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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 an 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

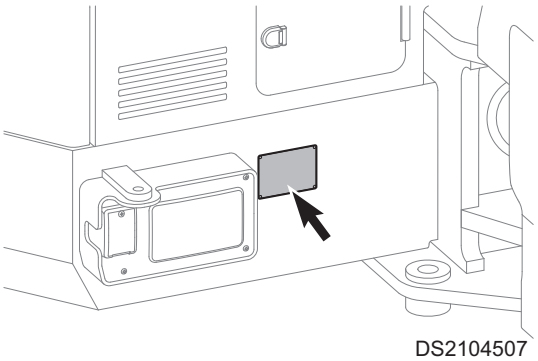
These and other attachments are approved for use on this machine. Do not use unapproved attachments. Attachments not manufactured by HD HYUNDAI CONSTRUCTION EQUIPMENT may not be approved. See your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for information about approved attachments and attachment manuals.

- Buckets
- Hydraulic Breakers
- Grapples
- Plate Compactors
- Quick Couplers

Product Identification Number (PIN)

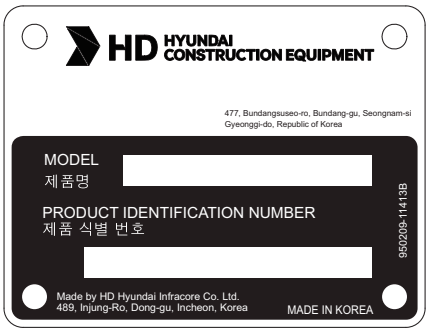
A pin number is stamped on upper frame back side of boom foot (1). It is also stamped on a product identification plate (2) on the front right side of upper frame.

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.*



DS2104507

Figure 1



DS2301647

Figure 2

Component Serial Numbers

There are many serial numbers on each traceable component of the machine. Record these numbers and their locations. These will be required whenever warranty service work is requested.

Engine Identification

Engine Data Plate

The engine data plate provides important facts about the engine. The engine serial number (ESN) and control parts list (CPL) provide information for service and ordering parts. The engine data plate must not be changed unless approved by HD HYUNDAI CONSTRUCTION EQUIPMENT.

Have the following engine data available when communicating with a HD HYUNDAI CONSTRUCTION EQUIPMENT Authorized Repair Location. The following information on data plate is mandatory when sourcing service parts:

Reference Number	Description
1	Engine Data Plate
2	Engine Serial Number

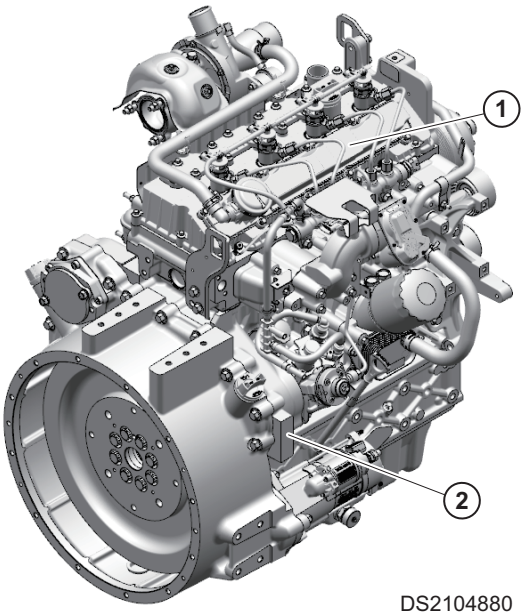


Figure 3

Your Machine Serial Numbers

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

Safety Messages

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

SAFETY ALERT SYMBOL

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.*

EC Declaration of Conformity
(Original instruction)

This declaration of conformity is issued under the sole responsibility of manufacturer:
HYUNDAI CONSTRUCTION EQUIPMENT CO., LTD.
12th Fl., Hyundai Bldg. 75, Yulgok-ro, Jongno-gu,
Seoul 03058, Korea

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

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

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

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

EMC (2014/30/EU)

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

Noise levels (2000/14/EC)

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

Engine information

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

Harmonized standards, other technical standards and specifications applied:

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

****

Managing Director

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

Safety

Safety Decals

Safety decals are attached to the machine to alert the operator or maintenance person about potential hazards, 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.

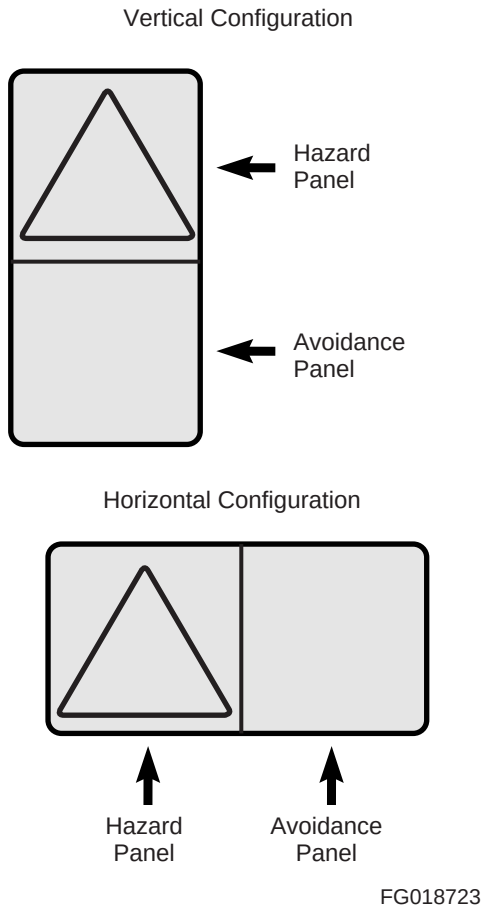


Figure 1

Information and Location for Safety Decals

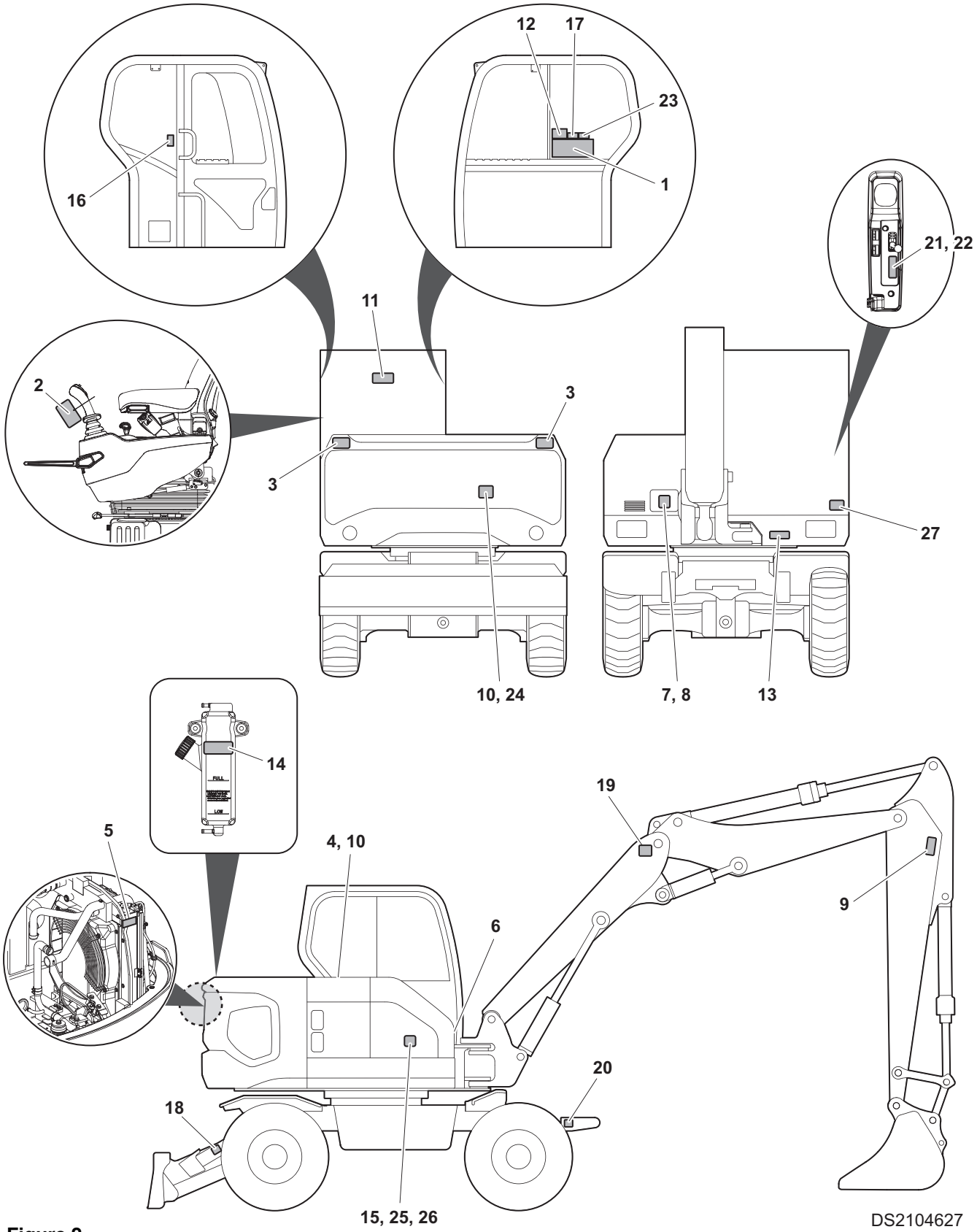
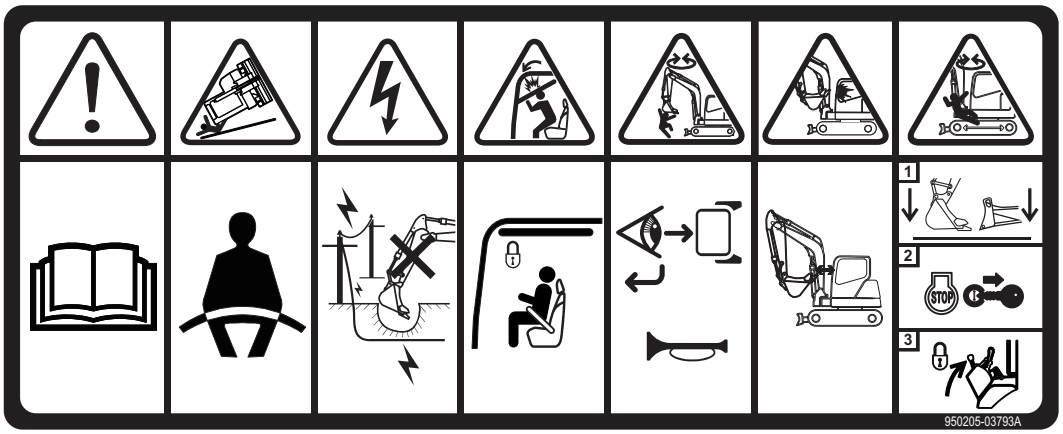


Figure 2

Reference Number	Description
1	General Hazard
2	Warning Tag - "Do Not Operate"
3	Keep Bystanders Away
4	Hot Pressurized Fluid
5	Rotating Fan / Hot Pressurized Fluid / Entanglement in Rotating Parts
6	Wait to Disconnect
7	Battery Explosion
8	Battery Disconnection
9	Crush Hazard
10	Hot Surface
11	Emergency Exit
12	ISO Control Pattern
13	Lift / Transport
14	Coolant

Reference Number	Description
15	Ultra Low Sulfur Diesel Fuel (If Equipped)
16	ROPS Warning (If Equipped)
17	Hydraulic Breaker
18	Lift / Tie Down
19	Lift
20	Tie Down
21	Stabilizer
22	Dozer
23	Lifting Capacity
24	Fluorinated Greenhouse Gas
25	Hydraulic Oil Check
26	DEF (AdBlue®)
27	Caution for Steering Wheel Interference

1. General Hazard (950205-03793A)



DS2104658

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

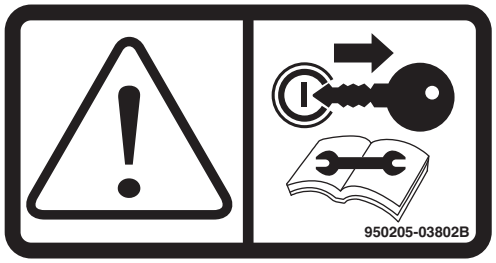
- **Never use excavator without instructions.**
- **Read Operation & Maintenance Manual before operation.**
- **Sound the horn to alert bystanders before operating.**
- **Always fasten your seat belt.**
- **Explosion or electrocution can occur if machine contacts utility lines or pipes. Check for overhead 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 prior to operation.**
- **Keep bystanders out of swing area and travel path and always look in the direction of travel.**
- **Ensure mirrors and rear 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 the engine and remove the key.**
  3) **Upper safety lever to LOCK position.**

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

WARNING

AVOID DEATH OR SERIOUS INJURY

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



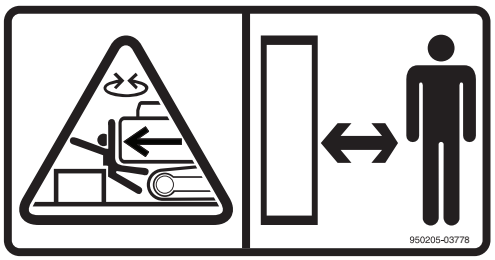
DS1801807

3. Keep Bystanders Away (950205-03778)

WARNING

AVOID DEATH OR SERIOUS INJURY

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



EX1402206

4. Hot Pressurized Fluid (950205-03781)

WARNING

HOT PRESSURIZED FLUID CAN CAUSE SERIOUS BURNS

- **Do not loosen or open cap when hot.**
- **Before opening:**
  - **1) Turn engine off.**
  - **2) Allow machine to cool.**
  - **3) Tip cap and open slowly to relieve pressure.**

EX1301180

5. **Rotating Fan / Hot Pressurized Fluid / Entanglement in Rotating Parts (950205-07530)**

DS2001307

WARNING

HOT PRESSURIZED FLUID CAN CAUSE SERIOUS BURNS

- **Do not loosen or open cap when hot.**
- **Before opening:**
  1) **Turn engine off.**
  2) **Allow machine to cool.**
  3) **Tip cap and open slowly to relieve pressure.**

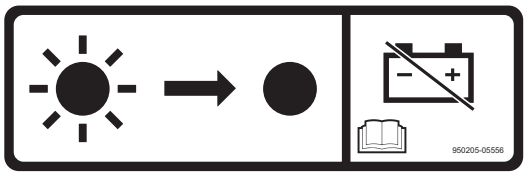
ROTATING PARTS CAN CAUSE DEATH OR SERIOUS INJURY

- **Keep away from belt and rotating parts. Stop engine before servicing.**

CONTACT WITH ROTATING FAN CAN CAUSE DEATH OR SERIOUS INJURY

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

6. **Wait to Disconnect (950205-05556)**



DS2102421

NOTICE

AVOID ELECTRICAL COMPONENT DAMAGE

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.

7. 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

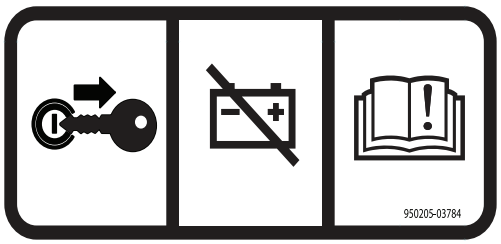
8. Battery Disconnection (950205-03784)

NOTICE

AVOID ELECTRICAL COMPONENT DAMAGE

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

Disconnect battery only when the engine is turned OFF.



EX1301184

9. Crush Hazard (950205-03787)

WARNING

AVOID DEATH OR SERIOUS INJURY

Stay clear of the boom, arm, and attachment.

EX1402207

10. Hot Surface (950205-03777)

WARNING

HOT SURFACE CAN CAUSE SERIOUS BURNS

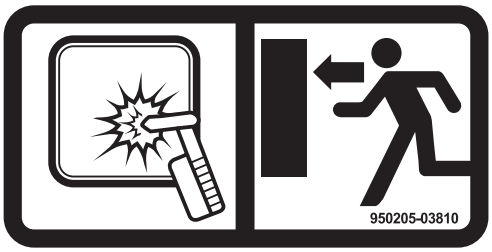
- **Do not touch hot surface.**
- **Allow to cool before servicing.**

EX1301189

11. Emergency Exit (950205-03810)

NOTICE

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



EX1301190

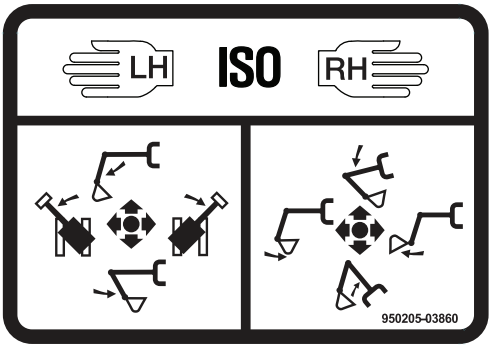
12. ISO Control Pattern (950205-03860)

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.



EX1301191

13. Lift/Transport (950205-03776)

WARNING

AVOID DEATH OR SERIOUS INJURY

- **Use a lifting fixture with sufficient capacity for the weight of the excavator plus any added attachments.**
- **Maintain center of gravity and balance when lifting.**
- **Do not swing boom or upperstructure.**
- **Never lift with operator on machine.**
- **Refer to Operation and Maintenance Manual for more information.**

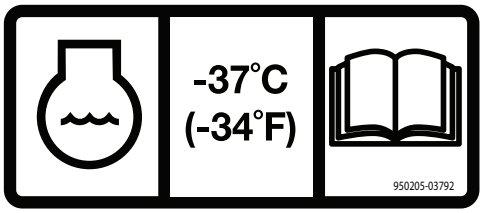
EX1402208

14. Coolant (950205-03792)

NOTICE

AVOID COOLING SYSTEM DAMAGE

- **Do not mix ethylene glycol and propylene glycol. Mixing the two antifreeze solutions together can cause generation of foreign material that can damage the system.**
- **Check freezing point of coolant with refractometer.**
- **Refer to Operation and Maintenance Manual for more information.**



EX1402209

15. Ultra Low Sulfur Diesel Fuel (If Equipped) (950205-03864)

NOTICE

Only use Ultra Low Sulfur Diesel (ULSD) fuel with this machine.

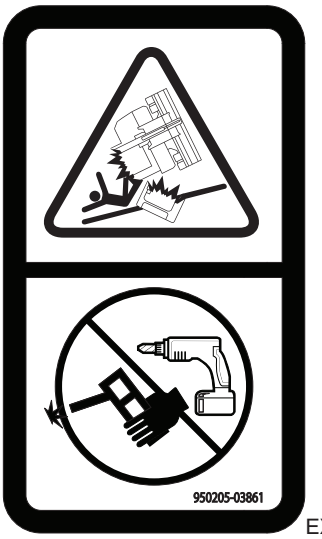
EX1301194

16. ROPS Warning (If Equipped) (950205-03861)

WARNING

AVOID DEATH OR SERIOUS INJURY

- **Do not weld on or drill holes in the protective structure.**
- **Replace ROPS, if damaged or modified.**



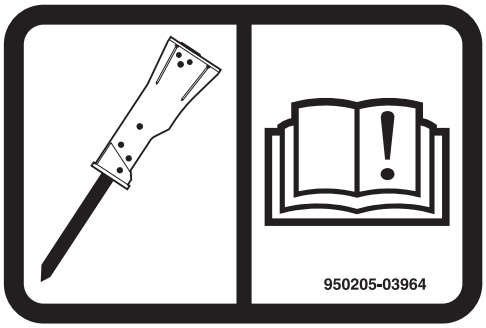
EX1301197

17. Hydraulic Breaker (950205-03964)

NOTICE

AVOID HYDRAULIC SYSTEM DAMAGE

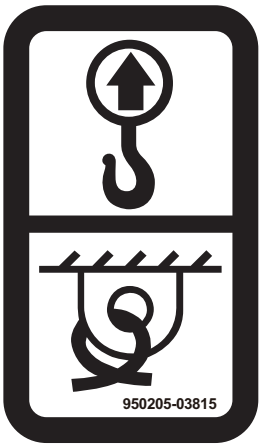
To adjust breaker impact, refer to Operation and Maintenance Manual for more information.



EX1301200

18. Lift/Tie Down (950205-03815)

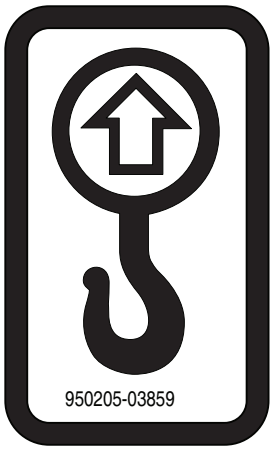
Identifies lift point and tie down point location.



EX1301201

19. Lift (950205-03859)

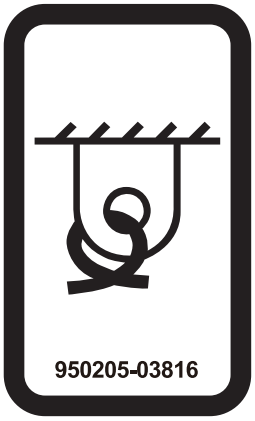
Identifies lift point and tie down point location.



EX1402212

20. Tie Down (950205-03816)

Identifies tie down point location.



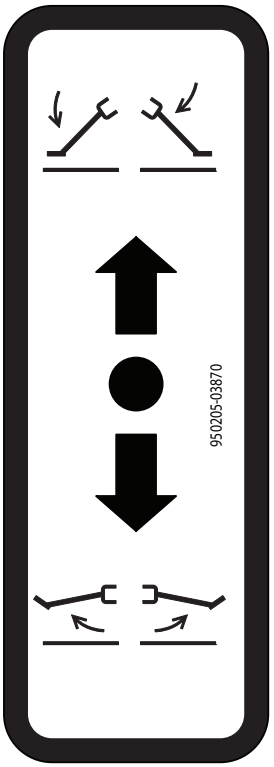
EX1301203

21. Stabilizer (950205-03870)

WARNING

AVOID DEATH OR SERIOUS INJURY

- **Before operating outrigger, read and understand the operation manual.**
- **Before operating outrigger, make sure there are no persons or property in the way. Sound the horn to alert workers and bystanders that you are about to move the machine.**
- **Operate the travel control levers smoothly to avoid sudden starts or stops.**
- **Before leaving the operator's seat, make sure to lock out all control system and stop engine to avoid accidental activation of the outrigger.**



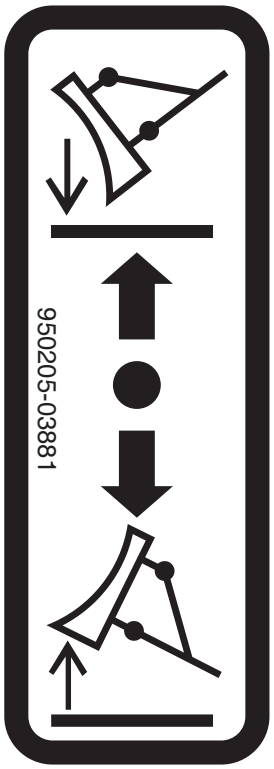
EX1402431

22. Dozer (950205-03881)

WARNING

AVOID DEATH OR SERIOUS INJURY

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



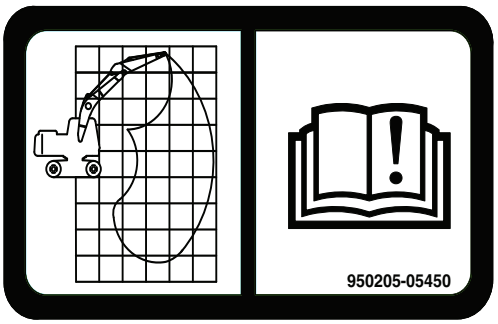
EX1402247

23. Lifting Capacity (950205-05450)

WARNING

AVOID DEATH OR SERIOUS INJURY

Whenever you handling and lifting objects, ensure operator manual available on the station and refer lifting chart.

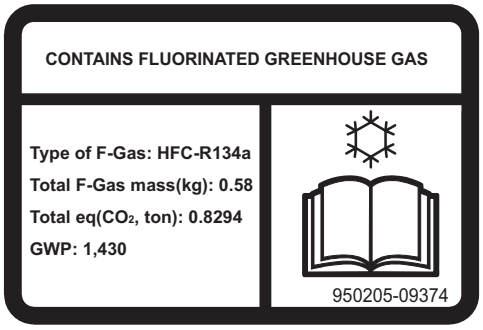


WE1500865

24. Fluorinated Greenhouse Gas (950205-09374, 950205-07796A)

NOTICE

- **This machine contains 0.58 kg of HFC-R134a, of which the CO_2 equivalent value is 0.8294 tons. The GWP of HFC-R134a is 1,430.**
- **Every Machine of HD HYUNDAI CONSTRUCTION EQUIPMENT is clearly attached with an information label.**
- **EU regulation 2015/2067 of 17 November 2015 imposes to all undertaking (natural persons or companies) performing the repair, maintenance or servicing of air Conditioning System to be certified at national level.**
  Please pass certification or subcontract the task to an approved company.



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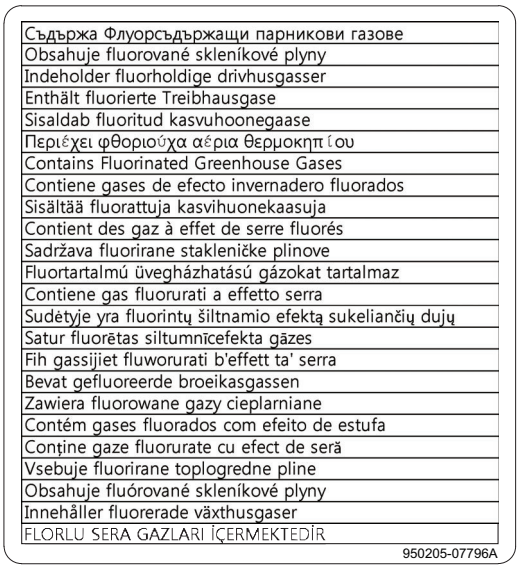


DS2300498

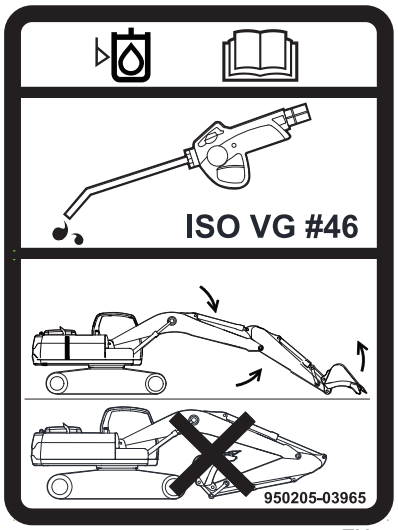
25. Hydraulic Oil Check (If Equipped) (950205-03965)

NOTICE

INCORRECT OIL LEVEL OR INCORRECT FLUID CAN CAUSE HYDRAULIC SYSTEM DAMAGE

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

26. DEF (AdBlue®) (950205-01489A, 950205-06494)

NOTICE

- **Use only the specified diesel exhaust fluid.**
- **See the Operation & Maintenance Manual for more information.**

WL1300370

WARNING

Foreign substances flowed into the reductive tank may damage after-treatment device and cause engine shutdown.

1. Fill DEF ONLY and DO NOT fill materials, which are not stipulated herein such as water, fuel, oil etc., and contaminated DEF
2. Make sure to thoroughly clean the surroundings of the injection hole to prevent any dust, iron powder and water from flowing into the reductive tank.
3. During winter season, fill DEF up to only two-thirds of the tank capacity to prevent it from freezing.

950205-06494

DS2100501

27. Caution for Steering Wheel Interference (950205-06858A)

NOTICE

AVOID INJURY

Be careful not to have the joystick and steering wheel interfere with one another when handling them.

Be careful not to have the steering touch the front windshield when handling it.

DS1703847

Safe Operation is Operator's Responsibility

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.

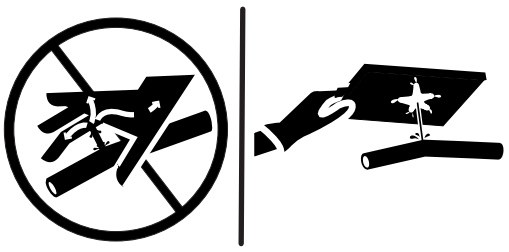
Never use attachment as a work platform or manlift.

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.



FG018457

Figure 3

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

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

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.

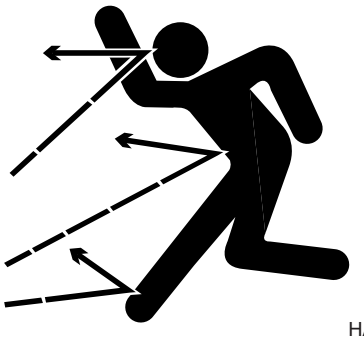
To prevent hot coolant from spraying out, stop engine and wait for coolant to cool. Using gloves, slowly loosen cap to relieve pressure.

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 4

HAOA100L

Figure 5

Personal Protective Equipment (PPE)

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

Do not wear oily clothes. They are highly flammable.

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.

HAOA020L

Figure 6

Correction of Machine Problems

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

Crushing and Cutting

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

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

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

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

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

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

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

HDO1010L

Figure 7

Hot Coolant and Oils - Burn Prevention

Do not touch any part of an operating engine. Immediately after operations are stopped, 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 8

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 9

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:

HDO1015I

Figure 10

- 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.

FG018458

Figure 11

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.

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 1-39, 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.

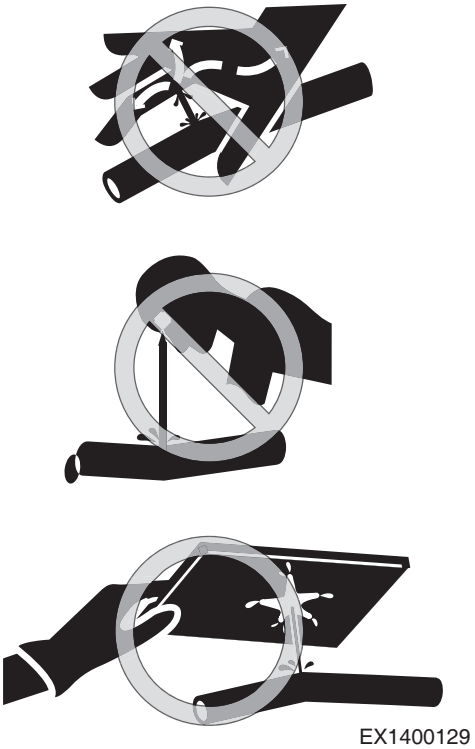
Hydraulic System

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 12

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 13

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 14

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

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 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.*

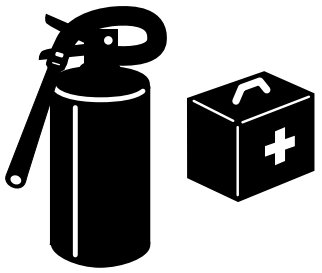
FG018459

Figure 15

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

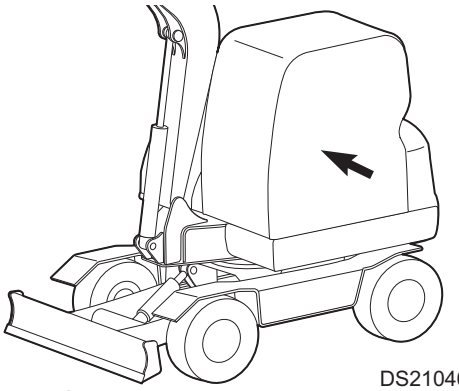
To be prepared in the event of a fire:

- 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 17) 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 16



DS2104698

Figure 17

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.*

Rollover 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 rollover 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 rollover 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.

ROPS Certification

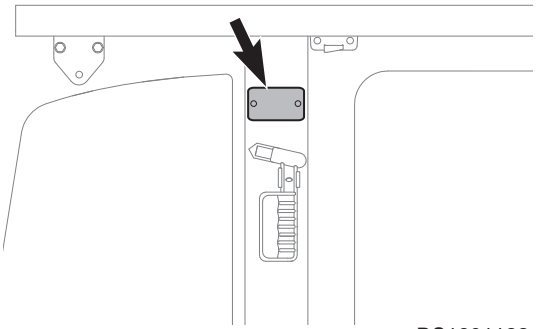
This HD HYUNDAI CONSTRUCTION EQUIPMENT excavator has an operator's cabin that meets ROPS requirements. The seat belt must be worn for rollover protection.

The ROPS certification plate (Figure 18) is found on the left side of the cabin on most models. It may vary slightly in its location on some models.

Check the ROPS cabin, mounting, and hardware for damage.

Never modify the ROPS cabin. Replace the cabin and hardware if damaged. See your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for parts.

ROPS – Roll-over Protective Structure complies with ISO 12117-2:2008, EN 13531:2001.



DS1901183

Figure 18

WARNING

AVOID DEATH OR SERIOUS INJURY

Never modify the operator cabin by welding, grinding, drilling holes or adding attachments unless instructed in writing by HD HYUNDAI CONSTRUCTION EQUIPMENT. Changes to the cabin can cause loss of operator protection from rollover and falling objects, and can result in death or serious injury.

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.

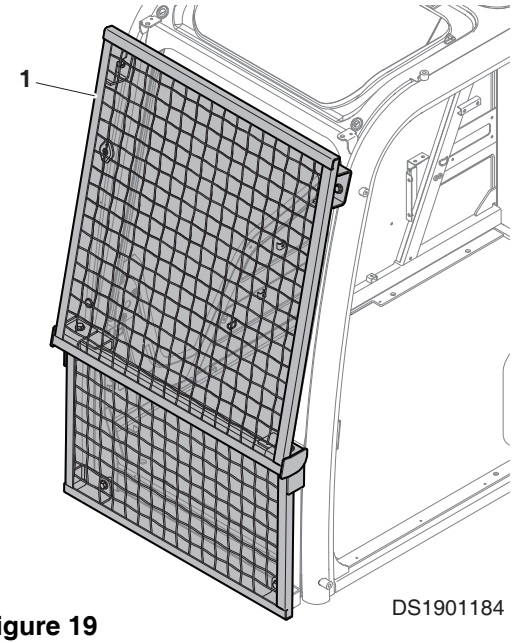


Figure 19

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.

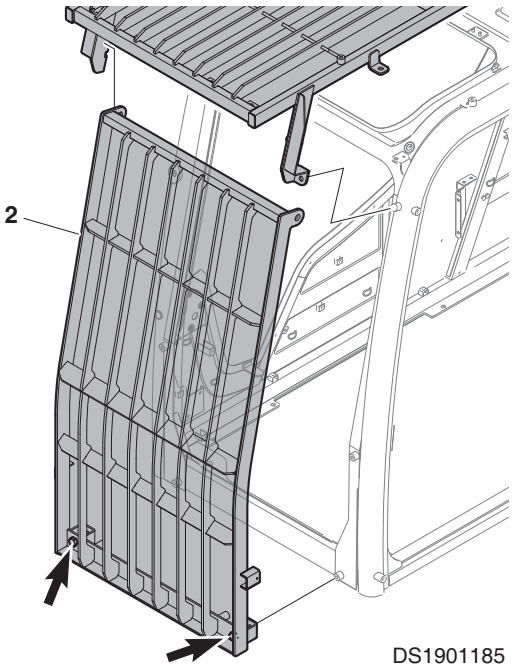


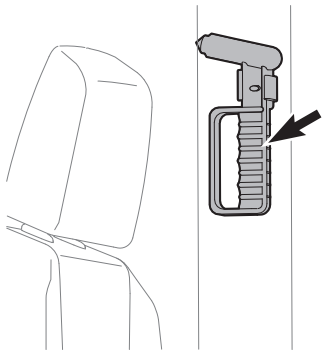
Figure 20

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.*

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.



DS191103

Figure 21

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.

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 rollover 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 tires, dozer, outriggers and lower structure. On a rainy day, be careful since ramp surfaces can be slippery.
- Turn auto idle selector button "OFF".
- Set machine travel speed to "LOW".
- Before moving the machine, check that the swing align sensor symbol on the display monitor is lit.
- 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 tires to drop down to the ramps or trailer. This will occur at the joint between the ramps and trailer. Travel slowly over this point.
- Cover the exhaust pipe to prevent turbocharger damage. Lock the cabin door and lower the antenna.
- After loading, block each tire and secure the machine with tie-downs of adequate load rating, so the machine cannot move.
- 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 lower structure. The normal travel position is with dozer blade to front under cabin and outriggers (stabilizers) to rear. When lower structure 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.

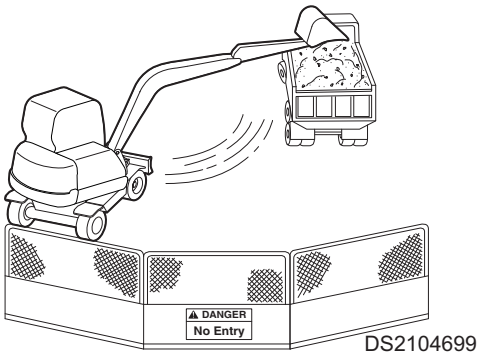


Figure 22

Mounting/Dismounting

Before getting on or off machine, if there is any oil, grease, or mud on handrails and steps, 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 and steps 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 climbing on top 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.

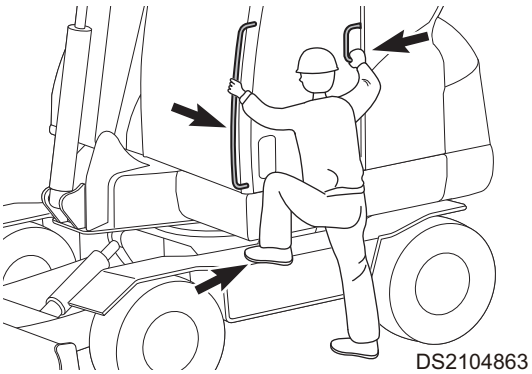


Figure 23

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 lock 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.

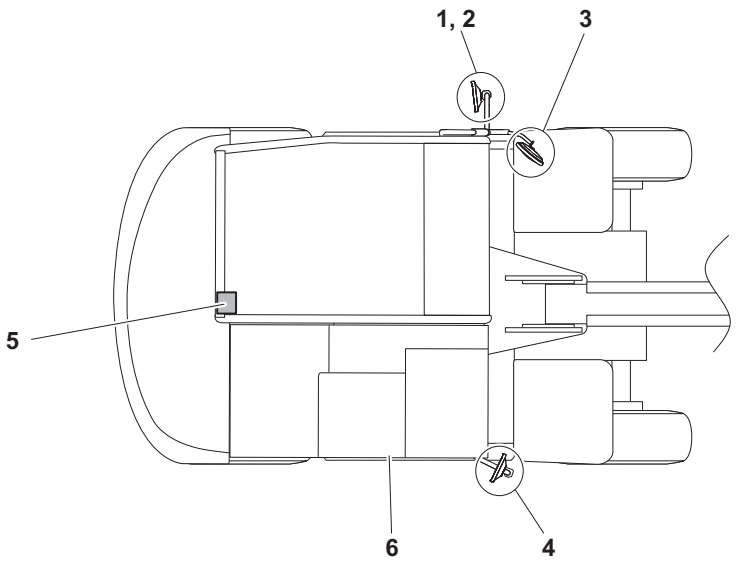
Always wear seat belt when operating machine.

Visibility Information

A rear/side 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 24 shown.*



1. Front Mirror on the Cabin (1)
2. Front Mirror on the Cabin (2)
3. Front Mirror on the Cabin (3)
4. Front Mirror on the Right Frame (4)
5. Rear View Camera
6. Side View Camera

DS2104660

Figure 24

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.

The Around View Monitoring (AVM) system (if equipped) provides view of surroundings and an operator can find who stands near.

NOTICE

Do not rely solely on AVM. every time swivel and moving, be sure No bystanders nearby and take a slow.

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 25 ~ Figure 26 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 27 provides the position of the attachment and equipment in the Travel position.

- Visible areas without visual aids at the ground level

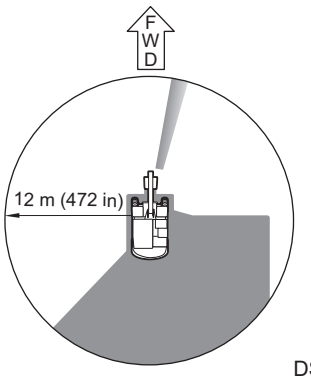
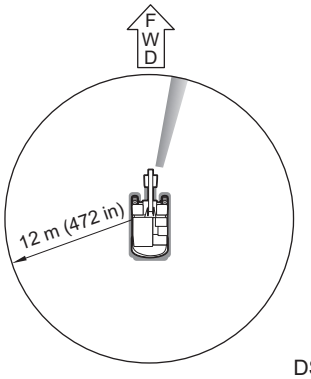


Figure 25

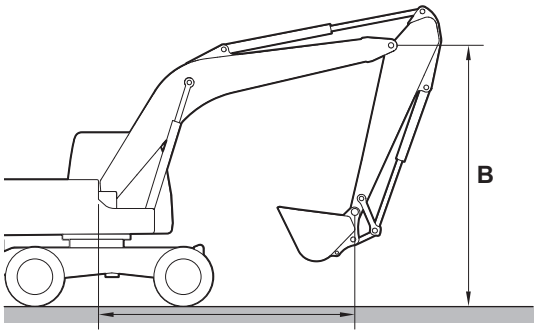
- Visible areas with rear/side camera and mirrors



DS2104662

Figure 26

- Machine travel position
  - A is 2.8 m (9' 2") from swing center to bucket pin
  - B is 3.4 m (11' 2") from ground to arm pin



DS1801327

Figure 27

Mirror Adjustment

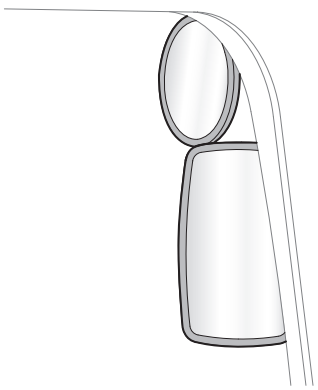
Frequently ensure the mirrors are directed properly.

- 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, 2)

   If equipped, adjust the front mirror on the cabin (1, 2) so the front of right tire can be seen from the operator seat.

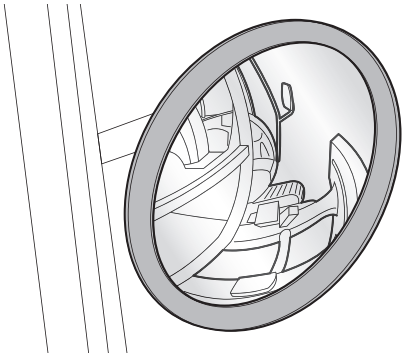


DS2104663

Figure 28

2. Front mirror on the cabin (3)

   If equipped, adjust the front mirror on the cabin (3) so the left side of machine can be seen from the operator seat.

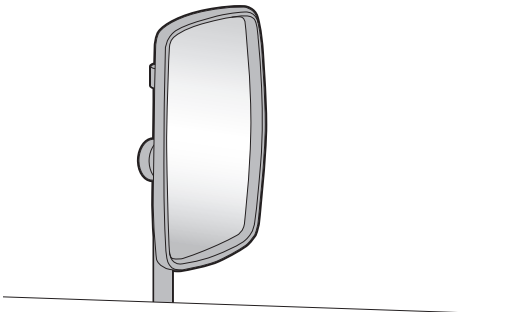


DS1801222

Figure 29

3. Front mirror on the right frame (4)

   If equipped, adjust the front mirror on the right frame (4) so the right side can be seen from the operator seat.



DS1801397

Figure 30

4. Additional mirrors other than Figure 24

   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 31

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 32) are mounted.
2. Connect one end of red cable (1, Figure 32) 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 32) 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 32).

   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.

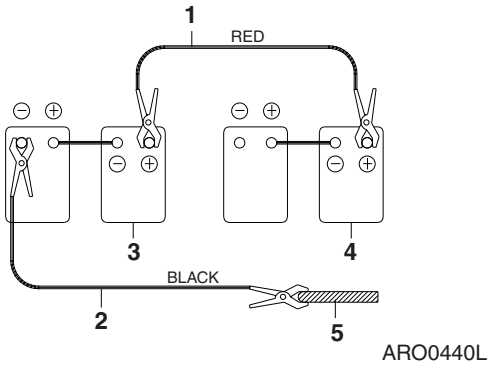


Figure 32

Disconnecting Booster Batteries

1. Disconnect black negative (-) cable (2, Figure 32) from the machine frame (5) first.
2. Disconnect the other end of black negative (-) cable (2, Figure 32) from the booster batteries (3).
3. Disconnect red positive (+) cable (1, Figure 32) from the booster batteries (3).
4. Disconnect red positive (+) cable (1, Figure 32) from the machine batteries (4).

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 lower structure or cabin. Be aware of position of work tool.

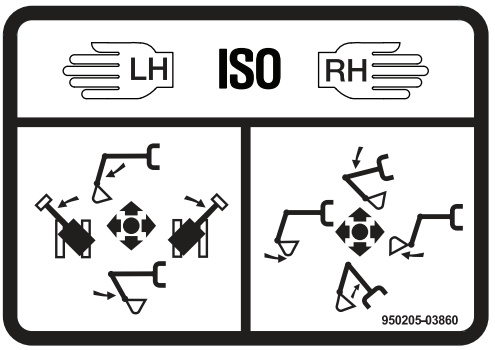
- Do not attempt to start engine by short-circuiting engine starting circuit. This can result in death or serious injury, or fire.
- When starting engine, sound horn as a warning to alert personnel in the work area.

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.

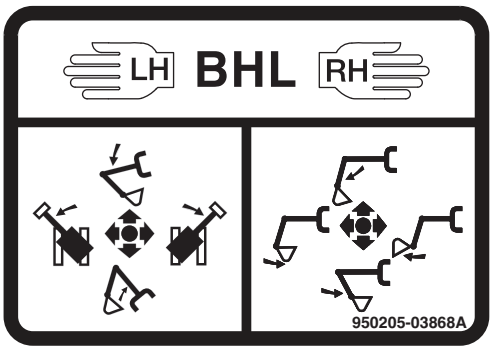
NOTE: *When starting engine in cold temperatures, "white engine exhaust smoke" from the tail pipe can occur until engine reaches normal operating temperatures.*

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 33



EX1503819

Figure 34

Swinging or Traveling

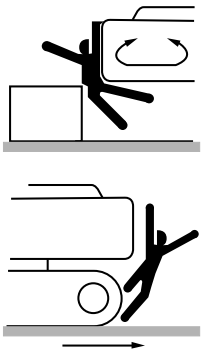
As a machine operator, you should know and follow local, state and federal laws and regulations when operating on public roads or highways.

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.

- Check all tires to make sure that they are properly inflated and are not damaged.
- Make sure that all excess mud, stones, etc. has been removed from the tires.
- Fully raise and secure all outriggers and the dozer blade.

  NOTE: *Be sure to "LOCK" the outriggers when traveling.*
- Make sure that upper structure is facing forwards with dozer blade in front.
- Store the front attachment in the transport position and set the function lock in the "TRAVEL" position.
- Set the ram cylinder toggle switch in the "Auto" position.
- 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.
- Before moving the machine, check that the swing align sensor symbol on the display monitor is lit.
- 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.



HAOA190L

Figure 35

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.

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 bottom of axle housing.

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 dozer blade to front under cabin and outriggers 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.

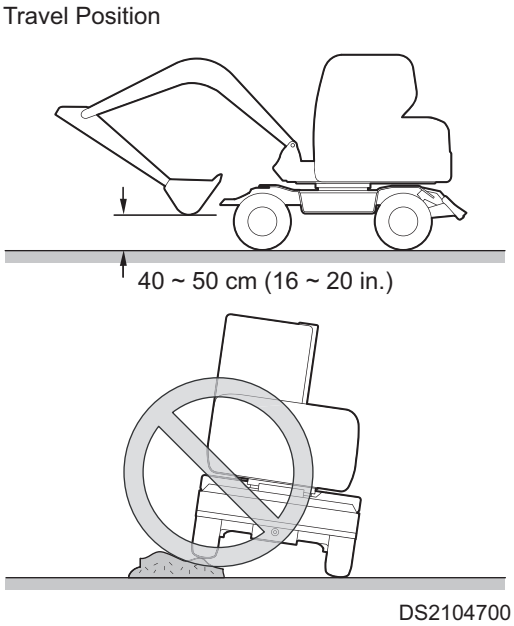


Figure 36

Lifting and Digging

When traveling on public roads or digging:

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

Always check the following before lifting loads or digging:

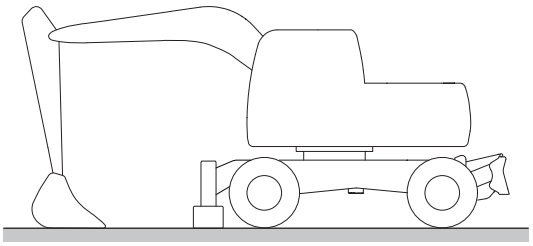
- Condition of ground support.
- Need for use of shoring equipment.
- Excavator configuration and attachments.
- Weight of load, lifting height and swing radius.
- Proper and secure rigging of load.
- Proper handling of suspended load.
- Need for additional barricades or other means to keep bystanders away.

Always look at the load when swinging and keep bystanders away. Keep load close to the machine for better stability before traveling any distances or swinging load.

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

Lower outriggers and raise rear tires slightly off the ground for better stability before digging or lifting loads.

NOTE: *All lift charts are shown with the outriggers "UP" and the dozer blade "UP".*



WE1400013

Figure 37

WARNING

AVOID DEATH OR SERIOUS INJURY

- **Always lower outriggers so rear tires are slightly raised.**
- **Do not suddenly lower, swing or stop work equipment. Operate controls smoothly.**
- **Do not move bucket (or work tool) over other personnel or work equipment. A load could fall or attachment could hit other personnel or equipment resulting in death or serious injury or property damage.**
- **Keep bystanders away.**
- **Do not suddenly lower, swing or stop work equipment. Operate controls smoothly.**
- **To prevent tipping or rollover when handling heavy loads, the ram lock switch must be in the "LOCKED" position.**

Operation on Slopes

NOTICE

Abnormal operation with half of the brake running, failure to comply with the brake oil change intervals, or excessive service brakes may increase the temperature of the axle oil during the operation, resulting in reduced braking forces.

For safety, do not drive on steep slopes that exceed Maximum Gradeability.

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, rollover 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 rollover.

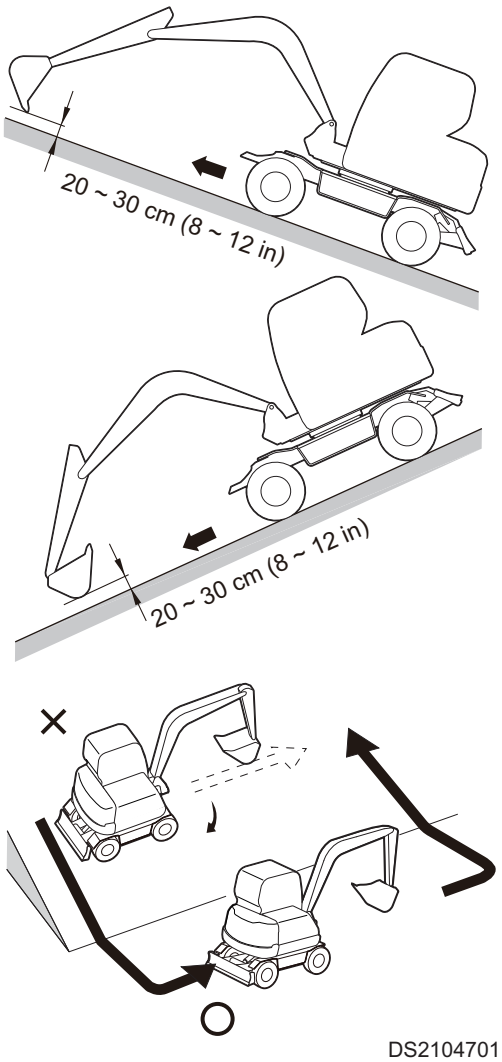
In addition, lower bucket as far as possible, keep it pulled into front, and keep swing speed as slow as possible.

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.

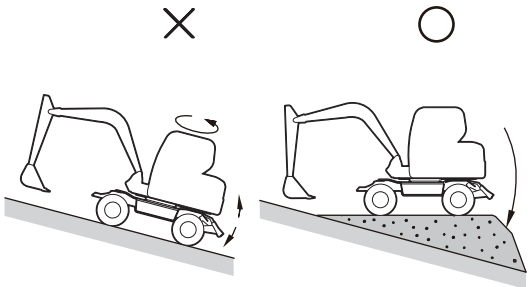
Keep the machine under control. Do not overload the machine beyond capacity.

- 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.



DS2104701

Figure 38



DS2104702

Figure 39

- 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.

Towing

NOTICE

Do not tow more than 1.5 times towing machine's own weight.

Be careful to secure the wire rope to both sides of the axle so that force is not applied to one side of the axle.

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

- Follow the instruction given in this manual.
- Use a wire rope of sufficient strength for towing.
- In the event of slipping into swampy ground or towing heavy objects, use a wire rope to tow the machine as shown in the illustration.
- Put wood blocks between the wire rope and the machine to protect the machine and wire rope from damage.
- Only use the towing hole for light objects.
- Be sure to use shackles. Keep the cable horizontal, straight, and parallel to the tires.
- Select the "LOW" travel mode. Slowly drive the machine when towing.
- 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.

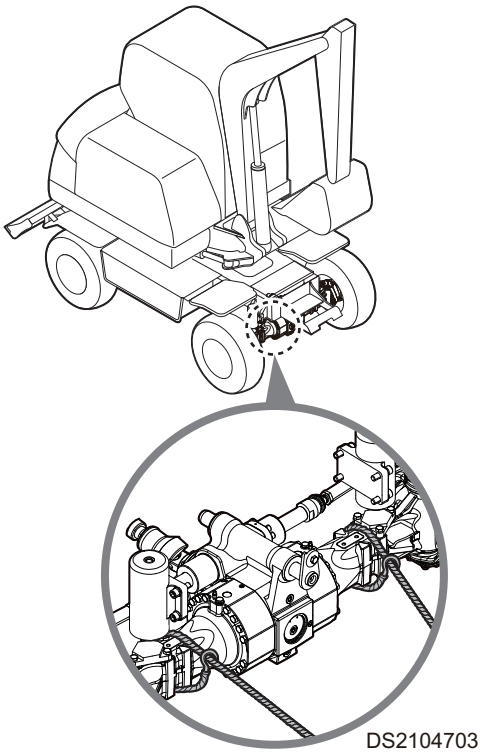


Figure 40

- 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.

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 will 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 tires 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. Lower dozer blade to ground, if equipped.

NOTE: *Do not lower outriggers when parking. Make sure that outriggers are "LOCKED" in place.*

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 lock 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 hydraulic lockout control to "LOCK" position before stopping off engine or immediately after engine stops running.

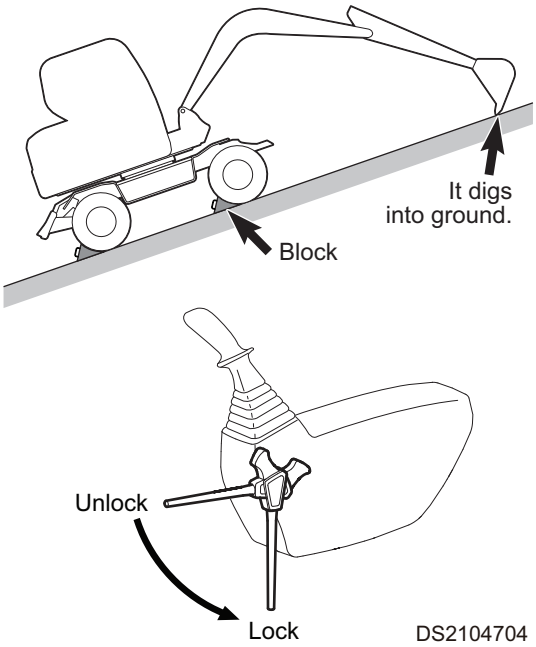


Figure 42

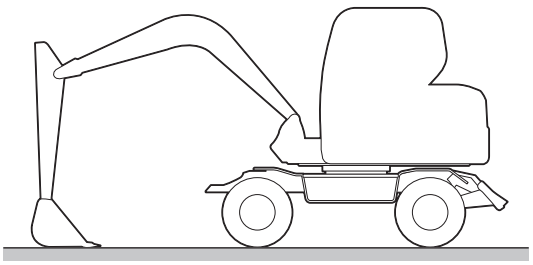


Figure 43

Service Brake

WARNING

AVOID DEATH OR SERIOUS INJURY

- **Before excavating, apply parking brake and depress the service brake pedal and "ENGAGE" the latch mechanism to lock the service brake in the applied position.**
- **"LOWER" the dozer blade and outriggers to the ground before working.**
- **When finishing work or parking the machine always "RELEASE" the service brake pedal to prevent damage caused by overheating.**
- **Before starting work, always check the condition of the service brakes. Service as necessary.**

NOTICE

Abnormal operation with half of the brake running, failure to comply with the brake oil change intervals, or excessive service brakes may increase the temperature of the axle oil during the operation, resulting in reduced braking forces.

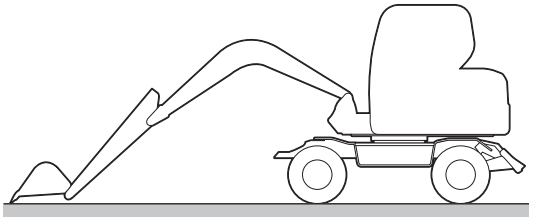
Long Term Storage

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:



DS2104706

Figure 44

Before Storage

Position the excavator as shown to prevent rust on the hydraulic piston rod.

- 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.*

During Storage

- Once a month, start the engine and follow the "Hydraulic Oil Warm-up" procedures listed in this manual.

  NOTE: *Remove all seals from the machine (i.e. crankcase and hydraulic breathers, engine air intake, fuel tank vent lines, etc.).*

  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. Drive machine to lubricate axles.

- 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 lock 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 fore and aft of each tire 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 or 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

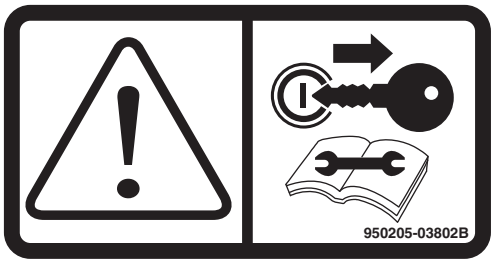
Alert others that service or maintenance is being performed by attaching a "DO NOT OPERATE" warning tag to the operator's cabin controls – and other machine areas, if required. Use of a chain or cable to keep the safety lock lever in the fully lowered "LOCK" position, complies with OSHA's lockout requirements.

"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 joystick lever or to controls before servicing or repairing equipment.
Warning tags are available from your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.



DS1801807

Figure 45

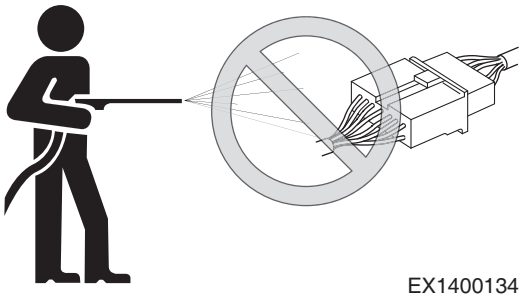
Cleaning

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.



EX1400134

Figure 46

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.

HDO1037L

Figure 47

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.

HDO1040L

Figure 48

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 49

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.

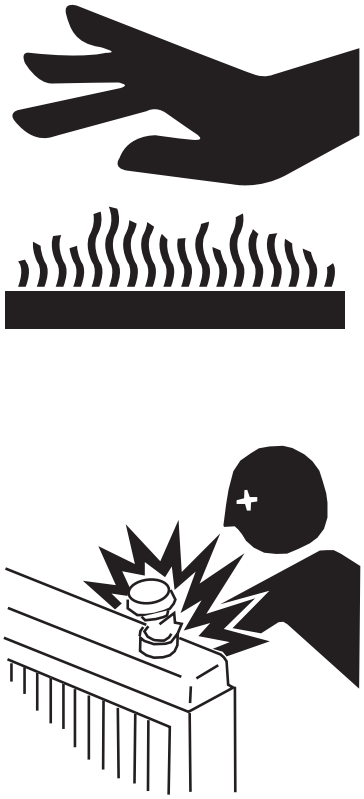
Relieve all pressure in hydraulic oil system, in fuel system, or in cooling system before disconnecting any lines, hoses, fittings, or related components.

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 50

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.

Welding Repairs

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:

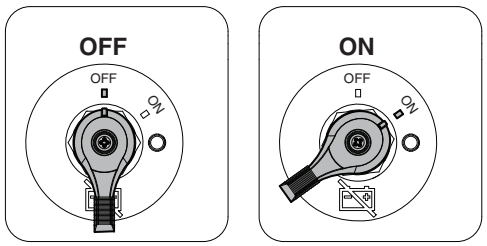
- To prevent battery explosion, turn battery disconnect switch to "OFF" position.
- Disconnect the connector between ECU and machine, and the connector between ECU and engine.
- Disconnect the negative (-) cable of battery.
- To prevent generation of gas, remove paint from location of the weld.

- 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 51

Warning for Counterweight and Front Attachment Removal

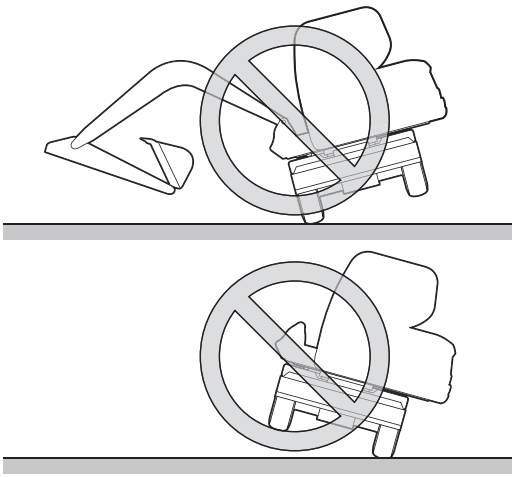
WARNING

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.



DS2104707

Figure 52

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 lower structure is 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 53

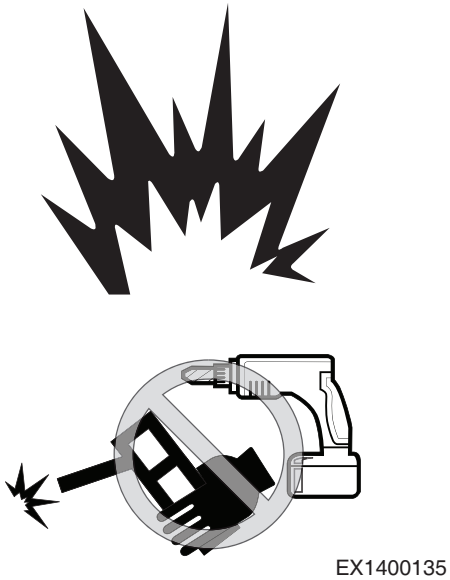
Accumulator

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".

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 54

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.

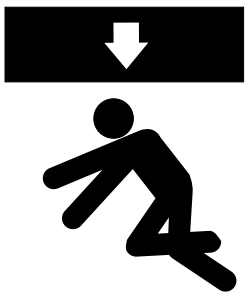
Supports and Blocking for Work Equipment

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

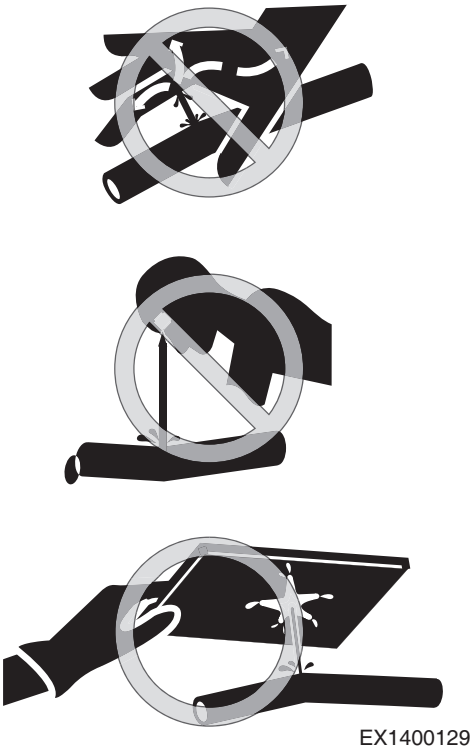
When inspecting or replacing high-pressure piping or hoses, check to verify that pressure has been released from circuit. Failure to release pressure can result in death or serious injury. Release pressure as described in "Handling of Accumulator". Always do the following:

- 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))" for more information.*

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.

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.

EX1400136

Figure 57

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.

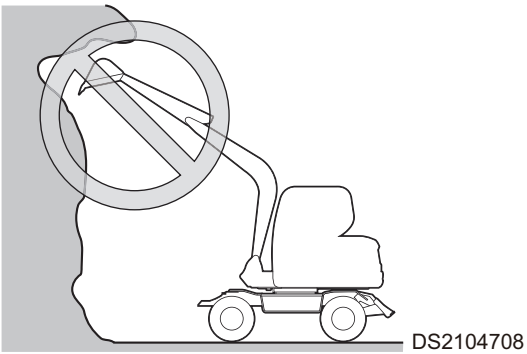


Figure 58

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 tires 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.

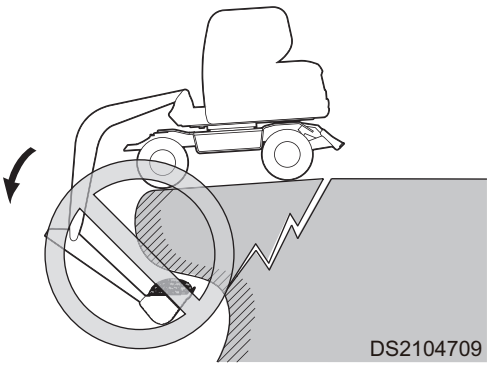


Figure 59

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 rollover, 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 rollover.

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

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

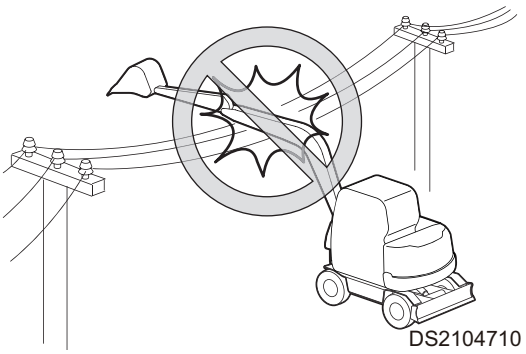


Figure 60

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.

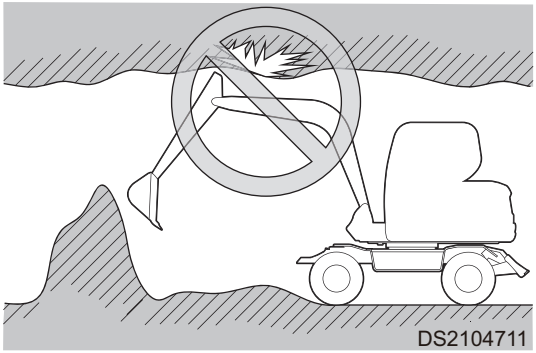


Figure 61

Working in Water

NOTICE

Do not exceed maximum permissible water depth. The water level must not reach higher than bottom of the axle housing.

After working in water, lubricate all lubrication points on lower structure, which have been underwater so water is removed. Check that no water has entered axles, transmission, driveshafts and other lower structure components.

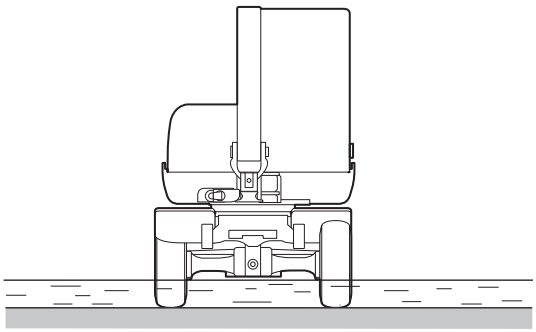


Figure 62

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 4-20, 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 fuel tank can cause death or serious injury. Never attempt to directly heat the fuel tank with open fire.

5. Lubricate entire machine according to "Lubrication and Service Chart" on page 4-16, 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. Check level of battery electrolyte daily. Keep electrolyte above plates to prevent damage to batteries. Use a slightly weaker electrolyte solution in hot climates. 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 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 4-16, 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 4-16. 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 4-16, 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.

ARO1770L

Figure 63

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.

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.

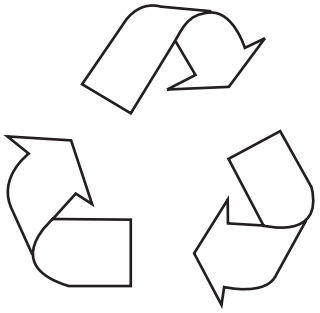


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Figure 64

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)	73 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)	98 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/s^2.

Whole Body Vibration Level

The highest root mean square value of weighted acceleration to which the whole body is subjected, is less than 0.5 m/s^2.

