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Foreword

This Operation & Maintenance Manual was written to give owner or operator 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. Examples include, but are not limited to, are: falling 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.

Engine and Emission Control System Maintenance

Proper inspection, maintenance and repair is essential to keeping engine and machine systems properly operating. This includes proper inspection and maintenance of the machine's emission control system. This could include machine and engine components, such as fuel system, turbocharger, electrical system, air intake system and/or cooling system.

As a heavy-duty off-road diesel engine owner, you are responsible for performing required maintenance. The required maintenance procedures are outlined in this Operation & Maintenance Manual, or Shop Manual. Do not remove, alter, or render inoperative, any emission control system.

Machine Capacity

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

Exceeding machine capacity can adversely affect machine performance characteristics such as: stability, system certifications such as brakes and steering, the Roll-over Protective Structure (ROPS) and can result in death or serious injury. Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for further information.

Attachments

These and other attachments are approved for use on this machine. 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 (Figure 1). It is also stamped on a product identification plate (Figure 2) on outside of cabin on right-hand side.

NOTE: *Record these numbers and their locations. These will be required whenever warranty or service work is requested. Keep these numbers on file in case machine is stolen.*

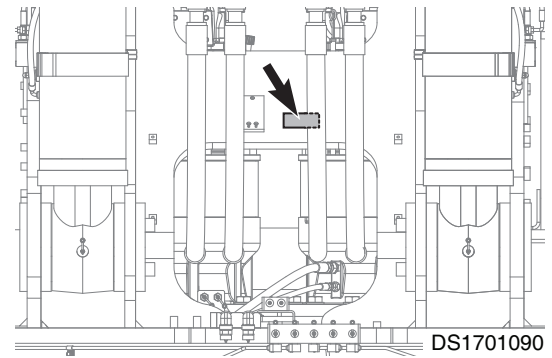


Figure 1

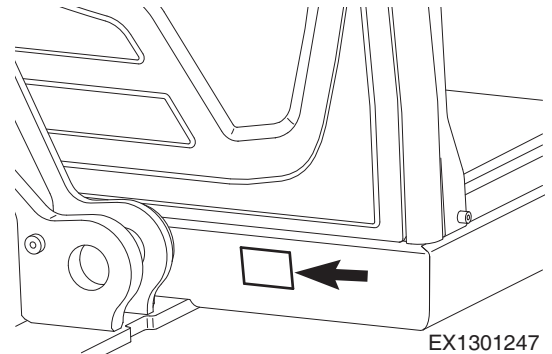


Figure 2

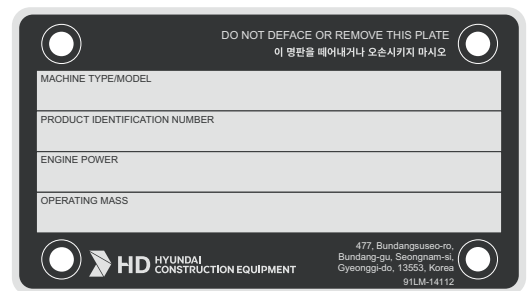


Figure 3

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.

Engine Identification

Engine Data Plate

The engine data plate provides important facts about the engine. The following information is stamped on the serial number plate: engine serial number, engine model and arrangement number. The engine data plate must not be changed unless approved by Perkins.

The emission certification plate is located on the oil cooler. Have the following engine data available when communicating with a Perkins Authorized Repair Location. The following information on data plate is mandatory when sourcing service parts:

Reference Number	Description
1	Engine Information and Emission Certification Plate
2	Perkins Engine Serial plate

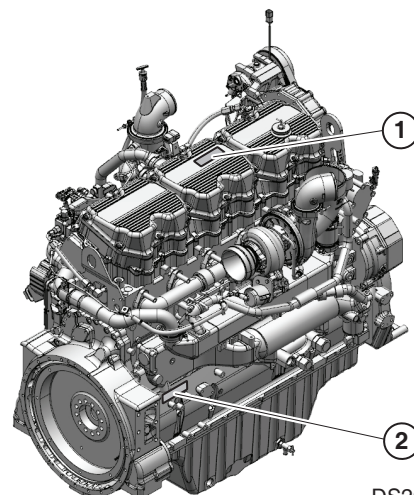


Figure 4

DS2001304

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.



Be Prepared - Get to Know All Operating 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 three indicate that a safety risk is involved. Observe the precautions indicated whenever a Safety Alert Symbol is present, no matter which signal word appears next to it.



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

In addition to safety signal words, the following 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 "NOTE" identifies information for effective use.*

Safety

Safety Decals

Safety decals are attached to the machine to alert the operator or maintenance person about potential hazards, the consequences of potential injury, and instructions and/or actions required to avoid the hazard. 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.

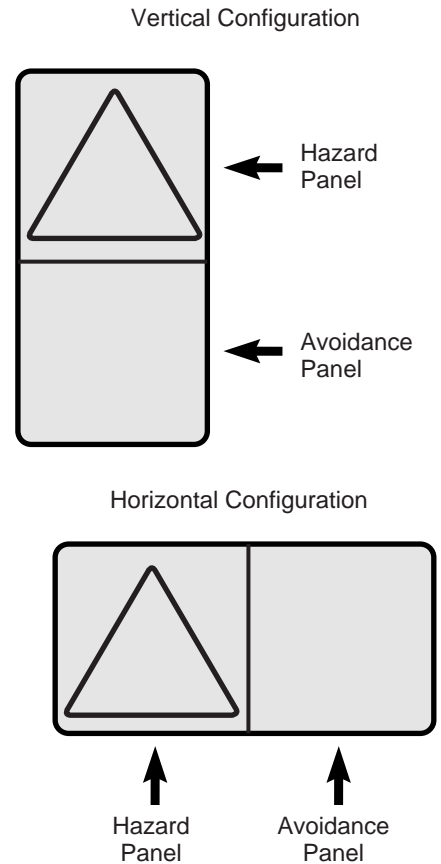
Safety Decals With Text

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.

A safety decal may contain more than one hazard panel and more than one avoidance panel.



FG018723

Figure 1

Safety Decals - Information and Location

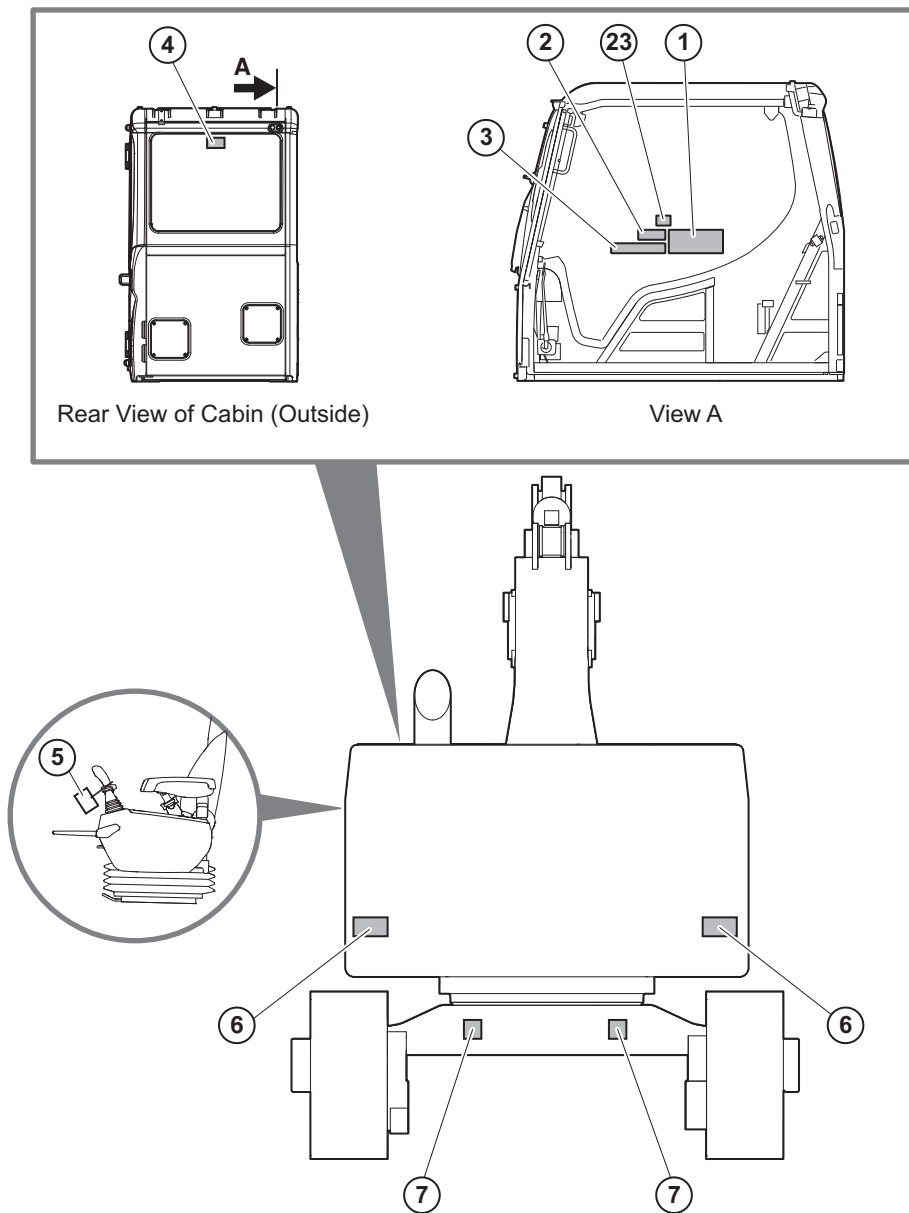
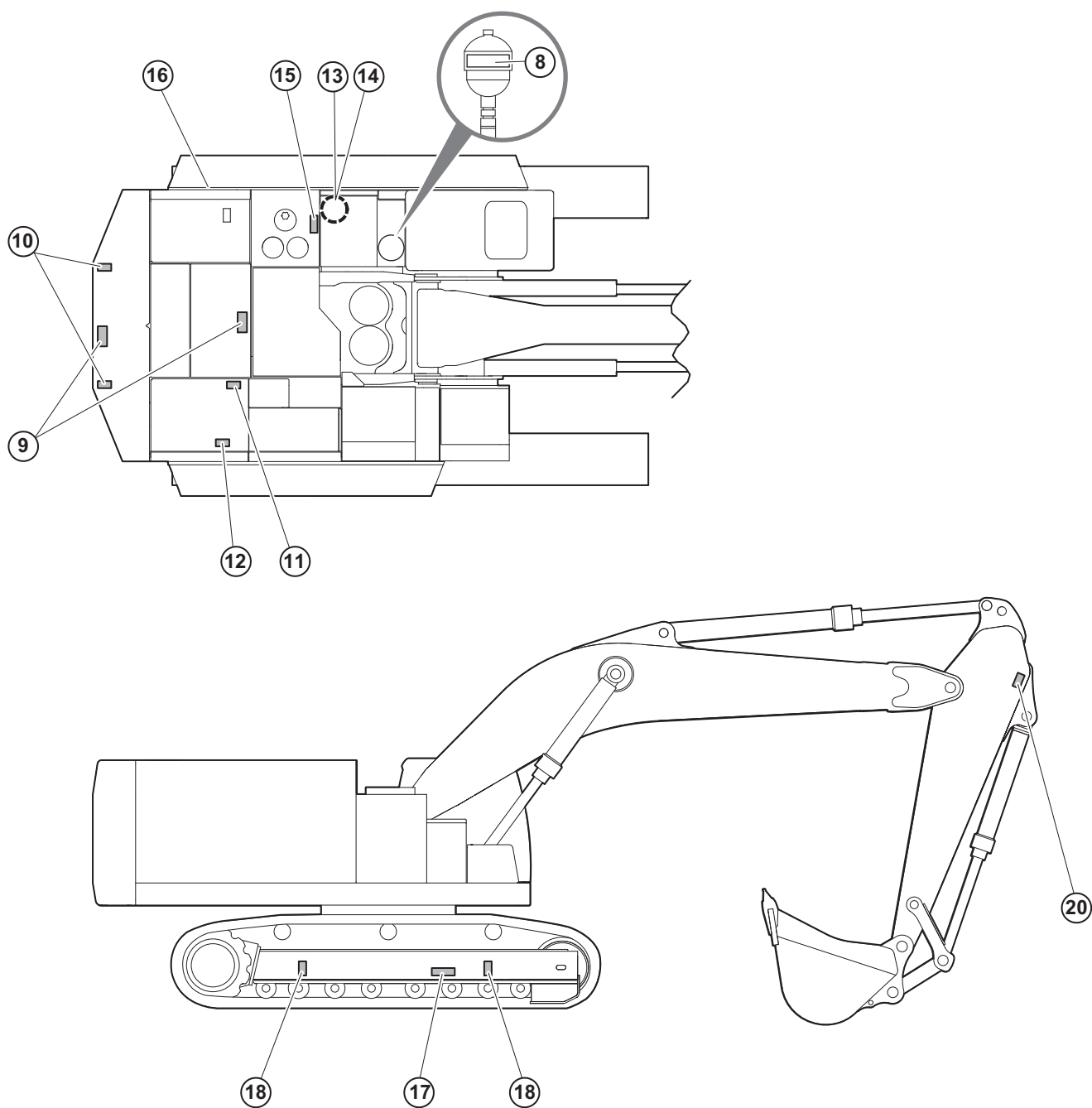


Figure 2

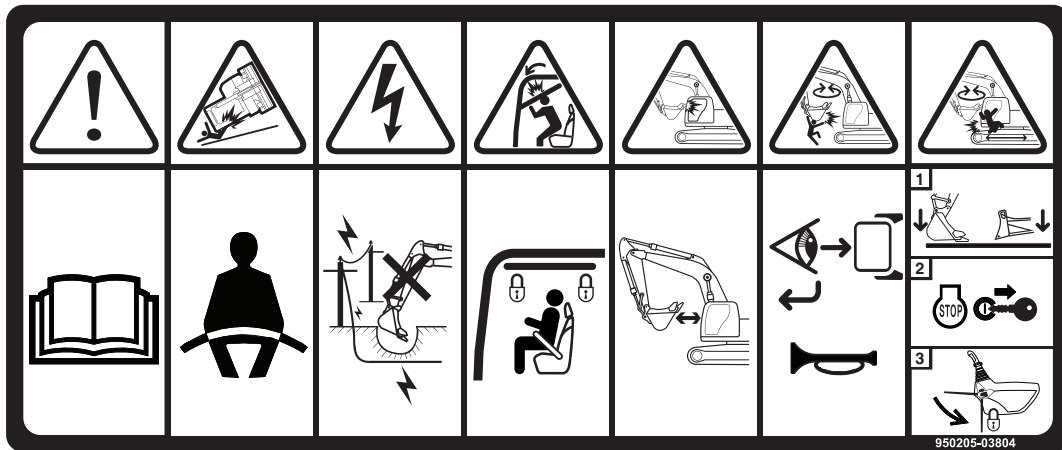
DS2003612



DS2003613

Figure 3

1. General Hazard (950205-03804)



EX1301176



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.
- Secure and lock front window when it is in raised position.
- 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.
- Ensure mirrors and rear/side view camera are clean and working properly.
- 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. BHL Control Pattern (US Only) (950205-03868)

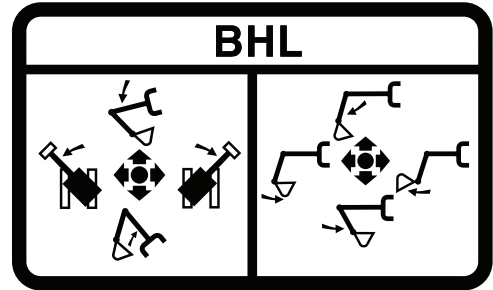


WARNING

AVOID INJURY OR DEATH

Read and understand the Operation & Maintenance Manual for more information.

Refer to the "Operating Instructions" section of this manual for detailed information regarding the work levers (joysticks) control functions.



EX1301192

3. ISO Control Pattern / Hydraulic Breaker / Electric Welding Attention (950205-07527)



WARNING

AVOID INJURY OR DEATH

Read and understand the Operation & Maintenance Manual for more information.

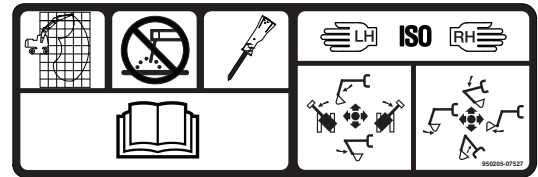
Refer to "Operating Instructions" section of this manual for details regarding the work levers (joysticks) control functions.

AVOID HYDRAULIC SYSTEM DAMAGE

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

AVOID ELECTRICAL COMPONENT INJURY

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



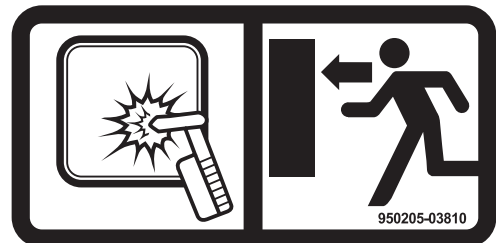
DS1802854

4. Emergency Exit (950205-03810)



NOTICE

If primary exit is blocked, use glass breaking tool to break glass for secondary exit.



EX1301190

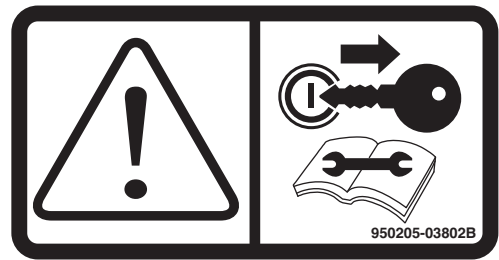
5. Warning Tag - "Do Not Operate" (950205-03802B)



WARNING

AVOID DEATH OR SERIOUS INJURY

- Stop engine and remove key.
- Attach "DO NOT OPERATE" warning tag to the controls before servicing the machine.
- Do not operate when performing inspection or maintenance.



DS1801807

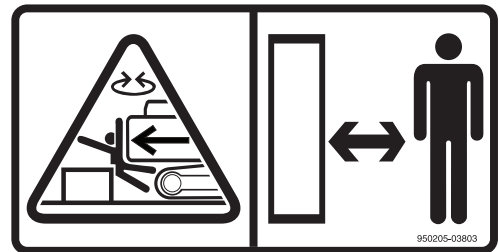
6. Keep Bystanders Away (950205-03803)



WARNING

AVOID DEATH OR SERIOUS INJURY

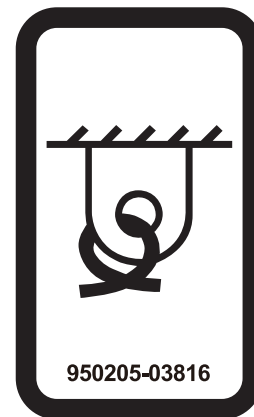
- Keep out of swing area and travel path.
- Always look in the travel direction.
- Make sure swing area is clear of bystanders and objects.



EX1301178

7. Tie down (950205-03816)

Identifies tie down point location.



EX1301203

8. Pressurized Gas and Fluid (950205-03782)



WARNING

AVOID DEATH OR SERIOUS INJURY

- Heat or impact can cause the accumulator to explode.
- Keep away from flame.
- Do not weld on or drill into accumulator.



EX1301187

9. Fall Hazard (950205-03783)



WARNING

AVOID DEATH OR SERIOUS INJURY

Do not step in this area.



EX1301188

10. Do Not Lift (950205-03570)

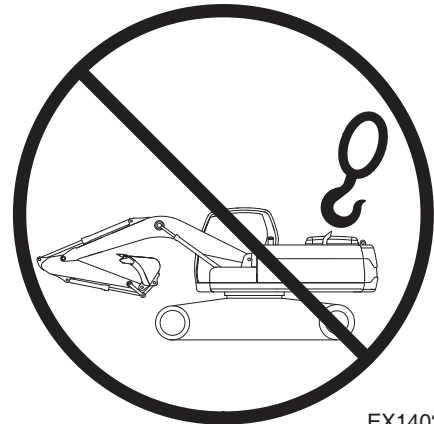


WARNING

AVOID DEATH OR SERIOUS INJURY

Not a lift point for machine.

Refer to the "Lifting Machine" section of this manual for details regarding the lifting point.



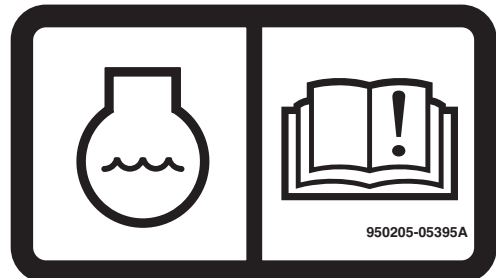
EX1402619

11. Coolant Level Check (950205-05395A)



NOTICE

- Do not mix an ethylene glycol coolant and a propylene glycol coolant.
- Mixing the two types of coolant may produce particles that damage the system.
- For details, read the Operation and Maintenance Manual.



DS1802847

12. Fan/Rotating Warning (950205-03788)



WARNING

CONTACT WITH ROTATING FAN CAN CAUSE
DEATH OR SERIOUS INJURY

Keep away from fan and rotating parts. Stop engine
before servicing.



DS2001307

13. Battery Explosion (950205-03785)



WARNING

AVOID DEATH OR SERIOUS INJURY

- Read and follow instructions in Operation & Maintenance Manual for battery maintenance.
- 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.



EX1301183

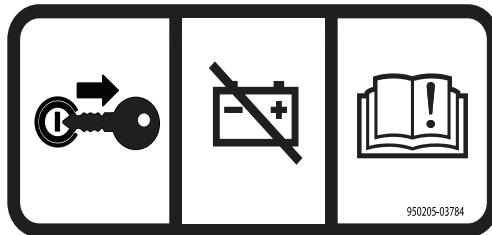
14. Battery Disconnection (950205-03784)



NOTICE

Disconnecting the battery while the engine is running or the LED is On can cause damage to electrical components.

Disconnect battery only when LED light is OFF after engine is turned OFF.



EX1301184

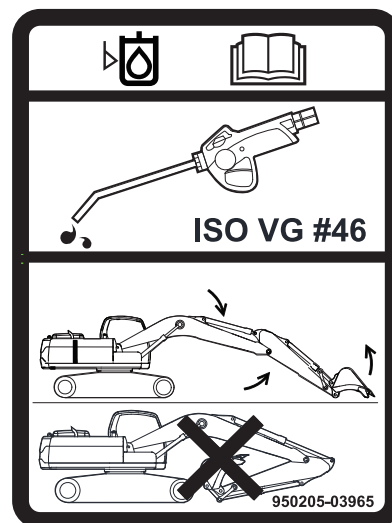
15. Hydraulic Oil Check (950205-03965)



NOTICE

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

Use hydraulic oil which is suitable for machine.



EX1505098

16. **Removable Counterweight System (950205-08648, 950205-05747, 950205-05691A)**



WARNING

AVOID DEATH OR SERIOUS INJURY

Do not change position of stop valve with engine running.

IMPORTANT

- Read, understand and follow the instruction for removal / install counterweight operation.
- Keep bystanders away from the machine and moving path of the counterweight.
- Set safety lever to "LOCK" position.
- Ensure nobody is in Operator Station.

Machine should stay still during removal / install operation.

- Inspect and maintenance carefully the hydraulic connections, bolts and other devices.

MACHINE POSITION

- Position the machine on even, firm and level ground.
- Put attachment on ground with full extension; to maximize machine stability.

COUNTERWEIGHT REMOVAL / INSTALL

- Turn off the engine.
- Rear Camera and Lamp electric separation.
- Detach Counterweight fastener.
- Turn on the engine. Ensure the Safety lever is still Lock Position.
- Open the STOP valve, which located right of pump.
- With toggle switch on, drag one spool valve lever right.
- Land the Counterweight down slowly and carefully.
- Detach Counterweight Pin and Yoke.
- Reverse Valve Lever left and return Link Arm.
- With toggle switch off, Turn Stop Valve Off.

950205-08648

DS2001308

CAUTION

1. FOR COUNTERWEIGHT REMOVAL OPERATION, ROTATE VALVE TO COUNTERWEIGHT REMOVAL.
2. DO NOT CHANGE POSITION OF STOP VALVE WITH ENGINE RUNNING.

FOR
NORMAL
OPERATION

FOR
COUNTERWEIGHT
REMOVAL

950205-05747

DS2001309

WARNING

AVOID DEATH OR SERIOUS INJURY.

This Machine is equipped with CounterWeight Removal system.
Read and understand Operator's manual and instruction diagram before handling the control lever.

Front view(Lever)

950205-05691A

DS2001310

17. Flying Debris or Objects (950205-03866)



WARNING

**HIGH-PRESSURE GREASE CAN CAUSE
DEATH OR SERIOUS INJURY**

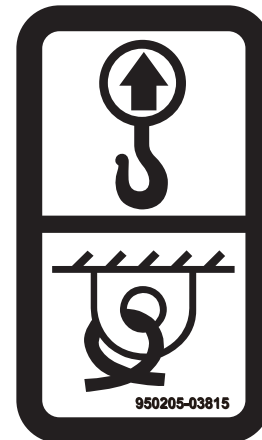
- Track adjusting systems use grease under high-pressure which can penetrate body if improperly serviced.
- **NEVER LOOSEN** track tension grease valve more than one complete turn from the fully tightened position.
- Bleed off pressure slowly and keep body away from grease valve.
- Wear eye protection.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



EX1301185

18. Lift/Tie down (950205-03815)

Identifies lift point and tie down point location.



EX1301201

19. Impact Hazard (950205-03963)

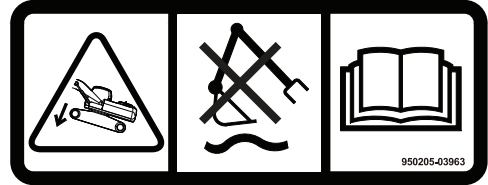


WARNING

AVOID DEATH OR SERIOUS INJURY

- Activating the Intelligent Floating Boom Control with the tracks raised up can cause the machine to drop suddenly.
- Do not activate Intelligent Floating Boom Control when tracks are raised.
- Do not raise tracks when control is activated.

Refer to "Intelligent Floating Boom Control (If Equipped)" section of this manual for more information.



EX1301193

20. Crush Hazard (950205-03805)



WARNING

AVOID DEATH OR SERIOUS INJURY

Stay clear of the boom, arm, and attachment.



EX1301186

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 safety guidance in this Safety and Shop manual, can result in death or serious injury.

Know Your Machine

Know how to operate your machine. Know the purpose of all controls, gauges, signals, indicators and monitor displays. Know the rated load capacity, speed range, braking and steering characteristics, turning radius and operating clearances. Keep in mind that rain, snow, ice, loose gravel, soft ground, slopes etc., can change operating capabilities of your 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. Because HD HYUNDAI CONSTRUCTION EQUIPMENT cannot anticipate, identify or test all attachments that owners may want to install on their machines, contact HD HYUNDAI CONSTRUCTION EQUIPMENT for written authorization and approval of attachments, and their compatibility with optional kits.

Attachments and attachment control systems that are compatible with the machine are required for safe and reliable machine operation. Do not exceed maximum operating weight (machine weight plus attachment) that is listed on ROPS certification plate.

Make sure that all guards and shields are in place on machine and on work tool. Depending on type or combination of work equipment, there is a potential that work equipment could interfere with the cabin or other parts of machine. Before using unfamiliar work equipment, check if there is any potential of interference, and operate with caution.

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

Never use attachment as a work platform or manlift.

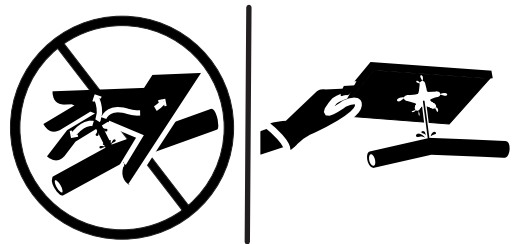
Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor about auxiliary hydraulic kits for attachments installation. If you are in doubt about compatibility of a particular attachment with a machine, consult your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.

Pressurized Fluids

Pressurized air or fluids can cause debris and/or fluids to be blown out. This could result in death or serious injury.

Immediately after operations are stopped, coolant, engine oil, and hydraulic oil are at their highest temperatures and the radiator and hydraulic tank are 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.

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.



FG018457

Figure 4

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

Releasing trapped pressure can cause sudden machine movement or attachment movement. Use caution if you disconnect hydraulic lines or fittings.

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.

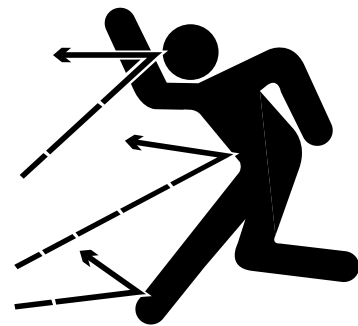
To prevent hot coolant from spraying out, stop engine and wait for coolant to cool. Using gloves, slowly loosen cap to relieve pressure.

Flying or Falling Objects

On work sites where there is a potential hazard that flying or falling objects can hit operator's cabin, select and use a guard to match operating conditions for additional operator protection.

Working in mines, tunnels, deep pits, and loose or wet surfaces, could produce hazard of falling rocks or flying objects. Additional protection for operator's cabin could be required such as an Operator Protection Guard (OPG) or window guards. Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for information on available protective guards.

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



HAOA110L

Figure 5



HAOA100L

Figure 6

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.

Do not forget that 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.



Figure 7

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 8

Hot Coolant and Oils - Burn Prevention

Do not touch any part of an operating engine. Immediately after operations are stopped, coolant, engine oil, and hydraulic oil are at their highest temperatures. The radiator and hydraulic tank are still under pressure. Always wait for temperature to cool down. Attempting to remove caps, drain oil or coolant, or replacing filters may lead to serious burns, if done when hot. Relieve all pressure in air system, hydraulic oil system, lubrication system, fuel system, and cooling system, before any lines, fittings or related items are disconnected.



FG019095

Figure 9

To prevent hot oil or coolant from spraying out, stop engine, wait for oil and coolant to cool. Using gloves, slowly loosen cap to relieve pressure.



FG019096

Figure 10

Fire and Explosion Prevention

All fuels, most lubricants and some coolant mixtures 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 such as spilled fuel and oil, and debris from machine. Do not allow any flammable materials to accumulate on machine.

Always observe the following:

- Add fuel, oil, antifreeze and hydraulic fluid to machine only in a well ventilated area. Machine must be parked with controls, lights and switches turned "OFF". Engine must be "OFF" and any flames, glowing embers, auxiliary heating units or 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 away from flames or sparks and wear dust mask when grinding painted parts.

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 exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases.

Do not operate machine near any flame.

Exhaust shields (if equipped) protect hot exhaust components from oil spray or fuel spray in case of a break in a line, hose, or seal. Exhaust shields must be correctly installed.



HDO1015I

Figure 11



FG018458

Figure 12

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. Use a voltmeter or a hydrometer.

Battery gas can explode and can result in death or serious injury. Follow procedures in this manual for connecting battery and for jump-starting. 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. Refer to "Boost Starting or Charging Engine Batteries" on page 1-38, for proper procedure in this manual.

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

After market radios or other electric operated equipment in cabin must have a fuse in the electrical circuit.

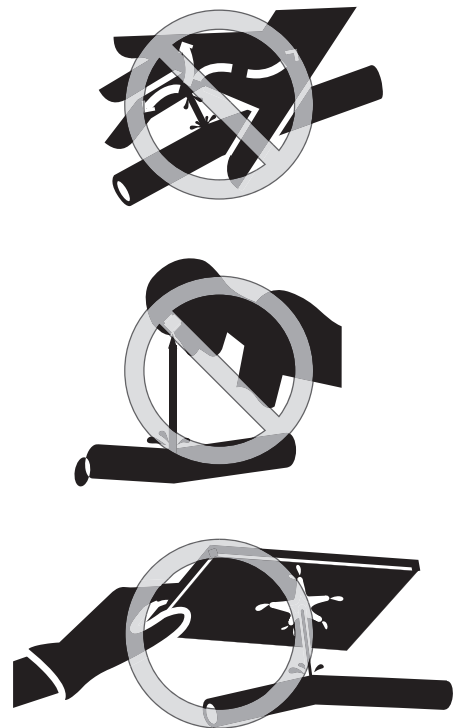
Hydraulic System

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 fluid spills. Do not use gasoline or diesel fuel for cleaning parts. Use commercial nonflammable solvents.



EX1400129

Figure 13

Fueling

Use caution when you are refueling a machine.

Fuel is flammable and can catch fire if it is brought close to a flame.

Stop engine and let it cool before adding fuel. Do not smoke while you are refueling a machine. Do not refuel a machine near flames or sparks. Fill fuel tank outdoors.

Keep fuel and other fluid reservoir caps tight and do not start engine until caps have been secured.

Store fuels and lubricants in properly marked containers away from unauthorized personnel. Store oily rags and any flammable materials in protective containers.

Static electricity can produce dangerous sparks at fuel filling nozzle. In very cold, dry weather or other conditions that could produce a static discharge, keep tip of fuel nozzle in constant contact with neck of fuel filling nozzle, to provide a ground.

Always place plastic fuel containers on the ground before filling.



EX1400130

Figure 14

Never Use Ether Starting Aids

Do not use ether or starting fluids on any engine that has glow plugs, or an electric grid type manifold heater. These starting aids can cause an explosion and result in death or serious injury.

Use procedures in this manual for connecting battery and for jump-starting.



FG018458

Figure 15

Welding and Grinding

Always clean machine and attachment, set battery disconnect switch to "OFF" position, and disconnect wiring from electronic controllers before welding. Cover rubber hoses, battery and all other flammable parts. Keep a fire extinguisher near machine when welding.

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.
- Use handrails, guardrails and steps to get off machine.
- Immediately call for help or fire station.
- 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.



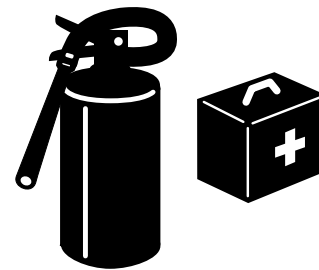
FG018459

Figure 16

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

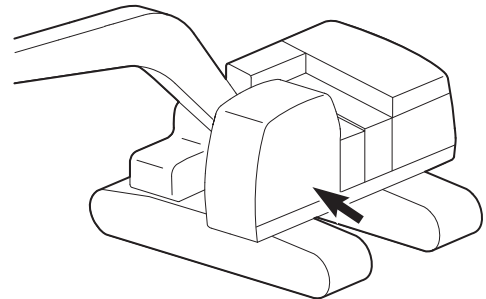
To be prepared in the event of a fire:

- Make sure fire extinguishers are always available and read labels to know how to use them. It is recommended that an appropriately sized (2.27 kg [5 lb] or larger) multipurpose A/B/C fire extinguisher be mounted in cabin. Check and service fire extinguisher at regular intervals and make sure that all work site crew members are adequately trained in its use.
- Inspect fire extinguisher and service fire extinguisher regularly.
- Follow instructions on extinguisher instruction plate.
- Keep a first aid kit in storage compartment (Figure 18) and keep another kit at work site. Check kit periodically and keep it properly supplied.
- Keep emergency numbers for doctor, ambulance service, hospital and fire department readily available.



HDO1009L

Figure 17



DS1701094

Figure 18

Electrical System and Electrical Shock

Ensure electric line to not be short-circuited. Shorting could damage electrical system and engine neutral start system.

Engine running generates high voltage through injector terminal and engine controller, and it remains residual immediately after the engine stopped. Do not contact injector terminal or engine controller inside.

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

Roll-over Protective Structure (ROPS)

The operator's cabin is a ROPS certified structure for protecting the seat-belted operator. It absorbs the impact energy of a roll-over impact. Do not allow machine weight (mass) to exceed certified value on certification plate. If weight is exceeded, the ROPS 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 ROPS. Never repair a damaged ROPS cabin.
- Always wear your seat belt when operating machine.

Protecting Cabin from Flying or Falling Objects (If Equipped)

In a work site where additional operator protection is necessary from falling or flying objects, install adequate protective guards on the cabin.

For breaker operation, install a front guard (1, Figure 19) and apply a laminated coating sheet to front glass. Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for recommendations.

When performing demolition or cutting operation, install a front guard and top guard.

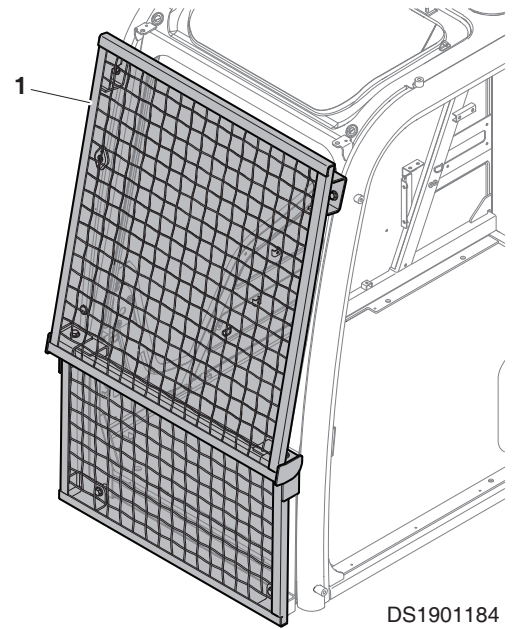


Figure 19

When working in mines, quarries or other work sites where there is a hazard of falling rocks, install Operator Protection Guard (OPG) (2, Figure 20).

When OPG is installed, and front window needs to be cleaned, loosen bolts marked with arrows (Figure 20). Be sure to tighten bolts when done.

Never attempt to alter or modify any protective structure reinforcement system, by drilling holes, welding, remounting or relocating fasteners. Any serious impact or damage to system requires a complete inspection of the structure. Reinstallation, recertification and/or replacement of system may be necessary.

Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for available safety guards and/or recommendations to protect against objects that could strike operator's cabin. Make sure that all other work site crew members are kept away from excavator when operating.

If any glass on machine is broken, replace it with new glass immediately.

NOTE: *The preceding instructions assume that conditions are for standard operations, but it may be necessary to add additional guards depending on operating conditions or local rules or regulations for the work site. Always contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for advice.*

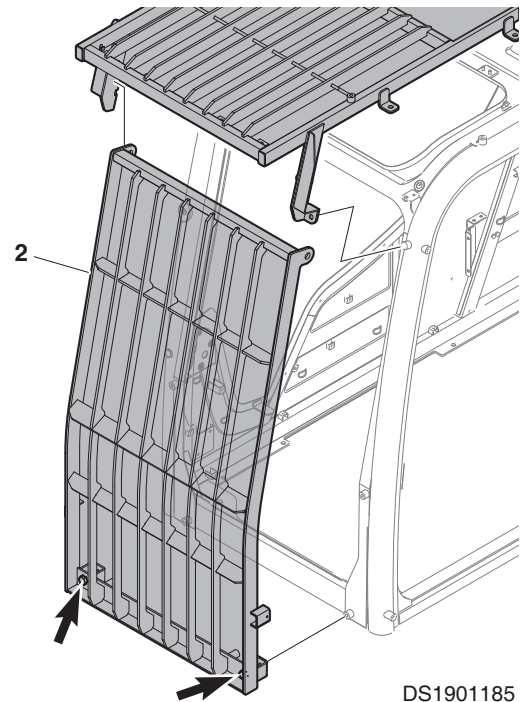


Figure 20

Emergency Exit from Operator's Station

This machine is equipped with a glass breaking tool. It is found on left pillar of cabin. This tool can be used to break the glass to exit from cabin in an emergency. Grip handle firmly and use sharp point to break glass.

- Be careful also not to slip on broken pieces of glass on ground.



WARNING

AVOID DEATH OR SERIOUS INJURY

Protect your eyes when breaking the glass.

Regulation 8.35(2) of the Mines Safety and Inspection Regulations (1995)

A person who has possession at a mine of any electrical detonators must ensure that those detonators are kept at a safe distance from sources of electromagnetic radiation to prevent the possibility of induced ignition of the detonators by such sources.

Information in regard to the determination of 'Safe Separation Distances' should be available from respective explosives manufacturers/suppliers, and may also be referenced from:

British Standard BS6657:1991 - Guide to Prevention of inadvertent initiation of electro-explosive devices by radio-frequency radiation.

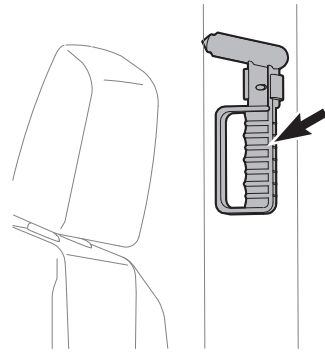


Figure 21

DS191103

Transportation

Obey State and Local Over-the-Road Regulations

Check federal, state and 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 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.
- Turn auto idle switch "OFF".
- 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.

- For machines equipped with a cabin, always lock door after loading machine to prevent door from suddenly opening during transportation.

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 coolant, fuel, and hydraulic tank oil levels, and check for clogged air cleaner and damage to electrical wiring.
- Check operation of gauges, cameras (if equipped) and angle of mirrors, and 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, directional or 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.

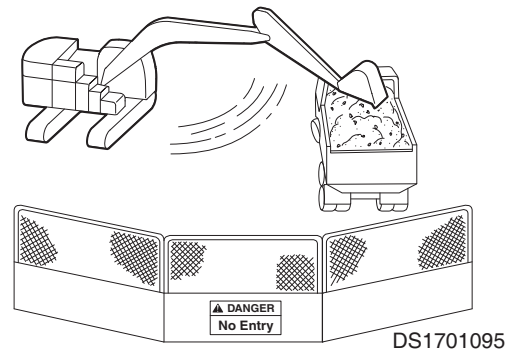


Figure 22

Mounting/Dismounting

Before getting on or off machine, if there is any oil, grease, or mud on handrails, guardrails, steps, or track 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.

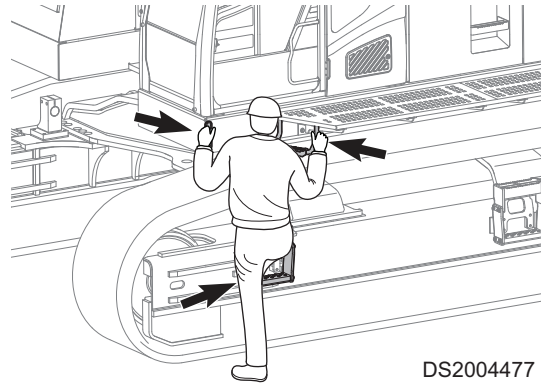
When getting on or off machine, always face machine. Maintain three-point contact (both feet and one hand or one foot and both hands) with handrails, guardrails, steps, and track shoes to ensure that you support yourself securely.

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

Securely latch door. If you grip handrail inside door when moving on top of track shoes, and door latch is not securely engaged, door may move and cause you to fall.

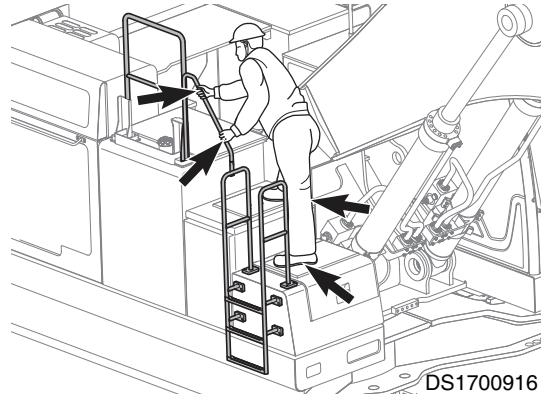
Use points marked by arrows in diagram when getting on or off machine.

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



DS2004477

Figure 23



DS1700916

Figure 24

Cleaning

Remove all straw, wood chips, leaves, grass, paper and other flammable debris accumulated in engine compartment, mufflers and around battery. Remove any dirt from window glass, mirrors, handrails, and steps.

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.

After using ashtray, make sure that any matches or cigarettes are properly extinguished, and be sure to close ashtray.

Clean window glass and working lights for good visibility.

Do not stick suction pads to window glass. Suction pads act as a lens and can cause fire.

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 such as lunch boxes, and other 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.

Keep all windows and doors closed on machine.

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.

Adjust and clean mirrors so area to rear of machine can be seen clearly from operator's seat.

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.

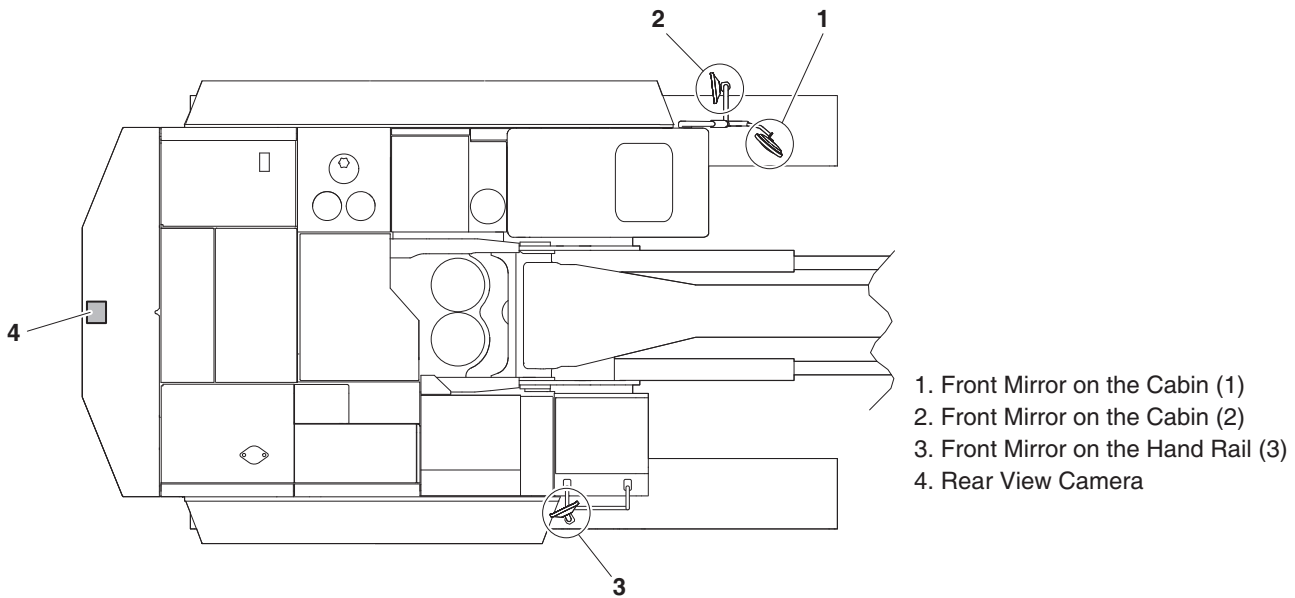
Always wear seat belt when operating machine.

Visibility Information

A rear view camera (if equipped) and mirrors provide the operator with additional means to see the work area.

NOTE: *These devices may vary from one region to another, depending upon local and regional regulations. If a machine is moved or sold into another region or marketplace, it is the owner's responsibility to make sure it complies with all applicable regulations.*

NOTE: *Your machine may be equipped with additional visual aids other than the Figure 25 shown.*



DS1801532

Figure 25



WARNING

AVOID DEATH OR SERIOUS INJURY

Failure to check for and clear people from the surrounding area of a machine can result in death or serious injury. The operator should make sure that visual aids (mirrors and camera(s)) are in proper working condition.

Your machine may be equipped with visual aids such as mirrors or a rear view camera. Even with these aids, there still may be areas around the machine which cannot be seen from the operator's seat. Always keep personnel and bystanders out of the work area. Be careful when operating and always look in direction of travel.

Adjust visual aids for best visibility around machine.

When swinging work equipment or backing up, press camera button (if equipped) to change display mode on display monitor so you can check rear and side of machine.

Before moving machine, look around work site and use mirrors and display monitor to confirm that no one is in the work area.

While operating or traveling in places with poor visibility it may be impossible to confirm condition of work site. Inspect and remove any obstacles around the machine that could be damaged and keep other personnel out of the work area.

Inspect equipment and repair immediately if there are problems with visual aids. If machine cannot be fixed immediately, DO NOT use the machine. Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor and arrange for repairs.

Restricted Visibility

Some areas may not be seen from the operator's position.

Get aid from proper job site organization and minimize visibility masking hazard.

Refer to "Visibility Information" in the Operation and Maintenance Manual for more information regarding job site organization.

Figure 26 ~ Figure 27 provide an approximate visual indication of the areas at ground level inside a radius of 12 m (39' 4") from the operator of significant restricted visibility for various machine configurations.

Figure 28 provides the position of the attachment and equipment in the Travel position.

- Visible areas without visual aids at the ground level

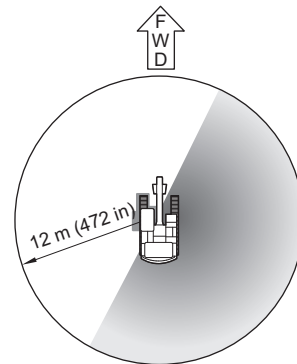
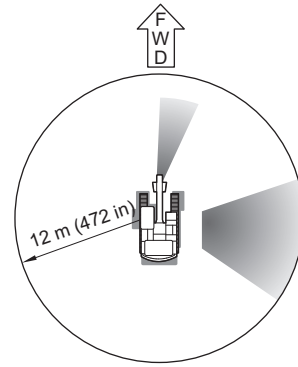


Figure 26

DS2004478

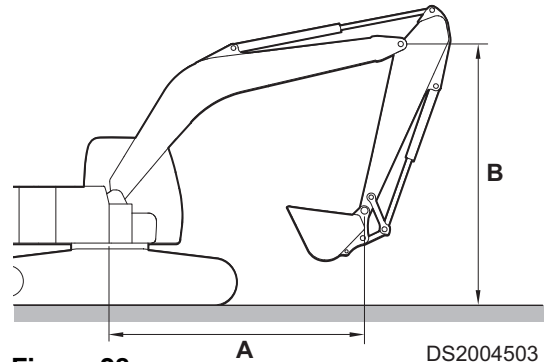
- Visible areas with rear CCTV and mirrors



DS2100287

Figure 27

- Machine travel position
 - A is 6.9 m (22' 8") from swing center to bucket pin
 - B is 7.1 m (23' 4") from ground to arm pin



DS2004503

Figure 28

Mirror Adjustment

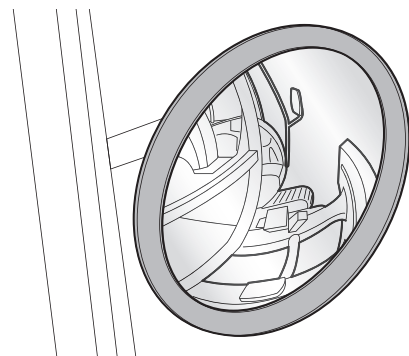
Frequently ensure the mirrors are directed properly.

- Park the machine on a level surface.
- Lower the attachment to the ground.
- Lower the safety lever to the LOCK position.
- Stop the engine.
- Use the machine access system.

NOTE: *You may need hand tools to adjust certain types of mirrors.*

1. Front mirror on the cabin (1)

If equipped, adjust the front mirror on the cabin (1, Figure 25) so the front of the right track can be seen from the operator seat.



DS1801222

Figure 29

2. Front mirror on the cabin (2)

If equipped, adjust the front mirror on the cabin (2, Figure 25) so the left side cover of machine can be seen from the operator seat.

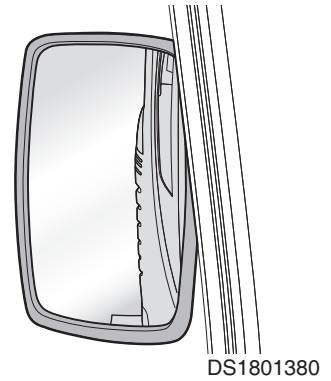


Figure 30

3. Front mirror on the hand rail (3)

If equipped, adjust the front mirror on the hand rail (3, Figure 25) so the right side can be seen from the operator seat.

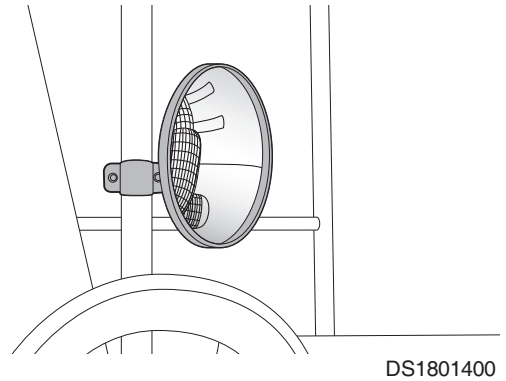


Figure 31

4. Additional mirrors other than Figure 25

If equipped, adjust the mirrors whenever you change operators and ensure the mirrors are in proper working conditions.

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 sandstorms.
- Check mirrors and rear view camera (if equipped) on machine before starting operations. Clean off any dirt and adjust view for good visibility.

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

It may not be possible to adjust all visual aids to see all the way around the machine. Therefore, additional precautions such as flagman, barricades, etc., must be taken to keep other personnel out of the work area.

Boost Starting or Charging Engine Batteries

Follow these instructions to prevent an explosion or fire when connecting booster cables to batteries:

- Turn "OFF" all electric equipment before connecting leads to battery. This includes electric switches on battery charger or battery booster equipment.
- When boost starting from another machine or vehicle do not allow two machines to touch. Wear safety goggles and gloves while battery connections are made.
- 24 volt battery units consisting of two series connected 12 volt batteries have a cable connecting one positive (+) terminal on one of the 12 volt batteries to a negative (-) terminal on the other battery. Booster or charger cable connections must be made between the nonseries connected positive (+) terminals and between the negative(-) terminal of the booster battery and metal frame of the machine being boosted or charged. The final booster cable connection, at metal frame of the machine being charged or boost started, must be as far away from the batteries as possible.
- Connect positive (+) cable first when installing cables and disconnect negative (-) cable first when removing them.

Starting Engine with a Booster Cable



WARNING

AVOID DEATH OR SERIOUS INJURY

1. An explosive gas is produced while batteries are in use or being charged. Keep flames or sparks away from the battery area.
 2. Charge batteries in a well ventilated area.
 3. Always wear eye protection when starting a machine with jumper cables.
 4. Improper jump-starting procedures can cause an explosion resulting in death or personal injury.
 5. Jump-start vehicles on dry ground or concrete. Do not jump-start the machine on a steel floor because the floor is always grounded.
 6. When starting from another machine, make sure the machines do not touch.
 7. Always connect the auxiliary battery positive (+) terminal to the depleted battery positive (+) terminal first. Then connect the auxiliary battery negative (-) terminal to the frame of the depleted battery machine second.
 8. Connect positive cables first when installing cables and disconnect the negative cables first when removing.
-



HAOA440L

Figure 32



NOTICE

The machine has a 24V (-) negative ground electrical system. Use the same capacity 24V booster batteries when jump-starting engine.

If the batteries are drained during starting procedures, jump-start engine using auxiliary or booster batteries according to the following procedure:

Connecting Booster Batteries

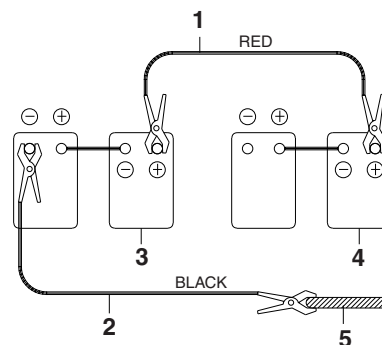
1. Stop engine before booster batteries (3, Figure 33) are mounted.
2. Connect one end of red cable (1, Figure 33) to the positive (+) terminal of the machine batteries (4), and the other end to the positive (+) terminal of the booster batteries. Booster or charger cable connections must be made between the nonseries connected positive (+) terminals.
3. Connect one end of black cable (2, Figure 33) to the negative (-) terminal of the booster batteries (3), and then make ground connection to the upper frame (5) of the machine to be started with the other end of black (-) cable (2, Figure 33).

When making the last connection to upper frame, be sure to connect the cable end as far away from the machine batteries as possible. **DO NOT CONNECT DIRECTLY TO THE NEGATIVE BATTERY TERMINAL.**

4. Start the engine.

Disconnecting Booster Batteries

1. Disconnect black negative (-) cable (2, Figure 33) from the machine frame (5) first.
2. Disconnect the other end of black negative (-) cable (2, Figure 33) from the booster batteries (3).
3. Disconnect red positive (+) cable (1, Figure 33) from the booster batteries (3).
4. Disconnect red positive (+) cable (1, Figure 33) from the machine batteries (4).



ARO0440L

Figure 33

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.

- Read and understand control pattern before operating. Check that movement of the machine matches display on control pattern label. If it does not match, replace it immediately with correct control pattern label.
- 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.

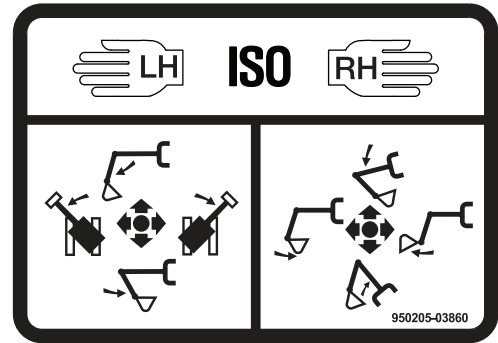
- Do not attempt to start engine by short-circuiting engine starting circuit. This can result in death or serious injury, or fire.
- When starting engine, sound horn as a warning to alert personnel in the work area.

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.

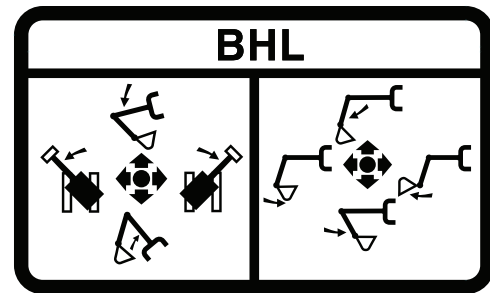
NOTE: When starting engine in cold temperatures, "white engine exhaust smoke" from the tail pipe can occur until engine reaches normal operating temperatures.

Also, a white residue, because of water vapor inside engine, can form at the engine oil fill location. These conditions will not affect engine performance or damage the engine or other exhaust system components.



EX1301191

Figure 34



EX1301192

Figure 35

Swinging or Traveling

As a machine operator, you should know and follow local, state and federal 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.

Be sure to observe above precautions even if a travel alarm or mirrors are installed.

- Check that travel alarm works properly and that mirrors are clean, not damaged and properly adjusted.
- Always latch door and windows of operator's cabin in position (open or closed).
- On work sites where there is a hazard of flying or falling objects, or of objects entering operator's cabin, check that door and windows are securely closed. Install additional guards, if work site application requires them.

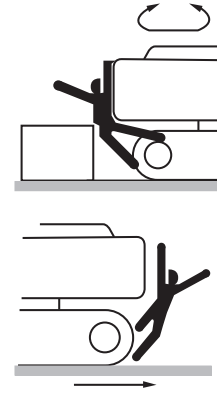


Figure 36

EX1400131

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.

Always operate within permissible water depth. 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.

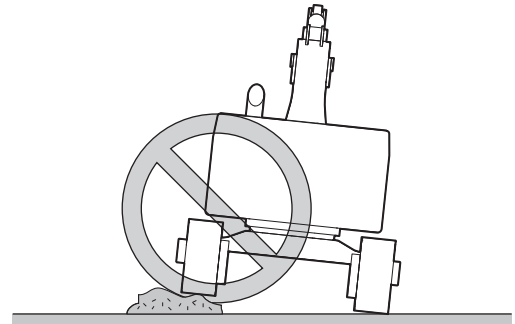
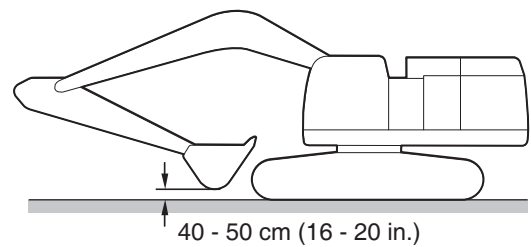
Never exceed maximum permitted load for bridges.

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.

Travel Position



DS1701096

Figure 37

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 (8 - 12 in) 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 roll-over.

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

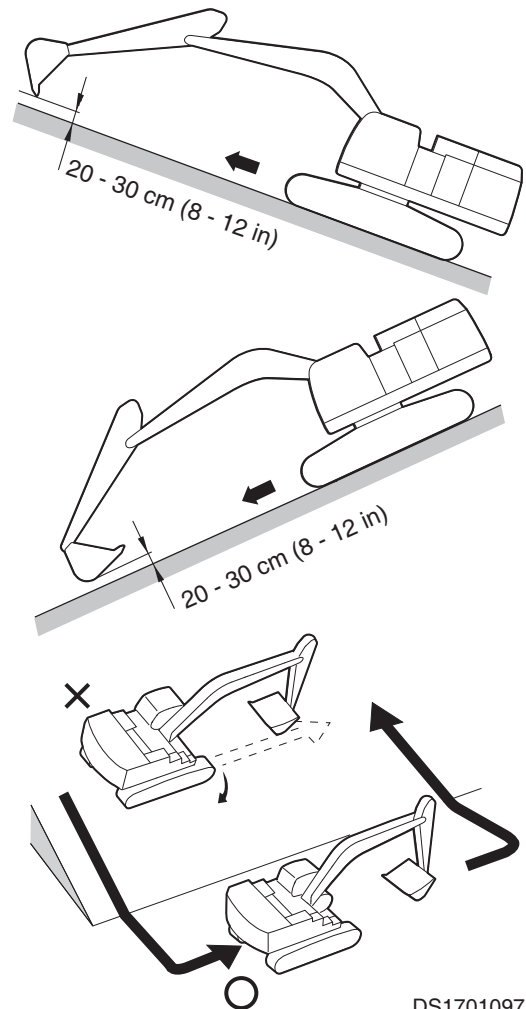


Figure 38

DS1701097

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 (8 - 12 in) 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 backup the slope again.

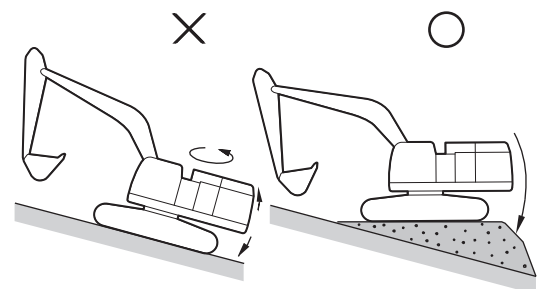


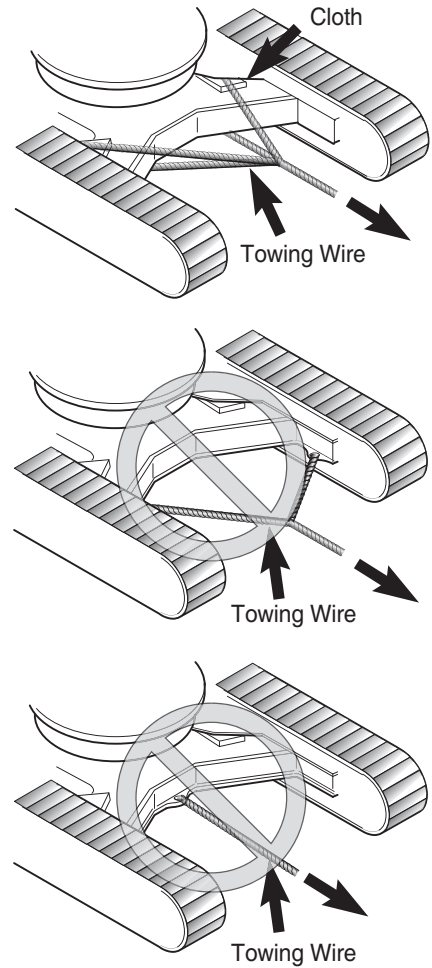
Figure 39

DS1701098

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.
- Do not use lightweight towing hook for towing another machine.
- 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.



DS2001725

Figure 40

Attachment

Never let anyone ride on any work attachment, such as bucket, crusher, grapple, or clamshell (grab bucket). 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 could result in death or serious injury.
- 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.



EX1400133

Figure 41

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. Keep in mind most systems use a high-pressure fluid or air to raise or lower equipment. The procedure can cause high-pressure air, or hydraulic pressure, or some other media to be released to lower the equipment.

Engine Stop

Turn engine starter switch to "O" (OFF) position and remove engine starter switch key.

Before lowering any equipment with engine stopped, clear area around equipment of all personnel and bystanders. This procedure will cause high-pressure air or hydraulic pressure to be released to lower equipment.

Do not stop engine immediately after the machine has been operated under load. This can cause overheating and accelerated wear of engine components.

After the machine is parked, allow engine to run for five minutes before stopping the engine. This allows hot areas of engine to cool gradually.

- Do not leave operator's seat when there is a raised load.

Parking Machine

Avoid making sudden stops, or parking machine wherever it happens to be at end of workday. 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, or to an overnight support saddle. 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.

Always close door of operator's cabin and lock all equipment to prevent any unauthorized person from operating the machine.

The hydraulic system remains pressurized, provided accumulator, is charged even when engine is not running. Accumulator pressure should decrease in a short time (approximately one minute). 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.

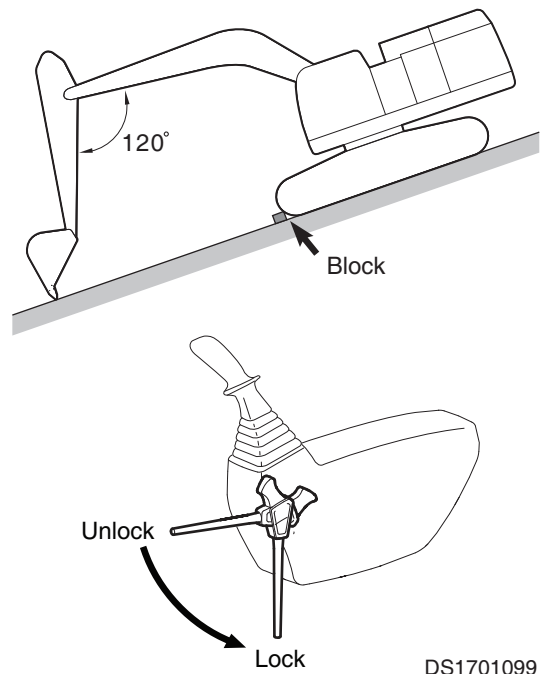


Figure 42

DS1701099

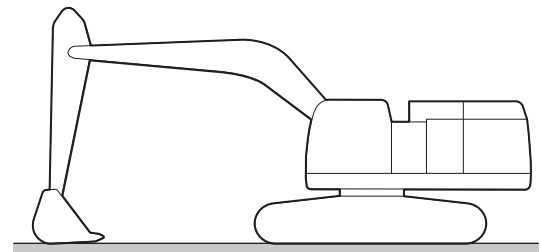


Figure 43

DS1701100

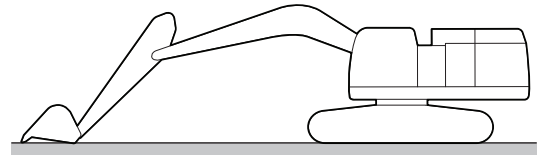
Long Term Storage

When a machine is taken out of service and stored for a time exceeding 30 days, 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:



DS1701288

Figure 44

Before Storage

Keep the excavator in the position shown in Figure 44 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.
- 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.)
- Remove battery from the excavator to be fully charged and stored.
- Inspect the coolant recovery tank and radiator to make sure the antifreeze level in the system is correct. Make sure that antifreeze concentration is enough for the lowest temperature anticipated during storage.
- Seal all external openings (i.e. engine exhaust outlet, crankcase and hydraulic breather, fuel vent line, etc.) with tape wide enough to cover the opening, regardless of size.

NOTE: *When sealing with tape, be sure to extend tape approximately one inch (25 mm) beyond opening to insure a good seal.*

NOTE: *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.*
- *Turning off electrical current with battery disconnect switch.*
- *Park machine where risk of theft, burglary and damage is minimized.*
- *Removing valuables from cabin such as cellular phone, computer, radio and bags.*

During Storage

- Once a month, start the engine and follow the "Hydraulic Oil Warm-up" procedures listed in this manual.
- 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. Rotate track to prevent track seizing".
- Every 90 days, use a hydrometer to measure the protection of the coolant. Refer to the antifreeze/coolant protection chart to determine protection of the cooling system. Add coolant as required.

After Storage

- Before operating the work equipment, remove all grease from the hydraulic cylinder rods.
- Add grease and oil at all lubrication points.
- Adjust fan and alternator belt tension.
- Connect the charged battery.
- Check condition of all hoses and connections.
- Check the levels of engine oil, fuel, coolant and hydraulic circuit 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 "Hydraulic Oil Warm-up" procedures listed in this manual.

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.
- Welding or grinding painted parts must be done in well ventilated areas.
- Wear a dust mask when grinding painted parts. Toxic dust and gas can be produced.
- Vent exhaust to outside when engine must be running for service.
- Exhaust system must be tightly sealed. Exhaust fumes are hazardous and can cause death or serious injury.
- 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 fill fuel tank while engine running, while smoking, or when near open flame.
- Keep body, jewelry and clothing away from moving parts, electrical contact, hot parts and exhaust.
- Wear eye protection to guard from battery acid, compressed springs, fluids under pressure and flying debris when engines are running or tools are used. Use eye protection approved for welding.

- 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.
- Check that battery relay is "OFF" and main power is shut off. (Wait for approximately one minute after turning "OFF" engine starter switch key and press horn switch. If horn does not sound, the main power is shut off.)
- Put blocks under track to prevent the machine from moving.
- To prevent injury, do not perform maintenance with engine running. If maintenance must be done with engine running, perform maintenance with at least two workers and do the following:
 - One worker must always sit in the operator's seat and be ready to stop engine at any time. All workers must maintain contact with other workers.
 - When maintenance operations are near fan, fan belt, or other rotating parts, there is a potential hazard of being caught in rotating parts. Keep hands and tools away.
- 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.
- Do not smoke when you service an air conditioner or if refrigerant gas is present.
- Inhaling fumes either from a flame or gas from a cigarette that has contacted air conditioner refrigerant can cause death or serious injury.
- Never put maintenance fluids into glass containers. Drain all liquids into a suitable containers.
- Unless instructed otherwise, perform maintenance with equipment in servicing position. Refer to this manual for procedure for placing equipment in servicing position.

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. Use of a chain or cable to keep the safety lever in the fully lowered "LOCK" position, complies with OSHA's lockout requirements.

"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.



Figure 45

DS1801807

Cleaning

Clean machine before performing inspection and 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 slipping and falling.
- Wear safety goggles and protective clothing when washing machine with high-pressure steam or water.
- Do not spray water directly on electrical components (sensors, connectors). If water gets into electrical system, it can cause operation problems.
- Pick up any tools or hammers that are laying in workplace. Wipe up any grease or oil to prevent slippery substances, that can cause tripping or slipping.
- When cleaning cabin top window which is made of polycarbonate material, use tap water. Avoid use of organic solvents for cleaning, such as benzene, toluene or methanol. These solvents can cause a chemical reaction that will dissolve and damage the window.

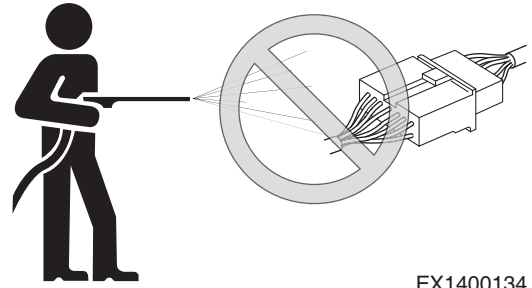


Figure 46

EX1400134

Proper Tools and Clothing

Only use tools that are intended for the type of service to be done. Metal pieces from low quality or damaged tools, such as chisels or hammers, can break off and hit a service person in the eyes or face causing serious injury.

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 fuel, oil, battery electrolyte, window washer fluid, or coolant, always use proper lighting equipment to prevent arcs or sparks that could cause a fire or explosion resulting in death or serious injury.

Fire and Explosion Prevention

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

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

Store oily rags and other flammable material in a protective container.

Tighten all fuel and oil caps.

Do not smoke while you refuel machine or while you are in a refueling area.

Do not smoke in battery charging areas or in areas that contain flammable material.

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 from the engine compartment, exhaust system components and hydraulic lines.



HDO1015I

Figure 47



FG018458

Figure 48

Burn Prevention

When checking radiator coolant level, stop engine, let engine and radiator cool down, then check coolant recovery tank. If coolant level in coolant recovery tank is near upper limit, there is enough coolant in radiator.

Using gloves, loosen radiator cap slowly to release internal pressure before removing radiator cap.

If coolant level in coolant recovery tank is below lower limit, add coolant.

Cooling system conditioner contains alkali which can cause personal injury. Do not allow alkali to contact skin, eyes, or mouth.

Allow cooling system components to cool before draining cooling system.

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

Vent hydraulic tank only after engine has been stopped and hydraulic tank is cool. Using gloves, slowly tilt hydraulic tank air breather to relieve pressure.

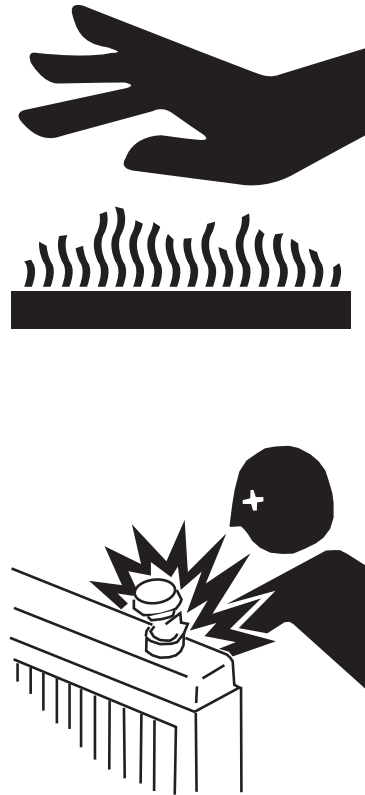
Relieve all pressure in hydraulic oil system, in fuel system, or in cooling system before disconnecting any lines, hoses, fittings, or related components.

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.



haae2090

Figure 49

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 engines, 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 under all circumstances be followed:

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.



NOTICE

When disconnecting or connecting connectors between ECU and engine, or connector between ECU and the machine, always disconnect the battery to prevent damage to ECU.

If you do not follow this procedure, the ECU will be damaged and/or the engine will not operate properly.

NOTE: *Disconnect battery only when LED light is OFF after engine is turned OFF.*

When performing welding repairs, perform welding in a properly equipped place. Repairs must be performed by a qualified welder. Welding operations, can create potential hazards, including generation of gas, fire, or electric shock. Never let an unqualified welder do welding.

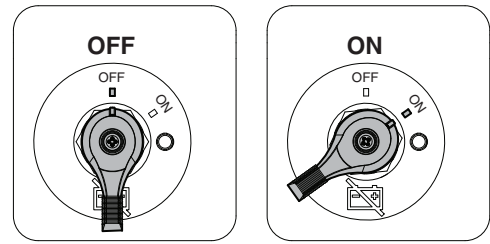
A qualified welder must do the following:

- To prevent battery explosion, turn battery disconnect switch to "OFF" position.
- Disconnect the connector between ECU and machine, and the connector between ECU and engine.
- Disconnect the negative (-) cable of battery.
- To prevent generation of gas, remove paint from location of the weld.
- If hydraulic equipment, piping or component ports close to them are heated, a flammable gas or mist could result in an explosion or fire. To prevent this, protect and insulate components from excessive heat.
- Do not weld on pipes or on tubes that contain flammable fluids. Do not flame cut pipes or tubes that contain flammable fluids. Before welding on pipes or tubes, or before flaming cut pipes or tubes, clean them thoroughly with a nonflammable solvent. Make sure pressure inside pipes or tubes does not cause a rupture of the component parts.
- If heat is applied directly to rubber hoses or piping under pressure, they may suddenly break, so cover and insulate them with a fireproof covering.
- Wear protective clothing.
- Make sure there is good ventilation.
- Remove all flammable objects and make sure a fire extinguisher is available.

Preparation for Electrical Welding On Body Structure

To prevent damage to ECU by electrical welding, observe the following procedures:

1. Turn battery disconnect switch to "OFF" position.
2. Disconnect the connector between ECU and machine, and the connector between ECU and engine.
3. Disconnect the negative (-) cable of battery.
4. Proceed with welding.
5. After welding, connect the connector between ECU and machine, and the connector between ECU and engine.
6. Connect the negative (-) cable of battery.
7. Clean battery compartment.
8. Turn battery disconnect switch to "ON" position.
9. Close battery compartment door.



EX1500481

Figure 50

Warning for Counterweight and Front Attachment Removal



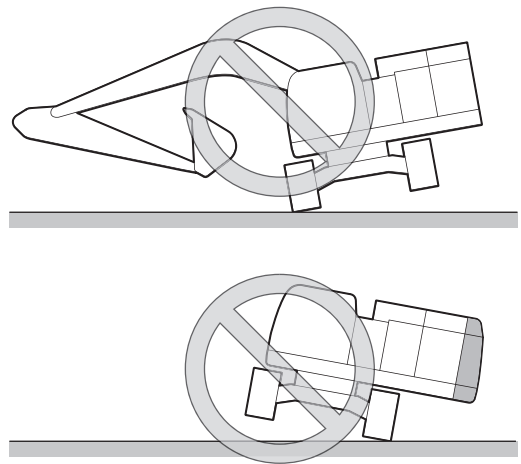
WARNING

AVOID DEATH OR SERIOUS INJURY

Removal of the machine counterweight, front attachment or any other part can affect the stability of the machine. This could cause unexpected movement, and result in death or serious injury.

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.



DS1701101

Figure 51

Lock Inspection Covers

When performing maintenance with inspection cover open, use lock bar to secure cover and prevent accidental lowering of the cover caused by wind or movement of the machine.

Working on Machine

When performing maintenance operations on machine, prevent tripping and falling by keeping area around your feet clean and free of objects and debris. Always do the following:

- Do not spill oil or grease.
- Do not leave tools laying around.
- Watch your step when walking.
- Never jump down from machine. When getting on or off machine, use steps and handrails, and maintain a three-point contact (both feet and one hand or both hands and one foot) to support yourself.
- If job requires it, wear protective clothing.
- To prevent injury from slipping or falling, when working on hood or covers, never stand or walk on areas except areas equipped with nonslip pads.
- If it is necessary to work under raised equipment or the machine, support work equipment and machine securely with blocks and stands strong enough to support weight of work equipment and machine.
- Do not work under the machine if track shoes are lifted off ground and the machine is supported only with work equipment. If any control levers are moved, or there is damage to hydraulic system, work equipment or the machine will suddenly drop causing death or serious injury.



ARO1380L

Figure 52

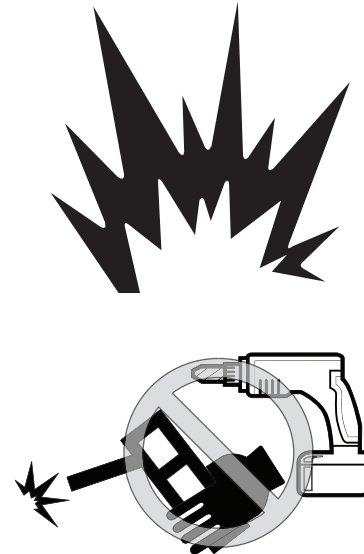
Accumulator

The pilot control system is equipped with an accumulator. For a short period of time after engine has been stopped, accumulator will store a pressure charge that allow hydraulic controls to be activated. Activation of any controls will allow selected functions to operate under force of gravity.

When performing maintenance on pilot control system, release hydraulic pressure in system as described in "Handling of Accumulator" on page 4-96.

The accumulator is charged with high-pressure nitrogen gas. If it is improperly handled it can explode causing death or serious injury. Always observe the following precautions:

- Do not drill or punch holes in accumulator or expose it to any flames, fire or external heat source.
- Do not weld on accumulator.
- When performing disassembly or maintenance of accumulator, or when disposing of accumulator, charged nitrogen gas must be properly released. Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for assistance.
- Wear safety goggles and leather gloves when working on an accumulator. Hydraulic oil under pressure can penetrate skin and result in death or serious injury. If fluid enters skin or eyes, get immediate medical attention from a physician familiar with this injury.



EX1400135

Figure 53

Compressed Air

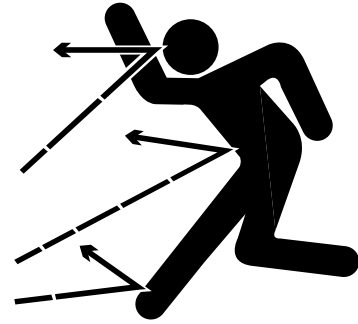
- When cleaning filters, radiator or other components with compressed air, there is a hazard of flying particles that can result in serious injury.
- Always wear safety goggles, dust mask, leather gloves, and other protective devices.

Track Tension Adjustments

Track adjusting systems use grease under high-pressure to keep track under tension. Grease under high-pressure can penetrate body and result in death or serious injury. Watch track or track spring to see if track is being loosened.

NEVER LOOSEN track tension grease valve. To release pressure from crawler frame track tension assembly, you should **NEVER** attempt to disassemble track adjuster or attempt to remove track tension grease valve assembly.

Keep your face and body away from grease valve. Refer to "Track Tension" on page 4-97, for proper procedure in this manual or Shop Manual.



HAOA110L

Figure 54

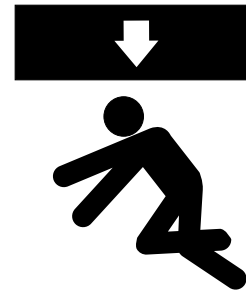
Supports and Blocking for Work Equipment

Do not allow weight or equipment loads to remain suspended and unsupported.

Lower work group to ground before leaving operator's seat.

Do not use hollow, cracked or unsteady wobbling supports.

Do not work under any equipment supported only by a lifting jack.



HDO1042L

Figure 55

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. Release pressure as described in "Handling of Accumulator" on page 4-96.

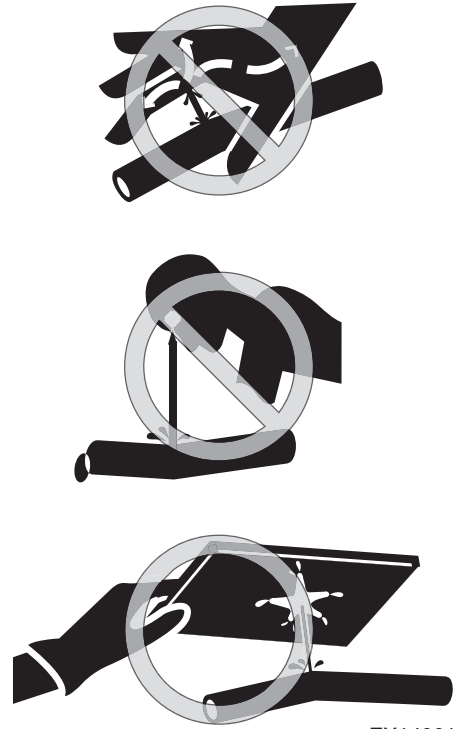
Always do the following:

- Wear eye protection and leather gloves.
- Fluid leaks from hydraulic hoses or pressurized components can be difficult to see but has enough force to pierce skin and can result in death or serious injury. Always use a piece of wood or cardboard to check for suspected hydraulic leaks. Never use your hands or expose your fingers. Wear safety goggles.
- Do not bend high-pressure lines. Do not strike 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.
 - Connection fittings are damaged or leaking.

NOTE: Refer to "Hose In-service Lifetime Limit (European Standard ISO 8331 and EN982 (CEN))" on page 4-81, for additional European regulations.

High-pressure is generated inside engine fuel lines when engine is running. Before performing inspection or maintenance of fuel line system, wait for at least thirty seconds after stopping engine to let internal pressure drop and tip breather cap up to release residual pressure.

Oil or fuel leaks from high-pressure hoses can cause fire or improper operation, which can result in 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 56

Battery

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. Always observe the following precautions.

- Do not smoke or bring any flame near battery.
- When cleaning top surface of battery, wipe it with a clean, damp cloth. Never use gasoline, thinner, or any other organic solvent or detergent.
- Tighten battery caps.
- If battery electrolyte is frozen, do not charge battery or start engine with power from another source. This could cause the battery to explode and start a fire.
- When charging battery or starting with power from another source, let battery electrolyte thaw and check that there is no leakage of battery electrolyte before starting operation.
- Always remove battery from machine before charging.
- Before maintaining or working with batteries, turn starter switch to "O" (OFF) position.



Figure 57

EX1400136

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

- Do not let tools, rings 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 "O" (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.
- After charging, tighten battery caps securely.
- After charging, secure battery back in machine.

When repairing or welding electrical system, wait for approximately one minute after turning engine starter switch key "OFF". Then disconnect negative (-) terminal of battery to stop flow of electricity.

Environment and Circumstances

Work Site Areas Requiring Extra Caution

- Do not operate too close to edge of a quay, ramp, etc.
- Do not operate too close to edge of a steep slope or drop-off. 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 work face under an overhang. This can cause overhang to collapse and fall on top of the machine.

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

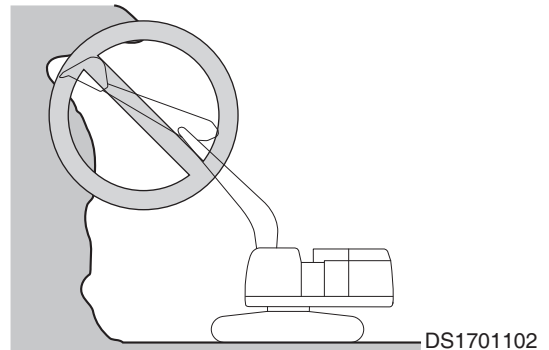


Figure 58

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.

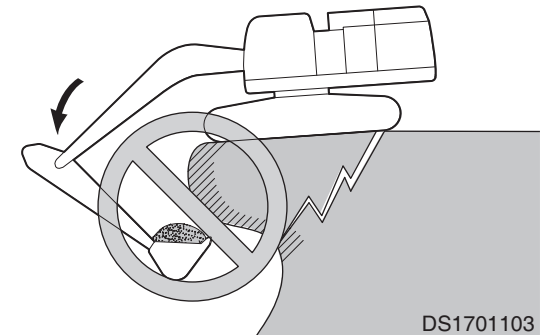


Figure 59

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, 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, on 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 roll-over.

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 5 m (16 ft) 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.

Loose ground may easily give way under weight of the machine.

When working on loose or unstable ground, it is important not to dig too deep and to carefully reposition the machine. Do not panic and do not raise bucket, if ground should begin to collapse. 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 spotter 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 (9' 10")
33.0 kV	4 m (13' 1")
66.0 kV	5 m (16' 5")
154.0 kV	8 m (26' 3")
275.0 kV	10 m (32' 10")

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

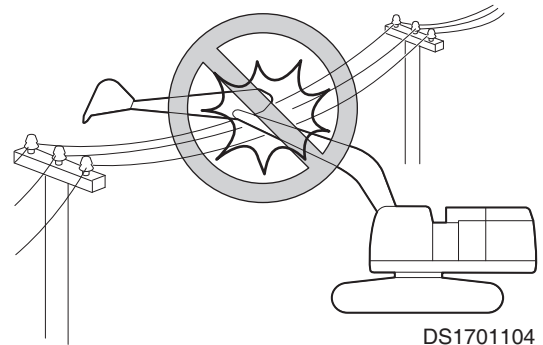


Figure 60

Underground Operation

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

Special equipment and engines may be required in some countries. Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for more information.

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. Also check which rules apply to ground personnel regarding exposing cables, utilities and electrical lines.

Consider all electrical cables as live.

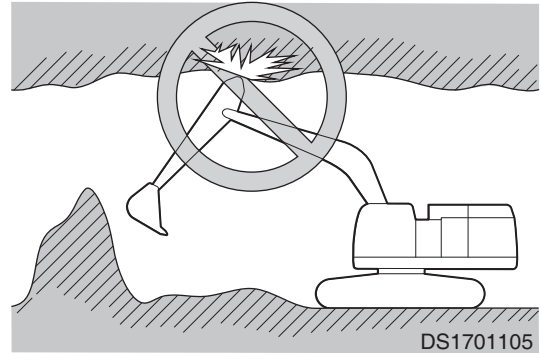


Figure 61

Working in Water



NOTICE

Do not exceed maximum permissible water depth. The water level must not reach higher than centerline of upper track roller(s) (1, Figure 62).

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.

