operation pattern. Failure to do so

A label (pictured below) showing the control patterns of the levers and pedals is attached on the right side in the cab.



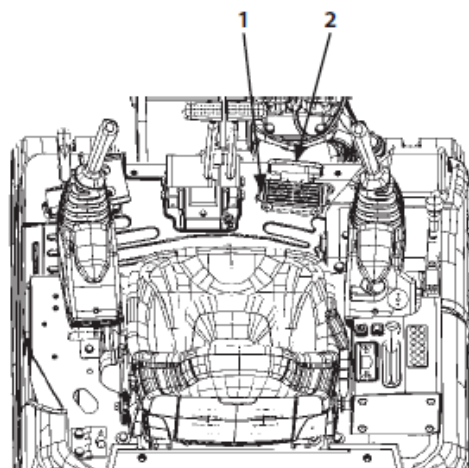
When a lever is released, it will automatically return to neutral, and that machine function will stop.

- 1- Arm Roll-Out
- 2- Arm Roll-In
- 3- Swing Left
- 4- Swing Right
- 5- Boom Lower
- 6- Boom Raise
- 7- Bucket Roll-In
- 8- Bucket Roll-Out



9.2. BOOM-SWING PEDAL

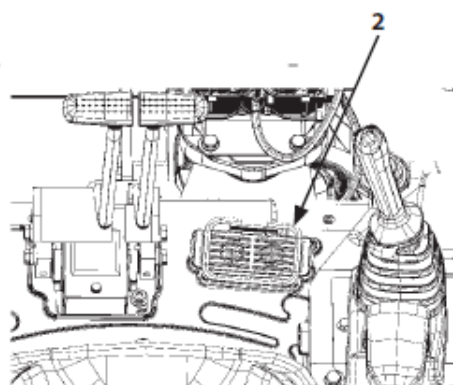
Use the boom swing function to efficiently operate the machine when excavating grooves along roadsides or near walls. The boom swing operation is performed using boom-swing pedal (1) located at the operator's right foot as illustrated to the right.



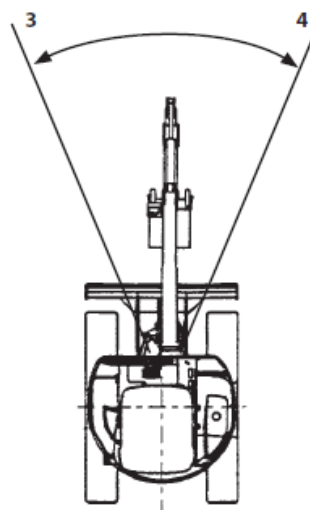
Unlock Position

9.2.1. BOOM-SWING OPERATION

1. Turn cover (2) for boom-swing pedal (1) forward.
2. Step on the left side of boom-swing pedal (1) to swing left. Step on the right side of pedal (1) to swing right.
3. Turn cover (2) backward over boom-swing pedal (1) when boom-swing operation is no longer required.
4. Swing Left (3), Swing Right (4)



Lock Position

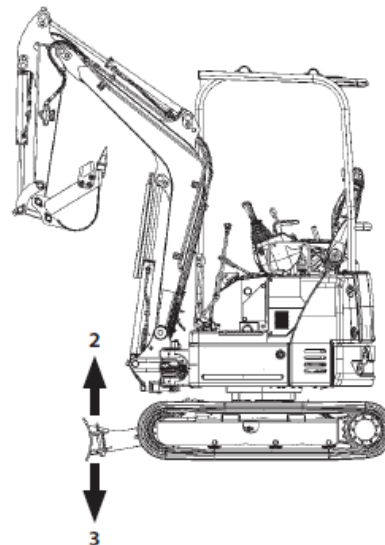
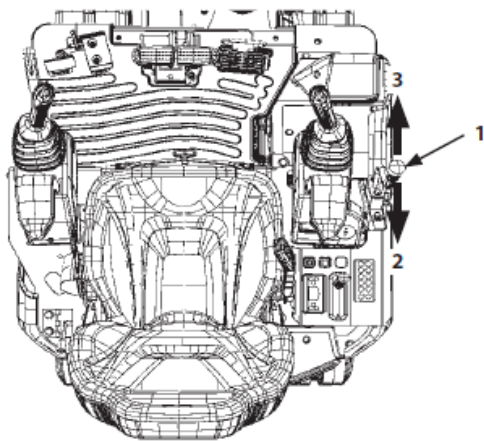


9.3. BLADE LEVER

Use blade lever (1) on the operator's right to raise and lower the blade.

When blade lever (1) is released, it automatically returns to neutral, holding the blade in the present position until lever (1) is operated again.

Raise Blade (2), Lower Blade (3)



9.4. PRECAUTIONS FOR BLADE OPERATION

This blade is designed as a light service attachment of the hydraulic excavator. Please keep the following points in mind:

- *This blade is designed for bull dozing work only.*
- *Do not attempt to dig deeply with the blade. Doing so may damage not only the blade but the undercarriage as well.*
- *Do not apply concentrated or uneven loads to the blade. Never allow the blade to forcefully collide with a load by running the machine into the load. Failure to do so may result in damage to the blade and the undercarriage.*
- *When jacking up the machine with this blade, the surface beneath the blade comes under high pressure, increasing the risk of surface collapse. Always be sure that the surface is strong enough to support the weight of the machine before jacking up the machine. Avoid dangerous uneven distribution of weight to the blade by maintaining even contact between the blade and the ground.*
- *While digging with the blade positioned in the front of the machine, take care not to allow the bucket to come into contact with the blade.*
- *When digging, take care not to allow the boom cylinder to come in contact with the blade.*

9.5. SIDE FRAME EXTEND / RETRACT LEVER (ZX17U-5A)

To adjust the side frame width, operate side frame extend /retract lever (1) as illustrated to the right.

WARNING:

Operate the machine with the side frames fully extended (1280 mm) or retracted (980 mm). If the machine is operated with the side frames extended insufficiently, the extended side frames are not securely held, causing the upper structure to keep moving and constituting a safety hazard.

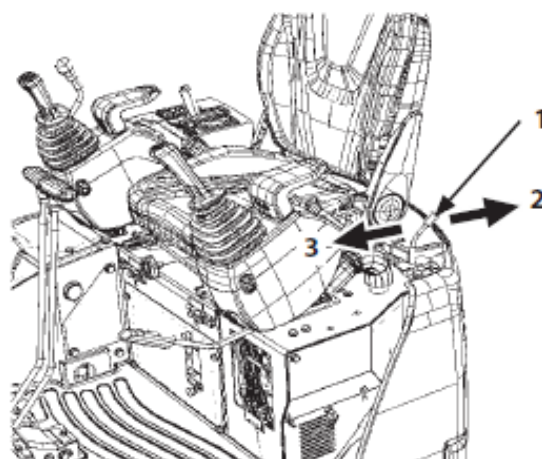
Operate the machine with the side frames fully retracted only when traveling through a flat narrow work site. Except for this condition, whenever traveling the machine, performing excavation, or operating the blade, be sure to fully extend the side frames. Failure to do so may cause the machine to turn over.

IMPORTANT:

Before extending or retracting the side frames, park the machine on a level surface with no obstructions and remove packed mud or gravel from the side frame extend / retract mechanism if any.

Operating the side frame extend / retract lever

1. Pull upside frame extend /retract lever (1) to extend the side frame.
2. Push downside frame extend /retract lever (1) to retract the side frame.
3. Extension (2), Retraction (3)



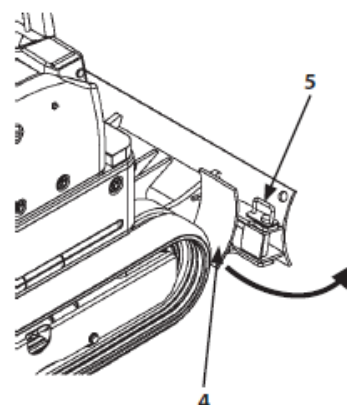
9.6. EXTENDING / RETRACTING BLADE WIDTH (ZX17U-5A)

Change the blade width in accordance with the side frame extension / retraction.

When working with the blade contact to ground, there are some cases that it is difficult to remove the pins. Work after raising the blade, and stopping the engine.

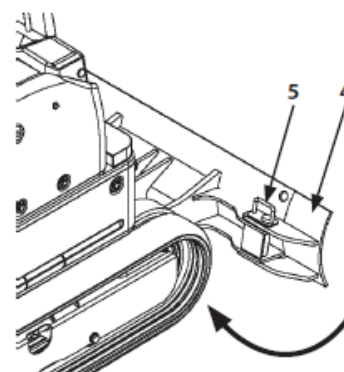
When extending the blade width:

1. Remove blade pin (5).
2. Turn over the extension blade (4) and align the pin hole.
3. Install blade pin (5).
4. Extend the left side following steps 1 to 3 above.



When retracting the blade width:

1. Remove blade pin (5).
2. Turn over the extension blade (4) so that the cutting edge side may turn to the track shoe side. Align the pin hole.
3. Install blade pin (5).
4. Retract the left side following steps 1 to 3 above.



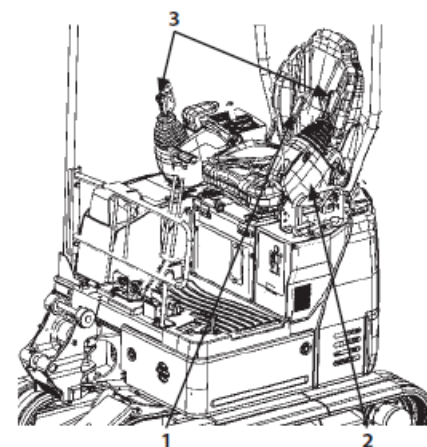
9.7. PILOT CONTROL SHUT-OFF LEVER

Pilot control shut-off lever (1) functions to prevent mis operation of the machine from occurring if the control levers are accidentally moved when leaving the operator's seat or when entering the cab.