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;
    - 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:

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

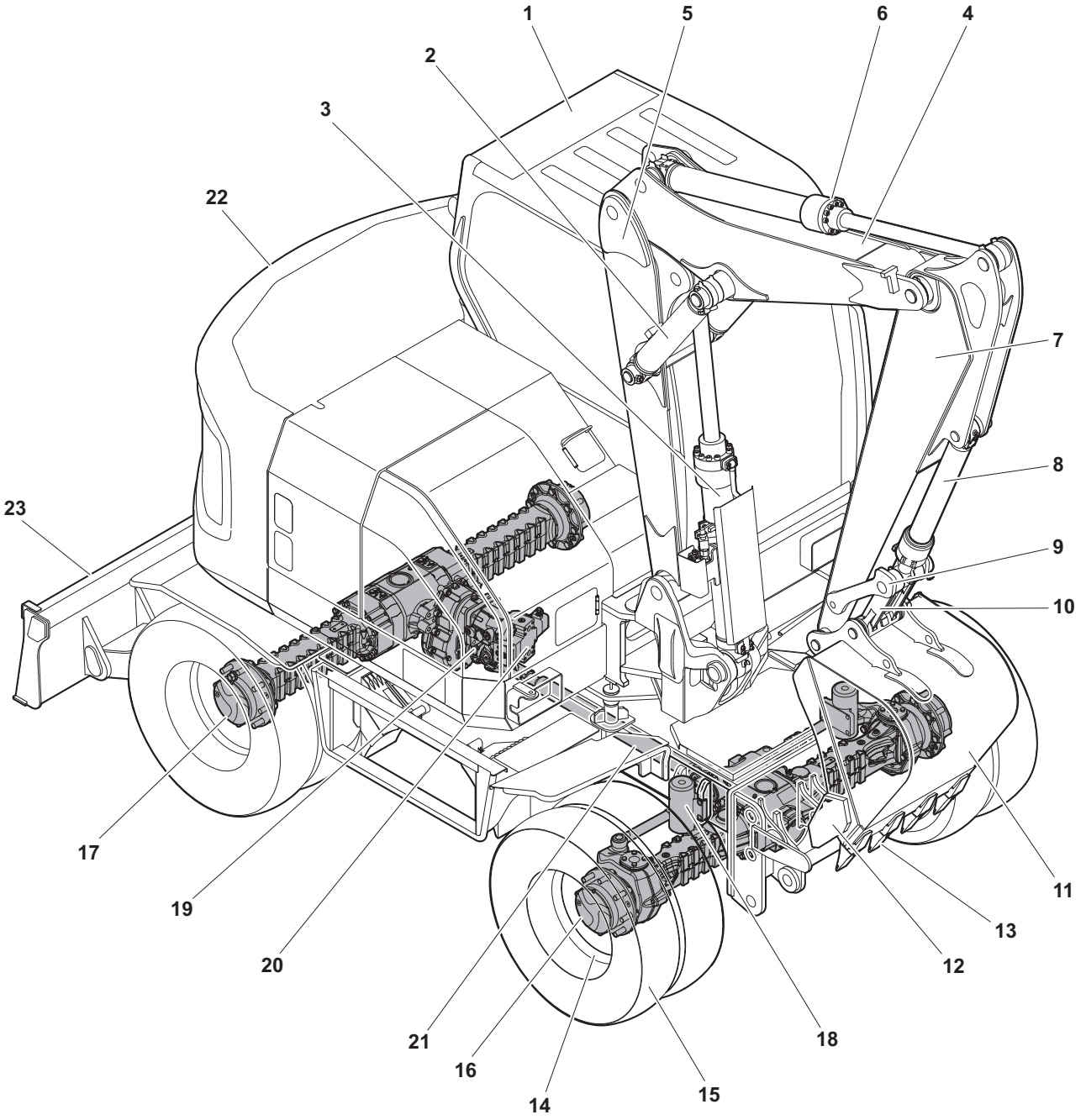

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Figure 1

Reference Number	Description
1	Cabin
2	Boom Cylinder
3	Arti Boom Cylinder
4	Upper Boom
5	Lower Boom
6	Arm Cylinder
7	Arm
8	Bucket Cylinder
9	Guide Link
10	Push Link
11	Bucket

Reference Number	Description
12	Side Cutter
13	Tooth Point
14	Rim
15	Wheel (Tire)
16	Front Axle
17	Rear Axle
18	Chocking Cylinder
19	Transmission
20	Travel Motor
21	Driveshaft
22	Counterweight

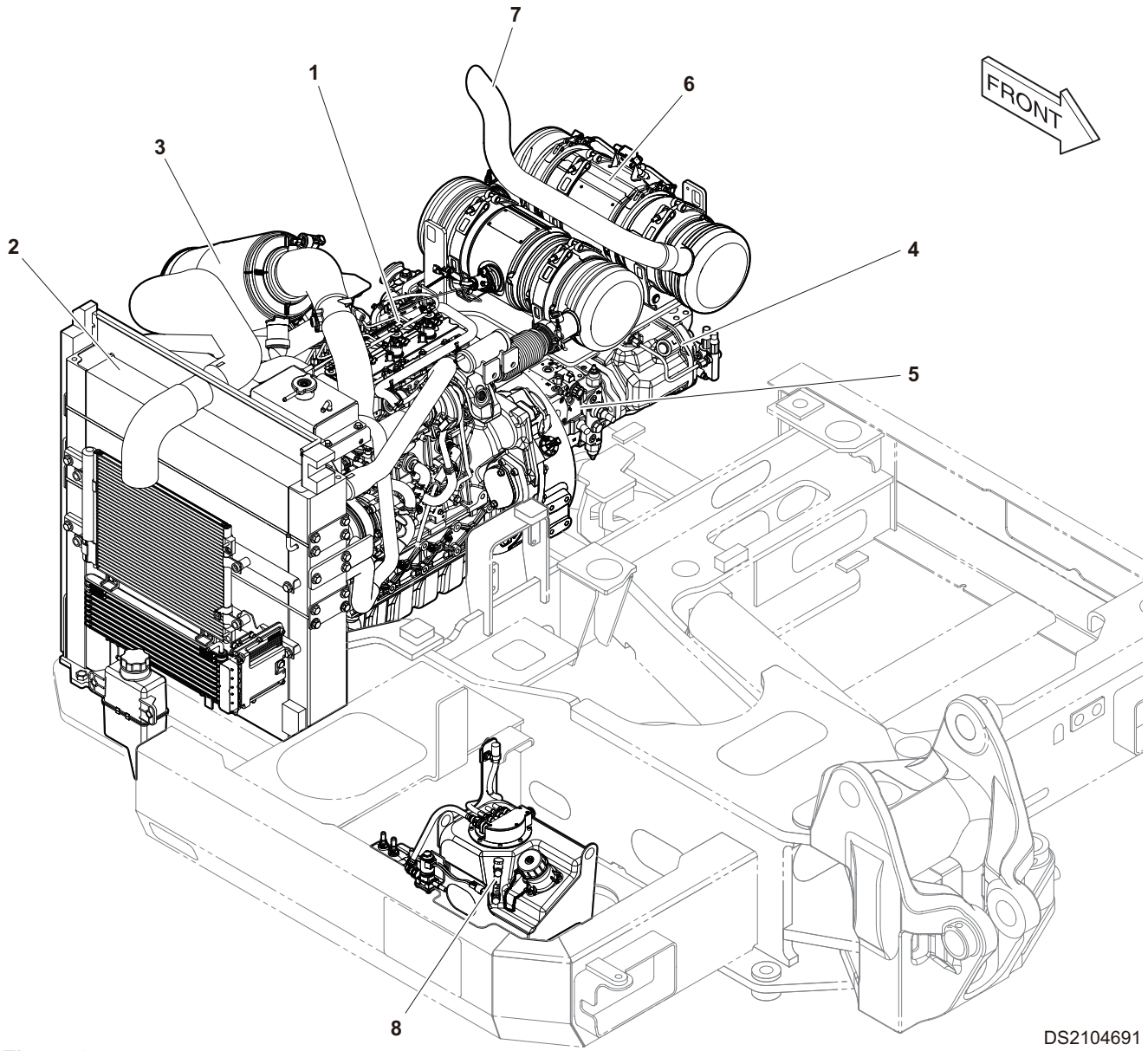

Figure 2

Reference Number	Description
1	Engine
2	Radiator
3	Air Cleaner
4	Main Pump

Reference Number	Description
5	HST Pump
6	Aftertreatment Ass'y
7	Muffler
8	DEF (AdBlue®) Tank

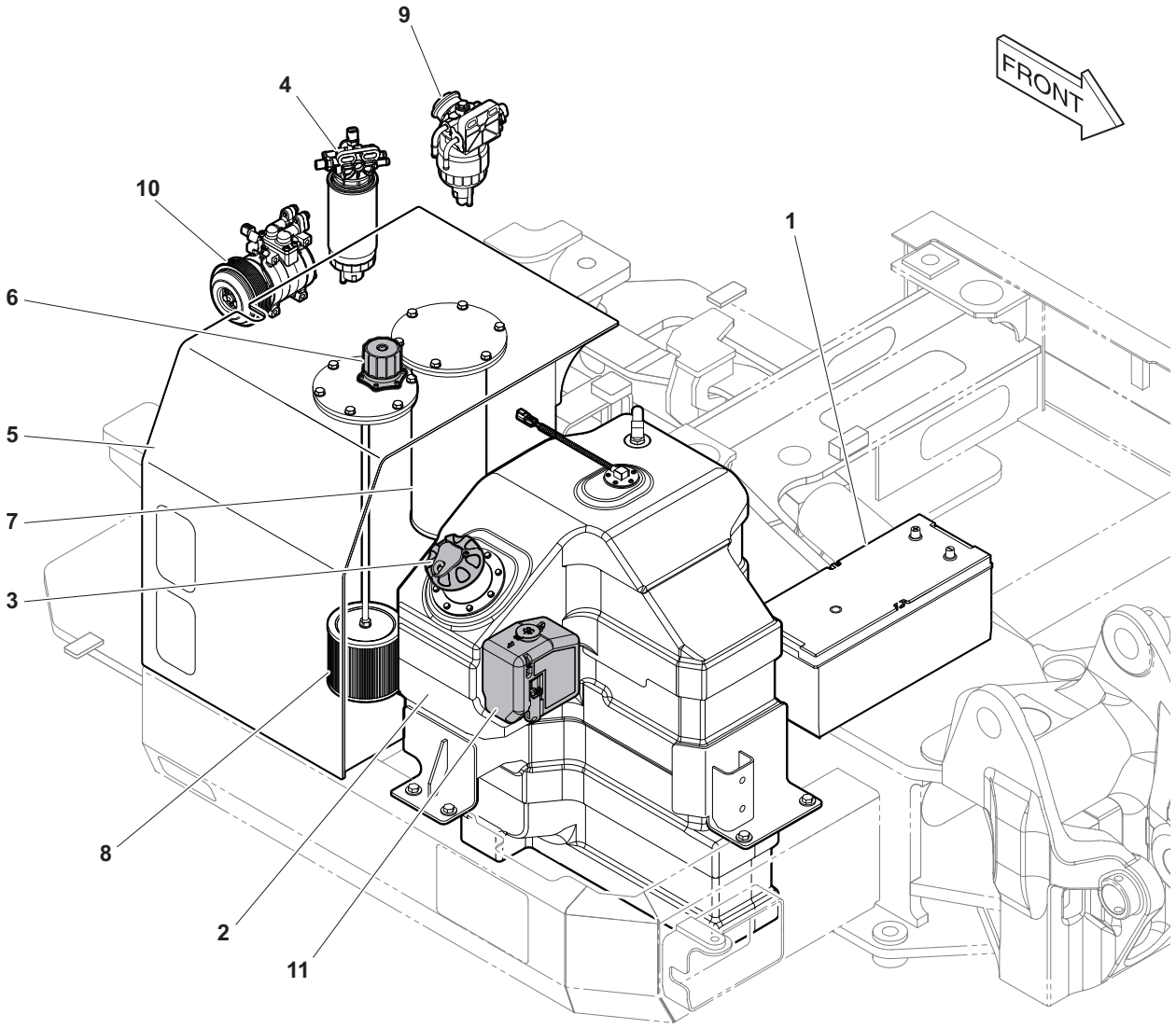

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Figure 3

Reference Number	Description
1	Battery
2	Fuel Tank
3	Fuel Cap
4	Fuel Filter
5	Hydraulic Oil Tank
6	Hydraulic Oil Tank Breather

Reference Number	Description
7	Return Filter
8	Suction Filter
9	Pre Fuel Filter and Water Separator
10	Air-conditioner Compressor
11	Window Washer Tank

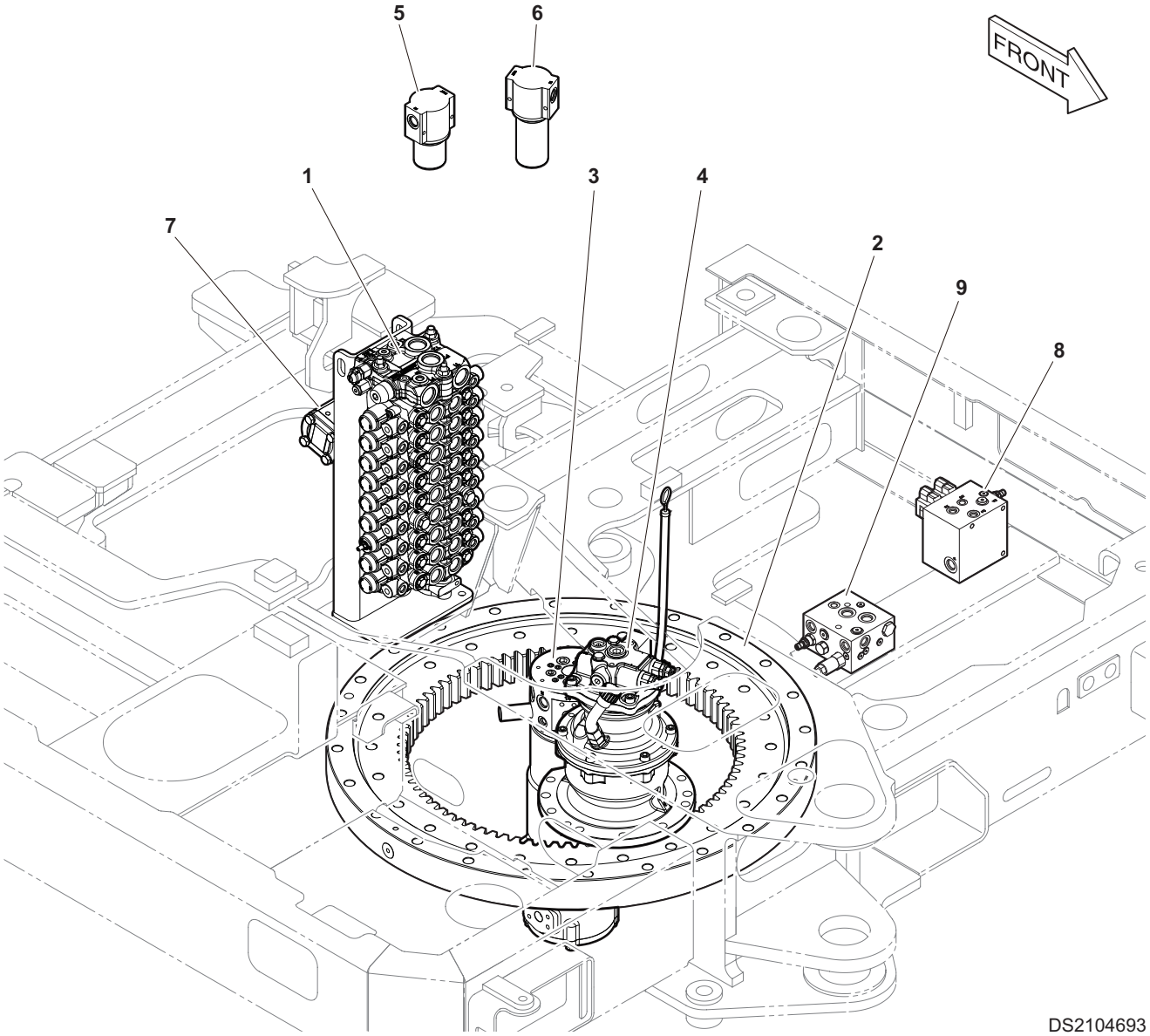

Figure 4

Reference Number	Description
1	Main Control Valve
2	Swing Bearing
3	Center Joint
4	Swing Device
5	Pilot Filter

Reference Number	Description
6	Brake Filter
7	Steering Gear Pump
8	Pilot Supply Valve
9	Brake Supply Valve

Operator's Area

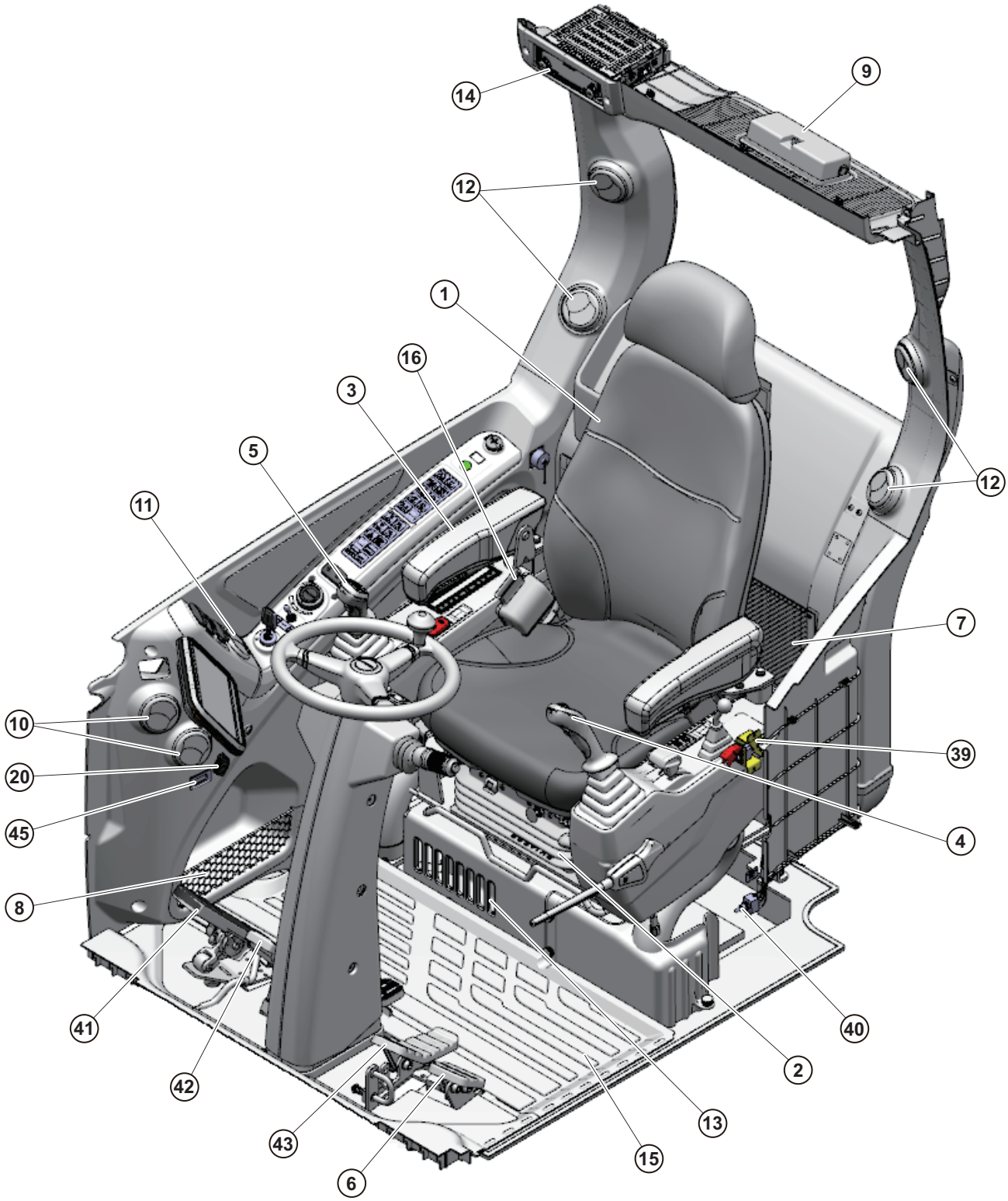

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Figure 5

Operational Controls and Panels

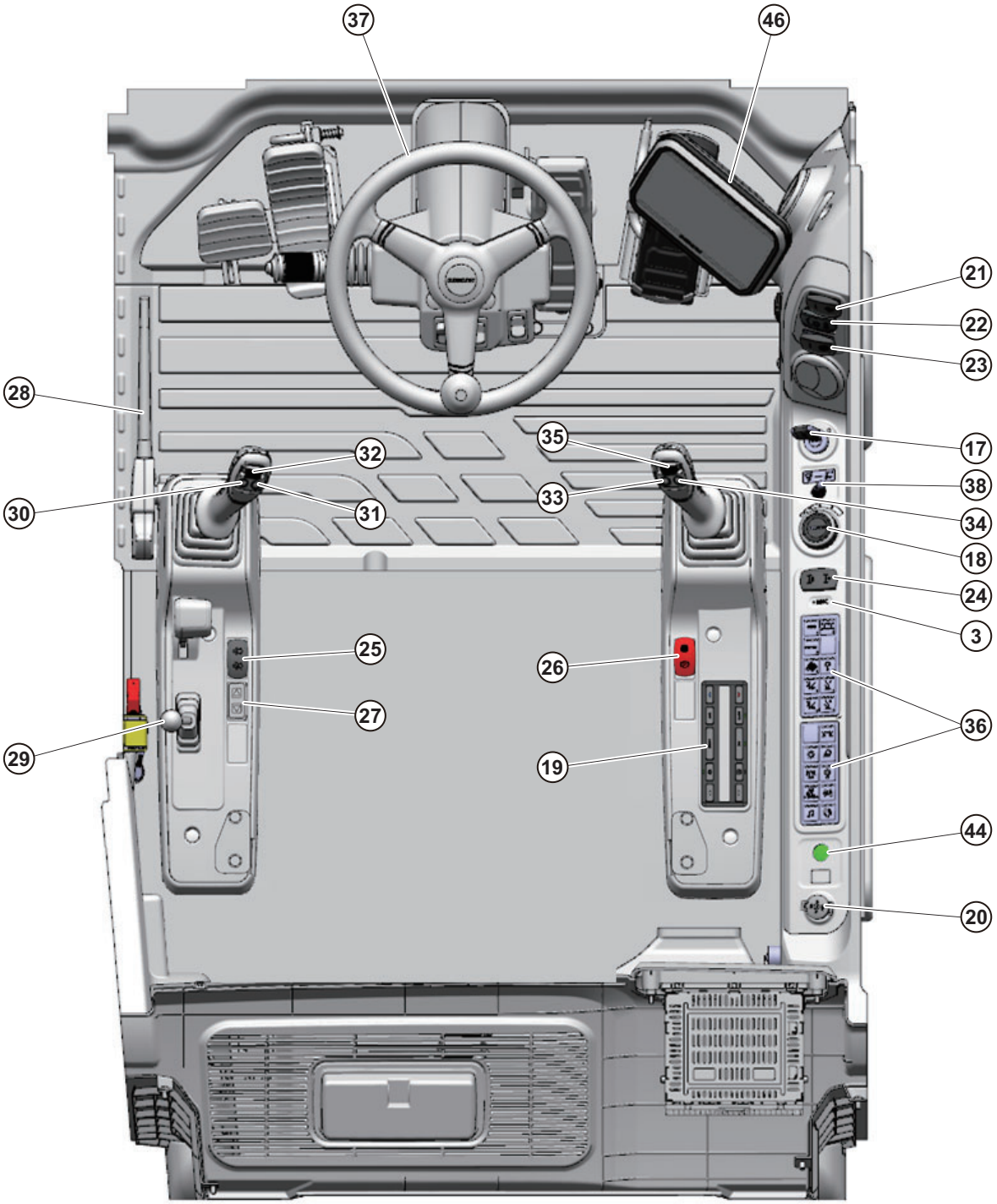

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Figure 6

Reference Number	Description
1	Seat
2	Suspension
3	Arm Rest
4	Left-hand Joystick Lever
5	Right-hand Joystick Lever
6	Footrest
7	Storage Space
8	Storage Space
9	Sunglass Case
10	Defroster Vent
11	Face Vent
12	Rear Vent
13	Foot Vent
14	Stereo
15	Mat
16	Seat Belt
17	Starter Switch
18	Engine Speed Control Dial
19	HVAC Control Panel
20	12V Power Socket
21	Travel Speed Selector Switch
22	Transmission Gear Selector Switch
23	Auto Hold Switch
24	Ram Lock Switch

Reference Number	Description
25	Aftertreatment System Switch
26	Parking Brake Switch
27	Trailer Turn Signal Indicator (If Equipped)
28	Safety Lever
29	Dozer/Outrigger Control Lever
30	One Touch Deceleration Button
31	Horn Button
32	Rotating Switch (If Equipped)
33	Breaker/Booster Button
34	Not Available
35	Shear Switch (If Equipped)
36	Keypad
37	Steering Console
38	Quick Coupler Switch (If Equipped)
39	Engine Emergency Stop Switch
40	Emergency Start Mode Switch
41	Accelerator Pedal
42	Brake Pedal
43	Arti Boom Control Pedal
44	Photo Sensor
45	Hour Meter
46	Display Monitor

Starter Switch

A four-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.

I. Turning switch to this position turns engine electrical system "ON". When the switch is first turned "ON", battery warning symbol and engine oil pressure warning symbols will turn "ON".

NOTE: *Preheat Indicator Symbol - The operation of the preheat cycle depends on coolant temperature. When the engine coolant is cold enough, the preheat indicator symbol will remain "ON" until engine preheat cycle is completed. The preheat cycle takes about twenty seconds to complete, and the indicator symbol will turn "OFF". When the symbol turns "OFF", engage the starter.*

⏢. 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.

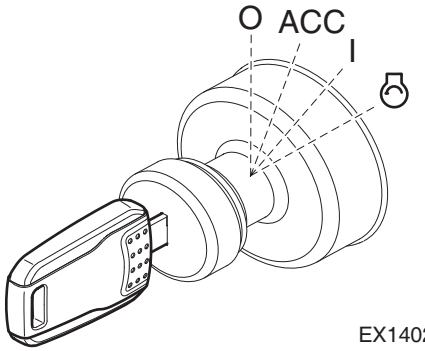

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Figure 7

WARNING

AVOID DEATH OR SERIOUS INJURY

DO NOT USE STARTING FLUIDS. The preheat system could cause the starting fluid to explode.

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 "15. Auto Idle Selector Button" on page 2-40*

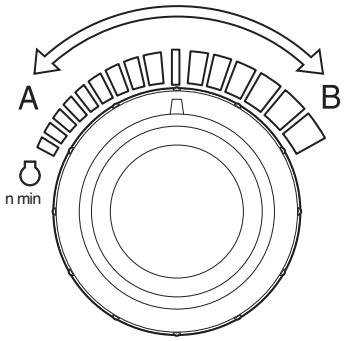

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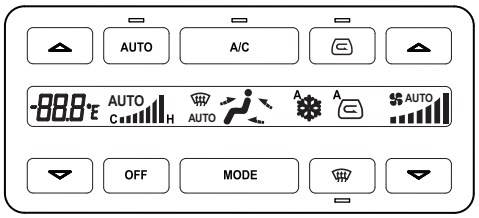
Figure 8

HVAC (Heating, Ventilation and Air Conditioning) Control Panel

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

Refer to "HVAC (Heating, Ventilation and Air Conditioning) Operation" on page 2-87, for more information.



DS2100103

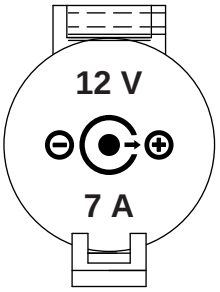
Figure 9

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.*



FG017015

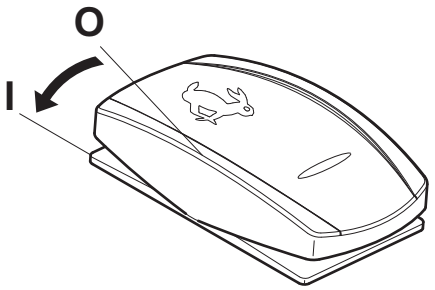
Figure 10

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.



DS2104558

Figure 11

This switch can toggle between low speed mode and high speed mode.

O. In this position, low speed.

I. In this position, high speed.

NOTE: *When engine is started (key on), travel speed (travel motor) will always be in low speed mode.*

NOTE: *High speed mode can not be activated while 4 wheel steer mode is selected.*

Transmission Gear Selector Switch

This switch can toggle between transmission 1st and 2nd gear.

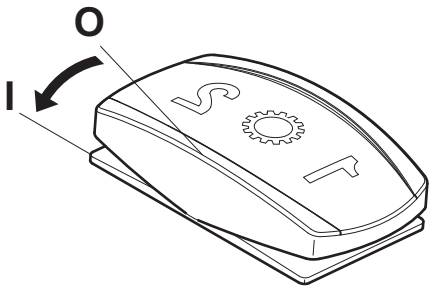
O. 1st gear

I. 2nd gear

NOTE: *To change the transmission gear, the following conditions must be met:*

- *Travel speed: 0 km/h (Complete stop)*
- *Forward/Reverse selector lever: Neutral (N)*
- *Brake pedal: ON*

NOTE: *For homologation version machine (max. speed limit version), transmission gear selector is not activated.*



DS2104559

Figure 12

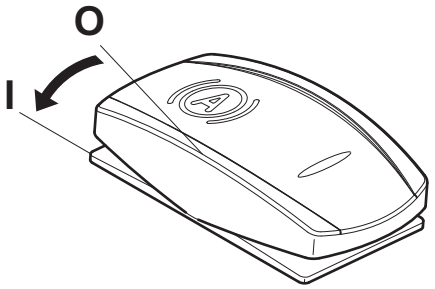
Auto Hold Switch

This switch is used to activates the auto hold functions.

O. Auto hold function is turned "OFF".

I. Auto hold function is turned "ON".

When stopping by operating the brake while driving, the auto hold green symbol lights up.
When you press the accelerator pedal again, the white symbol lights up when auto hold is released.



DS2104560

Figure 13

WARNING

AVOID DEATH OR SERIOUS INJURY

When the vehicle stops without stepping on the brake pedal, there may be an impact due to the auto hold operation.

When stopping the vehicle while driving uphill or downhill on a slope, press the brake pedal to stop.

During auto hold operation, the brake pedal may become light and may get caught in the latch.

When the function for auto hold is On, stop the equipment and operate the function after checking the danger factors in the vicinity.

When driving on the road, drive after confirming that Auto Hold is deactivated (not available in Travel Mode)

When ram lock is auto, ram lock can be released by canceling auto hold.

Ram Lock Switch

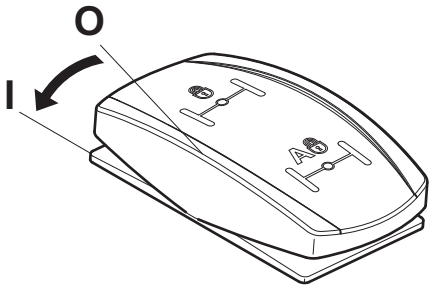
The ram lock switch controls the ram cylinder on the front axle.

NOTE: *Check the parking brake status first.*
If the parking brake is locked, it is automatically ram cylinder "LOCKED".
When the parking brake is released, the ram lock switch function is activated.

O. In this position, the ram lock cylinder is "AUTO".

- When the brake pedal is pressed, the ram cylinder is "LOCKED".
- When the brake pedal is not pressed, the ram cylinder is "UN-LOCK".

I. In this position, the ram lock cylinder is "LOCKED".



DS2104561

Figure 14

WARNING

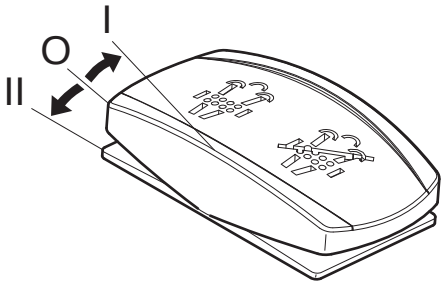
AVOID DEATH OR SERIOUS INJURY

To prevent tipping or rollover when handling heavy loads, the ram lock switch must be in the "LOCKED" position.

Aftertreatment System Switch

Used for manual (forced) regeneration or the inhibition (non-regeneration) of SCR regeneration.

NOTE: *Run machine at "LOW IDLE" and do not stop engine until regeneration cycle is completed. See "After Treatment System" on page 3-25, for more information.*



FG018280

Figure 15

NOTICE

Move safety lever to "LOCK" position for manual (forced) regeneration.

If the equipment is moved or switched off while manual (forced) regeneration is in process, the regeneration will need to be restarted.

O. The switch automatically returns to this position when it is released.

I. In this position, SCR regeneration is inhibited (non-regeneration).

The inhibition (non-regeneration) symbol will light up on the display monitor.

Pressing on the switch to this position when already in SCR regeneration inhibition (non-regeneration) relieves the inhibition.

II. In this position, manual (forced) regeneration is conducted for the SCR system.

Use this function when the regeneration warning symbol has lit up on the display monitor.

NOTE: *Turn "OFF" cutoff switch before you start forced regeneration.*

If the machine is moved or stopped while manual (forced) regeneration is in process, the regeneration cycle will need to be restarted.

If the switch is pressed to position II when in SCR regeneration inhibition (non-regeneration) mode, the warning lamp will light up on the display. Be careful.

Parking Brake Switch

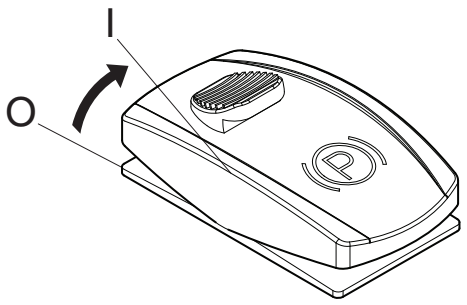
This switch is used to park the machine.

O. In this position, parking brake is "RELEASED" and the monitor light on the front display monitor turns "OFF".

I. In this position, parking brake is "APPLIED" and the monitor light on the front display monitor turns "ON".

NOTE: *If safety lever is unlocked or parking brake is released, the engine cannot be started. To start the engine, engage parking brake first.*

NOTE: *When starting the engine parking brake is engaged automatically.*
To release parking brake, turn parking brake switch "ON" then "OFF" once more although parking brake may look not to be engaged.

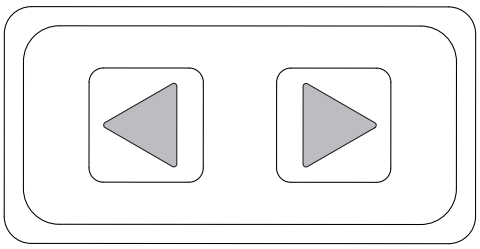


DS1603880

Figure 16

Trailer Turn Signal Indicator (If Equipped)

When a trailer is mounted, the trailer side turn signal is displayed.



DS2100510

Figure 17

Safety Lever

Refer to "Operation - Safety Lever" for more information.

NOTE: *The lock/unlock state of the safety lever is in effect only when the left stand is lowed.*
If the left stand is tilted, the lever is in the lock state at all times.

NOTE: *If safety lever is unlocked or parking brake is released, the engine cannot be started.*

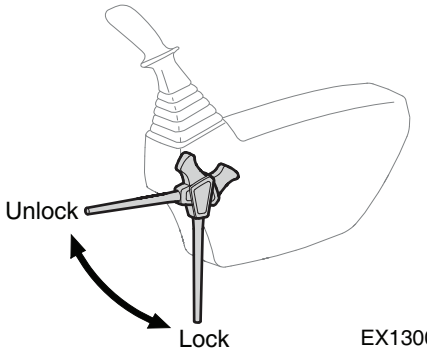


Figure 18

Dozer/Outrigger Control Lever

This switch is used to dozer/outrigger operation.

I. Dozer Blade/Outrigger Down

II. Dozer Blade/Outrigger Up

NOTE: *Whenever dozer blade is being used to level ground, make sure to set travel speed control to "LOW SPEED" Attempting to use dozer blade in "HIGH-SPEED" will cause damage to drive system.*

NOTE: *for the trailer mounting specifications, the designated function can be operated with the trailer/outrigger select switch.*

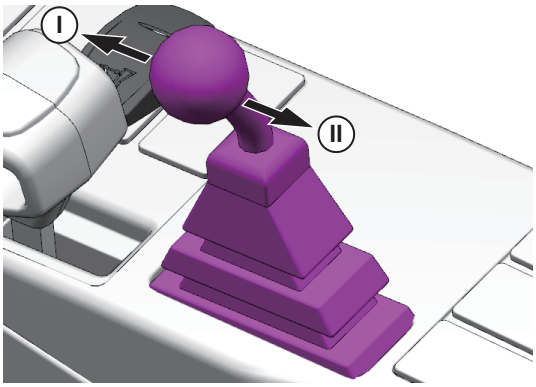


Figure 19

One Touch Deceleration Button

Press the left button on the top of the left-hand work lever (joystick) to reduce engine speed to "LOW IDLE".

When the button is pressed, the engine speed is immediately reduce to "LOW IDLE" rpm.

When the button is pressed, the machine is moved or the joystick is operated, the engine speed will return to the setting of the engine speed control dial.

- Two-way or Rotating

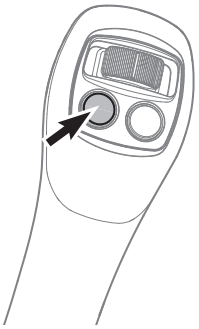


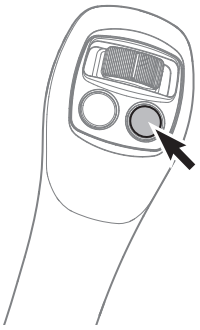
Figure 20

Horn Button

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

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

- Two-way or Rotating



DS2100515

Figure 21

Rotating Switch (If Equipped)

For a machine equipped with an attachment that rotates, move the thumb wheel switch on top of left-hand work lever (joystick) to rotate the attachment.

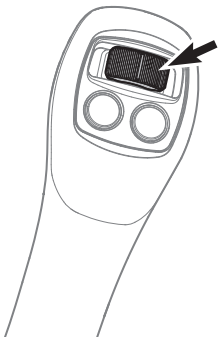
Rotating switch "RIGHT" is for "CLOCKWISE ROTATION".

Rotating switch "LEFT" is for "COUNTERCLOCKWISE ROTATION".

NOTICE

AVOID 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.



DS1601529

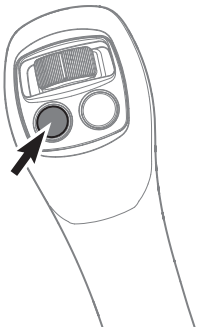
Figure 22

Breaker/Booster Button

Press the left button on the top of the right-hand work lever (joystick) to boost the hydraulic pressure.

NOTE: *This button works with the breaker/boost/shear selector switch. See "Work Mode" on page 3-30*

- Two-way or Rotating



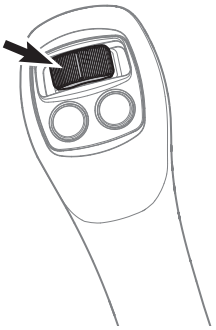
DS2100516

Figure 23

Shear Switch (If Equipped)

For a machine equipped with a shear, move the thumb wheel switch on top of right-hand work lever (joystick) to open or close the shear. Shear switch "RIGHT" is for "OPENING (DUMP)" and shear switch "LEFT" is for "CLOSING (CROWD)".

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



DS1601530

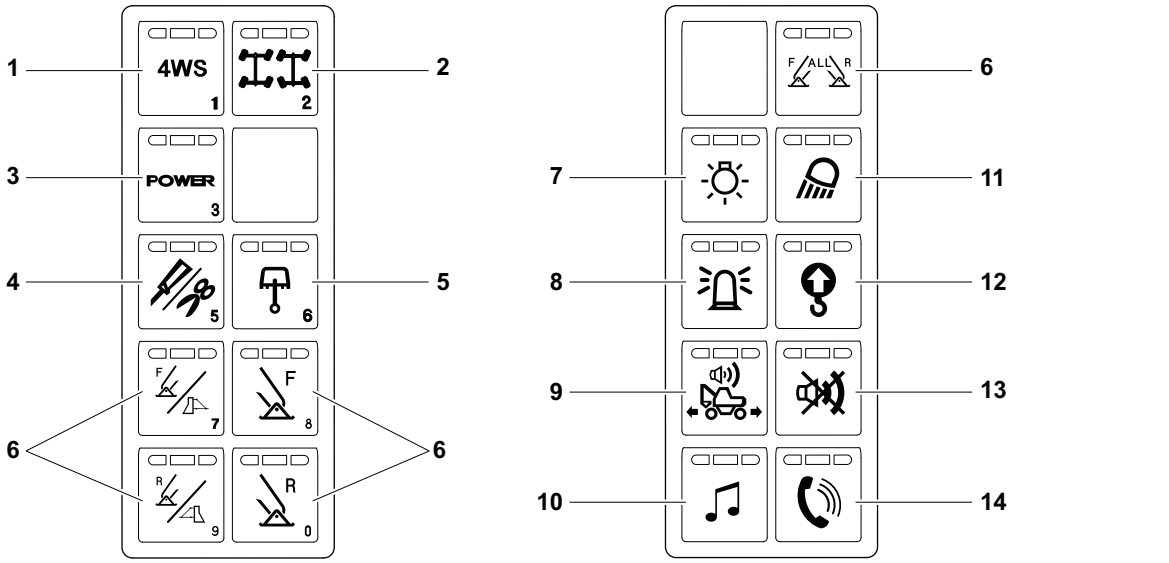
Figure 24

NOTICE

AVOID 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.

Keypad



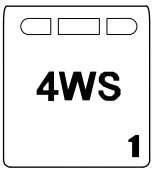
DS2104562

Figure 25

Reference Number	Description
1	2 Wheel / 4 Wheel Selector Button
2	Crab / Round Selector Button
3	Power Mode Selector Button
4	Work Mode Selector Button
5	Boom Swing Button
6	Dozer / Outrigger Selector Button
7	Light Button
8	Warning Light Button

Reference Number	Description
9	Travel Alarm Button
10	Radio Button
11	Working Lamp Button
12	Overload Warning Button
13	Buzzer Stop Button
14	Call Button

1. 2 Wheel / 4 Wheel Selector Button



DS2104563

Figure 26

NOTICE

For a stable steering mode change, and precise alignment, steer the front/rear axle very slowly when aligning. As soon as message "Alignment Completed" pop-up on the display, stop steering and check whether the steering mode is changed.

Press this button to switch between 2 wheel (front axle) steering and 4 wheel (front/rear axle) steering.

When the button is pressed, a message pop-up on the display monitor and follow that pop-up to align the front/rear axle.

When the steering mode change is complete, the symbol for that mode lights up on the display monitor.

Front wheel alignment is required when changing from 2 wheel steering to 4 wheel steering. And, rear wheel alignment is required when changing from 4 wheel steering to 2 wheel steering.

Symbol	Items
2WS	2 Wheel Steer
	4 Wheel Steer (Crab)
	4 Wheel Steer (Round)

Steering mode changeable conditions:

Travel speed selector switch: Low speed

Traveling is stopped

FNR is neutral position

NOTE: *If the rear axle alignment is misaligned due to an external impact greater than the steering cylinder pressure while driving in 2 wheel mode, a warning pop-up will occur.*
In this case, reset the steering mode.
If you ignore this warning and drive, you may drive at an angle or damage your tires.
Before traveling in 2WS mode, check the wheels of rear axle are in alignment for safety.

DS2104598

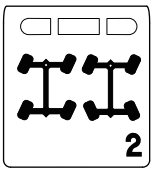
Figure 27

2. Crab / Round Selector Button

NOTICE

For a stable steering mode change, and precise alignment, steer the front/rear axle very slowly when aligning. As soon as message "Alignment Completed" pop-up on the display, stop steering and check whether the steering mode is changed.

If operator selects the 4Wheel, Depending on the previous operating state, Crab or Round mode is activated.

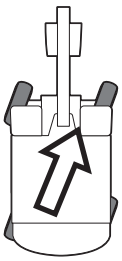


DS2104599

Figure 28

- Crab Mode

  The front and rear tires are steered in the same direction.

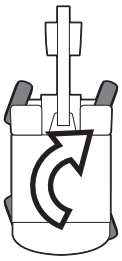


DS2104600

Figure 29

- Round Mode

  The front and rear tires are steered in opposite directions.



DS2104601

Figure 30

How to change round mode in crab mode:

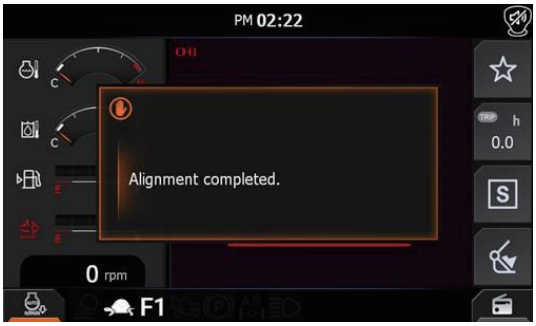
A. When the crab/round selector button is pressed, a pop-up occurs on the display monitor and the left LED of the button blinks.

B. Slowly align the front axle according to the corresponding pop-up message.

DS2104602

Figure 31

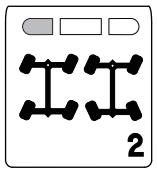
C. Align until the message "Alignment Completed" appears on the display monitor, then wait a moment for the mode to change completely.



DS2104603

Figure 32

D. When the change to round mode is completed, the LED on the left side of the button stops blinking and changes to a lit state.



DS2104604

Figure 33

How to change crab mode in round mode:

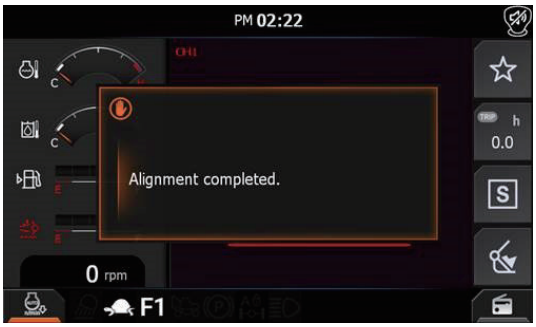
A. When the crab/round selector button is pressed, a pop-up occurs on the display monitor and the right LED of the button blinks.

B. Slowly align the front axle according to the corresponding pop-up message.

DS2104602

Figure 34

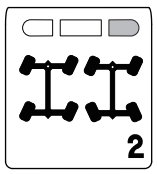
C. Align until the message "Alignment Completed" appears on the display monitor, then wait a moment for the mode to change completely.



DS2104603

Figure 35

D. When the change to crab mode is completed, the LED on the right side of the button stops blinking and changes to a lit state.



DS2104605

Figure 36

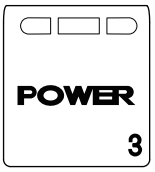
3. Power Mode Selector Button

Used for selecting the power mode, standard mode, or the economy mode.

Pressing the power mode selector switch will display the available modes on the main window.

Place the selection bar by pressing the power mode selector switch or ◀ and ▶ buttons. And than select the mode by pressing the ↵ button.

NOTE: *Power mode setting is available only digging mode.*



DS2104606

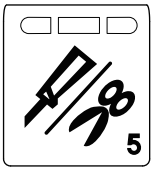
Figure 37

4. Work Mode Selector Button

Used to select the digging, breaker or shear mode.

Pressing the work mode selector button will display the available modes in the main window.

Place the selection bar by pressing the power mode selector switch or ◀ and ▶ buttons. And than select the mode by pressing the ↵ button.



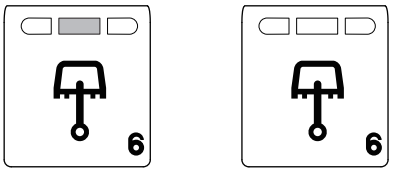
DS2104607

Figure 38

5 Boom Swing Button

If unit is equipped with a boom swing device, push this switch to activate it.

- Center LED lamp "OFF"; Boom swing will be deactivated.
- Center LED lamp "ON"; Boom swing will be activated. If the thumb wheel switch of left-hand work lever (joystick) is manipulated, boom swing will be activated.



DS2104608

Figure 39

6. Dozer/Outrigger Selector Button

Two switches are used to operate the front attachment and two switches are used to operate the rear attachment.

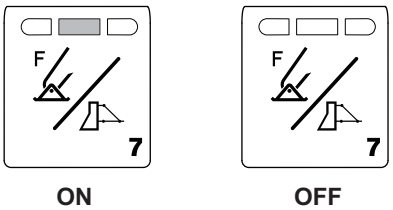
There is one switch to operate the front and rear attachments at once.

After pressing the button for the attachment you want to operate, move the dozer/outrigger control lever to activate the attachment.

- Front Attachment (Left) Select

  OFF: Not selected

  ON: Selected (Enabled)



DS2104609

Figure 40

- Front Attachment (Right) Select

  OFF: Not selected

  ON: Selected (Enabled)

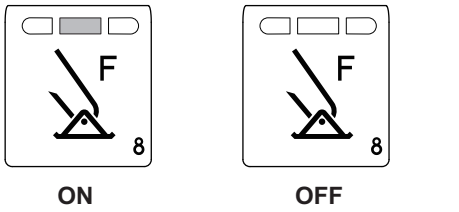


Figure 41

- Rear Attachment (Left) Select

  OFF: Not selected

  ON: Selected (Enabled)

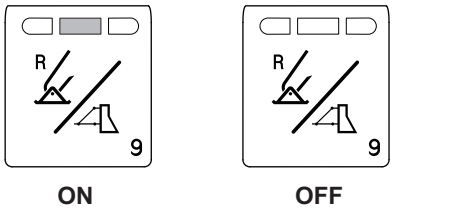


Figure 42

- Rear Attachment (Right) Select

  OFF: Not selected

  ON: Selected (Enabled)

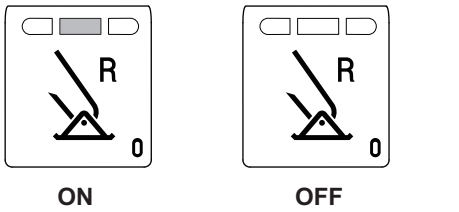


Figure 43

- Front/Rear Attachment (All) Select

  OFF: Not selected

  ON: Selected (Enabled)

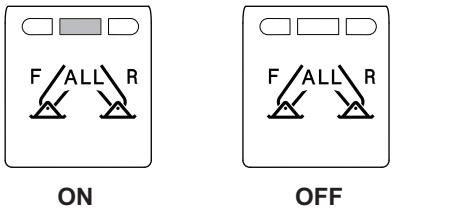


Figure 44

7. Light Button

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

OFF: All lights are "OFF".

Step 1: In this position, all illumination lights of the display monitor and the control switches are turned "ON".

Step 2: In this position, all illumination lights and work lights are turned "ON".

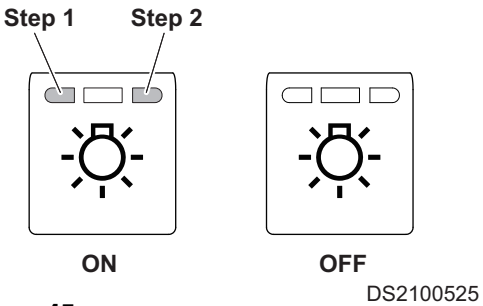
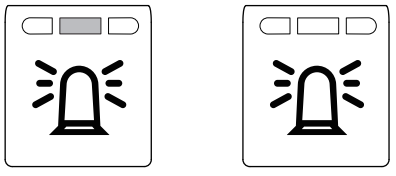


Figure 45

8. Warning Light Button

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

- Center LED lamp "OFF": The warning light is turned "OFF".
- Center LED lamp "ON": The warning light turns "ON" and will start flashing.



DS2104614

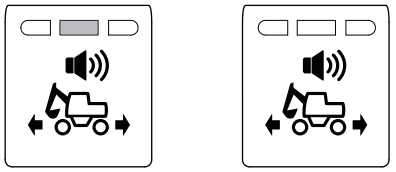
Figure 46

9. Travel Alarm Button

This switch is used to select travel alarm buzzer in either "Reverse or Forward Travel", and "Reverse Travel".

OFF: Buzzer will sound only in reverse travel.

ON: Buzzer will sound in both forward and reverse travel.

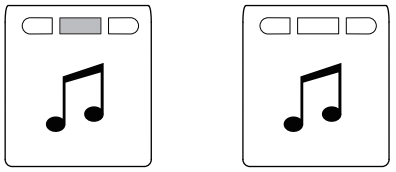


DS2100532

Figure 47

10. Radio Button

Press this button to change from the display monitor to the audio screen.



DS2104615

Figure 48

11. Working Lamp Button

Operates the work lights mounted on the boom.

NOTE: *Do not turn "ON" the work lights when traveling on public roads.*

OFF: Work light are turned "OFF".

Step 1 (Pressed once): All work light will turn "ON".

Step 2 (Pressed twice): Front work light turn "ON". AVM and Rear working light turn "OFF"

DS2202279

Figure 49

12. Overload Warning Button

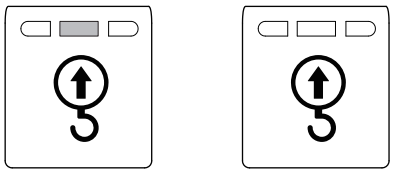
If unit is equipped with an overload warning device, push this switch to activate it.

OFF: Overload warning device is turned "OFF".

ON: 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.

OWD Limit	Warning
< 90%	No Action
90 ~ 95%	OWD Warning Light Blinking and Buzzer Sounds
95% ~	OWD Warning Light Constant and Buzzer Sounds

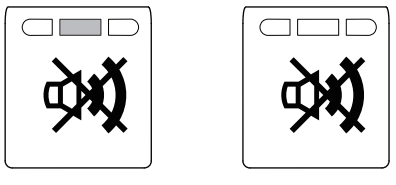


DS2100527

Figure 50

13. Buzzer Stop Button

Buzzer stop function: When warning light appears and the buzzer sounds, use this button to "STOP" buzzer from sounding.

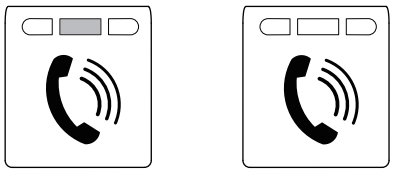


DS2104616

Figure 51

14. Call Button

Press this button to answer an incoming call.



DS2104617

Figure 52

Steering Console

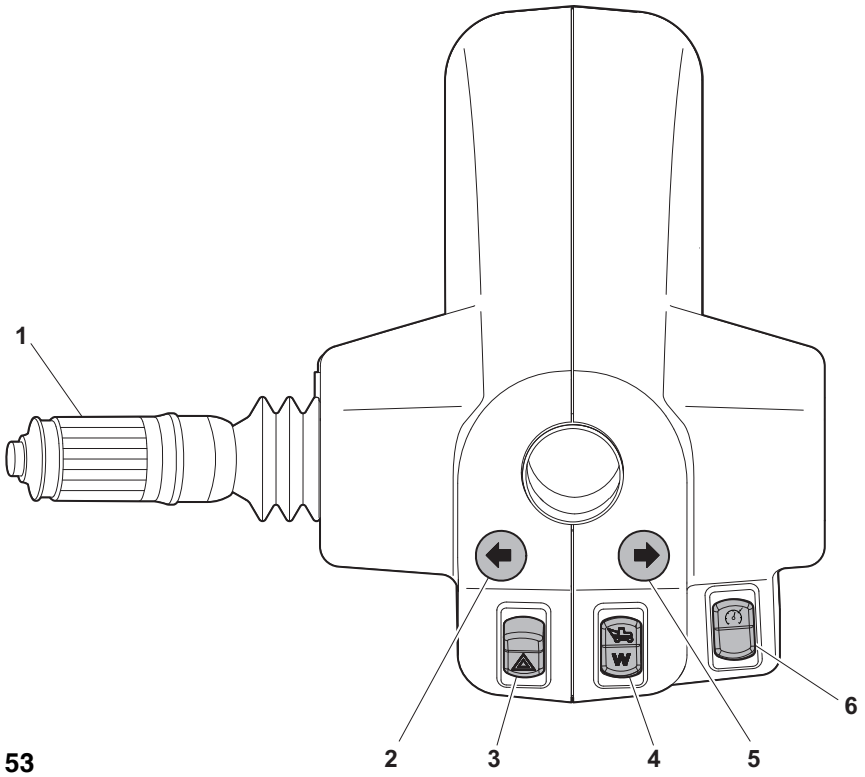


Figure 53

DS2104618

Reference Number	Description
1	Combination Switch
2	Left Turn Signal Light and Hazard Warning Light
3	Hazard Warning Light Switch

Reference Number	Description
4	Work/Travel Selector Switch
5	Right Turn Signal Light and Hazard Warning Light
6	Cruise Control Switch

Combination Switch (LH)

1. Wiper Switch

   Activates the windshield wiper when the outside area of the lever is rotated.

   O : In this position, windshield wiper runs at a constant speed.

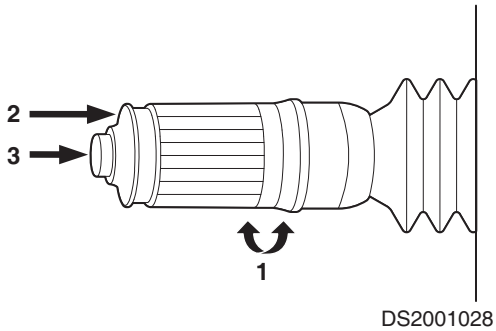
   OFF : In this position, windshield wiper is turned "OFF"

   JI : In this position, windshield wiper runs at approximately a three seconds intermittent cycle.

   JII : In this position, windshield wiper runs at approximately a six seconds intermittent cycle.

2. Window Washer Switch

   When the outside area of the lever is pressed, it activates the washer pump and sprays fluid onto the windshield. (Only while being pressed.)



DS2001028

Figure 54

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: *If you use soapy water or synthetic detergent instead of window cleaning fluid, the wiper blade or painted surfaces may be damaged.*

3. Horn Button

   The center button of the lever activates the horn. (Only while being pressed.)

4. Turn Signal Lever

   Operates the left and right direction lights.

   a. Right Side Direction Switch - Pushing lever forward, activates right outside directional lights and directional indicator light on instrument panel.

   b. Left Side Directional Switch - Pulling lever back, activates left outside directional lights and directional indicator light on instrument panel.

   NOTE: *When the turn is completed the lever automatically returns to "NEUTRAL" position. Should it not, it can be manually returned by hand.*

   NOTE: *Turn signals will function with starter switch in "OFF" position.*

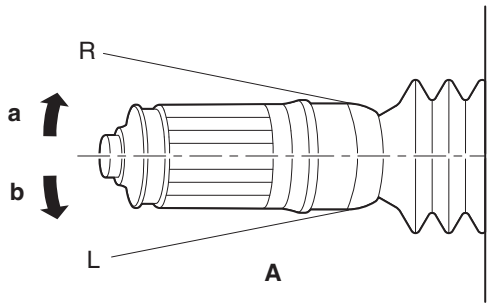
5. Headlight Switch

   a. Pull up - Momentarily turns "ON" both the low beams and high beams. (It returns to "NEUTRAL" position when released.)

   b. Neutral position - Normal low beams.

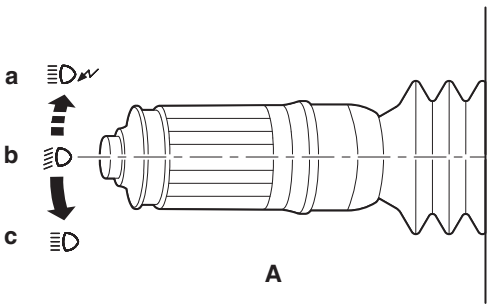
   c. Push down - Locks into position and turns "ON" high beams.

NOTE: *When the light switch is in the "II" position. High and low beams will be functioned simultaneously.*



DS2001029

Figure 55



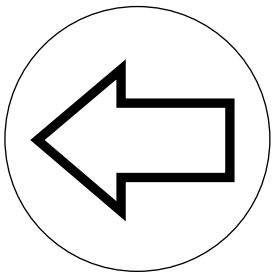
DS2001030

Figure 56

Left Turn Signal Light and Hazard Warning Light

This light blinks when left turn signal is turned "ON". Both turn signal lights blink when hazard warning light switch is turned "ON".

NOTE: *If left and right turn indicators blink together, or if they blink faster than normal, a light bulb is not operating or flasher solenoid is damaged.*



ACO0242L

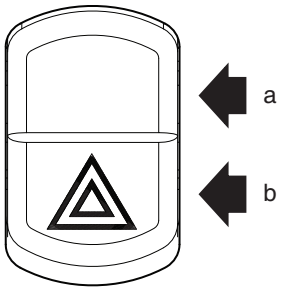
Figure 57

Hazard Warning Light Switch

This light is used when the equipment is stopped because of a malfunction or when an emergency occurs. When this switch is pressed the directional indicator lights in front and back of the machine light up and flash, warning others in the area. At the same time the directional indicator lights on the instrument and hazard warning light switch will light up to warn the operator. The hazard warning lights operate independent of the starter switch.

a. In this position, hazard warning lights are turned "OFF".

b. In this position, hazard warning lights are turned "ON".



WE1500206

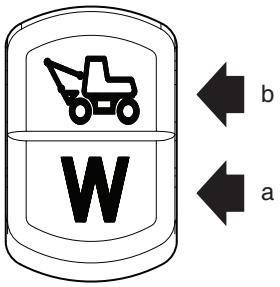
Figure 58

Work/travel Selector Switch

This switch is used to select work or travel modes.

a. In work mode position, "Work Mode" is selected for normal operation.

b. In travel mode position, "Travel Mode" is selected for street travel.



WE1401071

Figure 59

NOTICE

AVOID INJURY

When the switch is in the "b" position the work levers (joysticks) are not functional.

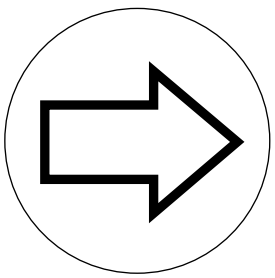
Although it is possible to travel with the switch in the work mode (a) position, extreme caution must be exercised since the front attachment can be moved by accidentally touching the work levers (joysticks).

In the above condition the engine speed will not increase even though the foot pedal is pressed to the maximum position, this is not a malfunction.

Right Turn Signal Light and Hazard Warning Light

This light blinks when right turn signal is turned "ON". Both turn signal lights blink when hazard warning light switch is turned "ON".

NOTE: *If left and right turn indicators blink together, or if they blink faster than normal, a light bulb is not operating or flasher solenoid is damaged.*



ACO0243L

Figure 60

Cruise Control Switch

The cruise control switch automatically controls the forward travel speed.

a. In this position, cruise control is turned "ON".

b. In this position, cruise control is turned "OFF".

When this switch is pressed to "I" position while traveling, the travel speed is maintained without using the foot pedal. While in cruise, the engine speed can be adjusted by turning the engine speed control dial.

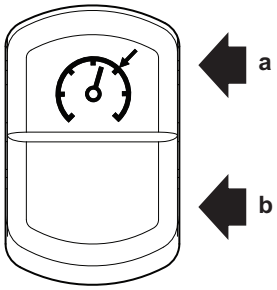
The cruise control is turned "OFF" if one of the following occurs:

- The brakes are "APPLIED".
- Travel speed selector switch is moved to "I" position.
- Transmission is shifted to "NEUTRAL".

NOTE: *When the auto idle mode is selected, the engine speed is lowered approximately 4 seconds after the cruise is turned "OFF".*

NOTE: *The cruise control will not activate in the reverse travel direction.*

Due to HST travel system characteristic, machine will not be departed while low engine rpm is selected. (below 1,350 rpm)



DS2104619

Figure 61

Quick Coupler Switch (If Equipped)

This switch is used for engaging or releasing the attachment.

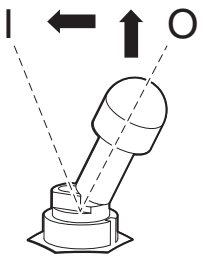
Refer to "Quick Coupler Operation" for more information.

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

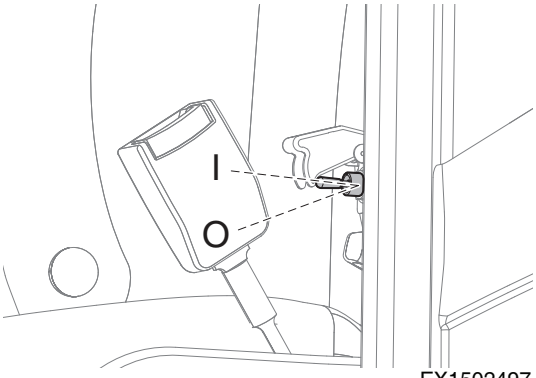
Figure 62

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.



EX1502497

Figure 63

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.

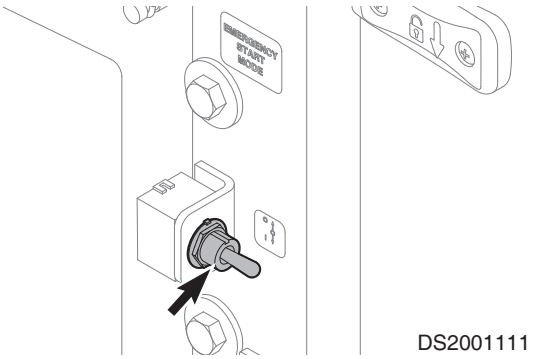
O. Emergency start mode "OFF"

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.



DS2001111

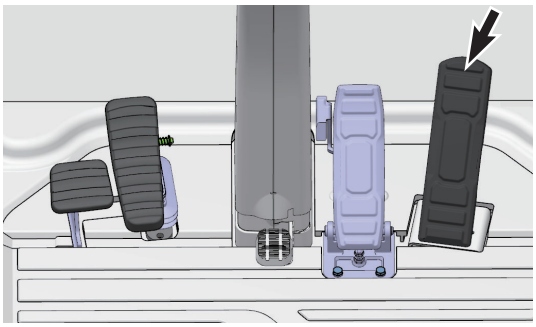
Figure 64

Accelerator Pedal

Controls the travel speed of machine.

NOTICE

The further the pedal is pressed, the more the engine speed will increases. However, do not press the pedal more than necessary otherwise, it will increase fuel consumption.



DS2104695

Figure 65

Brake Pedal

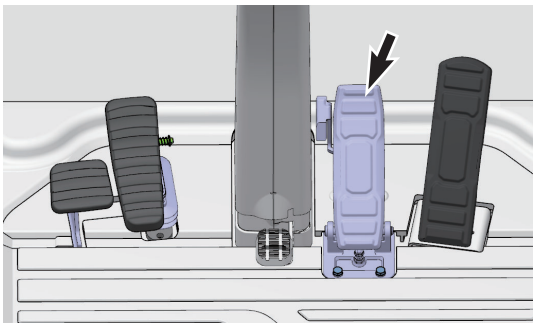
Pressing brake pedal will apply the brakes to the machine.

NOTICE

Abnormal operation with half of the brake running, failure to comply with the brake oil change intervals, or excessive service brakes may increase the temperature of the axle oil during the operation, resulting in reduced braking forces.

NOTICE

Do not use brake pedal as a footrest. This will cause brake disk to wear faster than normal, and this could reduce braking capability.



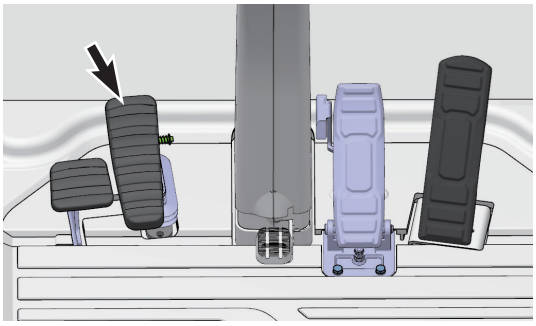
DS2104696

Figure 66

Arti Boom Control Pedal

Arti boom can be operated with this pedal.

Refer to "Operation - Work Levers" for more information.



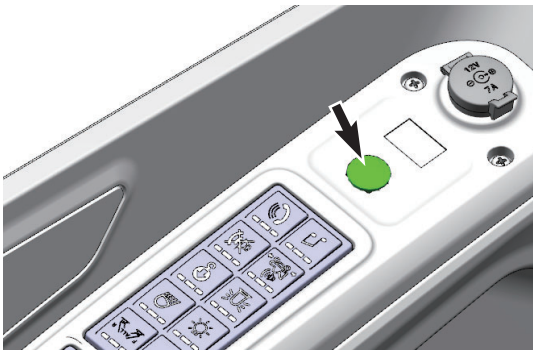
DS2104697

Figure 67

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.

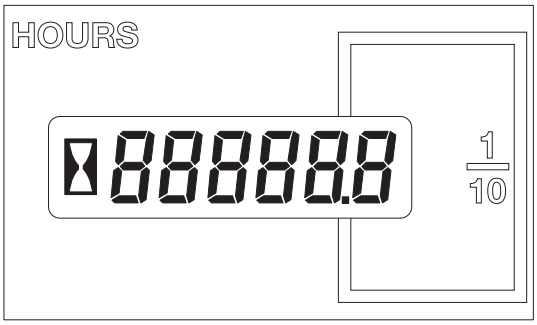


DS2104620

Figure 68

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 69

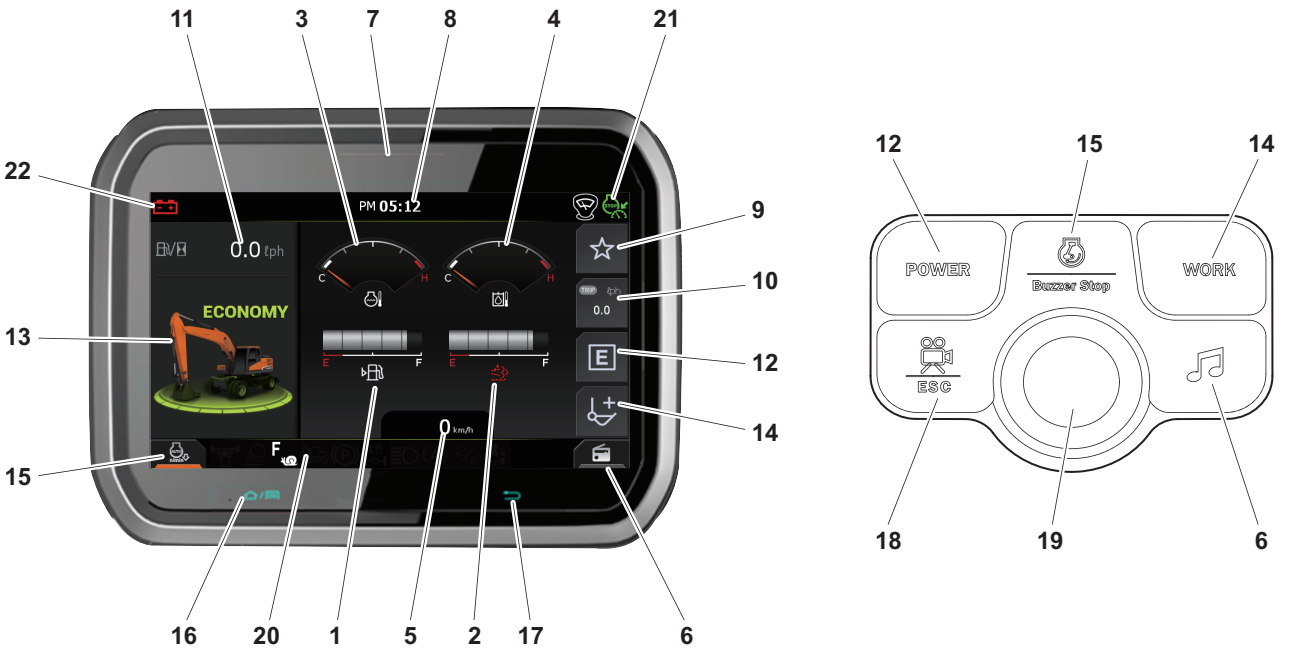
Display Monitor

See "Display Monitor" on page 2-33

DS1900479

Figure 70

Display Monitor



DS2100538

Figure 71

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

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

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

Functional Check

If the 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.

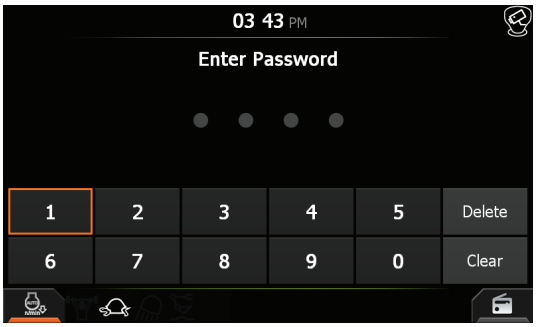
The HD HYUNDAI CONSTRUCTION EQUIPMENT logo is displayed on the screen during functional checks.

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 2-71.



DS1900406

Figure 72

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.

