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Foreword

This Operation & Maintenance Manual was written to give owner instructions on safe operation and maintenance of HD HYUNDAI CONSTRUCTION EQUIPMENT. READ AND UNDERSTAND THIS OPERATION AND MAINTENANCE MANUAL BEFORE OPERATING YOUR HD HYUNDAI CONSTRUCTION EQUIPMENT. Keep this manual in the cabin so it is always available. If it is lost, order another one from your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.

If there are any questions, contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor. This manual may illustrate options and accessories not installed on your equipment.

Any modification made without written authorization or approval from HD HYUNDAI CONSTRUCTION EQUIPMENT can create a safety hazard.

Always replace parts with genuine HD HYUNDAI CONSTRUCTION EQUIPMENT parts or HD HYUNDAI CONSTRUCTION EQUIPMENT authorized replacement parts.

Intended Use

The machine is intended to be used under normal conditions for applications described in this manual. If it is used for other purposes, or in potentially hazardous environments, special precautions must be followed and the machine must be equipped for such use. If necessary, install object guards, work lights, etc. Do not engage in prohibited uses as described in this manual. Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for further information.

Machine capacity

Do not exceed machine capacity by modifying machine or using unapproved attachments.

Exceeding machine capacity can adversely affect stability or machine performance characteristics such as brakes and steering, and can result in death or serious injury. Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for further information.

Attachment

Do not use unapproved attachments. Attachments not manufactured by HD HYUNDAI CONSTRUCTION EQUIPMENT may not be approved.

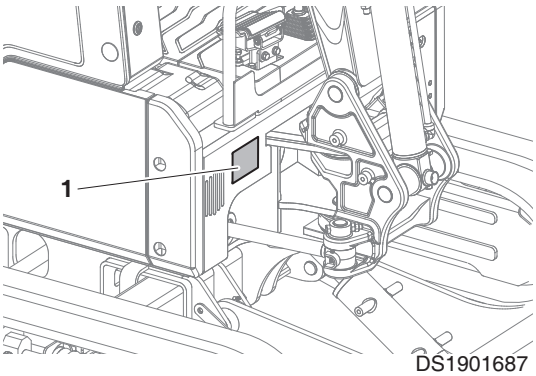
See your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for information about approved attachments and attachment manuals.

- Buckets
- Hydraulic breakers
- Grapples
- Plate compactors
- Quick couplers

Product Identification Number (PIN)

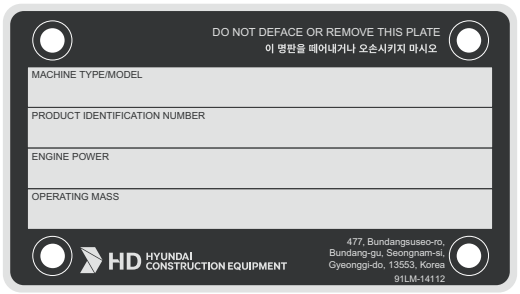
A PIN number is stamped on upper frame under boom foot (1, Figure 1).

NOTE: Record this number and its location. These will be required whenever warranty or service work is requested. Keep this number on file in case machine is stolen.



DS1901687

Figure 1



DS2401649

Figure 2

Component Serial Numbers

There are many serial numbers on each traceable component of the machine.

Record these numbers and their locations. These will be required whenever warranty service work is requested.

Machine Serial Numbers

Product Identification Number (PIN)	
Machine Serial No.	
Engine Serial No.	
Main Pump	
Swing Motor	
Travel Motor	
Main Control Valve	

Safety Messages

Safety messages and safety decals included in this manual and on the machine provide instructions how to operate, service and maintain the machine. Safety messages and safety decals indicate potential hazards and describe safety precautions required to avoid hazards. Operator and maintenance personnel should read and understand these safety messages and decals before beginning operation or maintenance.

⚠ SAFETY ALERT SYMBOL ⚠

Familiarize yourself with all driving and safety instructions.

This is a Safety Alert Symbol. Wherever it appears in this manual or on safety decals on the machine, you must be alert to the potential for personal injury or accidents. Always observe safety precautions and follow recommended procedures.

Signal words

The signal words "DANGER", "WARNING", "CAUTION" are used throughout safety messages and safety decals in this manual or on the machine. They indicate an existence of, and the relative seriousness of, a hazard. All these indicate that a safety risk is involved. Observe the precautions indicated whenever a Safety Alert Symbol is present.

DANGER

DANGER - This signal word is used on safety messages and safety labels and indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING - This signal word is used on safety messages and safety labels and indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION - This signal word is used on safety messages and safety labels and indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

Other Signal words

Others signal words are used to indicate proper and effective use of machine.

NOTICE

This signal word identifies procedures which must be followed to avoid damage to machine.

NOTE: The word "NOTICE" is used to provide information that is necessary for effective use machine or device.

EC Declaration of Conformity
(Original instruction)

This declaration of conformity is issued under the sole responsibility of manufacturer:

HYUNDAI CONSTRUCTION EQUIPMENT CO., LTD.
12th Fl., Hyundai Bldg. 75, Yulgok-ro, Jongno-gu,
Seoul 03058, Korea

Hyundai Construction Equipment Europe N.V located at Hyundailaan 4, 3980 Tessenderlo, Belgium, as authorized representative in the European Community is authorized to compile the technical construction file and declares that the product:

Type:	*********
Model:	******
Serial number (PIN):	**********

is in conformity with the relevant provisions of the Community harmonization legislation:

2006/42/EC - Machinery directive
2014/30/EU - Electromagnetic compatibility directive
2000/14/EC - Noise emission outdoor equipment directive
2002/44/EU - Exposure of workers to vibration risks directive
their amendments, and other applicable directives.

EMC (2014/30/EU)

Certificate number:	**********
Date:	DD/MM/YYYY
Notified body:	**********

Noise levels (2000/14/EC)

Certificate number:	**********
Date:	DD/MM/YYYY
Conformity assessment proc.:	Annex VIII Full Quality Assurance
Notified body:	**********
	**********
Measured sound power level:	nnn.n dB(A)
Guaranteed sound power level:	nnn.n dB(A)

Engine information

Manufacturer :	*********
Engine model name:	********
Type-approval number:	**********
Stage (Regulation) :	STAGE ** (**/**/**)
Gross Power (SAE J1995):	***kW / ****rpm
Net Power (SAE J1349):	***kW / ****rpm

Harmonized standards, other technical standards and specifications applied:

EN 474-1:2006+A*:**** (EMM - Safety - Part 1); EN 474-3:2006+A*:**** (EMM - Safety - Part 3); EN ISO 3471:2008 (EMM - ROPS: Lateral/Vertical/Longitudinal loads); EN ISO 3449:2008 (EMM - FOPS: Level II cabin); ISO 2631-1:1997 & ISO 2631-1:1997/Amd1 :2010 (Whole-body vibration); EN ISO 5349-1:2001 &EN ISO 5349-2:2001 & EN ISO 5349-2:2001/A1:2015 (Hand-arm vibration)

****

Managing Director

Place, date of issue:	Tessenderlo Belgium, DD MM YYYY

Safety

Safety Decals

Safety decals are attached to the machine to alert the operator or maintenance person about potential hazards, and instructions and/or actions required to avoid injury. The location of the safety decals and the description of the decals are reviewed in the following section. Please become familiarized with all safety decals and their messages.

Make sure that all the safety decals are in their correct location and legible. Clean or replace the safety decals if they are damaged, missing, or the texts and pictorials are not legible. When you clean the safety decals, use a soft cloth, water, and soap. Do not use solvent, gasoline, or other harsh chemicals to clean the safety decals because this could loosen the adhesive that secures the decals to the machine. Remember, if a safety decal is attached to a part that is replaced, install a new safety decal on the replacement part.

This machine uses safety decals with and without text. The type and number of safety decals can vary depending upon geographical regions and machine models.

Safety Decals With Text

Safety decals with text consist of a signal word, pictorial and a text message panel. In some cases, a pictorial panel may not be part of the safety decal.

Safety Decals Without Text (No-Text)

Safety decals without text consist of a hazard panel(s) and avoidance panel(s).

Hazard panels are located at the top or left side and the avoidance panels are located at the bottom or right side of the decal depending on its configuration. The hazard panels use a black triangular band and a pictorial to identify the hazard and the potential consequences of failure to follow the instructions. Avoidance panels use pictorials and/or prohibition signs to identify the actions necessary to avoid the hazard.

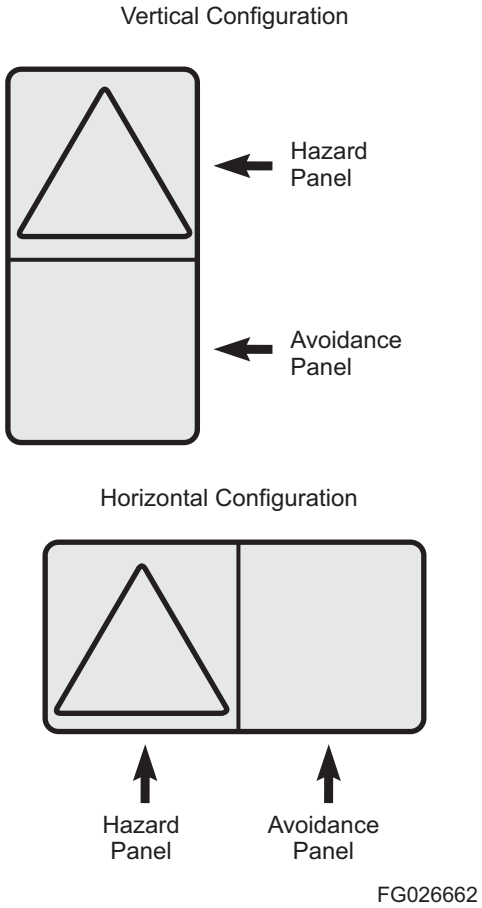
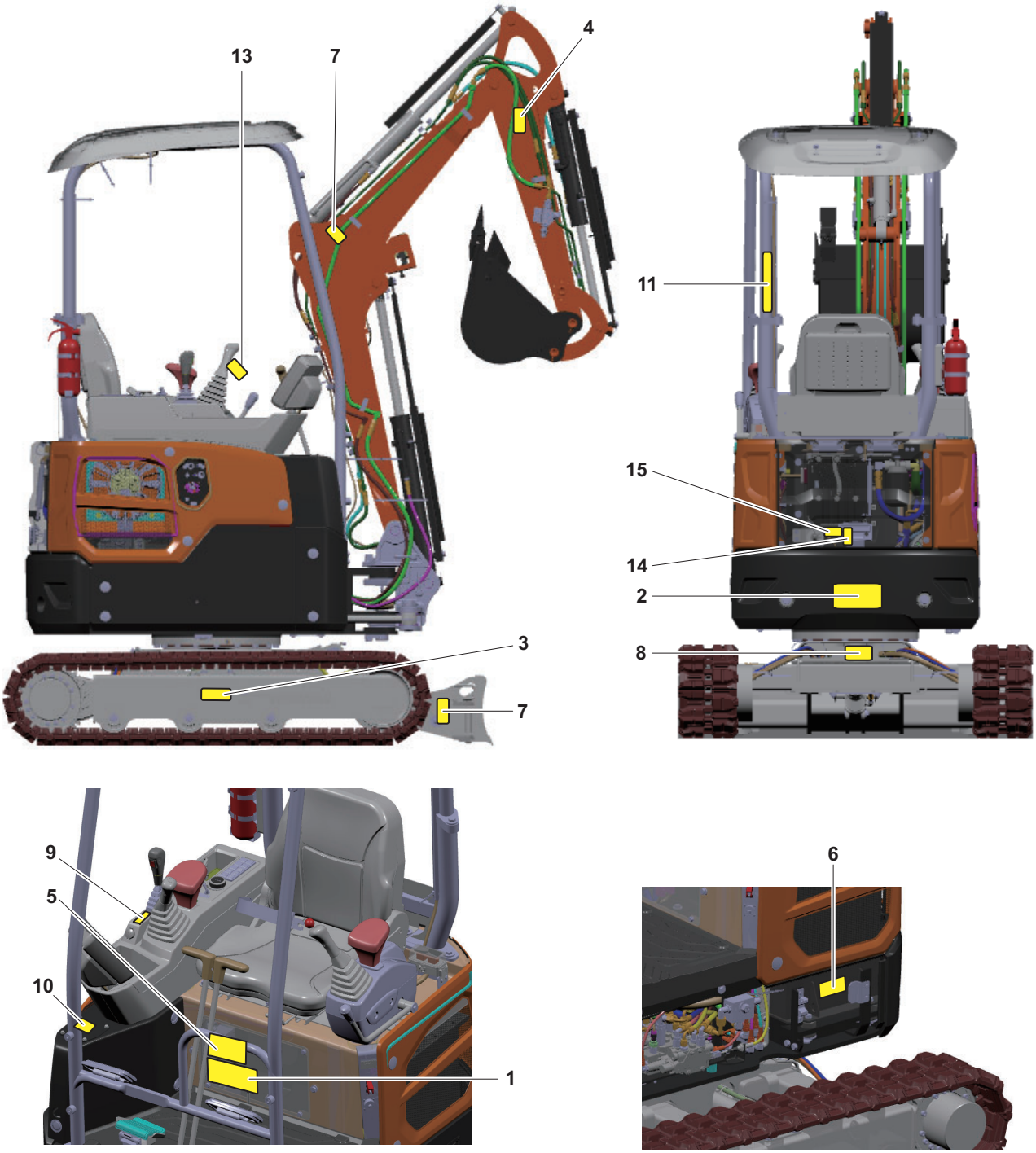


Figure 1

Safety Decals - Information and Location



DS2300347

Figure 2

1. General Hazard (950205-09501)

DS2300348

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

- **Never use excavator without instructions.**
- **Read Operation & Maintenance Manual before operation.**
- **Sound the horn to alert bystanders before operating.**
- **Always fasten your seat belt.**
- **Explosion or electrocution can occur if machine contacts utility lines or pipes. Check for overhead or underground lines before operating.**
- **Attachment interference can cause death, serious injury or machine damage. Check attachment to machine clearance through full working cycle before operation.**
- **Keep bystanders out of swing area and travel path and always look in the travel direction.**
- **Never operate machine from outside the operator's position.**
- **TO LEAVE THE EXCAVATOR:**
  1) **Lower the attachment and dozer blade (if equipped) to the ground and make sure all controls are in neutral.**
  2) **Stop engine and remove key.**
  3) **Lower safety lever to LOCK position.**

2. **Keep Bystanders Away (950205-03862)**

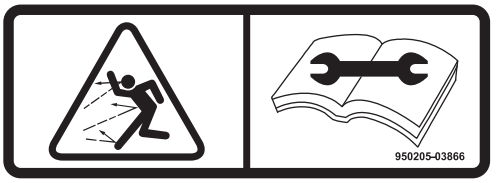
DS1605525

WARNING

AVOID DEATH OR SERIOUS INJURY

- **Keep out of swing area and travel path.**
- **Always look in the travel direction.**
- **Make sure swing area is clear of bystanders and objects.**

3. **Track Tensioning Device (Track Type) Hazard (950205-03866)**



EX1301185

WARNING

AVOID DEATH OR SERIOUS INJURY

- **Track adjusting systems use grease under high-pressure which can penetrate body if improperly serviced.**
- **NEVER LOOSEN track tension grease valve. Perform more than one complete turn from the fully tightened position.**
- **Bleed off pressure slowly and keep body away from grease valve.**
- **Wear eye protection.**
- **Read and follow instructions in Operation & Maintenance Manual for more information on track adjustment.**

4. **Crush Hazard (950205-03787)**

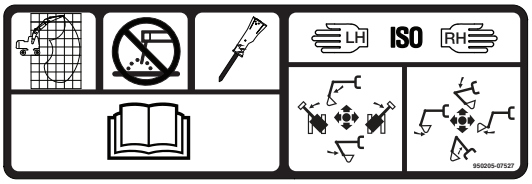
EX1402207

WARNING

AVOID DEATH OR SERIOUS INJURY

Stay clear of the boom, arm, and attachment.

5. Lifting Capacity Table / Electric Welding Attention / Hydraulic Breaker / ISO Control Pattern (950205-09502)



DS1802854

WARNING

AVOID DEATH OR SERIOUS INJURY

Read and understand the Operation & Maintenance Manual for more information.
For details on the operation pattern, refer to the "Work Lever (Joystick)" section of this instruction manual.

AVOID HYDRAULIC SYSTEM DAMAGE

To adjust breaker impact, see Operation & Maintenance Manual for additional instructions.

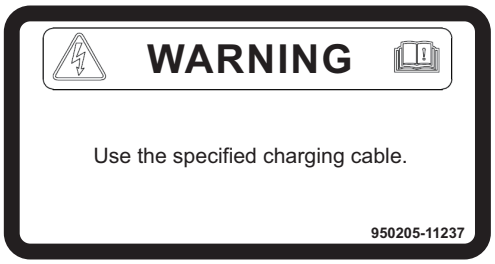
AVOID ELECTRICAL COMPONENT DAMAGE

Electrical welding on the frame can damage the engine's electronic control unit (ECU).

6. Charging cable (950205-11237)

WARNING

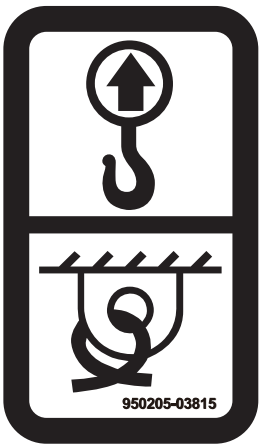
Use the specified charging cable.



DS2300349

7. Lift/Tie down (950205-03815)

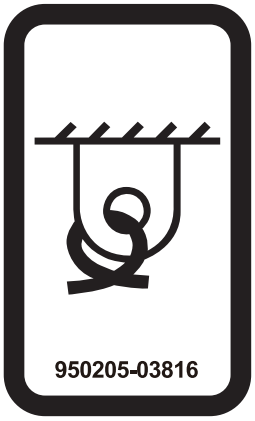
Identify lift point and tie down point location.



EX1301201

8. Tie down (950205-03816)

Identify tie down point location.



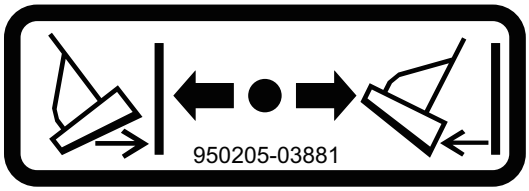
EX1301203

9. Dozer (950205-03881)

WARNING

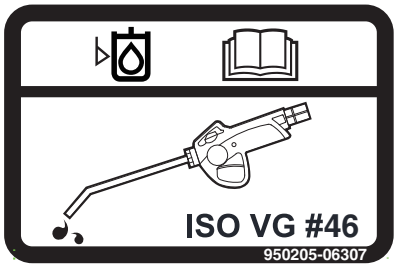
AVOID DEATH OR SERIOUS INJURY

- **Check the dozer blade location before traveling. When the blade is to the rear, operate the steering levers/foot pedal in the opposite direction to when the blade is in the front.**
- **Before moving, make sure there are no persons or property in the way. Never allow riders.**
- **Sound the horn to alert workers and bystanders that you are about to move the machine.**
- **Always make sure the path is clear during travel.**
- **Use extreme caution when reversing travel.**
- **Be sure there is a clear path behind the machine.**
- **Operate the travel control levers smoothly to avoid sudden starts or stops.**
- **Before leaving the operator's seat, make sure to lock out all control systems and stop engine to avoid accidental activation of the controls.**



DS2102871

10. Hydraulic Oil Check (950205-06307)



WL1501032

NOTICE

Place the excavator with the boom and arm fully extended with the attachment on the ground before checking hydraulic fluid level.

Use hydraulic fluid which is suitable for machine.

11. Canopy Attention (950205-06846)

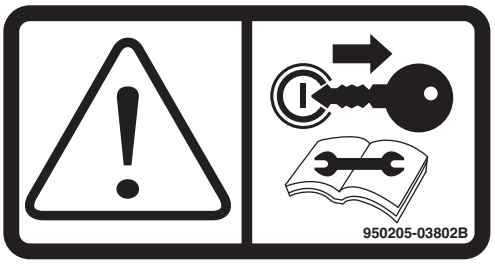
DS1702736

WARNING

AVOID DEATH OR SERIOUS INJURY

- **Do not remove the canopy arbitrarily.**
- **The canopy should be always installed for safety.**

13. Warning Tag - "Do Not Operate" (950205-03802B)



DS1801807

CAUTION

AVOID DEATH OR SERIOUS INJURY

- **Attach "DO NOT OPERATE" warning tag to the controls before servicing the machine.**
- **Do not operate when performing inspection or maintenance.**

14. Battery Explosion (950205-03785)

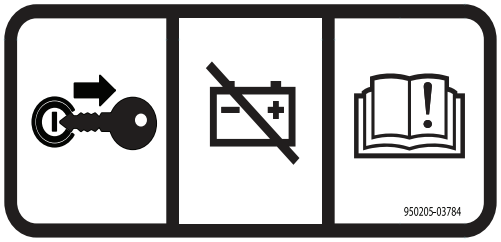
EX1301183

CAUTION

AVOID DEATH OR SERIOUS INJURY

- **Keep arcs, sparks, flames, and lighted tobacco away.**
- **Do not store metal tools or flammable materials on or around batteries.**
- **Wear safety goggles and rubber gloves when working with batteries.**
- **If battery acid contact occurs:**
  1) **Flush your skin with water immediately and apply baking soda or lime to neutralize the acid.**
  2) **Flush your eyes with water for 10 - 15 minutes.**
  3) **Get medical attention immediately.**

15. Battery Disconnection (950205-03784)



EX1301184

NOTICE

AVOID DAMAGE TO ELECTRICAL COMPONENTS

Disconnecting the battery while the engine is running can cause damage to electrical components. Disconnect battery only after engine is turned OFF.

General

Operator's Responsibility - Safe Operation

Only trained and authorized personnel should operate and maintain the machine.

Follow all safety rules, regulations and instructions when operating or performing maintenance on machine.

- Do not operate machine if you are under the influence of drugs or alcohol. An operator who is taking prescription drugs must get medical advice to determine if he or she can safely operate a machine.
- When working with other personnel on a work site, be sure that all personnel know nature of work and understand all hand signals that are to be used.
- Be sure that all guards and shields are installed in their proper location. Have guards and shields repaired or replaced immediately if damaged.
- Be sure that you understand the use and maintenance of all safety features such as safety lever and seat belt. Use them properly.
- Never remove, modify or disable any safety features. Always keep them in good operating condition.
- Always check for and know the location of underground and overhead utility lines before excavating.
- Failure to use and maintain in accordance with the instructions in this manual may result in death or serious injury.

Know Your Machine

Know how to operate your machine. Know the functions of all control levers, gauges, indicators and monitor displays.

Know the rated load capacity, speed range, braking and steering characteristics, turning radius and operating clearances. The operating capabilities of your machine may vary depending on the condition of the ground. Take this into account when operating the machine.

Proper Work Tools and Attachments

Only use work tools and attachments that are recommended by HD HYUNDAI CONSTRUCTION EQUIPMENT for use on HD HYUNDAI CONSTRUCTION EQUIPMENT machines. When installing and using optional attachments, read instruction manual for attachment, and general information related to attachments in this manual. Do not install attachments at your own discretion. Contact HD HYUNDAI CONSTRUCTION EQUIPMENT for written authorization and approval of attachments.

Attachments and attachment control systems that are compatible with the machine are required for safe and reliable machine operation.

While you are performing any maintenance or adjustments to attachments, stay clear of the following areas: cutting edges and pinch points.

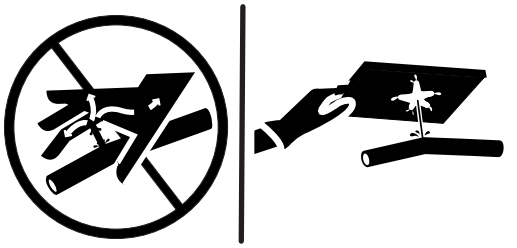
Never use attachment as a work platform or manlift.

Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor about auxiliary hydraulic kits for attachments installation. If you are in doubt about compatibility of a particular attachment with a machine, consult your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.

Pressurized Fluids

Pressurized air or fluids can cause death or serious injury.

Immediately after operations are stopped, hydraulic fluid is at its highest temperature and hydraulic tank is still under pressure. Always wait for temperature to cool down. Follow specified procedures when attempting to remove caps, drain oil or coolant, or replacing filters. Always wait for temperature to cool down, and follow specified procedures when performing these operations. Failure to do so can result in death or serious injury.



FG018457

Figure 3

When pressurized air and/or pressurized water is used for cleaning, wear protective clothing, protective shoes, and eye protection. Eye protection includes goggles or a protective face shield.

Pressure can be trapped in a hydraulic system and must be relieved before maintenance is started.

If trapped pressure is not released when disconnecting the hydraulic pressure line or connection unit, it can cause sudden machine movement or attachment movement.

High-pressure oil that is released can cause a hose to whip or oil to spray. Fluid penetration can result in death or serious injury. If fluid enters skin or eyes, get immediate medical attention from a physician familiar with this injury.

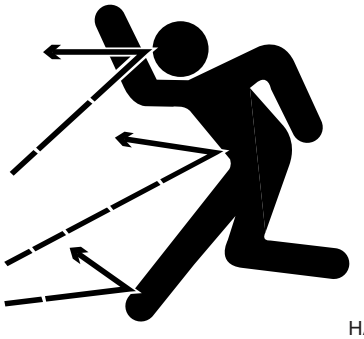
Obey all local laws and regulations for disposal of liquids.

Flying or Falling Objects

On work sites where there are many lying or falling objects, pay particular attention to the operating and surrounding environment.

Working in mines, tunnels, deep pits, and loose or wet surfaces, could produce hazard of falling rocks or flying objects.

To prevent personnel from being struck by flying objects, keep personnel out of work area.



HAOA110L

Figure 4

HAOA100L

Figure 5

Personal Protective Equipment (PPE)

Do not wear loose clothing and accessories. Secure long hair. These items can snag on controls or on other parts of equipment.

Do not wear oily clothes. They are highly flammable.

Some risks to your health may not be immediately apparent. Exhaust gases and noise pollution may not be visible, but these hazards can cause disabling or permanent injuries.
Breathing masks and/or ear protection may be required.

Wear a hard hat, safety shoes, safety goggles, mask, leather gloves, earplugs and other protective equipment, as required.

While working on machine, never use inadequate tools. They could break or slip, or they may not adequately perform intended functions.

HAOA020L

Figure 6

Correction of Machine Problems

If any machine problems are found during operation and maintenance (noise, vibration, smell, incorrect gauges, smoke, oil leakage, etc.), or if any abnormal warning alerts are displayed on display monitor, stop the machine and take the necessary corrective actions. Do not operate machine until problem has been corrected.

Crushing and Cutting

Keep objects away from moving fan blades. Fan blades can throw and cut objects.

Do not use a wire rope that is kinked or frayed, or a wire rope with any loss of diameter. Wear leather gloves when handling a wire rope.

When striking a loose retainer pin, it can fly out and can cause a serious injury. Make sure that area is clear of personnel when striking a retainer pin. To avoid injury to your eyes, wear safety goggles when striking a retainer pin.

Do not put your hand, arm or any other part of your body between movable parts. If going between movable parts is necessary, always position and secure work equipment so it cannot move. Properly support equipment before performing any work or maintenance under raised equipment.

If control levers are operated, clearance between machine and work equipment will change and this may lead to serious damage or can result in death or serious injury. Stay clear of areas that may have a sudden change in clearance with machine movement or equipment movement. Stay clear of all rotating and moving parts. Unless instructed, never attempt adjustments while machine is moving or while engine is running.

Do not depend on hydraulic cylinders to support raised equipment. Equipment can fall if a control is moved, or if a hydraulic line breaks, is loosened or disconnected.

If it is necessary to remove guards to perform maintenance, always install guards after maintenance is completed.

HDO1010L

Figure 7

Hot Coolant and Oils - Burn Prevention

Do not touch any part of an operating engine. Immediately after operations are stopped, hydraulic fluid is at its highest temperature. The hydraulic tank is still under pressure. Always wait for temperature to cool down.

Attempting to remove caps, or replace filters may lead to serious burns, if done when hot. Relieve all pressure in air system, hydraulic fluid system and lubrication system, before any lines, fittings or related items are disconnected.

FG019095

Figure 8

Fire and Explosion Prevention

Most lubricants are flammable and can cause a fire resulting in death or serious injury, and property damage. Flammable fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause fire.

Inspect for and remove all flammable materials. Do not allow any flammable materials to accumulate on machine.

HDO1015I

Figure 9

Always observe the following:

- Add oil to machine only in a well ventilated area. Machine must be parked with controls, lights and switches turned "OFF". Engine must be "OFF" and spark causing equipment must be extinguished, or turned "OFF" and kept well clear of machine.
- Dust that is generated from repairing or grinding nonmetallic hoods or nonmetallic fenders can be toxic, flammable and explosive. Repair these components in a well ventilated area and wear dust mask when grinding painted parts.

FG018458

Figure 10

Maintenance

The machine and some attachments have components that are at high temperatures under normal operating conditions. The primary source of high temperatures are the engine and exhaust system. If damaged or incorrectly maintained, the electrical system can be a source of arcs or sparks.

Flammable debris (leaves, straw, etc.) must be removed regularly. If flammable debris is allowed to accumulate, it can cause a fire hazard. Clean machine often to avoid this accumulation. Flammable debris in an engine compartment is a potential fire hazard.

The operator's area, engine compartment and engine cooling system must be inspected every day and cleaned. This is necessary to prevent fire hazards and overheating.

Operation

Do not use machine where arcs, sparks or hot components can contact flammable material, explosive dust or gases.

Do not operate machine near any flame.

Electrical

Check all electrical wiring and connections for damage daily.

Keep battery terminals clean and tight. Repair or replace any damaged part or wires that are loose or frayed. Clean all electrical connections and tighten all electrical connections.

Never check battery charge by placing a metal object across terminal posts.

Battery gas can explode and can result in death or serious injury.
Do not jump-start or charge a frozen or damaged battery. Keep any flames or sparks away from batteries. Do not smoke in battery charging area.

Improper jumper cable connections can cause an explosion that can result in death or serious injury.

Do not charge a frozen battery. This can cause an explosion.

Electric operated equipment in cabin must have a fuse in the electrical circuit.

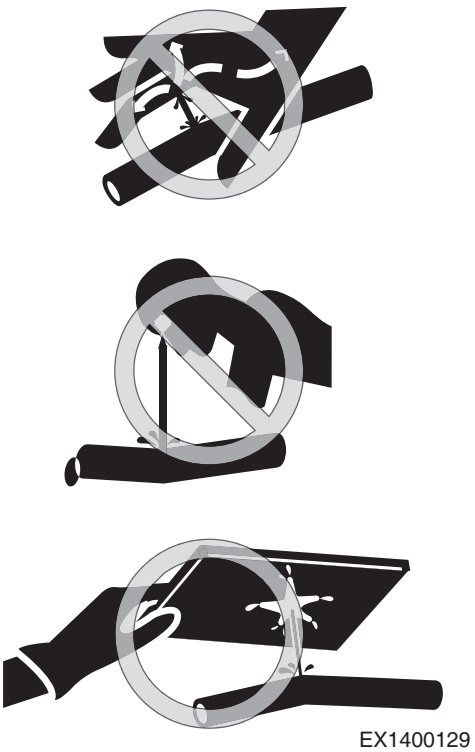
Hydraulic System

Check hydraulic tubes, hoses and fittings for damage, wear or for leaks. Hydraulic lines and hoses must be properly routed and have adequate support and secure clamps. Leaks can cause fires. Never use a flame or bare skin to check for leaks.

Tighten or replace any parts that show leakage.

Check that all hose and tube clamps, guards, and cushions are securely attached. If they are loose, they can vibrate during operation and rub against other parts. This can cause damage to hoses and cause high-pressure oil to spray on hot surfaces, causing a fire and death or serious injury.

Always clean machine. Do not use gasoline or diesel fuel for cleaning parts. Use commercial nonflammable solvents.



EX1400129

Figure 11

Grinding

Toxic dust or gas can be produced when grinding or welding painted parts. Grinding or welding painted parts must be done in a well ventilated area. Wear dust mask when grinding painted parts.

Dust generated from repairing nonmetallic parts such as hoods, fenders or covers can be flammable or explosive.

Repair such components in a well ventilated area away from flames or sparks.

Do not weld on lines or on tanks that contain flammable fluids. Do not flame cut lines or tanks that contain flammable fluid. Clean any such lines or tanks thoroughly with a nonflammable solvent before welding or flame cutting.

If a Fire Occurs

- Do not attempt to move machine or continue operations.
- Turn starter switch to "O" (OFF) position to stop engine.
- Get off machine as soon as possible.
- Immediately call for help or dial 119.
- When using a fire extinguisher, always aim extinguisher at base of fire.
- If an optional fire extinguishing system is in place, be familiar with its operating procedures.

NOTE: *Depending on job conditions, other procedures could be necessary if a fire occurs.*

FG018459

Figure 12

Fire Extinguisher and First-aid Kit (Emergency Medical Kit)

To be prepared in the event of a fire:

- Make sure fire extinguishers are always available and read labels to know how to use them. The multipurpose A/B/C fire extinguisher is mounted in the cabin of this construction machine. Check and service fire extinguisher at regular intervals and make sure that all work site crew members are adequately trained in its use.
- If the needle of the pressure gauge is out of its normal position, immediately contact the manufacturer or the seller, since the performance of the fire extinguishing cannot be guaranteed.
- Check the fire extinguisher on a regular basis, since problems caused by negligence in management are not guaranteed by the manufacturer or seller.

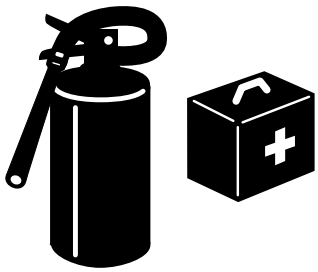


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Figure 13

- For more information, follow instructions on extinguisher instruction plate.
- Keep emergency numbers for doctor, ambulance service, hospital and fire department readily available.
- The fire extinguisher is mounted in the cab canopy structure.

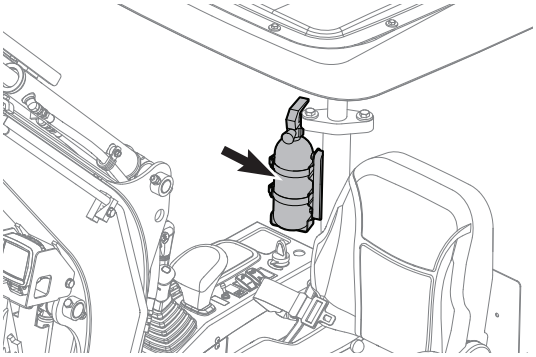

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Figure 14

Electrical System and Electrical Shock

Never short the starter terminals or across the battery. Shorting could damage electrical system.

There is a possibility of electric shock because high voltage is generated inside the motor controller. Never touch the inside of the motor controller.

NOTE: *Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor to access the engine controller inside.*

Tip-over Protective Structure (TOPS)

The operator's cabin is a TOPS certified structure for protecting the seat-belted operator. It absorbs the impact energy of a rollover impact. Do not allow machine weight (mass) to exceed certified value on certification plate. If weight is exceeded, the TOPS structure will not be able to fulfill its safety function. Do not increase machine weight beyond certified value by modifying machine or by installing attachments on machine. If weight limit of protective equipment is exceeded, protective equipment will not be able to protect operator, and this can result in death or serious injury. Always observe the following:

- This machine is equipped with a protective structure. Do not remove protective structure and perform operations without it.
- Never modify the operator's cabin by welding, grinding, drilling holes or adding attachments unless instructed by HD HYUNDAI CONSTRUCTION EQUIPMENT in writing. Changes to the cabin can cause loss of operator protection from roll-over and falling objects, and result in death or serious injury.
- When protective structure is damaged or deformed by falling objects or by rolling over, its strength will be reduced and it will not be able to adequately protect the operator. Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor if you have any questions about the TOPS. Never repair a damaged TOPS cabin at your own discretion.
- Always wear your seat belt when operating machine.

Transportation

Obey State and Local Over-the-Road Regulations

Check laws and regulations regarding weight, width and length of a load before making preparations for transporting on public roads or highways.
The hauling vehicle, trailer and load must be in compliance with applicable regulations for the shipping route.
Partial disassembly of excavator may be necessary to meet travel restrictions or particular conditions at work site. See Shop Manual for information on partial disassembly.
Refer to "Transportation" on page 5-1, for information on loading, unloading and towing.
The machine can be disassembled into parts for transporting. Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for assistance with disassembly.

Loading and Unloading

To prevent machine tipping or roll-over when loading or unloading machine, always do the following:

- Perform loading and unloading only on firm and level ground. Maintain a safe distance from edge of road or drop-off.
- Never use work equipment to load or unload machine. The machine may fall or tip over.
- Always use loading ramps of adequate strength and capacity. Be sure that ramps are wide, and long enough to provide a safe loading slope. Take steps to prevent ramps from moving out of position or coming off.
- Clean ramp surfaces so they are free of grease, oil, ice and loose materials. Remove dirt from machine tracks and undercarriage. On a rainy day, be careful since ramp surfaces can be slippery.
- Run engine at low speed and travel slowly.
- When on ramps, do not operate any control lever except for travel lever.
- Never correct your steering on ramps. If necessary, drive off ramps, correct machine direction, then drive back onto ramps.
- When driving up or down ramps, the center of gravity of machine will change suddenly causing the tracks to drop down to the ramps or trailer. This will occur at the joint between the ramps and trailer. Travel slowly over this point.

Transporting Machine

When transporting machine on a trailer or truck, do the following:

- The weight, transportation height, and overall length of machine may change depending on work equipment attached to it. Always check the machine dimensions and work equipment's dimensions before transporting.
- When passing over bridges or structures on private land, check that structure is strong enough to support weight of machine. Before traveling on public roads, check with appropriate authorities and follow their instructions.

Operation

Always make sure that the machine is properly maintained.

Before Engine Starting

Machine Condition

Every day before starting engine for first time, perform the following checks and repair machine before operating, as necessary. If these checks are not properly done death or serious injury could result.

- Check hydraulic tank oil levels, and check for damage to electrical wiring.
- Check that safety lever is in LOCKED position.
- Check that work equipment and travel controls move freely, and work controls return to "NEUTRAL" when released.
- Check that attachment is properly attached and locked.

Make sure that the machine is equipped with a lighting system that is adequate for job conditions and lights are working properly. Before moving machine, check position of undercarriage. The normal travel position is with idler wheels to front under cabin and drive sprockets to rear. When undercarriage is rotated in reversed position, travel controls must be operated in opposite directions.

Before performing checks, move machine to an area where there are no obstructions, and operate slowly. Do not allow personnel near machine.

Know maximum operating dimensions of your machine.

Work Site

Before starting operations, thoroughly check work area for any hazards, such as underground utility lines, overhead electrical lines, unstable ground, excessive slopes, etc.

Before starting engine and moving machine, make sure that no one is underneath machine, around machine, or on machine. Know width and length of your machine and work equipment to maintain proper clearance when you operate machine or work equipment near fences or near boundary obstacles.

Know appropriate work site hand signals and personnel that are authorized to give hand signals. Follow hand signals from only one person.

If you need to operate on a street, protect pedestrians and cars by designating a person for work site traffic duty or by erecting fences and posting "No Entry" signs around work site.

Erect barricades or fences, post "No Entry" signs, and take other steps to prevent people from coming close to or entering work site. If people come too close to a moving machine, they may be struck or caught by machine, and this can result in death or serious injury.

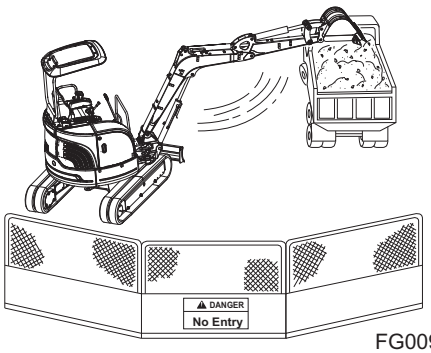

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Figure 15

Mounting/Dismounting

Before getting on or off machine, if there is any oil, grease, or mud on handrails, guardrails, steps, or rubber shoes, wipe it off immediately. Always keep these parts clean. Repair any damage and tighten any loose bolts.

Never jump on or off machine. In particular, never get on or off a moving machine. These actions can result in death or serious injury.

When getting on or off machine, always face machine. Maintain three-point contact (both feet and one hand or one foot and both hands) with handrails, guardrails, steps, and rubber shoes to ensure that you support yourself securely.

Never hold onto any control levers when getting on or off machine.

Use points marked by arrows in diagram when getting on or off machine.

Do not carry tools or supplies when you mount or dismount the machine.

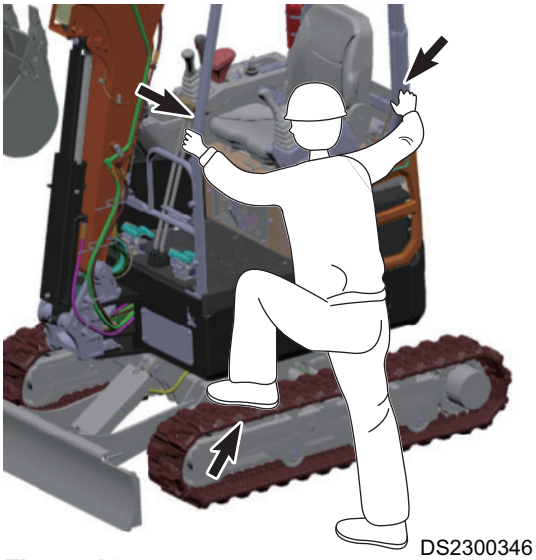

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Figure 16

Cleaning

Remove all straw, wood chips, leaves, grass, paper and other flammable debris accumulated around battery.

Do not leave tools or spare parts in operator's cabin. Vibration of machine during operation can cause tools or spare parts to fall and damage or break control levers or switches. Tools and spare parts can also get caught in spaces between control levers and cause accidental movement of work equipment causing death or serious injury.

When entering operator's cabin, always remove all mud and oil from your shoes. If you operate travel pedal with mud or oil stuck to your shoes, your foot could slip off the control, or dirt and debris may interfere with proper operation of control levers.

Clean working lights for good visibility.

Never bring flammable or explosive items into operator's cabin. Do not leave cigarette lighters laying around operator's cabin. If temperature inside operator's cabin becomes too high, there is a potential hazard that lighter could explode.

Secure all loose items that are not a part of equipment.

Operator Station

Inspect condition of seat belt and mounting hardware. Replace any parts that are worn or damaged. Do not use a seat belt extension on a retractable seat belt.

Adjust seat so full pedal travel can be achieved with operator's back against back of seat.

Adjust operator's seat to a position where it is easy to perform operations, and check that there is no damage or excessive wear to seat belt or mounting clamps.

When standing up from operator's seat, always place safety lever securely in "LOCK" position. If you accidentally move work equipment levers when they are not locked, the machine could suddenly move and cause damage, death or serious injury.

Seat Belt

Check seat belt daily for correct function.

Inspect seat belt system more often if machine is exposed to severe environmental conditions or applications. Conduct the following inspections and replace seat belt system as necessary:

1. Check webbing. If system is equipped with a retractor, pull webbing completely out and inspect full length of webbing. Look for cuts, wear, fraying, dirt and stiffness.
2. Check buckle and latch for correct operation.
3. Make sure latch plate is not excessively worn, deformed or buckle is not damaged or casing is broken.
4. Check retractor web storage device (if equipped) by extending webbing and checking that it spools out and retracts correctly.
5. Check webbing in areas exposed to ultraviolet (UV) rays from sun or extreme dust or dirt. If original color of webbing in these areas is extremely faded and/or webbing is packed with dirt, webbing strength may be reduced.

   NOTE: *Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for seat belt system replacement parts.*

WARNING

AVOID DEATH OR SERIOUS INJURY

Failure to properly inspect and maintain seat belt and seat belt system can cause lack of operator restraint and can result in death or serious injury.

Before fastening seat belt, check that there is no problem in belt mounting bracket. If it is worn or damaged, replace seat belt. Fasten seat belt so it is not twisted.

Always wear seat belt when operating machine.

Work Site Rules

- If visibility cannot be sufficiently assured, use a flagman. The operator should pay careful attention to signals and follow instructions from flagman.
- Signals should only be given by one flagman.
- When working in dark places, turn "ON" work lights and front lights on the machine. Set up additional lighting in area.
- Stop operations if there is poor visibility, such as fog, snow, rain, or yellow dust.

When operating or traveling during poor visibility conditions, follow the preceding work site rules.

Starting Engine

Only operate the machine from the operator's seat with your seat belt fastened.

Only operate controls while engine is running.

Check for proper operation of all controls and all protective devices while you operate the machine slowly in an open area.

- Check operation of work equipment, travel system and swing system.
- Check for any problem with machine. Check for unusual sounds, vibration, heat, odor, or improper readings from gauges. Check for any oil or fuel leaks.
- If any problem is found, stop operation and perform repairs immediately.

Do not use cellular telephones inside operator's cabin when driving or operating the machine.

When operating the machine, do not extend your hands or head out of window.

The boom and arm linkage can allow work tool or attachment to contact undercarriage or cabin. Be aware of position of work tool.

- When starting engine, sound horn as a warning to alert personnel in the work area.

If there is a warning tag or "DO NOT OPERATE" tag hanging from work levers (joysticks) or travel control levers, do not start engine or move levers.

- Prevent personnel from walking or standing under raised boom, unless it is properly supported.

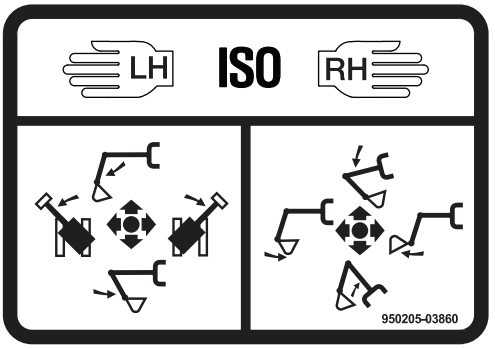

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Figure 17

Swinging or Traveling

The machine operator should know and follow laws and regulations when operating on public roads or highways.

It is important to keep in mind that the machine, in comparison with the rest of traffic, is a slow moving and wide vehicle which can cause traffic delays. Pay attention to traffic behind you and allow traffic to pass you.

Before operating the machine or work equipment, always observe the following precautions to prevent death or serious injury.

- When changing travel direction from forward to reverse or from reverse to forward, reduce speed and stop machine before changing travel direction.
- Sound horn to alert people in area.
- Check that there is no one in area around machine. There are restricted visibility areas behind machine so, if necessary, swing upper structure slowly to check that there is no one behind machine before traveling in reverse.
- When operating in areas with poor visibility, designate a flagman to direct work site traffic.
- Keep unauthorized personnel away from turning radius or travel path of the machine.

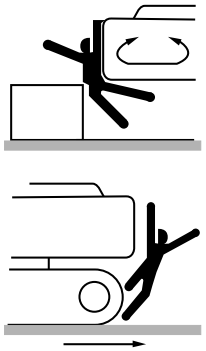

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Figure 18

Never turn starter switch to "O" (OFF) position when traveling. This can lead to a loss of steering control.

Do not operate attachments while traveling.

Do not change selected travel mode (FAST/SLOW) while traveling.

Never travel over obstacles or excessive slopes that will cause machine to tilt severely. Avoid slopes or obstacles where the machine is tilted more than 10° to the right or left or beyond its maximum gradeability.

Do not operate steering controls suddenly. Work equipment can hit ground and this can damage machine or structures in area.

When traveling on rough ground, travel at low speed, and avoid sudden changes in direction.
Avoid deep puddles. Permissible water depth is up to centerline of upper track roller(s).

When passing over bridges or structures on private land, check that structure is strong enough to support weight of machine. Before traveling on public roads, check with appropriate authorities and follow their instructions.
Never exceed maximum permitted load for bridges.

Always operate machine with idler wheels to front under cabin and drive sprockets to rear.

Know permitted ground pressure. Ground pressure of the machine may change depending on attachment and load.

Keep height and length of attachment in mind.

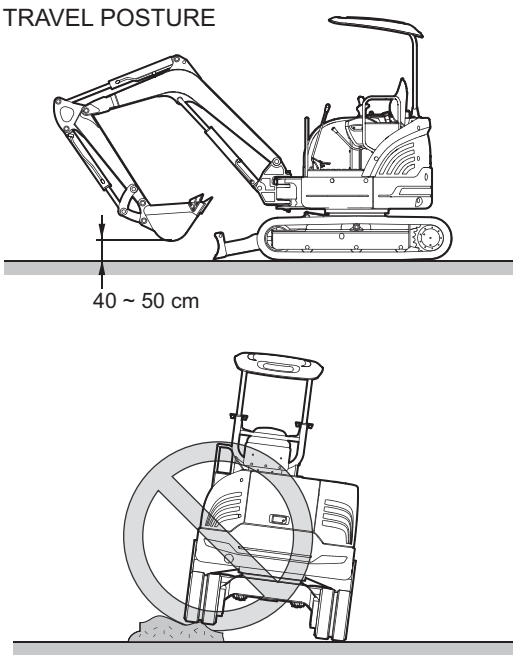

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Figure 19

Lifting and Digging

The operator is responsible for any load carried when traveling on public roads and while working with the machine.