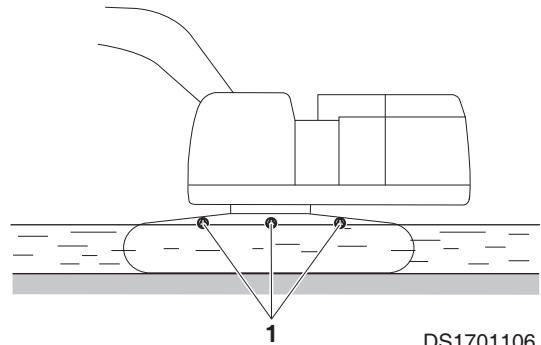


Figure 62

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 and stay away from even slight slopes. 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. The jolting shocks and impact loads caused by bumping or bottoming boom or attachment could cause severe stress in very cold temperatures. 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. Keep batteries fully charged to prevent freezing. If distilled water is added to batteries, run engine at least one hour to mix electrolyte solution.
When temperature drops below -10°C , efficacy of the battery is reduced accordingly. Insulation of the battery prevents reduction of efficacy, and supports improvement of starting power of the starter.



WARNING

AVOID DEATH OR SERIOUS INJURY

**Explosion of the battery can cause death or serious injury.
Never attempt to directly heat the battery with open fire.**

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. Refer to "Table of Recommended Lubricants" on page 4-18, in this manual or Shop Manual for details.
4. Always keep the fuel tank fully filled after completion of the operation. Always drain water from the fuel tank before and after the operation. In addition, check the water separator, and drain it if required. The fuel filter, if frozen, may interrupt the flow of fuel. Periodically remove water from the fuel tank, drain water from the filter, and replace the filter upon regular basis. To prevent fuel from being clogged because of formation of wax in fuel, make sure that wax formation point of fuel is lower than atmospheric temperature.



WARNING

AVOID DEATH OR SERIOUS INJURY

**Explosion of the battery can cause death or serious injury.
Never attempt to directly heat the battery with open fire.**

5. Lubricate entire machine according to "Lubrication and Service Chart" on page 4-13, in this manual or lubrication chart on machine.
6. Start engine and allow it to reach normal operating temperature before operating.
 - 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.
7. An extra outer air filter must be kept in operator's cabin to replace element that could become iced and cause restricted airflow to engine.
8. 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. Make frequent inspections and services of fan and radiator. Check coolant level in radiator. Check grilles and radiator fins for accumulation of dirt, debris and insects which could block cooling passages.
 - Formation of scale and rust in cooling system occurs more rapidly in extremely high temperatures. Change antifreeze each year to keep corrosion inhibitor at full strength.
 - If necessary, flush cooling system periodically to keep passages clear. Avoid use of water with a high alkali content which increases scale and rust formation.
2. 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.

3. Service fuel system as directed in "Fuel Level - Check" on page 4-27 and "Check for Leaks in Fuel System" on page 4-1, of this manual. Check for water content before filling fuel tank. High temperatures and cooling off cause condensation in storage drums.
4. Lubricate as specified in "Lubrication and Service Chart" on page 4-13, in this manual or Lubrication Decal on machine.

5. Do not park machine in sun for long periods of time. If possible, park machine under cover to protect it from sun, dirt and dust.
 - A. Cover machine if no suitable shelter is available. Protect engine compartment and hydraulics from dirt and debris.
 - B. In hot, damp climates, corrosion will occur on all parts of machine and will be accelerated during rainy season. Rust and paint blisters will appear on metal surfaces and fungus growth on other surfaces.
 - 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. Use care when servicing fuel system to prevent dust and sand from entering tank.
3. Service air cleaner at frequent intervals, check air restriction indicator daily and keep dust cup and dust valve clean. 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 4-13. 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 4-13, 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 at High Altitudes

Operation instructions at high altitudes are the same as those provided for extreme cold. Before operating at high altitudes, engine fuel and air mixture may have to be adjusted according to appropriate engine manual.

1. Check engine operating temperature for evidence of overheating. The radiator cap must make a perfect seal to maintain coolant pressure in cooling system.
 - Perform warming-up operation thoroughly. If machine is not thoroughly warmed up before control levers or control pedals are operated, reaction of machine will be slow.
 - If battery electrolyte is frozen, do not charge battery or start engine with a different power source. There is a potential hazard that could cause a battery explosion or fire.
 - Before charging or starting engine with a different power source, thaw battery electrolyte and check for any leakage of electrolyte before starting.

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.

Exhaust Ventilation

Engine exhaust gases can cause unconsciousness, loss of alertness, judgment and motor control. This can result in death or serious injury.

Make sure there is adequate ventilation before starting engine in any enclosed area.

Check for and be aware of any open windows, doors or ductwork where exhaust may be carried, or blown by wind, exposing others to hazardous exhaust gases.

Ventilation for Enclosed Area

If it is necessary to start engine within an enclosed area, or when handling fuel, flushing oil, or paint; open doors and windows to ensure that adequate ventilation is provided to prevent gas poisoning.

Diesel engine exhaust contains products of combustion which can be harmful to your health.

Always run engine in a well ventilated area. If you are in an enclosed area, vent exhaust to outside.



ARO1770L

Figure 63

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).

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.
- Comply with applicable laws and regulations for workplace.
- 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 OSHA or other work site rules, laws and regulations. Use a respirator, water spray or other means to control dust. Silica dust can cause lung disease and is known to the state of California to cause cancer.

Disposal of Hazardous Materials

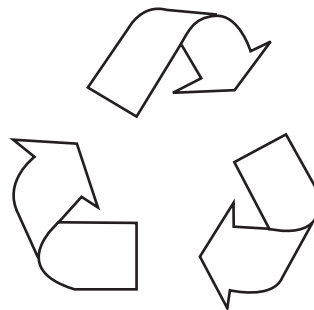
Physical contact with used motor oil or gear oil could create a health risk. Wipe oil from your hands promptly and wash off any remaining residue.

Used motor oil or gear oil is an environmental contaminant and should only be disposed of at approved collection facilities. To prevent pollution of environment, always do the following:

- Never dump waste 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 local regulations.

Use all cleaning solutions with care. Report all necessary repairs.



FG009156

Figure 64

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)	72 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)	110 dB(A)

Vibration Information

NOTE: *The level of vibration is influenced by many different parameters such as operator training, job site organization, weather, material, environment, machine type, machine and seat suspension system, attachments, and condition of the machine.*

Measurements are obtained on a representative machine, using measuring procedures as described in the following standards: ISO 2631/1, ISO 5349, and SAE J1166.

Vibration levels were given consideration in accordance with uncertainty (K) determined to manufacturer.

Hand/Arm Vibration Level

The vibration total value to which the hand-arm system is subjected, is less than 2.5 m/s².

Whole Body Vibration Level

The highest root mean square value of weighted acceleration to which the whole body is subjected, is more than 0.5 m/s² (less than 1.15 m/s²).

Guidelines for Use and Working Conditions of Earth-moving Machinery to Reduce Vibration Levels (ISO/TR 25398 Annex E)

Properly adjusting and maintaining machines, operating machines smoothly, and maintaining the terrain conditions can reduce whole-body vibrations. The following can help the users of earth-moving machinery reduce whole-body vibration levels.

1. Use the right type and size of machine, equipment, and attachments.
2. Maintain machines according to the manufacturer's recommendations: (for wheeled machine)
 - Tire pressure;
 - Brake and steering systems;
 - Controls, hydraulic system and linkages.
3. Keep the terrain where the machine is working and travelling in good condition:
 - Remove any large rocks or obstacles;
 - Fill any ditches and holes;
 - Provide machines and schedule time to maintain terrain conditions.
4. Use a seat in conformance with ISO 7096 and keep the seat maintained and adjusted:
 - Adjust the seat and suspension for the weight and size of the operator;

- Inspect and maintain the seat suspension and adjustment mechanisms.
5. Steer, brake, accelerate, shift gears, and move the attachments smoothly. (for wheeled machine)
 6. Adjust the machine speed and travel path to minimize the vibration level:
 - Drive around obstacles and rough terrain conditions;
 - Slow down when it is necessary to go over rough terrain.
 7. Minimize vibrations for long work cycle or long distance travelling: (for wheeled machine)
 - Use machines equipped with suspension systems;
 - Use lift arm suspensions on wheel loaders;
 - If no suspension system is available, reduce speed to prevent bouncing;
 - Haul machines long distances between worksites.
 8. Back pain associated with whole-body vibrations can be caused by other risk factors. To minimize the risk of back pain:
 - Adjust the seat and controls to achieve good posture;
 - Adjust the mirrors to minimize twisted posture;
 - Provide breaks to reduce long periods of sitting;
 - Avoid jumping down from the cab or access system;
 - Minimize repeated handling and lifting of loads;
 - Minimize any shocks and jolts during sports and leisure activities.

Operating Controls

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

1. "Component Locations" on page 2-2
2. "Operator's Area" on page 2-6
3. "Operational Controls and Panels" on page 2-8
4. "Display Monitor" on page 2-28
5. "User Menu" on page 2-46
6. "Around View Monitoring (AVM) System (If Equipped)" on page 2-70
7. "Proximity Alarm System (If equipped)" on page 2-73
8. "Heater and Air Conditioner Control Panel" on page 2-77
9. "Stereo" on page 2-82
10. "Miscellaneous Electrical Devices" on page 2-83
11. "Seat Adjustment" on page 2-85
12. "Seat Belt" on page 2-88
13. "Engine Emergency Stop Switch" on page 2-89
14. "Emergency Exit Glass Breaking Tool" on page 2-89
15. "Miscellaneous Convenience Devices" on page 2-90
16. "Miscellaneous Access Covers and Doors" on page 2-96
17. "Air Gun and Compressor (If Equipped)" on page 2-98

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

Warning symbols will appear above the gauges on the display monitor when a problem with the machine is detected.

The operator should monitor machine functions on the display monitor to ensure the machine is operating properly.

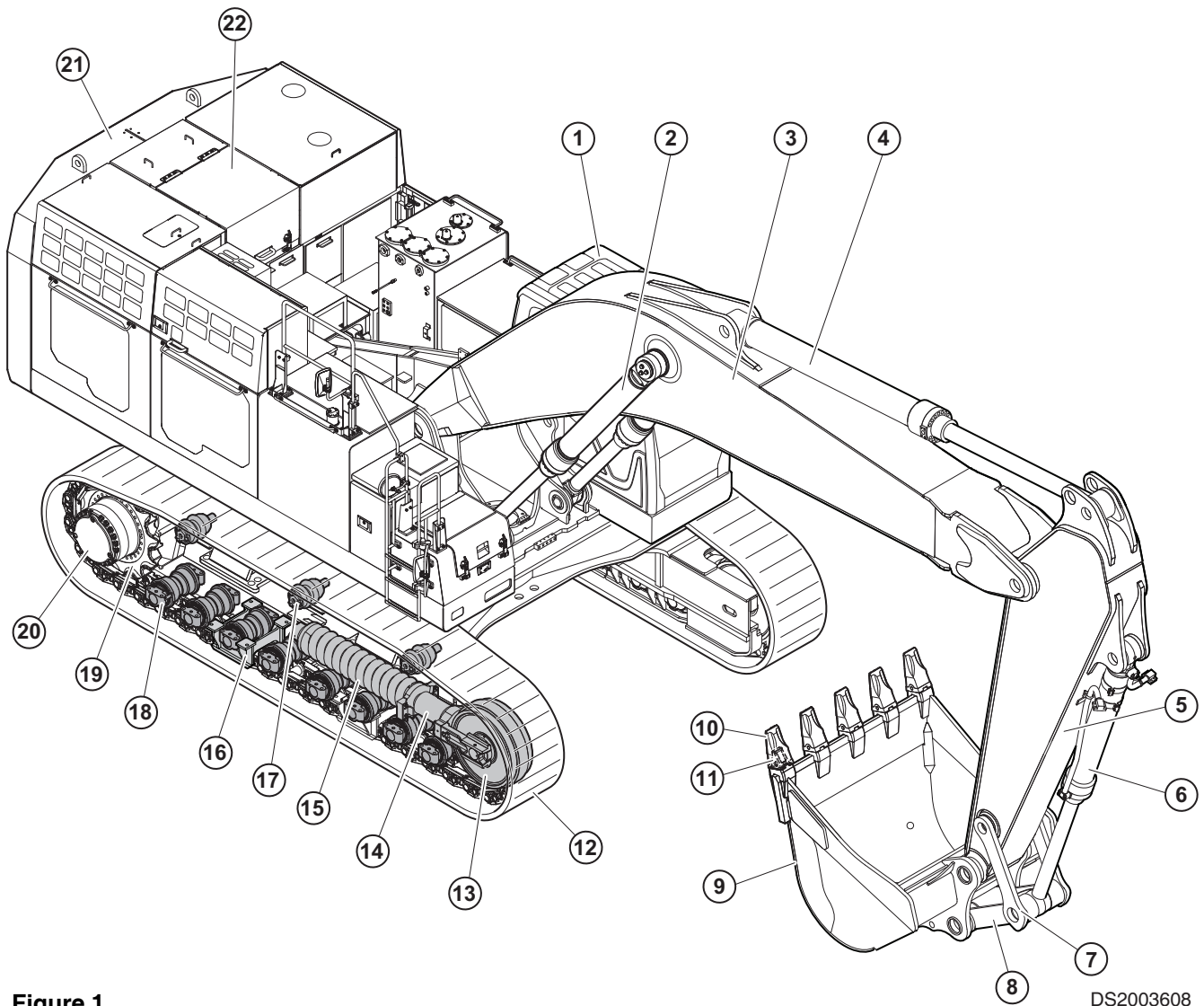


NOTICE

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.

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.*

Component Locations

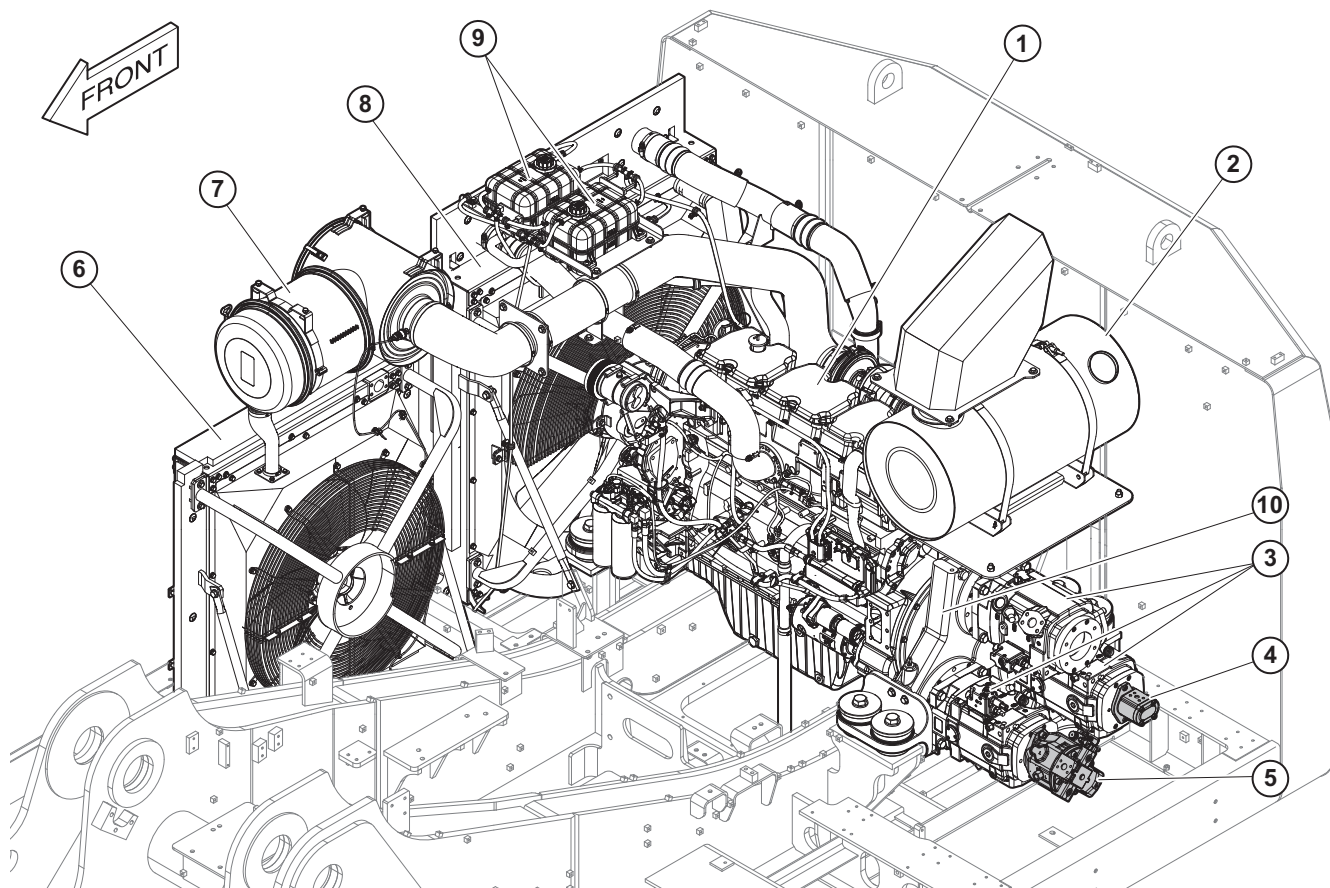


DS2003608

Figure 1

Reference Number	Description
1	Cabin
2	Boom Cylinder
3	Boom
4	Arm Cylinder
5	Arm
6	Bucket Cylinder
7	Guide Link
8	Push Link
9	Bucket
10	Tooth Point
11	Tooth Adapter

Reference Number	Description
12	Track Link and Shoe
13	Idler
14	Grease Cylinder
15	Track Spring
16	Track Guard
17	Upper Roller
18	Lower Roller
19	Sprocket
20	Travel Motor
21	Counterweight
22	Hood

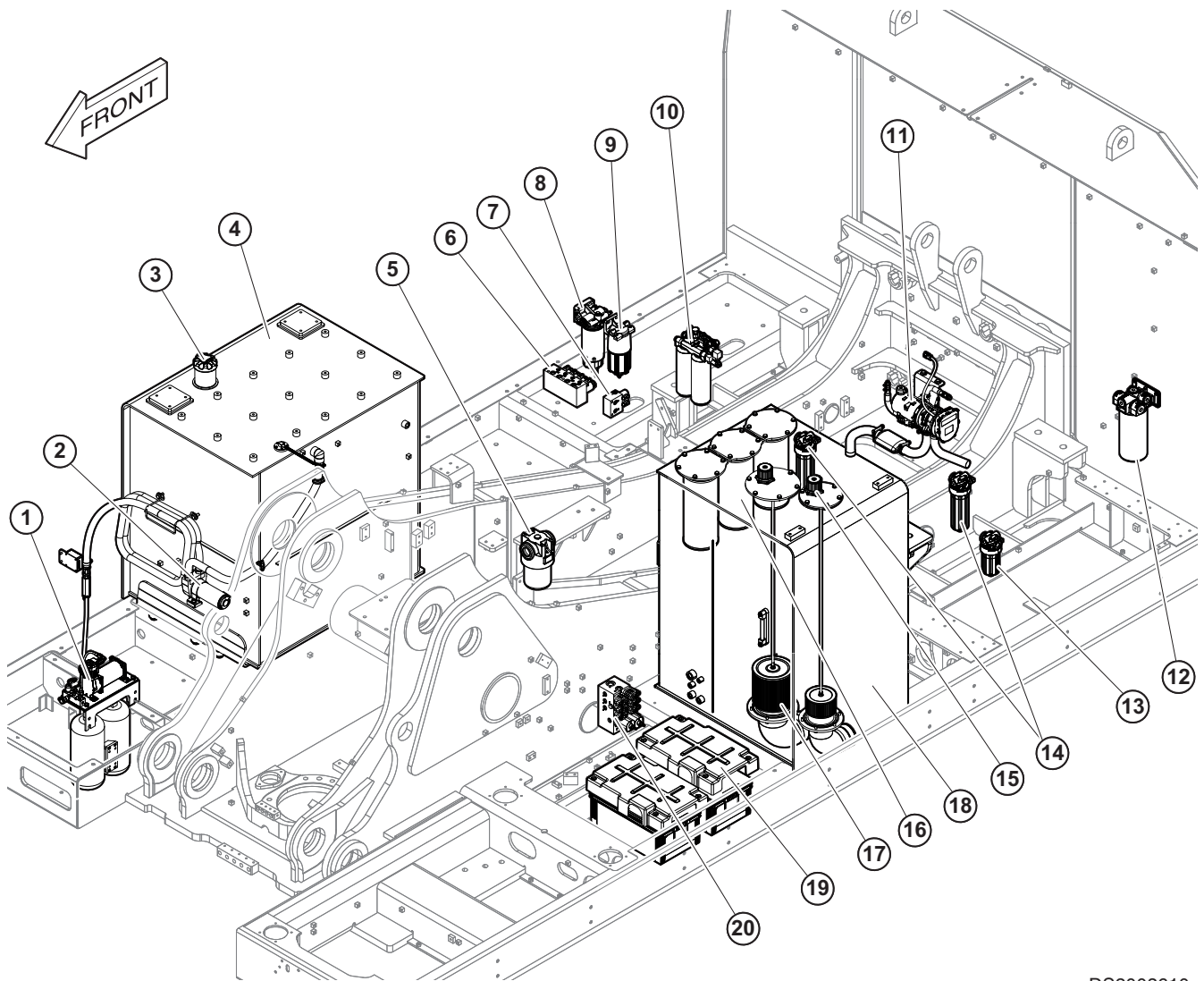


DS2003609

Figure 2

Reference Number	Description
1	Engine
2	Muffler
3	Main Pump
4	Pilot Pump
5	Fan Pump

Reference Number	Description
6	Oil Cooler
7	Air Cleaner
8	Radiator Assembly
9	Surge Tank
10	Pump Drive

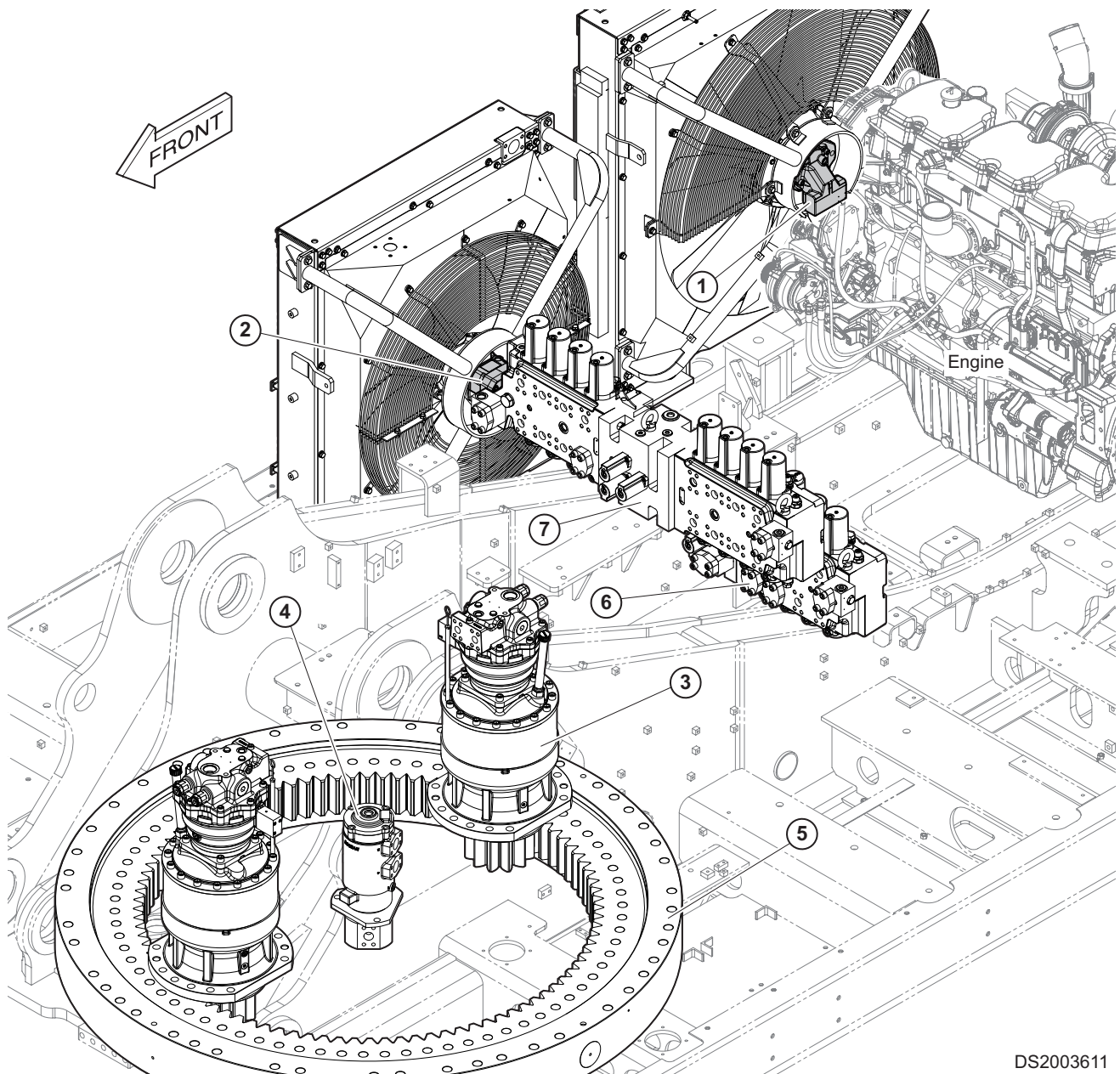


DS2003610

Figure 3

Reference Number	Description
1	Air compressor Pump (If Equipped)
2	Fuel Filler Pump (If Equipped)
3	Fuel Cap
4	Fuel Tank
5	Breaker Filter (If Equipped)
6	EPPR Package Valve
7	Bypass Cut Valve
8	Water Separator & Fuel Prefilter
9	Additional Water Separator (If Equipped)

Reference Number	Description
10	Main Fuel Filter
11	Diesel Heater (If Equipped)
12	Engine Oil Filter
13	Pilot Filter
14	Drain Filter
15	Hydraulic Oil Tank Breather
16	Return Filter
17	Suction Filter
18	Hydraulic Oil Tank
19	Battery
20	Solenoid Valve



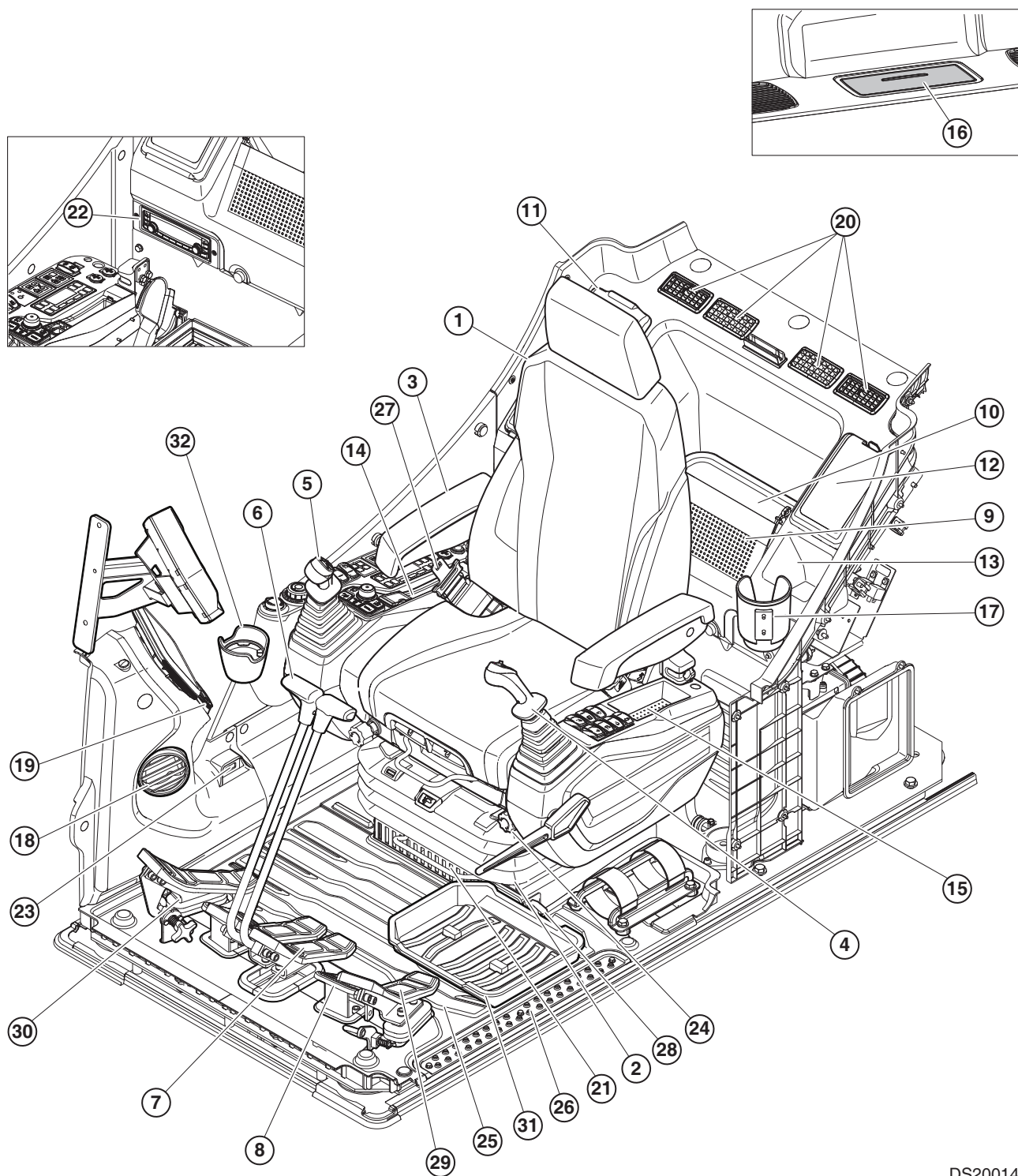
DS2003611

Figure 4

Reference Number	Description
1	Fan Motor (Radiator)
2	Fan Motor (Oil Cooler)
3	Swing Device
4	Center Joint

Reference Number	Description
5	Swing Bearing
6	Main Control Valve #2
7	Main Control Valve #1

Operator's Area



DS2001440

Figure 5

Reference Number	Description
1	Seat
2	Suspension
3	Arm Rest
4	Left-hand Work Lever (Joystick)
5	Right-hand Work Lever (Joystick)
6	Travel Lever
7	Travel Pedal
8	Footrest
9	Storage Net
10	Storage Space (Large)
11	Storage Space (Heating and Cooling)
12	Fuse Box
13	Storage Compartment (1)
14	Storage Compartment (2)
15	Storage Compartment (3)
16	Sunglass Case
17	Cup Holder

Reference Number	Description
18	Defroster Vent
19	Face Vent
20	Rear Vent
21	Foot Vent
22	Stereo
23	Hour Meter
24	Joystick Height Adjustment Knob
25	Mat
26	Step
27	Seat Belt
28	Engine Emergency Stop Switch
29	Straight Travel Pedal (If Equipped)
30	One/Two Way Pedal (If Equipped)
31	Shoe Case (If Equipped)
32	Cup Holder

Operational Controls and Panels

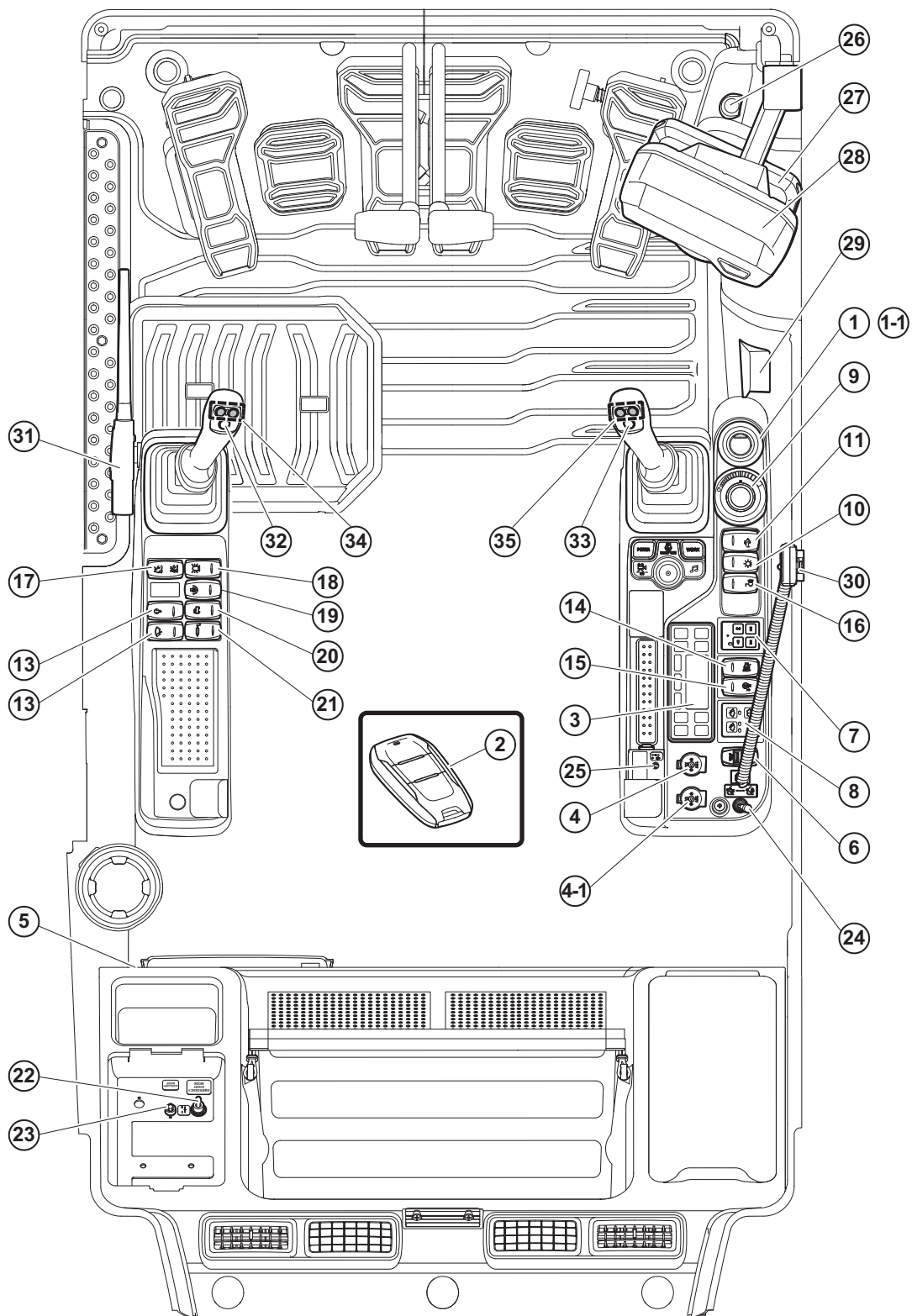


Figure 6

DS2003615

Reference Number	Description
1	Starter Switch
1-1	Start/Stop Button
2	Smart Key
3	Air Conditioning and Heating Control Panel
4	12V Power Socket
5	24V Power Socket
6	USB Charger
7	Bluetooth Control Panel
8	Wiper Control Panel
9	Engine Speed Control Dial
10	Light Switch
11	Travel Speed Selector Switch
12	Lower Wiper Switch (If Equipped)
13	Overload Warning Switch (If Equipped)
14	Buzzer Alarm Stop Switch (If Equipped)
15	Swing Priority Switch
16	Cabin Work Light Switch (If Equipped)
17	Intelligent Floating Boom Switch (If Equipped)

Reference Number	Description
18	Warning Light Switch (If Equipped)
19	Reverse Fan Switch (If Equipped)
20	Air Compressor Switch (If Equipped)
21	Auto Grease System Switch (If Equipped)
22	Emergency Start Mode Switch
23	Auxiliary Mode Switch
24	Quick Coupler Switch (If Equipped)
25	Swing Brake Release Switch
26	Photo Sensor
27	Display Monitor
28	Around View Monitoring (AVM) Monitor (If Equipped)
29	Hour meter
30	Micro Phone (If Equipped)
31	Safety Lever
32	Horn Button
33	Breaker/Booster Button
34	Rotation Buttons
35	Share Buttons

1. Starter Switch

A three-position starter switch is used to start or stop engine for equipment operation.

O. Turning switch to this position turns engine "OFF" with its electrical system. In this position, engine is "OFF" but interior cabin light and fuel tank transfer pump (if equipped) are functional.

ACC. Without starting engine, you can operate some electronic devices.

- Display Monitor Multimedia Function
- Stereo
- Handsfree
- Power Socket for 12 V
- USB Charger
- Jog Switch

I. Turning switch to this position turns engine electrical system "ON". When the switch is first turned "ON", six indicator/warning symbols across top of the display monitor, will turn "ON" for approximately two seconds. The battery warning symbol and engine oil pressure warning symbol should remain "ON" after the other four have turned "OFF".

⌚. Moving switch to this position will crank engine. When engine starts, release key and allow it to return to "I" (ON) position. Do not operate the starter switch for more than fifteen seconds at a time. This will help prevent damage to starter.

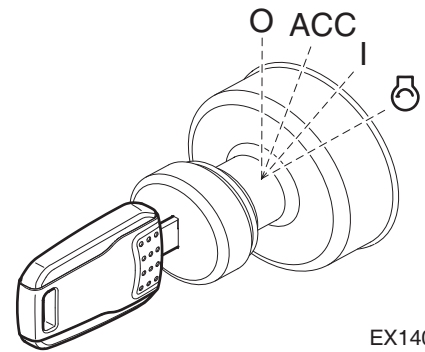


Figure 7

EX1402126



WARNING

AVOID DEATH OR SERIOUS INJURY

DO NOT USE STARTING FLUIDS. The starting fluids may explode.

1-1.Start/Stop Button

Use the engine start and stop switch to operate the machine.

A. Basic functions (OFF → ACC → Key On → START)

The color and illumination of the LED lamp indicate the current mode.

- OFF (LED: off)

The machine is motionless.

- ACC (LED: green)

Holding down the start/stop button for less than one second switches to ACC mode and activates certain electrical systems.

- Display Monitor Multimedia Function
- Stereo
- Hansfree
- Power Socket for 12V
- USB Charger

- Key On (LED: red)

Holding down the start/stop button for less than one second in ACC mode switches to key ON mode.

- START (LED: blue)

Holding down the start/stop button for one second or longer in any mode starts the engine.

NOTE: *Holding down the start/stop button for one second or longer while the engine is running stops the engine. For safety, the function cannot be used while working or driving.*

B. Emergency Off

Pressing the start/stop button three times within two seconds while the engine is running stops the engine.

NOTE: *If the smart key is not detected after being in ACC mode for 10 seconds, a 'No Smart Key' warning pop up appears. If the smart key is still not detected after one minute, the machine is turned off.*

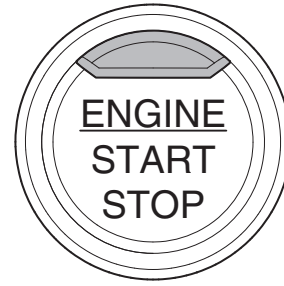


Figure 8

DS1901193



WARNING

AVOID DEATH OR SERIOUS INJURY

Never use starting fluid as it may cause an explosion.

2. Smart Key

The smart key only works in key OFF mode. The key operates when the buttons are released.

A. Operation method

Pushing button no.1 turns the lamp on for one minute.

Pushing button no.2 turns the lamp off.

Pushing button no.3 selects the registered machine.
(Up to six machines can be registered)

- Push once: The horn and lamp in registered machine no.1 turn on and off three times.
- Push twice: The horn and lamp in registered machine no.2 turn on and off three times.
- After pushing the button as many times as the number of registered excavators and the number of nearby excavators, the smart key returns to the first excavator.
- If only one excavator is registered, the lamp turns on three times and the horn sounds three times repeatedly when the button is pushed.

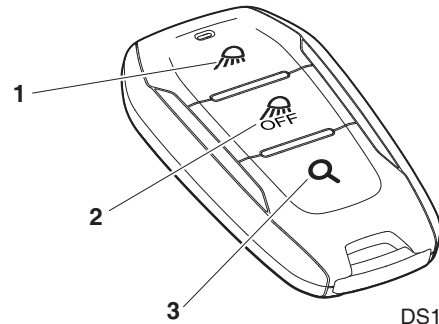


Figure 9



WARNING

AVOID DEATH OR SERIOUS INJURY

If the smart key is in the machine, the engine can be started by pushing the Start button.

Consequently, unanticipated accidents may occur if people unfamiliar with the system in the machine or young children are left alone in the machine, so please be careful.



NOTICE

Take note of the following when using the smart key.

- Always take the smart key with you when you leave the machine.
 - Place the smart key with the start button facing the rear of the machine to avoid starting the machine accidentally.
 - The machine can only be started with the registered smart key. Hence, if the smart key is lost, please contact your local service center for assistance or use the app to register a spare smart key.
 - Take care to keep the smart key away from any liquids such as water. Guaranteed repairs are not provided if the key is not working due to contact with liquids such as water.
-



NOTICE

In the following situations, the smart functions may not work or the operating range of the smart key may change due to interference between the frequency range of the smart key and other frequencies.

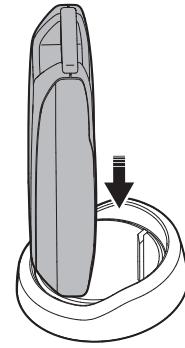
In such cases, use a normal key to open and close the door. In addition, if the engine does not start even when you have the smart key or the key is in the machine, push the Start button with the smart key to start the engine directly. If the engine still does not start, contact your local service center or authorized service agency for an inspection and maintenance.

- Near police stations, government offices, broadcasting stations, military bases, transmission towers, airports, ports, etc.
 - When the smart key is near mobile transceivers such as radios and cellphones
 - When a smart key is used with another nearby vehicle
 - When an external device is connected to the multipurpose socket and the smart key is placed near the external device
 - In extreme cold weather
-

B. Smart key 'Limp Home' function (Immobilizer)

If the smart key battery discharges or the machine does not start due to electromagnetic interference from electronic devices, push the start button with the smart key directly.

As shown in the figure (Figure 10), holding down the start/stop button with the smart key for three seconds or longer starts the engine with the emergency starter.



DS1900267

Figure 10

C. Changing the smart key battery

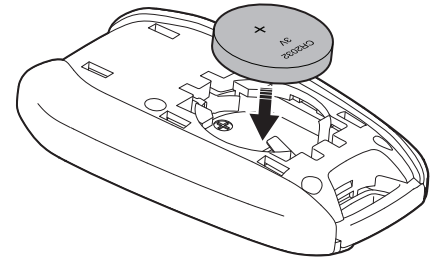
Batteries typically last several years, but be sure to replace the battery as the operating conditions require.

If you are unsure of how to replace the battery, contact your local HD HYUNDAI CONSTRUCTION EQUIPMENT service center or authorized service agency for inspections and replacements.

- 1) Remove the battery cover on the back of the smart key.
- 2) Check the battery specifications; then, install a new battery with the correct polarity.

NOTE: *The smart key uses a CR2032 battery.*

- 3) Reassemble it in the reverse order of disassembly.



DS1900268

Figure 11

D. Registering smart key to a machine

There are two ways to register a smart key in the machine.

- Have a service employee register the key
 - 1) Enter the eight-digit code in the 'Display Monitor - User Menu - User Settings - Manage Smart Keys' menu.
 - 2) The Start button turns blue-green and changes to 'Smart Key Registration' mode.
 - 3) Activate 'Limp Home'.

Once registration is complete, the color of the backlight on the start button changes from green (registration in progress) to blue (complete).
Then, when the light turns blue-green, another smart key can be registered.
 - 4) Wait one minute or push the 'Complete' button on the display monitor screen to complete the registration.

There are also two smart key registration modes.

When registering a new smart key after losing the key or when buying a used vehicle

- Reset the smart key




When creating a master key capable of controlling up to six machines

- Add a smart key

E. Warning Symbols

The following warning pop-ups are shown on the display monitor for 30 seconds.

Refer to "Display Warning Symbols" for more information.

Symbol	Type	Meaning
	Warning	Low Smart Key Battery
	Caution	No Smart Key
	Caution	Failed To Detect Smart Key

3. Air Conditioning and Heating Control Panel

This panel is used to control air conditioner and heater in operator's cabin.

Refer to "Heater and Air Conditioner Control Panel" on page 2-77, for more information.

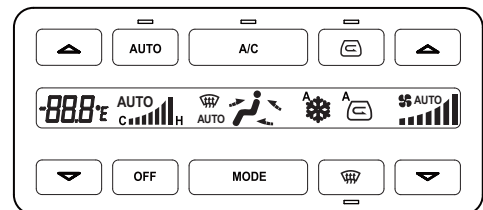


Figure 12

DS2100103

4. 12V Power Socket

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

It is installed on the back of the right-hand stand. 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.*

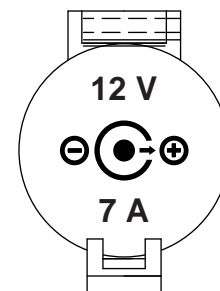


Figure 13

FG017015

5. 24V Power Socket

This is a DC power socket which can be used for small 24V electrical devices.

It is installed on the back of the left-hand side. Open the protective cap to use it.

NOTE: *Do not use the socket for electrical devices which require more than 120W of power.*



DS1900269

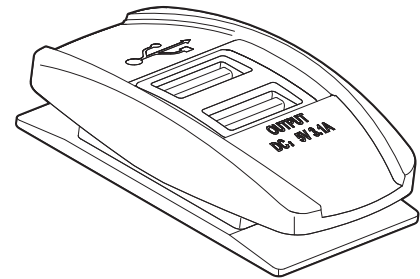
Figure 14

6. USB Charger

This device uses a USB port to supply 5V power. It can be used either to charge cellphones or as a power supply for electrical devices which use a USB port as a power supply plug.

NOTE: *Boost charging is not supported. Be sure to cover the charger with a cover to prevent dust, etc. from entering the charger when it is not in use.*

NOTE: *Take care not to allow water or liquids to enter the charger. This device was intended for use with low-capacity electronics; do not use it for high-capacity electronic devices.*



DS1900270

Figure 15

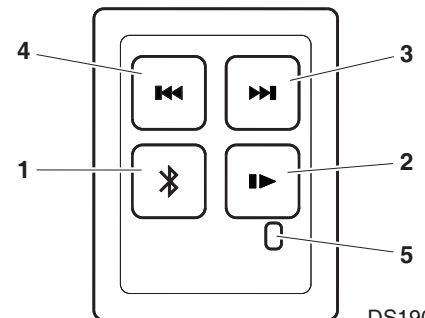
7. Bluetooth Control Panel

1. Bluetooth button
 - Holding the button down for one second or less turns Bluetooth play mode On/Off.
 - Holding the button down for 3 - 6 seconds connects/disconnects Bluetooth between your cellphone and the vehicle.
 - Holding the button down for 6 seconds or longer activates pairing mode.
2. Play/Pause button

Pressing the button plays or pauses music.
3. Next

Pressing the button plays the next track.
4. Previous

Pressing the button plays the previous track.
5. Mode check lamp
 - This lamp turns on when Bluetooth is in play mode and connected to a cellphone.



DS1900271

Figure 16

- The lamp blinks at intervals of 2.5 seconds if Bluetooth is not connected to a cellphone.
- In sync mode, the lamp blinks at intervals of 0.25 seconds.

8. Wiper Control Panel

This panel is only for operation of the upper windshield wiper. When the wiper stops running, it moves to right side of the cabin, resting in its support.

NOTE: *When the front window is lifted, the wiper motor will not operate.*

1. Constant Speed Button

Pressing the button turns "ON" the windshield wiper. An indicator light above the button will turn "ON" indicating that wiper is "ON". The wiper will run at a constant speed.

Pressing the button again, turns "OFF" the windshield wiper.

2. Intermittent Speed Button

Pressing button once (first time):

Windshield wiper runs approximately on a three second intermittent cycle. The left side indicator light will turn "ON".

Pressing button again (second time):

Windshield wiper runs approximately on a six second intermittent cycle. The right side indicator light will turn "ON".

Pressing button again (third time):

Turns "OFF" the windshield wiper. Both indicator lights will be turned "OFF".

3. Windshield Washer Button

Pressing the washer button will spray windshield washer fluid onto the windshield. Use only the proper windshield washer fluid in the system.

NOTE: *Do not operate the windshield washer without any fluid. If operated without any fluid, the washer motor may be damaged. Check level in washer tank and add fluid as required.*

NOTE: *Using soapy water or synthetic detergent instead of window cleaning fluid can damage the wiper blade or painted surfaces. Use standard window cleaning fluid: SSK703*

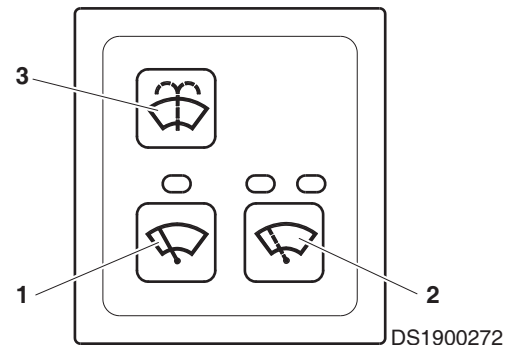


Figure 17

9. 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).

NOTE: The auto idle system will automatically reduce engine speed to "LOW IDLE" approximately four seconds after all the control levers are in the "NEUTRAL" position. This system is designed to reduce fuel consumption and noise. See "14. Auto Idle Selector Button" on page 2-34.

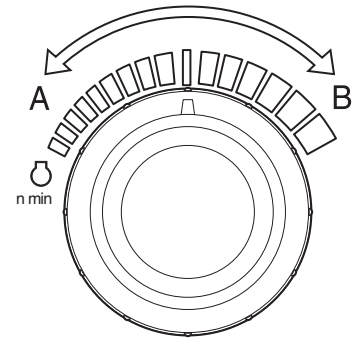


Figure 18

DS1900273

10. Light Switch

This switch is used to turn "ON" the lights.

- O. In this position, all lights are "OFF".
- I. In this position, all illumination lights of the display monitor and the control switches are turned "ON".
- II. In this position, all illumination lights and work lights are turned "ON".

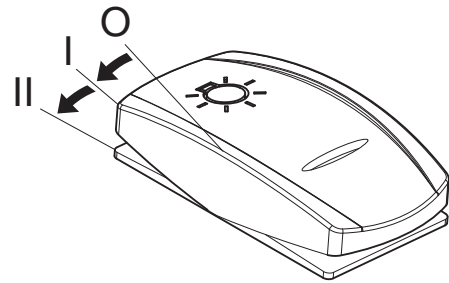


Figure 19

FG016017

11. Travel Speed Selector Switch



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.

This switch activates the automatic speed range for travel.

- O. In this position, "LOW" travel speed is selected.
- I. In this position, "HIGH" travel speed is selected.
- II. In this position, "AUTOMATIC" travel speed is selected. The travel speed automatically changes between "LOW" or "HIGH" range, depending on engine speed and travel motor loads.

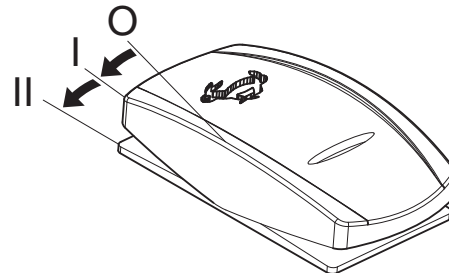


Figure 20

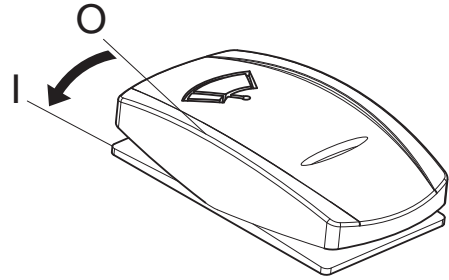
FG016016

12. Lower Wiper Switch (If Equipped)

This switch is used to control the lower front window wiper.

- O. In this position, lower windshield wiper is "OFF".
- I. In this position, lower windshield wiper runs at a constant speed.

NOTE: *Operating wiper without washer fluid or when there is sand or dirt present will damage the window and wiper.*



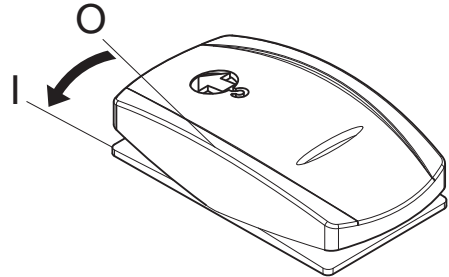
FG016021

Figure 21

13. Overload Warning Switch (If Equipped)

If unit is equipped with an overload warning device, push this switch to activate it.

- O. In this position, the overload warning device is turned "OFF".
- I. In this position, the overload warning device is turned "ON". When a load is lifted that reaches the machine's lifting limit, the warning symbol on the display monitor will turn "ON" and a warning buzzer will sound.



FG016023

Figure 22

OWD Limit	Warning
First Warning	OWD Warning Light Blinking and Buzzer Sounds
Second Warning	OWD Warning Light Constant and Buzzer Sounds



WARNING

AVOID DEATH OR SERIOUS INJURY

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. Check for and follow all applicable laws and regulations when lifting objects.

14. Buzzer Alarm Stop Switch (If Equipped)

In vehicle equipped with a warning alarm, the alarm can be muted using the buzzer alarm stop switch

- I. Press I once to Mute the alarm.
Press again to turn on.

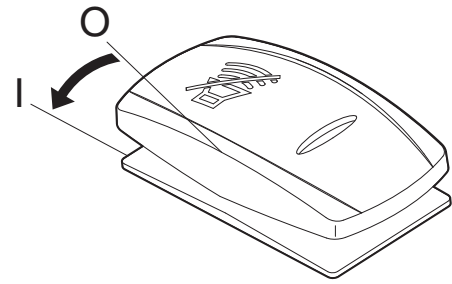


WARNING

AVOID DEATH OR SERIOUS INJURY

Be sure to check the surroundings carefully before activating the buzzer alarm stop switch.

Working with the alarm stopped may cause life-threatening injuries.



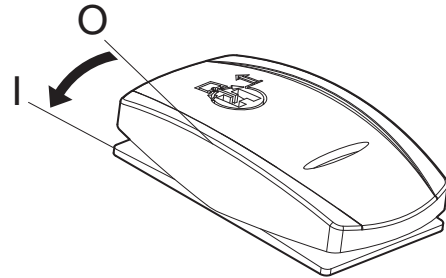
DS1900274

Figure 23

15. Swing Priority Switch

When swing angle is large, swing speed increase to reduce a cycle time.

- O. In this position, the swing priority mode is turned "OFF".
- I. In this position, the swing priority mode is turned "ON".



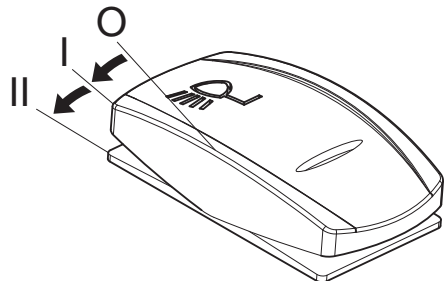
DS1701116

Figure 24

16. Cabin Work Light Switch (If Equipped)

This switch is used to control the cabin work lights, if unit is equipped with them.

- O. In this position, all cabin work lights are turned "OFF".
- I. In this position, the front cabin work lights on the front top of cabin will turn "ON".
- II. In this position, the front cabin work lights on the front top of cabin and rear cabin work lights on rear top of cabin will turn "ON".



FG016019

Figure 25

17. Intelligent Floating Boom Switch (If Equipped)

This switch is used to control the Intelligent Floating Boom function.

- O. In this position, "NORMAL MODE" is selected.
- I. In this position, "INTELLIGENT FLOATING BOOM MODE" is selected. The boom can move freely "UP" and "DOWN".
- II. In this position, "BREAKER MODE" is selected.

NOTE: See "Intelligent Floating Boom Control (If Equipped)" on page 3-33 for further information.

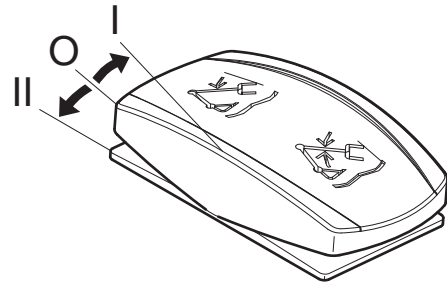


Figure 26

FG018272

18. Warning Light Switch (If Equipped)

If unit is equipped with a warning light, push this switch to activate it.

- O. In this position, the warning light is turned "OFF".
- I. In this position, the warning light turns "ON" and will start flashing.

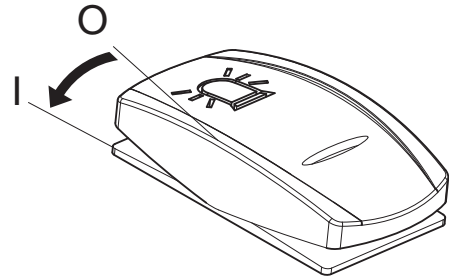


Figure 27

FG016020

19. Reverse Fan Switch

This switch causes the radiator and oil cooler cooling fans to rotate in the reverse direction. The function of reversing the direction of the radiator and oil cooler cooling fans is effective in cleaning the radiator and oil cooler.

This switch activates when the engine is running.

Reverse fan function operates for 15 seconds.

To activate this function, machine should be in the following state:

- Engine is running
- Safety lever is "LOCK" position
- O. In this position, reverse fan is turned "OFF". The switch is automatically returned to this position when it is released.
- I. In this position, reverse fan is turned "ON". And the reverse fan symbol on display monitor is turned "ON". If press again, the function will turn "OFF".

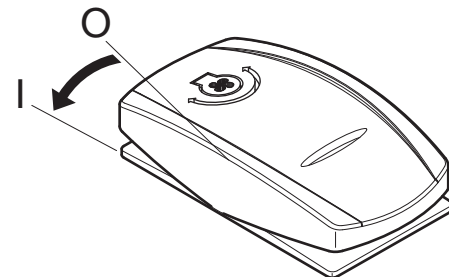


Figure 28

FG016027



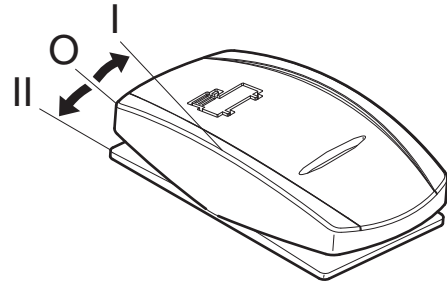
NOTICE

Never travel or work in the reverse fan rotation mode. This can cause damage to the cooling system. Make sure that this switch is in the "O" (OFF) position before starting the engine and operating the machine.

20. Air Compressor Switch (If Equipped)

This switch is used to activate the air compressor system.

- O. When the switch is turned off, it returns to this position automatically.
- I. Air compressor system "OFF".
- II. Air compressor system "ON".



FG018273

Figure 29



NOTICE

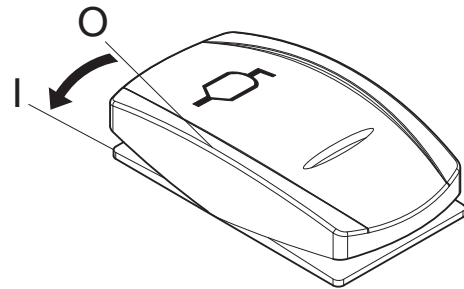
In order to prevent the air compressor motor from overheating, do not run or attempt to run the motor continuously for longer than 30 minutes.

If the air compressor motor runs continuously for longer than 30 minutes, the system turns off automatically.

21. Auto Grease System Switch (If Equipped)

This switch is used to activate the auto greasing system manually.

- O. Automatic mode: Activates automatically for 10 minutes every hour.
- I. Manual mode: Activated manually for 10 minutes only and returns to automatic mode when finished



WL1300379

Figure 30

22. Emergency Start Mode Switch

The engine may be turned on as an emergency measure in the event that a problem occurs in the engine ignition system.

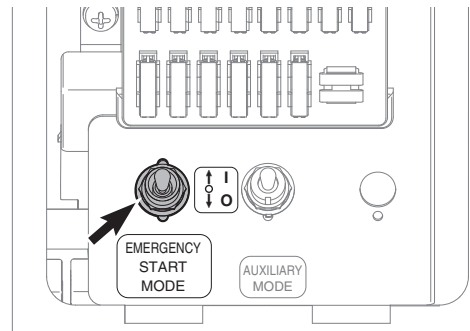
- O. Emergency start mode "OFF"
- I. Emergency start mode "ON"



NOTICE

Be sure to use the emergency start switch in emergencies only.

Once the fault in the controller has been corrected, turn the switch to the "O" (OFF) position.



DS1900482

Figure 31

23. Auxiliary Mode Switch

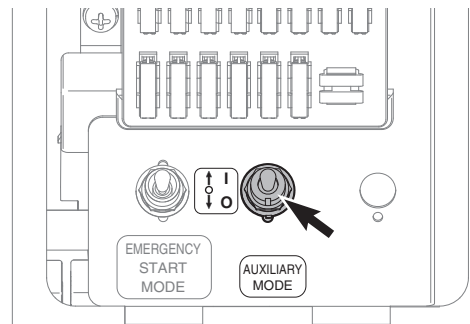
When the control system is out of order, the pump system can be controlled manually.

- O. In this position, the manual pump control is "OFF".
- I. In this position, the manual pump control is "ON".



NOTICE

Be sure to turn pump control to "O" (OFF) position, after the control system is operating properly.



DS1900481

Figure 32

24. Quick Coupler Switch (If Equipped)

This switch is used for engaging or releasing the attachment.

See "Quick Coupler Operation" for further information.

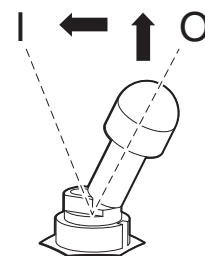


WARNING

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 33

25. Swing Brake Release Switch

When the control system does not operate, the swing brake release system can be controlled manually.

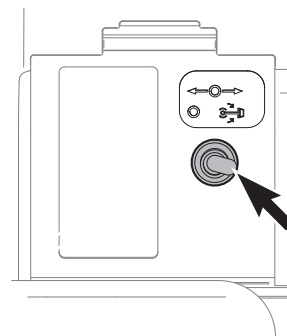
O. In this position, the manual swing brake release system is "LOCKED".

 In this position, the manual swing brake release system is "RELEASED".



NOTICE

Be sure to turn pump control to "O" (OFF) position, after the control system is operating properly.



DS1901522

Figure 34

26. Photo Sensor

The photo sensor detects the radiant energy of the sun.

In "AUTO MODE" the air conditioner will automatically adjust the air temperature based on detected radiant energy.



DS1900483

Figure 35

27. Display Monitor

See "Display Monitor" on page 2-28.



DS2003616

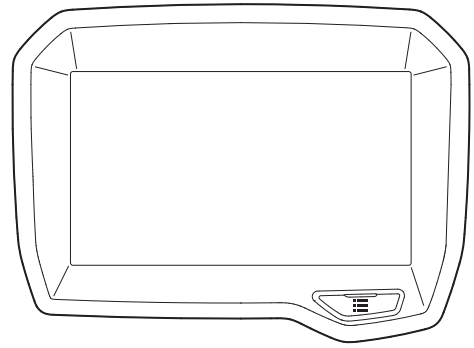
Figure 36

28. Around View Monitoring (AVM) Monitor (If Equipped)

This monitor is displayed on the screen. It supports various views, giving greater convenience for operating the machine.

An image appears on the monitor either when the key switch is in "I" (ON) mode or when the engine is running.

Holding down the menu button on the monitor for 3 seconds or longer turns the monitor ON/OFF.

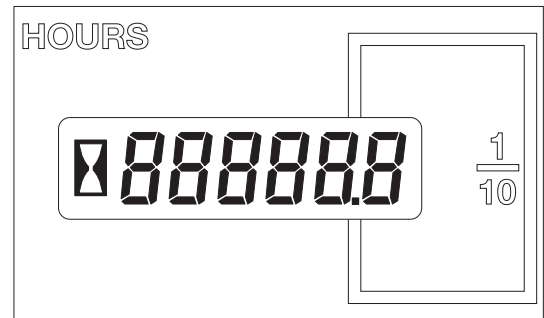


DS2105238

Figure 37

29. Hour Meter

The hour meter is used to indicate the total number of operating hours on the engine. The meter will flash every four seconds when the engine is running to indicate that it is functioning properly.



DS1901161

Figure 38

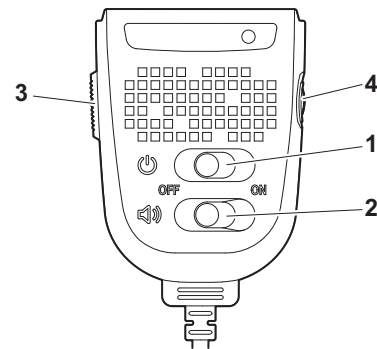
30. Micro Phone (If Equipped)

Used for alerting people around machine when starting up or operating the machine.

How to use the microphone:

- A. Siren
Turn switch (1, Figure 39) on the bottom to "ON" and set switch (2) on the top to the far left position (▷▷), the siren will be triggered.
- B. Microphone
Turn switch (1, Figure 39) on the bottom to "ON", set switch (2) on the top to the center position (⊙), and then press switch (3).

Turn switch (4, Figure 39) clockwise or counterclockwise to increase or decrease the volume.



DS1901280

Figure 39

31. Safety Lever

See "Safety Lever" on page 3-20.

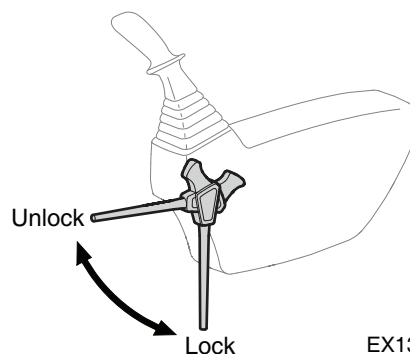


Figure 40

EX1300566

32. Horn Button

Press the center button on the left-hand work lever (joystick) to sound horn.

NOTE: *The starter switch must be "ON".*



Figure 41

DS1701109

33. Breaker/Booster Button

Press the center button on the right-hand work lever (joystick) to boost the hydraulic pressure. Refer to the "Boost Mode" on page 3-29.

NOTE: *This button works with the breaker/boost/shear selector switch. See "Work Mode" on page 3-28.*

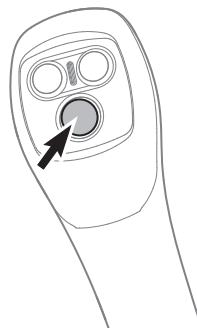


Figure 42

DS1701110

34. Rotating Button (If Equipped)

For a machine equipped with an attachment that rotates, press the upper two buttons on the top of the left-hand work lever (joystick) to rotate the attachment clockwise or counterclockwise.

Right button is for "CLOCKWISE ROTATION".

Left button is for "COUNTERCLOCKWISE ROTATION".



NOTICE

Before using any attachment in a work application, be sure to check its functional control.

Make sure that desired movement or action is being activated by the control, e.g. opening/closing, clockwise/counterclockwise, crowd/dump, etc.



Figure 43

DS2001311

35. Shear Button (If Equipped)

For a machine equipped with a shear, press the two upper buttons on the top of the right-hand work lever (joystick) to open or close the shear.

Right button is for "OPENING (DUMP)".

Left button is for "CLOSING (CROWD)".

NOTE: *This switch also interacts with the jog switch.*



NOTICE

Before using any attachment in a work application, be sure to check its functional control.

Make sure that desired movement or action is being activated by the control, e.g. opening/closing, clockwise/counterclockwise, crowd/dump, etc.

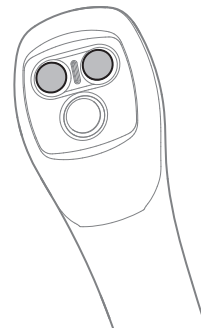
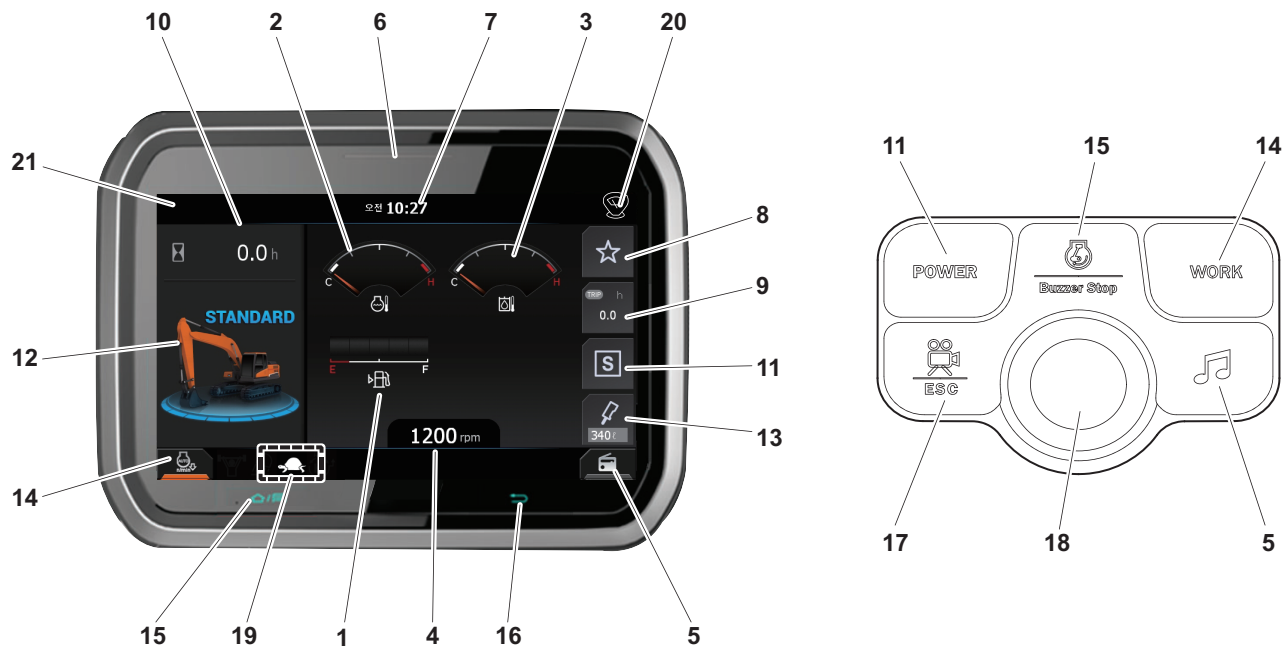


Figure 44

DS1701112

Display Monitor



DS2003617

Figure 45

Number	Name
1	Fuel Gauge
2	Engine Coolant Temperature Gauge
3	Hydraulic Oil Temperature Gauge
4	Tachometer
5	Audio Display
6	Main Warning Lamp
7	Digital Clock
8	Favorites Button
9	Main Information Selector Button
10	Main Information Indicator
11	Power Mode Selector Button

Number	Name
12	Power Mode Indicator
13	Operating Mode/Flow Setting Selector Button
14	Auto Idle Selector Button
15	Menu Selector Button
16	Back Button
17	Camera Mode Selector/ESC Button
18	Jog Switch
19	Mode Symbol Display
20	Indicator Display
21	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.

NOTE: Menus emitted to the instrument panel may differ depending on the regions.

Functional Check

If the start mode switches to ACC mode, switch/button indicators on the display monitor turn on, the warning indicator turns on and the warning buzzer sounds for two seconds.

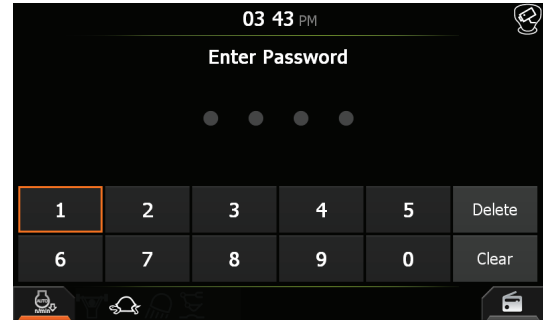
The HD HYUNDAI CONSTRUCTION EQUIPMENT logo is displayed on the screen during functional checks.

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 2-66.



DS1900406

Figure 46



NOTICE

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

1. Fuel Gauge

The fuel gauge indicates the amount of fuel remaining in the fuel tank.

White range - Normal amount of fuel.

Red range - Not enough fuel.

If the needle moves into the red range, the fuel level symbol is displayed. In such cases, be sure to stop the engine and add fuel immediately.

NOTE: For information about the location of this warning indicator and other indicators, please refer to "21. Display Warning Symbols" on page 2-37.

Check the fuel level on firm, level ground.



DS2004491

Figure 47

2. Engine Coolant Temperature Gauge

This gauge indicates the temperature of the engine coolant.

C range - Overcooled or initial start-up period.

H range - Engine 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 engine coolant temperature warning indicator turns on, the warning buzzer sounds and the engine speed decreases automatically. Operate the engine at the "lowest engine speed" until the temperature gauge returns to the white range. Once the gauge reaches the white range, idle the engine for another 3 ~ 5 minutes before stopping the engine.

Failing to idle the engine may damage the engine due to a sudden increase in temperature. Idling the engine releases heat. Check the coolant level; check whether the fan belt is loose; and check for any debris near the radiator.

Once the temperature reaches the normal range, the engine speed returns to normal automatically.

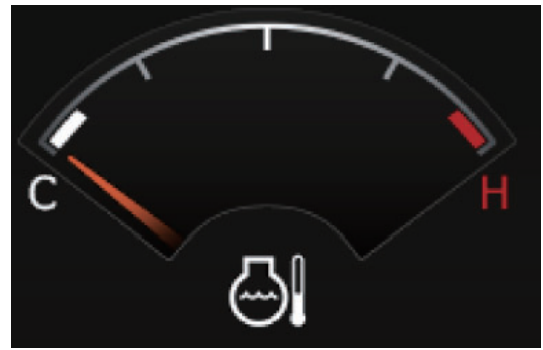


Figure 48

DS2004492

3. Hydraulic Oil Temperature Gauge

This gauge indicates the temperature of hydraulic oil.

C range - Low hydraulic oil 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 oil 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, please refer to "21. Display Warning Symbols" on page 2-37.



Figure 49

DS1900410

4. Tachometer

This indicates the engine speed as a number.



Figure 50

DS1900421

5. Audio Display

For radios, the button displays information on the frequency range of the radio.



Figure 51

DS1900422

6. Main Warning Lamp

The main warning lamp turns on when the machine or engine requires an inspection.



If the warning lamp turns on while the machine is in operation, stop the engine immediately and inspect the machine and engine.

If necessary, contact your local HD HYUNDAI CONSTRUCTION EQUIPMENT dealer or authorized service center for repairs.

NOTE: For information on warnings, please refer to "Warning Pop-Up Messages" on page 2-43.



Figure 52

DS2003618

7. Digital Clock

The digital clock indicates the current time in one of two ways.

- Time

06:18 PM

Figure 53

DS1900424

- Time + date

For more information on setting the time, please refer to "User Menu" on page 2-46.

2018/07/12 THU
06:19 PM

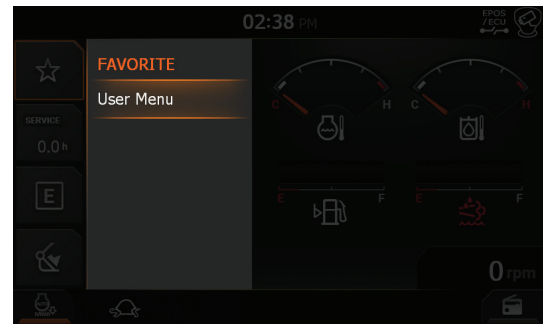
Figure 54

DS1900982

8. Favorites Button

Select the desired screen from the screens set with the "Bookmark" function to go to the corresponding screen.

For more information on setting bookmark, please refer to "User Menu" on page 2-46.



DS1900426

Figure 55

9. Main Information Selector Button

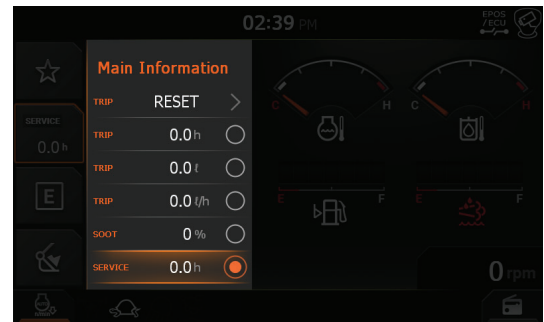
This button allows you to choose which information to display on the main information indicator.

The following main information can be selected.

- Reset trip information
- Trip operating time
- Trip fuel level
- Trip fuel consumption
- Service meter (Total operating time)

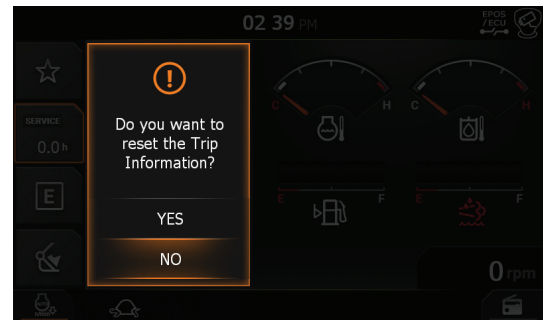
The following items are reset when "Reset Trip Information" is selected.

- Trip operating time
- Trip fuel level
- Trip fuel consumption



DS1900427

Figure 56



DS1900428

Figure 57

10. Main Information Indicator

Displays the information selected with the main information selector button.



DS2003619

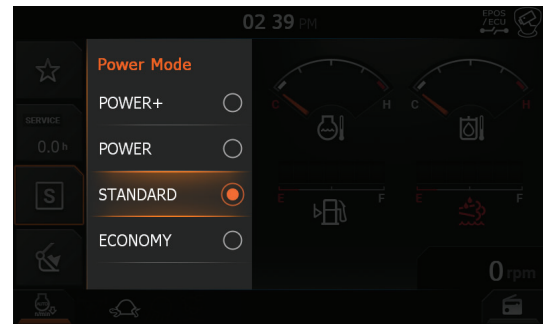
Figure 58

11. Power Mode Selector Button

This button allows you to select the power mode.

The following power modes can be selected.

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



DS1900430

Figure 59

12. Power Mode Indicator

The current power mode is displayed with an image of an excavator as shown in the figure.

- ECONOMY: Green
- STANDARD: Blue
- POWER: Yellow
- POWER +: Orange



DS1900431

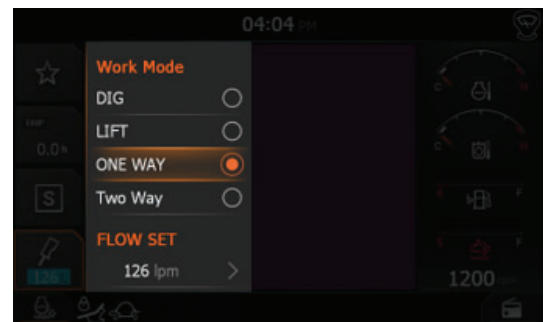
Figure 60

13. Operating Mode/Flow Setting Selector Button

This button allows you to set the operating mode and flow rate.

The following operating modes can be selected.

- DIG mode
- LIFT mode
- ONE WAY mode
- TWO WAY mode



DS1900760

Figure 61

The flow rate can be set for the selected attachment; the Breaker X and Two-Way X setting screens can be accessed with this button.

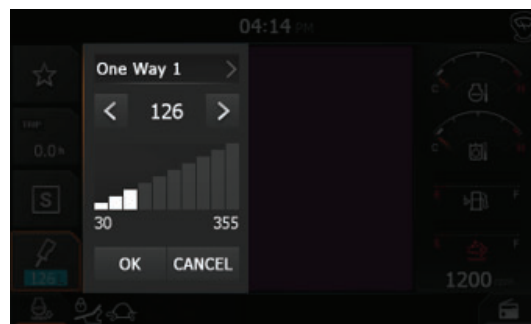


Figure 62

DS1900761

14. Auto Idle Selector Button

This button allows you to choose whether to use the auto idle function.

- Selected



Figure 63

DS1900435

- Not selected



Figure 64

DS1900436

15. Menu Selector Button

Allows you to access the main menu.



Figure 65

DS1900437

16. Back Button

This button allows you to return to the previous menu from each sub-menu.



DS1900438

Figure 66

17. Camera Mode Selector / ESC Button

Operating the switch while on the main screen displays the camera screen.

Operating the switch on any other screen except the main screen returns to the previous screen.

When a pop-up appears, pushing the switch closes the pop-up.

18. Jog Switch

Push or rotate the switch to select a menu and change numbers.







The engine rpm can be changed depending on the display monitor settings.

When a pop-up appears, pushing the switch closes the pop-up.

Pushing the switch while on the camera screen divides the screen into either two or three parts depending on the number of cameras set.









19. Mode Symbol Display

The mode symbol indicators are as follows.

Symbol	Meaning
	Boost ON (if the operating mode is in excavation/lift mode)
	Pedal/joystick set by operating the two-way option
	Low/high/auto speed selected
	Work light ON
	Intelligent floating boom
	ISO/BHL joystick mode selected




































20. Indicator Display

The indicator symbols are as follows.

Symbol	Input Terminal	Meaning
	USB	USB with display monitor update file recognized
	Auto shutdown	Auto shutdown enabled
	ACC	Currently in ACC mode
	Auto warm up	Auto warm up in progress
	Joystick one-touch	Function set with joystick one-touch
	VBO emergency mode	Emergency mode activated
	Preheat	Machine preheating in progress
	EPOS, ECU, EPOS/ECU communications offline	No regular message received from communications systems for over 10 seconds.

21. Display Warning Symbols

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

Number	Symbol	Type	Meaning	Number	Symbol	Type	Meaning
1		Warning	Battery warning	19		Warning	Clogged fuel filter
2		Warning	Engine oil pressure warning	20		Warning	Removable counterweight
3		Warning	Coolant overheated	21		Warning	Ultrasonic sensor failure
4		Warning	Engine warning	22		Warning	Engine rpm and starting restricted by TMS or TMS terminal failure
5		Warning	Stop engine	23		Warning	Coolant level warning
6		Warning	WIF sensor	24		Warning	Seat belt
7		Warning	Hydraulic oil warning	25		Warning	No smart key
8		Warning	Fuel warning	26		Warning	Failed to detect smart key
9		Warning	Air cleaner clogged	27		Warning	Low smart key battery
10		Warning	OWD warning	28		Caution	Return filter clogged
11		Warning	Quick coupler warning	29		Caution	Regeneration prohibition
12		Warning	Manual regeneration request	30		Caution	Regeneration operating
13		Warning	Low DEF level	31		Caution	GPS antenna failure
14		Warning	Problem in SCR system	32		Caution	GSM antenna failure
15		Warning	VBO angle sensor failure or I-CEPT sensor failure	33		Caution	Satellite antenna failure
16		Warning	VBO joystick pressure sensor failure	34		Failure	Check the machine
17		Warning	EPPR valve failure	35		Failure	Stop the machine
18		Warning	AGS warning				

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. Engine oil pressure warning

This symbol illuminates every time the engine is started. Once the engine starts, the symbol turns off again.

In the event that the engine is started while the engine oil pressure is low, this symbol illuminates and a warning buzzer sounds simultaneously. In such cases, be sure to stop the engine immediately and check for the cause of the problem.

Continuing to operate the engine while this warning lamp is illuminated may severely damage the engine.



NOTICE

Continuing to operate the engine while this symbol is illuminated may severely damage the engine.

3. Coolant overheated

If the engine coolant overheats, this warning symbol illuminates, an alarm sounds, and the engine speed decreases automatically until the coolant temperature drops again.

Do not turn off the engine at this time. Turning off the engine further overheats the coolant, which may lead to engine knocking due to a surge resulting from overheating.

NOTE: *Check the engine coolant temperature gauge. If the gauge pointer is in the red range, it means that the coolant is overheated. Hence, the coolant temperature warning lamp illuminates and the engine speed decreases automatically.*

In such cases, the engine must be idled until the gauge pointer returns to the normal white range. Once the pointer returns to the white range, do not turn off the engine immediately; idle the engine for another 3 ~ 5 minutes. Failing to do so may cause a surge resulting from overheating, thereby damaging the engine. Idling the engine releases heat slowly and reduces the temperature gradually.

Once all necessary measures have been taken, check the coolant level once again, as well as whether the fan belt is loose and whether there is any foreign matter on the radiator. Once the coolant temperature returns to normal, the engine speed returns to normal as well.

4. Engine warning

The light turns on when the engine needs to be inspected.

NOTE: *When the symbol illuminates, stop the machine, find the cause of the problem and perform any necessary repairs.*

5. Stop engine

The indicator turns on when there is a problem in one of the engine systems.



NOTICE

When an indicator illuminates, turn the engine off and check the corresponding engine system.

If necessary, contact your local HD HYUNDAI CONSTRUCTION EQUIPMENT dealer or authorized service center for repairs.

6. WIF sensor

This sensor indicates that the fuel pre-filter is full with water.

When this symbol appears on the screen, be sure to remove the water in the fuel pre-filter as soon as possible.

NOTE: *If water is not removed within 30 minutes of the oil-water separator warning lamp illuminating, engine power is reduced.*

7. Hydraulic oil warning

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

8. Fuel warning

This warning symbol appears on the screen when there is almost no more fuel left in the tank.

When this symbol is illuminated, be sure to refill the fuel immediately.

9. Air cleaner clogged

This symbol indicates that the air cleaner is clogged.

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

10. OWD warning

When an overload occurs, the overload warning switch turns on, this symbol appears on the screen, and a warning buzzer sounds. In such cases, reduce the load immediately.



WARNING

AVOID DEATH OR SERIOUS INJURY

If this warning appears on the screen and a warning buzzer sounds, reduce the load immediately.

Continuing to operate the machine in this state may cause the machine to flip over or damage hydraulic components and structure parts.

11. 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 properly engaged (locked), Once after release (unlock) the quick coupler especially.

Attachment falling can result in death or serious injury.

12. Manual regeneration request

It is illuminated when regeneration operation is necessary.

13. Low DEF level

It is illuminated when the DEF (AdBlue®) level is low.

14. Problem in SCR system

It is illuminated in three cases; interruption of dosing, poor reagent quality and monitoring malfunction.

15. VBO angle sensor failure or I-CEPT sensor failure

This warning appears when there is a problem with the operation of the pump angle sensor.

16. VBO joystick pressure sensor failure

This warning appears when there is a problem with the operation of the pilot pressure sensor.

17. EPPR valve failure

This warning appears when there is a problem with the operation of the pump EPPR valve.

18. AGS warning

This warning light will turn "ON", when auto grease system has two kinds of problems, lack of lubricants in the pump reservoir or blockage in the system.

19. Clogged fuel filter

Appears when the fuel filter is clogged.
Check the fuel filter replacement interval.

20. Removable counterweight

Appears when the removable counterweight is operated.

21. Ultrasonic sensor failure

Appears in the event of a failure in the ultrasonic sensor.

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

Appears when there is a problem in the TMS terminal.

23. Coolant level warning

Appears when there is a problem with the coolant level.
Add coolant if there is not enough coolant.

24. Seat belt

Appears when the seat belt is not worn.

25. No smart key

Appears when no smart key is detected.

26. Failed to detect smart key

Appears when the machine fails to recognize the smart key.

27. Low smart key battery

Appears when the smart key is low on battery power.

28. 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.

29. Regeneration prohibition

It is illuminated when regeneration is prohibited.

30. Regeneration operating

The lamp turns on when automatic regeneration begins.

31. GPS antenna failure

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

32. GSM antenna failure

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

33. Satellite antenna failure

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

34. 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.*

35. 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)

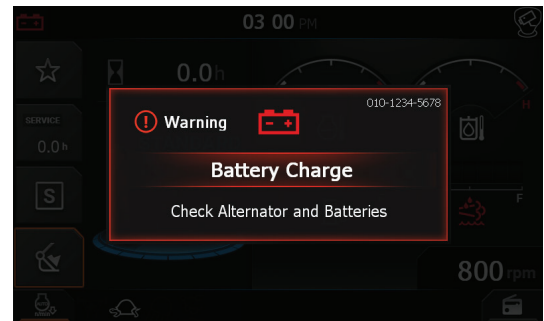


Figure 67

DS1900439

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.

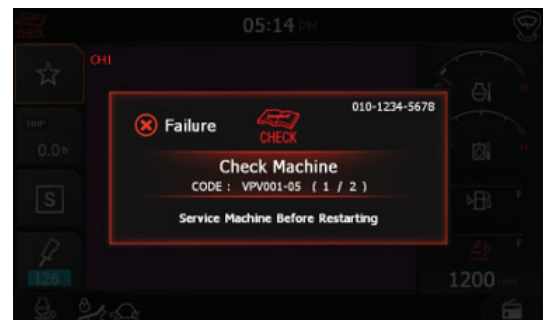


Figure 68

DS1900762

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



DS1900763

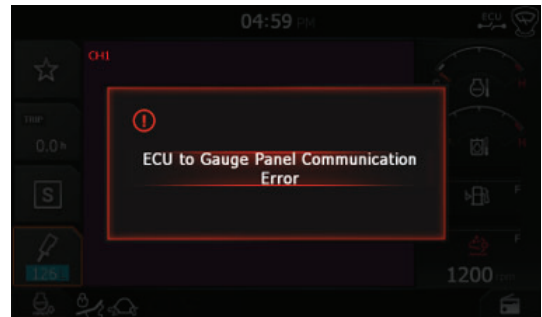
Figure 69

3. Communications offline

Indicates that the EPOS, ECU and EPOS/ECU communications are not working.