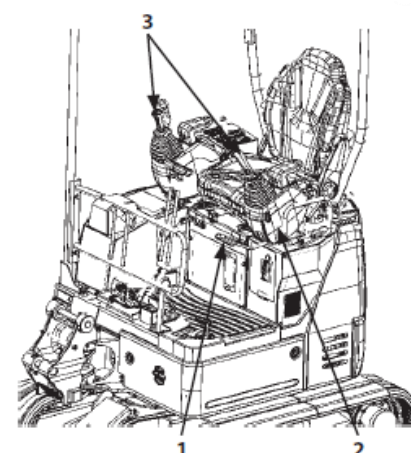
Pilot control shut-off lever (1) is linked to console (2) latch mechanism so that console (2) is raised in the LOCK position to aid in entering and exiting the operator's station and for maintenance.

WARNING:

- To deactivate control lever (3) and pedal functions, be sure to pull pilot control shut-off lever (1) and raise console (2) to the fully locked position. To reactivate control lever (3) function, always hold and push pilot control shut-off lever (1) down. Never attempt to lower raised console (2) or control lever (3) to reactivate all control lever function without holding pilot control shut-off lever (1).
- Be sure not to touch control lever (3) when operating pilot control shut-off lever (1). Failure to do so may allow the machine to unexpectedly move when a body part unintentionally comes in contact with the control lever, possibly resulting in serious personal injury or death.
- When leaving the machine, always stop the engine. Then, pull the pilot control shut-off lever (1) up to the LOCK position.
- Always check to be sure that the pilot control shut-off lever (1) is pulled up to the LOCK position before transporting the machine or leaving the machine at the end of the shift.



Lock Position



Unlock Position

MABA

Before Leaving the Machine

1. Park the machine on a firm and level surface. Lower the bucket and the blade to the ground. Return all control levers to neutral. Properly shut down the engine.
2. Pull pilot control shut-off lever (1) and raise console (2) to the full LOCK position.

9.8. BEFORE STARTING OPERATION:

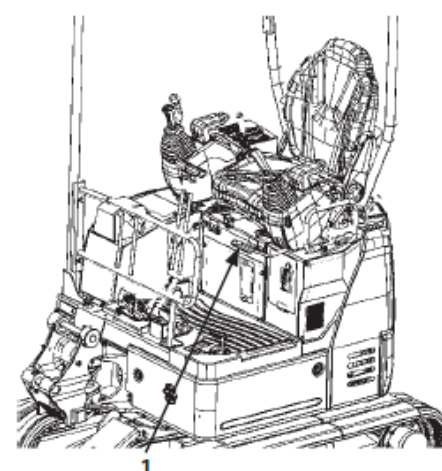
Confirm that pilot control shut-off lever (1) is pulled up to the LOCK position before starting the engine.
Slowly push down control shut-off lever (1) to UNLOCK position before starting operation.
Confirm that all control levers and pedals

WARNING:

If any part of the machine (any actuator) moves when pilot control shut-off lever (1) is lowered to the UNLOCK position despite the fact that all controls are placed in neutral, the machine is malfunctioning.

Immediately pull pilot control shut-off lever (1) back to the LOCK position and stop the engine.

Then contact the hirer of the machine for rectification..



Unlock Position

9.9. WARMING UP OPERATION

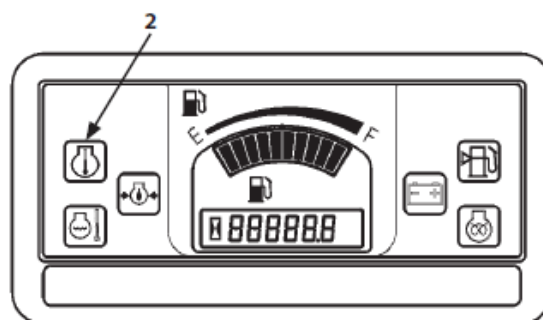
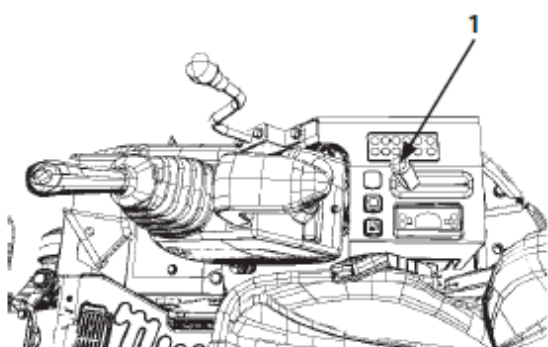
The normal operating temperature of hydraulic oil is between 50 and 80 °C (122 and 176 °F).

Hydraulic components may be seriously damaged if the machine is operated when the hydraulic oil temperature is below 20 °C (68 °F).

Before starting work, be sure to follow these warm-up procedures until the temperature of the hydraulic oil reaches above 20 °C (68 °F).

9.9.1. WARM-UP PROCEDURES:

1. Turn engine control lever (1) to the slow idle position. (Do not operate the machine until coolant temperature indicator (2) goes off.)
2. When coolant temperature indicator (2) goes off, run the engine for 5 to 10 minutes with the engine speed control lever at the medium position.
3. Extend and retract each cylinder several times and lightly operate the swing and travel motors to warm up them.



9.9.2. WARMING UP IN COLD WEATHER

IMPORTANT:

In case the hydraulic oil temperature is low, never operate the machine until all actuator speeds become normal after warming up operation.

NOTE:

During cold weather season, the warm-up operation system automatically operates so that the engine speed increases for a moment even though the engine control lever is in the slow idle position.

1. Run the engine at intermediate speed for 5 minutes (longer if the air temperature is extremely low).
2. Do not run the engine at either slow or fast speed during this time.
3. Extend and retract each cylinder several times and lightly operate the swing and travel motors to warm up them.
4. Extend the bucket cylinder to the stroke end. Be sure not to hold the bucket lever in this position for more than 30 seconds.
5. Retract the bucket cylinder to the other stroke end. Be sure not to hold the bucket lever in this position for more than 30 seconds.
6. Repeat steps 4 to 5 until the bucket cylinder cycle time becomes normal.

9.10. OPERATING BACKHOE

- Use the appropriate arm and bucket for the work.

- *(Refer to the "Bucket Types and Applications" in the Specifications section.)*
- *Pull the bucket toward the machine using the arm as the main digging force.*
- *When soil sticks to the bucket, remove it by moving the arm and/or bucket rapidly back and forth.*
- *Place the bucket teeth on the ground with the bottom of the bucket at a 45 degree angle to the ground.*
- *When trenching a straight line, position the tracks parallel to the trench. After digging to the desired depth, move the machine as required to continue the trench.*
- *When operating the arm, avoid*

IMPORTANT:

- *When digging at an angle, avoid striking the tracks with the bucket teeth.*
- *When lowering the boom, avoid sudden stops that may cause shock load damage to the machine.*
- *When digging a deep excavation, avoid striking the boom or bucket cylinder hoses against the ground.*
- *When operating the machine with the blade positioned towards the front, the bucket teeth may come in contact with the blade if you are not careful.*
- *When the bucket load is dumped with the boom raised, falling material may hit the base machine and/or the canopy. Always be aware of loads in the bucket during operation.*

9.11. GRADING OPERATION

Use the blade for soil refilling and general grading operations after excavation. Grading operation can be also performed by operating the boom, arm, and bucket simultaneously.

IMPORTANT:

Do not pull or push dirt with the bucket when traveling. Excess force will be applied on each part, and the machine may be damaged.

When grading by operating the boom, arm, and bucket simultaneously:

- 1. When grading from the forward to the backward, slowly roll in the arm while slightly raising the boom. As soon as the arm passes the vertical position, slowly lower the boom so that the bucket can be horizontally moved.*
 - 2. When grading from the backward to the forward, operate the arm and bucket rolled back as described in step 1.*
- Do the slope finishing work in the same procedure as described in steps 1 and 2.*

9.12. AVOID ABUSIVE OPERATION

Do not travel while thrusting the bucket teeth into the ground and do not raise the rear of the machine to use the machine's weight as additional digging force. Severe machine damage may result.



9.13. AVOID EXCAVATION USING UPPER STRUCTURE AND/OR BOOM SWING POWER

Never attempt to move rocks or excavate a cliff face by hitting the bucket using upper structure and/or boom swing power. Damage to the front attachment or shortening of the service life of the swing systems may result.



9.14. AVOID DRIVING BUCKET TEETH INTO GROUND

WARNING:

If the bucket teeth are forcedly driven into the ground, crushed material may spatter, possibly resulting in injury of the operator and/or co-workers around the machine. Furthermore, the service lifetime of all front attachment parts may be shortened.

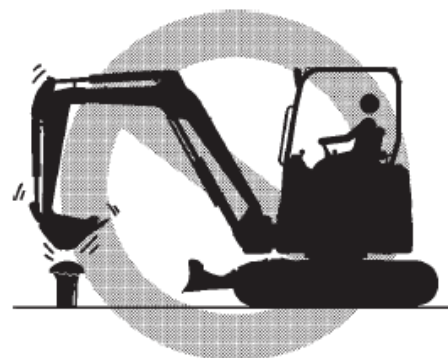
If the bucket teeth are forcedly driven into the ground, the service lifetime of all front attachment parts (especially the bucket) may be severely shortened. When excavating tightly fastened gravelly soil, use the bucket digging out force. Operate the boom, arm, and bucket simultaneously so that the bucket teeth can effectively penetrate the excavation surface. Carefully operate the machine to prevent crushed material from spattering, possibly resulting in injury to the operator and/or co-workers around the machine.

9.15. AVOID STRIKING WITH BUCKET

WARNING:

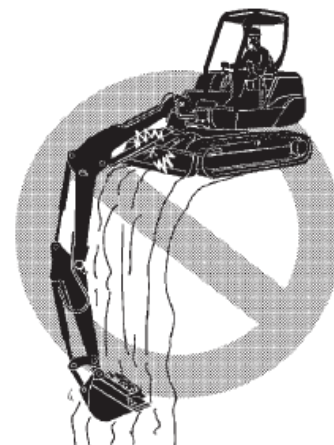
The bucket bottom is curved. Therefore, hammering or piling work with the bucket is very hazardous. In addition, damage to the bucket and the front attachment parts may result.

Hammering or piling work with the bucket may create hazardous situations. Never attempt to perform hammering or piling work with the bucket. Damage to the bucket and the front attachment parts may also result.