- Keep loads secure so they do not fall off while operating.
- Do not exceed maximum load for the machine. Machine operation will be affected when center of gravity changes, caused by extended loads and different attachments.

To lift loads safely when in digging mode, the following must be evaluated by the operator and work site crew.

- Condition of ground support.
- Excavator configuration and attachments.
- Weight, lifting height and swing radius.
- Safe rigging of load.
- Proper handling of suspended load.

Always watch load. Bring load close to the machine before traveling any distances or swinging load.

Lifting capacity decreases as load is moved further from the machine.

Set tracks at right angles to road shoulder or drop-off with sprocket at rear when performing operations to make it easier to move away from the work area.

Do not suddenly lower, swing, or stop work equipment.

- Do not move bucket over head of other personnel or over the operator's seat of dump trucks or other hauling equipment. The load may spill or bucket can hit dump truck causing property damage or cause death or serious injury.

Operation on Slopes

If the machine has to be used on a slope, pile soil to make a platform that will keep the machine as horizontal as possible.

Improper traveling on steep slopes could result in machine tipping, roll-over or sliding down the slope. Always fasten your seat belt.

When possible, operate machine up slopes and down slopes. Avoid operating machine across slope.

On hills, banks or slopes, carry bucket approximately 20 - 30 cm above ground. In case of an emergency, quickly lower bucket or work tool to ground to help stop machine.

Do not travel on grass, fallen leaves, or wet steel plates. Even slight slopes can cause machine to slide down a slope. Travel at low speed and make sure that the machine is always traveling directly up or down slope.

Do not change travel direction on a slope. This could result in tipping or sliding sideways of machine.

Improper operation when working on slopes can cause a tip over. Use caution when swinging or operating work equipment on slopes.

Do not swing work equipment from uphill side to downhill side when bucket is loaded. This could cause machine to tip or rollover.

In addition, lower bucket as far as possible, keep it pulled into front, and keep swing speed as slow as possible.

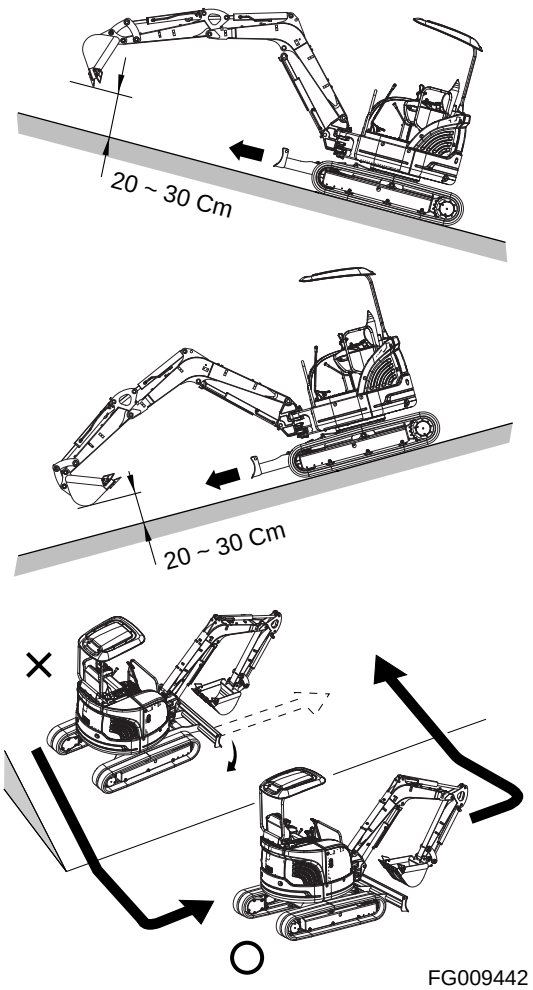

Figure 20

If the machine begins to slide down on a grade, immediately dump load and turn the machine downhill.

Be careful to avoid any ground condition which could cause the machine to tip. Tipping can occur when you work on hills, on banks, or on slopes. Tipping can also occur when you cross ditches, ridges, or travel over unexpected obstructions.

Keep the machine under control. Do not overload the machine beyond capacity.

- When traveling up a steep slope, extend work equipment to front to improve balance, keep work equipment approximately 20 - 30 cm above ground, and travel at low speed.
- Do not turn on slopes or travel across slopes. Always go down to a flat place to change position of the machine, then travel back up the slope again.

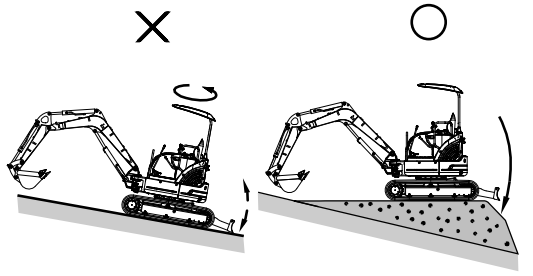

Figure 21

Towing

To prevent death or serious injury when towing, always do the following:

- Follow the instruction given in this manual.
- When performing preparation work for towing with two or more personnel, determine signals to use and correctly follow these signals.
- Always attach wire rope onto left and right hooks and secure in position.
- If engine on problem machine will not start or there is a failure in brake system, always contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.
- Never go between towing machine and towed machine during towing operation.
- Do not perform towing on steep slopes, so select a place where slope is gradual. If there is no place where slope is gradual, perform operations to reduce angle of slope before starting towing operation.
- When towing a machine, always use a wire rope with a sufficient towing capacity.
- Do not use a wire rope that is kinked or frayed, or a wire rope with any loss of diameter. Wear leather gloves when handling a wire rope.
- Make sure that towing eyes and towing devices are adequate for towing loads.
- Only connect wire rope to a drawbar or to a hitch.
- Operate the machine slowly and be careful not to apply any sudden load to wire rope.

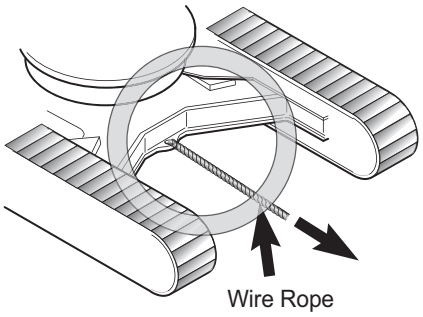

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Figure 22

Attachment

Never let anyone ride on any work attachment, such as bucket, crusher, grapple, or clamshell. This creates a falling and crushing hazard, and can result in death or serious injury.

The clamshell, grapple, or magnet can swing in all directions. Move work levers (joysticks) in a continuous motion. Failure to move work levers (joysticks) in a continuous motion can cause clamshell, grapple, or magnet to swing into cabin or into a person in work area. This can result in death or serious injury.

- When using a fork or grapple, do not attempt to pick up an object with its tips. This could damage the machine or cause personal injury, if picked-up object slips off attachment.
- Do not use impact force of work equipment for demolition work. This could damage work equipment, cause broken materials to fly off or tipping. This can result in death or serious injury.

EX1400133

Figure 23

- Do not use work equipment or swing mechanism to pull load in any direction. This could cause the work equipment to move suddenly if the load releases and can result in death or serious injury.

Equipment Lowering with Engine Stopped

Before lowering any equipment with the engine stopped, clear the area around the equipment of all personnel and bystanders. The procedure to use will vary with the type of equipment to be lowered. The procedure can cause high-pressure air, or hydraulic pressure, or some other media to be released to lower the equipment.

Parking Machine

Avoid making sudden stops and stop slowly as much as possible. Do not park the machine anywhere. Park machine on firm and level ground away from traffic and away from high walls, drop-offs and any area of potential water accumulation or runoff. If parking on inclines is unavoidable, block crawler tracks to prevent movement. Lower bucket or other working attachment completely to ground. To prevent unintended or accidental movement.

When parking on public roads, provide fences, signs, flags, or lights, and put up any other necessary signs to ensure that passing traffic can see machine clearly.
Park machine so machine, flags, signs and fences do not obstruct traffic.

After front attachment has been lowered to an overnight storage position and all switches and operating controls are in "OFF" position, safety lever must be moved to "LOCK" position. This will disable all pilot control functions.

Prevent any unauthorized person from operating the machine.

The hydraulic system remains pressurized even when engine is not running. While hydraulic system maintains a charge, hydraulic work tools and machine controls remain functional.

Machine movement will occur if any controls are moved. This can result in death or serious injury.

Always move safety lever to "LOCK" position before stopping off engine or immediately after engine stops running.

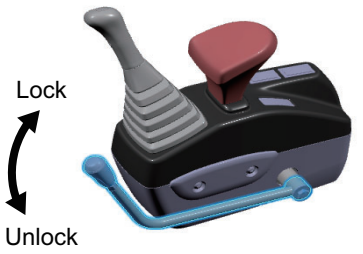

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Figure 24

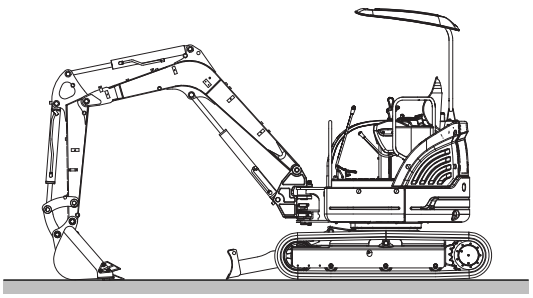

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Figure 25

Long Term Storage

When a machine is taken out of service and stored for more than a month, take the following steps.

Condition	Maintenance Required
Cleaning	Wash the undercarriage and track assembly. Check for damage, loose or missing parts.
Lubrication	Perform all daily lubrication procedures.
	Apply a coating of light oil to the exposed plated metal surfaces such as hydraulic cylinder rods, etc.
	Apply a coating of light oil to all the control linkage and control cylinders. (Control valve spools, etc.)
Hydraulic system	Start the engine once a month, and follow the "Warm-up Operation" on page 3-4 procedures listed in this manual.
Prevention of dust and moisture	Store in a dry garage and cover with a waterproof cover when storing outside.
Tools	Inspect and repair tools before storing.

1. Complete the steps described before.
2. Clean the machine well and repair the painting to prevent rust.
3. Apply the rust inhibitor to exposed parts, lubricate entire machine, and grease unpainted surfaces such as cylinders.
4. Fill the hydraulic fluid tank up to the "FULL" mark.
5. Park the machine on the level and solid ground that is not subject to freezing, mudslides, or flooding. Do not park the machine on a slope.

Keep in mind that theft and burglary risk can be minimized by:

- Removing starter key when the machine is left unattended.
- Locking doors and covers after working hours.
- Park machine where risk of theft, burglary and damage is minimized.
- Removing valuables from cabin such as cellular phone, computer, radio and bags.

For more details, refer to "Long Term Storage" on page 3-48.

After Storage

- Residual quantity of all oils and liquids
- Air pressure
- Battery and electrical connectors
- Applying grease to all lubrication points
- Removing oil coating from the piston rod
- Removing other foreign matters
- Check whether the power pack battery disconnect switch and battery (12V) disconnect switch are "ON".

Maintenance

Improper operation and maintenance can result in death or serious injury. Read manual and safety decals before operating or maintaining the machine. Follow all instructions and safety messages.

WARNING

AVOID DEATH OR SERIOUS INJURY

Follow instructions before operating or servicing machine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can result in death or serious injury.

- Never service HD HYUNDAI CONSTRUCTION EQUIPMENT without instructions.
- Always lower bucket and blade to ground before doing any maintenance.
- Use correct procedure to lift and support excavator.
- Cleaning and maintenance are required daily.
- Grinding or welding painted parts must be done in a well ventilated area.
- Wear dust mask when grinding painted parts. Toxic dust and gas can be produced.
- Stop and allow engine to cool and clean engine of flammable materials before checking fluids.
- Never service or adjust machine with engine running unless instructed to do so in this manual.
- Avoid contact with leaking hydraulic fluid or diesel fuel under pressure.
  It can penetrate skin or eyes.
- Never smoke or use tools that can cause an explosion.
- Keep body, jewelry and clothing away from moving parts, electrical contact, hot parts and exhaust.
- Wear eye protection when using tools to guard from battery acid, compressed springs, fluids under pressure and flying debris.
- Lead-acid batteries produce flammable and explosive gases.

- Keep arcs, sparks, flames and lighted tobacco away from batteries.
- Batteries contain acid which burns eyes or skin on contact.
- Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention from a physician familiar with this injury.
- The maintenance procedures which are given in this manual can be performed by the owner or operator without any specific technical training. Maintenance procedures which are not in this manual must be performed ONLY BY QUALIFIED SERVICE PERSONNEL.
  Always use genuine HD HYUNDAI CONSTRUCTION EQUIPMENT replacement parts.
- Only authorized personnel should service and repair the machine. Do not allow unauthorized personnel into work area.
- Lower work equipment and stop engine before performing maintenance.
- Park machine on firm and level ground.
- Turn starter switch to "ON' position and keep safety lever in "UNLOCK" position. Cycle work levers (joysticks) back and forth, left and right at full stroke 2 to 3 times to eliminate remaining internal pressure in hydraulic circuit. Then move safety lever to "LOCK" position.
- Put blocks under track to prevent the machine from moving.
- To prevent injury, do not perform maintenance with engine running.
- Never drop or insert tools or other objects into rotating fan or fan belt. Parts can break off and hit someone.
- Do not touch any control levers or control pedals. If any control levers or control pedals must be operated, always give a signal to other workers and instruct them to move away.
- When performing maintenance of engine and you are exposed to engine noise for long periods of time, wear hearing protection while working.
- If noise from the machine is too loud, it can cause temporary or permanent hearing problems.
- Never put maintenance fluids into glass containers. Drain all liquids into suitable containers.
- Unless instructed otherwise, perform maintenance with equipment in servicing position. Refer to this manual for procedure for placing equipment in servicing position.

"DO NOT OPERATE" warning tag

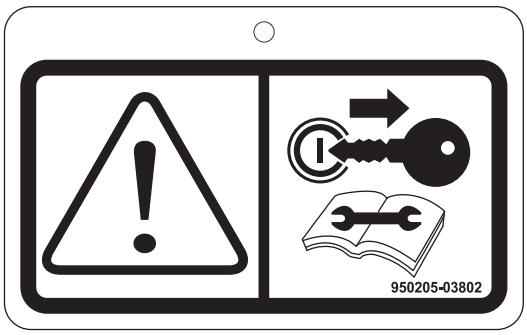
Alert others that service or maintenance is being performed by attaching a "DO NOT OPERATE" warning tag to the operator's cabin controls – and other machine areas, if required. If necessary, use a chain or cable to keep the safety lever in the fully lowered "LOCK" position.

"DO NOT OPERATE" warning tags, are available from your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.

- Always attach "DO NOT OPERATE" warning tag to work equipment control lever in the operator's cabin to alert others that you are performing service or maintenance on the machine. Attach additional warning tags on the machine, if necessary.

  Keep warning tags in tool box while it is not used. If there is not tool box or in the owner manual storage pocket.
- If any other person starts engine, and operates control levers or control pedals while you are performing service or maintenance, it can result in death or serious injury.

Attach a "DO NOT OPERATE" warning tag to starter switch or to controls before servicing or repairing equipment.
Warning tags are available from your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.



EX1301177

Figure 26

Inspection or Cleaning before Maintenance

Clean machine before performing inspection and maintenance.

This prevents dirt from getting into the machine and ensures safety during maintenance.

If inspection and maintenance are done when machine is dirty, it will become more difficult to locate problems, and you could slip on steps and work platform areas and injure yourself.

When washing machine, do the following:

- Wear shoes with nonslip soles to prevent yourself from slipping and falling on wet places.
- Wear safety glasses and protective clothing to prevent injury caused by high-pressure steam or water.
- Do not wash the machine using with high-pressure water. Spray water on the boom only for cleaning.
- Do not spray water directly on sensors or electric connectors. If water gets into electrical system, it can cause operation problems.

- Pick up any tools or hammers that are laying in the workplace. Wipe up any grease or oil or any other slippery substances, and clean the area. By doing so, work can be performed safely. If the workplace is left untidy, you may trip or slip and suffer injury.

Use of Proper Tools

Use only tools suited to the task. Using damaged, low qualify, faulty, or makeshift tools could cause personal injury.

HDO1037L

Figure 27

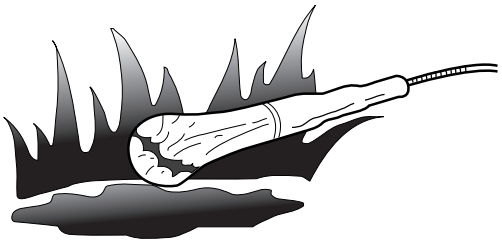
Disassembling Precautions

When using a hammer to remove pins, pins can fly out or metal particles may break off. Always do the following:

- Hitting hard metal pins, bucket teeth, cutting edges or bearings with a hammer, can cause metal pieces to break or fly off resulting in serious injury. Always wear safety goggles and leather gloves. Keep other personnel away.

Use of Lighting

When checking oil and battery electrolyte, always use proper lighting equipment to prevent arcs or sparks that could cause a fire or explosion resulting in death or serious injury.



HDO1040L

Figure 28

Fire and Explosion Prevention

Most lubricants are flammable.

Flammable fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause a fire.

Store all fuels and all lubricants in properly marked and approved containers and keep away from all unauthorized personnel.

Do not smoke near the machine.

Do not smoke in battery charging areas.

Clean all electrical connections and tighten all electrical connections.

Check electrical wires daily for wires that are loose or frayed.

Tighten all loose, and repair or replace all frayed, electrical wires before operating machine.

Remove all flammable materials and debris before they accumulate on the machine

Do not weld on pipes or on tubes that contain flammable fluids.

HDO1015I

Figure 29

FG018458

Figure 30

Burn Prevention

Do not allow hot oil or hot components to contact skin. Hot oil and hot components can cause personal injury.

Be sure to cool the hydraulic fluid tank when opening the air breather cap of the hydraulic fluid tank.
Wear gloves when opening the air breather cap of the oil tank.

Make sure to relieve all residual pressure in hydraulic fluid system, or in cooling system before disconnecting any lines, hoses, fittings, or related components.

Batteries give off flammable fumes that can explode and start a fire.

Do not smoke while you are checking battery electrolyte level.

Electrolyte is an acid. Electrolyte can cause personal injury. Do not allow electrolyte to contact skin or eyes.

Always wear safety goggles and face protection when working with batteries.

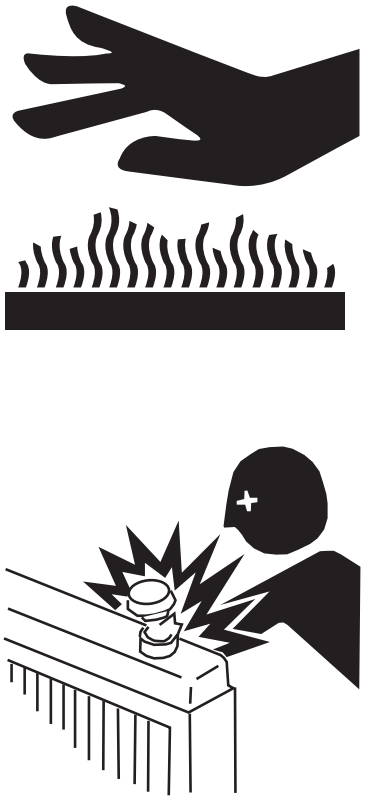


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Figure 31

Rubber That Contains Fluorides

Observe extra great care when it is suspected that you may have to handle rubber that contains fluorides.

Certain seals which have to withstand high operating temperatures (e.g. in transmissions, axles, hydraulic motors and pumps) may be made from rubber that contains fluorides, which, when exposed to high heat (fire), forms hydrogen fluoride and hydrofluoric acid. This acid is very corrosive and cannot be rinsed or washed off from the skin. It causes very severe burns which take a long time to heal.

It usually means that damaged tissue must be surgically removed. Several hours may pass after contact with the acid, before any symptoms appear and therefore one is not given any immediate warning. The acid may remain on the machine parts for several years after a fire.

If swelling, redness or a stinging feeling appears and one suspects that cause may be contact with heated rubber that contains fluorides, contact a medical doctor immediately. If a machine, or part of a machine, has been exposed to fire or severe heat, it must be handled by specially trained personnel. In all handling of machines after a fire, thick rubber gloves and protective goggles must be used.

The area around a part which has been very hot and which may be made of rubber that contains fluorides must be decontaminated by thorough and ample washing with limewater (a solution or suspension of calcium hydroxide, i.e. slaked lime in water). After the work has been completed, the gloves must be washed in limewater and then discarded.

Rubber and Plastics

Polymer materials when heated, can form compounds that create a health hazard and can harm the environment. Scrapped rubber and plastics must never be burned. Extra precautions must be taken when servicing machines that have been in a fire or exposed to extreme heat.

If gas cutting or welding is to be done near such materials, the following safety instructions must be followed:

- Protect the material from heat.
- Use protective gloves, protective goggles and an approved respirator.

Waste Hazardous to the Environment

Painted parts or parts made of plastic or rubber which are to be scrapped must never be burned, but must be taken care of by an approved refuse handling plant.

Batteries, plastic objects and anything else which is suspected of being dangerous to the environment must be taken care of in an environmentally safe way.

Check List After Fire

When handling a machine which has been damaged by fire or been exposed to intense heat, the following protective measures must be taken:

Use thick, gloves made of rubber and wear goggles which are certain to protect your eyes.

Never touch burned components with your bare hands, as there is a risk that you may come into contact with melted polymer materials. First wash thoroughly with plenty of limewater (a solution or suspension of calcium hydroxide, i.e. slaked lime in water).

As a precaution, seals (O-rings and other oil seals) should always be handled as if they were made of rubber that contains fluorides.

Treat skin, which is suspected of having touched burned rubber that contains fluorides, with Hydrofluoric Acid Burn Jelly or something similar. Seek medical advice. Symptom may not appear until several hours afterwards.

Discard gloves, rags etc. which are suspected of having touched burned rubber that contains fluorides.

Warning for Counterweight and Front Attachment Removal

WARNING

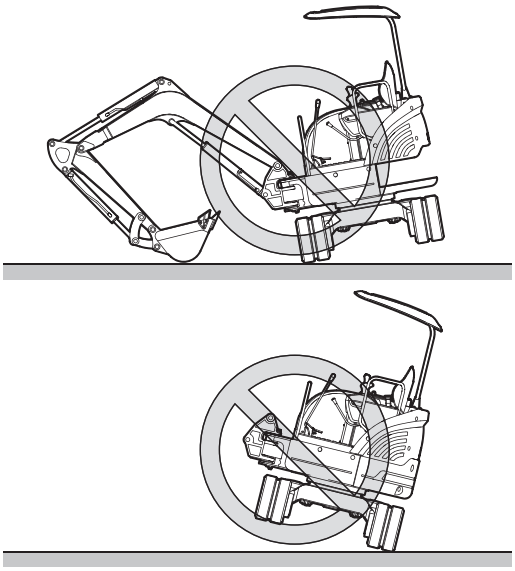
AVOID DEATH OR SERIOUS INJURY

Removal of the machine counterweight, front attachment (boom, arm, bucket) or any other part can affect the stability of the machine. This could cause the unexpected movement of the machine.

This result may lead to personal injury and we are not responsible for it.

Never remove counterweight or front attachment unless the upper structure is in-line with the lower structure.

Never rotate the upper structure once the counterweight or front attachment has been removed.



DS1702743

Figure 32

Lock Inspection Covers

When performing maintenance with inspection cover open, fix it using the "lock bar ".

Otherwise, if the cover is closed by wind during work, the operator can be injured.

Compressed Air

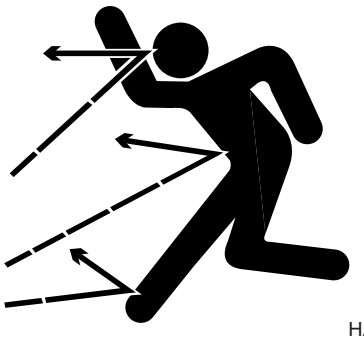
- When cleaning components with compressed air, flying particles can result in serious injury.
- Always wear safety goggles, dust mask, leather gloves, and other protective devices.

Track Tension Adjustments

Track tension adjusting systems use grease under high-pressure to keep track under tension. Do not remove grease fittings, valves, and track adjusters carelessly, since they may scatter when removed, resulting in serious personal injury. Please contact our sales office or branch.

Keep your body, such as your hands and face, away from the area where fittings and valves may scatter.

When adjusting the track tension, carefully read the methods and procedures in this manual and make sure to follow the adjustment procedure.



HAOA110L

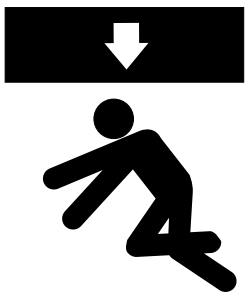
Figure 33

Maintenance of the Underside

Lower all attachments to the lowest position before servicing or repairing the underside of the machine.

Make sure to install a block on the rubber shoe to prevent the movement of the machine.

Never conduct maintenance work under the machine if it is not sufficiently supported.



HDO1042L

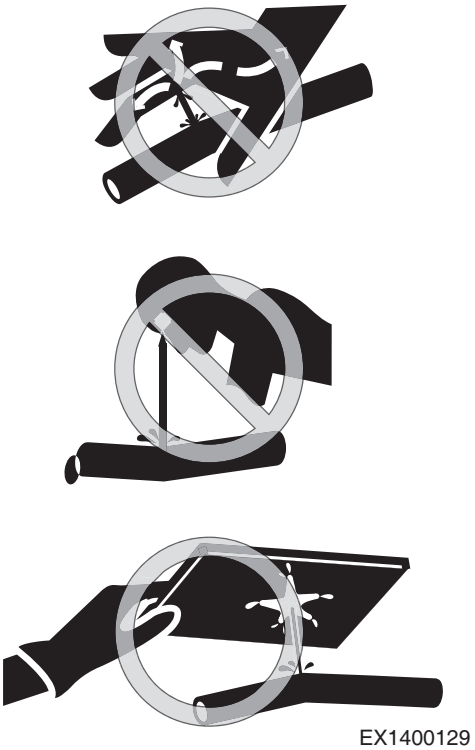
Figure 34

High-pressure Lines, Tubes and Hoses

When inspecting or replacing high-pressure piping or hoses, check to verify that pressure has been released from circuit. Failure to release pressure can result in death or serious injury. (Always do the following:)

- Wear eye protection and leather gloves.
- Fluid leaks from hydraulic hoses or pressurized components can be difficult to see. But it has enough force to pierce skin and can result in death or serious injury.
- Slowly put a wooden stick or cardboard to the leaking area of the hose or pipe to see if there is an oil spurt.
- Wear safety goggles.
- Do not bend high-pressure lines.
  Do not install lines, tubes or hoses that are bent or damaged.
- Make sure that all clamps, guards and heat shields are correctly installed to prevent vibration, rubbing against other parts, and excessive heat during operation.
- Replace hose or components if any of the following problems are found:
  - Damage or leakage from hose end fitting.
  - Wear, damage, cutting of hose covering, or wire braiding is exposed on any hose.
  - Cover portion is swollen in any section.
  - The hose is twisted or crushed.
  - Foreign material is embedded in hose covering.
  - Hose end is deformed.

Oil or fuel leaks from high-pressure hoses can cause death or serious injury. If any loose bolts are found, stop work and tighten to specified torque. If any damaged hoses are found, stop operations immediately and contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for replacement parts.



EX1400129

Figure 35

Battery (12V)

Battery Hazard Prevention

Battery electrolyte contains diluted sulfuric acid and generates hydrogen gas. Hydrogen gas is highly explosive, and improper handling can cause death or serious injury, or fire. Prevent your skin and eyes from contacting electrolyte. Wash your hands after handling batteries and connectors. It is recommended to use acid resistant gloves. Always observe the following precautions.

- Do not smoke or bring any flame near the battery.
- If you spill battery electrolyte on yourself or your clothes, immediately flush the area with water.
- If battery electrolyte gets into your eyes, flush them immediately with large quantities of water and see a doctor at once.
- If you accidentally drink battery electrolyte, immediately call the nearest public health center or medical institute for help and receive treatment from a doctor knowledgeable about this injury.
- When cleaning the top surface of the battery, wipe it with a clean cloth.
  Never use gasoline, thinner, or any other organic solvent or detergent.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with power from another source. There is a danger that battery may explode or catch fire.
- Do not use or charge the battery when the battery electrolyte level is below the "LOW LEVEL" line. This can cause an explosion.
- Before maintaining or working with batteries, turn starter switch to "OFF" position.

Since there is a potential hazard that sparks could be generated, always do the following:

- Do not let tools or other metal objects make any contact between battery terminals. Do not leave tools or other metal objects lying near battery.
- When disconnecting battery terminals, wait for approximately one minute after turning engine starter switch key to "OFF" position, and be sure to disconnect grounding terminal; negative (-) terminal first. Conversely, when connecting them, begin with positive (+) terminal and then grounding (-) terminal. Make sure that all terminals are connected securely.
- Flammable hydrogen gas is generated when battery is charged. Remove battery from machine, take it to a well ventilated place, and remove battery caps, before charging it.

EX1400136

Figure 36

Power Pack Battery

Contact your dealer when handling or servicing the power pack battery

Environment and Circumstances

Work Site Areas Requiring Extra Caution

- Do not operate too close to the edge of the ground where the machine may fall.
- Do not operate too close to the edge of a steep road or steep slope. Take care when working in a place where machine may tip over.
- Do not operate on soft ground or near riverbanks that could collapse or where ground may not support weight of excavator.
- Observe changes in ground and traction conditions after a rain or other changes in weather.

Digging Under an Overhang

Do not dig under an overhang. This can cause overhang to collapse and sand and rocks can fall on top of the machine.

- Do not perform overhead demolition or excavation work. This can cause broken objects and debris to fall on top of machine causing death or serious injury, or property damage.

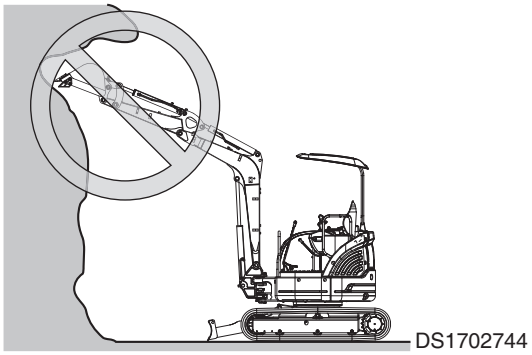


Figure 37

Deep Digging

Do not perform deep digging under front of machine. The ground under machine may collapse and cause machine to fall resulting in death or serious injury.

Working heavy loads on loose, soft or uneven ground, can cause side load conditions resulting in a tip over and injury. Traveling without a load or a balanced load may also be hazardous.

Never rely on lift jacks or other inadequate supports when work is being done. Block tracks fore and aft to prevent any movement.

Use machine only for its intended purpose. Using it for other purposes will cause failures.

- Do not perform demolition work under machine. There is a hazard that the machine may become unstable and tip over.
- When working on or from top of buildings or other structures, check if structure can support weight of machine and attachment. If a building structure collapses, this can cause death or serious injury.

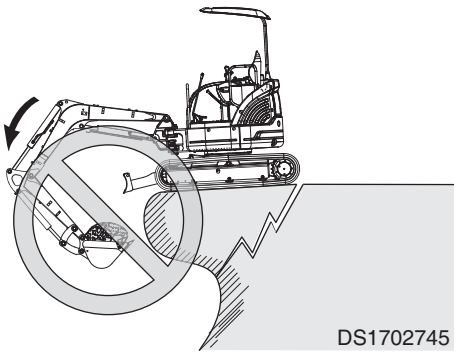


Figure 38

Drop-off or Edge

When working at edge of an excavation or near a drop-off, the machine could tip over, which can result in death or serious injury. Always fasten your seat belt. Check ground conditions of work site before operating to prevent the machine from falling or roll-over, and to prevent ground, stockpiles, or banks from collapsing.

Do not travel too close to edge of a drop-off.

Poor Visibility

For good visibility of the operator, always do the following:

- When working in dark areas, attach working lights and front lights to the machine. If necessary, set up additional lighting at work site.
- Stop operations when visibility is poor, such as in fog, mist, snow, and rain. Wait for visibility to improve before starting operation.

To avoid hitting work equipment and damaging other property, always do the following:

- When working in tunnels, under bridges, under electrical wires, or when parking the machine or performing other operations in places with limited height, be careful not to hit and damage other equipment or property.
- To prevent hitting objects, operate machine at a slow speed when working in confined spaces, indoors, or in crowded areas.
- Do not swing bucket over the top of personnel or over operator's cabin of dump truck.

Loose or Soft Ground

Do not operate on soft ground or near edge of drop-offs, overhangs, and deep ditches. The ground can collapse because of the weight of the machine causing the machine to fall or rollover.

Check ground conditions before beginning work with the machine. If ground is soft, reposition the machine before operating.

The excavated material must not be dumped too close to edge. How far away from edge of trench excavated material must be dumped depends on soil type and moisture content. If loose clay is being excavated, place it at least 5m away from edge.

If excavated material is dumped too close to edge, its weight can cause a landslide.

Thawing of frozen ground, rain, traffic, piling and blasting are other factors which increase risk of landslide. The risk also increases on sloping ground. If it is not possible to dig a trench and adequately slope its sides, always install shoring equipment.

Do not raise bucket, if ground should begin to collapse when working on the soft ground. Lower work equipment to improve stability of machine.

Never dig under machine, if there is a potential of causing a landslide.

High-voltage Cables

Do not travel or operate machine near electrical cables or overhead power lines. There is a hazard of electric shock, which can cause property damage and result in death or serious injury. The bucket or other attachment does not have to make physical contact with power lines for current to cause an electrocution.

Use a flagman and hand signals to stay away from power lines not clearly visible to operator. On work sites where machine may operate close to electrical cables, always do the following:

- Remember that electrical voltage determines what the minimum distance is to stay away from the power line. See the following table for minimum distances when working near electrical power lines. Electrical flashover can occur and damage machine and cause death or serious injury.

Voltage	Minimum Distance
6.6 kV	3 m
33.0 kV	4 m
66.0 kV	5 m
154.0 kV	8 m
275.0 kV	10 m

- Always contact the power company responsible before beginning work near high voltage power lines.

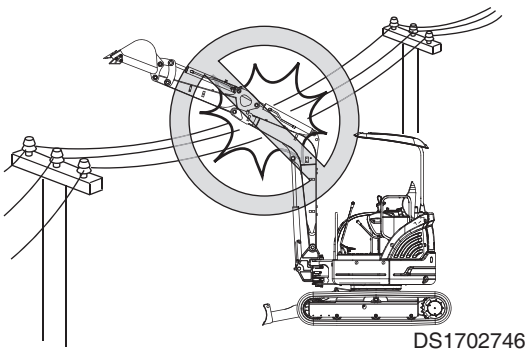

DS1702746

Figure 39

Underground Operation

If excavation is in an underground location or in a building, make sure there is adequate overhead clearance, and adequate ventilation.

Check that there is sufficient room for machine and load.

Move slowly.

Make sure that authorities or companies responsible for underground cables, utilities, and electrical lines have been contacted and that their instructions are followed.

Consider all electrical cables as live.

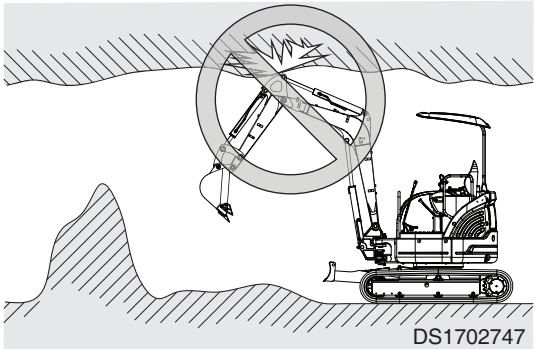


Figure 40

Working in Water

NOTICE

Do not exceed maximum permissible water depth. The water level must not reach higher than the upper track guide bracket. (1, Figure 41)

After working in water, lubricate all lubrication points on undercarriage, which have been underwater so water is removed. Check that no water has entered travel gearboxes and undercarriage components.

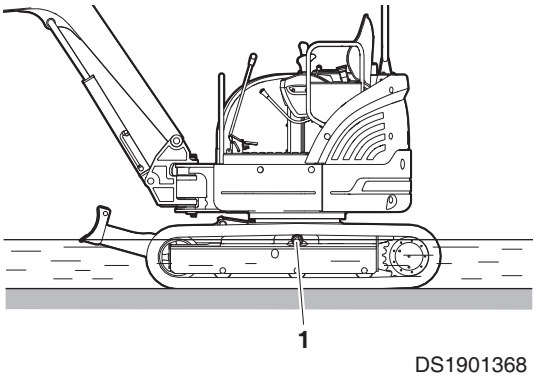


Figure 41

Working in Contaminated Environment

When working within area which is contaminated or where there is a health risk, check local regulations and contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for assistance with identifying what additional safety precautions need to be taken.

Operation in Extreme Conditions

Operation In Extreme Cold

In extremely cold weather, avoid sudden travel movements. Avoid the slope since the machine could slide down the slope.

Snow accumulation could hide potential hazards and slippery surfaces.

You can charge or operate only when engine warming-up is finished.
Vibration or impact caused by excessive movement of the attachment may adversely affect the structure. Reducing work cycle rate and workload may be necessary.

If machine is to be operated in extremely cold weather temperatures, certain precautions must be taken. The following paragraphs detail checks to be made to be certain machine is capable of operating at these temperatures.

1. Check the cooling system closely and repair if necessary.
2. Keep engine in good mechanical condition for easy starting and good performance during adverse weather.
3. Use engine oil with proper specifications for expected temperatures.
   For more information, refer to "Lubricants" on page 4-7 in this manual or Shop Manual for details.
4. Lubricate entire machine according to "Lubrication and Service Chart" on page 4-9 in this manual or lubrication chart on machine.
   - If mud and ice collects and freezes on any of moving parts while machine is idle, apply heat to thaw frozen material before attempting to operate machine.
   - Operate hydraulic units with care until they have reached a temperature which enable them to operate normally.
   - Check all machine controls and functions to be sure they are operating correctly.
5. Clean off all mud, snow and ice to prevent freezing. Cover machine with a tarp if possible, keep ends of tarp from freezing to ground.

Operation in Extreme Heat

Continuous operation of machine in high temperatures can cause machine to overheat. Monitor engine and hydraulic system temperatures and stop machine to let it cool, when necessary.

1. Batteries self-discharge at a higher rate if left standing for long periods at high temperatures. If machine is to stand for several days, remove batteries (12V) and store in a cool place.

NOTICE

Do not store acid type storage batteries near stacks of tires. Acid fumes can damage rubber.

2. Lubricate entire machine according to "Lubrication and Service Chart" on page 4-9 in this manual or lubrication chart on machine.
3. Do not park machine in sun for long periods of time. If possible, park machine under cover to protect it from direct rays of the sun, dirt and dust.
   A. Cover machine if no suitable shelter is available.
   B. In hot, damp climates, corrosion will occur on all parts of machine and will be accelerated during rainy season.
   C. Protect all unfinished, exposed surfaces with a film of preservative oil. Protect cables and terminals with ignition insulation compound. Apply paint or suitable rust preventive to damaged surfaces to protect them from rust and corrosion.

Operation In Dusty and Sandy Areas

Operation of machine can cause dust in almost any area. However, when in predominantly dusty or sandy areas, additional precautions must be taken.

1. Keep cooling system fins and cooling areas clean. Blow out with compressed air, if possible, as often as necessary.

WARNING

AVOID DEATH OR SERIOUS INJURY

Wear goggles when using compressed air to prevent face or eye injury.

2. Lubricate and perform services outlined on current lubrication chart on machine and "Lubrication and Service Chart" on page 4-9. Clean all lubrication fittings before applying lubricant.
   Foreign material mixed with lubricant becomes very abrasive and accelerates wear on parts.
3. Protect machine from dust and sand as much as possible. Park machine under cover to keep dust and sand from damaging unit.

Operation in Rainy or Humid Conditions

Operation under rainy or humid conditions is similar to that as in extreme heat procedures previously listed.

1. Keep all exposed surfaces coated with preservative oil. Pay particular attention to damaged or unpainted surfaces. Cover all paint cracks and chip marks as soon as possible to prevent corrosive effects.

Operation in Saltwater Areas

Saltwater and saltwater spray is very corrosive. When operating in saltwater areas, or in or around snow, observe the following precautions:

1. When exposed to saltwater, dry machine thoroughly and rinse with freshwater, as soon as possible.
2. Keep all exposed surfaces coated with preservative oil. Pay attention to damaged paint surfaces.
3. Keep all painted surfaces in good repair.
4. Lubricate machine as prescribed on lubrication chart on machine or "Lubrication and Service Chart" on page 4-9 in this manual. Shorten lubricating intervals for parts exposed to salt water.
5. Check operating controls to ensure proper functionality and that they return to "NEUTRAL" when released.

Operation During Electrical Storms

During electrical storms, do not enter or exit machine.

- If you are off machine, keep away from machine until storm passes.

Asbestos Information

WARNING

AVOID DEATH OR SERIOUS INJURY

Avoid exposure to dust containing asbestos as it can cause death or serious injury to the lungs and other organs (mesothelioma, lung and other cancers, and asbestosis).

ARO1770L

Figure 42

Asbestos dust can be HAZARDOUS to your health if it is inhaled. Materials containing asbestos fiber can be present on work sites. Breathing air that contains asbestos fiber can ultimately cause serious or fatal lung damage or diseases such as mesothelioma, lung and other cancers, and asbestosis. To prevent lung damage from asbestos fiber, observe the following precautions:

- Use an approved respirator that is approved for use in an asbestos-laden atmosphere.
- Use water for cleaning to keep down dust.
- Always observe any regulations related to work site and working environment.
- Avoid brushing or grinding materials that contain asbestos.
- A vacuum cleaner that is equipped with a high efficiency particulate air filter can also be used.
- Stay away from areas that might have asbestos particles in air.

Silica Dust Information

WARNING

AVOID DEATH OR SERIOUS INJURY

Avoid exposure to dust containing crystalline silica particles as it can cause serious injury to the lungs (silicosis).

Cutting or drilling concrete containing sand or rock containing quartz can result in exposure to silica dust. Do not exceed Permissible Exposure Limits (PEL) to silica dust as determined by work site rules, laws and regulations. Use a respirator, water spray or other means to control dust. Silica dust can cause lung disease.

Disposal of Hazardous Materials

Avoid physical contact with waste lubricating oil or hydraulic oil. If contacted, wipe the oil off the body without delay and wash off any remaining residue.

Drained lubricant and hydraulic fluid are an environmental contaminant and should only be disposed of at approved collection facilities. To prevent pollution of environment, always do the following:

- Never dump drained oil in a sewer system, rivers, etc.
- Always put drained oil from your machine in approved, leak proof containers. Never drain oil directly onto ground.
- Obey appropriate laws and regulations when disposing of harmful materials such as oil, fuel, solvent, filters, and batteries.

Improperly disposing of waste can threaten environment.

Potentially harmful fluids must be disposed of according to pertinent regulations.

Use all cleaning solutions with care.

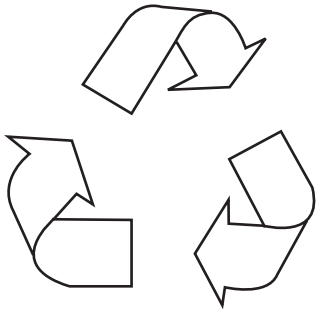


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Figure 43

Sound

Sound Level Information: Hearing protection may be required when machine is operated with an open operator station for extended periods or in a noisy environment.

Sound pressure level (LpA) at operator position (Measurement according to ISO 6396)	70 dB(A)
Sound power level (LwA) around the machine (Measurement according to 2000/14/EC with applicable appendices and measuring method according to ISO 6395)	85 dB(A)

Operating Controls

The "Operating Controls" section consists of the following groups:

Each group is explained with a point location drawing or photo and a brief description of each control lever, switch, gauge or valve.

Check warning symbols on the control console. Warning symbols will appear when a problem with the machine is detected.

NOTICE

When any one or more of the warning symbols on the control console comes "ON", immediately stop operation. Investigate and correct the problem before proceeding with operation.