The communications messages are as follows.

- EPOS communications offline: EPOS communications offline, ECU communications online
- ECU communications offline: EPOS communications online, ECU communications offline
- EPOS/ECU communications offline: EPOS communications offline, ECU communications offline



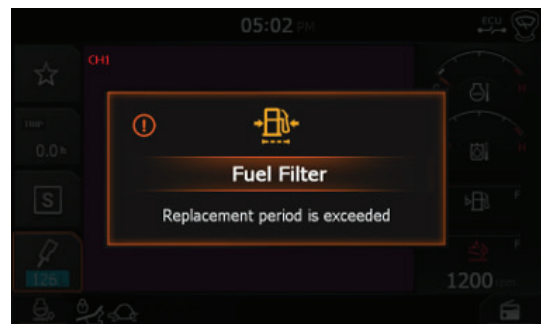
DS1900764

Figure 70

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.



DS1900765

Figure 71

The following replacement interval-related messages appear.

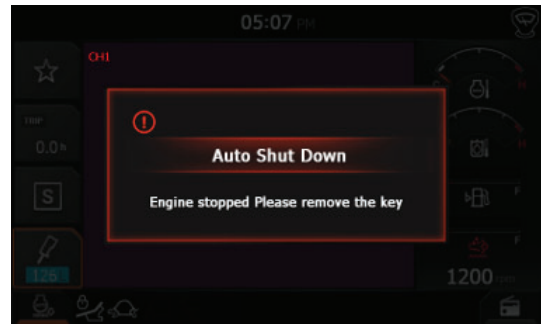
- Service interval is almost over: Service interval is within 10 hours of the replacement interval
- Service interval has expired: Service interval matches the replacement interval
- Service interval has passed: Service interval is over an hour past the replacement interval

5. Auto shutdown notifications

These notifications are displayed when the machine enters auto shutdown mode.

A countdown until the engine shutdown is displayed along with an engine shutdown notification. The notification messages are as follows.

- Countdown (1–60 sec. until shutdown):
Indicates the time remaining until engine shutdown
- Engine shutdown notification (0 sec.):
The engine has stopped. Please turn the key off.



DS1900766

Figure 72

User Menu

User Menu - Access and Escape Methods

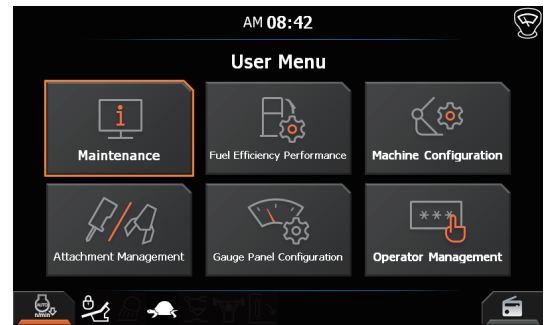
Access Method

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

The following menus can be accessed.

- Maintenance
- Fuel Efficiency Performance
- Machine Configuration
- Attachment Management
- Gauge Panel Configuration
- Operator Management

NOTE: *In the event that all of the attachment options are inactive, the attachment management menu is not shown.*



DS2301977

Figure 73

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
- Enable Part Replacement Notification
- Monitoring
- Confirmation of Warning Sign

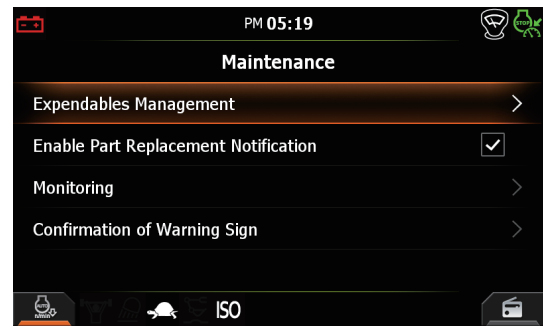
A. Expendables Management

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

How to access: User Menu → Maintenance → Expendables Management

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.



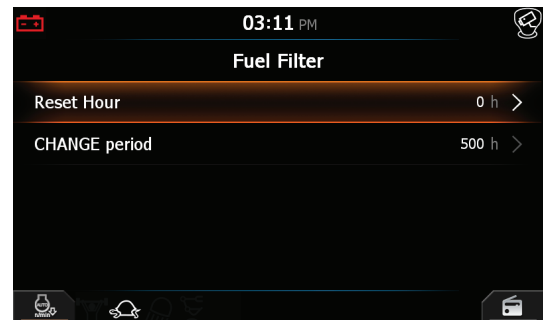
DS2100347

Figure 74



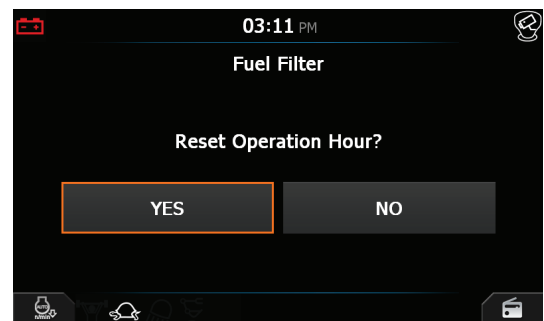
DS1900314

Figure 75



DS1900315

Figure 76

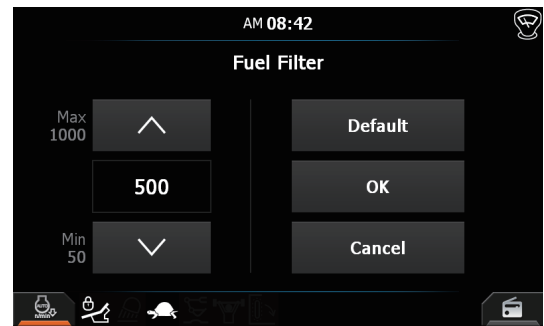


DS1900316

Figure 77

How to change the replacement interval

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



DS2301978

Figure 78

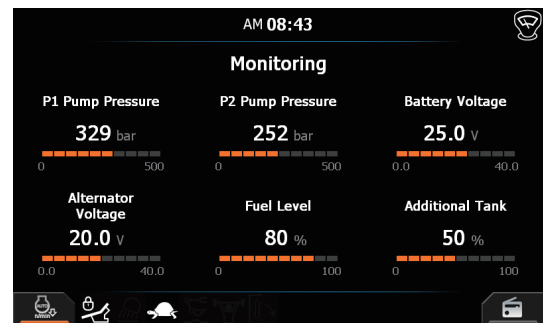
B. Enable Part Replacement Notification

Consumable replacement notifications can be toggled on/off.

C. Monitoring

The monitoring screen displays the information on vehicle pump pressure, voltage, fuel level, etc.

How to access: User Menu → Maintenance → Monitoring



DS2301979

Figure 79

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.

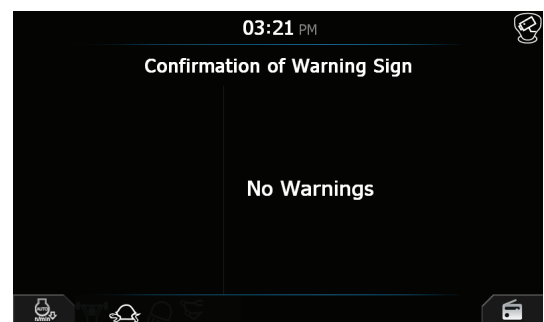
- Warning image
- Warning name
- Service phone number
- Warning details
- Failure code

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



DS1900319

Figure 80



DS1900320

Figure 81

2. Fuel Efficiency Performance

This menu displays information about the vehicle fuel consumption.

The following menus can be accessed.

- Fuel Efficiency Data
- Set Auto Shut-down
- Set Default Power Mode
- Set Auto Idle Time



DS2100348

Figure 82

A. Fuel Efficiency Data

This menu displays information about the vehicle fuel consumption.

How to access: User Menu → Maintenance → Monitoring

The following menus can be accessed.

- Power Mode Data by Day of Operation
- Fuel Efficiency Data by Day of Operation
- Fuel Efficiency Data by Time of Operation
- Daily Operational Data

1) Power Mode Data by Day of Operation

This menu provides information about the amount of fuel used and the operating time in each power mode during the past week.

How to access: User Menu → Fuel Efficiency Performance → Fuel Efficiency Data → Power Mode Data by Day of Operation

The following double bar graphs are displayed for each day.

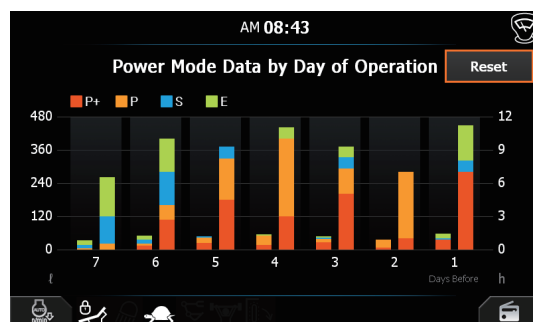
- Left-hand bar: Fuel used in each power mode
- Right-hand bar: Operating time in each power mode
- Bottom axis: Days of operation until the present

The fuel efficiency data can be reset by selecting the 'Reset' button.



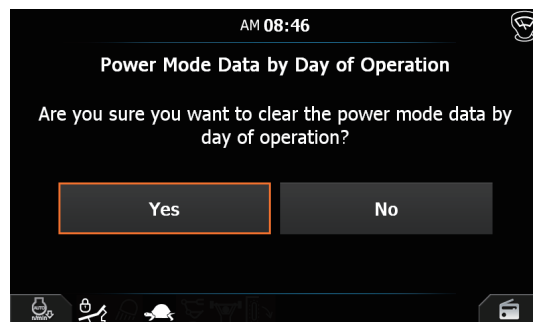
DS2302030

Figure 83



DS2302031

Figure 84



DS2302032

Figure 85

2) Fuel Efficiency Data by Day of Operation

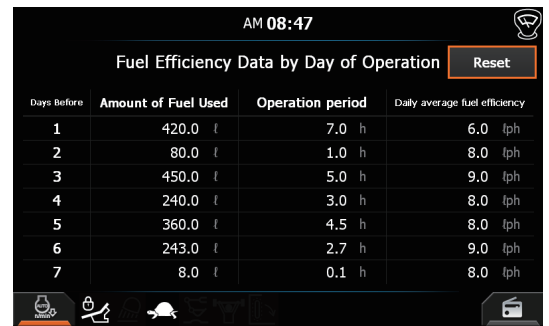
This menu displays the fuel consumption for the current day.

How to access: User Menu → Fuel Efficiency Performance → Fuel Efficiency Data → Fuel Efficiency Data by Day of Operation

The axes are as follows.

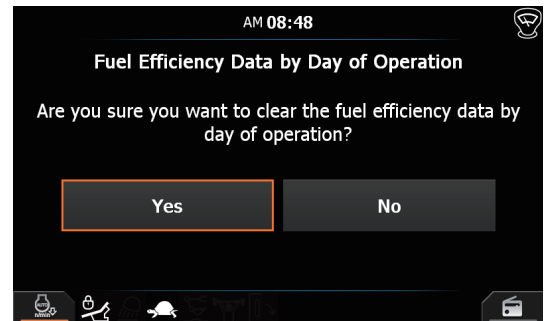
- Left-hand axis: Average fuel consumption
- Bottom axis: Operating time until the present

The fuel efficiency data can be reset by selecting the 'Reset' button.



DS2302035

Figure 86



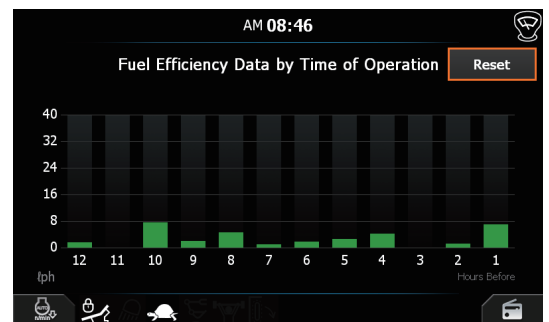
DS2302036

Figure 87

3) Fuel Efficiency Data by Time of Operation

This menu displays the amount of fuel used, operating time, and average daily fuel consumption for the last week.

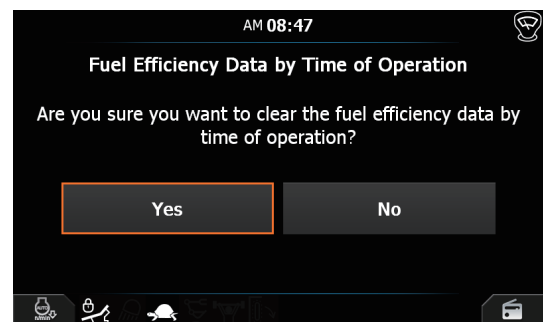
How to access: User Menu → Fuel Efficiency Performance → Fuel Efficiency Data → Fuel Efficiency Data by Time of Operation



DS2302033

Figure 88

The operation history data can be reset by selecting the 'Reset' button.



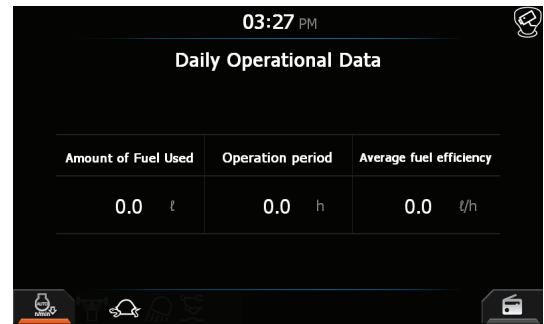
DS2302034

Figure 89

4) Daily Operational Data

This menu displays the machine operating time, average fuel consumption, and amount of fuel used for the current day.

How to access: User Menu → Fuel Efficiency Performance → Fuel Efficiency Data → Daily Operational Data



DS1900329

Figure 90

B. Set Auto Shut-down

The Auto Shut-down Setting menu allows you to set the machine to stop the engine automatically in the event that the machine is not used for a set period of time.

How to access: User Menu → Fuel Efficiency Performance → Set Auto Shut-down

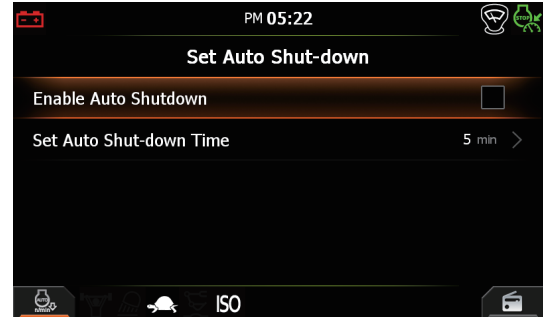
The following menus can be accessed.

- Enable Auto Shutdown
- Set Auto Shut-down Time

1) Enable Auto Shutdown

The auto shutdown function can be toggled on/off.

Auto shutdown conditions



DS2100349

Figure 91

	Input								Output
	GP Menu	Auto Idle Switch	Safety Lever	Engine rpm	Coolant Temperature	Hydraulic Oil Temperature	Dial Condition	Time	
Enabled	ON	ON	ON	Low rpm	50°C or higher	20°C or higher	Normal	In time settings	Stop engine signal
Disabled	In conditions other than those above								Reset time count

NOTE: Leaving the machine turned on without using it for an extended period of time after enabling the auto shutdown function may discharge the battery.

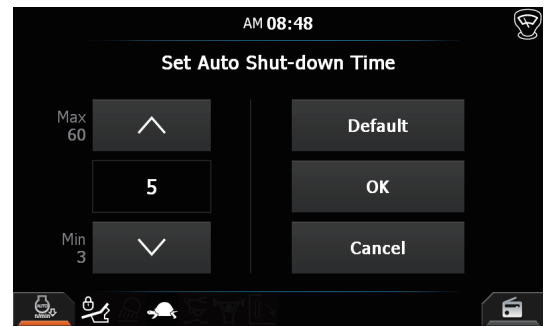
2) Set Auto Shut-down Time

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

How to access: User Menu → Fuel Efficiency Performance → Set Auto Shut-down → Set Auto Shut-down Time

How to change the time for enabling auto shutdown

- After setting the new time and pushing 'OK', the change of time for enabling auto shutdown is complete.
- Default setting: 5



DS2302037

Figure 92

C. Set Default Power Mode

This menu allows you to choose whether to use fuel saving mode (work, travel) and smart power control (SPC) mode.

How to access: User Menu → Fuel Efficiency Performance → Set Default Power Mode

The following menus can be accessed.

- Fuel Saving Mode (Work)
 - Enabled: Enters S mode if the engine is restarted when the operating power mode is P+ or P.
 - Disabled: Reverts to the default operating power mode when the engine is restarted.
- Fuel Saving Mode (Travel)
 - This function is used wheel excavator.
 - Enabled: Enters S mode if the engine is restarted when the travel power mode is P.
 - Disabled: Reverts to the default travel power mode when the engine is restarted.
- Smart Power Control (SPC) Mode
 - The machine remembers the previous setting and maintains the previous mode when the engine is restarted.
 - Enabled: Activate the smart power control (SPC) mode.
 - Disabled: Deactivate smart power control (SPC) mode.



DS2100350

Figure 93

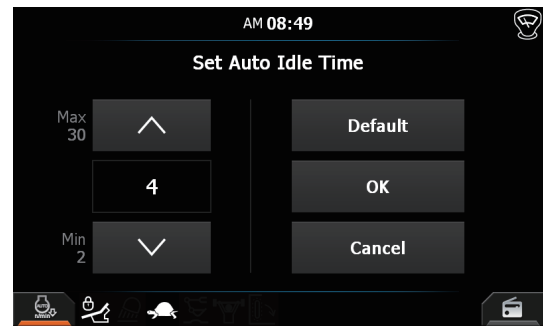
D. Set Auto Idle Time

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

How to access: User Menu → Fuel Efficiency Performance → Set Auto Idle Time

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



DS2302038

Figure 94

3. Machine Configuration

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

The following menus can be checked and changed.

- Set Cooling Fan Reverse Operating
- Set Travel/Swing Alarm
- Set Joystick
- Set AVM
- Set Control Dial
- Temporary Security Unlock

NOTE: In vehicles equipped with AVM, the AVM setting menu is displayed; in vehicles without AVM, the camera guideline menu is shown.

NOTE: The menu activation conditions are as follows.

Breaker Operation Time Setting:

When the breaker attachment option is enabled

Joystick Reception Setting:

When the two-way attachment option is enabled



DS2302039

Figure 95

A. Set Cooling Fan Reverse Operating

This allows the driver to set up the reverse rotation function of the cooling fan.

How to access: User Menu → Machine Configuration → Set Cooling Fan Reverse Operating

The following menus can be checked and changed.

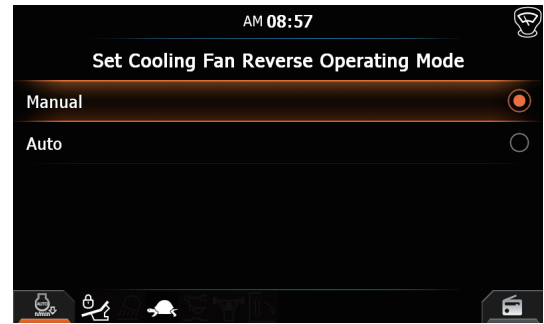
1) Set Cooling Fan Reverse Operating Mode

This allows the driver to set the reverse fan activation method.

Reverse fan operating mode can be set as follows. The symbol in the display monitor is illuminated when the reverse fan is enabled.

- Manual
- Auto

In manual mode, reverse fan is activated by pressing the start button on the display monitor.



DS2302040

Figure 96

2) Set Cooling Fan Reverse Period

If reverse fan mode is set automatically, the driver can adjust the reverse rotation fan activation interval as shown below.

- After setting the new operation interval and pushing 'OK', the change of reverse fan operation cycle is complete.
- Default setting: 120 minutes

If the reverse fan mode is set manually, the driver can adjust the reverse rotation fan activation interval as shown below.

- After setting the new operation interval and pushing 'OK', the change of reverse fan operation cycle is complete.
- Default setting: 15 seconds

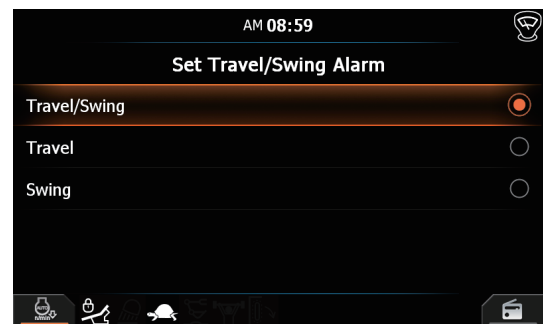


DS2302067

Figure 97

B. Set Travel/Swing Alarm

It is a function that allows an alarm to sound in a travel or swing operation according to a user's menu selection.



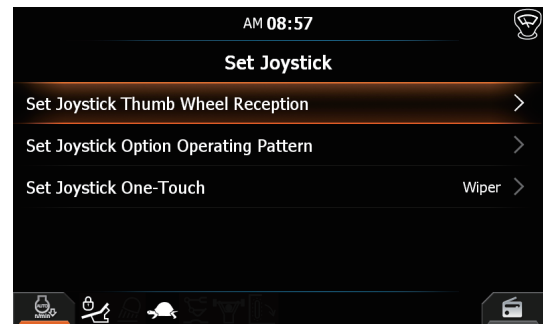
DS2302042

Figure 98

C. Set Joystick

The joystick thumbwheel sensitivity can be set.

How to access: User Menu → Machine Configuration → Set Joystick

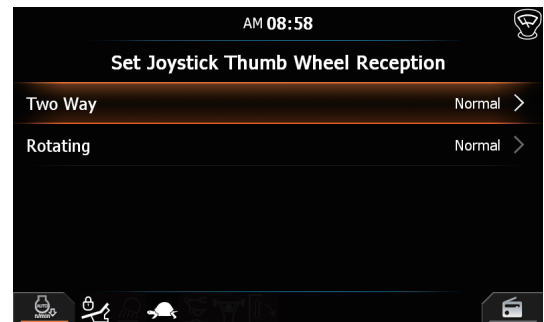


DS2302043

Figure 99

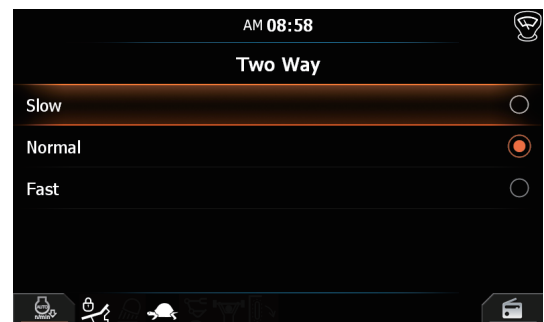
1) Set Joystick Thumb Wheel Reception

The Joystick Sensitivity for the two-way and rotating option can be set.



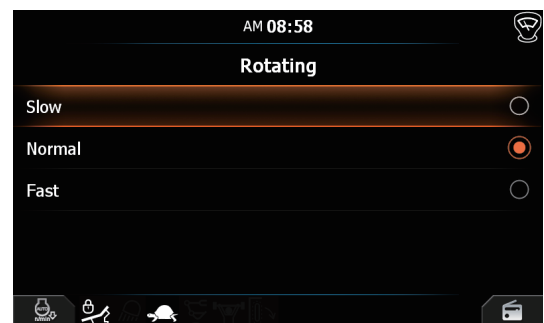
DS2302044

Figure 100



DS2302045

Figure 101

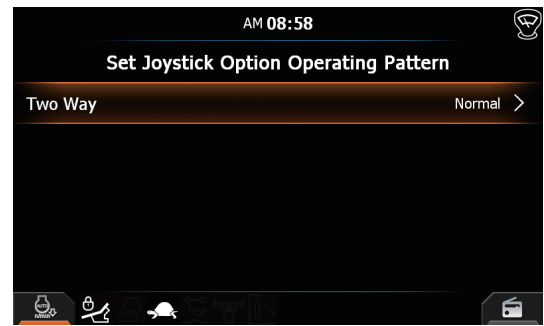


DS2302046

Figure 102

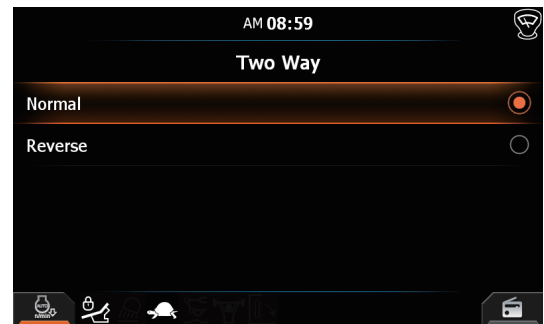
2) Set Joystick Option Operating Pattern

The Joystick operation pattern for the two-way and rotating option can be set.



DS2302047

Figure 103



DS2302048

Figure 104

3) Set Joystick One-Touch

The joystick one-touch function can be set. The following items can be set with the joystick onetouch function.

- Wiper
- Intelligent Floating Boom Temporary Reset
- Camera
- Mute Audio

NOTE: An image for the location of the joystick one-touch function may be displayed depending on whether the two-way option is installed.



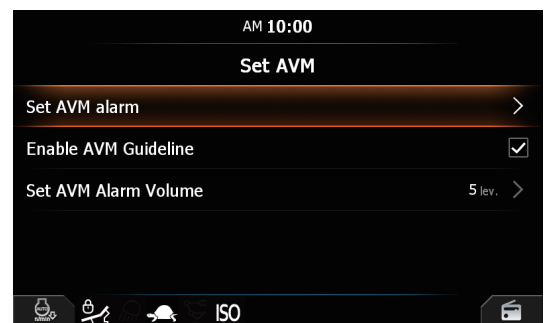
DS2100353

Figure 105

D. Set AVM

AVM-related alarms, volume and guidelines can be set.

How to access: User Menu → Machine Configuration → Set AVM



DS1900337

Figure 106

1) Set AVM Alarm

The AVM alarm buzzer can be turned on or off and the alarm detection range can be selected.

How to access: User Menu → Machine Configuration → Set AVM → Set AVM Alarm



DS1900338

Figure 107

2) Enable AVM Guideline

This menu allows you to choose whether to use guidelines.

3) Set AVM Alarm Volume

The AVM alarm volume can be set.

How to access: User Menu → Machine Configuration → Set AVM → Set AVM Alarm Volume

How to change the AVM alarm volume

- After setting the volume and pushing 'OK', the change of volume is complete.

NOTE: The volume has an adjustable range of 11 levels from 1 to 11.



DS2302130

Figure 108

E. Set Control Dial

The control dial input screen provides a method for controlling the engine rpm by using the display monitor's jog switch instead of the engine control dial.

How to access: User Menu → Machine Configuration → Set Control Dial

- Enable Dial Input
- Set Dial

1) Enable Dial Input

The selector dial function can be toggled on/off.

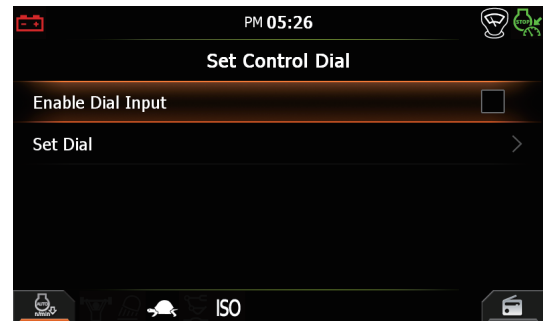
2) Set Dial

The range of the engine rpm can be adjusted.

How to change the control dial

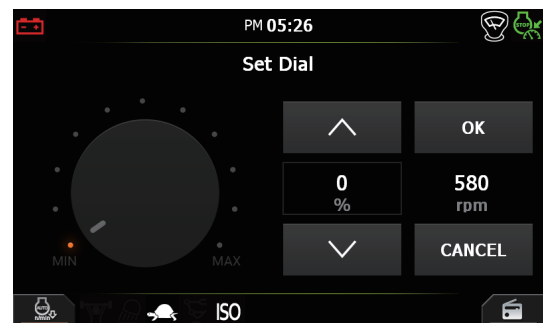
- After setting the rpm range and pushing 'OK', the change of control dial rpm is complete.

NOTE: The rpm has an adjustable range of 11 levels from 0 to 100%



DS2100354

Figure 109



DS2100355

Figure 110

F. Temporary Security Unlock

This menu enables authorized personnel to temporarily unlock those machines that have been locked by the TMS server (Ignition lock or RPM limitation) but are currently located where they cannot receive an unlocking command from the server.

4. Attachment Management

Breaker and two-way performance can be set, and the setting options can be selected.

The following menus can be checked and changed.

- Select One Way
- Set One Way
- Set One Way Operation Time
- Select Two Way
- Set Two Way
- Set Option Operations

NOTE: *Select One Way menu and Select Two Way menu are used in the same way, as are the Set One Way menu and Set Two Way.*

A. Select One Way/Two Way

This menu allows you to choose between five settings saved in the one way/two way settings.

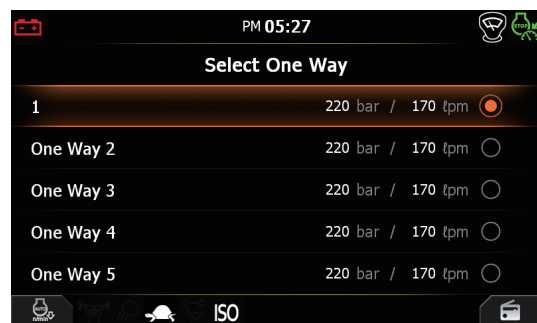
How to access: User Menu → Attachment Management → Select One Way/Two Way

The maximum flow rate and pressure for an attachment are displayed to the right of the name of the attachment.



DS2100356

Figure 111



DS2100357

Figure 112

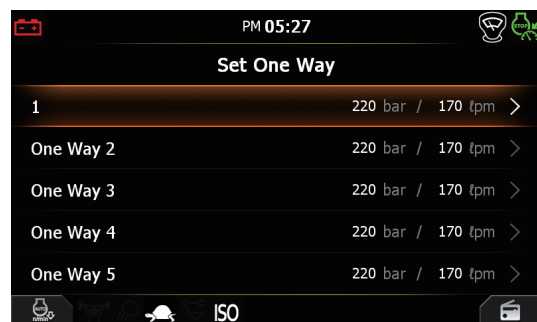
B. Set One Way/Two Way

This menu allows you to set up to five settings to use with the one-way/two-way option.

How to access: User Menu → Attachment Management → Set One Way/Two Way

The following items can be set.

- Max. Press.
- Max. E/G Limit
- Min. Flow
- Max. Flow
- Button Type
- Change Name



DS2100358

Figure 113

1) Max. Press.

The maximum pressure can be set.

The configurable max. pressure range varies depending on the machine.

How to access: User Menu → Attachment Management → Set One Way/Two Way → Max. Press.

How to change the maximum pressure

- After setting the new pressure and pushing 'OK', the change of maximum pressure is complete.
- Default setting: 340

NOTE: *The maximum pressure indication/setting resolution is 10 bar.*

2) Max. E/G Limit

The maximum engine rpm can be set.

The configurable max. engine rpm range varies depending on the machine.

How to access: User Menu → Attachment Management → Set One Way/Two Way → Max. E/G Limit

How to change the maximum engine rpm

- After setting the new rpm and pushing 'OK', the change of maximum engine rpm is complete.
- Default setting: 1800

NOTE: *The maximum engine rpm setting resolution is 50 rpm.*

3) Min. Flow

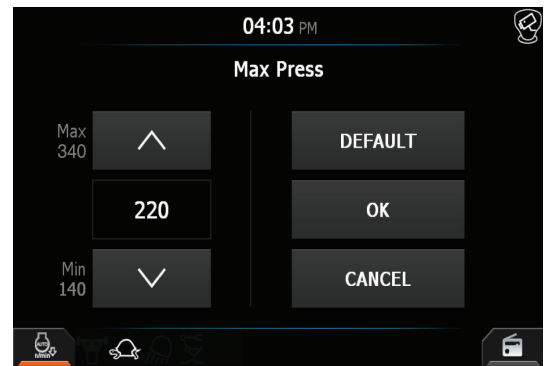
The minimum flow rate can be set.

How to access: User Menu → Attachment Management → Set One Way/Two Way → Min. Flow

How to change the minimum flow

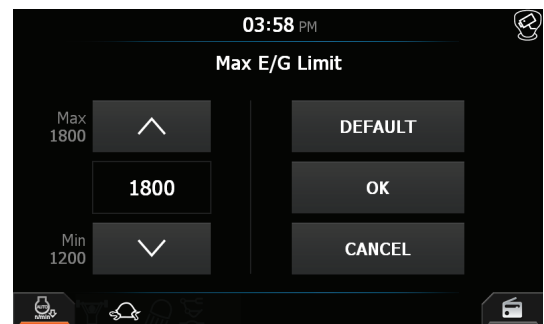
- After setting the new flow and pushing 'OK', the change of minimum flow is complete.
- Default setting: 30

NOTE: *The minimum flow rate can be set below the maximum flow rate in units of 10 lpm.*



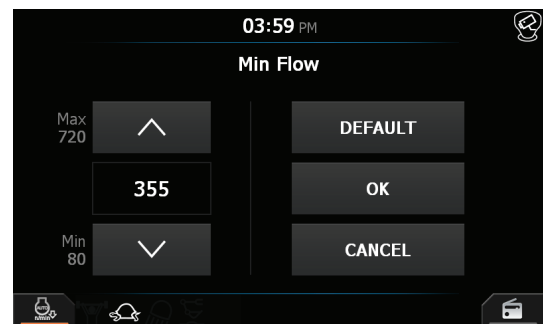
DS1901271

Figure 114



DS1900345

Figure 115



DS1900347

Figure 116

4) Max. Flow

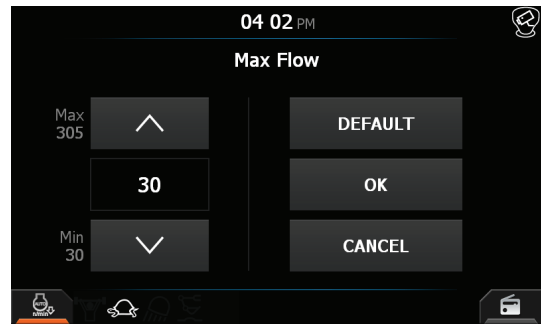
The maximum flow rate can be set.

How to access: User Menu → Attachment Management → Set One Way/Two Way → Max. Flow

How to change the maximum flow

- After setting the new flow and pushing 'OK', the change of maximum flow is complete.
- Default setting: 245

NOTE: The maximum flow rate can be set from the minimum flow rate up to 1,000 lpm in units of 5 lpm.



DS1900346

Figure 117

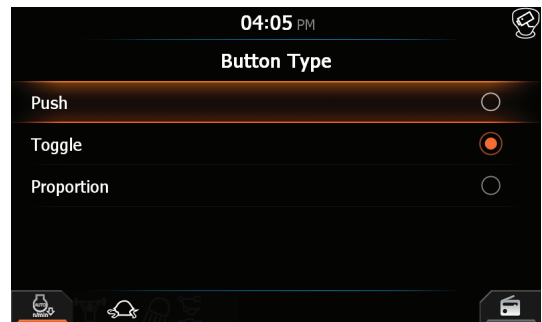
5) Button Type

The one-way/two-way button type can be set.

How to access: User Menu → Attachment Management → Set One Way/Two Way → Button Type

The attachment button types are as follows.

- One-way: Toggle, push
- Two-way: Toggle, push, proportion



DS1900348

Figure 118

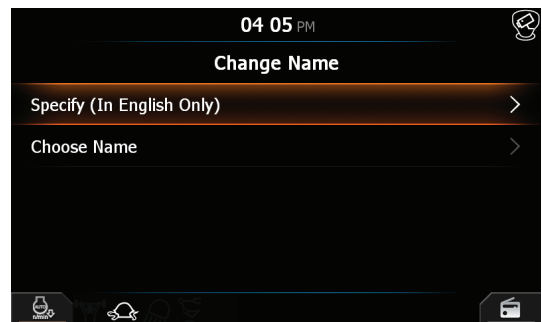
6) Change Name

The method of changing the one-way/two-way name can be selected.

How to access: User Menu → Attachment Management → Set One Way/Two Way → Change Name

The following menus can be changed.

- Specify (In English Only)
- Choose Name



DS1900349

Figure 119

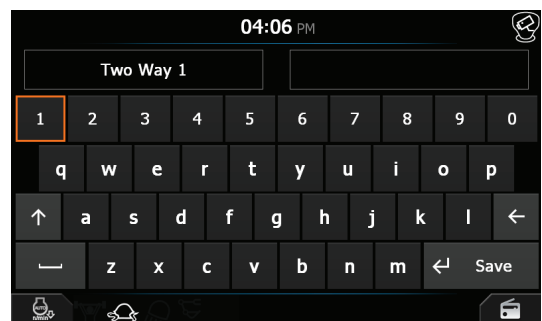
a) Specify (In English Only)

The one-way/two-way name can be entered and set using the English keypad.

How to access: User Menu → Attachment Management → Set One Way/Two Way → Change Name → Specify (In English Only)

The current attachment name is displayed on the left and the new attachment name being entered is displayed on the right.

NOTE: Only English characters and numbers may be used for the one-way/two-way name.



DS1900350

Figure 120

b) Choose Name

After selecting the one-way/two-way name, a screen appears where you may enter a number to add after the name.

How to access: User Menu → Attachment Management → Set One Way/Two Way → Change Name → Choose Name

The attachment names are as follows.

One-way: One Way, Breaker, Hammer

Two-way: Two way, Crusher, Clipping Shearing Machine, Secondary Crusher, Grapple, Tilt Bucket, Multiprocessor

The number can be set after selecting the name.

How to change the attachment number

- After selecting the attachment number and pushing 'OK', the attachment number is changed.

NOTE: The number for the name can be any number between 1 and 20.

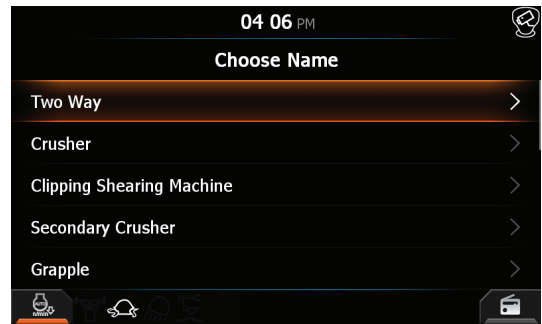


Figure 121

DS1900351

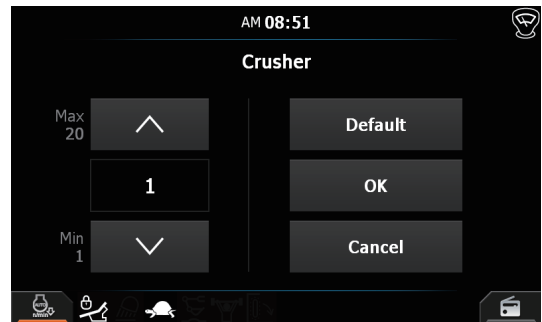


Figure 122

DS2302049

C. Set One Way Operation Time

The continuous breaker operating time is limited in order to protect the machine. The continuous breaker operating time can be set in this menu.

How to access: User Menu → Attachment Management → Set One Way Operation Time

How to change the breaker operating time

- After selecting the new time and pushing 'OK', the breaker operating time is changed.
- Default setting: 15

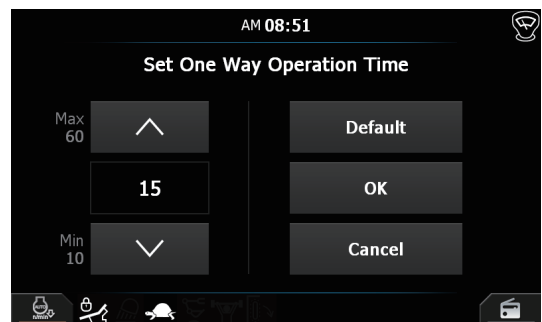


Figure 123

DS2302050

D. Set Option Operations

The method of operating the two-way option can be set.

How to access: User Menu → Attachment Management → Set Option Operations

The following operation-related items can be set.

- Joystick
- Option Pedal

NOTE: Only available in vehicles equipped with an option pedal.

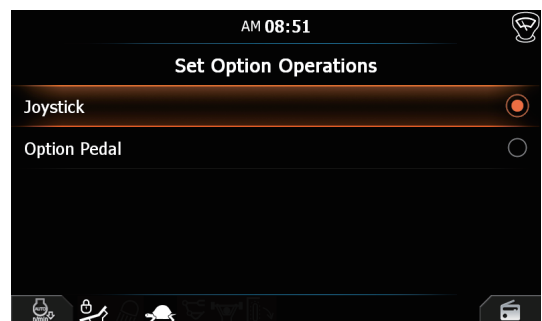


Figure 124

DS2302051

5. Gauge Panel Configuration

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

The following menus can be checked and changed.

- Set Bookmark
- Set Language
- Set Service Phone Number
- Set AVM Brightness
- Set Camera Brightness
- Set Screen Brightness
- Set Date and Time
- Set Unit

A. Set Bookmark

Bookmarks can be set.

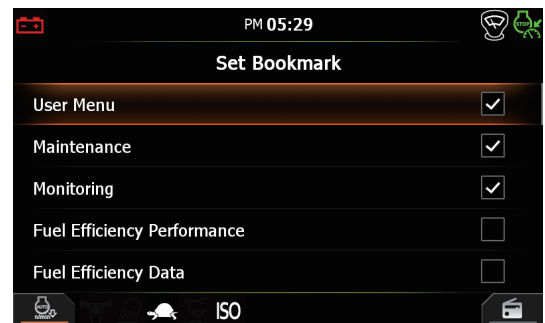
How to access: User Menu → Gauge Panel Configuration → Set Bookmark

Up to 5 bookmarks may be set.



DS2100360

Figure 125



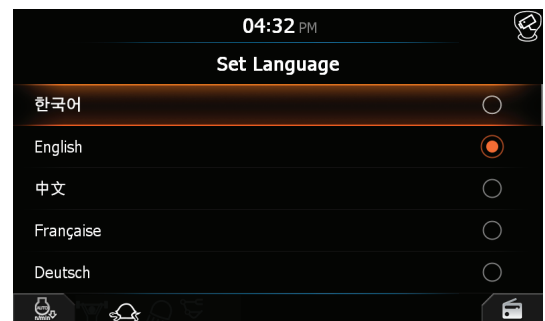
DS2100369

Figure 126

B. Set Language

The display monitor language can be set.

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



DS1900357

Figure 127

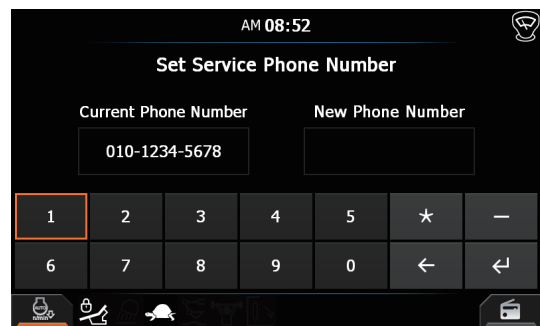
C. Set Service Phone Number

The service phone number can be set.

How to access: User Menu → Gauge Panel Configuration → Set Service Phone Number

The current service phone number is displayed on the left and the new service phone number being entered is displayed on the right.

In case a service phone number is entered, if a warning/alarm occurs, the corresponding phone number is displayed in the pop-up window.



DS2302052

Figure 128

D. Set AVM/Camera/Screen Brightness

The brightness of the AVM/camera/screen can be set.

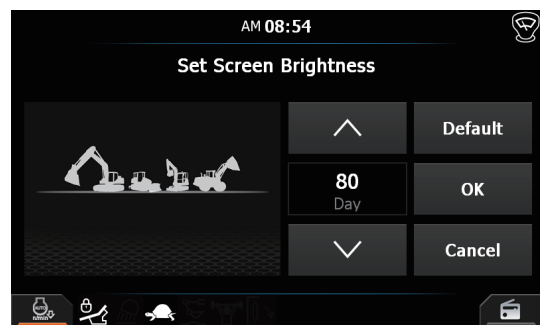
How to access: User Menu → Gauge Panel Configuration → Set AVM/Camera/Screen Brightness

Brightness can be set in two ways: day/night.

How to change the brightness

- After selecting the desired brightness and pushing 'OK', the brightness is changed.

NOTE: The brightness can be set in 11 levels from 0 to 100%.



DS2302053

Figure 129

E. Set Date and Time

The date and time can be set.

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

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

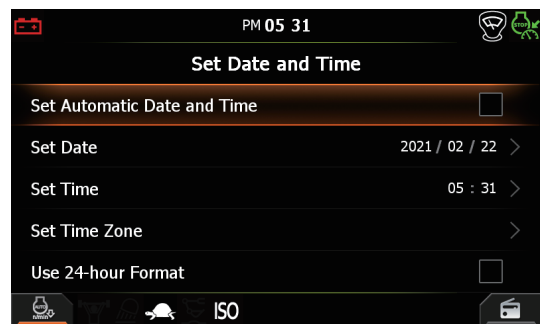
- Set Automatic Setting of Date and Time
- Set Date
- Set Time
- Select Time Zone
- Use 24-hour Format

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.



DS2100370

Figure 130

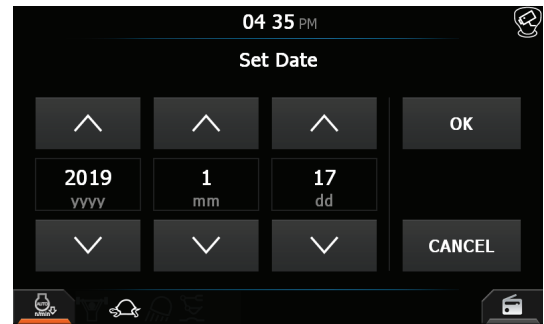
2) Set Date

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



DS1900361

Figure 131

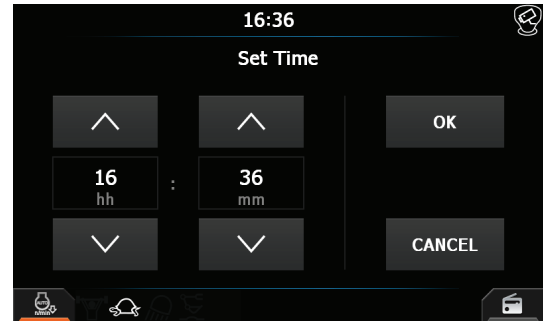
3) Set Time

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.

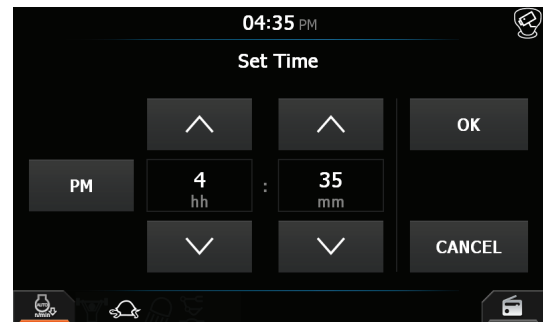
- Hour: hh
- Minute: mm



DS1900362

Figure 132

AM and PM are displayed on the left-hand side if the 24-hour format is enabled in the date and time setting.



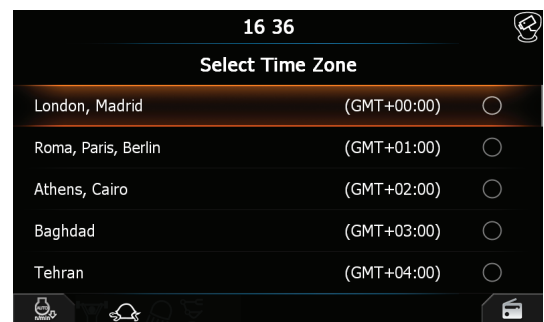
DS1900363

Figure 133

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



DS1900364

Figure 134

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	Roma, 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	Tehran	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

F. Set Unit

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

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

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

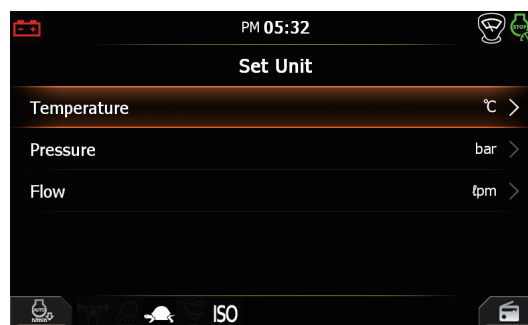


Figure 135

DS2100371

The following units can be selected.

- Temperature: °C, °F
- Pressure: bar, kg/cm², psi, Mpa
- Flow: lpm, gpm

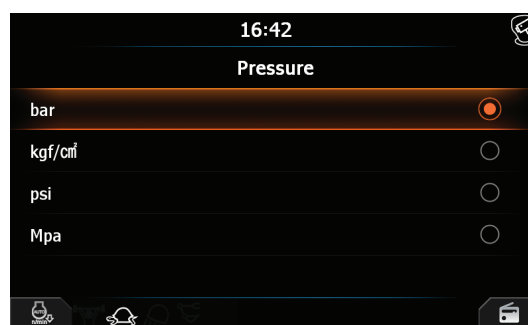


Figure 136

DS1900366

6. Operator Management

The owner and operator password can be set.

Machine start-up and the use of functions can be managed using the operator management function.

The following passwords can be set.

- Owner
- Operator

A. Owner

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

How to access: User Menu → Operator Management → Owner

The following items can be set.

- Change Owner Password
- Change Operator Password
- Set Owner Lock Use_Each Menu
- Set User Permission_Each Menu
- Set Engine Startup Lock Time
- Smart Key Management

1) Change Owner/Operator Password

The owner/operator password can be changed.

How to access: User Menu → Operator Management → Owner → Change Owner/Operator Password

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".

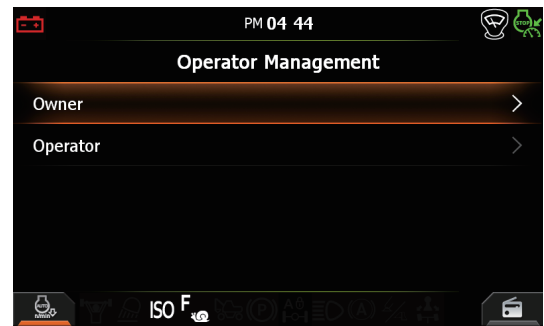


Figure 137

DS2100597



Figure 138

DS2100598

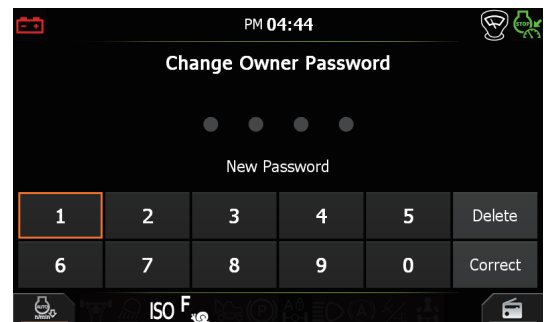


Figure 139

DS2100599

2) Set Owner Lock Use_Each Menu

The lock settings can be set for each menu.

How to access: User Menu → Operator Management → Owner → Set Owner Lock Use_Each Menu

The following menus can be locked.

- Start Engine
- Attachment Management
- Entertainment Use Setting



Figure 140

DS2100600

3) Set User Permission_Each Menu

The lock settings can be set for each user menu.

How to access: User Menu → Operator Management → Owner → Set User Permission_Each Menu

The following menus can be locked.

- Start Engine
- Attachment Management
- Entertainment Use Setting



Figure 141

DS2100601

4) Set Engine Startup Lock Time

The engine startup lock time can be set.

How to access: User Menu → Operator Management → Owner → Set Engine Startup Lock Time

The startup lock time can be set as follows.

- Always
- 1 minute
- 5 minutes

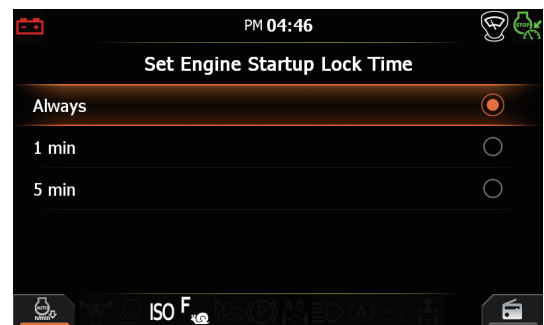


Figure 142

DS2100602

5) Smart Key Management

Smart key related items can be set.

The following items can be set.

- Register new smart key (complete initialization)
- Smart key additional registration

NOTE: The operator can only use smart key additional registration.



Figure 143

DS2000291

B. Operator

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

How to access: User Menu → Operator Management → Operator

The following items can be set.

- Change Operator Password
- Set Operator Lock Use_Each Menu
- Set Engine Startup Lock Time
- Smart Key Additional Registration

1) Change Operator Password

The operator password can be changed.

How to access: User Menu → Operator Management → Operator → Change Operator Password

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".

2) Set Operator Lock Use_Each Menu

The lock settings can be set for each menu.

How to access: User Menu → Operator Management → Operator → Set Operator Lock Use_Each Menu

The following menus can be locked.

- Start Engine
- Attachment Management
- Entertainment Use Setting

NOTE: *In the lock settings (administrator) for each menu, menus for which the user does not have access permission are marked 'Enabled/Disabled' depending on the lock settings (administrator) in each menu.*

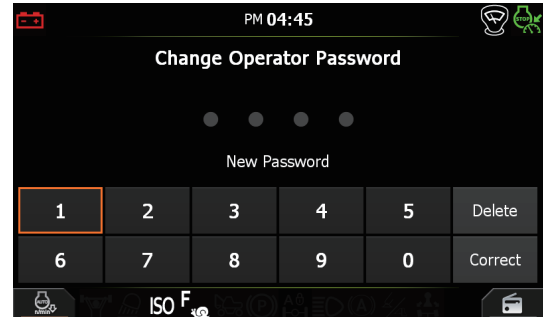


Figure 144

DS2100603



Figure 145

DS2100604

3) Set Engine Startup Lock Time

The engine startup lock time can be set.

How to access: User Menu → Operator Management → Operator → Set Engine Startup Lock Time

The startup lock time can be set as follows.

- Always
- 1 minute
- 5 minutes

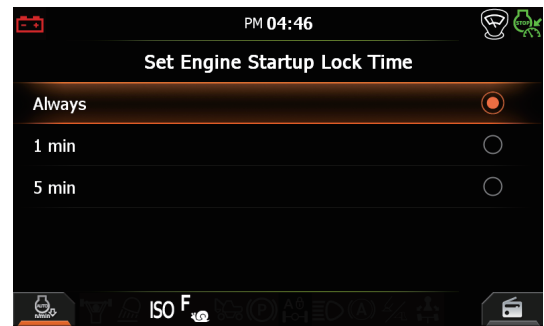


Figure 146

DS2100602

4) Smart Key Initialization / Additional Registration

NOTE: For information on registering smart keys, refer to 'Operating Controls - Smart Key'.

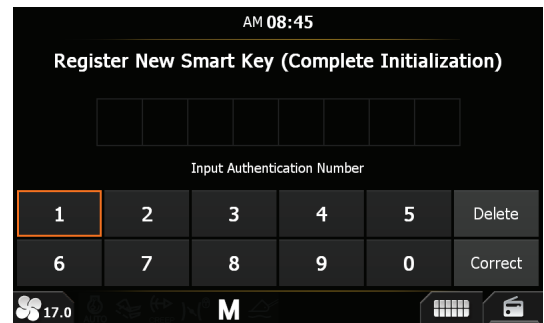


Figure 147

DS2000292

Press the complete button after pressing the start/stop button directly with the smart key to finish adding / registering the new smart key.

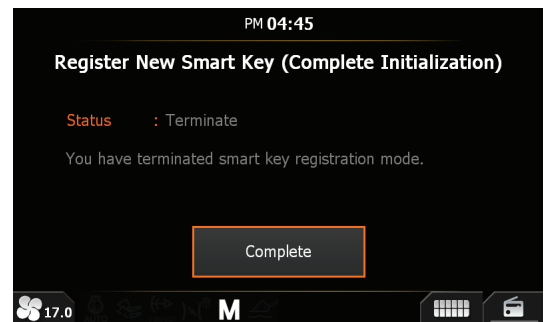


Figure 148

DS2000293

Around View Monitoring (AVM) System (If Equipped)

The Around View Monitoring (AVM) system is a device which enables the operator to check the machine surroundings on the monitor while working. A variety of views are provided, thereby enhancing convenience while operating the machine.

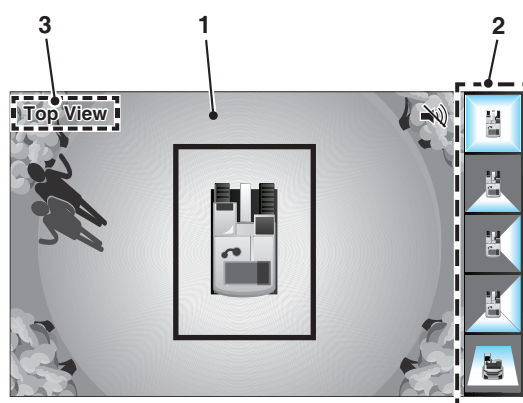
Operating Conditions and Instructions

An image is displayed on the AVM monitor while the engine is running. A variety of view modes can be selected using the icons.

The monitor can be turned on/off by holding down the menu button for three seconds or longer.

Screen Components and View Modes

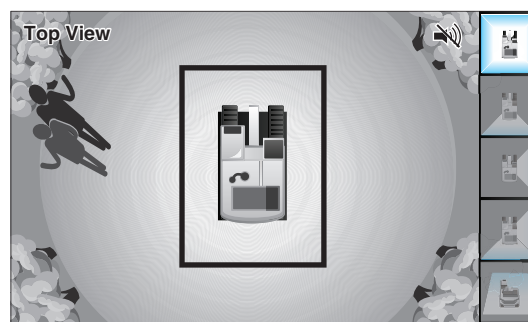
Number	Name
1	View Screen
2	View Icon
3	View Mode



EX1503200

Figure 149

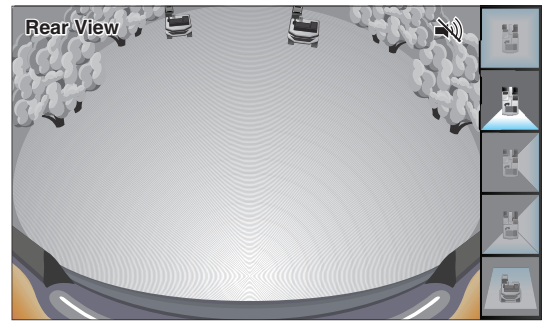
1. Top View
Displays an image of the entire surrounding area of the machine



EX1503201

Figure 150

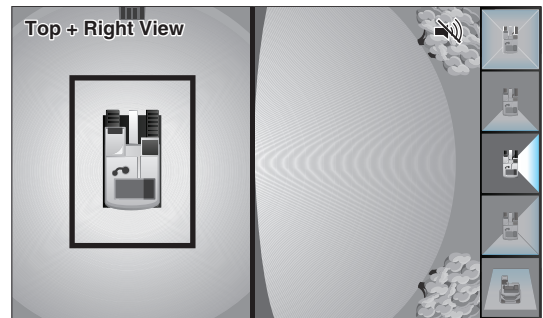
2. **Rear View**
Displays an image of the rear of the machine



EX1503202

Figure 151

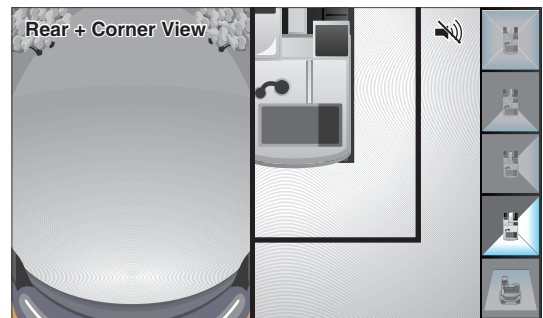
3. **Top + Right View**
Displays a mixed image of the surrounding area and right side of the machine



EX1503203

Figure 152

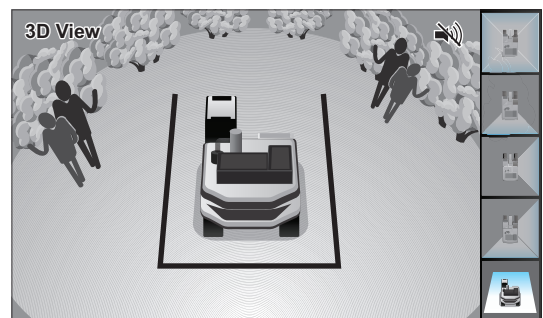
4. **Rear + Corner View**
Displays a mixed image of the rear and right-hand rear corner of the machine



EX1503204

Figure 153

5. **3D View**
Displays a 3D image of the surrounding area of the machine



EX1503205

Figure 154

Displaying Outlines of the Vehicle Area

Guidelines are displayed around the contour of the machine in order for the operator to be able to gauge distances around the machine while operating the machine.

- A guideline (red) of 1.6 m distant is displayed around the front/rear/left/right contour of the machine.

NOTE: *The vehicle contour is displayed in top view, rear + corner view, and 3D view.*

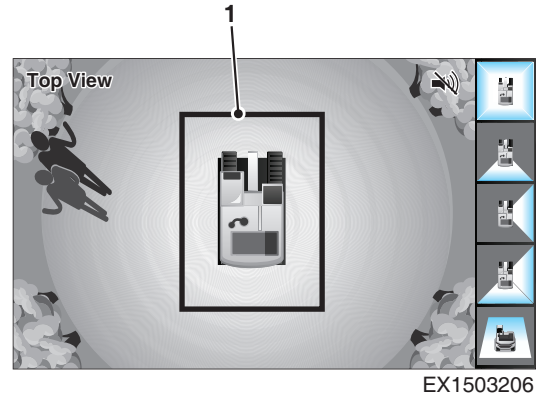


Figure 155

NOTE: *The vehicle guidelines can be turned on and off in the user menu.*

How to access: User Menu → Machine Configuration → Set AVM



WARNING

AVOID DEATH OR SERIOUS INJURY

A camera with a wide-angle lens is installed in order to provide a wider field of vision. Hence, there may be a difference between the distance shown on the screen and the actual distance. For the sake of safety, be sure to check the front/rear/left/right views directly.



WARNING

AVOID DEATH OR SERIOUS INJURY

The field of vision on the AVM screen may be restricted if a door on the machine is open.
Be sure to close all doors before using AVM.

NOTE: *In the event that the around view monitoring (AVM) system does not work properly, be sure to contact a HD HYUNDAI CONSTRUCTION EQUIPMENT service center for inspection and maintenance.*

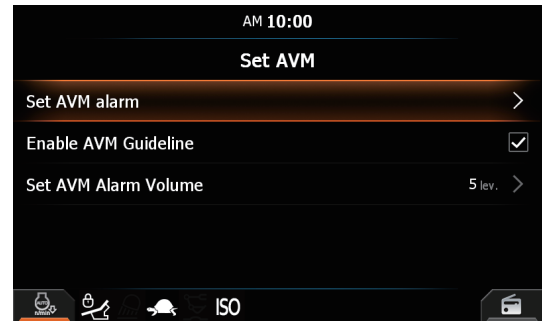


Figure 156

Proximity Alarm System (If equipped)

The proximity alarm system detects the distance of objects within a certain distance of the left/right side and rear of the vehicle and notifies the machine operator of obstacles with an alarm.



NOTICE

Even if a machine is equipped with the proximity alarm system, operate the machine just as carefully as if the system were not installed and be sure to check for obstacles on the left/right side and rear directly.

The system may not detect obstacles properly due to the surroundings and ambient conditions. Hence, an accident may occur if the machine operator relies only on the proximity alarm system.

Sensor Locations

Eight sensors (Figure 157) are installed at the top of the counterweight.

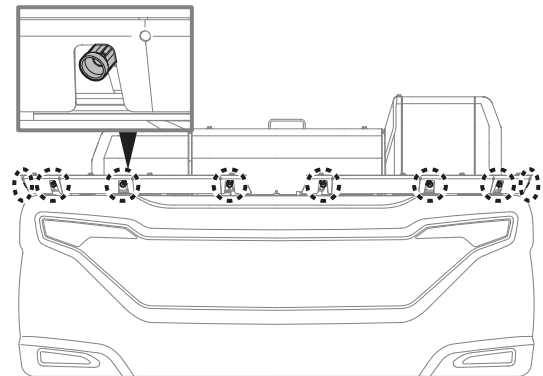


Figure 157

EX1503207

Sensor Operating Conditions and Settings

- While the engine is running
- While the ultrasonic sensor alarm is set to "Enabled"

How to access: User Menu → Machine Configuration → Set AVM → Set AVM Alarm

NOTE: The sensor detection range can be set to the "Upper Body" or "Entirety".

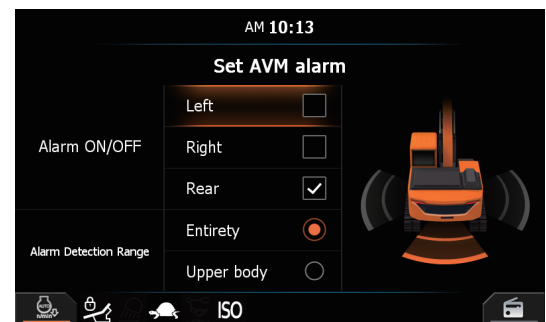


Figure 158

DS1900338

Sensor Alarm Setting

- The volume of the alarm in the cabin can be adjusted.




How to access: User Menu → Machine Configuration → Set AVM → Set AVM Alarm Volume



Figure 159

DS2302130

Operating Range and Display

Level	Distance	Display Icon	Alarm	Warning on Edge of Monitor
Level 1 warning (green)	Long range		100 ms ON, 700 ms OFF	Green flashing
Level 2 warning (yellow)	Medium distance		100 ms ON, 200 ms OFF	Yellow flashing
Level 3 warning (red)	Short distance		Sounds continuously	Red flashing

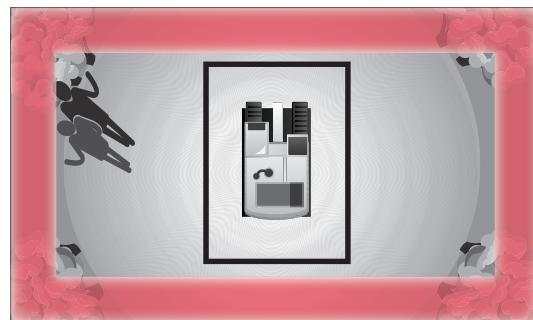
NOTE: In the case of wheel-type machines, the ultrasonic sensor stops working automatically at speeds of 10 km/h or higher.

NOTE: The display icon is only shown when objects are detected near each sensor.

NOTE: The display icon and alarm may appear differently if an obstacle is located between sensors or very close to the excavator, or depending on the surrounding conditions of the machine.

NOTE: The display icon shown above may differ from the actual display icon in the machine.

NOTE: Pushing the DMB/buzzer stop switch can stop the alarm temporarily.



WE1501120

Figure 160 Image of warning on edge of monitor

Sensor Non-Activation Conditions

1. In cases where a sensor may not operate normally
 - When a sensor is frozen
 - When foreign matter such as snow or condensation is blocking the surface of a sensor
2. In cases where a sensor may malfunction
 - When driving on bumpy roads, gravel roads, hills, and in forests
 - When the machine is near an object which generates ultrasonic waves, such as the engine noise of another nearby machine or the air brakes of a truck
 - In heavy rain or snowstorms
 - If powerful electromagnetic waves are generated near a sensor
 - If a sensor is covered in snow
 - When turning at a high speed
 - When the vehicle height changes significantly
 - When another nearby vehicle passes by quickly
3. In cases where the detection range may be reduced
 - When foreign matter such as snow or condensation is stuck to the surface of a sensor
 - In extreme heat or cold
 - When detecting objects with a diameter of less than 20 cm and a length of less than 1 m
4. Undetectable objects.
 - Sharp objects or thin objects such as rope
 - Objects which absorb sound waves, such as cotton sheet, sponges and snow



WARNING

AVOID DEATH OR SERIOUS INJURY

This system cannot detect objects which are not near the sensors installed. Furthermore, the system cannot detect objects in the area between sensors, low obstacles or thin obstacles, so be sure to check for such objects.

Be extremely careful when operating the machine around objects or people. Bear in mind that there are many cases where obstacles cannot be detected as the sensor has a limited detection range and cannot detect all objects

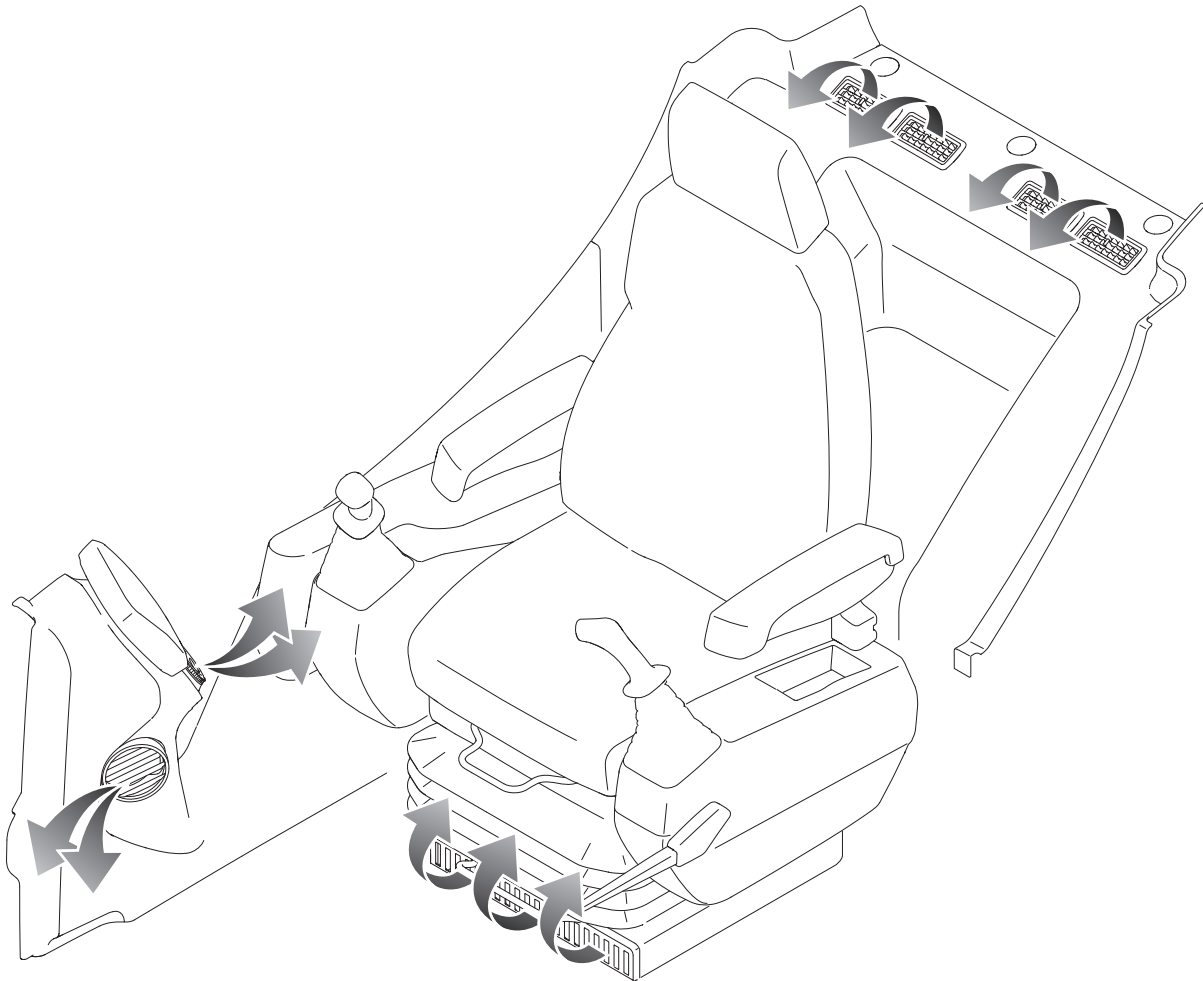
Sensor Management Information

The alarm may not sound in consecutive order depending on the shape of an obstacle.

- Sensors may malfunction if the height of the counterweight or the installed location of a sensor is changed, or if an accessory which was not originally installed in the machine at the time of factory release is mounted within the detection range of sensors near the counterweight.
- Sensors may not detect objects within 30 cm or less of the sensors, or an alarm for a different part of the vehicle may sound.
- In the event that a sensor is not working properly, the sensor may be frozen or covered in snow or condensation. Check the sensors and wipe them with a soft cloth if contaminated.
- Applying excessive force to the surface of sensors, hitting them with hard objects, or scratching them with sharp objects may damage the surface of sensors.

Heater and Air Conditioner Control Panel

Location of Controls and Vents



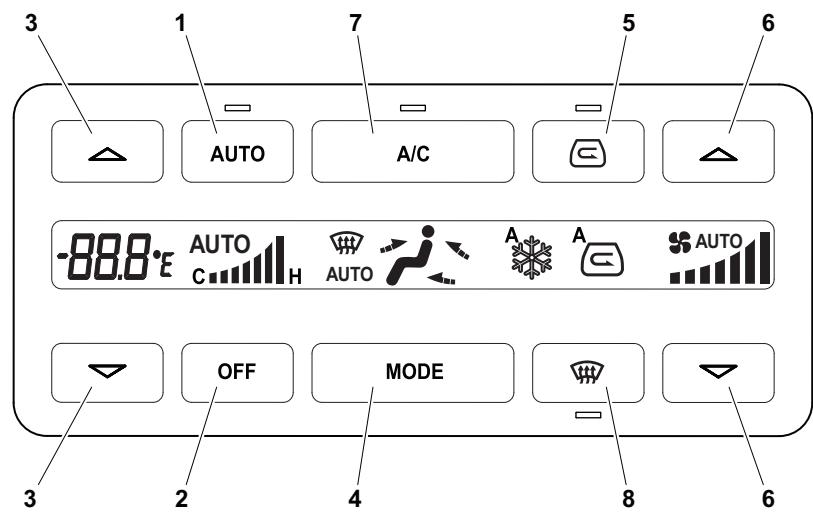
DS1901153

Figure 161

The heater and air conditioner are combined into one unit in the rear cover behind the operator's seat.

The operator can control cabin temperature using the control panel installed in the switch panel.

Control Panel



DS2100099

Figure 162

Reference Number	Description
1	Automatic Temperature Control Button
2	Off Button
3	Temperature Control Button
4	Air Outlet Selector Button

Reference Number	Description
5	Air Inlet Selector Button
6	Fan Speed Selector Button
7	Air Conditioner Button
8	Defroster Button
9	LCD Display

NOTE: When the light switch is turned to "I" or "II" position, the LED for illuminating in the control panel will turn "ON".

1. Automatic Temperature Control Button

This button is used to control the temperature level in the cabin, according to the temperature setting of the operating panel.

When the system is in "AUTO" mode, specifications can be manually changed by pushing another button.

If a function is manually changed, the word "AUTO" does not appear in the LCD display, but the unchanged functions will remain in "AUTO" mode.

NOTE: To change the temperature unit, press the auto temperature adjustment button and the system stop button simultaneously for three seconds.

2. Off Button

This button is used to stop the fan and air conditioner.

3. Temperature Control Button

These buttons are used to control the cabin temperature.

Temperature is adjustable from 17°C (62°F) to 32°C (90°F) by 0.5°C (1°F) increments.

Temperature setting is displayed on the LCD.

When the system is turned "ON", the previously set temperature is used as a starting point.

4. Mode Selector Button

This button is used to select which combination air outlets will be used.

- A. Used to direct airflow to upper portion of operator's cabin from both the front and rear.

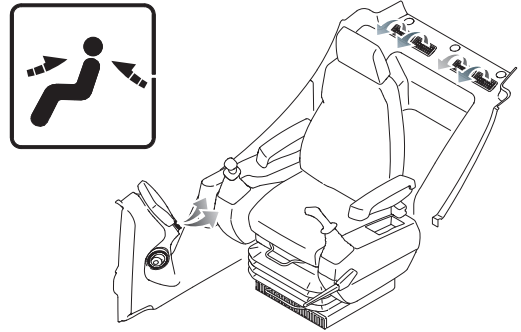


Figure 163

DS1901154

- B. Used to direct airflow to upper portion of operator's cabin from both the front and rear. It will also deliver air to the lower portion of operator's cabin from under the operator's seat.

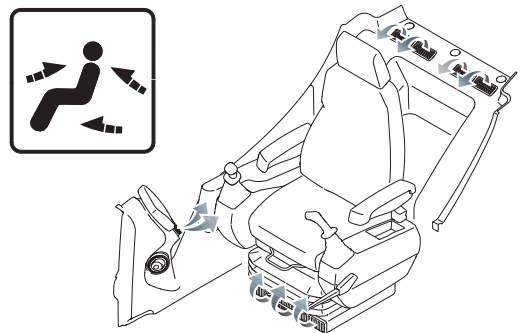


Figure 164

DS1901155

- C. Used to direct airflow to lower portion of operator's cabin and feet.

This mode is mainly used for heating.

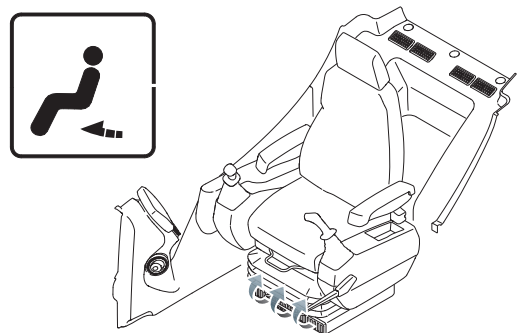


Figure 165

DS1901156

- D. Used to direct airflow to the front window and to operator's feet.

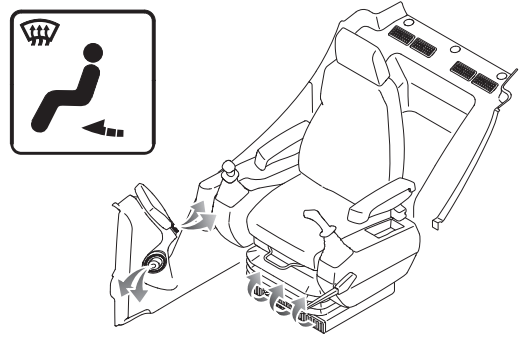


Figure 166

DS1901157

5. Air Inlet Selector Button

This button is used to select fresh air from outside the cabin, or recirculate air within the cabin.

Pressing this switch enables the choice between fresh air and recirculating air within the operator's cabin. The select mode is displayed on the LCD.

- Outside air introduction: When wishing to ventilate internal air. When wishing to remove moisture condensed on the glass window. (winter/rainy season)
- Internal air circulation: In the event that the interior needs to be warmed up or cooled down quickly. In the event of internal air circulation, the symbol shown on the right of the display will light up.

NOTE: Press the internal/outside air selection button for three seconds to display the outside air temperature.



Figure 167

DS2100104

6. Fan Speed Selector Buttons

These buttons are used to control the speed of the blower fan. Momentarily, pressing a button, changes the speed one stage.

Continuously pressing and holding a button, repeatedly changes the speed.

7. Air Conditioner Button

This button is used to turn the air conditioner "ON" or "OFF". When this function is activated, an "A/C" is displayed in the upper left corner of the LCD.

8. Defroster Button

Used to direct airflow to front window.

9. LCD Display

This display shows the current setting.

Memory Function

The air conditioner panel has a memory function. When the starter switch is turned "OFF", the settings for the panel will be stored. When the excavator is started, the last stored setting will be used.

Additional Operating Instructions

A proper indoor temperature in summer is 5 ~ 6°C (10 ~ 12°F) lower than the outdoor temperature.

Operate the air conditioner for twenty - thirty minutes a week to circulate the refrigerant in the system.

NOTE: *The blower button must be on "Three Bars".*

If operating the air conditioner or heater for a long time, operate the air inlet selector button and, when smoking, vent the air to the outside to prevent irritation to eyes.

Stereo

Before operating the stereo, read operation manual enclosed with stereo.

Stereo

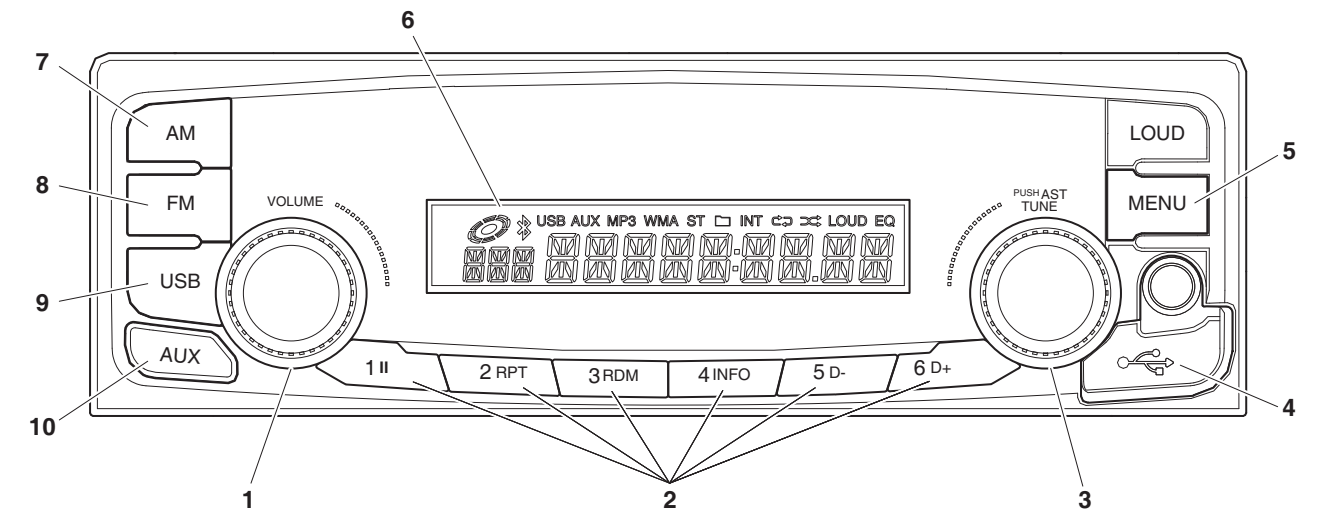


Figure 168

DS1901101

Reference Number	Description
1	Power/Volume Control
2	Preset Station
3	Tuning Up/Down
4	USB Loading Port
5	Menu

Reference Number	Description
6	LCD
7	AM Selection
8	FM Selection
9	USB Selection
10	Auxiliary Mode

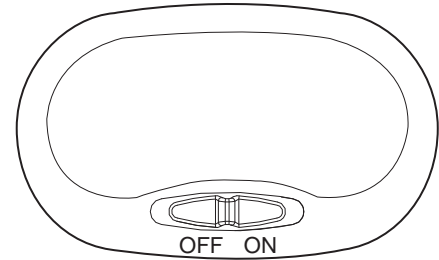
Miscellaneous Electrical Devices

Cabin Light

A light is installed on the top of the operator's cabin.

The light will work despite starter switch position.

NOTE: *If light is left "ON" for a long time while the engine is not running, the battery will be discharged.*

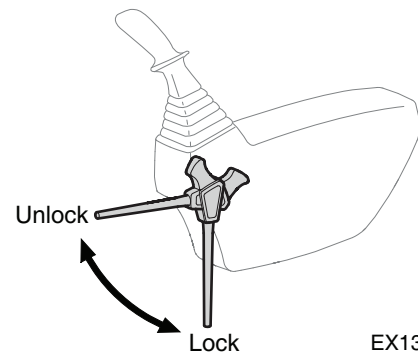


DS1900485

Figure 169

Safety Lever

When the safety lever is moved into "LOCK" position, the switch deactivates the work and travel levers. With the work and travel levers deactivated, no digging/operational work can be done.



EX1300566

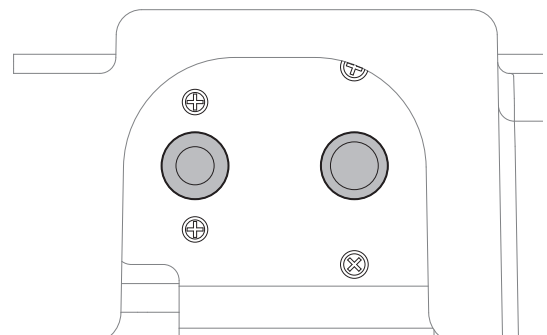
Figure 170

Circuit Breaker (30A, 80A)

A main circuit breaker is in the battery box. It will automatically cut off in case of an electrical short circuit or overload. This will prevent the electrical wiring and components from being burned or damaged.

If the circuit breaker is cut off, check all related circuits. This means something is wrong in the electrical circuit and it needs to be repaired.

After maintenance, press the red button for normal operation of circuit breaker.



DS1901151

Figure 171



WARNING

AVOID DEATH OR SERIOUS INJURY

Using the wrong circuit breaker could cause a wire harness short resulting in a fire, death or serious injury.

Junction Box

The junction box is inside the left side valve room. The fuses prevent electrical devices from overloading or shorting.

A decal attached outside the junction box access cover indicates the function and amperage of each fuse.

NOTE: For a further explanation see "Junction Box" on page 4-87.

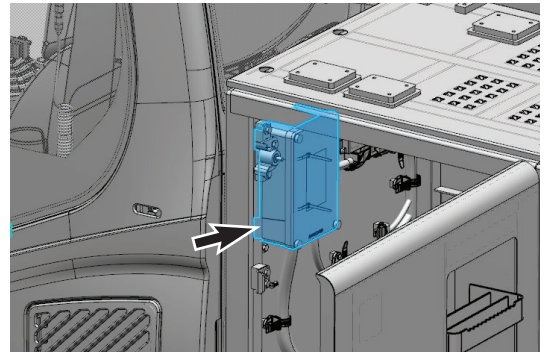
Change a fuse if the element separates. If the element of a new fuse separates, check the circuit and repair the circuit.



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.



DS2001312

Figure 172

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, apply the parking brake, and then adjust the seat.

Always fasten your seat belt while 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

Holding lever (1, Figure 173), raise it up, move the seat to the desired position. Release lever to lock the seat in the selected position. Adjustment range is 180 mm (7.1 in).

2. Adjusting Height of Seat and Depth of Cushion

Seat Height

It is possible to move the seat up or down by combining adjustments forward and rear tilt. Height adjustment is 60 mm (2.4 in).

Adjust height of seat by moving adjustment lever (2, Figure 173) up or down. Seat height can be adjusted by referring to the weight indication window (3, Figure 173) on the right.

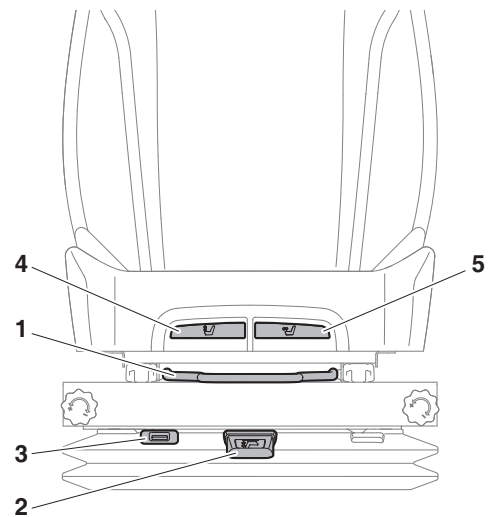
- Green: Standard weight
- Red: Underweight or overweight

Forward Tilt

Press the adjustment lever (4, Figure 173) to adjust the seat cushion angle. (0"/+4"/+8")

Cushion Slide

Press the adjustment lever (5, Figure 173), and adjust the seat cushion forward/backward by max. 50 mm, to fit with the length of the operator's thigh.



DS1901197

Figure 173

3. Reclining Position Adjustment

Pulling up left lever (1, Figure 174) allows seat backrest to be moved forward or backward.

Sit with your back against the seat back when adjusting it. If your back is not touching the seat back, the seat back may suddenly move forward.

4. Headrest

The headrest (2, Figure 174) can be adjusted forward/backward and up/down. Move it by holding both sides.

5. Lumbar Support Adjustment

A lumbar support is located in the seat back.

Turn the dial (3, Figure 174) counterclockwise to increase the force of the lumbar support.