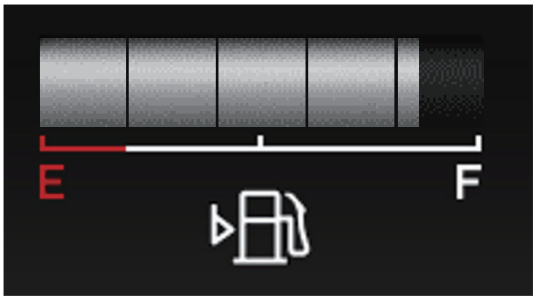
White range - Normal amount of fuel.

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 "22. Display Warning Symbols" on page 2-44.*

Check the fuel level on firm, level ground.



DS2100539

Figure 73

2. DEF (AdBlue®) Level Gauge

This gauge indicates the amount of DEF remaining in the DEF (AdBlue®) tank.

White range - Normal amount of DEF.

Red range - Not enough DEF.

If the needle moves into the red range, the SCR error warning indicator activates.

In such cases, be sure to stop the engine and add DEF immediately. Check the DEF level on firm, level ground.

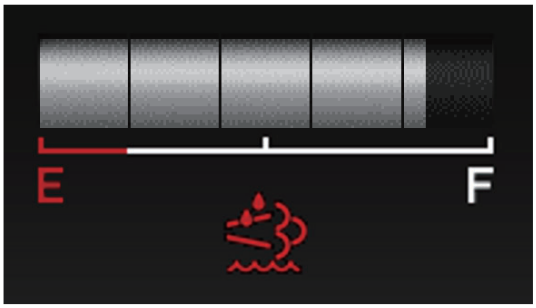


Figure 74 DS2100540

3. 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.

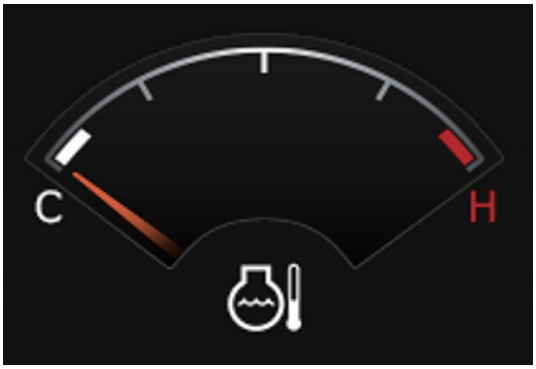


Figure 75 DS2100541

4. 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 "22. Display Warning Symbols" on page 2-44.*

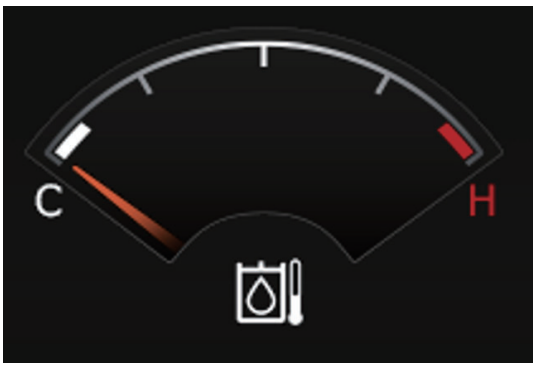


Figure 76 DS2100542

5. Tachometer

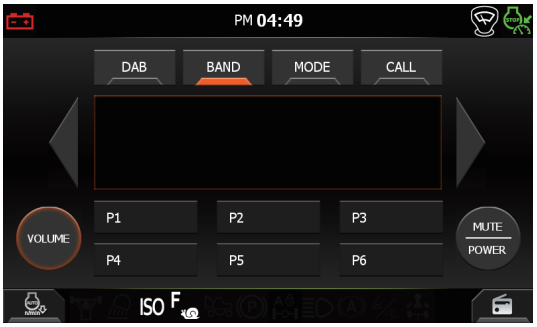
This indicates the travel speed as a number.

DS2100543

Figure 77

6. Audio Display

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



DS2100544

Figure 78

7. Main Warning Lamp

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

NOTICE

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

NOTICE

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 2-50.*

DS1900423

Figure 79

8. Digital Clock

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

- Time

DS1900424

Figure 80

- Time + date

  For more information on setting the time, please refer to "User Menu" on page 2-53.

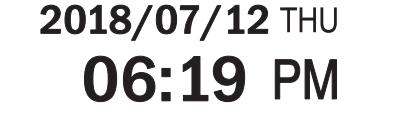


Figure 81 DS1900982

9. 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 2-53.

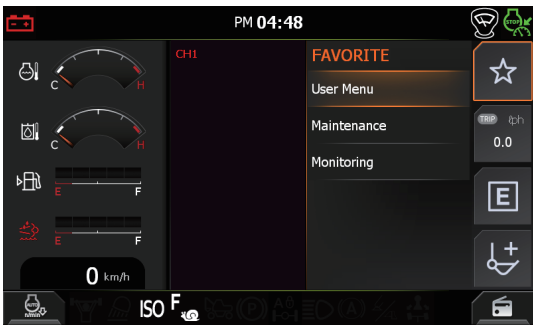


Figure 82 DS2100545

10. 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
- Soot level
- Service meter (Total operating time)

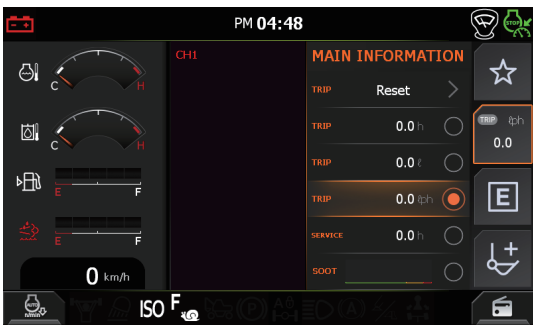
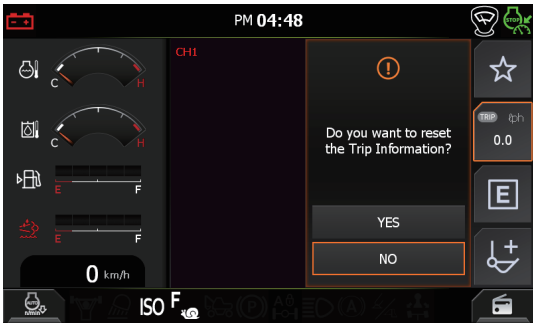


Figure 83 DS2100546

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

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



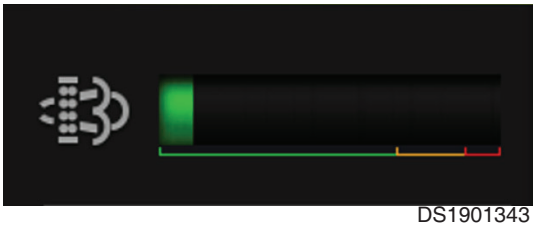
DS2100547

Figure 84

11. Main Information Indicator

Displays the information selected with the main information selector button.

NOTE: *The AVM option shows the soot gauge by default.*



DS1901343

Figure 85

12. 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 86

13. 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

NOTE: *When selecting the drive mode, available modes are power mode and standard mode.*

Figure 87 DS2100548

14. 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
- Tilt Rotator mode (If Equipped)

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 88 DS2100549

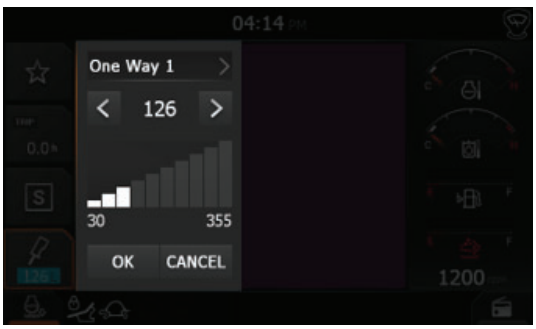


Figure 89 DS1900761

15. Auto Idle Selector Button

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

- Selected

DS1900435

Figure 90

- Not selected

DS1900436

Figure 91

16. Menu Selector Button

Allows you to access the main menu.

DS1900437

Figure 92

17. Back Button

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

DS1900438

Figure 93

18. 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.

19. 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.

20. 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
	FNR Symbol (Slow/Middle/High)
	Work Light ON
	ISO/BHL Joystick Mode Selected
	Travel Mode ON
	Parking Brake ON
	Ram Lock Auto/Lock
	High Beam ON
	Auto Hold Ready/Activate
	Dozer-Trailer ON
	Joystick Steering ON
	2 Wheel Steer
	4 Wheel Steer (Crab)
	4 Wheel Steer (Round)
	Transmission Gear (Forward/Reverse)

21. 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.
	Over the Air	OTA/OTA Massage OFF
	Mirror Heater (If Equipped)	Mirror Heater ON
	Cruise Mode	Cruise Mode ON
	Swing Align	Swing Align ON
	Bluetooth	Bluetooth Connected

22. 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	20		Warning	Removable counterweight
2		Warning	Engine oil pressure warning	21		Warning	Ultrasonic sensor failure
3		Warning	Coolant overheated	22		Warning	Engine rpm and starting restricted by TMS or TMS terminal failure
4		Warning	Engine warning	23		Warning	Coolant level warning
5		Warning	Stop engine	24		Warning	Seat belt
6		Warning	WIF sensor	25		Warning	No smart key
7		Warning	Hydraulic oil warning	26		Warning	Failed to detect smart key
8		Warning	Fuel warning	27		Warning	Low smart key battery
9		Warning	Air cleaner clogged	28		Warning	Steering warning
10		Warning	OWD warning	29		Caution	Return filter clogged
11		Warning	Quick coupler warning	30		Caution	Regeneration prohibition
12		Warning	Manual regeneration request	31		Caution	Active regeneration operating
13		Warning	Low DEF (AdBlue®) level	32		Caution	Manual regeneration
14		Warning	Problem in SCR system	33		Caution	GPS antenna failure
15		Warning	VBO angle sensor failure or I-CEPT sensor failure	34		Caution	GSM antenna failure
16		Warning	VBO joystick pressure sensor failure	35		Caution	Satellite antenna failure
17		Warning	EPPR valve failure	36		Failure	Check the machine
18		Warning	AGS warning	37		Failure	Stop the machine
19		Warning	Clogged fuel filter				

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.

Refer to "After Treatment System" on page 3-25, for more information.

13. Low DEF (AdBlue®) level

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

Refer to "Emission Control System" on page 3-23, for more information.

14. Problem in SCR system

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

Refer to "Emission Control System" on page 3-23, for more information.

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. Steering warning

There is a problem with the steering system.

29. 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.

30. Regeneration prohibition

It is illuminated when regeneration is prohibited.

Refer to "After Treatment System" on page 3-25, for more information.

31. Active regeneration operating

The lamp turns on when automatic regeneration begins.

Refer to "After Treatment System" on page 3-25, for more information.

32. Manual regeneration

The lamp turns on when forced regeneration begins.

Refer to "After Treatment System" on page 3-25, for more information.

33. GPS antenna failure

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

34. GSM antenna failure

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

35. Satellite antenna failure

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

36. 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.*

37. Stop the machine

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

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

Warning Pop-Up Messages

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

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

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

The types of warnings and alarms are as follows.

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

1. Warning pop-up messages

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

The warning types are as follows.

- Warning (red)
- Caution (orange)

DS1900439

Figure 94

2. Failure pop-ups

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

The types of failures and messages are as follows.

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

DS1900762

Figure 95

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

DS1900763

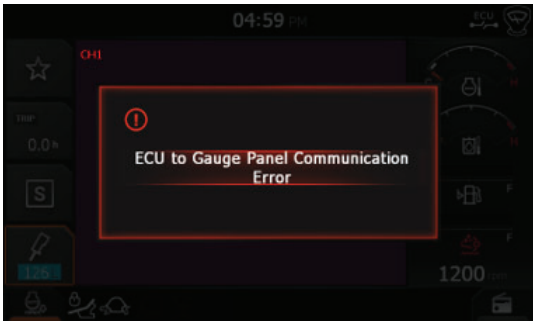
Figure 96

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 97

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 98

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

The ash load percent is displayed as follows.

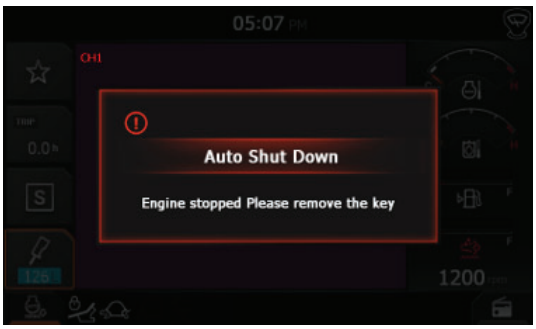
- Service interval is coming up. Please clean or replace the DPF:
  Ash load percent value is 80% or higher
- Service interval has expired. Stop the engine and clean or replace the DPF:
  Ash load percent value is 85%
- Service interval has passed. Stop the engine and clean or replace the DPF:
  Ash load percent value exceeds 85%

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 off the engine.



DS1900766

Figure 99

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.*

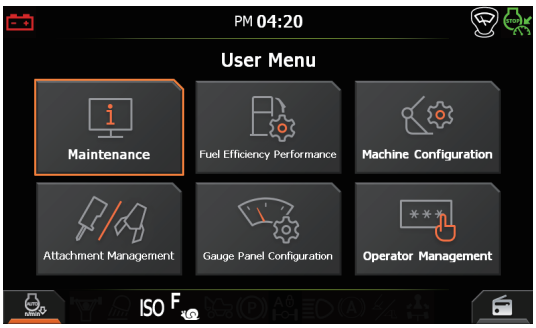


Figure 100 DS2100570

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 switch

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

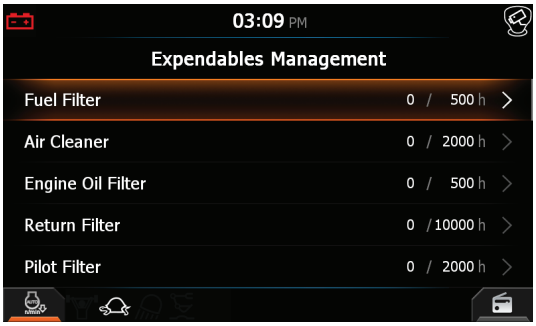
DS2100571

Figure 101

A. Expendables Management

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

How to access: User Menu → Maintenance → Expendables Management



DS1900314

Figure 102

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.

DS1900315

Figure 103

DS1900316

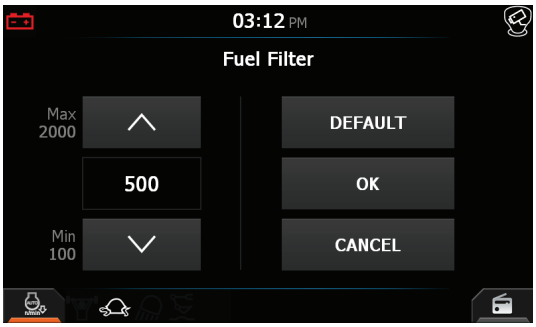
Figure 104

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.



DS1900317

Figure 105

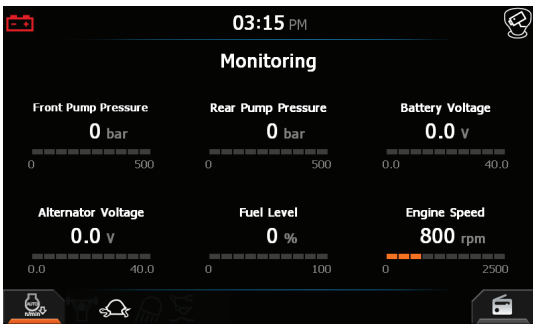
B. Enable Part Replacement Notification

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



DS1900318

Figure 106

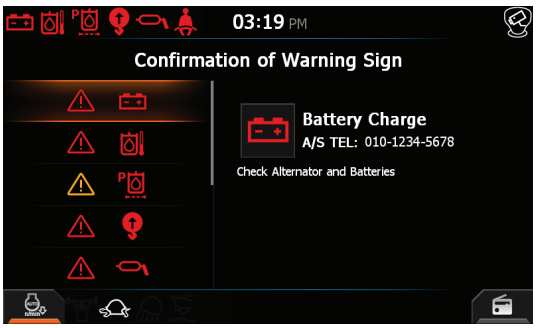
D. Confirmation of Warning Sign

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



DS1900319

Figure 107

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

DS1900320

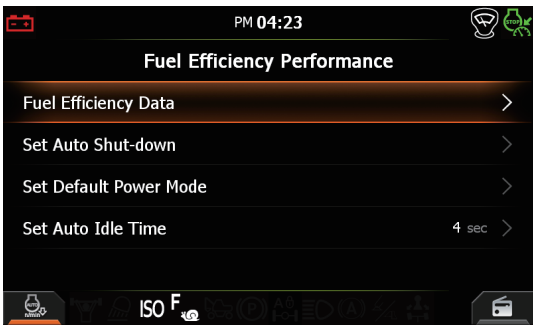
Figure 108

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



DS2100572

Figure 109

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.

- Weekly Fuel Efficiency Data
- Daily Fuel Efficiency Data
- Weekly Operation History Data
- Daily Operational Data

DS1900322

Figure 110

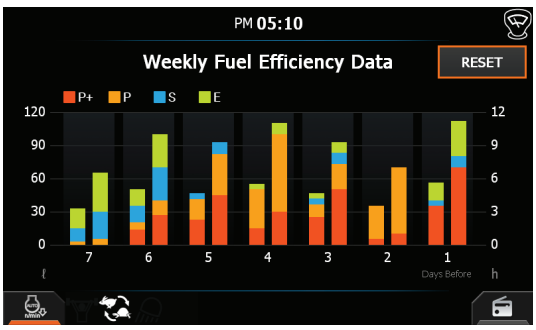
1) Weekly Fuel Efficiency Data

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 → Weekly Fuel Efficiency Data

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

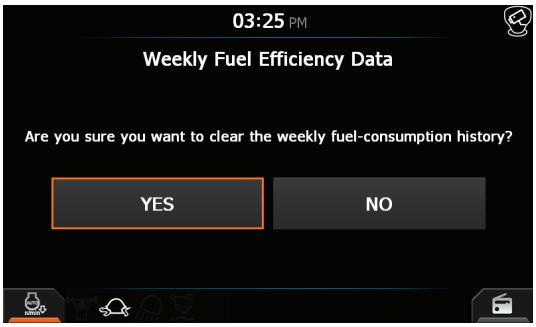


DS1900767

Figure 111

- Bottom axis: Days of operation until the present

The weekly fuel efficiency data can be reset by selecting the ‘Reset’ button.



DS1900324

Figure 112

2) Daily Fuel Efficiency Data

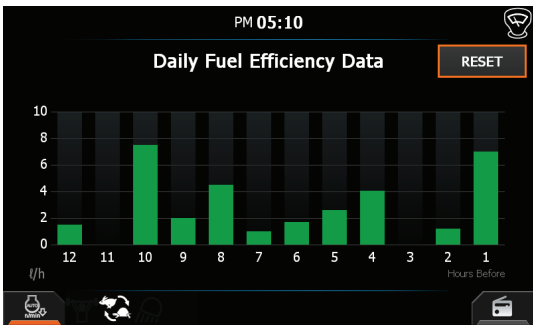
This menu displays the fuel consumption for the current day.

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

The axes are as follows.

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

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



DS1900768

Figure 113

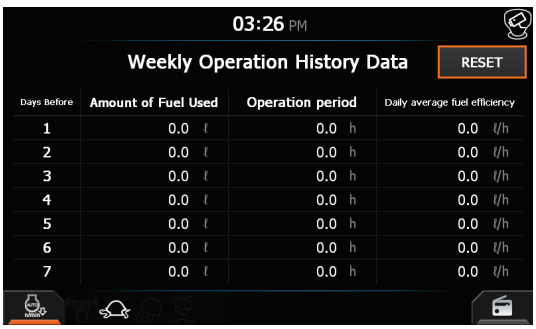
DS1900326

Figure 114

3) Weekly Operation History Data

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

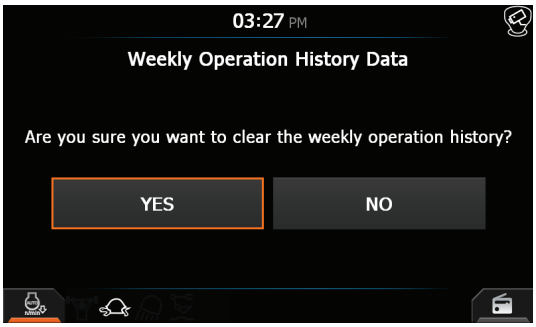
How to access: User Menu → Fuel Efficiency Performance → Fuel Efficiency Data → Weekly Operation History Data



DS1900327

Figure 115

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



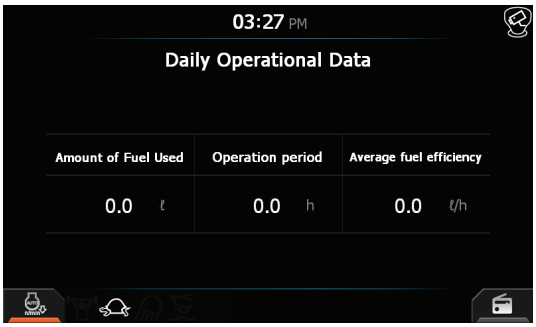
DS1900328

Figure 116

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 117

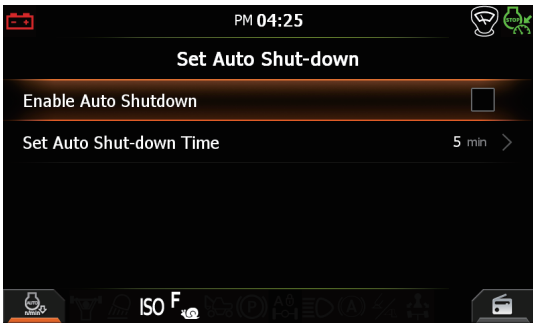
B. Set Auto Shut-down

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



DS2100573

Figure 118

1) Enable Auto Shutdown

The auto shutdown function can be toggled on/off.

Auto shutdown conditions

	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

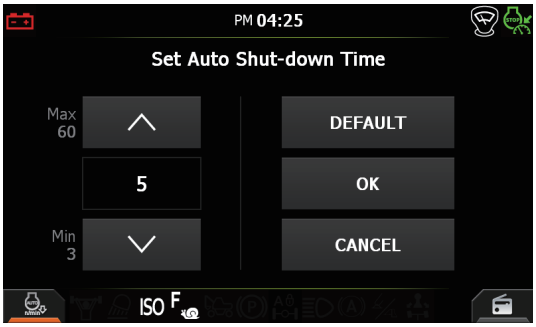


Figure 119 DS2100574

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.

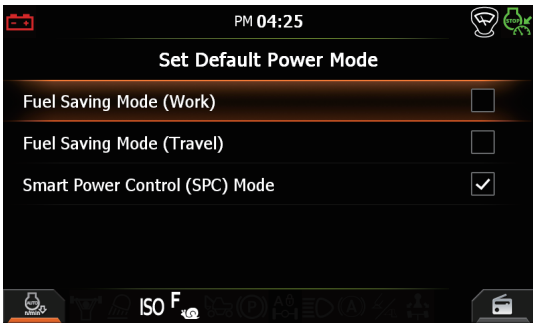


Figure 120 DS2100575

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

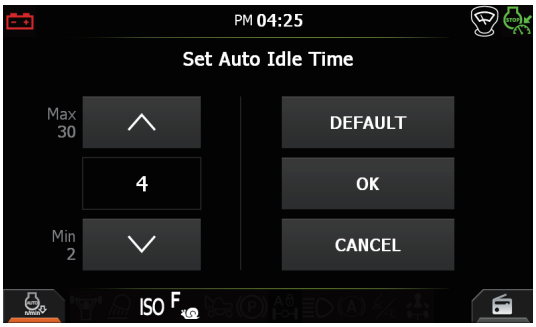


Figure 121 DS2100576

3. Machine Configuration

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

The following menus can be checked and changed.

- Set Joystick
- Set AVM
- Enable Center High Mounted Stop Lamp
- Disable Travel 2Pump
- Enable Camera Guideline
- Set Control Dial
- Temporary Secrity 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

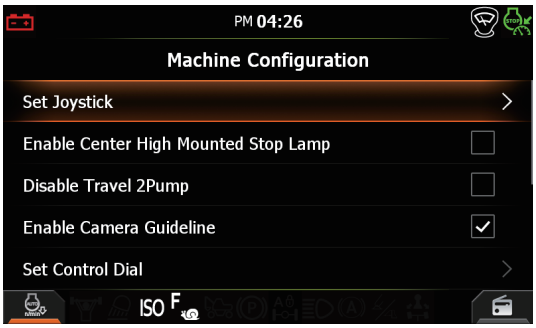


Figure 122 DS2100577

A. Set Joystick

Joystick function setting can be selected.

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

The following menus can be checked and changed.

- Joystick Reception
- Joystick Steering
- Joystick One-Touch

Figure 123 DS2100578

1) Set Joystick Thumb Wheel Reception

How to access: User Menu → Machine Configuration → Set Joystick → Set Joystick Thumb Wheel Reception

The joystick sensitivity for the two-way and rotating option, joystick steering can be set.

Figure 124 DS2100579

Sensitivity can be adjusted in 3 steps for each item.

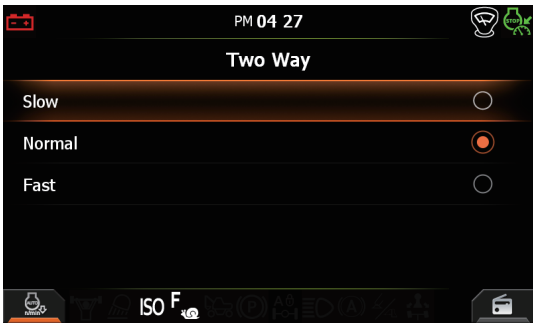


Figure 125 DS2100580

2) Set Joystick Steering

Functions can be set using the joystick thumb wheel button.

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

Figure 126 DS2100581

3) Set Joystick One-Touch

The joystick one-touch function can be set.

How to access: User Menu → Machine Configuration → Set Joystick → Set Joystick One-Touch

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

- Wiper
- Camera
- Ram Lock
- Mute Audio

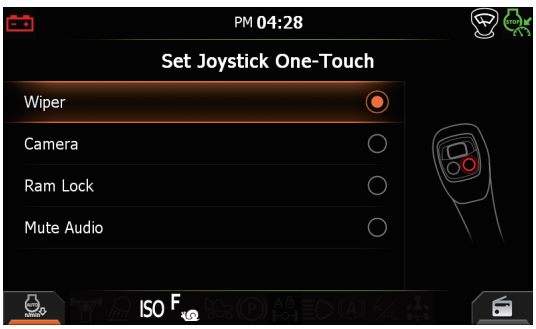


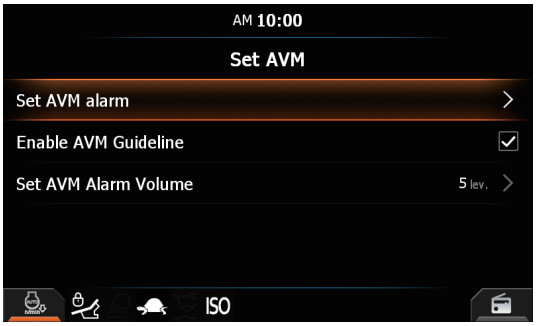
Figure 127 DS2100582

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

B. Set AVM

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

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



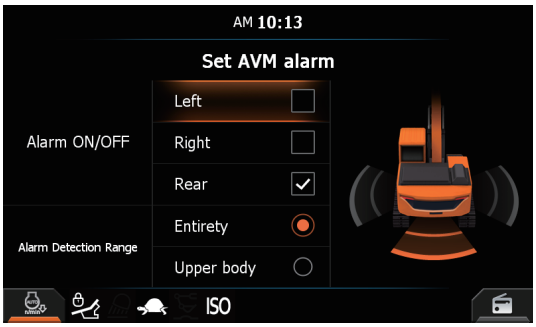
DS1900337

Figure 128

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 129

2) Enable AVM Guideline

This menu allows you to choose whether to use guidelines.

3) Enable Outside Voice

This menu allows you to choose whether to use outside voice.

4) Set AVM Alarm Volume

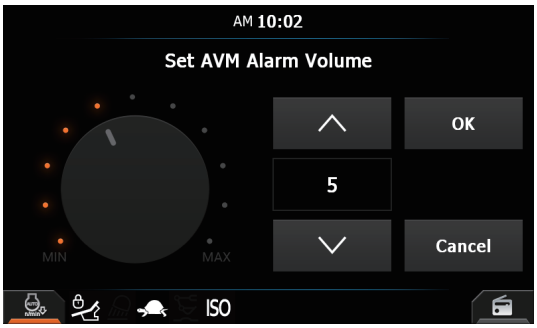
The AVM alarm volume can be set.

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 130

C. Enable Center High Mounted Stop Lamp

This menu allows you to choose whether to use CHMSL (Center High Mounted Stop Lamp).

D. Disable Travel 2 Pump

This menu allows you to choose whether to use 2pump when travel.

E. Enable Camera Guideline

This menu allows you to choose whether to use guidelines.

F. 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

1) Enable Dial Input

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

2) Set Dial

The maximum engine rpm can be set.

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

User Menu → Machine Configuration → Set Control Dial → Set Dial

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%.*

G. 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.

Figure 131 DS2100583

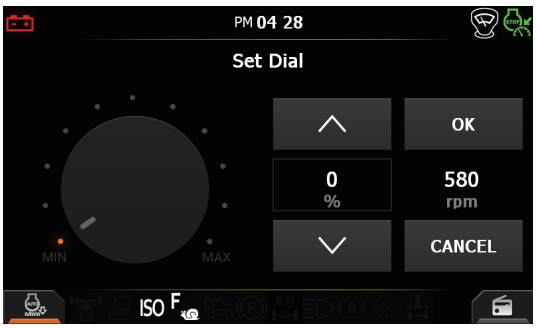


Figure 132 DS2100584

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.

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

Figure 133 DS2202240

A. Set One Way

This menu allows you to set up the one-way option.

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

The following items can be set.

- One Way 1

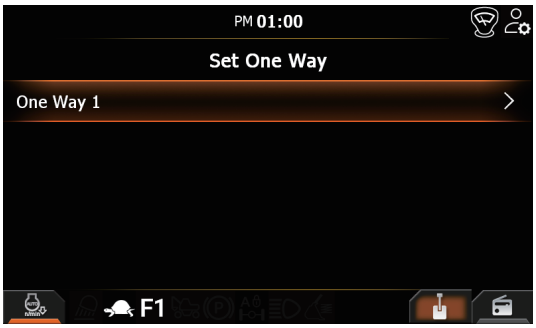


Figure 134 DS2202241

1) Button Type

The one-way button type can be set.

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

The attachment button types are as follows.

- One-way: Toggle, push

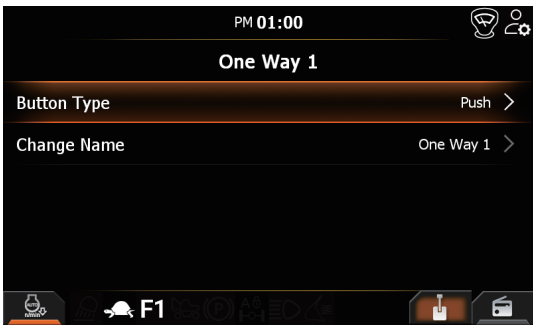


Figure 135 DS2202242

2) Change Name

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

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

The following menus can be changed.

- Specify (In English Only)
- Choose Name

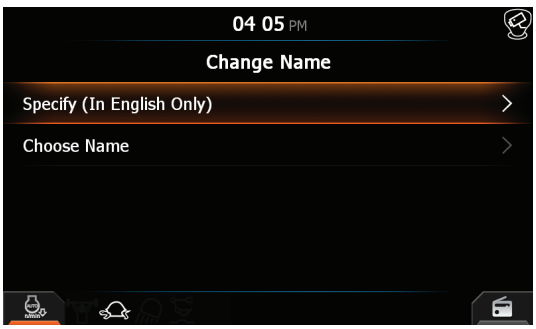


Figure 136 DS1900349

a) Specify (In English Only)

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

How to access: User Menu → Attachment Management → Set One 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 name.*

DS1900350

Figure 137

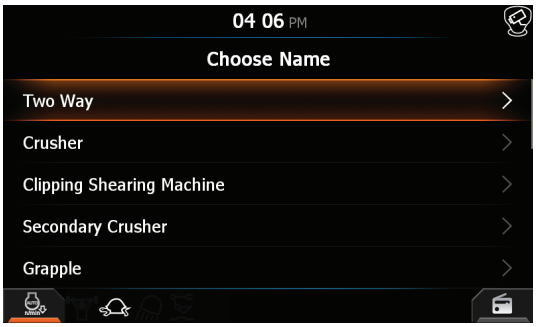
b) Choose Name

After selecting the one-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 → Change Name → Choose Name

The attachment names are as follows.

One-way: One Way, Breaker, Hammer



DS1900351

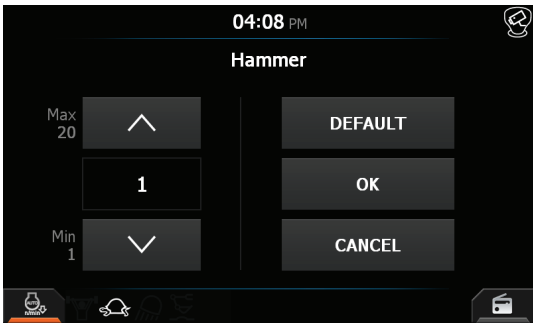
Figure 138

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.*



DS1900352

Figure 139

B. Set One Way Operation Time

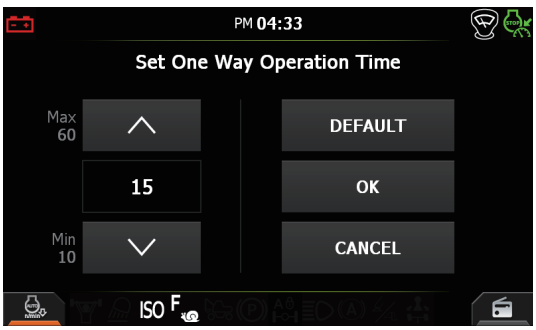
The continuous breaker operating time is limited in order to protect the machine. The continuous breaker operating time can be set in this menu.

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



DS2100588

Figure 140

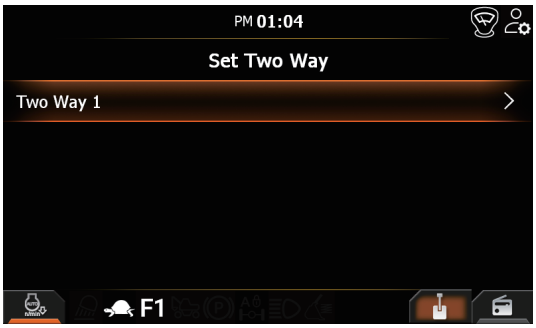
C. Set Two Way

This menu allows you to set up the two way option.

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

The following items can be set.

- Two Way 1



DS2202244

Figure 141

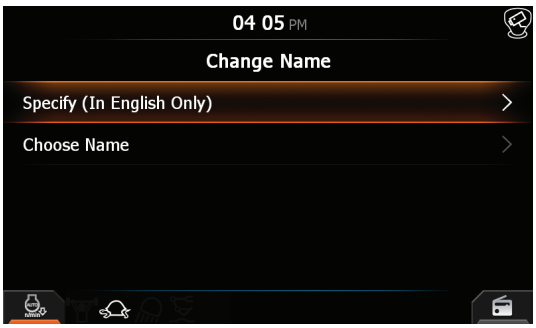
1) Change Name

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

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

The following menus can be changed.

- Specify (In English Only)
- Choose Name



DS1900349

Figure 142

a) Specify (In English Only)

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

How to access: User Menu → Attachment Management → Set 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 two-way name.

DS1900350

Figure 143

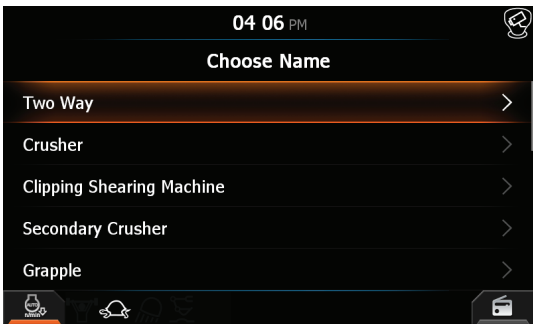
b) Choose Name

After selecting the 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 Two Way → Change Name → Choose Name

The attachment names are as follows.

Two Way: Two Way, Crusher, Clipping Shearing Machine, Secondary Crusher, Grapple



DS1900351

Figure 144

D. Set Option Operations

The method of operating the 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.*

DS2202243

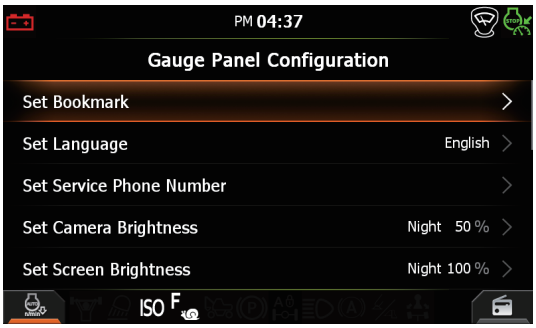
Figure 145

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



DS2100590

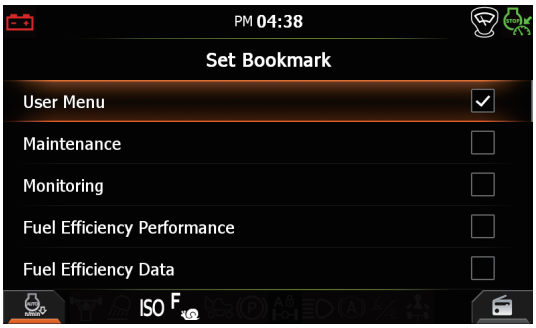
Figure 146

A. Set Bookmark

Bookmarks can be set.

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

Up to 15 bookmarks may be set.



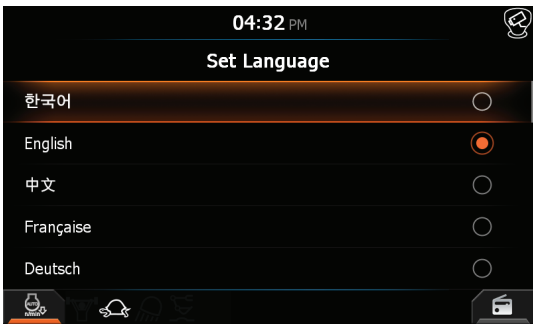
DS2100591

Figure 147

B. Set Language

The display monitor language can be set.

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



DS1900357

Figure 148

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.

Figure 149 DS2100592

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%.*

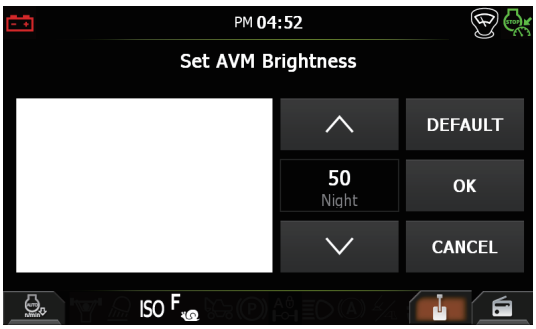


Figure 150 DS2104887

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 Date and Time
- Set Date
- Set Time
- Set 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) Set Automatic Date and Time

This option sets the date and time automatically.

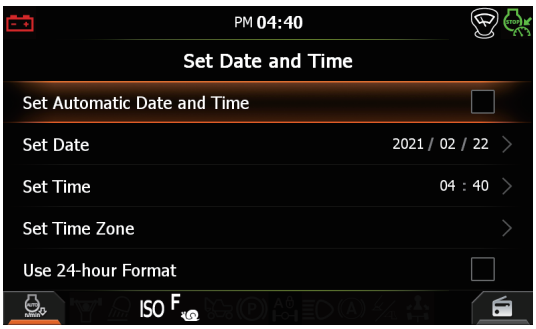


Figure 151 DS2100594

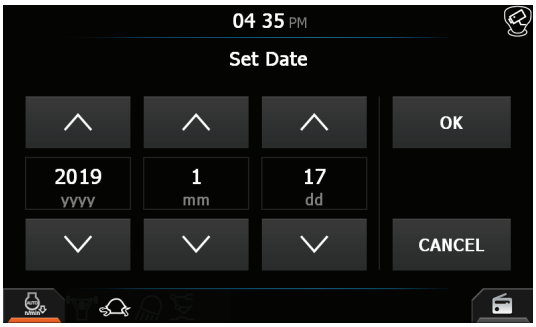
2) Set Date

The date can be set.

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

The format for the date is shown below.

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



DS1900361

Figure 152

3) Set Time

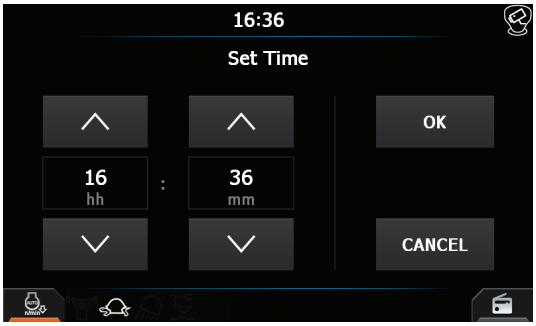
The time can be set.

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

The format for the time is shown below.

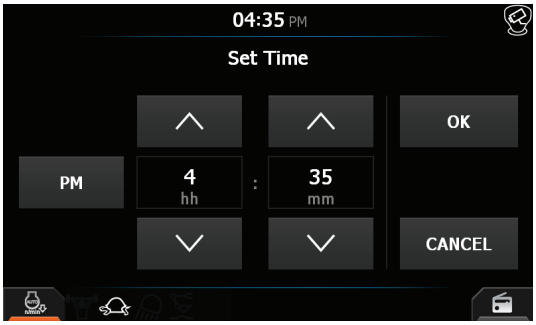
- Hour: hh
- Minute: mm

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



DS1900362

Figure 153



DS1900363

Figure 154

4) Set Time Zone

The time zone can be set.

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

DS2100595

Figure 155

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	Okhotsk
GMT +02:00	Athens, Cairo	GMT + 12:00	Wellington
GMT +03:00	Baghdad	GMT – 11:00	Midway
GMT + 04:00	Tehran	GMT – 10:00	Honolulu
GMT + 05:00	Karachi	GMT – 08:00	San Francisco, Seattle
GMT + 05:30	Kolkata	GMT – 07:00	Denver, Phoenix
GMT + 06:30	Yangon	GMT – 06:00	Chicago, Mexico City
GMT + 07:00	Bangkok	GMT – 05:00	New York, Miami
GMT + 08:00	Manila, Hong Kong, Beijing	GMT – 04:00	Georgetown, Goose Bay
GMT + 09:00	Seoul, Tokyo	GMT – 03:00	Rio de Janeiro

5) Use 24-hour Format

The 24-hour format can be selected.

How to access: User Menu → Gauge Panel Configuration → Set Date and Time → 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 156 DS2100596

The following units can be selected.

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

DS1900366

Figure 157

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

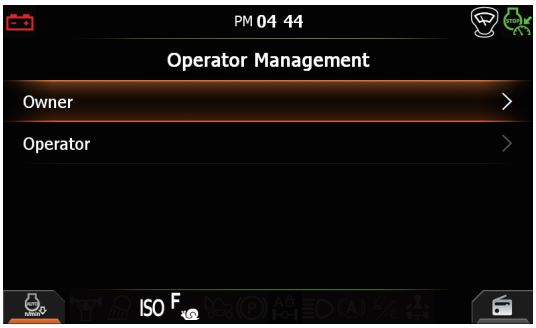


Figure 158 DS2100597

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

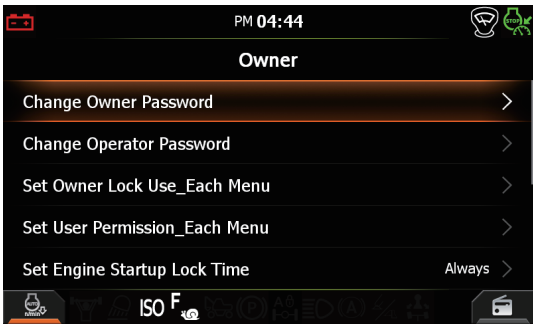


Figure 159 DS2100598

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".

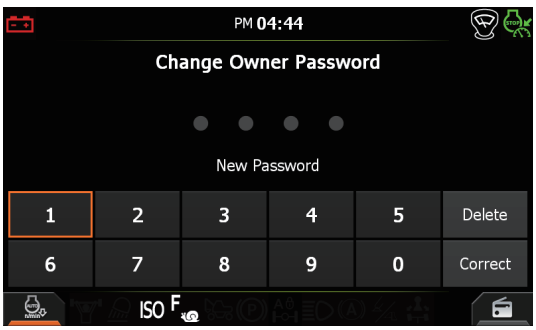


Figure 160 DS2100599

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 161 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 162 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

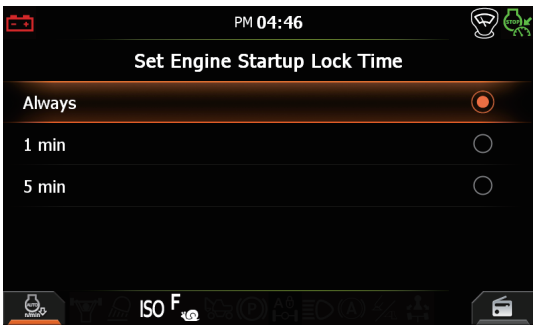


Figure 163 DS2100602

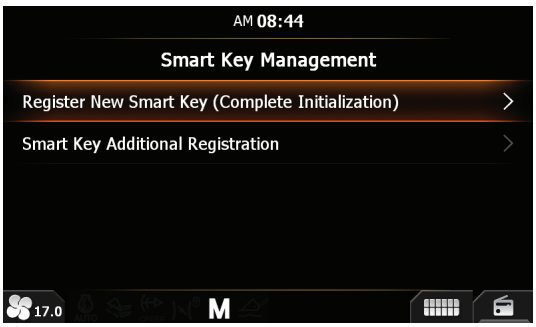
5) Smart Key Management

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.*



DS2000291

Figure 164

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".

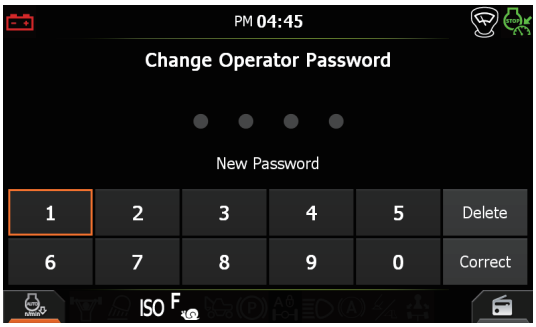


Figure 165 DS2100603

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 166 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

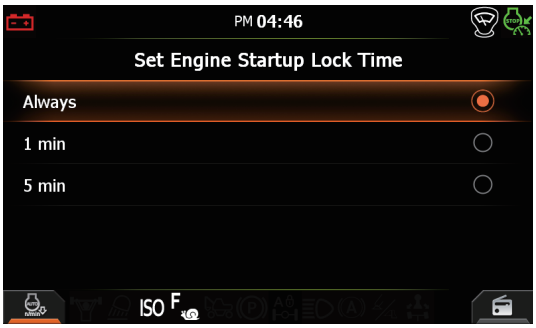
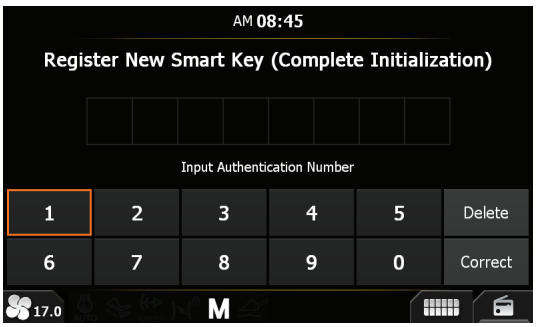


Figure 167 DS2100602

4) Smart Key Initialization / Additional Registration

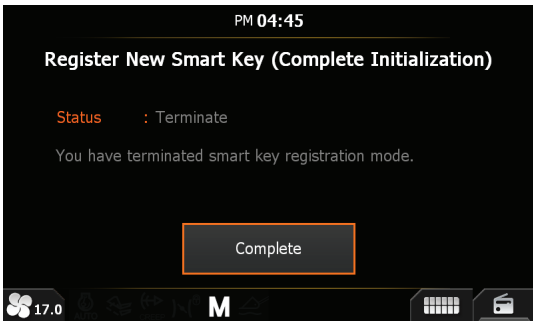
NOTE: *For information on registering smart keys, refer to 'Operating Controls - Smart Key'.*



DS2000292

Figure 168

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



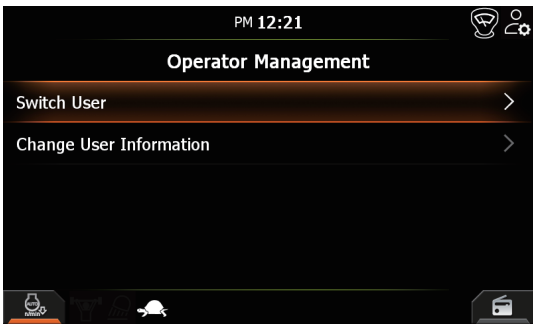
DS2000293

Figure 169

6-1. Operator Management (Keyless Start)

A. Switch User

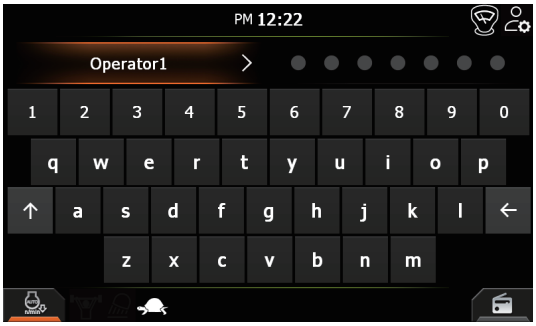
You can switch from an administrator to operator's and from operator's to administrator.



DS2200743

Figure 170

Select an administrator or operator's.



DS2200744

Figure 171

Please select an administrator or operator's to login.

NOTE: *To select operator's, you must have a smart key or unlocked by entering a password.*

According to the operator's selection, the function below brings up the existing stored information.

- Language setting.
- Joystick button setting.
- Joystick one-touch function setting.
- Joystick pattern setting.
- Save operation history information.

DS2200745

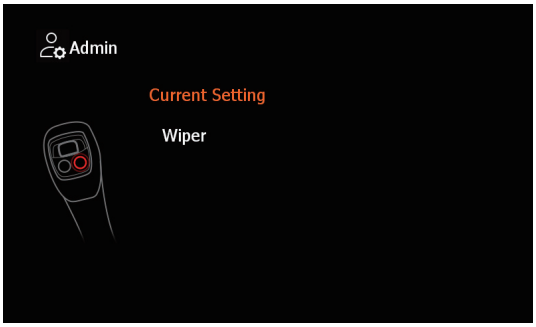
Figure 172

If you choose a user, you can check the function through the joystick mapping preview.

NOTE: *Whenever you login, joystick mapping information always pops up on the display monitor screen.*

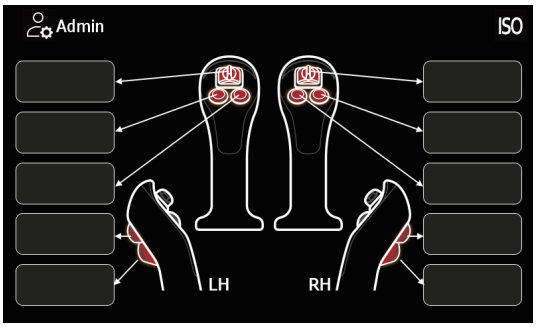
To skip the screen, touch the display monitor screen with your finger.

NOTE: *When the equipment is traveling mode or working mode, it will be changed to the main screen after a certain period of time.*



DS2200739

Figure 173

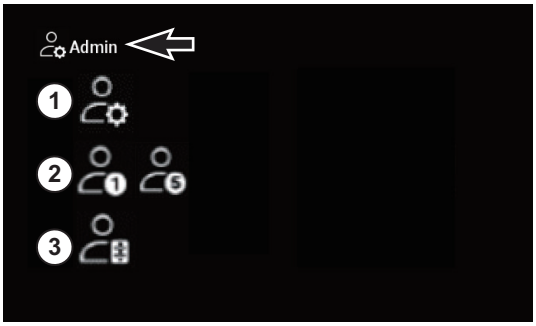


DS2200740

Figure 174

The logged in user is displayed as an icon on the display monitor.

- Administrator (1)
- Operator (2)
- Smart Key User (3)



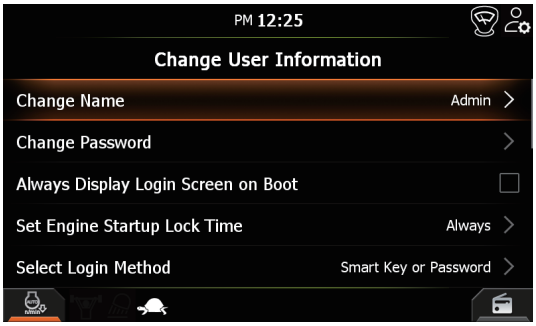
DS2200737

Figure 175

B. Change User Information

1) Change Name

If you need to change the name of the administrator or operator's, please change the user name.



DS2200746

Figure 176

If you want to change user information, login with the administrator password.

NOTE: *Contact your dealer for the administrator's initial password.*

If you want to login to the user password, enter a preset password in the display monitor.

NOTE: *If you forget administrator password, please contact your dealer.*

DS2200748

Figure 177

2) Change Password

If you need to change the user password of the administrator or operator's, please change the user password

NOTE: *Please double check if the password you want to change is correct.*

DS2200749

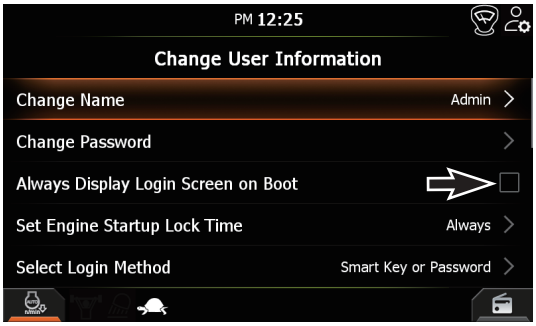
Figure 178

3) Always Display Login Screen on Boot

Even if you have a smart key in the cabin, you can always set the user password on the display monitor before using the equipment.

If you always want to enter a password when booting the display monitor, click the check box.

NOTE: *When clicking on the check box, a password input screen is always pop-up in the display monitor.*



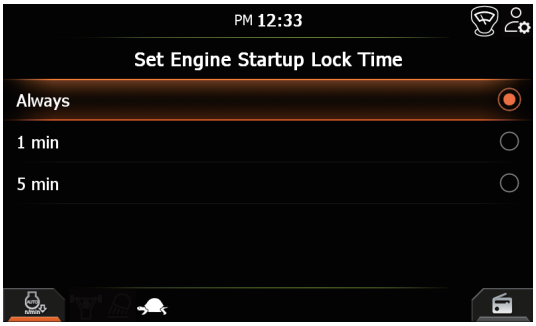
DS2200738

Figure 179

4) Set Engine Startup Lock Time

The engine startup lock time can be set.

NOTE: *To restart the set start within the locked time, the smart key must be in the cabin.*



DS2200750

Figure 180

5) Select Login Method

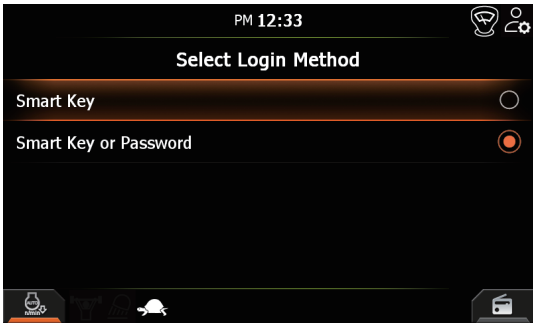
You can set the login method.

- Menu entry unavailable condition: ACC status and EPOS communication unavailable status.

NOTE: *You can set it only if you are logged in with the administrator password.*

- Smart Key: You must have a smart key inside the cabin to start the engine and use equipment.
- Smart Key or Password: If you don't have a smart key inside the cabin, you can start the engine and use the equipment with password login.

NOTE: *If the login method is set to "Smart Key or Password", even if there is a smart key in the cabin there It can be started engine after display monitor is booted.*



DS2200751

Figure 181

6) Smart Key Management

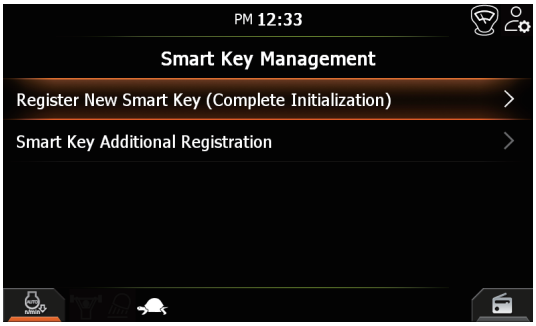
Smart key related items can be set.

- Menu entry unavailable condition: ACC status and Smart Key communication unavailable status.

The following items can be set.

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

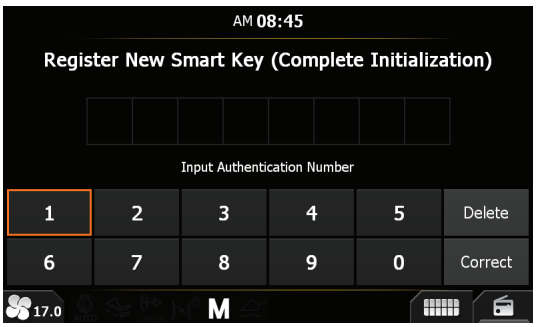
NOTE: *The operator can only use smart key additional registration.*



DS2200752

Figure 182

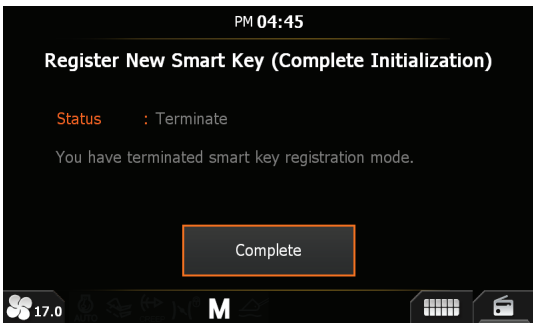
Smart Key Initialization / Additional Registration



DS2000292

Figure 183

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



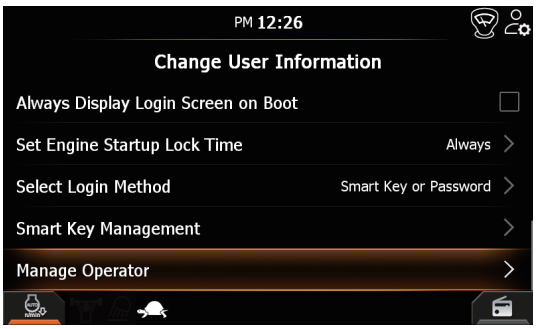
DS2000293

Figure 184

7) Manage Operator

Select the operator management menu to manage the operator's.

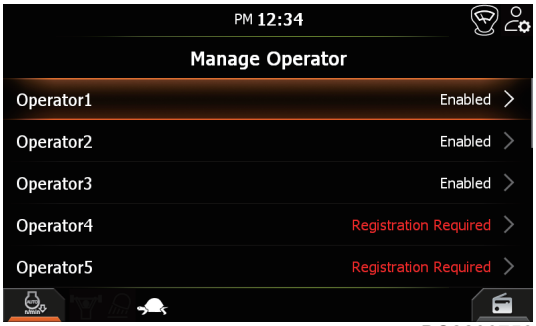
NOTE: *When entering the smart key operator from manage operator menu, only the use of attachment settings and initialization menus are displayed.*



DS2200747

Figure 185

If you want to add an operator, please register operator name and password first.

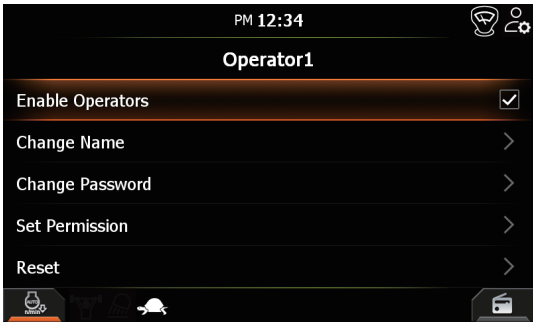


DS2200753

Figure 186

Registered users can be activated and disabled.
You can change the settings of the operator.

- Enable Operators
- Change Name
- Change Password
- Set Permission
- Reset

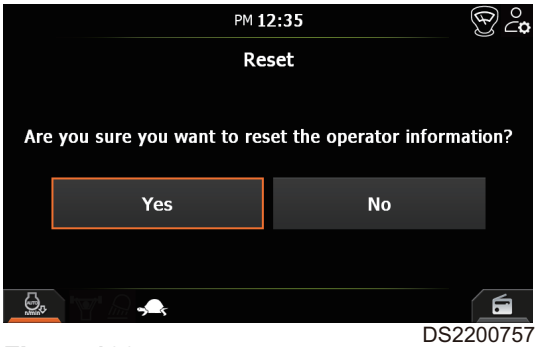


DS2200755

Figure 187

If you need to initialize the operator information, please initialize the operator information.

NOTE: *All functions related to the operator will be initialized.*

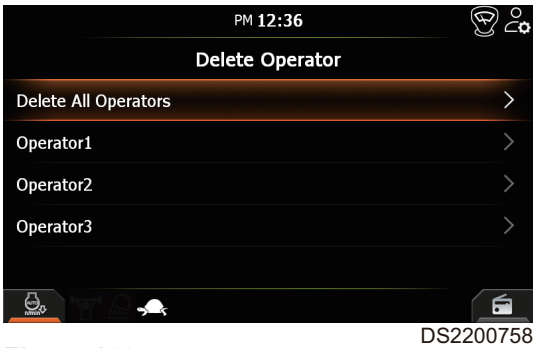


DS2200757

Figure 188

8) Delete Operator

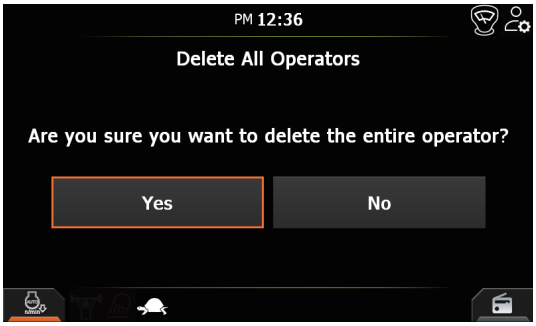
If you need to delete the operator's, please delete the operator's.



DS2200758

Figure 189

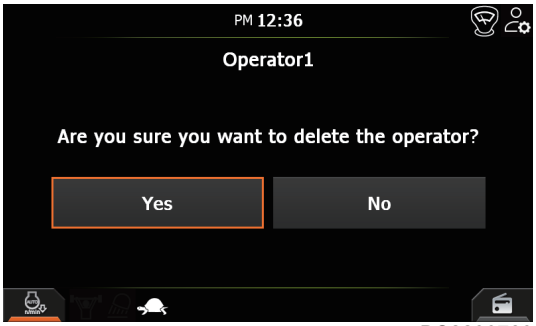
- Delete All Operators: You can delete all operator's



DS2200759

Figure 190

- Operator (Name): Only selected operator can be deleted.



DS2200760

Figure 191

How to check equipment information for each user.

Please check the your information and improve how to use the equipment.

- Operating time.
- I-DLE time.
- Operating time by mode
- Total fuel consumption.
- Fuel usage by mode.
- Fuel efficiency
- Today's operation information (fuel usage/ operation time/fuel economy/Idle time) *Display Monitor Only

Around View Monitoring (AVM) System

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.

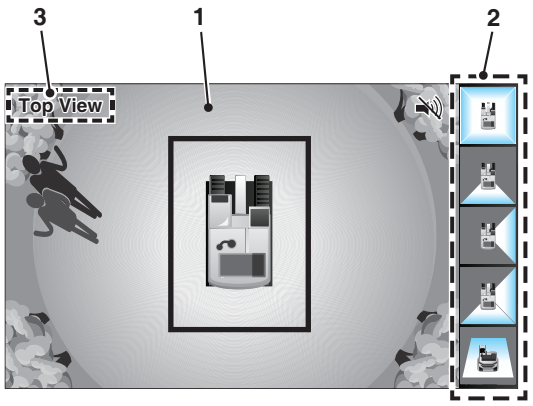
Operating Conditions and Instructions

An image is displayed on the display monitor while the engine is running.

A variety of view modes can be selected by tapping the display monitor.

Screen Components and View Modes

Number	Name
1	View Screen
2	View Icon
3	View Mode

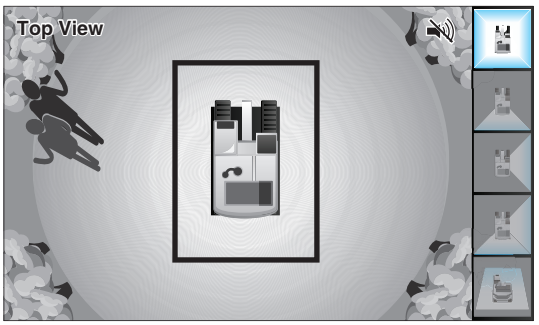


EX1503200

Figure 192

1. Top View

   Displays an image of the entire surrounding area of the machine

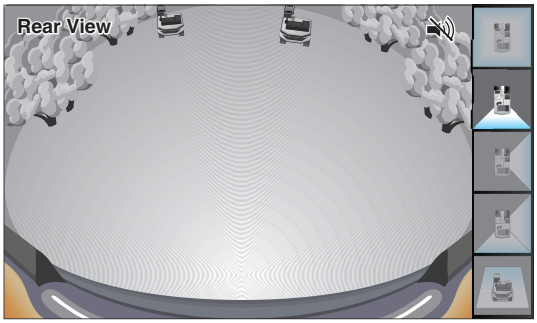


EX1503201

Figure 193

2. Rear View

Displays an image of the rear of the machine

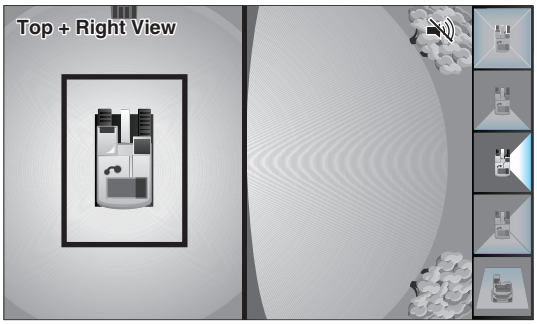


EX1503202

Figure 194

3. Top + Right View

Displays a mixed image of the surrounding area and right side of the machine

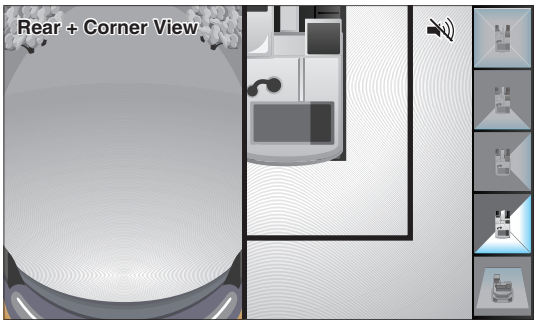


EX1503203

Figure 195

4. Rear + Corner View

Displays a mixed image of the rear and right-hand rear corner of the machine

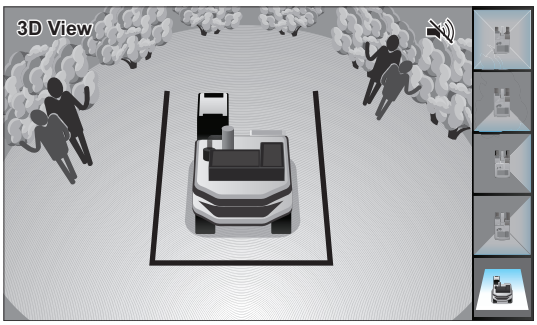


EX1503204

Figure 196

5. 3D View

Displays a 3D image of the surrounding area of the machine



EX1503205

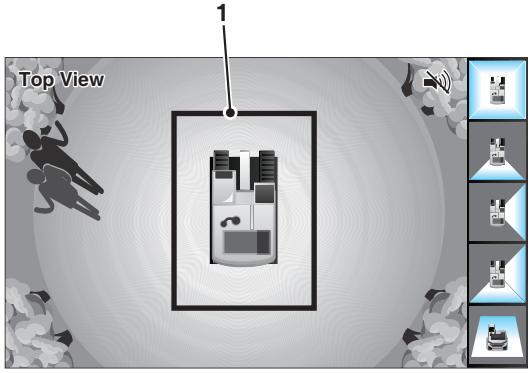
Figure 197

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.*

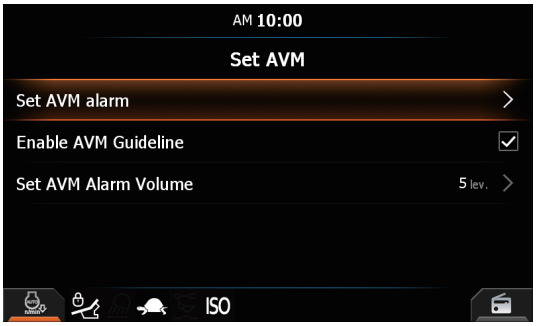


EX1503206

Figure 198

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

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



DS1900337

Figure 199

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.*

Proximity Alarm System

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.

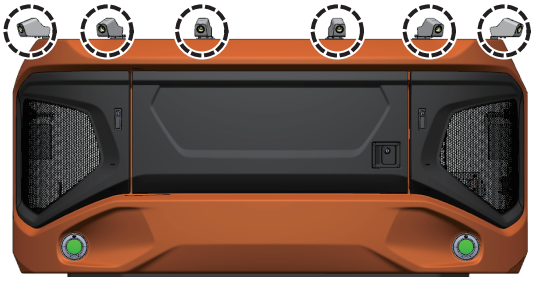
NOTICE

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 200) are installed at the top of the counterweight.