Component Locations

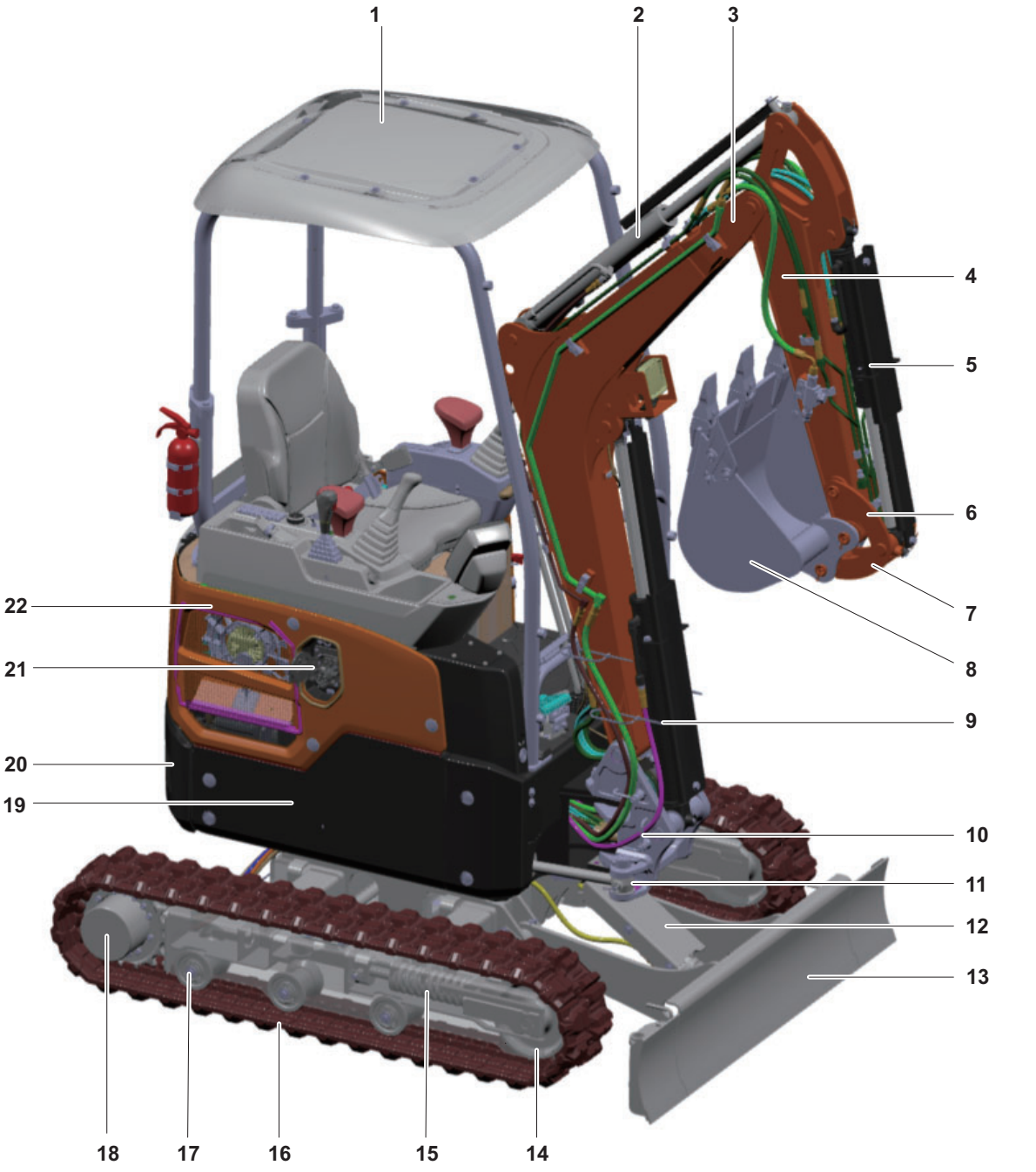


Figure 1

Reference Number	Description
1	Canopy
2	Arm Cylinder
3	Boom
4	Arm
5	Bucket Cylinder
6	Guide Link
7	Push Link
8	Bucket
9	Boom Cylinder
10	Swing Frame
11	Swing Cylinder

Reference Number	Description
12	Dozer Cylinder
13	Dozer Blade
14	Idler
15	Track Adjuster
16	Rubber Crawler
17	Lower Roller
18	Driving Motor
19	Swing Frame
20	Counterweight
21	Slow Charging Plug
22	Cover

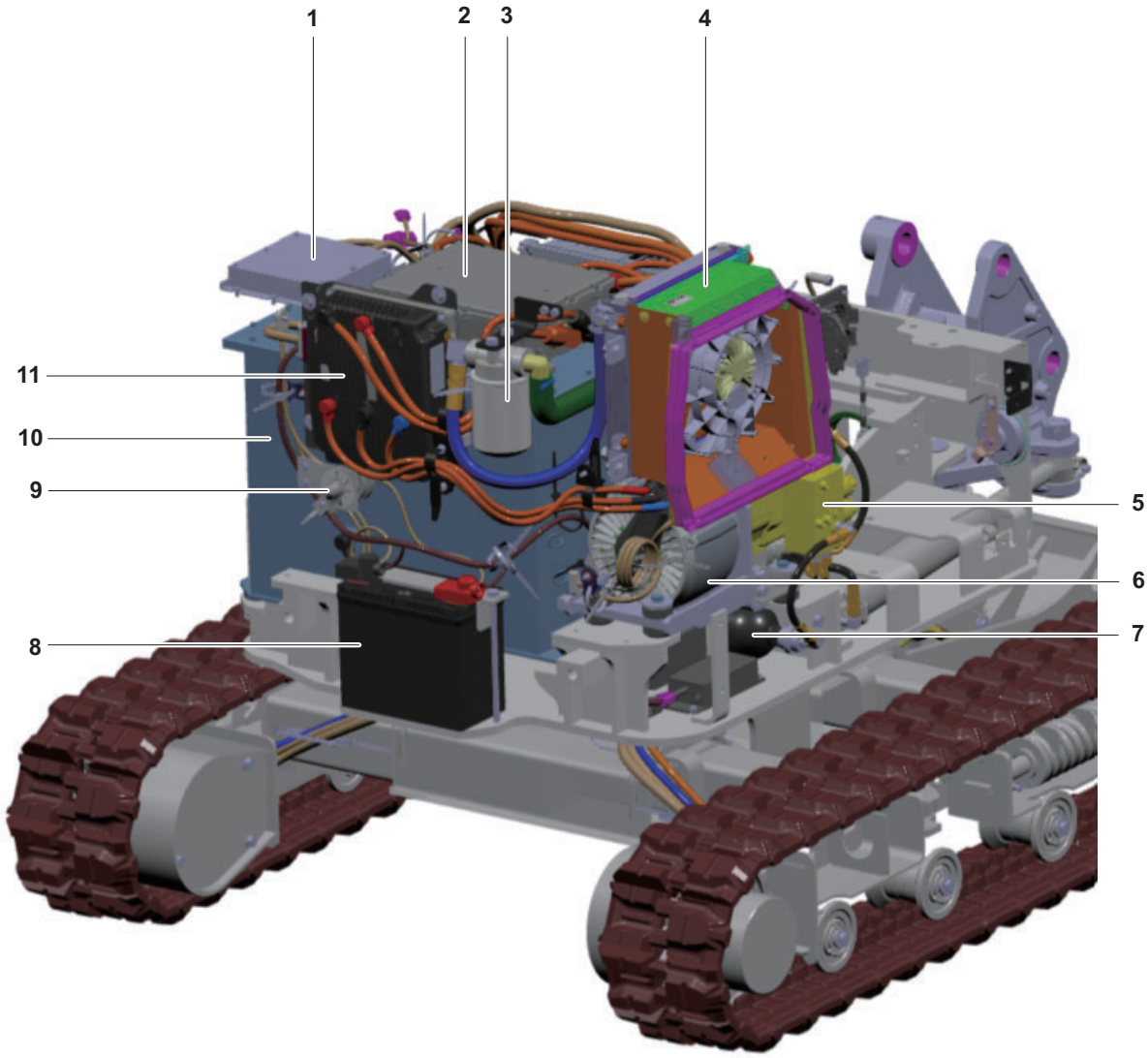
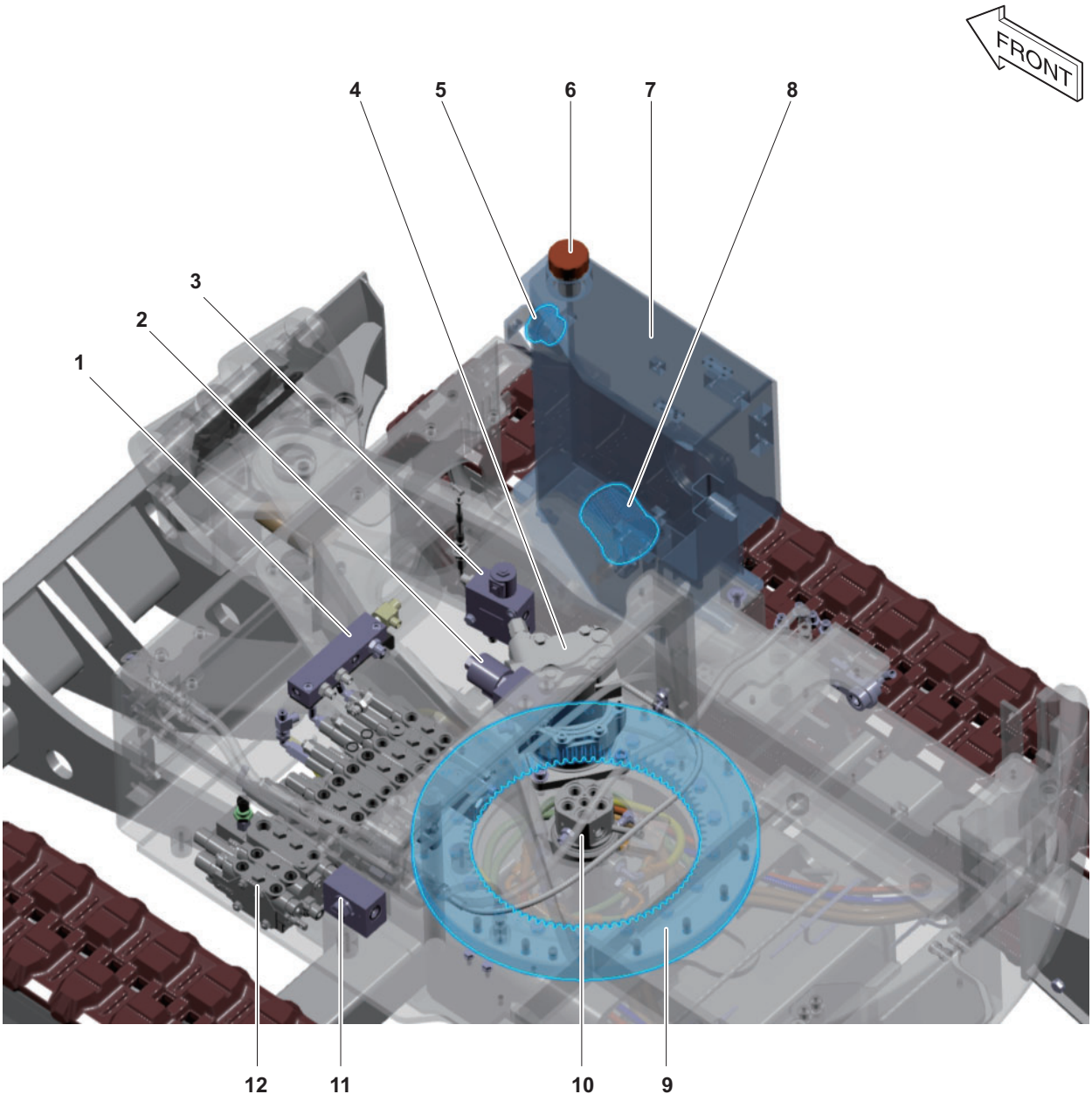


Figure 2 DS2300355

Reference Number	Description
1	VCU
2	PDU
3	Hydraulic Oil Return Filter
4	Cooler
5	Main Pump
6	Motor

Reference Number	Description
7	Accumulator
8	Battery (12V)
9	Battery Disconnect Switch (12 V)
10	Battery Pack
11	Inverter



DS2300370

Figure 3

Reference Number	Description
1	PT Block
2	Solenoid Valve
3	Quick Coupler Valve
4	Swing Motor
5	Hydraulic Oil Level Gauge
6	Hydraulic Oil Filler Cap and Tank Breather

Reference Number	Description
7	Hydraulic Oil Tank
8	Hydraulic Oil Return Filter
9	Swing Bearing
10	Center Joint
11	Breaker/Share Selector Valve
12	Control Valve

Operator's Area

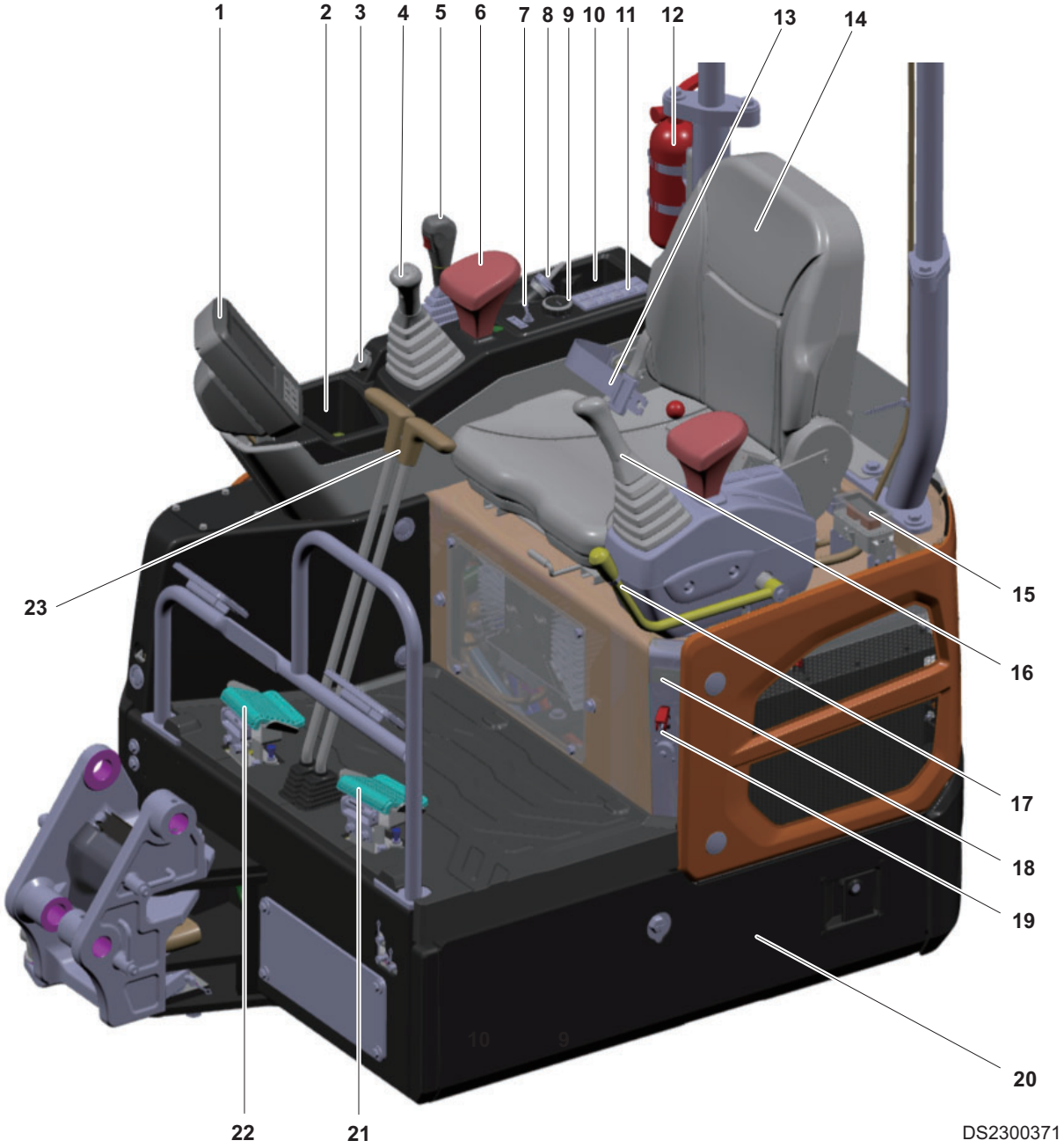


Figure 4

Reference Number	Description
1	Display Monitor
2	Storage Compartment
3	Power Socket (12V)
4	Right-hand Work Lever (Joystick)
5	Dozer Operating Lever/Track Extension Lever
6	Arm Rest
7	Quick Coupler Switch
8	Engine Start Switch
9	Engine Speed Control Dial
10	Storage Compartment
11	Keypad

Reference Number	Description
12	Fire Extinguisher
13	Seat Belt
14	Seat
15	Fuse Box
16	Left-hand Work Lever (Joystick)
17	Safety Lever
18	Hour Meter
19	Emergency Stop Switch
20	Cover (Quick Charge Plug)
21	One/Two Way Pedal
22	Boom Swing Pedal
23	Travel Lever

Operational Controls and Panels

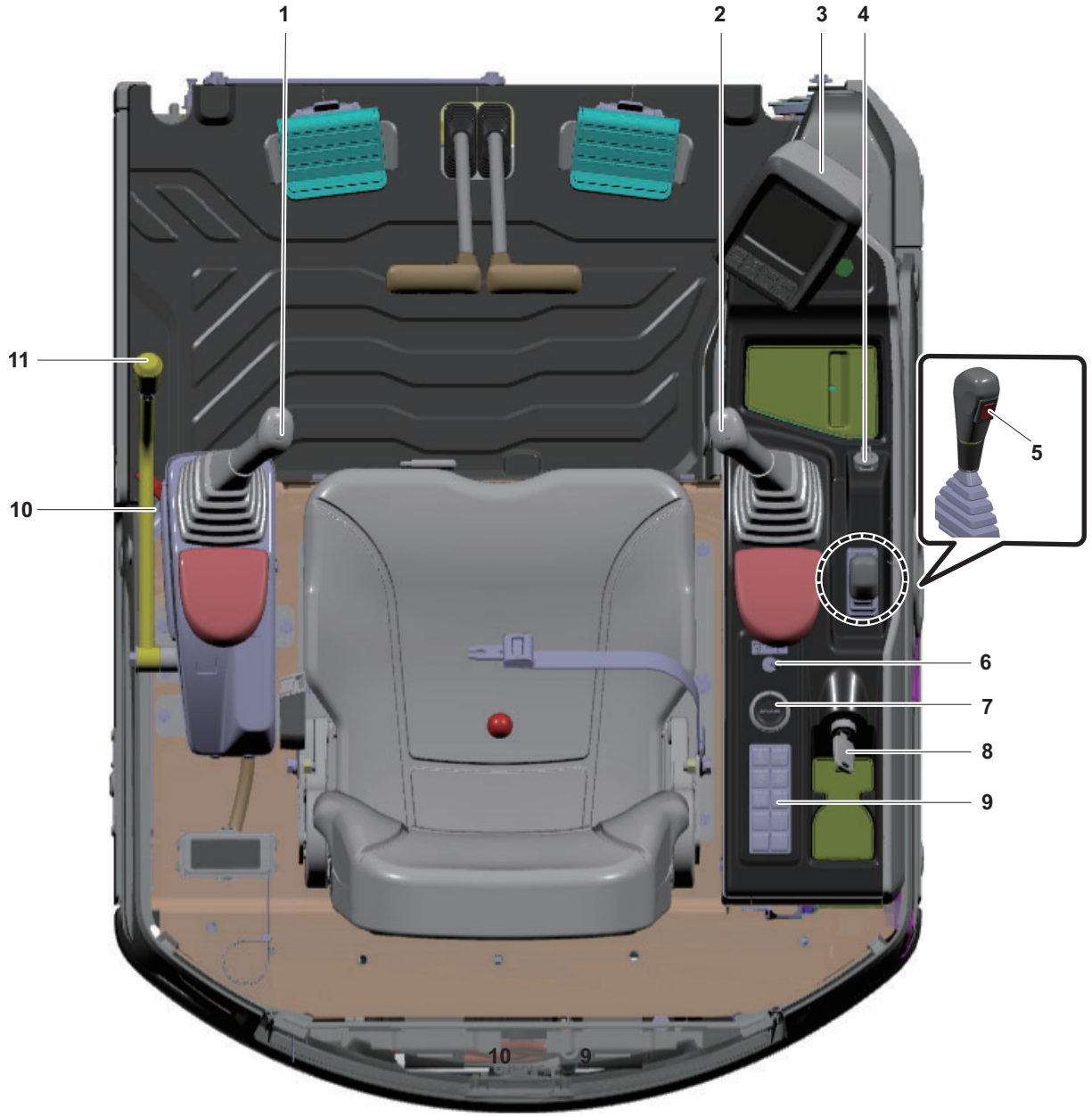


Figure 5

DS2300372

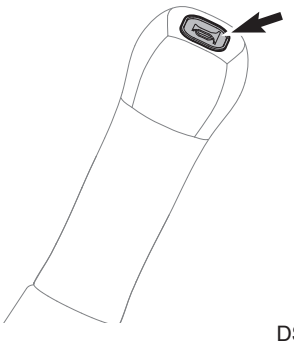
Reference Number	Description
1	Horn Switch
2	Auto Sleep Switch, Quick Coupler Operating Switch
3	Display Monitor
4	12V Power Socket
5	Travel Speed Selector Switch

Reference Number	Description
6	Quick Coupler Selector Switch
7	Engine Speed Control Dial
8	Engine Start Switch
9	Keypad
10	Hour Meter
11	Safety Lever

1. Horn Switch (Left-hand Work Lever)

Press the switch on the top of the left-hand work lever (joystick) to use the horn.

NOTE: *The engine start switch should be in the "ON" position.*



DS1702751

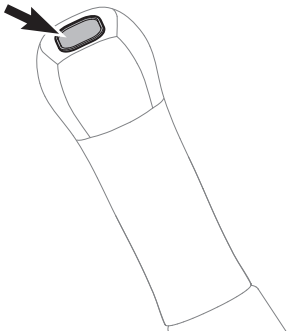
Figure 6

2. Auto Sleep Switch, Quick Coupler Operating Switch

Press the switch on the top of the right-hand work lever (joystick) to use the auto sleep or quick coupler.

NOTE: *If the auto sleep operating button on the keypad is turned on, the switch on the joystick starts auto sleep.*

NOTE: *If the quick coupler select switch is turned on, the switch on the joystick starts the quick coupler.*



DS1901440

Figure 7

3. Display Monitor

For more information, refer to "Display Monitor".

DS2300374

Figure 8

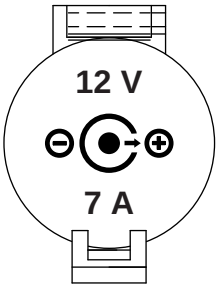
4. 12V Power Socket

This is a DC power socket which can be used for charging cellphones or using small 12V electrical devices.

Open the protective cap to use it.

NOTE: *This power socket is intended for low-capacity devices. Using it for high-capacity electrical devices may damage the socket.*

NOTE: *Be sure to cover the socket with a cover when it is not in use.*



FG017015

Figure 9

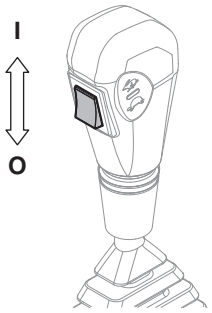
5. Travel Speed Selector Switch

When high-speed travel is selected, the high-speed travel indication light is turned on the right stand.

WARNING

AVOID DEATH OR SERIOUS INJURY

Do not operate the travel speed selector switch when machine is in motion. Temporary loss of control could result.



DS1901408

Figure 10

O. Low travel speed

I. High travel speed

6. Quick Coupler Selector Switch

This switch is used for engaging or releasing the attachment.

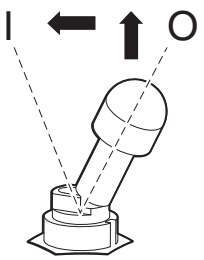
See "Quick Coupler Operation" for further information.

WARNING

AVOID DEATH OR SERIOUS INJURY

DO NOT OPERATE machine and attachment if quick coupler switch is in "I" (UNLOCKED) position.

Failure to fully engage and lock attachment to the quick coupler can allow attachment to fall off causing death or serious injury.



DS1903332

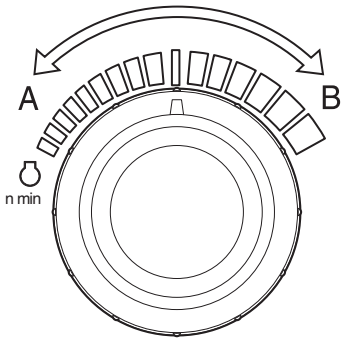
Figure 11

7. Engine Speed Control Dial

The engine speed is controlled by the dial. Rotating it clockwise increases engine speed (rpm) and rotating it counterclockwise decreases engine speed.

A Low Idle (Lowest engine speed).

B High Idle (Highest engine speed).



DS1900273

Figure 12

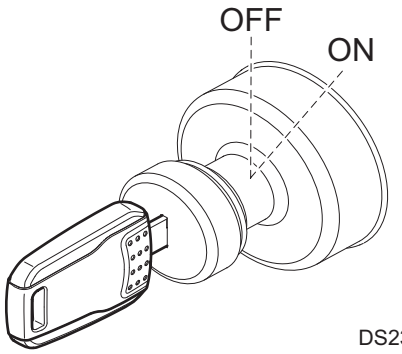
8. Engine Start Switch

Use this switch to start or stop the engine to operate the machine.

OFF: The engine start key can be inserted or removed in this position.
Turn the key to "OFF" to turn the engine off when it is running.

ON: Turn the engine start key to the "ON" position to start the engine.
The display monitor can be used.

NOTE: *Be sure to cover the socket with a cover when it is not in use.*

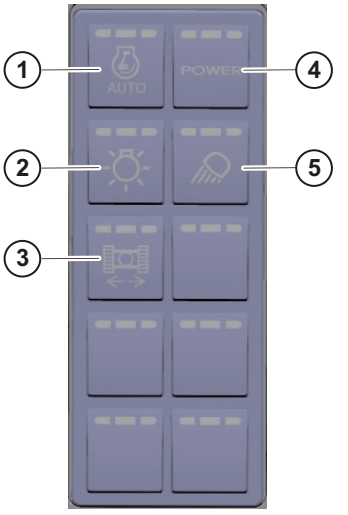


DS2300375

Figure 13

9. Keypad

1. Auto Sleep Operating Button
2. Light Button
3. Track Extension Selector Button
4. Power Mode Selector Button
5. Work Light Button



DS2300376

Figure 14

1. Auto Sleep Operating Button

Use this button to use auto sleep function.

WARNING

AVOID DEATH OR SERIOUS INJURY

Turn "OFF" auto idle function when performing work in close operating areas, i.e., working in a narrow area and loading/unloading on or off a trailer.

2. Light Button

Use this button to turn the light on.

Center LED lamp "OFF": The lighting lamp is turned off.

Center LED lamp "ON": The lighting lamp is turned on.

3. Track Extension Selector Button

Use this button to adjust the width of the left and right tracks.

For more information, refer to "Track Expansion Operating Lever".

4. Power Mode Selector Button

Use this button to change to power mode.

The following modes can be selected.

- ECONOMY mode
- STANDARD mode
- POWER mode
- POWER+ mode

Turn on POWER+ mode

To use POWER+ mode, press the Power Mode Select button on the keypad for at least 3 seconds.

When POWER+ mode is selected, pop-up is generated on the display monitor.

When the POWER+ mode is selected, all the LEDs on the power mode select button are illuminated.

POWER+ mode can be selected from all POWER/ STANDARD/ECONOMY modes.

Turn off POWER+ mode

Press the Power Mode Select button on the keypad once more in the POWER+ mode state to release the POWER+ mode.

When POWER+ mode is released, it returns to the mode set before POWER+ mode.

If the start key is "OFF" position, return to the mode set before to POWER+ mode.

5. Work Light Button

Use this button to turn on the work light. Use this button when it is difficult to secure a wider field of vision or when working in a dark place.

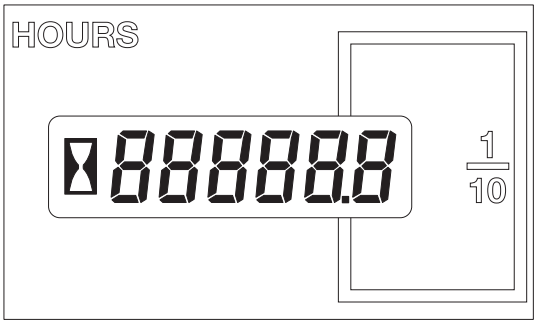
NOTICE

Do not turn on work lights when driving on public roads.

10. Hour Meter

The hour meter is used to indicate the total operating time of the engine.

This meter blinks every 4 seconds when activated to indicate that the engine is operating properly.



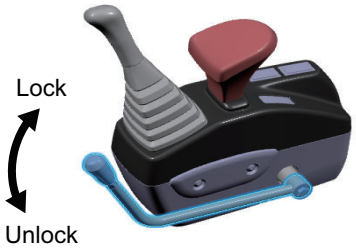
DS1901161

Figure 15

11. Safety Lever

Use the attachment when the safety lever released.

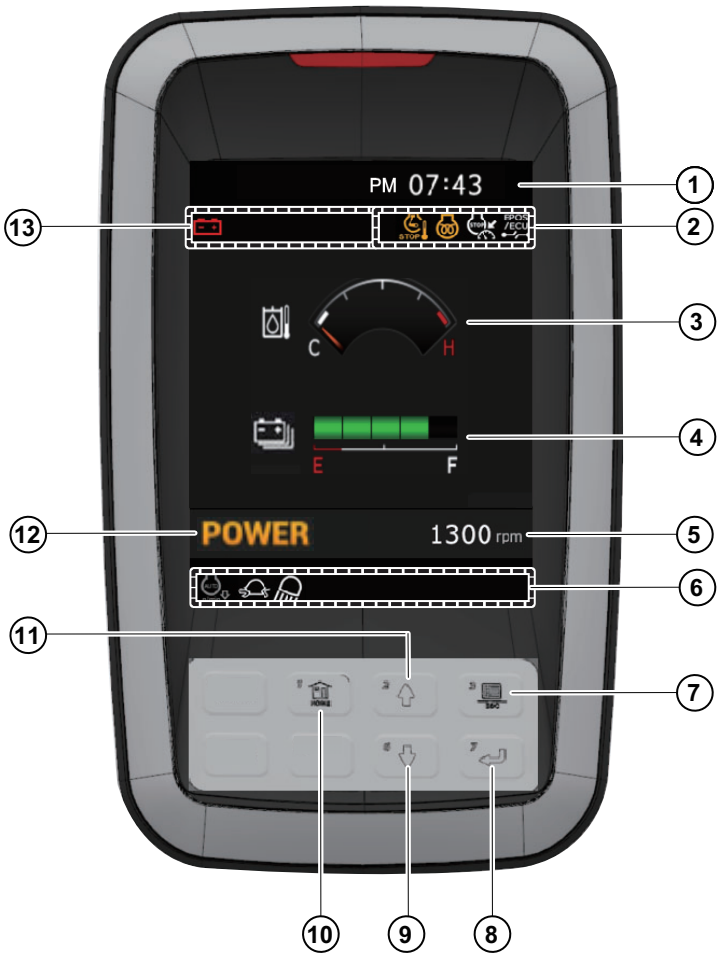
For more information, refer to "Safety Lever".



DS2300373

Figure 16

Display Monitor



DS2300377

Figure 17

Reference Number	Description
1	Digital Clock
2	Indicator Display
3	Hydraulic Oil Temperature Gauge
4	Battery Charge Gauge
5	Tachometer
6	Mode Symbol Display
7	Menu/ESC Button

Reference Number	Description
8	Selector Button
9	Down Arrow Button
10	Home Button
11	Up Arrow Button
12	Power Mode Indicator
13	Display Warning Symbols

NOTE: The Illustrations in this manual showing details or attachments that may look different from your machine. The function is not changed depending on the position of the switch or menu.

Functional Check

If the engine start key is turned "ON", switch/button indicators on the display monitor turn on, the warning indicator turns on and the warning buzzer sounds for two seconds.

The booting logo is displayed on the screen during functional checks.

Setting a Password

In the event that a password setting function is installed, a screen for entering the password appears after the functional check is complete.

By default, the password setting function is not provided when the machine is released from the factory.

For more information about setting passwords, please refer to "Operator Management" on page 2-32.

DS2104765

Figure 18

NOTICE

The machine cannot be operated normally if the password is incorrect.

1. Digital Clock

The digital clock indicates the current time.

- Time

DS2104731

Figure 19

2. Indicator Display

The indicator symbols are as follows.

Symbol	Meaning
	EPOS communications offline
	BMS communications offline
	PMI communications offline
	EPOS, BMS, PMI communications offline
	USB ON
	VBO emergency mode ON
	(When Positive Ack is received from EPOS after selecting 'Yes' in emergency mode pop-up)
	Reverse fan ON
	Mirror heat ON
	Auto preheat ON
	Auto preheat ON
	Auto shut down ON

Symbol	Meaning
	Highlands (3,000m below)
	Highlands (4,000m below)
	Highlands (4,000m over)
	Rear defrost ON
	Preheat ON
	Cruise ON
	Swing alignment ON
	DES ON
	Battery heater ON
	Slow charging ON
	Fast charging ON

3. Hydraulic Oil Temperature Gauge

This gauge indicates the temperature of hydraulic fluid.

C range - Low hydraulic fluid temperature.

H range - Hydraulic oil is overheated.

The needle must remain in the white range while the machine is in operation.

If the needle moves into the red range, the hydraulic fluid temperature indicator activates.

Operate the engine at the "lowest engine speed" until the temperature gauge returns to the white range.

NOTE: *For information about the location of this warning indicator and other indicators, see "13. Display Warning Symbols" on page 2-19.*

DS2201382

Figure 20

4. Power Pack Battery Gauge

The power pack battery gauge indicates the remaining battery capacity.

White area - Indicates that the power pack battery level is normal.

Red zone - Indicates that the power pack battery level is low.

When the bar moves to the red area, the power pack battery level symbol is displayed.

At this time, stop operation and charge the power pack battery immediately.

NOTE: *For more information on the warning indicators, see "Display Warning Symbols".*

DS2300378

Figure 21

5. Tachometer

This indicates the engine speed as a number.

DS2103095

Figure 22

6. Mode Symbol Display

The mode symbol indicators are as follows.

Symbol	Meaning
	Work/Travel ON
	Low/high/auto speed selected
	Work light ON
	Auto idle ON

7. Menu/ESC Button

Allows you to access the main menu or return to the previous screen.

8. Selector Button

Use this button to navigate the menu or clear the filter/oil run time.

9. Down Arrow Button

Use this button to move down the menu item.

10. Home Button

Use this button to return to the main screen.

11. Up Arrow Button

Use this button to move up the menu item.

12. Power Mode Indicator

The current power mode is displayed on the monitor.

- ECONOMY mode
- STANDARD mode
- POWER mode
- POWER+ mode

13. Display Warning Symbols

There are three types of warning symbols: Caution, Warning, and Failure. The symbols are as follows.

Number	Symbol	Type	Meaning
1		Warning	Battery warning
2		Warning	Hydraulic oil warning
3		Warning	Quick coupler warning
4		Warning	Engine rpm and starting restricted by TMS or TMS terminal failure
5		Warning	Seat belt
6		Warning	Battery charge
7		Warning	Battery pack overheated
8		Warning	Engine overheated
9		Warning	Inverter overheated
10		Caution	Return filter clogged
11		Caution	GPS antenna failure
12		Caution	GSM antenna failure
13		Caution	Satellite antenna failure
14		Failure	Check the machine
15		Failure	Stop the machine

1. Battery warning

This warning indicates that the engine must be stopped. Turn the engine off immediately when this symbol appears.
Continuing to work while this symbol is illuminated may severely damage the engine.

- This warning symbol illuminates when there is a problem with the charging system while the engine is running.
- It turns on while the engine is being started, and turns off after the engine is started.
- If this warning lamp illuminates while the engine is running, check the charging circuit.

2. Hydraulic fluid warning

This warning symbol appears on the screen when the hydraulic fluid temperature is too high.

3. Quick coupler warning

This warning appears and a buzzer sounds when the quick coupler is released.

WARNING

AVOID DEATH OR SERIOUS INJURY

Do not operate the machine or attachment with the quick coupler opened (unlocked).
Make sure the quick coupler is properly engaged (locked), once after the quick coupler is released (unlocked).
Attachment falling can result in death or serious injury.

4. Engine rpm and starting restricted by TMS or TMS terminal failure

Appears when there is a problem in the TMS terminal.

5. Seat belt

Appears when the seat belt is not worn.

6. Battery charge

7. Battery pack overheated

8. Engine overheated

9. Inverter overheated

10. Return filter clogged

Indicates that the return filter is clogged.

When this symbol appears on the screen, be sure to stop the machine immediately and replace the return filter.
After replacing the return filter, start the engine again and check whether the warning symbol is gone.

11. GPS antenna failure

Appears when the GPS antenna is malfunctioning or disconnected and cannot be recognized.

12. GSM antenna failure

Appears when the GSM antenna is malfunctioning or disconnected and cannot be recognized.

13. Satellite antenna failure

Appears when the satellite antenna is malfunctioning or disconnected and cannot be recognized.

14. Check the machine

This symbol illuminates when a certain machine function is not working.

NOTE: *When this symbol is illuminated, move the machine to a safe place, find the cause of the problem and fix it.*

15. Stop the machine

This symbol illuminates when a critical fault occurs in the machine.

NOTE: *When this symbol is illuminated, stop the machine immediately and call a service center to have the machine repaired.*

Warning Pop-Up Messages

Pop-up messages appear whenever a warning or alarm occurs in order to provide a brief description of the problem.

Warning pop-ups disappear when the warning symbol disappears or when the ESC button/jog switch is pushed.

In the event that there are several warnings and/or alarms, the jog switch can be used to check each warning and alarm.

The types of warnings and alarms are as follows.

- Warning pop-ups
- Failure pop-ups
- Communications offline
- Consumable replacement reminders
- Auto shutdown notifications

1. Warning Pop-Up Messages

In the event of a warning, these pop-ups display detailed information about the warning.

The warning types are as follows.

- Warning (red)
- Caution (orange)

DS1900439

Figure 23

2. Failure pop-ups

In the event of a failure, these pop-ups display detailed information about the failure.

The types of failures and messages are as follows.

- Check Machine: Check the machine. Some machine functions may not be working.

DS1900762

Figure 24

- Stop Machine Operation: Stop the machine immediately and contact a service center.

DS1900763

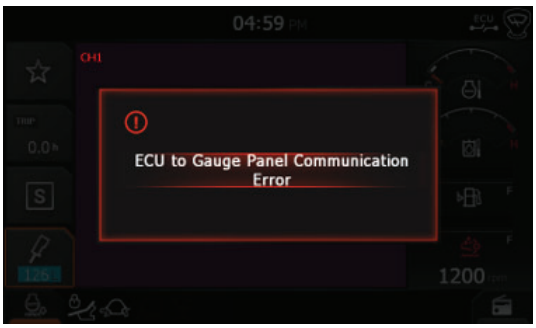
Figure 25

3. Communications offline

Indicates that the EPOS, ECU and PMI (Inverter) communications are not working.

The communications messages are as follows.

- EPOS communications offline: EPOS communications offline, BMS, PMI (Inverter) communications online
- BMS, PMI (Inverter) communications offline: EPOS communications offline, BMS, PMI (Inverter) communications offline
- EPOS/BMS, PMI (Inverter) communication offline: EPOS communication offline, BMS, PMI (Inverter) communication offline



DS1900764

Figure 26

4. Consumable replacement reminders

These reminders are shown when it is time to replace consumable parts or when the service interval has expired or passed.

The following image is shown for consumable replacement reminders.

The following replacement interval-related messages appear.

- Service interval is almost over: Service interval is within 10 hours of the replacement interval
- Service interval has expired: Service interval matches the replacement interval
- Service interval has passed: Service interval is over an hour past the replacement interval

User Menu

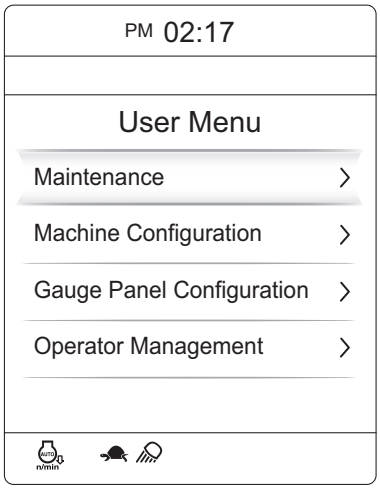
User Menu - Access and Escape Methods

Access Method

On the normal display screen, click on the jog switch to access the user menu screen.

The following menus can be accessed.

- Maintenance
- Machine Configuration
- Gauge Panel Configuration
- Operator Management



DS2300413

Figure 27

Exiting/Escaping Menus

- ESC Button
- Over 15 seconds have passed without any buttons being pushed
- The power was turned off by pushing the start/stop button

User Menu

Turn the jog switch and move the cursor to highlight the desired menu. Then, click on the jog switch to select the menu.

WARNING

AVOID DEATH OR SERIOUS INJURY

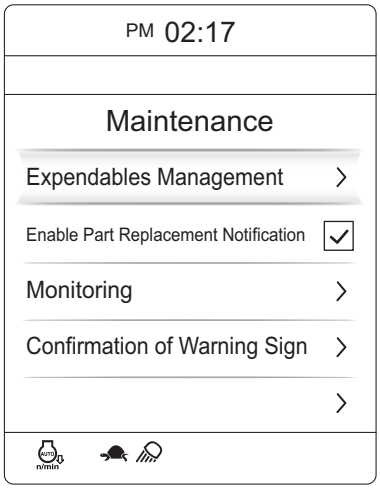
Do not change the vehicle mode while traveling or operating the machine.

1. Maintenance

Allows you to check the state of the consumables in the machine, monitor the machine, and check various notifications.

The following menus can be accessed.

- Expendables Management
- Maintenance Notification Setting
- Monitoring
- Confirmation of Warning Sign



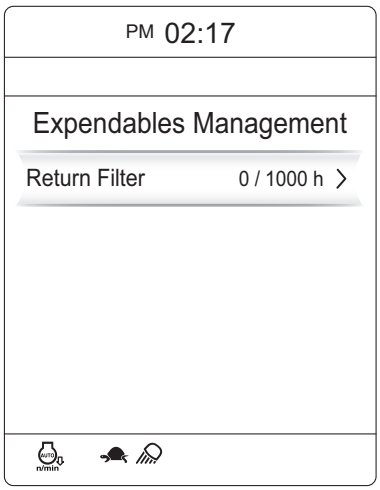
DS2104734

Figure 28

A. Expendables Management

This screen displays the usage time and replacement intervals for consumables.

How to access: User Menu → Maintenance → Expendables Management



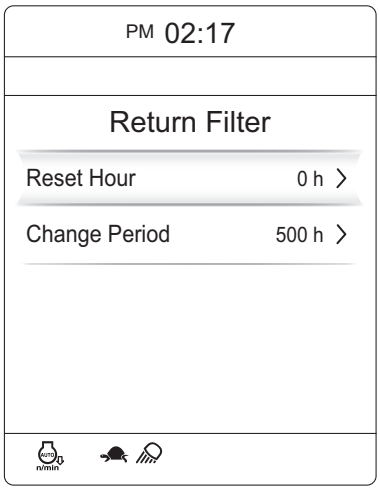
DS2300414

Figure 29

How to reset the time

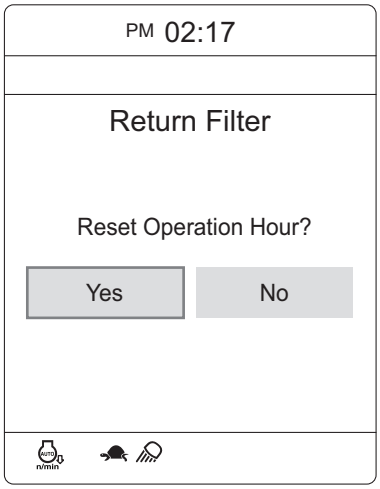
1) Select the consumable part that you wish to change.
2) After selecting the consumable part, select 'Reset'.
3) Push 'Yes' to complete the reset.

- After the reset, the timer restarts at 0hr.



DS2300415

Figure 30

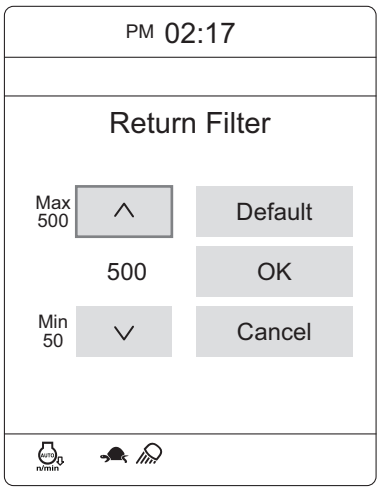


DS2300416

Figure 31

How to change the replacement interval

1) Select the consumable part that you wish to change.
2) Select the consumable part that you wish to change.
   After selecting the consumable part, select 'Change Period'.
3) After setting the new interval and pushing 'OK', the change of replacement interval is complete.



DS2300417

Figure 32

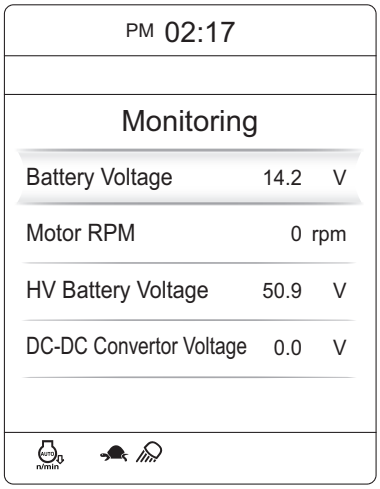
B. Maintenance Notification Setting

Consumable replacement notifications can be toggled on/off.

C. Monitoring

The monitoring screen displays the information on vehicle pump pressure and voltage.

How to access: User Menu → Maintenance → Monitoring



DS2300418

Figure 33

D. Confirmation of Warning Sign

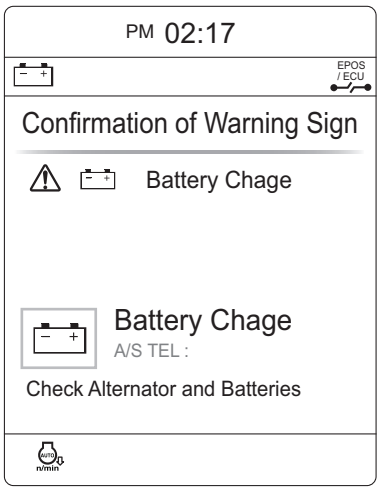
This menu allows you to see detailed information about warnings and failures in the machine.

How to access: User Menu → Maintenance → Confirmation of Warning Sign

The following information is provided in the detailed warning information display on the right.

- Warning image
- Warning name
- Service phone number
- Warning details
- Failure code

If there are no warnings, the following message is displayed: "No Warnings".



DS2104740

Figure 34

DS2104741

Figure 35

2. Machine Configuration

This menu allows you to check and change various vehicle settings.

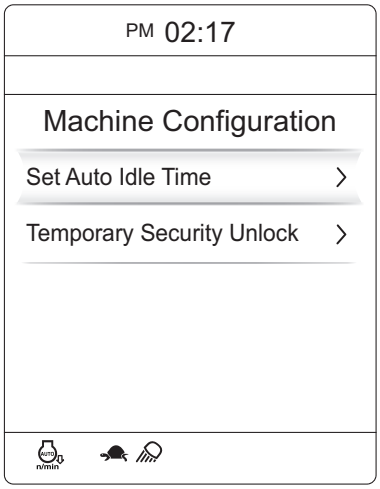
The following menus can be checked and changed.

- Auto Idle Time Setting
- Temporary TMS security release

NOTE: *The menus are enabled in the following conditions.*

Breaker operating time setting:
When the "Breaker" attachment option is enabled.

Joystick sensitivity settings:
When the "Two-way" attachment option is enabled.



DS2300446

Figure 36

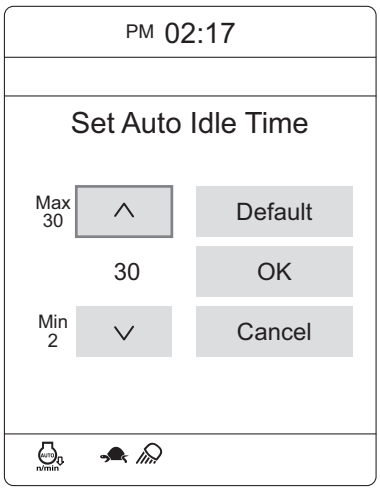
A. Auto Idle Time Setting

This menu allows you to set the time for enabling auto idle.

How to access: User Menu → Machine Configuration → Auto Idle Time Setting

1) How to change the time for enabling auto idle

- After setting the new time and pushing 'OK', the change of time for enabling auto shutdown is complete.
- Default setting : 4



DS2300419

Figure 37

B. Temporary TMS security release

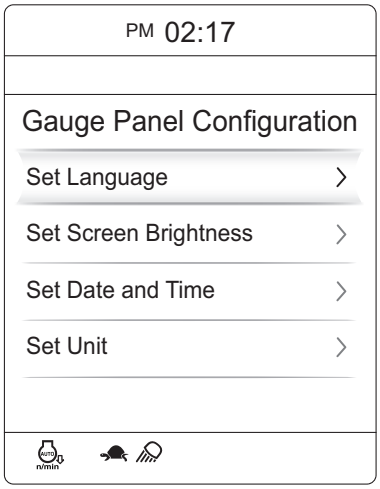
When the machine is located at a place where the unlock command cannot be received, this menu allows authorized operators to temporarily unlock the machine that is locked by the TMS server (ignition lock or RPM limit).

3. Gauge Panel Configuration

Items related to the display monitor settings can be managed and set.

The following menus can be checked and changed.

- Set Language
- Screen Brightness Setting
- Date and Time Setting
- Unit Setting



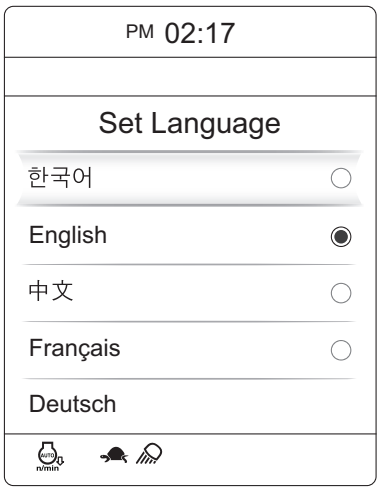
DS2300420

Figure 38

A. Set Language

The display monitor language can be set.

How to access: User Menu → Gauge Panel Configuration → Set Language



DS2104751

Figure 39

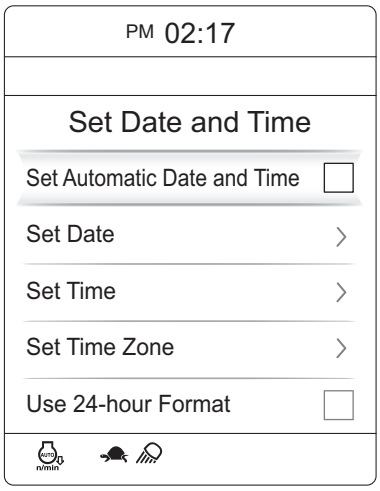
B. Date and Time Setting

The date and time can be set.

How to access: User Menu → Gauge Panel Configuration → Date and Time Setting

The following items can be set in the date and time settings.

- Automatic Setting of Date and Time
- Set Date
- Set Time
- Select Time Zone
- Use 24-hour Format



DS2104753

Figure 40

The following menus can only be set if the automatic setting of the date and time is disabled.

- Set Date
- Set Time
- Select Time Zone

1) Automatic Setting of Date and Time

   This option sets the date and time automatically.

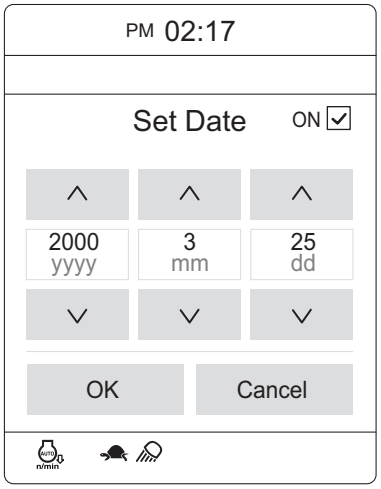
2) Set Date

   The date can be set.

   How to access: User Menu → Gauge Panel Configuration → Date and Time Setting → Set Date

   The format for the date is shown below.

   - Year: yyyy
   - Month: mm
   - Day: dd



DS2104754

Figure 41

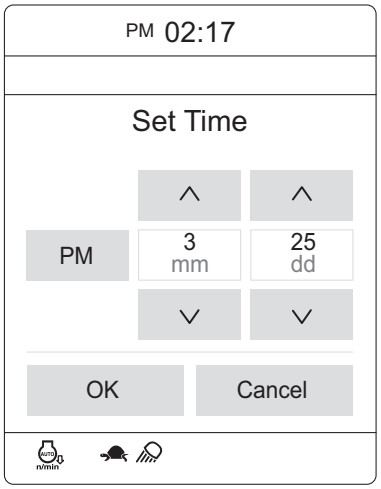
3) Set Time

   The time can be set.