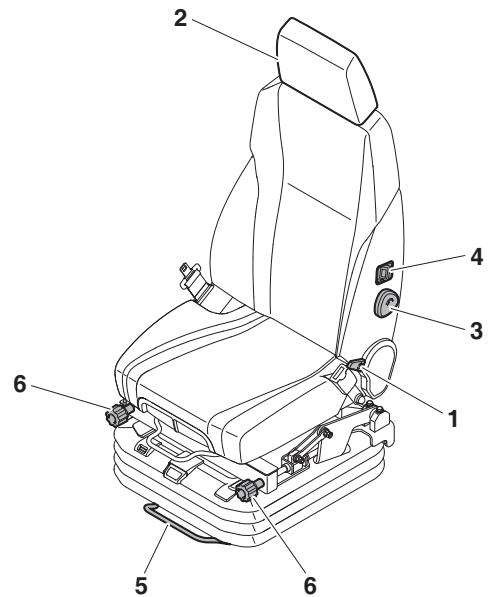


Figure 174

DS1901198

6. Seat Heater Switch

Seat Heater Switch (4, Figure 174) is used to raise the temperature of the driver's seat.

- I. 26 ~ 36°C (79 ~ 97°F)
- II. 35 ~ 45°C (95 ~ 113°F)

To raise the temperature of the driver's seat, set the switch to the applicable level until the desired temperature is reached.

Once the maximum temperature at each level is reached, the heating unit is shut off by a basic temperature control device.

NOTE: *If the seat is heating up to a higher than normal temperature, have seat serviced immediately.*

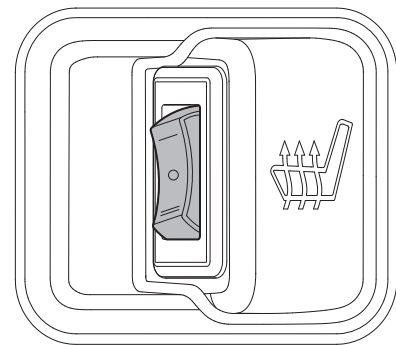


Figure 175

DS1901270

7. Left and Right Control Stand Adjustment

For operator's convenience, the right and left control stands and seat can slide together, within a 160 mm (6.3 in) forward or backward travel distance.

Holding lever (5, Figure 174), raise it up, set the seat to desired position. Release lever to lock seat in selected position.

8. Left and Right Control Stand Height Adjustment

The left and right dials (6, Figure 174) at the lower part of the seat can be turned to adjust the elevation height of each control stand. (± 1.2 in (± 30 mm))

It can be used to adjust the height of the control joystick.

9. Adjusting Height/Angle of Armrest

It is possible to adjust height of armrest by removing three bolts (2, Figure 176) holding armrest to driver's seat, and moving armrest up or down by intervals of 0.8 in (20 mm), and then installing armrest. Lift armrest slightly (1, Figure 176) and rotate dial on bottom of support to left and right to adjust angle of armrest.

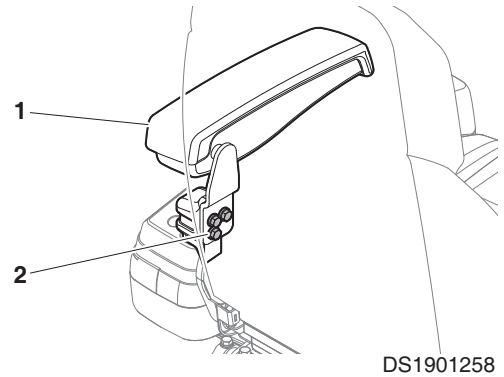


Figure 176

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 belt or bracket if damaged or worn.

When the seat belt is not worn, a warning symbol (Figure 177) illuminates on the display monitor; the symbol turns off when the seat belt is put on.



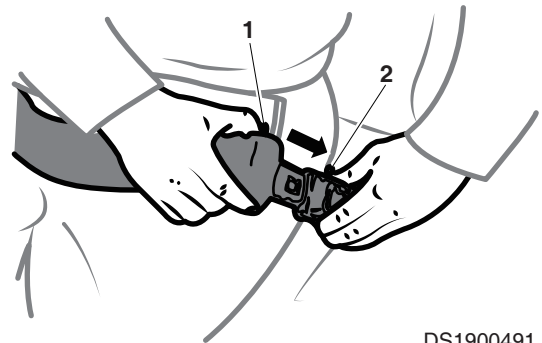
DS1901260

Figure 177

Seat Belt Locking and Unlocking

Insert belt end (1, Figure 178) into buckle (2, Figure 178). Pull belt to check that belt end is locked into buckle.

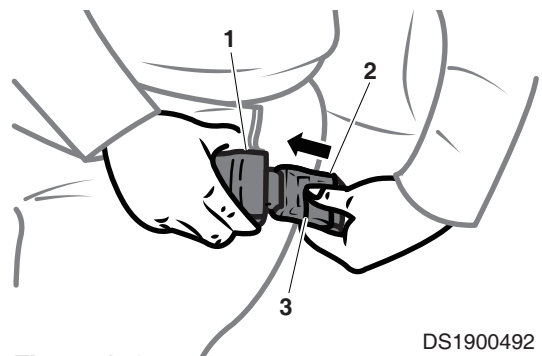
Adjust belt length so it is comfortably tight against operator's pelvic region (hipbone).



DS1900491

Figure 178

Press button (3, Figure 179) in center of buckle (2, Figure 179) and pull out belt (1, Figure 179) to unlock.



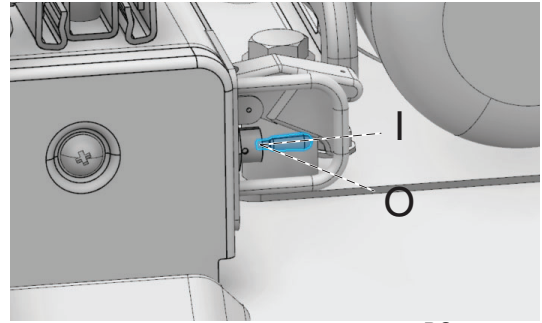
DS1900492

Figure 179

Engine 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.

- O. In this position, the engine emergency stop system is "OFF".
- I. In this position, "EMERGENCY STOP" is selected. The engine will stop.



DS2003620

Figure 180

Emergency Exit Glass Breaking Tool

This machine is equipped with a glass breaking tool. It is found on left pillar of cabin. This tool can be used to break the glass to exit from cabin in an emergency. Grip handle firmly and use sharp point to break glass.

- Be careful not to slip on broken pieces of glass on ground.



WARNING

AVOID DEATH OR SERIOUS INJURY

Protect your eyes when breaking the glass.

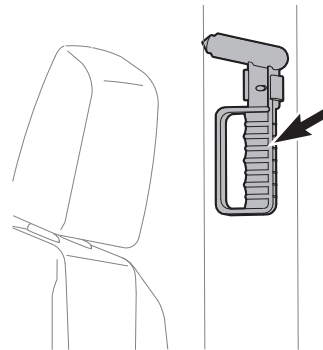


Figure 181

DS191103

Miscellaneous Convenience Devices

Ceiling Cover

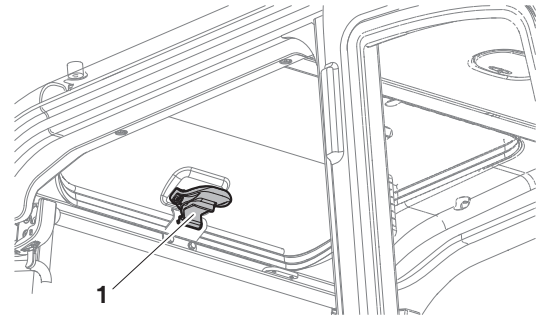
NOTE: *If machine is equipped with an optional transparent ceiling cover, never use any chemical cleaners on its surface. Only use warm water to wash dust and dirt from its surfaces and dry it with a soft fabric towel.*

Opening Ceiling Cover

1. Lower bucket or work tool to ground.
2. Move safety lever to "LOCK" position.
3. Pull lock (1, Figure 182) in front center of ceiling cover and push it up with handle.

Closing Ceiling Cover

1. Lower bucket or work tool to ground.
2. Move safety lever to "LOCK" position.
3. Pull down cover with handle (Figure 182) so lock (1, Figure 182) can be locked into bracket in ceiling frame.



DS1901104

Figure 182

Front Windows



WARNING

AVOID DEATH OR SERIOUS INJURY

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

Front Upper Window

The front upper window can be housed in cabin's ceiling.



WARNING

AVOID DEATH OR SERIOUS INJURY

When storing front window in cabin roof, make sure both lock levers (2, Figure 183) are securely latched.

1. Lower bucket or work tool to ground.
2. Move safety lever to "LOCK" position.
3. Set engine speed control dial to "LOW IDLE". Allow engine to idle for three - five minutes.
4. Stop engine by turning key to "O" (OFF) position.
5. Hold window handles (1, Figure 183), then pull lock levers (2, Figure 183) to release lock. The top of front window will come out.
6. Pull window up, and push it against lock pin at the rear of cabin. Make sure that it is securely latched.
7. Check that lock levers are securely latched in locked position.

NOTE: When front upper window is open, never extend your head or body through window frame.

NOTE: If window happens to fall against machine, while some part of your body is extended outside cabin, it can result in serious personal injury.

NOTE: The front window is spring loaded to aid in opening it. To fasten rear lock pin, hold handle and fasten rear lock pin.

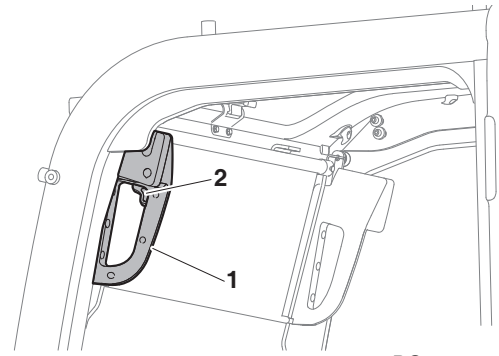


Figure 183

DS1901105

Closing Window



WARNING

AVOID DEATH OR SERIOUS INJURY

Keep hands away from window frame when opening or closing window.

1. Lower bucket or work tool to ground.
2. Move safety lever to "LOCK" position, and stop engine.
3. Holding upper handles (1, Figure 184) of front window with left and right-hand, pull lock levers (2, Figure 184) to release lock.
4. Push window forward, and lower it slowly.
5. When bottom of window, reaches top of the front bottom window, push front window to engage lock (2, Figure 184).
6. Check that lock levers are securely latched in lock position.

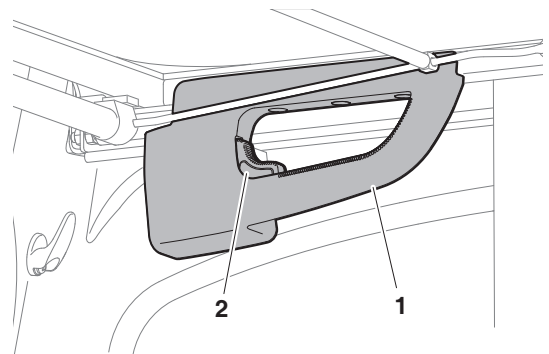


Figure 184

DS1901106

Front Bottom Window

Opening Window

The front bottom window can be removed and stored in rear of cabin.

1. Open front top window and secure it to ceiling. Press button to open levers on both sides (left and right), and lift bottom window (1, Figure 185) in direction of arrow.
2. Set bottom window in rubber holders (2, Figure 186) behind operator's seat. Push the window and secure it to the hook (1, Figure 186).



NOTICE

Keep hands dry when handling a window. Never drop window or let it come into contact with other parts of machine.

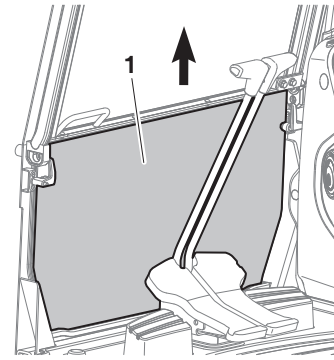


Figure 185

DS1901199

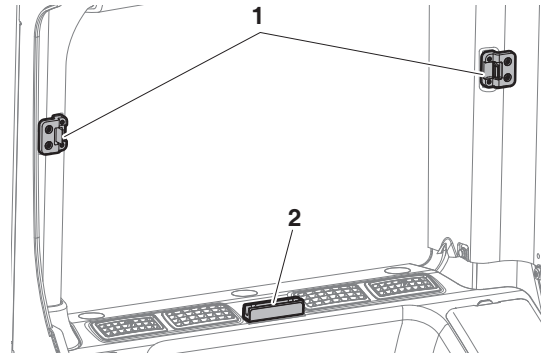


Figure 186

DS1901200

Closing Window

Reverse the removal procedure.



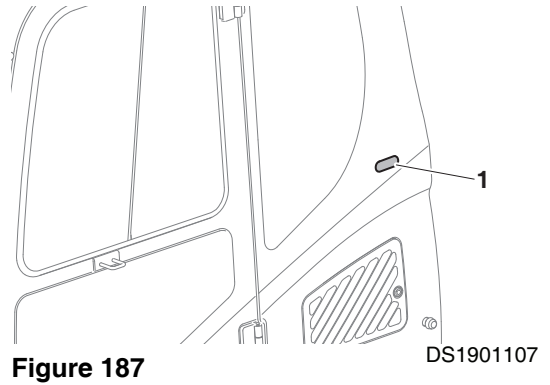
NOTICE

Make sure that bottom window is properly seated in bottom of the front cabin window opening. Closing upper window with bottom window unattached can damage bottom window.

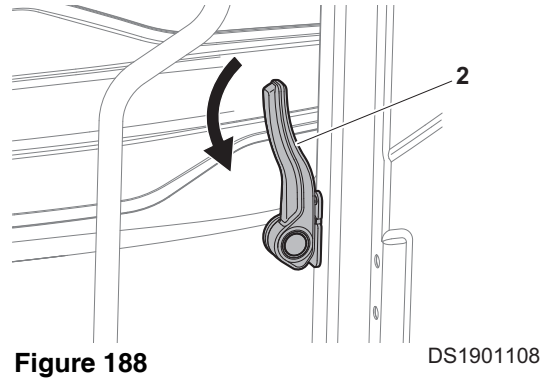
Door Side Latch

1. The door side latch (1, Figure 187) is used to secure door to side of cabin when it is opened.

NOTE: *Keep door closed and locked when machine is not in use.*



2. To release door from side of cabin, push latch lever (2, Figure 188) down. The latch lever is to the left of operator's seat.

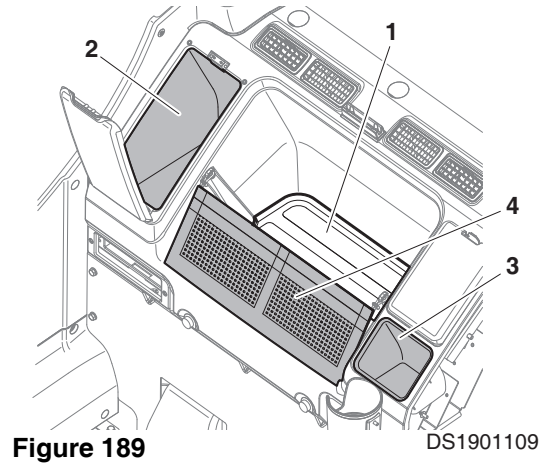


Cabin Storage Compartments

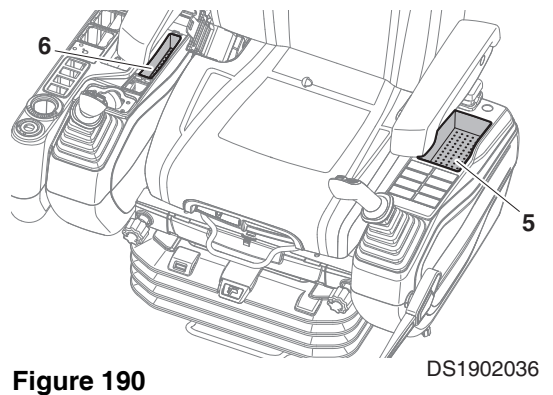
There are three storage compartments behind the operator's seat.

The large compartment (1, Figure 189) is for storing nonperishable items.

The covered other one (2, Figure 189) is interconnected with the air conditioner. It can be supplied with either warm or cool air when air conditioner is turned "ON". The small compartment (3, Figure 189) is for storing small items. A net storage bag (4, Figure 189) is added.



There is a separate small tray on left side (5, Figure 190) and right side (6, Figure 190) of operator's seat.



Sun Visor

This machine has three sun visors.



NOTICE

Be sure to maintain a certain distance between the folding area of the sun visors and your head.

Front Window Sun Visor

In order to reduce the amount of sunlight passing through the front glass, pull the bar downwards (1, Figure 191). In order to protect the sun visor from sunlight, hold onto the bar with your left hand and push the release button with your right hand (2, Figure 191). Doing so folds the sun visor.

NOTE: *Do not fold the sun visor without holding onto the bar. Otherwise, the sun visor may be damaged or may not fold.*

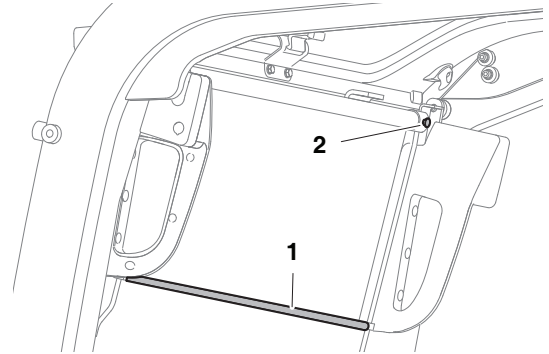


Figure 191

DS1901114

Ceiling Door Sun Visor (If Equipped)

In order to use the sun visor, pull the handle on the bar (1, Figure 192) towards the center of the holder (2, Figure 192) or the end of the holder (3, Figure 192). Connect the bar to the holder to fix the sun visor in place.

In order to fold the sun visor, pull lightly on the sun visor. Then, the sun visor returns to its original position.

NOTE: *Be careful not to allow the sun visor to roll back without holding onto the sun visor. Otherwise, the sun visor may be damaged or may not fold.*

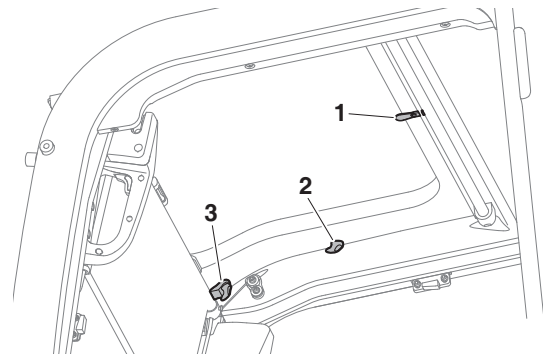


Figure 192

DS1901115

Rear Window Sun Visor (If Equipped)

In order to reduce the amount of sunlight passing through the rear glass, pull the bar downwards (1, Figure 193). In order to protect yourself from sunlight, hold onto the bar with your left hand and push the release button with your right hand (2, Figure 193). Doing so folds the sun visor.

NOTE: *Do not fold the sun visor without holding onto the bar. Otherwise, the sun visor may be damaged or may not fold.*

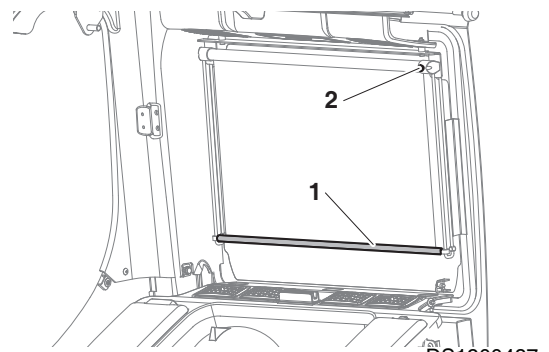


Figure 193

DS1900487

Sunglasses Case

The sunglasses storage case (1, Figure 194) is on the center top of the rear wall of the operator cabin.

Keep this case lid closed before and after use.

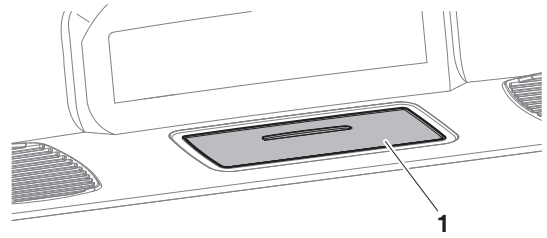


Figure 194

DS1901116

Cup Holder

There are two cup holders inside operator's cabin. Use it to keep your cup firmly in place.



NOTICE

When using cup holder, keep the cap closed to prevent spilling.

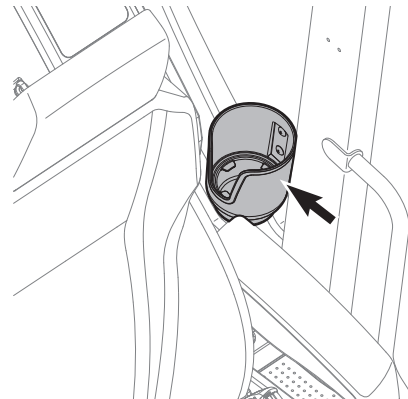


Figure 195

DS1901117

Storage Box

This storage box can store cell phones or smart keys.

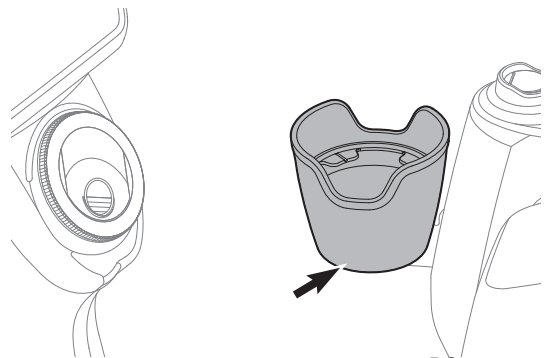


Figure 196

DS1901274

Miscellaneous Access Covers and Doors

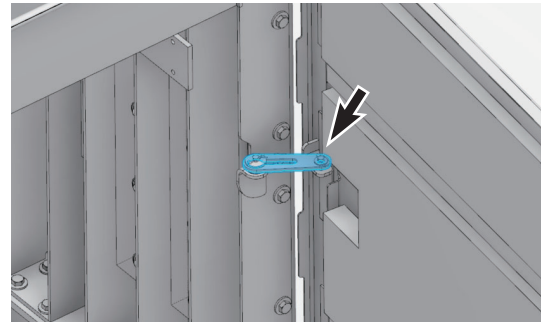
Side Door

Opening

Open door until locking device latches.

Closing

While holding door, lift it up device to release and close door.



DS2003621

Figure 197

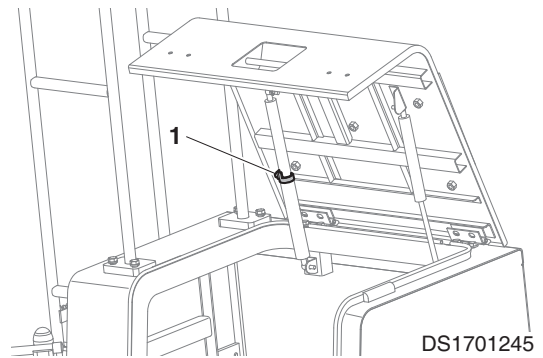
Storage Box Door

Opening

Open door until locking device (1, Figure 198) latches.

Closing

While holding door, press locking device to release lock and close door.



DS1701245

Figure 198

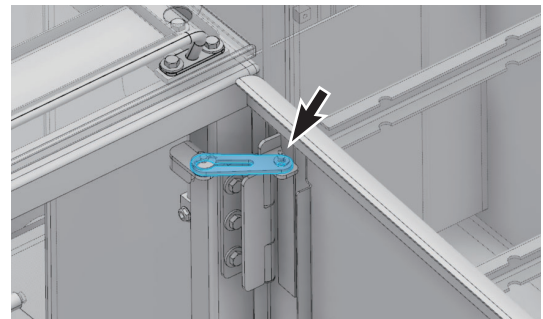
Battery Room Door

Opening

Open door until locking device latches.

Closing

While holding door, lift it up device to release and close door.



DS2003622

Figure 199

Engine Cover

Open the cover and slide prop rod (1, Figure 200) in the slot (2) until it locks in notch (3) at the end of slot to support the cover.

To close cover, move end of prop rod out of notch so it can slide in slot.

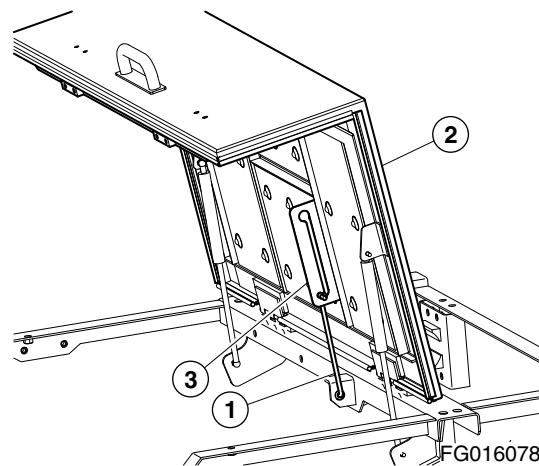
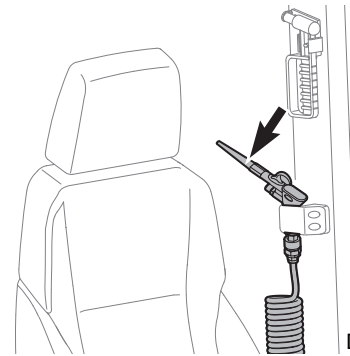


Figure 200

Air Gun and Compressor (If Equipped)

Air Gun

An air gun can be installed for cleaning the operator cabin and other components.



DS1901345

Figure 201

How to Use Air Compressor

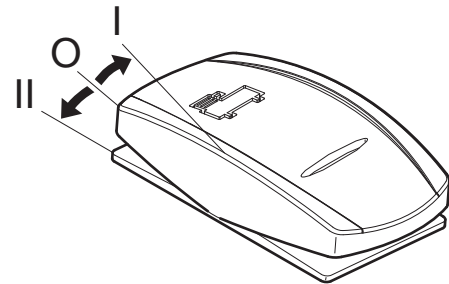
1. Start the engine, and set the air compressor operating switch to "II" position.
2. Point the air gun towards the object to be cleaned.
3. Pull the air gun handle to eject compressed air.



WARNING

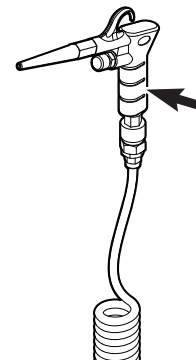
AVOID DEATH OR SERIOUS INJURY

Do not point air gun at other persons or at yourself.



FG018273

Figure 202



DS1802812

Figure 203



NOTICE

Do not run the air compressor for longer than 30 minutes; otherwise, the compressor may be damaged. Cool down the compressor after 30 minutes' continuous operation.

Do not start the air compressor while the engine is not running; otherwise, the battery may be fully discharged. Always start up the air compressor while the engine is running.

Do not run the air compressor in highly humid places or on a rainy day. Drain the water in the air tank periodically, using the drain valve (Figure 204).

Check that compressed air is free from moisture before using the air for cleaning.

Keep the area surrounding the air compressor clean. Periodically clean the air suction filter (Figure 205).

When cleaning the equipment, do not spray water directly onto the air compressor.

While the air compressor is running, check that needle point of the pressure gauge (Figure 205) reads below the maximum pressure 7.8 bar (8 kg/cm², 114 psi).

When the air compressor is not to be used over a long time, release the air pressure in the air tank.

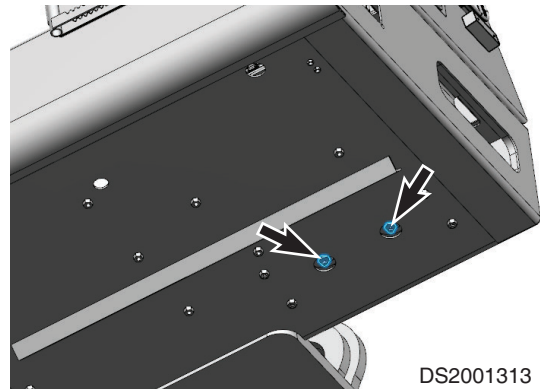


Figure 204

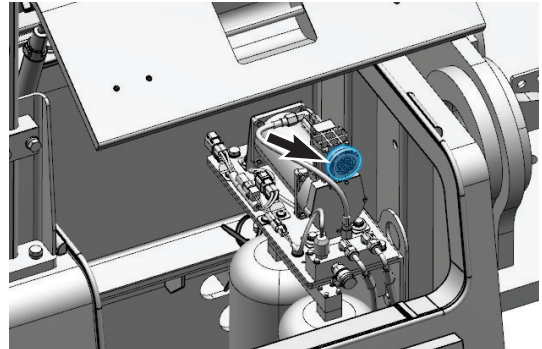


Figure 205



WARNING

AVOID DEATH OR SERIOUS INJURY

Do not allow people or animals inhale compressed air.

Keep away and do not touch the air compressor while the air compressor operating switch is at "II" position (operating). Motor or fan could start suddenly and result in death or serious injury.

How to Connect Air Gun

There are two ways to connect the air gun depending on how it is to be used.

- Connecting the air gun inside the cabin (for cleaning the cabin)
- Connecting the air gun directly to the air compressor motor in the battery box (for cleaning the filter and other purposes)

Connecting the Air Gun in the Cabin

The air gun hose can be connected to the quick coupler located at the bottom of the stand on the left-hand side of the cabin.

To connect the air gun: Push the bottom tip of the air gun hose (2, Figure 206) in the direction of the quick coupler (1, Figure 206) until a click is heard.

To disconnect the air gun: Push the handle on the quick coupler (1, Figure 206) downwards and pull the air gun hose (2, Figure 206) upwards.

NOTE: The air gun is connected inside the cabin by default.

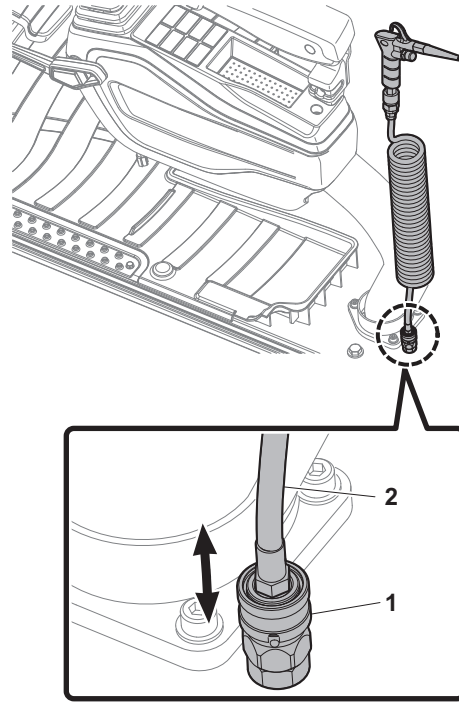


Figure 206

DS1900490

Connecting the Air Gun Directly to the Air Compressor Motor in the Battery Box

The air gun hose can be connected to the quick coupler located on the motor in the battery box.

To connect the air gun: Push the bottom tip of the air gun hose in the direction of the quick coupler (3, Figure 207) until a click is heard.

To disconnect the air gun: Push the handle on the quick coupler (3, Figure 207) backwards and pull the air gun hose in the opposite direction.

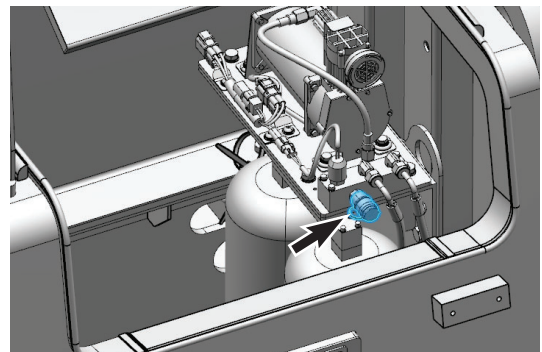


Figure 207

DS2001315



NOTICE

Take care not to squeeze your fingers in the coupler gap.

Operation

To Operate a New Excavator

All HD HYUNDAI CONSTRUCTION EQUIPMENT excavators are inspected before leaving the factory. However, it is required that operator follow these steps during the initial break-in period. Failure to follow these steps can result in damage to the equipment or reduced performance.

Hour	Load
For first 50 hours of operation	Maintain about 80% load of full capacity (Engine rpm: 80% of rated rpm)
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.

- NOTE:**
1. *Check daily for leakage of coolant, fuel, engine oil and hydraulic oil.*
 2. *Inspect all lubricants daily and add appropriate lubricants as required.*
 3. *During operation, monitor all instruments and gauges from time to time.*
 4. *Avoid an extreme engine load.*
 5. *Operate unit at 80% load until engine and all other components are at operating temperatures.*
 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.*
 9. *After the machine is newly installed or replaced, some of its components are to be initially and only once lubricated/greased or replaced. For details, refer to "Inspection, Maintenance and Adjustment" on page 4-1 of this manual.*

Starting and Stopping Engine

Inspection Before Starting Engine

Walk Around Checks



WARNING

AVOID DEATH OR SERIOUS INJURY

If flammable materials such as leaves, paper, etc. are allowed to accumulate on high temperature components, such as the engine muffler and turbo, a fire can occur. Fuel, lubricant, and hydraulic oil leaks can cause a fire. 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, play in work equipment, cylinders, linkages and hoses.
 - Check the undercarriage for damage, wear, crack, oil leakage and loose bolts.
 - Check for problems in doors, handrails, guardrails, steps and loose bolts.
 - Clean and check cabin glass, rearview mirrors, cameras and lights.
 - Clean and check monitor, switches and gauges in the cabin.
2. Cleaning
 - Remove dirt and debris from around engine, radiator, oil cooler and battery.
 - Check and remove flammable material around muffler, turbocharger, battery or other high temperature components.
 - Clean and inspect fins of radiator, oil cooler, CAC (Charged Air Cooler), fuel cooler and condenser.
3. Engine system
 - Check for coolant and oil leakage around the engine and cooling system.
 - Check engine emission control system.

4. Fuel system
 - Drain water and sediment from fuel tank and water separator.
 - Check for fuel leakage in fuel system.
5. Hydraulic system
 - Check for hydraulic oil leaks, damaged tubing and hoses and interference points of components.
6. Electric system
 - Check for damaged electrical cables and loose or missing connectors.
7. Lubrication
 - Perform all daily and periodic maintenance services. Perform services according to reading shown on hour meter.
8. Safety
 - Perform a machine walk-around. Make sure that no one is under the machine or performing any maintenance on it before starting engine.
9. 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. If the oil, fuel or coolant level are below the "LOW" mark, add it. For detail method, see "10 Hour / Daily Service" on page 4-24.

1. Grease boom, arm and front attachment pins.
2. Check engine oil level.
3. Check level of hydraulic oil tank.
4. Check fuel level.
5. Check oil level of swing reduction gear.
6. Clean dust net in front of oil cooler and intercooler.
7. Check cooling system and refill as required.
8. Check level of window washer liquid.
9. Inspect the bucket teeth and side cutters for signs of wear.
10. Inspect engine fan blade.
11. Check air intake system.
12. Inspect seat belt for any damage and proper operation.
13. Inspect the structure for cracks and faulty welds.
14. Check the operation of all switches.
15. 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

1. Turn battery disconnect switch to "ON" position.



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 the work levers and controls.

2. Move safety lever to "LOCK" position.
3. Fasten seat belt. Check for proper operation and condition.
4. Set all operation levers in "NEUTRAL".

NOTE: *Be careful not to move any switches when starting engine.*

5. Rotate the starter switch to "I" (ON) position. Check all indicator lights. Warning buzzers will sound for about two seconds. After two seconds, all lights except the following will turn "OFF".

NOTE: *Quick coupler release system has a different buzzer sound.*

- Charging warning light
- Engine oil pressure warning light
- Engine coolant temperature gauge
- Fuel gauge
- Hydraulic oil temperature gauge
- Engine rpm (0 rpm) digital readout

NOTE: *If all the indicator lights do not come "ON" when the key is first turned, there is a problem.*

Engine Start



WARNING

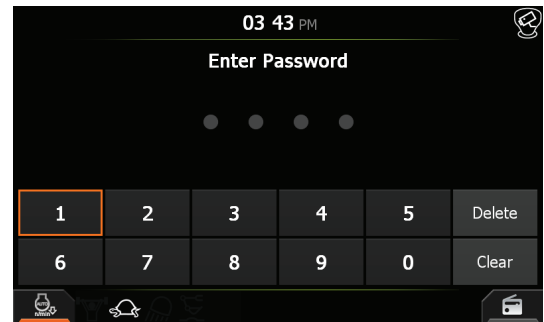
AVOID DEATH OR SERIOUS INJURY

Sound the horn before to starting the engine and make sure there are no people or obstacles in the operating area.

1. Perform all steps in "Operational Checks Before Starting Engine" on page 3-5.
2. Set engine speed control dial to "LOW IDLE". If control dial is at "HIGH IDLE", the engine will accelerate suddenly and cause damage to the engine.
3. Sound horn.
4. Turn starter switch to "I" (ON) position.
5. Enter password.

NOTE: *If the security system is "LOCKED", a four-digit password will be required to start the engine. If the system is "UNLOCKED", no password will be required and this display screen will not appear.*

6. Turn starter switch to  (START) position. Engine should start in approximately five (5) seconds.



DS1900406

Figure 1



NOTICE

If the engine does not start after approximately fifteen seconds of cranking, release the starter switch. Wait about five minutes and repeat above steps.

7. After engine has started, release key. Key will return to "I" (ON) position.
8. Follow procedures in "Hydraulic System Warm-up" on page 3-18.

9. After warming unit, check all operating indicators to make sure that all engine systems (oil pressure, coolant, etc.) are in the normal operating range. If any problems are noticed, stop engine and correct the problem.

Normal indicators are:

No.	Instrument Panel Light or Gauge	Indicator Reading
1	Engine Coolant Temperature Gauge	White Range
2	Fuel Gauge	
3	Hydraulic Oil Temperature Gauge	
4	Charging Warning	OFF
	Engine Oil Pressure Warning	
	Engine Coolant Temperature Warning	
	Engine Check Warning	

10. Check color of exhaust smoke.
 - No color or light blue - Engine is running in good condition.
 - Black - Incomplete combustion. Check cause.
 - White or dark blue - Engine is burning engine oil. Check cause.
11. Check for usual engine vibration and noises. If any are heard or felt, investigate cause.

NOTE: If engine coolant temperature gauge pointer moves into the red zone, the engine coolant temperature warning light will turn "ON", a warning buzzer will sound, and the engine speed will be automatically reduced. Allow the engine to run at low idle speed until temperature gauge registers in the white zone again. When the white zone is reached, allow the engine to idle for an additional three - five (3 - 5) minutes before stopping the engine. If not allowed to idle, heat surge may develop which will damage the engine. Allowing the engine to idle will dissipate heat. Check the coolant level, look for a loose fan belt, inspect for debris around radiator, etc.

12. Even if the engine starts, wait for the engine oil pressure monitor light to turn "OFF". Do not touch the control levers or control pedal while the engine oil pressure monitor light is "ON".



NOTICE

If the engine oil pressure monitor light does not turn "OFF", after 4 to 5 seconds have passed, stop engine immediately. Check the oil level, check for leakage of oil, and take necessary corrective action.



Figure 2

DS2004402

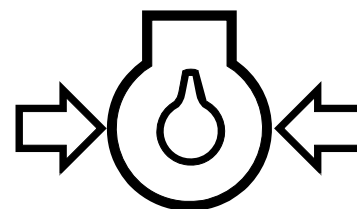


Figure 3

HAOA620L

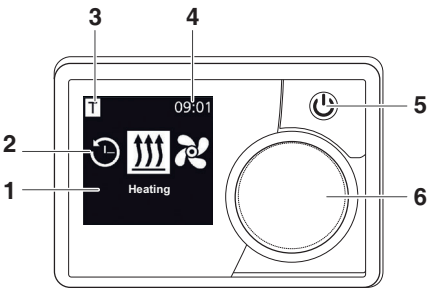
Diesel Heater (If Equipped)

The diesel heater helps start-up and operation of the engine and equipment at temperatures below -20°C (-4°F).

Overview

Control Element and Menu Structure

Reference Number	Description
1	Menu Name
2	Menu Symbol
3	Activated Time Settings
4	Hour
5	Quick Start Button with Status Display
6	Control Knob

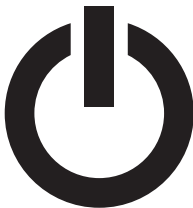


DS1601397

Figure 4

Buttons and Control

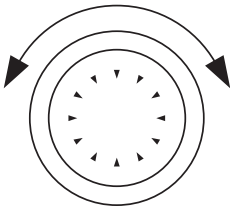
Quick start button with status display. (backlight)



DS1601398

Figure 5

Control knob (turn/push button) for selection and confirmation of the selected functions.



DS1601399

Figure 6

Status Display

Status of the heater is indicated using the color backlight of the quick start button.

Status	LED Backlight	
Heating mode	Green	Permanent
Ventilation mode	Blue	Permanent
Switched off heater-control element is activated	White	Permanent
Error-no heating mode	Red	Flashing
Preprogrammed heating mode- control element in stand-by mode*	Green	Flashing
Preprogrammed ventilation mode- control element in stand-by mode*	White	Flashing

* If a user does not make any entry using the control element for 60 seconds and the heater is switched off then the control element will go into the stand-by mode (display and LED are switched off).

Operating and Setting



WARNING

AVOID DEATH OR SERIOUS INJURY

Danger of explosion caused by the fumes and dust and hazardous substances.



WARNING

AVOID DEATH OR SERIOUS INJURY

Inhaling poisonous gases in the enclosed rooms.

Start Display after Switching On

The following information about the connected heater and control element is shown in the start display:

- Name of the connected control element
- Name of the connected heater
- Software version of the connected control element
- Hardware version of the connected control element

The view returns to the main menu after 1.5 seconds.



DS1601400

Figure 7

Heating Set-up

1. Switching on the heater using quick start button

"Quick start" function enables heating by simply pressing the button.

Operation time can be initially set. Instruction manual and description of the settings can be found in the chapter "Setting the quick start".

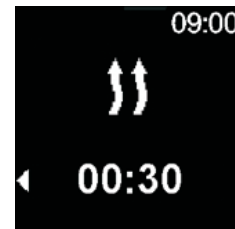
- Quick start button is programmed for heating.

A. Press quick start button.

Heating starts functioning.

Heating symbol and preset remaining operation time appear in the display.

Quick start button shows green light.



DS1601401

Figure 8

2. Switching on the heater through heating menu

- Heating symbol has been selected in the main menu.



DS1601402

Figure 9

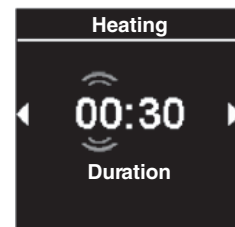
A. Press the control knob.

Operation time flickers in the display.

B. Turn the control knob to choose the duration of "an hour".

By means of turning the control knob in a clockwise direction one can select and activate maximum duration.

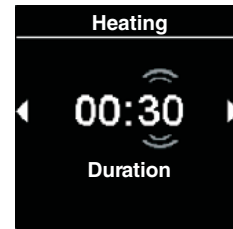
C. Press the control knob to confirm selection.



DS1601403

Figure 10

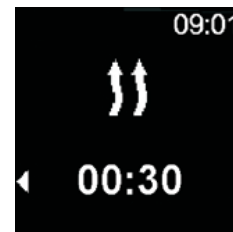
- D. Turn the control knob to choose duration of "a minute".



DS1601404

Figure 11

- E. Press the control knob to confirm selection.
Heating starts functioning.
Heating symbol and preset remaining operation time appear in the display.
Quick start button shows green light.

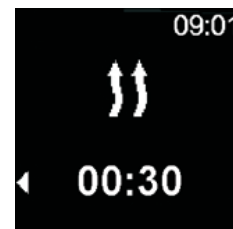


DS1601405

Figure 12

3. Adjusting the remaining operation time during functioning

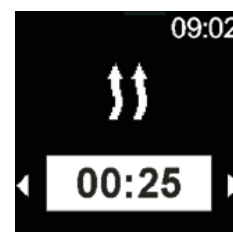
- The heater is in the heating mode.
During use the remaining operation time can be only reduced. One cannot make any changes from the minimum duration which amounts to 10 minutes. Increasing the operation time is possible only after performing switching off and restarting the device earlier.
- A. Turn the control knob to adjust the desired remaining operation time.
By means of turning the control knob in counterclockwise direction one can shorten remaining operation time.



DS1601405

Figure 13

- B. Press the control knob within 5 seconds to confirm selection.



DS1601406

Figure 14

4. Switching off heating

- The heater is in the heating mode.

A. Press quick start button.

The main menu appears in the display.

Backlight of quick start button changes its color from green into white color.

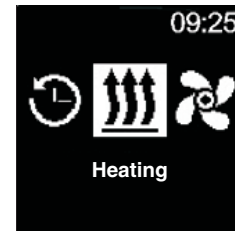


Figure 15

DS1601407

Timer Programming

There is a possibility of programming the time settings 7 days in advance. The heater switches on automatically at the programmed time. There is a possibility of saving up to 3 time settings per day and altogether up to 21 time settings.

Depending on the used variant of MultiControl device and application case (e.g. in a car, in a truck, on the boat, etc.), the number of actively available timers can fluctuate. There are maximum 21 active timers available.

1. Creating and enabling timers

- Time and current day of week are set.
- The heater is switched off.
- "Timer" symbol has been selected in the main menu.

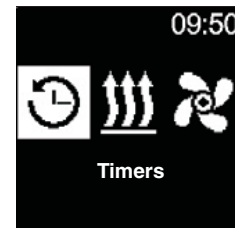


Figure 16

DS1601408

A. Press the control knob.

"Add timer" message (if no timer has been saved yet) appears in the display.

B. Press the control knob to add new timer.

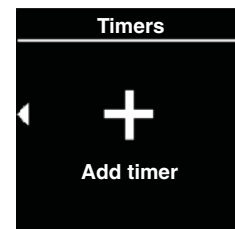


Figure 17

DS1601409

- C. Turn the control knob to choose "Day".
- D. Press the control knob to confirm selection.

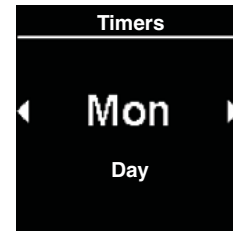


Figure 18

DS1601410

- E. Turn the control knob to choose the start time of "an hour".
- F. Press the control knob to confirm selection.

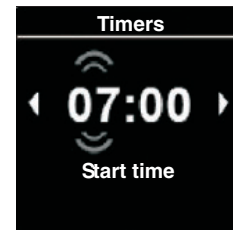


Figure 19

DS1601411

- G. Turn the control knob to choose the start time of "a minute".
- H. Press the control knob to confirm selection.

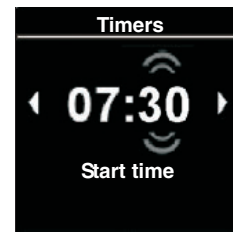


Figure 20

DS1601412

- I. Turn the control knob to choose the stop time of "an hour".
- J. Press the control knob to confirm selection.

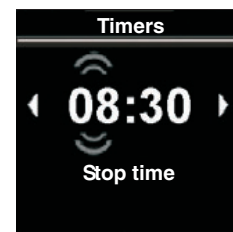


Figure 21

DS1601413

- K. Turn the control knob to choose the stop time of "a minute".
- L. Press the control knob to confirm selection.

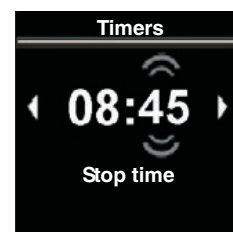


Figure 22

DS1601414

- M. Turn the control knob to choose the desired operation mode ("heating").

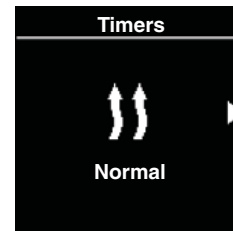


Figure 23

DS1601415

The programmed timer is saved and shown in the display.

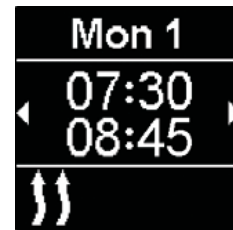


Figure 24

DS1601416

- N. Press the control knob to activate the programmed timer.

"Activate" message appears in the display.

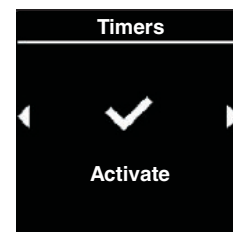


Figure 25

DS1601417

- O. Press the control knob to confirm selection.

Numbering of timers is established according to programming sequence. Activated time setting is marked by white bars. "T" symbol appears in the main menu. Quick start button flashes green when timer with heating is active but the display is off. Quick start button flashes blue when timer with ventilation is active but the display is off.

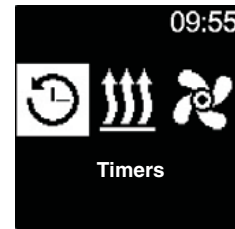


Figure 26

DS1601423

2. Deactivation, editing and removal of the programmed timer

- "Timer" symbol has been selected in the main menu.



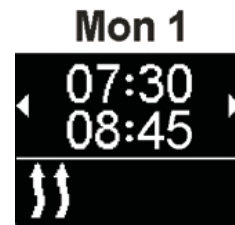
DS1601418

Figure 27

A. Press the control knob.

Stored timers appear in the display. Timers are arranged in chronological order according to days/hours. Next active timer is displayed as the first one.

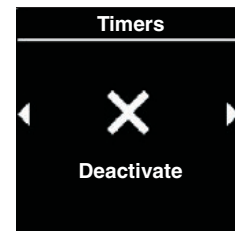
- B. Turn the control knob to choose the desired "Timer".
- C. Press the control knob to confirm selection.



DS1601423

Figure 28

D. Turn the control knob to choose operation (activate/deactivate/edit/delete).

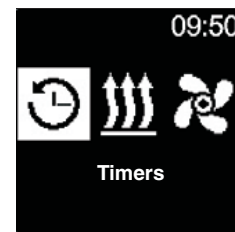


DS1601419

Figure 29

3. Removing all programmed timers

- "Timer" symbol has been selected in the main menu.



DS1601408

Figure 30

A. Press the control knob.

The stored timers appear in the display.



DS1601423

Figure 31

- B. Turn the control knob clockwise until "Delete all" message is shown in the display.

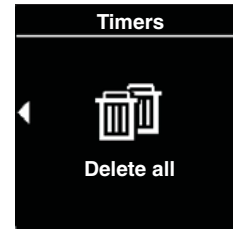


Figure 32

DS1601420

- C. Press the control knob to confirm selection.
"OK" is shown in the display.

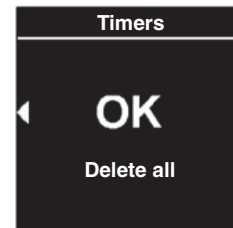


Figure 33

DS1601421

- D. Press the control knob to confirm selection.
All programmed timers have been removed. The main menu is shown in the display.



Figure 34

DS1601422

Quick Start Settings of Water Heaters

1. Setting heating
- "Settings" symbol has been selected in the main menu.

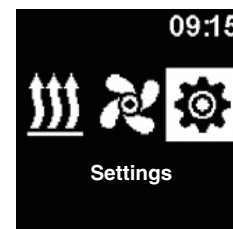


Figure 35

DS1601424

- A. Press the control knob.
- B. Press the control knob to choose "Quick start" submenu.

Heating mode appears in the display.

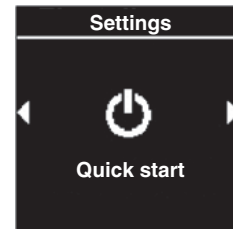


Figure 36

DS1601425

- C. Press the control knob to confirm selection.
- Duration flickers in the display.

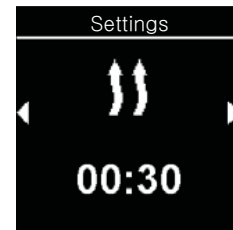


Figure 37

DS1601426

- D. Turn the control knob to choose the duration of "an hour".

By means of turning the control knob in a clockwise direction one can select and activate maximum duration.

- E. Press the control knob to confirm selection.

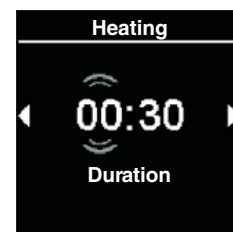


Figure 38

DS1601454

- F. Turn the control knob to choose the duration of "a minute".

- G. Press the control knob to confirm selection.

Quick start button is configured using the appropriate settings.

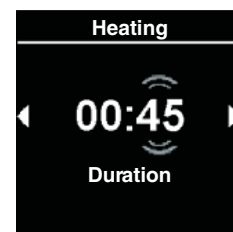


Figure 39

DS1601455

For a detailed explanation, refer to the provided CD.

Hydraulic System Warm-up

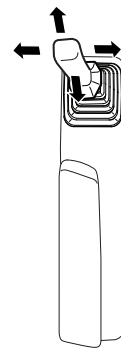
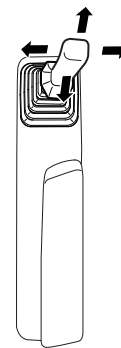


NOTICE

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

The correct operating temperature of the hydraulic oil is 50° - 80°C (120° - 175°F). Make sure to follow the procedures listed here for hydraulic fluid warm-up.

1. Run engine for approximately five (5) minutes set at the middle of the speed range, without a load.
2. Move safety lever to "UNLOCK" position.
3. Slowly cycle boom, arm and bucket cylinders about five times without a load to circulate the oil through the system. Do this for five (5) minutes.
4. Check for clearance and fully raise the front attachment. Swing clockwise three (3) revolutions. Swing counterclockwise three (3) revolutions.
5. Travel forward and reverse at low speed for two (2) revolutions of the drive sprocket.

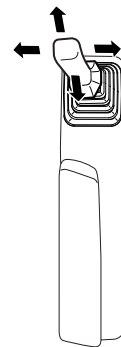
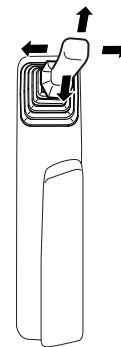


FG018384

Figure 40

Hydraulic System Warm-up – Cold Weather

1. Run engine at "LOW IDLE" (no load) for five (5) minutes.
2. Run engine for approximately five (5) minutes set at the middle of the speed range, without a load.
3. Move safety lever to "UNLOCK" position.
4. Slowly cycle boom, arm and bucket cylinders about five (5) times without a load to circulate the oil through the system. Do this for five (5) minutes.
5. Set engine speed control dial to "HIGH IDLE".
6. Repeat Step 4 for five (5) minutes. If working speeds continue to be slow, continue to operate but use extreme caution because machine function may be erratic.
7. Check for clearance and fully raise the front attachment. Slowly swing clockwise three (3) revolutions. Slowly swing counterclockwise three (3) revolutions.
8. Travel forward and reverse at low speed for two (2) revolutions of the drive sprocket.



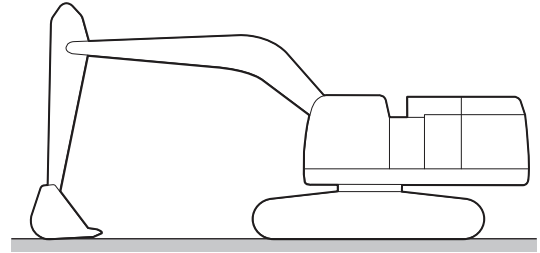
FG018384

Figure 41

Stopping Engine

NOTE: Allow engine to idle for three - five (3 - 5) minutes before stopping the engine. If not allowed to idle, heat surge may develop which will damage the engine. Allowing the engine to idle will allow the engine to cool down.

1. Park machine on firm and level ground.
2. Lower front end attachment to ground and make sure all operating controls are in "NEUTRAL".
3. Move safety lever to "UNLOCK" position.
4. Set engine speed control dial to "LOW IDLE". Allow engine to idle for three - five (3 - 5) minutes.
5. Stop engine by turning key to "O" (OFF) position.
6. Remove key from starter switch.



DS1701100

Figure 42

Checks and Maintenance After Stopping Engine

1. Park the machine on dry and hard ground.
2. Repair excavator if there are any coolant or oil leaks.
3. Inspect front attachment and undercarriage for abnormal appearances. Check that attachment is secure. Correct any problems.
4. Fill fuel tank and drain any water collected in the fuel system to prevent it from freezing.
5. Inspect and remove accumulated flammable materials, such as leaves, paper etc., in engine compartment.
6. Clean all mud, debris, etc. from undercarriage and tracks. Make sure that all steps and handholds are clean, and that operator's cabin is clean.

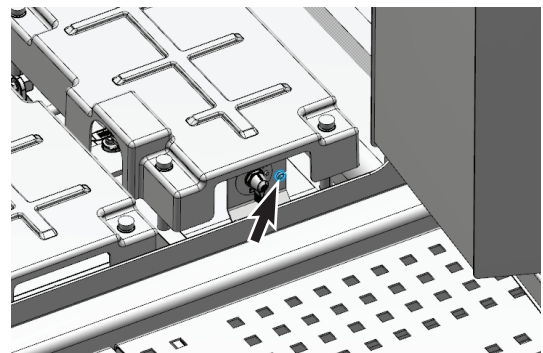
Wait to Disconnect Indicator

After engine is shutdown, the DEF system must perform an automatic fluid purge cycle that requires the use of the DEF pump motor. If battery power is turned "OFF", the purge cycle the fluid left within the pumps and the DEF lines may cause component failures and fault codes. Do not turn master disconnect switch for batteries until disconnect indicator is "OFF".



NOTICE

Do not turn master disconnect switch for batteries to the off position until disconnect indicator is "OFF" or serious damage to the DEF system can occur.



DS2001316

Figure 43

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 the work levers and controls.

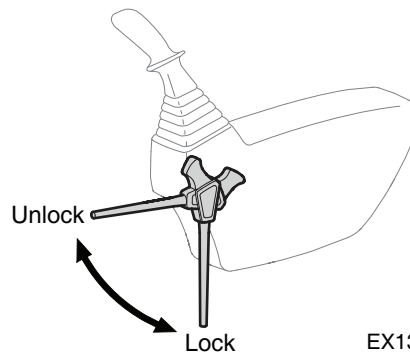
Be careful not to move the work levers (joysticks) when moving safety lever.

1. Move safety lever (Figure 44) down into "LOCK" position. When safety lever is in the "LOCK" position, the front attachment, work controls, swing and travel movement will be disabled.

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

2. Move safety lever (Figure 44) to "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 work levers (joysticks) can result in movement of the work equipment. The charged accumulators in the system will provide pilot pressure for control valve spool movement.



EX1300566

Figure 44

Travel



WARNING

AVOID DEATH OR SERIOUS INJURY

1. When moving travel controls forward, tracked excavator will move in the direction of the idlers. Wheeled excavator will move in the direction of steering axle.
 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. Always be sure the path is clear during travel.
 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 accidental activation of controls.
-

Automatic Travel Speed Control



WARNING

AVOID DEATH OR SERIOUS INJURY

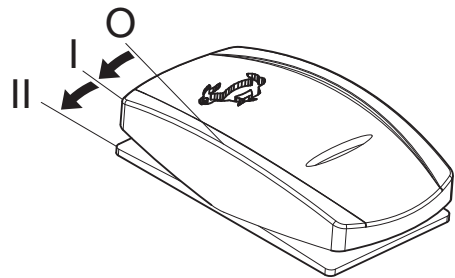
Do not change the travel mode while traveling. Always use speed mode "O" when traveling down a slope. Do not change to speed modes indicated "I" or "II" while going down a slope. Only change travel mode after coming to a complete stop.

Two travel speed ranges can be selected by using the travel speed selector switch on the control panel (Figure 45).

"O" (LOW) - In this position low travel speed and a higher torque are selected.

"I" (HIGH) - In this position high travel speed and a lower torque are selected.

"II" (AUTOMATIC) - Setting the control at the "II" position enables the machine to change to a different speed range automatically. This change happens automatically depending on the hydraulic oil pressure in the travel circuit. When hydraulic oil pressure rises, the travel speed is automatically set to low. An example is if the machine is traveling on a flat, solid surface, the higher speed range would be used. When a slope is encountered, the speed drops and the travel circuit hydraulic pressure rises, causing the control circuit to shift to the higher torque, lower speed range.



FG016016

Figure 45

Travel Control Lever Operation

1. To travel straight (Figure 46), push both travel control levers/pedals fully forward or backwards. The farther the levers/pedals are pressed, the faster the travel speed.

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

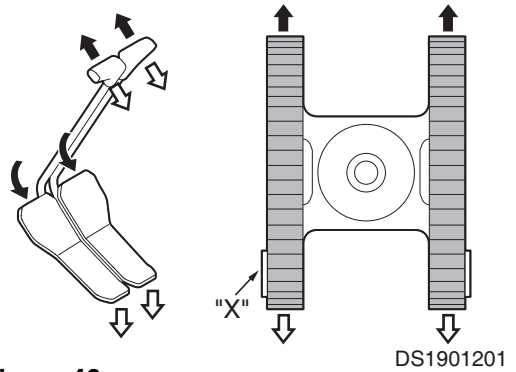


Figure 46

2. Pivot turns (Figure 47) are made by rotating only one track forward or backward. The machine will pivot on the nonmoving track.

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

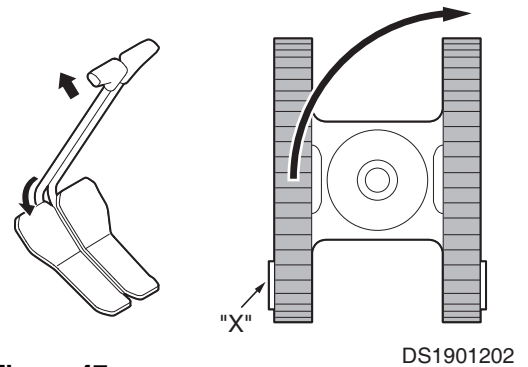


Figure 47

3. Spin turns (counterrotation) (Figure 48) are made by rotating one track forward and one track backward. The machine will spin around its center point.

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

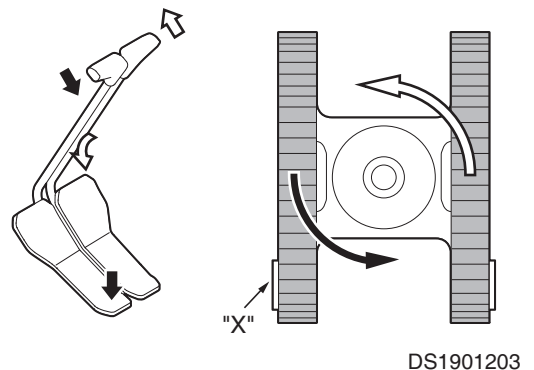


Figure 48

4. Stopping travel (Figure 49) - Returning travel levers to "NEUTRAL" position will automatically apply brakes and stop excavator.

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

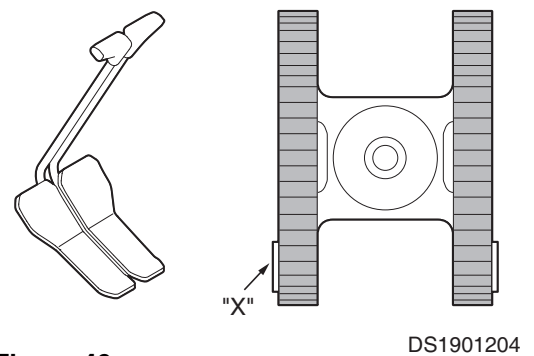
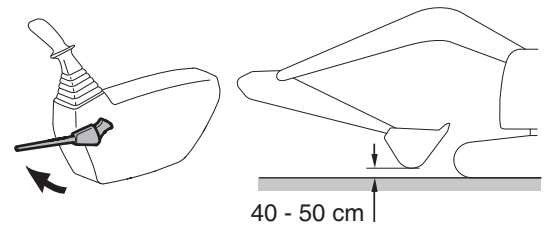


Figure 49

General Travel Instructions

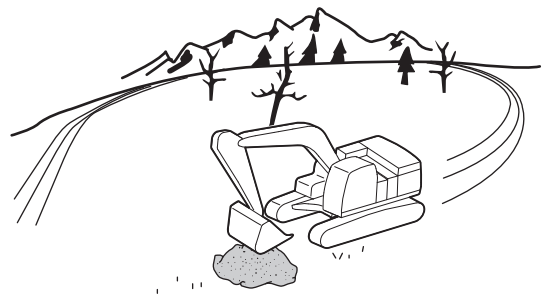
1. Set engine speed control dial on desired speed.
2. Move safety lever to "UNLOCK" position, and folding the front, raise it 40 - 50 cm (16 - 20 in) above ground. See Figure 50.



EX1300696

Figure 50

3. When possible, travel on firm and level ground. Avoid sudden movements and sharp turns.
4. When traveling on rough ground, travel at a slow speed (1.0 - 1.5 km/h (0.62 - 0.93 MPH)). Reduce engine speed, to avoid shock loading the equipment. Be careful that an excessive force is not added to equipment by climbing on rocks.



DS1701169

Figure 51

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



WARNING

AVOID DEATH OR SERIOUS INJURY

When traveling, keep bucket (attachment) raised from 20 - 30 cm (8 - 12 in) above the ground. Fasten your seat belt.

Operator should pay attention when traveling backward on a slope.

Never turn or travel across a slope.

Travel straight up or down the slope.

Choose a safe alternate route before climbing a slope.

If excavator starts to slip or becomes unstable, lower the bucket immediately into the ground, using it as a brake.

Avoid working on slopes, because there is a risk of roll-over while swinging and performing front attachment operations.

Do not swing towards bottom of slope with a loaded bucket.

In unavoidable cases, level the slope with fill soil to make the machine as horizontal as possible.

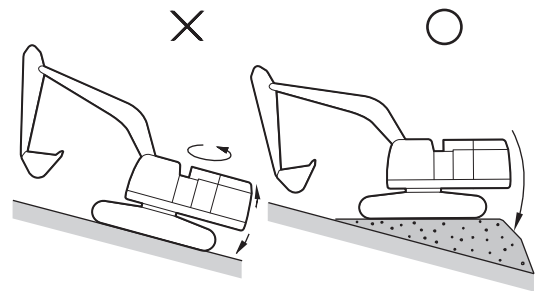
See Figure 52.

Do not travel on slopes more than 30° because of risk of roll-over.

6. Travel straight up or down slopes, never diagonally across the slope. See Figure 53 and Figure 54. Extend the arm and lower the boom to keep the bucket about 20 - 30 cm (8 - 12 in) 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.

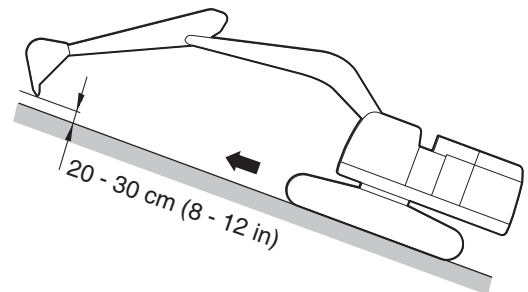
NOTE: Even though engine stops on a slope, do not operate swing control. The hydraulic accumulators can cause the unit to swing.

NOTE: Do not open or close operator's door on a slope. Make sure door is latched.



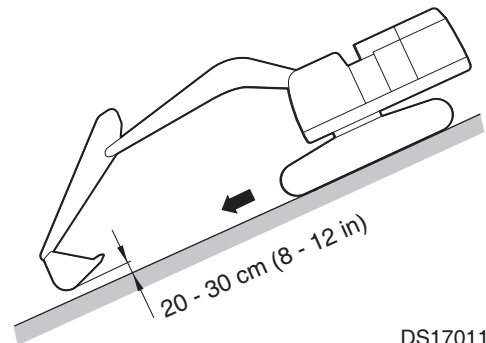
DS1701098

Figure 52



DS1701170

Figure 53



DS1701171

Figure 54

7. 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 any portion of the machine, roll the bucket until round base is against the ground. The angle of the arm to the boom must be at 90°.

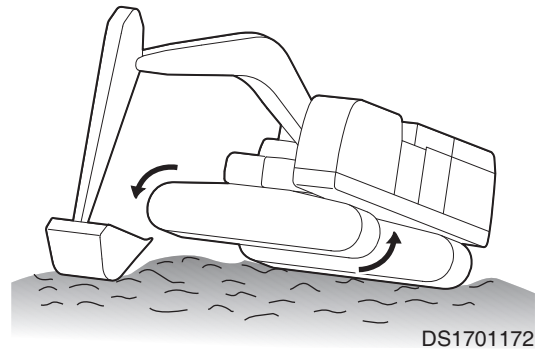


Figure 55

Make sure that material buildup has been cleared. See Figure 55 and Figure 56.

8. The excavator 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 3-42.

NOTE: If the machine is submerged to the point that water or mud gets into the swing bearing or center joint, stop machine operation. Remove machine from the submerged location to firm, dry ground. Do not operate until proper inspection and maintenance have been completed. Refer to the Shop Manual or contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.

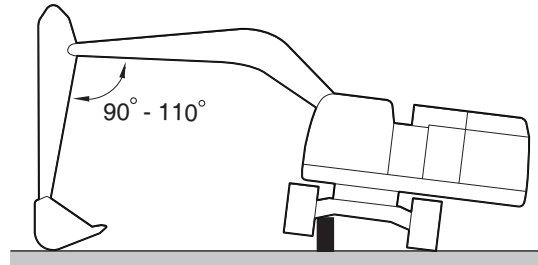


Figure 56

Straight Travel Pedal (If Equipped)



WARNING

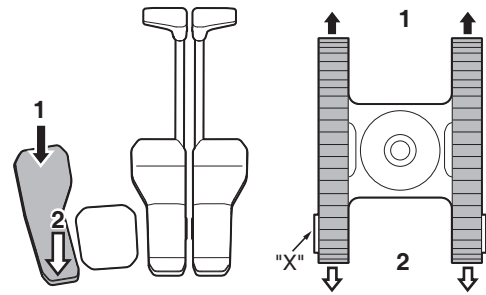
AVOID DEATH OR SERIOUS INJURY

1. When moving the straight travel pedal forward, the excavator will move forward in the direction of the idlers. When the pedal is moved backwards, the excavator will move backward in the direction of the drive sprocket.
 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. Always be sure the path is clear during travel.
 4. Use extreme caution when reversing travel. Be sure there is a clear path behind the machine.
 5. Operate the travel control pedal 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 accidental activation of controls.
-

Operating

1. Forward
2. Reverse

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

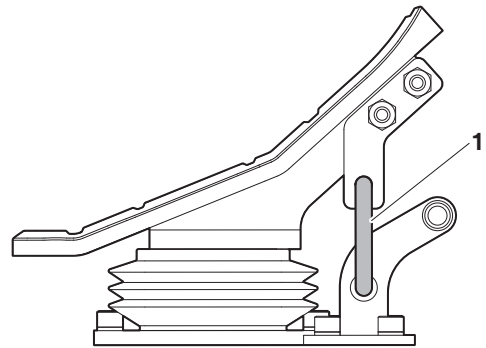


DS1900952

Figure 57

Locking Pedal

When straight travel pedal in not needed, the pedal can be locked by using the prop rod (1, Figure 58) locking device.

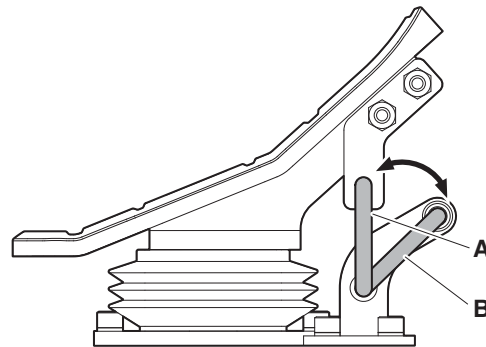


DS1900953

Figure 58

Locking is completed when the top end of the prop (1) is positioned into pedal hole.

- A. Location for "UNLOCKING" (Figure 59).
- B. Location for "LOCKING" (Figure 59).



DS1900953

Figure 59

Operating Instructions

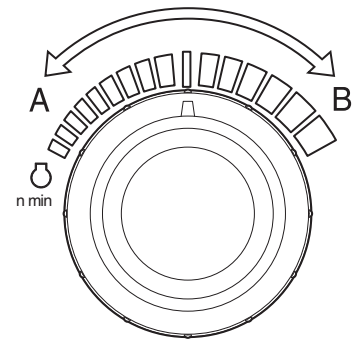
Engine Speed Control

Engine speed can be manually adjusted using the engine speed control dial. Increase engine speed by rotating the control knob clockwise. Decrease engine speed by rotating the control knob counterclockwise.



NOTICE

The engine speed control system has been set at the factory and should not require adjustment as part of routine maintenance.



DS1900273

Figure 60

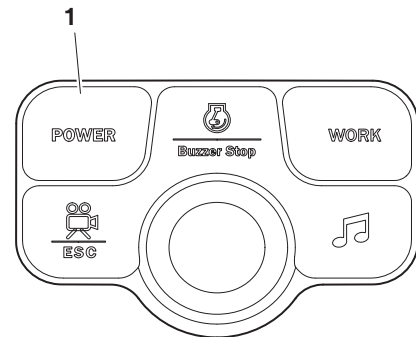
Mode Selection

More efficient work can be done by choosing a proper power and work mode combination, suitable to type of work and conditions. Use the mode selection according to the following guide.

Power Mode

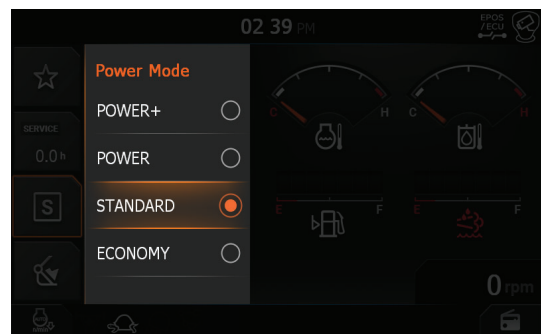
1. When the starter switch is turned "ON" the power mode is automatically defaulted to the standard setting.
2. Select a proper power mode using button (1, Figure 61) before starting work.
3. When the power mode button (1, Figure 61) is pressed, instrument panel displays a power mode selection pop up menu (Figure 62).

When power mode is selected, symbol shows on screen.



DS1900956

Figure 61



DS1901205

Figure 62

Mode	Selection Point
Power Plus Mode	<ul style="list-style-type: none"> Heavy work. Maximize production with full Power.
Power Mode	<ul style="list-style-type: none"> Fast work. Work in a short period of time.
Standard Mode	<ul style="list-style-type: none"> General work. Optimize speed and fuel consumption.
Economy Mode	<ul style="list-style-type: none"> Light work. Minimize fuel consumption. Reduce noise.

Work Mode

1. When the starter switch is turned "ON" the work mode is automatically defaulted to digging mode.
2. Select a proper work mode using button (4, Figure 63) before starting working.
(Digging/Lifting/Breaker/Shear Mode)

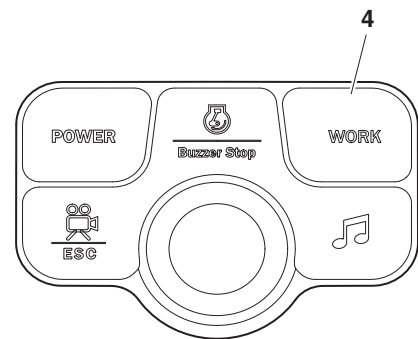


Figure 63

DS1900956

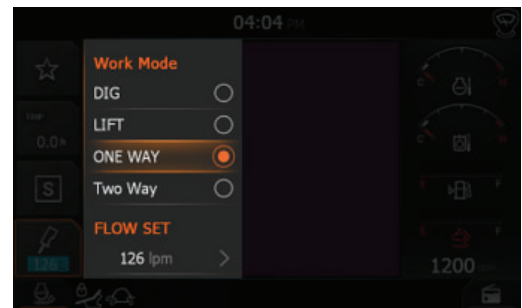


Figure 64

DS1900964

Auto Idle Mode

1. The system will automatically reduce engine speed to idle speed approximately four (4) seconds after all the control levers are in the "NEUTRAL" position. When any lever is operated, engine speed is automatically returned to the preselected range.
2. When the starter switch is turned "ON", the work mode is automatically defaulted to "AUTO IDLE".
3. When the symbol is turned "ON", the auto idle function is activated. Deactivate the auto idle function by again pressing the auto idle selector button (5, Figure 65). Now the symbol will be turned "OFF".

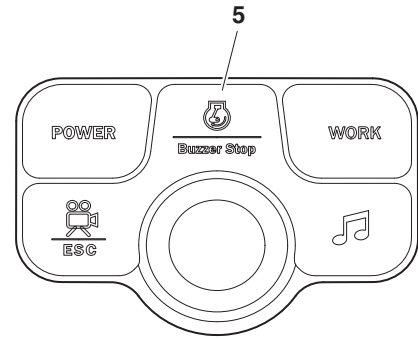


Figure 65

DS1900965



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.

Boost Mode

1. Power boost switch is used to achieve maximum digging force.
2. The power boost is activated when the left button is pressed on the top of right-hand work lever (joystick).

NOTE: Power boost mode does not affect forward and reverse travel.

NOTE: Do not use this switch for more than seven (7) seconds.

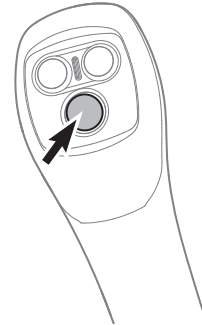


Figure 66

DS1701110

Change Machine Control Pattern By Selector Valve (If Equipped)



WARNING

AVOID DEATH OR SERIOUS INJURY

Check surrounding area before swinging. When operating a lever while in auto idle, proceed with caution because the engine speed will increase rapidly. Keep bystanders away.

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

The control pattern change valve is inside the left front side access door.

The machine control pattern can easily be changed to the ISO pattern or to the BHL pattern by changing the position of the selector valve (if equipped). Use the following procedure to change the position of the select valve.

The selector valve is located in the rear of the cabin.

1. Rotate spool to the ISO position or to BHL position.
2. A control pattern symbol shows on the display screen.

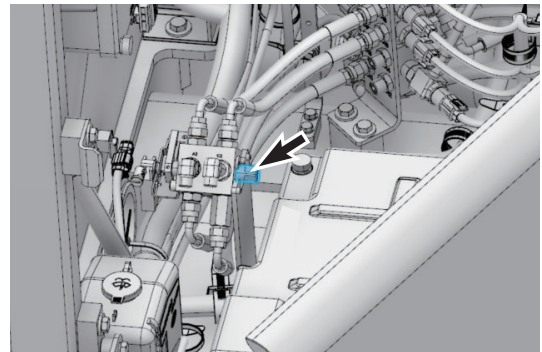
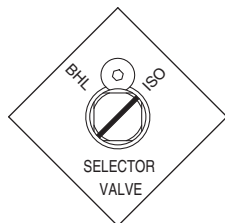


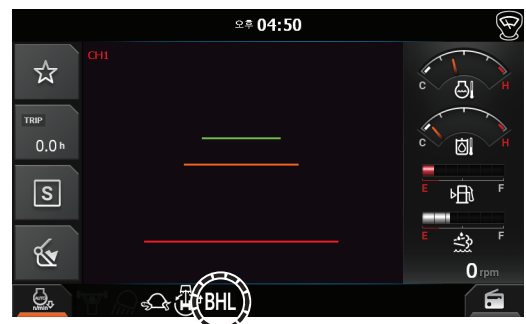
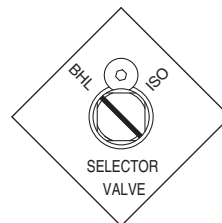
Figure 67

DS2004480

<ISO Pattern>



<BHL Pattern>



DS1903243

Figure 68

Work Levers (Joysticks) (ISO Pattern)



WARNING

AVOID DEATH OR SERIOUS INJURY

Check surrounding area before swinging. When operating a lever while in auto idle, proceed with caution because the engine speed will increase rapidly. Keep bystanders away.

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

This equipment is manufactured using the lever control pattern described in ISO standards. Do not change valving, hoses, etc., that would change this control pattern. The boom, arm and bucket movements and swing direction of work levers (joysticks) are as follows:

Left-hand Work Lever (Joystick) (Figure 69 and Figure 70)

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

NOTE: The swing brake is spring applied and hydraulically released. It is always engaged when the work lever (joystick) is in "NEUTRAL" or the engine is stopped.

NOTE: When operating the arm, it may stop momentarily. When the arm is operated, the weight of the arm can cause it to move faster than the amount of oil being supplied.

Right-hand Work Lever (Joystick) (Figure 69 and Figure 72)

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 safety lever to "UNLOCK" position and turning starter switch "ON".

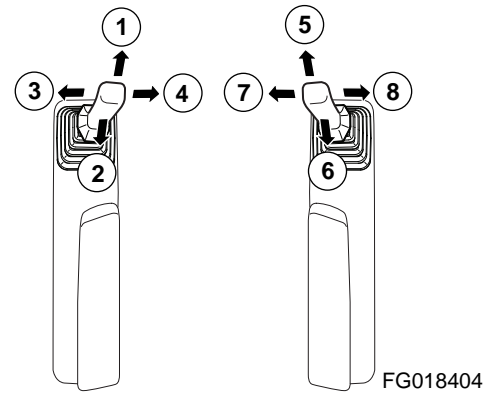


Figure 69

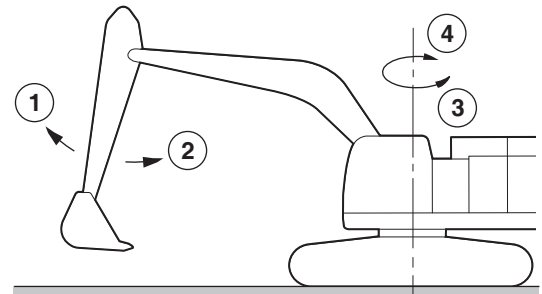


Figure 70

DS1701176

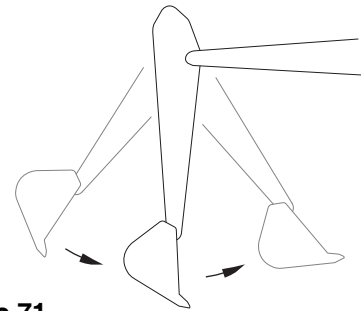


Figure 71

EX1300702

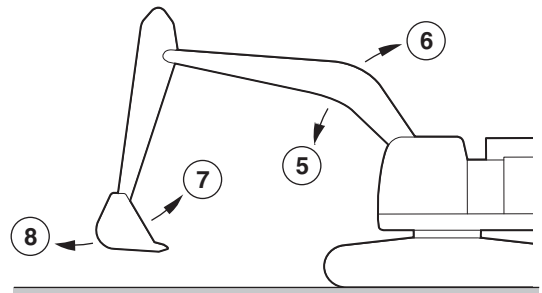


Figure 72

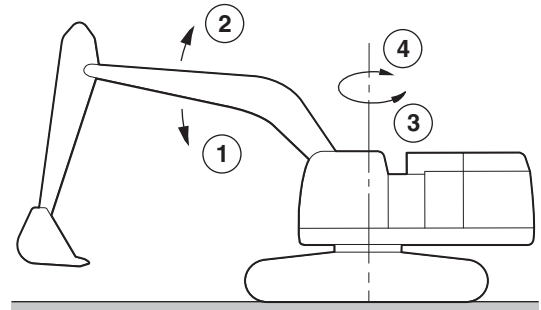
DS1701177

Work Levers (Joysticks) (BHL Pattern)

Left-hand Work Lever (Joystick) (Figure 69 and Figure 73)

1. Boom down
2. Boom up
3. Left swing
4. Right swing

NOTE: The swing brake is spring applied and hydraulically released. It is always engaged when the work lever (joystick) is in "NEUTRAL" or the engine is stopped.



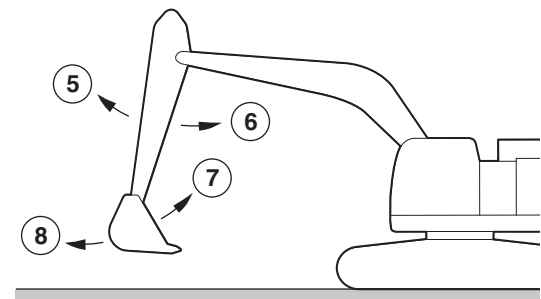
DS1701782

Figure 73

Right-hand Work Lever (Joystick) (Figure 69 and Figure 74)

5. Arm dump
6. Arm crowd
7. Bucket crowd
8. Bucket dump

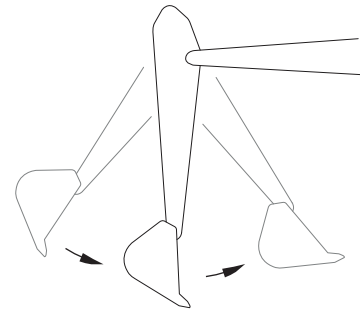
NOTE: Even after stopping the engine, the front can be lowered to the ground by the operating work lever (joystick) by moving safety lever to "UNLOCK" position and turning starter switch "ON".



DS1701783

Figure 74

NOTE: When operating the arm, it may stop momentarily. When the arm is operated, the weight of the arm can cause it to move faster than the amount of oil being supplied.



EX1300702

Figure 75

Intelligent Floating Boom Control (If Equipped)



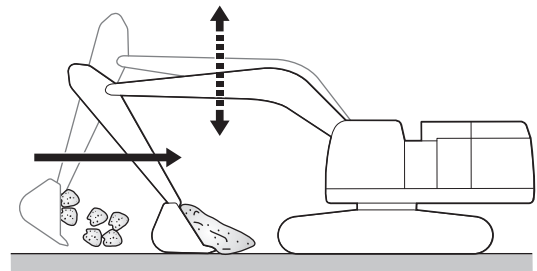
WARNING

AVOID DEATH OR SERIOUS INJURY

- Activating the Intelligent Floating Boom Control with the tracks raised up can cause the machine to drop suddenly.
- Do not activate Intelligent Floating Boom Control when tracks are raised.
- Do not raise tracks when control is activated.

- NOTE:**
1. The boom operating joystick must be in "NEUTRAL" position before operating the Intelligent Floating Boom mode selector switch.
 2. If the tracks are raised up, do not select and use the Intelligent Floating Boom mode. This could cause the tracks to suddenly lower resulting in death or serious injury.
 3. When the boom operating joystick is in boom lowering position and the bucket or other attachment is in contact with the ground, do not use Intelligent Floating Boom mode (temporary reset button). If the tracks are raised and the Intelligent Floating Boom mode has been selected, pressing the temporary reset button can cause a tip over when the boom lowering control is activated at the same time.

See "17. Intelligent Floating Boom Switch (If Equipped)" on page 2-21 for further information.



DS1701178

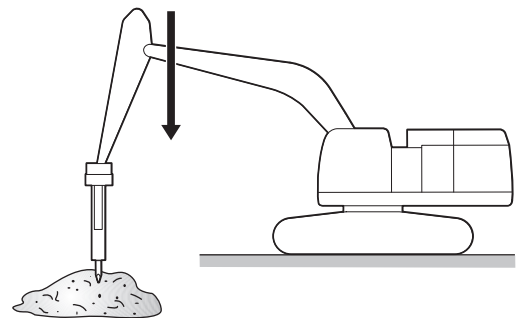
Figure 76

Intelligent Floating Boom Mode

The boom can move freely "UP" and "DOWN" when any external force up or down is applied to the boom. Applications like using a breaker attachment, leveling, or stone gathering are easier and more convenient.

Operating a Breaker

The boom can freely move "DOWN". The breaker can be operated with only the weight of the work group on the front without additional force, resulting in less shock and vibration, and extended service life of the breaker. The breaker will remain in constant contact with the object.



DS1701179

Figure 77

Truck Loading

Boom lowering can be controlled without hydraulic pump flow discharge, increasing productivity and fuel efficiency.

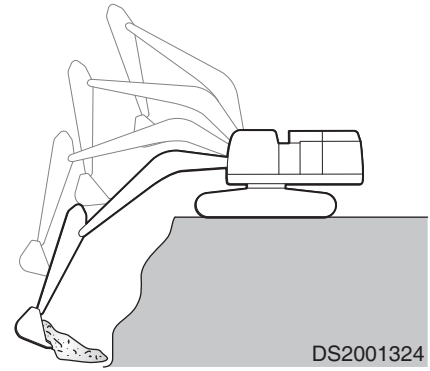


Figure 78

1. Intelligent Floating Boom Mode

To select the Intelligent Floating Boom mode, set the Intelligent Floating Boom selector switch from "O" (NORMAL MODE) to "I" (INTELLIGENT FLOATING BOOM MODE).

Moving joystick in boom-down direction after selecting Intelligent Floating Boom mode will lower boom by using its own weight, and the boom will move upwards naturally by external load forces.

NOTE: When the Intelligent Floating Boom selector switch is in "O" (NORMAL MODE) position, the Intelligent Floating Boom will not operate.