DS2104621

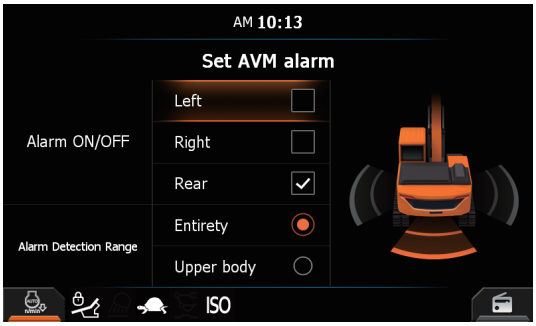
Figure 200

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

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



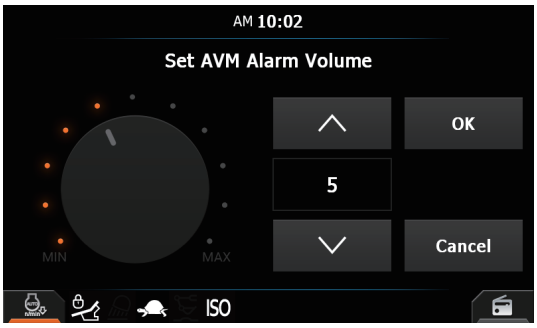
DS1900338

Figure 201

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



DS2302130

Figure 202

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

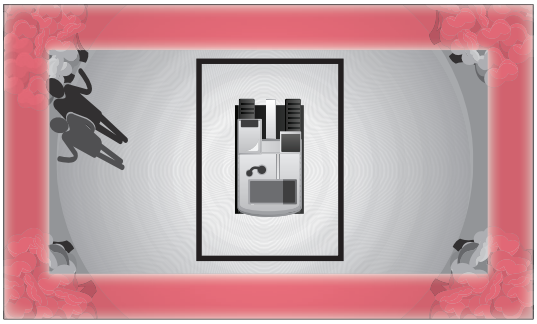
NOTE: *In the case of wheel-type machines, the ultrasonic sensor stops working automatically at speeds of 10 km/h or higher.*

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 203 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.

HVAC (Heating, Ventilation and Air Conditioning) Operation

Location of Vents

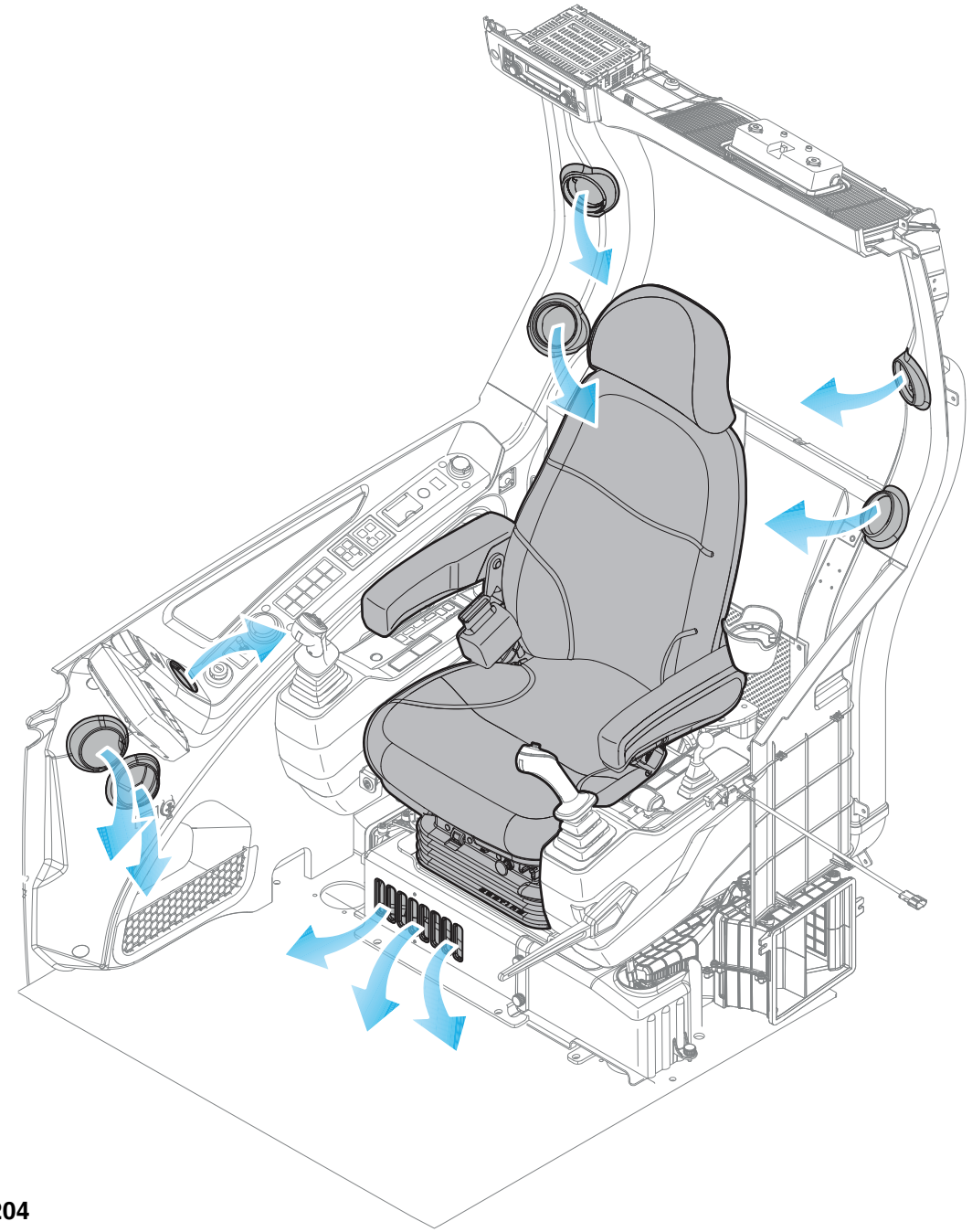


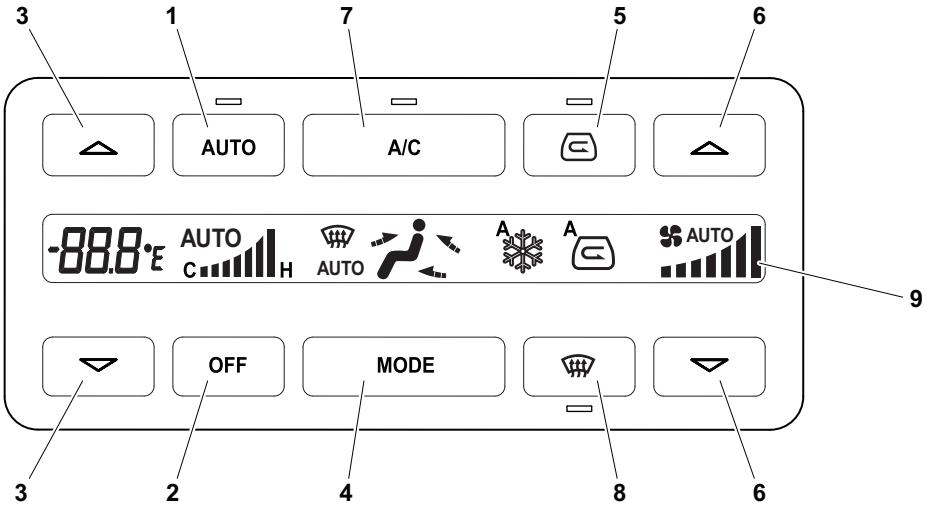
Figure 204

DS2001247

The heater and air conditioner are combined into one unit under the operator's seat.

The operator can control cabin temperature using the control panel installed in the left-hand control stand.

Control Panel



DS2104888

Figure 205

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.

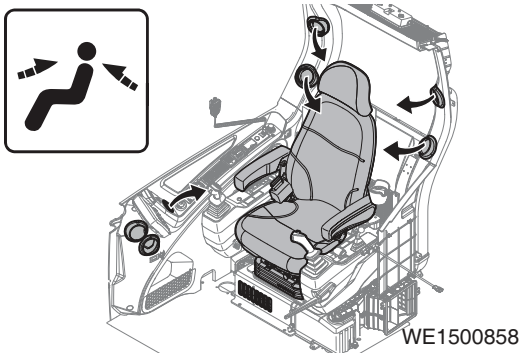


Figure 206

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.

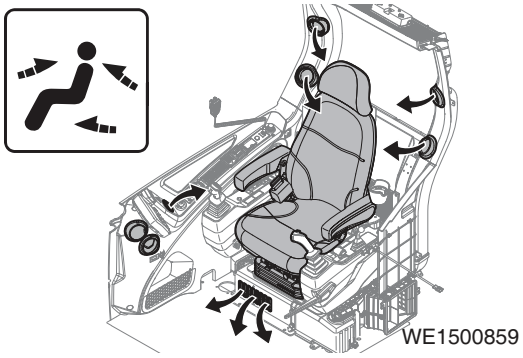


Figure 207

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

This mode is mainly used for heating.

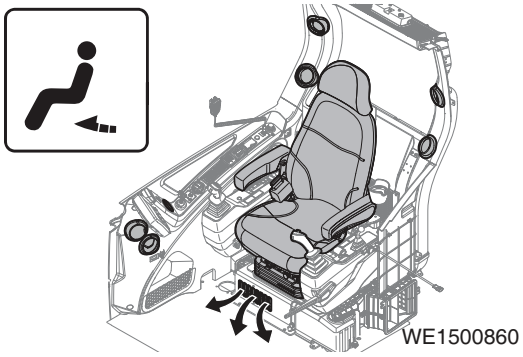


Figure 208

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

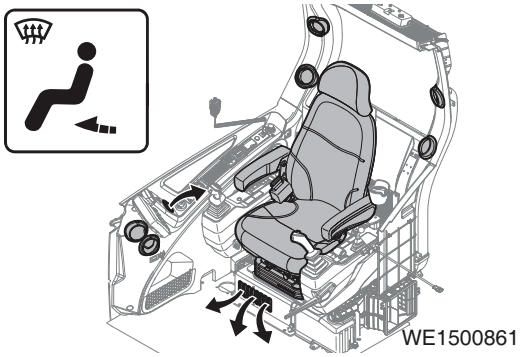


Figure 209

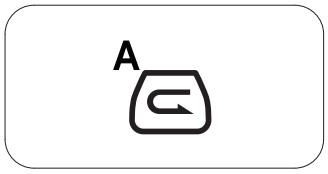
5. Air Inlet Selector Button

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.*



DS2100104

Figure 210

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.

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.

Sears Seat

Forward/Backward Adjustment

Holding lever (1), raise it, while pushing or pulling seat to desired position. Release lever once desired position is reached.

Height and Firmness Adjustment

To raise seat or increase firmness in ride, turn key to "ON" and push in on height / firmness adjustment knob (2).

To lower seat height or decrease firmness in ride, pull out on height / firmness adjustment knob.

Headrest

To raise it, pull up with both hands at the corners on the bottom of upper backrest (3). To lower it, press with both hands at the corners on the top of upper backrest.

Seat Heater Switch

The seat heater is turned on by pressing the switch.

Seat heater switch (4) is used to raise the temperature of the driver's seat.

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

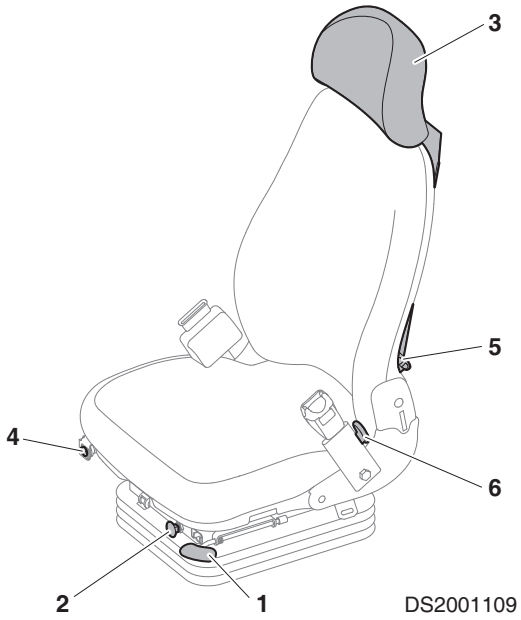


Figure 211

Lumbar Adjustment

Rotate lumbar control knob (5) to increase or decrease support to lower back.

Backrest Adjustment

Pulling up left lever (6) 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.

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.

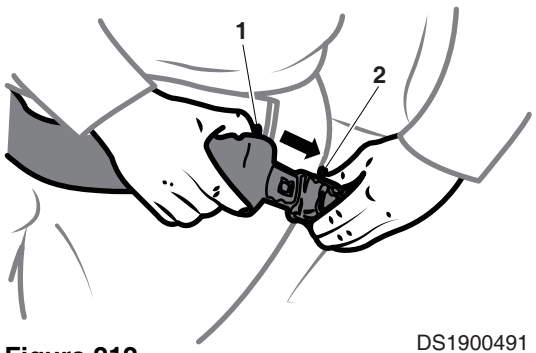
Do not adjust the seat position while the machine is in motion as it could lead to a loss of control. Stop the machine, apply the parking brake, and then adjust the seat.

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.

Seat Belt Locking and Unlocking

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

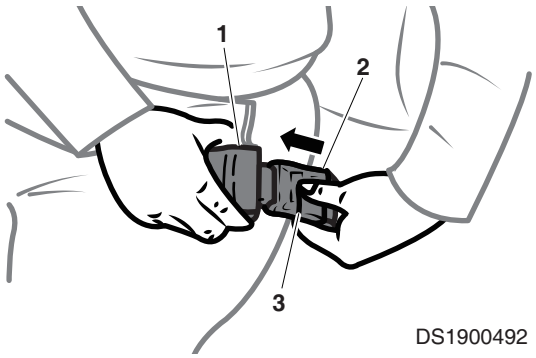
Adjust belt length so it is comfortably tight against operator's pelvic region (hipbone).



DS1900491

Figure 212

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



DS1900492

Figure 213

Miscellaneous Electrical Devices

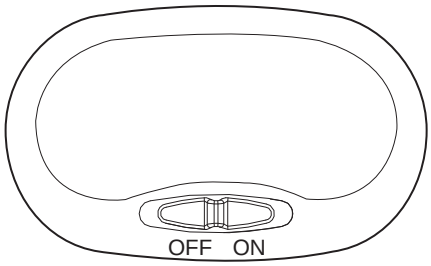
Cabin Light

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.*

NOTE: *When opening the door with the cabin light switch set in middle position, the light is automatically illuminated. When closing the door under this condition, the light automatically turned off in 10 seconds.*



DS1900485

Figure 214

Circuit Breaker (30 A, 50 A, 80 A)

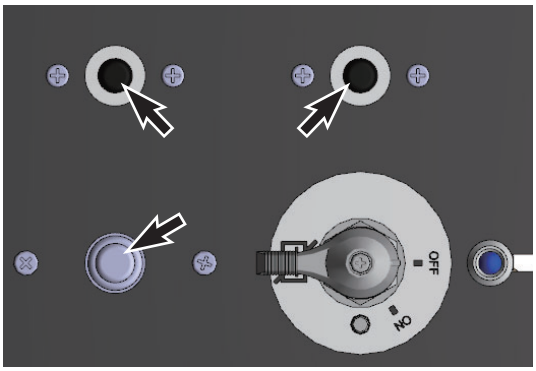
A circuit breaker is in the battery box.

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.

Replace the circuit breaker if damage and investigate cause.



DS2104622

Figure 215

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

There is a junction box on the right side of the back seat.

The fuses prevent electrical devices from overloading or shorting.

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

Refer to "Inspection, Maintenance and Adjustment - Junction Box" for more information.

NOTE: *Spare fuses and relays are mounted on the junction box.*

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

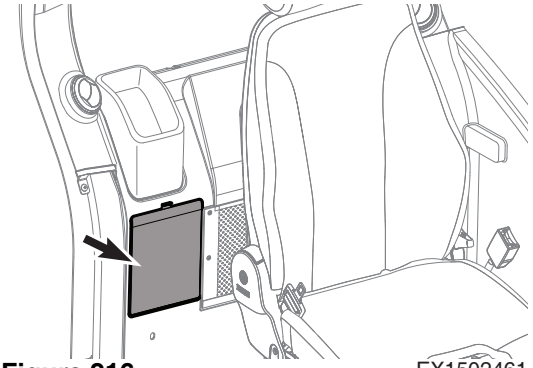


Figure 216 EX1502461

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.

DAB (Digital Audio Broadcasting) Audio

Before operating the DAB Audio, read operation manual enclosed with DAB Audio.

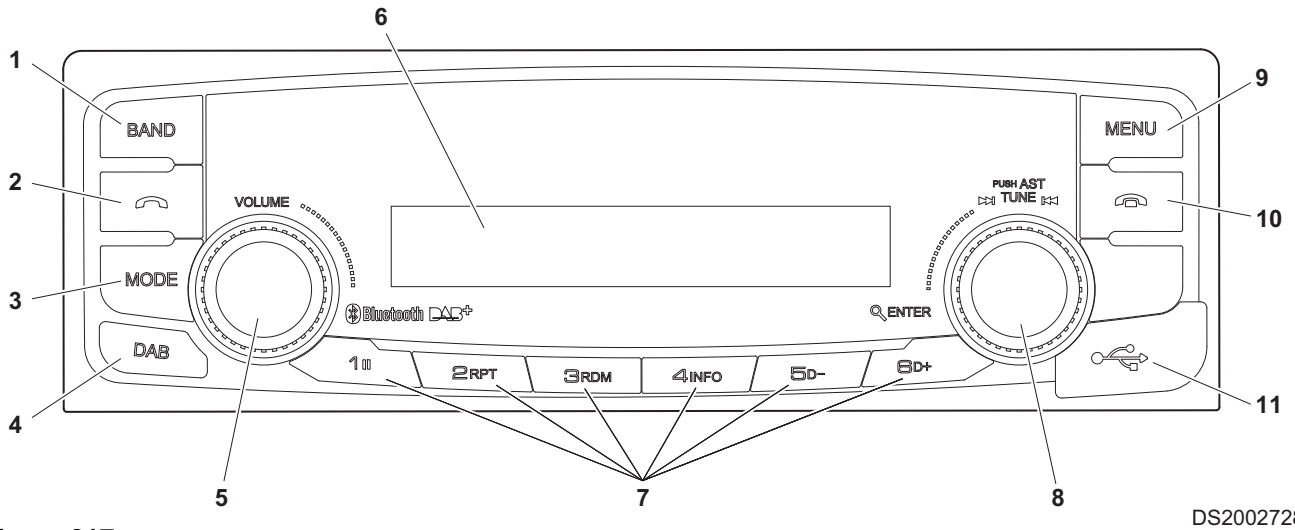


Figure 217

Reference Number	Description
1	Band Button
2	Call Button
3	Mode Button
4	DAB Button
5	Power Button with Volume Dial
6	Display LCD

Reference Number	Description
7	Preset Button
8	Enter/AST Button with Tune Dial
9	Menu Button
10	End Button
11	USB Port

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.

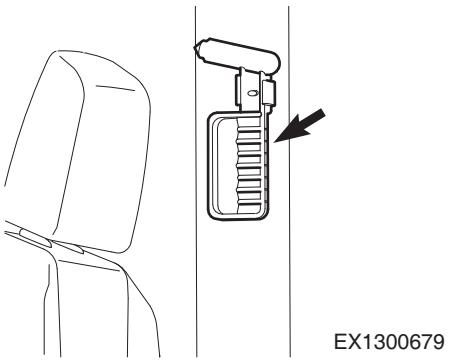


Figure 218

WARNING

AVOID DEATH OR SERIOUS INJURY

Protect your eyes when breaking the glass.

Miscellaneous Convenience Devices

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.

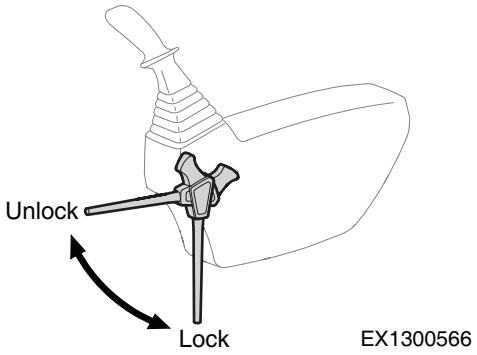


Figure 219

Front Upper Window

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

Opening Window

WARNING

AVOID DEATH OR SERIOUS INJURY

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

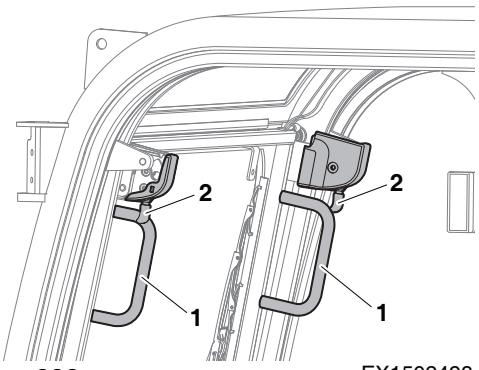


Figure 220

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), then pull lock levers (2) 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.*

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) of front window with left and right-hand, pull lock levers (2) 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).
6. Check that lock levers are securely latched in lock position.

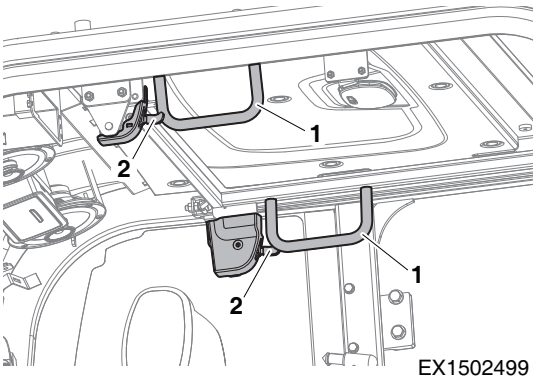


Figure 221

Door Side Latch

1. The door side latch (1) 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.*

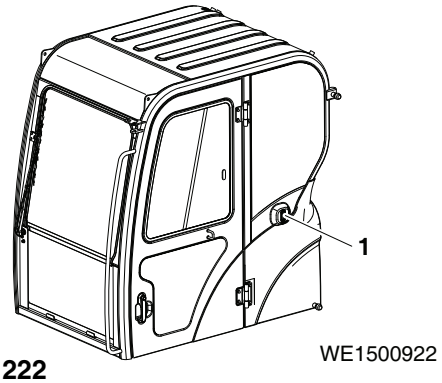


Figure 222

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

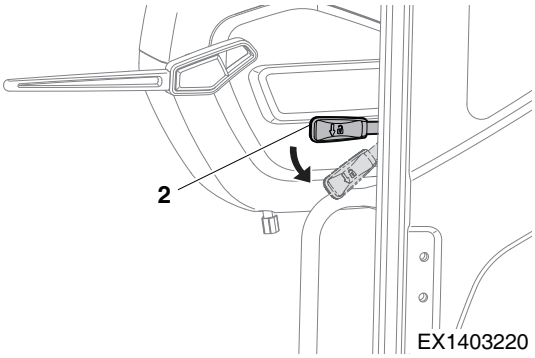


Figure 223

Cabin Storage Compartments

There are three storage compartments to the right of the operator's seat.

There is a separated storage compartment (1) at the front right side of the operator's seat.

Two storage (2 and 3) compartments are located below the switches.

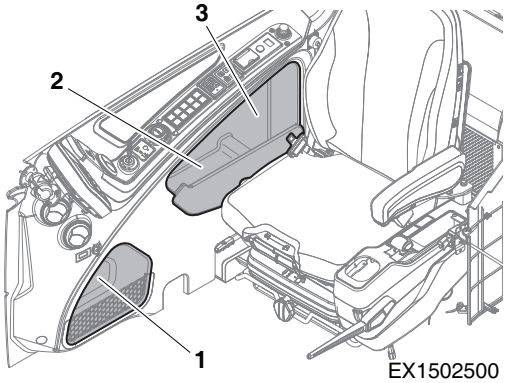


Figure 224

Also there are two storage compartments (1 and 2) behind the operator's seat.

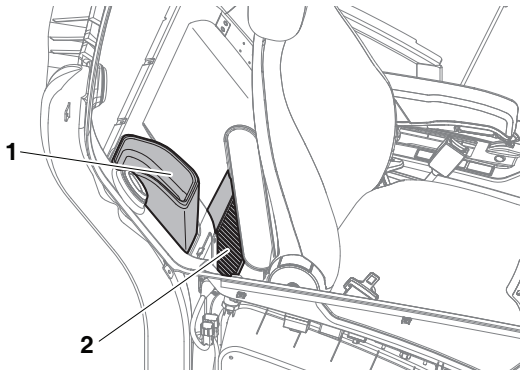


Figure 225

Sunglasses Case

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

Keep this case lid closed before and after use.

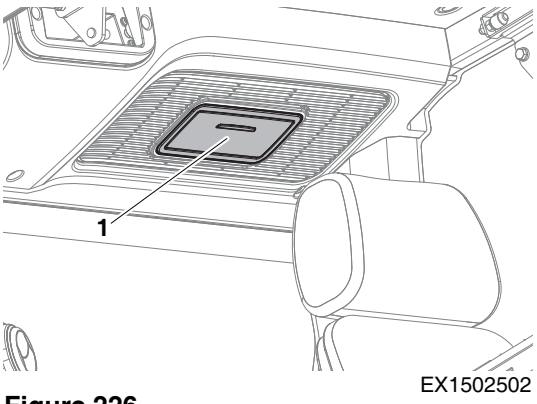


Figure 226

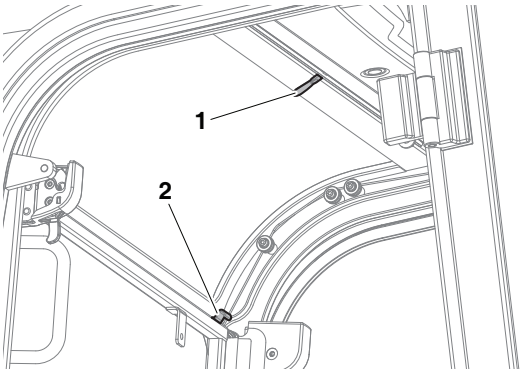
Sun Visor

The sun visor can be used to reduce the amount of sunlight coming through the front window and ceiling.

To reduce the amount of sunlight coming in the front window, pull bar (1) down, and hook it on each brackets (2).

To retract sun visor, unhook it from brackets (2) and pull forward slightly. Slowly let the sun visor retract.

NOTE: *Do not allow the sun visor to roll backup rapidly. It can result in damage to the sun visor and retracting mechanism.*



EX1502503

Figure 227

Hanger

A hanger (1) is located on upper left side of operator's cabin.

WARNING

AVOID DEATH OR SERIOUS INJURY

Do not hang anything that will easily fall down or restrict your view out of cabin.

Always check that hanging objects are secured on hanger.

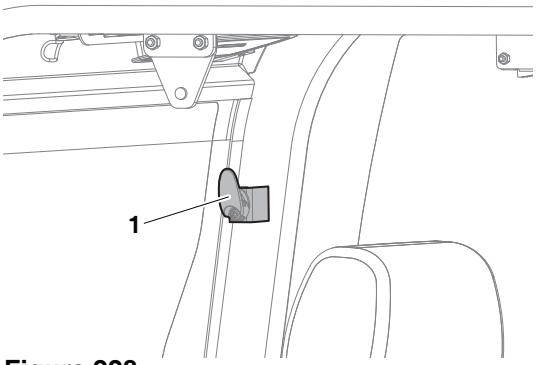


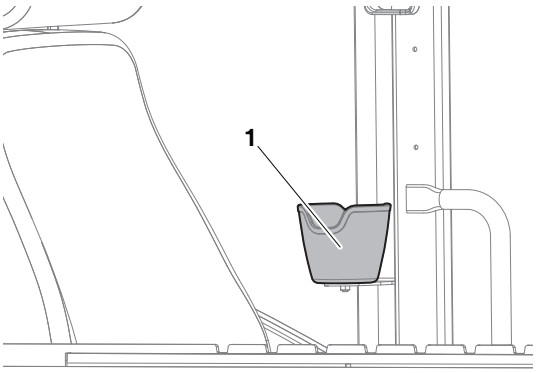
Figure 228 EX1502504

Cup Holder

There is a rubber cup holder 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.



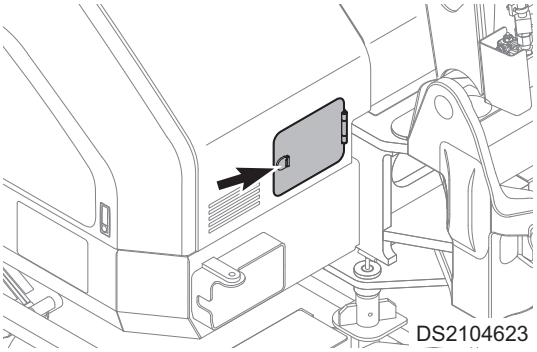
EX1502505

Figure 229

Miscellaneous Access Covers and Doors

Battery Box Cover

Use the key to unlock and open the cover.



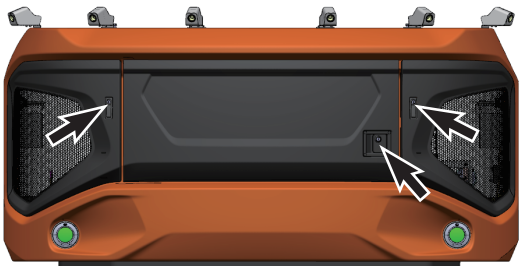
DS2104623

Figure 230

Engine Cover

Opening

Use the key to unlock and open the cover.

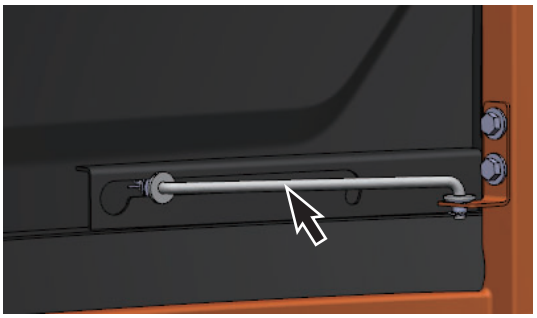


DS2104624

Figure 231

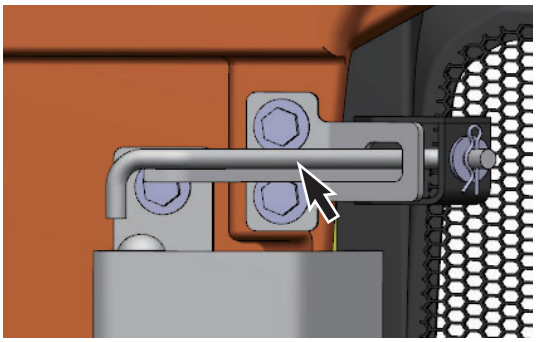
Closing

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



DS2104625

Figure 232



DS2104626

Figure 233

Operation

To Operate a New Excavator

WARNING

AVOID DEATH OR SERIOUS INJURY

Before operating this machine read and understand the operation and maintenance instructions in this manual.

Monitoring System

The monitoring system uses electrical circuits between control system and sensors installed at various machine system locations to monitor selected conditions. The monitoring system's function is to continually inform the operator of the machine's condition. Displays and gauge readouts on the instrument panel provide information such as engine speed, engine coolant temperature, transmission oil pressure, and electrical charge status.

New Machine Break-in Procedures

All HD HYUNDAI CONSTRUCTION EQUIPMENT machines 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.*

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.*

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, rear view camera 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. Refer to "10 Hour / Daily Service" for more information.

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. Clean dust net in front of oil cooler and intercooler.
6. Check cooling system and refill as required.
7. Check level of window washer liquid.
8. Inspect the bucket teeth and side cutters for signs of wear.
9. Inspect engine fan blade.
10. Check air intake system.
11. Inspect seat belt for any damage and proper operation.
12. Inspect the structure for cracks and faulty welds.
13. Check the operation of all switches.
14. Check the operation of all exterior lights, horn, travel alarm/ swing alarm (if equipped), rear 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. Set parking brake switch to "I" (APPLIED) position.
6. Make sure transmission is in "B" (NEUTRAL) position.

   NOTE: *Engine will not start if transmission is not in "NEUTRAL".*

7. 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

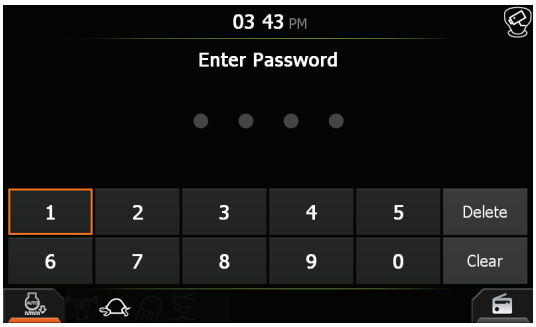
WARNING

AVOID DEATH OR SERIOUS INJURY

Sound the horn before 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".
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.*



DS1900406

Figure 1

6. Turn starter switch to "⏲" (START) position. Engine should start in approximately five (5) seconds.

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".

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	White Range
2	Fuel Gauge	
3	Hydraulic Oil	
4	Charging Warning	OFF
5	Engine Oil Pressure Warning	
6	Engine Coolant Temperature	
7	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.

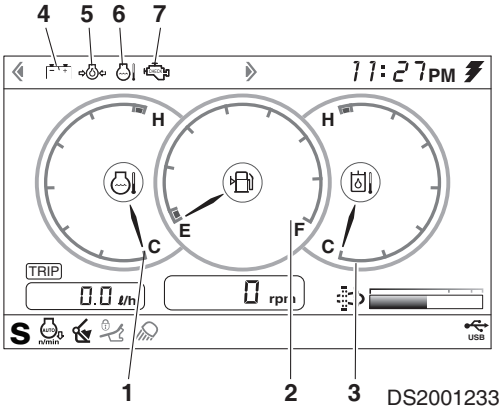
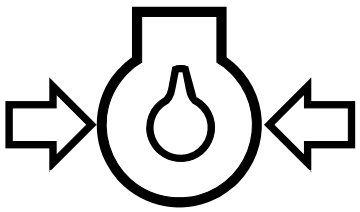


Figure 2



HAOA620L

Figure 3

Cold Weather Starting

Engine Pre-heater

The engine pre-heater enhances startability by increasing intake air temperature during low-temperature start.
The intake air warmed by the engine pre-heater's operation increases the temperature inside the engine cylinder to facilitate fuel injection and ignition.

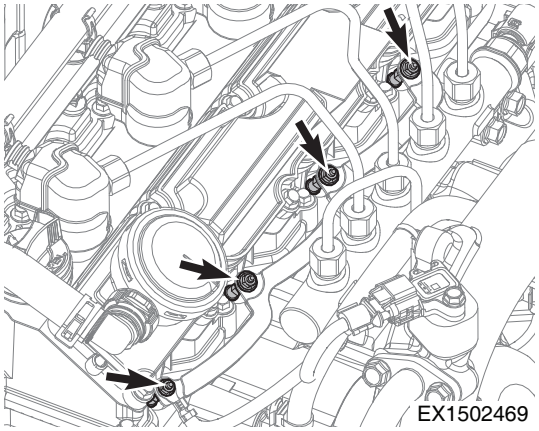


Figure 4

Operation Logic

1. To facilitate low-temperature start, turn the starter switch to "ON" to operate the preheating function and initiate the glow plug preheating. The preheating light is displayed on the instrument panel for up to 28 seconds after the key is turned on, and preheating starts automatically. Keeping the key on for a certain period of time based on the temperature is recommended for the glow plug preheating.

Engine Coolant Temp. (°C)	-30	-20	-10	0	20	30	40	60
Preheating Time (sec.)	28	22.5	20.25	16.5	13.5	11.25	9.5	3

2. Preheating is complete when the preheating light turns off.

   NOTE: *This machine is auto equipped with an auto warm-up system, so the engine speed will be 100 ~ 300 rpm highter than the normal idle speed under condition of low coolant temperature and low oil pressure.*
   And then it will return to normal speed when temperature and pressure is sufficient.

WARNING

AVOID DEATH OR SERIOUS INJURY

DO NOT USE STARTING FLUIDS. The preheat system could cause the starting fluid to explode.

1. Perform all steps in "Operational Checks Before Starting Engine".
2. Set engine speed control dial to "LOW IDLE". If control dial is at the "HIGH IDLE", the engine will accelerate suddenly and damage the engine.
3. Sound horn.
4. Turn starter switch to "I" (ON) position. When preheat cycle is completed, the preheat indicator light (1) will turn "OFF".
5. After the preheat completion, immediately turn starter switch to "⟲" (START) position.
   Engine should start in approximately five (5) seconds.

NOTICE

OVERHEATING STARTER CAN CAUSE DAMAGE

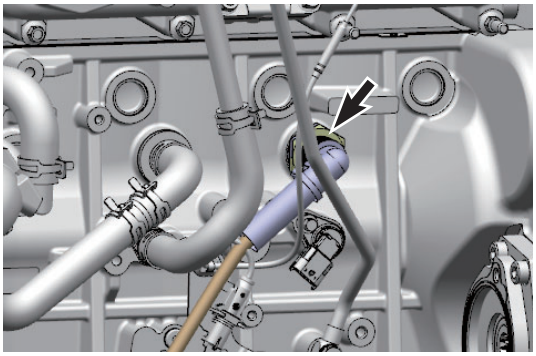
If the engine does not start after approximately fifteen seconds of cranking, release the starter switch. Wait about five (5) minutes for starter to cool and repeat above steps.

6. After engine has started, release key. Key will return to "I" (ON) position.
7. After the engine starts, 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.
8. Follow "Hydraulic System Warm-up" procedures in this section.

Plug Heater (If Equipped)

NOTE: *When temperature drops below -25°C, recommend to Use the Plug Heater.*

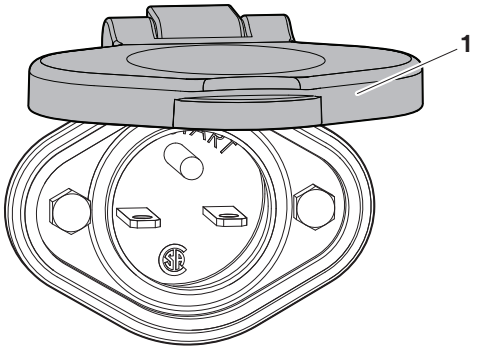
1. Installing the plug heater
   A. Open the flip cover (1).
   B. Connect extension cord to the receptacle at the flip cover.
   C. Route the cored to any convenient point and tie cord down to prevent damages and strain. Keep cord away from hot surfaces and moving object.



DS2104889

Figure 5

2. Using the plug heater
   A. Connect the extension cord to power supply.
   B. Keep the power supplied to rise coolant temperature in the engine block to start the engine.
   C. Start the engine.
   D. Remove extension cord and close the flip cover (1).



DS1900950

Figure 6

Starting Engine With a Booster Cable

HAOA440L

Figure 7

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.**

NOTICE

The machine has a 12V (-) negative ground electrical system. Use the same capacity 12V 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 the Booster Battery

1. Stop engine of the machine on which booster battery is mounted (3).
2. Connect one end of red cable (1) to the positive (+) terminal of the machine battery, and the other end to the positive (+) terminal of the booster battery (3).
3. Connect one end of black cable (2) to the negative (-) terminal of the booster battery, and then make ground connection to the upper frame of the machine (5) to be started with the other end of black negative (-) cable (2). When making the last connection to upper frame, be sure

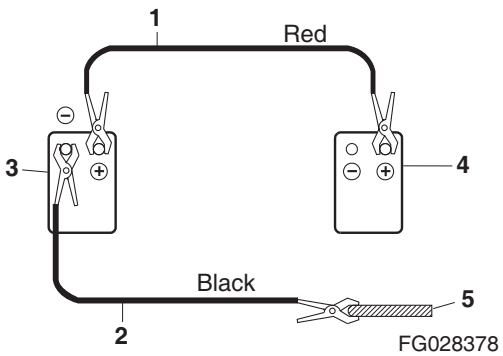


Figure 8

to connect the cable end as far away from the machine battery as possible. DO NOT CONNECT DIRECTLY TO THE NEGATIVE BATTERY TERMINAL.

4. Start the engine.

Disconnecting the Booster Battery

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

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.

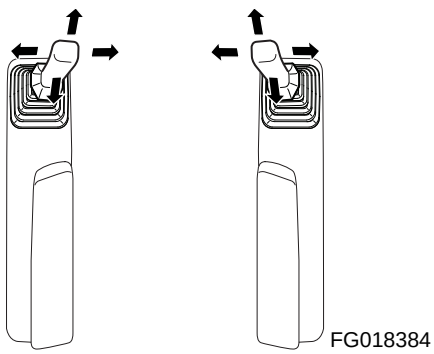


Figure 9

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) lengths of the machine.

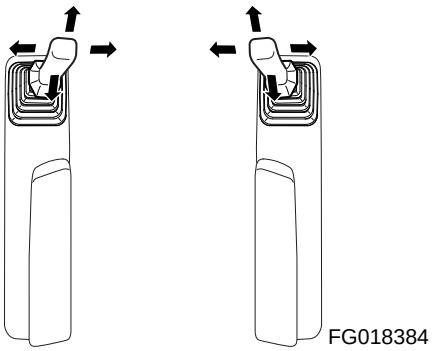


Figure 10

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 "LOCK" 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.

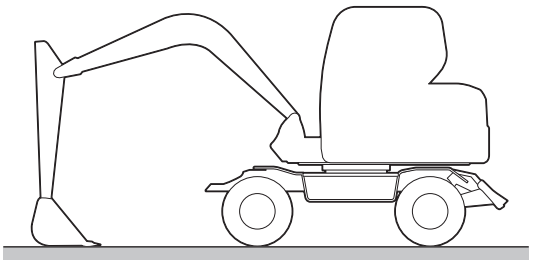


Figure 11

Checks and Maintenance After Stopping Engine

1. Park machine on firm and level ground.
2. "LOWER" dozer blade to ground, if equipped.
3. Set parking brake switch to "I" (APPLIED) position.
4. Move safety lever to "LOCK" position.
5. Stop engine.
6. Repair excavator if there are any coolant or oil leaks.
7. Inspect front attachment and lower structure for abnormal appearances. Check that attachment is secure. Correct any problems.
8. Fill fuel tank and drain any water collected in the fuel system to prevent it from freezing.
9. Inspect and remove accumulated flammable materials, such as leaves, paper etc., in engine compartment.
10. Clean all mud, debris, etc. from lower structure and tires. Make sure that all steps and handholds are clean, and that operator's cabin is clean.

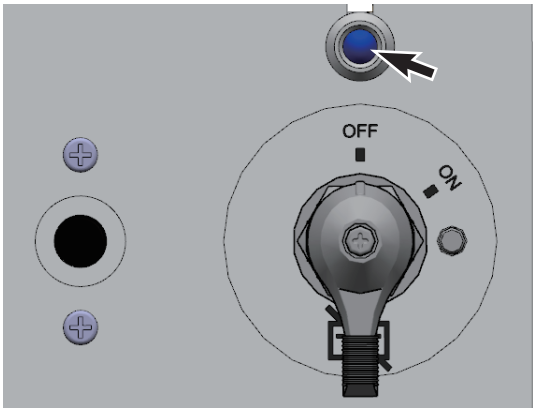
Wait to Disconnect Indicator

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

AVOID ELECTRICAL COMPONENT DAMAGE

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.



DS2104508

Figure 12

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 down into "LOCK" position. When safety lever is in the "LOCK" position, the front attachment, work controls, swing 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 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.*

   NOTE: *The lock/unlock state of the safety lever is in effect only when the stand on the left is lowered.*

   If the stand on the left is tilted, the lever is in the lock state at all times.

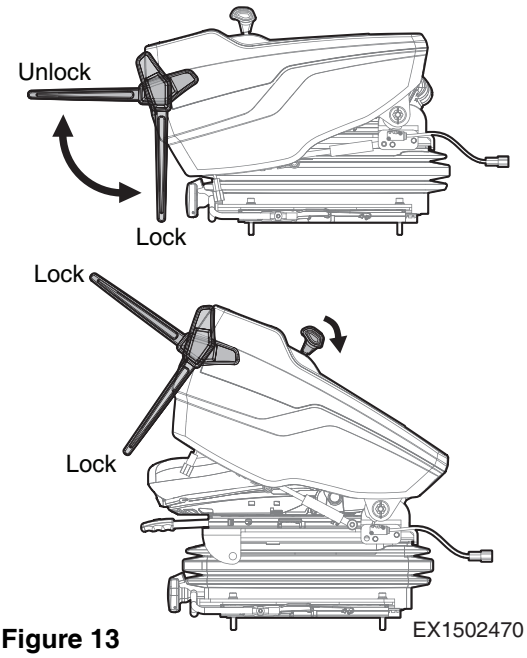


Figure 13

Travel

WARNING

AVOID DEATH OR SERIOUS INJURY

1. **Make sure to read and understand all operating instructions before traveling.**
2. **Obey all traffic regulations.**
3. **Do not travel faster than conditions allow.**
4. **Make sure to follow all applicable local and state regulations for travel in public roads.**
5. **Before putting the machine into gear, make sure in which direction the machine is facing. Locate the front section of the excavator and select the appropriate gear for travel direction desired.**
6. **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.**
7. **Always be sure the path is clear during travel.**
8. **Use extreme caution when reversing travel. Be sure there is a clear path behind the machine.**
9. **If an alarm buzzer sounds or a warning light turns "ON", stop immediately and determine the cause of the problem.**
10. **If an unusual sound or smell is noticed, immediately stop the machine and determine the cause of the problem.**
11. **Avoid sudden stops or turns.**
12. **Remain in the slowest travel lane possible.**
13. **The machine is top heavy. Make sure to make turns at a slow speed.**
14. **Take extreme caution when traveling on road shoulders or narrow streets.**
15. **Never jump off the machine while it is moving.**
16. **Before leaving the operator's seat, make sure to lock out all control systems and stop engine to avoid accidental activation of controls.**

Before Traveling

1. Check all tires to make sure that they are properly inflated and are not damaged.
2. Make sure that all excess mud, stone, etc. has been removed from the tires.
3. Fully raise and secure all outriggers and the dozer blade. Be sure to lock the outrigger legs.
4. Store the front attachment in the "TRANSPORT" position and set work/travel selector switch in the "TRAVEL" position.
5. Set the ram lock switch in the "UNLOCK" position.
6. Before moving the excavator, make sure that swing lock pin has been fully "ENGAGED". This will prevent the upper structure from accidentally rotating while traveling.
7. Before moving the excavator, check the steering mode and tire alignment.

Over the Road Traveling Procedures

1. Make sure that brake oil pressure warning light is "OFF".
2. After making sure that front attachment is facing forward, "RELEASE" the parking brake.
3. Using the right-hand work lever (joystick), select either "FORWARD" or "REVERSE" travel direction and step on the accelerator pedal.

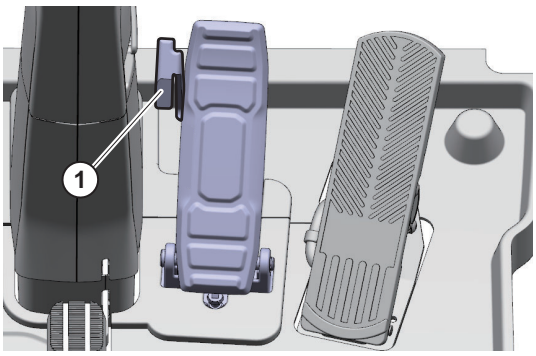
   NOTE: *The accelerator pedal functions in two ways. If the manual engine speed control dial is at the lowest setting, the accelerator pedal controls both engine speed and a hydraulic proportioning valve that controls the actual travel speed. If the manual engine speed control dial has been set to a higher rpm, the accelerator pedal functions only as a hydraulic proportioning valve control, enabling control of only travel speed and not engine rpm.*
4. Test the brakes before beginning over-the-road travel.

5. To stop the machine, slowly release the accelerator pedal. The dynamic braking action of the machine's momentum against the engine's back pressure will begin to slow the machine. Step on the brake to bring the machine to a full and controlled stop.

NOTICE

If the engine speed is controlled by the engine speed control dial, when the machine comes to a stop, the engine will continue to run at the preset rpm. If the engine speed is being controlled by the accelerator pedal, it will decrease and the machine will slow down as the pedal is released.

NOTE: *As the brake pedal is applied, and if it is pressed all the way to the floor, a mechanical lock will engage and hold the pedal in the fully applied position (1). Step on the release lever and the brake pedal will return to the released position.*



DS2101353

Figure 14

NOTICE

Abnormal operation with half of the brake running, failure to comply with the brake oil change intervals, or excessive service brakes may increase the temperature of the axle oil during the operation, resulting in reduced braking forces.

6. After traveling a long distance, the front attachment, outriggers or dozer blade may begin to drift because of normal internal hydraulic leakage. Position the machine in a safe location and move the work/travel selector switch to "WORK" position and reposition the front attachment, outriggers or dozer blade.
7. Return work/travel selector switch to "TRAVEL" position.

Traveling on a Work Site

WARNING

AVOID DEATH OR SERIOUS INJURY

When traveling, keep bucket (or attachment) from 20 ~ 30 cm (8 ~ 12 in) above ground. Fasten your seat belt.

Operator should pay attention when traveling backwards on a slope. Travel up or down the slope.

Never turn or travel across on a 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.

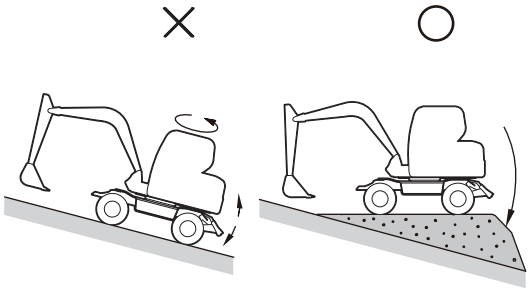
Avoid working on slopes, because there is a risk of rollover while swinging and performing front attachment operations.

Do not swing towards bottom of slope with a loaded bucket.

In unavoidable cases level the slope with fill soil, to make the vehicle as horizontal as possible.

Do not travel on slopes over 30° because of turnover danger.

1. Avoid obstacles, never drive over them.
2. Keep away from the shoulders or edges of slopes or excavations.
3. Always travel directly up or down a slope, never sideways.
4. Avoid changing directions or sudden starts or stops on a slope.
5. On a slope, make sure to fully extend the arm and lower the boom until bucket is 20 ~ 30 cm (8" ~ 12") above the ground. If the machine starts to slide or slip, lower the bucket to the ground to regain control. If the engine stalls, lower the bucket, make sure that all controls are in the "NEUTRAL" position and restart the engine.
6. Never travel up or down a slope with a vertical angle greater than 20°, or sideways on a slope with a vertical angle of greater than 5°.



DS2104702

Figure 15

Traveling on a Slope

1. Make sure to fully warm up the engine and the hydraulic system before attempting to travel on a slope.
2. If the engine stops when traveling on a slope, lower the bucket to the ground, make sure all controls are in the "NEUTRAL" position and restart the engine.
3. Before driving down a slope, test the brakes to make sure that they are fully functional.
4. Never drive down a slope with the transmission in "NEUTRAL".
5. When driving down a slope, allow the dynamic braking action of the machine's momentum against the engine's back pressure to slow the machine. Step on the brake to bring the machine to a full and controlled stop. Do not over use the brakes on a slope because they can burn out.

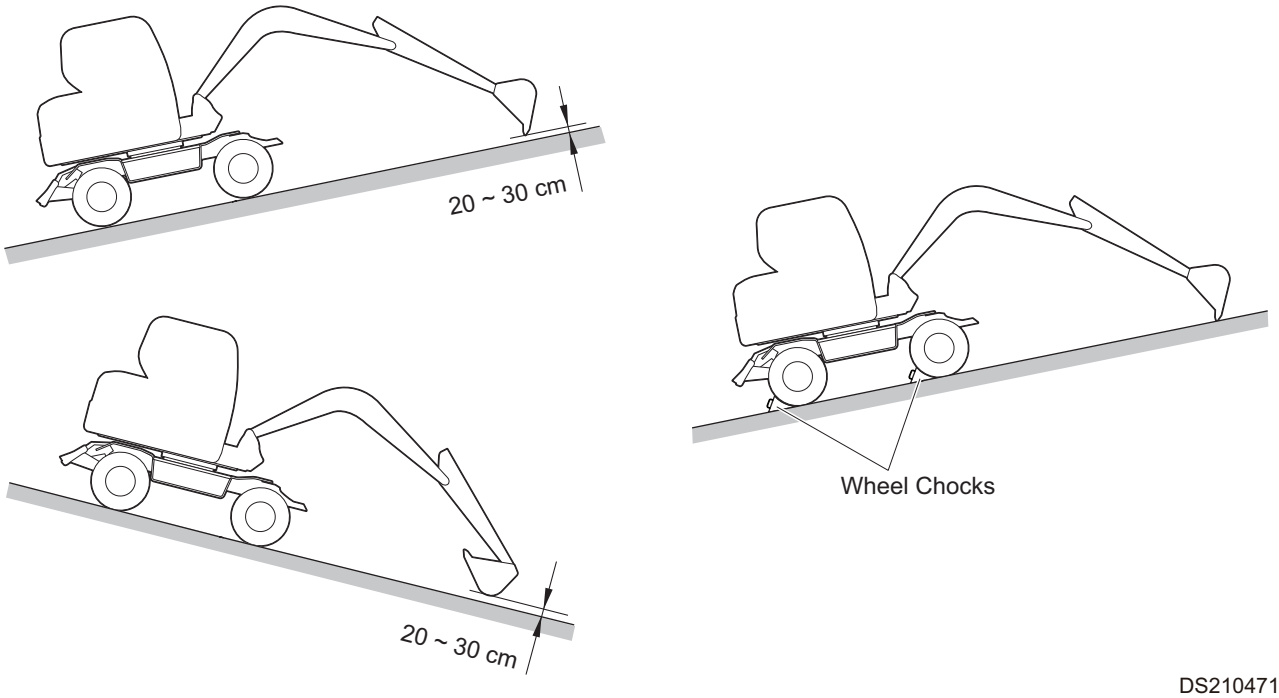
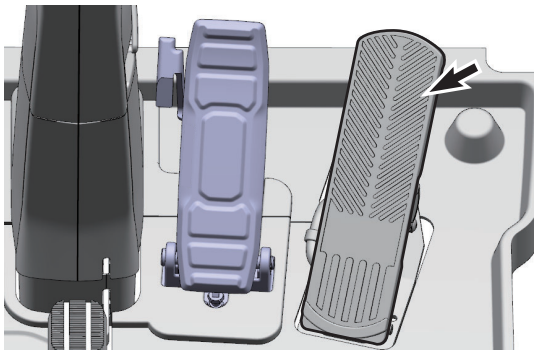


Figure 16

Parking

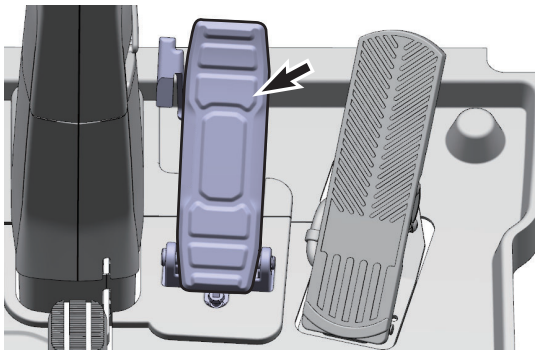
1. Slowly release the pressure on the accelerator pedal.



DS2101354

Figure 17

2. Step on the brake to fully stop the machine.



DS2101355

Figure 18

3. Make sure transmission is in "B" (NEUTRAL) position.

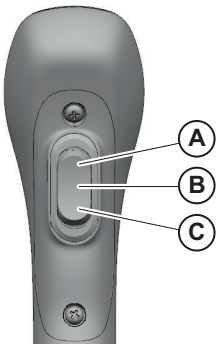
   NOTE: *Engine will not start if transmission is not in "NEUTRAL".*

   A. In this position, "FORWARD" direction is selected.

   B. In this position, "NEUTRAL" is selected.

   C. In this position, "REVERSE" direction is selected.

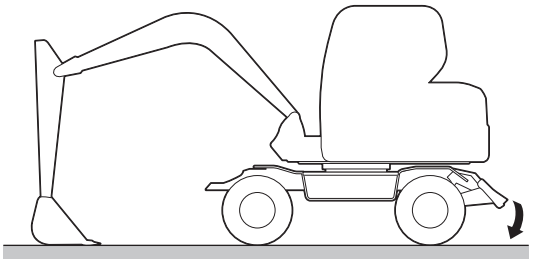
4. If you are using the manual speed control dial, reduce the engine speed to "LOW IDLE".



DS2100517

Figure 19

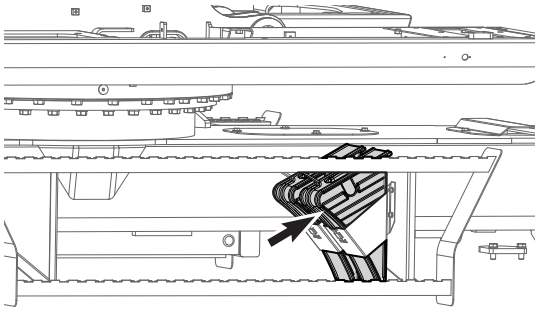
5. Park machine on firm and level ground. Lower bucket or attachment to ground.
6. "LOWER" dozer blade to ground.
7. Set parking brake switch to "I" position. This will ensure that parking brake is "APPLIED".
8. Stop engine by turning key to "O" (OFF) position.
9. Remove key from starter switch.



DS2104714

Figure 20

10. If the machine is parked on a slope, insert the wheel chocks on the downhill side of the tires to secure the machine. Wheel chocks are supplied with the machine and are stored on the lower structure directly below the cabin. When the upper structure is facing the front of the machine.



WE1401188

Figure 21

Travel Problems

1. If a problem develops when traveling, move the machine to the side of the road.
2. Determine the cause of the problem and correct it if possible.
3. If a hydraulic leak develops, lower the bucket and the dozer blade to the ground, stop engine, and release the air pressure from the hydraulic tank. Contain the hydraulic fluid if possible.

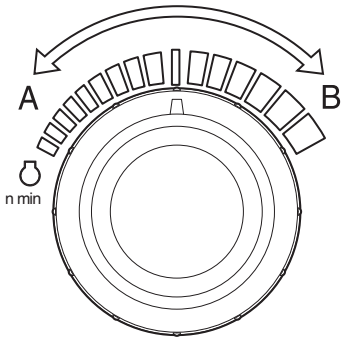
Operating Instructions

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 22

Emission Control System

This machine is equipped with an engine exhaust emission control system that meets applicable engine EU exhaust emission regulations. The owner/operator is responsible for proper operation and maintenance of the emission control system as provided in this manual and the emissions-related warranty provisions. The system provides a warning if there are faults in the Selective Catalytic Reduction System (SCR) system or if the level of reductant in the reductant tank is too low. For example, if doser cooling is not working, the engine torque is reduced.

Low Level DEF

The engine resumes normal torque after reductant has been filled to a level of at least 20%.

DEF Quality / Dosing Error

Once the fault has been corrected and the engine control unit received indication that it is working, engine torque returns to the normal level.

NOTICE

If the engine torque was reduced to 0% (low idling), the engine control unit will not detect that SCR system is functioning. Reset the system so normal torque is available.

The Value of the Carbon Dioxide (CO_2) Emissions

This CO_2 measurement results from testing over a fixed test cycle under laboratory conditions a(n) (parent) engine representative of the engine family. This value shall not imply or express any guarantee of the performance of a particular engine.

Engine Family Name	DM03VA
Parent Engine Model	DM03-MFL04
CO_2 Value [g/kWh]	810.2

Inducement

Inducement Items	Inducement Level	Reductant Level/Time	Notification Method	Torque Reduction	Symbol
Low level DEF	Warning	DEF tank level < 25%	Constant symbol	-	
	Moderate	DEF tank level < 2.5%	Slow blinking symbol	Torque Limit: ~ 25%	
	Severe	DEF tank level < 0%	Fast blinking symbol + buzzer	Torque Limit: ~ 50% Speed Limit: 60%	
Impeded EGR Valve	Warning	Immediately	Constant symbol	-	
	Level 1	+ 36 hours	Slow blinking symbol	Torque Limit: ~ 25%	
	Severe	+ 64 hours (100 hours)	Fast blinking symbol + buzzer	Torque Limit: ~ 50% Speed Limit: 60%	
Dosing Error	Warning	Immediately	Constant symbol	-	
	Moderate	+ 10 hours	Slow blinking symbol	Torque Limit: ~ 25%	
	Severe	+ 20 hours	Fast blinking symbol + buzzer	Torque Limit: ~ 50% Speed Limit: 60%	

After Treatment System

Sulfur contained in fuel and oil degrades NOx reduction performance of SCR (Selective Catalytic Reduction) catalyst after combustion. Therefore, to ensure high efficiency for NOx reduction, the temperature of exhaust gas needs to be increased periodically to eliminate sulfur content, and this process is called as regeneration.

The regeneration process is automatically performed by the ECU periodically based on the operating time of the machine. If the process is not successfully performed according to the operating condition, the corresponding "Warning Light" comes on.

In this case, park the vehicle in a safe place and perform the regeneration process manually according to the following procedure. If the process is successfully performed, the warning light goes off.

WARNING

AVOID DEATH OR SERIOUS INJURY

Exhaust gas temperature and exhaust system components are very hot during regeneration. This can cause a fire or burn hazard and result in death or serious injury or property damage. Keep flammable material and explosive gases away from exhaust system during regeneration.

WARNING

AVOID DEATH OR SERIOUS INJURY

The engine power can be degraded unless performing the regeneration process manually after the warning light is turned on.

HD HYUNDAI CONSTRUCTION EQUIPMENT regeneration system provide customer sustainability of machine operating but if soot level is high, manual regeneration by operator is needed.

To avoid confusion, pop-up message and symbol would be appeared on panel display.

State	Condition	Notification Method	Symbol
Active regeneration operating	Soot level (100% ~) Elapsed 100 hour from past regeneration	Constant	
Manual regeneration request 1	Soot level (105 ~ 120%)	Constant	
Manual regeneration operating	Activating manual regeneration by operator	Constant	
Regeneration prohibition	Inhibition switch in the "Regeneration Prohibition" condition	Constant	
Service request	Soot level (over 120%)	Fast Blinking + Buzzer	

NOTE: *Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for service regeneration and DPF replacement.*

NOTE: *If manual (forced) regeneration is necessary after the inhibited regeneration switch is turned "ON", press inhibited regeneration switch again to turn "OFF" the inhibit symbol. Press switch to manual (forced) regeneration position to activate system.*

Active Regeneration

No action by the operator is required to start active regeneration. Regeneration is automatically activated by the engine control unit (ECU). Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for more information.

Active regeneration can occur anytime the engine is running, while operating the machine or when the machine is parked. During regeneration, the regeneration light and the high temperature warning light turn "ON" to alert the operator of hot engine exhaust gases. Machine operation can continue, but the operator should keep engine exhaust away from flammable materials. The operator can choose to "inhibit" active regeneration, if operating conditions are not favorable to hot engine exhaust temperatures (e.g. working near flammable materials).

When completed, the regeneration lights on the monitor will turn "OFF".

NOTICE

Do not stop engine during regeneration. This can severely damage the SCR.

Manual (Forced) Regeneration

The regeneration is manually (forced) activated by the operator when the operator chooses to start the regeneration process. Manual (forced) regeneration may be required if the operator "inhibits" the active regeneration process for an extended period of time because the operating conditions are not favorable to hot engine exhaust temperatures (e.g. working near flammable materials).

Procedures for manual (forced) regeneration by the operator.

1. Park machine in a well ventilated area and away from flammable materials.
2. Set up machine in the following manner:
   A. Operate machine until engine coolant and oil temperatures are above 40°C (104°F).
   B. Set engine speed to "LOW IDLE".
   C. Put transmission lever in "NEUTRAL" and engage parking brake (Wheel excavator only).
3. Move safety lever to "LOCK" position.
4. Activate regeneration switch (Figure 23) to start regeneration process.

   NOTE: *Regeneration light on monitor will be "ON".*

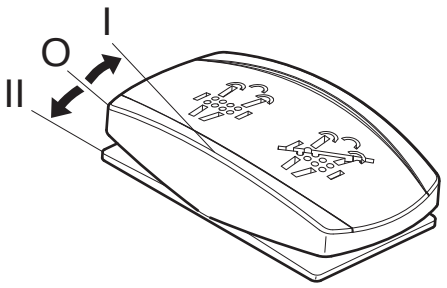
   NOTE: *Regeneration switch should be pushed 3 - 8 sec for regeneration.*
   If puch time is over 16 sec, fault code would be displayed on monitor.

Engine speed will gradually increase from "LOW IDLE" to 2,000 rpm and regeneration process will then start.

During regeneration, high temperature warning light will be "ON".

When regeneration stops, regeneration and high temperature warning lights will turn "OFF".

NOTE: *Operator can stop manual (forced) regeneration by raising safety lever to "UNLOCK" position.*



FG018280

Figure 23

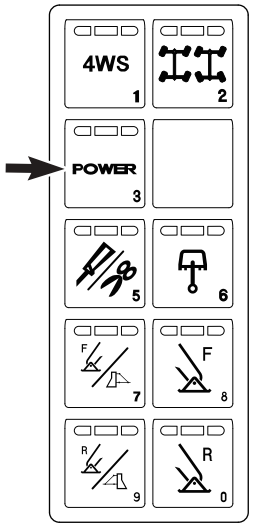
Mode Selection

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 before starting work.
3. When the power mode button is pressed, instrument panel displays a power mode selection pop up menu.

   When power mode is selected, symbol shows on screen.



DS2104509

Figure 24

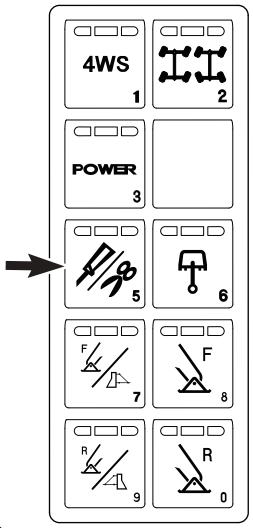
DS1901205

Figure 25

Mode	Selection Point
Power Plus Mode	• Heavy work. • Maximize production with full Power.
Power Mode	• Fast work. • Work in a short period of time.
Standard Mode	• General work. • Optimize speed and fuel consumption.
Economy Mode	• 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 before starting working.



DS2104510

Figure 26

DS1900964

Figure 27

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. Now the symbol will be turned "OFF".

DS2104511

Figure 28

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.

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:

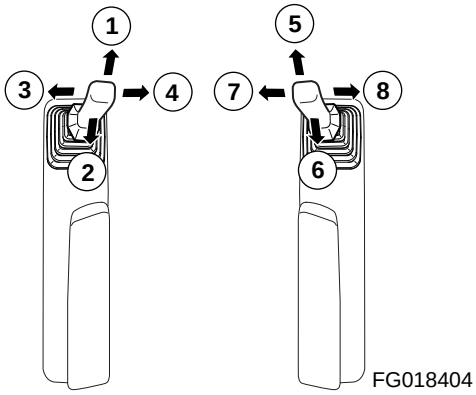


Figure 29

Left-hand Work Lever (Joystick)

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.*

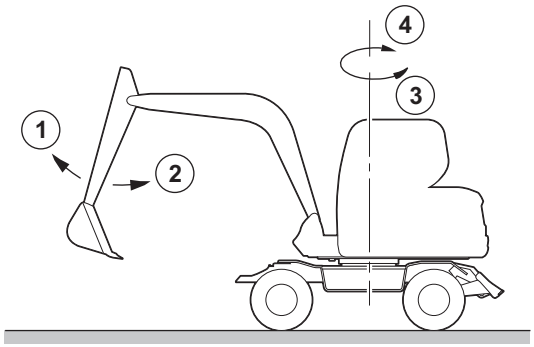


Figure 30

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.*

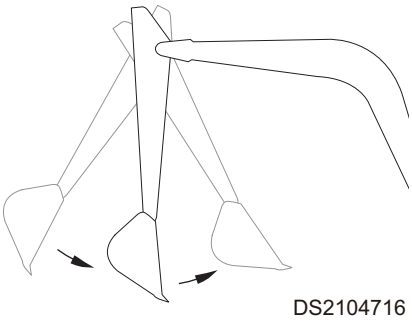


Figure 31

Right-hand Work Lever (Joystick)

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".*

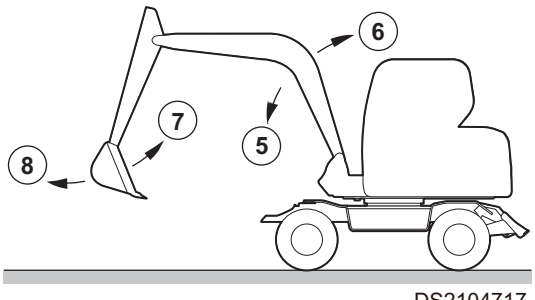


Figure 32

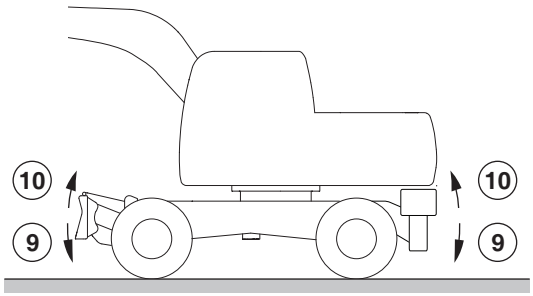
Dozer Blade and Outrigger Control Lever (Figure 30 and Figure 33)

9. Blade/Outrigger down

10. Blade/Outrigger up

The dozer blade control lever is on the left control stand. To lower blade, push lever forward; to raise blade, pull lever backwards.

Whenever dozer blade is being used to level ground, make sure to set travel speed control to "LOW SPEED" Attempting to use dozer blade in "HIGH-SPEED" will cause damage to drive system.



WE1400122

Figure 33

Independent Outriggers (Optional)

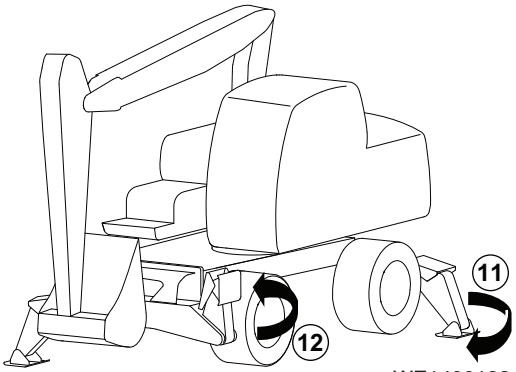
If the machine is equipped with the optional independent outriggers.

Independent outriggers are operated with dozer control lever and selector switches.

Select the outriggers with one or more of the switches, and then, push the lever forward to lower the outriggers, pull the lever backwards to raise the outriggers.