9.16. BOOM CYLINDER MAY HIT BLADE

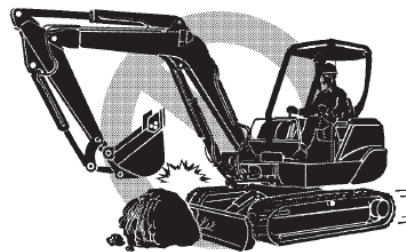
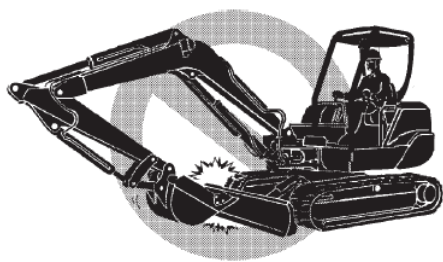
When digging deeply with the blade positioned at the front, the boom cylinder or bucket may accidentally hit the blade, causing damage. Take care to prevent this from happening.



9.17. AVOID HITTING BLADE WITH BUCKET & COLLIDING BLADE AGAINST ROCKS

When rolling in the arm in a travel or transportation position, be careful not to hit the blade with the bucket.

Do not attempt to allow the blade to collide with rocks. Premature damage to the blade and the blade cylinders may result.



9.18. USE CORRECT TRACK SHOE

Never use rubber crawlers or wide track shoes on rough terrain with scattered rocks, gravel or boulders.

Failure to do so may cause breakages of rubber crawlers, shoe bending, looseness of shoe bolts, or damage to track parts such as track links, or rollers. (Refer to the table for Shoe Types and Applications in the specification chapter)

Soil may easily become packed into the crawler during travel operation on sandy ground. If the machine is driven without removing the packed soil from the crawlers, the rubber crawlers will be overloaded, possibly resulting in breakage of the crawlers.

Avoid causing the crawlers to become packed with soil by removing soil as often as possible.

9.19. USING RUBBER CRAWLER

Rubber crawlers are designed to allow the machine to travel without damaging road surfaces such as paved road surfaces. Avoid damage to the rubber crawlers by following the precautions below:

Forbidden Operations:

- 1. Do not operate or steer the machine on or near river-terrace, boulder and boulder mixed ground, crushed-stone ground, uneven hardpan surfaces, stumps, reinforcing bars, scraps, and steel plate edges. Failure to do so may shorten the service life of the rubber crawlers to a great extent.*
- 2. Do not leave engine oil, fuel, and other kinds of lubricants remaining on the rubber crawlers, and avoid traveling on road surface covered with oil to reduce the danger of sliding.*
- 3. Do not travel the machine while raising one side crawler off the ground with the front attachment. Shear or damage to the rubber crawler may result.*

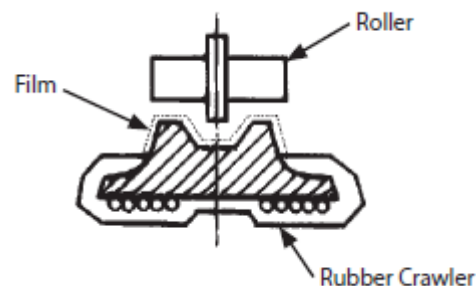
Precautions for Using Rubber Crawlers

WARNING:

The rubber crawler machine is less stable than the steel crawler machine, as the edge of the rubber crawler is easier to deform than steel crawler. Pay attention when operating the machine at an angle to the tracks.

- 1. Do not store the rubber crawlers in a place where they will be exposed to direct sunlight for a period of more than three months.*
- 2. Avoid unnecessary steering operations on concrete roads, possibly resulting in premature wear of shoe lugs and core metals. Also, avoid operating the machine on high temperature [over 60 °C (140 °F)] road surfaces during asphalt pavement work, possibly causing premature wear of the rubber crawlers as well as damage to the road surface.*

3. Operating the machine with rubber crawlers sagging on uneven surfaces can result in derailment of rubber crawler, possibly causing the rubber crawlers to be damaged.
4. When lowering the machine raised above the ground using the front attachment, slowly lower the machine to the ground.
5. The new rubber crawler has a thin rubber film (shown in dotted line) on its roller tread. During operation of a new machine, or immediately after the rubber crawlers are replaced, the rubber film may come off due to contact with the rollers. This is not abnormal. (See the right illustration.)
6. If the rubber crawler is damaged and the rubber crawler core wire rusts, the service lifetime of the rubber crawler will become short. If damaged, the rubber crawler must be repaired. Contact your authorized dealer.



9.20. AVOID OTHER THAN SPECIFIED MACHINE OPERATIONS

This machine has been exclusively designed for excavation and loading works.

Do not apply this machine to works other than excavation and loading. Do not operate the machine under any conditions beyond these specifications.

CAUTION:

Precautions for Lifting Work

- Operate the machine on level ground. Operating the machine on a slope may cause the machine to become unstable, possibly resulting in tipping accident.
- When lifting a load, carefully swing the machine not to cause the lifted load to come in contact with personnel working near the machine. Reduce the engine speed to slowly swing the machine. Failure to do so may cause the machine to tip over by swing centrifugal force.
- If traveling the machine with a lifted load is unavoidable, reduce the engine speed to slowly travel the machine.
- Never move the front attachment and/or swing the machine while traveling the machine with a lifted load. The lifted load may sway, possibly creating a hazardous situation.

9.21. SHACKLE BRACKET USAGE

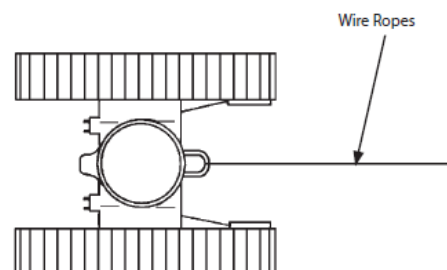
A shackle bracket is provided on the track frame to tow light weight objects as specified below.

IMPORTANT:

Be sure to conform to the restrictions and precautions stated below when towing a lightweight object using the shackle bracket provided on the track frame. The track frame and/or the shackle bracket may be damaged otherwise.

The maximum drawbar pull for ZX17U-5A - 4900 N (500 kgf)

- Be sure to use a shackle.
- Keep the tow line horizontal, straight, and parallel to the tracks.
- Select the slow travel mode. Slowly drive the machine when towing.



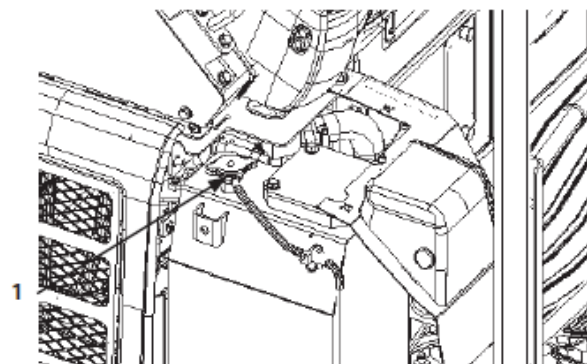
9.22. EMERGENCY BOOM LOWERING PROCEDURE

WARNING:

- Prevent personal injury. Confirm that no one is under the front attachment before starting the procedure below.
- Be sure to work only after oil temperature is low or before operation. Failure to do so may allow high temperature

If the engine stalls and cannot be restarted, lower the boom to lower the bucket to the ground referring to the emergency boom lowering procedure stated below.

1. Remove the cover above the hydraulic oil tank. Loosen filler cap (1) on the hydraulic oil tank to release air pressure from the hydraulic oil tank.

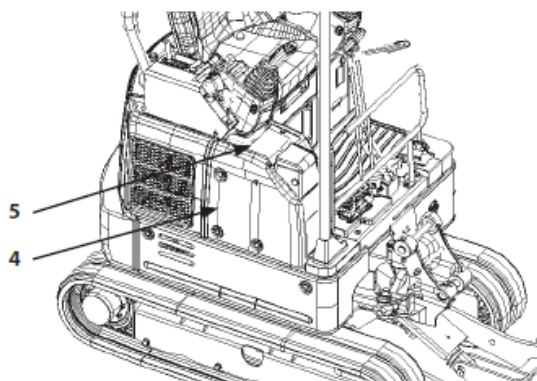


ZX17U-5A

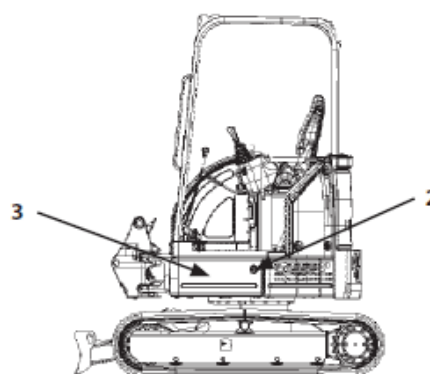
NOTE:

Upper cover (5) cannot be removed unless cover (4) at the right side of hydraulic oil tank is removed for ZX17U-5A.

2. Remove bolts (2) from the front and left side of cover (3) to remove cover (3).
3. Lower the boom in the procedures on the next page.



ZX17U-5A

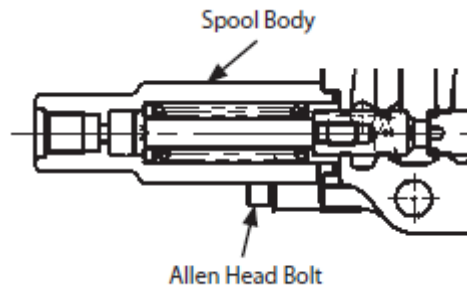
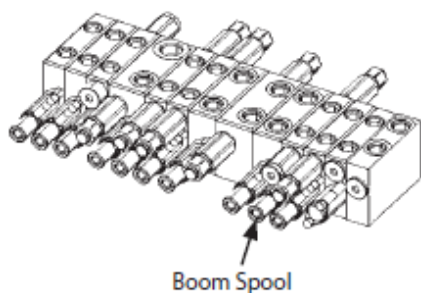


WARNING:

Do not pull the boom spool rapidly. Otherwise, the boom may lower rapidly and hydraulic oil may spout out from the control valve. Be sure to pull the boom spool slowly.

1. Remove allen head bolts and boom spool to lower the boom. Place a container to receive oil escaping from the control valve when removing the boom spool.
2. Ensure the boom is completely lowered, and then install the boom spool with allen head bolts.