   How to access: User Menu → Gauge Panel Configuration → Date and Time Setting → Set Time

   The format for the time is shown below.

   - Hour: hh
   - Minute: mm.



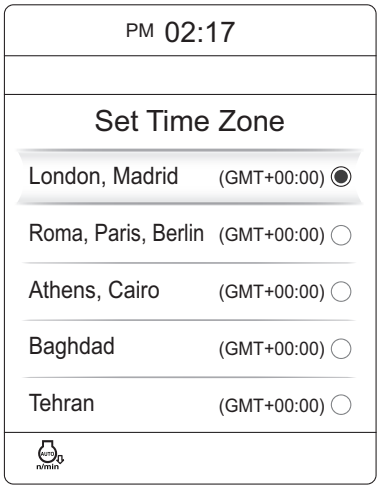
DS2104755

Figure 42

4) Select Time Zone

The time zone can be set.

How to access: User Menu → Gauge Panel Configuration → Date and Time Setting → Select Time Zone



DS2104764

Figure 43

Greenwich Mean Time (GMT) is displayed to the right of each city.

The following cities can be selected.

Time Zone	City	Time Zone	City
GMT +00:00	London, Madrid	GMT + 10:00	Sydney, Melbourne
GMT +01:00	Rome, Paris, Berlin	GMT + 11:00 AM	Okhotsk
GMT +02:00	Athens, Cairo	GMT + 12:00 PM	Wellington
GMT +03:00	Baghdad	GMT - 11:00	Midway
GMT + 4:00 AM	Teheran	GMT - 10:00 AM	Honolulu
GMT + 5:00 AM	Karachi	GMT - 8:00 AM	San Francisco, Seattle
GMT + 5:30 AM	Kolkata	GMT - 7:00 AM	Denver, Phoenix
GMT + 6:30 AM	Yangon	GMT - 6:00 AM	Chicago, Mexico City
GMT + 7:00 AM	Bangkok	GMT - 5:00 AM	New York, Miami
GMT + 8:00 AM	Manila, Hong Kong, Beijing	GMT - 4:00 AM	Georgetown, Goose Bay
GMT + 9:00 AM	Seoul, Tokyo	GMT - 3:00 AM	Rio de Janeiro

5) Use 24-hour Format

The 24-hour format can be selected.

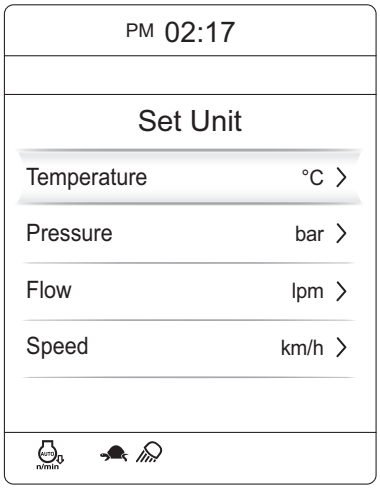
How to access: User Menu → Gauge Panel Configuration → Date and Time Setting → Use 24-hour Format

C. Unit Setting

The units of temperature, pressure, flow rate, and speed can be set.

How to access: User Menu → Gauge Panel Configuration → Unit Setting

The current unit is displayed to the right of each item.



DS2104756

Figure 44

The following units can be selected.

- Temperature: °C, °F
- Pressure: bar, kg/cm^2, psi, MPa
- Flow: lpm, gpm
- Speed: km/h, mph

DS2104757

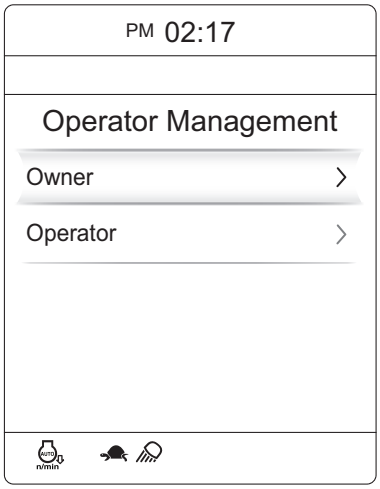
Figure 45

4. Operator Management

Password reset and various permission items can be managed and set.

The following menus can be checked and changed.

- Owner
- Operator



DS2104758

Figure 46

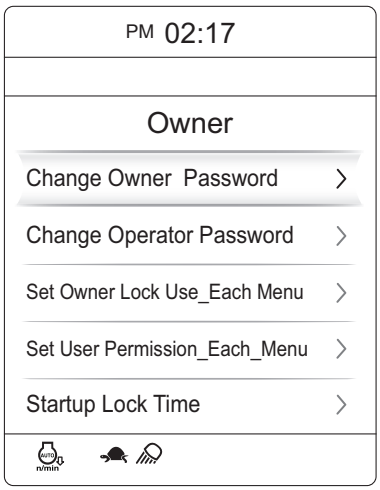
A. Owner/Operator

Items related to the owner password can be managed and set.

▻ **User Menu - User Management - Owner/ Operator**

The following items can be set.

- Change Owner/Operator Password
- Set Owner Lock Use_Each Menu
- Set User Permission_Each Menu
- Set Engine Startup Lock Time



DS2300476

Figure 47

B. Change Owner/Operator Password

The owner/operator password can be changed.

The password input modes are as follows.

- First input: New password
- Second input: Confirm new password

If the first password and second password match, the password is changed.

If the first password and second password do not match, a pop-up appears with the message:
"The passwords do not match".

DS2104760

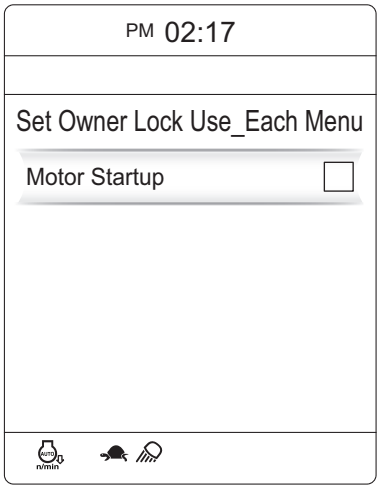
Figure 48

C. Set Owner Lock Use_Each Menu

The lock settings can be set for each menu.

The following menus can be locked.

- Start Engine



DS2300421

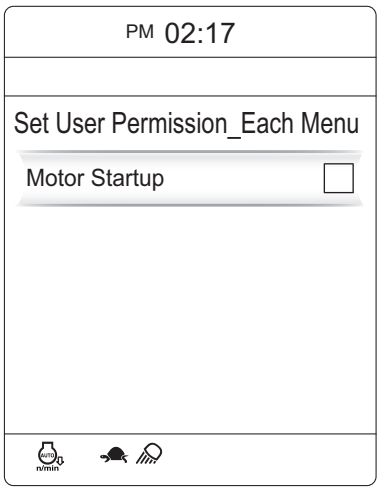
Figure 49

D. Set User Permission_Each Menu

The lock settings can be set for each menu.

The following menus can be locked.

- Start Engine



DS2300422

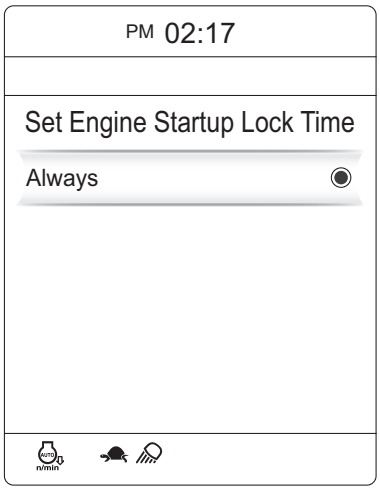
Figure 50

E. Set Engine Startup Lock Time

The engine startup lock time can be set.

The startup lock time can be set as follows.

- Always locked when Key Off



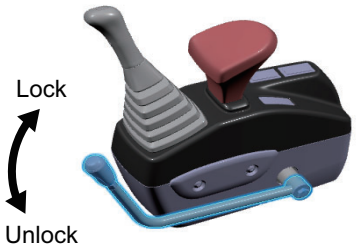
DS2300423

Figure 51

Miscellaneous Electrical Devices

Safety Lever

When the safety lever is moved into "LOCK" position, the switch deactivates the work and travel levers.



DS2300373

Figure 52

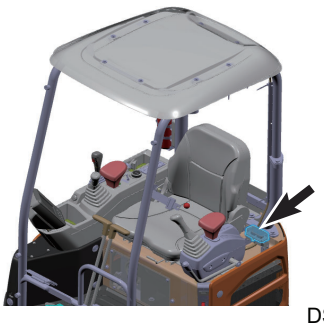
Fuse Box

The fuse box is under the driver's seat. The fuses prevent electrical devices from overloading or shorting.

The bottom of the fuse box indicates the function and amperage of each fuse.

Spare fuses are installed in the fuse box.

Change a fuse if the element separates. If the element of a new fuse separates, check the circuit and repair the circuit.



DS2300351

Figure 53

WARNING

AVOID DEATH OR SERIOUS INJURY

Always replace fuses with the same type and capacity fuse that was removed. Improper fuses can cause electrical damage and result in a fire, death or serious injury.

Seat Adjustment

WARNING

AVOID DEATH OR SERIOUS INJURY

Adjust the seat position before starting operation or after changing the operator.

Do not adjust the seat position while the machine is moving because a loss of control can occur.

Always stop the machine, and adjust the seat.

Always wear seat belt when operating machine.

Adjust the seat so the control levers and pedals can be operated freely and easily with the operator's back against the backrest.

1. Forward/Backward Adjustment

The fore-and-aft position of the driver's seat can be adjusted using the adjustment lever (1, Figure 54).

2. Reclining Position Adjustment

The reclining position can be adjusted using the reclining adjustment lever (2, Figure 54) to at the left bottom of the driver's seat.

DS1901432

Figure 54

Seat Belt

WARNING

AVOID DEATH OR SERIOUS INJURY

The seat belt is for the operator's safety and must be worn for operator restraint. Before operating the machine, adjust the seat to the desired position for maximum comfort and machine control, fasten the seat belt. Seat belts must be worn across the pelvic region and adjusted snugly. Never fasten a seat belt across the abdomen. Only operate the excavator while seated in the operators position.

Do not adjust the seat position while the machine is in motion as it could lead to a loss of control. Stop the machine, apply the parking brake, and then adjust the seat.

Always check the condition of seat belt and belt bracket before fastening it. Do not use seat belt with twists in it or with damaged or with missing hardware. Replace the safety belt or safety belt fixed unit if damaged or worn.

When the seat belt is not worn, a warning symbol (Figure 55) illuminates on the display monitor; the symbol turns off when the seat belt is put on.

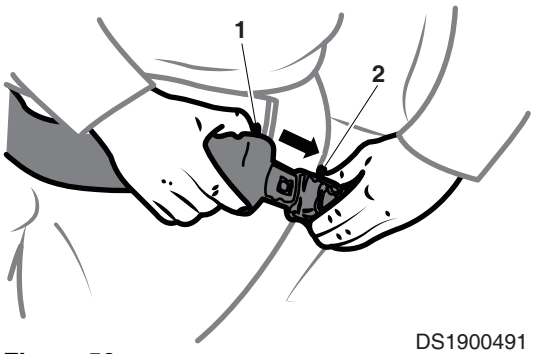
DS1901260

Figure 55

Seat Belt Locking and Unlocking

Insert belt end (1. Figure 56) into buckle (2). Slightly pull the belt to check whether the belt end is locked into buckle.

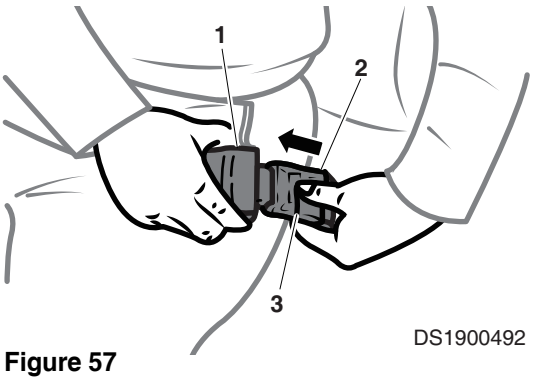
Adjust belt length so it is comfortably tight against operator's waist.



DS1900491

Figure 56

Press button (3) in center of buckle (2, Figure 57) pull out belt (1) to unlock.



DS1900492

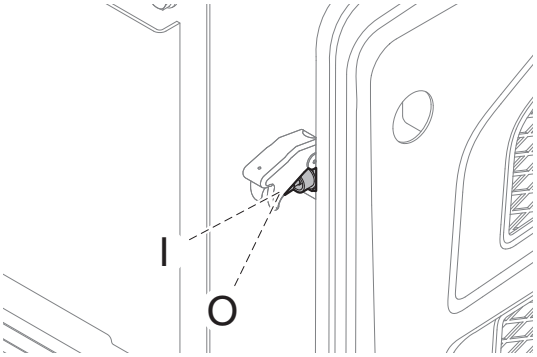
Figure 57

Emergency Stop Switch

If the engine cannot stop when using the starter switch, it can be stopped by moving the engine emergency stop switch to "I" (EMERGENCY STOP) position.
The emergency stop switch is located under the stand to the left of the driver's seat.

O. Emergency stop system "OFF".

I. "EMERGENCY STOP" is selected. The engine will stop.



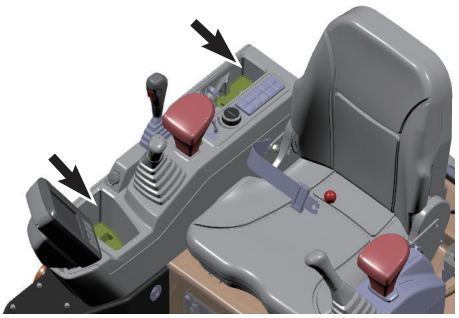
DS1901433

Figure 58

Miscellaneous Convenience Devices

Storage Compartment

The storage compartment is located to the right of the driver's seat.



DS2300501

Figure 59

Miscellaneous Access Covers and Doors

Grab the handle and open the cover.

For the side cover on the left side of the machine, open the side cover and fix the support to fix it completely.

DS2300352

Figure 60

Operation

To Operate a New Excavator

Even though all excavators are closely inspected and each part is completely adjusted before leaving the factory, operate the excavator in two stages according to the time indicated by the hour meter.

Hour	Load
For first 50 hours of operation	80% load of full capacity
After first 50 hours of operation	Full load

If machine is used at full load before it is broken in, it could affect the overall performance and service life of the machine due to seizure to small parts or small scratches. Therefore, pay sufficient attention.

NOTE:

1. *Check daily for leakage of hydraulic fluid. Inspect all lubricants daily and add appropriate lubricants as required.*
2. *Inspect and add lubricants daily on a regular basis, and tighten the bolts regularly.*
3. *During operation, monitor all instruments and gauges from time to time.*
4. *Avoid an extreme engine load.*
5. *Sufficiently warm up the machine. Operate the machine at 80% of the full load after warming-up.*
6. *Check that work equipment is operating normally.*
7. *Check machine for loose parts or for damage that may have occurred during shipping.*
8. *Check for loose wiring or terminals, check gauge operation and battery electrolyte level.*

Lubrication and Filters

1. Change hydraulic fluid return filter after first 250 hours of operation and the oil suction filter after 4,000 hours of operation.
2. Replace travel and reduction gear oil after first 500 hours of operation.

   NOTE: *For the replenishment of oil or grease, refer to "Inspection, Maintenance and Adjustment" on page 4-1 of this manual.*

Starting and Stopping Engine

Checks Before Starting Engine

Walk Around Checks

WARNING

AVOID DEATH OR SERIOUS INJURY

Clean machine, remove all flammable materials from machine, and repair machine before operating.

Before starting engine, inspect the following items. If any problem is found, repair it before machine operation.

1. Overall
   - Check for damage, wear, crack, oil leakage in attachments, cylinders, linkages and hoses.
   - Check the undercarriage for damage, wear, crack, oil leakage and loose bolts.
   - Check for problems in handrails, guardrails, and loose bolts.
   - Clean and check monitor, switches and gauges in the cabin.
2. Cleaning
   - Remove dirt and debris from around the battery.
   - Check and remove flammable material around the battery or other high temperature components.
3. Hydraulic system

   Check for hydraulic fluid leaks, damaged tubing and hoses and interference points of components.

4. Electric system

   Check for damaged electrical cables and loose or missing connectors.

5. Lubrication

   Perform all daily and periodic maintenance services. Perform services according to reading shown on hour meter.

6. Machine

   Check whether the parts are deformed, damaged or missing.

7. Safety

   Perform a machine walk-around. Make sure that no one is under the machine or performing any maintenance on it before starting engine.

8. After starting machine

   Check that all operational controls and components are in proper operating condition and are functioning correctly. Stop operation and correct any problems before continuing work.

Checks Before Starting Engine

Before starting engine, inspect the following items. If any problem is found, repair it before machine operation. Add oil when it is below the "LOW" mark. For more information, refer to "10 Hour / Daily Service" on page 4-12.

1. Grease boom, arm and front attachment pins.
2. Check level of hydraulic fluid tank.
3. Clean dust net in front of oil cooler and intercooler.
4. Inspect the bucket teeth and side cutters for signs of wear.
5. Inspect engine fan blade.
6. Inspect seat belt for any damage and proper operation.
7. Inspect the structure for cracks and faulty welds.
8. Check the operation of all switches.
9. Check the operation of all exterior lights, horn, travel alarm/ swing alarm (if equipped), rear/side view camera and control console indicator and monitor lights.

Operational Checks Before Starting Engine

WARNING

AVOID DEATH OR SERIOUS INJURY

When leaving operator's seat, move the safety lever to "LOCK" position to prevent accidental activation of the control levers.

1. Move safety lever to "LOCK" position.
2. Fasten seat belt. Check for the proper operation and condition of the machine.
3. Check whether each control lever is set to "NEUTRAL". Be careful not to touch any switches when starting engine.

Warm-up Operation

NOTICE

If a problem or abnormal operation occurs, immediately stop engine. Allow excavator to reach normal operating temperature before starting work, especially in cold weather.

Make sure to follow the procedures listed here for warm-up operation after starting the engine.

1. Move safety lever to "UNLOCK" position.
2. Slowly cycle boom, arm and bucket cylinders about five times without a load. Do this for five (5) minutes.
3. Perform boom, arm, bucket, swing, and travel operation 3 to 5 times each to circulate the heated hydraulic fluid to each part of the hydraulic equipment.

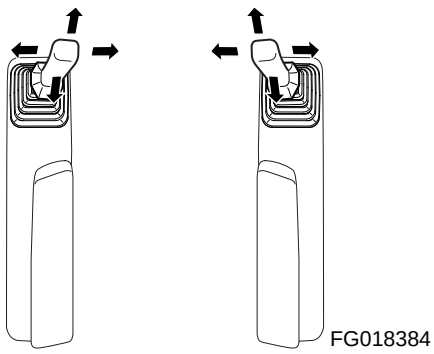


Figure 1

Warm-up Operation in Cold Weather

1. Set engine speed control dial to the middle position.
2. Move safety lever to "UNLOCK" position.
3. Slowly cycle boom, arm and bucket cylinders about five times without a load. Do this for five (5) minutes.
4. Set engine speed control dial to "HIGH IDLE" and repeat Step 3 for five (5) minutes.
5. Perform boom, arm, bucket, swing, and travel operation 3 to 5 times each to circulate the heated hydraulic fluid to each part of the hydraulic equipment.

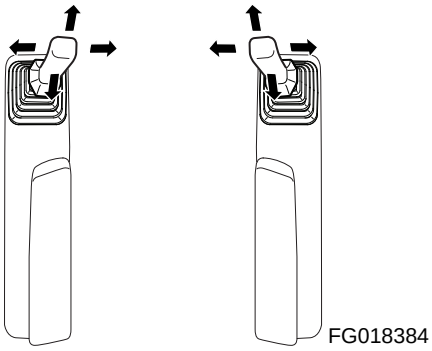


Figure 2

Stopping Engine

1. Park machine on firm and level ground.
2. Lower the bucket to ground.
3. Move safety lever to "UNLOCK" position.
4. Stop the engine by turning the starter switch to "OFF" position.
5. Remove the engine start switch.

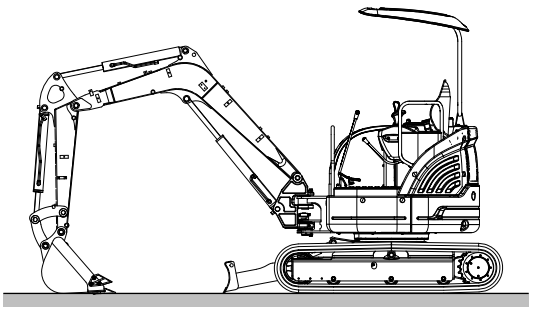


Figure 3

Checks and Maintenance After Stopping Engine

1. Park machine on firm and level ground.
2. Repair excavator if there are any coolant or oil leaks.
3. Inspect front and undercarriage and repair if any abnormality is found. Check whether the bucket or attachment is secure.
4. Inspect and remove accumulated flammable materials, such as leaves, paper etc., on the machine.
5. Clean all mud, debris, etc. from undercarriage and tracks. Make sure that guardrails and handrails are clean, and that operator's cabin is clean.

Safety Lever

WARNING

AVOID DEATH OR SERIOUS INJURY

When leaving operator's seat, move the safety lever to "LOCK" position and stop engine to prevent accidental activation of machine.

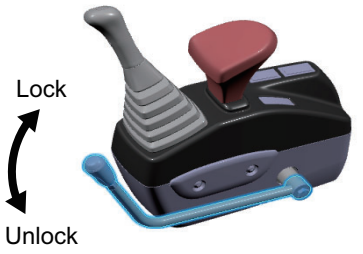
Be careful not to move the work levers (joysticks) when moving safety lever.

1. Move safety lever (Figure 4) down into "LOCK" position. When safety lever is in the "LOCK" position, all works are stopped, such as front work, swing work and travel work.

   NOTE: *Lower the bucket (front attachment) to ground. Place all control levers in "NEUTRAL", before moving the safety lever.*

2. Move the safety lever (Figure 4) to the "UNLOCK" position, by pulling it up before starting work.

   NOTE: *When the engine is not running, but the safety lever is in "UNLOCK" and the starter key is turned "ON", moving the control lever (joystick) can result in movement of the machine. The spool of the control valve can move due to the charged pressure in the accumulator.*



DS2300373

Figure 4

Travel

WARNING

AVOID DEATH OR SERIOUS INJURY

1. **When moving travel controls forward, tracked excavator will move in the direction of the idlers.**
2. **Before moving, make sure there are no persons or property in the way or on the machine. No riders. Sound the horn to alert workers and bystanders that you are about to move the machine.**
3. **When moving, always keep clear of the direction of travel and nearby.**
4. **Use extreme caution when reversing travel. Be sure there is a clear path behind the machine.**
5. **Operate the travel control levers smoothly to avoid sudden starts or stops.**
6. **Before leaving the operator's seat, make sure to lock out all control systems and stop engine to avoid an accident caused by malfunction.**

Automatic Travel Speed Control

WARNING

AVOID DEATH OR SERIOUS INJURY

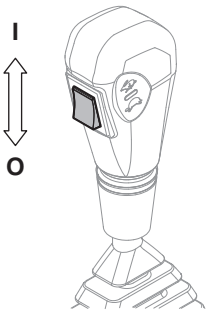
- **Do not change the travel mode while traveling. Always use low speed mode when traveling down a slope.**
- **If you change the speed while climbing up the slope, a very dangerous situation can occur. Always use speed mode after stopping a machine. Otherwise, serious personal accidents such as vehicle overturning may occur.**

Two travel speed ranges can be selected by using the track extension/dozer control lever.

I. High travel speed

O. Low travel speed

NOTE: When traveling at high speed, set the motor speed control dial to the maximum position.



DS1901408

Figure 5

Travel Control Lever Operation

1. Travelling Forward and Backward

   To travel straight, push both travel control levers/pedals fully forward or backwards. Push to move forward, or pull to move backward.

   NOTE: *"X" is the sprocket end of the track.*

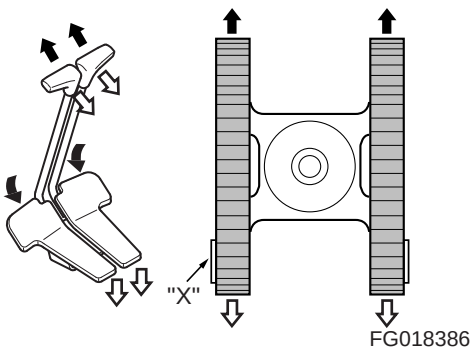


Figure 6

2. Pivot Turn

   A pivot turn is changing the direction by operating one crawler only, which can be performed by only one travel lever among two levers. The machine will pivot on the nonmoving track.

   NOTE: *"X" is the sprocket end of the track.*

WARNING

AVOID DEATH OR SERIOUS INJURY

Avoid sudden pivot turns or spin turns. In particular, stop the machine first before making a spin turn.

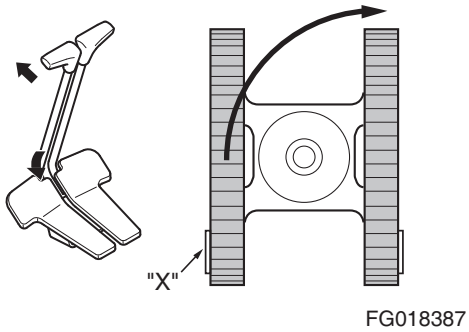


Figure 7

3. Spin Turn

   A spin turn is changing the direction on the spot by moving the left and right crawlers in opposite directions. Use one travel lever for moving forward and use the other lever for moving backward at the same time.

   NOTE: *"X" is the sprocket end of the track.*

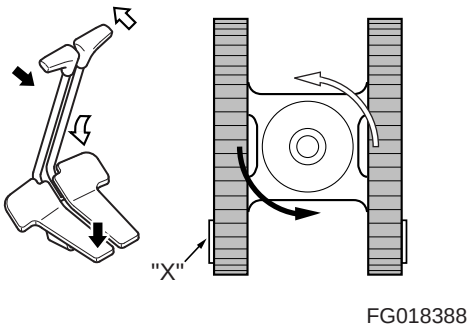


Figure 8

4. Stopping Travel

   Returning travel levers to "NEUTRAL" position will automatically apply brakes and stop excavator.

   NOTE: *"X" is the sprocket end of the track.*

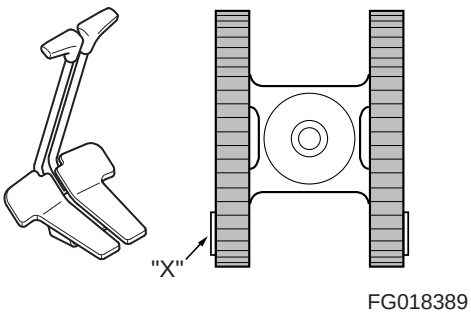
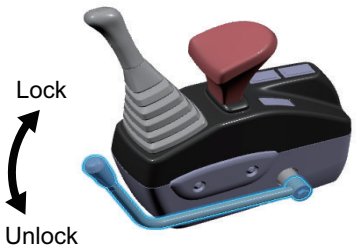


Figure 9

General Travel Instructions

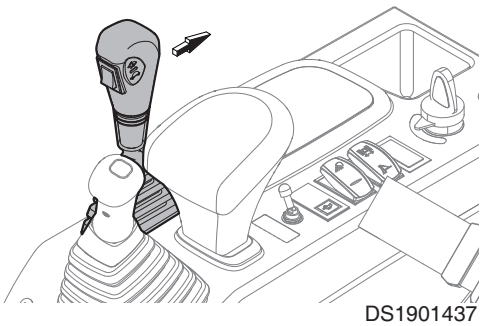
1. Set engine speed control dial on desired speed.
2. Move safety lever to "UNLOCK" position, and folding the front, raise it 40 - 50cm above ground.



DS2300373

Figure 10

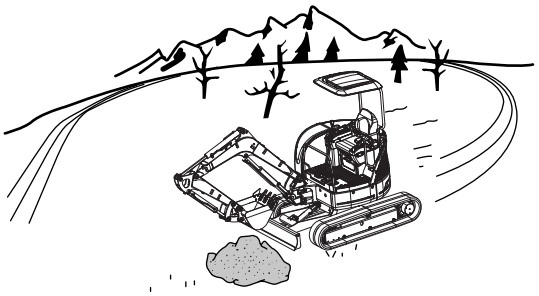
3. Raise the dozer blade.



DS1901437

Figure 11

4. When possible, travel by selecting firm and level ground. Also, make sure to set travel steering to straight with a large curvature, and avoid sharp pivot turns or spin turns as much as possible. When making turns in a confined space, repeat short movements several times.
5. When traveling on rough ground, travel at a slow speed (at 1.0 - 1.5 km/hr) by reducing the engine speed, since it has a great impact on this machine. In addition, be careful that the travel engine does not contact rocks, or an excessive force is applied to the track due to climbing on rocks.



FG009454

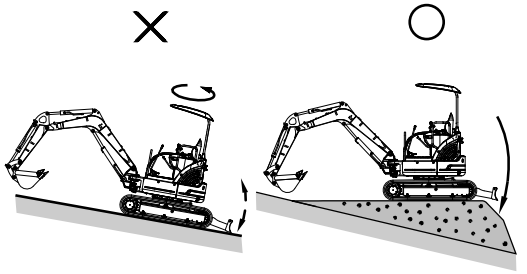
Figure 12

6. On rough, frozen or uneven terrain, travel slowly.

WARNING

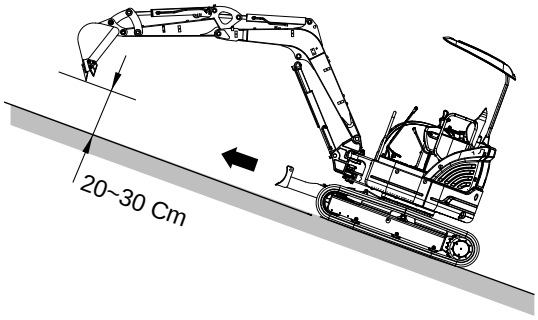
AVOID DEATH OR SERIOUS INJURY

- **When traveling, keep bucket (attachment) raised from 20 - 30 cm above the ground.**
  In addition, do not travel backward on a slope.
- **Never turn or travel crosswise on a slope. Perform safe travel, such as moving down on the flat ground and taking a detour.**
- **If excavator starts to slip or becomes unstable, immediately lower the bucket into the ground, using it as a brake.**
- **Avoid working on slopes, because there is a danger of overturning by becoming unbalance while swinging and performing front attachment operations. It is very dangerous to swing towards bottom of slope with a loaded bucket.**
  In unavoidable cases, level the slope with fill soil, to make the vehicle as horizontal as possible.
- **Do not travel on slopes more than 30° because of turnover danger.**



FG009448

Figure 13

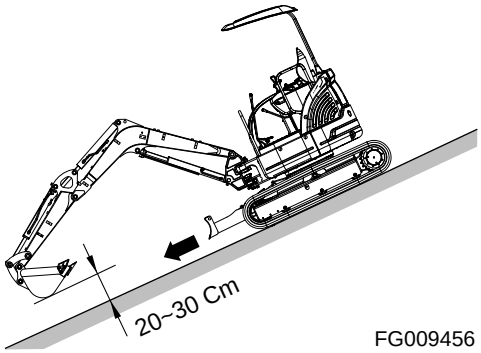


FG009455

Figure 14

7. When moving up or down a slope, travel vertically and never travel diagonally. See Figure 14 and Figure 15. Extend the arm and lower the boom to keep the bucket about 20 - 30 cm off the ground. If the machine starts to slide or becomes unstable, lower the bucket to regain control. If the engine stalls, lower the bucket, make sure that all controls are in the neutral position and restart the engine.

   NOTE: *Even though engine stops on a slope, never make a swing turn using the left control lever, since the machine can swing due to its tare weight.*



FG009456

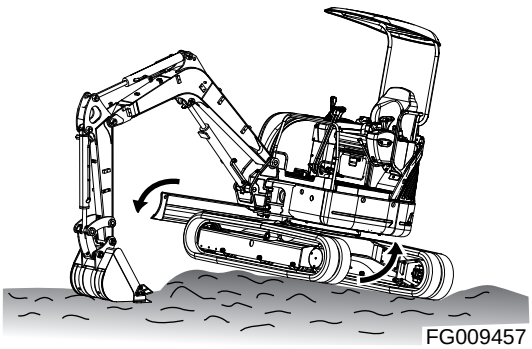
Figure 15

8. If dirt or mud builds up in the track frame, raise each track and rotate and clean that track.

NOTICE

When using the boom and arm to lift the undercarriage, roll the bucket until round base is against the ground.
At this time, the angle of the arm to the boom must be at 90° to 100°.

Make sure that material buildup has been cleared. See Figure 16 and Figure 17.



FG009457

Figure 16

9. The machine can travel in water that comes up to center of upper carriage rollers. Make sure that footing is solid so the machine will not sink. See "Working in Water" on page 3-28.

   NOTE: *If the machine is submerged to the point that water gets into the swing bearing or center joint, stop machine operation and remove the machine from the submerged location to firm, dry ground.*

   Do not operate until proper inspection is completed.

   Contact your designated service shop or local sales office.

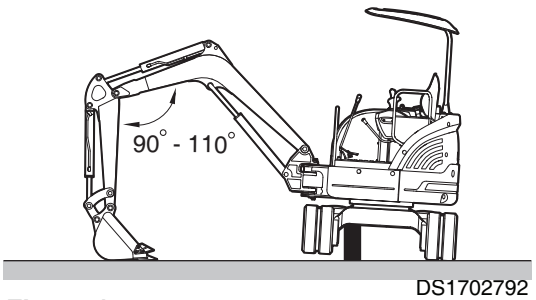


Figure 17

Work Levers (Joysticks)

WARNING

AVOID DEATH OR SERIOUS INJURY

Check surrounding area before swinging.
Keep bystanders away.

NOTE: When starting work, move work levers (joysticks) slowly and check movement of swing and front attachment.

This machine is assembled and shipped out using the lever method specified in the ISO standard, and the swing and front movement according to the control direction of the work lever is as follows:

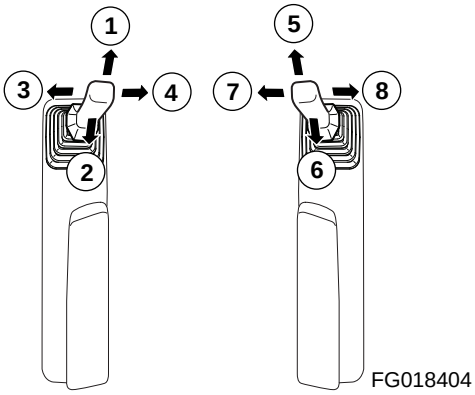


Figure 18

Left-hand Work Lever

1. Arm dump
2. Arm crowd
3. Left swing
4. Right swing

NOTE: The swing brake is activated by the spring.
The swing brake is activated when the work lever (joystick) is in "NEUTRAL" or the engine is stopped.

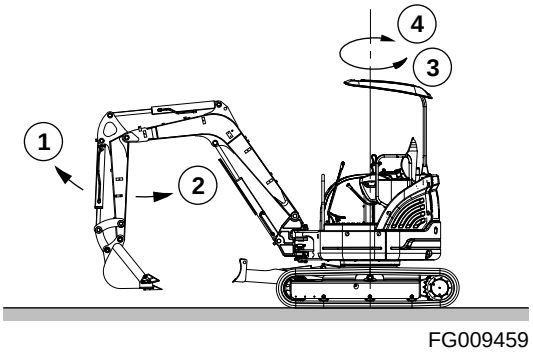


Figure 19

NOTE: The following is not a mechanical malfunction but a proper phenomenon of the excavator. When operating the arm lever, the arm may stop momentarily. This phenomenon occurs because the movement by bucket's own weight is faster the hydraulic fluid pressed from the pump, and does not affect the excavator.

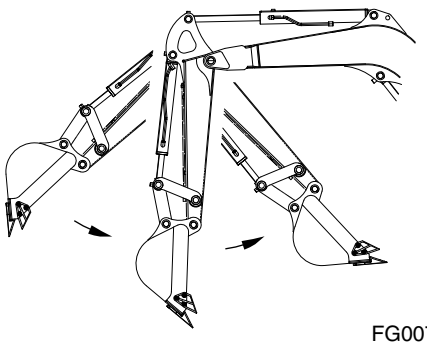
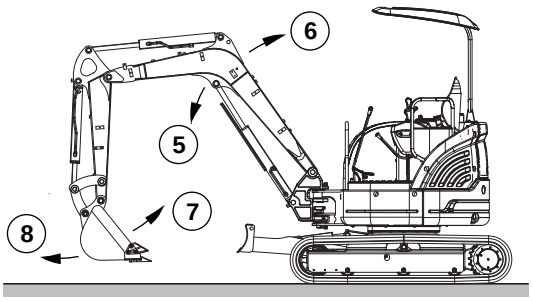


Figure 20

Right-hand Work Lever

5. Boom down
6. Boom up
7. Bucket crowd
8. Bucket dump

NOTE: *Even after stopping the engine, the front can be lowered to the ground by the operating work lever (joystick) by moving the safety lever to "UNLOCK" position and turning starter switch "ON".*



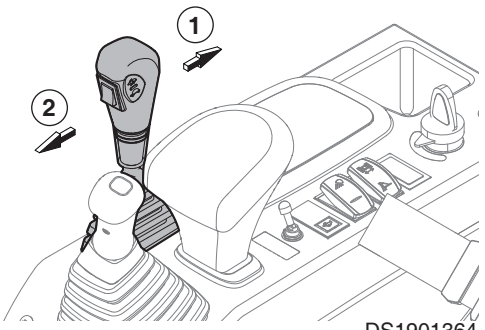
FG009460

Figure 21

Dozer Blade Control Lever

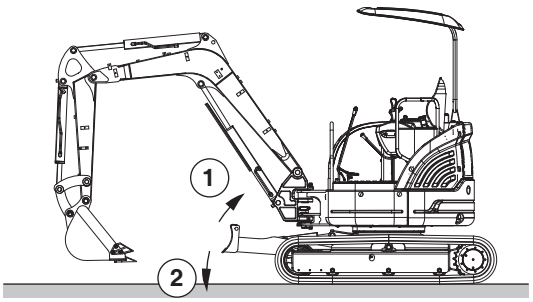
1. Control the dozer using the lever on the left side of the driver's seat.
   - Blade up (① direction)
   - Blade down (② direction)

   NOTE: *Check whether the track extension switch is turned off before operating the dozer blade.*



DS1901364

Figure 22



DS1702881

Figure 23

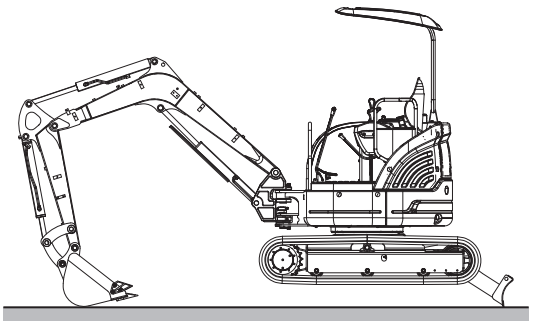
Caution When Using the Blade

The blade mounted on the machine is a simple blade for small excavators. Be careful when handling it.

1. This blade is designed for simple top dressing. Do not dig the ground with the blade.
   If you do, it can cause damage to the blade as well as the track parts.
2. Do not apply concentrated load or eccentric load to the blade. In particular, it is prohibited from colliding with the blade while traveling. Never do this action, since it can damage to the blade and track.
3. When jacking up the machine with blades, check whether the bearing ground is strong enough. When jacking up the machine, the ground can easily collapse, since the ground pressure is locally large. Therefore, ensure that lower surface of the blade is evenly grounded to prevent a concentrated load or an eccentric load on the blade.
4. When excavating by setting the blade forward (front side) or when folding the front during transport, be careful to prevent the blade from hitting by the bucket and boom cylinder.

Track Extension Control Lever

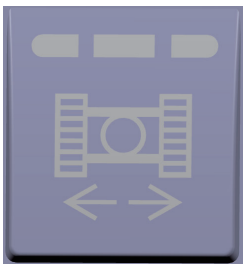
1. Place the machine as shown in the figure on the right before operating the track extension function.



DS1901438

Figure 24

2. Activate the track extension function by pressing the Track Extension Selector button.

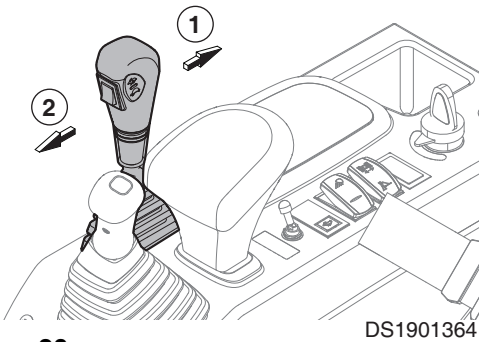


DS2300350

Figure 25

3. Expand or retract the track using the lever on the right side of the driver's seat.

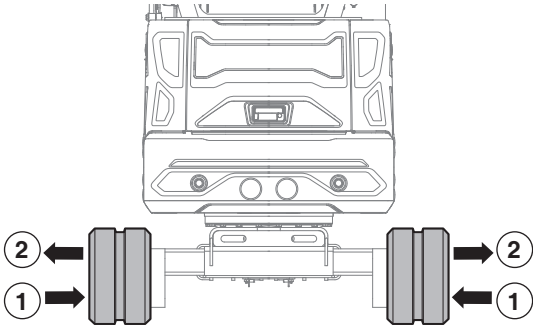
   NOTE: *When expanding or retracting the track, the track on the left side of the driver's seat is operated first.*
   When the operation of the left track is finished, the right track starts.



DS1901364

Figure 26

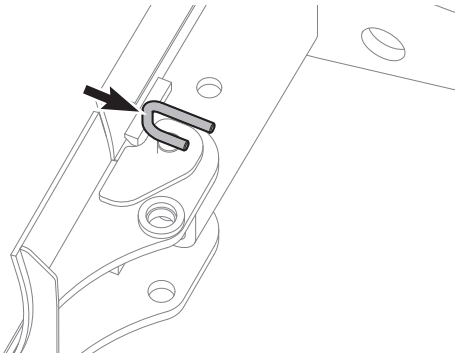
- Track retraction ((1) direction)
- Track extension ((2) direction)



DS1901365

Figure 27

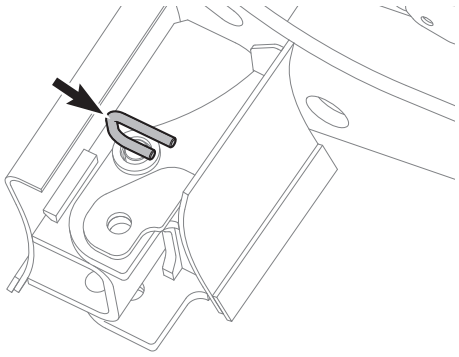
4. When the track width is increased or reduced, the width of the dozer can be changed accordingly. The blades on either side of the dozer can be extended and retracted by removing the pins.
   - Expansion



DS1901366

Figure 28

   - Retraction



DS1901367

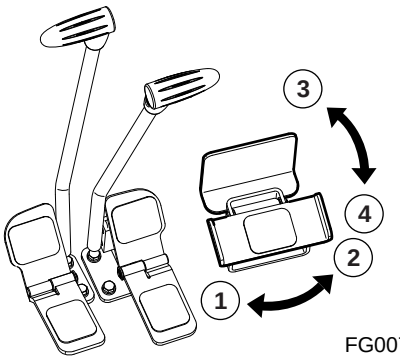
Figure 29

Boom Swing Pedal

Use the boom swing function using the boom swing pedal located on the right side of the driver's seat.

1. How to operate the boom swing pedal

   A. Unlock the pedal from ④ → ③ to operate the boom swing pedal.

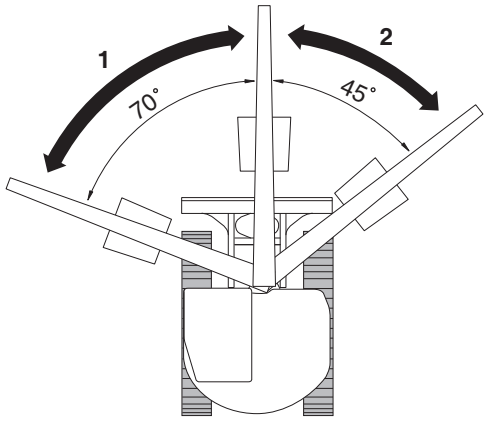


FG007602

Figure 30

   B. Step on the boom swing pedal in the ② direction to move the boom to the right, or in the ① direction to move the boom to the left.

   C. When not operating the boom swing pedal, lock the pedal from ③ → ④.



DS1901551

Figure 31

Charging System

Slow Charging

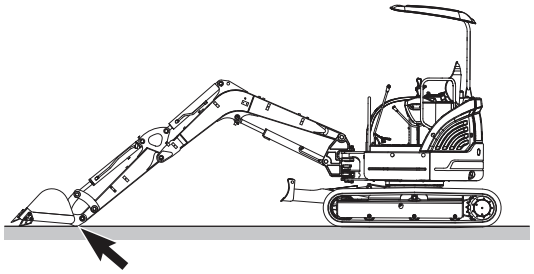
1. Retract the bucket cylinder and arm cylinder on a solid and flat ground, and lower the boom to put the bucket on the ground and then, turn off the engine.
2. Move safety lever to the lower "LOCK" position.
3. Prepare a slow charger. Slow charging conditions may vary by region.

   NOTE: *Make sure to check the voltage and current used in each country and region before slow charging.*

4. Properly connect the power cord of the slow charger provided with the machine to the outlet.

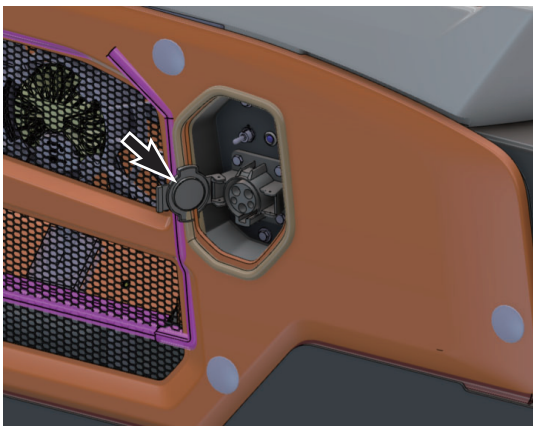
   NOTE: *Be familiar with the slow charger manual before using it.*

5. The slow charging plug is located on the right side of the machine. Open the plug cover.



DS1702818

Figure 32



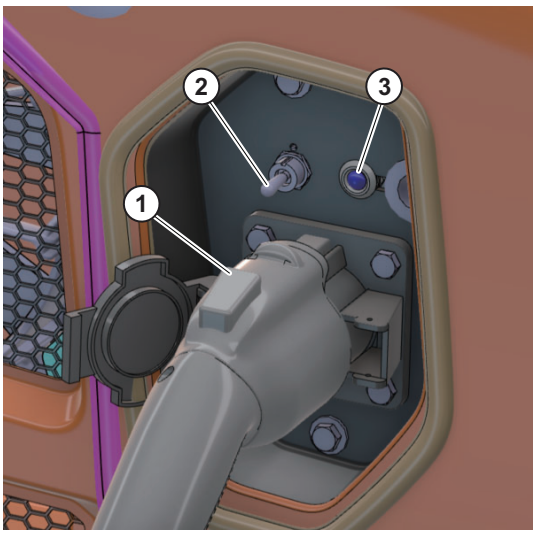
DS2300425

Figure 33

6. Hold the handle of the slow charging connector (1), connect it to the slow charging plug, and wait for 3 seconds.

   NOTE: *Strongly push the slow charging connector to connect it properly.*

7. Set the toggle switch (2) to the "ON" position.
   The slow charging lamp (3) is turned on in green after flashing, and slow charging starts.



DS2300426

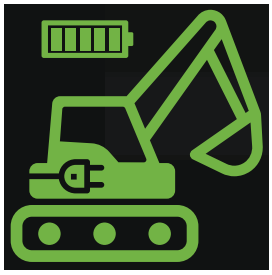
Figure 34

WARNING

AVOID DEATH OR SERIOUS INJURY

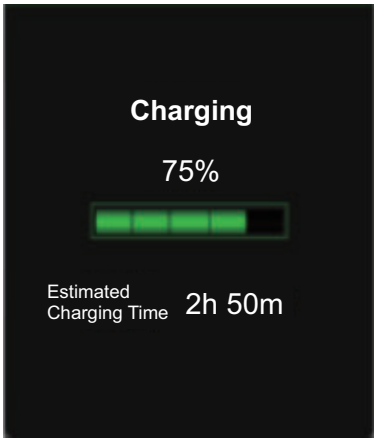
Do not disconnect the slow charge connector while the toggle switch is on. It may cause damage to the slow charging system.