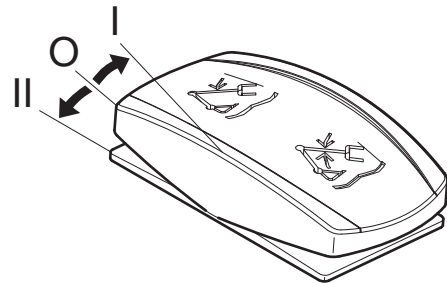


Figure 79

2. Breaker Mode

To select the breaker mode, set the Intelligent Floating Boom selector switch from "O" (NORMAL MODE) to "II" (BREAKER MODE).

Moving joystick in boom-down direction, the boom will be lowered by its own weight.

However, the boom upward movement is not smooth in breaker mode where the operator must move the joystick in boom rising direction.

NOTE: When the Intelligent Floating Boom selector switch is in "O" (NORMAL MODE) position, the Intelligent Floating Boom will not operate.

Smart Power Control (SPC)

The SPC mode is implemented by engine speed control and pump torque control.

How to access: User Menu → Fuel Efficiency Performance → Default Power Mode Setting

1. Smart engine speed control

This mode enhances fuel efficiency by reducing engine speed in the low load range to appropriate level through variable engine speed control which is carried out by detecting actual engine load and the operator's control action for heavy load operations, such as boom up and arm crowd.

- Heavy load: increase engine speed → maximize work performance
- Low load: decrease engine speed → maximize fuel efficiency

2. Smart pump torque control

This mode reduces smoke and increases fuel efficiency by reducing unnecessary engine load through optimized control of pump torque in accordance with the engine torque.



DS1900332

Figure 80

Operating Precautions



WARNING

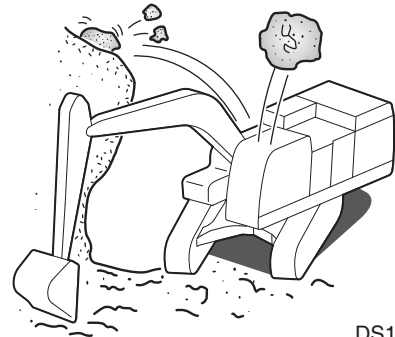
AVOID DEATH OR SERIOUS INJURY

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.

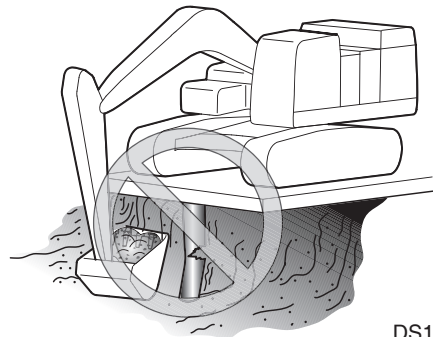
1. Before starting work, inspect terrain and soil conditions. Level ground and drain area if necessary.
2. Install window guards for additional operator protection when working if there is a possibility of falling rocks or other objects. See Figure 81.



DS1701181

Figure 81

3. Check strength of supported structures before working on them to avoid collapse of the structure caused by the weight of the excavator. If insufficient, reinforce it. See Figure 82.



DS1701182

Figure 82

4. When working close to the excavated edge or drop-off, make sure that the machine is sitting on solid ground. Keep the travel motors (1, Figure 83) to the rear. See Figure 83.

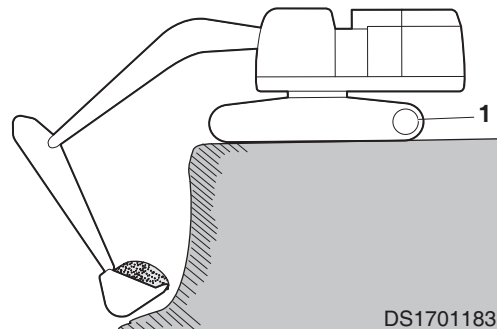


Figure 83

5. Do not allow bottom side of the boom to interfere with or touch the ground or track when digging a deep hole. See Figure 84.

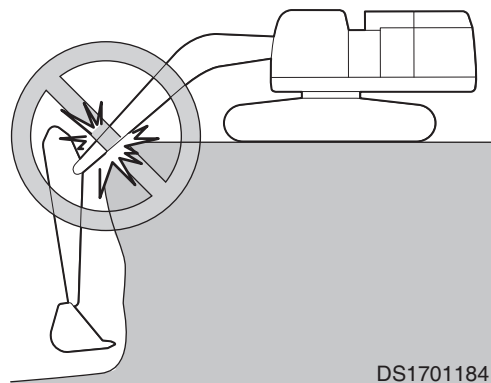


Figure 84

6. Do not excavate underneath the machine. The ground under the machine can collapse and cause the machine to fall and roll-over. See Figure 85.

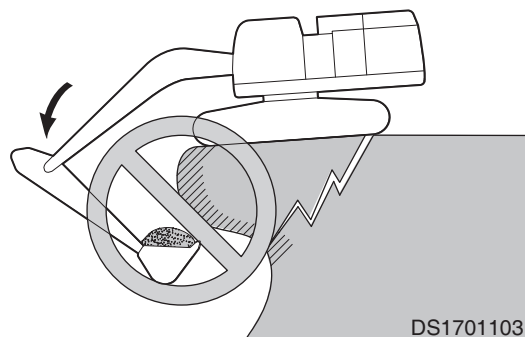


Figure 85

7. Make sure there is adequate clearance from overhead electrical supply lines. Check for underground utility lines before excavating. Call before you dig. See Figure 86.

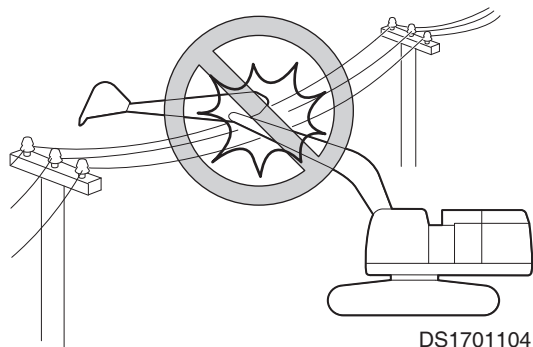


Figure 86

8. If the excavation is in an underground location or in a building, make sure there is adequate overhead clearance and there is adequate ventilation. See Figure 87.

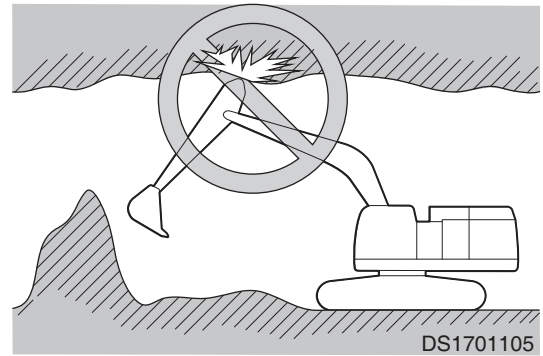


Figure 87

9. Do not continually "bottom out" the hydraulic cylinders. Machine damage can occur if the cylinders are fully extended or retracted. For example: arm cylinder fully retracted and the bucket cylinder is extended to rotate the bucket into the ground. See Figure 88.

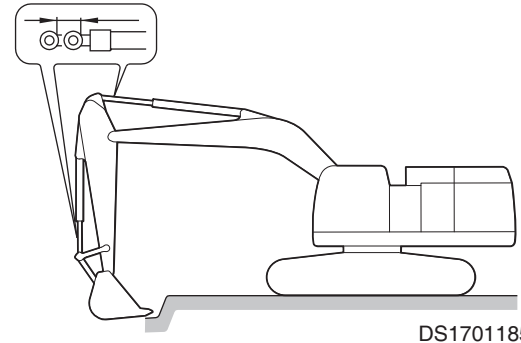


Figure 88

10. Do not dig with the excavator tracks raised. This can result in structural and mechanical failures. See Figure 89 and Figure 90.

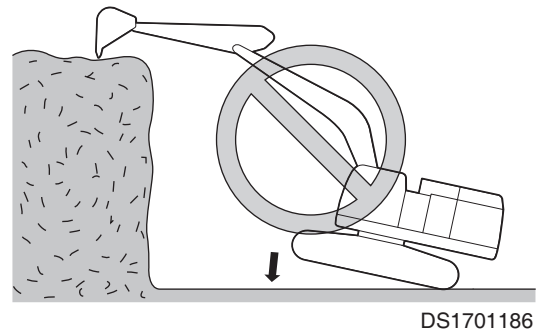


Figure 89

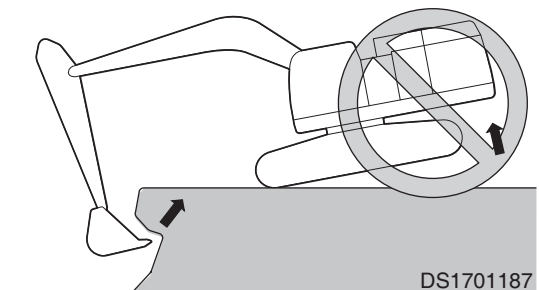
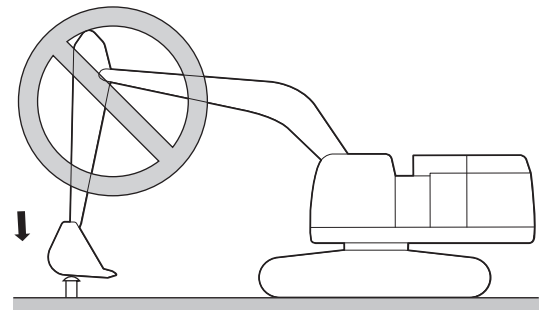


Figure 90

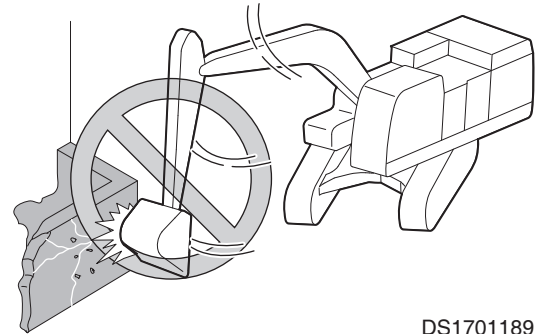
11. Do not use the bucket as a hammer or ramming device. This can cause damage to the front attachment. See Figure 91.



DS1701188

Figure 91

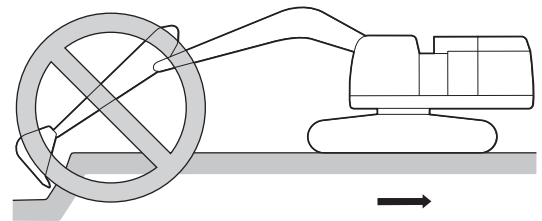
12. Do not move dirt or objects by swinging the excavator into them. This can result in structural and mechanical failures. See Figure 92.



DS1701189

Figure 92

13. Do not use machine travel when the bucket is in the ground to provide additional breakout force. See Figure 93.

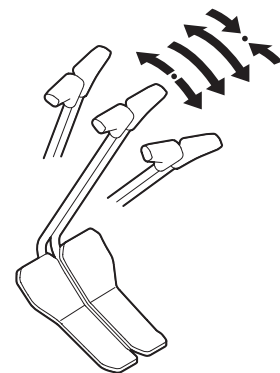


DS1701190

Figure 93

14. Do not operate travel levers quickly or jerk them when traveling in high range. See Figure 94.

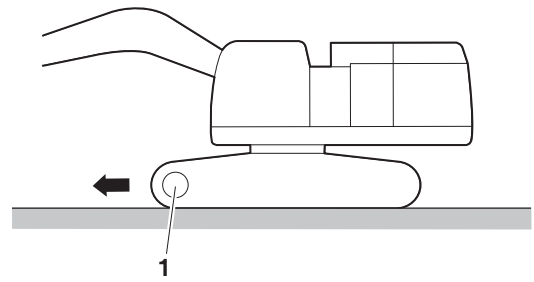
- Avoid sudden starts.
- When traveling in one direction, come to a complete stop before reversing directions. Do not rock excavator back and forth with levers.
- Avoid sudden stops. Return levers to neutral by hand. Do not let them snap back to neutral on their own.



DS1901208

Figure 94

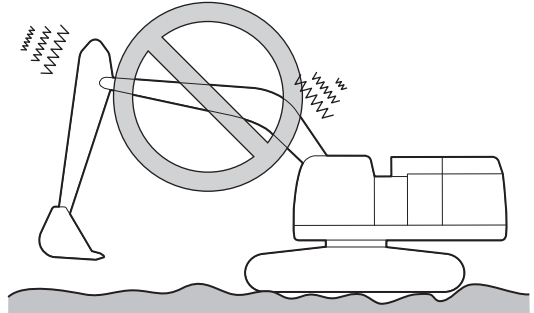
15. To protect undercarriage of the machine when traveling on rough ground or on rocks, set the idler (1, Figure 95) facing in travel direction. The idler and track spring are spring cushioned to absorb direct impacts.



DS1701191

Figure 95

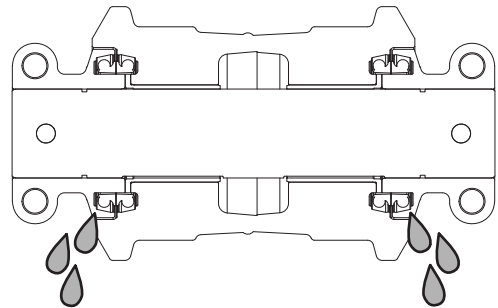
16. Do not travel at high-speed over rough ground or rocks. This can result in structural and mechanical failures and can reduce the service life of the machine. See Figure 96.



DS1701192

Figure 96

17. 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 15 minutes every 2 hours to allow the lubricating oil inside the track rollers to cool down. See Figure 97.



FG018452

Figure 97

18. 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 98.



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.

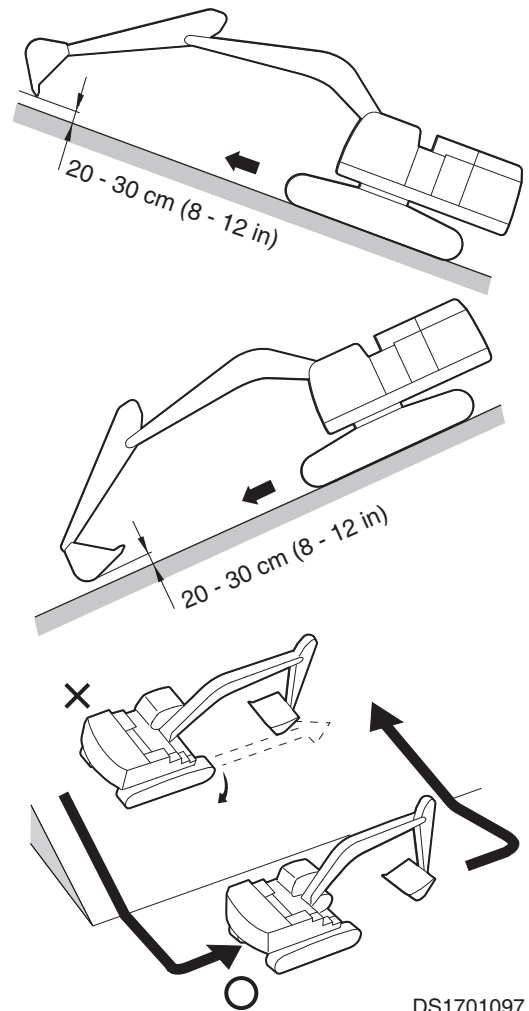


Figure 98

DS1701097

Working in Water



NOTICE

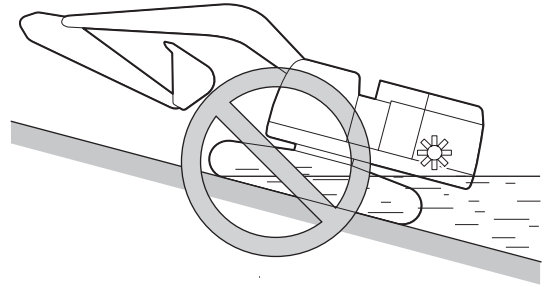
When working in water, do not exceed a slope of more than 15°. If the slope is over 15°, the rear part of the upper structure will be immersed in water, resulting in radiator fan and engine damage.

When working in water, do not operate in water higher than the center of upper track roller(s) (1, Figure 100).

If swing bearing gets wet, immediately grease it until all the old grease is purged from bearing.

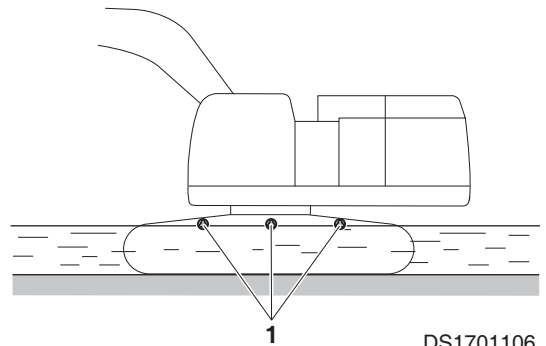
If water gets into swing gear housing, drain water immediately by removing lower inspection cover. Apply new grease.

After working in water, purge old grease from bucket pins.



DS1701193

Figure 99



DS1701106

Figure 100

Escaping From Mud

Be very careful to avoid getting stuck in mud.

Track On One Side Stuck

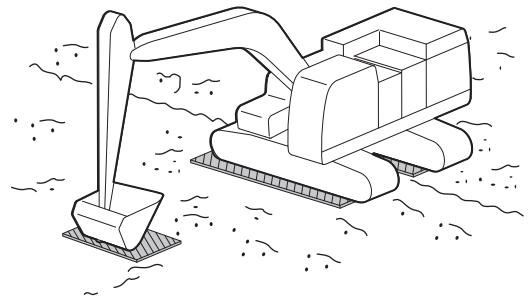
NOTE: When using the boom or arm to raise the machine, always have the bottom of the bucket in contact with the ground. The angle between the boom and arm must be 90° - 110°.

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.

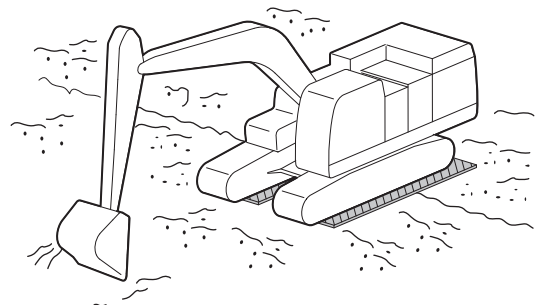
Tracks On Both Sides Stuck

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.



DS1701194

Figure 101



DS1701195

Figure 102

Parking Excavator



WARNING

AVOID DEATH OR SERIOUS INJURY

Park machine on firm and level ground. Avoid parking on slopes. If excavator must be parked on a slope, block tracks or wheels and place bucket teeth in ground. See Figure 103.

1. Park machine on firm and level ground. Lower bucket or work tool to ground as shown in Figure 104.
2. Set engine speed control dial on "LOW IDLE"
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.

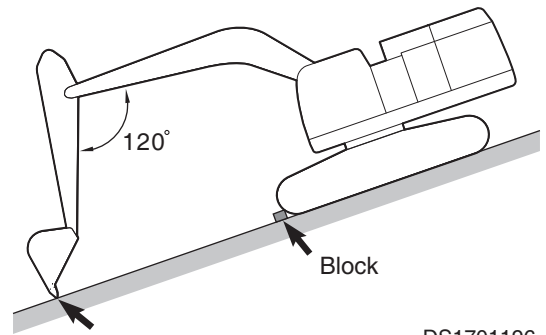


Figure 103

DS1701196

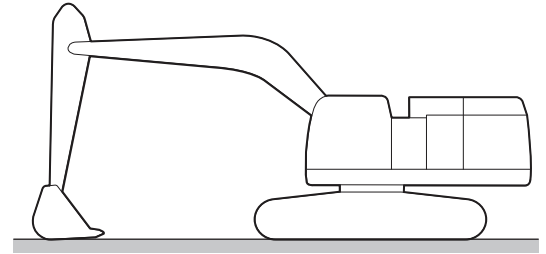


Figure 104

DS1701100

Towing Procedure



WARNING

AVOID DEATH OR SERIOUS INJURY

Never use a damaged wire rope or chain. They could brake and cause a serious accident.

Always wear gloves when handling a chain or wire rope (cable).

When towing the excavator, use a wire rope (cable) or chain capable of handling the load.

Attach chain or wire rope (cable) to track frame.

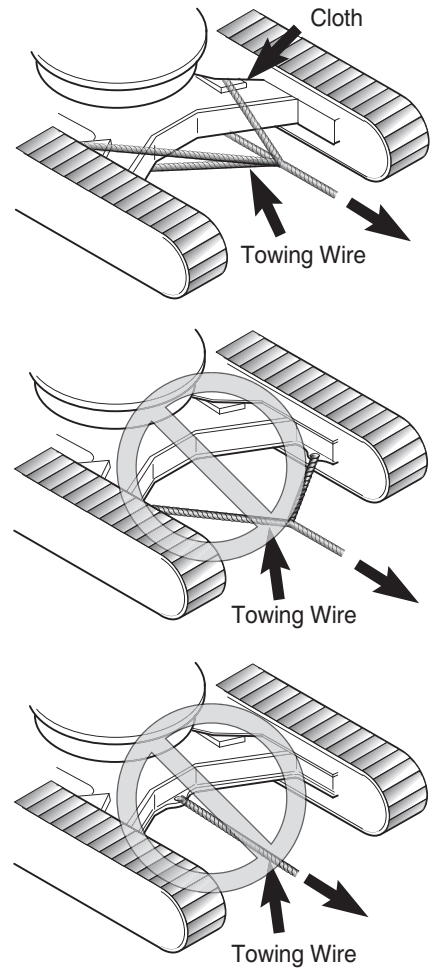
Insert protective material such as thick cloths between track frame and wire rope (cable) to prevent the wire rope from being damaged.



WARNING

AVOID DEATH OR SERIOUS INJURY

Only use shackle hook on track frame to haul objects that weigh less than 5 metric tons (5.51 U.S. Tons). Never use shackle hook to haul objects over 5 metric tons (5.51 U.S. Tons).



DS2001725

Figure 105

Attachments

Bucket - Replace and Reverse



WARNING

AVOID DEATH OR SERIOUS INJURY

Whenever removing an attachment, place it on the ground properly and ensure not to drop unintentionally.

Wear eye protection, hard hat, gloves, and other protective equipment when tools are being used and flying objects are possible.

Striking pins with a hammer may cause flying objects, keep bystanders clear of the area.

When removing pins, stand to the side of the bucket and do not place feet or body under a raised attachment.

When removing, inserting, or aligning pins, never insert your fingers into the pinholes.

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

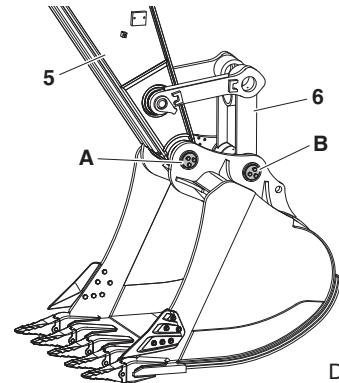
Replace

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



NOTICE

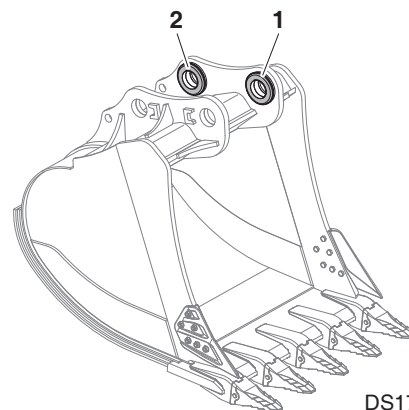
When removing the pins, place the bucket so it is resting slightly on the ground. If down pressure is applied to the bucket, the resistance will be increased and it will be difficult to remove pins. After removing the pins, make sure they are clean and do not allow mud, sand, or other debris to get on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



DS1701274

Figure 106

2. Remove three bolts (Figure 108) for arm pin (A, Figure 106) and link pin (B, Figure 106), pull out arm pin (A) and link pin (B, Figure 106), and then remove bucket.
3. Align the arm (5, Figure 106) with holes (1, Figure 107) of the replacement bucket and the link (6, Figure 106) with holes (2, Figure 107), then insert grease coated pins (A, Figure 106) and (B, Figure 106) into hole (1, Figure 107) and hole (2, Figure 107) respectively.



DS1701275

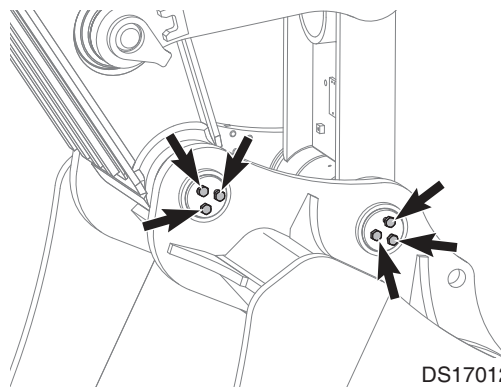
Figure 107

4. Install the three bolts for each pins.
5. 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.



DS1701276

Figure 108

Reverse (If Applicable)

1. Place the bucket on a flat surface.



NOTICE

When removing the pins, place the bucket so it is in 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. Remove three bolts for arm pin (A, Figure 109) and link pin (B, Figure 109), pull out arm pin (A, Figure 109) and link pin (B, Figure 109), and then remove bucket.

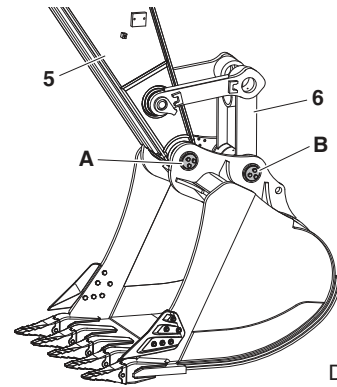


Figure 109

DS1701274

3. After removing the bucket, reverse it.
4. Align arm (5, Figure 109) with replacement bucket hole (1, Figure 110), then align link (6, Figure 109) with hole (2, Figure 110), then insert greased coated pins (A, Figure 109) and (B, Figure 109) into hole (1, Figure 110) and hole (2, Figure 110) respectively.

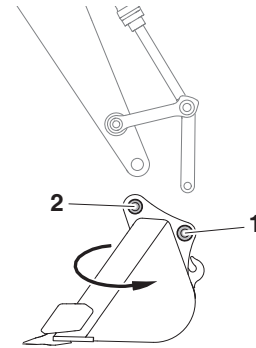


Figure 110

DS1900970



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 and nuts for each pin.
6. Lubricate with grease thoroughly until grease comes out from the end face.

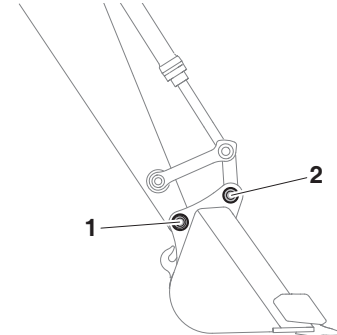


Figure 111

DS1900971



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.

Breaker Operation



NOTICE

If a hydraulic breaker and hydraulic piping is installed without HD HYUNDAI CONSTRUCTION EQUIPMENT's written authorization, it can damage the excavator and this will not be covered under the excavator warranty.

Selection of Hydraulic Breaker

If a hydraulic breaker is installed, consider equipment's stability and suitability for such modification. Also, consider hydraulic oil pressure and quantity. When selecting a hydraulic breaker, consult with a HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.

Hydraulic Hoses and Tubing for Breaker

1. When installing hydraulic breaker, assemble according to instructions provided with kit.
2. If breaker is taken off excavator, be sure to plug and cap all hoses and tubing to prevent contamination from entering hydraulic system.
3. Plug and cap all connectors and fittings on breaker to prevent contamination.
4. Check all hydraulic connections for signs of leaks or loose components before starting operation.

Breaker Operating Precautions

NOTE: Hydraulic pressure and flow settings may need to be changed. Refer to the Maintenance Section of this manual for further information.

1. Make sure to read and understand the breaker operator's manual.
2. Inspect all mechanical and hydraulic connections.
3. Do not use the breaker as a hammer. See Figure 112.
4. Do not drop breaker from extreme heights.

This can damage breaker or the excavator.

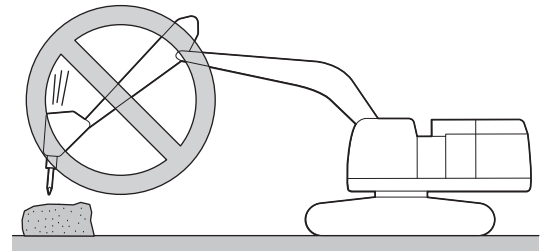


Figure 112

DS1701277

5. Do not operate the breaker with the boom or arm cylinders fully extended (bottomed out). See Figure 113.

Leave over 100 mm (4 in) of clearance between rod end of cylinder and cylinder head. This will help prevent damage to cylinders during breaker operation.

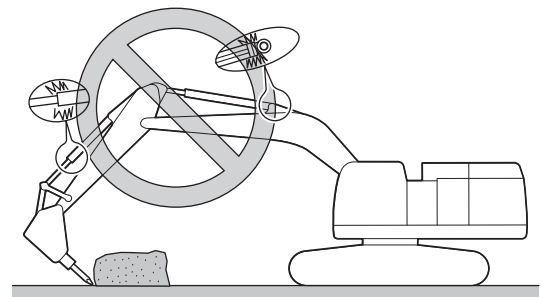


Figure 113

DS1701278

6. Do not use the breaker if the hydraulic hoses vibrate excessively. If excavator is operated under this condition, structural and hydraulic components can be damaged.

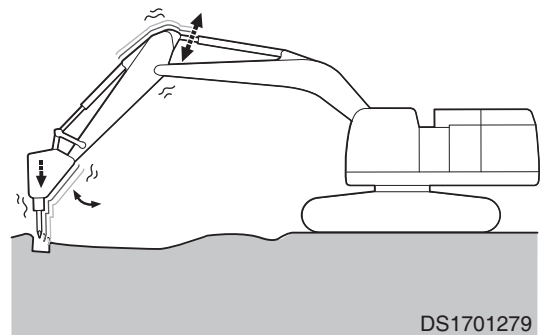


Figure 114

DS1701279

7. Do not allow the breaker body to go into water if not equipped for underwater operation. The breaker seal can be damaged and rust, foreign material or water can enter the hydraulic system and cause damage. Only insert the breaker tool into water. See Figure 115.

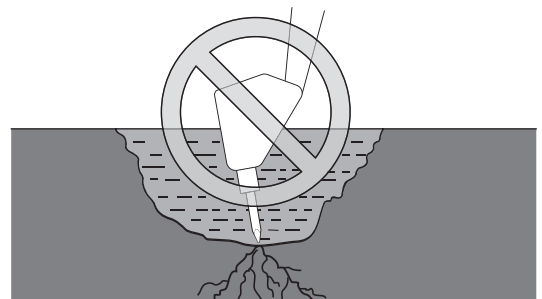
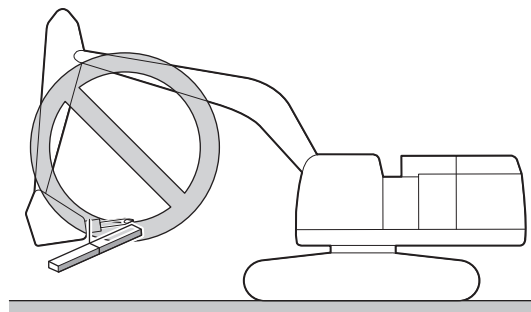


Figure 115

EX1502480

8. Do not lift or tow with a breaker. See Figure 116.



DS1701280

Figure 116

9. Operate the breaker only to the front and rear of the excavator. Do not use the breaker to either side of the excavator. Do not swing the breaker from side to side when operating it. See Figure 117.

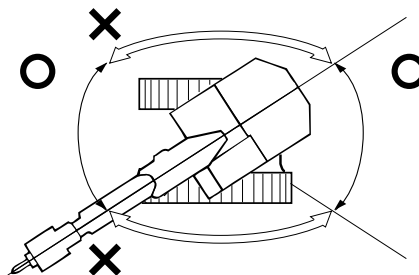


WARNING

AVOID DEATH OR SERIOUS INJURY

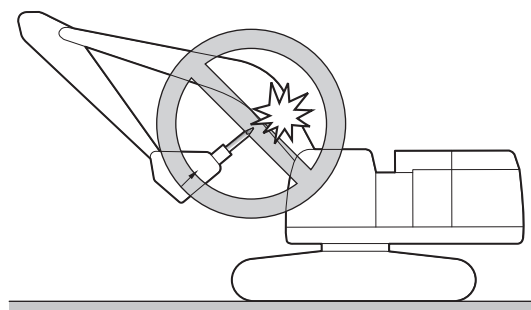
Operating a breaker with the upper structure turned 90° to the tracks can result in tipping over the machine or reduction in service life.

10. Do not curl the breaker tool tip into the arm or boom when traveling or parking the excavator. See Figure 118.



HAOB990L

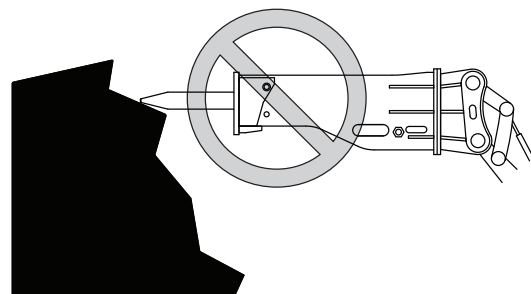
Figure 117



DS1701281

Figure 118

11. Do not operate the breaker as shown.



DS2002971

Figure 119

To Activate Breaker

1. Set work mode to breaker position using button (1, Figure 120)

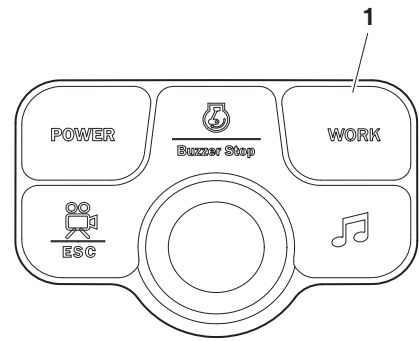


Figure 120

DS1900980

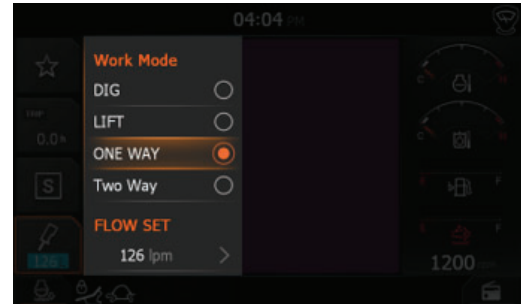


Figure 121

DS1900964

2. Press the lower button (Figure 122) on the right-hand work lever (joystick) to activate hydraulic breaker.
3. Release the lower button (Figure 122) on the right-hand work lever (joystick) to deactivate hydraulic breaker.

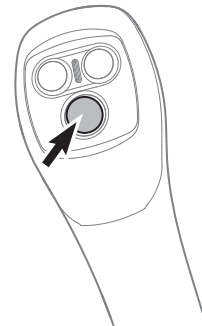


Figure 122

DS1701110

Shear Operation



WARNING

AVOID DEATH OR SERIOUS INJURY

Do not operate or work on this work tool unless you have read and understand the instructions and warnings given in this manual for both the work tool and the machine.

Failure to follow the instructions or heed the warnings could result in death or serious injury.

Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for replacement manuals. Proper care and maintenance is your responsibility.

NOTE: *Selection of a hydraulic shear must be done with extra care.*

Use of a hydraulic shear not recommended by HD HYUNDAI CONSTRUCTION EQUIPMENT could result in structural damage to the machine.

Consult your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for hydraulic shear information.

Be sure that no one is near the work tool to prevent injury. Keep the work tool under control always to prevent injury. When a demolition tool is used, all personnel should maintain a minimum distance of 10 m (33 ft).

Close all windows. Make sure that all required operator protective guards are in place. Wear all required personal protective equipment. Follow the instructions given in this manual for the work tool.



WARNING

AVOID DEATH OR SERIOUS INJURY

Death or serious injury could occur from the demolition of pipes, vessels, tanks or other containers that may contain gas, flammable materials, or hazardous chemicals.

Do not perform any demolition work on these items until all of their contents have been removed.

Follow all laws and regulations for the removal and disposal of these materials.

To Activate Shear

1. Set work mode to "SHEAR" position using button (1, Figure 123)

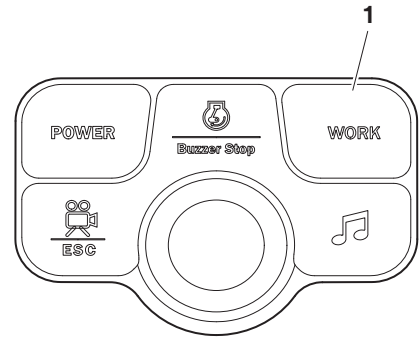




Figure 123

DS1900980

2. Push the left or right button on the top of the right-hand work lever (joystick) to shear. Pushing the right button will "OPEN" the work tool. 

3. Push the left or right button on the top of the right-hand work lever (joystick) to shear. Pushing the left button will "CLOSE" the work tool. 

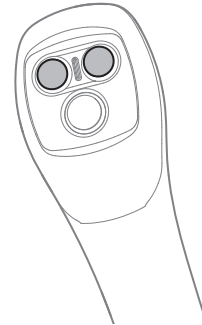


Figure 124

DS1701112



NOTICE

Cutting train or crane rails, engine crankshafts, welded fabrications, bearing, shafts, and other hard metals will increase the wear rate on the cutting edges and the shear.



NOTICE

Using the demolition tool to level the work site or push over standing structures can damage the machine or the demolition tool. Use appropriate equipment to do site preparation or maintenance operations.

Align the machine with the work area. Operate the hydraulic shear while you travel backward.



NOTICE

To avoid structural damage to the machine, do not break road surfaces by placing the cutting edge of the hydraulic shear on the ground and moving the machine.

To peel and remove road surface with the hydraulic shear, place the cutting edge of the stationary jaw between the road surface and the road bed. Use the work tool cylinder to separate the road surface and the road bed.



NOTICE

Operating the demolition tool with the cylinders fully retracted or fully extended could cause structural damage to the machine.



NOTICE

Using the machine hydraulic cylinder or the demolition tool rotating device to aid in the breaking or shearing process can damage the machine or the demolition tool rotating device. Use only the arm hydraulic cylinders to perform demolition operations.



NOTICE

Hitting the demolition tool against the ground or solid object to dislodge an obstruction or free the cutting arm can damage the demolition tool or the machine. Use a pry bar or cutting torch to free the cutting arm or dislodge the obstruction.

Always check the cutting edge alignment after the jaws are working properly.

One-Way/Two-Way Valve Operation

Activating Shear with Pedal Valve

1. Set work mode to "SHEAR" position using button.
2. Make sure that stopper (Figure 127) is in "SHEAR" position.

NOTE: When stopper is in "SHEAR" position, pedal valve can be moved/rocked in both directions.

3. Two-way operation is possible by rocking pedal back and forth between positions (1 and 2, Figure 125). When pedal is in its center (at rest) position, valve is in "NEUTRAL" and hydraulic oil flow is stopped.
4. Before operating attachment, be sure to check function controlled by direction of pedal movement.

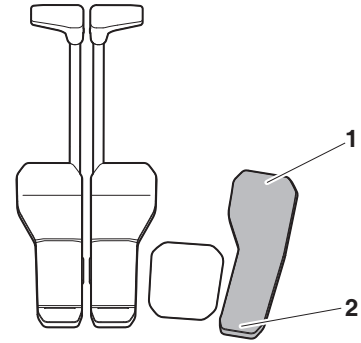


Figure 125

DS1900974

Activating Breaker with Pedal Valve

1. Set work mode to "BREAKER" position using button.
2. Make sure that stopper (Figure 127) is in "BREAKER" position.

NOTE: When stopper is in "BREAKER" position, pedal valve can be only moved in one direction.

3. With the stopper in "BREAKER" position, pedal can only be pressed in direction (1, Figure 125). When pedal is in its center (at rest) position, valve is in "NEUTRAL" and hydraulic oil flow is stopped.

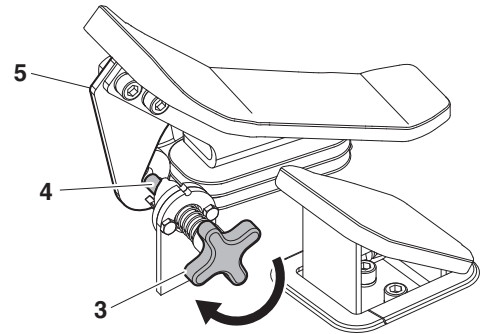


Figure 126

DS1900975

Stopper Positions

The stopper has three positions;

- Shear
 - Breaker
 - Locked
1. Rotate knob (3, Figure 126) clockwise in direction of arrow. The stopper (4) then engages or disengages the pedal bracket (5). The pedal can then function according to displayed symbol shown by knob rotation.

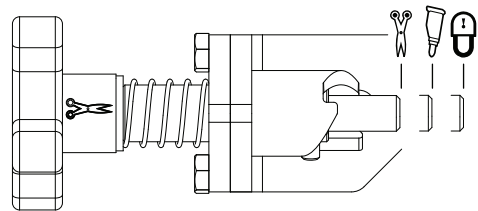


Figure 127

DS1701784



NOTICE

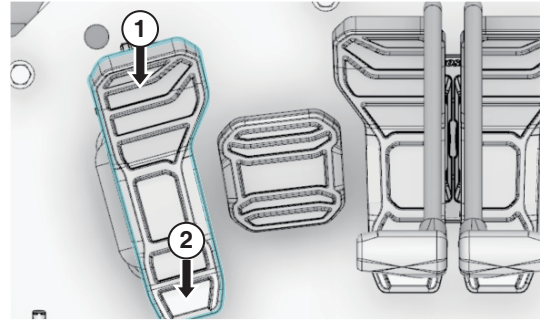
When only operating breaker or shear using joystick button(s), and it is not being controlled by pedal, make sure stopper is in "LOCKED" position to prevent pedal from being activated.

Rotating Operation

Attachment Rotating by Using the Pedal Valve

1. Pressing end (1, Figure 128) is used to turn clockwise.
2. Pressing end (2, Figure 128) is used to turn counterclockwise.

NOTE: Before activating the pedal, be sure to check the function of the attachment.



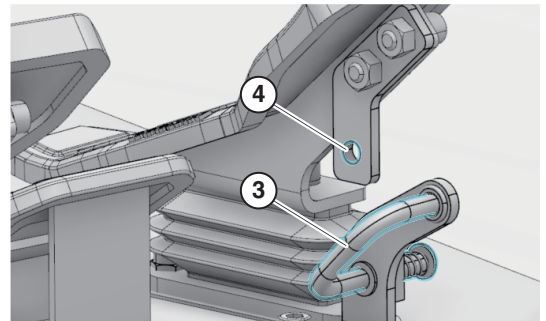
DS2003703

Figure 128

Locking the Pedal

When rotating is not needed, the pedal can be locked by using the prop rod (3, Figure 129) locking device.

Locking is completed when the top end of the prop (3, Figure 129) is positioned into pedal hole(4, Figure 129).



DS2003704

Figure 129

Attachment Rotation Using the Left-hand Work Lever (Joystick)

For a machine equipped with an attachment that rotates, press the upper two buttons on the top of the left-hand work lever (joystick) to rotate the attachment clockwise or counterclockwise.

Right button is for "CLOCKWISE ROTATION".

Left button is for "COUNTERCLOCKWISE ROTATION".



Figure 130

DS2001311



WARNING

AVOID DEATH OR SERIOUS INJURY

Before using any attachment in a work application, be sure to check its functional control. Make sure that desired movement or action is being activated by the control, e.g. opening/closing, clockwise/counterclockwise, crowd/dump, etc.

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

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 and decals.

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

- Do not operate the machine if there are other workers or people in the work area. Also, never allow people to stand or walk under the work tool or attachment while operating.
 - Do not start or perform any work unless you are properly trained. You should understand how to use the quick coupler according to the instructions.
 - Make sure that quick coupler is "FULLY ENGAGED AND LOCKED" 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. After checking the safe environment conditions for installing/removing the quick coupler, perform the below process.
3. To unlock the quick coupler switch, grab the switch and pull it up.

Pull the switch into the "I" (release) position; then, hold the switch in place until the quick coupler is released.

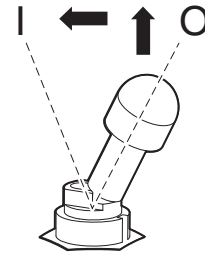
NOTE: If the switch held by the driver is released, the switch will automatically return to the "O" (locked) position.

NOTE: If the switch returns to the locked position before the pop-up notifying the operator that the quick coupler has been released appears on the gauge panel, the quick coupler switch must be pulled again.

4. Quick coupler symbols and warning messages appear in the multifunction display screen and a warning buzzer will sound.

NOTE: When the quick coupler switch is kept in the "I" (release) position, a warning pop-up appears and a warning buzzer sounds.

NOTE: The warning buzzer continues to sound until the quick coupler is locked again after being released.



DS1903332

Figure 131



DS1903347

Figure 132

5. With the quick coupler switch held in the "I" (release) position check the activation pop-up message and press the button of the joystick according to Figure 133 and type of installed joystick.

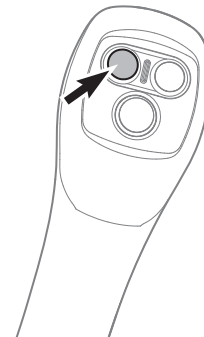
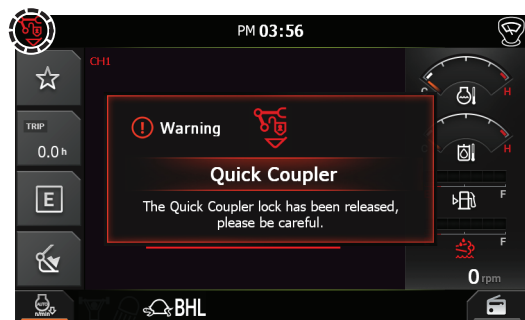


Figure 133

DS2001320

6. The warning message in the multifunction display is changed, and the quick coupler lock is released.

NOTE: *After changing warning message, the quick coupler unlock will work even if the user releases the quick coupler switch and the left button of the left joystick.*



DS1903348

Figure 134

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

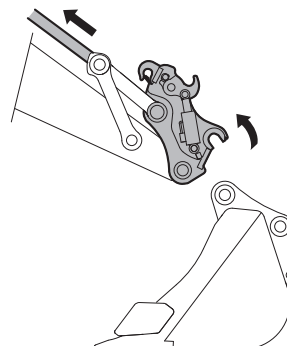


WARNING

AVOID DEATH OR SERIOUS INJURY

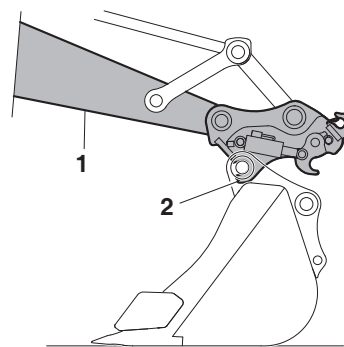
Keep attachment close to ground during engaging or releasing attachment. Attachment can fall off without warning if not "FULLY ENGAGED AND LOCKED" causing death or serious injury.

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



EX1300731

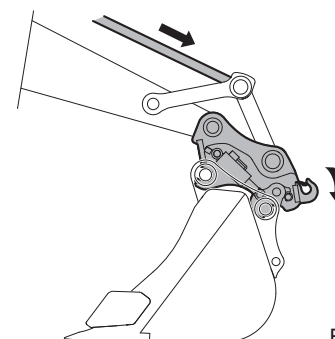
Figure 135



DS1903425

Figure 136

9. With the bucket crowded, engage the quick coupler to the lower attachment pin or interface.



EX1400299

Figure 137

10. To lock the quick-coupler, press the button of the right joystick according to Figure 138 and type of installed joystick.

NOTE: *The driver does not need to keep the button pressed.*

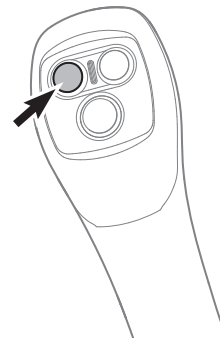


Figure 138

DS2001321

11. The warning message in the multifunction display is changed, and the quick coupler begins to lock.

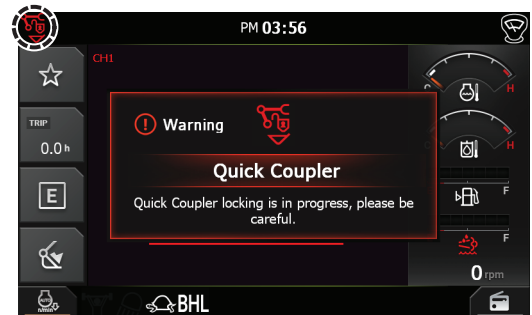


Figure 139

DS1903349

12. When the quick coupler is locked, the warning pop-up changes and the warning buzzer stops.

NOTE: *The warning pop-up disappears automatically after remaining on the screen for a moment.*



Figure 140

DS1903350

13. 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.

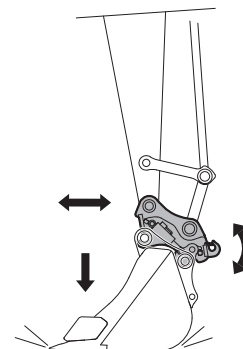


Figure 141

DS1903339

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



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.

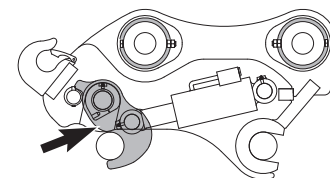
Operate quick coupler and attachment through its full range of motion to check for interference between attachment and machine that could damage the cabin, boom, coupler or attachment.



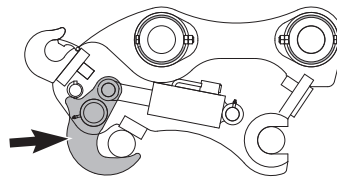
WARNING

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.



Push Type



Pull Type

DS1903533

Figure 142

To Release Attachment

1. Park the excavator and attachment on firm and level ground.
2. After checking the safe environment conditions for installing/removing the quick coupler, perform the below process.
3. To unlock the quick coupler switch, grab the switch and pull it up.

Pull the switch into the "I" (release) position; then, hold the switch in place until the quick coupler is released.

NOTE: If the switch held by the driver is released, the switch will automatically return to the "O" (locked) position.

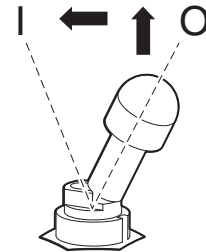
NOTE: If the switch returns to the locked position before the pop-up notifying the operator that the quick coupler has been released appears on the gauge panel, the quick coupler switch must be pulled again.

4. Quick coupler symbols and warning messages appear in the multifunction display screen and a warning buzzer will sound.

NOTE: When the quick coupler switch is kept in the "I" (release) position, a warning pop-up appears and a warning buzzer sounds.

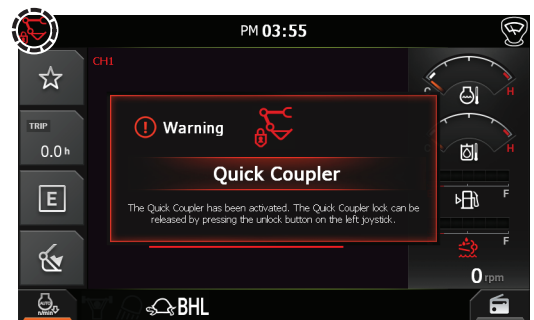
NOTE: The warning buzzer continues to sound until the quick coupler is locked again after being released.

5. With the quick coupler switch held in the "I" (release) position check the activation pop-up message and press the button of the left joystick according to Figure 145 and type of installed joystick.



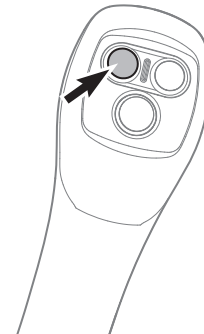
DS1903332

Figure 143



DS1903347

Figure 144



DS2001320

Figure 145

6. The warning message in the multifunction display is changed, and the quick coupler lock is released.

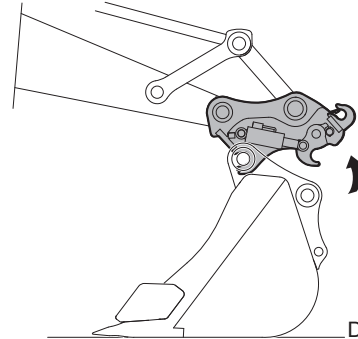
NOTE: *After changing warning message, the quick coupler unlock will work even if the user releases the quick coupler switch and the left button of the left joystick.*



DS1903348

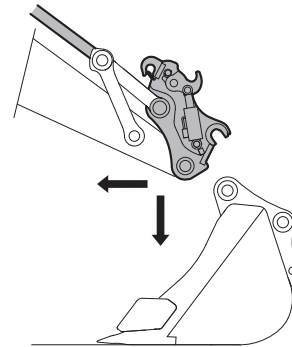
Figure 146

7. Retract the bucket cylinder to move the quick coupler toward the machine.



DS1903427

Figure 147

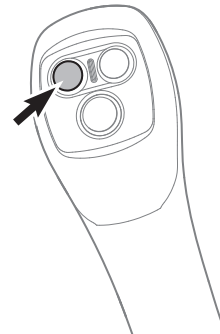


DS1903340

Figure 148

8. To lock the quick-coupler, press the button of the right joystick according to Figure 149 and type of installed joystick.

NOTE: *The driver does not need to keep the button pressed.*



DS2001321

Figure 149

9. The warning message in the multifunction display is changed, and the quick coupler begins to lock.



DS1903349

Figure 150

10. When the quick coupler is locked, the warning pop-up changes and the warning buzzer stops.

NOTE: *The warning pop-up disappears automatically after remaining on the screen for a moment.*



DS1903350

Figure 151

Lifting Objects



NOTICE

There may be local or government laws or regulations governing the use of excavators for the lifting of heavy loads. Always contact local and government agencies and follow all applicable laws and regulations.

When this machine is used in object handling applications, the machine must be properly configured and operated. Ensure the following safety working devices are equipped and operational.

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

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.

Short slings will prevent excessive load swing.

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

Always try to maintain the lifting eye (Figure 152) straight below the centerline of the arm and bucket pin. In this manner the weight of the load is being primarily held only by the pin, and not by the bucket cylinder, link, and link pins.

When a lifting eye is used, the sling/lifting device must be fastened to the eye in a manner that will not allow it to come loose.

The highest lift capacity of the machine is over the front and rear of the machine.

If the machine is equipped with a dozer, the highest lift capacity is over the rear (Figure 152).

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.

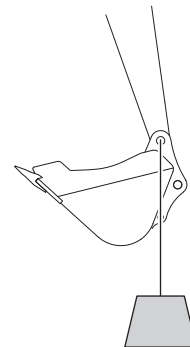


Figure 152

EX1300739

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.



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. Do not exceed the rated load capacity for the lift zone that will be used.

Lifting Known Weight

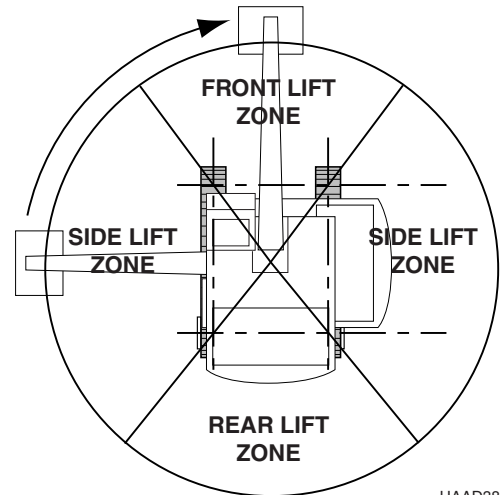
The load rating chart is the determining factor when lifting known weights. Refer to "Excavator Rated Lift Capacity Tables" on page 6-8 of this Operation & Maintenance Manual. Whenever possible, lift and swing loads between the front idler area.

Pick and Carry

The machine can pick and carry loads. It is recommended that when traveling with a suspended load, you evaluate the prevailing conditions and determine the work site precautions required in each case. The following factors must be considered before attempting to pick and carry a load.

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.

1. Use the shortest lifting radius distance possible.
2. Keep the load as close to the ground as conditions will permit.
3. Provide tag lines to prevent load from swinging back and forth. This can cause a change in the lift radius could exceed the load chart rating or cause a tip over.
4. Travel speed will depend on work site conditions.
5. Avoid sudden starts and stops.



HAAD3842

Figure 153

Lifting Objects with Quick Coupler

The lifting point capacity (1, Figure 154) for the quick coupler lift eye is marked on the product identification plate. This is the maximum lift capacity when using a coupler for lifting.

Before lifting objects using the quick coupler lift eye, remove any attachment that is connected to the quick coupler.

The highest lift capacity of the machine is over the front and rear of the machine. If the machine is equipped with a dozer, the highest lift capacity is over the rear.



WARNING

AVOID DEATH OR SERIOUS INJURY

Do not exceed the Rated Lift Capacity. Read and understand lift capacity charts for your excavator.

Be aware of the maximum machine lift capacity for your machine configuration and for the lift cycle and range of movement. The rated lift capacity of the quick coupler may be less than the rated capacity of the excavator or vice versa. It is important that lower of the two values is used to determine the rated lift capacity when the quick coupler is used with the excavator.

Lift capacity of the excavator is reduced when fitted with a quick coupler. Review the lift capacity charts of your excavator model and make allowances for the weight of the quick coupler and any additional work group attachments (such as thumbs) that may be fitted and used with the quick coupler and excavator.

The weight of the quick coupler can be found on the information plate fixed to the quick coupler body (Figure 154) and in the Quick Coupler Operation & Maintenance Manual.



WARNING

AVOID DEATH OR SERIOUS INJURY

- **Never permit personnel to stand in the maximum swing reach area while operating equipment.**
- **Never move a load above other personnel.**

Ensure all personnel and unnecessary equipment is moved clear of the operation site and cordon off the area using barricades or other methods to prevent bystanders from entering the work area.

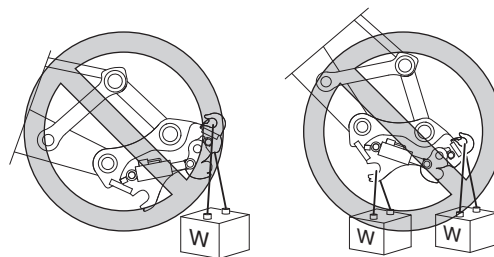
HD HYUNDAI CONSTRUCTION EQUIPMENT Co., Ltd 7-11 Hwasu Dong, Dong-gu, Incheon, Korea	
DESCRIPTION	DESIGNATION
SERIAL NO.	
MACHINE TYPE	
HYDRAULIC FLOW RATE	
GAL/MIN	LT/MIN
HYDRAULIC WORKING PRESSURE	
MPa	PSI
CAPACITY	
	SAE RATED
ASSY LOCATION	
LIFT EYE-SWL	
Y.O.M	WEIGHT

CE

DS2202262

Figure 154

Use only the specified lift eye position for lifting loads. Never use the attachment pin connection hooks of the quick coupler for lifting suspended loads (Figure 155).



EX1400302

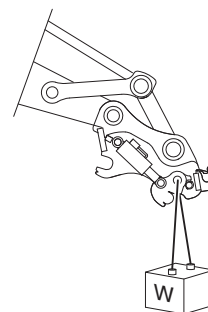
Figure 155

Lifting objects with a quick coupler should always be done with the quick coupler vertical so load and lifting accessories can hang free without contacting the coupler body (Figure 156).

Failure to follow the proper lifting instructions can result in equipment failure and the loss of the suspended load.

Always remove all lifting devices before engaging the quick coupler to any attachment.

For additional inspection, maintenance, and service schedule information refer to Quick Coupler Operation & Maintenance Manual.



EX1400303

Figure 156

Operation Under Abnormal Conditions

NOTE: See "Operation in Extreme Conditions" on page 1-69 for other recommendations.

See "Operation in Extreme Heat" on page 1-70 for other recommendations.

See "Operation In Dusty and Sandy Areas" on page 1-71 for other recommendations.

See "Operation in Rainy or Humid Conditions" on page 1-72 for other recommendations.

See "Operation in Saltwater Areas" on page 1-72 for other recommendations.

See "Operation at High Altitudes" on page 1-72 for other recommendations.

See "Operation During Electrical Storms" on page 1-73 for other recommendations.

See "Maintenance in Special Conditions" on page 4-102 for other recommendations.

Equipment Lowering with Engine Stopped

To lower the boom, place the safety lever in the "UNLOCKED" position and turn starter switch to "I" (ON) position. Move the joystick to "BOOM LOWER" position. If the accumulator is still charged, the boom will lower. Turn key to "O" (OFF) position and remove from starter switch.

If the boom does not lower, the accumulator is empty. Use one of the following methods to lower the boom.



WARNING

AVOID DEATH OR SERIOUS INJURY

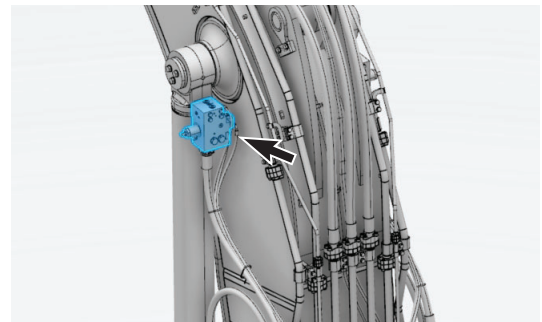
Boom weight can cause cylinder oil pressure to reach relief pressure of the boom lowering control device when the boom is supported by one cylinder. Boom can lower suddenly, causing death or serious injury.

To avoid death or serious injury, be sure no one is under or near the work tool before manually lowering the boom.

Keep all personnel and bystanders away from the boom area when lowering the boom with the engine stopped.



When you must manually lower the boom if the engine has stopped and cannot be started, or the hydraulic system is disabled, the operator can still lower the boom, using the following procedure, when machine is equipped with a boom lock valve.

1. Relieve the pressure in the hydraulic system before manually lowering the boom.
 - A. Turn starter switch or star/stop button to "I" (ON) position.
 - B. Move the safety lever to "UNLOCKED" position.
 - C. Move the joysticks and travel levers/pedals forward and backward to relieve accumulator pressure.
 - D. Turn starter key or start/stop button to "O" (OFF) position.



DS2003705

Figure 157

2. Loosen locknut (1, Figure 158) of the lock valve.
 - Tool: 13 mm ()
3. Open the cap (3, Figure 158) and slowly turn adjusting screw (2, Figure 158) counterclockwise two turns.
(1 turn = 145 bar (148 kg/cm², 2,103 psi))
 - Tool: 4 mm ()
4. Make sure that front attachment has been completely lowered onto the ground. Tighten adjusting screw (2, Figure 158).
5. Tighten locknut (1, Figure 158) to a torque of 7 N.m (0.7 kg.m, 5.2 ft lb) and close the cap (3, Figure 158).

After completion of the manual boom lowering, make necessary repairs before you operate the machine again.

NOTE: For additional information, contact your HD HYUNDAI CONSTRUCTION EQUIPMENT dealer.

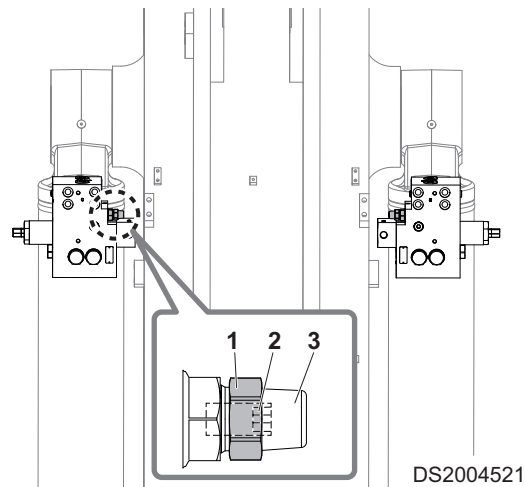


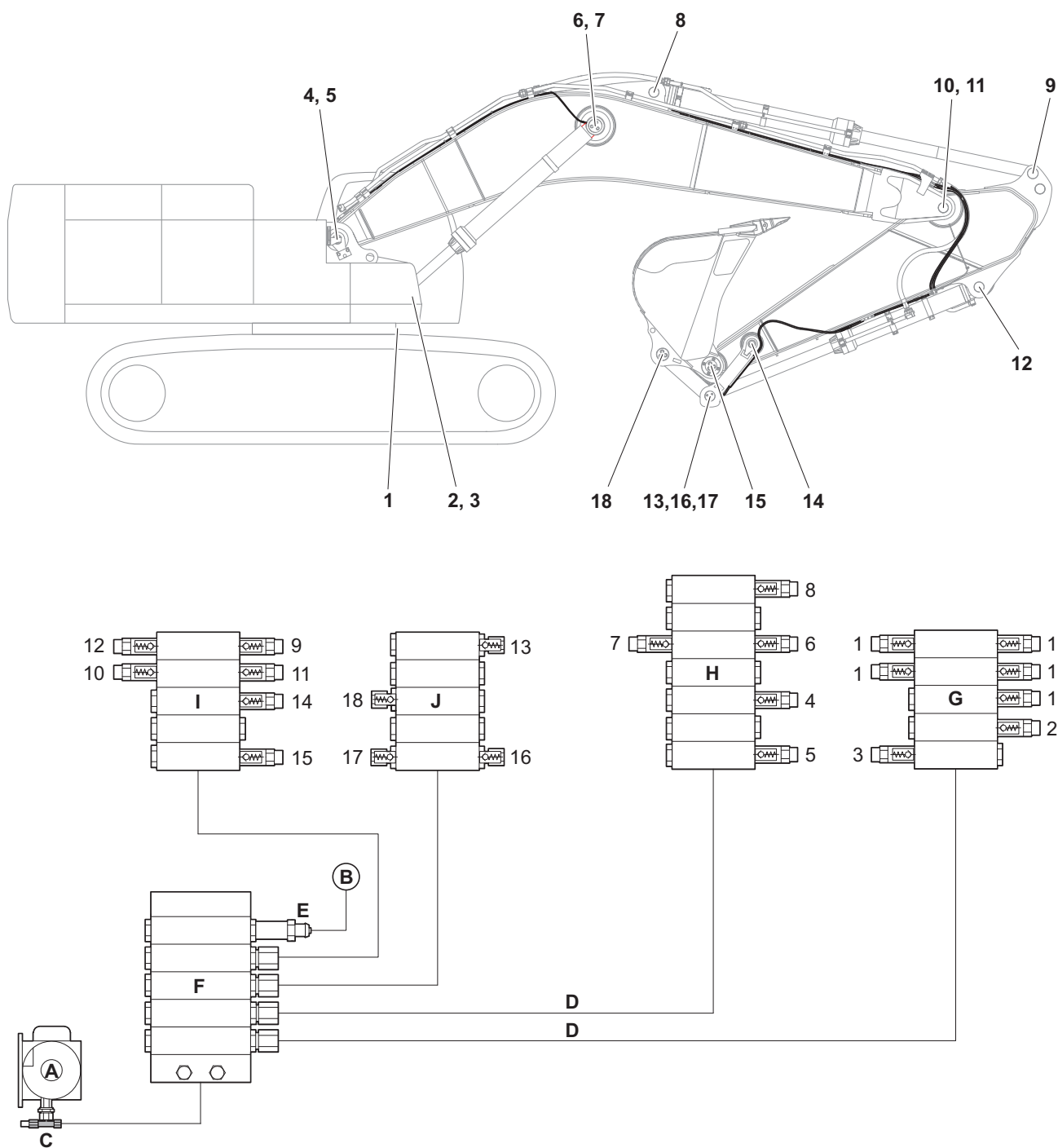
Figure 158

DS2004521

Auto Grease System (If Equipped)

Overview

HD HYUNDAI CONSTRUCTION EQUIPMENT Auto grease system is called "Progressive System".



DS2003640

Figure 159

Reference Number	Description
A	Central Lubrication Pump
B	Fault Indicator in Cabin
C	Pump Element with Pressure Relief Valve
D	Lubrication Lines
E	Piston Detector (Cycle Switch)
F	Main Feeder
G	Sub Feeder (Center Frame)
H	Sub Feeder (Boom)
I	Sub Feeder (Arm)
J	Sub Feeder (Bucket)
1	Swing Bearing (5 points)
2	Left Boom Cylinder Head
3	Right Boom Cylinder Head
4	Left Boom Foot

Reference Number	Description
5	Right Boom Foot
6	Left Boom Cylinder Rod
7	Right Boom Cylinder Rod
8	Arm Cylinder Head
9	Arm Cylinder Rod
10	Left Boom Arm Joint
11	Right Boom Arm Joint
12	Bucket Cylinder Head
13	Bucket Cylinder Rod
14	Arm Link Joint
15	Arm Bucket Joint
16	Left Link Joint
17	Right Link Joint
18	Bucket Link Joint

Location

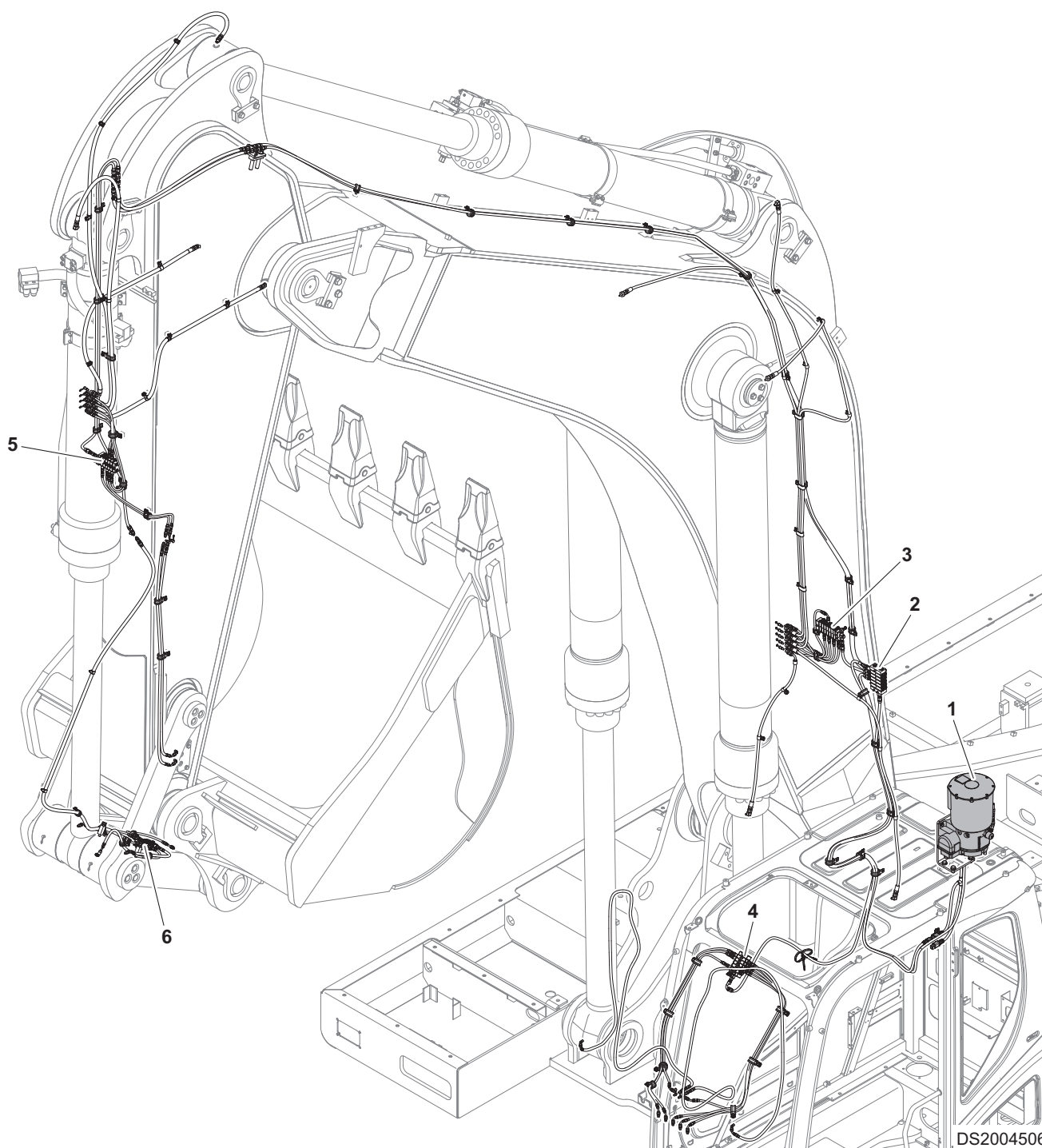


Figure 160

Reference Number	Description
1	AGS Pump
2	Main Feeder
3	Sub Feeder (Boom)

Reference Number	Description
4	Sub Feeder (Center Frame)
5	Sub Feeder (Arm)
6	Sub Feeder (Bucket)

Lubricants

Generally grease up to NLGI grade 2 is recommended for progressive systems. (Considering working conditions, the following lubricants can be used. NLGI Grade 1 to 2 greases with EP additives, compatible with plastics, NBR elastomers, copper and copper alloys, and NLGI Grade 000 to 0 fluid greases.)



NOTICE

When filling up grease, keep the area clean.

Contaminants remain in suspension in lubricating grease. They can damage bearings and system components.

Also make sure that systems are only filled with grease that uses the same types of thickener.

Sodium soap greases must not be used in the automotive sector (water-soluble).

Please, see also the important product usage information on the back cover.

Approved Lubricants



NOTICE

Only lubricants approved for the product may be used. Unsuitable lubricants can lead to failure of the product and to property damage.



NOTICE

Different lubricants cannot be mixed, as mixing can result in damage and necessitate costly and complicated cleaning of the product/lubrication system.

It is recommended that an indication of the lubricant in use be attached to the lubricant reservoir to prevent accidental mixing of lubricants.

The product described here can be operated using lubricants that meet the specifications in the technical data.

Note that in rare cases, there may be lubricants whose properties are within permissible limit values but whose other characteristics render them unsuitable for use in centralized lubrication systems. For example, synthetic lubricants may be incompatible with elastomers.



NOTICE

Centralized lubrication systems must always be free of leaks. Leaking lubricant is hazardous because of the risk of slipping and injury. Be mindful of any lubricant leaking out during assembly, operation, maintenance, and repair of centralized lubrication systems. Leaks must be sealed off without delay.

Lubricant leaking from centralized lubrication systems is a serious hazard. Leaking lubricant can create risks that can result in physical harm to persons or damage to other material assets.

Lubricants are a hazardous substance. The safety instructions on the lubricant's safety data sheet must be followed. The safety data sheet for a lubricant can be requested from the lubricant manufacturer.

Lubricant Filling



NOTICE

The entire system must be ventilated if the reservoir has been emptied below the "min" mark.



NOTICE

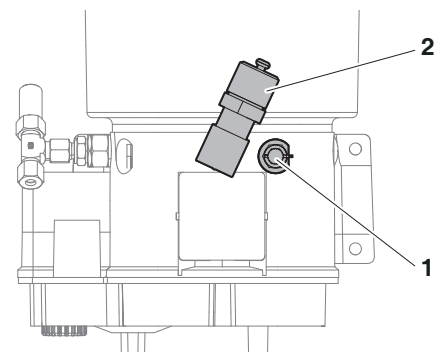
Do not open top cover of reservoir for lubricant filling. Only use a conical head nipple.

Only fill using clean lubricant and an appropriate filling device. Contaminated lubricants can result in severe system malfunction.

8 L - Reservoirs

Lubricant filling is performed using a M10x1 conical head nipple (1, Figure 161) and a conventional grease press.

The conical head nipple can be twisted onto the position (2, Figure 161), for example to gain better access. As an alternative, the connection (2) can be used to mount a lubricant return or filler coupling.



DS1603416

Figure 161



NOTICE

Switch off the power supply before starting filling.



NOTICE

Risk of bursting if the reservoir is overfilled.

When filling the reservoir using pumps with a large delivery volume do not exceed the maximum filling mark.



Figure 162

DS2103276

Filler Coupling

As an alternative or addition to a conical head nipple (1, Figure 163), the unit can also be equipped with a filler socket (2) to fill using a filling pump. A corresponding coupling socket (3) must be mounted on the filling pump. The cap on the filler socket must be removed before filling.



NOTICE

Clean filler coupling regularly and check it for cracks. If any cracks exist, replace the filler coupling.

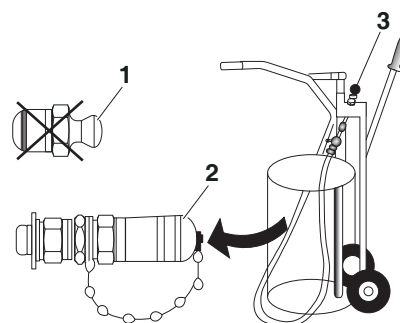


Figure 163

DS2000896

Filling Cylinder (Optional)

The pump unit can also be filled through one of the lubricant outlets using a filling cylinder (1, Figure 164). To do this, remove M20x1.5 screw plug (2) in the lubricant outlet and replace it with a filler socket (3). The caps (4) on the socket and filling cylinder must be removed before filling.

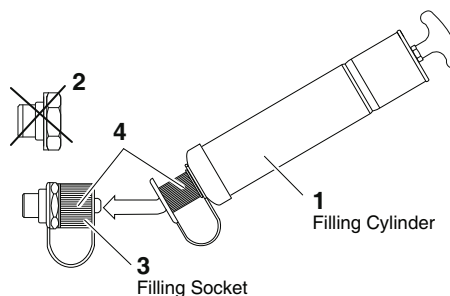
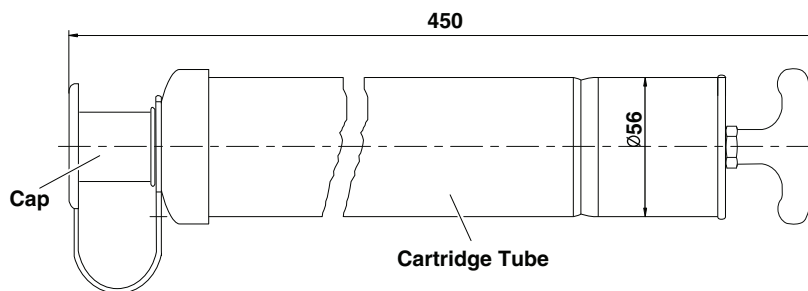


Figure 164

DS2000897

Filling Cylinder Complete

Suitable for cartridges according to an effective content of 450 cm³ and 550 cm³.



DS2000898

Figure 165



Figure 166

Cleaning




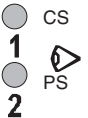




When pressurized air and/or pressurized water is used for cleaning, be careful water is not to get into auto grease system.

Water can cause malfunctions or damage of system.

Pump Display and Control Elements of Control Screen

The display and control unit is protected from water splashes and mechanical damage by a transparent plastic cover. The cover must be removed to program the unit and then remounted afterwards.

Display and Control Elements

Representation	Description	Function
	Three-digit LED display	Values and operating status
	Pause LED	Interval time
	Contact LED	Display contact time (pump operation)
	1 = CS LED	Monitors system function by an external piston detector CS = Cycle Switch, piston detector 2 = PS LED Monitors function with an external pressure switch PS = Pressure Switch
	Fault LED	Fault notification
	UP or DOWN key	<ul style="list-style-type: none"> Switch on display Display values and parameters Set values and parameters
	SET key	<ul style="list-style-type: none"> Switch between programming mode and display mode Confirm values
	DK key	<ul style="list-style-type: none"> Trigger interim lubrication Delete fault notification

Three-digit LED Display



The display is off in normal mode. It can be activated by briefly pressing one of the two push buttons (▲)(▼). Current values and preset parameters are displayed. The display also serves to guide and prompt the operator while programming operating parameters.





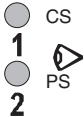


WL1300072

Figure 167 Device display-Three-digit LED display






Display	Meaning	Statement	Control function
	t = TIMER PA = PAUSE	The control unit is functioning as a timer and is currently in PAUSE mode.	Part of lubrication cycle; entry and display value in hours.
	t = TIMER CO = CONTACT	The control unit is functioning as a timer and is currently in a pump cycle (CONTACT).	CONTACT = time during which the pump delivers lubricant; entry and display value in minutes.
	c = Cycle O = OFF P = Pressure	Display the "Monitoring settings" menu.	
	Monitoring OFF	The CS and PS monitoring functions are switched off.	No system monitoring
	Cycle Switch Piston detector (progressive systems)	Piston detector monitoring is active.	The piston detector is monitored for signals during the CONTACT pump cycle.
	Low Level Fault: fill level too low.	The minimum fill level has been reached in the reservoir.	
	Fault Cycle Switch Fault: Piston detector	No signal from piston detector during pump cycle.	The control unit is currently in FAULT mode. The operational sequence has been stopped.
	Operation Hour Meter	The values shown after this are the number of hours, the control unit has operated.	The control unit is currently in FAULT mode. The operational sequence has been stopped.

Display	Meaning	Statement	Control function
	Fault Hour Meter	The values shown after this are the number of fault hours, i.e., the amount of time the vehicle or machine was operated in FAULT mode.	
	Block Mode	No signal from the piston detector. Unlike in normal mode, the control unit is still the monitoring sequence. A fault notification is issued if the fault remains for three pump cycles times.	

LED Display

LED	LED Lights up = Display Mode	LED Flashes = Programming Mode
	Operating voltage is present on pump unit and control unit, system is currently in operating status PAUSE.	Value for PAUSE can be changed.
	Operating voltage is present on pump unit and control unit, system is currently in operating status CONTACT (pump motor ON).	Value for CONTACT can be changed.
	<p>A cycle switch (CS) is used for system monitoring. On progressive feeders, monitoring is performed during the pump cycle (CONTACT).</p> <p>The LED light turns "ON" when a signal is received.</p> <p>A pressure switch (PS) is used for system monitoring. On single-line systems, monitoring is performed during the pump cycle. (Not applied to HD HYUNDAI CONSTRUCTION EQUIPMENT auto grease system.)</p> <p>The LED light turns "ON" when a changeover signal is received.</p>	<p>Monitoring type can be switched off in programming mode.</p> <p>COP = CS monitoring is active COP = OFF monitoring is switched off</p> <p>Monitoring by pressure switch cannot be activated on progressive systems.</p> <p>COP = CS monitoring is active COP = OFF monitoring is switched off</p>
	<p>The operating voltage is present on the pump unit and control unit. The control unit is in operating status FAULT. The cause can be accessed by the LED display and shown as a fault code by pressing the  push button.</p> <p>The operational sequence has been stopped.</p>	

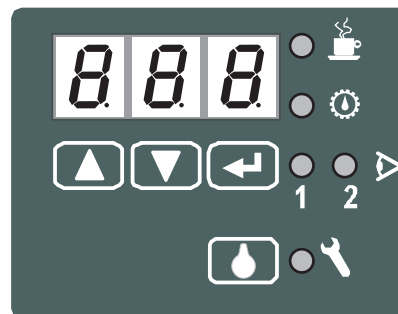
Push Button Operation

	Key	Function
 WL1300117		Pressing during PAUSE triggers an interim lubrication. Fault notifications are acknowledged and deleted.
		Switch on the display in display mode Call up next parameter in programming mode Increase displayed value by 1
		Switch on the display in display mode Call up last parameter in programming mode Reduce displayed value by 1
		Switch between programming mode and display mode Confirm values entered

Pump Display Mode





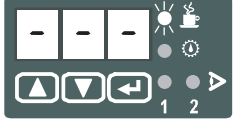


Display mode can be identified by the lit-up LED displays. The display does not flash. It is used to query the current settings and operating parameters.

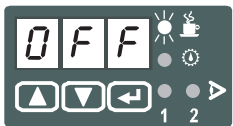
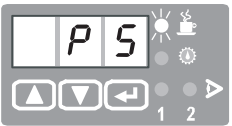

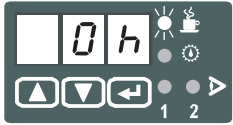


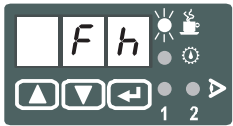


Always start the display mode by briefly pressing one of the two keys (▲)(▼).



WL1300156

Figure 168 Display

Step	Key	Display
1	▲ ▼ Press briefly	 The current operating status is shown Example: Timer operation pause
2	▲	 Display remaining interval time for current lubrication cycle. Example: 1 h
3	▲	 Display preset total interval time. Example: 2.6 h (factory setting) Display is in hours
4	▲	 Display pump cycle Example: Timer operation
5	▲	 Example: System is currently in operating status Pause, current tCO display (timer contact) not possible
6	▲	 Display the preset value Example: 9.5 min. (factory setting) Display is in minutes
7	▲	 Display system monitoring

Step	Key	Display
8	▲	 Monitoring switched off (factory setting) or  Monitoring by piston detector  Not permitted for progressive systems.
9	▲	 Display operating hours
10, 11	▲	 Example: 1st part of total value Write down. +  2nd part of total value Total value: 00533.8 h Maximum value: 99999.9 h
12	▲	 Display fault hours
13, 14	▲	 Example: 1st part of total value Write down. +  2nd part of total value Total value: 00033.8 h Maximum value: 99999.9 h
	▲	Display clears Oh and Fh values are stored in EEPROM and cannot be deleted.

Pump Programming








The working/interval times can be reprogrammed to adapt the lubrication intervals and the resulting lubricant quantities to specific requirements.



Start Programming Mode

NOTE: *Programming mode can be identified by the flashing LED displays.*

Change Lubrication Interval Times

NOTE: *If the 000 factory setting has been changed, the current code must be selected using the ▲ ▼ keys and confirmed using the ↵ key.*


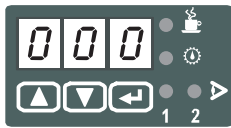





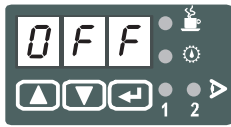





Step	Key	Display
1	↵ Press for more than 2s	 Display flashes (000 = factory setting)
2	↵ Press briefly (confirm code)	 Automatic display of first parameter: "pause in timer operation" "PAUSE" LED flashes
3	↵ Press briefly	 Interval time 1 h (factory setting) (display in hours)
4	▲ ▼	 Set new value Example: 6.8 h = 6 h 48 min.
5	↵ Press briefly (confirm new value)	 Display next parameter "pump cycle time in timer operation" "CONTACT" LED flashes
6	↵ Press briefly	 Pump cycle time 4.0 min. (factory setting) Note the operating mode/set duration (display in minutes)
7	▲ ▼	 Set new value Example: 3 min.

Step	Key	Display
8	 Press briefly (confirm new value)	
9	 Press for more than 2s	Changes are written to memory, the values are activated and the display clears.

Configure System Monitoring

System monitoring can be changed to activate or deactivate the monitoring functions for lubrication.


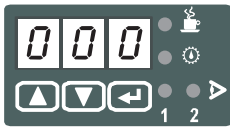





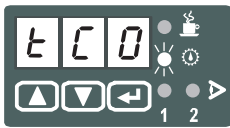




When system monitoring is active, you can select monitoring by piston detector on progressive systems or monitoring by pressure switch on single-line systems.

Step	Key	Display
1	 Press for more than 2s	 Display flashes (000 = factory setting)
2	 Press briefly (confirm code)	 Automatic display of first parameter: "pause in timer operation" "PAUSE" LED flashes
3	 Press until:	 Beginning of monitoring settings is displayed
4	 Press briefly	 System monitoring switched off (factory setting)
5	 Press either until	 Monitoring by piston detector "CS" LED flashes
		 Not permitted for progressive systems!
6	 Press briefly	Confirm new setting
7	 Press for more than 2s	New settings are written to memory, the valves are activated and the display clears

Change Operating Modes

A change of operation mode means changing to timer operation, counter operation or special applications.

Please refer to Pump Display Mode for further information.

Step	Key	Display
1	 Press for more than 2s	 Display flashes (000 = factory setting)
2	 Press briefly (confirm code)	 Automatic display of first parameter: "pause in timer operation" "PAUSE" LED flashes
3		 Change from interval time to counter operation (only possible with external electrical pulse generator) Values in pulses
4	 Press briefly to confirm counter operation	 Display pump cycle time in timer operation
5		 Change from pump cycle time to counter operation, special application
6	 Press briefly	Confirm new setting
7	 Press for more than 2s	New settings are written to memory and the display clears



NOTICE

This factory default code is now deleted and the new value is valid. Write down the new value and store it in a safe place. The parameters cannot be programmed if the code is lost or forgotten.



NOTICE

Do not enter the digits 321 as the new code.