Tightening Torque: 6 to 7 N·m (0.6 to 0.7 kgf·m, 4.4 to 5.2 lbf·ft)



9.23. PRECAUTIONS FOR AFTER OPERATIONS

- After finishing the day's operation, drive the machine to a firm, level ground where no possibility of falling stones, ground collapse or floods are present.
- (Refer to the group for "PARKING THE MACHINE" in the DRIVING THE MACHINE section.)
- Fully refill the fuel tank
- Clean the machine

10. TRANSPORTING

10.1. TRANSPORTING BY ROAD

When transporting the machine on public roads, be sure to first understand and follow all local regulations.

- When transporting the machine using a truck, check the width, height, length and weight of the trailer with the machine loaded. Note that transporting weight and dimensions may vary depending on the type of shoe or front attachments installed.
- Investigate beforehand the conditions of the route to be travelled, such as dimensional limits, weight limits, and traffic regulations.

In some cases, getting the permission from the local authority concerned or disassembling the machine to bring it within dimensional limits or weight limits of local regulations may become necessary. Notify the nearest dealer that you are transporting the unit.

10.2. LOADING/UNLOADING ON A TRUCK

Always load and unload the machine on a firm, level surface.

WARNING:

- Be sure to use a loading dock or a ramp for loading/unloading. Never load or unload the machine onto or off a truck or trailer using the front attachment functions when driving up or down the ramp.
- The machine may meander when the front attachment is operated during travel on a slope. Do not operate the front attachment when traveling on a slope.

Ramp/Loading Dock:

1. Before loading, thoroughly clean the ramps, loading dock and flatbed. Dirty ramps, loading docks, and flatbeds with oil, mud, or ice on them are slippery and dangerous.
2. Place blocks against the truck wheels while using a ramp or loading dock.

3. Ramps must be sufficient in width, length, and strength. Be sure that the incline of the ramp is less than 15 degrees.
4. Loading docks must be sufficient in width and strength to support the machine and have an incline of less than 15 degrees.
5. When transporting the machine equipped with a blade, take care not to hit the blade.

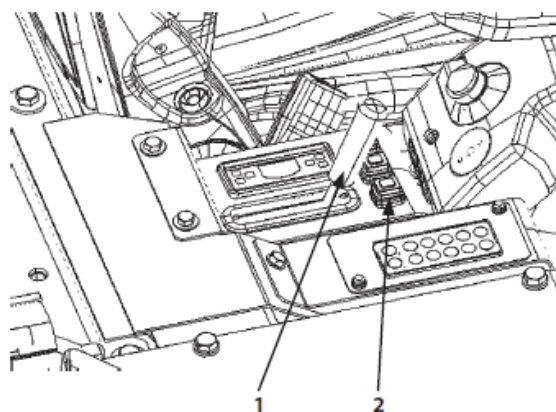
10.3. LOADING

WARNING:

- *Always travel the machine slowly.*

Before descending a slope, always ensure that engine control lever (1) is in the slow idle position, and then reduce the engine speed.

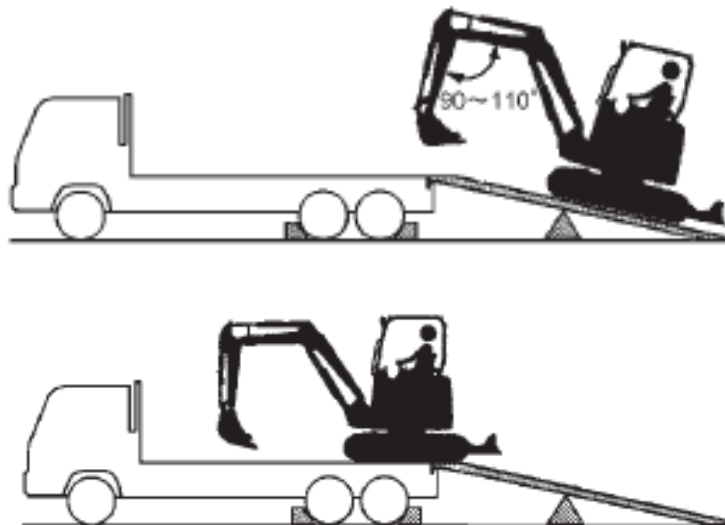
- *Never steer while driving up or down a ramp as it is extremely dangerous and may cause the machine to turnover. NEVER attempt to change directions whilst positioned on the ramp. If repositioning is necessary, first move back to the ground or flatbed, modify traveling direction, and begin to drive again.*
- *The top end of the ramp where it meets the flatbed is a sudden bump. Take care when traveling over it as the balance may be lost.*
- *Extreme care must be taken when swinging the upper structure when the machine is on the truck flatbed. If the front attachment is fitted, swing slowly with the arm fully roll-in underneath the boom being careful not to lose the balance of the machine.*



1. Load the machine so that the centreline of the machine aligns with the centreline of the trailer flatbed.
2. Drive the machine onto the ramp slowly.
3. Determine a position for the bucket in line with the truck. Adjust the angle of the boom and the arm at 90 to 110°.
4. Lower the bucket onto to the deck of the truck before the unit passes over the end of the ramp for support.
5. Move the machine as illustrated right. And then, slowly rotate the upper structure 180° while keeping the arm fully rolled in.
6. Reverse the machine to the specified position.
7. Rest the front attachment on supports such as wooden blocks placed on the truck flatbed. Also lower the blade onto the deck at this time (if fitted).
8. Stop the engine. Remove the key from the key switch.
9. Place the pilot control shut-off lever in the LOCK position.
10. Cover the openings on the machine to prevent wind and/or rain from coming in.

CAUTION:

In cold weather, be sure to warm up the machine before loading or unloading.



10.4. FASTENING MACHINE FOR TRANSPORTING

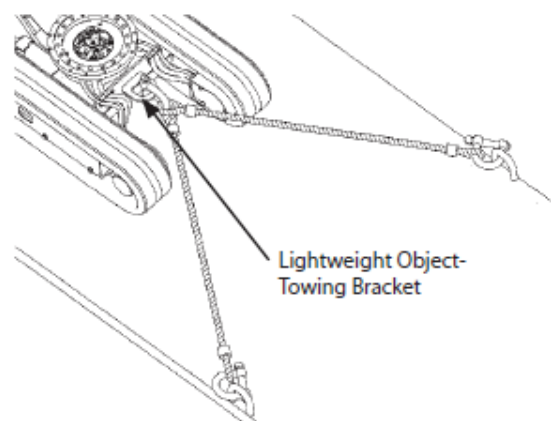
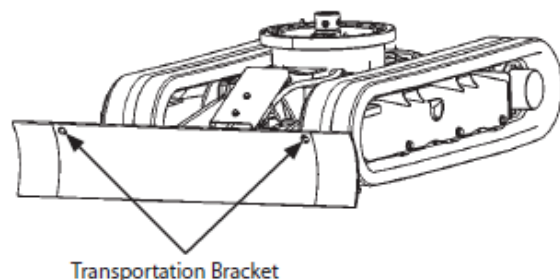
CAUTION:

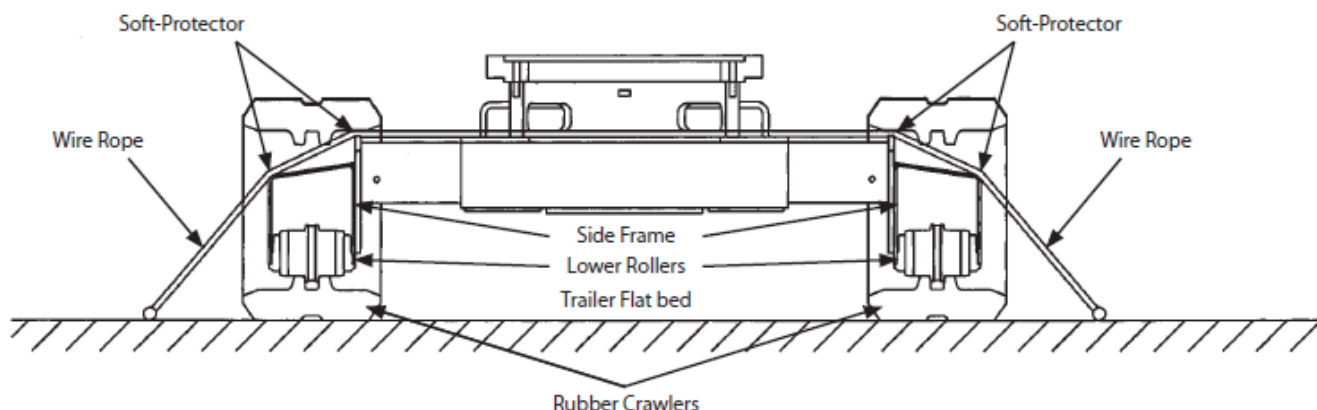
- Securely fasten the machine to the flatbed with wire ropes.
- Fasten the machine using the lightweight object-towing bracket of the truck frame to the truck flatbed with wire ropes. Be careful not to allow the wire rope to come in contact with the track shoe.

1. Place cog stoppers or blocks in front of and behind the tracks to help secure the unit.
2. Fasten each corner of the machine and front attachment to the truck with appropriate strength of chains or cables.

Transporting the machine equipped with rubber crawlers

When securing the machine to the flatbed, do not directly tighten the rubber crawler with wire ropes. As illustrated below, place soft protectors against left/right side frame respectively to securely tighten the machine to the flatbed before transporting the machine.

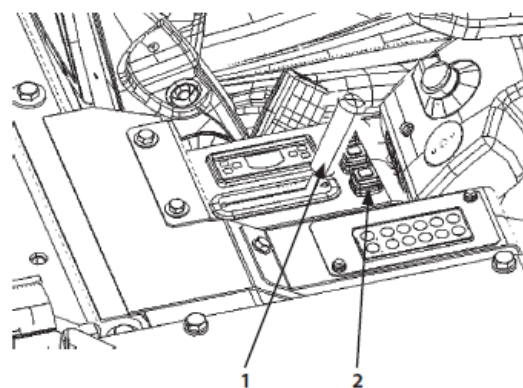




10.5. UNLOADING

WARNING:

- Always travel the machine slowly.
- Before descending a slope, always ensure that engine control lever (1) is in the slow idle position, and then reduce the engine speed. Turn the travel mode switch (2) to slow speed for ZX26U-5A.
- Never steer while driving up or down a ramp as it is extremely dangerous and may cause the machine to turnover. NEVER attempt to change directions whilst positioned on the ramp. If repositioning is necessary, first move back to the ground or flatbed, modify traveling direction, and begin to drive again.
- The top end of the ramp where it meets the flatbed is a sudden bump. Take care when travelling over it as the balance may be lost.