8. Slow charging is displayed on the gauge panel as shown in the figure.



DS2300427

Figure 35



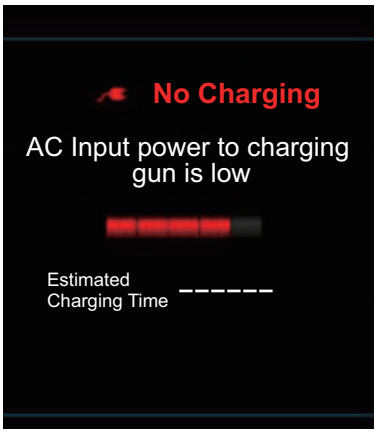
DS2300428

Figure 36

9. When charging is not in progress, it is displayed on the display monitor as shown in the figure.
Check the above instructions and try again. If the problem still cannot be not solved, contact your dealer.

Warning

- Low AC input power of the charging gun.
  Check the charging gun.
- High AC input power of the charging gun.
  Check the charging gun.
- Inaccurate charging signal. Check the charging gun.



DS2300429

Figure 37

10. When slow charging is complete, check the residual quantity of the power pack battery.

NOTE: *If slow charging is not completed normally, check all of the above instructions, and contact your dealer for inquiries.*

11. When slow charging is complete, the charge lamp (3) turns off. Set the toggle switch (2) to the "OFF" position.
12. Press and hold the handle button of the slow charging connector (1) to disconnect it.
13. Disconnect the power cord from the outlet.

DS2300378

Figure 38

Fast Charging

If possible, charge the battery using the slow charging method.

If necessary, use the fast charging method.

DS2300394

Figure 39

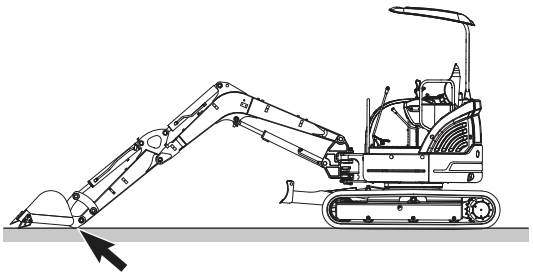
1. Retract the bucket cylinder and arm cylinder on a solid and flat ground, and lower the boom to put the bucket on the ground and then, turn off the engine.
2. Move safety lever to the lower "LOCK" position.
3. Prepare a fast charger. Fast charging conditions may vary by region.

   NOTE: *Make sure to check the voltage and current used in each country and region before fast charging.*

4. Properly connect the power cord of the fast charger.

   NOTE: *Be familiar with the slow charger manual before using it.*

5. The fast charging plug is located on the left side of the machine.
6. First, open the lower left cover of the machine.



DS1702818

Figure 40

DS2300395

Figure 41

7. Hold the handle of the fast charge connector (1) and connect it to the fast charge plug.

   NOTE: *Strongly push the fast charging connector to connect it properly.*

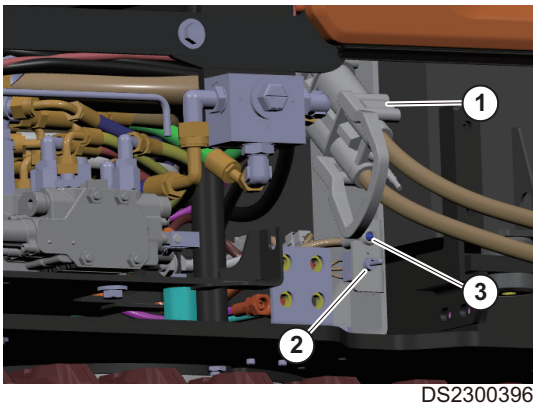
8. Set the toggle switch (2) to the "ON" position.
   The fast charging lamp (3) is turned on in green after flashing, and fast charging starts.

WARNING

AVOID DEATH OR SERIOUS INJURY

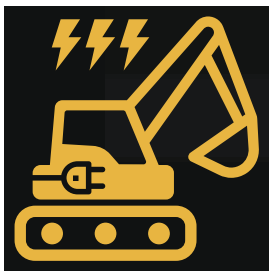
Do not disconnect the fast charge connector while the toggle switch is on. It may cause damage to the fast charging system.

9. Fast charging is displayed on the gauge panel as shown in the figure.



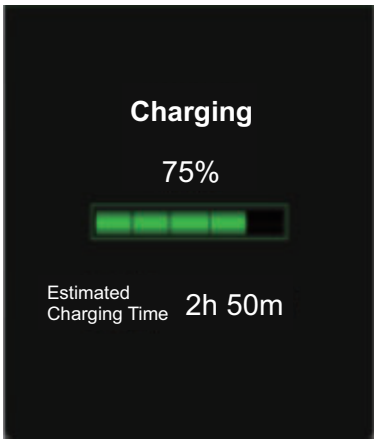
DS2300396

Figure 42



DS2300430

Figure 43



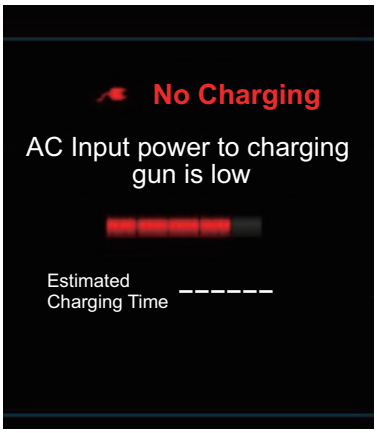
DS2300428

Figure 44

10. When charging is not in progress, it is displayed on the display monitor as shown in the figure.
Check the above instructions and try again. If the problem still cannot be not solved, contact your dealer.

Warning

- Low AC input power of the charging gun.
  Check the charging gun.
- High AC input power of the charging gun.
  Check the charging gun.
- Inaccurate charging signal. Check the charging gun.



DS2300429

Figure 45

11. When fast charging is complete, check the residual quantity of the power pack battery.

    NOTE: *If fast charging is not completed normally, check all of the above instructions, and contact your dealer for inquiries.*

12. When fast charging is complete, the charge lamp (3) turns off. Set the toggle switch (2) to the "OFF" position.
13. Pull the handle of the fast charge connector (1) to disconnect it.
14. Disconnect the power cord from the outlet.

DS2300378

Figure 46

Operating Precautions

WARNING

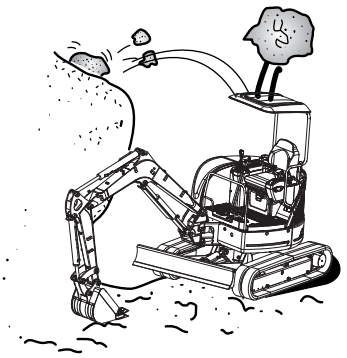
AVOID DEATH OR SERIOUS INJURY

Do not rest your feet on the travel pedals during normal machine operation. Unexpected machine travel can occur.

If levers or pedals are operated when the auto idle is being actuated, the engine rpm will suddenly increase so be careful during operation.

It is possible that boom, arm, or bucket may come into contact with the upper or lower structure of the machine. There are digging conditions which could allow this to happen.

1. Before starting work, inspect terrain and soil conditions. If necessity, check safety well by leveling ground and draining area begin operations.
2. Install a separate head guard provided by the manufacturer for additional operator protection when working if there is a possibility of falling rocks or other objects.
   Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for the separate head guard.



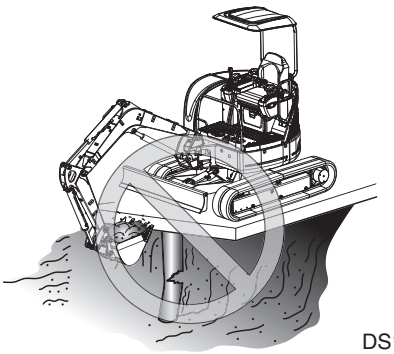
FG009461

Figure 47

3. When working on a cliff, carefully investigate the topography and geological features. If there is a risk of collapse, firmly reinforce the ground.

   Check strength of supported structures on the construction site before working on them.

   If the strength is no sufficient, reinforce it.
4. Be careful that the boom, arm, and bucket may contact the upper and lower parts of the machine during excavation work.



DS1702795

Figure 48

5. When working close to the excavated edge or drop-off, make sure that the machine is sitting on solid ground. When working in such a place, keep the travel motor (1, Figure 49) to the rear.

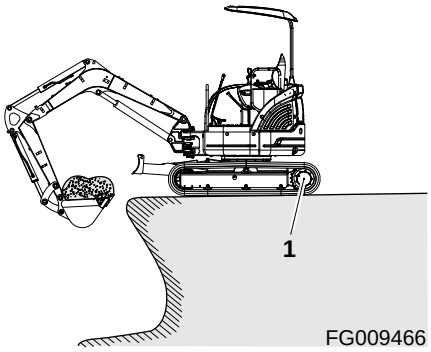


Figure 49

6. Do not allow bottom side of the boom to interfere with or touch the ground or track when digging a deep hole.

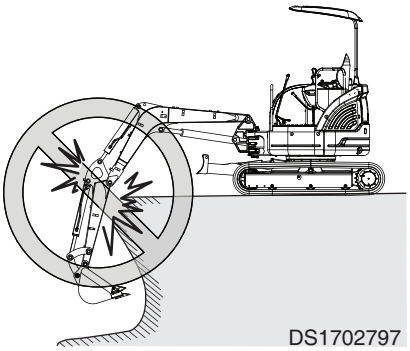


Figure 50

7. Do not excavate underneath the machine. The ground under the machine can collapse and cause the machine to fall and roll-over.

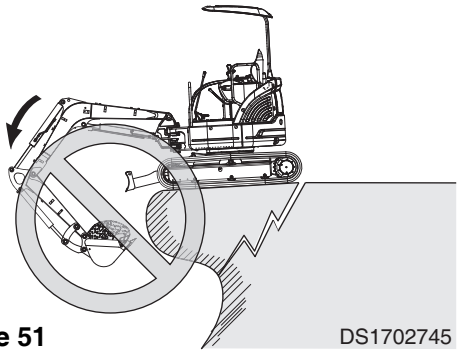


Figure 51

8. Make sure there is adequate clearance from overhead electrical supply lines. Check for underground utility lines before excavating. Call the person in charge before digging.

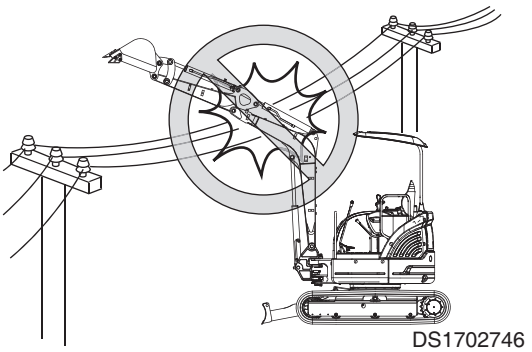


Figure 52

9. If the excavation is in an underground location or in a building, make sure there is adequate overhead clearance from the ceiling or protrusions.
   Such places should be ventilated adequately.

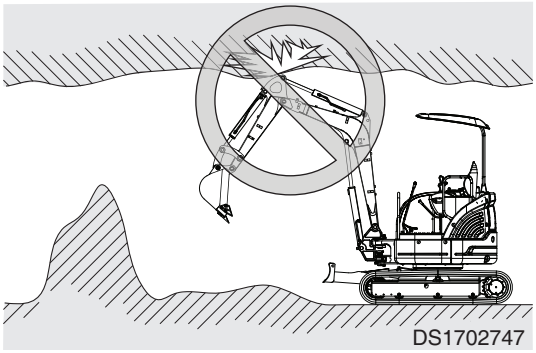


Figure 53

10. If hydraulic cylinders are operated to the end of strokes during work, a strong force is applied to the stopper inside the cylinder, reducing the service life of the machine. Operate the machine with a margin at the end of the stroke.

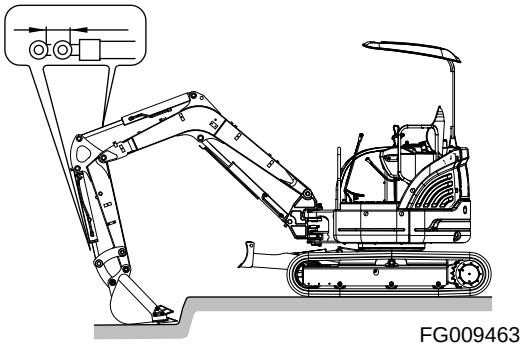


Figure 54

11. Do not dig with the excavator tracks raised. This can result in structural and mechanical failures. See Figure 55 and Figure 56.

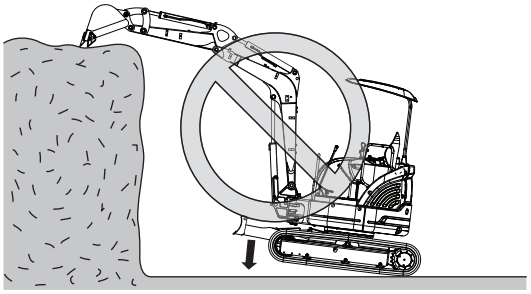


Figure 55

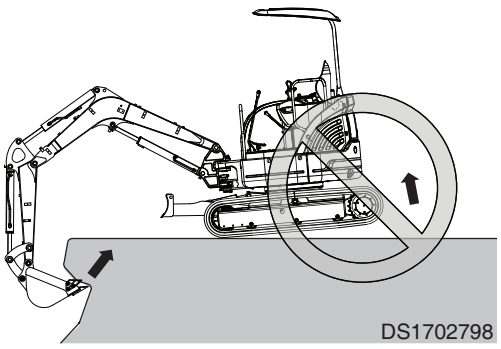
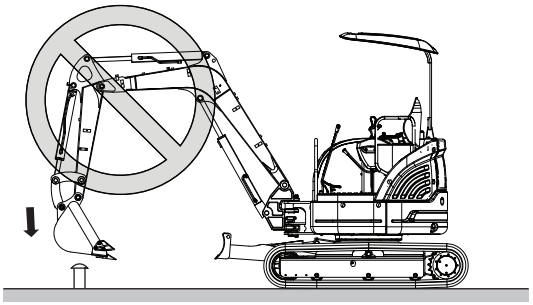


Figure 56

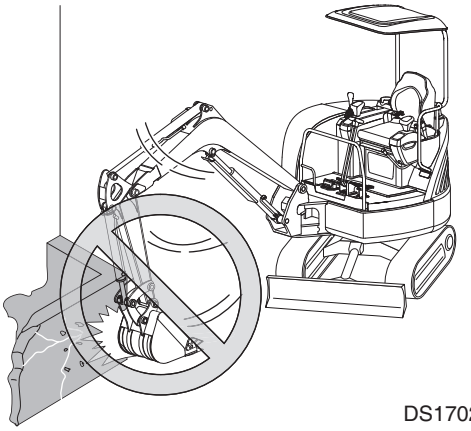
12. Do not excavate using the falling force of the bucket or use the bucket as a hammer, since excessive force is applied to the machine body and the machine is damaged and become dangerous.



DS1702800

Figure 57

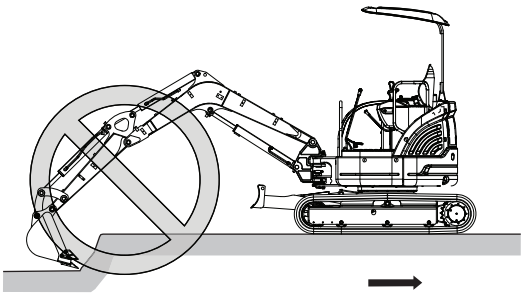
13. Do not move dirt or objects aside by swinging the excavator into them. This can result in structural and mechanical failures.



DS1702802

Figure 58

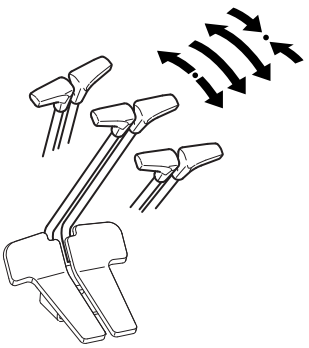
14. Do not use machine travel when the bucket is in the ground to provide additional breakout force, since an excessive force is applied to the machine.



DS1702801

Figure 59

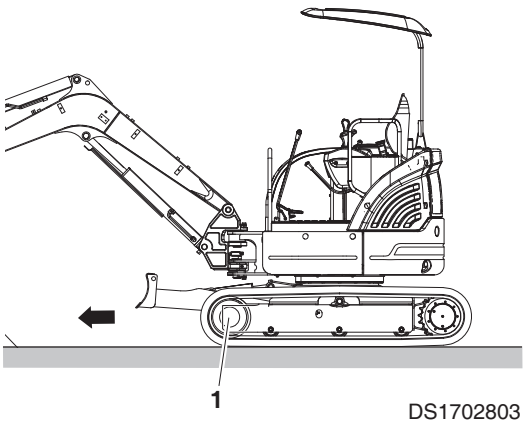
15. Do not operate levers suddenly when traveling in high range.
    - Avoid sudden starts by operating the travel lever rapidly.
    - Do not use reverse lever operation that moves the machine backward while moving forward, or vice versa.
    - Avoid sudden stops (removing your hand from the travel lever) while driving at high speed.
    - Return levers to neutral by hand.



FG018422

Figure 60

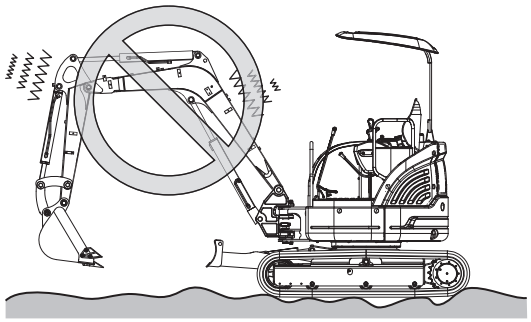
16. To protect undercarriage of the machine when traveling on rough ground or on rocks, set the idler (1, Figure 61) facing in travel direction. The idler and track spring are spring cushioned to absorb direct impacts.



DS1702803

Figure 61

17. Do not travel at high-speed over rough ground or rocks. This can result in structural and mechanical failures and can reduce the service life of the machine.
18. Do not travel continuously for a long time. The lubricating oil temperatures inside the track rollers will rise, and this will cause damage to the oil seal or leakage of oil. If traveling continuously for a long time, it is recommended to stop the machine for 10 minutes every 1 hour to allow the lubricating oil inside the track rollers to cool down.



DS1702804

Figure 62

19. If optional long fronts (arm extensions) or attachments or heavy-duty front end attachments are used, the machine balance will be altered. Follow these additional operating precautions. See Figure 63.

WARNING

AVOID DEATH OR SERIOUS INJURY

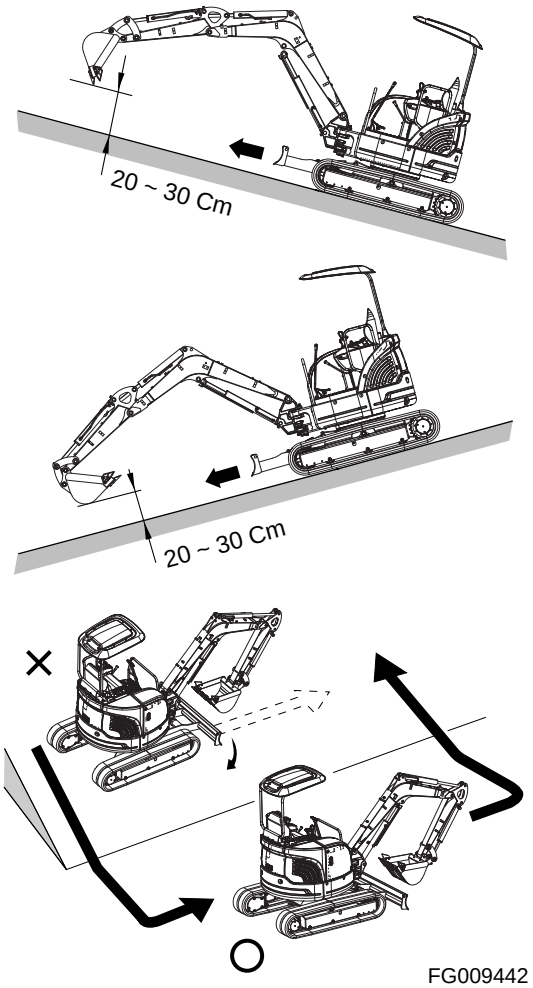
Do not travel downhill with front end attachments raised.

Do not travel across slopes. Travel straight up or down slopes.

Use extreme caution when swinging the upper frame when positioned on a slope. Keep bystanders away from swing area.

Allow extra swing stopping room. The additional momentum generated by the longer or heavier front end equipment will increase the amount of time needed to stop the swing motion.

Make sure that all optional equipment has been authorized and installed properly.



FG009442

Figure 63

NOTICE

If the machine is positioned on the slope at an angle of over 15° when moving out of water, the rear part of the upper structure will be immersed in water, resulting in engine damage.
Pay special attention.

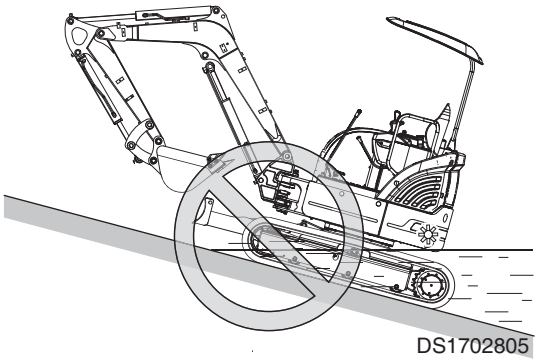


Figure 64

- The water level must not reach higher than the upper track guide bracket.
- If swing bearing is immersed in water, immediately grease it until all the old grease is purged from bearing. If water gets into swing gear housing, drain water immediately by removing lower inspection cover. Apply new grease.
- After working in water, make sure to apply grease to bucket pins.

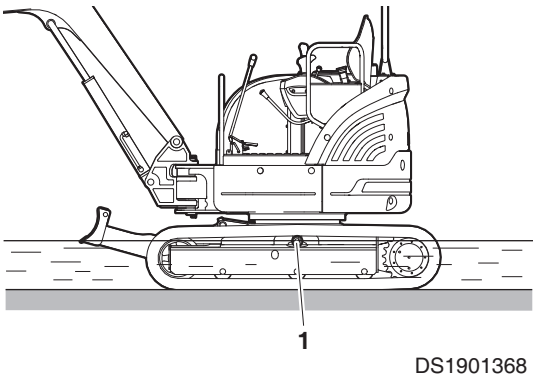


Figure 65

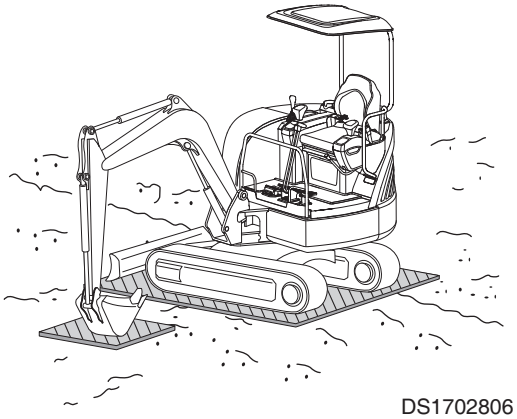
Escaping From Mud

Be very careful to avoid getting stuck in mud.

Track On One Side Stuck

NOTE: *When using the boom or arm to raise the machine, always have the bottom of the bucket in contact with the ground. The angle between the boom and arm must be 90° - 110°. The same applies when using the bucket installed in the reverse direction.*

When only one side is stuck in mud, use the bucket to raise the track and then lay boards or logs and drive the machine out.

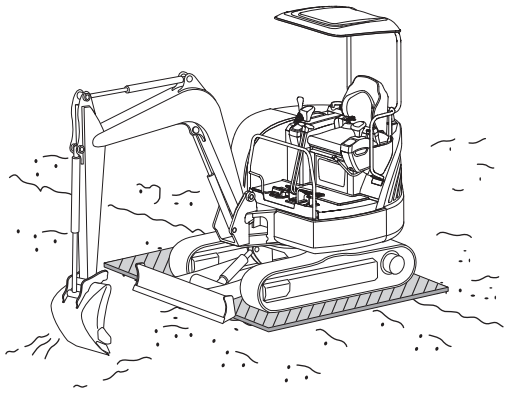


DS1702806

Figure 66

Tracks On Both Sides Stuck

When the tracks on both sides are stuck in mud and slipping, making it impossible for the machine to move, lay boards or logs as explained above and dig the bucket into the ground in front. Then pull in the arm as in normal digging operations and put the travel levers in the FORWARD position to pull the machine out.



DS1702807

Figure 67

Parking Excavator

WARNING

AVOID DEATH OR SERIOUS INJURY

- **Avoid making sudden stops and stop slowly as much as possible.**
- **Park machine on firm and level ground. Avoid parking on slopes. If excavator must be parked on a slope, block the track shoe to prevent movement and place bucket teeth in ground.**
- **If you move the operation lever unintentionally, the machine will unexpectedly activate and cause a serious accident.**
- **Before leaving operator's seat, move safety lever to "LOCK" position.**

1. Choose a firm and level ground and place the bucket on the ground with the back of the bucket level.
2. Set the motor speed control dial to the lowest position and set it to the lowest rotation without load.
3. If you move the operation lever unintentionally, it can cause accidental movement of the work group on attachment. Before leaving operator's seat, move safety lever to "LOCK" position. Stop engine.

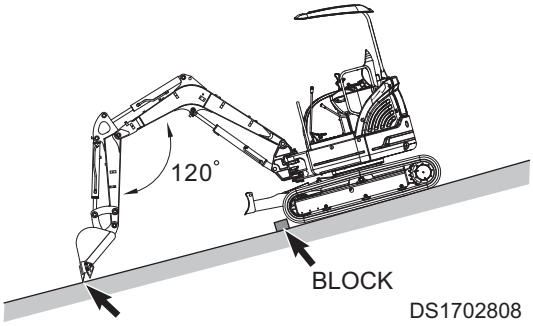


Figure 68

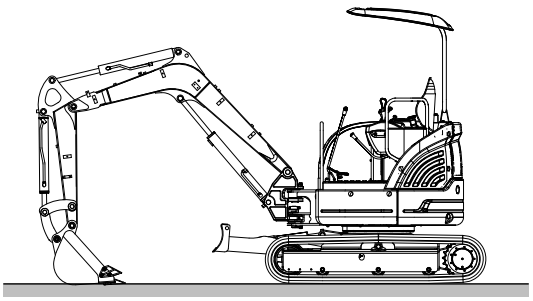


Figure 69

Towing Procedure

WARNING

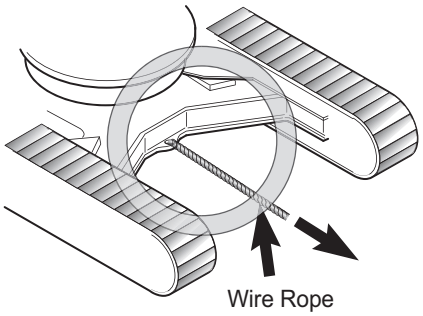
AVOID DEATH OR SERIOUS INJURY

- **Never use damaged cables, ropes, chains, etc., as there is a risk of personal injury if they are damaged.**
- **Always wear gloves when handling a chain or wire rope (cable).**
- **When towing the excavator using this machine, use a wire rope or chain capable of sufficiently handling the load of this machine.**
- **Attach chain or wire rope (cable) to track frame in the both towing and towed machine as shown in the figure.**
- **Insert protective material such as thick cloths between track frame and wire rope (cable) to prevent the wire rope from being damaged.**

WARNING

AVOID DEATH OR SERIOUS INJURY

Only use shackle hook on track frame to haul objects that weigh less than 5 metric tons, and never use shackle hook to haul objects over 5 metric tons.



DS1901369

Figure 70

Attachment

Bucket - Replace and Reverse

NOTICE

This method is not recommended because operation can be disturbed during reverse assembly.

WARNING

AVOID DEATH OR SERIOUS INJURY

If the pin is hammered into place, metal fragments may fly out and cause serious personal injury.

Wear eye protection, hard hat, gloves, and other protective equipment when conducting this work.

Place the bucket in a stable location after removing it.

If you hit the pin with a hammer, the pin may come out and injure others around you. Keep bystanders clear of the area before starting the work.

Do not stand behind the bucket when removing pins. Do not put your feet under the buckets when standing around the work.

Be careful not to pinch your fingers when removing or inserting the pin.

Do not insert your fingers into the pinhole when aligning the pin into the hole.

Stop the machine on a firm and flat surface and perform the work. When performing work with more than one person, appoint a lead and follow that person's instructions and signals.

Replace

1. Place the bucket in contact with a flat surface.

NOTICE

When removing the pins, place the bucket so it is resting slightly on the ground. If down pressure is applied to the bucket, the resistance will be increased and it will be difficult to remove pins. After removing the pins, make sure they are clean and do not allow mud, sand, or other debris to get on them. Dust seals are fitted at both ends of the bushings. Be careful not to damage them.

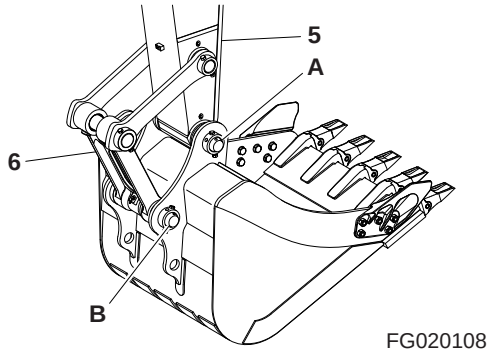


Figure 71

2. Disassemble the double nut from the bolt assembled to the arm pin (A, Figure 71) and link pins (B, Figure 71), remove the bolt, pull out the arm pin (A) and link pin (B), and separate the bucket.
3. Align the hole in the bucket to be replaced (1, Figure 72) and arm (5, Figure 71), and align the link (6, Figure 71) and the hole in the bucket (2, Figure 72). Then assemble the grease-coated pins (A, Figure 71) and (B, Figure 71) into the hole (1, Figure 72) and hole (2, Figure 72) respectively.

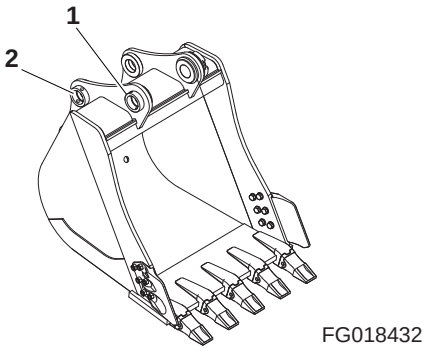


Figure 72

4. When installing the bucket, move the O-ring (3, Figure 73) from the arm pin (A, Figure 71) to the left and right ends. Insert the pin, and move the O-ring (3, Figure 73) back to its original position.
5. Install the three bolts for each pins.
6. Lubricate with grease thoroughly until grease comes out from the end face.

NOTICE

When replacing the bucket, replace the dust seal if it has been damaged. If a damaged seal is used without being replaced, sand and dirt may enter the pin portion and cause abnormal wear of the pin.

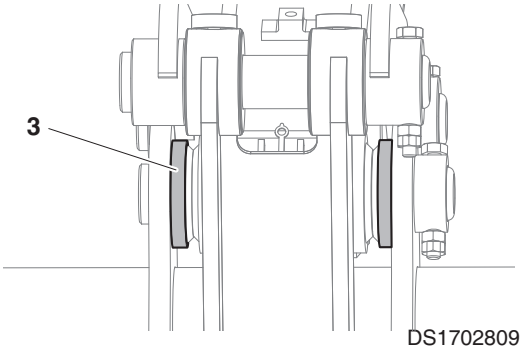


Figure 73

Reverse (If Applicable)

1. Place the bucket on a flat surface.

NOTICE

When removing the pins, place the bucket so it is resting slightly on the ground. If down pressure is applied to the bucket, the resistance will be increased and it will be difficult to remove pins. After removing the pins, make sure they are clean and do not allow mud, sand, or other debris to get on them. Dust seals are fitted at both ends of the bushings. Be careful not to damage them.

2. Disassemble the double nut from the bolt assembled to the arm pin (A, Figure 74) and link pins (B, Figure 74), remove the bolt, pull out the arm pin (A) and link pin (B), and separate the bucket.
3. Assemble in reverse after removing the bucket.
4. Align the arm (5, Figure 74) and the hole of the replacement bucket, and align the link (6, Figure 74) and the grease-coated pin (A, Figure 74) and (B, Figure 74) into each hole.

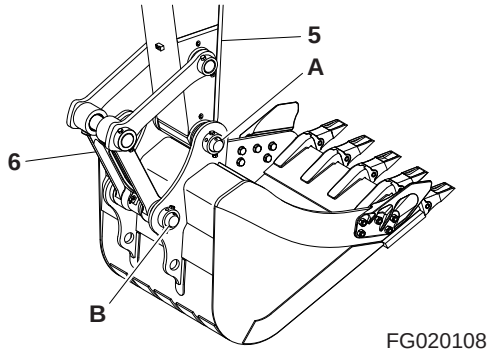


Figure 74

NOTICE

When reversing, do not install an O-ring. Keep the O-ring in a safe place until using it next.

5. Install the three bolts for each pins.
6. Lubricate with grease thoroughly until grease comes out from the end face.

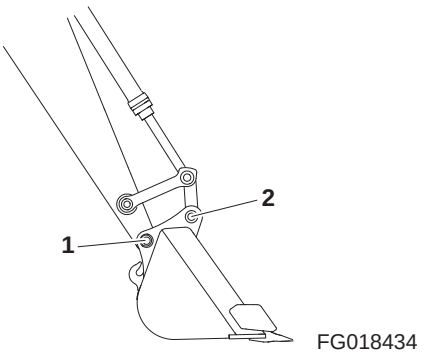


Figure 75

NOTICE

When replacing the bucket, replace the dust seal if it has been damaged. If a damaged seal is used without being replaced, sand and dirt may enter the pin portion and cause abnormal wear of the pin.

Quick Coupler Operation

NOTE: *The quick coupler installed on your machine may be different than the one shown in this manual. Always read and follow the manufacturer's Quick Coupler Owner's Manual for more instructions.*

To Engage Attachment

WARNING

AVOID DEATH OR SERIOUS INJURY

As the following safety instructions are for your safety, the safety of bystanders, and to prevent property damage, read the instructions before using the machine and make sure you are familiar with all safety messages.

Hydraulic quick couplers must be installed, operated, inspected, serviced, maintained and repaired by properly trained and experienced people.

Check whether attachment and bucket are empty. If attachment connected to the quick coupler is in an unstable state, it may lead to a serious accident.

A buzzer will sound when the coupler is disconnected. Scratch the ground slightly with the attachment to see if it is properly connected.

- **Do not operate the machine if there are other workers or people besides the operator in the work area. Also, never allow people to stand or walk under the bucket or attachment while operating under any circumstances.**
- **Do not start or perform any work unless you are properly trained according to the instructions of this manual.**
- **Make sure that the equipment to be changed is safe and works properly every time after you change work tools or attachments.**
- **Perform the recommended daily inspection and maintenance for proper operation.**
- **Attachments used with the machine should not exceed the rated capacity and load limits of the excavator.**
- **Check for changes to load radius, maximum operating capacity and read and follow load rating charts before lifting loads or objects.**

WARNING

AVOID DEATH OR SERIOUS INJURY

Never use attachments or buckets which are not approved by HD HYUNDAI CONSTRUCTION EQUIPMENT. Buckets and attachments for safe loads of specified densities are approved for each model. Unapproved attachments can cause death or serious injury.

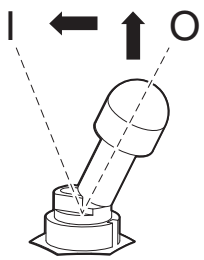
1. Park the excavator and attachment on firm and level ground.
2. Set the quick coupler switch to the "I" (Release) position.

   NOTE: *Refer to the "Operating Controls" section of this manual for additional information.*

   If the quick coupler switch is set to "I" (**Release**), the quick coupler symbol is turned on the selected function, and a warning buzzer will sound in the cab.

   NOTE: *To release the quick coupler, fully extend the bucket cylinder (bucket crowd), and keep the hydraulic relief condition for 5 seconds using the switch that is in the "I" (**Release**) position.*

   NOTE: *Each time the quick coupler switch is set to "I" (**Release**) position, the quick coupler disconnect system activates a signal, quick coupler symbols and warning messages appear in the multifunction display screen and a warning buzzer will sound. Set the switch to "O" (**Lock**) position to turn off the quick coupler symbol and stop the buzzer stops.*



DS1903332

Figure 76

3. Retract the bucket cylinder. Align the quick coupler with attachment mounting pins or interface.

WARNING

AVOID DEATH OR SERIOUS INJURY

Keep attachment close to ground during engaging or releasing attachment. Attachment can fall off without warning if not "FULLY ENGAGED AND LOCKED" causing death or serious injury.

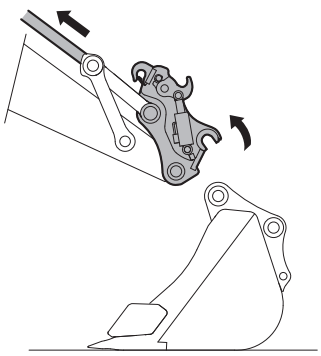
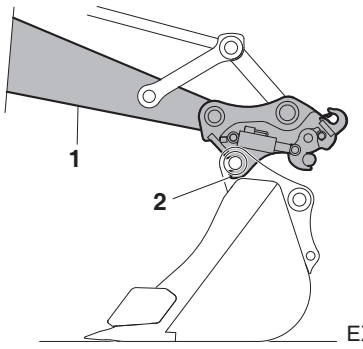

EX1300731

Figure 77

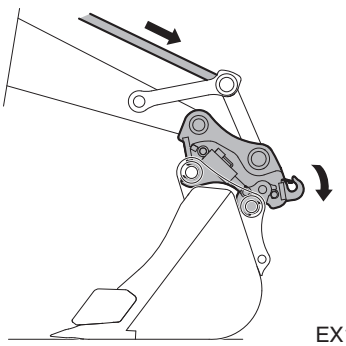
4. Move the arm (1, Figure 78) and raise it until hook (2) engages the upper pin or interface of attachment.



EX1300732

Figure 78

5. Extend the bucket cylinder (bucket crowd) and contact the quick coupler with the lower attachment pin or interface.
6. Set the quick coupler switch to the "O"(Lock) position.

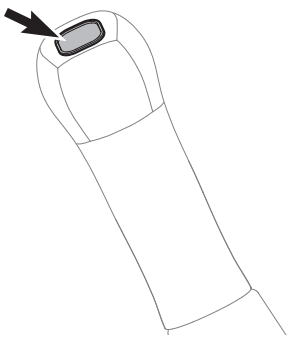


EX1400299

Figure 79

7. Press the button on the right joystick to contact with the quick coupler and attachment completely, and fasten it.
8. Fully extend the bucket cylinder (bucket crowd) to fully contact and lock the quick coupler to the attachment.

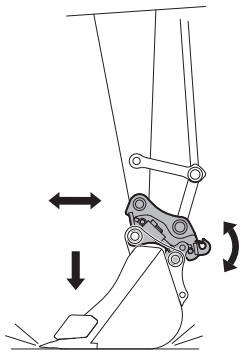
   NOTE: *To keep the quick coupler in a locked state, fully extend the bucket cylinder (bucket crowd), and keep the hydraulic relief condition for 10 seconds using the quick coupler switch that is in the "O"(**Lock**) position.*



DS1901440

Figure 80

9. Shake the attachment vigorously and lower the boom to the ground and apply down pressure to the quick coupler and attachment to check that attachment is fully engaged and locked to the quick coupler. (Figure 81)



DS1901442

Figure 81

10. Visually check that quick coupler is fully engaged and locked before operating the machine and attachment.

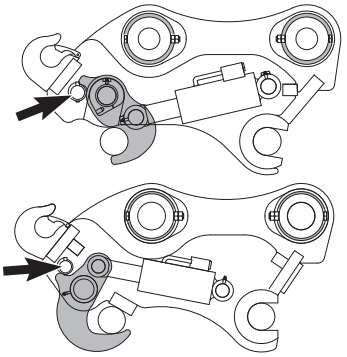


Figure 82

WARNING

AVOID DEATH OR SERIOUS INJURY

Failure to visually check that quick coupler is "FULLY ENGAGED AND LOCKED" before operating can allow the attachment to fall off causing death or serious injury.

WARNING

AVOID DEATH OR SERIOUS INJURY

The attachment swing radius is increased when the quick coupler is installed.

Operate quick coupler and attachment through its full range of motion to check for interference between attachment and machine that could damage the cabin, boom, coupler or attachment.

WARNING

AVOID DEATH OR SERIOUS INJURY

Never use quick coupler or attachment to transport or lift persons. Always use quick coupler and attachment according to the instructions provided by the manufacturer.

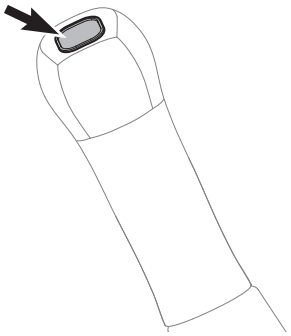
To Release Attachment

1. Park the excavator and attachment on firm and level ground.
2. Set the quick coupler switch to the "I"(**Release**) position.

   If the quick coupler switch is set to "I" (**Release**), quick coupler symbols and warning messages appear in the multifunction display screen and a warning buzzer will sound.

   NOTE: *To release the quick coupler, fully extend the bucket cylinder (bucket crowd), and keep the hydraulic relief condition for 5 seconds using the switch that is in the "I" (**Release**) position.*

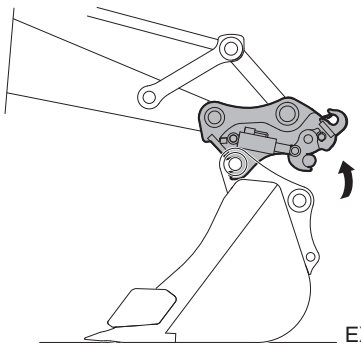
   NOTE: *Each time the quick coupler switch is set to "I" (**Release**) position, the quick coupler disconnect system activates a signal, quick coupler symbols and warning messages appear in the multifunction display screen and a warning buzzer will sound. Set the switch to "O" (**Lock**) position to turn off the quick coupler symbol and stop the buzzer stops.*
3. Remove the quick coupler by pressing the right joystick button.



DS1901440

Figure 83

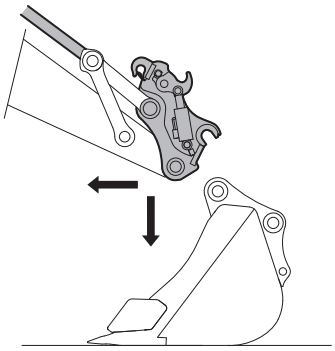
4. Release the bucket cylinder and move the quick coupler towards the machine. (Figure 84)



EX1300737

Figure 84

5. Set the quick coupler switch to the "O"(**Lock**) position. Lower the arm from the attachment and move it toward the machine.



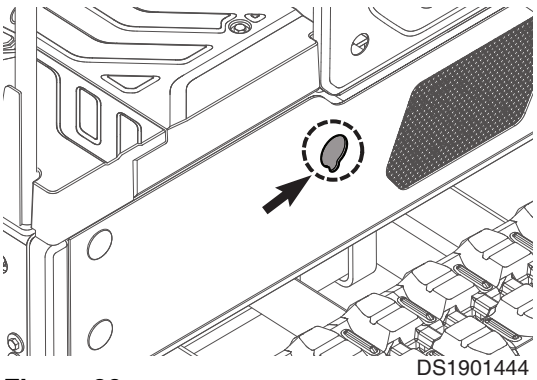
DS1901443

Figure 85

Breaker Operation

How to operate the breaker

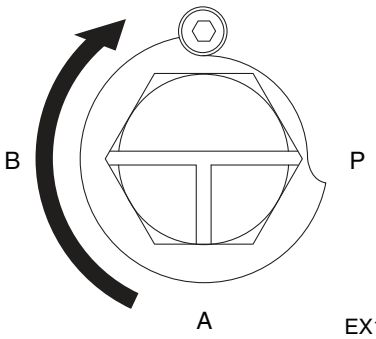
Set the direction of the selector valve to use the breaker.
The selector valve is on the left side of the machine.



DS1901444

Figure 86

1. Turn the selector valve clockwise all the way. (Figure 87)

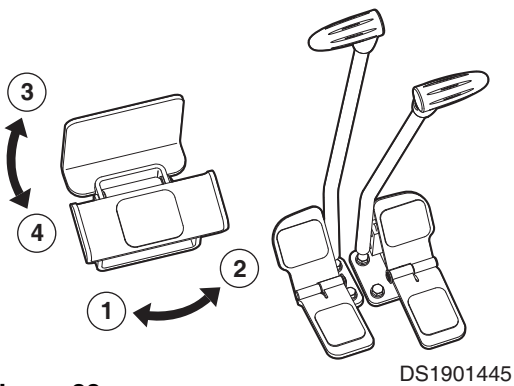


EX1300280

Figure 87

2. To operate the breaker, release the left pedal lock from ④ → ③ to activate the breaker.
3. Step on the breaker pedal in the ① direction to activate the breaker.

   NOTE: *Stepping on ② does not activate the breaker.*
4. If you take off the left pedal, the breaker will not operate.



DS1901445

Figure 88

Shear Operation

How to operate the shear

Set the direction of the selector valve to use the shear. The selector valve is on the left side of the machine.

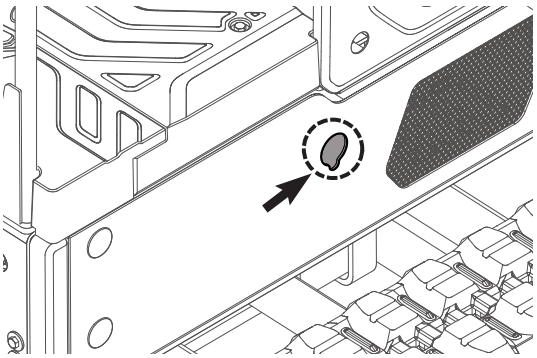


Figure 89

1. Turn the selector valve counterclockwise all the way. (Figure 90)

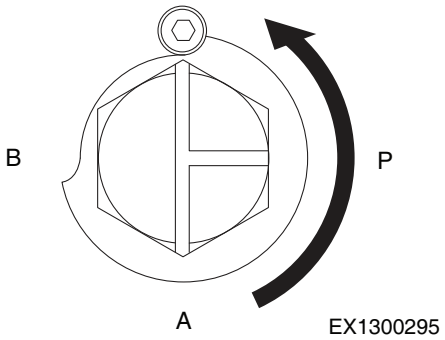


Figure 90

2. Release the left pedal lock from ④ → ③ to activate the shear.
3. Step on the breaker pedal in the ① or ② direction to activate the shear.
4. If you take off the left pedal, the shear will not operate.

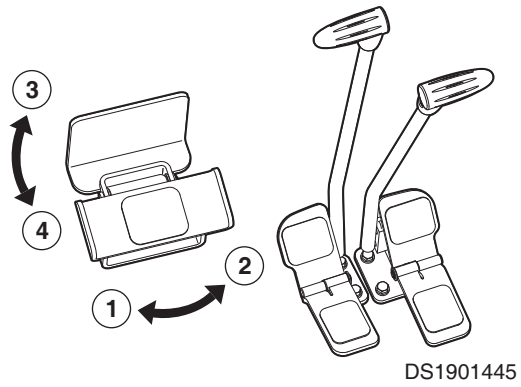


Figure 91

Lifting Objects

When lifting heavy objects, safety working devices and related options are required.

- Lifting eye for load hooking.
- Hose burst protection on both boom and arm.

To prevent injury, do not exceed the rated load capacity of the machine.

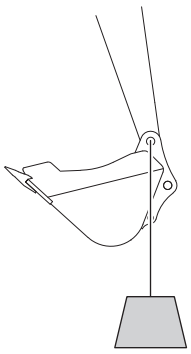
If the machine is not on level ground, load capacities will vary.

Use the lifting eye on the bucket that is provided to lift objects.

When the "lifting eye" is used at the bucket pin location on the arm centerline, the sagging of the lifting object can be prevented, and work can be done in the most stable way.

For best stability, carry a load as close to the ground and machine as possible.

Lift capacity decreases as the distance from the machine swing centerline is increased.