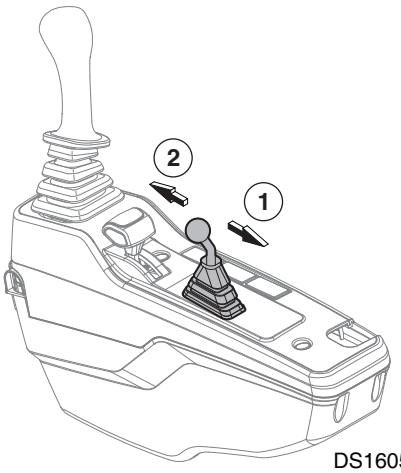
11. Outrigger down

12. Outrigger up



WE1400123

Figure 34

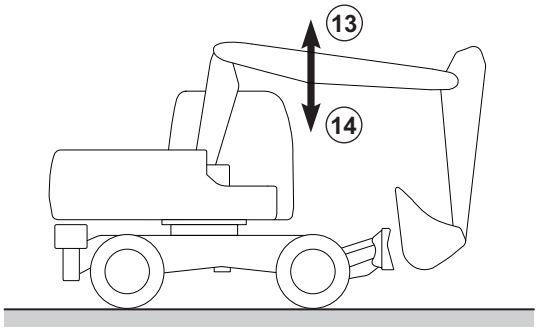


DS1605547

Figure 35

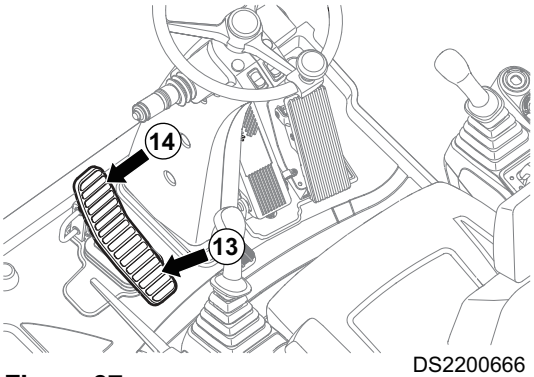
Two-Piece Boom

13. Upper boom "UP"
14. Upper boom "DOWN"



WE1400058

Figure 36



DS2200666

Figure 37

Operating Precautions

WARNING

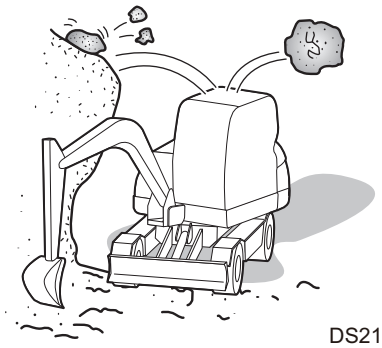
AVOID DEATH OR SERIOUS INJURY

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.

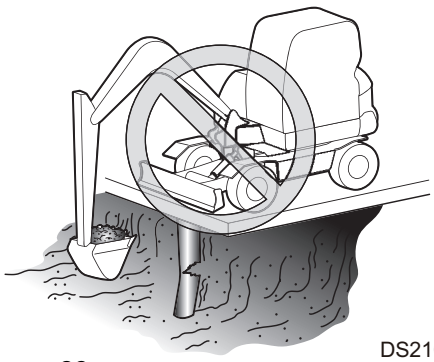
1. Before starting work, inspect terrain and soil conditions. Level ground and drain area if necessary.
2. Install window guards for additional operator protection when working if there is a possibility of falling rocks or other objects.



DS2104838

Figure 38

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.



DS2104839

Figure 39

4. When working close to the excavated edge or drop-off, make sure that the machine is sitting on solid ground. Keep the dozer blade to the front.

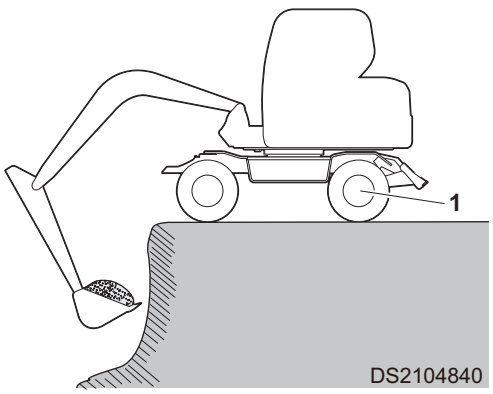


Figure 40

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

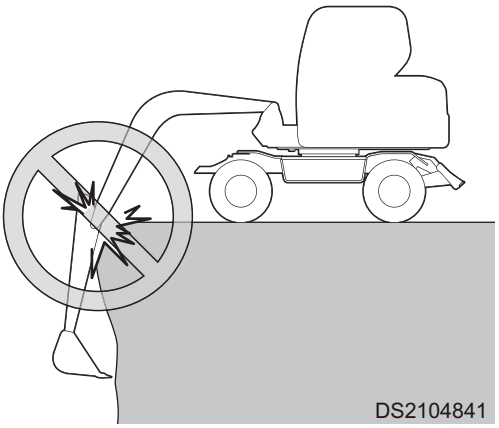


Figure 41

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

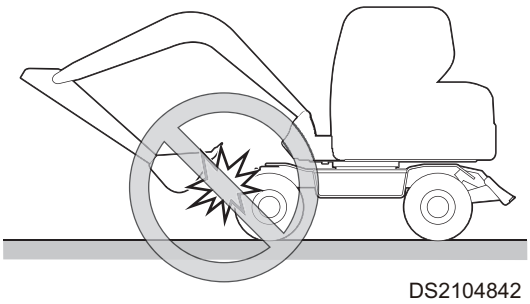


Figure 42

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

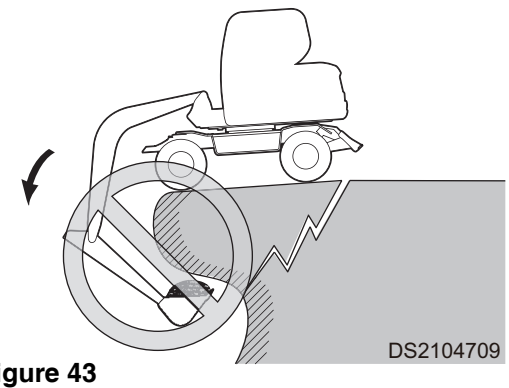


Figure 43

8. Make sure there is adequate clearance from overhead electrical supply lines. Check for underground utility lines before excavating. Call before you dig.

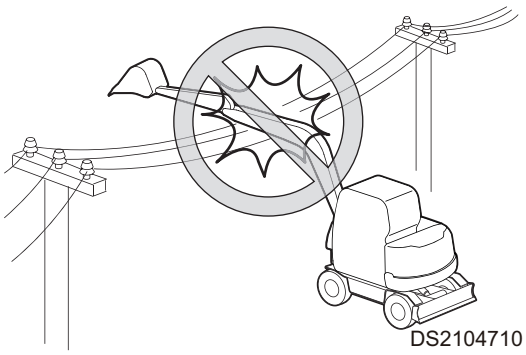


Figure 44

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

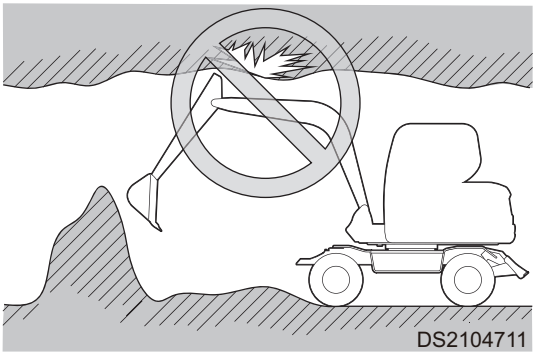


Figure 45

10. 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.

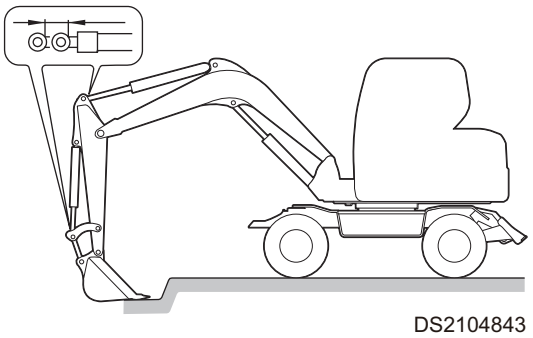


Figure 46

11. Do not dig with the excavator tires raised. This can result in structural and mechanical failures.

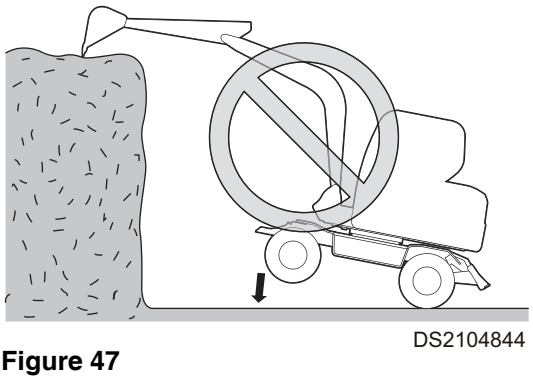


Figure 47

12. Do not use weight of machine to provide additional breakout force.

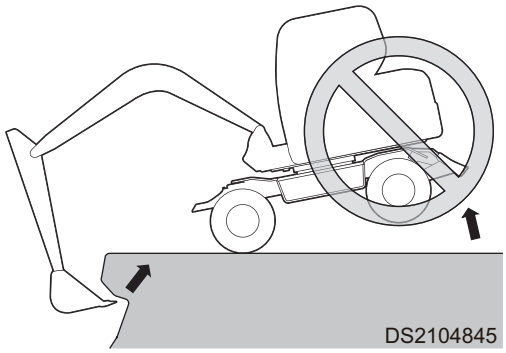


Figure 48

13. Do not use the bucket as a hammer or ramming device. This can cause damage to the front attachment.

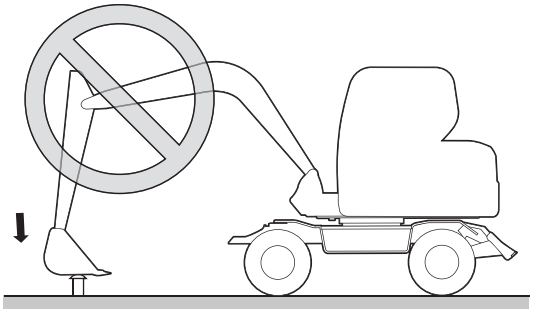


Figure 49

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

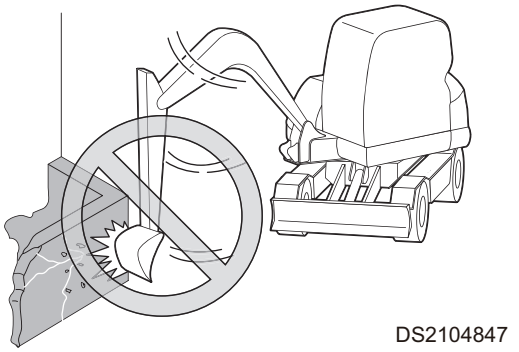


Figure 50

15. Do not use machine travel or swing when the bucket is in the ground to provide additional breakout force.

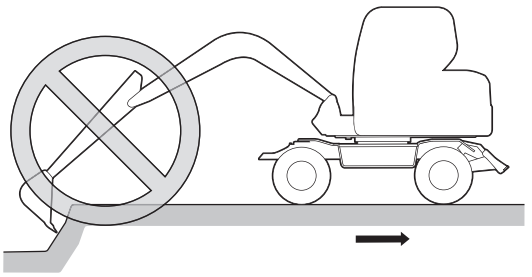
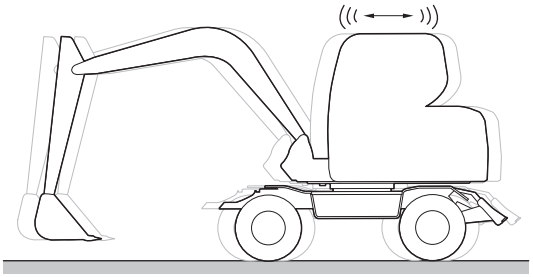


Figure 51

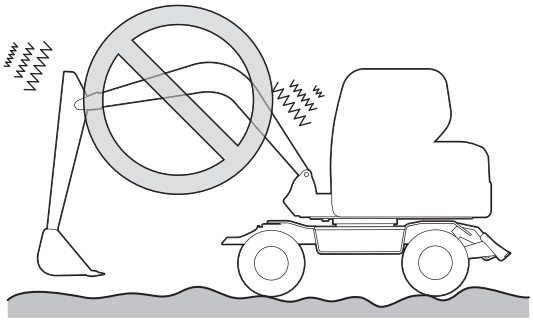
16. When traveling in high range:
    - Avoid sudden starts.
    - When traveling in one direction come to a complete stop before reversing directions. Do not rock excavator back and forth.
    - Avoid sudden stops.



DS2104849

Figure 52

17. Do not travel at high-speed over rough ground or rocks. This can result in structural and mechanical failures and can reduce the service life of the machine.



DS2104850

Figure 53

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.

WARNING

AVOID DEATH OR SERIOUS INJURY

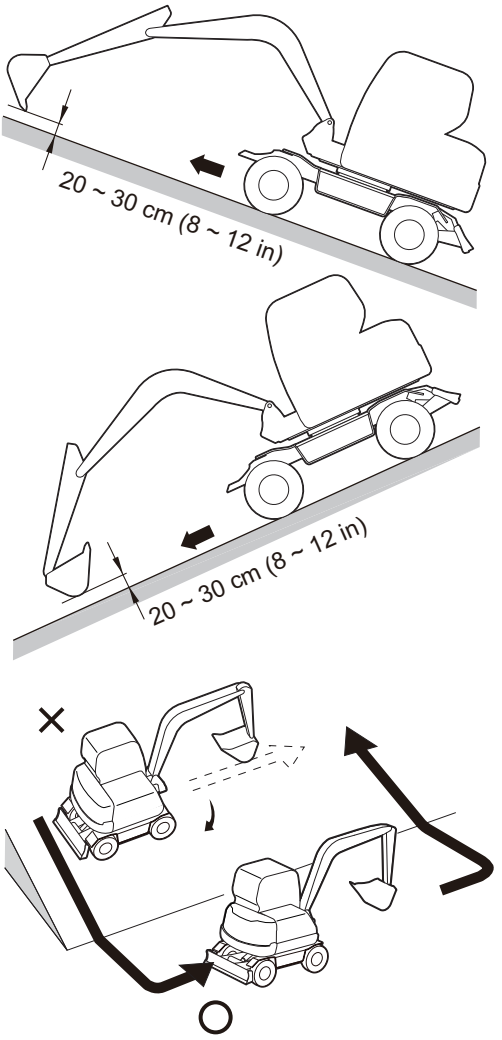
Do not travel downhill with the front end attachments raised.

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.

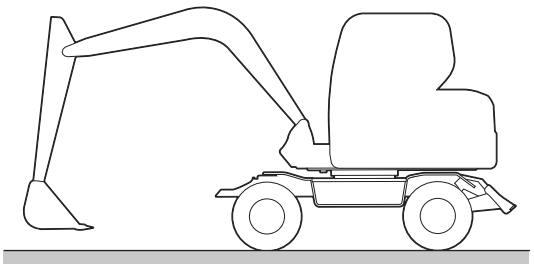
Make sure that all optional equipment has been authorized and installed properly.



DS2104701

Figure 54

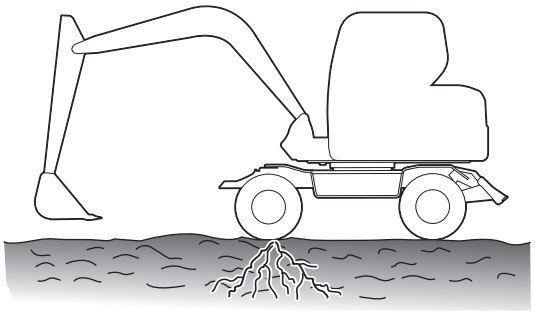
19. The machine may be equipped with visual aids such as mirrors or a rear view camera. Even with these aids, there still may be areas around the machine which cannot be seen from the operator's seat. Always keep personnel and bystanders out of the work area. Be careful when operating and always look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



DS2104851

Figure 55

20. When working on soft or muddy ground, make sure that the machine is not sinking.



DS2104852

Figure 56

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 ECU damage.

1. When working in water, do not operate in water over center of axle (1).

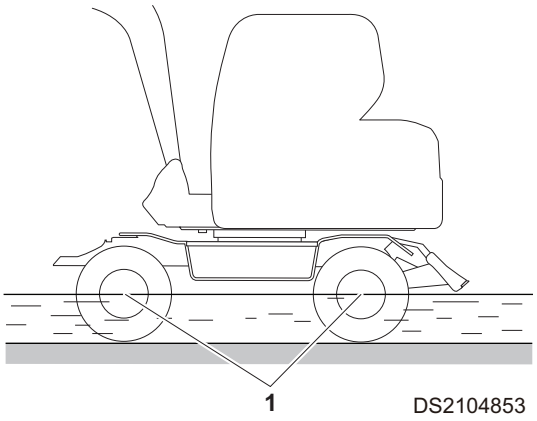
   If swing bearing gets wet, immediately grease it until all old grease is purged from bearing.

   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 on bucket pins.

2. It is possible to work and travel in shallow water if the ground is stable. If the terrain is rough or if the water is flowing heavy it is unsafe to operate the equipment.

3. When working in wet soil, the equipment can sink into the soft ground. Select solid ground to secure the equipment before starting work.



DS2104853

Figure 57

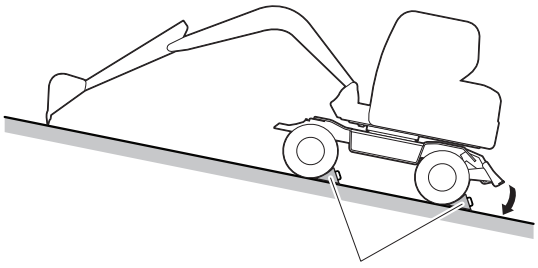
Parking Excavator

WARNING

AVOID DEATH OR SERIOUS INJURY

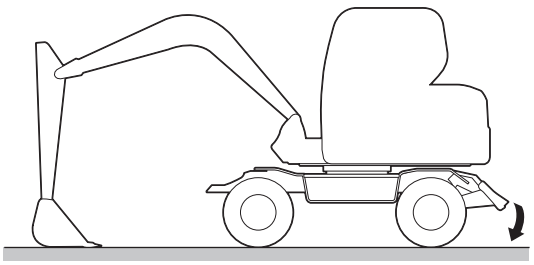
Park machine on firm and level ground. Avoid parking on slopes. If excavator must be parked on a slope, block tires (1) using the supplied wheel chocks and place bucket teeth in ground.

1. Park machine on firm and level ground. Lower bucket or attachment to ground.
2. "LOWER" dozer blade to ground.
3. Set engine speed control dial on "LOW IDLE".
4. If control levers (joysticks) are moved unintentionally, it can cause accidental movement of the work equipment or attachment. Before leaving operator's seat, move safety lever to "LOCK" position. Stop engine.



DS2104854

Figure 58



DS2104714

Figure 59

Towing Procedure

WARNING

AVOID DEATH OR SERIOUS INJURY

Towing should be performed only to remove the machine from a dangerous situation, and it should be performed with the engine running.

If the engine does not start, move the machine using a trailer if possible.

When the engine does not start, the steering and brake functions are limited. Also, related parts can be damaged during towing.

In this case, only trained and authorized personnel should perform towing in an emergency.

Make sure that the upper structure is secured before towing.

WARNING

AVOID DEATH OR SERIOUS INJURY

Make sure that towing machine can handle the weight of the machine being towed and that it has adequate braking capacity.

Never use a damaged wire rope or chain. They could break and cause a serious accident.

Always wear gloves when handling a wire rope or chain.

When towing excavator use a wire rope or chain capable of handling the load.

Always have one person in cabin at all times.

NOTICE

Parking brake is automatically "APPLIED" when engine is stopped. If engine is operational, "RELEASED" parking brake before towing machine.

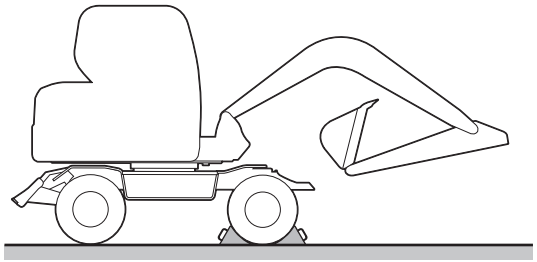
If engine will not start, the parking brake will have to be "MANUALLY RELEASED" before towing machine. Refer to "Releasing Parking Brake Manually" for more information.

NOTICE

Do not tow more than 1.5 times towing machine's own weight.

Be careful to secure the wire rope to both sides of the axle so that force is not applied to one side of the axle.

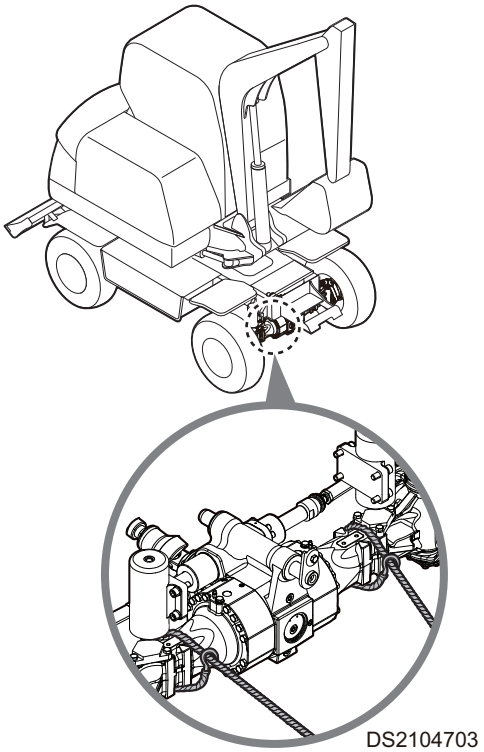
1. Secure equipment with wheel chocks so equipment will not move.



DS2104855

Figure 60

2. Attach wire rope to equipment and remove slack with towing machine.



DS2104703

Figure 61

3. If engine is operational, "RELEASE" the parking brake.

   NOTE: *Always have one person in cabin at all times.*

   NOTE: *If parking brake will not "RELEASE" when engine is running, parking break will have to be "MANUALLY RELEASED" before towing machine. Refer to "Releasing Parking Brake Manually" for more information.*

NOTE: *If engine does not operate, transmission will have to be "Manually shifted" before towing machine. Refer to "Shifting transmission to neutral manually" for more information.*

4. Remove wheel chocks and tow equipment.

NOTICE

When towing machine, speed must be less than 10 km/h (6.2 MPH). Travel distance must be less than 5 km (3.1 miles). Use trailer if machine is moved over 5 km (3.1 miles).

Always have one person in cabin at all times.

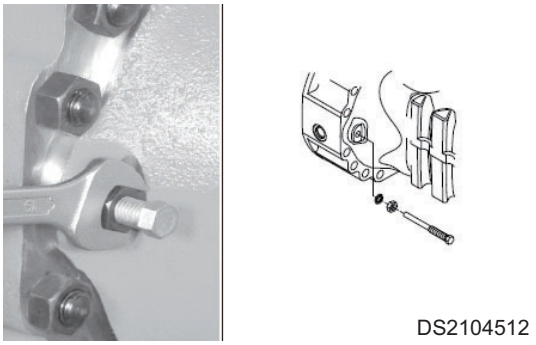
Releasing Parking Brake Manually

When parking brake switch does not work because engine starting system has a problem parking brake can be release manually.

NOTICE

Do not operate accelerator pedal when parking brake has been "MANUALLY RELEASED".

1. Loosen nuts of screws provided for the mechanical and manual release of the braking units, then completely move the nuts backwards.

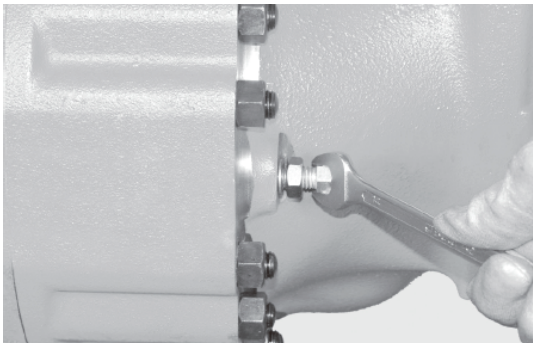


DS2104512

Figure 62

2. Screw in release bolts until contact is made with the pusher plate.
   Once contact is made, the torque to rotate will increase.
3. From this position, gradually tighten the bolts 1/4 turn alternating between each side.

   NOTE: *A maximum of 1.5 turns of the screw can be used to release the brakes.*



DS2104513

Figure 63

Adjusting Parking Brake Manually

If adjustment is required after manually releasing the parking brake, follow the procedure below.

1. Remove screws complete with nuts and seals.
   Replace seals, apply silicone-based Tecno Lube/101 grease to the screws and install all parts into the arm.

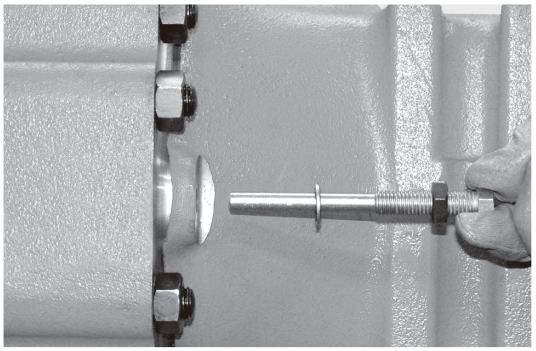


Figure 64 DS2104890

2. Adjust screws (1) to obtain a distance of 34 ±0.5 mm between axle machined surface and screw underhead.

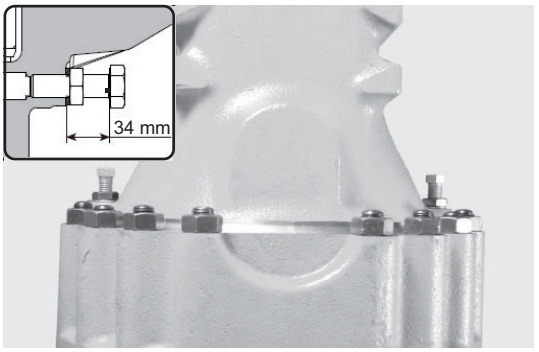


Figure 65 DS2104891

3. Lock into position with nuts (2).

   NOTE: *Hold screws (1) into position while locking the nuts (2); after locking, check the distance of screws (1) once more.*

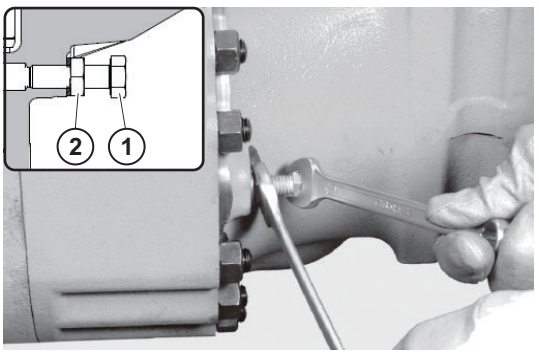


Figure 66 DS2104892

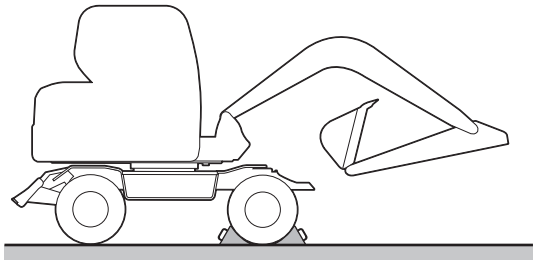
Shifting transmission to neutral manually.

If it is impossible to transport the machine with a trailer and the engine does not start, shift the transmission to neutral state manually before towing it.

NOTE: *If towing the machine with the transmission not in the neutral state, the power train components can be damaged.*

1. Secure equipment with wheel chocks so equipment will not move.

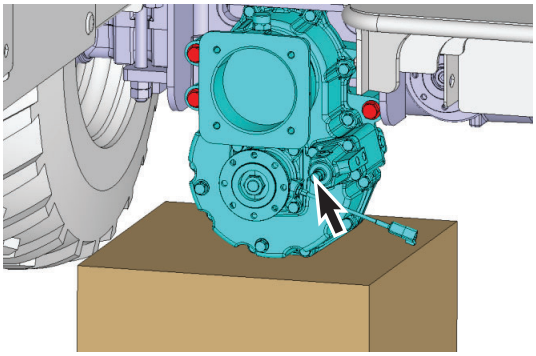
   NOTE: *When the transmission is shifted to the neutral state manually, the machine may move, leading to a severe injury or even death.*



DS2104855

Figure 67

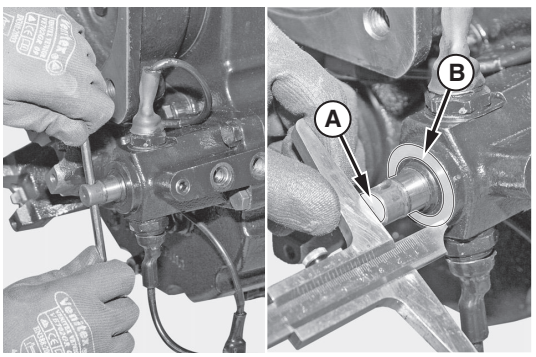
2. It is possible to turn the manual neutral position control lever of the transmission to adjust the gear.



WE1502040

Figure 68

3. Fit a screwdriver into the hole of the manual neutral position control lever and turn the lever as follows.
   Measure the distance between the points A and B and check the condition.



WE1502041

Figure 69

Shifting from 1st gear to neutral gear :

Turn the lever counterclockwise until the lever is protruded for 10 mm.

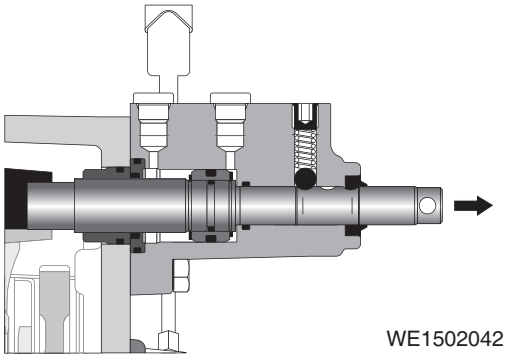


Figure 70

Shifting from 2nd/3rd gear to neutral gear :

Turn the lever clockwise until the lever is inserted for 10 mm.

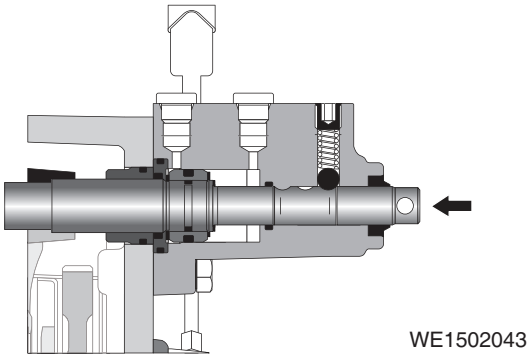


Figure 71

4. When it is approximate 21 mm as shown in the Figure 72, the neutral gear is selected.

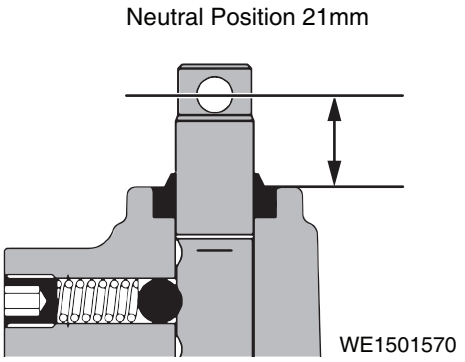


Figure 72

Bucket Replacement and Reversal

NOTICE

Mounting in reverse direction can result in interference during operation, and is not recommended.

WARNING

AVOID DEATH OR SERIOUS INJURY

When pins are knocked in with a hammer, pieces of metal may fly and cause serious injury.

When performing this operation, always wear goggles, hard hat, gloves, and other protective equipment.

When the bucket is removed, place it in a stable condition.

If pins are struck with a hammer, there is a potential hazard that they can fly out and injure a bystander. Make sure there is no one in the surrounding area before starting the operation.

When removing the pins, do not stand behind the bucket. Do not put your foot under the bucket while standing at the side for the work.

When removing or inserting pins, be careful not to get your fingers caught.

Never insert your fingers into the pinholes when aligning the holes.

Stop the machine on a firm and flat surface and do the work. When performing joint work, appoint a lead and follow that person's instructions and signals.

Replacement

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.

2. Remove double nut from bolt for arm pin (A, Figure 73) and link pin (B, Figure 73), remove bolt, pull out arm pin (A) and link pin (B, Figure 73), and then remove bucket.
3. Align the arm (5, Figure 73) with holes (1, Figure 74) of the replacement bucket and the link (6, Figure 73) with holes (2, Figure 74), then insert grease coated pins (A, Figure 73) and (B, Figure 73) into hole (1, Figure 74) and hole (2, Figure 74) respectively.

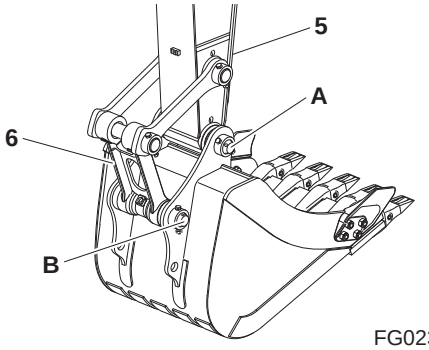


Figure 73

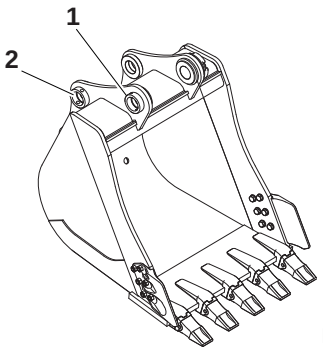


Figure 74

4. When installing the bucket, for arm pin portion (A, Figure 73), fit O-rings (3, Figure 75) on bucket (4, Figure 75) in the position shown in the diagram on the right. After inserting the pin, position them in the standard groove.
5. Install the stopper bolts and nuts for each pins.
6. Lubricate with grease thoroughly until grease comes out from the end face.

NOTICE

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

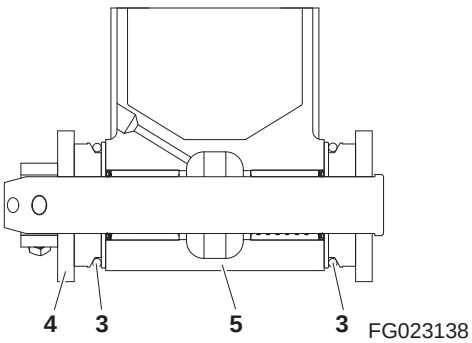


Figure 75

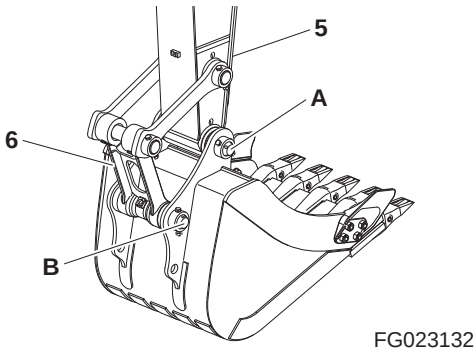
Reversal (If Applicable)

1. Place the bucket on a flat surface.

NOTICE

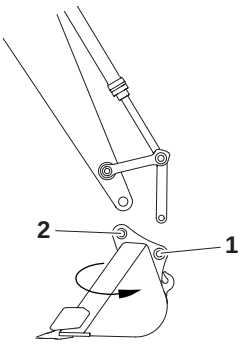
When removing the pins, place the bucket so it is in resting slightly on the ground. If down pressure is applied to the bucket, the resistance will be increased and it will be difficult to remove pins. After removing the pins, make sure they are clean and do not allow mud, sand, or other debris to get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

2. Remove double nut on the stopper bolt for arm pin (A, Figure 76) and link pin (B, Figure 76), remove bolt, pull out arm pin (A, Figure 76) and link pin (B, Figure 76), and then remove bucket.



FG023132

Figure 76



FG018433

Figure 77

3. After removing the bucket, reverse it.
4. Align arm (5, Figure 76) with replacement bucket hole (1, Figure 77), then align link (6, Figure 76) with hole (2, Figure 77), then insert greased coated pins (A, Figure 76) and (B, Figure 76) into hole (1, Figure 77) and hole (2, Figure 77) respectively.

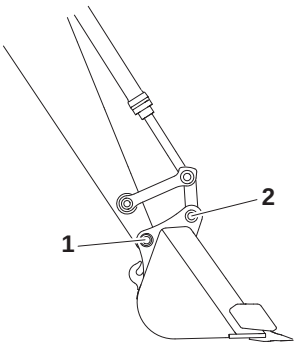
NOTICE

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

5. Install the stopper bolts and nuts for each pin.
6. Lubricate with grease thoroughly until grease comes out from the end face.

NOTICE

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



FG018434

Figure 78

Hydraulic Attachments (If Equipped)

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

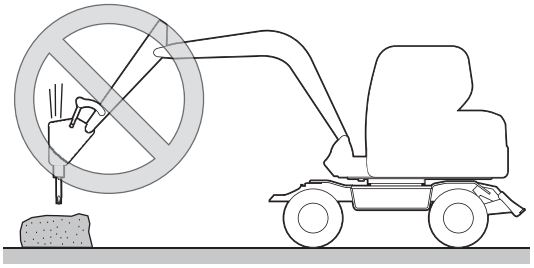
1. When installing hydraulic breaker, assemble according to instructions provided with kit.
2. If breaker is taken off excavator, be sure to plug and cap all hoses and tubing to prevent contamination from entering hydraulic system.
3. Plug and cap all connectors and fittings on breaker to prevent contamination.
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.
4. Do not drop breaker from extreme heights.

   This can damage breaker or the excavator.

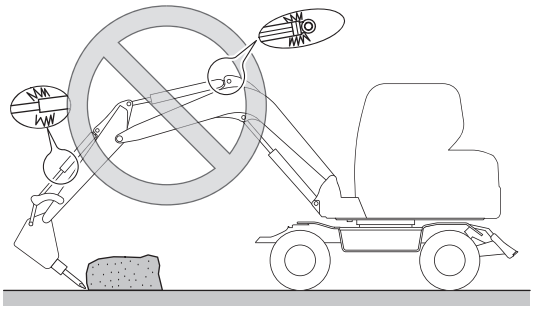


DS2104856

Figure 79

5. Do not operate the breaker with the boom or arm cylinders fully extended (bottomed out).

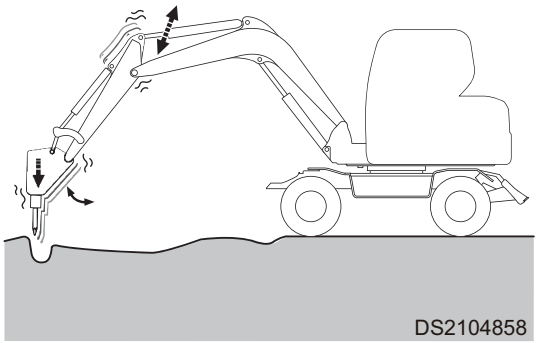
   Leave over 100 mm (4 in) of clearance between rod end of cylinder and cylinder head. This will help prevent damage to cylinders during breaker operation.



DS2104857

Figure 80

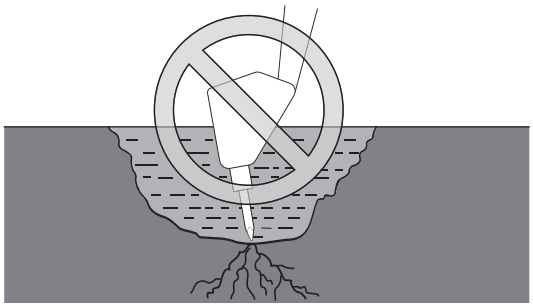
6. Do not use the breaker if the hydraulic hoses vibrate excessively. If excavator is operated under this condition, structural and hydraulic components can be damaged.



DS2104858

Figure 81

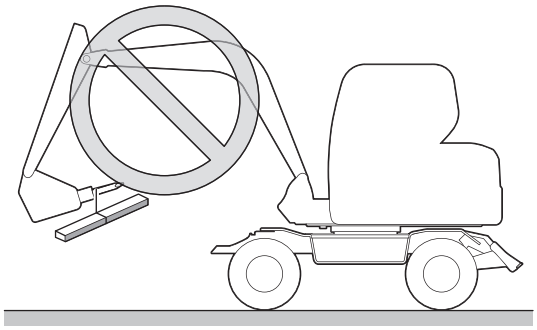
7. Do not allow the breaker body to go into water if not equipped for underwater operation. The breaker seal can be damaged and rust, foreign material or water can enter the hydraulic system and cause damage. Only insert the breaker tool (chisel) into water.



EX1502480

Figure 82

8. Do not lift or tow with a breaker.



DS2104859

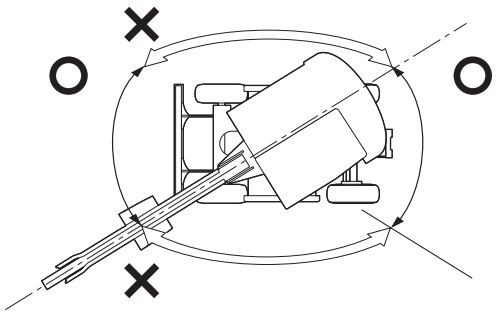
Figure 83

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.

WARNING

AVOID DEATH OR SERIOUS INJURY

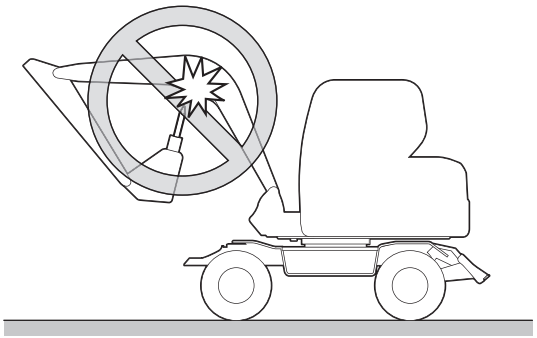
Operating a breaker with the upper structure turned 90° to the lower structure can result in tipping over the machine or reduction in service life.



DS2104860

Figure 84

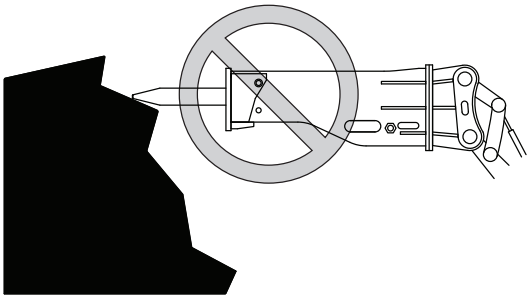
10. Do not curl the breaker tool tip into the arm or boom when traveling or parking the excavator.



DS2104861

Figure 85

11. Do not operate the breaker as shown.

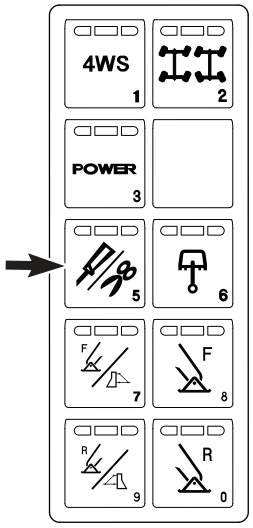


DS2002971

Figure 86

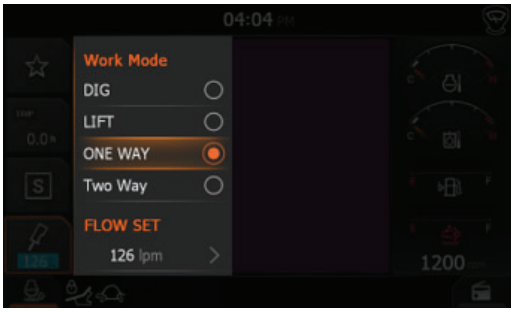
To Activate Breaker

1. Set work mode to breaker position using button.



DS2104510

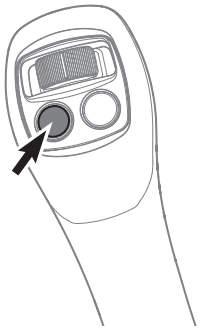
Figure 87



DS1900964

Figure 88

2. Press the left button on the top of right-hand work lever (joystick) to activate hydraulic breaker.
3. Release the left button on the top of right-hand work lever (joystick) to deactivate hydraulic breaker.



DS2100516

Figure 89

Shear Operation (If Equipped)

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 (If Equipped)

1. Set work mode to "SHEAR" position using button.

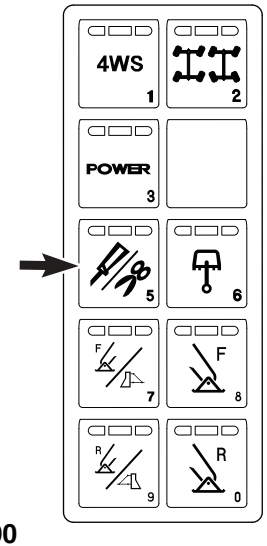


Figure 90 DS2104510

Figure 91 DS1900964

2. Move the thumb switch on the top of the right-hand work lever (joystick) to shear. Moving thumb wheel to the right will "OPEN" the work tool.

3. Move the thumb switch on the top of the right-hand work lever (joystick) to shear. Moving thumb wheel to the left will "CLOSE" the work tool.

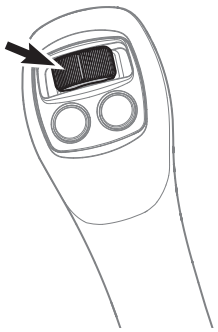


Figure 92 DS1601530

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.

Rotating Operation (If Equipped)

For a machine equipped with an attachment that rotates, move the thumb wheel switch on top of left-hand work lever (joystick) to rotate the attachment.

Rotating switch "RIGHT" is for "CLOCKWISE ROTATION".

Rotating switch "LEFT" is for "COUNTERCLOCKWISE ROTATION".

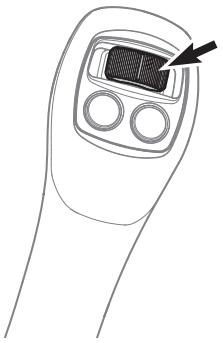


Figure 93 DS1601529

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.

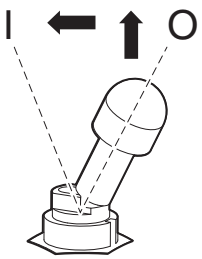
Unapproved attachments can cause death or serious injury.

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.*



DS1903332

Figure 94

4. Quick coupler symbols and warning messages appear in the multifunction display screen and a warning buzzer will sound.

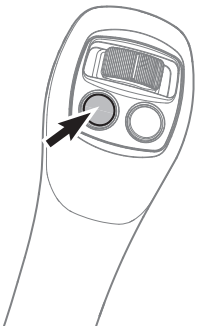
   NOTE: *When the quick coupler switch is kept in the "I" (release) position, a warning pop-up appears and a warning buzzer sounds.*

   NOTE: *The warning buzzer continues to sound until the quick coupler is locked again after being released.*

DS1903347

Figure 95

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 96 and type of installed joystick.



DS2100514

Figure 96

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

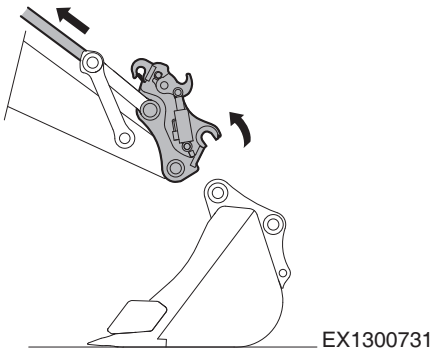
Figure 97

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

WARNING

AVOID DEATH OR SERIOUS INJURY

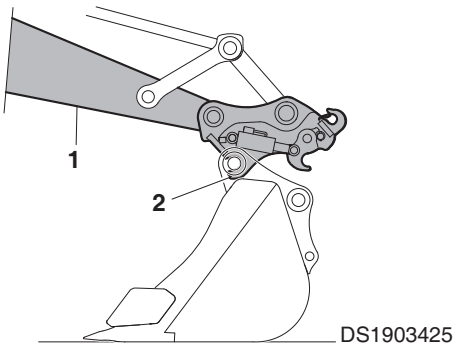
Keep attachment close to ground during engaging or releasing attachment. Attachment can fall off without warning if not "FULLY ENGAGED AND LOCKED" causing death or serious injury.



EX1300731

Figure 98

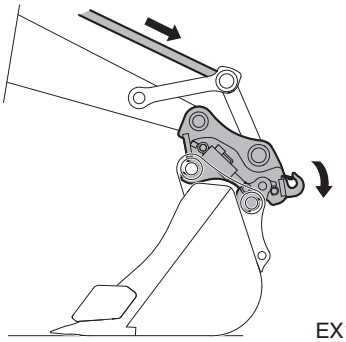
8. Move the arm (1) and raise it until hook (2) engages the upper pin or interface of attachment.



DS1903425

Figure 99

9. With the bucket crowded, engage the quick coupler to the lower attachment pin or interface.

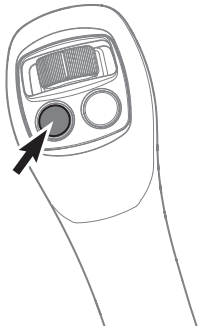


EX1400299

Figure 100

10. To lock the quick-coupler, press the button of the right joystick according to Figure 101 and type of installed joystick.

    NOTE: *The driver does not need to keep the button pressed.*



DS2100516

Figure 101

11. The warning message in the multifunction display is changed, and the quick coupler begins to lock.

DS1903349

Figure 102

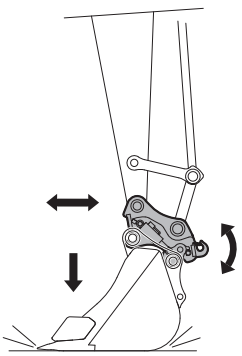
12. When the quick coupler is locked, the warning pop-up changes and the warning buzzer stops.

    NOTE: *The warning pop-up disappears automatically after remaining on the screen for a moment.*

DS1903350

Figure 103

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.



DS1903339

Figure 104

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.

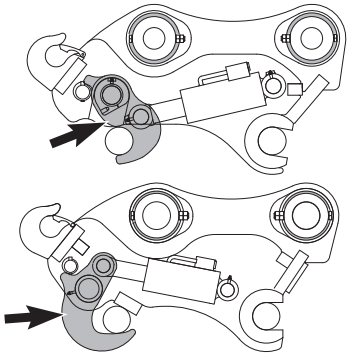


Figure 105

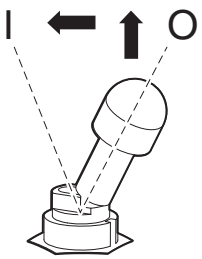
To Release Attachment

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.*



DS1903332

Figure 106

4. Quick coupler symbols and warning messages appear in the multifunction display screen and a warning buzzer will sound.

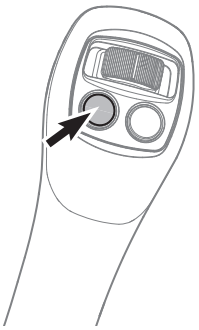
   NOTE: *When the quick coupler switch is kept in the "I" (release) position, a warning pop-up appears and a warning buzzer sounds.*

   NOTE: *The warning buzzer continues to sound until the quick coupler is locked again after being released.*

DS1903347

Figure 107

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 108 and type of installed joystick.



DS2100514

Figure 108

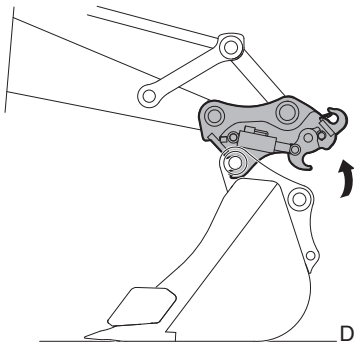
6. The warning message in the multifunction display is changed, and the quick coupler lock is released.

   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

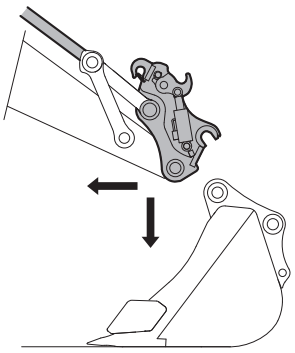
Figure 109

7. Retract the bucket cylinder to move the quick coupler toward the machine.



DS1903427

Figure 110

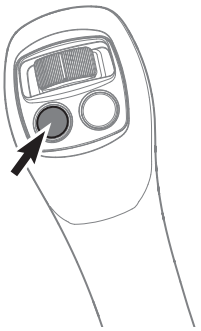


DS1903340

Figure 111

8. To lock the quick-coupler, press the button of the right joystick according to Figure 112 and type of installed joystick.

   NOTE: *The driver does not need to keep the button pressed.*



DS2100516

Figure 112

9. The warning message in the multifunction display is changed, and the quick coupler begins to lock.

DS1903349

Figure 113

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 114

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.

WARNING

AVOID DEATH OR SERIOUS INJURY

To prevent tipping or rollover when handling heavy loads, the ram lock switch must be in the "LOCKED" position.

When this machine is used in object handling applications, the machine must be properly configured and operated properly. Ensure the following safety working devices equipped and operated.

- 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.

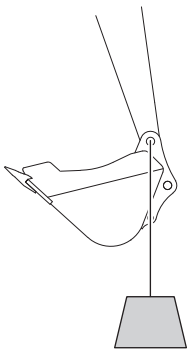
Always try to maintain the lifting eye (Figure 115) straight below the centerline of the arm and bucket pin. In this manner the weight of the load is being primarily held only by the pin, and not by the bucket cylinder, link, and link pins.

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 most stable position is over the corner of the machine.

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

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



EX1300739

Figure 115

Lifting Objects with Quick Coupler

The lifting point capacity (1, Figure 116) 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.

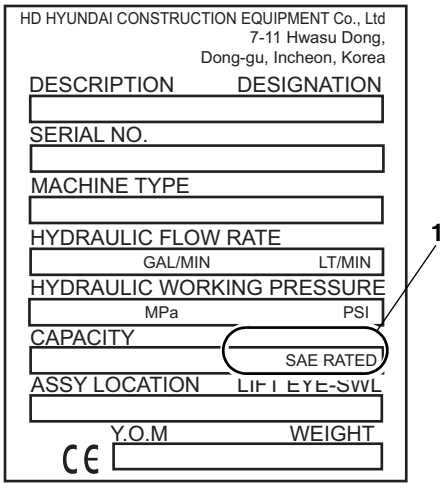


Figure 116

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 116) and in the Quick Coupler Operation & Maintenance Manual.

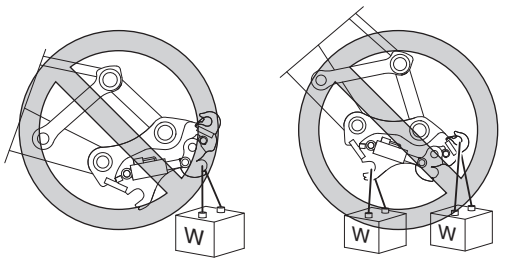
WARNING

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.

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 117).



EX1402192

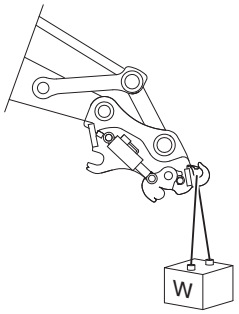
Figure 117 Wrong Lifting Procedure

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 118).

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.



EX1402193

Figure 118 Correct Lifting Procedure

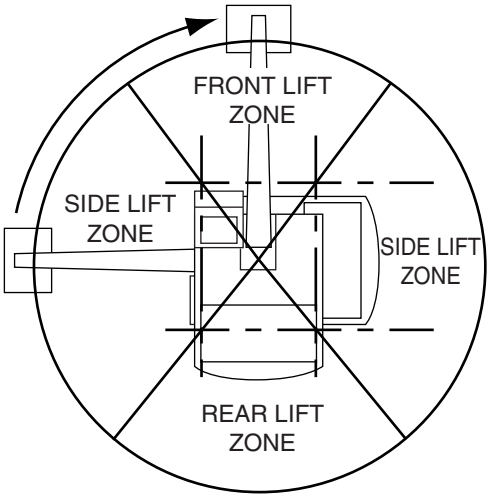
Lifting Unknown Weight

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 LOAD RATING CHART 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.



FG006217

Figure 119

Lifting Known Weight

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

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.

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.

Windshield Washer Fluid

Use automobile window washer fluid, and be careful not to let any dirt get into it.

Fresh and Clean Lubricants

Use clean oil and grease. Keep containers of oil and grease containers clean and keep foreign materials away.

Check Drained Oil and Used Filter

After oil is changed or filters are replaced, check oil and filters for metal particles and foreign materials. If large quantities of metal particles or foreign materials are found, take corrective action.

Fuel Strainer

If your machine is equipped with a fuel strainer, do not remove it while fueling.

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 4-109.

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?

Breather

Before initial operation and when changing the oil within the oil change interval, clean breather and check its operability.

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

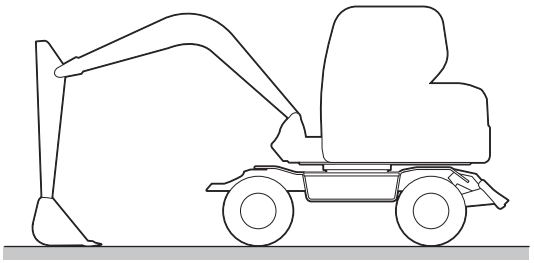
Before beginning any service work, park the machine using the following procedure (except for service work requiring the machine to be positioned differently).

1. Park machine on firm and level ground. Lower bucket or attachment to ground.
2. "LOWER" dozer blade to ground, if equipped.
3. Set parking brake switch to "I" (APPLIED) position.
4. Move safety lever to "LOCK" position.
5. 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.
6. Stop engine by turning key to "O" (OFF) position. After releasing hydraulic system and tank pressure.
7. Before starting maintenance work, place a "DO NOT OPERATE" Warning Tag on cabin door or work lever.

WARNING

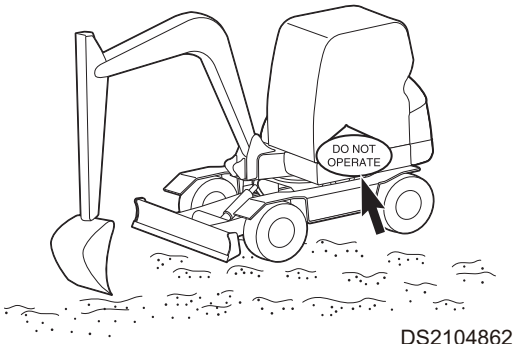
AVOID DEATH OR SERIOUS INJURY

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.



DS2104705

Figure 1



DS2104862

Figure 2

Maintenance Handling Access

Entering/Leaving/Climbing On Machine

WARNING

AVOID DEATH OR SERIOUS INJURY

Do not jump ON/OFF a machine. Never get ON/OFF when the machine is running.

Never grasp control lever to get ON/OFF.

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

Use three-point grip, i.e. two hands and one foot or two feet and one hand.

Always face machine.

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

Clean your boots and wipe your hands before getting on the machine. Always wear proper footgear.

Do not use hand grip (A) of cabin door as a support when entering, leaving or climbing the machine. It is not strong enough to be used as a support. It should only be used for closing the door.

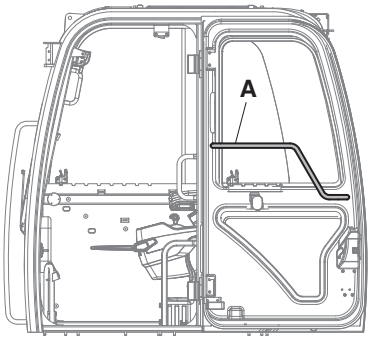


Figure 3 EX1502675

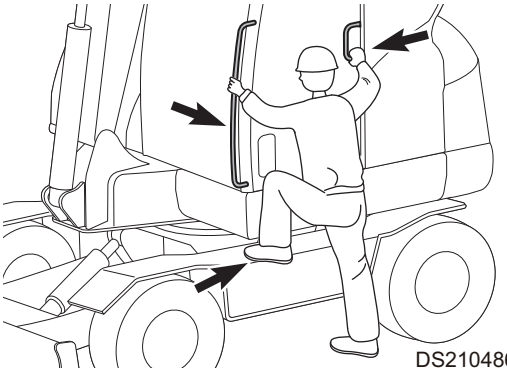


Figure 4 DS2104863

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 Ameraica (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 levels 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.

DEF (AdBlue®)

- Use the AdBlue indicated at DIN 70070.
- DEF (AdBlue®) is a harmless, colorless and odorless liquid.
- The freezing point of DEF is -11°C (12.2°F). Because the volume of DEF (AdBlue®) may expand about 9% when it is frozen, it's recommended to leave 10% of the total volume of the tank empty after filling.
- DEF (AdBlue®) may have a foul odor if the temperatures of the DEF (AdBlue®) is high.
- HD HYUNDAI CONSTRUCTION EQUIPMENT recommends that temperature of the DEF (AdBlue®) is between 4°C (39°F) to 60°C (140°F).
- If the temperature rises above 60°C (140°F), the DEF (AdBlue) concentration might be high because of the evaporation.
- In the worst case, the circulation line of DEF (AdBlue®) might be clogged by the DEF (AdBlue®) crystallization.

Non-permitted Container Materials for Storing DEF (AdBlue®)
Materials forming compounds because of reaction with ammonia, which may negatively interfere with the SCR system: carbon steels, zinc coated carbon steels, mild iron
Non ferrous metals and alloys (copper, copper alloys, zinc, lead)
Solders containing lead, silver, zinc or copper
Aluminium, aluminium alloys
Magnesium, magnesium alloys
Plastics or metals coated with nickel

Allowable DEF (AdBlue®) Storage Days	
Constant Ambient Storage Temperature °C (°F)	Minimum Shelf Life (months)
10 (50)	36
25 (77)	18
30 (86)	12
35 (95)	6

Engine Oil

HD HYUNDAI CONSTRUCTION EQUIPMENT engine oils have been developed and tested to provide the full performance and life that has been designed and built into HD HYUNDAI CONSTRUCTION EQUIPMENT engines.

HD HYUNDAI CONSTRUCTION EQUIPMENT engine oils that meet API CJ-4 are required for use as explained below.

These chemical limits are designed to maintain the expected aftertreatment device list, performance, and service interval.

If oils meeting the API CJ-4 specifications are not available, oils meeting ACEA E9 may be used.

ACEA E9 oils meet the chemical limits designed to maintain aftertreatment device life.

Failure to meet the listed requirements will damage aftertreatment-equipped engines and can negatively impact the performance of the aftertreatment devices.

The cost of repairs caused by improper engine oils will not be covered by the HD HYUNDAI CONSTRUCTION EQUIPMENT warranty for your machine.

Other systems may apply.

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 using HD HYUNDAI CONSTRUCTION EQUIPMENT coolant, there is no need to use a corrosion resistor. For details, see "Engine Cooling System" on page 4-95.
- 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 4-95 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 4-97.
  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 4-16.

  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 fan belt tension, 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 "12V Power Socket" on page 2-11.

  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 CJ-4/ACEA-E9 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 4-16 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 inside of the cabin door. The symbols used in the lubrication and service chart are illustrated in the following table.

Symbol	Description
	Lubrication
	Gear Oil (Transmission)
	Engine Oil
	Engine Oil Filter
	Hydraulic Oil
	Hydraulic Oil Filter
	Hydraulic Oil Tank Breather
	Coolant
	Breather Oil Separator Filter
	Air Cleaner Filter
	Fuel Filter

Symbol	Description
	Water Separator
	Air Conditioner Filter
	Drain Water
	Fuel Cap Filter
	Level Check
	Pre Cleaner
	Axle Oil
	DPF Soot Filter
	DEF (AdBlue®)
	DEF (AdBlue®) Filter
	DEF (AdBlue®) Breather Filter

Lubrication and Service Chart

SERVICE DATA														
No.	**Items to Check**		**Service**	**Qty.**	**Service Interval (hr)**								
					10	**50**	**150**	**250**	**500**	**1000**	**2000**	**4500**	**5000**
1	Arm, Bucket Joint Pin		Grease	5	F100	W10							
2	Boom Swing Bracket Pin		Grease	2	F100	W10							
3	Undercarriage Attachment Pin		Grease	8	F100	W10							
4	Front Axle Trunnion Bushing		Grease	2	F	W10							
5	Swing Bearing		Grease	1		W10							
6	Boom, Arm Joint Pin	Upper	Grease	7	F100			W10					
		Lower	Grease	6	F100			W10					
7	Boom Swing Cylinder Pin		Grease	2	F100			W10					
8	Engine Oil		Engine Oil	12.6 L	V								
9	Axle Steering Knuckle	Front	Grease	4					W10				
		Rear (Opt)	Grease	4					W10				
10	Driveshaft		Grease	3					W10				
11	Engine Oil Filter		Cartridge	1									
12	Pinion Gear (Swing)		Grease	1									
13	Main Fuel Filter		Cartridge	1	D,V								
14	Pre Fuel Filter & Water Separator		Cartridge	1	D,V								
15	Swing Reduction Gear		Grease	1									
			Gear Oil	1.5 L	V				F				
16	Transmission		T/M Oil	1.6 L			F						
17	Axle Case (Front)		Gear Oil	7.5 L			F						
18	Axle Case (Rear)	2 Wheel Steer	Gear Oil	8.1 L			F						
		4 Wheel Steer	Gear Oil	6.8 L			F						
19	Hub Reduction Gear Case		Gear Oil	2 x 0.8 L			F						
20	Hydraulic Oil Return Filter		Element	1				F					
21	Pilot Filter		Element	1				F					
22	Brake Filter		Element	1				F					
23	Air Conditioner Filter		Element	2					C				
24	Hydraulic Oil Tank Breather Filter*		Element	1									
25	Fuel Cap Filter		Element	1									
26	Radiator		Coolant	16 L	V								
27	Hydraulic Oil Tank		Hydraulic Oil	94 L	V								
28	Air Cleaner	Outer	Element	1					C				
		Inner	Element	1									
29	DEF (AdBlue®) Main Filter		Element	1									
30	DEF (AdBlue®) Breather Filter		Element	1									

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"*

*: When the machine is operated under dusty work sites, the air breather filter needs to be cleaned or replaced regularly even before the expected replacement date.

SERVICE DATA												
No.	**Items to Check**	**Service**	**Qty.**	**Service Interval (hr)**								
				10	**50**	**150**	**250**	**500**	**1000**	**2000**	**4500**	**5000**
31	Fuel Tank	Diesel	145 L	V	D							
32	DEF (AdBlue®) Tank	DEF	20 L	V								
33	Hydraulic Oil Suction Filter	Strainer	1						C			
34	DPF	Soot Filter	1									C
	Radiator Core	Clean	1					C				
	Oil Cooler Core	Clean	1					C				
	Fuel Cooler Core	Clean	1					C				
	Intercooler Core	Clean	1					C				
	Aircon Condenser Core	Clean	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"*												
*****: When the machine is operated under dusty work sites, the air breather filter needs to be cleaned or replaced regularly even before the expected replacement date.												

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.			

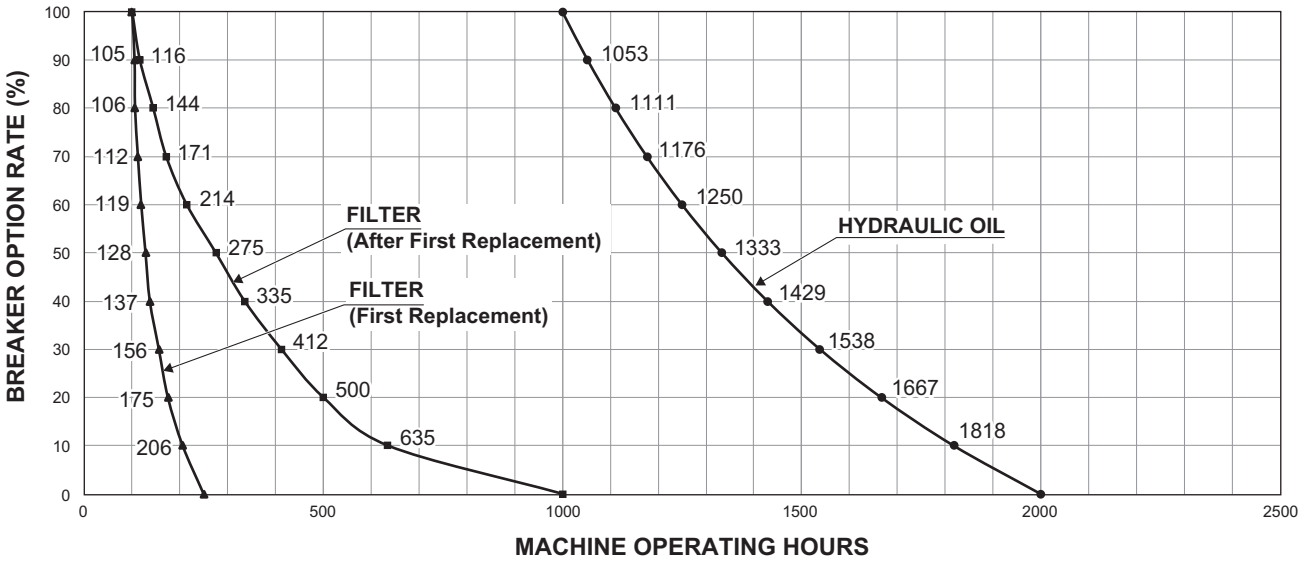


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Figure 5

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	12.6 L (3.3 U.S. gal.)
	Cooling System	16 L (4.2 U.S. gal.)
Fuel Tank		145 L (38.3 U.S. gal.)
DEF (AdBlue®) Tank		20 L (5.3 U.S. gal)
Hydraulic Oil	Tank Level	94 L (24.8 U.S. gal.)
	System	238 L (62.9 U.S. gal.)
Transmission		1.6 L (0.4 U.S. gal.)
Swing Reduction Gear		1.5 L (0.4 U.S. gal.)
Axle	Front Case	7.5 L (2.0 U.S. gal.)
	Front Hub Reduction Gear	2 x 0.8 L (2 x 0.2 U.S. gal.)
	Rear Case	2 Wheel Steer: 8.1 L (2.1 U.S. gal) 4 Wheel Steer: 6.8 L (1.8 U.S. gal)
	Rear Hub Reduction Gear	2 x 0.8 L (2 x 0.2 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" 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	[2]SAE 5W-40 SAE 10W-30 [3]SAE 10W-40 [4]SAE 15W-40
Hydraulic Oil Tank	[6]Hydraulic Oil	ISO VG 15 ISO VG 32 ISO VG 46 ISO VG 68
Fuel Tank	Diesel Fuel	[1]ASTM D975 No. 2 ASTM D975 No. 1

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
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.
Transmission	Gear Oil	**[1]SAE 80W-90 API GL5**
Axle Hub and Differential	Gear Oil	**SAE 90** **[1]SAE 80W-90** **SAE 140**

[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 Europens 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.

NOTICE

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

** These checks need to be completed by an authorized HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.

10 Hour / Daily Service

All Tires for Correct Tire Pressure and Signs of Damage or Abnormal Wear - Inspect

Inflate tires to proper operating pressure for working conditions. Refer to "Tire Changing Procedure" for more information.

Boom, Arm and Front Attachment Pins - Lubricate

Grease every 10 hours for first 100 hours and every 50 or 250 hours thereafter.

NOTE: *If the unit has been running or working in water must be greased daily or every 10 hours.*

Undercarriage Attachment Pins - Lubricate

Grease every 10 hours for first 100 hours and every 50 hours thereafter.

NOTE: *If the unit has been running or working in water must be greased daily or every 10 hours.*

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 (2) and wipe the oil off with a clean cloth.
3. Insert dipstick fully in oil gauge tube, then take it out again.