IMPORTANT:

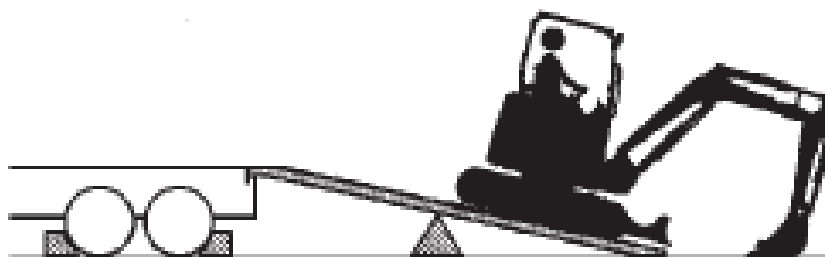
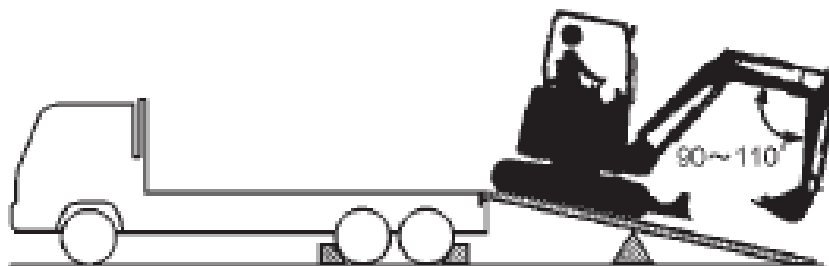
Make sure that the angle of the boom and the arm is kept at between 90 to 110 ° when unloading the unit. Damage to the unit is possible if the arm is kept in a suspended state during unloading.

1. Travel extremely slowly with the bucket on the ground and the angle of the arm and the boom kept at between 90 to 110 ° when moving from the edge of the truck onto the ramp.

IMPORTANT:

When driving the machine over the ramp, do not allow the machine to hit the ground too hard with the arm. Possible damage to the hydraulic cylinders may result.

2. The bucket must be on the ground before the machine begins to tip forward.
3. As the machine moves forward, raise the boom and extend the arm until the machine is completely off the ramp.



11. OPERATING THE MACHINE

11.1. PRECAUTIONS FOR OPERATIONS

Investigate the work site before starting operations.

- Be sure to wear close fitting clothing and safety equipment appropriate for the job, such as a hard hat, etc. when operating the machine.
- Clear all persons and obstacles from area of operation and machine movement. Do not permit persons other than the operator to enter areas where there is danger such as flying objects. Always beware of the surroundings while operating. When working in a small area surrounded by obstacles, take care not to hit the upper structure against obstacles.
- When loading onto trucks, bring the bucket over the truck beds from the rear side. Take care not to swing the bucket over the cab or over any person.

11.2. INVESTIGATE JOB SITE BEFOREHAND

When working at the edge of an excavation or on a road shoulder, the machine could tip over, possibly resulting in serious injury or death



- Investigate the configuration and ground conditions of the job site beforehand to prevent the machine from falling and to prevent the ground, stockpiles or banks from collapsing.
- Make a work plan. Use machines appropriate to the work and job site.
- Reinforce ground, edges, and road shoulders as necessary. Keep the machine well back from the edges of excavations and road shoulders.
- When working on an incline or on a road shoulder, employ a signal person as required.
- Confirm that your machine is equipped with a FOPS cab before working in areas where the possibility of falling stones or debris exist.
- When the footing is weak, reinforce the ground before starting work.
- When working on frozen ground, be extremely alert. As ambient temperatures rise, footing becomes loose and slippery.
- Beware the possibility of fire when operating the machine near flammable objects such as dry grass.
- Make sure the worksite has sufficient strength to firmly support the machine.
- When working close to an excavation or at road shoulders, operate the machine with the tracks positioned perpendicular to the cliff face with travel motors at the rear, so that the machine can more easily evacuate if the cliff face collapses.
- If working on the bottom of a cliff or a high bank is required, be sure to investigate the area first and confirm that no danger of the cliff or bank collapsing exists. If any possibility of cliff or bank collapsing exists, do not work on the area.
- Soft ground may collapse when operating the machine on it, possibly causing the machine to tip over. When working on soft ground is required, be sure to reinforce the ground first using large pieces of steel plates strong and firm enough to easily support the machine.
- Note that there is always a possibility of machine tipping over when working on rough terrain or on slopes. Prevent machine tipping over from occurring. When operating on rough terrain or on slopes:
 - Reduce the engine speed.
 - Select slow travel speed mode.
 - Operate the machine slowly and be cautious with machine movements.



11.3. RESTRICTION OF ATTACHMENT INSTALLATION

Do not install an attachment which exceeds specified weight for the machine structure.

11.4. CONFIRM DIRECTION OF MACHINE TO BE DRIVEN

- Incorrect travel pedal/lever operation may result in serious injury or death.
- Before driving the machine, confirm the position of the undercarriage in relation to the operator's position. If the travel motors are located in front of the cab, the machine will move in reverse when travel pedals/levers are operated to the front.

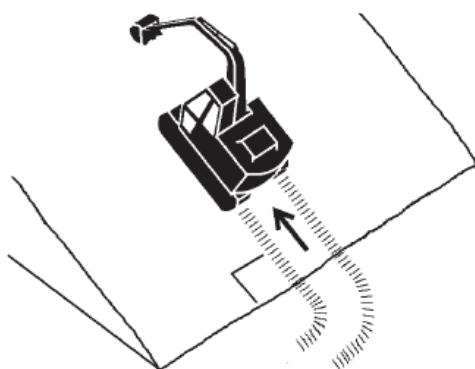
11.5. DRIVE MACHINE SAFELY

Before driving the machine, always confirm that the travel levers/pedals direction corresponds to the direction you wish to drive.

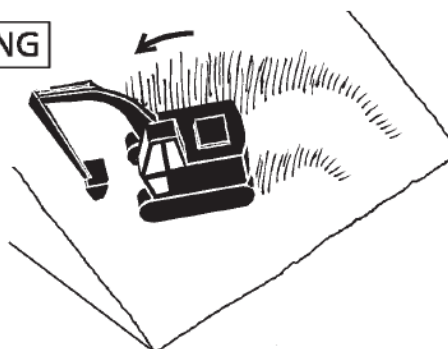
- Be sure to detour around any obstructions.
- Avoid traveling over obstructions. Soil, fragments of rocks, and/or metal pieces may scatter around the machine. Do not allow personnel to stay around the machine while traveling.

Driving on a slope may cause the machine to slip or overturn, possibly resulting in serious injury or death.

- Never attempt to ascend or descend 25 degrees or steeper slopes.
- Be sure to fasten the seat belt.
- When driving up or down a slope, keep the bucket facing the direction of travel, approximately 200 to 300 mm (8 to 12 in) (A) above the ground.
- If the machine starts to skid or becomes unstable, immediately lower the bucket to the ground and stop.
- Driving across the face of a slope or steering on a slope may cause the machine to skid or turnover. If the direction must be changed, move the machine to level ground, then, change the direction to ensure safe operation.
- Avoid swinging the upper structure on slopes. Never attempt to swing the upper structure downhill. The machine may tip over. If swinging uphill is unavoidable, carefully operate the upper structure and boom at slow speed.
- If the engine stalls on a slope, immediately lower the bucket to the ground. Return the control levers to neutral. Then, restart the engine.



WRONG



- When the machine descends a slope at high speed, machine weight accelerates descending speed. It may cause collision accident due to misjudging of braking distance or machine turnover due to running on an unexpected obstacle.
- Before descending a slope, always ensure that engine control lever (1) is in the slow idle position, and then reduce the engine speed. Turn the travel mode switch (2) to slow speed for ZX26U-5A.
- Be sure to thoroughly warm up the machine before ascending steep slopes. If hydraulic oil has not warmed up sufficiently, sufficient performance may not be obtained.
- Use a signal person when moving, swinging, or operating the machine in congested areas. Coordinate hand signals before starting the machine.
- Before moving machine, determine which way to move travel pedals/levers for the direction you want to go. When the travel motors are in the rear, pushing down on the front of the travel pedals or pushing the levers forward moves the machine forward, towards the idlers.
- An arrow-mark seal is stuck on the inside surface of the side frame to indicate the machine front direction.
- Select a travel route that is as flat as possible. Steer the machine as straight as possible, making small gradual changes in direction.
- Before traveling on them, check the strengths of bridges and road shoulders, and reinforce if necessary.
- Use wood plates in order not to damage the road surface. Be careful of steering when operating on asphalt roads in summer.
- When crossing train tracks, use wood plates in order not to damage them.
- Do not make contact with electric wires or bridges.
- When crossing a river, measure the depth of the river using the bucket, and cross slowly. Do not cross the river when the depth of the river is deeper than the upper edge of the upper roller.

- When traveling on rough terrain, reduce engine speed. Select slow travel speed. Slower speed will reduce possible damage to the machine.
- Avoid operations that may damage the track and undercarriage components.
- During freezing weather, always clean snow and ice from track shoes before loading and unloading machine, to prevent the machine from slipping.

11.6. AVOID INJURY FROM ROLLAWAY ACCIDENTS

Death or serious injury may result if you attempt to mount or stop a moving machine.

To avoid rollaway:

- Select level ground when possible to park the machine.
- Do not park the machine on a grade.
- Lower the bucket and/or other work tools to the ground.
- Run the engine at slow idle speed without load for 5 minutes to cool down the engine.
- Stop the engine and remove the key from the key switch.
- Pull the pilot control shut-off lever to LOCK position.
- Block both tracks and lower the bucket to the ground. Thrust the bucket teeth into the ground if you must park on a grade.
- Position the machine to prevent rolling.
- Park at a reasonable distance from other machines.