Step	Key	Display
1	 Press for more than 2s	 Display flashes (000 = factory setting)
2	 Press briefly (confirm code)	 Key number is selected (321 = factory default setting)
3	 Press briefly (confirm key)	 Display flashes (000 = factory setting)
4	 Press briefly (confirm code)	 Display flashes
5	 Press either until	 new code is set Example: 666 NOTE: Do not enter 321.
6	 Press briefly	Confirm new code
7	 Press for more than 2s	New code is written to memory and the display clears

Programming Ranges

Function	Programming Ranges*
Interval Time	0.1 h to 99.9 h
Pump Cycle Time	0.1 min. to 99.9 min.
Pulses	1 to 999

Display Ranges

Function	Display Ranges
Fault Hours	0.1 h to 99999.9 h
Operating Hours	0.1 h to 99999.9 h

Maintenance



WARNING

AVOID DEATH OR SERIOUS INJURY

Work on products that have not been de-energized can result in bodily injury. Assembly, maintenance and repair work may only be performed on products that have been de-energized by qualified technical personnel. The supply voltage must be switched off before opening any of the product's components.



WARNING

AVOID DEATH OR SERIOUS INJURY

Centralized lubrication systems are pressurized during operation. Centralized lubrication systems must therefore be depressurized before starting assembly, maintenance or repair work, or any system modifications or system repairs.



WARNING

AVOID DEATH OR SERIOUS INJURY

The described product is pressurized during operation. The product must therefore be depressurized before starting assembly, maintenance or repair work, or any system modifications or system repairs.

The Lubrication Systems is low-maintenance. However, all connections and fittings must be regularly inspected for proper seating to ensure proper function and to prevent hazards from arising.

If necessary, the product can be cleaned using mild cleaning agents that are compatible with the product's materials (non-alkaline, non-soap). For safety reasons, the product must be disconnected from the power supply and the hydraulic and/or compressed air supply.

It must be ensured that no cleaning agent enters the interior of the product during cleaning.

It is not necessary to clean the interior of the product if the product is operated normally and intercompatible lubricants are used.

The interior of the product must be cleaned if incorrect or contaminated lubricant is accidentally filled into the product. If this occurs, contact the Service department of HD HYUNDAI CONSTRUCTION EQUIPMENT.



NOTICE

Dismantling of the product or individual parts thereof within the statutory warranty period is not permitted and voids any claims.



NOTICE

Only original spare parts from HD HYUNDAI CONSTRUCTION EQUIPMENT may be used. Arbitrary alterations to products and the use of non-original spare parts and accessories are not permitted and nullify the statutory warranty.

General Information


The following maintenance table contains an overview of the inspections and maintenance work that must be performed regularly.

The maintenance intervals depend on customer-specific settings and operating conditions. The customer is therefore responsible for determining and observing the maintenance intervals on its own.



NOTICE

All work beyond this scope must be performed by authorized Service establishments.


Maintenance Work	Action	Interval
Check of fill level in lubricant reservoir	Refill if necessary.	Depends on planned lubricant consumption
Inspection of system components (lubricant lines, connection points, seals, etc.) for leaks	Parts that exhibit leaks must be replaced. Please contact to service office.	After each refill of the lubricant reservoir or after long operational pauses before commissioning the machine/vehicle
Visual inspection of bearings' lubrication	In case of insufficient bearing lubrication, a fault in the lubrication system or incorrect system configuration is the probable cause. Observe the instructions contained in these operating instructions. If necessary, contact to service office.	In conjunction with lubrication reservoir filling
Check of basic function of control unit and system components	To inspect the basic functions, trigger an interim lubrication by pressing the  key	After each lubrication reservoir filling
Inspection of electrical cables for damage	Damaged cables must be replaced. Please contact to service office.	After long operational pauses before commissioning the machine/vehicle
Inspection of electrical connections and contacts for firm attachment and corrosion	Tighten loose contacts. Clean any corroded electrical contacts with a wire brush, then apply a small amount of contact grease after installation	Semi-annual

Troubleshooting

Operational Malfunctions

The operator/operating personnel must perform visual fill level control of the lubricant reservoir at regular intervals. The control intervals depend on the amount of lubricant required and the pump's run time. The operator/operating personnel must therefore determine the intervals on their own based on the specific conditions of usage.




If the reservoir has been emptied, the entire system must be ventilated after refilling (see assembly instructions).

All fault notifications are displayed by the LEDs  as a centralized fault notification. When a fault notification is issued, the control unit stops the normal operational sequence and the fault that has occurred is saved and displayed.


The cause of the fault can be read on the display. This greatly simplifies failure diagnostics, though it requires system monitoring.

Display Faults

- Start the display mode with one of the two keys ▲ ▼
- Press the ▲ key until you reach the fault notification (see the following table)

Display	Explanation
	Fault Cycle Switch: No signal from piston detector during pump cycle (See "Pump Display Mode" on page 3-83.)
	Fault Pressure Switch: No signal from pressure switch during pump cycle. (Not applied to HD HYUNDAI CONSTRUCTION EQUIPMENT auto grease system)
	Fault Low Level: The level in the reservoir has fallen below the minimum fill level. The further operational sequence has been stopped.

Delete fault notification

All fault notifications can be acknowledged and deleted using the  key.

In timer operation, this can also be performed using an external push button, if installed.



NOTICE

Determine and remedy the cause of faults before deleting fault notifications. The user is liable for damages resulting from operating the machine without lubrication.







NOTICE

The time during which the control unit and pump unit have been operated without lubrication is stored as fault hours Fh in the EEPROM and cannot be deleted.

Fault Types

Depending on the severity of the fault, the control unit issues either a warning or a malfunction notification (see the following table).

Fault Type	Definition	Display	Example of Fault	Response by Control Unit
Warning	A problem has occurred that does not affect the operational sequence but can lead to an operational malfunction if not remedied.	 LED light turns "ON" and remains constant	The fill level in the reservoir sinks to the level of the pre-warning sensor (only on systems equipped and configured with this functionality).	<ul style="list-style-type: none">• The  LED flashes.• A fault notification is generated.• Operation continues as normal.
Malfunctions	<p>A fault has occurred that affects the proper functioning of the lubrication system.</p> <p><i>Note: The lubrication points may not be supplied with adequate lubrication because a malfunction has affected the proper functioning of the lubrication system.</i></p> <p><i>Malfunctions must always be remedied immediately.</i></p>	 LED flashes	Insufficient number of piston detector signals from a lubrication zone during the pump cycle	<ol style="list-style-type: none">1. Block operation up to configured number of repetitions.2. If the piston detector signal has still not been received, the valve is closed and a fault notification is generated. <p>The  LED light turns "ON".</p>

Recording Fault Times

Fault-state Counter

The amount of time that passes from issuance of a failure notification to its acknowledgment is added up in hours. After acknowledgment, this value is automatically transferred to the fault-hours counter.

Fault-hours Counter

The fault-hours counter adds up all fault-state times occurring during the total running time of the unit. The current counter reading can be read in display mode in two blocks of three digits each by calling up the parameter Fh. See "Three-digit LED Display" on page 3-80.

The maximum reading that can be displayed is 99 999.9 hours. The smallest recordable interval is 0.1 hours = 6 minutes. The memory cannot be deleted.

Maintenance and Repair

The following maintenance and repair work must be performed regularly:

- Inspect fill level in lubricant reservoir.
- Regularly inspect system components for leaks.
- Visually inspect lubrication of bearings.
- Inspect electrical cables for damage.
- Inspect electrical connections and contacts.
- The basic function of the control unit and system components can be inspected by triggering an interim lubrication.
- Inspect electrical connections in case of malfunction notifications.
- Replace defective fuses with new fuses of the same performance and characteristics.

The purity of the lubricants used is the decisive factor in the service life of the pump elements.

Malfunctions on Pump Unit in Progressive System

Block Operation

Block operation is the reaction of the control unit to the absence of signals from the piston detector.

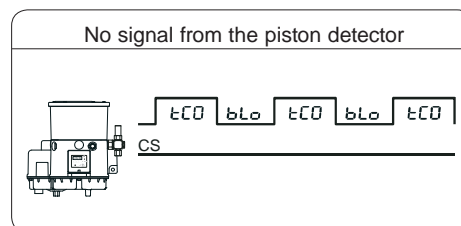
Possible Causes:

- Defective lubrication lines
- Blocked progressive feeder
- Defective piston detector
- Insufficient lubricant

No Signal from Piston Detector During Pump Cycle:

- Normal operation is interrupted.
- Block pause begins with query to piston detector.
- No signal from piston detector during block pause:
- Second lubrication cycle begins in block operation.

As soon as a signal is received from the piston detector, block operation is aborted and the normal lubrication cycle starts with a pause.



WL1300071



NOTICE

A total of three lubrication cycles are performed with query to the piston detector.

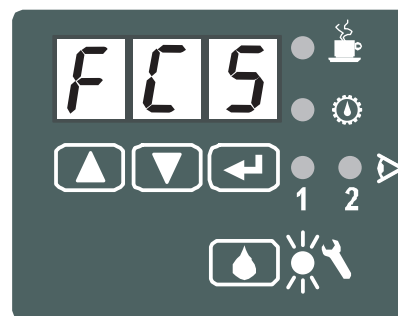
Three pump cycles and two block pauses without signal from the piston detector:

Block operation is aborted Malfunction notification is issued.

Duration of Block Pause	
Pause tPA Block Pause	Normal Operation Block Pause
0.1 h	6 min.
0.2 h	12 min.
0.3 h and longer	15 min.

- Determine and remedy cause of fault



Figure 169



WL1300072

Figure 170 Fault notification on device display

Malfunctions on Pump Units

Fault	Category	Possible Cause	Rectification
Pump Agitator in grease reservoir does not rotate during the activated pump cycle (CONTACT mode).	Malfunctions	<ul style="list-style-type: none"> Mechanical damage, e.g., motor defective Under voltage Electrical connection interrupted 	<ul style="list-style-type: none"> Replace pump <ul style="list-style-type: none"> Loosen main line at outlet of pressure regulating valve. Loosen electrical connection. Loosen three fastening screws. Remove defective pump. Mount new pump and connect lubrication line and electrical cable. Perform commissioning and functional inspection. Be sure the interval and contact times are correct. Check or replace fuse. Check electrical connections Check cable set for damage.
Pump does not function when the  key is pressed, although all electrical connections are OK.	Malfunctions	<ul style="list-style-type: none"> Electrical control has failed. Pump drive/motor is defective. Lubricant level in reservoir is below minimum. Agitator does not rotate. 	<ul style="list-style-type: none"> Check fuse Replace pump Fill lubricant reservoir to "max". Replace pump element. <i>Note: Metering is indicated by grooves.</i>
Pump does not deliver any lubricant, although agitator is rotating.	Malfunctions	<ul style="list-style-type: none"> Suction problems because of air pockets in grease. Pump element does not build up pressure, pump element is worn out. (This is indicated when the outlet can be closed with a finger once the main line is removed.) Lubricant too stiff 	<ul style="list-style-type: none"> Dismantle pump element and operate pump using  key until grease discharges from outlet on housing. Replace pump element. <i>Note: Metering is indicated by grooves.</i> If necessary, adjust lubricant to work properly at lowest working temperature.

Fault	Category	Possible Cause	Rectification
Pressure regulating valve on pump opens and lubricant discharges.	Malfunctions	<ul style="list-style-type: none"> • System pressure is over 200/300 bar, e.g., because of feeder blockage or blocked lubrication point. • Valve is damaged or contaminated, so it does not close properly. 	<ul style="list-style-type: none"> • Check system and repair/rework the system so the maximum system pressure at 20°C is 200 bar. • Replace pressure regulating valve.

Inspection, Maintenance and Adjustment

Maintenance Information

This section deals with information for 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.

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 for Leaks in Fuel System

Perform an inspection of engine compartment to verify that fuel system is not leaking. If any is noted, determine source of leak and repair.

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.

Welding Instructions

- Disconnect battery only when LED light is OFF after engine is turned OFF.

- Do not apply more than 200 V continuously.
- Connect grounding cable within 1 m (3.3 ft) of area to be welded. If grounding cable is connected near instruments, connectors, etc., instruments can be damaged.
- If a seal or bearing happens to come between part being welded and grounding point, change grounding point to avoid these types of parts.
- Do not use area around work equipment pins or hydraulic cylinders as grounding point.

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.
- Replace fuel filter more frequently.
- Clean electrical components, especially starting motor and alternator, 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.

Never mix different brands or grades of oil.

Locking Inspection Covers

Lock inspection cover securely into position with lock bar. If inspection or maintenance is performed with inspection cover not locked in position, it could fall and cause 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 4-99.

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

Perform checks after inspection and maintenance to prevent operation problems. Always do the following:

- 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? If parts are dropped inside the machine and get caught in lever linkage mechanism, and this could cause improper operation of 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 4-4 and pay careful attention to safety.
 - Are inspection and maintenance items working properly?
 - Is there any leakage of fuel or oil when engine speed is raised?

Coolant, Oil, Fuel - Drain and Change

The engine must be turned off when draining, replacing, or adding fluid to the machine.

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.

Machine Setup Position for Maintenance

Before beginning any service work, park the machine using the following procedure (except for service work requiring the machine to be positioned differently).

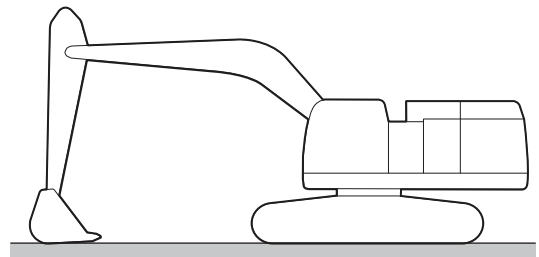
1. Position the machine on even, firm and level ground.
2. Put attachment on ground.
3. Move safety lever to "LOCK" position.
4. Allow engine to run at "LOW IDLE" for a minimum of five minutes to allow engine to cool, If this is not done, heat surge can occur.
5. Stop engine by turning key to "O" (OFF) position. After releasing hydraulic system and tank pressure, remove starter switch key.
6. Before starting maintenance work, place a "DO NOT OPERATE" Warning Tag on cabin door or work lever.



WARNING

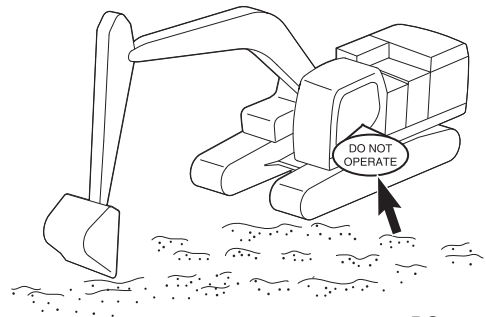
AVOID DEATH OR SERIOUS INJURY

If engine must be running while performing maintenance, use extreme care. Always have one person in cabin at all times. Never leave cabin with engine running.



DS1701100

Figure 1



DS1701250

Figure 2

Handling Oil, Fuel, DEF (AdBlue®), Coolant

Oil

- Oil is used in the engine and hydraulic equipment under extremely severe conditions (high temperature, high-pressure, etc.) and deteriorates with use. Always use oil that matches the grade and maximum and minimum ambient temperatures recommended in this manual. 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.

Fuel

To ensure good fuel consumption characteristics and exhaust gas characteristics, the engine mounted on this machine uses an electronically controlled high-pressure fuel injection device. This device uses high precision parts and lubrication. If low viscosity fuel with reduced lubricating ability is used, the durability of the fuel injection device could be affected.

- To prevent moisture in air from condensing and forming water inside fuel tank, always fill fuel tank after completing day's work.
- The fuel pump is a precision instrument and if fuel containing water or dirt is used, it cannot work properly.
- Be careful not to let impurities get in when storing or adding fuel.
- Always use fuel specified for temperature given in this manual.

- If fuel is used at temperatures lower than specified temperature (particularly at temperatures below -15°C (5°F), the fuel will gel-up and solidify.
- If fuel is used at temperatures higher than specified temperature, the viscosity will drop, and this can cause performance problems.
- Before starting engine, or when 10 minutes have passed after adding fuel, drain sediment and water from fuel tank.
- If engine runs out of fuel, or if filters have been replaced, it is necessary to bleed air from circuit.
- If there is any foreign material in fuel tank, wash tank and fuel system.



NOTICE

This machine is equipped with an exhaust aftertreatment system, which requires the use of ultra low sulfur diesel (ULSD) fuel.

For ULSD, please use a Diesel with a specification specific to your country, as the adoption specification differs by country.

North America (ASTM D975) : 0.0015% (Sulfur \leq 15 ppm (mg/kg))

Europe (EN 590) : 0.0010% (Sulfur \leq 10 ppm (mg/kg))

- Using fuels of higher sulfur level can have the following negative effects:
- Shorten the time interval between aftertreatment device service intervals (cause the need for more frequent service intervals)
- Adversely impact the performance and life of aftertreatment devices (cause loss of performance)
- Reduce regeneration intervals of aftertreatment devices
- Reduce engine efficient and durability
- Increase the wear.
- Increase the corrosion.
- Increase the deposits.
- Lower fuel economy.
- Shorten the time period between Oil drain intervals (more frequent oil drain intervals)
- Increase overall operating costs.

Failures that result from use of improper fuels are not HD HYUNDAI CONSTRUCTION EQUIPMENT factory defects. Therefore the cost of repairs would not be covered by a HD HYUNDAI CONSTRUCTION EQUIPMENT warranty.

Grease

- 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.
- Always wipe off all old grease that is pushed out when greasing.

Wipe off old grease where sand or dirt sticking in the grease can cause wear of rotating parts.

Coolant and Water for Dilution

- The coolant has the important function of preventing corrosion and preventing freezing.
Even in areas where freezing is not an issue, use of antifreeze coolant is essential.
HD HYUNDAI CONSTRUCTION EQUIPMENT machines are supplied with HD HYUNDAI CONSTRUCTION EQUIPMENT coolant. HD HYUNDAI CONSTRUCTION EQUIPMENT coolant has excellent anticorrosion, antifreeze and cooling properties and can be used continuously for 1 year or 2,000 hours. Therefore, it is recommended to use authorized genuine HD HYUNDAI CONSTRUCTION EQUIPMENT antifreeze solution.
- When diluting antifreeze coolant, use distilled water.
Natural water, such as a river water or well water (hard water), contains large amounts of minerals (calcium, magnesium, etc.), and this makes it easier for scale to form inside engine or radiator. Once scale is deposited inside engine or radiator, it is extremely difficult to remove.
If tap water needs to be used, refer to "Engine Cooling System" on page 4-90 for further information on standards and precautions.
- When using antifreeze, always observe precautions given in this manual.
- Antifreeze coolant is flammable, so be sure to keep it away from any flame.
- The ratio of HD HYUNDAI CONSTRUCTION EQUIPMENT coolant to water differs according to ambient temperature.
For details of ratio when mixing, see "Antifreeze Concentration Tables" on page 4-92.
HD HYUNDAI CONSTRUCTION EQUIPMENT coolant may be supplied premixed. Never add distilled water.
- If engine overheats, wait for engine to cool before adding coolant.
- If coolant level is low, it will cause overheating and corrosion problems because of air entering coolant.

- Never mix lime (hard water), salt or water contained metal material with coolant.
- If a HD HYUNDAI CONSTRUCTION EQUIPMENT pure antifreeze is not available, the antifreeze specification provided on the "Type of anti-freeze" page must be used.

Filters

- Filters are extremely important safety parts. They prevent impurities in hydraulic oil, fuel and air circuits from causing problems.

Replace all filters periodically. See details given in "Lubrication and Service Chart" on page 4-13.

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.

Electrical System Maintenance

- If electrical equipment becomes wet or covering of wiring is damaged, this will cause an electrical short circuit and result in improper machine operation. Do not wash inside of operator's cabin with water. When washing the machine, be careful not to let water get into electrical components.
- Service relating to the electrical system is: checking damage or wear to the fan belt, and checking battery electrolyte level.
- Never install any electric components other than those specified by HD HYUNDAI CONSTRUCTION EQUIPMENT.
- External electromagnetic interference can cause malfunction of the control system controller. Before installing a radio receiver or other wireless equipment, contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor to prevent electromagnetic interference.
- When working in saltwater areas or in or around snow, carefully clean the electrical system to prevent corrosion.
- When installing electrical equipment, connect it to the special power source connector. See "4. 12V Power Socket" on page 2-15 or "5. 24V Power Socket" on page 2-16.

Do not connect the optional power source to a fuse, starter switch, or battery relay.

Recommend Fuel, Coolant, and Lubricant

- Lubrication is an important part of preventive maintenance. To keep your machine in the best condition for long periods of time, it is essential to follow the instructions given in this manual.
- Failure to follow these recommendations can result in shortened life or excess wear of the engine, power train, cooling system, and/or other components.
- Commercially available lubricant may be good for the machine, but it can also cause harm. HD HYUNDAI CONSTRUCTION EQUIPMENT does not recommend any commercially available lubricant additive.
- When starting the engine in temperatures below 0°C (32°F), be sure to use recommended multigrade oil, even if the ambient temperature may become higher during the course of the day.
- If the machine is operated at temperatures below -20°C (-4°F), a separate device is needed, so discuss with HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.
- Only use Ultra Low Sulfur Diesel (ULSD) fuel and API CI-4 grade engine oil.

Lubrication

Lubrication is an important part of preventive maintenance. If the machine is lubricated in a specified way, the life of equipment and components can be considerably extended. The "Lubrication and Service Chart" on page 4-13 makes lubrication work much easier and reduces the risk of forgetting lubrication intervals.




















NOTICE

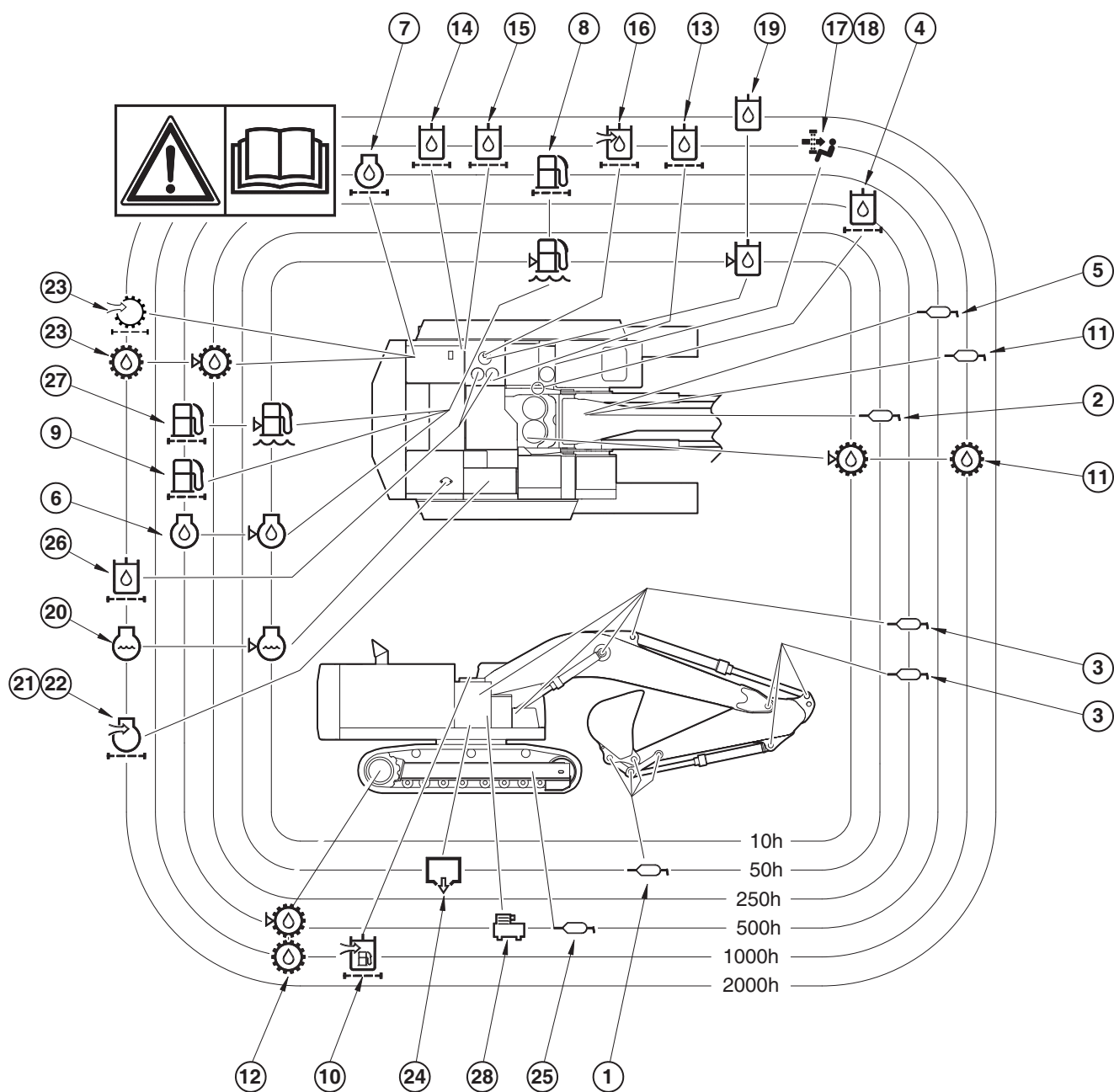
Wipe off grease fittings and grease gun before greasing to prevent sand and dirt particles from penetrating into components.

Symbols for "Lubrication and Service Chart"

The lubrication and service chart is on the left side door of cabin.
The symbols used in the lubrication and service chart are illustrated in the following table.

Symbol	Description	Symbol	Description
	Lubrication		Air Cleaner Filter
	Gear Oil (Swing Device, Travel Device, Pump Drive)		Fuel Filter
	Pump Drive Air Breather Cartridge		Water Separator
	Engine Oil		Air Conditioner Filter
	Engine Oil Filter		Drain Water
	Hydraulic Oil		Fuel Cap Filter
	Hydraulic Oil Filter		Level Check
	Hydraulic Oil Tank Breather		Air Compressor Filter
	Coolant		

Lubrication and Service Chart



DS2103274

Figure 3

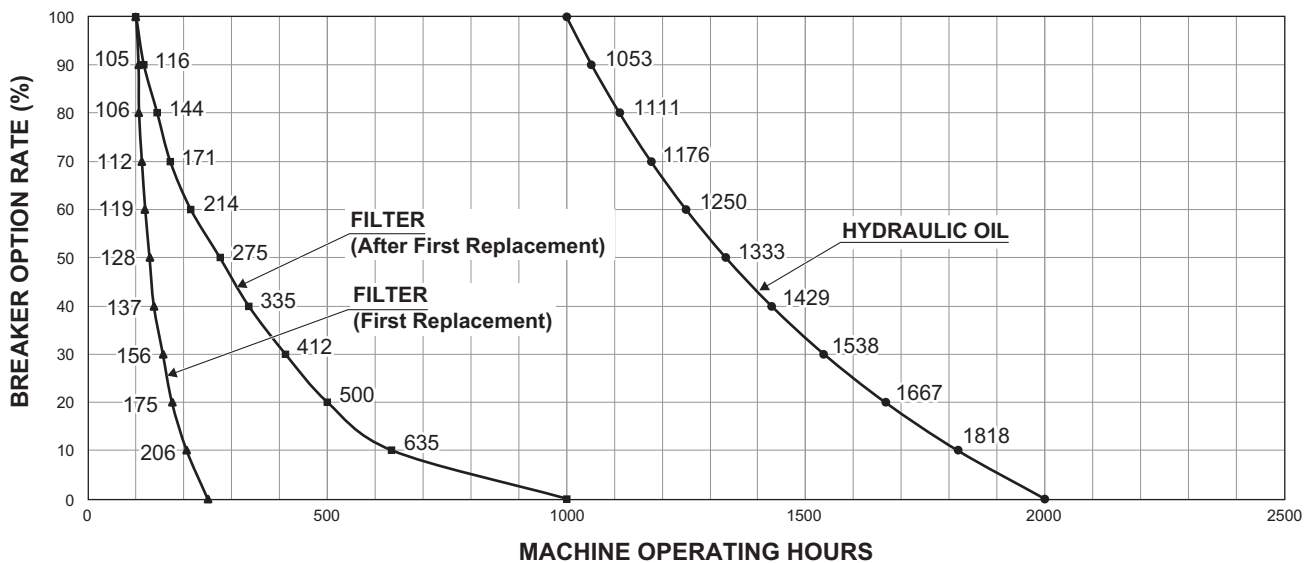
SERVICE DATA									
No.	Items to Check	Service	Qty.	Service Interval (hr)					
				10	50	250	500	1000	2000
1	Arm, Bucket Joint Pin	Grease	6	F100	W10, V				
2	Swing Bearing	Grease	5		W10, V				
3	Boom, Arm Joint Pin	Grease	11	F100		W10, V			
4	Breaker Filter (If Equipped)	Cartridge	1						
5	Swing Gear and Pinion	Grease	1				W10		
6	Engine Oil	Engine Oil	65 L	V					
7	Engine Oil Filter	Cartridge	1						
8	Fuel Prefilter and Water Separator	Cartridge	2	D					
9	Main Fuel Filter	Cartridge	2						
10	Fuel Cap Filter	Element	1						
11	Swing Reduction Gear	Grease	2					W10, V	
		Gear Oil	2 x 8 L	V			F		
12	Travel Reduction Gear	Gear Oil	2 x 25 L	V			F		
13	Hydraulic Oil Return Filter	Element	3			F			
14	Pilot Filter	Element	1			F			
15	Drain Filter	Element	2			F			
16	Hydraulic Oil Tank Breather	Element	2						
17	Air Conditioner Filter (Outer)	Element	1				C		
18	Air Conditioner Filter (Inner)	Element	1				C		
19	Hydraulic Oil Tank	Hydraulic Oil	533 L	V					
20	Radiator	Coolant (with Diesel Heater)	98.8 (99.1) L + SCA 1L	V					
21	Air Cleaner (Outer)	Element	1				C		
22	Air Cleaner (Inner)	Element	1						
23	Pump Drive	Gear Oil	9.5 L			F		V	
		Air Breather Cartridge	1						
24	Fuel Tank	Diesel	1,138 L	V	D				
25	Track Spring	Grease	2				W10, V		
26	Hydraulic Oil Suction Strainer	Strainer	2						C
27	Additional Water Separator	Strainer	1	D			C		
28	Air Compressor Filter (If Equipped)	Element	1				C		
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 4-21.									
NOTE: This capacity may include the tank (reservoir), lines, pipes and components and attachment. Observe all sight gauge and level indicators in order to ensure that the systems and compartment are refilled to the proper level.									

SERVICE DATA									
No.	Items to Check	Service	Qty.	Service Interval (hr)					
				10	50	250	500	1000	2000
	Radiator Core	Core	1				C		
	Fuel Cooler Core	Core	1				C		
	Oil Cooler Core	Core	1				C		
	Intercooler Core	Core	1				C		
	Aircon Condenser Core	Core	1				C		
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 4-21.									
NOTE: This capacity may include the tank (reservoir), lines, pipes and components and attachment. Observe all sight gauge and level indicators in order to ensure that the systems and compartment are refilled to the proper level.									

Hydraulic Oil and Filter Service Intervals

When using a hydraulic breaker, the viscosity breakdown and contamination of hydraulic oil is faster because the work condition is more severe than during normal digging work. To prevent the hydraulic components (especially pump) from having a shortened life cycle, replace the hydraulic oil and main hydraulic oil return filter using the following schedule.

Attachment	Operation Rate	Hydraulic Oil	Filter
Bucket Work	100%	2,000 Hours	250 Hours (First Replacement) 1,000 Hours (After First Replacement)
Hydraulic Breaker Work	100%	1,000 Hours	100 Hours
* These service intervals only apply, when genuine HD HYUNDAI CONSTRUCTION EQUIPMENT hydraulic oil and filter are used. If any other brands are used, the guaranteed change interval must be reduced in half.			



DS2201975

Figure 4

NOTE: The replacement intervals of hydraulic oil and filter depend upon amount of time hydraulic breaker is being used. These service intervals must be followed as opposed to regularly scheduled maintenance.

Fluid Capacities

Component			Capacity
Engine	Oil Pan with Filter		65 L (17.2 U.S. gal.)
	Cooling System	Non Diesel Heater	98.8 L + SCA 1L (26.1 U.S. gal.)
		With Diesel Heater	99.1 L + SCA 1L (26.2 U.S. gal.)
Fuel Tank			1,138 L (300.6 U.S. gal.)
DEF (AdBlue®) Tank			47 L (12.4 U.S. gal.)
Hydraulic Oil	Tank Level		533 L (140.8 U.S. gal.)
	System		881 L (232.7 U.S. gal.)
Travel Reduction Gear (Each)			25 L (6.6 U.S. gal.)
Swing Reduction Gear (Each)			8 L (2.1 U.S. gal.)
Pump Drive Gear			9.5 L (2.5 U.S. gal.)

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 oil.*

Table of Recommended Lubricants



NOTICE

It is highly recommend to use HD HYUNDAI CONSTRUCTION EQUIPMENT Genuine Products or products which meet the following specifications. Using other products can damage the equipment.

NOTE: Refer to the "Lubrication and Service Chart" on page 4-13 for locations.

Reservoir	Kind of Fluid	Ambient Temperature											
		-58	-40	-22	-4	14	32	50	68	86	104	122 °F	
		-50	-40	-30	-20	-10	0	10	20	30	40	50 °C	
Engine Oil Pan	5) Engine Oil												
Swing Drive Case	Gear Oil												
Final Drive Case													
Pump Drive													
Hydraulic Oil Tank	6) Hydraulic Oil												

Fuel Tank	Diesel Fuel						1) ASTM D975 No. 2				
							ASTM D975 No. 1				
Grease Fitting	Grease						DIN 51502 KP-1K-30 / NLGI No.1				
							DIN 51502 KP-2K-10 / NLGI No.2				
							DIN 51502 KP-3K-10 / NLGI No.3				
Cooling System	Coolant	Add Antifreeze 1) (50% antifreeze - 50% distilled water) (Note that mixing ratio is for reference purpose only, and is not an absolute standard.) Make sure to use HD HYUNDAI CONSTRUCTION EQUIPMENT's genuine antifreeze. If HD HYUNDAI CONSTRUCTION EQUIPMENT's genuine antifreeze is not available, see the "Type of Antifreeze" page.									
1) Installed at factory.											
2) (5W40) - Recommended for use at extremely low temperature below -20°C.											
3) (10W40) - Filled at factory. HD HYUNDAI CONSTRUCTION EQUIPMENT genuine engine oil is recommended for use.											
4) (15W40) - HD HYUNDAI CONSTRUCTION EQUIPMENT genuine engine oil is recommended for use.											
5) (Engine oil) - Engine oil must meet API CJ-4/ACEA E9.											
6) Note that oil grade is for reference purpose only, and is not an absolute standard.											
API: American Petroleum Institute.											
ACEA: Association des Constructeurs Européens d'Automobiles.											
ASTM: American Society of Testing and Materials.											
ISO: International Organization for Standardization.											
NLGI: National Lubricating Grease Institute.											
SAE: Society of Automotive Engineers.											
DIN: Deutsche Industrie Normen											



NOTICE

Do not mix oils from different manufacturers. HD HYUNDAI CONSTRUCTION EQUIPMENT does not endorse specific brands but recommends that owners select quality oils whose manufacturers provide assurance that required standards will always be met or exceeded.

Fluctuating daily or weekly extremes of temperature, or operation in subzero freezing temperatures, may make it impractical to use straight weight lubricants. Select lubricants that are appropriate for climate conditions.



NOTICE

We recommend using genuine HD HYUNDAI CONSTRUCTION EQUIPMENT products for the grease applied to this equipment.

In areas where the use of genuine products is restricted, greases of at least the following specifications should be used.

- **DIN 51502 Specification**
 - Extreme Cold Area : KP-1K-30 / NLGI No. 1
 - Normal Area : KP-2K-10 / NLGI No. 2
 - Extreme Heat Area : KP-3K-10 / NLGI No. 3
- **EP (Extreme Pressure) Specification**
 - Normal : 250 kgf or more
 - Front Pin-Bush : 315 kgf or more

Maintenance Intervals

SERVICE ITEM	PAGE
10 Hour / Daily Service	
Boom, Arm and Front Attachment Pins - Lubricate	4-24
Engine Oil Level - Check	4-24
Hydraulic Oil Level - Check	4-25
Fuel Level - Check	4-27
Fuel Prefilter and Water Separator - Check	4-28
Additional Water Separator - Check	4-29
Swing Reduction Gear Oil Level - Check	4-30
Dust Net - Clean	4-31
Coolant Level - Check	4-32
Travel Reduction Gear Oil - Check	4-33
Window Washer Liquid Level - Check	4-33
Bucket Teeth and Side Cutters - Inspect	4-34
Cooling Fan Blade - Inspect	4-34
Air Intake System and Emission Control System - Check	4-35
Seat Belt - Inspect	4-35
AVM (Around View Monitoring system) - Check	4-35
Mirrors - Check	4-36
Structure - Inspect	4-36
All Switches and Travel Alarm (If Equipped) - Check	4-36
Safety Lever - Check	4-36
Exterior Lights, Horn, Control Console Indicator, Gauge Panel - Check	4-37
Overall of Engine Condition - Check	4-37
All Controls and Linkages - Check	4-38
50 Hour / Weekly Service	
Perform All Daily Service Checks	4-39
Arm and Bucket Joint Pins - Lubricate	4-39
Swing Bearing - Lubricate	4-40
Fuel Tank Water and Sediment - Drain	4-40
Air Compressor and Tank - Check	4-41
Engine Fan Belt - Check	4-41
Track Assemblies (Links, Shoes, Rollers, Idlers) - Inspect	4-41
250 Hour / Monthly Service	
Perform All Daily and 50 Hour Service Checks	4-42
Boom and Arm Joint Pins - Lubricate	4-42
Engine Fan and Alternator Belts - Check	4-45
Breaker Filter (If Equipped) - Replace	4-46
Hydraulic Oil Return Filter - Replace	4-46

SERVICE ITEM	PAGE
Pilot Filter - Replace	4-46
Drain Filter - Replace	4-47
Pump Drive Gear Oil - Change	4-47
Pin and Bushings of the Front End Attachment - Inspect	4-47
Battery Fluid - Check	4-47
Bolts and Nuts - Inspect	4-47
Fuel System Hose Clamps - Inspect	4-47
500 Hour / 3 Month Service	
Perform All Daily, 50 and 250 Hour Service Checks	4-48
Track Spring - Check	4-48
Swing Gear and Pinion - Lubricate	4-48
Engine Oil and Filter - Replace	4-49
Air Compressor Filter (If Equipped) - Clean	4-51
Air-conditioning Outer Filter - Clean	4-52
Air-conditioning Inner Filter - Clean	4-53
Cooling System - Clean	4-54
Air Cleaner Outer Filter - Clean	4-55
Fuel Prefilter and Water Separator - Replace	4-57
Additional Water Separator (If Equipped) - Clean	4-58
Main Fuel Filter - Replace	4-59
Check Belt	4-60
Travel Reduction Gear Oil - Change	4-61
Swing Reduction Gear Oil - Change	4-61
Fuel Cap Filter - Replace	4-61
1,000 Hour / 6 Month Service	
Perform All Daily, 50, 250 and 500 Hour Service Checks	4-63
Swing Reduction Gear - Lubricate	4-63
Hydraulic Oil Tank Breather Filter - Replace	4-63
Hydraulic Oil Return Filter - Replace	4-64
Pilot Filter - Replace	4-65
Drain Filter - Replace	4-66
Travel Reduction Gear Oil - Change	4-67
Swing Reduction Gear Oil - Change	4-68
Pump Drive Gear Oil - Change	4-68
Air-conditioning Outer Filter - Replace	4-69
Air-conditioning Inner Filter - Replace	4-70
2,000 Hour / Yearly Service	
Perform All Daily, 50, 250, 500 and 1,000 Hour Service Checks	4-71
Air Cleaner Outer and Inner Filter - Replace	4-71
Pump Drive Gear Oil - Change	4-73

SERVICE ITEM	PAGE
Coolant - Change	4-75
Hydraulic Oil and Suction Filter - Replace	4-77
Alternator and Starter** - Check	4-79
Rubber Antivibration Shock Mounts - Check	4-79
Perform and Record Results of Cycle Time Tests	4-79
Inspect Machine to Check for Cracked or Broken Welds or other Structural Damage	4-79
Adjust Valve Clearance** - Check	4-79
Head Bolt Torques - Check	4-79
4,000 Hour / 2 Year Service	
Major Parts - Periodic Replacement	4-80
12,000 Hour / 6 Year Service	
Hose In-service Lifetime Limit (European Standard ISO 8331 and EN982 (CEN))	4-81

** These checks need to be completed by an authorized HD
HYUNDAI CONSTRUCTION EQUIPMENT distributor.

10 Hour / Daily Service

Boom, Arm and Front Attachment Pins - Lubricate

Perform a visual inspection every 10 hours for the first 100 hours and every 50 or 250 hours thereafter. If necessary, lubricate front attachment pins.

NOTE: *If the unit has been running or working in water, the front attachment must be greased on a 10 hour/daily basis.*

Engine Oil Level - Check



WARNING

AVOID DEATH OR SERIOUS INJURY

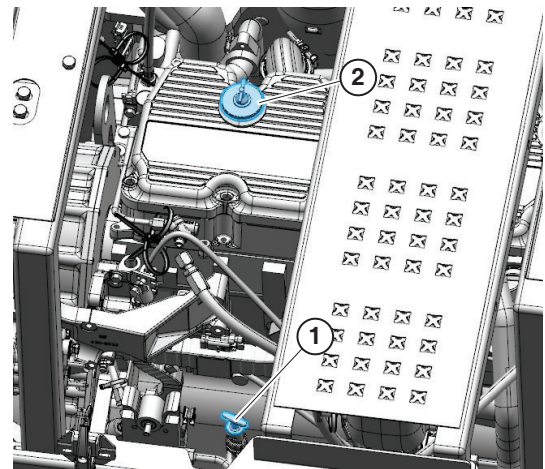
Allow engine to cool before checking oil level to avoid burn injury.

NOTE: *When checking level, use a dipstick and always remove and wipe it clean before making final level check.*

1. Stop engine and wait for fifteen minutes. This will allow all oil to drain back to oil pan.
2. Remove dipstick (1, Figure 5) and wipe the oil off with a clean cloth.
3. Insert dipstick fully in oil gauge tube, then take it out again.
4. Engine oil level must be between "HIGH" and "LOW" marks on dipstick.

NOTE: *If oil is above "HIGH" mark on dipstick, oil must be drained to return oil to proper level.*

5. Add oil through engine oil fill cap (2, Figure 5), if the oil level is below the "LOW" mark.



DS2001373

Figure 5



DS1701253

Figure 6

Hydraulic Oil Level - Check



WARNING

AVOID DEATH OR SERIOUS INJURY

The hydraulic oil will be hot after machine operation. Allow system to cool before attempting to service any hydraulic components.

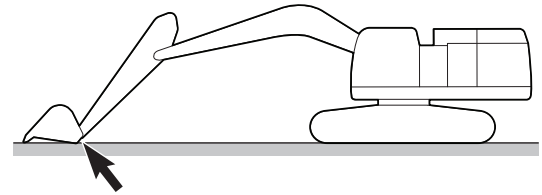
The hydraulic tank is pressurized. Tip breather cap up slowly to allow the pressurized air to vent. After the pressure has been released, remove service covers.

1. Park machine on firm and level ground. Lower boom and position bucket on ground as shown in Figure 8.
2. Move engine speed to "LOW IDLE".
3. Move safety lever to "LOCK" position.
4. Have a second person, check hydraulic oil level gauge by opening left front access door. Oil level must be between marks on sight gauge.



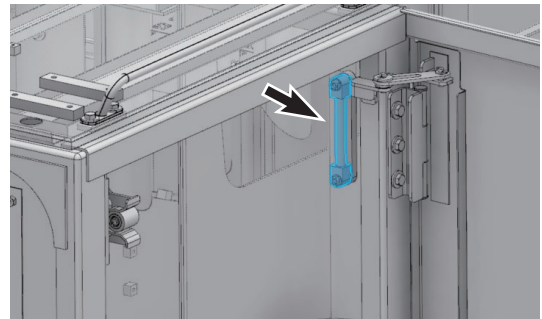
ARO1760L

Figure 7



DS1701254

Figure 8



DS2003629

Figure 9



FG020182

Figure 10

5. If the level is below "L" mark add oil.
 - A. Stop engine.
 - B. The hydraulic tank is pressurized. Tip breather cap up slowly to allow the pressurized air to vent.
 - C. Remove upper cover of the hydraulic tank and add oil.



NOTICE

Do not fill above "H" mark on sight gauge. Overfilling can result in damage to equipment and oil leaking from hydraulic tank because of expansion.



NOTICE

When refilling the oil, use the same hydraulic oil as the system is filled with.

6. If oil level is above the "H" mark drain oil.
 - A. Stop engine and wait for the hydraulic oil to cool down.
 - B. Remove the undercover at the bottom of the hydraulic oil tank.
 - C. Drain the excess oil from drain plug (Figure 12) at the bottom of the tank into an approved container, using a hose at the point (plug).



NOTICE

Dispose of waste oil/liquids in compliance with all applicable environmental laws and regulations.

Disconnect the drain hose and install the protecting cap.

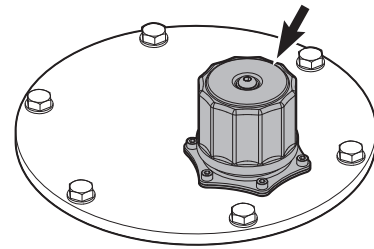


Figure 11

DS1900831

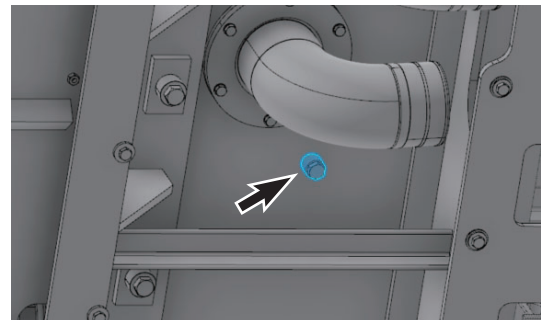


Figure 12

DS2003630

Fuel Level - Check



WARNING

AVOID DEATH OR SERIOUS INJURY

Use extreme safety precautions while refueling to prevent explosions or fire.

Immediately clean up any spilled fuel.



WARNING

AVOID DEATH OR SERIOUS INJURY

Stop engine when refueling.

Turn diesel heater "OFF" before filling fuel, to prevent a fire or explosion.

1. At end of each workday, fill fuel tank. Add fuel through fuel fill tube (1, Figure 13). When working at a temperature of 0°C (32°F) or higher, use ASTM No. 2-D or its equivalent. At temperatures below 0°C (32°F) use ASTM No. 1-D or its equivalent.
2. Make sure that fuel fill hose is grounded to the excavator before fueling begins.
3. Check the amount of fuel in tank by fuel gauge of display monitor.
4. The excavator may be equipped with the optional battery operated fuel fill pump. The pump assembly is in the hydraulic pump compartment. Put the suction hose of the pump into the fuel resupply tank. Turn the switch in the pump compartment "ON", and the fuel will be pumped into the excavator fuel tank.

NOTE: See "Fuel Transfer Pump (If Equipped)" on page 4-93, for further information.

5. Do not overfill the tank.
6. Securely tighten cap after fueling.

NOTE: If breather holes (3, Figure 14) in cap are clogged, a vacuum may form inside the tank preventing proper fuel flow to engine. Keep holes in fuel cap clean.

NOTE: Be careful not to damage the fuel level gauge on the fuel tank by allowing it to becoming stained from thinner or oil.

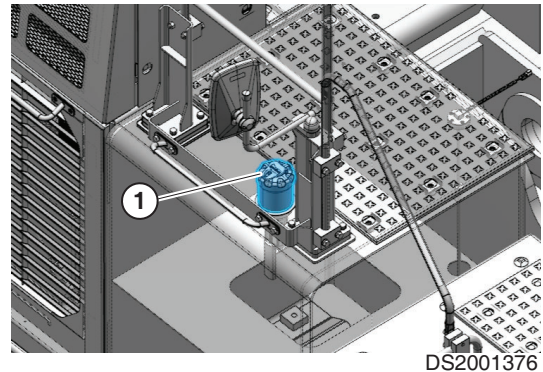


Figure 13

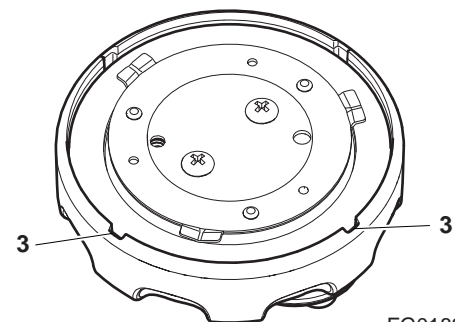


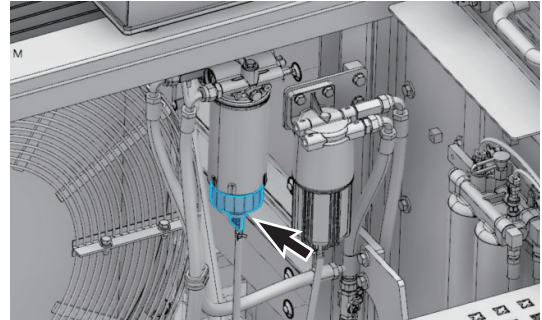
Figure 14

Fuel Prefilter and Water Separator - Check

NOTE: If water in fuel warning symbol on display monitor comes "ON", drain the collected water in fuel prefilter.

NOTE: If operator leave the machine with no measure for 30 minutes after the water in fuel warning light up, the engine power will be derated.

1. A fuel prefilter is located as shown.



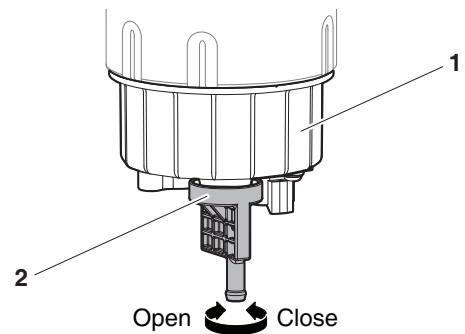
DS2003631

Figure 15

2. It is necessary to drain collected water if bowl is full of water or sediment.
3. Position a small container under fuel prefilter. Drain water or sediment by opening drain valve (2, Figure 16) on bottom of bowl (1).

NOTE: Dispose of drained fluids in compliance with all applicable environmental regulations.

4. Close drain valve.



DS1900837

Figure 16

Additional Water Separator - Check

1. A additional water separator is located as shown.

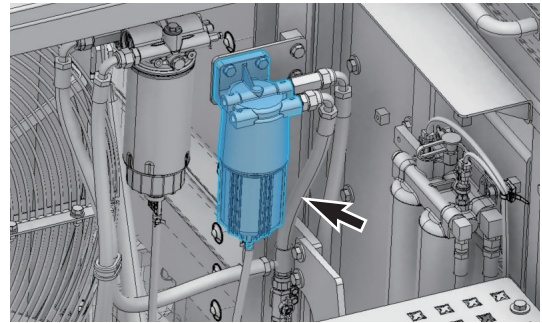


Figure 17

2. It is necessary to drain the collected water if the bowl is full of water or sediment.
3. Position a small container under additional water separator. Drain water or sediment by opening drain valve (2, Figure 18) on bottom of bowl (1).

NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*

4. Close drain valve.

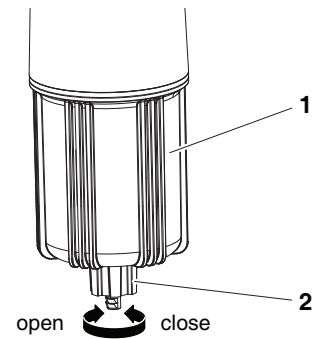


Figure 18

DS1602385

Swing Reduction Gear Oil Level - Check



WARNING

AVOID DEATH OR SERIOUS INJURY

The gear oil is very hot after the machine has been operating. Shut all systems down and allow them to cool. Before fully removing any motor case or inspection port plug, etc., loosen the plug slightly to allow pressurized air to escape.

NOTE: When checking the oil level, use a dipstick and always remove and wipe it clean before making the final level check.

1. Remove the dipstick (1, Figure 19) and wipe the oil from the dipstick with a cloth.
2. Insert the dipstick (1) fully into the dipstick tube.
3. When the dipstick (1) is pulled out, the oil level must be between the "HIGH" and "LOW" marks on the dipstick.
4. If the oil level is below the "L" mark on the dipstick (1), open the breather cap (2) and add oil.

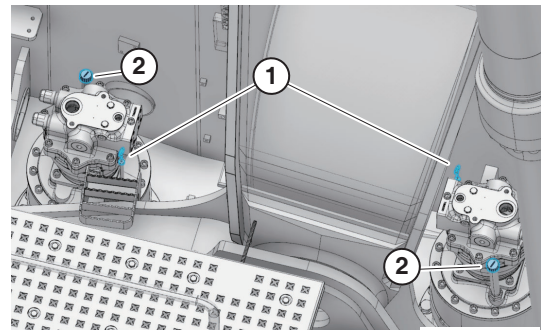
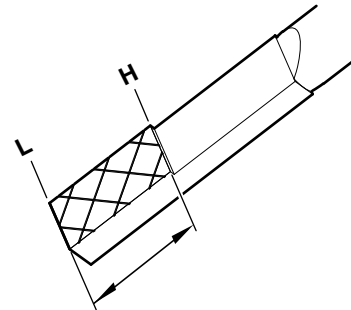


Figure 19



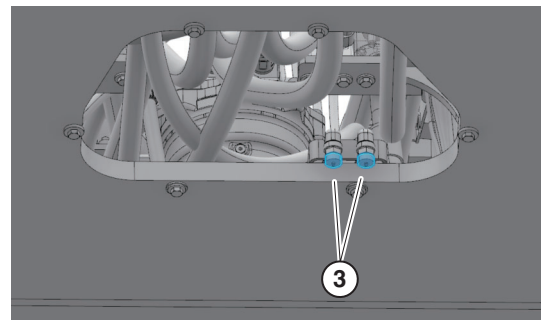
FG000419

Figure 20

5. If the oil level exceeds the "H" mark on the dipstick, open the drain plug (3, Figure 21) and use a hose to drain the excess oil into a suitable container. After draining the oil, disconnect the hose and cover the valve with the cap.

NOTE: Dispose of drained fluids in compliance with all applicable environmental laws and regulations.

NOTE: Drain plugs can be accessed by opening the bottom cover of machine.



DS2003634

Figure 21

Dust Net - Clean



NOTICE

If running excavator in dusty area, check dust net everyday and clean it if dirty.



WARNING

AVOID DEATH OR SERIOUS INJURY

If using compressed air or water to clean the dust net, wear safety goggles for proper eye protection.

Oil Cooler

1. Open the access door on right rear side of the machine.
2. Clean with compressed air or water.

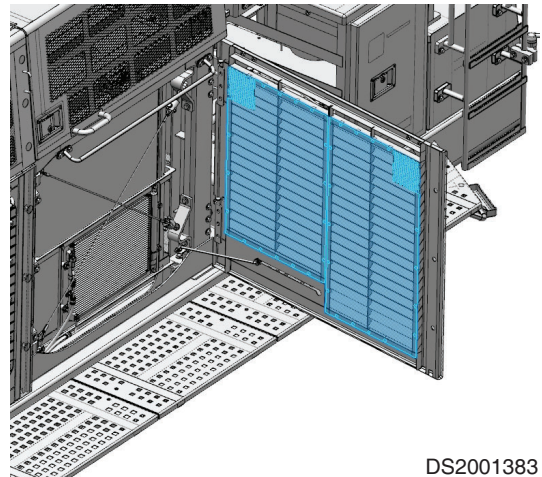


Figure 22

DS2001383

Radiator

1. Open the access door on right rear side of the machine.
2. Clean the dust nets in the upper and lower covers with compressed air or water.

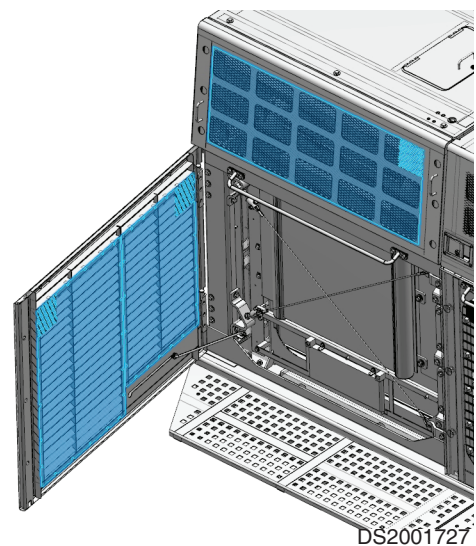


Figure 23

DS2001727

Coolant Level - Check



WARNING

AVOID DEATH OR SERIOUS INJURY

Allow the engine to cool before releasing the radiator cap. Loosen the cap slowly to release any remaining pressure.

Radiator cleaning is performed while the engine is running. Lock out and tag the controls alerting personnel that service work is being performed. Do not remove radiator cap unless it is required. Check the coolant level in the surge tank.

NOTE: Do not mix ethylene glycol and propylene glycol antifreeze together.
See "Engine Cooling System" and "Types of Antifreeze" page for further details.

1. Open the surge tank cover.

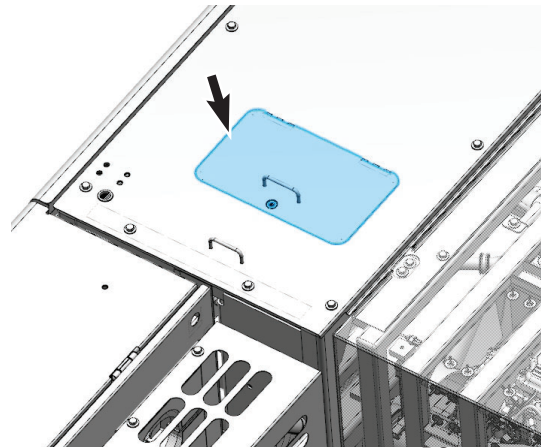


Figure 24

2. Check to make sure that coolant transfer line from the surge tank to the radiator is free and clear of obstructions, or is not pinched.
3. Check the level of coolant in the surge tank. The normal cold engine fluid level must be between "FULL" and "LOW" marks on tank.
4. If the coolant is below the "LOW" mark, add genuine part of 50% concentration coolant to the tank.
5. If coolant level is lower than "LOW" mark, coolant level warning symbol is popped up and buzzer is alarmed.

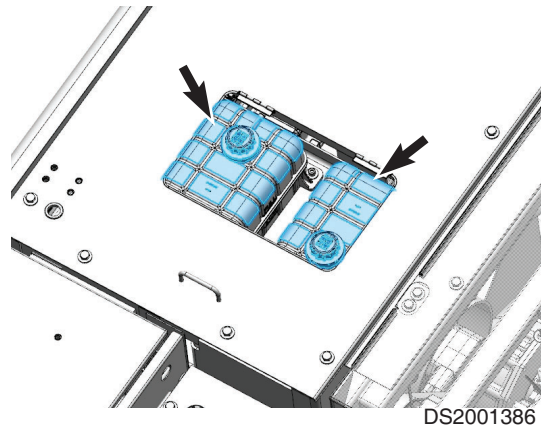


Figure 25

Travel Reduction Gear Oil - Check



WARNING

AVOID DEATH OR SERIOUS INJURY

The gear oil is very hot after the machine has been operating. Shut all systems down and allow them to cool before performing any inspections.

Before removing the motor case, loosen the plug slightly to allow pressurized air to escape. Residual pressure in the travel reduction gear can cause the plug to be dislodged and oil to squirt out suddenly.

Number	Name
1	Oil level and filler plug
2	Drain plug

1. Make sure that the machine is on firm and level ground.
2. Rotate the track as shown in the figure to position the drain plug (2) at the bottom of the vertical axis.
3. Loosen the oil level and filler plug (1) slowly to allow pressurized air to escape.
4. Remove the oil level and filler plug (1).
5. Check the oil level. The oil must be near the bottom of the level plug opening.
6. If necessary, add oil through the oil level and filler plug (1).
7. Wipe the oil level and filler plug (1) clean and retighten it.
8. Repeat this procedure on the other travel reduction gear.

Window Washer Liquid Level - Check

1. Open left front access door and check fluid level in windshield washer tank.
2. Open fill cap and add fluid.

NOTE: Use a washer liquid that is rated for all seasons. This will prevent freezing during cold weather operation.

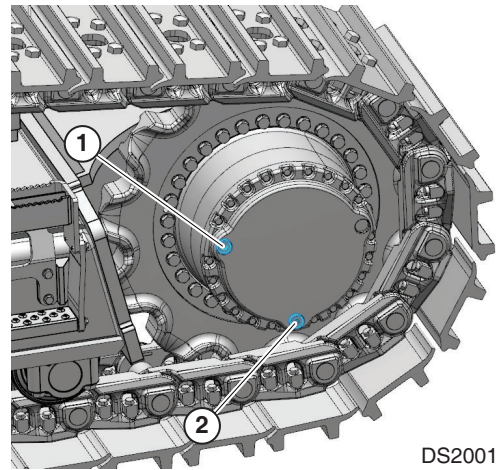


Figure 26

DS2001413

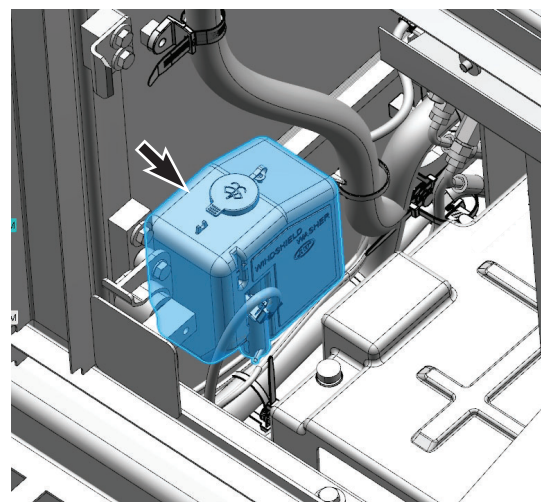


Figure 27

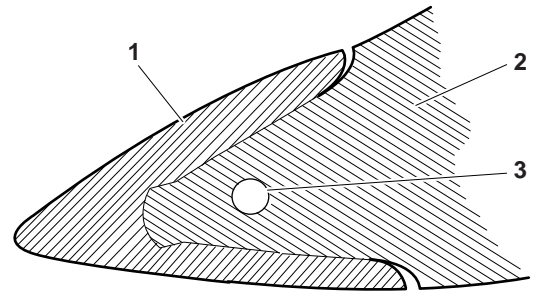
DS2001387

Bucket Teeth and Side Cutters - Inspect

1. Inspect the bucket teeth daily to make sure that tooth wear or breakage has not developed.
2. Do not allow the replaceable bucket teeth to wear down to the point that bucket adapter is exposed. See Figure 28.

NOTE: *These instructions are only for HD HYUNDAI CONSTRUCTION EQUIPMENT OEM buckets. If you are using other manufacturers' buckets, refer to their specific instructions.*

Reference Number	Description
1	Point
2	Adapter
3	Pin



HAOE870L

Figure 28

Cooling Fan Blade - Inspect



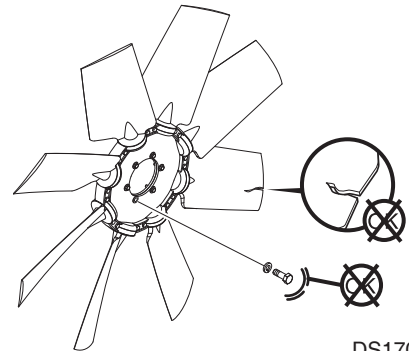
WARNING

AVOID DEATH OR SERIOUS INJURY

Death or serious injury can result from a fan blade failure. Never pull or pry on the fan. This can damage the fan blade(s) and cause fan failure.

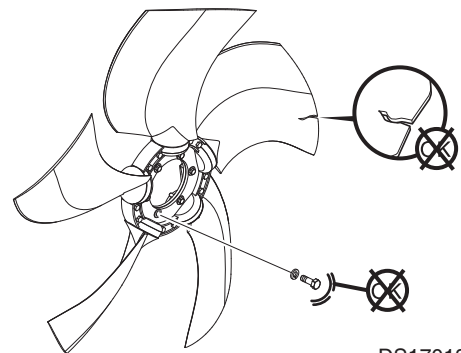
NOTE: *Manually rotate the crankshaft by using a wrench on the accessory drive pulley nut.*

1. An inspection of the cooling fan is required daily. Check for cracks, loose bolts, bent or loose blades, and for contact between the blade tips and the fan shroud. Check the fan to make sure it is securely mounted. Tighten the bolts if necessary. Replace any fan that is damaged.



DS1701263

Figure 29 Radiator Fan



DS1701342

Figure 30 Oil Cooler Fan

Air Intake System and Emission Control System - Check



WARNING

AVOID DEATH OR SERIOUS INJURY

Hot engine components can cause burns.

Avoid contact with hot engine components

1. Park the machine on a firm and level surface, lower the attachment to the ground, move safety lever to "LOCK" position, and stop engine.
 2. Check the engine intake hose and hose bands for damage and tightness.
 3. Check the exhaust pipe and several exhaust system components, and check the V-clamp tightness to prevent leaking gases.
 4. If damaged, wrinkled, or loose, replace or retighten or contact your nearest HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.
-



NOTICE

Severe engine damage will result from running with unfiltered air.

Do not operate engine if any leaks or damage are found on air intake system.

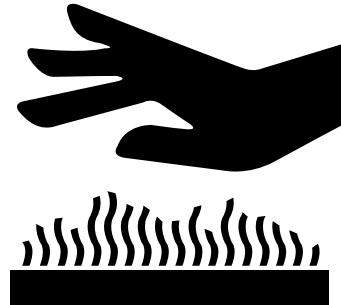


Figure 31

HAOA050L

Seat Belt - Inspect

See "Seat Belt" on page 1-33 for further information.

AVM (Around View Monitoring system) - Check



WARNING

AVOID DEATH OR SERIOUS INJURY

To access the camera, use a separate ladder or a movable platform. Do not stepping your foot onto the engine hood. This may cause a dangerous situation.

Mirrors - Check

Structure - Inspect

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.

All Switches and Travel Alarm (If Equipped) - Check

Verify the working condition of all switches before starting the engine.

Safety Lever - Check

A safety lever has a pivoting safety lever that deactivates the work group, swing and travel control functions.

When the safety lever is moved down into "LOCK" position, the work group, swing and travel control functions are deactivated.

When the safety lever is moved up into "UNLOCK" position, the work group, swing and travel control functions can be operated.



WARNING

AVOID DEATH OR SERIOUS INJURY

The Safety Lever must deactivate the work group, swing and travel control functions when the safety lever is moved down into "LOCK" position.

Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor immediately if the controls do not deactivate. DO NOT MODIFY THE SYSTEM.

Inspection and Maintenance of the Safety Lever

1. Check for and keep bystanders away from the work area. Sit in operator's seat and fasten seat belt.
2. Start engine and move safety lever up into "UNLOCK" position.
3. Operate the work group (joystick) levers in all directions to check that boom, arm, bucket (or other attachment) and swing functions operate correctly. Also, check that travel controls operate properly.

NOTE: *Hydraulic system must be warmed up to operating temperatures.*

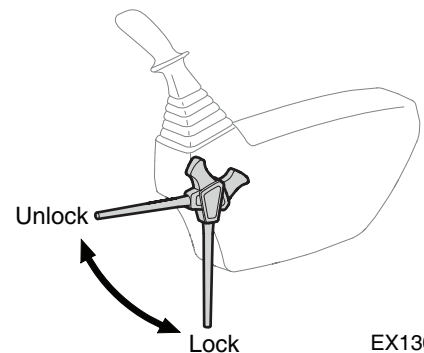


Figure 32

EX1300566

4. Raise the boom and arm so the bucket (or other attachment) is about 1 m (3 ft.) off the ground.
5. Move the safety lever down into "LOCK" position to deactivate the work group and travel functions. Move the work group (joystick) levers. There must be no movement of the boom, arm, and attachment or swing functions when the controls are moved.
6. With the safety lever still in the "LOCK" position, move the travel controls. There must be no movement of the excavator tracks.
7. Move safety lever up into "UNLOCK" position. Raise the boom so the bucket (or other attachment) is about 3 m (10 ft.) off the ground. Operate the work group (joystick) lever to lower the boom slowly. While boom is lowering, move the safety lever down into "LOCK" position. Boom movement must stop. Repeat these steps for arm, bucket (attachment), swing and travel functions.
8. Lower work group to the ground and stop engine.

NOTE: *If the Safety Lever does not deactivate the work group and travel functions as described above or if any parts are damaged, bent or missing, contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor immediately for service. DO NOT MODIFY THE SYSTEM.*

Exterior Lights, Horn, Control Console Indicator, Gauge Panel - Check

1. Turn engine starter switch to "I" (ON) position and observe all the indicator lights.
2. Restore operation of any light bulbs that do not turn "ON" now.
3. Sound the horn. Repair or replace if required.
4. Turn "ON" and inspect all exterior work lights. Replace any monitors, burned-out bulbs or cracked or broken housings or lenses.

Overall of Engine Condition - Check

All Controls and Linkages - Check



NOTICE

Cold weather operation requires that operator fully warm up the hydraulic oil before beginning machine operation. Follow all warm up instructions listed in the Operating Instruction section of this manual. Make sure to cycle oil through all the components, including all cylinders, both travel motors and the swing motor. Cold hydraulic oil in the lines and components needs to be warmed before beginning full operation. If this is not done, damage to the cylinders or hydraulic motors can occur.

1. With the engine at rated speed, operate all the controls.
2. Follow cold weather hydraulic system warm-up procedures.
3. Note any slow operations or unusual movements. Determine the cause and repair before operating.

50 Hour / Weekly Service

Perform All Daily Service Checks

Arm and Bucket Joint Pins - Lubricate

Perform a visual inspection every 10 hours for the first 100 hours and every 50 hours thereafter. If necessary, lubricate front attachment pins.

NOTE: *If the unit has been running or working in water, the front attachment must be greased on a 10 hour/daily basis.*

- Position machine on firm and level ground as shown below and lower the front attachment to the ground and stop engine.
- Press the grease fitting and inject grease with the grease gun on the marked point.
- After greasing, clean off the old grease that has been purged.

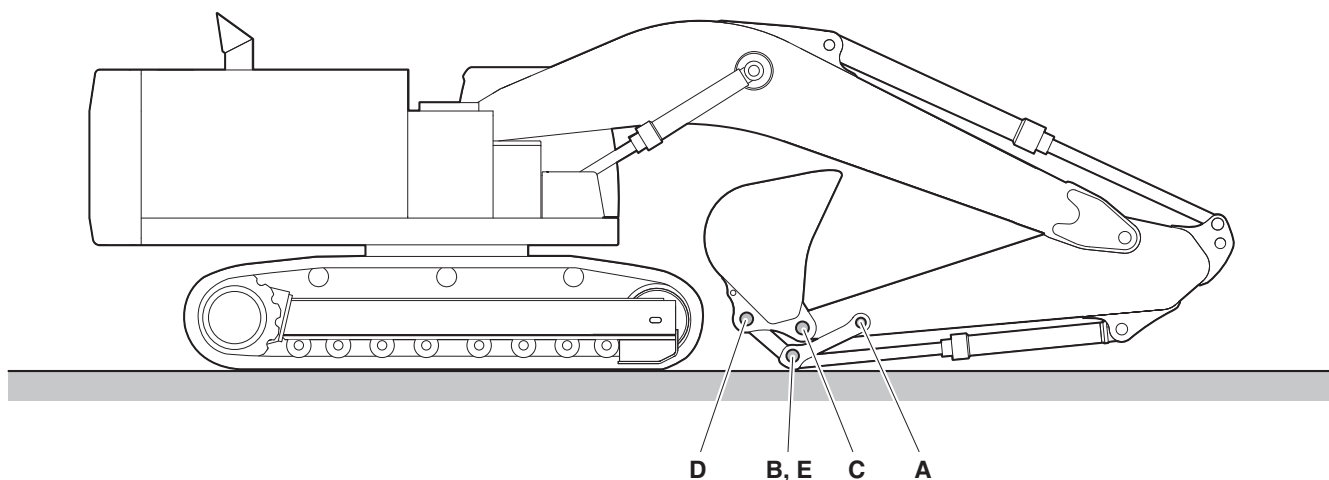


Figure 33

Reference Number	Description
A	Arm Link Joint Pin (1 Point)
B	Link Joint Pin (2 Points)
C	Arm Bucket Joint Pin (1 Point)

Reference Number	Description
D	Bucket Link Joint Pin (1 Point)
E	Bucket Cylinder Rod Pin (1 Point)

- A. Arm link joint pin (1 point)
- B. Link joint pin (2 points)
- C. Arm bucket joint pin (1 point)
- D. Bucket link joint pin (1 point)
- E. Bucket cylinder rod pin (1 point)

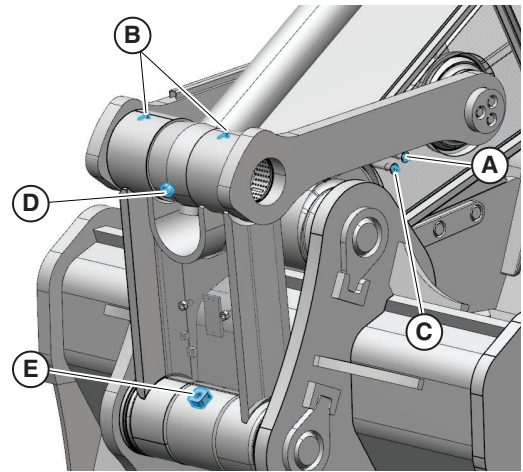


Figure 34

DS2001388

Swing Bearing - Lubricate

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. There are grease fittings for the swing bearing. Do not over lubricate. Purge old grease with new. Remove all purged grease.

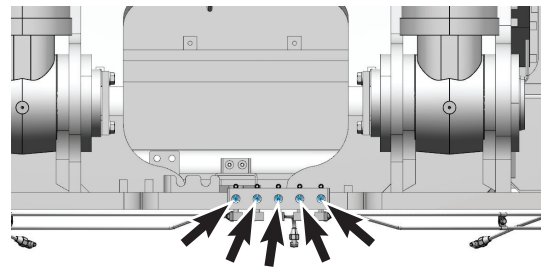


Figure 35

DS2001389

Fuel Tank Water and Sediment - Drain

1. Perform this procedure before operating the machine.
2. Drain water and sediment from bottom of fuel tank into an approved container.

NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*

NOTE: *Always completely fill fuel tank at end of each workday to prevent condensation from forming on the inside walls of the tank.*

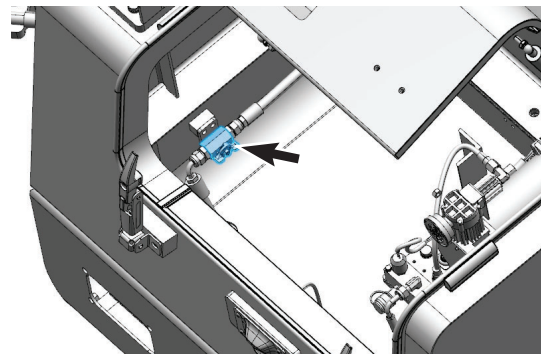


Figure 36

DS2001390

Air Compressor and Tank - Check

1. Set air compressor operating switch to "I" (OFF) position.
2. Using air gun in the cabin, completely release all air in compressor tank.
3. The air compressor drain valve is on the bottom of the storage box on front right side of the machine.
4. Put a pan under the drain valve, push valve handle sideways to drain water.



WARNING

AVOID DEATH OR SERIOUS INJURY

The drain valve does not work when the pressure in the air compressor tank is 1.0 kg/cm² (14 psi) or above. Compressed air inside tank must be released first.

Wear safety goggles to protect your eyes from water and/or flying objects from drain valve.

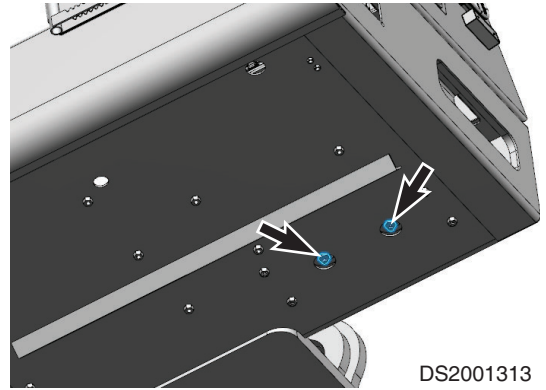


Figure 37

Engine Fan Belt - Check

1. Inspect after first 50 hours of operation and every 250 hours thereafter. For details, see "Engine Fan and Alternator Belts - Check" on page 4-45.

Track Assemblies (Links, Shoes, Rollers, Idlers) - Inspect

1. Do a daily walk-around inspection of all components including the track assemblies. Look for missing, damaged or excessively worn parts. See "Track Tension" on page 4-97.
2. Jack up each track and perform the two speed travel motor test.

250 Hour / Monthly Service

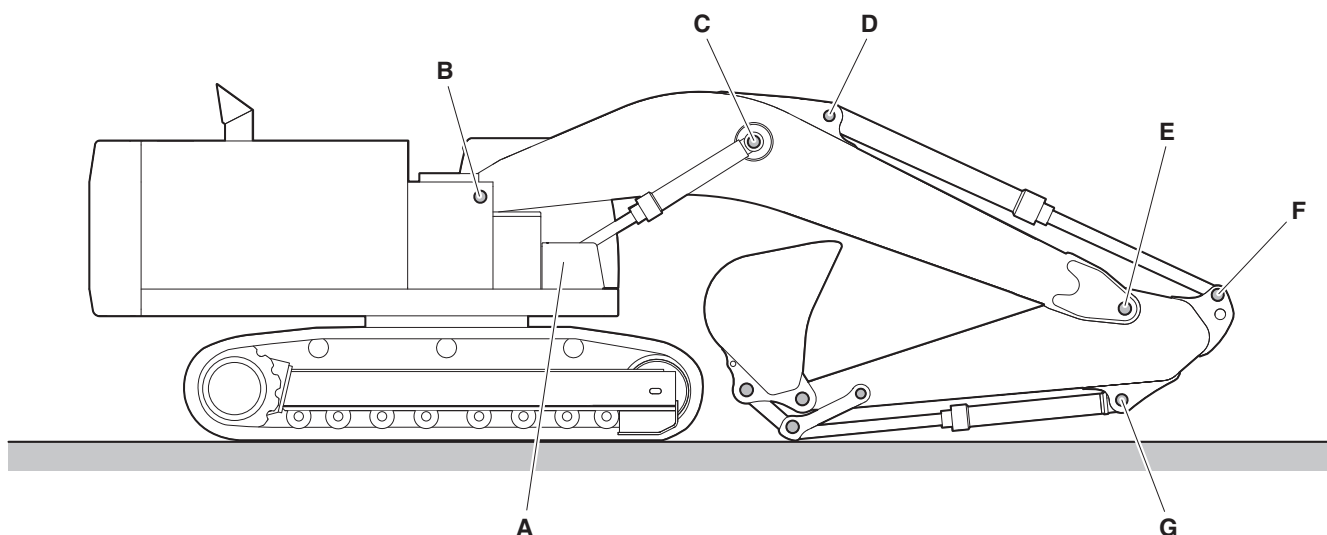
Perform All Daily and 50 Hour Service Checks

Boom and Arm Joint Pins - Lubricate

Perform a visual inspection every 10 hours for the first 100 hours and every 250 hours thereafter. If necessary, lubricate front attachment pins.

NOTE: *If the unit has been running or working in water, the front attachment must be greased on a 10 hour/daily basis.*

- Position machine on firm and level ground as shown below and lower the front attachment to the ground and stop engine.
- Press the grease fitting and inject grease with the grease gun on the marked point.
- After greasing, clean off the old grease that has been purged.



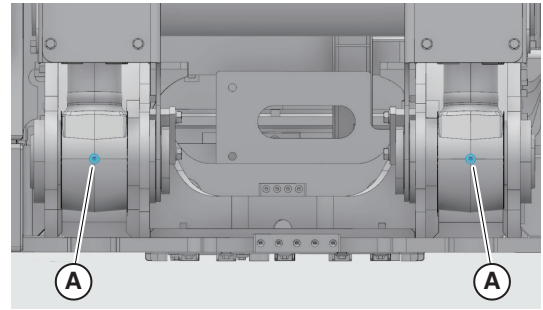
DS2003636

Figure 38

Reference Number	Description
A	Boom Cylinder Rod Pin (2 Points)
B	Boom Foot Pin (2 Points)
C	Boom Cylinder Head Pin (2 Points)
D	Arm Cylinder Head Pin (1 Point)

Reference Number	Description
E	Boom Arm Joint Pin (2 Points)
F	Arm Cylinder Rod Pin (1 Point)
G	Bucket Cylinder Head Pin (1 Point)

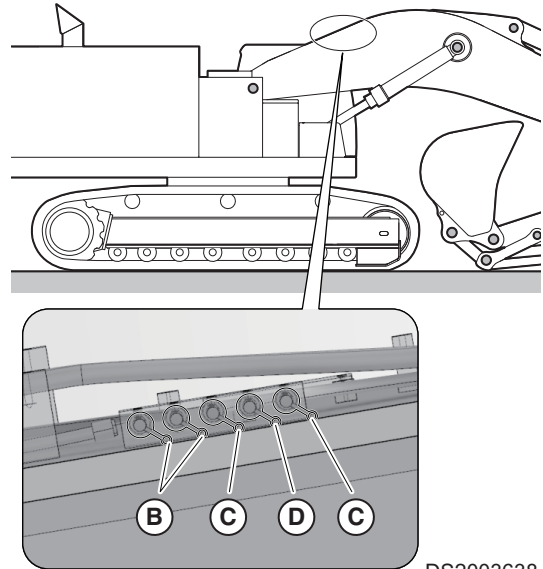
A. Boom cylinder rod pin (2 points)



DS2003637

Figure 39

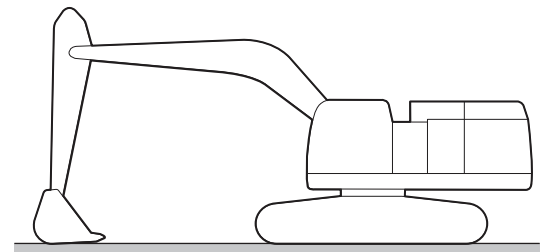
- B. Boom foot Pin (2 points)
- C. Boom cylinder head pin (2 point)
- D. Arm cylinder head pin (1 point)



DS2003638

Figure 40

NOTE: For greasing the boom foot pin, grease it while keeping the position shown Figure 38 the first time, and then grease it once more after lowering the boom to put slight pressure on the surface shown Figure 41.



DS1701100

Figure 41

- E. Boom arm joint pin (2 points)
- F. Arm cylinder rod pin (1 point)
- G. Bucket cylinder head pin (1 point)

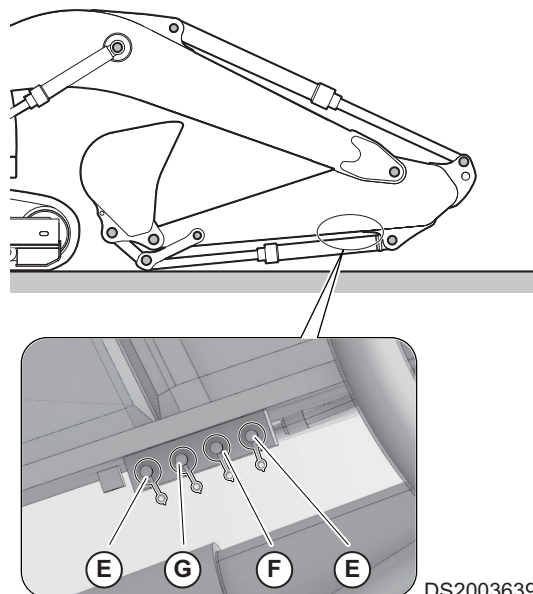


Figure 42

DS2003639

Engine Fan and Alternator Belts - Check



WARNING

AVOID DEATH OR SERIOUS INJURY

Keep clear of engine fan and fan drive belts when the engine is running. Contact with rotating belt can cause injury.

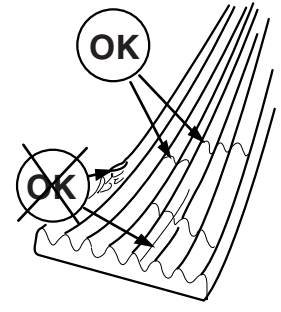


WARNING

AVOID DEATH OR SERIOUS INJURY

When checking, adjusting, or replacing drive belts, precautions must be taken to prevent accidental cranking of the engine. Be sure the starter switch is in the "OFF" position and the controls are tagged.

1. Replace badly worn, greasy, or severely cracked belts immediately. These conditions prevent proper belt function. Visually inspect the belt. Check the belt for intersecting cracks. Transverse (across the belt width) cracks are acceptable. Longitudinal (direction of belt length) cracks that intersect with transverse cracks are not acceptable. Replace the belt if it is frayed or has pieces of material missing.
2. Before installing new belts, make sure all pulley grooves are clean and not worn. Replace pulley, if damaged, or if the grooves are worn.
3. All pulley support bearings, shafts, and brackets must be in working order.
4. When replacing belts and pulleys, pulley alignment must be checked with belts tensioned and brackets securely clamped. A misalignment that can be visually detected and will reduce belt performance.
5. Do not force the belts into the pulley grooves by prying with a screwdriver or pry bar. This will damage the belt side cords which will cause the belts to turn and result in severe belt damage or breakage during operation.



HAAA4030

Figure 43

Breaker Filter (If Equipped) - Replace




WARNING

AVOID DEATH OR SERIOUS INJURY

The hydraulic oil will be hot after machine operation.

Allow the system to cool down before changing breaker filter.

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Tip the hydraulic oil tank breather cap up to release pressure.
3. Locate breaker filter assembly.
4. Position a container under the filter assembly.
5. Using a 36 mm wrench, unscrew filter housing from filter bottom (Figure 44).
6. Remove O-ring and back-up ring from filter head.
7. Replace filter element (1, Figure 45).
8. Apply a small amount of oil around the entire O-ring and back-up ring and install the filter housing on the filter head.
 - Tool: 36 mm ()
 - Torque: 30 N.m (3 kg.m, 22 ft lb) and turn 1/4 counterclockwise
9. After changing breaker filter, vent air from pump and check level of hydraulic oil tank.

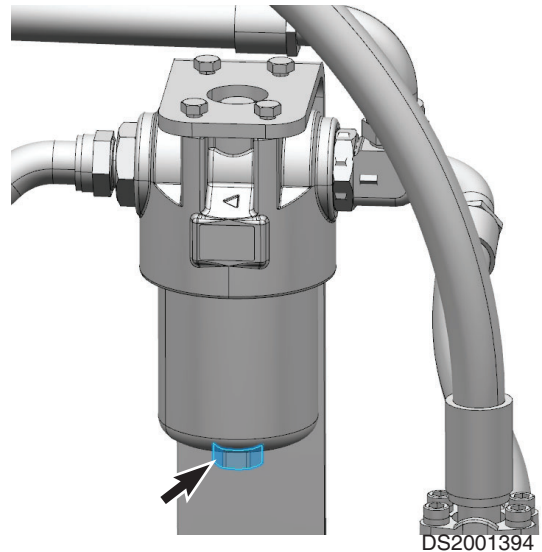


Figure 44

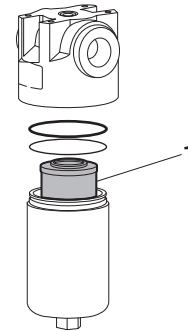


Figure 45

Hydraulic Oil Return Filter - Replace

NOTE: Replace hydraulic oil return filter after first 250 hours of operation or rebuild, then every 1,000 hours thereafter (See page 4-64).

Pilot Filter - Replace

NOTE: Change pilot filter after first 250 hours and every 1,000 hours thereafter (See page 4-65).

Drain Filter - Replace

NOTE: *Replace drain filter after first 250 hours of operation or rebuild, then every 1,000 hours thereafter.
(See page 4-66)*

Pump Drive Gear Oil - Change

NOTE: *Drain and refill oil after first 250 hours of operation or rebuild, and every 1,000 or 2,000 hours thereafter.
(See page 4-73)*

Pin and Bushings of the Front End Attachment - Inspect

Battery Fluid - Check

See "Inspection of Battery Electrolyte Level" on page 4-86 for further information.

Bolts and Nuts - Inspect

Fuel System Hose Clamps - Inspect

500 Hour / 3 Month Service

Perform All Daily, 50 and 250 Hour Service Checks

Track Spring - Check

Check the track tension every 500 hours. If necessary, adjust the track spring.

NOTE: *If the unit has been running or working in water, the track spring must be greased on a 10 hour/daily basis.*

Swing Gear and Pinion - Lubricate



WARNING

AVOID DEATH OR SERIOUS INJURY

Greasing swing gear and pinion must be done by only one person.