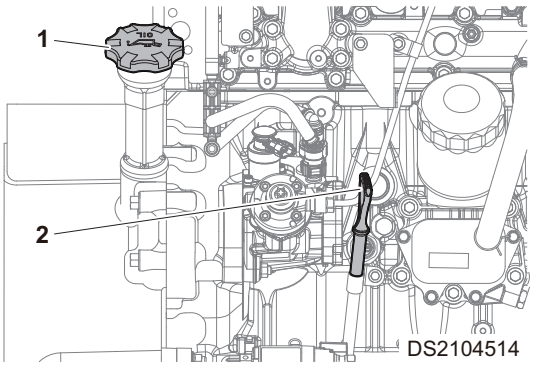

Figure 6

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 (1), if the oil level is below the "LOW" mark.

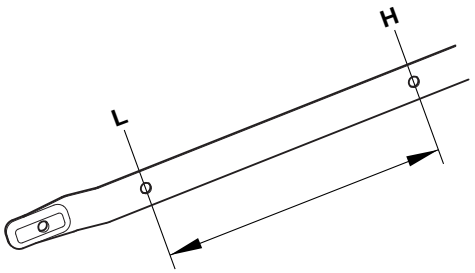

Figure 7

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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.

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Figure 8

1. Park machine on firm and level ground. Lower boom and position bucket on ground as shown in Figure 9.
2. Move engine speed to "LOW IDLE".

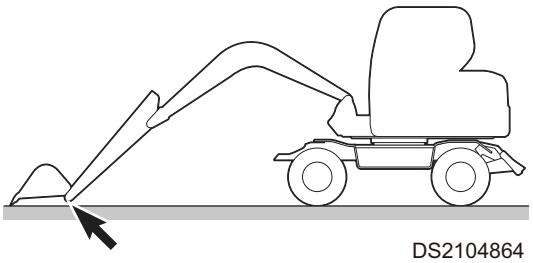

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Figure 9

3. Move safety lever to "LOCK" position.
4. Have a second person, check hydraulic oil level gauge on the right side of the hydraulic oil tank. Oil level must be between marks on sight gauge.

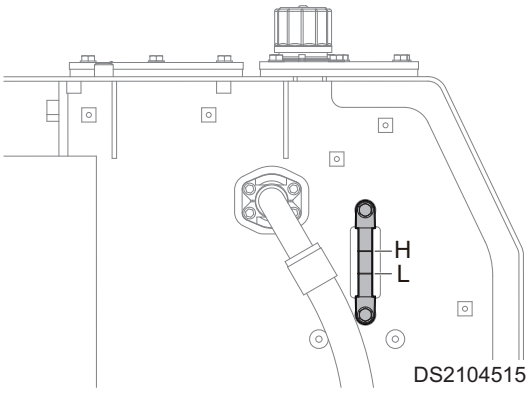

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Figure 10

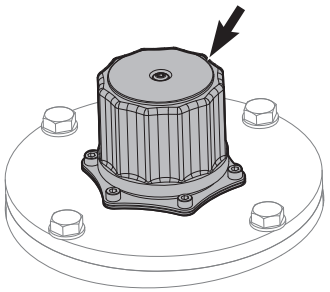
5. If the level is below "L" mark add oil.

   A. Stop engine.

   B. 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.



EX1502679

Figure 11

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.

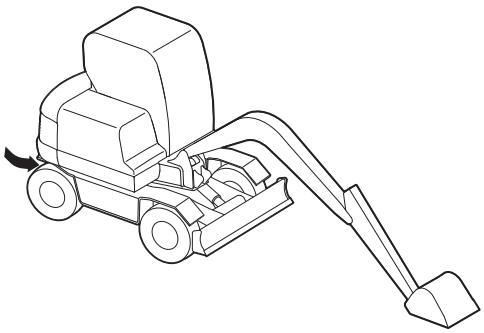
   A. Stop engine and wait for the hydraulic oil to cool down.

   B. Drain the excess oil from drain plug at the bottom of the tank into an approved container, using a hose at the point (plug).

NOTICE

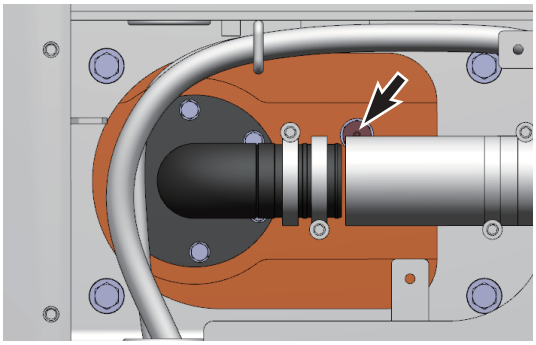
Dispose of waste oil/liquids in compliance with all applicable environmental laws and regulations.

Disconnect the drain hose and install the protecting cap.



DS2104865

Figure 12



DS2104516

Figure 13

Fuel Level - Check

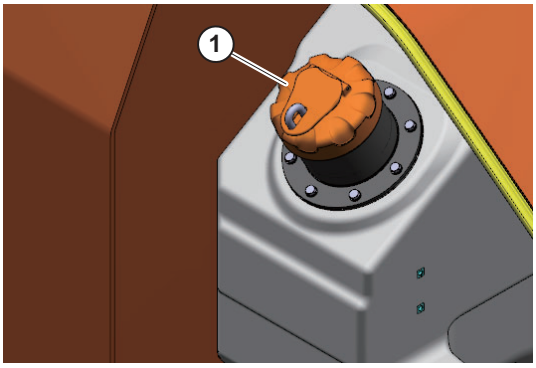
WARNING

AVOID DEATH OR SERIOUS INJURY

Use extreme safety precautions while refueling to prevent explosions or fire.

Immediately clean up any spilled fuel.

1. At end of each workday, fill fuel tank. Add fuel through fuel fill tube (1). 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.



DS2104517

Figure 14

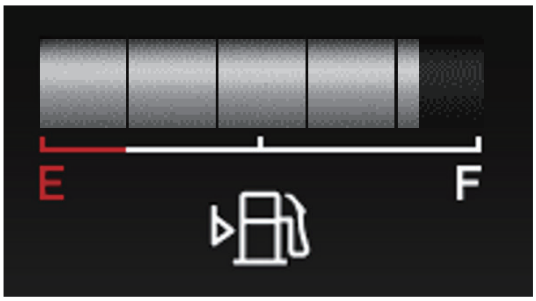
3. Check the amount of fuel in the tank by fuel gauge of gauge panel.

   NOTE: *Refer to "Fluid Capacities" for more information.*
4. The excavator may be equipped with the optional battery operated fuel fill pump. 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: *Refer to "Fuel Transfer Pump (If Equipped)" for more information.*
5. Do not overfill the tank.
6. Securely tighten cap after fueling.

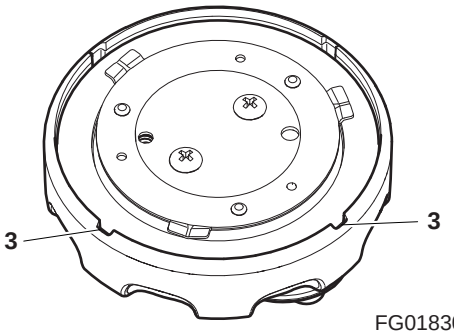
   NOTE: *If breather holes (3) in cap are clogged, a vacuum may form inside the tank preventing proper fuel flow to engine. Keep holes in fuel cap clean.*

   NOTE: *Be careful not to damage the fuel level gauge on the fuel tank by allowing it to becoming stained from thinner or oil.*



DS2100539

Figure 15



FG018302

Figure 16

DEF (AdBlue®) Tank Level - Check

1. At end of each workday, fill DEF (AdBlue®) tank. Add the DEF (AdBlue®) through DEF (AdBlue®) fill cap (1).

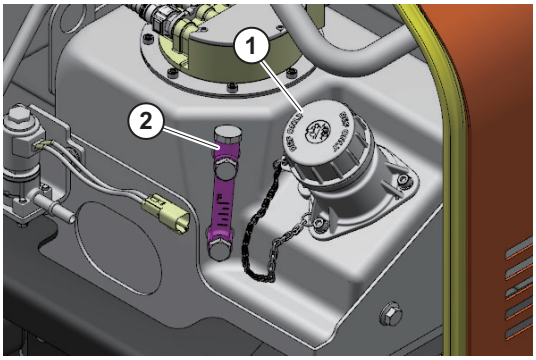
   NOTE: *Inject until the DEF level gauge (2) reaches the "F" line.*

NOTICE

Do not let impurities get in when storing or adding DEF (AdBlue®).

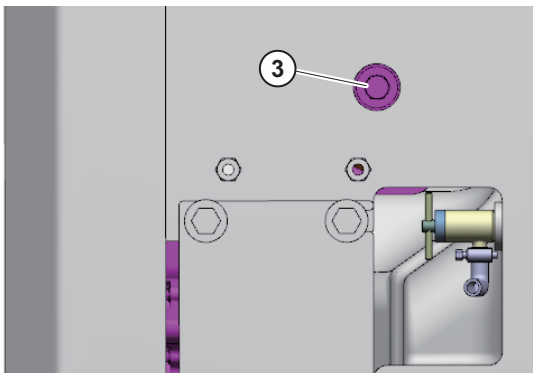
If impurities get in the tank, drain all DEF (AdBlue®) through the drain port at the bottom of the DEF tank (3).

2. Securely tighten cap after filling.



DS2104518

Figure 17



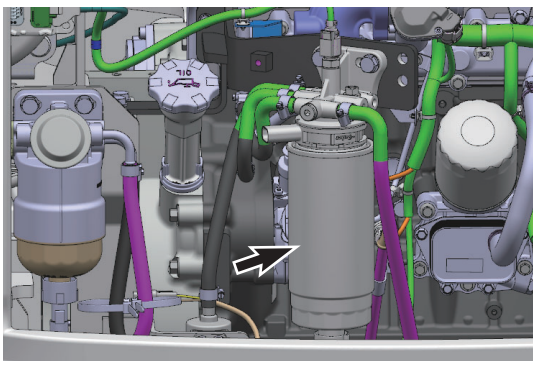
DS2104519

Figure 18

Main Fuel Filter - Check

NOTE: *If water in fuel warning symbol on display monitor comes "ON", drain the collected water in main fuel filter and fuel prefilter.*

1. A main fuel filter (water separator) is inside the engine compartment.
2. Open the bonnet.
3. Turn the cock valve to "CLOSE" position.



DS2104520

Figure 19

4. Drain water or sediment by opening drain valve (1) on bottom of filter.

   NOTE: *Dispose of drained fluids in compliance with all applicable environmental regulations.*

5. Close drain valve.
6. Turn the cock valve to "OPEN" position.

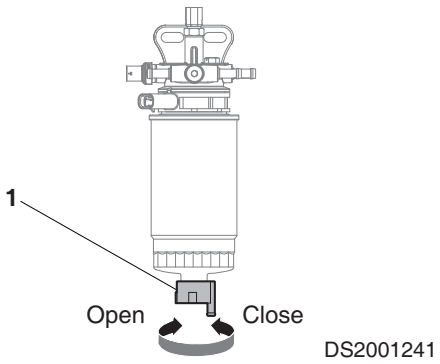


Figure 20

Pre Fuel Filter and Water Separator - Check

NOTE: *If water in fuel warning symbol on display monitor comes "ON", drain the collected water in fuel prefilter.*

1. A fuel prefilter is inside the engine compartment.
2. Open the bonnet.
3. It is necessary to drain collected water if bowl is full of water or sediment.
4. Turn the cock valve to "CLOSE" position.

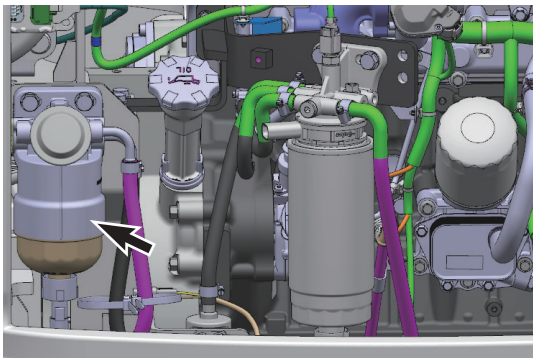


Figure 21

5. Position a small container under fuel prefilter. Drain water or sediment by opening drain valve (2) on bottom of bowl (1).

   NOTE: *Dispose of drained fluids in compliance with all applicable environmental regulations.*

6. Close drain valve.
7. Turn the cock valve to "OPEN" position.

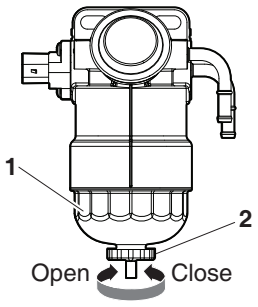


Figure 22

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 inspection, port plug, etc., loosen the plug slightly to allow pressurized air to escape.

NOTE: *When checking level, use a dipstick and always remove and wipe it clean before making final level check.*

1. Remove dipstick (1, Figure 23) and wipe the oil from the dipstick with a cloth.
2. Insert dipstick (1, Figure 23) fully into dipstick tube.
3. When dipstick is pulled out, oil level must be between "HIGH" and "LOW" marks on dipstick.

   NOTE: *If oil is above "HIGH" mark on dipstick, some must be drained to proper level.*
4. If the oil does not reach the "L" mark on the dipstick, add oil through fill port (2, Figure 23).

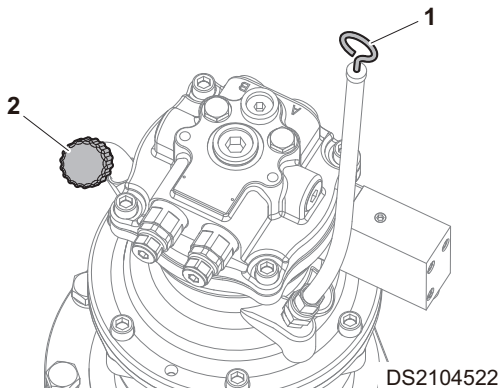


Figure 23

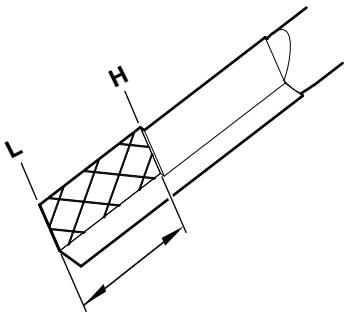


Figure 24

5. If the oil level exceeds the "H" mark on the dipstick, release the drain plug (3, Figure 23). Drain the excessive oil into an approved container.

   NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*

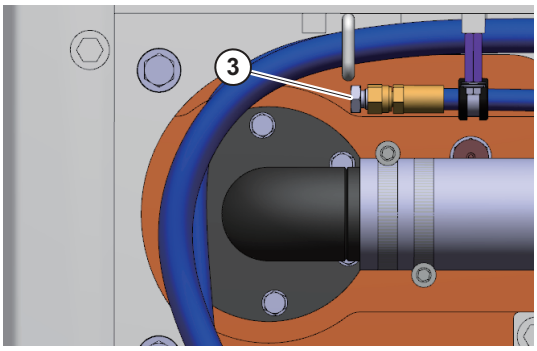


Figure 25

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.

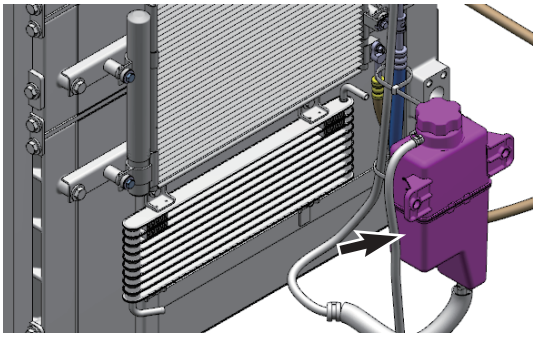
Radiator cleaning is performed while the engine is running. Lock out and tag the controls alerting personnel that service work is being performed. Do not remove radiator cap unless it is required. Check the coolant level in the coolant recovery tank.

NOTE: *Do not mix ethylene glycol and propylene glycol anti-freeze together.*
See "Engine Cooling System" and "Types of Anti-freeze" page for further details.

1. When the engine is cold, check the coolant level inside the surge tank. Refer to coolant concentration table.
2. Check to make sure that coolant transfer line from the surge tank to the radiator and the engine water pump are 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.

   NOTE: *When refill or replace coolant, select "heater-full hot" mode to fully open the water valve.*

   Coolant will then flow into the heater's core to prevent air from being trapped in it.



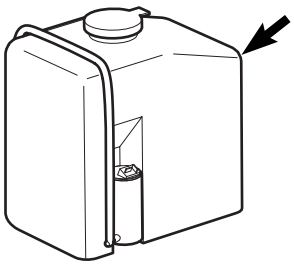
DS2104524

Figure 26

Check Level of Window Washer Liquid

1. Open battery room cover 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.*



FG020184

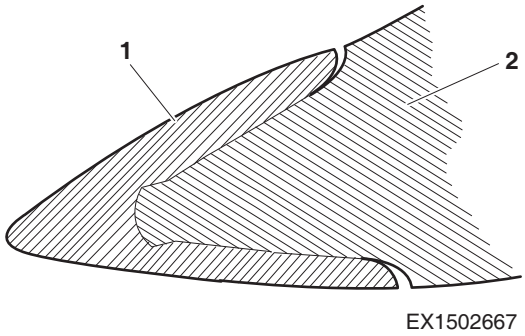
Figure 27

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.

   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



EX1502667

Figure 28

Cooling Fan - Inspect

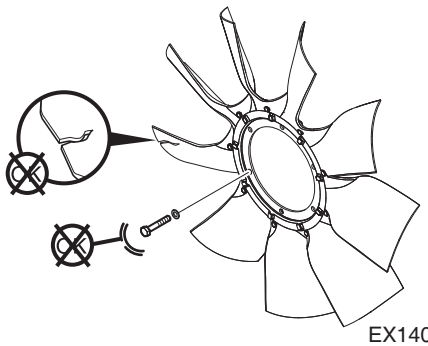
WARNING

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.*

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.



EX1404482

Figure 29

Air Intake System and Emission Control System - Check

WARNING

AVOID DEATH OR SERIOUS INJURY

Hot engine components can cause burns.

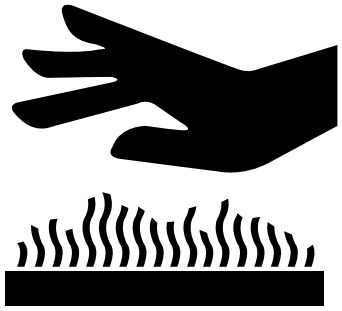
Avoid contact with hot engine components

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 amount of dust accumulated inside the pre cleaner.
4. Check the exhaust pipe and several exhaust system components, and check the V-clamp tightness to prevent leaking gases.
5. 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.



HAOA050L

Figure 30

Seat Belt - Inspect

Refer to "Seat Belt" for more information.

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 pilot cutoff switch 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.

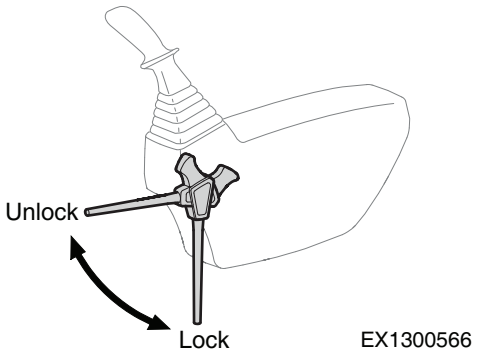


Figure 31

WARNING

AVOID DEATH OR SERIOUS INJURY

The PILOT CUTOFF SWITCH (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 Pilot Cutoff Switch

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.*
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. 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.

7. Lower work group to the ground and stop engine.

NOTE: *If the PILOT CUTOFF SWITCH (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, Display Monitor - 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.

Pipes and Heses - Check

1. Check hoses that carry brake fluid to wheel brakes. Also check hoses that carry hydraulic fluid to steering cylinders.
2. The best way to maintain proper braking and steering operation and to maintain maximum performance is to check hoses regularly. If any brake or steering hoses become damaged, replace them immediately.

AVM (Around View Monitoring System) (If Equipped) - 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.

Boom Swing Bracket - Lubricate

Grease every 10 hours for first 100 hours and every 50 hours thereafter.

Boom Swing Cylinder Pin - Lubricate

Grease every 10 hours for first 100 hours and every 250 hours thereafter.

Front Axle Trunnion Bushing - Lubricate

Grease first 10 hours and every 50 hours thereafter.

Brake System - Test

WARNING

AVOID DEATH OR SERIOUS INJURY

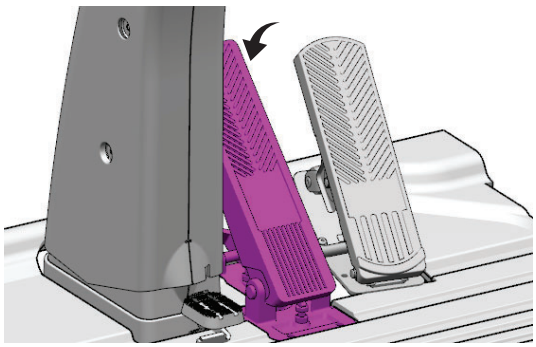
- **Fasten your seat belt when testing the brake system.**
- **Park the machine on firm and level ground.**
- **Check the area around the machine to ensure it is clear of all personnel and bystanders.**

The following tests are used to determine whether the braking system is functional. These tests are not intended to measure the maximum brake holding effort. The required brake holding effort for sustaining a machine at a specific engine rpm varies from one machine to another. The variations include differences in the engine setting, the power train, etc.

Service Brake Test

Refer to "Operating Controls" for more information.

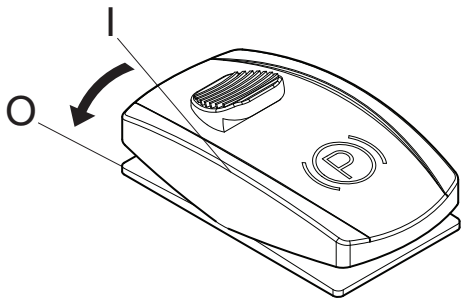
1. Start the engine. Raise the work equipment so it is about 400 mm above the ground.
2. Move the machine to a flat and level area.
3. Apply the service brake.



DS2001462

Figure 32

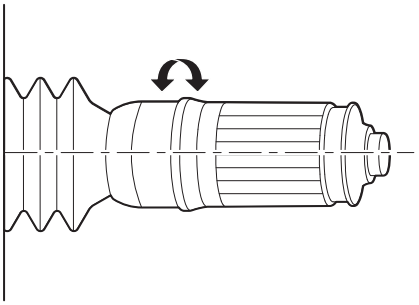
4. Release the parking brake.



DS2001452

Figure 33

5. With the service brake applied, change the transmission lever to the highest forward gear.



DS2001453

Figure 34

6. With the service brake still applied, gradually increase the engine speed to high idle. The machine should not move.

WARNING

AVOID DEATH OR SERIOUS INJURY

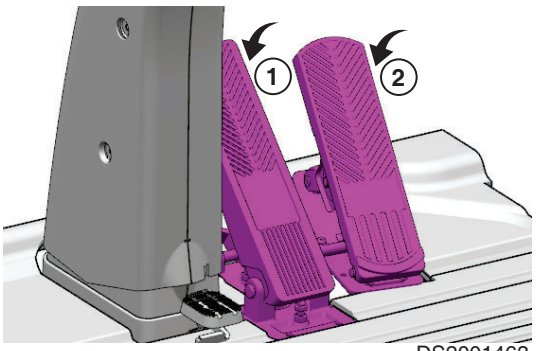
If the machine begins to move during the test, reduce the engine speed immediately and engage the parking brake.

7. Reduce the engine speed to low idle. Move the transmission lever or switch to the neutral position. Engage the parking brake. Lower the work equipment to the ground.
8. Stop engine.

NOTICE

If the machine moved during the test, contact your dealer for a brake inspection.

Make any necessary repairs before the machine is returned to operation.



DS2001463

Figure 35

1. Brake Pedal
2. Accelerator Pedal

Parking Brake Test

Refer to "Operating Controls" for more information.

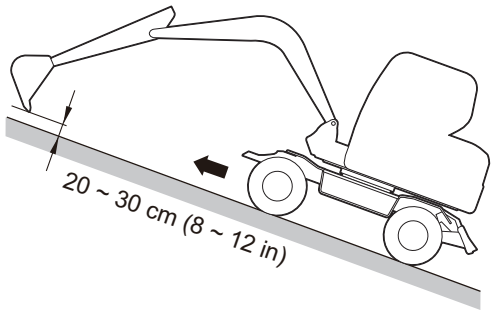
1. Start the engine.
2. Attach the heaviest approved attachment.
3. Move the machine to an area with a dry, hard surface with a slope equivalent to the maximum authorized slope on the work site where the machine will be operated.

WARNING

AVOID DEATH OR SERIOUS INJURY

- **Perform the test if there is no problem with braking by the service brake.**
- **For safety, do not test on steep slopes that exceed Maximum Gradeability.**
- **Keep the front of the machine uphill.**
- **Do not exceed rated operating capacity.**
- **Check for adequate traction.**

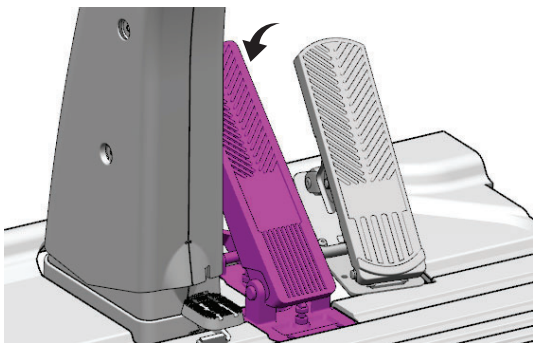
4. Drive the machine up the incline with the front of the machine facing uphill.



DS2104866

Figure 36

5. Apply the service brake.



DS2001462

Figure 37

6. Engage the parking brake. The parking brake indicator light must be illuminated on the dash.

7. Release the service brake. The machine should not move.

WARNING

AVOID DEATH OR SERIOUS INJURY

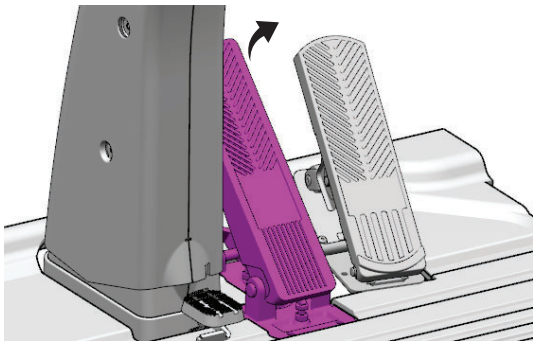
If the machine begins to move, immediately reapply the service brake.

8. Apply the service brake and release the parking brake. Move the machine to a flat area.
9. Reduce the engine speed to low idle. Move the transmission lever or switch to the neutral position. Engage the parking brake. Lower the work equipment to the ground.
10. Stop engine.

NOTICE

If the machine moved during the test, contact your dealer for a brake inspection.

Make any necessary repairs before the machine is returned to operation.



DS2001464

Figure 38

50 Hour / Weekly Service

Perform All Daily Service Checks

Arm and Bucket Joint Pins - Lubricate

Grease every 10 hours for first 100 hours and every 50 hours thereafter.

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.

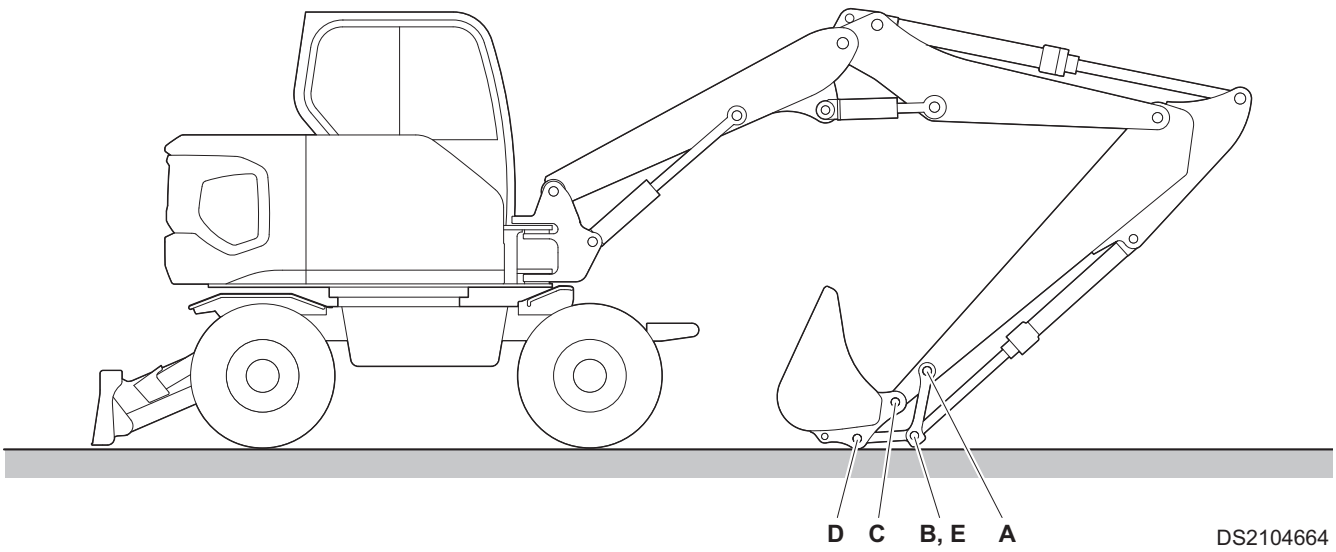


Figure 39

Reference Number	Description
A	Arm Link Joint Pin (1 Point)
B	Link Joint Pin (1 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 (1 points)

C. Arm bucket joint pin (1 point)

D. Bucket link joint pin (1 point)

E. Bucket cylinder rod pin (1 point)

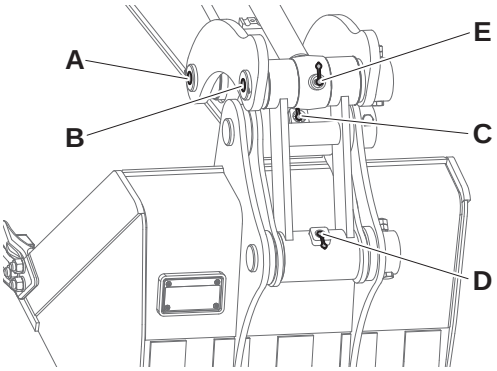


Figure 40 EX1502776

Dozer Blade Pin - Lubricate

WARNING

AVOID DEATH OR SERIOUS INJURY

Lower dozer blade to the ground to avoid death or serious injury when working on blade.

NOTE: *Grease dozer blade every 10 hours during initial break-in period of 100 hours. After break-in period grease it every 50 hours thereafter.*

NOTE: *In case of performing work underwater, grease it per 10 hours irrespective of elapsed period.*

1. Lower dozer blade to the ground.
2. Inject grease at using grease gun.
3. After greasing, clean off the old grease that has been purged.

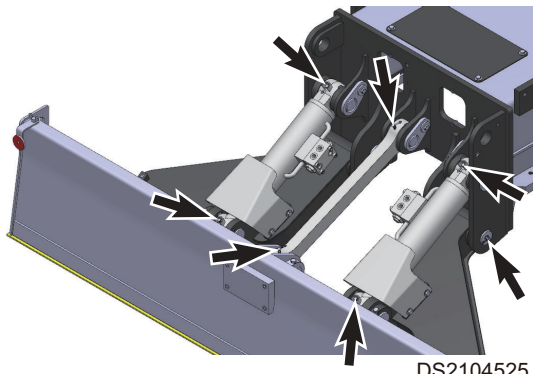


Figure 41 DS2104525

Outrigger Pin - Lubricate

Grease every 10 hours for first 100 hours and every 50 hours thereafter.

NOTE: *If the unit has been working in water the must be lubricated daily or every 10 hours.*

1. lower the outrigger legs to the ground and stop engine.
2. Press the grease fitting and inject grease with the grease gun on the marked points.
3. Inject grease at 4 points per outrigger cylinder (8 points total) using grease gun.
4. After greasing, clean off the old grease that has been purged.

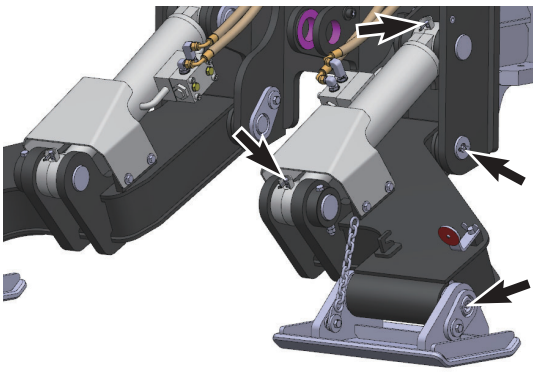
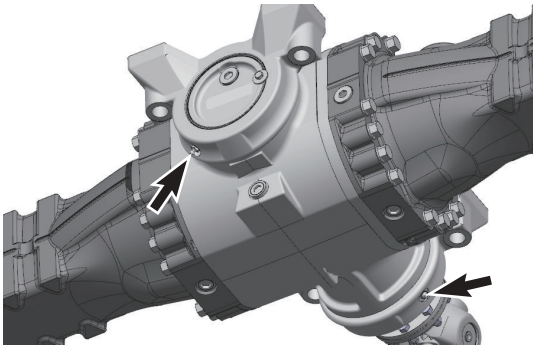


Figure 42 DS2104526

Front Axle Trunnion Bushing - Lubricate

NOTE: *If the unit has been running or working in water the front attachment must be greased daily or every 10 hour.*

1. Lower the front attachment to ground.
2. Press the grease fitting and inject grease with the grease gun on the marked point.
3. After greasing, clean off the old grease that has been purged.

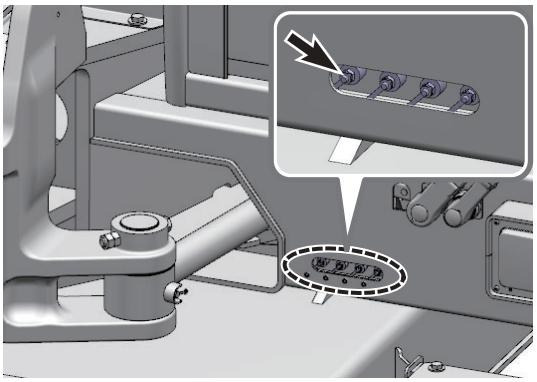


DS2104527

Figure 43

Swing Bearing - Lubricate

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Do not over lubricate.
3. After greasing, clean off the old grease that has been purged.



DS2104528

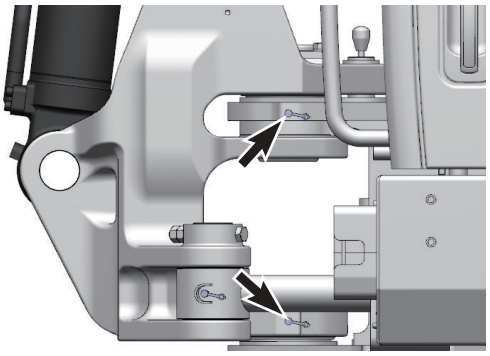
Figure 44

Boom Swing Bracket - Lubricate

Grease every 10 hours for first 100 hours and every 50 hours thereafter.

NOTE: *If the unit has been running or working in water the front attachment must be greased on a 10 hour/daily basis.*

1. Lower the front attachment to ground.
2. Press the grease fitting and inject grease with grease gun on the marked points. After injection, clean off the old grease that has been purged.



DS2104529

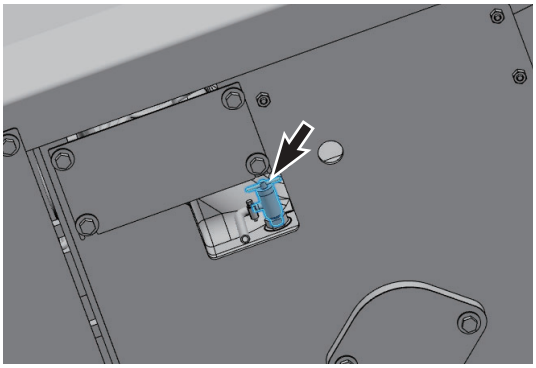
Figure 45

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.*



DS2400307

Figure 46

Engine Fan Belt - Check

Inspect after first 50 hours of operation and every 250 hours thereafter. Refer to "Engine Fan and Alternator Belts - Check" for more information.

All Nuts and Bolts - Inspect

All nuts and bolts must be inspected after first 50 hours of operation. There after every 250 hours.

150 Hour / 3 Week Service

Perform All 10 Hours/Daily and 50 Hour Service Checks

Front/Rear Axle Case Oil - Change

The front/rear axle case oil must be drained and refilled after the first 150 hours of operation or rebuild, and every 1,000 hours thereafter.

Hub Reduction Gear Oil - Change

The hub reduction gear oil must be drained and refilled after the first 150 hours of operation or rebuild, and every 1,000 hours thereafter.

Transmission Fluid - Change

The transmission fluid must be drained and refilled after the first 150 hours of operation and at every 1,000 hours thereafter.

250 Hour / Monthly Service

Perform All Daily and 50 Hour Service Checks

Boom and Arm Joint Pins - Lubricate

Grease every 10 hours for first 100 hours and every 250 hours thereafter.

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.

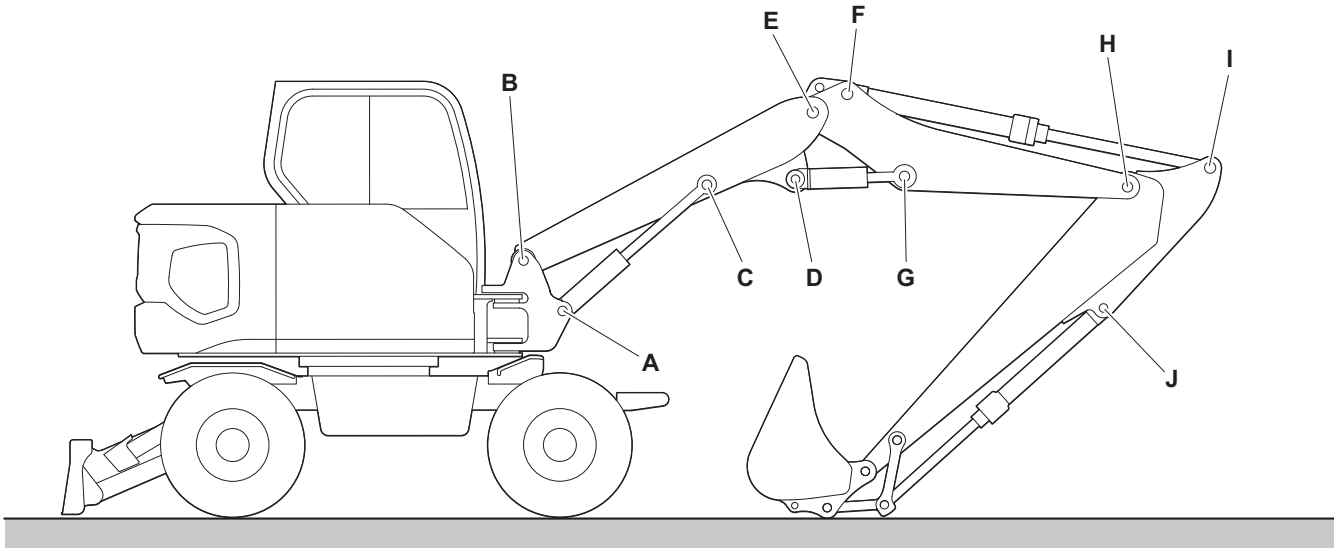


Figure 47

DS2104531

Reference Number	Description
A	Boom Cylinder Head Pin (1 Point)
B	Boom Foot Pin (1 Point)
C	Arti Boom Cylinder Head Pin (3 Points)
D	Boom Cylinder Rod Pin (1 Point)
E	Lower, Upper Boom Joint Pin (1 Point)

Reference Number	Description
F	Arm Cylinder Head Pin (1 Point)
G	Arti Boom Cylinder Rod Pin (3 Points)
H	Boom Arm Joint Pin (1 Point)
I	Arm Cylinder Rod Pin (1 Point)
J	Bucket Cylinder Head Pin (1 Point)

A. Boom cylinder head pin (1 point)

B. Boom foot pin (1 point)

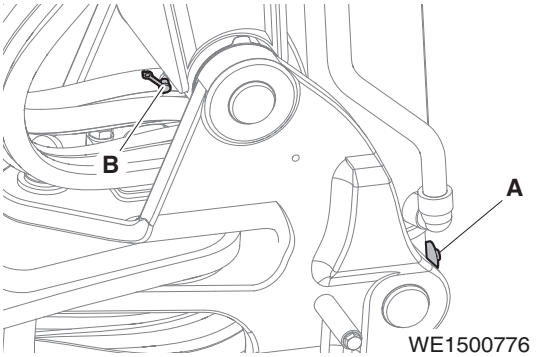


Figure 48

C. Arti boom cylinder head pin (3 points)

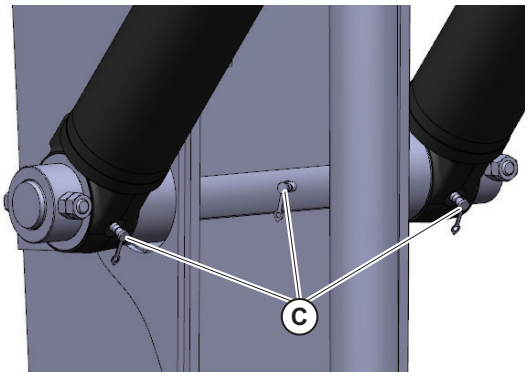


Figure 49

D. Boom cylinder rod pin (1 point)

E. Lower, upper boom joint pin (1 point)

F. Arm cylinder head pin (1 point)

G. Arti boom cylinder rod pin (3 points)

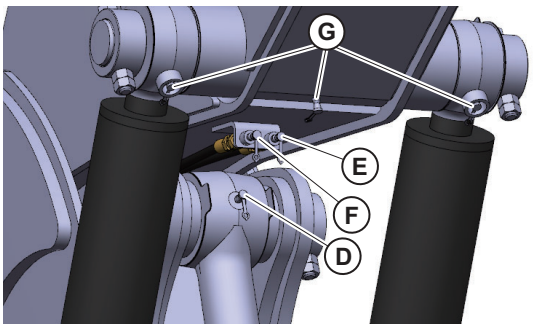


Figure 50

H. Boom arm joint pin (1 point)

I. Arm cylinder rod pin (1 point)

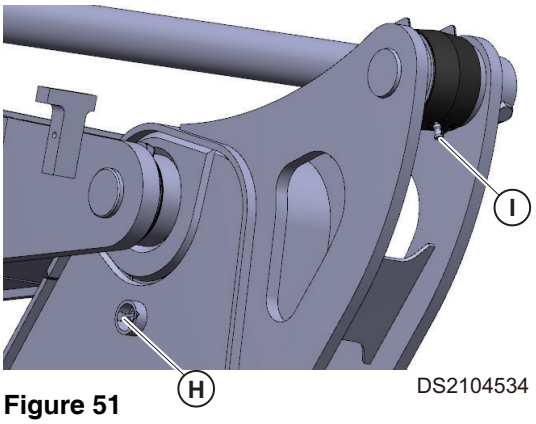
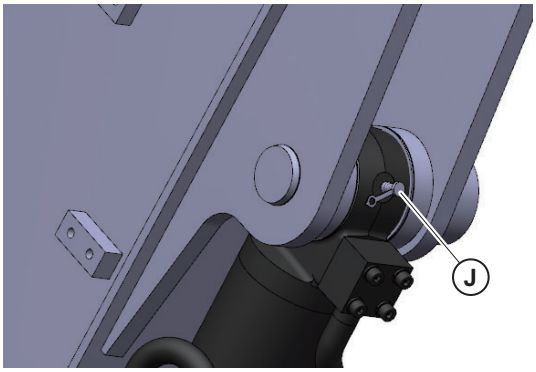


Figure 51

J. Bucket cylinder head pin (1 point)



DS2104535

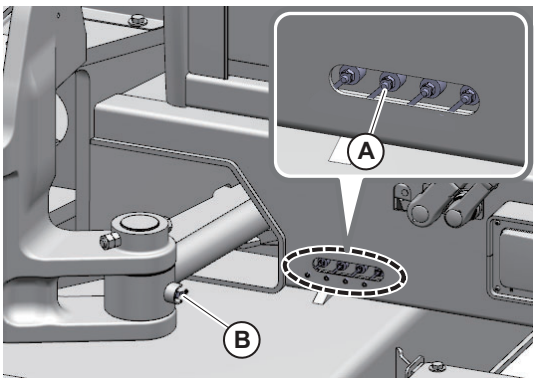
Figure 52

Boom Swing Cylinder - Lubricate

Grease every 10 hours for first 100 hours and every 50 hours thereafter.

NOTE: *If the unit has been running or working in water the front attachment must be greased on a 10 hour/daily basis.*

1. Lower the front attachment to ground.
2. Press the grease fitting and inject grease with grease gun on the marked points. After injection, clean off the old grease that has been purged.
   A. Boom swing cylinder head (1 point)
   B. Boom swing cylinder rod (1 point)



DS2104536

Figure 53

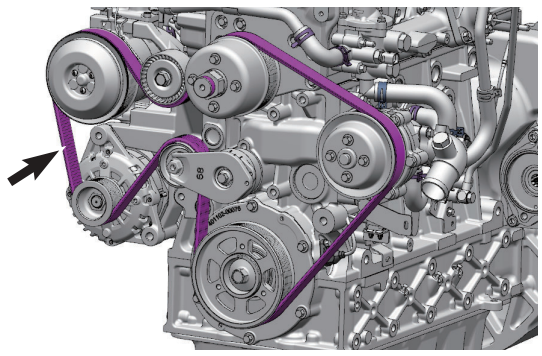
Engine Fan and Alternator Belts - Check

NOTICE

A loose fan belt can cause engine overheating, poor charging, and/or premature belt wear. A belt that is too tight can cause damage to the water pump, alternator bearing, or belt.

Inspect every 250 hours. (Inspect after first 50 hours of operation.)

Belt Tension (N)	
New	667 N (68 kgf)
Used	600 N (61 kgf)



DS2104537

Figure 54

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.*

Pin and Bushings of the Front End Attachment - Inspect

Battery Fluid - Check

Refer to "Inspection of Battery Electrolyte Level" for more information.

Bolts and Nuts - Inspect

Fuel System Hose Clamps - Inspect

Pilot Filter - Replace

NOTE: *Change pilot filter after 250 hours on new machine and every 1,000 hours thereafter.*

Brake Filter - Replace

NOTE: *Replace brake filter after 250 hours on new machine and every 1,000 hours thereafter.*

500 Hour / 3 Month Service

Perform All Daily, 50 and 250 Hour Service Checks

Engine Oil and Filter - Replace

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. Position a larger container under the engine.
2. Remove cap of drain cock and install the separately provided drain hose.
3. Drain the engine oil.

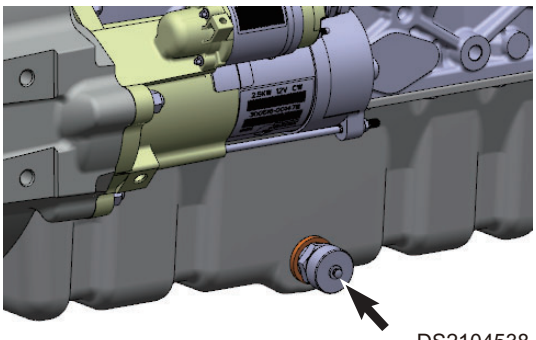
   NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*

NOTICE

Dispose of filters/oils/liquids in compliance with all applicable environmental laws and regulations.

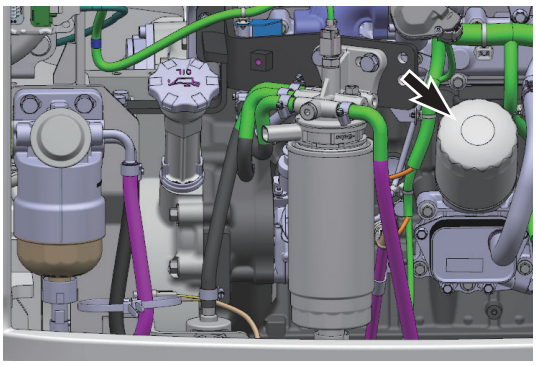
4. Place a suitable container below the oil filter assembly.
5. Remove oil filter with a suitable tool.
6. Clean the sealing surface.

   NOTE: *Do not fill the oil filters with oil before installing them.*
   This oil would not be filtered and could be contaminated.
   Contaminated oil can cause accelerated wear to engine components.



DS2104538

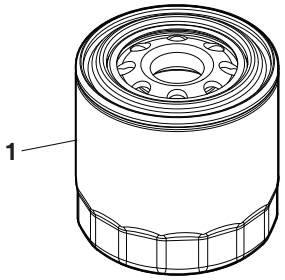
Figure 55



DS2104539

Figure 56

7. Apply clean engine oil to gasket for the new oil filter (1).
8. Install the new oil filter. Spin on the oil filter until gasket contacts the sealing surface. Then rotate the oil filter 3/4 of a full turn. Remove container and disposal of the waste oil according to local regulations.

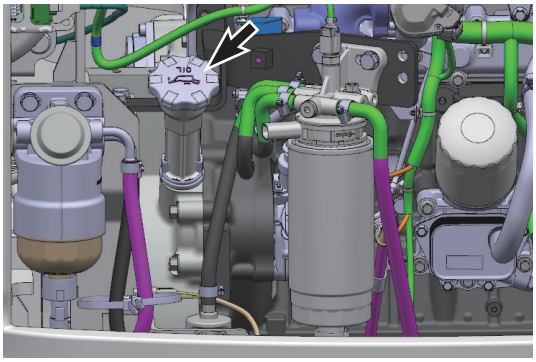


EX1502710

Figure 57

9. 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: *Refer to "Fluid Capacities" for more information.*
10. Start engine. Run engine for five minutes at "LOW IDLE" and check engine oil pressure light.
11. Stop engine. Look for signs of leaks at filter. Recheck oil level after fifteen minutes.



DS2104540

Figure 58

Air Conditioning Filter - Clean

1. Remove three bolts and outer cover from operator's seat base.

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.

If using compressed air to clean the element, make sure that proper eye protection is worn.

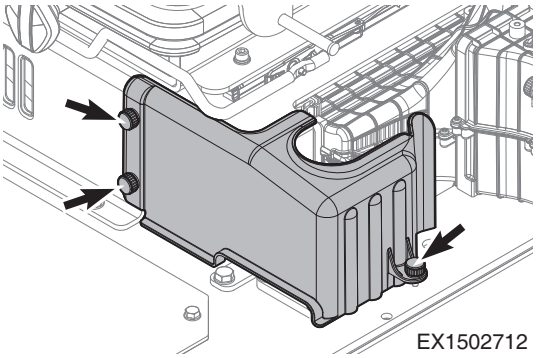


Figure 59

2. Remove inner cover by pulling knob outward while pressing the right and left of the cover handle.

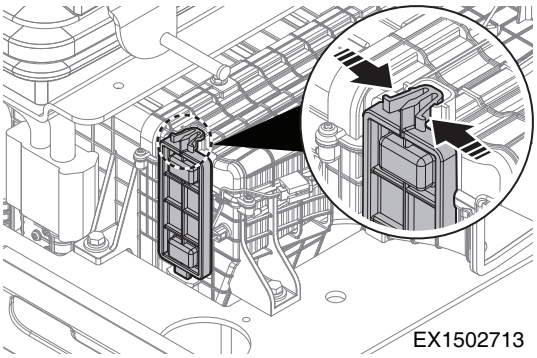


Figure 60

3. Remove two filters from seat base. Clean filter using compressed air. If filter is still not clean, replace with a new one.
4. After inserting filters, install inner and outer cover. Secure cover in place with three bolts.

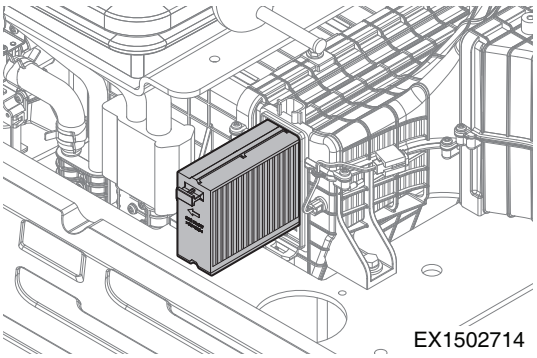


Figure 61

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 precess. Keep personnel and bystanders clear of work area.

1. Open the bonnet and loosen the fuel cooler bolts (1).
2. Remove the fuel cooler (2).
3. 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.
4. Clean air conditioner condenser core (3) 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.

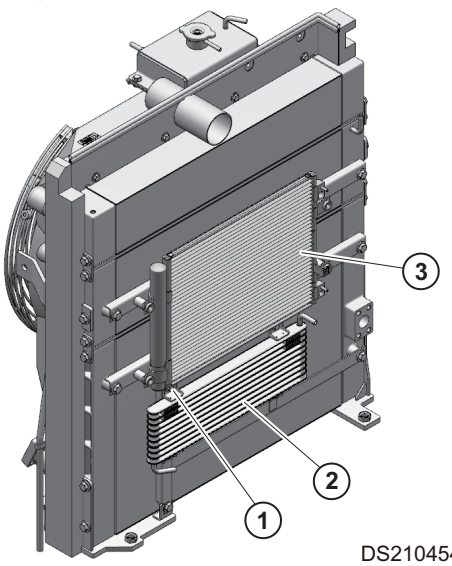


Figure 62

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.*

2. Remove and clean rubber evacuator valve (1) from bottom of air cleaner housing cover (2). Inspect seal lips for wear or damage. Replace valve if necessary.
3. Remove access cover (2) by loosening the latches (3).
4. Remove outer filter (4) from the housing. Do not remove inner filter (5).

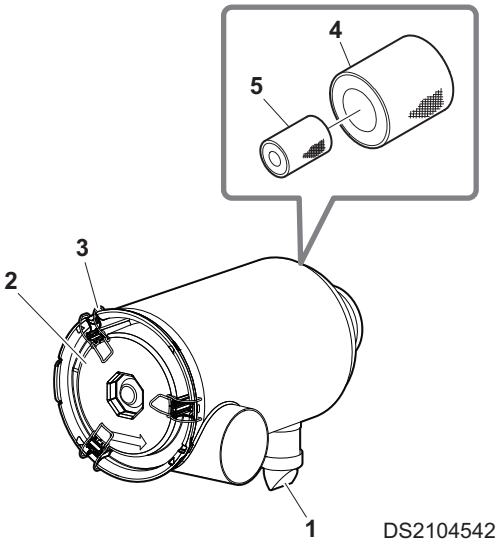
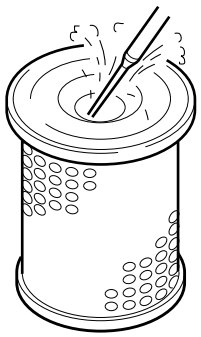


Figure 63

5. Clean the outer filter (4) by blowing compressed air from the inside of the filter towards the outside. Do not use more than 205 kPa (30 psi) air pressure.

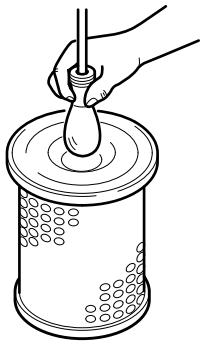


HDO5046I

Figure 64

6. Check outer filter by shinning a light through it. If small holes or thinner parts are found on the element after cleaning it, replace the filter.
7. Clean the inside of the air cleaner body and the inside of the air cleaner cover. Do not use compressed air.
8. Properly install the air filter and cover.

NOTE: *If after cleaning the outer filter, the air cleaner clogged indicator remains "ON", replace the outer and inner filters. Do not clean inner filter.*



FG000412

Figure 65

Main Fuel Filter - Replace

WARNING

AVOID DEATH OR SERIOUS INJURY

Exchange filter after waiting for engine to cool. Be careful of fire hazards. Do not smoke.

1. Locate fuel filter inside engine compartment.
2. Turn the cock valve to "CLOSE" position.
3. Position a small container under fuel filter.
4. Unscrew fuel filter cartridge from head assembly. Discard fuel filter cartridge.

   NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*

   NOTE: *Do not discard the drain valve (Integrated WIF sensor).*
   This component can be reused.
5. After cleaning filter head, install new fuel filter. Screw filter on head until gasket contacts head, and turn filter 3/4 turn more by hand.
6. Turn the cock valve to "OPEN" position.

   NOTE: *Coat fuel filter gasket with fuel.*

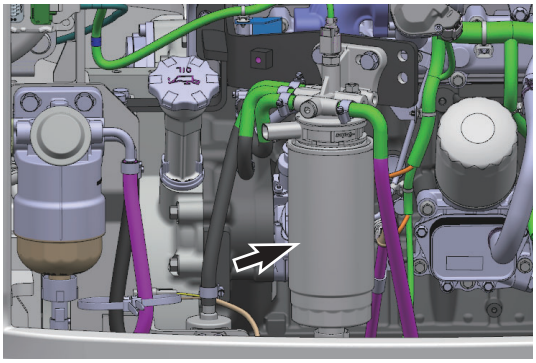
   NOTE: *Fill fuel filter with clean fuel. This will help reduce fuel system priming.*

Fuel System Priming

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.

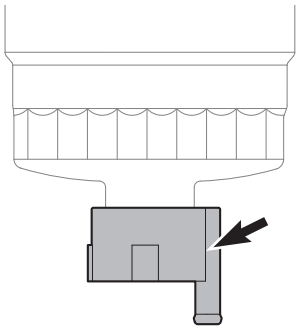
If the machine happens to have run out of fuel, or if the fuel filter has been replaced, air may need to be bled using the following procedure:

1. Stop engine.
2. Fill fuel tank.
3. Press the start/stop button to access key on mode to activate the electric fuel pump. Wait more than 2 minutes.
4. Start engine and check fuel system for leaks.



DS2104520

Figure 66



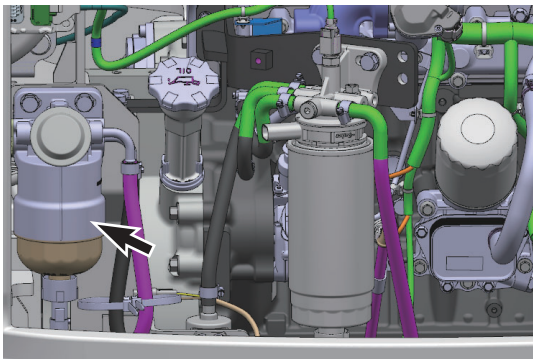
DS2001115

Figure 67

Pre Fuel Filter and Water Separator - Replace

1. Open the bonnet.
2. Turn the cock valve to "CLOSE" position.
3. Position a small container under prefilter. Drain fuel by opening drain valve on bottom of filter.

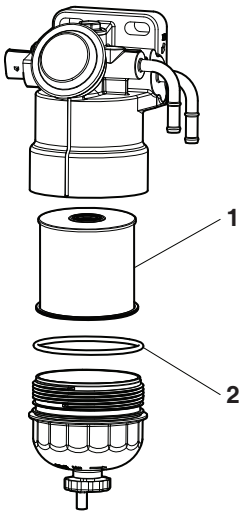
   NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*
4. Remove bowl using supplied tool.
5. Remove element (1) and replace the new element.



DS2104521

Figure 68

6. Coat surface of O-ring (2) with fuel, and tighten the bowl with tool.
7. Turn the cock valve to "OPEN" position.

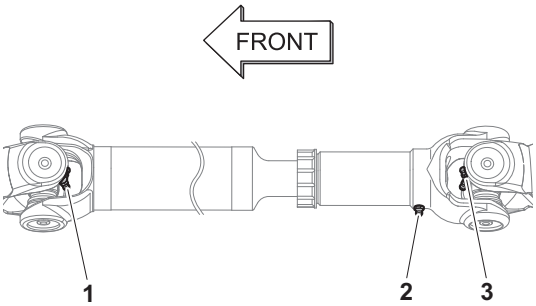


EX1502723

Figure 69

Drive Shaft - Lubricate

1. Drive Shaft Front U-joint (1 Point)
2. Drive Shaft Spline (1 Point)
3. Drive Shaft Rear U-joint (1 Point)



DS2104543

Figure 70

Front/Rear Axle Steering Knuckle - Lubricate

NOTE: *If the unit has been running or working in water the front attachment must be greased 3 months or every 500 hours.*

1. Press the grease fitting and inject grease with the grease gun on the marked point.

   NOTE: *There is an upper and lower grease fitting on each end of the front axle.*

2. After greasing, clean off the old grease that has been purged.

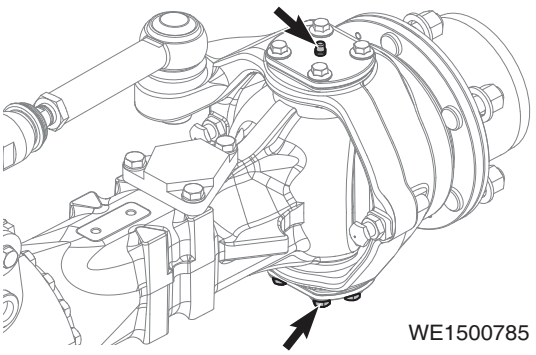


Figure 71

Swing Gear and Pinion - Lubricate

WARNING

AVOID DEATH OR SERIOUS INJURY

Greasing swing gear and pinion must be done by only one person.

1. Lower boom and position bucket on ground.
2. Move safety lever to "LOCK" position.
3. Run engine for five minutes at "LOW IDLE".
4. Stop engine.
5. Inject grease through the grease fitting using a grease gun.
6. Lift bucket about 20 cm (8 in) from ground.
   Turn upper body 90° at a time for full turn, greasing the swing gear at each stop.

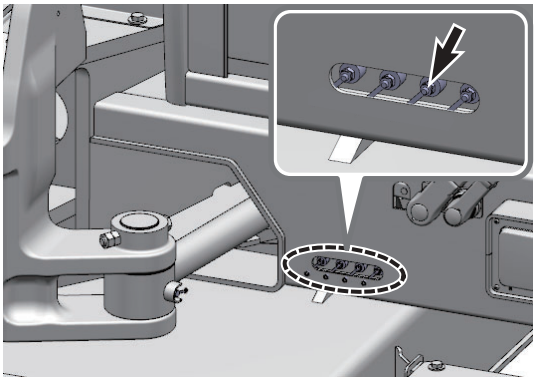


Figure 72

Swing Reduction Gear Oil (After First 500 Hours) - Drain and Refill

NOTE: *Change swing reduction device oil after first 500 hours on a new machine and every 1,000 hours thereafter. (See page 4-62).*

1,000 Hour / 6 Month Service

Perform All Daily, 50, 250 and 500 Hour Service Checks

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

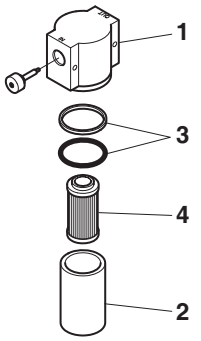
The hydraulic oil will be hot after normal machine operation.

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 breather cap up (1) slightly to release the internal pressure.
3. Locate pilot system filter assembly.
4. Unscrew canister (2) and remove O-ring (3) and filter cartridge (4).

   NOTE: *The canister will be filled with oil. Use caution when removing this assembly.*
5. Insert a new filter cartridge and O-ring. Apply a small amount of oil around the entire O-ring and install the canister assembly onto the filter head (1.

   NOTE: *Used filter should always be disposed of according to local regulations.*
6. After changing pilot filter, vent air from pump and check level of hydraulic oil tank.

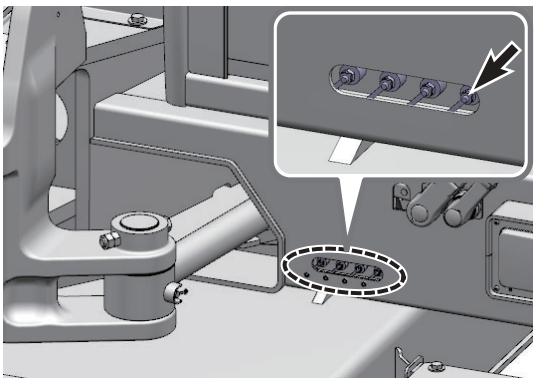


DS1703795

Figure 73

Swing Reduction Gear - Lubricate

1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Press grease fitting and inject grease with the grease gun on the marked point.



DS2200473

Figure 74

Swing Reduction Gear Oil - Change

NOTE: *Change swing reduction device oil after first 500 hours of operation or rebuild, and every 1,000 hours thereafter.*

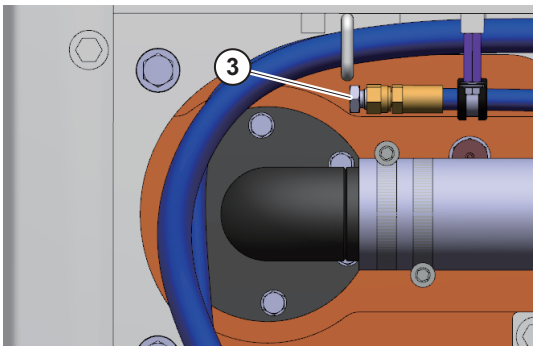
WARNING

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.

1. Set a container under excavator.
2. Release the drain plug (3, Figure 75) and drain the swing reduction device oil into a container.

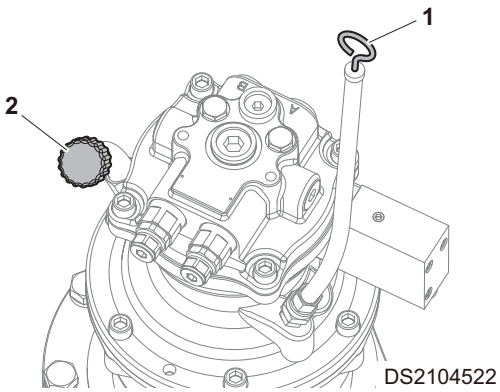
   NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*
3. After draining oil, tighten the drain plug.



DS2104523

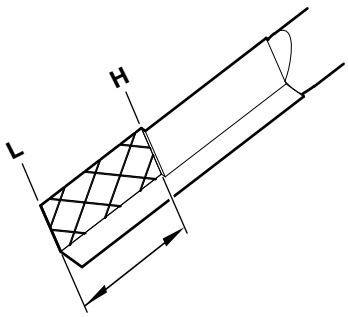
Figure 75

4. Remove breather/fill cap (2, Figure 75) and add oil to "H" mark on dipstick (1).



DS2104522

Figure 76



FG000419

Figure 77

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.*

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) slightly to release the internal pressure.
3. Remove bolts (2) and service cover (3). Remove O-ring (4), spring (5), valve (6) and then filter (7).
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. Add oil if necessary.

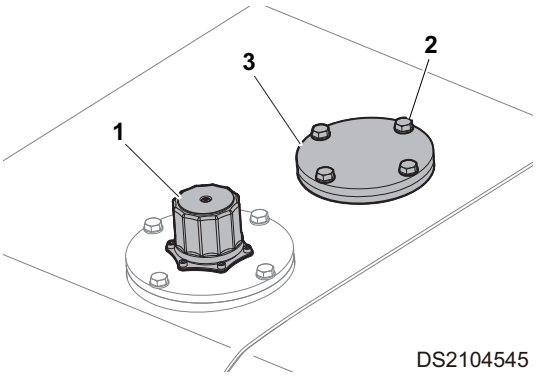


Figure 78

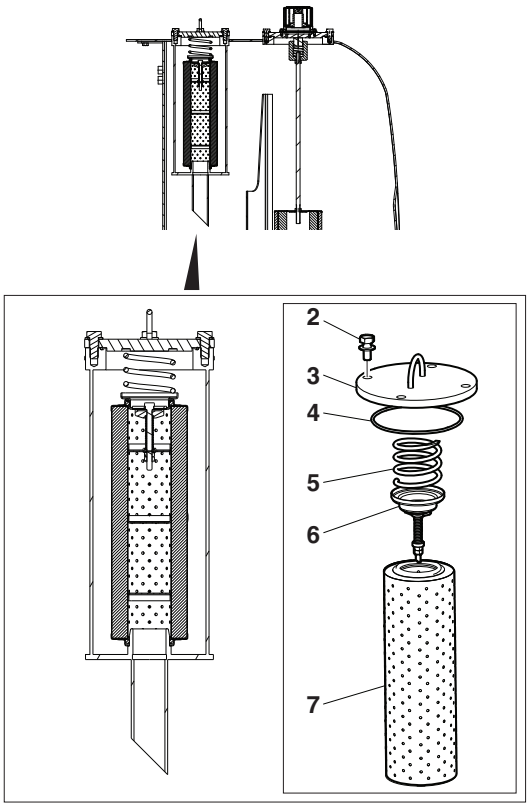


Figure 79

Hydraulic Oil Suction Filter - Clean

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.

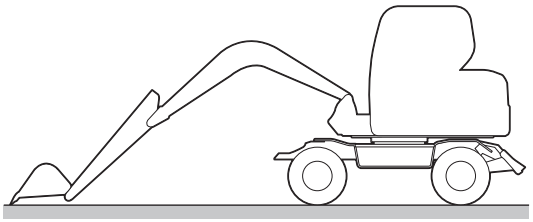
ARO1760L

Figure 80

NOTICE

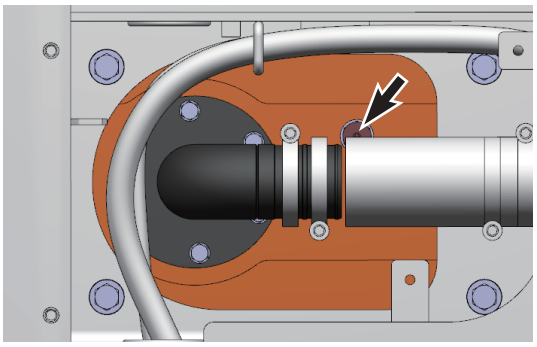
Make sure to clean any dirt or water from the top of the hydraulic tank, especially around the fill port and filter ports.

1. Park machine on firm and level ground. Swing upper structure parallel to tires. Lower boom and position bucket on ground as shown in Figure 81.
2. Set parking brake switch "I" (APPLIED) position.
3. Move safety lever to "LOCK" position.
4. Stop engine.
5. Release pressurized air from hydraulic tank by tip breather cap up (1).



DS2104706

Figure 81



DS2104516

Figure 82

6. Carefully remove bolts and cover (2) from top of hydraulic oil tank. There is a spring (3) under the cover that will force the cover up.
7. Remove spring (3) and suction filter (5), by pulling on rod (4).
8. Clean inside and outside of suction filter.
   Replace suction filter if it is broken.
9. Position suction filter (5) on boss portion of suction pipe (6).