11.7. AVOID INJURY FROM BACK-OVER AND SWING ACCIDENTS

If any person is present near the machine when backing or swinging the upper structure, the machine may hit or run over that person, resulting in serious injury or death.

To avoid back-over and swing accidents:

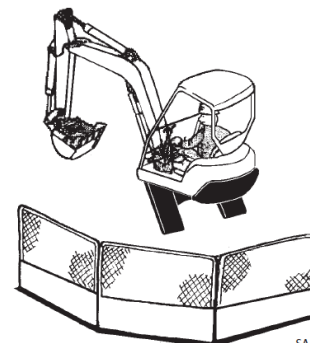
- Always look around BEFORE YOU BACK UP AND SWING THE MACHINE. BE SURE THAT ALL BYSTANDERS ARE CLEAR.
- Keep the travel alarm in working condition (if equipped).
- ALWAYS BE ALERT FOR BYSTANDERS MOVING INTO THE WORK AREA. USE THE HORN OR OTHER SIGNAL TO WARN BYSTANDERS BEFORE MOVING MACHINE.
- USE A SIGNAL PERSON WHEN BACKING UP IF YOUR VIEW IS OBSTRUCTED. ALWAYS KEEP THE SIGNAL PERSON IN VIEW.
- Use hand signals, which conform to your local regulations, when work conditions require a signal person.
- No machine motions shall be made unless signals are clearly understood by both signalman and operator.
- Learn the meanings of all flags, signs, and markings used on the job and confirm who has the responsibility for signalling.
- Keep windows, mirrors, and lights clean and in good condition.
- Dust, heavy rain, fog, etc., can reduce visibility. As visibility decreases, reduce speed and use proper lighting.
- Read and understand all operating instructions in the operator's manual.



11.8. KEEP PERSON CLEAR FROM WORKING AREA

A person around the operating machine may be hit severely by the swinging front attachment or counterweight, be caught in other objects, and/or be struck by flying objects, resulting in serious injury or death.

- Set up barriers and/or put a NO ADMISSION sign at the machine operating site and areas exposed by flying objects to prevent anyone from entering the work area.
- Check that all personnel or obstacles other than the signal person are not present in the working area before operating the machine.



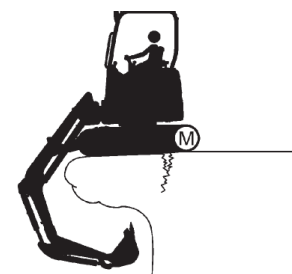
11.9. NEVER POSITION BUCKET OVER ANYONE

- Never lift, move, or swing bucket above anyone or a truck cab.
- Serious injury or machine damage may result due to bucket load spill or due to collision with the bucket.



11.10. AVOID UNDERCUTTING

- In order to retreat from the edge of an excavation if the footing should collapse, always position the undercarriage perpendicular to the edge of the excavation with the travel motors at the rear.
- If the footing starts to collapse and if retreat is not possible, do not panic. Often, the machine can be secured by lowering the front attachment, in such cases.



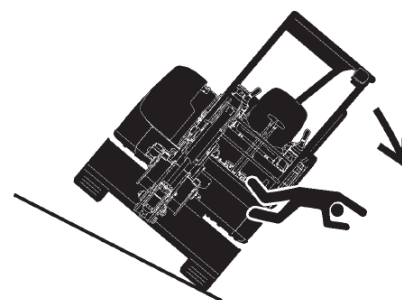
11.11. AVOID TIPPING

Do not attempt to jump clear of a tipping machine - Serious or fatal crushing injuries will result. A machine will tip over faster than you can jump free. Always ensure that the SEAT BELT has been fastened before moving and operating the excavator

The danger of tipping is always present when operating on a grade, possibly resulting in serious injury or death.

To avoid tipping:

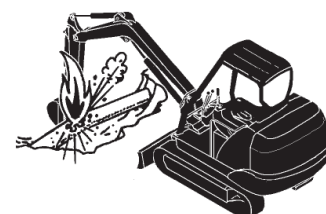
- Be extra careful before operating on a grade.
 - Prepare machine operating area flat.
 - Keep the bucket low to the ground and close to the machine.
 - Reduce operating speeds to avoid tipping or slipping.
 - Avoid changing direction when traveling on grades.
 - NEVER attempt to travel across a grade steeper than 15 degrees if crossing the grade is unavoidable.
 - Reduce swing speed as necessary when swinging loads.
- Be careful when working on frozen ground.
 - Temperature increases will cause the ground to become soft and make ground travel unstable.



11.12. DIG WITH CAUTION

Accidental severing of underground cables or gas lines may cause an explosion and/or fire, possibly resulting in serious injury or death.

- Before digging check, the location of cables, gas lines, and water lines.
- Keep the minimum distance required, by law, from cables, gas lines, and water lines.
- If a fibre optic cable should be accidentally severed, do not look into the end. Doing so may result in serious eye injury.
- Contact your local “diggers hot line” if available in your area, and/or the utility companies directly.



11.13. NEVER UNDERCUT A HIGH BANK

- The edges could collapse, or a land slide could occur causing serious injury or death.

11.14. OPERATE WITH CAUTION

If the front attachment or any other part of the machine hits against an overhead obstacle, such as a bridge, both the machine and the overhead obstacle will be damaged, and personal injury may result as well.

- Take care to avoid hitting

11.15. AVOID POWER LINES

Serious injury or death can result if the machine or front attachments are not kept at a safe distance from electric lines.

- When operating near an electric line, NEVER move any part of the machine or load closer than 3 m (10 ft) plus twice the line insulator length.
- Check and comply with any local regulations that may apply.
- Wet ground will expand the area that could cause any person on it to be affected by electric shock. Keep all bystanders or co-workers away from the site.

11.16. PRECAUTIONS FOR LIGHTNING

Lightning may strike the machine.

If lightning comes close, immediately stop the operation, and take the following action.

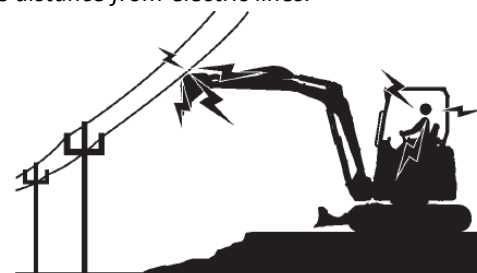
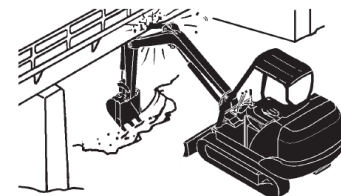
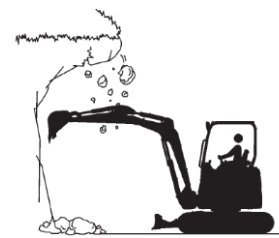
- When you are around the machine or operating cab-less machine, evacuate to a safe place far away from the machine.
- When you are in the cab, stay in the cab until lightning has passed and safety is secured. Close the cab doors and windows. Lower the bucket to the ground and stop the engine. Put your hands on your lap to avoid contact with any metal surfaces. Never go out of the cab.

Important: If lightning strikes the machine or near the machine, check all the machine safety devices for any failure after lightning has passed and safety is secured. If any trouble is found, operate the machine only after repairing it.

11.17. OBJECT HANDLING

If a lifted load should fall, any person nearby may be struck by the falling load or may be crushed underneath it, resulting in serious injury or death.

- When using the machine for craning operations, be sure to comply with all local regulations.
- Do not use damaged chains or frayed cables, cables, slings, or ropes.
- Before craning, position the upper structure with the travel motors at the rear.
- Move the load slowly and carefully. Never move it suddenly.
- Keep all persons well away from the load.
- Never move a load over a person's head.
- Do not allow anyone to approach the load until it is safely and securely situated on supporting blocks or on the ground.
- Never attach a sling or chain to the bucket teeth. They may come off, causing the load to fall.



11.18. PROTECT AGAINST FLYING DEBRIS AND FALLING OBJECT

During hammer operation, debris from earth, rock or metal may fly in all directions, resulting in a serious personal injury or death.

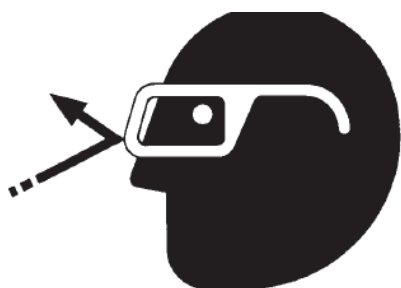
- When driving the connecting pins in or out, wear goggles or safety glasses, hard hat and face shield.

During machine operation, debris from earth, rock or metal may fly off from the track and bucket, resulting in a serious personal injury or death.

- Ensure nobody presents in or around the work area while machine is operating.

Falling of accumulated earth or dirt onto people may result in a serious personal injury or death.

- Before performing maintenance or inspection under carriage, remove accumulated debris.



11.19. PARK MACHINE SAFELY

To avoid accidents:

- Park machine on a firm, level surface.
- Lower bucket to the ground.
- Run engine at slow idle speed without load for 5 minutes.
- Turn key to the OFF position to stop engine.
- Remove the key from the key switch.
- Pull the pilot control shut-off lever to the LOCK position.
- Close windows, roof vent, and cab door.
- Lock all access doors and compartments.



11.20. HANDLE FLUIDS SAFELY—AVOID FIRES

Handle fuel with care; it is highly flammable. If fuel ignites, an explosion and/or a fire may occur, possibly resulting in serious injury or death.

- Do not refuel the machine while smoking or when near open flame or sparks.
- Always stop the engine before refuelling the machine.
- Fill the fuel tank outdoors.



All fuels, most lubricants, and some coolants are flammable.

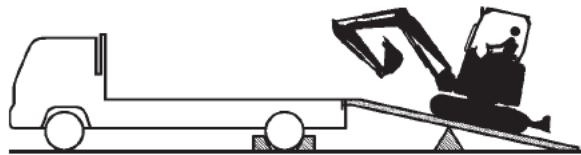
- Store flammable fluids well away from fire hazards.
- Do not incinerate or puncture pressurized containers.
- Do not store oily rags; they can ignite and burn spontaneously.
- Securely tighten the fuel and oil filler cap.