1. Remove inspection cover on the main frame and inspect the condition of the grease. Inspect for water or other contaminants on the gear teeth.

NOTE: *The upper structure must be rotated a little at a time so the entire face of the swing gear can be lubricated. Use extreme caution when performing this operation.*

2. If water or other contaminations are found, remove lower access cover bottom of the track frame so the gear teeth can be thoroughly cleaned and lubricated.
3. Install access covers after lubricating gear teeth.

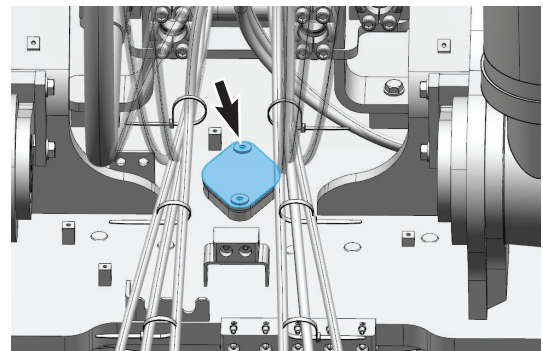


Figure 46

DS2001395

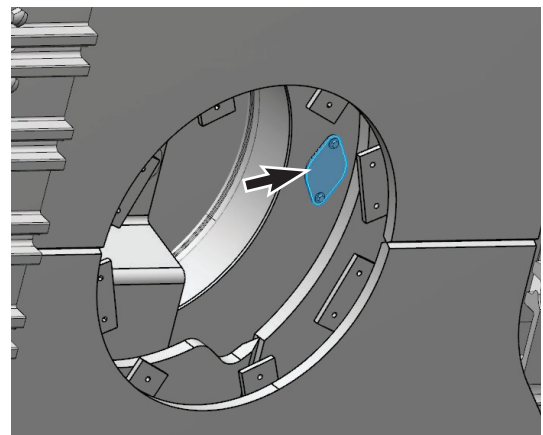


Figure 47

DS2001396

Engine Oil and Filter - Replace

NOTE: *Change engine oil and filter after every 500 hours of operation or rebuild.*



WARNING

AVOID DEATH OR SERIOUS INJURY

DO NOT change oil on a hot engine. Allow the engine to cool down before attempting to change the engine oil and filter to avoid burns by touching hot engine parts.

1. Remove the cover (1).

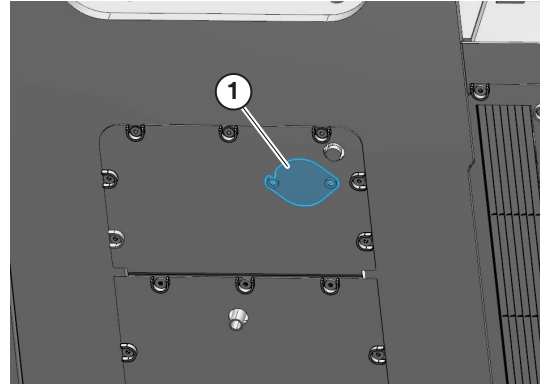


Figure 48

DS2001397

2. Turn the drain valve knob counterclockwise in order to drain the engine oil.

NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*



NOTICE

Dispose of filters/oils/liquids in compliance with all applicable environmental laws and regulations.

After drain the engine oil, turn the drain valve knob clockwise to close the drain valve.

3. Remove the engine oil filter by using filter wrench.

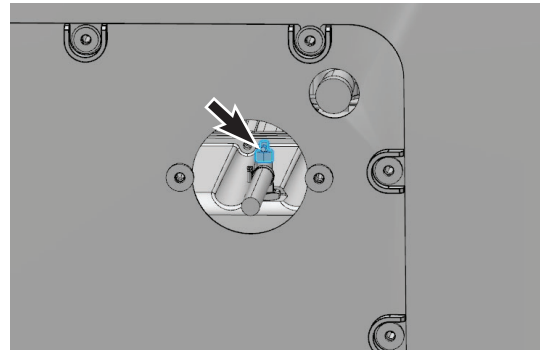


Figure 49

DS2001398

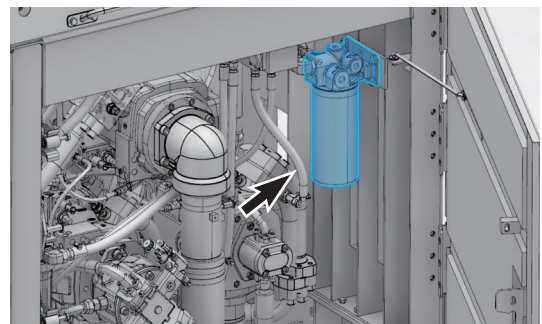
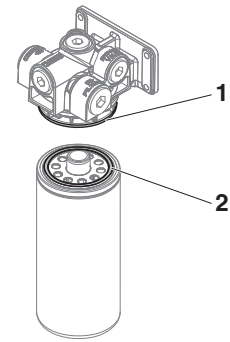


Figure 50

DS2003641

4. Clean sealing surface of filter head (1) and apply clean engine oil to O-ring seal (2) for new oil filter.



DS1701362

Figure 51

NOTICE

Do not use an adjustable wrench or other open tool as there is risk of damaging the filter cover.

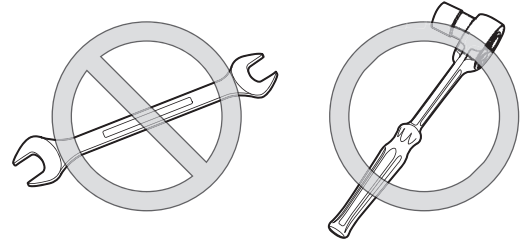
5. Install the new oil filter. Spin on the oil filter until the O-ring (2) contacts the sealing surface (1).

Then rotate the oil filter 1 full turn.

6. Refill the engine with the correct oil through the oil fill port. Refer to the Lubrication Table of this manual for the recommended oil for the operating conditions.

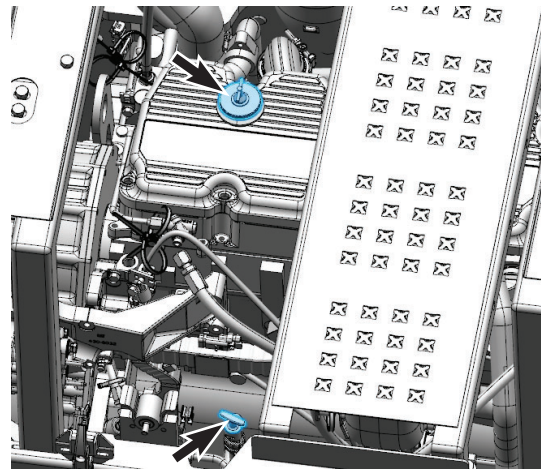
NOTE: See *"Fluid Capacities"* on page 4-17 for capacity.

7. Stop engine. Look for signs of leaks at filter. Recheck oil level after fifteen minutes.



EX1401310

Figure 52

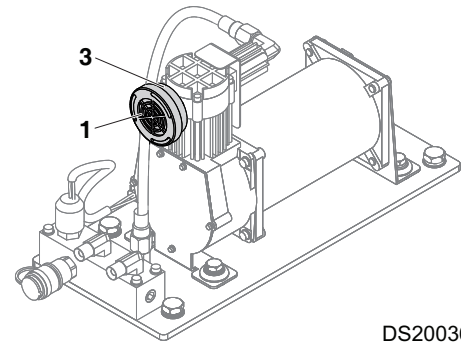


DS2001728

Figure 53

Air Compressor Filter (If Equipped) - Clean

1. Set air compressor operating switch to "I" (OFF) position.
2. Open the storage box on front right side of the machine.
3. Remove filter cap (1, Figure 54) manually, remove air filter (2, Figure 55) in the housing, and clean the cap and inside of the housing (3, Figure 54).
4. Clean and dry the filter with clean, dry, compressed air (2 kg/cm² or lower).
5. After the cleaning, illuminate the inside of the filter and inspect it for any holes, tears, or other damage. If any, replace the filter.
6. Assemble the filter and filter cap in the reverse order of disassembly.



DS2003642

Figure 54

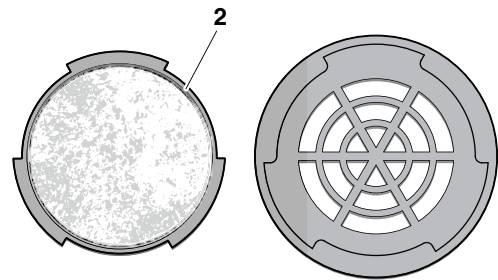


WARNING

AVOID DEATH OR SERIOUS INJURY

Do not clean or replace the filter while the air compressor is running.

Wear safety goggles to protect your eyes from flying dust when cleaning or replacing the filter.



DS1800346

Figure 55

Air-conditioning Outer Filter - Clean

The machine is equipped with an air filtration system which filters out dirt and dust particles from air being circulated into operator's cabin. This filter must be cleaned out.

NOTE: *If the unit is being operated in a dusty environment, the cleaning and replacement must be performed more frequently. If filter is damaged, replace damaged filter with a new one.*



WARNING

AVOID DEATH OR SERIOUS INJURY

All service and inspection of air-conditioning system must be performed with the starter switch in the "O" (OFF) position.



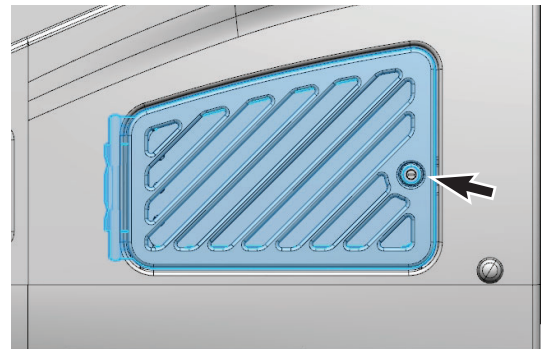
WARNING

AVOID DEATH OR SERIOUS INJURY

If using compressed air to clean the element, make sure that proper eye protection is worn.

NOTE: *All right and left call outs are based on the operator being seated in the operator's seat facing the front.*

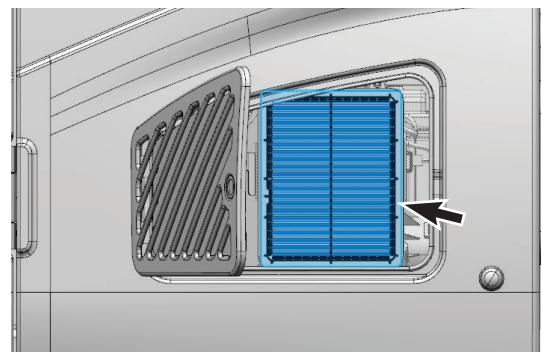
1. Open the cover by using the starter KEY in the left side of the cabin.



DS2001402

Figure 56

2. Remove filter (Figure 57) and inspect for any damage.
3. Use compressed air to clean filter. If filter is still dirty, then replace filter.
4. Reassemble in reverse order.



DS2001403

Figure 57

Air-conditioning Inner Filter - Clean



WARNING

AVOID DEATH OR SERIOUS INJURY

All service and inspection of air-conditioning system must be performed with the starter switch in the "O" (OFF) position.



WARNING

AVOID DEATH OR SERIOUS INJURY

If using compressed air to clean the element, make sure that proper eye protection is worn.

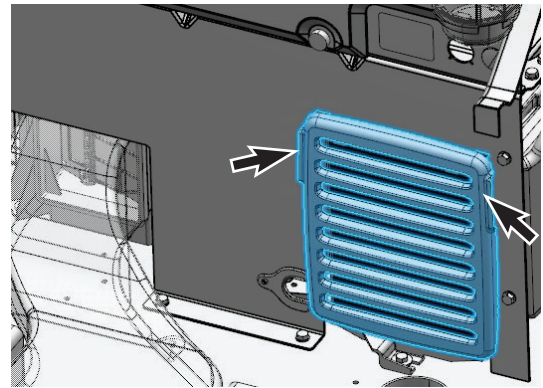
1. Remove cover by pulling knob outward on top of the left and right of the filter which is inside the left rear part of the cabin.
2. Remove inner filter by pulling knob outward while pressing the upperpart and lower part of the filter handle.
3. Use compressed air to clean filter. If the filter is damaged, replace with a new one.

If the filter is very dirty, use a mild soap or detergent and water to clean it.



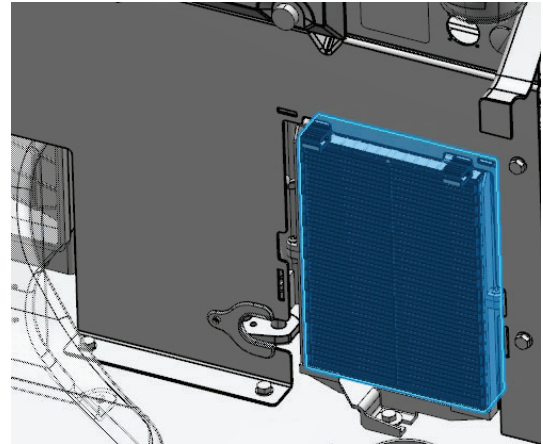
NOTICE

If water was used to clean filter, be certain that filter is completely dry before installing.



DS2001405

Figure 58



DS2001404

Figure 59

Cooling System - Clean



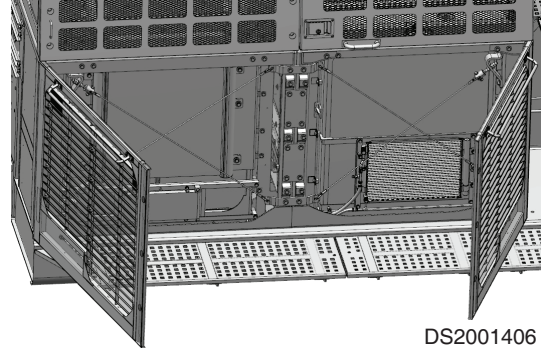
WARNING

AVOID DEATH OR SERIOUS INJURY

Using compressed air, steam or water to clean can cause serious injury. Always wear safety goggles, mask and safety shoes during the cleaning process. Keep personnel and bystanders clear of work area.

1. Open the right rear side door(s).
2. Clean the outside of the radiator and oil cooler, intercooler and fuel cooler with compressed air, steam or water. Wash from the outside of the engine compartment towards the inside. Repeat the cleaning process from the inside of the engine compartment towards the outside to remove all dirt and debris.

NOTE: Clean dust net after cleaning radiator, oil cooler, intercooler and fuel cooler.



DS2001406

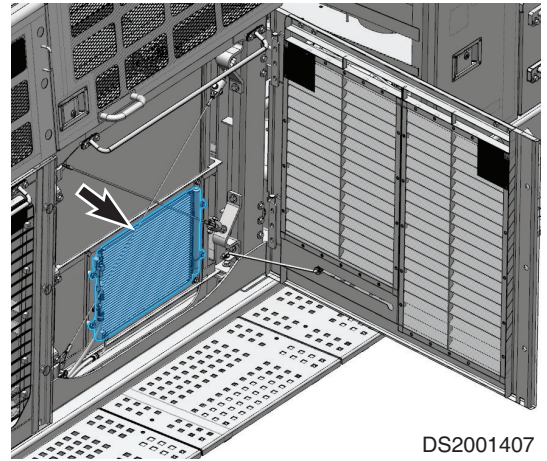
Figure 60

3. Clean air conditioner condenser core with compressed air, steam or water.



NOTICE

To prevent damage to the cores, apply compressed air from an appropriate distance. Damaged cores can cause leakage or overheating. In dusty conditions, check the cores daily.



DS2001407

Figure 61

Air Cleaner Outer Filter - Clean

NOTE: Clean outer filter every 500 hours/3 months of service.

NOTE: If air cleaner clogged warning symbol on display monitor comes "ON", the air cleaner must be serviced.

NOTE: When working in very dusty conditions, the service interval must be shortened.



WARNING

AVOID DEATH OR SERIOUS INJURY

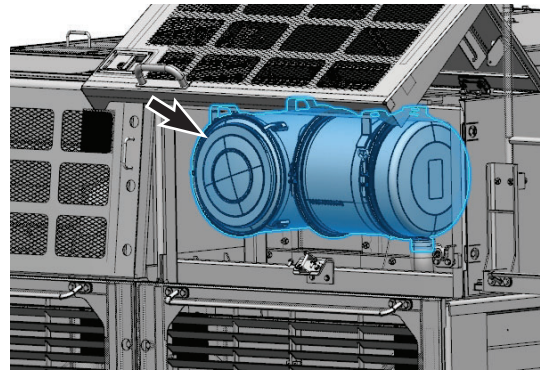
Never clean or attempt to remove air cleaner filter if the engine is running.

If using compressed air to clean the filter, make sure that proper eye protection is worn.

1. Locate the air cleaner assembly.

NOTE: When it reaches every 500 hours or If indicator symbol on display monitor comes "ON" the air cleaner must be serviced.

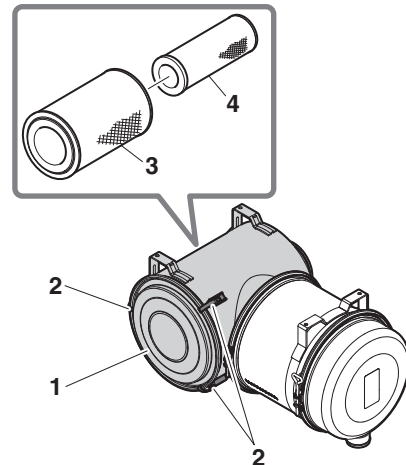
NOTE: Replace outer filter after cleaning 5 times or every 2,000 hours/1 year of service.



DS2001408

Figure 62

2. Remove access cover (1, Figure 63) by loosening the latches (2).
3. Remove outer filter (3, Figure 63) from the housing. Do not remove inner filter (4).



DS1701369

Figure 63

4. Clean the outer filter (4, Figure 63) by blowing compressed air from the inside of the filter towards the outside. Do not use more than 205 kPa (30 psi) air pressure.



Figure 64

HAOC570L

5. Check outer filter by shining a light through it. If small holes or thinner parts are found on the element after cleaning it, replace the filter.
6. Clean the inside of the air cleaner body and the inside of the air cleaner cover. Do not use compressed air.
7. Properly install the air filter and cover.

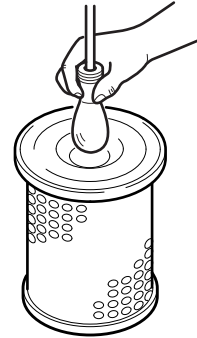
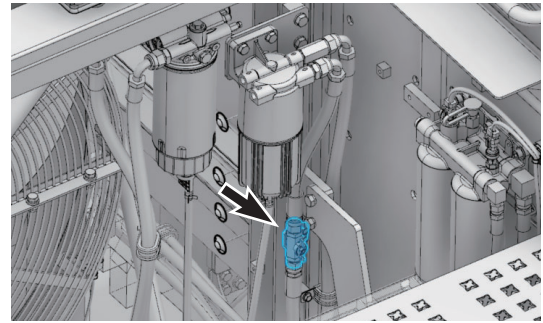


Figure 65

FG000412

Fuel Prefilter and Water Separator - Replace

1. Fuel prefilter and cock valve are located as shown.
2. Turn cock valve to "CLOSE" position.



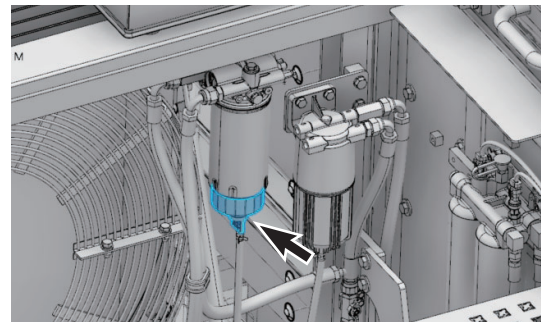
DS2003643

Figure 66

3. Position a small container under prefilter. Drain fuel by opening drain valve on bottom of filter.

NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*

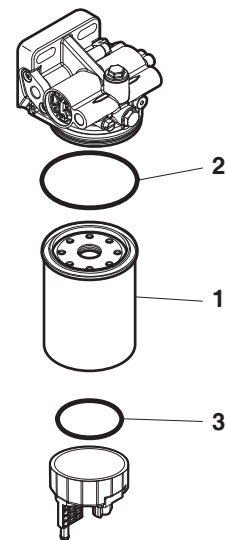
4. Remove bowl using supplied tool.
5. Remove cartridge.



DS2003631

Figure 67

6. Coat surface of packing (2, Figure 68) with fuel on new cartridge (1).
7. Tighten cartridge by hand until packing comes into contact with surface of filter housing head.
8. When packing contacts surface, tighten the cartridge about 3/4 of a turn more.
9. Coat surface of seal (3, Figure 68) with fuel, and tighten the bowl with tool.



DS1603088

Figure 68

Additional Water Separator (If Equipped) - Clean

1. Open the pump compartment door to access additional water separator.
2. Position a small container under additional water separator. Drain fuel by opening drain valve on bottom of filter.

NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*

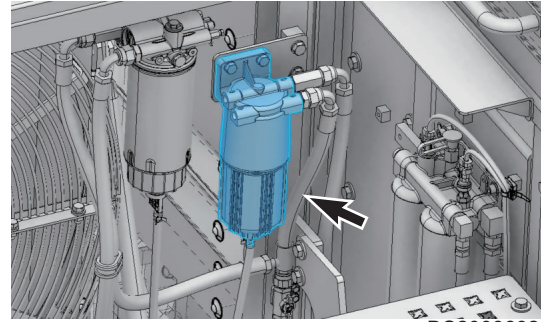


Figure 69

3. Remove bowl using supplied tool.

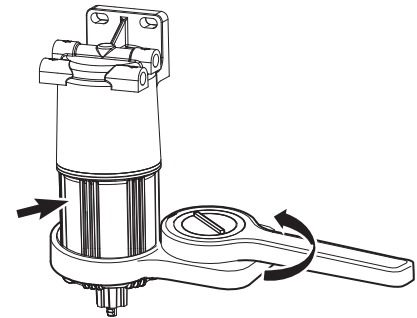


Figure 70

4. Remove the strainer (1, Figure 71) from the head and remove any foreign material from it using fuel.

NOTE: *Make sure to use fuel only to clean it.*

5. After mounting the strainer on the head, coat the surface of seal (2, Figure 71) with fuel and tighten the bowl (3) with tool.

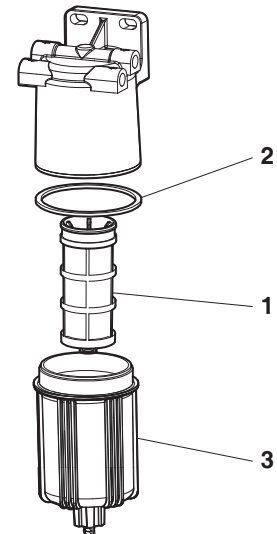


Figure 71

Main Fuel Filter - Replace



WARNING

AVOID DEATH OR SERIOUS INJURY

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire. To help prevent possible injury, turn the start switch off when changing fuel filters or water separator elements.

Clean up fuel spills immediately.



NOTICE

Do not allow dirt to enter the fuel system. Thoroughly clean the area around a fuel system component that will be disconnected. Fit a suitable cover over any disconnected fuel system components.

1. Open the pump compartment door to access main fuel filter.
2. Place a suitable container under the fuel filters to catch any fuel that might spill. Clean up any spilled fuel. Clean the outside body of both fuel filters.

NOTE: *The fuel system has two secondary filters, both must be replaced.*

3. The residual fuel pressure in the fuel system may need relieving. Wait from 1 minute to 5 minutes until the fuel pressure has lowered.

4. Remove filter (1, Figure 73) using supplied tool.
5. Ensure the sealing surface (2, Figure 73) is clean. Lubricate the O-ring seal (3, Figure 73) on the new filter with clean diesel fuel.
6. Install the new filter (1, Figure 73) to the head assembly (4). Spin on the filter until the O-ring seal (3, Figure 73) contact the sealing surface (2). Then, rotate the spin on filter 1 full turn.
7. Replace the other secondary fuel filter, refer to step 5 through to step 7.

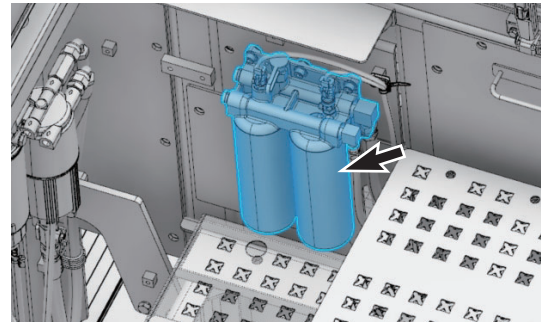


Figure 72

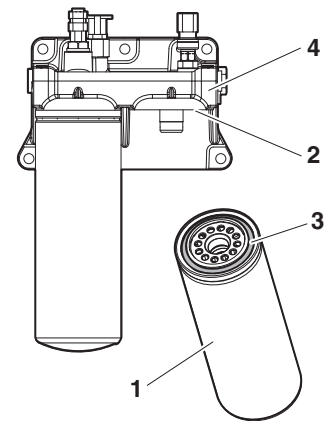




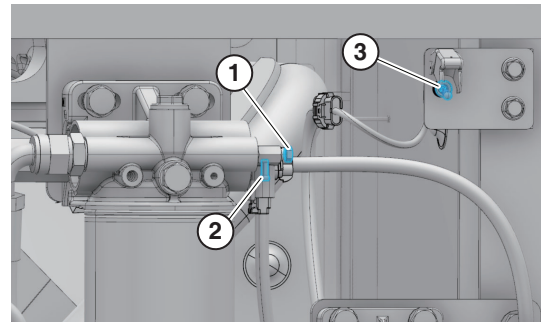
Figure 73

Bleeding Fuel System

If air remains in the fuel inlet line to the engine, it can cause the engine to run in an abnormal condition. Air may impact the starting capability of the engine, and may also result in surging engine speeds.

If the machine happens to have run out of fuel or the fuel filter has been replaced and engine doesn't start at a time after long-term storage, bleed the air out using the following procedure:

1. Stop Engine.
2. Check cock valve is open.
3. Loosen plug (1) on the pre fuel filter head.
 - Tool: 10 mm ()
4. Loosen plug (1) on the main fuel filter head.
 - Tool: 10 mm ()
5. Turn electric transfer pump switch (3) to "I"(ON) position.
6. When pure fuel falls from tap (2) on the pre fuel filter head, turn electric transfer pump switch (3) to "O" (OFF) position.
7. Tighten (1) plug on the pre fuel filter head.
 - Plug tightening torque: 8 ± 2 N.m (0.8 ± 0.2 kg.m, 5.9 ± 1.5 ft lb)
8. Turn electric transfer pump switch (3) to "I" (ON) position.
9. When pure fuel flows out from plug hole on the main fuel filter head, turn electric transfer pump switch (3) to "O" (OFF) position.
10. Tighten plug (1) on the main fuel filter head.
 - Plug tightening torque: 8 ± 2 N.m (0.8 ± 0.2 kg.m, 5.9 ± 1.5 ft lb)
11. Start engine and look for signs of leaks.
12. Repeat procedure if necessary.



DS2003645

Figure 74

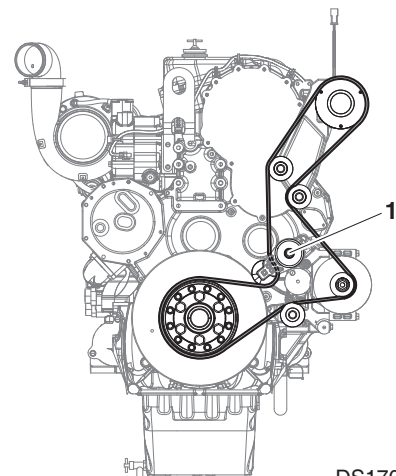
Check Belt

To maximize the engine performance, inspect the belt for wear and for cracking. Replace the belt if the belt is worn or damaged.

- Inspect the belt for cracks, splits, glazing, grease, displacement of the cord and evidence of fluid contamination.

The belt must be replaced if the following conditions are present.

- The belt has a crack in more than one rib.
- More than one section of the belt is displaced in one rib of a maximum length of 50.8 mm (2 in)
- If necessary, loosen the bolt (1, Figure 75) of auto tensioner.
- Tightening torque: 50 N.m (5.1 kg.m, 36.9 ft lb)



DS1701378

Figure 75

Travel Reduction Gear Oil - Change

NOTE: Drain and refill oil after first 500 hours of operation or rebuild, and every 1,000 hours thereafter (See page 4-67).

Swing Reduction Gear Oil - Change

NOTE: Change swing reduction gear oil after first 500 hours on a new machine and every 1,000 hours thereafter (See page 4-68).

Fuel Cap Filter - Replace



NOTICE

External shock or damage to fuel cap can cause permanent damage to filter.

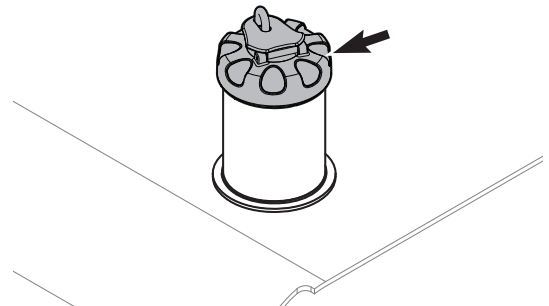


Figure 76

DS1900874

1. Remove screws and filter assembly from fuel cap (Figure 77).

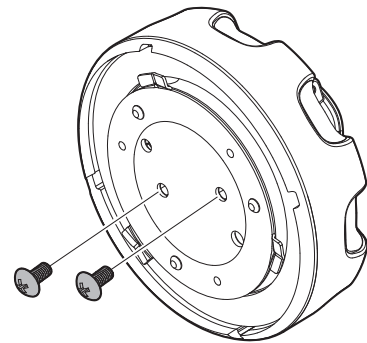


Figure 77

DS1900898

2. After disassembly, carefully lay it as shown in Figure 78.

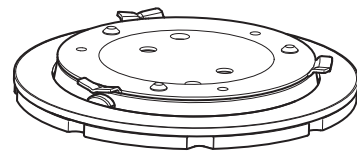
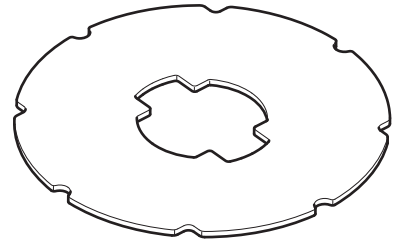


Figure 78

FG015685

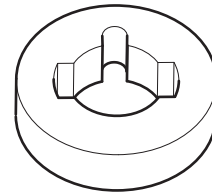
3. After disassembly (Figure 78), remove rubber piece as shown on (Figure 79).



FG015686

Figure 79

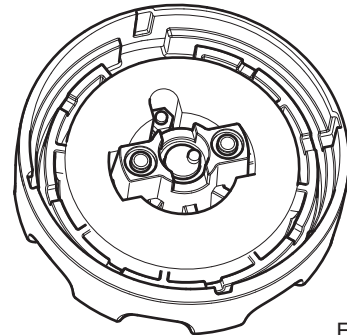
4. After disassembly as shown in (Figure 79), replace filter (Figure 80) with a new one.



FG015687

Figure 80

5. After installing new filter, assemble fill cap in reverse order.



FG015688

Figure 81

1,000 Hour / 6 Month Service

Perform All Daily, 50, 250 and 500 Hour Service Checks

Swing Reduction Gear - Lubricate

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Remove air vent plug (1, Figure 82) from swing reduction gear.

NOTE: *There are two air vent plugs of this machine.*

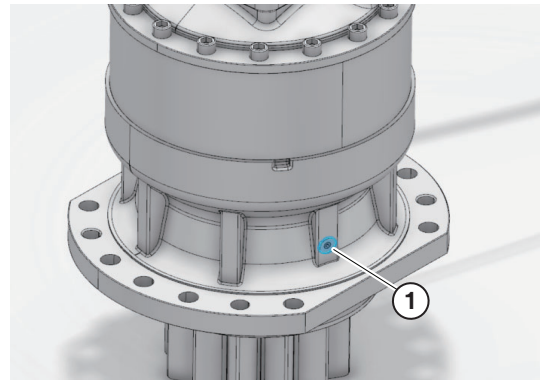


Figure 82

DS2003646

3. Grease to the fitting (2, Figure 83) until clean grease flows out of hole (1, Figure 82).
4. Install air vent plug (1, Figure 82) in swing reduction gear.

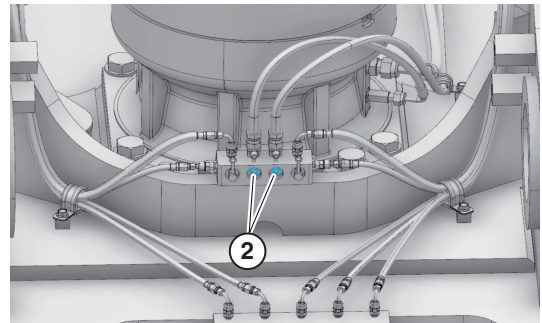


Figure 83

DS2003647

Hydraulic Oil Tank Breather Filter - Replace

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Tip breather cap up (2, Figure 84) slightly to release the internal pressure.
3. Unscrew the bolt (1, Figure 84) and take off the breather cap (2).
4. Change a filter cartridge (3, Figure 84) and assemble the breather cap by tightening the bolt.

NOTE: *The used filter should always be disposed of according to local regulations.*

NOTE: *When the machine is operated under dusty work sites, the hydraulic oil tank breather needs to be cleaned or replaced regularly even before the expected replacement date.*

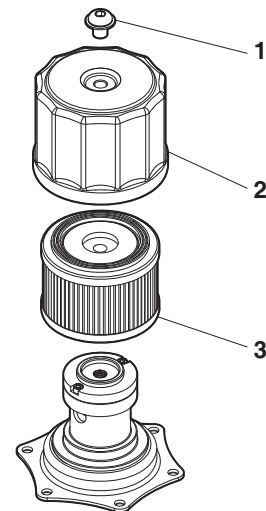


Figure 84

DS1900872

Hydraulic Oil Return Filter - Replace

NOTE: Change hydraulic oil return filter after first 250 hours of operation or rebuild, and every 1,000 hours thereafter.

NOTE: If return filter clogged warning symbol on display monitor comes "ON" the return filter must be serviced.



WARNING

AVOID DEATH OR SERIOUS INJURY

The hydraulic oil will be hot after machine operation. Allow the system to cool before attempting to service any of the hydraulic components.

The hydraulic tank is pressurized. Tip the hydraulic breather cap up slightly to allow the pressurized air to vent. After the pressure has been released, remove service covers or drain water from tank.



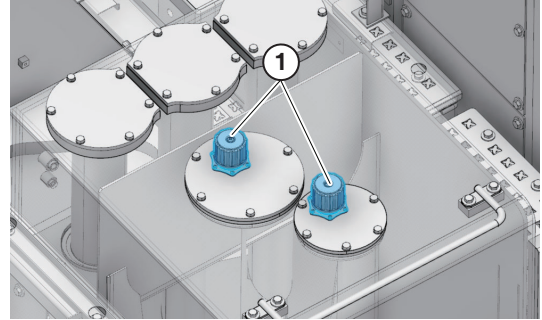
NOTICE

Make sure to clean any dirt or water from the top of the hydraulic tank, especially around the fill port and filter ports.

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Tip breather cap up (1, Figure 85) slightly to release the internal pressure.
3. Remove bolt and washer (2, Figure 85) and service cover (3). Remove O-ring (4), spring (5), bypass valve (6) and bypass strainer (7), and then filter (8).
4. Remove filter and discard.

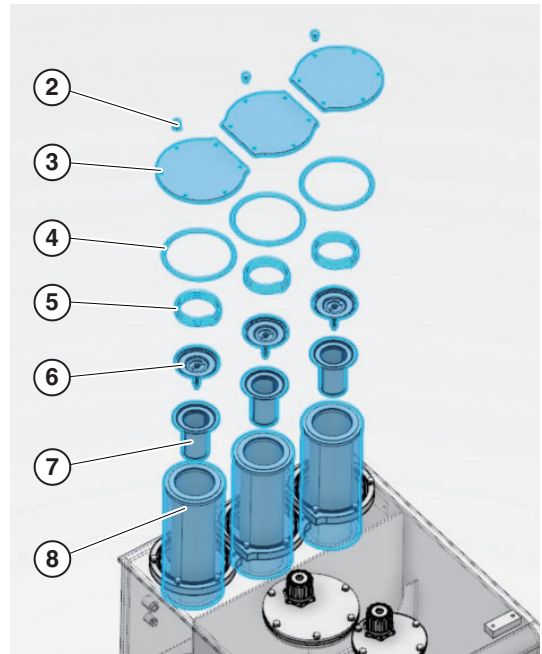
NOTE: Used filter should always be disposed of according to local laws and regulations.

5. Install new filter and a new O-ring. Install bypass strainer, valve and spring. Install service cover plate.
6. Run engine for ten minutes at "LOW IDLE" to purge air from circuit.
7. Check level in hydraulic oil tank (See page 4-25). Add oil if necessary.



DS2003648

Figure 85



DS2003693

Figure 86

Pilot Filter - Replace

NOTE: *Change pilot filter after first 250 hours of operation or rebuild, and every 1,000 hours thereafter.*



WARNING

AVOID DEATH OR SERIOUS INJURY

The hydraulic oil will be hot after machine operation.

Allow the system to cool down before changing pilot filter.

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Tip hydraulic oil tank breather slightly to release the internal pressure.
3. Unscrew filter bowl (1).
4. Remove filter element (2). Examine the surface of the element for contamination residue and larger particles. These can be an indication of possible component damage.

NOTE: *Drain fluid into a suitable container and clean or dispose of it in accordance with environmental regulations.*

5. Replace filter element (2).
 - A. Wet the sealing surfaces (4) and thread on the filter head and bowl, as well as the O-ring, with clean operating oil.
Apply anti-seize to threads of the filter bowl.
 - B. When fitting a new filter element, check that the designation corresponds to that of the old element.
 - C. Place filter element in the filter bowl.
6. Clean filter bowl (1) and filter head (3).
Particular attention must be given to the threads.
7. Examine filter, especially sealing surfaces (4), for mechanical damage.
8. Check O-rings – and replace if necessary.
9. Screw in filter bowl fully and tighten to 40 N.m (4.1 kg.m, 29.5 ft lb).
10. After changing pilot filter, check filter for leakage.
And vent air from pump and check level of hydraulic oil tank.

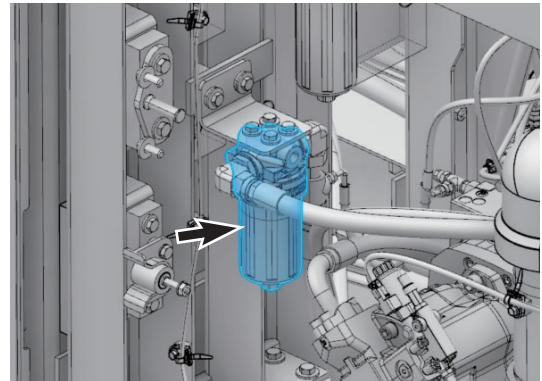


Figure 87

DS2004404

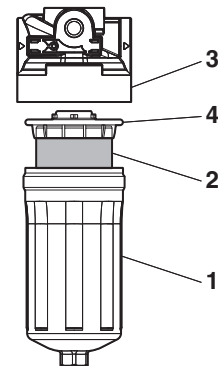


Figure 88

DS1701384

Drain Filter - Replace

NOTE: Change drain filter after first 250 hours of operation or rebuild, and every 1,000 hours thereafter.



WARNING

AVOID DEATH OR SERIOUS INJURY

The hydraulic oil will be hot after machine operation.

Allow the system to cool down before changing drain filter.

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Tip hydraulic oil tank breather slightly to release the internal pressure.
3. Unscrew filter bowl (1).
4. Remove filter element (2). Examine the surface of the element for contamination residue and larger particles. These can be an indication of possible component damage.
5. Replace filter element (2).
 - A. Wet the sealing surfaces (4) and thread on the filter head and bowl, as well as the O-ring, with clean operating oil. Apply anti-seize to threads of the filter bowl.
 - B. When fitting a new filter element, check that the designation corresponds to that of the old element.
 - C. Place filter element in the filter bowl.
6. Clean filter bowl (1) and filter head (3). Particular attention must be given to the threads.
7. Examine filter, especially sealing surfaces (4), for mechanical damage.
8. Check O-rings – and replace if necessary.
9. Screw in filter bowl fully and tighten to 40 N.m (4.1 kg.m, 29.5 ft lb).
10. After changing pilot filter, check filter for leakage. And vent air from pump and check level of hydraulic oil tank.

NOTE: As the red popped indicator (1) is moved farther from green section (2) and thus closer to red section (3), a greater contamination of the filter is meant.

If the filter is found contaminated, replace it even though the replacement interval is not yet reached.

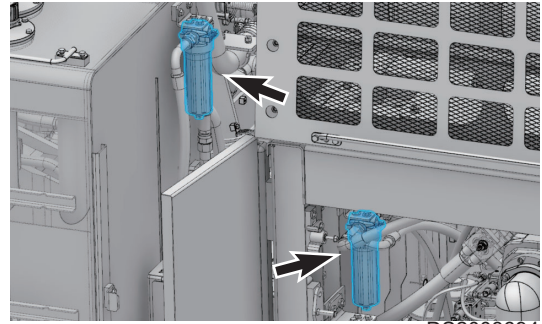


Figure 89

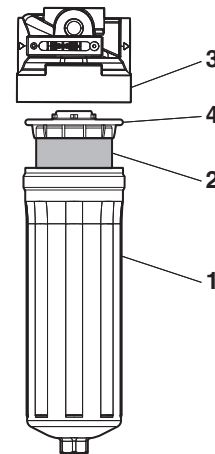


Figure 90

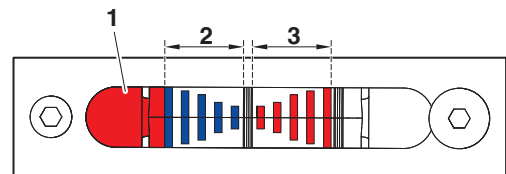


Figure 91

Travel Reduction Gear Oil - Change



WARNING

AVOID DEATH OR SERIOUS INJURY

The gear oil is very hot after the machine has been operating. Shut all systems down and allow them to cool before performing any inspections.

Before removing the motor case, loosen the plug slightly to allow pressurized air to escape. Residual pressure in the travel reduction gear can cause the plug to be dislodged and oil to squirt out suddenly.

Number	Name
1	Oil level and filler plug
2	Drain plug

NOTE: Change the oil after the first 500 hours of operation and every 2,000 hours thereafter.

1. Make sure that the machine is on firm and level ground.
2. Rotate the track as shown in the figure to position the drain plug (2, Figure 92) at the bottom of the vertical axis.
3. Place a container under the drain plug (2, Figure 92) and remove the plugs (1 and 2) to drain the travel reduction gear oil.

NOTE: Dispose of drained fluids in compliance with all applicable environmental laws and regulations.

4. Install the drain plug (2, Figure 92). Add oil until it reaches the bottom of the oil level and filler plug (1, Figure 92). Install the oil level and filler plug (1, Figure 92).

NOTE: See "Fluid Capacities" on page 4-17 for the capacity.

5. Repeat this procedure on the other travel reduction gear.

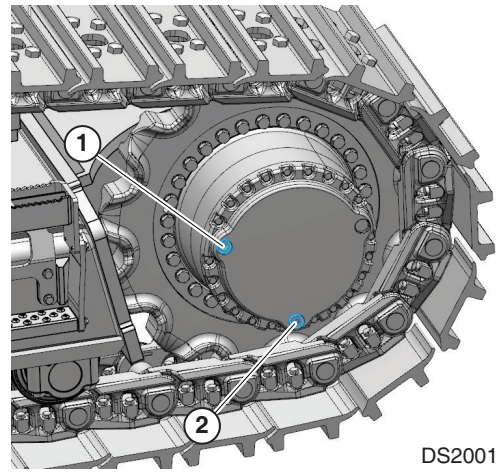


Figure 92

DS2001413

Swing Reduction Gear Oil - Change

NOTE: *Change the swing reduction gear oil after the first 500 hours of operation and every 1,000 hours thereafter.*



WARNING

AVOID DEATH OR SERIOUS INJURY

The gear oil is very hot after the machine has been operating. Shut all systems down and allow them to cool before performing any inspections.

1. Place a container under the machine.
2. Release the drain plug (3, Figure 94) and drain the swing reduction gear oil into the container.

NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*

3. After draining the oil, tighten the drain plug.

NOTE: *Drain plugs can be accessed by opening the bottom cover of machine.*

4. Open the breather/filler cap (2, Figure 93) and add oil to the "H" mark on the dipstick (1).

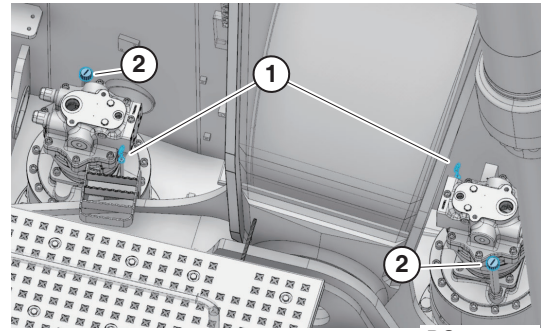


Figure 93

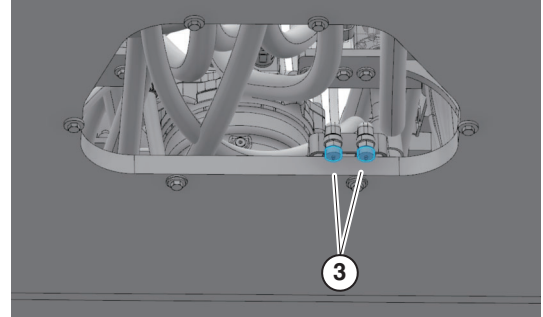


Figure 94

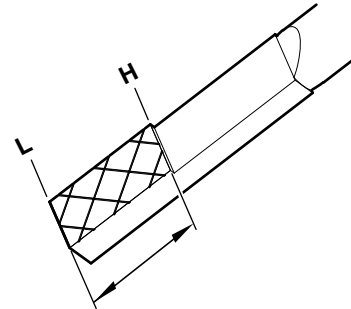


Figure 95

Pump Drive Gear Oil - Change

NOTE: *Check the oil level, if running short, replenish the oil, if the burnt smell detected, replace the oil.*

Air-conditioning Outer Filter - Replace

The unit is equipped with an air filtration system which filters out dirt and dust particles from air being circulated into operator's cabin. This filter must be cleaned.

NOTE: *In the unit is being operated in a dusty environment, the cleaning and replacement must be performed more frequently. If filter is damaged, replace damaged filter with a new one.*



WARNING

AVOID DEATH OR SERIOUS INJURY

All service and inspection of air-conditioning system must be performed with the starter switch in the "O" (OFF) position.

NOTE: *All right and left call outs are based on the operator being seated in the operator's seat facing the front.*

1. Open the cover by using the starter KEY in the left side of the cabin.

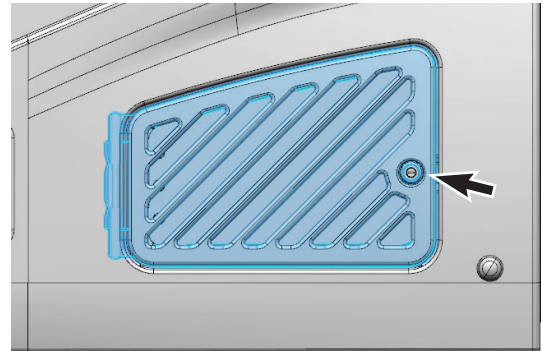


Figure 96

2. Remove filter (Figure 97) and replace with new one.
3. Reassemble in reverse order.

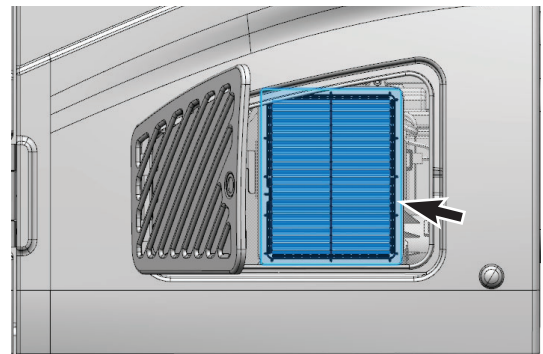


Figure 97

Air-conditioning Inner Filter - Replace

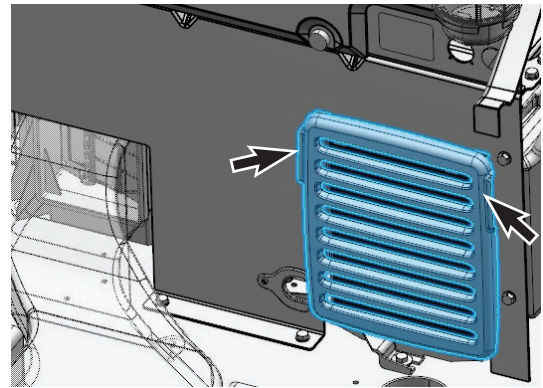


WARNING

AVOID DEATH OR SERIOUS INJURY

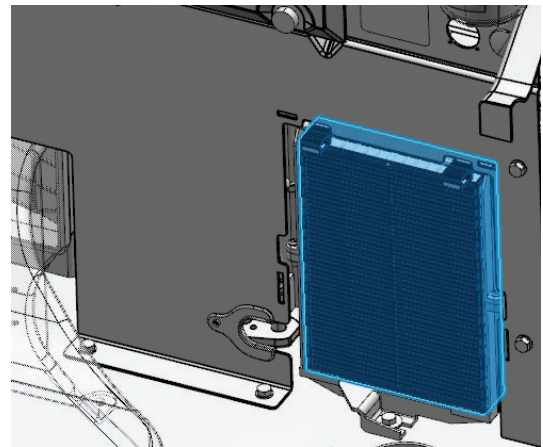
All service and inspection of air-conditioning system must be performed with the starter switch in the "O" (OFF) position.

1. Remove cover by pulling knob outward on top of the left and right of the filter which is inside the left rear part of the cabin.
2. Remove inner filter by pulling knob outward while pressing the upperpart and lower part of the filter handle.
3. Replace with new one.
4. Reassemble filter in reverse order.



DS2001405

Figure 98



DS2001404

Figure 99

2,000 Hour / Yearly Service

Perform All Daily, 50, 250, 500 and 1,000 Hour Service Checks

Air Cleaner Outer and Inner Filter - Replace



WARNING

AVOID DEATH OR SERIOUS INJURY

Never clean or attempt to remove air cleaner filter if the engine is running.

NOTE: Replace outer element after cleaning 5 times or every 2,000 hours of service.

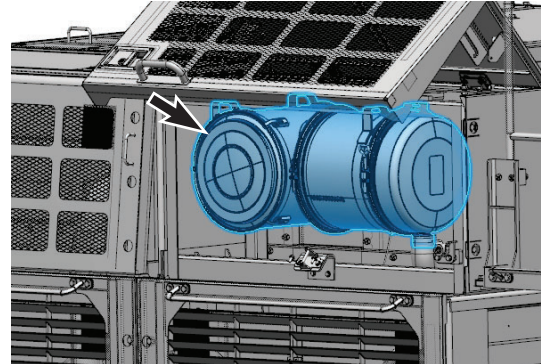
NOTE: Replace inner element whenever a new outer element is installed.

1. Locate the air cleaner assembly, remove 3 latches (1 Figure 101), then remove cover (2).
2. Loosen wing bolt of outer filter.
3. Hold the outer element (3, Figure 101), rock it lightly up and downward, and swing the element to pull it out. Remove inner element (4) after doing this.
4. Wipe off the dirt stuck to the air cleaner cover and the inside of the air cleaner housing.

NOTE: When replacing the outer element, replace the inner element simultaneously. Do not reuse the inner element.

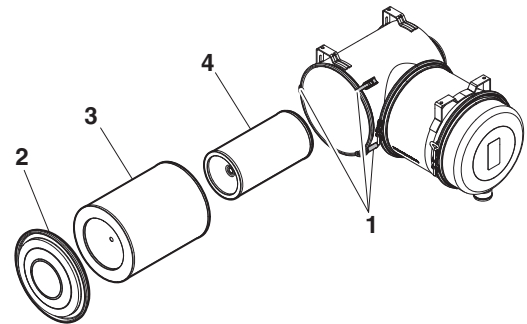
NOTE: If the inner element is not installed properly and the outer element and cover are installed, the outer element will be damaged.

5. Remove inner element (4, Figure 101), then install a new inner element. Insert the inner element properly so it does not move.
6. Push the new outer element (3, Figure 101) in straight to the air cleaner body and tighten the wing bolt.



DS2001408

Figure 100



DS1701388

Figure 101

NOTICE

Be sure to install the air cleaner filters facing in the correct direction. If the direction of installation is incorrect, this will damage the air cleaner filters or the engine.

7. Install cover.

NOTE: *Generally, tubes are self cleaning and need no service. But when filter clogging is occurred within short time even after cleaning/changing filter element, the tubes cleaning is required.*

Clean Pre-Cleaner Tubes

With the dust cup (1, Figure 102) removed, check the tubes (2). A visual inspection is usually adequate.

- If the tubes carry light dust, remove it with a stiff brush.
- If plugging with fibrous material is evident, remove the pre-cleaner.
Then clean it with compressed air or water no hotter than 72°C (162°F).

Any time the pre-cleaner is removed, the body gaskets should be replaced. When reinstalling the dust cup, be sure it seals 360° around the air cleaner body.

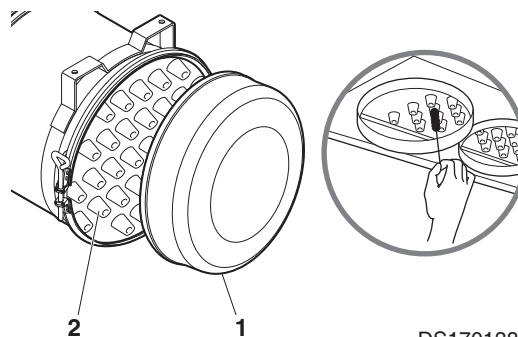


Figure 102

DS1701389

Pump Drive Gear Oil - Change

NOTE: *Change the oil after the first 250 hours of operation and every 2,000 hours thereafter.*



WARNING

AVOID DEATH OR SERIOUS INJURY

The gear oil is very hot after the machine has been operating. Shut all systems down and allow them to cool before performing any inspections.

1. Make sure that the machine is on firm and level ground.
2. Remove the under cover.

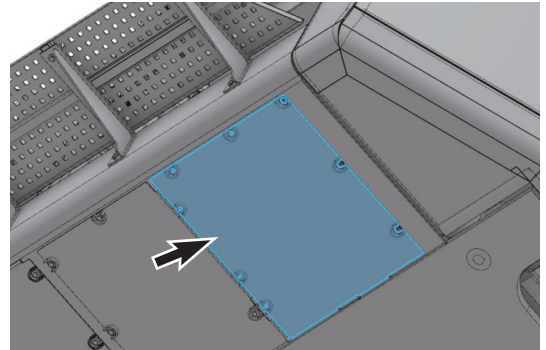


Figure 103

DS2004481

3. Remove the cap of drain plug and install the hose to drain gear oil.
After draining gear oil, install the cap of drain plug.

NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*

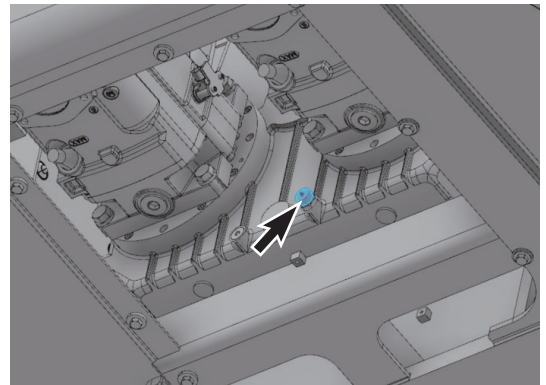


Figure 104

DS2004482

4. Remove the cover.

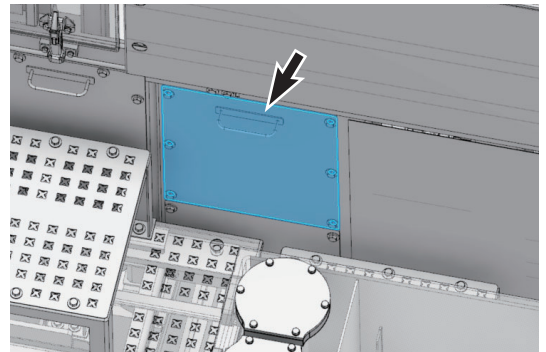


Figure 105

DS2004483

5. Remove oil level dipstick and wipe the oil off with a clean cloth.

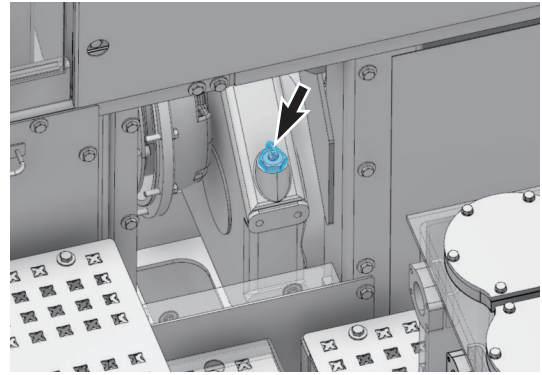


Figure 106

DS2004484

6. Add oil through dipstick port.

NOTE: See "Fluid Capacities" on page 4-17 for the capacity.

7. Install oil level dipstick.

NOTE: Gear Oil level must be between "MIN" and "MAX" marks on dipstick.
If gear oil above "MAX" mark on dipstick, oil must be drained to return oil to proper level.



Figure 107

DS2004593

8. Open the pump compartment door to access pump drive air breather cartridge.
9. Remove air breather cartridge to rotate counterclockwise.
10. Install the new cartridge.
 - Torque: 110 N.m (10.2 kg.m, 74 ft lb)
11. Perform installation in the reverse order to removal.

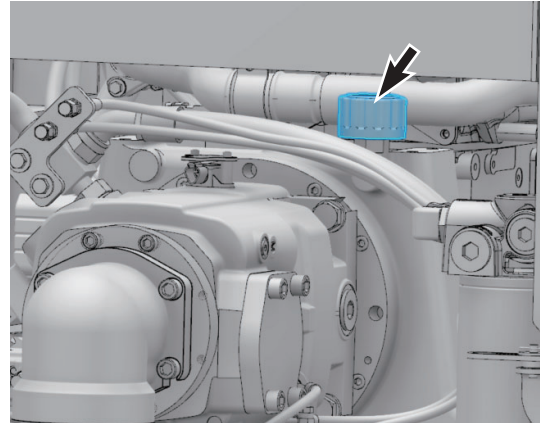


Figure 108

DS2103275

Coolant - Change

NOTE: Do not mix ethylene glycol and propylene glycol antifreeze together. Refer to "Engine Cooling System" and "Types of Antifreeze" page for further details.



WARNING

AVOID DEATH OR SERIOUS INJURY

Allow the engine to cool before releasing the radiator cap. Make sure to loosen the cap slowly to release any remaining pressure.

Radiator cleaning is performed while the engine is running. Take extreme caution when working on or near a running engine. Make sure to lock out and tag the controls notifying personnel that service work is being performed.

Do not remove radiator cap unless it is required. Check the coolant level in the surge tank.



NOTICE

Do not mix up the antifreeze from different makers. Mixing the two compounds can cause generation of foreign material which can damage the system. Therefore, it is recommended to use authorized HD HYUNDAI CONSTRUCTION EQUIPMENT genuine antifreeze solution.

To achieve the best cooling performance, keep the mixing ratio of the antifreeze and water by 50 : 50. Using water only can corrode the coolant circuit.

In bitterly cold working conditions, the customer should frequently check the performance of the coolant for appropriateness for the weather and then determine change cycle of the coolant.

1. Slowly open the radiator cap and the surge tank cap (Figure 109) to allow any pressure to escape.

NOTE: See "Fluid Capacities" on page 4-17. for capacity.

NOTE: Some models may have no surge tank or radiator cap. This instruction is only applicable to those with the cap.

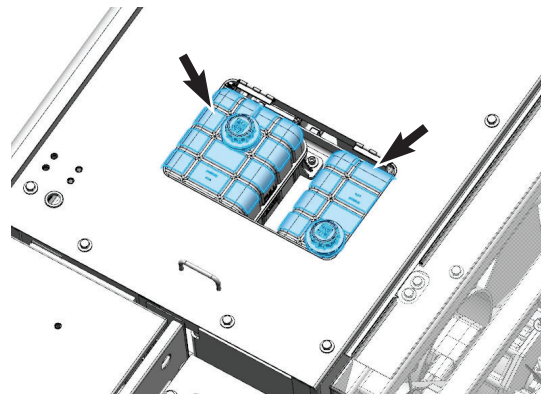
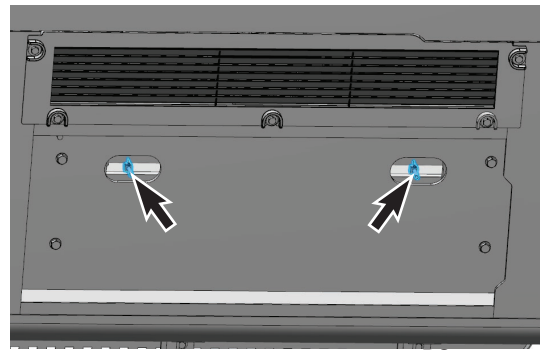


Figure 109

2. Place a container under the radiator and open the drain plug.

NOTE: *Dispose of drained fluids according to local applicable environmental laws and regulations.*

3. Fill cooling system with a flushing solution.
4. Run engine at low idle until coolant temperature gauge reaches the "WHITE ZONE". Run engine for another ten minutes.
5. Allow engine to cool.
6. Drain flushing fluid and fill system with water.
7. Run engine again to allow water to completely circulate.
8. After allowing engine to cool, drain water and fill system with proper antifreeze mixture for ambient temperature. Refer to coolant concentration table. See "Antifreeze Concentration Tables" on page 4-92.
9. Run engine without surge tank cap installed, so all air will be purged from system. Fill surge tank.



DS2001422

Figure 110

Hydraulic Oil and Suction Filter - Replace



WARNING

AVOID DEATH OR SERIOUS INJURY

The hydraulic oil will be hot after machine operation. Allow the system to cool before attempting to service any of the hydraulic components.

The hydraulic tank is pressurized. Tip breather cap up to allow the pressurized air to vent. After the pressure has been released, remove service covers.



NOTICE

Make sure to clean any dirt or water from the top of the hydraulic tank, especially around the fill port and filter ports.

NOTE: *Based on the type of excavating being completed, the working conditions (extremely hot or dusty) and the extra front end attachments being used (hydraulic breaker, etc.), the hydraulic fluid will need to be changed more frequently.*

1. Park machine on firm and level ground. Swing upper structure parallel to tracks. Lower boom and position bucket on ground as shown in Figure 112.
2. Move safety lever to "LOCK" position.
3. Stop engine.
4. Release pressurized air from hydraulic tank by tip breather cap up (1, Figure 116).



Figure 111

ARO1760L

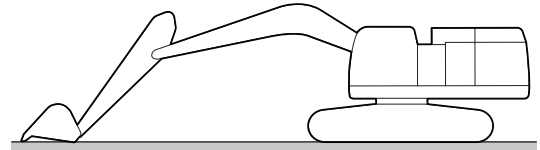


Figure 112

DS1701288

5. Drain hydraulic oil from oil tank (Figure 113) and oil cooler (Figure 114) into a container capable of holding 792 L (209.2 U.S. gal.). After draining tank, install drain plug.

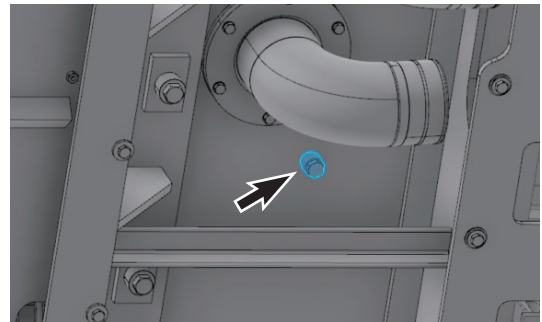


WARNING

AVOID DEATH OR SERIOUS INJURY

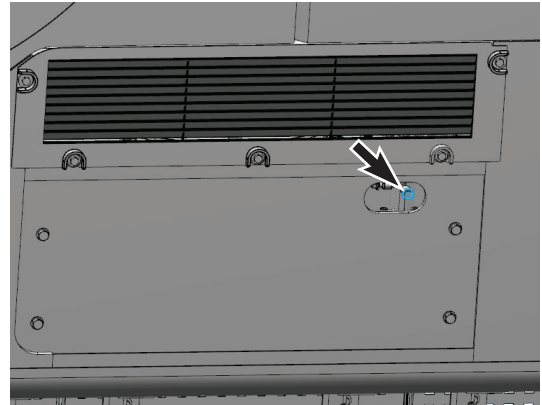
Be careful of squirting oil when removing drain plug.

NOTE: *Used filter and used oil should always be disposed of according to local laws and regulations.*



DS2003630

Figure 113

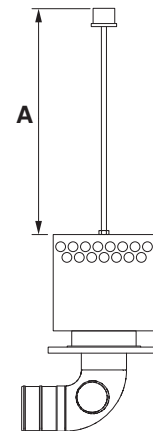


DS2001424

Figure 114

6. Carefully remove bolts and cover (2, Figure 116) from top of hydraulic oil tank. There is a spring (3, Figure 116) under the cover that will force the cover up.
7. Remove spring (3, Figure 116) and strainer (5, Figure 116), by pulling on rod (4, Figure 116).
8. Clean inside and outside of strainer. Replace strainer if it is broken.
9. Position strainer (5, Figure 116) on boss portion of suction pipe (6, Figure 116).

NOTE: *Measurement "A" is 1,090 mm (36.4 in).*



EX1400644

Figure 115

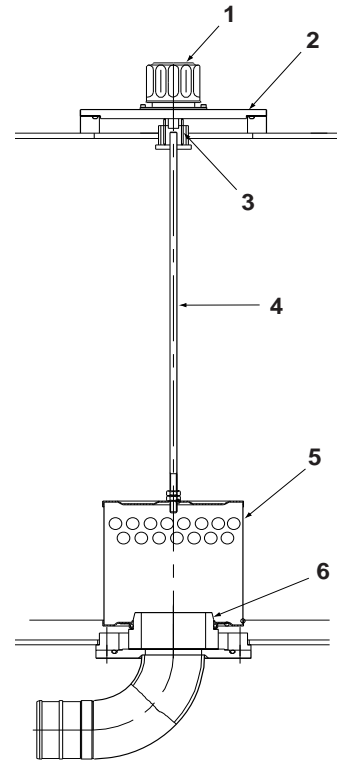
10. Fill the hydraulic oil tank. Check level using sight gauge on side of tank.
11. Place spring (3, Figure 116) on rod (4, Figure 116) and assemble cover (2, Figure 116).
12. After replacing and cleaning the hydraulic oil, filter, and strainer, vent the system. See "Venting and Priming Hydraulic System" on page 4-99.



NOTICE

When the hydraulic breaker is being used, because of the higher heat generated by this unit, use replacement intervals recommended under the "Hydraulic Oil and Filter Service Intervals" on page 4-16.

13. Check level of hydraulic oil tank. (See page 4-25)



ARO1720L

Figure 116

Alternator and Starter** - Check

Rubber Antivibration Shock Mounts - Check

Perform and Record Results of Cycle Time Tests

Inspect Machine to Check for Cracked or Broken Welds or other Structural Damage

Adjust Valve Clearance** - Check

Head Bolt Torques - Check

**These checks need to be completed by an authorized HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.

4,000 Hour / 2 Year Service

Major Parts - Periodic Replacement

For proper operation and work, perform periodic inspections. These parts are those most often subjected to abrasion, heat and fatigue. Replace these parts with new ones at the designated time intervals, even if the old parts look satisfactory.

Replace all related parts such as gaskets and O-rings with original equipment manufacturer's parts.

Major Component		Parts Name to be Replaced Periodically	Time to Replace
Engine		Fuel Hose (Tank to Pre Fuel Filter)	2 years or 4,000 hours
		Fuel Hose (Pre Fuel Filter to CP Pump)	
		Fuel Hose (CP Pump to Main Fuel Filter)	
		Fuel Hose (Main Fuel Filter to CP Pump)	
		Fuel Hose (CP Pump to Tank)	
		Fuel Hose (Tank to Drain Valve)	
		Heater Hose	
		Air Conditioner Hose	
Hydraulic System	Body	Pump Suction Hose	
		Pump Discharge Hoses	
		Pump Side Branch Hoses	
		Swing Motor Hoses	
		Travel Motor Hoses	
	Work Device	Boom Cylinder Line Hoses	
		Arm Cylinder Line Hoses	
		Bucket Cylinder Line Hoses	

12,000 Hour / 6 Year Service

Hose In-service Lifetime Limit (European Standard ISO 8331 and EN982 (CEN))

European regulations state that in-service life of any hydraulic hose may not exceed six years. HD HYUNDAI CONSTRUCTION EQUIPMENT recommends the following:

- 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, but replace hoses described in "Major Parts - Periodic Replacement" on page 4-80, every 2 years. Always replace hoses having exceeded the allowed in-service lifetime irrespective of the external appearance/wear.
- Always store hoses in a dark place at a maximum of 65% relative humidity, between 0°C (32°F) and 35°C (95°F) but as close as possible to 15°C (59°F) and away from copper, manganese or tube generating Ozone.

Air-conditioning System

NOTE: See *"Air-conditioning Outer Filter - Clean"* on page 4-52.

Gauge Panel - Check

When a function switch is pushed, the last setting has to be displayed on the LCD display.

When the light switch is turned to "I" position, the LED for illumination in the control panel has to turn "ON".

Air Conditioner Hoses - Check

Check the hose for cracking and damage. Replace if necessary.

Condenser - Check

Inspect the condenser for dust and debris. Clean if necessary.

NOTE: See *"Cooling System - Clean"* on page 4-54.

Magnetic Clutch - Check

Check the magnetic clutch for dirt and interference.

Push the "A/C" switch to energize and check magnetic clutch.

Bucket

Bucket Tooth - Replace



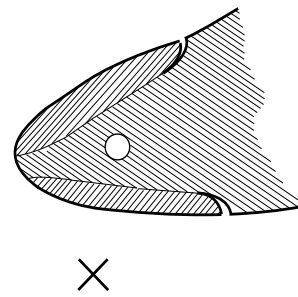
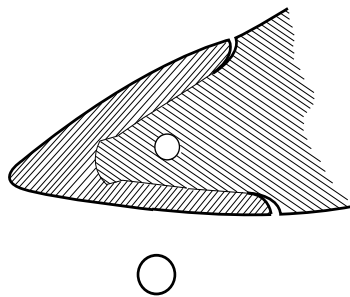
WARNING

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.

Curl the bucket upwards and place the round rear surface of the bucket firmly on the ground. Stop engine and lock out the hydraulic controls before working on the bucket.

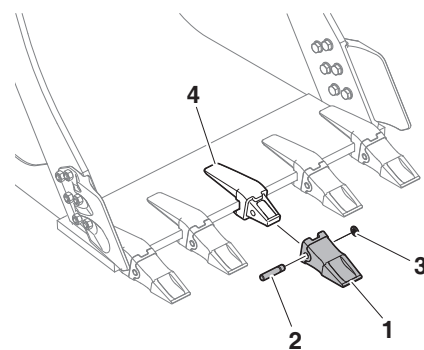
NOTE: *These instructions are only for HD HYUNDAI CONSTRUCTION EQUIPMENT OEM, buckets. If you are using other manufacturers buckets, refer to their specific instructions.*



HAOC680L

Figure 117

1. On a routine basis, inspect bucket teeth to make sure that tooth wear or breakage has not developed. Do not allow replaceable bucket teeth to wear down to a point that bucket adapter is exposed. See Figure 117.
2. To replace a tooth (1, Figure 118), use a hammer and punch to drive locking pin (2) and lock washer (3) out of tooth adapter (4).
3. Once worn tooth has been removed, use a putty knife to scrape adapter as clean as possible.
4. Slide new tooth into position and insert lock washer.
5. Insert locking pin into tooth and use a hammer, to drive pin in until lock washer seats in locking groove.



DS1901244

Figure 118

Bucket O-ring - Replace

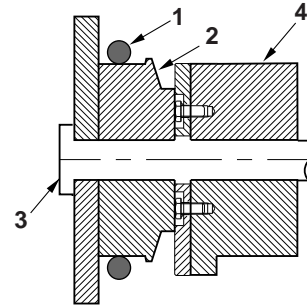


WARNING

AVOID DEATH OR SERIOUS INJURY

Due to possibility of flying metal objects and to avoid death or serious injury, always wear safety helmet, protective gloves and eye protection when changing pins.

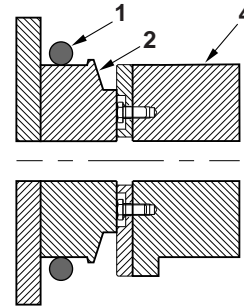
1. Inspect bucket O-rings on a routine basis. If worn or damaged, replacement is necessary.
2. Roll old O-ring (1, Figure 119) onto boss (2, Figure 119) around bucket pin (3, Figure 119). Remove bucket pin and move arm or bucket link (4, Figure 119) out of way.



FG019071

Figure 119

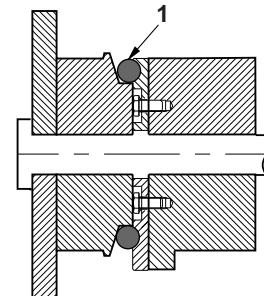
3. Remove old O-ring and temporarily install new O-ring (1, Figure 120) onto bucket boss (2, Figure 120). Make sure that O-ring groove on both bucket link (4, Figure 120) and boss have been cleaned.
4. Realign arm or link with bucket pinhole and insert bucket pin (3, Figure 119).



FG019074

Figure 120

5. Roll new O-ring (1, Figure 121) into O-ring groove.



FG019075

Figure 121

Electrical System

NOTE: *Never disassemble electrical or electronic parts. Consult a HD HYUNDAI CONSTRUCTION EQUIPMENT distributor before servicing.*

Battery



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

In colder weather, a greater drain is placed on the batteries when they are used for the preheat cycle and when starting a cold engine. 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 batteries. They never require the addition to water.

When the charge indicator becomes white, this indicates a low electrolyte state because of a leakage or charging system error. Determine the cause of problem and replace the batteries immediately.

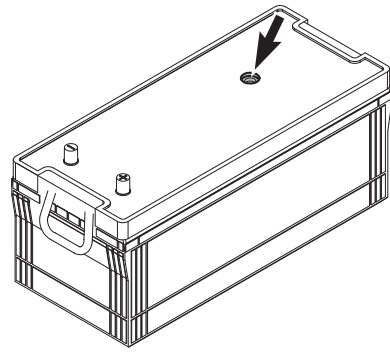


Figure 122

DS1900913

Check Charging State

Check charging state through the charging indicator.

- GREEN: Sufficiently charged.
- BLACK: Insufficient charged.
- WHITE: 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.

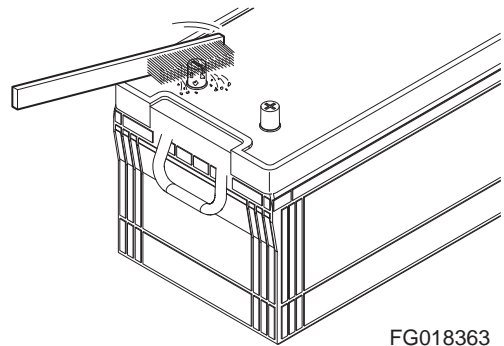


Figure 123

FG018363

Battery Replacement

When the charging indicator shows a white condition, replace the battery. The batteries should always be replaced in pairs.

Using an old battery with a new one will shorten the life span of the new battery.

Fuses

1. The fuses in the fuse box are used to protect the various electrical circuits and their components from being damaged. See Figure 124. The fuses used are standard automotive type fuses.
2. The section on "Fuse/Relay Identification" on page 4-88 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.



NOTICE

Before replacing a fuse, be sure to turn starter switch to "O" (OFF) position.

Junction Box

The junction box is inside the left side valve room. The fuses prevent electrical devices from overloading or shorting.

A decal attached inside the fuse box's cover indicates the function and amperage of each fuse.

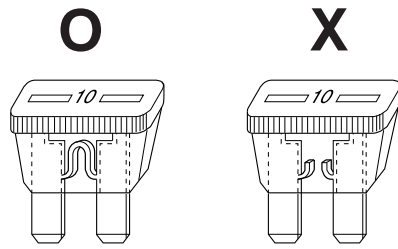
Change a fuse if the element separates. If the element of a new fuse separates, check the circuit and repair the circuit.



WARNING

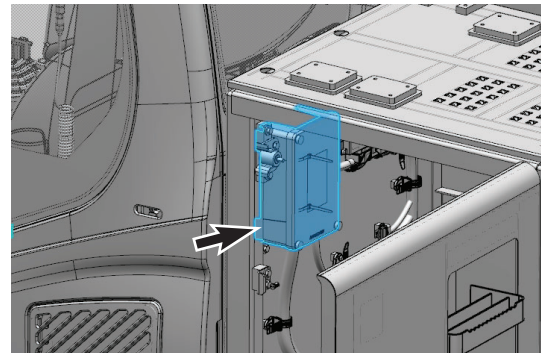
AVOID DEATH OR SERIOUS INJURY

Always replace fuses with the same type and capacity fuse that was removed. Otherwise, electrical damage or fire could result.



HAOC670L

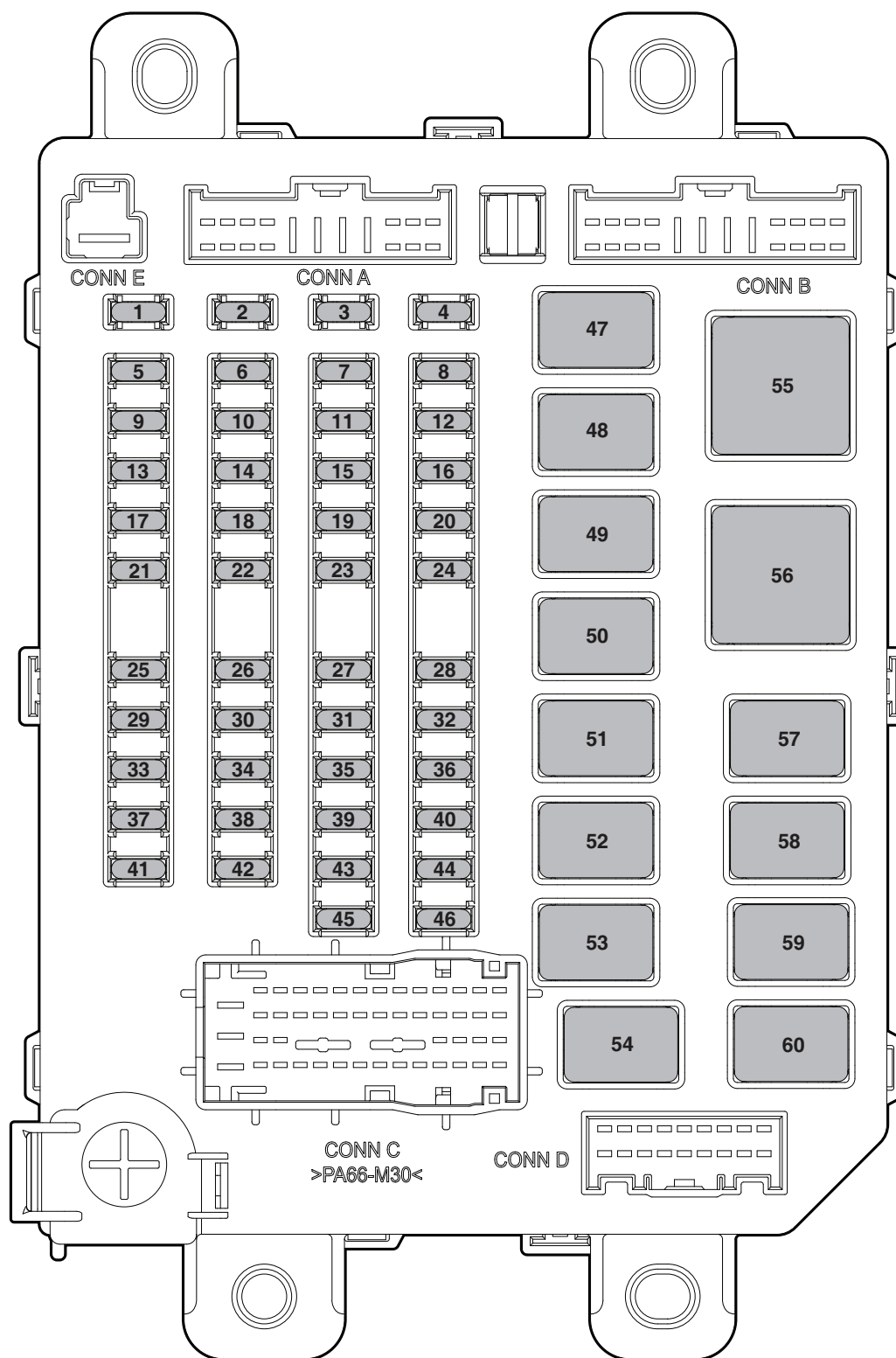
Figure 124



DS2001312

Figure 125

Fuse/Relay Identification



EX1502820

Figure 126

No.	Name	Capacity
1	Spare	5A
2	Spare	10A
3	Spare	20A
4	Spare	30A
5	ECU	20A
6	EPOS, Gauge Panel	30A
7	12V Power Socket	10A
8	Alarm	2A
9	Auto Shut Off	20A
10	PETU	30A
11	USB, Audio	10A
12	Relay	2A
13	Air Conditioner, Wiper	10A
14	Cabin Working Lamp	10A
15	Fuel Heater	20A
16	-	15A
17	Room Lamp, Wiper	5A
18	Audio Backup, Diesel Heater	10A
19	Air Compressor	20A
20	-	15A
21	TMS, Horn	10A
22	Hour meter, Key Switch	5A
23	Pressure Sensor	2A
24	-	2A
25	Joystick (RH)	2A
26	Lower Wiper, Auto Grease, Pilot Buzzer	5A
27	Relay	2A
28	Working Lamp	10A
29	Joystick (LH)	2A
30	Rotating Beacon	5A

No.	Name	Capacity
31	TMS	5A
32	Rear Cabin Lamp	10A
33	Air Conditioner Unit	30A
34	Swing Brake, Auxiliary Mode	10A
35	Pressure Sensor	2A
36	-	10A
37	Seat Heater, Air Suspension	15A
38	ECU	20A
39	Wiper, Window Washer, Mic	10A
40	Weight Light	15A
41	Fuel Heater 2	20A
42	Pressure Sensor	2A
43	12V Power Socket	10A
44	Head Lamp	15A
45	24V Power Socket	10A
46	-	10A
47	Alarm	Relay
48	-	Relay
49	-	Relay
50	Rear Cabin Lamp	Relay
51	Weight Light	Relay
52	-	Relay
53	-	Relay
54	-	Relay
55	-	Relay
56	Working Lamp	Relay
57	-	Relay
58	Head Lamp	Relay
59	-	Relay
60	USB, Audio, 12V Power Socket	Relay

Engine Cooling System

General

Keeping an engine's cooling system in peak operating condition can have many benefits in keeping a machine in good operating condition. A properly functioning cooling system will improve fuel efficiency, reduce engine wear, and extend component life.

Always use distilled water in the radiator. Contaminants in tap water neutralize the corrosion inhibitor components. If tap water must be used, Refer to "Table of Standards for Allowed Tap Water" on page 4-92. Water that has been treated with a water softener also contains salt that will cause corrosion of components. Water from creeks and stagnant pools usually contain dirt, minerals and/or organic material that are deposited in the cooling system and impair cooling efficiency. As such, the use of distilled water is recommended.

Engine coolant shall be mixed with antifreeze solution and water in ratio of 50 : 50.

Coolant shall be checked every 500 hours of operation for ensuring adequate concentration of antifreeze solution and additives.

Engine overheating is often caused by bent or clogged radiator fins. The spaces between the fins can be cleaned by use of air or water under pressure. When straightening bent fins, use care not to damage the tubes or break the bonding joint between the fins and the tubes.



WARNING

AVOID DEATH OR SERIOUS INJURY

Pressure at air nozzle must not exceed 2 kg/cm² (28 psi). Always wear goggles when using compressed air.

Do not pour cold water into radiator when engine is hot and water level is below the top of the tubes. Such action could result in damage to engine cylinder heads.

Heavy-duty diesel engines require a balanced mixture of water and antifreeze. Drain and replace the mixture 1 year or 2,000 hours of operation, whichever comes first. This will eliminate buildup of harmful chemicals.

Antifreeze is essential in any climate. It broadens the operating temperature range by lowering the coolant's freezing point and by raising its boiling point. Do not use more than 50% antifreeze in the mixture unless additional antifreeze protection is required. Never use more than 60% antifreeze under any condition.

Types of Antifreeze

Ethylene Glycol - HD HYUNDAI CONSTRUCTION
EQUIPMENT Genuine Antifreeze Solution
(for all seasons)

Ethylene glycol is a very hazardous material to human beings, animals and environment. Drain of coolant must be disposed of by an authorized waste material treatment service provider.

The color does not provide a standard. Unauthorized coolant may have the same color. Please check the label on the container. Use genuine product.



NOTICE

Do not mix solutions from different manufacturers. Otherwise, the performance may be deteriorated. It is recommended to use the standard product from HD HYUNDAI CONSTRUCTION EQUIPMENT.

In extreme temperatures, the performance of the coolant must be checked frequently and the coolant change cycle adjusted as necessary.

When refilling and changing coolant, use HD HYUNDAI CONSTRUCTION EQUIPMENT's genuine coolant is the top priority. The coolant, additives and SCA specifications must meet the following table.

Description	Coolant	
	Refill	Change
Coolant Standard	ASTM D6210	ASTM D6210
Coolant Base	Ethylene Glycol Base (Do not use Propylene Glycol)	Ethylene Glycol Base or Propylene Glycol (Both available)
Additive	Only Phosphate type available	Only Phosphate type available (Do not use Silicates type additive)
SCA (Supplemental coolant additives)	Nitrites : 1L (SCA) / 100L (Coolant)	Nitrites : 1L (SCA) / 100L (Coolant)
Remark	Below should not be contained for Scania Engine <ul style="list-style-type: none">2-EHA (mono carboxylate acid)Benzoat (aromatic carboxylate acid)	

Antifreeze Concentration Tables

Ethylene Glycol - HD HYUNDAI CONSTRUCTION EQUIPMENT Genuine Antifreeze Solution (for all seasons) (2,000 Hour/1 Year)		
Ambient Temperature	Cooling Water	Antifreeze
-20°C (-4°F)	67%	33%
-25°C (-13°F)	60%	40%
-30°C (-22°F)	56%	44%
-40°C (-40°F)	50%	50%

NOTE: The concentration shall be kept at 50% and in worst case at 30% minimum for the least corrosion resistance.

NOTE: Replacement cycle of the HD HYUNDAI CONSTRUCTION EQUIPMENT Genuine Product is 2,000 hours or one year.

Table of Standards for Allowed Tap Water

Requirement					
Item	Inorganic chloride	Sulfates	Total Hardness	Total Solids	Acidity
Value	< 40 ppm	< 50 ppm	< 9.5° d.H	< 340 ppm	5.5 - 9.0

PPM (Parts Per Million) - Unit of concentration of minor materials.

- 1 ppm = 1 mg/1 kg, 1 mL/1 L

° d.H - Unit of concentration of minor materials.

- 1° d.H = 17 ppm



NOTICE

The standard of tap water is for reference only, and may not be regarded as a standard.

If quality of the water is not trustable, stop using tap water whenever possible and use distilled water.

Fuel Transfer Pump (If Equipped)



NOTICE

Please open fuel cap before operate fuel transfer pump to avoid any safety issue/damages due to the pressure building up.

Dry operating fuel pump for more than fifteen seconds can cause wear and/or damage to pump.

- Cooling and lubrication of pump is achieved by fuel passing through pump. If pump is dry operated, heat generated by moving parts will cause damage to pump rotors, vanes and seals.

Do not operate pump for more than fifteen minutes at a time.

- Continuous usage of pump over recommended time interval will cause overheating of motor and will result in motor damage.

Do not use fueling pump for other types of fuel or fluids. (Use only for diesel fuel)

- Do not use fueling pump for other types of fuel which have a low flash point.
- Do not use fueling pump for fuel contaminated with water or high humidity. Moisture in pump mechanism can cause rust and can create pump failure.