EX1300739

Figure 92

Lifting Unknown Weight

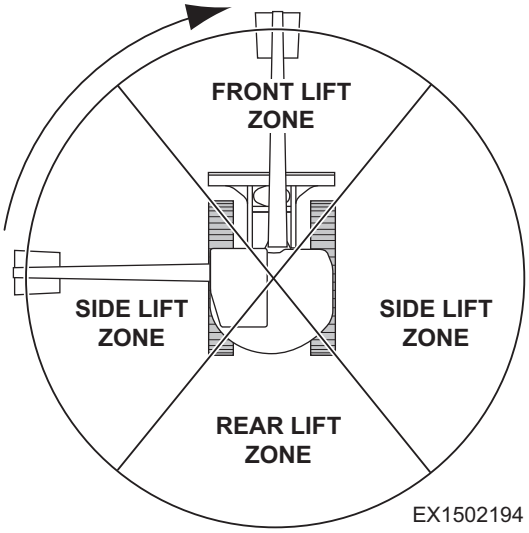
When the weight of the load is unknown, the person responsible for the job shall determine that weight of the load does not exceed the machine RATED LIFTING CAPACITY at the radius at which it is to be lifted.

To prevent overturning, it is important to come to understand how to lift.

For example, try to lift slowly at the 90˚ position of the machine and see if any gap is created from the ground.

If a gap occurs, turn to the front of the vehicle in that state.

Do not increase the radius of swing when doing so.



EX1502194

Figure 93

WARNING

AVOID DEATH OR SERIOUS INJURY

If a load is picked-up from the front zone and swung into the side zone, a tip over could result, resulting in a fatal injury.

Lifting Known Weight

The load rating chart is the determining factor when lifting known weights.

To prevent the risk of overturning, the operator should perform work correctly based on a separate understanding on that factor.

Whenever possible, lift and swing loads between the front idler area.

Pick and Carry

The machine can pick and carry loads without assistance.

It is recommended that when traveling with a suspended load, determine and observe safety precautions for each division and continuous operation.

Align the boom with the forward direction of machine travel.

Maintain this boom position when turning the machine.

Turn only when necessary, at the slowest speed, and at a wide turning radius.

Use the shortest lifting radius distance possible.

Keep the load as close to the ground as possible.

Provide tag lines to prevent load from swinging back and forth.

The pendulum motion causes the lifting radius to increase, which results in an excess lifting load and creates a capsizing condition.

Travel speed will depend on work site conditions.

Avoid sudden starts and stops.

Operation in Extreme Conditions

NOTE: For more information on other recommendations, refer to "Maintenance in Special Conditions" on page 4-47.

Operation In Extreme Cold

In extremely cold weather, avoid sudden travel movements. Avoid the slope since the machine could slide down the slope.

Snow accumulation could hide potential hazards and slippery surfaces.

Warming up engine for a short period may be necessary to avoid operating with sluggish or reduced working capacity. Vibration or impact caused by excessive movement of the attachment may adversely affect the structure. Reducing work cycle rate and workload may be necessary.

If machine is to be operated in extremely cold weather temperatures, certain precautions must be taken. The following paragraphs detail checks to be made to be certain machine is capable of operating at these temperatures.

1. Check the cooling system closely and repair if necessary.
2. Keep batteries fully charged to prevent freezing.
3. Keep engine in good mechanical condition for easy starting and good performance during adverse weather.
4. Use engine oil with proper specifications for expected temperatures. For more information, refer to "Lubricants" on page 4-7 in this manual or Shop Manual for details.
5. Lubricate entire machine according to "Lubrication and Service Chart" on page 4-9 in this manual or lubrication chart on machine.
    - If mud and ice collects and freezes on any of moving parts while machine is idle, apply heat to thaw frozen material before attempting to operate machine.
    - Operate hydraulic units with care until they have reached a temperature which enable them to operate normally.
    - Check all machine controls and functions to be sure they are operating correctly.
6. Clean off all mud, snow and ice to prevent freezing. Cover machine with a tarp if possible, keep ends of tarp from freezing to ground.

Operation in Extreme Heat

Continuous operation of machine in high temperatures can cause machine to overheat. Monitor engine and hydraulic system temperatures and stop machine to let it cool, when necessary.

1. Check the battery (12V) electrolyte level daily. Keep the electrolyte in the right amount to avoid damage to the battery. Use a slightly weaker electrolyte solution in hot climate. Batteries self-discharge at a higher rate if left standing for long periods at high temperatures. If machine is to stand for several days, remove batteries and store in a cool place.

NOTICE

Do not store acid type storage batteries near stacks of tires. Acid fumes can damage rubber.

2. Lubricate entire machine according to "Lubrication and Service Chart" on page 4-9 in this manual or lubrication chart on machine.
3. Do not park machine in sun for long periods of time. If possible, park machine under cover to protect it from direct rays of the sun, dirt and dust.
   A. Cover machine if no suitable shelter is available. Prevent dust and sand from entering hydraulics as much as possible.
   B. In hot, damp climates, corrosion will occur on all parts of machine and will be accelerated during rainy season.
      Protect all unfinished, exposed surfaces with a film of preservative oil. Protect cables and terminals with ignition insulation compound. Apply paint or suitable rust preventive to damaged surfaces to protect them from rust and corrosion.

Operation In Dusty and Sandy Areas

Operation of machine can cause dust in almost any area. However, when in predominantly dusty or sandy areas, additional precautions must be taken.

1. Keep cooling system fins and cooling areas clean. Blow out with compressed air, if possible, as often as necessary.

WARNING

AVOID DEATH OR SERIOUS INJURY

Wear goggles when using compressed air to prevent face or eye injury.

2. Prevent dust and sand from entering the tank.
3. Prevent dust and sand from entering engine parts and compartments as much as possible.
4. Lubricate and perform services outlined on current lubrication chart on machine and "Lubrication and Service Chart" on page 4-9. Clean all lubrication fittings before applying lubricant.
   Sand mixed with lubricant becomes very abrasive and accelerates wear on parts.
5. Protect machine from dust and sand as much as possible. Park machine under cover to keep dust and sand from damaging unit.

Operation in Rainy or Humid Conditions

Operation under rainy or humid conditions is similar to that as in extreme heat procedures previously listed.

1. Keep all exposed surfaces coated with preservative oil. Pay particular attention to damaged or unpainted surfaces. Cover all paint cracks and chip marks as soon as possible to prevent corrosive effects.

Operation in Saltwater Areas

Saltwater and saltwater spray is very corrosive. When operating in saltwater areas, or in or around snow, observe the following precautions:

1. When exposed to saltwater, dry machine thoroughly and rinse with freshwater, as soon as possible.
2. Keep all exposed surfaces coated with preservative oil. Pay attention to damaged paint surfaces.
3. Keep all painted surfaces in good repair.
4. Lubricate machine as prescribed on lubrication chart on machine or "Lubrication and Service Chart" on page 4-9in this manual. Shorten lubricating intervals for parts exposed to salt water.
5. Check operating controls to ensure proper functionality and that they return to "NEUTRAL" when released.

Operation During Electrical Storms

During electrical storms, do not enter or exit machine.

- If you are off machine, keep away from machine until storm passes.
- If you are in cabin, remain seated with machine stationary until storm passes. Do not touch controls or anything metal.

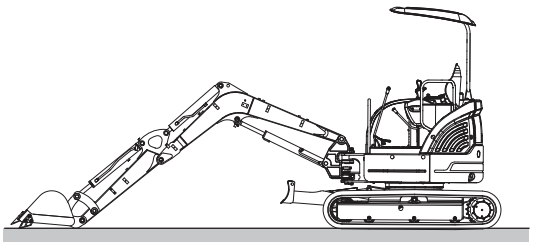
Long Term Storage

When a machine is taken out of service and stored for a time exceeding one month, steps must be taken to protect the machine. Leaving equipment outdoors exposed to the elements will shorten its life.

An enclosure will protect the machine from rapid temperature changes and lessen the amount of condensation that forms in hydraulic components, engine, fuel tank, etc. If it is not possible to put the machine in an enclosure, cover it with a tarpaulin.

Check that storage site is not subject to flooding or other natural disasters.

After the machine has been positioned for storage and the engine stopped, perform the following operations:



DS1702815

Figure 94

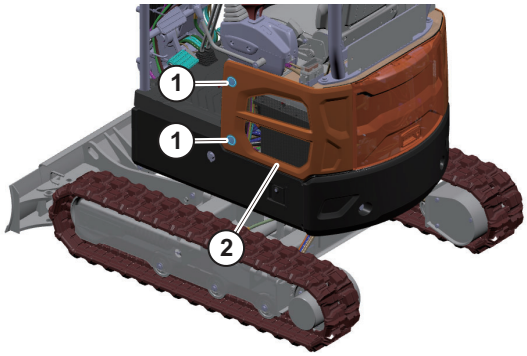
Before Storage

Keep the excavator in the position shown in Figure 94 to prevent rust of the hydraulic piston rods.

- Inspect for damaged, loose or missing parts.
- Repaint necessary areas to prevent oxidation.
- Wash and clean all parts of machine, if necessary.
- Store the machine in an indoor, stable place. If stored outside, cover with a waterproof tarp.
- Perform lubrication procedures on all grease points.
- Apply a coating of light oil to the exposed plated metal surfaces such as hydraulic cylinder rods, etc. and to all the control linkage and control cylinders. (Control valve spools, etc.)
- Seal all external openings with tape wide enough to cover the opening, regardless of size.

  NOTE: *When sealing with tape, be sure to extend tape approximately one inch beyond opening to insure a good seal.*

- Remove the mounting bolts (1) and the cover (2) on the left side of the machine.



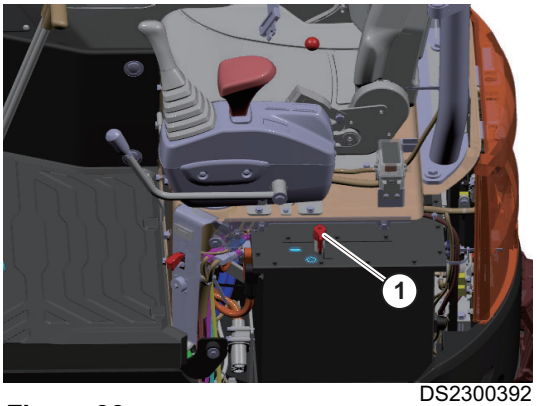
DS2300391

Figure 95

- Turn the power pack disconnect switch (1) to the "OFF" position.

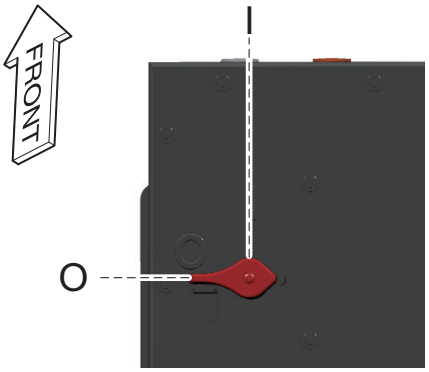
  I (ON) : The power pack battery is activated.

  O (OFF) : The power pack battery is deactivated



DS2300392

Figure 96



DS2300393

Figure 97

During Storage

Operate hydraulic functions for traveling, swing and digging two or three times for lubrication after "Hydraulic Oil Warm-up". Coat all the moving parts and surfaces of the components with a new oil film after operating. At the same time, charge the battery and rotate track to prevent track seizing.

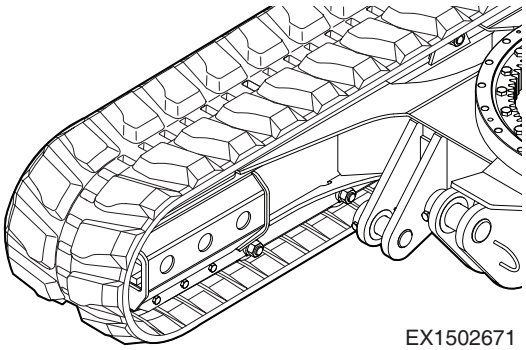
After Storage

- Before operating the work equipment, remove all grease from the hydraulic cylinder rods.
- Add grease and oil at all lubrication points.
- Connect the charged battery.
- Check condition of all hoses and connections.
- Check the levels of hydraulic oil.
  If there is water in the oil, change all the oil.
- Change all filters.
- Inspect for signs of nests. (i.e. birds, rodents, etc.)
- When starting the engine after long-term storage, follow the "Warm-up Operation" on page 3-4 procedures listed in this manual.
- Turn the power pack battery disconnect switch to the "ON" position.

Road Liners (Machine Equipped with Road Liner)

Road Liners Information

Road liners are weaker than steel shoes. Therefore, use the road liners appropriately according the condition of the jobsite and the nature of the work. Pay attention to handling precautions and avoid prohibited operations.



EX1502671

Figure 98

Warranty for Road Liners

1. It is important to inspect and maintain the tracks at the correct tension. Furthermore, these shoes must not be used near objects where they are likely to suffer damage, such as the corner of steel plates, U-shaped ditch liners, blocks, on crushed rock or the sharp edges of rocks, iron beams, or scrap iron.
2. Any damage resulting from the customer's mistaken use of the machine shall not be included in the scope of the warranty.

Using Road Liners

Prohibited Works

Do not carry out the following types of work

1. Carrying out operations and steering on crushed rock, extremely rough hard rock, steel beams, scrap iron, or near the edges of steel plates will cause damage to the rubber shoes and road liners.
2. In places such as river beds where they are large numbers of large and small boulders, the stones may get caught and damage the rubber shoes and road liners or make the shoes come off. If dozing operations are carried out when the shoes are slipping, this will reduce the life of the rubber shoes and road liners.
3. Be careful not get oil, fuel, or chemical solvent on the rubber shoes and road liners. If such a substance should get on the shoes, remove it immediately. Do not travel on road surfaces where oil has collected.

Operation

1. When putting the machine into long-term storage (3 months or more), store the machine indoors where it is protected from direct sunlight or rain.
2. Do not use the machine in high-temperature areas where there is burning wood, steel plates that have been left under the hot sun, or places where asphalt has been laid.

Long Life Operation

Be careful of the following points when carrying out work.

1. Avoid carrying out counter rotation turns on concretes surfaces. There is danger that concrete surface will scrape off the rubber from the shoe.
2. Avoid making sudden changes in direction. This can cause premature wear or damage to the rubber shoes and road liners.
3. Avoid operating the steering when traveling over places where there is a big difference in height. In this case, drive the machine at right angles to the obstacle to prevent the shoes from coming off.
4. If the machine has been raised using the bucket. Lower it slowly.
5. Avoid doing work with materials that produce oil when crushed(soy beans, corn, or remains of vegetables squeezed for oil), and wash the machine after use, if operated under unavoidable circumstances.
6. Avoid handling materials that will attack the adhesion of the steel core, such as salt, ammonium sulphate, potassium chloride, potassium sulphate, or calcium superphosphate. Wash the machine after use, if operated under unavoidable circumstances.
7. The adhesion of the core will be attacked by salt, so avoid using the machine in coastal areas.
8. When handling salt, sugar, wheat, or soy bean, if there is any deep cut in the rubber shoes and road liners, these substances may get into the lugs or cut portion of the rubber. Always repair the rubber before use.
9. Do not carry out work that involves scraping against walls or concrete embankments.
10. Road liners slip extremely easily on snow or frozen roads. Be careful not to slip when traveling or working on slopes.
11. The properties of road liners change when working in extremely cold places, and this will reduce the life of the rubber shoes and road liners.
12. Because of the properties of rubber, use the road liners within a range of -25°C to +65°C.
13. When carrying out bucket operations, be careful not to damage the road liners with the bucket.

Inspection, Maintenance and Adjustment

Maintenance

This section describes information on proper maintenance of the machine. Therefore, ensure that all safety information, warnings, and instructions are read and understood before any operation or any maintenance procedures are performed.

Operational Hour Meter Reading

Check operational hour meter reading every day to see if necessary maintenance is scheduled to be performed.

HD HYUNDAI CONSTRUCTION EQUIPMENT Genuine Replacement Parts

Use HD HYUNDAI CONSTRUCTION EQUIPMENT genuine parts specified in Parts Book as replacement parts.

HD HYUNDAI CONSTRUCTION EQUIPMENT Genuine Lubricants

For lubrication of the machine, use HD HYUNDAI CONSTRUCTION EQUIPMENT genuine lubricants. Use oil of specified viscosity according to ambient temperature.

Clean Lubricants

All oils and greases to be used should be clean. Therefore, keep oil and lubricant storage container carefully to prevent foreign matters from entering inside.

Inspection of Removed Oil and Used Filter

Check the amount of metal particles or foreign matters in the used oil or filter when injecting new oil or replacing the filter. If the amount is large, take appropriate actions.

Do Not Drop Things Inside Machine

- When opening inspection windows or oil filler port of tank to perform inspection, be careful not to drop nuts, bolts, or tools inside the machine.

  If parts are dropped inside machine, it can cause damage and/or improper operation of the machine. If you drop anything inside the machine, always remove it immediately.

Dusty Work Site

When working at a dusty work site, do the following:

- Clean radiator fins and other parts of heat exchange equipment more frequently, and take care not to let fins become clogged.
- Clean electrical components to avoid accumulation of dust.
- When checking and replacing oil or filters, move the machine to a place where there is no dust and take care to prevent dust from entering system.

Avoid Mixing Lubricants

If a different brand or grade of oil has to be added, drain all old oil before adding new brand or grade of oil. That is, never mix and use different brands or grades of oil.

Locking Inspection Covers

Lock inspection cover securely into position with lock bar after inspection or maintenance. If it is neglected, the cover may come loose and fall, causing injury.

Hydraulic System - Air Bleeding

When hydraulic equipment has been repaired or replaced, or hydraulic piping has been removed and installed again, air must be bled from circuit. For details, see "Venting and Priming Hydraulic System" on page 4-42.

Hydraulic Hose Installation

- When removing part at locations with O-rings or gasket seals, clean mounting surface and replace with new parts. When doing this, be careful not to forget to assemble O-rings and gaskets.
- When installing hoses, do not twist them or bend them sharply. This will extend service life and prevent damaging hoses.

Checks After Inspection and Maintenance Works

After performing inspection and maintenance work, review all of the following checkpoints without omission once again in order to prevent problems in operation.

- Checks after operation (with engine stopped).
  - Have any inspection and maintenance points been forgotten?
  - Have all inspection and maintenance items been performed correctly?
  - Have any tools or parts been dropped inside the machine?
  - Are there any coolant or oil leaks? Have all nuts and bolts been tightened?
- Checks when operating engine.
  - For details of checks when operating engine, see "Safety Precautions" on page 4-3 pay careful attention to safety.
  - Are inspection and maintenance items working properly?

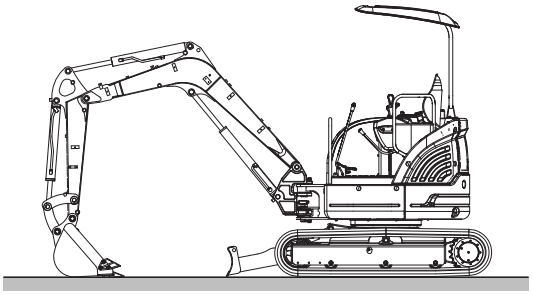
Safety Precautions

1. Make sure to lock out hydraulic controls and place a "DO NOT OPERATE" Warning Tag on the machine to indicate that the machine is being serviced and to prevent any unauthorized operation.
2. Clean up any fluid spills, especially around engine.
3. Inspect all fuel lines to make sure that fittings, lines, filters, O-rings, etc. are tight and are not showing signs of leakage, wear or damage.
4. If inspection or test procedure requires that engine be running, make sure to keep all unauthorized personnel away from the machine. In addition, comply with all occupational safety precautions.

Machine Setup Position for Maintenance

Before beginning any service work described in this manual, park the machine first as described below, except where otherwise stated,

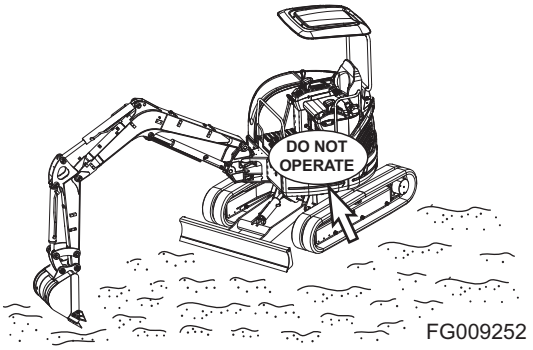
1. Position the machine on even, firm and level ground.
2. Put attachment on ground.
3. Move safety lever to "LOCK" position.
4. Run the engine at "LOW IDLE" for at least 5 minutes without load by operating the engine speed control dial.
5. Stop the engine by turning the engine start key to the "O" (OFF) position. After releasing hydraulic system and tank pressure, remove the engine start key.



FG009483

Figure 1

6. Before starting maintenance work, place a "DO NOT OPERATE" Warning Tag on cabin door or work lever.



FG009252

Figure 2

WARNING

AVOID DEATH OR SERIOUS INJURY

If engine must be running while performing maintenance, use extreme care. Always have one person in cabin at all times when the engine is running, and take actions to make a person in the cabin stay until the engine is stopped.

Maintenance Handling Access

Entering/Leaving/Climbing On Machine

WARNING

AVOID DEATH OR SERIOUS INJURY

Do not jump ON/OFF a machine. In particular, never get ON/OFF when the machine is running.

Never grasp control lever when getting on/off the cabin.

Use handholds and steps when entering, leaving or climbing the machine.

Use these handholds and steps by either the three-point grip that puts one foot on while holding two hands or the three-point grip that puts both feet on while holding one hand.

Always move by facing the machine.

Always wipe mud and oil off all footboards, handrails, guardrails and your footwear, especially when cleaning windows, rearview mirrors and lights.

Clean your boots and wipe your hands before handling the machine and starting work, and wear shoes that are suitable for the job.

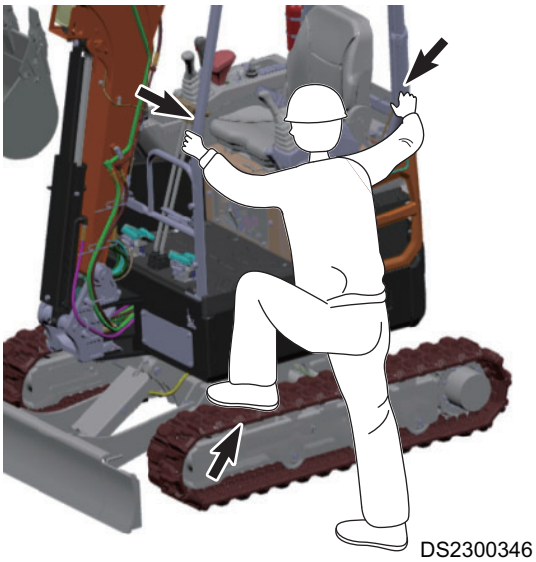


Figure 3

Handling Oil

Oil

- The oil used in the hydraulic system operates under extremely severe conditions (high temperature and high pressure, etc.) and its performance gradually deteriorates over time. Always use the oil grade recommended in this manual, considering the maximum and minimum temperatures in the working environment in which the machine is used. Even if oil is not dirty, always change oil at specified interval.
- Always be careful when handling oil to prevent any impurities (water, metal particles, dirt, etc.) from getting in.
- Operating problems with the machine can be caused by impurities in oils.
- Take particular care not to let any impurities get in when storing or adding oil.
- Never mix oils of different grades or brands.
- Always add specified amount of oil.
- Having too much or too little oil can cause operational problems.
- If oil in work equipment is not clear, there may be water or air getting into circuit. In such cases, contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.
- When changing oil, always replace related filters at same time.

Lubricants

1. Lubricant Specifications and Products

   Use genuine HD HYUNDAI CONSTRUCTION EQUIPMENT lubricant.

Item	Hydraulic oil	Gear oil	Grease
	Hydraulics	**Travel reducer**	**Swing reducer** **Swing bearing** **Front joint pin**
Quality and viscosity grade	ISO VG 46	API GL-5, SAE 80W90	For centralized refueling Type 4 No. 2 NLGI No.2
Genuine HD HYUNDAI CONSTRUCTION EQUIPMENT oil	HD HYUNDAI CONSTRUCTION EQUIPMENT hydraulic fluid (high quality hydraulic fluid)	HD HYUNDAI CONSTRUCTION EQUIPMENT gear oil	HD HYUNDAI CONSTRUCTION EQUIPMENT grease EP

NOTE: *It is recommended to use genuine HD HYUNDAI CONSTRUCTION EQUIPMENT grease for our construction machinery.*

- **KS M 2130 standard**
  - For centralized refueling, Type 4 No. 2 / NLGI No. 2
- **Based on extreme pressure (EP)**
  - Normal: 250 kgf or more
  - Front joint pin: 315 kgf or more

Grease (Front Joint Pin)

- For summer, use NLGI No.3 grade grease with low dripping due to high viscosity.
- Grease is used to prevent seizure and noises at joints.
- This construction equipment is used under heavy-duty conditions. Always use recommended grease and follow change intervals and recommended ambient temperatures given in this manual, and observe the recommended maintenance interval.
- When injecting new grease, be sure to clean the grease that has been previously injected before injecting it. If sand or dust is present in the previously injected grease, it can wear the rotating part of the machine, so special care is required when wiping it off.

Filters

- Filters are extremely important safety parts in terms of the safety of the machine as it prevents functional problems caused by hydraulic oil or impurities.

  Make sure to replace all filters periodically. See details given in "Lubrication and Service Chart" on page 4-9.

  When working in severe conditions, replace filters at shorter intervals according to oil and fuel (sulfur content) being used.
- Never try to clean filter (cartridge type) and use them again. Always replace with new filters.
- When replacing oil filters, check if any metal particles are attached to oil filter. If any metal particles are found, contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.
- Do not open packages of spare filters until just before they are to be used.
- Always use HD HYUNDAI CONSTRUCTION EQUIPMENT genuine filters.

Fluid Capacities

Component		Capacity
Hydraulic oil	Standard capacity	16 L
Travel reduction gear (each)		0.35 L
System capacity		28.5 L

NOTE: *If the level is between lower limit line and upper limit line of the gauge, the level is correct.*
If the level is low, open the cover on the tank and add hydraulic fluid.

Symbols for "Lubrication and Service Chart"

The symbols shown here are used in the lubrication and service chart on the next page.

Symbol	Description
	Grease
	Gear Oil (Travel Device)
	Hydraulic Oil
	Hydraulic Oil Filter

Symbol	Description
	Hydraulic Oil Tank Breather
	Drain Water
	Level Check

Lubrication and Service Chart

Service Data										
Number	Items to Check	Service	Qty.	Service Interval (hr)						
				10	50	250	500	1000	4000	6000
1	Arm, Bucket Joint Pin	Grease	6	F100	W10					
2	Swing Bearing	Grease	1	F100	W10					
3	Boom Swing Bracket Pin	Grease	2							
	Boom Swing Cylinder Pin									
4	Dozer Blade Pin	Grease	4	F100	W10					
	Dozer Cylinder Pin			F100	W10					
5	Boom, Arm Joint Pin	Grease	7	F100		W10				
6	Track Adjuster	Grease	2				W10			
7	Hydraulic Oil Return Filter	Hydraulic oil	1			F				
8	Travel reducer	Gear oil	2 x 0.35 L				F, V			
9	Hydraulic Oil Tank	Hydraulic oil	16 L	V						
10	Hydraulic Oil Suction Filter	Strainer	1					C		
11	Hydraulic Oil Tank Breather	Element	1	V						
	Oil Cooler Core	Core	1	V						
V : Maintenance and Refill. / **C** : Cleaning. / **D** : Drain Water. / **F** : First Time Exchange Only.										
F100 : Every 10 Hours for First 100 Hours. / **W10** : Every 10 Hours If Operating In Water.										
: Replacement On Every Interval.										
NOTE: *For additional service items see list of "Maintenance Intervals" on page 4-10.*										

Maintenance Intervals

Service Intervals	Page
Check for Crack in Machine Structure and Damage to Weld Lines	4-31
4,000 Hour / 2 Year Service	
Replace Hydraulic Fluid	4-32
Replace Major Parts Periodically	4-34
12,000 Hour / 6 Year Service	
Hose In-service Lifetime Limit	4-35

** This inspection should be performed by our authorized dealer.

10 Hour / Daily Service

Grease Front Attachment Pins (for first 100 hours)

Grease it per 10 hours during initial period of 100 hours after buying your new machine, and every 50 (arm and bucket joint pin) or 250 hours (boom and arm joint pin) thereafter.

NOTE: *If the unit has been running or working in water the front attachment must be greased on a 10 hour/daily basis.*

Grease Dozer Blade Pin (for first 100 hours)

Grease it per 10 hours during initial period of 100 hours after buying your new machine, after which period grease it per 50 hours.

NOTE: *If the unit has been running or working in water the front attachment must be greased on a 10 hour/daily basis.*

Grease Swing Bearing (for first 100 hours)

Grease it per 10 hours during initial period of 100 hours after buying your new machine, after which period grease it per 50 hours.

Check for Leaks in Hydraulic System

Perform a daily walk-around inspection to make sure that hoses, piping, fittings, cylinders and hydraulic motors are not showing any signs of leakage.
If any is noted, determine the source of the leak and repair.

Check Hydraulic Oil Tank Level and Refill

WARNING

AVOID DEATH OR SERIOUS INJURY

Hydraulic oil is hot during and after operation. Perform maintenance and inspection after the hydraulic fluid has sufficiently cooled down.

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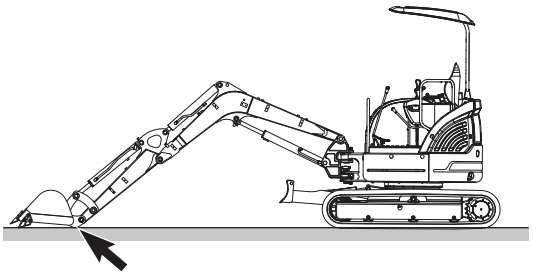
Figure 4

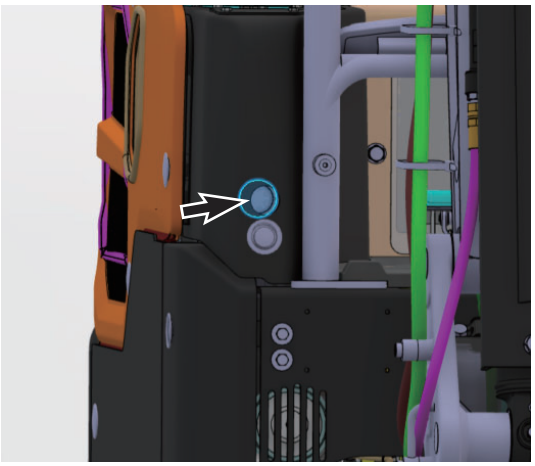
1. Retract the bucket cylinder and arm cylinder on a solid and flat ground as shown in (Figure 6), and lower the boom to put the bucket on the ground and then, set the engine speed to low.
2. Move safety lever to the lower "LOCK" position.



DS1702818

Figure 5

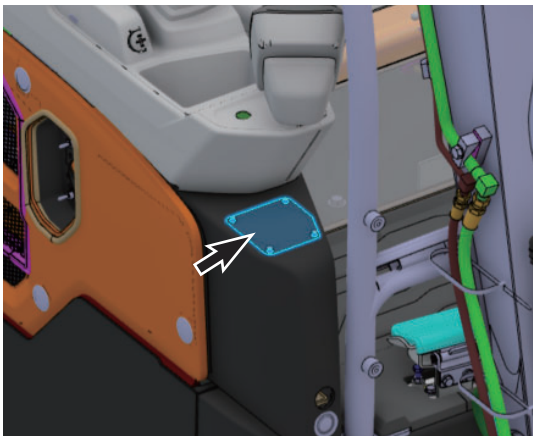
3. The level gauge can be checked on the right front of the machine. The oil level should be visible in the center red circle on the level gauge.



DS2300431

Figure 6

4. When the oil level is below the red circle, stop the engine and replenish hydraulic fluid. Remove the cover.



DS2300432

Figure 7

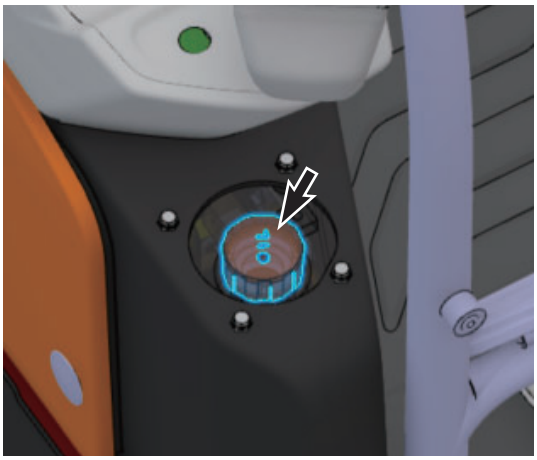
5. Open the hydraulic fluid plug to replenish hydraulic fluid.

NOTICE

Do not to replenish above the top of the red circle. It can damage the hydraulic circuit and eject hydraulic.

NOTICE

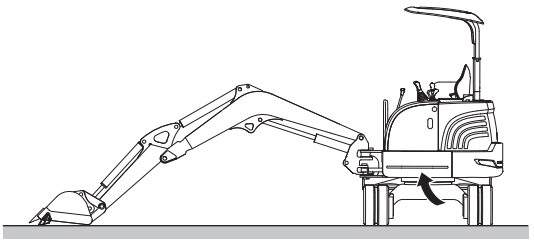
To replenish hydraulic fluid, always use the same product that is suitable for the pertinent system.



DS2300433

Figure 8

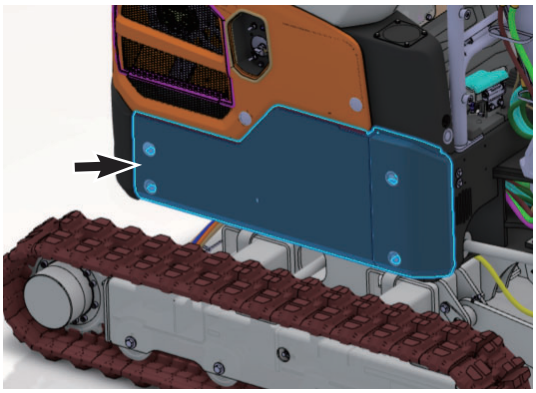
6. If the oil level is above the center of the red circle, the oil must be drained.
   A. Swing the upper body by 90° as shown in the picture.
   B. Stop the engine and wait for the hydraulic fluid temperature to drop.



DS1901452

Figure 9

C. Remove the cover on the right side of the tank.

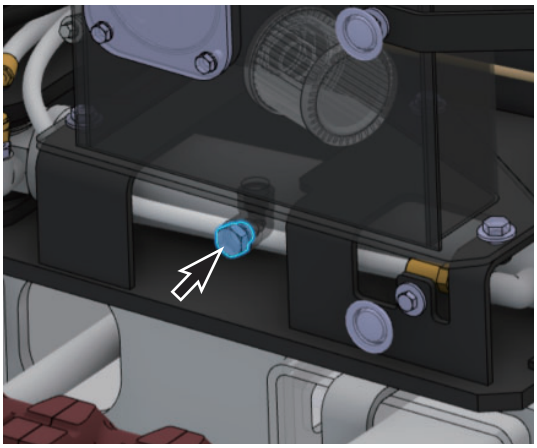


DS2300434

Figure 10

D. Disassemble the drain plug and drain the hydraulic fluid.

NOTE: *Dispose the removed oil properly by complying with environmental laws and regulations.*



DS2300435

Figure 11

Inspect Seat Belt for Proper Operation

Inspect Structure for Cracks and Faulty Welds

During the daily walk-around inspection and when greasing the machine, look for any visible damage to the machine. Repair or replace any damaged parts before operating the machine.

Check Operation of All Switches

Verify the working condition of all switches before starting the engine.

Check Operation of All Exterior Lights, Horn and Control Console Indicator and Monitor Lights

1. Turn engine starter switch to start key "ON" position and observe all of the indicator lights.
   Restore operation of any light bulbs that do not turn "ON" at this time.
2. Sound the horn. Repair or replace if required.

Check Operation of All Controls

NOTICE

In cold weather, perform a warm-up operation before beginning machine operation in full.

Follow all warm up instructions listed in the Operating Instruction section of this manual.

Make sure to evenly circulate hydraulic fluid through all of the components, including all cylinders, both travel motors and the swing motor. Cold hydraulic fluid in the lines and components needs to be warmed before beginning full operation.

If warm-up operation is not performed, damage to the cylinders or hydraulic motors can occur.

1. Follow hydraulic system warm-up in cold weather procedures.
2. If any abnormal operation is detected, determine the cause and repair the fault before operating.

Inspect Hydraulic Oil Tank Breather and Clean Periodically

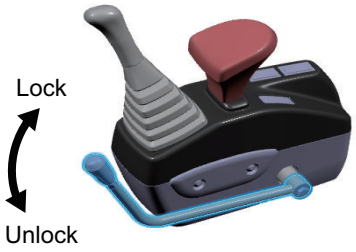
Wash the oil cooler.

Safety Lever

The safety levers include the pivoting safety lever that stops the swing, traveling and front operation.

Move the safety lever to the "lock" position to stop the swing, traveling and front operation.

Move the safety lever to the "unlock" position to start the swing, traveling and front operation.



DS2300373

Figure 12

WARNING

AVOID DEATH OR SERIOUS INJURY

If the machine operation is not stopped even after moving the safety lever to the "lock" position, contact your nearest HD HYUNDAI CONSTRUCTION EQUIPMENT representative immediately. Also, do not modify the system at your discretion.

Safety Lever Operation Check

1. Check whether there are any pedestrians in the work area and keep them away. Sit in the driver's seat and fasten your seat belt.
2. Start the engine and move the safety lever to the "unlock" position.
3. Move the joystick in all directions to check whether the boom, arm, bucket (or other attachment) and swing functions are properly performed. In addition, operate the travel lever to check whether the machine travels.

   NOTE: *Increase the temperature of the hydraulic system up to operating temperature.*
4. Raise the boom and arm and lift the bucket about 1 m above the ground.
5. Move the safety lever to the "lock" position and operate the joystick. At this time, do not activate the front and swing function of the machine.
6. Move the travel level in the situation of step 5 above. At this time, the machine should not be travel.
7. Move the safety lever to the "unlock" position and raise the boom up to lift the bucket (or other attachment) approximately 1 m above the ground. Move the joystick to slowly lower the boom. While the boom is lowering, move the safety lever to the "lock" position. At this time, the boom operation should stop. Check the arm, bucket (other attachments), swing and drive functions in the same way as the above procedure.
8. Lower the front implement to the ground and stop the engine.

50 Hour / Weekly Service

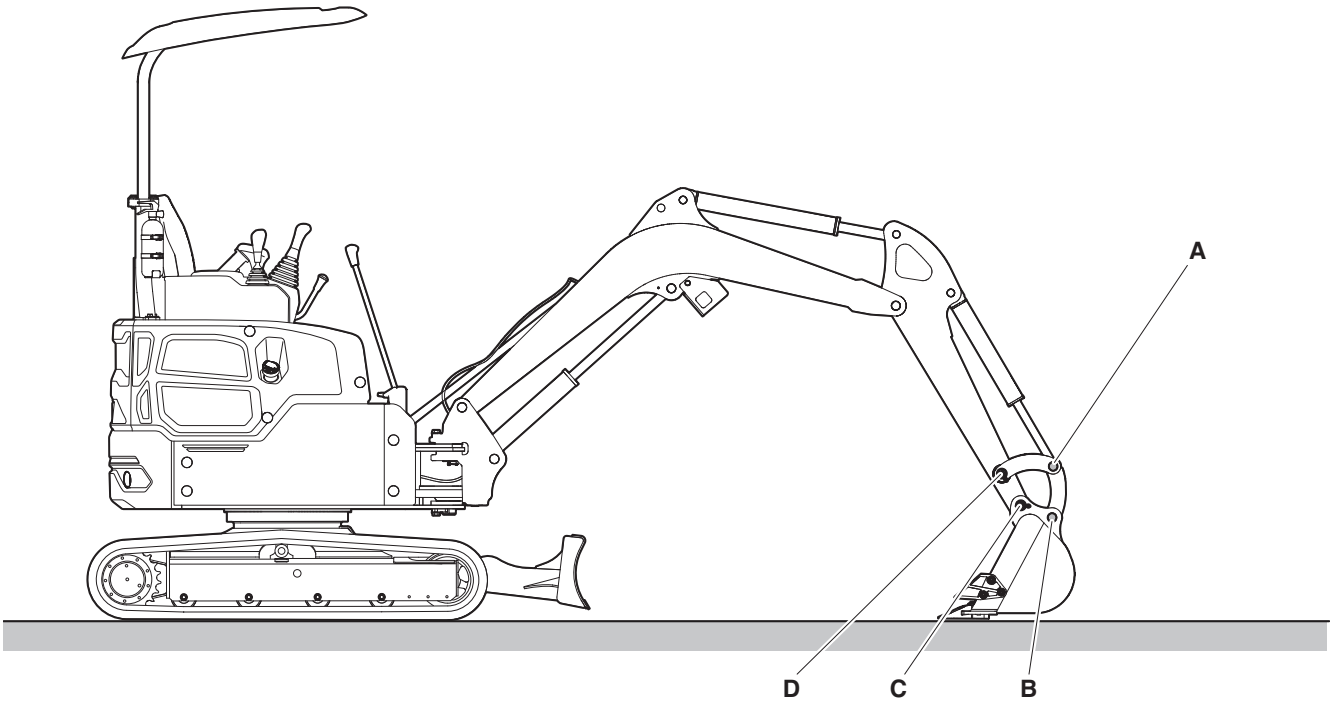
Perform All 10 Hour/Daily Service Checks

Grease Arm, Bucket Joint Pins

Grease every 10 hours for first 100 hours of machine operation (10 times) and every 50 hours thereafter.

NOTE: *If the unit has been running or working in water, it must be greased on a 10 hour/daily basis, regardless of the operating period.*

- Position machine on a level surface, lower the front attachment to the ground and stop engine.
- Inject grease into the nipple of the indicated part (A-D) using a grease dispenser.
- After injection, clean off the old grease that has been spread around.



DS1901458

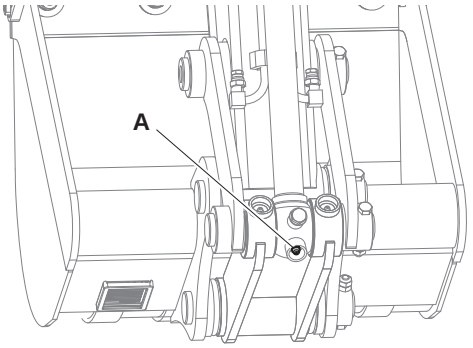
Figure 13

Reference Number	Description
A	Bucket Cylinder (1 point)
B	Link Joint (3 points)

Reference Number	Description
C	Arm Bucket Joint (1 point)
D	Arm Link Joint Pin (1 point)

A. Bucket Cylinder (1 point)

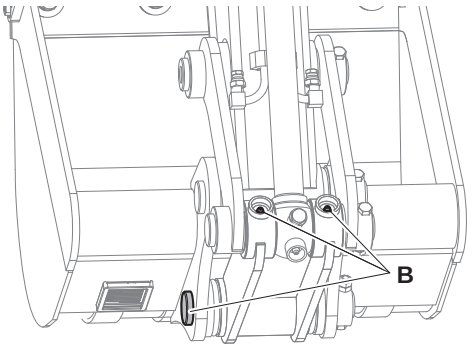
- Rod side



DS1902150

Figure 14

B. Link Joint (3 points)

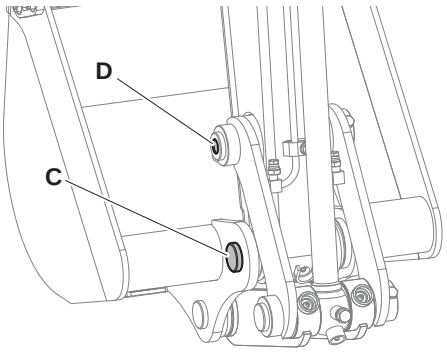


DS1902151

Figure 15

C. Arm Bucket Joint (1 point)

D. Arm Link Joint (1 point)



DS1901459

Figure 16

Grease Dozer Pins and Cylinders

A. Dozer Cylinder (2 points)

B. Dozer Pin (2 points)

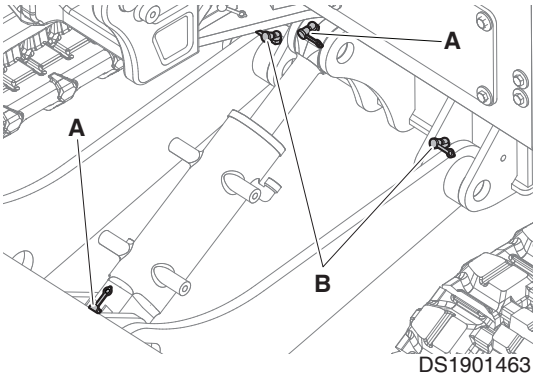


Figure 17

Grease Boom Swing Cylinder, Swing Gear, and Swing Bearing

1. Boom Swing Cylinder Head (1 point, A)
2. Swing Reduction Gear (1 point, B)
   - Inject grease into the nipple B with a grease gun.
   - Raise the bucket on the ground about 20 cm and apply a small amount of grease to the entire gear surface with a grease by dividing it about 20 times.
3. Swing Bearing (1 point, C)
   - Inject grease into the nipple C with a grease gun.
   - Raise the bucket by 20cm above the ground and grease each time the upper swing body turns by about 90°. Repeat this process 8 times.

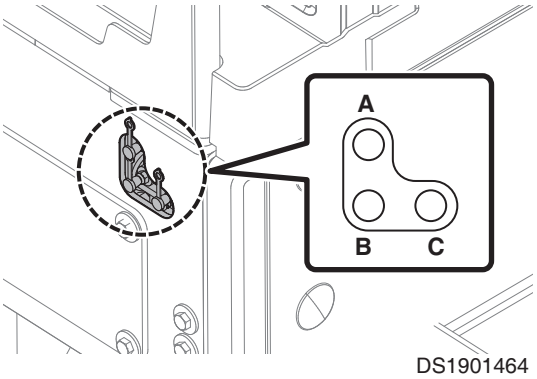


Figure 18

Grease Boom Swing Unit

1. Boom Swing Cylinder Rod (1 point, D)
2. Boom Swing Bracket (2 points, E)

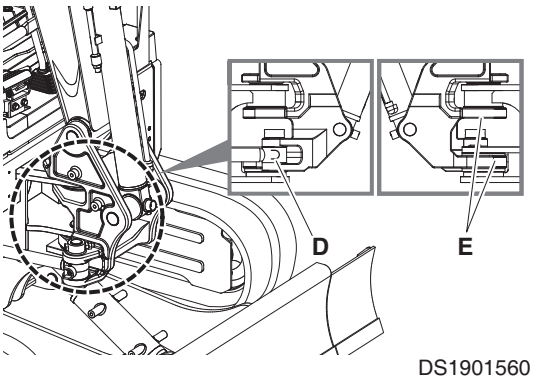


Figure 19

Inspect Track Assemblies for Proper Tension and Loose, Worn or Damaged Parts (Track Links, Shoes, Rollers, Idlers)

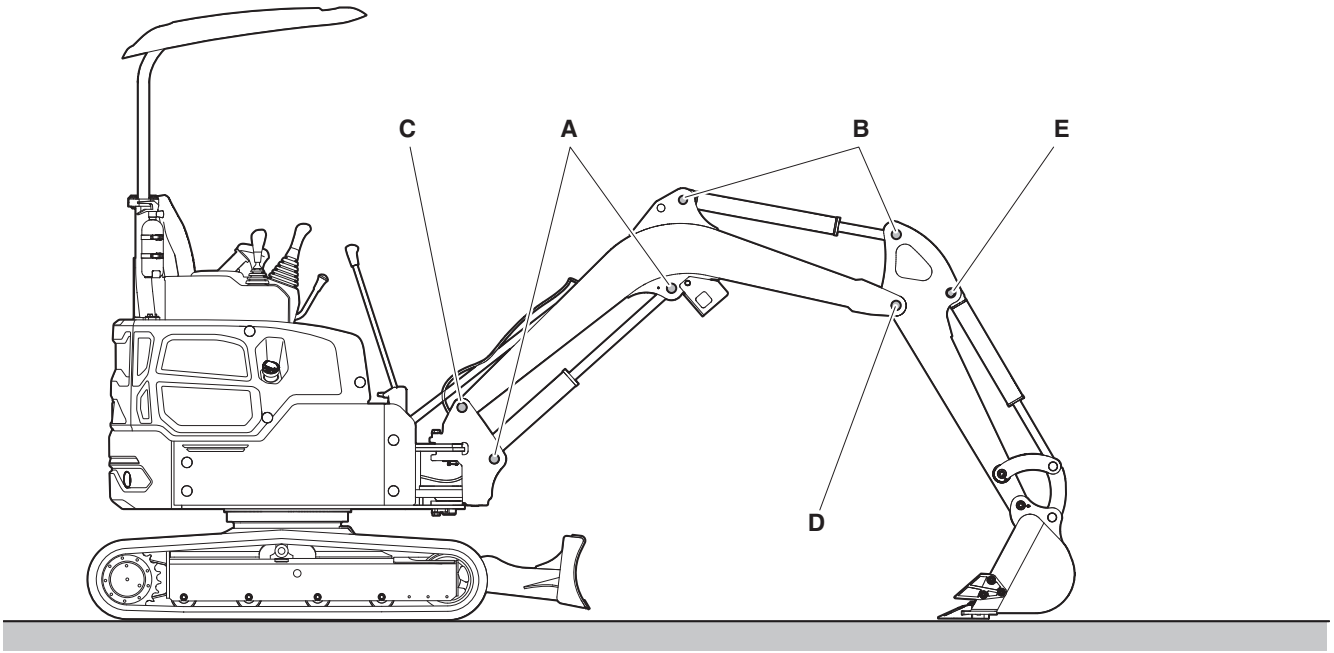
1. Visually inspect track components. Look for missing, damaged or excessively worn parts. See "Track Tension" on page 4-40.
2. Jack up each track and perform the two speed travel motor test.