11.21. TRANSPORT SAFELY

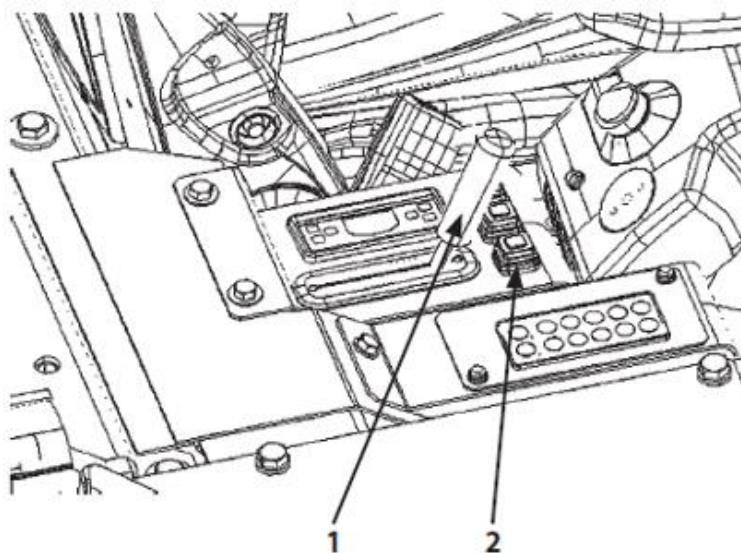
Take care the machine may turn over when loading or unloading the machine onto or off a truck or trailer.

- Observe the related regulations and rules for safe transportation.
- Select an appropriate truck or trailer for the machine to be transported.
- Be sure to use a signal person.
- Always follow the following precautions for loading or unloading:



1. Select solid and level ground.
2. Always use a ramp or deck strong enough to support the machine weight.
3. Select the slow travel mode for loading or unloading the machine.

Before descending a slope, always ensure that engine control lever (1) is in the slow idle position, and then reduce the engine speed. Turn the travel mode switch (2) to slow speed for ZX26U-5A.



4. Never load or unload the machine onto or off a truck or trailer using the front attachment functions when driving up or down the ramp.
5. Never steer the machine while on the ramp. If the traveling direction must be changed while on the ramp, unload the machine from the ramp, reposition the machine on the ground, then try loading again.
6. The top end of the ramp where it meets the flatbed is a sudden bump. Take care when traveling over it.
7. Place blocks in front of and behind the tires. Securely hold the machine to the truck or trailer deck with wire ropes.

Note: *Be sure to further follow the details described in the TRANSPORTING section.*

11.22. PRACTICE SAFE MAINTENANCE

To avoid accidents:

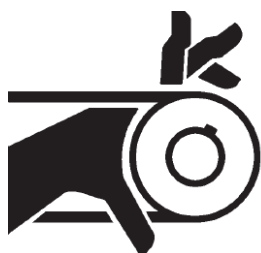
- The recipient who hires the mini excavator is only permitted to perform a prestart inspection, all other repairs & maintenance are only to be performed by an authorised service technician.
- Do not spray water or steam inside cab.
- Never lubricate or inspect the machine while it is moving.
- Keep hands, feet, and clothing away from power-driven parts.

- Report damaged, worn or broken parts immediately so replacement can occur **(Do not operate until rectified)**
- *Never attempt to work on the machine without securing the machine first.*
- Always lower the attachment to the ground before you work on the machine.
- Do not work under a machine that is supported solely by a jack and at no time support the machine on cinder blocks, hollow tires, or props that may crumble under continuous load.

11.23. STAY CLEAR OF MOVING PARTS

Entanglement in moving parts can cause serious injury.

- To prevent accidents, care should be taken to ensure that hands, feet, clothing, jewellery and hair do not become entangled when working around rotating parts.



11.24. PREVENT PARTS FROM FLYING

Grease in the track adjuster is under high pressure. Failure to follow the precautions below may result in serious injury, blindness, or death.

- Do not attempt to remove GREASE FITTING or VALVE ASSEMBLY.
- As pieces may fly off, be sure to keep body and face away from valve.
- Never attempt to disassemble the track adjuster. Inadvertent disassembling of the track adjuster may cause the parts such as a spring to fly off, possibly resulting in severe personal injury or death.

11.25. AVOID INJURY FROM ATTACHMENT FALLING ACCIDENT

Stored attachments such as buckets, hydraulic hammers, and blades can fall and cause serious injury or death.

- To avoid possible personal injury from attachment falling accident, use a platform when replacing an attachment.
- Securely store attachments and implements to prevent falling.
- Keep children and bystanders away from storage areas.

11.26. PREVENT BURNS

After operation, engine coolant is hot and under pressure. Hot water or steam is contained in the engine, radiator, and heater lines.

Skin contact with escaping hot water or steam can cause severe burns.

- To avoid possible injury from hot spraying water. DO NOT remove the radiator cap until the engine is cool. When opening, turn the cap slowly to the stop. Allow all pressure to be released before removing the cap.
- The hydraulic oil tank is pressurized. Again, be sure to release all pressure before removing the cap.

Hot fluids and surfaces:

Engine oil, gear oil and hydraulic oil also become hot during operation.

The engine, hoses, lines and other parts become hot as well.

- Wait for the oil and components to cool before starting any maintenance or inspection work.



11.27. AVOID HIGH-PRESSURE FLUIDS

Fluids such as diesel fuel or hydraulic oil under pressure can penetrate the skin or eyes causing serious injury, blindness, or death.

- Avoid this hazard by relieving pressure before disconnecting hydraulic or other lines. (Disconnection of hydraulic lines should only occur when installing attachments required to operate auger and must never occur at any other time)
- Take care to protect hands and body from high-pressure fluids. Wear a face shield or goggles for eye protection.
- If an accident occurs, see a doctor familiar with this type of injury immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result.



11.28. PREVENT FIRES

Check for Oil Leaks:

Fuel, hydraulic oil and lubricant leaks can lead to fires.

- Check for oil leaks due to missing or loose clamps, kinked hoses, lines or hoses that rub against each other, damage to the oil-cooler, and loose oil-cooler flange bolts.
- Report any missing, loose or damaged clamps, lines, hoses, oil-cooler and oil-cooler flange bolts.
- Do not bend or strike high-pressure lines.

Check for Shorts:

Short circuits can cause fires.

- Check before each day of operation for loose, kinked, hardened or frayed electrical cables and wires.
- Check before each day of operation for missing or damaged terminal caps.
- DO NOT OPERATE MACHINE if cable or wires are loose, kinked, etc.
- Never attempt to modify electric wirings.

Clean up Flammable Materials:

Spilled fuel and oil, and trash, grease, debris, accumulated coal dust, and other flammable materials may cause fires.

- Prevent fires by inspecting and cleaning the machine daily, and by removing adhered oil or accumulated flammable materials immediately. Check and clean high temperature parts such as the exhaust outlet and mufflers earlier than the normal interval.
- Do not wrap high temperature parts such as a muffler or exhaust pipe with oil absorbents.
- Do not store oily cloths as they are vulnerable to catching fire.
- Keep flammable materials away from open flames.
- Do not ignite or crush a pressurized or sealed container.
- Wire screens are provided on openings on the engine compartment covers to prevent flammable materials such as dead leaves from entering. However, flammable materials which have passed through the wire screen may cause fires. Check and clean the machine every day and immediately remove accumulated flammable materials.

Check Key Switch:

If a fire breaks out, failure to stop the engine will escalate the fire, hampering firefighting.

Always check key switch function before operating the machine every day:

- Start the engine and run it at slow idle.

- Turn the key switch to the OFF position to confirm that the engine stops.
- If any abnormalities are found, be sure to report them so repairs can occur before operating the machine.

Check Heat Shields:

Damaged or missing heat shields may lead to fires.

- Damaged or missing heat shields must be repaired or replaced before operating the machine.
- If hydraulic hoses are broken while the engine cover is open, splattered oil on the high temperature parts such as mufflers may cause fire. Always close the engine cover while operating the machine.

11.29. EVACUATING IN CASE OF FIRE

If a fire breaks out, evacuate the machine in the following way:

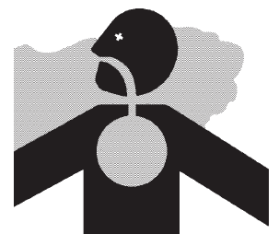
- Stop the engine by turning the key switch to the OFF position if there is time.
- Use a fire extinguisher if there is time.
- Exit the machine.



11.30. BEWARE OF EXHAUST FUMES

Prevent asphyxiation. Engine exhaust fumes can cause sickness or death.

- If you must operate in a building, be sure there is adequate ventilation. Either use an exhaust pipe extension to remove the exhaust fumes or open doors and windows to bring enough outside air into the area.



11.31. VISIBILITY MAP FOR MACHINE MODEL ZX17U-5A SERIES

Personal Hazard

This machine complies with the essential health and safety requirements for visibility set out by Machinery Directive 2006/42/EC. The map shows the residual maskings (blind spots) observed by a seated operator (wearing the recommended seat restraint) in the cab using direct vision and the standard visual aids supplied with the machine.

This map shows an approximation of the residual masking. This can be used as a guide when conducting a site risk assessment, utilized for site management and to consider additional visual aids.

Conditions: Driver's visibility on 1mRB and VTC are evaluated under ISO 5006.