   NOTE: *Measurement "A" is 569 mm (22.4 in).*

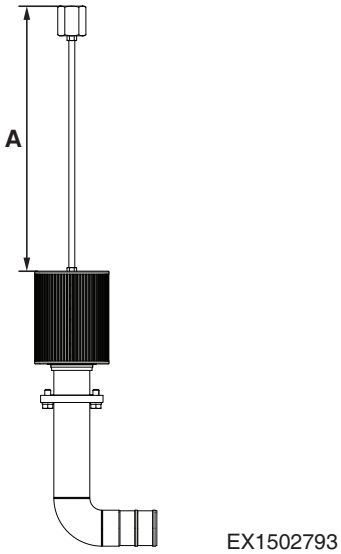


Figure 83

10. Place spring (3) on rod (4) and assemble cover (2).

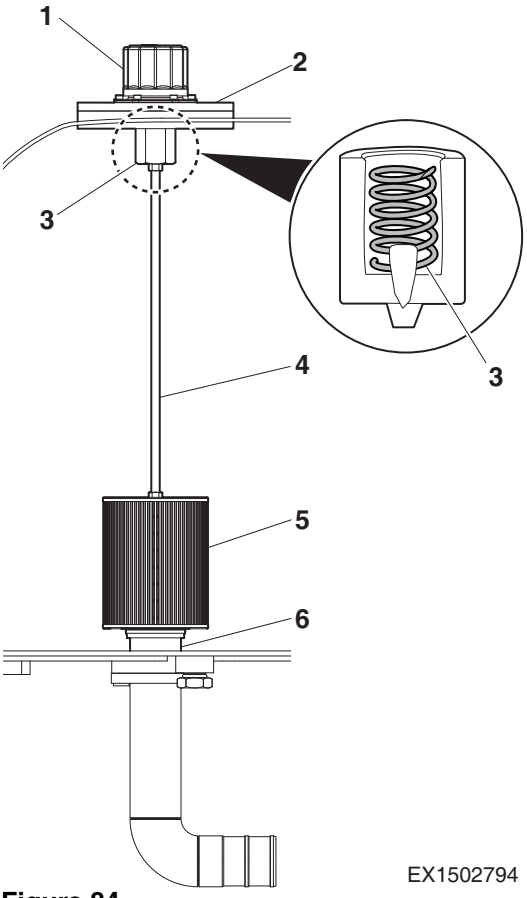


Figure 84

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) slightly to release the internal pressure.
3. Unscrew the bolt (1) and take off the breather cap (2).
4. Change a filter cartridge (3) 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 air breather filter needs to be cleaned or replaced regularly even before the expected replacement date.*

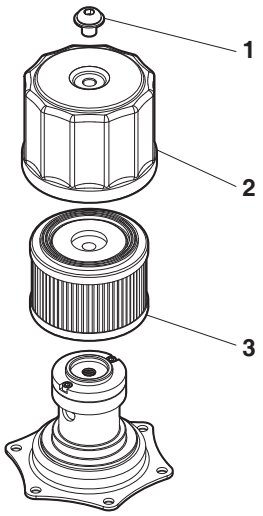


Figure 85

Transmission Fluid - Change

NOTE: *The transmission fluid must be drained and refilled after first 150 hours of operation. There after every 1,000 hours of operation.*

NOTE: *The oil level must be checked on level ground. When replacing fluid, only use approved grade transmission fluid.*

1. The gear oil drain and fill holes are located on the front lower section of the transmission.
2. Clean off any dirt, grease and other foreign materials from area surrounding the drain (1) and fill (2) holes of the transmission.
3. Place a drain pan under the drain plug and remove the drain plug.
4. Clean the drain plug. Inspect the O-ring for deterioration or damage and replace if necessary. Reinstall drain plug.
5. Remove the fill plug (2) and fill to the bottom of the fill hole with approved transmission fluid.

   NOTE: *Refer to "Fluid Capacities" for more information.*

6. Clean the fill plug. Inspect the fill plug O-ring for deterioration or damage and replace if necessary. Reinstall the fill plug.

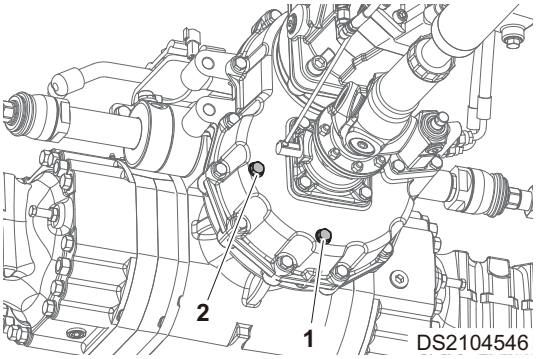


Figure 86

Front Axle Case Oil - Change

NOTE: *The front axle case oil must be drained and refilled after the first 150 hours of operation and at every 1,000 hours there after.*

NOTE: *The oil level must be checked on level ground. When replacing fluid, only use approved grade axle fluid.*

1. The oil drain holes are located in the lower section of the axle case and the fill hole is located in the rear section of the axle case.
2. Clean off any dirt, grease and other foreign materials from area surrounding the drain (1) and fill (2) holes of the axle case.
3. Place a drain pan under the drain plug and remove the drain plug.
4. Clean the drain plug. Inspect the O-ring for deterioration or damage and replace if necessary. Reinstall drain plug.
5. Remove the fill plug (2) and fill to the bottom of the fill hole with approved gear oil.

   NOTE: *Refer to "Fluid Capacities" for more information.*
6. Clean the fill plug. Inspect the fill plug O-ring for deterioration or damage and replace if necessary. Reinstall the fill plug.

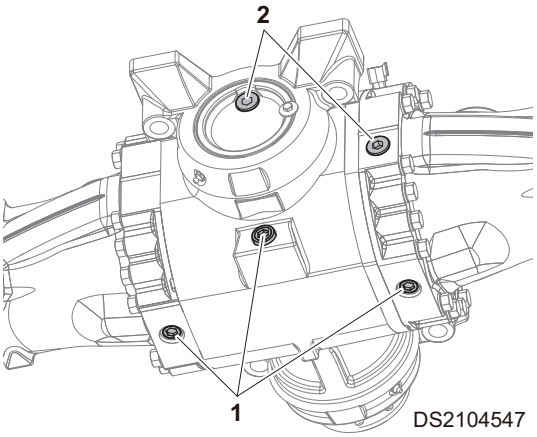


Figure 87

Rear Axle Case Oil - Change

NOTE: *The rear axle case oil must be drained and refilled after the first 150 hours of operation and at every 1,000 hours there after.*

NOTE: *The oil level must be checked on level ground. When replacing fluid, only use approved grade axle fluid.*

1. The oil drain (1,) holes are located in the lower section of the axle case and the fill (2) hole is located in the rear section of the rear axle case.
2. Clean off any dirt, grease and other foreign materials from area surrounding the drain (1) and fill (2) holes of the axle case.
3. Place a drain pan under the drain plug and remove the drain plug.
4. Clean the drain plug. Inspect the O-ring for deterioration or damage and replace if necessary. Reinstall drain plug.
5. Remove the fill plug (2) and fill to the bottom of the fill hole with approved gear oil.

   NOTE: *Refer to "Fluid Capacities" for more information.*
6. Clean the fill plug. Inspect the fill plug O-ring for deterioration or damage and replace if necessary. Reinstall the fill plug.

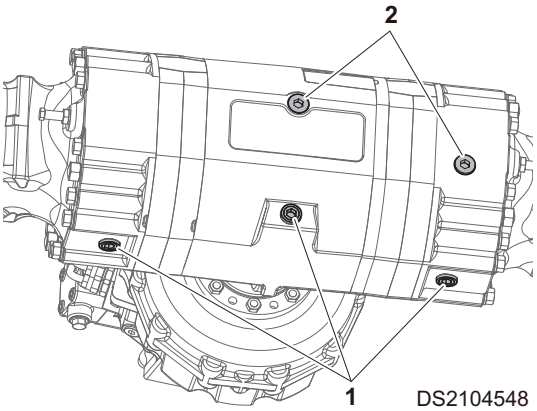


Figure 88

Hub Reduction Gear Oil - Change

NOTE: *The hub reduction gear oil must be drained and refilled after the first 150 hours of operation and at every 1,000 hours there after.*

NOTE: *The oil level must be checked on level ground. When replacing fluid, only use approved grade axle fluid.*

1. Move the excavator slowly and position the drain/fill hole (1) to the lowest position.
2. Clean off any dirt, grease and other foreign materials from area around the drain/fill hole (1) of the reduction gear.
3. Place a drain pan under the drain plug and remove plug.

   NOTE: *Dispose of drained fluids in compliance with all applicable environmental laws and regulations.*
4. When oil has finished draining, move the excavator slowly and position the oil level mark (2) on the gear housing parallel to the ground.
5. Fill to the bottom of the fill hole with approved gear oil.

   NOTE: *For more information, refer to "Fluid Capacities".*
6. Clean the drain/fill plug. Inspect the plug O-ring for deterioration or damage and replace if necessary. Install the plug.
7. Repeat the process for the remaining hubs.

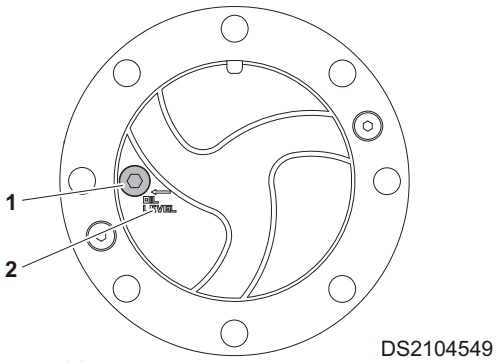


Figure 89

Air Conditioning Filter - Replace

1. Remove three bolts and outer cover from operator's seat base.

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.

If using compressed air to clean the element, make sure that proper eye protection is worn.

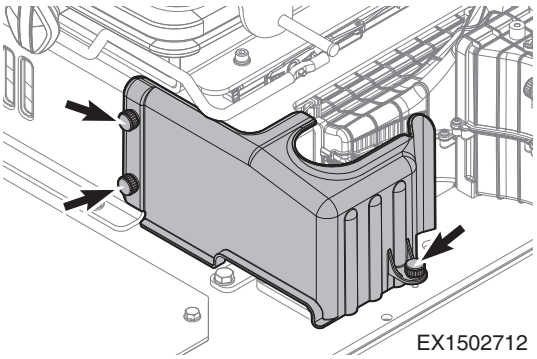


Figure 90

2. Remove inner cover by pulling knob outward while pressing the right and left of the cover handle.

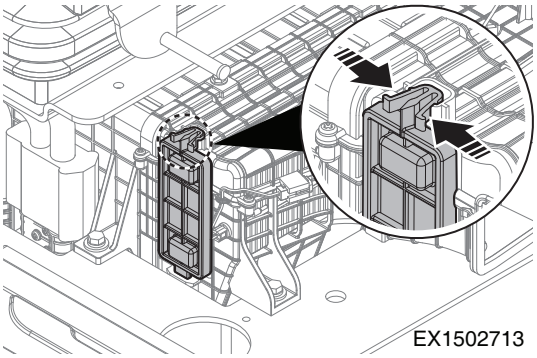


Figure 91

3. Remove two filters from seat base and replace that with the new filters.
4. After replacing filters, install inner and outer cover. Secure cover in place with three bolts.

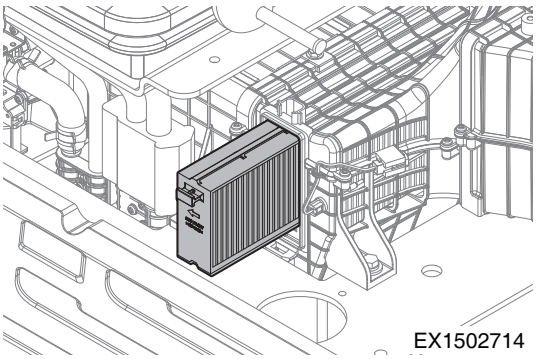


Figure 92

Brake Filter - Replace

NOTE: *Change brake 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 brake filter.

1. Park machine on firm and level ground. Lower bucket or attachment to ground.
2. "LOWER" dozer blade to ground, if equipped.
3. Set parking brake switch to "I" (APPLIED) position.
4. Move safety lever to "LOCK" position.
5. Stop engine.
6. Tip breather cap up slightly to release the internal pressure.
7. Locate brake system filter assembly.
8. Unscrew canister (5) and remove O-ring (3) and filter cartridge (4).

   NOTE: *The canister will be filled with oil. Use caution when removing this assembly.*

9. Insert a new filter cartridge and O-ring. Apply a small amount of oil around the entire O-ring and install the canister assembly onto the filter head (1).

   NOTE: *Used filter should always be disposed of according to local regulations.*

10. After changing brake filter, vent air from the breather of the front and rear axle and check level of hydraulic oil tank.

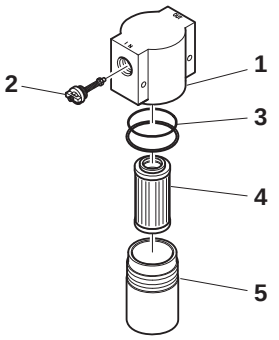
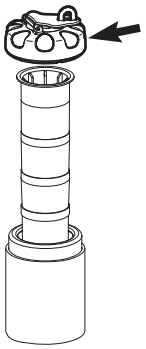


Figure 93

Fuel Cap Filter - Replace

NOTICE

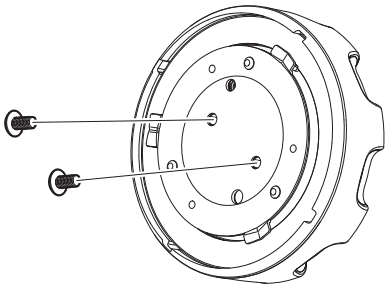
External shock or damage to fuel cap can cause permanent damage to filter.



FG020189

Figure 94

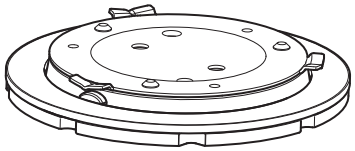
1. Remove screws and filter assembly from fuel cap.



FG015684

Figure 95

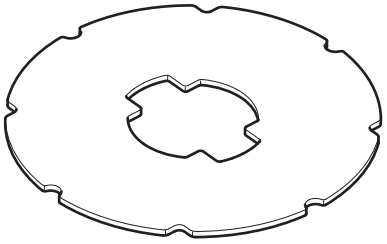
2. After disassembly, carefully lay it as shown in Figure 96.



FG015685

Figure 96

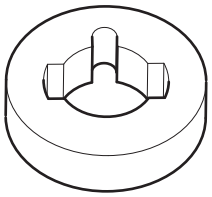
3. After disassembly, remove rubber piece as shown on.



FG015686

Figure 97

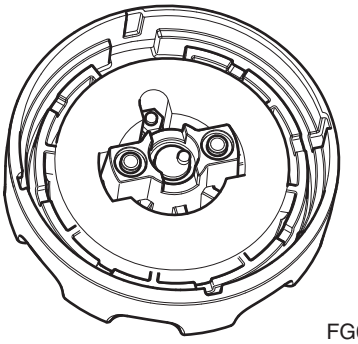
4. After disassembly as shown in, replace filter with a new one.



FG015687

Figure 98

5. After installing new filter, assemble fill cap in reverse order.



FG015688

Figure 99

Engine - Check and Adjust**

Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for checking and adjusting the following items:

- Engine Compression Pressure.
- Injection Pressure.
- Injection Timing.

**These checks need to be completed by an authorized HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.

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. Open the battery room cover, remove 3 latches (3), then remove cover.
2. Remove evacuator valve (1) from the air cleaner cover (2).

   NOTE: *Inspect evacuator valve seal lips for wear or damage. Replace valve if necessary. Install evacuator valve with lips parallel to the cover.*
3. Hold the outer element (4), rock it lightly up and downward, and swing the element to pull it out. Remove inner element (5) 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. Install a new inner element. Insert the inner element properly so it does not move.
6. Push the new outer element (4) in straight to the air cleaner body.

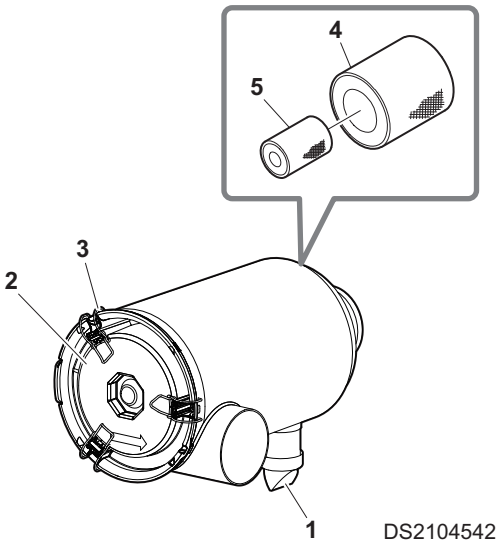


Figure 100

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.

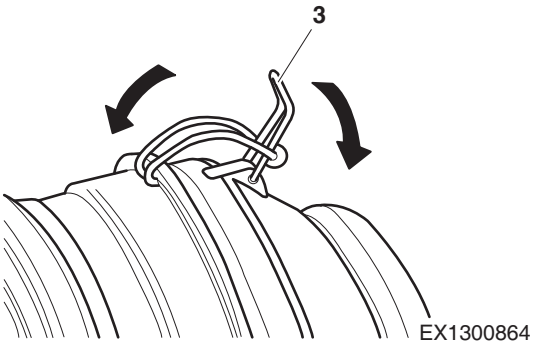


Figure 101

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 and surge tank 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 (1) and the surge tank cap (2) to allow any pressure to escape.

   NOTE: *Refer to "Fluid Capacities" for more information.*

   NOTE: *Some models may have no surge tank or radiator cap. This instruction is only applicable to those with the cap.*

2. Place a container under the radiator and open the drain plug (3).

   NOTE: *Dispose of drained fluids according to local applicable environmental laws and regulations.*

3. Fill cooling system with a flushing solution.

   NOTE: *The speed of filling must be within 5 LPM to prevent overflow.*

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. Refer to "Antifreeze Concentration" for more information.

9. Run engine without radiator cap and surge tank cap installed, so all air will be purged from system. Fill radiator to fill neck.

10. Drain and fill surge tank.

    NOTE: *When refill or replace coolant, select "heater-full hot" mode to fully open the water valve.*

    Coolant will then flow into the heater's core to prevent air from being trapped in it.

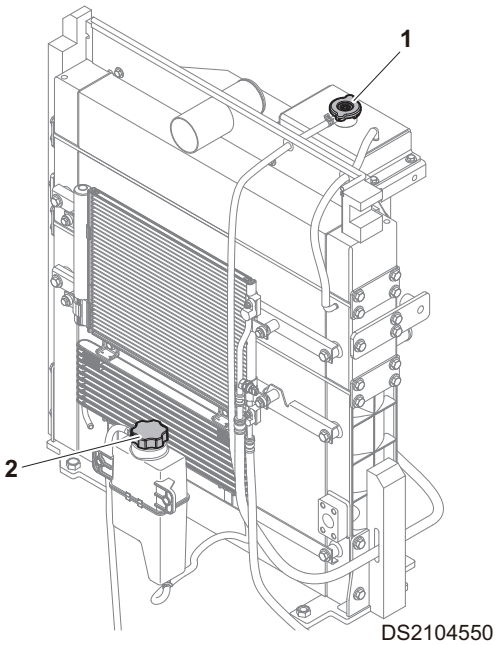


Figure 102

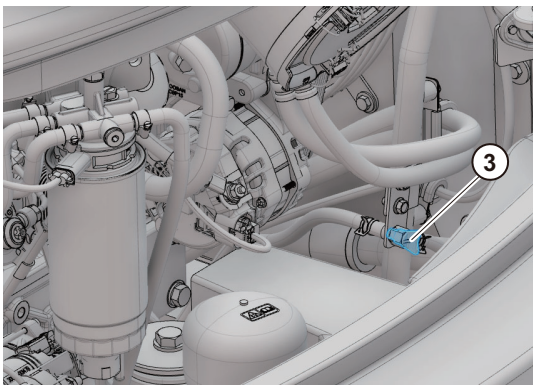


Figure 103

Hydraulic Oil - Change

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.

ARO1760L

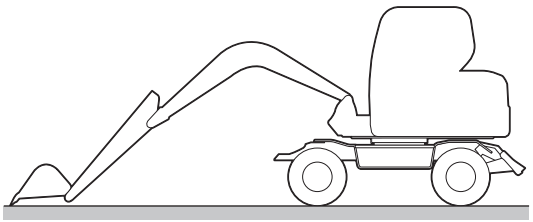
Figure 104

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 lower structure. Lower boom and position bucket on ground as shown in Figure 81.
2. Lower outriggers and dozer blade to ground, to displace oil into hydraulic oil tank.
3. Set parking brake switch to "I" (APPLIED) position.
4. Move engine speed to "LOW IDLE".
5. Move safety lever to "LOCK" position.
6. Tip breather cap up slightly to release the internal pressure.
7. Drain hydraulic oil from tank into a container capable of holding 94 L (24.8 U.S. gal.). After draining tank, install drain plug.



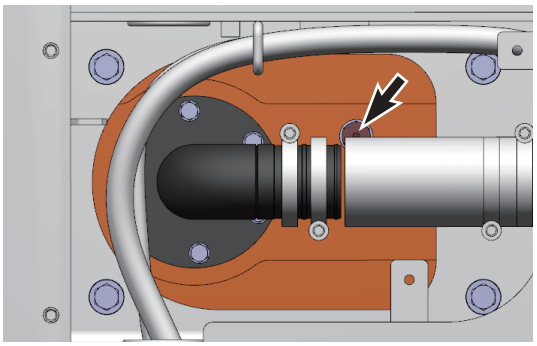
DS2104706

Figure 105

WARNING

AVOID DEATH OR SERIOUS INJURY

Be careful of squirting oil when removing drain plug.



DS2104516

Figure 106

NOTE: *Used filter and used oil should always be disposed of according to local laws and regulations.*

8. Fill the hydraulic oil tank. Check level using sight gauge on side of tank.
9. After replacing and cleaning the hydraulic oil, vent the system. See "Venting and Priming Hydraulic System" on page 4-109

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 4-18.

10. Check level of hydraulic oil tank. (See page 4-27)

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 / Biennial 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 cock valve)	2 years or 4,000 hours
		Fuel Hose (Cock Valve to Fuel Prefilter)	
		Fuel Hose (Fuel prefilter to fuel feed pump)	
		Fuel Hose (Fuel feed pump to fuel main filter)	
		Fuel Hose (Fuel main filter to engine)	
		Fuel Hose (Engine to Fuel Cooler)	
		Fuel Hose (Fuel Cooler to Tank)	
		Heater Hose (Heater to engine)	
		Heater Hose (Heater to radiator)	
		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	

DEF (AdBlue®) Filter - Replace

NOTICE

The replacement interval of the DEF (AdBlue®) (urea solution) filter is different by the amount of foreign materials in DEF (AdBlue®).

Make sure to use only the specified DEF (AdBlue®) and container and keep the surrounding area of the tank clean to prevent possible foreign materials.

1. Remove filter cover.

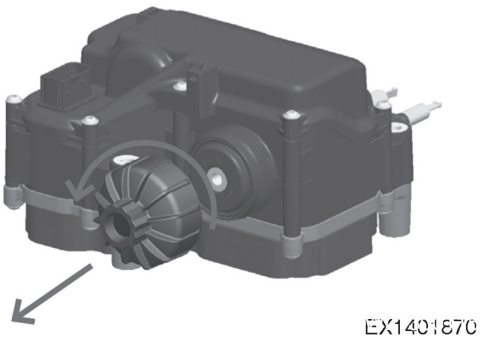


Figure 107

2. Remove equalizing element.

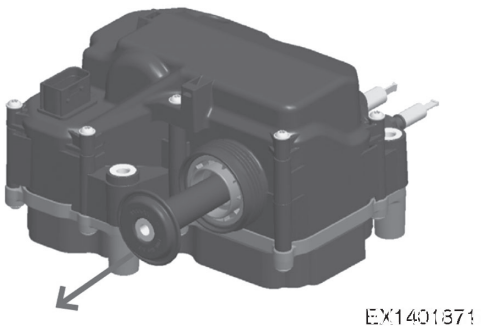


Figure 108

3. Check the color (gray/green) in the filter.

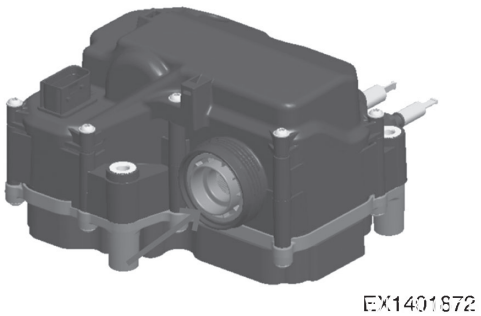


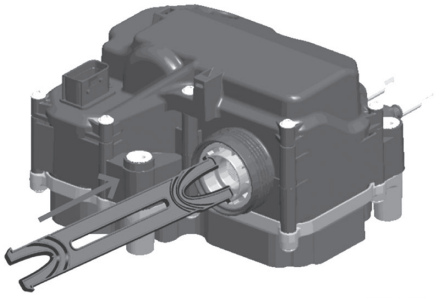
Figure 109

4. Set the color of the mark on the end of the filter removing tool in the same direction with the filter color section.

EX1401873

Figure 110

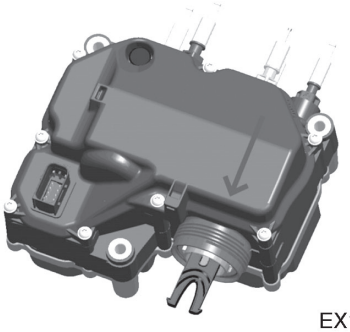
5. Insert the end of the filter removing tool until a clicking sound is heard or engagement with the filter is felt.



EX1401874

Figure 111

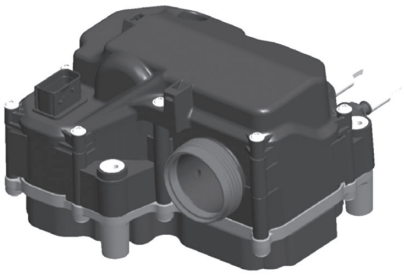
6. Pull the filter removing tool to remove filter.



EX1401875

Figure 112

7. The surface must be kept clean. It can be cleaned with water only.



EX1401881

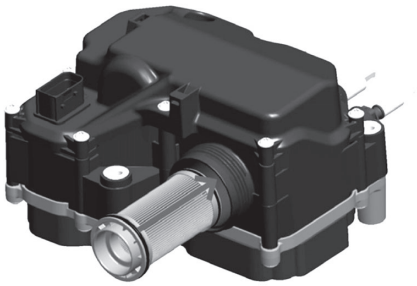
Figure 113

8. Apply oil to the O-ring and install a new filter.

NOTICE

AVOID INJURY

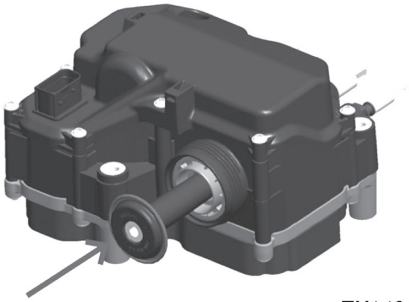
Use Mobil Velocite No. 6 oil from Bosch.



EX1401882

Figure 114

9. Install a new equalizing element.



EX1401883

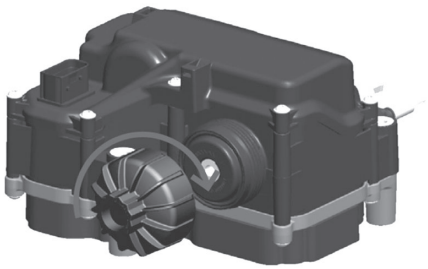
Figure 115

10. Tighten the filter cover to 20 + 5 N.m.

NOTICE

AVOID INJURY

Check that filter surface is clean. It can be cleaned with water only.



EX1401884

Figure 116

DEF (AdBlue®) Breather Filter - Replace

1. Open the storage cover.

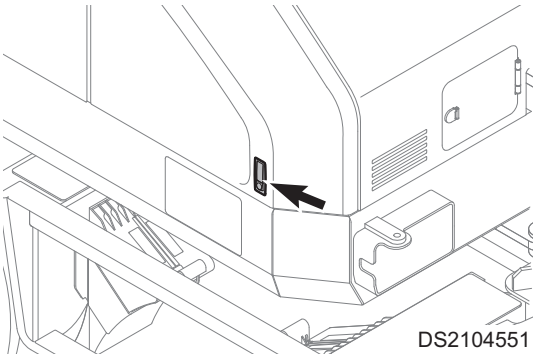
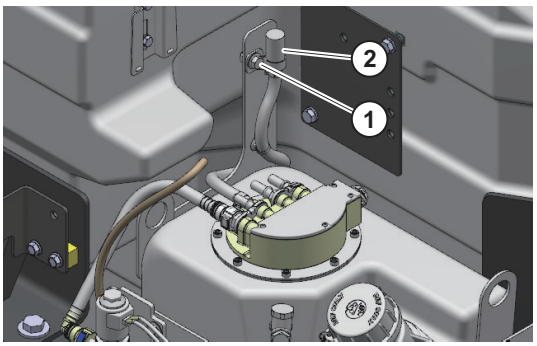

DS2104551

Figure 117

2. Unscrew and remove clamp (1) for DEF (AdBlue®) breather filter fitting (2).
3. Replace the new breather filter and refit.



DS2104552

Figure 118

5,000 Hour / 2 Years and 6 Months Service

DPF Soot Filter - Clean

During the regeneration of soot in the DPF, ash accumulates in the DPF.

Once a certain amount of ash accumulates, engine performance and fuel efficiency are affected due to a build-up of back pressure in the exhaust system, so ash cleaning must be performed regularly to prevent any worsening of engine performance and fuel efficiency.

NOTE: *This procedure need to be completed by an authorized HD HYUNDAI CONSTRUCTION EQUIPMENT distributor.*

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", 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: *Refer to "Air Conditioning Filter - Clean" for more information.*

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 Hose - Check

Check the hose for cracking and damage. Replace if necessary.

Condenser - Check

Inspect the condenser for dust and debris. Clean if necessary.

NOTE: *Refer to "Cooling System - Clean" for more information.*

Magnetic Clutch - Check

Check the magnetic clutch for dirt and interference.

Push the "A/C" switch to energize and check magnetic clutch.

Belt Tension - Check

NOTE: *Refer to "Engine Fan and Alternator Belts - Check" for more information.*

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.

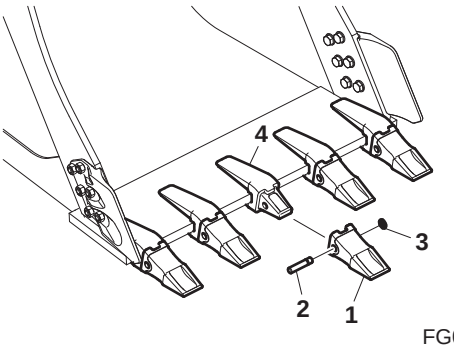
Curl the bucket upwards and place the round rear surface of the bucket firmly on the ground. Stop engine and lock out the hydraulic controls before working on the bucket.

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 119

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 119.
2. To replace a tooth (1, Figure 120), 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.



FG018361

Figure 120

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 121) onto boss (2, Figure 121) around bucket pin (3, Figure 121). Remove bucket pin and move arm or bucket link (4, Figure 121) out of way.

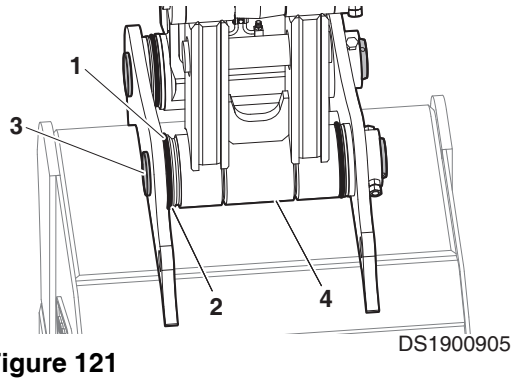


Figure 121

3. Remove old O-ring and temporarily install new O-ring (1, Figure 122) onto bucket boss (2, Figure 122). Make sure that O-ring groove on both bucket link (4, Figure 122) and boss have been cleaned.
4. Realign arm or link with bucket pinhole and insert bucket pin (3, Figure 121).

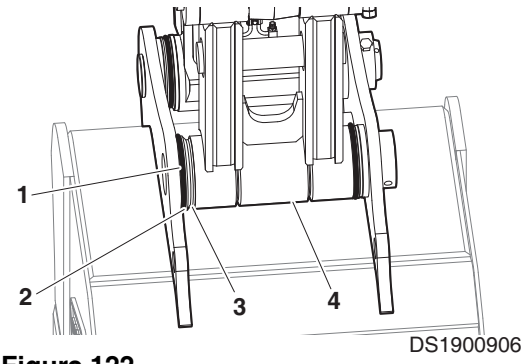


Figure 122

5. Roll new O-ring (1, Figure 123) into O-ring groove.

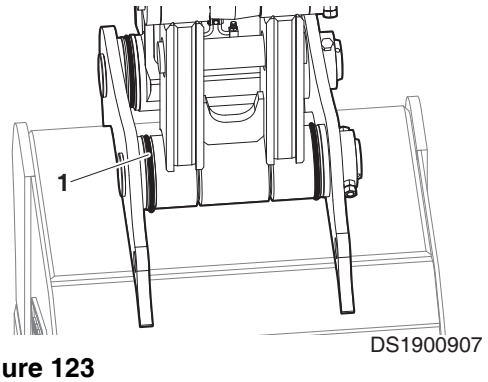


Figure 123

Bucket Shimming Procedures

New Bucket Installation

1. If a new bucket is being installed on excavator, measure inside dimension between bucket ears and outside dimension across arm mounting boss.
2. Subtract clearance on both sides from difference of two and shim accordingly, before assembly.

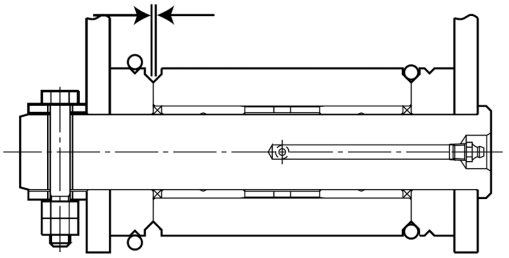
WARNING

AVOID DEATH OR SERIOUS INJURY

To check end play (side to side) clearance at bucket attachment point, the bucket must be free to move but at all other times lower it to the ground or use support blocks to immobilize this assembly. Stop engine and tag and lock out controls to prevent accidental machine movement during this procedure.

Shimming Procedures for Installed Bucket

1. With bucket attached, curl bucket and arm outward and lower boom so bucket teeth are pointing away from excavator, just a few inches off ground. This position provides easy accessibility for dimensional measurements.
2. Force bucket to one side and check for end play (side to side) clearance under O-rings at attachment point. Clearance must be between 0.2 ~ 0.7 mm (0.008 ~ 0.027 in) on each end of arm boss, between side face of boss and inside edge of ear busing. Too tight a fit can cause excessive wear while too much clearance may produce excessive noise and potentially hazardous slack control.
3. Recheck end play by forcing bucket towards opposite side and repeating clearance measurements.
4. If an adjustment is required, remove bolt and pin. Add or remove shims have been provided for A/S as required. Install pin and bolt. Torque blots to 42 N.m (4.3 kg.m, 31 ft lb).



FG007698

Figure 124

Bucket - Replace

WARNING

AVOID DEATH OR SERIOUS INJURY

Prevent injury from flying metal pieces. Wear safety goggles, safety helmet and safety gloves.

Bucket Disassembly

1. Place bucket as shown in illustration.

NOTICE

In next step, O-rings are removed with pins. Be careful not to damage them.

2. Remove bolts holding pins A and B, remove pins, and remove bucket.

   NOTE: *If pins do not come out easily, the bucket may be resting on the ground too "heavily".*

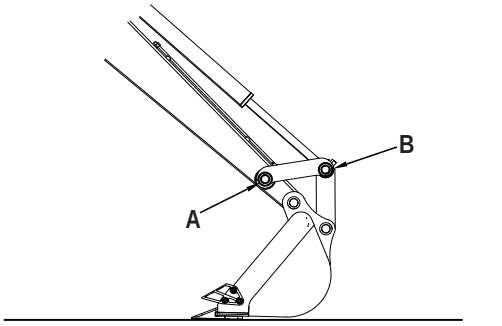


Figure 125

Bucket Installation

1. Clean and grease pins and pinholes.
2. Install new bucket as shown in illustration.
3. Install pins, aligning arm hole A with push link hole B. Install O-rings.
4. Apply grease to pins.
5. Run engine at low idle and move bucket slowly through one stroke to make sure parts are installed correctly.

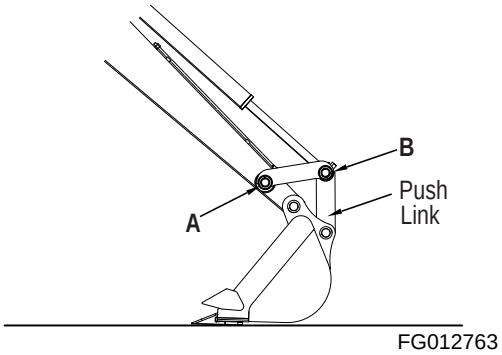


Figure 126

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, engine off.

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

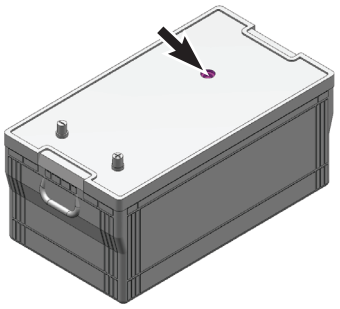
In colder weather, a greater drain is placed on the batteries when they are used for the preheat cycle and when starting a cold engine. Battery performance decreases as the temperature gets lower.

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.



DS2000203

Figure 127

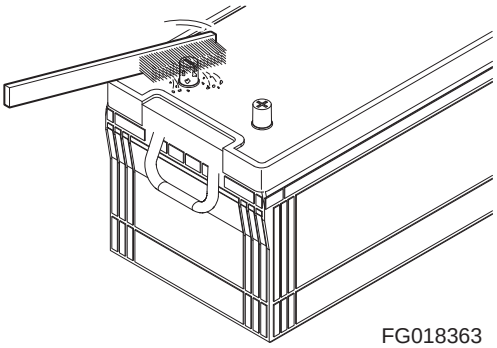
Check Charging State

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.



FG018363

Figure 128

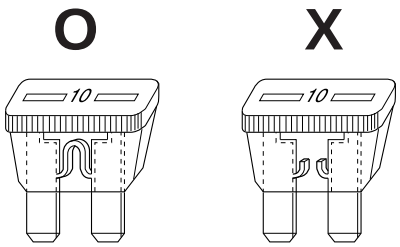
Battery Replacement

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 junction box are used to protect the various electrical circuits and their components from being damaged. See Figure 129. The fuses used are standard automotive type fuses.
2. The section on "Fuse and Relay Identification" lists the circuits and the fuse amperage required for each circuit. If a fuse blows, determine the cause and repair any electrical faults or failures.
3. Do not insert a higher amperage fuse into a lower amperage slot. Serious damage to the electrical components or fire can result.



HAOC670L

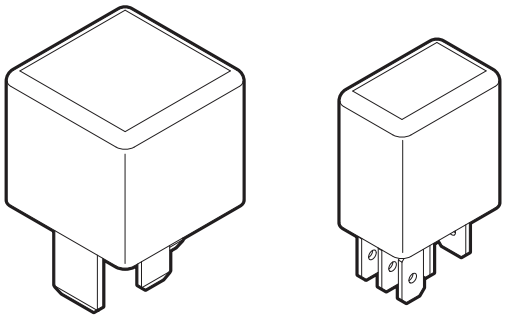
Figure 129

NOTICE

Before replacing a fuse, be sure to turn starter switch to "O" (OFF) position.

Relays

The relays are in the junction box. If the problem is not solved after replacing the fuse, check the function of the relay.



EX1502819

Figure 130

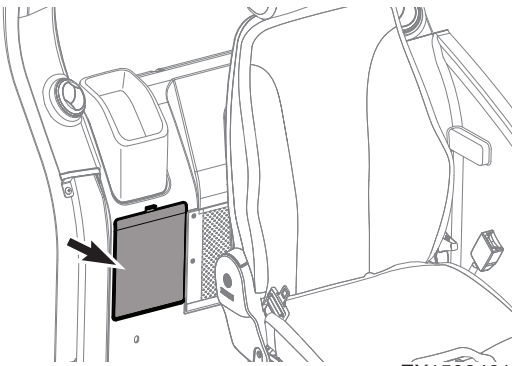
Junction Box

There is a junction box on the back right side of the seat. The fuses prevent electrical devices from overloading or shorting.

A decal attached inside the junction box cover indicates the function and amperage of each fuse and relay.

Spare fuses and relays are mounted on the junction box.

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



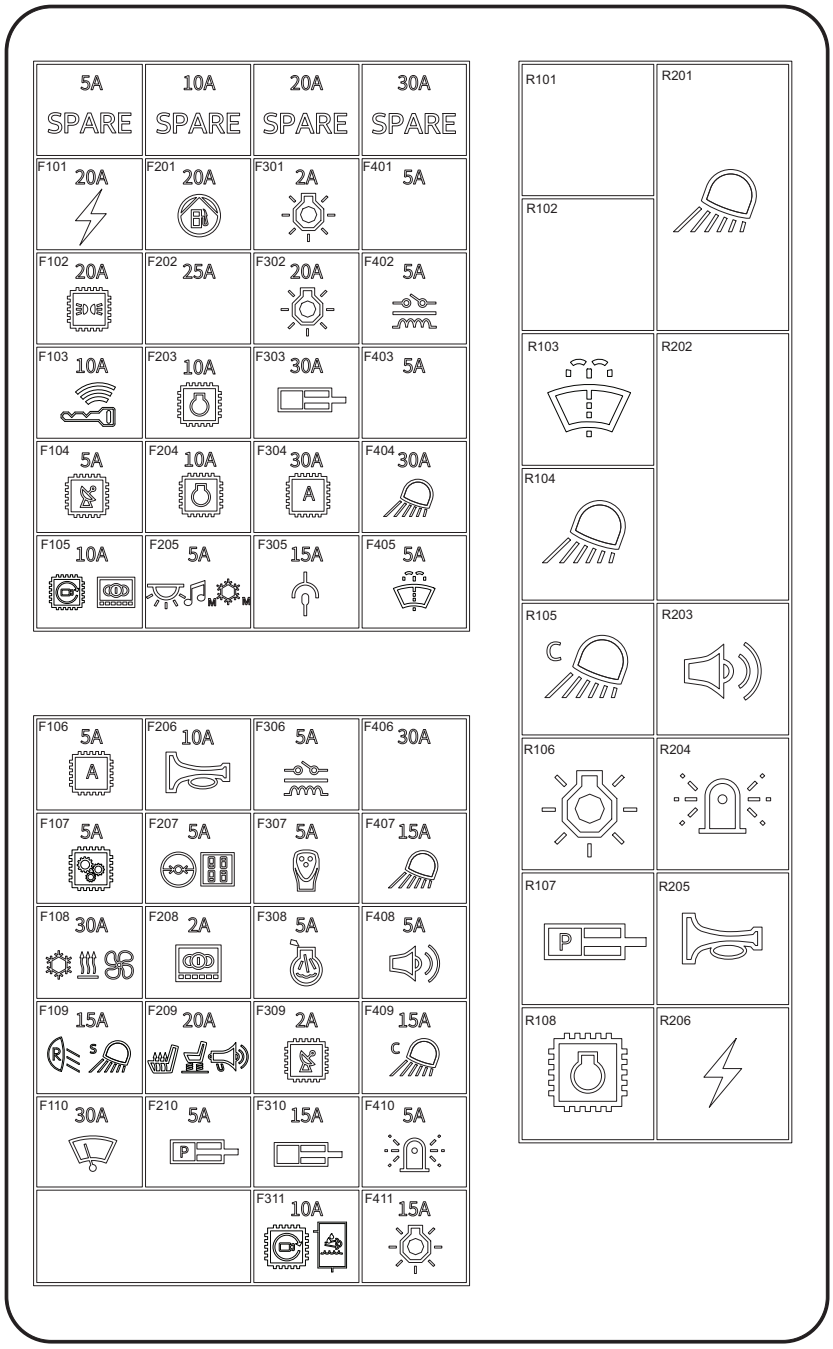
EX1502461

Figure 131

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.



DS2104553

Figure 132

Fuse		
No.	**Name**	**Capacity**
A	Spare	5A
B	Spare	10A
C	Spare	15A
D	Spare	30A
F101	ACC Relay	20A
F102	Blink Unit, Hazard Signal, Combi Switch	20A
F103	Smart Key Horn/Lamp, Horn/ Lamp Relay	5A
F104	TMS	5A
F105	Key Switch, Radio, GP Display, AVM	5A
F106	ACU Power	5A
F107	VCU	5A
F108	Aircon System	30A
F109	Reverse Lamp, Stop Lamp, Horn/Washer Signal	15A
F110	Wiper	10A
F201	Fuel Transfer Pump	25A
F202	-	30A
F203	SCR Controller	10A
F204	SCR Heater	10A
F205	Radio, A/C Back Up, VCU, Room Lamp	5A
F206	Horn/Horn Relay	5A
F207	Kepad, Check Connector, Pressure Sensor, 4wheel Sensor	5A
F208	GP Display, Pilot Buzzer	10A
F209	Seat Heater, Air Suspension, Micro Phone	5A
F210	Parking Switch, Pilot Cutoff Sol.	5A

Fuse		
No.	**Name**	**Capacity**
F301	LH Clearance, ILL	10A
F302	RH Clearance, ILL	20A
F303	ACU Sol.	20A
F304	ACU ACT Power	20A
F305	12V Socket	5A
F306	VCU	5A
F307	Joystick	5A
F308	Fuel Feed Pump	5A
F309	TMS	10A
F310	Solenoid	10A
F311	AVM, Urea Level	10A
F401	-	5A
F402	-	5A
F403	-	15A
F404	Working Lamp	30A
F405	Washer Motor	5A
F406	-	30A
F407	Combination Switch Head Lamp	10A
F408	Alarm	10A
F409	Cabin Working Lamp	10A
F410	Rotating Beacon	30A
F411	ILL	15A

Relay	
No.	**Name**
R101	-
R102	Parking S/V
R103	Wiper System
R104	Working Lamp
R105	Cabin Working Lamp
R106	Add. Working Lamp
R107	Pilot Cutoff S/V
R108	ECU, ATS S/W, Wait to Disconnect

Relay	
No.	**Name**
R201	-
R202	-
R203	Alarm
R204	Rotating Beacon
R205	Horn
R206	12V Socket, Radio, Antenna, GP

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" for more information. 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/cm^2 (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. If HD HYUNDAI CONSTRUCTION EQUIPMENT's genuine coolant is not available, the coolant and additives 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)
Remark	Below should not be contained for Scania Engine • 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 referece 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

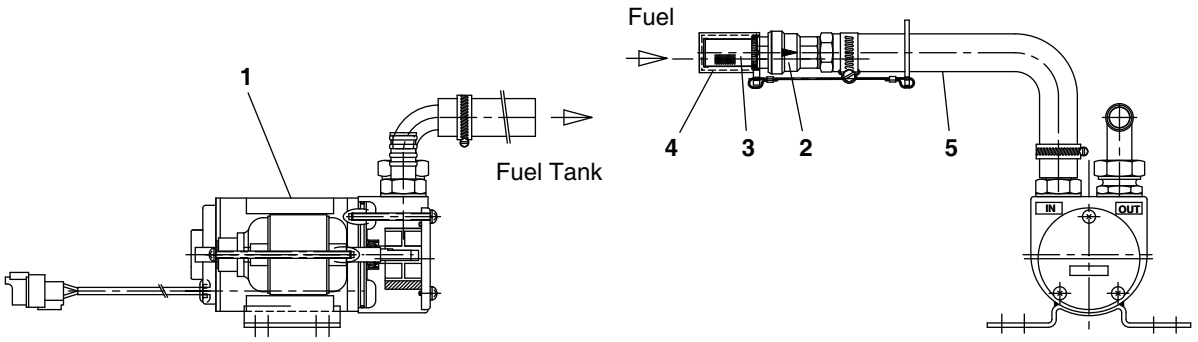
AVOID DEATH OR SERIOUS INJURY

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 is used to transfer fuel from a refueling source to the fuel tank. A check valve is installed in the inlet hose 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.



FG000161

Figure 133

Reference Number	Description
1	Body
2	Check Valve
3	Strainer

Reference Number	Description
4	Strainer Cap
5	Inlet Hose

1. Open the fuel cap on the fuel tank.
2. Remove strainer cap (4) from strainer (3) on end of inlet hose (5).

   NOTE: *Keep strainer cap (4) in a safe location to reseal strainer (3) after refueling is complete.*

3. Insert inlet hose (5) into refueling tank.

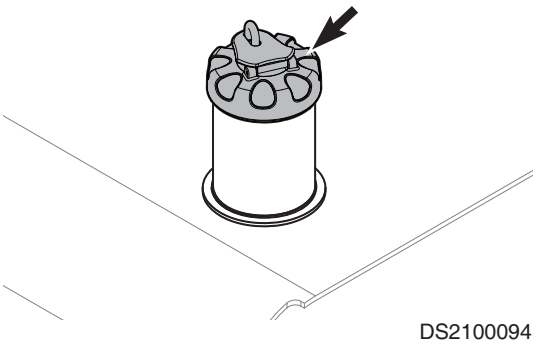


Figure 134

4. Move switch to "I" (ON) position inside of battery box to operate the pump.
5. When fuel transfer is completed, move switch to "O" (OFF) position to stop the pump.
6. Lift inlet hose (5) from fueling source and move switch to "I" (ON) position.
   After two-three seconds, move switch to "O" (OFF) position to drain remaining fuel from hose to fuel tank.
7. Install strainer cap (4) on inlet strainer (3) and return hose (5) to storage position.

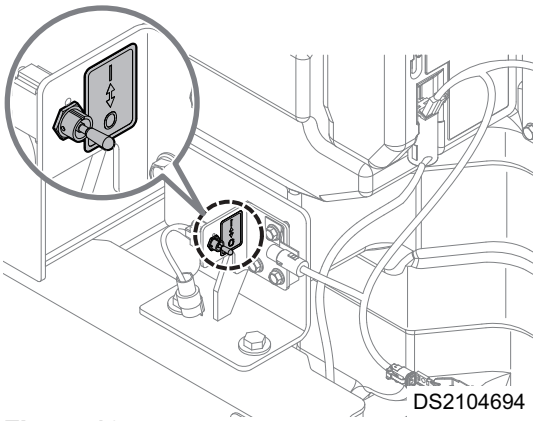


Figure 135

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:

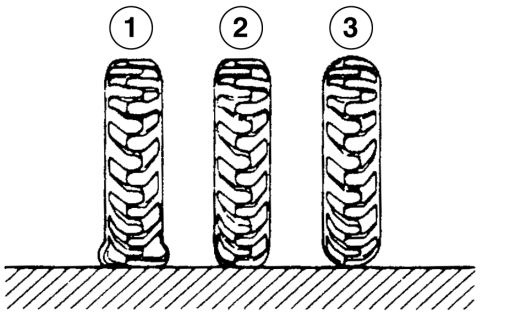
1. Park machine on firm and level ground. Lower the front attachment to the ground and stop engine.
2. Move safety lever to "UNLOCK" position.
3. Turn starter switch to "I" (ON) position.
4. Fully stroke work and travel levers in all directions.
5. Move safety lever to "LOCK" position.
6. Turn key to "O" (OFF) position and remove from starter switch.
7. Remove accumulator by unscrewing it slowly.

Tires and Wheels

Properly inflated tire (2) is an important factor in determining tire performance and tire life. A tire that is under inflated (1) does not properly support machine, and will wear out quickly. Overinflated tires (3) have poor traction and puncture easily.

Use a pressure gauge to measure tire pressure. Always measure tire pressure before machine has been working, when tires are cold. Use table below to determine correct pressure for front or rear tires when driving machine, or when working machine.

Check tires for damage and embedded objects. Check valve stems for damage.



HCB3049S

Figure 136

Tire Dimension	Working Pressure		Remarks
	Front Tire	Rear Tire	
500/45-20	6.12 kg/cm^2 (87 psi)	6.12 kg/cm^2 (87 psi)	Single Tire
8.25-20-14PR	8.44 kg/cm^2 (120 psi)	8.44 kg/cm^2 (120 psi)	Twin Tire

Tire - Check

WARNING

AVOID DEATH OR SERIOUS INJURY

Improper servicing or changing tires and rims can cause explosion resulting in serious injury or death.

Do not service or change tires and rims unless properly trained and equipped.

Contact your nearest HD HYUNDAI CONSTRUCTION EQUIPMENT excavator dealer or tire manufacturer's local dealer for tire servicing or changing.

WARNING

AVOID DEATH OR SERIOUS INJURY

Overheated tire may explode causing serious injury or death.

If overheated tire is suspected, do not approach tire to distance of less than 15 m (50 ft).

Stay away until tire and rim cool down.

If the following defects are found in tires, for safety reasons the tires must be replaced with new tires.

For the replacement contact HD HYUNDAI CONSTRUCTION EQUIPMENT excavator dealer or a tire manufacturer's local dealer.

- Bead wire is broken or bent, or the tire is greatly deformed.
- Wear is excessive and the carcass ply (including breaker) is exposed for more than 1/4 of the circumference.
- Damage to the carcass exceeds 1/3 of the tire width.
- Tire layers are separated.
- Radial cracks reach the carcass.
- Deformation or damage which makes the tire unsuitable for use.

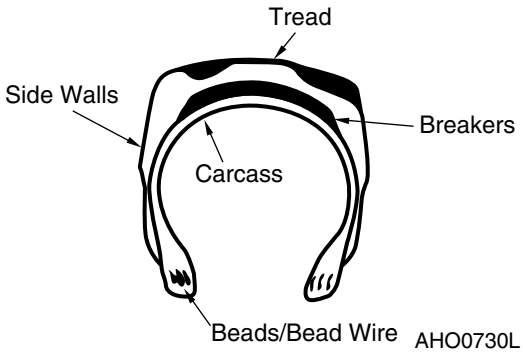
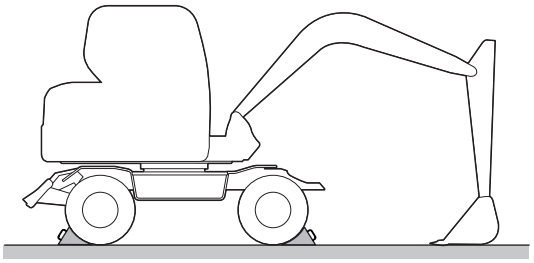


Figure 137

Tire Changing Procedure

NOTICE

1. **Before changing tires, move safety lever to "LOCKED" position. Place a warning tag on controls so that no one begins to operate machine while tires are being changed.**
2. **Secure other tires not being changed by using wheel chocks.**



DS2104867

Figure 138

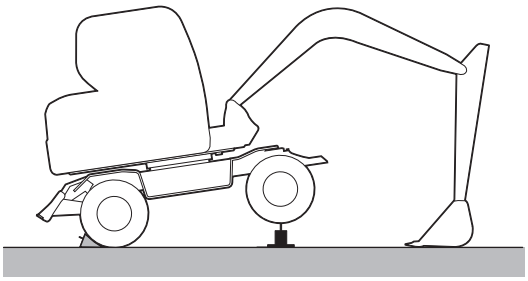
When mounting tires, be certain that tires are mounted with direction of rotation mark facing in proper direction. If no rotation direction arrow is visible, examine tread marks and position them to face the front of machine for proper traction and wear.

NOTE: *Unmatched tires will cause uneven wear and put unnecessary load on the final drive. Use recommended, matched tires for proper wear and performance.*

HAOM290L

Figure 139

1. Park machine on secure and level ground able to support weight of machine.
2. Using a jack rated for weight of machine, raise machine to a height so that tires have enough clearance. Place appropriate stands under frame to support machine.
3. Lower bucket or work tool to ground.
4. Stop engine.



DS2104871

Figure 140

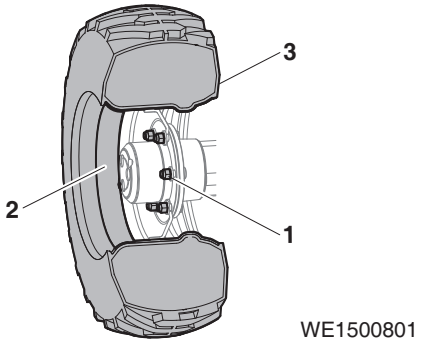
Single Tire

5. Tire assembly cross section view

Reference Number	Description
1	Wheel Nut
2	Tire Rim
3	Tire

NOTICE

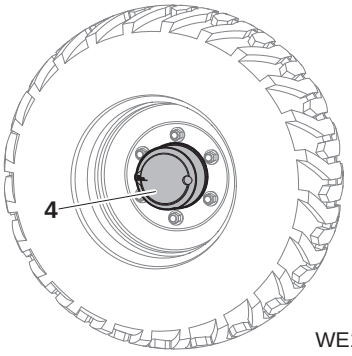
When assembling tire, you should only assemble after checking the assembling direction position of each assembling bolt, nut and washer.



WE1500801

Figure 141

6. Remove tire (2) out of axle hub (4) after releasing wheel nut (1) by means of wheel wrench.



WE1500802

Figure 142

7. When mounting the tire at the bottom of the axle, make sure that the tire rim does not damage the wheel bolt (5) of the axle.

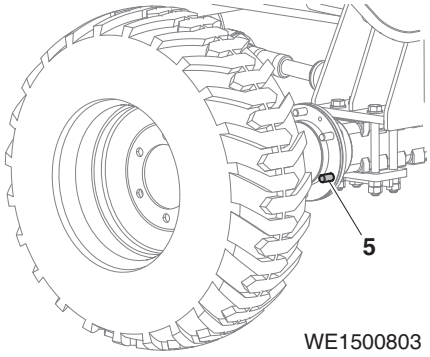


Figure 143

NOTICE

Check the assembling direction and location of the bolts, the nuts and the washers of the tire and then assemble them.

8. Follow tightening pattern when tightening wheel nuts. Tighten to specified torque.
   - Tightening torque: 55 ±3 kg.m (297.8 ±21.7 lb ft)

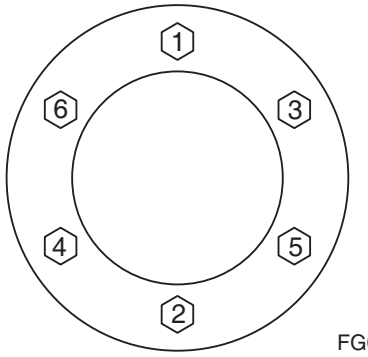


Figure 144

9. Run machine forward and backward several times to ensure proper assembly and seating of the washers. Retighten wheel nuts to ensure proper torque.
   - Torque: 55 ±3 kg.m (297.8 ±21.7 lb ft)

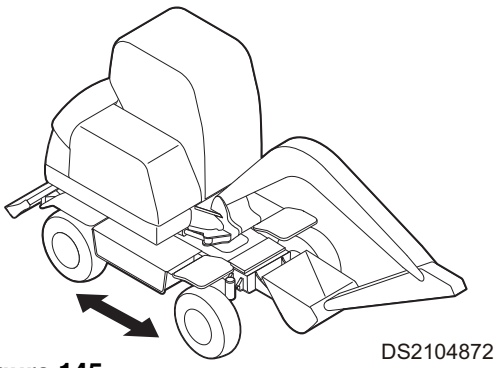


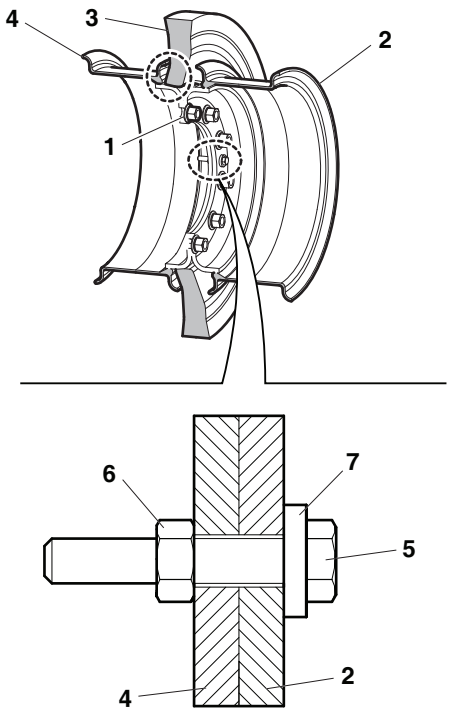
Figure 145

Double Tire

5. This is a cross-sectional view tire assembly

   NOTE: *Rubber spacer protrusion must face inner tire rim.*

Reference Number	Description
1	Wheel Nut
2	Outer Tire Rim
3	Rubber Spacer
4	Inner Tire Rim
5	Outer and Inner Tire Assembly Bolt
6	Outer and Inner Tire Assembly Nut
7	Outer and Inner Tire Assembly Washer

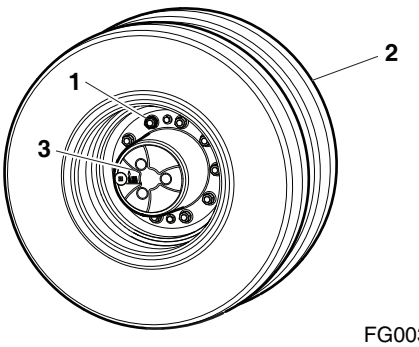


FG003431

Figure 146

6. Remove wheel nuts (1), and tire assembly (2) from axle hub (3).

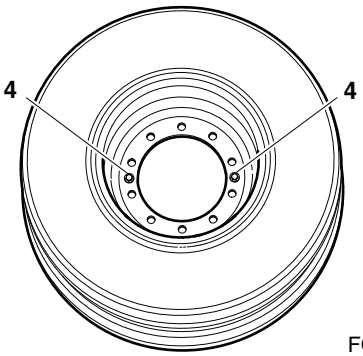
   NOTE: *Examine wheel nuts for wear and damage. Replace all necessary parts.*



FG003432

Figure 147

7. Place the tire assembly (outer and inner tires, and spacer) on flat surface and remove tire assembly bolts (4).

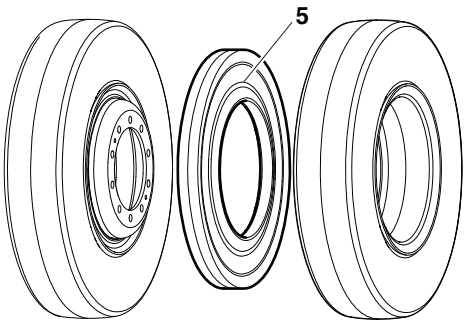


FG003433

Figure 148

8. Separate tires and rubber spacer (5).

   NOTE: *Examine all parts for excessive wear and damage. Replace all necessary parts.*



FG003434

Figure 149

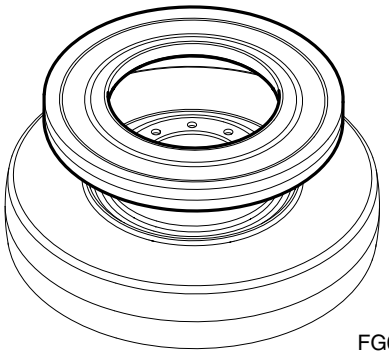
NOTICE

AVOID INJURY

When assembling tires check assembly position of each bolt, washer and nut. See Figure 146.

9. When assembling the tire assembly place inner tire on ground, Position rubber spacer so it is centered on inner tire rim.

   NOTE: *Rubber spacer protrusion must face inner tire rim.*

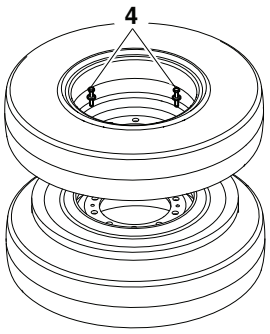


FG003435

Figure 150

10. Position outer tire on rubber spacer. Align outer and inner tire assembly bolt holes. Install bolts, washers and nuts (4, Figure 151). Tighten nuts to 11 kg.m (80 ft lb).

    NOTE: *Make sure tire rims are against each other. Washer and bolt head must be against inner rim. See Figure 146.*

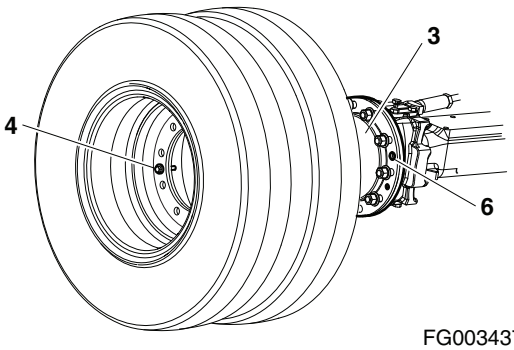


FG003436

Figure 151

11. Install tire assembly on axle hub (3).

    NOTE: *Make sure that wheel assembly bolts (4) are positioned in relief holes (6) on axle hub. Make sure tire assembly bolts (4) do not damage axle hub (3).*



FG003437

Figure 152

12. Follow tightening pattern when tightening wheel nuts. Tighten to specified torque.
    - Tightening torque: 55 ±3 kg.m (297.8 ±21.7 lb ft)

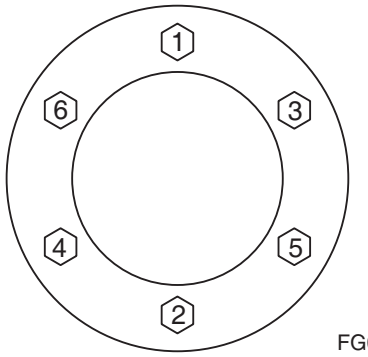


Figure 153

13. Run machine forward and backward several times to ensure proper assembly and seating of the washers. Retighten wheel nuts to ensure proper torque.
    - Torque: 55 ±3 kg.m (297.8 ±21.7 lb ft)

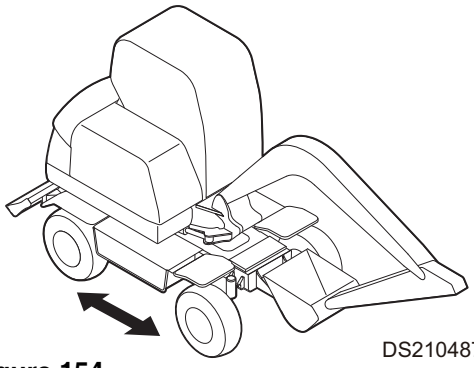


Figure 154

Venting and Priming Hydraulic System

Main System 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. Keep engine less than 1,000 rpm and operate each actuator more than 3 cycle.
2. Allow engine to idle more than 5 minutes.
3. With the engine stopped, remove vent plug to see if any oil is present.
4. If oil is not present, fill oil tank with oil.
5. Install vent plug first.
6. Slowly loosen vent plug several turns, until hydraulic oil flows out of plug. This shows that air has been released.
7. Tighten the plug.

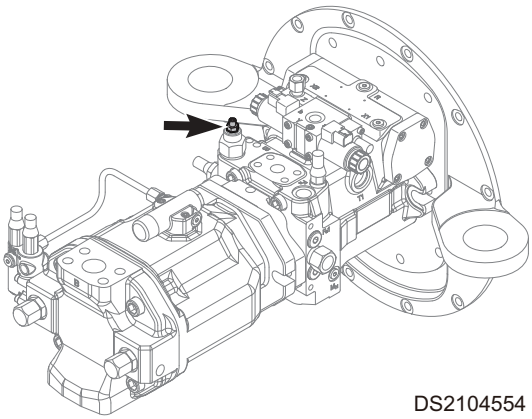


Figure 155

Hydraulic 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.

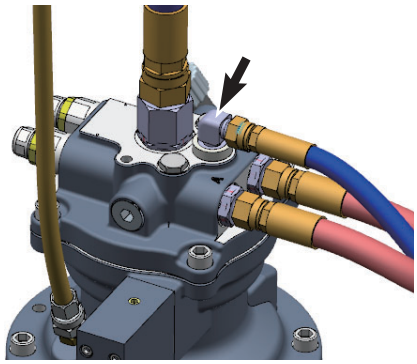
Swing Motor

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.



DS2104894

Figure 156

Brake Line

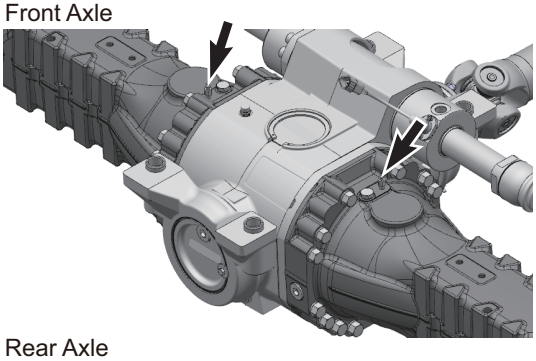
NOTICE

Use a transparent vinyl hose for air ejection.

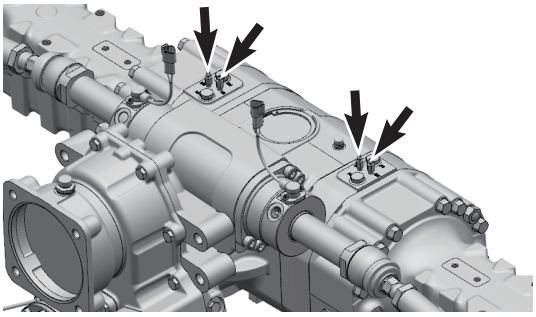
Do not push the brake pedal fully after opening the bleeder.

1. Run the engine at "LOW IDLE".
2. Open the brake bleeder at axle.
3. Push the brake pedal slowly to drain hydraulic oil.
4. Close the bleeder.
5. Repeat steps 2 through 4 until hydraulic oil contains no bubble which means that air is completely expelled. If hydraulic still contains bubbles, repeat steps 2 through 4.
6. Use the same steps to eject air of other brake lines.

Front Axle



Rear Axle



DS2104895

Figure 157

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: *Refer to "Operation Under Abnormal Conditions" 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 lower structure and tire assemblies for damage or excessive wear.
	Inspect for loose or damaged fittings or bolts.
	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.

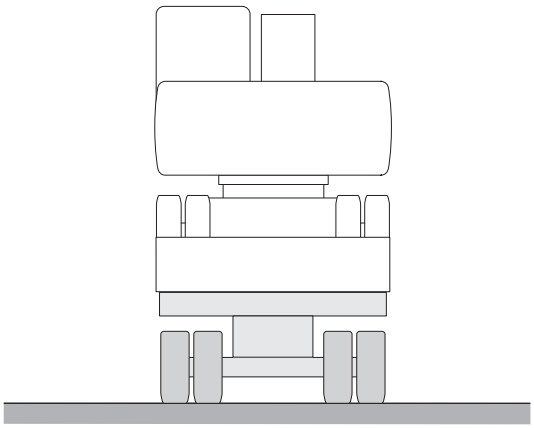
Check the intended route for road width, overhead clearances, weight restrictions, and traffic control regulations. Special approval or permits may be required.

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.