Grease Boom and Arm Joint Pins

Grease every 10 hours for first 100 hours of machine operation (10 times) and every 250 hours thereafter.

NOTE: *If the unit has been running or working in water, it must be greased on a 10 hour/daily basis, regardless of the operating period.*

- Position machine on a level surface, lower the front attachment to the ground and stop engine.
- Inject grease into the nipple of the indicated part (A-D) using a grease dispenser.
- After injection, clean off the old grease that has been spread around.



DS1901458

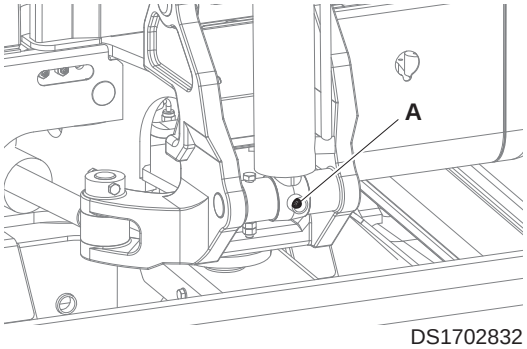
Figure 20

Reference Number	Description
A	Boom Cylinder (2 points)
B	Arm Cylinder (2 points)
C	Boom and Boom Swing Joint (1 point)

Reference Number	Description
D	Boom Arm Joint (1 point)
E	Bucket Cylinder (1 point)

A. Boom Cylinder (2 points)

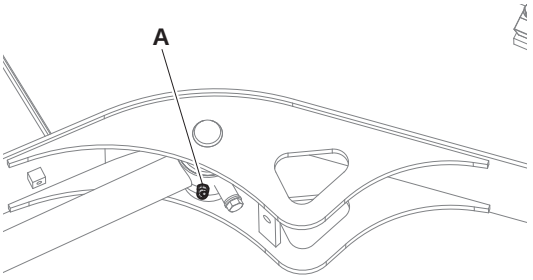
- Head side



DS1702832

Figure 21

- Rod side

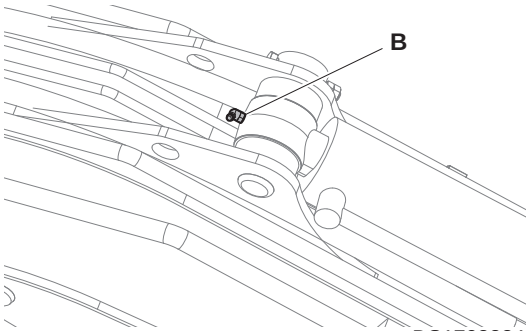


DS1702833

Figure 22

B. Arm Cylinder (2 points)

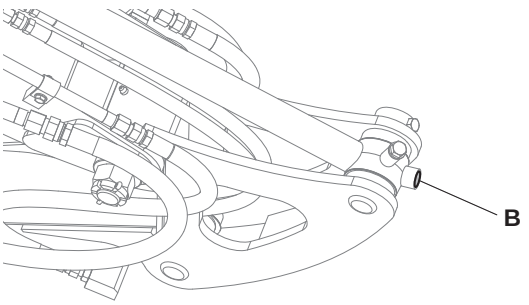
- Head side



DS1702834

Figure 23

- Rod side



DS1702835

Figure 24

C. Boom and Boom Swing Joint (1 point)

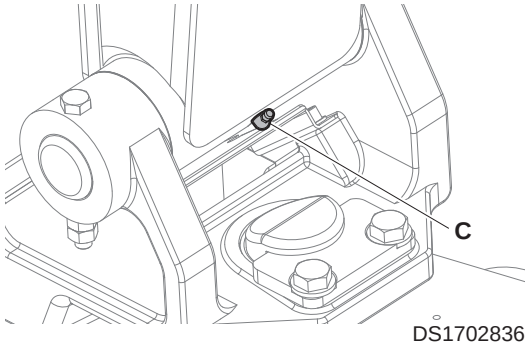


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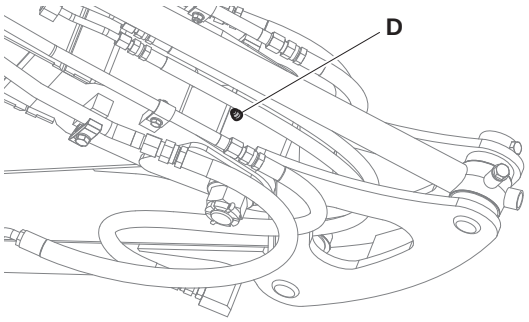
Figure 25

D. Boom Arm Joint (1 point)

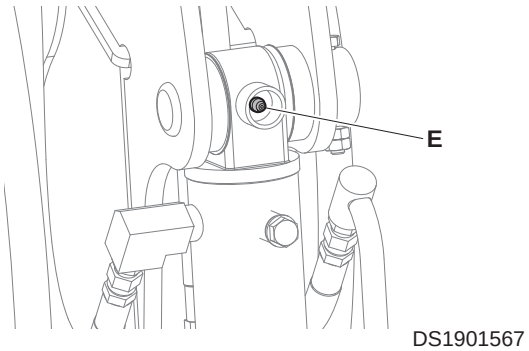


DS1702837

Figure 26

E. Bucket Cylinder (1 point)

- Head side



DS1901567

Figure 27

Replace Hydraulic Oil Return Filter (including Packing) (after first 250 hours of operation)

NOTE: *Replace the hydraulic oil return filter after the first 250 hours of use and every 500 hours thereafter.*

Inspect Pin and Bushings of Front or Attachment Wear

Check Battery Fluid

See "Check Battery Fluid" on page 4-25 for further information.

Check for Loose or Missing Nuts or Bolts

500 Hour / 3 Month Service

Perform 10, 50 Hour Service Checks

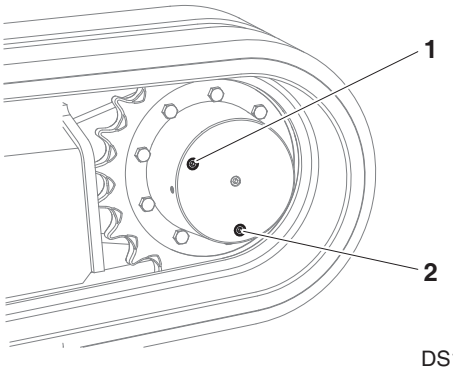
Check and Replenish the Oil Level of the Travel Reducer

WARNING

AVOID DEATH OR SERIOUS INJURY

Since the gear oil temperature is high immediately after starting the machine, stop starting the engine and wait until the temperature drops before inspection.

When checking the oil level, loosen the plug slowly and remove residual pressure. Oil can spurt suddenly because the plug is disengaged due to the residual pressure inside the travel reducer.



DS1901531

Figure 28

Reference Number	Description
1	Level Plug
2	Drain Plug

1. Place the machine on a firm and level surface.
2. Rotate the track as shown in the figure to move the ports (1 to 2, Figure 28) to the home position.
3. Open the level plug (1, Figure 28) slowly to release the residual pressure.
4. Check the oil level using the level plug (1, Figure 28) and inject oil if the oil is insufficient.
   Stop oil injection when oil starts to overflow from the level plug (1, Figure 28).
5. Wipe the level plug (1, Figure 28) clean, and tighten it again.
6. Repeat the above procedure for travel reducer on the opposite side.

Check Track Adjuster and Grease Track Tension is Insufficient

When working in water, check and grease every 10 hours.

Replace Hydraulic Oil Return Filter (after first 250 hours)

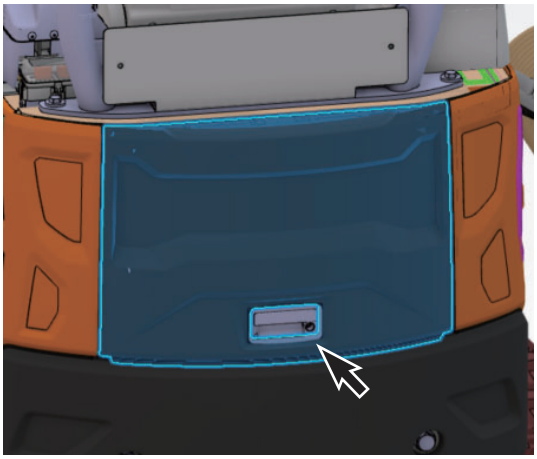
NOTE: *Replace the hydraulic oil return filter after the first 250 hours of use and every 500 hours thereafter.*

WARNING

AVOID DEATH OR SERIOUS INJURY

Since the hydraulic oil is hot immediately after operation, cool it down before maintenance. Therefore, make sure to wait until the hydraulic system cools down before maintaining the hydraulic system parts.

1. Position machine on a level surface, lower the front attachment to the ground and stop engine.
2. Open the machine bonnet.



DS2300436

Figure 29

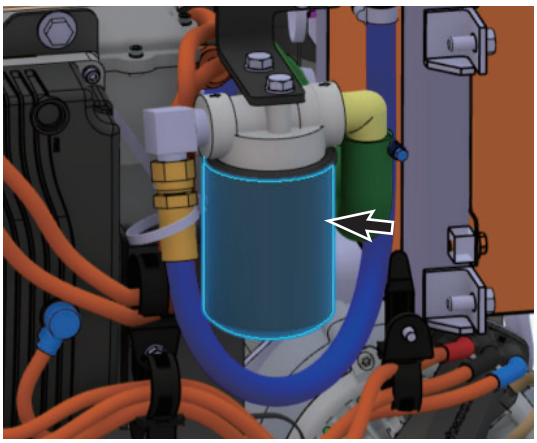
3. Hook a filter wrench on the return filter to remove it, and replace it with a new one. After replacement, assemble in the reverse order of disassembly.

   NOTE: *Properly dispose used waste filters in accordance with relevant laws and regulations.*

4. Start the engine to bleed air from the circuit, and idle at the lowest speed without load for 10 minutes.
5. Stop the engine.

   NOTE: *Start the engine after more than 5 minutes so that bubbles in the hydraulic can be released from the tank.*

6. Check the level of the hydraulic oil tank, and replenish the appropriate amount if necessary. See "Check Hydraulic Oil Tank Level and Refill" on page 4-13.



DS2300437

Figure 30

1,000 Hour / 6 Month Service

Perform 10, 50, 250 and 500 Hour Service Checks

Clean Hydraulic Oil Suction Filter

WARNING

AVOID DEATH OR SERIOUS INJURY

Since the hydraulic oil is hot immediately after operation, cool it down before maintenance. Therefore, make sure to wait until the hydraulic system cools down before maintaining the hydraulic system parts.


ARO1760L

Figure 31

NOTICE

Make sure to clean any dirt or water from the top of the hydraulic tank, especially around the filter ports.

1. Park the machine on a firm and level ground as shown in the figure.
2. Move safety lever to "LOCK" position.
3. Stop the engine.

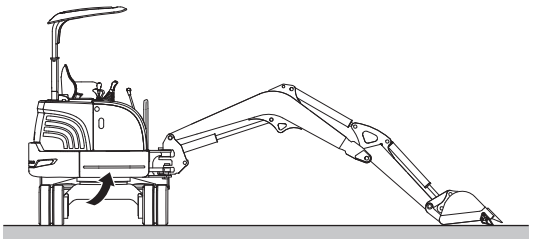


Figure 32 DS1702821

4. Remove the cover on the right side of the tank.

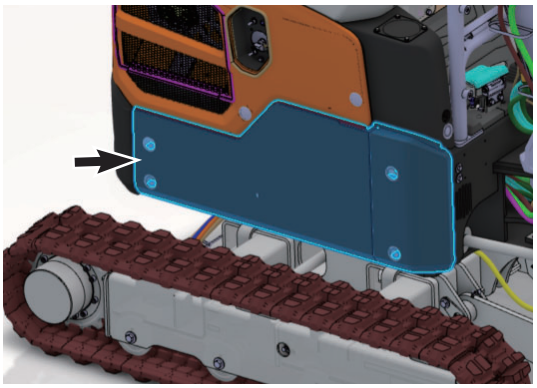
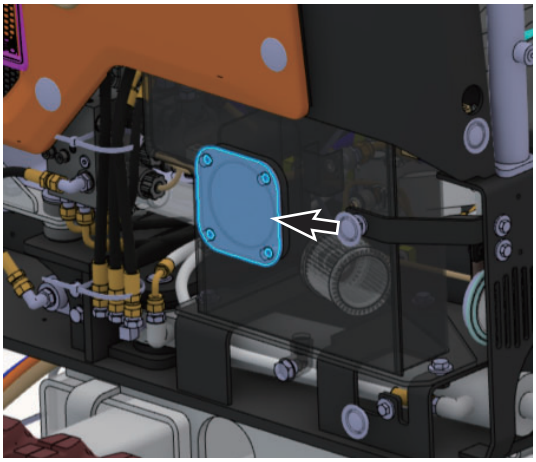

DS2300434

Figure 33

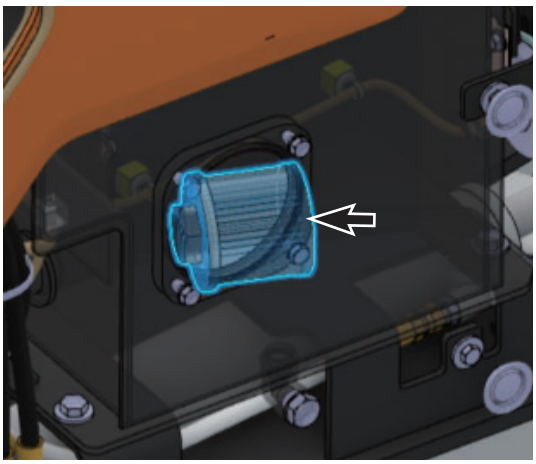
5. Remove the cover.



DS2300438

Figure 34

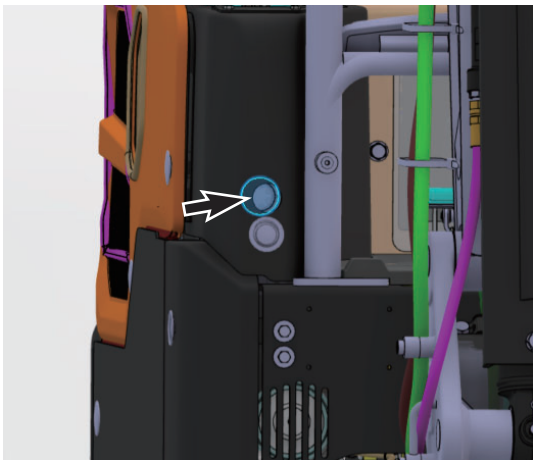
6. Remove the suction filter.
7. Wash the removed suction filter clean, and if the filter is damaged, replace it with a new one.
8. After cleaning, assemble the suction filter and cover in the reverse order of disassembly.



DS2300439

Figure 35

9. Check the proper flow rate using a level gauge.



DS2300431

Figure 36

Change Oil in Travel Reducer (both Tracks)

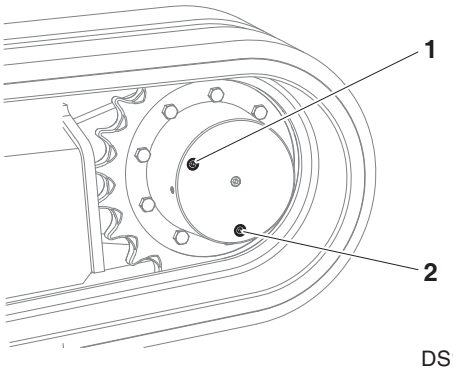
WARNING

AVOID DEATH OR SERIOUS INJURY

Since the gear oil temperature is high immediately after starting the machine, stop starting the engine and wait until the temperature drops before inspection.

When checking the oil level, loosen the plug slowly and remove residual pressure. Oil can spurt suddenly because the plug is disengaged due to the residual pressure inside the travel reducer.

Reference Number	Description
1	Level Plug
2	Drain Plug



DS1901531

Figure 37

NOTE: *Check or replenish oil after the first 250 hours of use and every 1,000 hours thereafter.*

1. Place the machine on a firm and level surface.
2. Rotate the track as shown in the figure to move the ports (1 to 2, Figure 37) to the home position.
3. Open the level plug (1, Figure 37) slowly to release the residual pressure.
4. Support the container at the bottom of the drain plug (2, Figure 37) and remove it to drain the gear oil.

   NOTE: *All discharged liquid waste should be properly disposed by complying with environmental laws and related regulations.*
5. Assemble the drain plug (2, Figure 37). Inject the gear oil through the level plug (1, Figure 37), and stop injecting if it leaks out. When fully injected, assemble the level plug (1).

   NOTE: *See "Fluid Capacities" on page 4-8 for proper capacity.*
6. Repeat the above procedure for travel reducer on the opposite side.

2,000 Hour / Yearly Service

Perform 10, 50, and 250 Hour Service Checks

Check All mounting Rubbers for Anti-vibration

Check Periodic Inspection Items and Record Results

Check for Crack in Machine Structure and Damage to Weld Lines

Replace Hydraulic Fluid

WARNING

AVOID DEATH OR SERIOUS INJURY

Since the hydraulic oil is hot immediately after operation, cool it down before maintenance. Therefore, make sure to wait until the hydraulic system cools down before maintaining the hydraulic system parts.

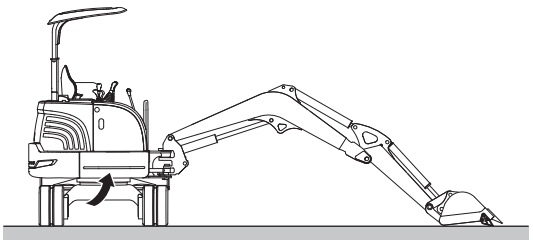
Figure 38

NOTICE

Make sure to clean any dirt or water from the top of the hydraulic tank, especially around the filter ports.

Replace the hydraulic fluid every 4,000 hours only when using genuine HD HYUNDAI CONSTRUCTION EQUIPMENT parts. It is recommended to replace every 1,000 hours if other brands of hydraulic fluid are used.

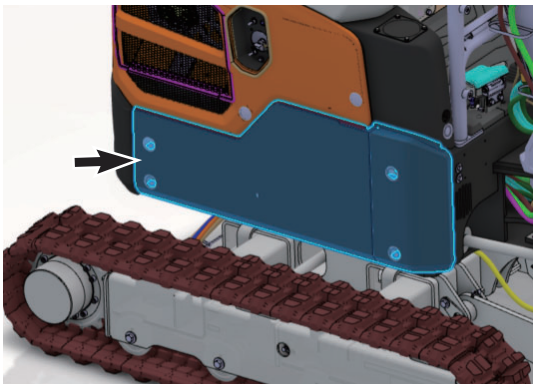
1. Park the machine on a firm and level ground as shown in the figure.
2. Move safety lever to "LOCK" position.
3. Stop the engine.



DS1702821

Figure 39

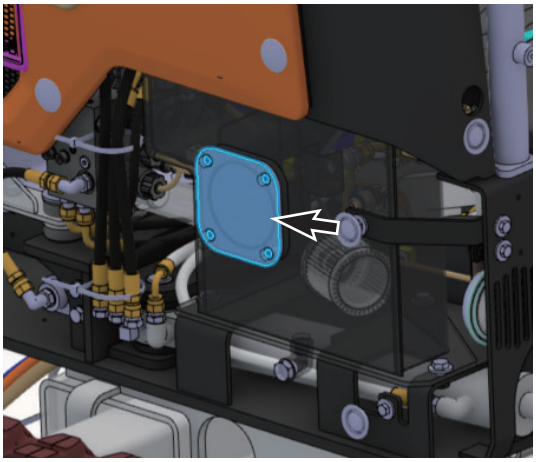
4. Remove the cover on the right side of the tank.



DS2300434

Figure 40

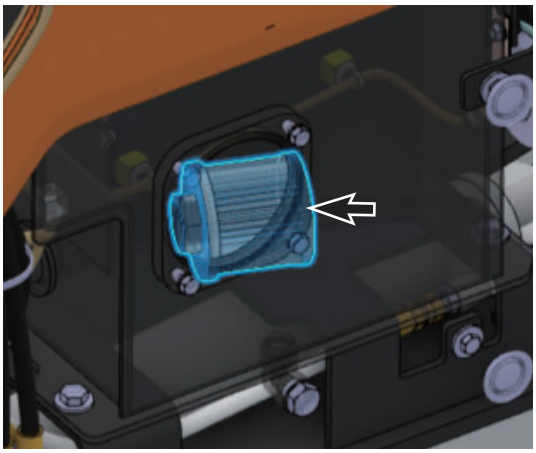
5. Remove the cover.



DS2300438

Figure 41

6. Remove the suction filter.

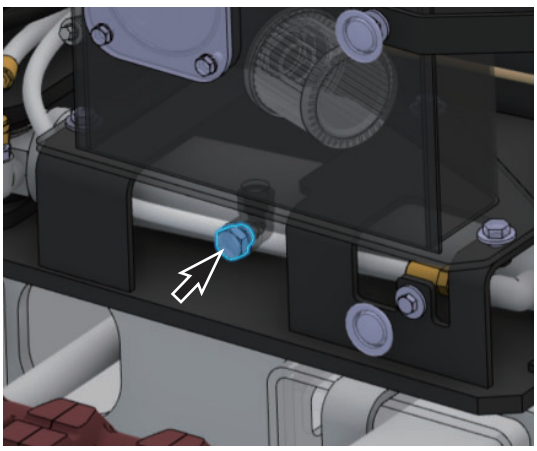


DS2300439

Figure 42

7. Place the container under the drain plug.
8. Disassemble the drain plug and drain the hydraulic fluid.

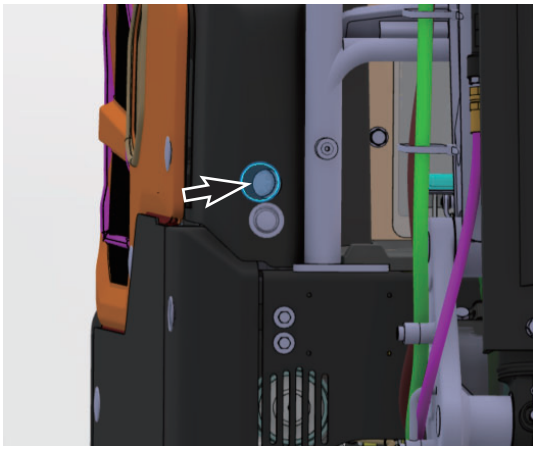
   NOTE: *Dispose the removed oil properly by complying with environmental laws and regulations.*
9. When completely discharged, assemble all disassembled covers and plugs in the reverse order of disassembly.



DS2300435

Figure 43

10. Inject hydraulic fluid in a way that the level is located in the center of the red circle.



DS2300431

Figure 44

Replace Major Parts Periodically

For proper operation and work, perform periodic inspections.

Also, replace the following parts to increase safety.

These parts are those most often subjected to abrasion, heat and fatigue.

Replace these parts with new ones at the designated time intervals.

Major components		Parts Name to be Replaced Periodically	Time to Replace
Hydraulic System	Main Body	Pump Suction Hoses	2 years or 4,000 hours
		Return Hoses	
		Swing Motor Hoses	
		Travel Motor Hoses	
	Work Device	Boom Cylinder Line Hoses	
		Arm Cylinder Line Hoses	
		Bucket Cylinder Line Hoses	
		Pilot Hoses	
		Boom Swing Cylinder Line Hoses	

12,000 Hour / 6 Year Service

Hose In-service Lifetime Limit

It is recommended to replace all hydraulic hoses within 6 years of use as follows.

- Hoses at the customer premises cannot be stored more than 2 years before being discarded or installed on a machine.
- In-service lifetime of hoses fitted on a machine can never exceed 6 years. In addition to this, major parts mentioned in the periodic replacement table should be replaced every 2 years.
- Always replace hoses having exceeded the allowed in-service lifetime irrespective of the external appearance.

Always store hoses in a dark place at a maximum of 65% relative humidity, between 0°C and 35°C. Keep it as close as possible to 15°C and away from copper, manganese or tube generating Ozone.

Bucket

Replace Bucket Tooth Points

WARNING

AVOID DEATH OR SERIOUS INJURY

Due to the possibility of flying metal objects and to avoid death or serious injury, always wear safety helmet, protective gloves and eye protection when changing bucket teeth.

Stop engine and lock out the hydraulic controls before working on the bucket.

Time to Replace Tooth Points

Determine according to (Figure 45).

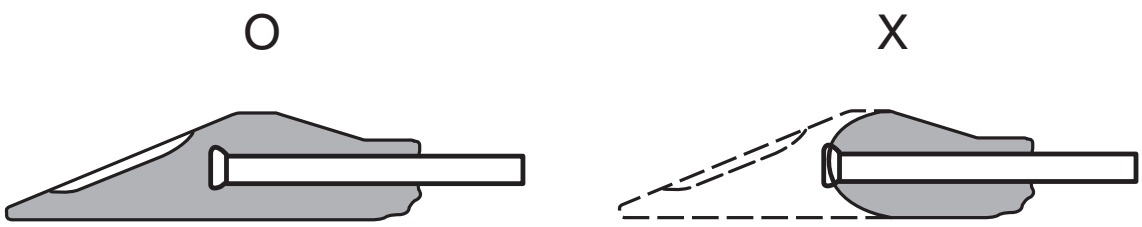


Figure 45

HAOJ022I

Check and Replace Tooth Points

1. Check whether the tooth point and side cutter are worn out or loosened.
2. Tighten the loose tooth point and side cutter gain, and replace those with severe wear.
3. Remove the nut(1, Figure 46), washer (2) and bolt (3), and remove the side cutter (4).
4. Remove the nut(5, Figure 46), washer (6) and bolt (7), and remove the tooth point (8).
5. Remove the worn and damaged tooth points and side cutters in the same order.
6. Assemble the new tooth point and sight cutter in the reverse order of disassembly.
7. Tighten the nut additionally after replacement or first operation.

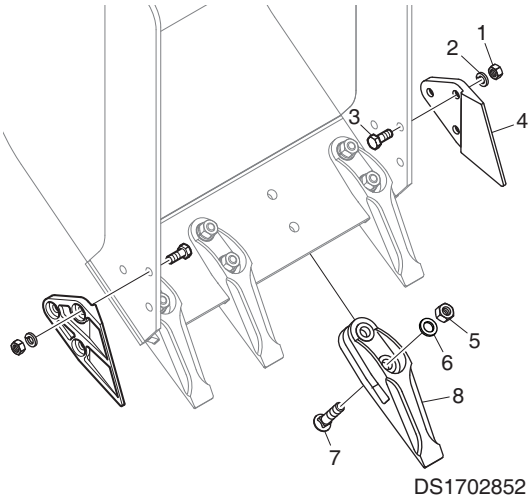


Figure 46

Replace Bucket

WARNING

AVOID DEATH OR SERIOUS INJURY

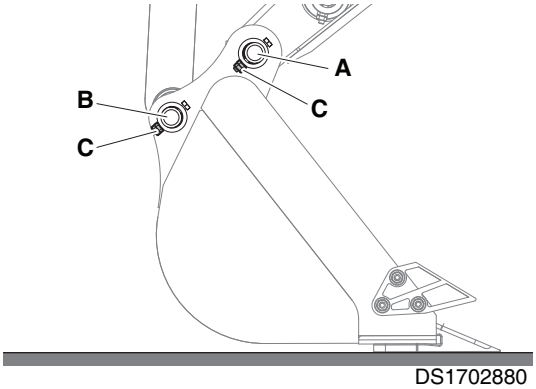
When attaching and detaching the pin, wear protective glasses such as the protective hat and gloves, since metal objects can fly.

Disassemble Bucket

1. Place the bucket on the ground as shown in the figure. (Figure 47)
2. Disassemble the pin retaining nut (C, Figure 47) and remove the pin (A)and pin (B) and then, separate the bucket from the arm.

   At this time, the O-ring (for seal) is also separated, so be careful not to damage it.

   NOTE: *If the bucket is placed on the ground with a strong force, the pin will not be easily removed.*

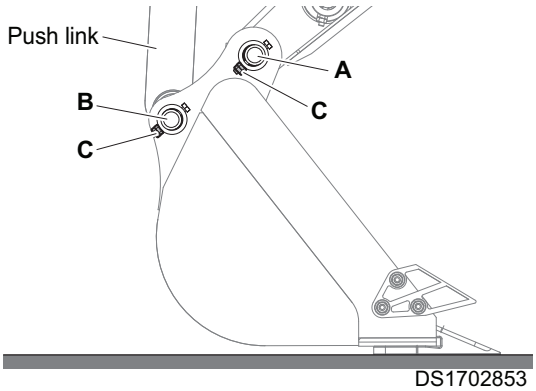


DS1702880

Figure 47

Mount Bucket

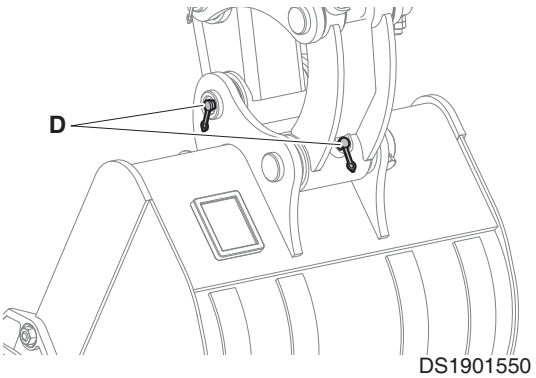
1. Clean and grease the pin and pin inserting holes.
2. Place the new bucket on the ground as shown in the figure. (Figure 48)
3. Connect the pin according to the position of the arm and insertion hole (A, Figure 48), and push link insertion hole (B, Figure 47). At this time, also install the O-ring.
4. Make sure to assemble the pin fixing bolt (C) when mounting the pin (A, Figure 48) and pin (B).



DS1702853

Figure 48

5. Grease the nipple(D, Figure 49).
6. When the bucket is assembled, run the engine at low speed without a load and move the bucket to the stroke end to check bucket interference.



DS1901550

Figure 49

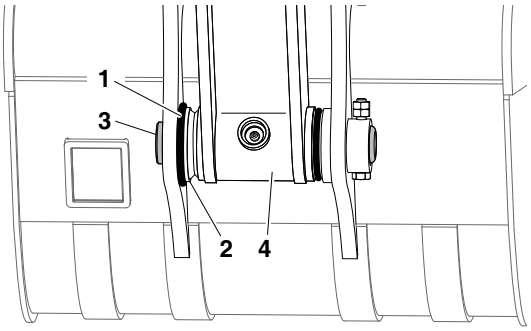
Replace Bucket O-ring

WARNING

AVOID DEATH OR SERIOUS INJURY

When removing or inserting a pin, always wear protective gears such the safety helmet, safety glasses and safety shoes due to a risk of injury caused by metal scattering.

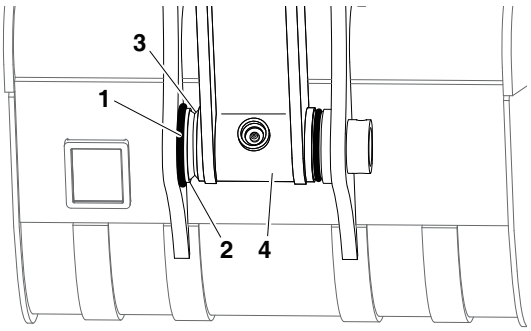
1. Inspect the bucket O-ring on a regular basis. Replace the O-ring if worn or damaged.
2. Roll the O-ring in use (1, Figure 50) and place it on the bucket boss (2, Figure 50). Remove the bucket pin (3, Figure 50) and then, remove the arm or push link (4, Figure 50).



DS1702855

Figure 50

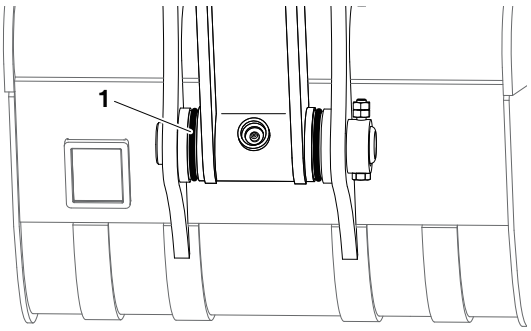
3. Remove the O-ring in use and install a new O-ring (1, Figure 51) to the bucket boss (2, Figure 51) temporarily. Check whether the push link (4, Figure 51) and the O-ring groove of the boss (3, Figure 51) is cleaned.
4. Align the arm or link with the bucket pinhole and insert the bucket pin.



DS1702856

Figure 51

5. Roll new O-ring (1, Figure 52) into O-ring groove.



DS1702897

Figure 52

Bucket Shim Assembly Procedure

Install New bucket

1. When installing a new bucket on an excavator, measure the inner width of the bucket (A, Figure 53) and the width of the arm (B).
2. Assembling after properly adjusting the interval between them by considering the dimension of (A, Figure 53) and (B), and the thickness of the shim.

   NOTE: *Make sure to insert more than 1 shim on the left and right side.*

   NOTE: *The quantity difference between left and right should be less than 1.*

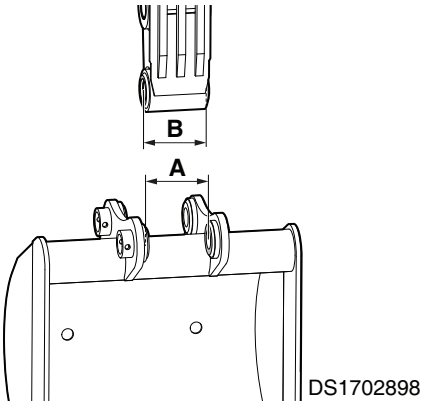


Figure 53

WARNING

AVOID DEATH OR SERIOUS INJURY

To check the end play (left and right) gap at the point where the bucket is attached, the bucket should be free to move. In other cases, always place the bucket on the ground or use a support block to prevent movement. In this procedure, stop the engine to prevent a sudden movement of the machine and attach the "DO NOT OPERATE" warning tag.

Check and Assemble Bucket Shim

1. Place the bucket tooth about 10 cm away above the ground as shown in the figure.

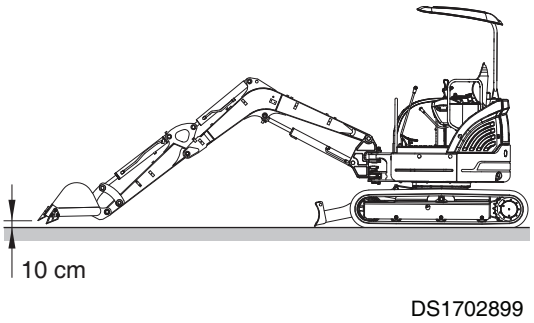


Figure 54

2. Push the bucket to one side and check the left and right gap (1, Figure 55) where the O-ring is attached. The gap should be between 0.2 and 0.7 mm wide. If the gap is too narrow, the bucket wears excessively. If the gap is too wide, noise can occur and there is a risk of slack control.
3. Push the bucket to the other side to check the gap on the opposite side.
4. If it needs to be adjusted, disassemble the bolt and pin, and add or remove the shim. Assemble the pins and bolts when adjustment is finished.

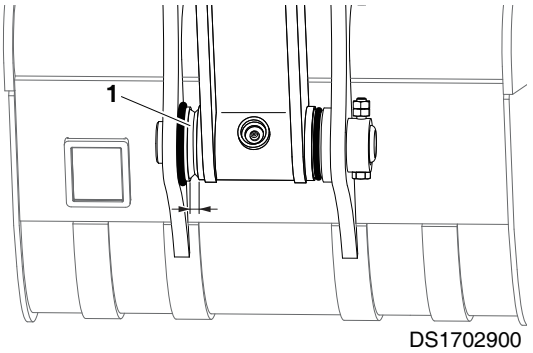


Figure 55

Track Tension

WARNING

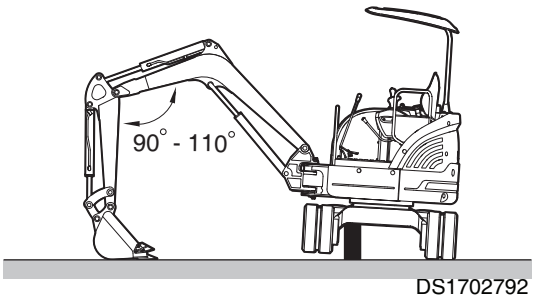
AVOID DEATH OR SERIOUS INJURY

When checking the track tension, it should be done by two people for safety.
Always follow these guidelines.

- **When one person operates controls in the cabin to lift up one frame and keep the frame position, the other person should check the dimension.**
- **Use all precautions to prevent the movement of the machine or lowering down of the side frame during maintenance.**
- **Park the excavator in an area that provides level, uniform ground support and/or use support blocks when necessary.**

Inspect the machine on a regular basis for the normal use of travel-related parts, which may be necessary depending on working conditions. This machine is equipped with rubber tracks, and measure the track tension according to the procedure below.

1. Swing the upper swing body by 90° against the track, lower the bucket, and lift the track off the ground. At this time, set the angle between the boom and the arm to 90° to 110°.
2. Support the block at the bottom of the track frame.
3. Rotate the lifted track forward and backward twice each.

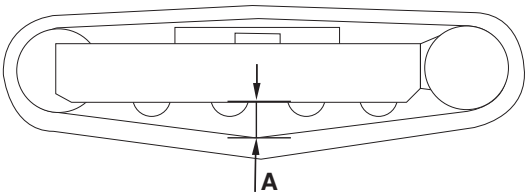


DS1702792

Figure 56

4. It is recommended to leave a space of 35 to 55mm between the bottom of the side frame and the top of the lowest rubber shoe. If the gap is less than 35 mm, the service life of the under carriage parts related to travel will be shortened.

   NOTE: *Too much mud, dirt or debris on the track assembly make this measurement inaccurate. Clean the tracks before measuring the gap.*



EX1300538

Figure 57

WARNING

AVOID DEATH OR SERIOUS INJURY

The track adjuster is under very high pressure. Do not release pressure suddenly.

<u>Do not release the track tension grease valve more than one turn when it is fully engaged.</u> Relieve pressure slowly and always keep your body away from the valve before performing maintenance. A problem with the valve threads can cause death or serious injury due to a high-velocity blowout of the valve itself.

Do not loosen or remove the grease fitting until the pressure is completely relieved by loosening the valve slowly.

Tension Adjustment Procedure

1. Inject grease into the inlet of the track adjuster.
2. Move the track back and forth to apply the grease evenly, then measure the track tension again.
   If the measured value is out of the permissible range, adjust it again.
3. If tension does not increase, replace the cylinder seal and track.

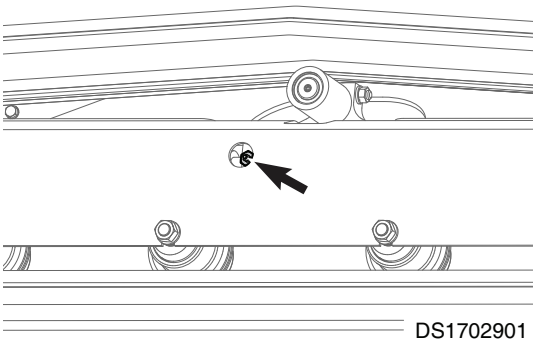


Figure 58

Tension Loosening Procedure

1. Release the grease valve of the track adjuster (1, Figure 59) to discharge grease, which will reduce the track tension. Slowly loosen the valve up to 1 time.
2. Tighten the valve after adjusting the track tension.
   - Tool: 22 mm ( )
   - Torque: 8 kg.m
3. Move the track back and forth to check the tension again.
4. If the tension is not correct, adjust it again.

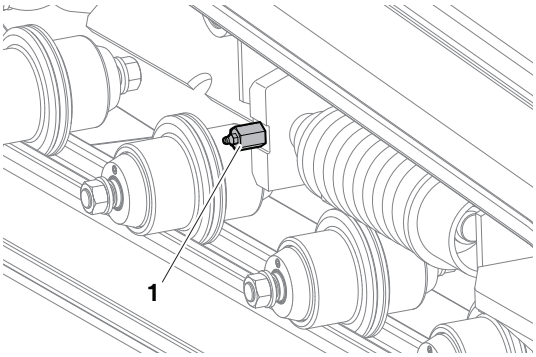
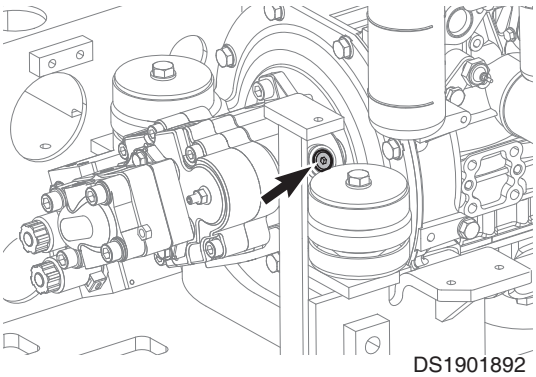


Figure 59

Venting and Priming Hydraulic System

Venting Main Pump

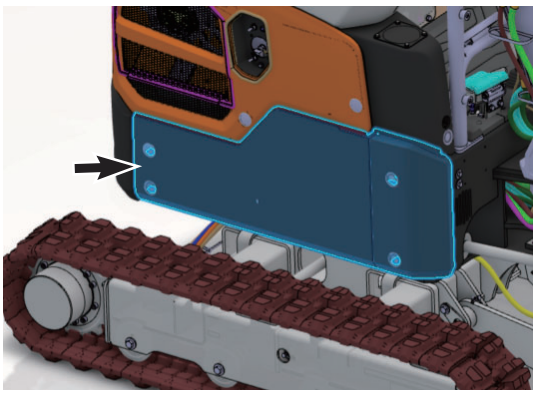
NOTE: *If pump is run without sufficient oil in the main hydraulic pump, damage can occur. Always vent pump of air after draining hydraulic system.*



DS1901892

Figure 60

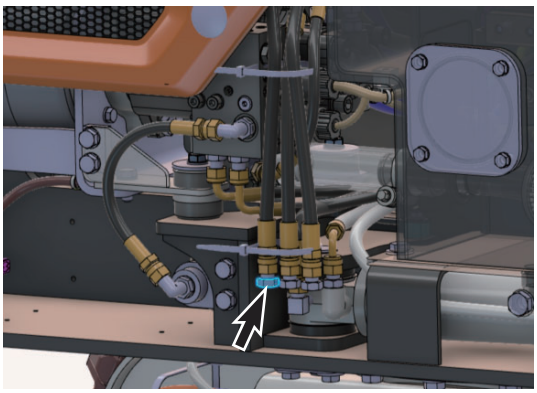
1. Stop the engine and remove the cover.



DS2300434

Figure 61

2. Disassemble the plug while lifting and holding the end of the hose higher than the top of the main pump.
3. Fasten the plug when hydraulic fluid starts to flow out.



DS2300440

Figure 62

Venting Cylinders

1. Run engine at "LOW IDLE", and extend and retract each cylinder to within 100 mm of fully stroking it 4 - 5 times.
2. Operate each cylinder 3 to 4 times at full stroke.
3. Operate each cylinder 4 to 5 times at full stroke to completely discharge air.

NOTICE

If the cylinder is operated to the end while the engine is running at high speed, air in the cylinder may damage the piston packing, which causes damage to the cylinder. Always discharge air when the engine is running at low speed.

Venting Travel Motor

1. Start the motor, idle at low speed, and wait for about 5 minutes.
2. Push and pull the travel lever little by little while the motor is running. At this time, do not run the motor engine at full speed.
3. After minute operation, move forward and backward within 1 m.
4. Operate the machine after confirming that the machine runs normally.

Venting Swing Motor

NOTE: *When the motor is started, hydraulic fluid is supplied to the make-up line.*

1. Move the joystick to the left and right little by little while the motor is running. At this time, do not swing the machine completely.
2. After minute operation, perform a swing motion by about 20° to the left and right.
3. Operate the machine after confirming that the machine runs normally.

Operation

1. Stop the engine after discharging air and start it again after 5 minutes or more.
   This is to release air bubbles mixed in the hydraulic fluid in the tank.
2. Run the engine at low speed and check the proper flow rate with a level gauge.
3. Check for oil leaks and clean the oil stain from the equipment.

Electrical System

NOTE: *Never disassemble electrical and electronic components. For replacement, consult with our sales office or branch.*

Battery (12V)

WARNING

AVOID DEATH OR SERIOUS INJURY

Battery electrolyte contains sulfuric acid and can quickly burn the skin and eat holes in clothing. If you spill acid on yourself, immediately flush the area with water.

Battery acid could cause blindness if splashed into the eyes. If acid gets into the eyes, flush them immediately with large quantities of water and seek professional medical attention immediately.

If you accidentally ingest acid, call a doctor or poison prevention center immediately.

When working with batteries, always wear safety goggles.

Battery generates hydrogen gas, so there is a danger of an explosion. Do not smoke near batteries, or do anything that will cause sparks.

Before working with batteries, stop engine and turn the starter switch to "O" (OFF) position.

Avoid short-circuiting the battery terminals through accidental contact with metallic objects, such as tools.

When removing or installing, check which is the positive (+) terminal and negative (-) terminal.

When removing the battery, first disconnect the negative (-) terminal. When installing the battery, first connect the positive (+) terminal.

If the terminals are loose, there is a danger that defective contact may generate sparks that will cause an explosion.

When installing the terminals, install them tightly.

Batteries in Cold Weather

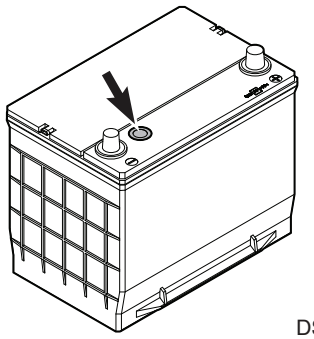
Batteries are consumed more in winter. Battery performance decreases as the temperature gets lower.

In extremely cold weather, remove batteries at night and move them to a warm location. This will help to keep them at a higher energy level.

Inspection of Battery Electrolyte Level

This machine has two maintenance free (MF) batteries, which does not require the addition to water under normal use.

When the charge indicator on the upper case of the battery is transparent, this indicates a low electrolyte state, and the battery cannot be used continuously because of a leakage or electrolyte loss due to a charging system error. Determine the cause of problem and replace the batteries immediately.



DS1702904

Figure 63

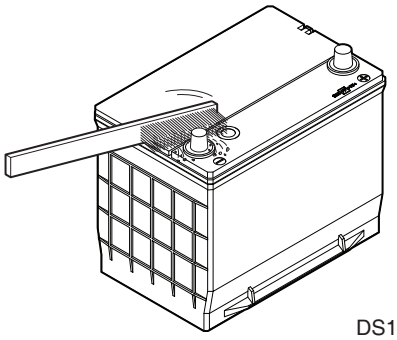
Check Charging State

Check charging state through the charging indicator.

- GREEN: Sufficiently charged.
- BLACK: Insufficiently charged - Charge the battery.
- TRNSPARENT: Insufficient battery fluid - Replace battery.

Check Battery Terminals

Be certain that battery is held securely in its compartment. Clean the battery terminals and the battery cable connectors. A solution of baking soda and water will neutralize acid on the battery surface, terminals, and cable connectors. Petroleum jelly or grease can be applied to the connectors to help prevent corrosion.



DS1702905

Figure 64

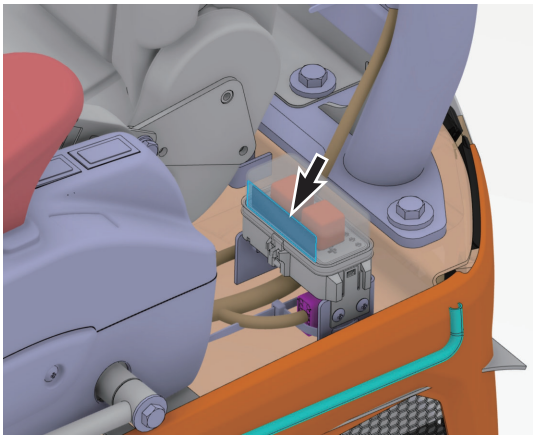
Battery Replacement

When the charging indicator shows a transparent condition, replace the battery.

Fuse Box

The fuse box is (Figure 65) under the driver's seat. The fuse prevents electrical devices from overloading or shorting.
A decal attached inside the fuse box's cover indicates the function and amperage of each fuse.

Spare fuses are installed in the fuse box.
Change a fuse if the element separates. If the element of a new fuse separates, check the circuit and repair the circuit.