- Test Height (on 1mRB): 1.0 m to 1.2 m Ground Level
 - (1mRB to VTC/on VTC): 1.0 m to 1.2 m Ground Level
- Operator eye Height: 1.2 m from the canopy floor
- Applicable visual aids: none

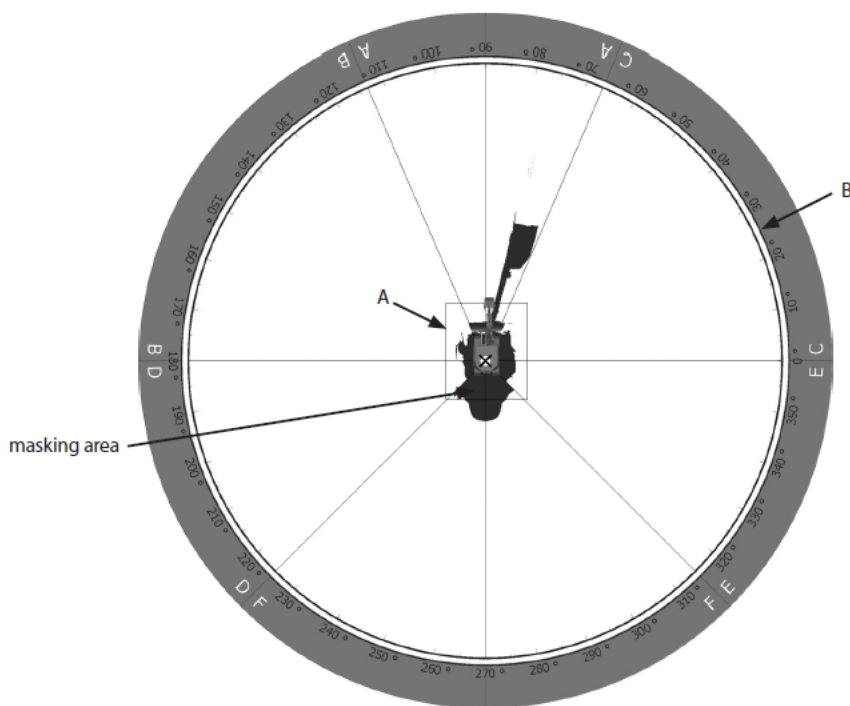


Machine Position Image

MABA-VM-001

⊗ : Operator's eye point
 A : 1 m Rectangular Boundary (1mRB)
 B : 12 m Visibility Test Circle (VTC)

 : Masking area

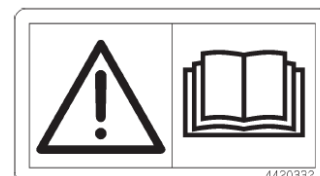


Visibility Map

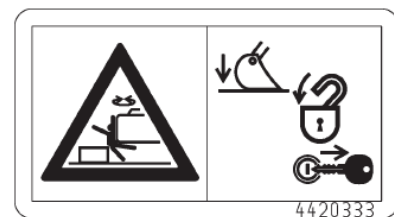
12. SAFETY SIGNS

All safety signs and their locations affixed on the machine are illustrated in this group. Make sure of the contents described in the safety signs through reading actual ones affixed on the machine to ensure safe machine operation. Always keep the safety signs clean. In case a safety sign is broken or lost, immediately, obtain a new replacement and affix it again in position on the machine. Use the part No. indicated under the right corner of each safety sign illustration when ordering it at your authorized dealer.

- Always read the Operator's Manual before operating, servicing, disassembling, assembling, and transporting the machine.

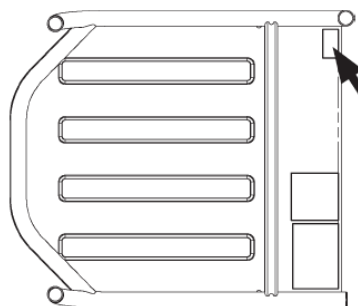
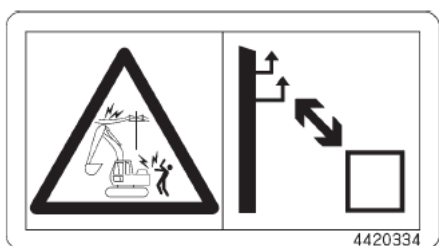


- If the parked machine is unexpectedly moved, serious injury or death due to crushing may result. Be sure to lower the front attachment to the ground, lock the control levers, and remove the engine key before leaving the machine unattended.

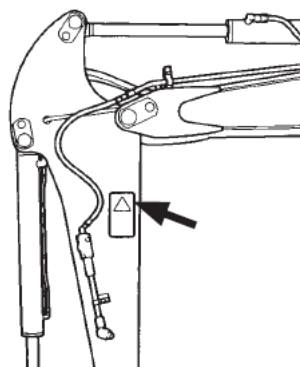


- Before starting engine, pilot control shut-off lever must be in up position.

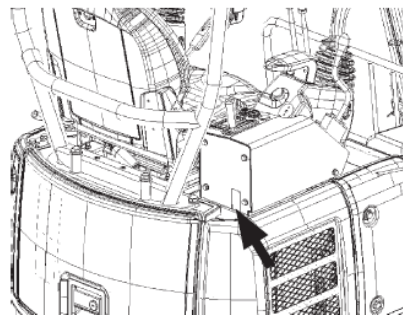
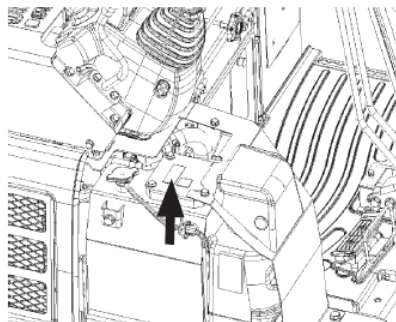
- Electrocuting is possible if the machine is operated too close to power lines. Always keep a safe distance from power lines.



- Stand clear of the equipment. If knocked over by the equipment, serious injury may result.



- Hot coolant or oil may spout if the radiator or hydraulic oil cap is removed while the machine temperature is still high, possibly causing a burn. Wait until the machine has cooled to remove the cap.



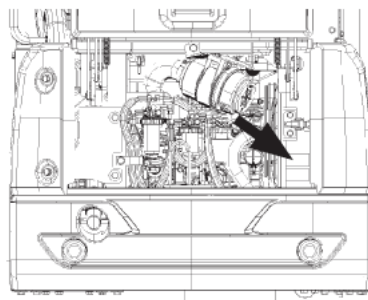
ZX17U-5A

indicates the hazard of rotating parts, such as fan, etc. that could cause injury by being caught. Turn it off completely before inspection and maintenance.

- Sign



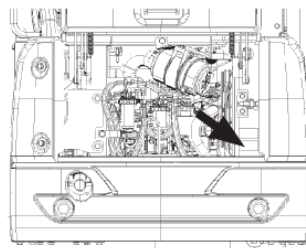
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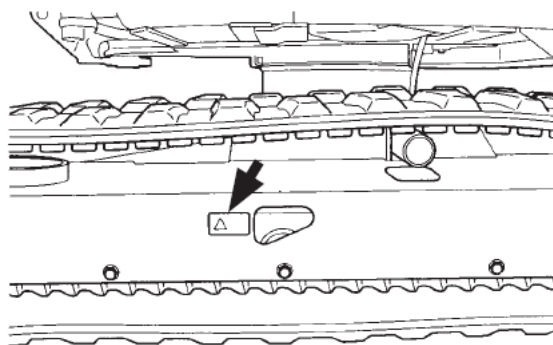
- Sign indicates the hazard of rotating parts, such as belt, etc. that could cause injury by being caught. Turn it off completely before inspection and maintenance.



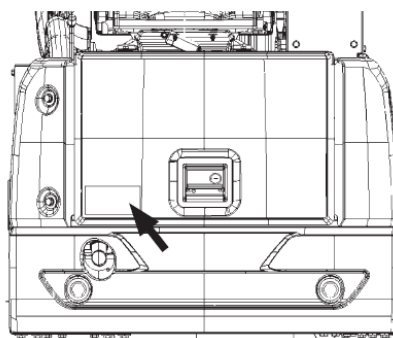
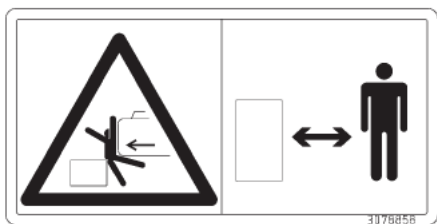
ZX17U-5A



- Serious injury may result if the plug flies off the track adjuster. Read the Operator's Manual before loosening the track and adjust the track sag following the correct procedure.



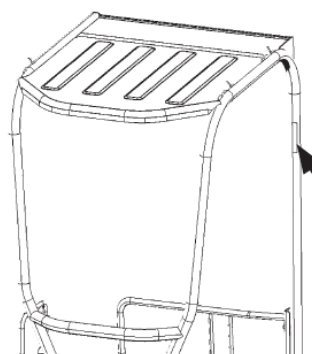
- Personnel in the swing radius may be crushed by the upper structure when the machine swings. Stand clear of the swing radius.



- If the machine should overturn, the operator may become injured and/or thrown from the cab and/or crushed by the overturning machine.



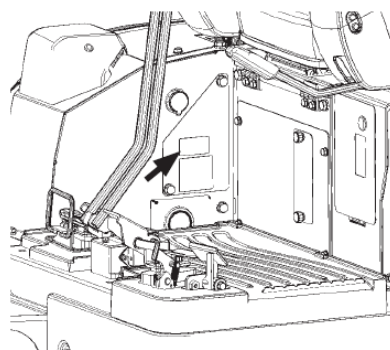
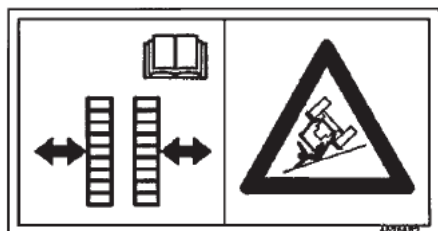
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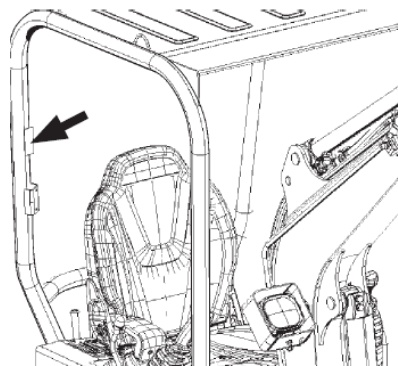
CANOPY
7X1711-5A

Precautions for extending/retraction side frame

- Operate the machine with the side frames retracted only when traveling on a flat narrow work site.
- Except for the above operating conditions, always operate the machine with the side frames extended for travel, excavation, and blade operations. Failure to do so may cause the machine to turn over.



A machine attached with below certification meets strength authentication of operator's station (such as ROPS/TOPS/TOP Guard). Never attempt to modify the ROPS, TOPS or TOP Guard other than authorized personnel. If an operator's station is detached or a bolt is installed/removed by unauthorized personnel, it may not comply with ROPS, TOPS or TOP Guard. Consult your nearest authorized dealer when any modification is required.



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ZX17U-5A