Always operate pump using strainer installed on inlet hose. This will prevent any foreign materials from being introduced into pump. Always maintain pump and all of its components in a clean condition.

- If dirt or other foreign materials enter pump, they can become lodged between the rotor and/or vanes and generate heat which can cause pump damage.
- Do not remove strainer or use a strainer with larger mesh to increase flow of fuel.

Be careful not to overfill or spill fuel.

Make sure direction of check valve is in line with flow direction of fuel.

Any pump parts or components that become lost, damaged or inoperable must be immediately replaced.



WARNING

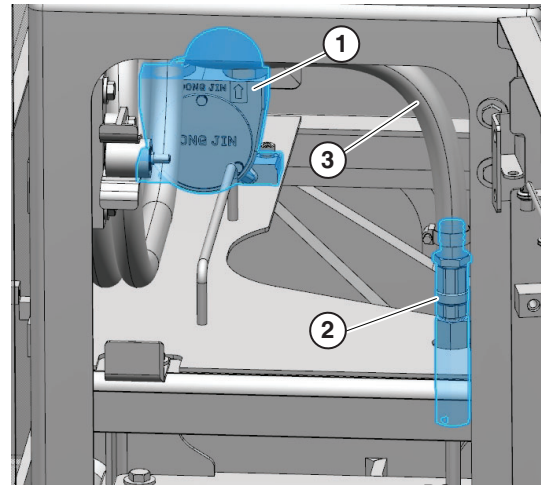
AVOID DEATH OR SERIOUS INJURY

If there is any sign of leakage while operating transfer pump, inspect the following components to prevent fire or hazardous fuel spill:

- Check all hoses leading to and from the transfer pump.
- Check all hose clamps.
- Check transfer pump inlet port.

The transfer pump (1, Figure 127) is used to transfer fuel from a refueling source to the fuel tank. A check valve (2) is installed in the inlet hose (3) to prevent fuel from flowing back from fuel tank to source. A strainer is installed in inlet hose to prevent any foreign material from being introduced into transfer pump or fuel tank.

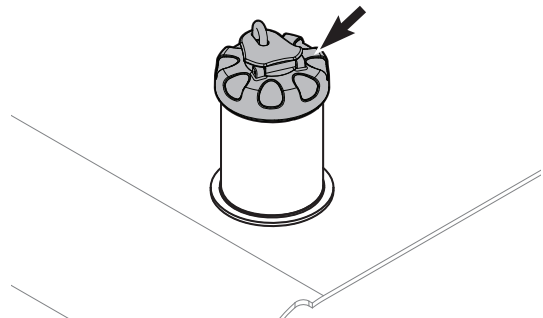
A thermal limiter, built into the motor, will automatically shut off power if motor is overheating to protect it from being damaged.



DS2001438

Figure 127

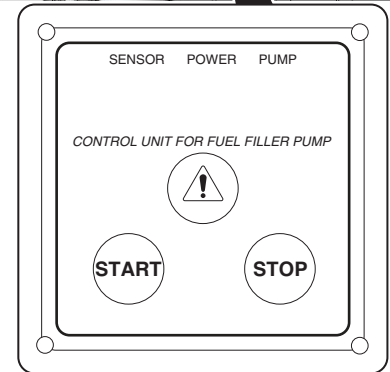
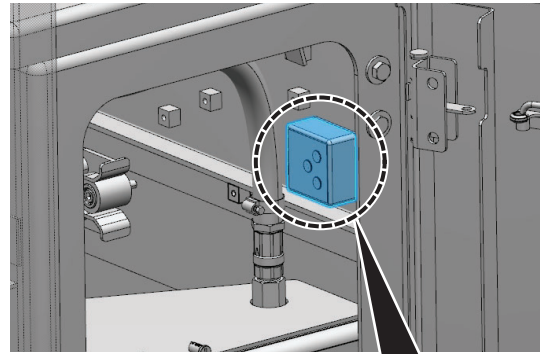
1. Open the fuel cap on the fuel tank.
2. Insert inlet hose (3, Figure 127) into refueling tank.



DS2100094

Figure 128

3. Push fuel pump "START" switch inside of DEF (AdBlue®) tank on front side.
4. Once fuel transfer is completed, the pump will automatically turn "OFF".
5. Lift inlet hose (3, Figure 127) from fueling source and push "START" switch and push "STOP" switch after two - three seconds to drain remaining fuel from hose to fuel tank.
6. Return hose (3, Figure 127) to storage position.



DS2001426

Figure 129

Handling of Accumulator



WARNING

AVOID DEATH OR SERIOUS INJURY

Even though the engine is stopped, the hydraulic accumulators for the pilot system are still charged. Do not disconnect any pilot system hoses until accumulator pressure has been released from the circuit. To release pressure, turn the starter switch to "I" (ON) position and operate all hydraulic control levers and forward/reverse travel levers. Even though the engine is stopped, hydraulic actuated components may move while releasing pilot pressure. Keep all personnel and bystanders away from excavator while performing this operation.

- Move safety lever to "LOCK" position after stopping engine.
 - DO NOT mishandle accumulator(s), because they contain high-pressure nitrogen gas.
 - DO NOT puncture or apply heat or fire to an accumulator.
 - DO NOT weld on accumulator, or try attaching anything to it.
 - When replacing an accumulator, contact a HD HYUNDAI CONSTRUCTION EQUIPMENT distributor or sales agency so the gas can be properly released.
 - Wear safety goggles and protective gloves when working on an accumulator. Hydraulic oil under pressure can penetrate the skin and cause death or serious injury.
-

Release pilot accumulator pressure using the following procedure:

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Move safety lever to "UNLOCK" position.
3. Turn starter switch to "I" (ON) position.
4. Fully stroke work and travel levers in all directions.
5. Move safety lever to "LOCK" position.
6. Turn key to "O" (OFF) position and remove from starter switch.
7. Remove accumulator by unscrewing it slowly.

Track Tension



WARNING

AVOID DEATH OR SERIOUS INJURY

Measuring track tension requires two people. One person must be in the operator's seat, operating the controls while the other person makes dimensional checks. Block frame to make sure the machine won't move or shift position during service. Warm up the engine to prevent stalls, park the excavator in an area that provides level, uniform ground support and/or use support blocks when necessary.

NOTE: *The track tension must be adjusted in accordance with the operating conditions. If a lot of dust stick to the track assembly in the working place, keep the track as loose as possible.*

Track shoe link pins and bushings wear with normal usage, reducing track tension. Periodic adjustment is necessary to compensate for wear and it may also be required by working conditions.

1. Track tension is checked by jacking up one side of the excavator. See Figure 130. Place blocking under frame while taking measurement.

Turn the track backward 1 ~ 2 turns.

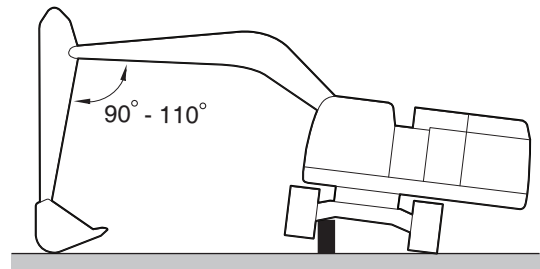


Figure 130

DS1701173

2. Measuring the distance (A, Figure 131) between the bottom of the side frame and the top of the lowest crawler shoe. Recommended tension for operation over most types of terrain is as below table.

NOTE: *Clean off the tracks before checking clearance for accurate measurements.*

3. Too little sag in the crawler track (less than clearance distance "A" on below table) can cause excessive component wear. The recommended adjustment can also be too tight causing accelerated stress and wear if ground conditions are wet, marshy or muddy.

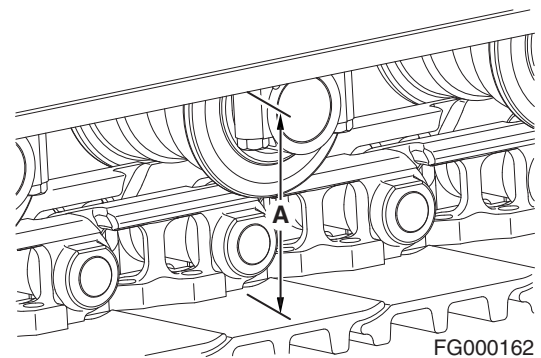


Figure 131

FG000162

4. A track that is properly adjusted may have a different sag according to the track options. Contact your dealer for information.

Terrain Type	Distance "A"
Normal	460 ~ 490 mm (16.7 ~ 17.9 in)



WARNING

AVOID DEATH OR SERIOUS INJURY

The track adjusting mechanism is under very high-pressure. **NEVER** release grease pressure too fast. The track tension grease valve should never be loosened more than one (1) complete turn from the fully tightened down position. Bleed off grease pressure slowly. Keep your body away from the valve always. Always wear eye and face protection when adjusting track tension.

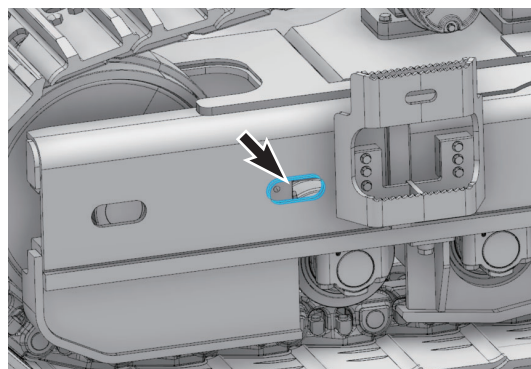


Figure 132

DS2004485

5. Track tension adjustments are made through the grease fitting (1) in the front of each side frame. Filling the grease fittings with grease increases the length of the adjustable cylinders. The longer the adjustable cylinders become, the more pressure builds in the tension springs which expand beyond the track idlers.
6. If the tracks and adjustment devices expand to the point that there is a lack of deflection or space between parts, turn the grease fitting valve (2) counterclockwise, until grease comes out. Once the track tension is suitable, tighten the handle screw in the clockwise direction.
 - Grease fitting valve (2) tightening torque: 137 N.m (14 kg.m, 101 ft lb)
 - Check the tension again after rotating the track 3 ~ 4 times.

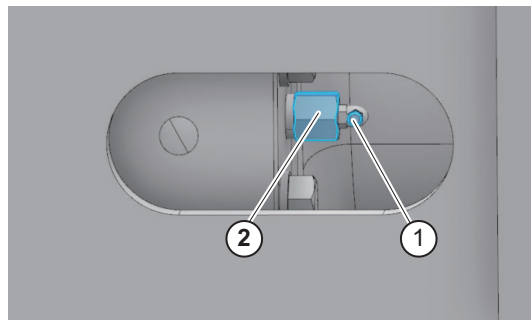


Figure 133


DS2003696

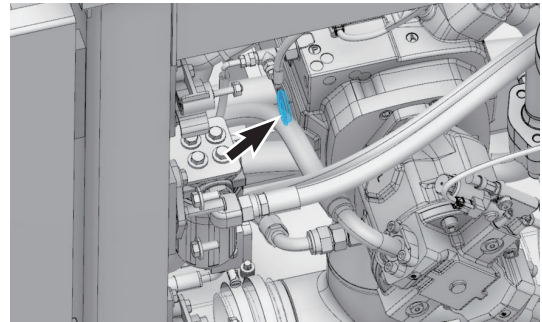
NOTE: After draining, failure to turn the grease fitting valve (2) clockwise will allow the grease to keep draining. Also, turning it too far clockwise may cause damage to the stopper of the screw.

Venting and Priming Hydraulic System

Main Pump

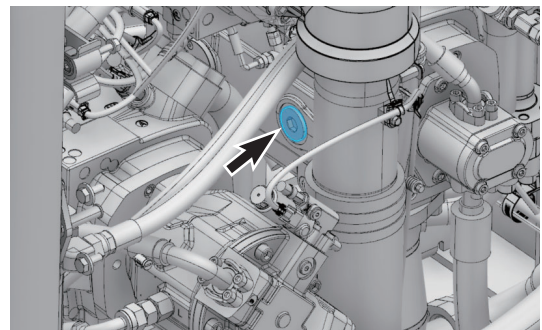
NOTE: If pump is run without sufficient oil in the main hydraulic pump, damage can occur. Always vent pump of air after draining hydraulic system.

1. With the engine stopped, remove vent plug to see if any oil is present.
 - Tool: 19 mm ()
2. If oil is not present, fill oil tank with oil.
3. Install vent plug first.
4. Start engine and run it for several minutes at low idle engine speed. This will pressurize the hydraulic oil tank and system.
5. Slowly loosen vent plug several turns, until hydraulic oil flows out of plug. This shows that air has been released.
6. Tighten the plug.
 - Torque: 320 N.m (32.6 kg.m, 236 ft lb)



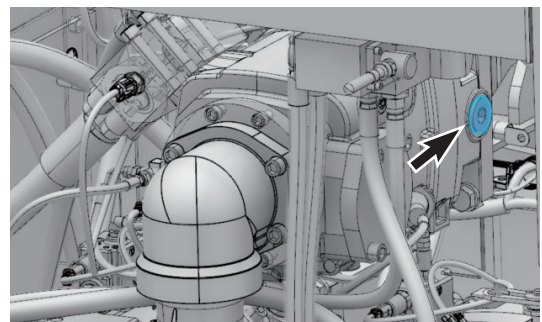
DS2003697

Figure 134



DS2003698

Figure 135



DS2003699

Figure 136

Cylinders



NOTICE

If cylinders are operated in "HIGH IDLE" after the hydraulic system has been drained or the cylinder has been rebuilt, damage to piston packing and seals can occur. Always vent air from cylinders at "LOW IDLE" and at a slow speed.

1. Run engine at "LOW IDLE". Extend and retract each cylinder to within 100 mm (4 in) of fully stroking it 4 - 5 times.
2. Operate fully extend and retract each cylinder 3 - 4 times.
3. Repeat procedure until cylinders extend and retract smoothly.

Swing Motor

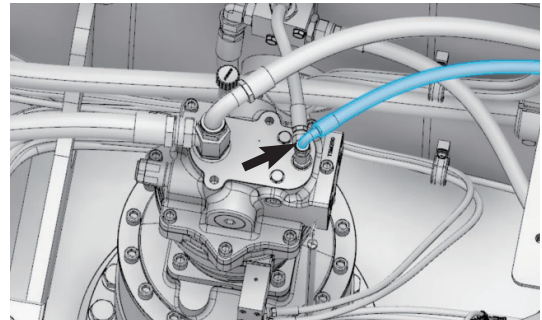


NOTICE

If the air is not vented from the system, it will cause damage to the swing motor and bearings.

NOTE: Perform this only when oil has been drained from swing motor.

1. Stop engine.
2. Disconnect drain hose and fill swing motor case with hydraulic oil.
3. Connect the drain hose.
4. Start engine and set throttle at "LOW IDLE" and swing upper structure slowly two full revolutions to the left and right.



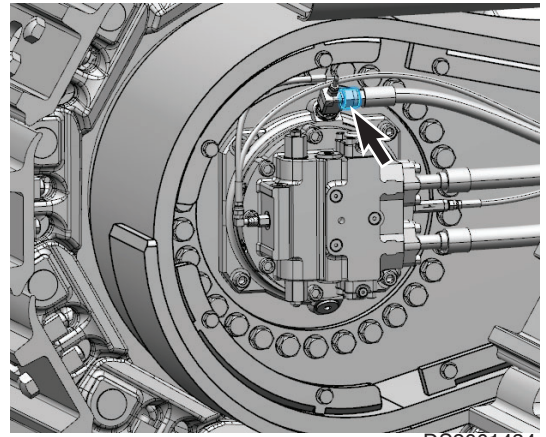
DS2003700

Figure 137

Travel Motor

NOTE: *Perform this only when oil is drained from travel motor.*

1. Stop engine.
2. Disconnect drain hose (Figure 138) and fill motor case with hydraulic oil.
3. Connect drain hose.
4. Start engine and set engine speed control dial to "LOW IDLE". Run the engine for one minute and slowly drive excavator forwards and backwards.



DS2001434

Figure 138

General Venting

1. After venting air from all components, stop engine and check the hydraulic oil level. Fill hydraulic oil tank to "H" mark on sight gauge.
2. Start engine and operate all controls again, and run engine for five minutes to ensure all systems have been vented and purged of air. Move engine speed to "LOW IDLE" and check hydraulic oil level again. Add oil as necessary.
3. Check for oil leaks and clean all fill and venting locations.

Maintenance in Special Conditions

NOTE: See "Operation in Extreme Conditions" on page 1-69 for other recommendations.

Conditions	Maintenance Required
Operating in mud, water or rain.	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 air intake filters on a more frequent basis.
	Clean the radiator and oil cooler fins to remove embedded dirt and dust.
	Clean the fuel system intake strainer and fuel filter more frequently.
	Inspect and clean as required the starter and alternator.
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.
	Using a hydrometer, check the antifreeze to make sure that it is providing the proper cold weather freeze protection.
	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 federal, state and 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.

If the actual height exceed the limitation on the trailer, the operator must submit special permission to the government. Consult to the national or regional Road authorities.

Or, to avoid height limit, one may disassemble front linkage or guardrail during transportation.



WARNING

AVOID DEATH OR SERIOUS INJURY

Whenever removal or reassemble guardrail, always use external ladder to access, and NEVER climbing up machine without guardrail and external ladder.

Consult to the HD HYUNDAI CONSTRUCTION EQUIPMENT dealer.



NOTICE

Do not reuse counterweight torque bolt. Once fastened and used under the harsh condition such as counterweight, the bolt may exceeded its yield point.

Use new bolt to counterweight reassemble every time.

Disassembly and Assembly

Before and after Transportation

When necessary, machine should have counterweight and front attachment removed for transport between locations. The tracks must be retracted before removing counterweight and front attachment.

If equipped, removable counterweight may also have to be removed.

NOTE: *Obey all local, state or federal regulations for transportation of excavator. If unsure of regulations check with local authorities.*

Check intended route for road width, overhead clearances, weight restrictions, and traffic control regulations. Special approval or permits may be required.

When doing this operation, make sure that it is done on solid level ground, with adequate room for maneuvering all equipment and keeping personnel at a safe distance when required.



WARNING

AVOID DEATH OR SERIOUS INJURY

If engine must be run while performing maintenance, use extreme care. Always have one person in cabin at all times. Never leave cabin with engine running.

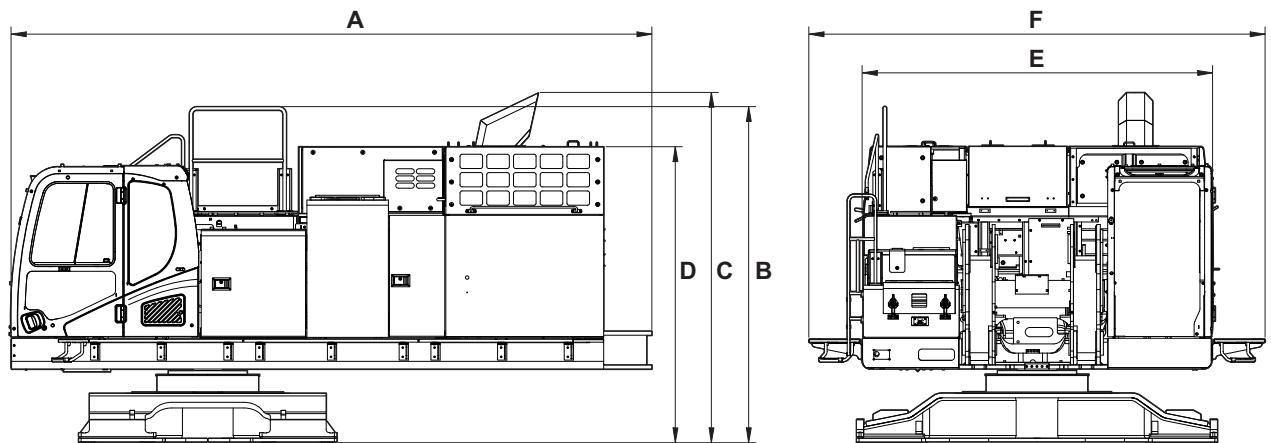
Personnel and Equipment

1. Disassembly and Reassembly: 3 persons
2. Crane Operator: 1 person
3. Crane Equipment: 1 machine

Disassembly and Reassembly

Work	Procedures	Equipment to be Used
Disassembly and Loading on Carrier	Counterweight Disassembly	Crane
	Track Side Frame Disassembly	
	Front Disassembly	
Reassembly	Front Assembly	
	Track Side Frame Assembly	
	Counterweight Assembly	

- Upper Structure

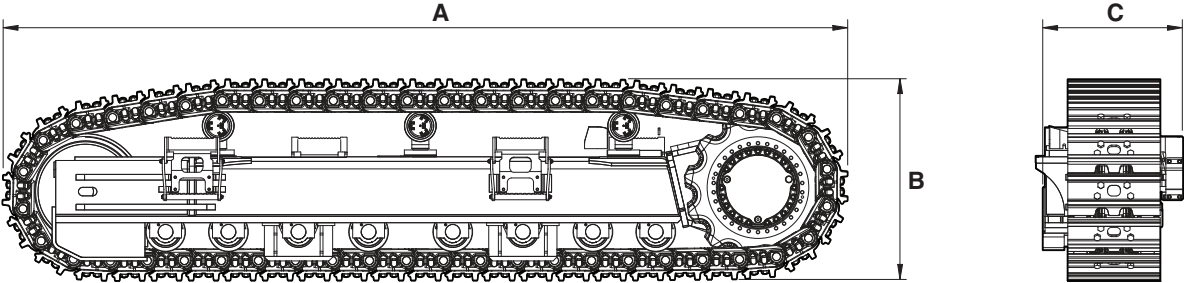


DS2004405

Figure 1

A	Length	6,282 mm (20' 7")
B	Height (Top of Guardrail)	3,280 mm (10' 9")
C	Height (Top of Muffler)	3,215 mm (10' 7")
D	Height (Top of Cabin)	2,720 mm (8' 11")
E	Width (Without CatWalks)	3,410 mm (11' 2")
F	Width (With CatWalks)	4,450 mm (14' 7")
	Weight	32,870 kg (72,466 lb)

- Undercarriage



DS1701427

Figure 2

A	Length	6,370 mm (20' 11")
B	Height	1,455 mm (4' 9")
C	Width (with Steps)	1,185 mm (3' 11")
	Weight	14,150 kg (31,195 lb)

- Counterweight

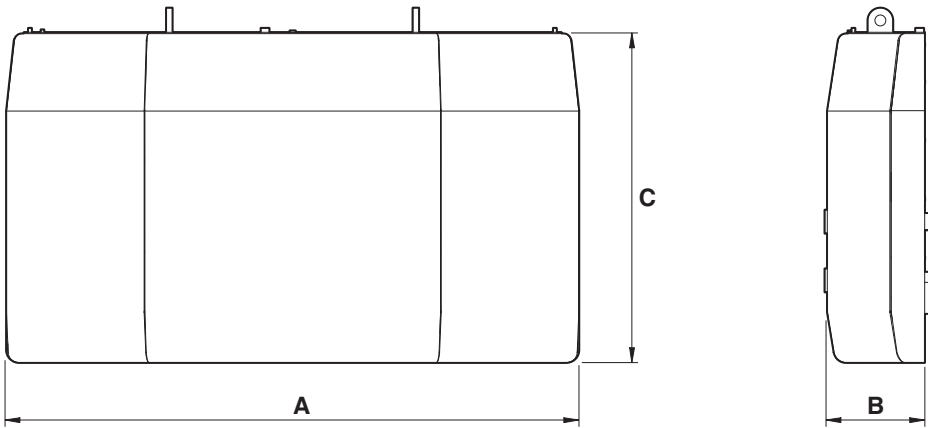


Figure 3

DS2001435

A	Width	3,410 mm (11' 2")
B	Length	680 mm (2' 3")
C	Height	1,970 mm (6' 6")
	Weight	12,700 kg (27,999 lb)

- Removable Counterweight (If Equipped)

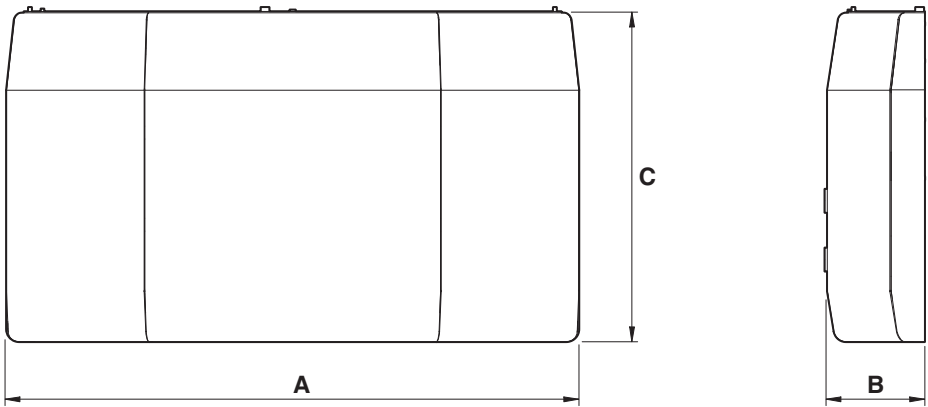


Figure 4

DS2004486

A	Width	3,410 mm (11' 2")
B	Length	675 mm (2' 3")
C	Height	1,970 mm (6' 6")
	Weight	11,300 kg (24,912 lb)

- Boom

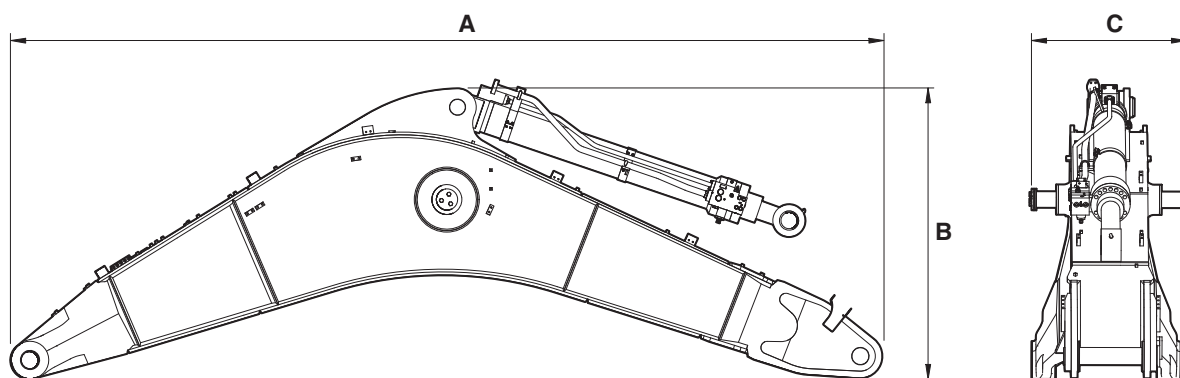


Figure 5

DS1701429

		8.4 m (27' 7")	7.25 m (23' 9")
A	Length	8,805 mm (28' 11")	7,640 mm (25' 1")
B	Height (Top of Hoses)	2,340 mm (7' 8")	2,610 mm (8' 7")
C	Width	1,340 mm (4' 5")	
	Weight	10,740 kg (23,678 lb)	10,230 kg (22,553 lb)

- Arm

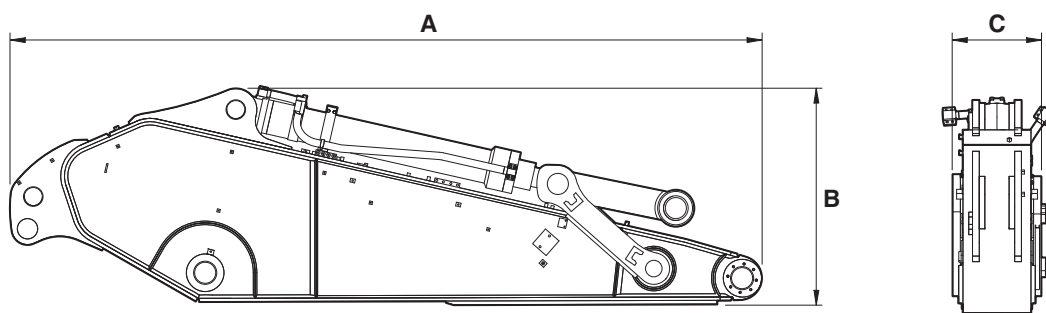


Figure 6

DS1701430

		3.75 m (12' 4")	2.9 m (9' 6")
A	Length	5,305 mm (17' 5")	4,490 mm (14' 9")
B	Height	1,730 mm (5' 8")	1,505 mm (1' 11")
C	Width	820 mm (2' 8")	
	Weight	5,825 kg (12,842 lb)	5,590 kg (12,324 lb)

Remove and Install Counterweight



WARNING

AVOID DEATH OR SERIOUS INJURY

Death or serious injury can occur from a counterweight falling during removal or installation. Do not allow personnel under or around the counterweight during removal or installation.

Use certified cables and shackles of adequate load rating. Improper lifting can allow the load to shift and cause death or serious injury.

Removal

1. Park on firm and level ground.
2. Lower front attachment (bucket) to ground.
3. Stop engine.
4. Move safety lever to "UNLOCK" position.
5. Turn starter switch or start/stop button to key "ON" position.



WARNING

AVOID DEATH OR SERIOUS INJURY

If engine must be running while performing maintenance, use extreme care. Always have one person in the cabin at all times. Never leave the cabin with the engine running.

6. Fully stroke work levers (joysticks) in all directions to relieve any pressure from accumulators.
7. Move safety lever to "LOCK" position.
8. Turn starter switch or start/stop button to key "OFF" position.
9. Attach maintenance warning tag on controls.
10. Turn battery disconnect switch to "OFF" position.
11. Make sure all electrical lines and other items are disconnected.
12. Install the lifting wire.

NOTE: Thread: M64 x 6.0

13. Using a suitable lifting device capable of handling the weight of the counterweight, partially support counterweight from lifting wire (5, Figure 7), counterweight (1) before loosening six bolts (2). Stop lifting with assist crane as soon as lifting slings are taut.

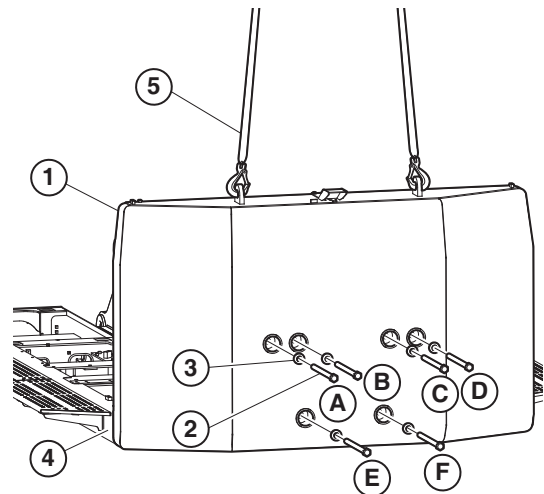



Figure 7

14. Remove bolts (2) and washers (3) from counterweight (1).

- Tool: 55 mm ()
- Remove order: C → B → E → D → F → A
- Counterweight:
 - 12,700 kg (27,999 lb)
 - 11,300 kg (24,912 lb)

NOTE: Heat bolts, if necessary, to free them.

15. When bolts (2, Figure 7) and washers (3) have been removed, lift counterweight (1) a very short distance above support frame (4) and stop. Check slings and make sure counterweight is being supported evenly.


Installation

1. Using suitable lifting device capable of handling the weight of the counterweight, support counterweight from lifting wire (5, Figure 8). Raise counterweight (1) into position just above support frame (4) leaving counterweight suspended. Verify that counterweight is level and even.

NOTE: Leave counterweight (1, Figure 8) suspended 3 mm (0.125") above support frame (4) until all mounting bolts (2) are started in counterweight mounting holes.

2. Slide washers (3, Figure 8) onto bolts (2). Apply Loctite #262 to mounting bolt threads.

3. Install bolts (2, Figure 8) with washers (3) into counterweight until washers contact support frame. Fully lower counterweight onto support frame and finish tightening bolts.

- Tool: 55 mm ()
- Install order: A → F → D → E → B → C
- First torque: 490 N.m (50 kg.m, 361 ft lb)
- Second torque: 2,942 N.m (300 kg.m, 2,170 ft lb)

4. Remove lifting wire from counterweight. (5, Figure 8)

5. Make sure all electrical lines and other items are connected.

6. Turn battery disconnect switch to "ON" position.

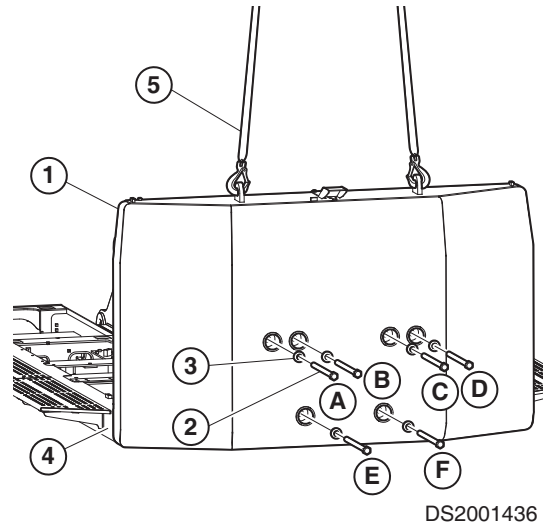


Figure 8

Track Frame Extension and Retraction



NOTICE

Be sure to clean all off all dirt and mud from tread surface of center frame, and on side frames; otherwise, it can cause bolts to loosen.

Operate machine with side frames retracted only when loading and unloading machine, or during driving for loading and unloading.

Do not retract side frames for excavating or during normal driving and operation. If machine is operated with either side frame retracted, or even one side frame retracted, during operation, cabin/machine will become unstable. This can cause damage to, center frame, side frames, bolts, etc. There are bolts holding side frame at each location.

Operation with side frame retracted could even result in a tip over, serious injury and death.

Track Width Adjustment

This machine has a variable track width device that allows tracks to be retracted on each side of machine.

The retraction device should only be used during transportation.

During machine operation at a work site, track width device must be adjusted to have widest track width. If not, stability of machine will be greatly reduced, which could result in fatal accidents and damage.

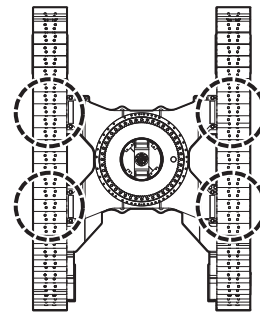


Figure 9

DS1903253

Frame Retraction

1. Remove bolts (1), washers (1) and plate (2).
2. Remove bolts, harden washers and spacers (4) from side frame (3) to be retracted.

NOTE: Do not loosen bolts (5) on guide (6).

NOTE: Repeat the procedure at the same side.

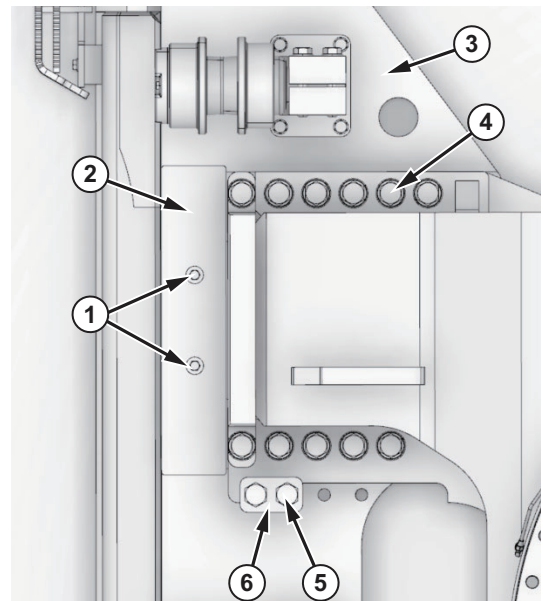


Figure 10

DS2004487

3. Remove the upper cover at the rear side.

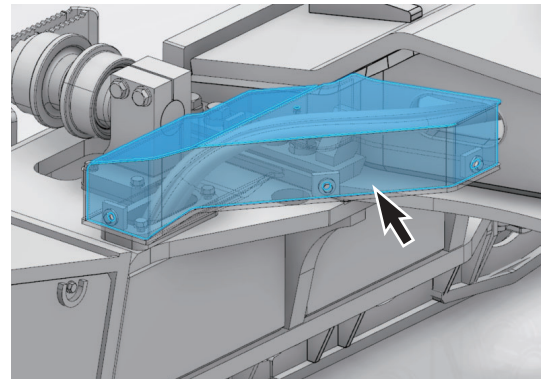


Figure 11

DS2004592

4. Turn superstructure so it is perpendicular to side frame to be retracted.
Raise side frame to approximately a 15° angle from ground using a jack.
Side frame should slide by its own weight and hit against stop.

NOTE: If side frame does not slide in this condition, allow side frame that is not contacting ground to move back and forth slowly.

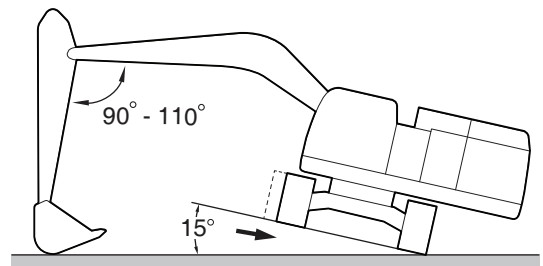


Figure 12

DS1701431



NOTICE

The arm must be set at a 90 ~ 110° angle. Never set it at an angle less than 90°

5. After side frame (1) has slid into place, lower superstructure to ground. Install spacers, harden washers and bolts (2).

NOTE: Tighten bolts to 288 kg.m (2,083 ft lb).

NOTE: Repeat procedure at other center frame support (3).

6. After bolts and cover for one side frame are fastened, repeat Steps 1 thru 4 for other side frame.
7. Store remaining bolts, plates, spacers and washers with machine.

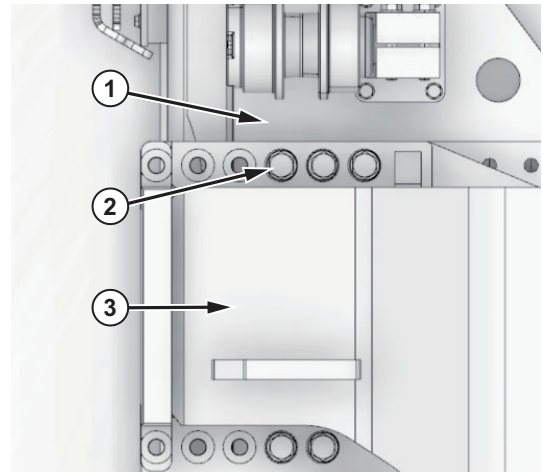


Figure 13

DS2004488

Frame Extension

1. Remove bolts, harden washers and spacers (1) from side frame (2) to be extended.

NOTE: Do not loosen bolts (3) on guide (4).

NOTE: Repeat the procedure at the same side.

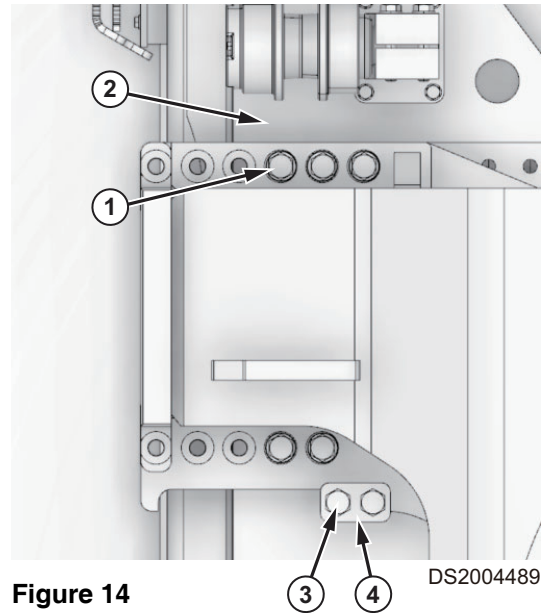


Figure 14

DS2004489

2. Remove the upper cover at the rear side.

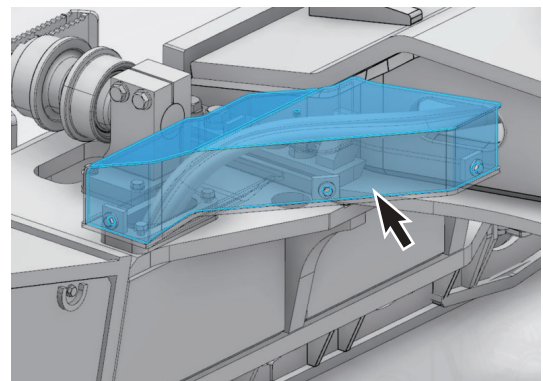


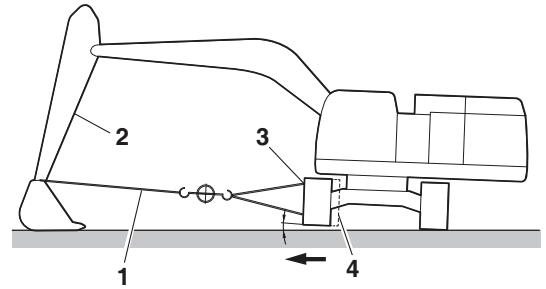
Figure 15

DS2004592

3. Turn superstructure so it is perpendicular to side frame to be extended.

NOTE: Do not attach cable on side frame step.

4. Attach one end of cable (1, Figure 16) (6 x 19 normal Z to $\varnothing 18 \sim \varnothing 20$ A type) on arm (2) and other end on side frame (3). Connect it with an appropriate holding device on both ends.
5. Raise side frame (3, Figure 16) slightly with jack and block (4). Extend arm (2) gradually to slide side frame out until it hits stop.



DS1701432

Figure 16

6. After side frame (1) has slid into place. Lower superstructure to ground. Remove cable.

7. Install bolts (3), washers (3) and plate (2).

NOTE: Tighten bolts to 27 kg.m (195 ft lb).

8. Install bolts, harden washers and spacers (4).

NOTE: Tighten bolts to 288 kg.m (2,083 ft lb).

NOTE: Repeat procedure at other center frame support (1).

9. Install the upper cover at the rear side. (Figure 15).

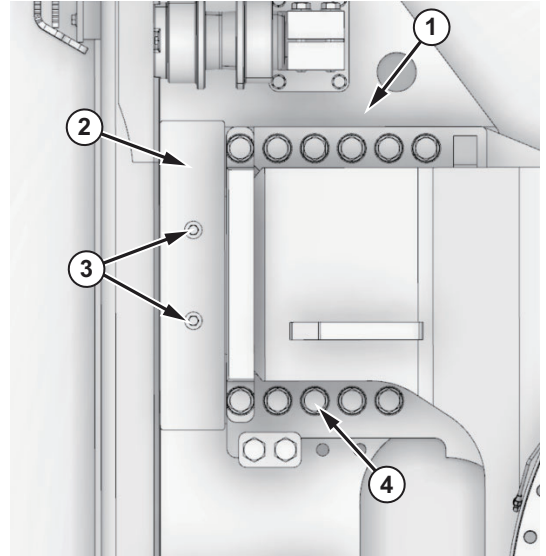


Figure 17

DS2004490

Loading and Unloading

Warning for Counterweight and Front Attachment Removal



WARNING

AVOID DEATH OR SERIOUS INJURY

HD HYUNDAI CONSTRUCTION EQUIPMENT warns any user, that removal of counterweight from machine, front attachment or any other part, may affect stability of machine. This could cause unexpected movement, resulting in death or serious injuries. HD HYUNDAI CONSTRUCTION EQUIPMENT is not liable for any misuse.

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

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



WARNING

AVOID DEATH OR SERIOUS INJURY

When transporting machine, know width, height, length and weight.

Loading or unloading machine can be a dangerous operation. Make sure to run engine at lowest speed setting, and travel at slowest speed possible.

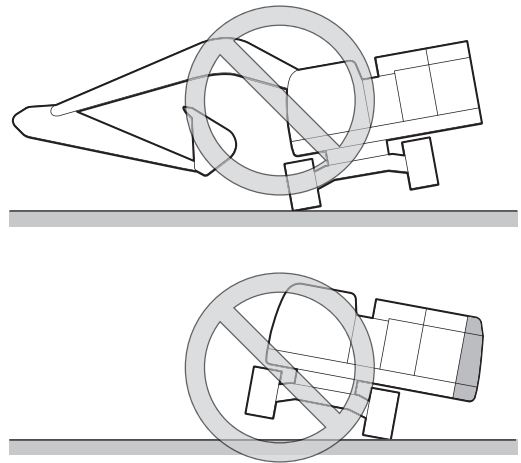
Make sure that ramp being used can handle weight of machine. If required, add blocking under ramp for additional support.

Make sure that ramp surface is free of grease or mud that could cause machine to slip or slide.

Make sure that trailer is parked on firm and level ground before attempting to load/unload excavator.

If it is required to turn machine while it is on trailer, make sure to do this at slowest engine and travel speeds possible.

Make sure to secure excavator onto trailer as required by local transportation laws.



DS1701101

Figure 18

1. Make sure that trailer is parked on firm and level ground. See Figure 19.
2. Make sure that ramps that are being used are designed to handle weight of excavator. If required, add blocking under ramp to provide additional support.
3. The ramp angle must be less than or not exceeding a 15° angle. Ramps steeper than this can cause a problem when loading or unloading.

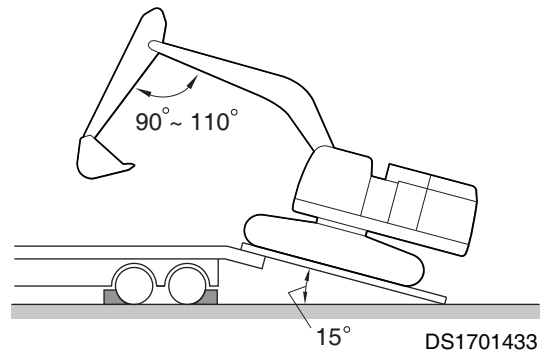


Figure 19

4. Set travel speed selector switch to "O" (OFF) position. See Figure 20.

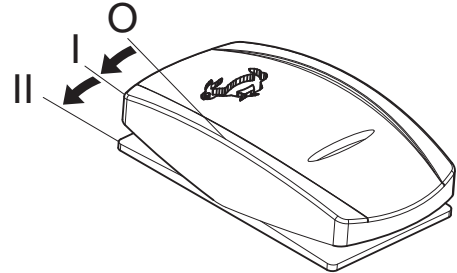


Figure 20

5. Turn "OFF" auto idle selector button (1, Figure 21). The indicator symbol will be disappeared.
6. Move engine speed to "LOW IDLE".

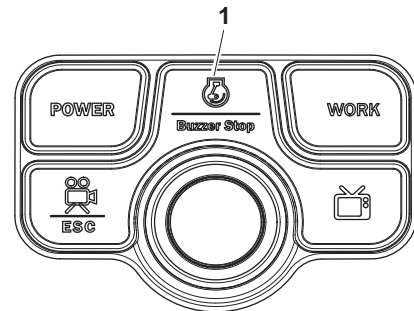


Figure 21

7. If machine is equipped with work equipment, set work equipment at front, and travel forward to load it.

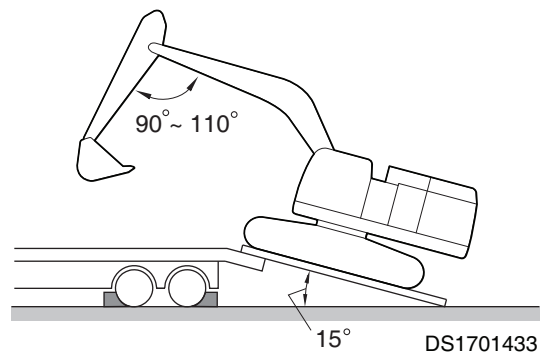
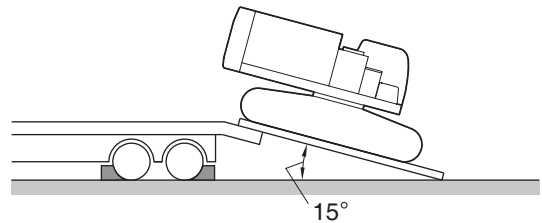


Figure 22

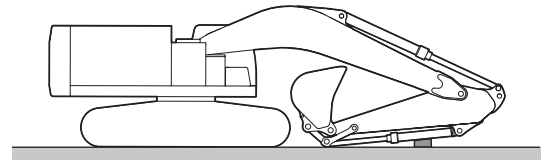
8. The unit does not require disassembly for normal over-the-road transportation. If boom and arm need to be removed, counterweight will place more weight on rear of machine. Make sure to back excavator onto trailer so counterweight end of excavator is positioned on ramp first. See Figure 23.



DS1701435

Figure 23

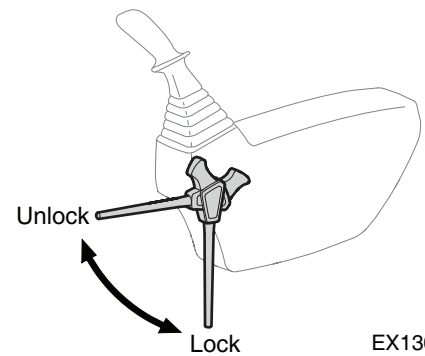
9. Extend bucket and arm cylinders to maximum length and then lower boom slowly.



DS2004504

Figure 24

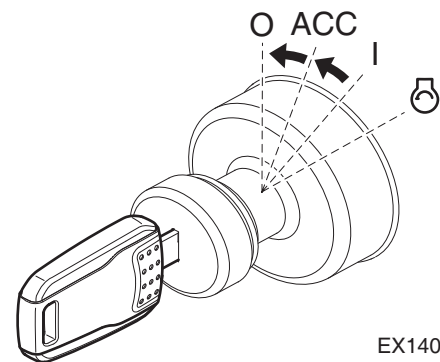
10. Move safety lever to "LOCK" position.



EX1300566

Figure 25

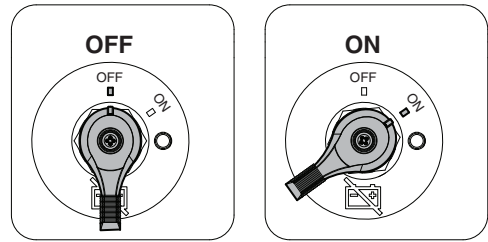
11. Stop engine by turning key to "O" (OFF) position (Figure 26).
12. Remove key from starter switch.



EX1402155

Figure 26

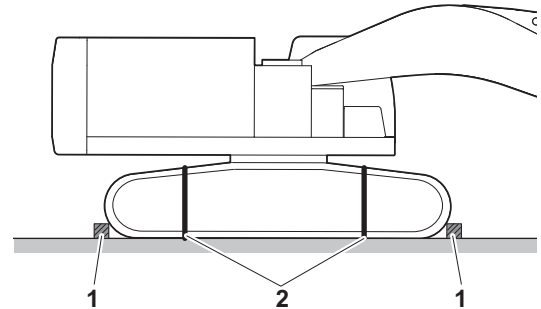
13. Turn battery disconnect switch to "OFF" position (Figure 27).
14. Lock all doors and covers.
15. Adjust direction of rotating beacon and TMS antenna.



EX1500481

Figure 27

16. Make sure to secure excavator onto trailer before transporting. Place blocking (1, Figure 28) in front of and behind each track. Use chains or cable tie-downs (2) as required by local transportation laws.
17. Refer to Dimensions for Transportation table and drawing for overall machine height and width measurements. Make sure to position excavator as shown. If not transported in this position, height measurements may be different.



DS2004505

Figure 28

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

Never go in the area under or around the machine when it is raised.

Always use the posture given in the procedure below and use the proper lifting equipment to lift the machine.

1. Refer to "Specification" section of this manual for weight and dimensional information.
2. Lower the work equipment to the ground as shown in the diagram on the right
3. Lower the dozer blade to the ground. (if equipped)
4. Move safety lever to "LOCK" position. Stop engine.
5. Ensure that there is nothing around the operator's compartment, close the cab door and front glass securely.
6. Bind wire ropes between the 1st and 2nd track rollers from the front and between the 1st and 2nd track rollers from the rear.
7. Use spreader bars between the wire rope and the machine to prevent damage to the rope or machine. Set the lifting angle (1, Figure 29) of the wire rope to $30^{\circ} \sim 40^{\circ}$.
8. After the machine comes off the ground, check the hook condition and the lifting posture, and then lift slowly.

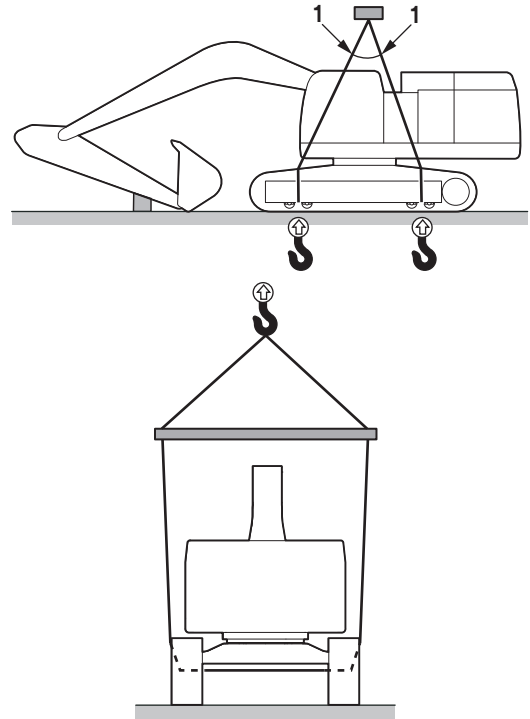


Figure 29

DS1701458

Specification

Standard Specification

Component			Specification	
			Metric	English
Bucket Capacity	CECE		6.1 m³	8.0 yd³
	SAE (PCSA)		6.8 m³	8.9 yd³
Operating Weight			98.3 metric tons	108.3 tons
Engine	Model		Perkins 2806D	
	Type		4-cycle, Turbocharged after Water Cooled, MEUI (Mechanical Electronic Unit Injector)	
	Rated Output		470 kW @2,100 rpm	630 HP (639 PS) @2,100 rpm
	Maximum Torque		2,768 N.m @ 1,400 rpm	2,041.6 ft lb @ 1,400 rpm
Hydraulic Pump	Type		Axial Piston	
	Discharging Pressure		356 kg/cm²	5,063 psi
	Maximum Discharge Quantity		3 x 523 L/min	3 x 138 U.S. gpm
Performance	Swing Speed		6.1 rpm	
	Travel Speed	High-speed	4.5 km/h	2.79 MPH
		Low Speed	2.6 km/h	1.62 MPH
	Traction Force	High-speed	36.9 metric tons	40.7 tons
		Low Speed	60.6 metric tons	66.8 tons
	Gradeability		35° (70% slope)	
Track Shoe Width			650 mm	25.6 in
Upper Roller Qty.			3 per side	
Lower Roller Qty.			9 per side	

Base Option: Boom (8,400 mm), Arm (3,750 mm), Counterweight (12,700 kg)

Overall Dimensions

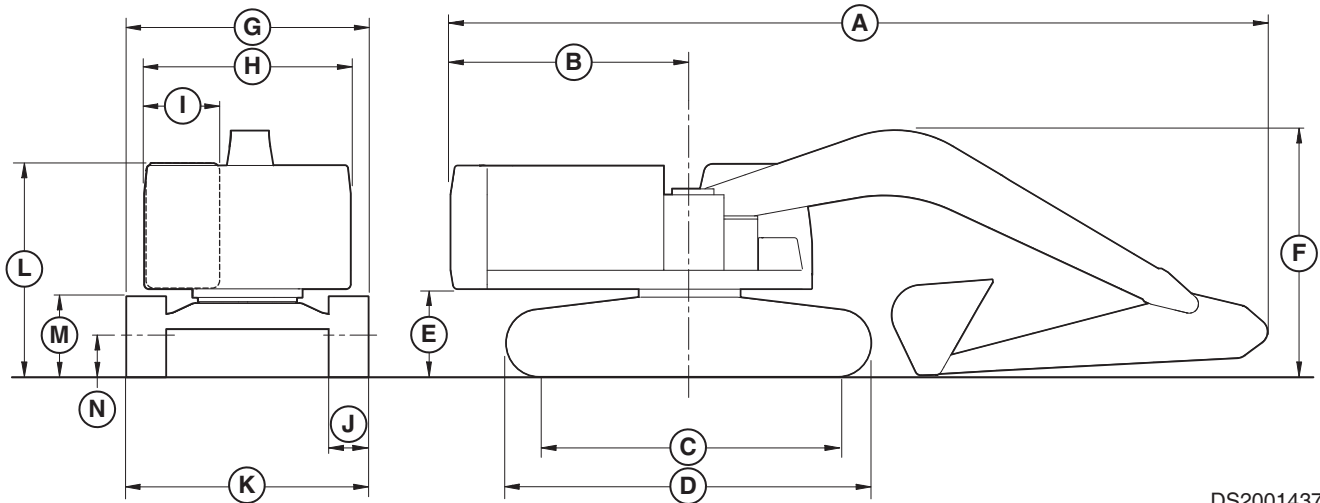


Figure 1

DS2001437

Dimension		7.25 m (23' 9") Boom	8.4 m (27' 7") Boom
		2.9 m (9' 6") Arm	3.75 m (12' 4") Arm
A	Shipping Length	13,800 mm (45' 3")	14,550 mm (47' 9")
B	Tail Swing Radius	4,620 mm (15' 2")	
C	Tumbler Distance	5,100 mm (16' 9")	
D	Track Length	6,341 mm (20' 10")	
E	Counterweight Clearance	*1,560 / 1,615 mm (*5' 1" / 5' 4")	
F (Boom)	Shipping Height	5,090 mm (16' 8")	5,450 mm (17' 11")
F (Hose)	Shipping Height	5,150 mm (16' 11")	5,590 mm (18' 4")
G	Shipping Width	3,440 mm (11' 3")	
H	House Width	***3,410 / 4,450 mm (**11' 2" / 14' 7")	
I	Cabin Width	1,010 mm (3' 4")	
J	Shoe Width	650 mm (2' 2")	
K	Undercarriage Width (Without Step)	**3,732 / 4,492 (**3,440 / 4,200) mm (12' 3" / 14' 9" (11' 3" / 13' 9"))	
L	Height Over Cabin	3,615 mm (11' 10")	
M	Track Height	*1,350 / 1,405 mm (*4' 5" / 4' 7")	
N	Car Body Clearance	*860 mm (2' 10")	

* : Without Grouser / With Grouser

** : Retracted / Extended

*** : Without Catwalk / With Catwalk

Ground Pressure

Description	Shoe Width mm	Boom Length mm (ft in)	Arm Length mm (ft in)	Bucket Capacity m ³ (yd ³)	Counterweight kg (lb)	Operating Weight kg (lb)	Ground Pressure kg/cm ² (psi)
Double Grouser	650	7,250 (23' 9")	2,900 (9' 6")	6.8 (8.9)	12,700 (27,999)	97,000 (213,848)	1.37 (19.5)
	750	7,250 (23' 9")	2,900 (9' 6")	6.8 (8.9)		68,000 (149,914)	1.19 (16.9)
		8,400 (27' 7")	3,750 (12' 4")	5.4 (7.1)		54,000 (119,050)	1.20 (17.1)
	900	8,400 (27' 7")	3,750 (12' 4")	5.4 (7.1)		54,000 (119,050)	1.01 (14.4)

Digging Force

Arm - Tearout Force

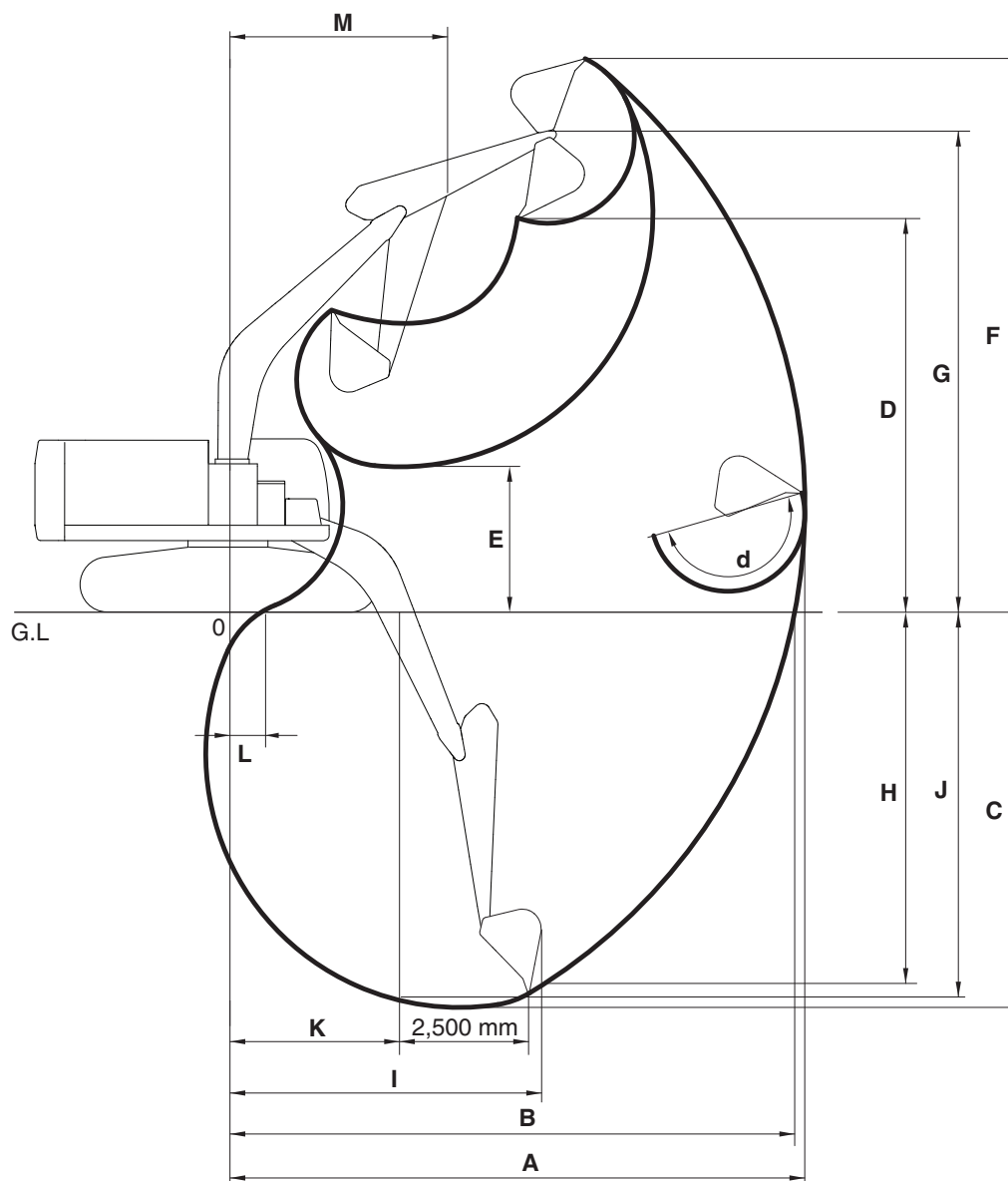
Boom (m)	Arm	Length (m)	Digging Force		
			unit	SAE	ISO
8.4	Standard	3.75	kN	355.2	360.2
			kg	36,220	36,730
			lb	79,851	80,976
7.25	Short	2.9	kN	395.2	400.1
			kg	40,300	40,800
			lb	88,846	88,949

Bucket - Breakout Force

Bucket	Capacity (m ³)		Bucket Width (mm)		Digging Force (NOM., Ton)		
	CECE	SAE	W/Cutter	W/O Cutter	Unit	SAE	ISO
S Class	4.9	5.4	1,940	1,940	kN	392.3	421.3
					kg	40,000	42,960
					lb	88,184	94,710
	6.1	6.8	2,320	2,320	kN	392.3	421.3
					kg	44,800	48,200
					lb	88,184	94,710

Working Range

Variable Track



DS1701460

Figure 2

DIM.	Boom Type	8.4 m (27' 7")	7.25 m (23' 9")
	Arm Type	3.75 m (12' 4")	2.9 m (9' 6")
	Bucket Type (PCSA)	5.4 m ³ (4.47 yd ³)	6.8 m ³ (8.89 yd ³)
A	Max. Digging Reach	14,275 (46' 10")	12,430 (40' 9")
B	Max. Digging Reach (Ground)	14,000 (45' 11")	12,110 (39' 9")
C	Max. Digging Depth	8,795 (28' 10")	7,260 (23' 10")
D	Max. Loading Height	9,440 (31' 0")	8,100 (26' 7")
E	Min. Loading Height	4,210 (13' 10")	3,910 (12' 10")
F	Max. Digging Height	13,840 (45' 5")	12,425 (40' 9")
G	Max. Bucket Pin Height	11,862 (38' 11")	10,515 (34' 6")
H	Max. Vertical Wall Depth	4,470 (14' 8")	2,965 (9' 9")
I	Max. Radius Vertical	12,265 (40' 3")	10,995 (36' 1")
J	Max. Depth to 2,500 mm Line	8,665 (28' 5")	7,110 (23' 4")
K	Min. Radius 2,500 mm Line	5,290 (17' 4")	4,410 (14' 6")
L	Min. Digging Reach	3,365 (11' 0")	1,970 (6' 6")
M	Min. Swing Radius	6,295 (20' 8")	5,345 (17' 6")
d	Bucket Angle	143.8°	145.3°

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

Keep bystanders away from the boom cylinder. While operating, boom, arm or bucket hydraulic hoses could burst causing high-pressure oil to spray or sudden lowering of the load or front structure. This could cause death or serious injury.

When changing the hydraulic hoses, record the part numbers of the hoses to factory log book.



WARNING

AVOID DEATH OR SERIOUS INJURY

All rated lift capacities are based on the machine and the load both remaining level at all times. DO NOT EXCEED THE RATED LIFT CAPACITY. Lifting loads greater than those shown in the rated capacity tables can cause tipping, equipment failure and/or structural failure of the machine.

Operate the excavator on firm and level ground and surfaces that can support the weight of the excavator and the loads that will be lifted. Avoid operating the excavator, if these conditions exist:

- Soft or uneven ground.
- Unlevel terrain.
- Side loads.
- Modifications or poor maintenance of the excavator.
- Failure to lift squarely over the end or over the side of the machine.

When a load is in the air, the operator must:

- Avoid use of uneven slings that can cause side loads when traveling with a load or swinging the load.

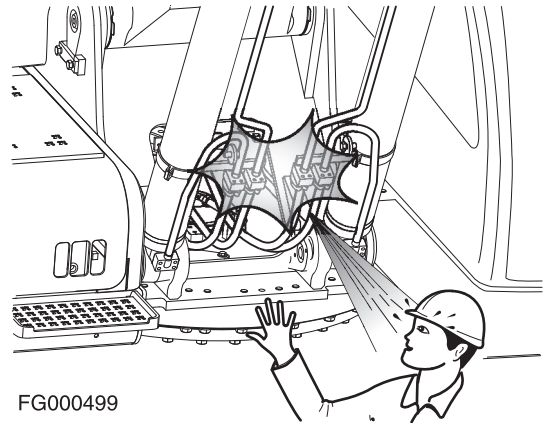


Figure 3

- Avoid lifting loads that 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. Use tag lines on opposite sides of the load to help stabilize the load and prevent side loads caused by wind gusts.

The following rated loads are in compliance with ISO 10567 and applicable ISO standards for hydraulic excavators performing lifting operations on firm supporting surfaces. An asterisk (*) next to the load rating indicates rated load does not exceed 87% of hydraulic capacity. All other ratings do not exceed 75% of tipping capacity.

Do not attempt to lift or hold any load that exceeds rated load capacity at the specified distances (from the machine's rotation centerline and height - see "Lifting Radius" and "Lifting Point Height" in the reference drawing, Figure 4).

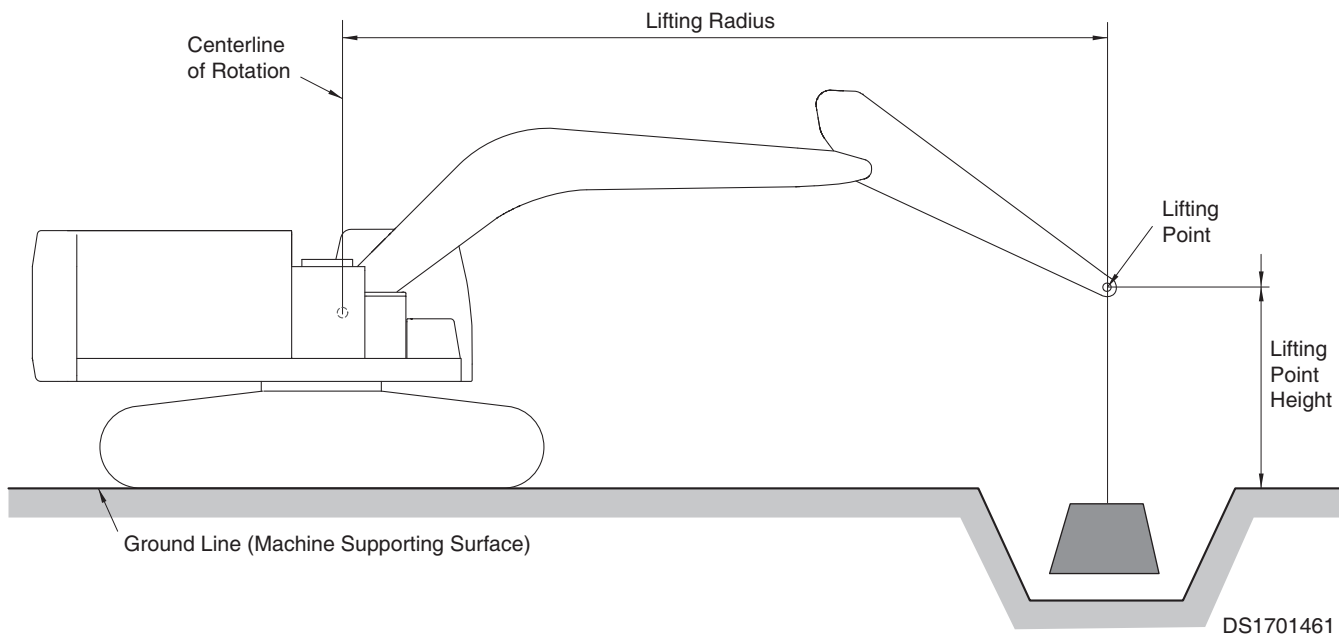


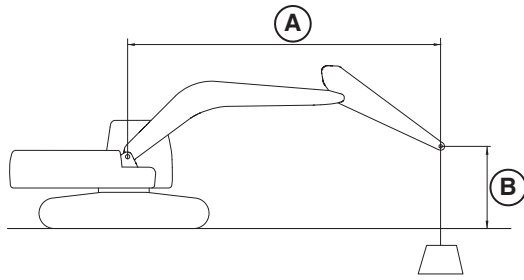
Figure 4

The weight of slings and any auxiliary lifting device (and/or the weight difference of any attachment heavier than standard configuration) must be deducted from the rated lift capacity to determine net lifting load. The lift point must be on the end of the arm, as shown in Figure 4.



NOTICE

Select the Digging Mode switch on the Instrument Panel before using the excavator for lifting work. Engine and hydraulic oil should both be fully warmed up to operating temperature before operating.



Track Width : 4.2 m (13' 9") Track
 Boom : 7.25 m (23' 9")
 Arm : 2.9 m (9' 6")
 Bucket : Without Bucket
 Counterweight : 12,700 kg (27,999 lb)
 Shoe : 650 mm (26")
 : Rating Over Front
 : Rating Over Side or 360 degree
 Unit : 1,000 kg (1,000 lb)

DS2004411

Figure 5

METRIC

1,000 kg

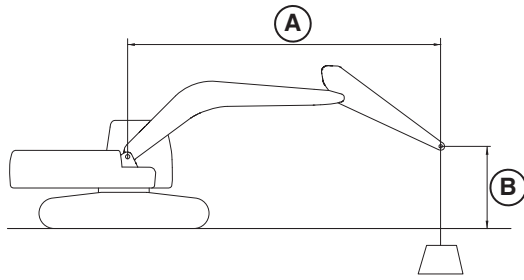
A (m) \ B (m)	4.5		6		7.5		9		MAX. REACH		A (m)
10.5									* 19.98	* 19.98	6.40
9					* 21.16	* 21.16			* 17.95	* 17.95	7.90
7.5					* 21.36	* 21.36			* 17.12	* 17.12	8.91
6			* 26.69	* 26.69	* 22.77	* 22.77	* 20.63	19.84	* 16.94	* 16.94	9.57
4.5			* 30.62	* 30.62	* 24.73	* 24.73	* 21.48	19.26	* 17.25	16.35	9.96
3			* 34.06	33.81	* 26.63	24.38	* 22.42	18.64	* 18.06	15.64	10.10
1.5			* 35.83	32.51	* 27.90	23.51	* 23.05	18.13	* 19.47	15.55	10.02
0			* 35.76	31.96	* 28.14	23.02	* 22.94	17.83	* 20.80	16.12	9.70
-1.5	* 43.15	* 43.15	* 34.02	31.92	* 27.04	22.91	* 21.42	17.87	* 20.89	17.57	9.13
-3	* 37.87	* 37.87	* 30.36	* 30.36	* 23.91	23.25			* 20.57	20.57	8.23
-4.5	* 29.38	* 29.38	* 23.41	* 23.41					* 19.02	* 19.02	6.89

FEET

1,000 lb

A (ft) \ B (ft)	15		20		25		30		MAX. REACH		A (ft)
35									* 44.04	* 44.04	20.99
30					* 46.64	* 46.64			* 39.57	* 39.57	25.93
25					* 47.08	* 47.08			* 37.73	* 37.73	29.23
20			* 58.84	* 58.84	* 50.20	* 50.20	* 45.49	43.74	* 37.34	* 37.34	31.39
15			* 67.52	* 67.52	* 54.52	* 54.52	* 47.36	42.46	* 38.04	36.05	32.67
10			* 75.09	74.54	* 58.71	53.75	* 49.44	41.09	* 39.82	34.47	33.15
5			* 78.99	71.68	* 61.50	51.83	* 50.81	39.96	* 42.92	34.27	32.88
0			* 78.84	70.45	* 62.03	50.74	* 50.58	39.31	* 45.86	35.53	31.84
-5	* 95.13	* 95.13	* 75.00	70.37	* 59.61	50.51	* 47.22	39.41	* 46.06	38.74	29.94
-10	* 83.49	* 83.49	* 66.93	* 66.93	* 52.71	51.25			* 45.35	45.34	27.00
-15	* 64.78	* 64.78	* 51.60	* 51.60					* 41.92	* 41.92	22.61

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.



Track Width : 4.2 m (13' 9") Track
 Boom : 7.25 m (23' 9")
 Arm : 2.9 m (9' 6")
 Bucket : Without Bucket
 Counterweight : 12,700 kg (27,999 lb)
 Shoe : 750 mm (29.5")
 : Rating Over Front
 : Rating Over Side or 360 degree
 Unit : 1,000 kg (1,000 lb)

DS2004412

Figure 6

METRIC

1,000 kg

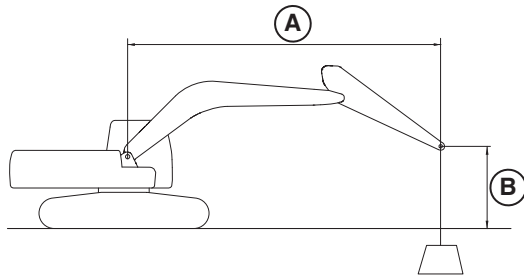
A (m) \ B (m)	4.5		6		7.5		9		MAX. REACH		A (m)
10.5									* 19.98	* 19.98	6.40
9					* 21.16	* 21.16			* 17.95	* 17.95	7.90
7.5					* 21.36	* 21.36			* 17.12	* 17.12	8.91
6			* 26.69	* 26.69	* 22.77	* 22.77	* 20.63	19.96	* 16.94	* 16.94	9.57
4.5			* 30.62	* 30.62	* 24.73	* 24.73	* 21.48	19.39	* 17.25	16.46	9.96
3			* 34.06	34.03	* 26.63	24.54	* 22.42	18.76	* 18.06	15.74	10.10
1.5			* 35.83	32.73	* 27.90	23.67	* 23.05	18.25	* 19.47	15.65	10.02
0			* 35.76	32.17	* 28.14	23.17	* 22.94	17.96	* 20.80	16.23	9.70
-1.5	* 43.15	* 43.15	* 34.02	32.13	* 27.04	23.07	* 21.42	18.00	* 20.89	17.69	9.13
-3	* 37.87	* 37.87	* 30.36	* 30.36	* 23.91	23.40			* 20.57	* 20.57	8.23
-4.5	* 29.38	* 29.38	* 23.41	* 23.41					* 19.02	* 19.02	6.89

FEET

1,000 lb

A (ft) \ B (ft)	15		20		25		30		MAX. REACH		A (ft)
35									* 44.04	* 44.04	20.99
30					* 46.64	* 46.64			* 39.57	* 39.57	25.93
25					* 47.08	* 47.08			* 37.73	* 37.73	29.23
20			* 58.84	* 58.84	* 50.20	* 50.20	* 45.49	44.01	* 37.34	* 37.34	31.39
15			* 67.52	* 67.52	* 54.52	* 54.52	* 47.36	42.74	* 38.04	36.29	32.67
10			* 75.09	75.01	* 58.71	54.10	* 49.44	41.36	* 39.82	34.71	33.15
5			* 78.99	72.15	* 61.50	52.18	* 50.81	40.23	* 42.92	34.51	32.88
0			* 78.84	70.92	* 62.03	51.09	* 50.58	39.59	* 45.86	35.78	31.84
-5	* 95.13	* 95.13	* 75.00	70.84	* 59.61	50.85	* 47.22	39.68	* 46.06	39.01	29.94
-10	* 83.49	* 83.49	* 66.93	* 66.93	* 52.71	51.60			* 45.35	* 45.35	27.00
-15	* 64.78	* 64.78	* 51.60	* 51.60					* 41.92	* 41.92	22.61

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.



Track Width : 4.2 m (13' 9") Track
 Boom : 8.4 m (27' 7")
 Arm : 3.7 m (12' 2")
 Bucket : Without Bucket
 Counterweight : 12,700 kg (27,999 lb)
 Shoe : 750 mm (29.5")
 : Rating Over Front
 : Rating Over Side or 360 degree
 Unit : 1,000 kg (1,000 lb)

DS2004413

Figure 7

METRIC

1,000 kg

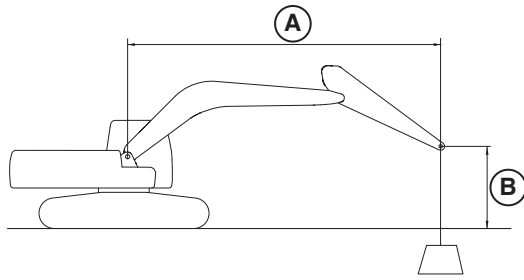
A (m) \ B (m)	4.5		6		7.5		9		10.5		MAX. REACH		A (m)
10.5							* 15.25	* 15.25			* 14.63	* 14.63	9.06
9							* 17.95	* 17.95			* 13.90	* 13.90	10.17
7.5					* 20.71	* 20.71	* 18.47	* 18.47	* 17.01	15.53	* 13.63	* 13.63	10.96
6					* 22.52	* 22.52	* 19.41	* 19.41	* 17.35	15.18	* 13.67	12.87	11.50
4.5					* 24.49	* 24.49	* 20.48	18.75	* 17.86	14.69	* 14.00	12.00	11.83
3					* 26.09	23.34	* 21.41	17.91	* 18.30	14.19	* 14.64	11.53	11.95
1.5					* 26.88	22.31	* 21.92	17.22	* 18.47	13.76	* 15.63	11.42	11.88
0					* 26.68	21.71	* 21.80	16.76	* 18.16	13.46	* 15.67	11.67	11.62
-1.5			* 31.29	30.12	* 25.46	21.48	* 20.88	16.55	* 17.09	13.36	* 15.37	12.36	11.14
-3	* 33.04	* 33.04	* 28.04	* 28.04	* 23.16	21.56	* 18.91	16.61			* 14.81	13.68	10.43
-4.5	* 27.13	* 27.13	* 23.42	* 23.42	* 19.41	* 19.41	* 15.18	* 15.18			* 13.70	* 13.70	9.41
-6.0			* 16.64	* 16.64	* 13.05	* 13.05					* 11.34	* 11.34	7.98

FEET

1,000 lb

A (ft) \ B (ft)	15		20		25		30		35		MAX. REACH		A (ft)
35							* 33.63	* 33.63			* 32.26	* 32.26	29.72
30							* 39.57	* 39.57			* 30.65	* 30.65	33.37
25					* 45.66	* 45.66	* 40.71	* 40.71	* 37.49	34.25	* 30.04	* 30.04	35.97
20					* 49.64	* 49.64	* 42.78	* 42.78	* 38.25	33.47	* 30.14	28.38	37.74
15					* 53.99	* 53.99	* 45.16	41.33	* 39.37	32.39	* 30.87	26.45	38.80
10					* 57.52	51.45	* 47.20	39.47	* 40.35	31.28	* 32.26	25.43	39.21
5					* 59.26	49.19	* 48.32	37.96	* 40.72	30.33	* 34.47	25.18	38.98
0					* 58.82	47.86	* 48.06	36.94	* 40.04	29.68	* 34.55	25.74	38.11
-5			* 68.99	66.39	* 56.14	47.35	* 46.04	36.49	* 37.68	29.46	* 33.88	27.26	36.55
-10	* 72.85	* 72.85	* 61.82	* 61.82	* 51.05	47.54	* 41.69	36.62			* 32.66	30.16	34.20
-15	* 59.81	* 59.81	* 51.64	* 51.64	* 42.80	* 42.80	* 33.46	* 33.46			* 30.21	* 30.21	30.86
-20			* 36.68	* 36.68	* 28.77	* 28.77					* 25.01	* 25.01	26.19

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.



Track Width : 4.2 m (13' 9") Track
 Boom : 8.4 m (27' 7")
 Arm : 3.7 m (12' 2")
 Bucket : Without Bucket
 Counterweight : 12,700 kg (27,999 lb)
 Shoe : 900 mm (35")
 : Rating Over Front
 : Rating Over Side or 360 degree
 Unit : 1,000 kg (1,000 lb)

DS2004414

Figure 8

METRIC

1,000 kg

A (m) \ B (m)	4.5		6		7.5		9		10.5		MAX. REACH		A (m)
10.5							* 15.25	* 15.25			* 14.63	* 14.63	9.06
9							* 17.95	* 17.95			* 13.90	* 13.90	10.17
7.5					* 20.71	* 20.71	* 18.47	* 18.47	* 17.01	15.73	* 13.63	* 13.63	10.96
6					* 22.52	* 22.52	* 19.41	* 19.41	* 17.35	15.38	* 13.67	13.05	11.50
4.5					* 24.49	* 24.49	* 20.48	18.99	* 17.86	14.89	* 14.00	12.17	11.83
3					* 26.09	23.64	* 21.41	18.15	* 18.30	14.39	* 14.64	11.70	11.95
1.5					* 26.88	22.62	* 21.92	17.46	* 18.47	13.96	* 15.63	11.60	11.88
0					* 26.68	22.01	* 21.80	17.00	* 18.16	13.66	* 15.67	11.85	11.62
-1.5			* 31.29	30.53	* 25.46	21.78	* 20.88	16.79	* 17.09	13.56	* 15.37	12.55	11.14
-3	* 33.04	* 33.04	* 28.04	* 28.04	* 23.16	21.87	* 18.91	16.85			* 14.81	13.88	10.43
-4.5	* 27.13	* 27.13	* 23.42	* 23.42	* 19.41	* 19.41	* 15.18	* 15.18			* 13.70	* 13.70	9.41
-6.0			* 16.64	* 16.64	* 13.05	* 13.05					* 11.34	* 11.34	7.98

FEET

1,000 lb

A (ft) \ B (ft)	15		20		25		30		35		MAX. REACH		A (ft)
35							* 33.63	* 33.63			* 32.26	* 32.26	29.72
30							* 39.57	* 39.57			* 30.65	* 30.65	33.37
25					* 45.66	* 45.66	* 40.71	* 40.71	* 37.49	34.69	* 30.04	* 30.04	35.97
20					* 49.64	* 49.64	* 42.78	* 42.78	* 38.25	33.91	* 30.14	28.77	37.74
15					* 53.99	* 53.99	* 45.16	41.86	* 39.37	32.83	* 30.87	26.84	38.80
10					* 57.52	52.12	* 47.20	40.01	* 40.35	31.72	* 32.26	25.80	39.21
5					* 59.26	49.86	* 48.32	38.49	* 40.72	30.77	* 34.47	25.56	38.98
0					* 58.82	48.53	* 48.06	37.48	* 40.04	30.12	* 34.55	26.13	38.11
-5			* 68.99	67.31	* 56.14	48.02	* 46.04	37.02	* 37.68	29.90	* 33.88	27.66	36.55
-10	* 72.85	* 72.85	* 61.82	* 61.82	* 51.05	48.21	* 41.69	37.16			* 32.66	30.60	34.20
-15	* 59.81	* 59.81	* 51.64	* 51.64	* 42.80	* 42.80	* 33.46	* 33.46			* 30.21	* 30.21	30.86
-20			* 36.68	* 36.68	* 28.77	* 28.77					* 25.01	* 25.01	26.19

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.

Approximate Weight of Workload Materials



NOTICE

Weights are approximations of estimated average volume and mass. 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/m ³ (2,000 lb/yd ³), or less	Density 1,500 kg/m ³ (2,500 lb/yd ³), or less	Density 1,800 kg/m ³ (3,000 lb/yd ³), or less	Density 2,100 kg/m ³ (3,500 lb/yd ³), or less
Charcoal	401 kg/m ³ (695 lb/yd ³)	-	-	-
Coke, blast furnace size	433 kg/m ³ (729 lb/yd ³)	-	-	-
Coke, foundry size	449 kg/m ³ (756 lb/yd ³)	-	-	-
Coal, bituminous slack, piled	801 kg/m ³ (1,350 lb/yd ³)	-	-	-
Coal, bituminous r. of m., piled	881 kg/m ³ (1,485 lb/yd ³)	-	-	-
Coal, anthracite	897 kg/m ³ (1,512 lb/yd ³)	-	-	-
Clay, DRY, in broken lumps	1,009 kg/m ³ (1,701 lb/yd ³)	-	-	-
Clay, DAMP, natural bed	-	-	1,746 kg/m ³ (2,943 lb/yd ³)	-
Cement, portland, DRY granular	-	-	1,506 kg/m ³ (2,583 lb/yd ³)	-
Cement, portland, DRY clinkers	-	1,362 kg/m ³ (2,295 lb/yd ³)	-	-
Dolomite, crushed	-	-	1,522 kg/m ³ (2,565 lb/yd ³)	-
Earth, loamy, DRY, loose	-	1,202 kg/m ³ (2,025 lb/yd ³)	-	-
Earth, DRY, packed	-	-	1,522 kg/m ³ (2,565 lb/yd ³)	-
Earth, WET, muddy	-	-	1,762 kg/m ³ (2,970 lb/yd ³)	-
Gypsum, calcined, (heated, powder)	961 kg/m ³ (1,620 lb/yd ³)	-	-	-

Material	Density 1,200 kg/m³ (2,000 lb/yd³), or less	Density 1,500 kg/m³ (2,500 lb/yd³), or less	Density 1,800 kg/m³ (3,000 lb/yd³), or less	Density 2,100 kg/m³ (3,500 lb/yd³), or less
Gypsum, crushed to 3 inch size	-	-	1,522 kg/m ³ (2,565 lb/yd ³)	-
Gravel, DRY, packed fragments	-	-	-	1,810 kg/m ³ (3,051 lb/yd ³)
Gravel, WET, packed fragments	-	-	-	1,922 kg/m ³ (3,240 lb/yd ³)
Limestone, graded above 2	-	1,282 kg/m ³ (2,160 lb/yd ³)	-	-
Limestone, graded 1-1/2 or 2	-	1,362 kg/m ³ (2,295 lb/yd ³)	-	-
Limestone, crushed	-	-	1,522 kg/m ³ (2,565 lb/yd ³)	-
Limestone, fine	-	-	1,602 kg/m ³ (2,705 lb/yd ³)	-
Phosphate, rock	-	1,282 kg/m ³ (2,160 lb/yd ³)	-	-
Salt	929 kg/m ³ (1,566 lb/yd ³)	-	-	-
Snow, light density	529 kg/m ³ (891 lb/yd ³)	-	-	-
Sand, DRY, loose	-	-	1,522 kg/m ³ (2,565 lb/yd ³)	-
Sand, WET, packed	-	-	-	1,922 kg/m ³ (3,240 lb/yd ³)
Shale, broken	-	1,362 kg/m ³ (2,295 lb/yd ³)	-	-
Sulfur, broken	529 kg/m ³ (891 lb/yd ³)	-	-	-

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