DS2300441

Figure 65

WARNING

AVOID DEATH OR SERIOUS INJURY

Always replace fuses with the same type and capacity fuse that was removed. Improper fuses can cause electrical damage and result in a fire, death or serious injury.

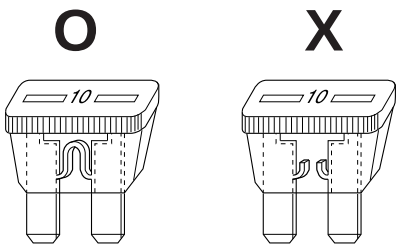
Fuse Classification Table

Number	Description	Capacity
1	Main fuse (Const.)	20A
2	Main fuse (key ON)	30A
3	BMS, TMS	10A
4	PDU, OBC, VCU, TMS	10A
5	Key switch, hour meter	5A
6	Gauge panel, keypad	10A
7	Charging switch, LV main relay	10A

Number	Description	Capacity
8	Key ON signal (BMS, OBC, hour meter)	10A
9	-	10A
10	High speed/quick coupler solenoid, Track extension solenoid	10A
11	Inverter	10A
12	Connector check, horn, pilot buzzer, work light	10A
13	Power socket	10A
14	Emergency stop, pilot cut-off	10A

Fuses

1. The fuses in the fuse box are used to protect the various electrical circuits and their components from being damaged. The fuses used are standard automotive type fuses.
2. The section on "Fuse Classification Table" on page 4-46 lists the circuits and the fuse amperage required for each circuit. If a fuse blows, determine the cause and repair any electrical faults or failures.
3. Do not insert a higher amperage fuse into a lower amperage slot. Serious damage to the electrical components or fire can result.



HAOC670L

Figure 66

NOTICE

Before replacing a fuse, be sure to turn starter switch to "OFF" position.

Maintenance in Special Conditions

NOTE: *See "Operation in Extreme Conditions" on page 3-44 for other recommendations.*

Conditions	Maintenance required
Working in muddy water, rain and snow	Perform a walk around inspection to check for any loose fittings, obvious damage to the machine or any fluid leakage.
	After completing operations, clean mud, rocks or debris from the machine. Inspect for damage, cracked welds or loosened parts.
	Perform all daily lubrication and service.
	If the operations were in salt water or other corrosive materials, make sure to flush the affected equipment with fresh water and check that all control systems operate properly.
Operating in an extremely dusty or hot environment.	Clean the machine on a more frequent basis.
	Clean the oil cooler fins to remove embedded dirt and dust.
Operating in rocky terrain.	Check the undercarriage and track assemblies for damage or excessive wear.
	Inspect for loose or damaged fittings or bolts.
	Relax track tension.
	On a more frequent basis, inspect the front end attachments for damage or excessive wear.
	Install a top guard and front guard as required for protection against falling rock.
Operating in extreme cold.	Use the proper fuel for the temperature conditions.
	Verify the condition of the batteries. In extreme cold weather, remove batteries at night and store them in a warmer area.
	Remove mud buildup as soon as possible to prevent it from freezing to the undercarriage and causing damage.

Transportation

Check local laws and regulations regarding weight, width, and length of a load before making preparations for transporting on public roads or highways.

The hauling vehicle, trailer, and load must comply with all applicable laws and regulations.

Check the intended route for road width, overhead clearances, weight restrictions, and traffic control regulations. Special approval or permits may be required.

Loading and Unloading

Warning when Removing Counterweight / Canopy / Front

WARNING

AVOID DEATH OR SERIOUS INJURY

Removal of the counterweight, canopy, and front attachment from the machine (boom, arm, bucket) or any other part can affect the stability of the machine. This could cause the unexpected movement of the machine.
This result may lead to personal injury and we are not responsible for it.
Never remove counterweight or front attachment unless the upper structure is in-line with the lower structure.
Never rotate the upper structure once the counterweight or front attachment has been removed.

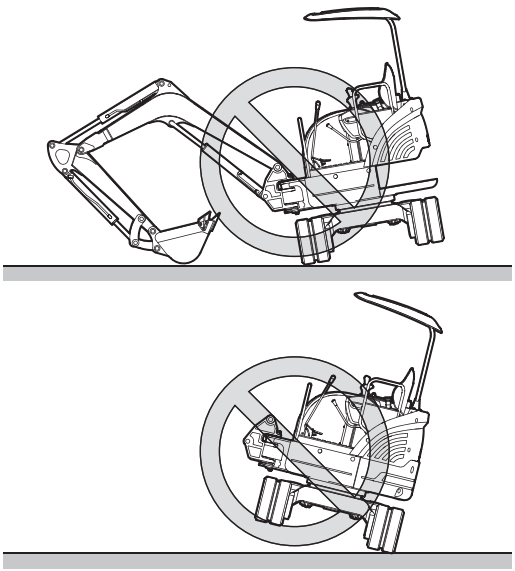
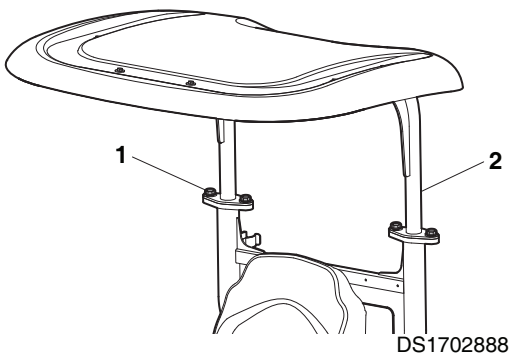


Figure 1 DS1702743

When Removing Canopy

NOTE: The canopy mounted on this machine can be mounted or dismounted as it is manufactured for the purpose of machine transportation. Never remove the canopy at your own discretion except for mounting and dismounting for machine transportation.

1. Remove 4 bolts (1, Figure 2) on the top of the canopy.
   - Tool: 19 mm ( )
2. Hold the upper side of the canopy body (2, Figure 2) and it.



DS1702888

Figure 2

When Assembling Canopy

1. Assemble in reverse order of disassembly.
   - Tool: 19 mm ( )
   - Torque: 11 kg.m

WARNING

AVOID DEATH OR SERIOUS INJURY

When transporting the machine, know the width, height, length, and weight.

When loading or unloading the machine, make sure to run the engine at the lowest speed setting and travel at the slowest speed possible.

Make sure that ramp being used can handle the weight of the machine.

If required, add blocking under the ramp for additional support.

Make sure that ramp surface is free of grease, debris, or mud that could cause the machine to slip or slide.

Make sure that trailer is parked on firm and level ground before attempting to load/unload the excavator.

If it is necessary to turn the machine while it is on the trailer, make sure to do this at the slowest engine and travel speeds possible.

Make sure to secure the excavator onto the trailer as required by local transportation laws and regulations.

1. Make sure that trailer is parked on firm and level ground. See Figure 3.
2. Make sure that ramps that are being used are designed to handle the weight of the excavator. If required, add blocking under the ramp to provide additional support.
3. The ramp angle must be less than a 15° angle. Ramps steeper than this can cause traction or stability problems when loading or unloading.
4. Set the travel switch to low.
5. Move engine speed to "LOW IDLE".
6. If the machine is equipped with work equipment, position the work equipment toward the front of the excavator, and travel forward to load it.
7. The unit does not require disassembly for normal over-the-road transportation. If the boom and arm need to be removed, the counterweight will place more weight on the rear of the machine. Make sure to back the excavator onto the trailer so the counterweight end (heavy end) of the excavator is positioned on the ramp first. See Figure 4.

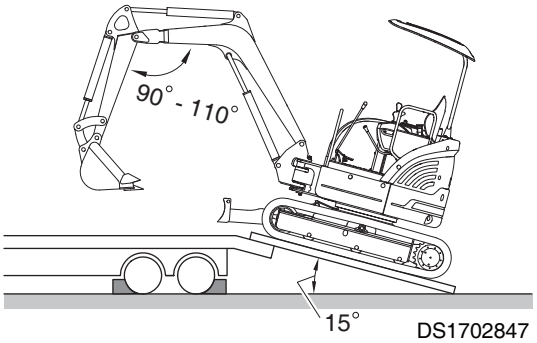


Figure 3

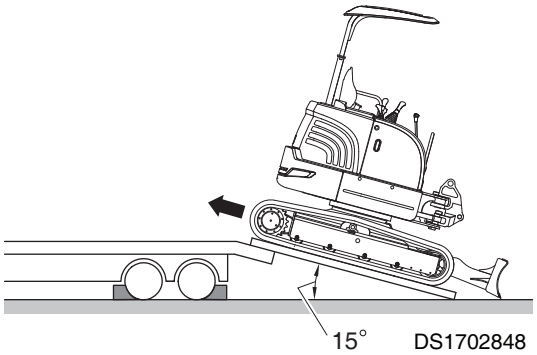
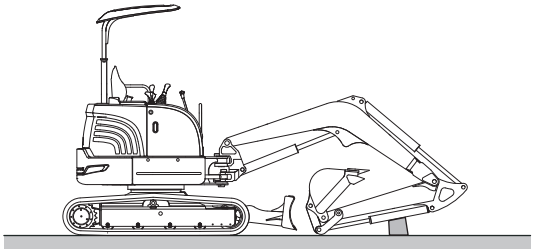


Figure 4

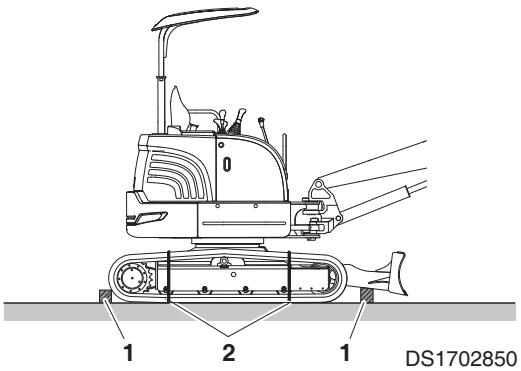
8. Extend bucket and arm cylinders to maximum length and then lower the boom slowly.
9. Move safety lever to "LOCK" position.
10. Stop engine by turning key to "OFF" position.
11. Remove key from starter switch.
12. Lock all doors and covers.



DS1702849

Figure 5

13. Make sure to secure the excavator onto the trailer before transporting. Place blocking (1, Figure 6) in front of and behind each track. Tie front and rear (2) of the lower frame with wire cable as required by local transportation regulations.
14. Refer to "Specification" section of this manual for overall machine height and width dimensions. Make sure to position the excavator as shown.
    If not transported in this position, the height measurements may be different.



DS1702850

Figure 6

Lifting Machine

WARNING

AVOID DEATH OR SERIOUS INJURY

Never lift the machine with a person in the cabin or on the machine.

Never enter the area under or around a raised machine.

Improper lifting can allow load to shift and cause death or serious injury or property damage.

When lifting, move the safety lever to "lock" position to prevent the machine from moving unexpectedly.

Use only properly rated cables and slings.

1. Refer to "Specification" section of this manual for weight and dimensional information. Weight may differ depending on the options.
2. Life the machine as shown in (Figure 7).
3. Use cables, slings and fixing devices suitable for lifting. Use the cable of sufficient length to prevent contact between the machine and cable.
4. Install a guard between the lifting cable, cabin and upper body to protect the machine.
5. The gap between the lifting cables should not exceed 45°.
6. Keep the machine level and balanced when lifting.

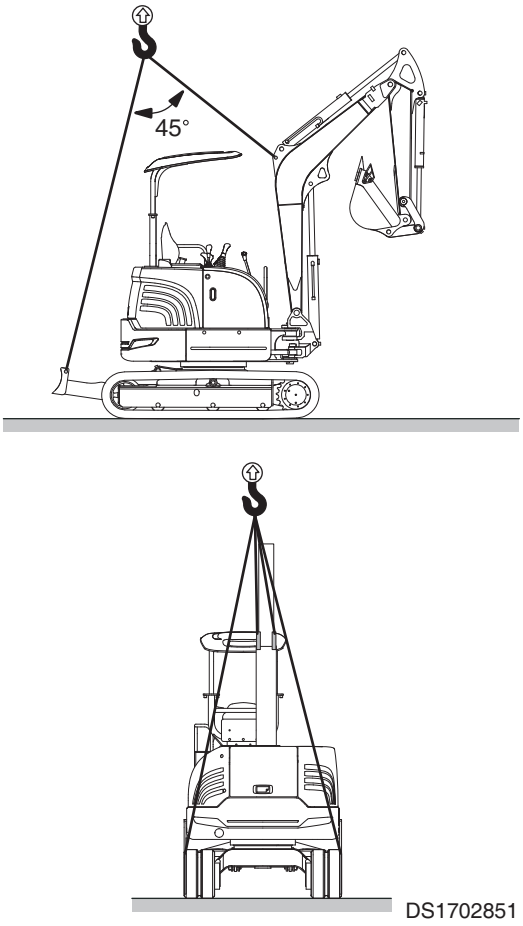


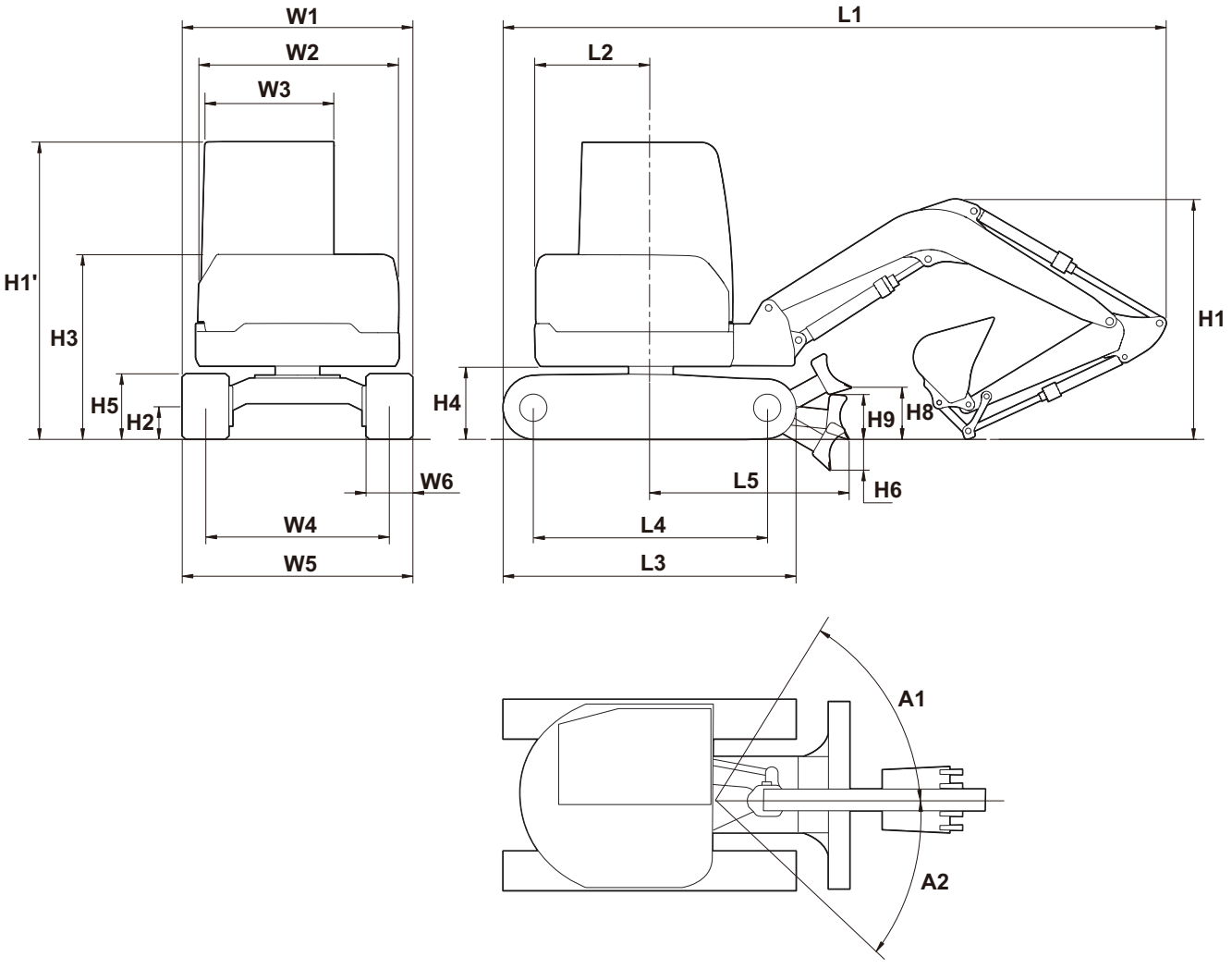
Figure 7

Specification

Standard Specification

Component			Specification
Bucket Capacity	CECE		0.038 m^3 (0.05 yd^3)
	SAE		0.05 m^3 (0.07 yd^3)
Machine Weight			1.87 tons
Power System (EPS)	Engine Output (Peak)		20.5 kWh
	Engine Output (Continuous)		6 kW
	Battery Capacity		20.4 kW
Hydraulic Pump	Type		Split, Piston Shaft
	Maximum Discharge Quantity		2 x 17.6
	System Pressure	P1, P2/P3	206 bar / 163 bar
Performance	Digging Force (ISO)	Bucket (STD)	1.53 tons
		Arm (STD)	0.9 tons
	Swing Speed		9.6 rpm
	Travel Speed	High Speed	3.7 km/h
		Low Speed	2 km/h
	Gradeability		30˚(58% slope)
	Ground Contact Pressure		309 kg/cm^2

Overall Dimensions



DS2104837

Figure 1

Boom				**1.725 m (5' 8")**
Arm				**1.1 m (0' 4")**
Bucket				**0.05 m^3 (0.07 yd^3)**
Cabin				**4 Pillar Canopy**
Overall	L1	Overall Length		3,460 mm (11' 4")
	H1	Overall Height	Boom	1,283 mm (4' 3")
			Cabin	2,345 mm (7' 8")
	W1	Overall Width		950 (*1,360) mm (3' 1" (*4' 6"))
	R1	Tail Swing Radius		720 mm (2' 4")
	R2	Minimum Front Swing Radius	Fixed	1,535 mm (5' 0")
			B/S	1,090 mm (3' 7")
	H2	Minimum Ground Clearance		155 mm (0' 6")
Swing Body	L2	Tail End Distance		720 mm (2' 4")
	W2	Upper Body Width		950 mm (3' 1")
	W3	Cab Width		950 mm (3' 1")
	H3	Total Height to Cover		1,151 mm (3' 9")
	H4	Counterweight Ground Clearance		419 mm (1' 4")
	A1 / A2	Boom Swing Angle (left/right)		45° / 70°
Undercarriage	H5	Track Height		356 mm (1' 2")
	L3	Track Length		1,612 mm (5' 3")
	L4	Distance between Tumbler Centers		1,258 mm (4' 2")
	W4	Track Gauge		720 (*1,130) mm (2' 4" (*3' 8"))
	W5	Undercarriage Width STD		950 (*1,360) mm (3' 1" (*4' 6"))
	W6	Shoe Width		230 mm (0' 9")
	etc.	Grouser/Rug Height		26 mm (0' 1")
Lower Attachment	H6	Dozer Digging Depth		234 mm (0' 9")
	H8	Dozer Lift Clearance		251 mm (0' 10")
	H9	Dozer Blade Height		265 mm (0' 10")
	L8	Distance to End of Dozer		1,045 mm (3' 5")

*: With the extended track

Digging Force

Description			Unit	1.725 m boom
Bucket	0.05 m^3	ISO	kN	15
			kg	1,532
			lb	3,377
Arm	0.95 m		kN	8.5
			kg	868
			lb	1,914
	1.1 m		kN	7.7
			kg	785
			lb	1,731

Working Range

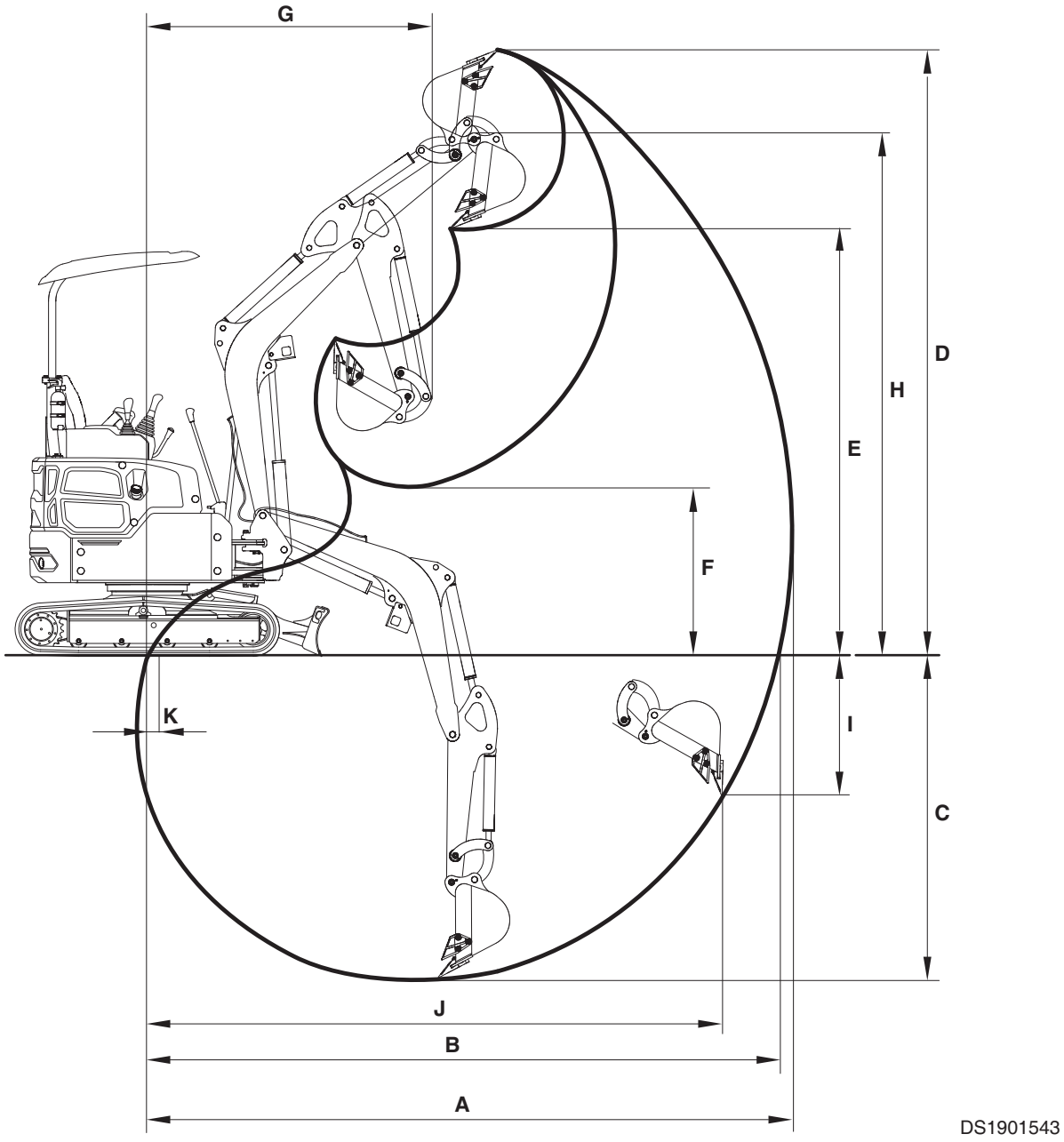
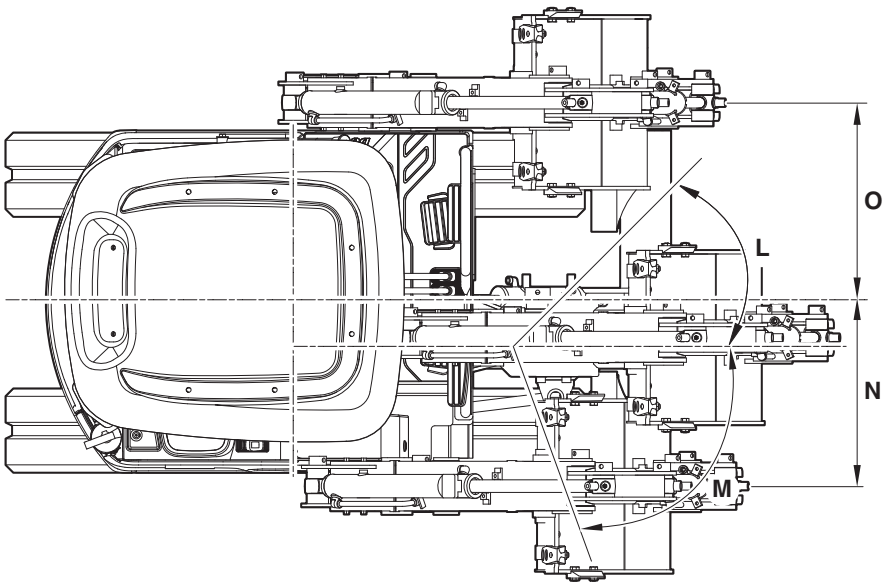


Figure 2



DS1901635

Figure 3

Dimension	Boom	1.725 m (5' 8")	
	Arm	0.95 m (3' 1")	1.1 m (3' 7")
	Bucket Type (ISO)	0.05 m³ (0.07 yd³)	
A	Max. Digging Radius	3,830 mm (12' 7")	3,975 mm (13' 0")
B	Max. Vertical Digging Depth	3,725 mm (12' 3")	3,875 mm (12' 9")
C	Max. Digging Depth	2,200 mm (7' 3")	2,350 mm (7' 9")
D	Max. Digging Height	3,680 mm (12' 1")	3,650 mm (11' 12")
E	Max. Dump Height	2,625 mm (8' 7")	
F	Min. Dump Height	1,020 mm (3' 4")	810 mm (2' 8")
G	Min. Swing Radius	1,490 mm (4' 11")	1,535 mm (5' 0")
H	Max. Bucket Pin Height	3,190 mm (10' 6")	
I	Max. Vertical Wall Depth	1,010 mm (3' 4")	1,130 mm (3' 8")
J	Max. Vertical Digging Radius	3,250 mm (10' 8")	3,340 mm (10' 11")
K	Min. Digging Reach	180 mm (0' 7")	-10 mm (0' 0")
L	Boom Swing Angle (Left)	45°	
M	Boom Swing Angle (Right)	70°	
N	Boom Offset (Right)	513 mm (1' 8")	
O	Boom Offset (Left)	553 mm (1' 10")	

Excavator Rated Lift Capacity Tables

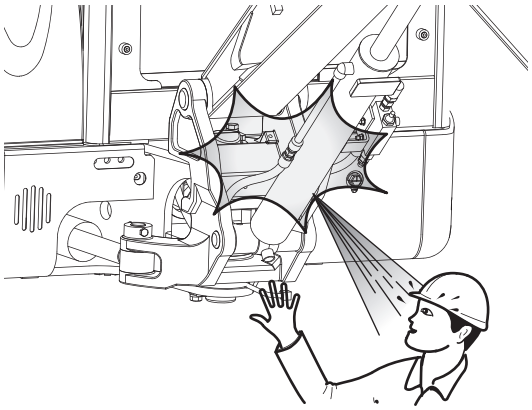
NOTICE

Always keep operators manual in operator station.
Whenever you handling and lifting objects, ensure operator manual available on the station and refer the lifting chart.
See the specification handbook for specifications not listed below.

WARNING

AVOID DEATH OR SERIOUS INJURY

During the lifting operation, the assistant should not be near the boom cylinder. If hydraulic fluid leaks due to the breakdown of the boom hose, arm hose or bucket house during operation, or other hydraulic lines, serious injury can be cause, which can, in turn, cause an injury due to a caused by self-weight of lifting object or front work device.
When replacing the pertinent hose, the genuine products provided by us should be used, and our service person should perform the work.



DS1702059

Figure 4

WARNING

AVOID DEATH OR SERIOUS INJURY

All rated lift capacities are based on the machine and the load both remaining level at all times, and the machine may roll over if the machine or the lifting object moves, because the value of gravity acting on the lift increases. Therefore, handle the weight below the rated value in consideration of the change in gravitational acceleration caused by machine movement.
The excavator can roll over it these instructions are not followed, which may cause serious damage to the machine and fatal injury to the operator.

1. The lifting operation must be performed on a homogenous, level and firm location on the ground.
2. The operator should prepare proper work conditions considering the followings.
    - When the ground is soft or uneven
    - Unlevel terrain.
    - Side loads.
    - Modifications or poor maintenance of the excavator.
    - A possibility of failing to lift an object squarely over the end or over the side of the machine.

3. When a load is in the air, the operator should be careful about the followings.
   Avoid the tilting of an object due to incomplete connection.
   - Do not move the machine with an raised object.
   - Do not swing quickly with an raised object.
   - A lifting object can become unbalanced if the hook line is twisted and starts to rotate.
   - If the surface area of the load is large enough, wind gusts can create side loads.
   - Keep the arm end point directly over the load.
   - Using the tag line (auxiliary guide line) properly can be helpful.
4. Do not operate the machine with heavy objects in the air.
5. Pull the heavy object inside the arm when performing swing operation and place it on a safe position in terms of side stability.
   At this time, keep a proper distance between heavy object and machine.
6. There are asterisks (*) on the weight table.
   An asterisk (*) indicates that 87% of the hydraulic overload relief pressure is not exceeded.
7. All other ratings are determined not to exceed 75% of tipping capacity.
8. Do not attempt to lift or hold any load that exceeds rated load capacity, considering the center distance of the lifting object.

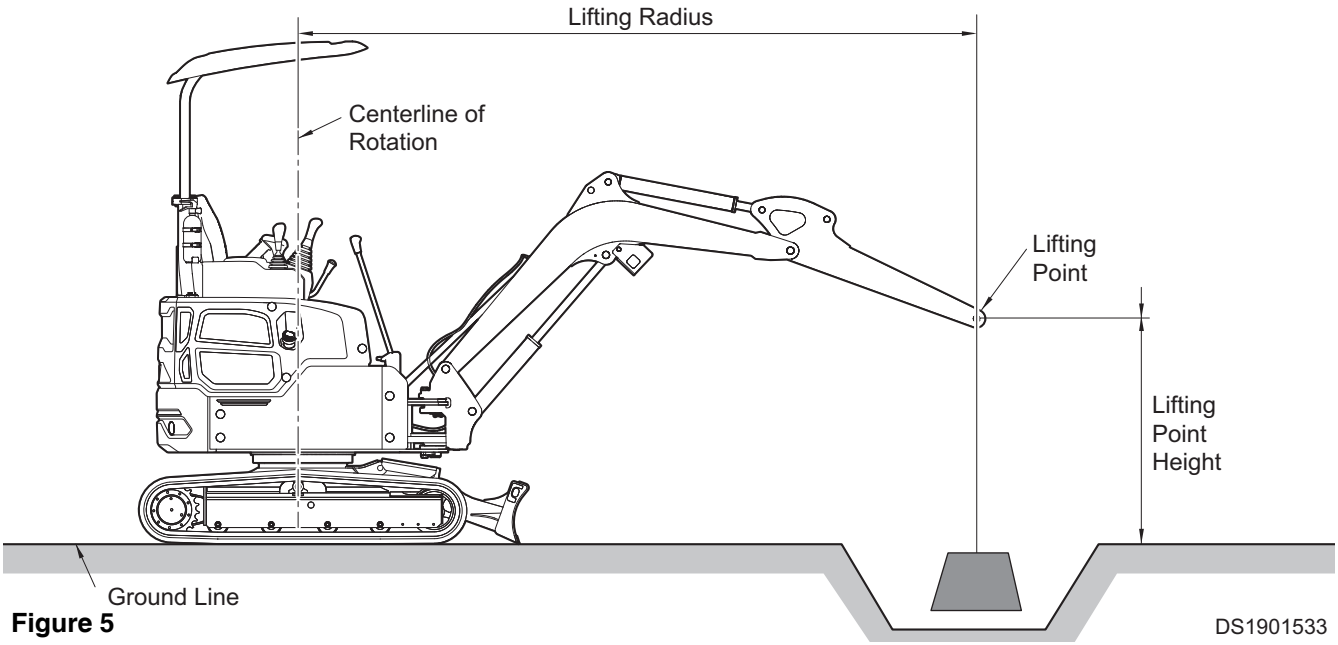
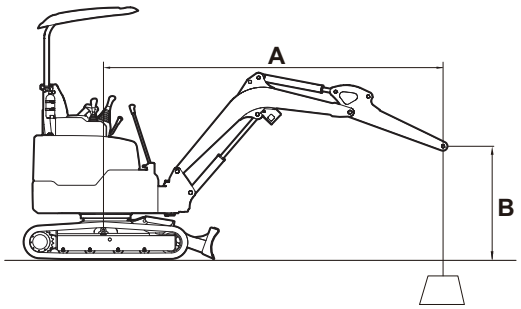


Figure 5

9. When calculating the lifting weight, the weight of the lifting object should be added to the weight of the auxiliary lifting equipment.
10. The lifting point should be placed on a bucket, etc.

NOTICE

Select the Digging Mode switch on the Instrument Panel before using the excavator for lifting work. Fully warm up before lifting operation.



Boom : 1.725 m
Arm : 0.95 m
Bucket : Without Bucket
Counterweight : 201 kg
Shoe : 230 mm (Rubber)
Dozer : Dozer Down_2 Pillar Canopy
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2300442

Figure 6

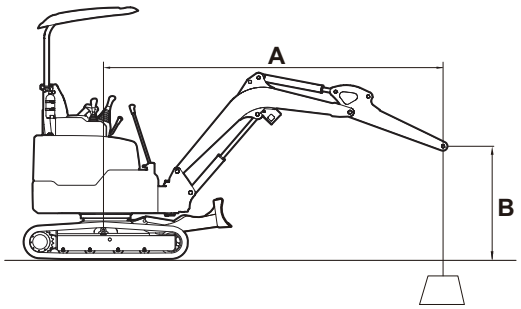
METRIC 1,000 kg

A (m) / B (m)	1		1.5		2		2.5		3		MAX. REACH		
													A (m)
3					* 0.38	* 0.38					* 0.39	* 0.39	2.08
2.5							* 0.36	* 0.36			* 0.34	* 0.34	2.65
2					* 0.36	* 0.36	* 0.36	* 0.36			* 0.31	* 0.31	2.99
1.5			* 0.65	* 0.65	* 0.48	* 0.48	* 0.41	* 0.41	* 0.38	0.32	* 0.31	0.29	3.18
1					* 0.64	0.58	* 0.48	0.41	* 0.41	0.32	* 0.32	0.28	3.26
0.5					* 0.76	0.56	* 0.54	0.40	* 0.43	0.31	* 0.35	0.28	3.25
0			* 0.77	* 0.77	* 0.79	0.55	* 0.57	0.40	* 0.44	0.31	* 0.39	0.29	3.14
-0.5	* 0.85	* 0.85	* 1.14	0.87	* 0.76	0.55	* 0.55	0.39			* 0.42	0.32	2.91
-1	* 1.30	* 1.30	* 0.94	0.88	* 0.65	0.55	* 0.44	0.4			* 0.43	0.39	2.53
-1.5			* 0.56	* 0.56							* 0.39	* 0.39	1.83

FEET 1,000 lb

A (ft) / B (ft)	10		15		20		25		30		MAX. REACH		
													A (ft)
30					* 0.84	* 0.84					* 0.87	* 0.87	6.82
25							* 0.79	* 0.79			* 0.74	* 0.74	8.70
20					* 0.79	* 0.79	* 0.79	* 0.79			* 0.69	* 0.69	9.80
15			* 1.43	* 1.43	* 1.05	* 1.05	* 0.90	* 0.90	* 0.83	0.71	* 0.68	0.65	10.42
10					* 1.40	1.27	* 1.05	0.91	* 0.90	0.70	* 0.71	0.61	10.71
5					* 1.67	1.23	* 1.19	0.89	* 0.96	0.68	* 0.76	0.61	10.67
0			* 1.70	* 1.70	* 1.75	1.21	* 1.25	0.87	* 0.97	0.68	* 0.87	0.64	10.29
-5	* 1.88	* 1.88	* 2.51	1.93	* 1.68	1.20	* 1.21	0.87			* 0.93	0.71	9.55
-10	* 2.86	* 2.86	* 2.07	1.95	* 1.42	1.21	* 0.98	0.88			* 0.94	0.87	8.31
-15			* 1.23	* 1.23							* 0.87	* 0.87	6.02

1. Load point is the end of the arm.
2. Capacities marked with an asterisk (*) are limited by hydraulic capacities.
3. Lift capacities shown do not exceed 75% of minimum tipping loads or 87% of hydraulic capacities.
4. The least stable position is over the side.
5. Lift capacities apply only to the machine as originally manufactured and normally equipped by the manufacturer.
6. Lift capacities are in compliance with ISO 10567.



Boom : 1.725 m
Arm : 0.95 m
Bucket : Without Bucket
Counterweight : 201 kg
Shoe : 230 mm (Rubber)
Dozer : Dozer Up_2 Pillar Canopy
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2300443

Figure 7

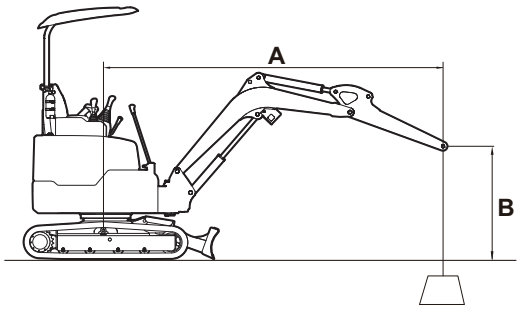
METRIC 1,000 kg

A (m) / B (m)	1		1.5		2		2.5		3		MAX. REACH		
													A (m)
3					* 0.38	* 0.38					* 0.39	* 0.39	2.08
2.5							* 0.36	* 0.36			* 0.34	* 0.34	2.65
2					* 0.36	* 0.36	* 0.36	* 0.36			0.31	* 0.31	2.99
1.5			* 0.65	* 0.65	* 0.48	* 0.48	0.41	* 0.41	0.31	0.32	0.28	0.29	3.18
1					0.55	0.58	0.39	0.41	0.30	0.32	0.26	0.28	3.26
0.5					0.53	0.56	0.38	0.40	0.30	0.31	0.26	0.28	3.25
0			* 0.77	* 0.77	0.52	0.55	0.38	0.40	0.29	0.31	0.27	0.29	3.14
-0.5	* 0.85	* 0.85	0.84	0.87	0.52	0.55	0.38	0.39			0.30	0.32	2.91
-1	* 1.30	* 1.30	0.85	0.88	0.53	0.55	0.38	0.40			0.37	0.39	2.53
-1.5			* 0.56	* 0.56							* 0.39	* 0.39	1.83

FEET 1,000 lb

A (ft) / B (ft)	10		15		20		25		30		MAX. REACH		
													A (ft)
30					* 0.84	* 0.84					* 0.87	* 0.87	6.82
25							* 0.79	* 0.79			* 0.74	* 0.74	8.70
20					* 0.79	* 0.79	* 0.79	* 0.79			0.68	* 0.69	9.80
15			* 1.43	* 1.43	* 1.05	* 1.05	0.89	* 0.90	0.67	0.71	0.62	0.65	10.42
10					1.21	1.27	0.87	0.91	0.66	0.70	0.58	0.61	10.71
5					1.17	1.23	0.84	0.89	0.65	0.68	0.58	0.61	10.67
0			* 1.70	* 1.70	1.15	1.21	0.83	0.87	0.64	0.68	0.61	0.64	10.29
-5	* 1.88	* 1.88	1.85	1.93	1.15	1.20	0.83	0.87			0.67	0.71	9.55
-10	* 2.86	* 2.86	1.87	1.95	1.16	1.21	0.84	0.88			0.82	0.87	8.31
-15			* 1.23	* 1.23							* 0.87	* 0.87	6.02

1. Load point is the end of the arm.
2. Capacities marked with an asterisk (*) are limited by hydraulic capacities.
3. Lift capacities shown do not exceed 75% of minimum tipping loads or 87% of hydraulic capacities.
4. The least stable position is over the side.
5. Lift capacities apply only to the machine as originally manufactured and normally equipped by the manufacturer.
6. Lift capacities are in compliance with ISO 10567.



Boom : 1.725 m
Arm : 1.1 m
Bucket : Without Bucket
Counterweight : 201 kg
Shoe : 230 mm (Rubber)
Dozer : Dozer Down_4 Pillar Canopy
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2300444

Figure 8

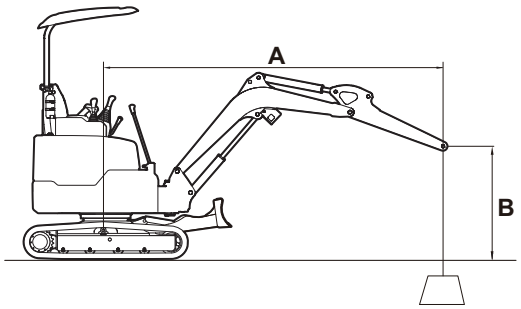
METRIC 1,000 kg

A (m) / B (m)	0.5		1		1.5		2		2.5		3		MAX. REACH		
															A (m)
3													* 0.33	* 0.33	2.32
2.5									* 0.31	* 0.31			* 0.28	* 0.28	2.83
2									* 0.32	* 0.32	* 0.33	0.32	* 0.26	* 0.26	3.15
1.5							* 0.42	* 0.42	* 0.37	* 0.37	* 0.35	0.32	* 0.26	* 0.26	3.33
1							* 0.58	0.57	* 0.45	0.41	* 0.39	0.31	* 0.27	0.26	3.41
0.5							* 0.72	0.55	* 0.52	0.40	* 0.42	0.31	* 0.29	0.26	3.39
0					* 0.77	* 0.77	* 0.79	0.54	* 0.56	0.39	* 0.44	0.30	* 0.33	0.27	3.29
-0.5	* 0.73	* 0.73	* 0.76	* 0.76	* 1.12	0.86	* 0.77	0.54	* 0.56	0.39	* 0.42	0.30	* 0.39	0.29	3.08
-1	* 0.98	* 0.98	* 1.12	* 1.12	* 1.02	0.87	* 0.69	0.54	* 0.49	0.39			* 0.41	0.35	2.72
-1.5			* 1.29	* 1.29	* 0.71	* 0.71	* 0.47	* 0.47					* 0.40	* 0.40	2.13

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		25		30		MAX. REACH		
															A (ft)
30													* 0.72	* 0.72	7.62
25									* 0.68	* 0.68			* 0.62	* 0.62	9.29
20									* 0.71	* 0.71	* 0.74	0.71	* 0.58	* 0.58	10.32
15							* 0.92	* 0.92	* 0.82	* 0.82	* 0.78	0.70	* 0.58	* 0.58	10.91
10							* 1.29	1.27	* 0.99	0.90	* 0.85	0.69	* 0.59	0.57	11.18
5							* 1.59	1.22	* 1.14	0.88	* 0.92	0.67	* 0.64	0.56	11.14
0					* 1.70	* 1.70	* 1.73	1.19	* 1.23	0.86	* 0.96	0.66	* 0.72	0.59	10.78
-5	* 1.61	* 1.61	* 1.68	* 1.68	* 2.47	1.89	* 1.70	1.18	* 1.23	0.85	* 0.92	0.66	* 0.86	0.64	10.09
-10	* 2.15	* 2.15	* 2.48	* 2.48	* 2.25	1.91	* 1.51	1.19	* 1.08	0.86			* 0.90	0.77	8.92
-15			* 2.84	* 2.84	* 1.56	* 1.56	* 1.03	* 1.03					* 0.88	* 0.88	7.00

1. Load point is the end of the arm.
2. Capacities marked with an asterisk (*) are limited by hydraulic capacities.
3. Lift capacities shown do not exceed 75% of minimum tipping loads or 87% of hydraulic capacities.
4. The least stable position is over the side.
5. Lift capacities apply only to the machine as originally manufactured and normally equipped by the manufacturer.
6. Lift capacities are in compliance with ISO 10567.



Boom : 1.725 m
Arm : 1.1 m
Bucket : Without Bucket
Counterweight : 201 kg
Shoe : 230 mm (Rubber)
Dozer : Dozer Up_4 Pillar Canopy
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2300445

Figure 9

METRIC 1,000 kg

A (m) / B (m)	0.5		1		1.5		2		2.5		3		MAX. REACH		
															A (m)
3													* 0.33	* 0.33	2.32
2.5									* 0.31	* 0.31			* 0.28	* 0.28	2.83
2									* 0.32	* 0.32	0.31	0.32	* 0.26	* 0.26	3.15
1.5							* 0.42	* 0.42	* 0.37	* 0.37	0.30	0.32	0.26	* 0.26	3.33
1							0.55	0.57	0.39	0.41	0.30	0.31	0.24	0.26	3.41
0.5							0.53	0.55	0.38	0.40	0.29	0.31	0.24	0.26	3.39
0					* 0.77	* 0.77	0.51	0.54	0.37	0.39	0.29	0.30	0.25	0.27	3.29
-0.5	* 0.73	* 0.73	* 0.76	* 0.76	0.82	0.86	0.51	0.54	0.37	0.39	0.29	0.30	0.28	0.29	3.08
-1	* 0.98	* 0.98	* 1.12	* 1.12	0.83	0.87	0.51	0.54	0.37	0.39			0.33	0.35	2.72
-1.5			* 1.29	* 1.29	* 0.71	* 0.71	* 0.47	* 0.47					* 0.40	* 0.40	2.13

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		25		30		MAX. REACH		
															A (ft)
30													* 0.72	* 0.72	7.62
25									* 0.68	* 0.68			* 0.62	* 0.62	9.29
20									* 0.71	* 0.71	0.68	0.71	* 0.58	* 0.58	10.32
15							* 0.92	* 0.92	* 0.82	* 0.82	0.67	0.70	0.57	* 0.58	10.91
10							1.21	1.27	0.86	0.90	0.65	0.69	0.54	0.57	11.18
5							1.16	1.22	0.84	0.88	0.64	0.67	0.53	0.56	11.14
0					* 1.70	* 1.70	1.14	1.19	0.82	0.86	0.63	0.66	0.56	0.59	10.78
-5	* 1.61	* 1.61	* 1.68	* 1.68	1.81	1.89	1.13	1.18	0.81	0.85	0.63	0.66	0.61	0.64	10.09
-10	* 2.15	* 2.15	* 2.48	* 2.48	1.83	1.91	1.14	1.19	0.82	0.86			0.73	0.77	8.92
-15			* 2.84	* 2.84	* 1.56	* 1.56	* 1.03	* 1.03					* 0.88	* 0.88	7.00

1. Load point is the end of the arm.
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3. Lift capacities shown do not exceed 75% of minimum tipping loads or 87% of hydraulic capacities.
4. The least stable position is over the side.
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6. Lift capacities are in compliance with ISO 10567.

Approximate Weight of Workload Materials

NOTICE

Approximate average of the volume and weight ratio, which can be differently in each workplace. Exposure to rain, snow or groundwater; settling or compaction because of overhead weight and chemical or industrial processing or changes because of thermal or chemical transformations could all increase value of weights listed in table.

Material	Density 1,200 kg/m³ or less	Density 1,500 kg/m³ or less	Density 1,800 kg/m³ or less	Density 2,100 kg/m³ or less
Charcoal	401 kg/m³	-	-	-
Coke, blast furnace size	433 kg/m³	-	-	-
Coke, foundry size	449 kg/m³	-	-	-
Coal, bituminous slack, piled	801 kg/m³	-	-	-
Coal, bituminous	881 kg/m³	-	-	-
Coal, anthracite	897 kg/m³	-	-	-
Clay, DRY, in broken lumps	1,009 kg/m³	-	-	-
Clay, DAMP, natural bed	-	-	1,746 kg/m³	-
Cement, portland, DRY granular	-	-	1,506 kg/m³	-
Cement, portland, DRY clinkers	-	1,362 kg/m³	-	-
Dolomite, crushed	-	-	1,522 kg/m³	-
Earth, loamy, DRY, loose	-	1,202 kg/m³	-	-
Earth, DRY, packed	-	-	1,522 kg/m³	-
Earth, WET, muddy	-	-	1,762 kg/m³	-
Gypsum, calcined, (heated, powder)	961 kg/m³	-	-	-
Gypsum, crushed to 3 inch size	-	-	1,522 kg/m³	-
Gravel, DRY	-	-	-	1,810 kg/m³
Gravel, WET	-	-	-	1,922 kg/m³
Limestone, graded above 2	-	1,282 kg/m³	-	-
Limestone, graded 1-1/2 or 2	-	1,362 kg/m³	-	-
Limestone, crushed	-	-	1,522 kg/m³	-
Limestone, fine	-	-	1,602 kg/m³	-
Phosphate, rock	-	1,282 kg/m³	-	-
Salt	929 kg/m³	-	-	-
Snow, light density	529 kg/m³	-	-	-
Sand, DRY, loose	-	-	1,522 kg/m³	-
Sand, WET, packed	-	-	-	1,922 kg/m³
Shale, broken	-	1,362 kg/m³	-	-
Sulfur, broken	529 kg/m³	-	-	-

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