DS1601932

Figure 1

Loading and Unloading

Warning for Counterweight and Front Attachment Removal

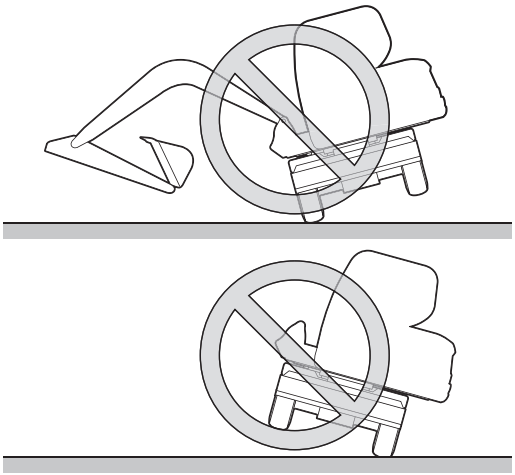
WARNING

AVOID DEATH OR SERIOUS INJURY

DO NOT remove machine counterweight, front attachment or any other part. This could cause tipping or roll-over resulting 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.



DS2104707

Figure 1

WARNING

AVOID DEATH OR SERIOUS INJURY

When transporting the machine, know the width, height, length, and weight.

When loading or unloading the machine, make sure to run the engine at the lowest speed setting and travel at the slowest speed possible.

Make sure that ramp being used can handle the weight of the machine. If required, add blocking under the ramp for additional support.

Make sure that ramp surface is free of grease, debris, or mud that could cause the machine to slip or slide.

Make sure that trailer is parked on firm and level ground before attempting to load/unload the excavator.

If it is necessary to turn the machine while it is on the trailer, make sure to do this at the slowest engine and travel speeds possible.

Make sure that swing lock pin is fully engaged before transporting the machine to prevent accidental rotation of the upper structure.

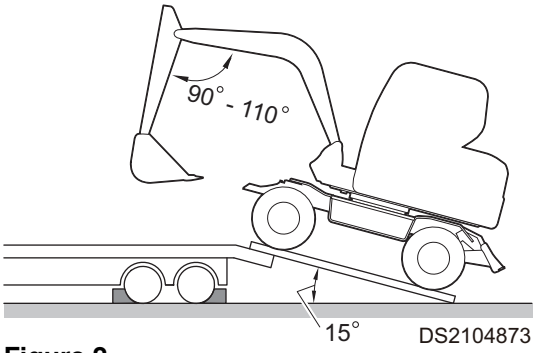
Make sure to secure the excavator onto the trailer as required by local transportation laws and regulations.

Short Distance Self-powered Travel

1. Follow the Travel Instructions in Section 3 of this manual.
2. Make sure to fully "ENGAGE" the Swing Lock pin to secure the upper frame assembly before traveling more than a very short distance.
3. If traveling across a bridge, make sure that its capacity is rated for the weight of the machine and that it is wide enough. Add extra bracing as required.

Trailer Loading/Unloading Procedures

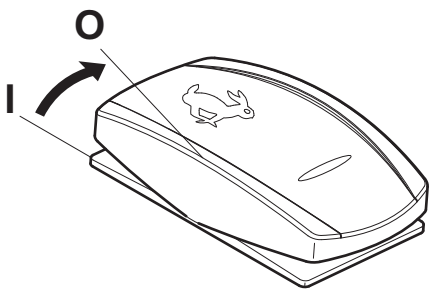
1. Make sure that trailer is parked on firm and level ground.
2. Make sure that ramps that are being used are designed to handle the weight of the excavator. If required, add blocking under the ramp to provide additional support.
3. The ramp angle must be less than a 15° grade. Ramps steeper than this can cause a problem when loading or unloading.



DS2104873

Figure 2

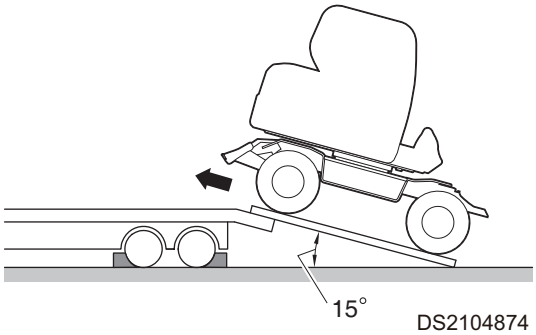
4. Set the travel speed selector switch to "O" position and step on the accelerator pedal slowly.
5. If the machine is equipped with work equipment, position the work equipment toward the front of the excavator, and travel forward to load it.



DS2104896

Figure 3

6. The unit does not require disassembly for normal over-the-road transportation. If the boom and arm need to be removed, the counterweight will place more weight on the rear of the machine. Make sure to back the excavator onto the trailer so the counterweight end of the excavator is positioned on the ramp first.



DS2104874

Figure 4

7. Store the front attachment in the "Transport position and set the Function Lock in the "TRANSPORT" position.

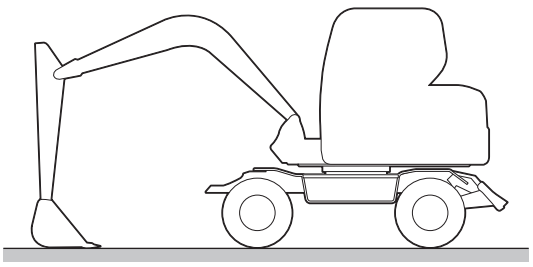
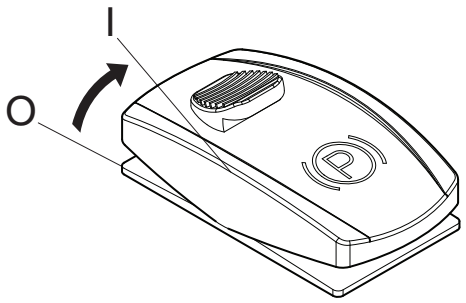

DS2104705

Figure 5

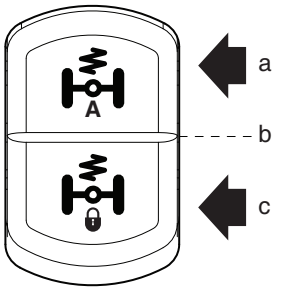
8. Set parking brake switch to "I" (APPLIED) position.



DS1603880

Figure 6

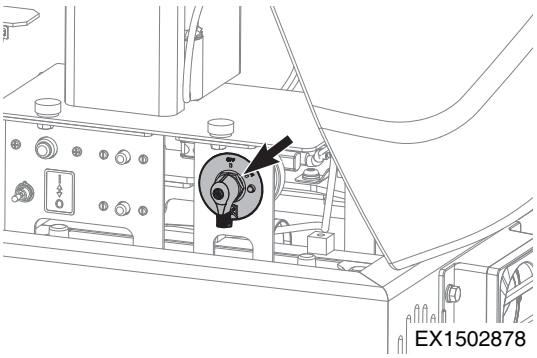
9. Set ram lock switch in "c" position.



DS1605544

Figure 7

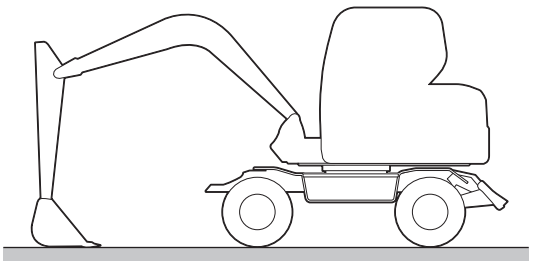
10. Stop engine by turning key to "O" (OFF) position.
11. Remove key from starter switch.
12. Move safety lever to "LOCK" position.
13. Turn battery disconnect switch to "OFF" position.
14. Lock all doors and access covers.
15. Adjust direction of rotating beacon and TMS antenna.



EX1502878

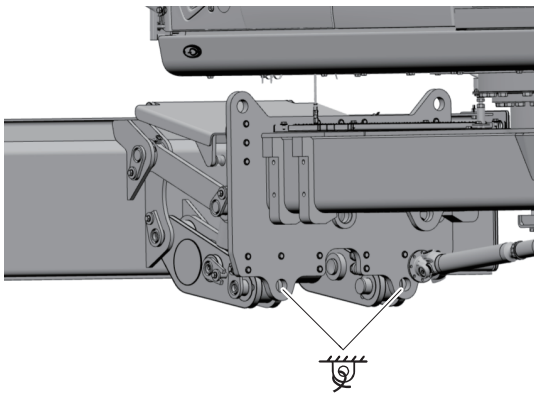
Figure 8

16. Before transporting the excavator, make sure that swing lock pin has been fully engaged. This will prevent the upper structure from accidentally rotating during transportation.
17. Make sure to secure the excavator onto the trailer before transporting. Use chains or cable tie-downs as required by local transportation laws. Use the wheel chocks supplied with the machine to secure machine.
18. Refer to "Specification" for overall machine height and width dimensions. Make sure to position the excavator as shown. If not transported in this position, the height measurements may be different.



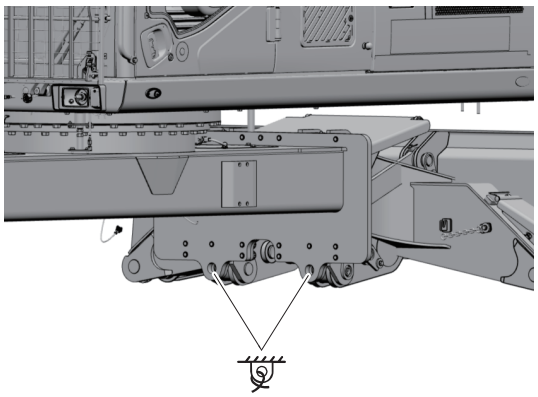
DS2104705

Figure 9



DS2300499

Figure 10



DS2300500

Figure 11

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.

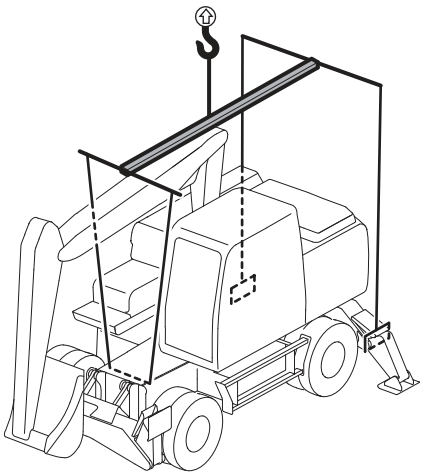
Improper lifting can allow load to shift and cause death or serious injury or property damage.

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.

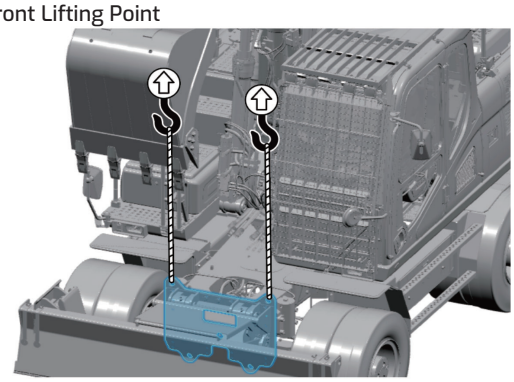
1. Refer to "Specification" section of this manual for weight and dimensional information.
2. Lower the work equipment to the ground.
3. Lower the dozer blade and the outrigger to the ground. (if equipped)
4. Move safety lever to "LOCK" position. Stop engine.
5. Ensure there is nothing around the operator's compartment, close the cabin door and front glass securely.
6. Tie each wire rope to the equipment lifting hook.
7. For equipment that does not have a lifting hook of the front frame, install the wire rope to the front dozer or outrigger.
8. Use spreader bars between the wire rope and the machine to prevent damage to the rope or machine. When lifting, keep the machine horizontal and lift the machine slowly to keep it balanced.
9. After the machine comes off the ground, check the hook condition and the lifting posture, and then lift slowly.



EX1300843

Figure 12

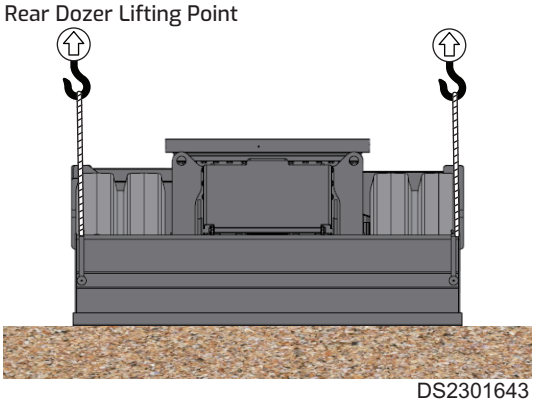
Front Lifting Point



DS2301645

Figure 13

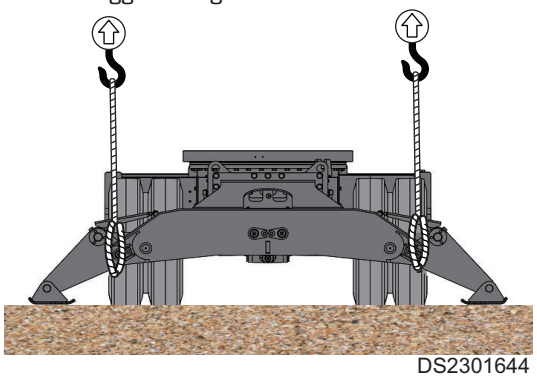
Rear Dozer Lifting Point



DS2301643

Figure 14

Rear Outrigger Lifting Point



DS2301644

Figure 15

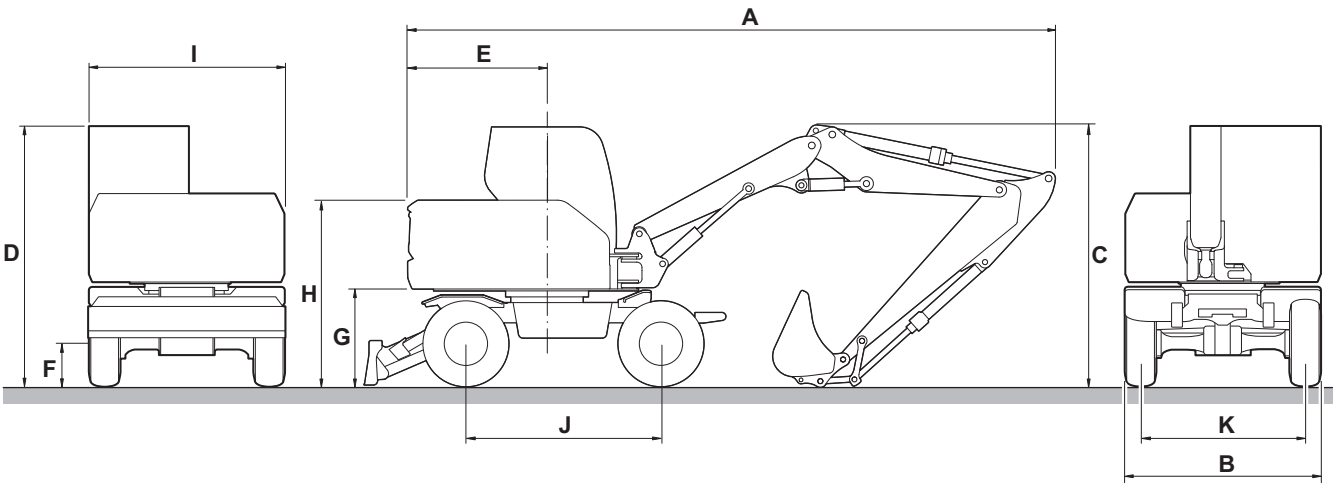
Specification

Standard Specification

Component			Specification	
			Metrics	English
Operating Weight			10.7 Metric tons	11.8 US ton
Bucket Capacity	SAE (PCSA)		0.28 m^3	0.37 yd^3
Engine	Emission		EU Stage V	
	Maker and Model		HD HYUNDAI CONSTRUCTION EQUIPMENT / D34	
	Type		Water Cooled, Direct Injection	
	Rated Net Output		75.0 kW @ 2,000 rpm	100 HP (101 PS) @ 2,000 rpm
	Maximum Torque		429.5 N.m @ 1,400 rpm	316.8 ft lb @ 1,400 rpm
	Fuel Tank Capacity		145 L	38.3 U.S. gal.l
Hydraulic Pump	Type		Axial Piston	
	System Pressure		301 kg/cm^2	4,281 psi
	Maximum Discharge Quantity		200 L/min	52.84 U.S. gal./min
	Hydraulic Oil Capacity	Level	94 L	24.8 U.S. gal.
		System	238 L	62.9 U.S. gal.
Performance	Travel Speed	1st	16.9 (High) / 5.4 (Low) km/h	10.5 (High) / 3.4 (Low) MPH
		2nd	37.4 (High) / 12.9 (Low) km/h	23.2 (High) / 8.0 (Low) MPH
	Digging Capability (SAE)	Arm	3.6 metric ton	4.0 ton
		Bucket	5.3 metric ton	5.8 ton
	Digging Capability (ISO)	Arm	3.7 metric ton	4.1 ton
		Bucket	6.0 metric ton	6.6 ton
	Swing Speed		10.0 rpm	
	Gradeability		21.2° (39% Slope)	
	Minimum Swing Radius		3,105 mm	10' 2"
Travel System	Drive System		2 Speed	
	Tire Size		Double 8.25 - 20 - 14PR	
	Brake Type		Wet Disc Brake	

Base Option: Arti Boom + 2.25 m Arm + 0.28 m^3 Bucket + Front Cradle + Rear Dozer

Overall Dimensions



DS2104877

Figure 1

Dimension		1.89 m (14' 5") Upper + 1.88 m (15' 1") Lower Boom	
		2.25 m (6' 11") Arm	
		Rear Dozer	**Rear Outrigger**
A	Overall Length (Travel*)	5,809 mm (19' 1")	5,687 mm (18' 8")
A'	Overall Length (Transport**)	7,319 mm (24' 0")	7,281 mm (23' 11")
B	Overall Width	2,450 mm (8' 0")	
C	Overall Height (Travel*)	3,941 mm (12' 11")	3,952 mm (13' 0")
D	Overall Height (Top of Cab)	3,000 mm (9' 10")	3,011 mm (9' 11")
E	Tail Swing Radius	1,600 mm (5' 3")	
F	Min. Ground Clearance	317 mm (1' 0")	328 mm (1' 1")
G	Upper Structure Ground Clearance	1,099 mm (3' 7")	1,110 mm (3' 8")
L / M	Center to Wheel	932 mm / 1,308 mm (4' 3" / 3' 1")	
I	Upper Structure Width	2,250 mm (7' 5")	
J	Wheel Base	2,240 mm (7' 4")	
K	Tread Width	1,987 mm (6' 6")	1,944 mm (6' 5")
-	Dozer Blade Max. Lifting Height	350 mm (1' 2")	
-	Dozer Blade Max. Lowering Depth	175 mm (0' 7")	
-	Dozer Blade Height	500 mm (1' 8")	

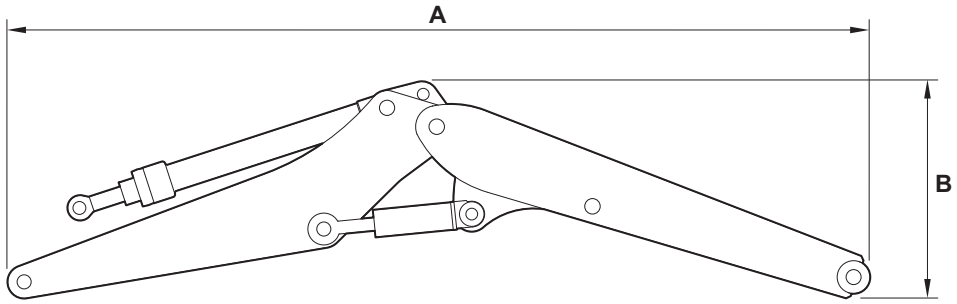
*: Road Homologation Travel Position

**: Transport Position (Dozer at ground, Front at ground)

Disassembled Parts, Dimension and Weight

Components

Boom

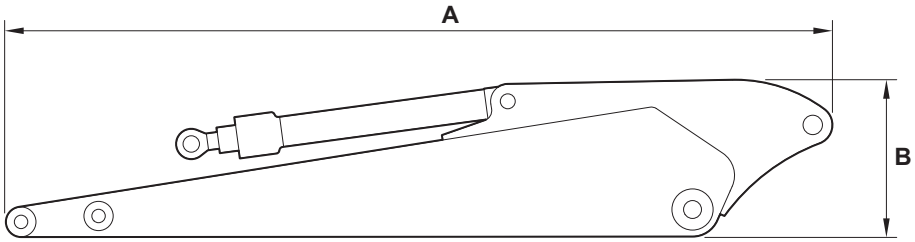


DS2104665

Figure 2

Description		3.71 m (12' 2") Two-Piece
Length (A)	mm (ft in)	3,710 (12' 2")
Length (B)		890 (2' 11")
Width		599 (2' 0")
Weight	kg	800
	lb	1,764

Arm

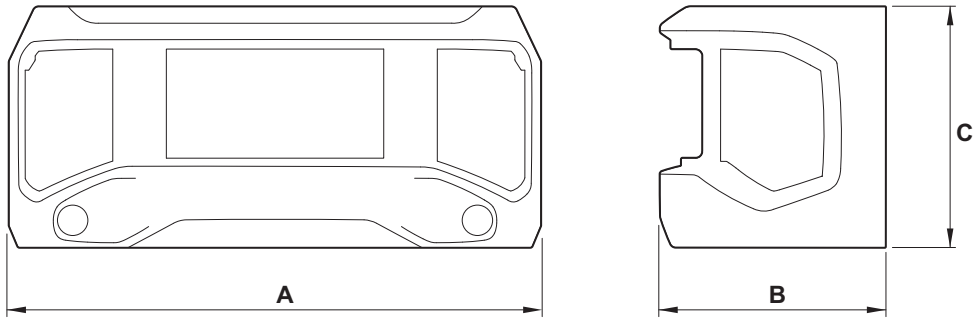


DS2104666

Figure 3

Description		2.25 m (6' 11")
Length (A)	mm (ft in)	2,785 (9' 2")
Length (B)		530 (1' 9")
Width		206 (0' 8")
Weight	kg	335
	lb	739

Counterweight



DS2104667

Figure 4

Description		1.35 ton
Length (A)	mm (ft in)	2,250 (7' 5")
Length (B)		955 (3' 2")
Length (C)		1,020 (3' 4")
Weight	kg	1,350
	lb	2,976

Digging Force

Arm-Tearout Force

Type	Digging Force		
	Unit	SAE	ISO
2.5 m Arm	kN	35.6	36.5
	kg	3,630	3,722
	lb	8,003	8,206

Bucket - Breakout Force

Type	Capacity (m^3)	Bucket Width (mm)		Digging Force		
	SAE	With Cutter	Without Cutter	Unit	SAE	ISO
Two-Piece Boom	0.28	816	700	kN	51.6	58.6
				kg	5,262	5,976
				lb	11,600	13,174

Working Range

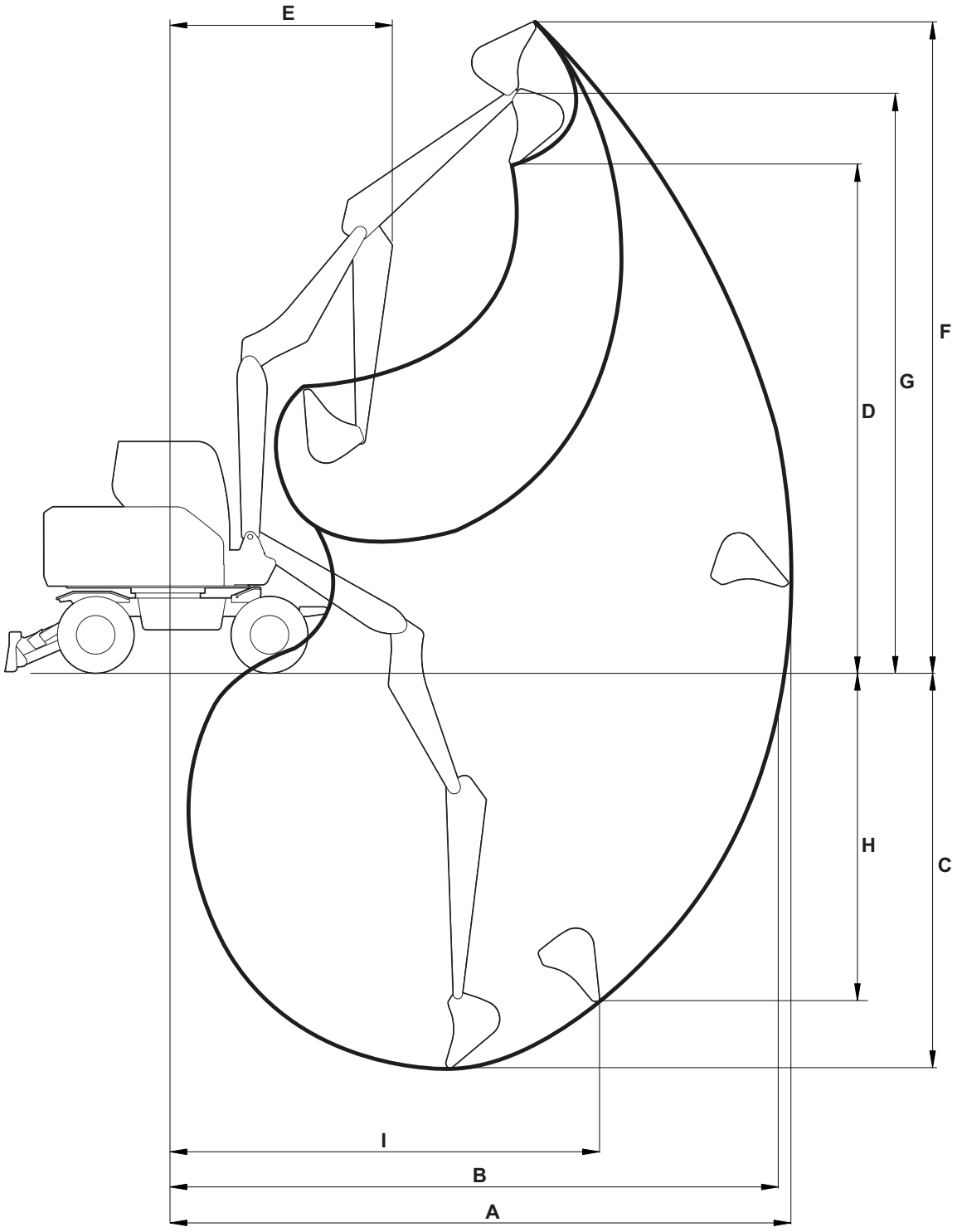


Figure 5

Dim.	Boom Type	1.89 m (14' 5") Upper + 1.88 m (15' 1") Lower Boom
	Arm Type	**2.25 m (6' 11") Arm**
	Bucket Type (SAE)	**0.28 m^3 (0.37 yd^3)**
A	Max. Digging Reach	7,815 mm (25' 8")
B	Max. Digging Reach (Ground)	7,605 mm (24' 11")
C	Max. Digging Depth	4,245 mm (13' 11")
D	Max. Dumping Height	6,250 mm (20' 6")
E	Min. Swing Radius	3,105 mm (10' 2")
F	Max. Digging Height	8,265 mm (27' 1")
G	Max. Bucket Pin Height	7,255 mm (23' 10")
H	Max. Vertical Wall Depth	3,670 mm (12' 0")
I	Max. Radius Vertical	4,800 mm (15' 9")
-	Boom Swing Angle (Left)	60°
-	Boom Swing Angle (Right)	60°

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.

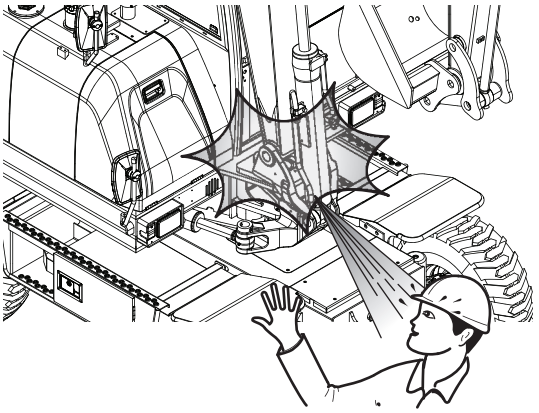
See the specification handbook for specifications not listed below.

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.



WE1500774

Figure 6

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.

- 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).

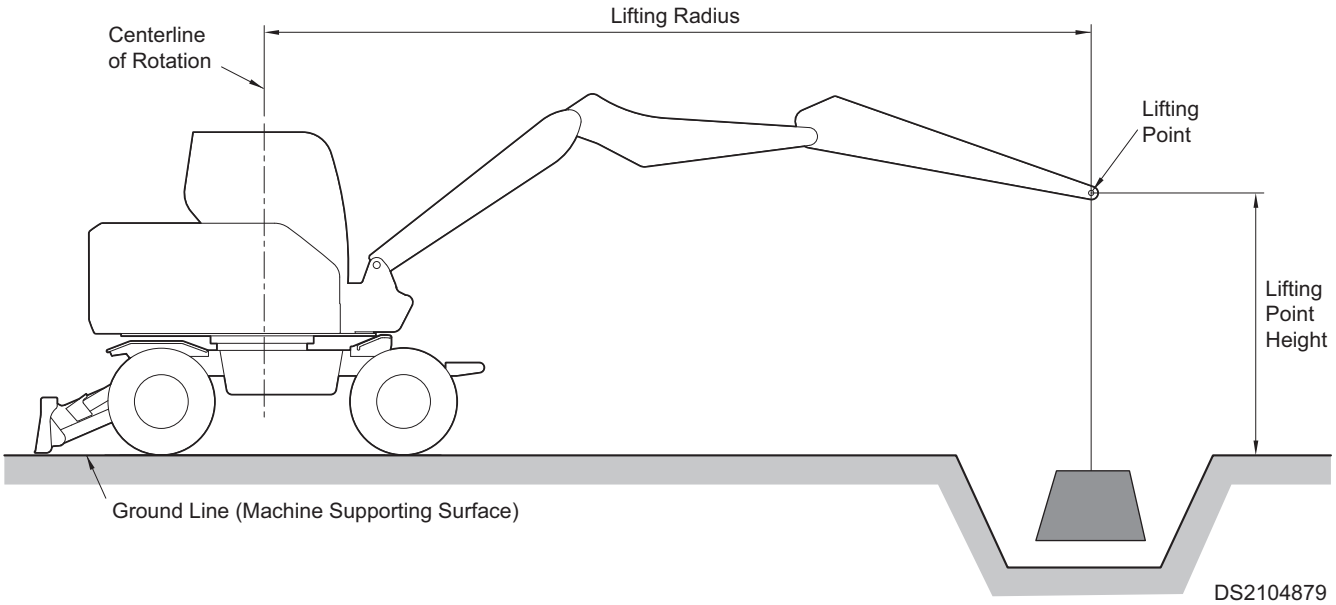
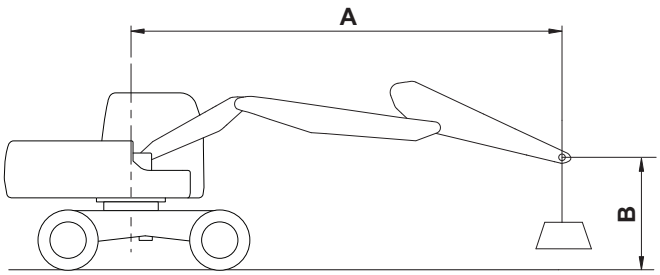


Figure 7

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 7.

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.



Front : Cradle, Rear : Dozer, Under Attach Up, Looking at the Front

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Double
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104668

Figure 8

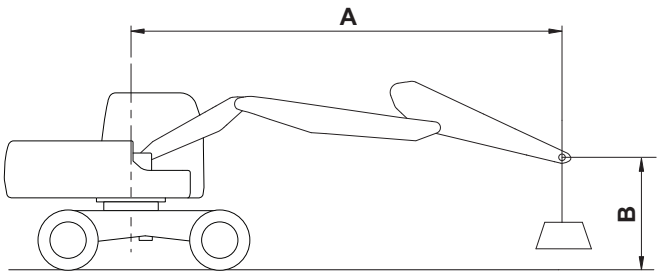
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	1.75	4.91
4.5					* 1.92	* 1.92	* 1.75	1.26	* 1.55	1.22	6.10
3					* 2.24	1.97	* 1.77	1.24	* 1.47	1.03	6.67
1.5					* 2.64	1.80	* 1.85	1.18	* 1.51	0.98	6.80
0			* 3.11	3.03	* 2.68	1.70	* 1.76	1.14	* 1.41	1.02	6.54
-1.5	* 3.36	* 3.36	* 3.40	3.07	* 2.15	1.69			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	3.86	16.13
15					* 4.23	* 4.23	* 3.85	2.78	* 3.42	2.69	20.02
10					* 4.94	4.34	* 3.91	2.74	* 3.23	2.27	21.88
5					* 5.82	3.97	* 4.08	2.61	* 3.32	2.15	22.32
0			* 6.87	6.68	* 5.92	3.74	* 3.88	2.52	* 3.11	2.25	21.45
-5	* 7.40	* 7.40	* 7.50	6.76	* 4.74	3.72			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Cradle, Rear : Dozer, Under Attach Down, Looking at the Rear

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Double
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104669

Figure 9

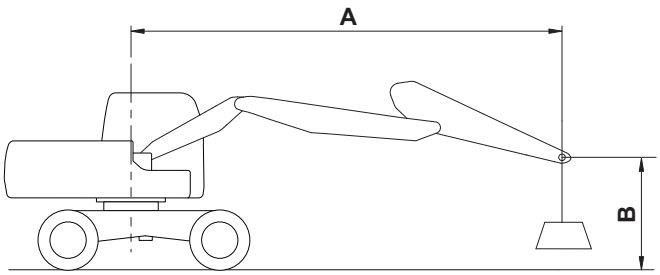
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	* 1.88	4.91
4.5					* 1.92	* 1.92	* 1.75	1.41	* 1.55	1.36	6.10
3					* 2.24	2.19	* 1.77	1.39	* 1.47	1.16	6.67
1.5					* 2.64	2.02	* 1.85	1.33	* 1.51	1.10	6.80
0			* 3.11	* 3.11	* 2.68	1.92	* 1.76	1.29	* 1.41	1.15	6.54
-1.5	* 3.36	* 3.36	* 3.40	* 3.40	* 2.15	1.91			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	* 4.15	16.13
15					* 4.23	* 4.23	* 3.85	3.11	* 3.42	3.00	20.02
10					* 4.94	4.83	* 3.91	3.06	* 3.23	2.55	21.88
5					* 5.82	4.46	* 4.08	2.93	* 3.32	2.42	22.32
0			* 6.87	* 6.87	* 5.92	4.22	* 3.88	2.84	* 3.11	2.53	21.45
-5	* 7.40	* 7.40	* 7.50	* 7.50	* 4.74	4.20			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Cradle, Rear : Dozer, Under Attach Up, Looking at the Rear

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Double
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104670

Figure 10

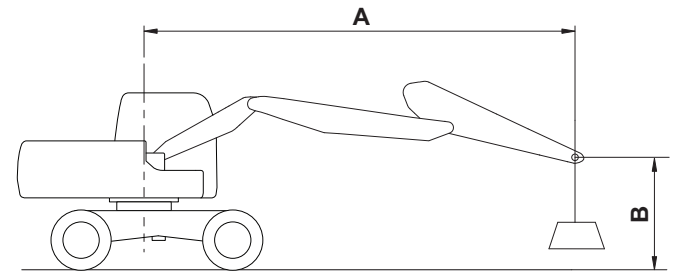
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					1.88	* 2.01			1.58	1.75	4.91
4.5					1.89	* 1.92	1.13	1.26	1.09	1.22	6.10
3					1.78	1.97	1.12	1.24	0.92	1.03	6.67
1.5					1.61	1.80	1.06	1.18	0.87	0.98	6.80
0			2.68	3.03	1.51	1.70	1.02	1.14	0.91	1.02	6.54
-1.5	* 3.36	* 3.36	2.72	3.07	1.50	1.69			1.08	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					4.14	* 4.42			3.49	3.86	16.13
15					4.17	* 4.23	2.50	2.78	2.41	2.69	20.02
10					3.92	4.34	2.46	2.74	2.03	2.27	21.88
5					3.56	3.97	2.33	2.61	1.91	2.15	22.32
0			5.91	6.68	3.33	3.74	2.24	2.52	2.00	2.25	21.45
-5	* 7.40	* 7.40	5.99	6.76	3.31	3.72			2.39	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Dozer, Rear : Outrigger, Under Attach Down, Looking at the Front

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Double
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104671

Figure 11

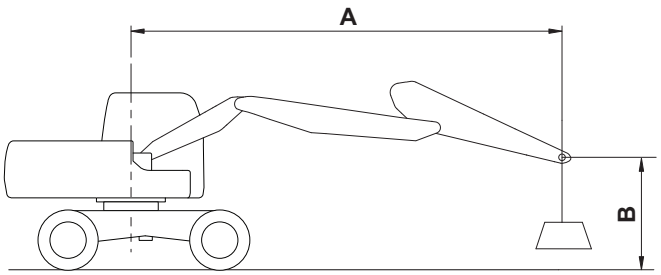
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	* 1.88	4.91
4.5					* 1.92	* 1.92	* 1.75	1.54	* 1.55	1.49	6.10
3					* 2.24	* 2.24	* 1.77	1.52	* 1.47	1.27	6.67
1.5					* 2.64	2.22	* 1.85	1.46	* 1.51	1.21	6.80
0			* 3.11	* 3.11	* 2.68	2.11	* 1.76	1.42	* 1.41	1.27	6.54
-1.5	* 3.36	* 3.36	* 3.40	* 3.40	* 2.15	2.10			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	* 4.15	16.13
15					* 4.23	* 4.23	* 3.85	3.40	* 3.42	3.29	20.02
10					* 4.94	* 4.94	* 3.91	3.35	* 3.23	2.80	21.88
5					* 5.82	4.89	* 4.08	3.22	* 3.32	2.67	22.32
0			* 6.87	* 6.87	* 5.92	4.66	* 3.88	3.13	* 3.11	2.79	21.45
-5	* 7.40	* 7.40	* 7.50	* 7.50	* 4.74	4.64			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Dozer, Rear : Outrigger, Under Attach Up, Looking at the Front

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Double
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104672

Figure 12

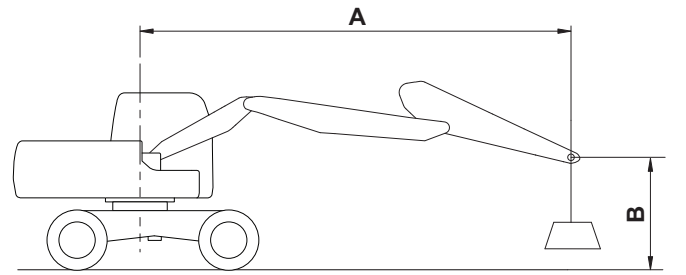
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	1.82	4.91
4.5					* 1.92	* 1.92	* 1.75	1.32	* 1.55	1.27	6.10
3					* 2.24	2.05	* 1.77	1.30	* 1.47	1.08	6.67
1.5					* 2.64	1.88	1.72	1.24	1.42	1.02	6.80
0			* 3.11	* 3.11	2.54	1.78	1.68	1.20	* 1.41	1.07	6.54
-1.5	* 3.36	* 3.36	* 3.40	3.21	* 2.15	1.77			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	4.02	16.13
15					* 4.23	* 4.23	* 3.85	2.91	* 3.42	2.81	20.02
10					* 4.94	4.51	* 3.91	2.87	* 3.23	2.38	21.88
5					* 5.82	4.15	3.80	2.74	3.14	2.26	22.32
0			* 6.87	* 6.87	5.61	3.92	3.71	2.65	* 3.11	2.37	21.45
-5	* 7.40	* 7.40	* 7.50	7.07	* 4.74	3.90			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Dozer, Rear : Outrigger, Under Attach Down, Looking at the Rear

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Double
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104673

Figure 13

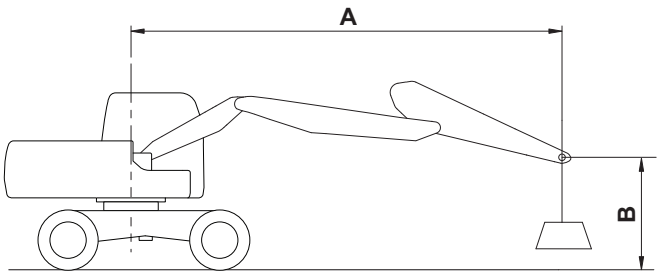
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	* 1.88	4.91
4.5					* 1.92	* 1.92	* 1.75	1.54	* 1.55	1.49	6.10
3					* 2.24	* 2.24	* 1.77	1.52	* 1.47	1.27	6.67
1.5					* 2.64	2.22	* 1.85	1.46	* 1.51	1.21	6.80
0			* 3.11	* 3.11	* 2.68	2.11	* 1.76	1.42	* 1.41	1.27	6.54
-1.5	* 3.36	* 3.36	* 3.40	* 3.40	* 2.15	2.10			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	* 4.15	16.13
15					* 4.23	* 4.23	* 3.85	3.40	* 3.42	3.29	20.02
10					* 4.94	* 4.94	* 3.91	3.35	* 3.23	2.80	21.88
5					* 5.82	4.89	* 4.08	3.22	* 3.32	2.67	22.32
0			* 6.87	* 6.87	* 5.92	4.66	* 3.88	3.13	* 3.11	2.79	21.45
-5	* 7.40	* 7.40	* 7.50	* 7.50	* 4.74	4.64			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Dozer, Rear : Outrigger, Under Attach Up, Looking at the Rear

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Double
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104674

Figure 14

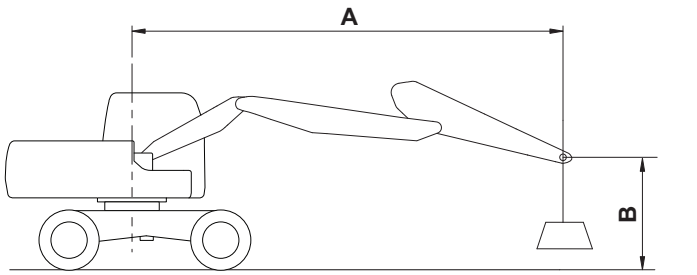
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	1.82	4.91
4.5					* 1.92	* 1.92	1.42	1.32	1.37	1.27	6.10
3					2.18	2.05	1.40	1.30	1.17	1.08	6.67
1.5					2.02	1.88	1.34	1.24	1.11	1.02	6.80
0			* 3.11	* 3.11	1.91	1.78	1.30	1.20	1.16	1.07	6.54
-1.5	* 3.36	* 3.36	* 3.40	3.21	1.91	1.77			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	4.02	16.13
15					* 4.23	* 4.23	3.13	2.91	3.03	2.81	20.02
10					4.81	4.51	3.09	2.87	2.58	2.38	21.88
5					4.45	4.15	2.96	2.74	2.45	2.26	22.32
0			* 6.87	* 6.87	4.22	3.92	2.87	2.65	2.57	2.37	21.45
-5	* 7.40	* 7.40	* 7.50	7.07	4.20	3.90			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Outrigger, Rear : Outrigger, Under Attach Down, Looking at the Front

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Double
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104675

Figure 15

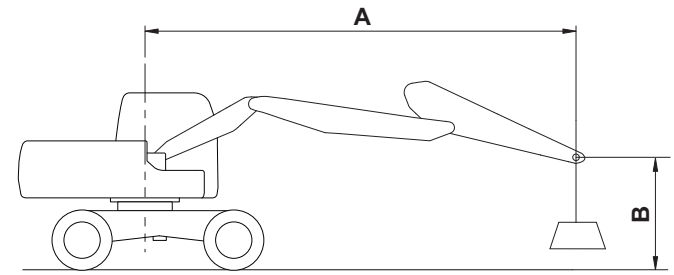
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	* 1.88	4.91
4.5					* 1.92	* 1.92	* 1.75	1.39	* 1.55	1.34	6.10
3					* 2.24	2.15	* 1.77	1.36	* 1.47	1.14	6.67
1.5					* 2.64	1.98	* 1.85	1.31	* 1.51	1.08	6.80
0			* 3.11	* 3.11	* 2.68	1.88	* 1.76	1.26	* 1.41	1.13	6.54
-1.5	* 3.36	* 3.36	* 3.40	* 3.40	* 2.15	1.87			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	* 4.15	16.13
15					* 4.23	* 4.23	* 3.85	3.05	* 3.42	2.95	20.02
10					* 4.94	4.74	* 3.91	3.01	* 3.23	2.50	21.88
5					* 5.82	4.37	* 4.08	2.88	* 3.32	2.38	22.32
0			* 6.87	* 6.87	* 5.92	4.14	* 3.88	2.79	* 3.11	2.49	21.45
-5	* 7.40	* 7.40	* 7.50	* 7.50	* 4.74	4.12			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Outrigger, Rear : Outrigger, Under Attach Up, Looking at the Front

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Double
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104676

Figure 16

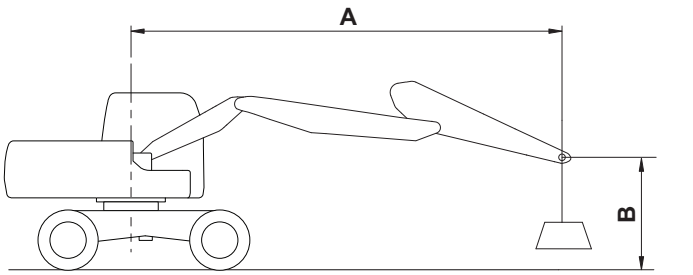
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	1.79	4.91
4.5					* 1.92	* 1.92	* 1.75	1.29	* 1.55	1.25	6.10
3					* 2.24	2.01	* 1.77	1.27	* 1.47	1.06	6.67
1.5					* 2.64	1.85	1.76	1.22	1.45	1.00	6.80
0			* 3.11	3.11	2.59	1.74	1.71	1.18	* 1.41	1.05	6.54
-1.5	* 3.36	* 3.36	* 3.40	3.14	* 2.15	1.73			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	3.95	16.13
15					* 4.23	* 4.23	* 3.85	2.85	* 3.42	2.75	20.02
10					* 4.94	4.43	* 3.91	2.81	* 3.23	2.33	21.88
5					* 5.82	4.07	3.87	2.68	3.20	2.21	22.32
0			* 6.87	6.85	5.71	3.84	3.77	2.59	* 3.11	2.31	21.45
-5	* 7.40	* 7.40	* 7.50	6.93	* 4.74	3.82			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Outrigger, Rear : Outrigger, Under Attach Down, Looking at the Rear

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Double
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104677

Figure 17

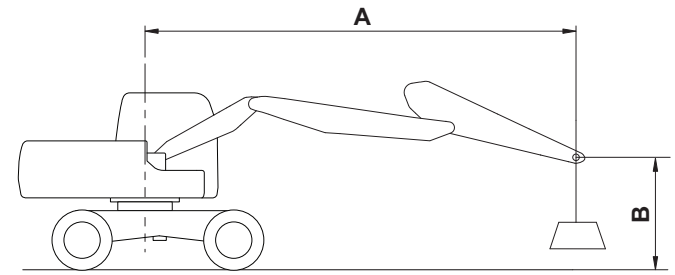
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	* 1.88	4.91
4.5					* 1.92	* 1.92	* 1.75	1.39	* 1.55	1.34	6.10
3					* 2.24	2.15	* 1.77	1.36	* 1.47	1.14	6.67
1.5					* 2.64	1.98	* 1.85	1.31	* 1.51	1.08	6.80
0			* 3.11	* 3.11	* 2.68	1.88	* 1.76	1.26	* 1.41	1.13	6.54
-1.5	* 3.36	* 3.36	* 3.40	* 3.40	* 2.15	1.87			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	* 4.15	16.13
15					* 4.23	* 4.23	* 3.85	3.05	* 3.42	2.95	20.02
10					* 4.94	4.74	* 3.91	3.01	* 3.23	2.50	21.88
5					* 5.82	4.37	* 4.08	2.88	* 3.32	2.38	22.32
0			* 6.87	* 6.87	* 5.92	4.14	* 3.88	2.79	* 3.11	2.49	21.45
-5	* 7.40	* 7.40	* 7.50	* 7.50	* 4.74	4.12			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Outrigger, Rear : Outrigger, Under Attach Up, Looking at the Rear

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Double
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104678

Figure 18

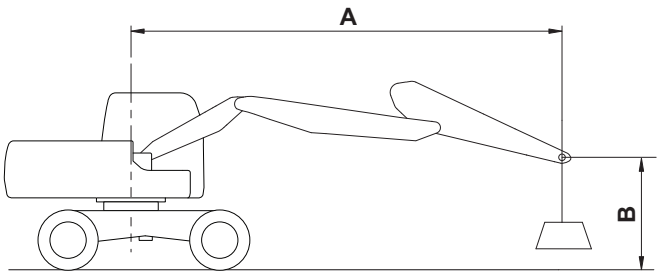
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			1.84	1.79	4.91
4.5					* 1.92	* 1.92	1.33	1.29	1.29	1.25	6.10
3					2.06	2.01	1.31	1.27	1.09	1.06	6.67
1.5					1.89	1.85	1.25	1.22	1.04	1.00	6.80
0			* 3.11	3.11	1.79	1.74	1.21	1.18	1.09	1.05	6.54
-1.5	* 3.36	* 3.36	3.20	3.14	1.78	1.73			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			4.05	3.95	16.13
15					* 4.23	* 4.23	2.94	2.85	2.84	2.75	20.02
10					4.54	4.43	2.89	2.81	2.41	2.33	21.88
5					4.17	4.07	2.77	2.68	2.29	2.21	22.32
0			* 6.87	6.85	3.95	3.84	2.68	2.59	2.39	2.31	21.45
-5	* 7.40	* 7.40	7.06	6.93	3.93	3.82			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Cradle, Rear : Dozer, Under Attach Up, Looking at the Front

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Single
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104679

Figure 19

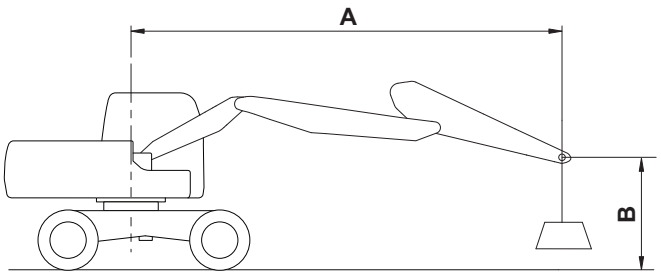
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	1.77	4.91
4.5					* 1.92	* 1.92	* 1.75	1.28	* 1.55	1.23	6.10
3					* 2.24	1.99	* 1.77	1.26	* 1.47	1.04	6.67
1.5					* 2.64	1.82	* 1.85	1.20	* 1.51	0.99	6.80
0			* 3.11	3.08	* 2.68	1.72	* 1.76	1.16	* 1.41	1.03	6.54
-1.5	* 3.36	* 3.36	* 3.40	3.12	* 2.15	1.71			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	3.90	16.13
15					* 4.23	* 4.23	* 3.85	2.81	* 3.42	2.71	20.02
10					* 4.94	4.39	* 3.91	2.77	* 3.23	2.29	21.88
5					* 5.82	4.02	* 4.08	2.64	* 3.32	2.17	22.32
0			* 6.87	6.79	* 5.92	3.79	* 3.88	2.55	* 3.11	2.28	21.45
-5	* 7.40	* 7.40	* 7.50	6.87	* 4.74	3.77			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Cradle, Rear : Dozer, Under Attach Down, Looking at the Rear

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Single
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104680

Figure 20

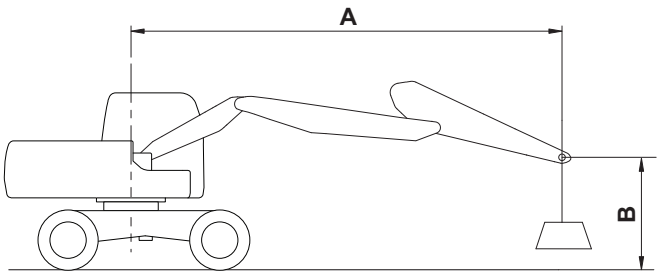
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	* 1.88	4.91
4.5					* 1.92	* 1.92	* 1.75	1.40	* 1.55	1.36	6.10
3					* 2.24	2.19	* 1.77	1.38	* 1.47	1.15	6.67
1.5					* 2.64	2.02	* 1.85	1.32	* 1.51	1.09	6.80
0			* 3.11	* 3.11	* 2.68	1.91	* 1.76	1.28	* 1.41	1.14	6.54
-1.5	* 3.36	* 3.36	* 3.40	* 3.40	* 2.15	1.90			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	* 4.15	16.13
15					* 4.23	* 4.23	* 3.85	3.10	* 3.42	2.99	20.02
10					* 4.94	4.83	* 3.91	3.05	* 3.23	2.54	21.88
5					* 5.82	4.45	* 4.08	2.92	* 3.32	2.41	22.32
0			* 6.87	* 6.87	* 5.92	4.21	* 3.88	2.83	* 3.11	2.52	21.45
-5	* 7.40	* 7.40	* 7.50	* 7.50	* 4.74	4.19			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Cradle, Rear : Dozer, Under Attach Up, Looking at the Rear

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Single
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104681

Figure 21

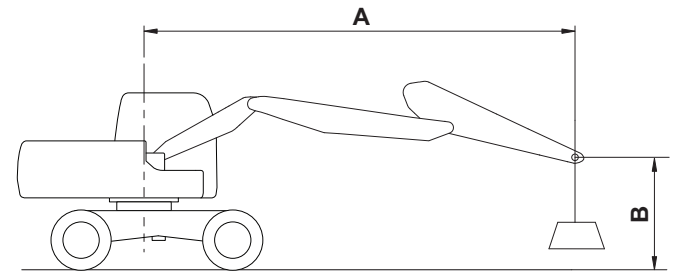
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					1.84	* 2.01			1.55	1.77	4.91
4.5					1.85	* 1.92	1.11	1.28	1.06	1.23	6.10
3					1.73	1.99	1.09	1.26	0.89	1.04	6.67
1.5					1.57	1.82	1.03	1.20	0.84	0.99	6.80
0			2.61	3.08	1.47	1.72	0.99	1.16	0.88	1.03	6.54
-1.5	* 3.36	* 3.36	2.65	3.12	1.46	1.71			1.05	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					4.05	* 4.42			3.41	3.90	16.13
15					4.08	* 4.23	2.44	2.81	2.35	2.71	20.02
10					3.82	4.39	2.39	2.77	1.97	2.29	21.88
5					3.46	4.02	2.27	2.64	1.86	2.17	22.32
0			5.75	6.79	3.24	3.79	2.18	2.55	1.94	2.28	21.45
-5	* 7.40	* 7.40	5.83	6.87	3.22	3.77			2.32	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Dozer, Rear : Outrigger, Under Attach Down, Looking at the Front

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Single
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104682

Figure 22

METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	* 1.88	4.91
4.5					* 1.92	* 1.92	* 1.75	1.51	* 1.55	1.46	6.10
3					* 2.24	* 2.24	* 1.77	1.49	* 1.47	1.24	6.67
1.5					* 2.64	2.18	* 1.85	1.43	* 1.51	1.18	6.80
0			* 3.11	* 3.11	* 2.68	2.07	* 1.76	1.39	* 1.41	1.24	6.54
-1.5	* 3.36	* 3.36	* 3.40	* 3.40	* 2.15	2.06			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	* 4.15	16.13
15					* 4.23	* 4.23	* 3.85	3.33	* 3.42	3.22	20.02
10					* 4.94	* 4.94	* 3.91	3.29	* 3.23	2.74	21.88
5					* 5.82	4.80	* 4.08	3.16	* 3.32	2.61	22.32
0			* 6.87	* 6.87	* 5.92	4.56	* 3.88	3.06	* 3.11	2.74	21.45
-5	* 7.40	* 7.40	* 7.50	* 7.50	* 4.74	4.54			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.
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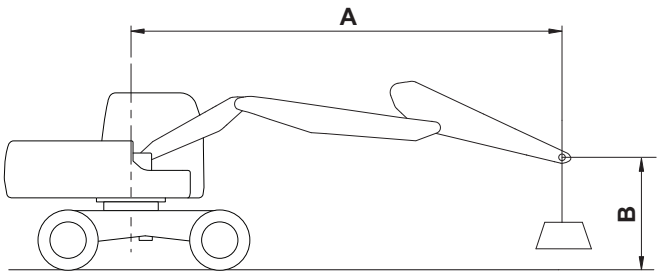

Front : Dozer, Rear : Outrigger, Under Attach Up, Looking at the Front

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Single
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104683

Figure 23

METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	1.84	4.91
4.5					* 1.92	* 1.92	* 1.75	1.33	* 1.55	1.29	6.10
3					* 2.24	2.07	1.76	1.31	1.47	1.09	6.67
1.5					2.61	1.91	1.69	1.26	1.40	1.04	6.80
0			* 3.11	* 3.11	2.50	1.80	1.65	1.21	* 1.41	1.08	6.54
-1.5	* 3.36	* 3.36	* 3.40	3.26	* 2.15	1.79			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	4.07	16.13
15					* 4.23	* 4.23	* 3.85	2.94	* 3.42	2.84	20.02
10					* 4.94	4.57	3.87	2.90	3.23	2.41	21.88
5					5.76	4.20	3.73	2.77	3.08	2.28	22.32
0			* 6.87	* 6.87	5.51	3.97	3.63	2.68	* 3.11	2.39	21.45
-5	* 7.40	* 7.40	* 7.50	7.19	* 4.74	3.95			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

1. Load point is the end of the arm.
2. Capacities marked with an asterisk (*) are limited by hydraulic capacities.
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4. The least stable position is over the side.
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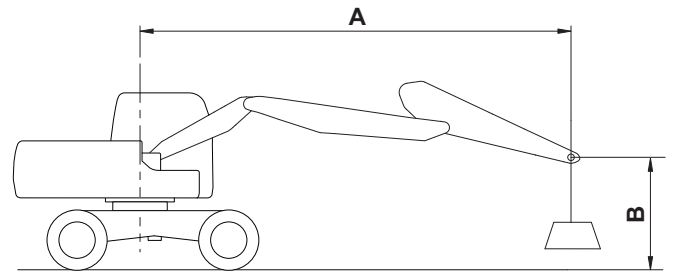

Front : Dozer, Rear : Outrigger, Under Attach Down, Looking at the Rear

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Single
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104684

Figure 24

METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	* 1.88	4.91
4.5					* 1.92	* 1.92	* 1.75	1.51	* 1.55	1.46	6.10
3					* 2.24	* 2.24	* 1.77	1.49	* 1.47	1.24	6.67
1.5					* 2.64	2.18	* 1.85	1.43	* 1.51	1.18	6.80
0			* 3.11	* 3.11	* 2.68	2.07	* 1.76	1.39	* 1.41	1.24	6.54
-1.5	* 3.36	* 3.36	* 3.40	* 3.40	* 2.15	2.06			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	* 4.15	16.13
15					* 4.23	* 4.23	* 3.85	3.33	* 3.42	3.22	20.02
10					* 4.94	* 4.94	* 3.91	3.29	* 3.23	2.74	21.88
5					* 5.82	4.80	* 4.08	3.16	* 3.32	2.61	22.32
0			* 6.87	* 6.87	* 5.92	4.56	* 3.88	3.06	* 3.11	2.74	21.45
-5	* 7.40	* 7.40	* 7.50	* 7.50	* 4.74	4.54			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

1. Load point is the end of the arm.
2. Capacities marked with an asterisk (*) are limited by hydraulic capacities.
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4. The least stable position is over the side.
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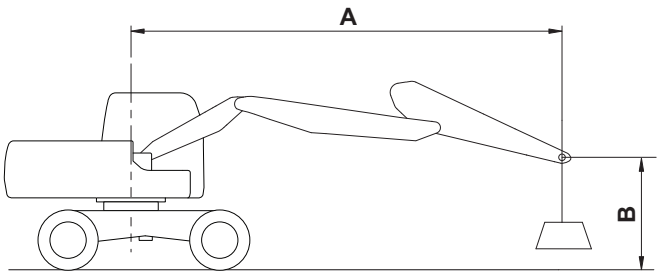

Front : Dozer, Rear : Outrigger, Under Attach Up, Looking at the Rear

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Single
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104685

Figure 25

METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	1.84	4.91
4.5					* 1.92	* 1.92	1.39	1.33	1.34	1.29	6.10
3					2.14	2.07	1.37	1.31	1.14	1.09	6.67
1.5					1.97	1.91	1.31	1.26	1.09	1.04	6.80
0			* 3.11	* 3.11	1.87	1.80	1.27	1.21	1.14	1.08	6.54
-1.5	* 3.36	* 3.36	3.34	3.26	1.86	1.79			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	4.07	16.13
15					* 4.23	* 4.23	3.06	2.94	2.96	2.84	20.02
10					4.71	4.57	3.02	2.90	2.52	2.41	21.88
5					4.35	4.20	2.89	2.77	2.40	2.28	22.32
0			* 6.87	* 6.87	4.12	3.97	2.80	2.68	2.51	2.39	21.45
-5	* 7.40	* 7.40	7.37	7.19	4.10	3.95			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

1. Load point is the end of the arm.
2. Capacities marked with an asterisk (*) are limited by hydraulic capacities.
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4. The least stable position is over the side.
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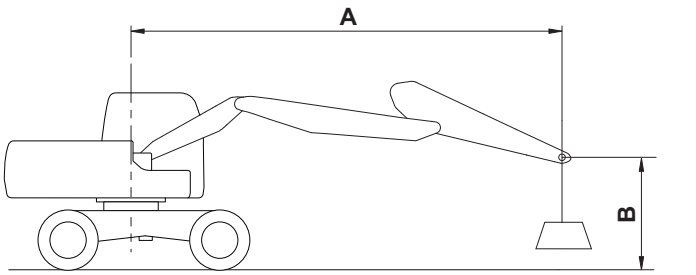


Front : Outrigger, Rear : Outrigger, Under Attach Down, Looking at the Front

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Single
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104686

Figure 26

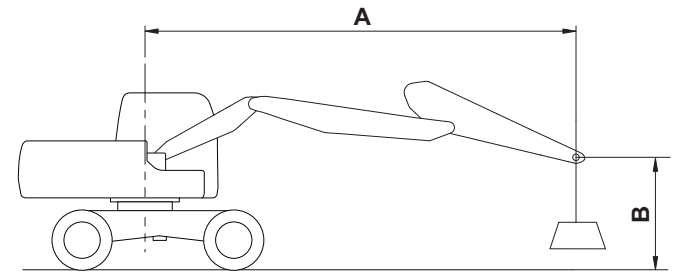
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	1.88	4.91
4.5					* 1.92	* 1.92	* 1.75	1.36	* 1.55	1.31	6.10
3					* 2.24	2.11	* 1.77	1.34	* 1.47	1.11	6.67
1.5					* 2.64	1.94	* 1.85	1.28	* 1.51	1.05	6.80
0			* 3.11	* 3.11	* 2.68	1.84	* 1.76	1.24	* 1.41	1.10	6.54
-1.5	* 3.36	* 3.36	* 3.40	3.35	* 2.15	1.83			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	4.14	16.13
15					* 4.23	* 4.23	* 3.85	2.99	* 3.42	2.89	20.02
10					* 4.94	4.66	* 3.91	2.95	* 3.23	2.45	21.88
5					* 5.82	4.29	* 4.08	2.82	* 3.32	2.33	22.32
0			* 6.87	* 6.87	* 5.92	4.05	* 3.88	2.73	* 3.11	2.44	21.45
-5	* 7.40	* 7.40	* 7.50	7.38	* 4.74	4.03			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Outrigger, Rear : Outrigger, Under Attach Up, Looking at the Front

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Single
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104687

Figure 27

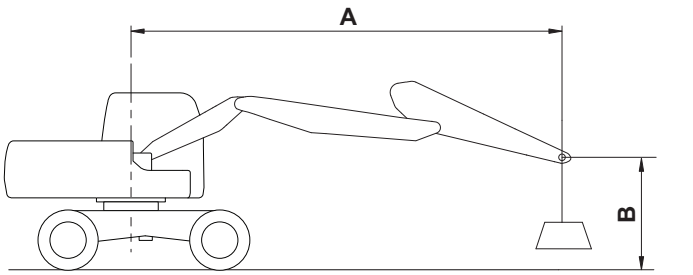
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	1.81	4.91
4.5					* 1.92	* 1.92	* 1.75	1.31	* 1.55	1.26	6.10
3					* 2.24	2.03	* 1.77	1.29	* 1.47	1.07	6.67
1.5					* 2.64	1.87	1.72	1.23	1.42	1.01	6.80
0			* 3.11	* 3.11	2.54	1.76	1.68	1.19	* 1.41	1.06	6.54
-1.5	* 3.36	* 3.36	* 3.40	3.20	* 2.15	1.75			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	3.99	16.13
15					* 4.23	* 4.23	* 3.85	2.88	* 3.42	2.78	20.02
10					* 4.94	4.49	* 3.91	2.84	* 3.23	2.36	21.88
5					* 5.82	4.12	3.80	2.71	3.14	2.23	22.32
0			* 6.87	* 6.87	5.61	3.89	3.70	2.62	* 3.11	2.34	21.45
-5	* 7.40	* 7.40	* 7.50	7.05	* 4.74	3.87			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Outrigger, Rear : Outrigger, Under Attach Down, Looking at the Rear

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Single
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104688

Figure 28

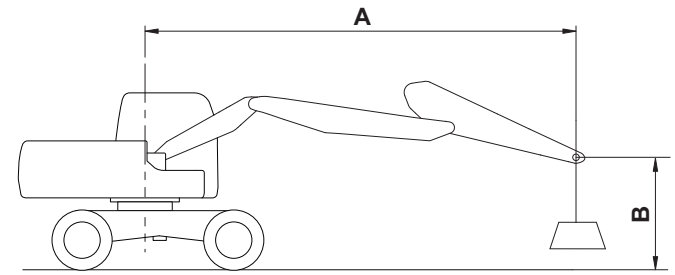
METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			* 1.88	1.88	4.91
4.5					* 1.92	* 1.92	* 1.75	1.36	* 1.55	1.31	6.10
3					* 2.24	2.11	* 1.77	1.34	* 1.47	1.11	6.67
1.5					* 2.64	1.94	* 1.85	1.28	* 1.51	1.05	6.80
0			* 3.11	* 3.11	* 2.68	1.84	* 1.76	1.24	* 1.41	1.10	6.54
-1.5	* 3.36	* 3.36	* 3.40	3.35	* 2.15	1.83			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			* 4.15	4.14	16.13
15					* 4.23	* 4.23	* 3.85	2.99	* 3.42	2.89	20.02
10					* 4.94	4.66	* 3.91	2.95	* 3.23	2.45	21.88
5					* 5.82	4.29	* 4.08	2.82	* 3.32	2.33	22.32
0			* 6.87	* 6.87	* 5.92	4.05	* 3.88	2.73	* 3.11	2.44	21.45
-5	* 7.40	* 7.40	* 7.50	7.38	* 4.74	4.03			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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.



Front : Outrigger, Rear : Outrigger, Under Attach Up, Looking at the Rear

Boom : Upper Boom 1.89 m (14' 5")
: Lower Boom 1.88 m (15' 1")
Arm : 2.25 m (6' 11")
Bucket : Without Bucket
Counterweight : 1,350 kg (2,976 lb)
Tire : 2W_Single
: Rating Over Front
: Rating Over Side or 360 degree
Unit : 1,000 kg (1,000 lb)

DS2104689

Figure 29

METRIC 1,000 kg

A (m) / B (m)	1.5		3		4		6		MAX. REACH		
											A (m)
6					* 2.01	* 2.01			1.80	1.81	4.91
4.5					* 1.92	* 1.92	1.30	1.31	1.26	1.26	6.10
3					2.02	2.03	1.28	1.29	1.07	1.07	6.67
1.5					1.85	1.87	1.23	1.23	1.01	1.01	6.80
0			3.09	* 3.11	1.75	1.76	1.18	1.19	1.06	1.06	6.54
-1.5	* 3.36	* 3.36	3.13	3.20	1.74	1.75			* 1.17	* 1.17	5.81
-3									* 0.70	* 0.70	4.04

FEET 1,000 lb

A (ft) / B (ft)	5		10		15		20		MAX. REACH		
											A (ft)
20					* 4.42	* 4.42			3.96	3.99	16.13
15					* 4.23	* 4.23	2.87	2.88	2.77	2.78	20.02
10					4.44	4.49	2.83	2.84	2.35	2.36	21.88
5					4.08	4.12	2.70	2.71	2.23	2.23	22.32
0			6.82	* 6.87	3.85	3.89	2.61	2.62	2.34	2.34	21.45
-5	* 7.40	* 7.40	6.9	7.05	3.84	3.87			* 2.58	* 2.58	19.06
-10									* 1.55	* 1.55	13.26

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/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
Charcoal	401 kg/m³ (695 lb/yd³)	-	-	-
Coke, blast furnace size	433 kg/m³ (729 lb/yd³)	-	-	-
Coke, foundry size	449 kg/m³ (756 lb/yd³)	-	-	-
Coal, bituminous slack, piled	801 kg/m³ (1,350 lb/yd³)	-	-	-
Coal, bituminous r. of m., piled	881 kg/m³ (1,485 lb/yd³)	-	-	-
Coal, anthracite	897 kg/m³ (1,512 lb/yd³)	-	-	-
Clay, DRY, in broken lumps	1,009 kg/m³ (1,701 lb/yd³)	-	-	-
Clay, DAMP, natural bed	-	-	1,746 kg/m³ (2,943 lb/yd³)	-
Cement, portland, DRY granular	-	-	1,506 kg/m³ (2,583 lb/yd³)	-
Cement, portland, DRY clinkers	-	1,362 kg/m³ (2,295 lb/yd³)	-	-
Dolomite, crushed	-	-	1,522 kg/m³ (2,565 lb/yd³)	-
Earth, loamy, DRY, loose	-	1,202 kg/m³ (2,025 lb/yd³)	-	-
Earth, DRY, packed	-	-	1,522 kg/m³ (2,565 lb/yd³)	-
Earth, WET, muddy	-	-	1,762 kg/m³ (2,970 lb/yd³)	-
Gypsum, calcined, (heated, powder)	961 kg/m³ (1,620 lb/yd³)	-	-	-

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/m³ (2,565 lb/yd³)	-
Gravel, DRY, packed fragments	-	-	-	1,810 kg/m³ (3,051 lb/yd³)
Gravel, WET, packed fragments	-	-	-	1,922 kg/m³ (3,240 lb/yd³)
Limestone, graded above 2	-	1,282 kg/m³ (2,160 lb/yd³)	-	-
Limestone, graded 1-1/2 or 2	-	1,362 kg/m³ (2,295 lb/yd³)	-	-
Limestone, crushed	-	-	1,522 kg/m³ (2,565 lb/yd³)	-
Limestone, fine	-	-	1,602 kg/m³ (2,705 lb/yd³)	-
Phosphate, rock	-	1,282 kg/m³ (2,160 lb/yd³)	-	-
Salt	929 kg/m³ (1,566 lb/yd³)	-	-	-
Snow, light density	529 kg/m³ (891 lb/yd³)	-	-	-
Sand, DRY, loose	-	-	1,522 kg/m³ (2,565 lb/yd³)	-
Sand, WET, packed	-	-	-	1,922 kg/m³ (3,240 lb/yd³)
Shale, broken	-	1,362 kg/m³ (2,295 lb/yd³)	-	-
Sulfur, broken	529 kg/m³ (891 lb/yd³)	-	-	-

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